

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

HYUNDAI MOTOR COMPANY
2005 Hyundai Tucson 4-Door MPV
NHTSA No. C50506

MGA RESEARCH CORPORATION
446 Executive Drive
Troy, Michigan 48083



Test Dates: May 24-26, 2005
Report Date: May 27, 2005

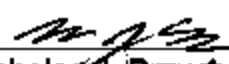
FINAL REPORT

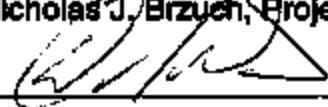
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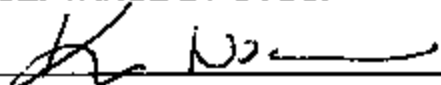


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16. Abstract A compliance test series was conducted on the subject 2005 Hyundai Tucson 4-Door MPV, NHTSA No. C50506, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-201U-01 for the determination of FMVSS 201U compliance. The testing was conducted at MGA Research Corporation in Troy, Michigan on May 24-26, 2006. Test failures identified were as follows: None The data recorded seems to indicate that the 2006 Hyundai Tucson 4-Door MPV tested appears to comply with the requirements for FMVSS 201U which were set forth by the National Highway Traffic Safety Administration.			
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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 2005 Hyundai Tucson 4-Door MPV, meets the performance requirements of FMVSS 201U, Occupant Protection in Interior Impact - Upper Interior Head Impact Protection.

Tests were conducted during May 24-26, 2005 on a 2005 Hyundai Tucson 4-Door MPV, manufactured by Hyundai Motor Company.

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 March 20, 2003.

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 March 20, 2003.

2.0 COMPLIANCE TEST DATA SUMMARY

The 2005 Hyundai Tucson 4-Door MPV was equipped with A, B, C, and rear-pillars, a grab handle located on the side rail above the front passenger and each rear door, an adjustable seat belt anchorage on each B-pillar, a non-adjustable seat belt anchorage on each C-pillar, and a seat belt anchorage on the rear upper roof.

Upon completion of targeting the test vehicle, twelve (12) targets were chosen to be impacted based upon engineering judgment and certification test data provided by Hyundai. Targets were chosen which appeared most likely to give high HIC(d) values. The twelve (12) targets chosen were:

AP1	BP1	RP2	UR2
AP2	BP3	RH	UR4
AP3	OP2	SR2-A	UR6

The 2005 Hyundai Tucson 4-Door MPV tested appears to comply with the performance criteria for FMVSS 201U. 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: 2005 Hyundai Tucson 4-Door MPV

VEH. NHTSA NO.: C50508 VIN: KM8JM12B45U064356 COLOR: White

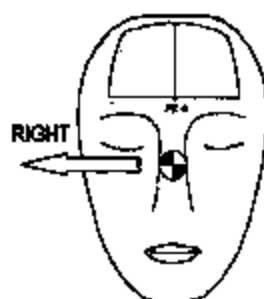
VEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

TARGET	VEHICLE SIDE	HORIZONTAL ANGLE (deg)	VERTICAL ANGLE (deg)	VELOCITY (kph)	HIC(d)	FMH HIC	IMPACT ON FMH (mm)	
							Above	Left/Right
AP1	Right	114	31	18.7	489	401	6	3 Left
AP2	Left	202	47	18.8	432	352	5	4 Left
AP3	Right	158	42	18.9	384	261	11	3 Right
BP1	Right	90	20	18.5	482	392	28	0
BP3	Right	81	-6	23.7	748	771	18	14 Right
OP2	Right	90	0	24.0	671	668	28	0
RP2	Right	85	2	23.6	661	656	18	11 Right
RH	Left	0	50	23.6	705	713	5	4 Right
SR2-A	Left	270	28	18.8	326	210	35	0
UR2	Left	270	40	23.7	684	660	25	7 Left
UR4	Right	90	46	23.3	722	737	35	0
UR6	Right	90	40	23.7	713	724	35	6 Left

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



POST TEST COMMENTS:

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

AP3 Right: A-pillar trim cracked.

BP3 Right: B-pillar trim cracked.

UR4 Right: Headliner deformation.

REMARKS:

The targets listed were impacted in the following order:

Right: AP3, AP1, UR4, BP3, BP1, OP2, UR6, RP2

Left: RH, UR2, SR2-A, AP2

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

RECORDED BY: Nicholas J. Brzuch

DATE: May 26, 2005

APPROVED BY: David G. Gotwals

TABLE 2-2

GENERAL TEST AND VEHICLE PARAMETER DATA

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Hyundai Tucson 4-Door MPV

VEH. NHTSA NO.: C50506 VIN: KM8JM12B45U064356 COLOR: White

VEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

INTERIOR TRIM INFORMATION: A, B, C, and rear-pillars, a grab handle located on the side rail above the front passenger and each rear door, an adjustable seat belt anchorage on each B-pillar, a non-adjustable seat belt anchorage on each C-pillar, and a seat belt anchorage on the rear upper roof.

SUNROOF INFORMATION:

Installed: Yes X No
Operation: Electric Manual

ROLL-BAR INFORMATION:

Installed: Yes X No
Padded: Yes X No
Braces: Yes X No

GENERAL INFORMATION:

Date Received: March 17, 2005; Odometer Reading 89 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Hyundai Motor Company

Date of Manufacture: October, 2004; VIN: KM8JM12B45U064356

GVWR: 2029.8 kg; GAWR FRONT: 1149.9 kg;

GAWR REAR: 1100.0 kg

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load:

FRONT: 210 kpa REAR: 210 kpaRecommended Tire Size: P215/65R16

Recommended Cold Tire Pressure:

FRONT: 210 kpa REAR: 210 kpaSize of Tire on Test Vehicle: P215/65R16Type of Spare Tire: T155/90R16 Saver: X; Standard _____

VEHICLE CAPACITY DATA:

Type of Front Seats: Bench X; Bucket _____; Split Bench _____Number of Occupants: Front 2; Rear 3; TOTAL 5

VEHICLE CAPACITY WEIGHT:

Vehicle Capacity Weight (VCW) = 390 kgNo. of Occupants x 68 kg = 340 kgRated Cargo/Luggage Weight (RCLW) = 50 kg (difference) (110 lbs.)

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

Right Front = 460.5 kg Right Rear = 309.0 kgLeft Front = 457.5 kg Left Rear = 309.0 kgTOTAL FRONT = 918.0 kg TOTAL REAR = 618.0 kg% Total Weight = 59.8 % % Total Weight = 40.2 %TOTAL DELIVERED WEIGHT = 1536.0 kg

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 1536.0 kgMax. Test Cargo/Luggage Weight = 50.0 kgTarget Test Weight = 1586.0 kg

WEIGHT OF TEST VEHICLE FULLY LOADED:

Right Front =	<u>460.5</u> kg	Right Rear =	<u>334.5</u> kg
Left Front =	<u>456.5</u> kg	Left Rear =	<u>335.0</u> kg
TOTAL FRONT =	<u>917.0</u> kg	TOTAL REAR =	<u>669.5</u> kg
% Total Weight =	<u>57.8</u> %	% Total Weight =	<u>42.2</u> %
TOTAL TEST WEIGHT = <u>1586.5</u> kg			
Weight of ballast secured in vehicle's cargo area = <u>50.5</u> kg			

TEST VEHICLE ATTITUDE:

AS DELIVERED: Right Front 759 mm; Left Front 759 mm;
 Right Rear 790 mm; Left Rear 786 mm;
 Pitch Angle at Right Door Sill = 0.4 Rear higher
 Pitch Angle at Left Door Sill = 0.0
 Roll Angle at Front Bumper = 0.5 Left side higher
 Roll Angle at Rear Bumper = 0.4 Left side higher

FULLY LOADED: Right Front 757 mm; Left Front 758 mm;
 Right Rear 781 mm; Left Rear 778 mm;
 Pitch Angle at Right Door Sill = 0.2 Rear higher
 Pitch Angle at Left Door Sill = 0.2 Front higher
 Roll Angle at Front Bumper = 0.3 Left side higher
 Roll Angle at Rear Bumper = 0.4 Left side higher

AS TARGETED: Right Front 891 mm; Left Front 894 mm;
 Right Rear 909 mm; Left Rear 906 mm;
 Pitch Angle at Right Door Sill = 0.2 Rear higher
 Pitch Angle at Left Door Sill = 0.2 Front higher
 Roll Angle at Front Bumper = 0.4 Left side higher
 Roll Angle at Rear Bumper = 0.4 Left side higher

AS TESTED ON RIGHT SIDE:

Pitch Angle at Right Door Sill = 0.2 Rear higher
Pitch Angle at Left Door Sill = 0.2 Front higher
Roll Angle at Front Bumper = 0.4 Left side higher
Roll Angle at Rear Bumper = 0.4 Left side higher

AS TESTED ON LEFT SIDE:

Pitch Angle at Right Door Sill = 0.2 Rear higher
Pitch Angle at Left Door Sill = 0.2 Front higher
Roll Angle at Front Bumper = 0.3 Left side higher
Roll Angle at Rear Bumper = 0.4 Left side higher

VEHICLE WHEELBASE = 2615 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: Nicholas J. BrzuchDATE: May 20, 2005APPROVED BY: David G. Gotwals

TABLE 2-3
HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Hyundai Tucson 4-Door MPV

VEH. NHTSA NO.: C50506 VIN: KM8JM12B45U064356 COLOR: White

VEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005

TEST LABORATORY: MGA Research Corporation

OBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

HORIZONTAL IMPACT ANGLE RANGE FOR A AND B PILLARS

	HORIZONTAL ANGLE SPECIFIED RANGE	MINIMUM HORIZONTAL ANGLE	MAXIMUM HORIZONTAL ANGLE
A-PILLAR	L 195°-255°	L 201.8°	L 246.8°
	R 105°-165°	R 113.5°	R 158.3°
B-PILLAR	L 195°-345°	L 201.1°	L 279.1°
	R 15°-165°	R 80.5°	R 159.1°

AS DETERMINED USING THE PROCEDURES SPECIFIED IN S8.13.4.1

REMARKS:

RECORDED BY: Nicholas J. Brzuch

DATE: May 20, 2005

APPROVED BY: David G. Gotwals

TABLE 2-4

VERTICAL IMPACT ANGLE RANGES

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Hyundai Tucson 4-Door MPVVEH. NHTSA NO.: C50506 VIN: KM8JM12B45U084356 COLOR: WhiteVEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

VERTICAL IMPACT ANGLE RANGES

		VERTICAL ANGLE SPECIFIED RANGE		MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
FRONT HEADER	FH1	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
	FH2	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°
SIDE RAIL	SR1	L	0°-50°	L 0°	L 21°
		R	0°-50°	R 0°	R 31°
	SR2A	L	0°-50°	L 0°	L 26°
		R	0°-50°	R 0°	R 50°
	SR2B	L	0°-50°	L 0°	L 25°
		R	0°-50°	R 0°	R 43°
	SR3-1	L	0°-50°	L 0°	L 43°
		R	0°-50°	R 0°	R 45°
	SR3-2	L	0°-50°	L 0°	L 41°
		R	0°-50°	R 0°	R 41°
	SR3-3	L	0°-50°	L 0°	L 30°
		R	0°-50°	R 0°	R 28°
REAR HEADER	RH	L	0°-50°	L 0°	L 50°
		R	0°-50°	R 0°	R 50°

		VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
A-PILLAR	AP1	L -5°-50°	L -5°	L 32°
		R -5°-50°	R -5°	R 31°
	AP2	L -5°-50°	L -5°	L 47°
		R -5°-50°	R -5°	R 47°
	AP3	L -5°-50°	L -5°	L 42°
		R -5°-50°	R -5°	R 42°
B-PILLAR	BP1	L -10°-50°	L -10°	L 19°
		R -10°-50°	R -10°	R 20°
	BP2*	L 0°-50°	L 0°	L 0°
		R 0°-50°	R 0°	R 0°
	BP3	L -10°-50°	L -10°	L -7°
		R -10°-50°	R -10°	R -6°
	BP4	L -10°-50°	L -10°	L -8°
		R -10°-50°	R -10°	R -10°
OTHER PILLAR	OP1*	L 0°-50°	L 0°	L 14°
		R 0°-50°	R 0°	R 14°
	OP2	L -10°-50°	L -10°	L 0°
		R -10°-50°	R -10°	R 0°
REAR PILLAR	RP1	L -10°-50°	L -10°	L 33°
		R -10°-50°	R -10°	R 40°
	RP2	L 0°-50°	L -10°	L 6°
		R 0°-50°	R -10°	R 2°
UPPER ROOF 1		0°-50°	0°	39°
UPPER ROOF 2		0°-50°	0°	40°
UPPER ROOF 3		0°-50°	0°	33°
UPPER ROOF 4		0°-50°	0°	45°
UPPER ROOF 5		0°-50°	0°	27°

	VERTICAL ANGLE SPECIFIED RANGE	MINIMUM VERTICAL ANGLE	MAXIMUM VERTICAL ANGLE
UPPER ROOF 6	0°-50°	0°	40°

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

RECORDED BY: Nicholas J. Brzuch

DATE: May 20, 2005

APPROVED BY: David G. Gotwals

TABLE 2-5

TARGET MEASUREMENTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Hyundai Tucson 4-Door MPVVEH. NHTSA NO.: C50506 VIN: KMBJM12B45U064356 COLOR: WhiteVEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

Measurement	Description	Left Side	Right Side
M	Seat Fore/Aft Travel (Front seats)	240 mm	240 mm
T°	Horizontal < {CG-F1 (Left Seat) to (Right A-Pillar)}	113.2°	--
A1°	360° - T°	246.8°	--
W°	Horizontal < {CG-2 (Left Seat) to (Left A-Pillar)}	201.8°	--
A2°	A2° = W°	201.8°	--
U°	Horizontal < {CG-2 (Left Seat) to (Left B-Pillar)}	279.1°	--
B1°	B1° = U°	279.1°	--
V°	Horizontal < {CG-R (Left Seat) to (Left B-Pillar)}	201.1°	--
B2°	B2° = V°	201.1°	--
W° (right)	Horizontal < {CG-F2 (Right Seat) to (Right A-Pillar)}	--	158.3°
A1° (right)	A1° (right) = W° (right)	--	158.3°
T° (right)	Horizontal < {CG-F1 (Right Seat) to (Left A-Pillar)}	--	246.5°
A2° (right)	360° - T° (right)	--	113.5°
V° (right)	Horizontal < {CG-R (Right Seat) to (Right B-Pillar)}	--	159.1°
B1° (right)	B1° (right) = V° (right)	--	159.1°
U° (right)	Horizontal < {CG-F2 (Right Seat) to (Right B-Pillar)}	--	80.5°
B2° (right)	B2° (right) = U° (right)	--	80.5°
J	A-Pillar {(Plane 3) - (Plane 5)}	364.7 mm	365.1 mm
J/2	J + 2	177.4 mm	177.6 mm
D1	Upper Roof {(Plane A) - (Plane B)}	2010.0 mm	
D1/2	D1 + 2	1005.0 mm	
D2	Upper Roof {(Plane C) - (Plane D)}	1215.8 mm	

Measurement	Description	Left Side	Right Side
D2/2	D2 ÷ 2	607.9 mm	
.35D1	.35 × D1	703.5 mm	
.35D2	.35 × D2	425.5 mm	
N	B-Pillar ((BPR) - (lowest point on daylight opening forward of B-Pillar))	443.0 mm	452.4 mm
N/2	B-Pillar ((BP3) - (lowest point on daylight opening forward of B-Pillar))	221.5 mm	226.2 mm
N/4	B-Pillar ((BP4) - (lowest point on daylight opening forward of B-Pillar))	110.8 mm	113.1 mm
Q	O-Pillar (Plane 13 – Plane 14)	406.0 mm	408.6 mm
Q/2	Q / 2	203.0 mm	204.3 mm
D	R-Pillar (Point 7 – Point M)	825.0 mm	840.0 mm
3D/7	3*D / 7	353.6 mm	360.0 mm

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

SgRP Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1325.0	-352.9	419.8	1325.2	358.1	420.0
Rear Row	2154.0	-336.2	448.8	2154.2	344.8	449.0

SgRP Locations (vehicle coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
Front	1325.0	-355.0	420.0	1325.0	355.0	420.0
Rear	2155.0	-340.0	443.0	2155.0	340.0	443.0

CG Locations (world coordinates)						
	Left (mm)			Right (mm)		
	x	y	z	x	y	z
CGF1	1245.0	-352.9	1079.8	1245.2	358.1	1080.0
CGF2	1485.0	-352.9	1079.8	1485.2	358.1	1080.0
CGR	2314.0	-336.2	1108.8	2314.2	344.8	1108.0

REFERENCE FOR VEHICLE COORDINATE SYSTEM (measured in millimeters):

Upper door striker bolt (x, y, z) = 1545.7, 748.1, 501.9

Driver, front outboard seat anchorage (x, y, z) = 1832.2, 605.2, 1276.4

Upper door striker bolt (x, y, z) = 1545.7, -748.1, 501.9

REMARKS:

RECORDED BY: Nicholas J. Brzuch

DATE: May 20, 2005

APPROVED BY: David G. Gotwals

TABLE 2-6

SUMMARY OF TARGETING RESULTS

VEH. MOD YR/MAKE/MODEL/BODY: 2005 Hyundai Tucson 4-Door MPVVEH. NHTSA NO.: C50506 VIN: KMBJM12B45U064356 COLOR: WhiteVEH. BUILD DATE: October, 2004 TEST DATES: May 24-26, 2005TEST LABORATORY: MGA Research CorporationOBSERVERS: David Gotwals, Nicholas Brzuch, Bryan Hood, Matt Kerr

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
A-Pillar Left Side								
AP1	1029.1	-547.2	1194.4	246	32	No	—	No
AP2	893.3	-599.4	1108.3	202	47	No	—	Yes
AP3	746.9	-628.0	1019.8	202	42	No	—	No
A-Pillar Right Side								
AP1	1033.1	551.8	1187.9	114	31	No	—	Yes
AP2	894.0	603.1	1099.7	158	44	No	—	No
AP3	746.1	630.3	1012.5	158	42	No	—	Yes
B-Pillar Left Side								
BP1	1676.2	-463.9	1281.1	270	19	No	—	No
BP2	1552.2	-590.3	1031.7	270	0	No	—	No
BP3	1619.1	-615.2	1061.5	—	—	Yes	—	—
REL	1517.8	-609.3	1069.7	278	-7	—	1	No
BP4	1611.8	-651.1	951.9	202	-8	No	—	No
B-Pillar Right Side								
BP1	1579.1	486.5	1281.9	90	20	No	—	Yes
BP2	1554.0	593.6	1027.3	90	0	No	—	No
BP3	1522.7	618.2	1056.3	—	—	Yes	—	—
REL	1517.7	614.3	1081.2	81	-6	—	1	Yes
BP4	1614.1	655.0	943.6	159	-10	No	—	No

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
Other Pillar Left Side								
OPR	2322.4	-478.1	1276.7			No	--	No
OP1	2425.9	-605.7	1018.0	270	14	No	--	No
OP2	2046.6	-612.1	1073.1	--	--	Yes	--	--
REL	2366.6	-601.0	1067.3	270	0	--	2	No
Other Pillar Right Side								
OPR	2324.7	478.3	1274.1			No	--	No
OP1	2427.5	608.8	1016.2	90	14	No	--	No
OP2	2407.4	615.0	1069.6	--	--	Yes	--	--
REL	2372.5	600.0	1101.8	90	0	--	2	Yes
Rear Pillar Left Side								
RP1	2721.2	-506.1	1166.9	310	33	No	--	No
RP2	2666.3	-625.1	1036.5	--	--	Yes	1	--
REL	2675.5	-614.9	1044.1	280	6	--	--	No
Rear Pillar Right Side								
RP1	2711.7	500.5	1160.6	--	--	Yes	--	--
REL	2721.2	477.2	1157.6	45	40	--	1	No
RP2	2671.2	637.9	1011.6	--	--	Yes	--	--
REL	2693.4	625.8	1017.9	65	2	--	1	Yes
Front Header Left Side								
FH1	973.4	-457.2	1243.9	--	--	Yes	--	--
REL	968.5	-430.8	1242.6	180	50	--	1	No
FH2	957.0	-308.0	1253.6	180	50	No	--	No
Front Header Right Side								
FH1	975.9	462.5	1240.2	--	--	Yes	--	--
REL	971.4	435.1	1240.1	180	50	--	1	No
FH2	959.2	311.6	1249.9	180	50	No	--	No
Side Rail Left Side								
SR1	1179.1	-601.1	1267.2	--	--	Yes	--	--

SUMMARY OF TARGETING RESULTS								
Target	Location (mm)			Horizontal Angle (deg)	Vertical Angle (deg)	Relocation (Yes/No)	Extension (# of 25 mm Spheres)	Impact (Yes/No)
	x	y	z					
REL	1178.4	-478.3	1275.2	270	21	-	1	No
SR2A	1329.3	-494.9	1279.7	-	-	Yes	-	-
REL	1327.8	-471.2	1286.1	270	28	-	1	Yes
SR2B	1275.7	-496.4	1275.1	-	-	Yes	--	-
REL	1276.6	-476.6	1283.5	270	25	-	1	No
SR3-1	1893.0	-469.7	1273.6	270	43	No	-	No
SR3-2	2099.6	-471.3	1266.1	270	41	No	-	No
SR3-3	2471.9	-524.5	1221.4	270	30	No	-	No
Side Rail Right Side								
SR1	1163.0	496.0	1253.5	90	31	No	--	No
SR2A	1333.6	498.4	1276.6	-	-	Yes	-	-
REL	1376.2	477.3	1261.6	90	60	-	2	No
SR2B	1278.7	499.4	1271.5	-	-	Yes	-	--
REL	1284.7	471.8	1238.0	90	43	-	2	No
SR3-1	1889.9	476.7	1271.8	90	45	No	-	No
SR3-2	2105.6	480.3	1263.9	90	41	No	-	No
SR3-3	2475.2	526.2	1221.0	90	28	No	-	No
Rear Header Left Side								
RH	2689.3	-338.0	1233.2	0	50	No	--	Yes
Rear Header Right Side								
RH	2690.8	342.3	1209.1	0	50	No	-	No
Upper Roof Left Side								
UR1	1194.2	419.1	1287.5	270	39	No	-	No
UR2	1887.5	417.1	1319.4	270	40	No	--	Yes
UR3	2322.4	418.7	1300.5	270	33	No	-	No
Upper Roof Right Side								
UR4	1277.0	-419.9	1310.1	90	45	No	-	Yes
UR5	1578.0	-418.7	1322.0	90	27	No	-	No
UR6	2475.2	-421.7	1291.9	90	40	No	-	Yes

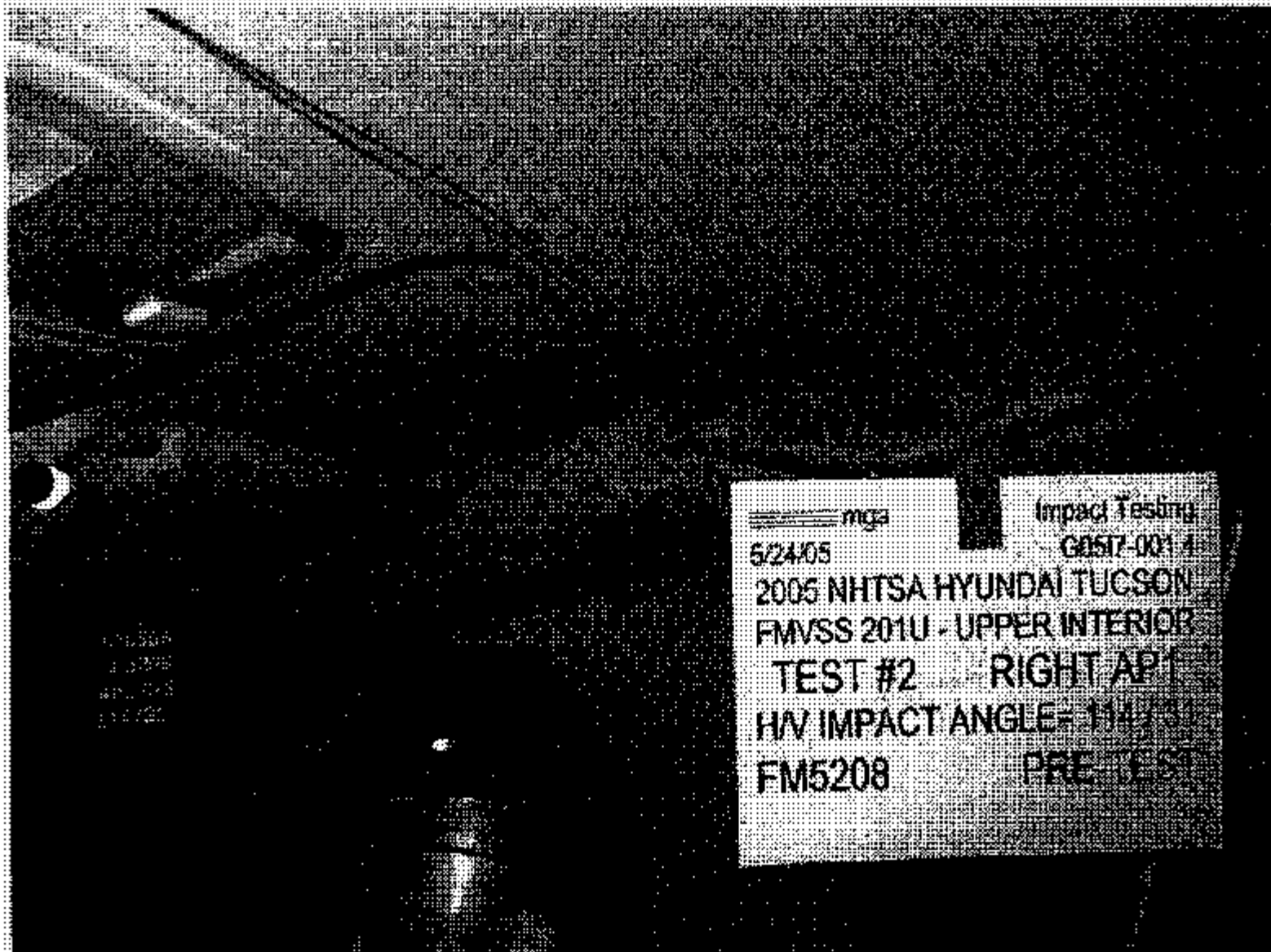
As determined using the Procedures specified in S10.1-10.13.

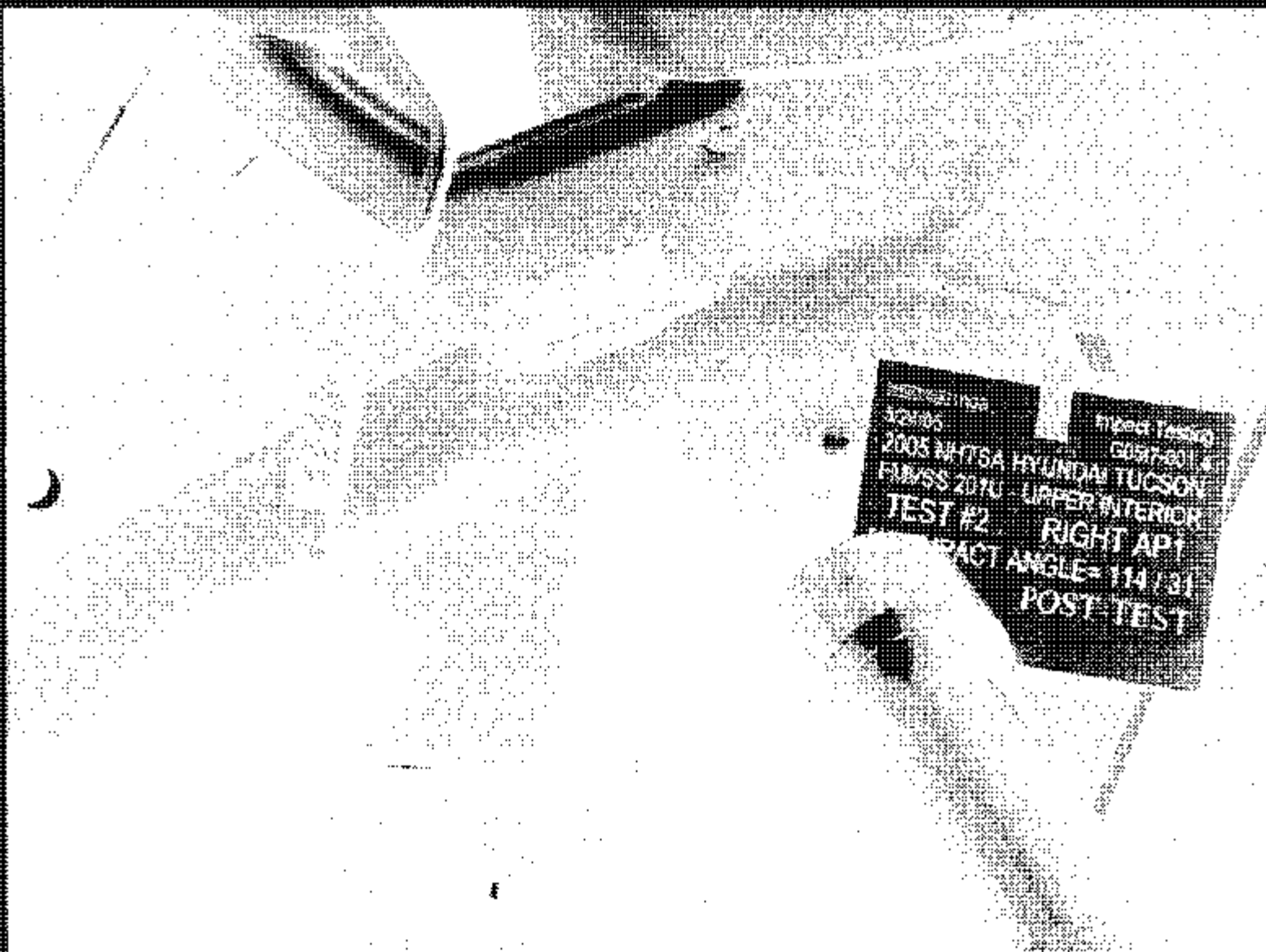
REMARKS: Targets AP1, AP2, AP3, BP1, RP1, SR1, SR2A, SR2B, SR3-1, SR3-2, and SR3-3 are located in the curtain airbag zone and subject to a reduced velocity Impact.

RECORDED BY: Nicholas J. Brzuch

DATE: May 20, 2005

APPROVED BY: David G. Gotwala





024106
2005 NHISA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #2 - RIGHT AP1
HIVIMPACT ANGLE = 114/31
FMVSS 201U - POST-TEST

MICHIGAN OPERATIONS
 DATE: 2/8/01
 SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
 REVISION NO.: 2
 PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Test Number: #2

Target (Vehicle Side): AP1 Right

Temperature: 22C

MGA Test Reference No.: FM5206

Humidity: 43%

Approach Horizontal Angles: 114°

Time of Test: 1:55 PM

Approach Vertical Angles: 31°

FMH Serial No.: [037]

Additional Description:

TEST RESULTS:

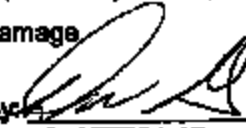
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
489	401	5	18.7	6	3 L

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	95.7	1.54	1.54
Z	7	J35791	89.5	1.39	1.39

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

No visible damage

Recorded By:  Approved By:  Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G0517-001.4

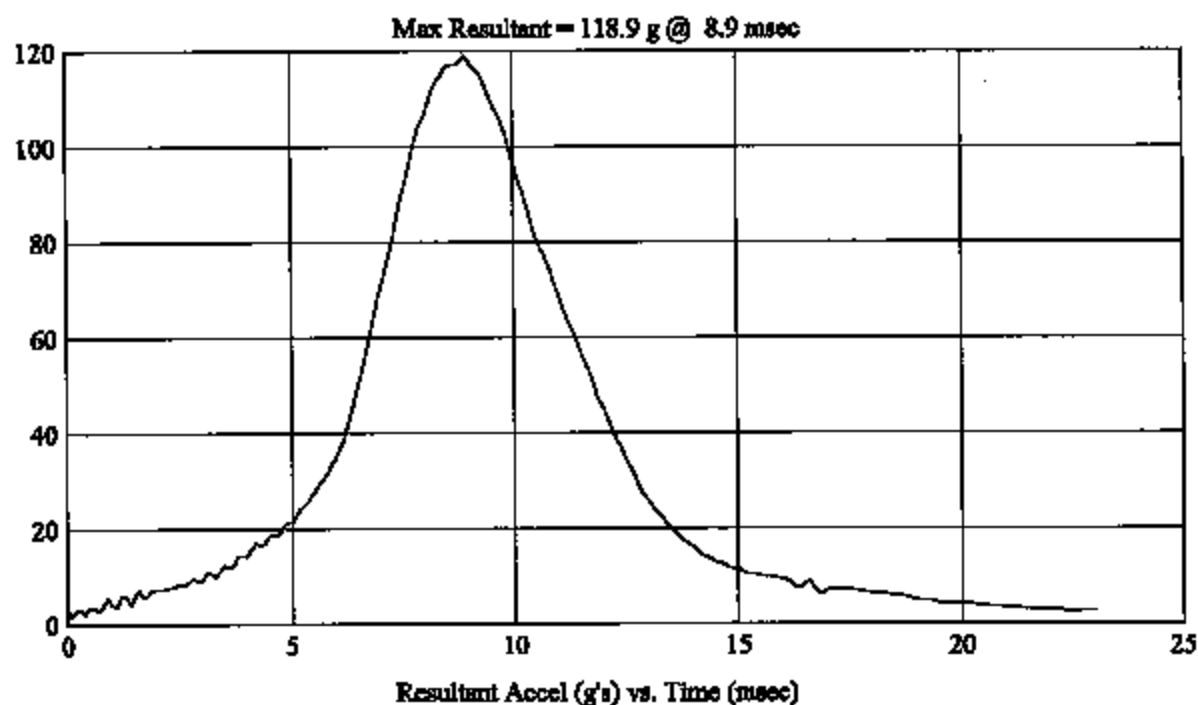
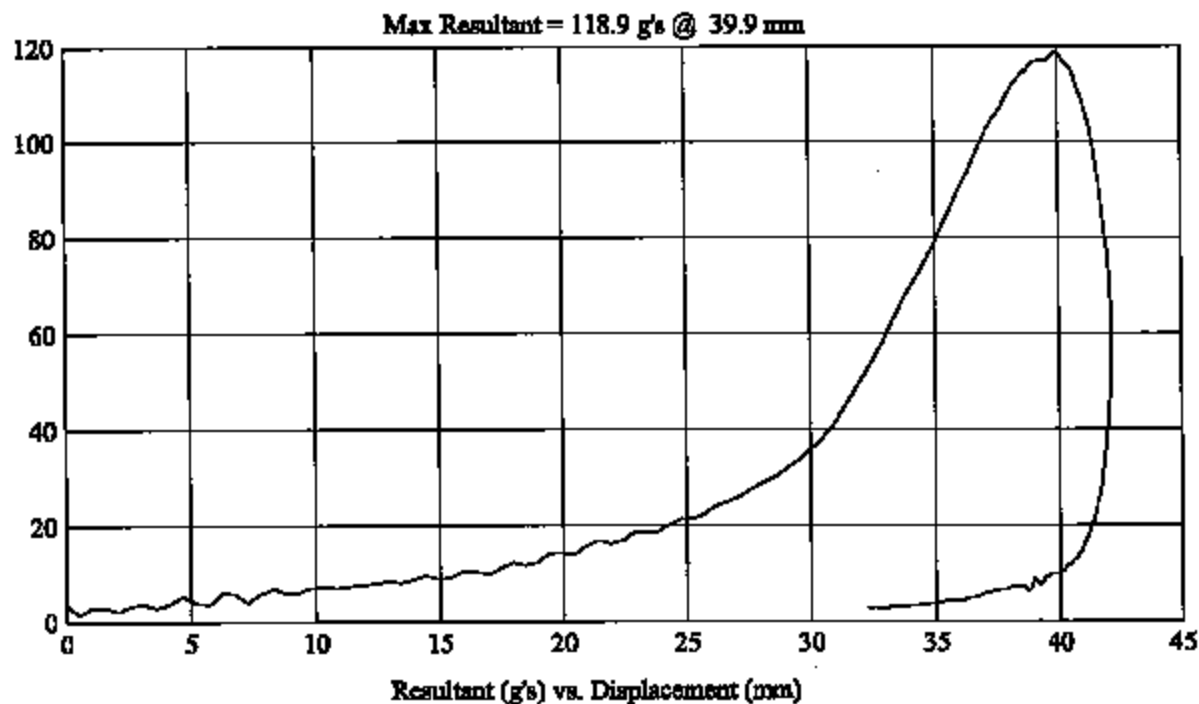
Customer: NHTSA
Test # 2
FM5208
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 114/31

HIC(d) = 469, HIC = 401, Delta T = 5 msec



FMH
G0517-001.4

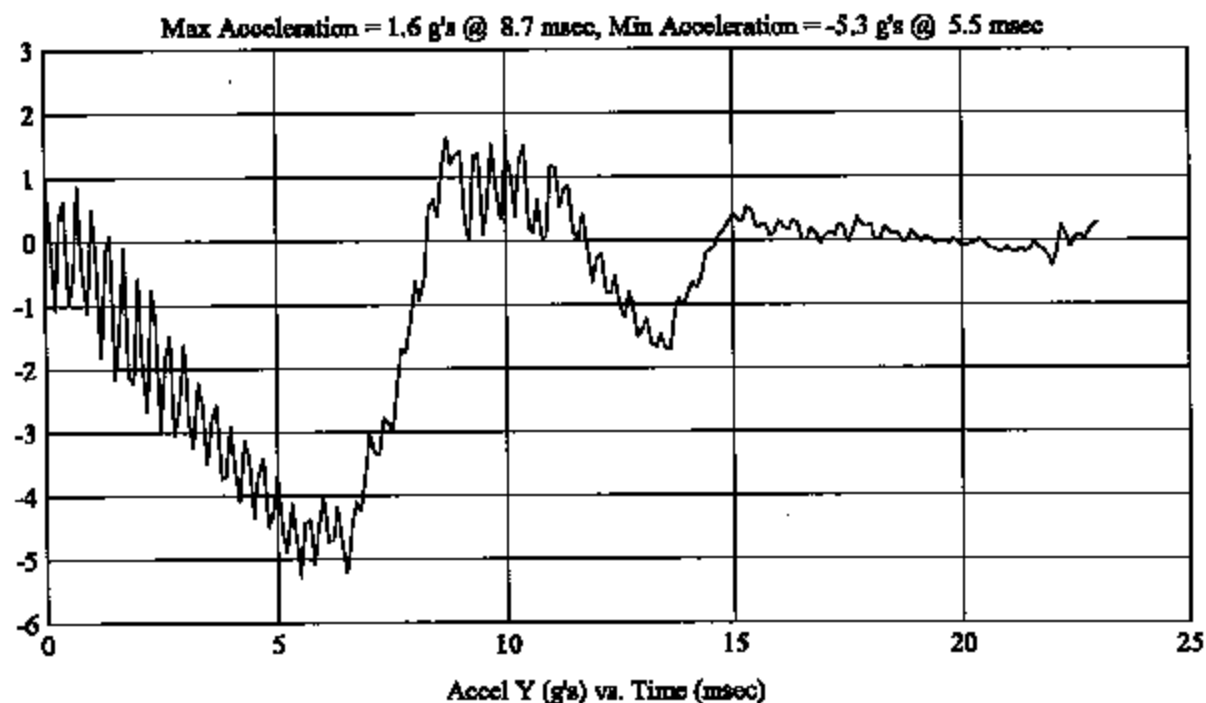
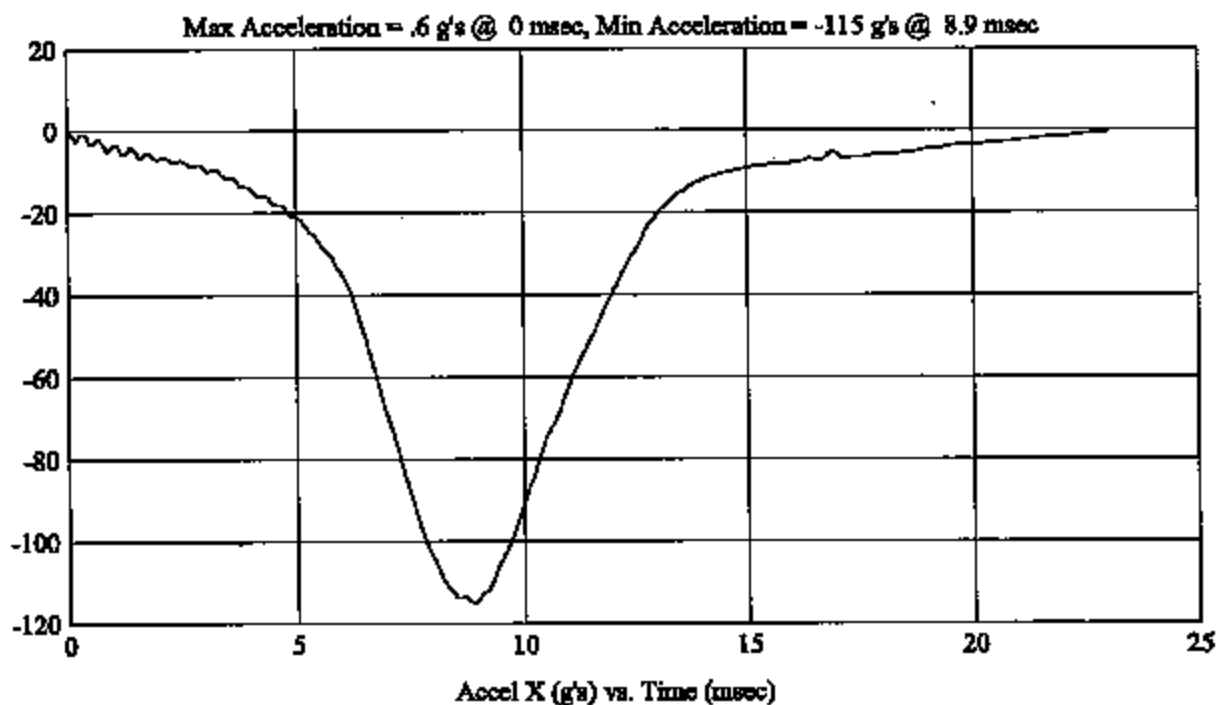
Customer: NHTSA
Test # 2
FM5208
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 114/31

HIC(d) = 469, HIC = 401, Delta T = 5 msec



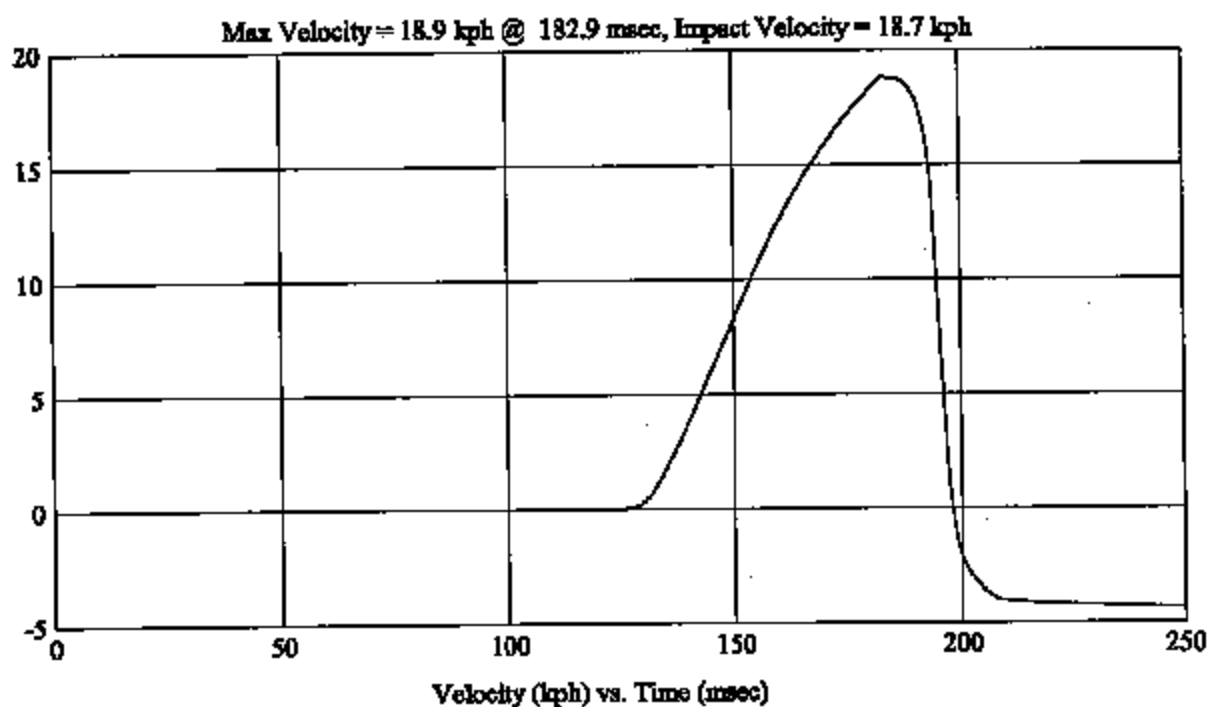
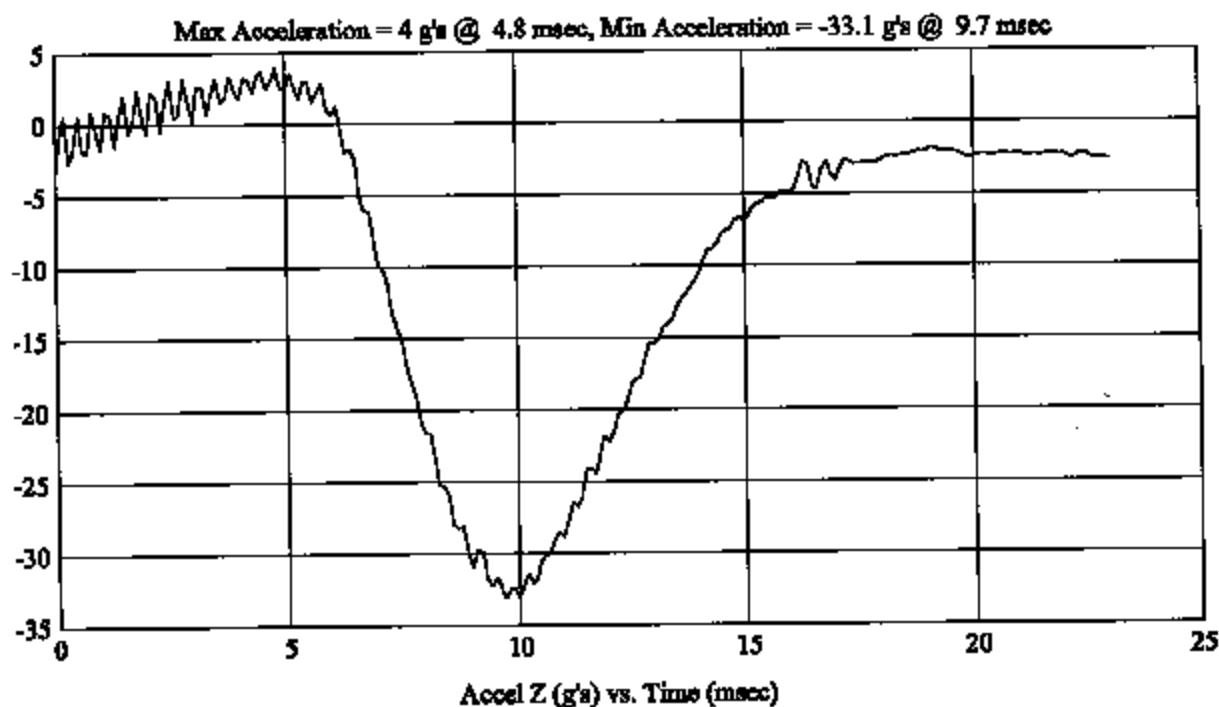
FMH
G05I7-001.4Customer: NHTSA
Test # 2
FM5208
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 114/31

HIC(d) = 469, HIC = 401, Delta T = 5 msec



FMH
G05T7-001.4

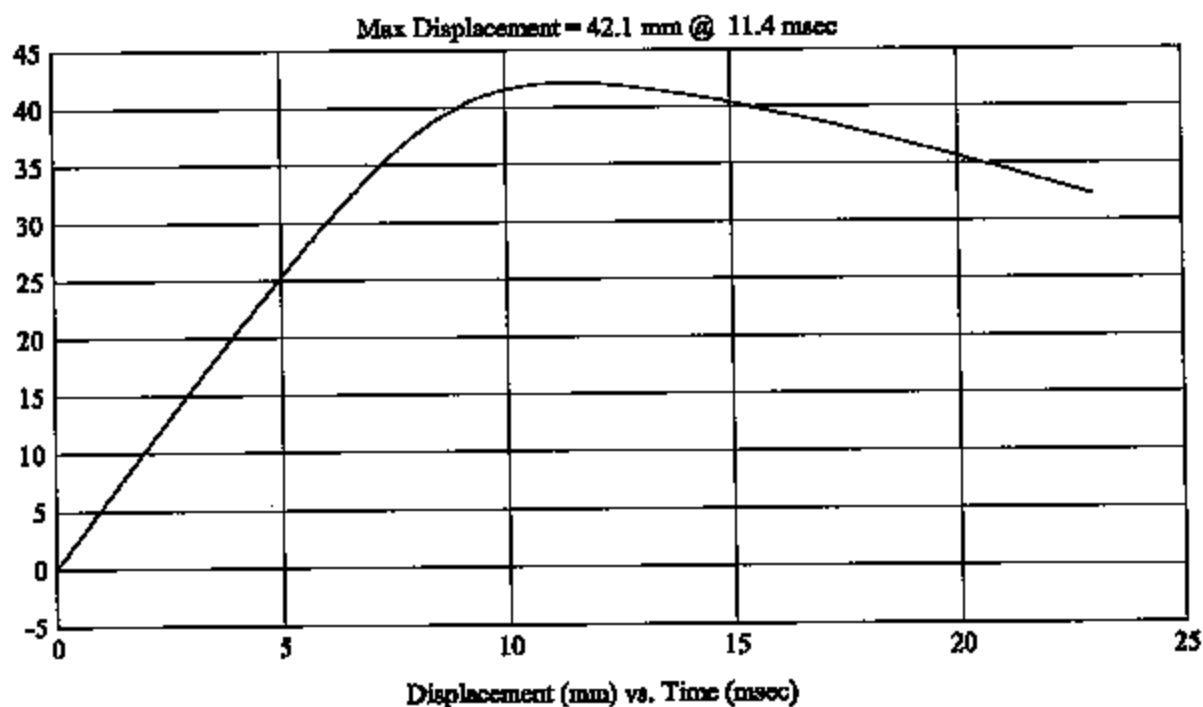
Customer: NHTSA
Test # 2
FM5208
Additional Desc: N/A

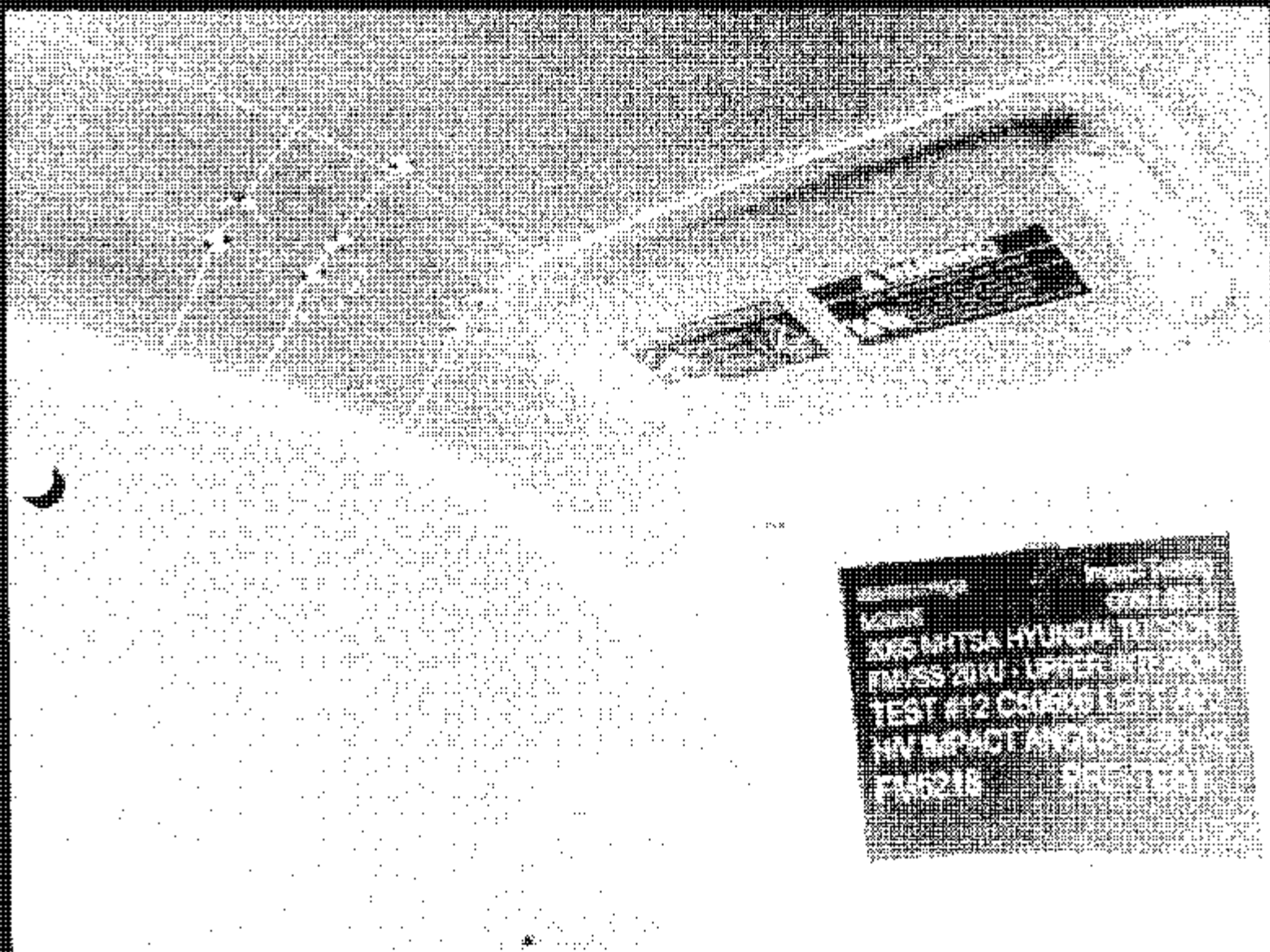
Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP1
Vehicle Side: Right
Horz/Vert Angle: 114/31

HIC(d) = 469, HIC = 401, Delta T = 5 msec





~~XXXXXXXXXX~~ mga

Impact Testing

5/26/05

G0507-001A

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #12 C50506 LEFT AP2

H/V IMPACT ANGLE= 202 / 47

FM5218 POST-TEST

MICHIGAN OPERATIONS
 DATE: 2/8/01
 SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
 REVISION NO.: 2
 PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL:2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Test Number:#12

Target (Vehicle Side): AP2 Left

Temperature:21C

MGA Test Reference No.:FM5218

Humidity:46%

Approach Horizontal Angles:202°

Time of Test:9:22 AM

Approach Vertical Angles:47°

FMH Serial No:[038]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
432	352	8.6	18.8	5	4 L

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-106.9	1.43	1.43
Y	6	J36193	102.8	1.54	1.54
Z	7	J36353	98.8	1.39	1.39

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

No visible damage.

Recorded By:  Approved By:  Date: 5/26/05

*Only necessary for NHTSA (Government) Compliance testing.

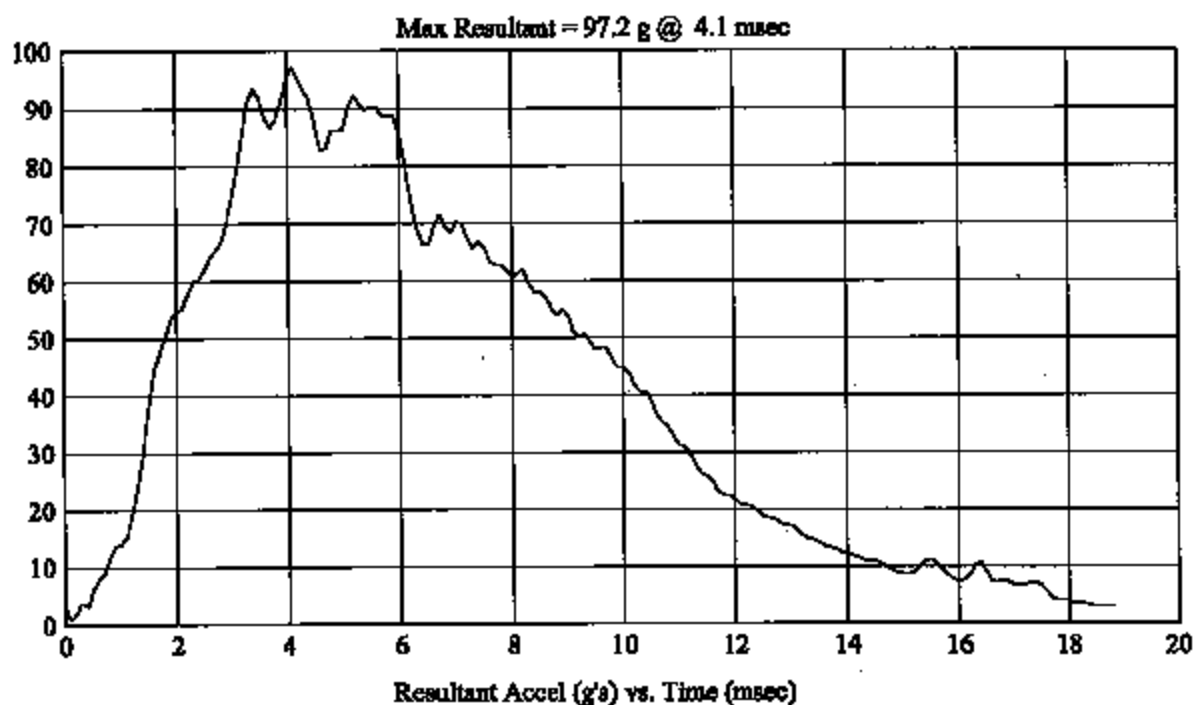
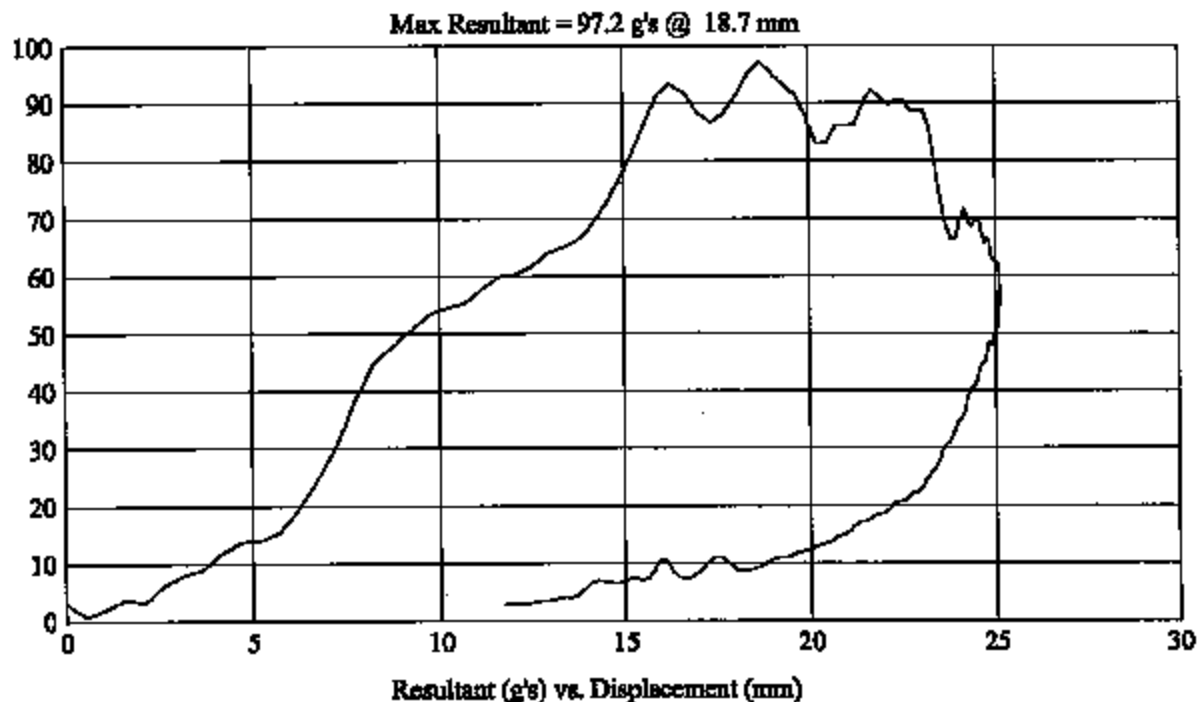
FMH
G05T7-001.4Customer: NHTSA
Test # 12
FM5218
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 202/47

HIC(d) = 432, HIC = 352, Delta T = 8.6 msec



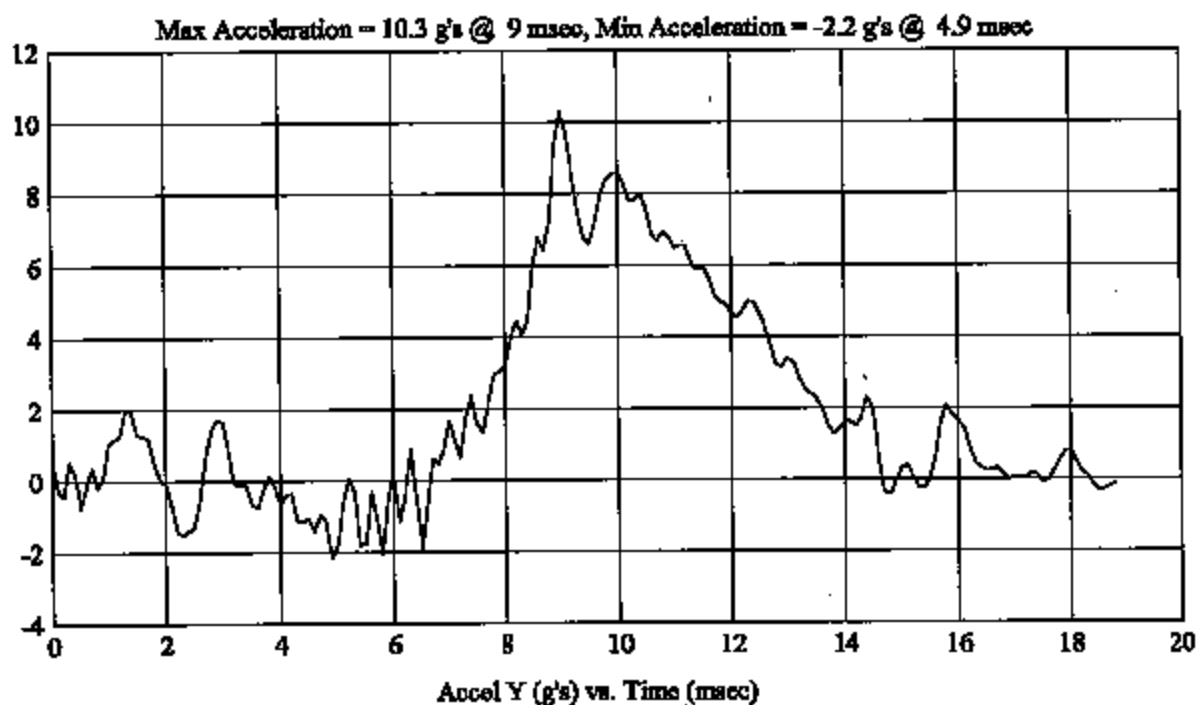
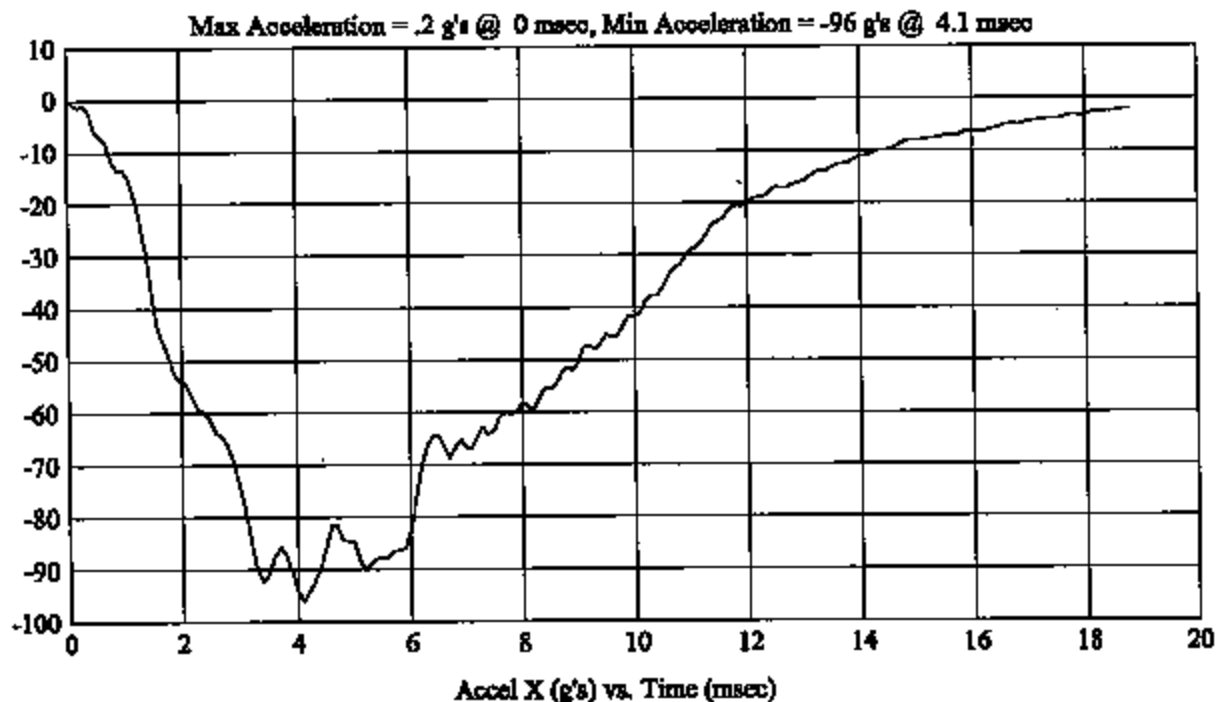
FMH
G0517-001.4Customer: NHTSA
Test # 12
FM5218
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 202/47

HIC(d) = 432, HIC = 352, Delta T = 8.6 msec



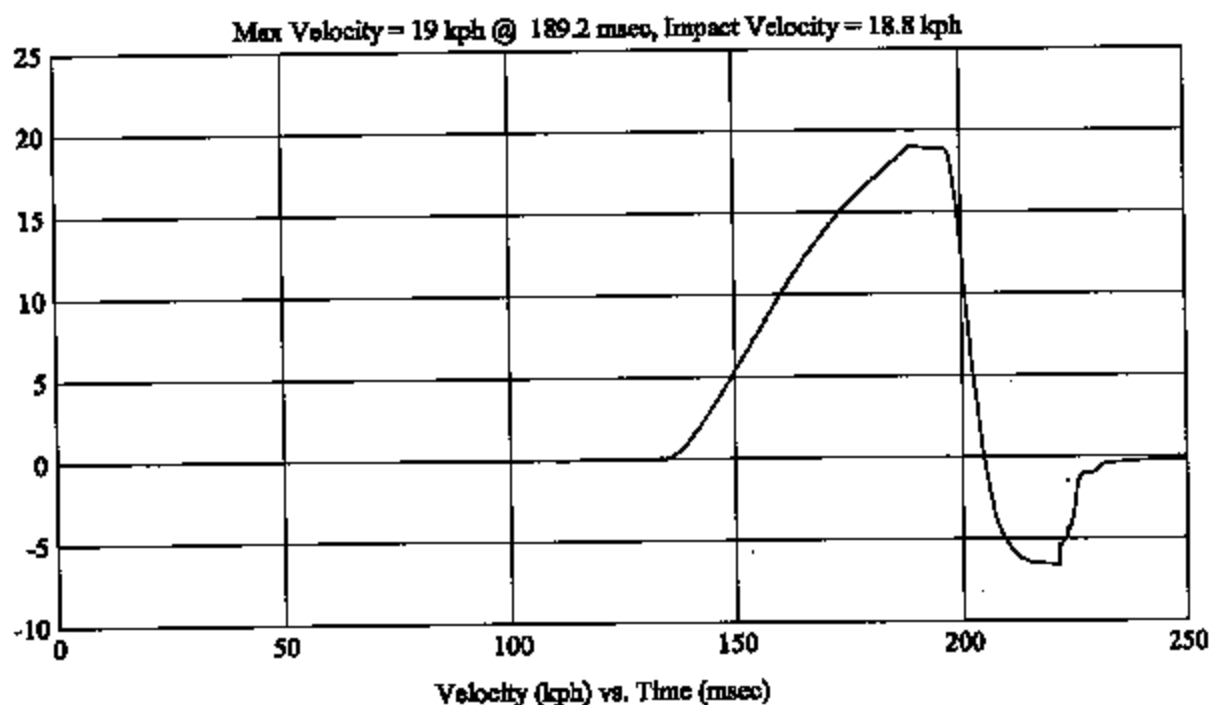
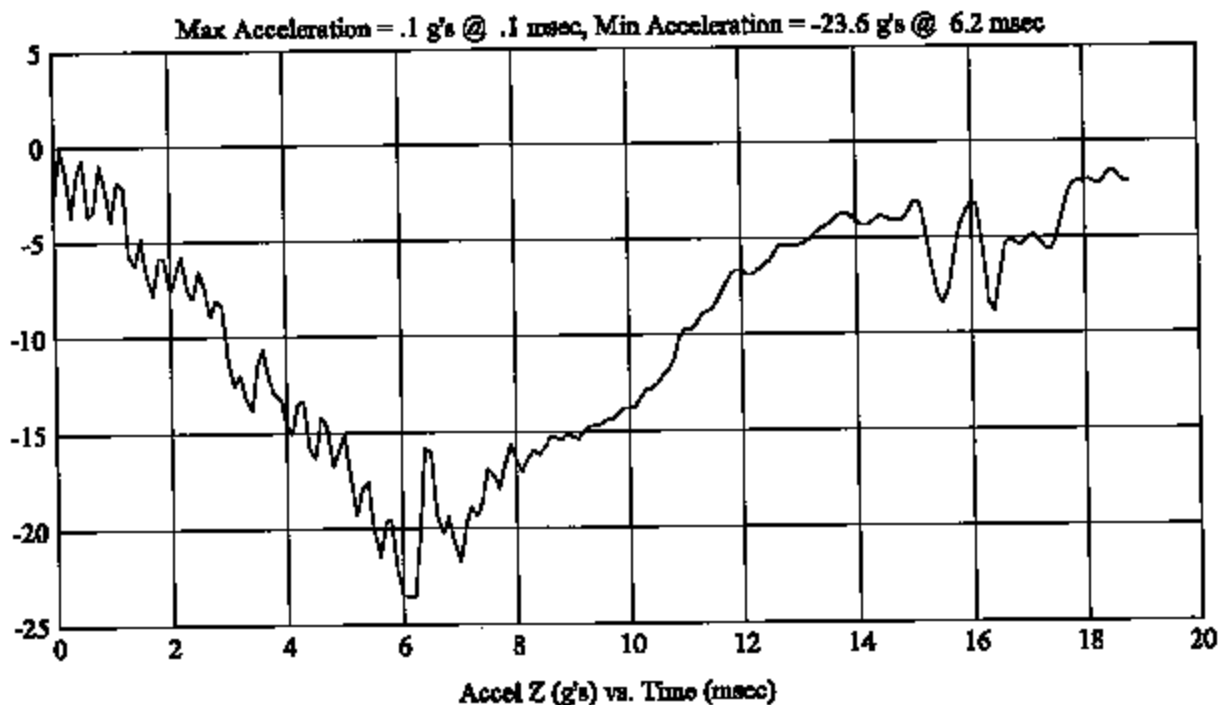
FMH
G05I7-001.4Customer: NHTSA
Test # 12
FM5218
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 202/47

HIC(d) = 432, HIC = 352, Delta T = 8.6 msec



FMH
G0517-001.4

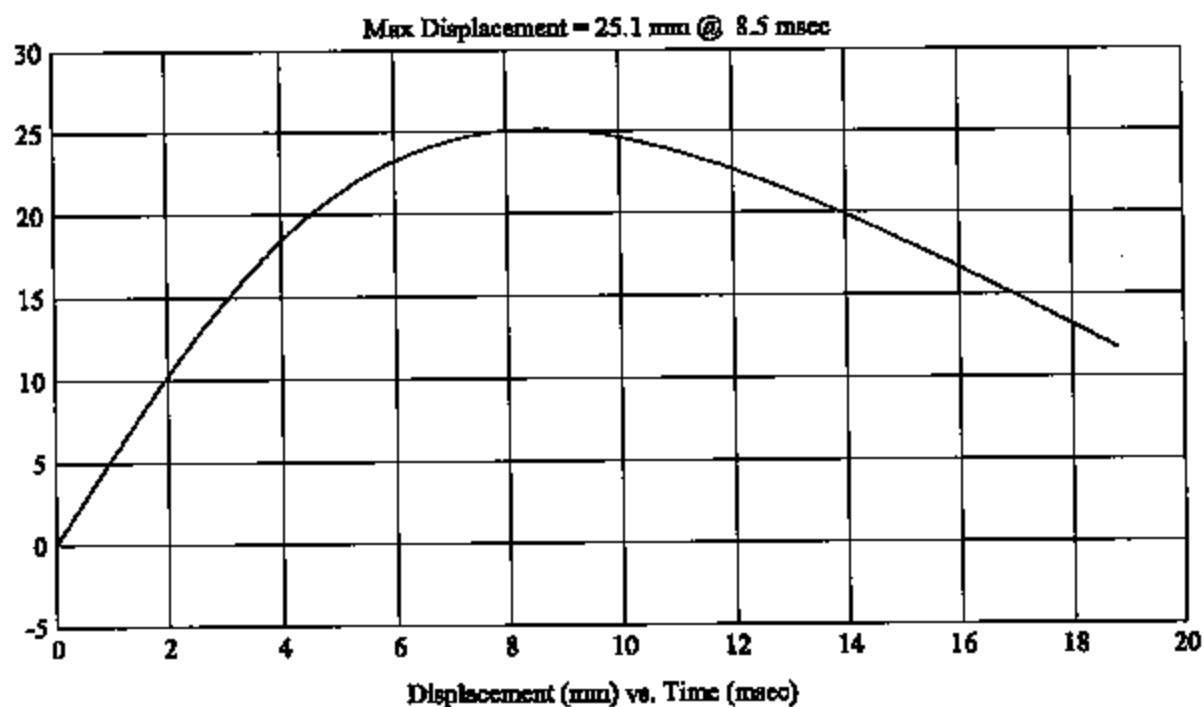
Customer: NHTSA
Test # 12
FM5218
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: AP2
Vehicle Side: Left
Horz/Vert Angle: 202/47

HIC(d) = 432, HIC = 352, Delta T = 8.5 msec



mg2

Impact Testing

5/24/05

G0317-001A

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #1 C50506 RIGHT SIDE

HV IMPACT ANGLE = 18.7°

FM5207

PRE-TEST

5/24/05

Impact Test

5/24/05

5/24/05

2005 NHTSA HYUNDAI TUCSON

FMVSS 2010 - UPPER INTERIOR

TEST #1 C50506 RIGHT ARM

H/V IMPACT ANGLE = 158/12

FM5207

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/2/01
SUPERCEDES: MGATP2072102

DOC. NO.: MGATP2072102
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): AP3 Right

MGA Test Reference No.: FM5207

Approach Horizontal Angles: 158°

Approach Vertical Angles: 42°

Additional Description:

Test Number: #1

Temperature: 22C

Humidity: 43%

Time of Test: 11:43 AM

FMH Serial No.: [035]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
384	281	8.4	18.9	11	3 R

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.8	1.44	1.44
Y	6	J35919	97	1.54	1.54
Z	7	J22684	95.6	1.39	1.39

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

A-pillar trim cracked during impact.

Recorded By: [Signature] Approved By: [Signature] Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing.

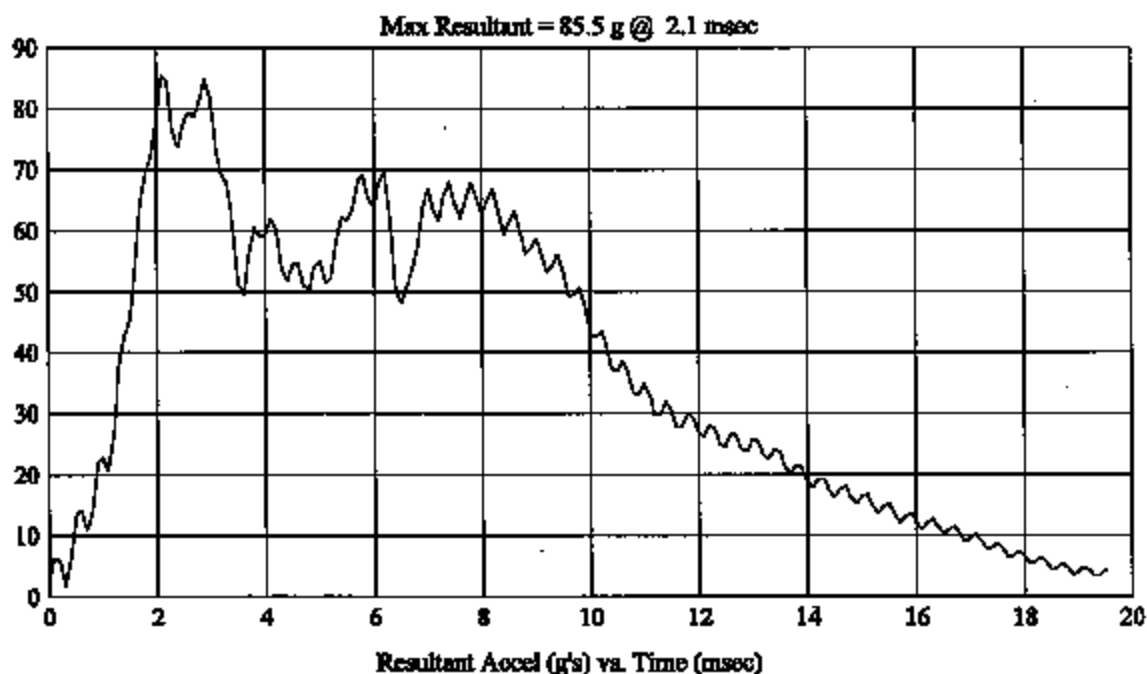
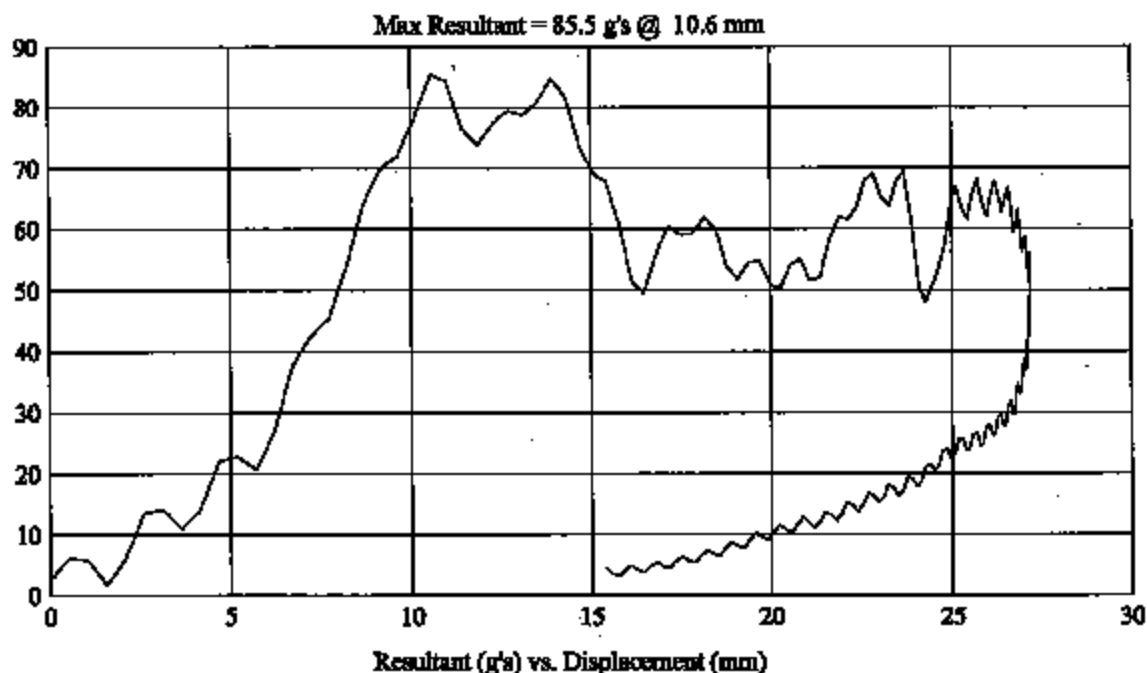
FMH
G05I7-001.4Customer: NHTSA
Test # 1
FM5207
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/03

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/42

HIC(d) = 364, HIC = 261, Delta T = 9.4 msec



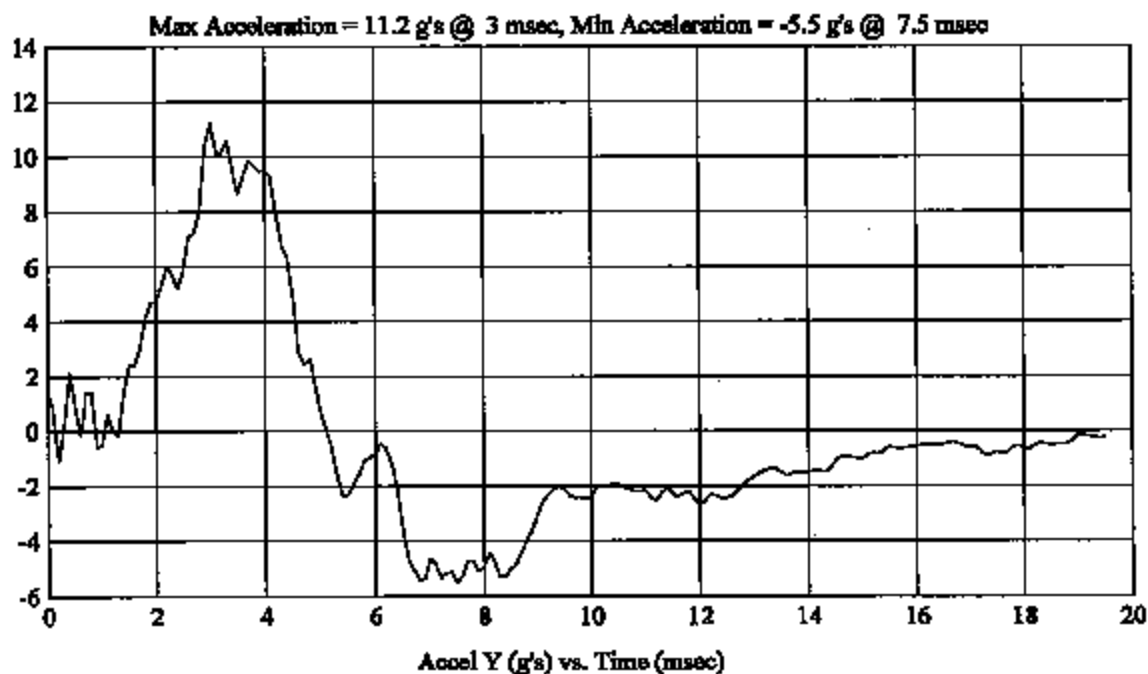
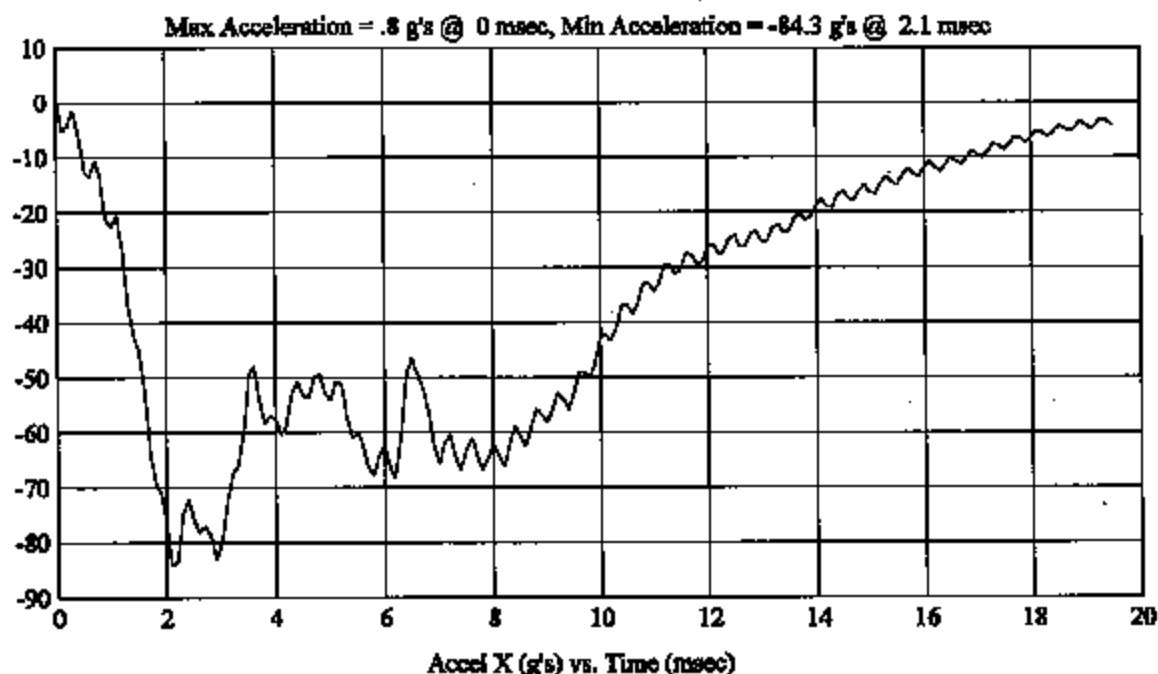
FMH
G05I7-001.4Customer: NHTSA
Test # 1
FM5207
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/42

HIC(d) = 364, HIC = 261, Delta T = 9.4 msec



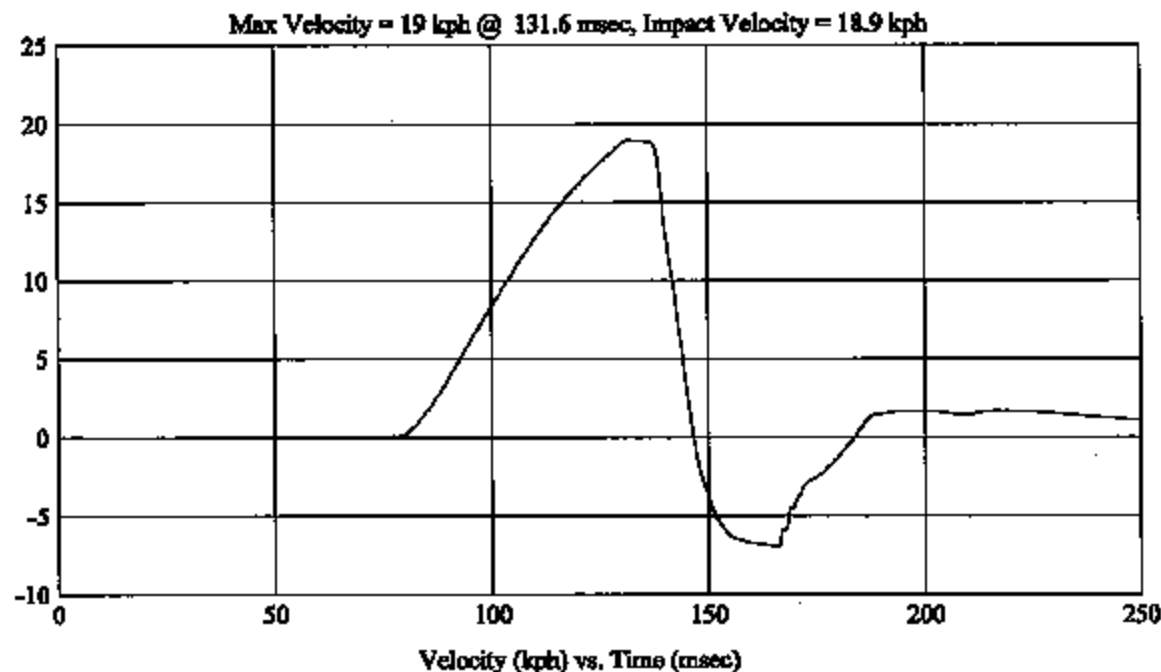
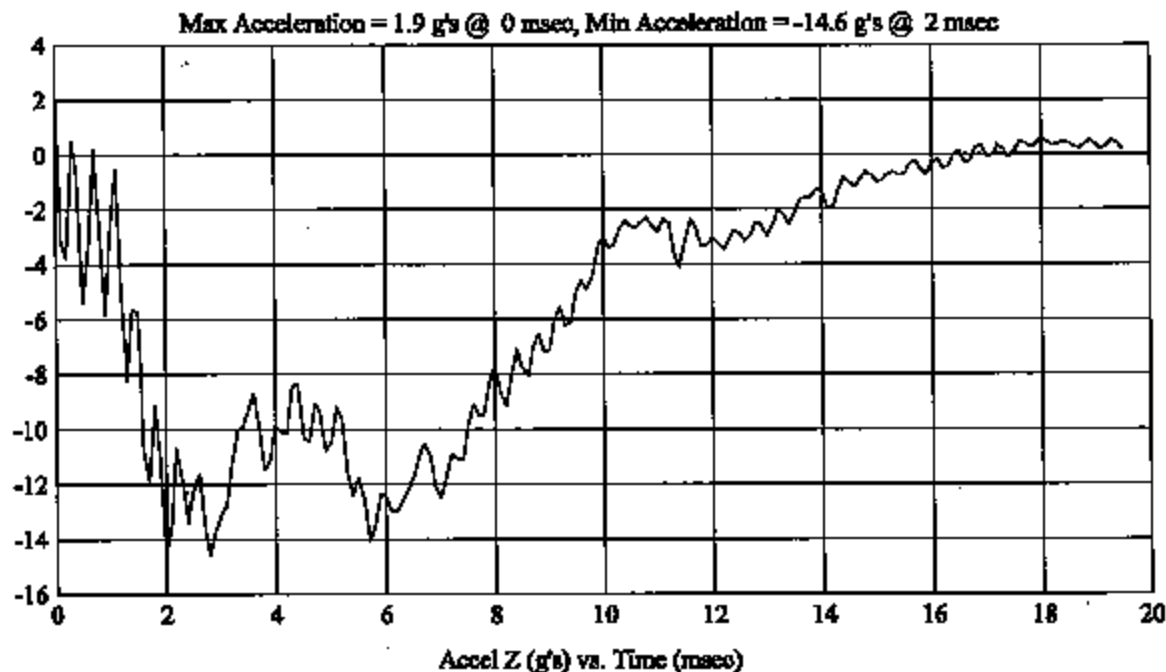
FMH
G05I7-001.4Customer: NHISA
Test # 1
FMS207
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/42

HIC(d) = 364, HIC = 261, Delta T = 9.4 msec



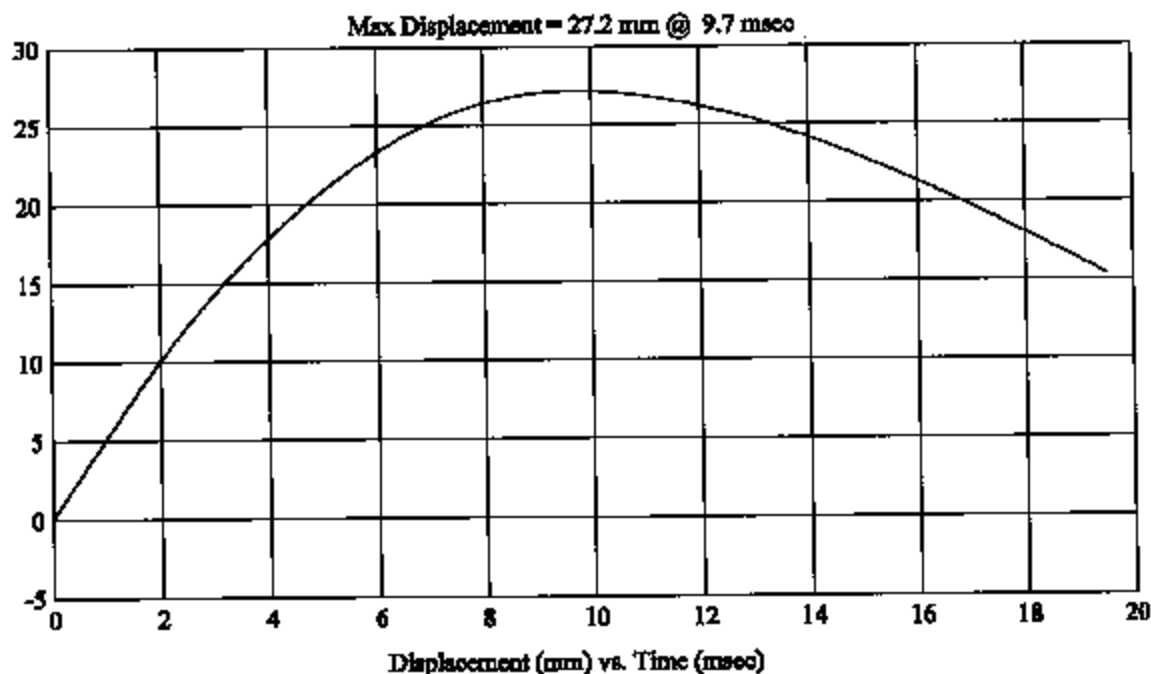
FMH
G05I7-001.4Customer: NHTSA
Test # 1
FMS207
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: AP3
Vehicle Side: Right
Horz/Vert Angle: 158/42

HIC(d) = 364, HIC = 261, Delta T = 9.4 msec



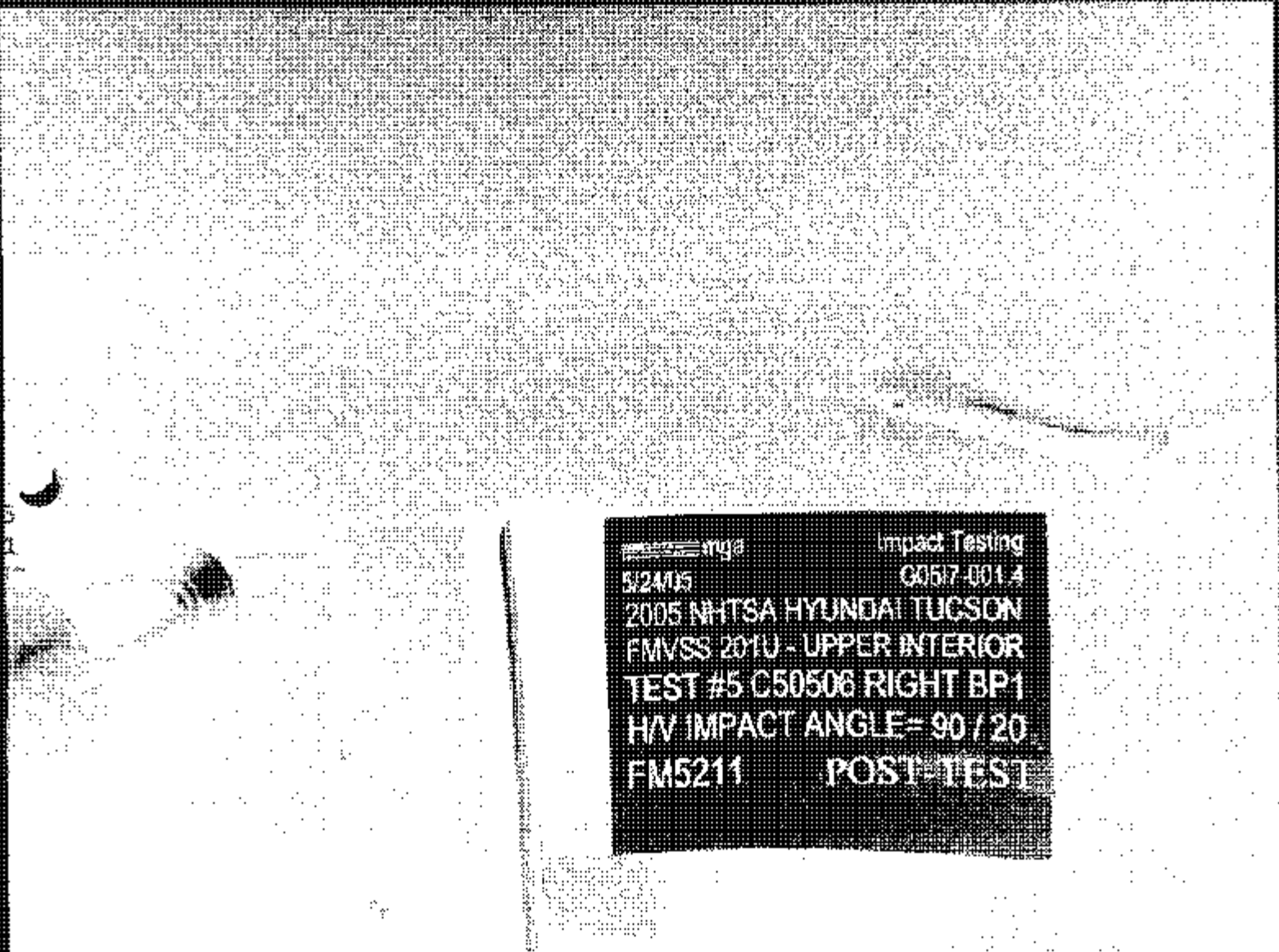
5/24/05

Impact Testing

G0017-0014

2005 NHTSA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #5 C50506 RIGHT BFT
HV IMPACT ANGLE= 90 / 20
FM5211

PRE-TEST



5/24/05

Impact Testing

C0517-001.4

2005 NHTSA HYUNDAI TUCSON

FMVSS 2010 - UPPER INTERIOR

TEST #5 C50506 RIGHT BP1

H/V IMPACT ANGLE= 90 / 20

FM5211 POST-TEST

mga

Impact Testing

6/24/05

G0517-001.4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #5 C50506 RIGHT BP1

H/V IMPACT ANGLE= 90 / 20

FM5211

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL:2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): BP1 Right

MGA Test Reference No.:FM5211

Approach Horizontal Angles:90°

Approach Vertical Angles:20°

Additional Description:

Test Number:#5

Temperature:22C

Humidity:48%

Time of Test:6:30 PM

FMH Serial No:[037]

TEST RESULTS:

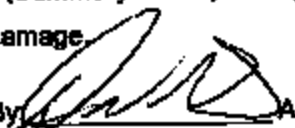
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
482	392	7.8	18.6	28	0

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.44	1.44
Y	6	J35841	95.7	1.54	1.54
Z	7	J35791	89.6	1.39	1.39

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

No visible damage.

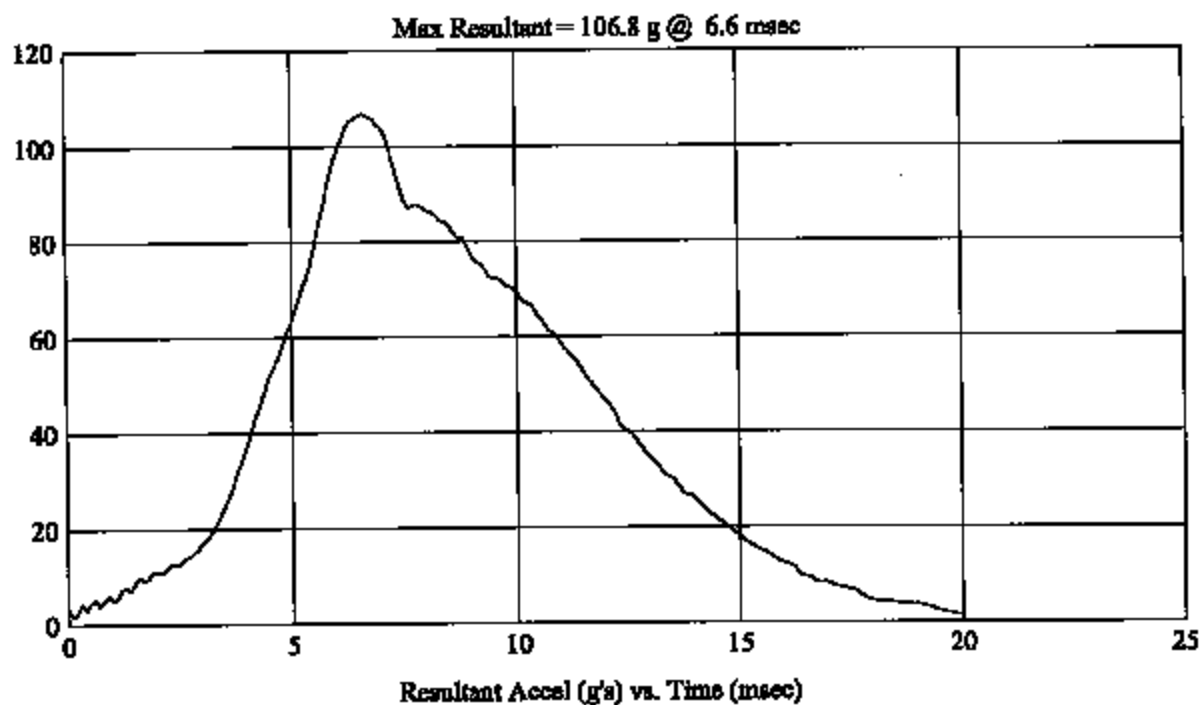
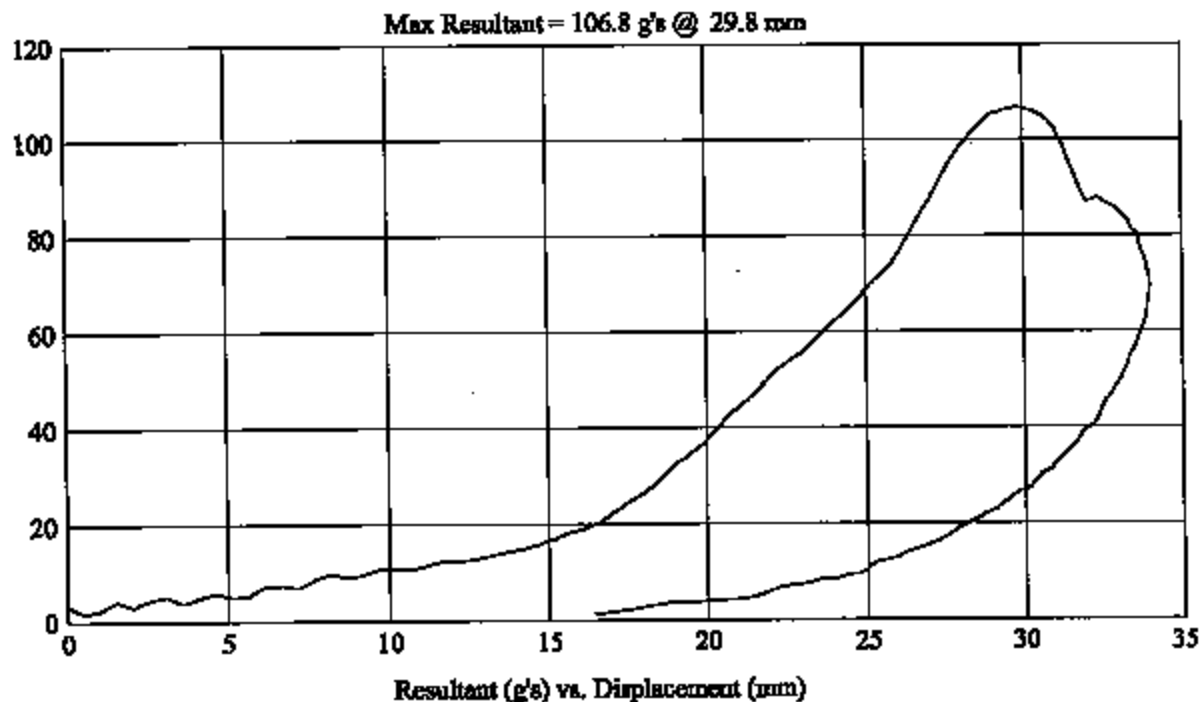
Recorded By:  Approved By:  Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing.

FMH
G0517-001.4Customer: NHTSA
Test # 5
FM5211
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BPI
Vehicle Side: Right
Horz/Vert Angle: 90/20 $HIC(d) = 462$, $HIC = 392$, $\Delta T = 7.8 \text{ msec}$ 

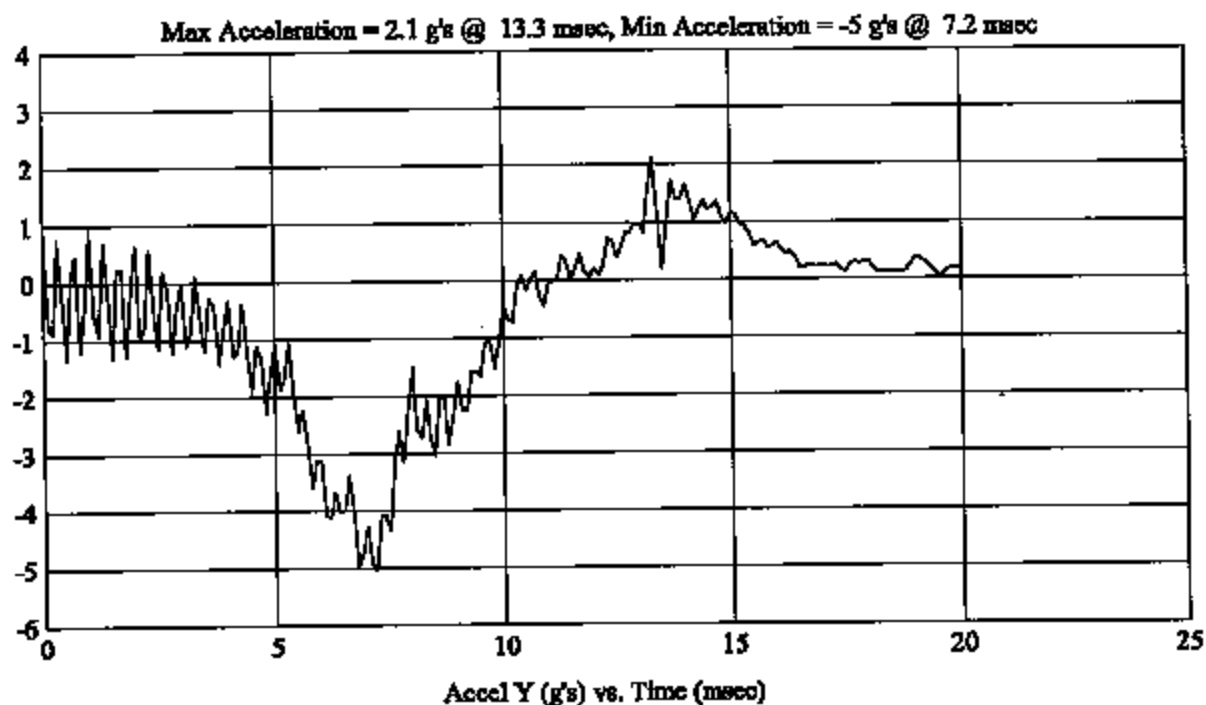
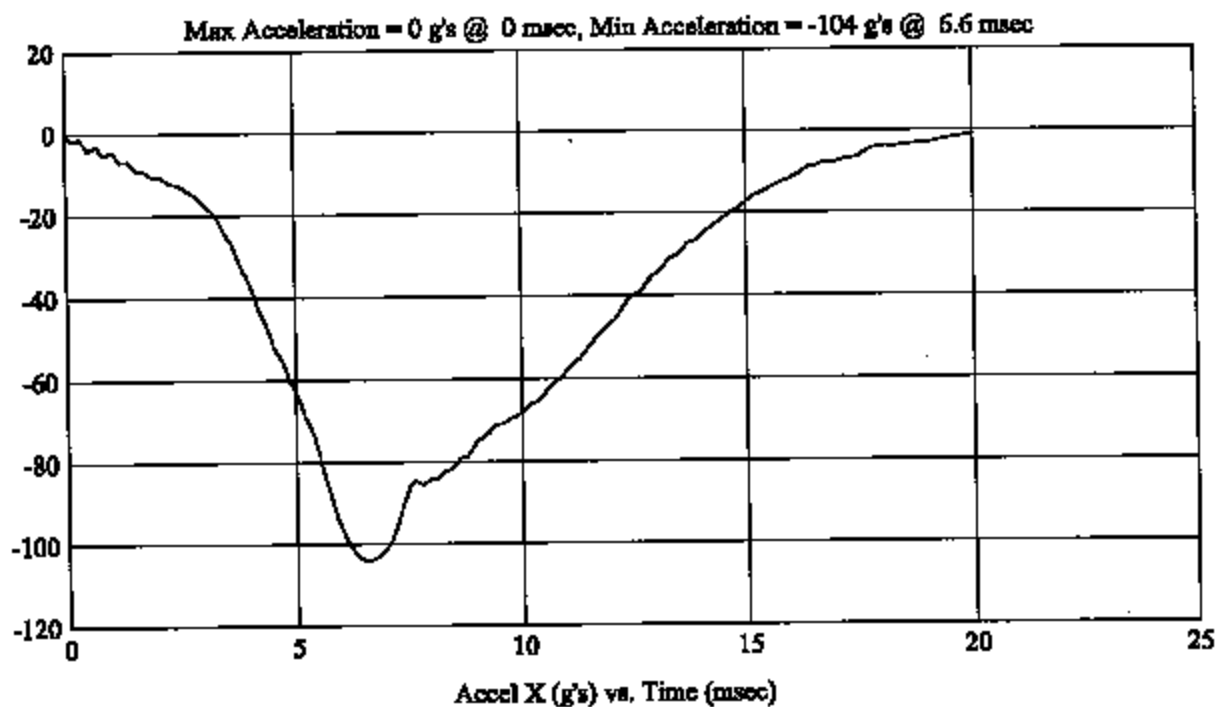
FMH
G05T7-001.4Customer: NHTSA
Test # 5
FM5211
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/20

HIC(d) = 462, HIC = 392, Delta T = 7.8 msec



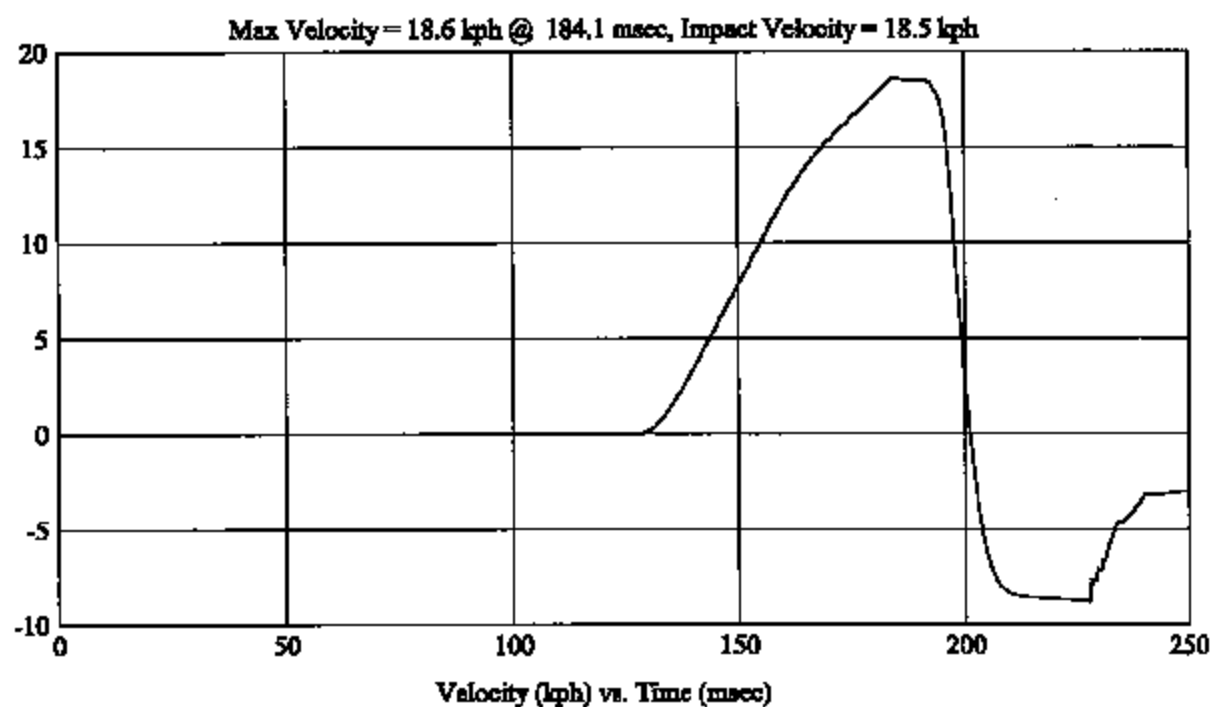
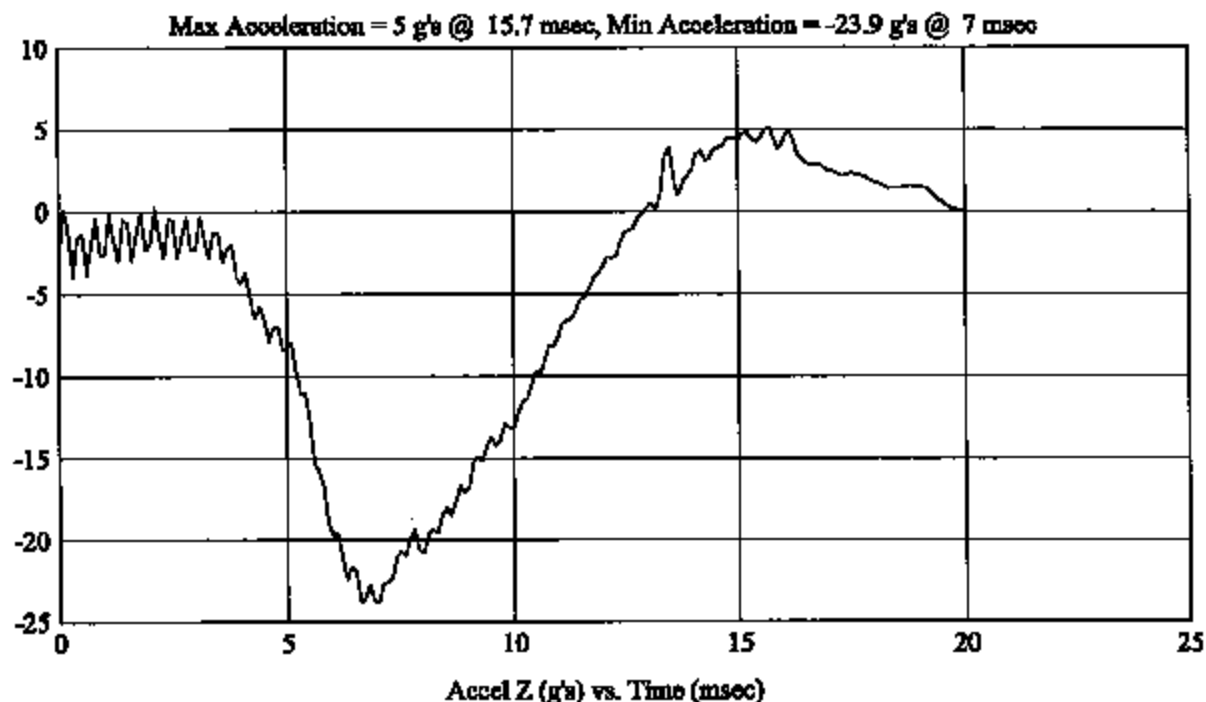
FMH
G0517-001.4Customer: NHTSA
Test # 5
FM5211
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/20

HIC(d) = 462, HIC = 392, Delta T = 7.8 msec



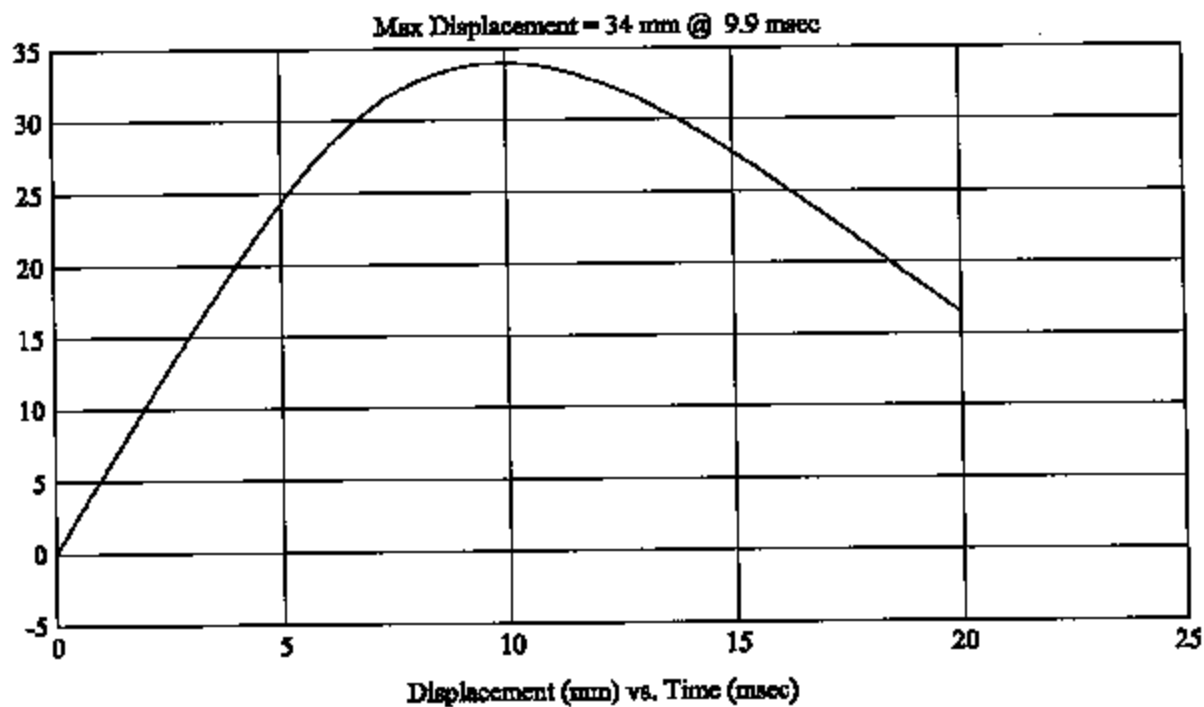
FMH
G05I7-001.4Customer: NHTSA
Test # 5
FM5211
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP1
Vehicle Side: Right
Horz/Vert Angle: 90/20

HIC(d) = 462, HIC = 392, Delta T = 7.8 msec



Impact Testing
G0617-001.4
2015 NHTSA HYUNDAI TUCSON
FVSS 2010- UPPER INTERIOR
TEST #4 C50506 RIGHT BP3
IMPACT ANGLE=81/-6
FM5210 PRE-TEST

5/24/05
2005 NHTSA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #4 C50506 RIGHT BP3
H/V IMPACT ANGLE = 81 / 16
FM5210 POST-TEST

17406
 2105 NH1 SAH MUNDAR 18350
 FM 66 2000 UPPER INTERIOR
 NES 114 051506 113413
 FM 66 2000 UPPER INTERIOR
 FM 66 2000 UPPER INTERIOR
 FM 66 2000 UPPER INTERIOR

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL:2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Test Number:#4

Target (Vehicle Side): BP3 Right

Temperature:22C

MGA Test Reference No.:FM5210

Humidity:46%

Approach Horizontal Angles:81°

Time of Test:4:55 PM

Approach Vertical Angles:-6°

FMH Serial No:[035]

Additional Description:

TEST RESULTS:

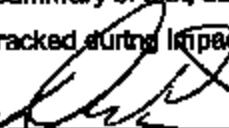
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above PL O	Left/Right Pt. O
748	771	8.6	23.7	18	14 R

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

Axle	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.8	1.44	1.44
Y	6	J35019	97	1.54	1.54
Z	7	J22664	95.6	1.39	1.39

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

B-pillar trim cracked during impact.

Recorded By:  Approved By:  Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing.

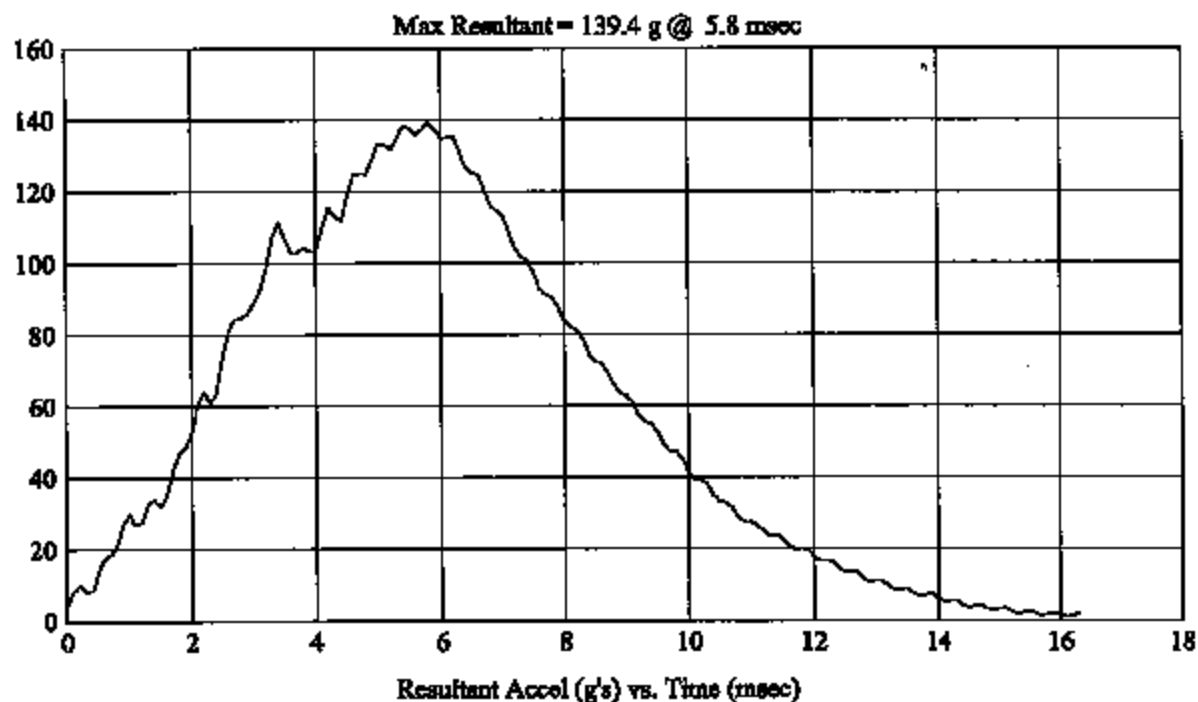
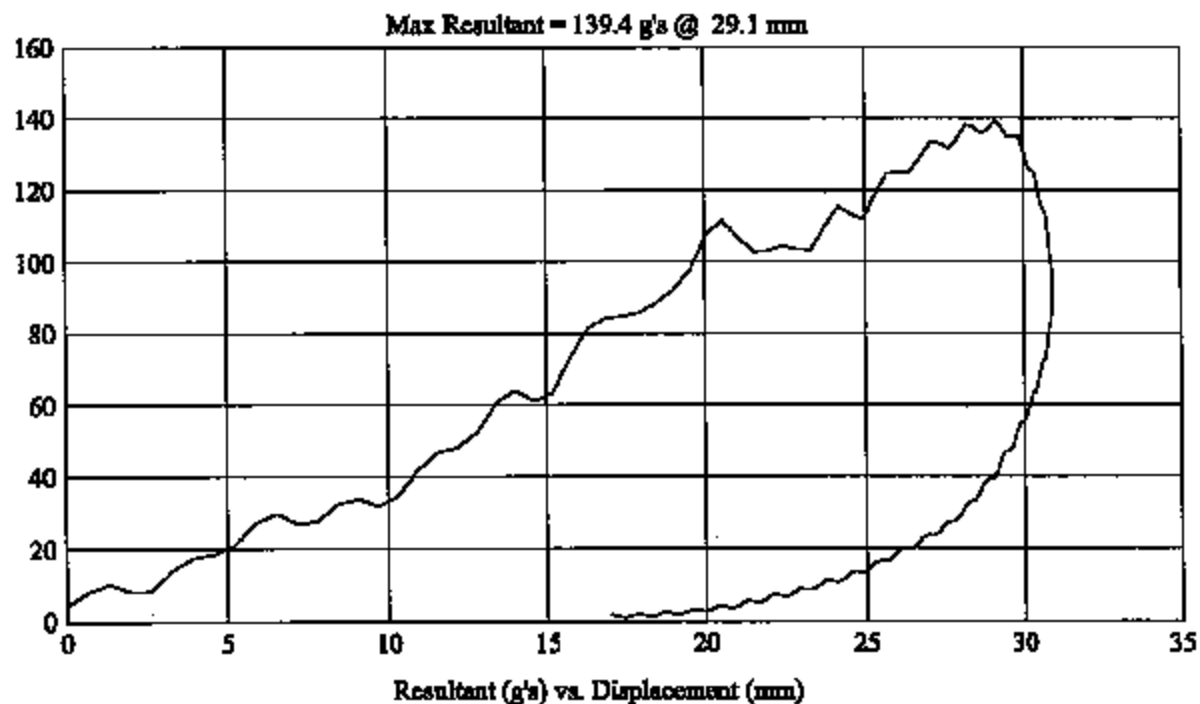
FMH
G0517-001.4Customer: NHTSA
Test # 4
FM5210
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP3
Vehicle Side: Right
Horz/Vert Angle: 81/-6

HIC(d) = 748, HIC = 771, Delta T = 6.5 msec



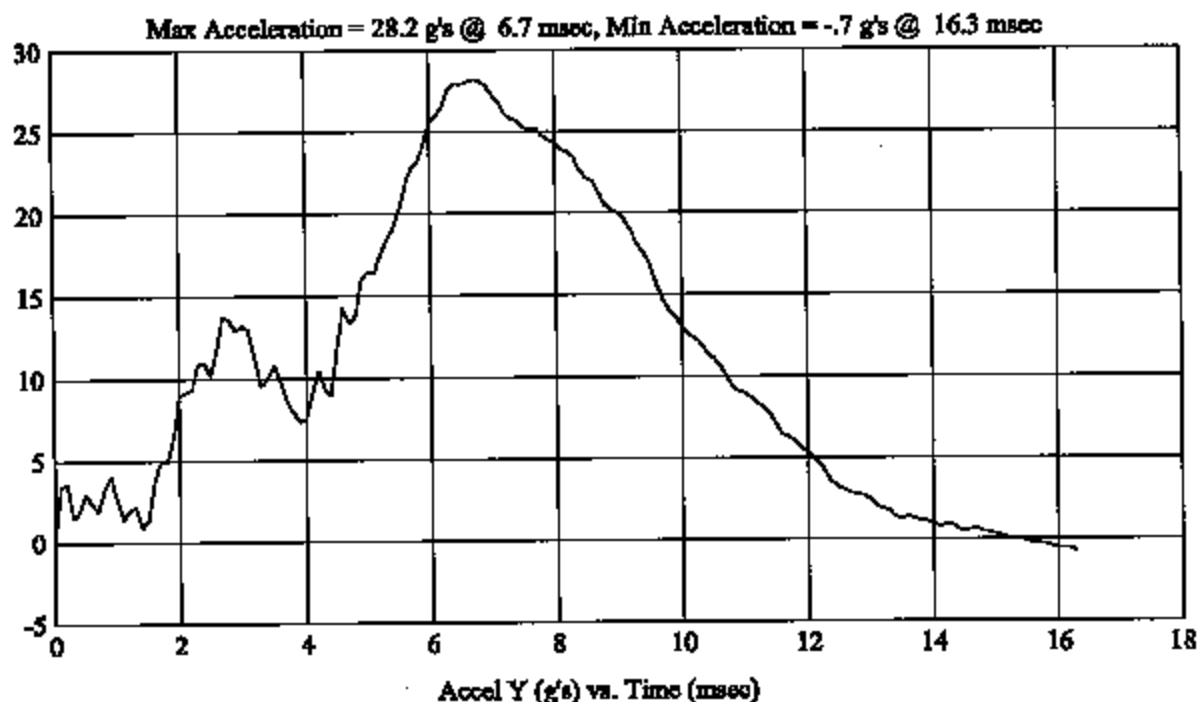
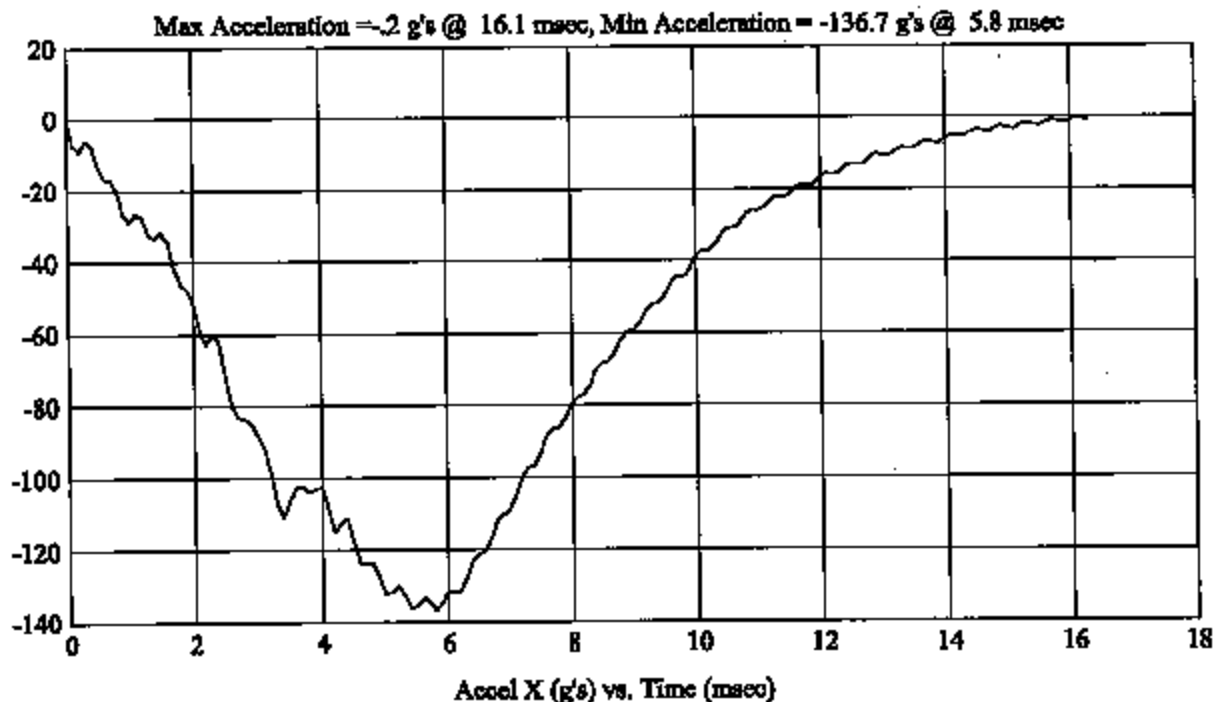
FMH
G0517-001.4Customer: NHTSA
Test # 4
FM5210
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP3
Vehicle Side: Right
Horz/Vert Angle: 81/-6

HIC(d) = 748, HIC = 771, Delta T = 6.5 msec



FMH
G0517-001.4

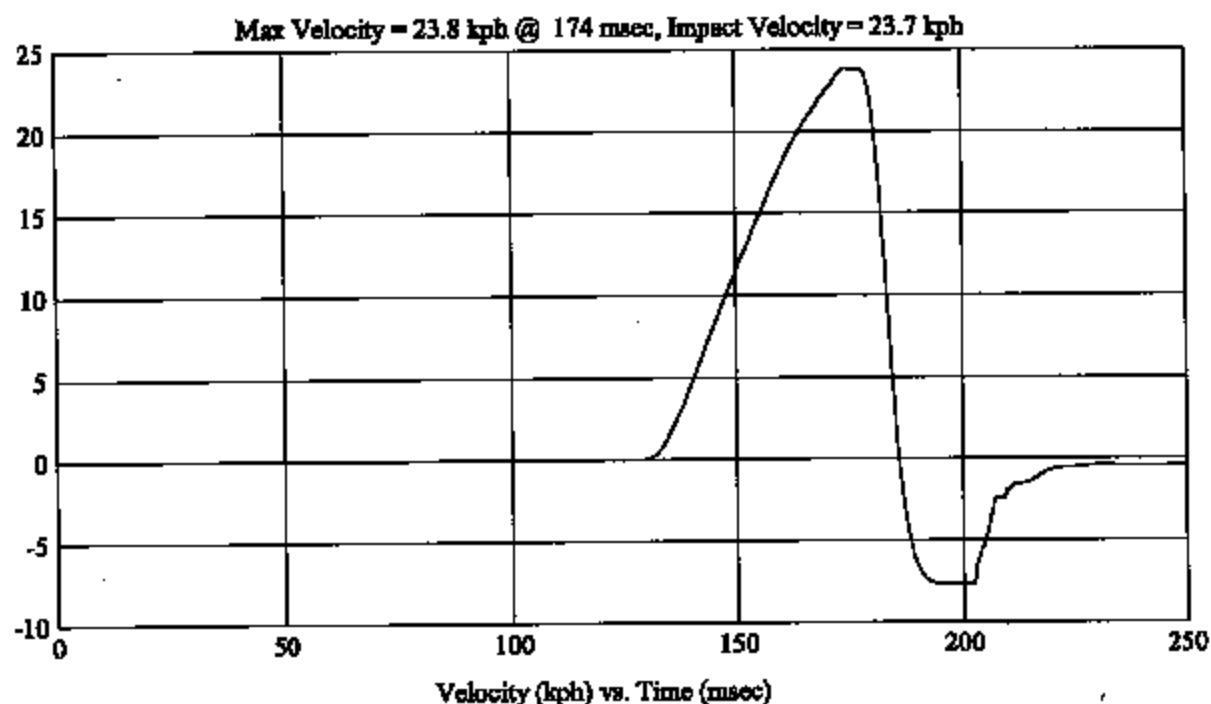
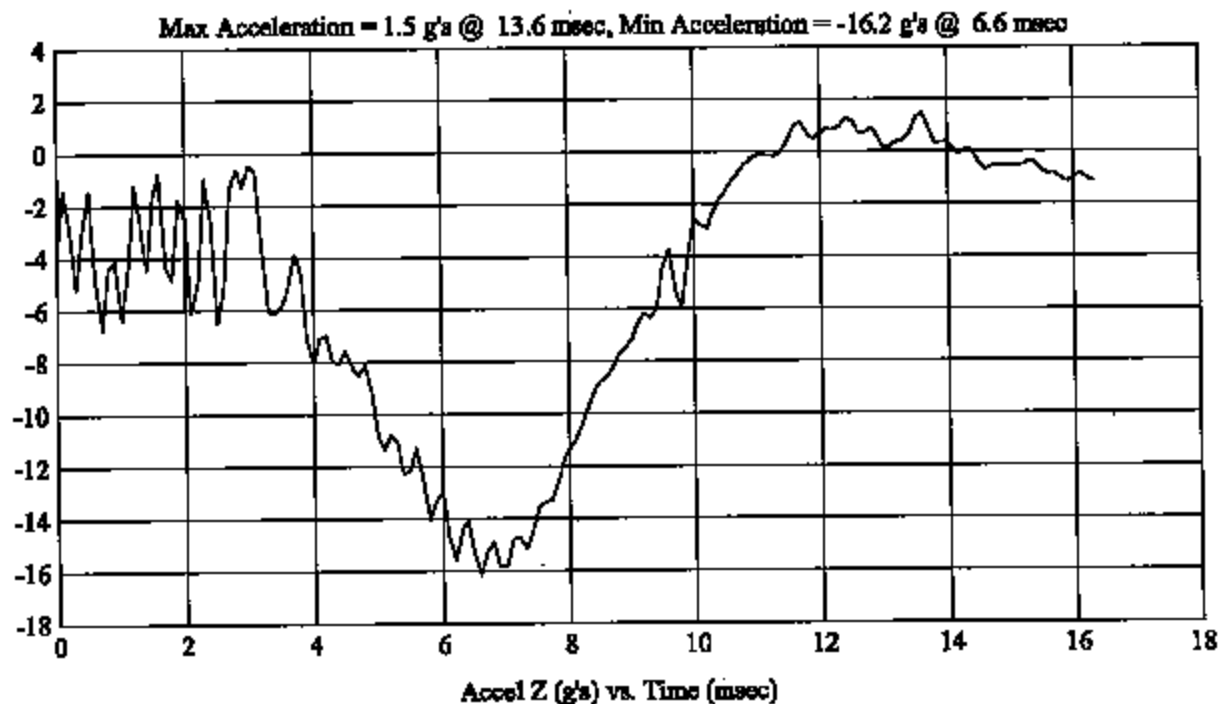
Customer: NHTSA
Test # 4
FM5210
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP3
Vehicle Side: Right
Horz/Vert Angle: 81/-6

HIC(d) = 748, HIC = 771, Delta T = 6.5 msec



FMH
G0517-001.4

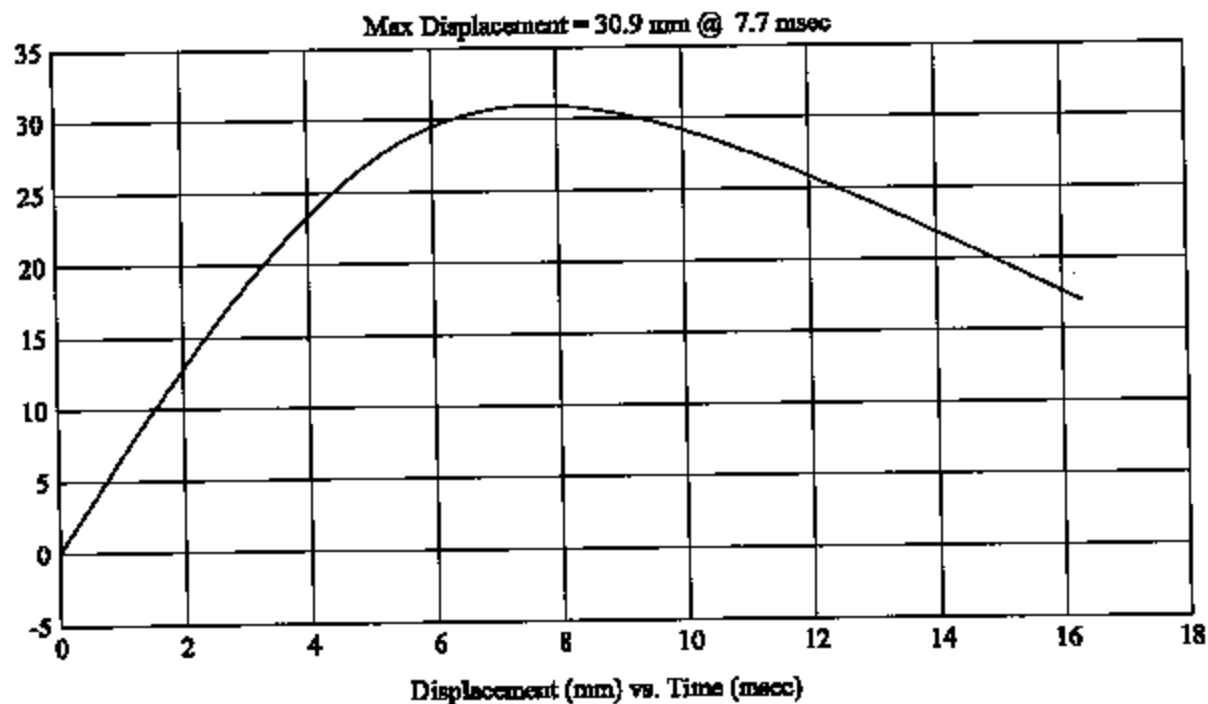
Customer: NHTSA
Test # 4
FM5210
Additional Desc: N/A

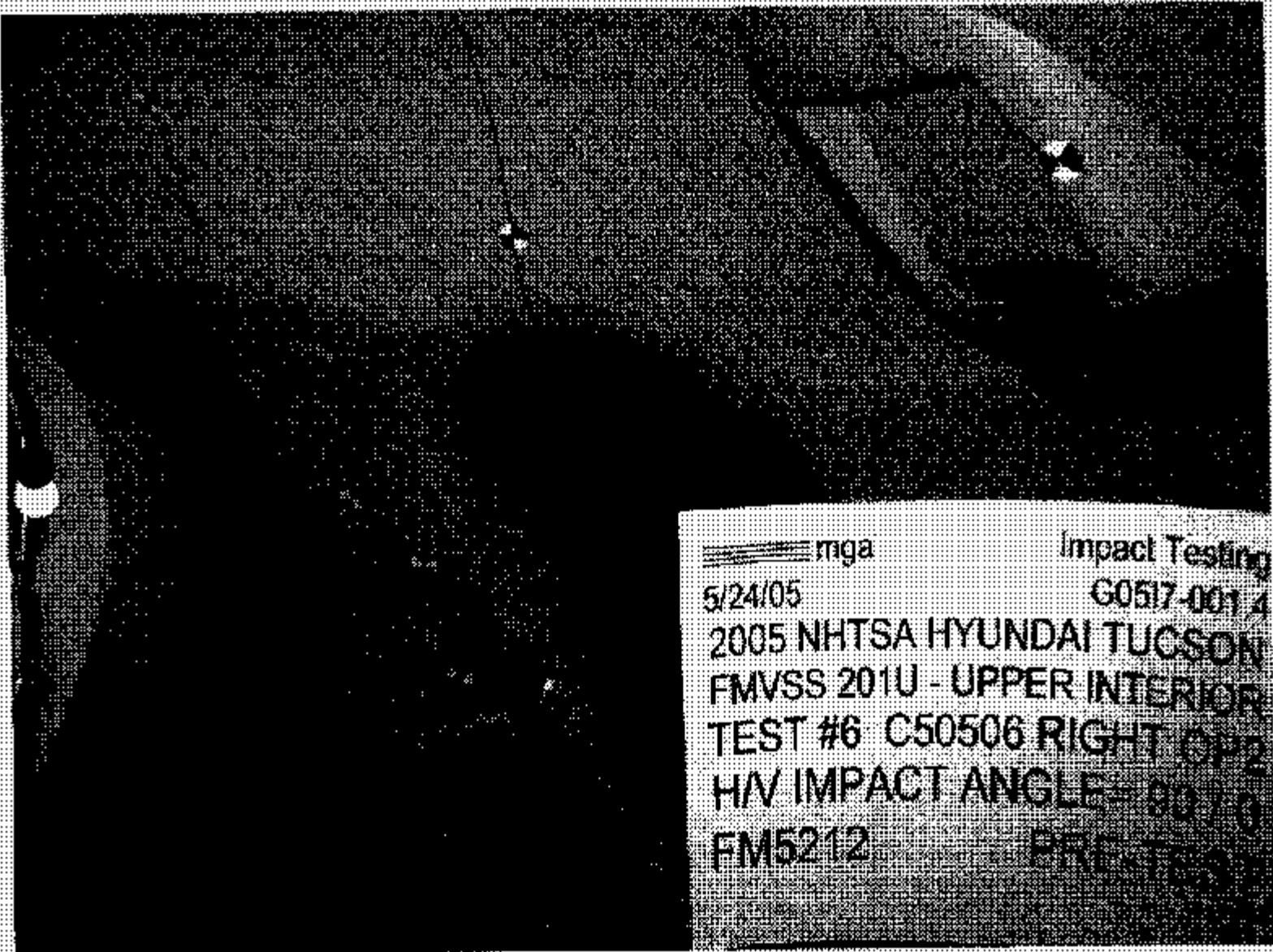
Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: BP3
Vehicle Side: Right
Horz/Vert Angle: 81/-6

HIC(d) = 748, HIC = 771, Delta T = 6.5 msec





mga

5/24/05

Impact Testing

G0517-001.4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #6 C50506 RIGHT OP2

H/V IMPACT ANGLE = 90°/0°

FM5212

PRE-TEST

FM5212

Impact Testing

5-24-05

G0517-001.4

2005 NHTSA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #6 C50506 RIGHT OP2
H/V IMPACT ANGLE= 90 / 0
FM5212 POST-TEST

mga

Interlock

5/24/05

C60506

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #6 C60506 RIGHT SIDE

H/V IMPACT ANGLE = 90°

FM5212 POST TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): OP2 Right

MGA Test Reference No.: FM5212

Approach Horizontal Angles: 90°

Approach Vertical Angles: 0°

Additional Description:

Test Number: #6

Temperature: 22C

Humidity: 44%

Time of Test: 7:16 AM

FMH Serial No: [038]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
671	668	6.3	24.0	28	0

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J38197	-108.9	1.43	1.44
Y	6	J38193	102.8	1.54	1.54
Z	7	J38353	98.8	1.38	1.39

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

No visible damage.

Recorded By:  Approved By:  Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing

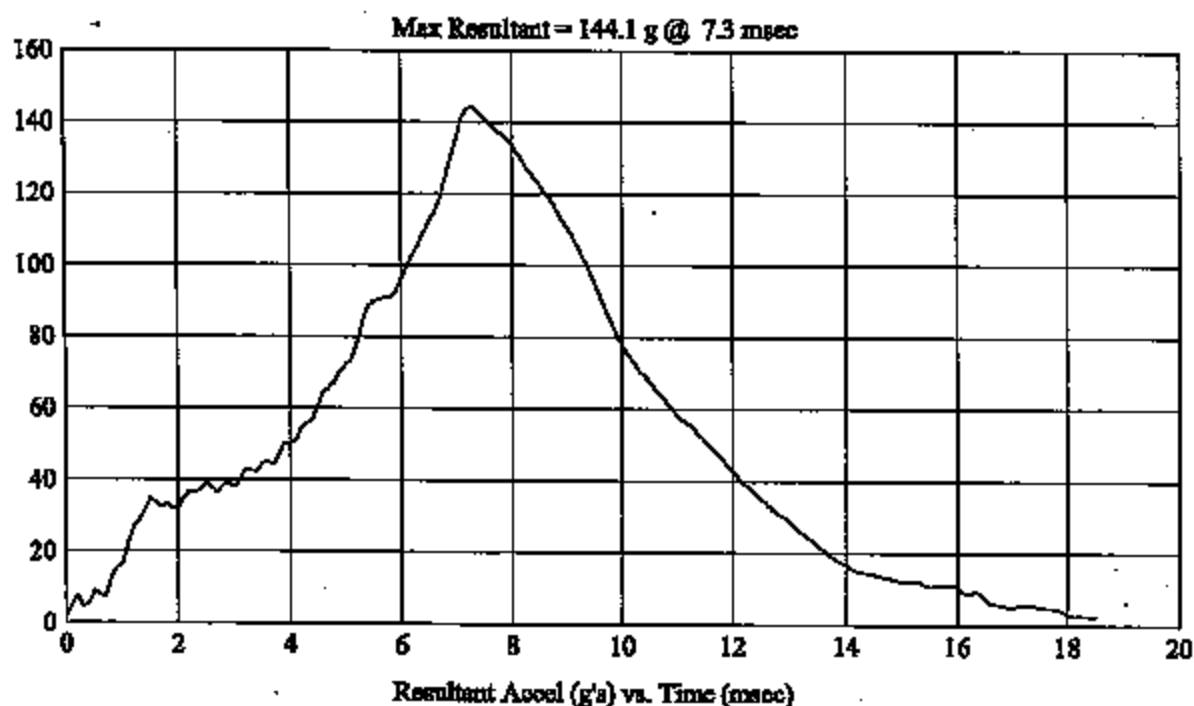
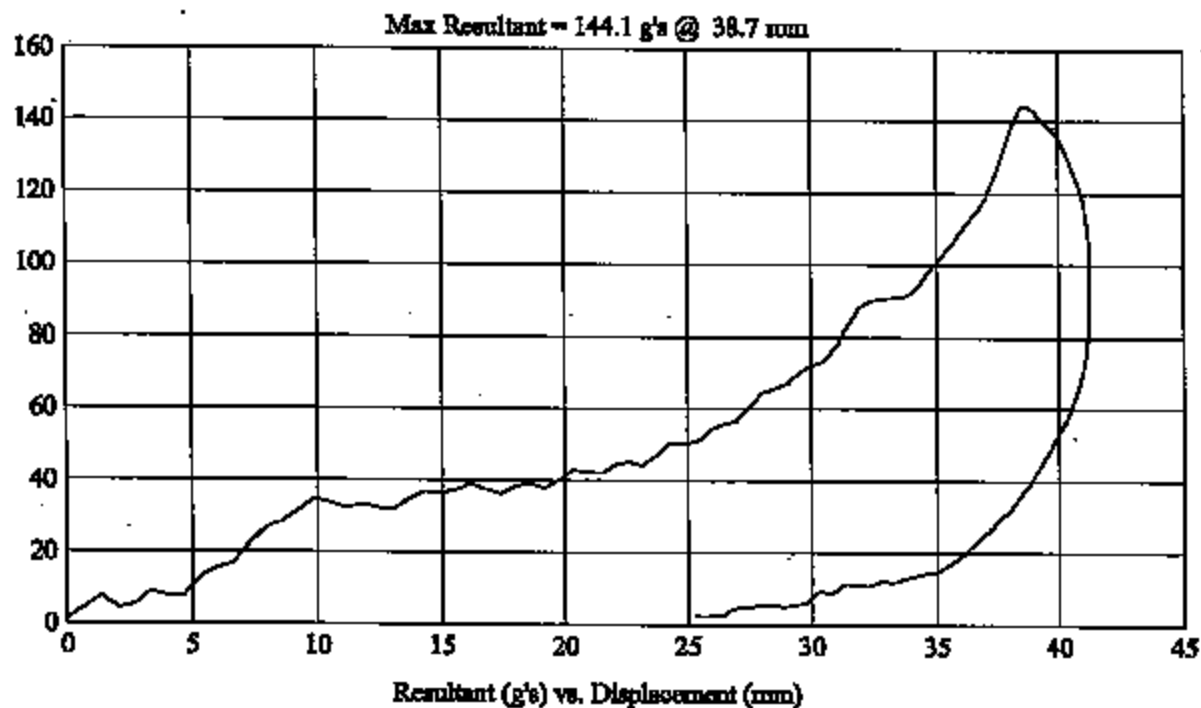
Customer: NHTSA
Test # 6
FMS212
Additional Desc: N/A

Vehicle Program: Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 671, HIC = 668, Delta T = 6.3 msec



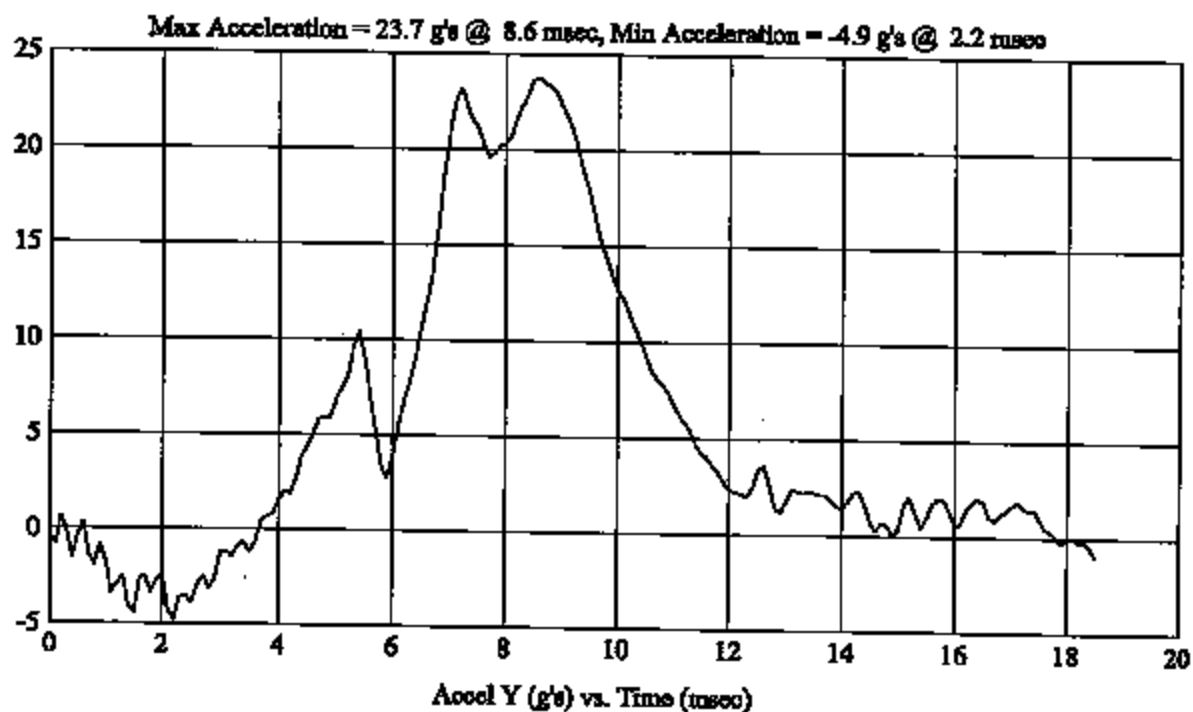
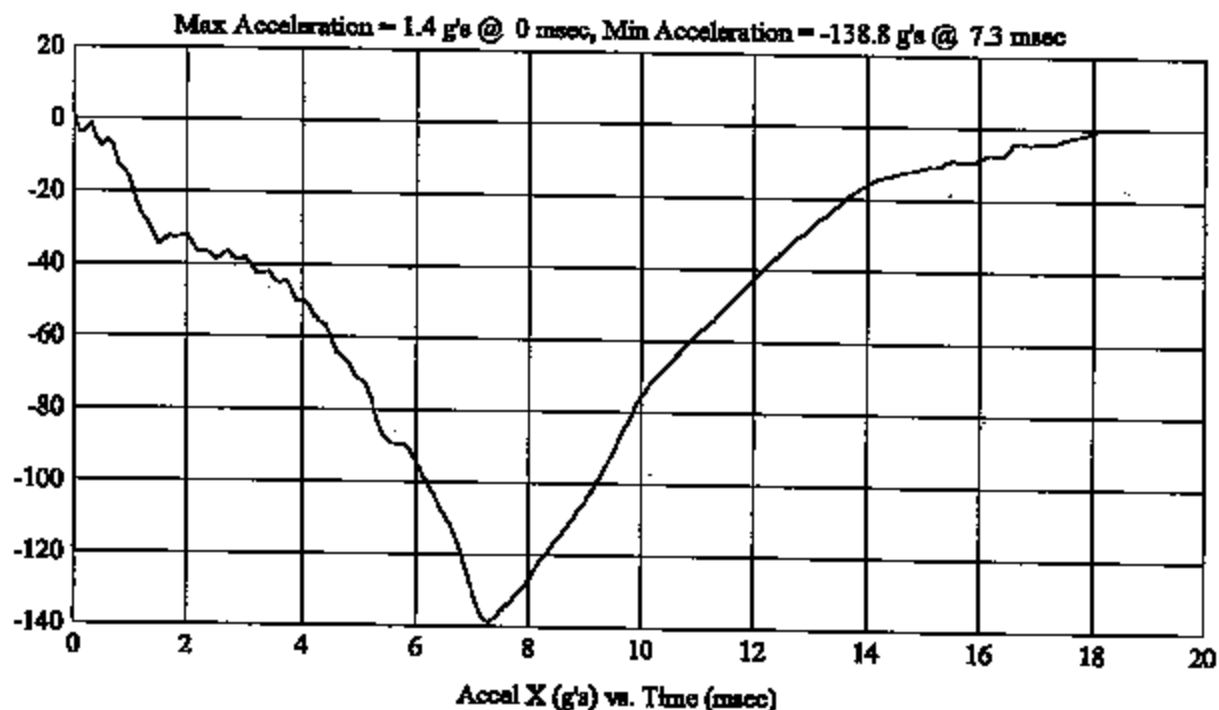
FMH
G0517-001.4Customer: NHTSA
Test # 6
FMS212
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 671, HIC = 668, Delta T = 6.3 msec



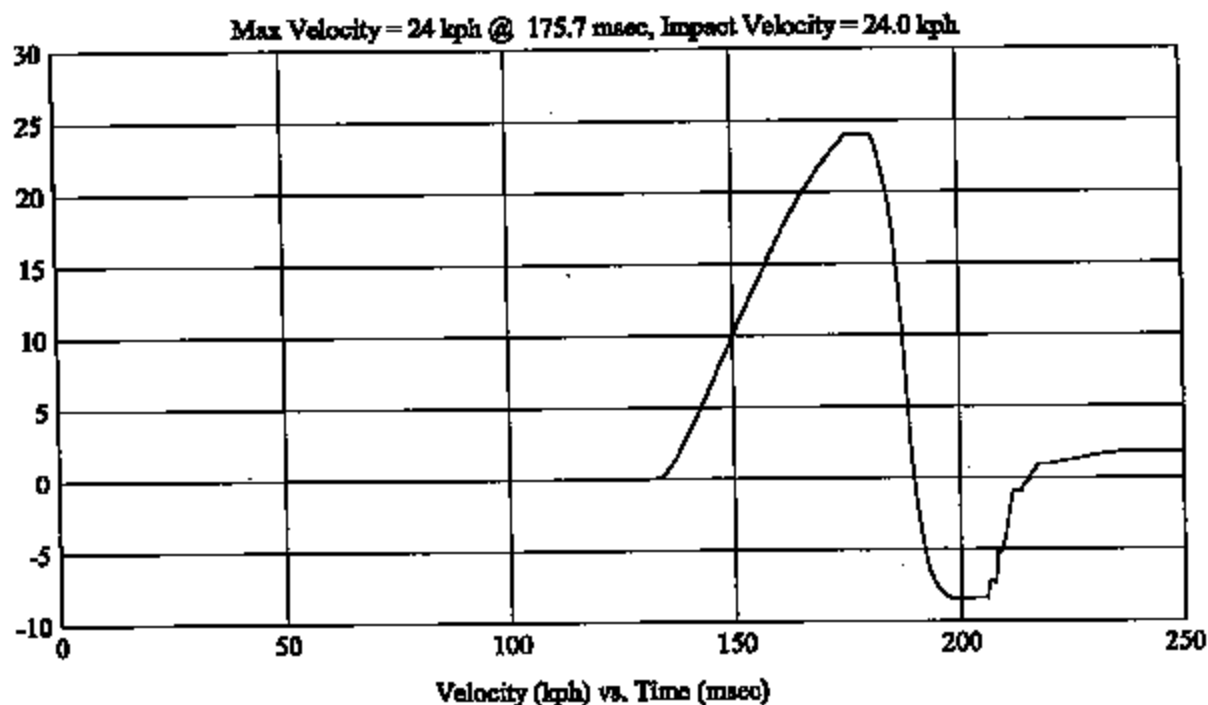
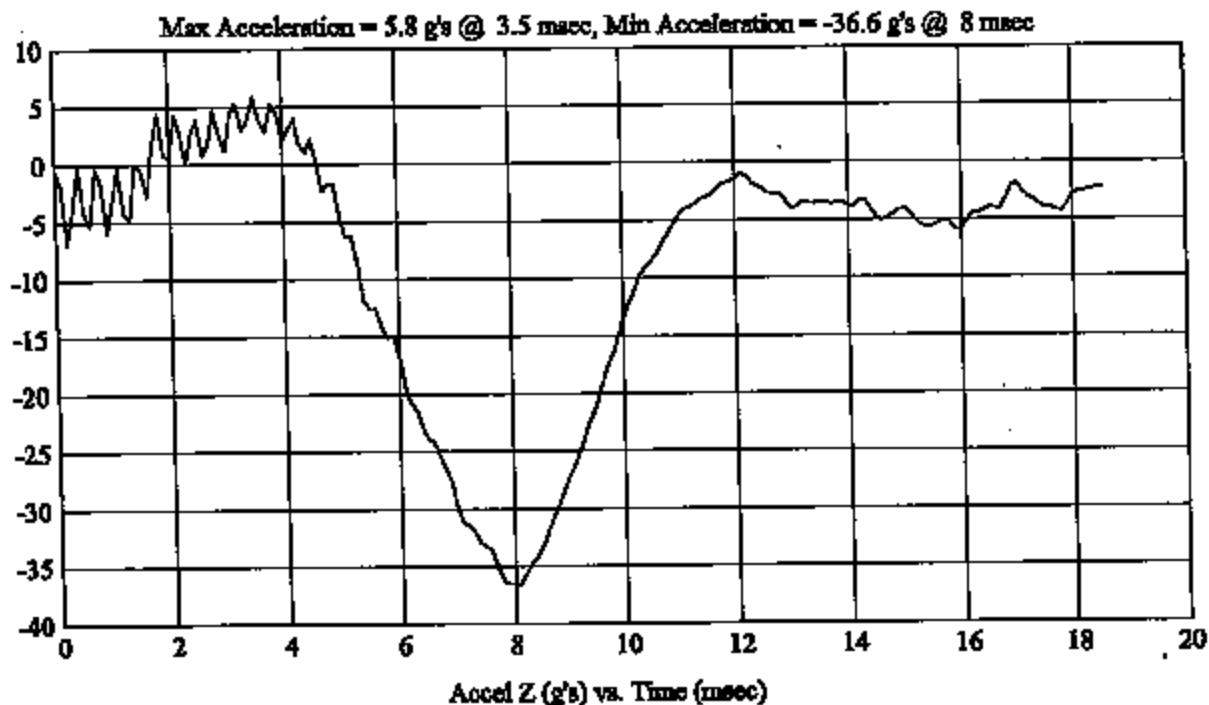
Customer: NHTSA
Test # 6
FM5212
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 671, HIC = 668, Delta T = 6.3 msec



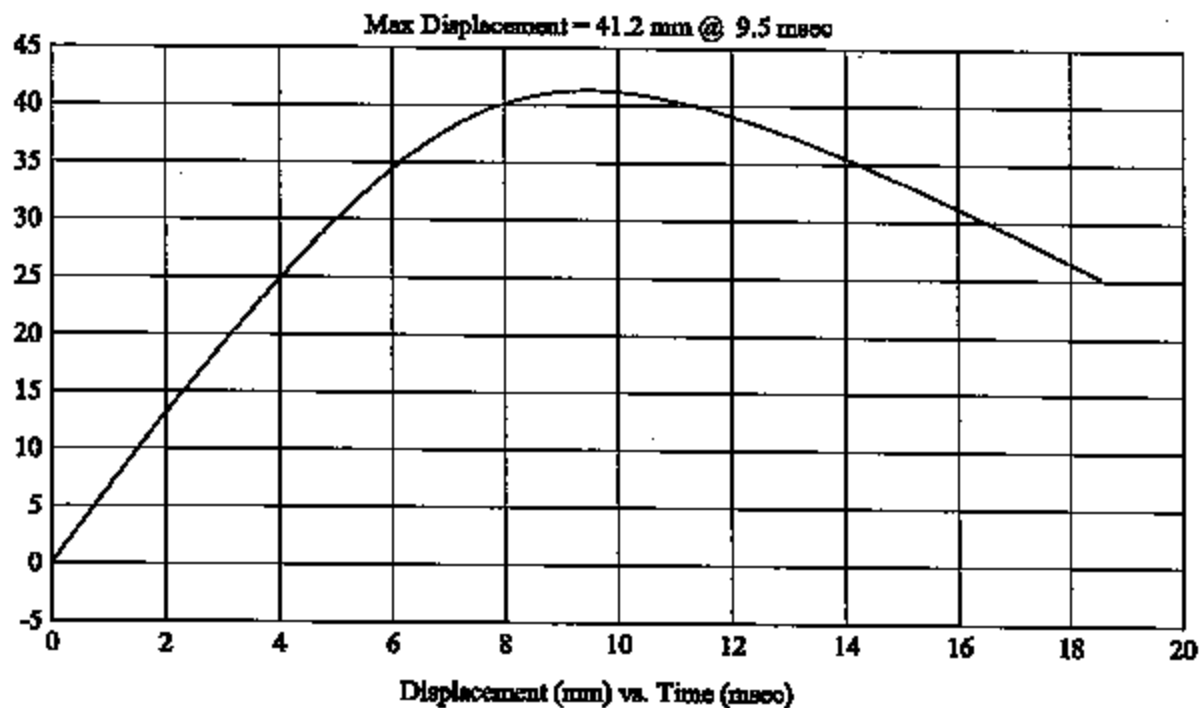
Customer: NHTSA
Test # 6
FM5212
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: OP2
Vehicle Side: Right
Horz/Vert Angle: 90/0

HIC(d) = 671, HIC = 668, Delta T = 6.3 msec



3/20/15
2005 NHTSA HYUNDAI TUCSON
FMVSS 2010 - UPPER INTERIOR
TEST #8 C50506 RIGHT RP2
HV IMPACT ANGLE= 85 / 2
FM5214 PRE-TEST

mga

Impact Testing

5/25/05

G0517-001.4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #8 C50506 RIGHT RP2

H/V IMPACT ANGLE= 85 / 2

FM5214

POST-TEST

G0517-001.4
FM5214
H/V IMPACT ANGLE= 85 / 2

Impact Testing

Impact Testing

8/25/05

G0517-0014

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #8 C50506 RIGHT RP2

HV IMPACT ANGLE = 85 / 2

FM5214 POST-TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 2010 TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): RP2 Right

MGA Test Reference No.: FM5214

Approach Horizontal Angles: 85°

Approach Vertical Angles: 2°

Additional Description:

Test Number: #8

Temperature: 21°C

Humidity: 46%

Time of Test: 1:55 PM

FMH Serial No.: [037]

TEST RESULTS:

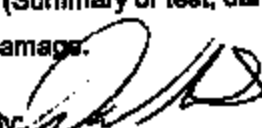
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
661	656	9.2	23.6	18	11 R

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35600	-88.4	1.43	1.43
Y	6	J35641	95.7	1.54	1.54
Z	7	J35791	89.5	1.39	1.39

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

No visible damage.

Recorded By:  Approved By:  Date: 5/25/05

*Only necessary for NHTSA (Government) Compliance testing.

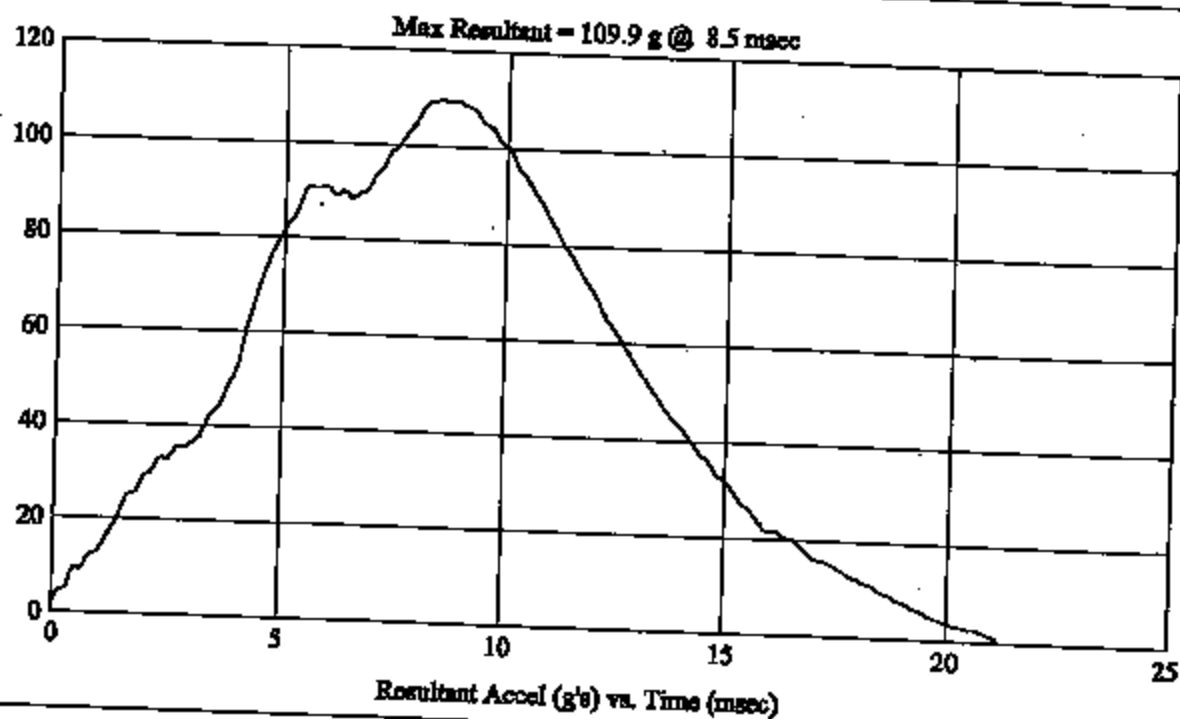
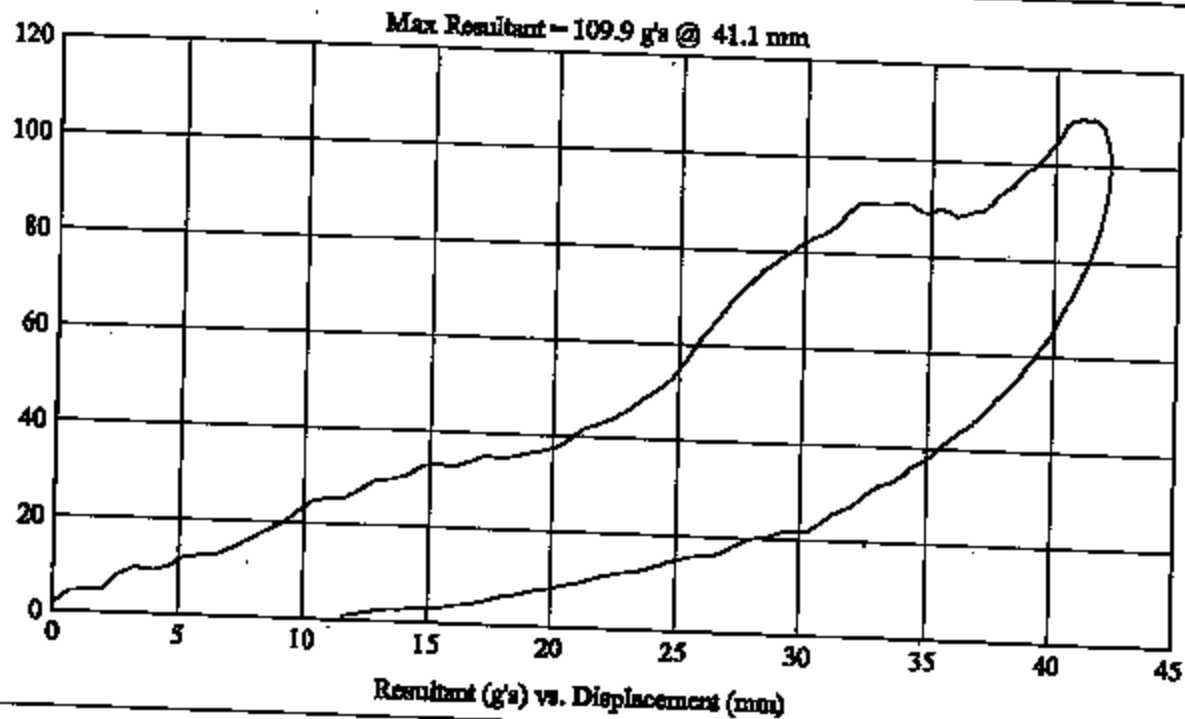
FMH
G0517-001.4Customer: NHTSA
Test # 8
FM5214
Additional Desc: N/A

Vehicle Program: Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RP2
Vehicle Side: Right
Horz/Vert Angle: 85/2

HIC(d) = 661, HIC = 656, Delta T = 9.2 msec



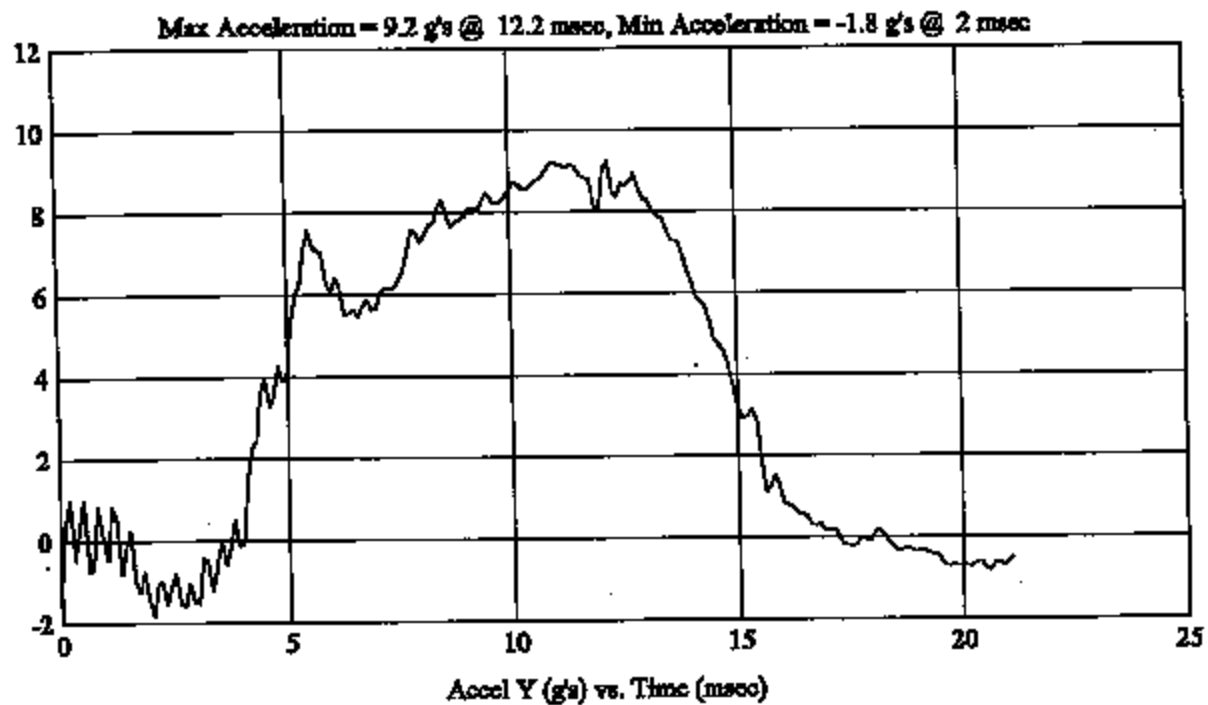
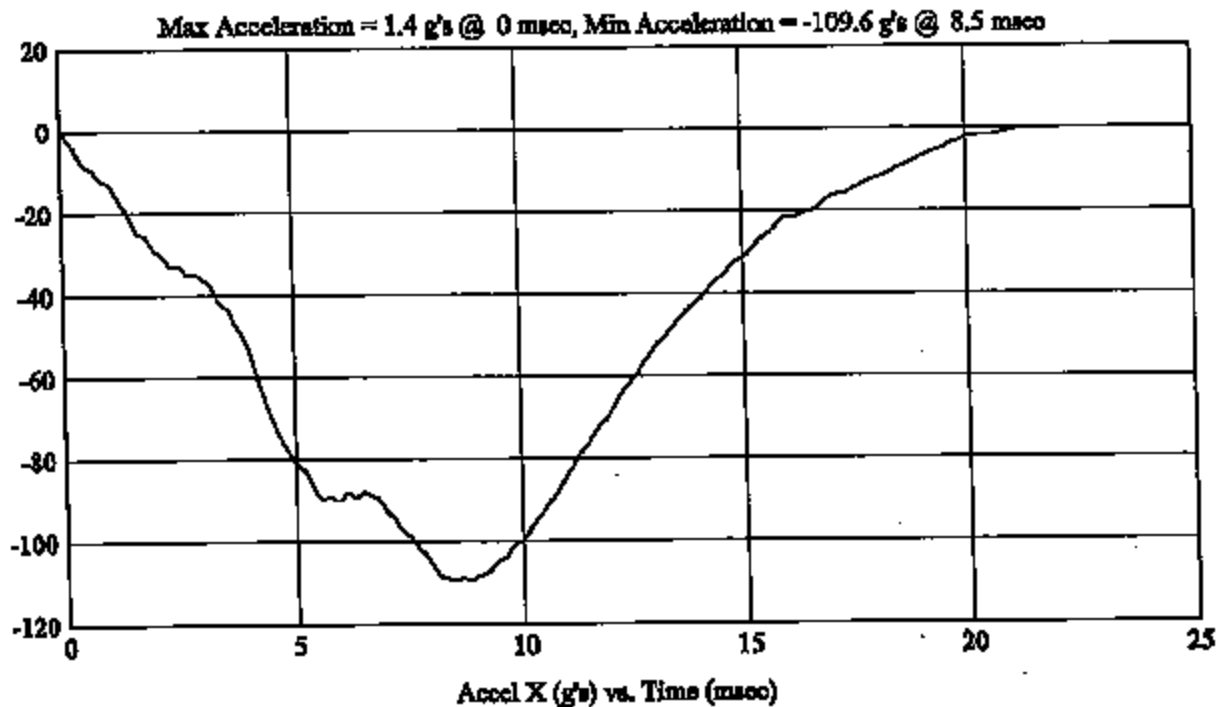
Customer: NHTSA
Test # 8
FMS214
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RP2
Vehicle Side: Right
Horz/Vert Angle: 85/2

HIC(d) = 661, HIC = 656, Delta T = 9.2 msec



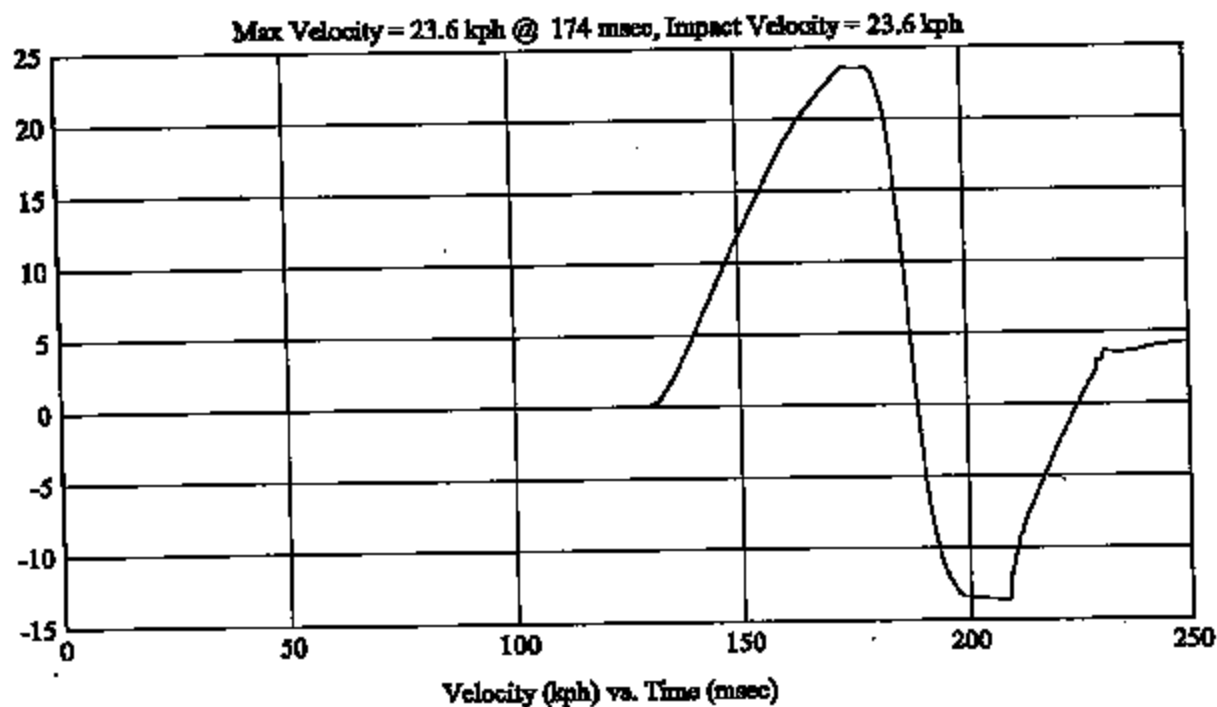
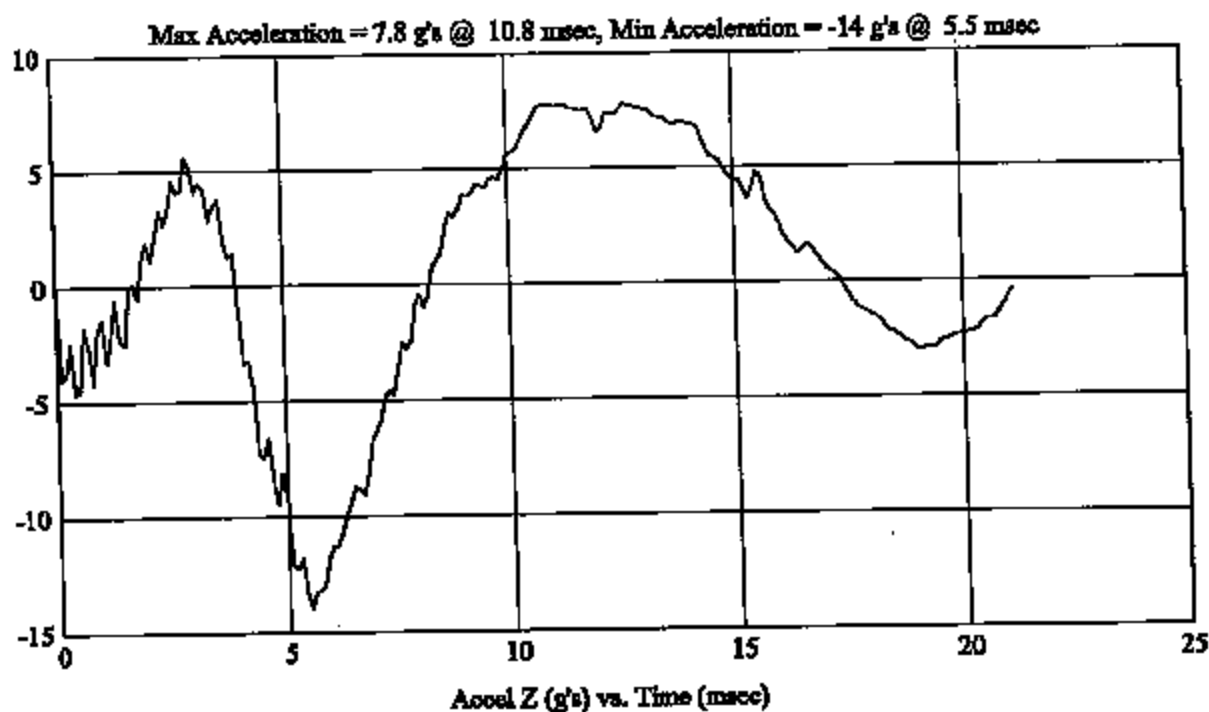
Customer: NHTSA
Test # 8
FM5214
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RP2
Vehicle Side: Right
Horz/Vert Angle: 85/2

HIC(d) = 661, HIC = 656, Delta T = 9.2 msec



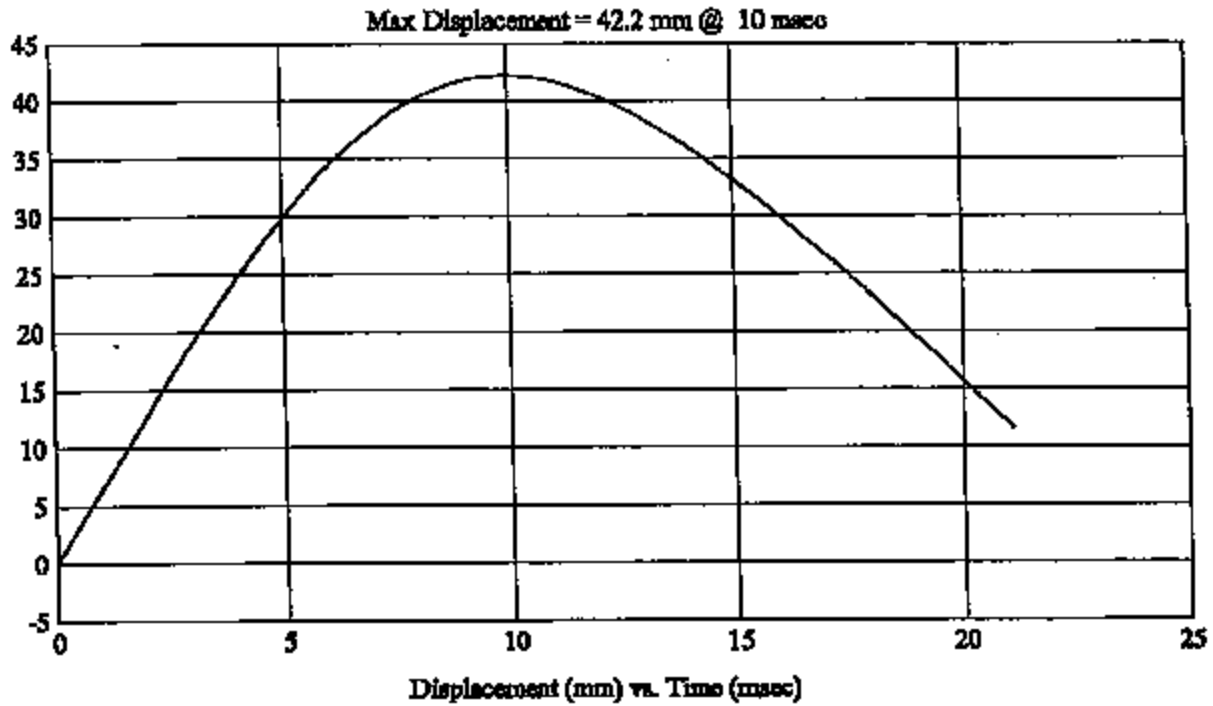
Customer: NHTSA
Test # 8
FM5214
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RP2
Vehicle Side: Right
Horz/Vert Angle: 85/2

HIC(d) = 661, HIC = 656, Delta T = 9.2 msec



5/25/05

5/25/05

5/25/05

5/25/05

2005 NHTSA HYUNDAI TUCSON

FMVSS 2010 - UPPER INTERIOR

TEST #9 C50506 LEFT RH

H/V IMPACT ANGLE = 0 / 50

FM5215

PRE-TEST

523/05
2005 NHTSA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #9 C50506 LEFT RH
H/V IMPACT ANGLE= 0 / 50
FM5215 POST-TEST

150508
FM5215
RH 115
0 / 50

mga

Impact Testing

5/25/05

G0517-001.4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #9 C50506 LEFT RH

H/V IMPACT ANGLE= 0/50

FM5215

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/20/05
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): RH Left

MGA Test Reference No.: FM5215

Approach Horizontal Angles: 0°

Approach Vertical Angles: 50°

Additional Description:

Test Number: #9

Temperature: 22°C

Humidity: 45%

Time of Test: 3:53 PM

FMH Serial No: [038]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
705	713	7.7	23.6	5	4 R

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-106.9	1.44	1.44
Y	6	J36193	102.8	1.54	1.54
Z	7	J36353	98.8	1.39	1.39

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

No visible damage

Recorded By:  Approved By:  Date: 5/25/05

*Only necessary for NHTSA (Government) Compliance testing.

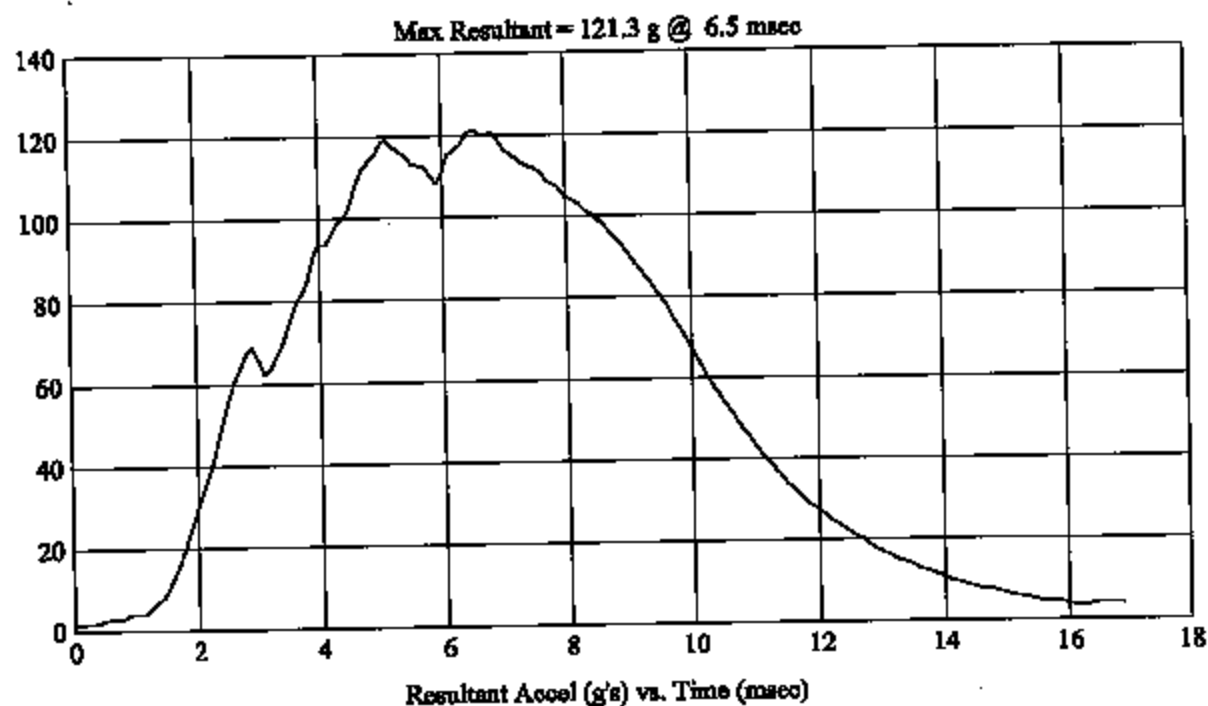
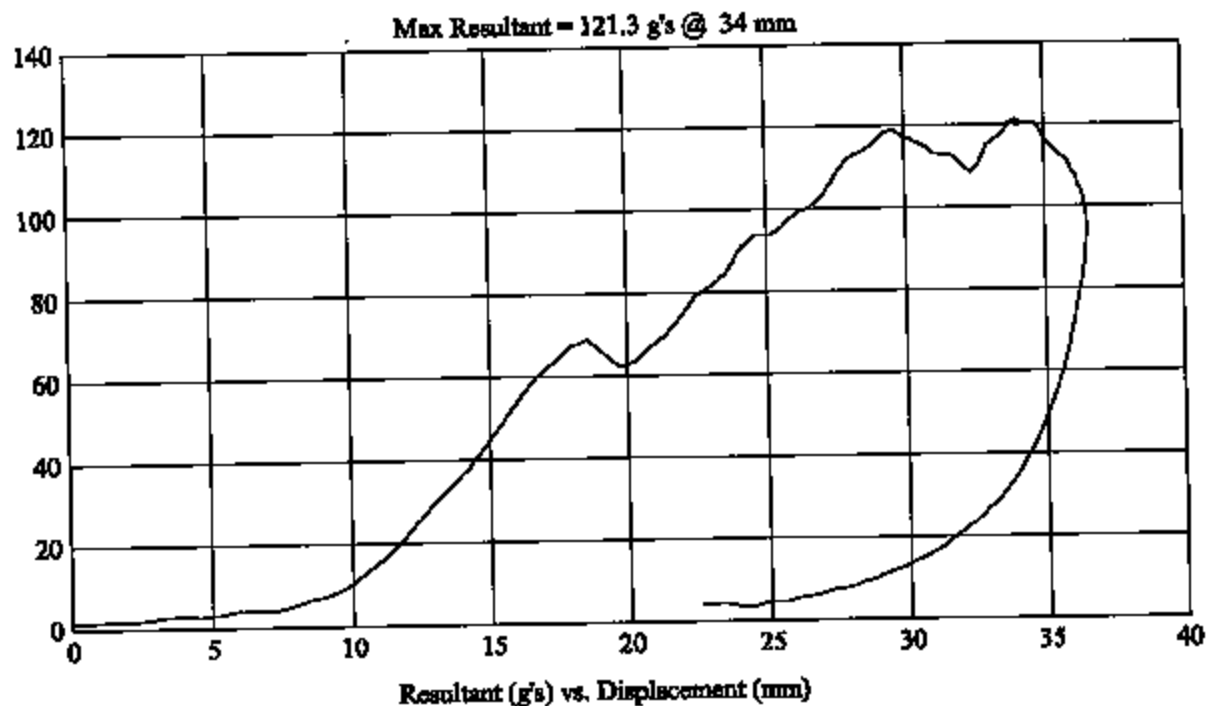
FMH
G0517-001.4Customer: NHTSA
Test # 9
FMS215
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RH
Vehicle Side: Left
Horz/Vert Angle: 0/50

HIC(d) = 705, HIC = 713, Delta T = 7.7 msec



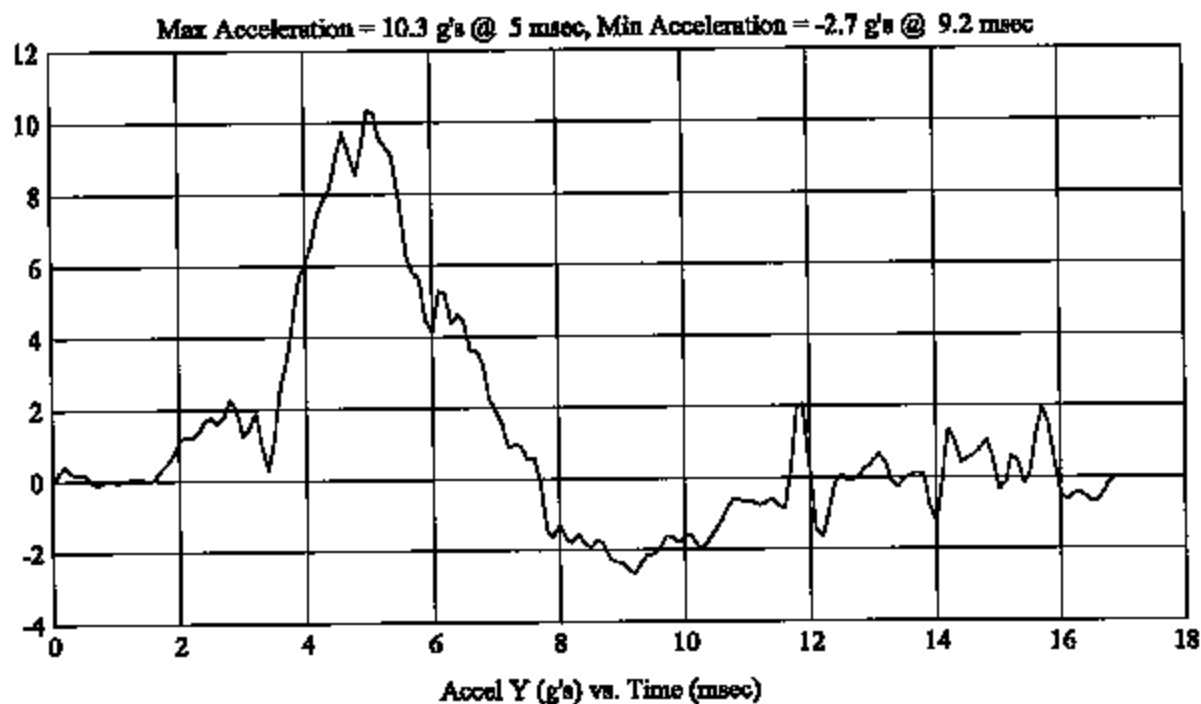
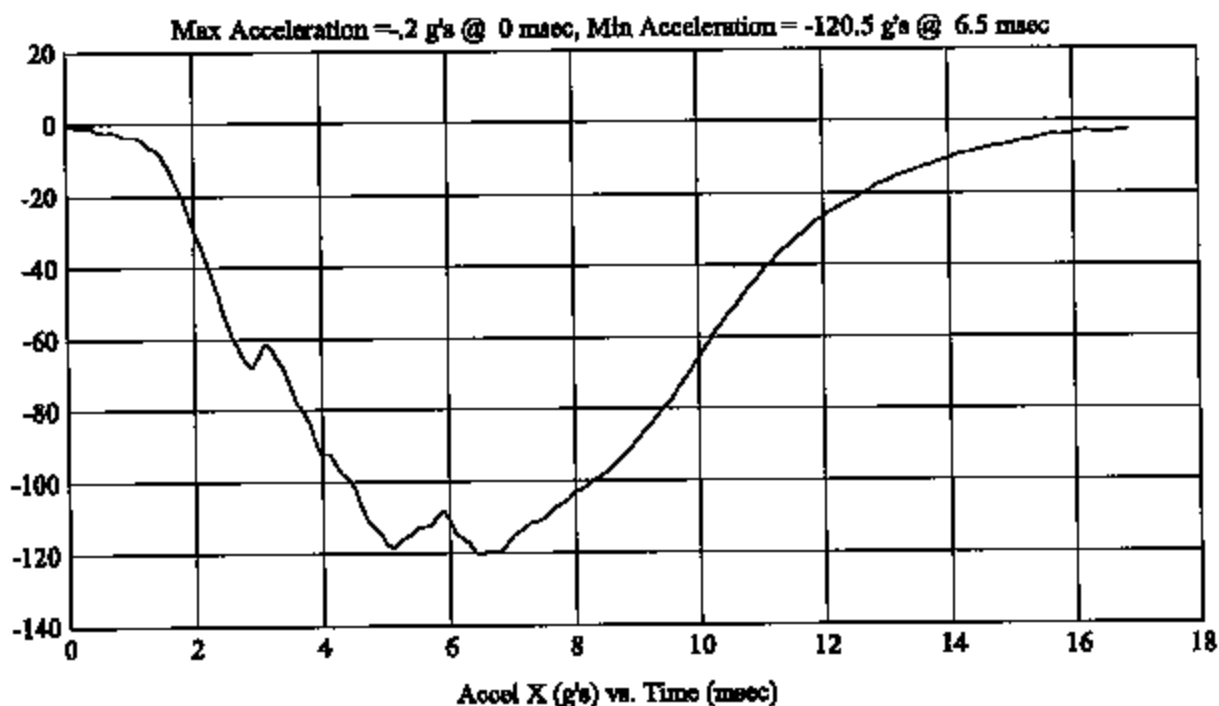
FMH
G05I7-001.4Customer: NHTSA
Test # 9
FM5215
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RH
Vehicle Side: Left
Horz/Vert Angle: 0/50

HIC(d) = 705, HIC = 713, Delta T = 7.7 msec



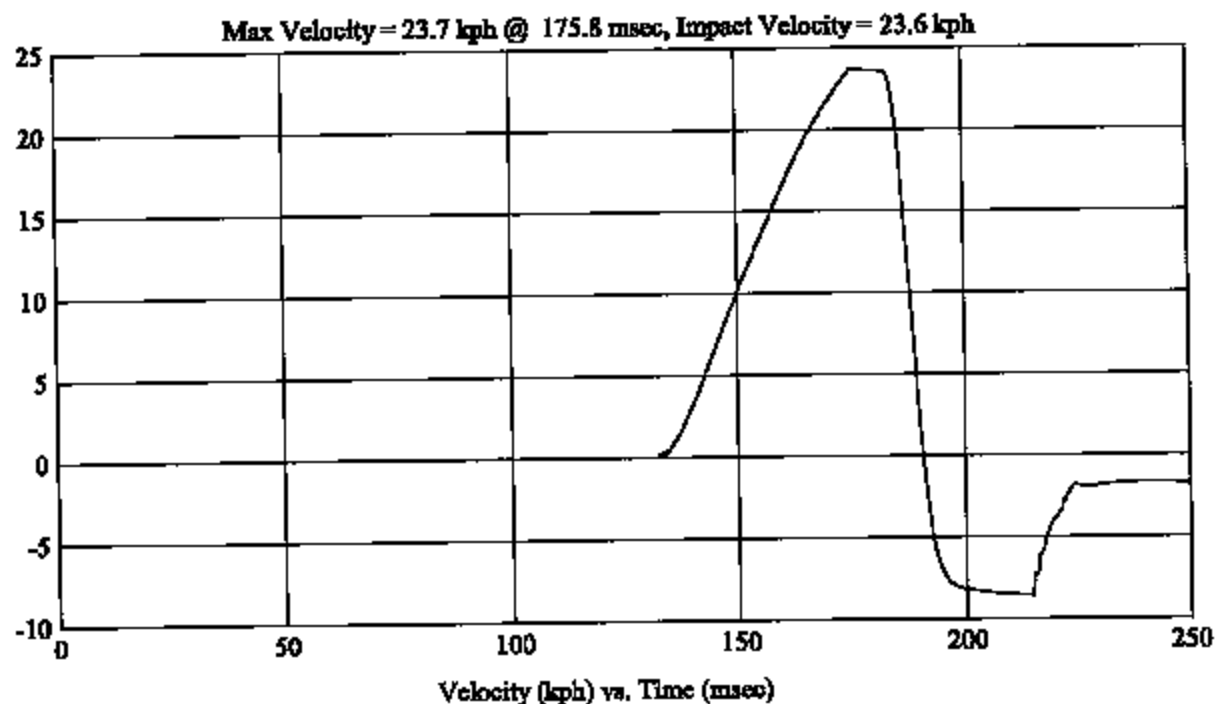
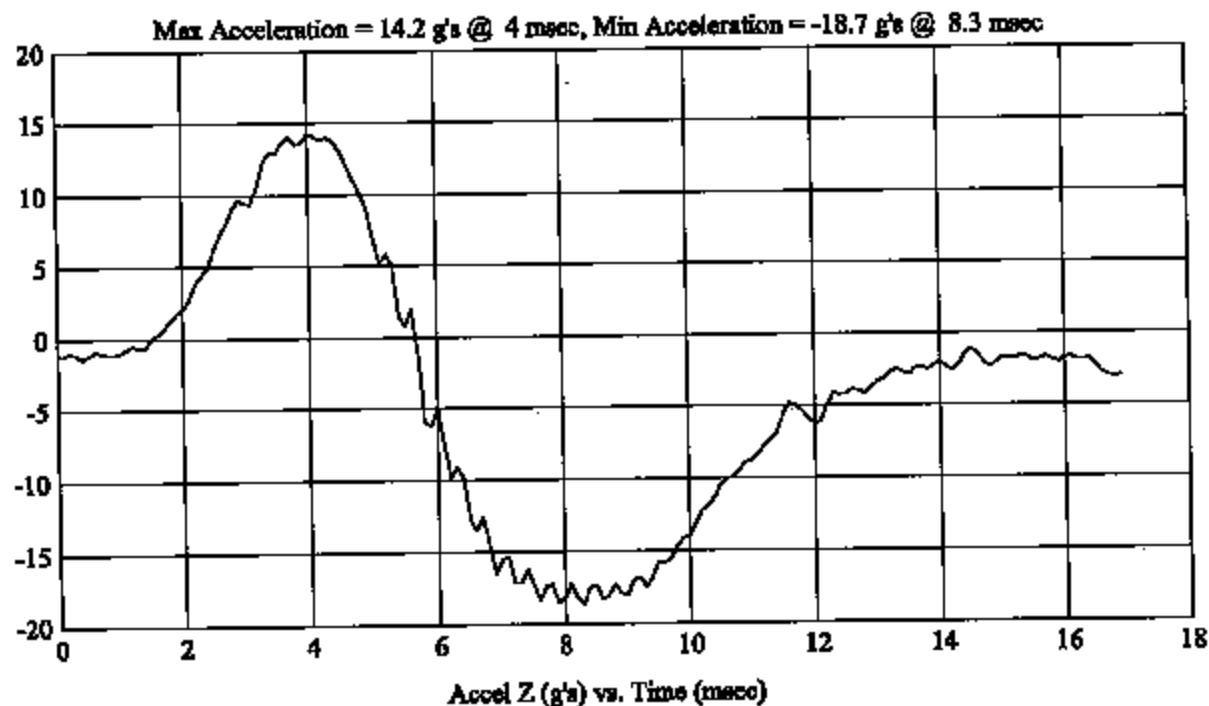
FMH
G05I7-001.4Customer: NHTSA
Test # 9
FM5215
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RH
Vehicle Side: Left
Horz/Vert Angle: 0/50

HIC(d) = 705, HIC = 713, Delta T = 7.7 msec



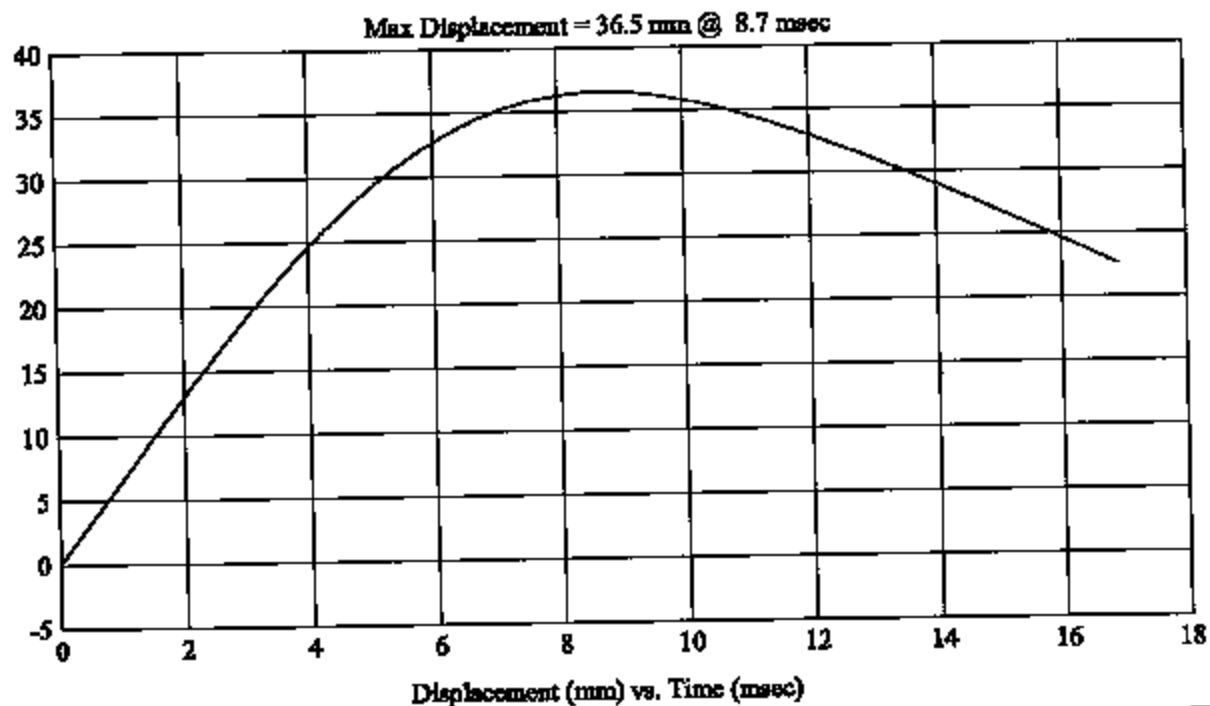
FMH
G05I7-001.4Customer: NHTSA
Test # 9
FM5215
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: RH
Vehicle Side: Left
Horz/Vert Angle: 0/50

HIC(d) = 705, HIC = 713, Delta T = 7.7 msec



5/28/05

Impact Testing

5/28/05

GUST CO1 -

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #11 C50506 LEFT SR2(A)

HV IMPACT ANGLE= 270 / 26

FM5217

PRE-TEST

5/26/06

Impact Testing
G0517-001.4

5/26/06

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #11 C50506 LEFT SR2(A)

H/V IMPACT ANGLE= 270 / 26

FM5217 POST-TEST

~~XXXXXXXXXX~~ mga

Impact Testing

5/26/05

60517-001-4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #11 C50506 LEFT SR2(A)

H/V IMPACT ANGLE = 270 / 28

FM5217

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/3/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): SR2(a) Left

MGA Test Reference No.: FM5217

Approach Horizontal Angles: 270°

Approach Vertical Angles: 28°

Additional Description:

Test Number: #11

Temperature: 21°C

Humidity: 46%

Time of Test: 8:30 AM

FMH Serial No.: [037]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
325	210	6.8	18.9	35	0

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35800	-98.4	1.43	1.43
Y	6	J35841	95.7	1.54	1.54
Z	7	J35791	89.5	1.39	1.39

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

No visible damage

Recorded By:  Approved By:  Date: 5/26/05

*Only necessary for NHTSA (Government) Compliance testing.

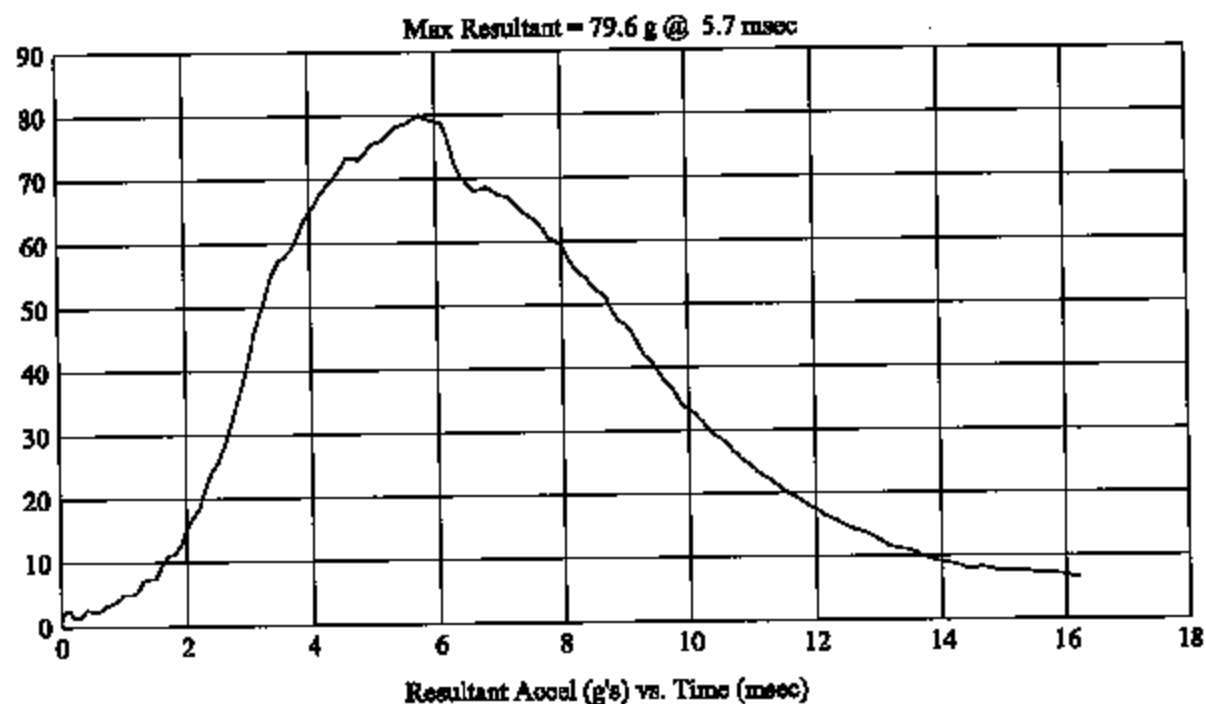
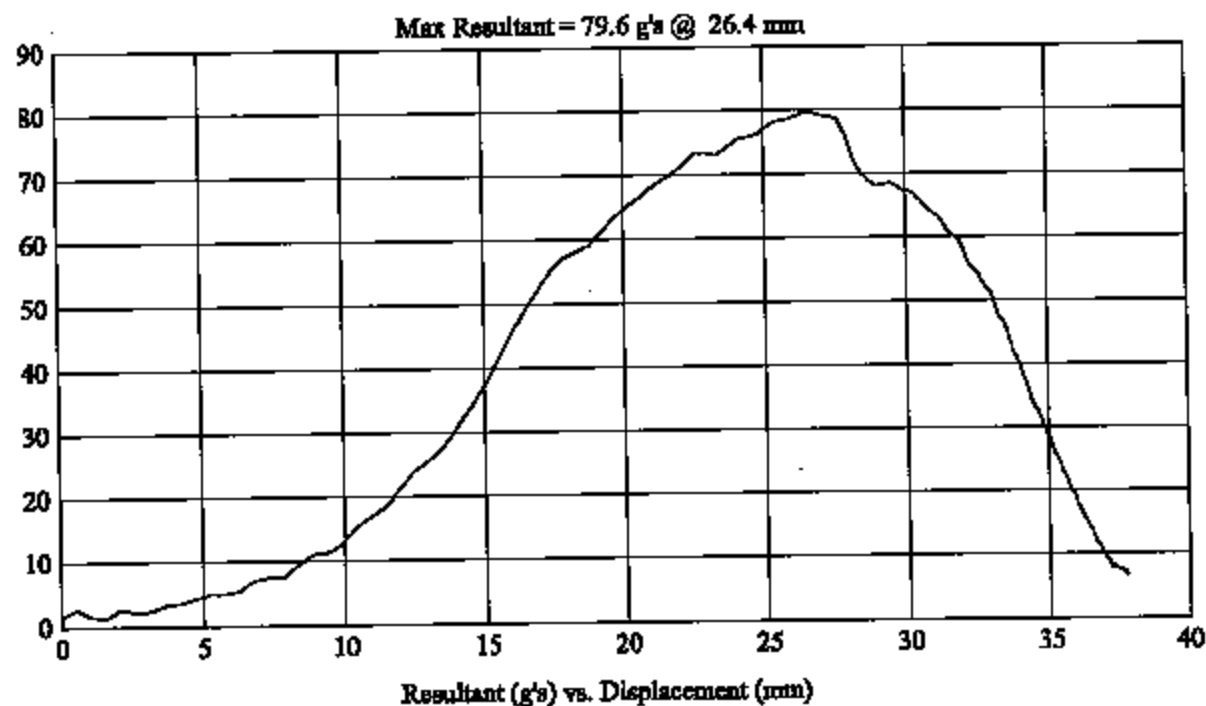
FMH
G05I7-001.4Customer: NHTSA
Test # 11
FM5217
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/26

HIC(d) = 325, HIC = 210, Delta T = 6.8 msec



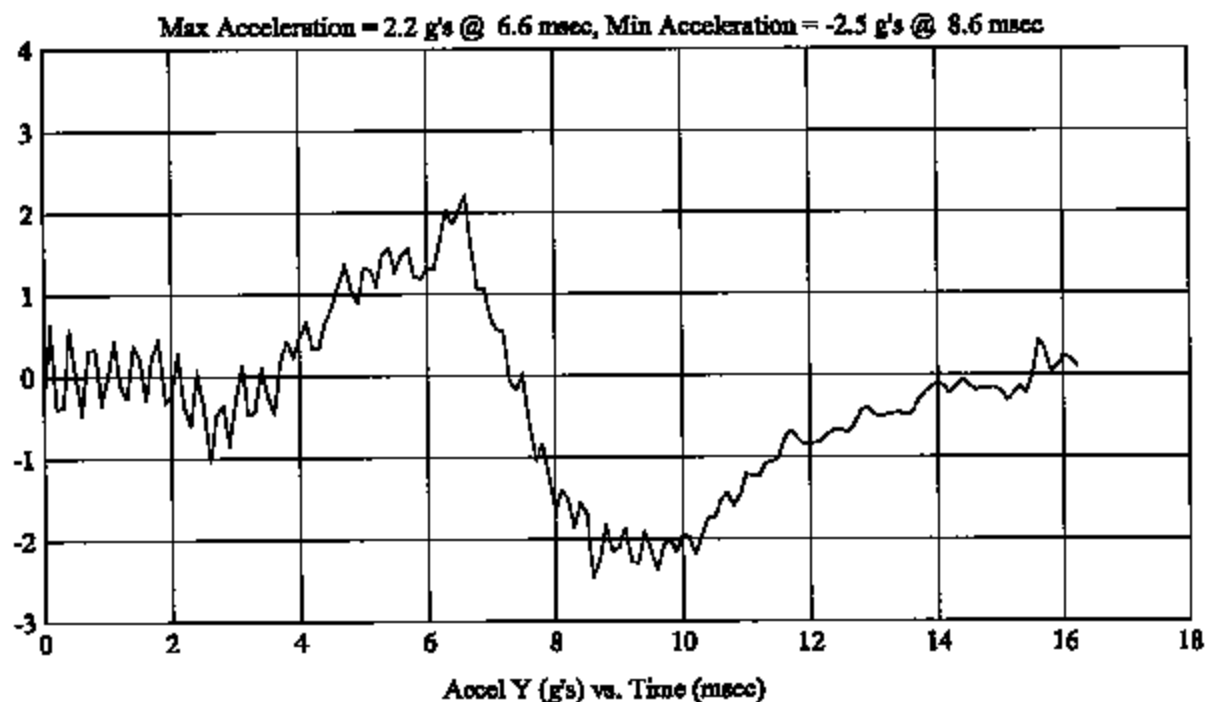
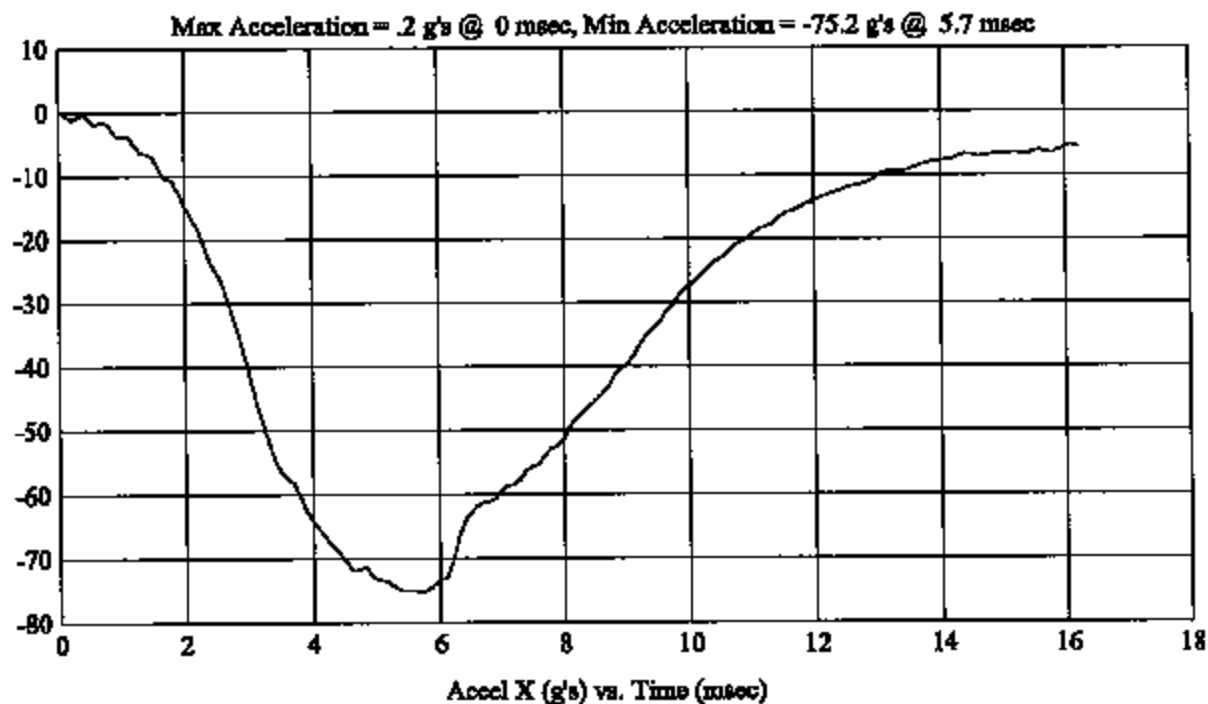
FMH
G05Y7-001.4Customer: NHTSA
Test # 11
FMS217
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/26

HIC(d) = 325, HIC = 210, Delta T = 6.8 msec



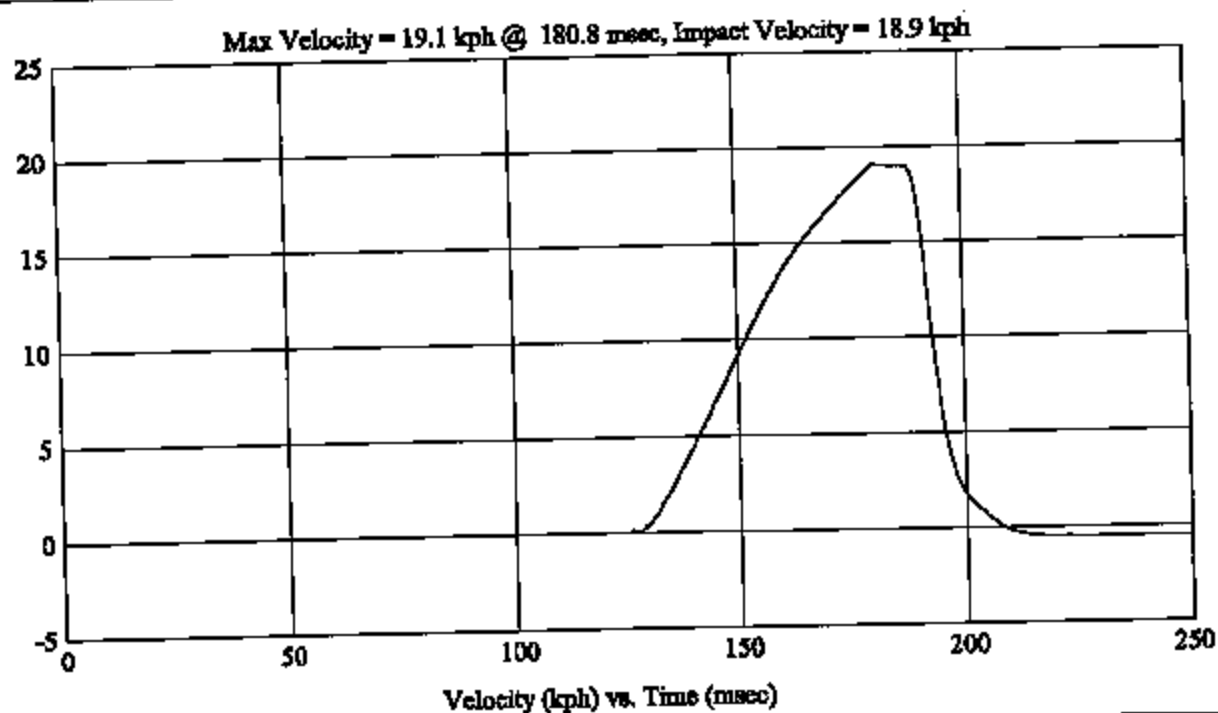
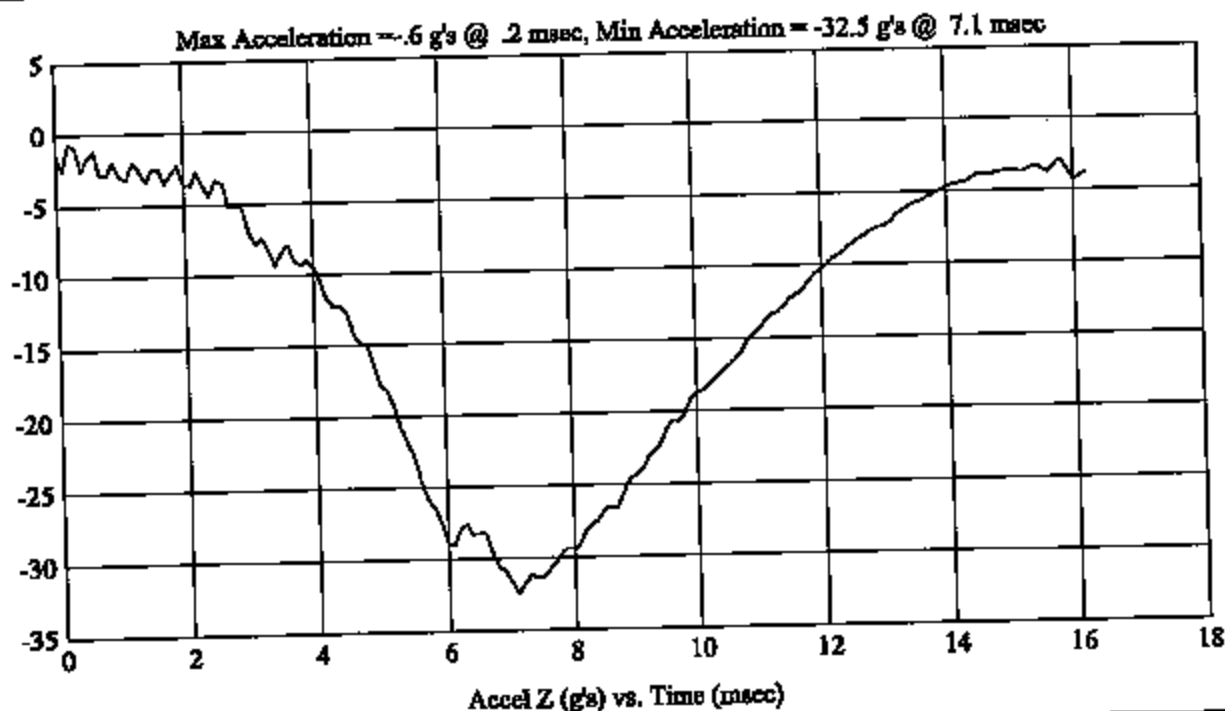
FMH
G0517-001.4Customer: NHTSA
Test # 11
FM5217
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: SR2(a)
Vehicle Side: Left
Horz/Vent Angle: 270/26

HIC(d) = 325, HIC = 210, Delta T = 6.8 msec



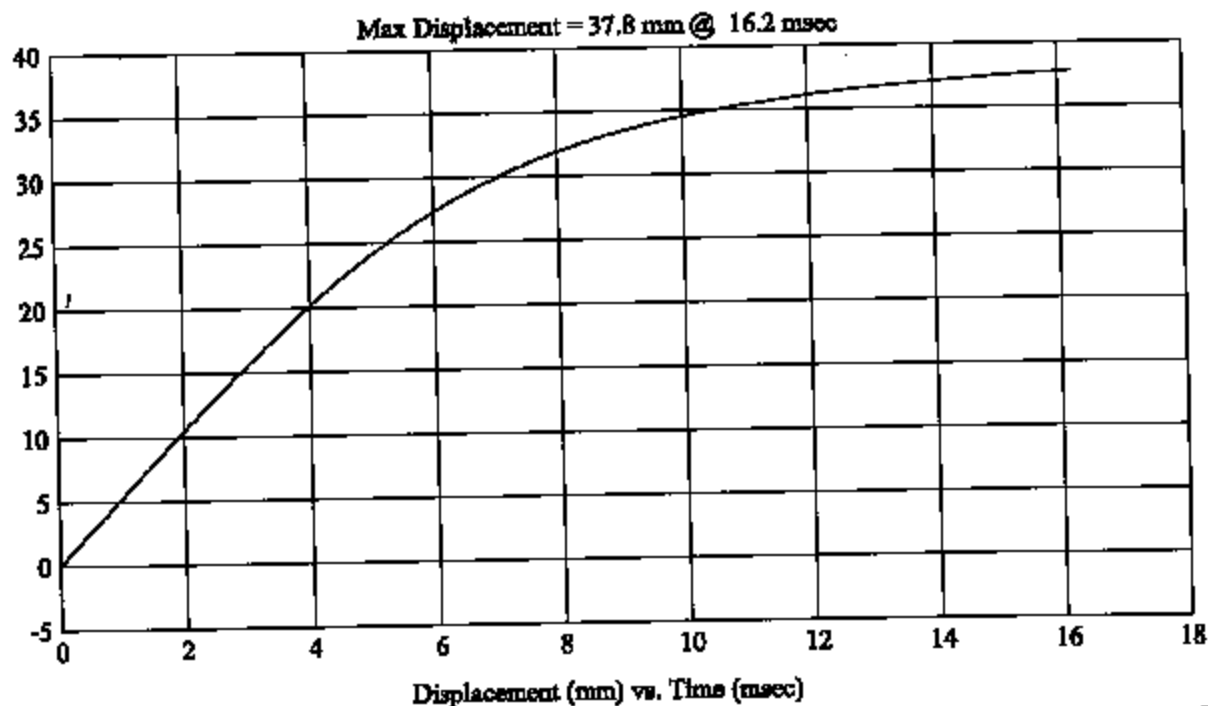
FMH
G05T7-001.4Customer: NHTSA
Test # 11
FMS217
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/26/05

Model Year: 2005
Target: SR2(a)
Vehicle Side: Left
Horz/Vert Angle: 270/26

HIC(d) = 325, HIC = 210, Delta T = 6.8 msec



RECEIVED FROM
DATE OF
RICE WATSON WILSON
ELEMENTS OF
TECHNICAL GROUP - LEFT LRL
HPL IMPACT ANGLE - 370-40
FM6210 PRE TEST

mga

Impact Testing

5/25/05

G0517-0014

2005 NHTSA HYUNDAI TUCSON

· MVSS 201U - UPPER INTERIOR

TEST #10 C50506 LEFT UR2

H/V IMPACT ANGLE= 270 / 40

FM5216 POST-TEST

2005 NHTSA HYUNDAI TUCSON

FMVSS 2010 - UPPER INTERIOR

TEST #10 C50501

HV IMPACT ANGLE 55/40/25

FM5216

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR2 Left

MGA Test Reference No.: FM5216

Approach Horizontal Angles: 270°

Approach Vertical Angles: 40°

Additional Description:

Test Number: #10

Temperature: 22C

Humidity: 42%

Time of Test: 4:30 PM

FMH Serial No.: [035]

TEST RESULTS:

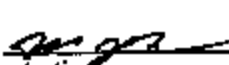
HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
664	860	7.7	23.7	25	7 L

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

Axis	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.8	1.44	1.43
Y	6	J35919	97	1.54	1.54
Z	7	J22864	95.6	1.39	1.39

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

No visible damage

Recorded By:  Approved By:  Date: 5/25/05

*Only necessary for NHTSA (Government) Compliance testing

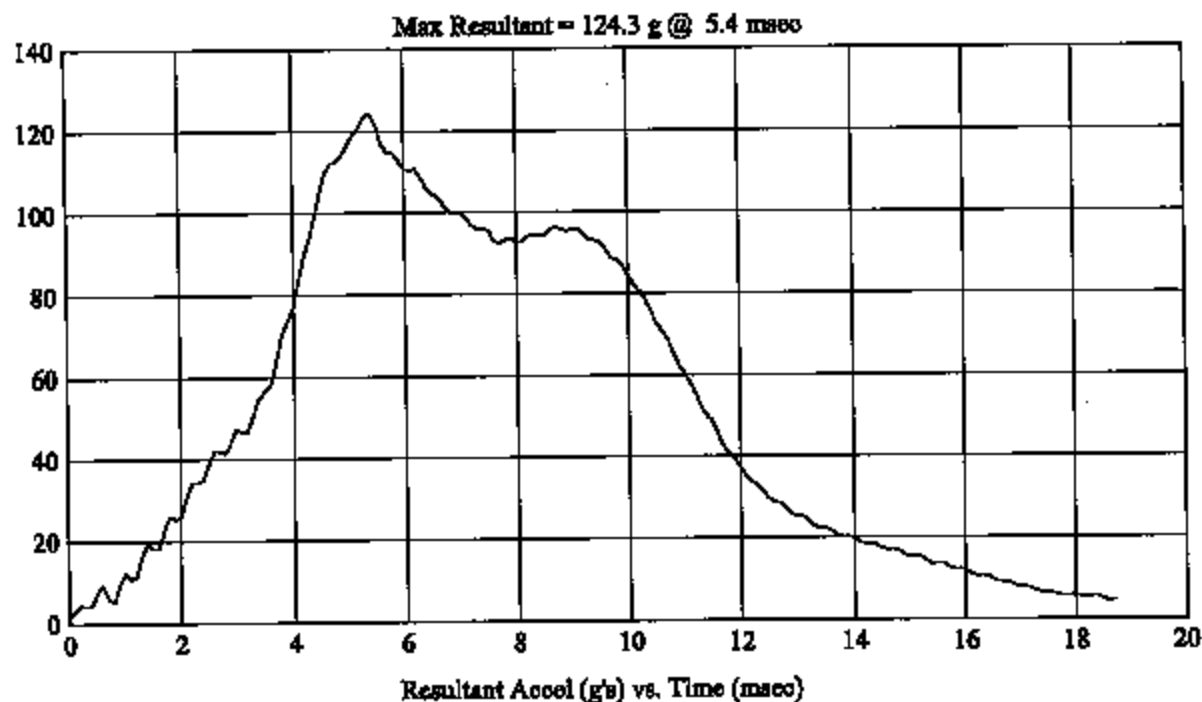
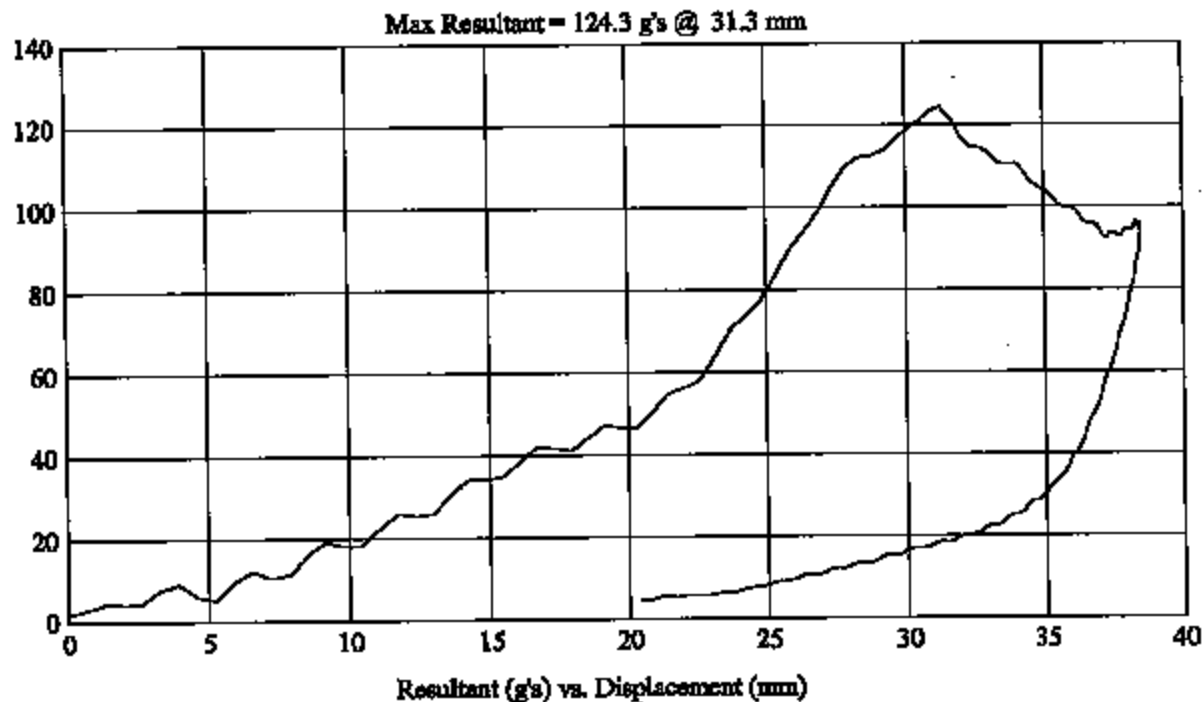
FMH
G05I7-001.4Customer: NHTSA
Test # 10
FM5216
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/40

HIC(d) = 664, HIC = 660, Delta T = 7.7 msec



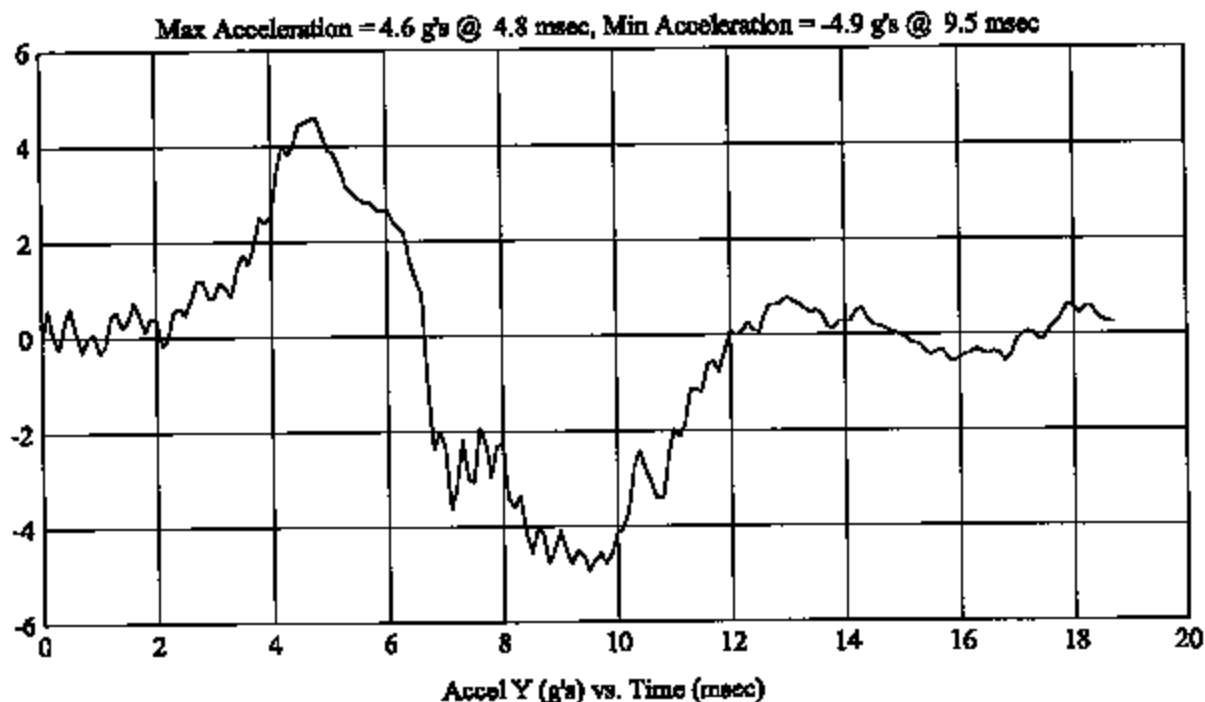
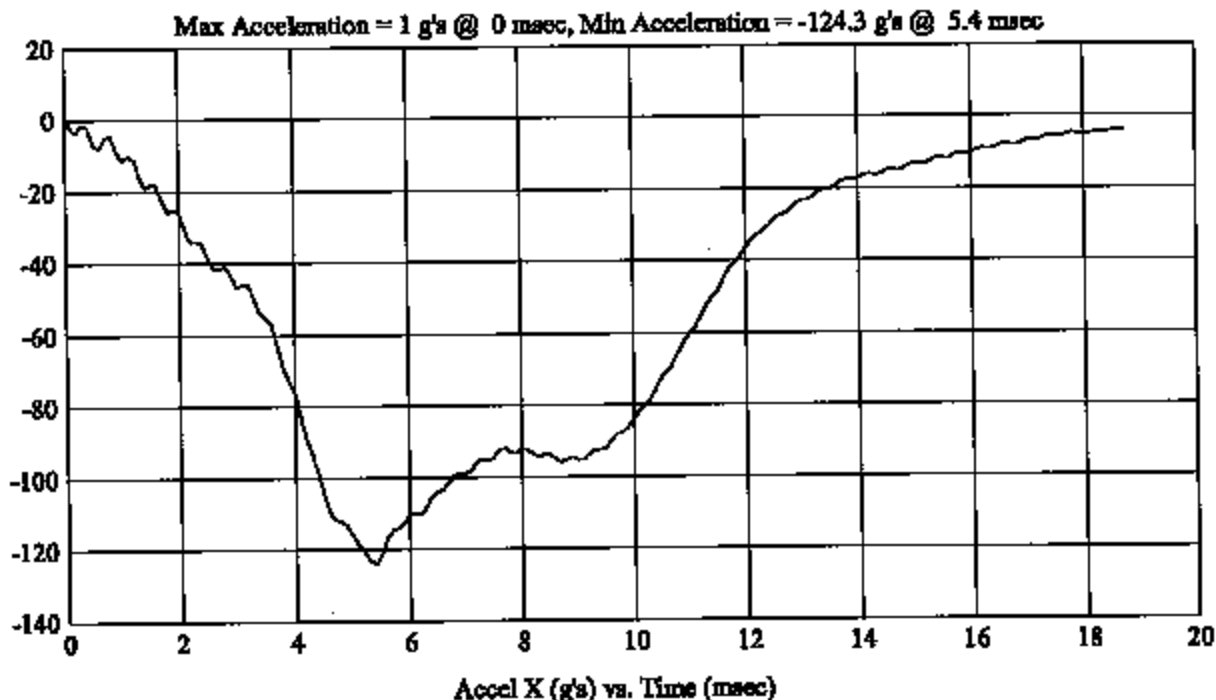
FMH
G05I7-001.4Customer: NHTSA
Test # 10
FMS216
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/40

HIC(d) = 664, HIC = 660, Delta T = 7.7 msec



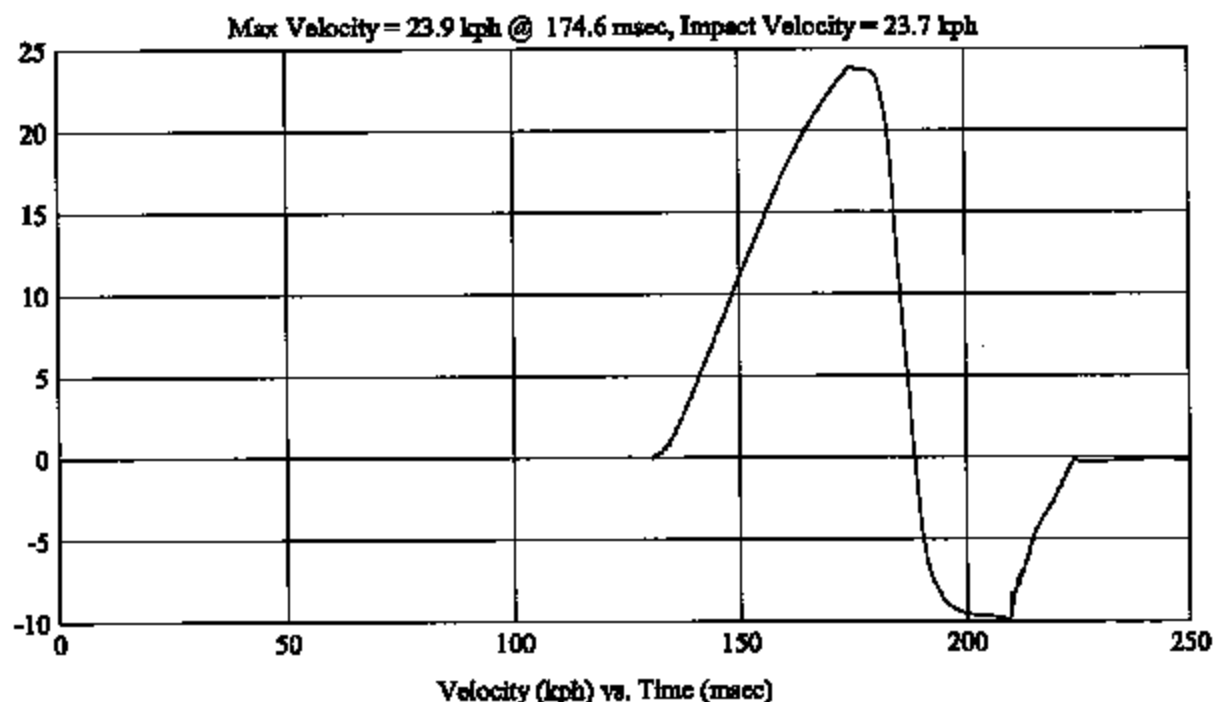
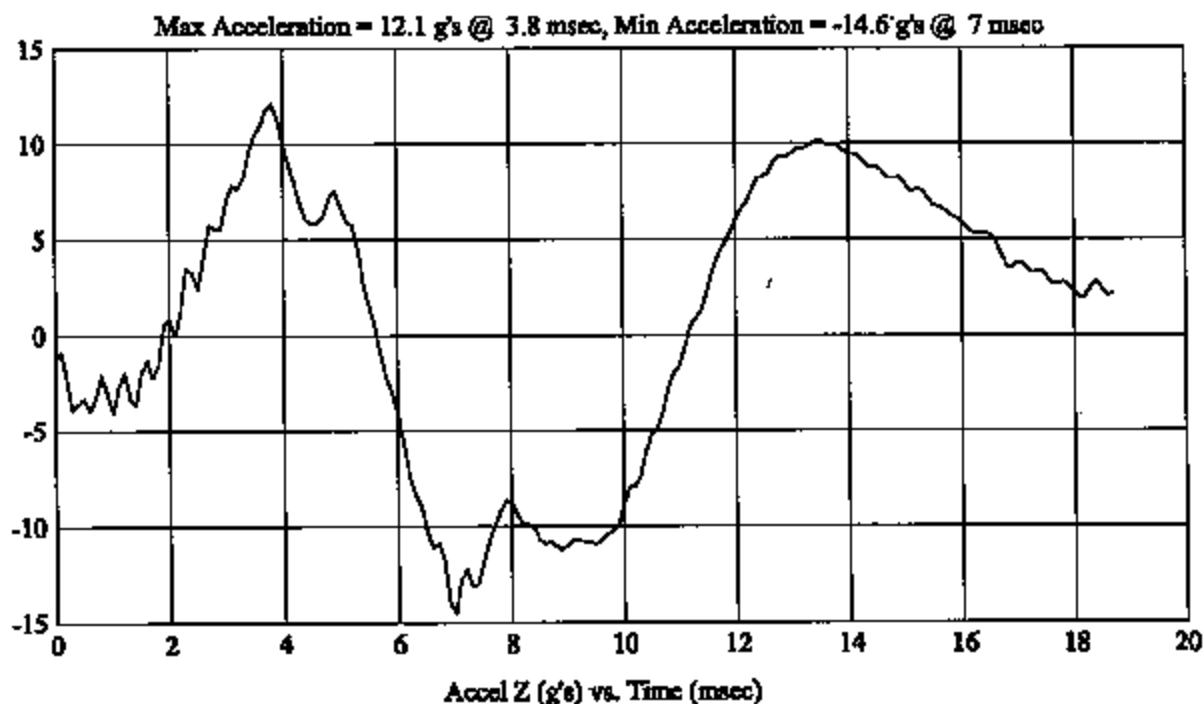
FMH
G05I7-001.4Customer: NHTSA
Test # 10
FM5216
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/40

HIC(d) = 664, HIC = 660, Delta T = 7.7 msec



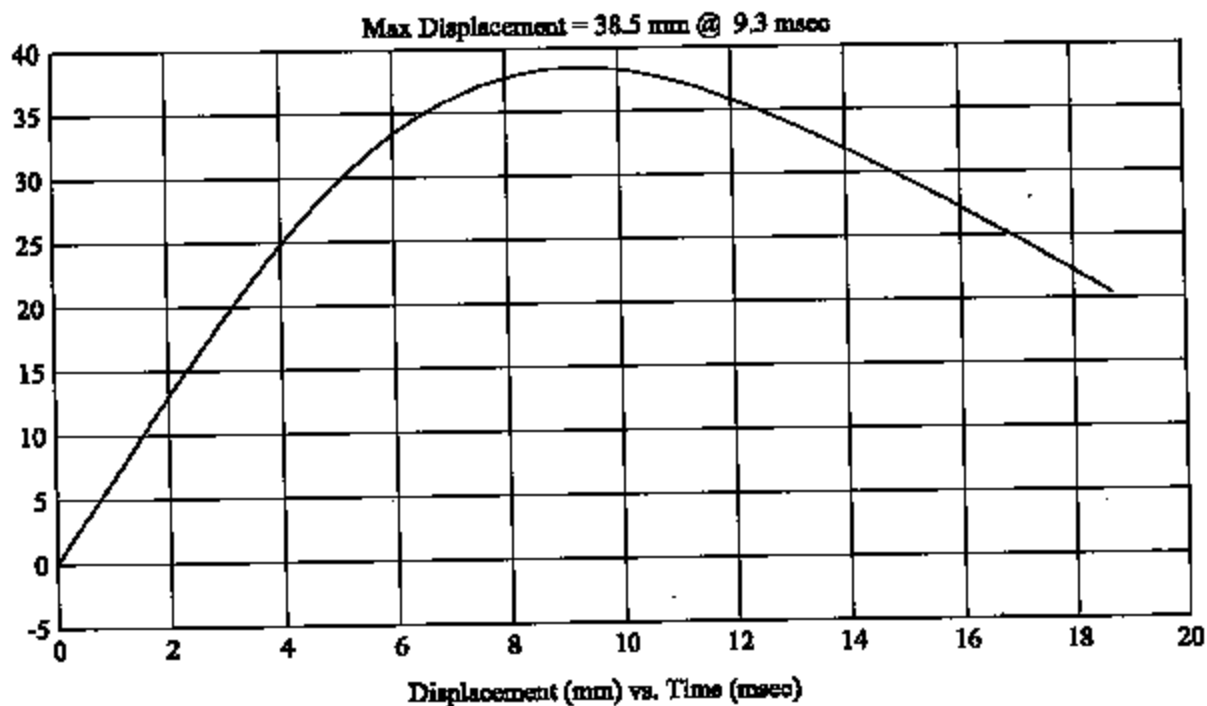
FMH
G0517-001.4Customer: NHTSA
Test # 10
FMS216
Additional Desc: N/A

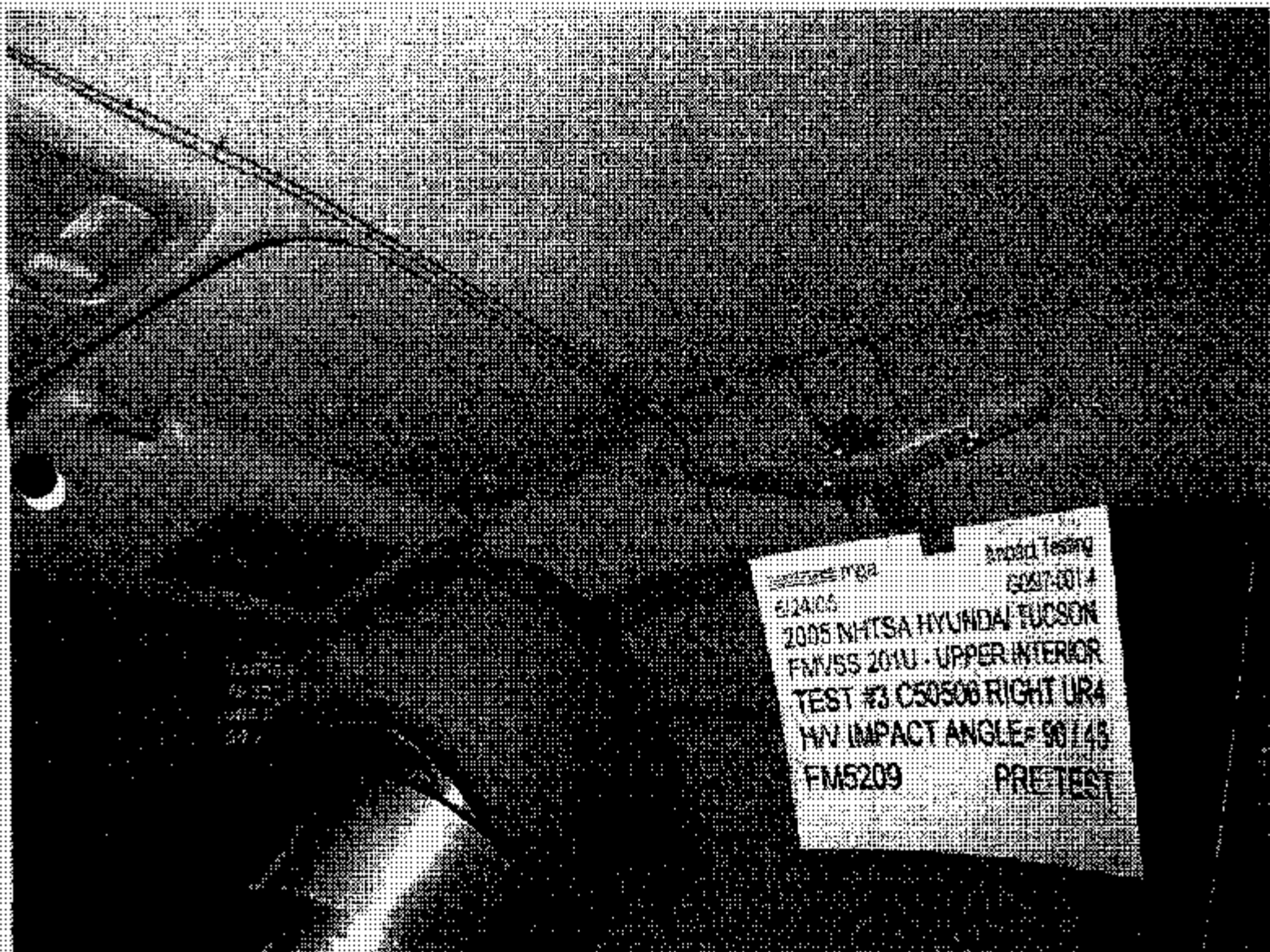
Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR2
Vehicle Side: Left
Horz/Vert Angle: 270/40

HIC(d) = 664, HIC = 660, Delta T = 7.7 msec





100506
R1510
J01 01
00 / 05

Impact Testing
G0517-401.4

672405

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #3 C50506 RIGHT DPA

H/V IMPACT ANGLE - 40/14

FM5209

POSITIVE

mga

Impact Testing

5/24/05

G0517-001-4

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #3 C50506 RIGHT UR4

H/V IMPACT ANGLE= 90 / 45

FM5209

POST-TEST

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL:2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Target (Vehicle Side): UR4 Right

MGA Test Reference No.:FM5209

Approach Horizontal Angles:90°

Approach Vertical Angles:45°

Additional Description:

Test Number:#3

Temperature:22C

Humidity:46%

Time of Test:3:49 PM

FMH Serial No:[036]

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
722	737	6.9	23.3	35	0

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

AxIs	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J36197	-106.9	1.44	1.44
Y	6	J36193	102.8	1.54	1.54
Z	7	J36353	96.8	1.38	1.38

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

Headliner deformation.

Recorded By:  Approved By:  Date: 5/24/05

*Only necessary for NHTSA (Government) Compliance testing.

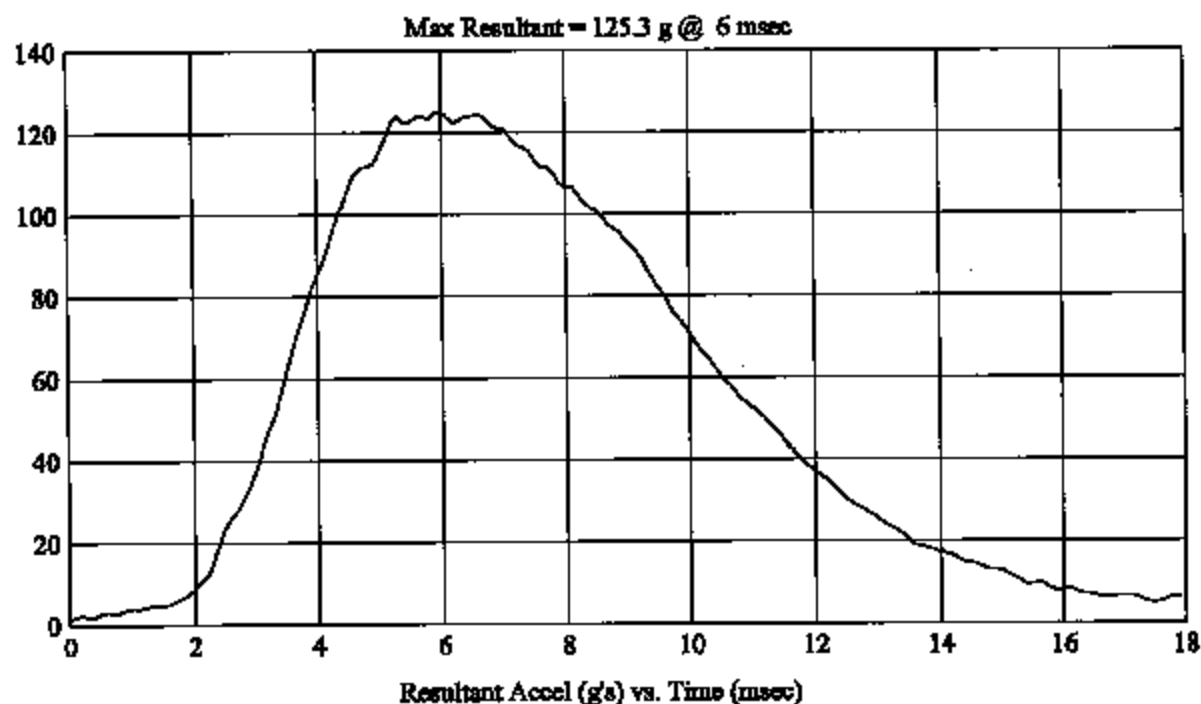
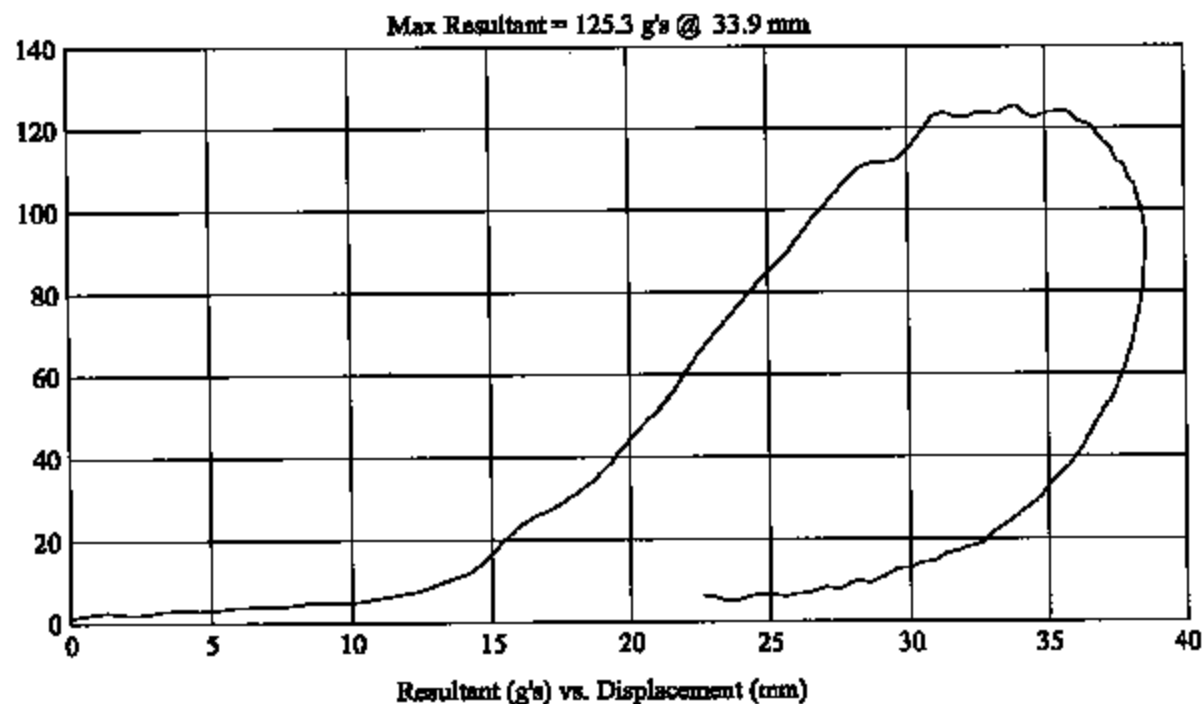
FMH
G0517-001.4Customer: NHTSA
Test # 3
FM5209
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/45

HIC(d) = 722, HIC = 737, Delta T = 6.9 msec



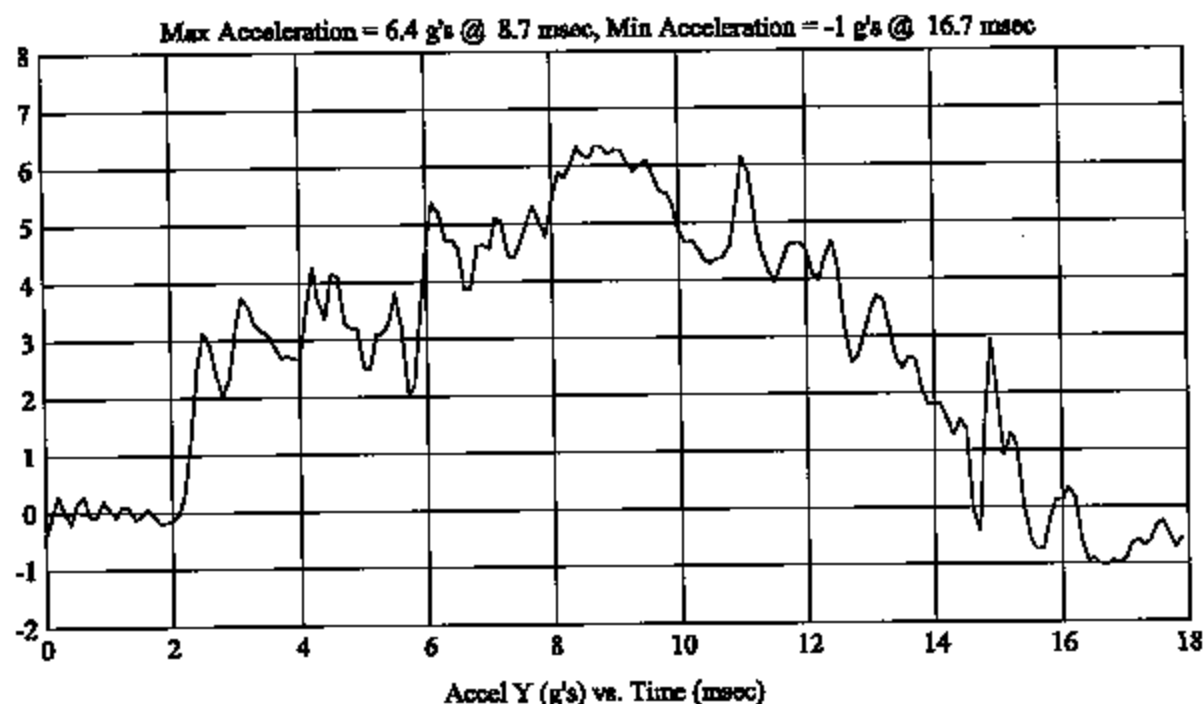
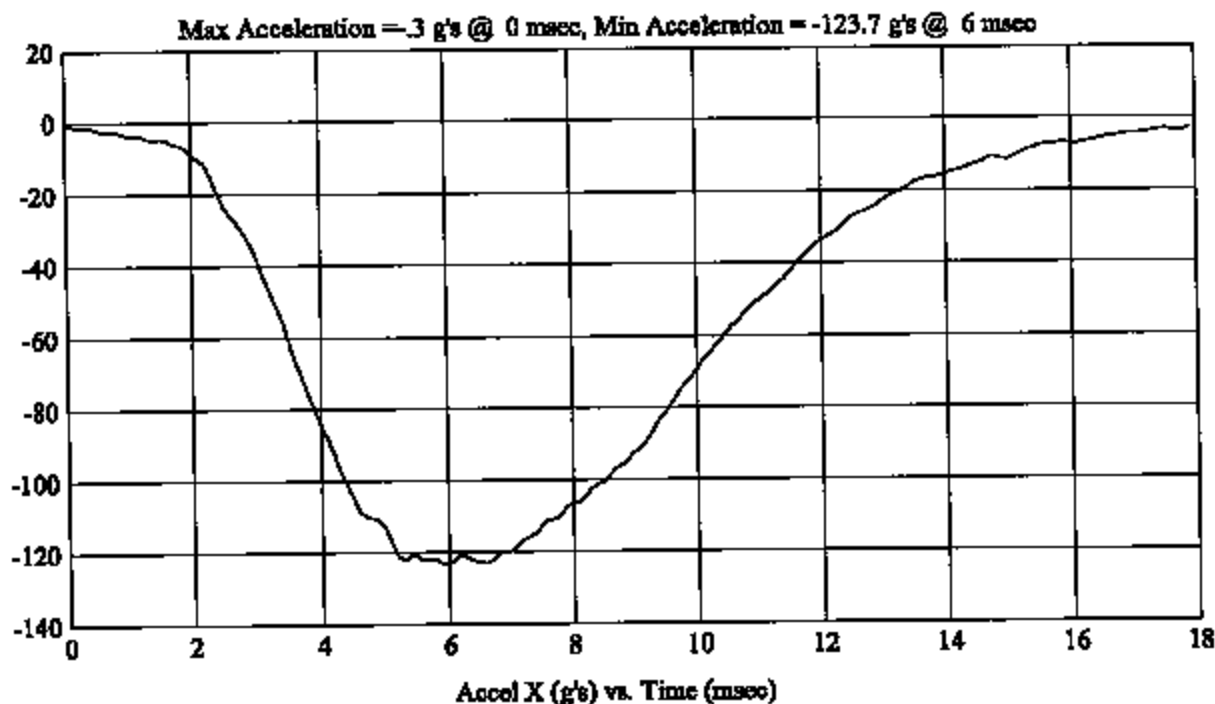
FMH
G05T7-001.4Customer: NHTSA
Test # 3
FM5209
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/45

HIC(d) = 722, HIC = 737, Delta T = 6.9 msec



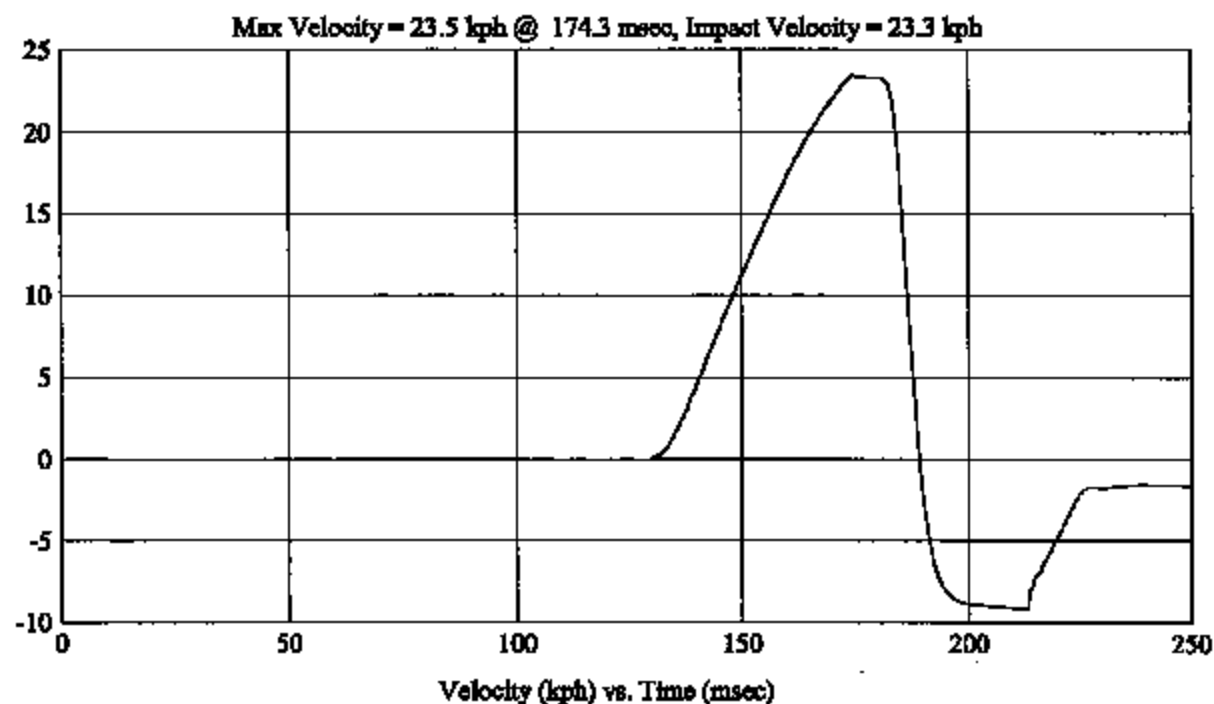
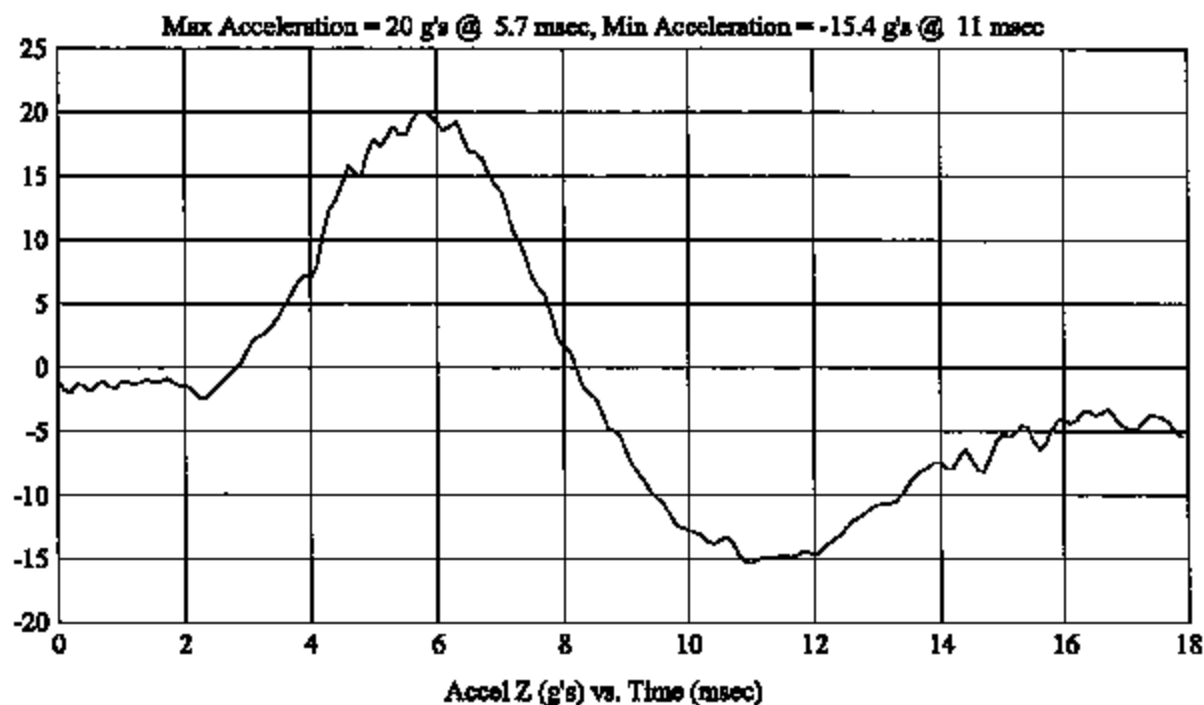
FMH
G05I7-001.4Customer: NHTSA
Test # 3
FM5209
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/45

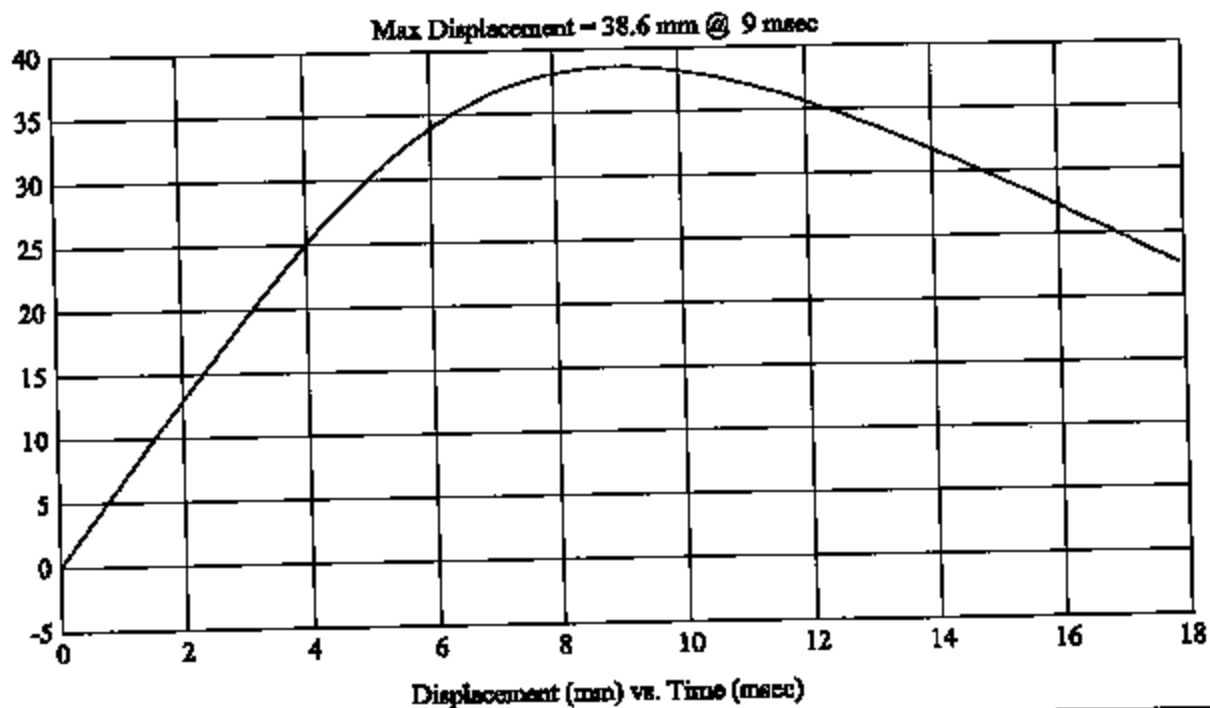
HIC(d) = 722, HIC = 737, Delta T = 6.9 msec



FMH
G0517-001.4Customer: NHTSA
Test # 3
FM5209
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/24/05

Model Year: 2005
Target: UR4
Vehicle Side: Right
Horz/Vert Angle: 90/45 $HIC(d) = 722$, $HIC = 737$, $\Delta T = 6.9 \text{ msec}$ 

80512
2005 HYUNDAI ELANTRA
FMS 2010 - UPPER INTERIOR
TEST #7 C50526 RIGHT UR6
HV IMPACT ANGLE = 90 - 40
FM5213 PRE-TEST

6/25/05

Impact Testing

G0517-001-4

2005 NHTSA HYUNDAI TUCSON
FMVSS 201U - UPPER INTERIOR
TEST #7 C50506 RIGHT UR6
H/V IMPACT ANGLE= 80 / 40
FM5213 POST-TEST

mga

5/25/05

2005 NHTSA HYUNDAI TUCSON

FMVSS 201U - UPPER INTERIOR

TEST #7 C50506 RIGHT SIDE

H/V IMPACT ANGLE=00/40

FM5213

POST-IMPACT

MICHIGAN OPERATIONS
DATE: 2/8/01
SUPERCEDES: MGATP207210.2

DOC. NO.: MGATP207210.3
REVISION NO.: 2
PAGE 1 OF 1

SUMMARY OF FMVSS 201U TEST

JOB/NHTSA NO: G0517-001.4 VEHICLE YR/MAKE/MODEL: 2005/NHTSA/Hyundai Tucson

GENERAL TEST PARAMETERS:

Test Number: #7

Target (Vehicle Side): UR6 Right

Temperature: 21C

MGA Test Reference No.: FM5213

Humidity: 43%

Approach Horizontal Angles: 90°

Time of Test: 10:30 AM

Approach Vertical Angles: 40°

FMH Serial No.: [036]

Additional Description:

TEST RESULTS:

HIC(d)	HIC	Δt (msec)	Velocity (kph)	Impact location on FMH (mm)	
				Above Pt. O	Left/Right Pt. O
713	724	6.7	23.7	35	6 L

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

Axle	Channel	Serial No.	DLR Value	ΔV Pre-Test	ΔV Post-Test
X	5	J35924	-91.8	1.44	1.42
Y	6	J35919	97	1.54	1.54
Z	7	J22664	95.6	1.39	1.39

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

No visible damage.

Recorded By: [Signature] Approved By: [Signature] Date: 5/25/05

*Only necessary for NHTSA (Government) Compliance testing.

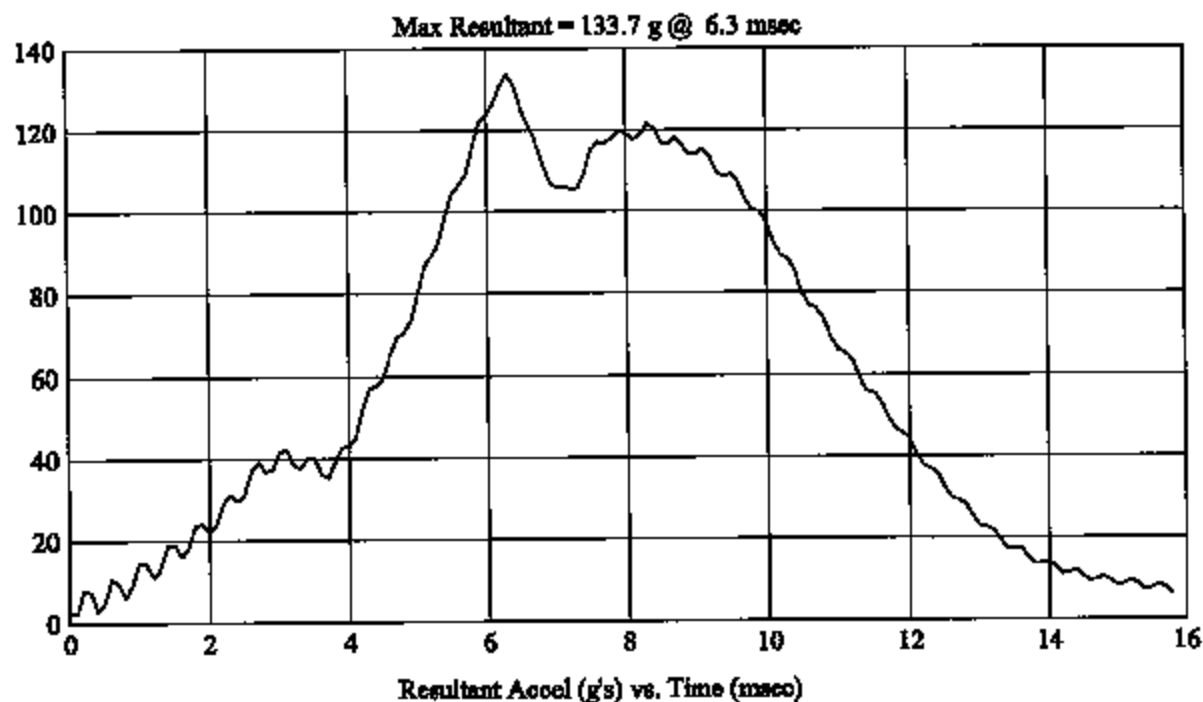
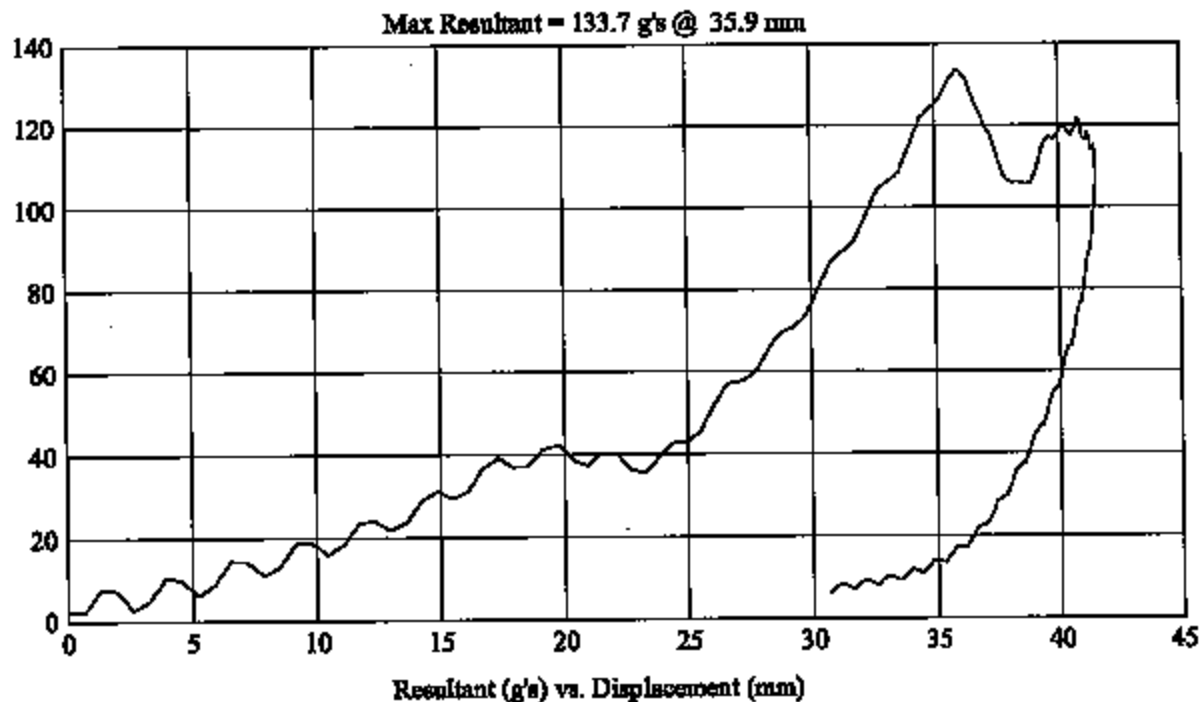
FMH
G0517-001.4Customer: NHTSA
Test # 7
FMS213
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/40

HIC(d) = 713, HIC = 724, Delta T = 6.7 msec



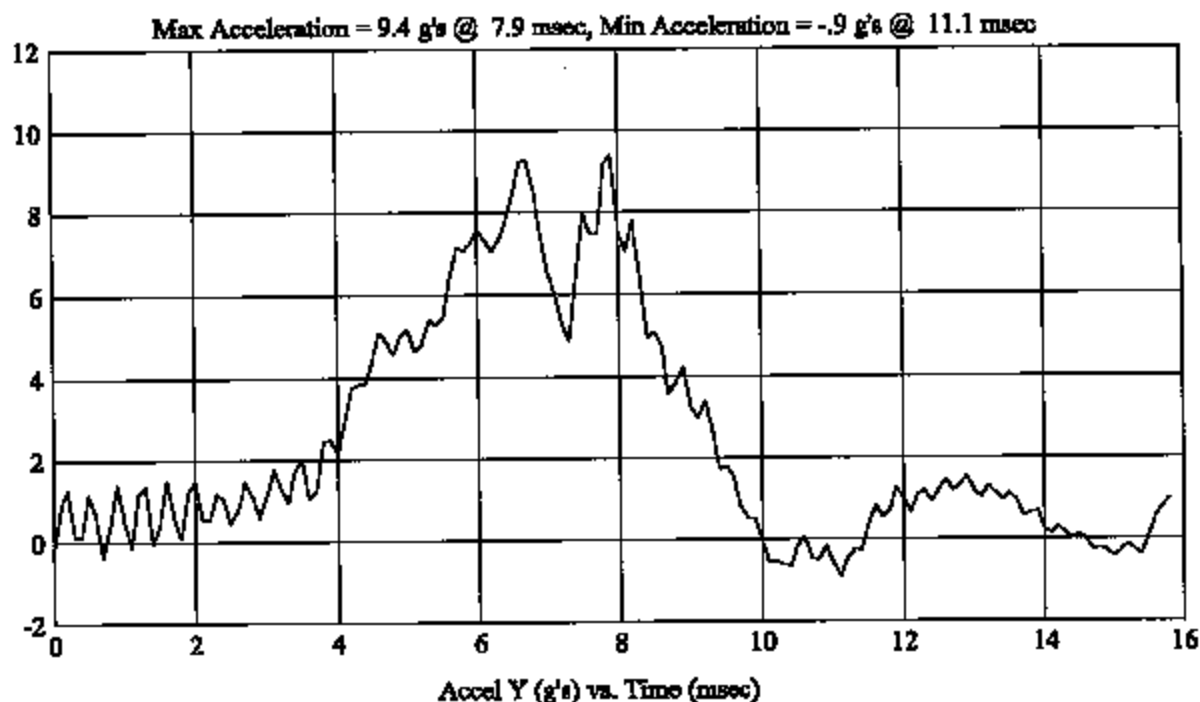
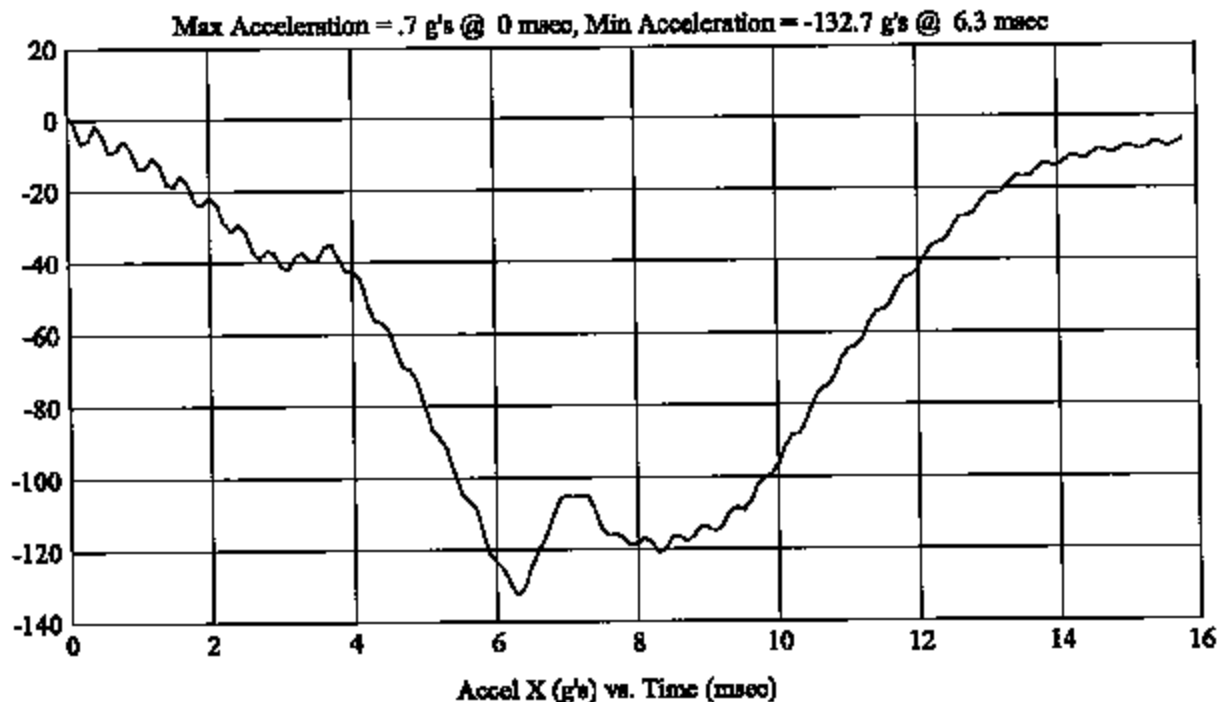
FMH
G05I7-001.4Customer: NHTSA
Test # 7
FM5213
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/40

HIC(d) = 713, HIC = 724, Delta T = 6.7 msec



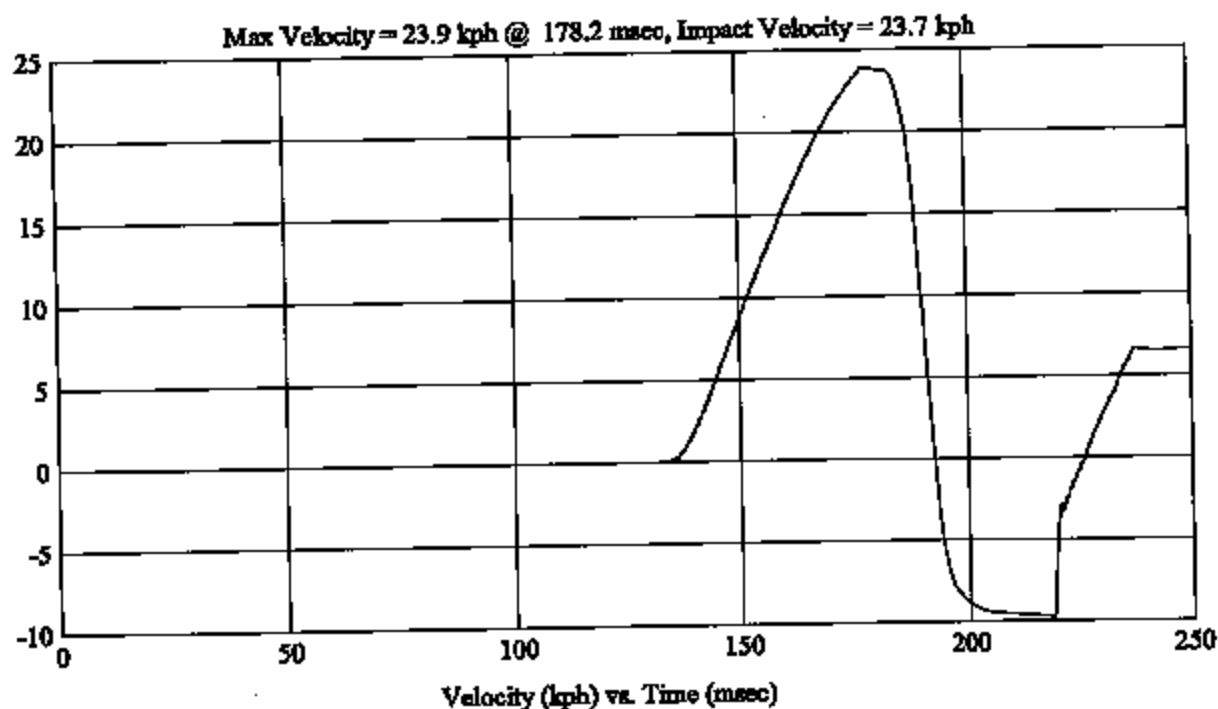
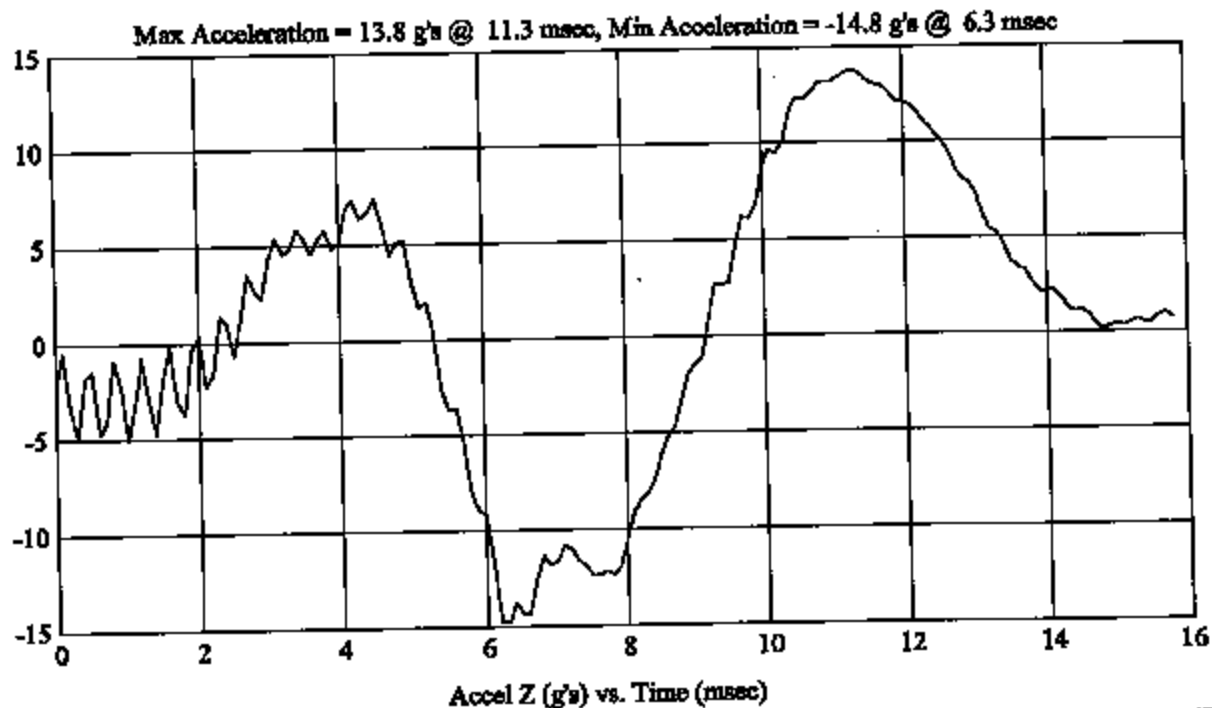
FMH
G0517-001.4Customer: NHTSA
Test # 7
FM5213
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/40

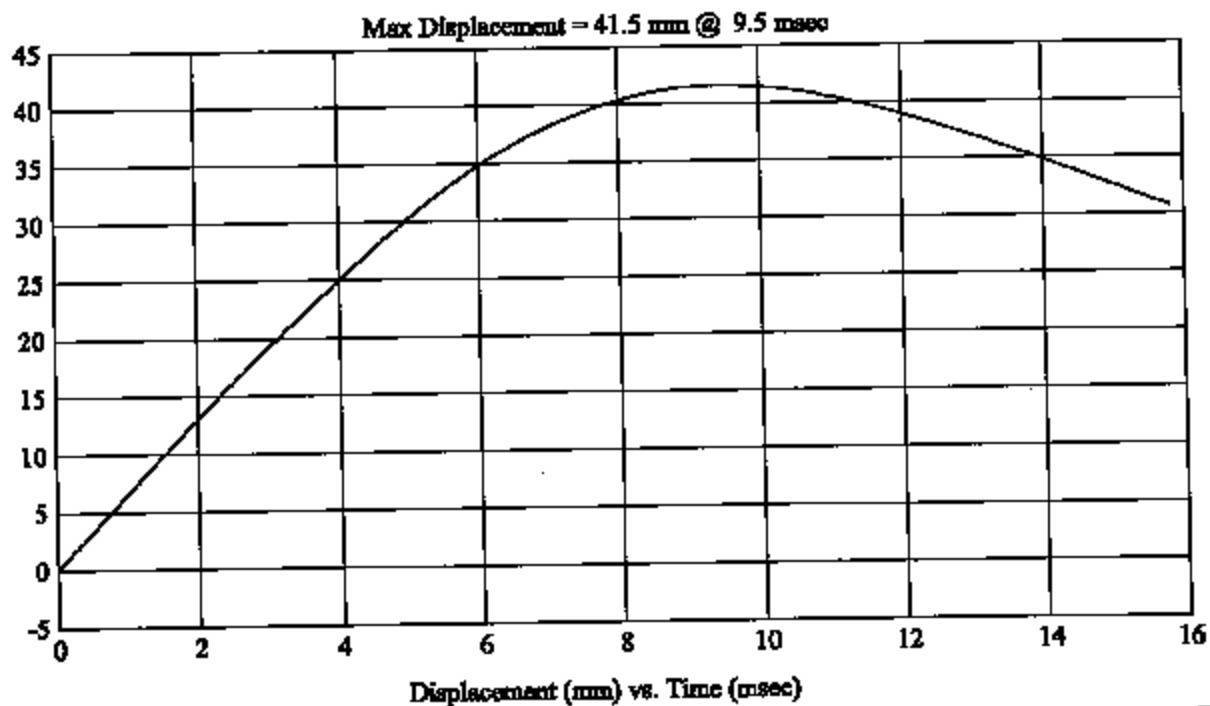
HIC(d) = 713, HIC = 724, Delta T = 6.7 msec



FMH
G0517-001.4Customer: NHTSA
Test # 7
FM5213
Additional Desc: N/A

Vehicle Program : Hyundai Tucson

Test Date: 5/25/05

Model Year: 2005
Target: UR6
Vehicle Side: Right
Horz/Vert Angle: 90/40 $HIC(\Delta) = 713$, $HIC = 724$, $\Delta T = 6.7 \text{ msec}$ 

4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

The following section lists the test equipment for the compliance test series.

Items marked with an asterisk are calibrated by an external lab. An additional summary table is given for the pre and post-test calibration data for the Free Motion Headforms.

The temperature trace to confirm testing was conducted between 66°F and 78°F (19°C - 26°C) is included in Appendix A. Calibration certificates can be found in Appendix B.

TABLE 4-1 LIST OF ITEMS USED

ITEM	MANUFACTURER NAME	MODEL #	FUNCTION OF ITEM	ACCURACY	CAL INTERNAL
Head Drop Tower (Includes test frame and DAS)	MGA Research Corp.	MGA-100-DC	FMH Calibration	N/A	N/A
Accelerometers	Endevco	7264-2000	Acceleration Data	±0.5%	6 months
*Digital Inclinator	Mitutoyo	PRO 360 (MGA00071)	Set Angle of FMH/Targeting	0.1°	Annual
FMVSS 201U Test Frame (Includes the propulsion control system, actuator, test frame, and DAS)	MGA Research Corp.	MGA-100-FMH	Test System	N/A	N/A
Free Motion Headforms	UTAMA UTAMA UTAMA	035 037 038	Test Device	N/A	Pre and Post-Test Series
High Speed Video	Redlake	HGLE	Record Event	N/A	N/A
*FARO™	Faro Technologies	G08020203122	Targeting	0.1 mm	Annual
Measuring Devices: - Tape Measure - Plumb Bobs - Protractor	Jonnsson N/A Mitutoyo	457 - MGA00034	Measurement Targeting FMH setup Horizontal Measurement	1 mm N/A 0.5°	Annual
*Vehicle Scale	Intercomp	26032389	Weighing Vehicle	± .5 kg	Annual
* Scale	Detecto	AP-20 (MGA00081)	Weigh FMH Head	± 0.01 lb	Annual
*Temperature Recorder	Dickson	TM-325 (MGA00146)	Record Temperature and Humidity	± 1°C ± 1% RH	Annual

TABLE 4-2 FMH CALIBRATION SUMMARY DATA SUMMARY TABLE

FMH Serial #		Weight (lbs)	Temp (°C)	% Humidity	Peak Resultant Acceleration (G's)	Peak Lateral Acceleration (G's)	Unimodal
Pre	#35	10.02	22	43	248.5	7.9	Yes
Post	#35	10.02	22	44	243.7	2.6	Yes
Pre	#37	9.96	22	43	255.7	2.1	Yes
Post	#37	9.96	22	44	249.4	9.3	Yes
Pre	#38	9.92	22	43	264.8	10.4	Yes
Post	#38	9.92	22	44	264.3	4.3	Yes

RECORDED BY: Nicholas J. BrzuchDATE: May 26, 2005APPROVED BY: David G. Gotwals

MICHKIAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

DOC. NO.: MGATP201UHD
REVISION NO.: 6
PAGE 6 OF 7

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>35</u>		CALIBRATION DATE: <u>5/24/05</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>10.02</u>
Temperature	19° C to 26° C	<u>22°C</u>
Relative Humidity	10% to 70%	<u>43%</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>218.5</u>
Peak Lateral Acceleration	15 G's Maximum	<u>7.9</u>
Unimodal Acceleration Curve	YES	<u>YES</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>5</u>	ENDEVCO	7264-2000	<u>J35724</u>	<u>5/2/05</u>	<u>11/2/05</u>
<u>6</u>	ENDEVCO	7264-2000	<u>J35719</u>	<u>5/2/05</u>	<u>11/2/05</u>
<u>7</u>	ENDEVCO	7264-2000	<u>J22664</u>	<u>5/2/05</u>	<u>11/2/05</u>

REMARKS:

RECORDED BY: [Signature]

DATE: 5/24/05

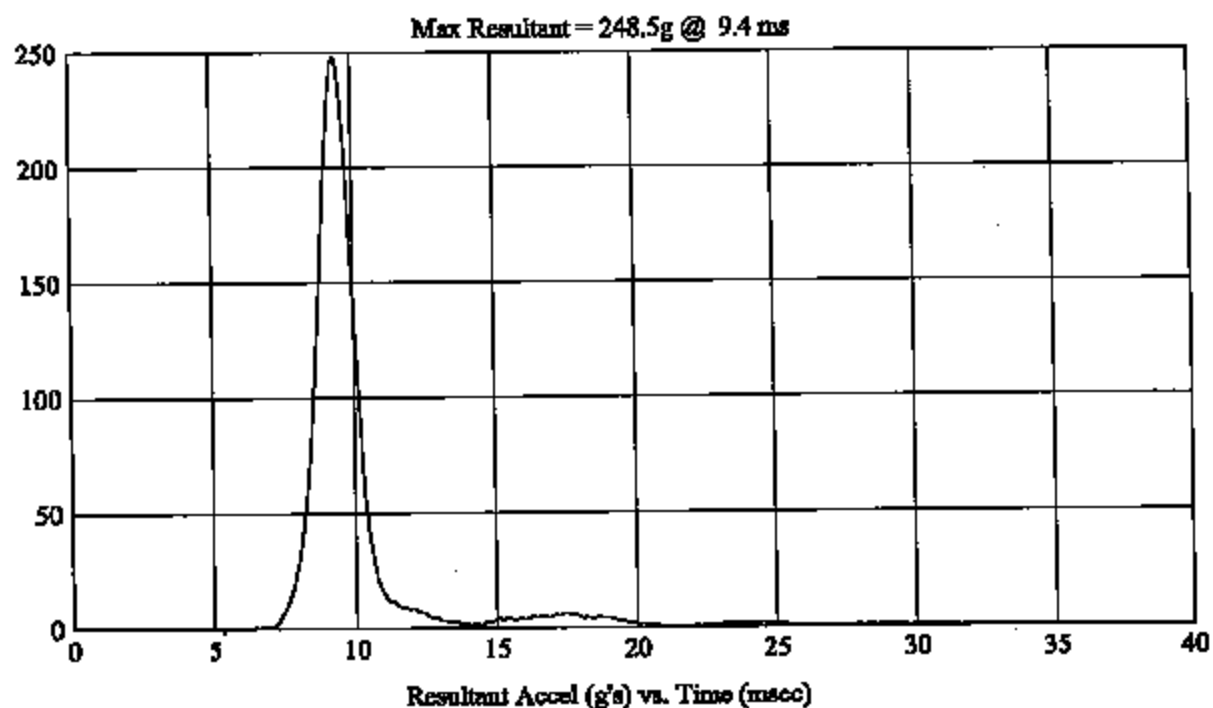
APPROVED BY: [Signature]

Head Drop
(Preliminary Test Report)

Test Number: H35296
Test Description: 10.02

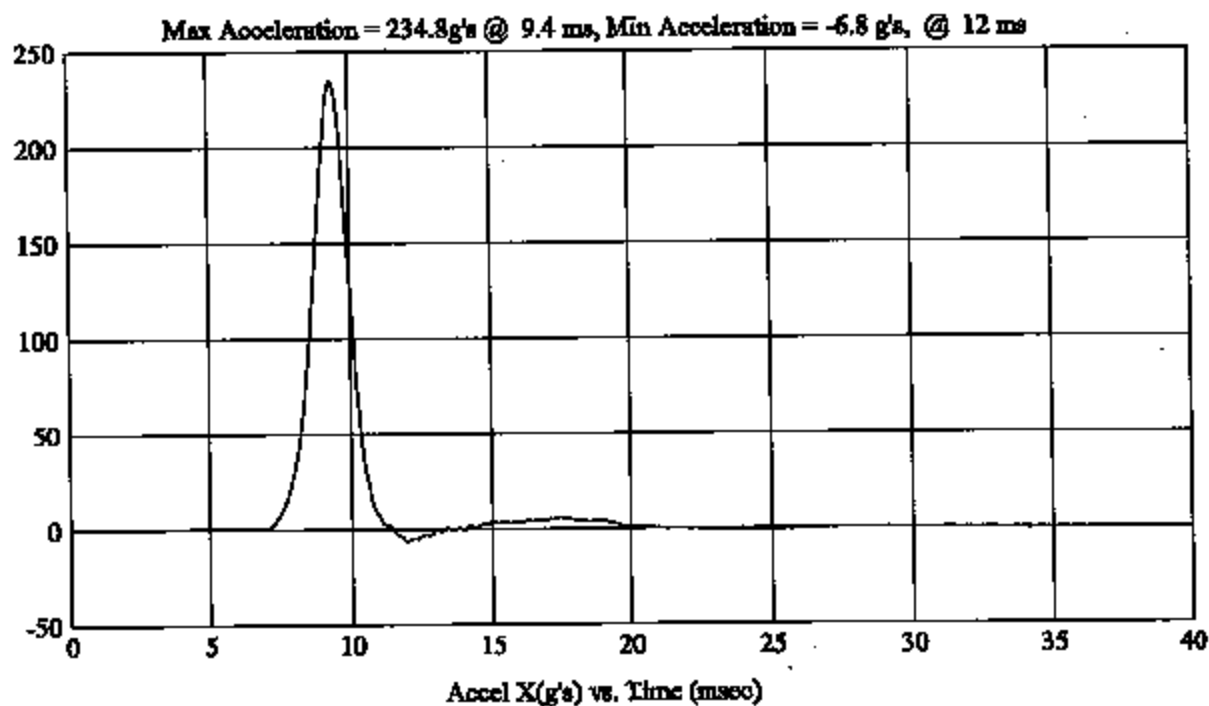
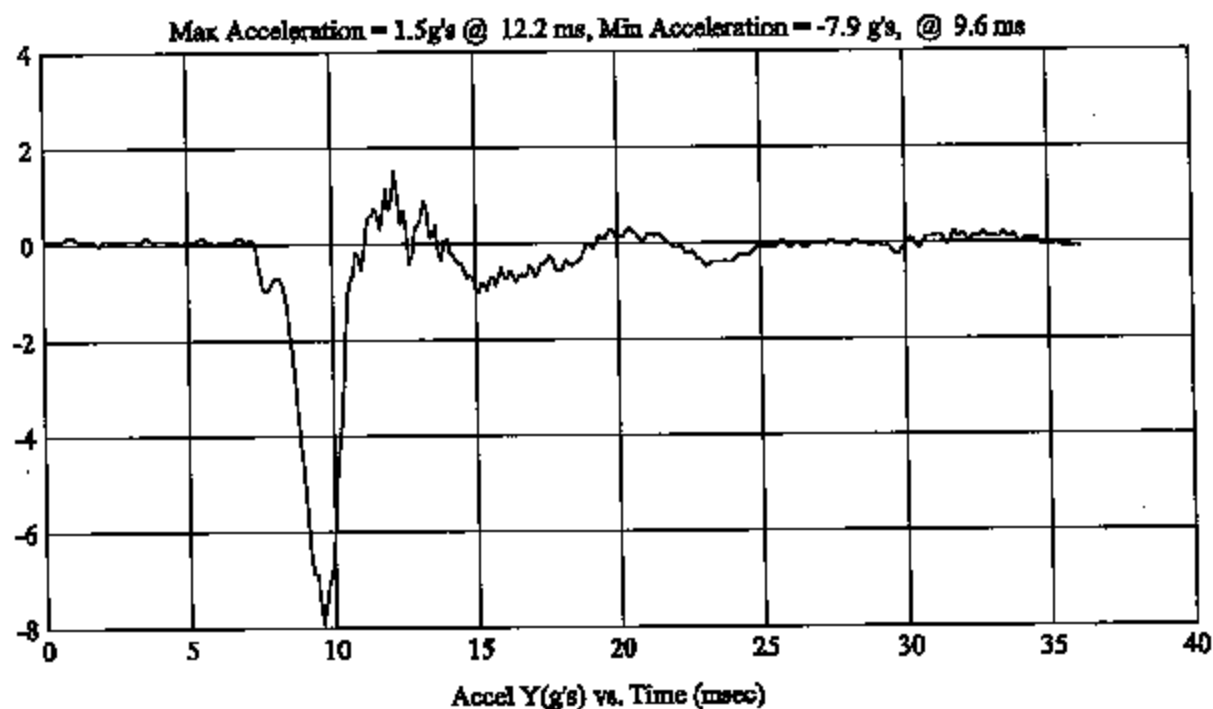
MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 035



Head Drop
(Preliminary Test Report)Test Number: H35296
Test Description: 10.02

MGA Job Number: G05Y7-001.4

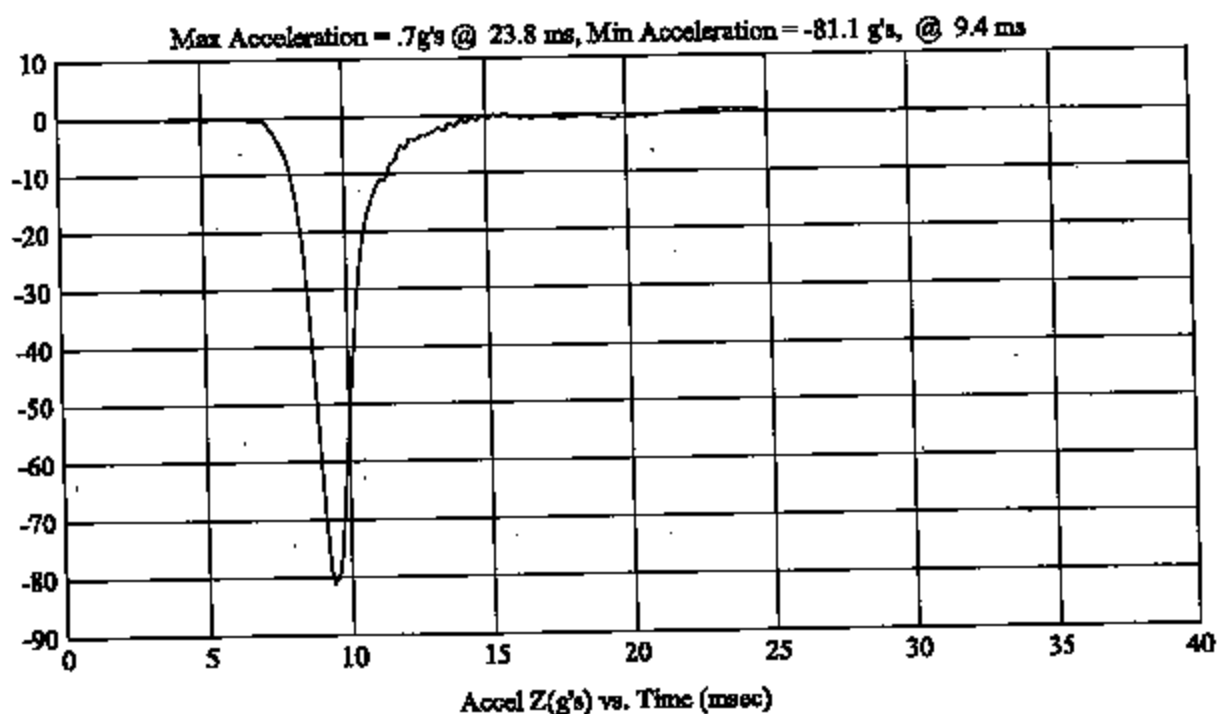
Test Date: 5/24/05
Head #: 035

Head Drop
(Preliminary Test Report)

Test Number: H35296
Test Description: 10.02

MGA Job Number: G05I7-001.4

Test Date: 5/24/05
Head #: 035



MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.1

DOC. NO.: MGATP201UHD
REVISION NO.: 6
PAGE 6 OF 7

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>35</u> CALIBRATION DATE: <u>5/26/05</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	10.02
Temperature	19° C to 26° C	22
Relative Humidity	10% to 70%	44
Peak Resultant Acceleration	225 G's to 275 G's	243.7
Peak Lateral Acceleration	15 G's Maximum	2.6
Unimodal Acceleration Curve	YES	Yes

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
5	ENDEVCO	7264-2000	J35924	5/02/05	11/02/05
6	ENDEVCO	7264-2000	J35919	5/02/05	11/02/05
7	ENDEVCO	7264-2000	J22664	5/02/05	11/02/05

REMARKS:

RECORDED BY: *Matthew*

DATE: 5/26/04

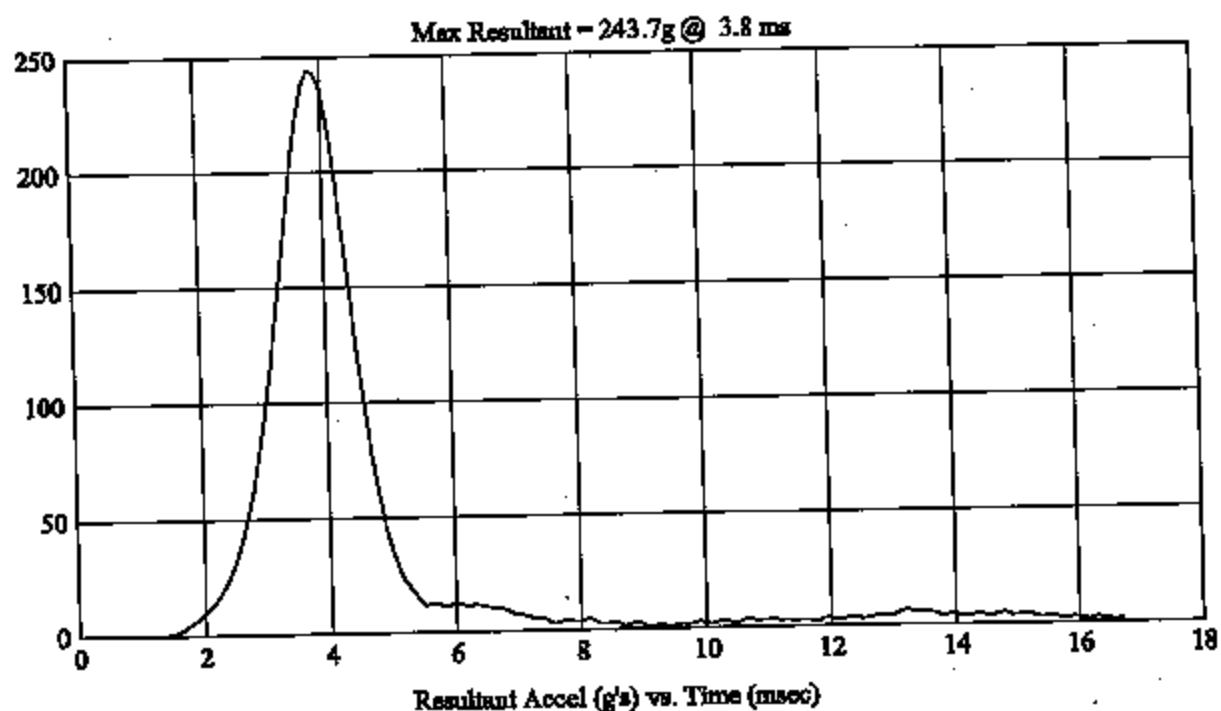
APPROVED BY: *[Signature]*

Head Drop
(Preliminary Test Report)

Test Number: H35297
Test Description: 10.02

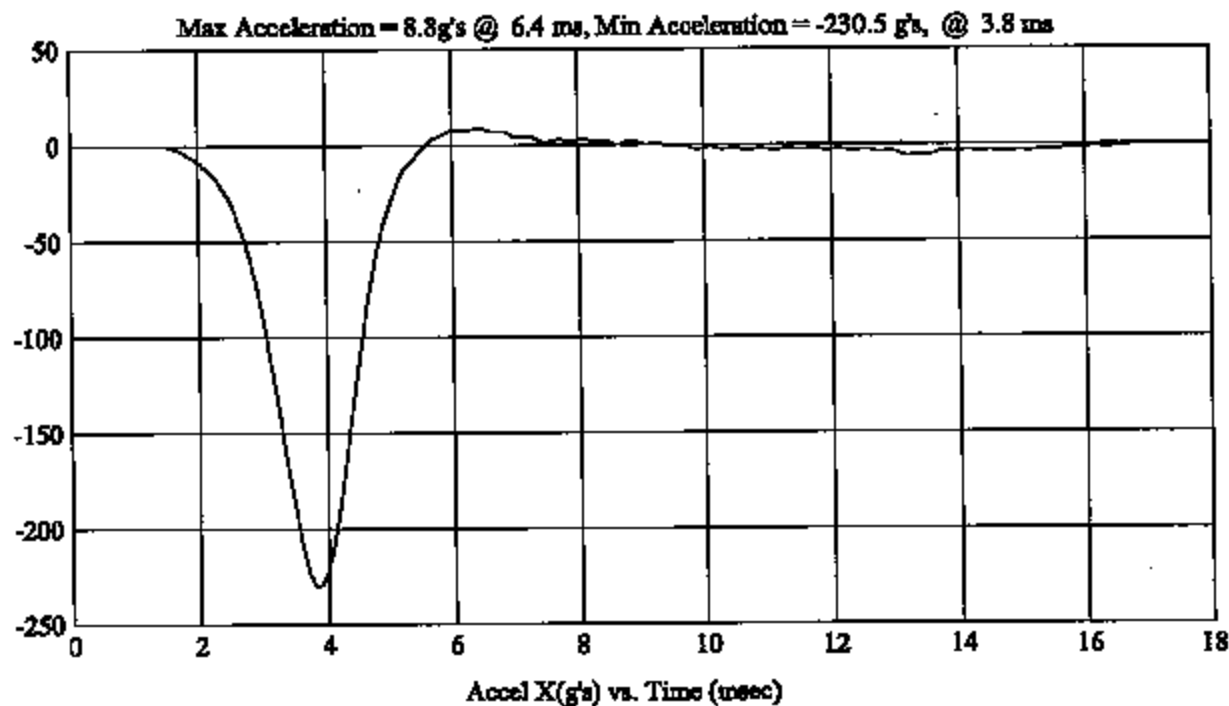
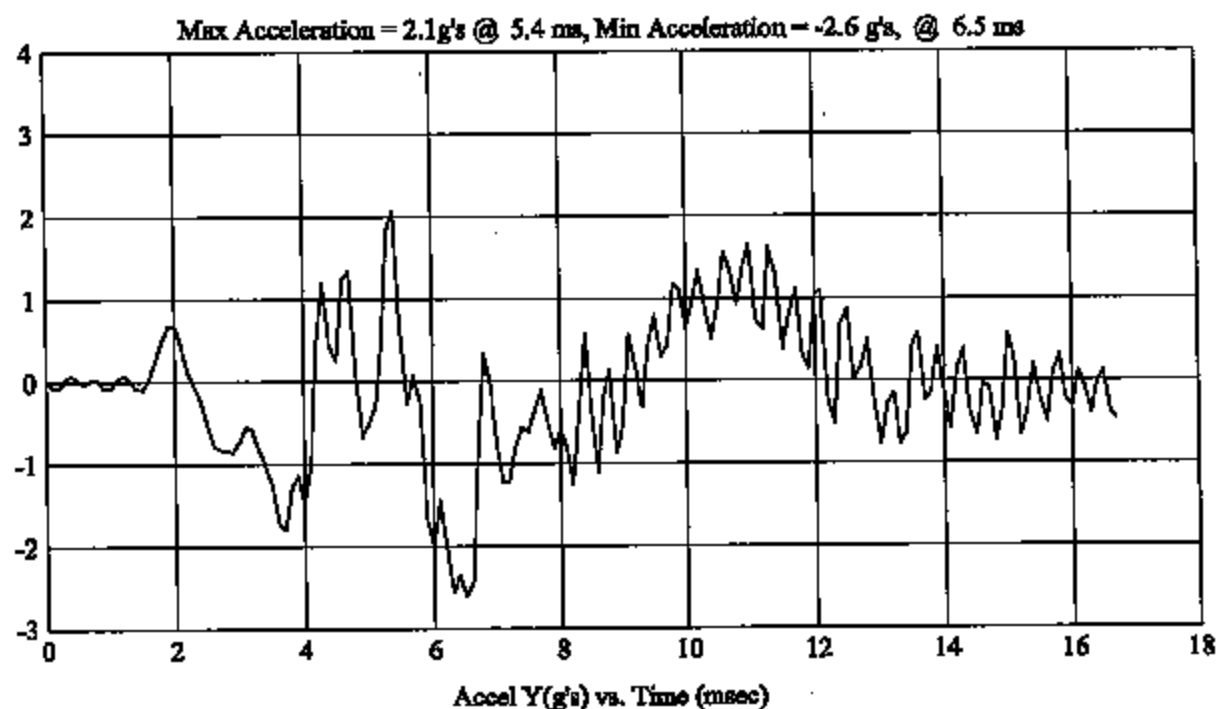
MGA Job Number: G0517-001.4

Test Date: 5/26/05
Head #: 35



Head Drop
(Preliminary Test Report)Test Number: H35297
Test Description: 10.02

MGA Job Number: G0517-001.4

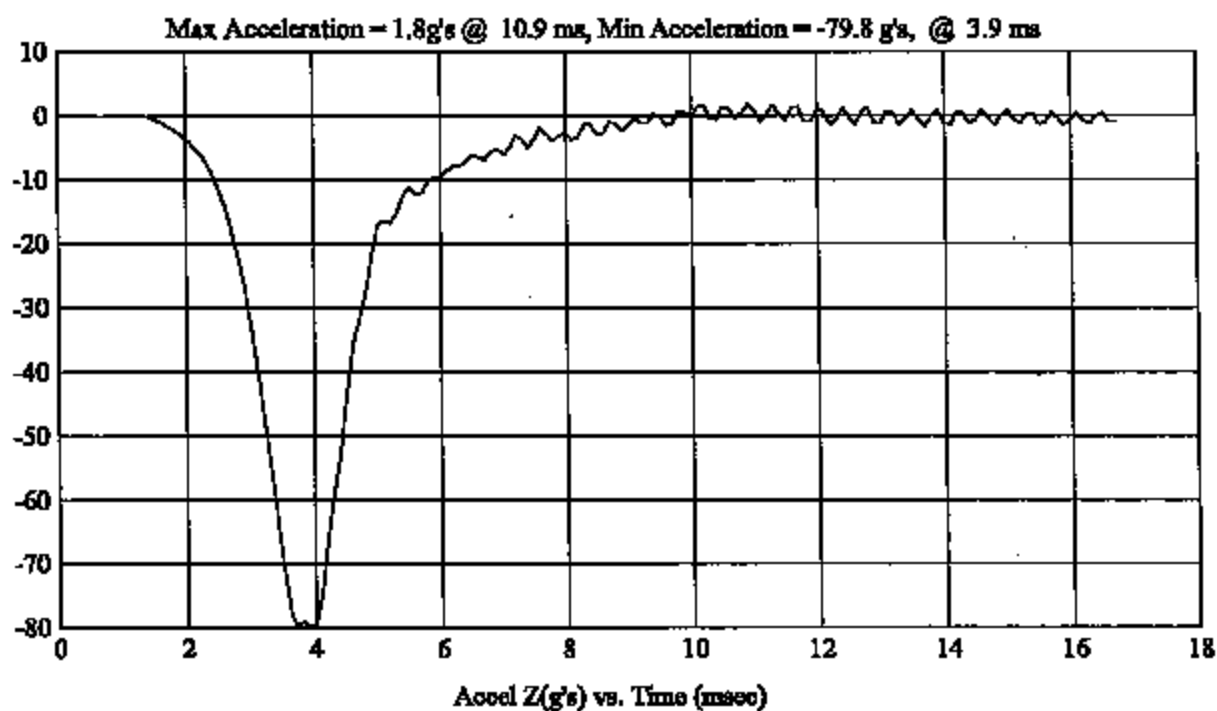
Test Date: 5/26/05
Head #: 35

Head Drop
(Preliminary Test Report)

Test Number: H35297
Test Description: 10.02

MGA Job Number: G0577-001.4

Test Date: 5/26/05
Head #: 35



MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

DOC. NO.: MGATP201UHD
REVISION NO.: 6
PAGE 6 OF 7

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>037</u> CALIBRATION DATE: <u>5/24/05</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>9.96</u>
Temperature	19° C to 26° C	<u>22° C</u>
Relative Humidity	10% to 70%	<u>43%</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>255.7</u>
Peak Lateral Acceleration	15 G's Maximum	<u>2.1</u>
Unimodal Acceleration Curve	YES	<u>YES</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>5</u>	ENDEVCO	7264-2000	<u>J35800</u>	<u>5/2/05</u>	<u>11/2/05</u>
<u>6</u>	ENDEVCO	7264-2000	<u>J35841</u>	<u>5/2/05</u>	<u>11/2/05</u>
<u>7</u>	ENDEVCO	7264-2000	<u>J35791</u>	<u>5/2/05</u>	<u>11/2/05</u>

REMARKS:

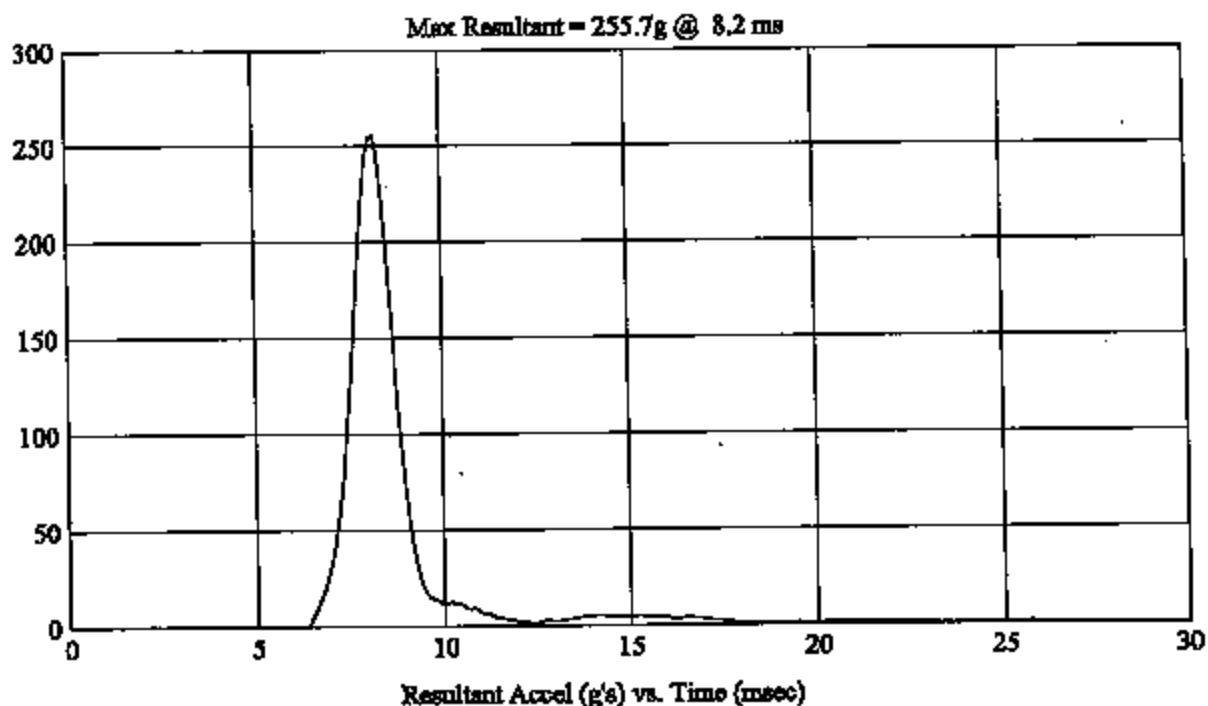
RECORDED BY: [Signature]DATE: 5/24/05APPROVED BY: [Signature]

Head Drop
(Preliminary Test Report)

Test Number: H37167
Test Description: 9.96

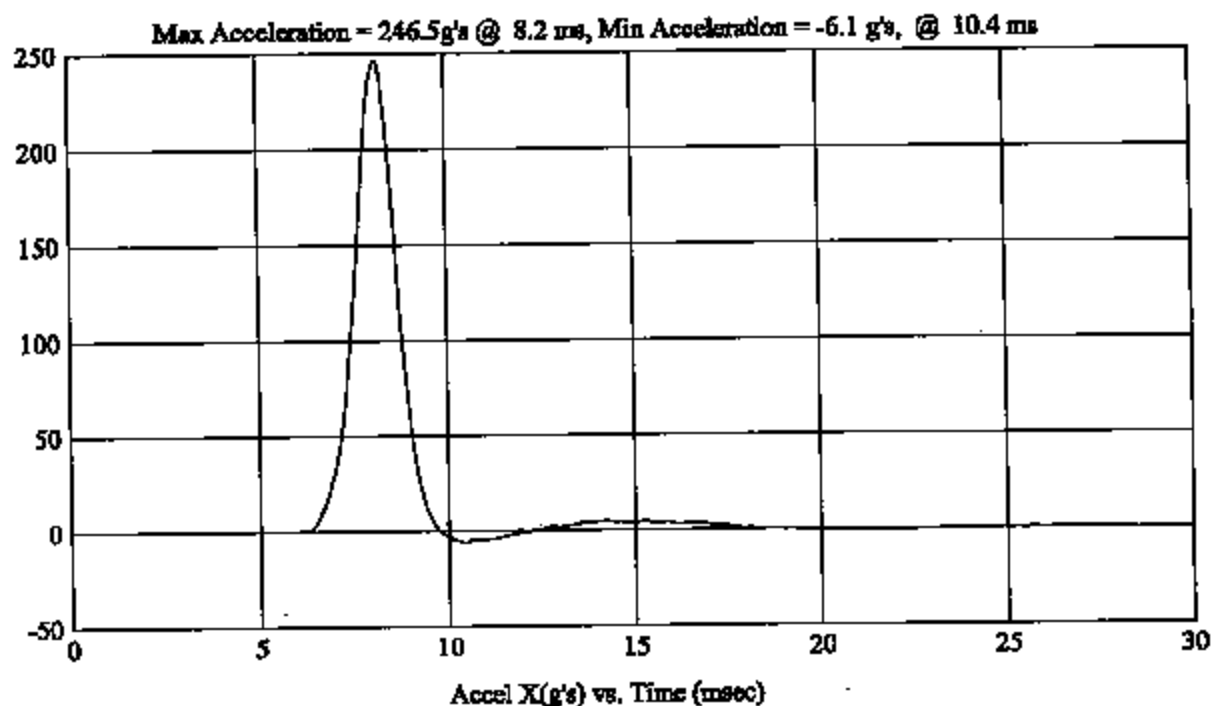
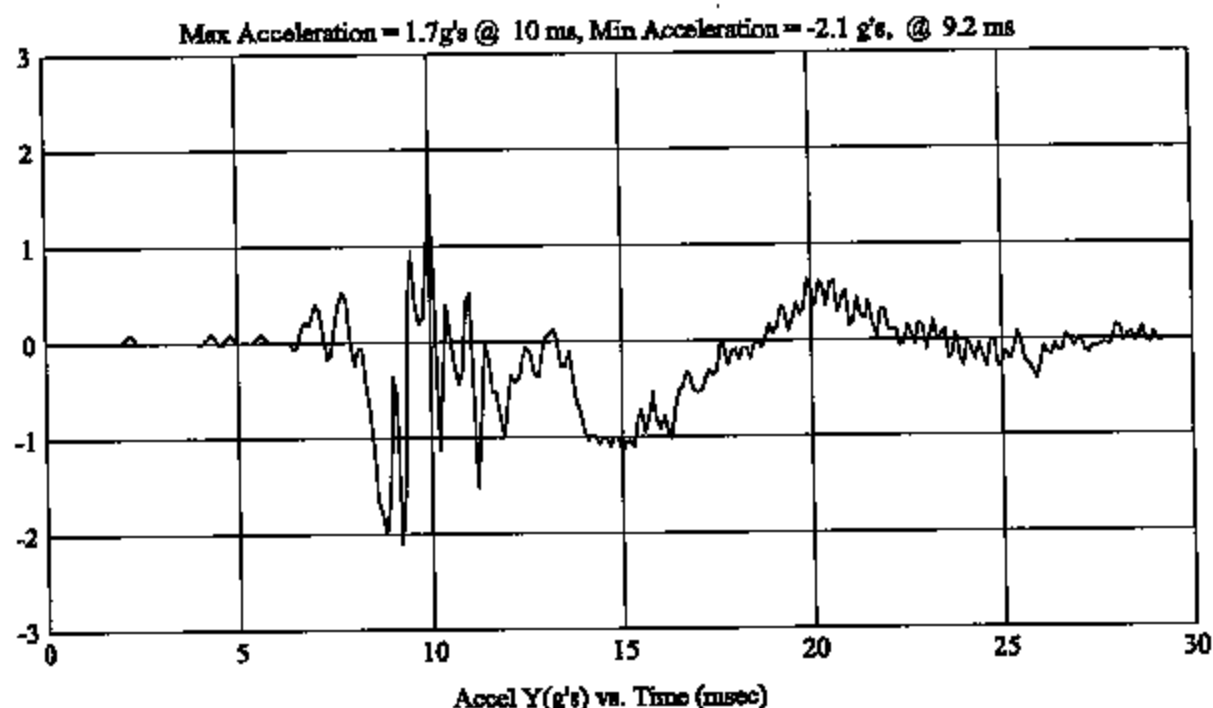
MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 037



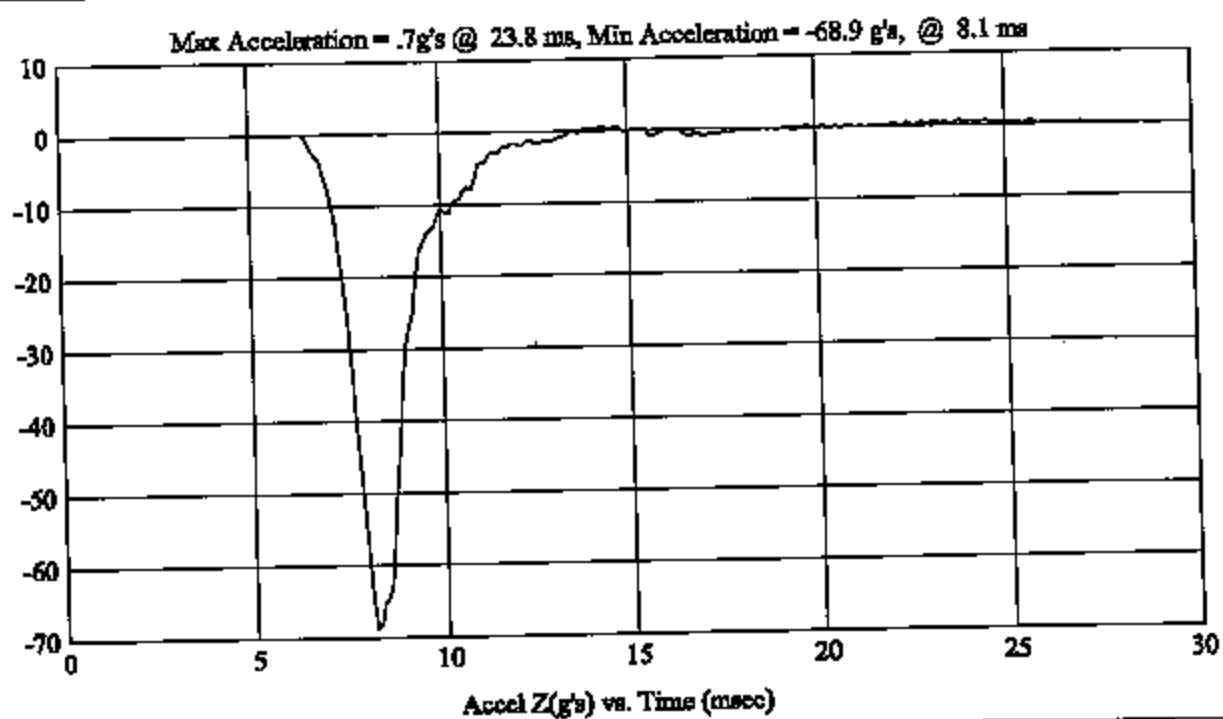
Head Drop
(Preliminary Test Report)Test Number: H37167
Test Description: 9.96

MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 037

Head Drop
(Preliminary Test Report)Test Number: H37167
Test Description: 9.96

MGA Job Number: G05T7-001.4

Test Date: 5/24/05
Head #: 037

MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCEDES: MGATPHDT.5

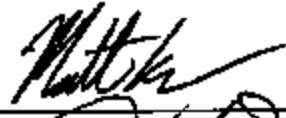
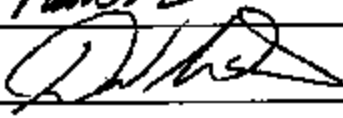
DOC. NO.: MGATP2D1UHD
REVISION NO.: 6
PAGE 6 OF 7

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>37</u>		CALIBRATION DATE: <u>5/26/05</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>9.46</u>
Temperature	19° C to 26° C	<u>22</u>
Relative Humidity	10% to 70%	<u>44</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>249.4</u>
Peak Lateral Acceleration	15 G's Maximum	<u>9.3</u>
Unimodal Acceleration Curve	YES	<u>Yes</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>5</u>	ENDEVCO	7264-2000	<u>335800</u>	<u>5/02/05</u>	<u>11/02/05</u>
<u>6</u>	ENDEVCO	7264-2000	<u>335841</u>	<u>5/02/05</u>	<u>11/02/05</u>
<u>7</u>	ENDEVCO	7264-2000	<u>335791</u>	<u>5/02/05</u>	<u>11/02/05</u>

REMARKS:

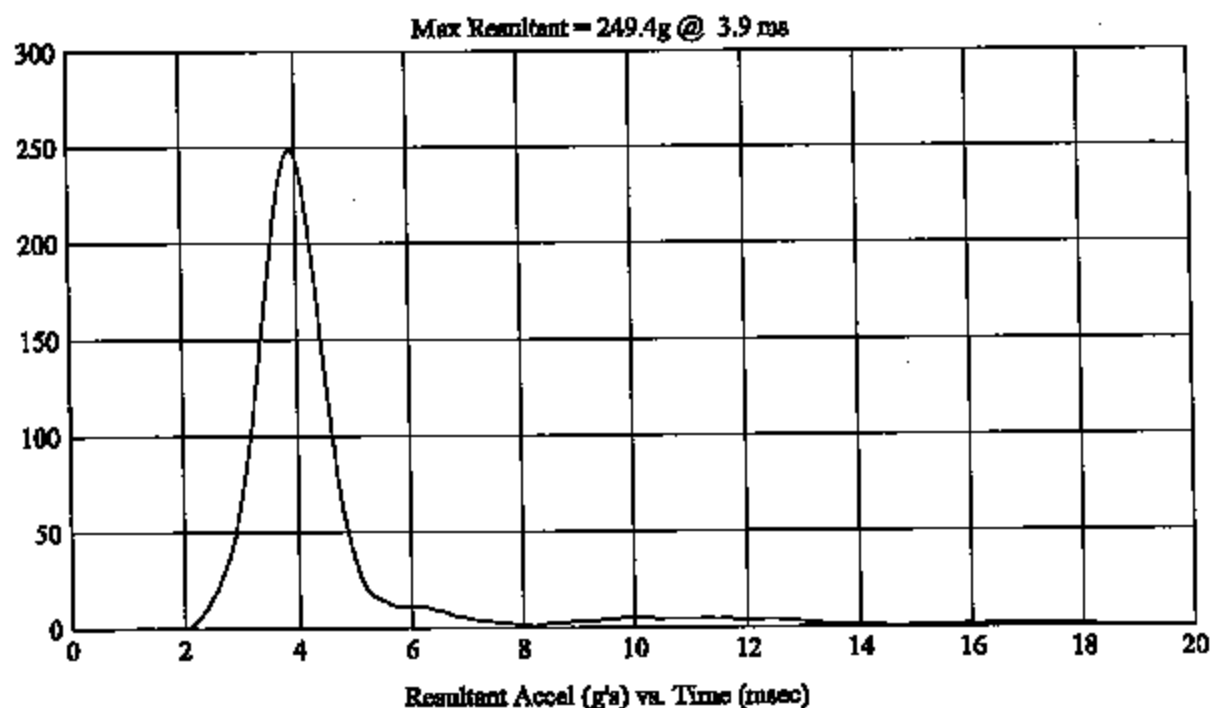
RECORDED BY: DATE: 5/26/05APPROVED BY: 

Head Drop
(Preliminary Test Report)

Test Number: H37168
Test Description: 9.96

MGA Job Number: G05Y7-001.4

Test Date: 5/26/05
Head #: 37

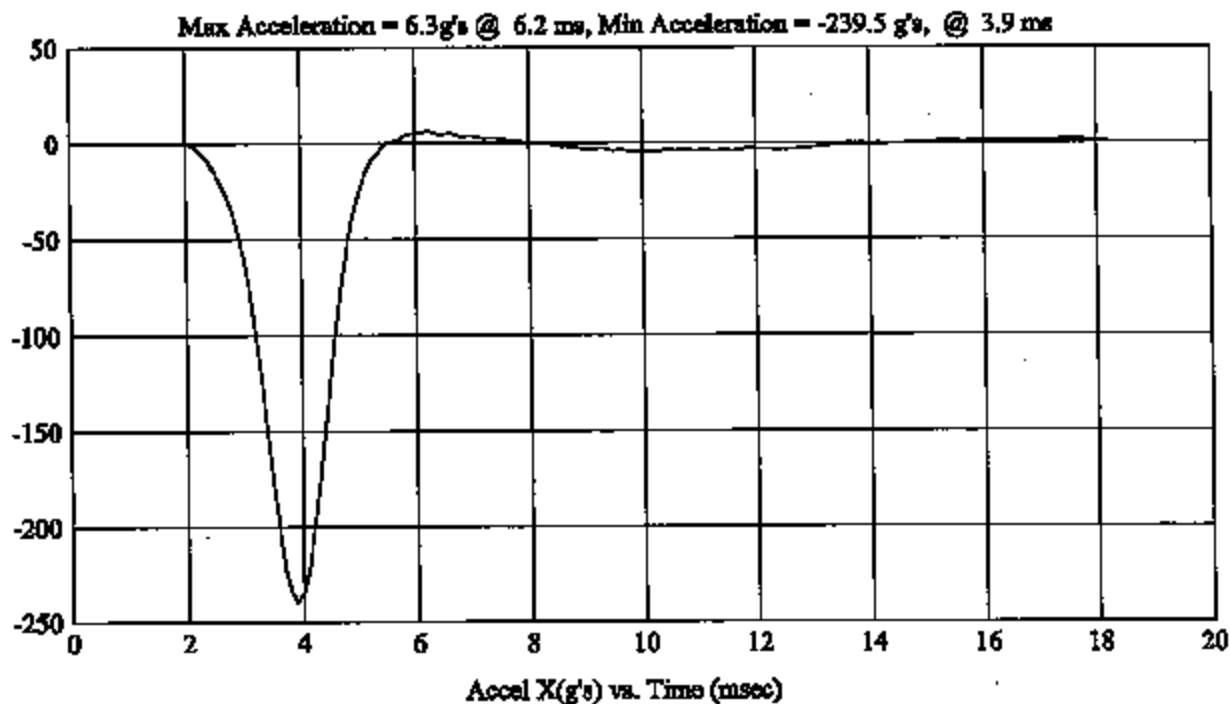
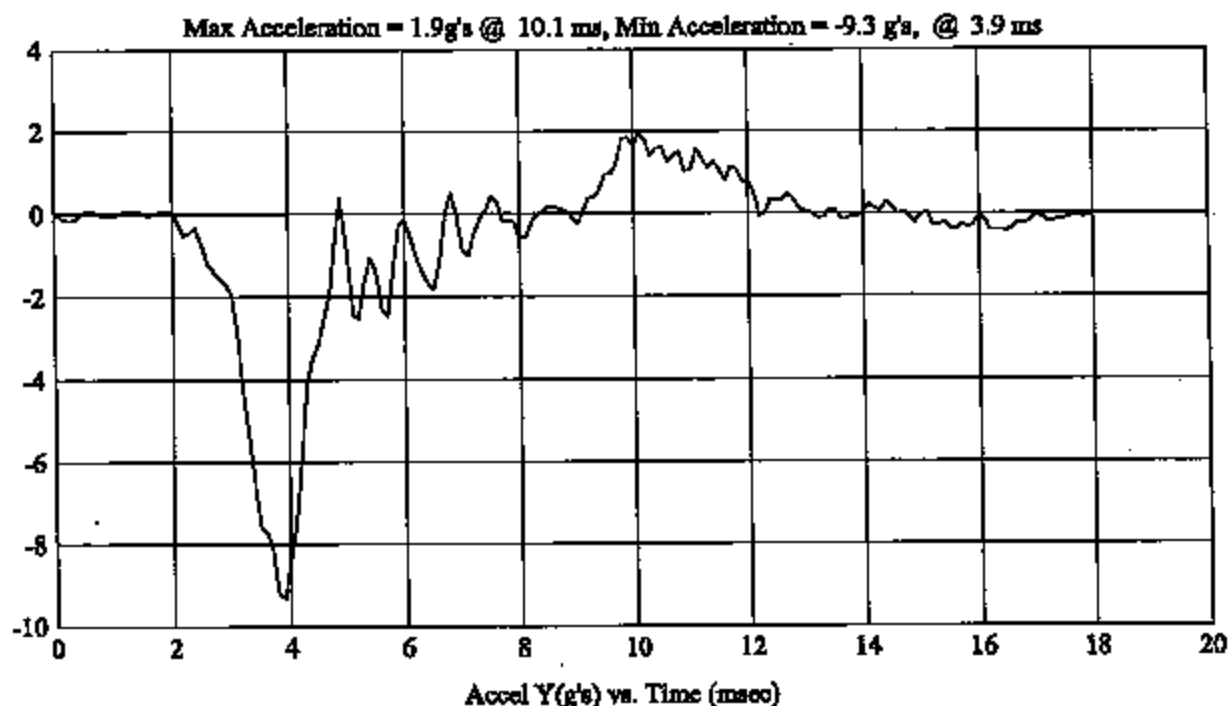


Head Drop
(Preliminary Test Report)

Test Number: H37168
Test Description: 9.96

MGA Job Number: G05T7-001.4

Test Date: 5/26/05
Head #: 37

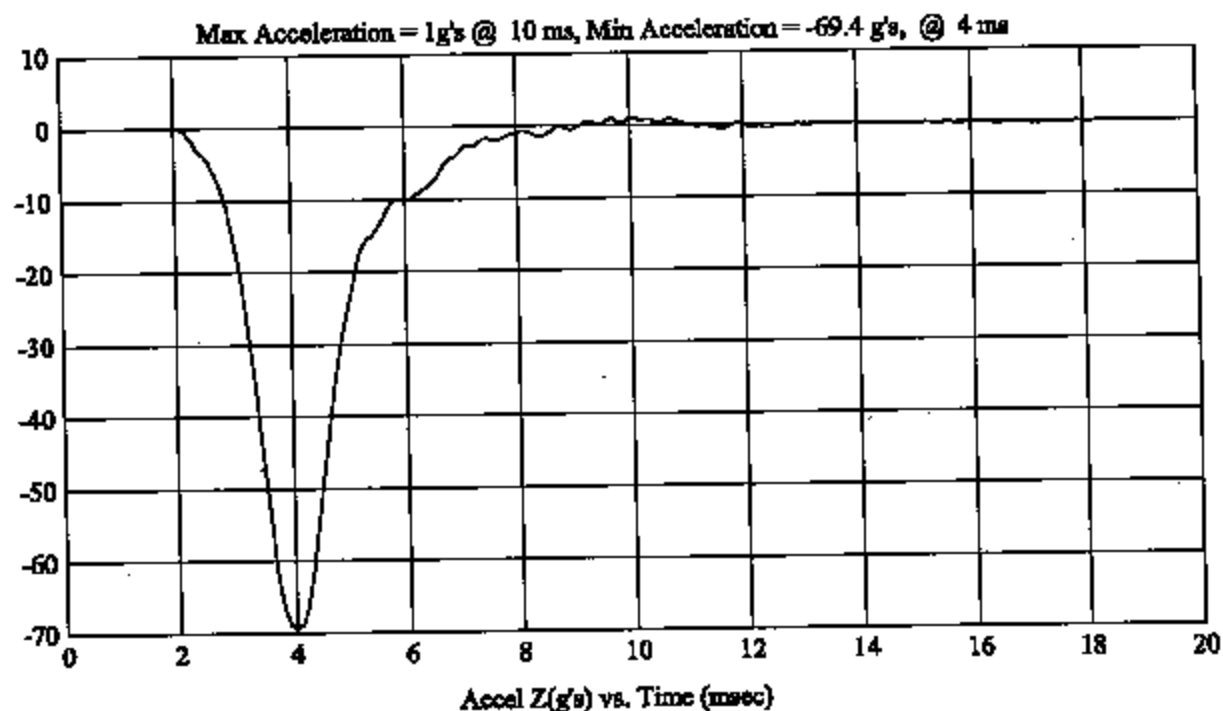


Head Drop
(Preliminary Test Report)

Test Number: H37168
Test Description: 9.96

MGA Job Number: G0517-001.4

Test Date: 5/26/05
Head #: 37



MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCHIDES: MGATPHDT.5

DOC. NO.: MGATP201UHD
REVISION NO.: 6
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HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>038</u> CALIBRATION DATE: <u>5/24/05</u>		
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	9.92
Temperature	19° C to 26° C	22°C
Relative Humidity	10% to 70%	43%
Peak Resultant Acceleration	225 G's to 275 G's	264.8
Peak Lateral Acceleration	15 G's Maximum	10.4
Unimodal Acceleration Curve	YES	YES

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
5	ENDEVCO	7264-2000	J36117	5/2/05	11/2/05
6	ENDEVCO	7264-2000	J36193	5/2/05	11/2/05
7	ENDEVCO	7264-2000	J36353	5/2/05	11/2/05

REMARKS:

RECORDED BY: [Signature]

DATE: 5/24/05

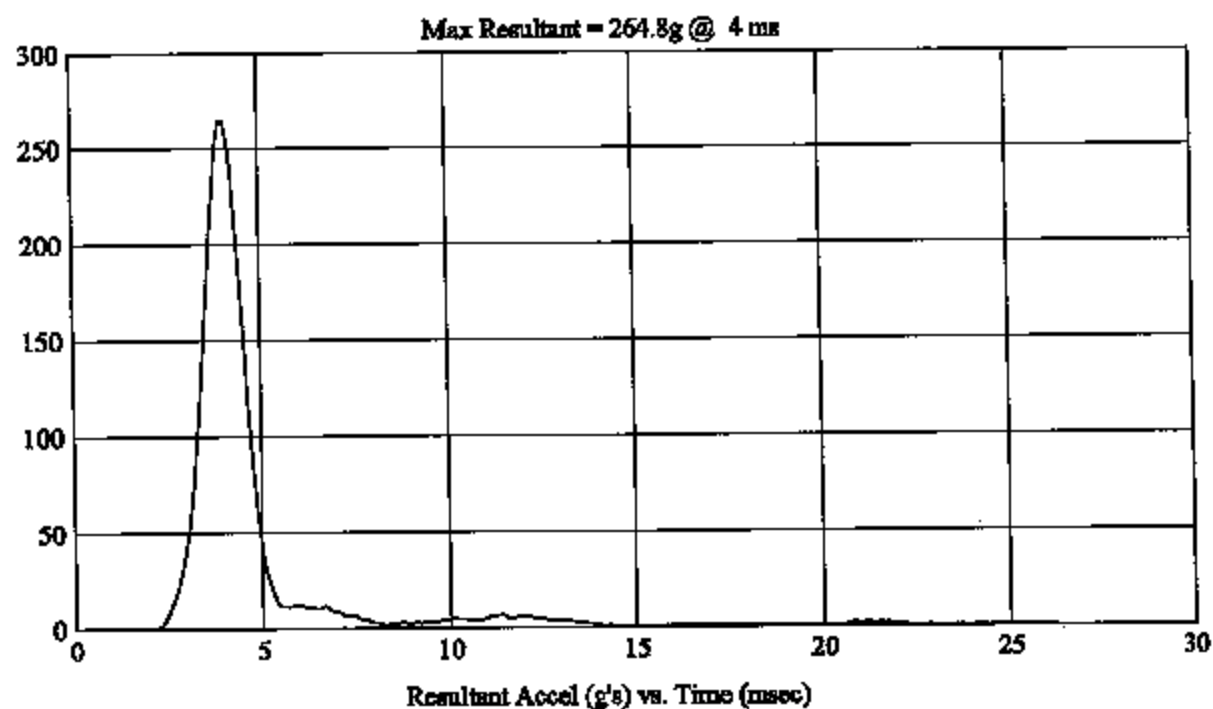
APPROVED BY: [Signature]

Head Drop
(Preliminary Test Report)

Test Number: H38276
Test Description: 9.92

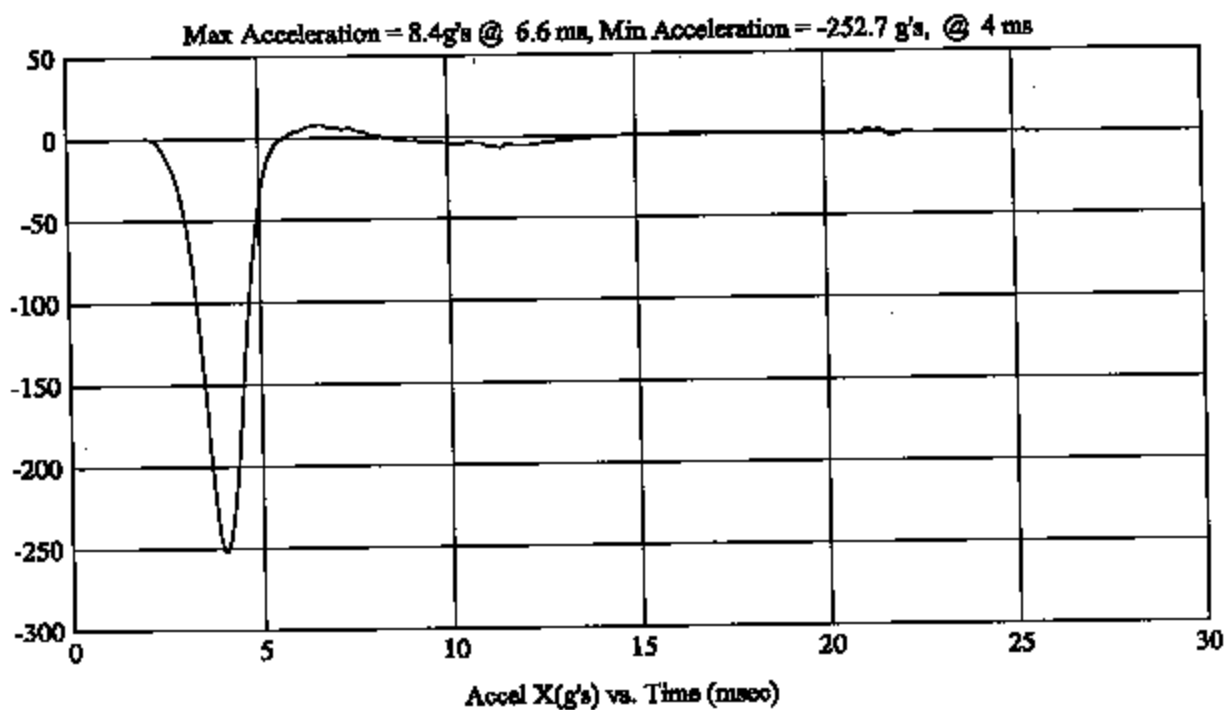
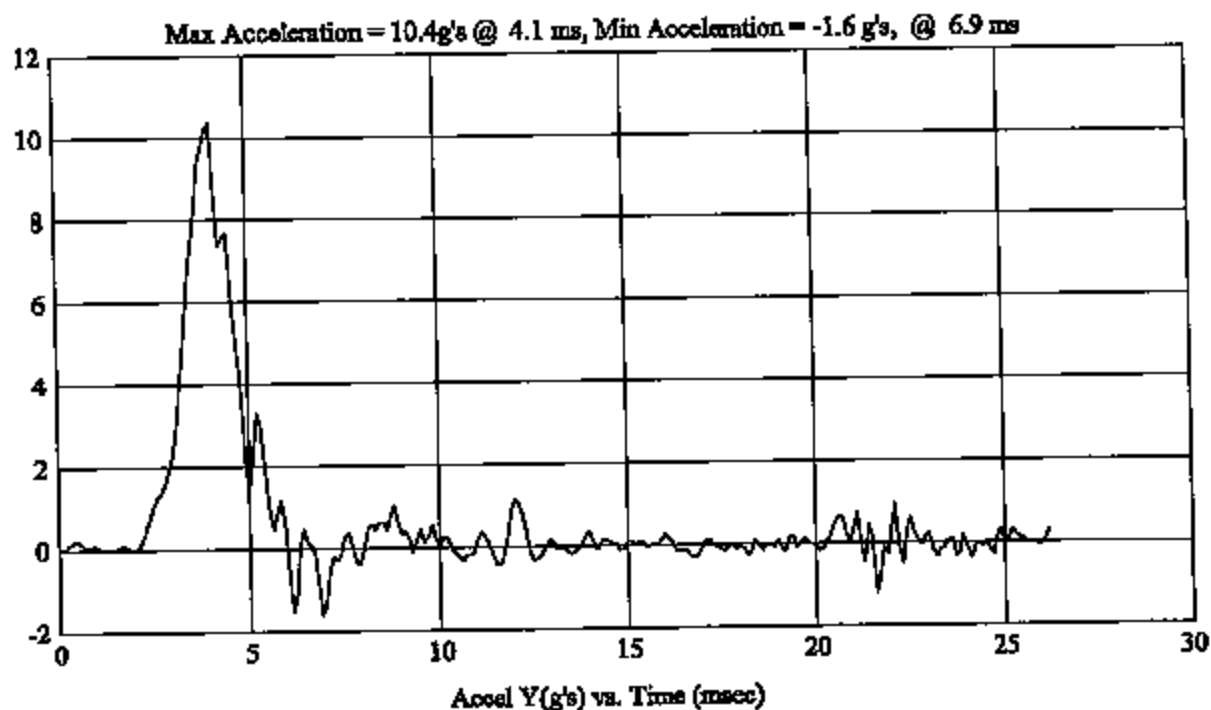
MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 038



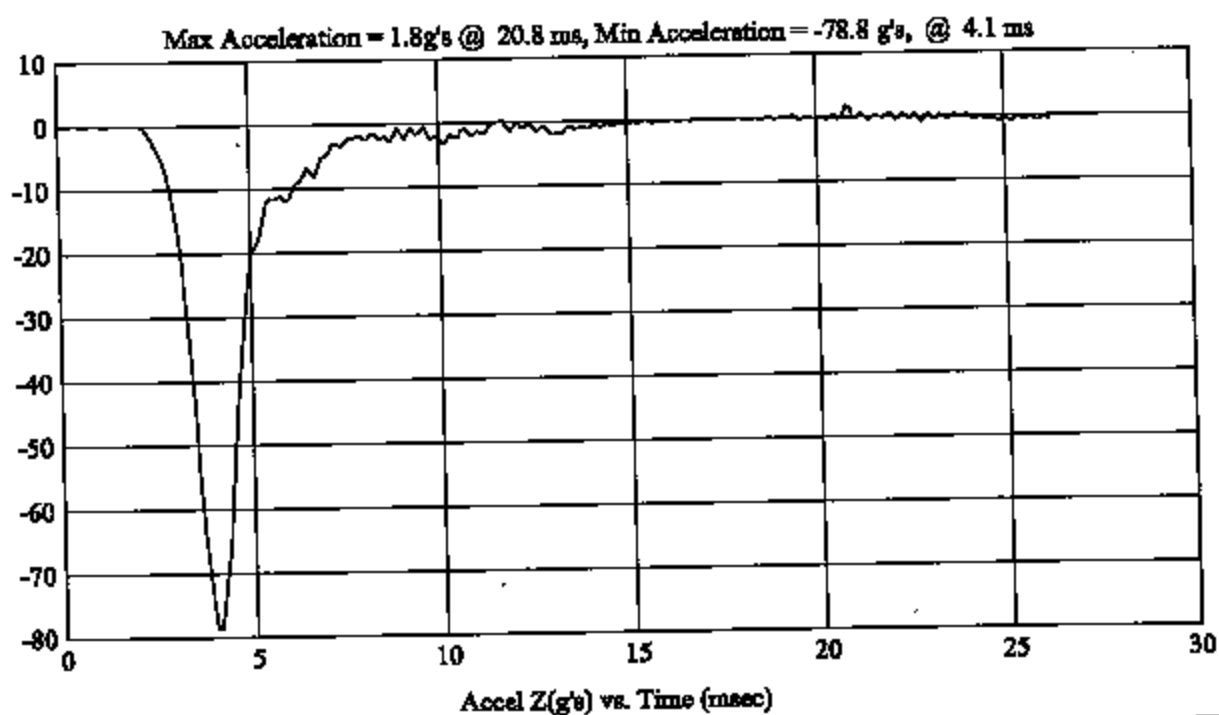
Head Drop
(Preliminary Test Report)Test Number: H38276
Test Description: 9.92

MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 038

Head Drop
(Preliminary Test Report)Test Number: H38276
Test Description: 9.92

MGA Job Number: G0517-001.4

Test Date: 5/24/05
Head #: 038

MICHIGAN OPERATIONS
DATE: 3/20/03
SUPERCHIDES: MGATPEDITJ

DOC. NO.: MGATP201UHD
REVISION NO.: 6
PAGE 6 OF 7

HEAD DROP TEST SUMMARY PART 572L

HEADFORM SERIAL NUMBER: <u>38</u>		CALIBRATION DATE: <u>5/26/05</u>
TEST PARAMETER	SPECIFICATION	TEST RESULTS
Weight	9.90 to 10.10 lbs.	<u>9.92</u>
Temperature	19° C to 26° C	<u>22</u>
Relative Humidity	10% to 70%	<u>44</u>
Peak Resultant Acceleration	225 G's to 275 G's	<u>269.3</u>
Peak Lateral Acceleration	15 G's Maximum	<u>4.3</u>
Unimodal Acceleration Curve	YES	<u>Yes</u>

FMH INSTRUMENTATION					
HEAD ACCELEROMETERS					
Channel Number	Manufacturer	Model Number	Serial Number	Date of Last Calibration	Date of Next Calibration
<u>5</u>	ENDEVCO	7264-2000	<u>J36197</u>	<u>5/02/05</u>	<u>11/02/05</u>
<u>6</u>	ENDEVCO	7264-2000	<u>J36193</u>	<u>5/02/05</u>	<u>11/02/05</u>
<u>7</u>	ENDEVCO	7264-2000	<u>J36353</u>	<u>5/02/05</u>	<u>11/02/05</u>

REMARKS:

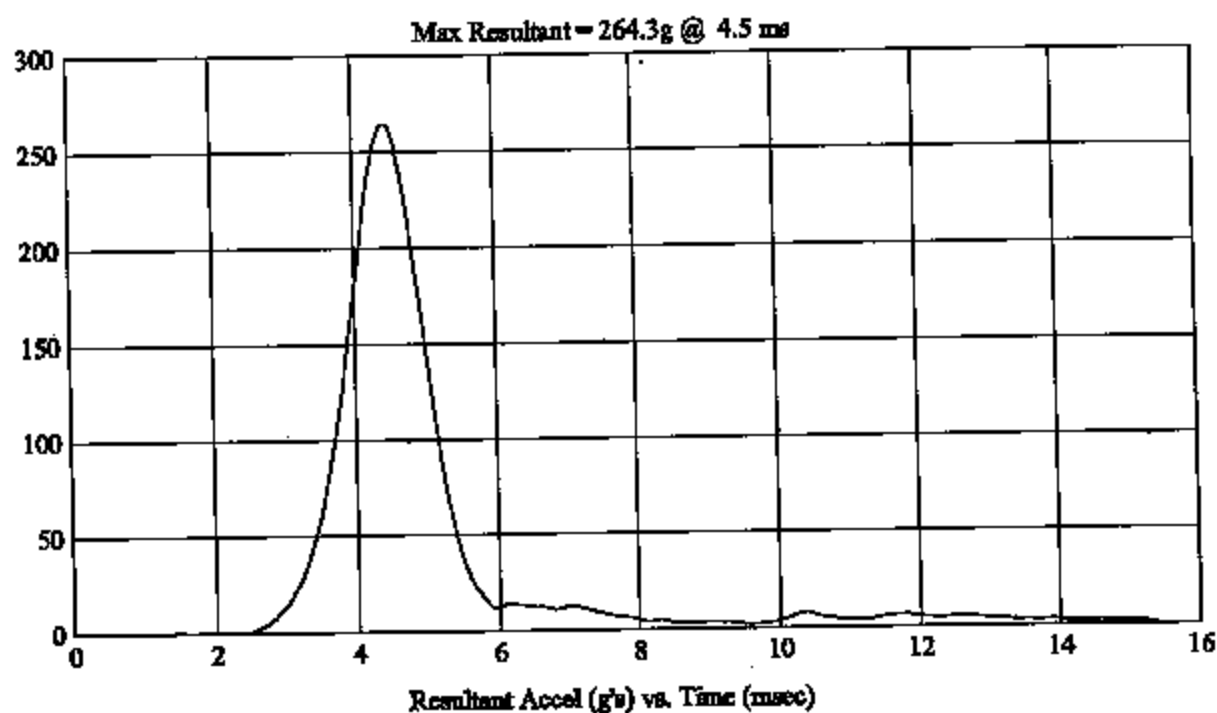
RECORDED BY: *Matt K...*DATE: 5/26/05APPROVED BY: *[Signature]*

Head Drop
(Preliminary Test Report)

Test Number: H38277
Test Description: 9.92

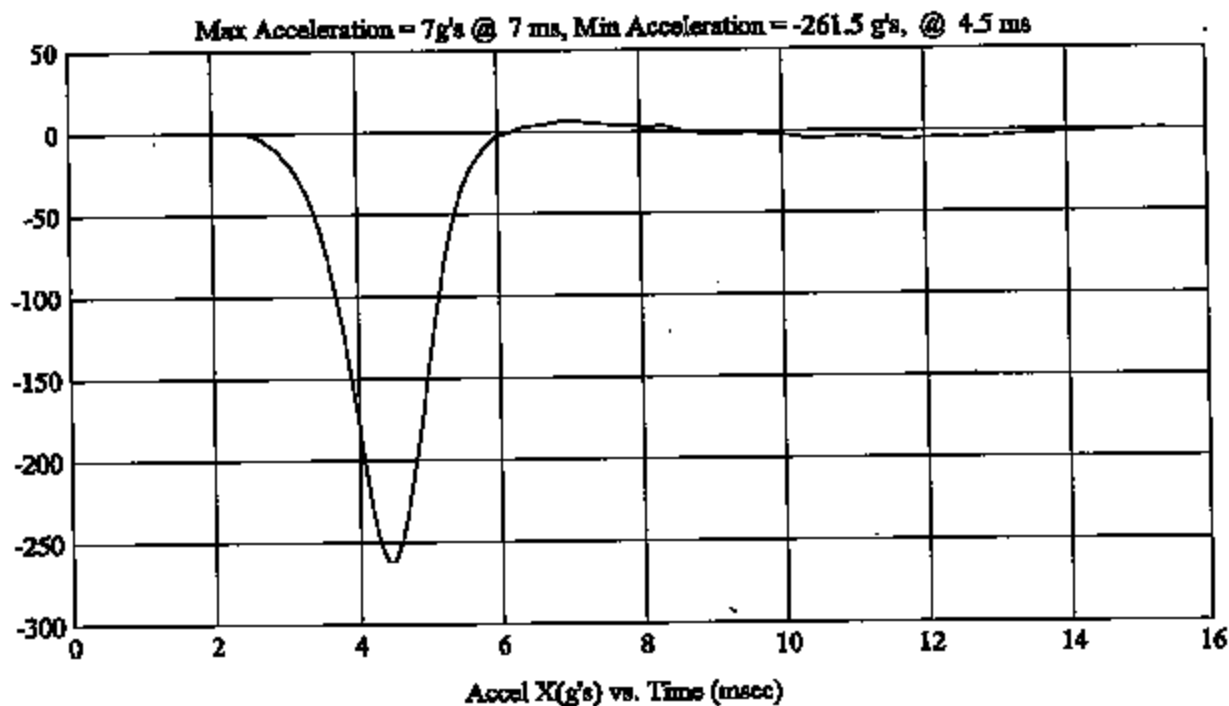
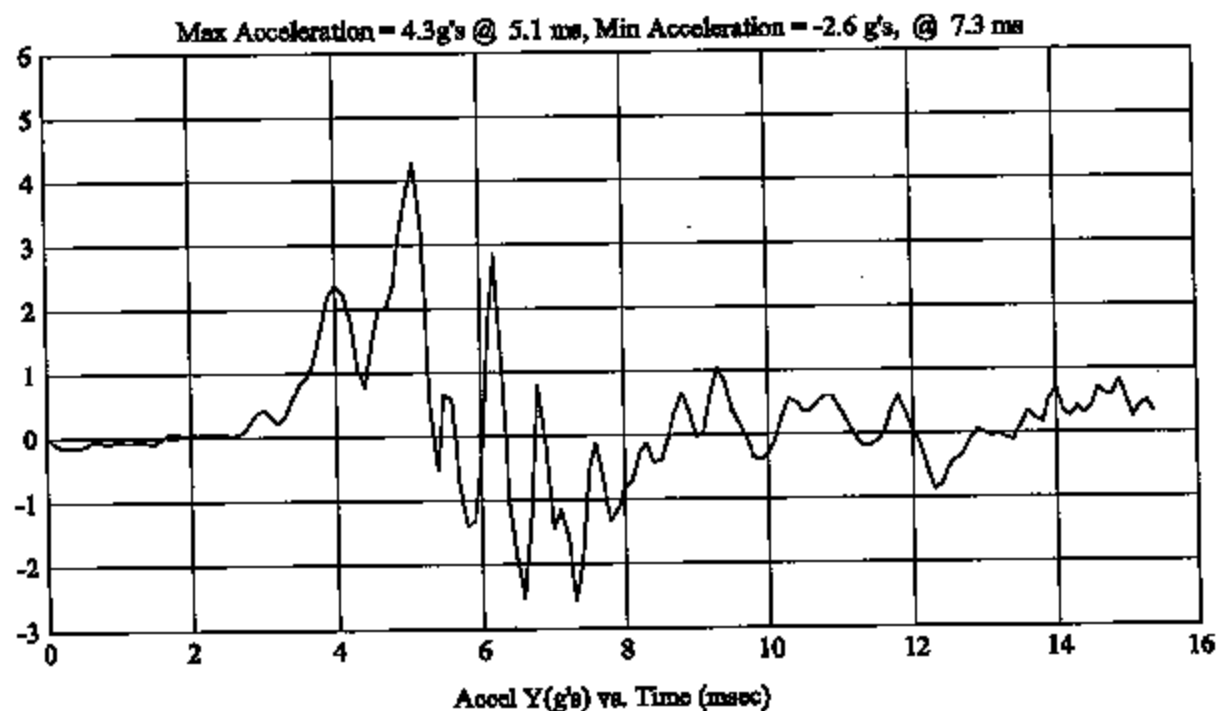
MGA Job Number: G05T7-001.4

Test Date: 5/26/05
Head #: 38



Head Drop
(Preliminary Test Report)Test Number: H38277
Test Description: 9.92

MGA Job Number: G0517-001.4

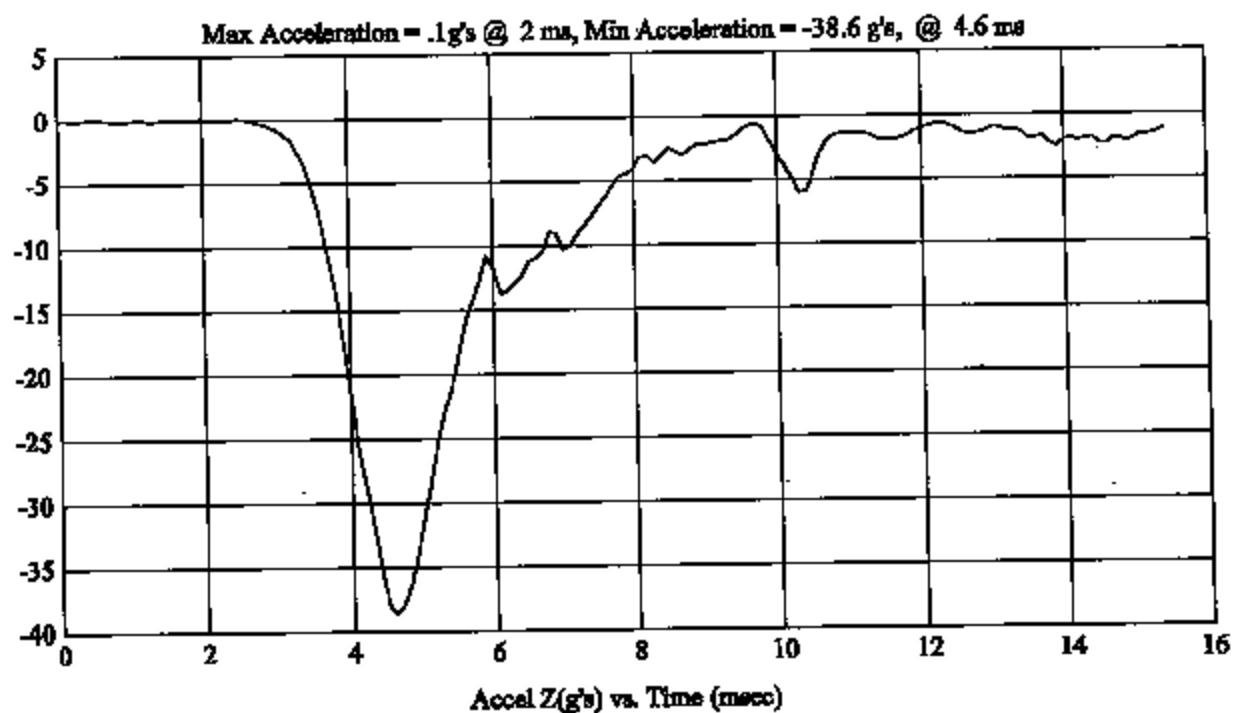
Test Date: 5/26/05
Head #: 38

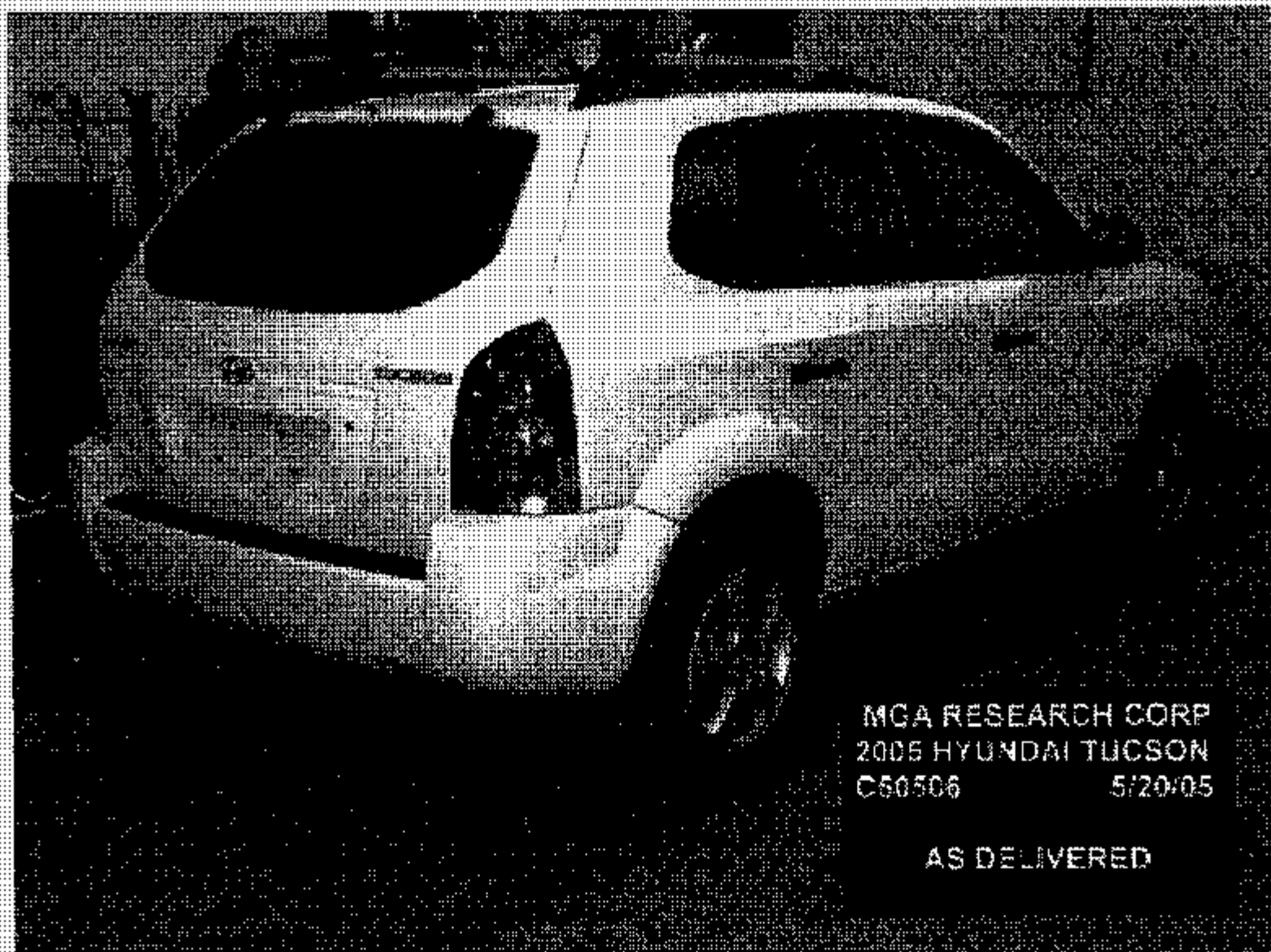
Head Drop
(Preliminary Test Report)

Test Number: H38277
Test Description: 9.92

MGA Job Number: G0517-001.4

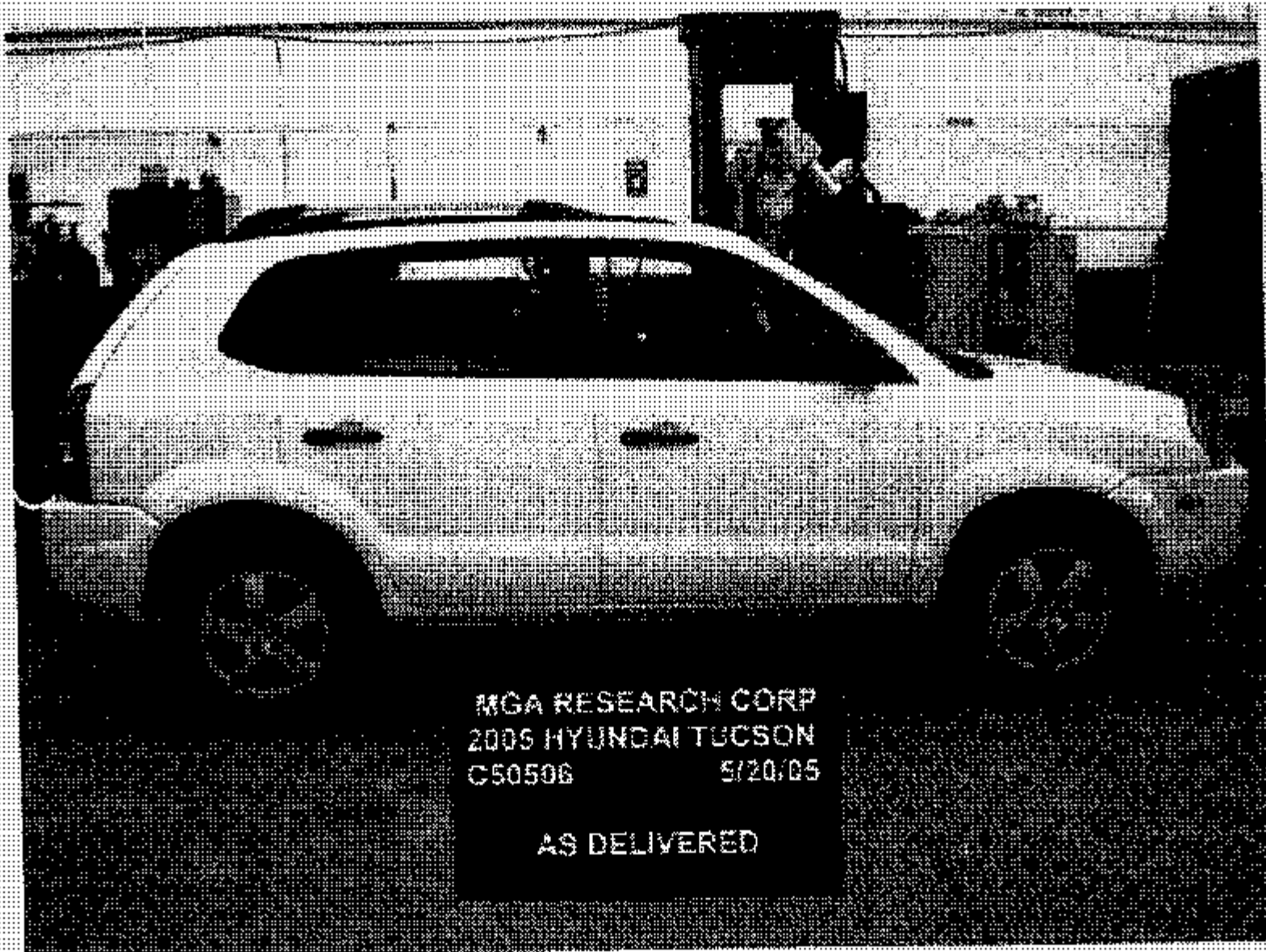
Test Date: 5/26/05
Head #: 38





MCA RESEARCH CORP
2005 HYUNDAI TUCSON
C50506 5/20/05

AS DELIVERED



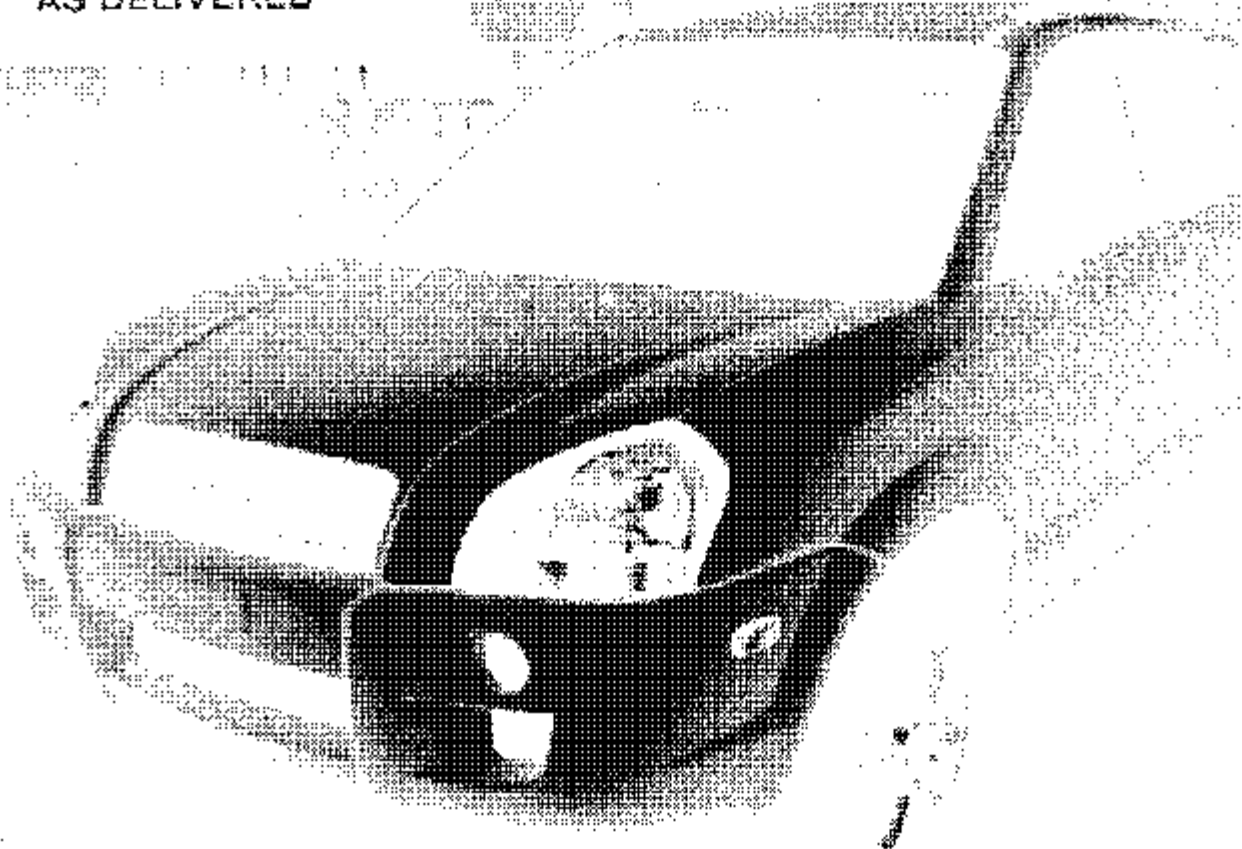
MGA RESEARCH CORP
2005 HYUNDAI TUCSON
C50506 5/20/05

AS DELIVERED



MGA RESEARCH CORP
2005 HYUNDAI TUCSON
C50506 5/20/05

AS DELIVERED



TIE AND LOADING INFORMATION

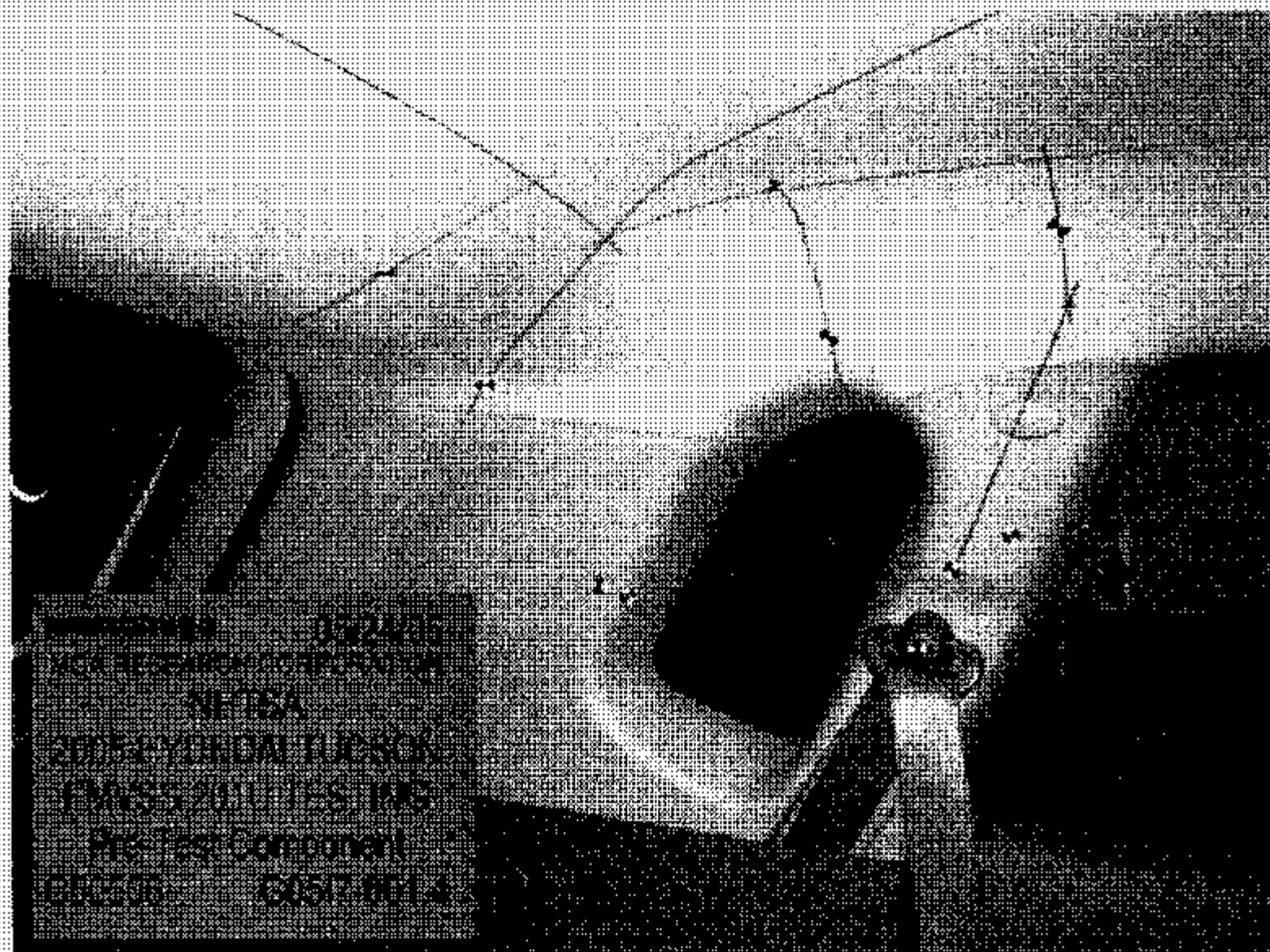
SPRINKLER TIE TIE 1 TIE 2 TIE 3

The combined weight of occupants and cargo should never exceed 500 kg or 1100 lbs.

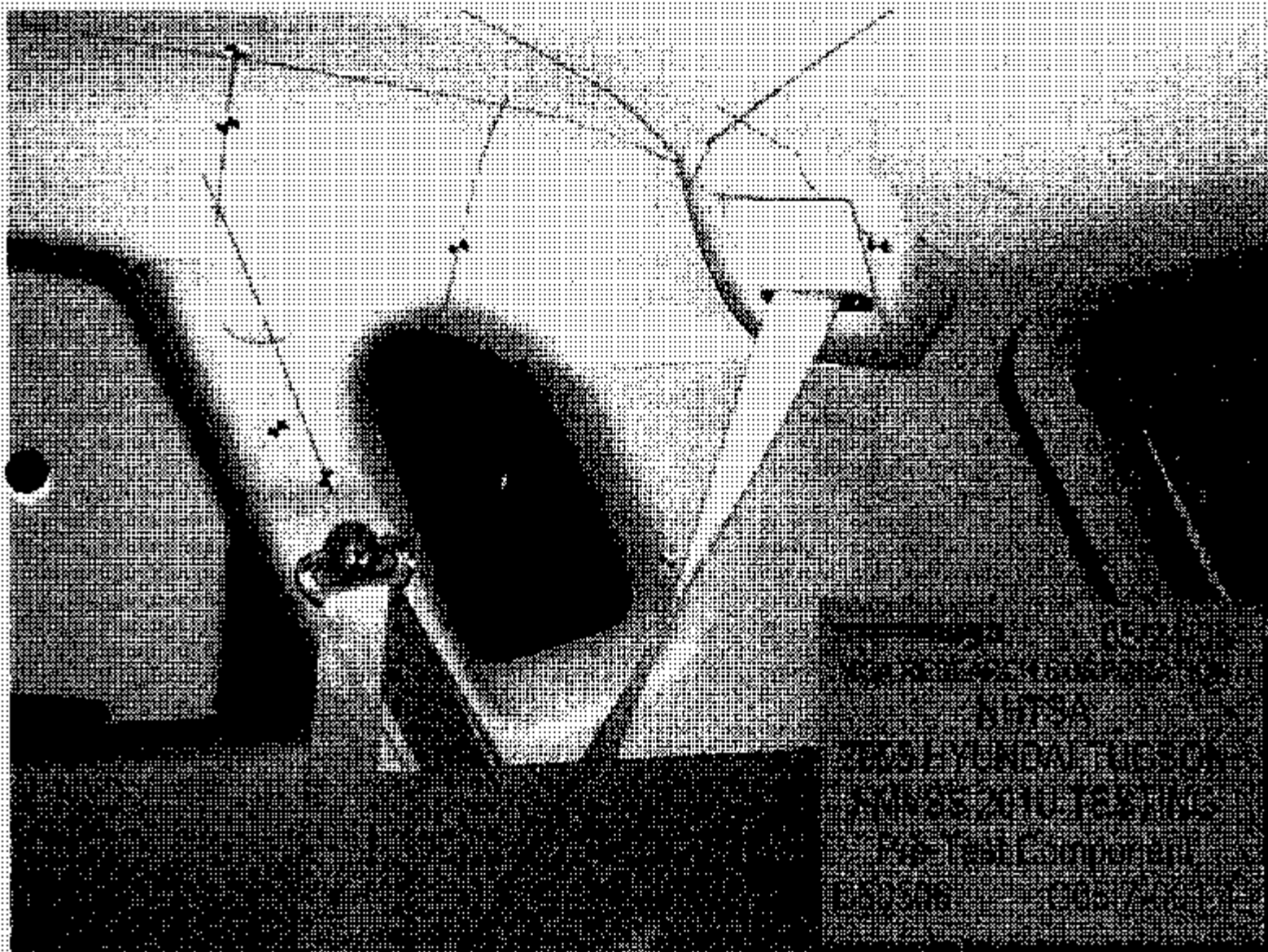
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT
WEIGHT	WEIGHT	WEIGHT

SEE OWNER'S
MANUAL FOR
ADDITIONAL
INFORMATION

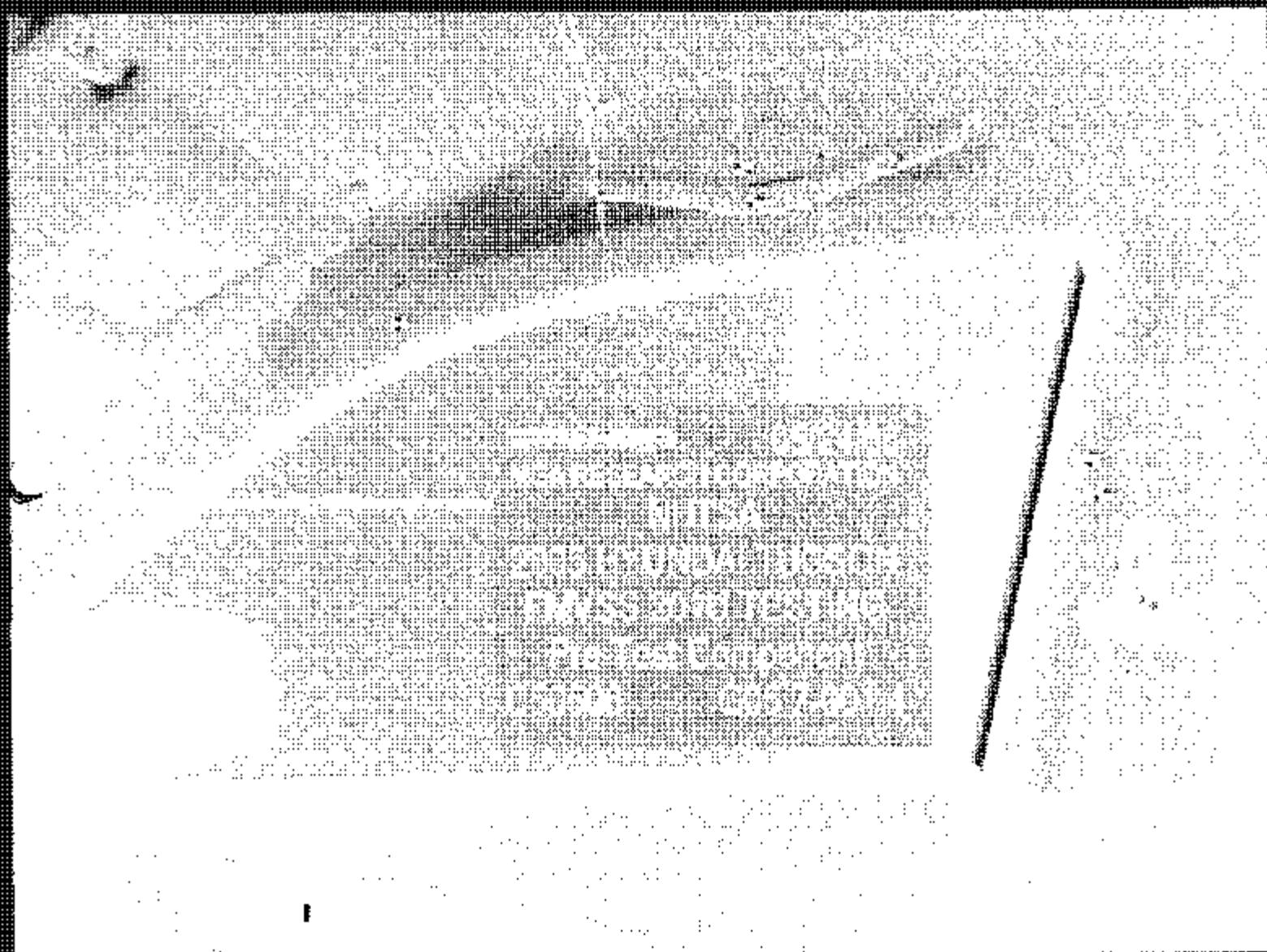


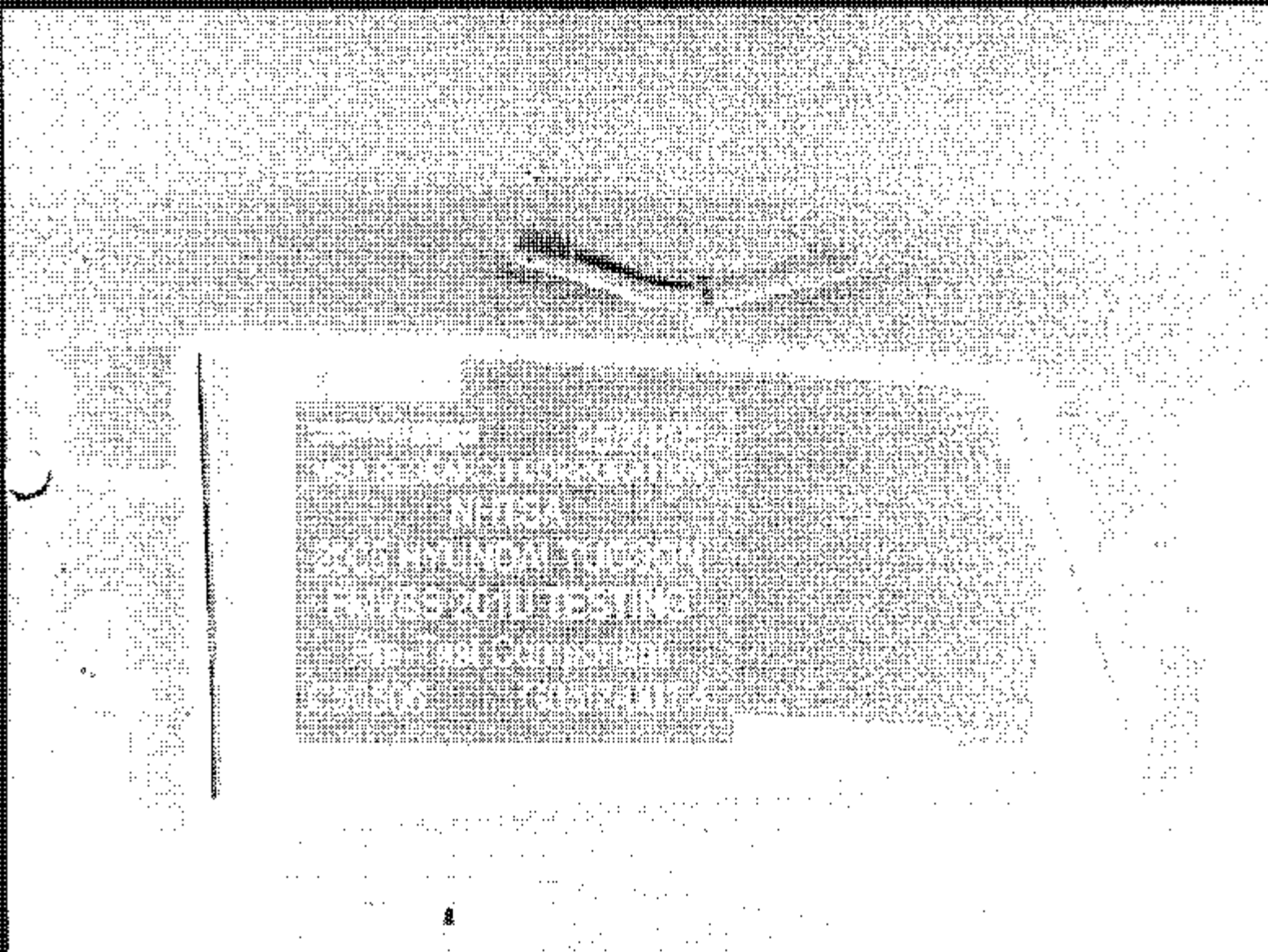


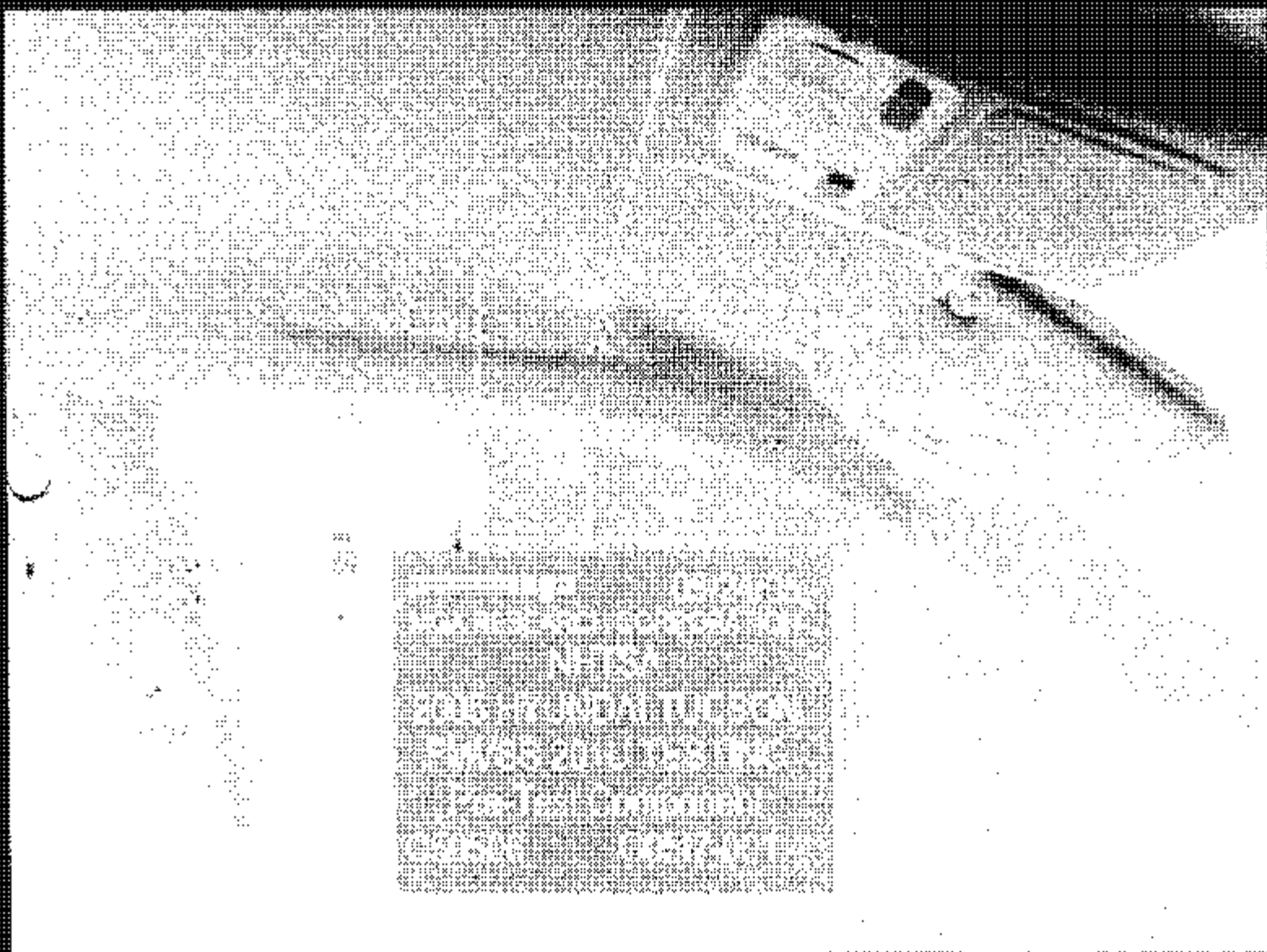
0522406
NETSA
2005 YUNCAI TUCKER
FMSS 2010 TESTING
Pre Test Component
0522406 0517 0014

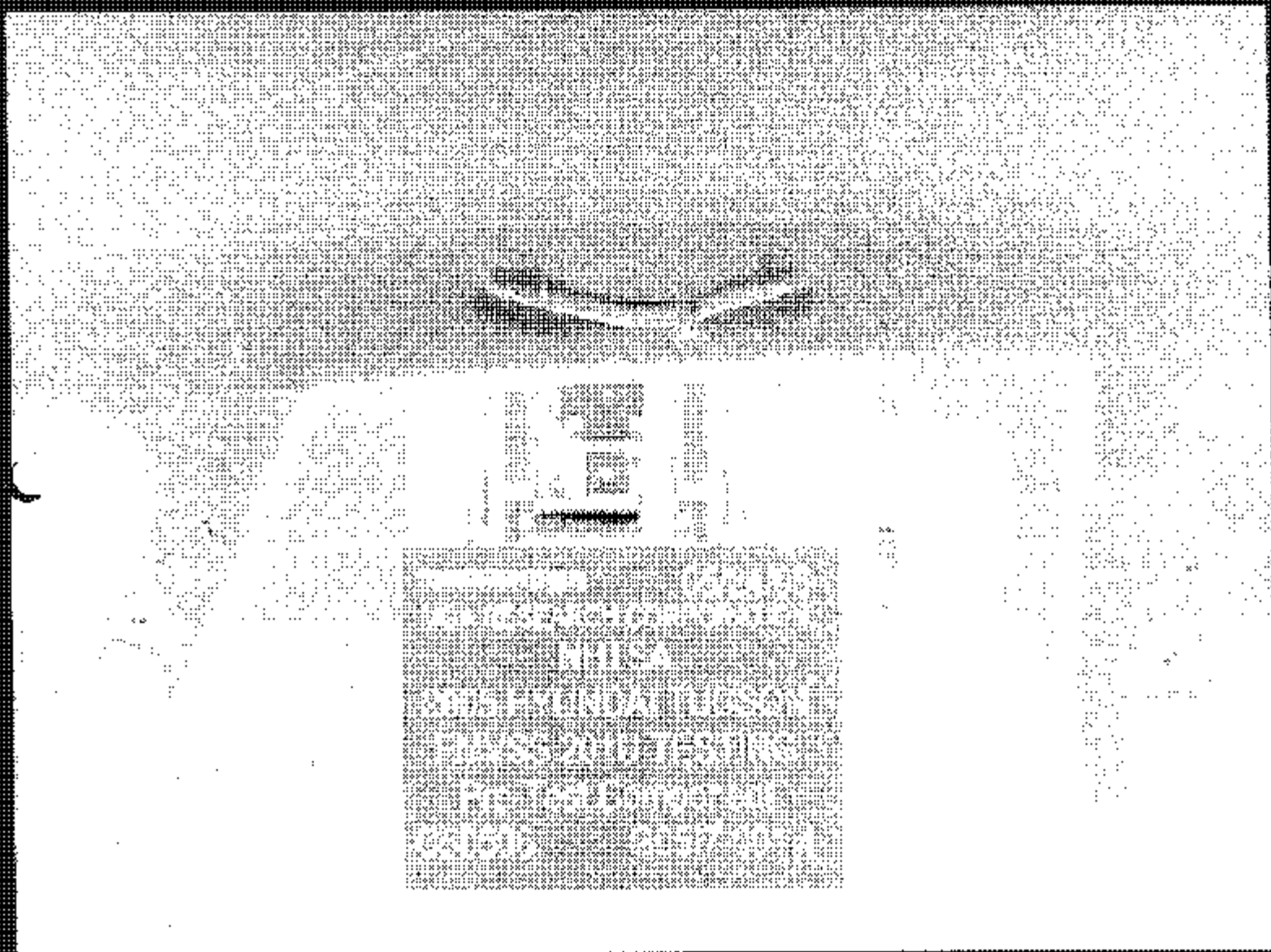






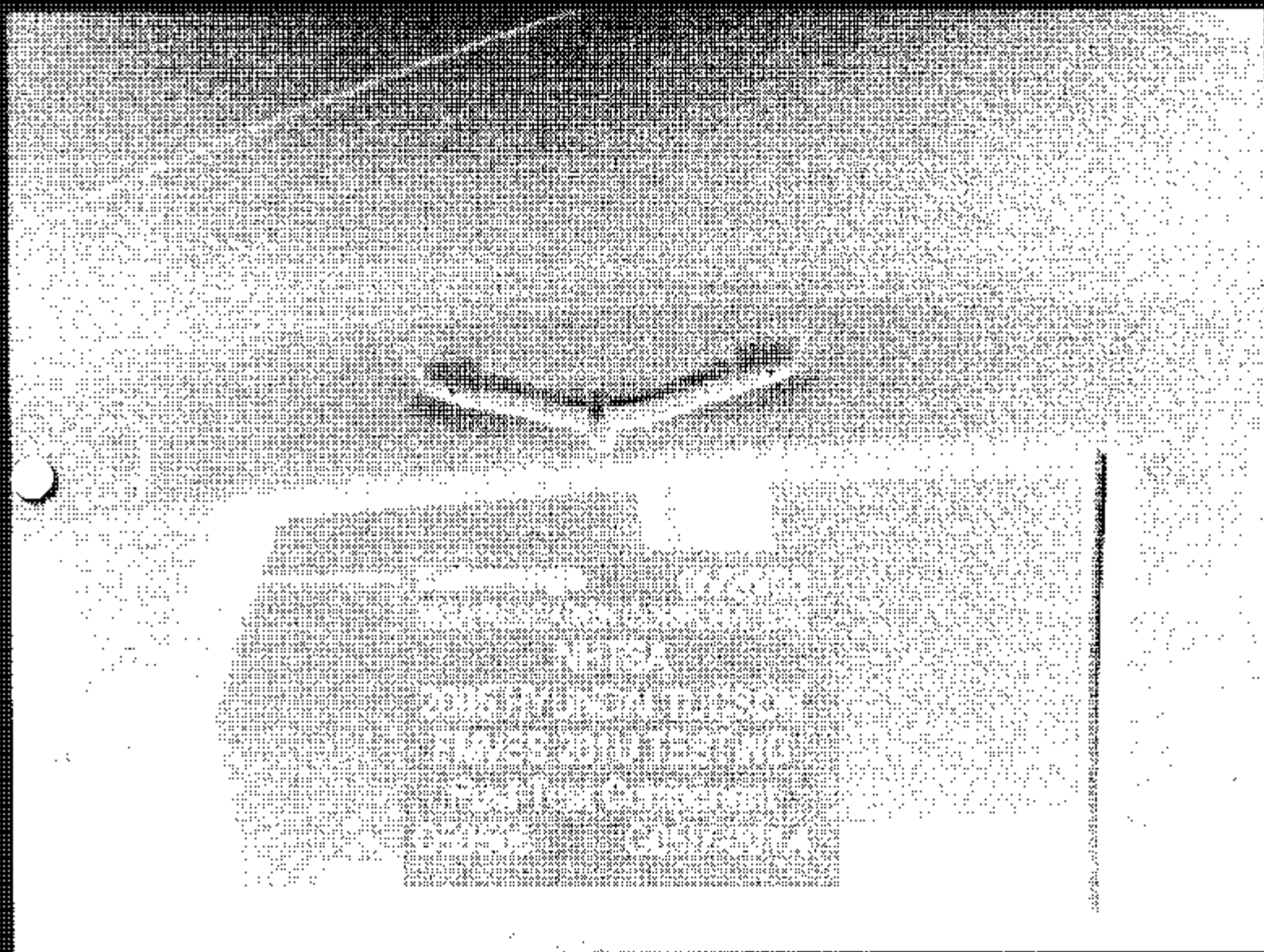




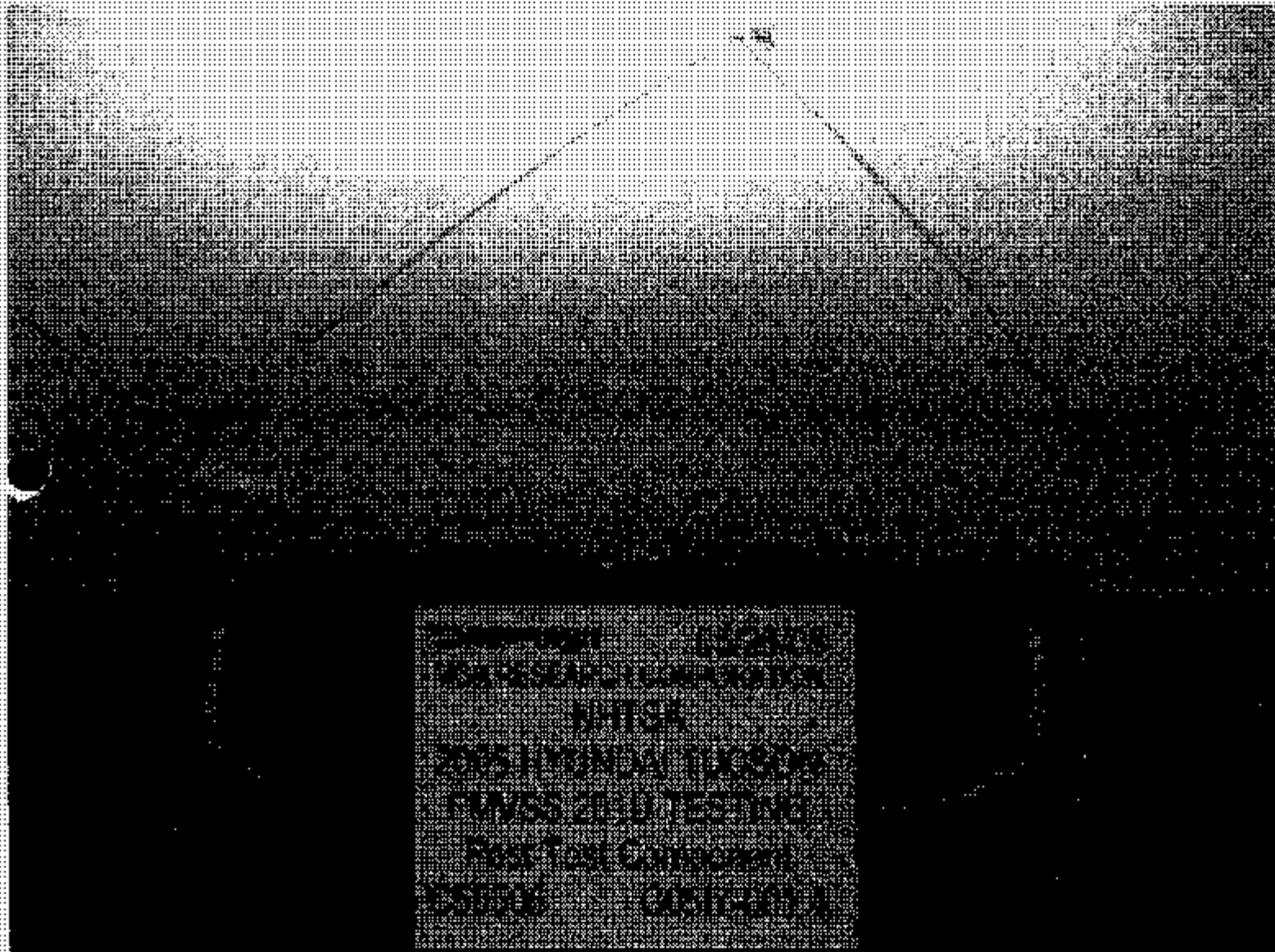


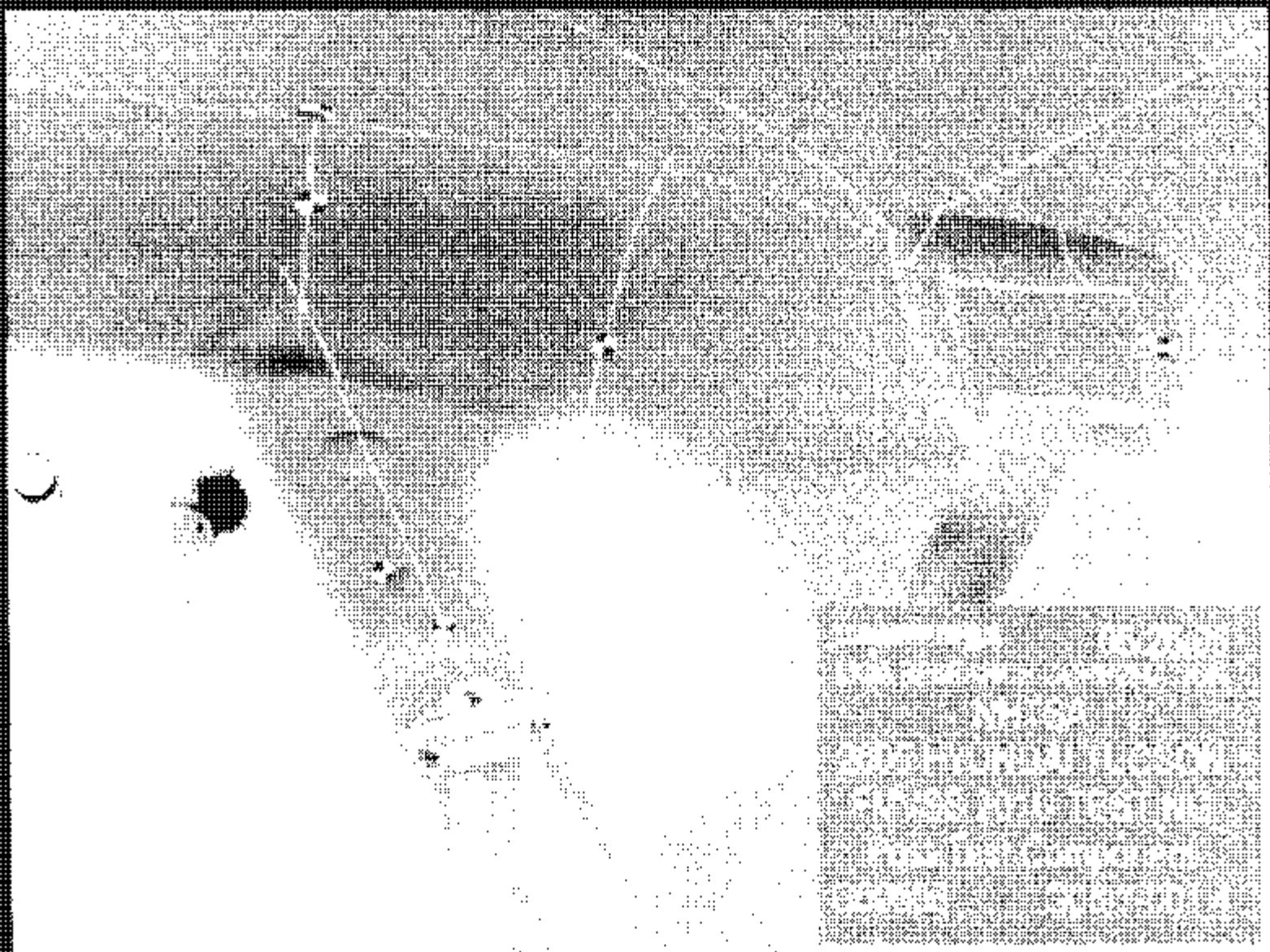


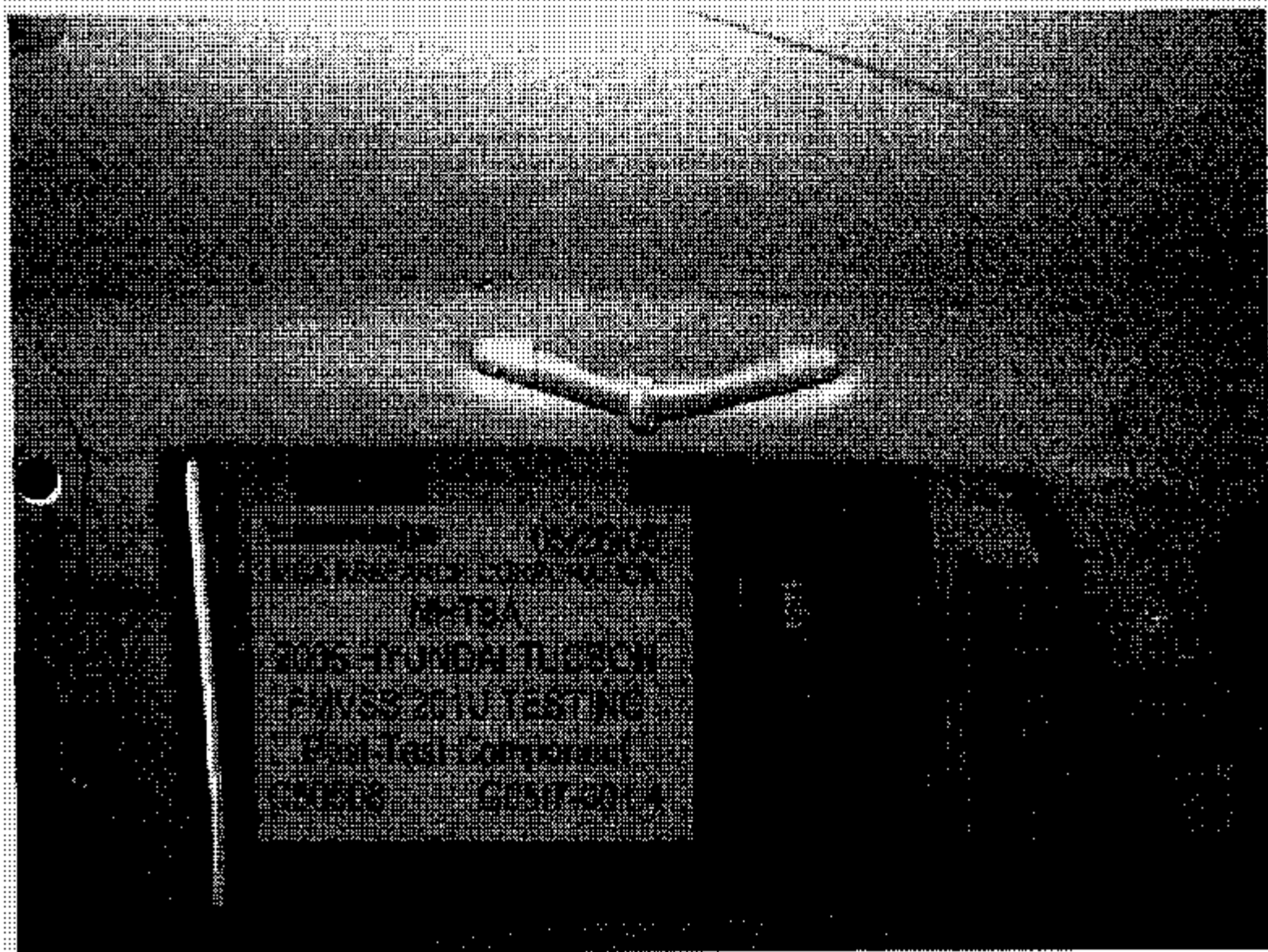


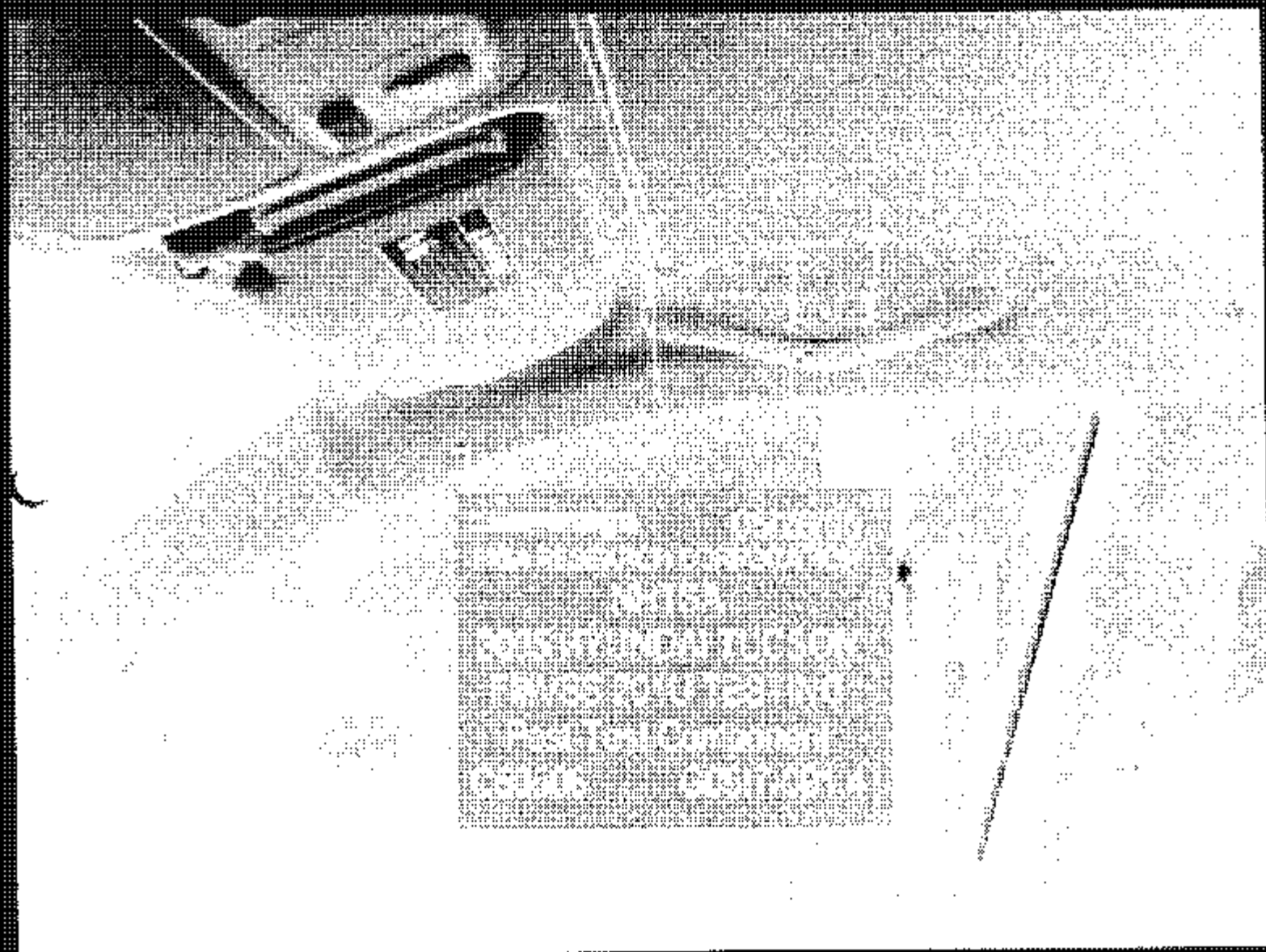










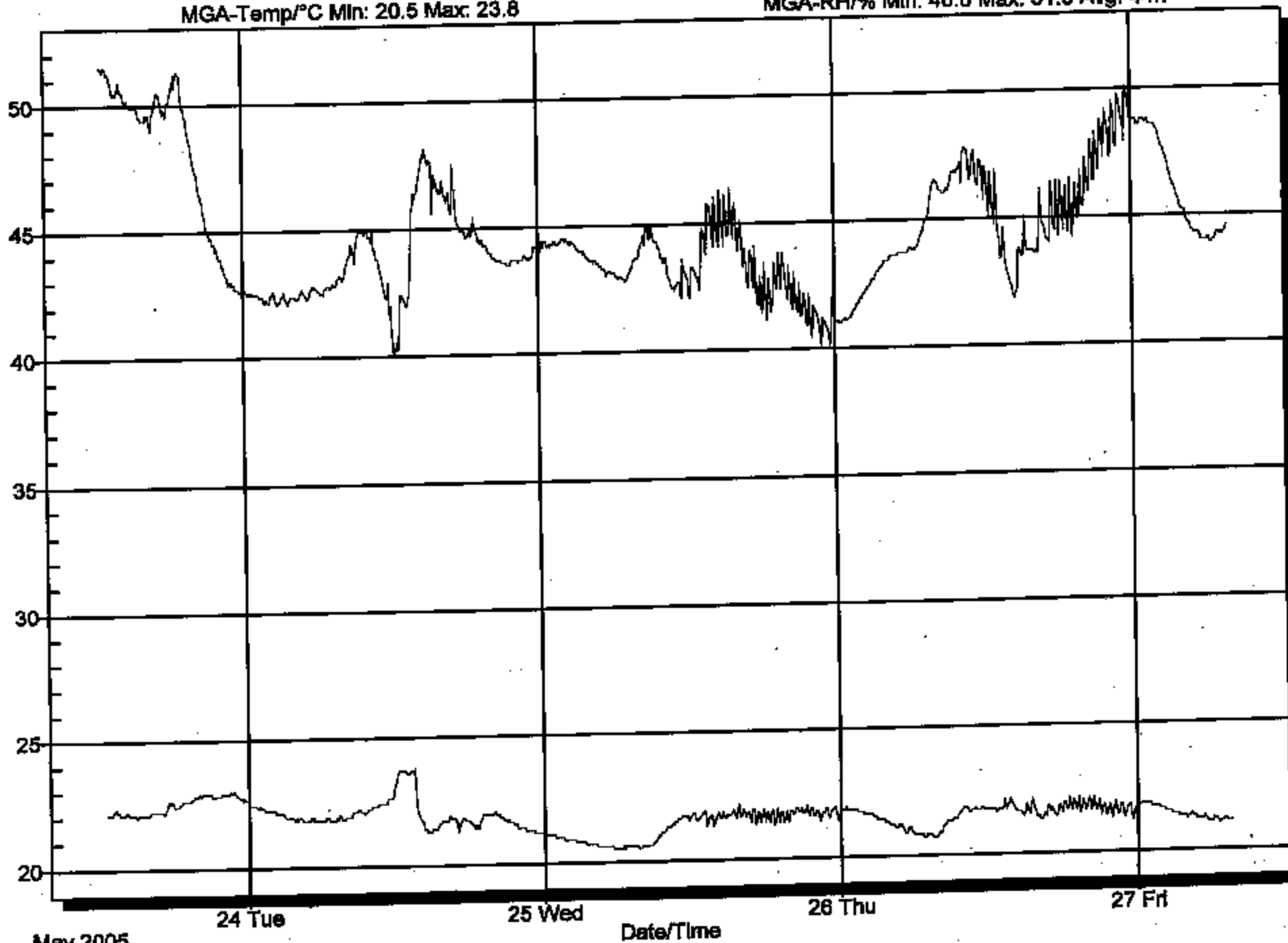


C50506 2005 Lyndai Tucson

Temperature Trace May 24 - 26, 2005

MGA-Temp/°C Min: 20.5 Max: 23.8

MGA-RH/% Min: 40.0 Max: 51.5 Avg: 44.7





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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35924	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0512

New DLR (100k, Units:G): 91.8

StdDeviation (%): 0.1

% Difference in DLR (New vs. Old): -2.461

Temperature (°F): 70

Humidity (%): 27

Performed By:

Todd Deane

Approved By:

Donald Kalito

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
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 $k=2$.

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www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35919	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0512

New DLR (100k, Units:G): 97.0

StdDeviation (%): 0.556

% Difference in DLR (New vs. Old): 2.899

Temperature (°F): 70

Humidity (%): 27

Performed By:

Todd Deme

Approved By:

Donald Kalito

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
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 $k=2$.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J22664	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0512

New DLR (100k, Units:G): 95.6

StdDeviation (%): 0.511

% Difference in DLR (New vs. Old): 3.075

Temperature (°F): 70

Humidity (%): 27

Performed By:

Todd Wenzel

Approved By:

Donald Kalito

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$. 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 $k=2$.

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**mga research corporation****CALIBRATION CERTIFICATE**

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J35800	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0513

New DLR (100k , Units:G): 98.4

StdDeviation (%) 0.323

% Difference in DLR (New vs. Old): -0.053

Temperature (°F): 70

Humidity (%): 27

Performed By:

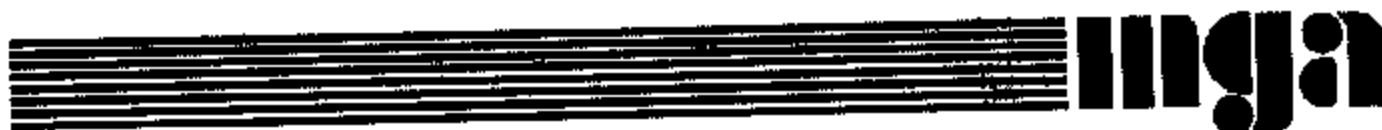


Approved By:



All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
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 $k=2$.

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CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J35841	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0513

New DLR (100k , Units:G): 95.7

StdDeviation (%) 0.399

% Difference in DLR (New vs. Old): 3.367

Temperature (°F): 70

Humidity (%): 27

Performed By:

Todd Wenne

Approved By:

Donald Kalito

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
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 $k=2$.

446 executive drive • troy, mi 48083
248 / 577-5001 • fax 248 / 577-5025
www.mga-research.com

**mga research corporation****CALIBRATION CERTIFICATE**

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J35791	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0513

New DLR (100k, Units:G): 89.5

StdDeviation (%): 0.261

% Difference in DLR (New vs. Old): 0.777

Temperature (°F): 70

Humidity (%): 27

Performed By:

Approved By:

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 4.1\%$. 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 $k=2$.

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www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J36197	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0513

New DLR (100k, Units:G): 106.9

StdDeviation (%): 0.303

% Difference in DLR (New vs. Old): -2.83

Temperature (°F): 70

Humidity (%): 27

Performed By: 

Approved By: 

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is ±4.1%.
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.

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www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: <i>Reference Accelerometer</i>
Model: 7264-2000	Model: 301M09/484B
S/N: J36193	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: <i>Chris Vega/PCB Piezotronics, Inc.</i>

Test Reference Number: A0513

New DLR (100k , Units:G): 102.8

StdDeviation (%) 0.197

% Difference in DLR (New vs. Old): 0.926

Temperature (°F): 70

Humidity (%): 27

Performed By:

Todd Dennis

Approved By:

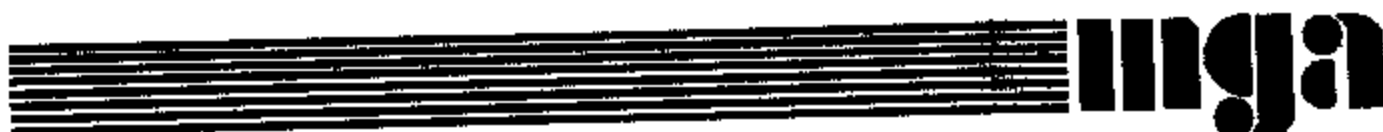
Donald Kalito

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
All certification data and equipment are on file for inspection at your request. Best uncertainties represent expanded uncertainty
expressed at approximately the 95% confidence level using a coverage factor $k=2$.

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248 / 577-5001 • fax 248 / 577-5025

www.mgaresearch.com



mga research corporation

CALIBRATION CERTIFICATE

Sensor Information	Reference Sensor Information
Name: 2000 G Accelerometer	Name: Reference Accelerometer
Model: 7264-2000	Model: 301M09/484B
S/N: J36353	S/N: 862/247
Capacity: 2000 G	Capacity: 170 G
Calibration Date: 05/02/2005	Calibration Date: 05/11/2004
	Calibrated By: Chris Vega/PCB Piezotronics, Inc.

Test Reference Number: A0513

New DLR (100k, Units:G): 98.8

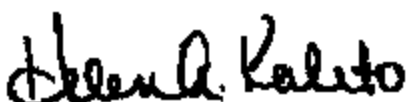
StdDeviation (%): 0.28

% Difference in DLR (New vs. Old): 2.204

Temperature (°F): 70

Humidity (%): 27

Performed By: 

Approved By: 

All calibrations are traceable to the National Institute of Standards and Technology. Estimated uncertainty of the measurement is $\pm 0.1\%$.
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.

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248 / 577-5001 • fax 248 / 577-5025
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~Certificate of Calibration~

Model Number: 4843	N.I.B.T. Project #: 6720912
Serial Number: 2470	Calibration Date: 06/11/2004
Description: Signal Conditioner	Recalibration Date:
Test Procedure: AT-105-1	Calibration Technician: Chris Vega <i>CV</i>
Temperature: 74° F	Relative Humidity: 42%

TESTS	BEFORE	AFTER
INPUT VOLTAGE ($24 \pm 0.1V$)	24.02	24.02
ICP CURRENT ($4 \pm 0.6mA$)	3.97	3.97
DC OFFSET A.C. MODE (volts)	-.001	-.001
GAIN (REF 1 VRMS, 1kHz)	1.0000	NOT ADJUSTABLE
DRIFT (DC MODE)	< 2mV/min.	NOT ADJUSTABLE
FREQUENCY RESPONSE 10 Vp-p, 1 kHz REFERENCE	FLAT TO 200kHz	NOT ADJUSTABLE

As Received: In tolerance

As Left: In tolerance

Special Notes: MGA Research

This document certifies that the equipment referenced above meets published specifications. The calibration procedure is in compliance with NIST 10013-1, and follows MIL-STD-45658A and is traceable to NIST. *Measurement uncertainty (95% confidence level, coverage factor of 2) for scale factors is $\pm 0.25\%$.

This certificate may not be reproduced, except in full, without written approval of

~ Calibration Certificate ~

Per NIST 1013-21

Model Number: 2011M054040 (35-0M17 SYSTEM)Serial Number: 062/2478Description: ICP® AccelerometerMethod: Back-to-Back Comparison CalibrationManufacturer: PCB

Calibration Data

Sensitivity @ 100.0 Hz: 31.17 mV/g Output Bias: 0.6 VDC
(3.179 mV/ms²) Transverse Sensitivity: 3.0 %

Sensitivity



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
5.0	-2.5	REF. FREQ.	0.0	5000.0	1.1
10.0	-1.9	300.0	0.7		
15.0	-1.4	500.0	0.8		
30.0	-0.6	1000.0	1.0		
50.0	-0.2	3000.0	1.1		

Manufacturer's label that includes data entry: None None

Manufacturer's label that includes data entry: None None

Condition of Unit

As Found: In Tolerance, No Adjustment NecessaryAs Left: In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 823/267400 and FIB Traceable thru Project 1055.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI/NCCL Z540-1-1994 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz: $\pm 2.0\%$, 10-99 Hz: $\pm 1.5\%$, 100-1999 Hz: $\pm 1.0\%$, 2-10 kHz: $\pm 2.5\%$.

Technician: Chris D'AmicoCheck: D'AmicoDate: 05/13/04

Cert No: 000000

PCB PIEZOTRONICS

VERIFICATION DIVISION

3425 Wadsworth Avenue, Dayton, OH 45424

TEL: 937-894-0001 FAX: 937-894-0001 www.pcb.com

Interim Certification Document

Part Description: Gold Certification Date: 08/17/05 Serial#: 005-02-02-53122
 Single Point 2 Sigma: 005-02 +/-0.03mm (+/-0.0025") Certificate#: 00212220-005
 Linear Displacement 2 Sigma: 005-02 +/-0.03mm (+/-0.0025") Ambient Temperature: 22°C +/- 2°C

Measurement Standards, N.I.S.T., U.K.A.S. Traceability
 Bal-Tec Invar Ball Bar Kit Kit Number: 999 NIST/UKAS Cert No: 1101940001 Date: 08/16/05

Toson Snap Gauge, Mitutoyo Corporation Code No.: 813-744 N.I.S.T. Cert No: 118107228 Date: 10/22/03
 Asset No.: 992 U.K.A.S. Cert No: 148851 Date: 11/05/03

Measuring range: 1.5in

* Uncertainty shown here is calculated with a coverage factor of 2 (95% level of confidence) and is based on the standard uncertainty of the measurement. The uncertainty is expressed as a percentage of the measured value.

Certification Results

A single four quadrant certification included with all FARO Arms and comprised of: 2 vertical level single point repeatability test in 4 quadrants with 5 repeats from 4 directions
 Snap Gauge Test in 4 quadrants, 3 orientations per quadrant
 3 Levels, 5 position line ball bar test in 4 quadrants

* Calibration and maintenance performed in accordance with FARO Arm 4.00.0000.

Instrument condition as received

Not within specifications

Instrument condition outgoing

Within specifications

Technician

David Richards
 David Richards

Date

2/1/05

5/1/05

This certificate shall not be reproduced, except in full, without permission of FARO Technologies, Inc.
 This certificate is valid only for the item specified or listed.

FARO Technologies, Inc.
 Michigan Regional Office
 PH: 248-688-8020

FAX: 248-688-8005

48006 Magellan Drive
 Warren, MI 48093
 USA

FARO

Page 1 of 15



LABORATORY
 ACCREDITATION
 BUREAU
 ISO/IEC 17025 Accredited



Certificate Number: 20050092Cal

Detroit Testing Laboratory, Inc.



7111 E. 11 Mile Road, Warren, MI 48093-8700 • (586) 784-9000 • FAX (586) 784-8046 • www.dtl-lab.com

Certificate of Calibration

Equipment Information

Customer: MGA Research Corporation
446 Executive Drive
Troy, MI 48063

Model: TM329
Serial Number: 04063532
Manufacturer: Michone
Description: Thermohygrometer

System ID: MGA00146

Customer Asset No.:

Calibration Information

Calibration Date: 1/14/05
Calibration Due: 1/14/06
Calibration Interval: 12 Month
Read In Test: Yes/Pass
Returned In Test: Yes/Pass
Performed On Site: No
Calibration Limitations:

Procedure Used: 33K5-4-84-1705, MFR
Calibrated to: $\pm 0.8^\circ\text{F}$, $\pm 2\%RH$
Temperature: 23 $^\circ\text{C}$
Humidity: 33.5%RH

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: 0.7°F , 1.1%RH

Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedure utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for

Calibration Standards Used

System ID:	Model:	Serial:	Manufacturer:	Description:	Date Due:
07683	5690	10434	Beco-Hera	TEMP. PROBE	1/26/05
09324		09324	DTL	ASTM Sol. Solutions	7/17/06
10545	A2/HP101A-X	51619/516	Romtek	Calibrate Thermohygrometer	1/22/05

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may affect drift of reported values over time there is no assurance implied that this item will maintain its stated accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 17025:1999. Reported results are from standards with uncertainty that are traceable to the International System of Units (SI), derived from physical constants, or to measurement, national measurement standards, or comparison to measuring standards. Measurement uncertainty is expressed as a percentage of the measured value.

Signature: *[Signature]* Date: 1-17-05 Technician: *[Signature]* Approved: *[Signature]* Date: 1-18-05

Date Printed: 01/17/05 Printed By: Jerry Wells Page: 1 of 2 QRC 1046-1 Rev 4/17/03

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Detroit Testing Laboratory, Inc.

CALIBRATION DATA SHEET

Date: 1/14/05
 CTR. I.D.: MGA00148
 Cert. No.: 20050022C4

Cal Point: Applied Temp	Reading as Found	Reading as Left	Deviation as Found	Deviation as Left	% of Allowed Dev as Found	% of Allowed Dev as Left
°F	°F	°F	°F	°F		
std	std	std				
80.08	80.4	80.4	0.32	0.32	40.0	40.0
70.65	71.1	71.1	0.27	0.27	83.7	83.7
82.85	82.8	82.8	-0.25	-0.25	-81.8	-81.8
Applied Humidity						
% RH	% RH	% RH	% RH	% RH		
82.0	84.1	84.1	1.2	1.2	80.0	80.0
75.3	77.0	77.0	1.7	1.7	85.0	85.0



4700 Eerden Court S.E. • Kentwood, MI 49512 • Telephone: 616.936.3124 • Fax: 616.936.2554



Certificate of Calibration

MGA Research
440 Essouvie Drive
Troy, MI 48063

Order Number: 43372
Report Number: 08080398
Page: 1 of 1

Gauge Number: MGA00071
Gauge Desc: Digital Protractor
Manufacturer: Pro 390
Model Number: N/A
Serial Number: N/A

Customer PO: 87-45-4524
Last Calibration: 12/8/94
Calibration Date: 2/2/95
Next Calibration: 2/2/96

As Found Condition: In Tolerance

As Left Condition: In Tolerance

MetroCal Inc. maintains reference standards of measurement which are traceable to the National Institute of Standards and Technology, or other authorized National Standards. Calibration was performed in accordance with MetroCal Proc. No. CP045 and complies with the ANSI/MGSL Z390-1 and ISO/IEC 17025 Standards. Results shall not be reproduced except in full without the written approval of MetroCal, Inc. Results relate only to the facility calibrated. Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has elapsed. Statements of compliance made using simple acceptance rules.

Calibration Procedure:
Uncertainty Expressed as
95% confidence interval
± 0.0015 degrees

Manufacturer: MGA
Gage No: Sol 841323
CoAS Date: 8/1/94

Cal Date:
8/1/94
12/8/94

Cal Date:
8/1/94
12/8/94

Traceable to:
NIST 601-44-50
NIST 601-44-50 & 601-44-51

Results:

	Normal	Actual	Deviation
Links	5.00	5.0	0.00
Decimal Deg.	10.00	10.1	0.10
	20.00	20.0	0.00
	30.00	30.1	0.10
Tolerance	40.00	40.1	0.10
± .2° Maximum Error	40.00		

Reference Level Checks: Within ± 0.1 degrees

	Normal	Actual	Deviation
	5.00	5.0	0.00
	10.00	10.1	0.10
	20.00	20.1	0.10
	30.00	30.0	0.00
	40.00	40.0	0.00

Reference Level Checks: Within ± 0.1 degrees

Comments: Environmental conditions during calibration: 65 deg. F., 34% RH.
Deburred surfaces for more accurate readings.

[Signature]
Date: 2/2/95
Calibration Technician

☐ Checked box indicates the calibration was performed at the customer's facility.

MECHANICAL OPERATIONS
DATE: 2/20/04
SUPERVISOR: MGA/PTMCJ

DOC. NO. 1584/PTMCJ
REVISION NO. 6
PAGE 5 OF 9

Tape Measure Calibration Certificate

Reference Steel Rule

Brand: Joanston
SN: M6800120
Calibration Date: 3/8/04

Subject Tape Measure

Brand: Stanley
SN: 457
Calibration Date: 3/8/04

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 $\pm 1/32$ of an inch (1 mm), then the tape measure is acceptable.

Pass X Fail Maximum Difference = 0

Date: 3/7/05 Performed By: RJ Mike

All calibrations are traceable to the National Institute of Standards and Technology. National uncertainty of the measurement is $\pm 0.2 \mu$.
All certification data and equipment are on file for inspection at your request. Next scheduled inspection required certification
expiring at approximately the 10% confidence level using a coverage factor k=2.

8#
3-7-05



Certificate Number: 20042272Cal

Detroit Testing Laboratory, Inc.



7115 E. 11 Mile Road, Warren, MI 48090-2709 • (586) 764-8200 • FAX (586) 764-8043 • www.dtl-inc.com

Certificate of Calibration

Equipment Information

Customer: MGA Research Corporation
446 Executive Drive
Troy, MI 48063

Model: R235/40-0354
Serial Number: 2086
Manufacturer: Johnson level & Tool
Description: 36" Stainless Steel Rule

System ID: MGA00122
Customer Asset No.:

Calibration Information

Calibration Date: 9/8/04
Calibration Due: 9/8/05
Calibration Interval: 12 Month
Rec'd In Test: No/Fail
Returned In Test: Yes/Pass
Performed On Site: No

Procedure Used: CPQ 12/C
Calibrated to: ± 0.005 in
Temperature: 20 °C
Humidity: 41 %RH

Calibration Limitations: 16lb scale not calibrated.

The Uncertainty of the Measurements Pertaining to This Calibration are Estimated to be: 0.003 in

Pass/Fail or In/Out of Tolerance statements are opinions only of the person performing the calibration based on data from measurements at the time they were made, procedures utilized, professional experience, and the uncertainty associated with this calibration. It is ultimately up to the user of this equipment to determine if this item meets their specific requirements for accuracy for its intended application.

Calibration Standards Used

System ID	Model	Serial	Manufacturer	Description	Date Due
10584	6-1000 mm	002553	ROC	Digital Caliper	9/16/05
09098	CT485B	61201094	Omega	Thermohygrometer	7/7/05

Any calibration interval and due date of this device, if stated, is at the request of the customer. Due to the fact that many variables may affect drift of required values over time there is no assurance implied that this item will maintain its stated accuracy through the end of this interval.

This Calibration has been performed per requirements of ISO 9001:1994. Reported results are from standards with uncertainty that are traceable to the International System of Units (SI), derived from physical constants, metrological standards, national measurement standards, or compared to constant standards. Measurement uncertainty is expressed at a confidence level of approximately 95% (coverage factor k=2).

Signature: <i>Robert West</i> Rob West Technician	Date: 9-8-04	Signature: <i>Paul W.</i> Paul W. Date: 9-8-04
Date Printed: 09/08/04	Printed By: Robert West	Page: 1 of 2

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Detroit Testing Laboratory, Inc.

CALIBRATION DATA SHEET

Date: 9/8/04
 DTL ID: MGA00122
 Cert. Number: 20042272Cal

Cal Point and In.	Reading as Found in.	Reading as Left in.	Deviation as Found in.	Deviation as Left in.	% of Allowed Dev as Found	% of Allowed Dev as Left
18in" scale						
5.0	8.0015	6.0015	0.0015	0.0015	30.0	30.0
12.0	12.0020	12.0020	0.0020	0.0020	40.0	40.0
18.0	18.0030	18.0030	0.0030	0.0030	60.0	60.0
24.0	24.0030	24.0030	0.0030	0.0030	60.0	60.0
30.0	30.0030	30.0030	0.0030	0.0030	60.0	60.0
36.0	35.9975	35.9975	-0.0025	-0.0025	-60.0	-60.0
18in" scale						
5.0	5.9860	5.9860	-0.0140	-0.0140	-280.0	-280.0
12.0	11.9870	11.9870	-0.0130	-0.0130	-260.0	-260.0
18.0	17.9885	17.9885	-0.0115	-0.0115	-230.0	-230.0
24.0	23.9895	23.9895	-0.0105	-0.0105	-210.0	-210.0
30.0	29.9930	29.9930	-0.0070	-0.0070	-140.0	-140.0
36.0	35.9930	35.9930	-0.0070	-0.0070	-140.0	-140.0

Remarks: Limited Calibration: 18in" scale not Calibrated.

Form: F410/12-3 Revision Date 03-11-03
Revision Level: B
STANDARD FORM

20950 Boering St.
Southfield MI 48075
Phone (248) 358-0398 Fax (248) 355-2529

Sterling Scale Company Inc. Scale Certificate of Calibration

Customer: MGA Research
Location of Calibration: 446 E. 10th St.
Toy, MI 48063
Certification Number: 6774
Date of Calibration: 8-11-2004
**Next Calibration Due: 8-2005
Environmental Condition: ☒ Good ☐ Fair ☐ Poor

Make:	Model:	Serial/ID#:	Capacity:
<u>S.W. Scales</u>	<u>SW Deluxe</u>	<u>26032389</u>	<u>5000 x 1 lb</u>

This certifies that the above scale has been calibrated using the relevant NIST, original equipment manufacturer calibration procedures along with Handbook 44 tolerances using weights traceable to the National Institute of Standards and Technology as well as the International System of Units (SI).

Sterling Scale Weight/Weight kit serial #: 1160, 12002, 50967, 20600, 8095, 20150

Calibrated to class: III
Date Weight/Weight kit calibrated: 9/03
Date Weight/Weight kit due: 9/05

Expanded Uncertainty (k=2) confidence level of 95% is reported with the before and after readings on next page.

Temperature 72° Humidity 60% Pg 1 of 3

These items relate only to these results
Tolerances followed are manufacturer's acceptance per NIST-44
This report shall not be reproduced, except in full, without written approval of the laboratory.
** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.
The reported uncertainty is valid only for the environment in which it is determined.



1448.01

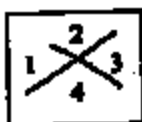
Form R410/12-3 Revision Date 03-11-03
 Revision Level: E
 STANDARD FORM

20950 Booming St.
 Southfield MI 48075
 Phone (248) 358-0590 Fax (248) 358-0590

Sterling Scale Company Inc.
Scale Certificate of Calibration

Applied Test Weight	Before Adjustment	Tolerance $\pm$	In tolerance Y / N	After Adjustment	In tolerance Y / N	expected accuracy
50 lb	50 lb	1 lb	Y	50 lb	Y	-0.0318
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	-0.148
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	-13
50 lb	50 lb	1 lb	Y	50 lb	Y	-0.03
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	-0.16
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	-13

Shift test:



N/A - Final and

	1	2	3	4
Before Adj				
After Adj				

Scale condition as found: As is

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified

☐ Scale Rejected

If scale is rejected, why?

Larry / Larry
 Sterling Scale Service Rep.

Date: 8-11-04

re 2-1-3

These items relate only to these results.
 This report shall not be reproduced, except in full, without written approval of the laboratory.
 Tolerances followed are maintenance acceptance per NIST-44
 ** Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has elapsed.



1448.01

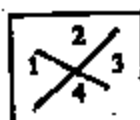
Form F410/12-3 Revision Date 03-11-03
Revision Level: B
STANDARD FORM

20950 Boering St.
Southfield MI 48075
Phone (248) 358-0590 Fax (248) 358-8590

Sterling Scale Company Inc.
Scale Certificate of Calibration

Applied Test Weight	Before Adjustment	Tolerance +/-	In tolerance Y / N	After Adjustment	In tolerance Y / N	expected repeatability
50 lb	50 lb	1 lb	Y	50 lb	Y	.002
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13
50 lb	50 lb	1 lb	Y	50 lb	Y	.003
1000 lb	1000 lb	2 lb	Y	1000 lb	Y	.06
2200 lb	2200 lb	2 lb	Y	2200 lb	Y	.13

Shift test



10/10 - Small pad

	1	2	3	4
Before Adj				
After Adj				

Scale condition as found: New

Tests performed: ☒ Repeatability ☒ Linearity ☐ Sensitivity ☒ Discrimination

☒ Scale Certified

☐ Scale Rejected

If scale is rejected, why?

James J. Gray
Sterling Scale Service Rep.

Date: 12-11-04

Wt. 32.3

These items relate only to these results.
This report shall not be reproduced, except in full, without written approval of the laboratory.
Tolerances followed are minimum acceptance per NIST-44
** Any number of factors may cause the calibration team to drift out of calibration before the recommended interval has expired.



1048.01