

REPORT NUMBER: 214D-MGA-2002-004

**SAFETY COMPLIANCE TESTING FOR FMVSS 214
SIDE IMPACT PROTECTION
INDICANT**

Hyundai Motor Company
2002 Hyundai Sonata 4 door
NHTSA NUMBER: C20501

**PREPARED BY:
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February 6, 2002

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW, ROOM 6111 (NSA-30)
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-97-C-11033.

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COTR, Side Impact

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15. Supplementary Notes																								
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier INDICANT Compliance Test was conducted on the 2002 Hyundai Sonata 4 door in accordance with the specifications of the Office of Vehicle Safety Compliance Laboratory Test Procedure No. TP-214D-06 Side Impact Protection (except the test was conducted 8 km/h (5 mph) faster than the standard specifies) for determination of FMVSS No. 214 Side Impact Protection. The test was conducted at MGA Research Corporation, in Burlington Wisconsin on February 6, 2002. The impact velocity of the Moving Deformable Barrier (MDB) was 62.0 km/h, and the ambient temperature at the struck side (driver's) of the vehicle was 21 °C. The target vehicle's maximum post test static crush was 365 mm at level 2. The test vehicle's occupant performance is as follows: <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th style="text-align: left;"></th> <th style="text-align: center;"><u>DRIVER</u></th> <th style="text-align: center;"><u>PASS.</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: left;">Left Upper Rib (LUR) Accel., g</td> <td style="text-align: center;">44</td> <td style="text-align: center;">41</td> </tr> <tr> <td style="text-align: left;">Left Lower Rib (LLR) Accel., g</td> <td style="text-align: center;">48</td> <td style="text-align: center;">56</td> </tr> <tr> <td style="text-align: left;">Lower Spine (T₁₂) Accel., g</td> <td style="text-align: center;">80</td> <td style="text-align: center;">60</td> </tr> <tr> <td style="text-align: left;">Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">64</td> <td style="text-align: center;">58</td> </tr> <tr> <td style="text-align: left;">Pelvis (PEV) Accel., g</td> <td style="text-align: center;">94</td> <td style="text-align: center;">89</td> </tr> <tr> <td style="text-align: left;">HIC</td> <td style="text-align: center;">135</td> <td style="text-align: center;">583</td> </tr> </tbody> </table> The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.					<u>DRIVER</u>	<u>PASS.</u>	Left Upper Rib (LUR) Accel., g	44	41	Left Lower Rib (LLR) Accel., g	48	56	Lower Spine (T ₁₂) Accel., g	80	60	Thoracic Trauma Index (TTI)	64	58	Pelvis (PEV) Accel., g	94	89	HIC	135	583
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HIC	135	583																						
17. Key Words Compliance Testing FMVSS 214D Side Impact Protection Side Impact Dummy (SID) New Car Assessment Program (NCAP)		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Adm. Technical Ref. Division, Room 5108 (NAD-52) 400 Seventh Street, S.W. Washington, D.C. 20590																						
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SECTION 1

PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

This side impact test is conducted as part of the FY' 2002 test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-97-C-11033. The purpose of this test was to evaluate side impact protection in a 2002 Hyundai Sonata 4 door manufactured by Hyundai Motor Company.

1.2 TEST PROCEDURE

The side impact test was conducted in accordance with the current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC), Laboratory Test Procedure TP-214D-06, dated July 26, 2001 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA2 with the exception of the test speed, which was at the NCAP High Speed Lateral Impact level (61.2 km/h, approximately 8 km/h faster than compliance speed). The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2

SUMMARY OF SIDE IMPACT TEST

2.1 SUMMARY OF SIDE IMPACT TEST

A model year 2002 Hyundai Sonata 4 door was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.0 km/h. The specified impact velocity range is from 61.1 to 62.7 km/h. The test (target) vehicle was stationary and positioned 63° to the line of forward motion. The weight of the vehicle as tested was 1682.0 kg and the test weight of the MDB was 1362.0 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on February 6, 2002.

One (1) real-time motion picture camera and nine (9) high-speed motion picture cameras were used to document the impact event. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and Side Impact Dummies (SIDs) can be found in Appendix A. Two 50th percentile adult male SID's were placed in the driver and left rear passenger designated seating positions according to instructions specified in the OVSC Laboratory Test Procedure dated July 26, 2001. Each SID was instrumented with fourteen (14) accelerometers in the following locations:

- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)
- Head Center of Gravity (CG) tri-axial accelerometers (X,Y and Z axes primary and redundant).

The test vehicle was instrumented with twenty (20) structural accelerometers and the MDB was instrumented with five (5) accelerometers and two (2) contact switches on the bumper to compare left side to right side bumper impact timing. All data channels were recorded with a fully self contained on-board EME Data Acquisition System. The data was digitally sampled at 10,000 samples per second and processed per Appendix V of the Test Procedure.

2.2 GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 365 mm at level 2, 1350 mm rearward of the left vertical impact point. The driver and passenger SID's, Serial Nos. 049 and 048 respectively, were calibrated just prior to this test. The SID's injury criteria is summarized as follows:

Measurements	Units	Driver	Passenger
Thoracic Trauma Index (TTI)	G's	64	58
Peak Pelvic G's (PEV)	G's	94	89
Head Injury Criteria (HIC)	none	135	583

Test summaries and post-test observations are presented in Section 3. The vehicle, camera, and occupant measurements are presented in Section 4. Appendix A contains the still photograph prints. Appendix B contains the driver and passenger SID's, vehicle, and MDB response data traces. Appendix C contains the SID's configuration and performance verification data. Appendix D contains the test equipment information.

TEST NOTES

The following accelerometers were not used for this test:

Left Front Door on Centerline
Midrear of Left Front Door
Left Front Door Upper Centerline
Midrear of Left Rear door
Left Rear Door Upper Centerline
Rear Seat Track

SECTION 3

SIDE IMPACT DUMMY (SID) AND VEHICLE TEST DATA

Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	English Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressure	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	$=(tf - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

*Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

TEST VEHICLE INFORMATION

Make	Hyundai
Model	Sonata
Body Style	4 door
NHTSA No.	C20501
VIN	KMHWF25S92A559263
Color	Black
Delivery Date	November 13, 2001
Odometer Reading (mile)	62
Dealer	Arrow
Transmission	Manual
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.4
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbag	Yes
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	No
Anti-lock Brakes	No
AM/FM/CD	Yes
Anti-theft System	No
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	9/27/01

GVWR (kg)	1920
GAWR Front (kg)	1060
GAWR Rear (kg)	915

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	230	230
Cold / Test Pressure (kPa)	210	210
Recommended Tire Size	P205/65R15	P205/65R15
Tire Size on Vehicle	P205/65R15	P205/65R15
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contour		
Number Of Occupants x 68.04 (kg)	2	3		340.2
Capacity Wt. (VCW) (kg)				390.1
Cargo Wt. (RCLW) (kg)				49.9

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002 Hyundai Sonata 4 door NHTSA No. C20501
 Test Program: 214 Indicant Side Impact Test Date: 2/6/02

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	450.9	293.0		504.9	372.4	
Right	kg	453.1	281.2		467.7	337.0	
Ratio	%	61.2	38.8		57.8	42.2	
Totals	kg	904.0	574.2	1478.2	972.6	709.4	1682.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1478.2
Weight of 2 P572E ATDs	kg	161.5
Rated Cargo/Luggage Weight (RCLW)	kg	49.9
Calculated Vehicle Target Weight (TVTW)	kg	1689.6

- Actual As Tested Weight (ATW) will be TVTW -5/-10 kg

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	681	684	696	709	1047
As Tested	mm	664	675	663	680	1137
Fully Loaded	mm	662	680	656	677	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2696
Total Vehicle Length at Left Side	mm	4135
Total Vehicle Length at Centerline	mm	4740
Total Vehicle Length at Right Side	mm	4135
Total Vehicle Width	mm	1780
Weight of Ballast in Cargo Area	kg	9.8
Amount of Stoddard Solvent in Fuel Tank	liters	59.9

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2696
Target Impact Point Aft of Front Axle	mm	408
Actual Impact Point Aft of Front Axle	mm	420

DATA SHEET NO. 1...(continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

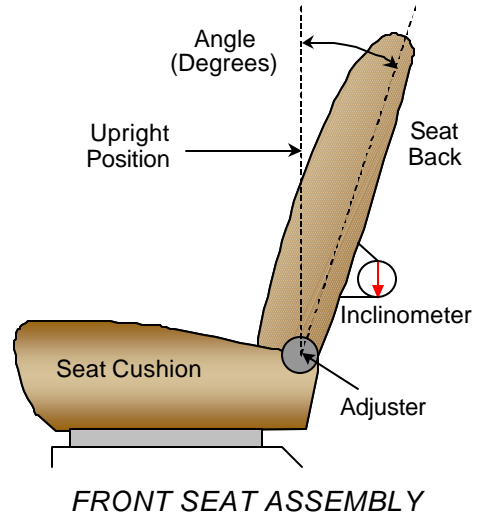
Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02

NORMAL DESIGN RIDING POSITION

The driver seat is positioned to the manufacturer's designated angle. The procedure for the seat is as follows: Set the seat back angle to 26 degrees from vertical measuring along the rear edge of the metal seat back frame

Driver seat back angle: 26.3 deg
Passenger seat back angle: non adjustable



SEAT FORE/AFT POSITIONS

The driver's seat is manually operated and the rear passenger seat has no adjustments. The fore/aft is set to the middle position for the driver's seat. The first detent is numbered "1".

Driver seat fore/aft total travel: 20 detents
Passenger seat fore/aft total travel: non adjustable
Driver seat fore/aft position: 11th detent
Passenger seat fore/aft position: non adjustable

SEAT BELT UPPER ANCHORAGE

The test vehicle is equipped with adjustable "D" ring anchorage for the driver's seat position. There are 4 positions or detents, with the uppermost position numbered "1". The driver's "D" ring anchorage is placed in position 2.

DATA SHEET NO. 1...(continued)

TEST VEHICLE INFORMATION

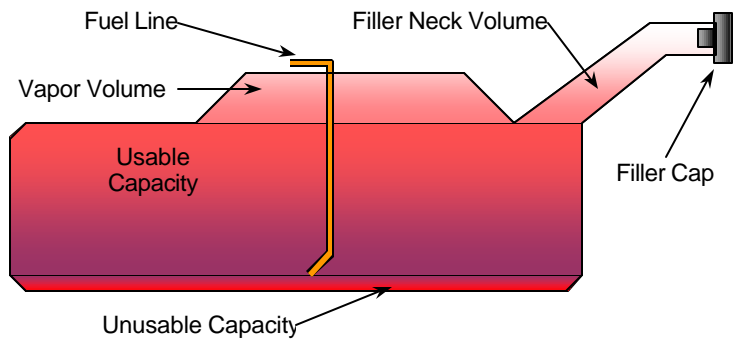
Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 65.1 liters
The "Usable Capacity" of any optional equipment fuel tank is: n/a liters
92-94% of "Usable Capacity" for certification to FMVSS 301 requirements: 59.9 – 61.2 liters
Actual amount of Stoddard solvent added to vehicle for certification test: 59.9 liters

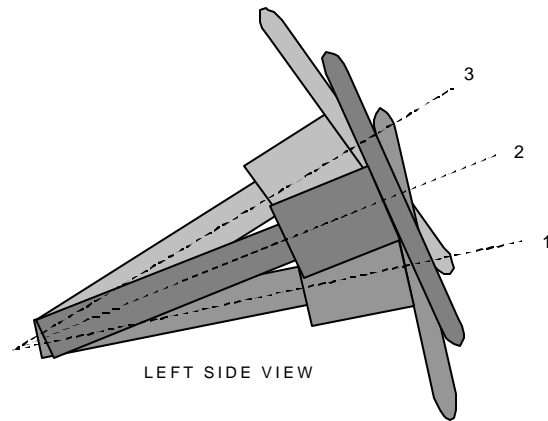
The test vehicle is equipped with an electric fuel pump. The fuel filler door is located on the left rear fender.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes, when it is moved through its full range of motion. A aluminum plate is placed across the rim of the steering wheel, and inclinometer is placed onto the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

Lowermost, position 1: 18.0°
Geometric center, position 2: 22.7°
Uppermost, position 3: 29.5°

DATA SHEET NO. 2

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	450.9	293.0		504.9	372.4	
Right	kg	453.1	281.2		467.7	337.0	
Weight Ratio	%	61.2	38.8		57.8	42.2	
Totals	kg	904.0	574.2	1478.2	972.6	709.4	1682.0

MAXIMUM EXTERIOR STATIC CRUSH

Level	Measured Parameter	Units	Maximum Crush	Above Ground
Level 1	Sill Top Height	mm	260	301
Level 2	Occupant H-Point	mm	365	495
Level 3	Mid Door	mm	343	599
Level 4	Window Sill	mm	282	881
Level 5	Window Top	mm	108	1334
Level 2	Maximum Penetration	mm	365	495

INSTRUMENTATION

Driver SID Accelerometers	11
Passenger SID Accelerometers	11
Vehicle Structure Accelerometers	20
MDB Accelerometers	5
Total	47

DATA SHEET NO. 3

MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel base of Framework Carriage	2590
C.G. Location aft of Front Axle	1127

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	395.1	293.8	
Right	kg	385.7	287.4	
Ratio	%	57.3	42.7	
Totals	kg	780.8	581.2	1362.0

SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.0
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.1
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.3

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush
Level	Description	Height	Distance	Direction	
1	Center of Bumper (mm)	432	800	Right	192
2	Top of Bumper (mm)	533	800	Left	124
3	Mid Level (mm)	686	700	Left	70
4	Top of Stack (mm)	813	800	Left	183

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	5
Contact Switches	2
High Speed Cameras	2

DATA SHEET NO. 4

POST TEST OBSERVATIONS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat SID	Rear Seat SID
Dummy Type / Serial No.	SID/049	SID/048
Head Contact	Side airbag	C Post
Upper Torso Contact	Side airbag	Door trim panel
Lower Torso Contact	Door trim panel	Door trim panel
Left Knee Contact	Door trim panel	Door trim panel
Right Knee Contact	Left knee	Left knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Door Opening	None	None
Right Side Door Opening	None	None
Seat Movement	None	None
Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	None
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Both left side windows broke
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver	Front Passenger	Rear Passenger
Front	Yes	No	None
Side	Yes	No	None

MDB LEFT EDGE IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	12 rearward
Vertical Offset	mm	+/-20	11 up

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 5

SID INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

THORAX AND PELVIS PEAK ACCELERATIONS (FIR 100 Filtered)

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Upper Rib (LUR)	Y	G's	43.6	15	14.4	77	40.8	48	8.9	76
Upper Rib (LUR)(R)	Y	G's	42.0	15	14.3	77	40.7	48	7.6	76
Lower Rib (LLR)	Y	G's	48.3	37	14.0	88	56.2	47	17.9	73
Lower Rib (LLR) (R)	Y	G's	48.7	38	13.5	88	56.5	47	19.1	73
Lower Spine (T ₁₂)	Y	G's	79.5	36	13.8	80	60.0	50	15.3	70
Lower Spine (T ₁₂) (R)	Y	G's	78.4	36	13.9	80	58.1	50	15.9	70
Pelvis (PEV)	Y	G's	93.6	30	18.1	70	89.3	41	10.1	83
Pelvis (PEV) (R)	Y	G's	94.2	30	18.0	71	90.8	41	10.5	82

THORACIC TRAUMA INDEX (TTI) AND PELVIC ACCELERATION (FIR 100 Filtered)

Location	Driver				Passenger			
	LLR	T ₁₂	TTI(g)	PEV(g)	LLR	T ₁₂	TTI(g)	PEV(g)
Rib, Spine, and Pelvis	48.3	79.5	64	93.6	56.2	60.0	58	89.3
Rib, Spine, and Pelvis (R)	48.7	78.4	64	94.2	56.5	58.1	57	90.8

HEAD CG PEAK ACCELERATIONS (SAE CLASS 1000 Filtered)

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	7.7	41	20.5	78	8.5	97	20.7	61
Head CG	Y	G's	38.2	49	1.1	31	77.3	58	25.0	72
Head CG	Z	G's	25.4	50	3.5	78	40.4	49	52.5	60
Head CG Resultant		G's	45.4	50			88.6	58		

HEAD INJURY CRITERIA (SAE CLASS 1000 Filtered)

Location	Driver				Passenger			
	HIC	T ¹	T ²	Avg G's	HIC	T ¹	T ²	Avg G's
Head CG	135	40.3	76.3	26.9	583	47.9	67.8	61.2

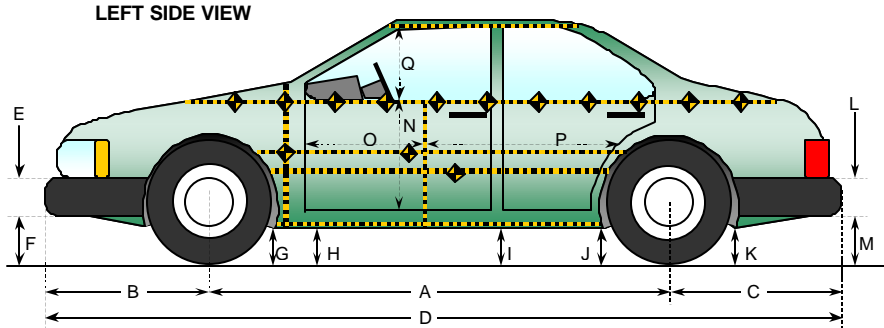
Positive Acceleration Polarities: Longitudinal (X) = Forward
 (Conforms to SAE J211) Lateral (Y) = Right
 Vertical (Z) = Down

DATA SHEET NO. 6

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02



All Measurements in mm

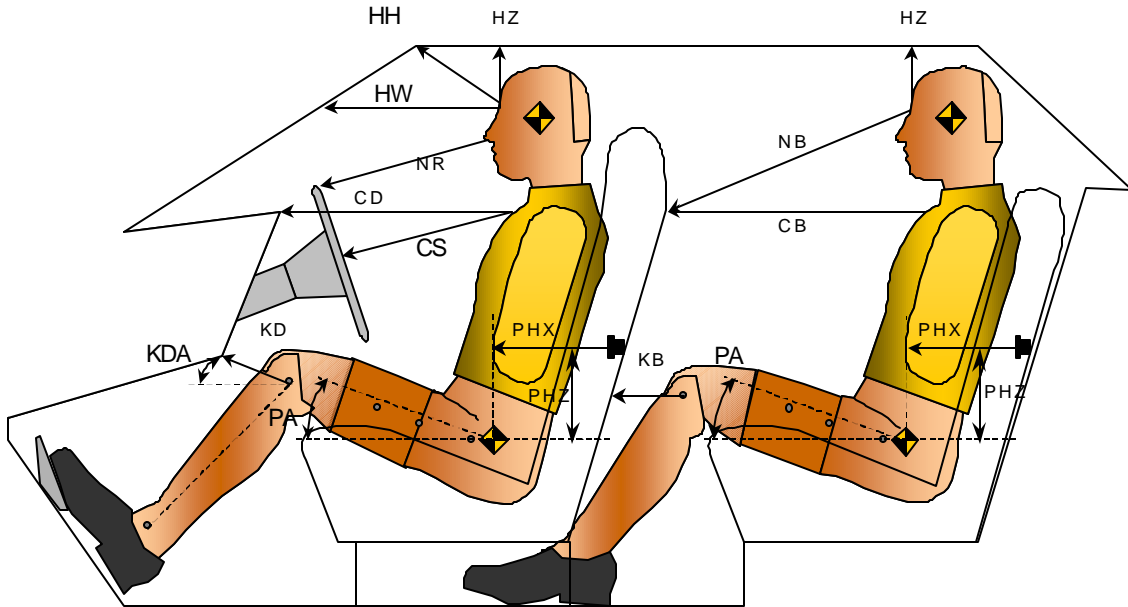
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2696	2654	-42
B	Front Axle to FSOV	966	985	19
C	Rear Axle to RSOV	1078	1026	-52
D	Total Length at Centerline	4740	4665	-75
E	Front Bumper Thickness	110	110	0
F	Front Bumper Bottom to Ground	390	426	36
G	Sill Height at Front Wheel Well	169	155	-14
H	Sill Height at Front Door Leading Edge	172	178	6
I	Sill Height at "B" Pillar	176	208	32
J1	Sill Height at Rear Wheel Well	181	196	15
J2	Pinch Weld Height at Rear Wheel Well	179	177	-2
K	Sill Height Aft of Rear Wheel Well	254	254	0
L	Rear Bumper Thickness	220	220	0
M	Rear Bumper Bottom to Ground	345	352	7
N	Sill Height to Window Bottom Sill	635	575	-60
O	Front Door Leading Edge to Impact CL	748	671	-77
P	Rear Door Trailing Edge to Impact CL	1240	1096	-144
Q	Front Window Opening	428	405	-23
R	Right Side Length	4135	4141	6
S	Left Side Length	4135	4052	-83
T	Vehicle Width at "B" Post	1780	1483	-297

DATA SHEET NO. 7

SID LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

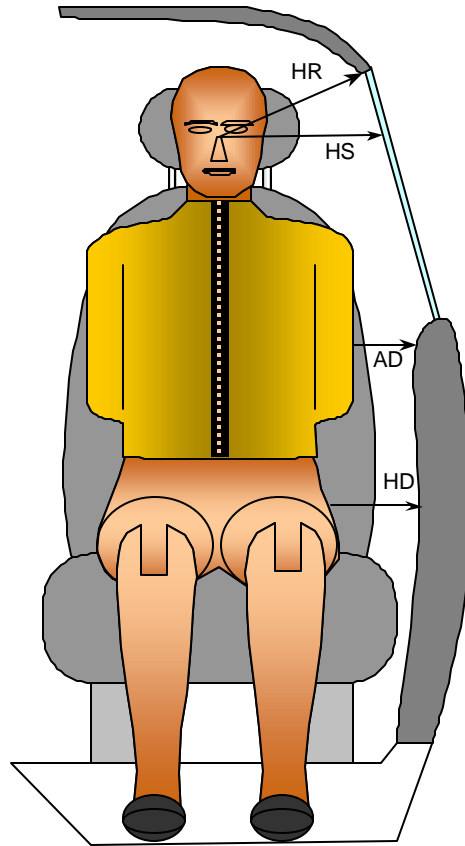


Driver Code	Pass. Code	Measurement Description	Driver #49		Passenger #48	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	394			
HW		Head to Windshield	598			
HZ	HZ	Head to Roof	176		144	
NR	NB	Nose to Rim/Nose to Seatback	489		603	
CD	CB	Chest to Dash or Seatback	563		520	
CS		Chest to Steering Wheel	384			
KDL	KBL	Left Knee to Dash or Seatback	201	0.0	117	0.0
KDR	KBR	Right Knee to Dash or Seatback	232	0.0	205	0.0
PA	PA	Pelvic Angle		23.0		24.2
PHX	PHX	H-Point to Striker (X-Axis)	207		256	
PHZ	PHZ	H-Point to Striker (Z-Axis)	154		279	

DATA SHEET NO. 8
SID LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02



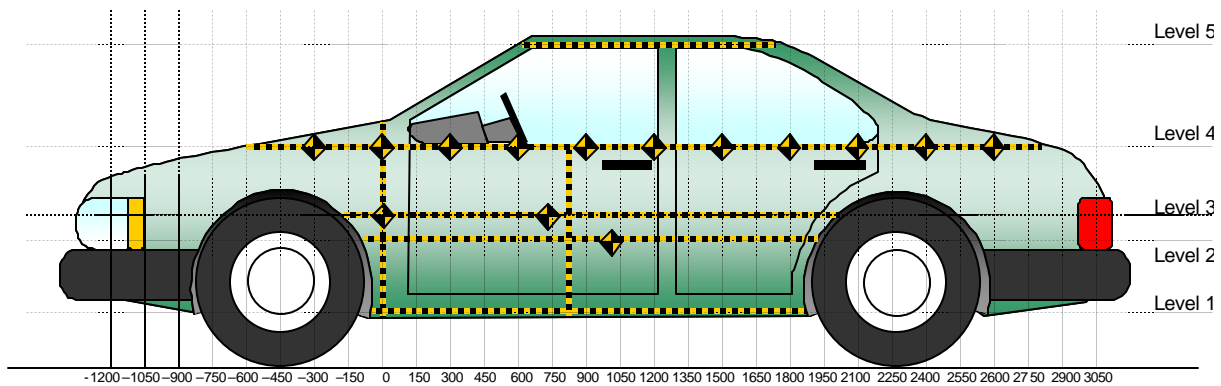
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	199	168
HS	Head to Side Window	mm	324	319
AD	Arm to Door	mm	112	113
HD	H-Point to Door	mm	142	169

DATA SHEET NO. 9
VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02



All Measurements Shown in mm

LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 800 mm.
All measurements below in mm.

Level	Measurement Description	Height Above Ground
5	Window	1334
4	Window Sill	881
3	Mid Door	599
2	Occupant H-Point	495
1	Sill Top	301

DATA SHEET NO. 10

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1050															
-900				254					244					-10	
-750				232					228					-4	
-600				217					214					-3	
-450				205					219					14	
-300				197					205					8	
-150			109	190				152	206				43	16	
0	152	108	113	186		184	219	189	209		32	111	76	23	
150	155	112	117	182		342	366	330	231		187	254	213	49	
300	153	114	117	180		364	408	396	284		211	294	279	104	
450	154	115	117	180		382	421	408	334		228	306	291	154	
600	156	115	117	179		383	434	420	392		226	319	303	213	
750	155	115	117	177	439	392	439	421	399	450	237	324	304	222	11
900	156	115	117	176	439	397	454	427	409	479	241	339	310	233	40
1050	156	115	116	177	433	408	457	426	430	500	252	342	310	253	67
1200	157	115	117	178	431	417	460	441	460	539	260	345	324	282	108
1350	157	114	118	181	428	400	479	454	460	504	243	365	336	278	76
1500	157	113	118	183	427	384	462	461	444	480	227	349	343	261	53
1650	157	112	118	186	428	341	421	444	423	455	184	309	326	237	27
1800	157	111	118	188	429	294	404	419	344	438	137	293	301	156	9
1950		127	118	193	435		278	305	262	436		278	187	69	1
2100			112	196	447			179	215	445			67	19	-2
2250				200					224					24	
2400				208					219					11	
2550			130	216				134	220				4	4	
2700			155	227				156	218				1	-9	
2850			176	244				175	228				-1	-16	
3000			203	267				200	243				-3	-24	
3150															
3300															

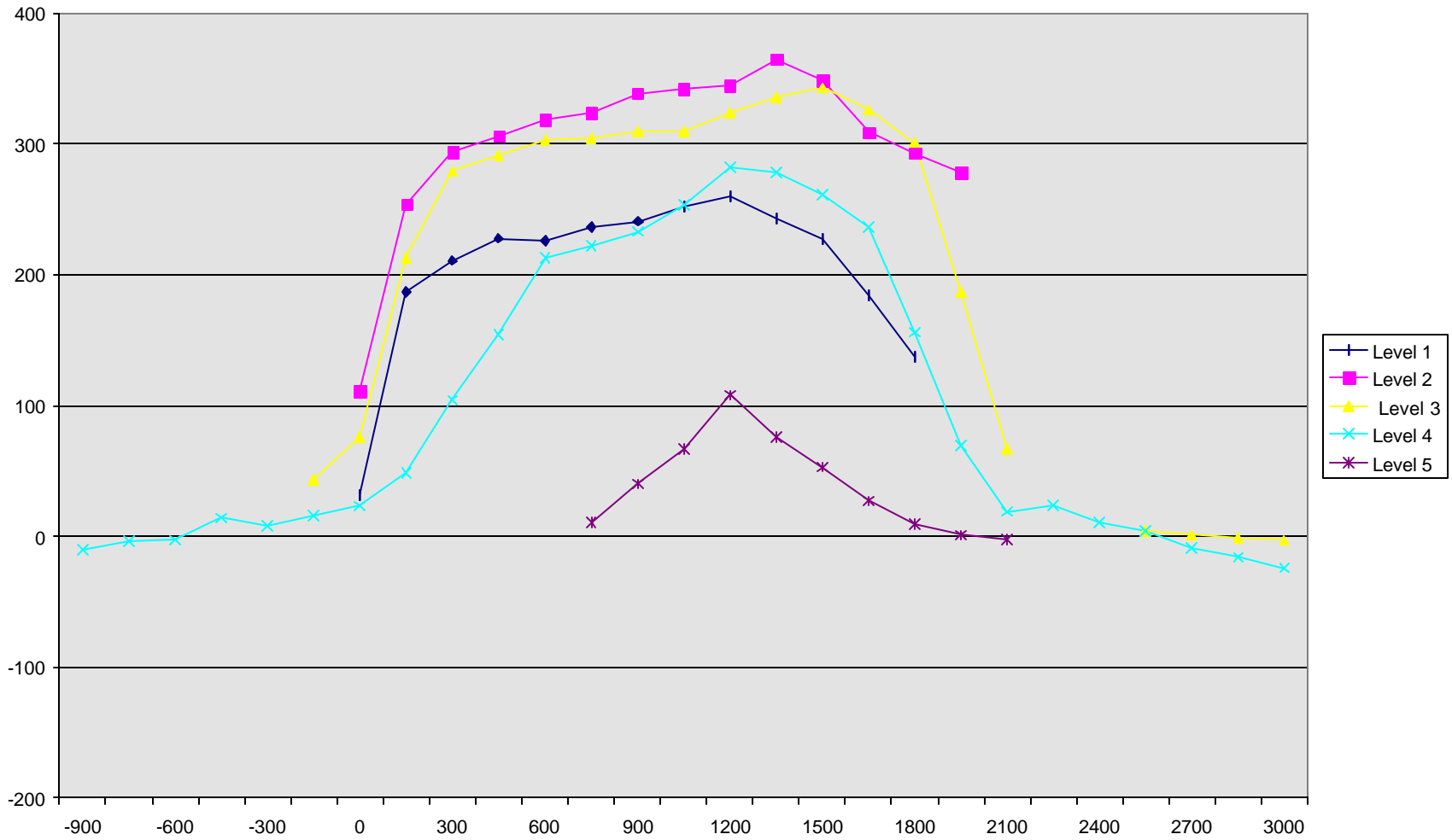
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

DATA SHEET NO. 10...(continued)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02

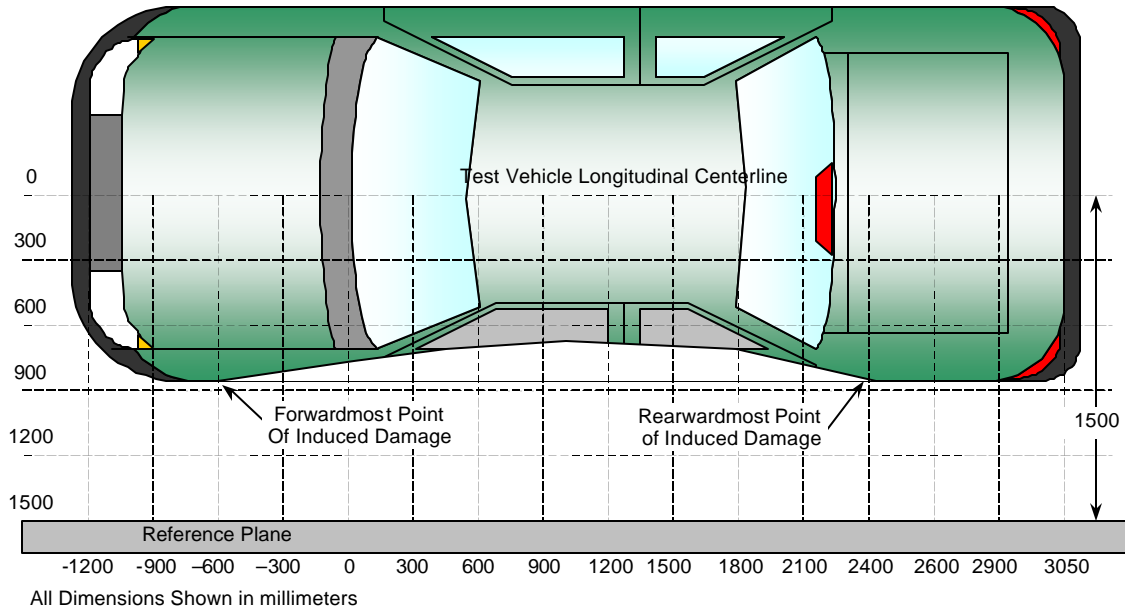


DATA SHEET NO. 11

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2550 mm	4	216	220	4
2	1927 mm	4	190	272	82
3	1261 mm	3	117	447	330
4	650 mm	3	117	426	309
5	43 mm	3	115	197	82
6	-600 mm	4	217	214	-3

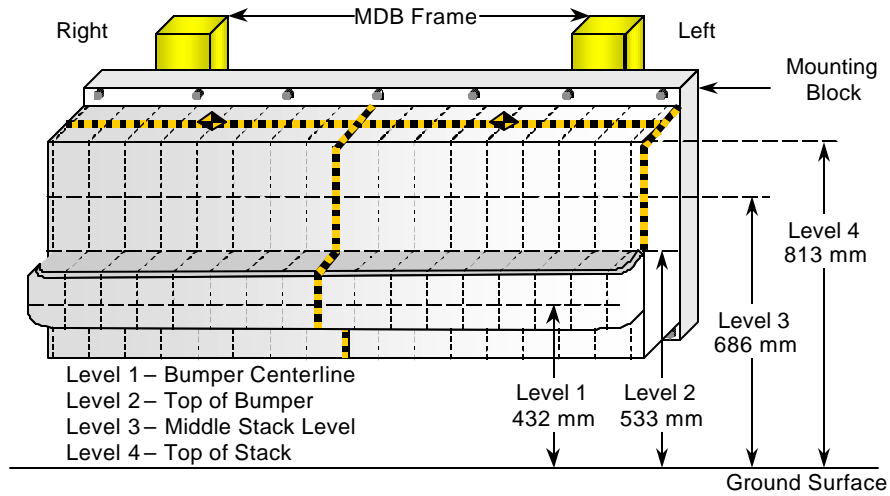
Reference plane is parallel to test vehicle longitudinal centerline.
 Given dimensions = Reference plane to car body.

DATA SHEET NO. 12

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02



DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C _L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	192	158	123	99	83	77	75	76	77	79	81	82	85	89	99	112	149
2	74	81	66	40	31	31	30	33	34	39	52	57	65	69	78	89	124
3	35	9	8	9	10	12	20	17	14	14	14	21	25	43	44	70	41
4	64	105	96	93	94	99	112	113	112	113	119	121	126	142	87	130	183

All Dimensions in mm

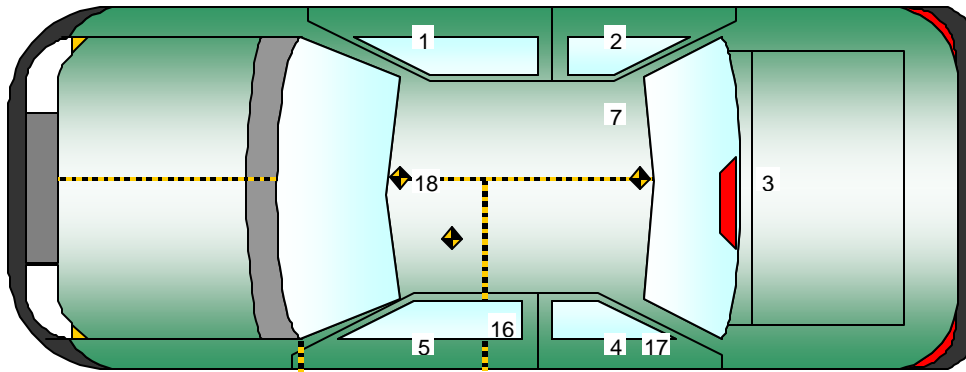
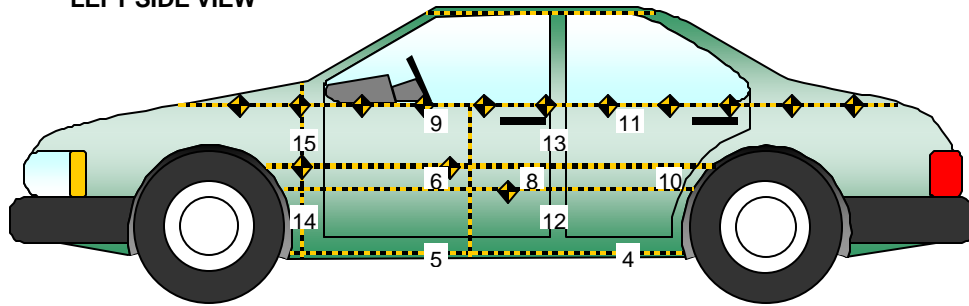
DATA SHEET NO. 13

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

LEFT SIDE VIEW



No.	Location
1	Right Sill at Front Seat
2	Right Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Sill at Rear Door
5	Left Sill at Front Door
6	Left Front Door Centerline
7	Right Rear Occupant Compartment
8	Left Front Door Mid-Rear
9	Left Front Door Upper Centerline

No.	Location
10	Left Rear Door Mid-Rear
11	Left Rear Door Upper Centerline
12	Left Lower B-Post
13	Left Middle B-Post
14	Left Lower A-Post
15	Left Middle A-Post
16	Front Seat Track
17	Rear Seat Track or Structure
18	Vehicle CG

DATA SHEET NO. 13... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Measurements (mm)			Peak Values (G's)				
		X	Y	Z	Axis	Max	Time	Min	Time
1	Right Sill at Front Seat	2526	698	-216	X	4.9	65	1.8	89
					Y	21.1	17	2.6	101
					Z	6.1	42	3.3	22
					RES	21.4	17		
2	Right Sill at Rear Seat	1738	698	-226	X	4.9	66	4.6	16
					Y	19.9	17	4.1	90
					Z	4.5	40	3.4	26
					RES	20.5	17		
3	Rear Floorpan Above Axle	1040	0	-560	X	5.8	37	11.9	32
					Y	21.3	41	3.2	118
					Z	23.1	32	18.1	37
					RES	32.9	32		
4	Left Sill at Rear Door	1728	-698	-221	Y	45.5	15	5.0	57
5	Left Sill at Front Door	2538	-698	-216	Y	56.4	16	8.8	45
7	Rear Occupant Compartment	1820	312	-332	Y	23.8	17	2.3	99
12	B-Post Lower	2044	-710	-320	Y	81.6	5	10.0	57
13	B-Post Middle	2122	-752	-850	Y	153.5	6	26.9	34
14	A-Post Lower	3108	-710	-310	Y	62.0	10	18.2	16
15	A-Post Middle	3150	-760	-870	Y	20.0	13	12.0	24
16	Front Seat Track	2279	-576	-270	Y	75.1	13	31.5	24
18	Vehicle CG	2580	0	-376	X	2.9	22	8.2	30
					Y	30.2	16	1.1	78
					Z	12.1	29	19.1	19
					RES	33.4	17		

Reference Points X - Test Vehicle Rear Bumper (+ forward)
 Y - Test Vehicle Centerline (+ to right)
 Z - Ground Plane (+ down)

DATA SHEET NO. 14

MDB ACCELEROMETER LOCATIONS AND DATA SUMMARY

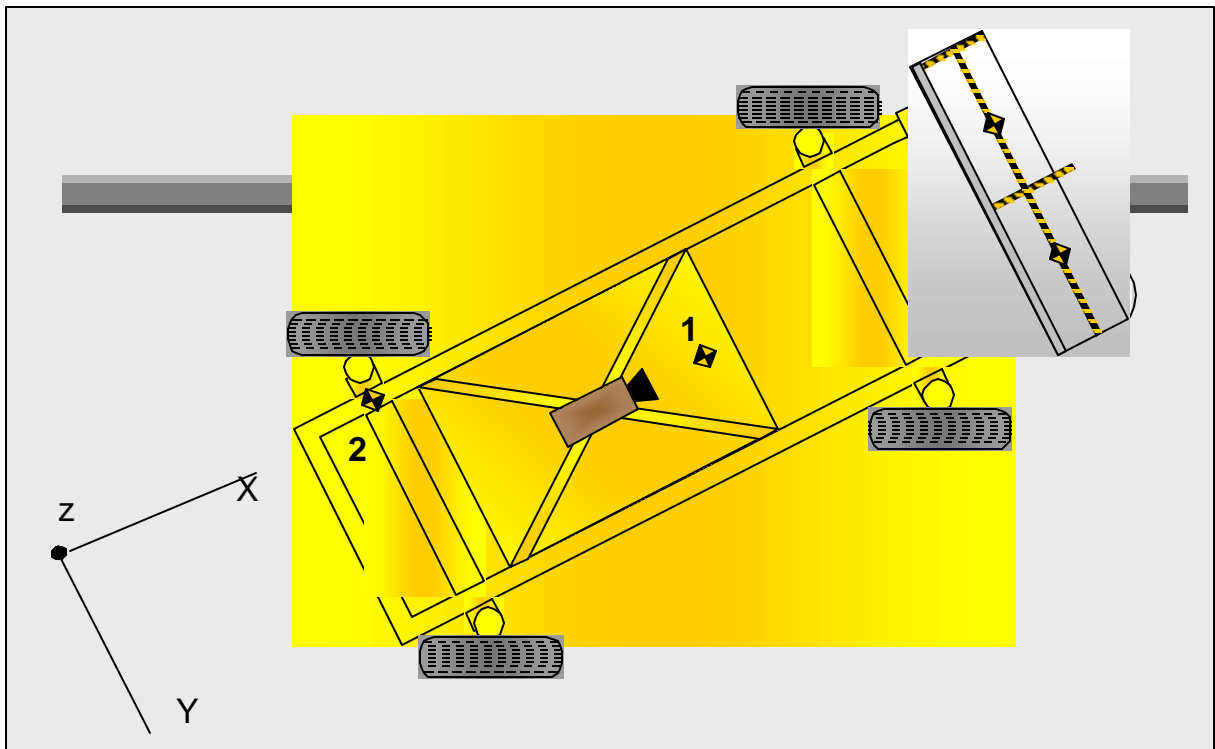
Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02

MDB ACCELEROMETER PEAK DATA AND LOCATIONS

Loc. No.	Accelerometer Location	Measurement (mm)			Peak Values (G's)				
		X	Y	Z	Axis	Max	Time	Min	Time
1	MDB CG	-1092	0	-483	X	2.5	99	19.1	44
					Y	2.5	64	5.9	45
					Z	19.3	50	24.1	44
					RES	31.2	44		
2	MDB Rear	-2591	-625	-622	X	2.2	96	21.8	30
					Y	5.9	29	0.9	68

Reference Points X - MDB Front Axle (+ forward)
 Y - MDB Centerline (+ to right)
 Z - Ground Plane (+ down)

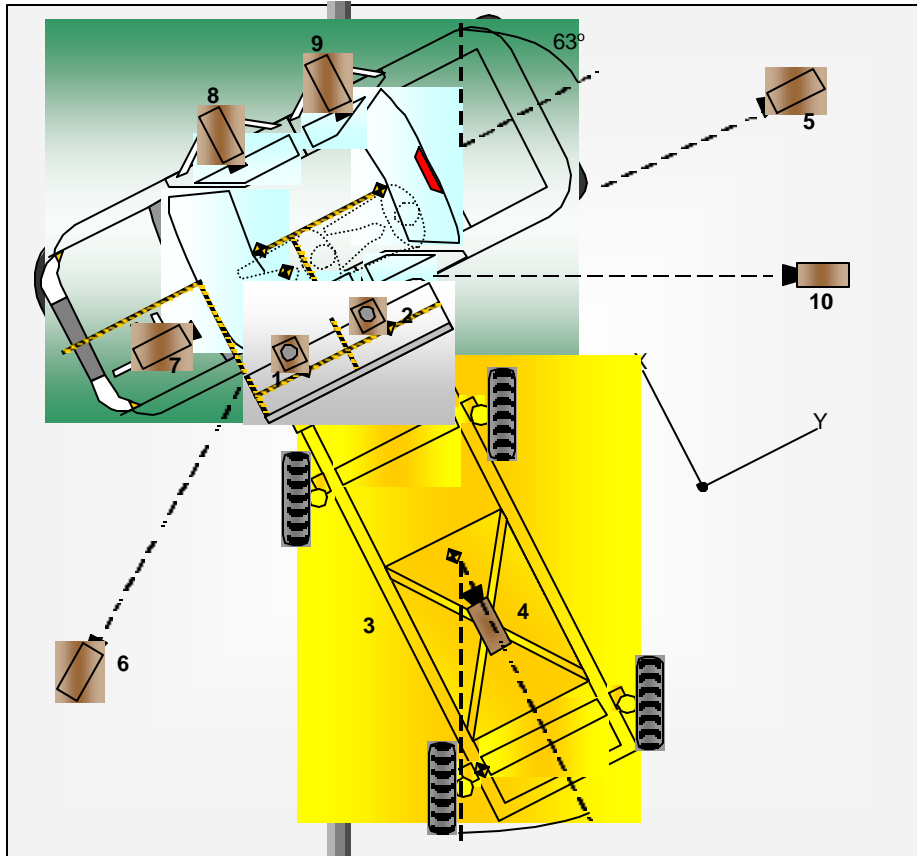


DATA SHEET NO. 15

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

NHTSA No. C20501
 Test Date: 2/6/02



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	1002	20	-4990	8	1111
2	Overhead Close-up	-729	608	-4950	-	1047
3	MDB Onboard, Impact Point Close-up				35	1010
4	MDB Onboard, Centerline of Impact				13	1031
5	Right Side, Ground Level, Overall	3910	8914	-1743	25	952
6	Left Side, Ground Level, Overall	-1708	-1638	-1422	13	1005
7	Vehicle Onboard Front SID, Front				13	513
8	Vehicle Onboard Front SID, Side				7.5	503
9	Vehicle Onboard Rear SID, Side				13	515
10	Real Time Coverage					

Reference Points X - Impact Line
 Y - MDB Left Edge Impact Point
 Z - Ground Plane

DATA SHEET NO. 16

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2002 Hyundai Sonata 4 door
Test Program: 214 Indicant Side Impact

NHTSA No. C20501
Test Date: 2/6/02

Test Time: 11:14 am

Temperature at Time of Impact: 21 °C

Stoddard Solvent Spillage Measurements

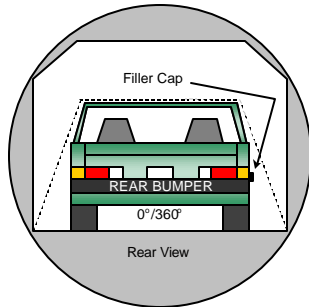
- A. From impact until vehicle motion ceases: 0 oz.
(Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage Details: None

DATA SHEET NO. 17

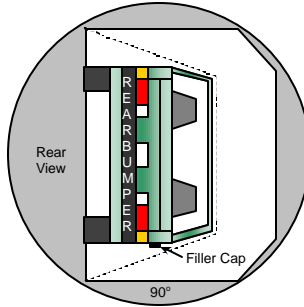
FMVSS 301 STATIC ROLLOVER DATA SHEET

Test Vehicle: 2002 Hyundai Sonata 4 door
 Test Program: 214 Indicant Side Impact

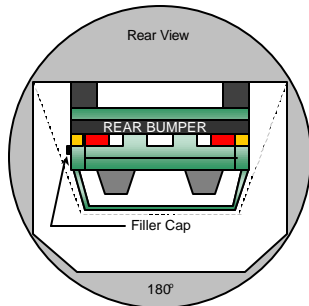
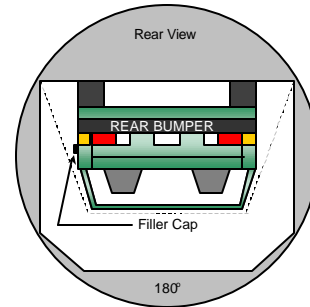
NHTSA No. C20501
 Test Date: 2/6/02



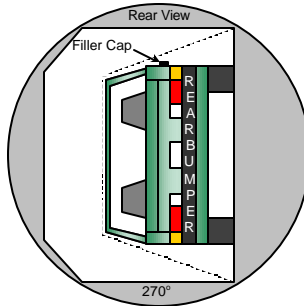
0° to 90°



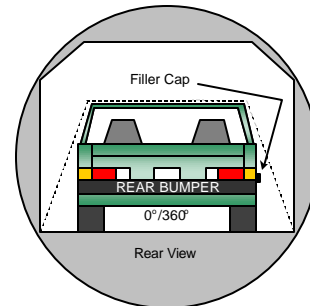
90° to 180°



180° to 270°



270° to 360°



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage locations:

Rollover Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	164	300	0
90° to 180°	151	300	0
180° to 270°	135	300	0
270° to 360°	162	300	0

APPENDIX A
PHOTOGRAPHS

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A-1.



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle

A-5.



Pre-Test Left Side View of Test Vehicle

A-6.



Post-Test Left Side View of Test Vehicle

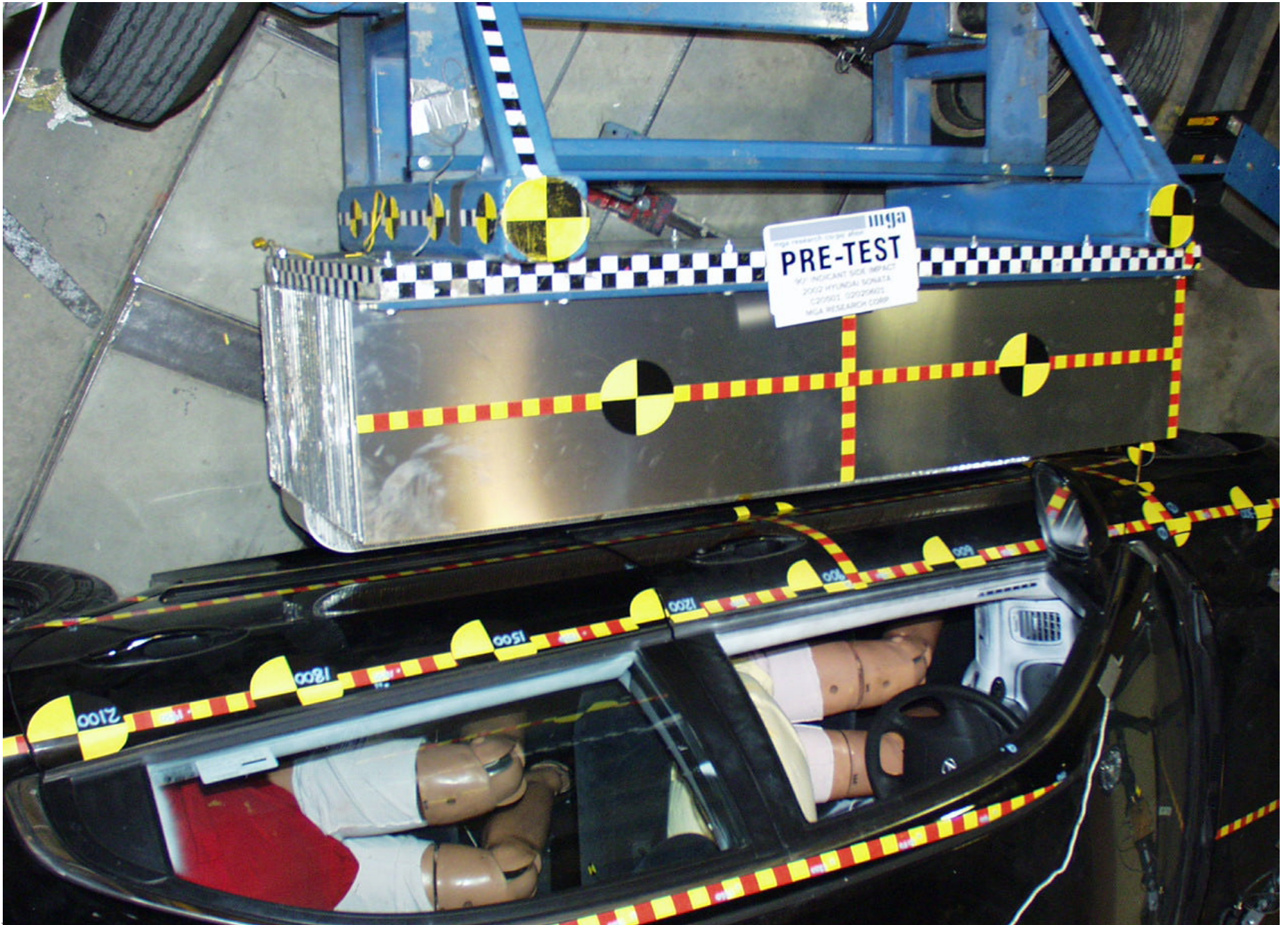


Pre-Test MDB Positioned Against Vehicle (left side)



Pre-Test MDB Positioned Against Vehicle (right side)

A-9.



Pre-Test MDB Positioned Against Vehicle Overhead View

A-10.



Post-Test MDB and Vehicle (left side)



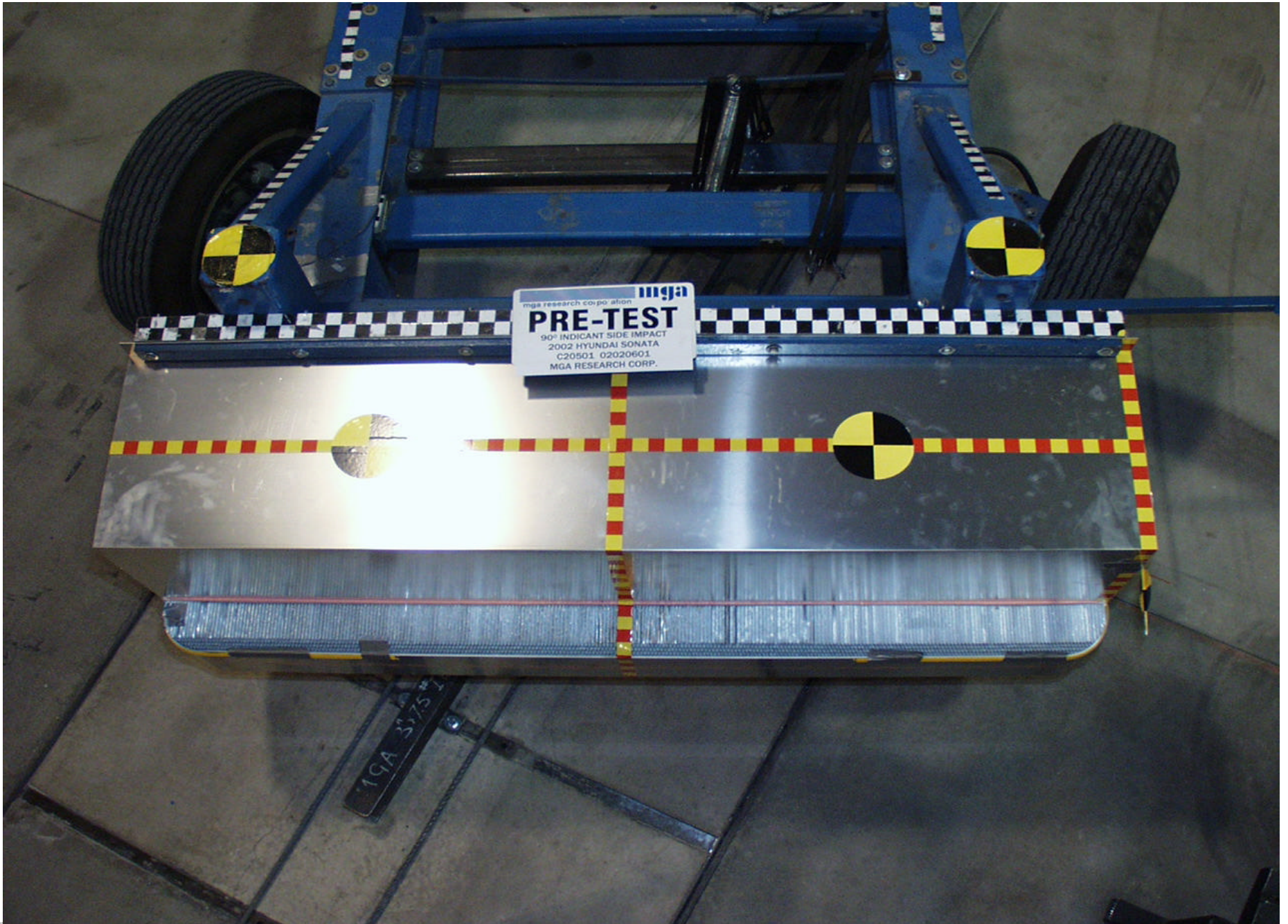
Post-Test MDB and Vehicle (right side)

A-12.



Post-Test MDB and Vehicle Overhead View

A-13.



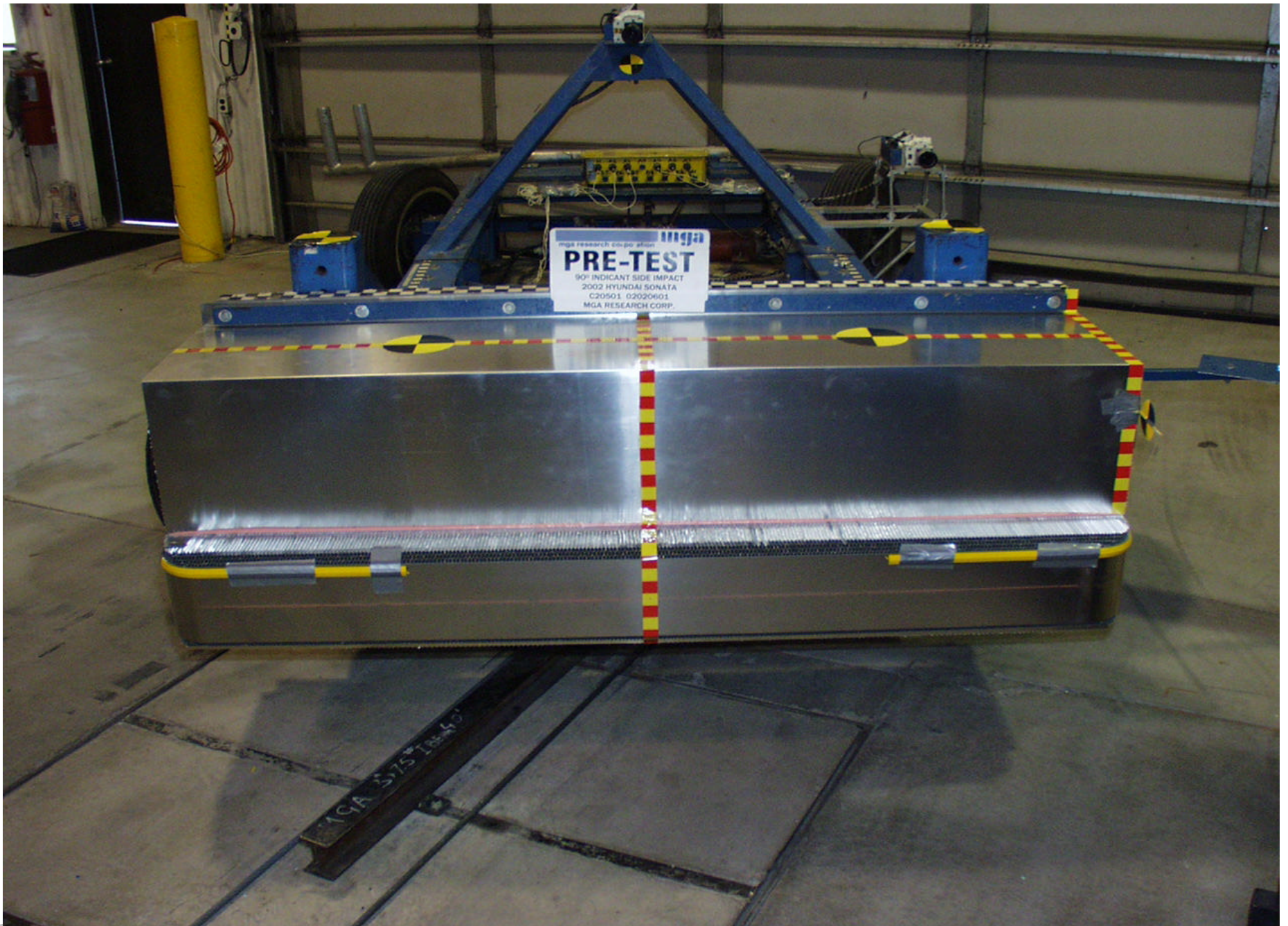
Pre-Test MDB Top View

A-14.



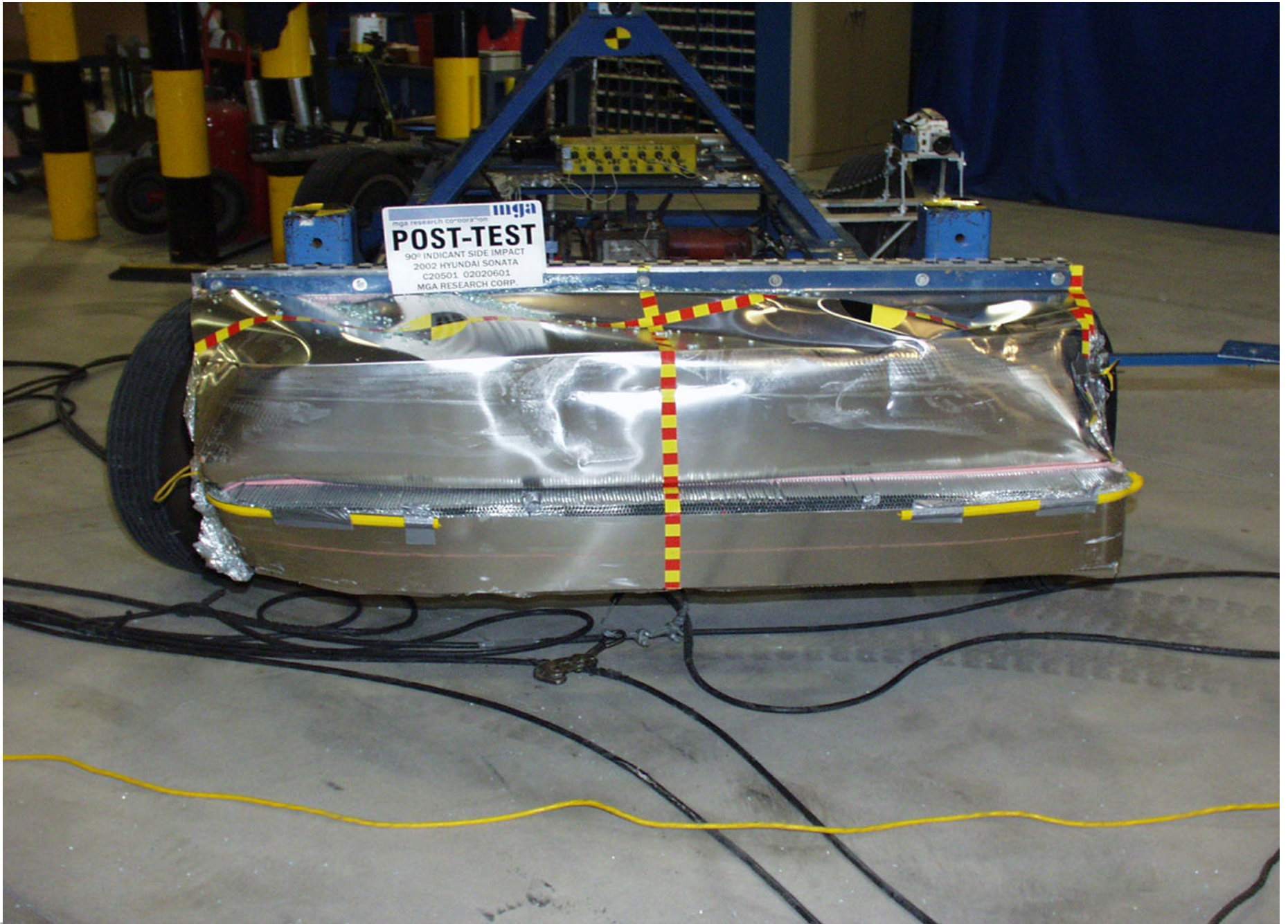
Post-Test MDB Top View

A-15.



Pre-Test MDB Front View

A-16.



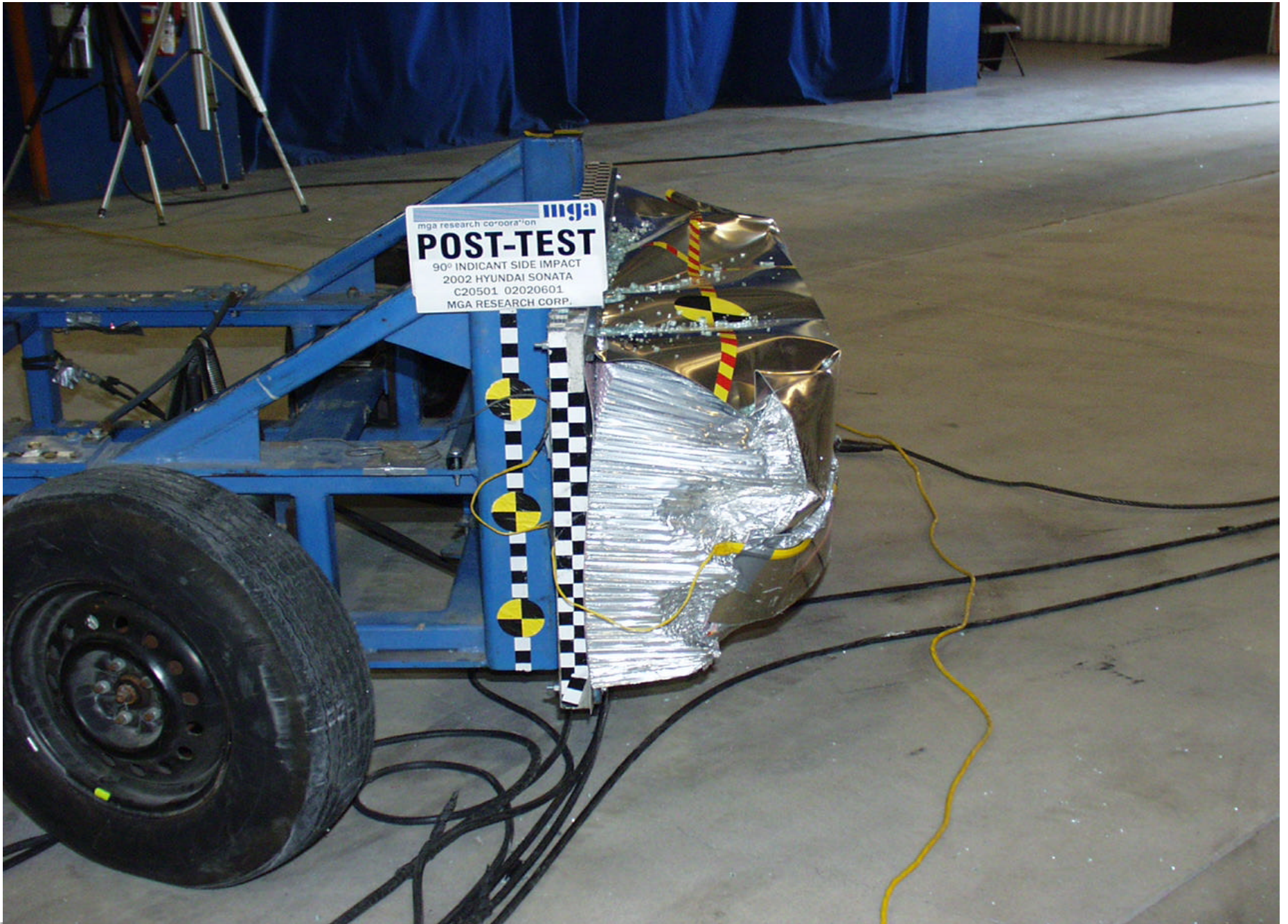
Post-Test MDB Front View

A-17.

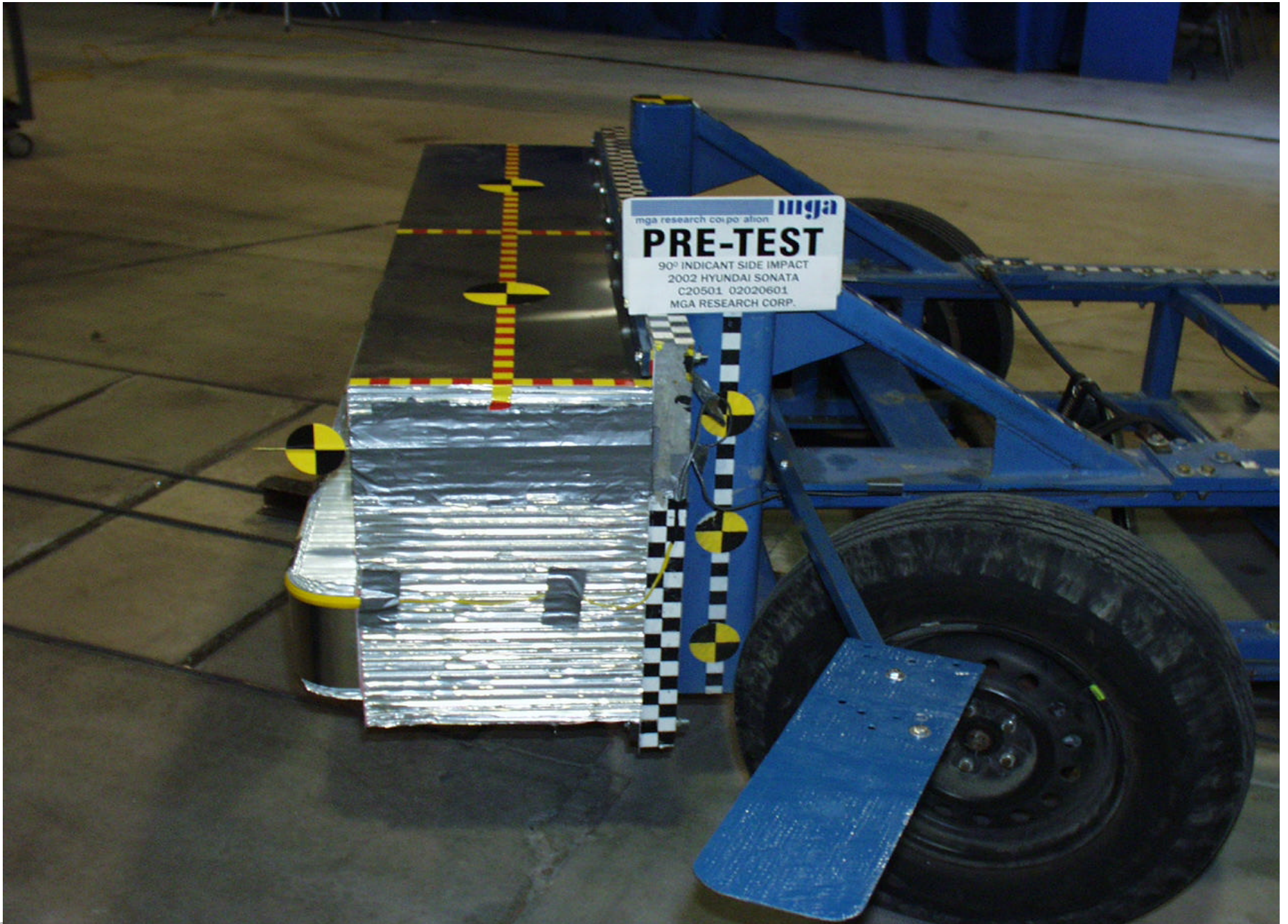


Pre-Test MDB Right Side View

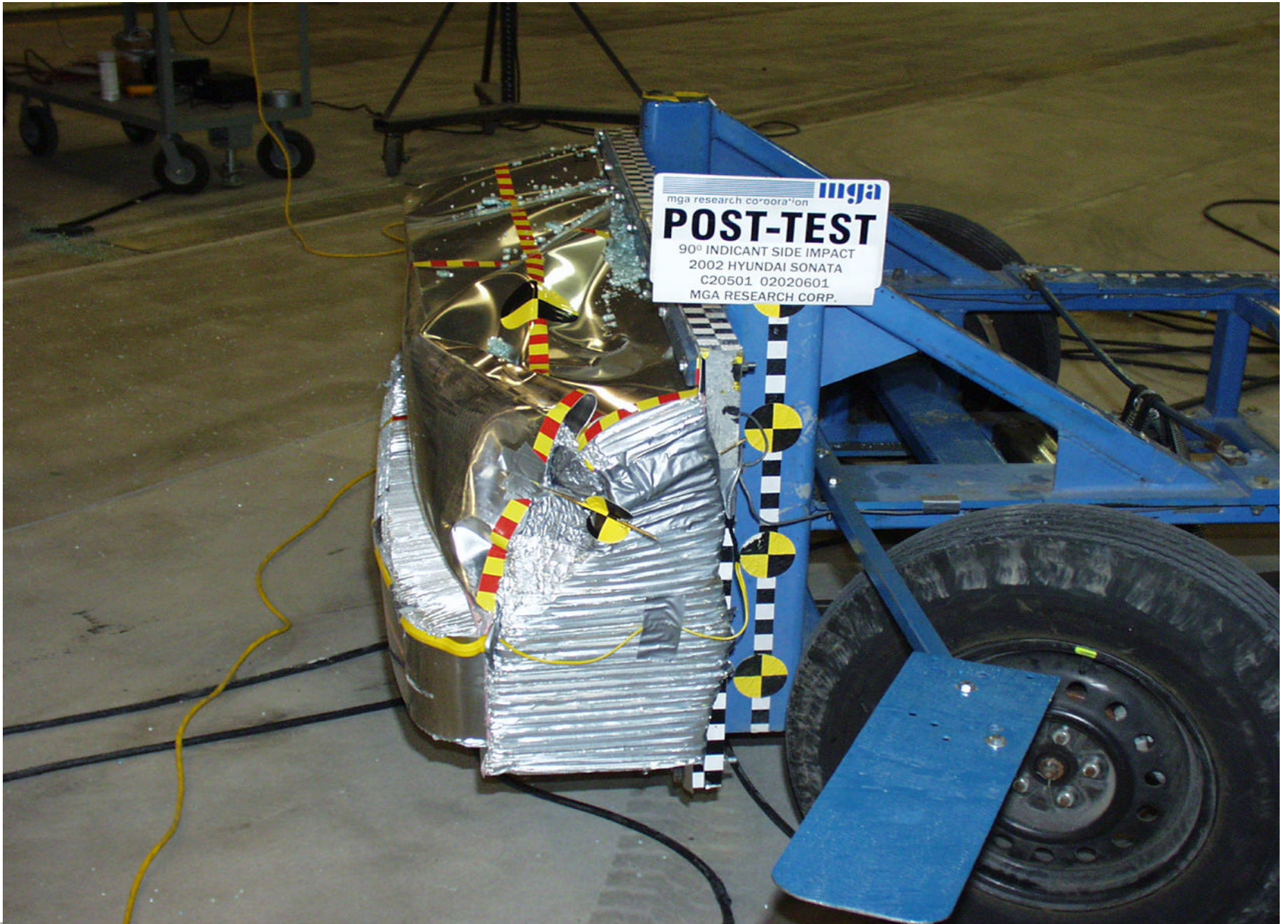
A-18.



Post-Test MDB Right Side View



Pre-Test MDB Left Side View



Post-Test MDB Left Side View



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



Pre-Test Driver Dummy Left Side View



Post-Test Driver Dummy Left Side View



Pre-Test Driver Dummy Left Side View (Door Open)



Pre-Test Driver Dummy Shoulder and Door Top View



Post-Test Driver Dummy Shoulder and Door Top View



Post-Test Driver Dummy Contact



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View

A-31.



Pre-Test Passenger Dummy Left Side View



Post-Test Passenger Dummy Left Side View



Pre-Test Passenger Dummy Left Side View (Door Open)



Pre-Test Passenger Dummy Shoulder and Door Top View



Post-Test Passenger Dummy Shoulder and Door Top View



Post-Test Passenger Dummy Contact

A-37.



Post-Test Passenger Dummy Contact

A-38.



Post-Test Passenger Dummy Head Contact



Pre-Test Left Front Impact Point on Vehicle



Post-Test Left Front Impact Point on Vehicle

A-41.



Impact



Vehicle Certification Label

0 RECOMMENDED INFLATION PRESSURE-COLD

VEHICLE CAPACITY WEIGHT . LBS:860
SEATING CAPACITY:TOTAL 5 FRONT 2 REAR 3

TIRE PRESSURE-COLD.KPA(PSI):

TIRE SIZE	LOAD UP TO 2 PERSONS		MAX. VEHICLE WEIGHT LIMIT	
	FRONT	REAR	FRONT	REAR
P205/65 R15, P205/60 R16	210 (30)	210 (30)	230 (33)	230 (33)
T125/70 D15, T125/70 R15	420 (60)	420 (60)	420 (60)	420 (60)

Tire Placard

A-44.



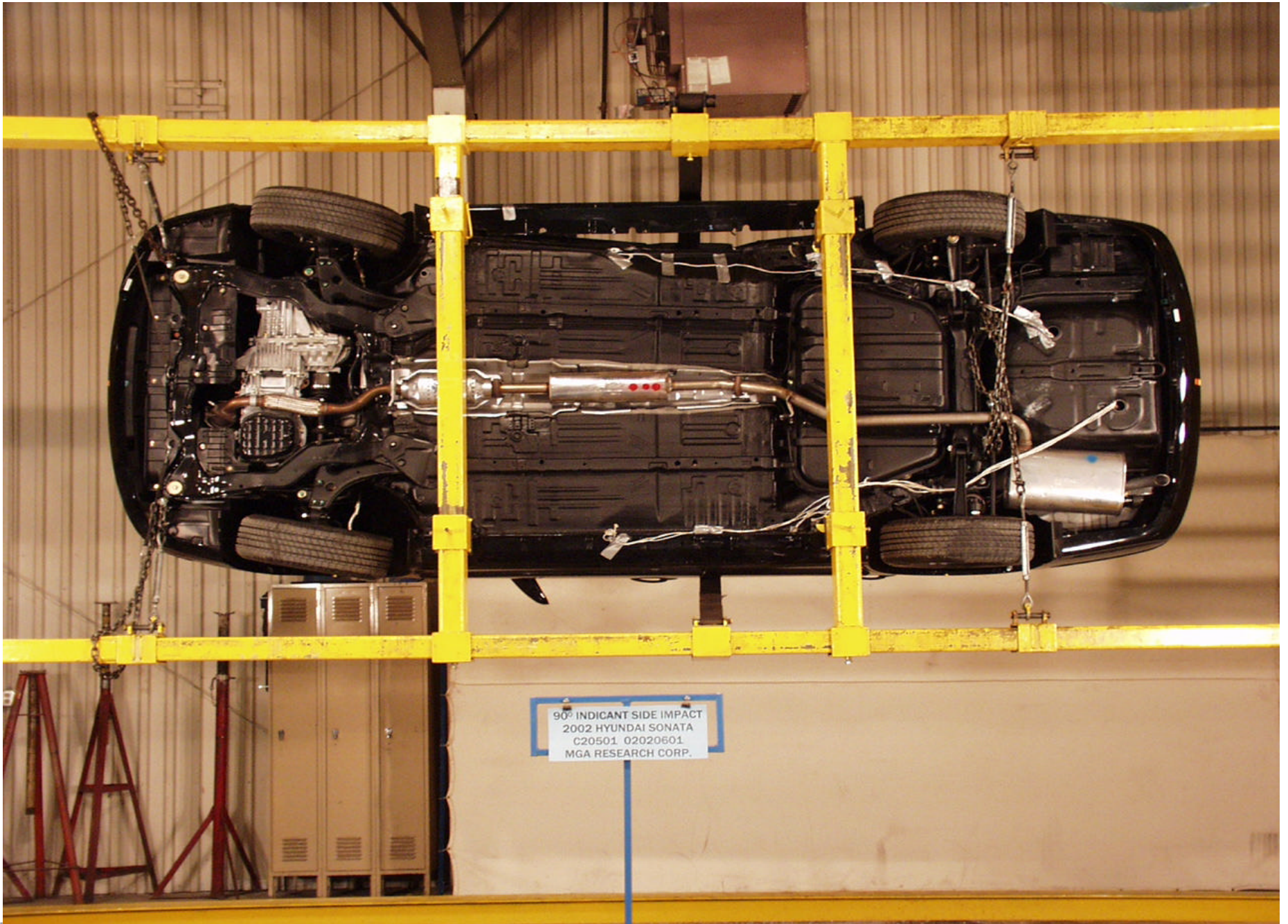
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A-45.



Rollover 180

A-46.



Rollover 270

A-47.



Rollover 360

APPENDIX B

SID, VEHICLE, AND MDB RESPONSE DATA

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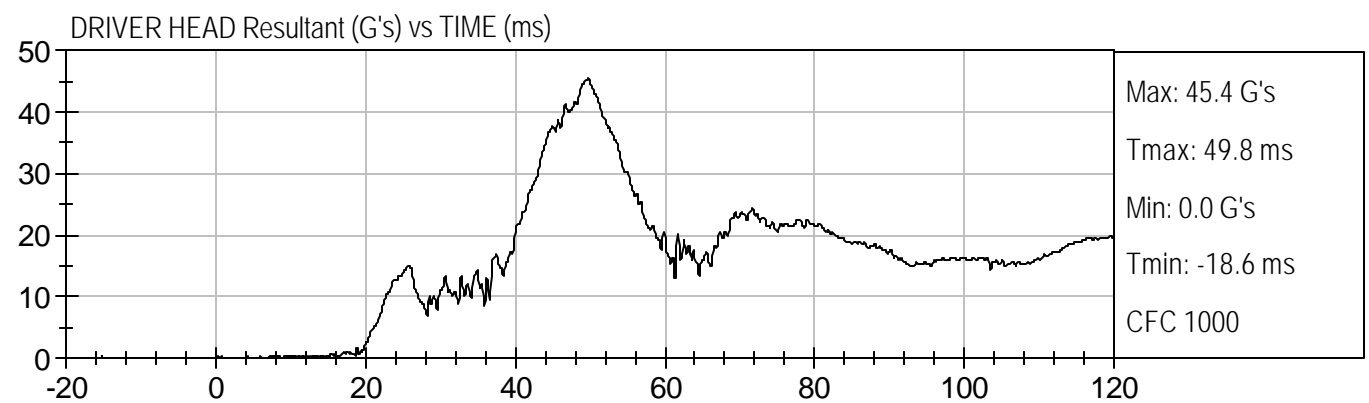
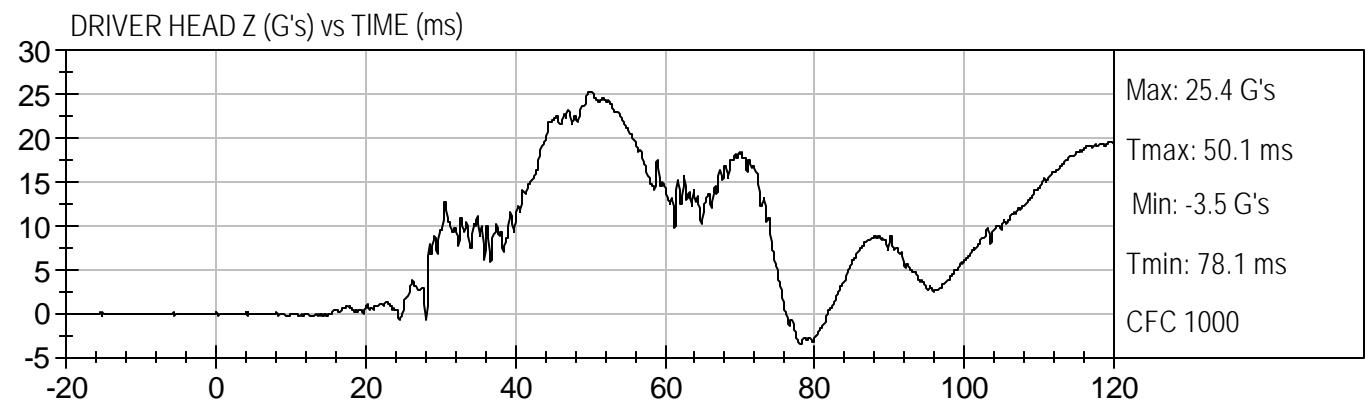
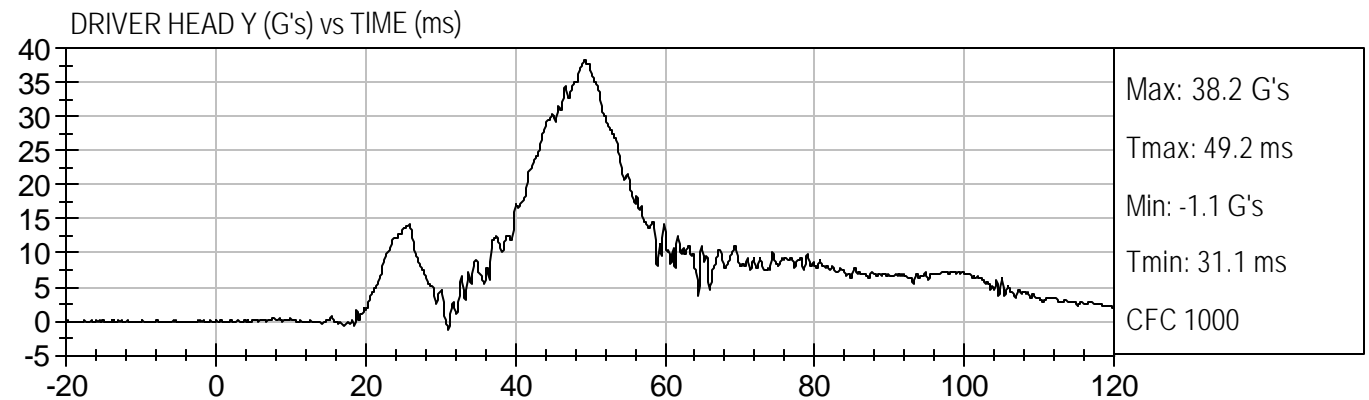
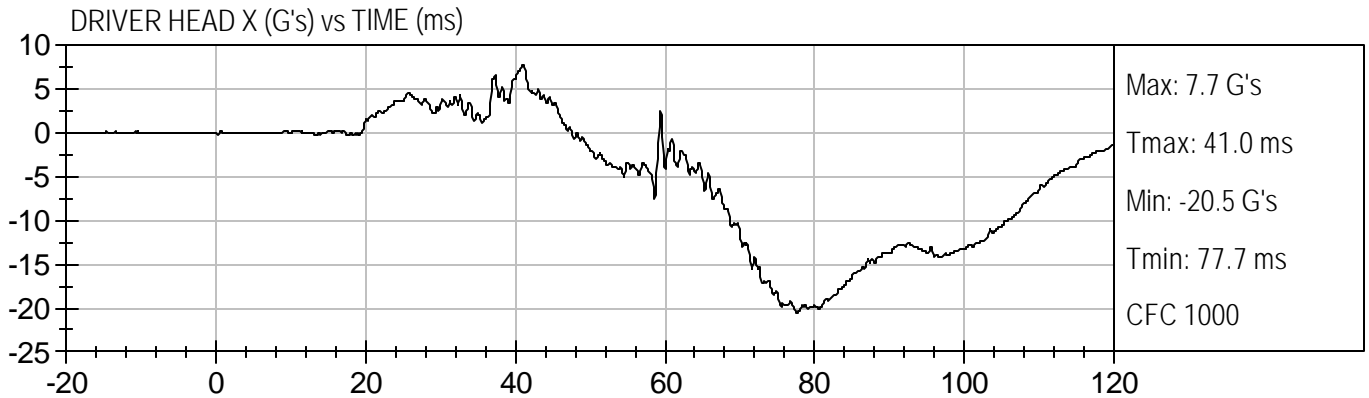
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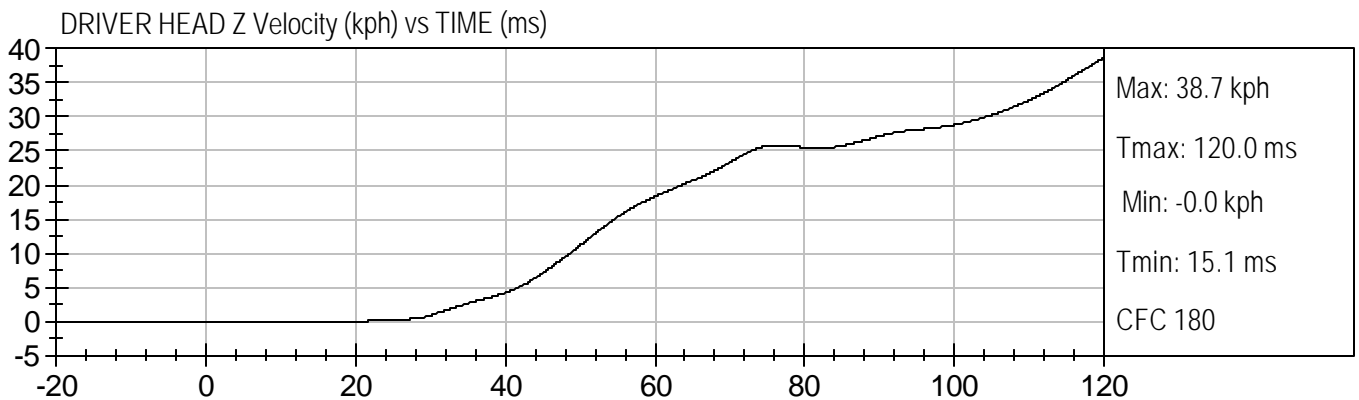
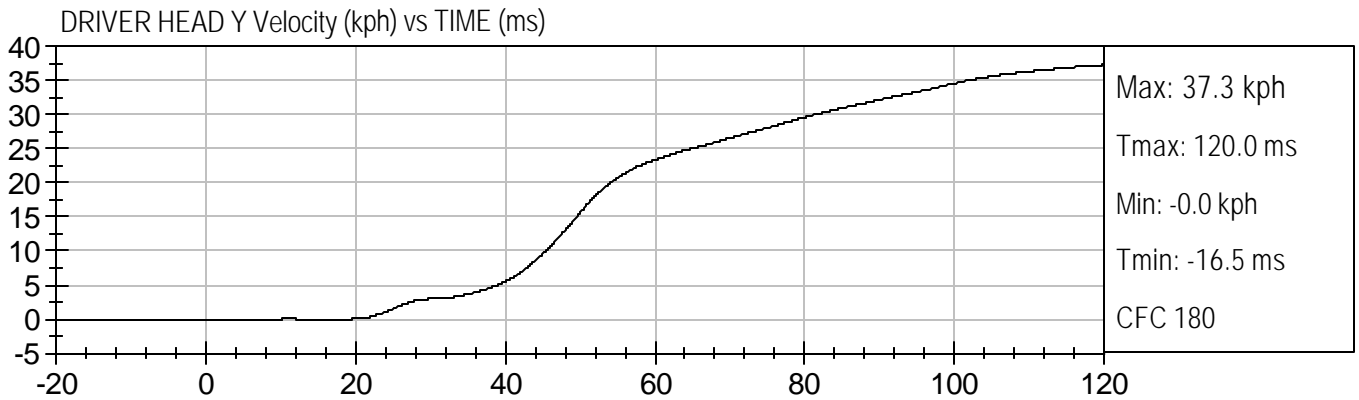
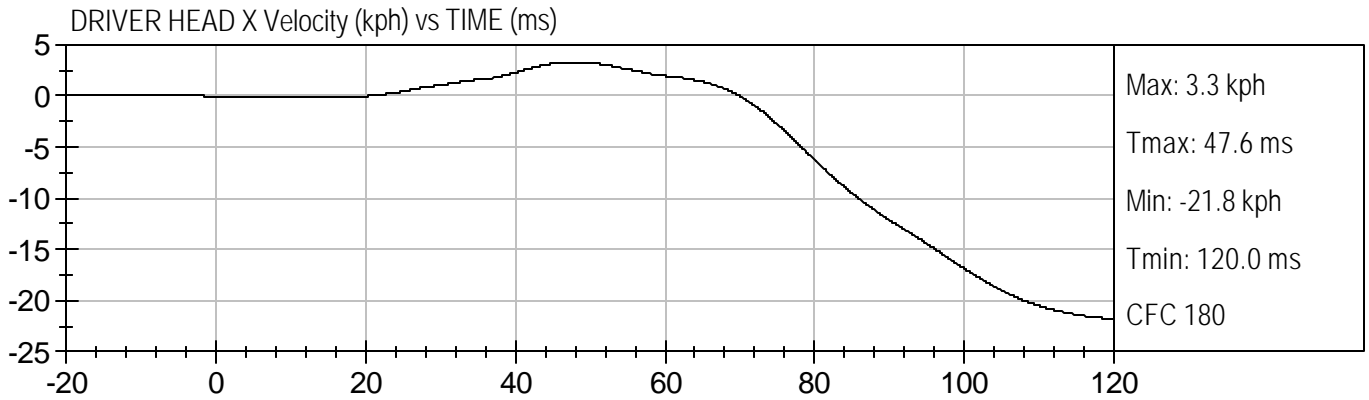
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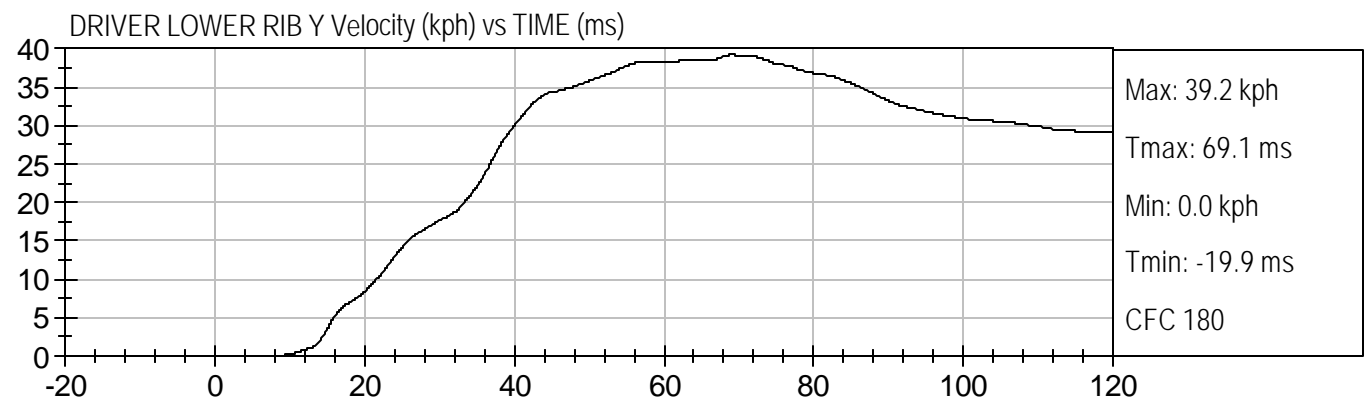
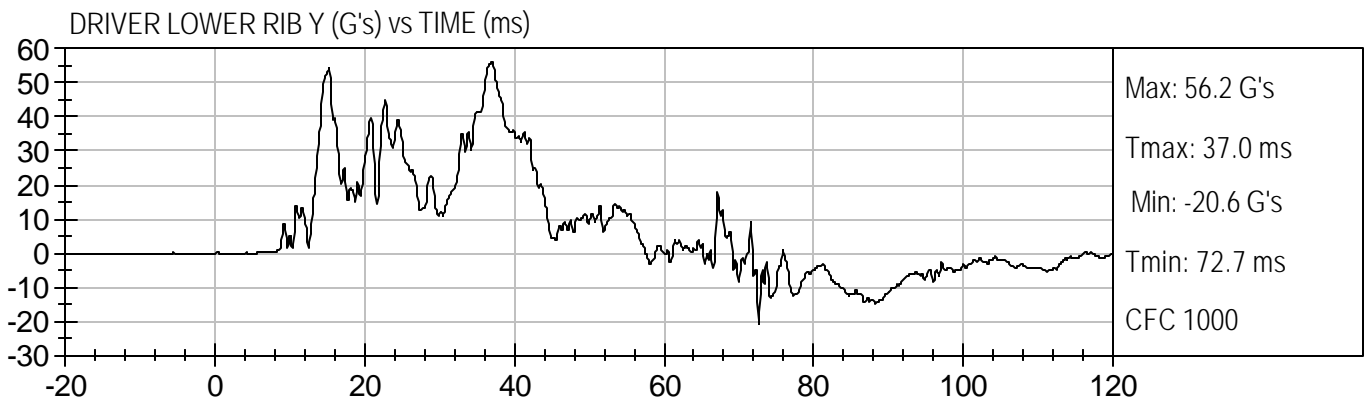
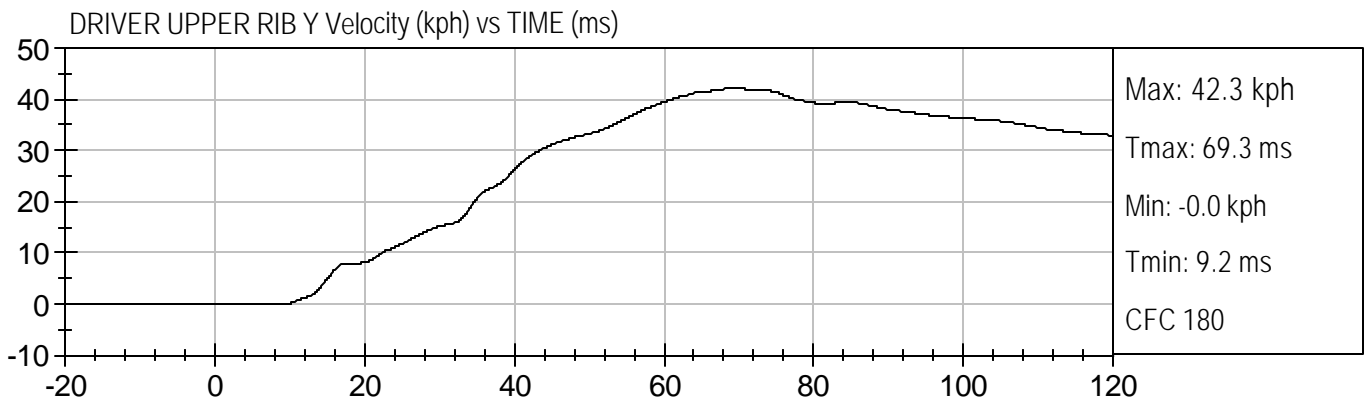
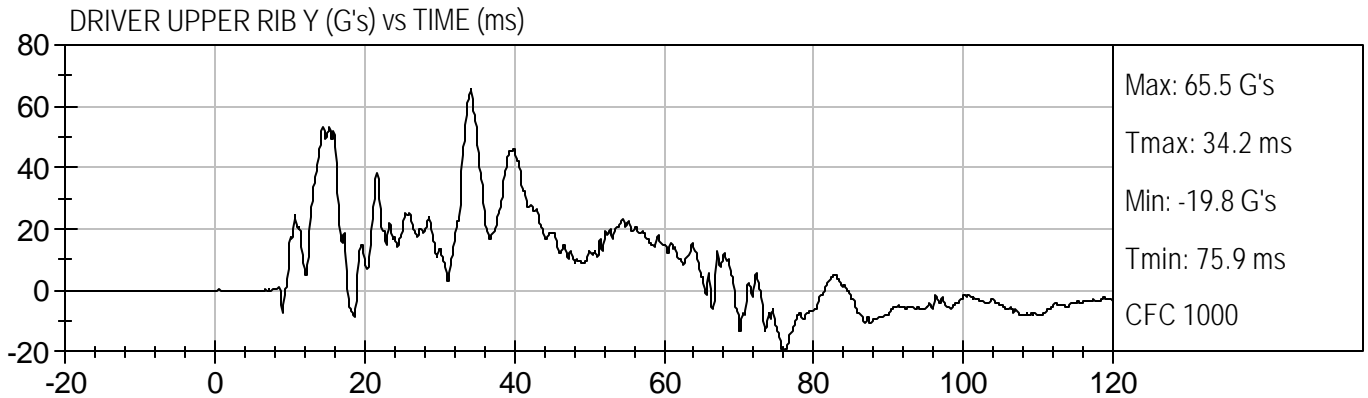
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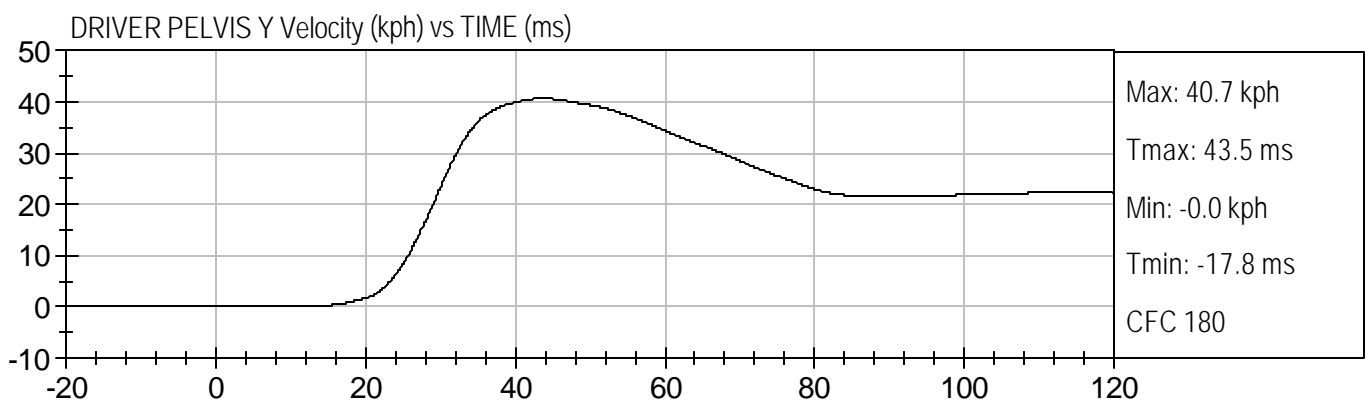
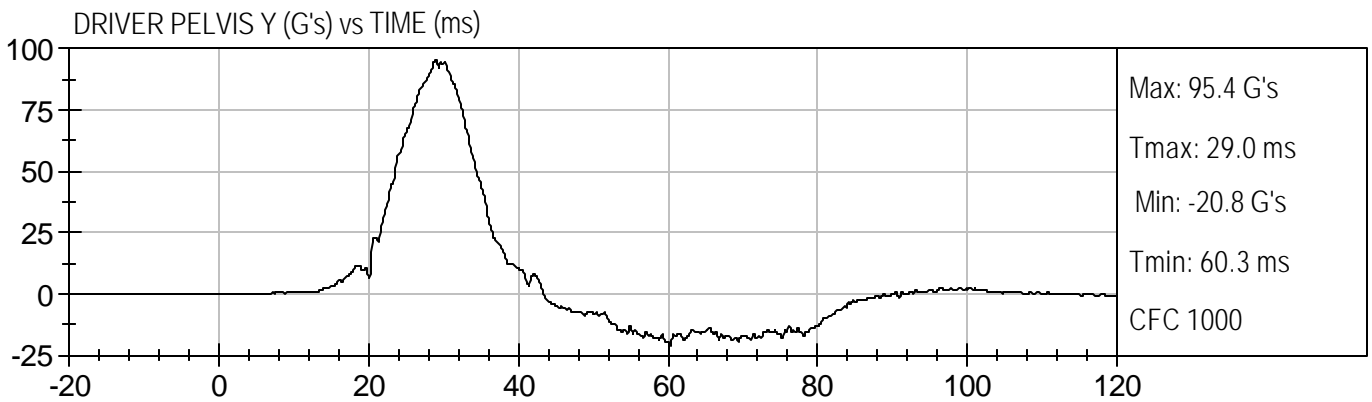
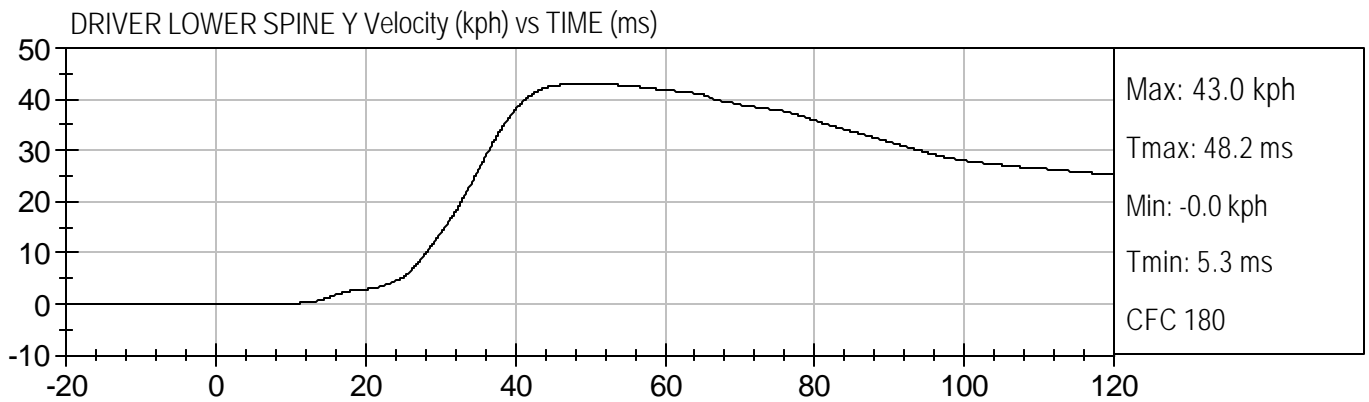
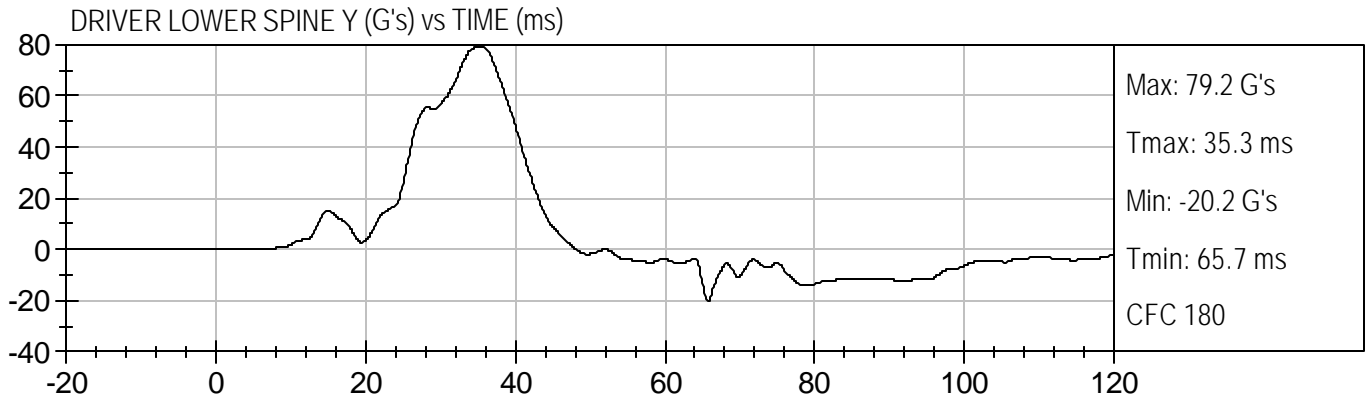
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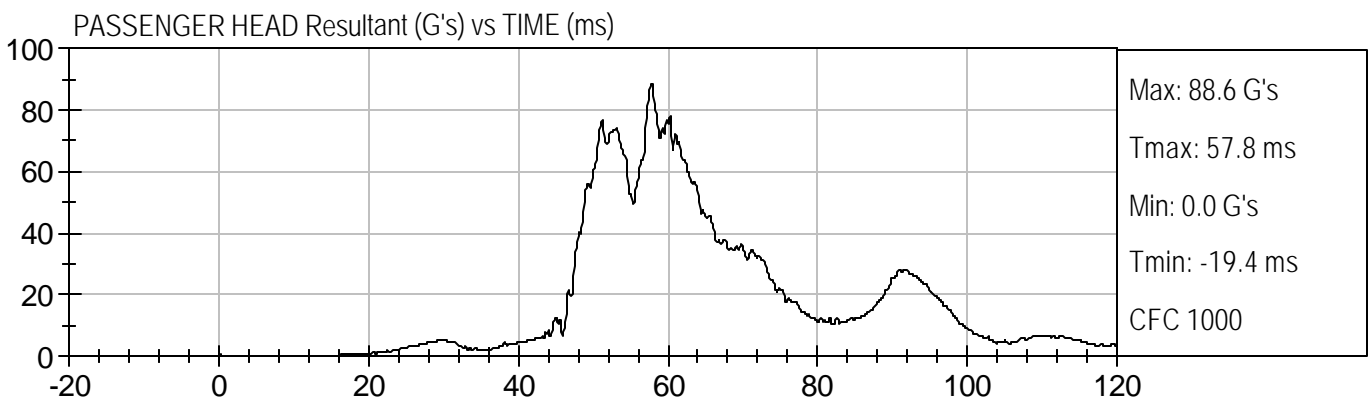
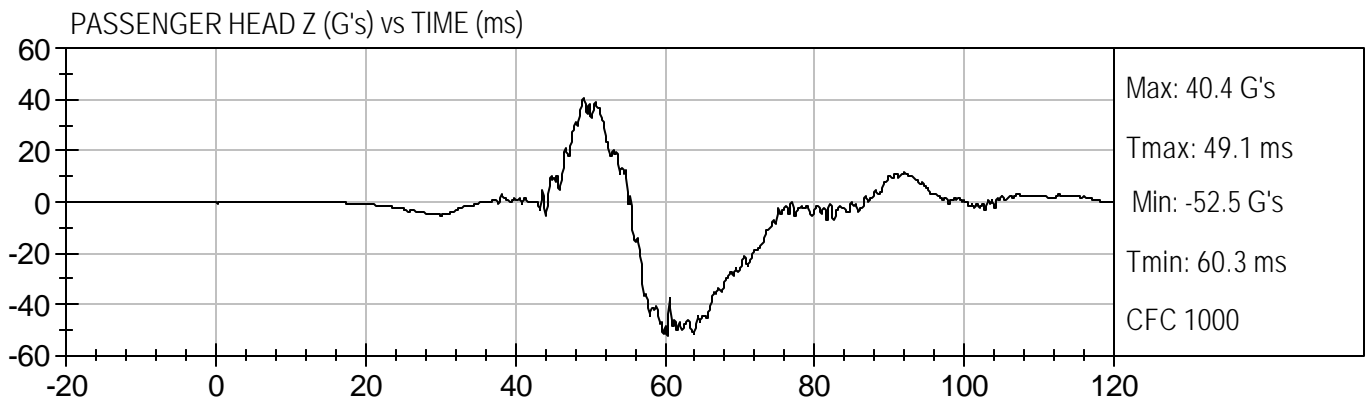
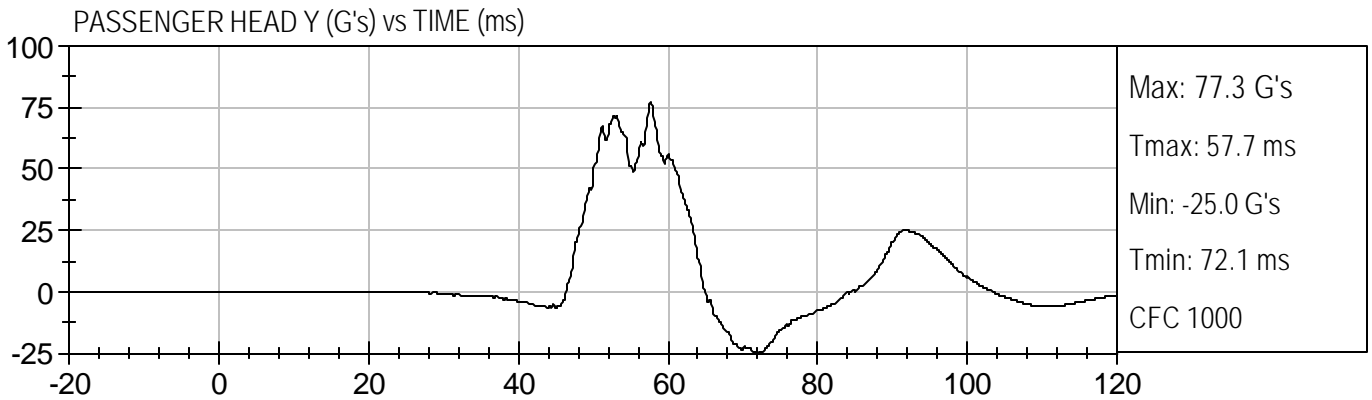
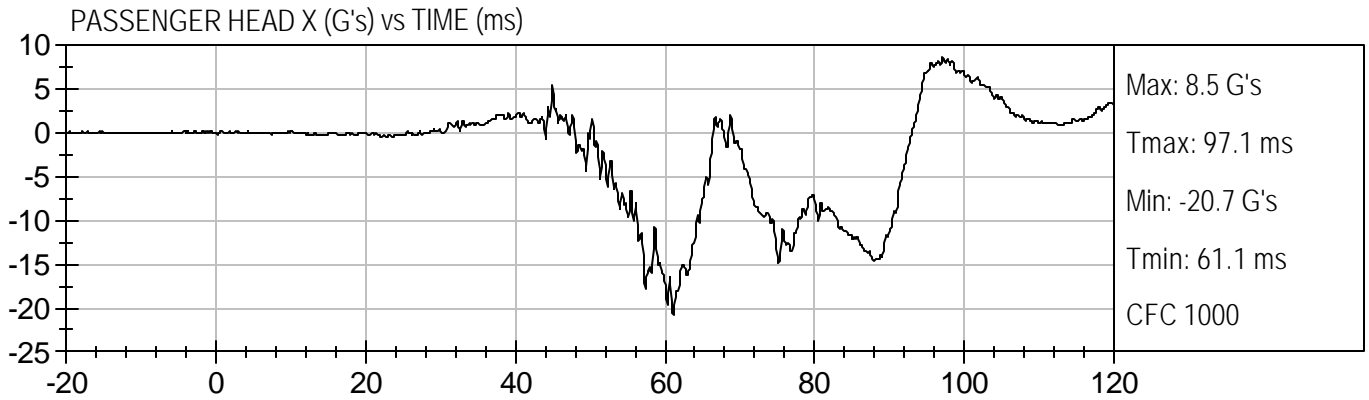
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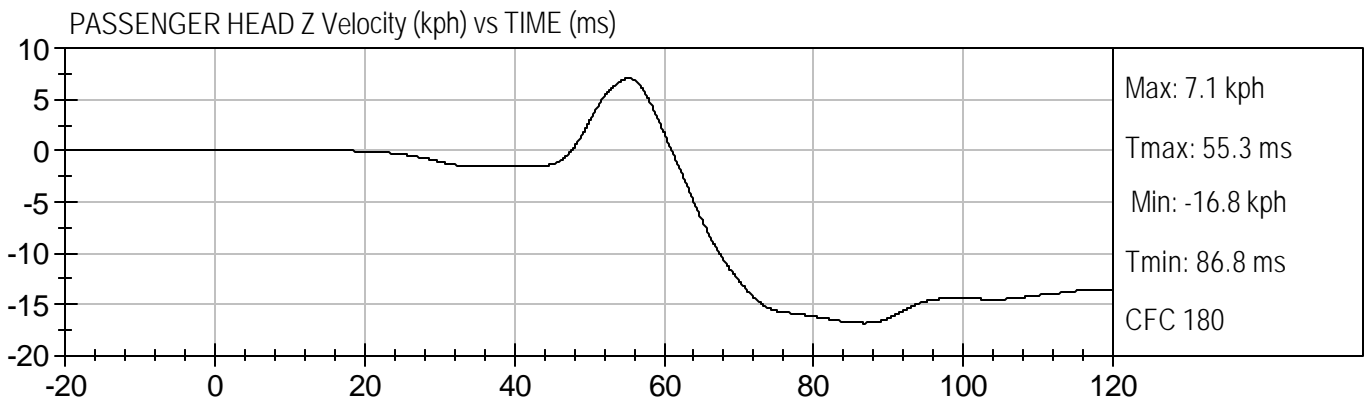
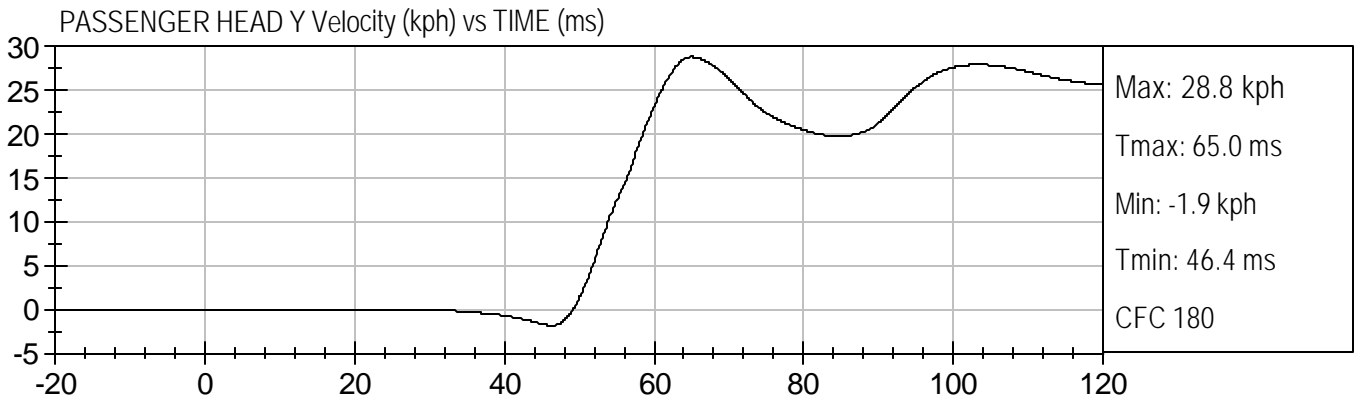
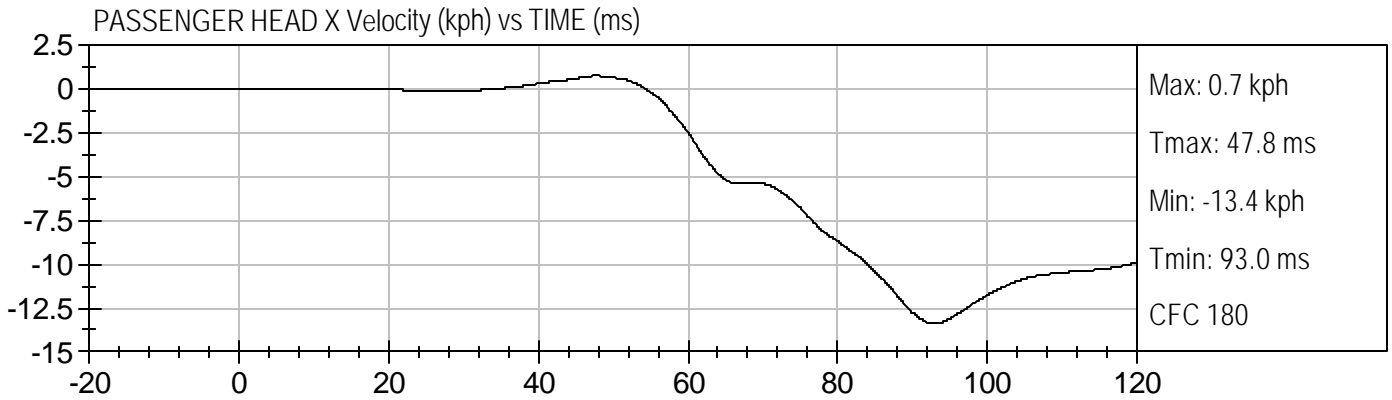


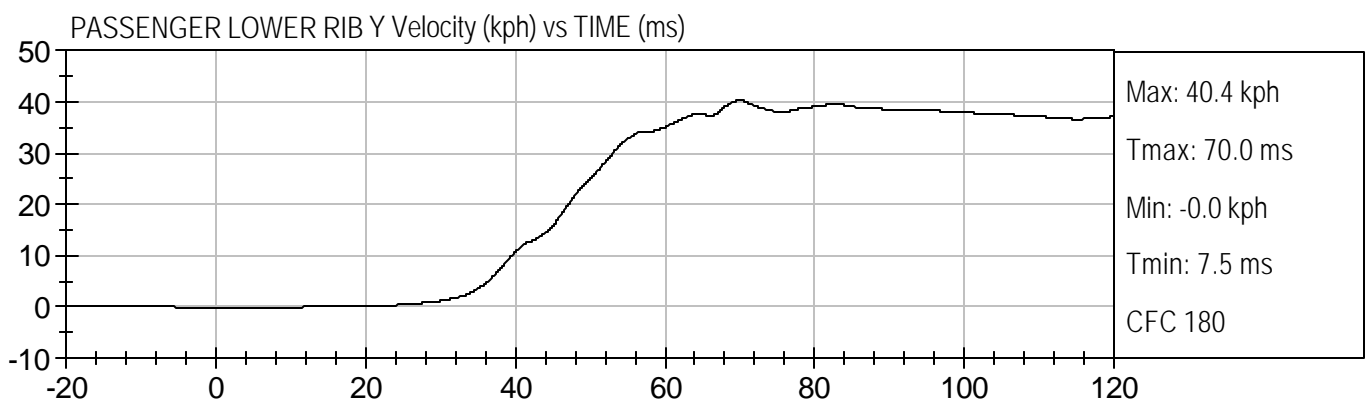
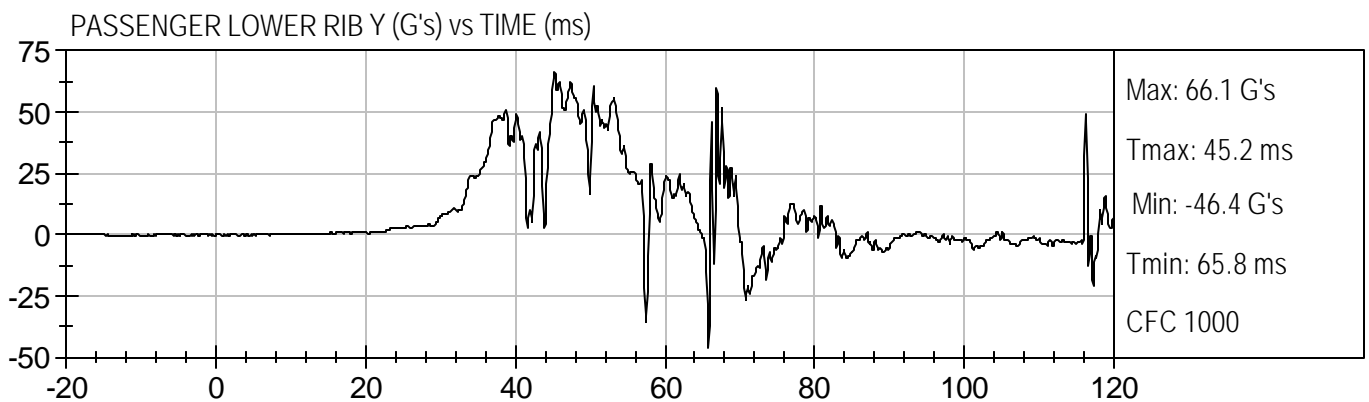
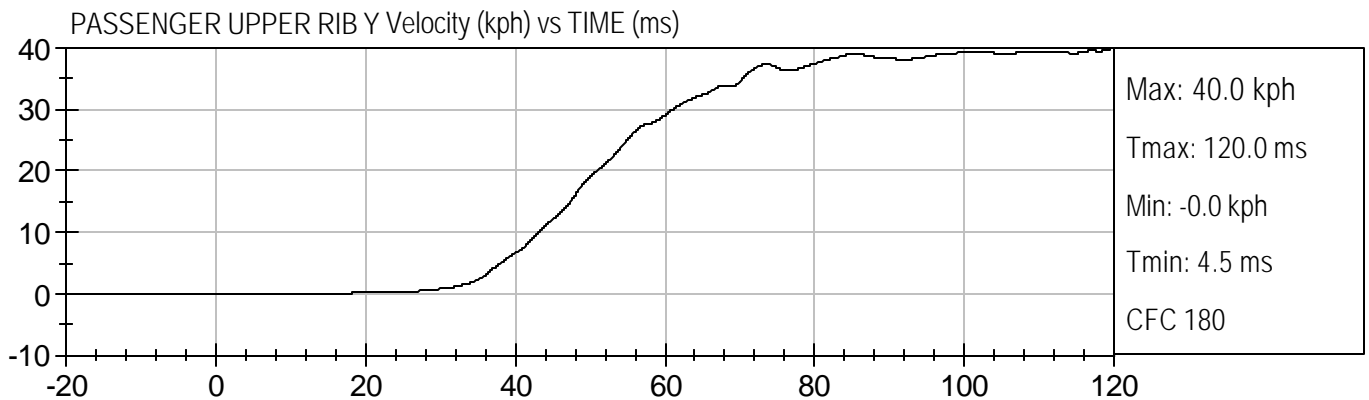
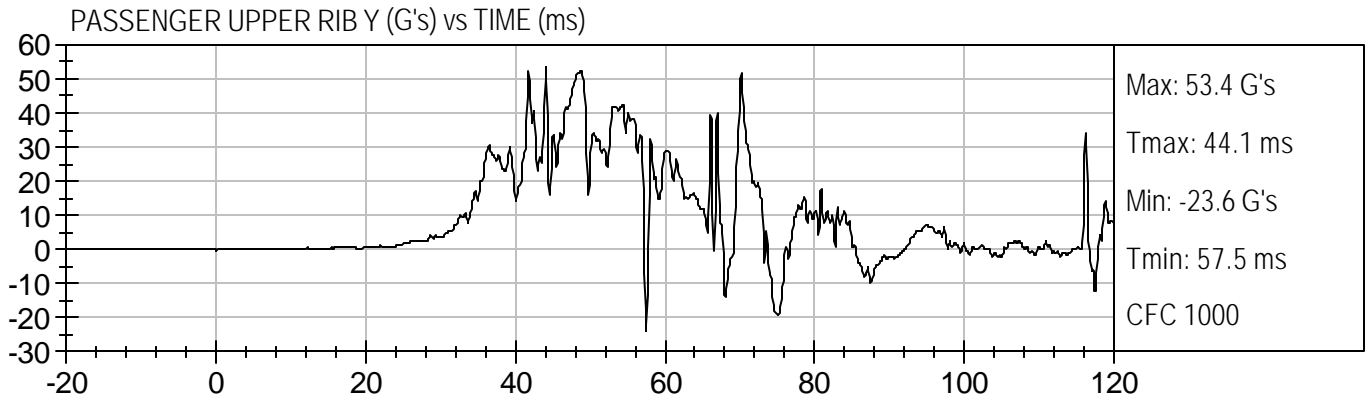


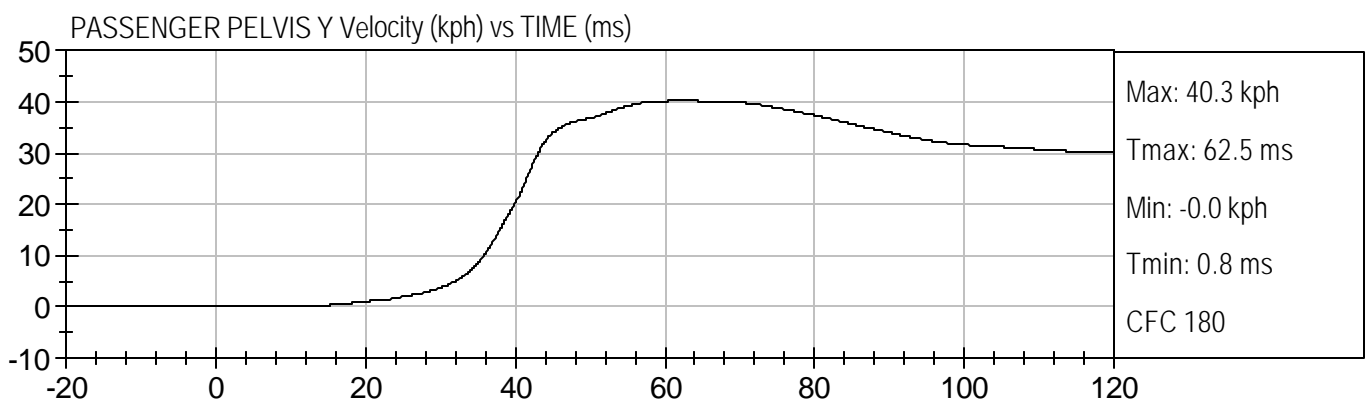
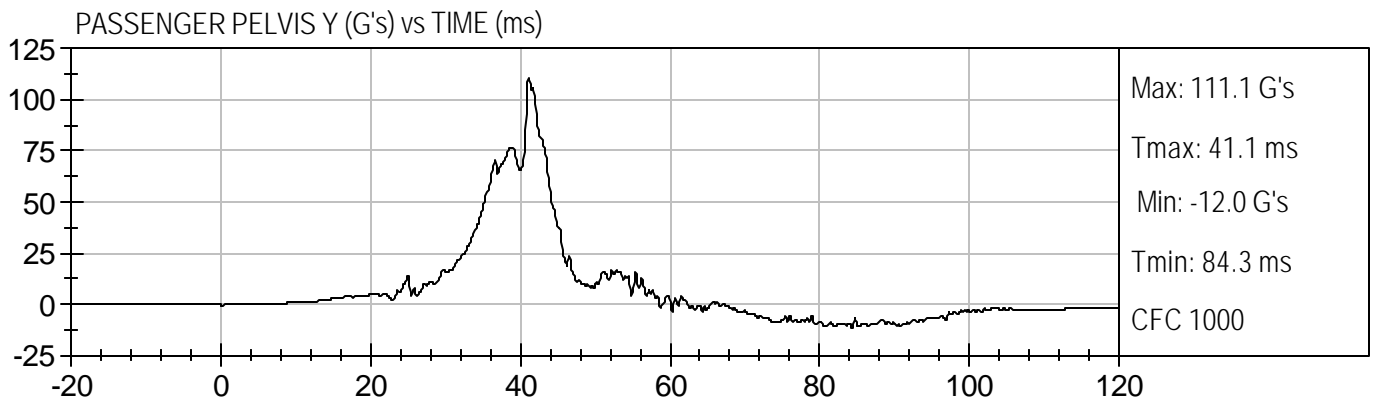
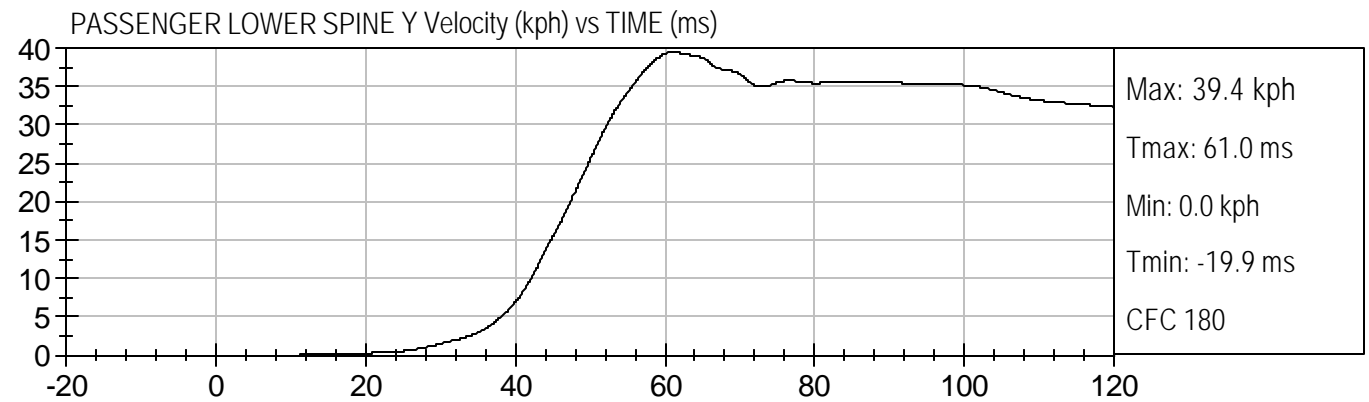
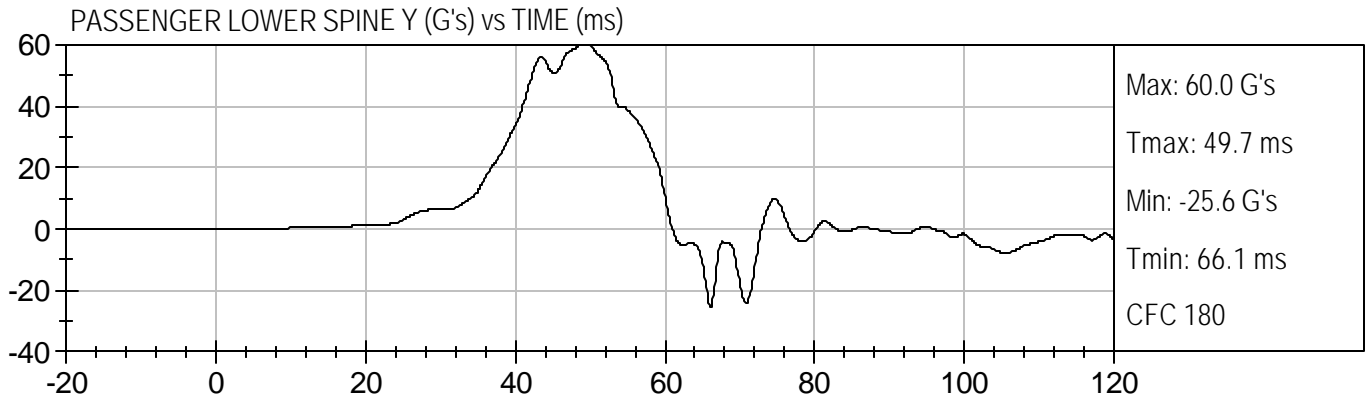


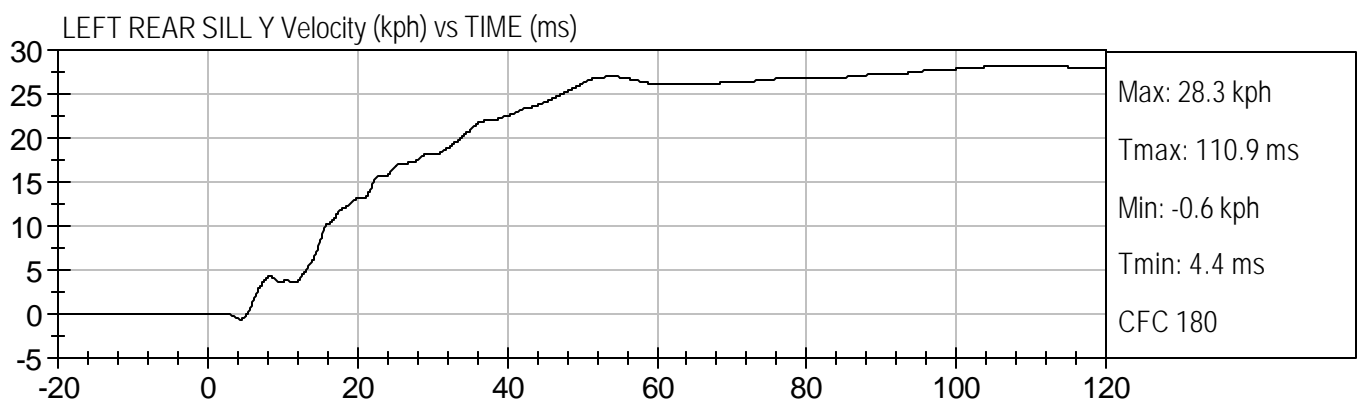
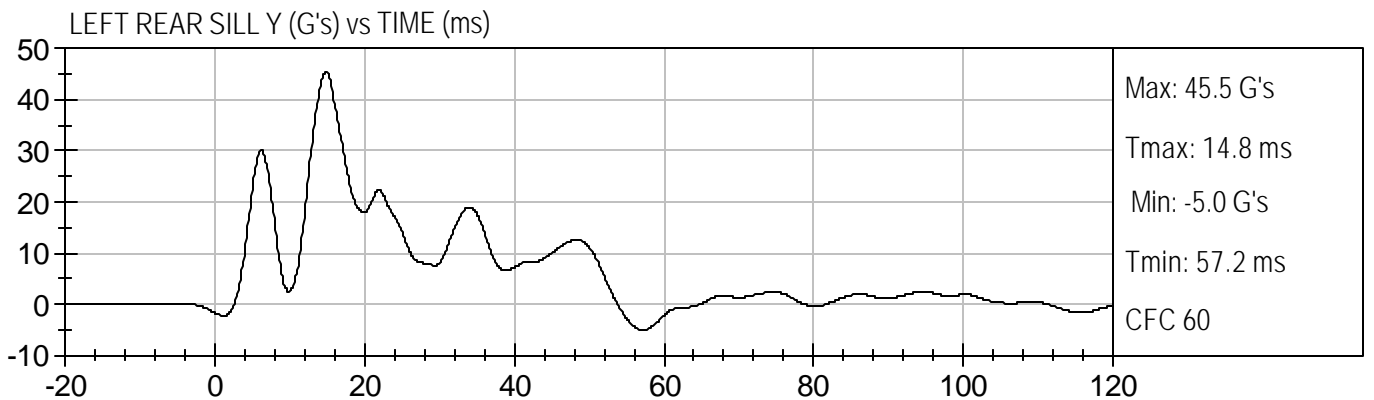
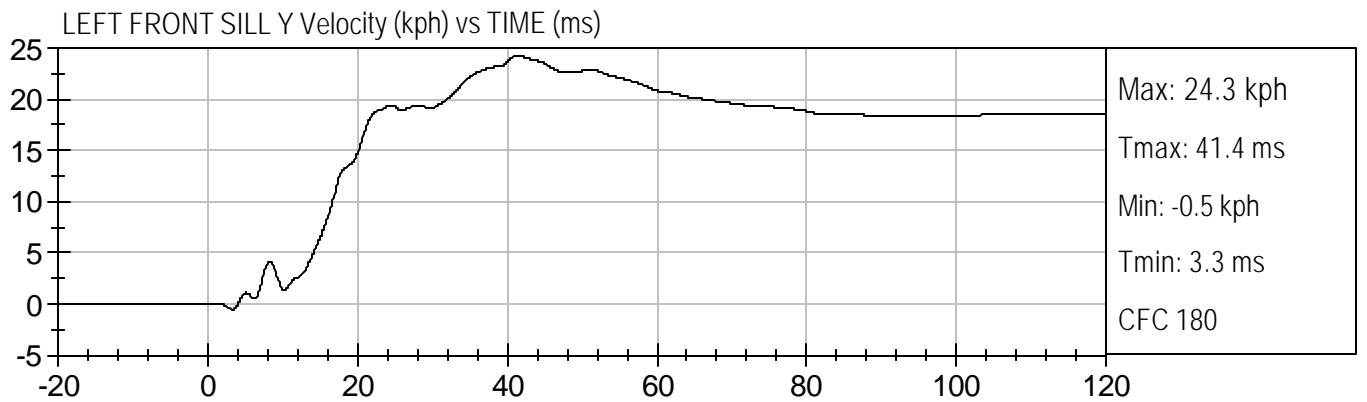
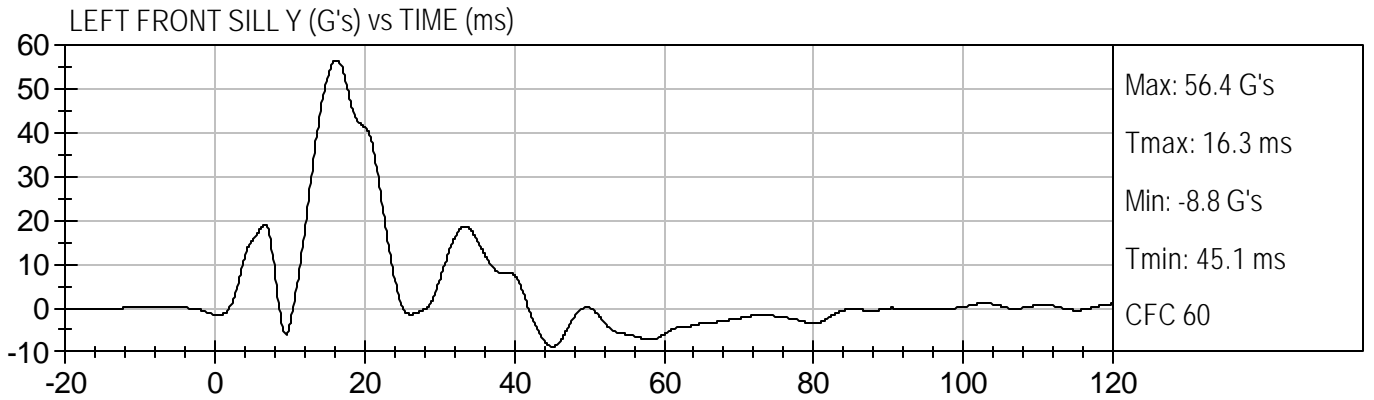
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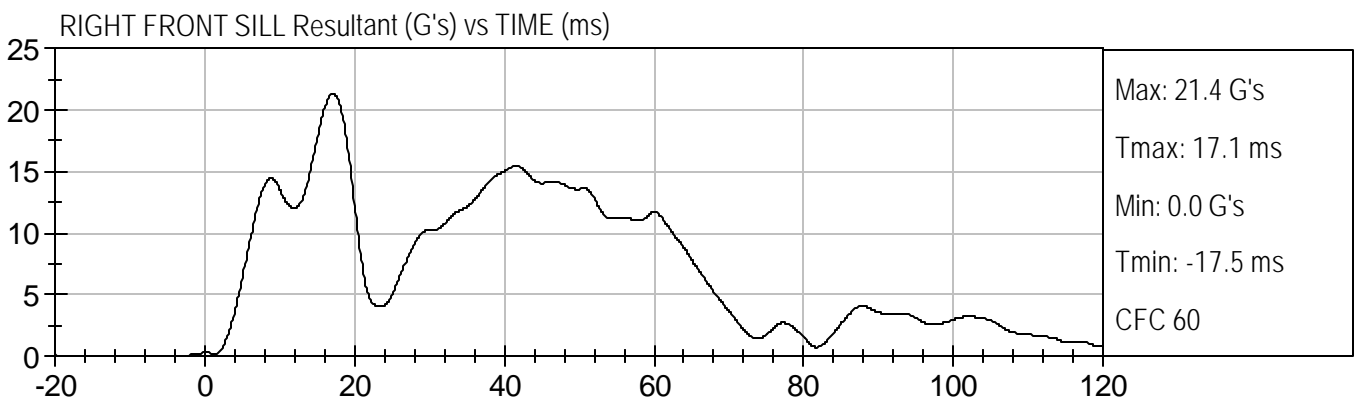
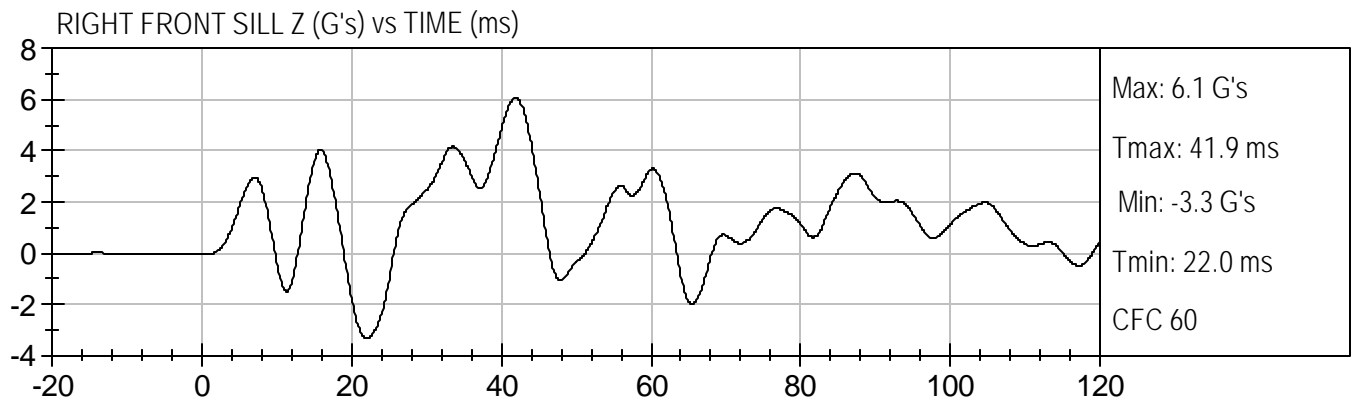
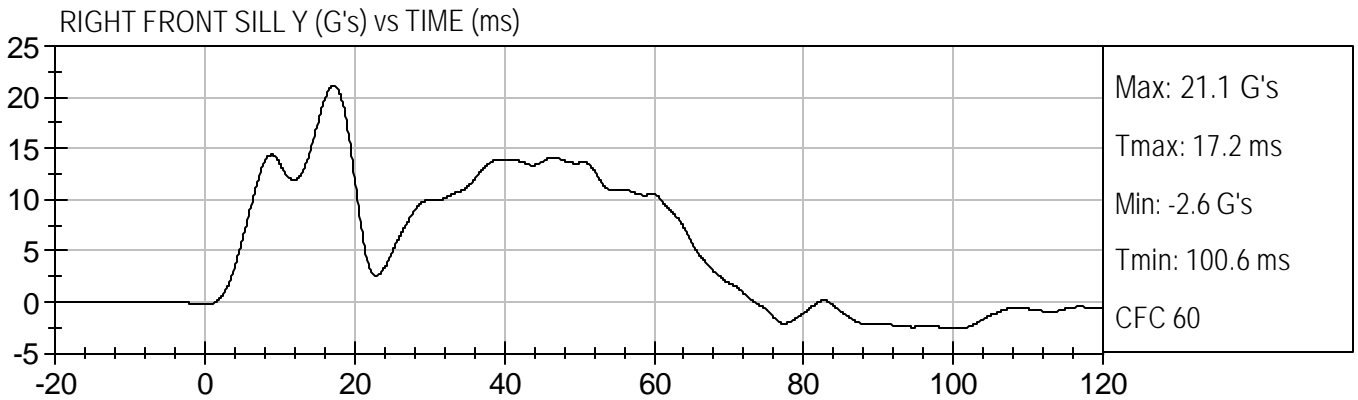
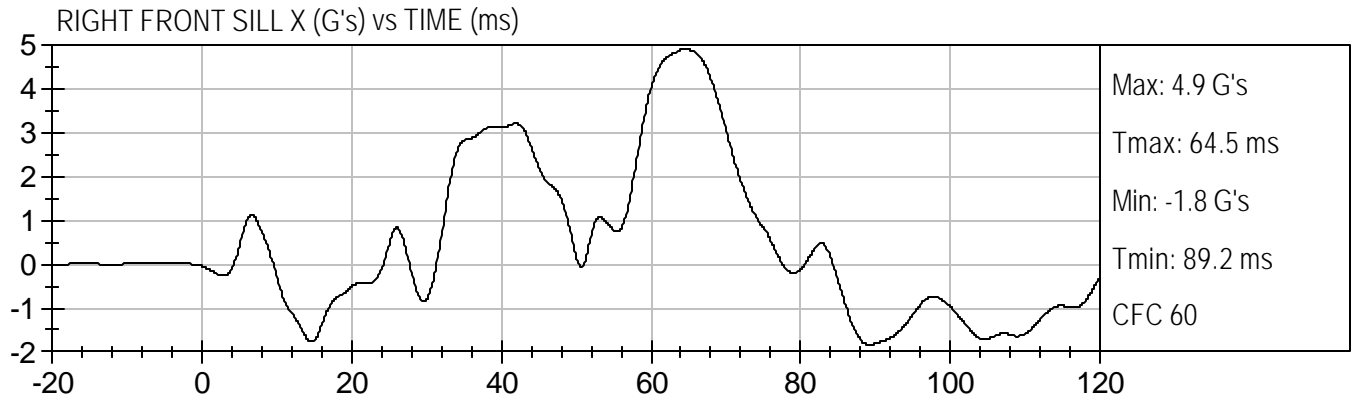
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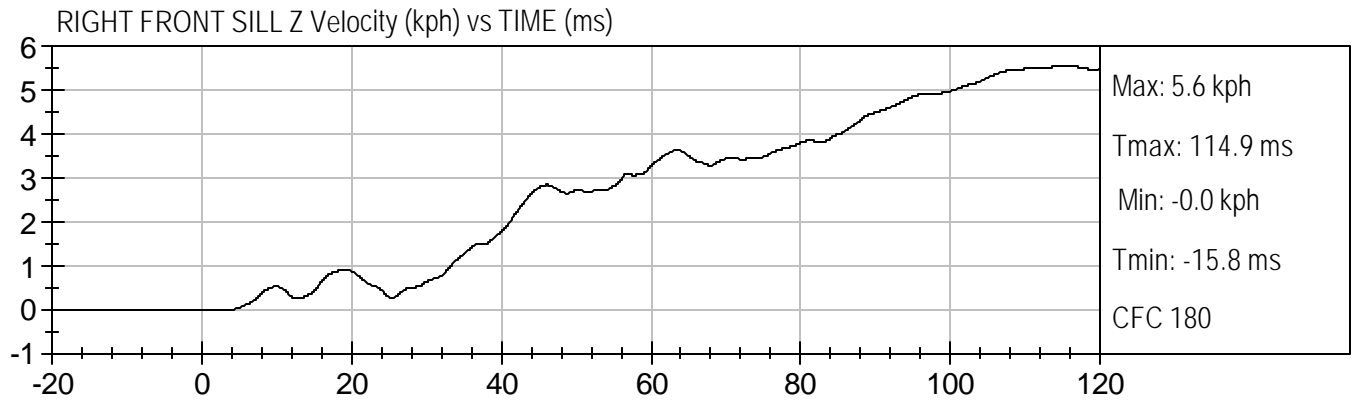
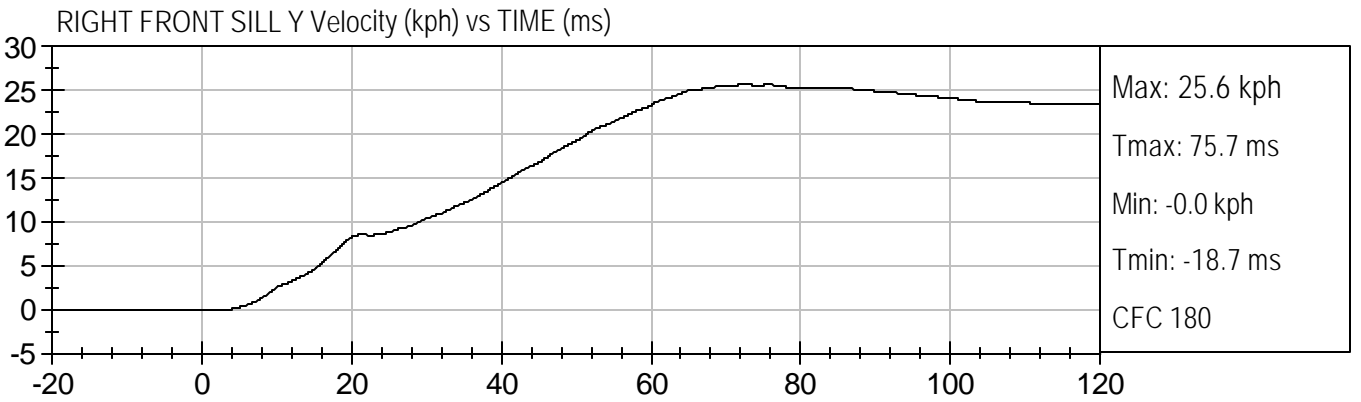
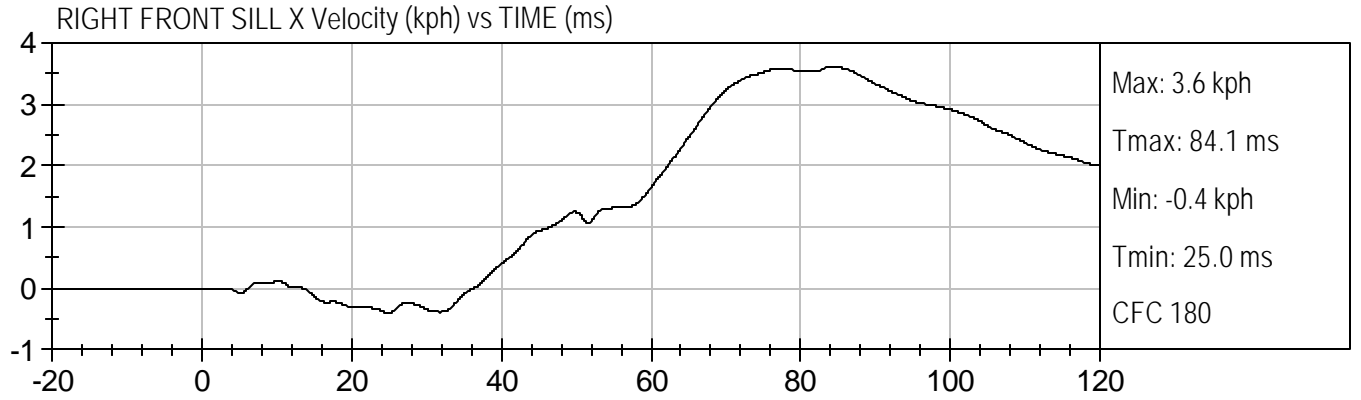


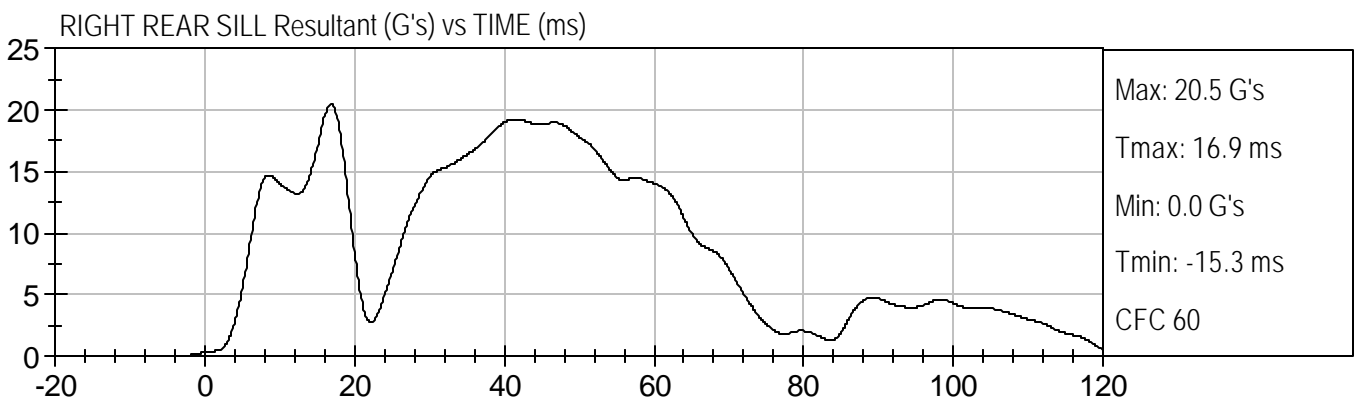
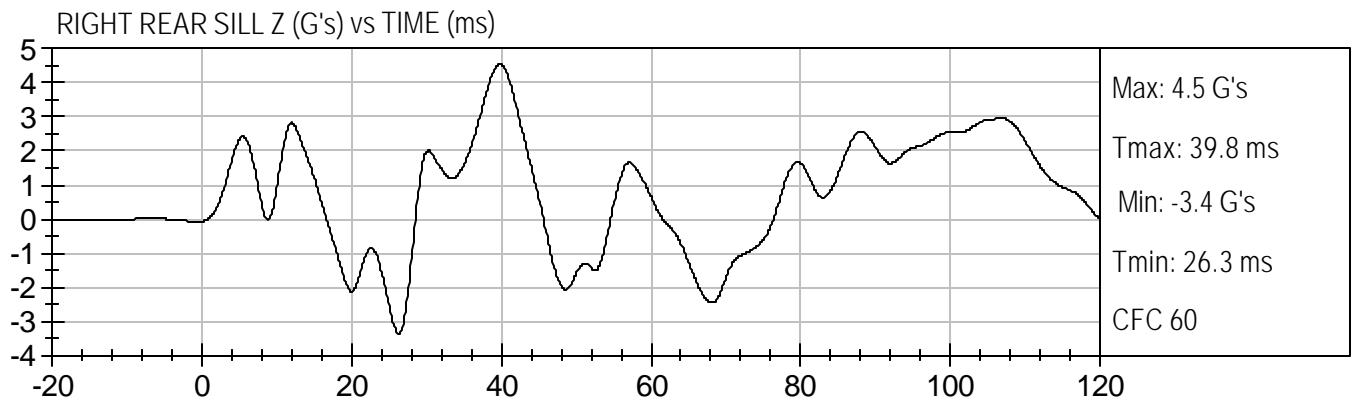
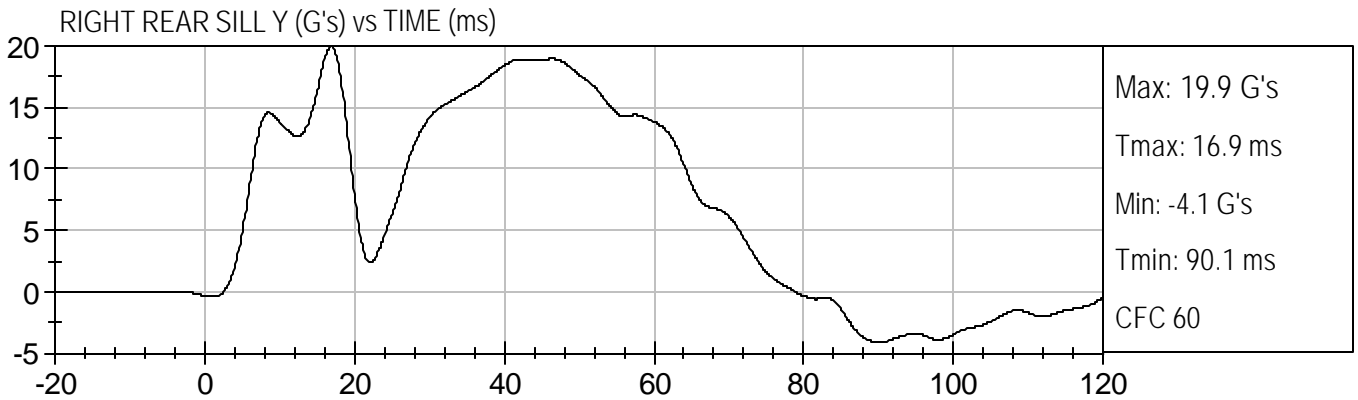
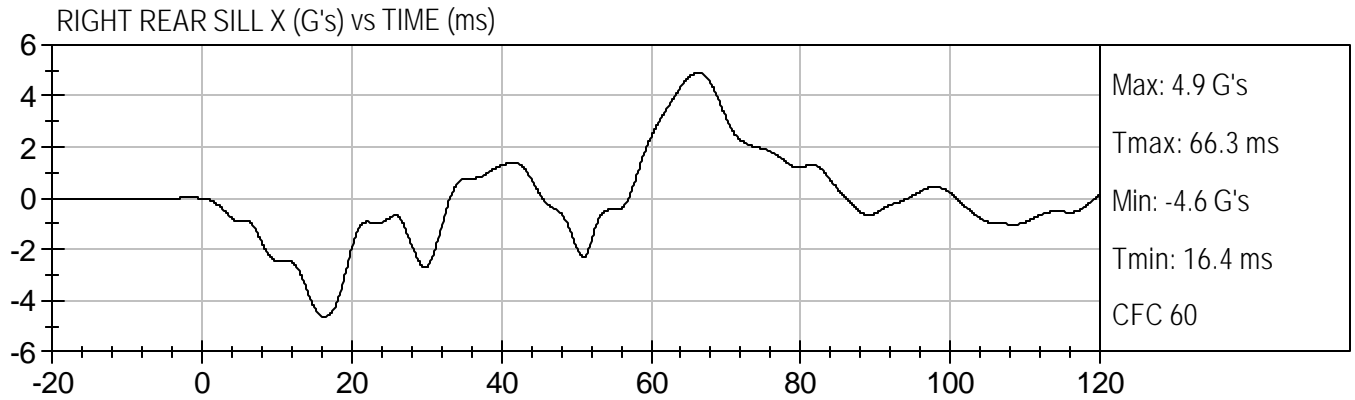


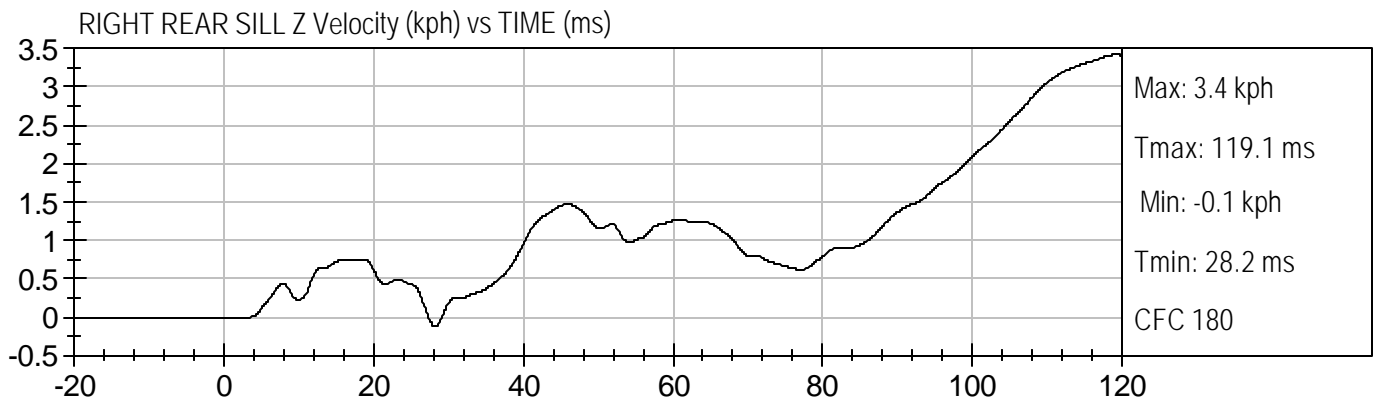
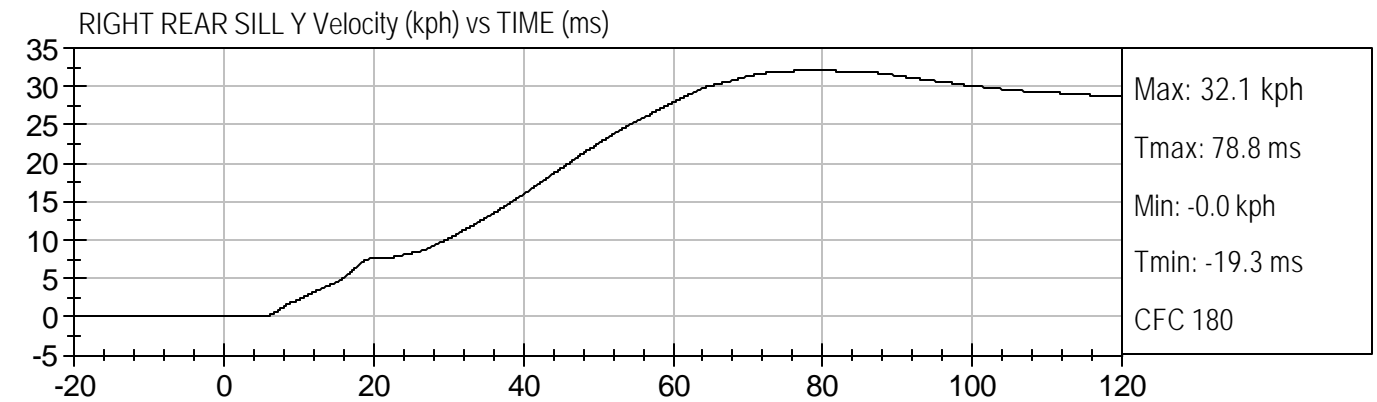
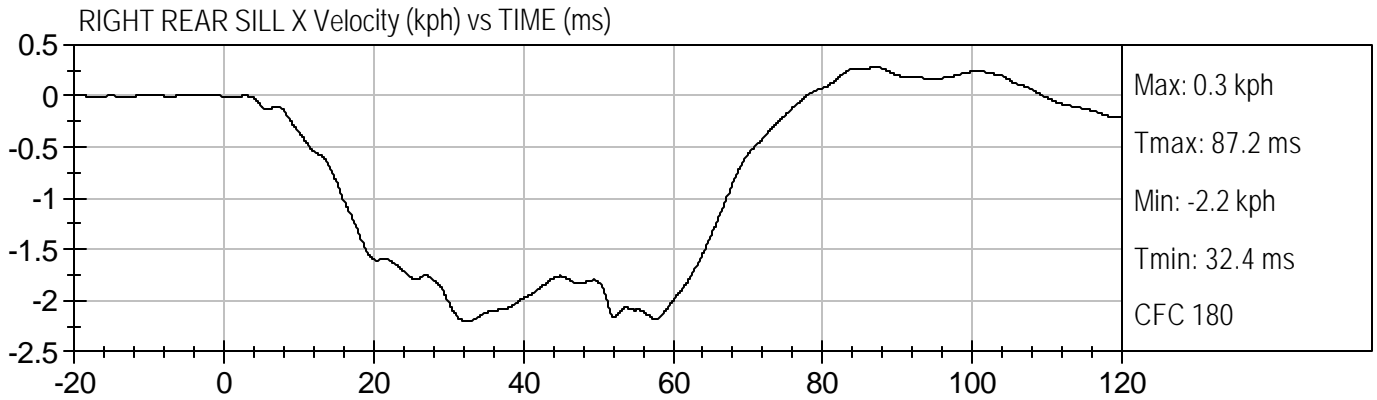


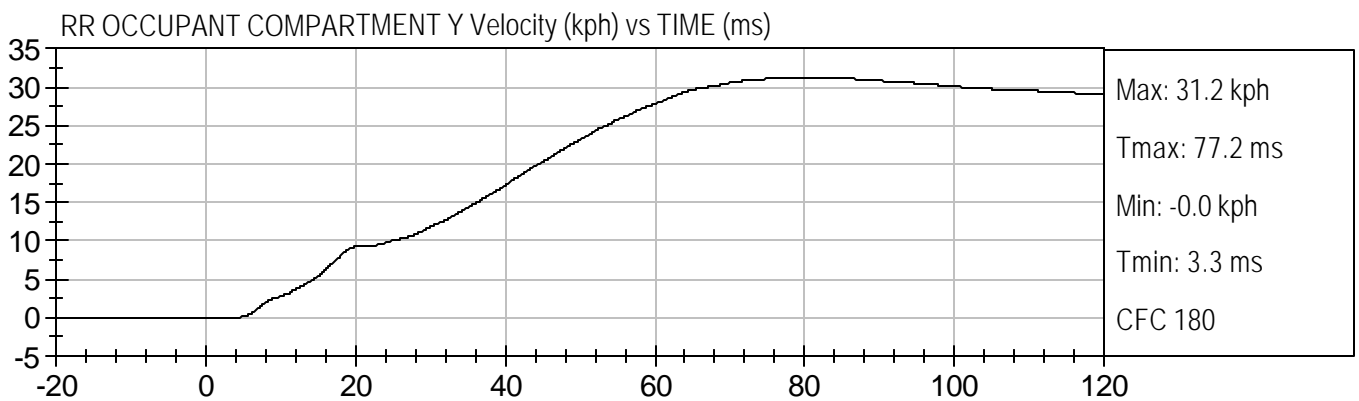
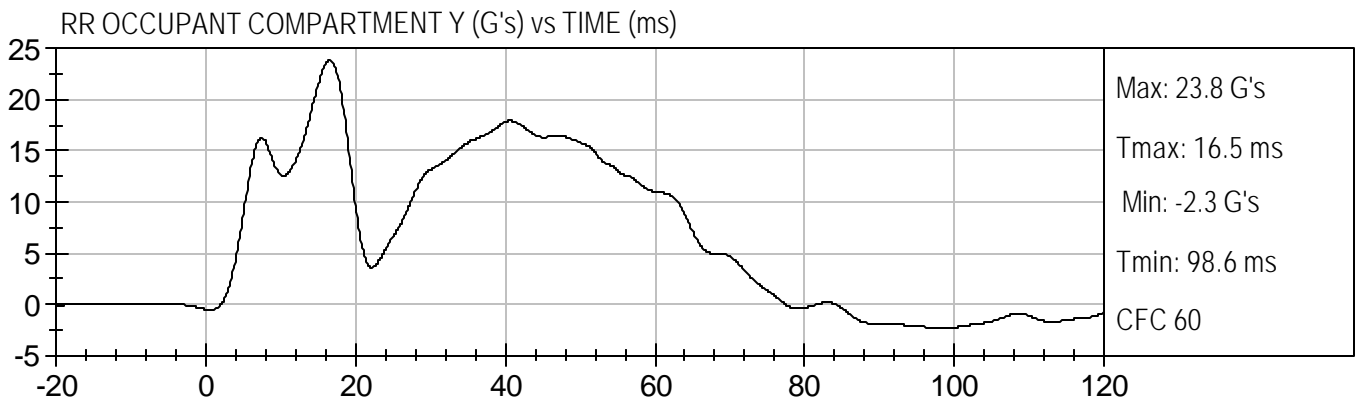
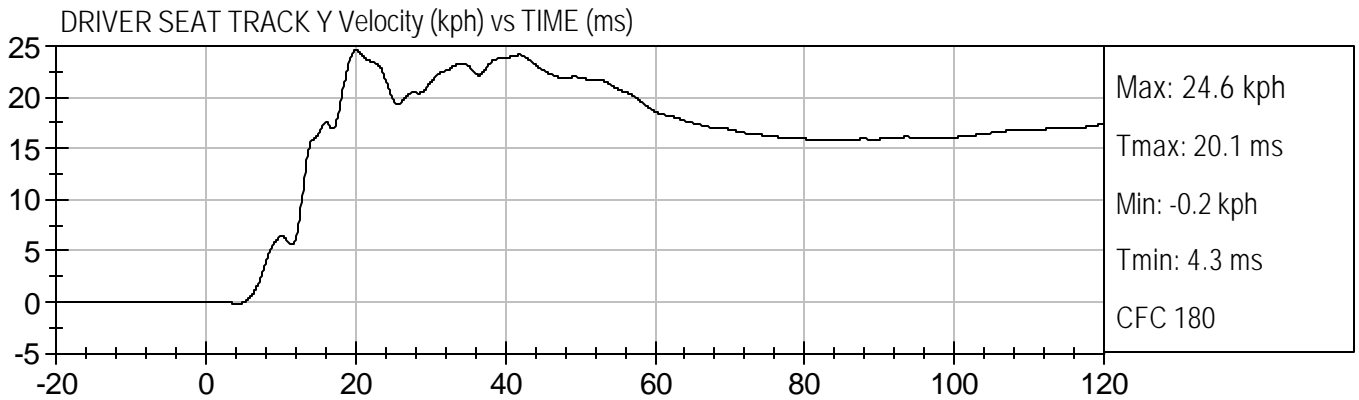
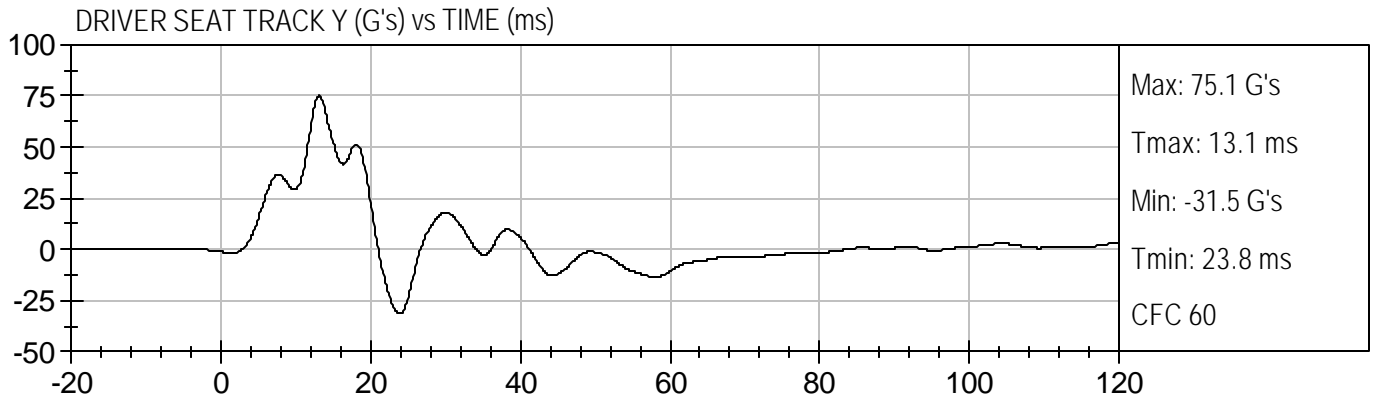


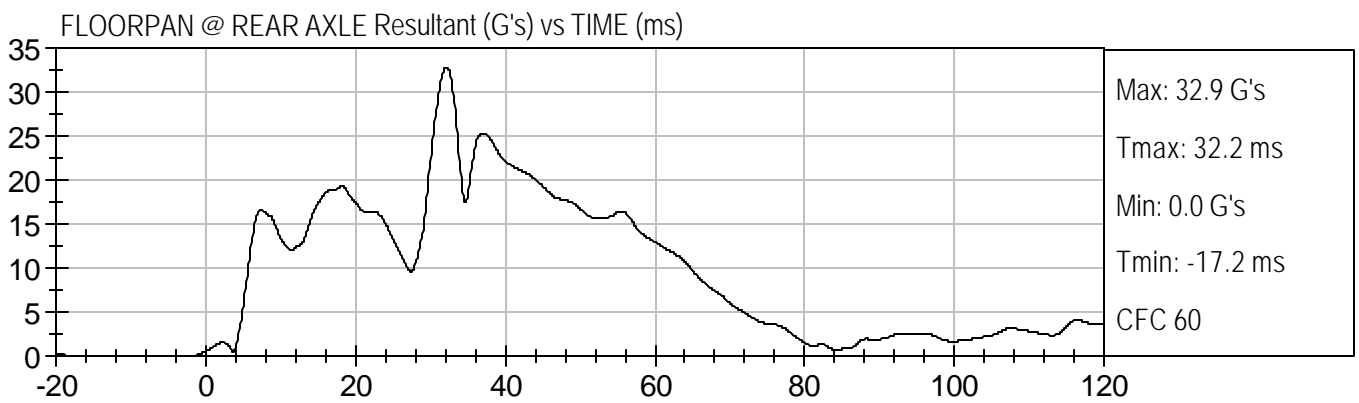
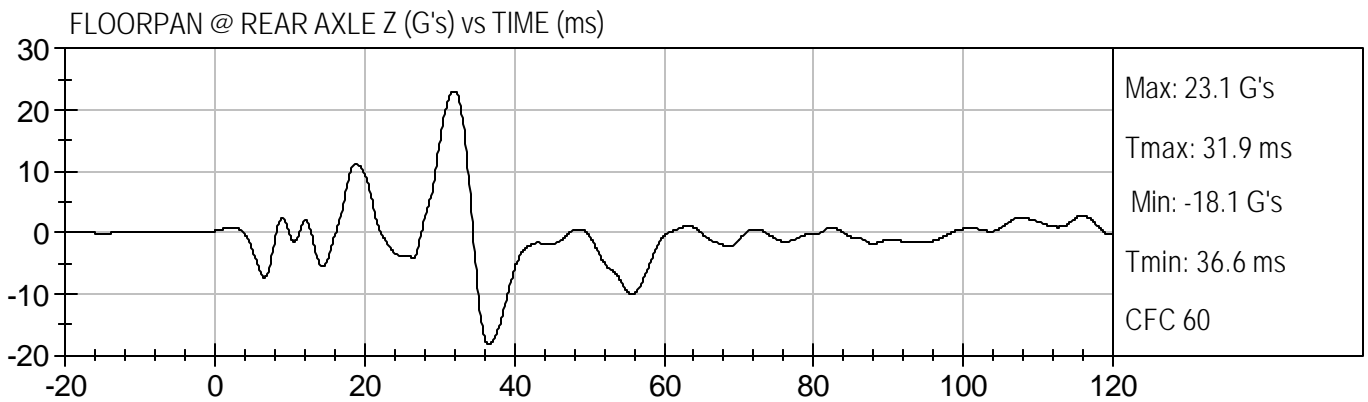
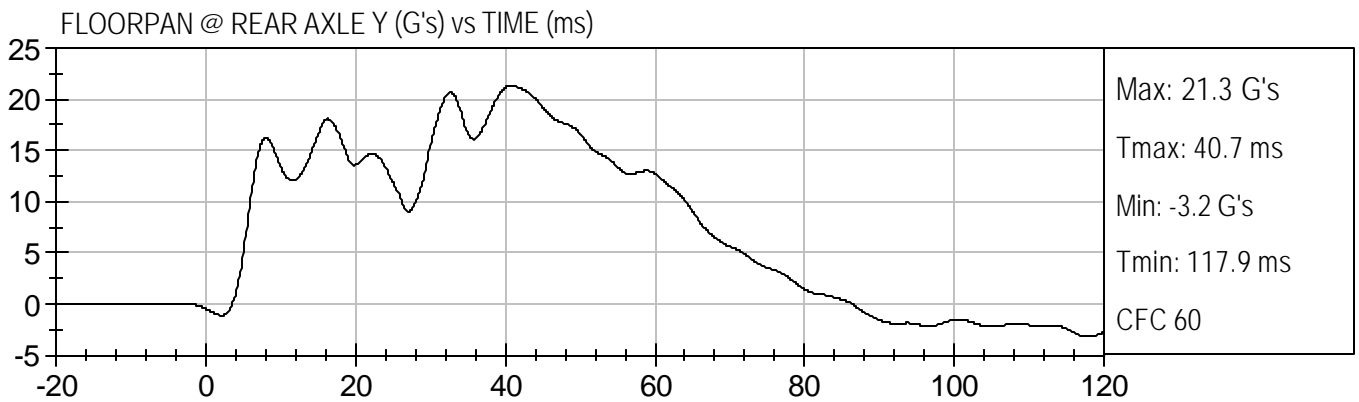
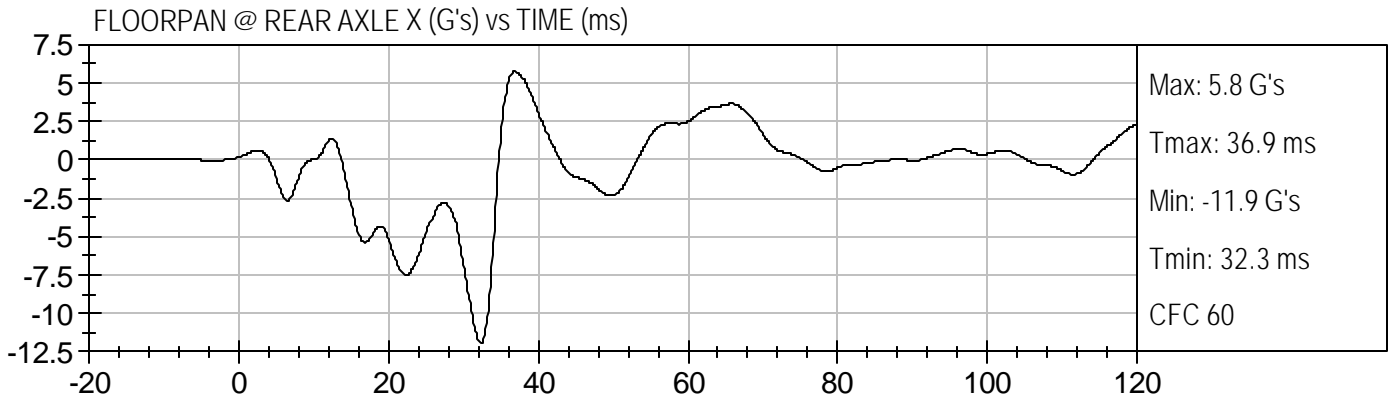






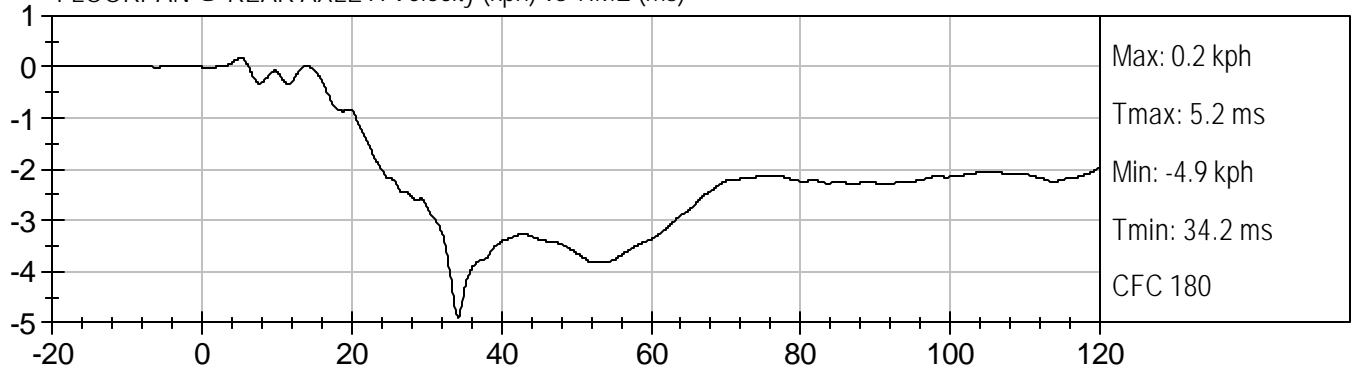




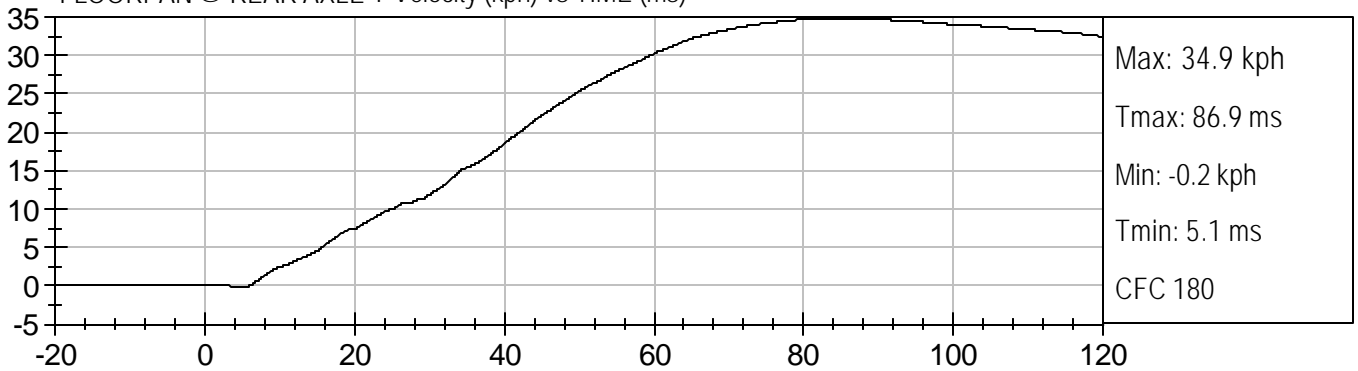




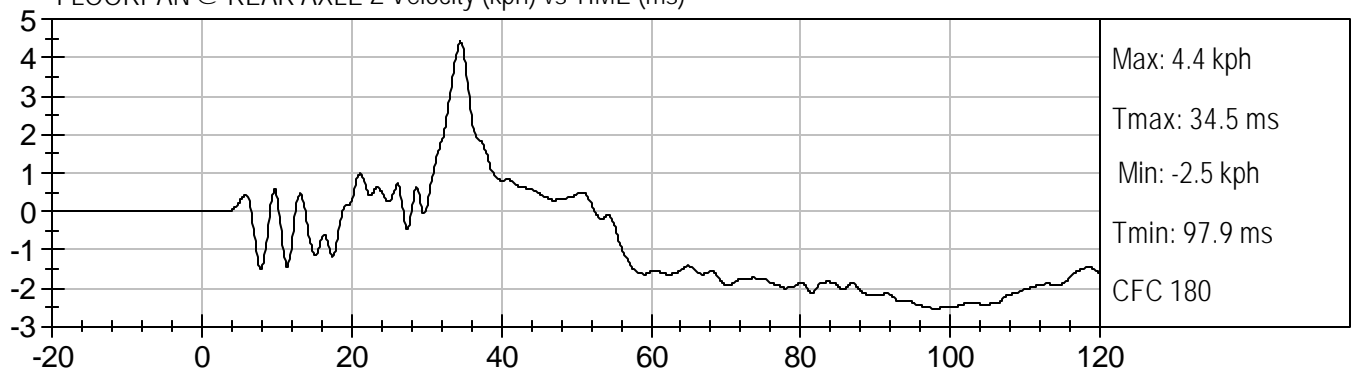
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)

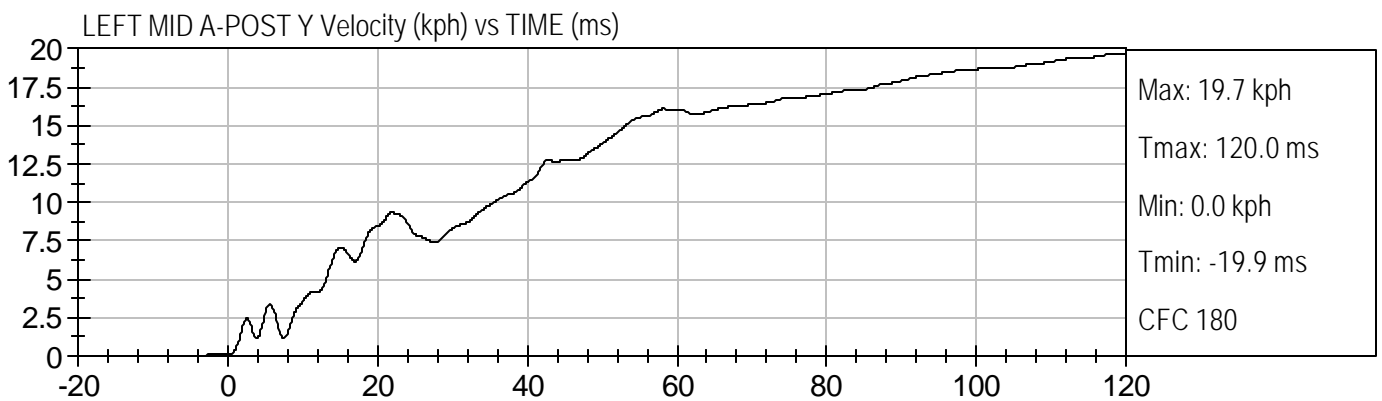
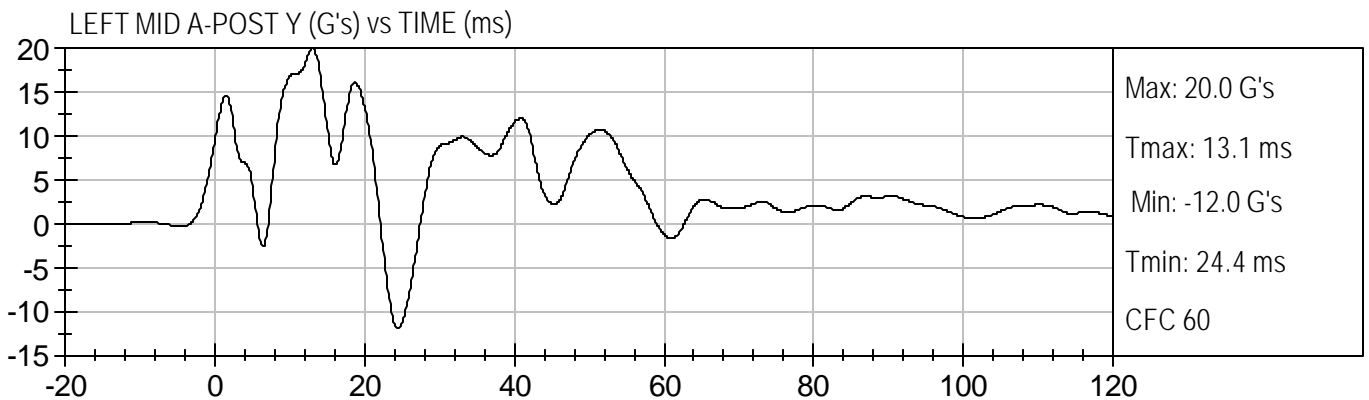
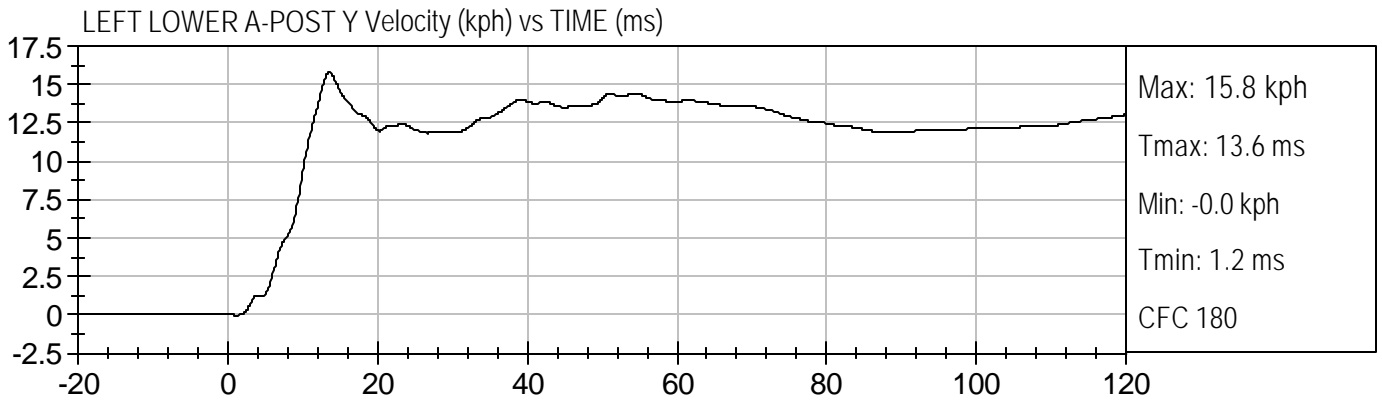
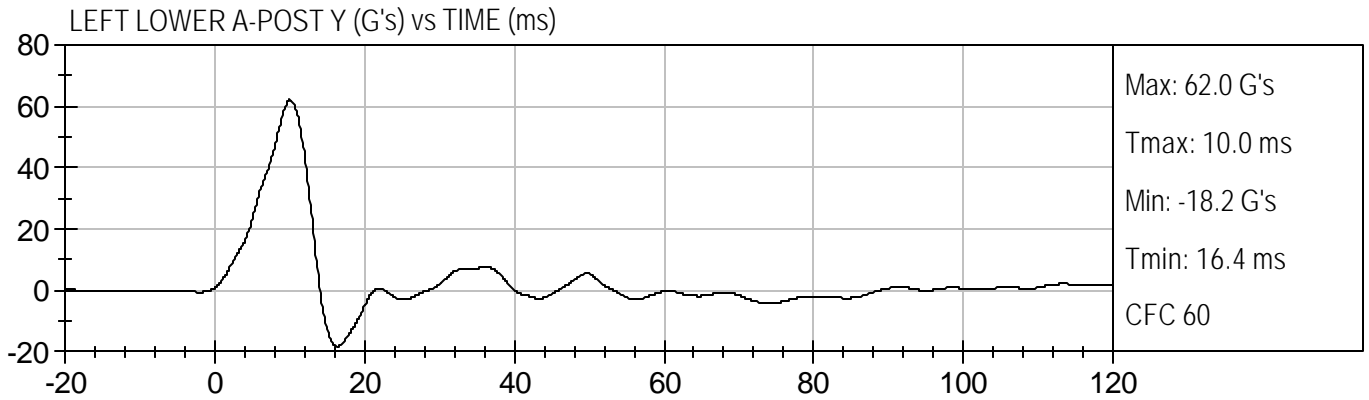


FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)



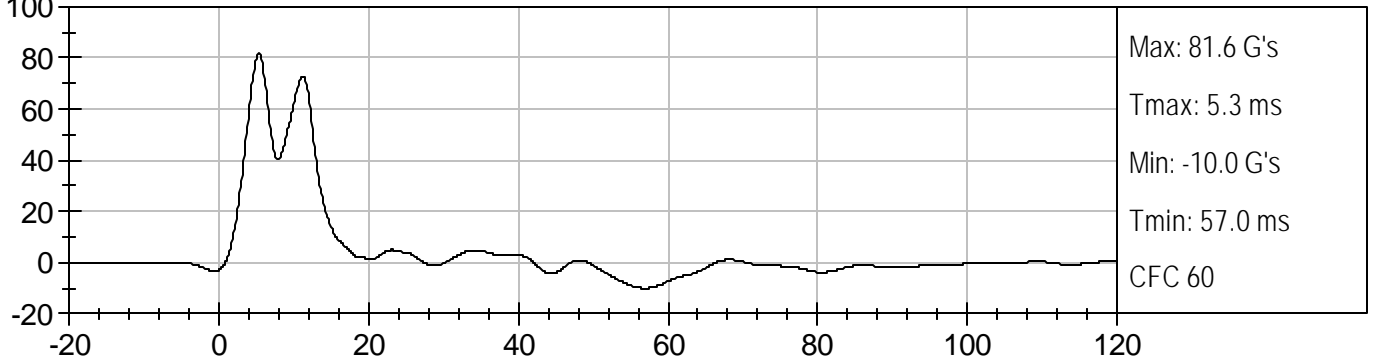
FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)



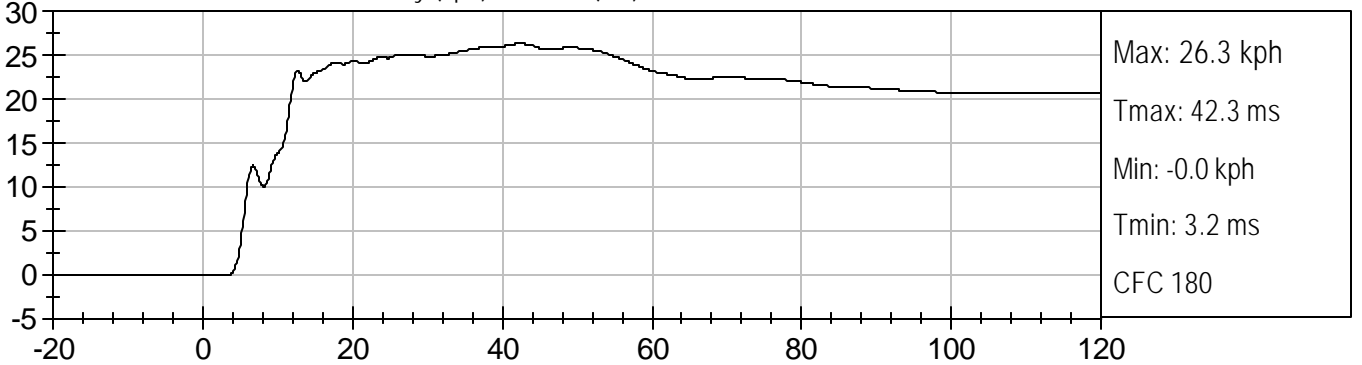




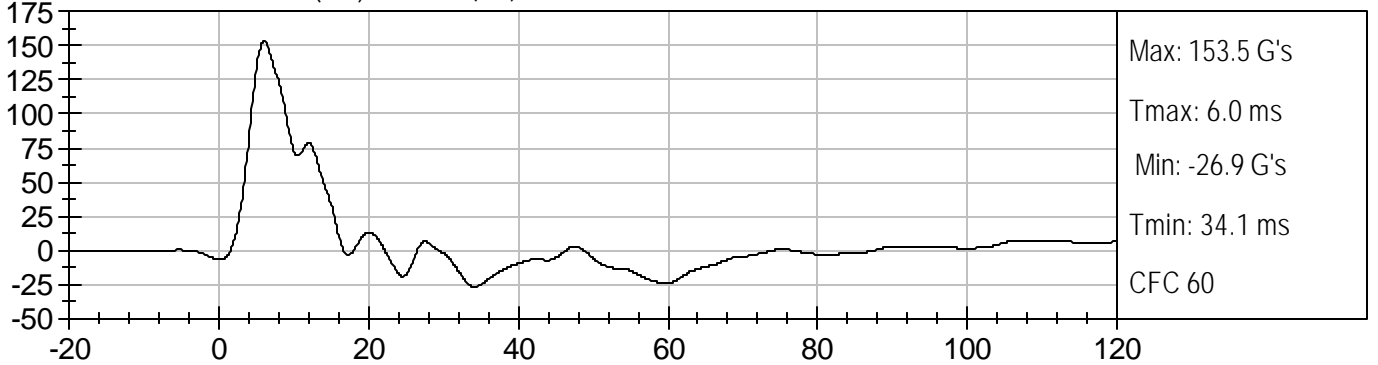
LEFT LOWER B-POST Y (G's) vs TIME (ms)



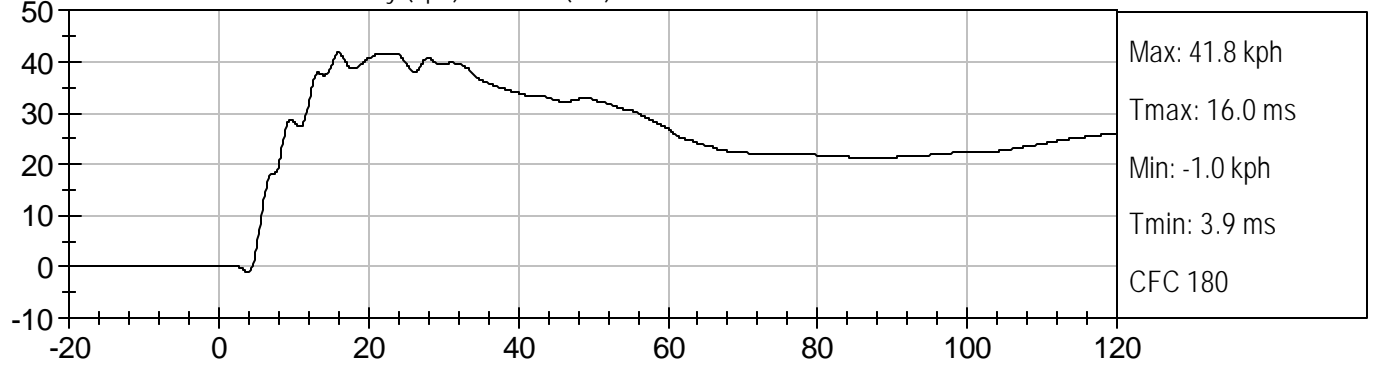
LEFT LOWER B-POST Y Velocity (kph) vs TIME (ms)

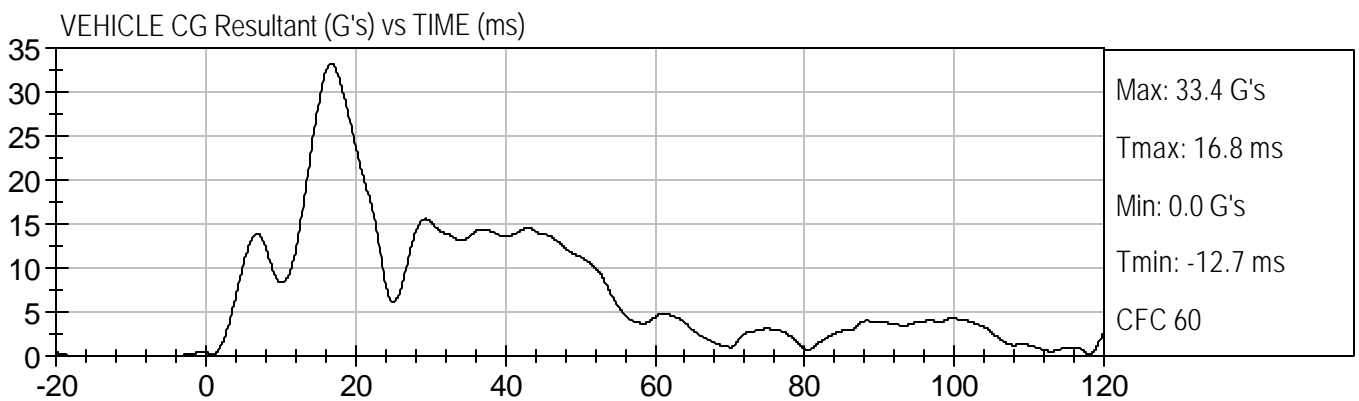
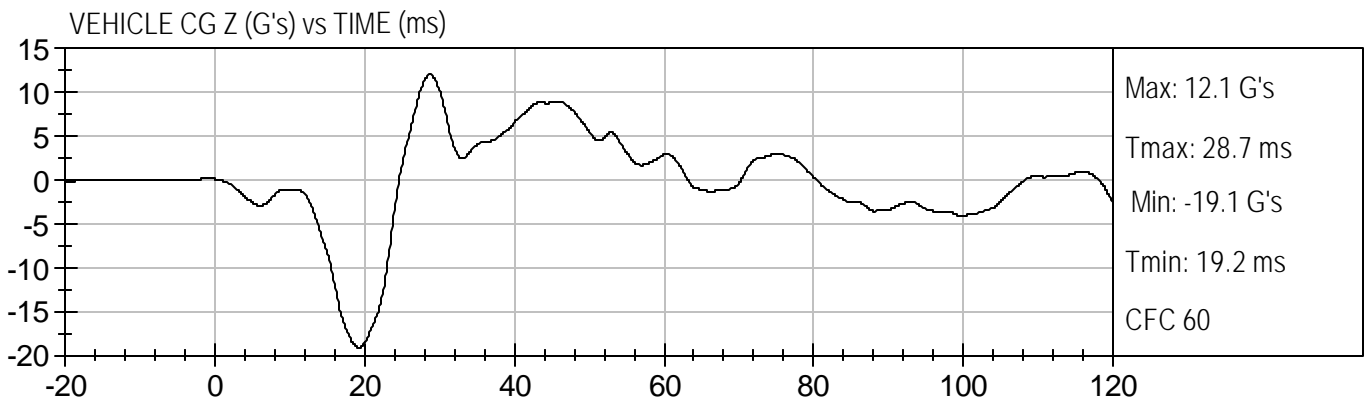
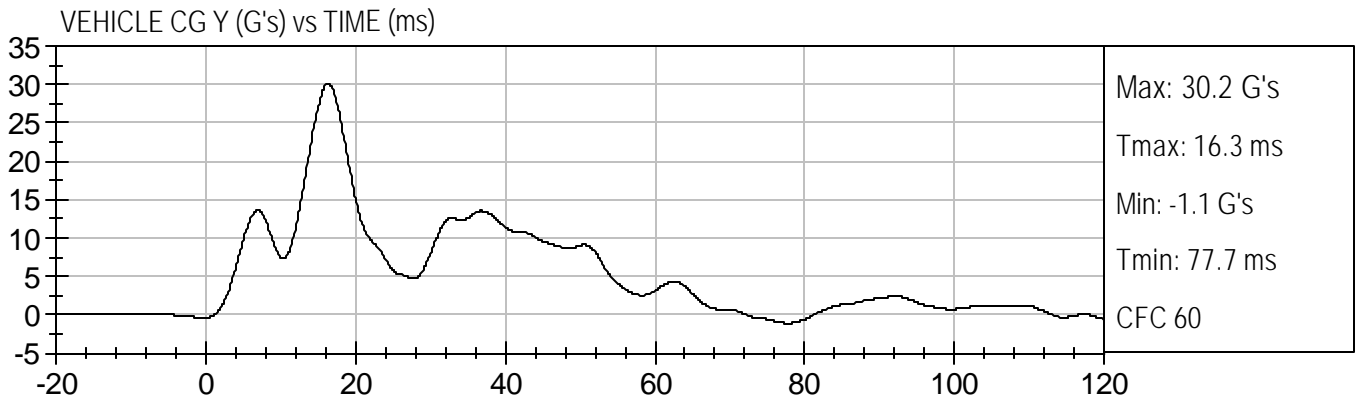
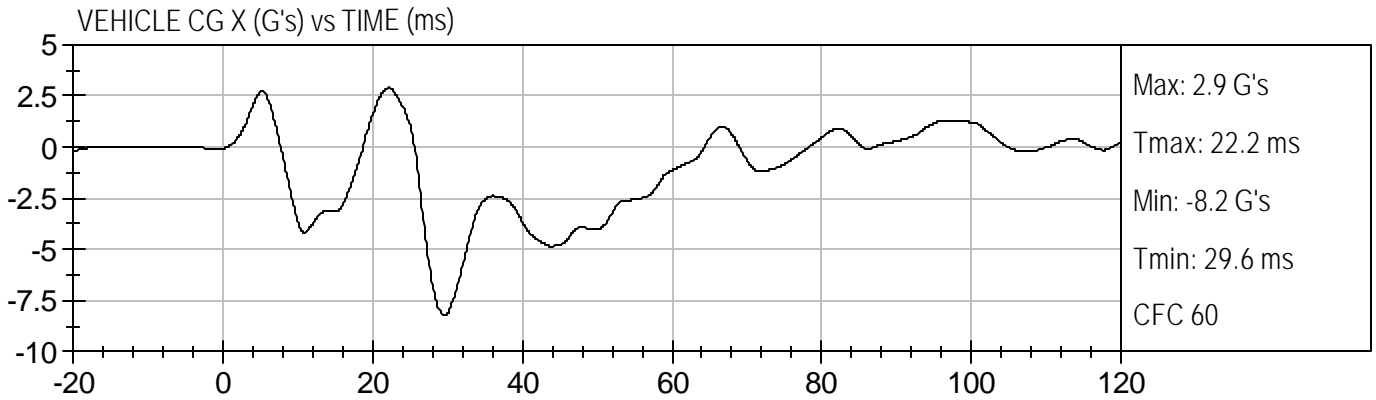


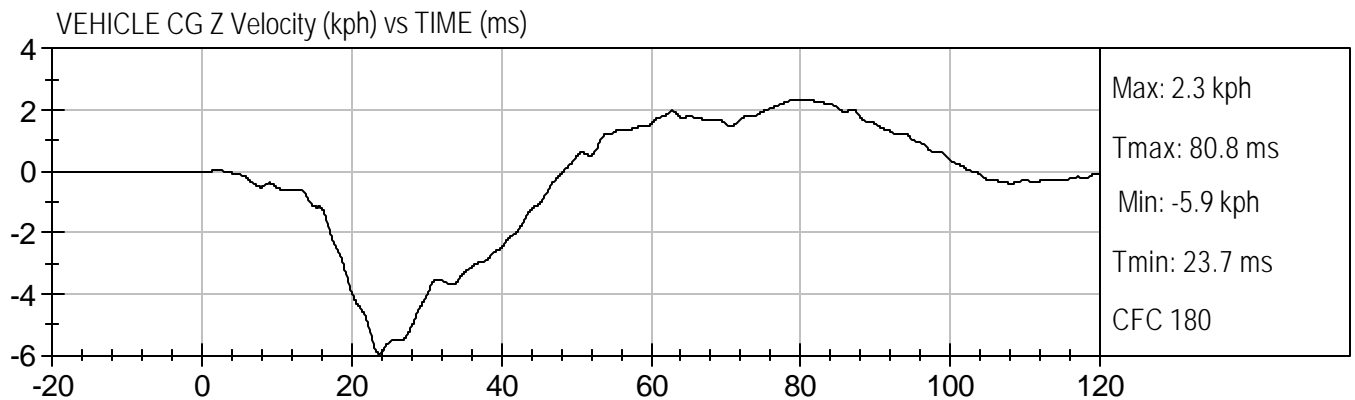
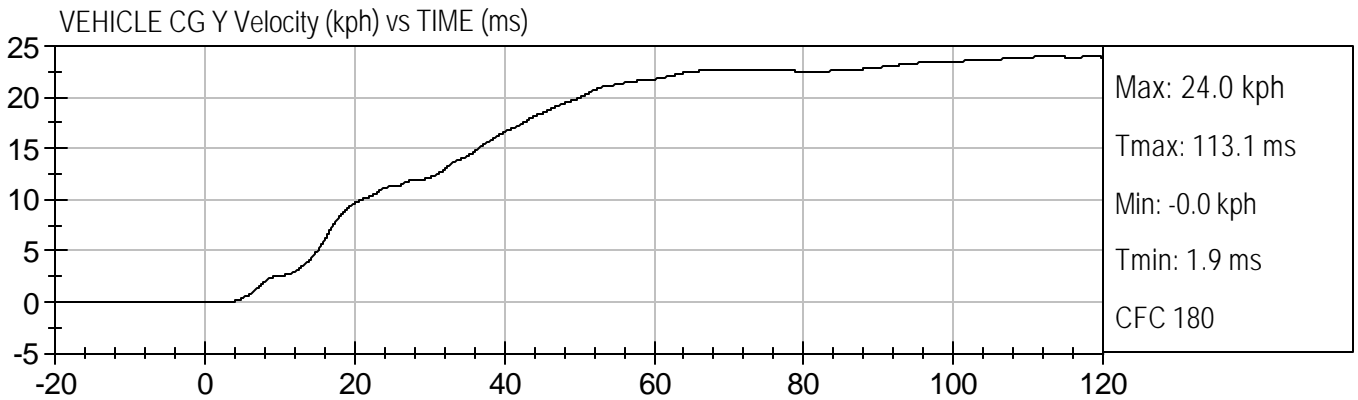
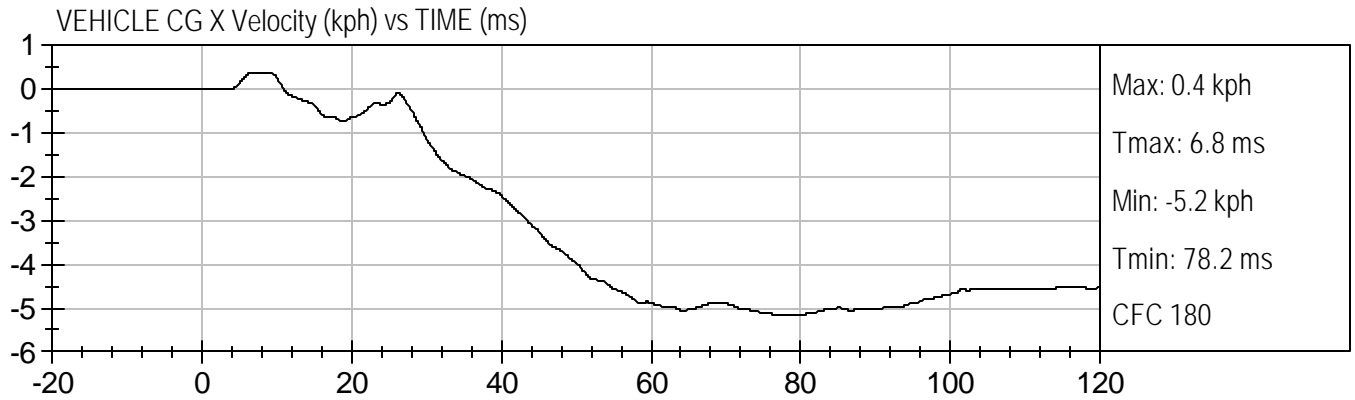
LEFT MID B-POST Y (G's) vs TIME (ms)

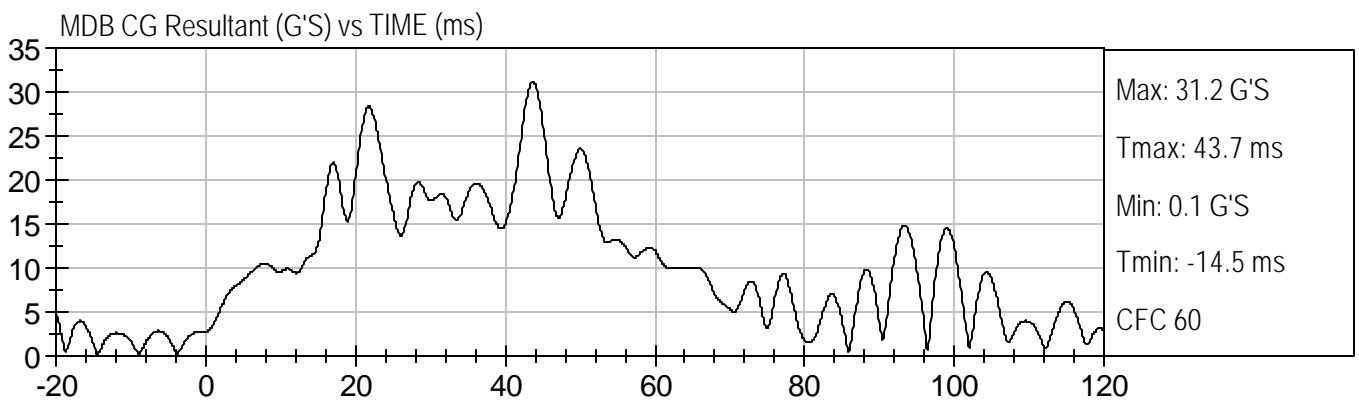
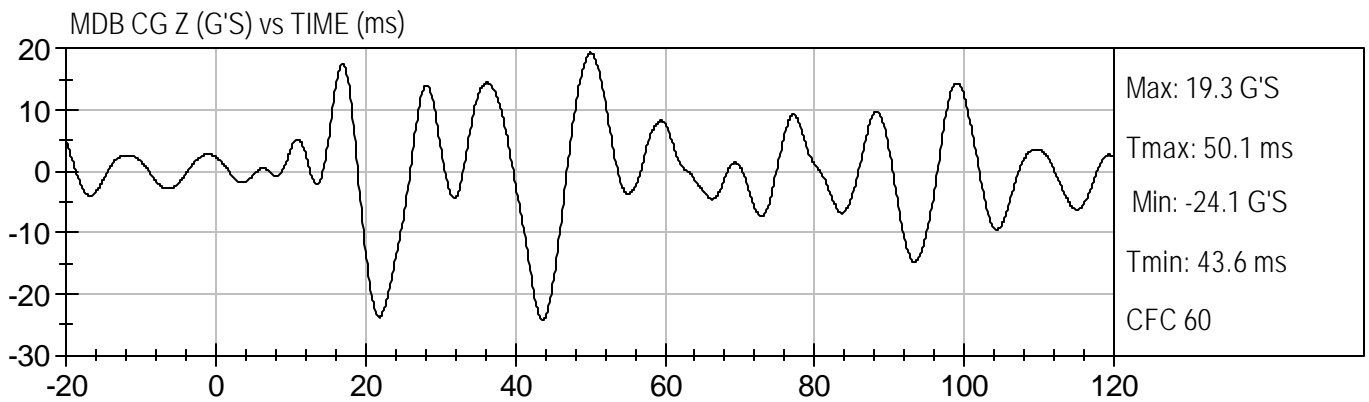
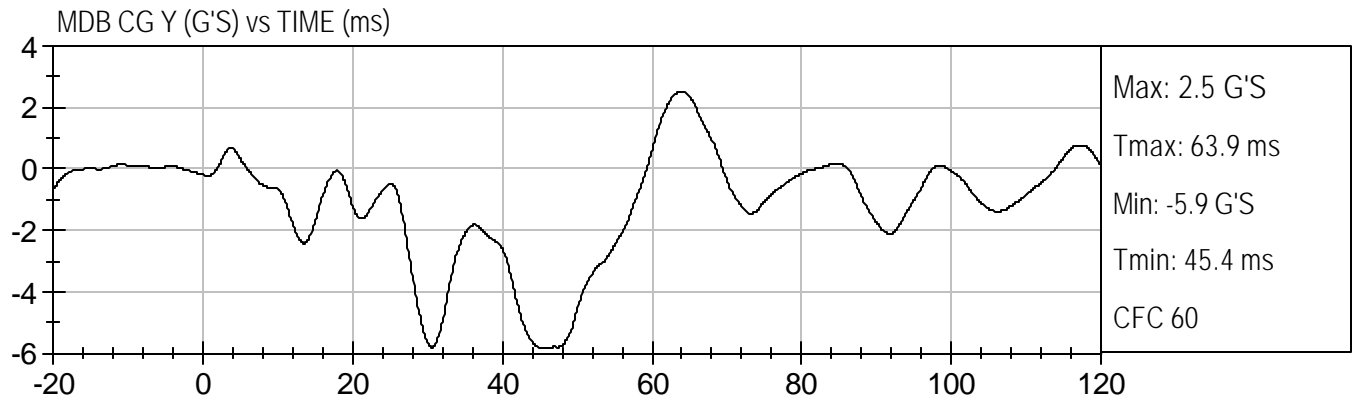
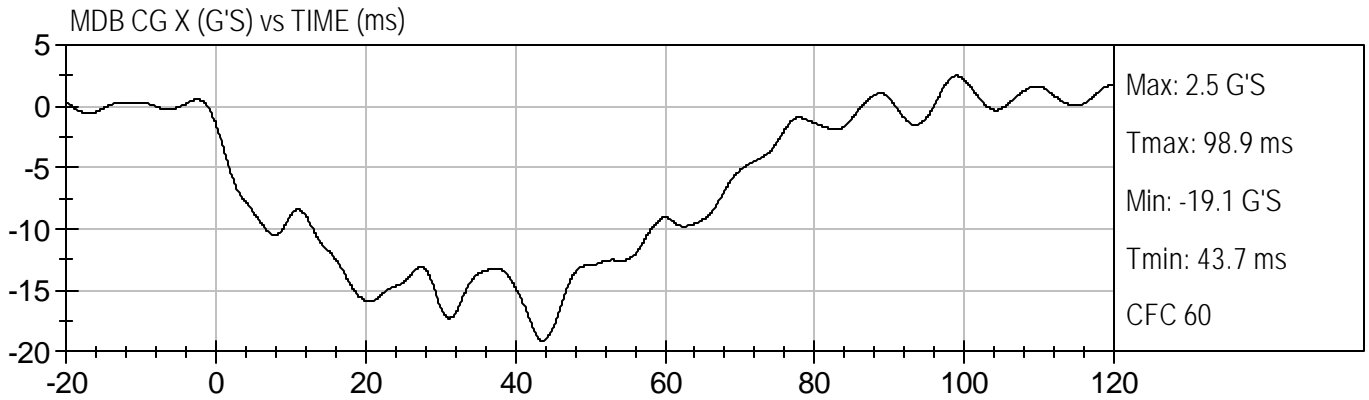


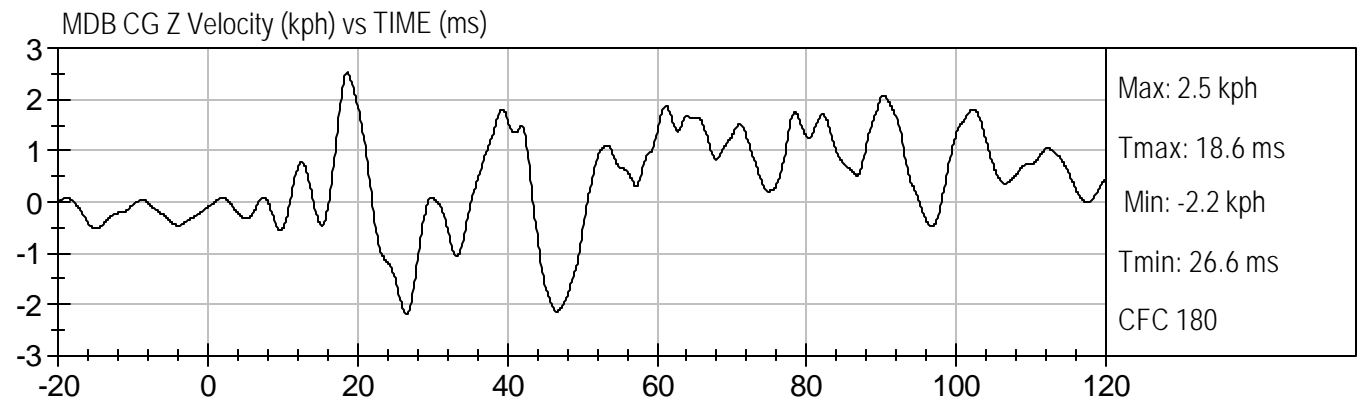
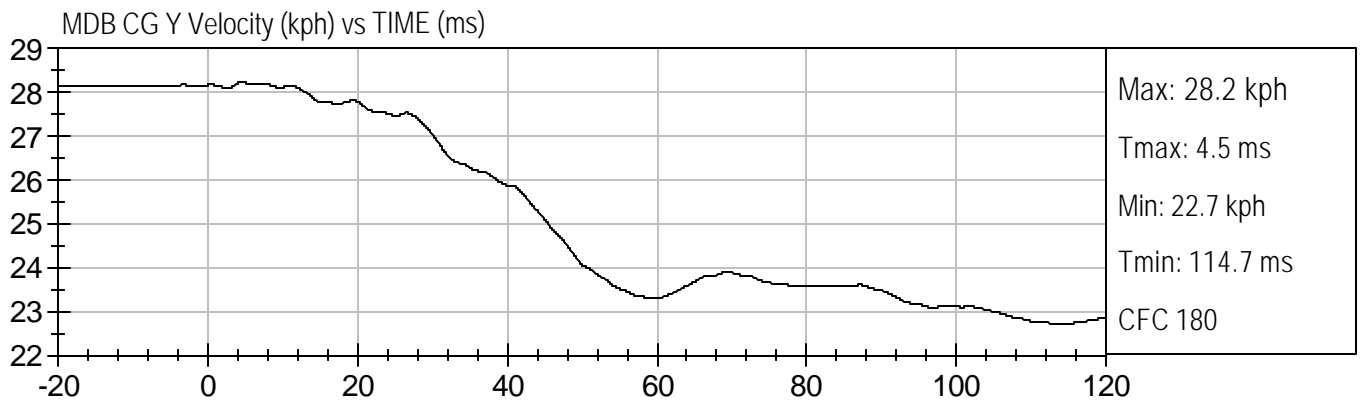
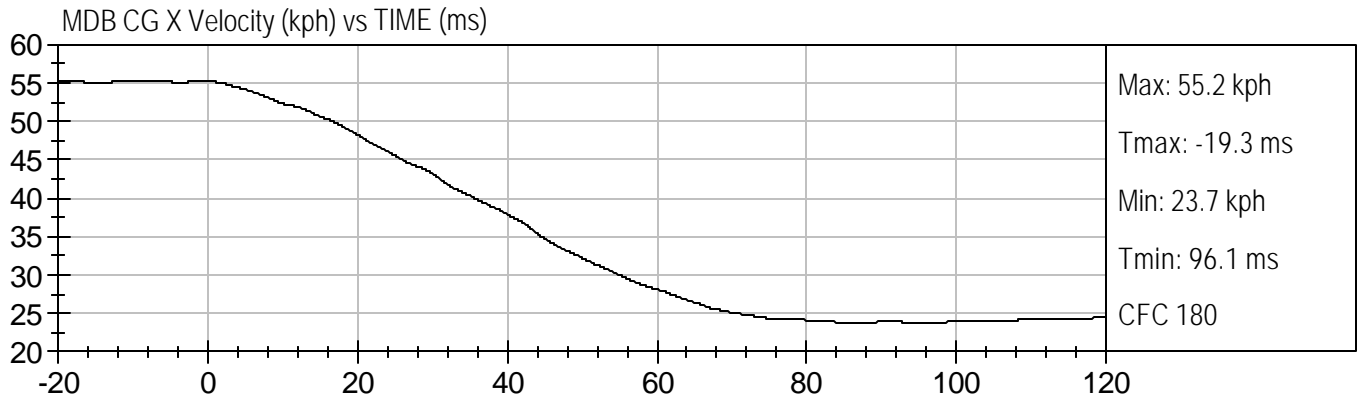
LEFT MID B-POST Y Velocity (kph) vs TIME (ms)

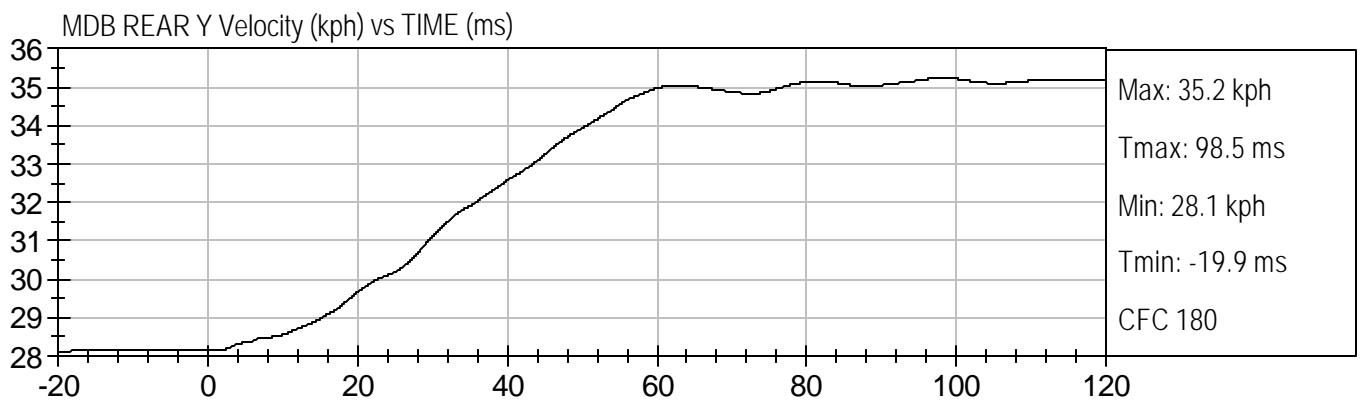
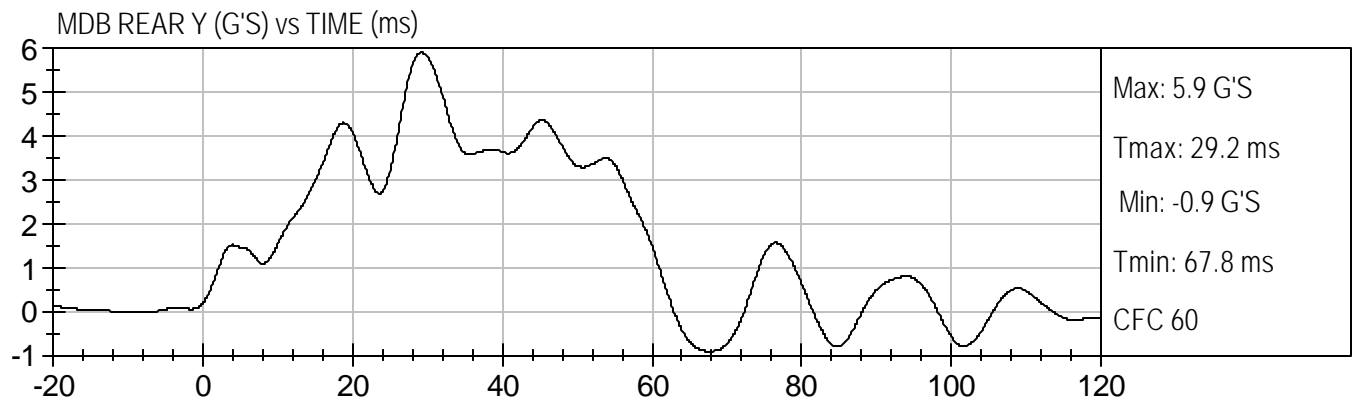
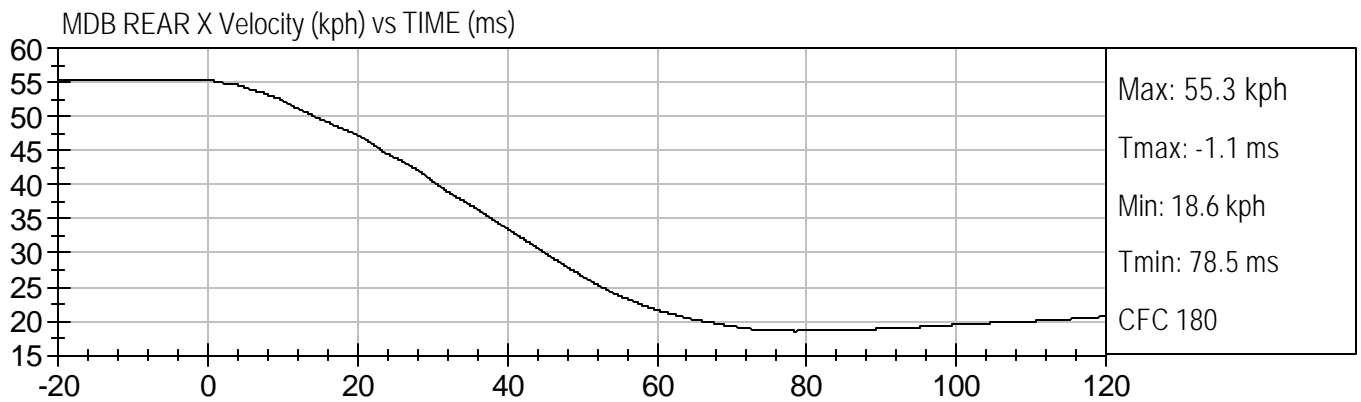
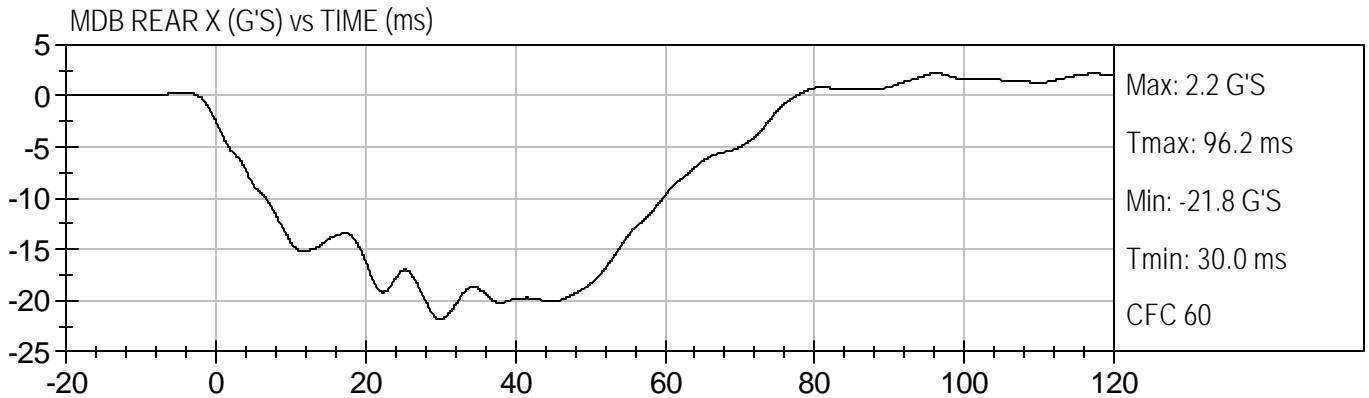








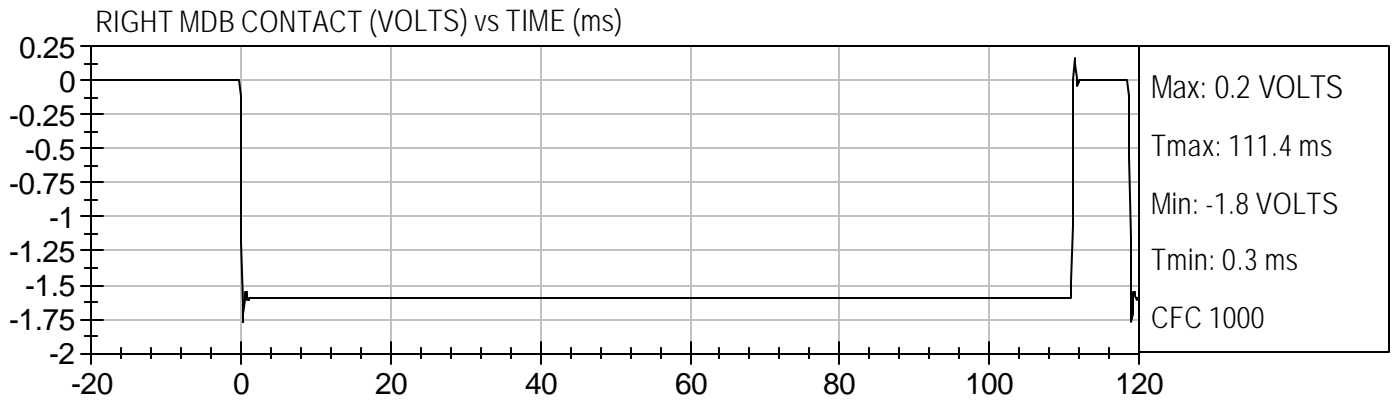
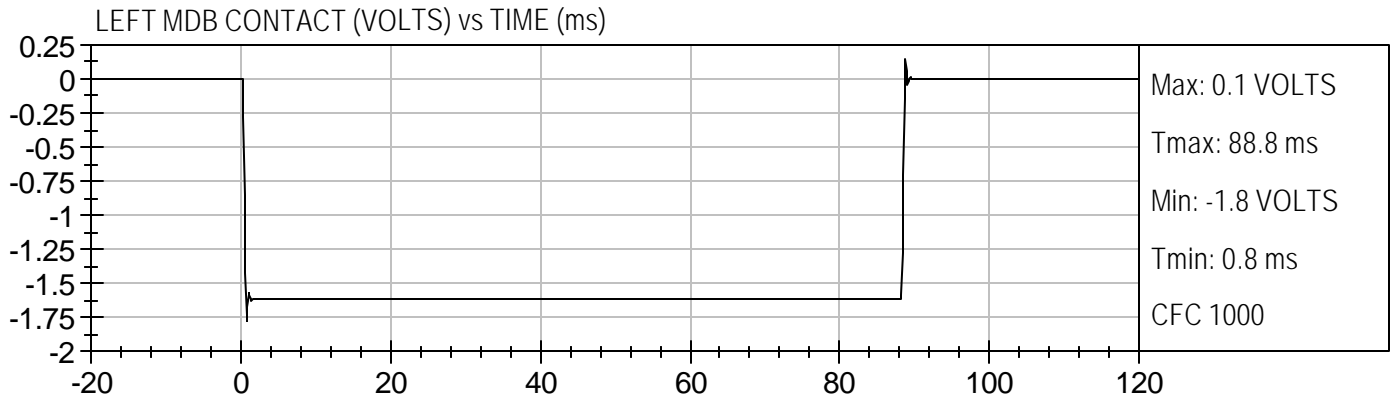


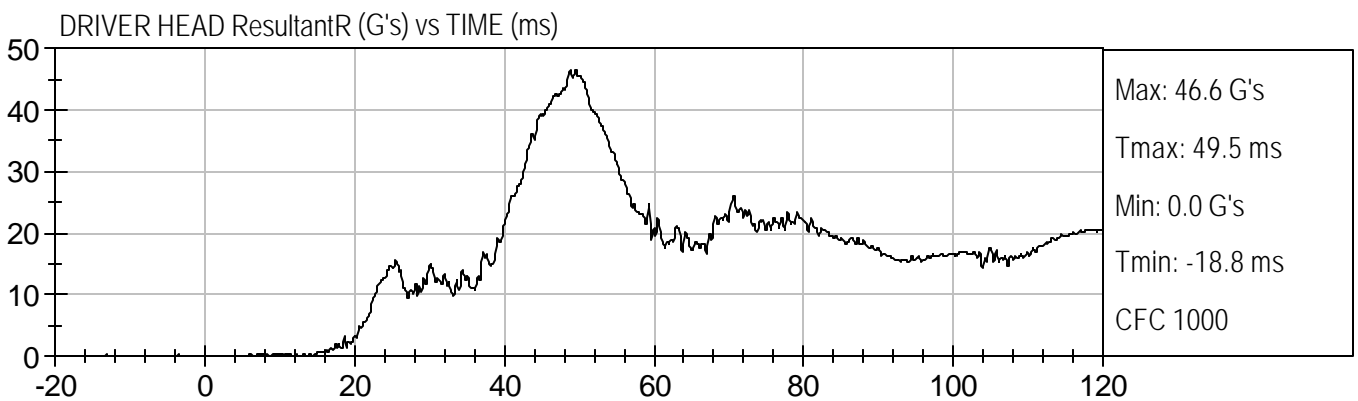
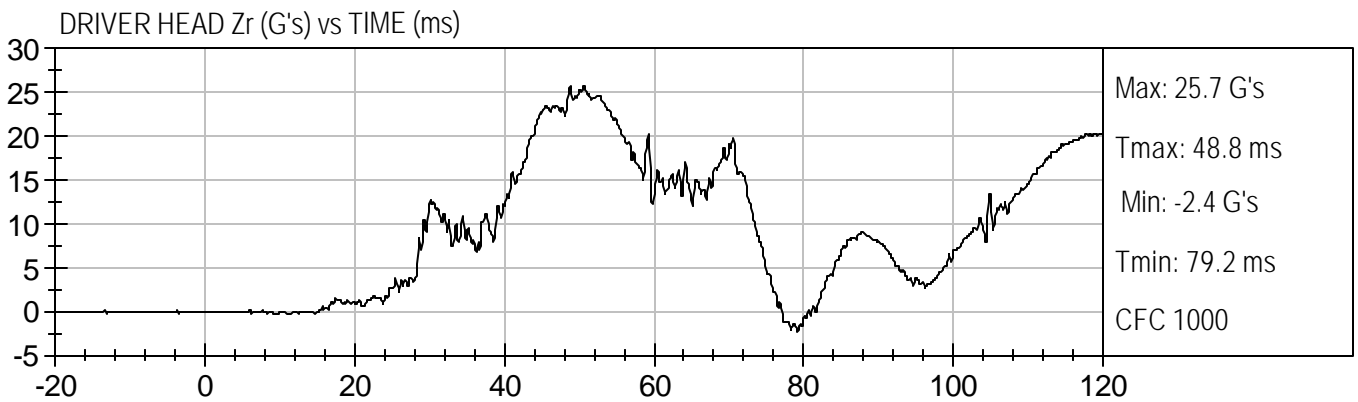
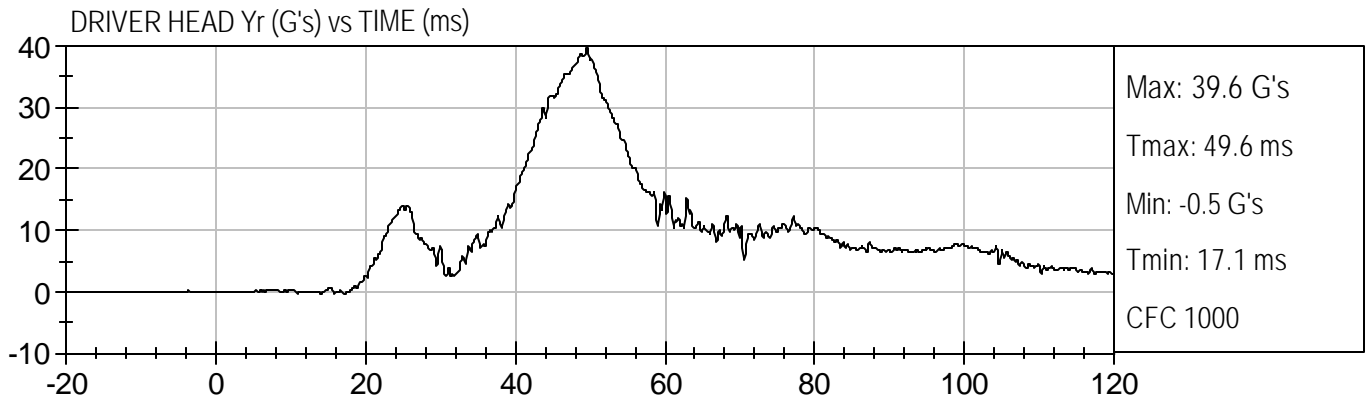
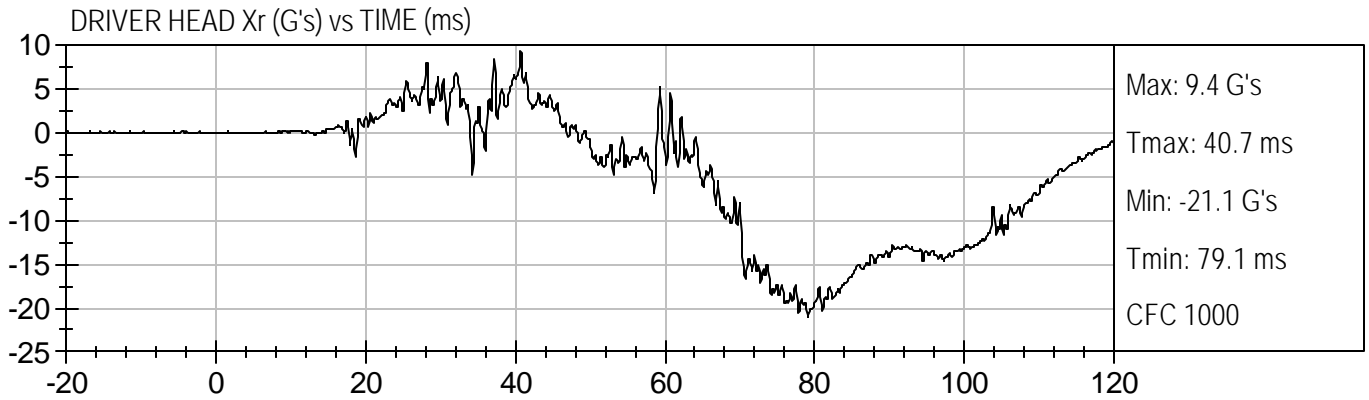


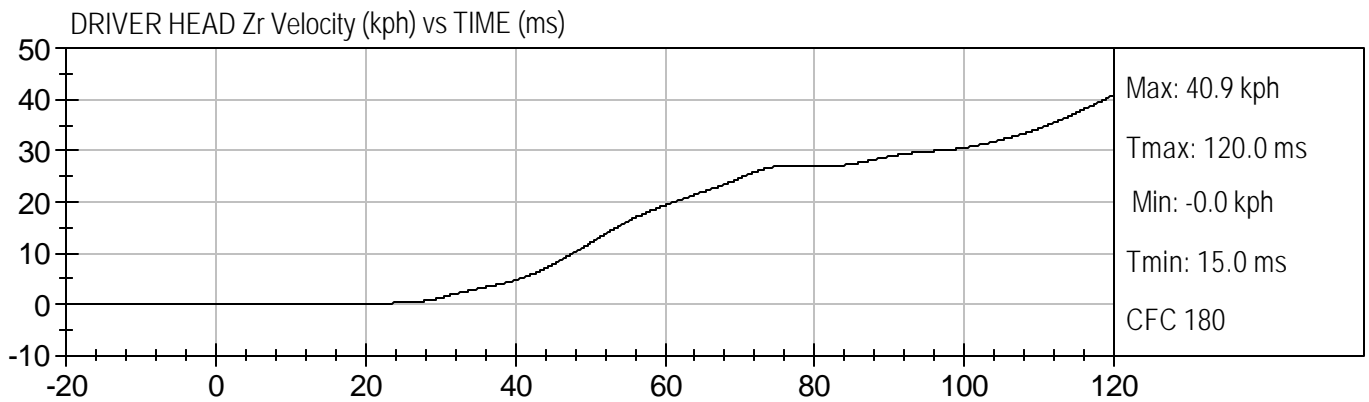
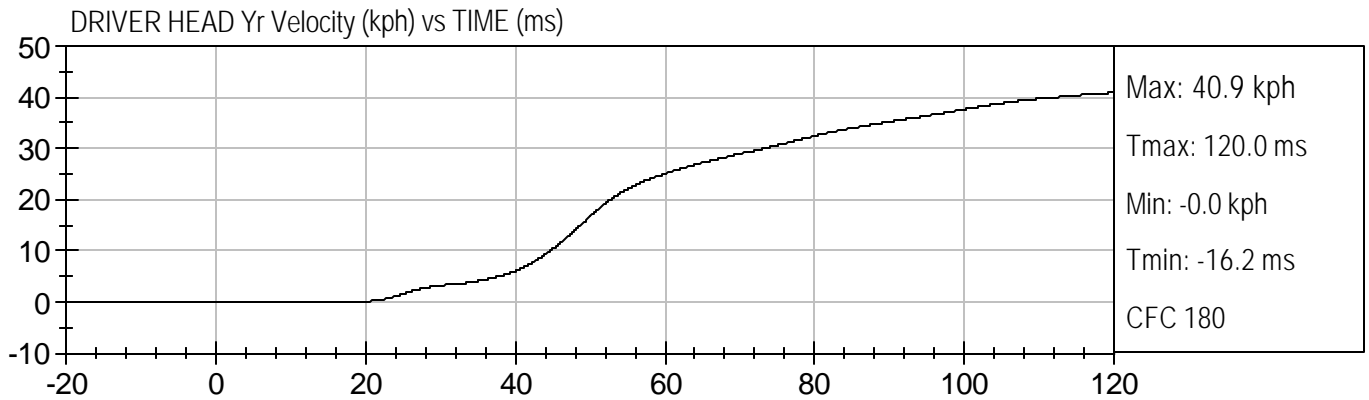
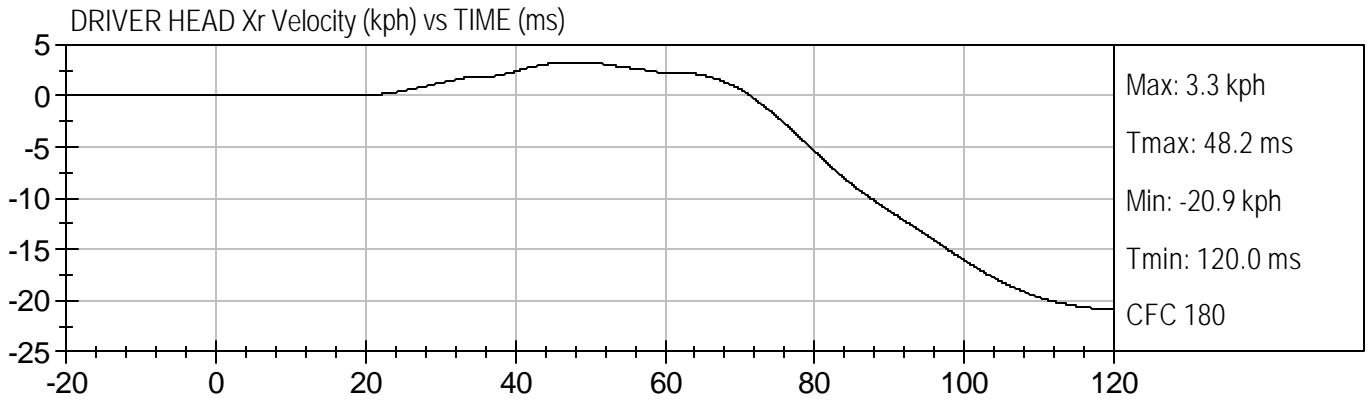


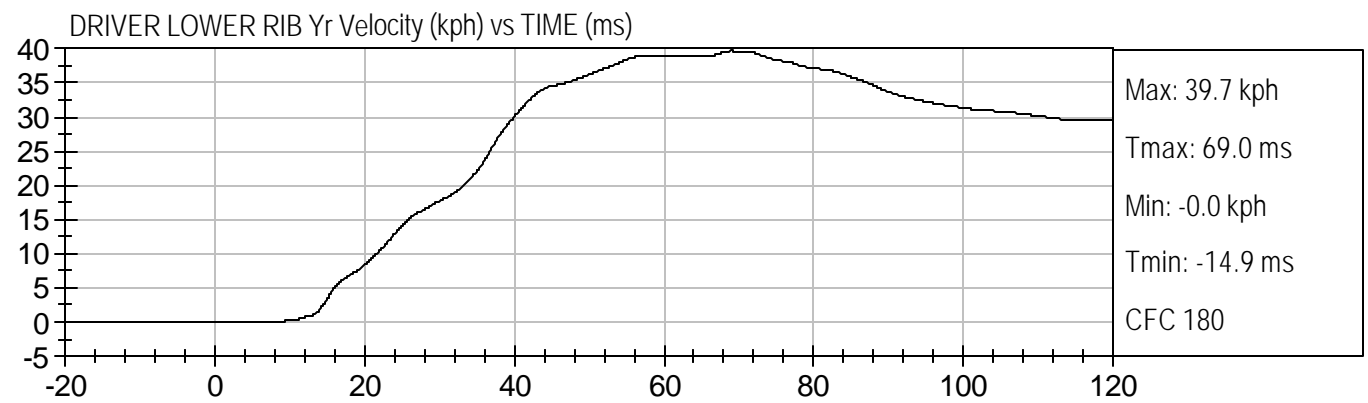
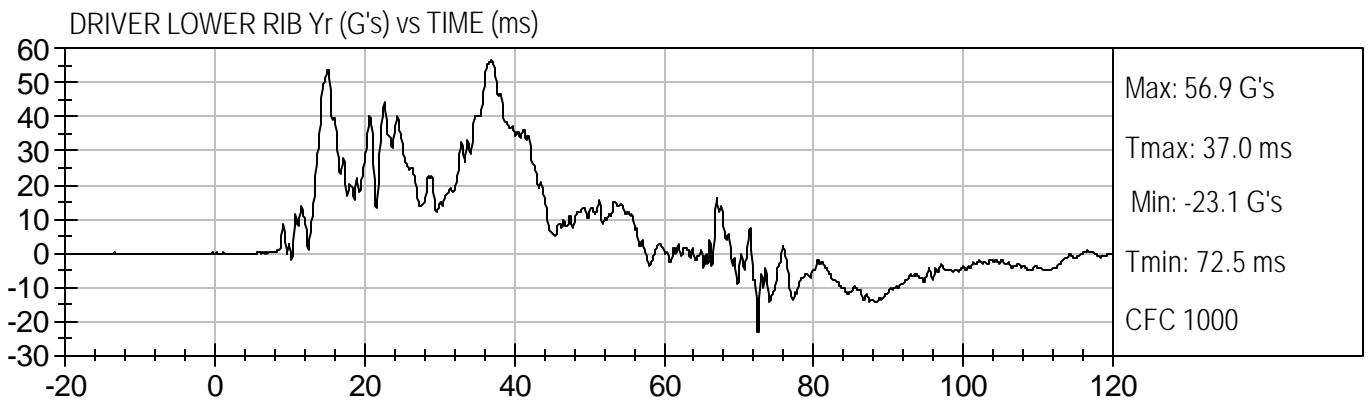
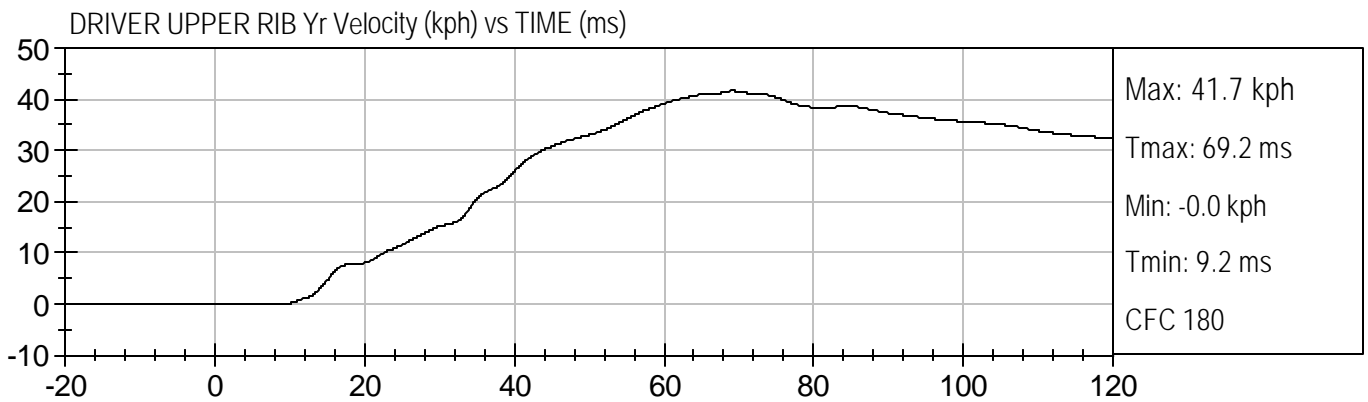
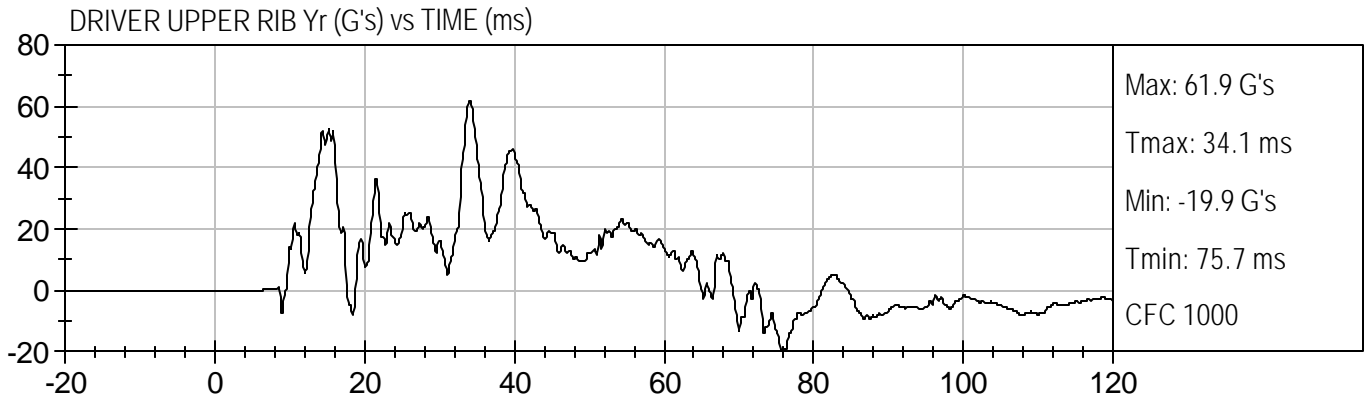
90 DEGREE INDICANT SIDE IMPACT
2002 HYUNDAI SONATA (C20501)

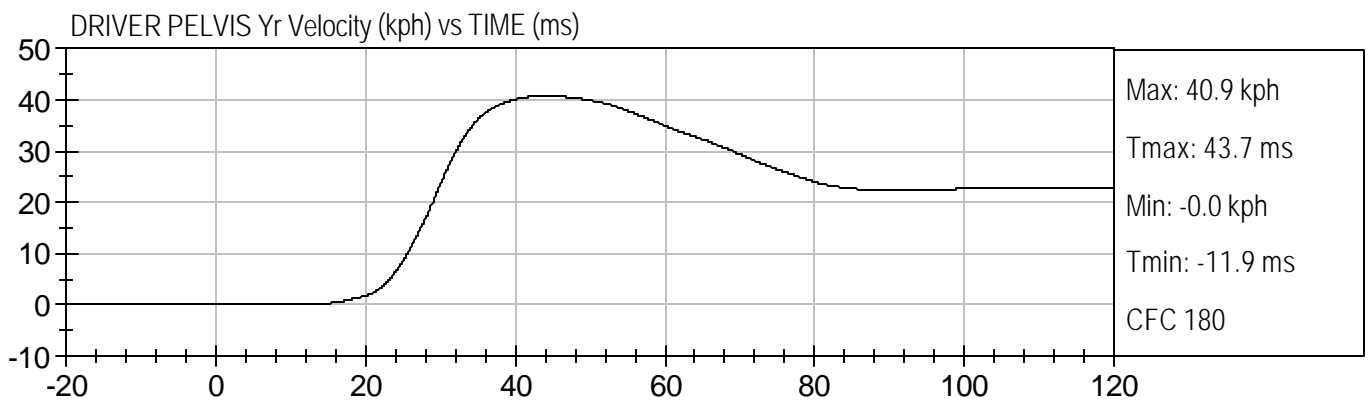
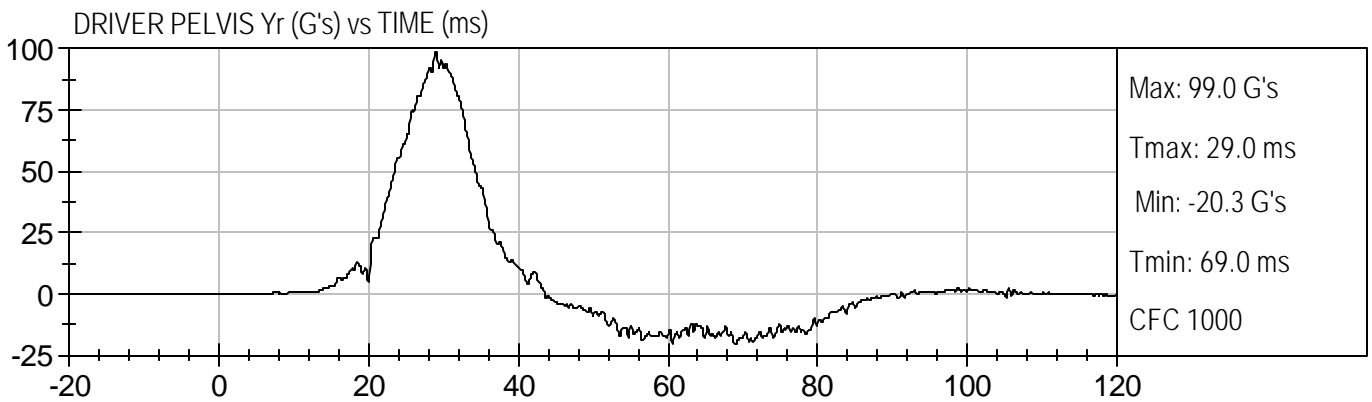
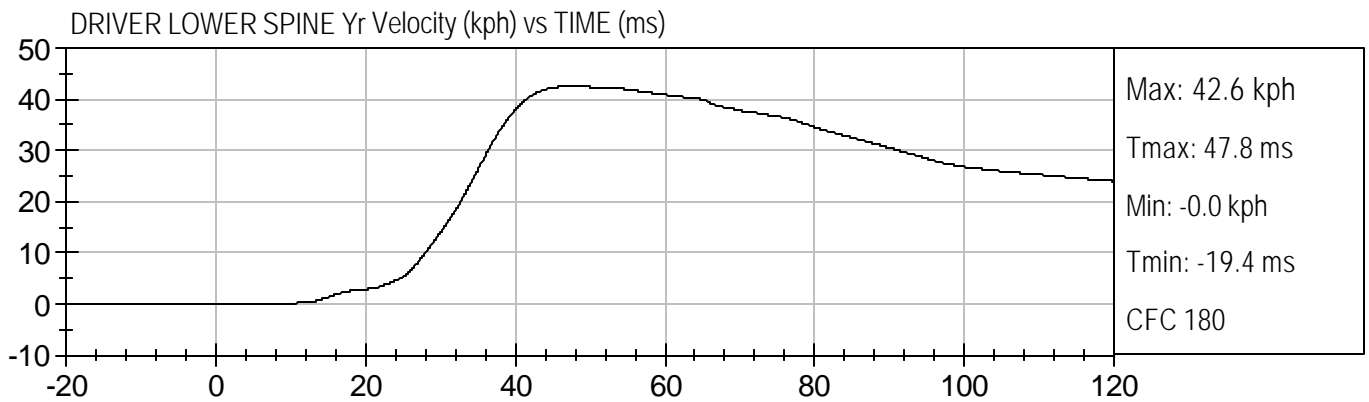
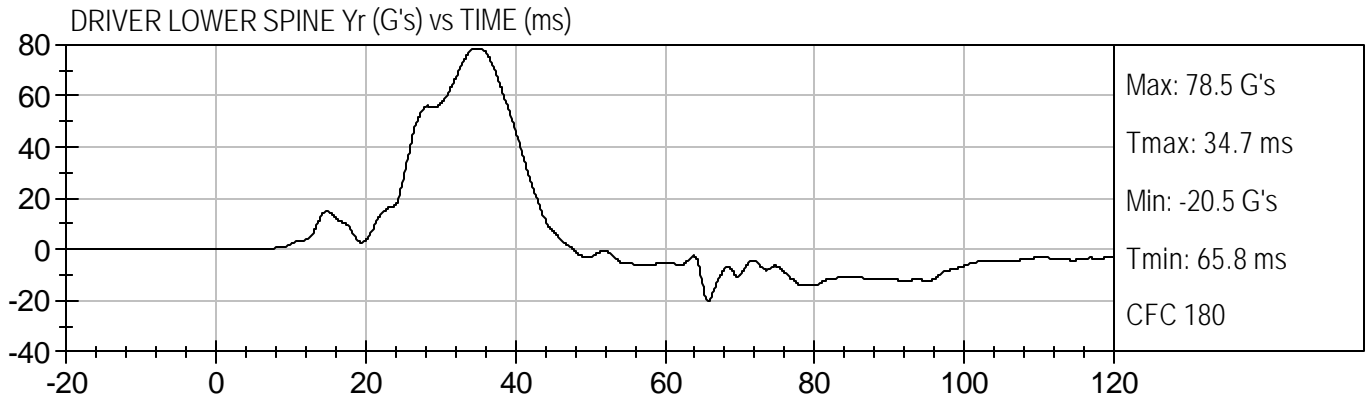
Test Date: 2/6/02
Speed: 38.5 mph (62.0 km/h)

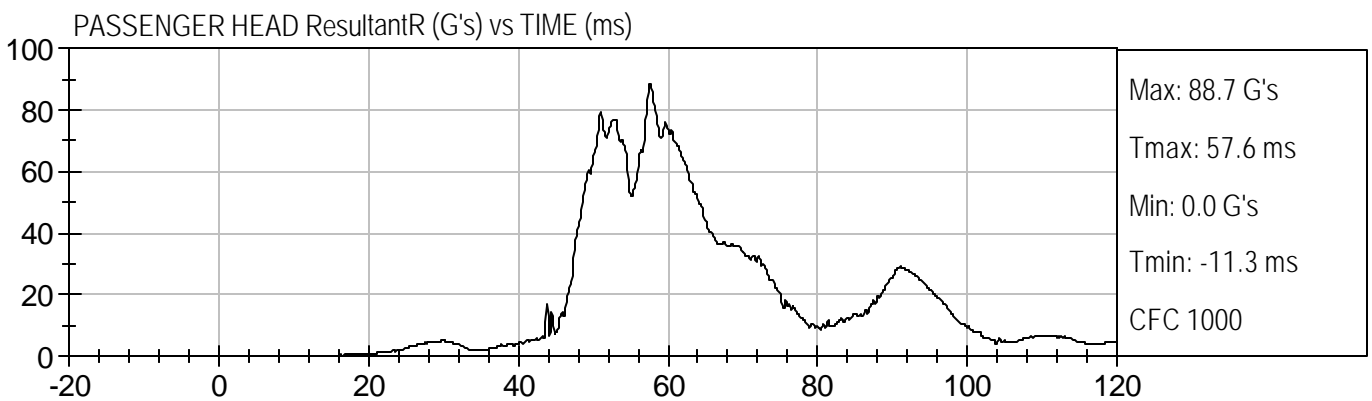
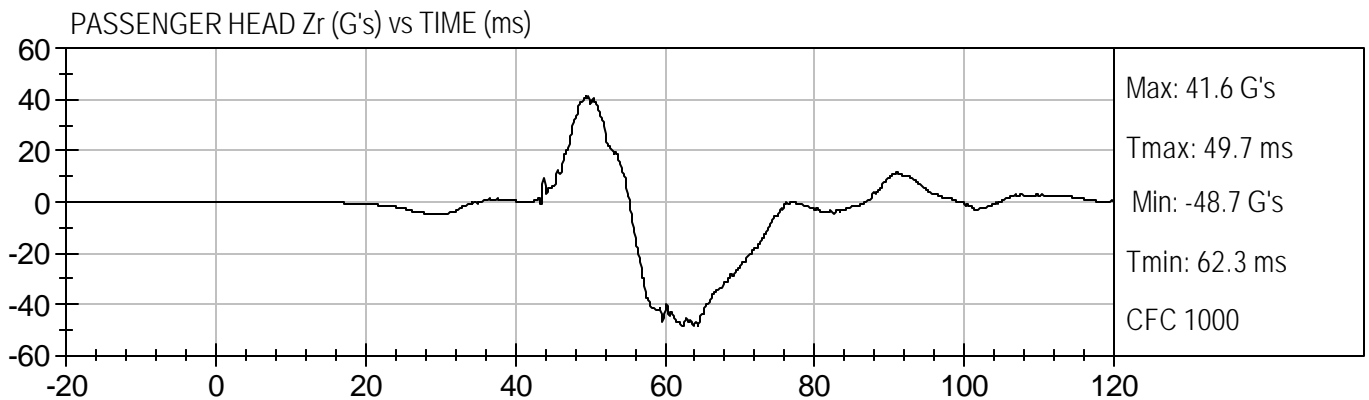
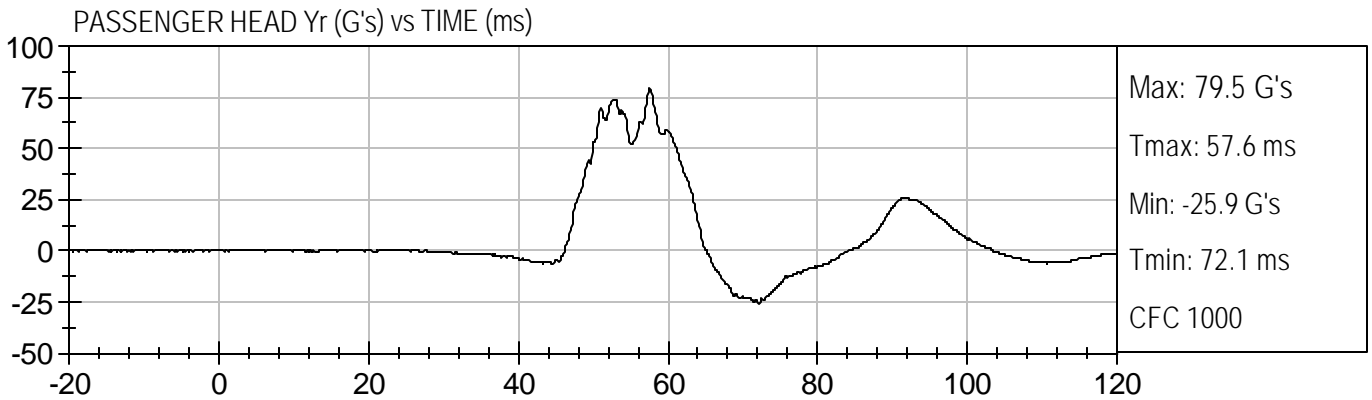
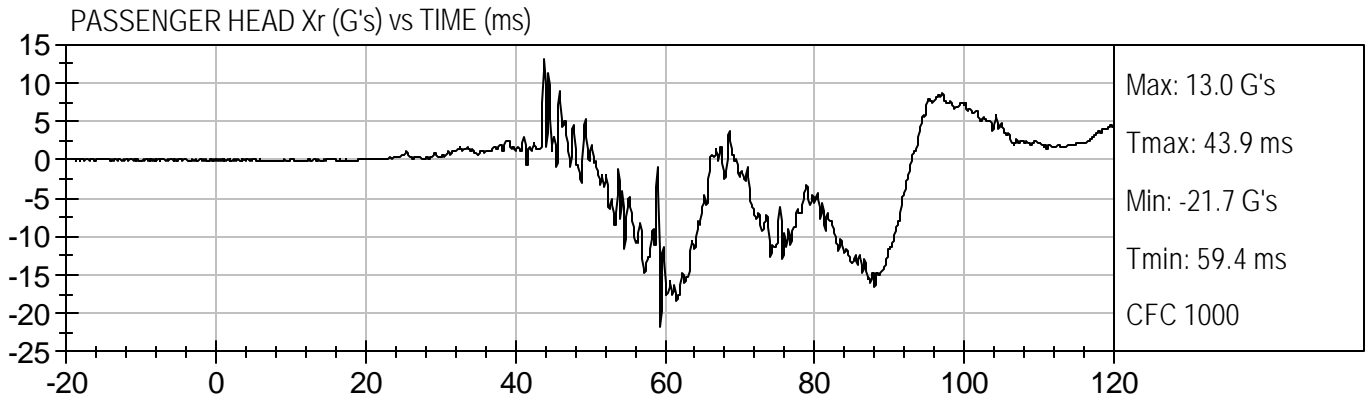








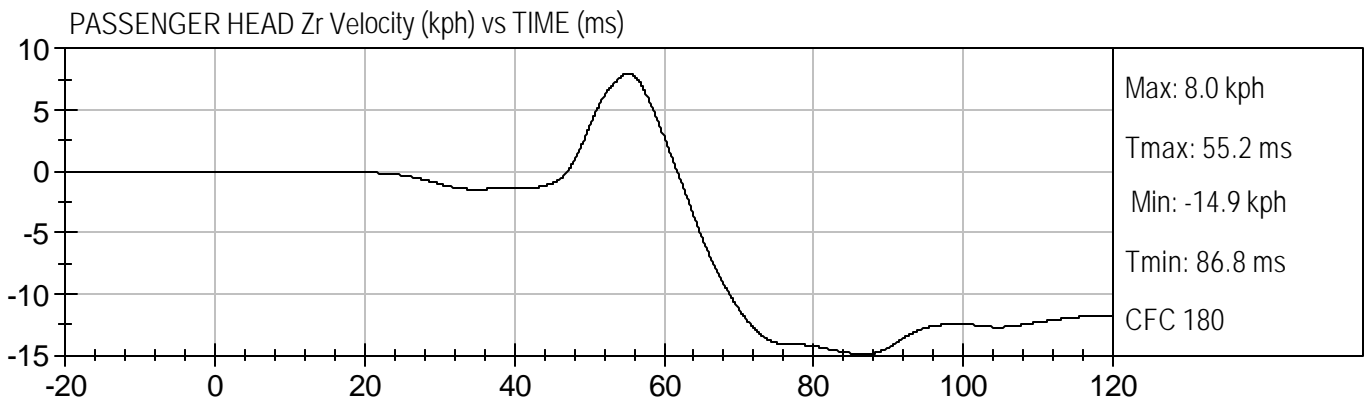
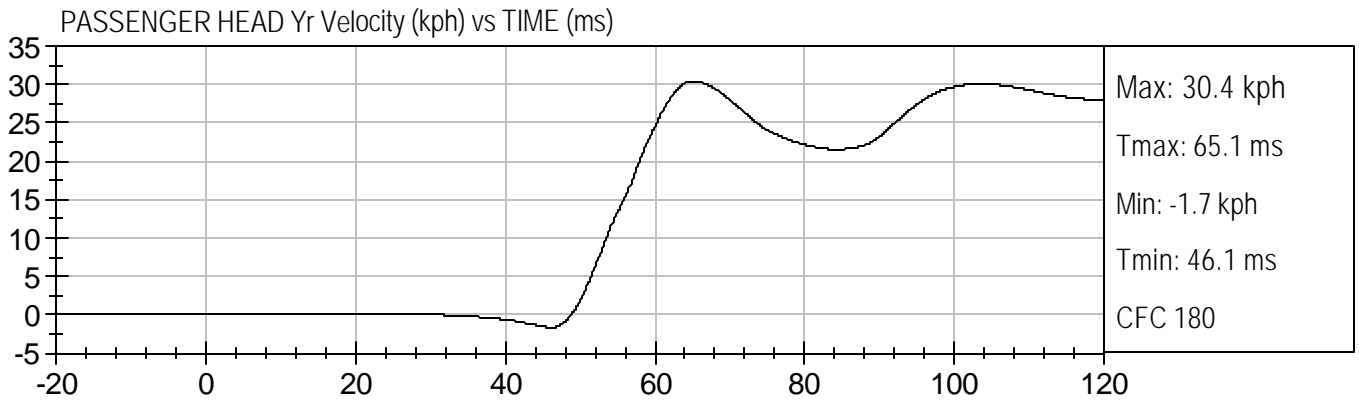
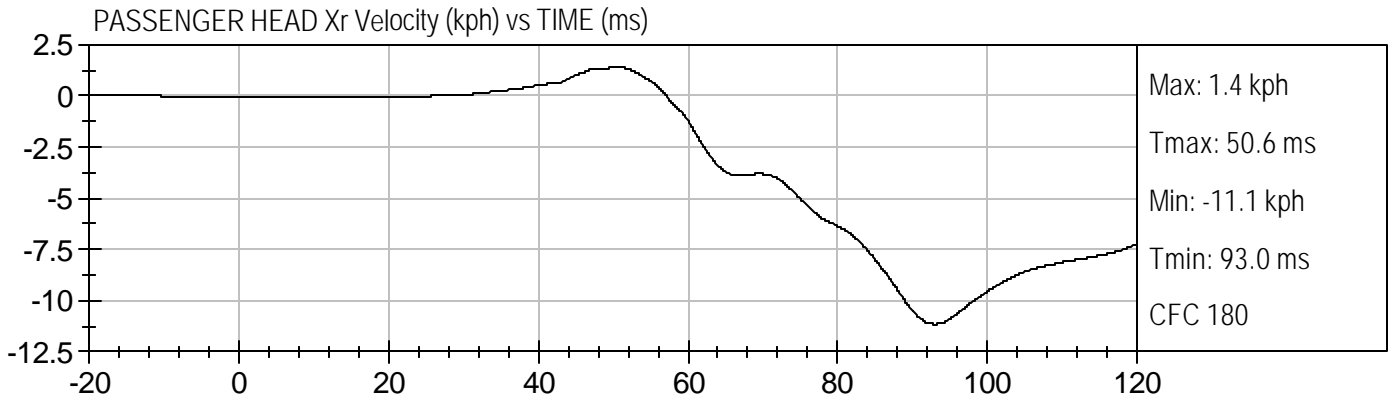






90 DEGREE INDICANT SIDE IMPACT
2002 HYUNDAI SONATA (C20501)

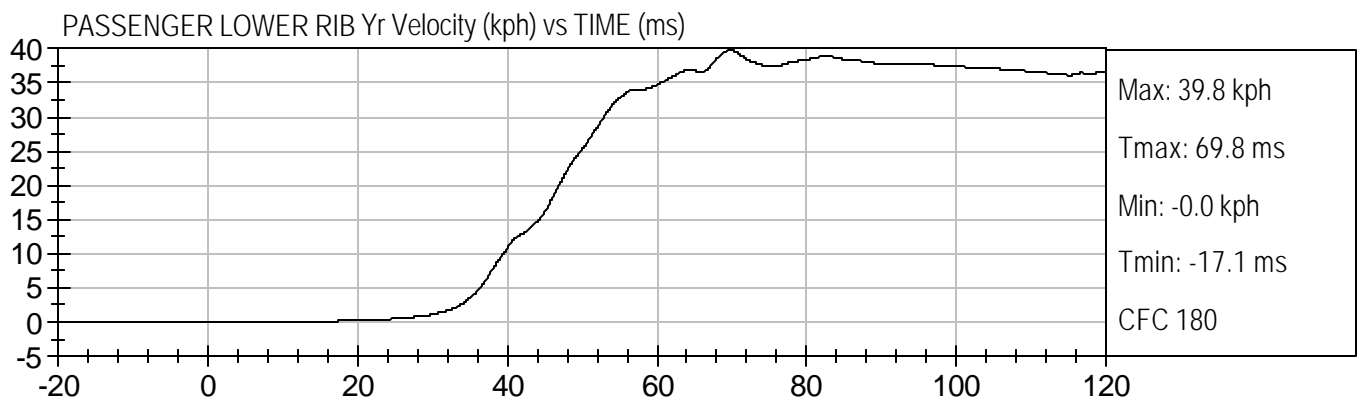
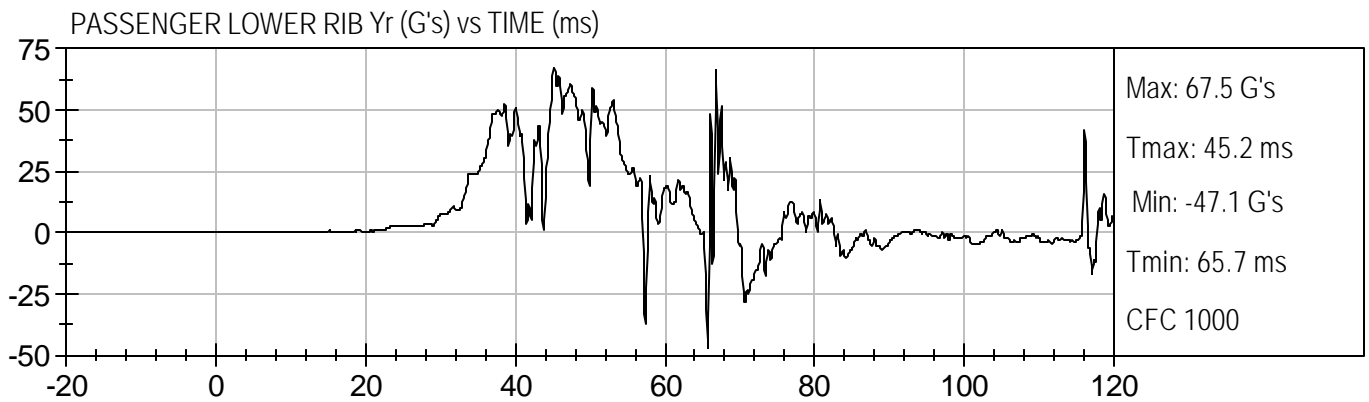
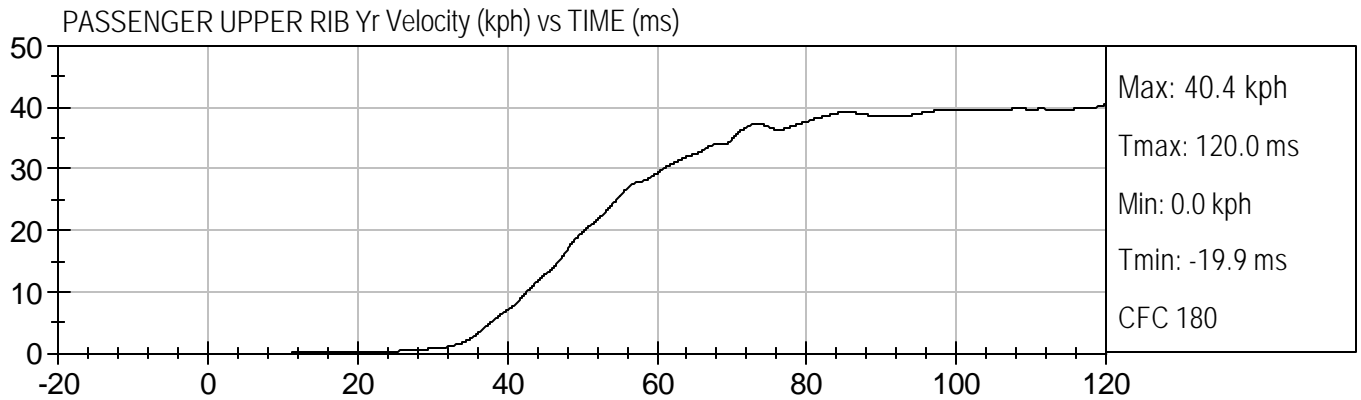
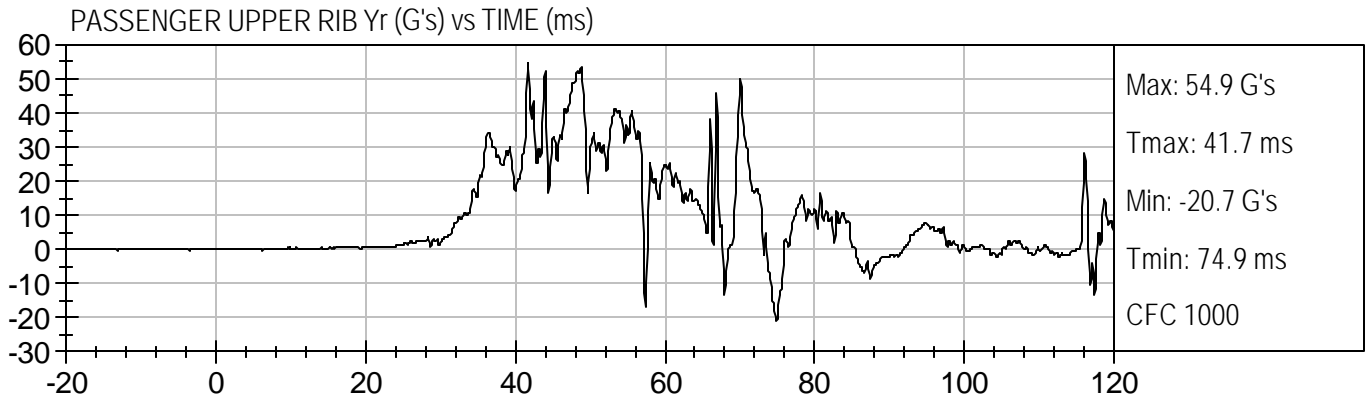
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Speed: 38.5 mph (62.0 km/h)

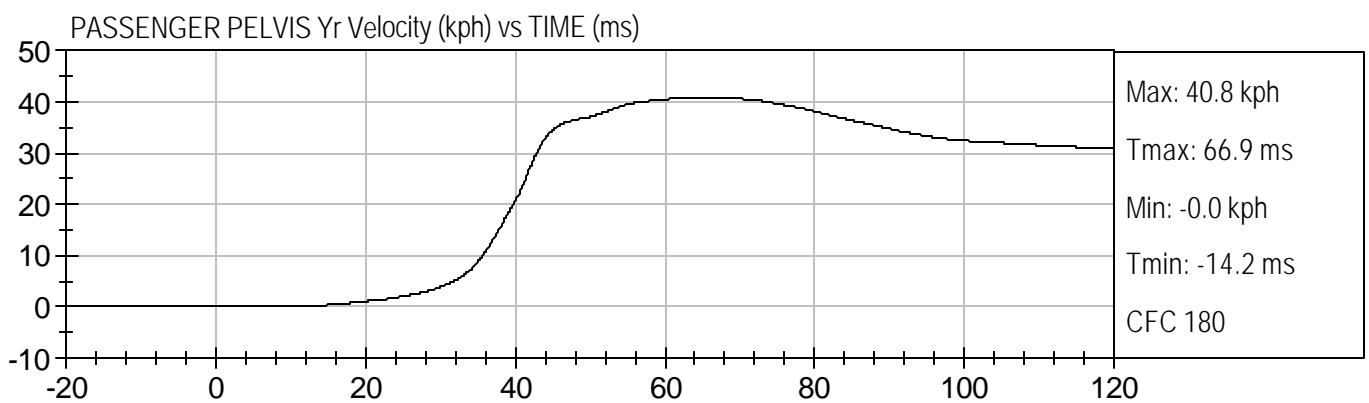
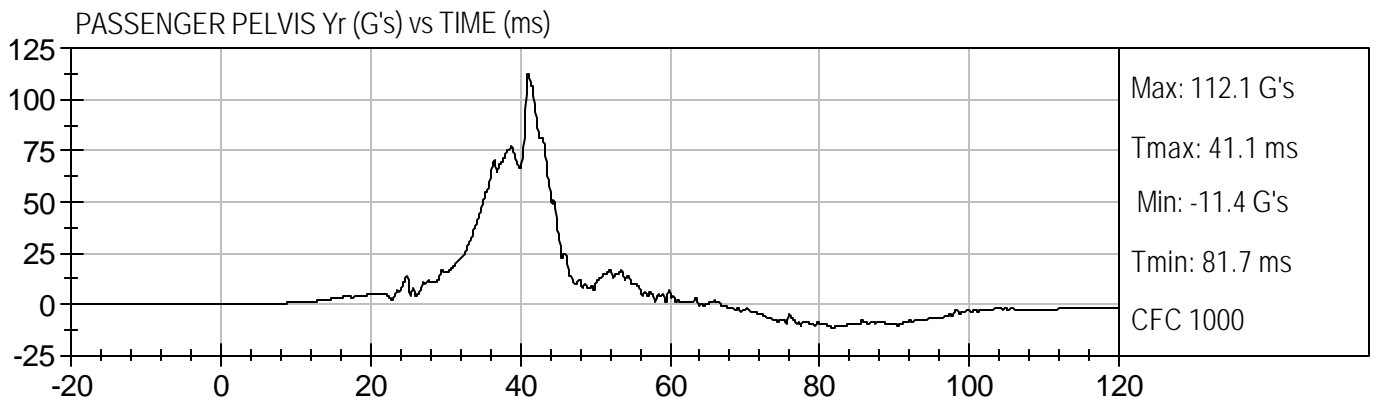
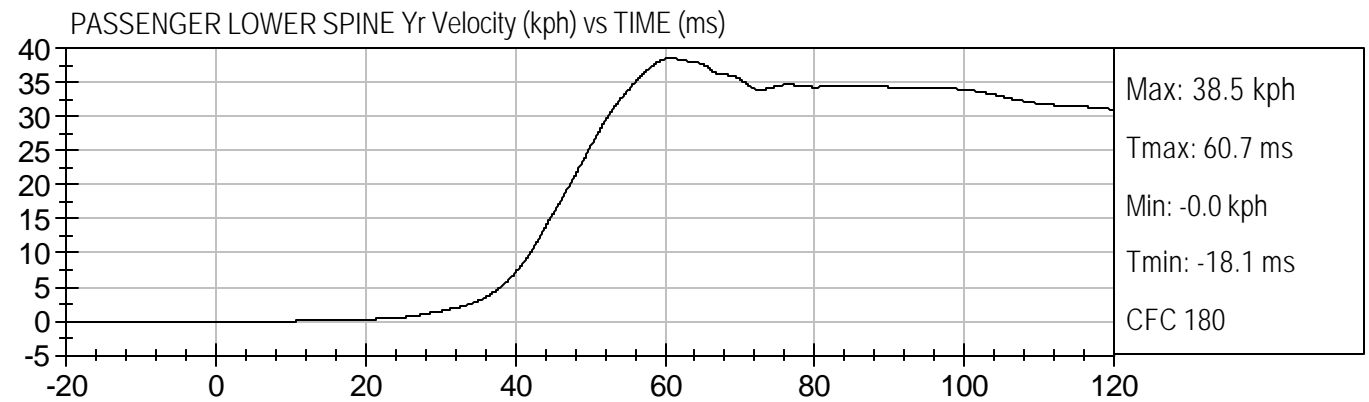
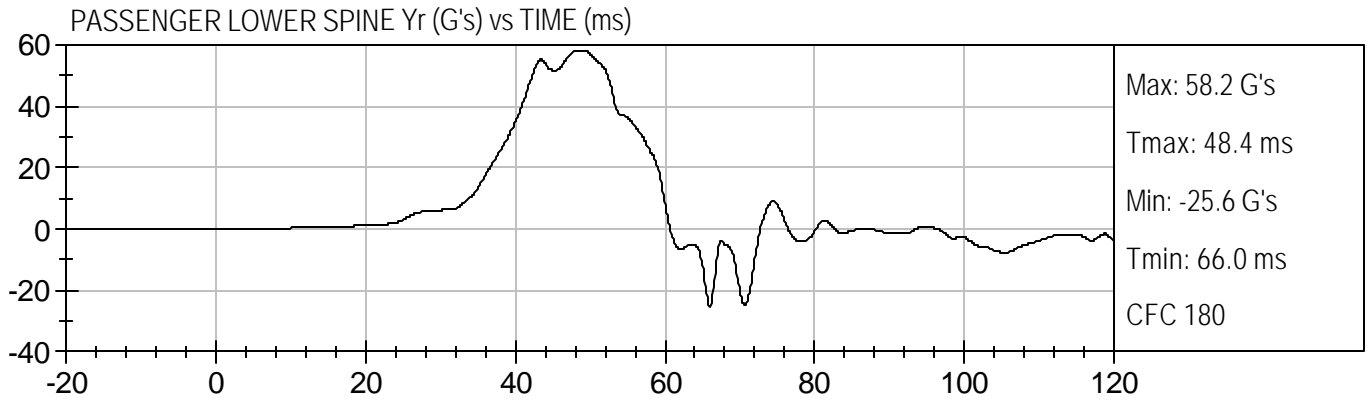


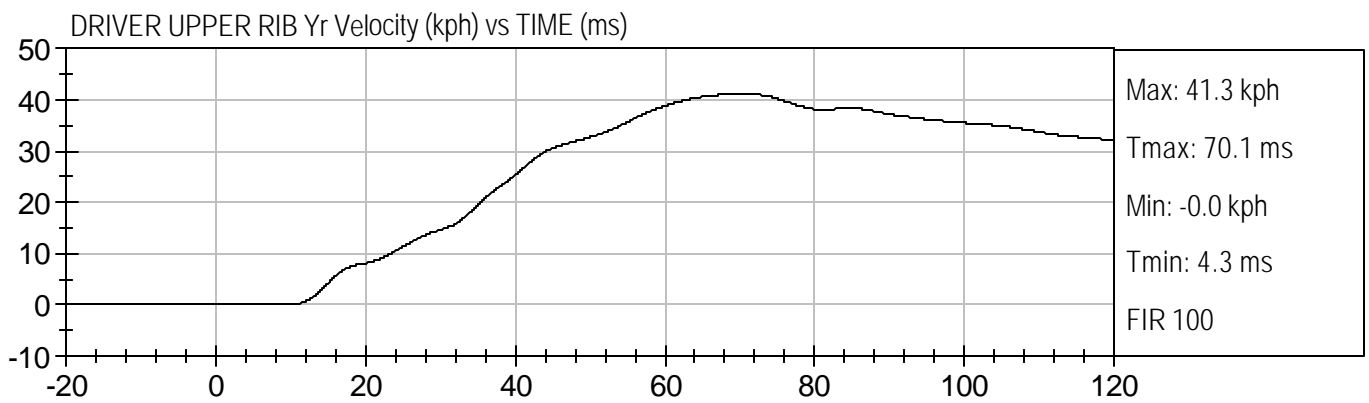
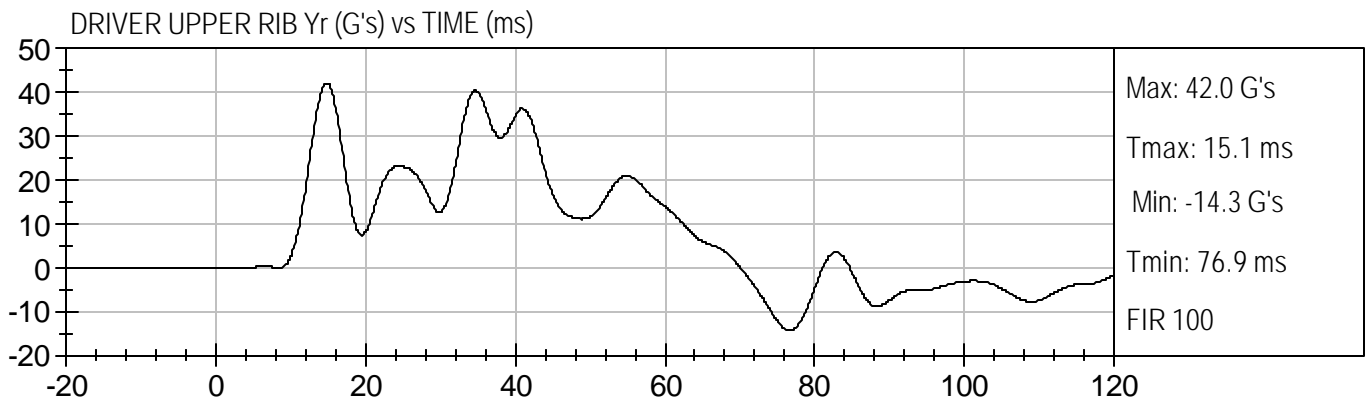
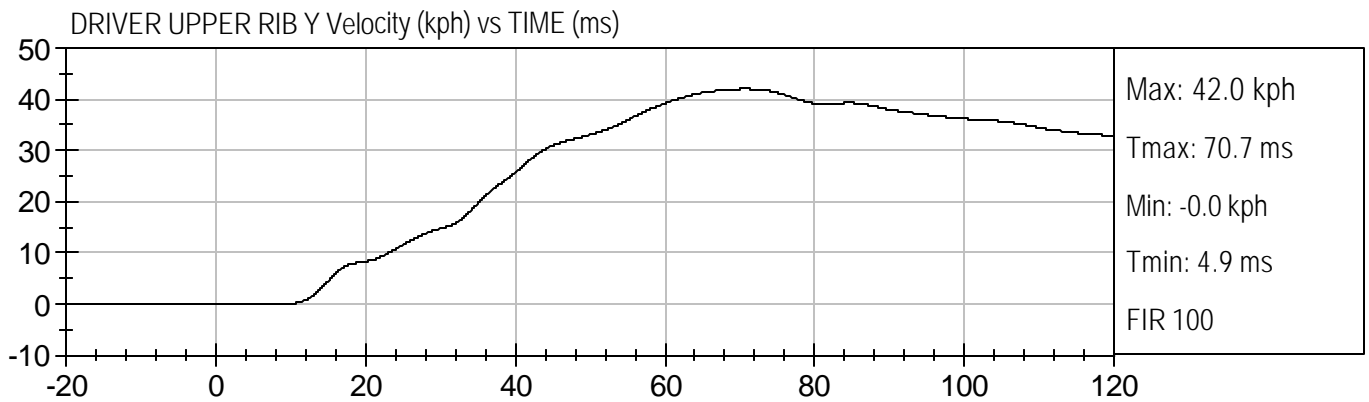
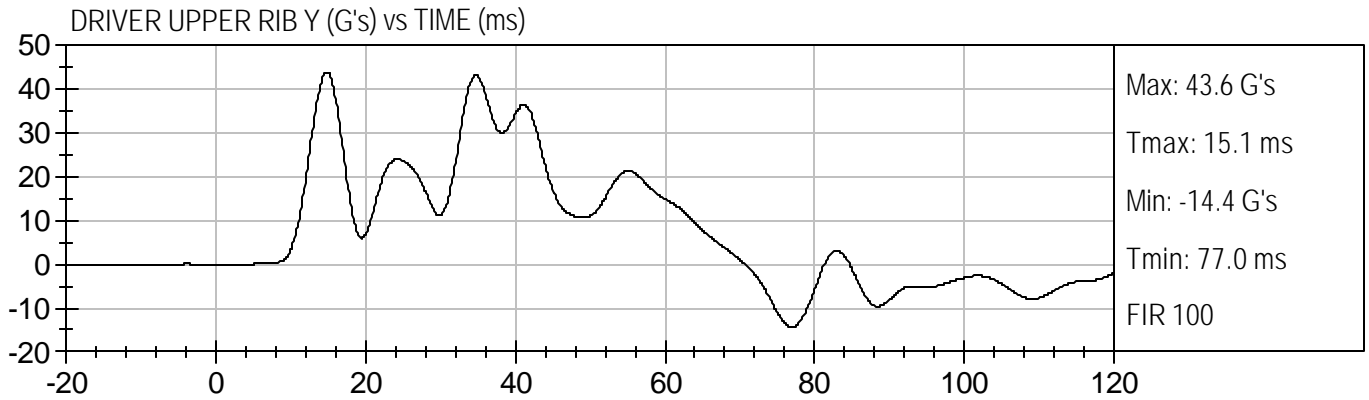


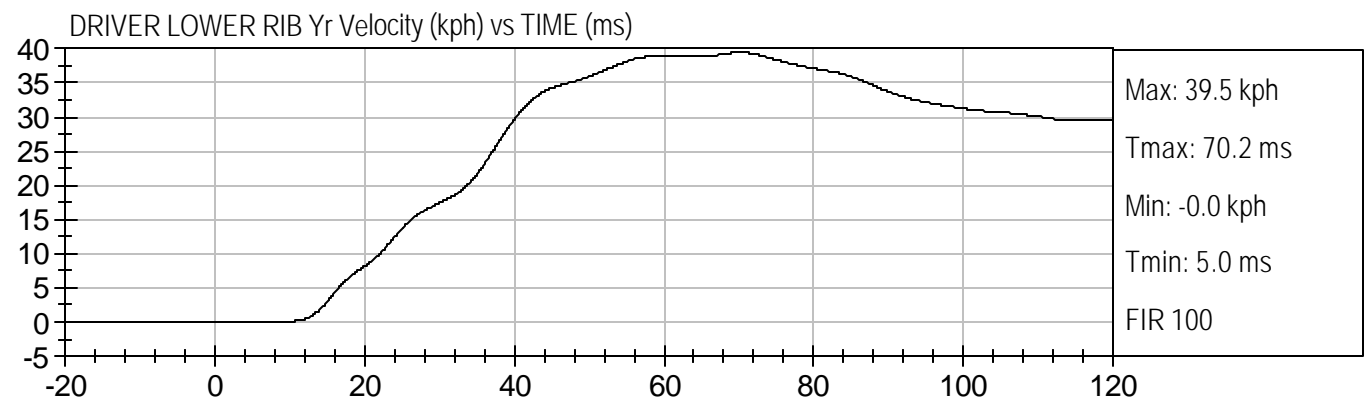
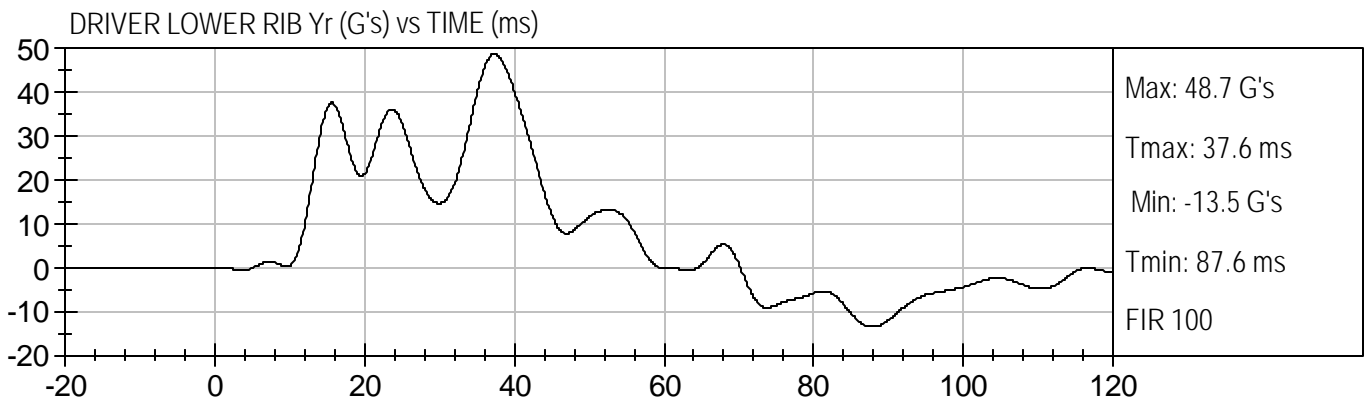
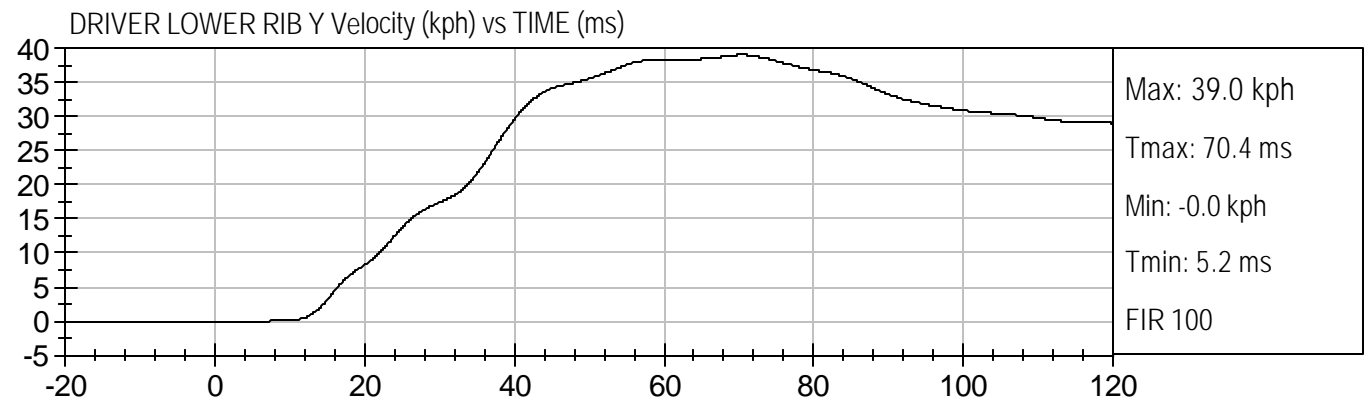
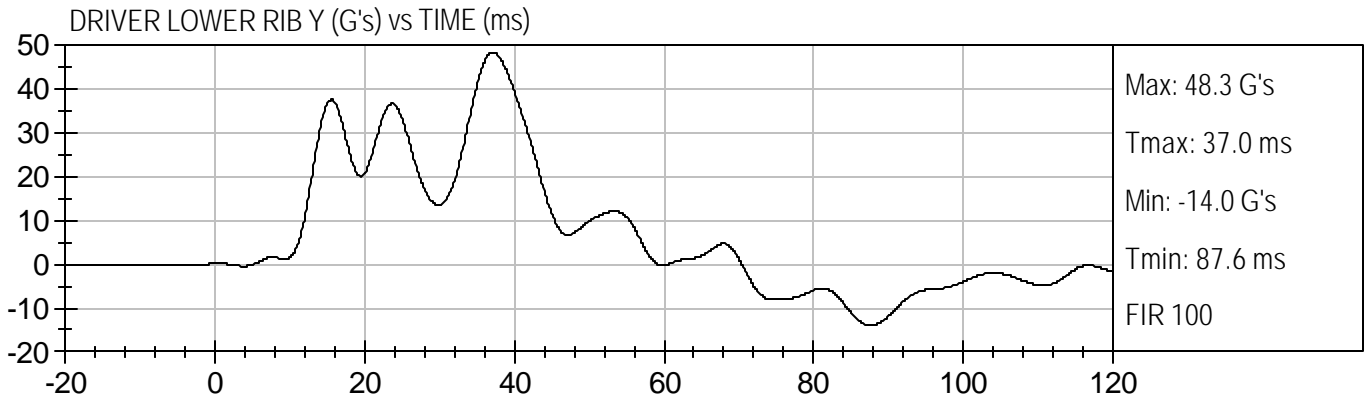
90 DEGREE INDICANT SIDE IMPACT
2002 HYUNDAI SONATA (C20501)

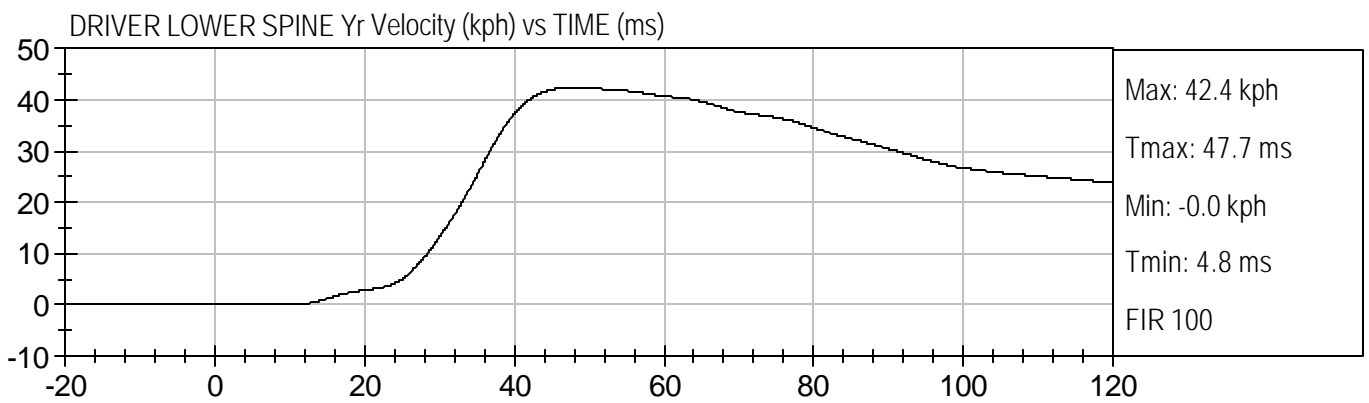
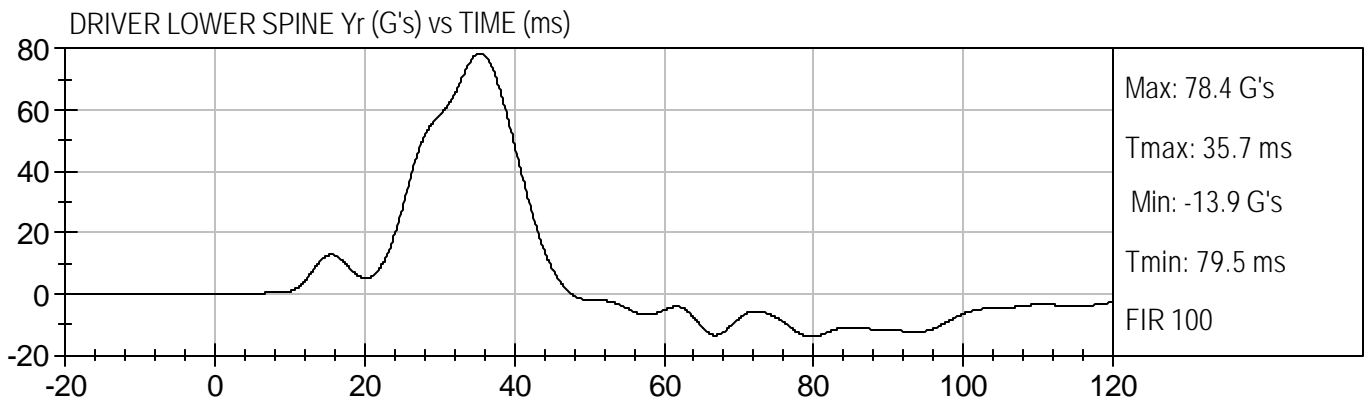
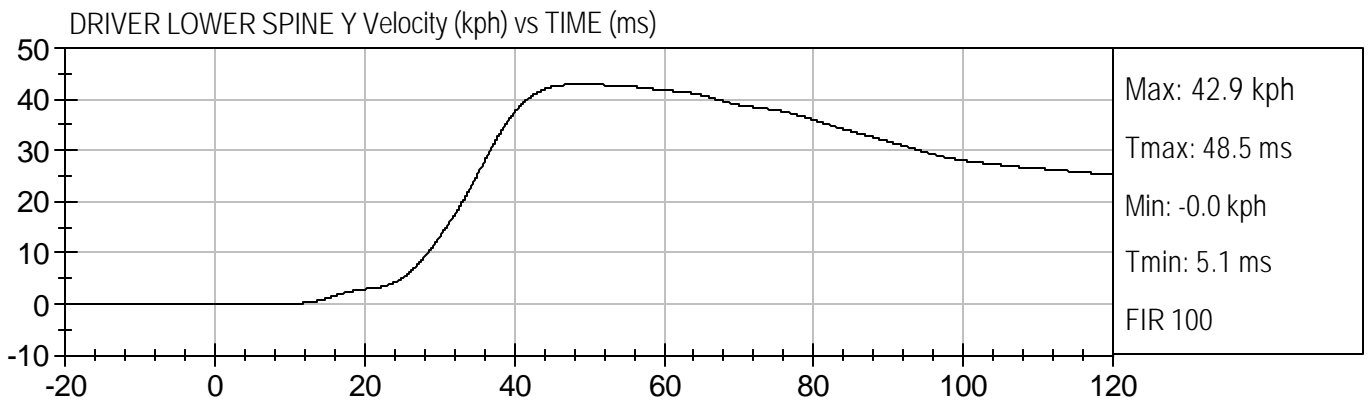
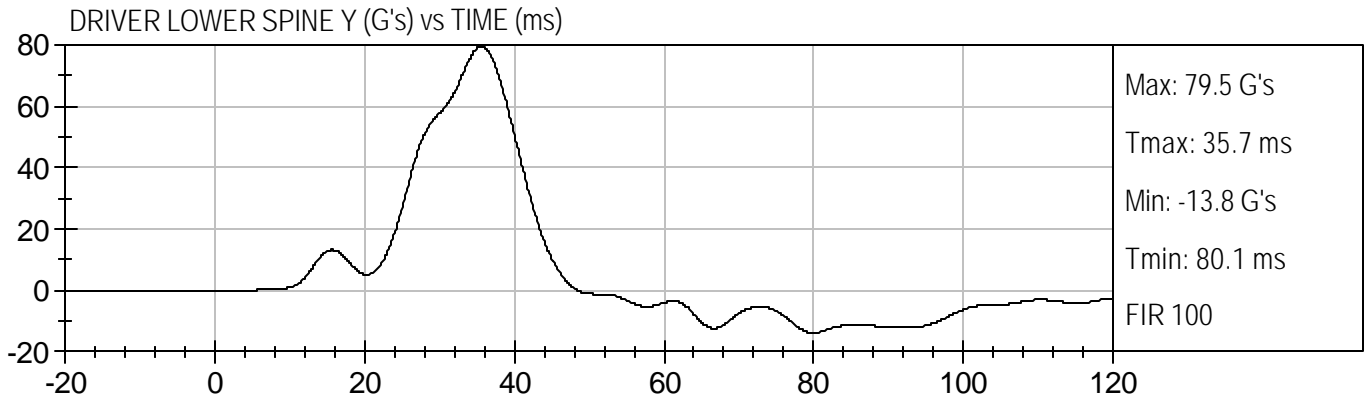
Test Date: 2/6/02
Speed: 38.5 mph (62.0 km/h)

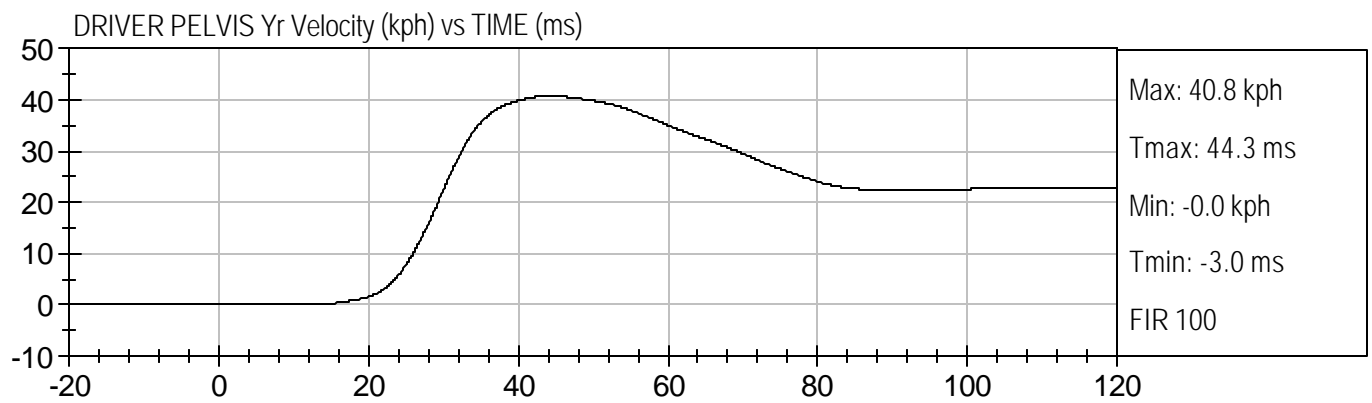
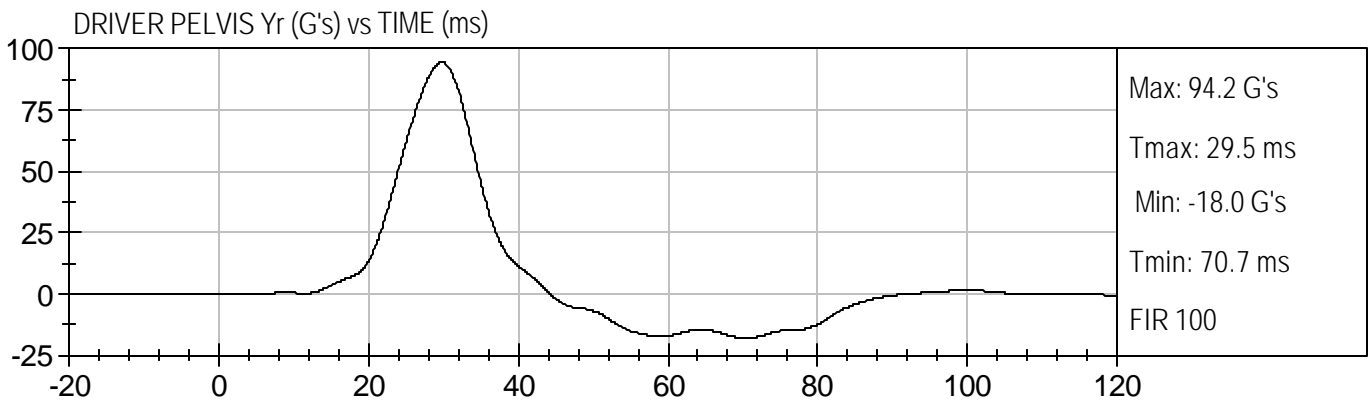
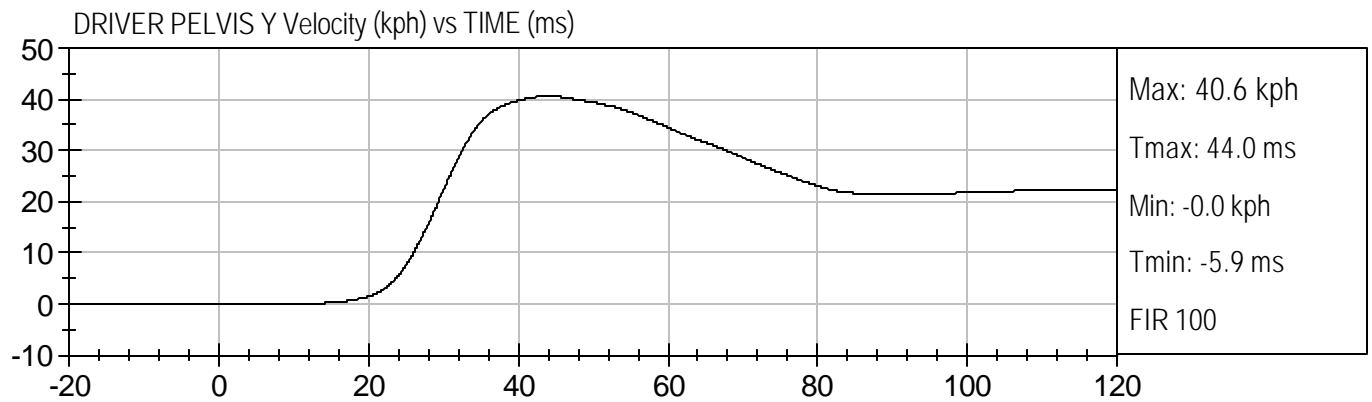
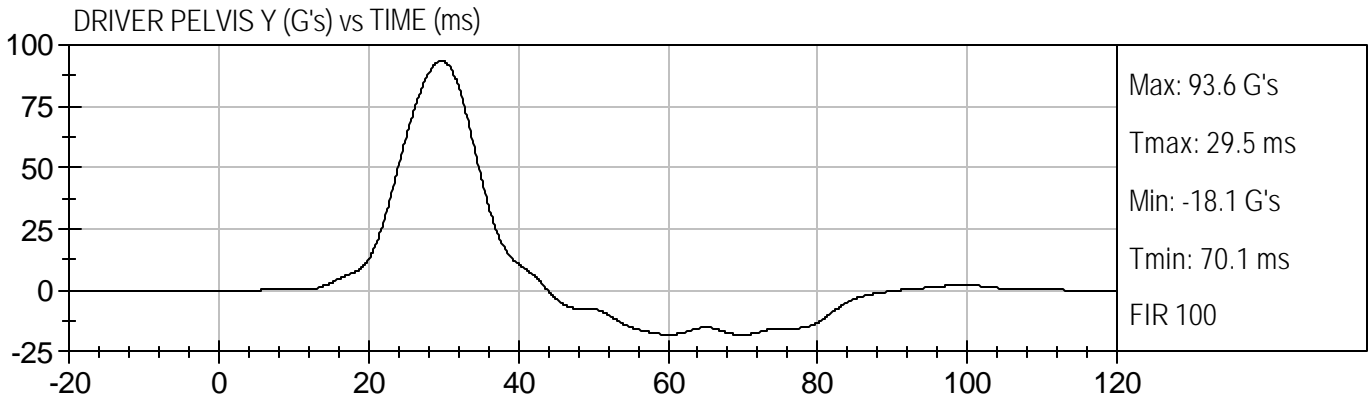


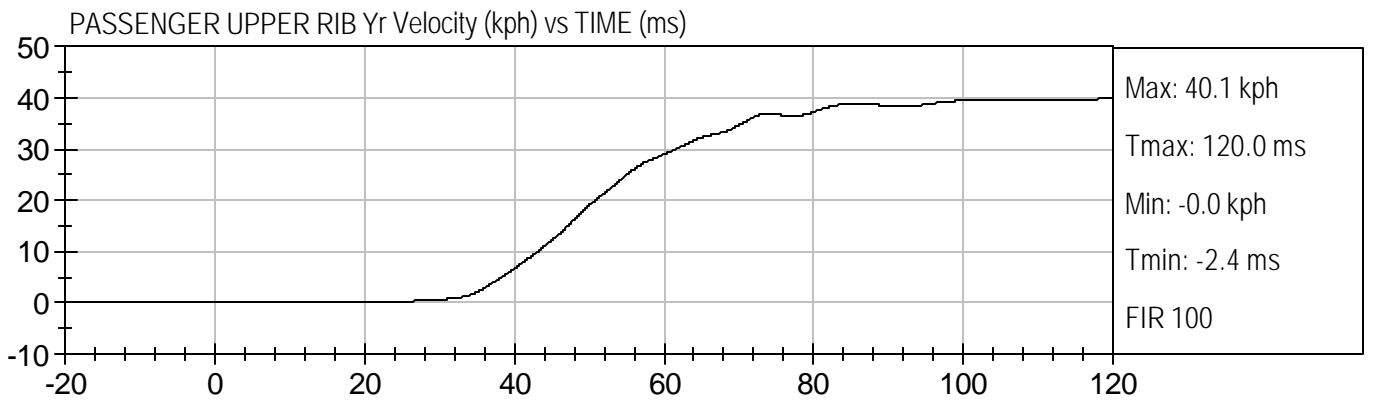
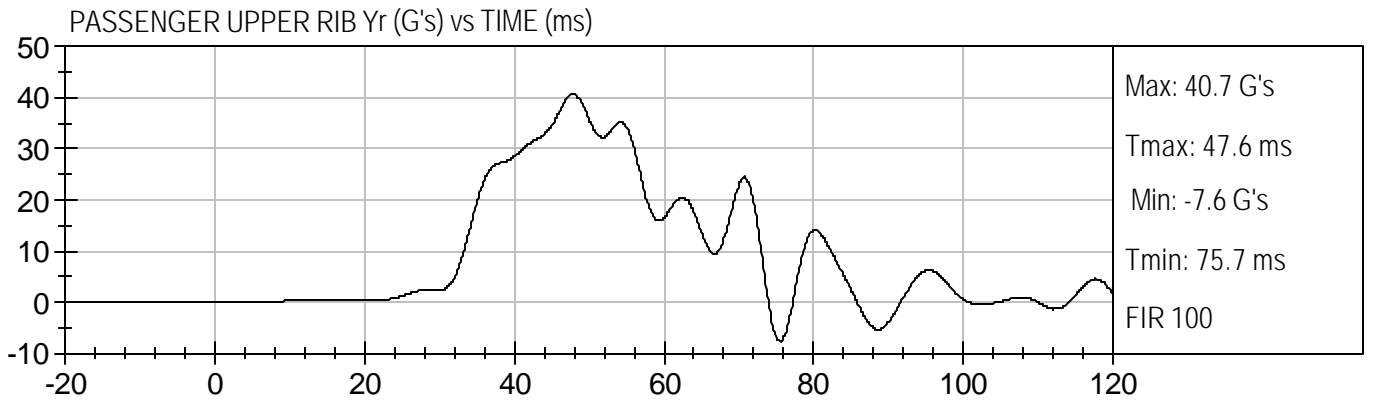
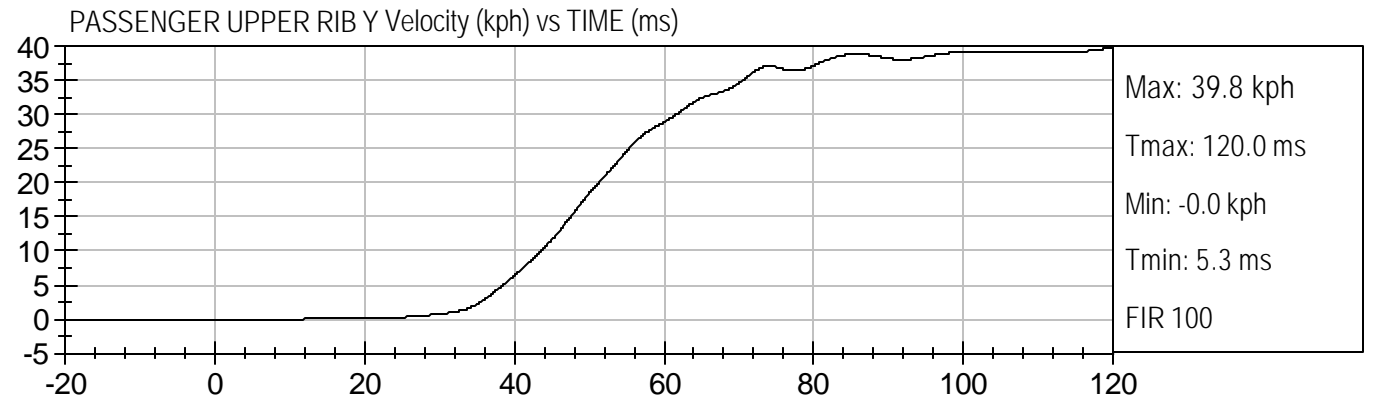
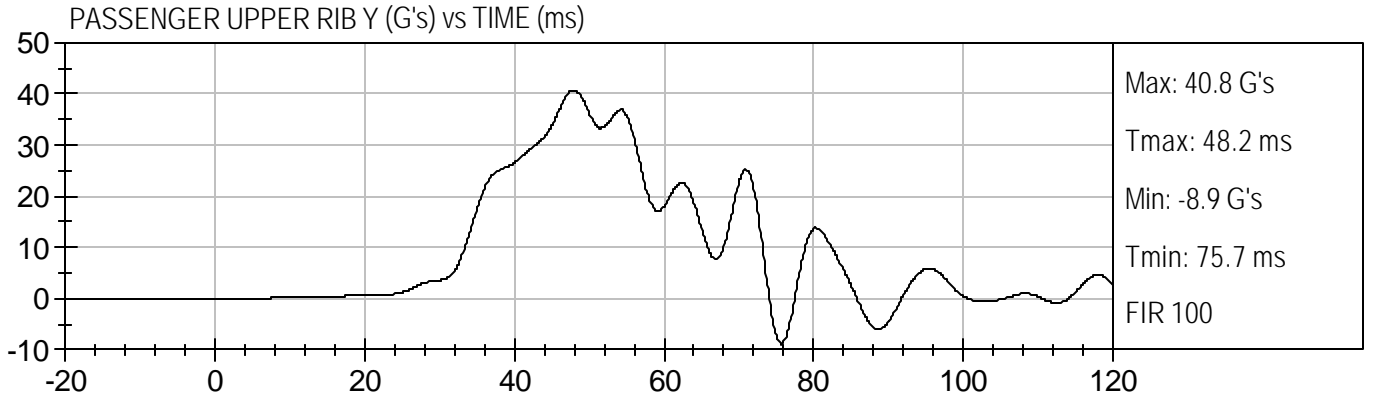


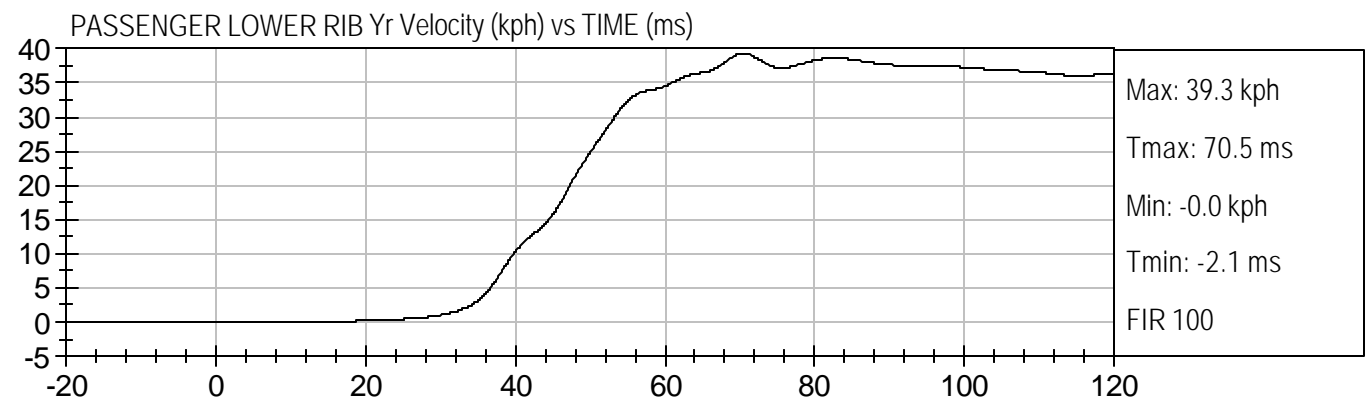
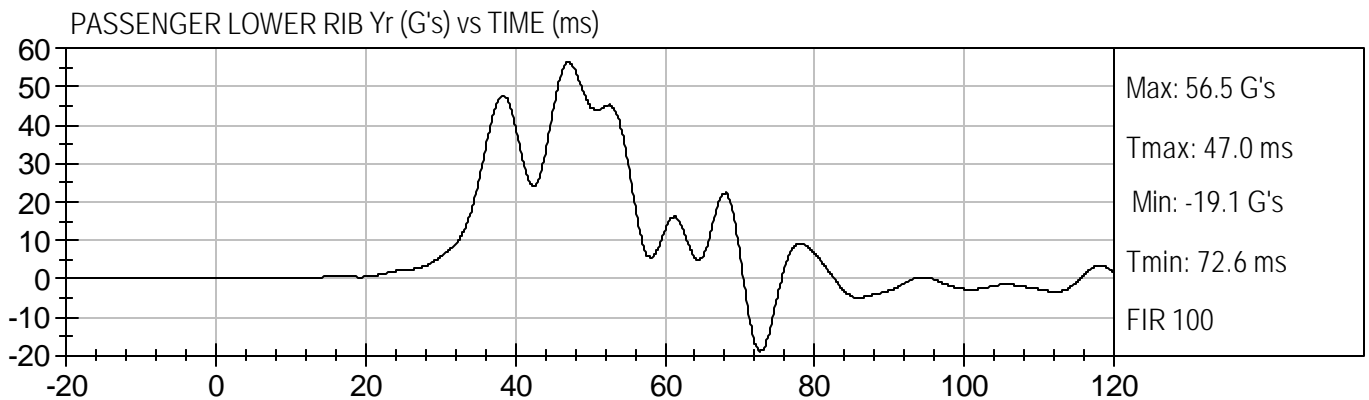
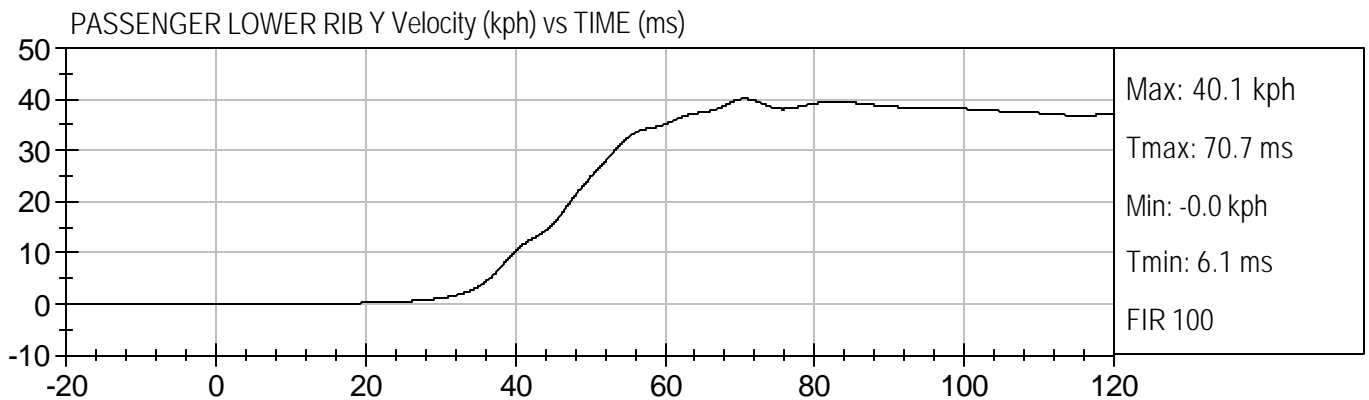
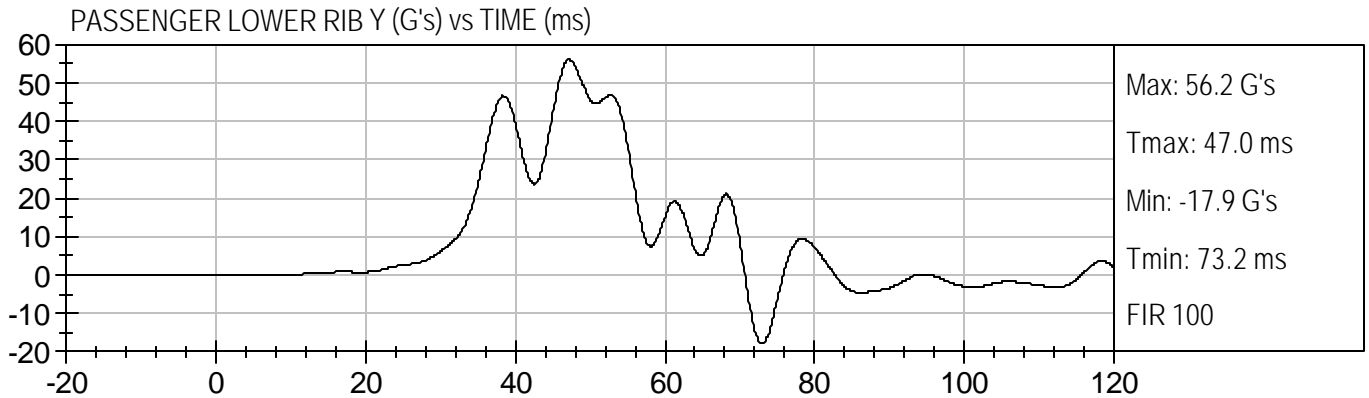


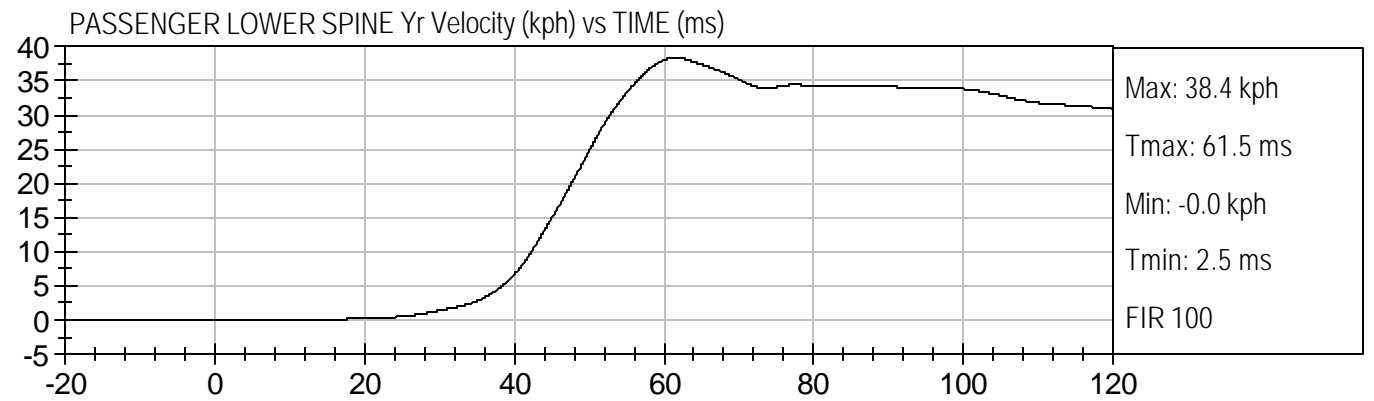
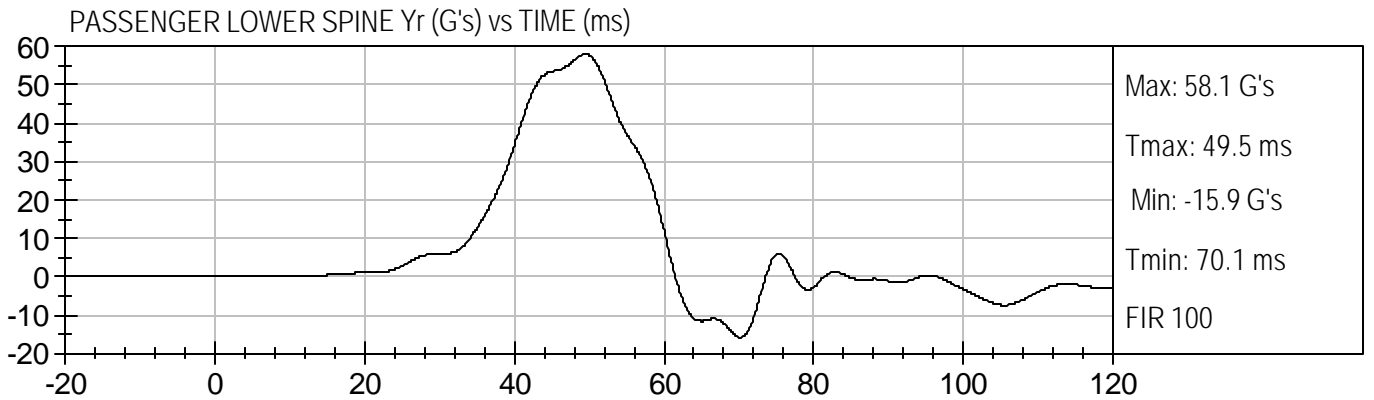
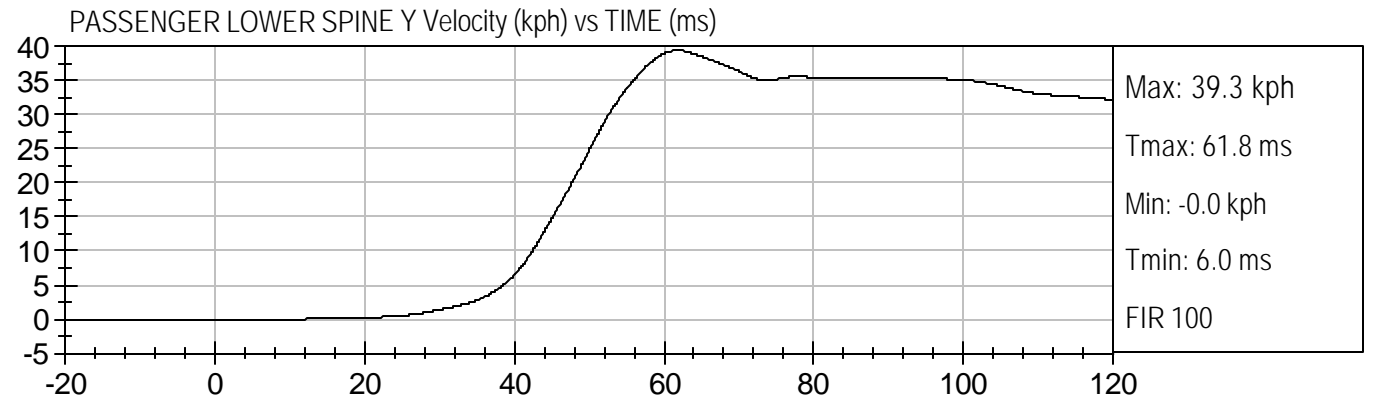
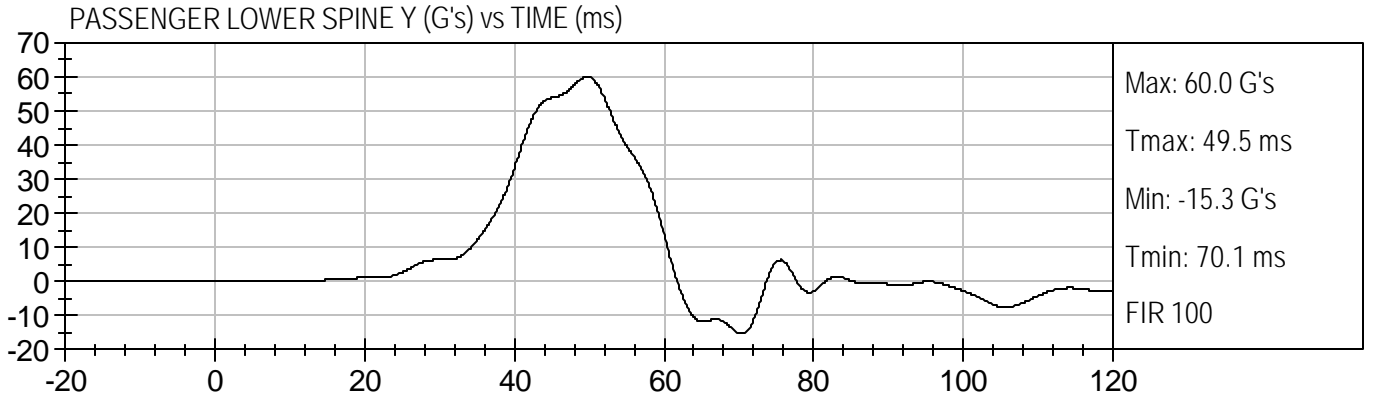


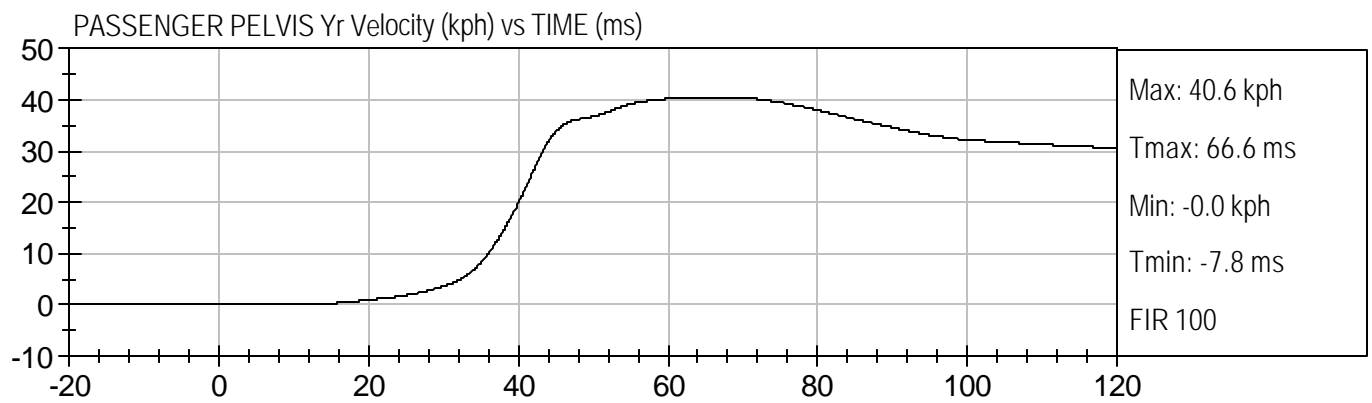
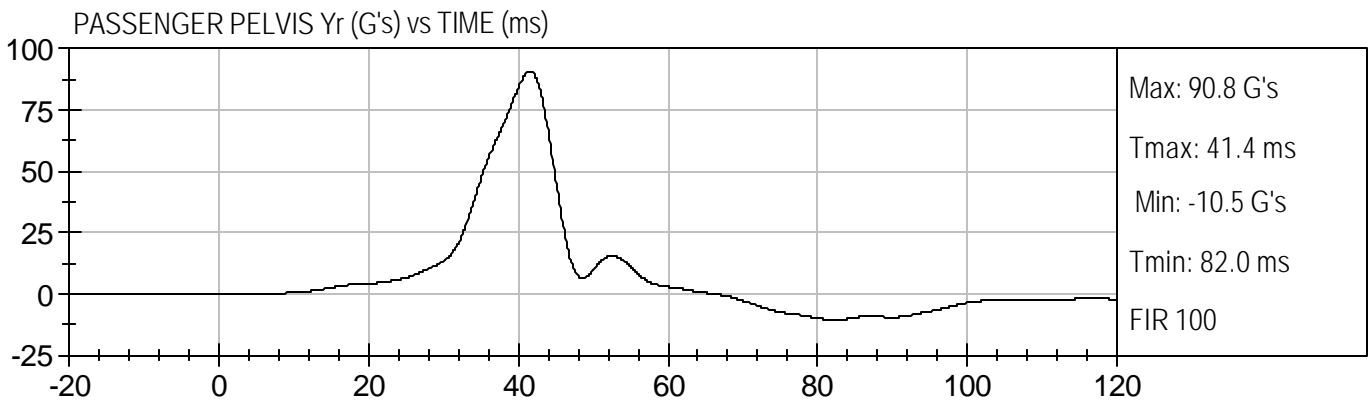
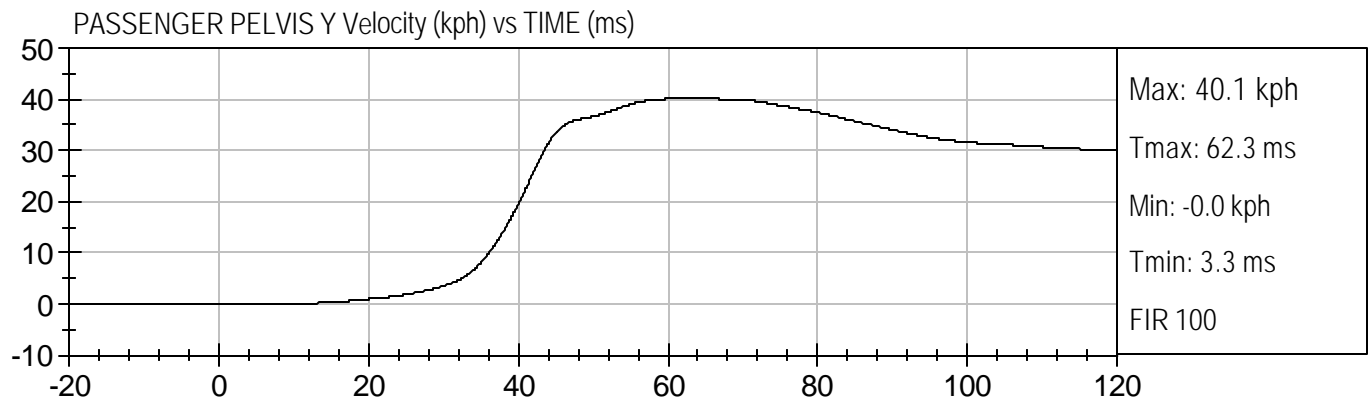
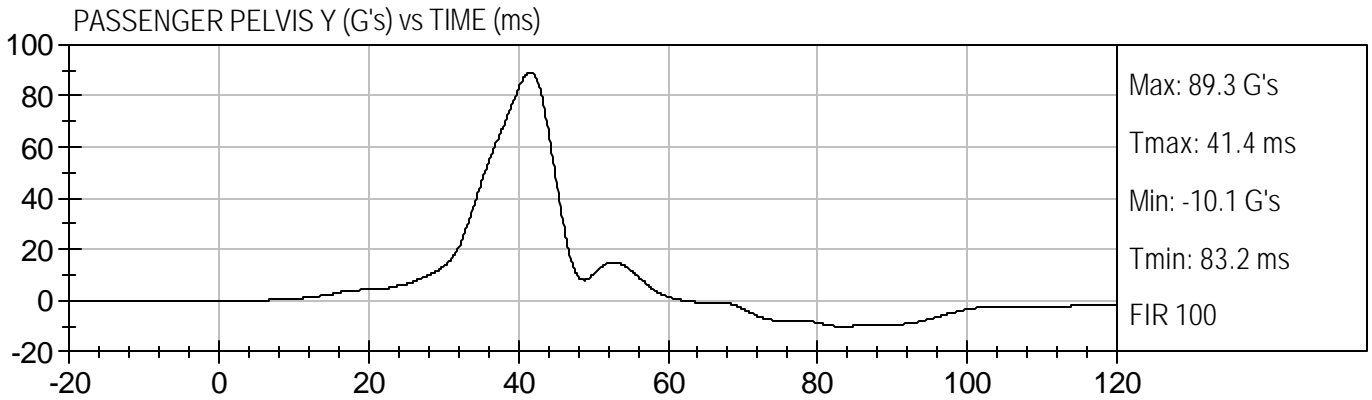












APPENDIX C

SID CONFIGURATION AND PERFORMANCE VERIFICATION DATA

SID Calibration Data Sheet
Side Impact Dummy
Configured to Left Side Impact

Technician: Tim Michnay

Tested Parameter	Units	Specification	Dummy Serial Number:049		Dummy Serial Number:048	
			Pre-Test	Post-Test	Pre-Test	Post-Test
SH – Seated Height	mm	889 - 909	898	898	902	902
RH – Rib Height	mm	501 – 521	517	517	507	507
HP – Hip Pivot Height	mm	99 ref.	99	99	99	99
RD-Rib from Back Line	mm	229 – 241	232	232	236	236
KV – Knee Pivot from Back Line	mm	511 – 526	522	522	519	519
SW – Knee Pivot to Floor	mm	490 – 505	492	492	492	492
HW – Hip Width	mm	356 – 391	367	367	364	364
Thorax Impact						
Laboratory Temperature	°C	18.9 to 25.5	21.1	20.7	21.7	21.8
Laboratory Relative Humidity	%	10 to 70	35	21	23	23
Probe Velocity	m/s	4.27 – 4.33	4.29	4.30	4.27	4.27
Upper Rib	G's	37 – 46	37	38	37	40
Lower Rib	G's	37 – 46	42	38	42	38
Lower Spine	G's	15 – 22	19	17	19	19
Pelvis Impact						
Laboratory Temperature	°C	18.9 to 25.5	21.1	20.7	21.7	21.8
Laboratory Relative Humidity	%	10 to 70	35	21	23	23
Probe Velocity	m/s	4.27 – 4.33	4.30	4.30	4.28	4.28
Pelvis	G's	40 - 60	55	47	50	48

CERTIFICATION DATA

Dummy Serial Number: 049

Calibration Test Results Summary

Dummy Serial Number: 049

Pre-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No.:049

Test Number:D0212

Tested Parameter	Units	Specification	Result	Pass/Fail
SH – Seated Height	mm	889 - 909	898	Pass
RH – Rib Height	mm	501 – 521	517	Pass
HP – Hip Pivot Height	mm	99 ref.	99	Pass
RD-Rib from Back Line	mm	229 – 241	232	Pass
KV – Knee Pivot from Back Line	mm	511 – 526	522	Pass
SW – Knee Pivot to Floor	mm	490 – 505	492	Pass
HW – Hip Width	mm	356 – 391	367	Pass
Overall Test Results				Pass

Laboratory Technician

1/23/02
Test Date

Approved By

SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration

ATD Serial No.:049

Test I.D.:D02121

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	20.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	210 to 260	227	Pass
Peak Lateral Acceleration	G's	< 10	-4	Pass
Time Above 100 G	msec	0.9 – 1.5	1.2	Pass
Overall Test Results				Pass

 Laboratory Technician

1/18/02
 Test Date

 Approved By

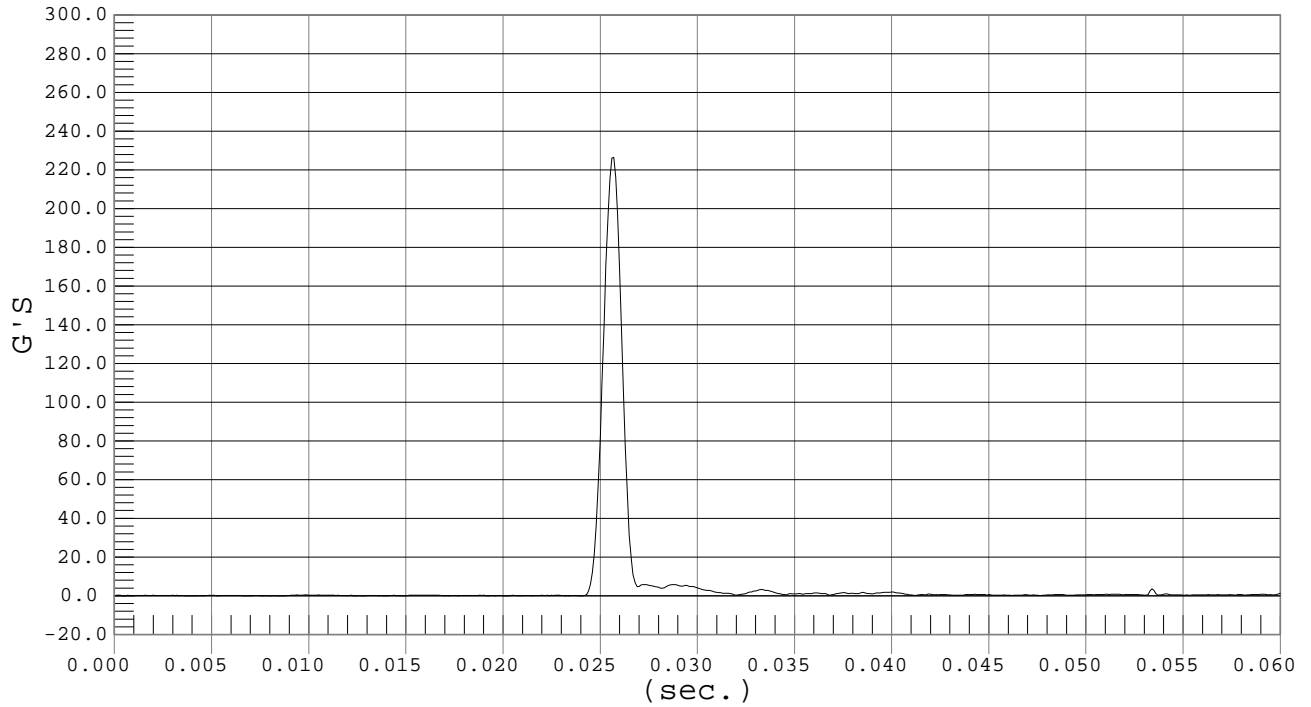


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #049

Test Date: 01-18-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .06 G'S @ 0.0007 sec., Ymax = 226.5 G'S @ 0.0256 sec.

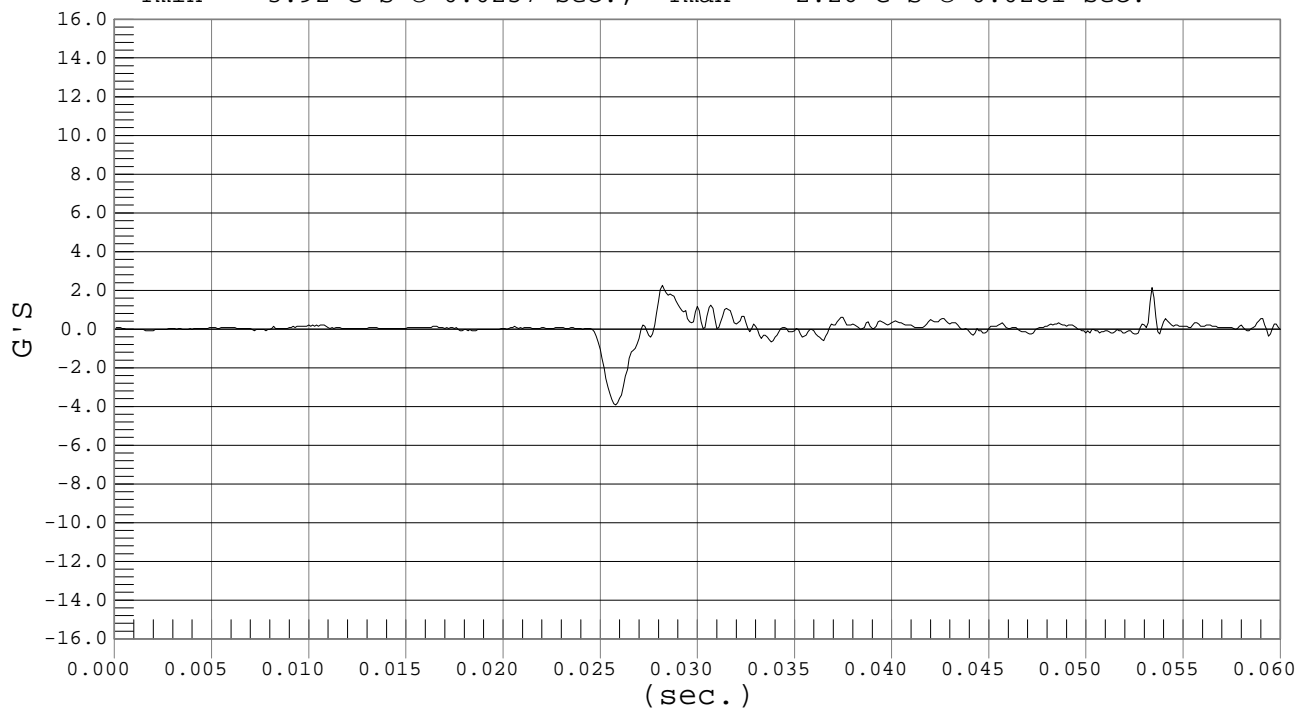


PEAK LATERAL ACCELERATION

Test Desc.: Head Drop
Component: Dummy #049

Test Date: 01-18-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -3.92 G'S @ 0.0257 sec., Ymax = 2.26 G'S @ 0.0281 sec.



SID Calibration Data Sheet
Side Impact Dummy
Thoracic Shock Absorber Calibration

ATD Serial No.: 049

Test I.D.: D02126/7/8

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Velocity 3.05 m/s	Force	N	836 – 1125	1078	Pass
	Displacement	mm	30 – 35	32	Pass
Velocity 4.27 m/s	Force	N	1730 – 2099	1940	Pass
	Displacement	mm	32 – 37	35	Pass
Velocity 6.1 m/s	Force	N	3741 – 4448	4148	Pass
	Displacement	mm	33 - 40	37	Pass
Overall Test Results					Pass

Laboratory Technician

1/22/02
Test Date

Approved By

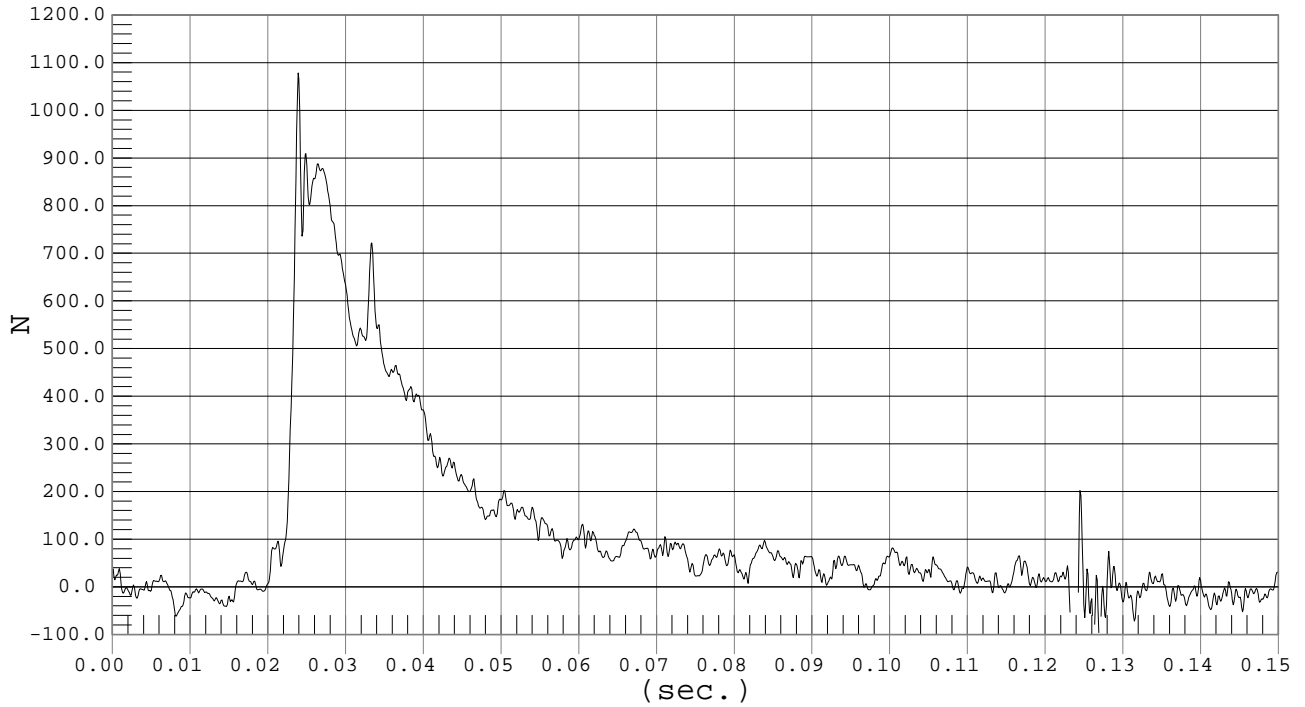


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK FORCE

Test Date: 01-22-02
Speed: 10.0 fps, 3.05 M/s

Ymin = -1006.32 N @ 0.1238 sec., Ymax = 1077.97 N @ 0.0238 sec.

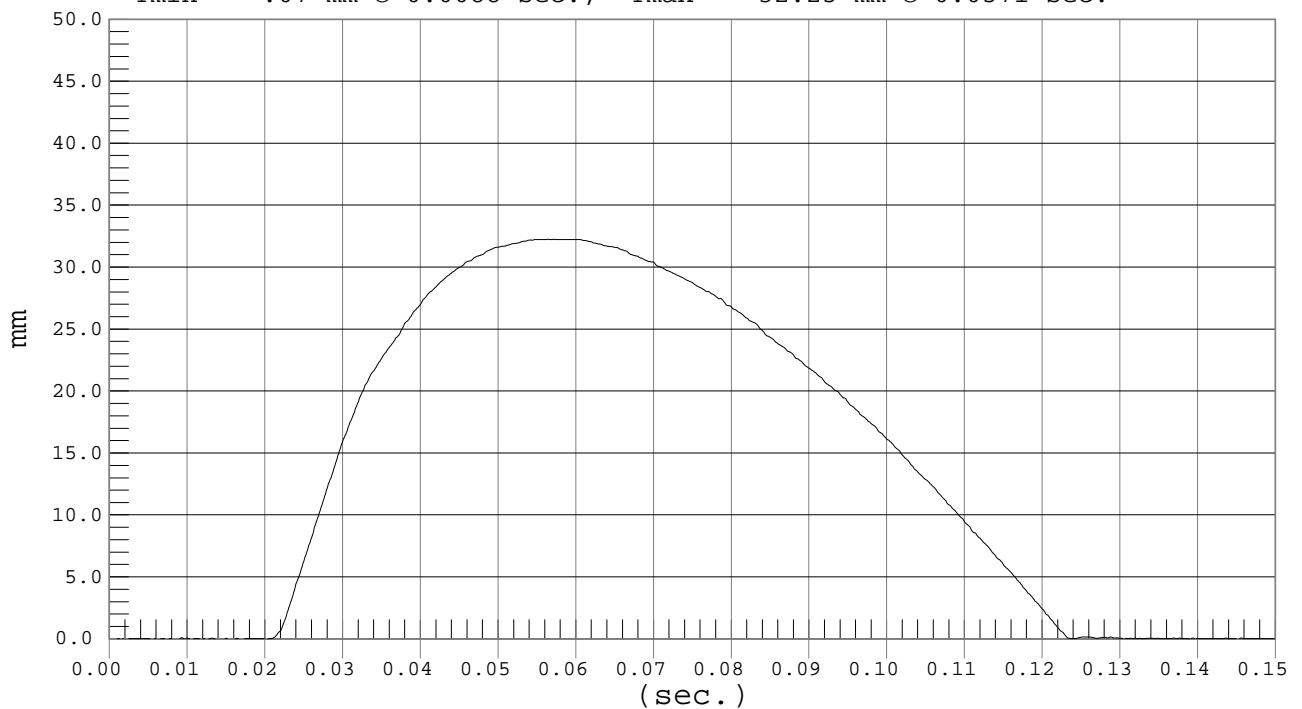


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK DISPLACEMENT

Test Date: 01-22-02
Speed: 10.0 fps, 3.05 M/s

Ymin = -.07 mm @ 0.0088 sec., Ymax = 32.25 mm @ 0.0571 sec.



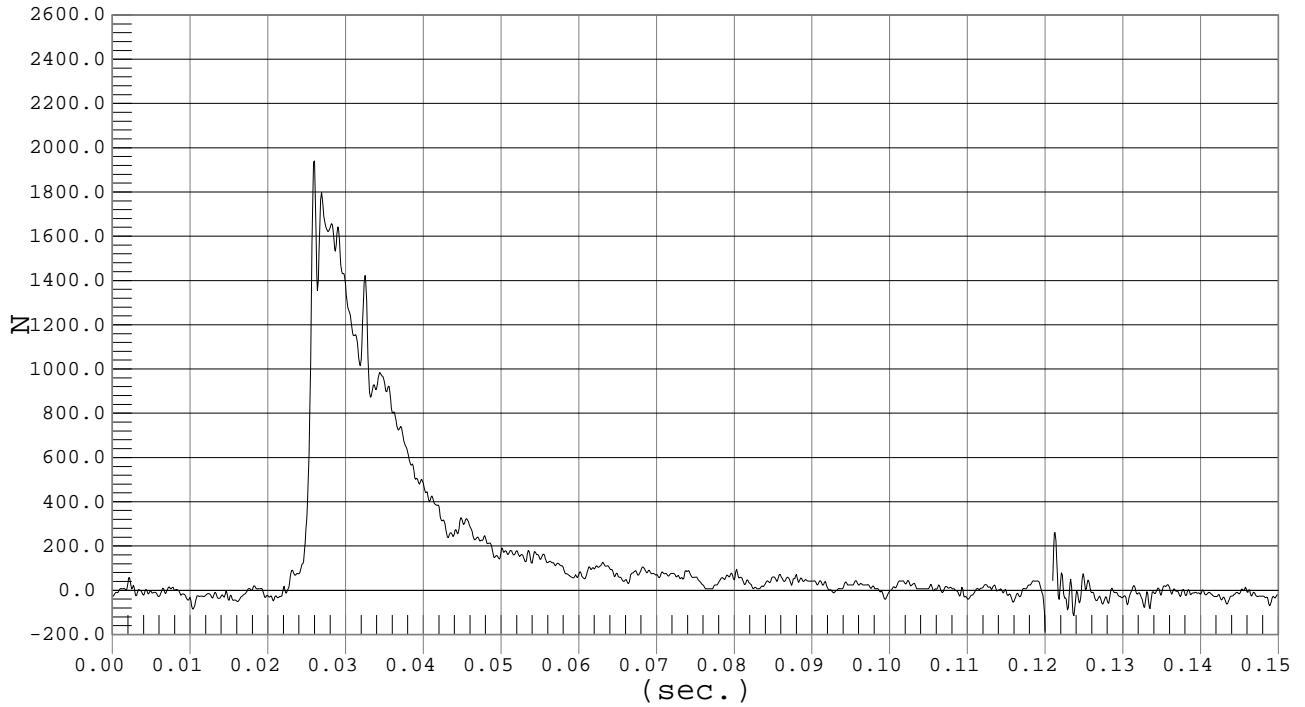


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK FORCE

Test Date: 01-22-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -1086.07 N @ 0.1204 sec., Ymax = 1939.89 N @ 0.0259 sec.

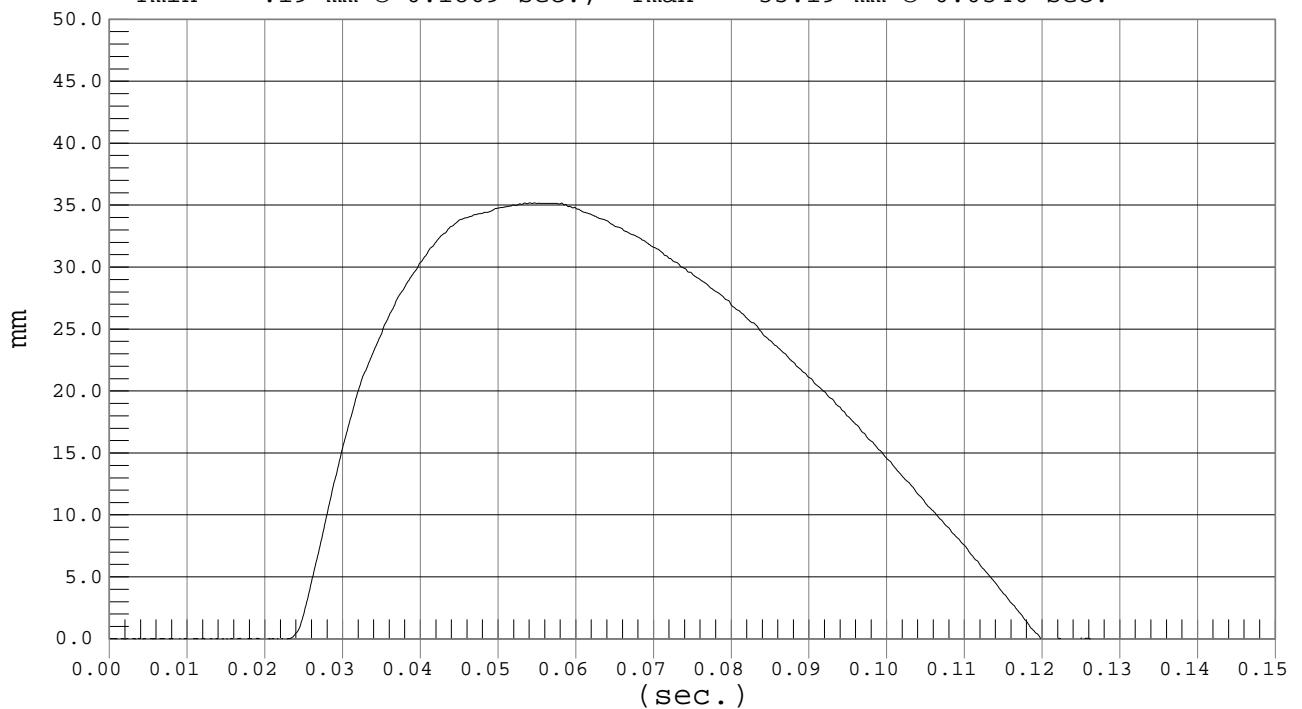


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK DISPLACEMENT

Test Date: 01-22-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -.19 mm @ 0.1869 sec., Ymax = 35.19 mm @ 0.0540 sec.



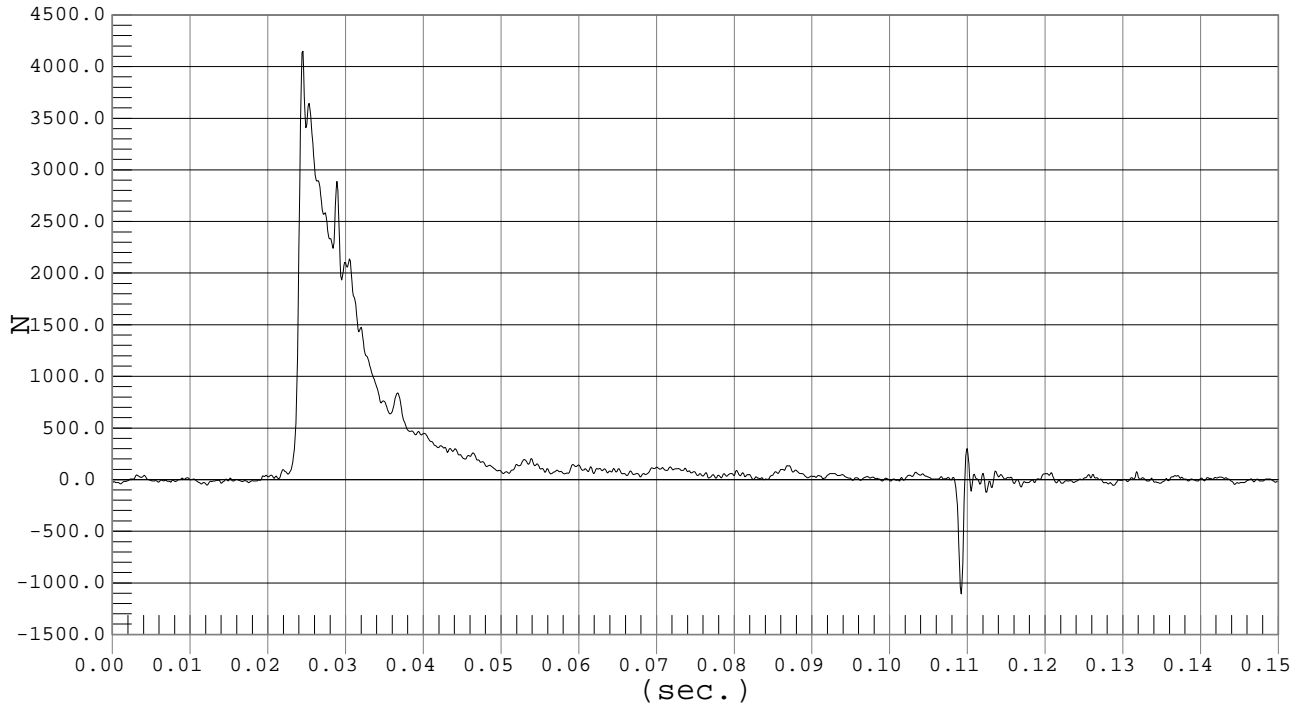


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK FORCE

Test Date: 01-22-02
Speed: 20.0 fps, 6.10 M/s

Ymin = -1108.35 N @ 0.1091 sec., Ymax = 4147.6 N @ 0.0244 sec.

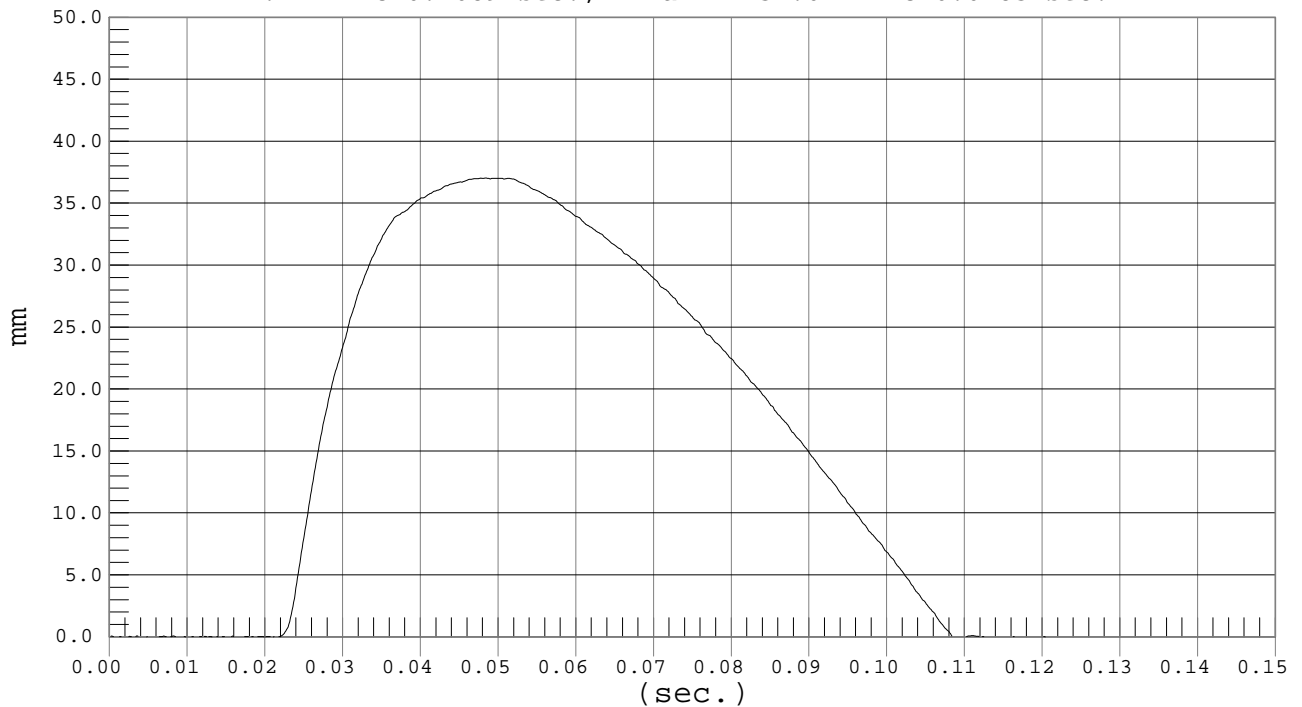


Test Desc.: Dampener Impact
Component: Dummy #049

PEAK DISPLACEMENT

Test Date: 01-22-02
Speed: 20.0 fps, 6.10 M/s

Ymin = -.17 mm @ 0.1089 sec., Ymax = 37.02 mm @ 0.0483 sec.



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Calibration

ATD Serial No.:049

Test I.D.:D02122

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Velocity	m/s	4.27 – 4.33	4.29	Pass
Upper Rib	G's	37 – 46	37	Pass
Lower Rib	G's	37 – 46	42	Pass
Lower Spine	G's	15 - 22	19	Pass
Overall Test Results				Pass

 Laboratory Technician

1/23/02
 Test Date

 Approved By

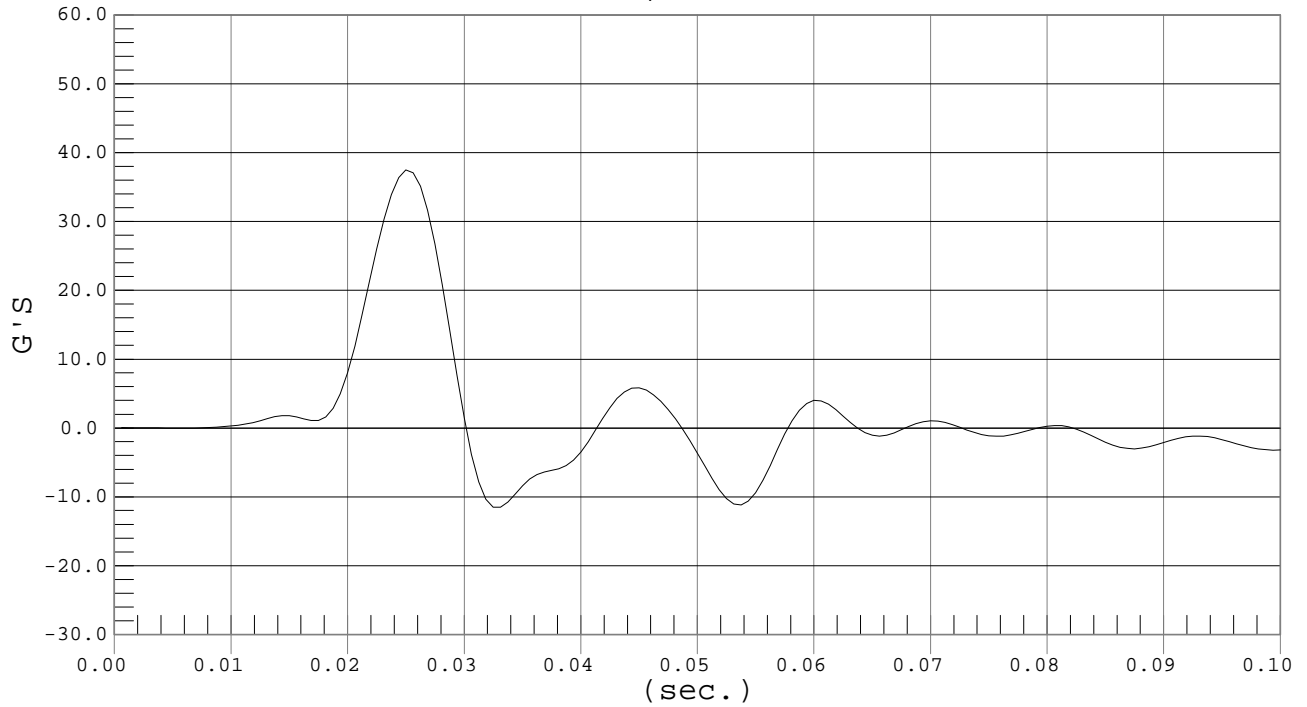


UPPER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 01-23-02
Speed: 14.1 fps, 4.29 M/s

Ymin = -11.53 G'S @ 0.0330 sec., Ymax = 37.48 G'S @ 0.0249 sec.

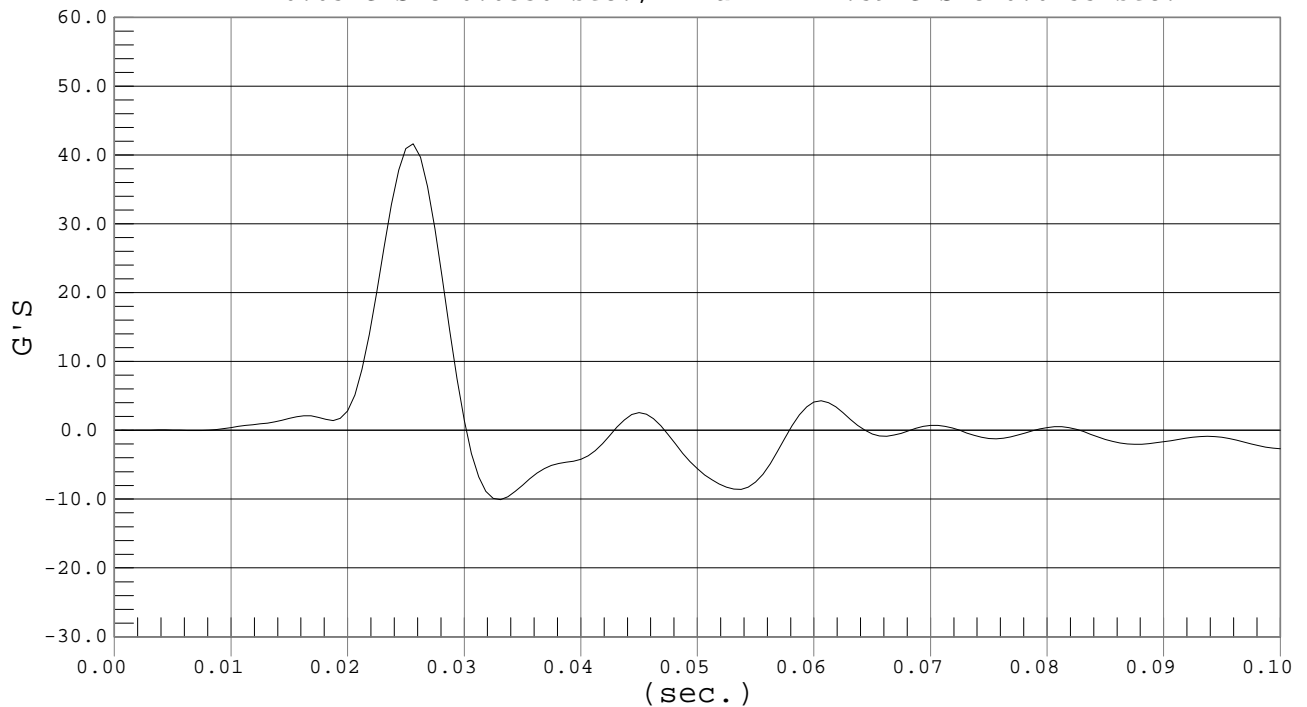


LOWER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 01-23-02
Speed: 14.1 fps, 4.29 M/s

Ymin = -10.05 G'S @ 0.0330 sec., Ymax = 41.59 G'S @ 0.0255 sec.



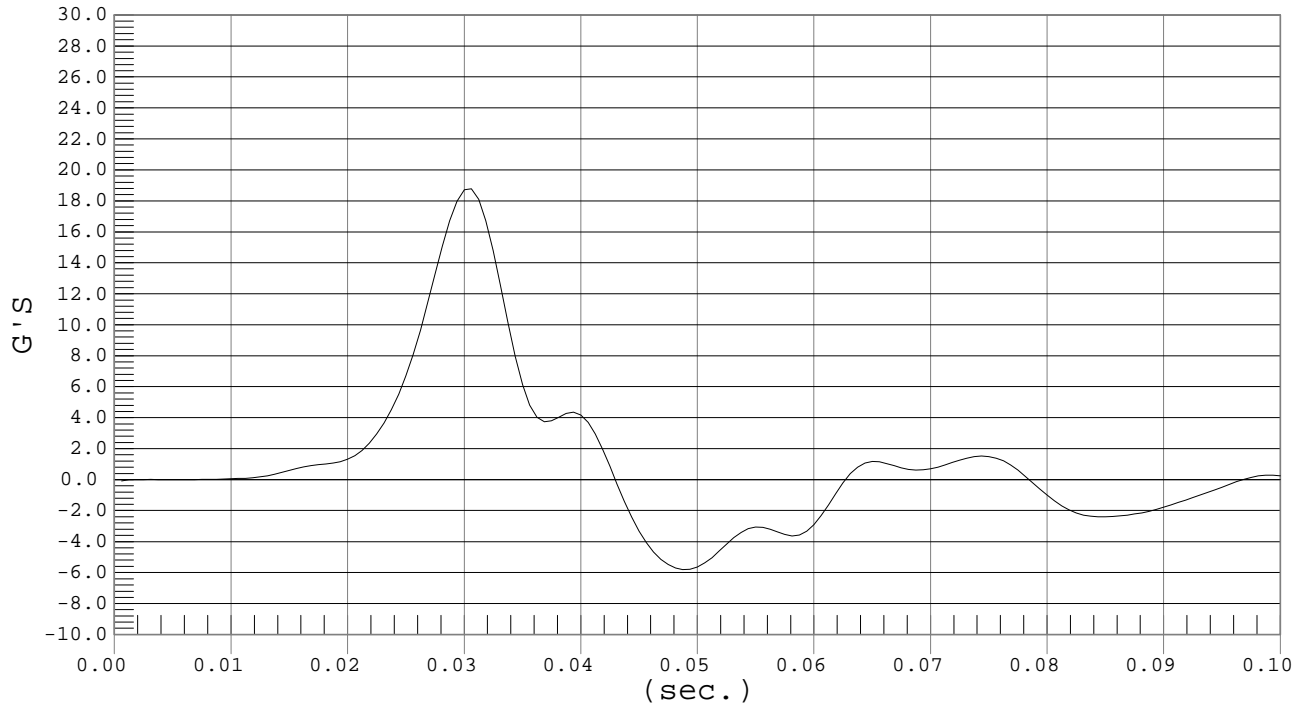


LOWER SPINE ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 01-23-02
Speed: 14.1 fps, 4.29 M/s

Ymin = -5.81 G'S @ 0.0487 sec., Ymax = 18.76 G'S @ 0.0305 sec.



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Calibration

ATD Serial No.:049

Test I.D.:D02123

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	35	Pass
Probe Speed	m/s	4.27 – 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	55	Pass
Overall Test Results				Pass

Laboratory Technician

1/23/02
Test Date

Approved By

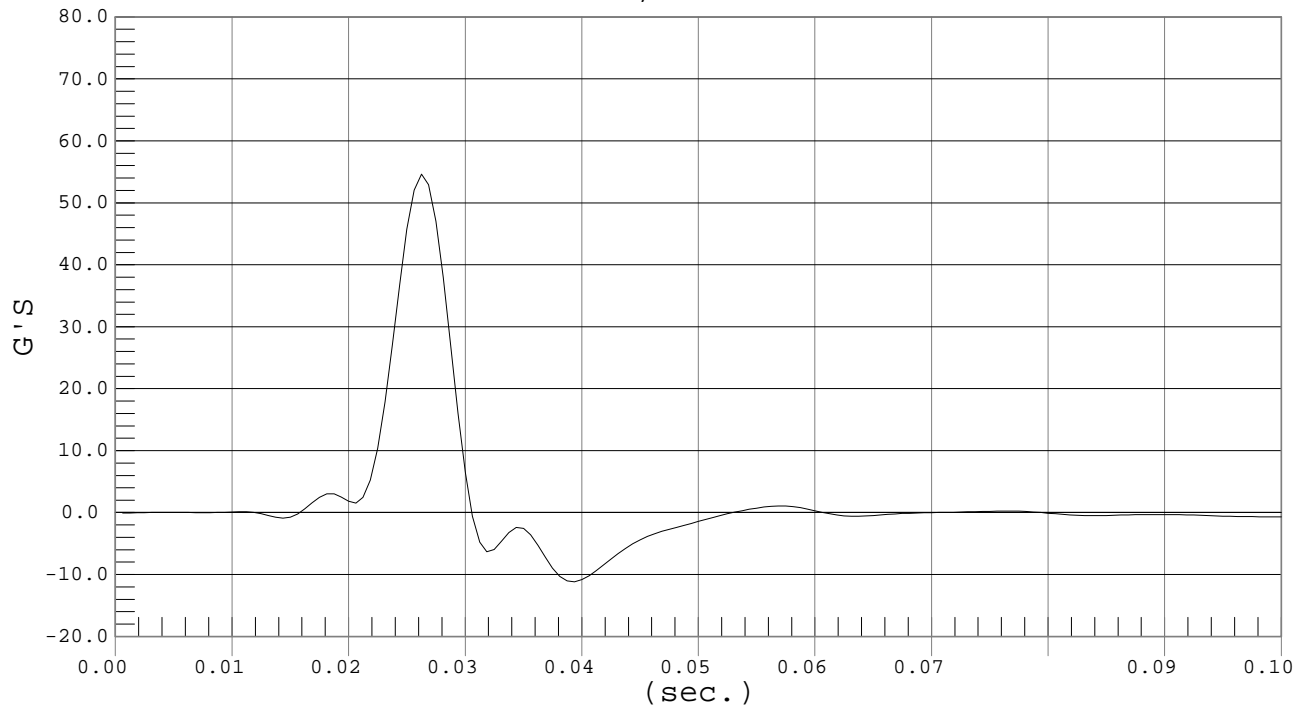


PELVIS ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 01-23-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -11.16 G'S @ 0.0393 sec., Ymax = 54.66 G'S @ 0.0262 sec.



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Preload = 10 lbs)

ATD Serial No.:049

Test I.D.:D02124

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force @ 12.7	mm	104 – 162	136	Pass
Force @ 19	mm	163 – 222	190	Pass
Force @ 25.4	mm	222 – 280	254	Pass
Force @ 33	mm	325 - 391	356	Pass
Overall Test Results				Pass

 Laboratory Technician

1/17/02
 Test Date

 Approved By

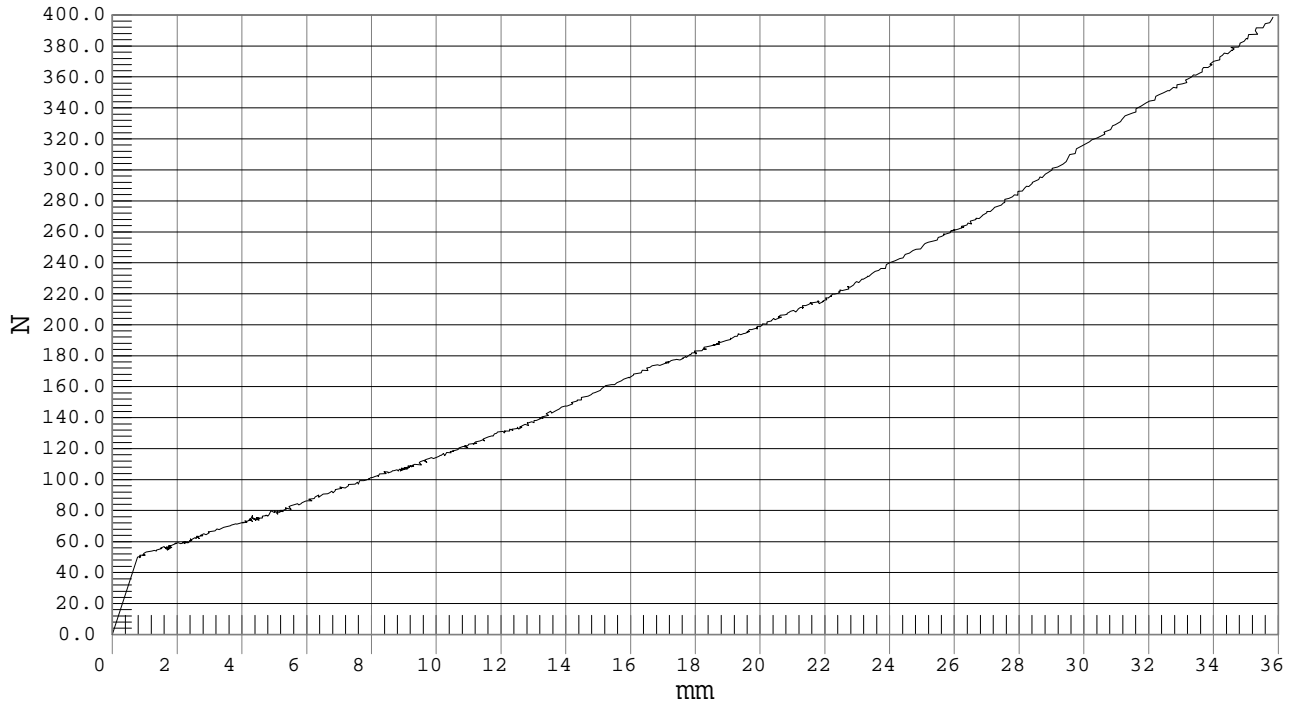


ABDOMEN COMPRESSION

Test Desc.: Abdominal Compression
Component: Dummy #049

Test Date: 01-17-02
Speed: 0.0 fps, 0.00 M/s

Ymin = 0 N @ -0.0001 mm, Ymax = 430.87 N @ 38.1903 mm



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No.:049

Test I.D.:D02125

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force @ 0	mm	0 – 26.7	0	Pass
Force @ 20	mm	97.9 – 151.2	132.0	Pass
Force @ 30	mm	151.2 – 204.6	191.8	Pass
Force @ 40	mm	204.6 – 258.0	243.6	Pass
Return Angle	Degrees	12 Maximum	2	Pass
Overall Test Results				Pass

Laboratory Technician

1/17/02
Test Date

Approved By

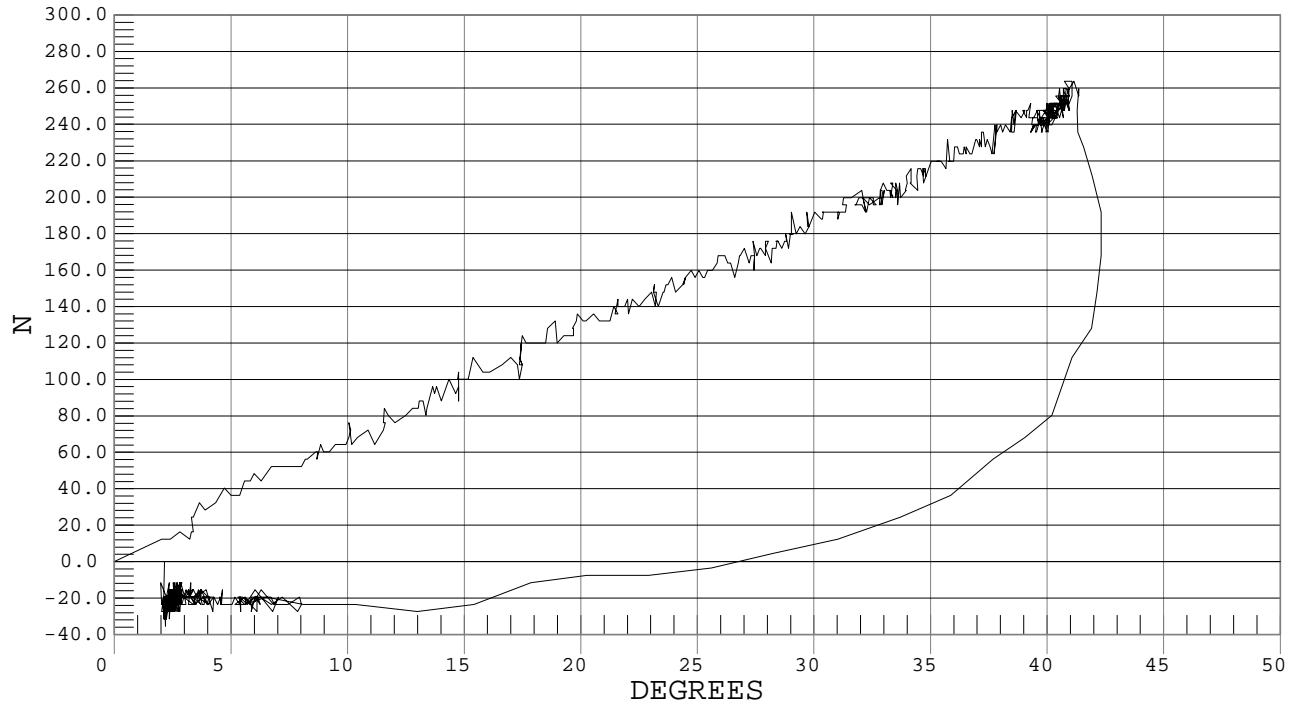


LUMBAR FLEXION

Test Desc.: LUMBAR FLEXION
Component: DUMMY # 049

Test Date: 01-17-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -35.44 N @ 2.1918 DEGREES, Ymax = 263.55 N @ 41.0746 DEGREES



SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No.:049

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, weldment, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Pass Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

Notes (include component/problem/section/reason):

Laboratory Technician

1/23/02
Test Date

Approved By

CERTIFICATION DATA

Dummy Serial Number: 048

Calibration Test Results Summary

Dummy Serial Number: 048

Pre-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No.: 048

Test Number: D0210

Tested Parameter	Units	Specification	Result	Pass/Fail
SH – Seated Height	mm	889 - 909	902	Pass
RH – Rib Height	mm	501 – 521	507	Pass
HP – Hip Pivot Height	mm	99 ref.	99	Pass
RD-Rib from Back Line	mm	229 – 241	236	Pass
KV – Knee Pivot from Back Line	mm	511 – 526	519	Pass
SW – Knee Pivot to Floor	mm	490 – 505	492	Pass
HW – Hip Width	mm	356 – 391	364	Pass
Overall Test Results				Pass

Laboratory Technician

1/18/02
Test Date

Approved By

SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration

ATD Serial No.:048

Test I.D.:D02101

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	20.5	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	210 to 260	243	Pass
Peak Lateral Acceleration	G's	< 10	-10	Pass
Time Above 100 G	msec	0.9 – 1.5	1.1	Pass
Overall Test Results				Pass

 Laboratory Technician

1/18/02
 Test Date

 Approved By

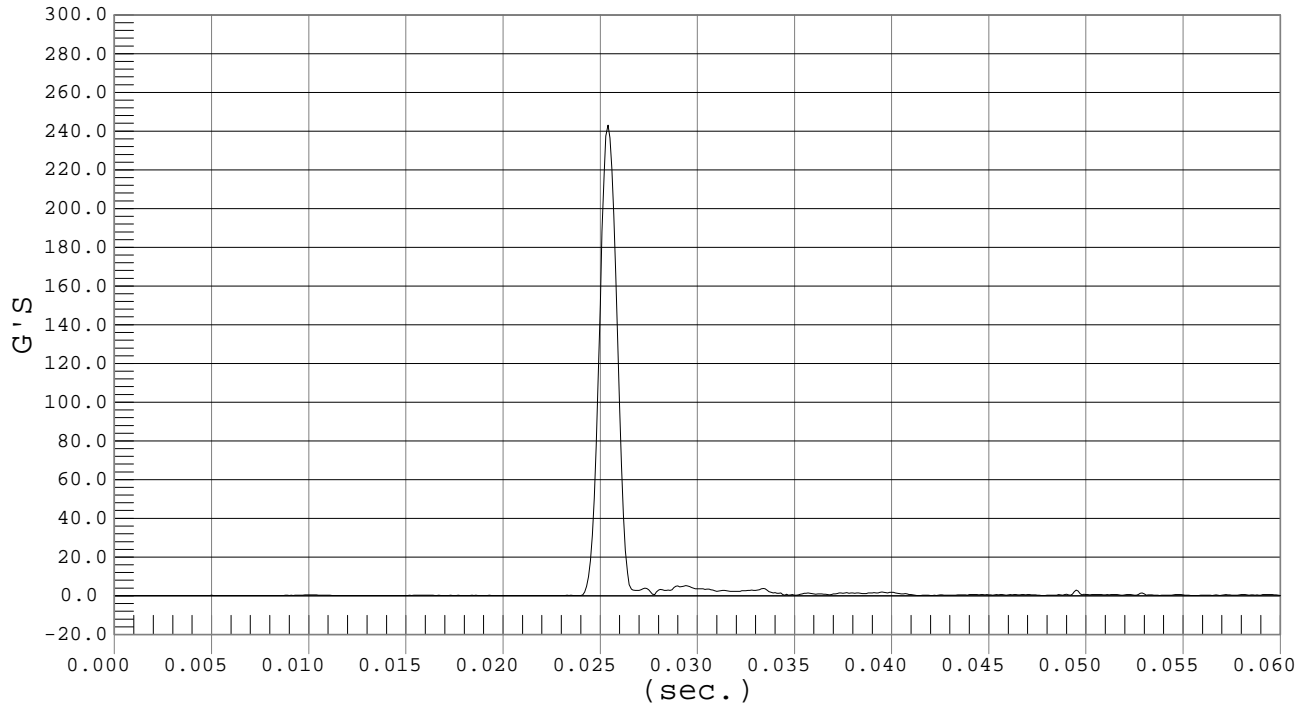


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #048

Test Date: 01-18-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0001 sec., Ymax = 243.13 G'S @ 0.0253 sec.

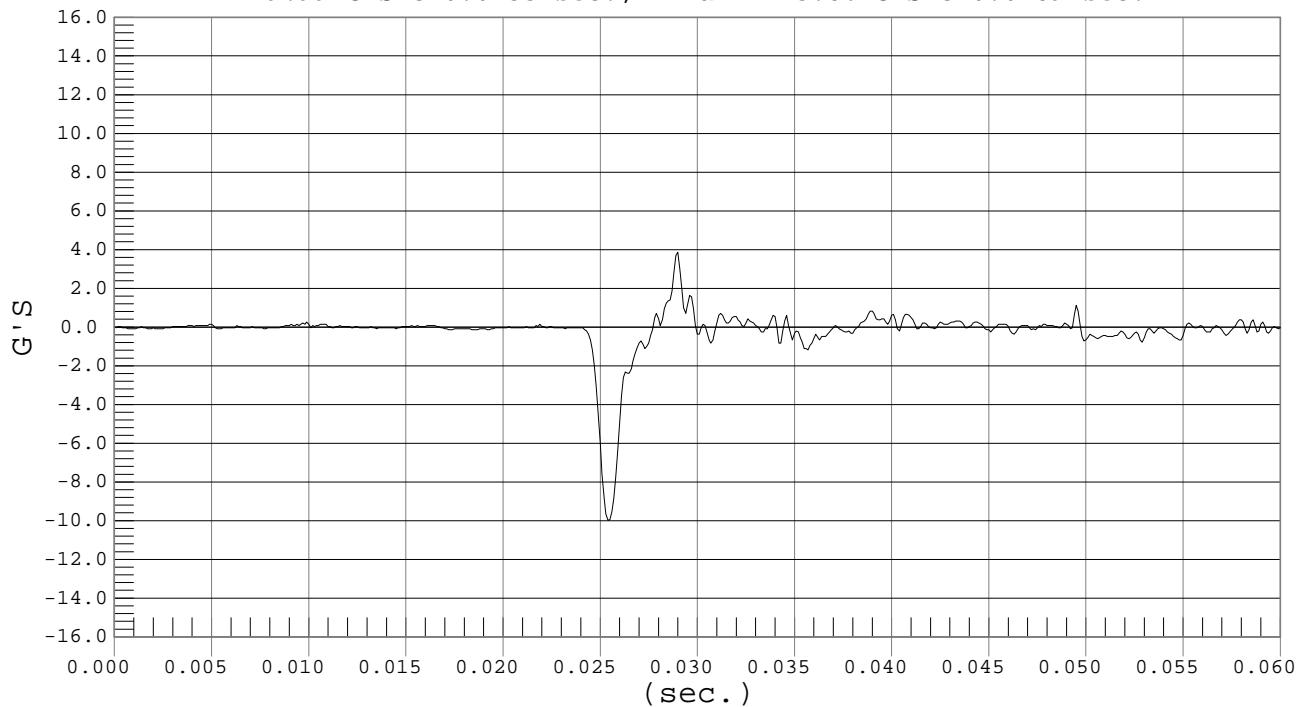


PEAK LATERAL ACCELERATION

Test Desc.: Head Drop
Component: Dummy #048

Test Date: 01-18-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -9.99 G'S @ 0.0253 sec., Ymax = 3.86 G'S @ 0.0289 sec.



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Calibration

ATD Serial No.: 048

Test I.D.: D02102

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Velocity	m/s	4.27 – 4.33	4.30	Pass
Upper Rib	G's	37 – 46	38	Pass
Lower Rib	G's	37 – 46	38	Pass
Lower Spine	G's	15 - 22	17	Pass
Overall Test Results				Pass

 Laboratory Technician

1/18/02
 Test Date

 Approved By

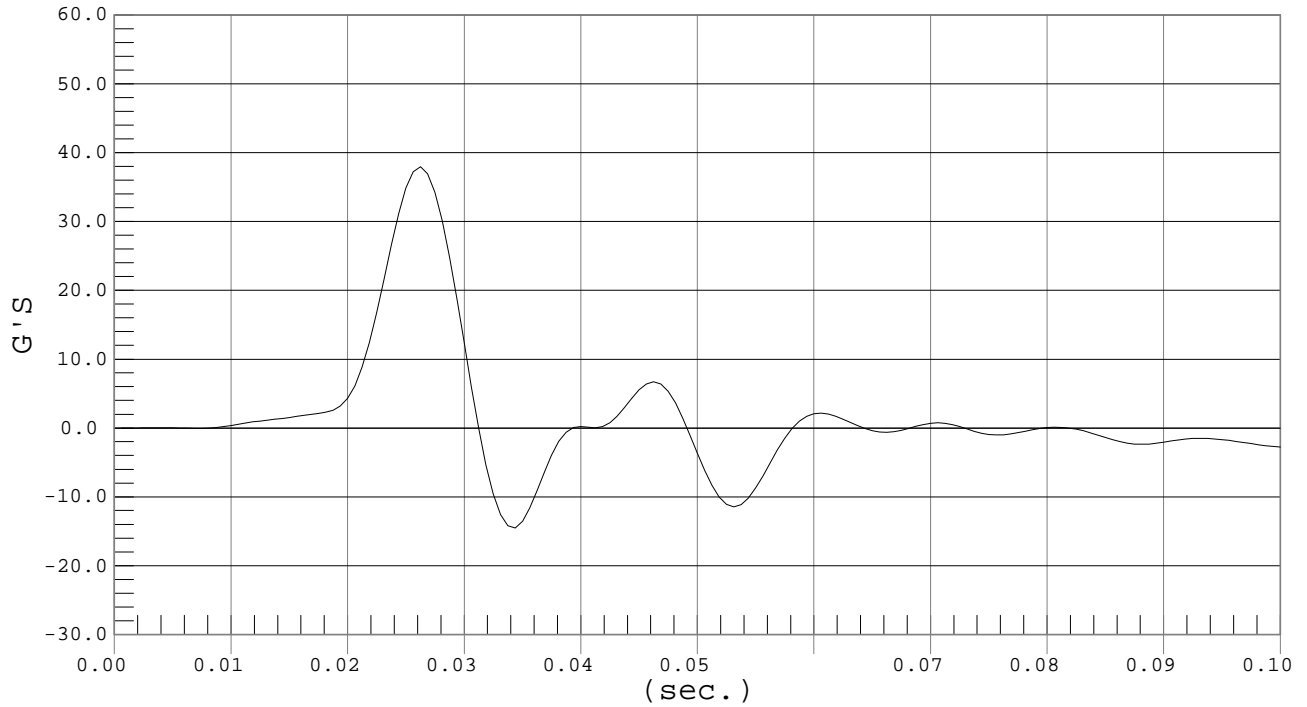


UPPER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 01-18-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -14.5 G'S @ 0.0343 sec., Ymax = 37.94 G'S @ 0.0262 sec.

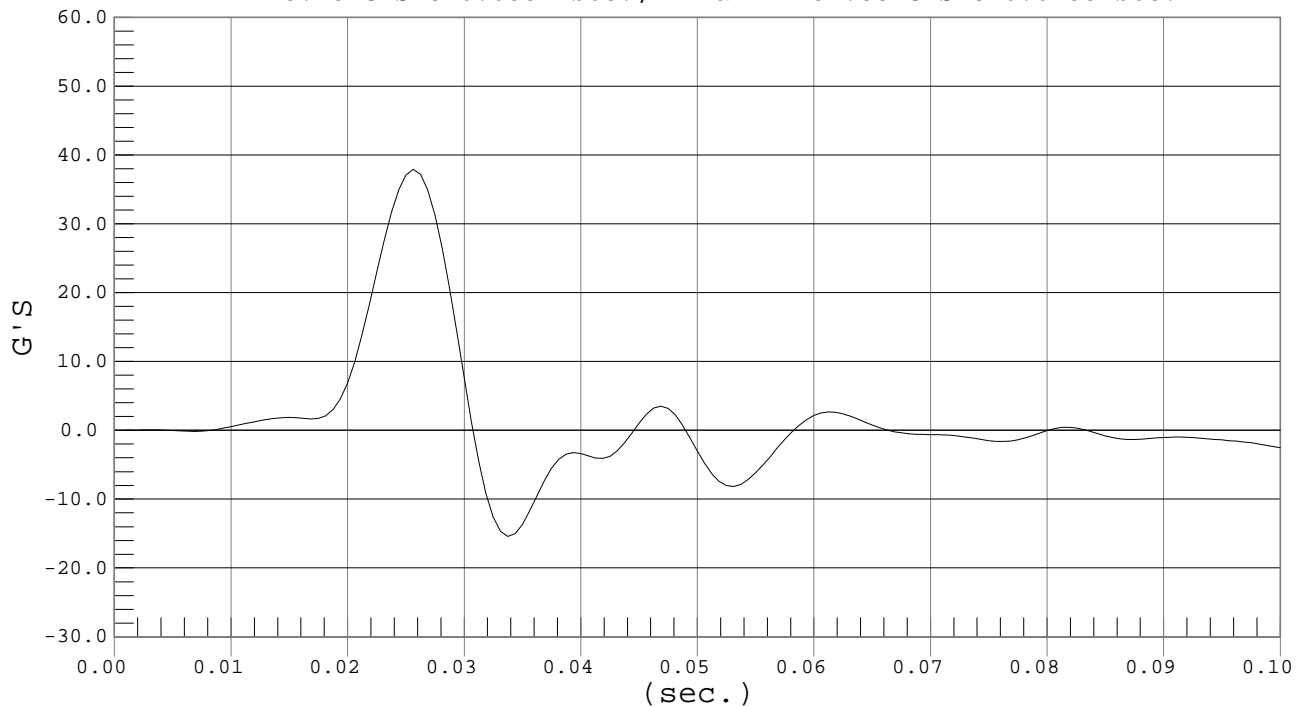


LOWER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 01-18-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -15.43 G'S @ 0.0337 sec., Ymax = 37.88 G'S @ 0.0255 sec.



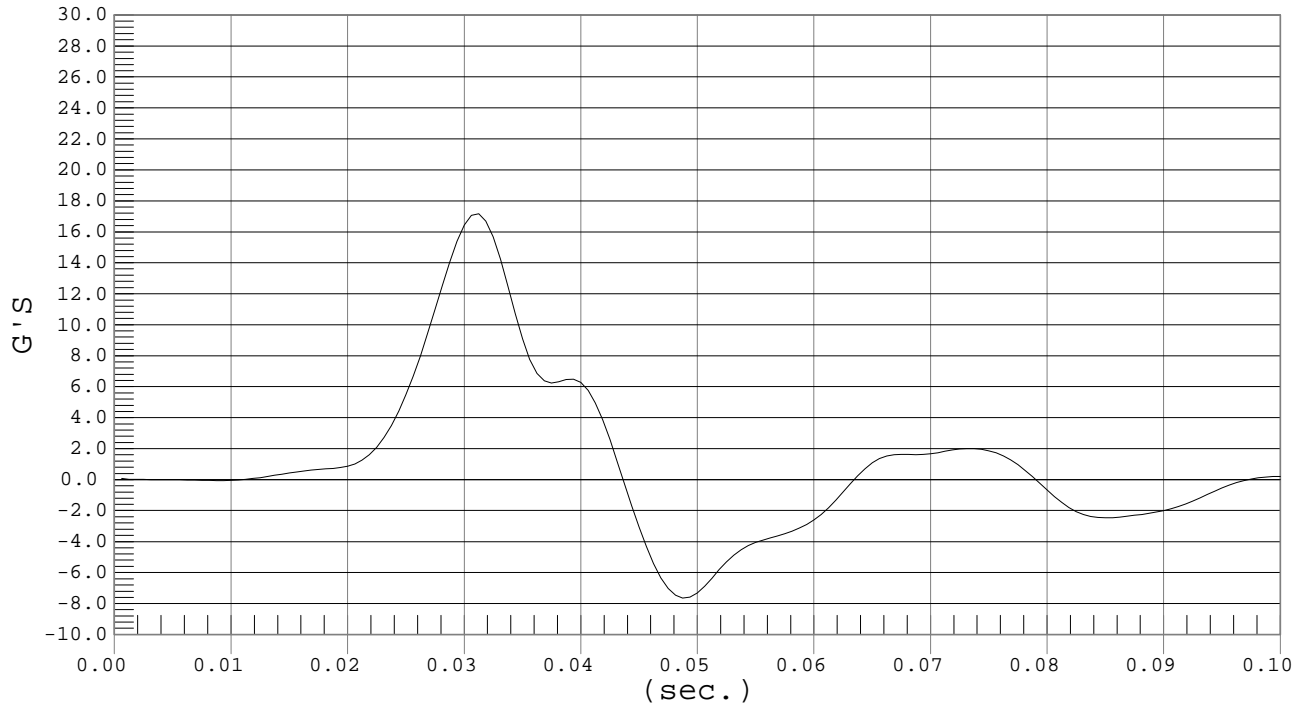


LOWER SPINE ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 01-18-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -7.65 G'S @ 0.0487 sec., Ymax = 17.16 G'S @ 0.0312 sec.



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Calibration

ATD Serial No.:048

Test I.D.:D02103

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Probe Speed	m/s	4.27 – 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	47	Pass
			Overall Test Results	Pass

Laboratory Technician

1/18/02
Test Date

Approved By

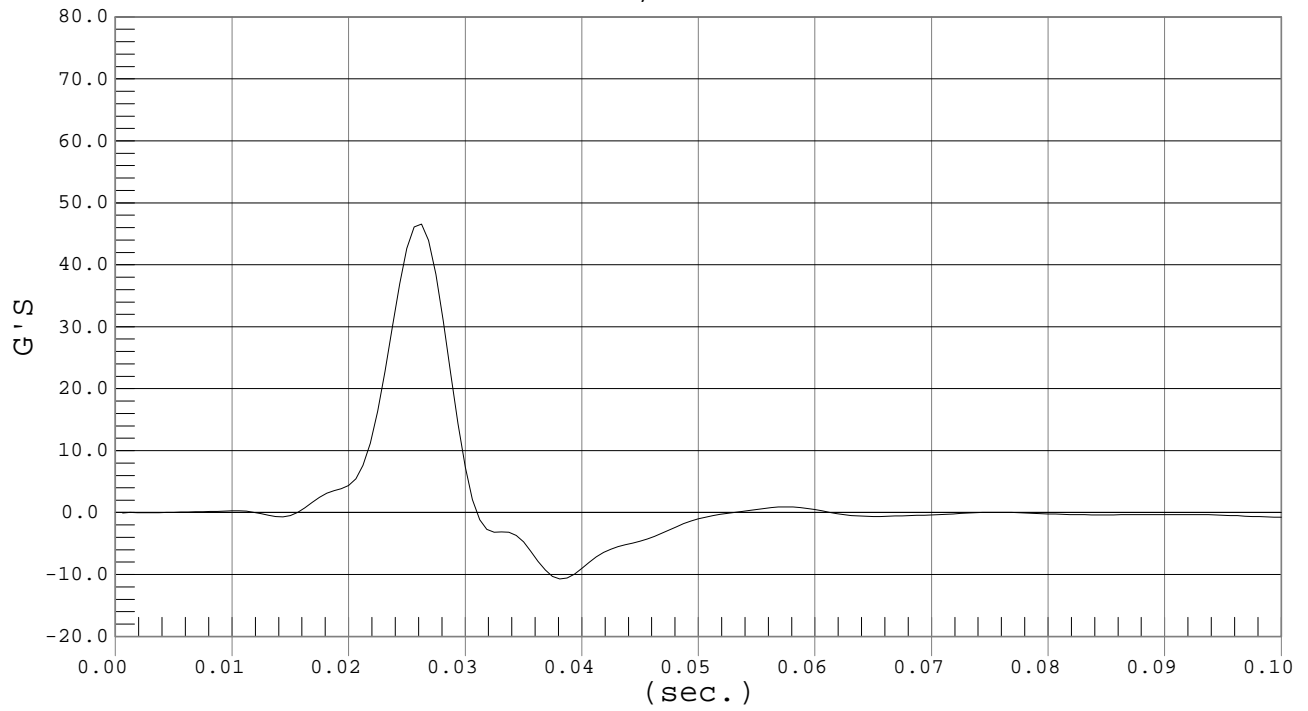


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #048

Test Date: 01-18-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -10.71 G'S @ 0.0380 sec., Ymax = 46.59 G'S @ 0.0262 sec.



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Preload = 10 lbs)

ATD Serial No.:048

Test I.D.:D02104

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force @ 12.7	mm	104 – 162	129	Pass
Force @ 19	mm	163 – 222	180	Pass
Force @ 25.4	mm	222 – 280	241	Pass
Force @ 33	mm	325 - 391	346	Pass
Overall Test Results				Pass

 Laboratory Technician

1/17/02
 Test Date

 Approved By

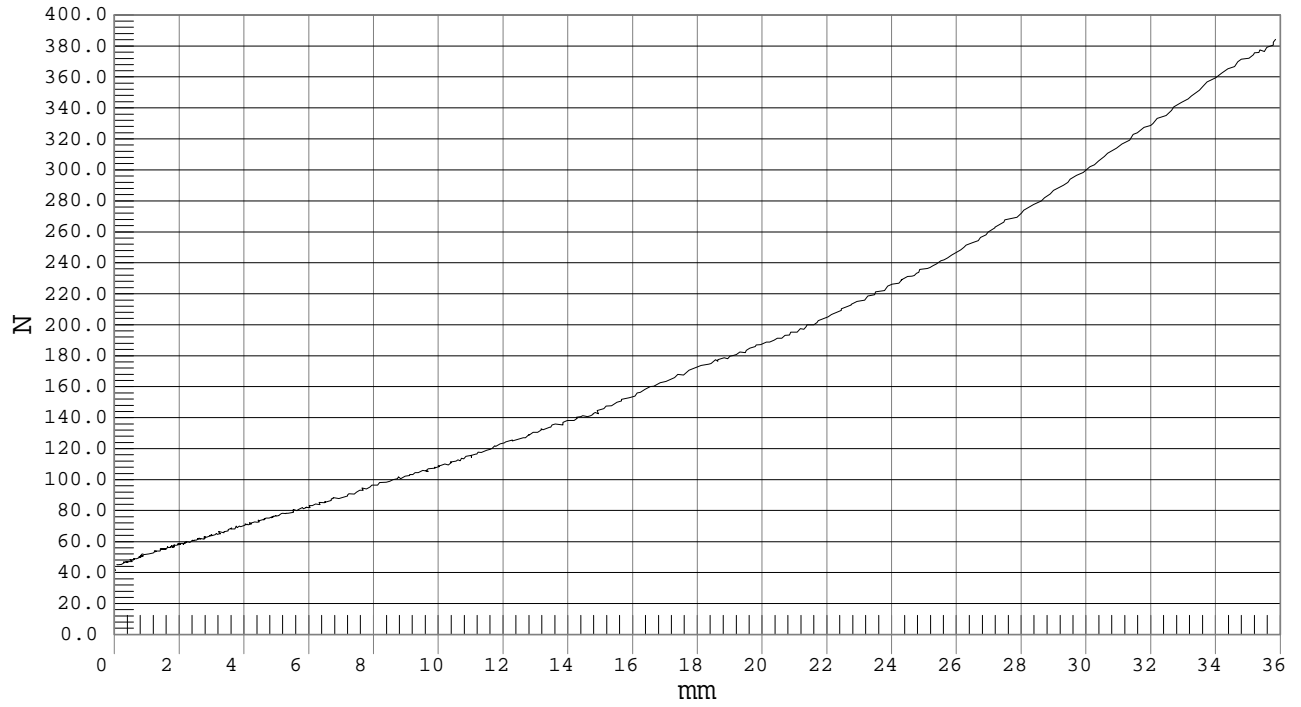


ABDOMEN COMPRESSION

Test Desc.: ABDOMEN COMPRESSION
Component: DUMMY # 048

Test Date: 01-17-02
Speed: 0.0 fps, 0.00 M/s

Ymin = 0 N @ -0.0001 mm, Ymax = 432.04 N @ 38.8543 mm



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No.:048

Test I.D.:D02105

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Force @ 0	mm	0 – 26.7	0	Pass
Force @ 20	mm	97.9 – 151.2	110.9	Pass
Force @ 30	mm	151.2 – 204.6	162.7	Pass
Force @ 40	mm	204.6 – 258.0	218.5	Pass
Return Angle	Degrees	12 Maximum	5	Pass
Overall Test Results				Pass

 Laboratory Technician

1/17/02
 Test Date

 Approved By

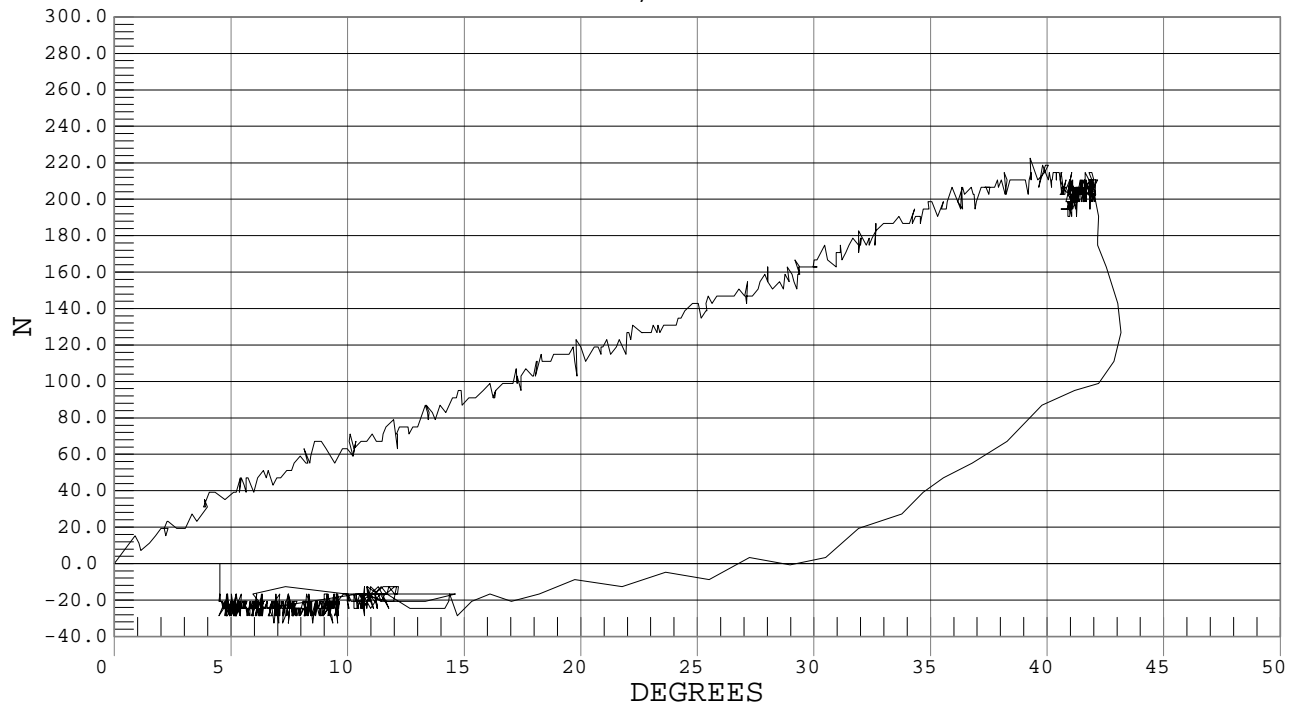


LUMBAR FLEXION

Test Desc.: LUMBAR FLEXION
Component: DUMMY # 048

Test Date: 01-17-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -32.6 N @ 9.5755 DEGREES, Ymax = 222.53 N @ 39.2754 DEGREES



SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No.:048

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, weldment, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Pass Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

Notes (include component/problem/section/reason):

Laboratory Technician

1/18/02
Test Date

Approved By

CERTIFICATION DATA

Dummy Serial Number: 049

Calibration Test Results Summary

Dummy Serial Number: 049

Post -Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No.:049

Test Number:D0217

Tested Parameter	Units	Specification	Result	Pass/Fail
SH – Seated Height	mm	889 - 909	898	Pass
RH – Rib Height	mm	501 – 521	517	Pass
HP – Hip Pivot Height	mm	99 ref.	99	Pass
RD-Rib from Back Line	mm	229 – 241	232	Pass
KV – Knee Pivot from Back Line	mm	511 – 526	522	Pass
SW – Knee Pivot to Floor	mm	490 – 505	492	Pass
HW – Hip Width	mm	356 – 391	367	Pass
Overall Test Results				Pass

Laboratory Technician

2/6/02
Test Date

Approved By

SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration

ATD Serial No.:049

Test I.D.:D02171

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	210 to 260	212	Pass
Peak Lateral Acceleration	G's	< 10	-5	Pass
Time Above 100 G	msec	0.9 – 1.5	1.2	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

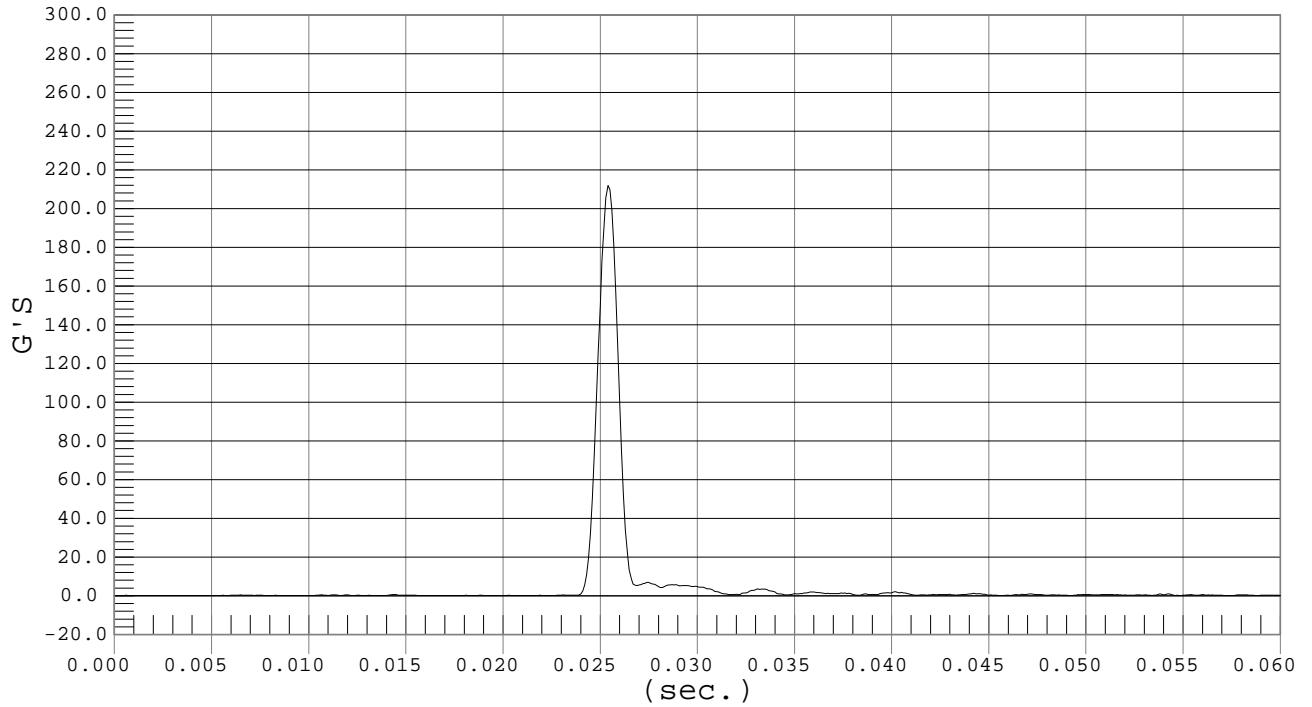


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #049

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0006 sec., Ymax = 211.92 G'S @ 0.0253 sec.

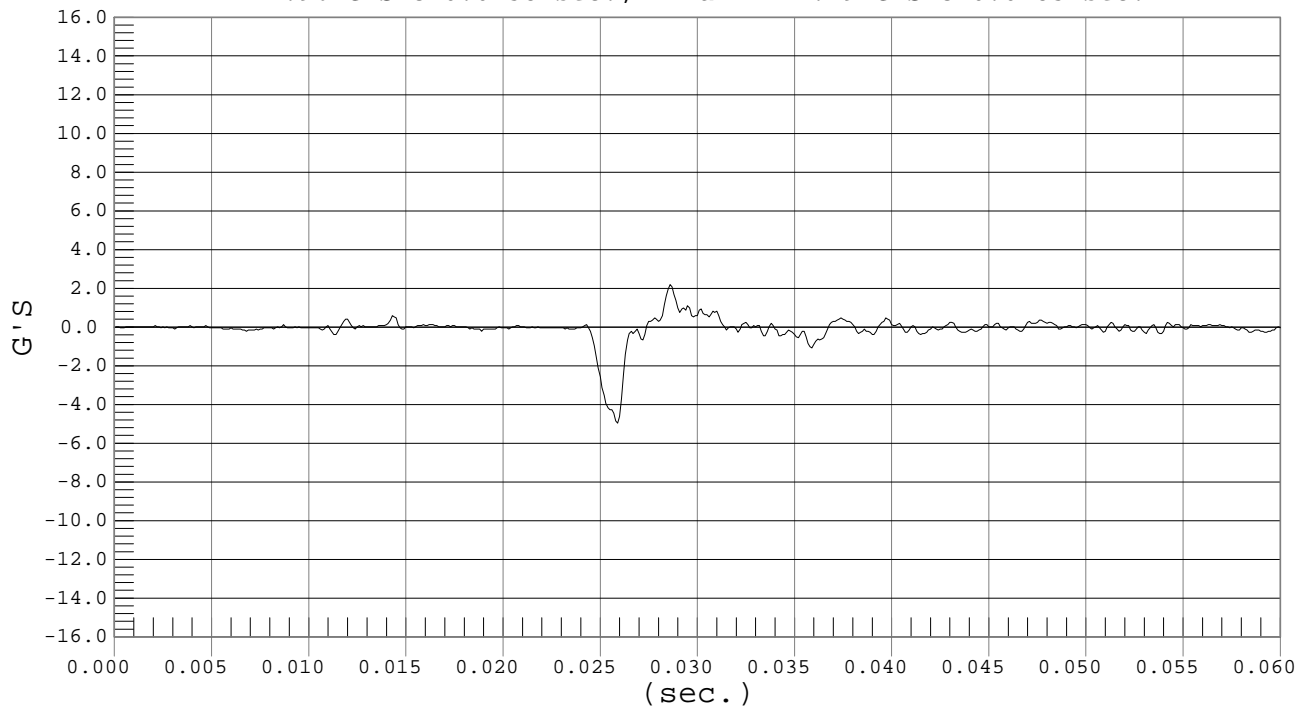


PEAK LATERAL ACCELERATION

Test Desc.: Head Drop
Component: Dummy #049

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -4.96 G'S @ 0.0258 sec., Ymax = 2.19 G'S @ 0.0285 sec.



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Calibration

ATD Serial No.:049

Test I.D.:D02172

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	4.27 – 4.33	4.27	Pass
Upper Rib	G's	37 – 46	37	Pass
Lower Rib	G's	37 – 46	42	Pass
Lower Spine	G's	15 - 22	19	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

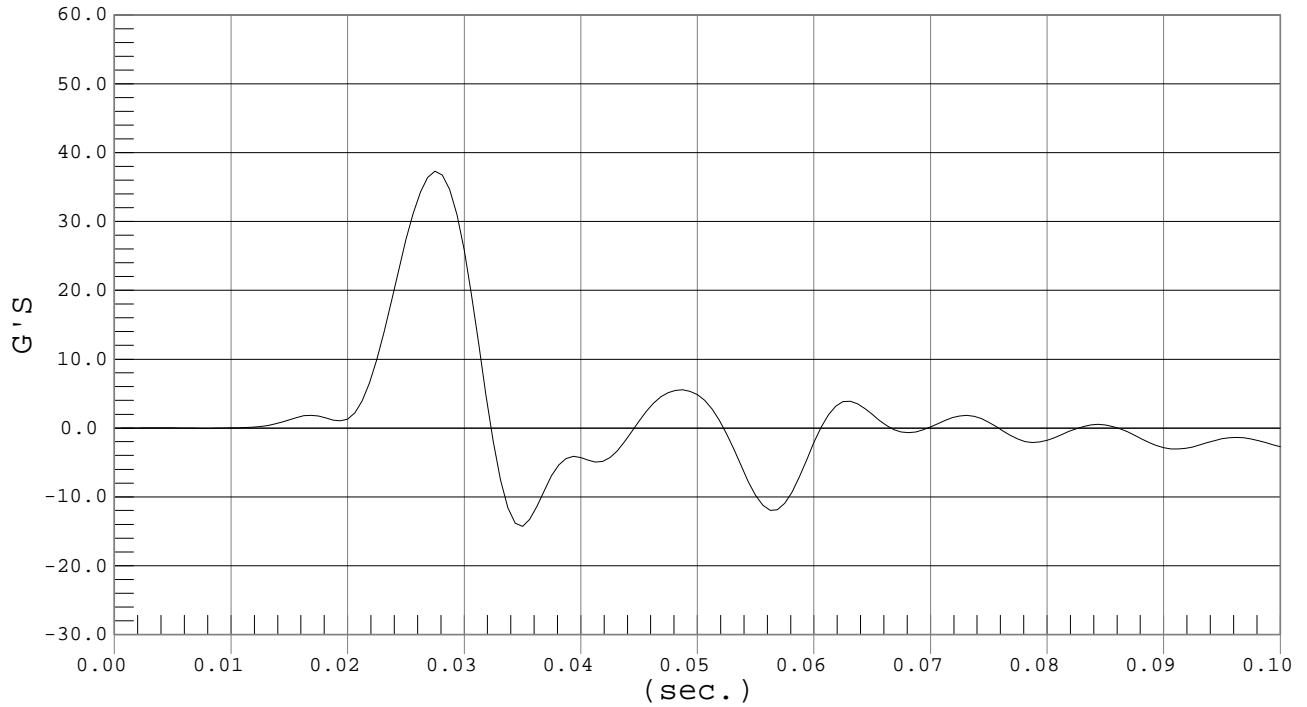


UPPER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -14.27 G'S @ 0.0349 sec., Ymax = 37.28 G'S @ 0.0274 sec.

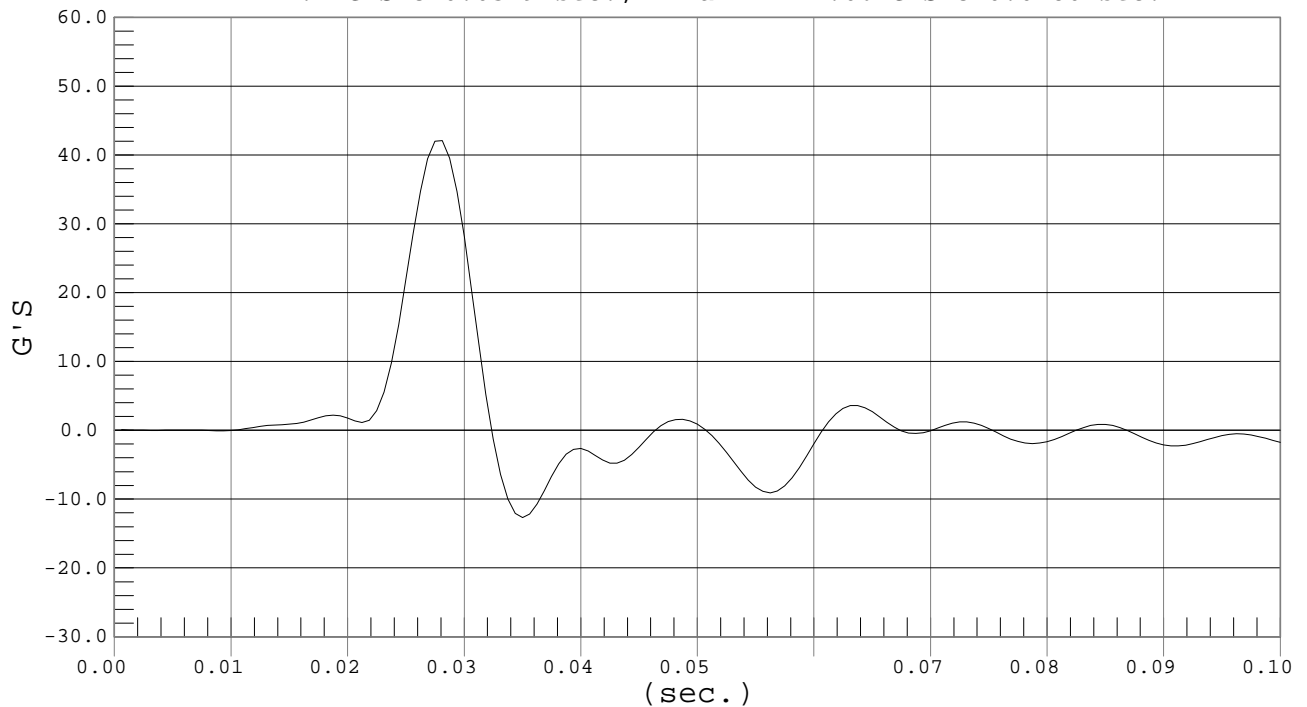


LOWER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -12.7 G'S @ 0.0349 sec., Ymax = 42.06 G'S @ 0.0280 sec.



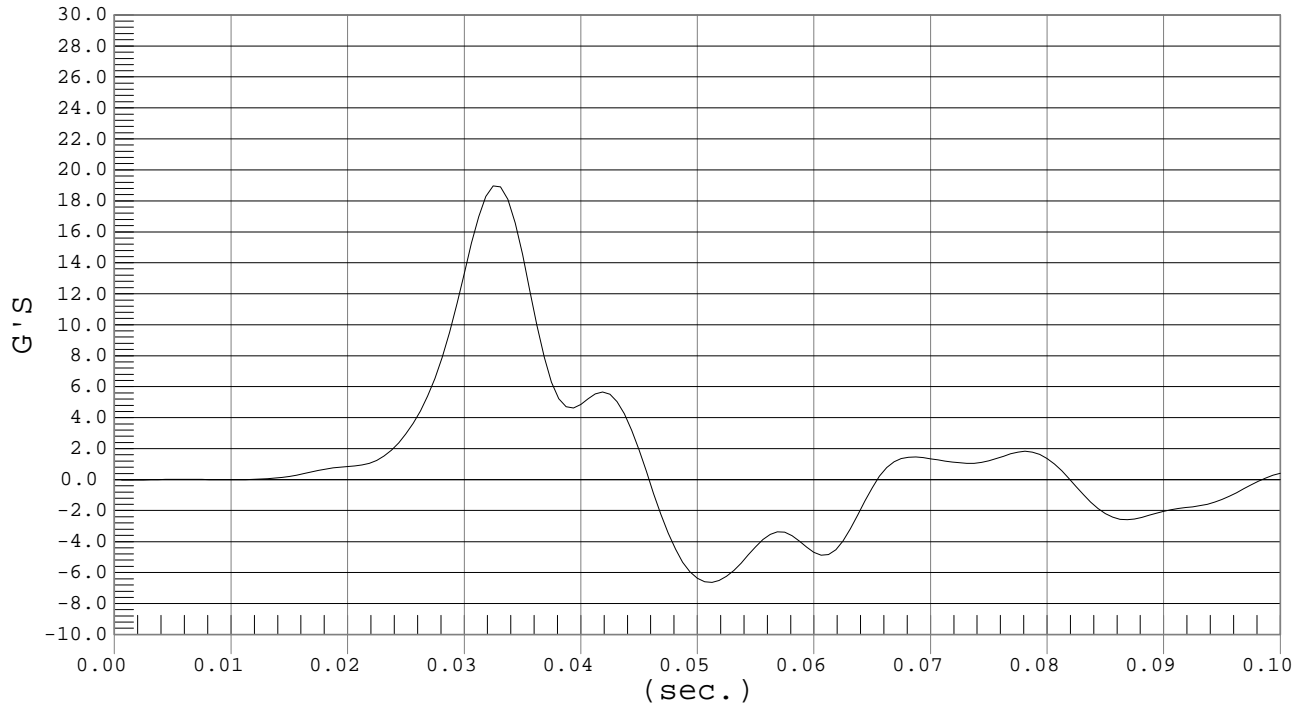


LOWER SPINE ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #049

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -6.62 G'S @ 0.0512 sec., Ymax = 18.96 G'S @ 0.0324 sec.



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Calibration

ATD Serial No.:049

Test I.D.:D02172

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	4.27 – 4.33	4.28	Pass
Pelvis Acceleration	G's	40 - 60	50	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

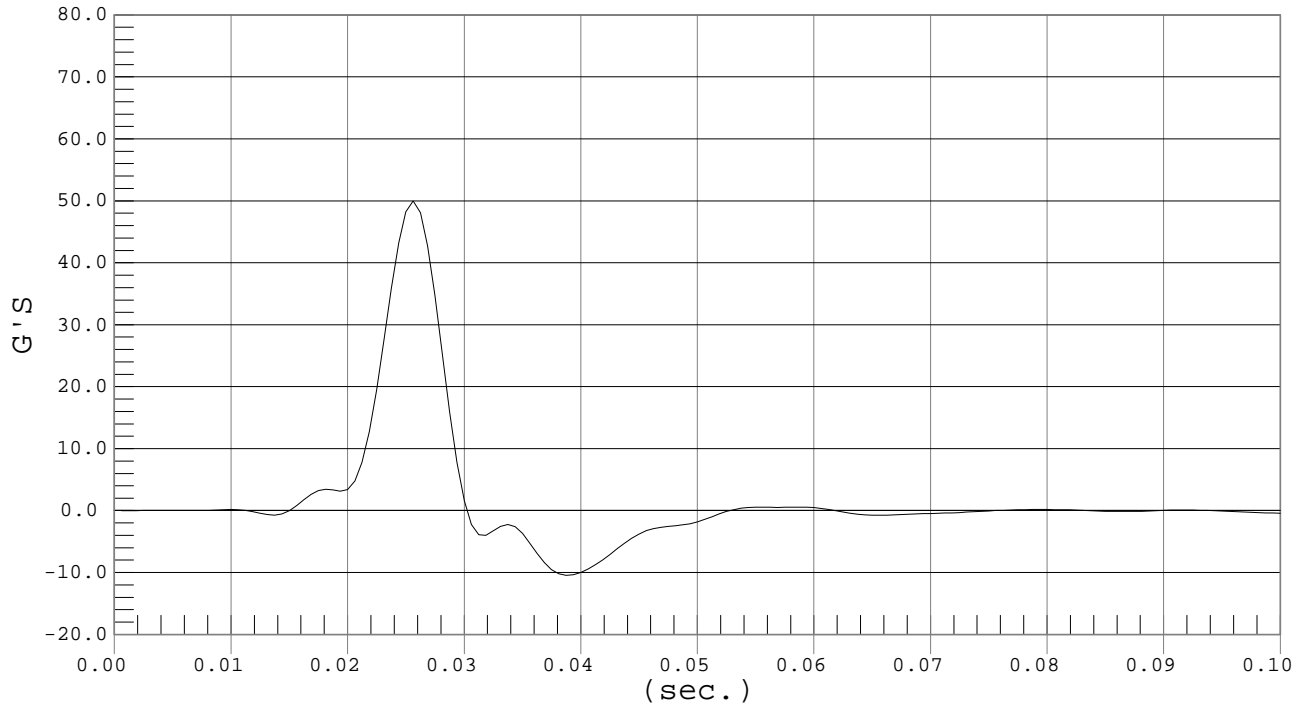


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #049

Test Date: 02-06-02
Speed: 14.0 fps, 4.28 M/s

Ymin = -10.47 G'S @ 0.0387 sec., Ymax = 50 G'S @ 0.0255 sec.



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Preload = 10 lbs)

ATD Serial No.:049

Test I.D.:D02174

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force @ 12.7	mm	104 – 162	144	Pass
Force @ 19	mm	163 – 222	202	Pass
Force @ 25.4	mm	222 – 280	269	Pass
Force @ 33	mm	325 - 391	380	Pass
			Overall Test Results	Pass

Laboratory Technician

2/6/02
Test Date

Approved By

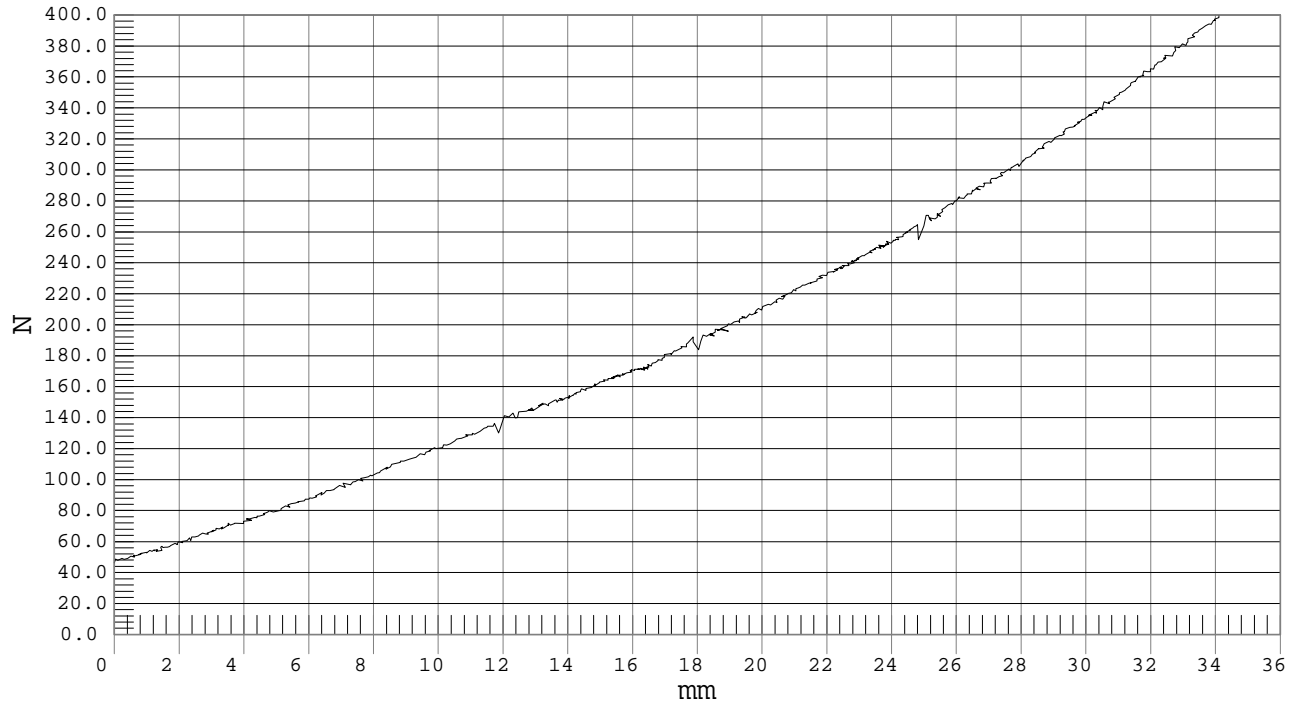


ABDOMEN COMPRESSION

Test Desc.: ABDOMEN COMPRESSION
Component: DUMMY # 049

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -6.67 N @ 36.9372 mm, Ymax = 446.43 N @ 36.7667 mm



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No.:049

Test I.D.:D02175

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force @ 0	mm	0 – 26.7	0	Pass
Force @ 20	mm	97.9 – 151.2	126.5	Pass
Force @ 30	mm	151.2 – 204.6	190.2	Pass
Force @ 40	mm	204.6 – 258.0	253.9	Pass
Return Angle	Degrees	12 Maximum	2	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

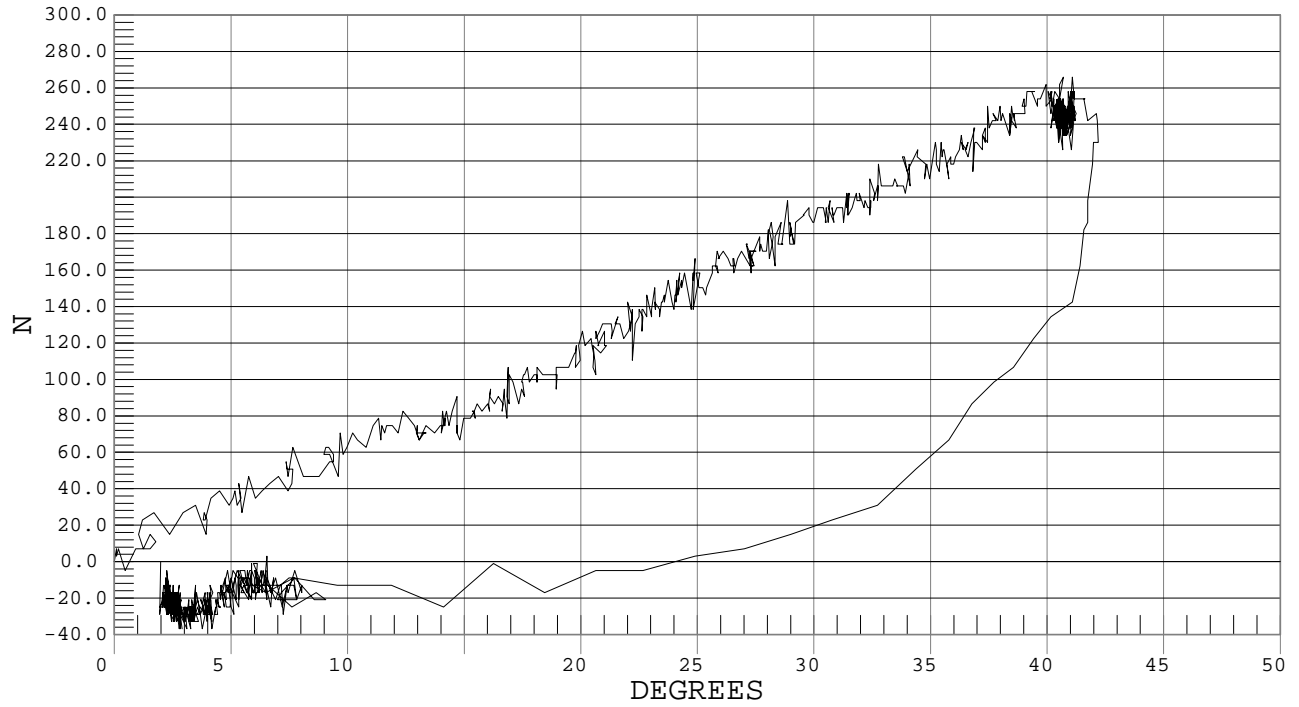


LUMBAR FLEXION

Test Desc.: LUMBAR FLEXION
Component: DUMMY # 049

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -40.84 N @ 3.1482 DEGREES, Ymax = 265.89 N @ 40.7074 DEGREES



SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No.:049

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, weldment, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Pass Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

Notes (include component/problem/section/reason):

Laboratory Technician

2/6/02
Test Date

Approved By

CERTIFICATION DATA

Dummy Serial Number: 048

Calibration Test Results Summary

Dummy Serial Number: 048

Post-Test Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Pelvic Impact Test:	The pelvis passed all impact test requirements.
Abdominal Compression Test:	The abdomen passed all compression test requirements.
Lumbar Flexion Test:	The lumbar passed all flexion test requirements.

SID Calibration Data Sheet
Side Impact Dummy
External Measurements

ATD Serial No.: 048

Test Number: D0216

Tested Parameter	Units	Specification	Result	Pass/Fail
SH – Seated Height	mm	889 - 909	902	Pass
RH – Rib Height	mm	501 – 521	507	Pass
HP – Hip Pivot Height	mm	99 ref.	99	Pass
RD-Rib from Back Line	mm	229 – 241	236	Pass
KV – Knee Pivot from Back Line	mm	511 – 526	519	Pass
SW – Knee Pivot to Floor	mm	490 – 505	492	Pass
HW – Hip Width	mm	356 – 391	364	Pass
Overall Test Results				Pass

Laboratory Technician

2/6/02
Test Date

Approved By

SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration

ATD Serial No.:048

Test I.D.:D02161

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Peak Resultant Acceleration	G's	210 to 260	242	Pass
Peak Lateral Acceleration	G's	< 10	-3	Pass
Time Above 100 G	msec	0.9 – 1.5	1.1	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

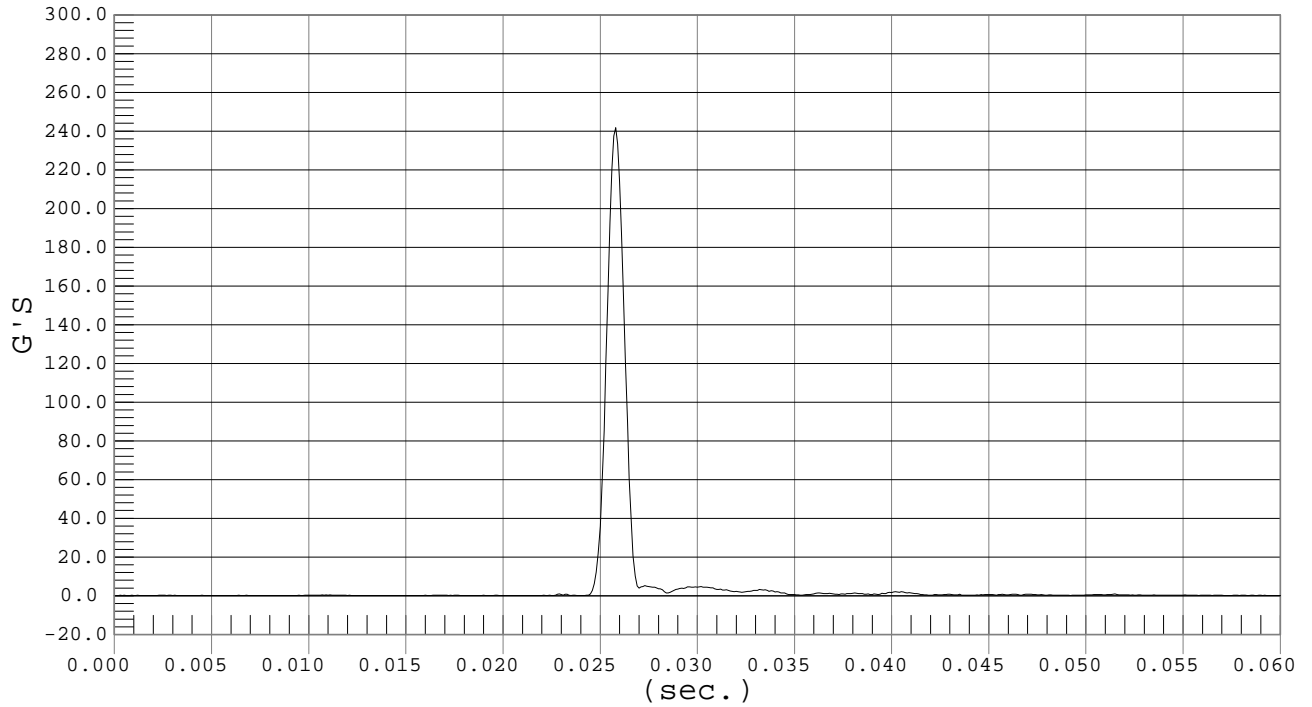


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #048

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .08 G'S @ 0.0017 sec., Ymax = 241.78 G'S @ 0.0257 sec.

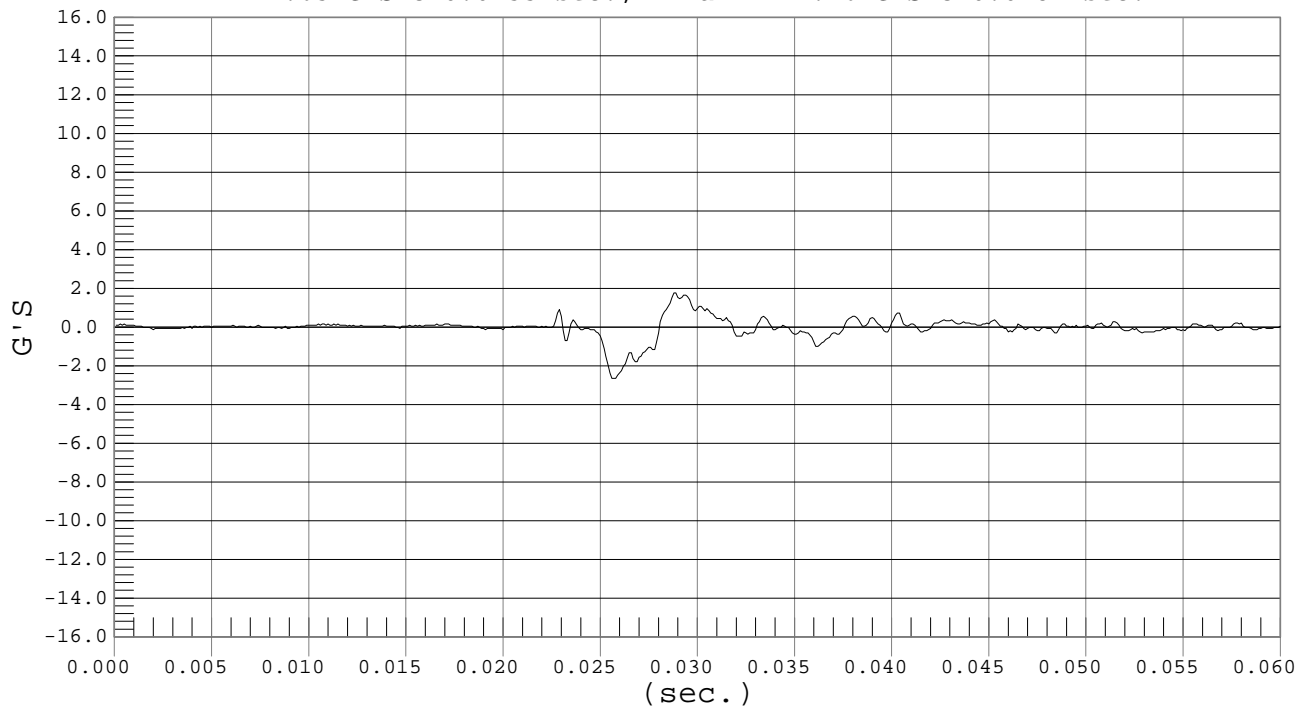


PEAK LATERAL ACCELERATION

Test Desc.: Head Drop
Component: Dummy #048

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -2.65 G'S @ 0.0255 sec., Ymax = 1.76 G'S @ 0.0287 sec.



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Calibration

ATD Serial No.:048

Test I.D.:D02162

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Velocity	m/s	4.27 – 4.33	4.27	Pass
Upper Rib	G's	37 – 46	40	Pass
Lower Rib	G's	37 – 46	38	Pass
Lower Spine	G's	15 - 22	19	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

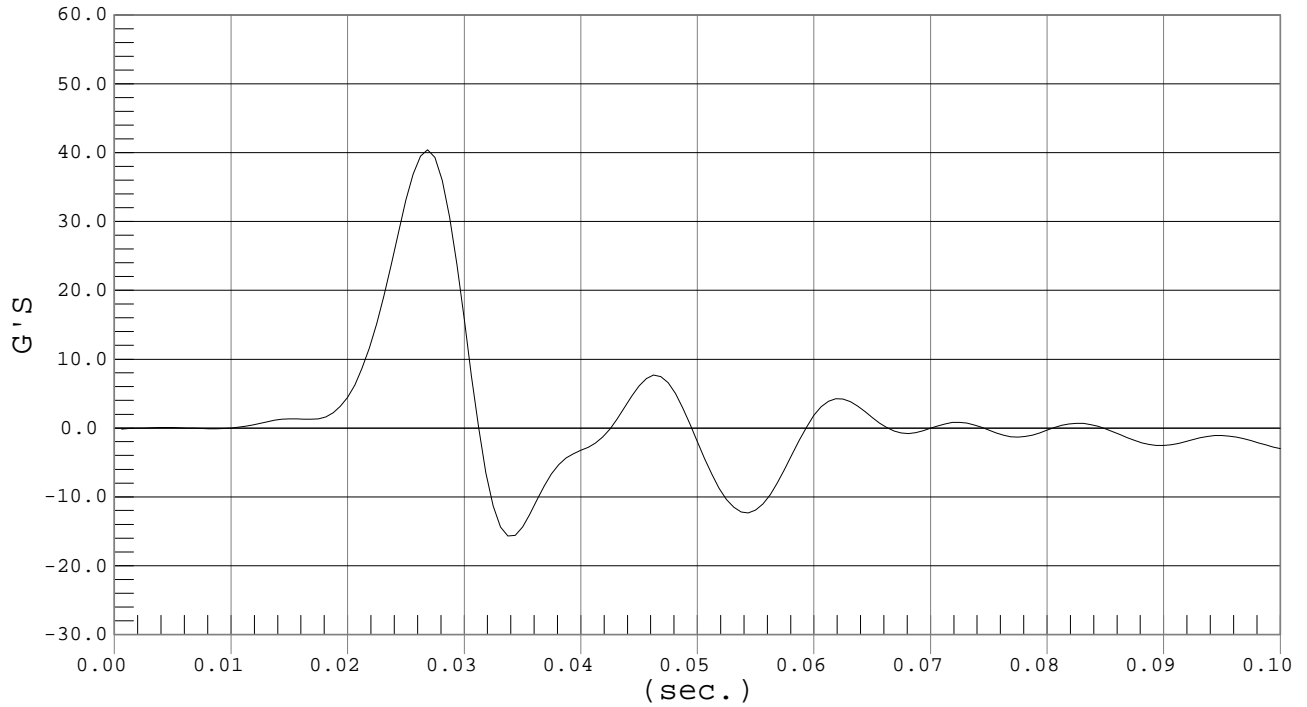


UPPER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -15.71 G'S @ 0.0337 sec., Ymax = 40.43 G'S @ 0.0268 sec.

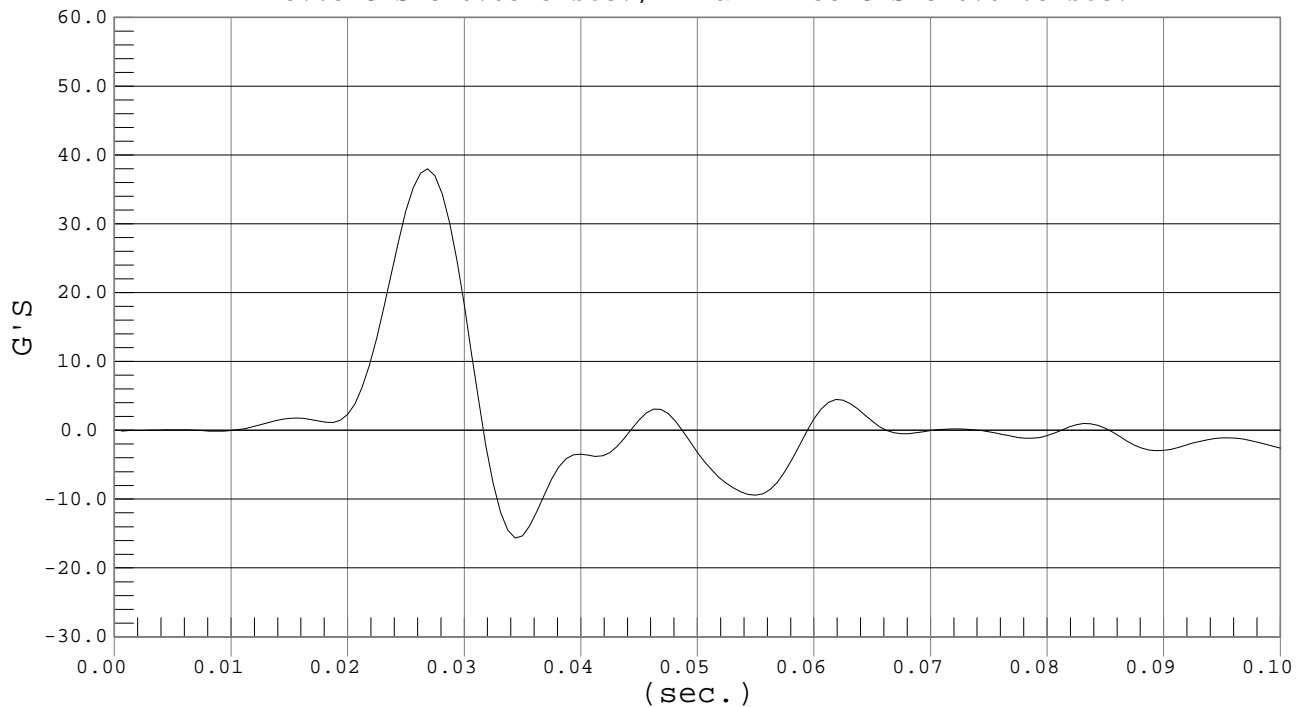


LOWER RIB ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -15.63 G'S @ 0.0343 sec., Ymax = 38 G'S @ 0.0268 sec.



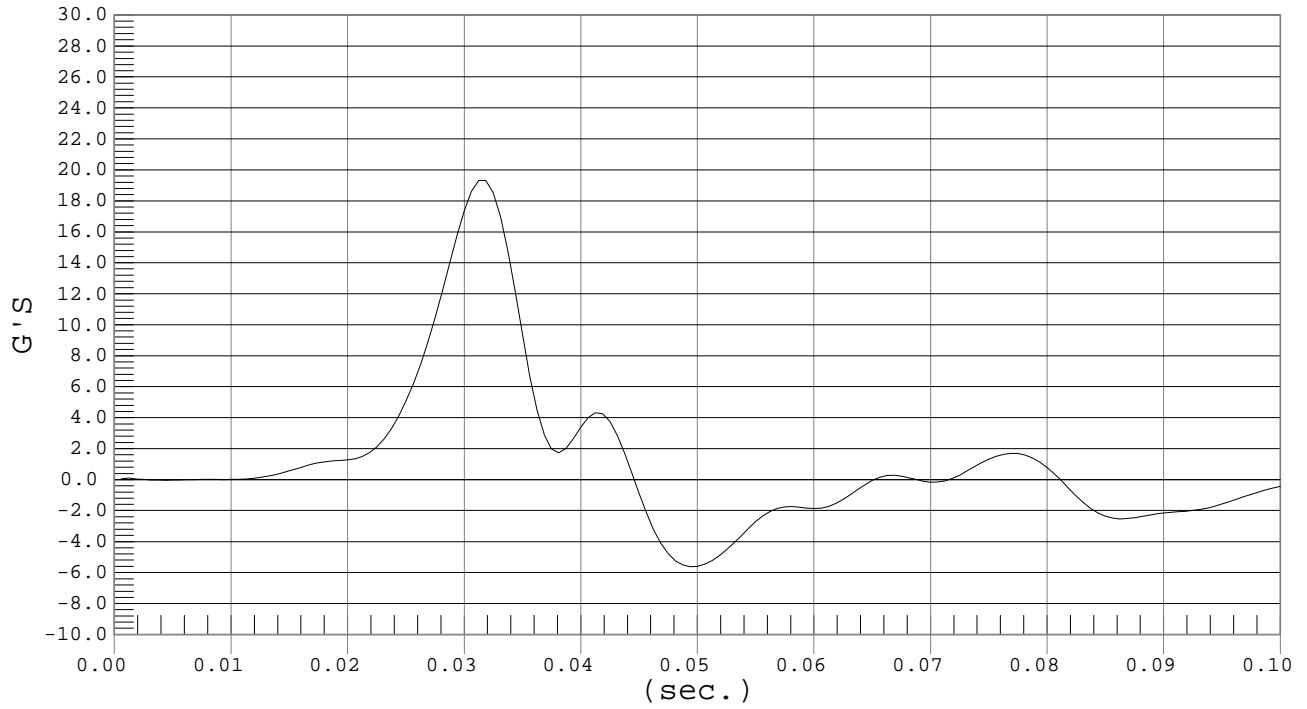


LOWER SPINE ACCELERATION

Test Desc.: Thorax Impact
Component: Dummy #048

Test Date: 02-06-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -5.62 G'S @ 0.0493 sec., Ymax = 19.31 G'S @ 0.0312 sec.



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Calibration

ATD Serial No.:048

Test I.D.:D02163

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	23	Pass
Probe Speed	m/s	4.27 – 4.33	4.28	Pass
Pelvis Acceleration	G's	40 - 60	48	Pass
			Overall Test Results	Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

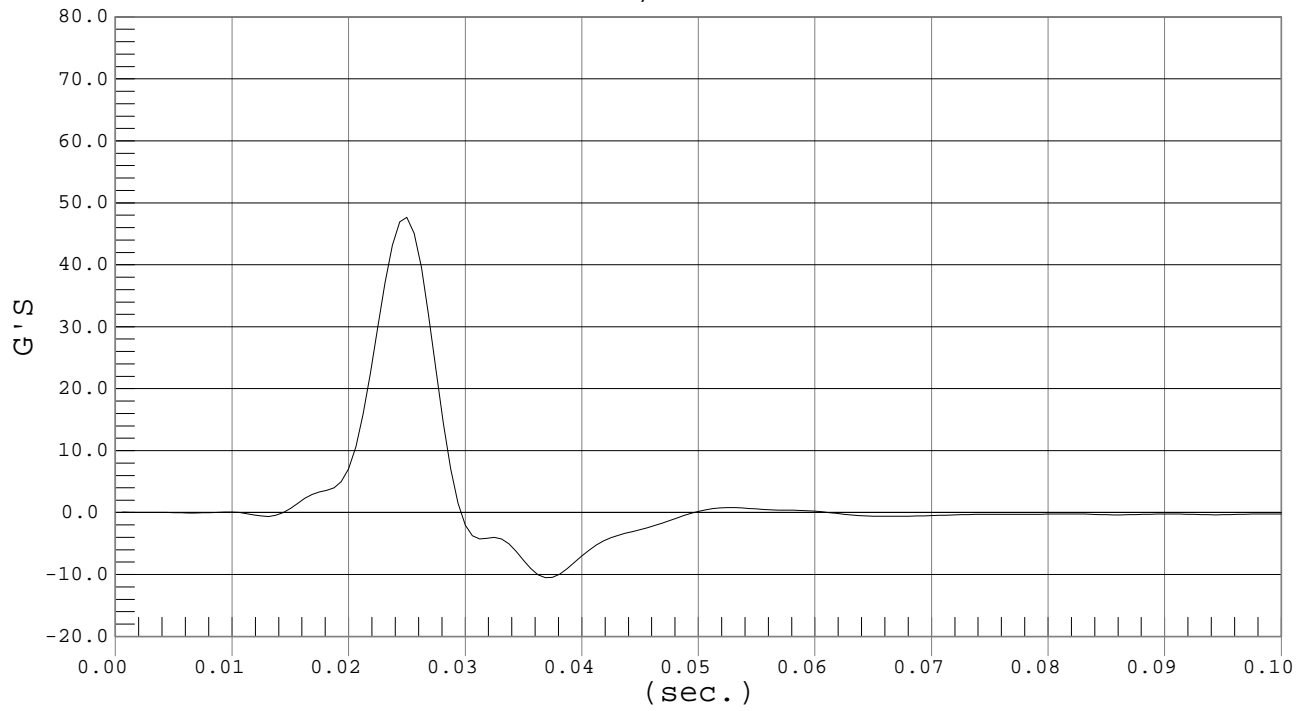


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #048

Test Date: 02-06-02
Speed: 14.0 fps, 4.28 M/s

Ymin = -10.51 G'S @ 0.0368 sec., Ymax = 47.66 G'S @ 0.0249 sec.



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Preload = 10 lbs)

ATD Serial No.:048

Test I.D.:D02164

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force @ 12.7	mm	104 – 162	126	Pass
Force @ 19	mm	163 – 222	177	Pass
Force @ 25.4	mm	222 – 280	243	Pass
Force @ 33	mm	325 - 391	338	Pass
Overall Test Results				Pass

 Laboratory Technician

2/6/02
 Test Date

 Approved By

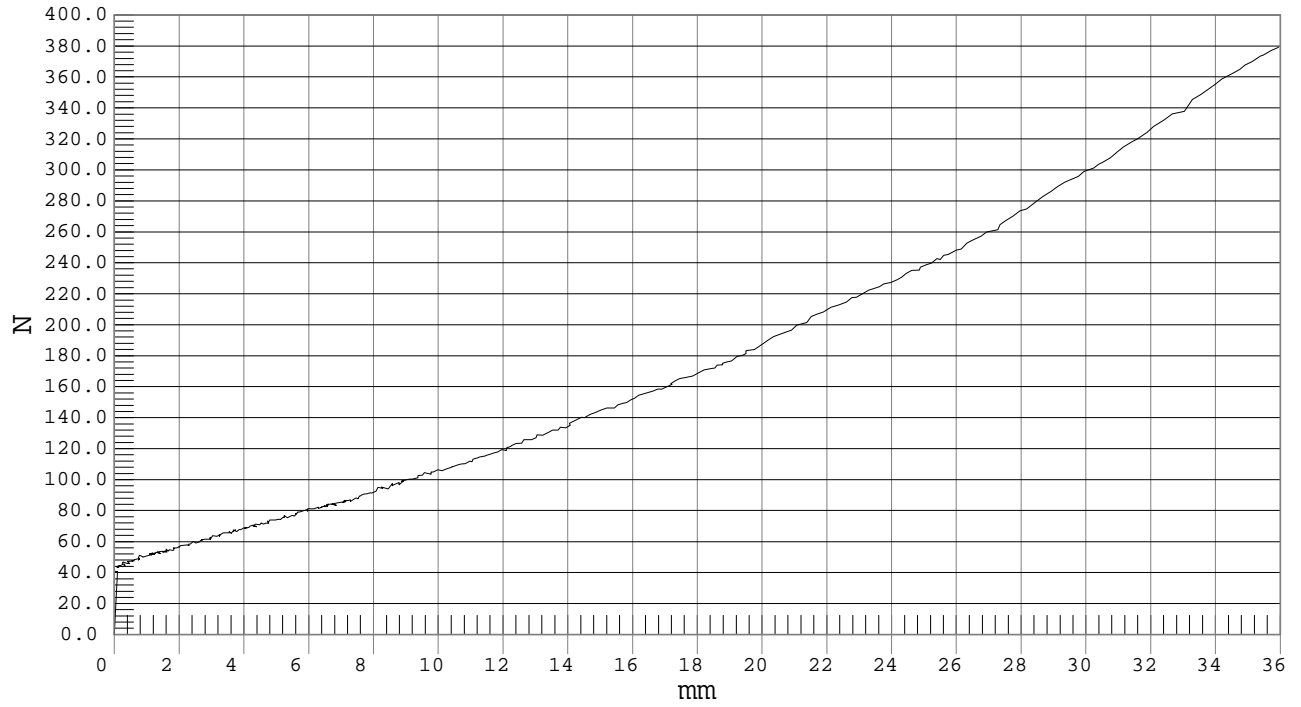


ABDOMEN COMPRESSION

Test Desc.: ABDOMEN COMPRESSION
Component: DUMMY # 048

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = 0 N @ -0.0001 mm, Ymax = 483.96 N @ 43.5806 mm



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No.:048

Test I.D.:D02165

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 – 25.5	22.5	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Force @ 0	mm	0 – 26.7	0	Pass
Force @ 20	mm	97.9 – 151.2	106.9	Pass
Force @ 30	mm	151.2 – 204.6	178.6	Pass
Force @ 40	mm	204.6 – 258.0	230.4	Pass
Return Angle	Degrees	12 Maximum	6	Pass
Overall Test Results				Pass

Laboratory Technician

2/6/02
Test Date

Approved By

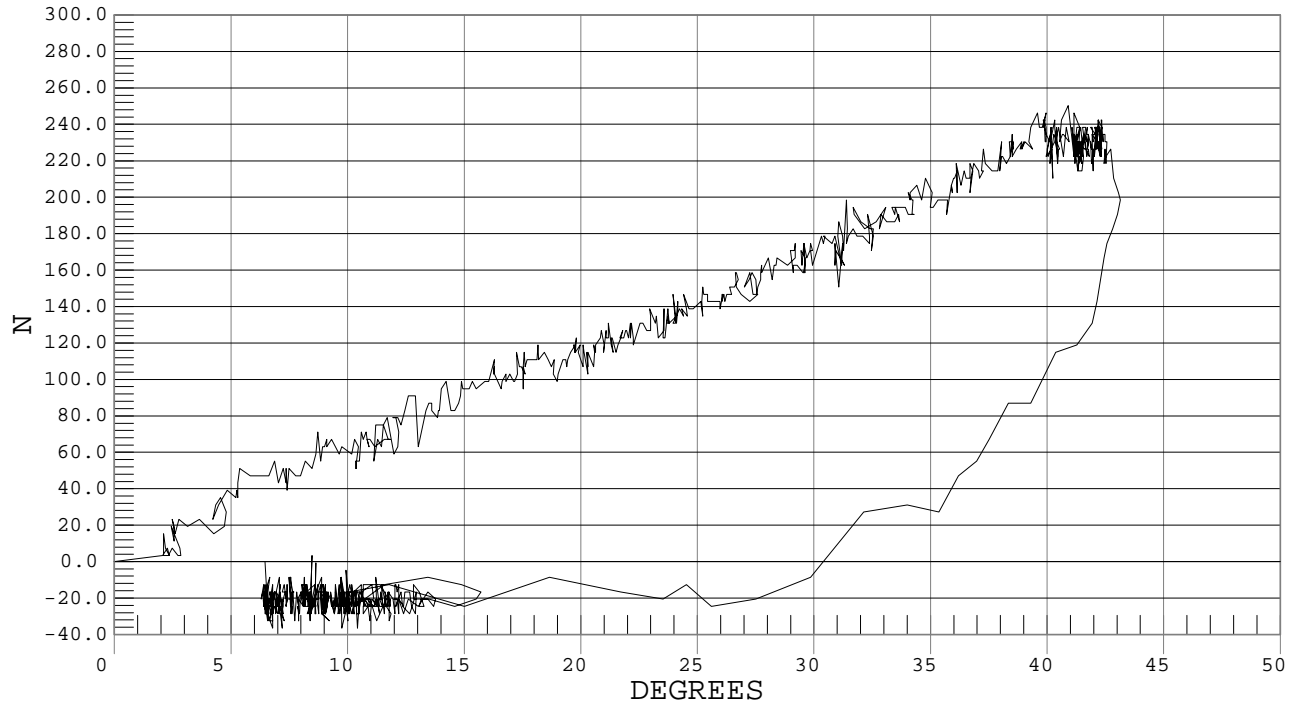


LUMBAR FLEXION

Test Desc.: LUMBAR FLEXION
Component: DUMMY # 048

Test Date: 02-06-02
Speed: 0.0 fps, 0.00 M/s

Ymin = -36.51 N @ 10.4229 DEGREES, Ymax = 250.29 N @ 40.9087 DEGREES



SID Calibration Data Sheet
Side Impact Dummy
Inspection Checklist

ATD Serial No.:048

Test Part	Items Checked	Result
Skin	Visual inspection	Pass
Head	Visual, ballast, accelerometer mount	Pass
Neck	Visual	Pass
Spine Box	Visual, ballast, weldment, accelerometer mount	Pass
Rib Cage	Visual, measure	Pass
Sternum	Visual	Pass
Lumbar Spine	Visual	Pass
Abdomen	Visual	Pass
Pelvis	Visual, palpate, accelerometer mount	Pass
Upper Legs	Visual	Pass
Knees	Visual	Pass
Pass Lower Legs	Visual, range of motion	Pass
Ankles	Visual, range of motion	Pass
Feet	Visual, range of motion	Pass
Joints	1 to 2 g range	Pass
Other		Pass

Notes (include component/problem/section/reason):

Laboratory Technician

2/6/02
Test Date

Approved By

APPENDIX D

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR DRIVER DUMMY NO. 49		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Rib Y	AGTMB	Endevco	1/8/02
Lower Rib Y	AN8D5	Endevco	1/8/02
Lower Spine Y	AK972	Endevco	1/7/02
Pelvis Y	AGRW3	Endevco	1/8/02
Upper Rib Redundant Y	AJ411	Endevco	1/8/02
Lower Rib Redundant Y	AGP28	Endevco	1/8/02
Lower Spine Redundant Y	AHY71	Endevco	1/8/02
Pelvis Redundant Y	AMPYO	Endevco	1/8/02
Head Center of Gravity X	J11047	Endevco	1/8/02
Head Center of Gravity Y	AHT20	Endevco	1/8/02
Head Center of Gravity Z	AH0N9	Endevco	1/8/02

	INSTRUMENTS FOR PASSENGER DUMMY NO. 48		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Upper Rib Y	J23808	Endevco	1/7/02
Lower Rib Y	AHWP2	Endevco	1/8/02
Lower Spine Y	AN8D2	Endevco	1/8/02
Pelvis Y	ALFP5	Endevco	1/7/02
Upper Rib Redundant Y	AKAF3	Endevco	1/7/02
Lower Rib Redundant Y	AHY98	Endevco	1/8/02
Lower Spine Redundant Y	J13709	Endevco	1/8/02
Pelvis Redundant Y	AK956	Endevco	1/7/02
Head Center of Gravity X	J11166	Endevco	1/8/02
Head Center of Gravity Y	J12471	Endevco	1/7/02
Head Center of Gravity Z	J11784	Endevco	1/8/02

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	G01-J02	Entran	8/21/01
Left Lower A-Post Y	I12-F04	Entran	10/10/01
Left Mid B-Post Y	G01-J04	Entran	11/2/01
Left Lower B-Post Y	J07-X16	Entran	10/29/01
Rear Floorpan Above Axle X	H14-N07	Entran	9/12/01
Rear Floorpan Above Axle Y	H14-N10	Entran	9/12/01
Rear Floorpan Above Axle Z	H14-N11	Entran	9/12/01
Driver Seat Track Y	F18-G07	Entran	8/29/01
Right Side Sill at Front Seat X	H14-N03	Entran	9/12/01
Right Side Sill at Front Seat Y	H14-N14	Entran	9/12/01
Right Side Sill at Front Seat Z	H14-N01	Entran	9/12/01
Right Side Sill at Rear Seat X	G13-F15	Entran	8/8/01
Right Side Sill at Rear Seat Y	H01-J01	Entran	11/2/01
Right Side Sill at Rear Seat Z	I12-F03	Entran	10/10/01
Left Side Sill at Front Seat Y	I12-F09	Entran	10/10/01
Left Side Sill at Rear Seat Y	D05-R16	Entran	8/21/01
Right Rear Occupant Compartment Y	I12-F14	Entran	10/29/01
Vehicle CG X	K11-J07	Entran	8/7/01
Vehicle CG Y	H14-N15	Entran	9/12/01
Vehicle CG Z	E03-H09	Entran	6/6/01

Note: All Endevco accelerometers are Model No. 7264-2000
 All Entran accelerometers are Model No. EGE-72