

REPORT NUMBER: TO11-MGA-2002-001

FULL SCALE SIDE IMPACT POLE TESTS OF BASELINE VEHICLES

**Volvo
1999 Volvo S80 Sedan
NHTSA NUMBER: RX5904**

**PREPARED BY:
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TEST DATE: AUGUST 21, 2002

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
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This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, in response to Contract Number DTRS57-98-D-00041.

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-98-D-00041, task order 11, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test is to evaluate the responses of the ES-2 and SID/HIII dummies in a 1999 Volvo S80, when subjected to a rigid pole side impact at 285 degrees.

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

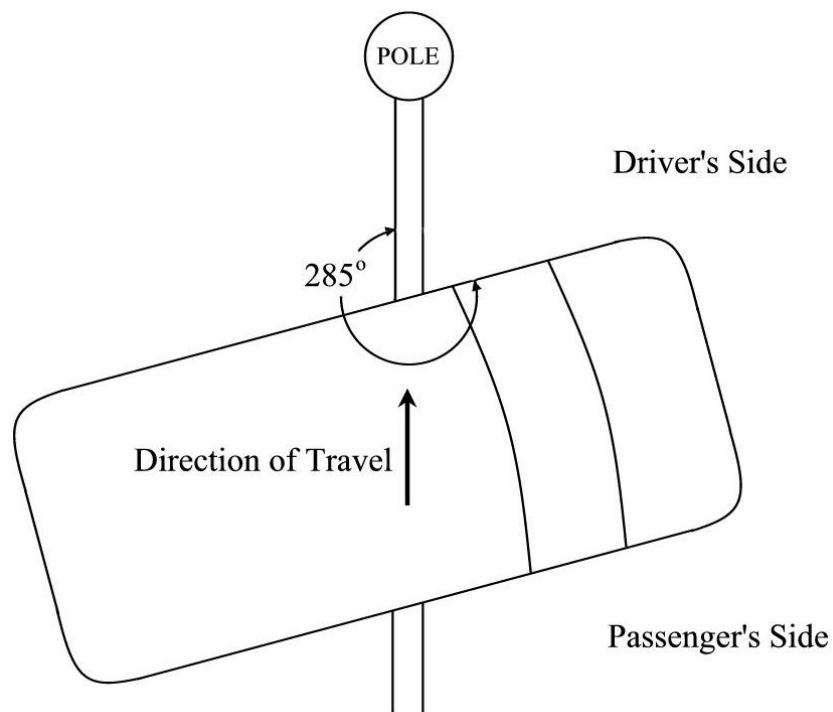
SECTION 2

SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 1999 Volvo S80. The subject vehicle was towed into a rigid pole at a velocity of 32.3 km/h. The weight of the vehicle as tested was 1797 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on August 21, 2002. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One SID/HIII side impact dummy was placed in the left front designated seating position according to instructions specified in the FMVSS 201P Laboratory Test Procedure which is dated April 21, 2000. The side impact event was documented by ten high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Appendix B contains the vehicle and dummy response data traces. A summary of the dummy configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report. Appendix E contains the dummy peak responses.



SECTION 2...continued
SUMMARY OF SIDE IMPACT TEST

The following table summarizes the results of the Left Side Impact Test:

HIC		Left Front
	T1 (msec)	62.3
	T2 (msec)	63.4
	T2 – T1 (msec)	1.1
	HIC	2213

Fir Filtered	Left Front
Upper Rib Y (g's)	56.3
Lower Rib Y (g's)	55.7
Upper Spine Y (g's)	41.6
Lower Spine Y (g's)	56.8
Pelvis Y (g's)	57.6
TTI (g's)	57

Contacts	Left Front
Rib (msec)	11.7
Pelvis (msec)	**

**= Questionable data

TEST NOTES

The following data channels were found to have Questionable Data:

Vehicle CG X Acceleration

Vehicle CG Y Acceleration

Vehicle CG Z Acceleration

Dummy Pelvis Contact

SECTION 3
SIDE IMPACT DUMMY (SID/HIII) AND VEHICLE TEST DATA

DATA SHEET NO. 1**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 1999 Volvo S80 SedanTest Date: August 21, 2002**TEST VEHICLE INFORMATION**

Make	Volvo
Model	S80
Body Style	Sedan
VIN	YVITS97D5X1059659
Color	Silver
Odometer Reading (mile)	39806
Transmission	Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	2.9
Engine Placement	lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain/seat side
Power Windows	Yes
Power Steering	Yes
Power Door	No
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Anti-lock Brakes	Yes
AM/FM/CD	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Volvo	GVWR (kg)	2090.2
Date of Manufacture	4-99	GAWR Front (kg)	1129.9
		GAWR Rear (kg)	1040.1

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	273	273
Cold Pressure (kPa)	203	203
Recommended Tire Size	P215/55R16	P215/55R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Continental	Continental

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contour		
Number Of Occupants x 68.04 kg.	136.1	204.1		340.2
Capacity Wt. (VCW) (kg)				405.1
Cargo Wt. (RCLW) (kg)				64.9

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 1999 Volvo S80 SedanTest Date: August 21, 2002**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	479.9	348.8		527.1	393.9	
Right	kg	480.4	335.2		507.6	369.2	
Ratio	%	58.4	41.6		57.6	42.4	
Totals	kg	960.3	684.0	1644.3	1034.7	762.5	1797.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Calculated Vehicle Target Weight (TVTW)	kg	1797

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.4 ND	0.1 ND	0.0
Left Door Sill Angle	Deg	0.3 ND	0.0	0.1 ND
Front Bumper Angle	Deg	0.0	0.2 LD	0.2 LD
Rear Bumper Angle	Deg	0.0	0.2 LD	0.2 LD

ND=Nose down, BD = Back Down, LD = Left Down, RD = Right Down

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2794
Total Vehicle Length at Left Side	mm	4110
Total Vehicle Length at Centerline	mm	4784
Total Vehicle Length at Right Side	mm	4110
Total Vehicle Width	mm	1826
Weight of Ballast in Cargo Area	kg	0
Amount of water in Fuel Tank	liters	67.8

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Actual Impact Point	mm	5 rear

DATA SHEET NO. 1... (continued)

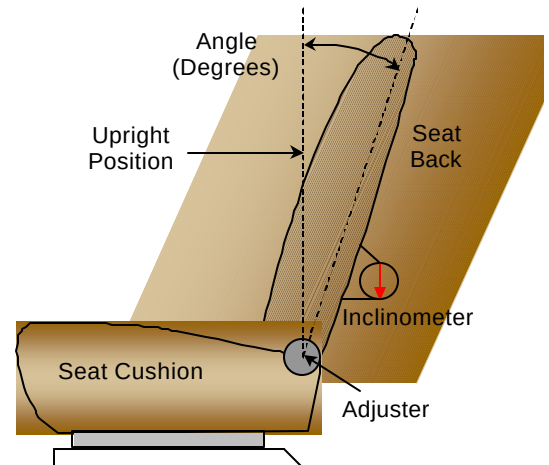
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 17.7 degrees



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver's seat is electronically operated.

The fore/aft is set to the middle position for the driver's seat.

Driver seat fore/aft total travel: 280 mm

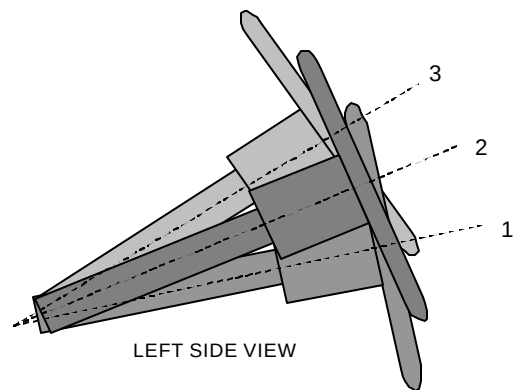
Driver seat fore/aft position: 140 mm

SEAT BELT UPPER ANCHORAGE

The test vehicle "D" ring anchorage for the driver's seat position was placed in the full up position.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position of travel.



STEERING COLUMN ASSEMBLY

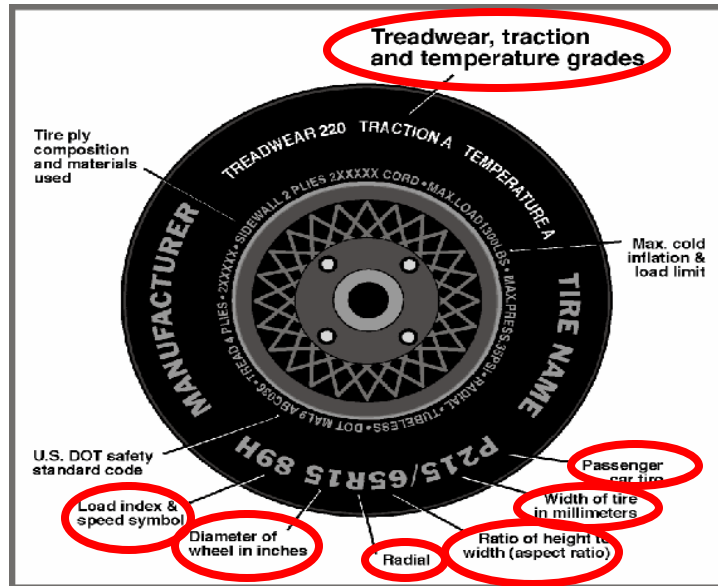
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

Vehicle Year	1999	Vehicle Make	Volvo
Vin	YVITS97D5X1059659	Vehicle Model	S80



	Front	Rear
Tire Manufacturer	Continental	Continental
Tire Name	Touring Contact AS	Touring Contact AS
Tire Type	Passenger Car	Passenger Car
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	60	60
Radial	Radial	Radial
Wheel Diameter	16	16
Load Index & Speed Symbol	94T	94T
Treadwear	520	520
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3
POST TEST OBSERVATIONS

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	SID III
Head Contact	Curtain airbag
Upper Torso Contact	Side seat airbag
Lower Torso Contact	Side seat airbag
Left Knee Contact	Lower door panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING

Description	Left Front	Left Rear
Left Side Door Opening	Remained latched and closed	Remained latched and closed
Right Side Door Opening	Remained latched and closed	Remained latched and closed

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No failures
Sill Separation	None
Windshield Damage	Left side shattered
Window Damage	Left side windows down for test / Sunroof shattered
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	Yes
Curtain	Yes

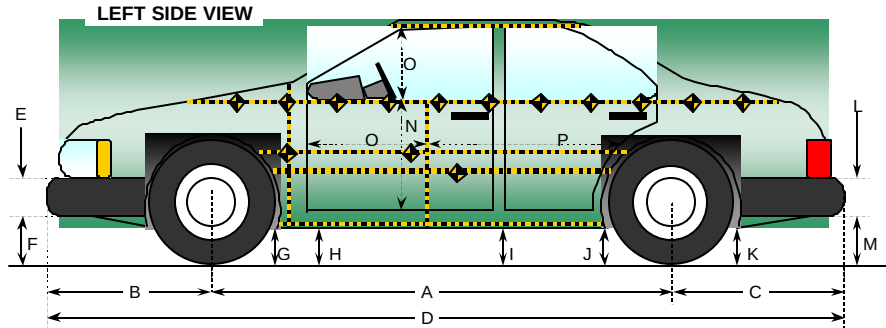
SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002



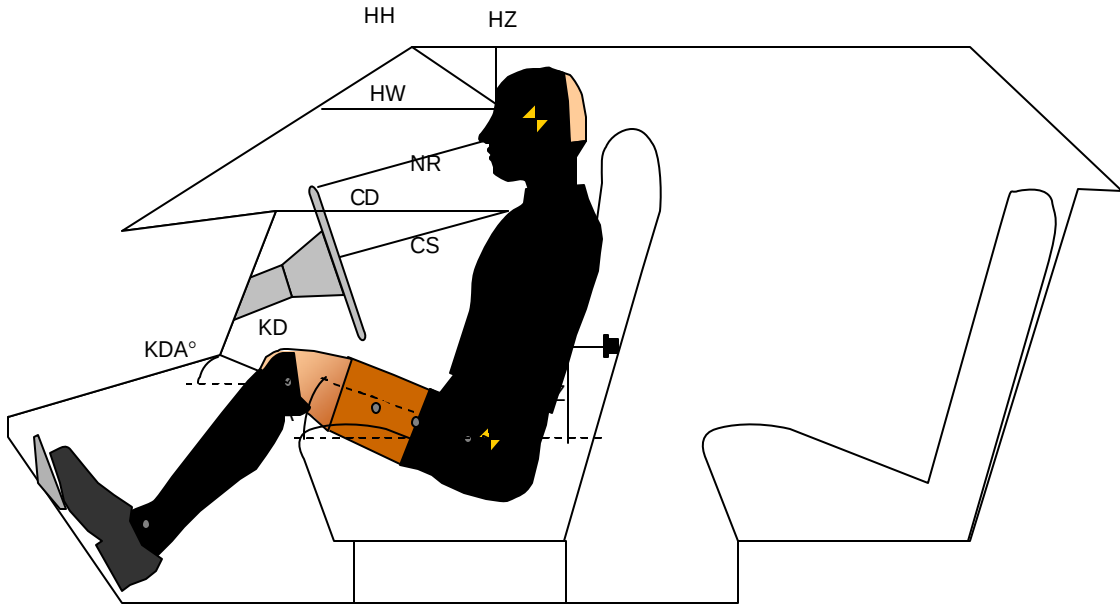
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2794	2600	-194
B	Front Axle to FSOV	946	1028	82
C	Rear Axle to RSOV	1044	1070	26
D	Total Length at Centerline	4784	4698	-86
E	Front Bumper Thickness	155	155	0
F	Front Bumper Bottom to Ground	420	420	0
G	Sill Height at Front Wheel Well	247	244	3
H	Sill Height at Front Door Leading Edge	242	255	13
I	Sill Height at "B" Pillar	255	283	28
J1	Sill Height at Rear Wheel Well	260	281	21
J2	Pinch Weld Height at Rear Wheel Well	252	287	35
K	Sill Height Aft of Rear Wheel Well	315	332	17
L	Rear Bumper Thickness	120	120	0
M	Rear Bumper Bottom to Ground	356	500	144
N	Sill Height to Window Bottom Sill	675	652	-23
O	Front Door Leading Edge to Impact CL	905	771	-134
P	Rear Door Trailing Edge to Impact CL	1062	925	-137
Q	Front Window Opening	445	432	-13
R	Right Side Length	4110	4139	29
S	Left Side Length	4110	3909	-201
T	Vehicle Width at "B" Post	1826	1565	-261

DATA SHEET NO. 5
SID/HIII LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

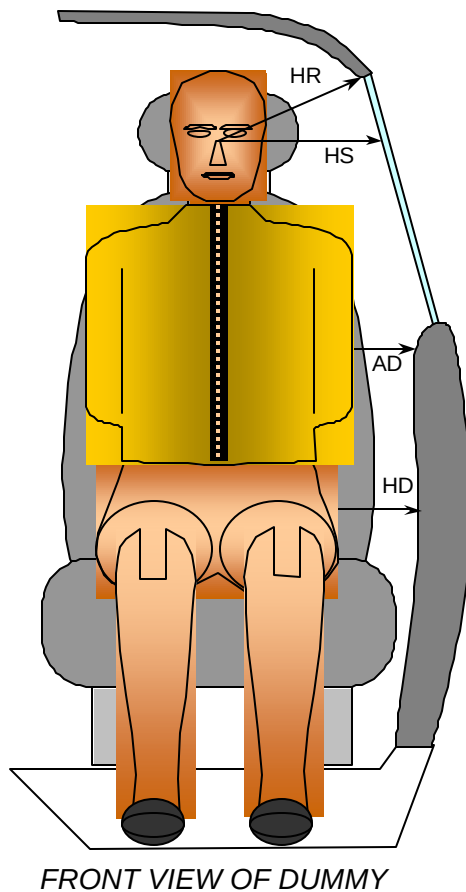


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	339	
HW	Head to Windshield	642	
HZ	Head to Roof	195	
NR	Nose to Rim	405	
CD	Chest to Dash	532	
CS	Chest to Steering Wheel	313	
KDL	Left Knee to Dash	196	0
KDR	Right Knee to Dash	189	0
PA	Pelvic Angle (Longitudinal)		24.5
PHX	H-Point to Striker (X-Axis)	223	
PHY	H-point to Striker (Y-Axis)	266	
PHZ	H-Point to Striker (Z-Axis)	230	

DATA SHEET NO. 6
SID/HIII LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002



FRONT VIEW OF DUMMY

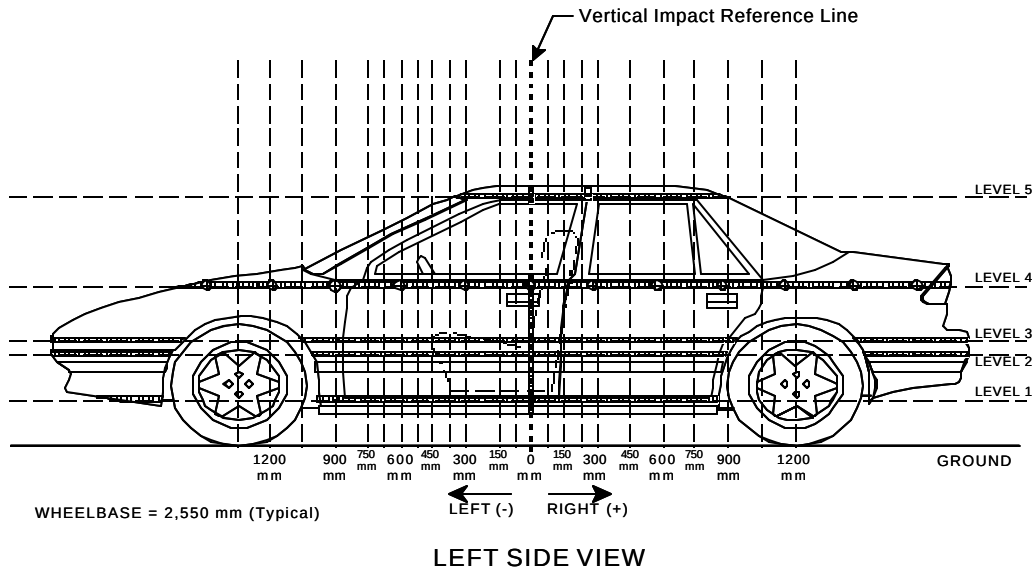
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	230
HS	Head to Side Window	mm	319
AD	Arm to Door	mm	74
HD	H-Point to Door	mm	140

DATA SHEET NO. 7 **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 0 mm.
All measurements below in mm.

Level	Measurement Description	Height Above Ground
5	Window	1400
4	Window Sill	965
3	Mid Door	664
2	Occupant H-Point	600
1	Sill Top	338

DATA SHEET NO. 8
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1950				321					327					6	
-1800				296					316					20	
-1650				280					309					29	
-1500				265					305					40	
-1350				253					300					47	
-1200				255					312					57	
-1050		196	194	270			274	266	329			78	72	59	
-900	246	195	192	268		354	268	262	327		108	73	70	59	
-825	249	193	191	264		351	320	290	329		102	127	99	65	
-750	250	191	190			362	320	319			112	129	129		
-675	250	190	189	256		373	348	348	353		123	158	159	97	
-600	252	189	188	252		392	379	379	375		140	190	191	123	
-525	252	188	187	250		418	416	417	411		166	228	230	161	
-450	253	187	186	250		441	450	454	446		189	263	268	196	
-375	254	186	186	248		470	490	494	486		216	304	308	238	
-300	253	186	185	248	462	511	529	535	523	521	258	343	350	275	59
-225	253	186	185	248	454	569	571	575	565	559	316	385	390	317	105
-150	251	185	185	246	453	607	609	611	602	605	356	424	426	356	152
-75	251	185	185	247	455	612	615	617	622	623	361	430	432	375	168
0	250	185	185	248	457	589	588	594	610	608	339	403	409	362	151
75	248	185	186	248	457	539	537	540	573	590	291	352	354	325	133
150	247	185	186	249	457	482	467	473	528	568	235	282	287	279	111
225	246	186	186	250	458	472	415	419	490	553	226	229	233	240	95
300	245	187	187	252	463	443	386	388	476	541	198	199	201	224	78
375	244	188	188	252	463	402	347	348	451	517	158	159	160	199	54
450	244	189	189	256	464	370	314	318	434	499	126	125	129	178	35
600	244	191	190	258	471	301	274	284	398	501	57	83	94	140	30
750	243	193	193	261	475	243	244	253	359	508	0	51	60	98	33
900	244	193	196	266	479	244	194	194	340	535	0	1	2	74	56
1050		192	195	272	499		192	195	302	536		0	0	30	37
1200				281					294					13	
1350				292					313					21	
1500				308					331					23	
1650				325					345					20	
1800				342					360					18	
1950				360					367					7	
2100				382					378					4	

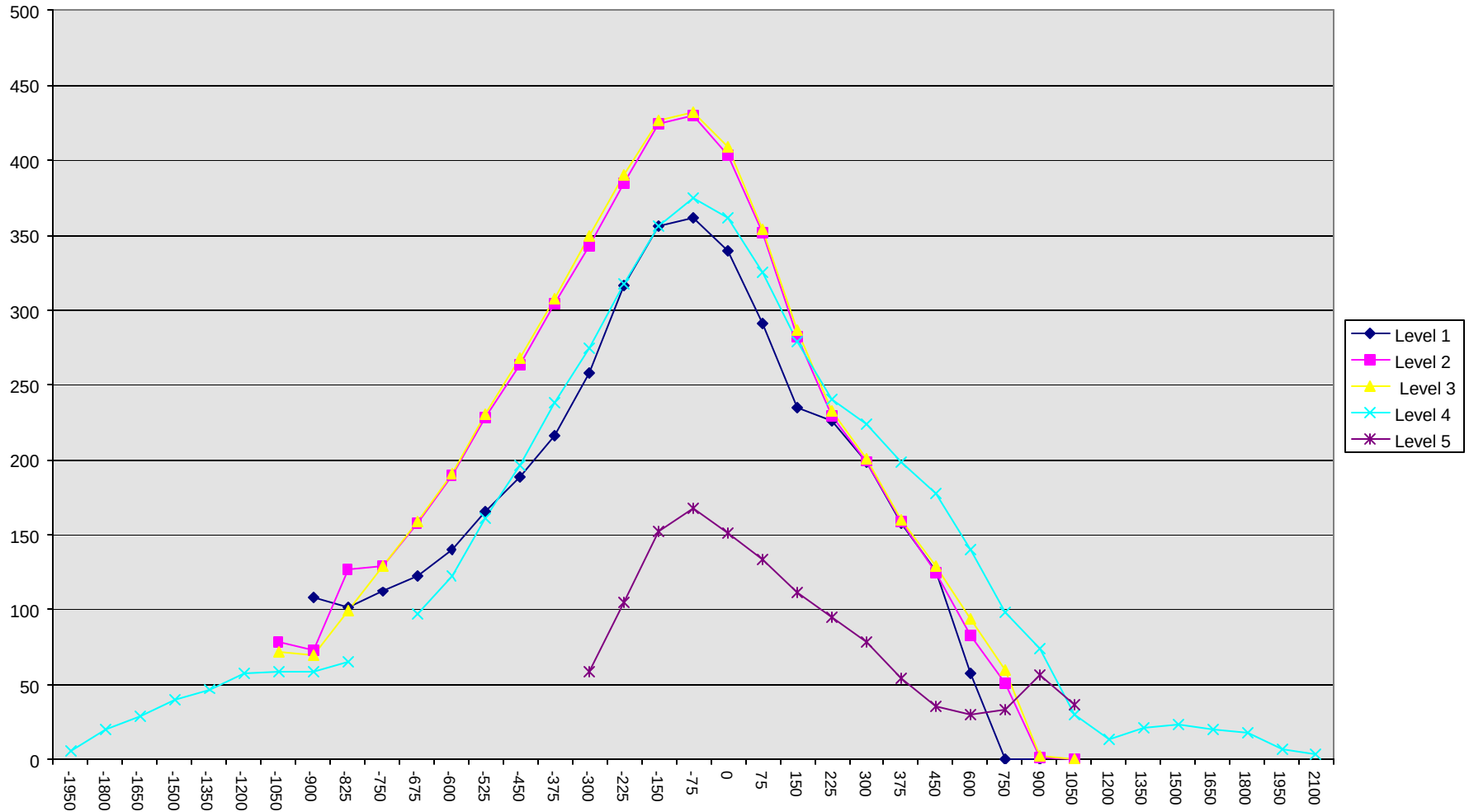
Reference plane is parallel to test vehicle longitudinal centerline.
 Given dimensions = Reference plane to car body.
 Measurements in mm.

DATA SHEET NO. 8... (continued)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

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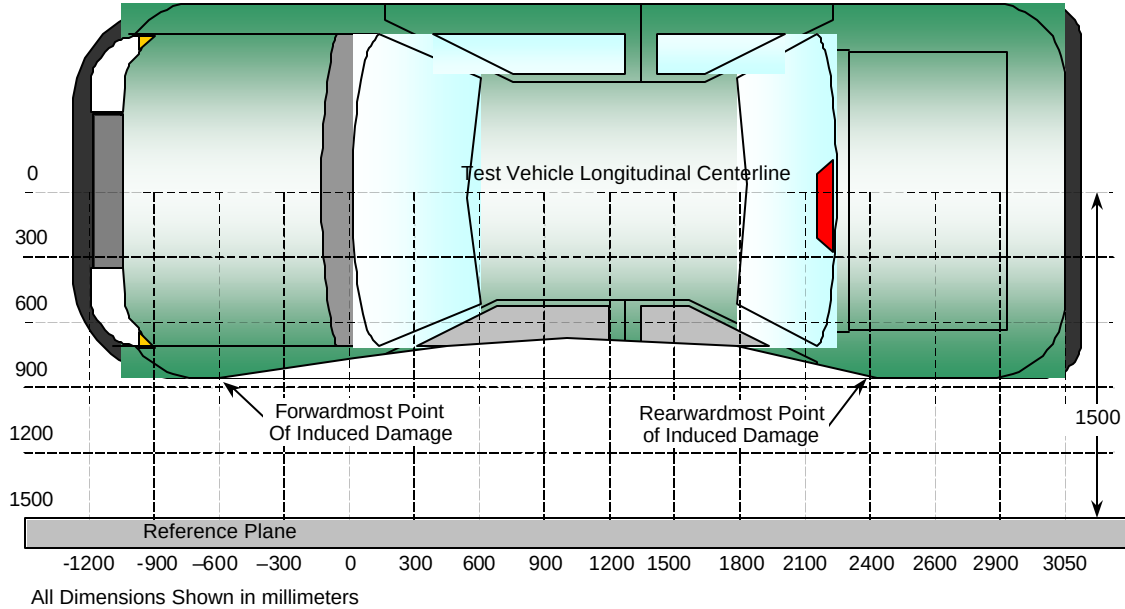


Measurement in mm.

DATA SHEET NO. 9
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2100 mm	4	382	378	4
2	1325 mm	4	290	332	42
3	528 mm	4	257	487	230
4	-375 mm	3	186	593	407
5	-1180 mm	4	257	324	67
6	-1950 mm	4	321	327	6

Reference plane is parallel to test vehicle longitudinal centerline.

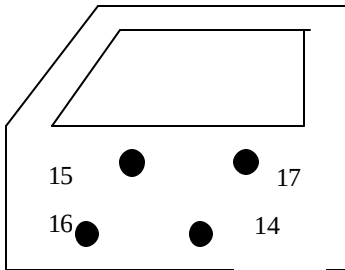
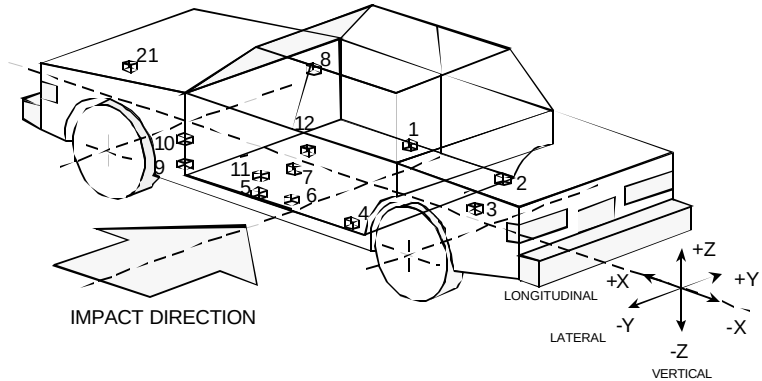
Given dimensions = Reference plane to car body.

DATA SHEET NO. 10

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002



No.	Location
1	Right Side Sill at Front Seat
2	Right Side Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Side Sill at Rear Door
5	Left Side Sill at Front Door
6	Left Lower B-Post
7	Left Mid B-Post
8	Left Upper B-Post
9	Left Lower A-Post
10	Left Mid A-Post
11	Driver Seat Track

No.	Location
12	Vehicle CG
13	Left A-Pillar @ Roof
14	Left Front Door @ Pelvis
15	Left Front Door @ Arm
16	Left Front Door @ Knee
17	Left Front Door @ Rib
19	Left Driver Seat Frame
20	Right Driver Seat Frame
21	Lower Center Radiator Support

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Long (X) Maximums (g's) (CFC 60)		Lat. (Y) Maximums (g's) (CFC 60)		Vert. (Z) Maximums (g's) (CFC 60)		Resultant (g's) (CFC 60)
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Max.
1	Right Side Sill at Front Seat	1.4	2.4	16.7	0.3	3.4	3.2	17.1
2	Right Side Sill at Rear Seat	2.9	1.6	17.1	0.5	1.4	3.0	17.2
3	Rear Floorpan Above Axle	2.9	4.0	13.9	1.1	3.9	4.1	13.9
4	Left Side Sill at Rear Door			22.8	3.5			
5	Left Side Sill at Front Door****							
6	Left Lower B-Post			61.7	5.2			
7	Left Mid B-Post			67.7	23.5			
8	Left Upper B-Post							
9	Left Lower A-Post			14.2	0.5			
10	Left Mid A-Post			19.9	6.2			
11	Driver Left Seat Track			66.1	17.0			
12	Vehicle CG	9.2*	7.4*	62.0**	22.9**	21.7***	8.1***	62.8***
13	Left A- Pillar at Roof							
14	Left Front Door at Pelvis			70.1	12.9			
15	Left Front Door at Arm			120.0	93.2			
16	Left Front Door at Knee			90.0	24.4			
17	Left Front Door at Rib			70.9	70.9			
19	Left Driver Seat Frame							
20	Right Driver Seat Frame							
21	Lower Center Radiator Support	4.1	12.9	13.4	5.1	6.7	5.4	15.2

*= QD after 50 msec.

**= QD after 132 msec.

***= QD after 45 msec.

****= No valid data.

Sign Convention

X - Test Vehicle Rear Bumper (+ forward)

Y - Test Vehicle Centerline (+ to right)

Z - Ground Plane (+ down)

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2525	675	227
2	Right Side Sill at Rear Seat	1760	690	230
3	Rear Floorpan Above Axle	1100	0	590
4	Left Side Sill at Rear Door	1467	-715	232
5	Left Side Sill at Front Door	2858	-715	224
6	Left Lower B-Post	2215	-695	3301
7	Left Mid B-Post	2148	-733	1000
8	Left Upper B-Post	*	*	*
9	Left Lower A-Post	3275	-720	400
10	Left Mid A-Post	3292	-854	855
11	Driver Left Seat Track	2420	-560	295
12	Vehicle CG	2850	0	165
13	Left A-Pillar @ Roof	*	*	*
14	Left Door @ Pelvis	2560	-763	552
15	Left Door @ Arm	2720	-783	858
16	Left Door @ Knee	2454	-796	628
17	Left Door @ Rib	1947	-786	858
19	Left Driver Seat Frame	*	*	*
20	Right Driver Seat Frame	*	*	*
21	Lower Center Radiator Support	4485	-440	388

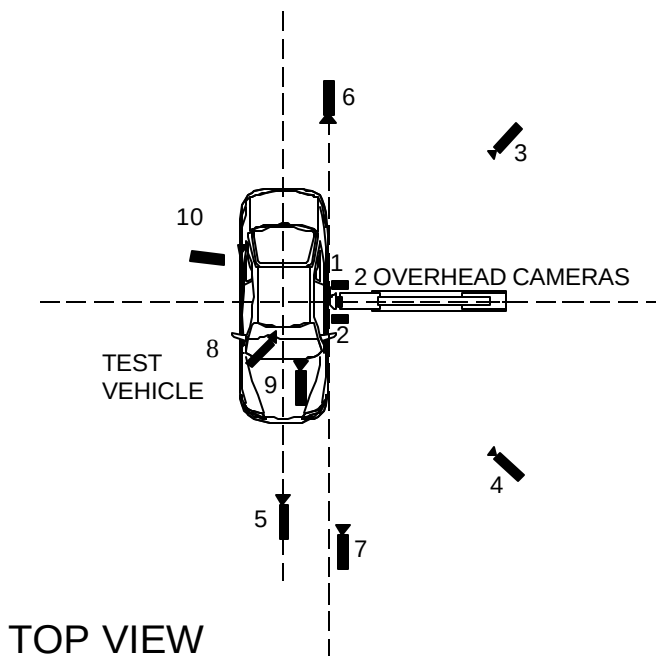
Sign Convention X – Rear Bumper (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ up)

* = Not used to avoid interference with restraint system.

DATA SHEET NO. 11
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 1999 Volvo S80 Sedan

Test Date: August 21, 2002



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	-820	0	5000	8	1000
2	Overhead Close-up	0	0	5000	13	1000
3	Left Side 45 deg. Rearward Pole View	3000	7000	1380	50	1031
4	Left Side 45 deg. Forward Pole View	3720	5000	1330	50	1000
5	Real Time					
6	Left Side Rear Pole View	-340	9000	1600	25	1000
7	Front Ground Level Vehicle/Pole Impact	-930	9300	1500	25	641
8	Test Vehicle Onboard Driver Side View				13	503
9	Test Vehicle Onboard Driver Front View				13	500
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Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Up from Ground

APPENDIX A
PHOTOGRAPHS

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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



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Vehicle Positioned Against Pole (left side)



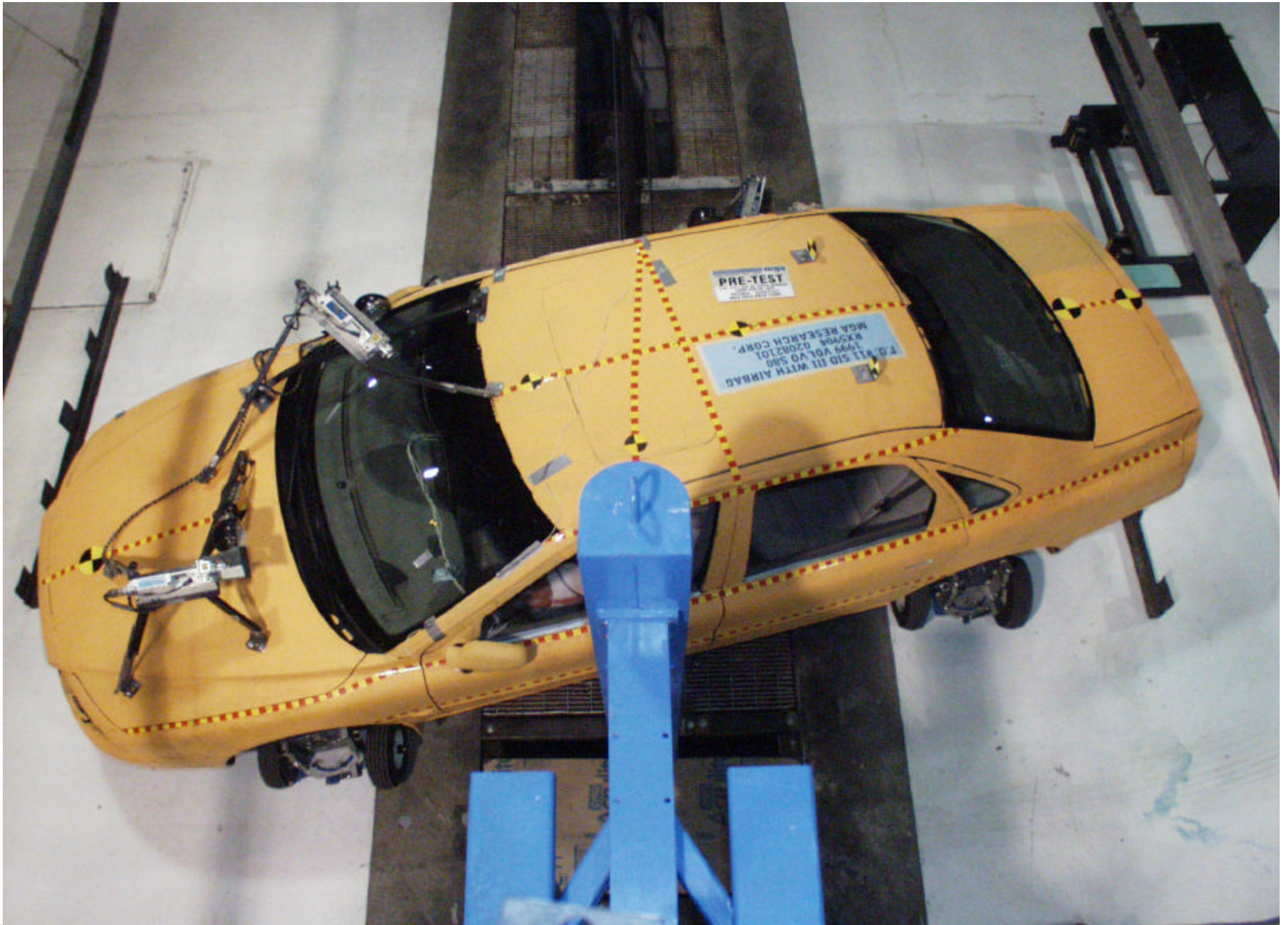
Post-Test Pole and Vehicle (left side)



Pre-Test Vehicle Positioned Against Pole (right side)



Post-Test Pole and Vehicle (right side)



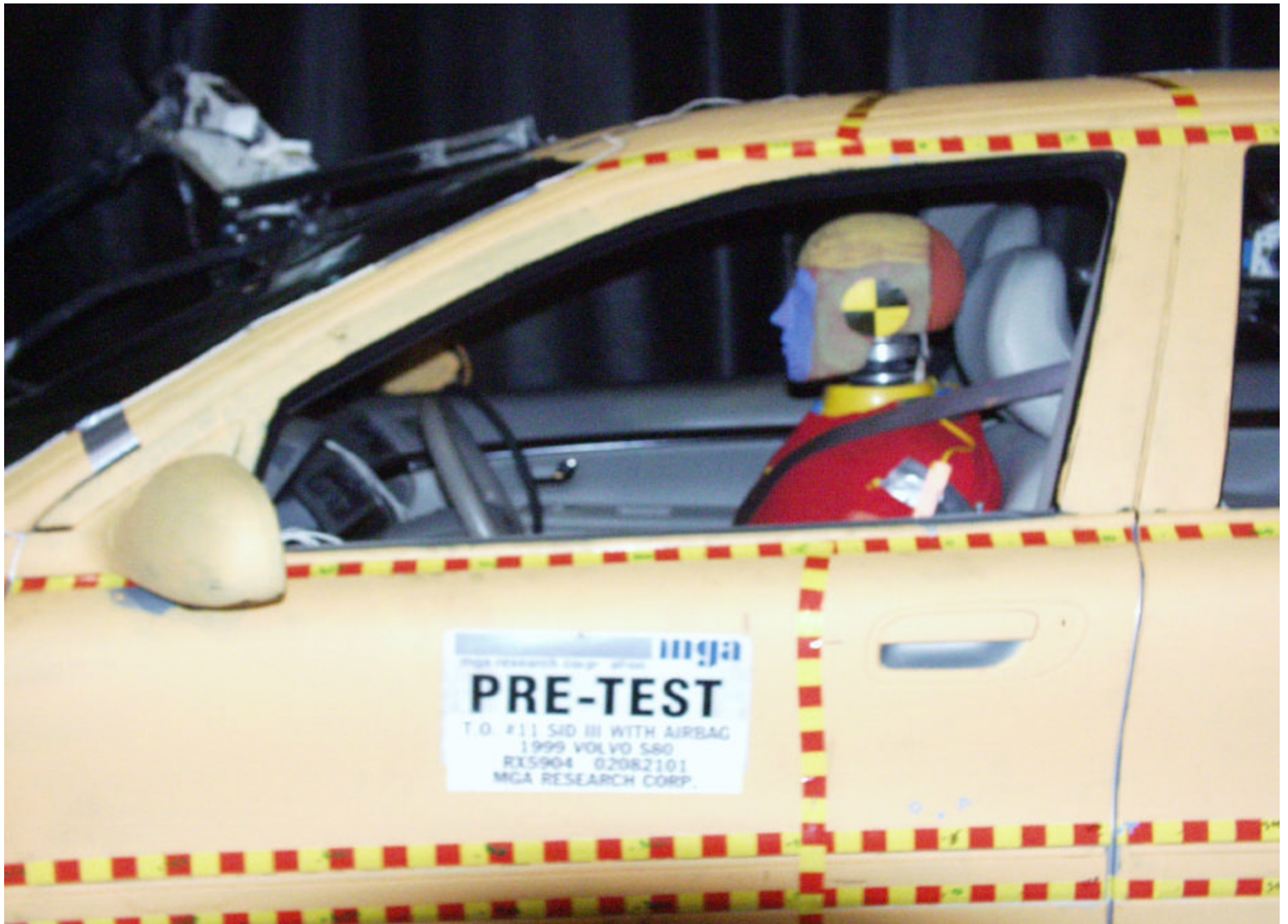
Pre-Test Vehicle Positioned Against Pole Overhead View



Post-Test Pole and Vehicle Overhead View



Pre-Test Driver Dummy Seat Position



Pre-Test Driver Dummy Left Side View



Post-Test Driver Dummy Left Side View



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right 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



Post-Test Driver Dummy Head Contact



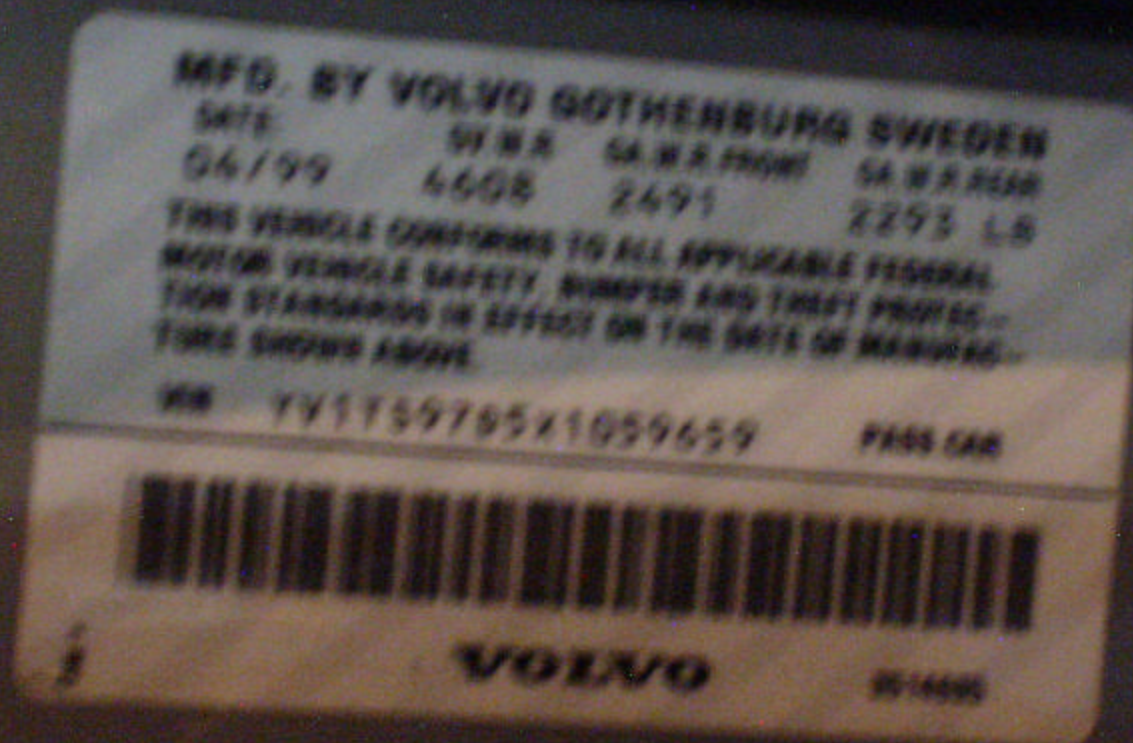
Pre-Test Impact Point on Vehicle



Post-Test Impact Point on Vehicle



Impact



Vehicle Certification Label



Left Front Attitude Point



Right Front Attitude Point



Left Rear Attitude Point



Right Rear Attitude Point

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DUMMY AND VEHICLE RESPONSE DATA TRACES

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* No valid data after approximately 50 msec.

** No valid data after approximately 132 msec.

*** No valid data after approximately 45 msec.

**** No Valid Data Collected

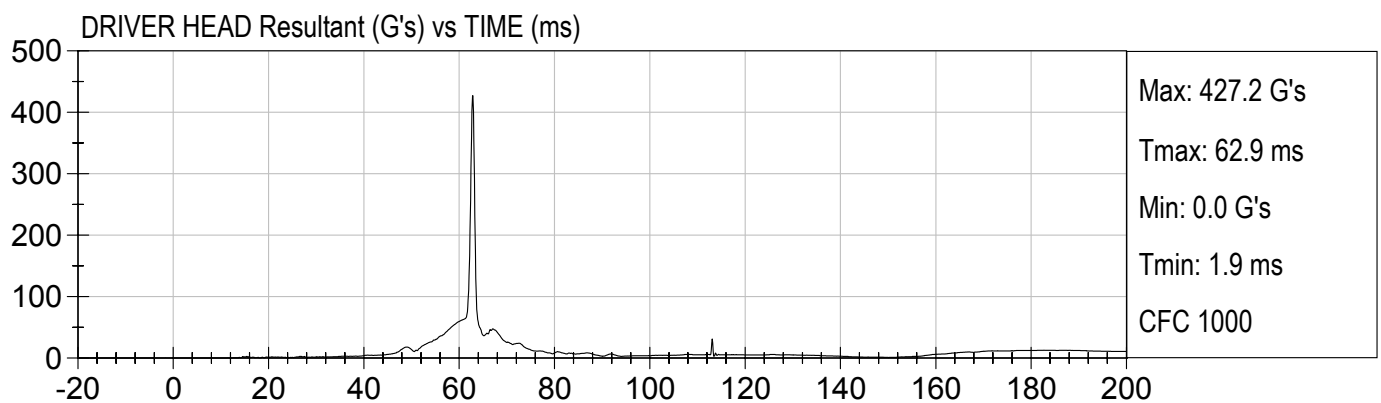
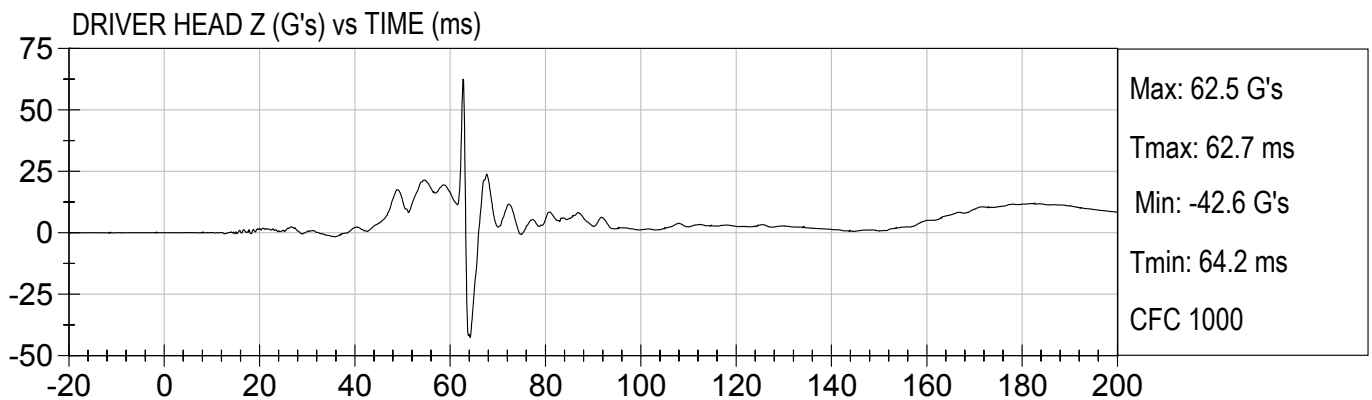
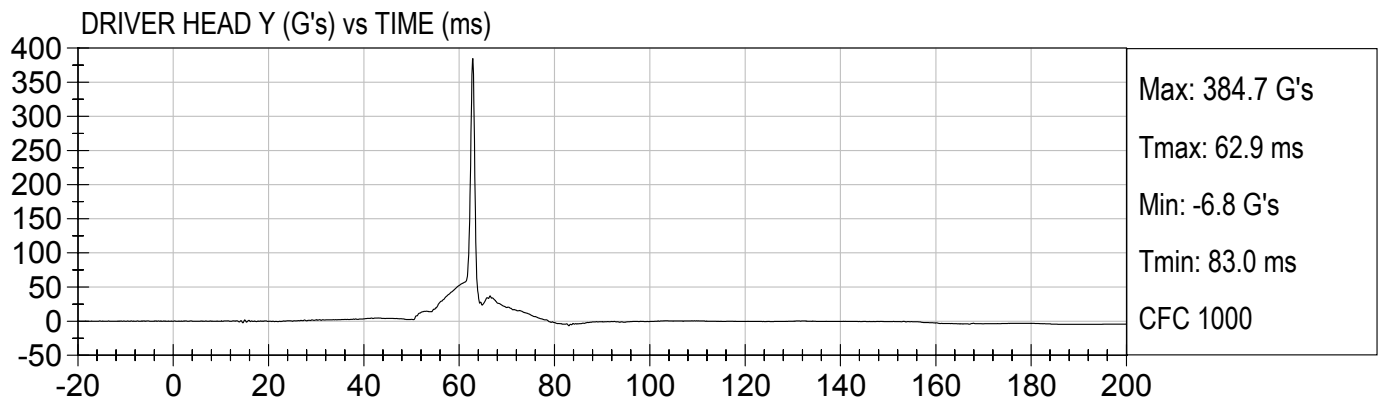
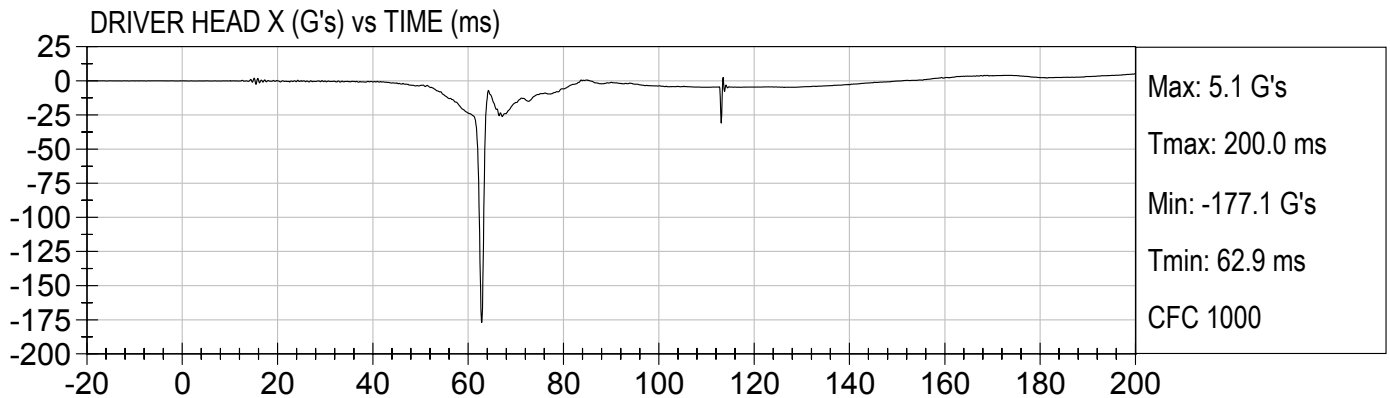
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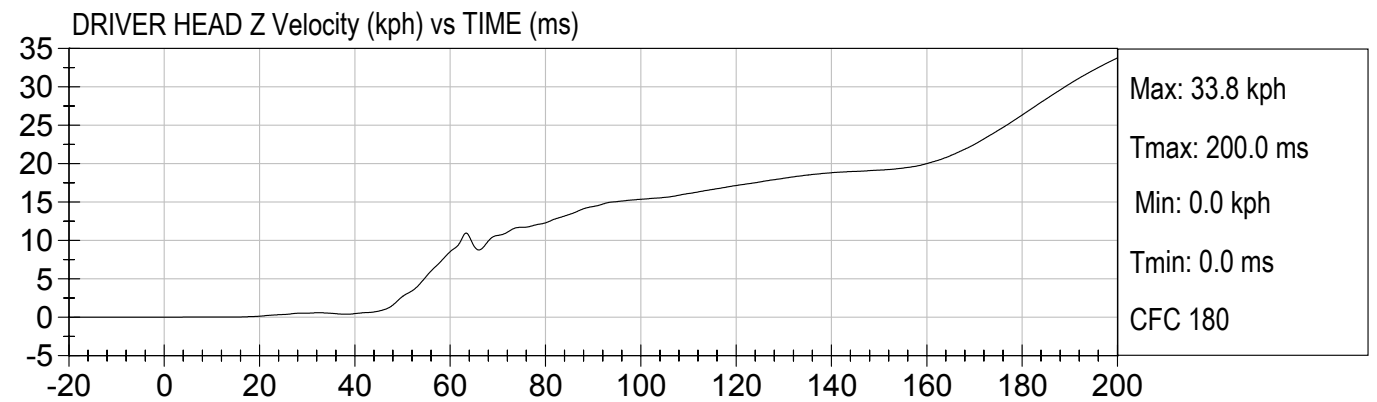
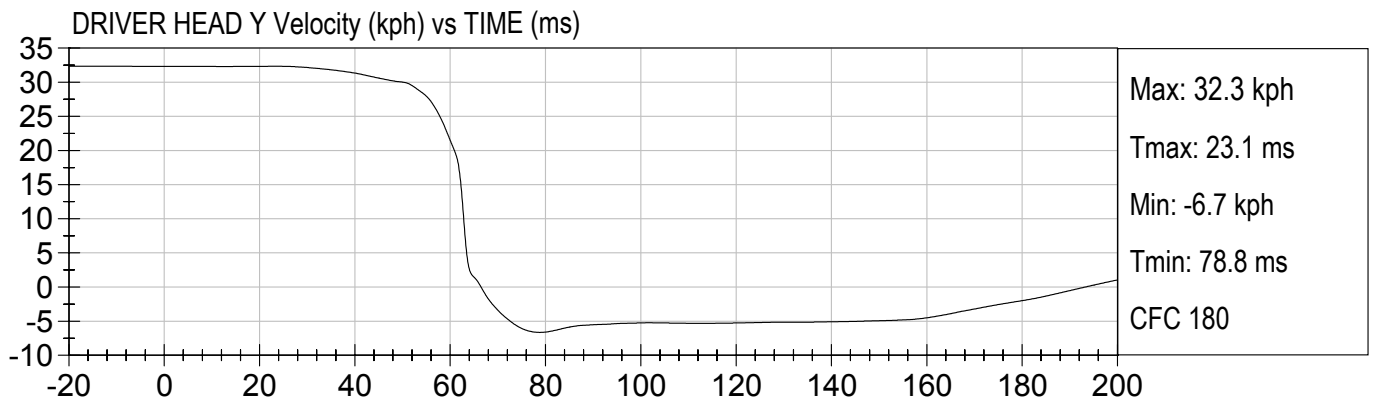
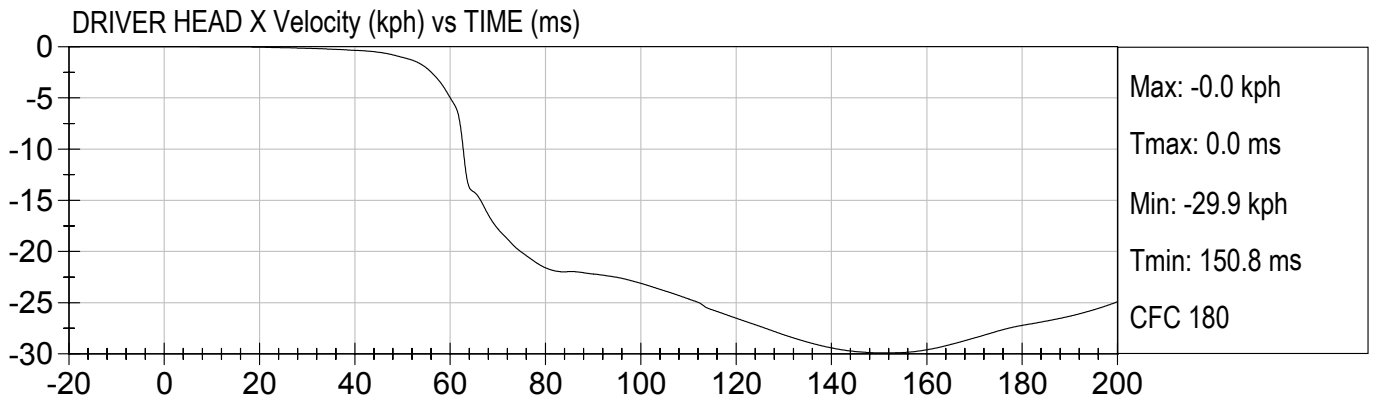
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20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)



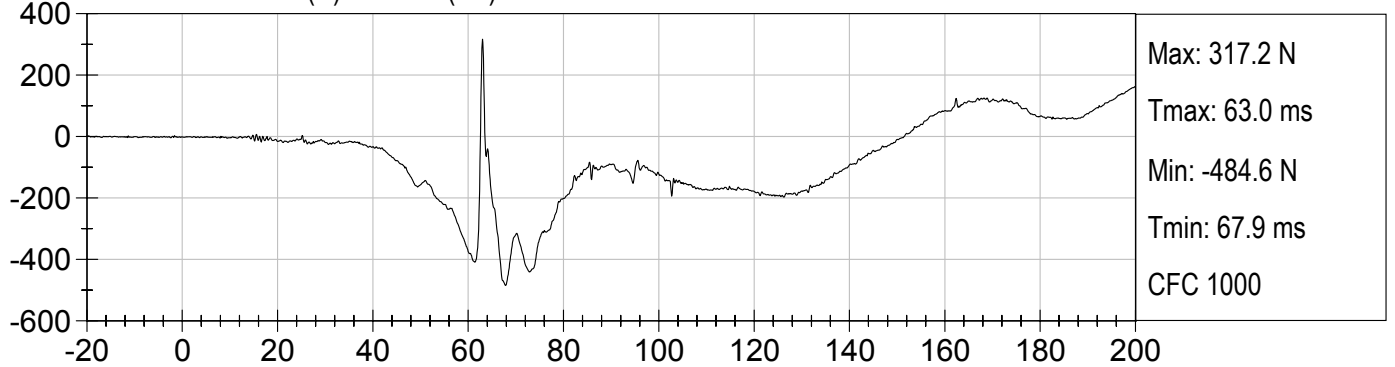




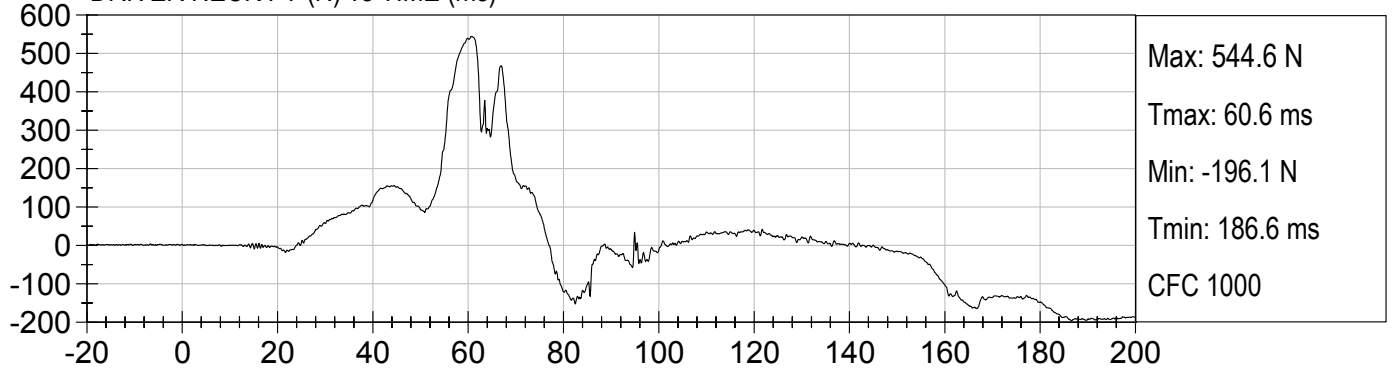
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1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
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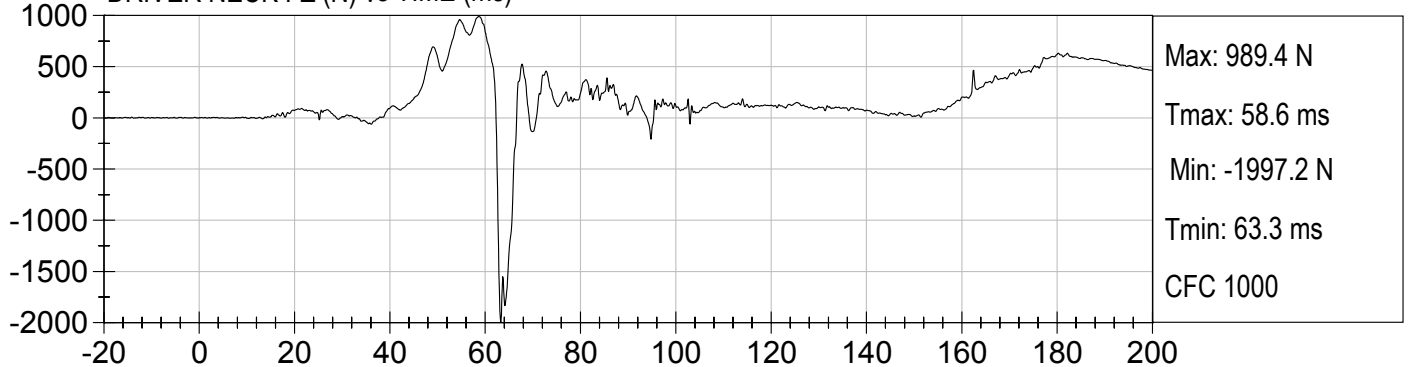
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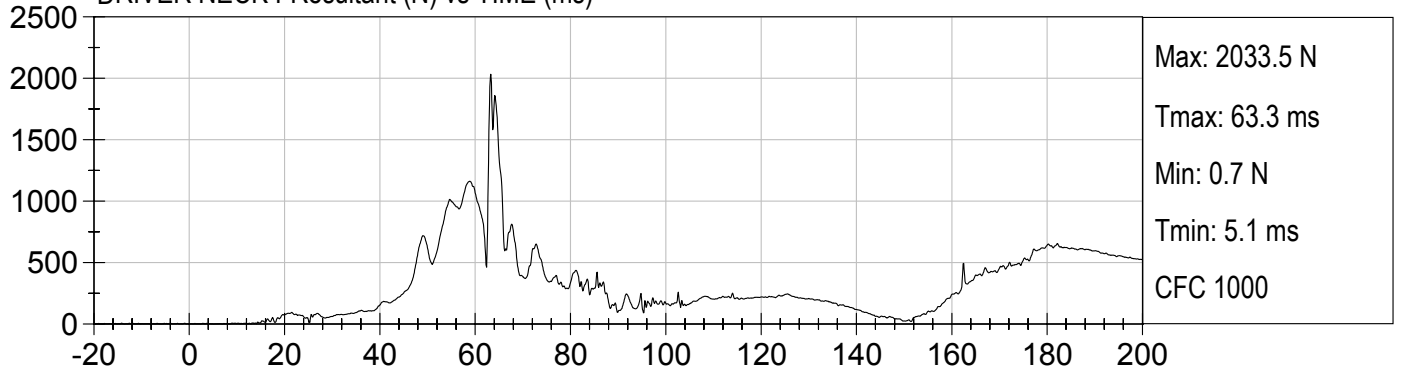
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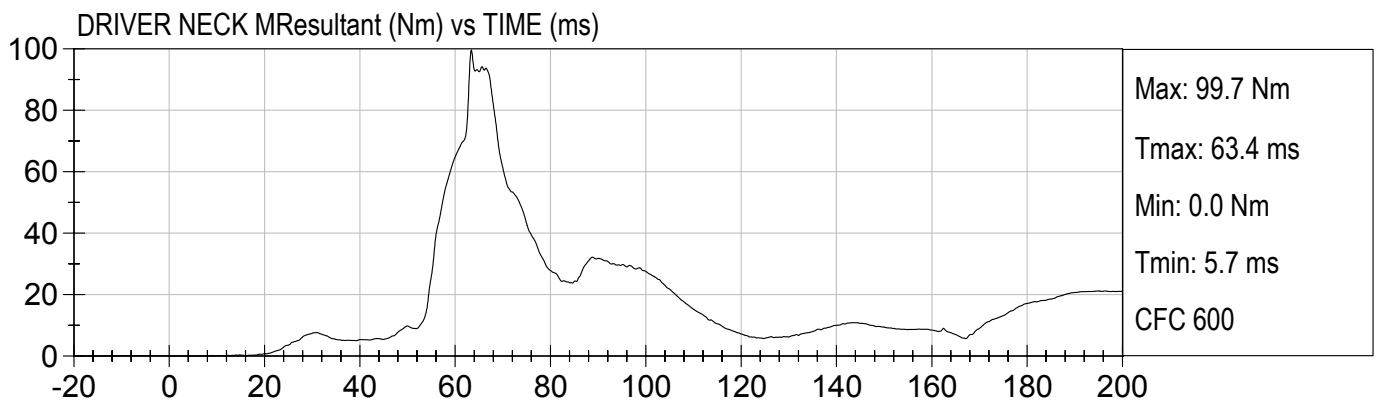
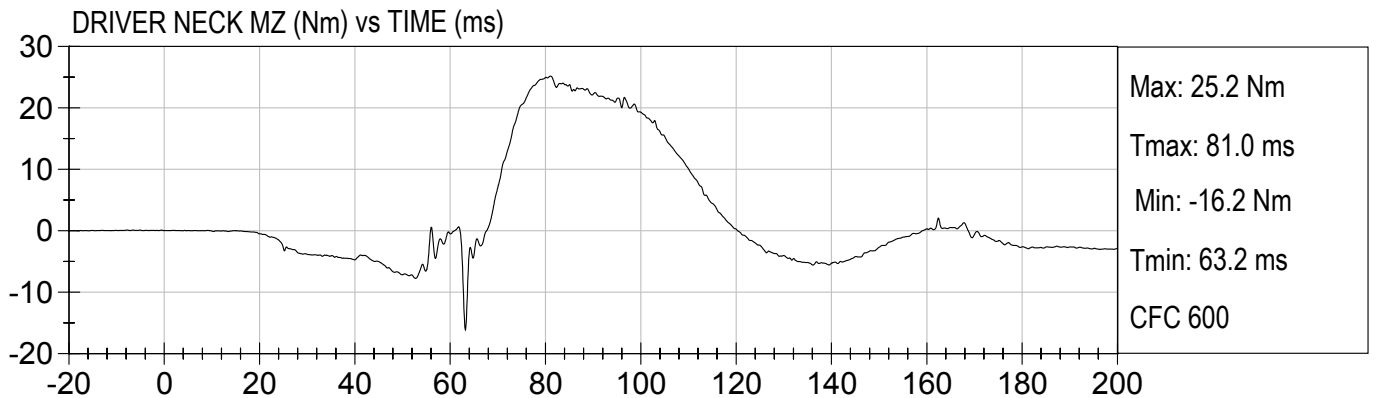
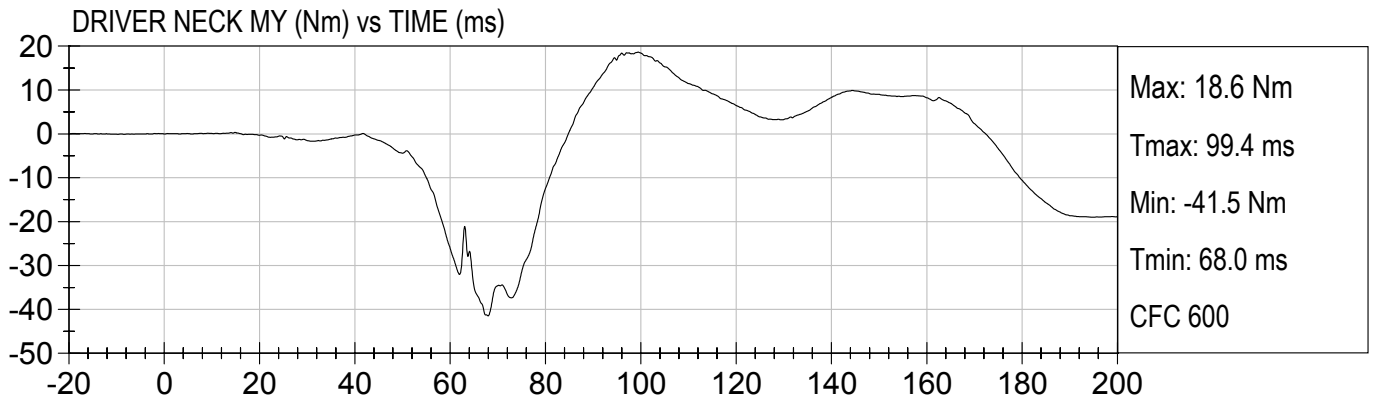
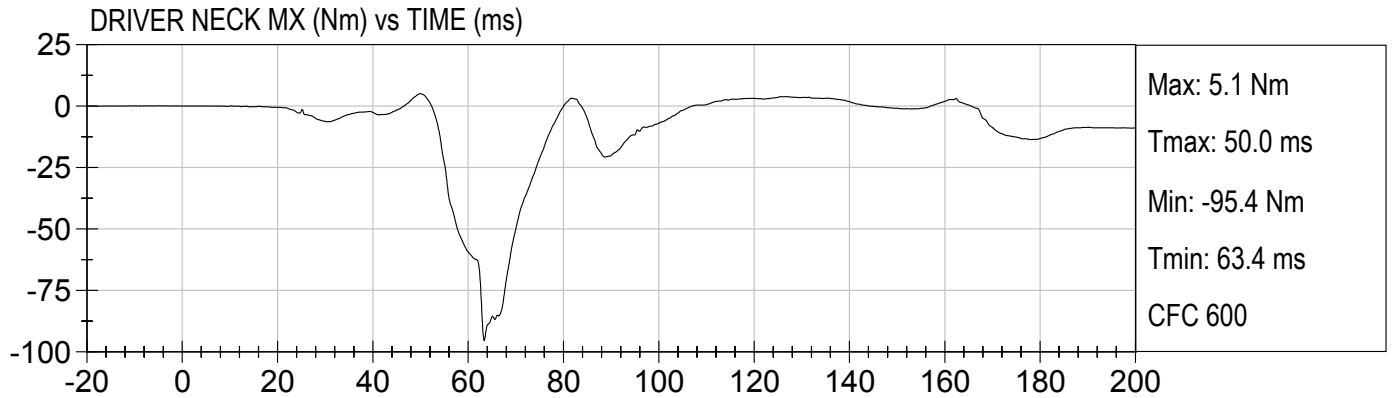
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20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

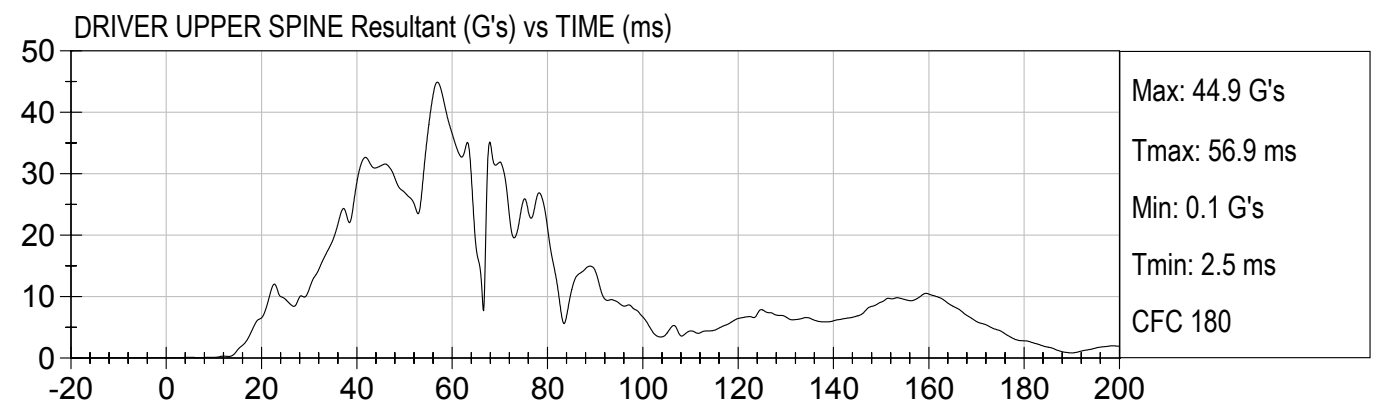
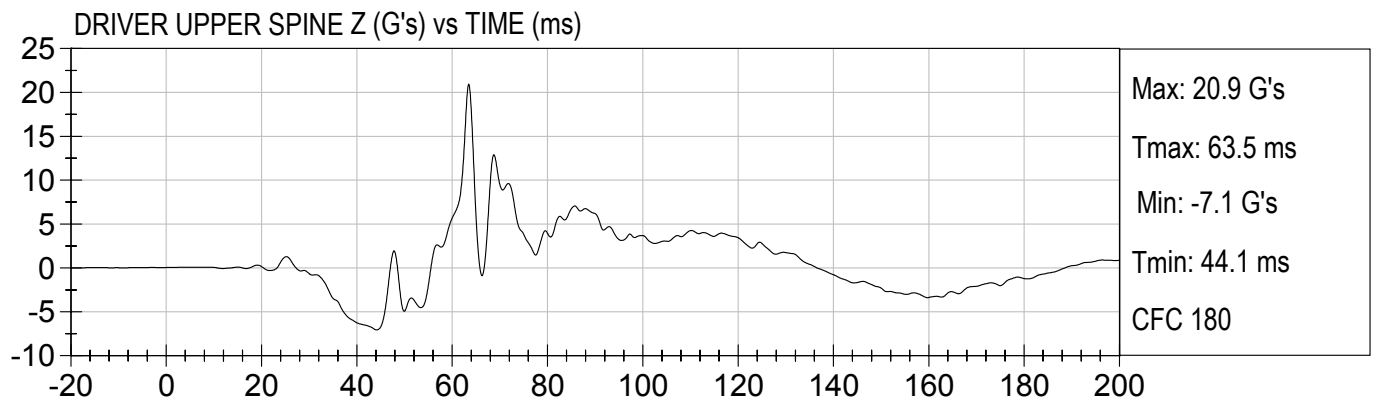
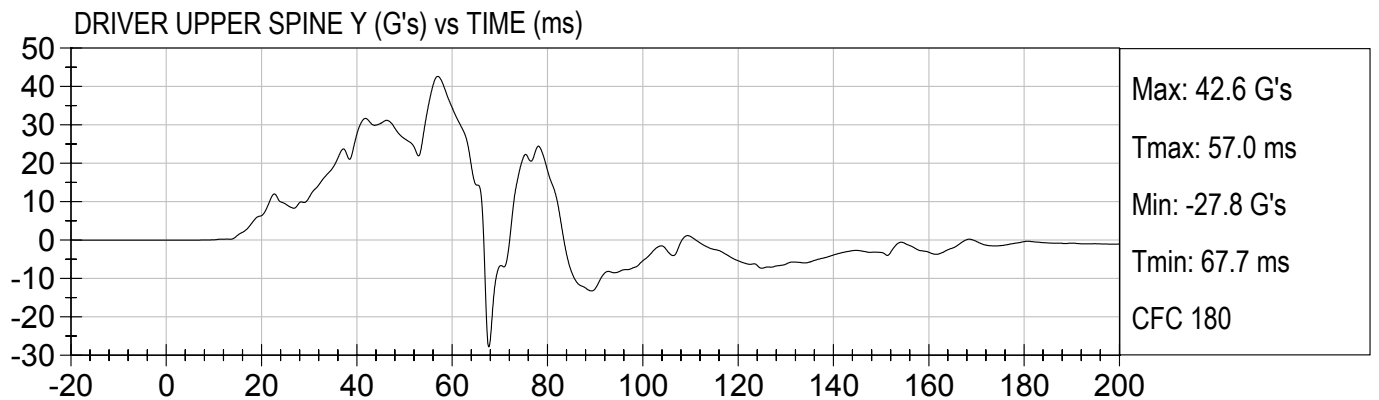
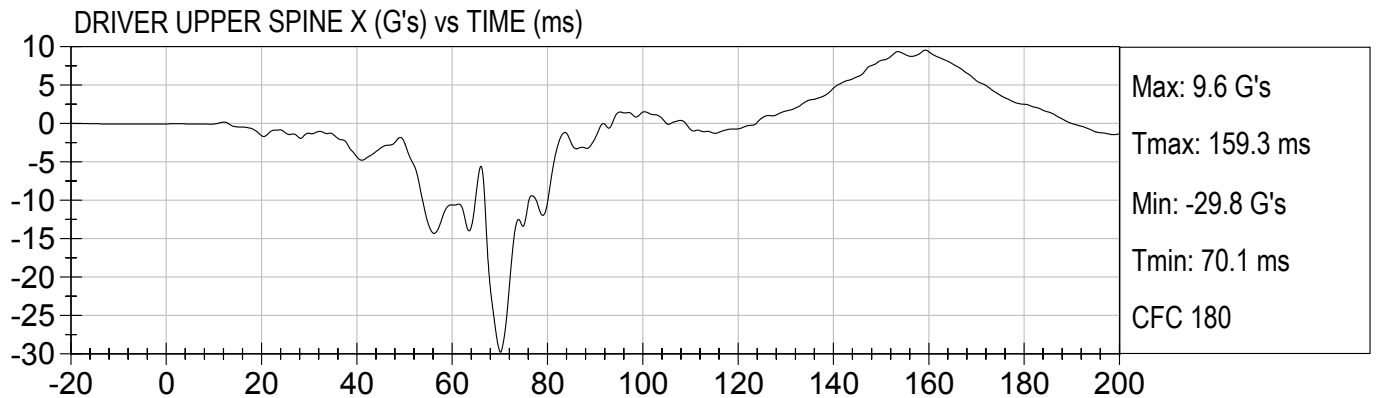
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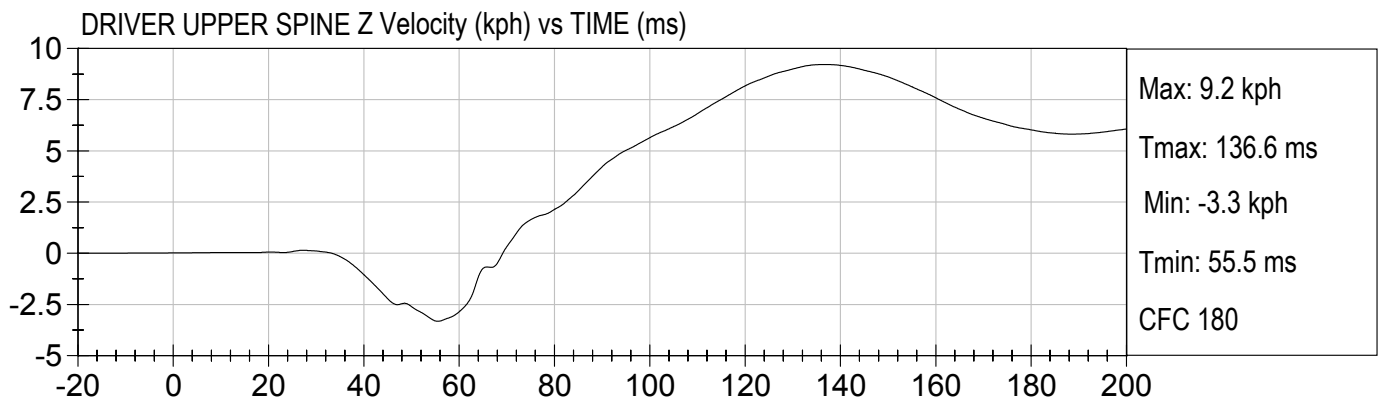
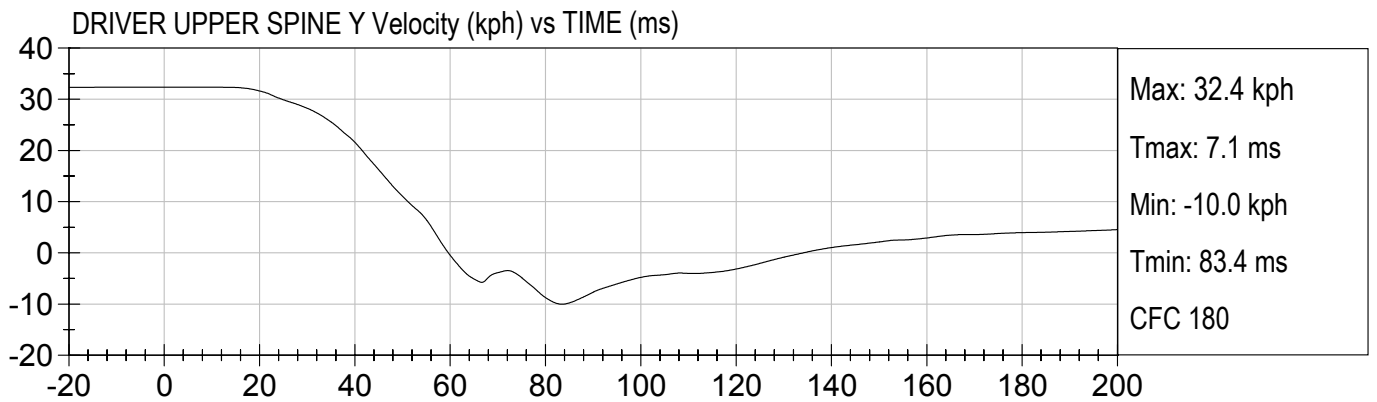
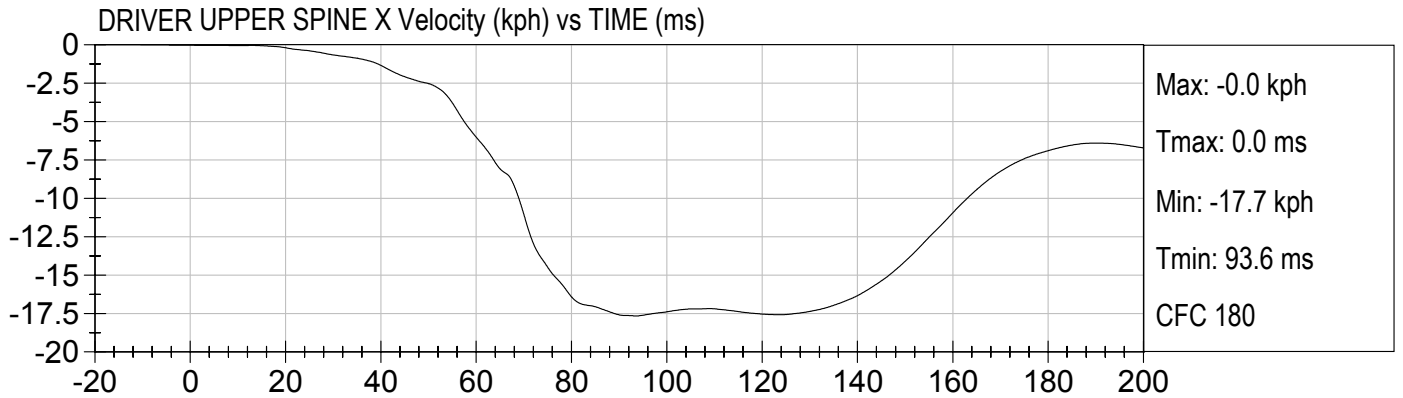




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1999 VOLVO S80 W/AIRBAG

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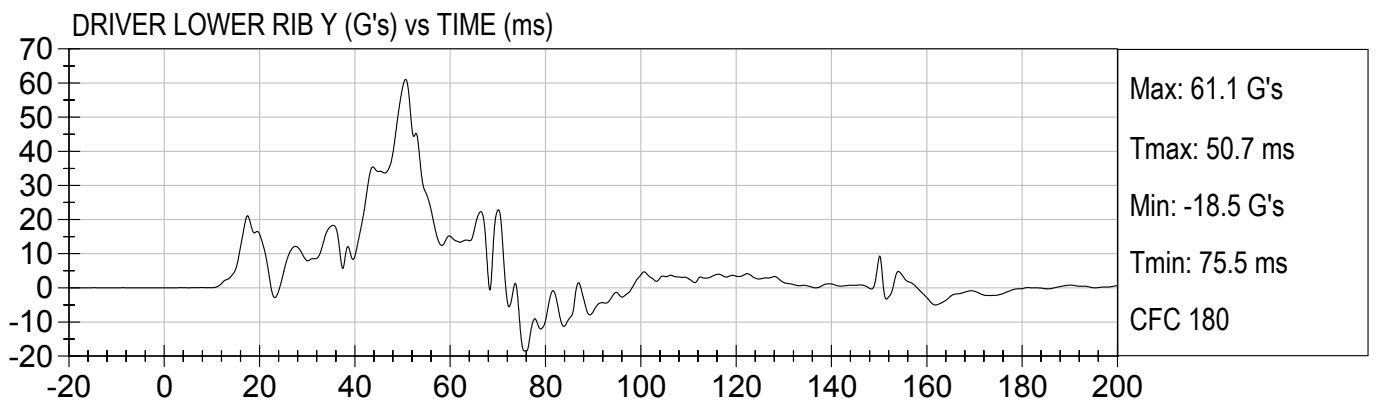
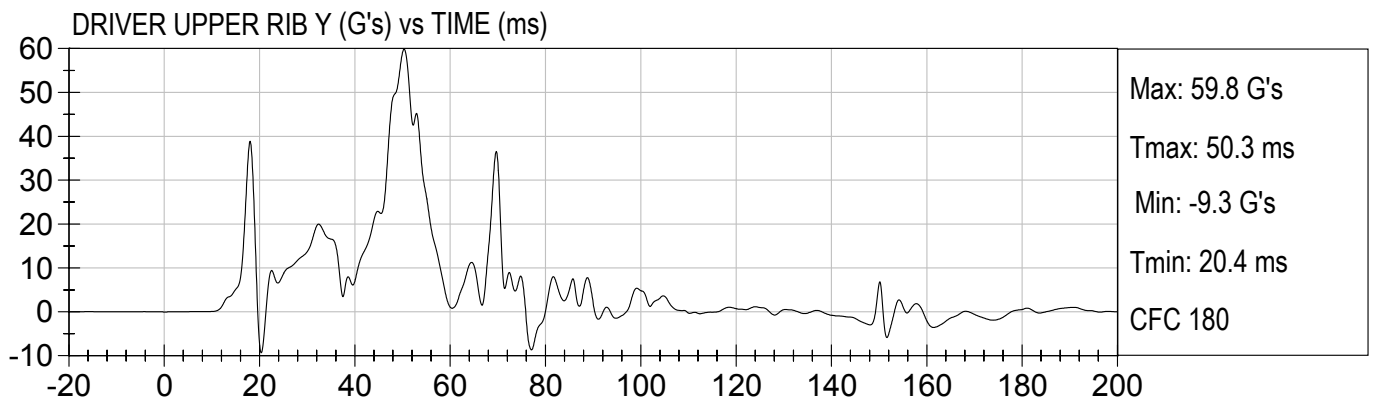
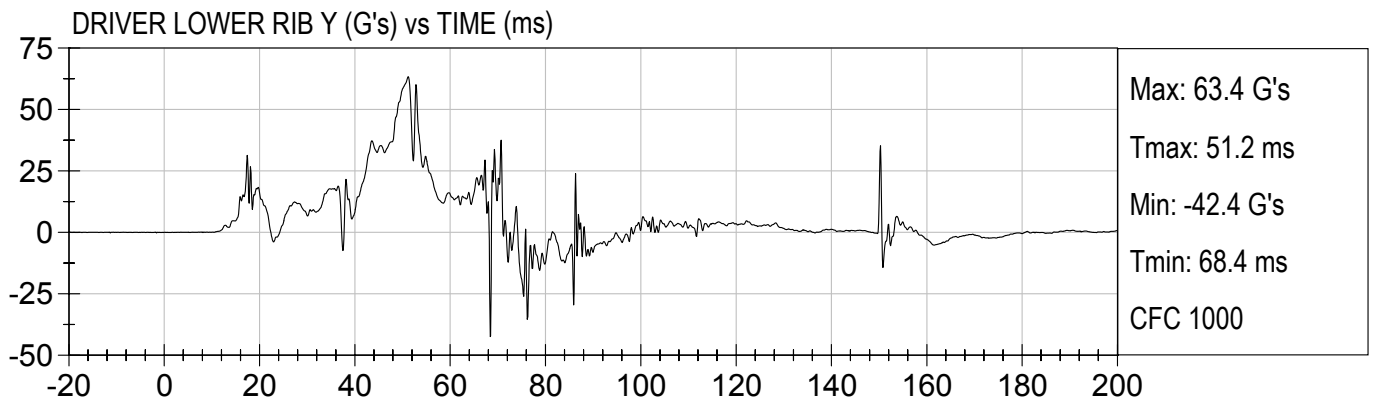
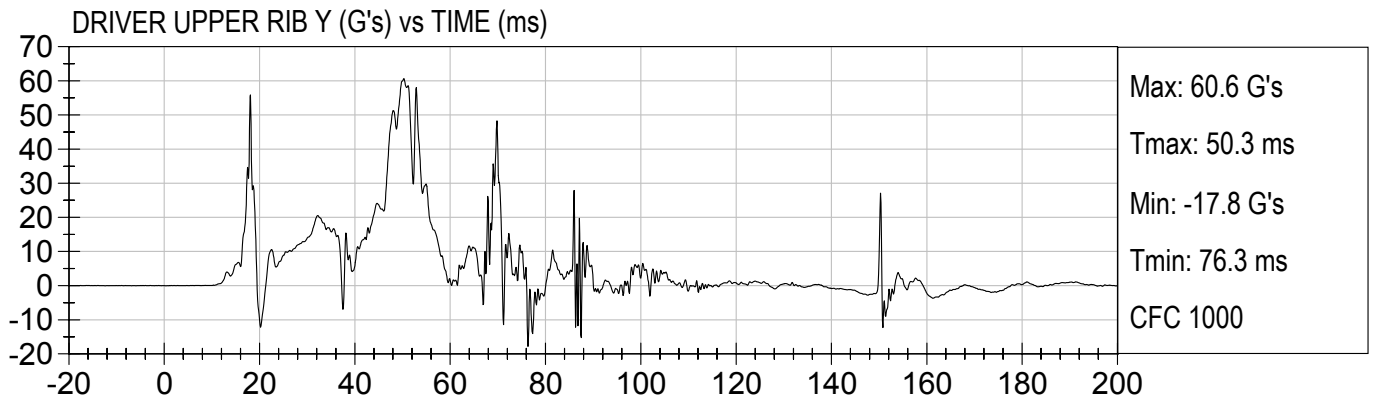






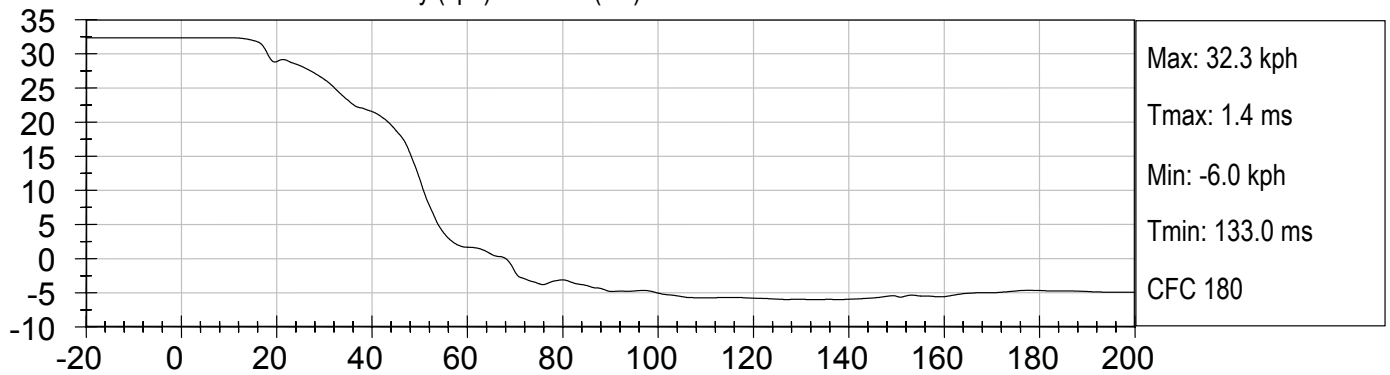
20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
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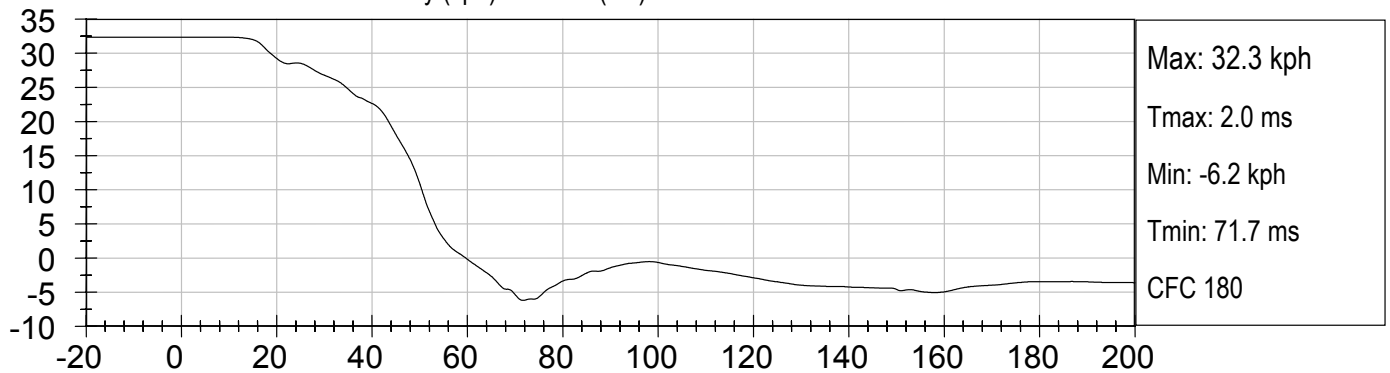




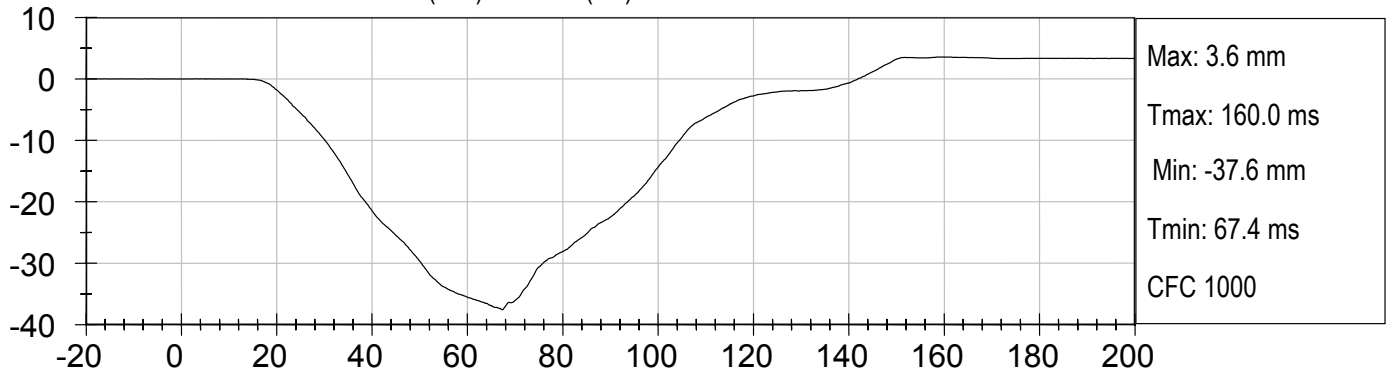
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



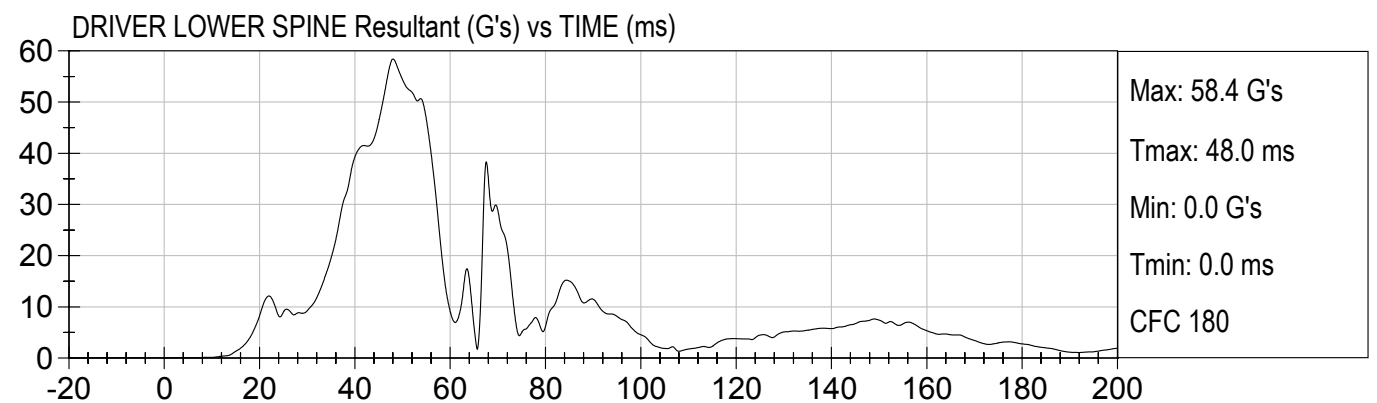
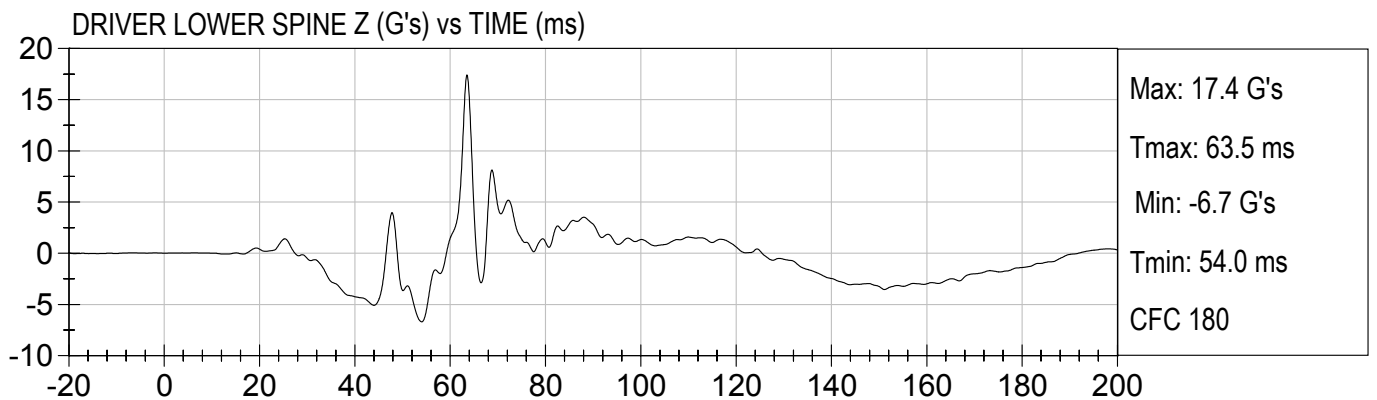
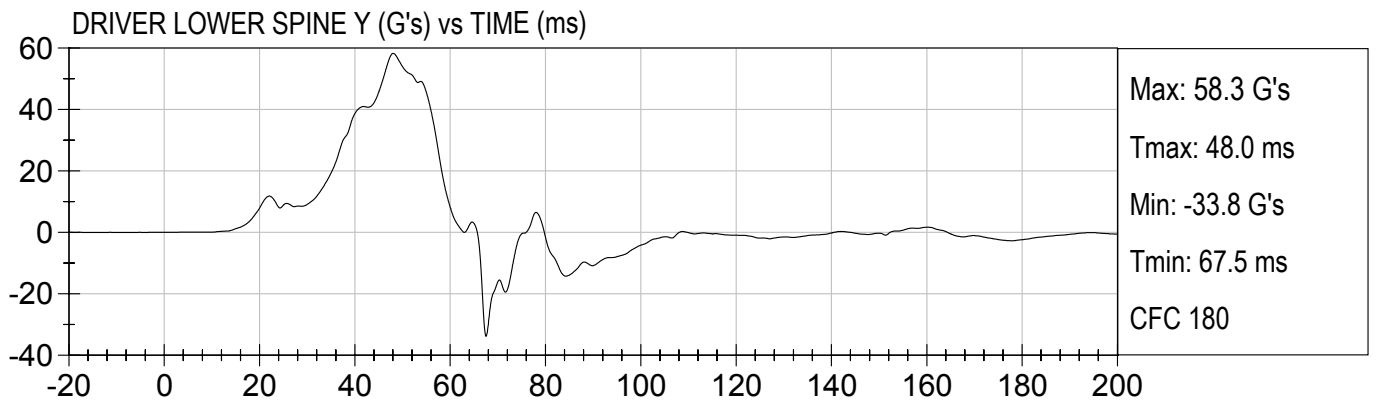
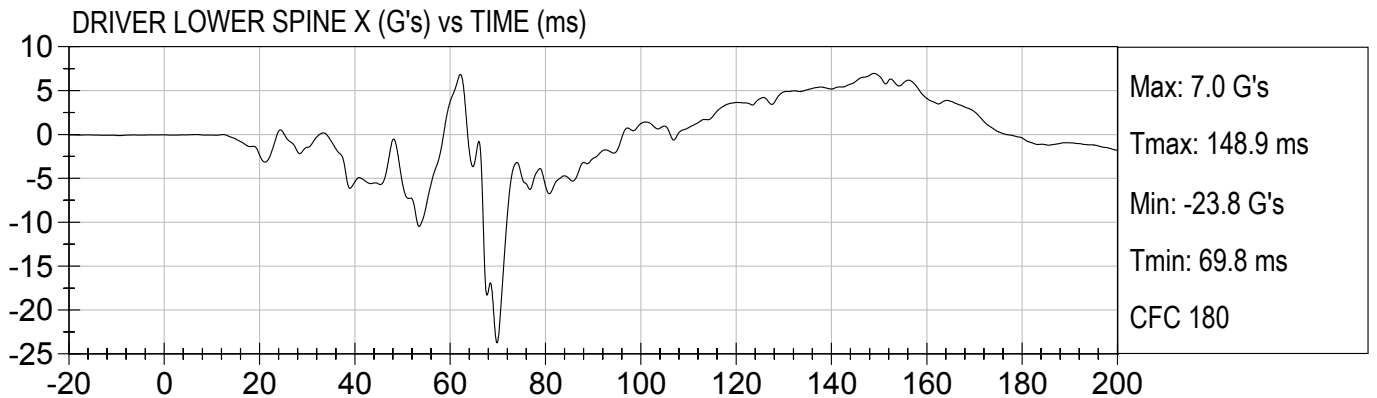
DRIVER RIB DISPLACEMENT (mm) vs TIME (ms)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

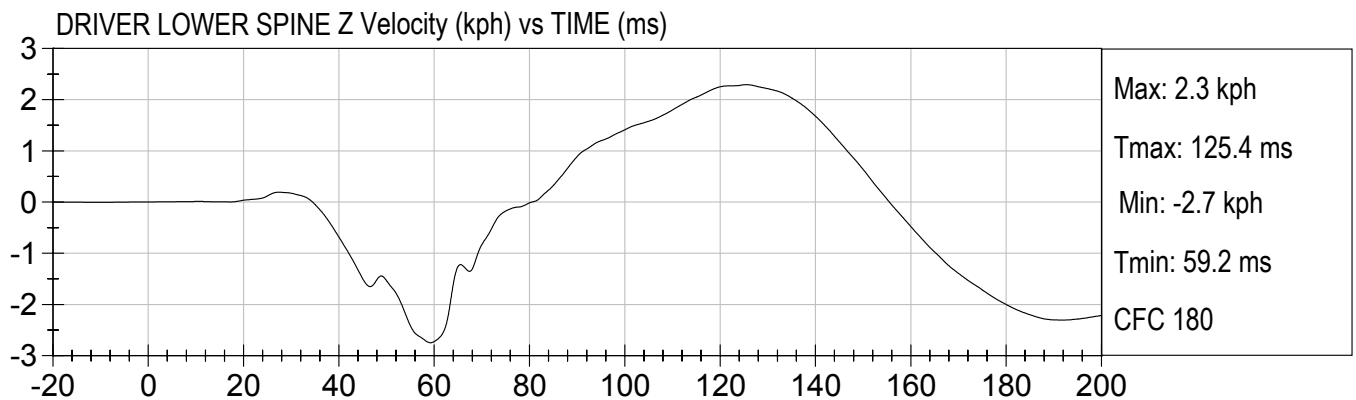
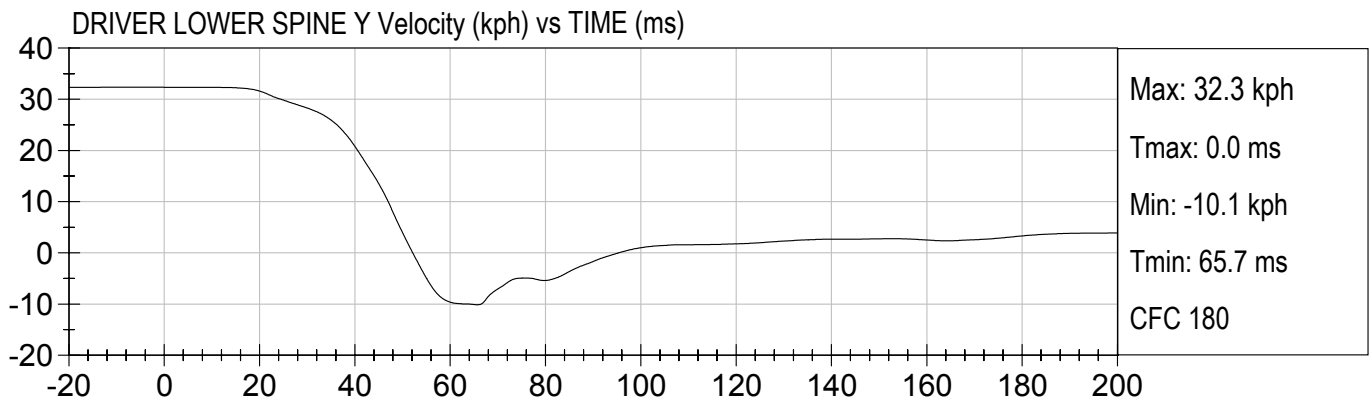
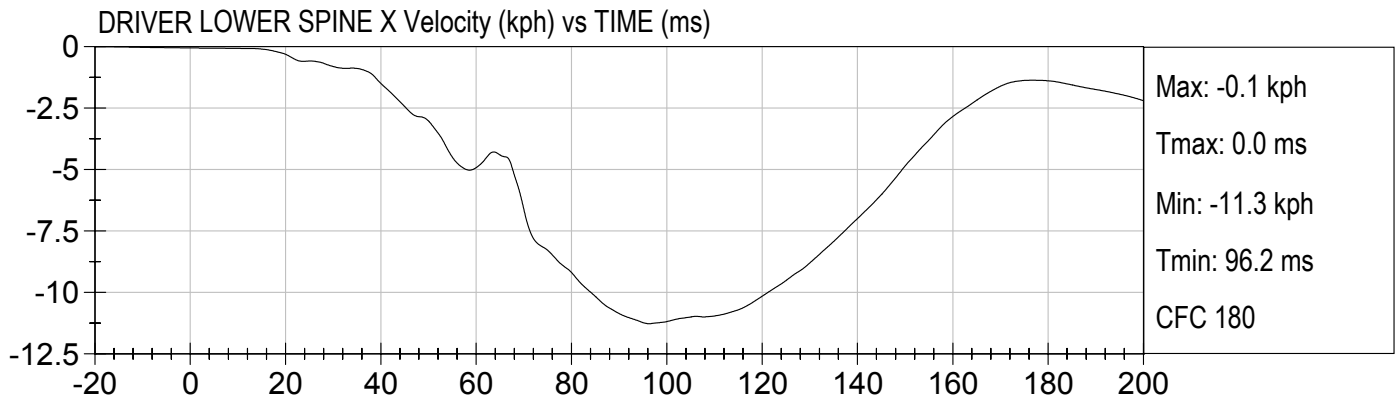
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20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

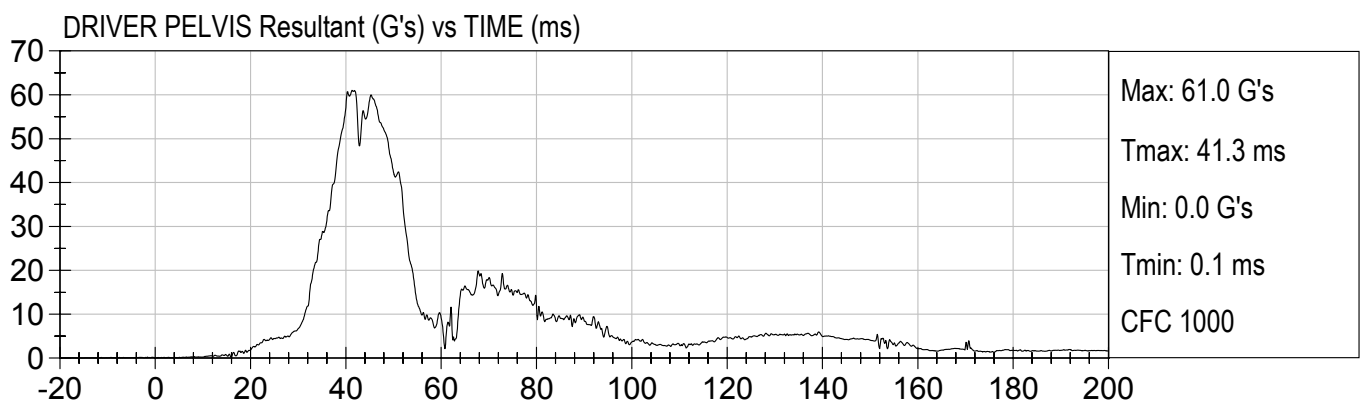
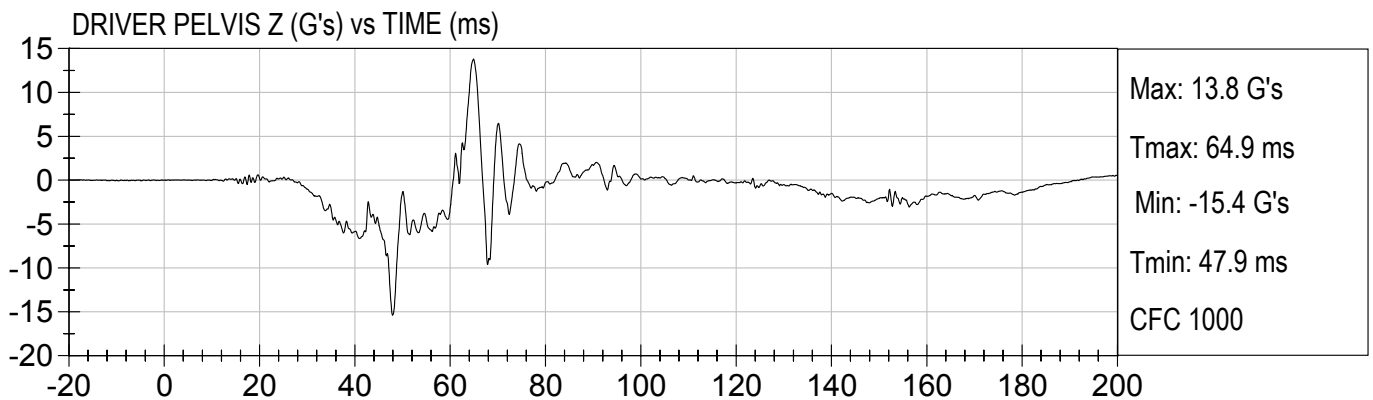
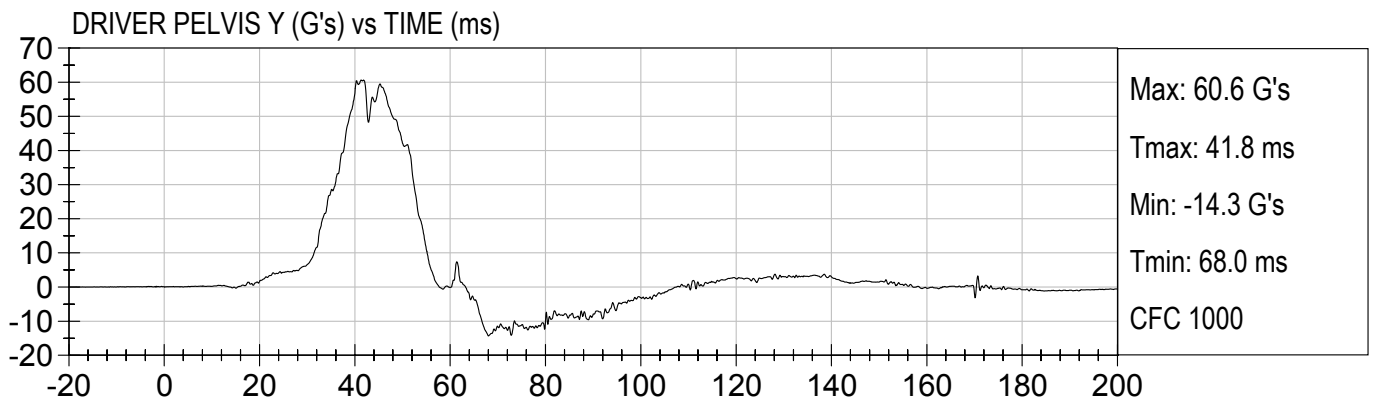
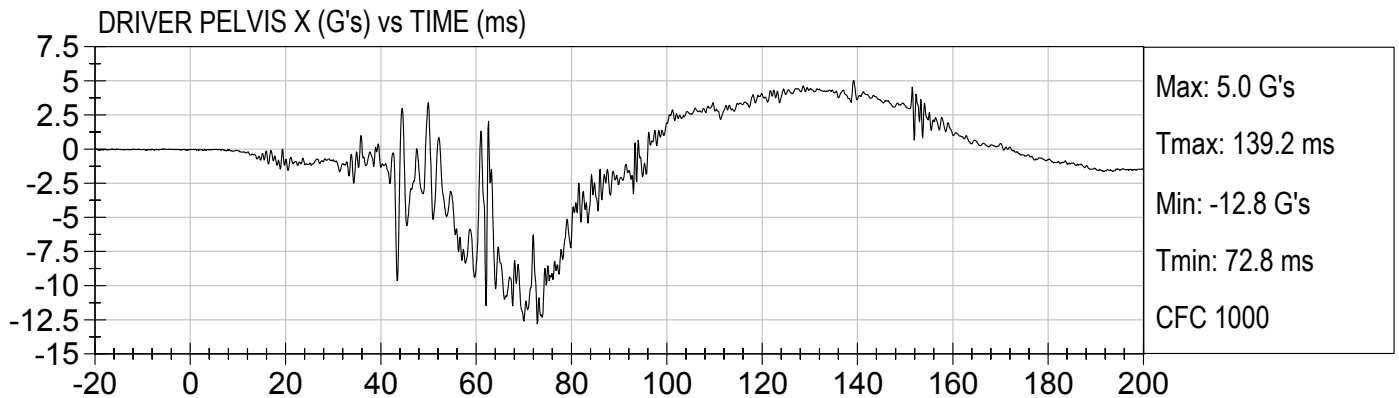
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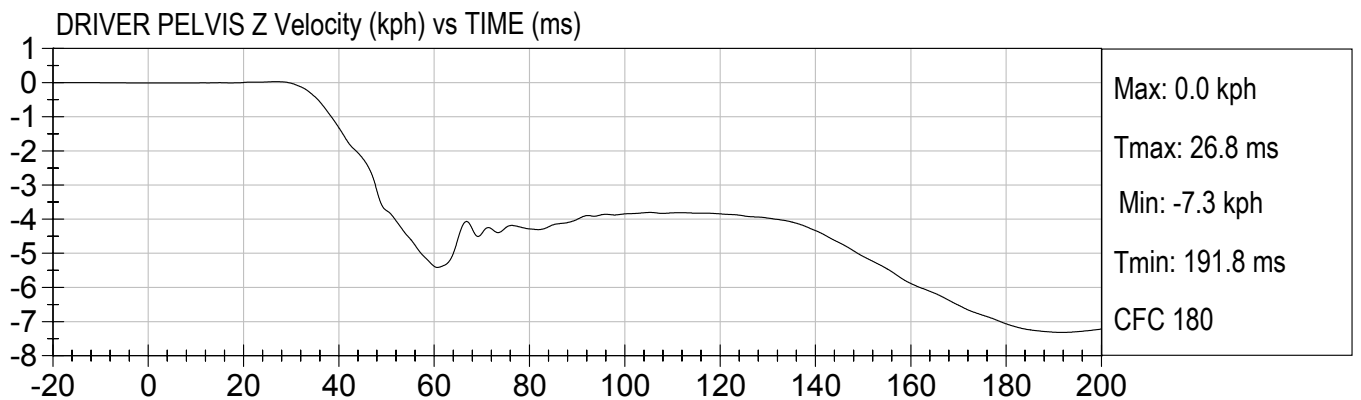
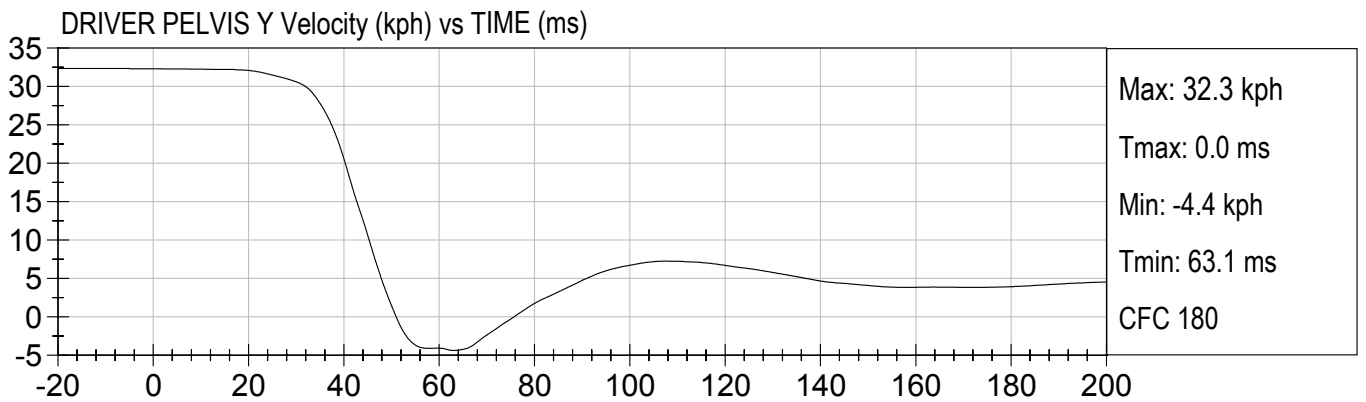
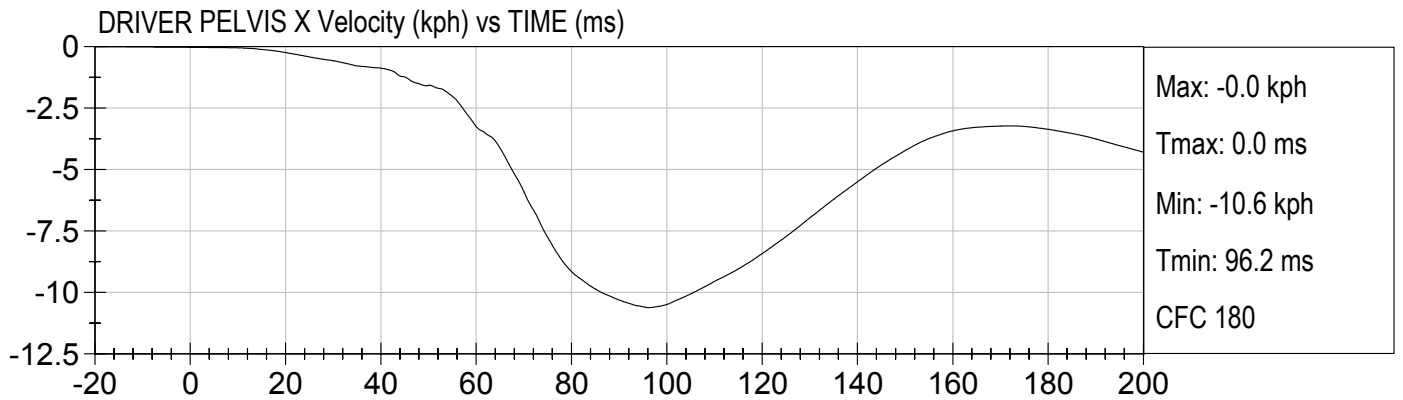


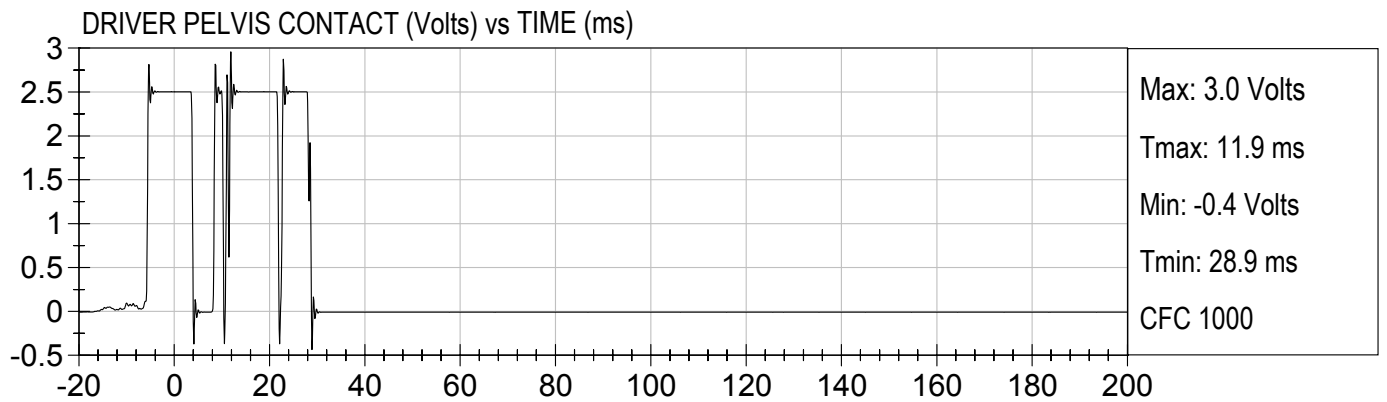
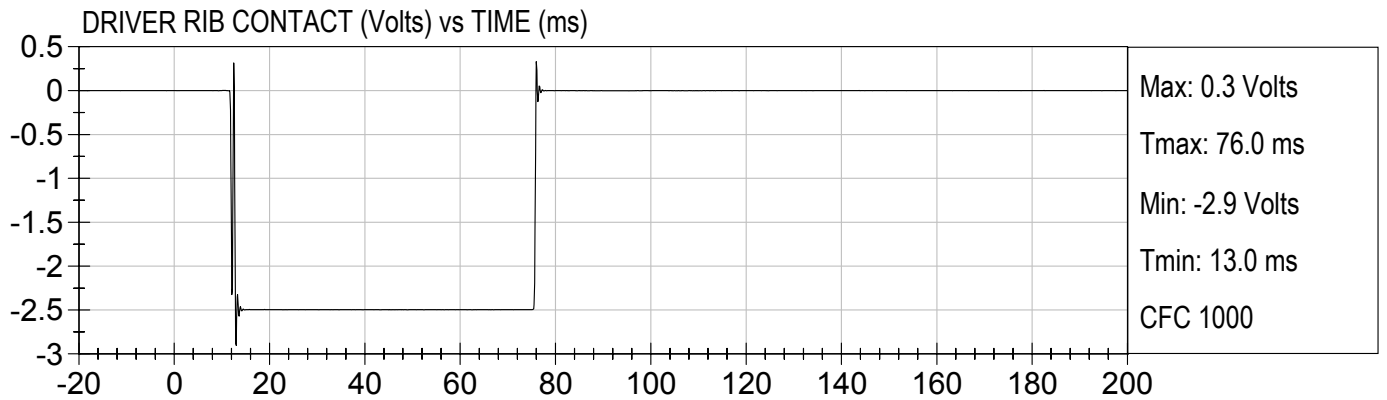


20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)



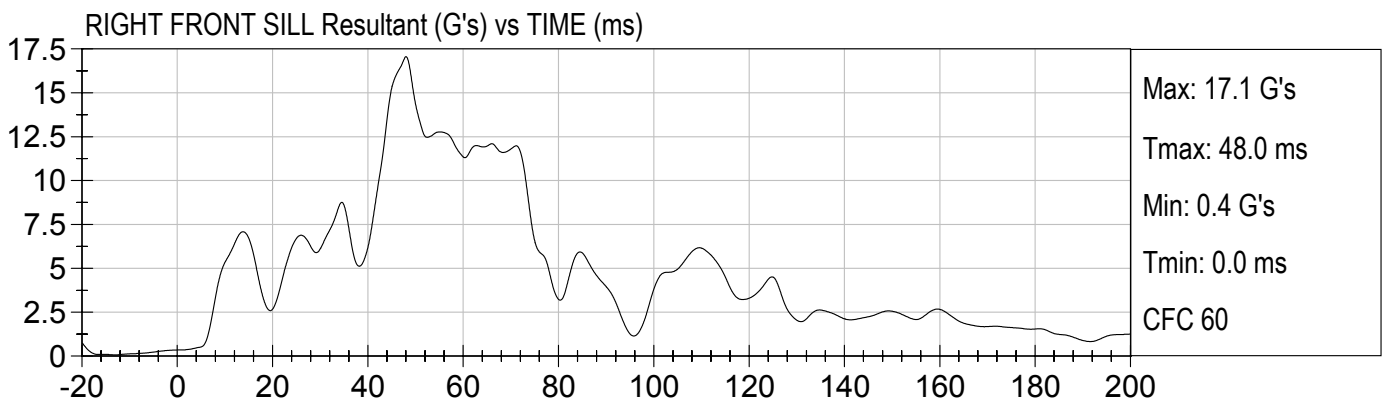
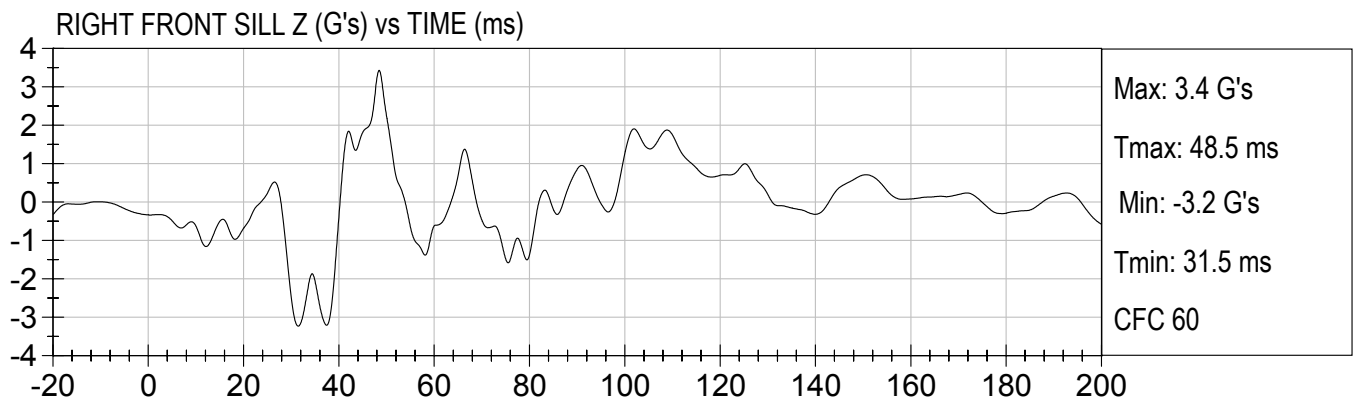
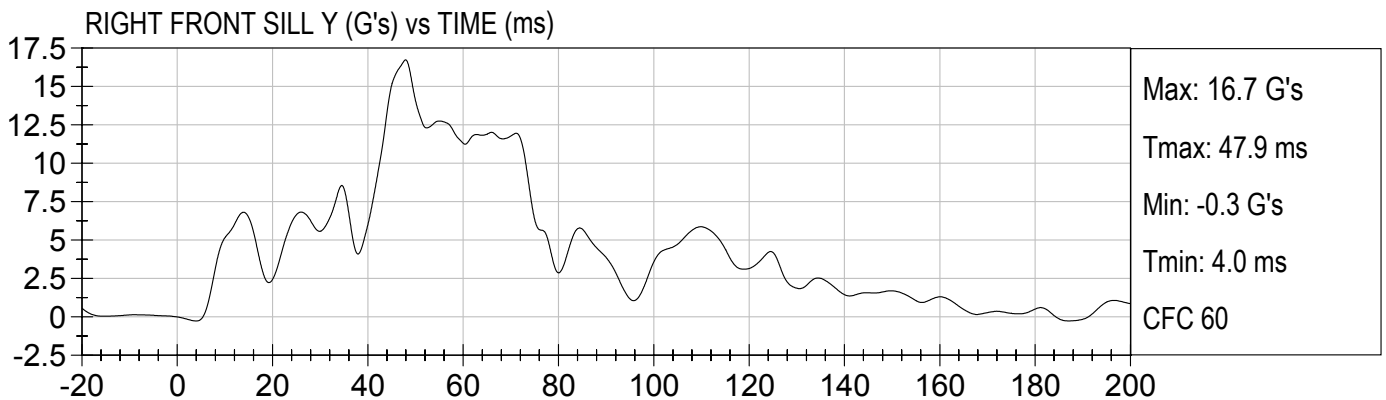
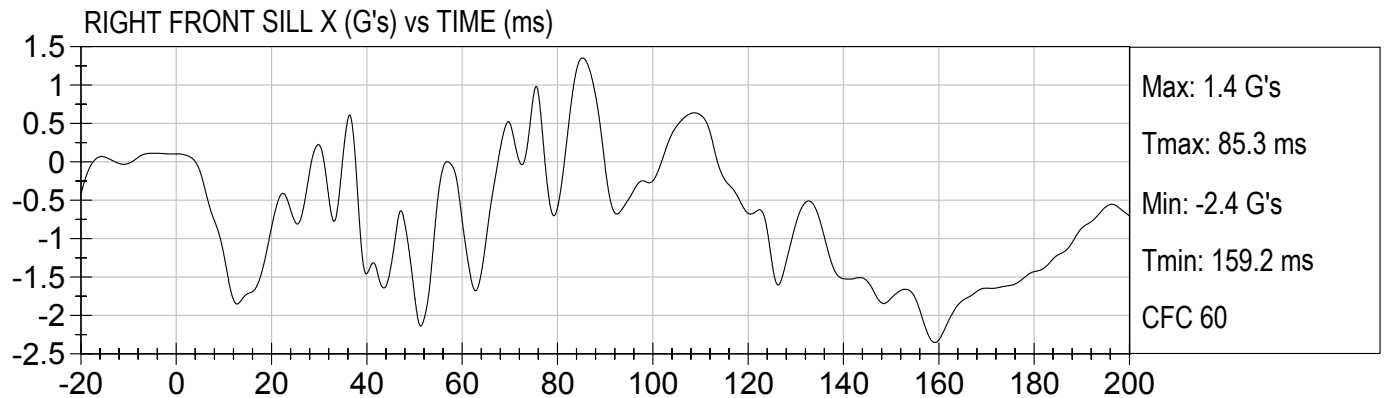


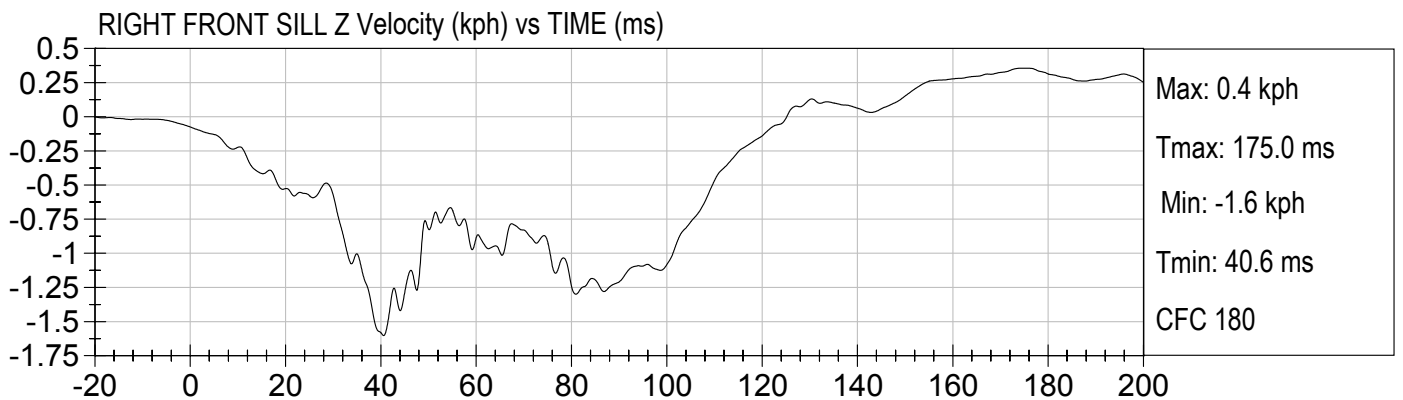
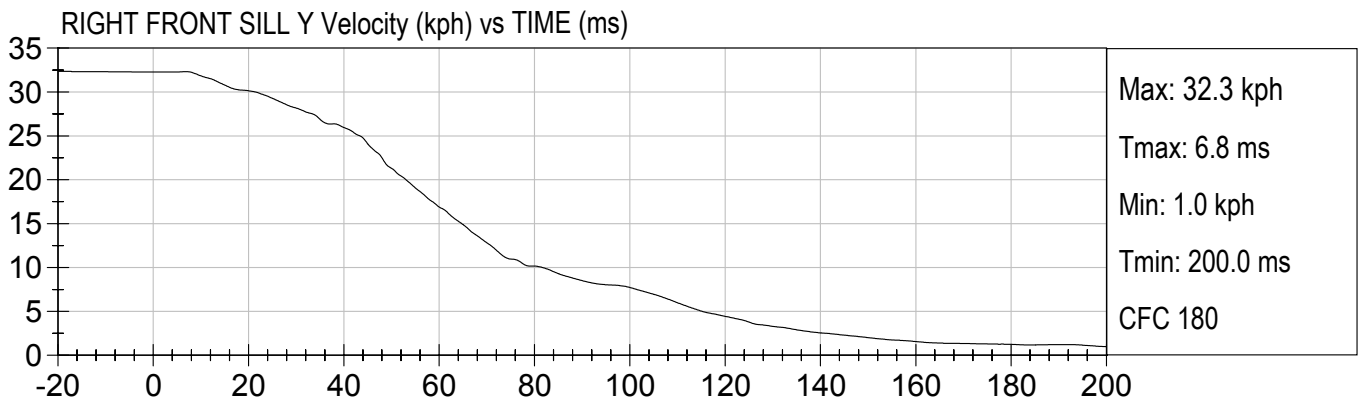
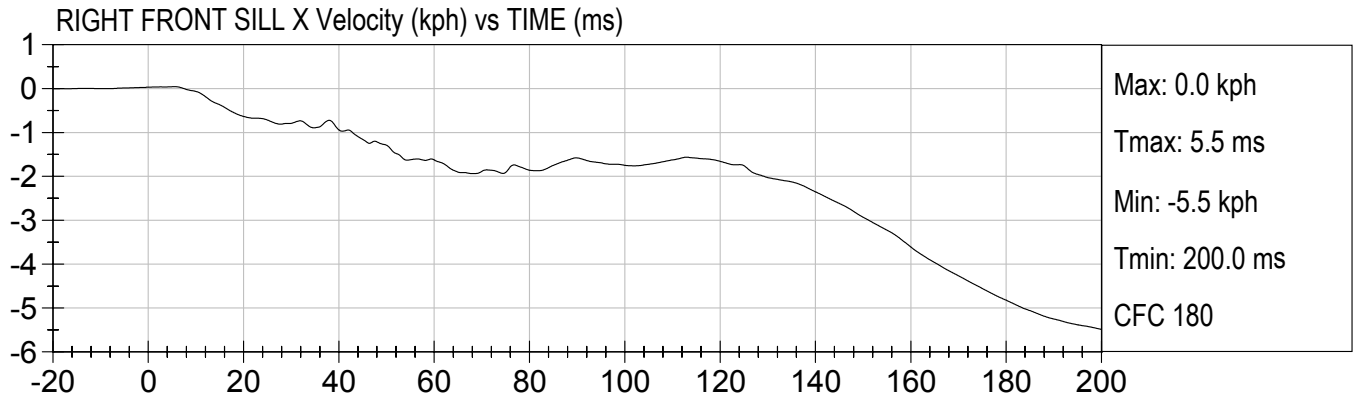




20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)



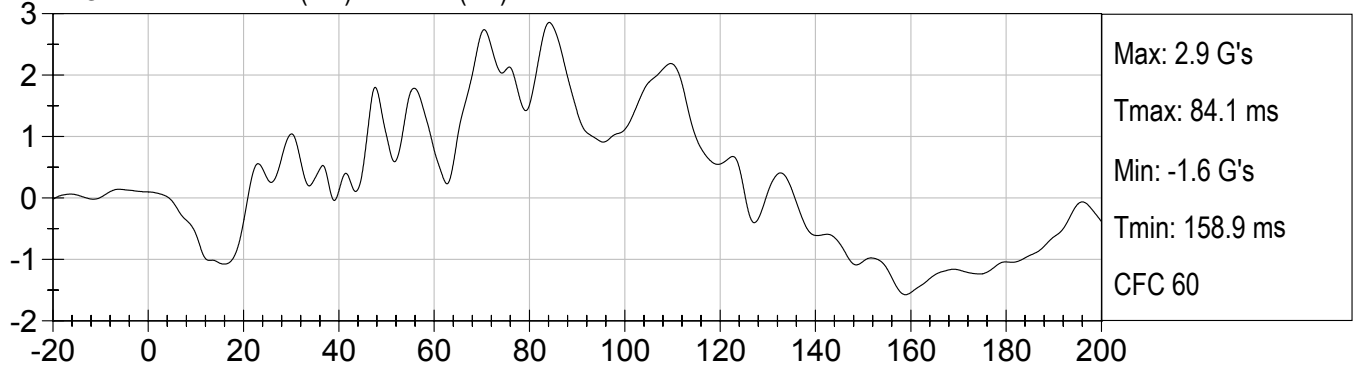




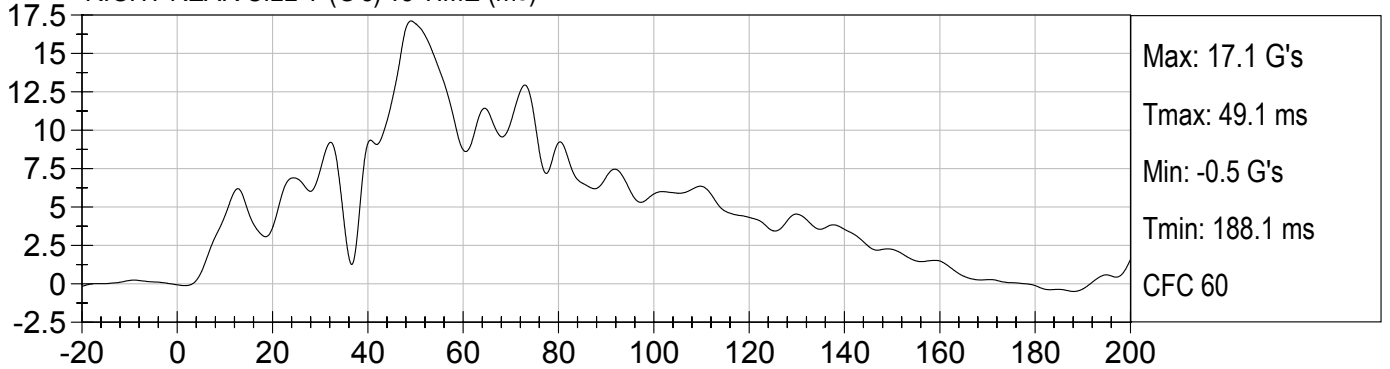
20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

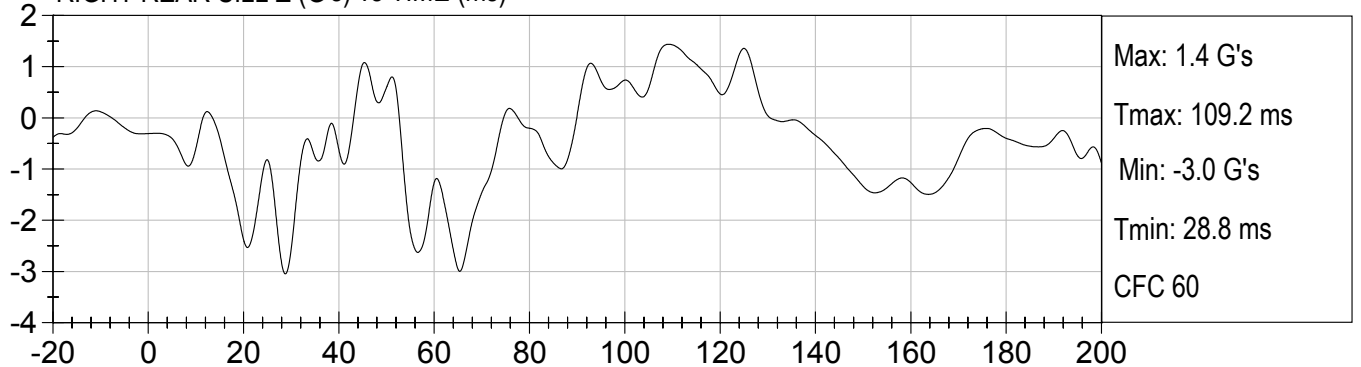
RIGHT REAR SILL X (G's) vs TIME (ms)



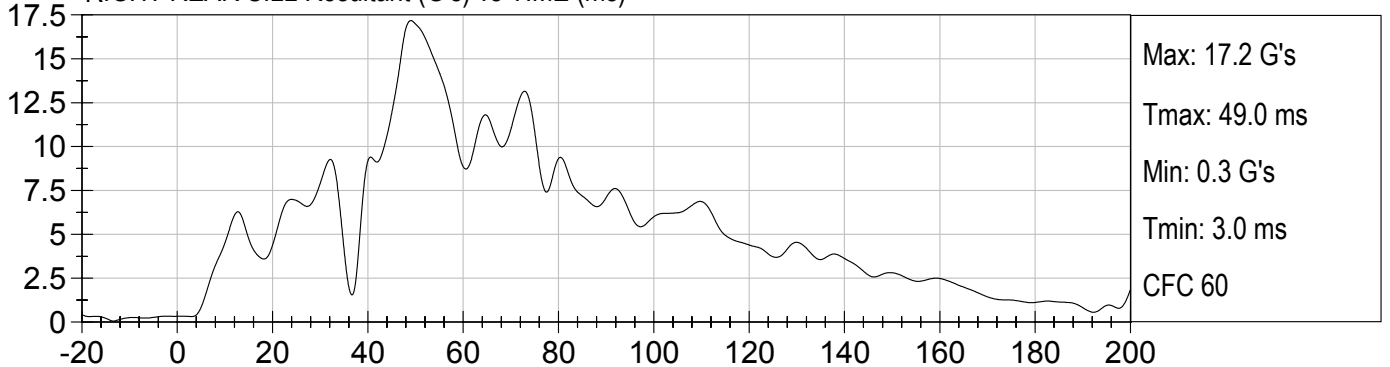
RIGHT REAR SILL Y (G's) vs TIME (ms)



RIGHT REAR SILL Z (G's) vs TIME (ms)

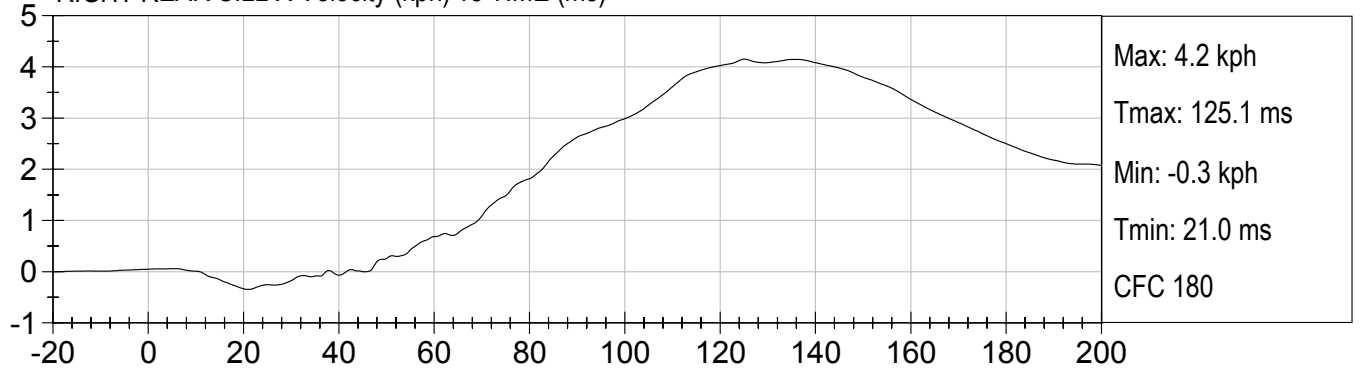


RIGHT REAR SILL Resultant (G's) vs TIME (ms)

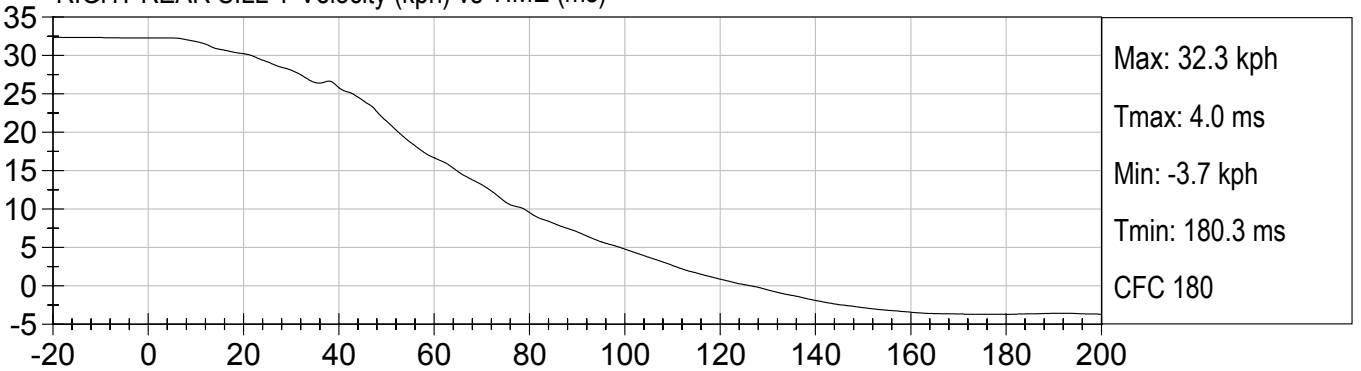




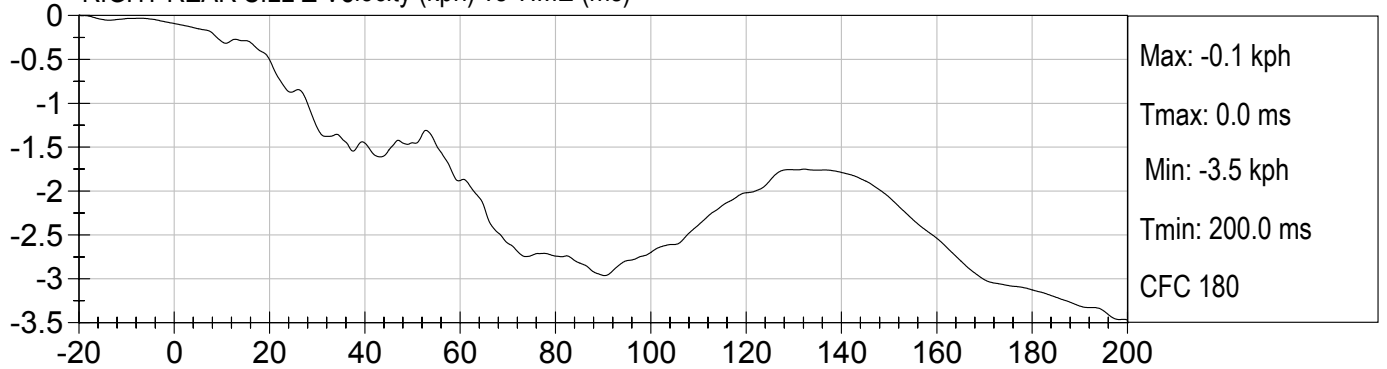
RIGHT REAR SILL X Velocity (kph) vs TIME (ms)



RIGHT REAR SILL Y Velocity (kph) vs TIME (ms)



RIGHT REAR SILL Z Velocity (kph) vs TIME (ms)

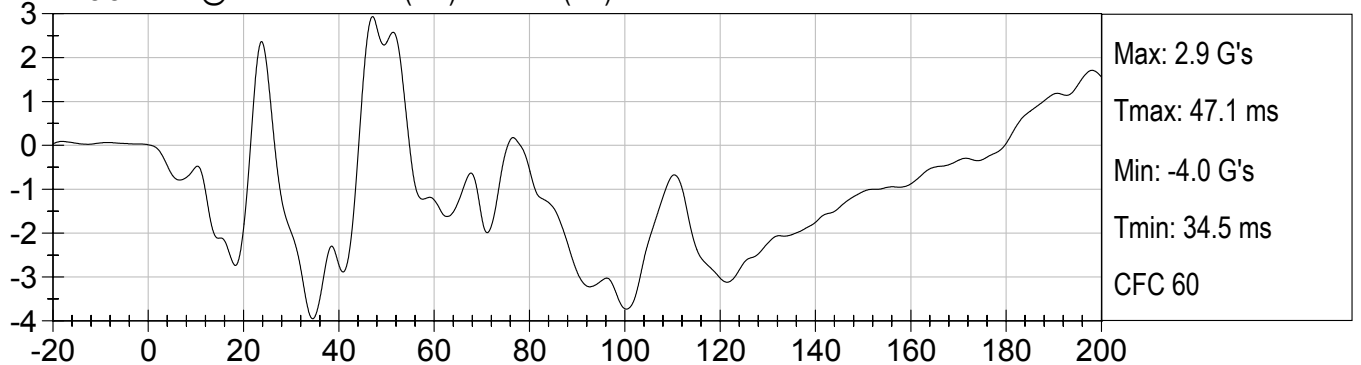




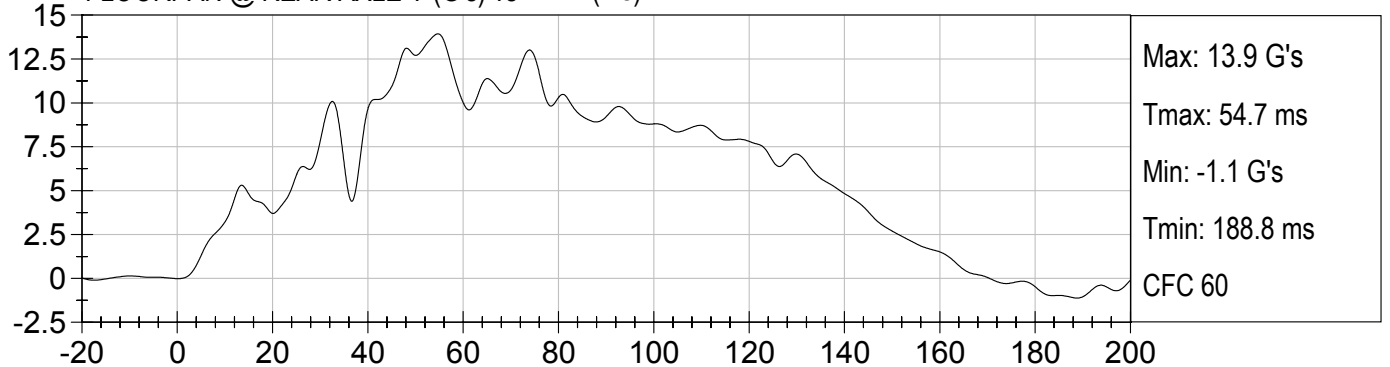
20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

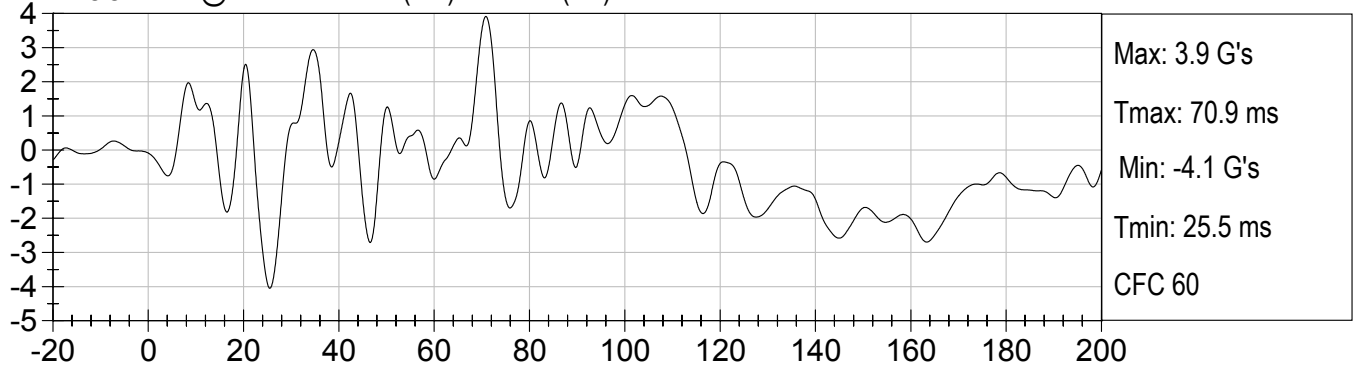
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



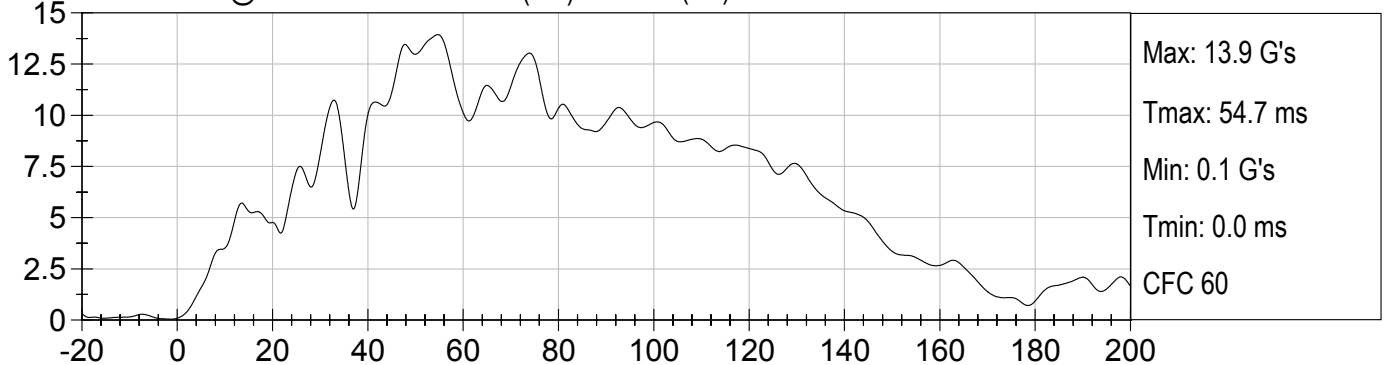
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)

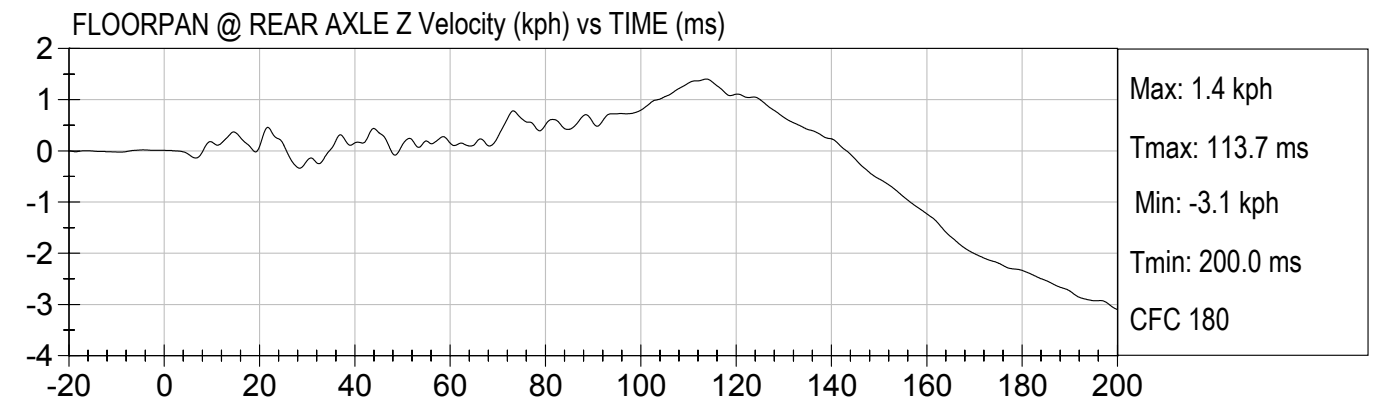
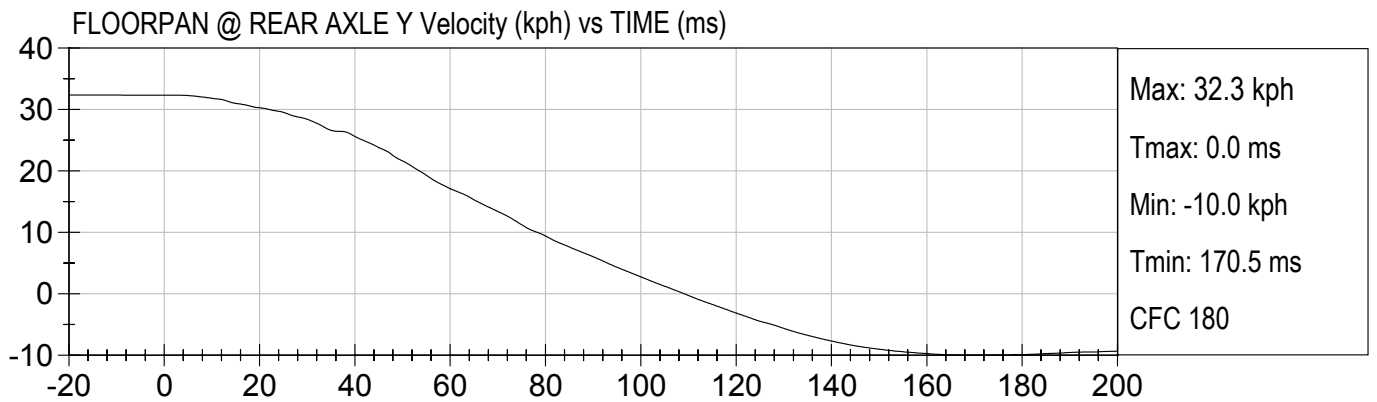
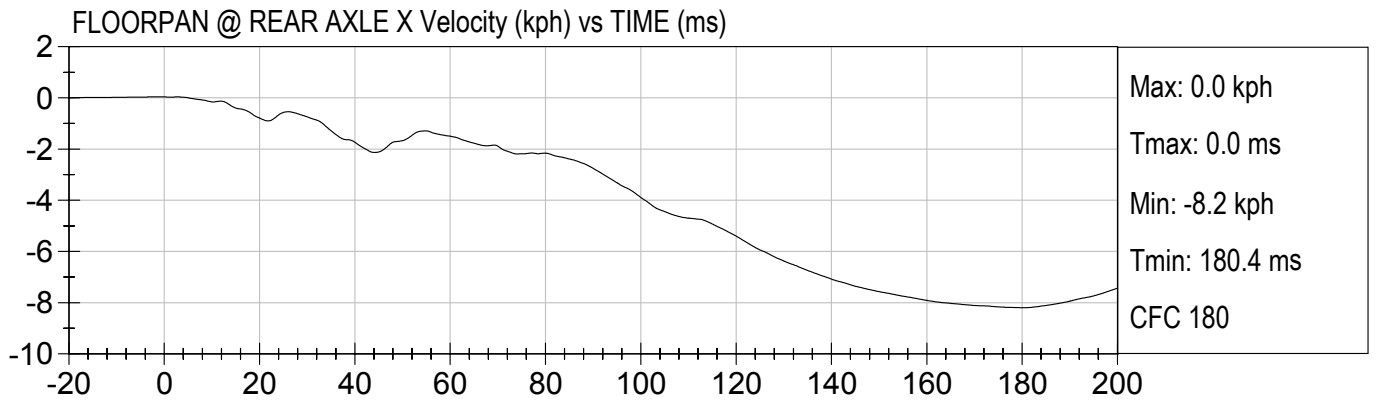


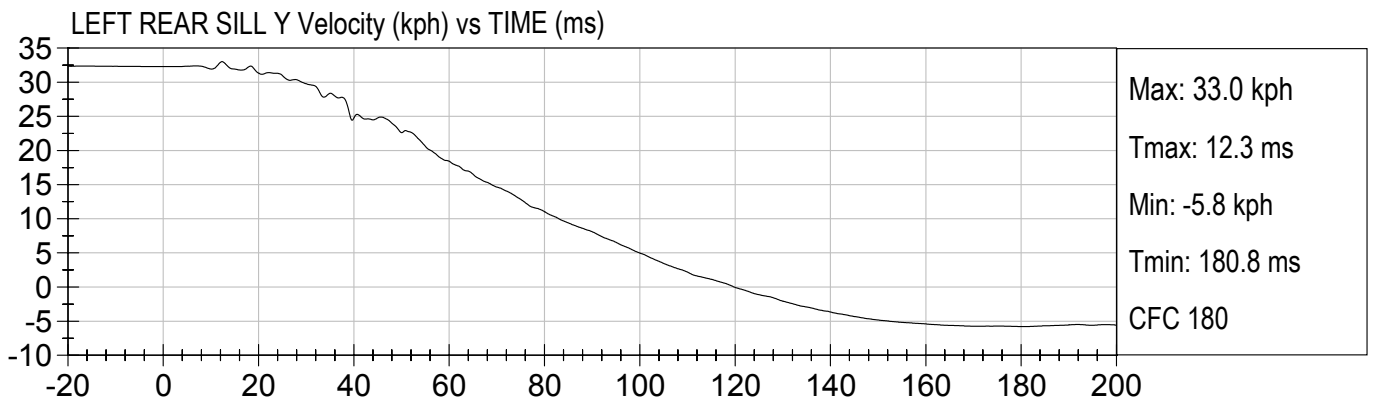
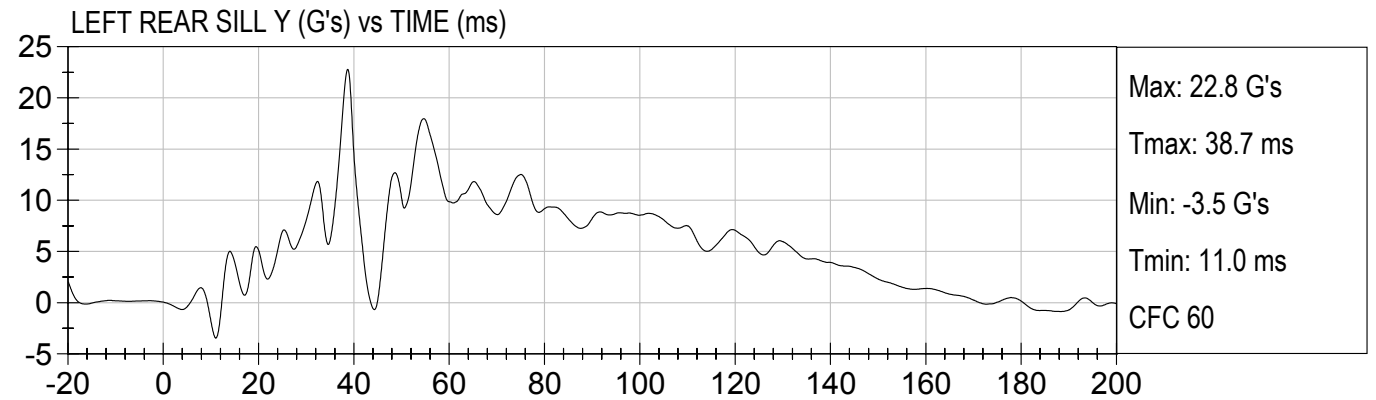
FLOORPAN @ REAR AXLE Z (G's) vs TIME (ms)



FLOORPAN @ REAR AXLE Resultant (G's) vs TIME (ms)





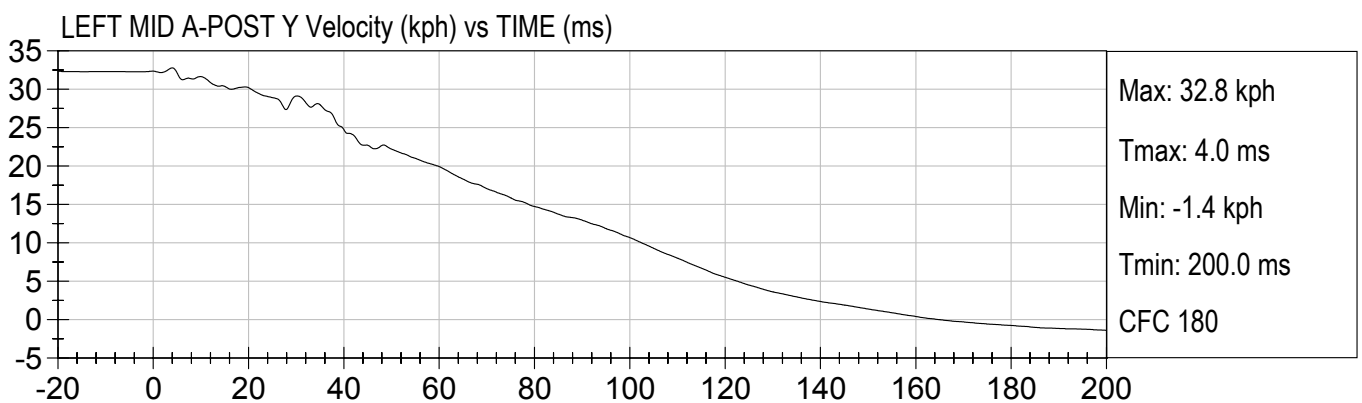
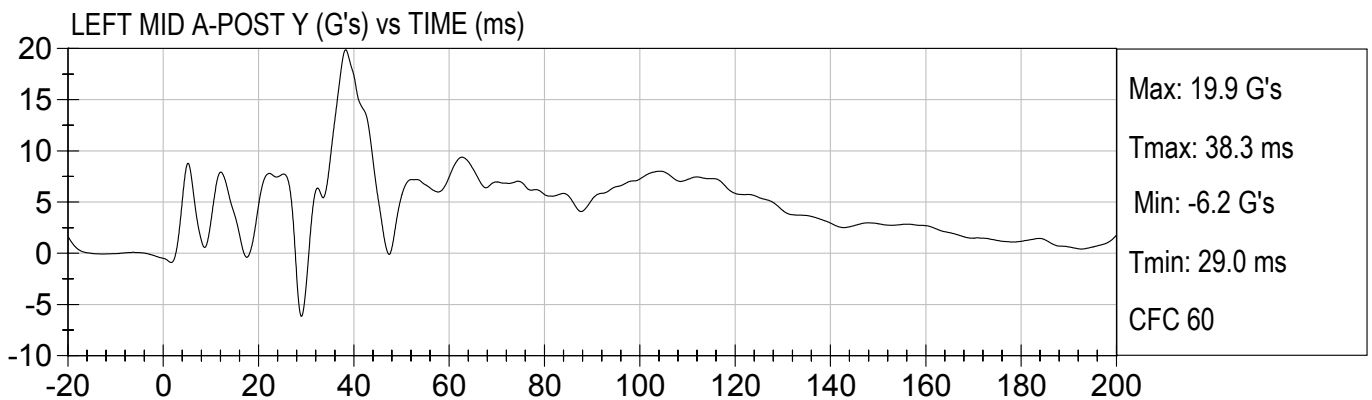
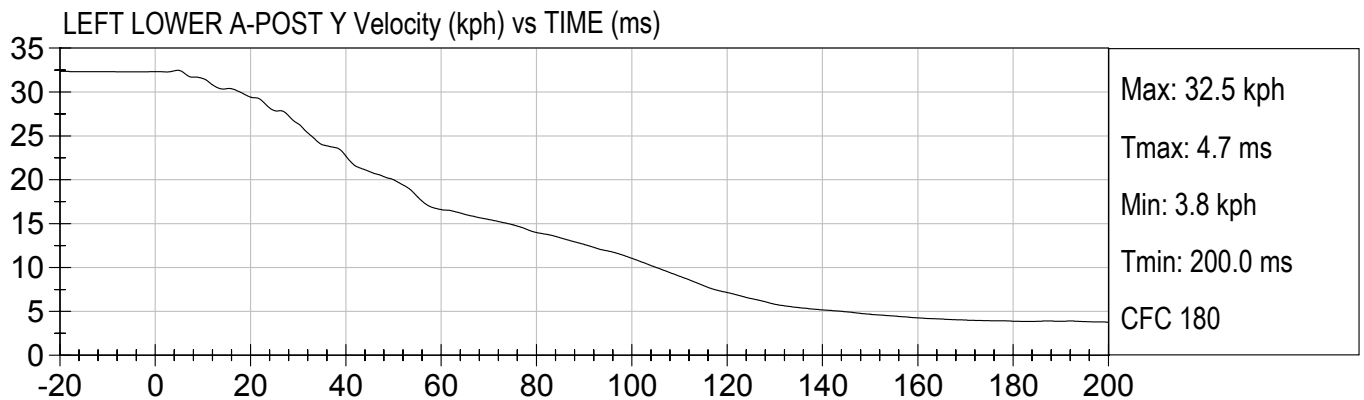
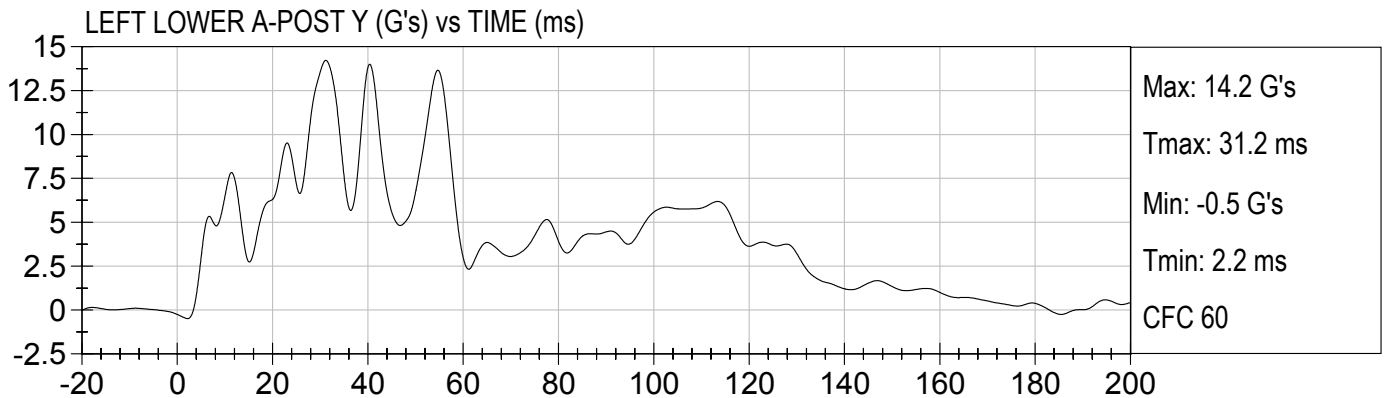


LEFT FRONT SILL vs TIME (ms)
NO VALID DATA COLLECTED



20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

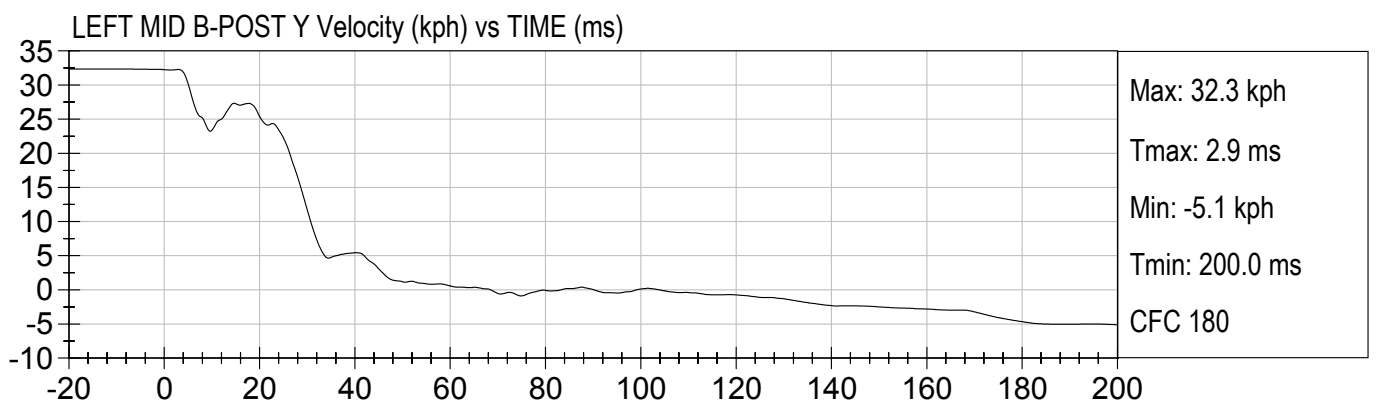
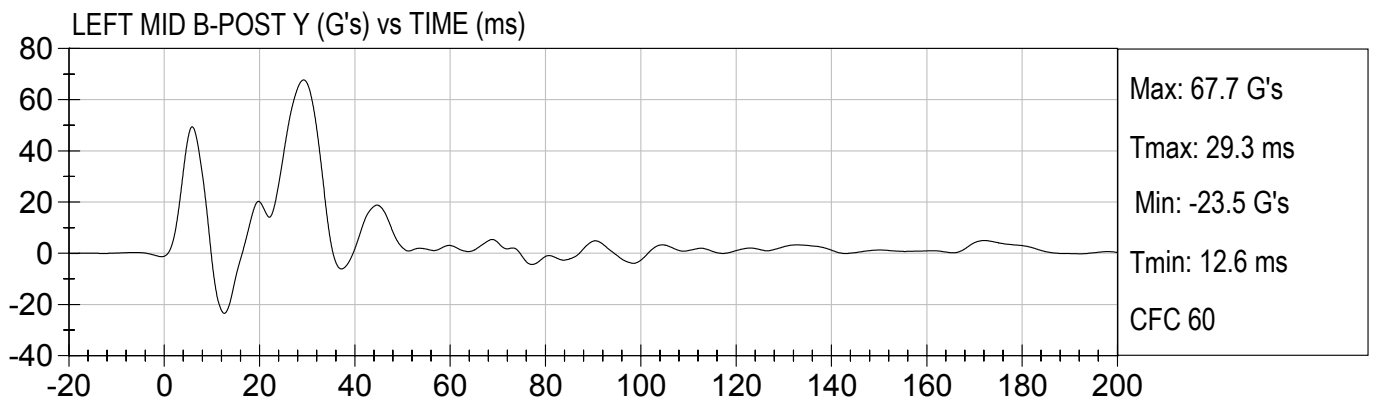
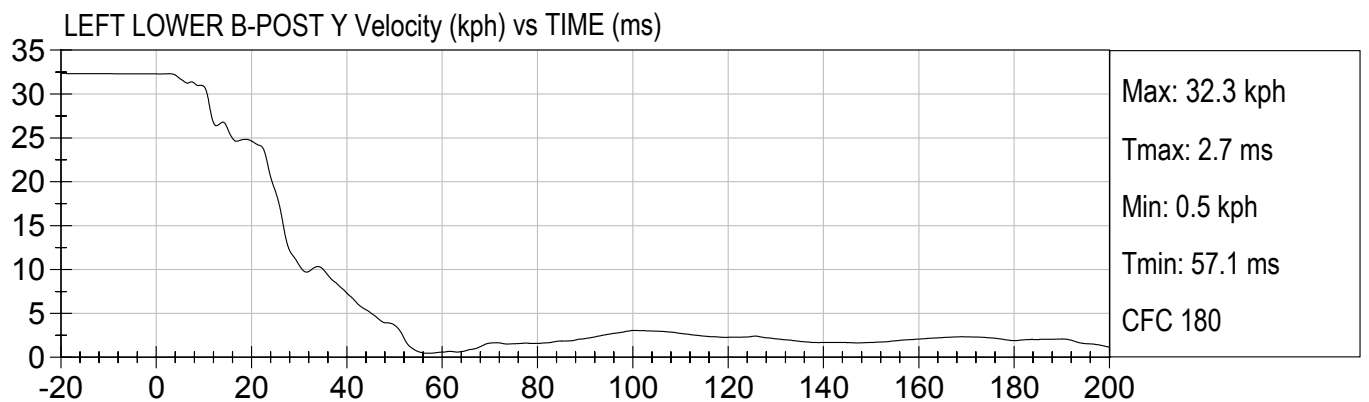
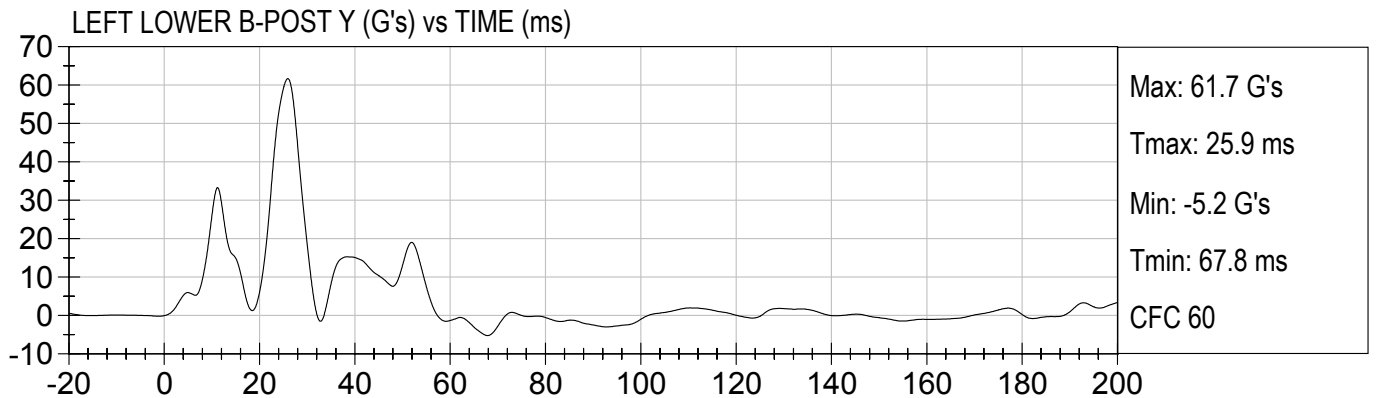
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

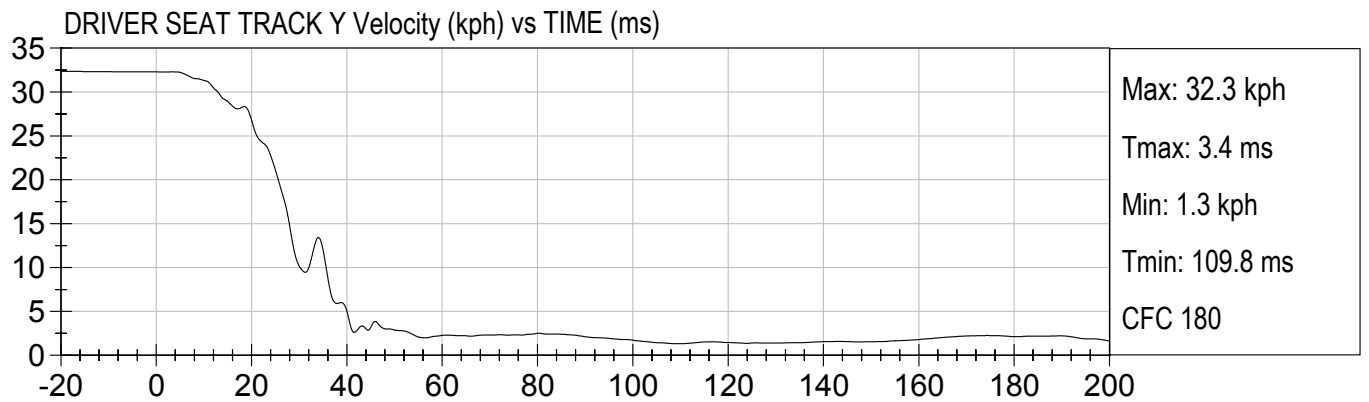
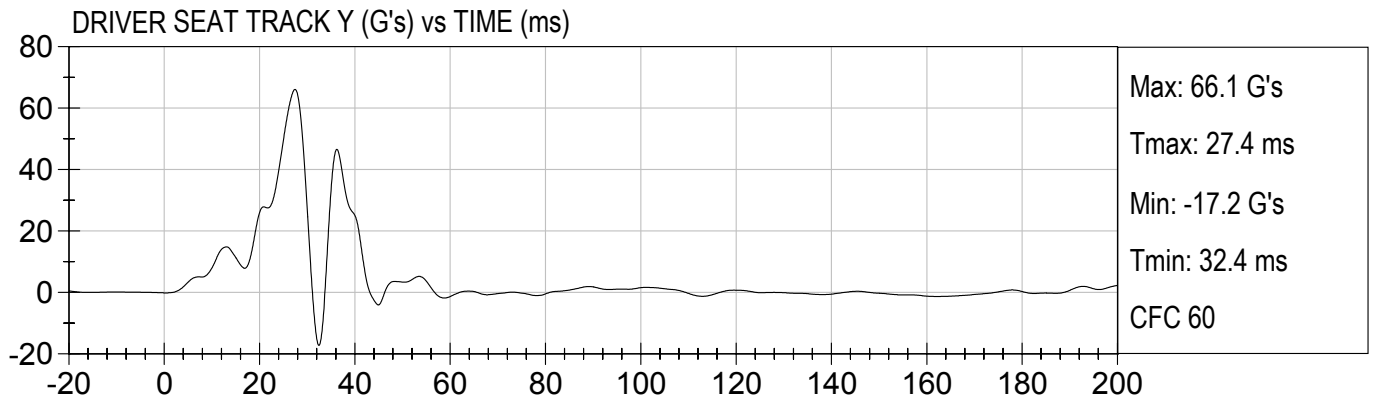
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

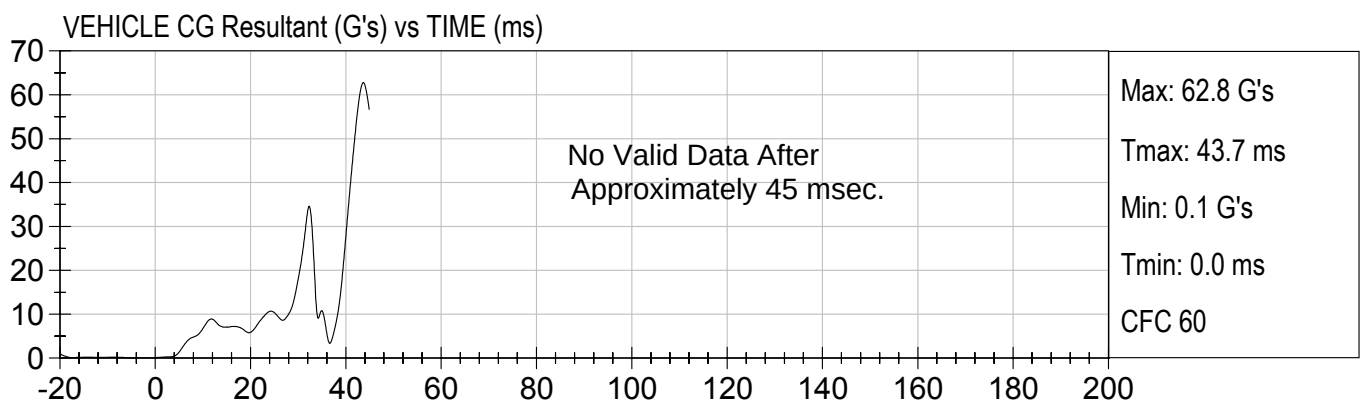
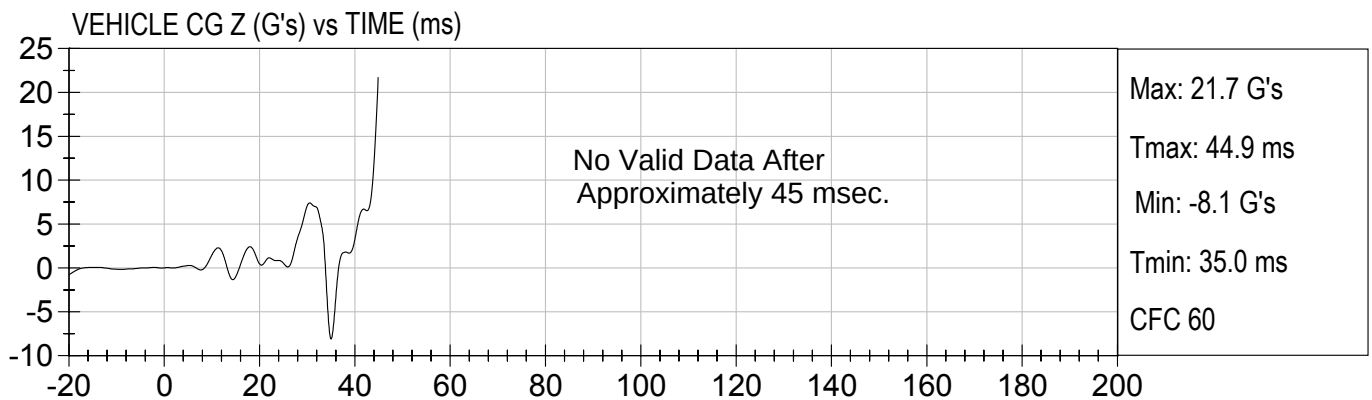
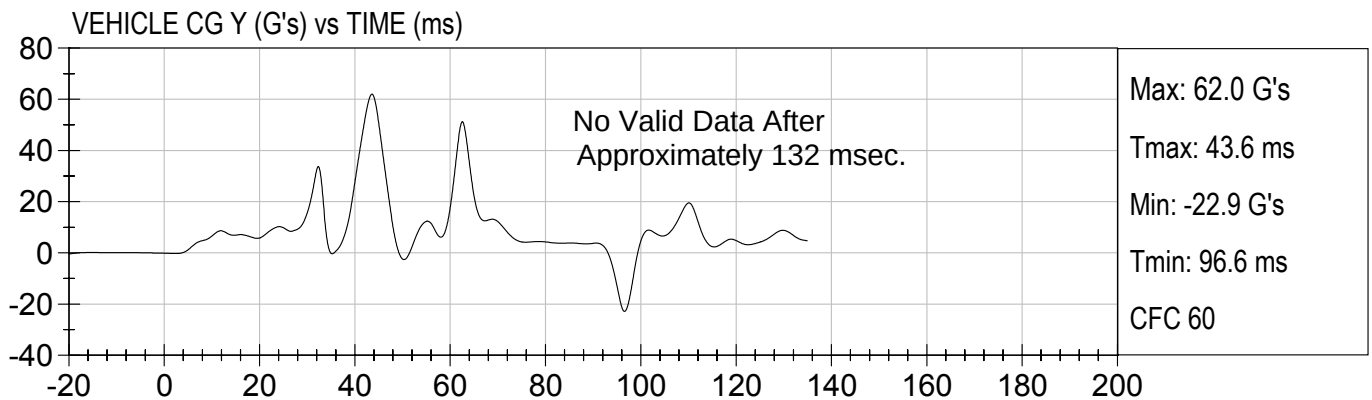
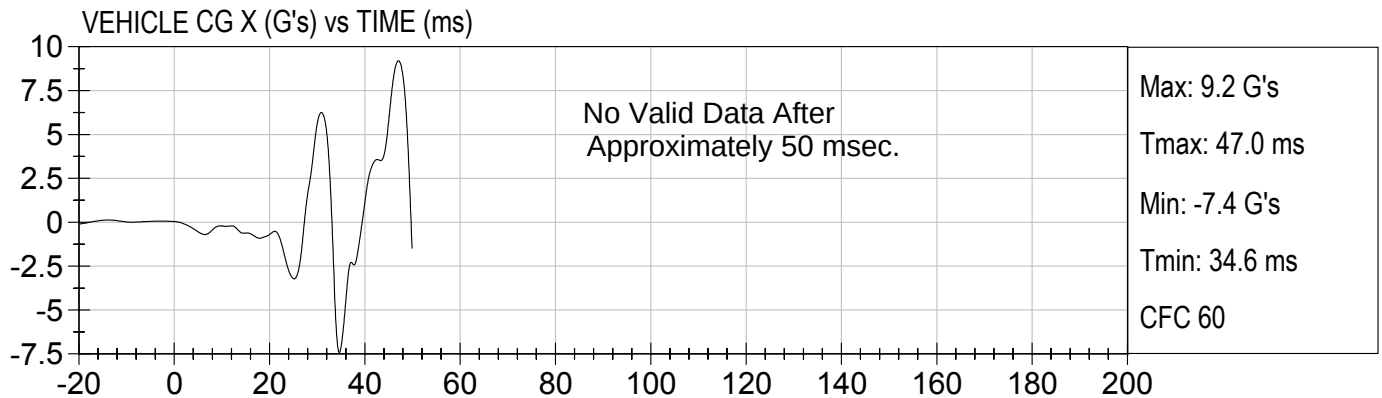
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

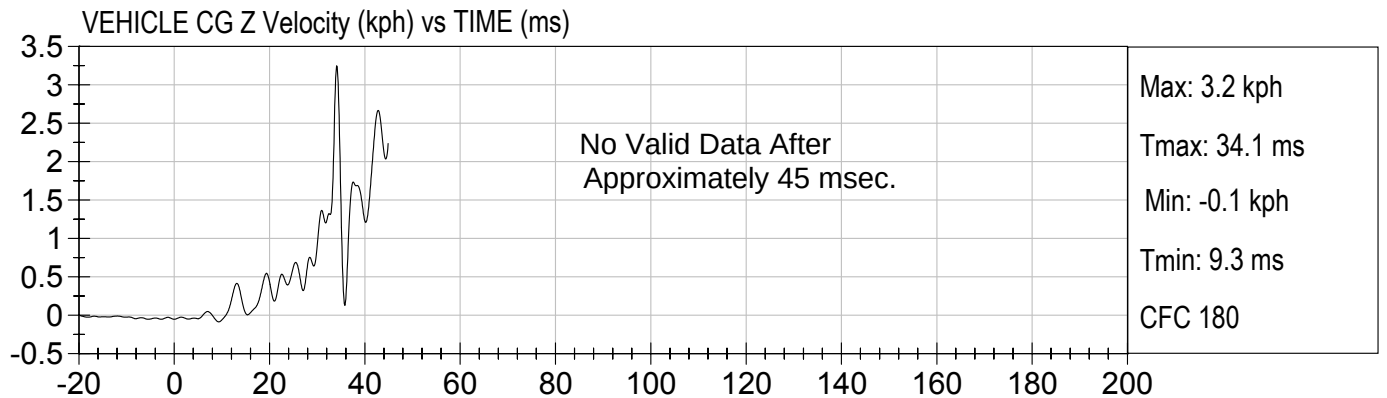
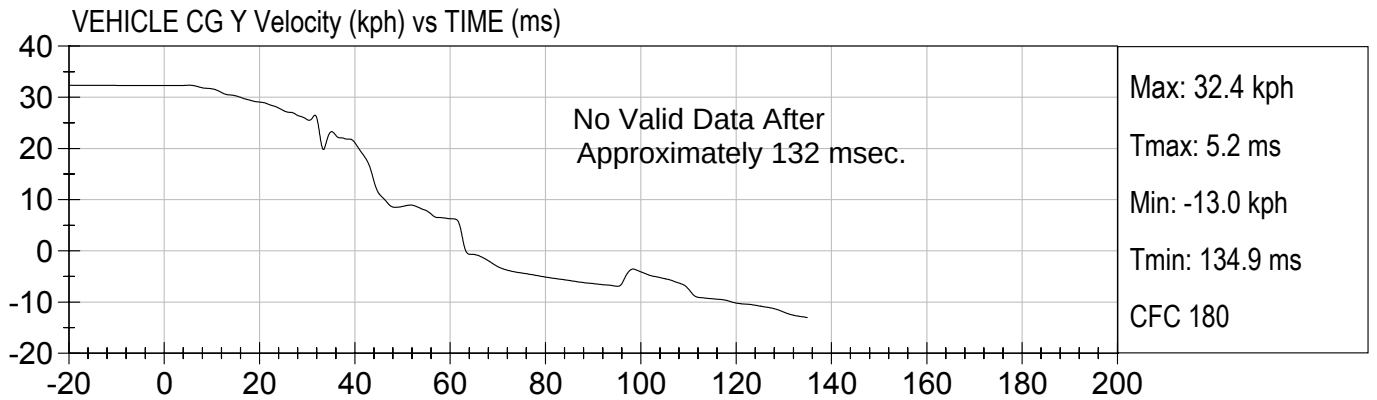
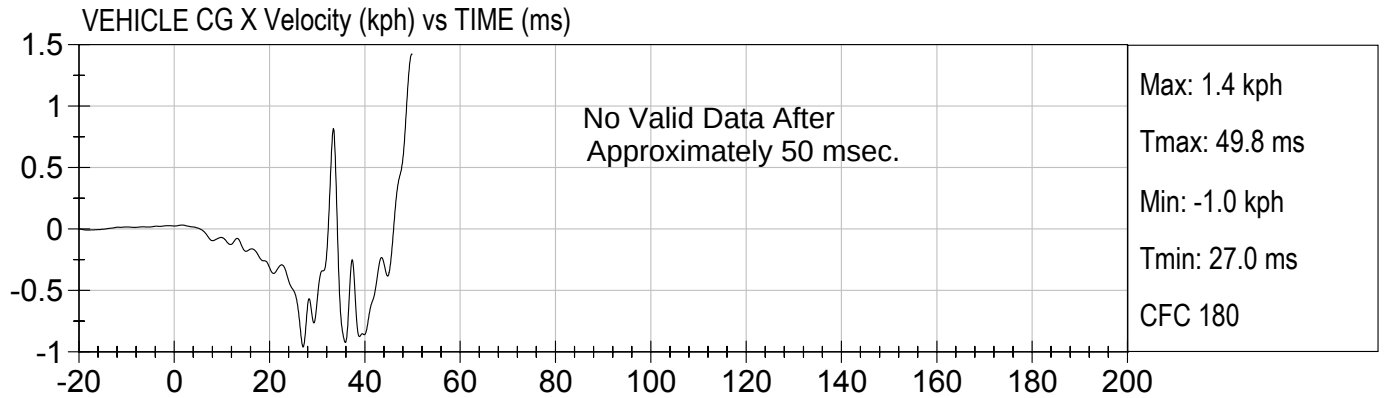




20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

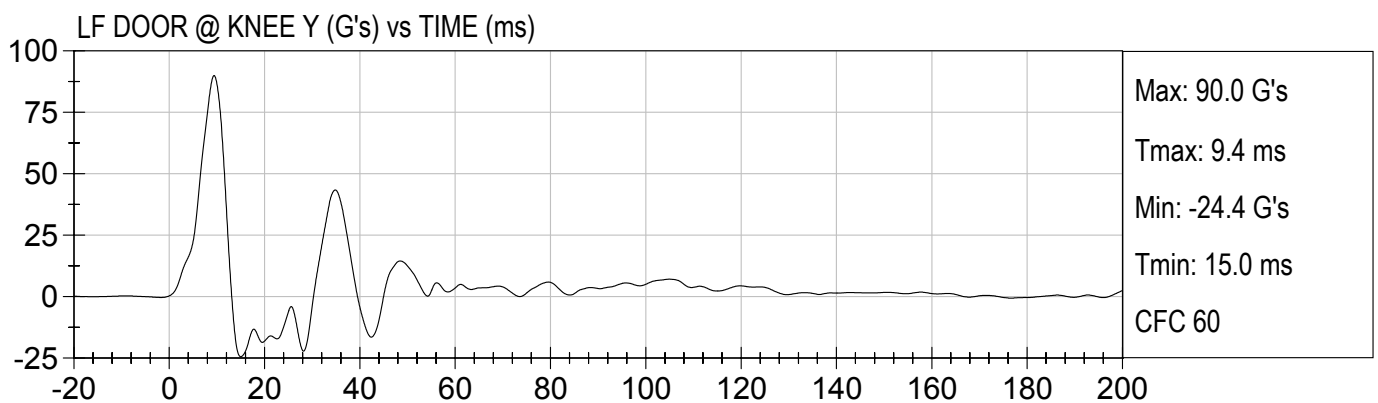
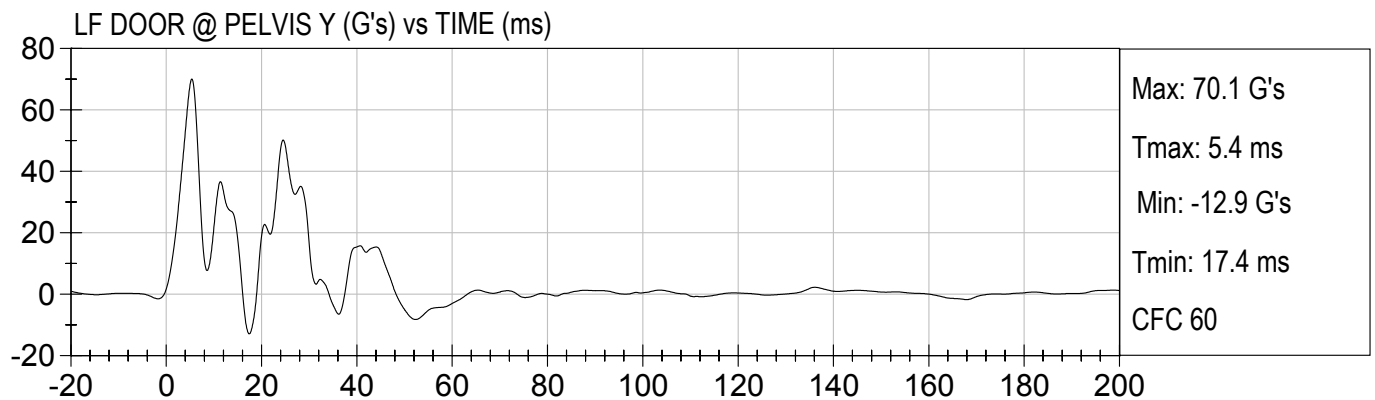
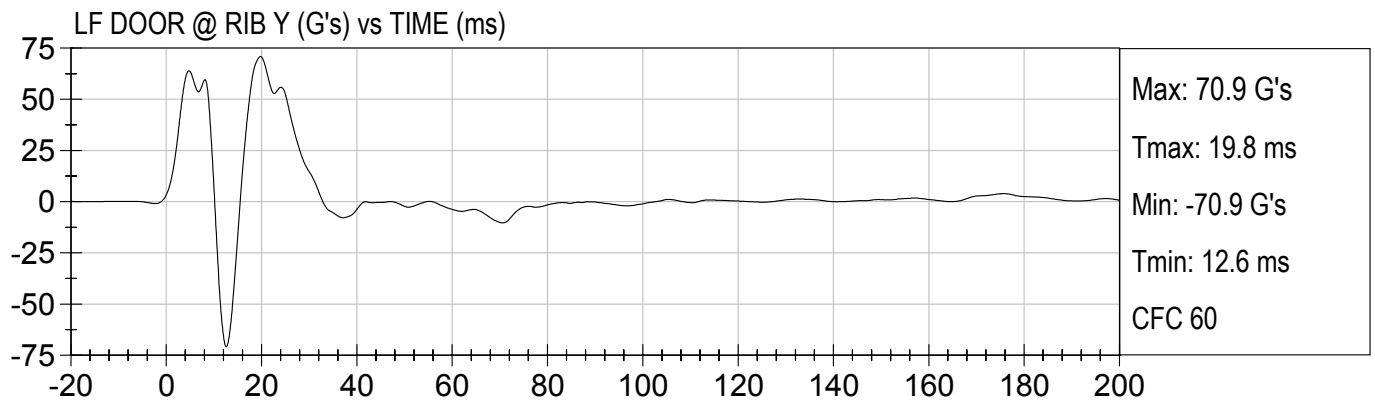
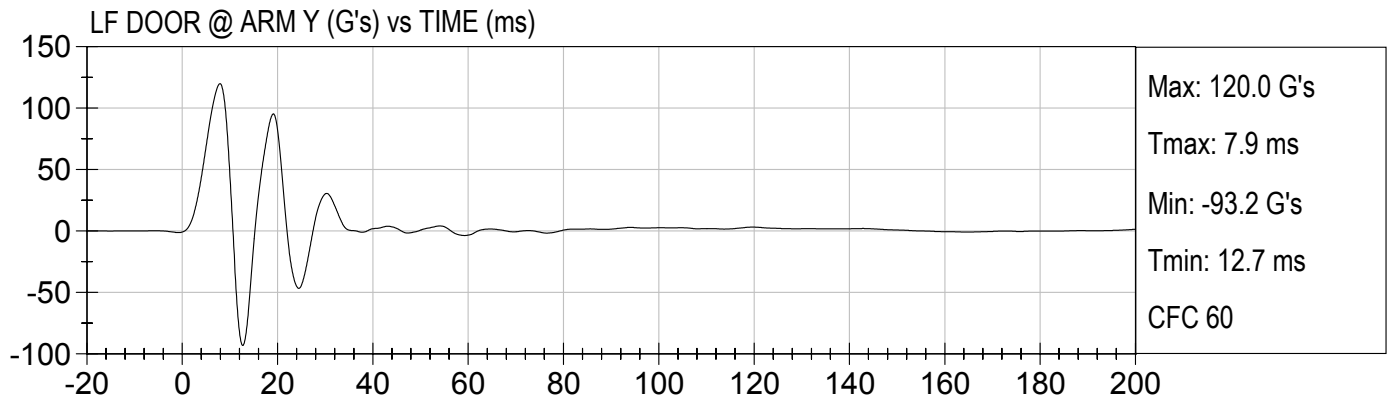






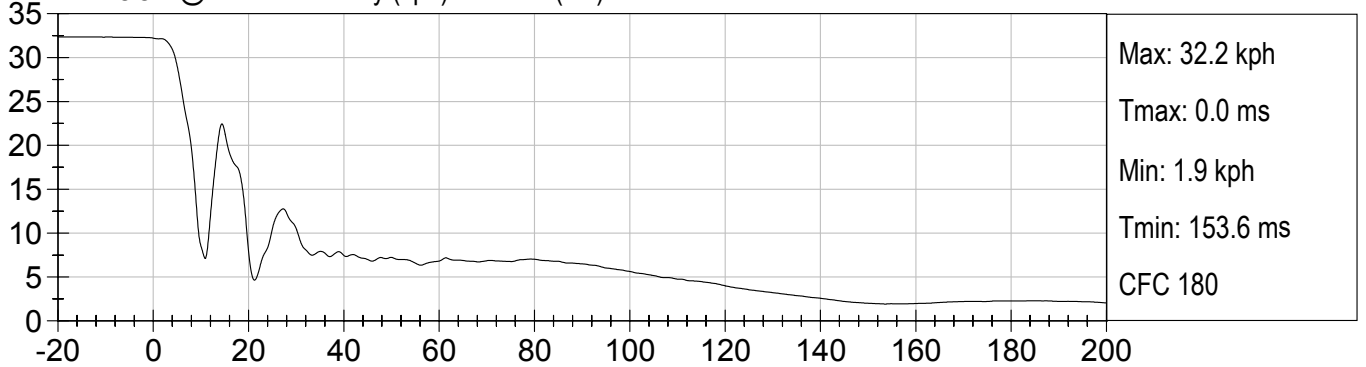
20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

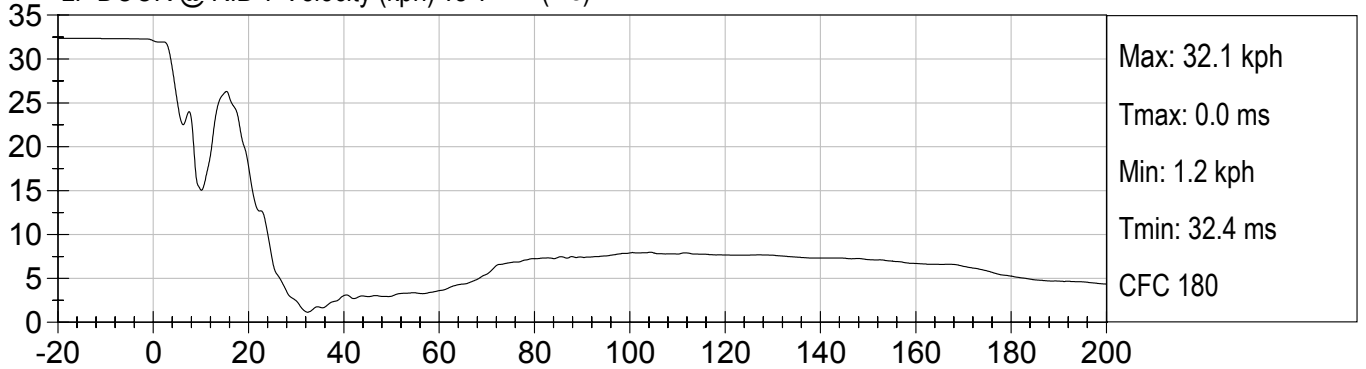




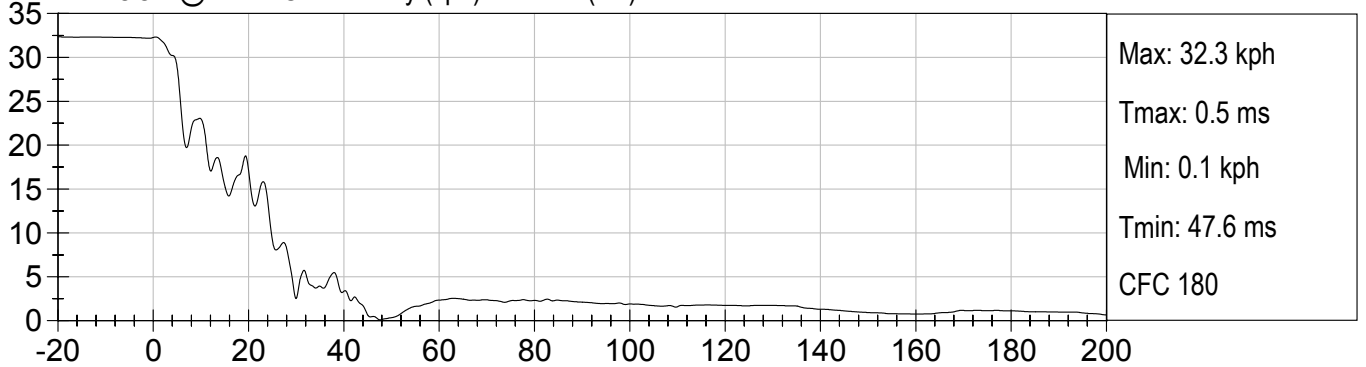
LF DOOR @ ARM Y Velocity (kph) vs TIME (ms)



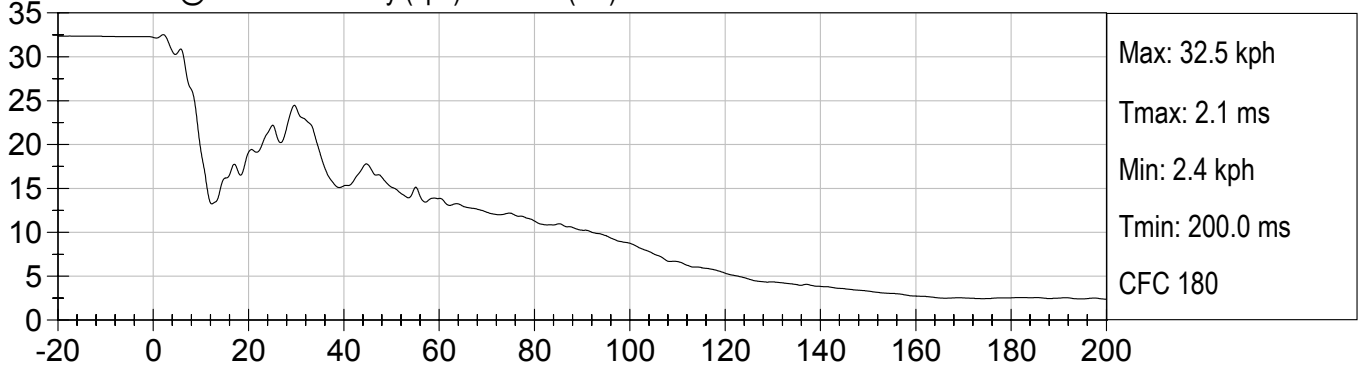
LF DOOR @ RIB Y Velocity (kph) vs TIME (ms)



LF DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)



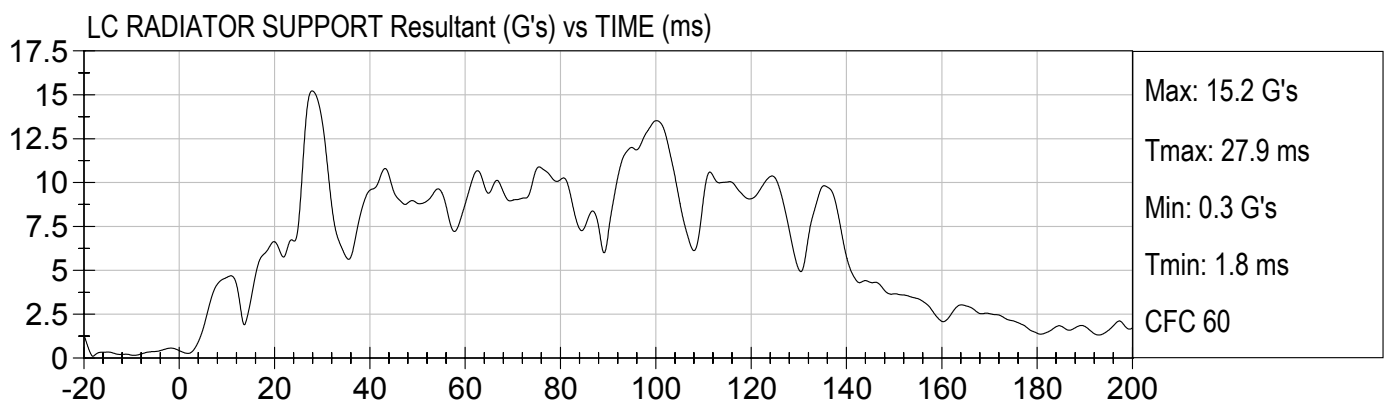
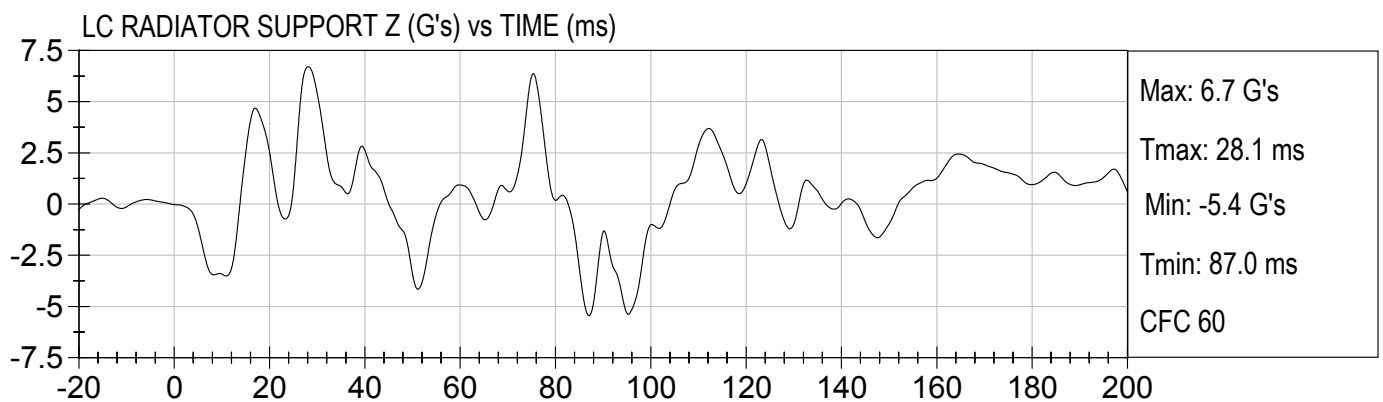
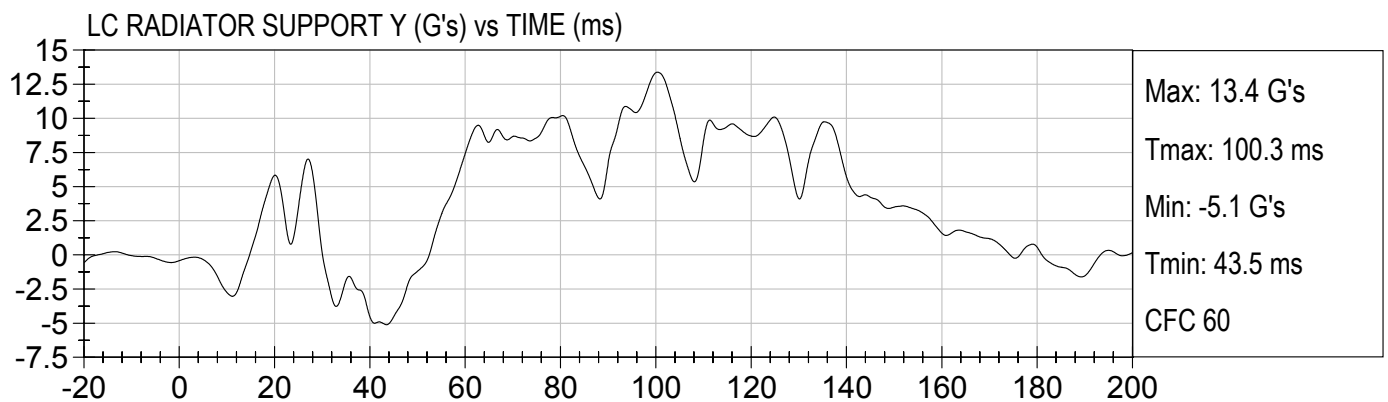
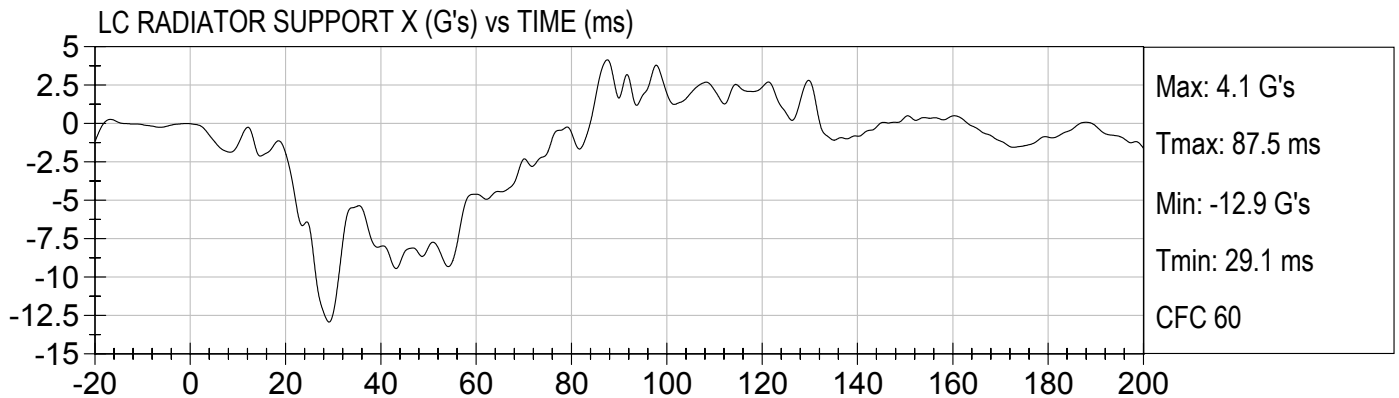
LF DOOR @ KNEE Y Velocity (kph) vs TIME (ms)

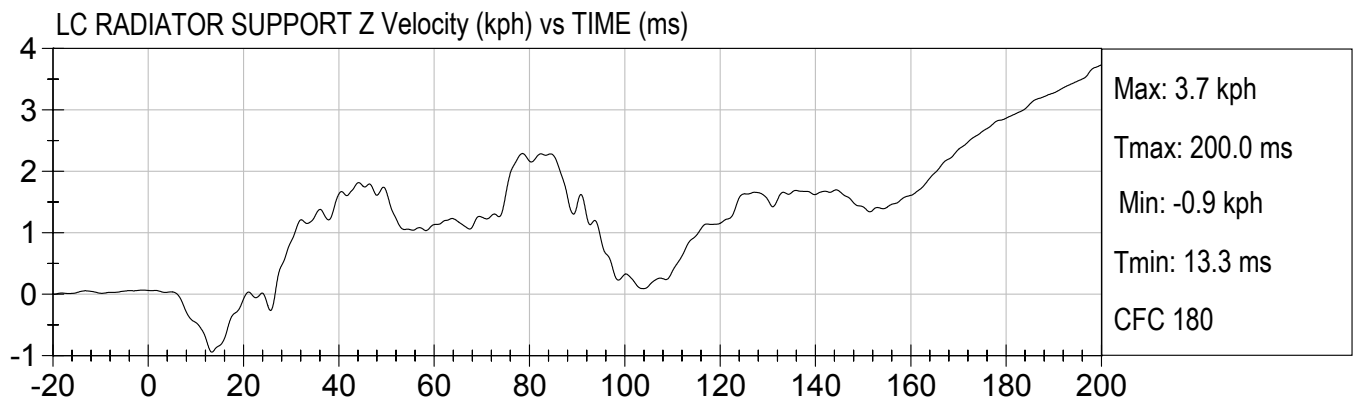
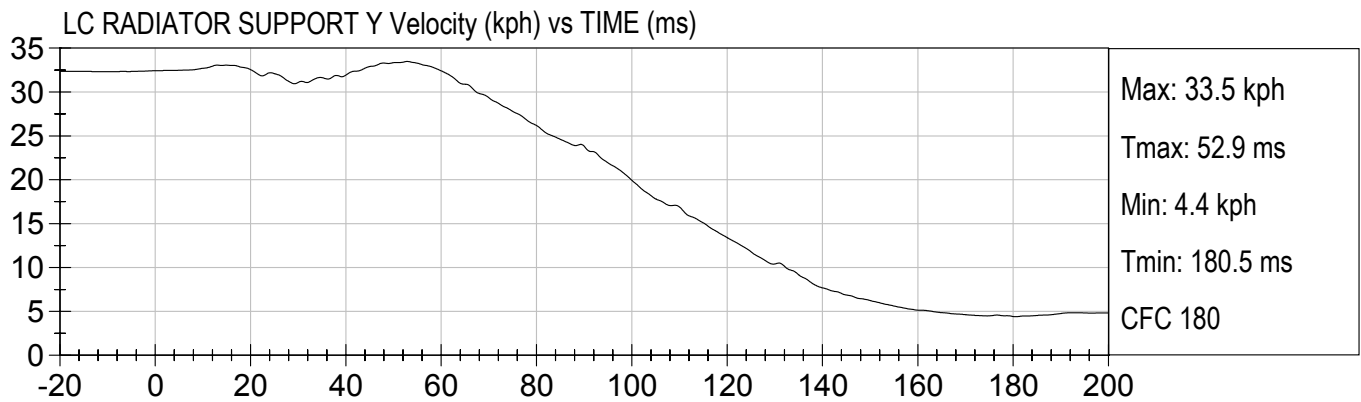
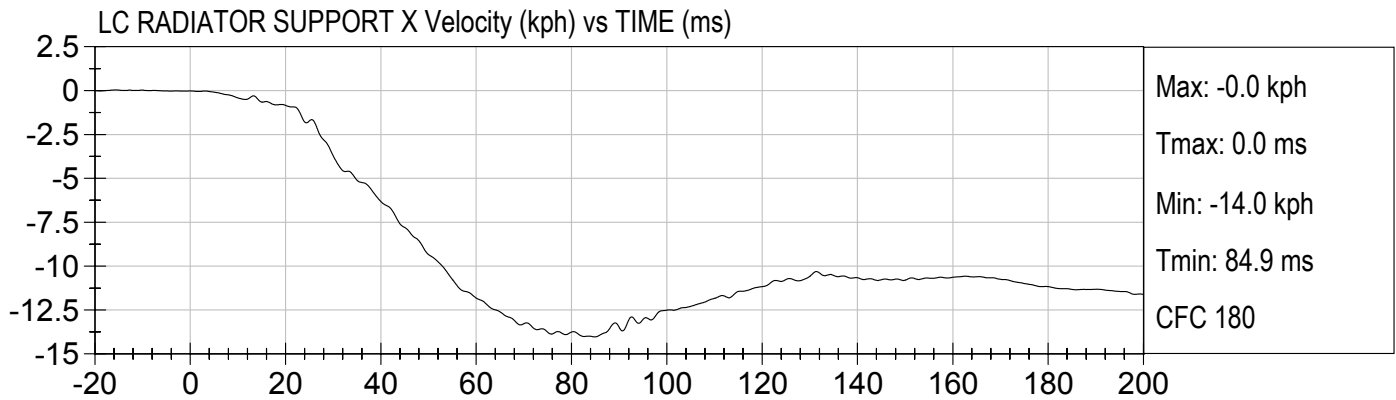




20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

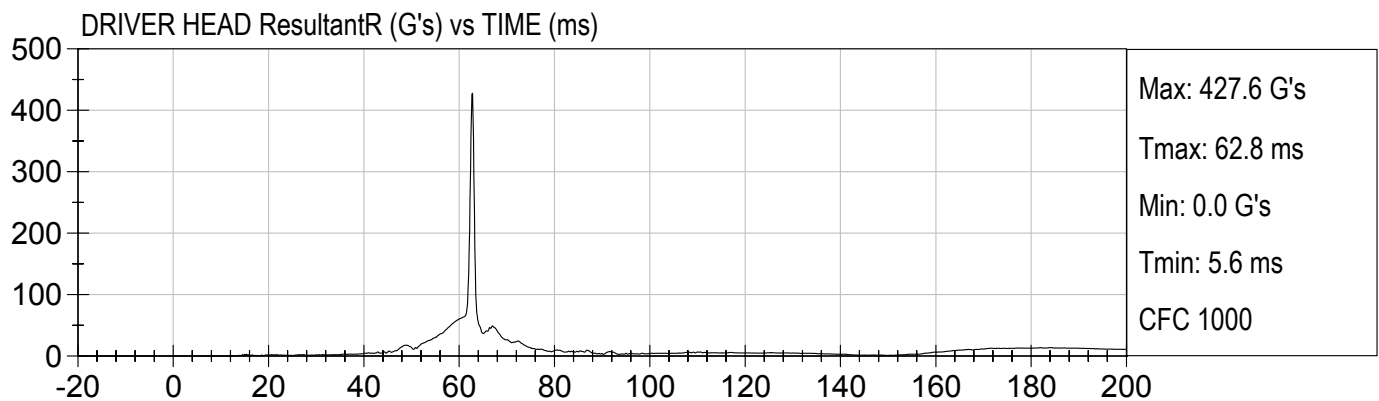
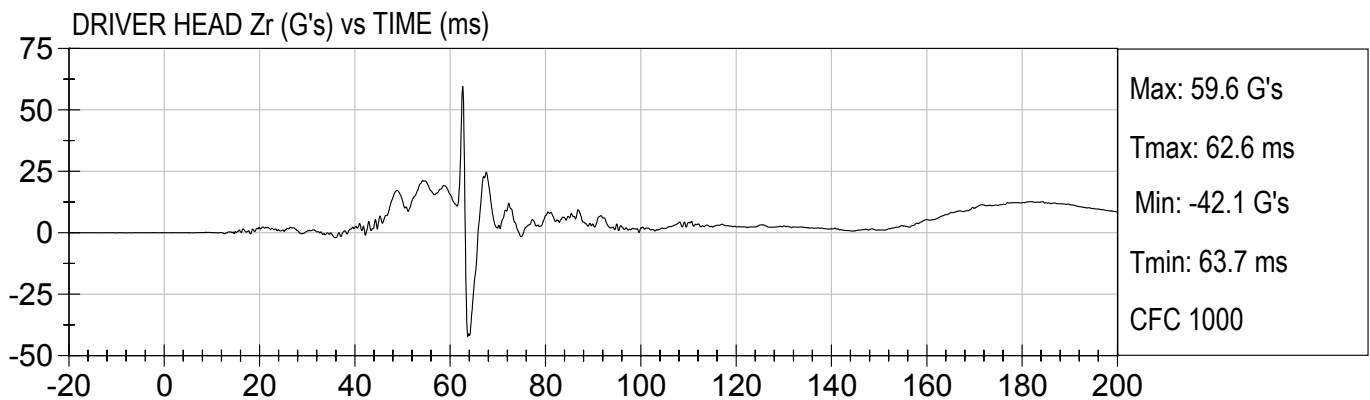
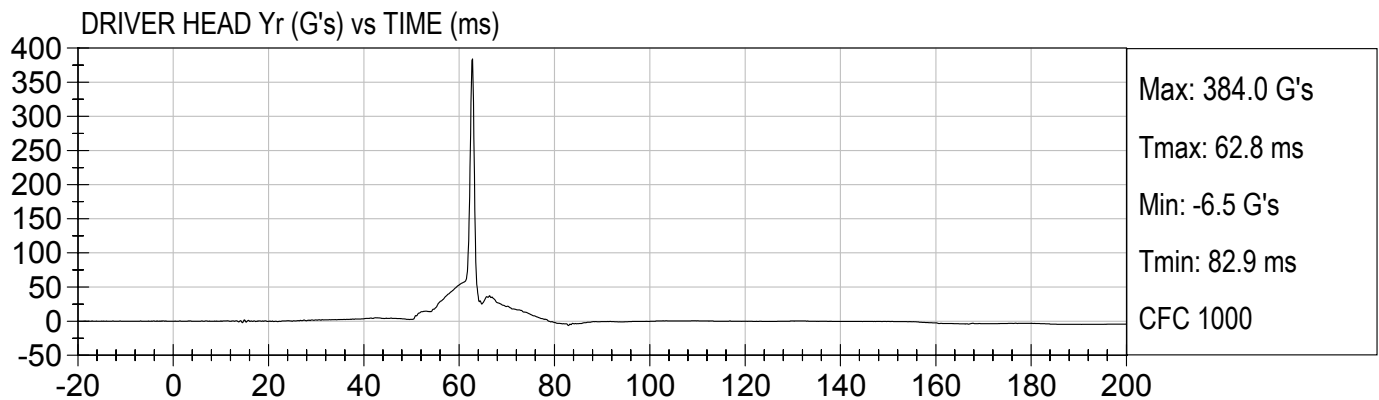
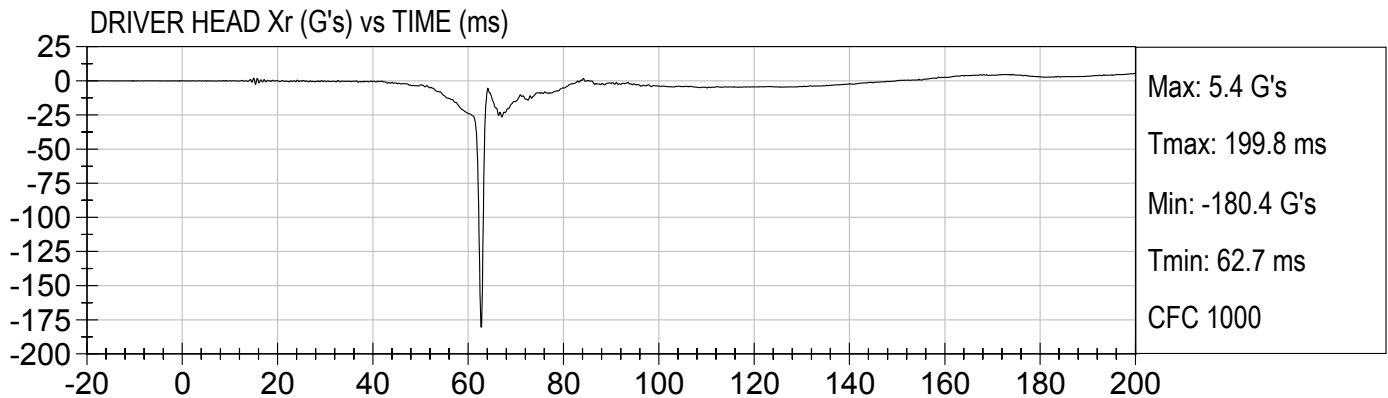


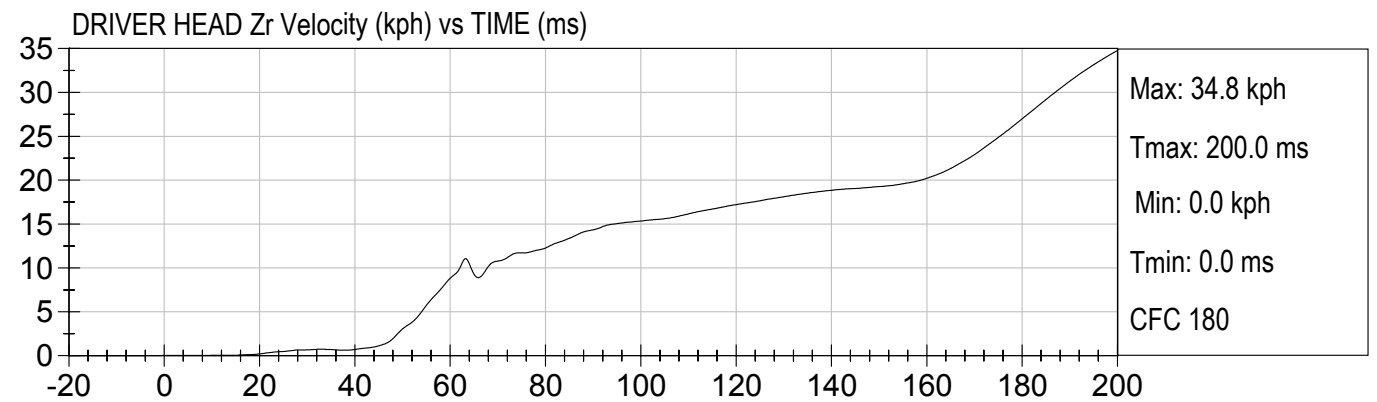
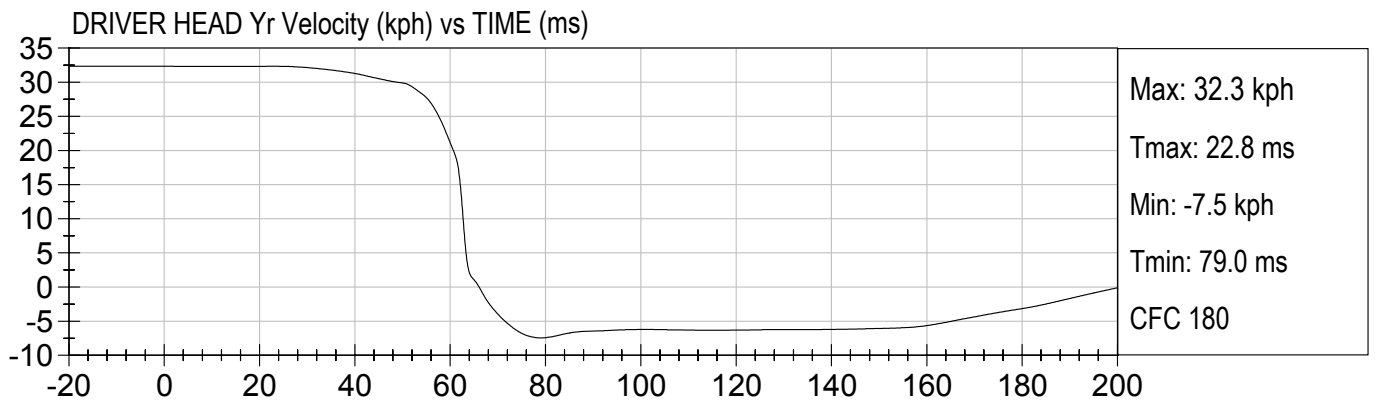
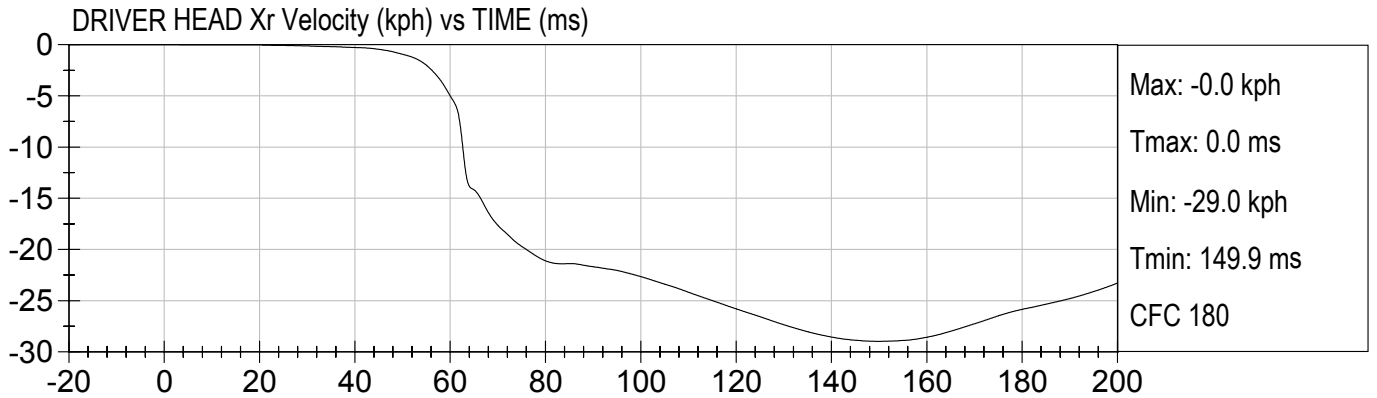




20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

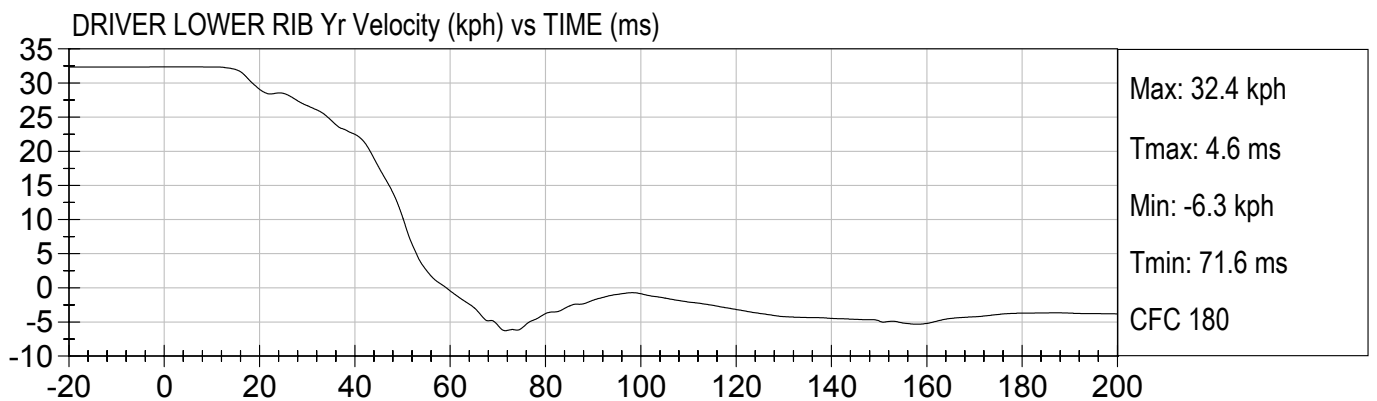
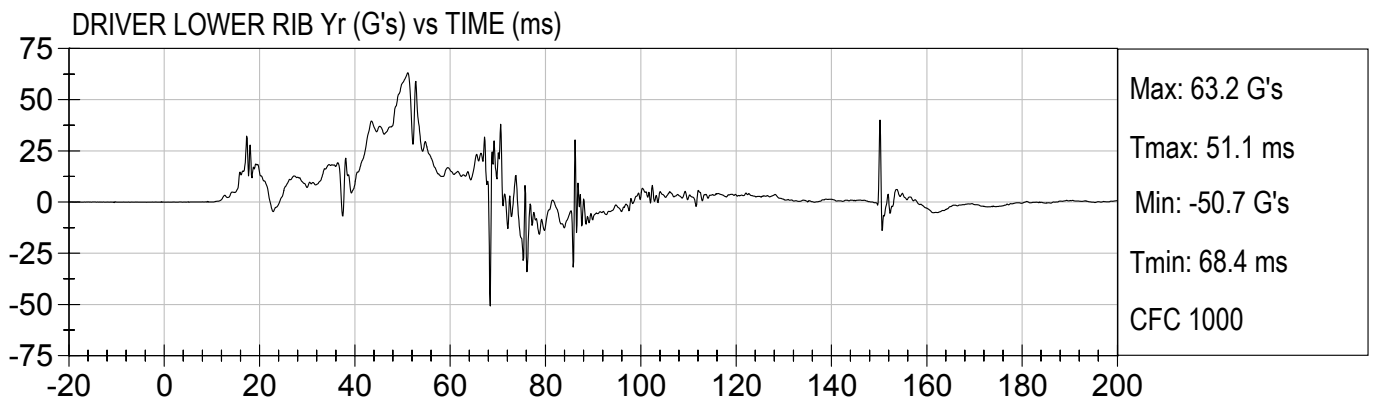
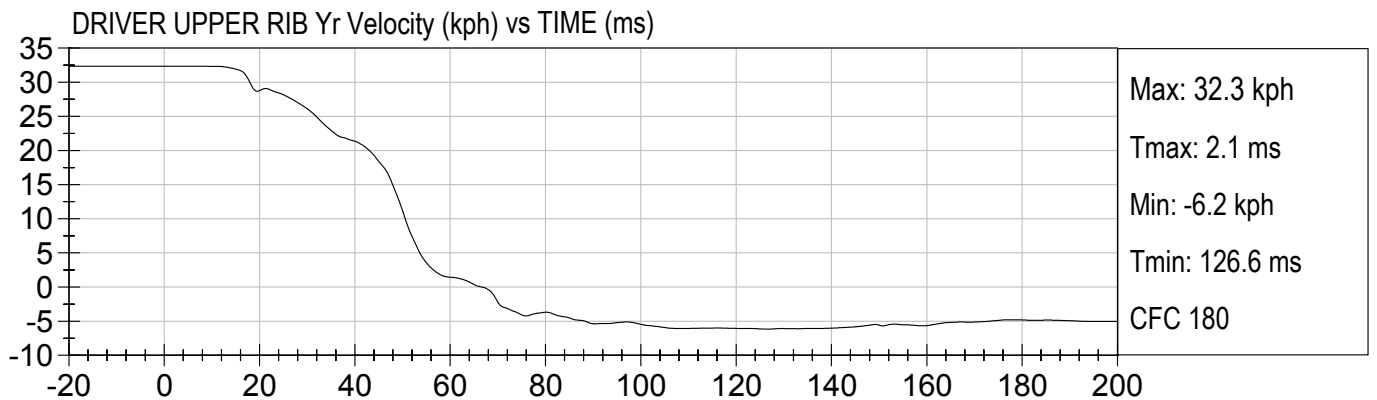
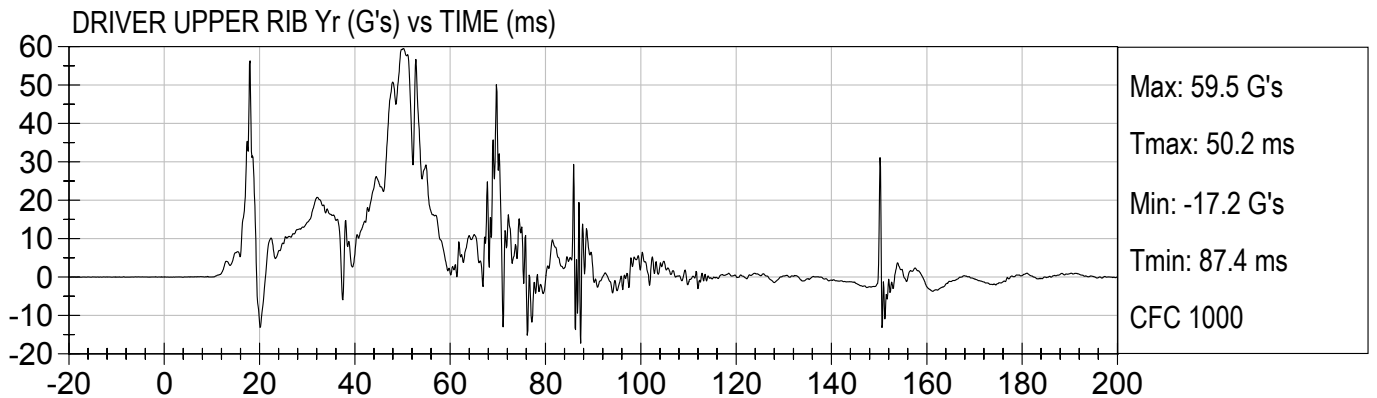






20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

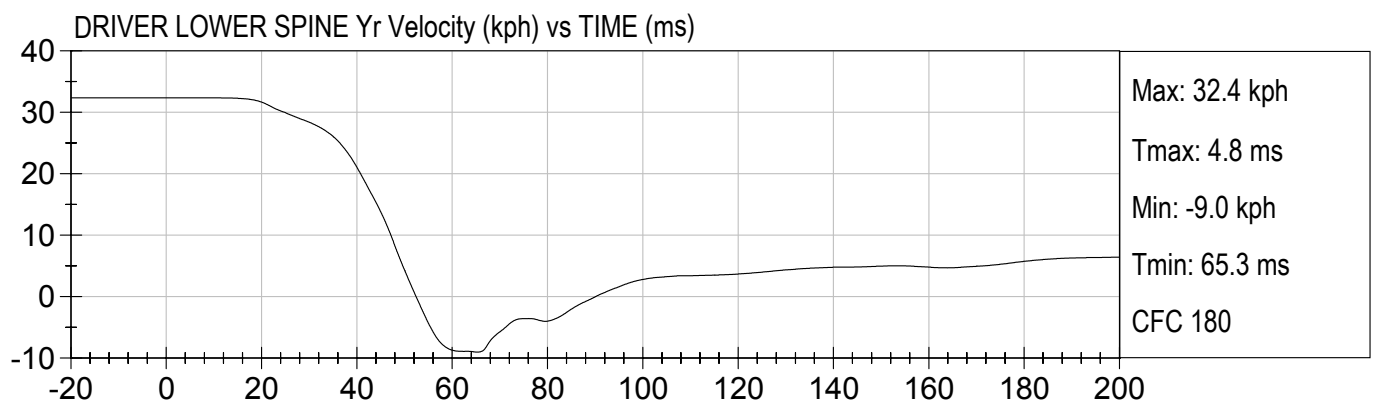
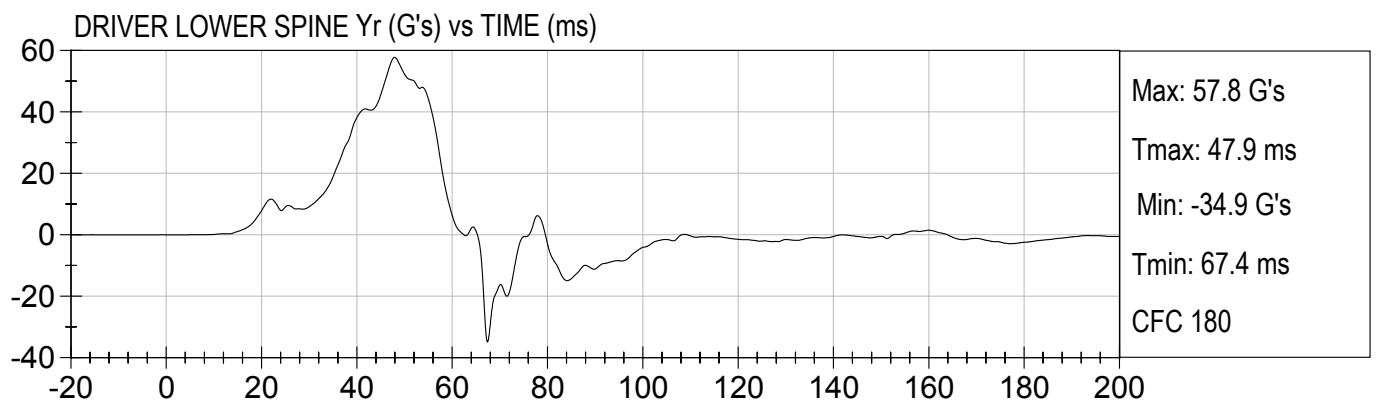
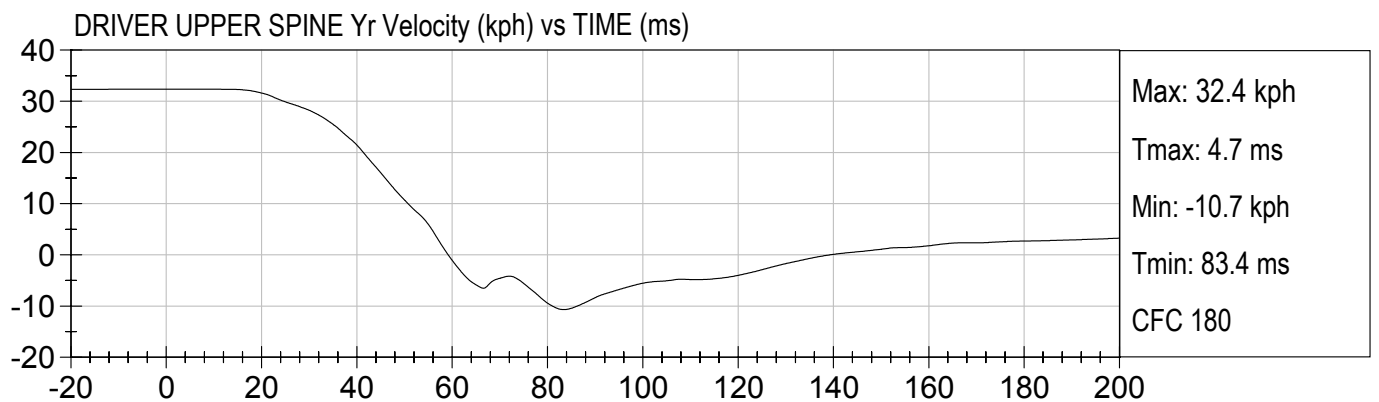
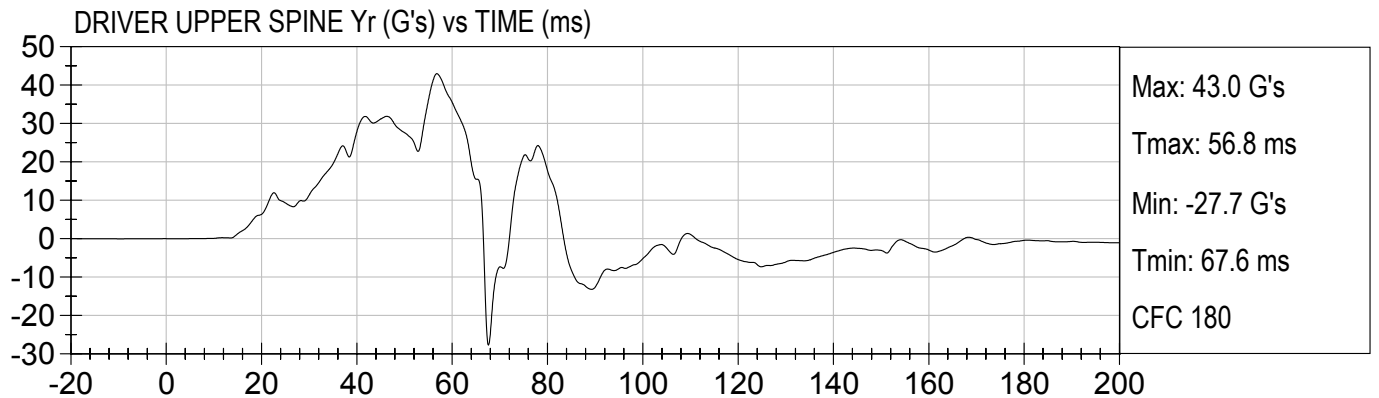
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

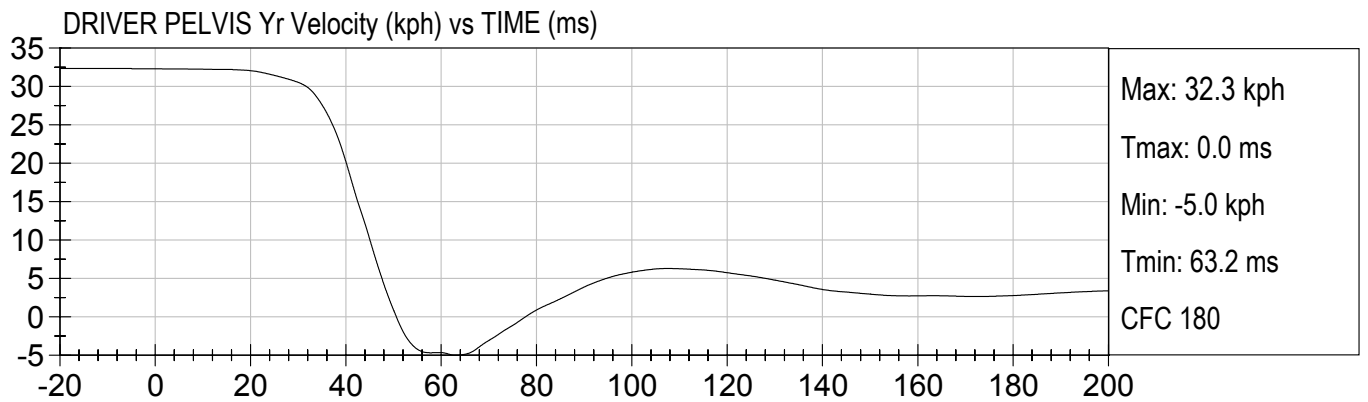
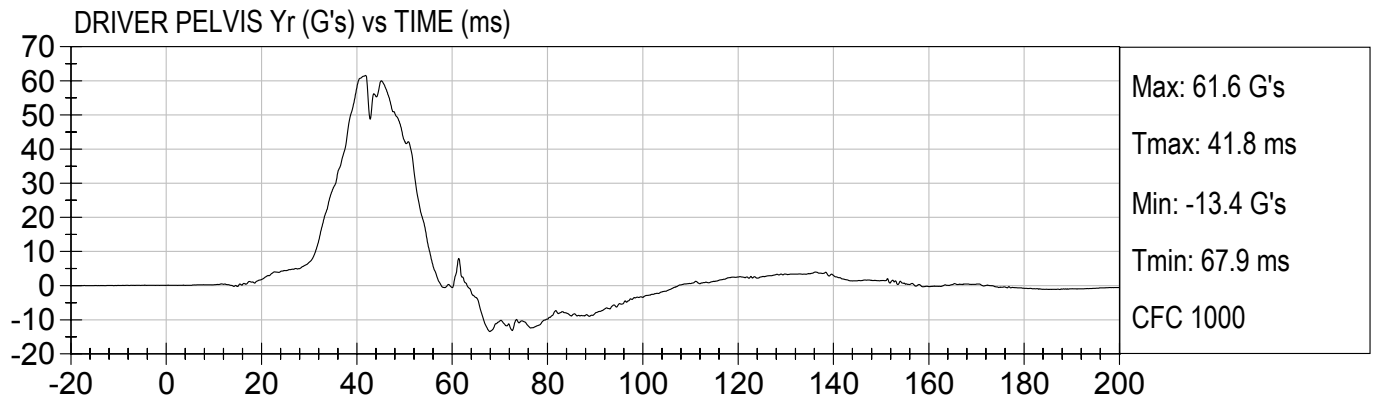
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

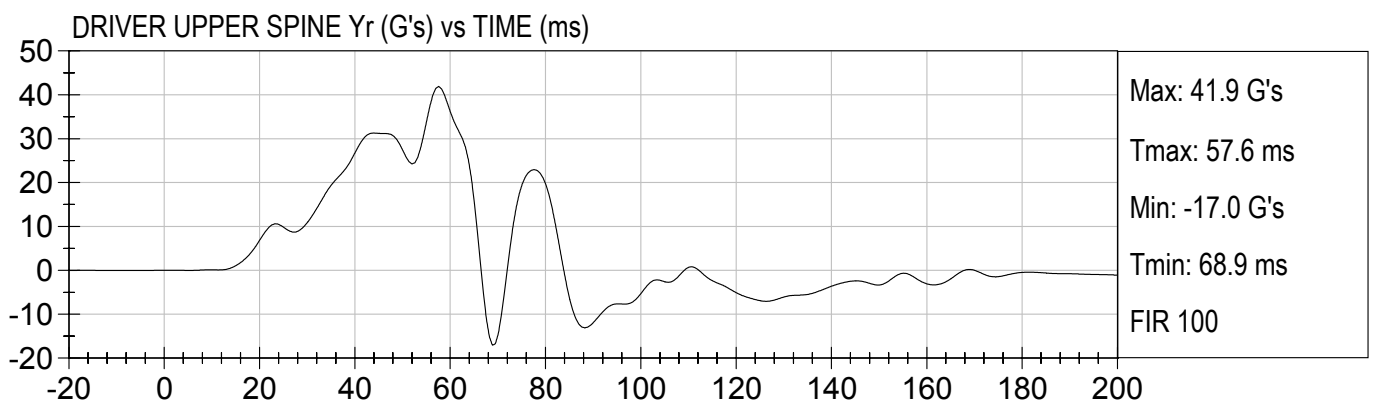
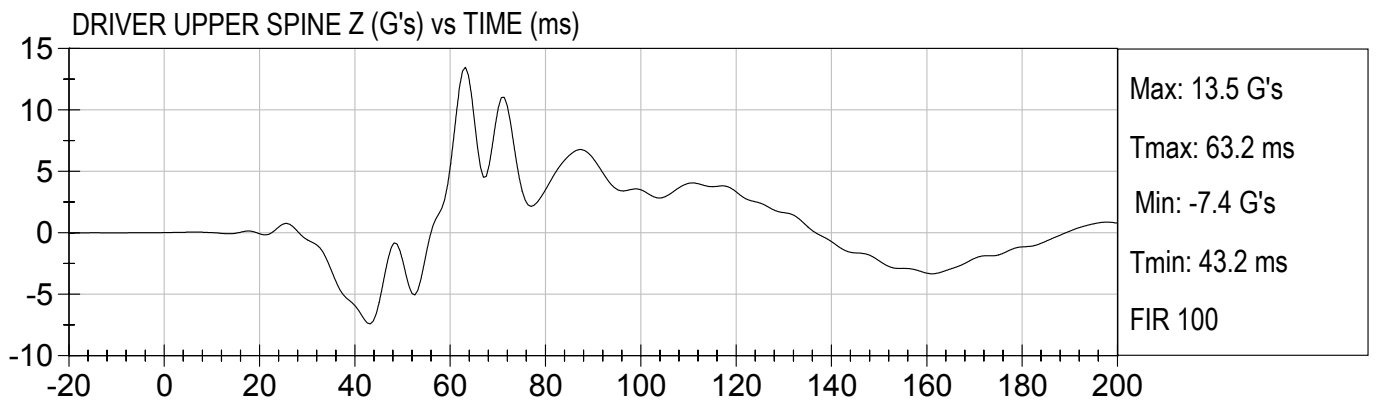
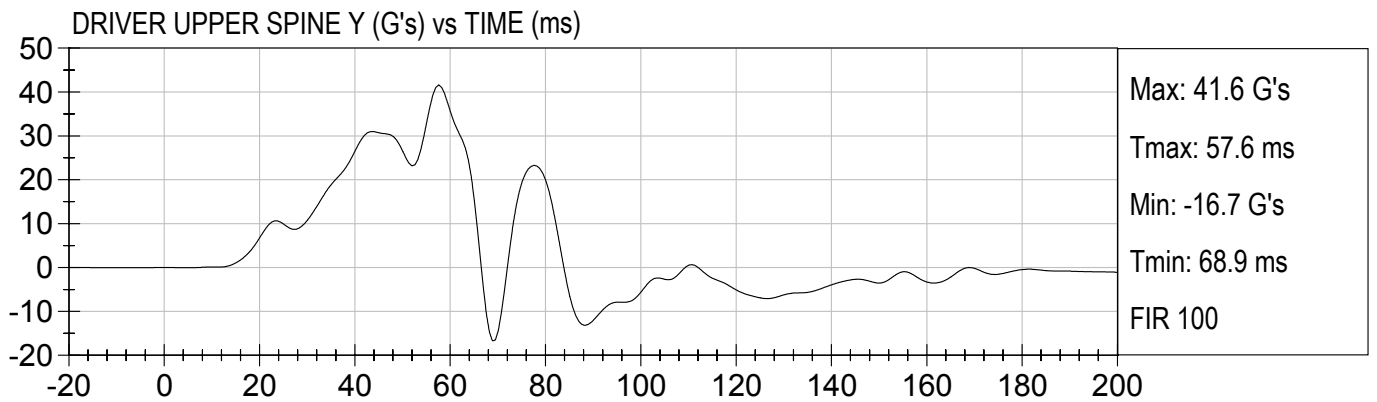
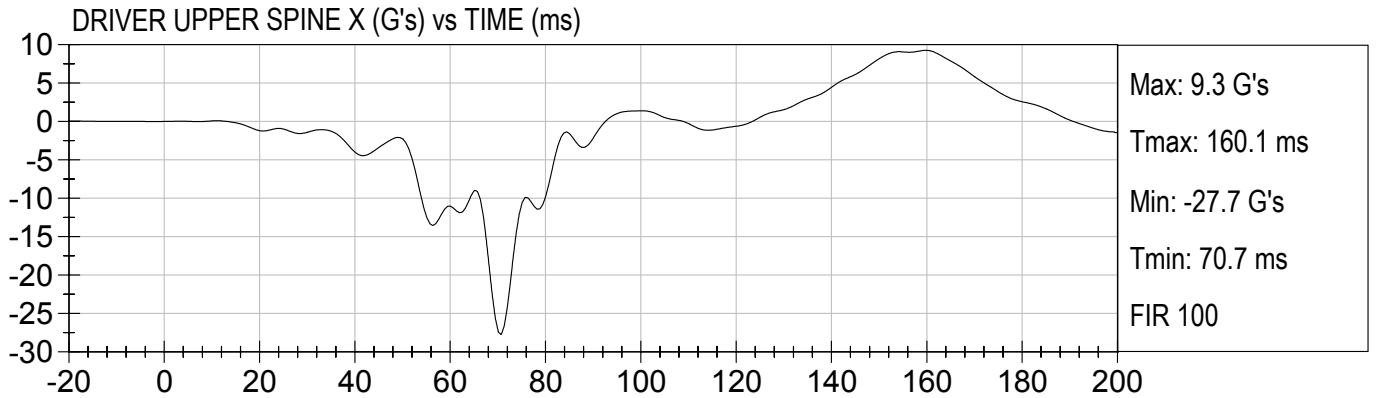




20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)

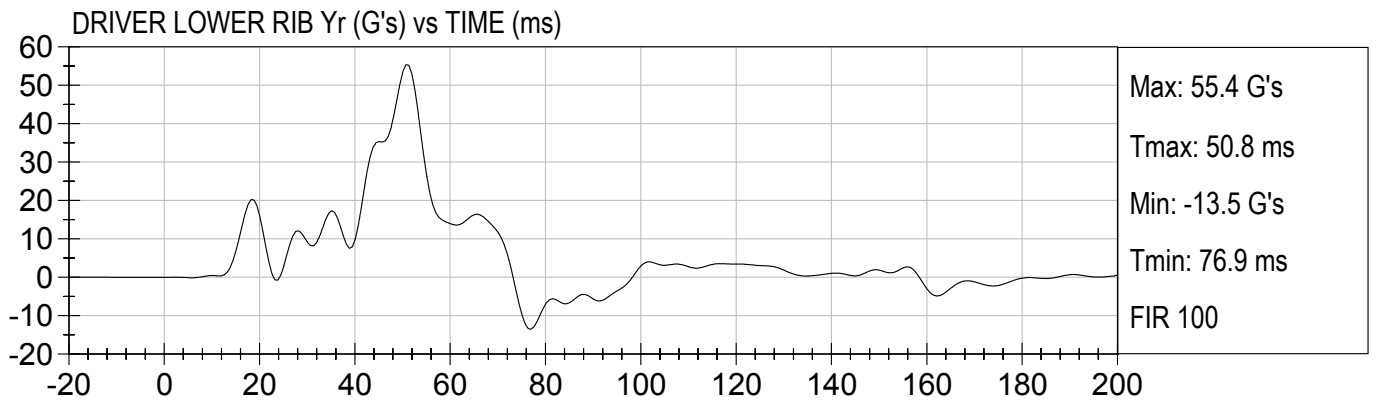
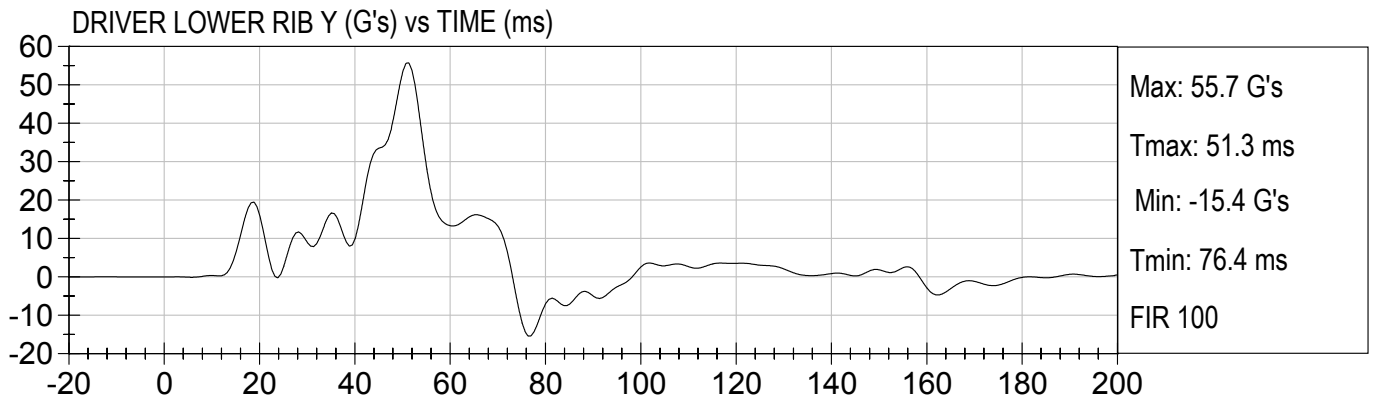
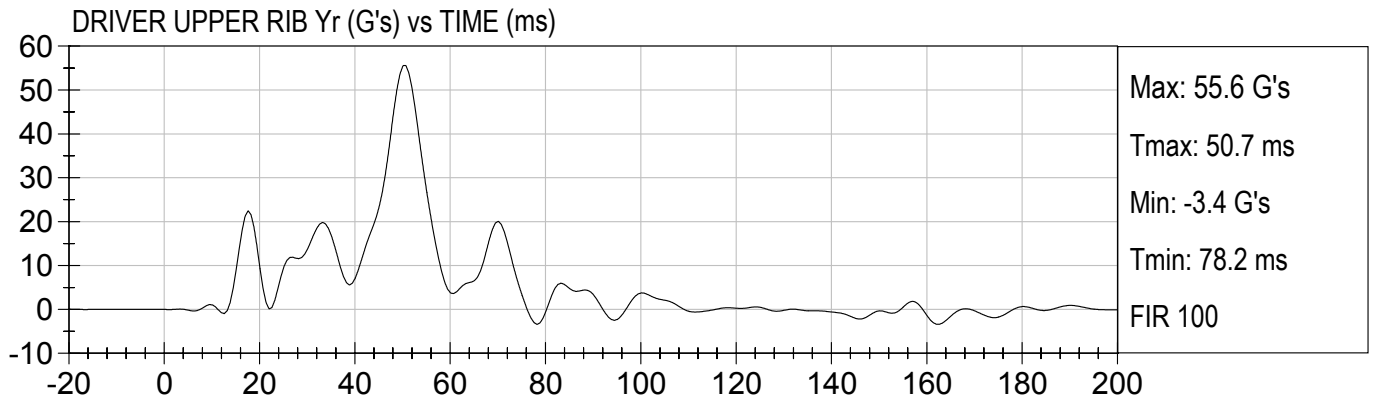
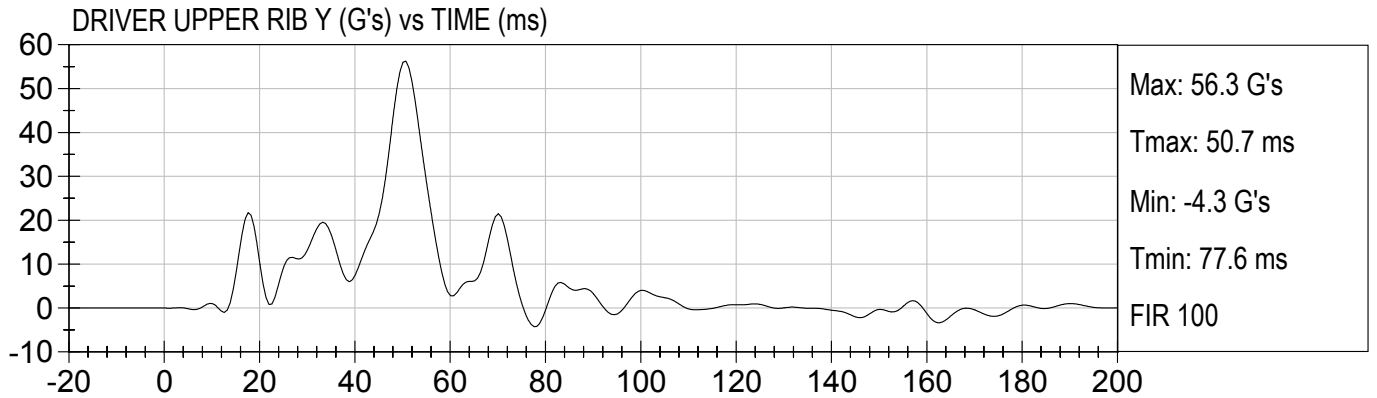






20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

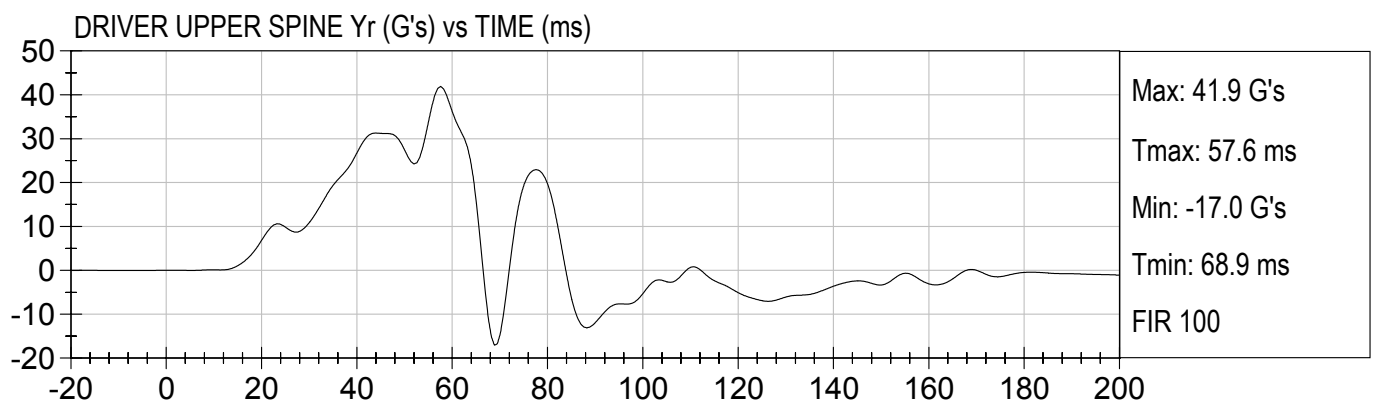
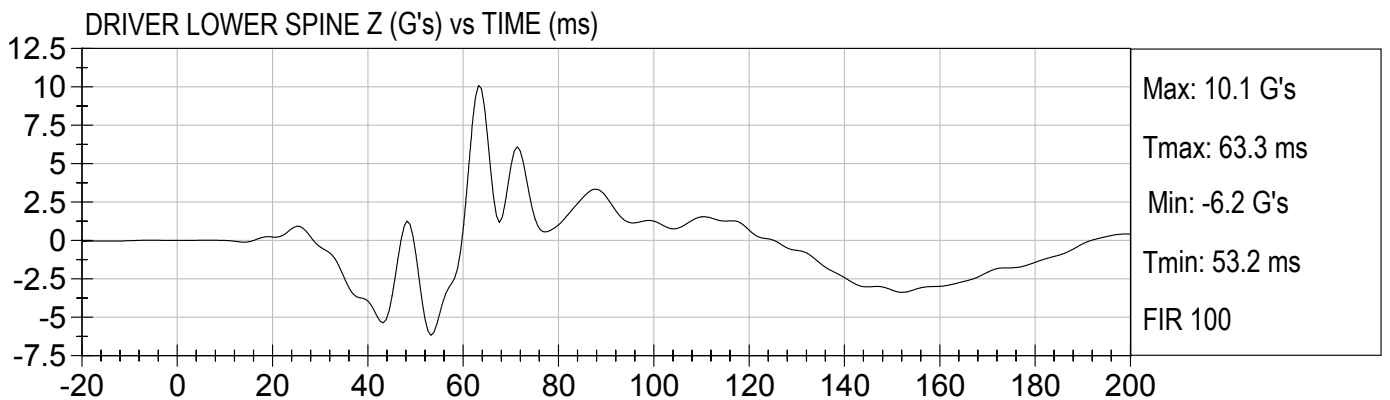
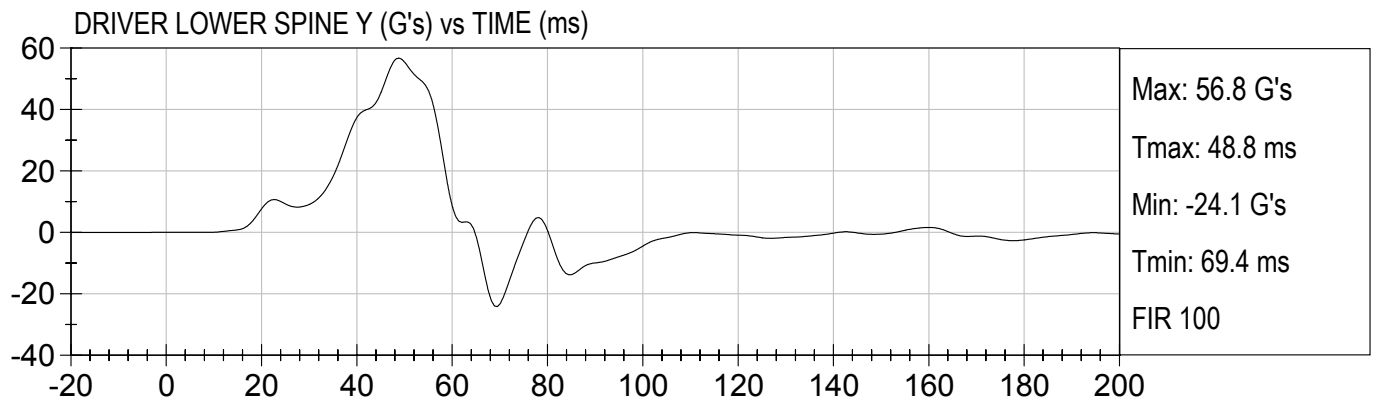
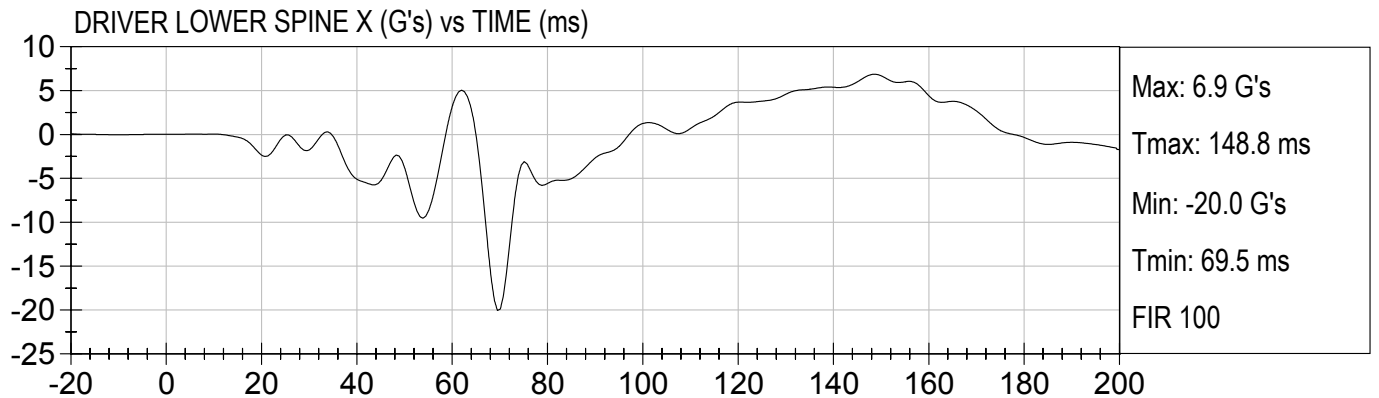
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

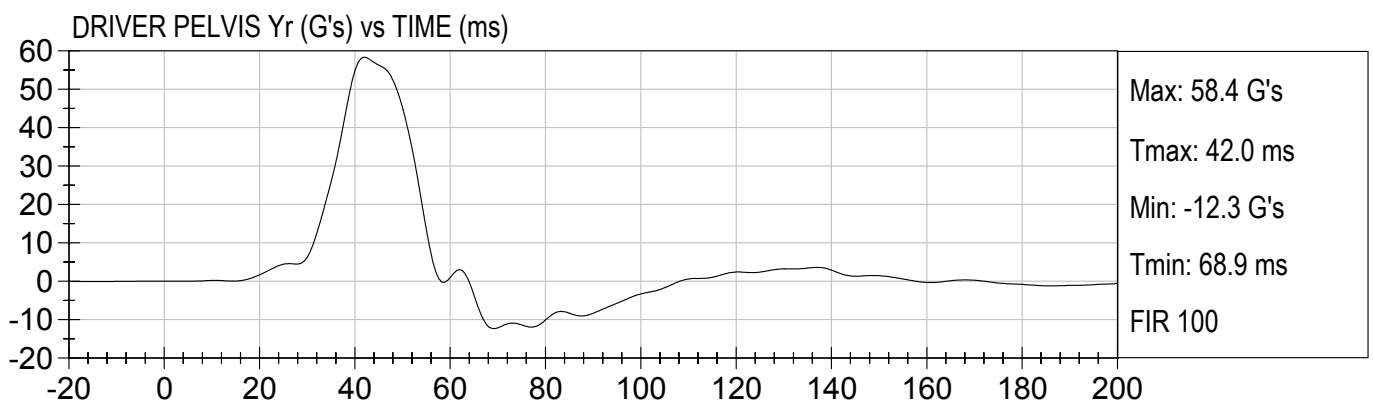
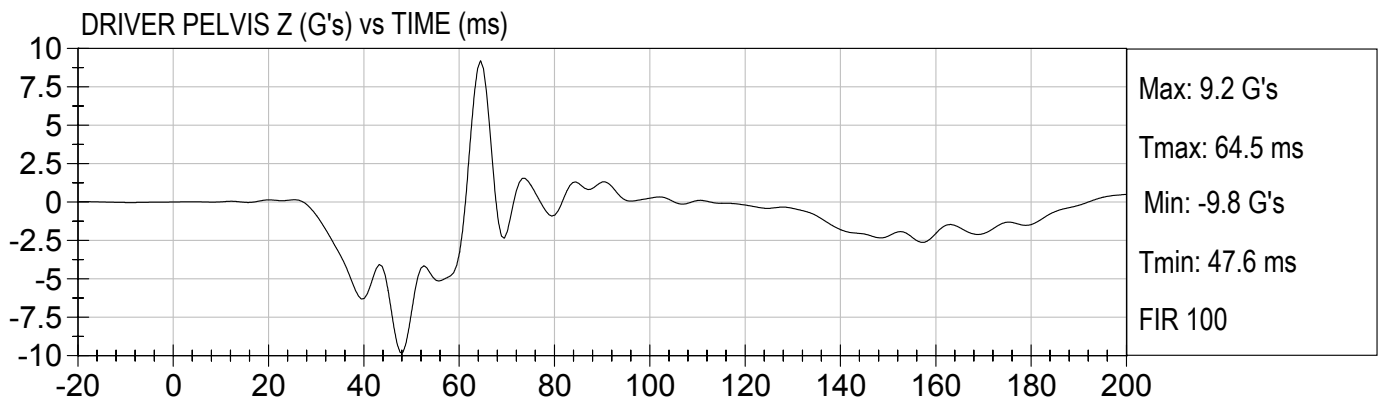
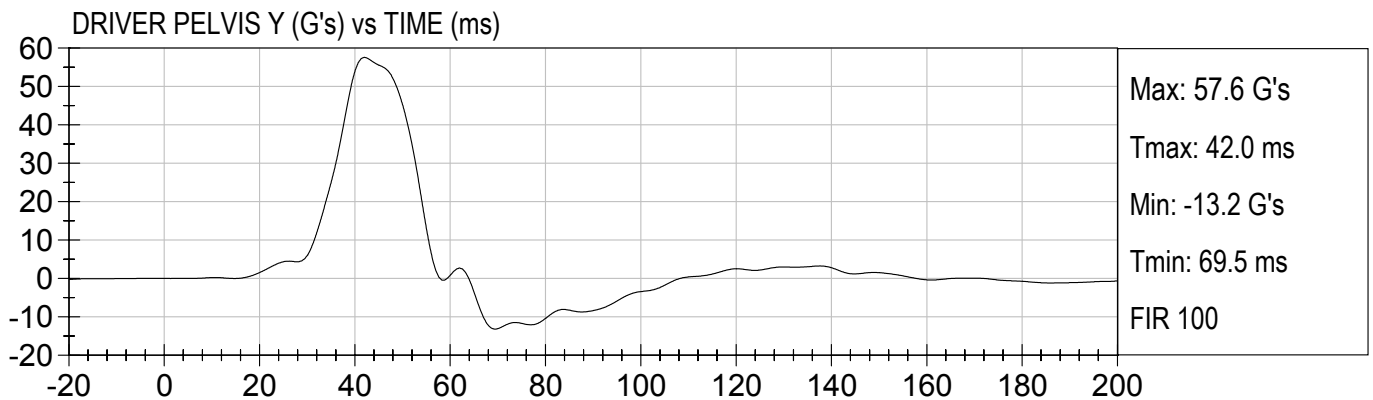
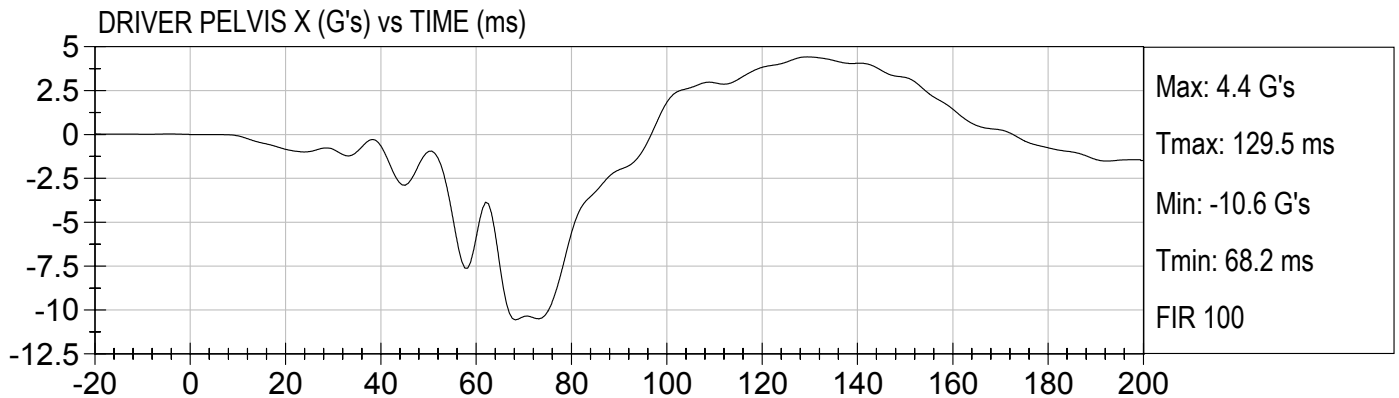
Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)





20 MPH SIDE POLE
1999 VOLVO S80 W/AIRBAG

Test Date: 8/21/2002
Speed: 20.1 mph (32.3 km/h)



APPENDIX C

SID-HIII CONFIGURATION AND PERFORMANCE VERIFICATION DATA

SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 295

Test I.D: D021061

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Peak Resultant Acceleration	G's	120 to 150	145	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-6	Pass
Overall Test Results				Pass

Laboratory Technician

08/15/2002
Test Date

Approved By



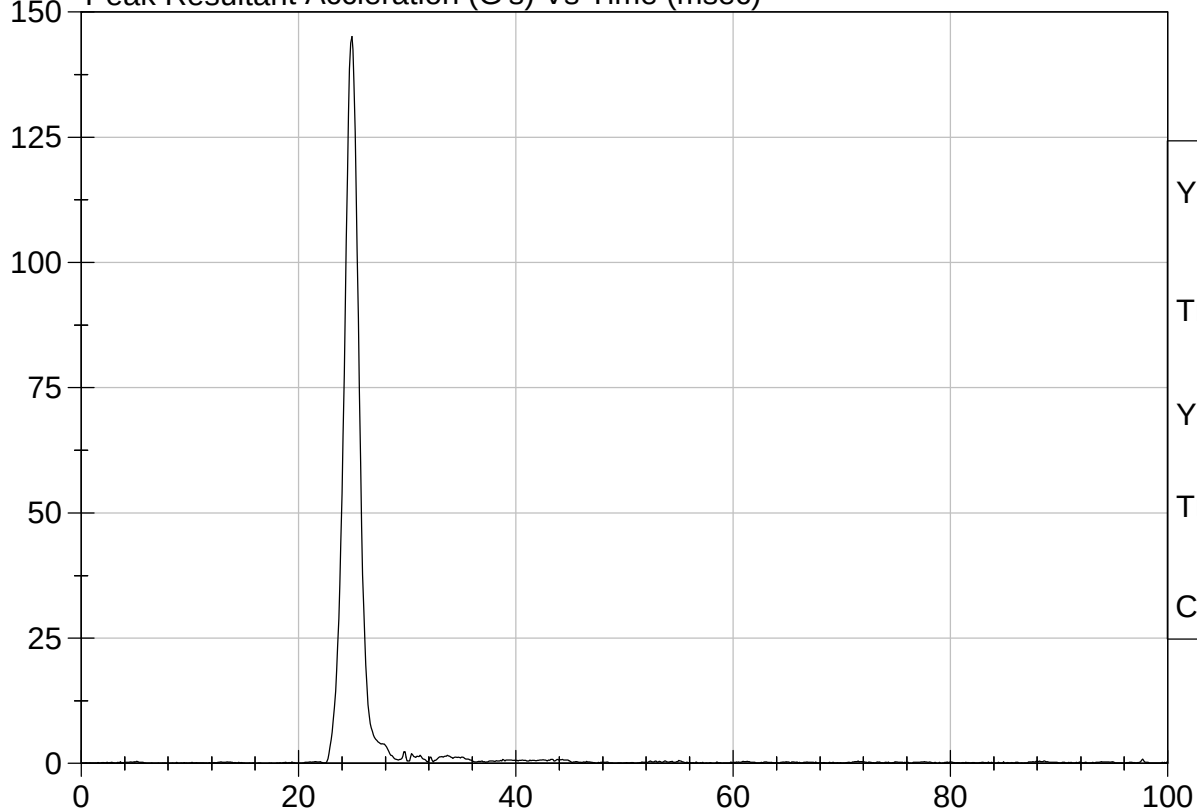
Test Description: Head Drop

Test Date: 08/15/2002

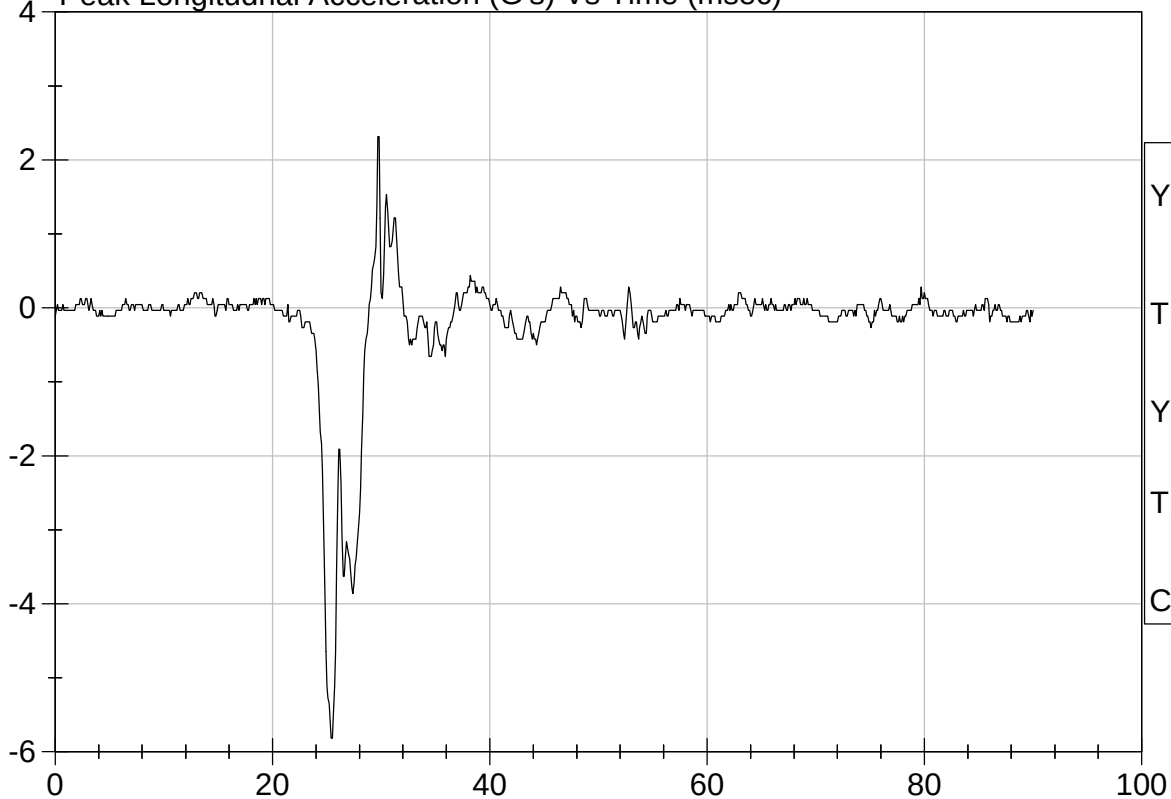
Component: D021061

Speed: 0 ft/s, 0.00 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



Peak Longitudnal Acceleration (G's) Vs Time (msec)



SID Calibration Data Sheet
Side Impact Dummy (SID)
Neck Pendulum Test

ATD Serial No: 295

Test I.D: D021069

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	55	Pass
Impact Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.32	Pass
	20 msec	m/s	4.12 to 5.10	4.53	Pass
	30 msec	m/s	5.73 to 7.01	6.26	Pass
	40 to 70 msec	m/s	6.27 to 7.64	7.04	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	69	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	62	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	76	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	53	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	8	Pass

Laboratory Technician

08/15/2002

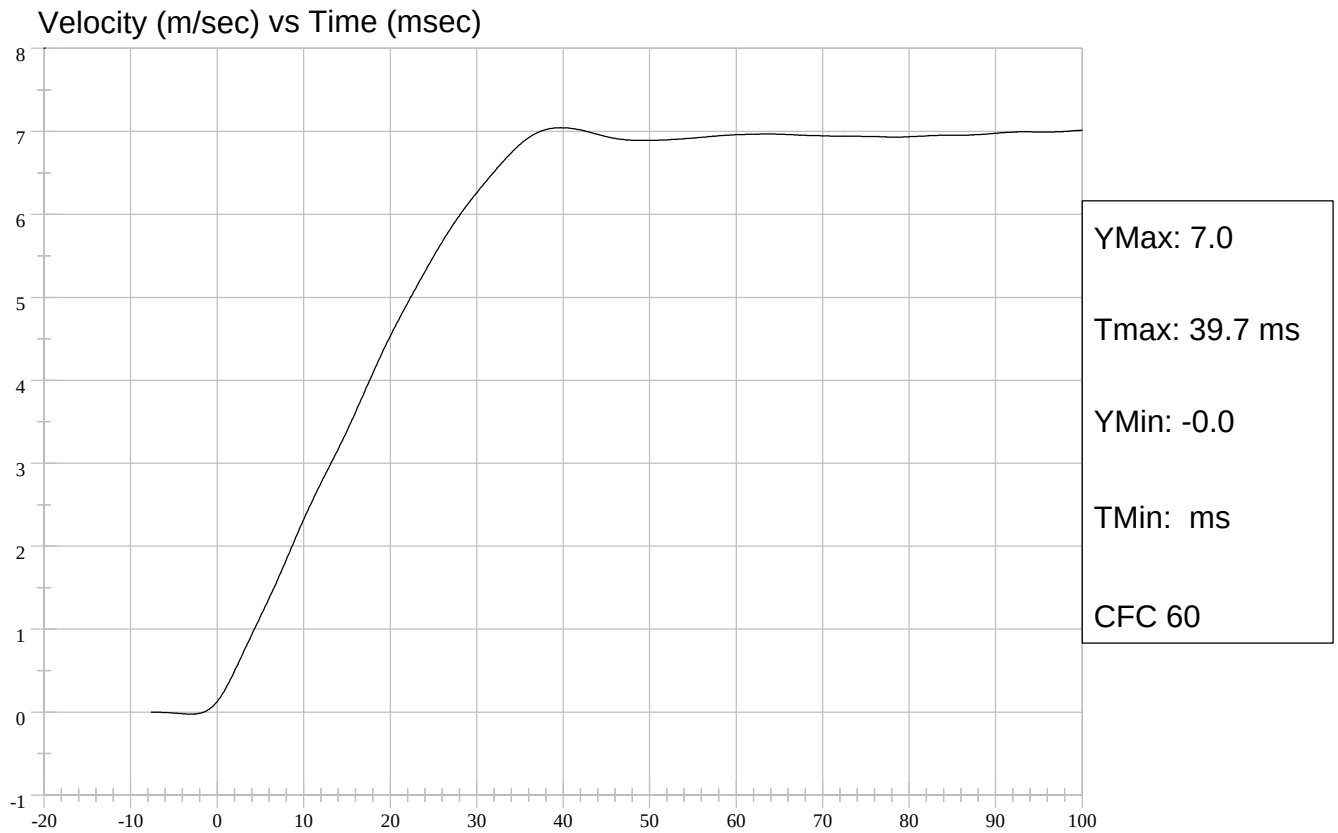
Test Date

Approved By



Test Desc: Neck Bending
Component ID: D021069

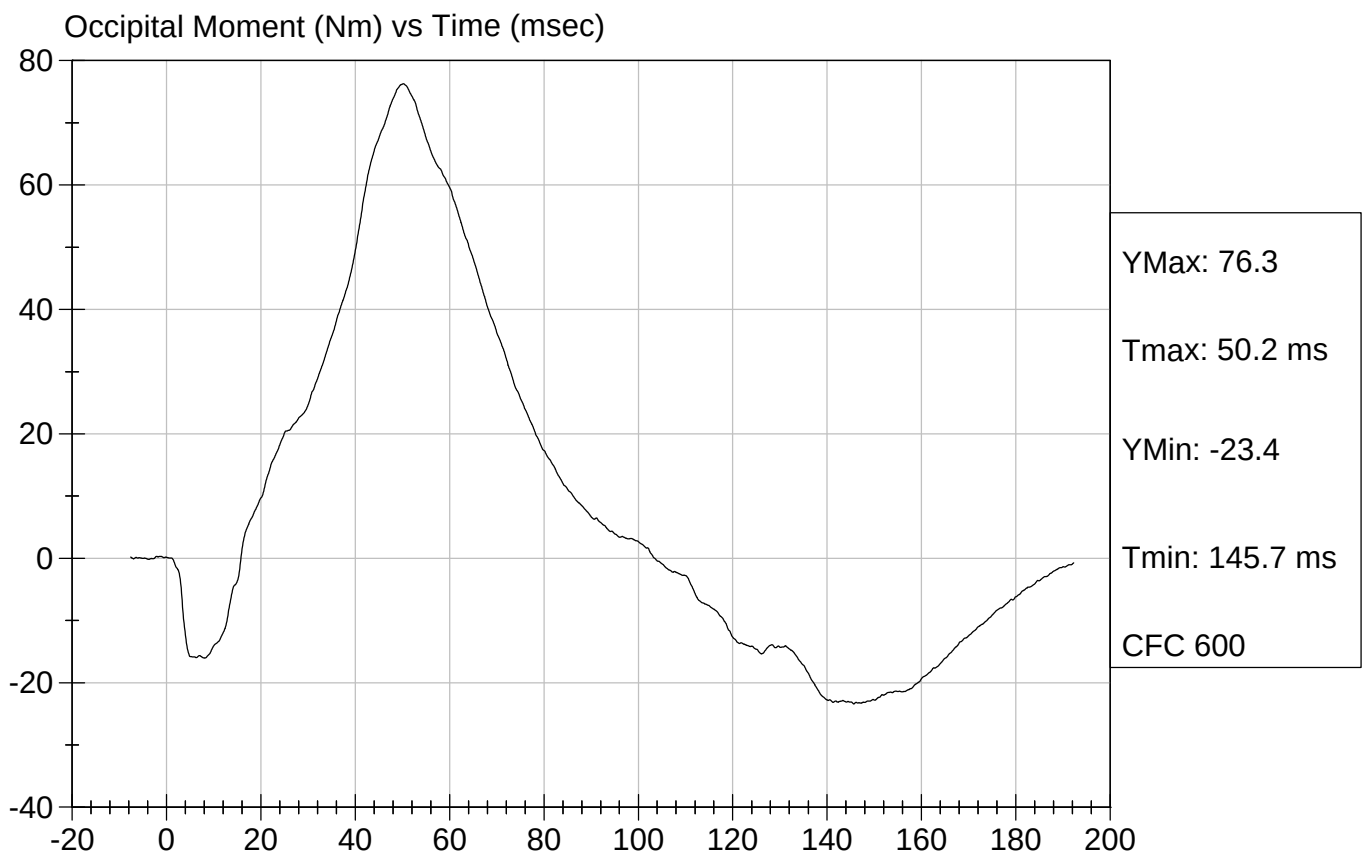
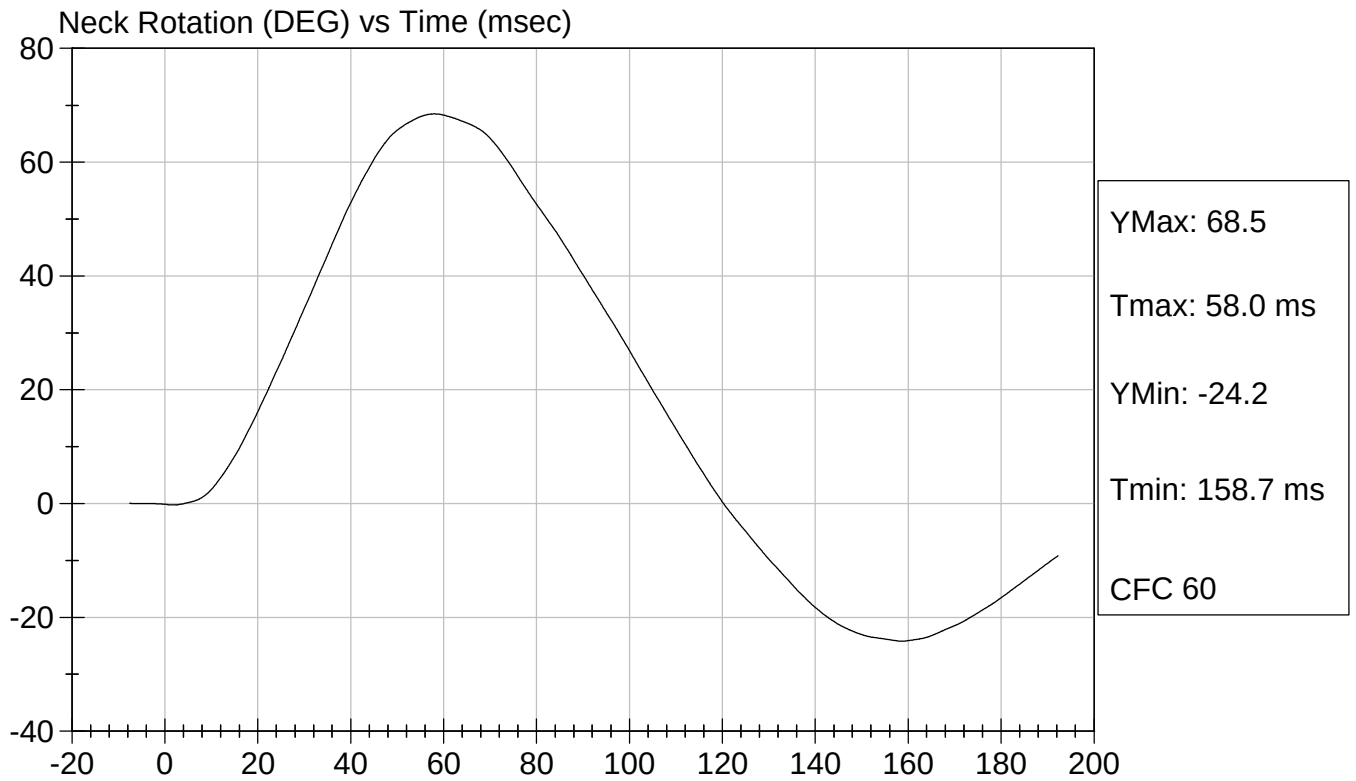
Test Date: 08/15/2002
Speed: 23.16 ft/sec, 7.06 m/sec





Test Desc: Neck Bending
Component ID: D021069

Test Date: 08/15/2002
Speed: 23.16 ft/sec, 7.06 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 295

Test I.D: D021062

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.33	Pass
Upper Rib	G's	37 - 46	43	Pass
Lower Rib	G's	37 - 46	40	Pass
Lower Spine	G's	15 - 22	22	Pass
Overall Test Results				Pass

Laboratory Technician

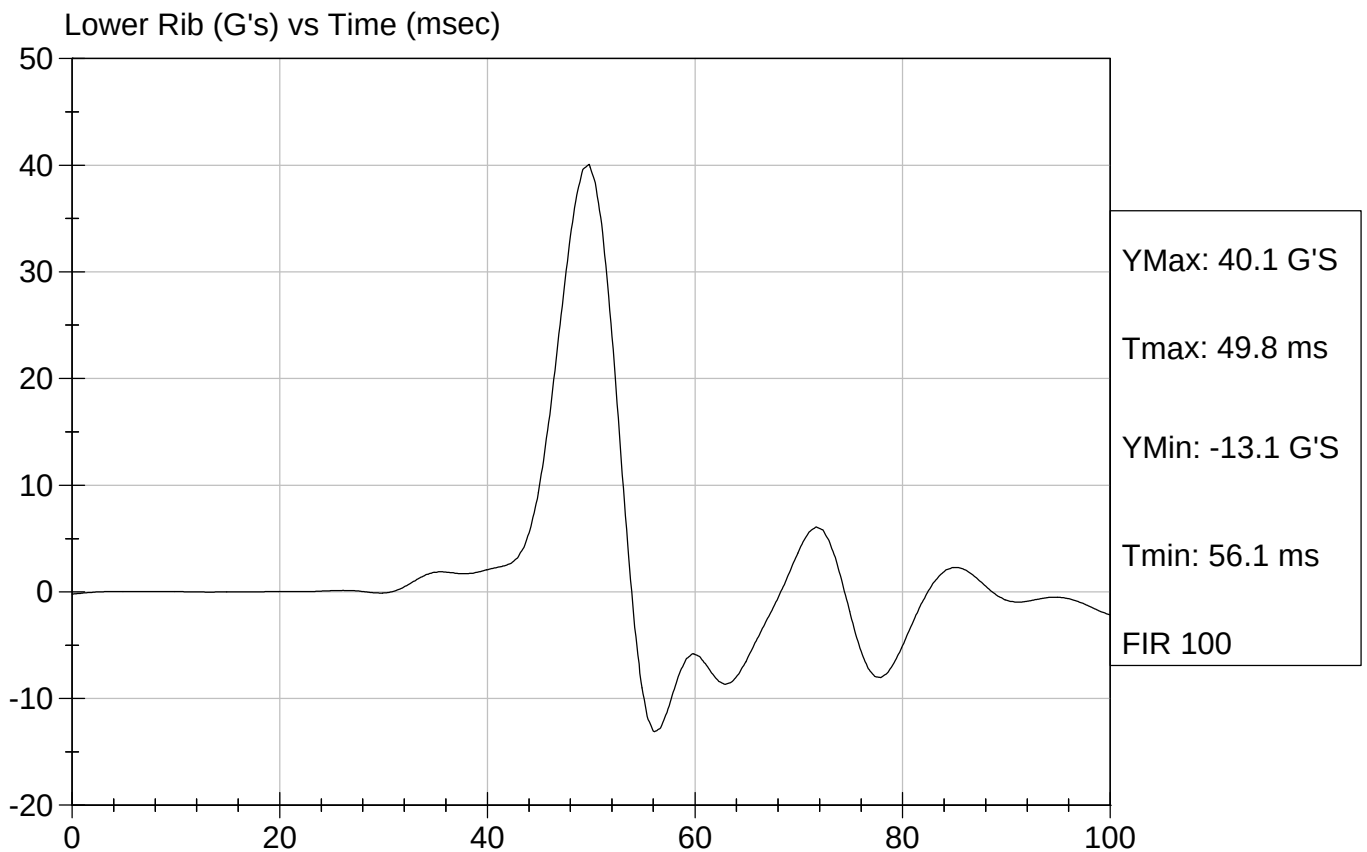
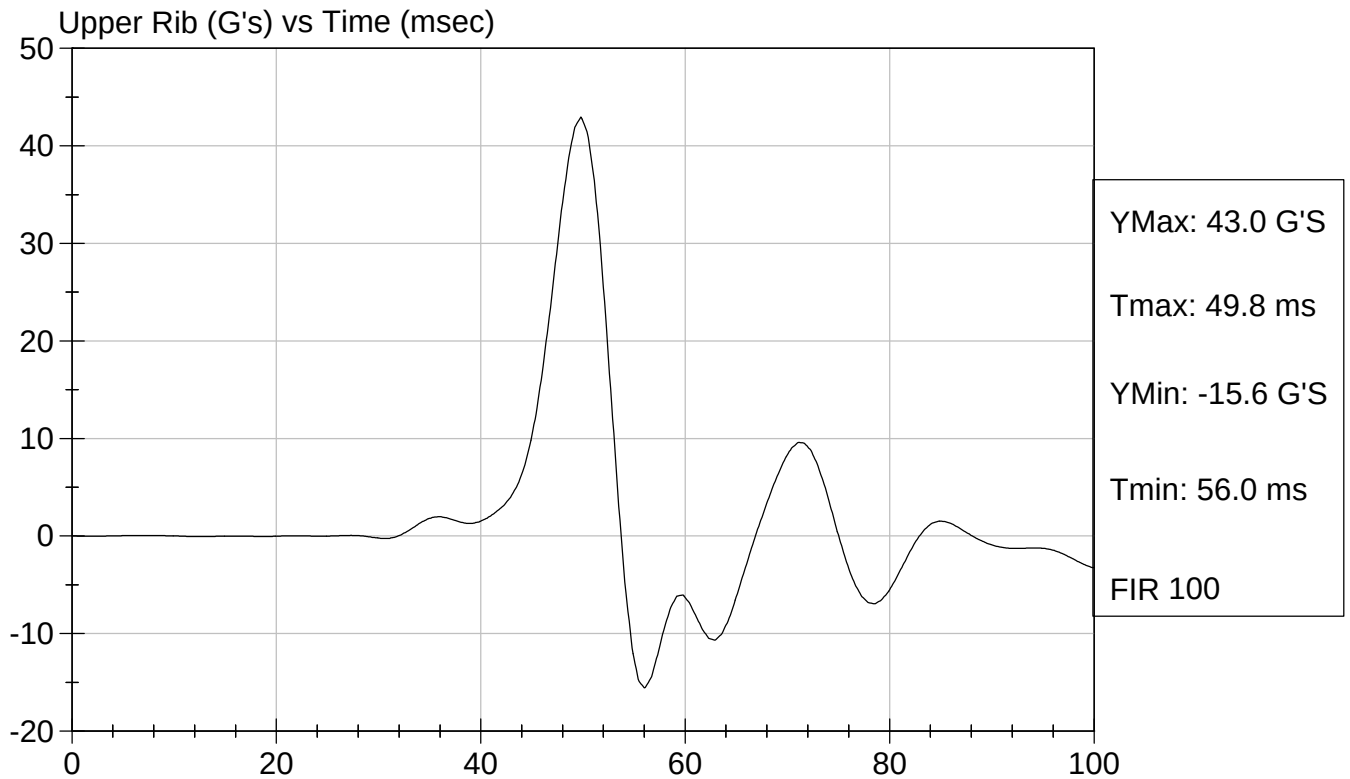
08/16/2002
Test Date

Approved By



Test Desc: Thorax Impact
Component ID: D021062

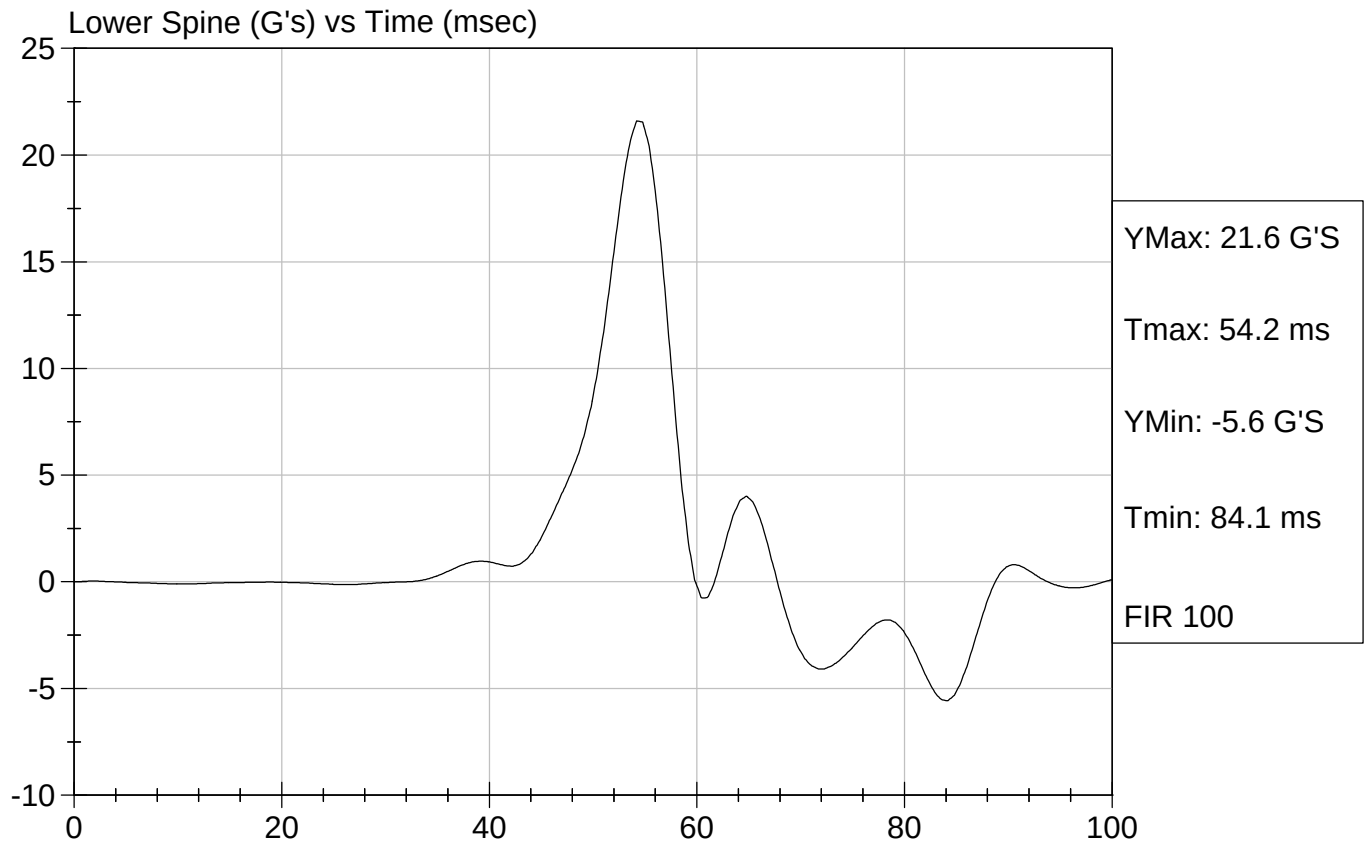
Test Date: 08/16/2002
Speed: 14.19 ft/sec, 4.33 m/sec





Test Desc: Thorax Impact
Component ID: D02062

Test Date: 08/16/2002
Speed: 14.19 ft/sec, 4.33 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 295

Test I.D: D021063

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Probe Velocity	m/s	4.27 - 4.33	4.30	Pass
Pelvis Acceleration	G's	40 - 60	46	Pass
Overall Test Results				Pass

Laboratory Technician

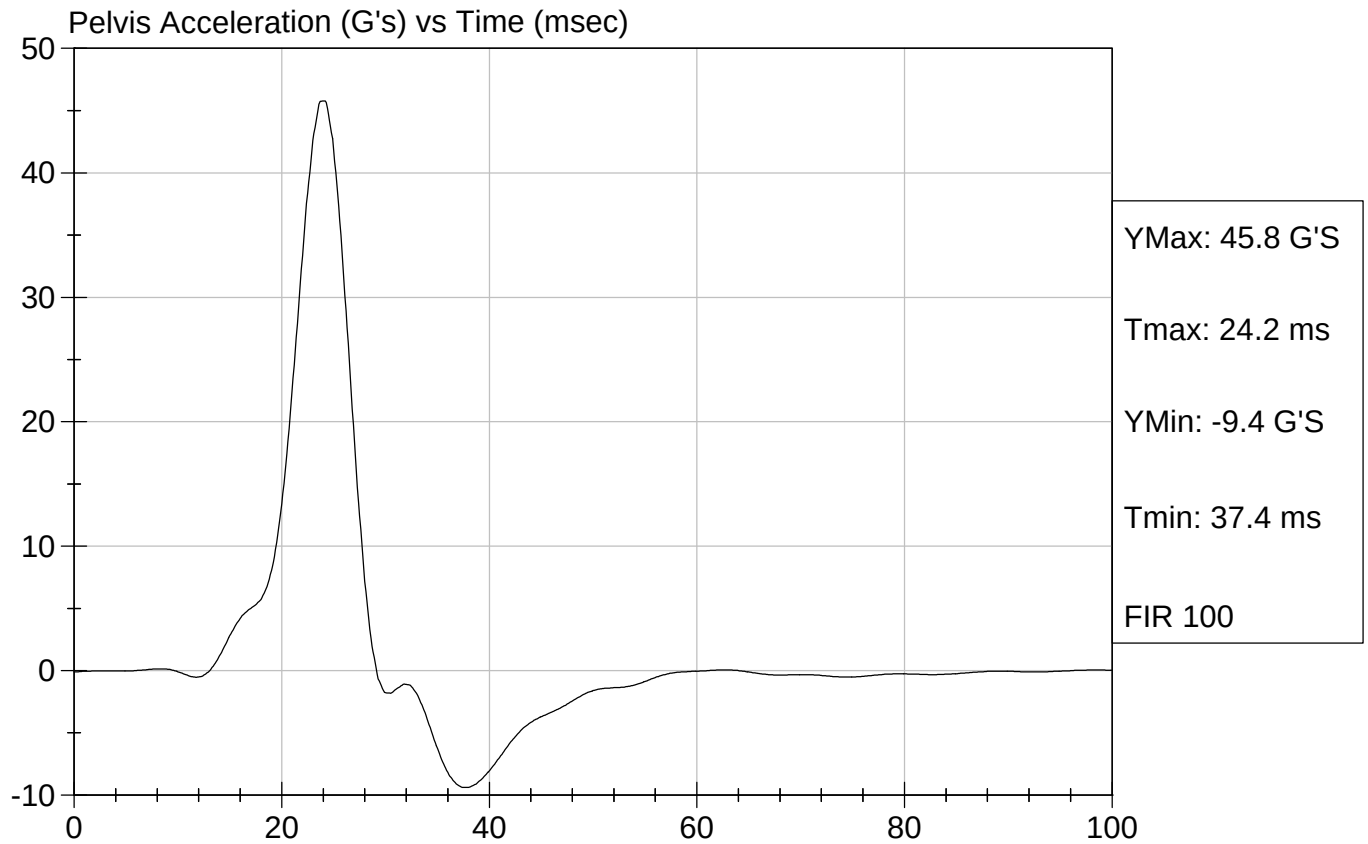
08/15/2002
Test Date

Approved By



Test Desc: Pelvis Impact
Component ID: D021063

Test Date: 08/15/2002
Speed: 14.11 ft/sec, 4.30 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 295

Test I.D: D021064

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Force At 12.7 mm	N	104 -162	148	Pass
Force At 19 mm	N	163 - 222	203	Pass
Force At 25.4 mm	N	222 - 280	271	Pass
Force At 33 mm	N	325 - 391	380	Pass
Overall Test Results				Pass

Laboratory Technician

08/15/2002
Test Date

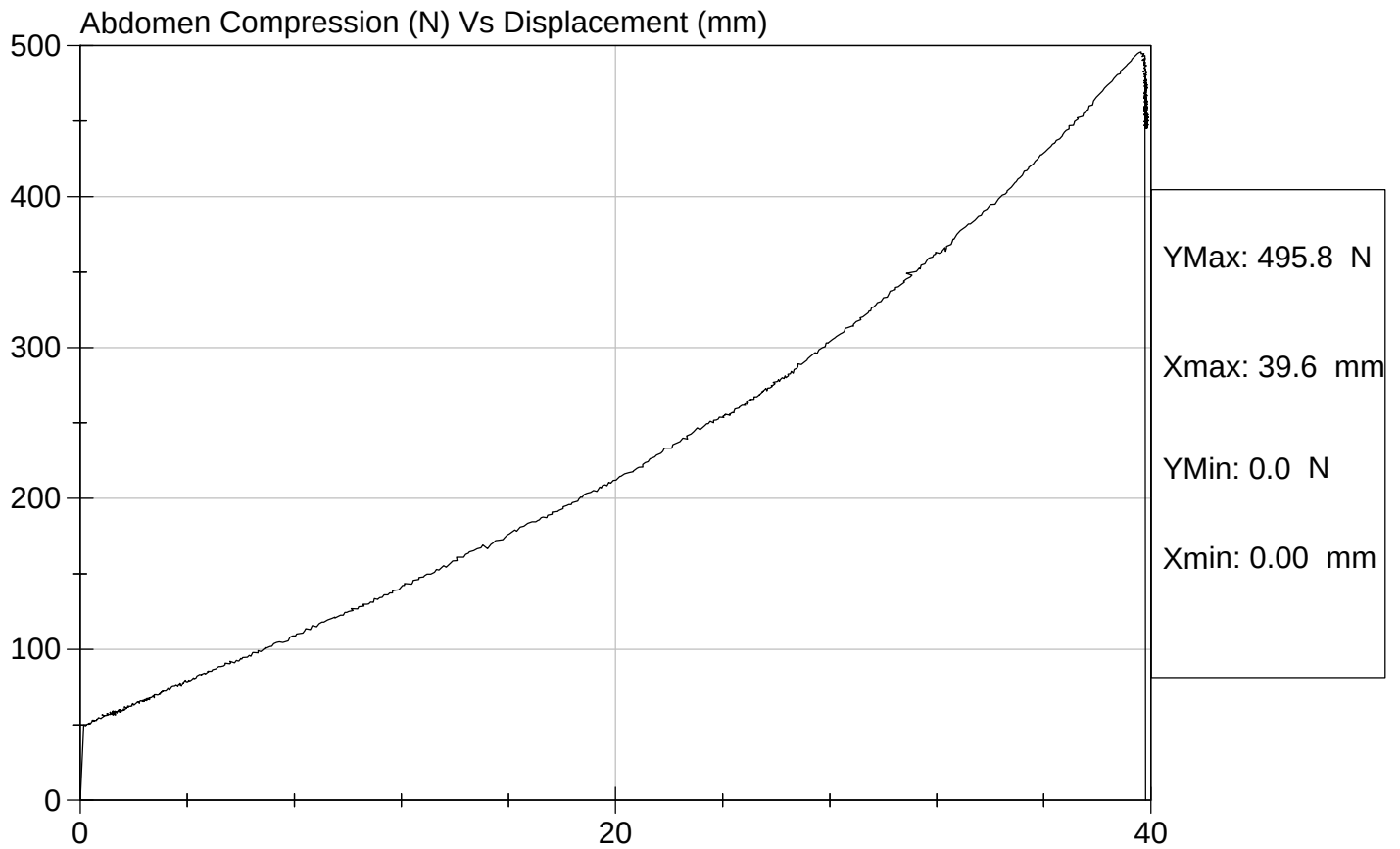
Approved By



Test Description: Abdomen Compression Test Date: 08/15/2002

Component: D021064

Speed: 0 ft/sec, 0 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 295

Test I.D: D021065

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	99.6	Pass
Force At 30 deg	N	151.2 - 204.6	156.0	Pass
Force At 40 deg	N	204.6 - 258.0	212.4	Pass
Return Angle	Deg	12 Maximum	3	Pass
Overall Test Results			Pass	

Laboratory Technician

08/15/2002
Test Date

Approved By



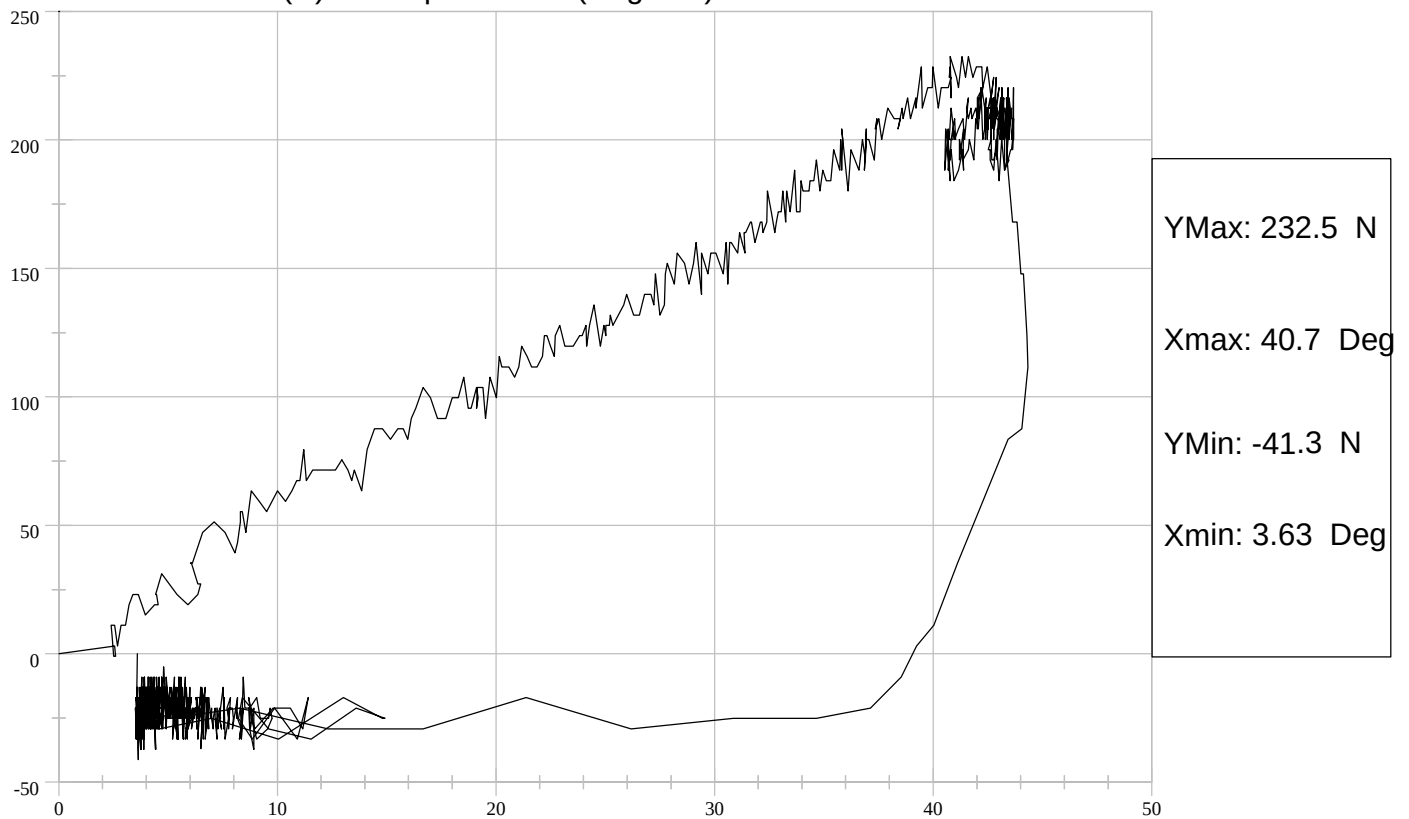
Test Description: Lumbar Flexion

Test Date: 08/15/2002

Component: D021065

Speed: 0 ft/sec, 0 m/sec

Lumbar Flexion (N) Vs Displacement (Degrees)



SID Calibration Data Sheet
Side Impact Dummy
Head Drop Calibration (Lateral)

ATD Serial No: 295

Test I.D: D021201

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	56	Pass
Peak Resultant Acceleration	G's	120 to 150	146	Pass
Is Resultant Curve Unimodal?	Yes/No	15% of peak	Yes	Pass
Peak Longitudnal Acceleration	G's	+/- 15	-5	Pass
			Overall Test Results	Pass

Laboratory Technician

09/03/2002
Test Date

Approved By



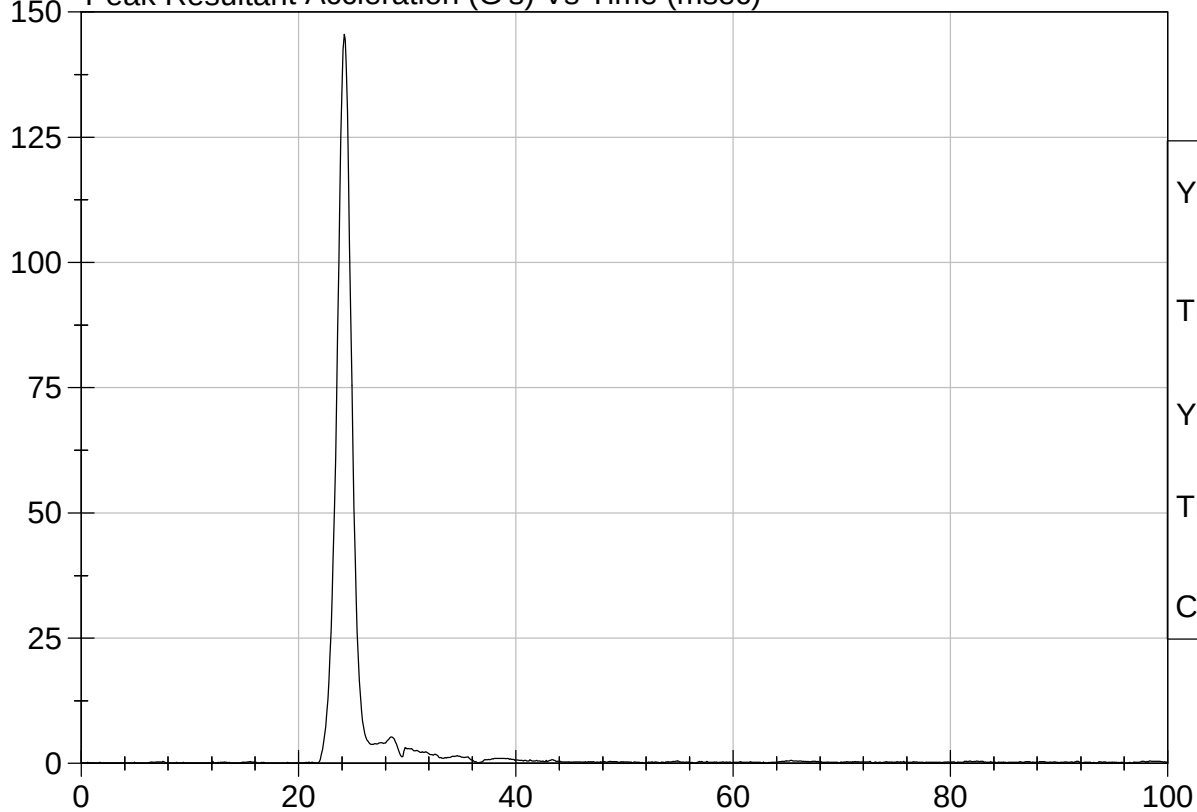
Test Description: Head Drop

Test Date: 09/03/2002

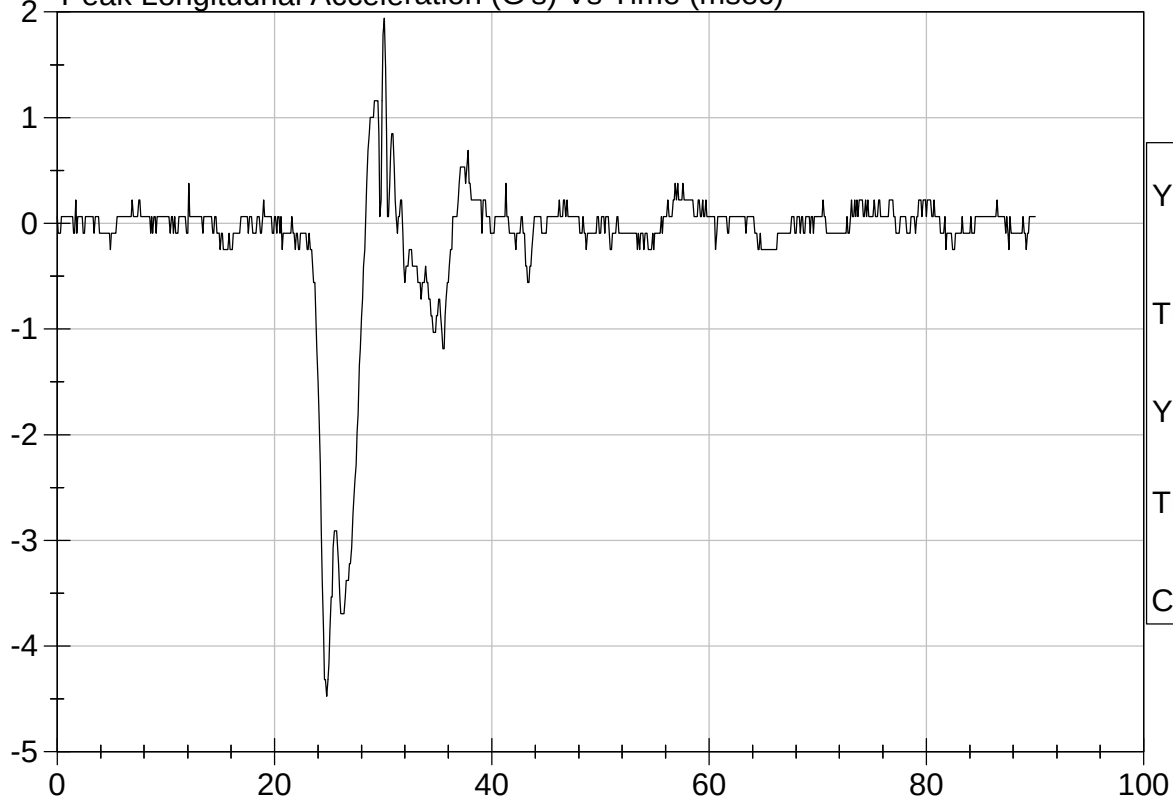
Component: D021201

Speed: 0 ft/s, 0.00 m/s

Peak Resultant Acceleration (G's) Vs Time (msec)



Peak Longitudnal Acceleration (G's) Vs Time (msec)



SID Calibration Data Sheet
Side Impact Dummy (SID)
Neck Pendulum Test

ATD Serial No: 295

Test I.D: D021209

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Impact Velocity		m/s	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	m/s	1.96 to 2.55	2.45	Pass
	20 msec	m/s	4.12 to 5.10	4.80	Pass
	30 msec	m/s	5.73 to 7.01	6.63	Pass
	40 to 70 msec	m/s	6.27 to 7.64	6.89	Pass
Midsagittal Plane Max Rotation		deg	66 to 82	70	Pass
Head Rotation Peak to Zero - Decay Time		msec	58 to 67	61	Pass
Max. Mx at Occipital Condyles		Nm	73 to 88	80	Pass
Mx Peak To Zero - Decay Time		msec	49 to 64	57	Pass
Mx Peak to Max. Head Rotation		msec	2 to 16	12	Pass

Laboratory Technician

09/06/2002

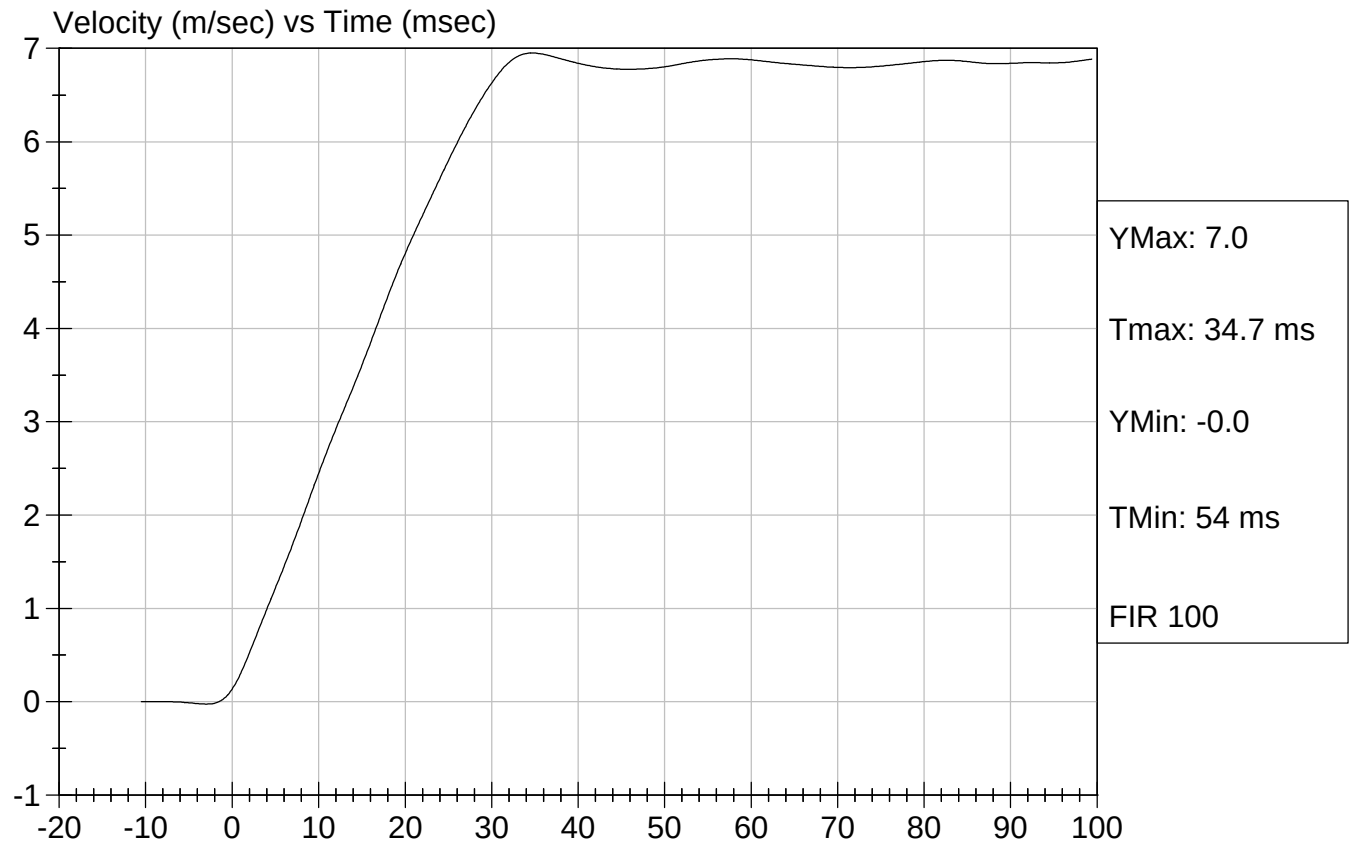
Test Date

Approved By



Test Desc: Neck Bending
Component ID: D021209

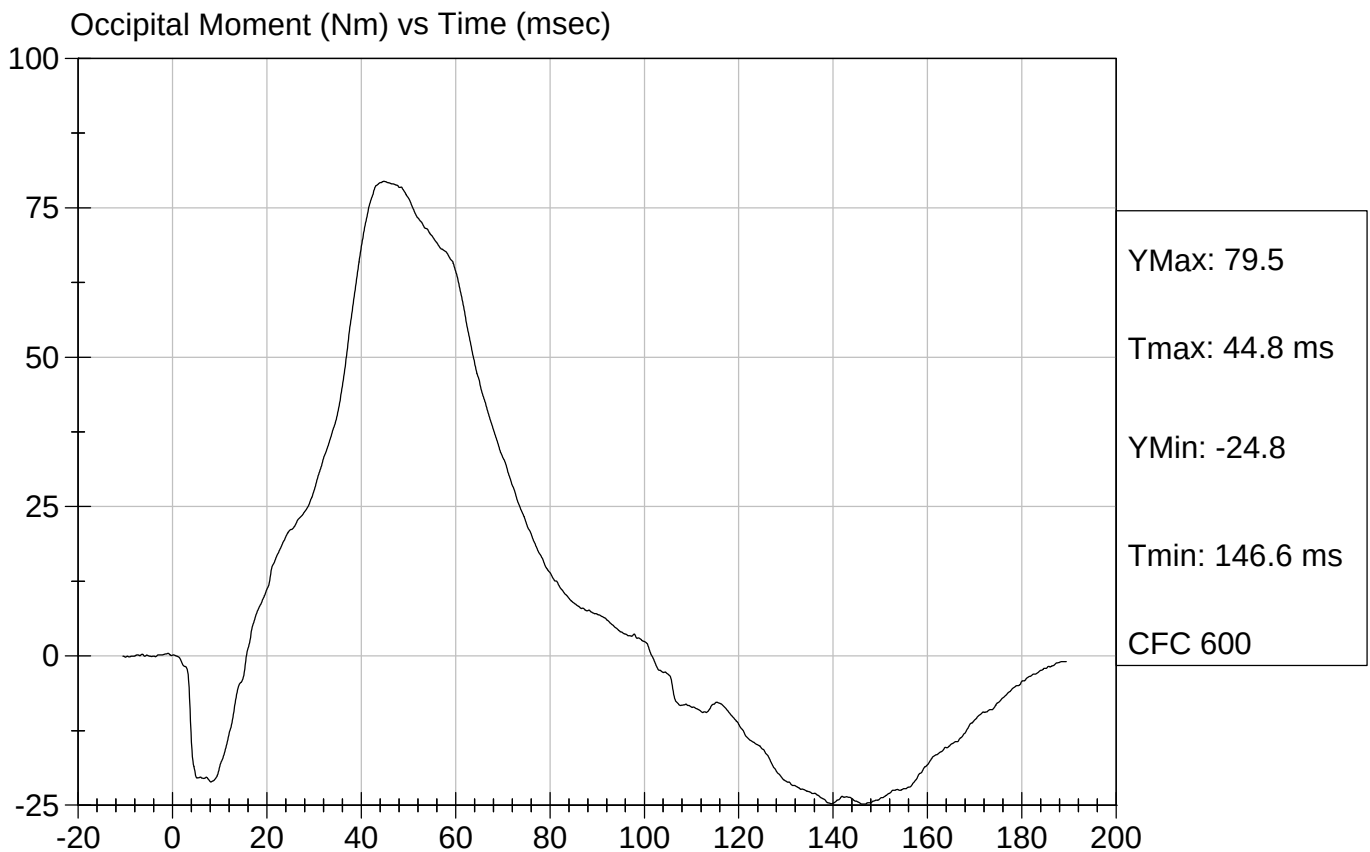
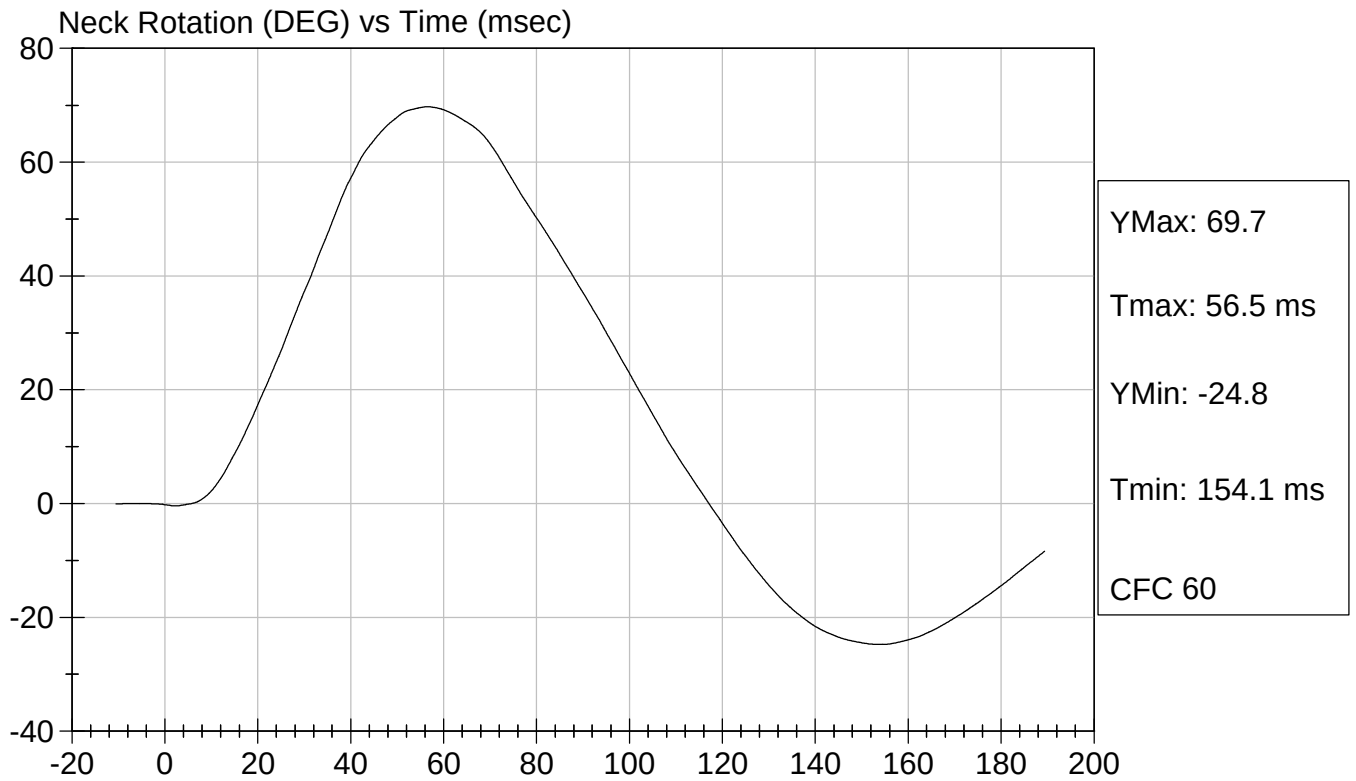
Test Date: 09/06/2002
Speed: 22.8 ft/sec, 6.95 m/sec





Test Desc: Neck Bending
Component ID: D021209

Test Date: 09/06/2002
Speed: 22.8 ft/sec, 6.95 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Thorax Impact Test

ATD Serial No: 295

Test I.D: D021202

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Velocity	m/s	4.27 - 4.33	4.28	Pass
Upper Rib	G's	37 - 46	42	Pass
Lower Rib	G's	37 - 46	38	Pass
Lower Spine	G's	15 - 22	22	Pass
Overall Test Results				Pass

Laboratory Technician

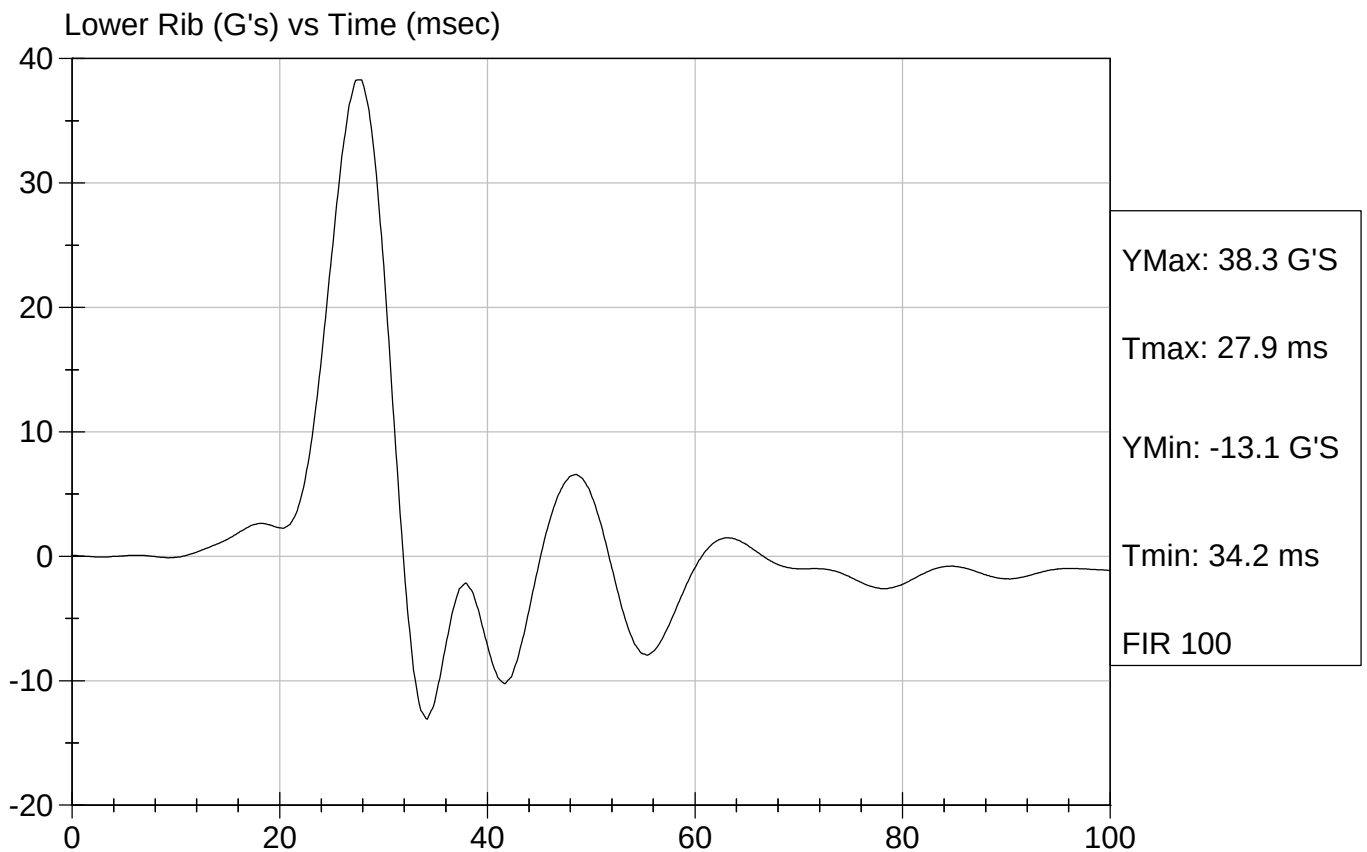
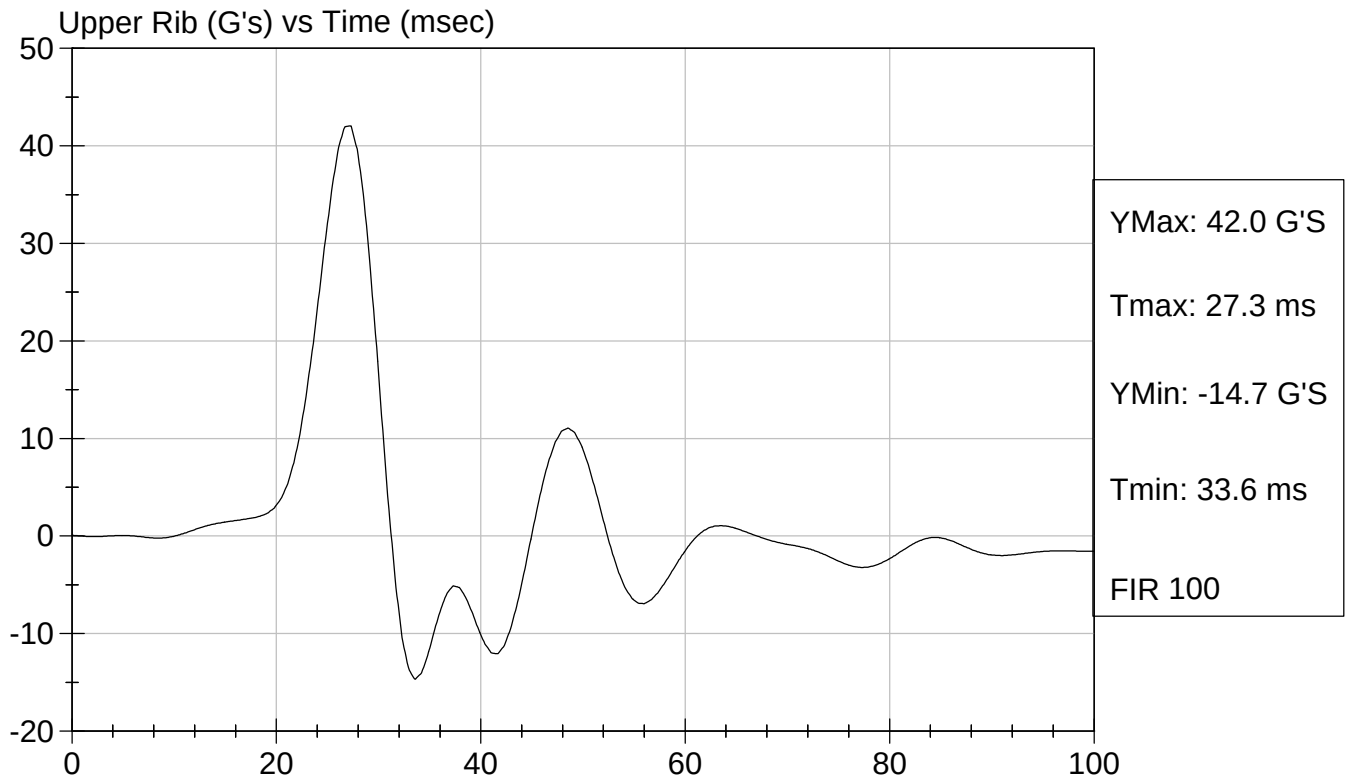
09/06/2002
Test Date

Approved By



Test Desc: Thorax Impact
Component ID: D021202

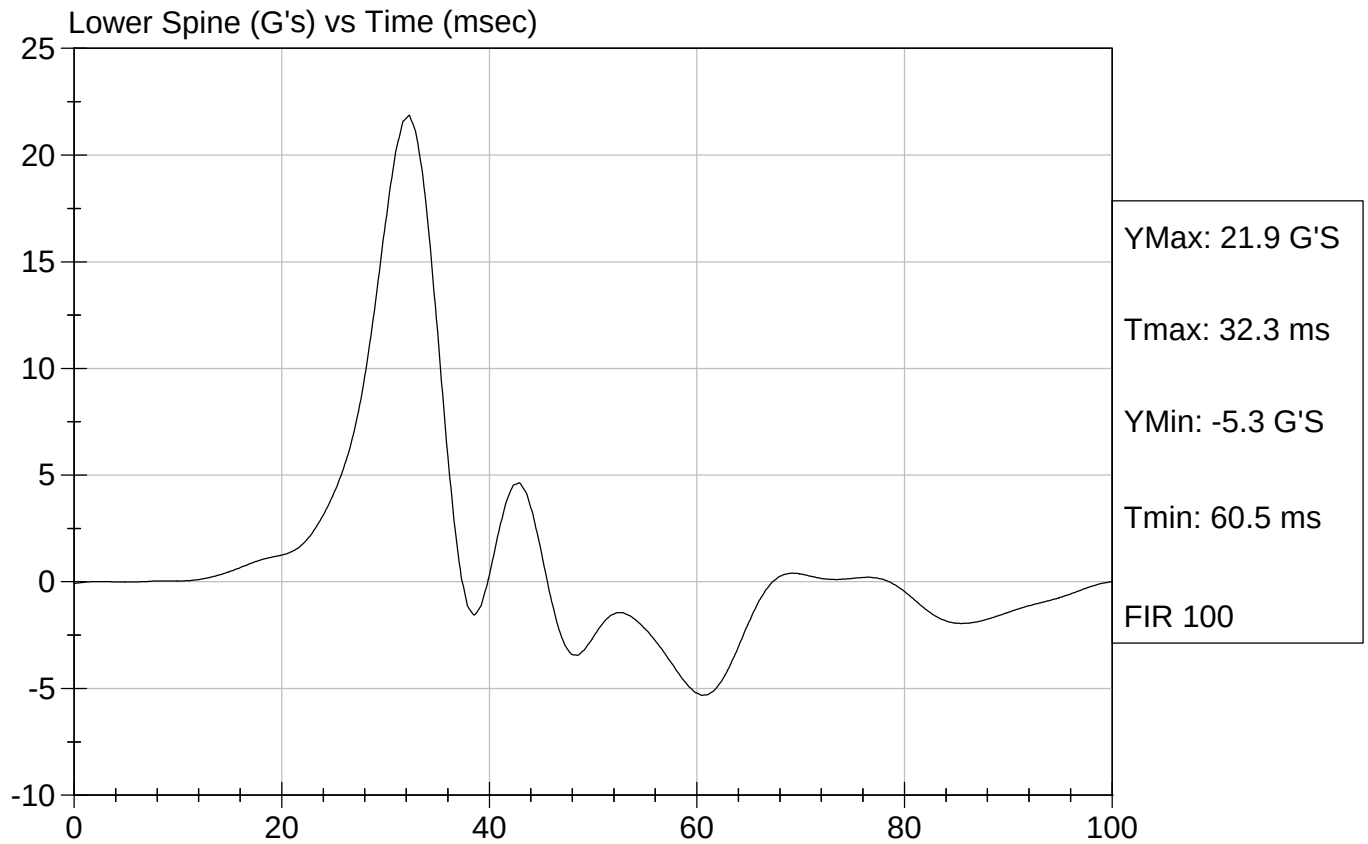
Test Date: 09/06/2002
Speed: 14.04 ft/sec, 4.28 m/sec





Test Desc: Thorax Impact
Component ID: D021202

Test Date: 09/06/2002
Speed: 14.04 ft/sec, 4.28 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Pelvis Impact Test

ATD Serial No: 295

Test I.D: D021203

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	54	Pass
Probe Velocity	m/s	4.27 - 4.33	4.28	Pass
Pelvis Acceleration	G's	40 - 60	50	Pass
Overall Test Results				Pass

Laboratory Technician

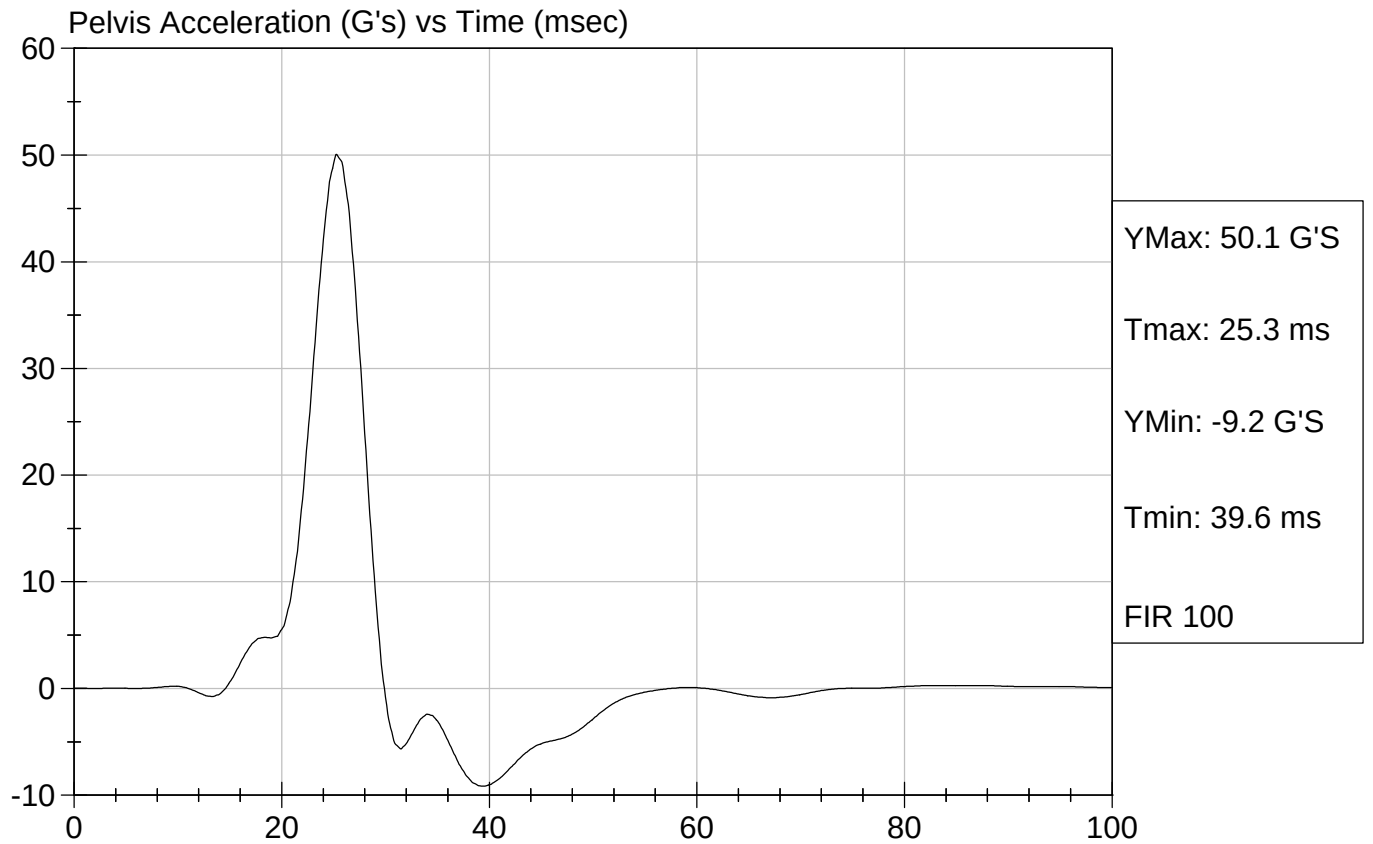
09/06/2002
Test Date

Approved By



Test Desc: Pelvis Impact
Component ID: D021203

Test Date: 09/06/2002
Speed: 14.03 ft/sec, 4.28 m/sec



SID Calibration Data Sheet
Side Impact Dummy
Abdominal Compression Calibration (Pre-Load = 10 lbs)

ATD Serial No: 295

Test I.D: D021204

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Force At 12.7 mm	N	104 -162	151	Pass
Force At 19 mm	N	163 - 222	205	Pass
Force At 25.4 mm	N	222 - 280	274	Pass
Force At 33 mm	N	325 - 391	373	Pass
Overall Test Results				Pass

Laboratory Technician

09/06/2002
Test Date

Approved By

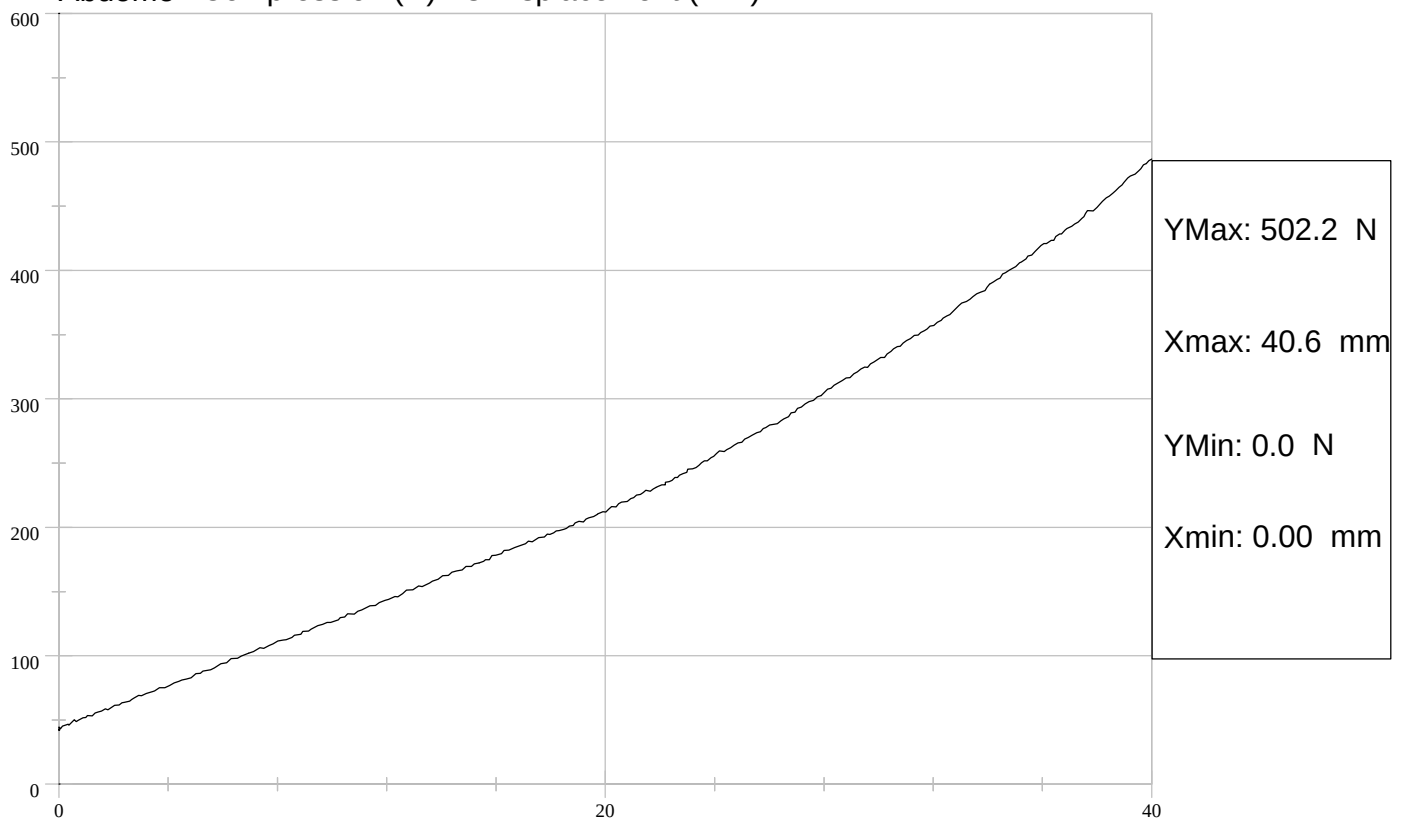


Test Description: Abdomen Compression Test Date: 09/06/2002

Component: D021204

Speed: 0 ft/sec, 0 m/sec

Abdomen Compression (N) Vs Displacement (mm)



SID Calibration Data Sheet
Side Impact Dummy
Lumbar Flexion Calibration

ATD Serial No: 295

Test I.D: D021205

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	53	Pass
Force At 0 deg	N	0 - 26.7	0.0	Pass
Force At 20 deg	N	97.9 - 151.2	119.6	Pass
Force At 30 deg	N	151.2 - 204.6	171.9	Pass
Force At 40 deg	N	204.6 - 258.0	224.3	Pass
Return Angle	Deg	12 Maximum	5	Pass
			Overall Test Results	Pass

Laboratory Technician

09/06/2002
Test Date

Approved By

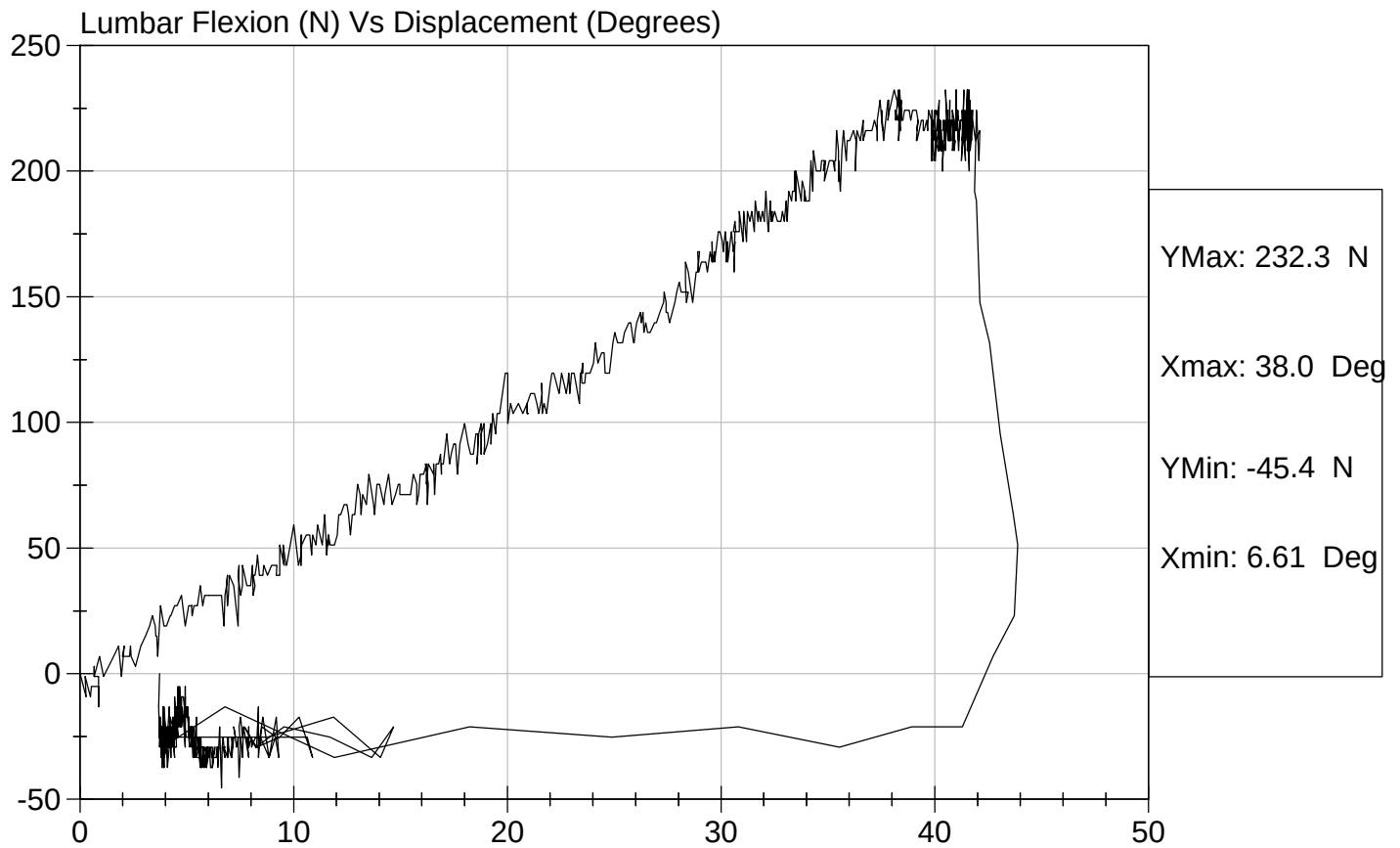


Test Description: Lumbar Flexion

Test Date: 09/06/2002

Component: D021205

Speed: 0 ft/sec, 0 m/sec



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY NO.		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	J12425	Endevco	7/2/02
Head Y Accelerometer	J12449	Endevco	7/2/02
Head Z Accelerometer	J12462	Endevco	7/2/02
Driver Neck FX	N442FX	Denton	3/15/02
Driver Neck FY	N442FY	Denton	3/15/02
Driver Neck FZ	N442FZ	Denton	3/15/02
Driver Neck MX	N442MX	Denton	3/15/02
Driver Neck MY	N442MY	Denton	3/15/02
Driver Neck MZ	N442MZ	Denton	3/15/02
Upper Spine X Accelerometer	AH1G2	Endevco	7/2/02
Upper Spine Y Accelerometer	AM751	Endevco	7/2/02
Upper Spine Z Accelerometer	AP138	Endevco	7/2/02
Upper Rib Y Accelerometer	AC913	Endevco	7/3/02
Lower Rib Y Accelerometer	AN8L6	Endevco	7/3/02
Lower Spine X Accelerometer	AGTM8	Endevco	7/2/02
Lower Spine Y Accelerometer	ANBP7	Endevco	7/2/02
Lower Spine Z Accelerometer	AJ411	Endevco	7/2/02
Pelvis X Accelerometer	AJ9N4	Endevco	7/2/02
Pelvis Y Accelerometer	AJ8T5	Endevco	7/2/02
Pelvis Z Accelerometer	AJ808	Endevco	7/2/02
Head Xr Accelerometer	AHT13	Endevco	7/2/02
Head Yr Accelerometer	AJ9A7	Endevco	7/2/02
Head Zr Accelerometer	AM748	Endevco	7/2/02
Upper Rib Yr Accelerometer	AGTT3	Endevco	7/3/02
Lower Rib Yr Accelerometer	APY13	Endevco	7/3/02
Upper Spine Yr Accelerometer	AP0G2	Endevco	7/2/02
Lower Spine Yr Accelerometer	AP1C6	Endevco	7/2/02
Pelvis Yr Accelerometer	J12439	Endevco	7/2/02

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	D11-F05	ENTRAN	3/8/02
Left Lower A-Post Y	K21-N05	ENTRAN	6/24/02
Left Mid B-Post Y	I12-F10	ENTRAN	5/29/02
Left Lower B-Post Y	K21-N08	ENTRAN	6/25/02
Floorpan @ Rear Axle X	99F349	ENTRAN	4/22/02
Floorpan @ Rear Axle Y	99F216	ENTRAN	4/22/02
Floorpan @ Rear Axle Z	99F254	ENTRAN	4/22/02
Driver Seat Track Y	G01-N17	ENTRAN	7/31/02
Right Front Sill X	K21-N31	ENTRAN	3/6/02
Right Front Sill Y	G13-F15	ENTRAN	3/6/02
Right Front Sill Z	K21-N29	ENTRAN	3/6/02
Right Rear Sill X	99F253	ENTRAN	4/22/02
Right Rear Sill Y	I12-F20	ENTRAN	5/29/02
Right Rear Sill Z	E10-F20	ENTRAN	6/17/02
Left Rear Sill Y	99F251	ENTRAN	4/22/02
Left Front Sill Y	L23-A05	ENTRAN	5/30/02
Vehicle CG X	H14-N15	ENTRAN	6/17/02
Vehicle CG Y	K21-N04	ENTRAN	6/24/02
Vehicle CG Z	K21-N26	ENTRAN	6/25/02
Left Front Door @ Pelvis Y	H14-N06	ENTRAN	6/17/02
Left Front Door @ Arm Y	L23-A07	ENTRAN	5/30/02
Left Front Door @ Knee Y	I12-F11	ENTRAN	6/17/02
Left Rear Door @ Rib Y	L23-A08	ENTRAN	5/30/02
Lower Center Radiator Support X	G03-N15	ENTRAN	3/1/02
Lower Center Radiator Support Y	A08-A13	ENTRAN	3/1/02
Lower Center Radiator Support Z	G03-N02	ENTRAN	3/1/02

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

APPENDIX E
DUMMY PEAK RESPONSE

DUMMY PEAK RESPONSE COMPARISON TABLE

Location	Peak Values				
				1999 Volvo S80	
	Class	Axis	Units	Peak	Time
Head	1000	X	G	177.1	-62.9
	1000	Y	G	384.7	62.9
	1000	Z	G	62.5	62.7
	1000	RES	G	427.2	62.9
Head Injury Criteria (HIC)				2213	
t1				62.3	
t2				63.4	
Upper Neck Force	1000	X	N	485	-67.9
	1000	Y	N	545	60.6
	1000	Z	N	1997	-63.3
	1000	RES	N	2034	63.3
Upper Neck Moment	600	X	Nm	95.4	-63.4
	600	Y	Nm	41.5	-68.0
	600	Z	Nm	25.2	81.0
	600	RES	Nm	99.7	63.4
Upper Spine	180	X	G	29.8	-70.1
	180	Y	G	42.6	57.0
	180	Z	G	20.9	63.5
	180	RES	G	44.9	56.9
Lower Spine	180	X	G	23.8	-69.8
	180	Y	G	58.3	48.0
	180	Z	G	17.4	63.5
	180	RES	G	58.4	48.0
Upper Rib	180	Y	G	59.8	50.3
Lower Rib	180	Y	G	61.1	50.7
Upper Rib Deflection	180	Z	mm	37.6	-67.4

DUMMY PEAK RESPONSE COMPARISON TABLE

Location	Peak Values				
				1999 Volvo S80	
	Class	Axis	Units	Peak	Time
Pelvis	1000	X	G	12.8	-72.8
	1000	Y	G	60.6	41.8
	1000	Z	G	15.4	-47.9
AR (arm to door)			mm	74	
HP (H-point to door)			mm	140	
HR (head to roof)			mm	230	
HS (head to side)			mm	319	