REPORT NUMBER: TO11-MGA-2002-005

FULL SCALE SIDE IMPACT POLE TESTS OF BASELINE VEHICLES
Task Order #T0007 / RFP #0011

SAAB AUTOMOBILE AB
2000 Saab / 9-5 / 4 Door
NHTSA NUMBER: RY0512

PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105

September 19, 2002

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
55 BROADWAY, KENDALL SQUARE
CAMBRIDGE, MA 02142

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 2000 Saab / 9-5 / 4 Door, when subjected to a rigid pole side impact at 285 degrees.

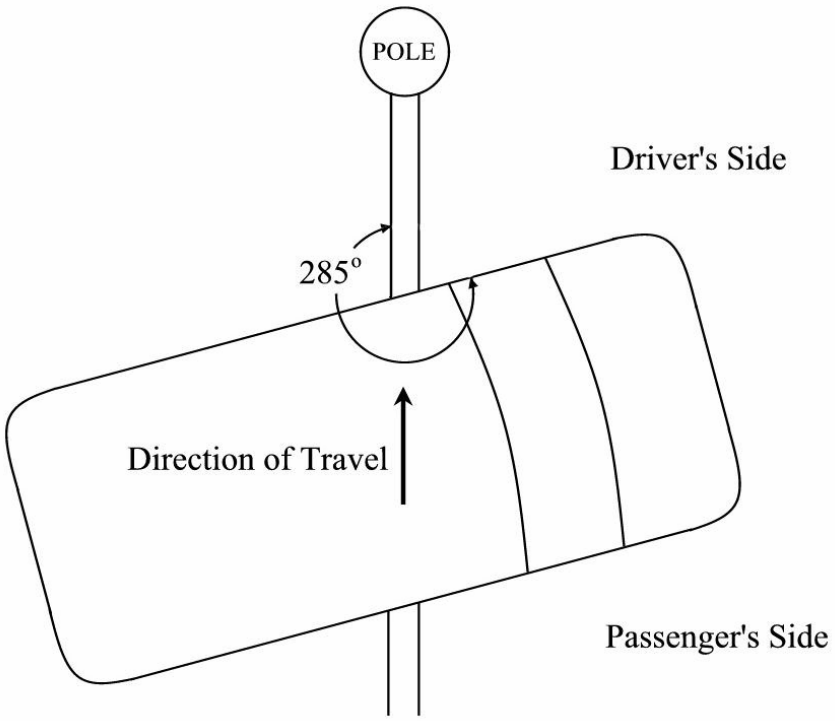
MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 2000 Saab / 9-5 / 4 Door. The subject vehicle was towed into a rigid pole at a velocity of 32.0 km/h. The weight of the vehicle as tested was 1699 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on September 19, 2002. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One ES-2 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 and Evaluation of Eurosid-1 Positioning Procedure Appendix A dated February 5, 1997. The side impact event was documented by nine 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 positioning procedure. Appendix F contains dummy peak responses.



SECTION 2…continued

SUMMARY OF SIDE IMPACT TEST

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

Head Performance Criteria		Left Front
<1000	T1 (msec)	50.8
	T2 (msec)	66.2
	HPC	243
Thorax Performance Criteria		
Chest Deflection <42 mm	Upper Rib Deflection	-49.9
	Mid Rib Deflection	-43.0
	Lower Rib Deflection	-33.2
Viscous Criteria <1.0 (m/sec.)	Upper Rib	1.3
	Mid Rib	0.9
	Lower Rib	0.5
Abdominal Protection Criteria		
Sum < 2500 N	Front Abdominal Force	219.2
	Mid Abdominal Force	466.0
	Rear Abdominal Force	702.3
	Sum of Abdominal Force	1381.5
Pelvis Performance Criteria		
< 6000 N	Pubic Symphysis Force	-2672.6

		Left Front
HIC	T1 (msec)	50.8
	T2 (msec)	66.2
	T2 – T1 (msec)	15.4
	HIC	243.0

Fir Filtered	Left Front
Upper Rib Y (g's)	154.9
Mid Rib Y (g's)	126.8
Lower Rib Y (g's)	103.2
Upper Spine Y (g's)	57.6
Lower Spine Y (g's)	55.9
Pelvis Y (g's)	68.9
TTI (g's)	105.4

Contacts	Left Front
Rib (msec)	20.1
Pelvis (msec)	23.0
Arm (msec)	14.9

TEST NOTES

The following channels did not collect any valid data:

1. Left Upper B-Post Y

SECTION 3

ES-2 SIDE IMPACT DUMMY AND VEHICLE TEST DATA

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

TEST VEHICLE INFORMATION

Make	Saab
Model	9-5
Body Style	4 Door
VIN	YS3EF48ZOY3043366
Color	Painted Orange
Odometer Reading (mile)	39996
Transmission	4 sp Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Seat side
Power Windows	Yes
Power Steering	Yes
Power Door	Yes
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	Saab Automobile AB
Date of Manufacture	11/99

GVWR (kg)	2087
GAWR Front (kg)	1134
GAWR Rear (kg)	1048

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	273	273
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/55R16	P215/55R16
Tire Size on Vehicle	P215/55R16	P215/55R16
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				417.3
Cargo Wt. (RCLW) (kg)				77.1

DATASHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	513.9	310.7		567.9	298.0	
Right	kg	492.6	308.0		480.4	352.4	
Ratio	%	61.9	38.1		61.7	38.3	
Totals	kg	1006.5	618.7	1625.2	1048.3	650.4	1698.7

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Calculated Vehicle Target Weight (TVTW)	kg	1698.7

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.8 ND	0.4 ND	0.3 ND
Left Door Sill Angle	Deg	0.7 ND	0.3 ND	0.4 ND
Front Bumper Angle	Deg	0.1 RU	0.2 RU	0.2 RU
Rear Bumper Angle	Deg	0.0	0.3 RU	0.3 RU

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	2702
Total Vehicle Length at Left Side	mm	4075
Total Vehicle Length at Centerline	mm	4845
Total Vehicle Length at Right Side	mm	4072
Total Vehicle Width	mm	1797
Weight of Ballast in Cargo Area	kg	0
Amount of Water in Fuel Tank	liters	0

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Actual Impact Point	mm	22 Rear

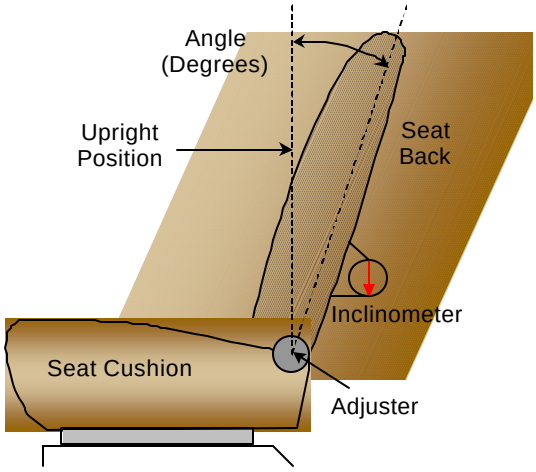
DATA SHEET NO. 1… (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 14 degree



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

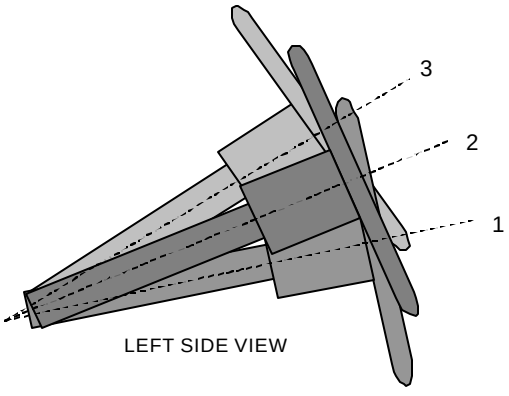
Driver seat fore/aft position: 140 mm

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 column was placed in the mid position of travel.



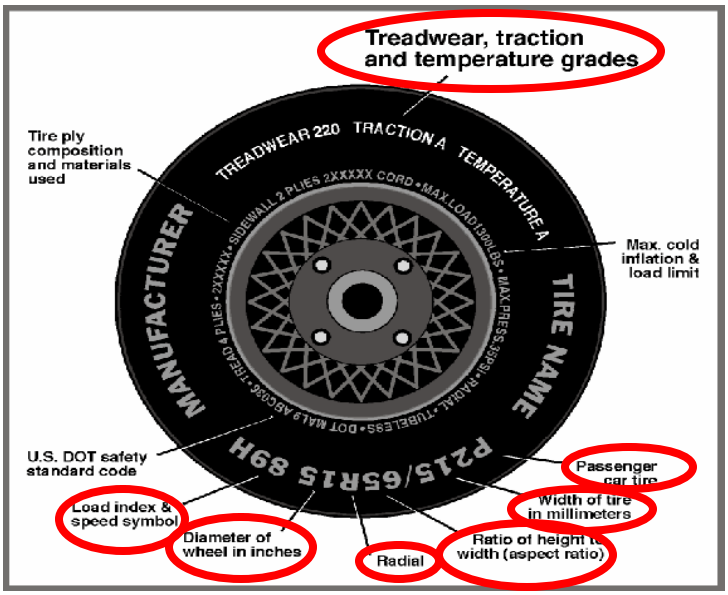
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

Vehicle Year	2000	Vehicle Make	Saab
Vin	YS3EF48ZOY3043366	Vehicle Model	9-5/ 4 Door



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV 4	Energy MXV 4
Tire Type	Passenger	Passenger
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	55	55
Radial	Yes	Yes
Wheel Diameter	16	16
Load Index & Speed Symbol	93 V	93 V
Tread wear	340	340
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3

POST TEST OBSERVATIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES 2
Head Contact	Top of head hit side bag/pole. Back of head hit side bag.
Upper Torso Contact	Arm hit Front Bag/ side bag
Lower Torso Contact	Hit side bag
Left Knee Contact	Mid door below arm rest
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	None
Sill Separation	None
Windshield Damage	Left side shattered
Window Damage	Left side windows down for test
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	Yes
Side	Yes
Curtain	None

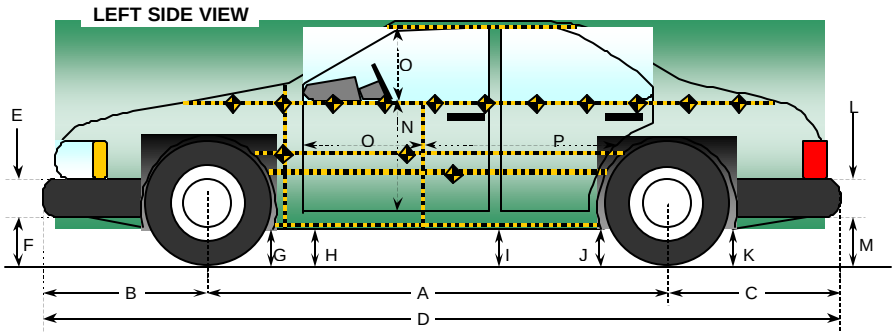
SECTION 4

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002



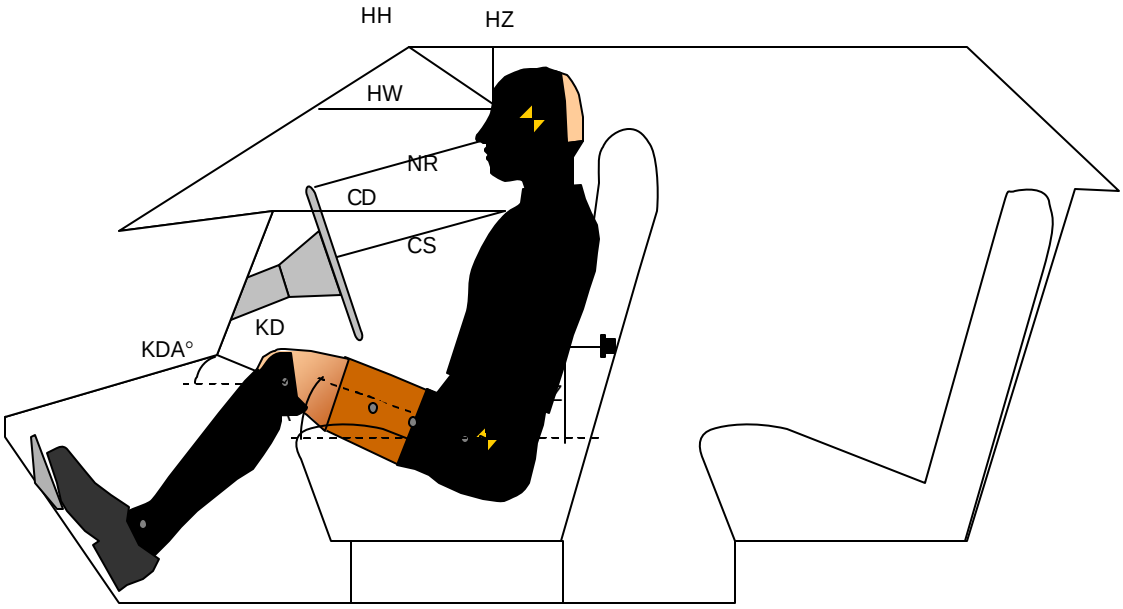
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2702	2559	-143
B	Front Axle to FSOV	1008	1036	28
C	Rear Axle to RSOV	1135	1135	0
D	Total Length at Centerline	4845	4730	-115
E	Front Bumper Thickness	150	150	0
F	Front Bumper Bottom to Ground	535	561	26
G	Sill Height at Front Wheel Well	321	298	-23
H	Sill Height at Front Door Leading Edge	323	302	-21
I	Sill Height at "B" Pillar	323	317	-6
J1	Sill Height at Rear Wheel Well	330	352	22
J2	Pinch Weld Height at Rear Wheel Well	326	348	22
K	Sill Height Aft of Rear Wheel Well	380	407	27
L	Rear Bumper Thickness	170	170	0
M	Rear Bumper Bottom to Ground	525	526	1
N	Sill Height to Window Bottom Sill	680	708	28
O	Front Door Leading Edge to Impact CL	845	833	-12
P	Rear Door Trailing Edge to Impact CL	1118	1104	-14
Q	Front Window Opening	465	444	-21
R	Right Side Length	4075	4106	31
S	Left Side Length	4072	3872	-200
T	Vehicle Width at "B" Post	1797	1502	-295

DATA SHEET NO. 5

ES-2 LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

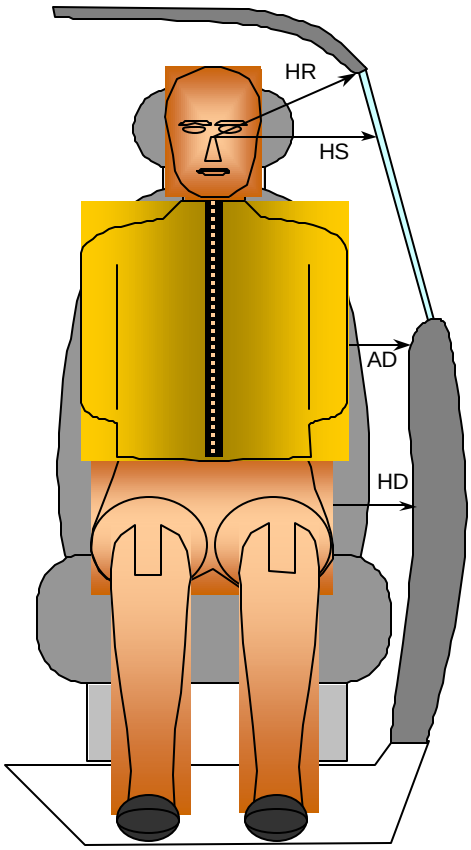


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	346	
HW	Head to Windshield	546	
HZ	Head to Roof	165	
NR	Nose to Rim	432	
CD	Chest to Dash	531	
CS	Chest to Steering Wheel	336	
KDL	Left Knee to Dash	185	0
KDR	Right Knee to Dash	227	0
PA	Pelvic Angle (Longitudinal)		23.0
PA	Pelvic Angle (Lateral)		-0.2
SA	Spine Angle (Longitudinal)		22.0
SA	Spine Angle (Lateral)		0.4
PHX	H-Point to Striker (X-Axis)	208	
PHZ	H-Point to Striker (Z-Axis)	109	

DATA SHEET NO. 6

ES-2 LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002



FRONT VIEW OF DUMMY

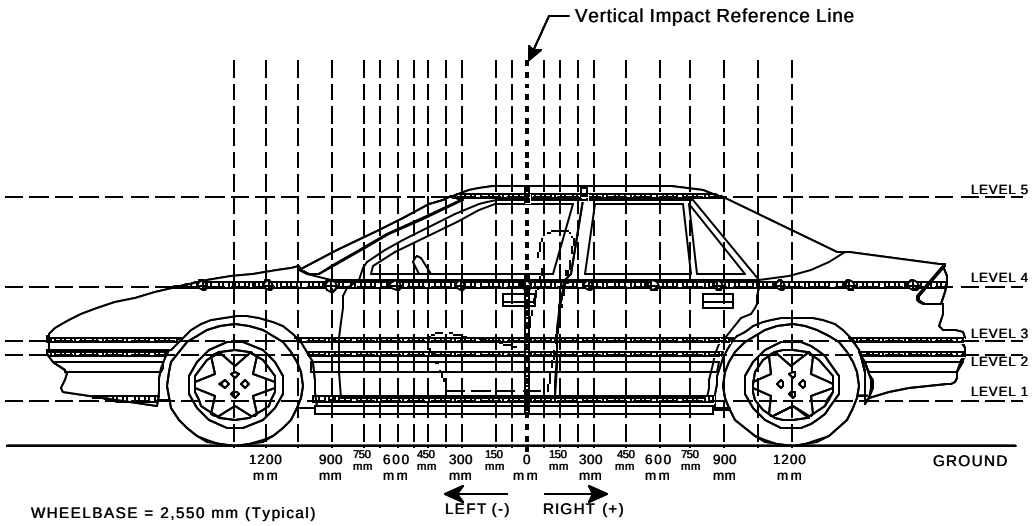
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	187
HS	Head to Side Window	mm	312
AD	Arm to Door	mm	92
HD	H-Point to Door	mm	166

DATA SHEET NO. 7

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



LEFT SIDE VIEW

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	1481
4	Window Sill	1031
3	Mid Door	750
2	Occupant H-Point	674
1	Sill Top	443

DATA SHEET NO. 8

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1950															
-1800															
-1650				301					298					-3	
-1500				285					281					-4	
-1350				271					266					-5	
-1200				260					320					60	
-1050			204	253				310	348				106	95	
-900	238	209	207	247		198	336	321	357		-40	127	114	110	
-825	241	209	207	244		215	361	337	365		-26	152	130	121	
-750	239	208	205	243		228	373	345	383		-11	165	140	140	
-675	243	207	203	241		240	389	363	406		-3	182	160	165	
-600	243	205	202	240		259	407	389	435		16	202	187	195	
-525	245	205	201	239		294	437	414	475		49	232	213	236	
-450	246	204	200	239		350	461	440	503		104	257	240	264	
-375	246	203	199	239		402	488	473	524		156	285	274	285	
-300	248	204	199	238		453	512	507	540		205	308	308	302	
-225	250	203	198	239		504	538	535	563		254	335	337	324	
-150	250	203	198	240	478	550	563	563	592	575	300	360	365	352	97
-75	251	203	198	239	478	585	599	594	617	621	334	396	396	378	143
0	251	203	198	240	476	605	624	626	638	666	354	421	428	398	190
75	252	203	198	240	476	585	610	616	626	656	333	407	418	386	180
150	252	203	198	240	477	536	563	562	587	620	284	360	364	347	143
225	253	203	198	240	477	478	506	502	533	593	225	303	304	293	116
300	254	204	199	244	478	436	426	433	493	568	182	222	234	249	90
375	254	205	200	245	481	385	389	408	468	563	131	184	208	223	82
450	253	205	201	246	481	353	369	382	453	561	100	164	181	207	80
525	252	205	201	246	482	328	344	359	439	559	76	139	158	193	77
600	251	206	202	249	481	294	316	330	419	548	43	110	128	170	67
750	249	206	203	254	483	235	257	274	371	521	-14	51	71	117	38
900	245	207	205	261	484	186	218	234	332	503	-59	11	29	71	19
1050		209	208	266	490		190	196	294	488		-19	-12	28	-2
1200				275	498				266	496				-9	-2
1350				284					277					-7	
1500				294					270					-24	
1650			232	305				193	269				-39	-36	
1800			262	319				213	271				-49	-48	
1950			282	334				283	338				1	4	
2100			304	350				306	360				2	10	

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

DATA SHEET NO. 8 (cont.d)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

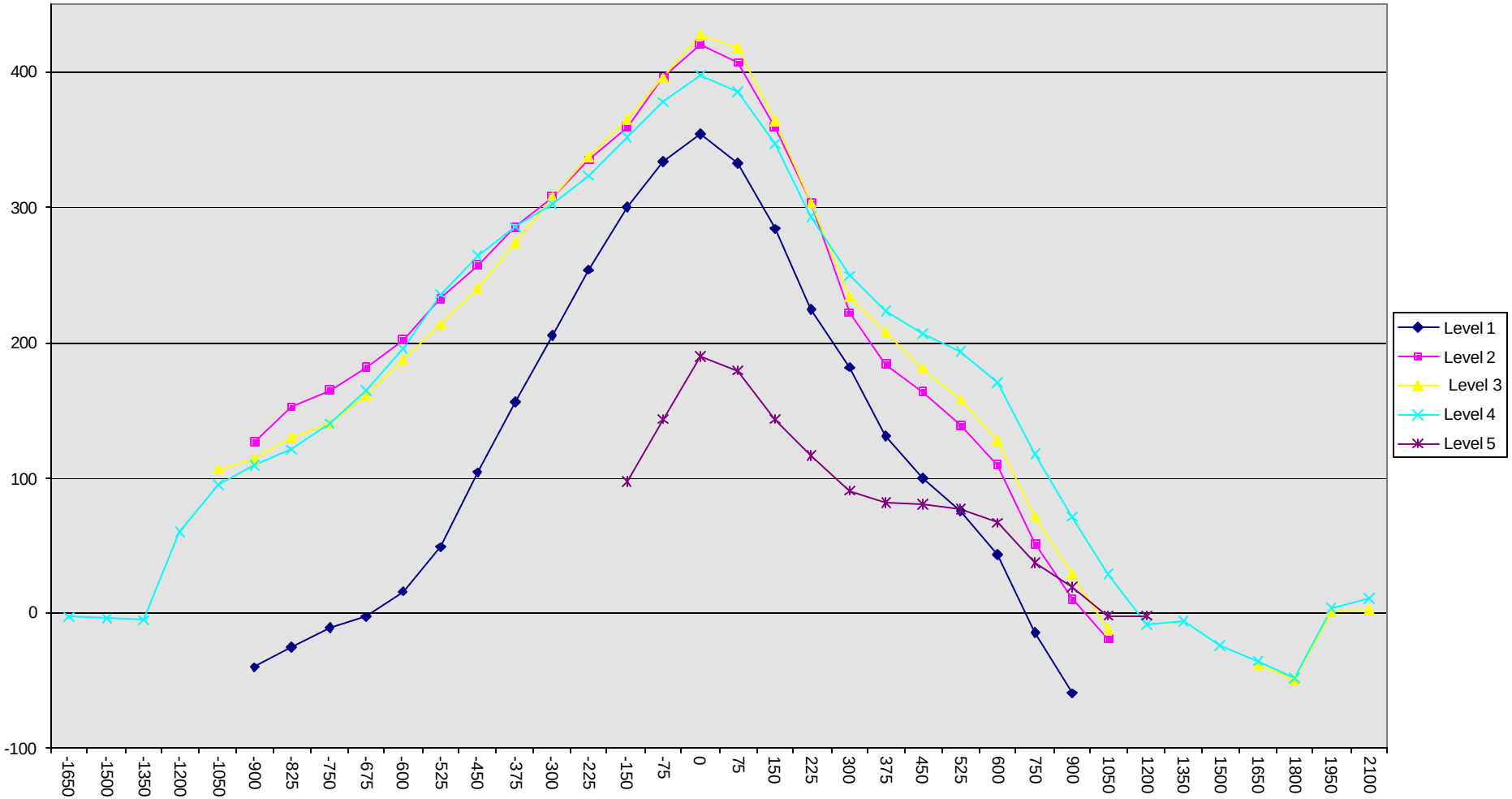
	Pre Test Level 6	Post Test Level 6	Difference at Level 6
-1950			
-1800	1096	1141	45
-1650	1094	1151	57
-1500	1095	1162	67
-1350	1096	1173	77
-1200	1095	1118	23
-1050			
-975			
-900			
-825			
-750			
-675			
-600			
-525			
-450			
-375			
-300	1095	1254	159
-225	1090	1251	161
-150	1090	1256	166
-75	1090	1254	164
0	1091	1253	162
75	1091	1251	160
150	1091	1249	158
225	1091	1248	157
300	1088	1246	155
375	1093	1244	151
450	1092	1233	141
525	1093	1223	130
600	1092	1218	126
750	1092	1217	125
900	1090	1207	117
1050	1092	1203	111
1200	1094	1192	98
1350	1094	1192	98
1500	1094	1192	98
1650	1094	1192	98
1800	1094	1192	98
1950	1088	1128	40
2100	1090	1119	29

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: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

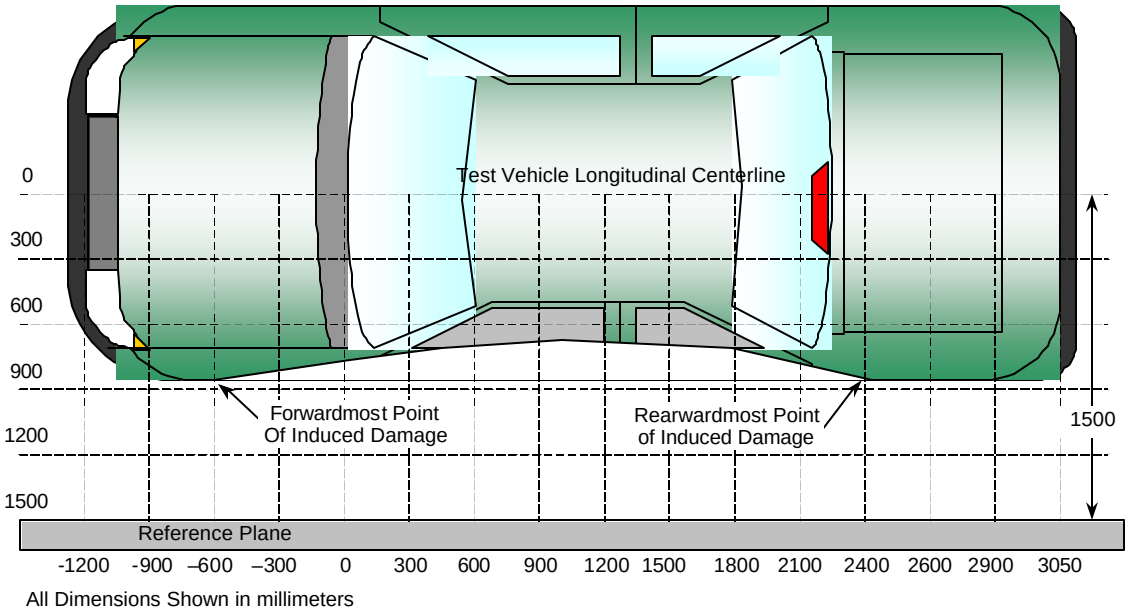


Measurement in mm.

DATA SHEET NO. 9

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 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	350	389	39
2	1389 mm	4	281	372	91
3	675 mm	4	251	517	266
4	-163 mm	4	240	702	462
5	-943 mm	4	242	353	111
6	-1650 mm	4	301	355	54

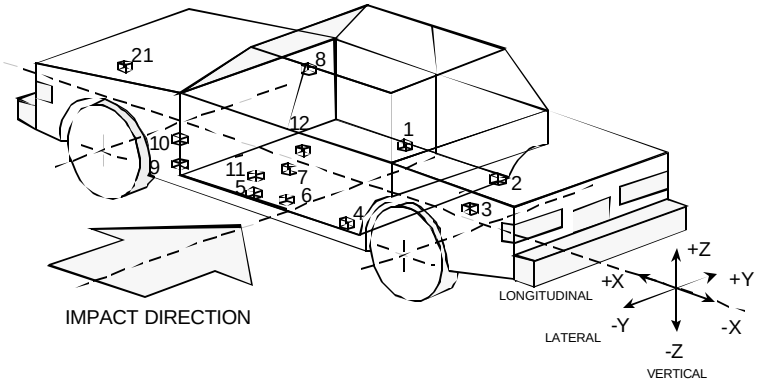
Reference plane is parallel to test vehicle longitudinal centerline.

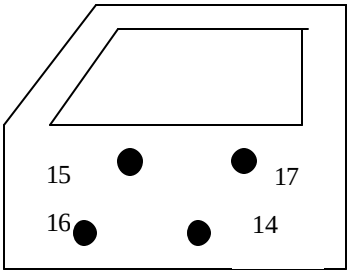
Given dimensions = Reference plane to car body.

DATA SHEET NO. 10

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 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: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 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	1.8	3.0	10.1	0.1	10.1	4.9	13.3
2	Right Side Sill at Rear Seat	2.4	1.4	13.6	0.1	3.0	2.3	13.6
3	Rear Floorpan Above Axle	2.3	4.0	12.2	0.1	4.0	5.4	12.4
4	Left Side Sill at Rear Door			13.0	6.5			
5	Left Side Sill at Front Door			48.5	11.4			
6	Left Lower B-Post			47.3	14.2			
7	Left Mid B-Post							
8	Left Upper B-Post **							
9	Left Lower A-Post			16.4	2.2			
10	Left Mid A-Post			14.5	8.8			
11	Driver Left Seat Track			69.7	14.3			
12	Vehicle CG	3.8	5.5	21.5	4.2	***	***	***
13	Left A- Pillar @ Roof			44.0	2.0			
14	Left Front Door @ Pelvis			125.4	23.5			
15	Left Front Door @ Arm			95.2	22.4			
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	0.8	6.0	8.5	1.5	2.6	4.4	8.6

** = not used to avoid interference with airbags.
***= no valid data after 32 msec

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: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2492	675	227
2	Right Side Sill at Rear Seat	1872	675	244
3	Rear Floorpan Above Axle	1097	10	544
4	Left Side Sill at Rear Door	1488	-675	236
5	Left Side Sill at Front Door	2724	-675	219
6	Left Lower B-Post	2178	-657	332
7	Left Mid B-Post	*	*	*
8	Left Upper B-Post	2129	-516	1384
9	Left Lower A-Post	3267	-704	273
10	Left Mid A-Post	3317	-788	903
11	Driver Left Seat Track	2333	-549	339
12	Vehicle CG	2817	90	339
13	Left A-Pillar @ Roof	2707	-567	1275
14	Left Front Door @ Pelvis	2523	-764	658
15	Left Front Door @ Arm	2708	-757	832
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	4372	0	213

* = Not used to avoid interference with the restraint system

Sign Convention X – Rear Bumper (+ forward)

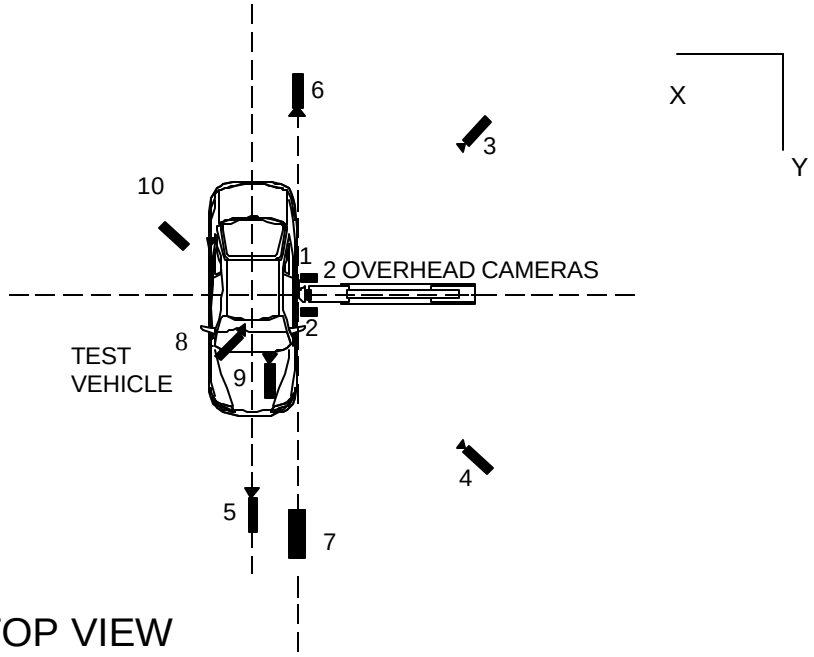
Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ up)

DATA SHEET NO. 11

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: September 19, 2002



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	800	0	5000	8	1058
2	Overhead Close-up	0	0	5000	13	1005
3	Left Side 45 deg. Rearward Pole View	-2480	-5480	1590	50	1020
4	Left Side 45 deg. Forward Pole View	-3540	4400	1560	50	1005
5	Real Time					
6	Left Side Rear Pole View	390	-8690	1630	25	1005
7	Front Ground Level Vehicle/Pole Impact	300	9180	1690	25	957
8	Test Vehicle Onboard Driver Side View				13	506
9	Test Vehicle Onboard Driver Front View				13	498
10	Test Vehicle Onboard Driver ¾ Rear View				13	518

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Up from Ground

APPENDIX A

PHOTOGRAPHS

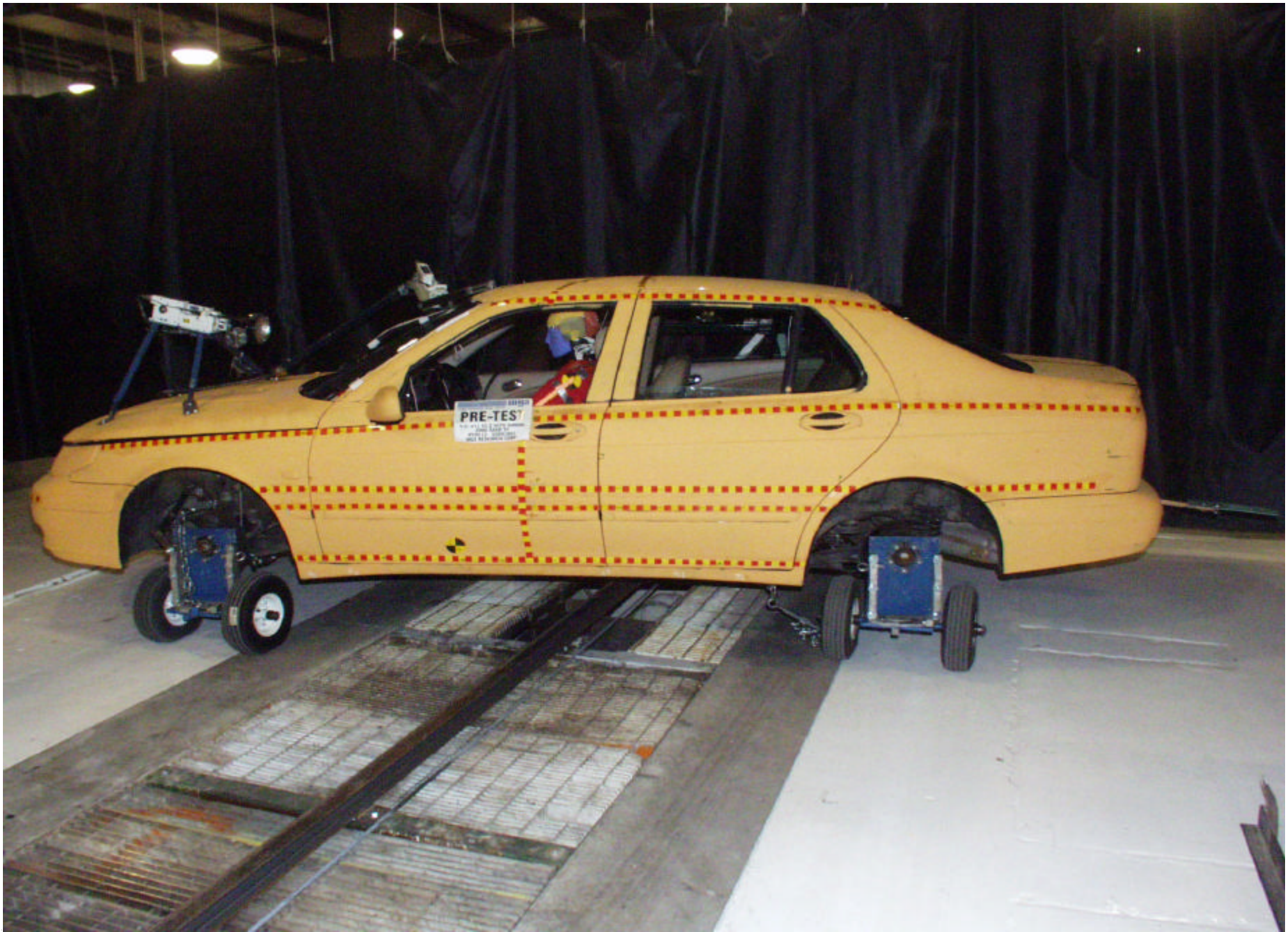
TABLE OF PHOTOGRAPHS

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 Left ¾ Front View of Test Vehicle

Post-Test Left ¾ Front View of Test Vehicle

Pre-Test Left ¾ Rear View of Test Vehicle

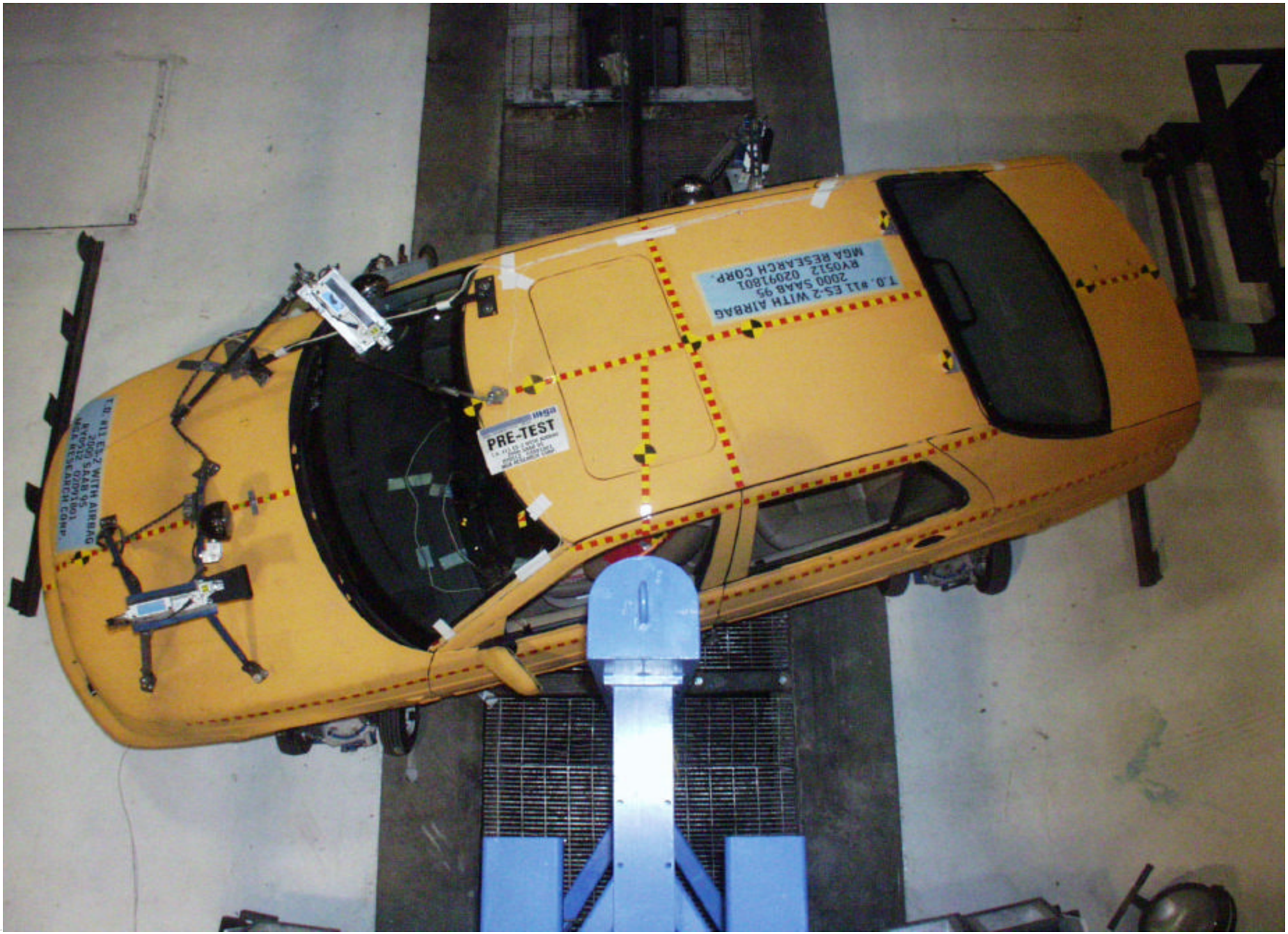
Post-Test Left ¾ Rear View of Test Vehicle

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 Seat Position

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

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 Shoulder and Door Top View

Post-Test Driver Dummy Shoulder and Door Top View

Post-Test Driver Dummy Contact

Post-Test Driver Dummy Lower Body Contact

Post-Test Driver Dummy Head Contact

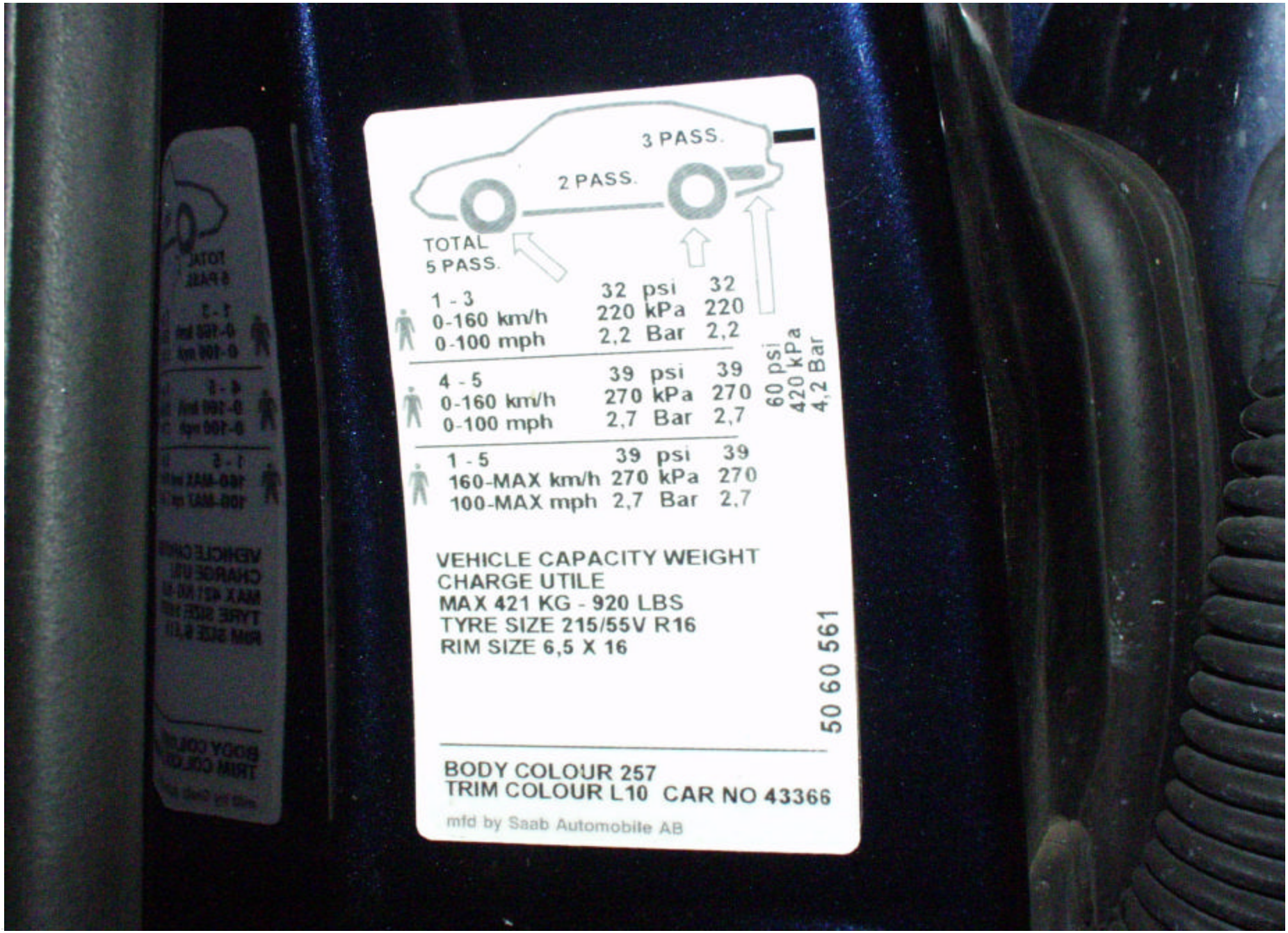
Pre-Test Impact Point on Vehicle

Post-Test Impact Point on Vehicle

Post-Test Impact Point on Vehicle (Close-up)

Impact

Vehicle Certification Label



Tire Placard

Left Front Attitude Point

Right Front Attitude Point

Left Rear Attitude Point

Right Rear Attitude Point

APPENDIX B

DUMMY AND VEHICLE RESPONSE DATA TRACES

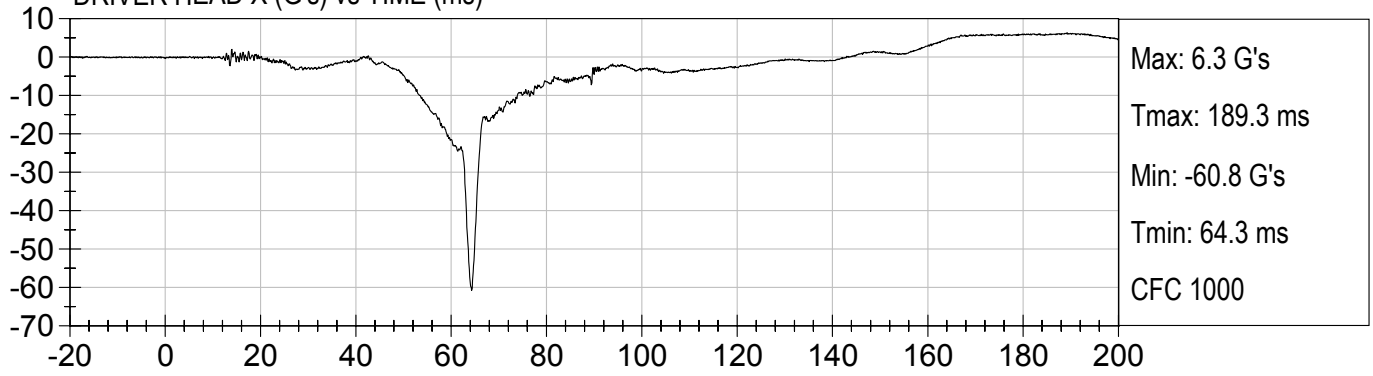
TABLE OF DATA PLOTS

* = No Valid Data after approximately 32 msec.

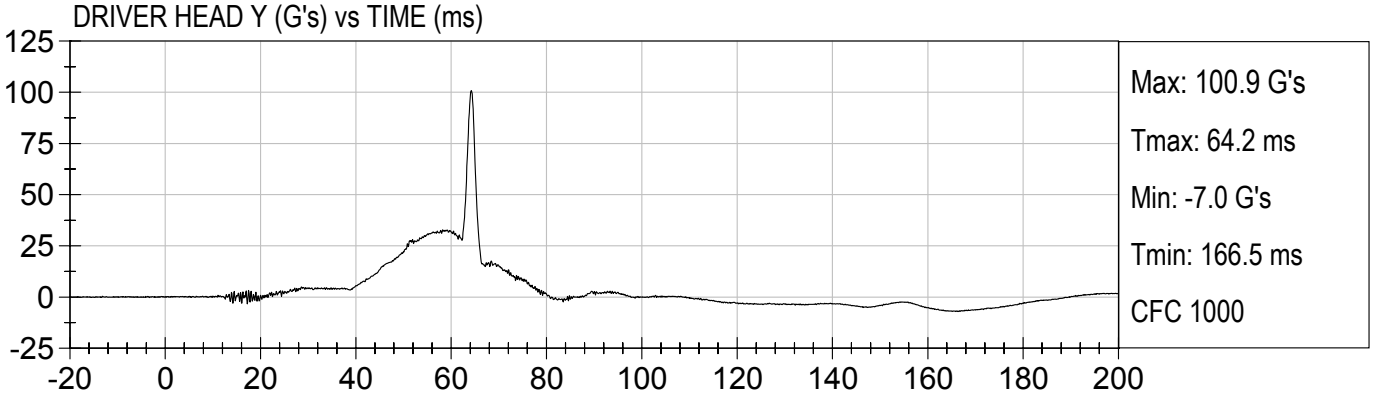
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

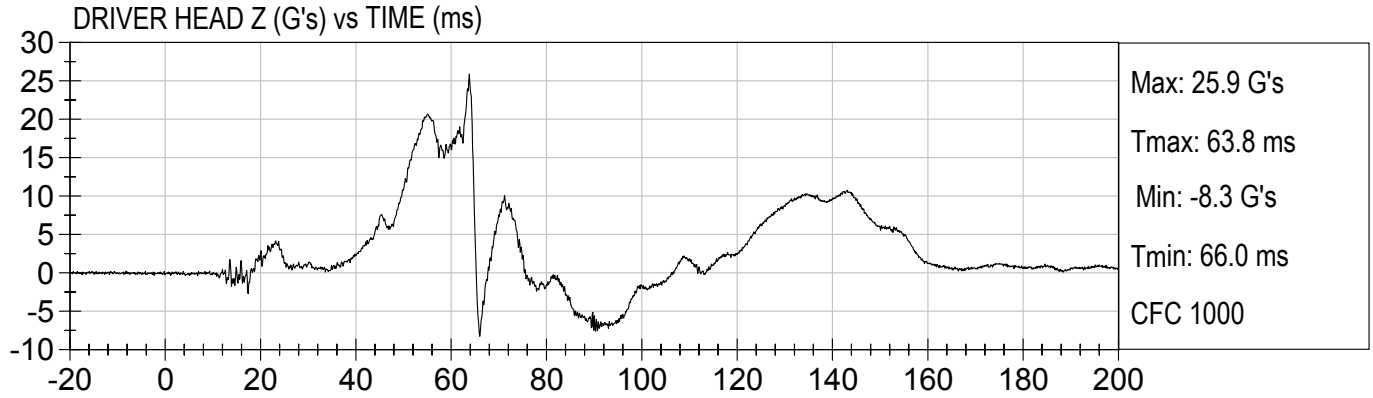
DRIVER HEAD X (G's) vs TIME (ms)



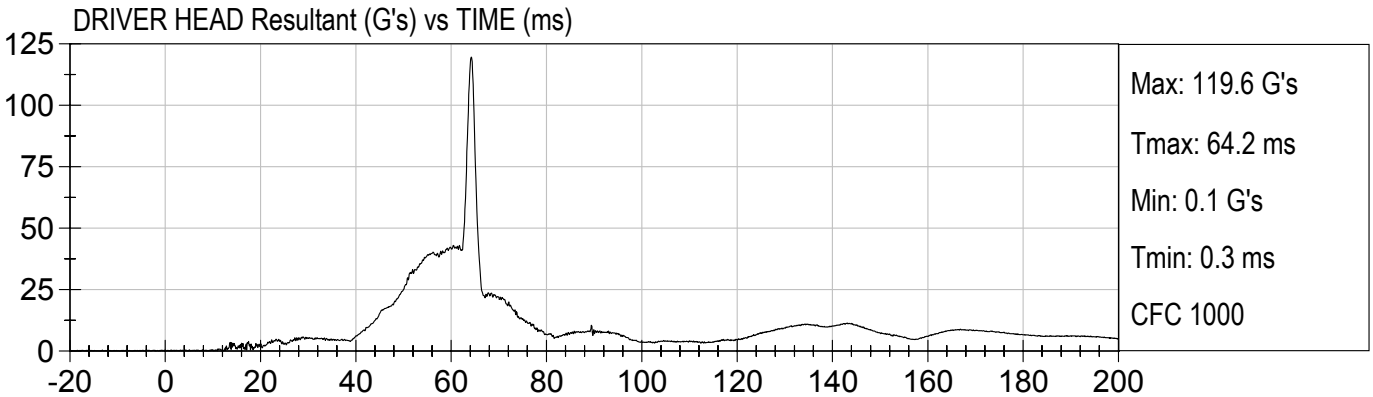
DRIVER HEAD Y (G's) vs TIME (ms)

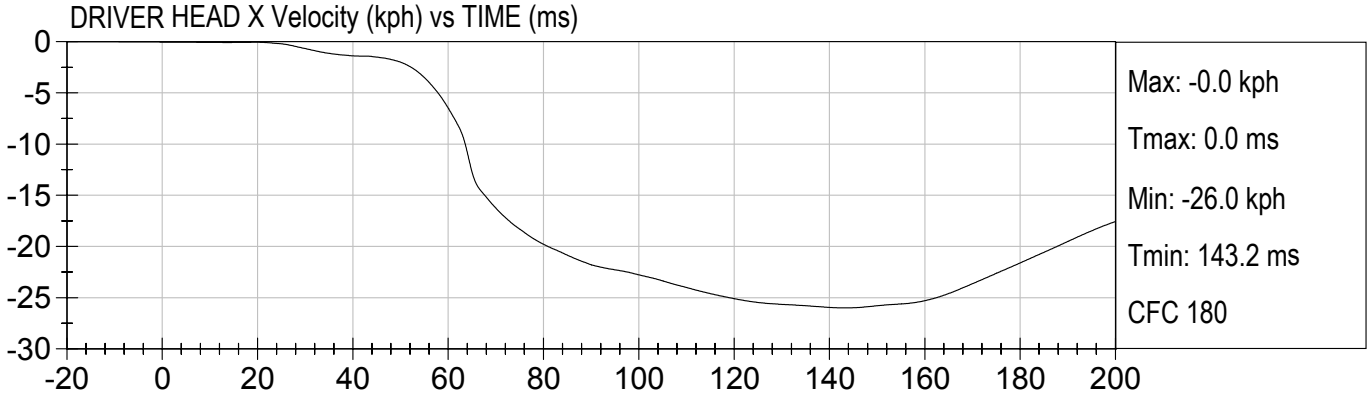


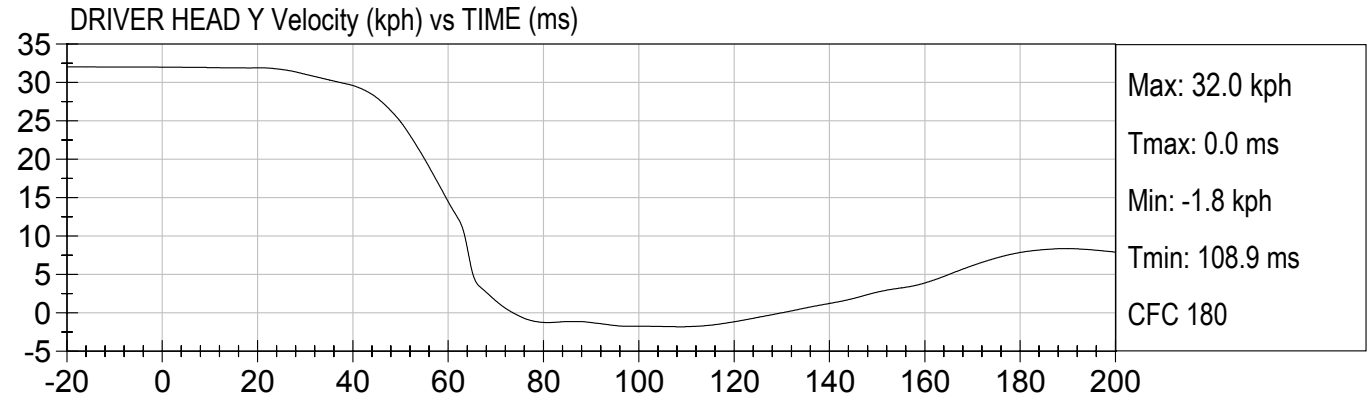
DRIVER HEAD Z (G's) vs TIME (ms)

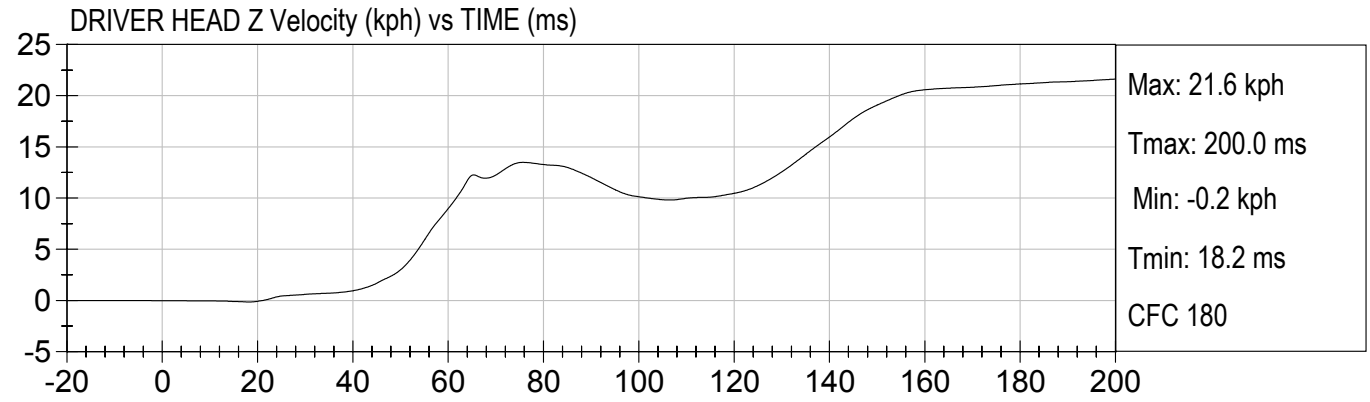


DRIVER HEAD Resultant (G's) vs TIME (ms)




DRIVER HEAD X Velocity (kph) vs TIME (ms)
0
-5
-10
-15
-20
-25
-30
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 0.0 ms
Min: -26.0 kph
Tmin: 143.2 ms
CFC 180

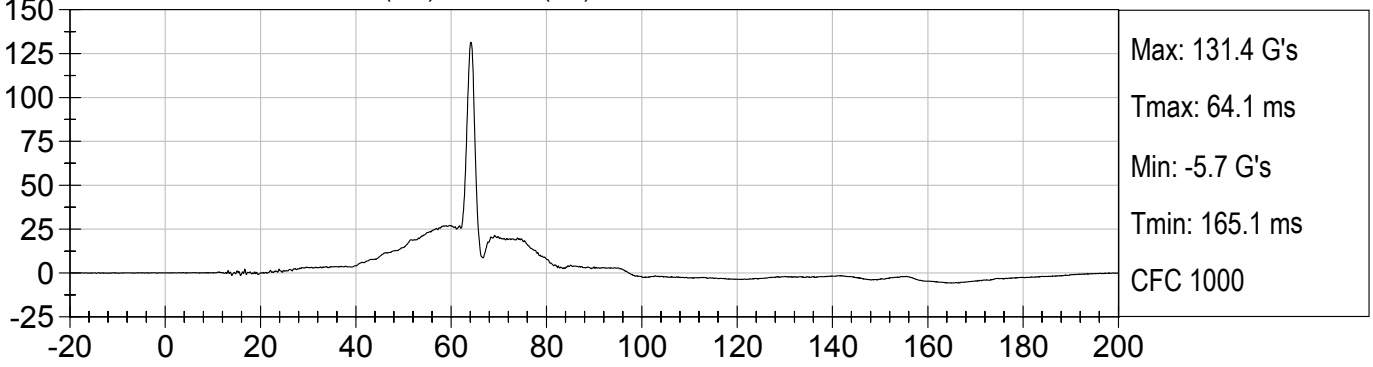

DRIVER HEAD Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 0.0 ms
Min: -1.8 kph
Tmin: 108.9 ms
CFC 180


DRIVER HEAD Z Velocity (kph) vs TIME (ms)
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 21.6 kph
Tmax: 200.0 ms
Min: -0.2 kph
Tmin: 18.2 ms
CFC 180

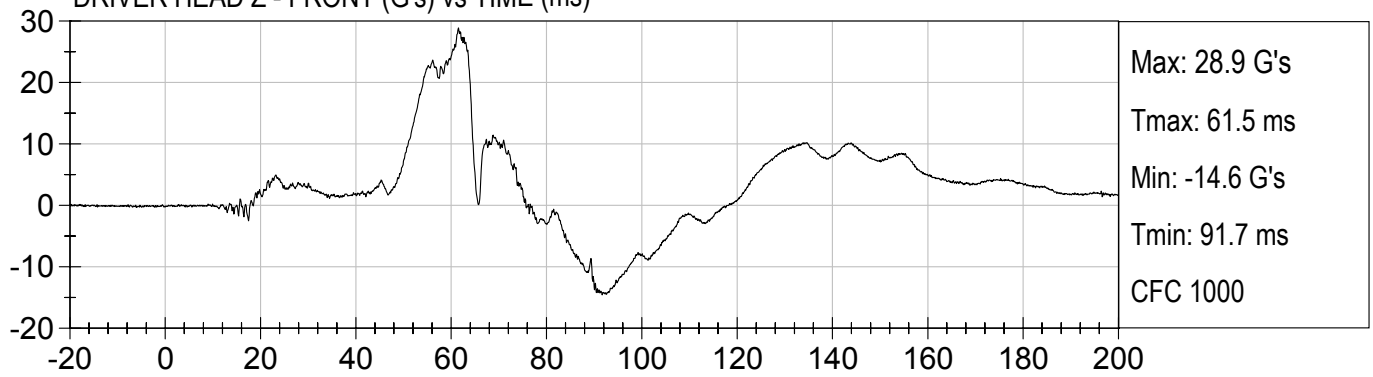
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

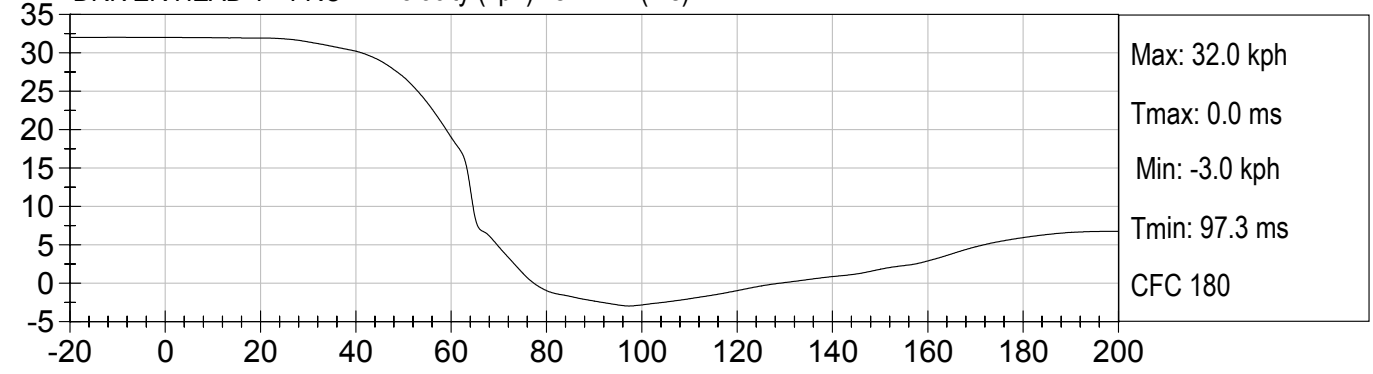
DRIVER HEAD Y - FRONT (G's) vs TIME (ms)



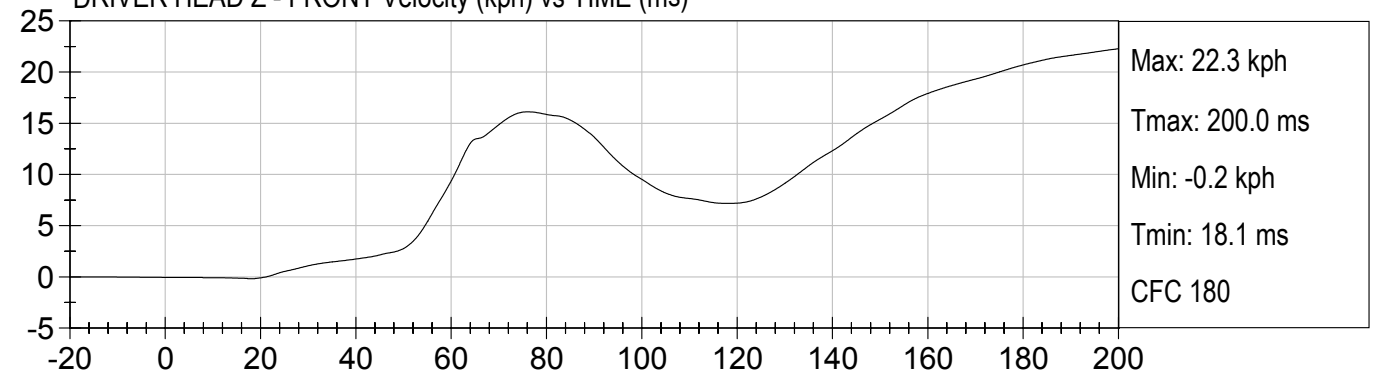
DRIVER HEAD Z - FRONT (G's) vs TIME (ms)



DRIVER HEAD Y - FRONT Velocity (kph) vs TIME (ms)



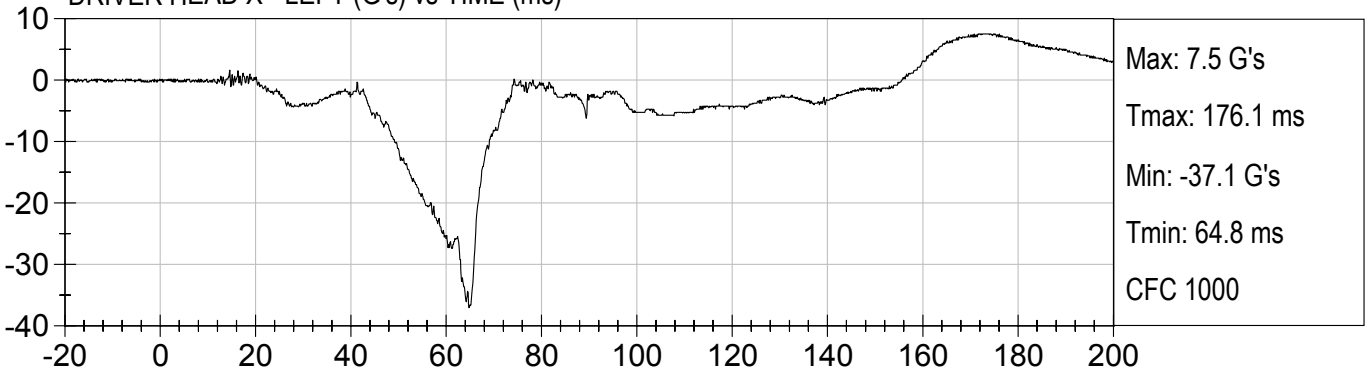
DRIVER HEAD Z - FRONT Velocity (kph) vs TIME (ms)



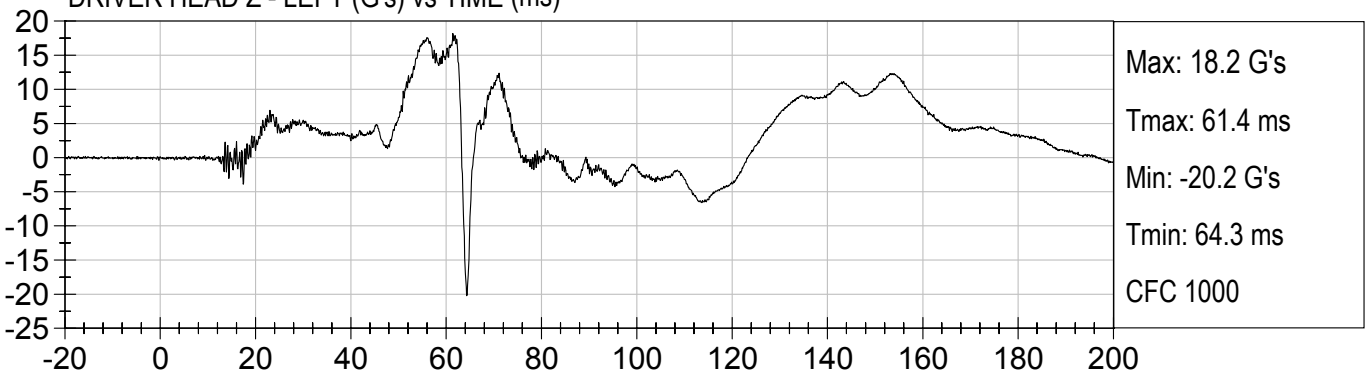
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

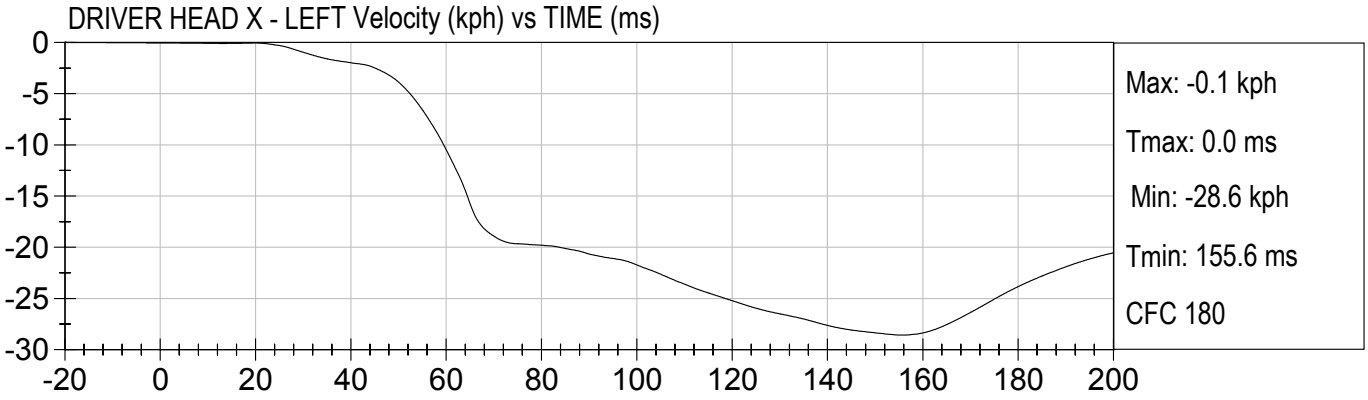
DRIVER HEAD X - LEFT (G's) vs TIME (ms)



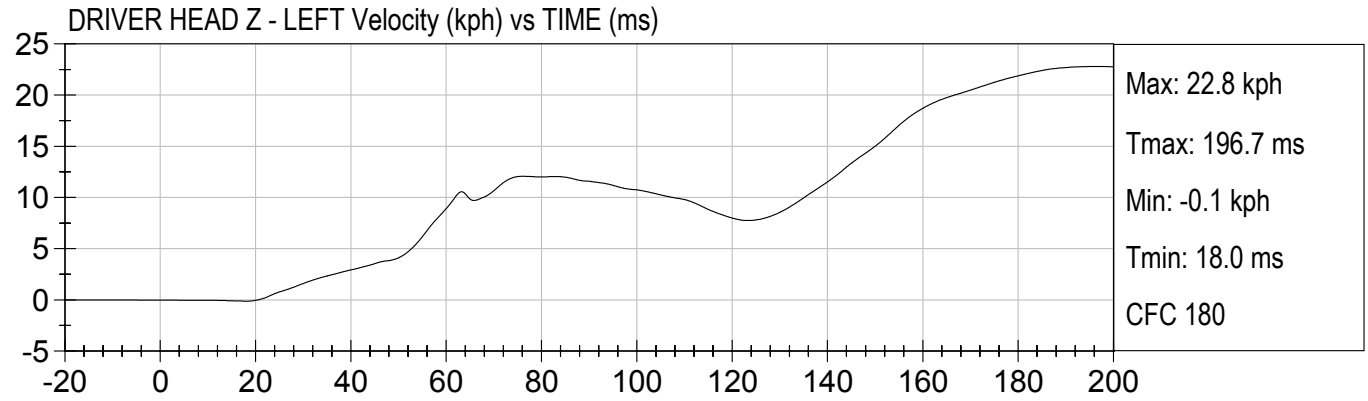
DRIVER HEAD Z - LEFT (G's) vs TIME (ms)



DRIVER HEAD X - LEFT Velocity (kph) vs TIME (ms)

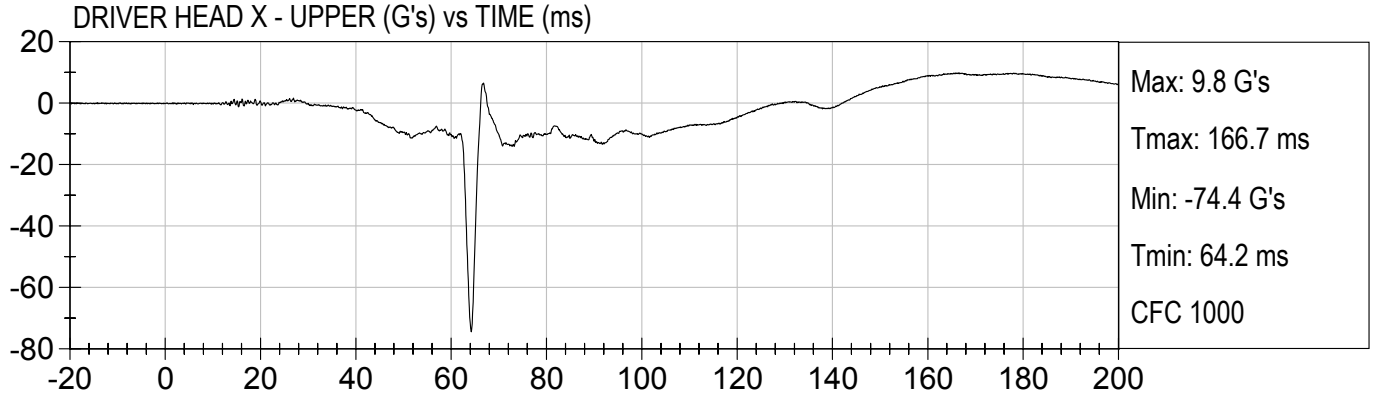


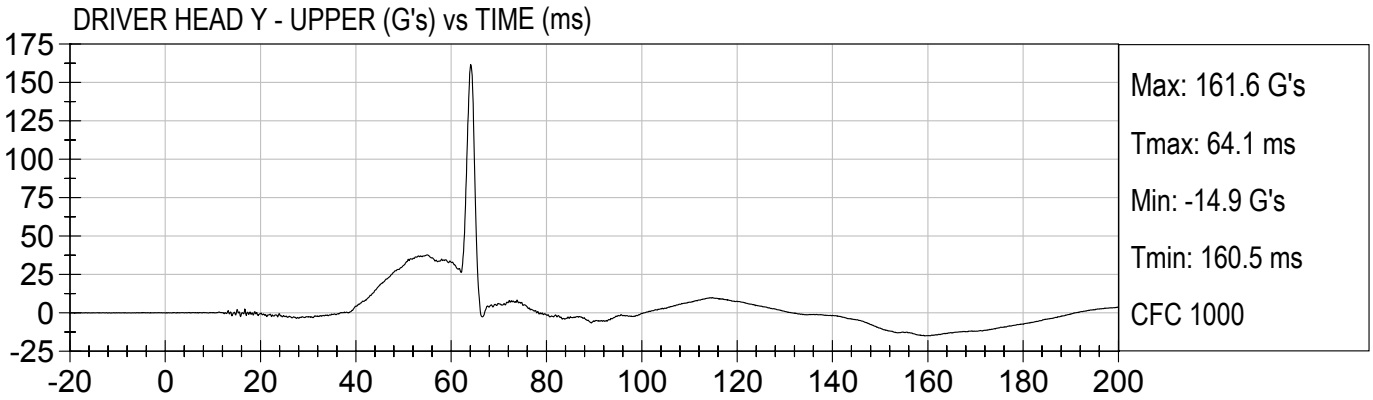
DRIVER HEAD Z - LEFT Velocity (kph) vs TIME (ms)

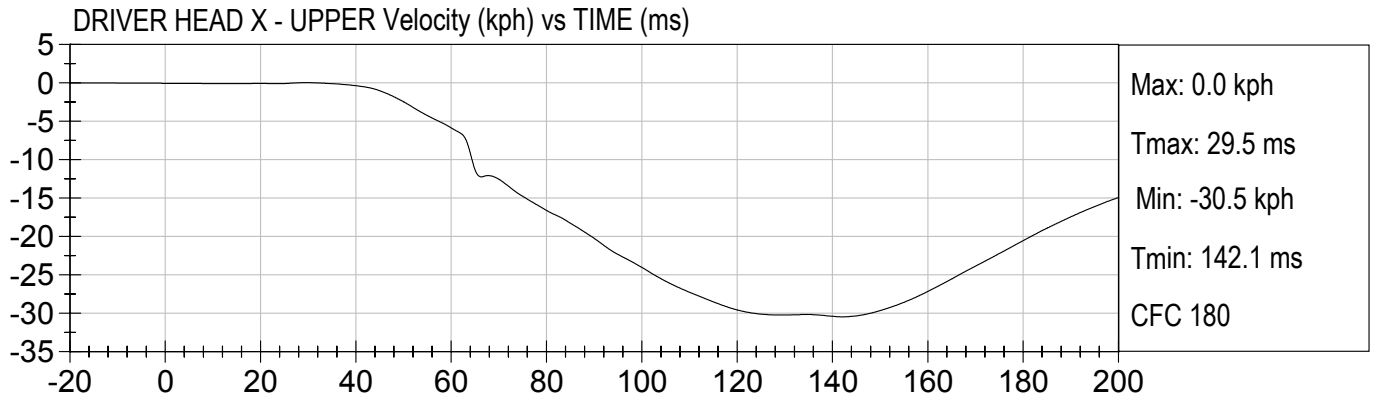


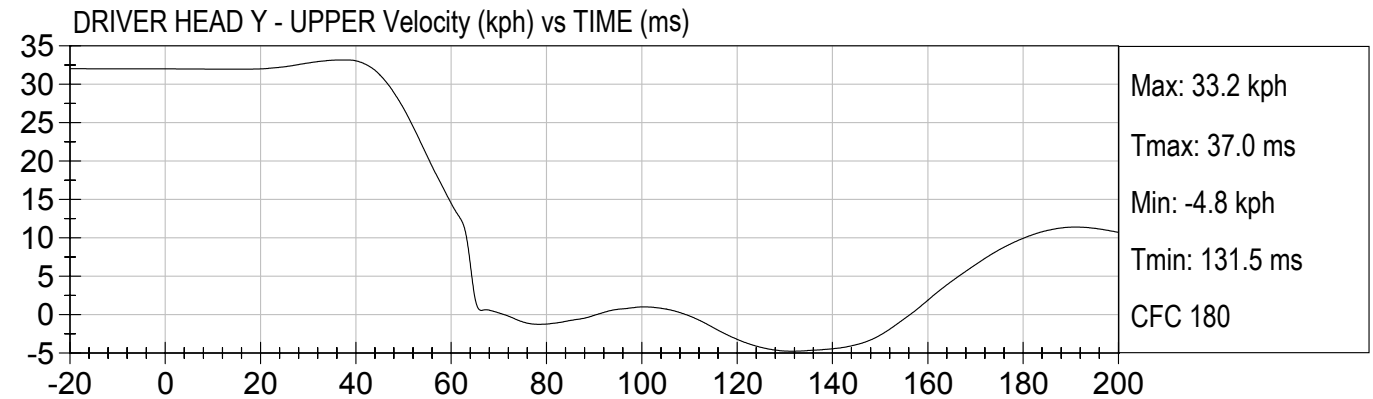
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)





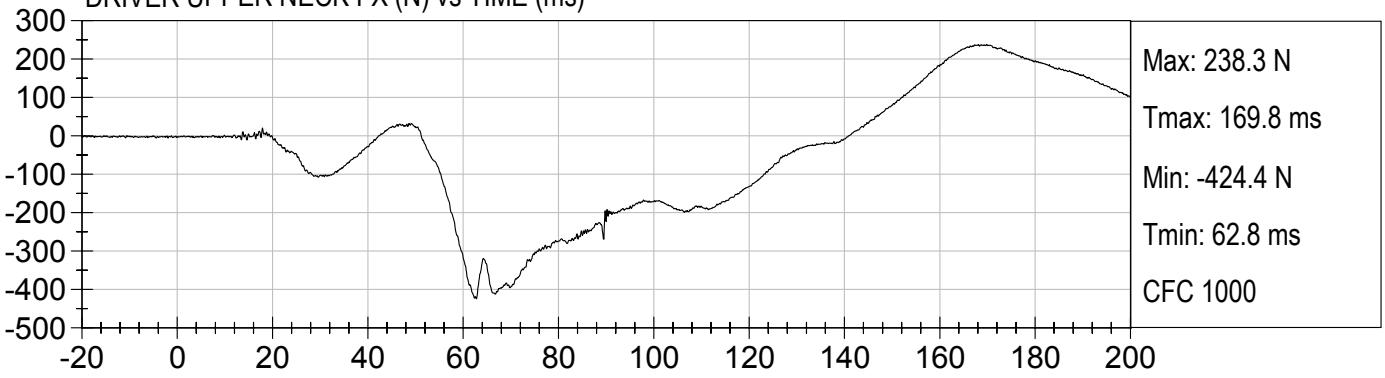




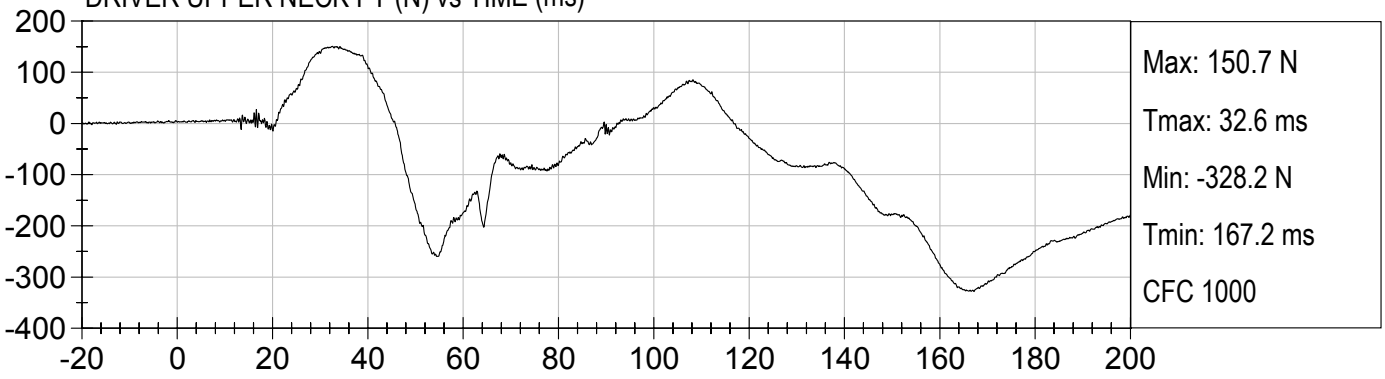
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

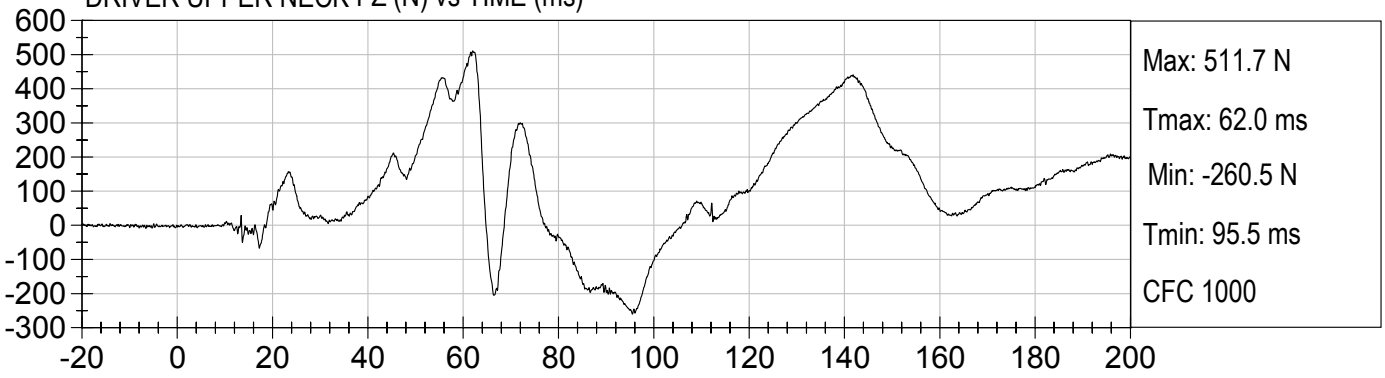
DRIVER UPPER NECK FX (N) vs TIME (ms)



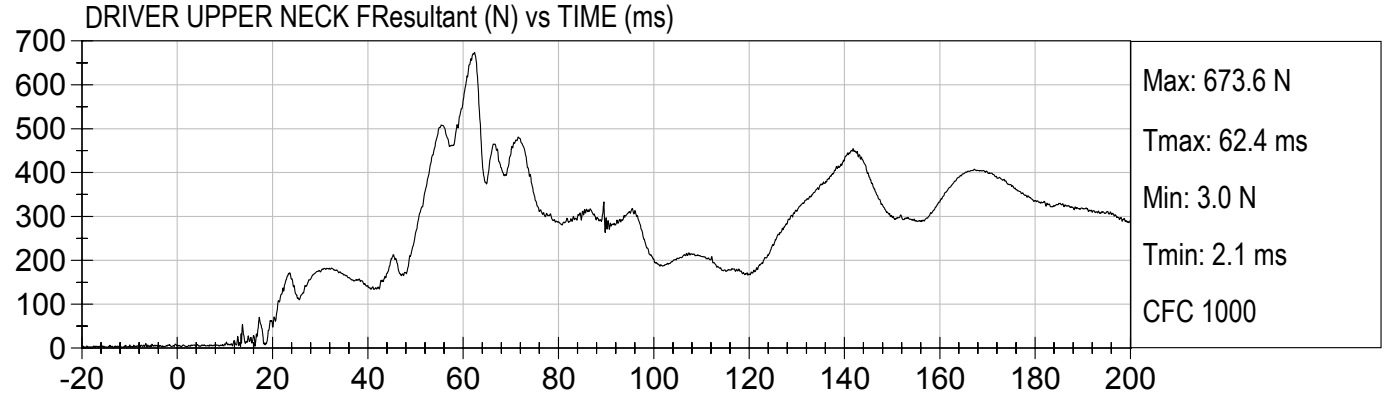
DRIVER UPPER NECK FY (N) vs TIME (ms)



DRIVER UPPER NECK FZ (N) vs TIME (ms)



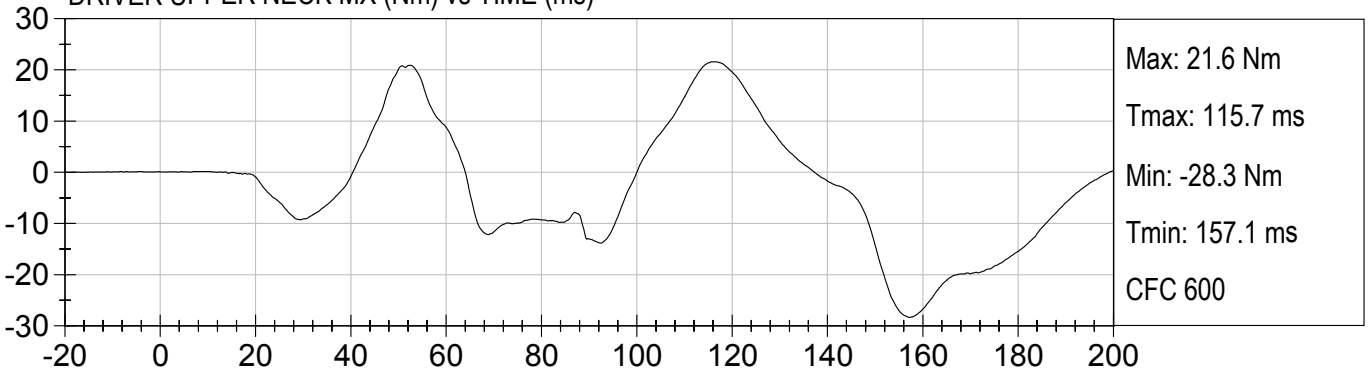
DRIVER UPPER NECK FResultant (N) vs TIME (ms)



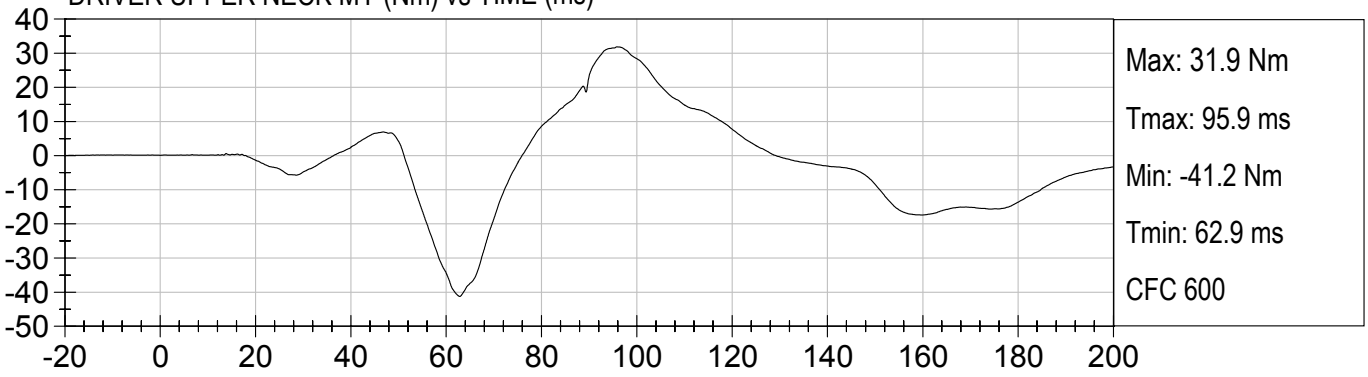
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

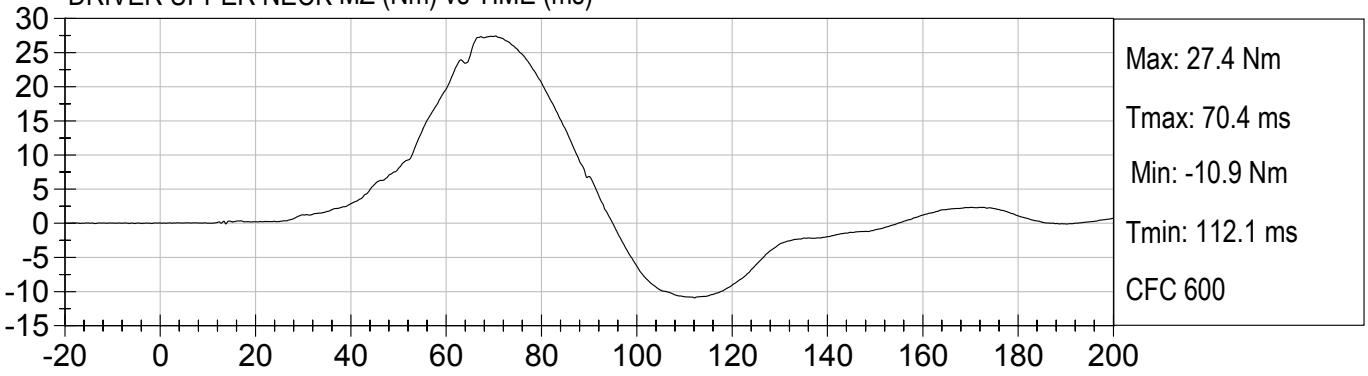
DRIVER UPPER NECK MX (Nm) vs TIME (ms)



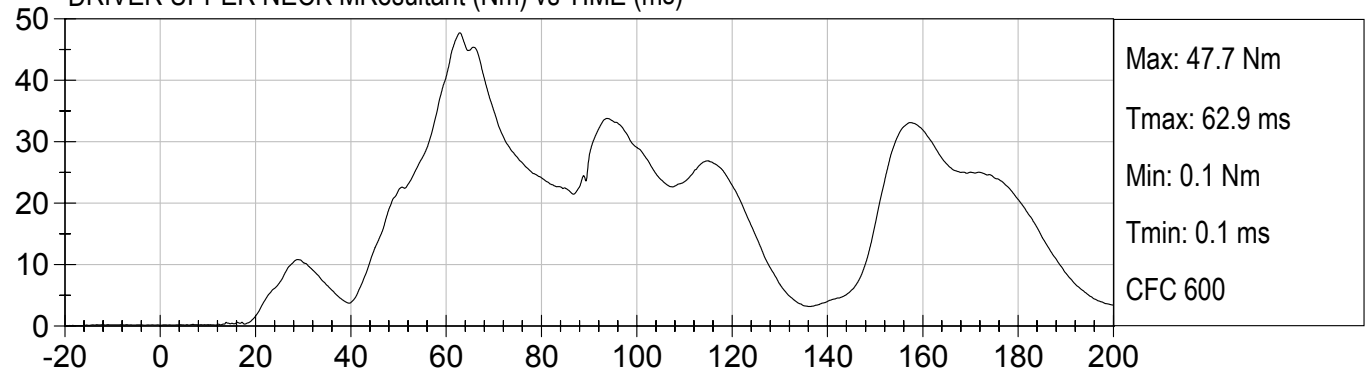
DRIVER UPPER NECK MY (Nm) vs TIME (ms)



DRIVER UPPER NECK MZ (Nm) vs TIME (ms)

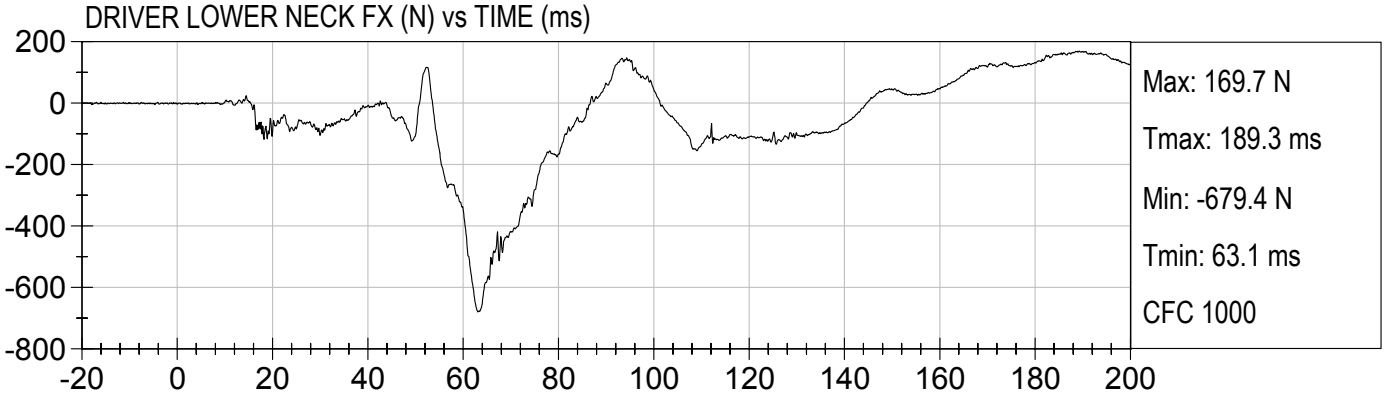


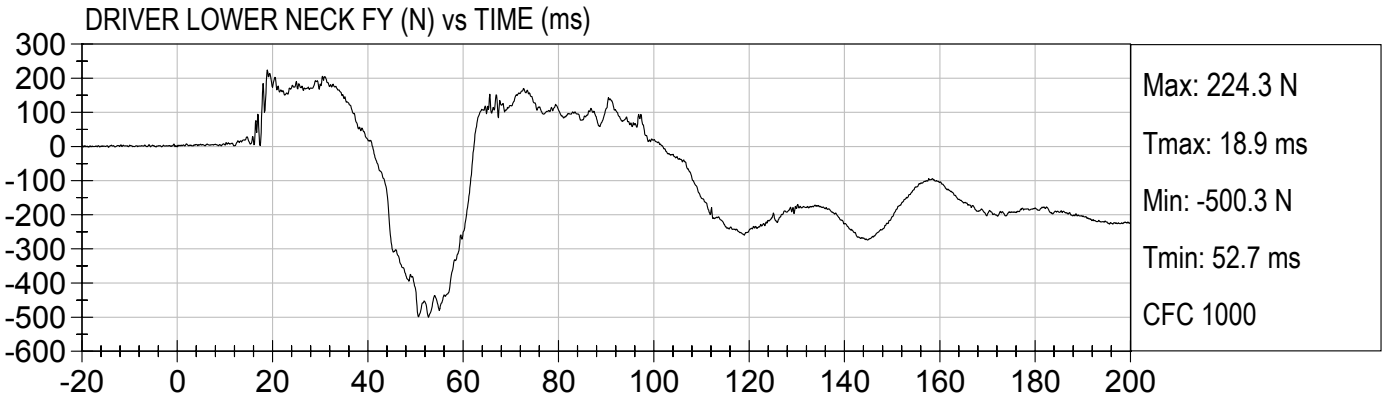
DRIVER UPPER NECK MResultant (Nm) vs TIME (ms)

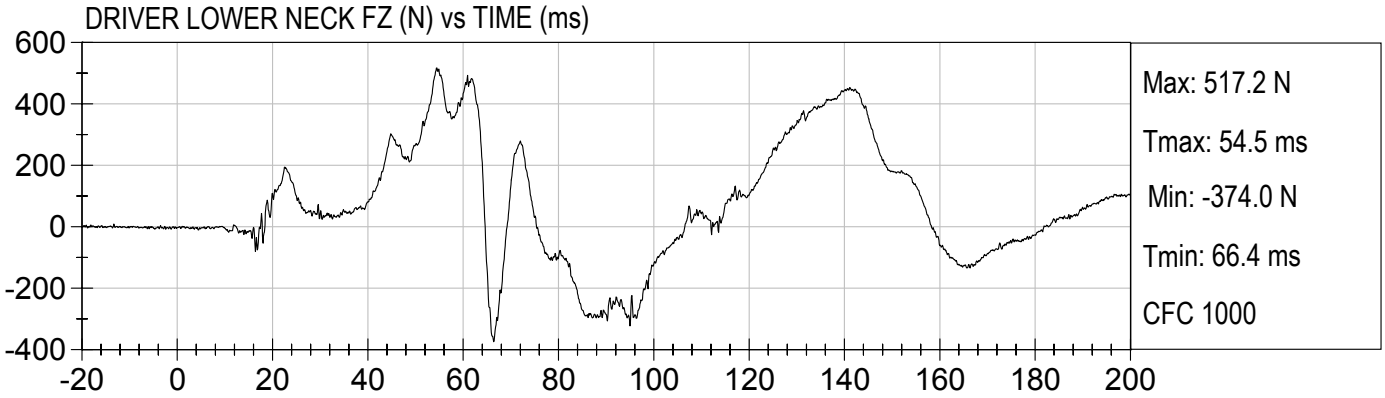


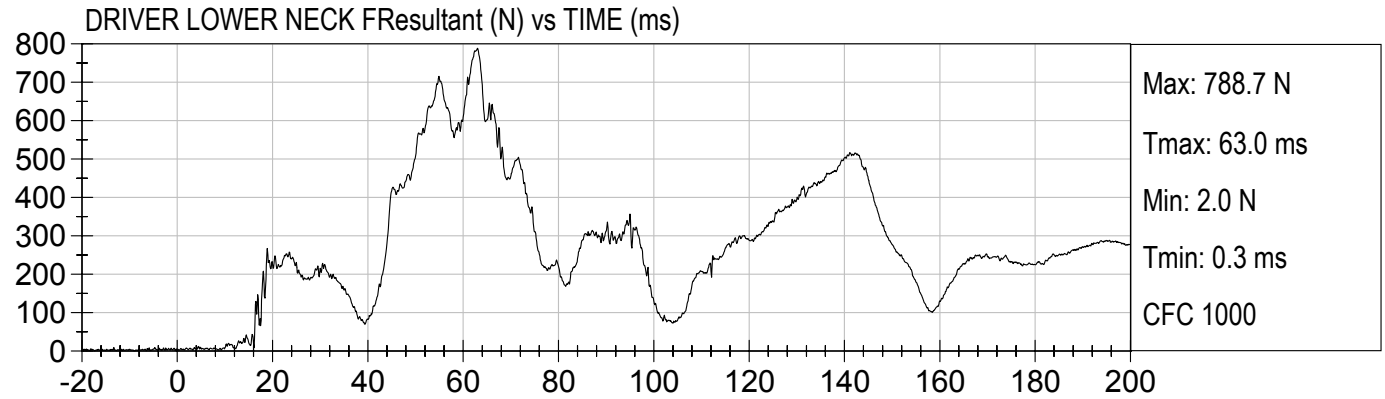
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)





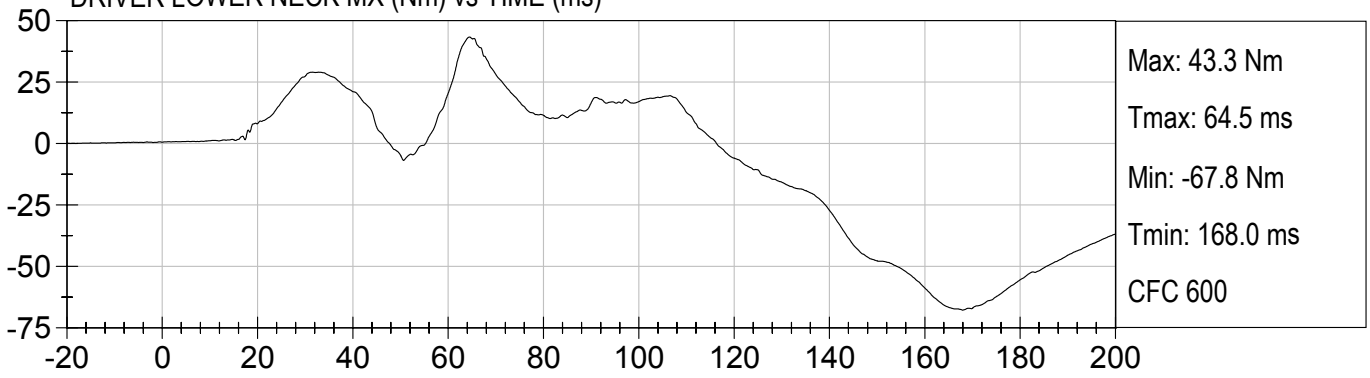




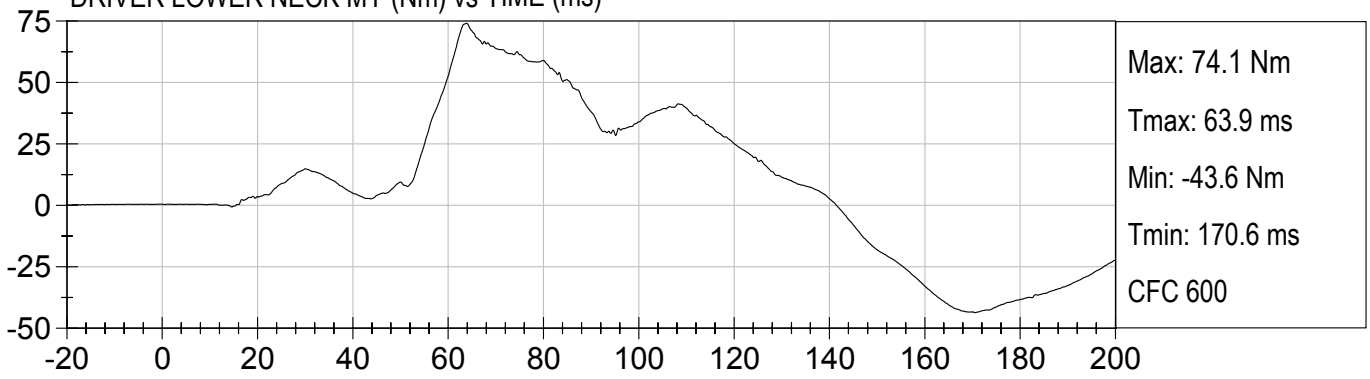
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

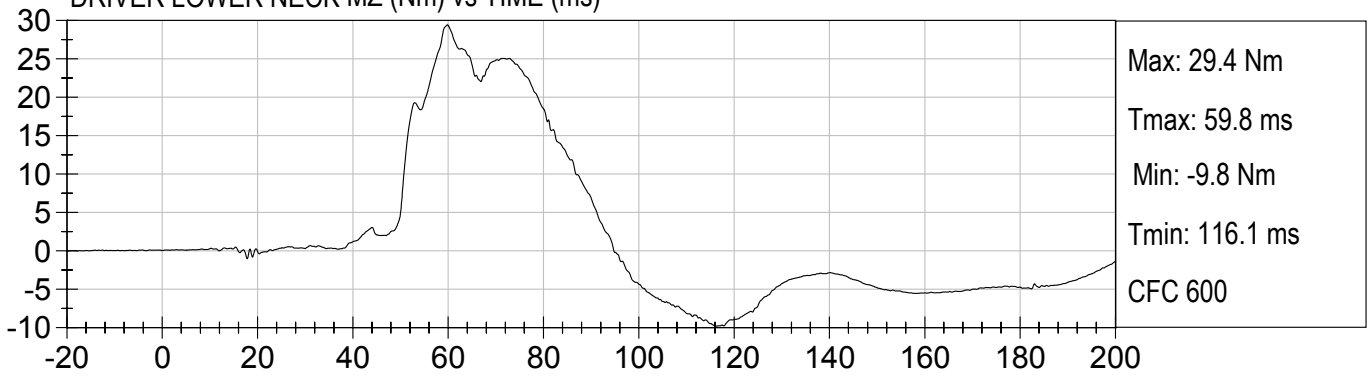
DRIVER LOWER NECK MX (Nm) vs TIME (ms)



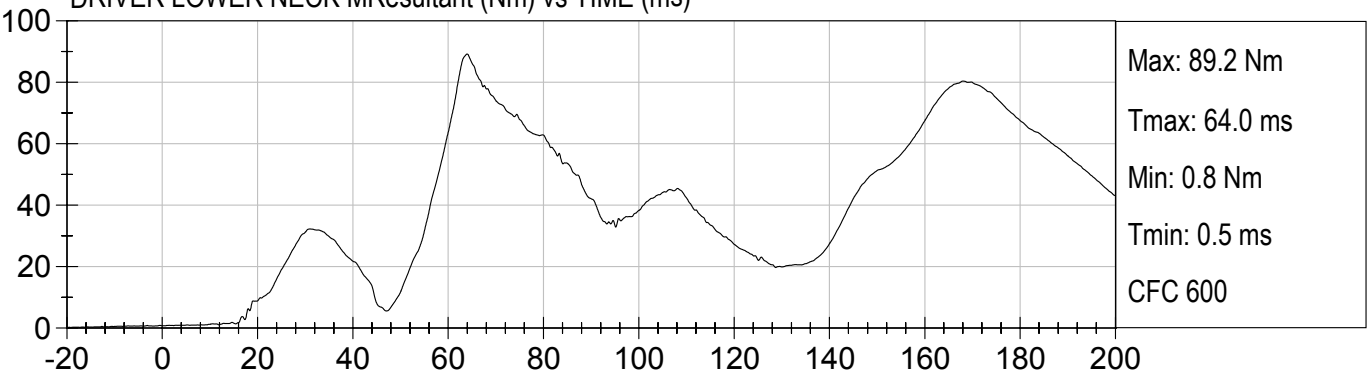
DRIVER LOWER NECK MY (Nm) vs TIME (ms)



DRIVER LOWER NECK MZ (Nm) vs TIME (ms)

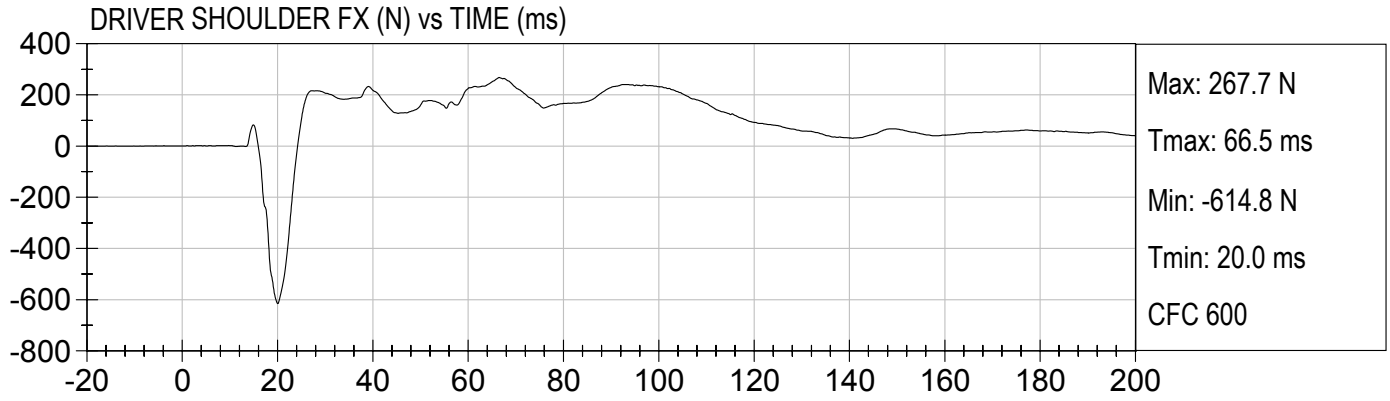


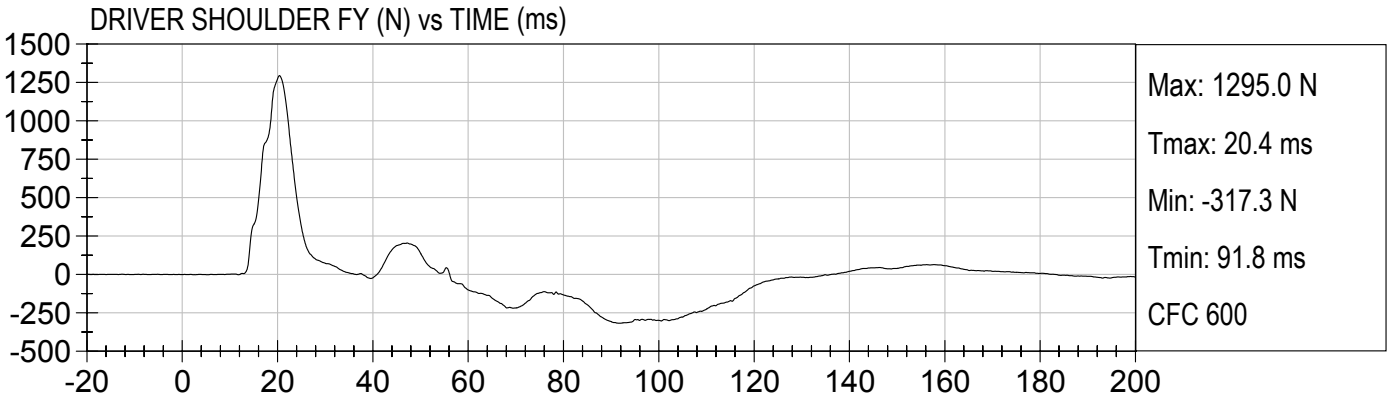
DRIVER LOWER NECK MResultant (Nm) vs TIME (ms)

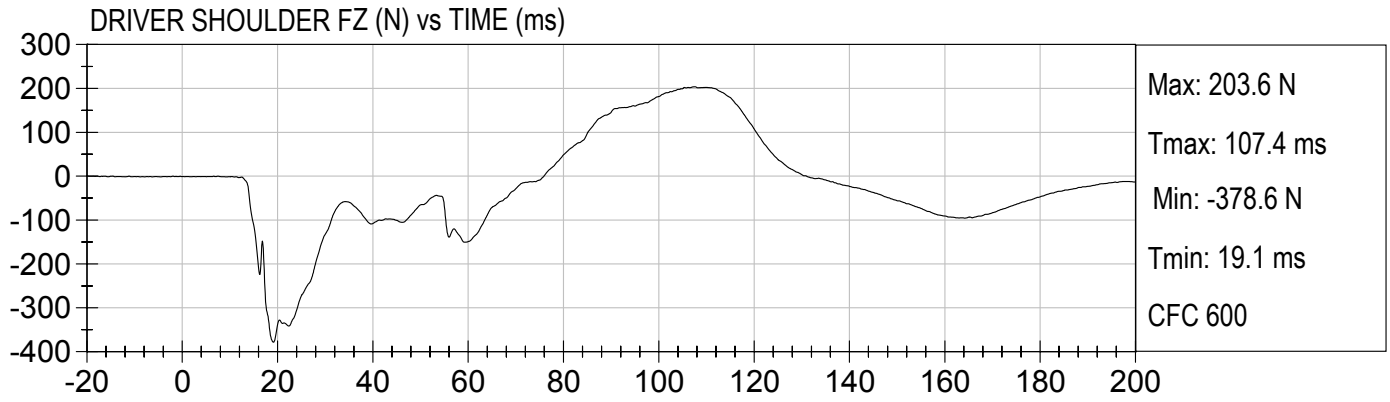


20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)



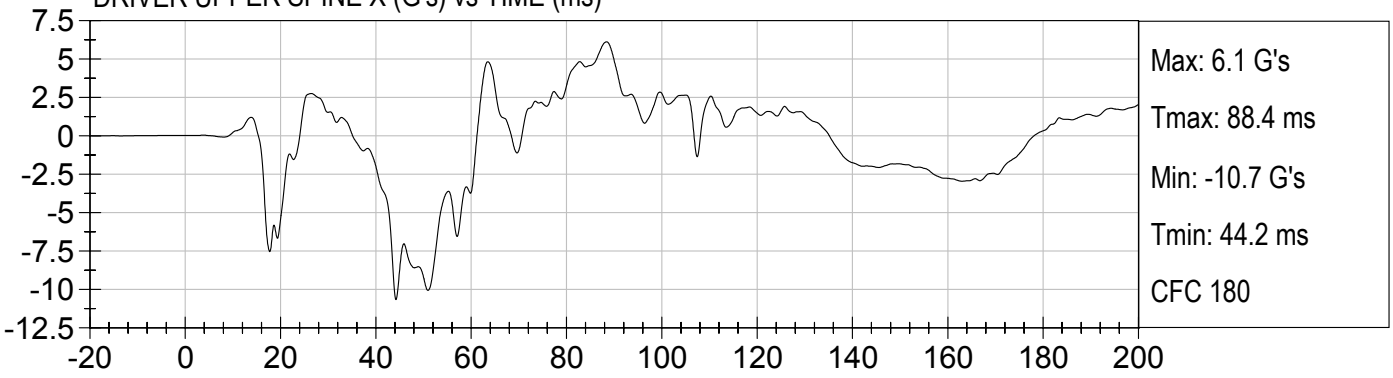




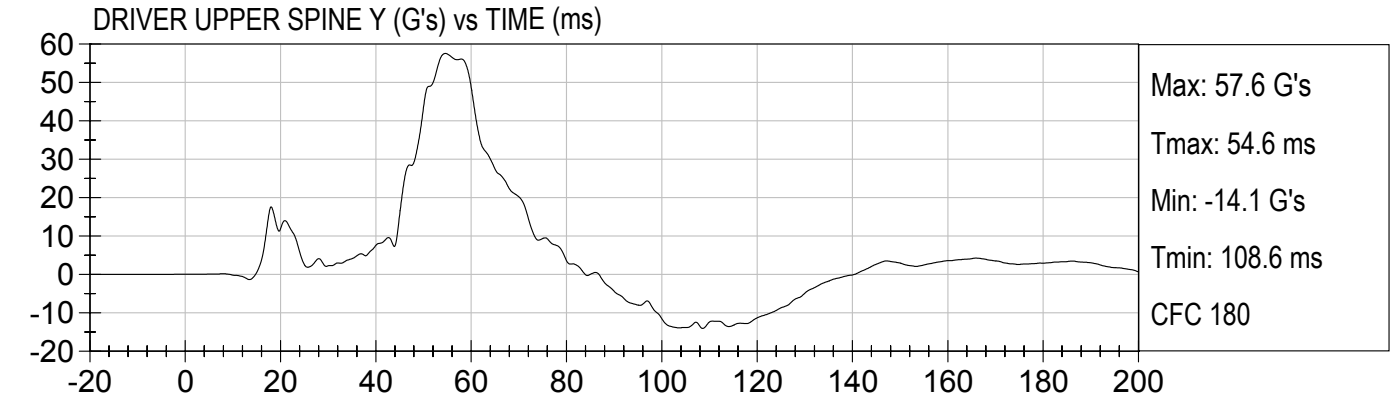
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

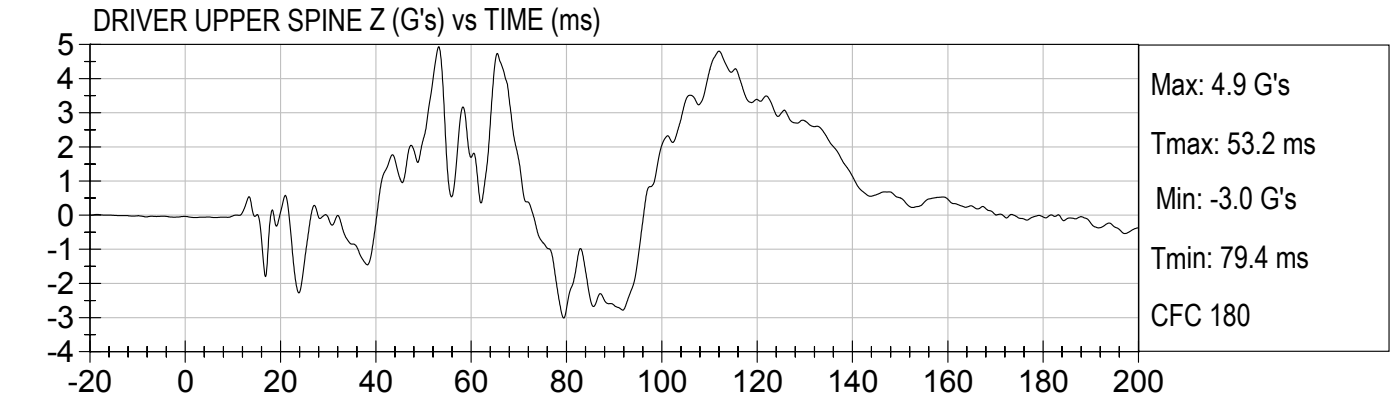
DRIVER UPPER SPINE X (G's) vs TIME (ms)



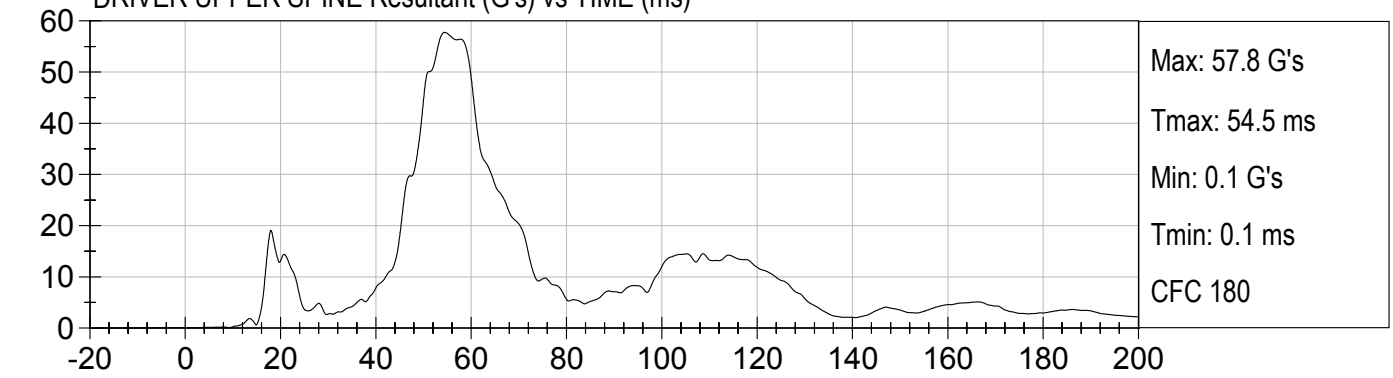
DRIVER UPPER SPINE Y (G's) vs TIME (ms)

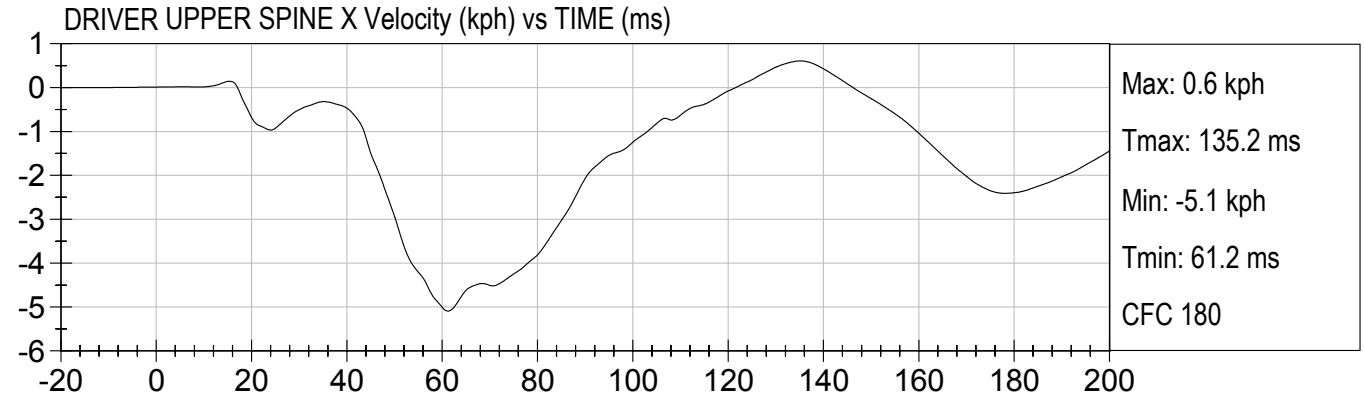


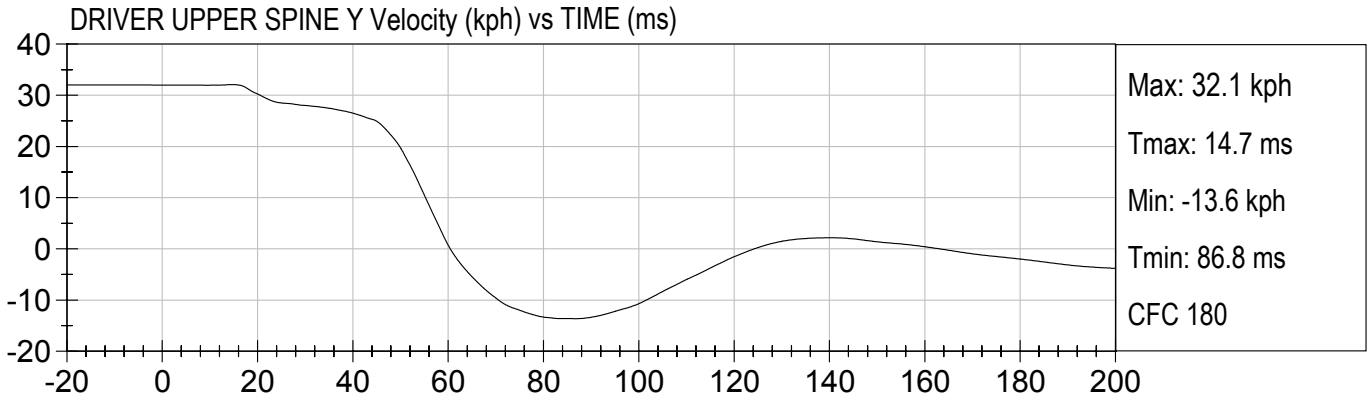
DRIVER UPPER SPINE Z (G's) vs TIME (ms)

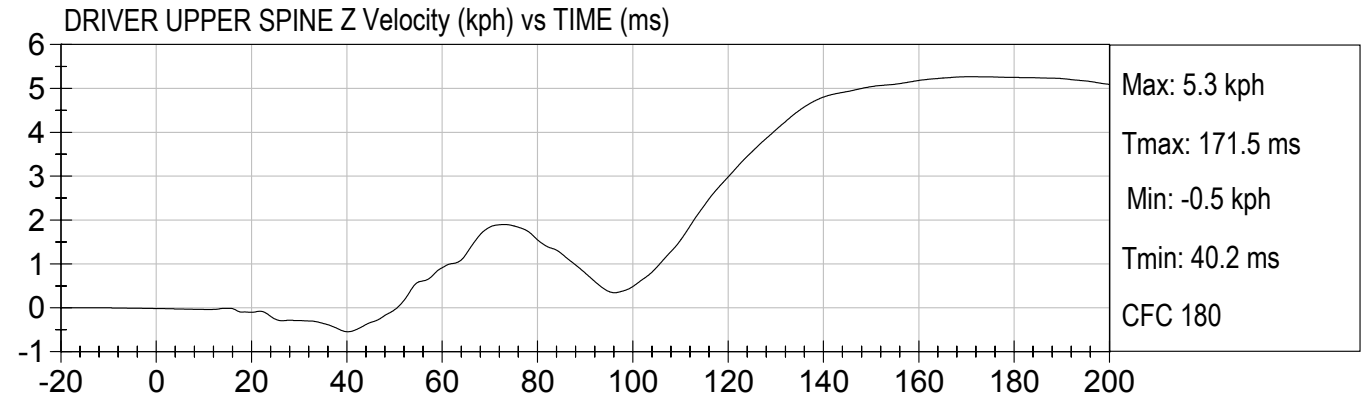


DRIVER UPPER SPINE Resultant (G's) vs TIME (ms)




DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.6 kph
Tmax: 135.2 ms
Min: -5.1 kph
Tmin: 61.2 ms
CFC 180

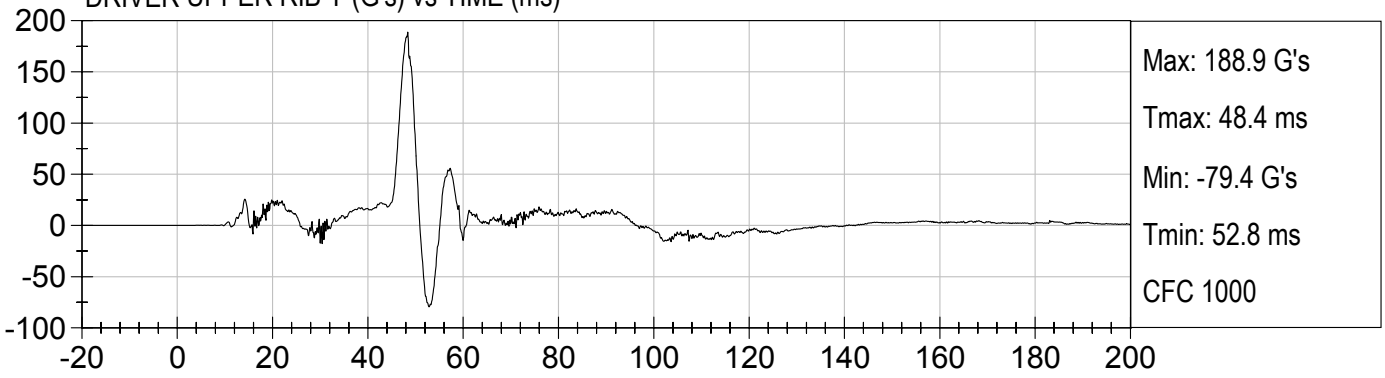

DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.1 kph
Tmax: 14.7 ms
Min: -13.6 kph
Tmin: 86.8 ms
CFC 180


DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)
6
5
4
3
2
1
0
-1
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 5.3 kph
Tmax: 171.5 ms
Min: -0.5 kph
Tmin: 40.2 ms
CFC 180

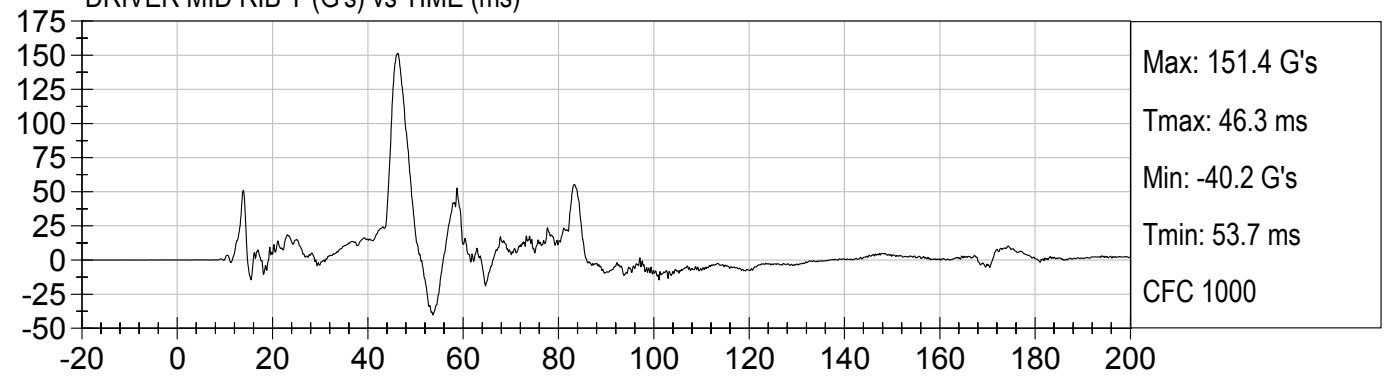
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

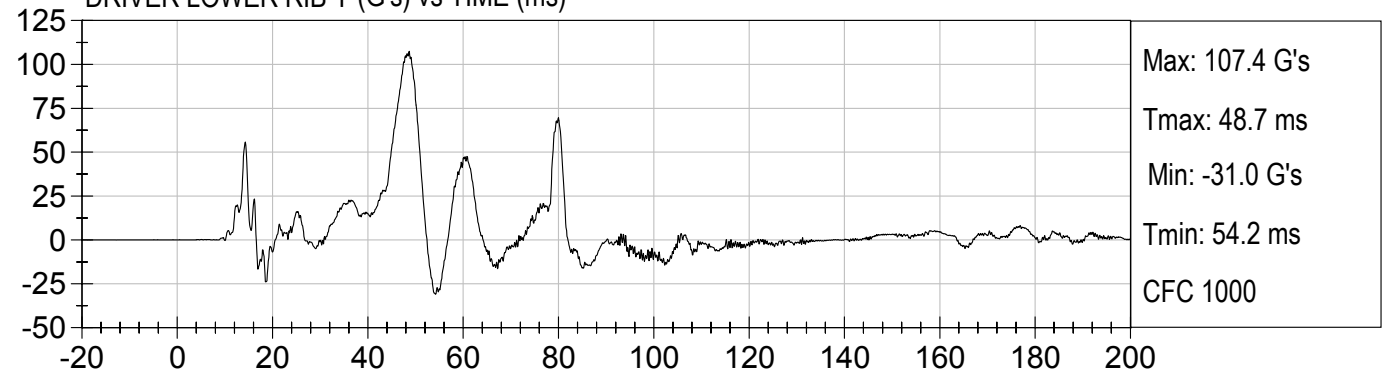
DRIVER UPPER RIB Y (G's) vs TIME (ms)



DRIVER MID RIB Y (G's) vs TIME (ms)



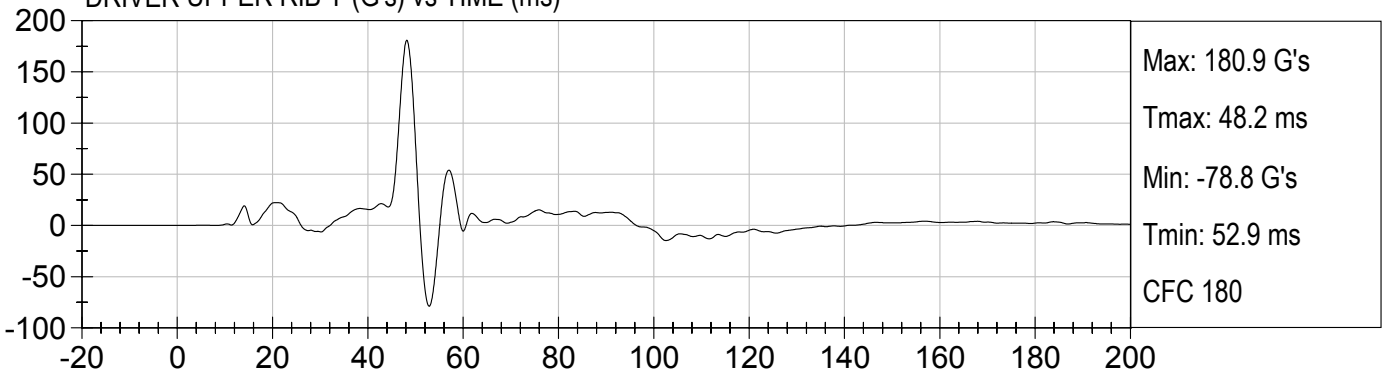
DRIVER LOWER RIB Y (G's) vs TIME (ms)



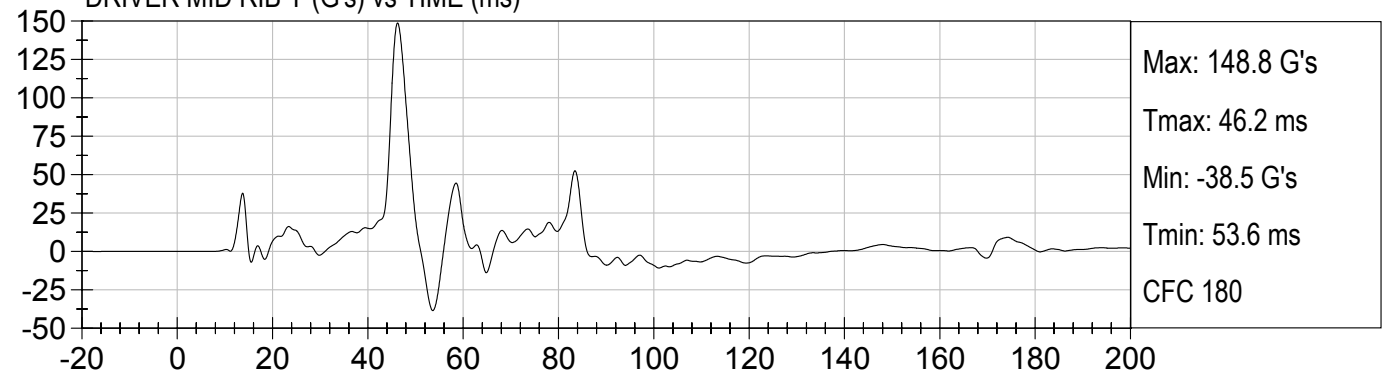
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

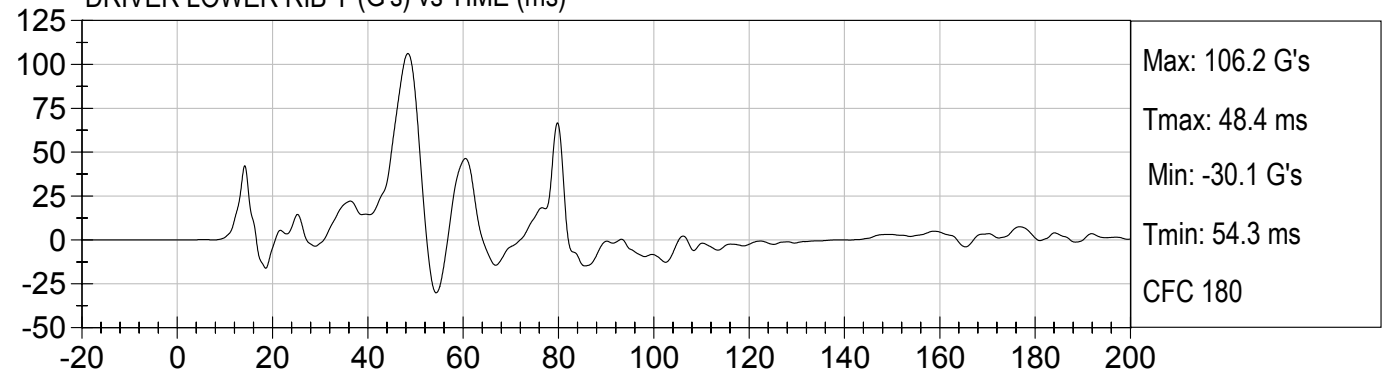
DRIVER UPPER RIB Y (G's) vs TIME (ms)



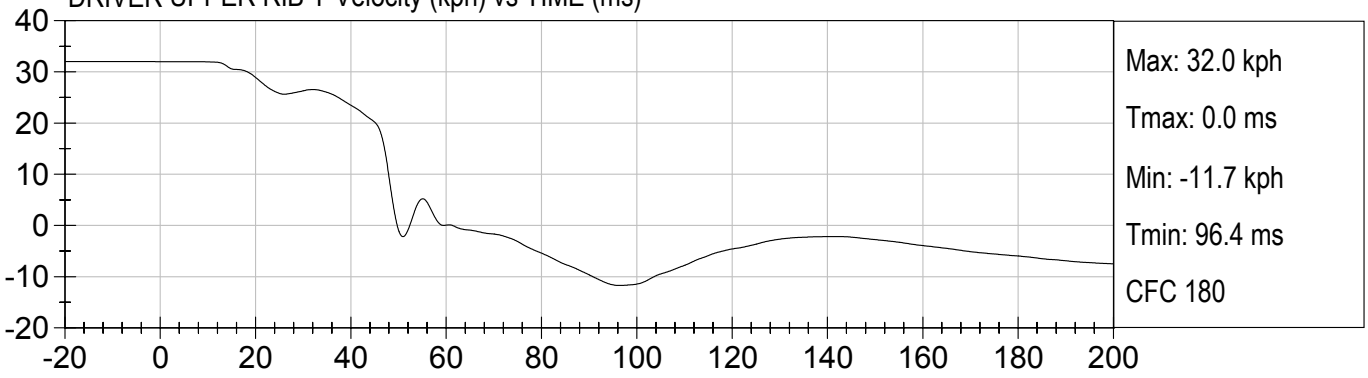
DRIVER MID RIB Y (G's) vs TIME (ms)



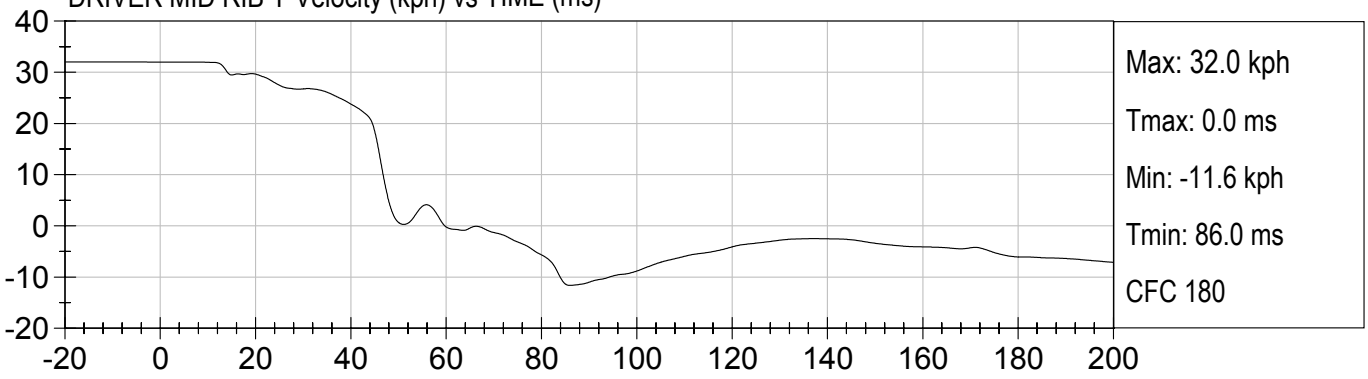
DRIVER LOWER RIB Y (G's) vs TIME (ms)



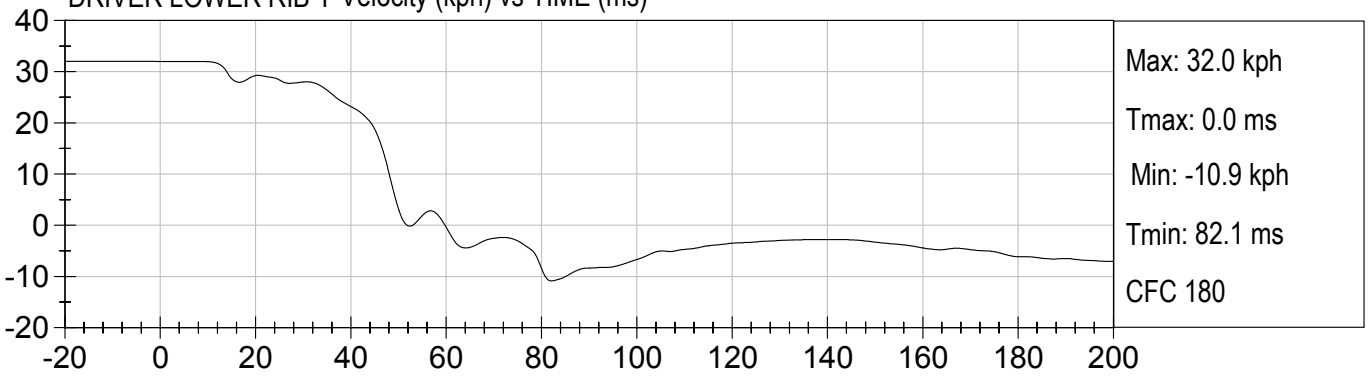
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



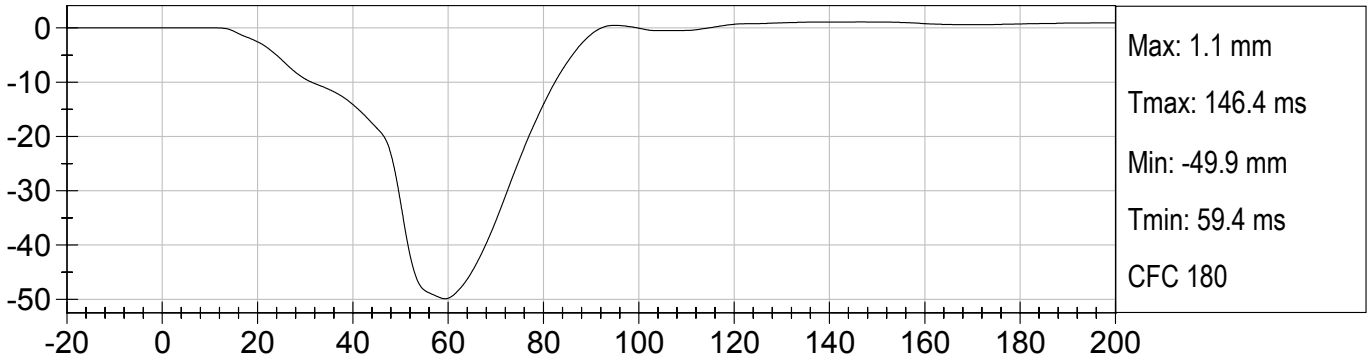
DRIVER MID RIB Y Velocity (kph) vs TIME (ms)



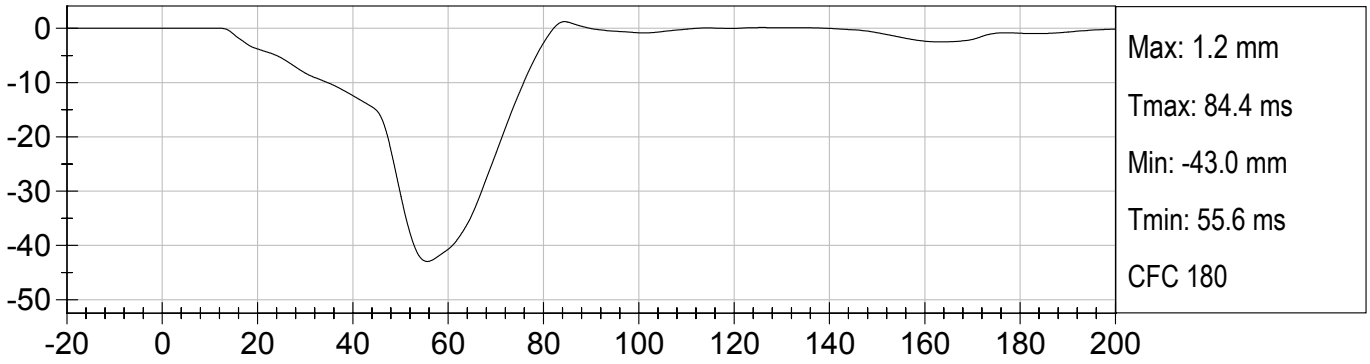
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



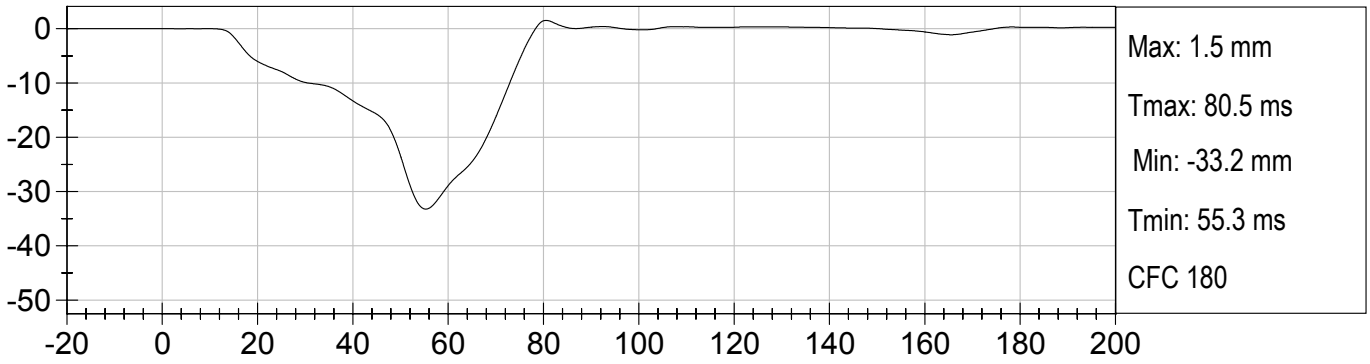
DR UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



DR MID RIB DISPLACEMENT (mm) vs TIME (ms)

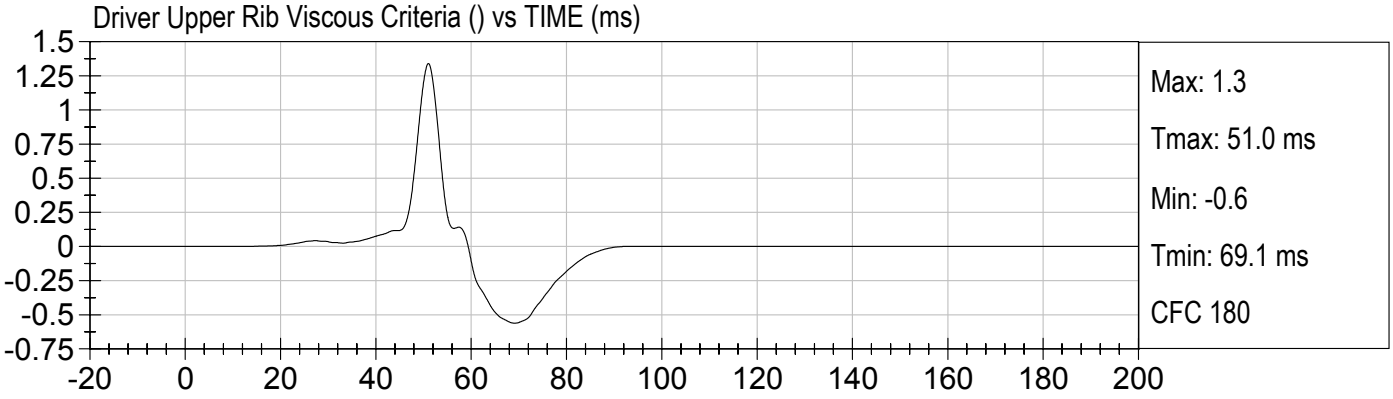


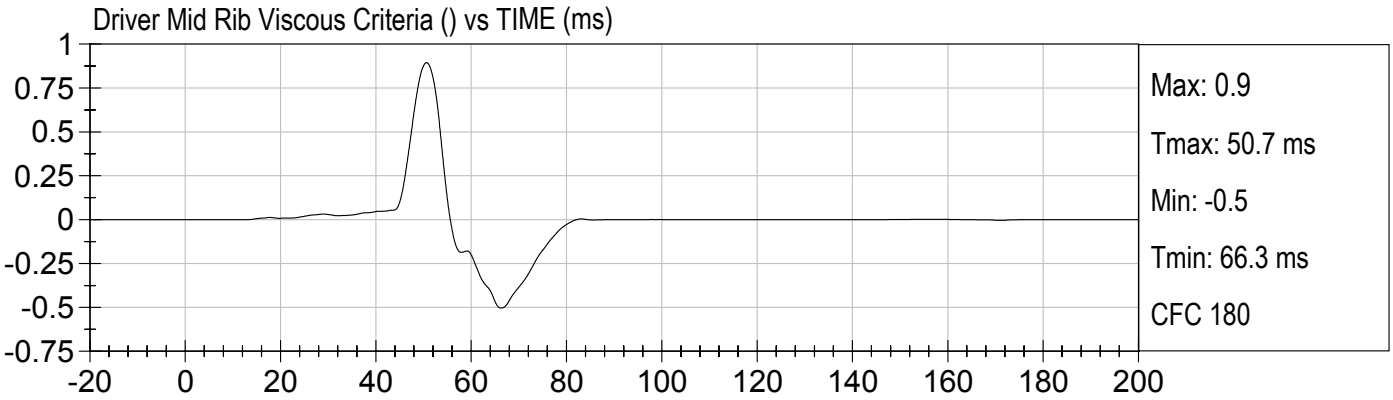
DR LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

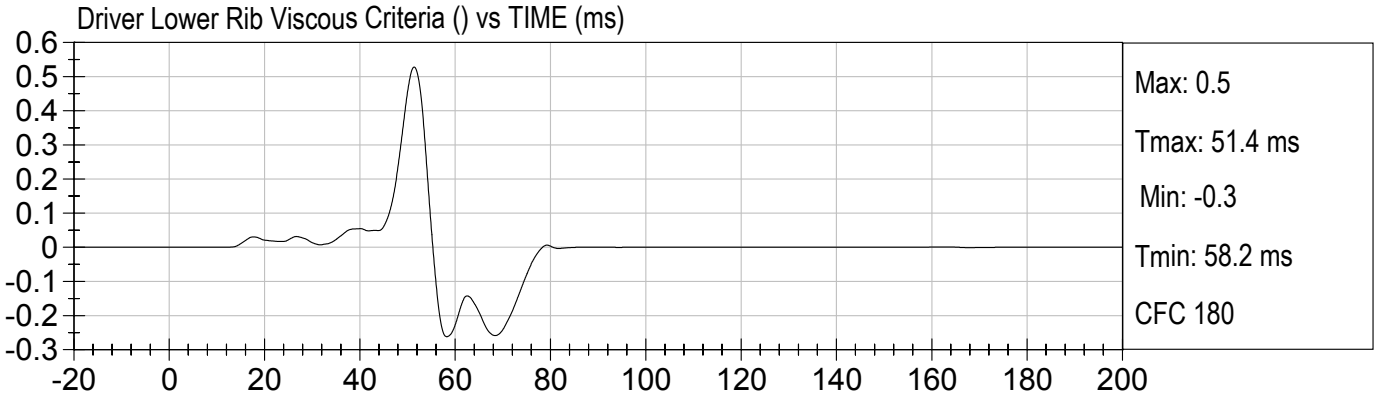


20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)



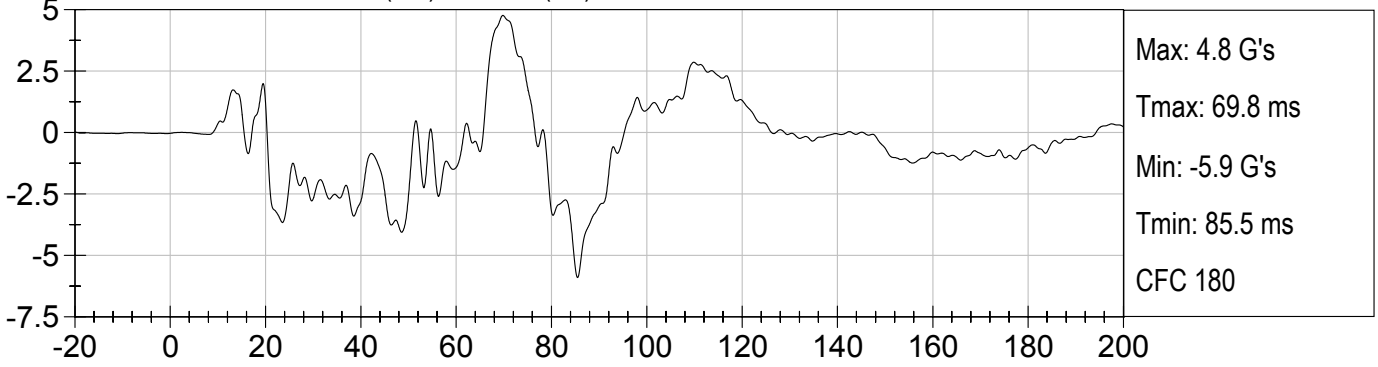




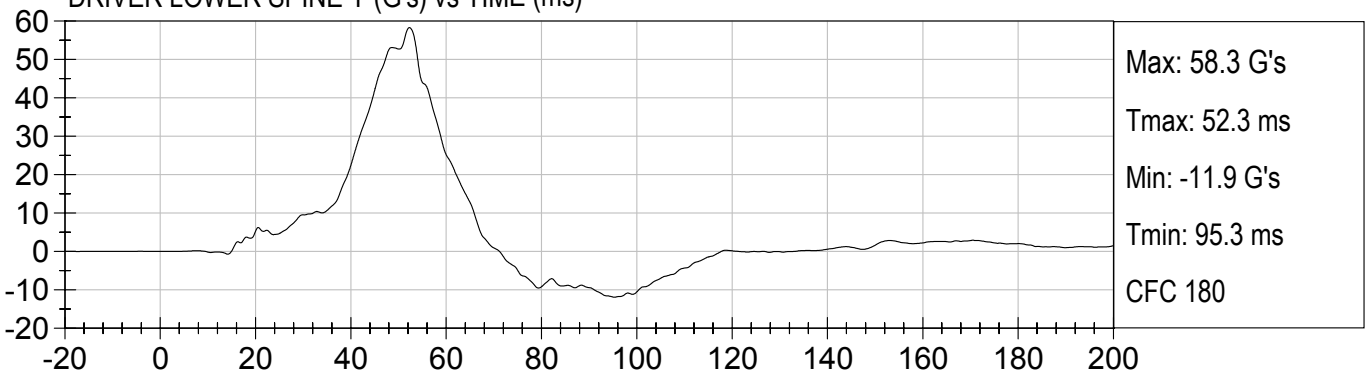
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

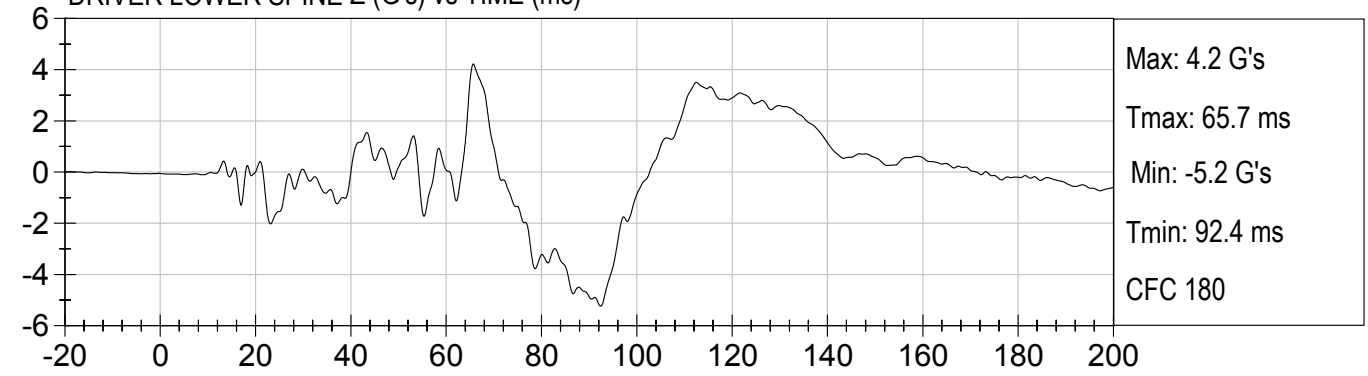
DRIVER LOWER SPINE X (G's) vs TIME (ms)



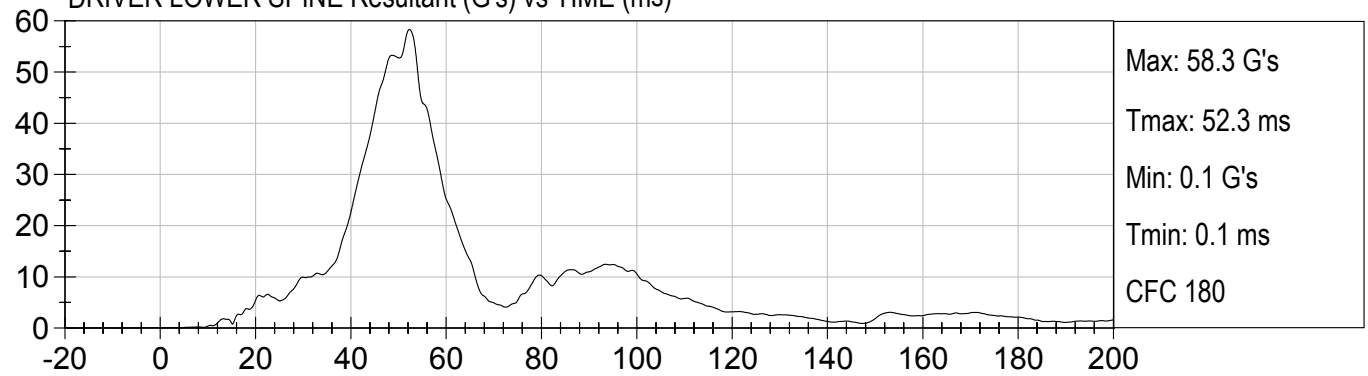
DRIVER LOWER SPINE Y (G's) vs TIME (ms)

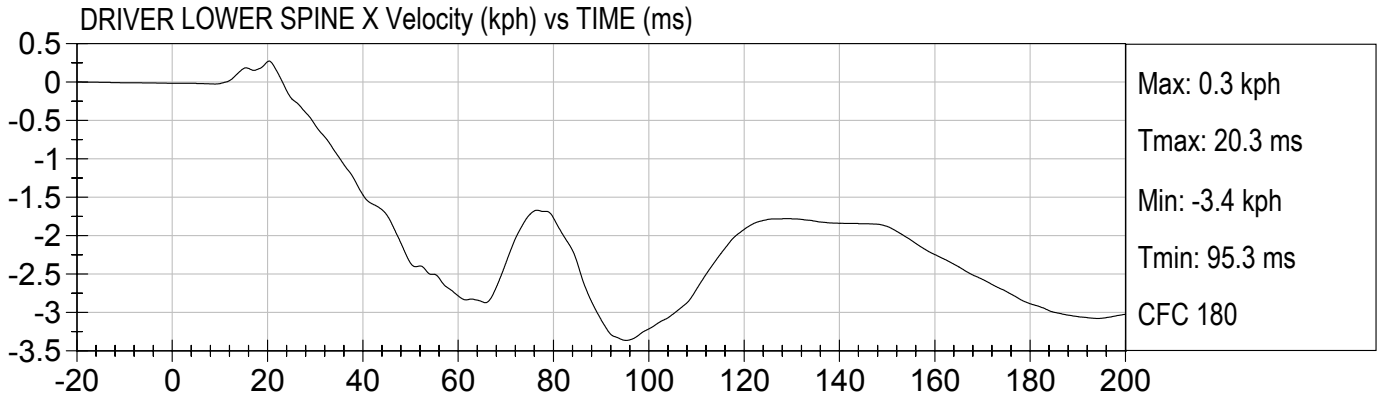


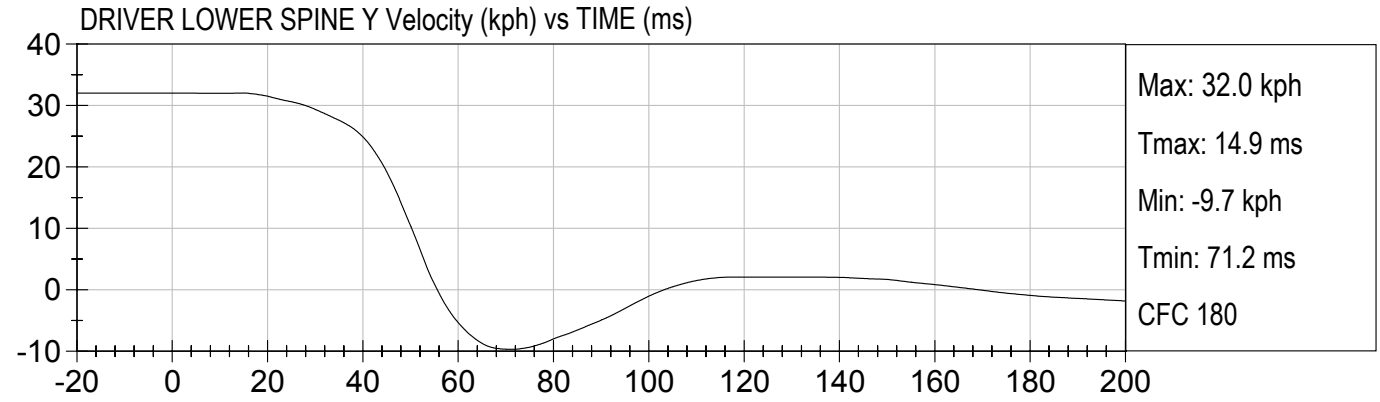
DRIVER LOWER SPINE Z (G's) vs TIME (ms)

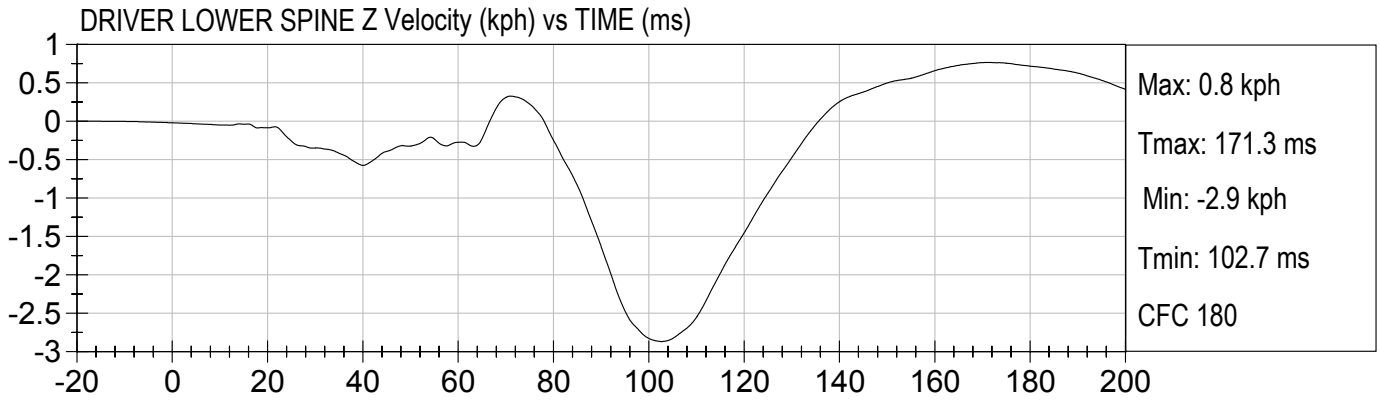


DRIVER LOWER SPINE Resultant (G's) vs TIME (ms)




DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.3 kph
Tmax: 20.3 ms
Min: -3.4 kph
Tmin: 95.3 ms
CFC 180

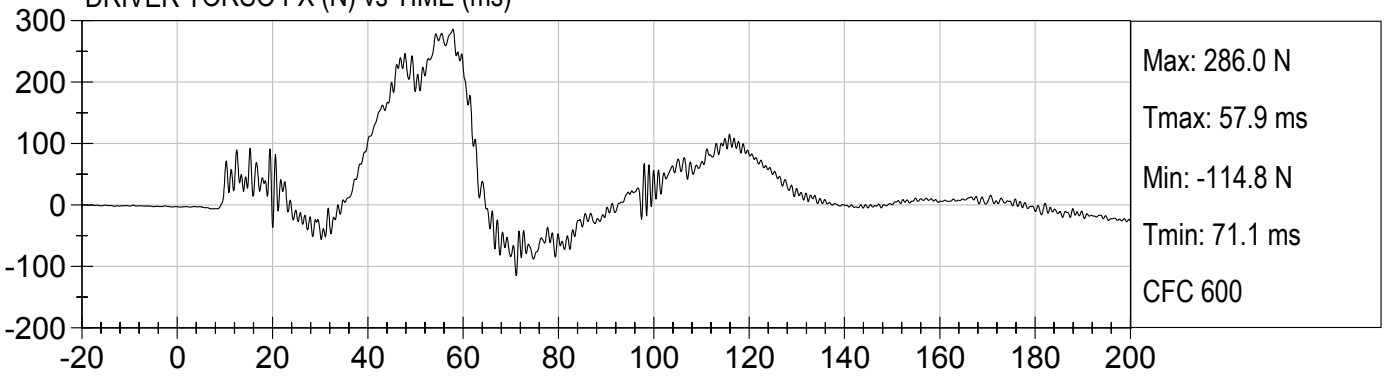

DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 14.9 ms
Min: -9.7 kph
Tmin: 71.2 ms
CFC 180


DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.8 kph
Tmax: 171.3 ms
Min: -2.9 kph
Tmin: 102.7 ms
CFC 180

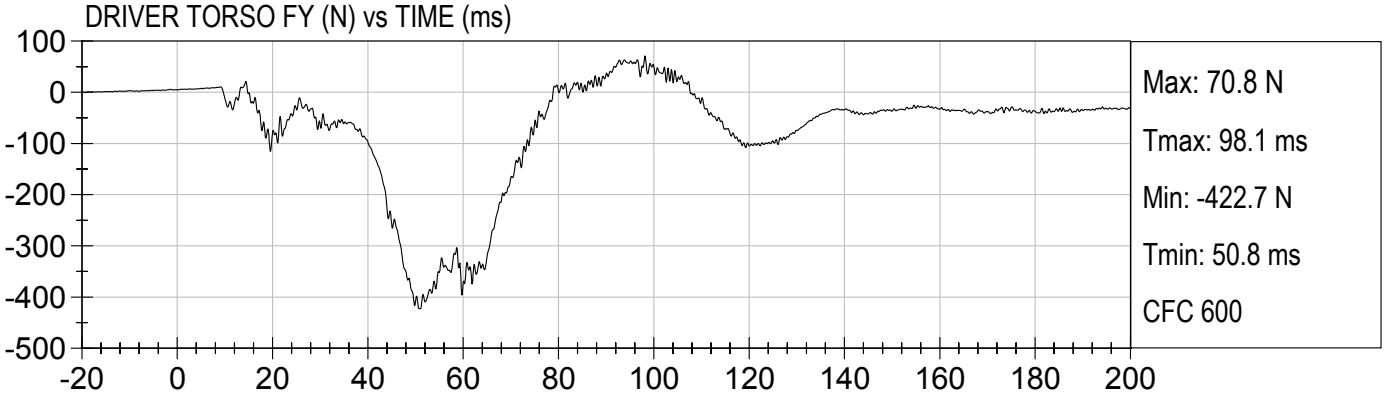
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

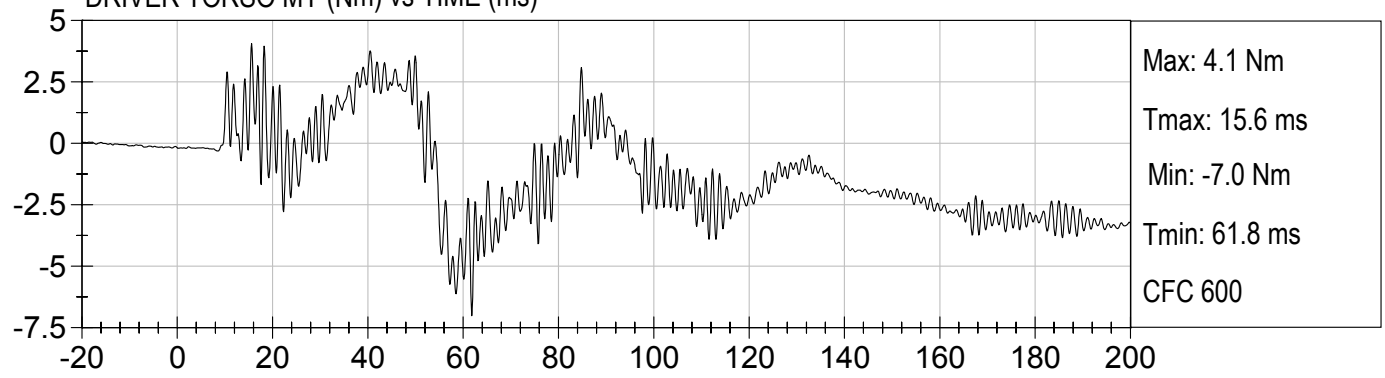
DRIVER TORSO FX (N) vs TIME (ms)



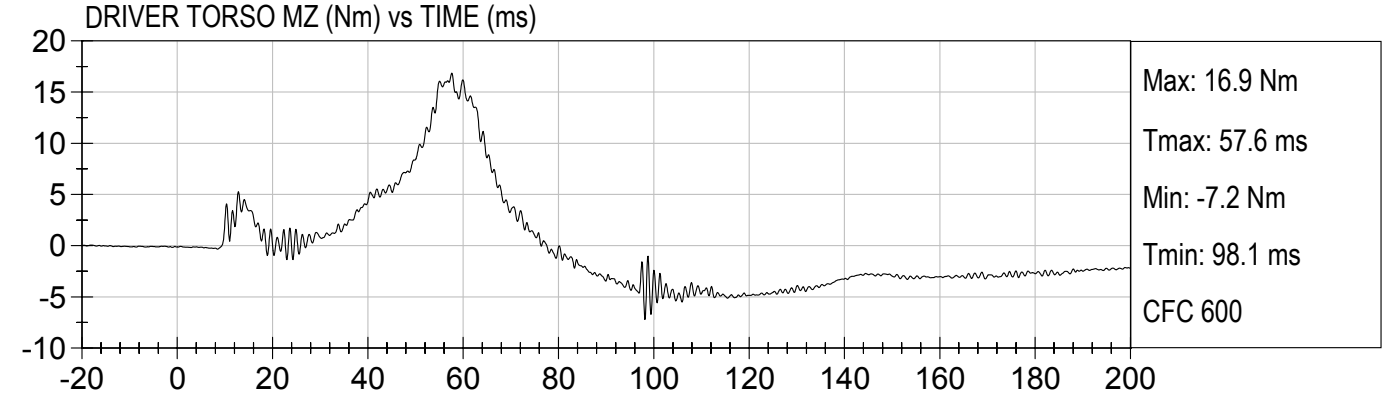
DRIVER TORSO FY (N) vs TIME (ms)



DRIVER TORSO MY (Nm) vs TIME (ms)

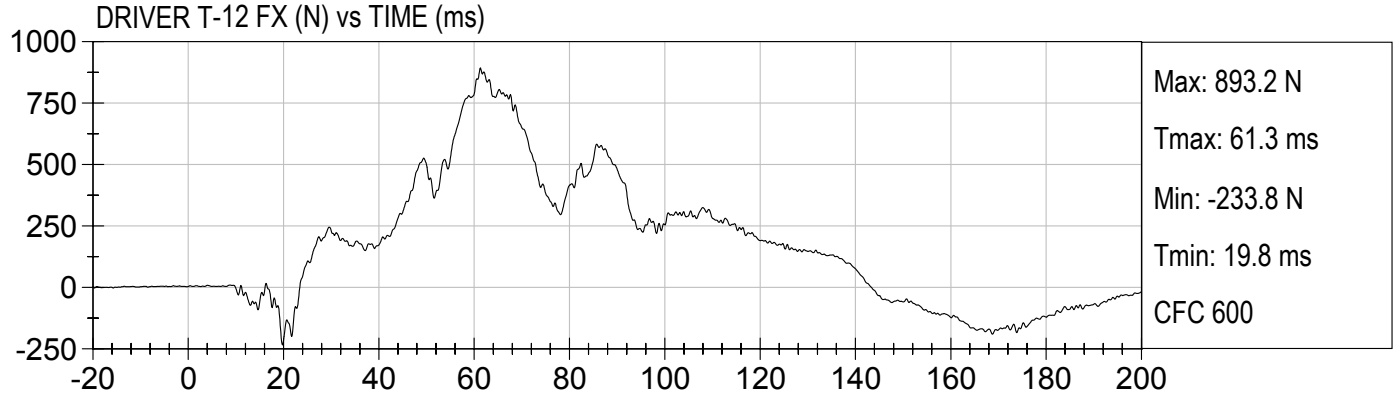


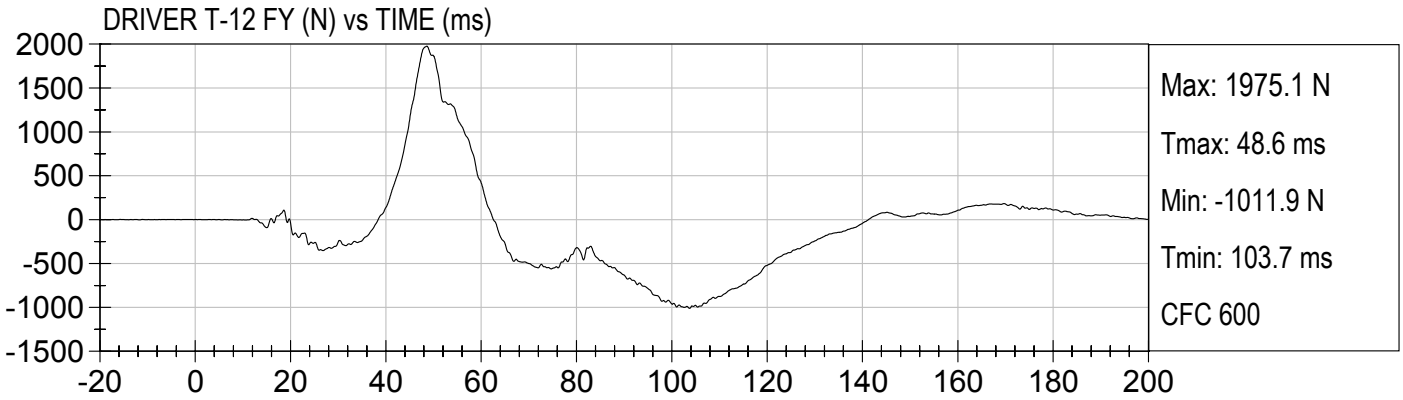
DRIVER TORSO MZ (Nm) vs TIME (ms)

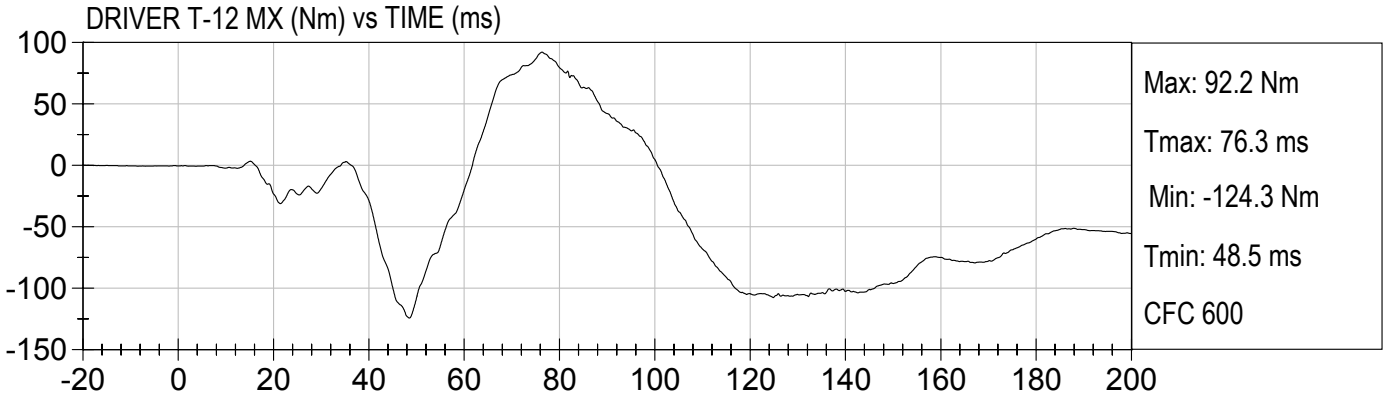


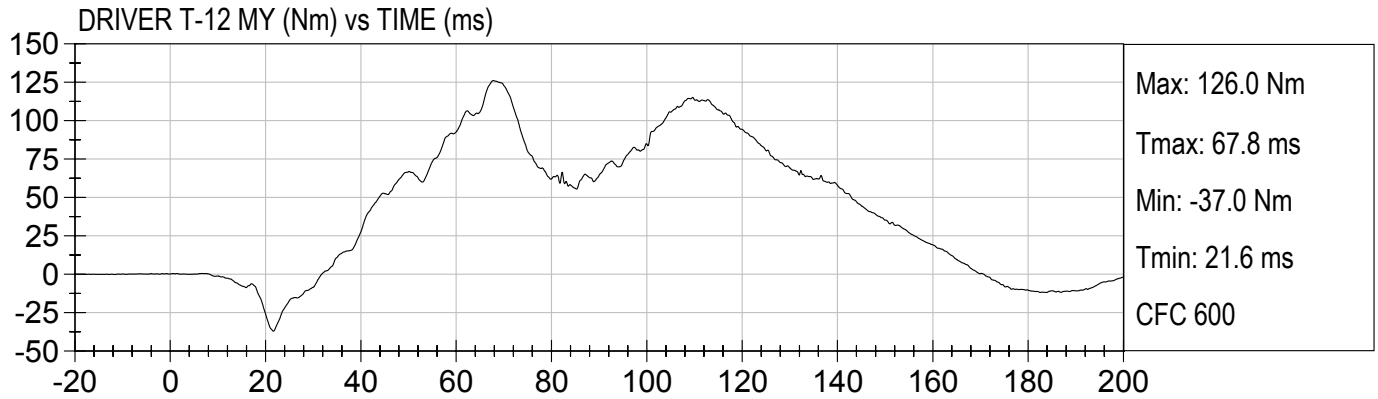
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)



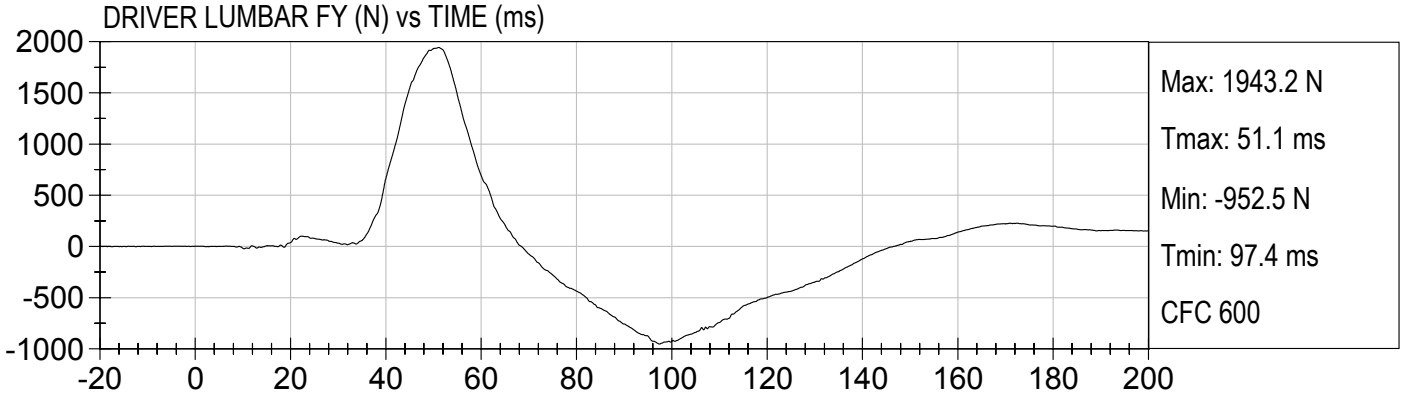


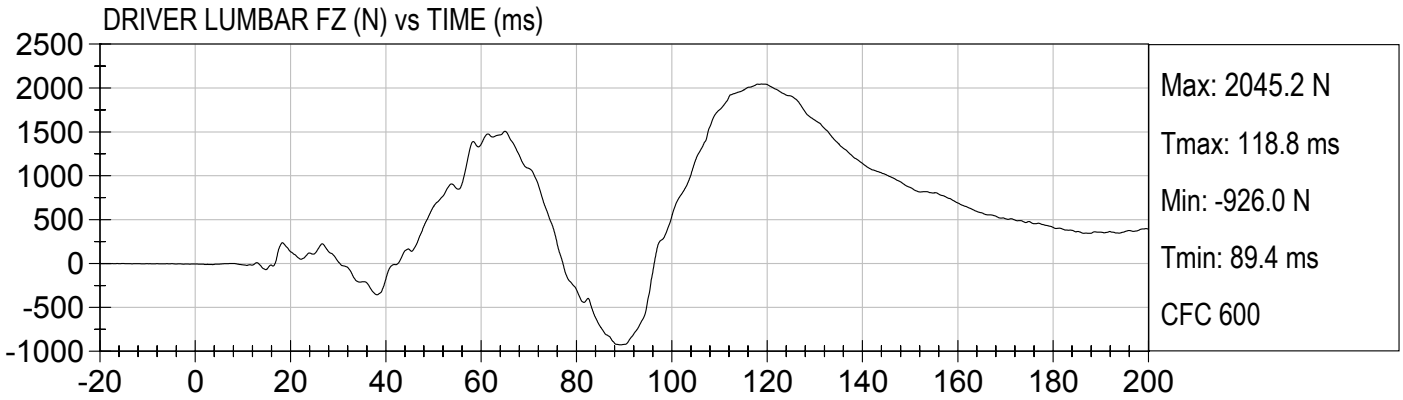


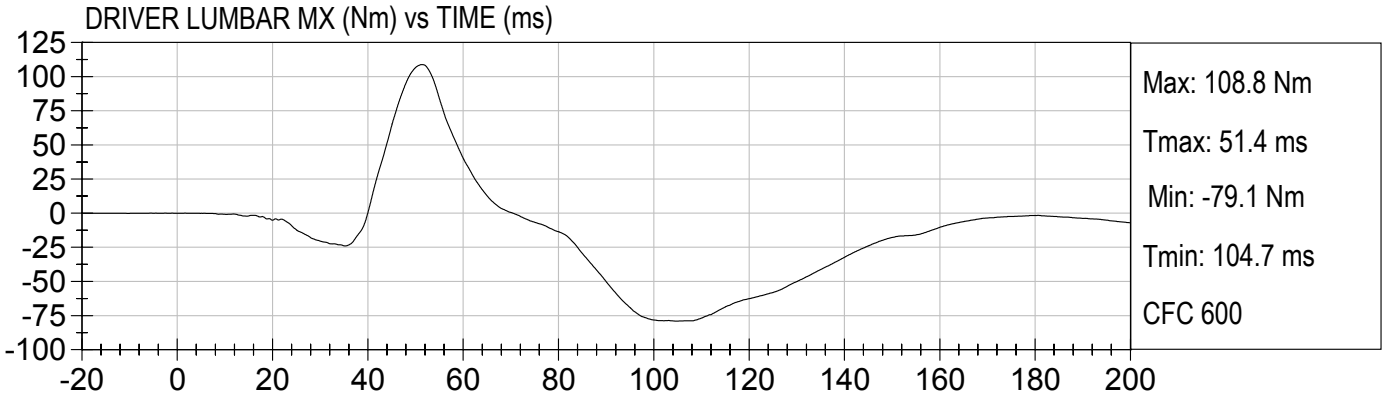


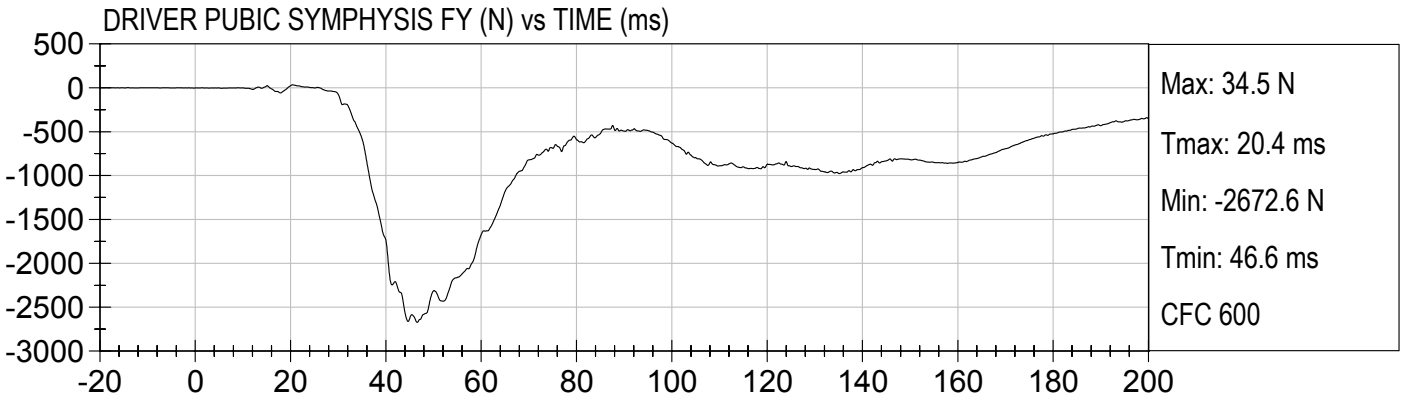
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)





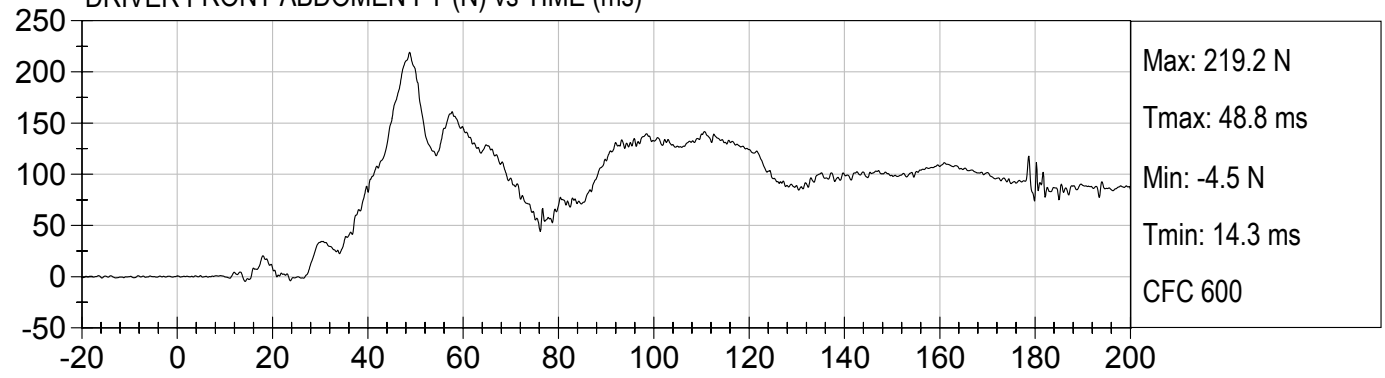




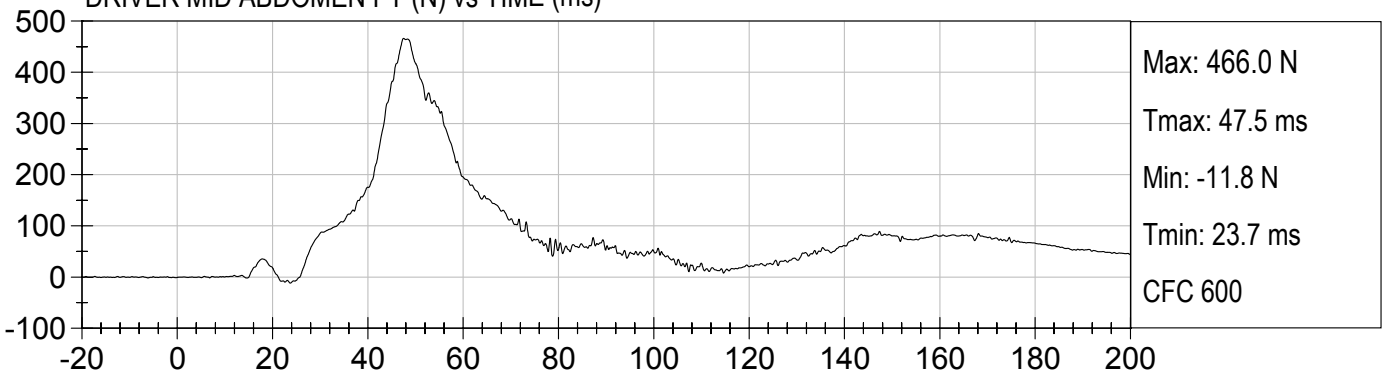
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

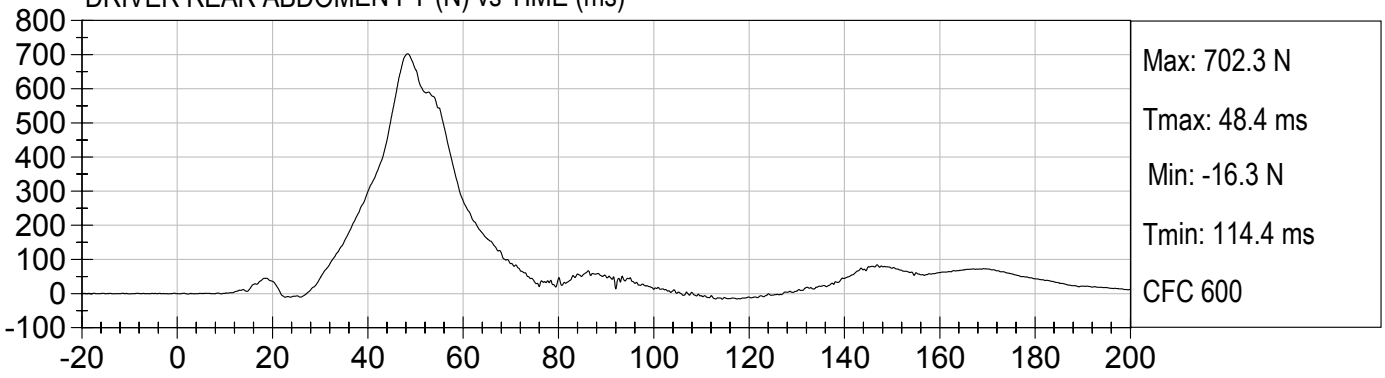
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



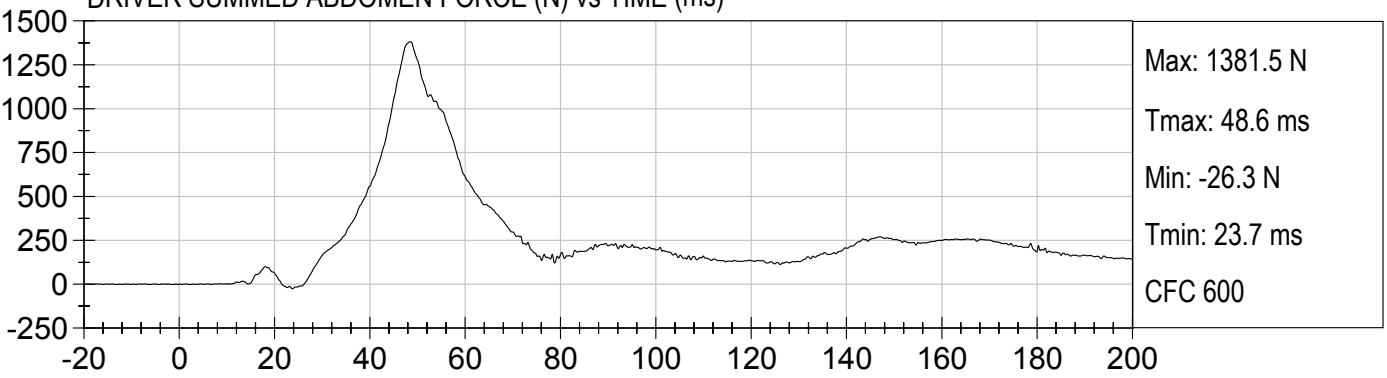
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



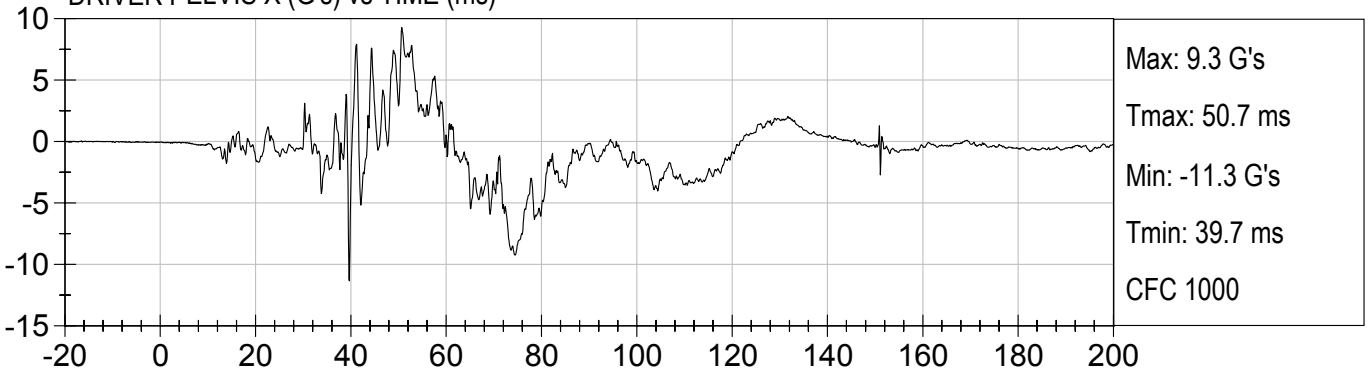
DRIVER REAR ABDOMEN FY (N) vs TIME (ms)



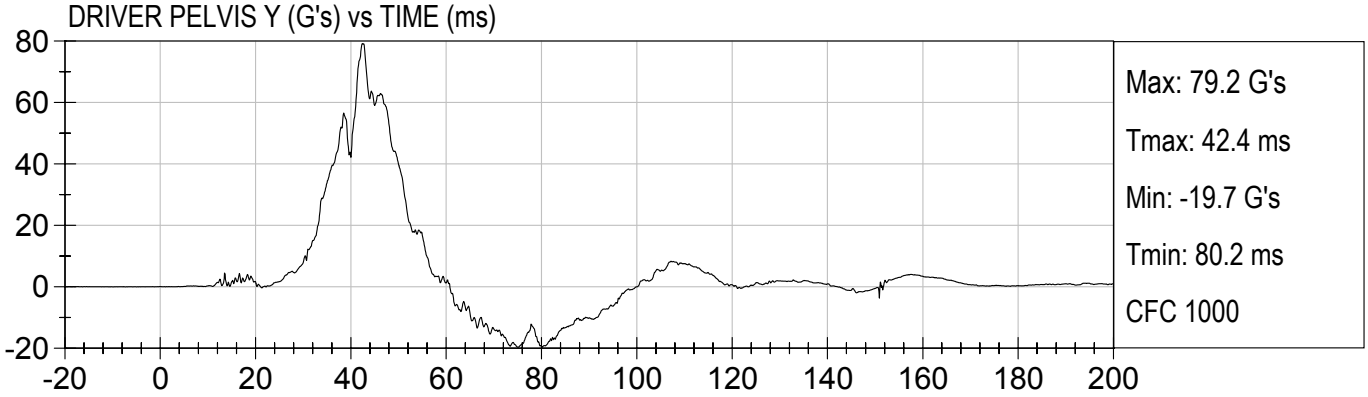
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



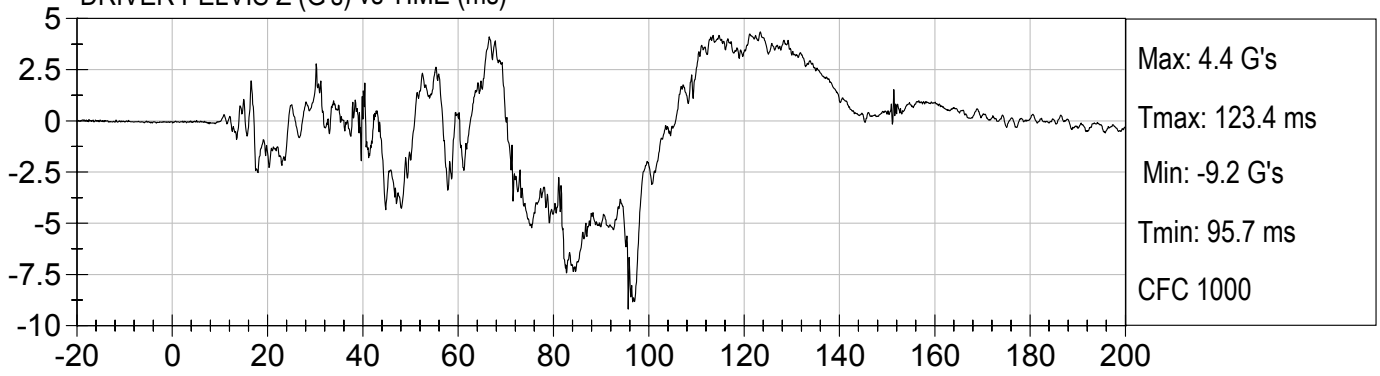
DRIVER PELVIS X (G's) vs TIME (ms)



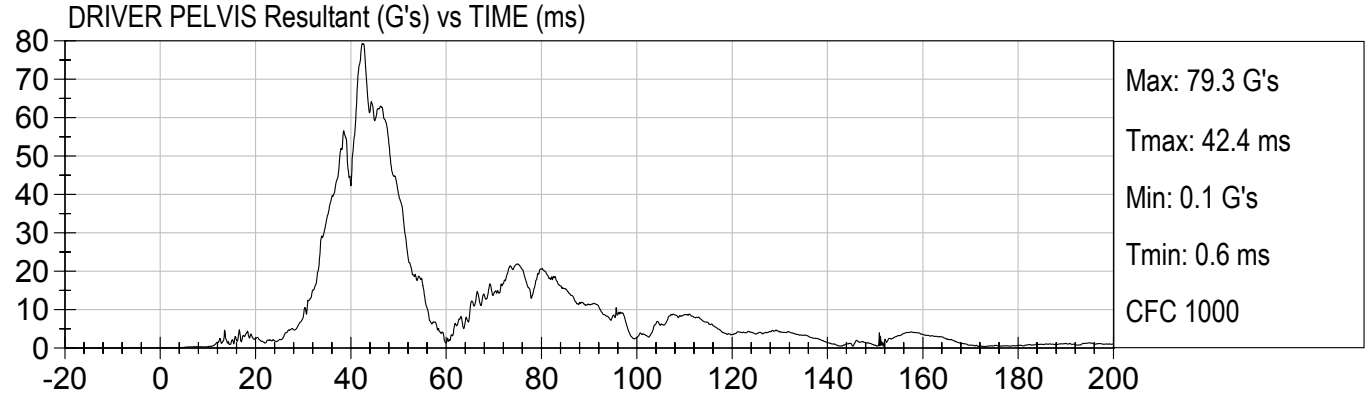
DRIVER PELVIS Y (G's) vs TIME (ms)

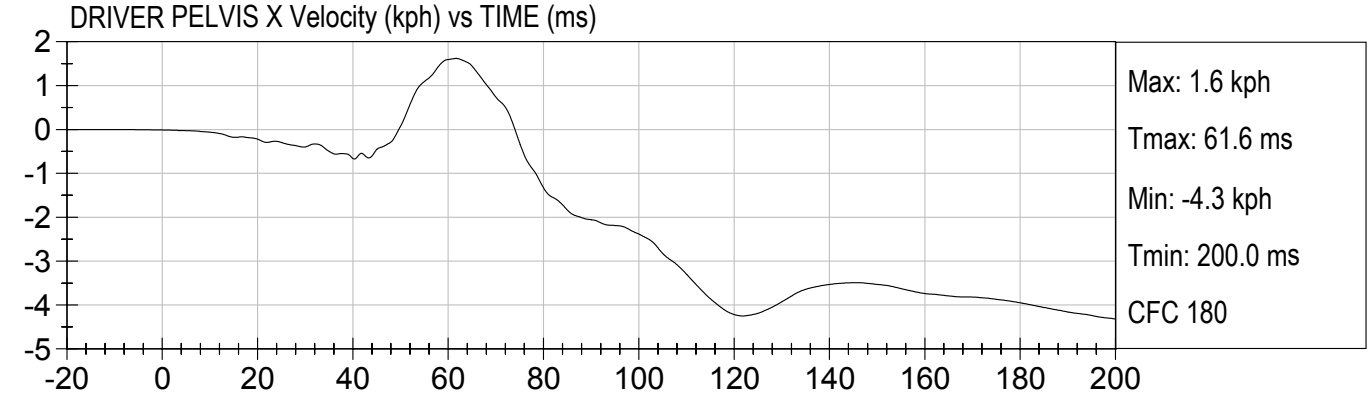


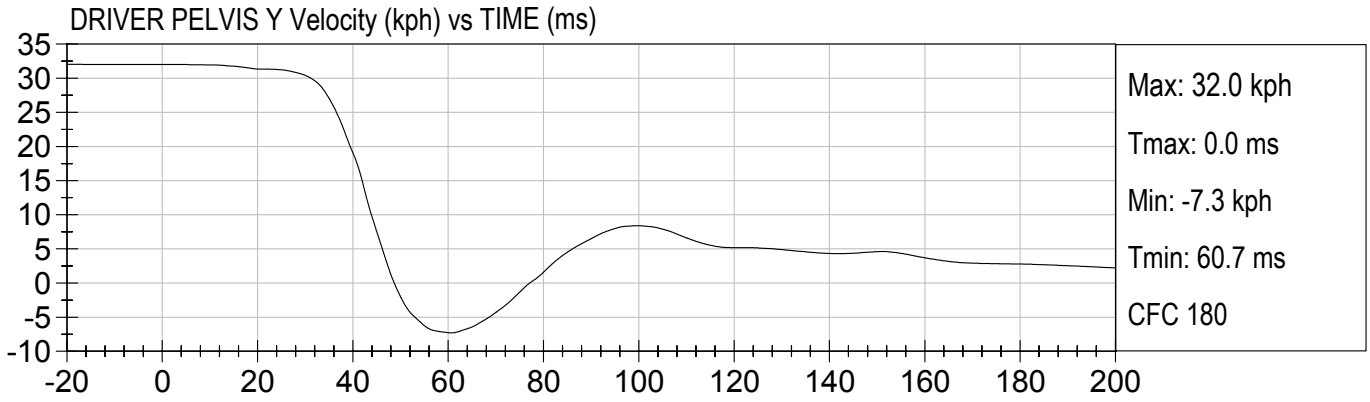
DRIVER PELVIS Z (G's) vs TIME (ms)

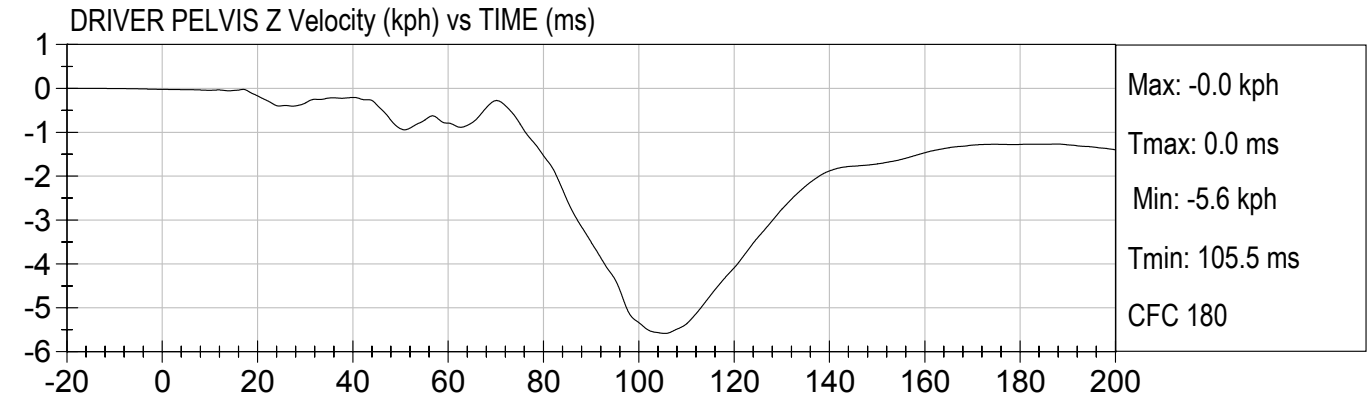


DRIVER PELVIS Resultant (G's) vs TIME (ms)




DRIVER PELVIS X Velocity (kph) vs TIME (ms)
2
1
0
-1
-2
-3
-4
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.6 kph
Tmax: 61.6 ms
Min: -4.3 kph
Tmin: 200.0 ms
CFC 180

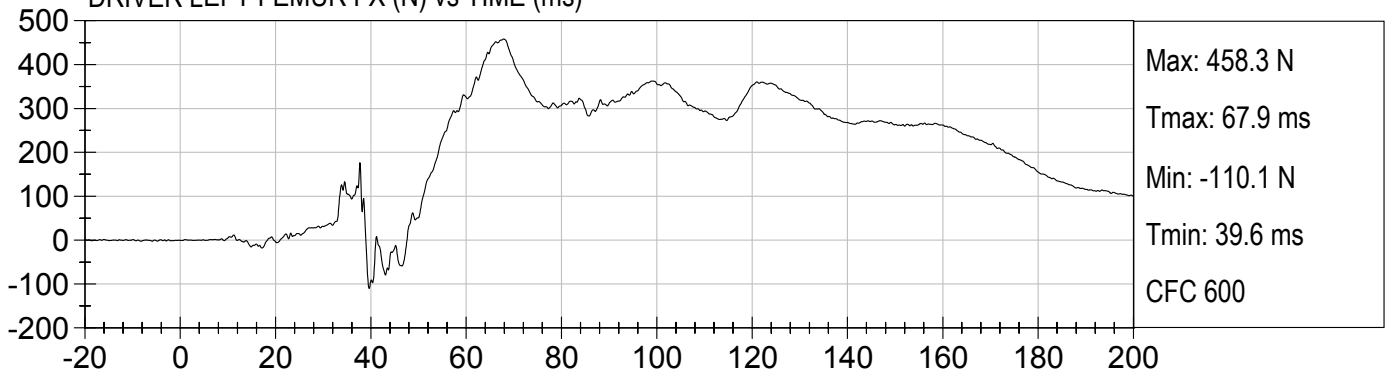

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 0.0 ms
Min: -7.3 kph
Tmin: 60.7 ms
CFC 180


DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 0.0 ms
Min: -5.6 kph
Tmin: 105.5 ms
CFC 180

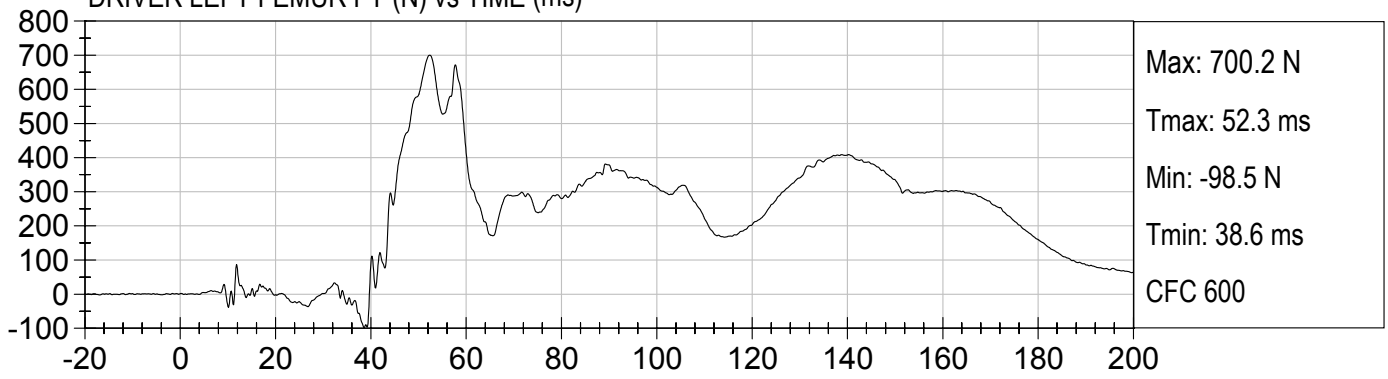
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

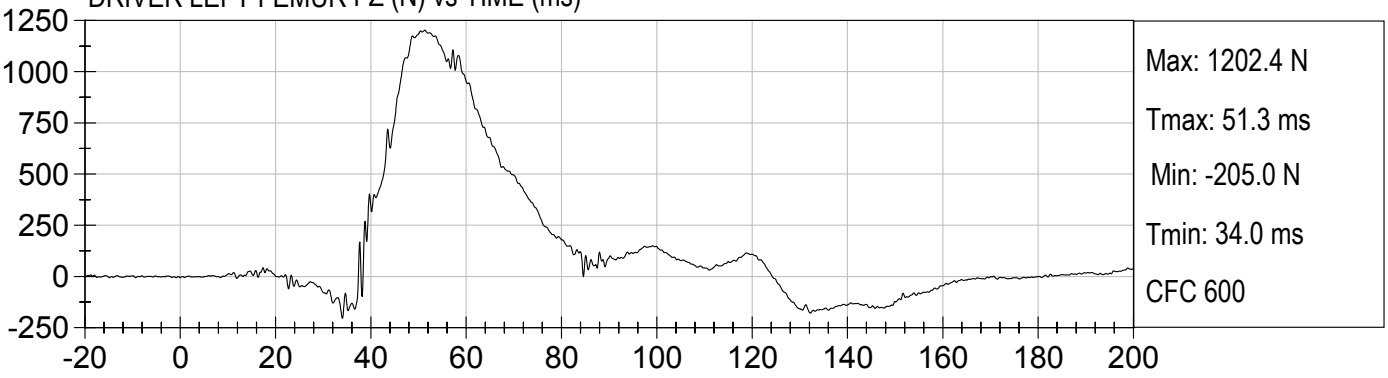
DRIVER LEFT FEMUR FX (N) vs TIME (ms)



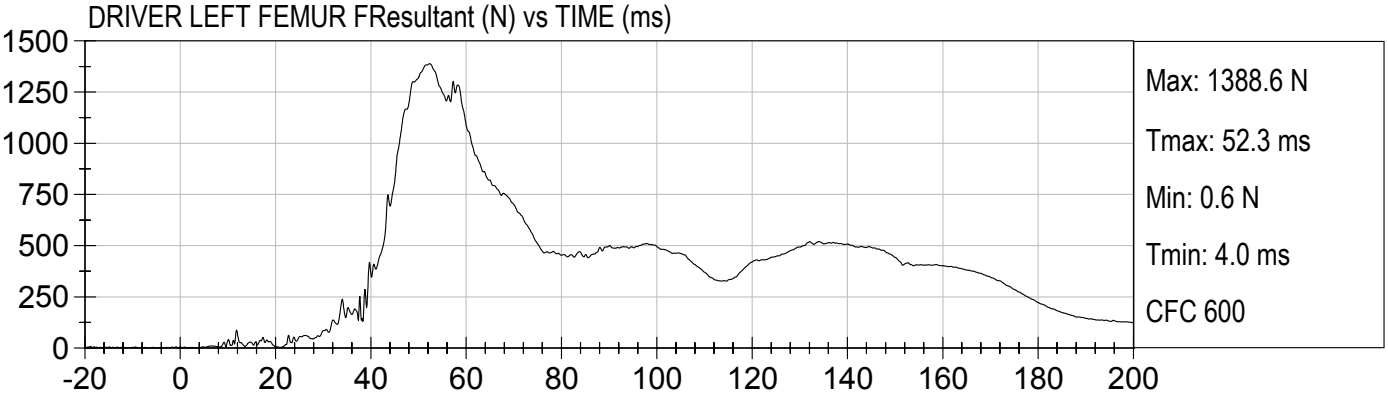
DRIVER LEFT FEMUR FY (N) vs TIME (ms)



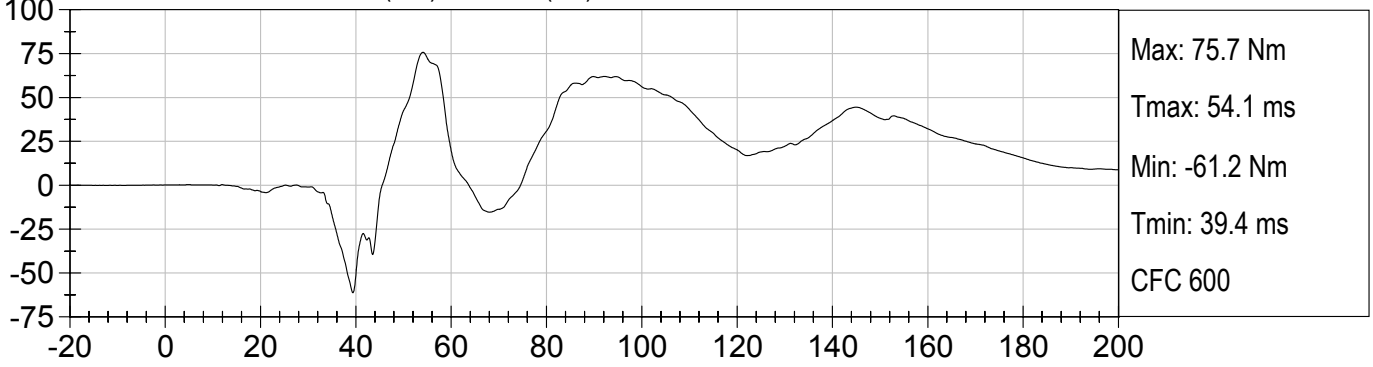
DRIVER LEFT FEMUR FZ (N) vs TIME (ms)



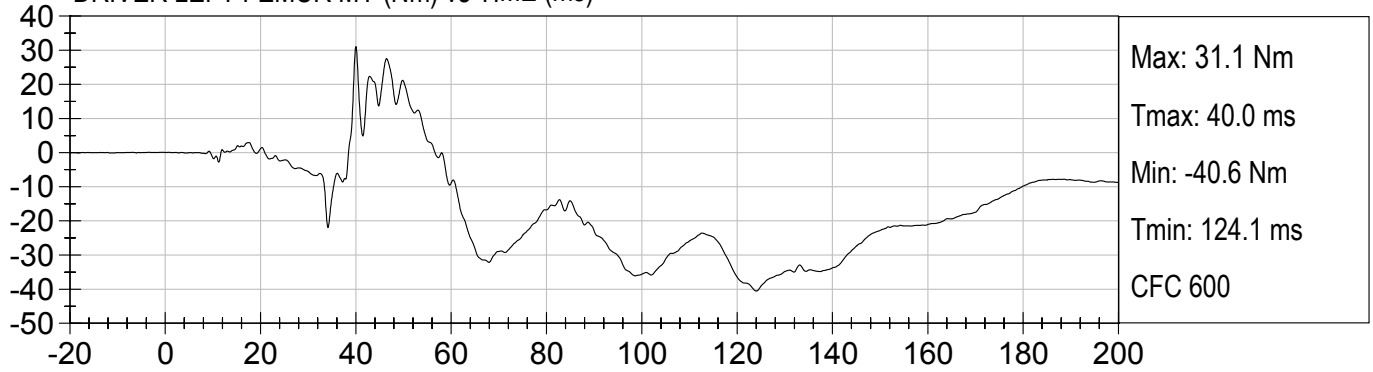
DRIVER LEFT FEMUR FResultant (N) vs TIME (ms)



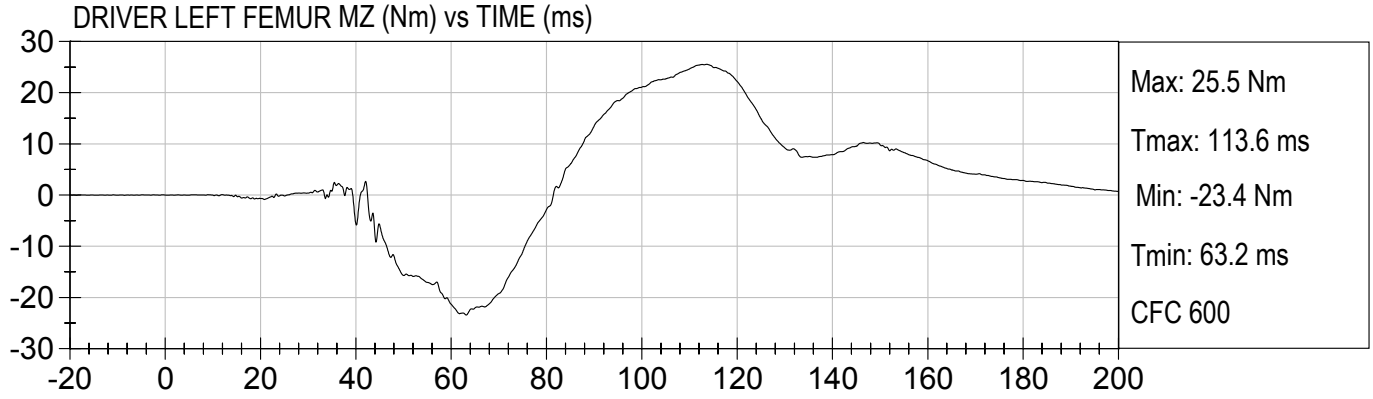
DRIVER LEFT FEMUR MX (Nm) vs TIME (ms)



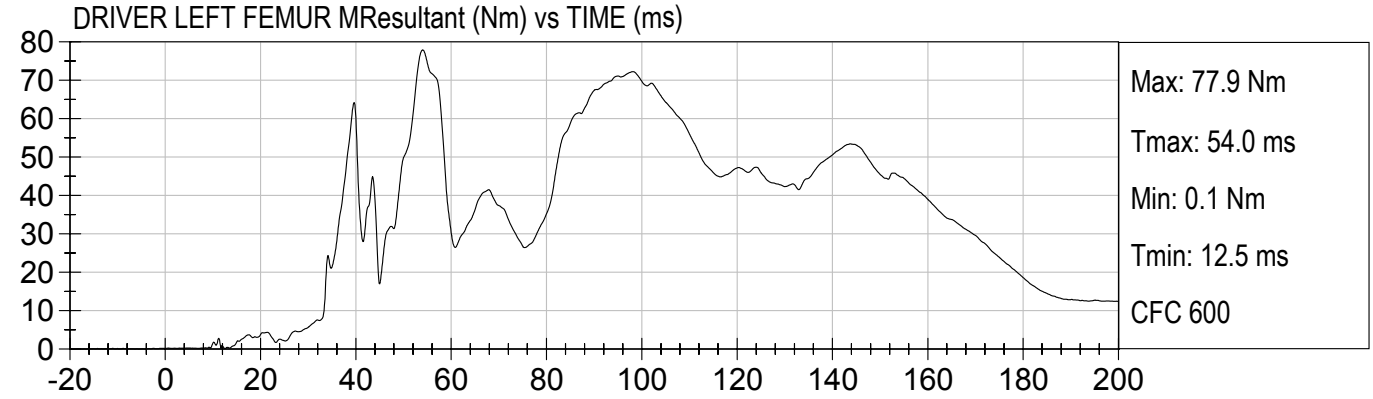
DRIVER LEFT FEMUR MY (Nm) vs TIME (ms)



DRIVER LEFT FEMUR MZ (Nm) vs TIME (ms)



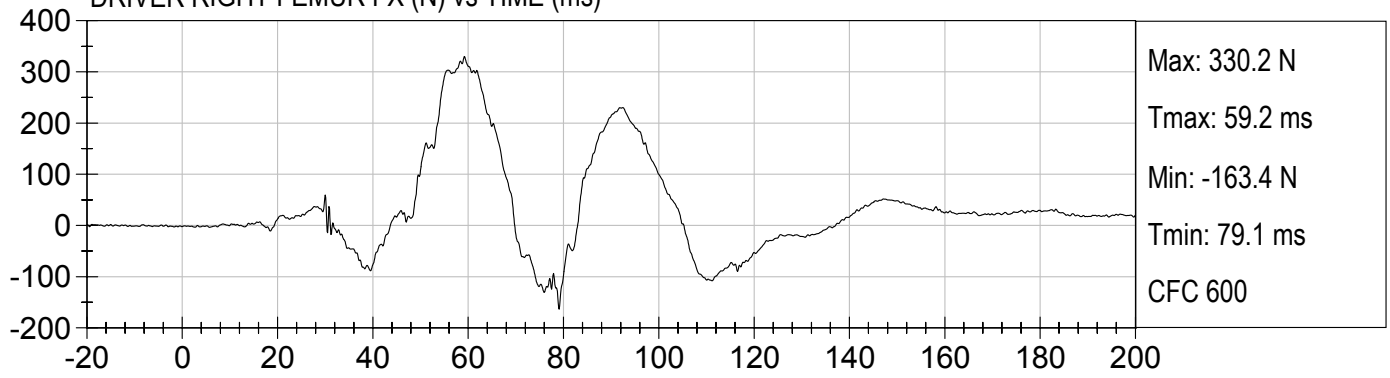
DRIVER LEFT FEMUR MResultant (Nm) vs TIME (ms)



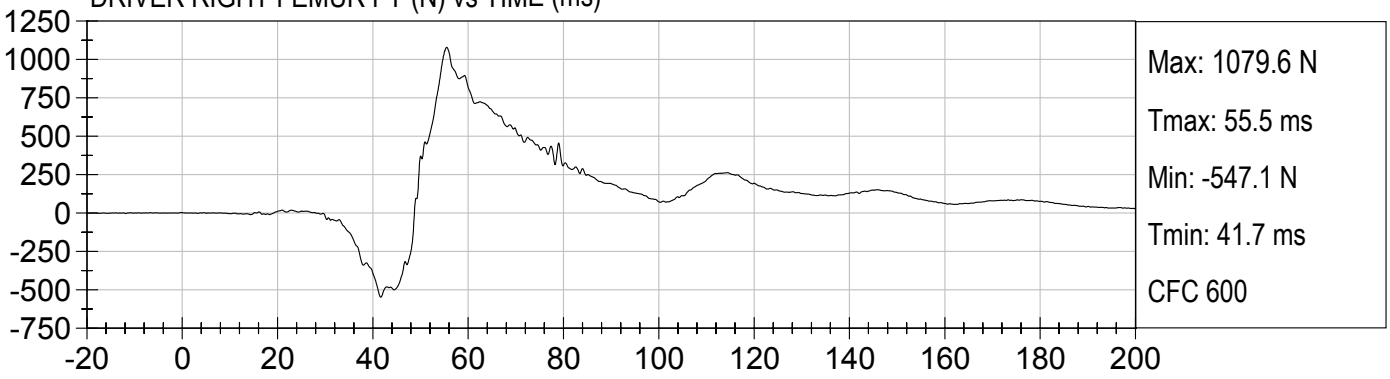
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

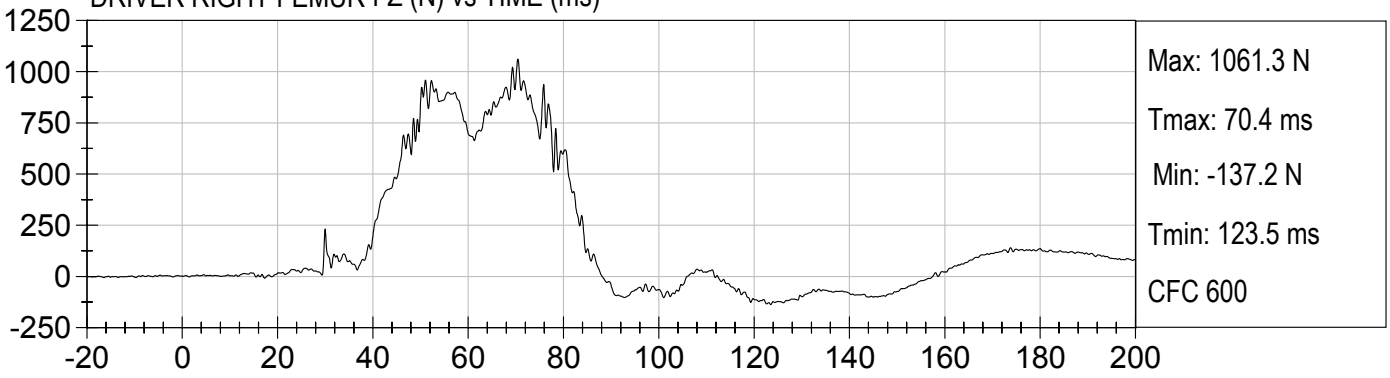
DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



DRIVER RIGHT FEMUR FY (N) vs TIME (ms)

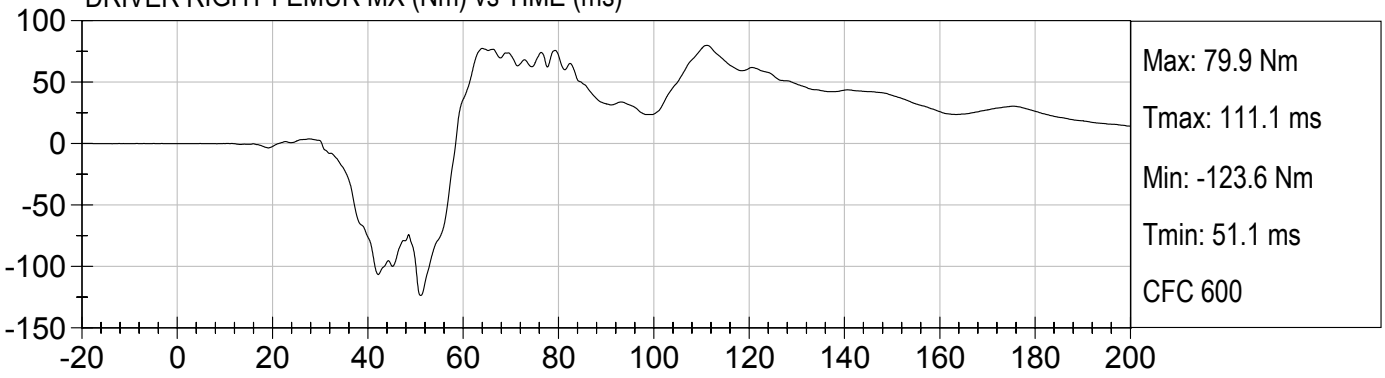


DRIVER RIGHT FEMUR FZ (N) vs TIME (ms)

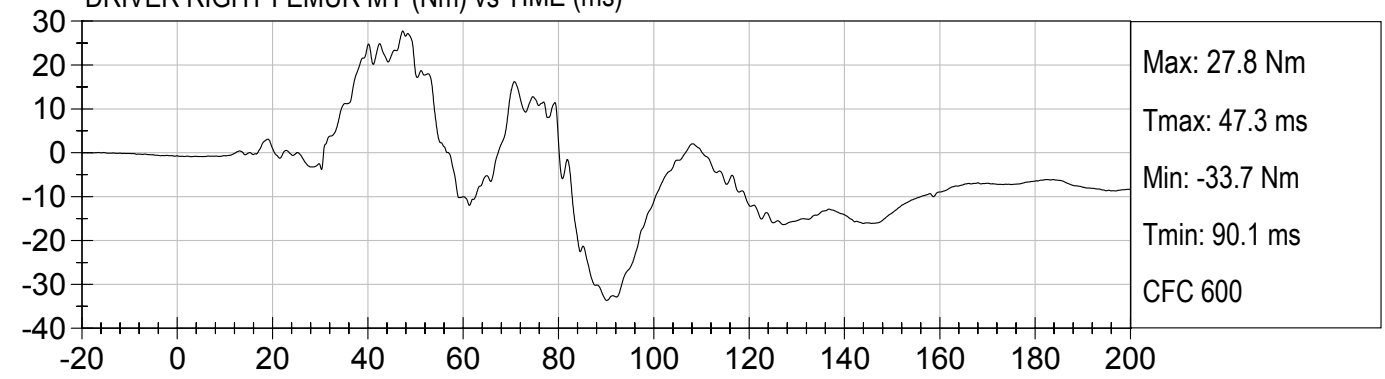


DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)

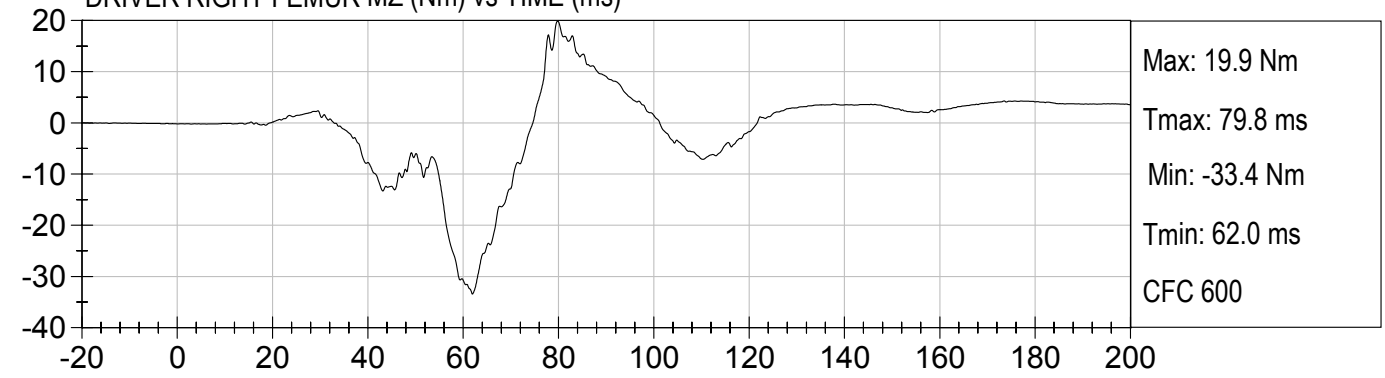
DRIVER RIGHT FEMUR MX (Nm) vs TIME (ms)



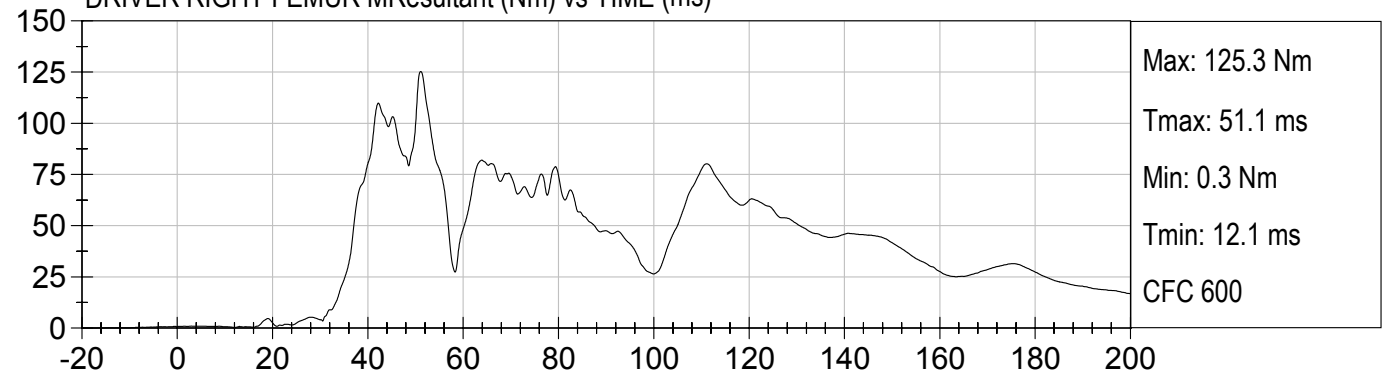
DRIVER RIGHT FEMUR MY (Nm) vs TIME (ms)



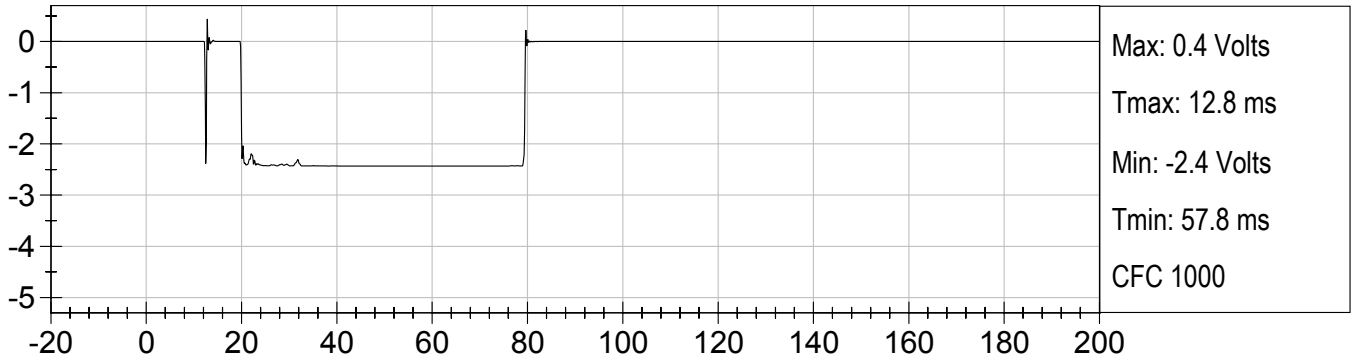
DRIVER RIGHT FEMUR MZ (Nm) vs TIME (ms)



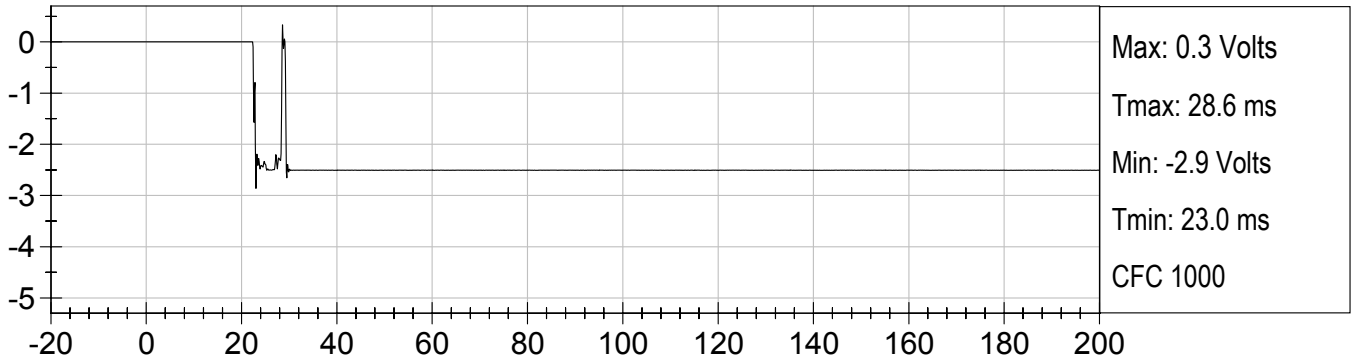
DRIVER RIGHT FEMUR MResultant (Nm) vs TIME (ms)



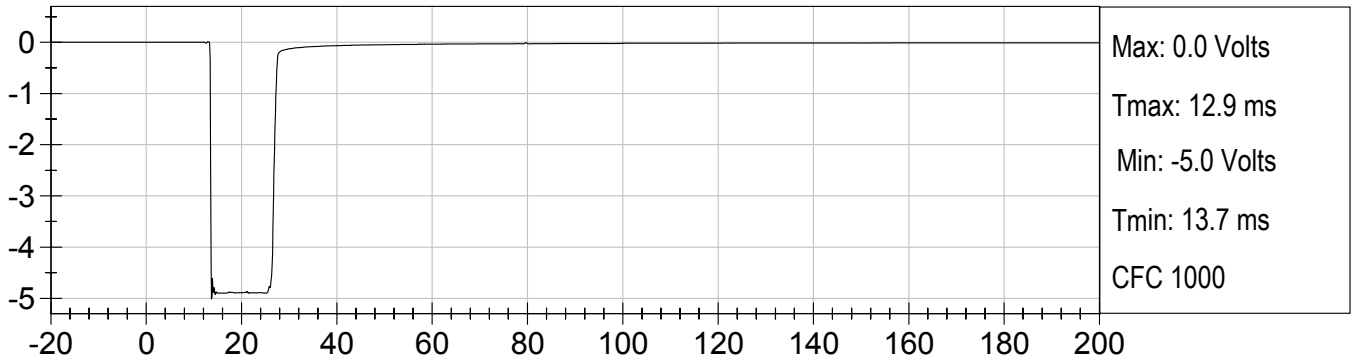
DRIVER RIB CONTACT (Volts) vs TIME (ms)



DRIVER PELVIS CONTACT (Volts) vs TIME (ms)



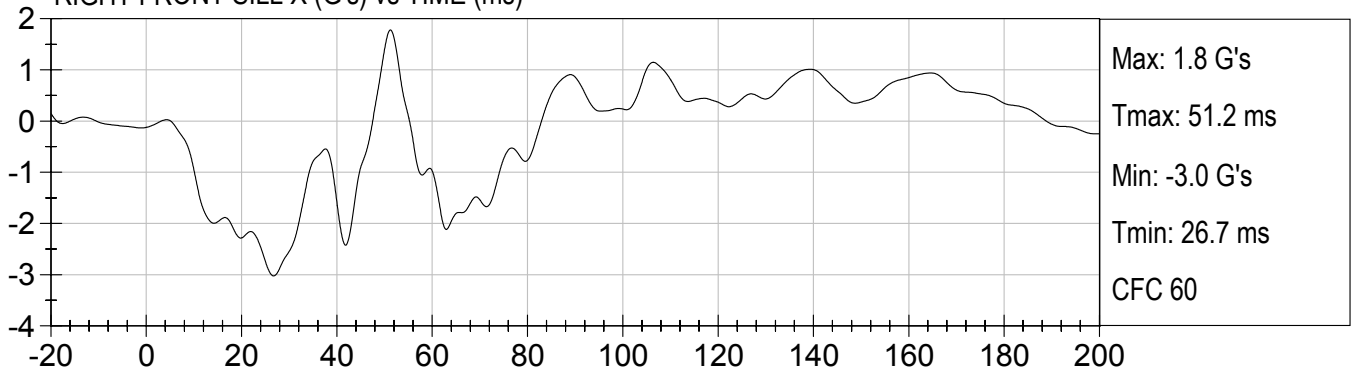
DRIVER ARM CONTACT (Volts) vs TIME (ms)



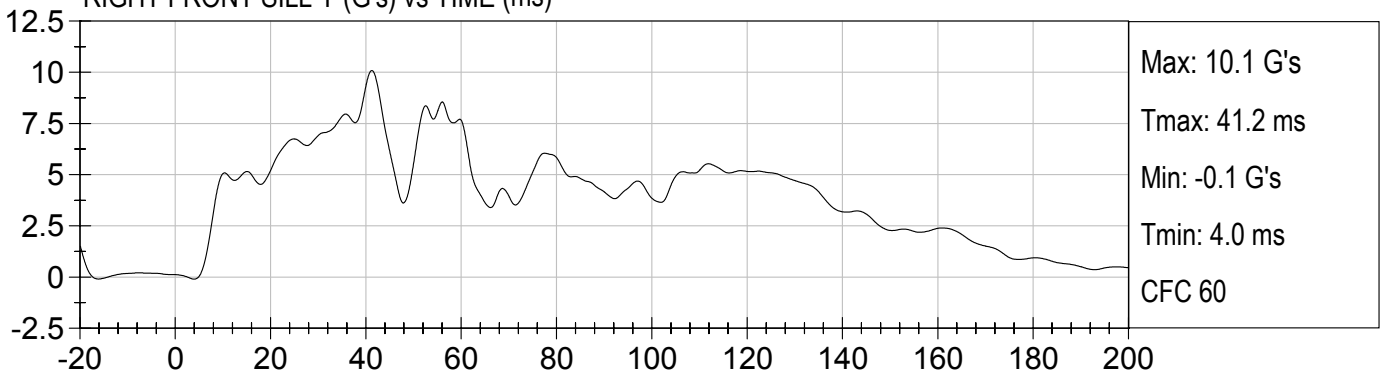
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

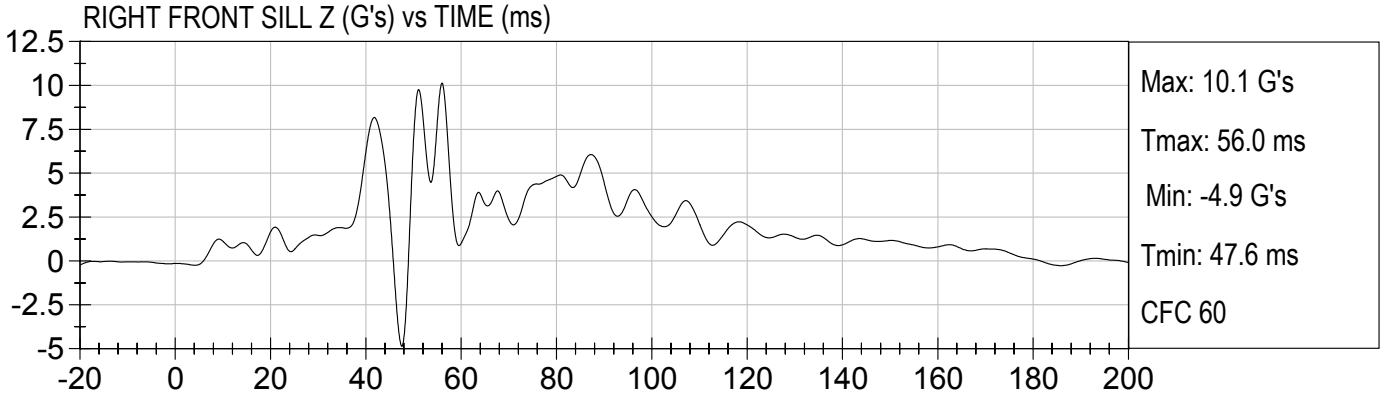
RIGHT FRONT SILL X (G's) vs TIME (ms)



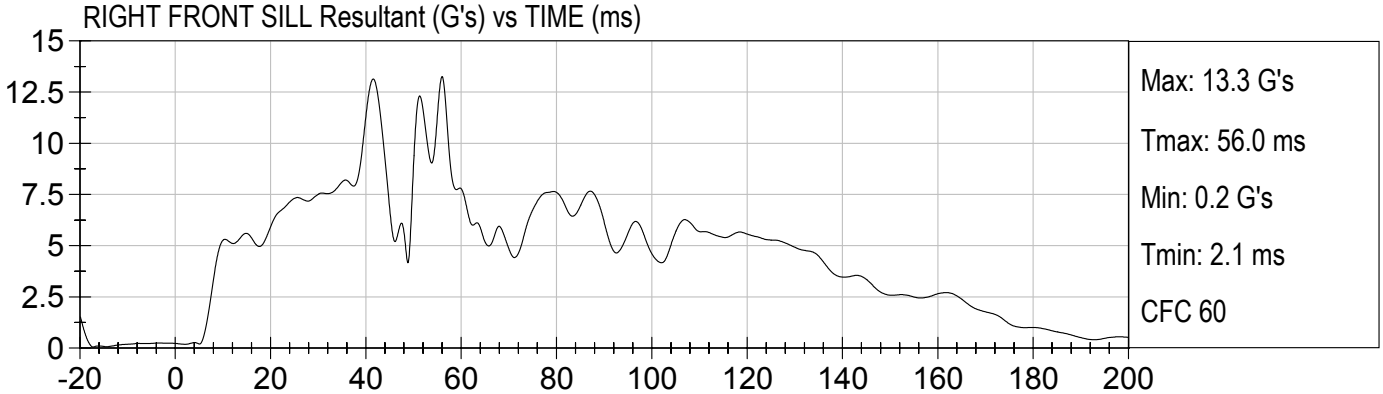
RIGHT FRONT SILL Y (G's) vs TIME (ms)

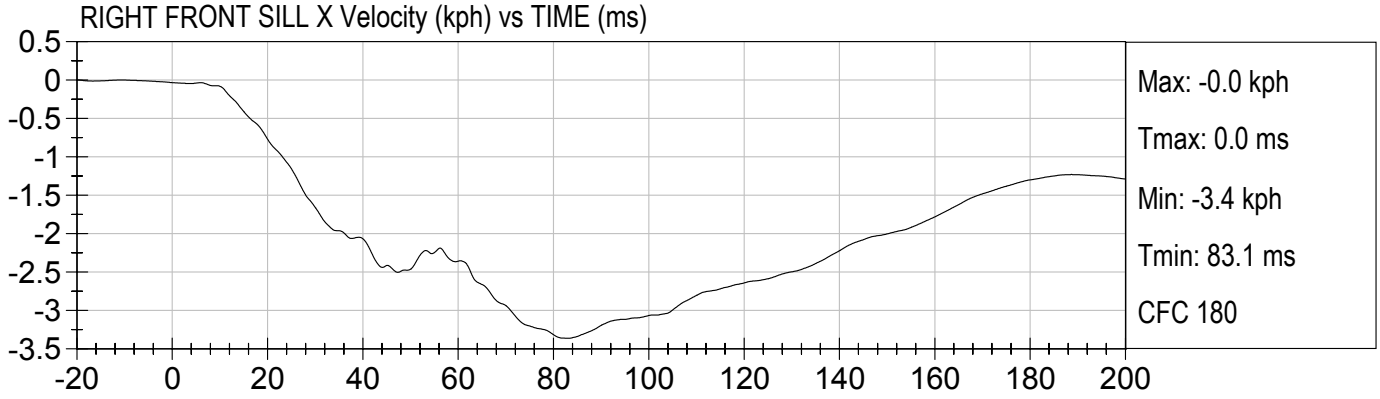


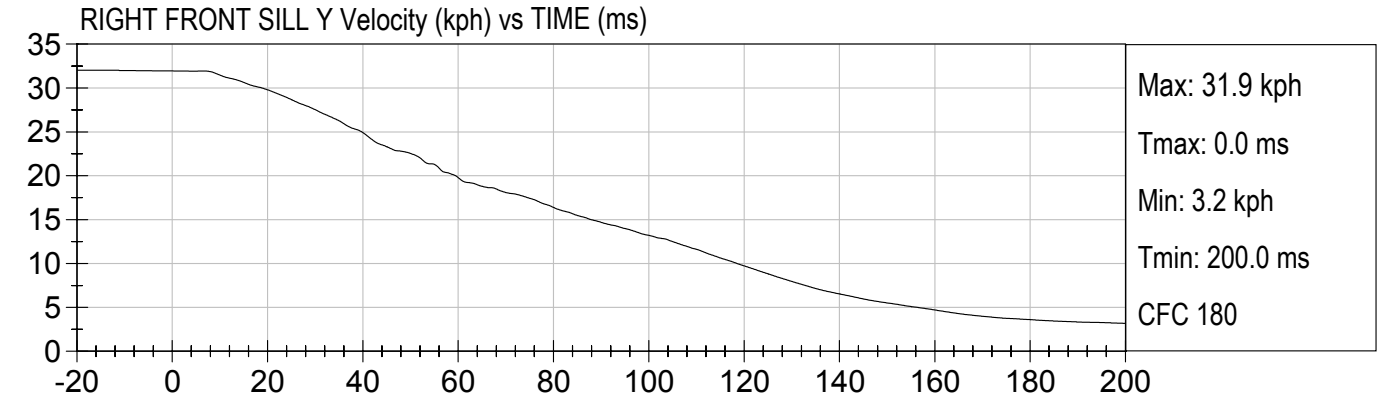
RIGHT FRONT SILL Z (G's) vs TIME (ms)

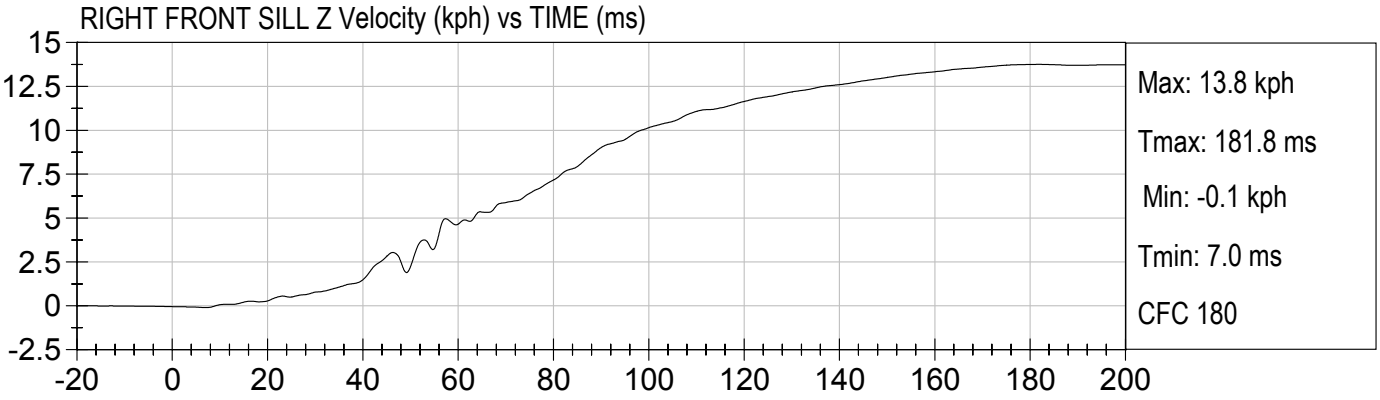


RIGHT FRONT SILL Resultant (G's) vs TIME (ms)




RIGHT FRONT SILL X Velocity (kph) vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 0.0 ms
Min: -3.4 kph
Tmin: 83.1 ms
CFC 180

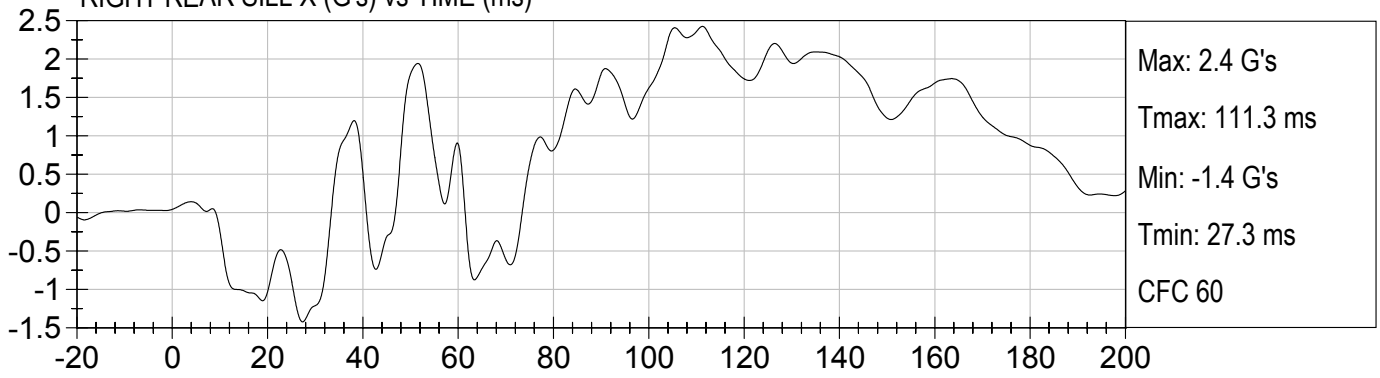

RIGHT FRONT SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 31.9 kph
Tmax: 0.0 ms
Min: 3.2 kph
Tmin: 200.0 ms
CFC 180


RIGHT FRONT SILL Z Velocity (kph) vs TIME (ms)
15
12.5
10
7.5
5
2.5
0
-2.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 13.8 kph
Tmax: 181.8 ms
Min: -0.1 kph
Tmin: 7.0 ms
CFC 180

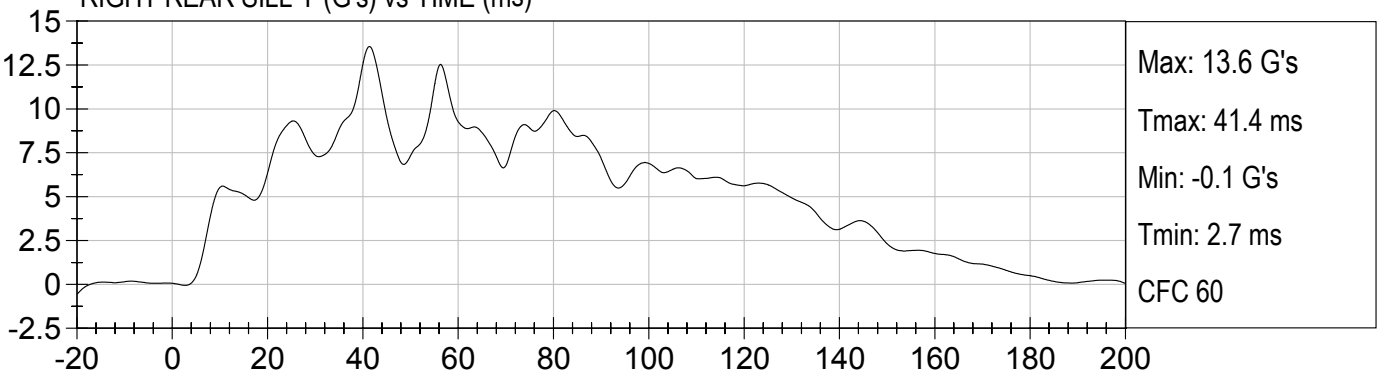
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

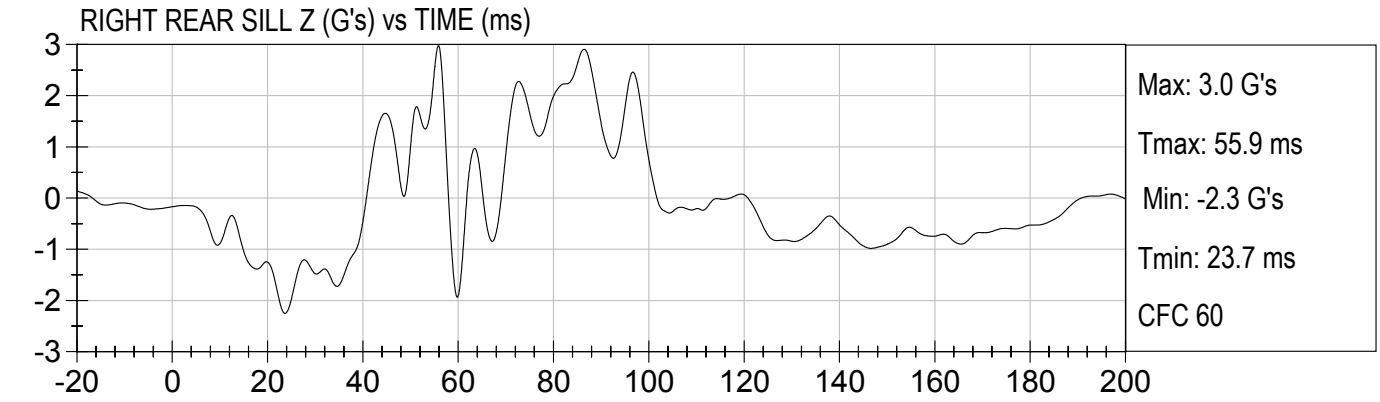
RIGHT REAR SILL X (G's) vs TIME (ms)



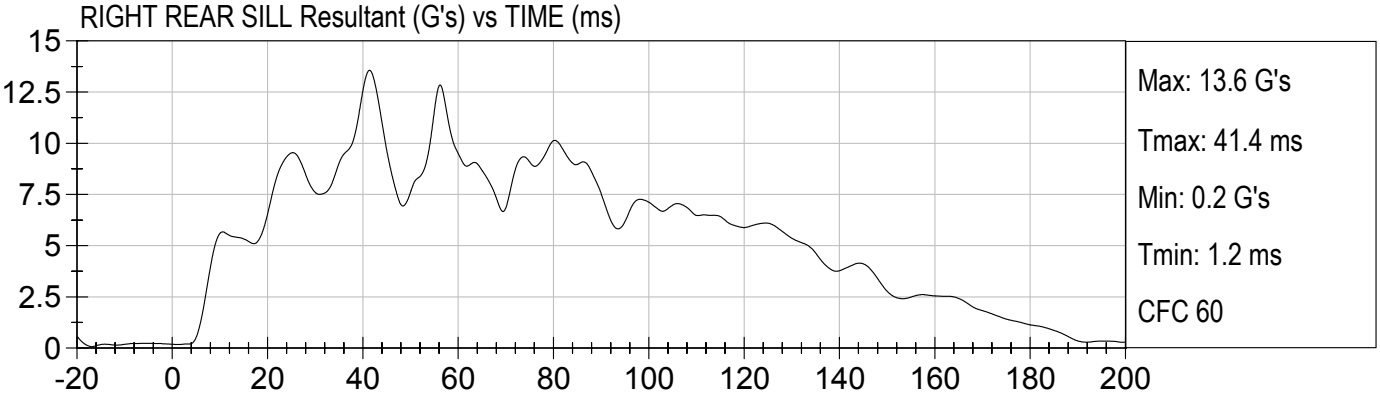
RIGHT REAR SILL Y (G's) vs TIME (ms)

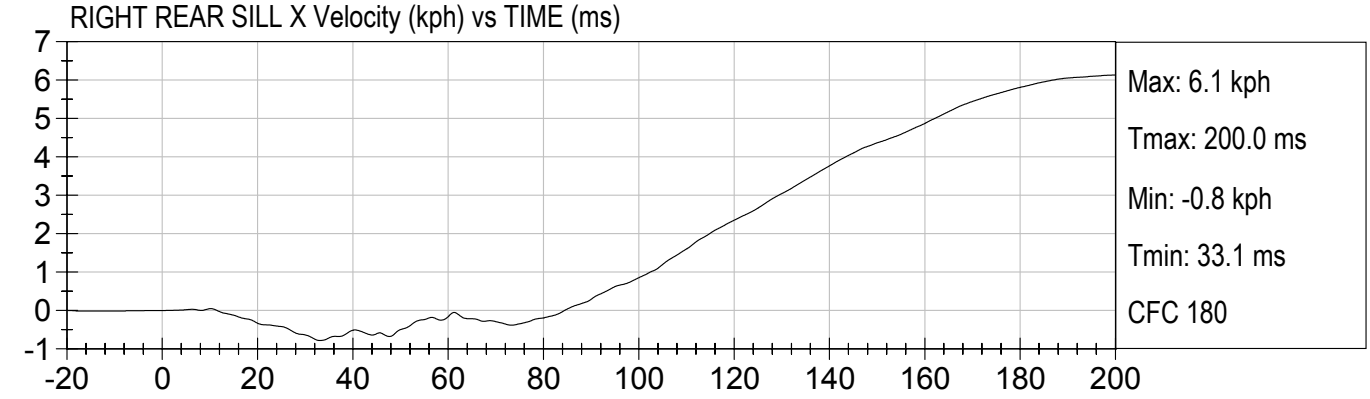


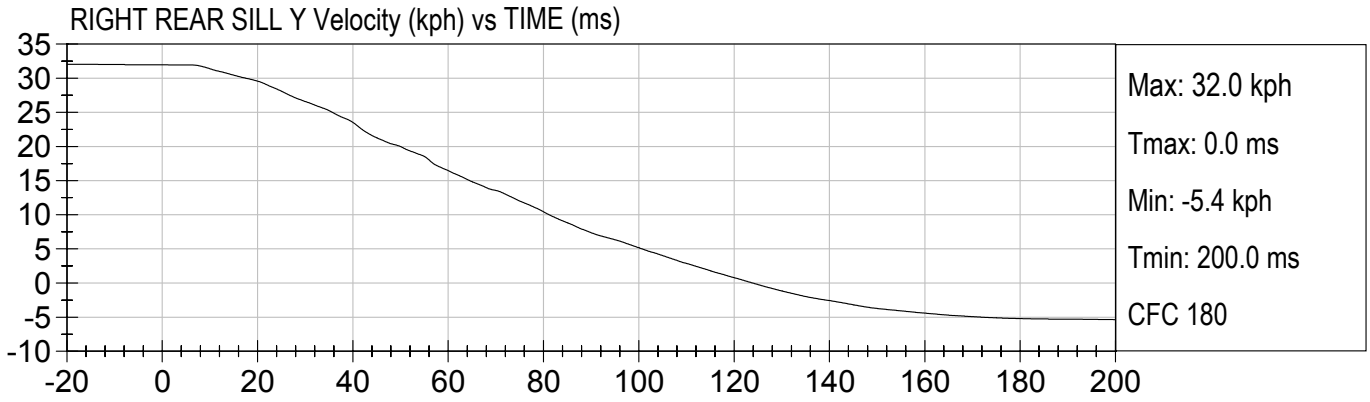
RIGHT REAR SILL Z (G's) vs TIME (ms)

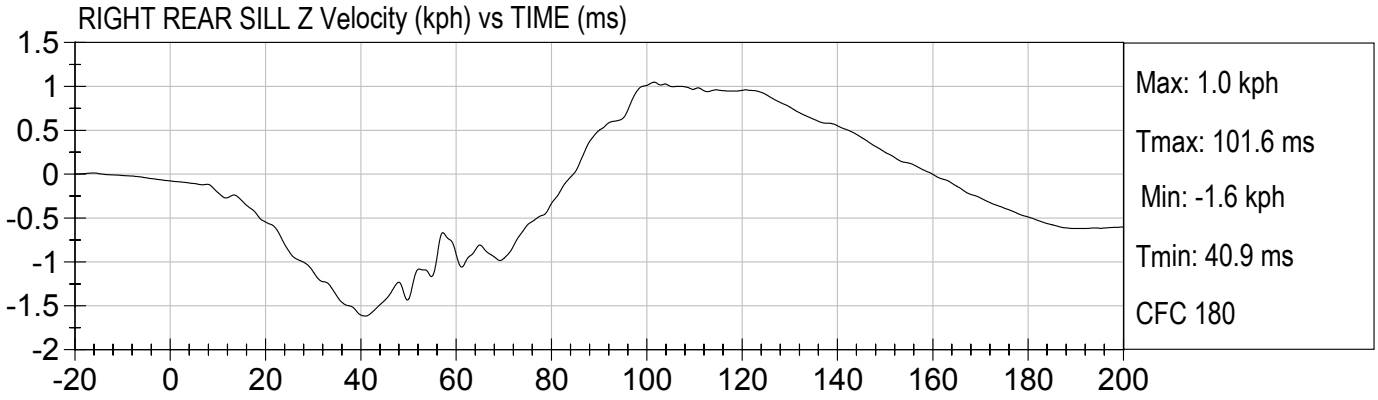


RIGHT REAR SILL Resultant (G's) vs TIME (ms)



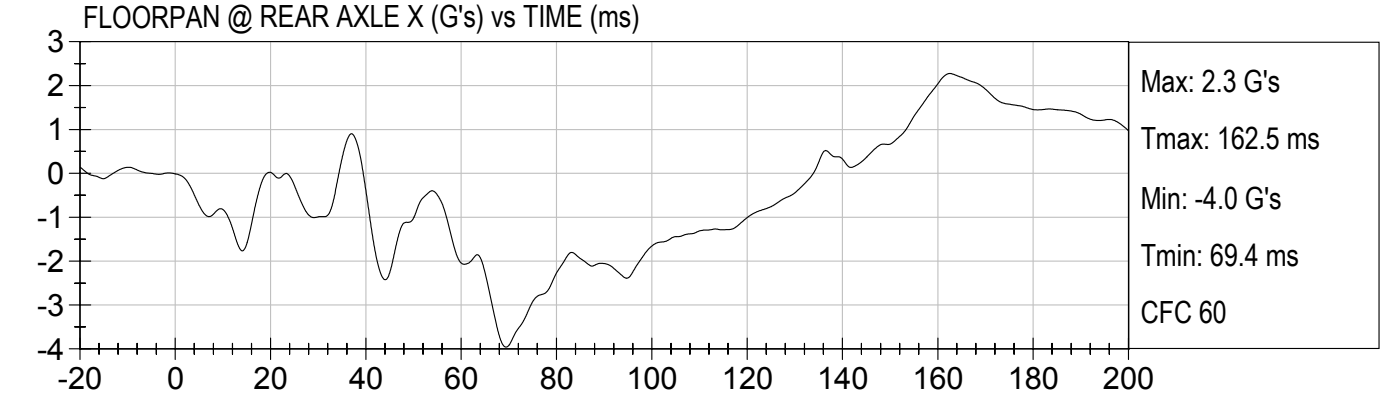

RIGHT REAR SILL X Velocity (kph) vs TIME (ms)
7
6
5
4
3
2
1
0
-1
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 6.1 kph
Tmax: 200.0 ms
Min: -0.8 kph
Tmin: 33.1 ms
CFC 180

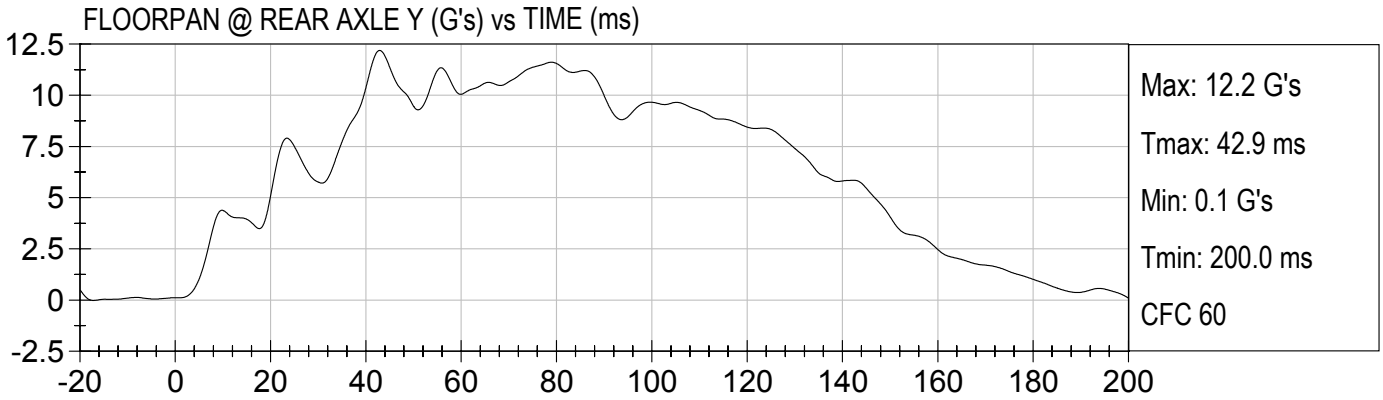

RIGHT REAR SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 0.0 ms
Min: -5.4 kph
Tmin: 200.0 ms
CFC 180

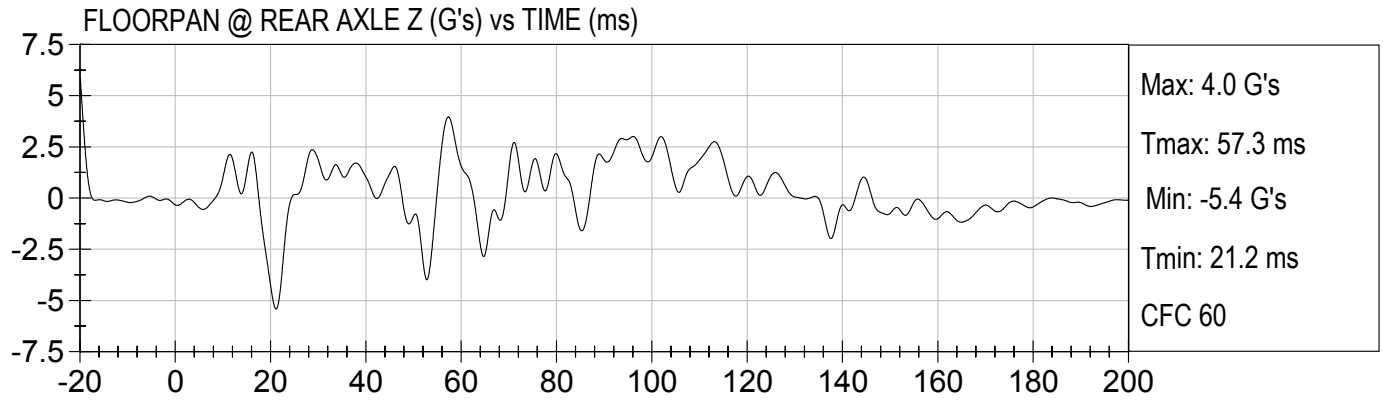

RIGHT REAR SILL Z Velocity (kph) vs TIME (ms)
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.0 kph
Tmax: 101.6 ms
Min: -1.6 kph
Tmin: 40.9 ms
CFC 180

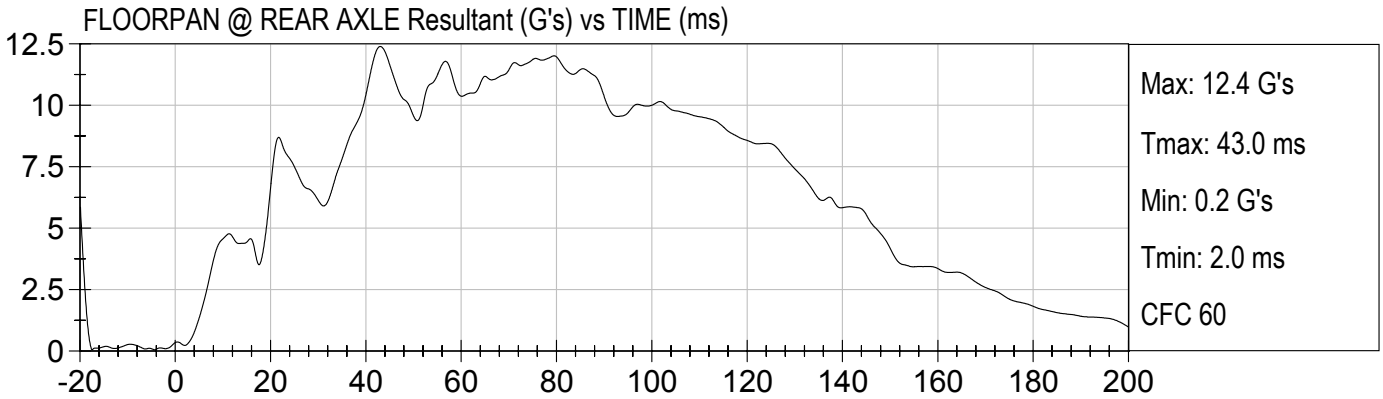
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

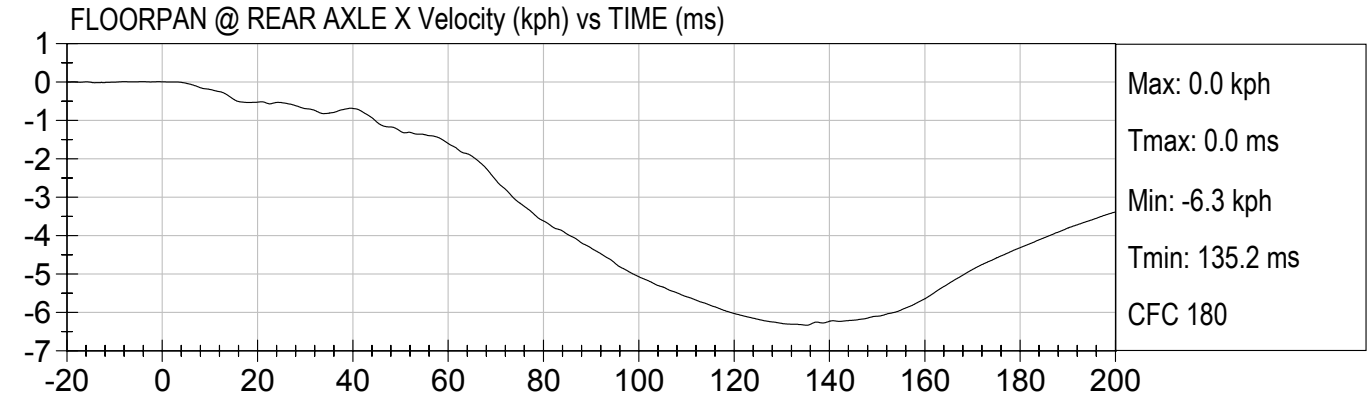
Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

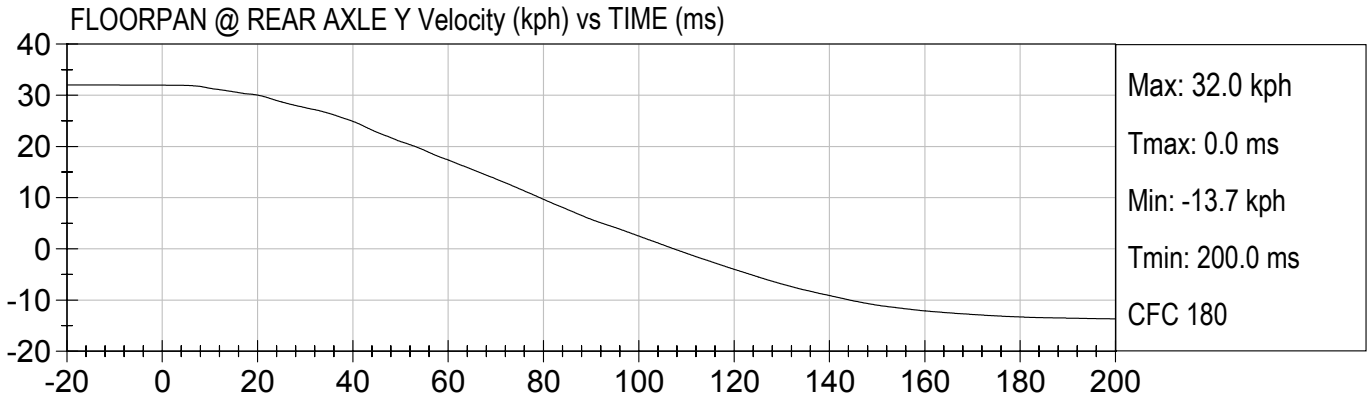


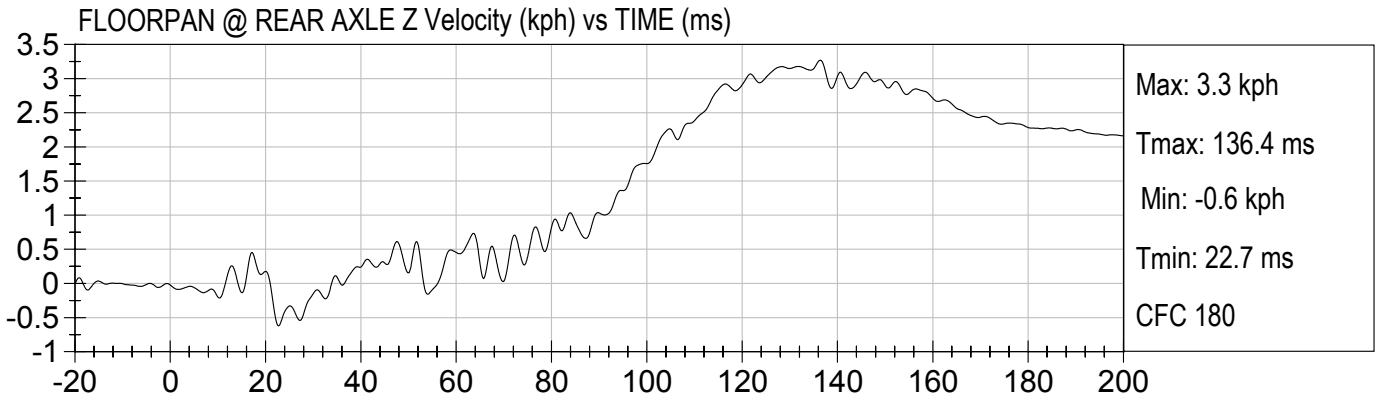




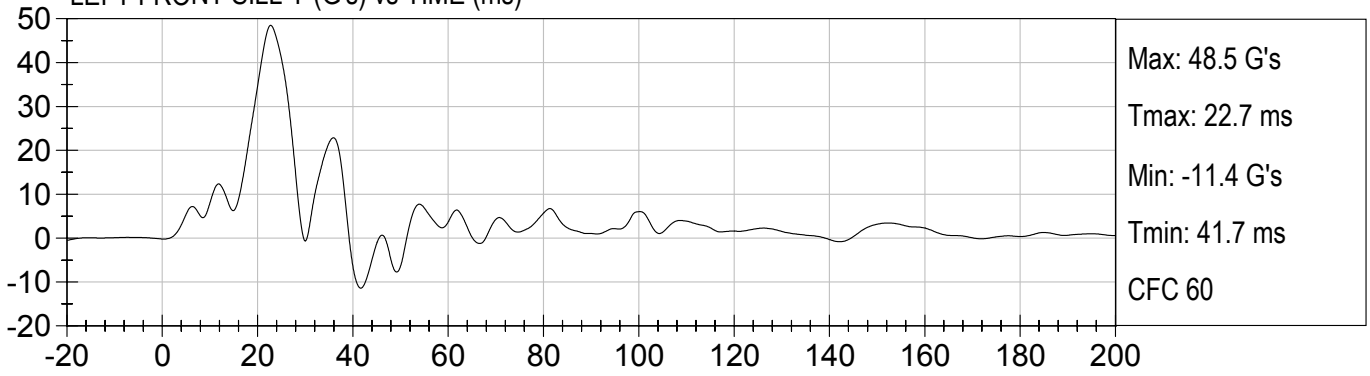



FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.0 kph
Tmax: 0.0 ms
Min: -6.3 kph
Tmin: 135.2 ms
CFC 180

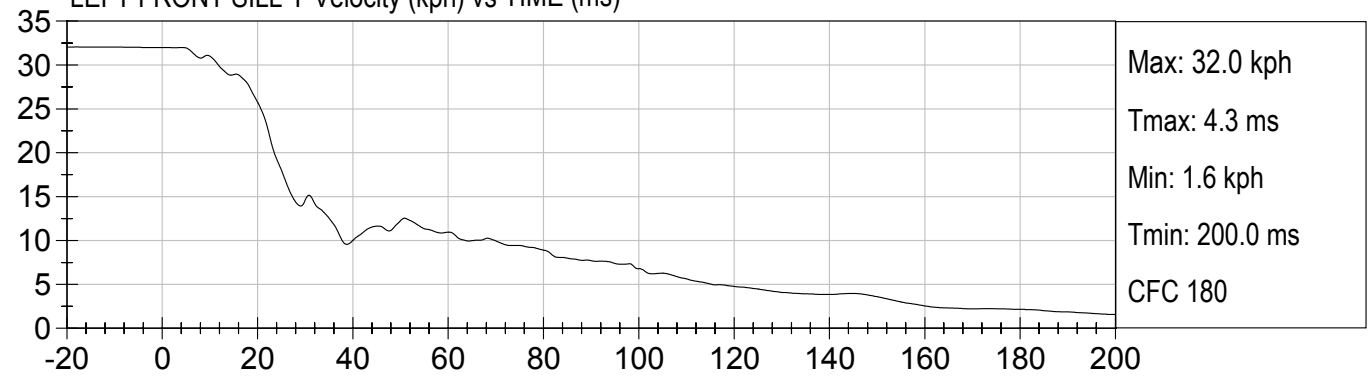

FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 0.0 ms
Min: -13.7 kph
Tmin: 200.0 ms
CFC 180


FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 3.3 kph
Tmax: 136.4 ms
Min: -0.6 kph
Tmin: 22.7 ms
CFC 180

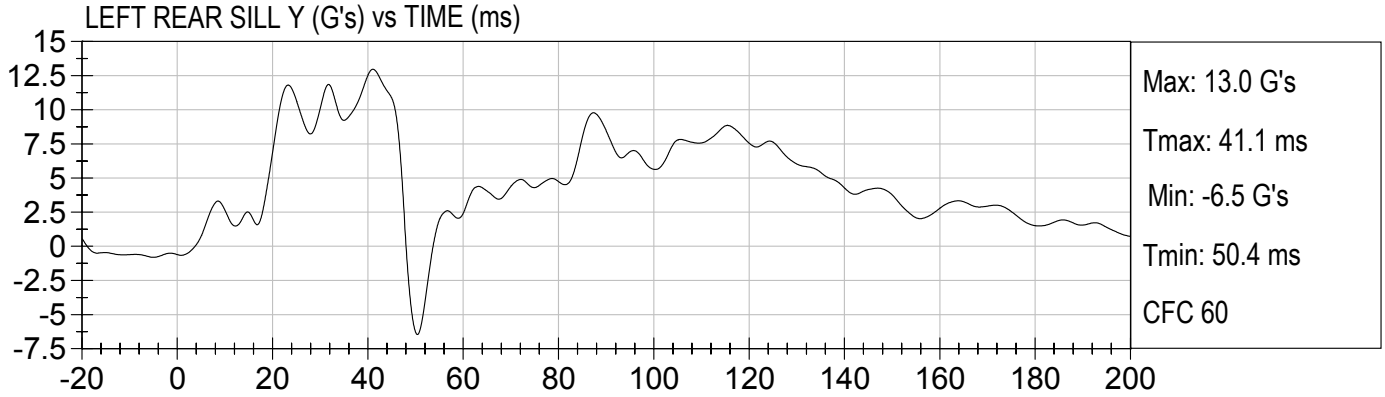
LEFT FRONT SILL Y (G's) vs TIME (ms)



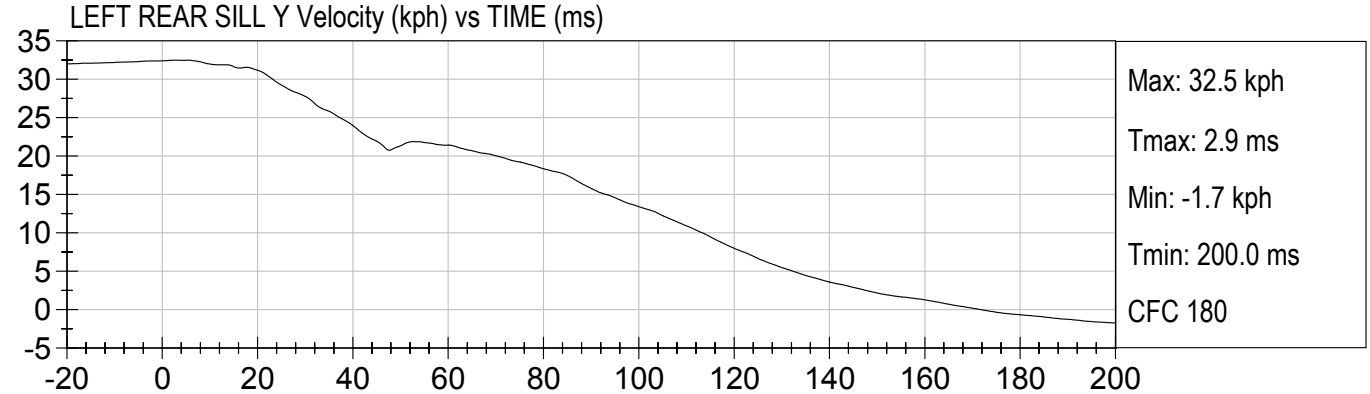
LEFT FRONT SILL Y Velocity (kph) vs TIME (ms)



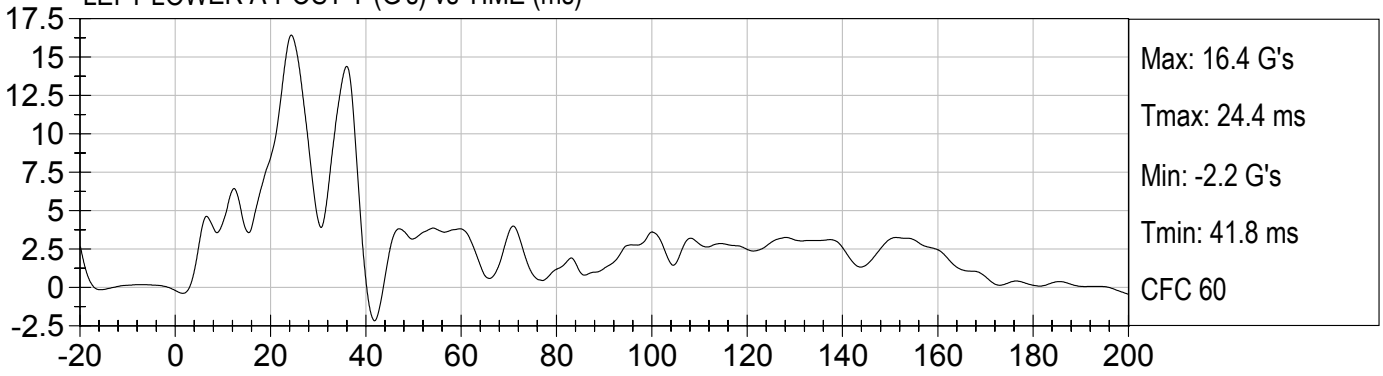
LEFT REAR SILL Y (G's) vs TIME (ms)



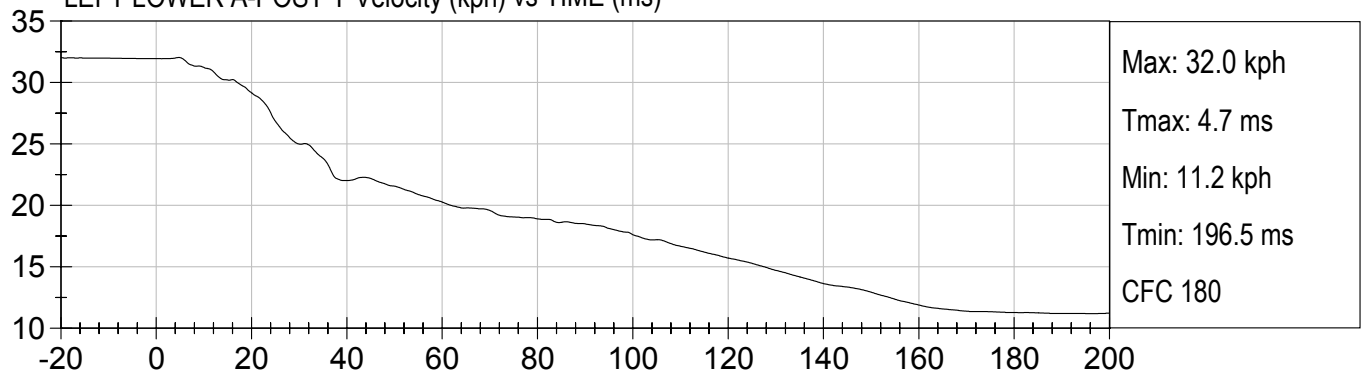
LEFT REAR SILL Y Velocity (kph) vs TIME (ms)



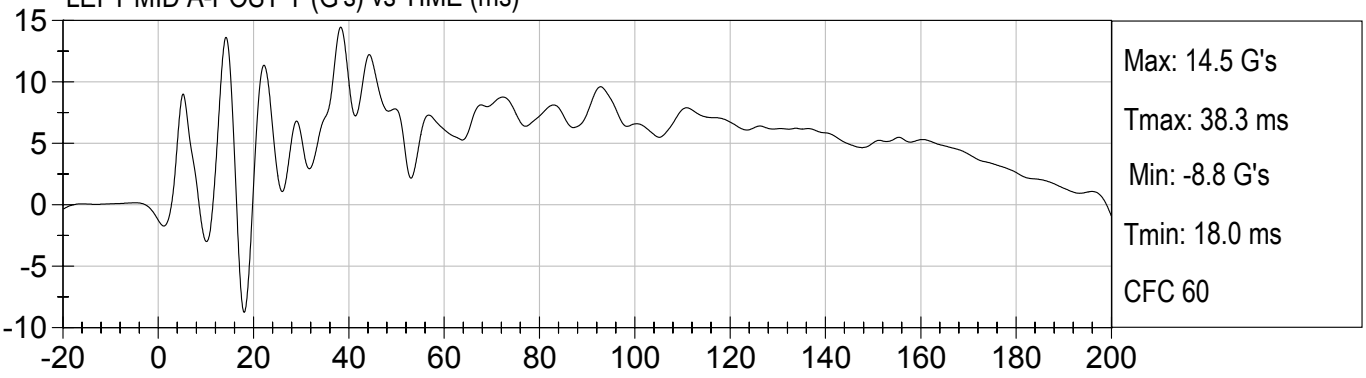
LEFT LOWER A-POST Y (G's) vs TIME (ms)



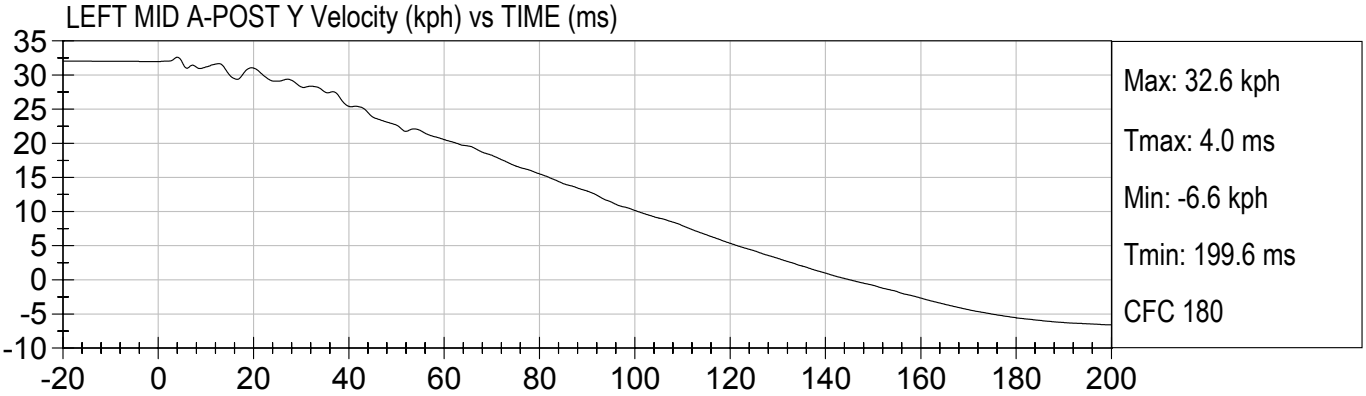
LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)



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



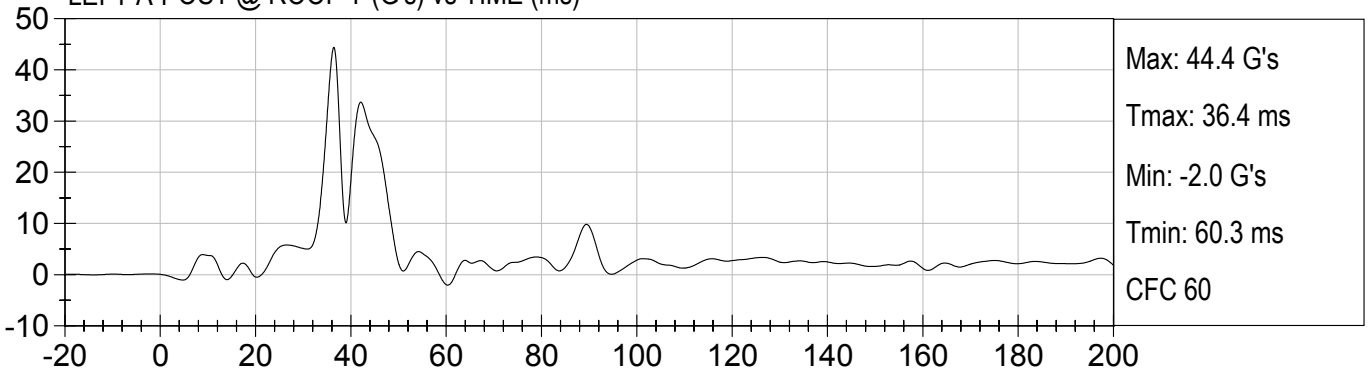
LEFT MID A-POST Y Velocity (kph) vs TIME (ms)



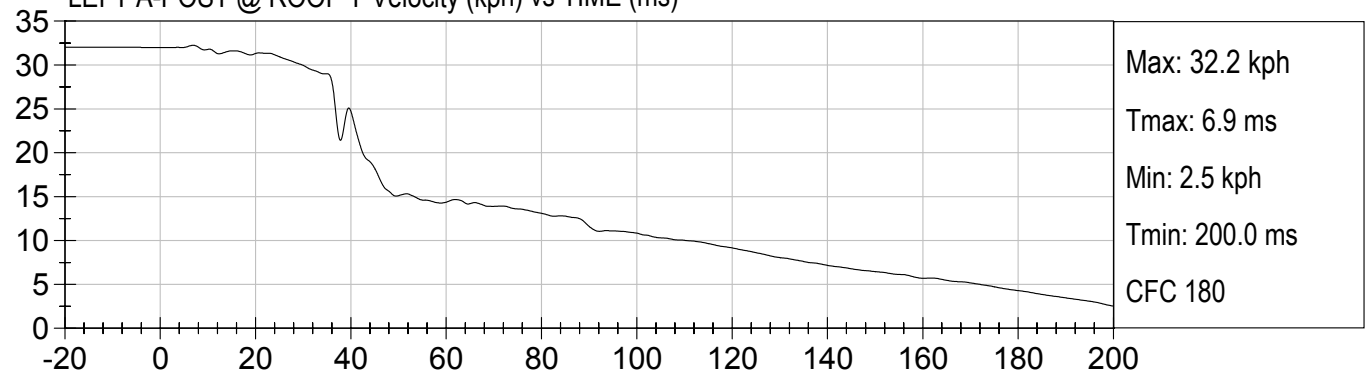
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

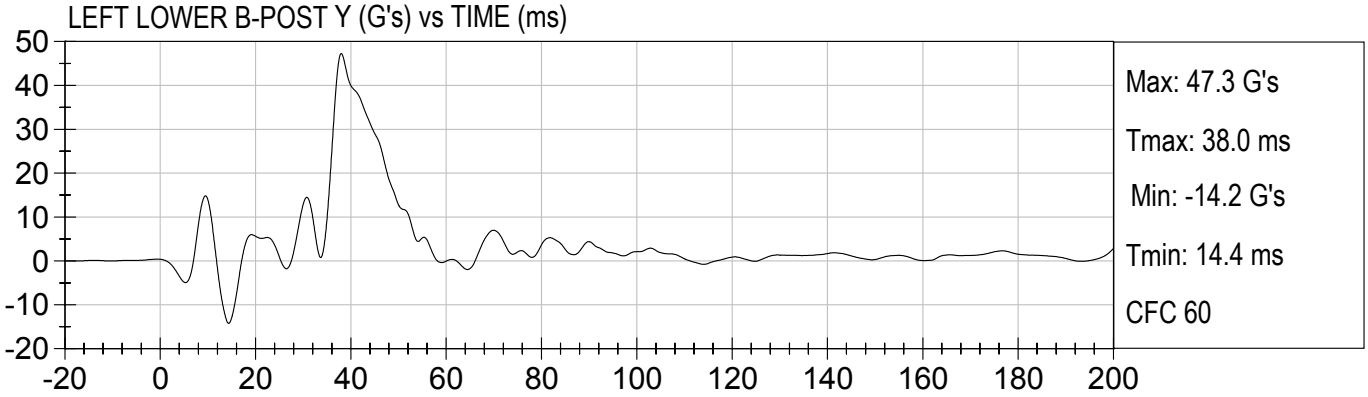
LEFT A-POST @ ROOF Y (G's) vs TIME (ms)



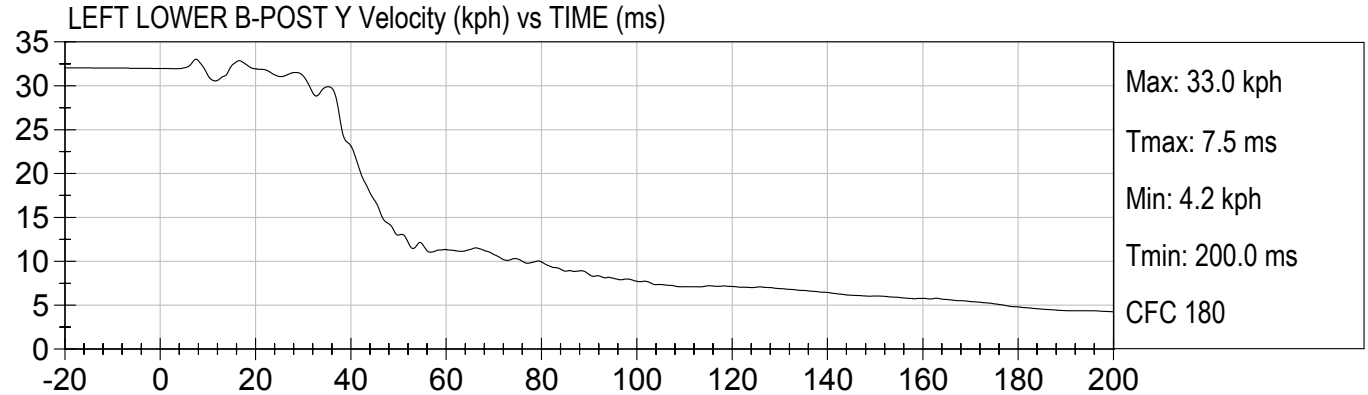
LEFT A-POST @ ROOF Y Velocity (kph) vs TIME (ms)

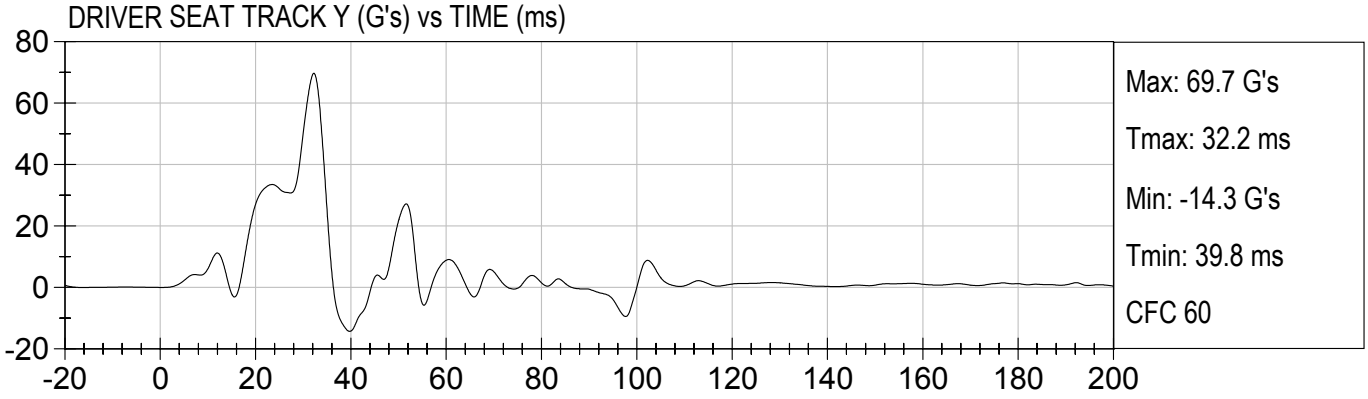


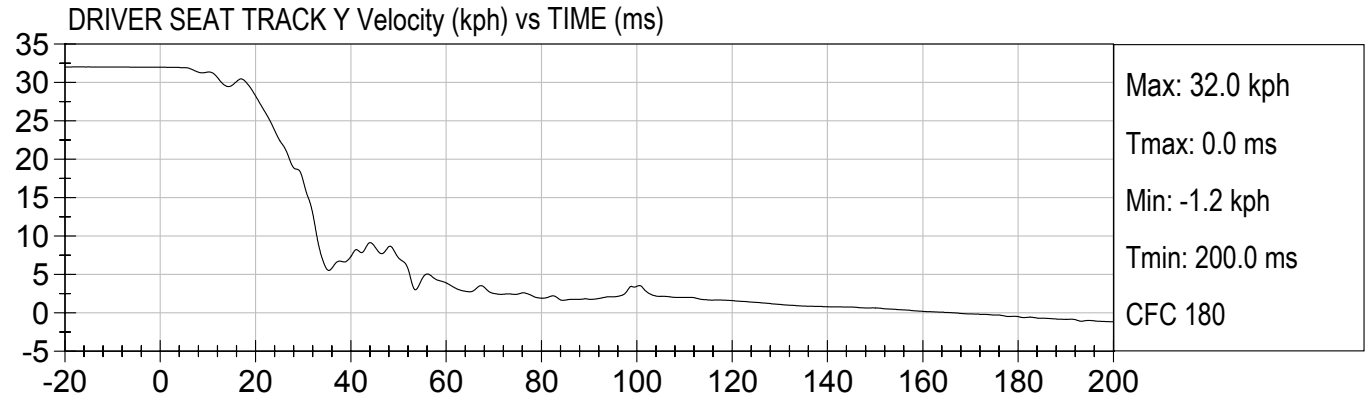
LEFT LOWER B-POST Y (G's) vs TIME (ms)



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

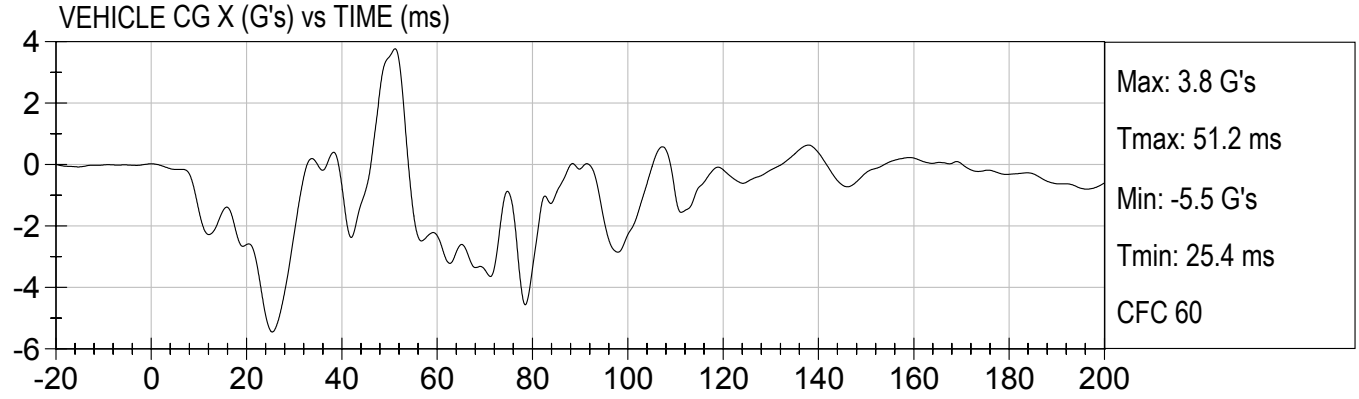


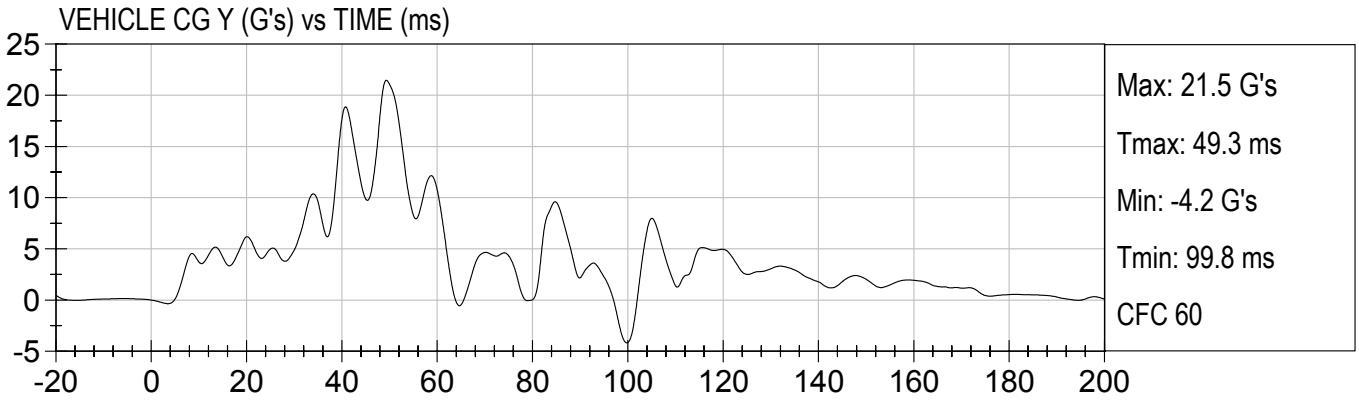

DRIVER SEAT TRACK Y (G's) vs TIME (ms)
80
60
40
20
0
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 69.7 G's
Tmax: 32.2 ms
Min: -14.3 G's
Tmin: 39.8 ms
CFC 60

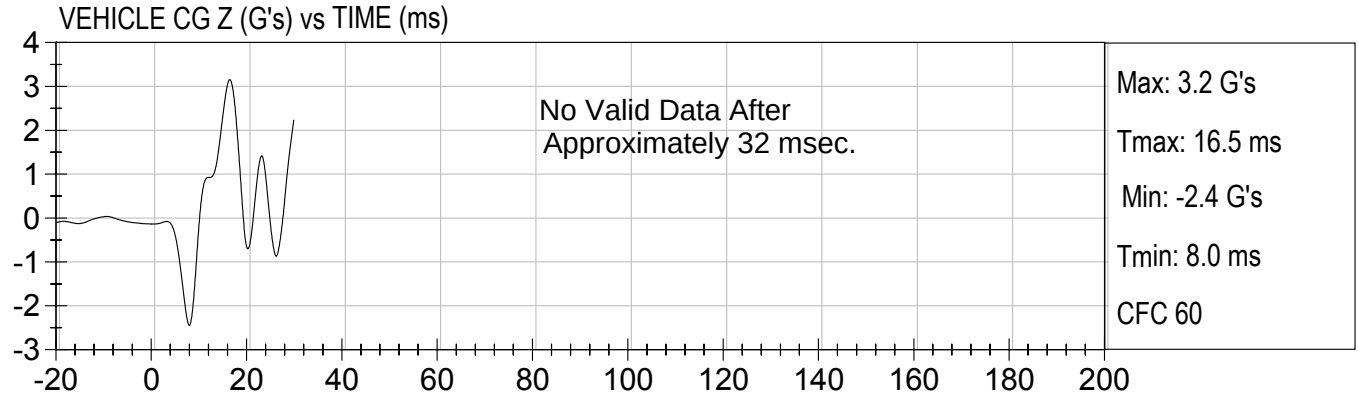

DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 0.0 ms
Min: -1.2 kph
Tmin: 200.0 ms
CFC 180

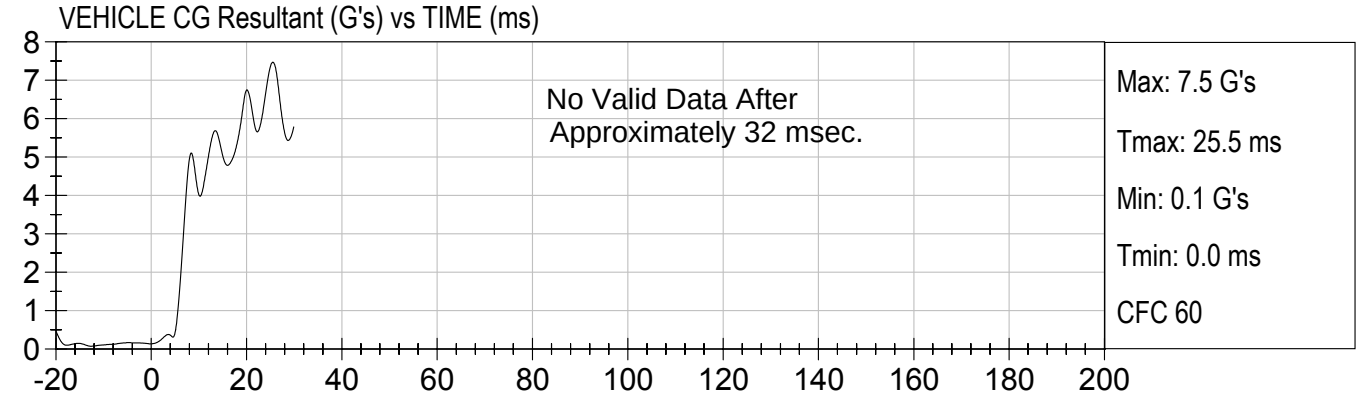
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

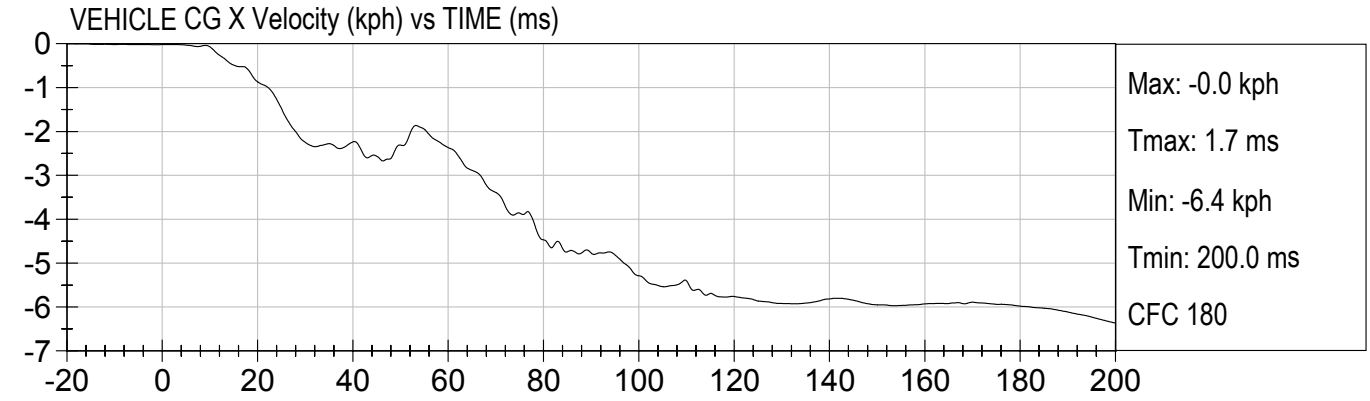
Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

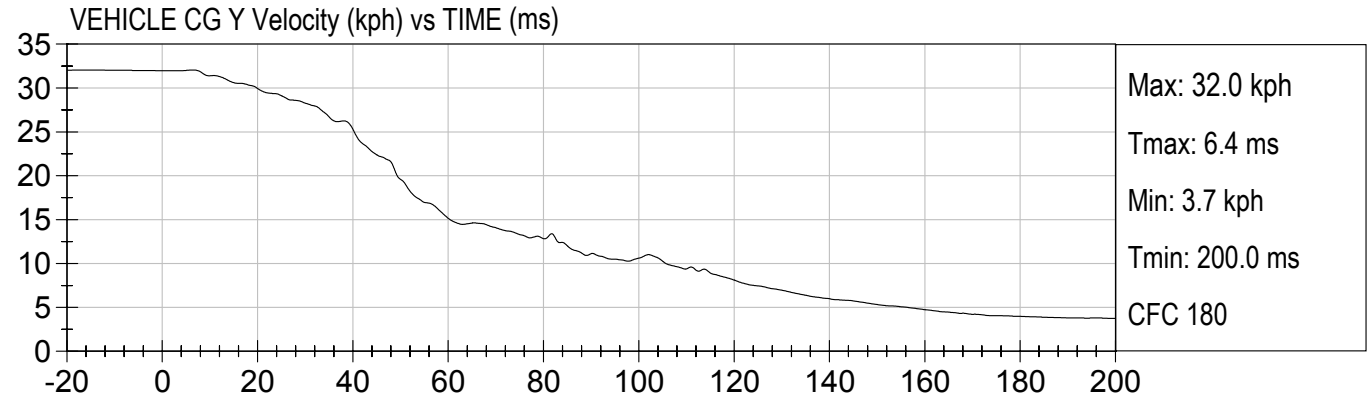


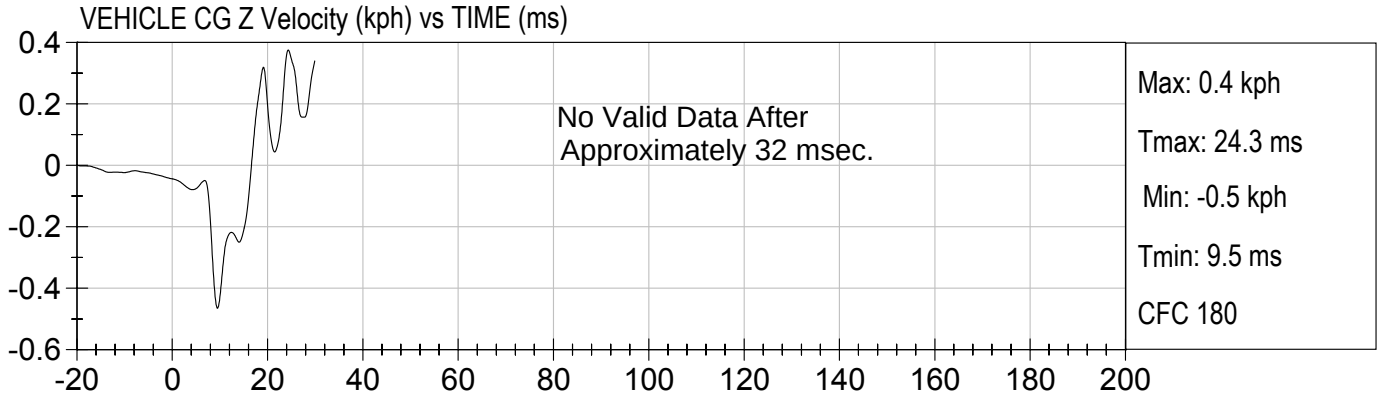






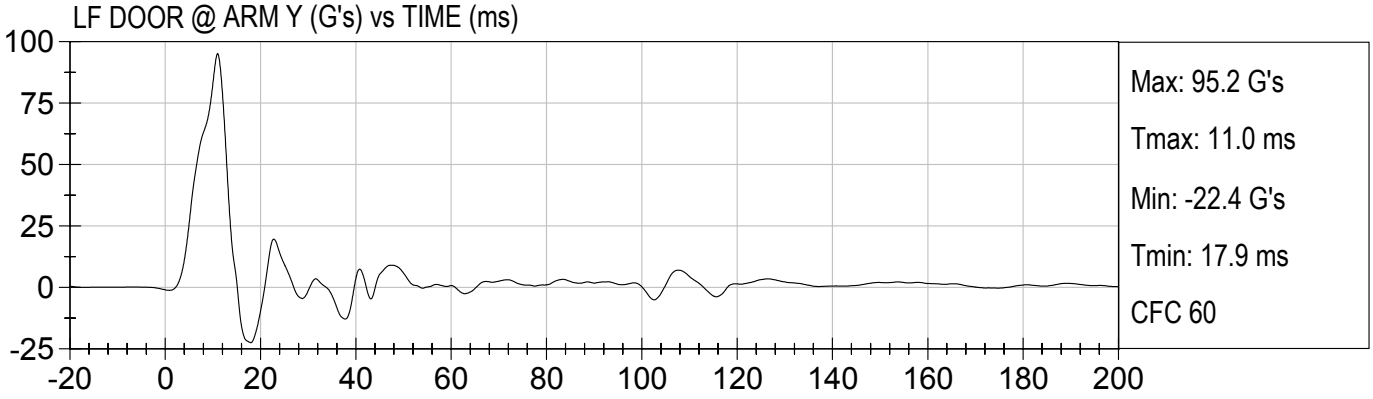

VEHICLE CG X Velocity (kph) vs TIME (ms)
0
-1
-2
-3
-4
-5
-6
-7
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.0 kph
Tmax: 1.7 ms
Min: -6.4 kph
Tmin: 200.0 ms
CFC 180

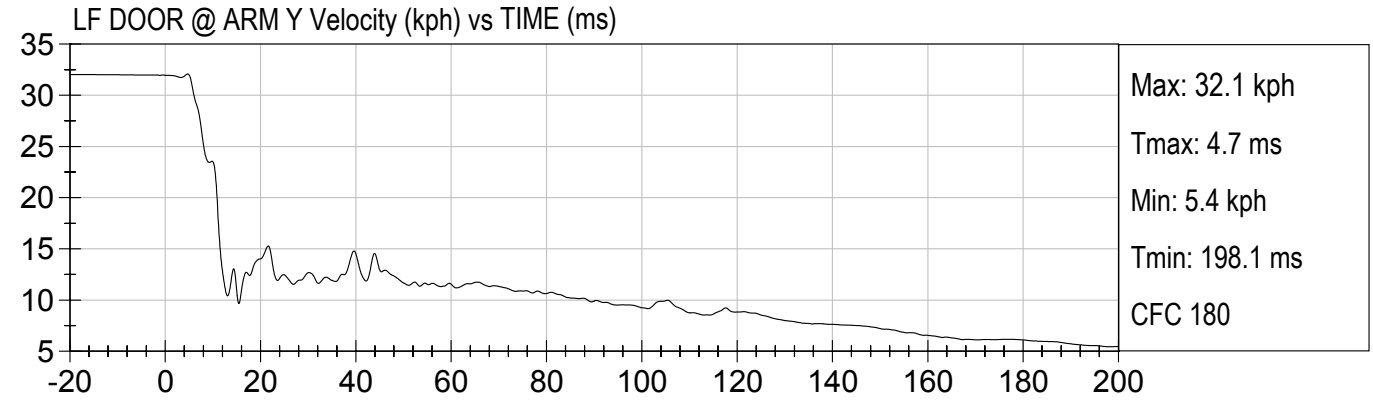

VEHICLE CG Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.0 kph
Tmax: 6.4 ms
Min: 3.7 kph
Tmin: 200.0 ms
CFC 180

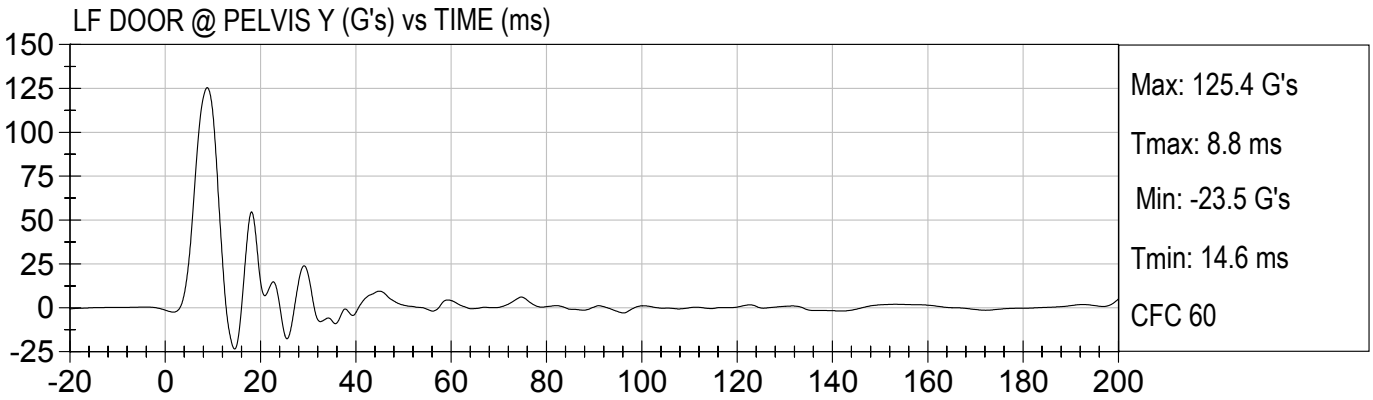

VEHICLE CG Z Velocity (kph) vs TIME (ms)
0.4
0.2
0
-0.2
-0.4
-0.6
-20
0
20
40
60
80
100
120
140
160
180
200
No Valid Data After
Approximately 32 msec.
Max: 0.4 kph
Tmax: 24.3 ms
Min: -0.5 kph
Tmin: 9.5 ms
CFC 180

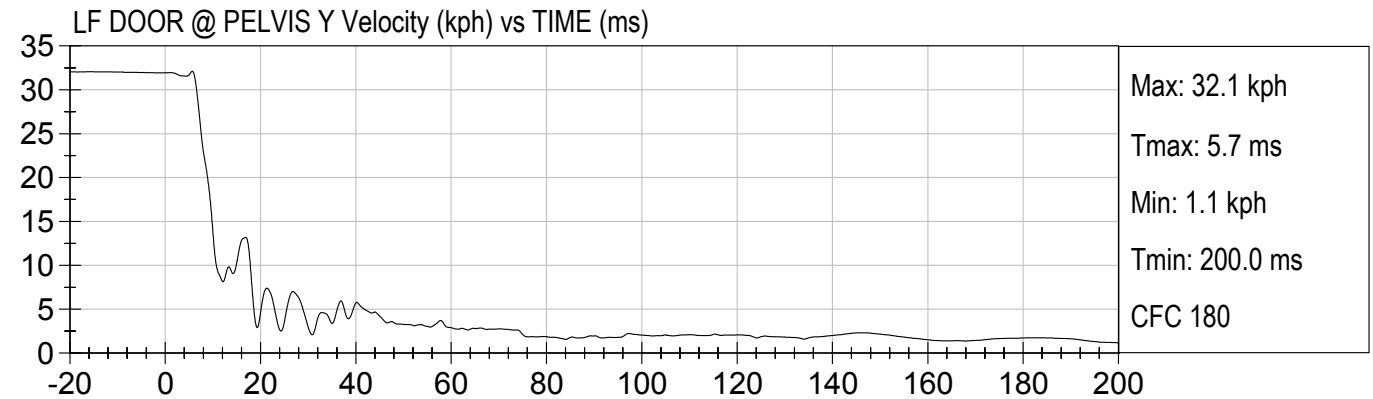
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

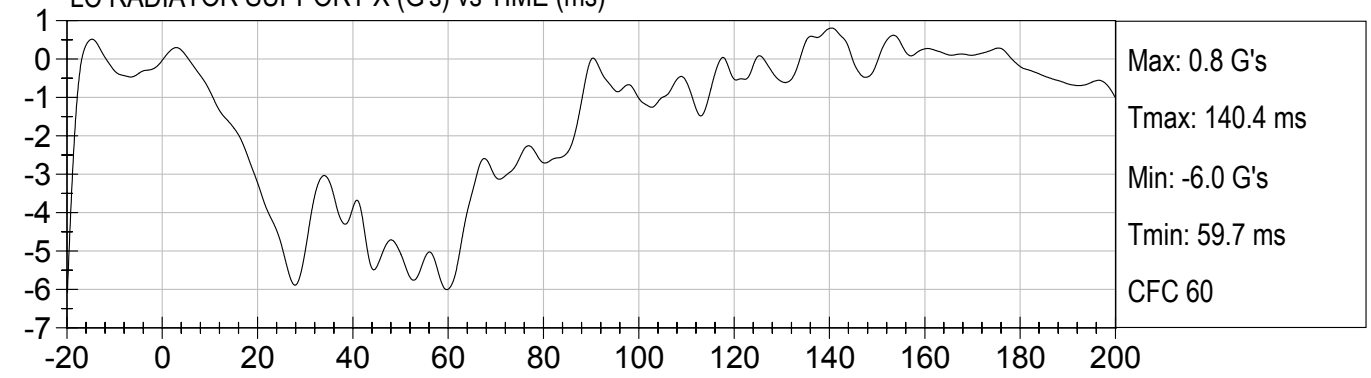




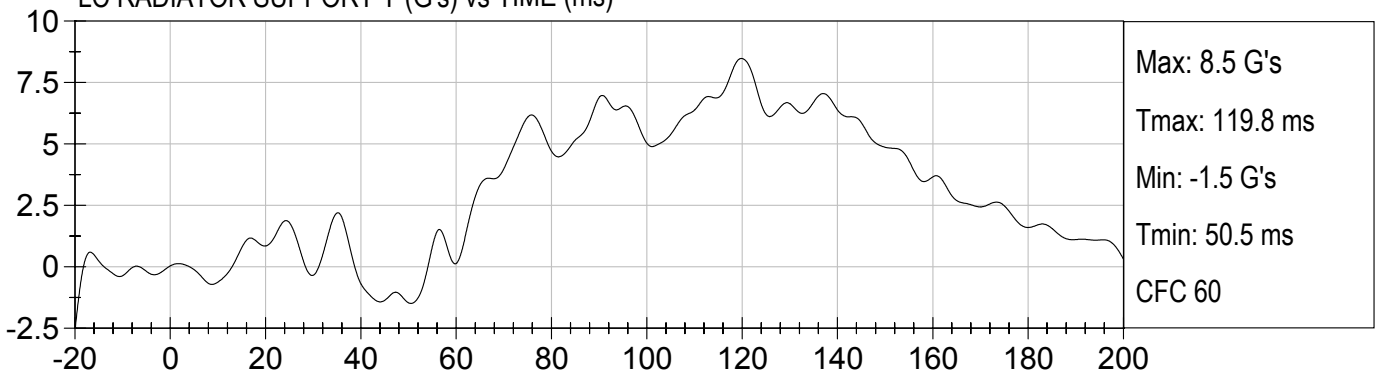




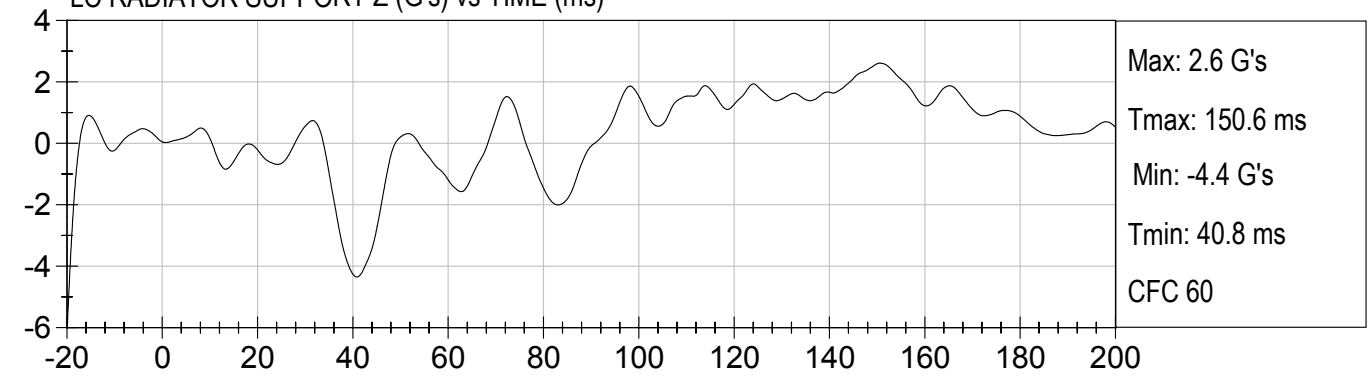
LC RADIATOR SUPPORT X (G's) vs TIME (ms)



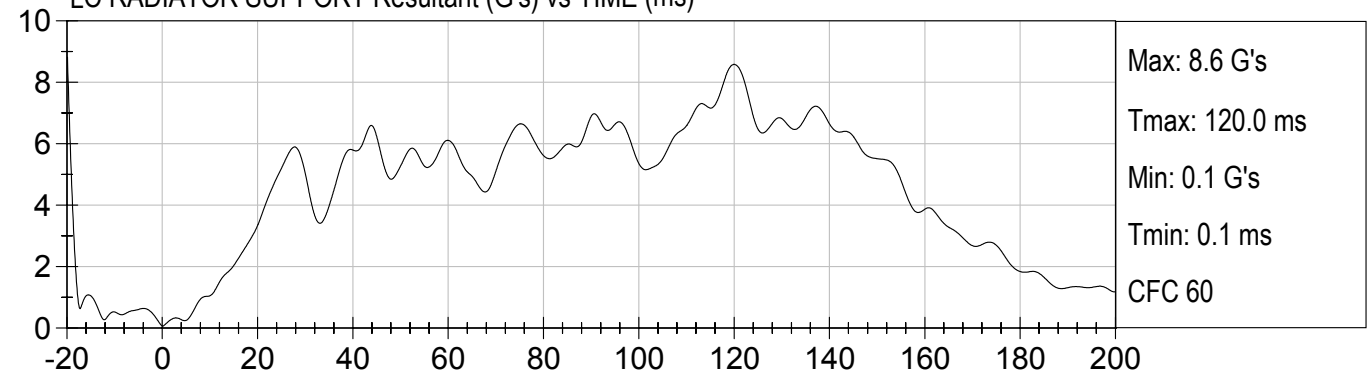
LC RADIATOR SUPPORT Y (G's) vs TIME (ms)

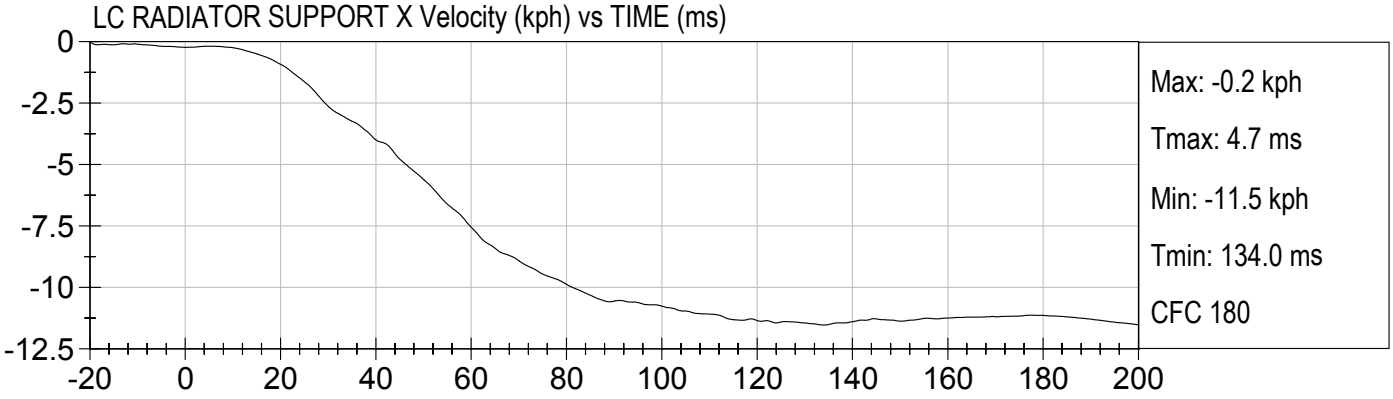


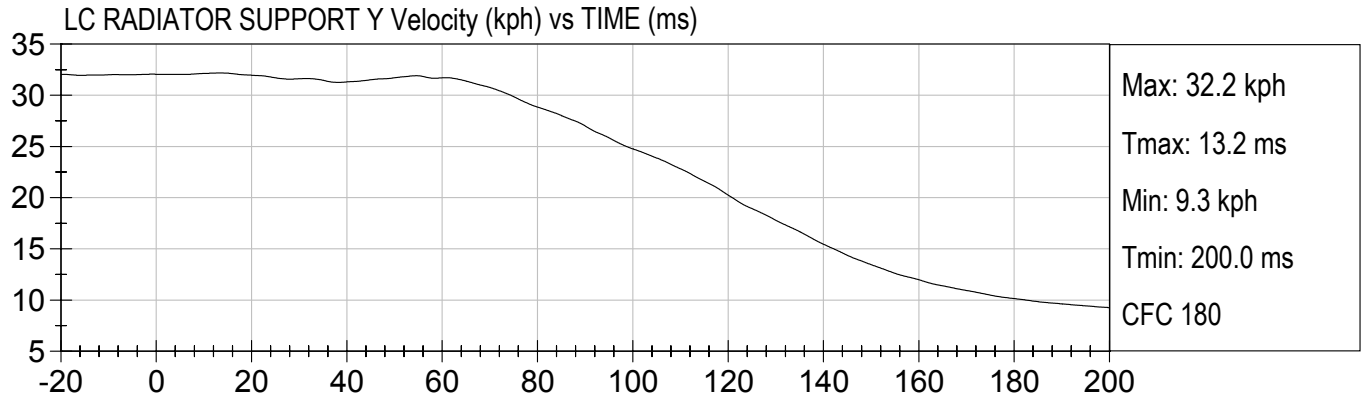
LC RADIATOR SUPPORT Z (G's) vs TIME (ms)

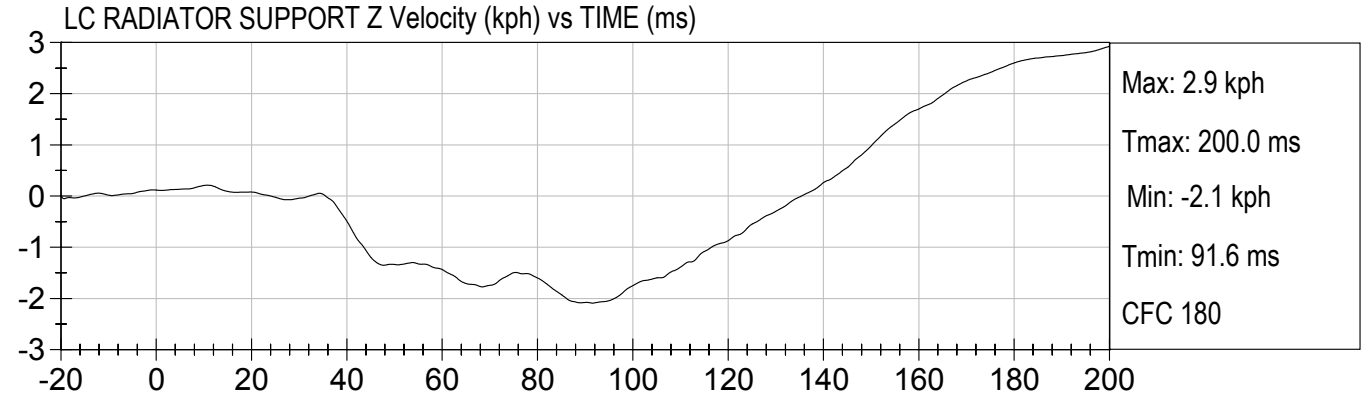


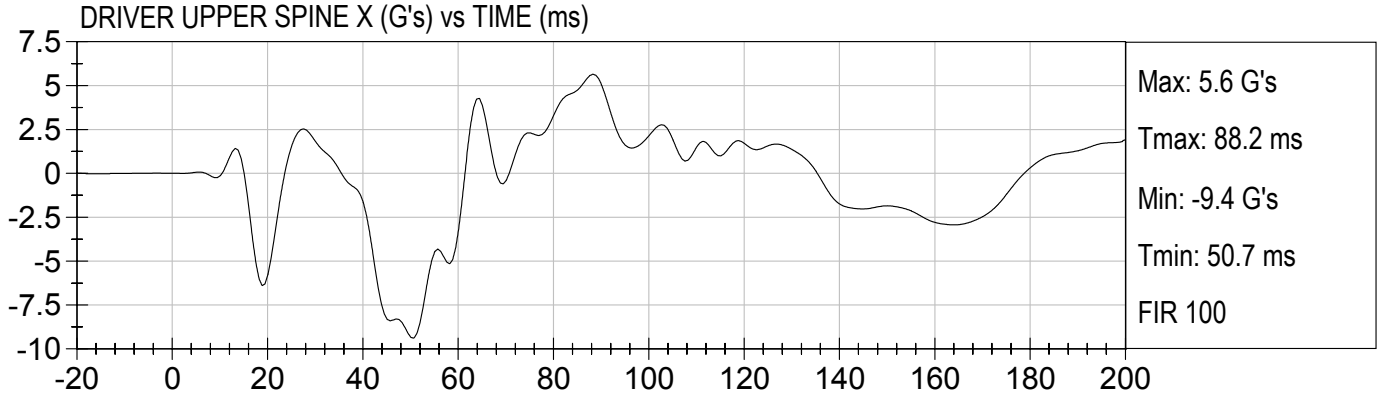
LC RADIATOR SUPPORT Resultant (G's) vs TIME (ms)

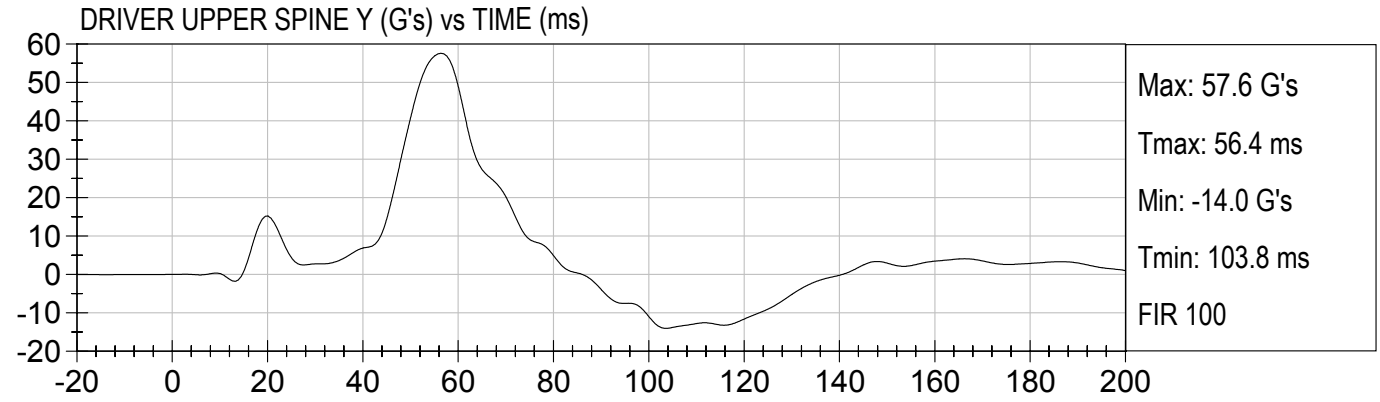


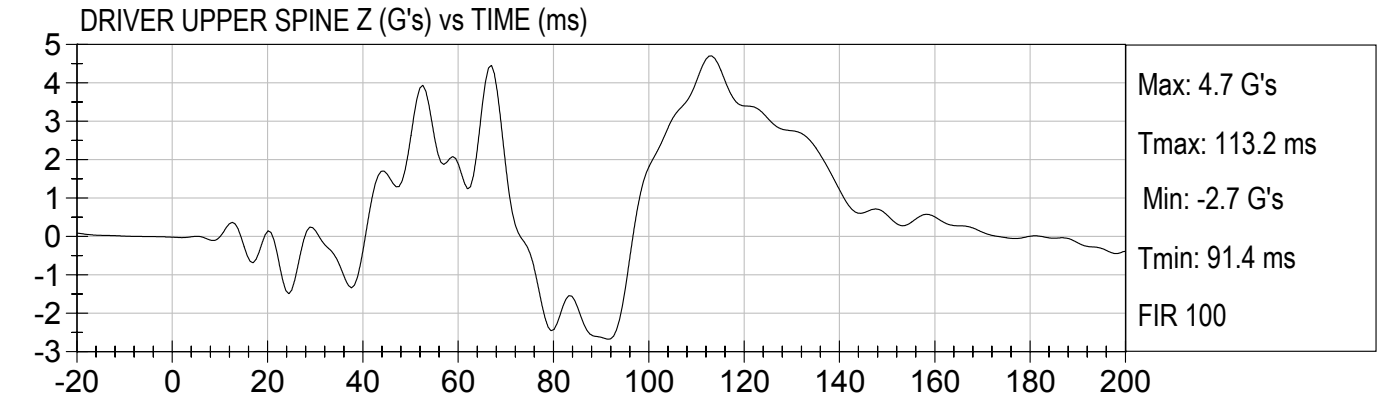

LC RADIATOR SUPPORT X Velocity (kph) vs TIME (ms)
0
-2.5
-5
-7.5
-10
-12.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: -0.2 kph
Tmax: 4.7 ms
Min: -11.5 kph
Tmin: 134.0 ms
CFC 180


LC RADIATOR SUPPORT Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.2 kph
Tmax: 13.2 ms
Min: 9.3 kph
Tmin: 200.0 ms
CFC 180


LC RADIATOR SUPPORT Z Velocity (kph) vs TIME (ms)
3
2
1
0
-1
-2
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2.9 kph
Tmax: 200.0 ms
Min: -2.1 kph
Tmin: 91.6 ms
CFC 180

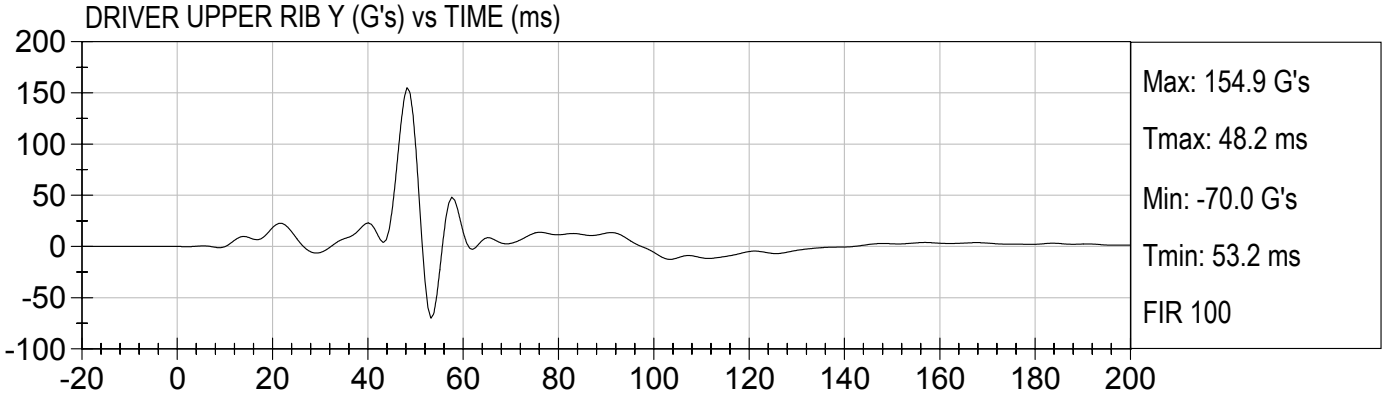

DRIVER UPPER SPINE X (G's) vs TIME (ms)
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 5.6 G's
Tmax: 88.2 ms
Min: -9.4 G's
Tmin: 50.7 ms
FIR 100

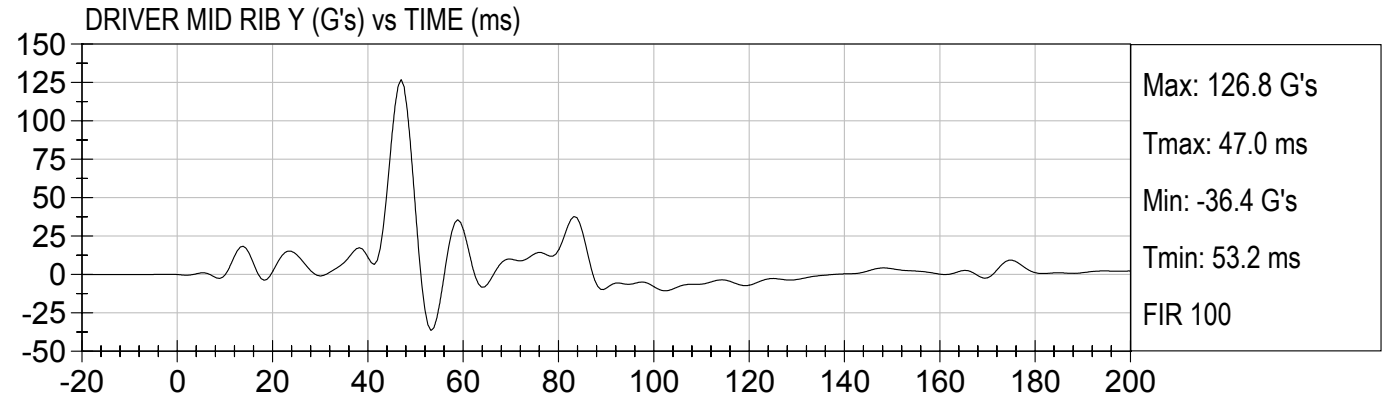

DRIVER UPPER SPINE Y (G's) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 57.6 G's
Tmax: 56.4 ms
Min: -14.0 G's
Tmin: 103.8 ms
FIR 100

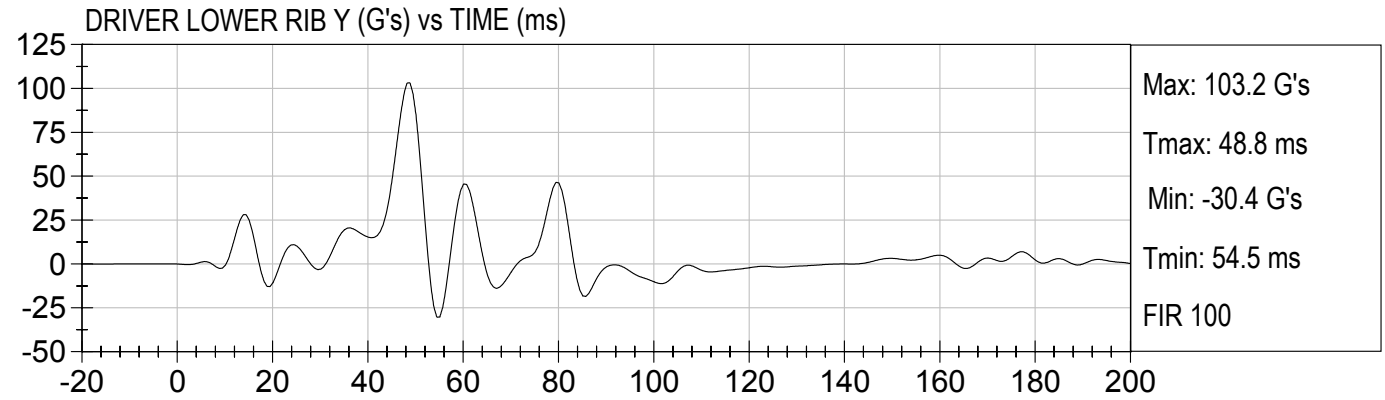

DRIVER UPPER SPINE Z (G's) vs TIME (ms)
5
4
3
2
1
0
-1
-2
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.7 G's
Tmax: 113.2 ms
Min: -2.7 G's
Tmin: 91.4 ms
FIR 100

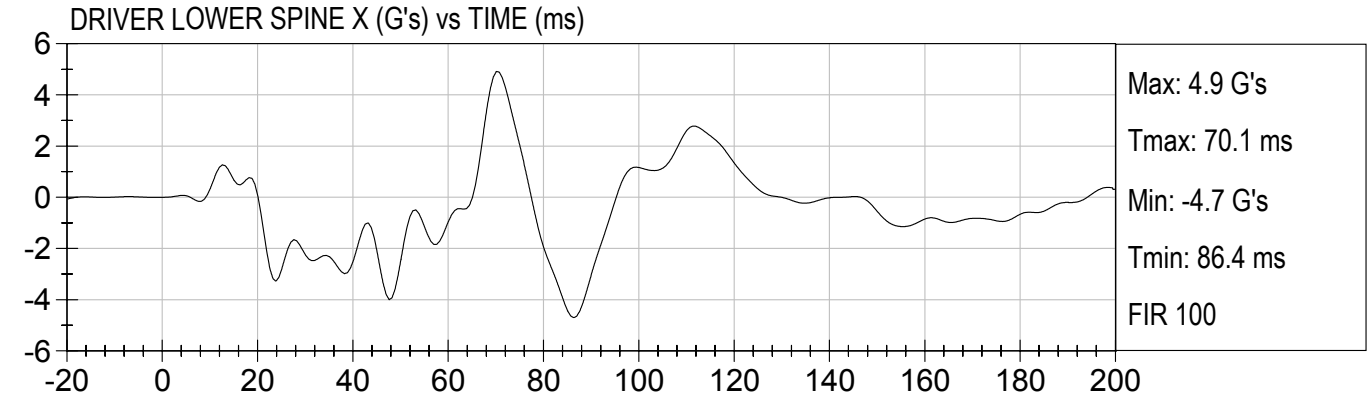
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

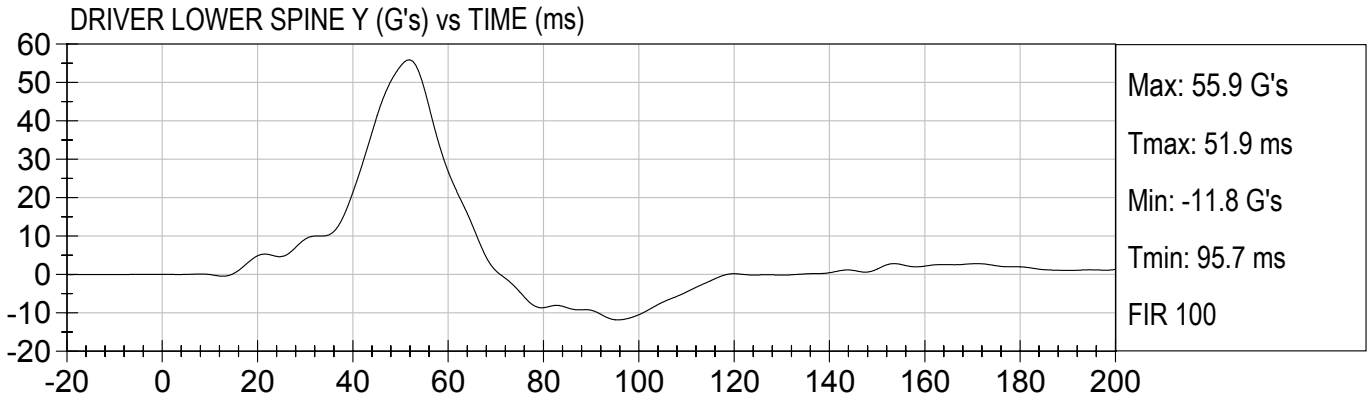
Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

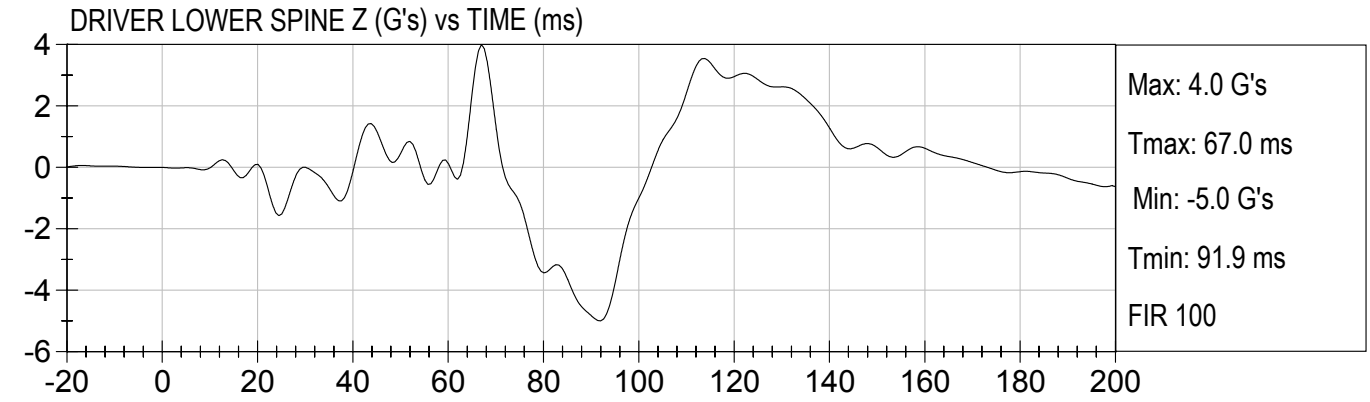


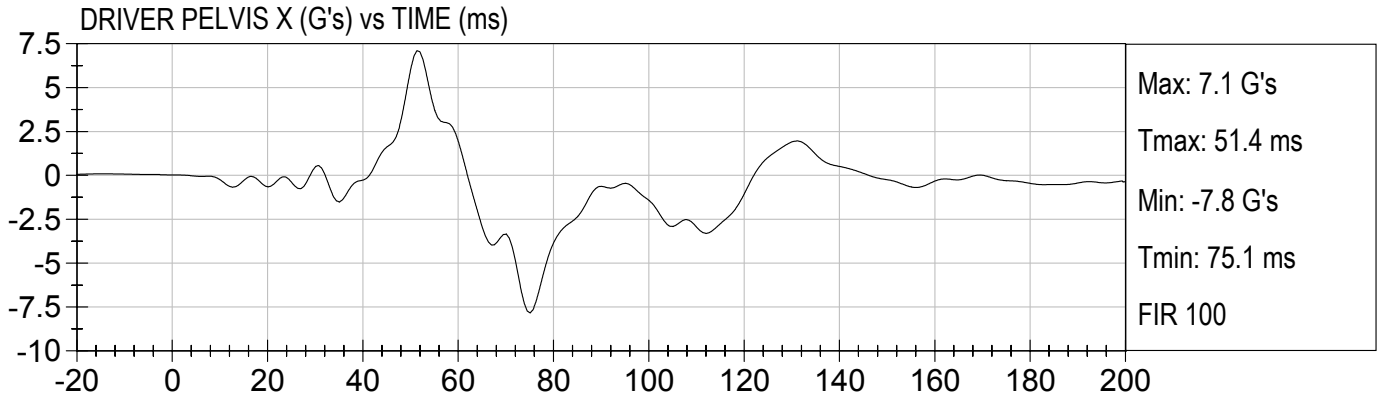


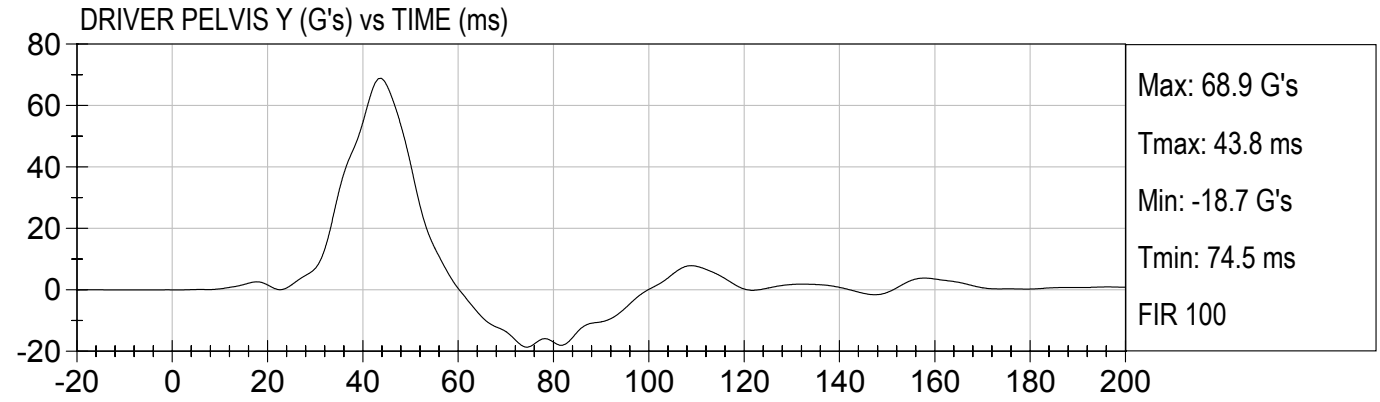


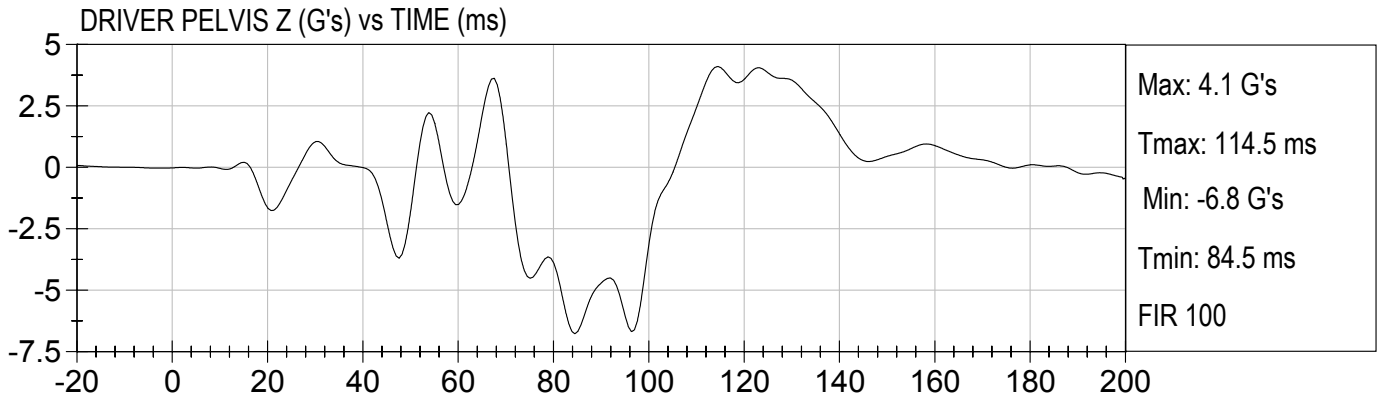

DRIVER LOWER SPINE X (G's) vs TIME (ms)
6
4
2
0
-2
-4
-6
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.9 G's
Tmax: 70.1 ms
Min: -4.7 G's
Tmin: 86.4 ms
FIR 100


DRIVER LOWER SPINE Y (G's) vs TIME (ms)
60
50
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 55.9 G's
Tmax: 51.9 ms
Min: -11.8 G's
Tmin: 95.7 ms
FIR 100


DRIVER LOWER SPINE Z (G's) vs TIME (ms)
4
2
0
-2
-4
-6
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.0 G's
Tmax: 67.0 ms
Min: -5.0 G's
Tmin: 91.9 ms
FIR 100


DRIVER PELVIS X (G's) vs TIME (ms)
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 7.1 G's
Tmax: 51.4 ms
Min: -7.8 G's
Tmin: 75.1 ms
FIR 100

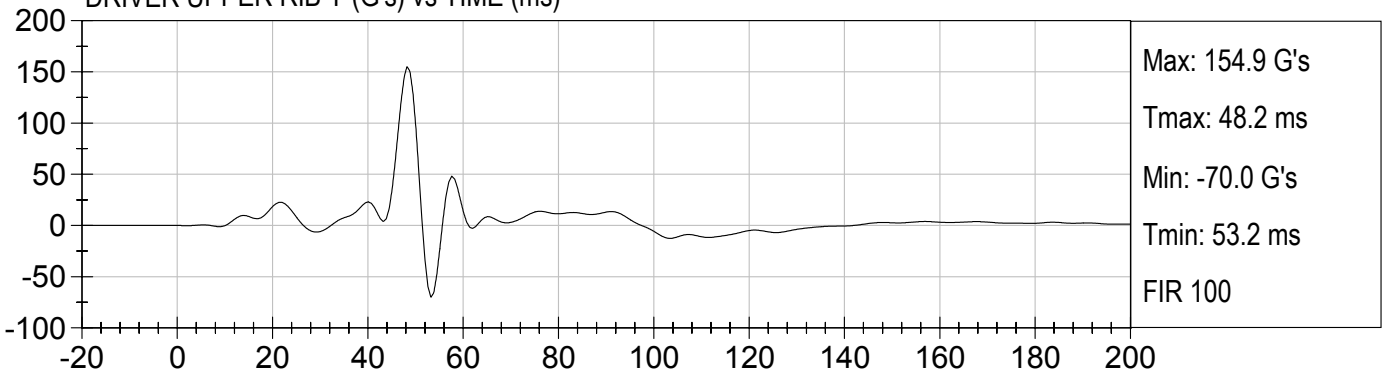

DRIVER PELVIS Y (G's) vs TIME (ms)
80
60
40
20
0
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 68.9 G's
Tmax: 43.8 ms
Min: -18.7 G's
Tmin: 74.5 ms
FIR 100


DRIVER PELVIS Z (G's) vs TIME (ms)
5
2.5
0
-2.5
-5
-7.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.1 G's
Tmax: 114.5 ms
Min: -6.8 G's
Tmin: 84.5 ms
FIR 100

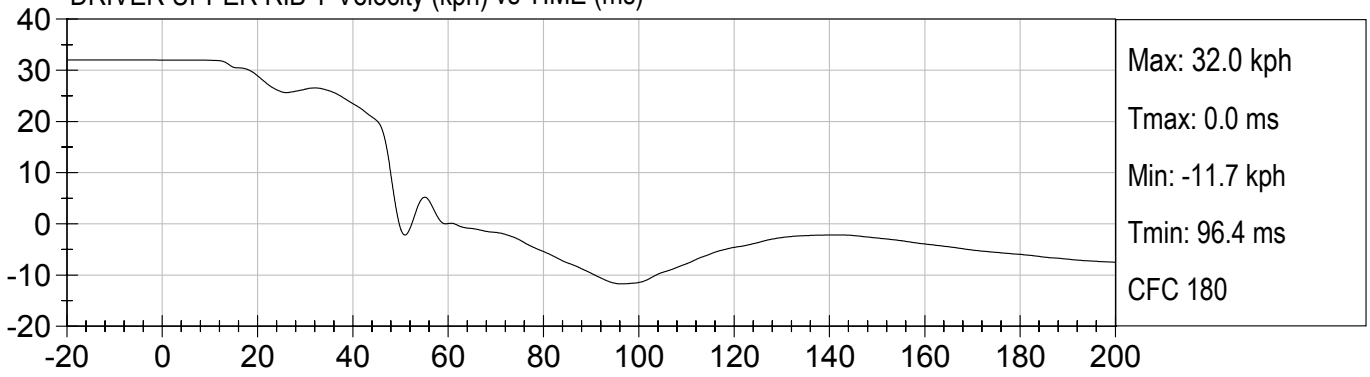
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

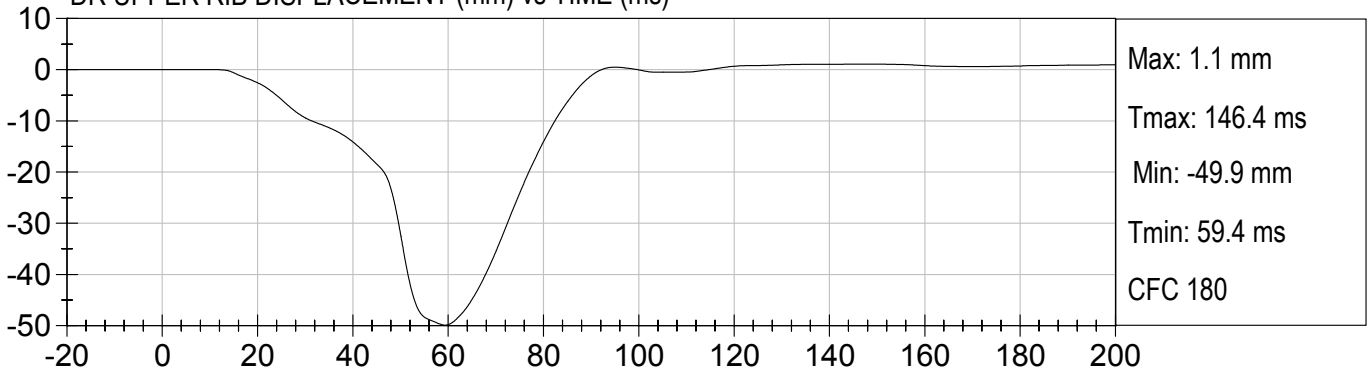
DRIVER UPPER RIB Y (G's) vs TIME (ms)



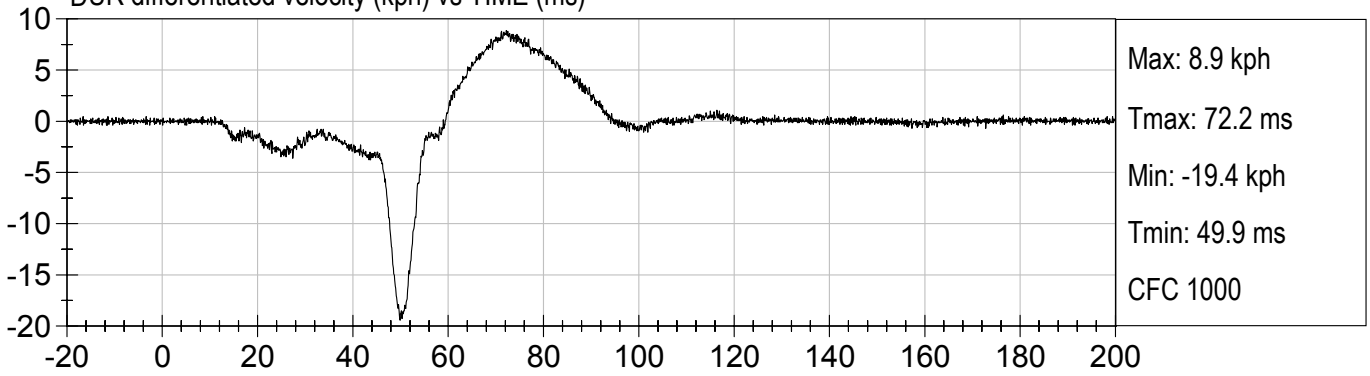
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



DR UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



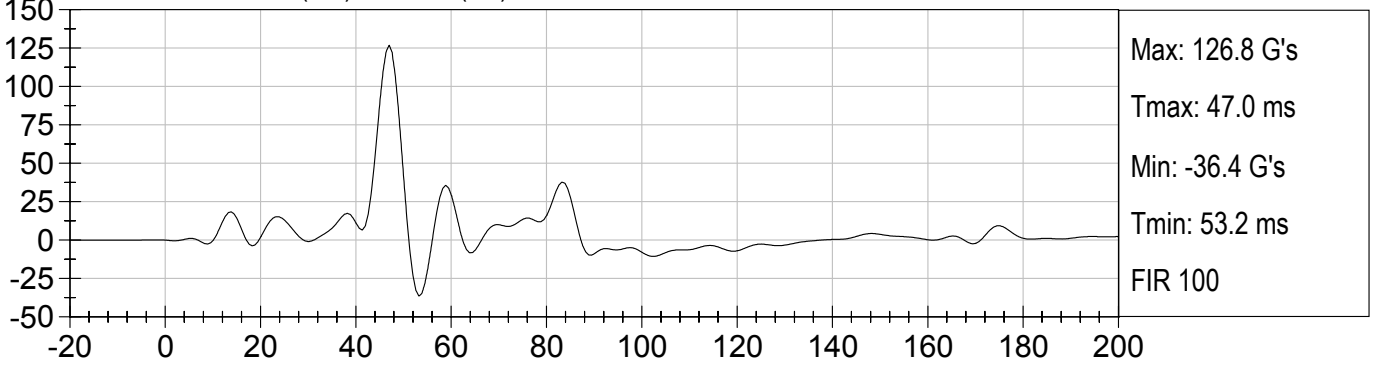
DUR differentiated velocity (kph) vs TIME (ms)



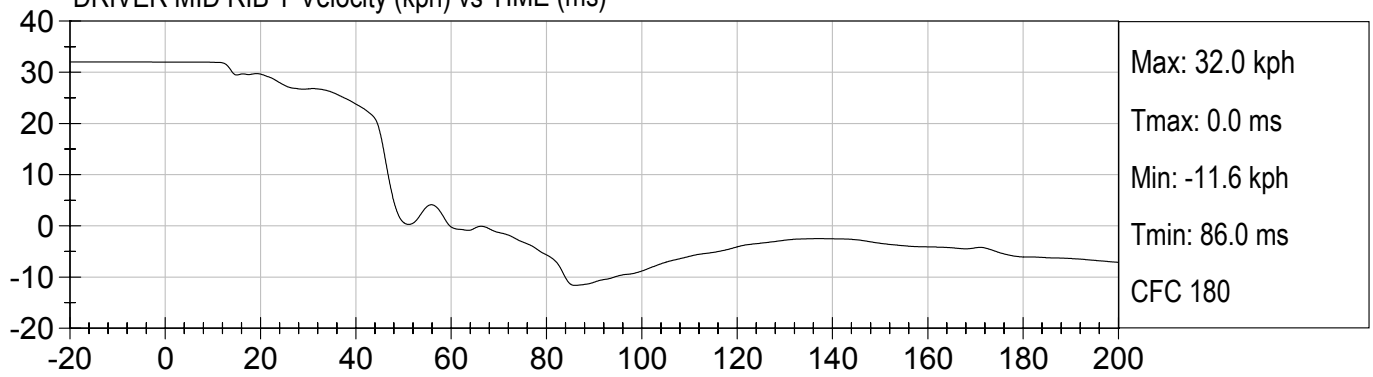
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

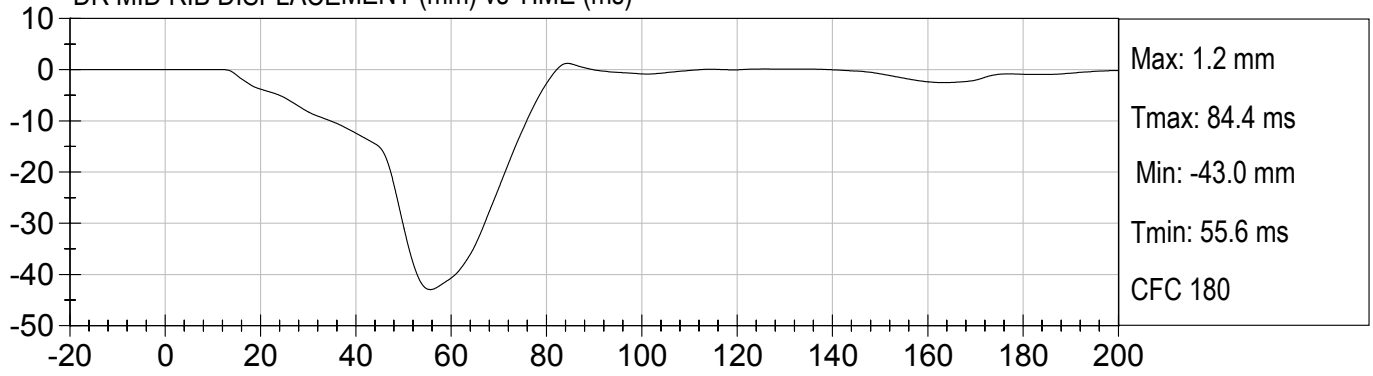
DRIVER MID RIB Y (G's) vs TIME (ms)



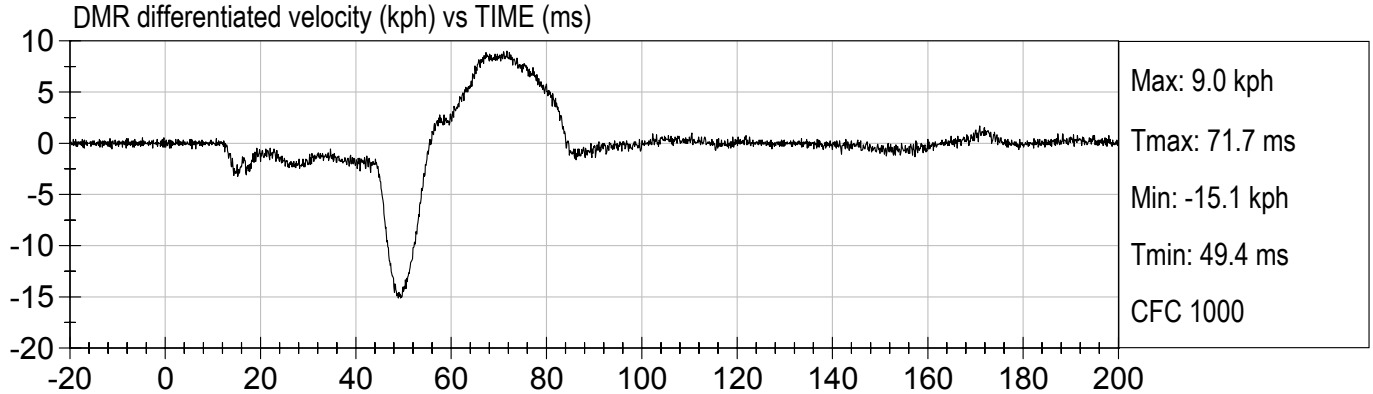
DRIVER MID RIB Y Velocity (kph) vs TIME (ms)



DR MID RIB DISPLACEMENT (mm) vs TIME (ms)



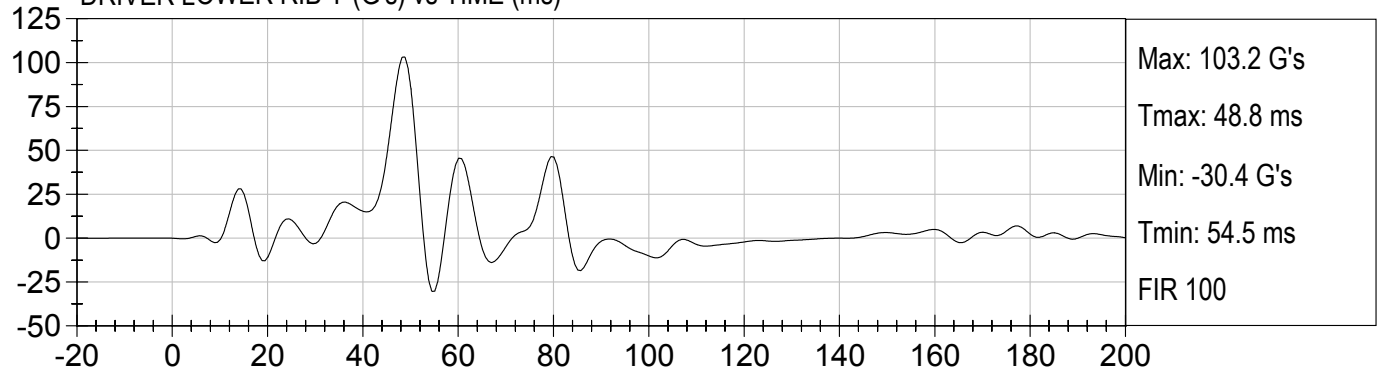
DMR differentiated velocity (kph) vs TIME (ms)



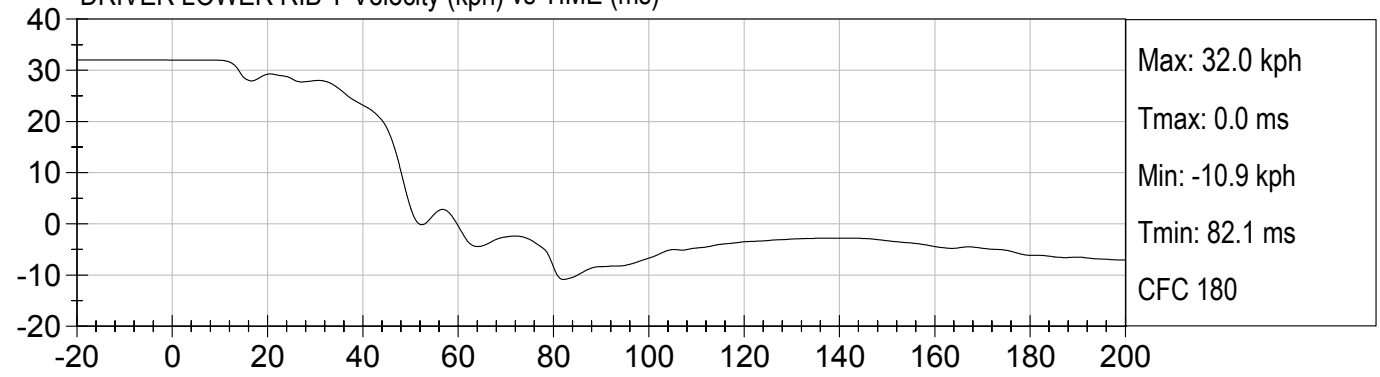
20 MPH SIDE POLE
2000 SAAB/9-5/4 DOOR

Test Date: 9/19/2002
Speed: 19.9 mph (32.0 km/h)

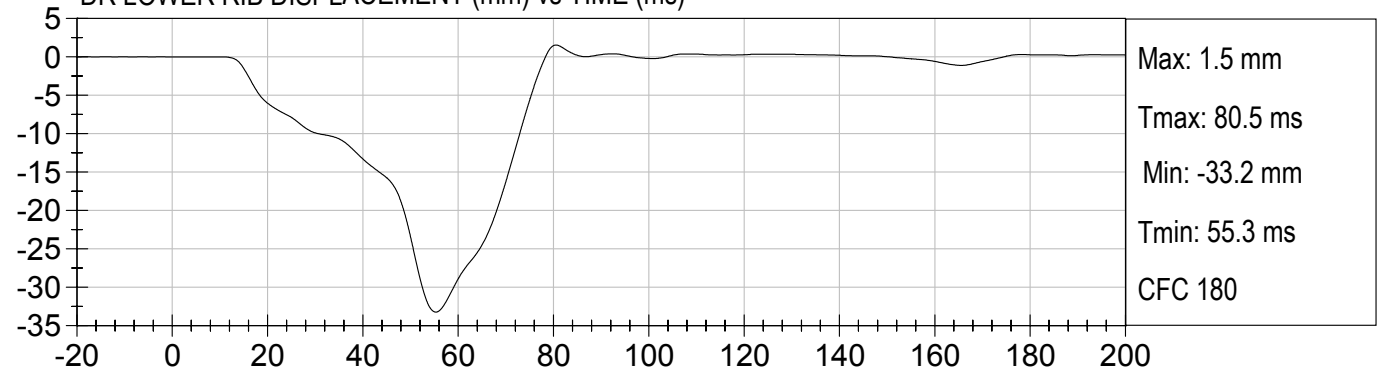
DRIVER LOWER RIB Y (G's) vs TIME (ms)



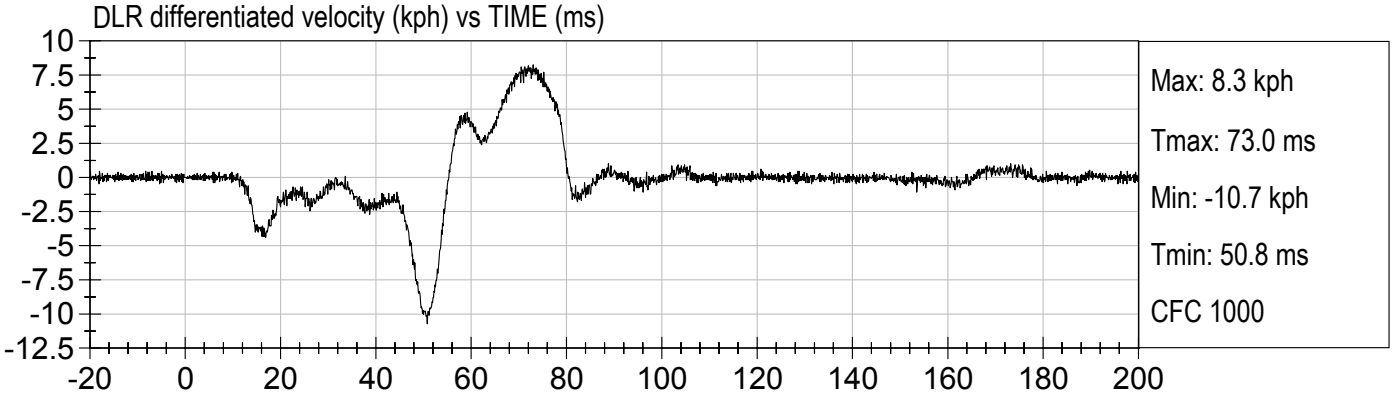
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



DR LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



DLR differentiated velocity (kph) vs TIME (ms)



APPENDIX C

ES-2 CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

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HEAD DROP TEST

EUROSID 2 DUMMY

Date: 9/3/02

Dummy Serial Number: 009

Test Number: D021181

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.5
Relative Humidity (%)	10 – 70	51
Peak Resultant Acceleration	100 – 150 g's	146
Time of Max. Res. Acceleration	msec	2.4

TEST MEETS SPECIFICATIONS

Technician: _____

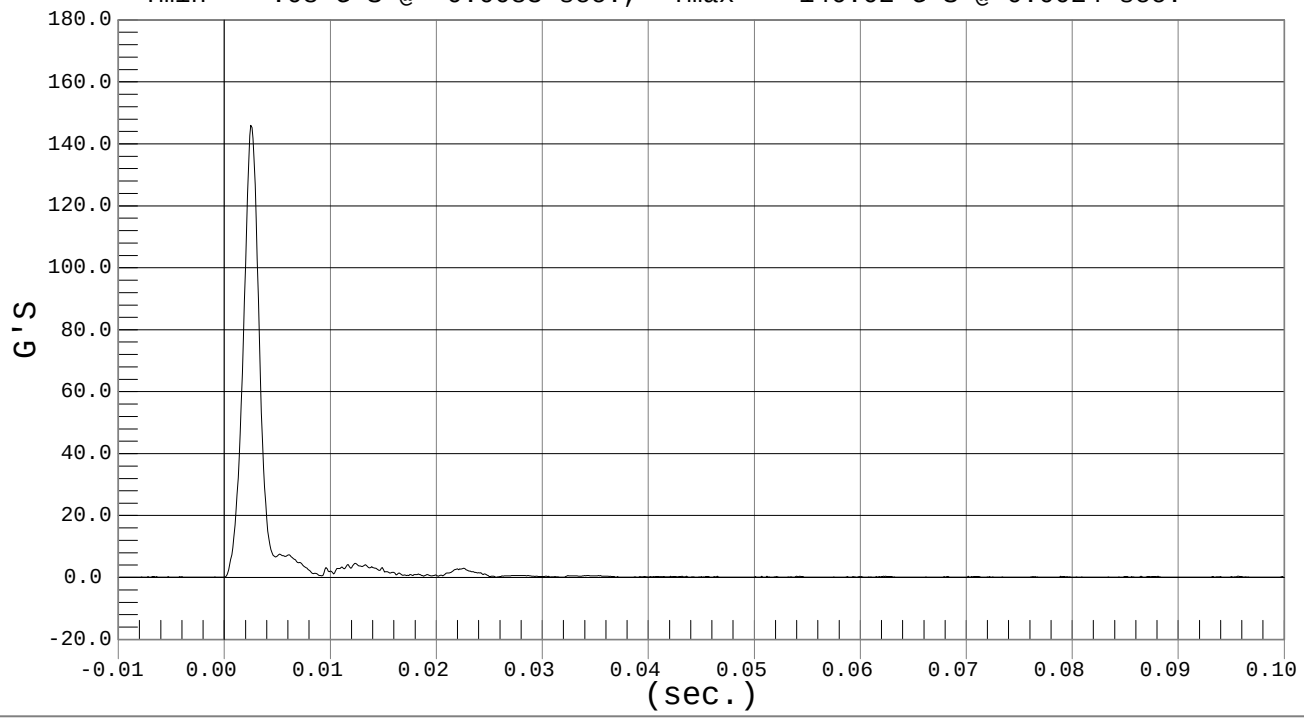
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 09-03-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .08 G'S @ -0.0083 sec., Ymax = 146.02 G'S @ 0.0024 sec.



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NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 9/4/02

Dummy Serial Number: 009

Test Number: D021182

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.8
Relative Humidity (%)		10 – 70	45
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.33
	8 msec	¯1.59 - ¯2.04 m/sec	-1.75
	14 msec	¯3.20 - ¯3.85 m/sec	-3.43
Maximum Flexion Angle		49.0 – 59.0 deg	53.5
Time of Max. Flexion Angle		54.0 – 66.0 ms	58.0
Maximum Angle Theta (A)		32.0 – 37.0 deg	35.1
Time of Max. Theta (A)		53.0 – 63.0 ms	57.7
Maximum Angle Theta (B)		30.18 – 32.68 deg	31.65
Time of Max. Theta (B)		54.0 – 64.0 ms	57.9

TEST MEETS SPECIFICATIONS

Technician: _____

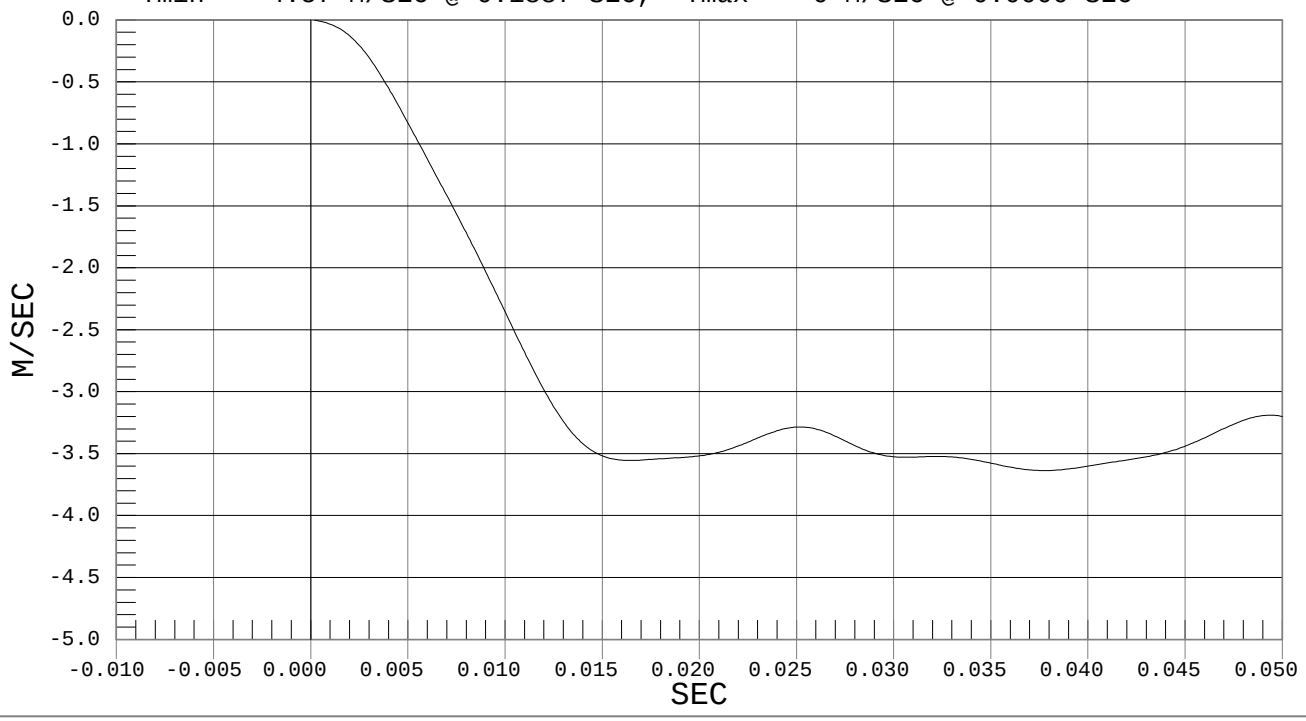
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-04-02
Speed: 11.2 fps, 3.42 M/s

Ymin = -4.57 M/SEC @ 0.1887 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

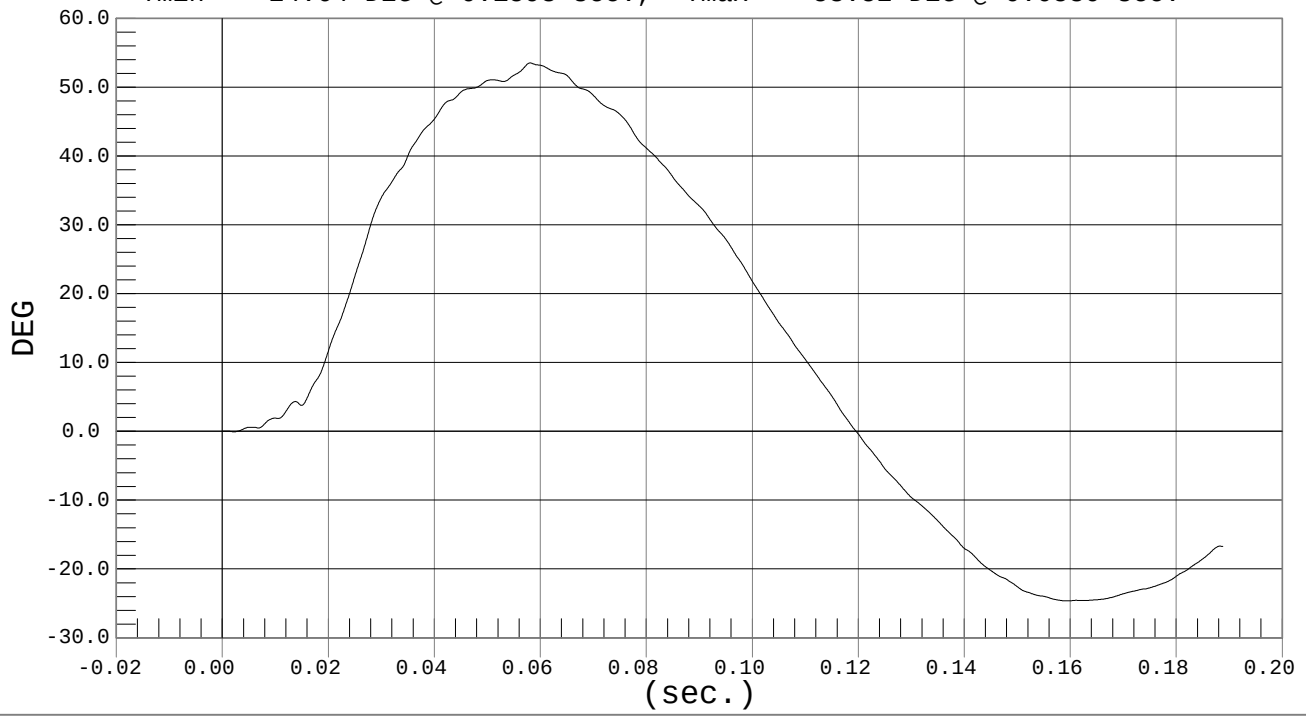


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-04-02
Speed: 11.2 fps, 3.42 M/s

Ymin = -24.64 DEG @ 0.1593 sec., Ymax = 53.52 DEG @ 0.0580 sec.

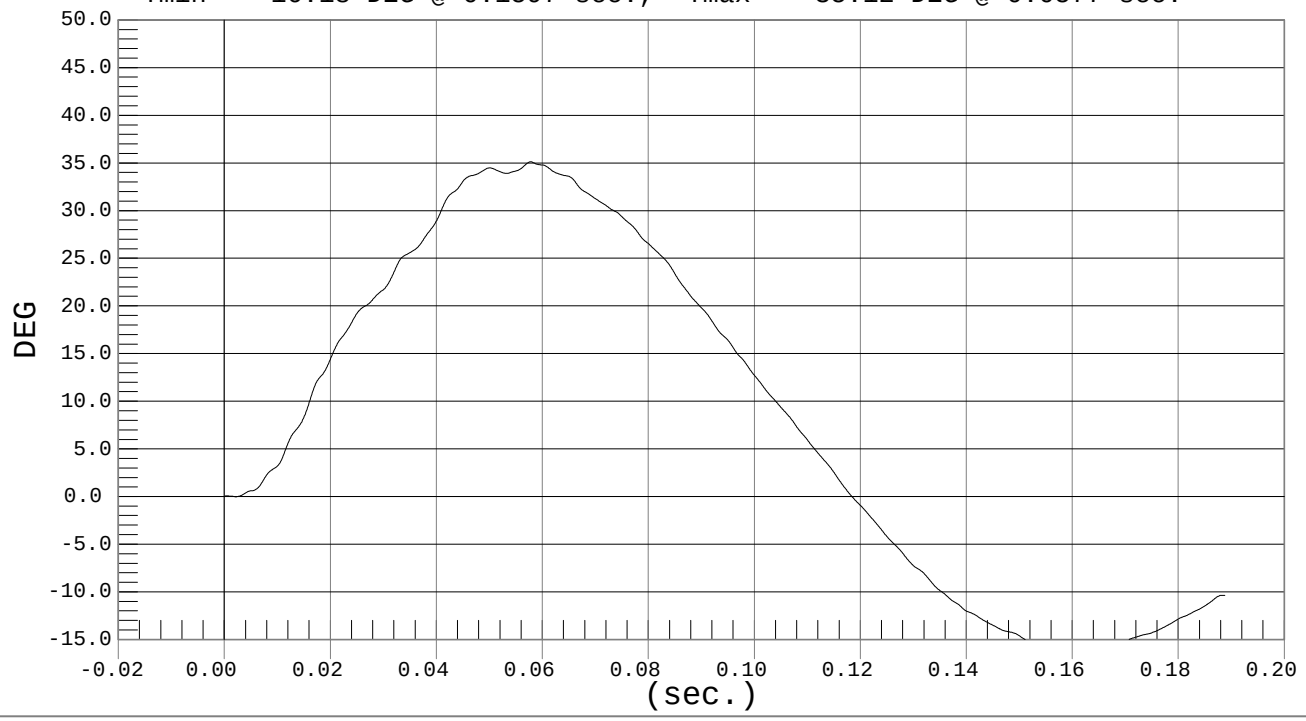


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-04-02
Speed: 11.2 fps, 3.42 M/s

Ymin = -16.18 DEG @ 0.1597 sec., Ymax = 35.12 DEG @ 0.0577 sec.

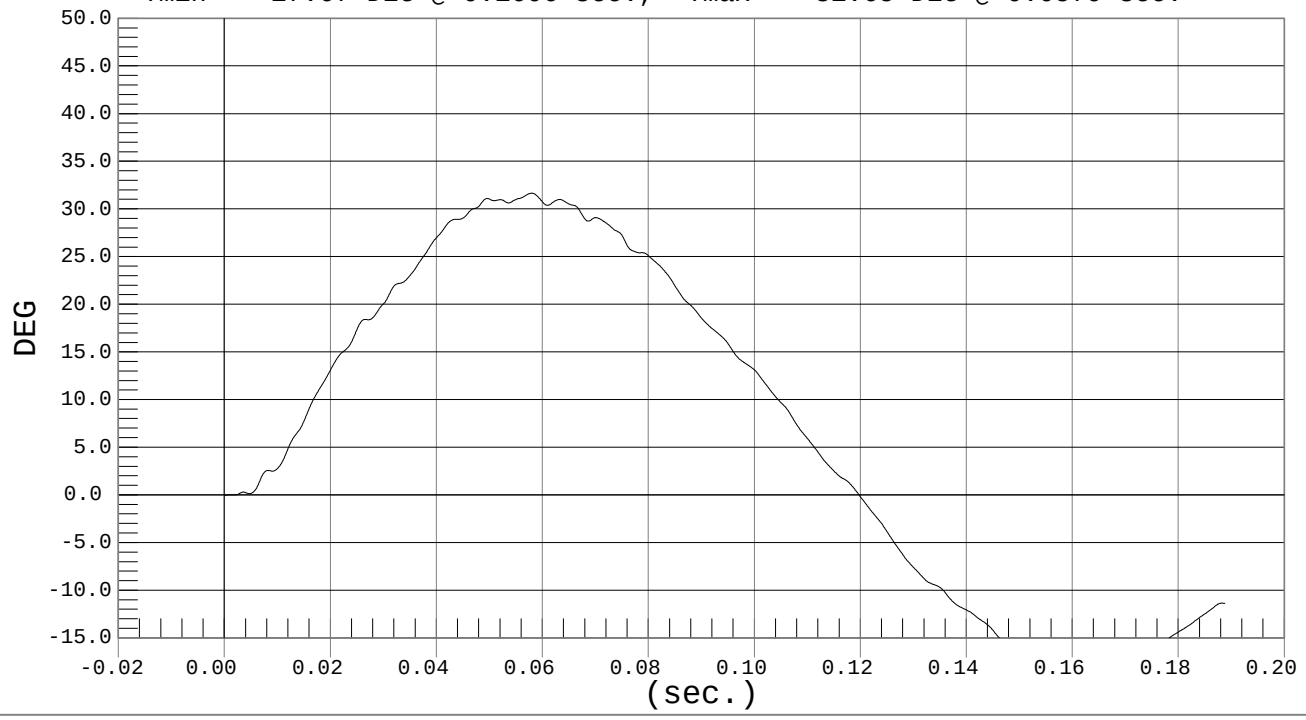


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-04-02
Speed: 11.2 fps, 3.42 M/s

Ymin = -17.67 DEG @ 0.1606 sec., Ymax = 31.65 DEG @ 0.0579 sec.



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SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 9/5/02

Dummy Serial Number: 009

Test Number: D021183

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.0
Relative Humidity (%)	10 – 70	54
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.8
Time of Max. Pendulum Acceleration	msec	11.6

TEST MEETS SPECIFICATIONS

Technician: _____

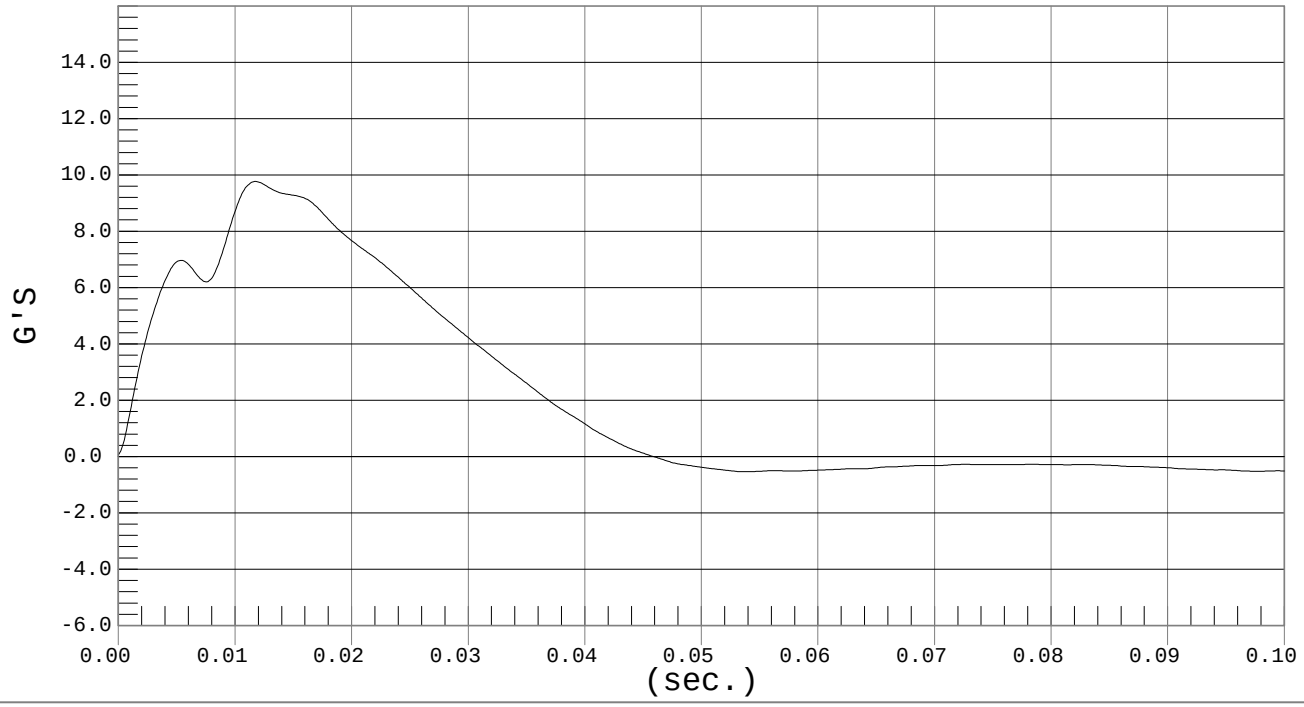
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 09-05-02
Speed: 14.0 fps, 4.27 M/s

Ymin = -.54 G'S @ 0.0535 sec., Ymax = 9.77 G'S @ 0.0116 sec.



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UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 9/4/02

Dummy Serial Number: 009

Test Number: D021845/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	52
Displacement at 2 m/s	23.5 – 27.5 mm	26.0
Displacement at 3 m/s	36.0 – 40.0 mm	37.8
Displacement at 4 m/s	46.0 – 51.0 mm	48.4

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	52
Displacement at 2 m/s	23.5 – 27.5 mm	25.5
Displacement at 3 m/s	36.0 – 40.0 mm	39.0
Displacement at 4 m/s	46.0 – 51.0 mm	51.0

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	52
Displacement at 2 m/s	23.5 – 27.5 mm	24.7
Displacement at 3 m/s	36.0 – 40.0 mm	36.6
Displacement at 4 m/s	46.0 – 51.0 mm	48.1

TEST MEETS SPECIFICATIONS

Technician: _____

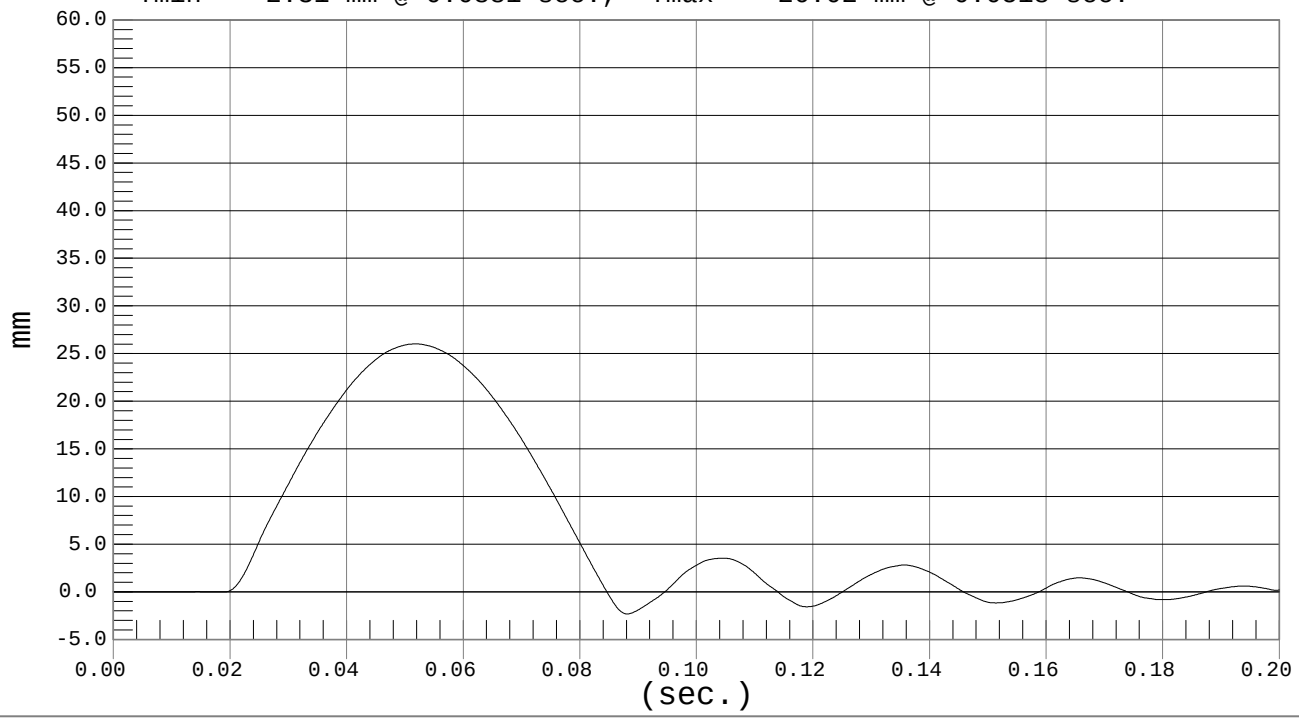
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: UPPER RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -2.31 mm @ 0.0881 sec., Ymax = 26.02 mm @ 0.0518 sec.

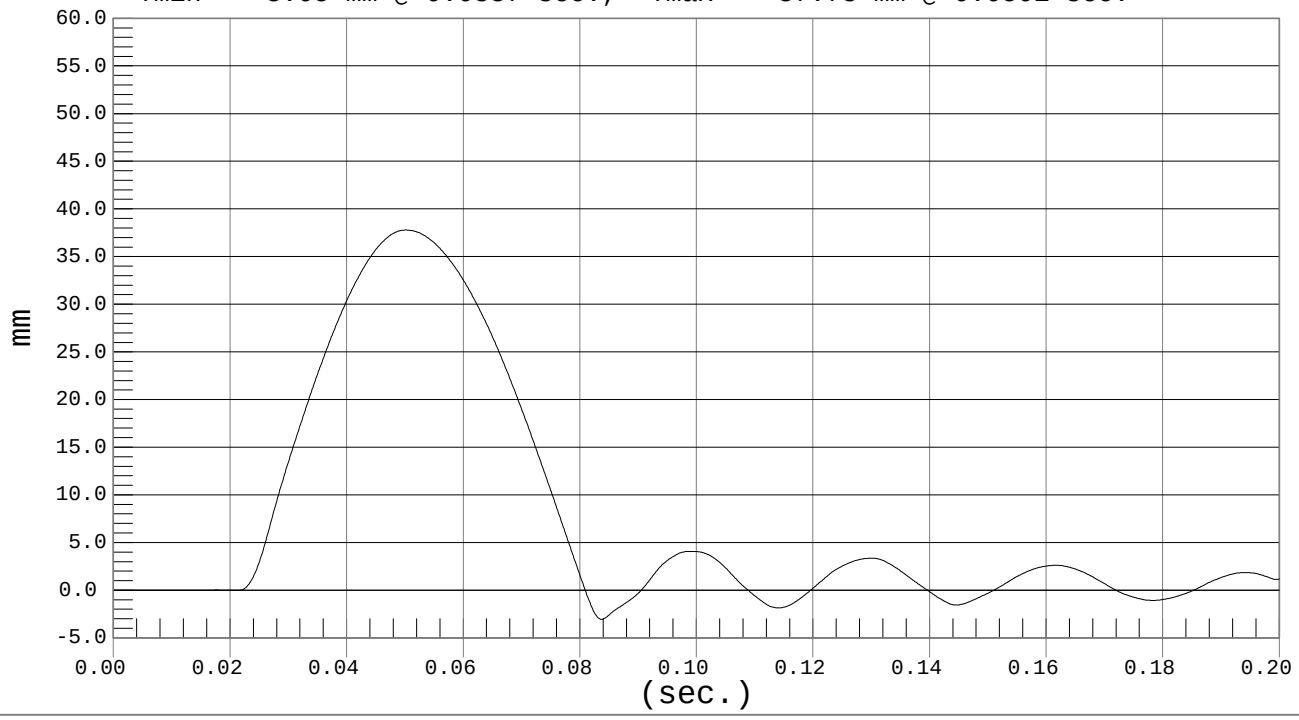


UPPER RIB DISPLACEMENT

Test Desc.: UPPER RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -3.05 mm @ 0.0837 sec., Ymax = 37.78 mm @ 0.0501 sec.

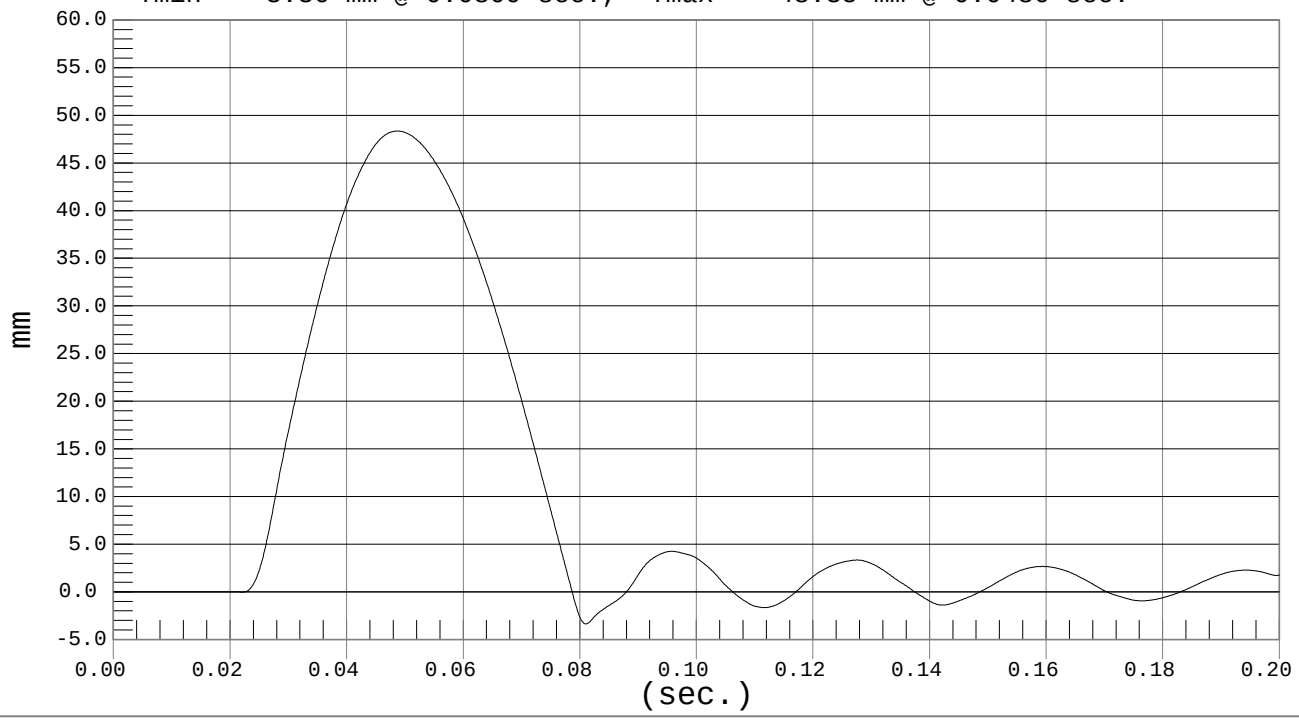


UPPER RIB DISPLACEMENT

Test Desc.: UPPER RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -3.36 mm @ 0.0809 sec., Ymax = 48.35 mm @ 0.0486 sec.

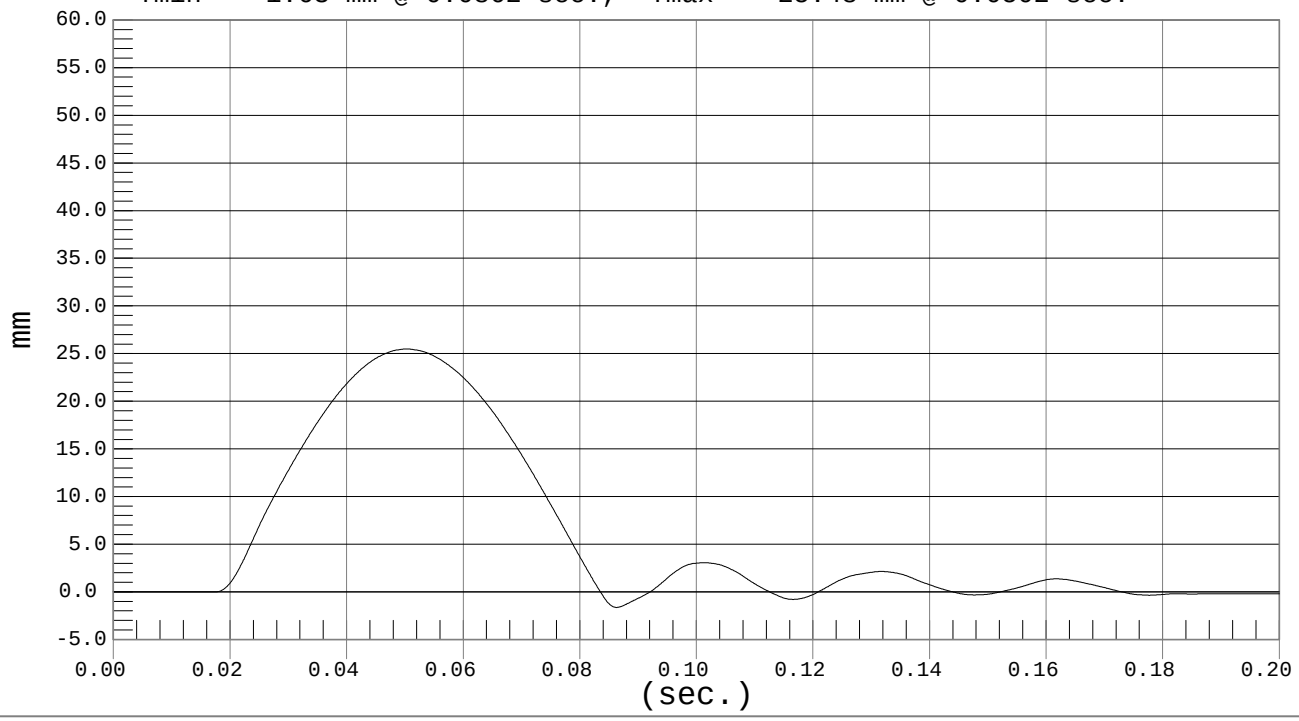


MIDDLE RIB DISPLACEMENT

Test Desc.: MIDDLE RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -1.63 mm @ 0.0862 sec., Ymax = 25.48 mm @ 0.0502 sec.

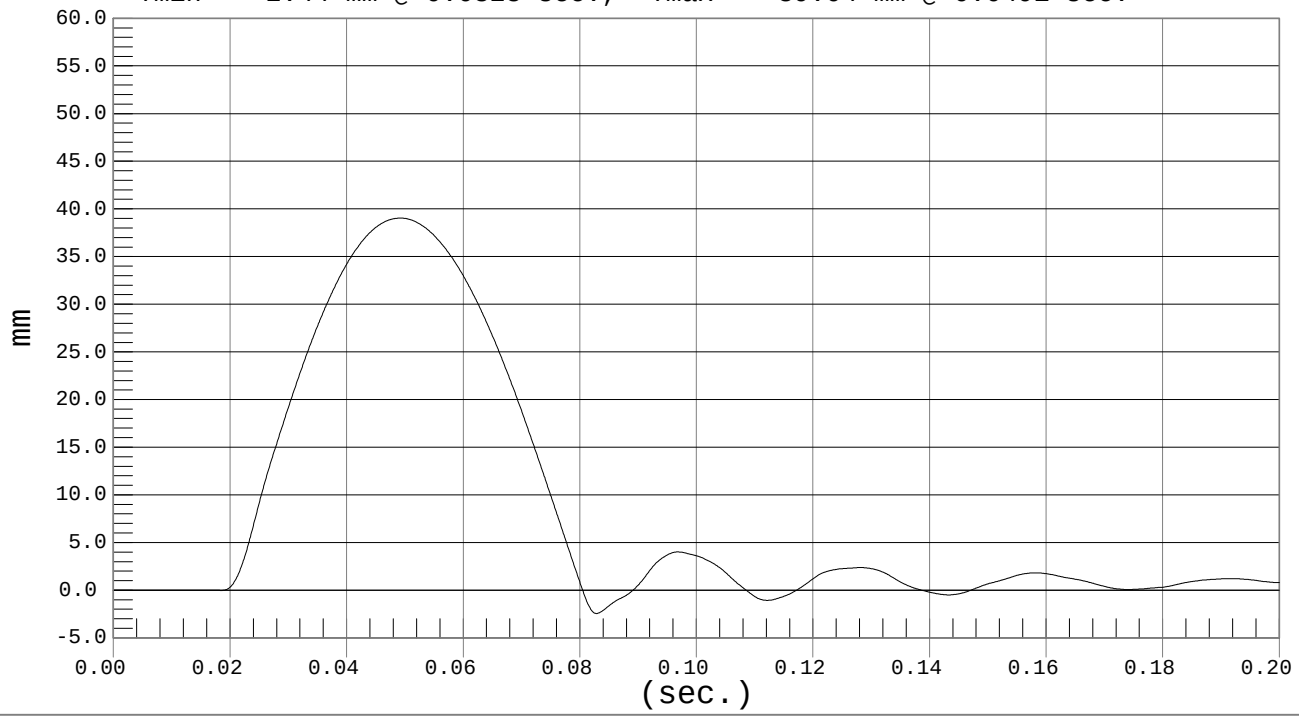


MIDDLE RIB DISPLACEMENT

Test Desc.: MIDDLE RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -2.44 mm @ 0.0828 sec., Ymax = 39.04 mm @ 0.0491 sec.

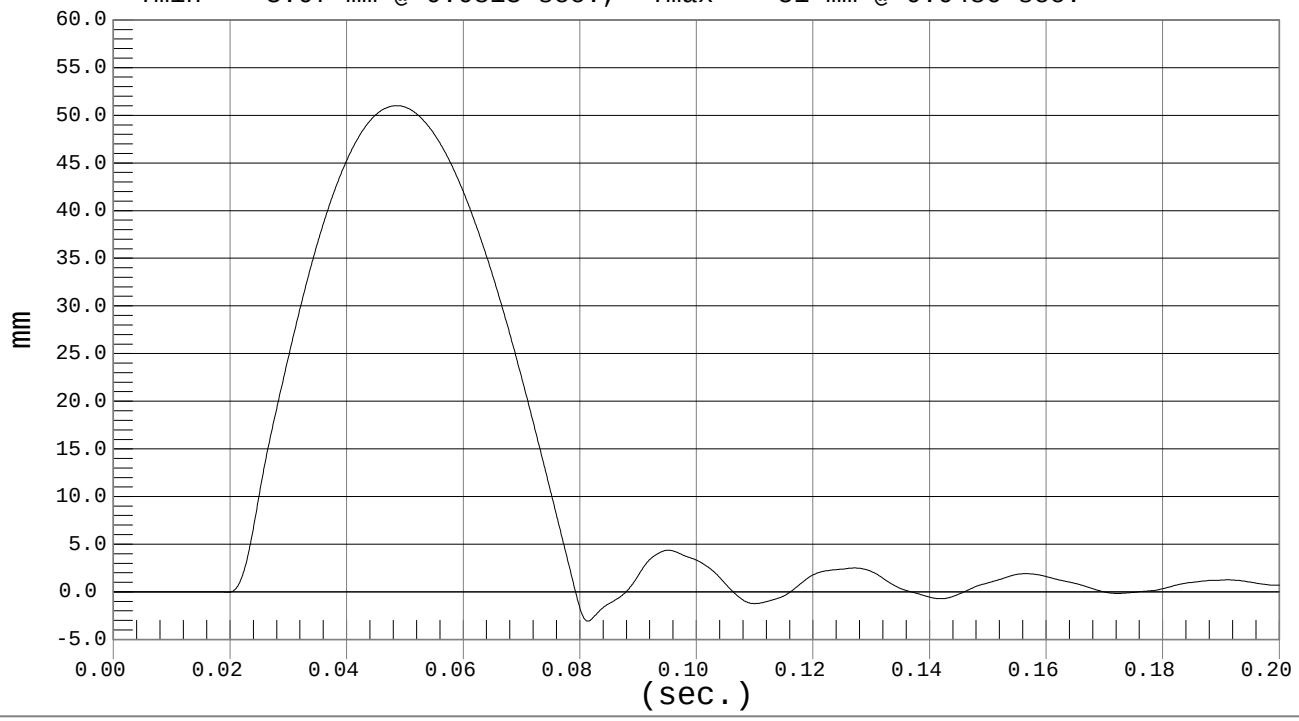


MIDDLE RIB DISPLACEMENT

Test Desc.: MIDDLE RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -3.07 mm @ 0.0813 sec., Ymax = 51 mm @ 0.0486 sec.

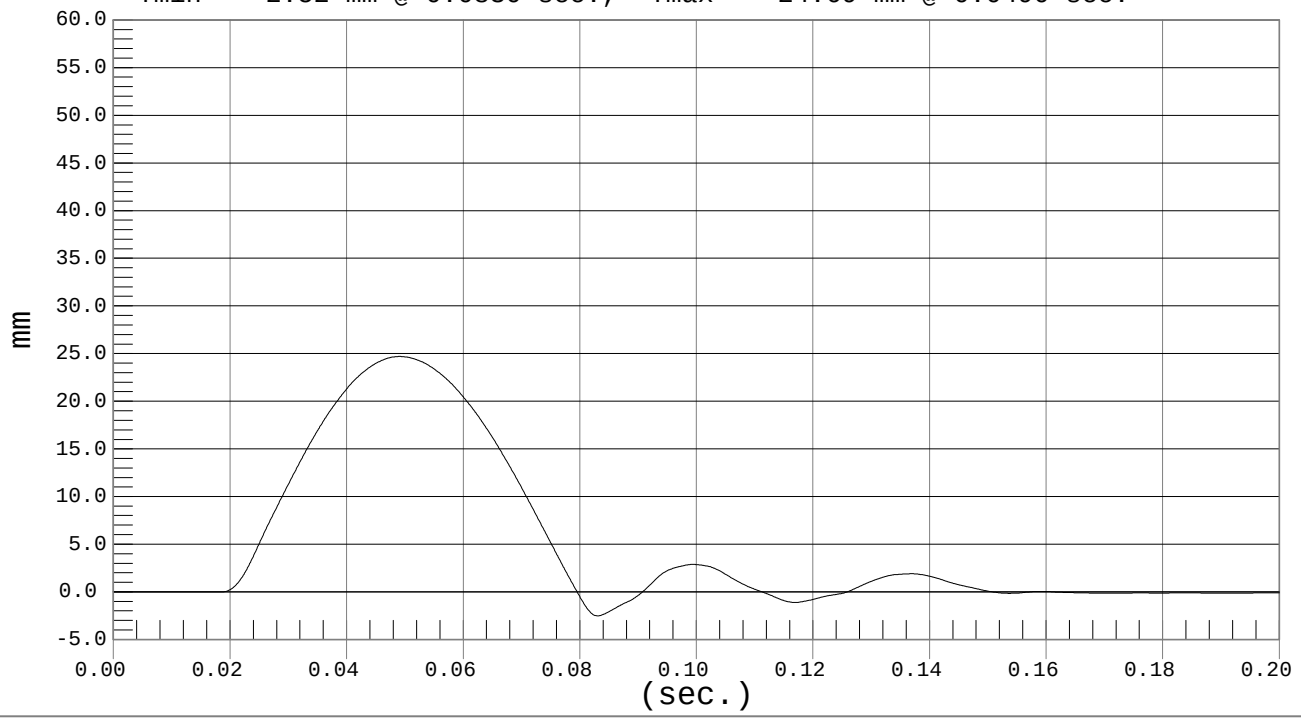


LOWER RIB DISPLACEMENT

Test Desc.: LOWER RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -2.52 mm @ 0.0830 sec., Ymax = 24.69 mm @ 0.0490 sec.

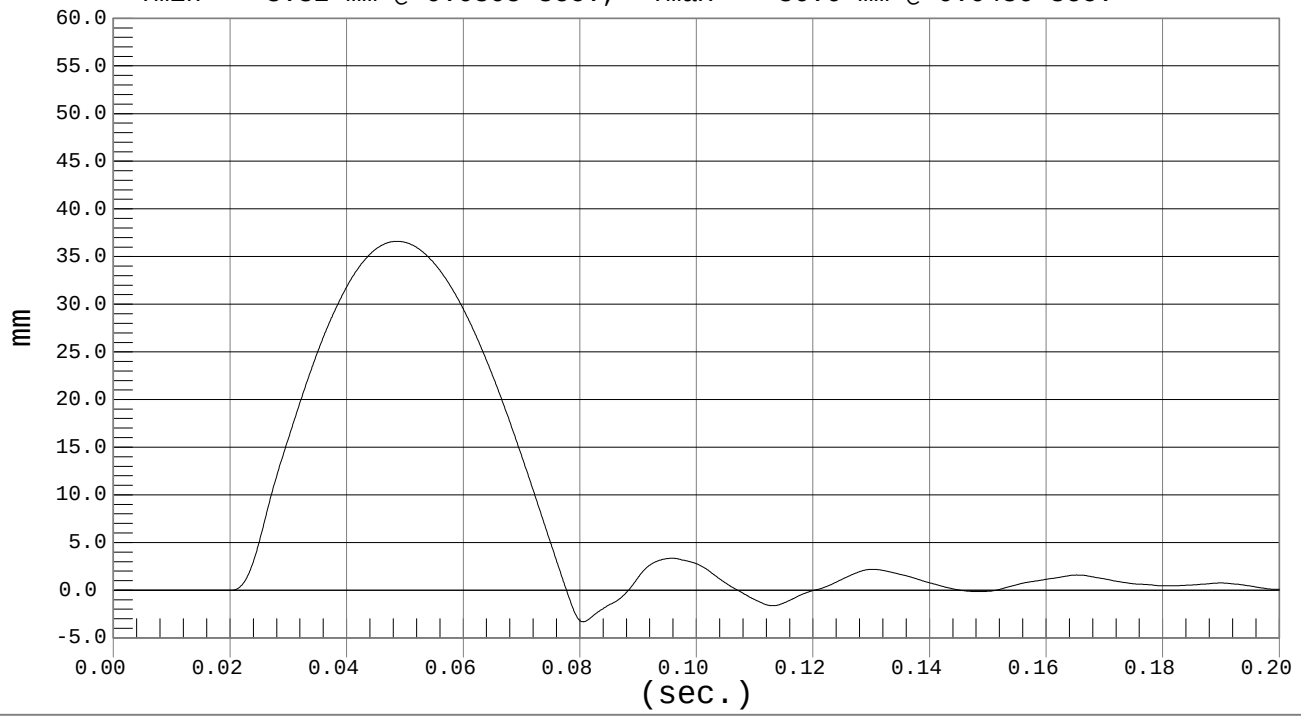


LOWER RIB DISPLACEMENT

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 09-04-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -3.32 mm @ 0.0805 sec., Ymax = 36.6 mm @ 0.0486 sec.

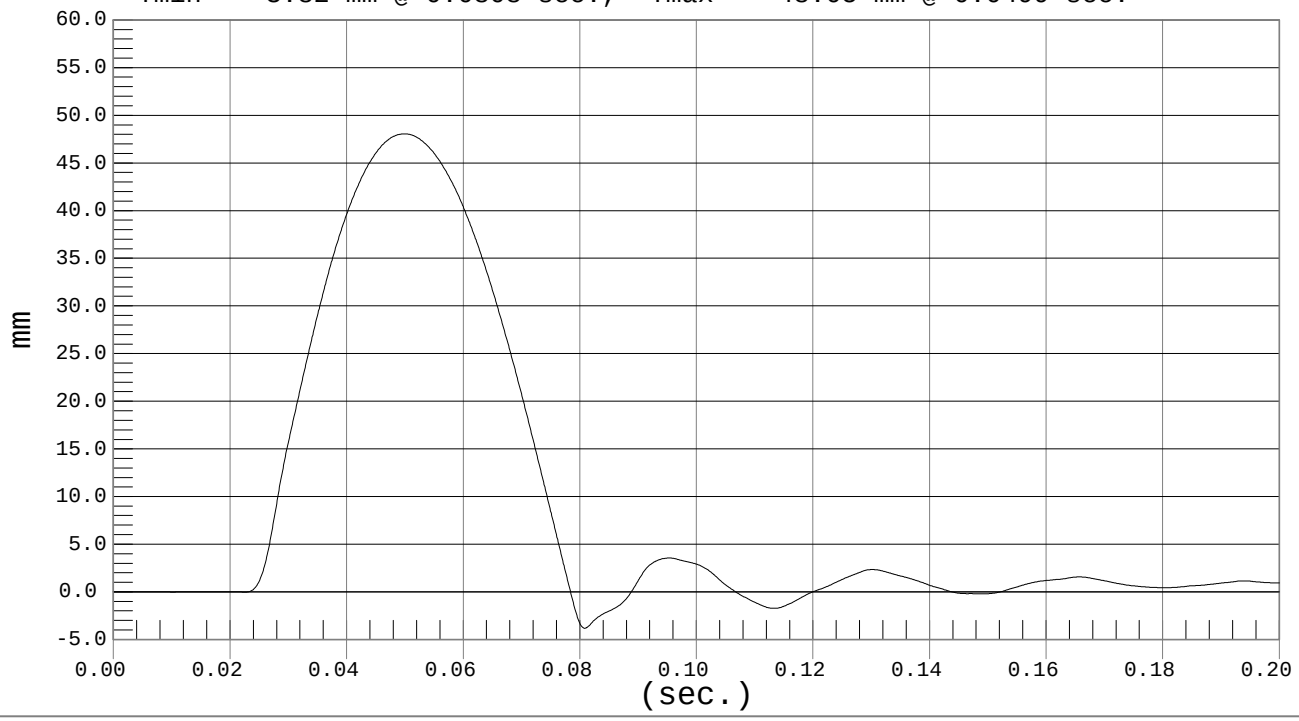


LOWER RIB DISPLACEMENT

Test Desc.: LOWER RIB
Component: Dummy #009

Test Date: 09-04-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -3.82 mm @ 0.0808 sec., Ymax = 48.05 mm @ 0.0499 sec.



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ABDOMEN TEST

EUROSID 2 DUMMY

Date: 9\5\02

Dummy Serial Number: 009

Test Number: D021187

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.1
Relative Humidity (%)	10 – 70	54
Probe Speed (m/s)	3.90 – 4.10	4.01
Maximum Impact Force	4.00 – 4.80 kN	4.59
Time of Maximum Force	10.60 – 13.00 ms	11.50
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.39
Time of Max. Total Force	10.00 – 12.30 ms	11.20

TEST MEETS SPECIFICATIONS

Technician: _____

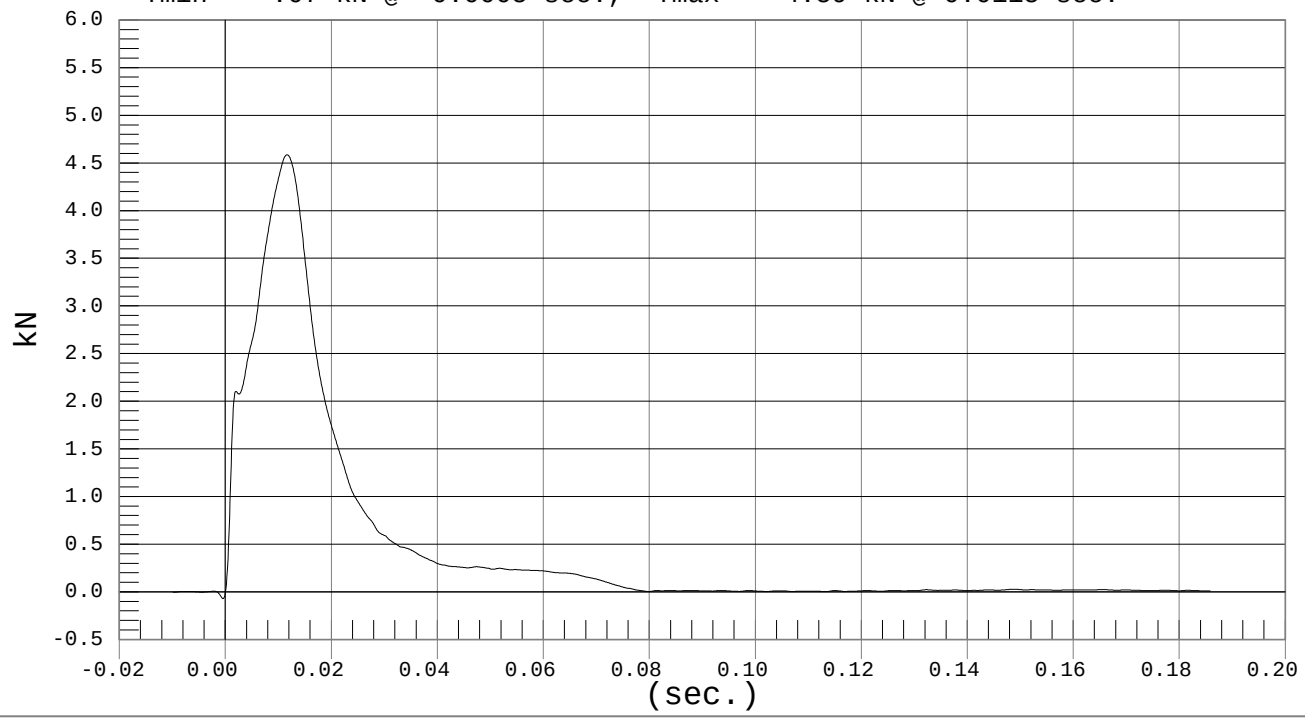
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 09-05-02
Speed: 13.1 fps, 4.01 M/s

Ymin = -.07 kN @ -0.0005 sec., Ymax = 4.59 kN @ 0.0115 sec.

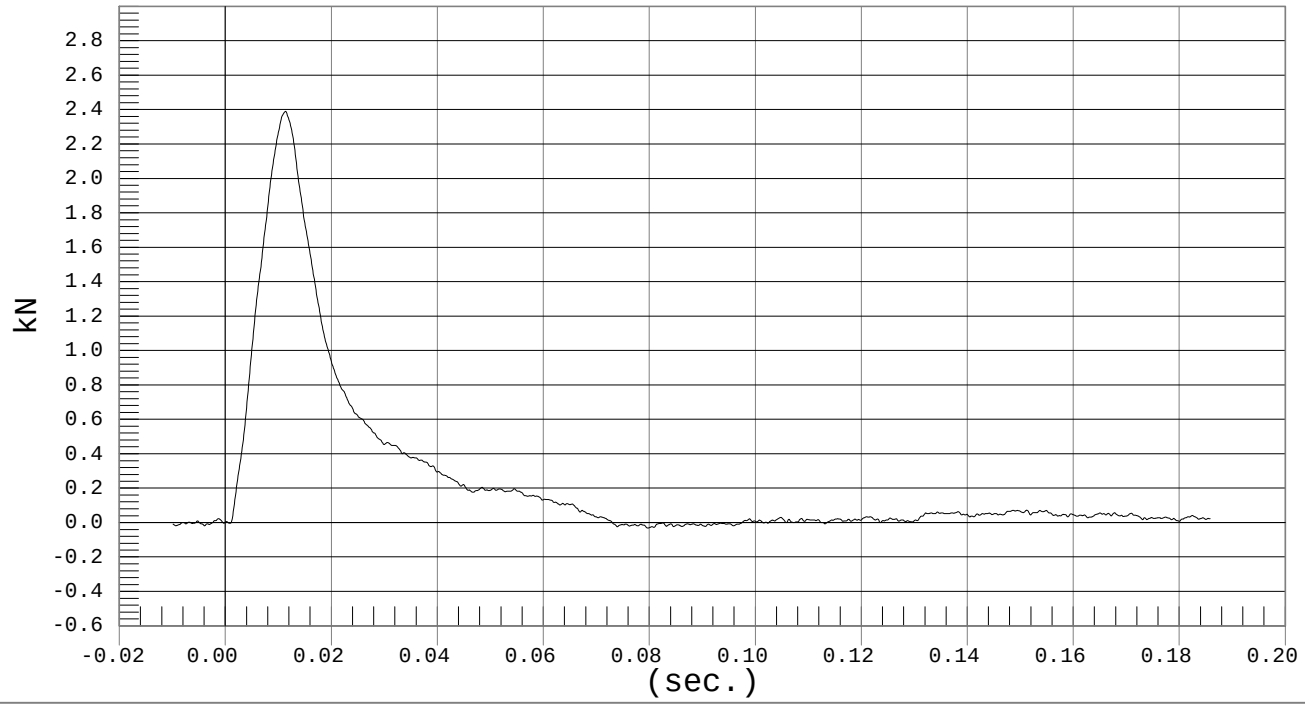


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 09-05-02
Speed: 13.1 fps, 4.01 M/s

Ymin = -.03 kN @ 0.0796 sec., Ymax = 2.39 kN @ 0.0112 sec.



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LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 9\4\02

Dummy Serial Number: 09

Test Number: D02188

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.9
Relative Humidity (%)		10 – 70	46
Pendulum Speed		5.95 – 6.15	6.11
Pendulum Deceleration	10 msec	$^{-}$2.46 - $^{-}$1.59 m/sec	-2.07
	20 msec	$^{-}$5.25 - $^{-}$4.07 m/sec	-4.65
	25 msec	$^{-}$6.64 - $^{-}$5.30 m/sec	-5.82
	30 msec	$\geq$ -6.5 m/sec	-6.29
Maximum Flexion Angle		45.0 – 55.0 deg	45.3
Time of Max. Flexion Angle		39.0 – 53.0 ms	44.4
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.3
Time of Max. Theta (A)		44.0 – 52.0 ms	44.2
Maximum Angle Theta (B)		27.04– 29.54 deg	28.00
Time of Max. Theta (B)		44.0 – 52.0 ms	45.7

TEST MEETS SPECIFICATIONS

Technician: _____

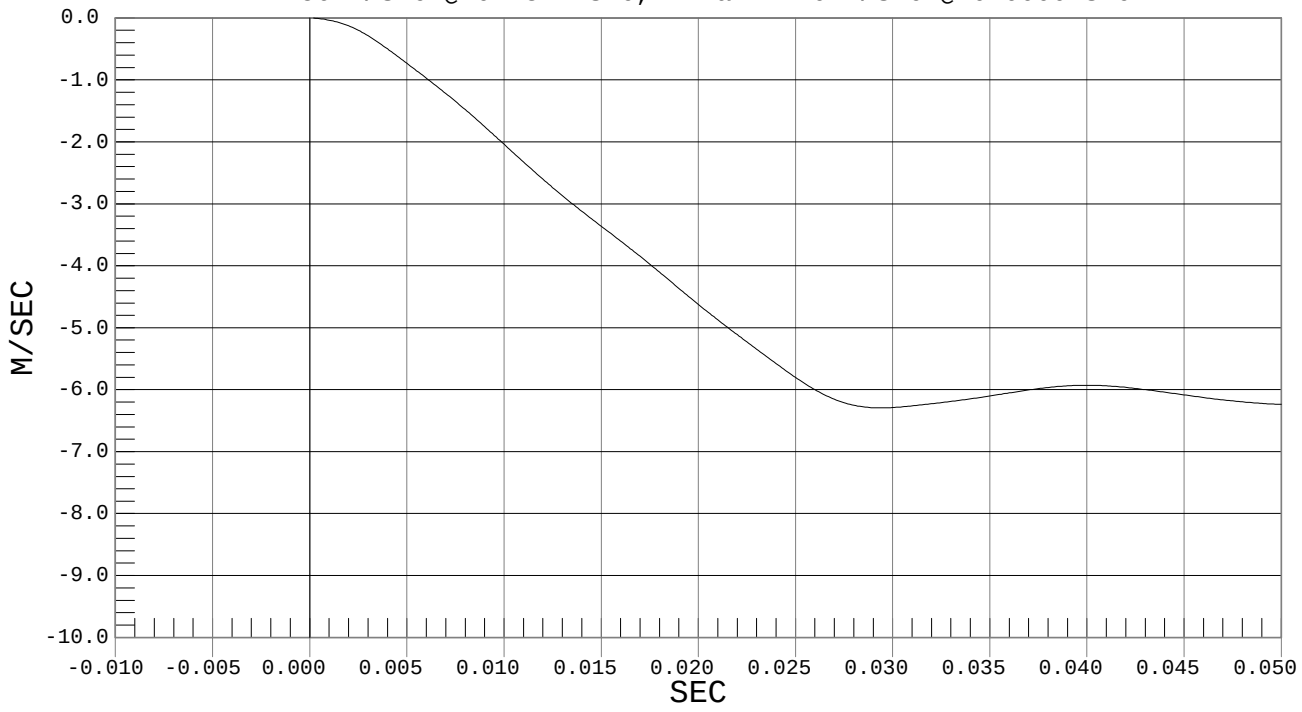
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-04-02
Speed: 20.0 fps, 6.11 M/s

Ymin = -7.56 M/SEC @ 0.1377 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

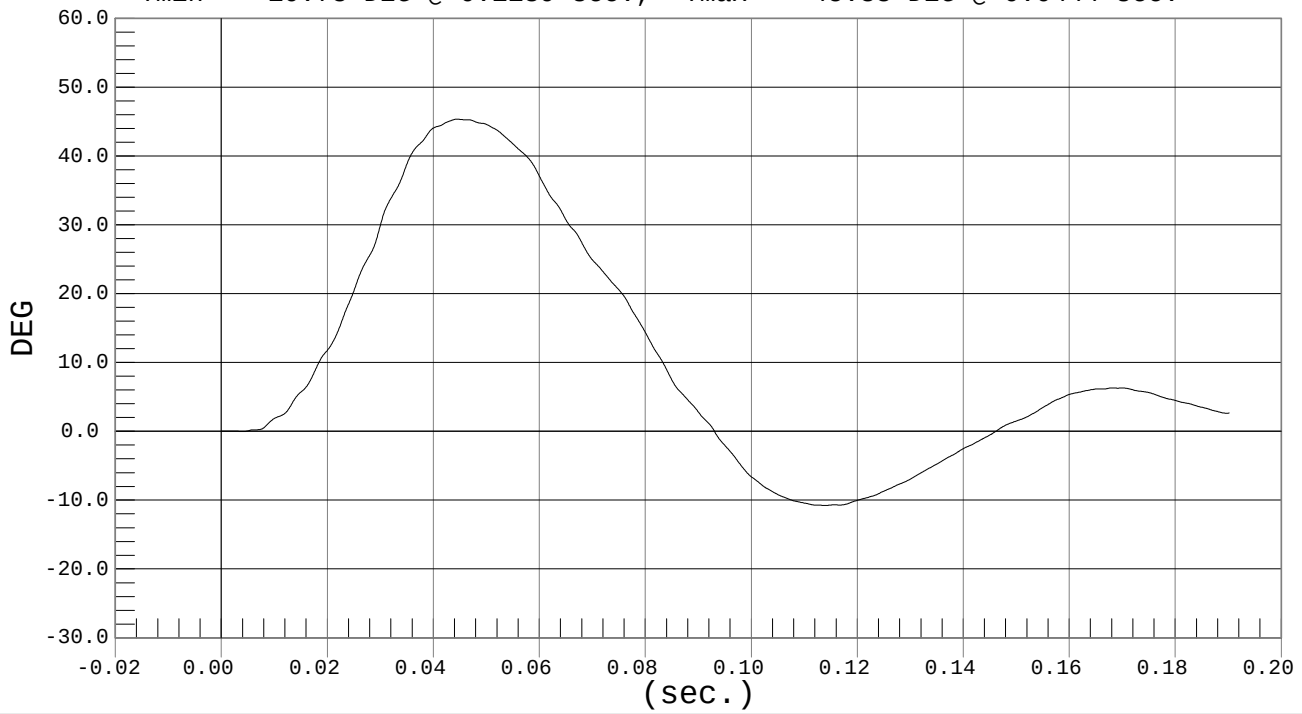


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-04-02
Speed: 20.0 fps, 6.11 M/s

Ymin = -10.78 DEG @ 0.1139 sec., Ymax = 45.33 DEG @ 0.0444 sec.

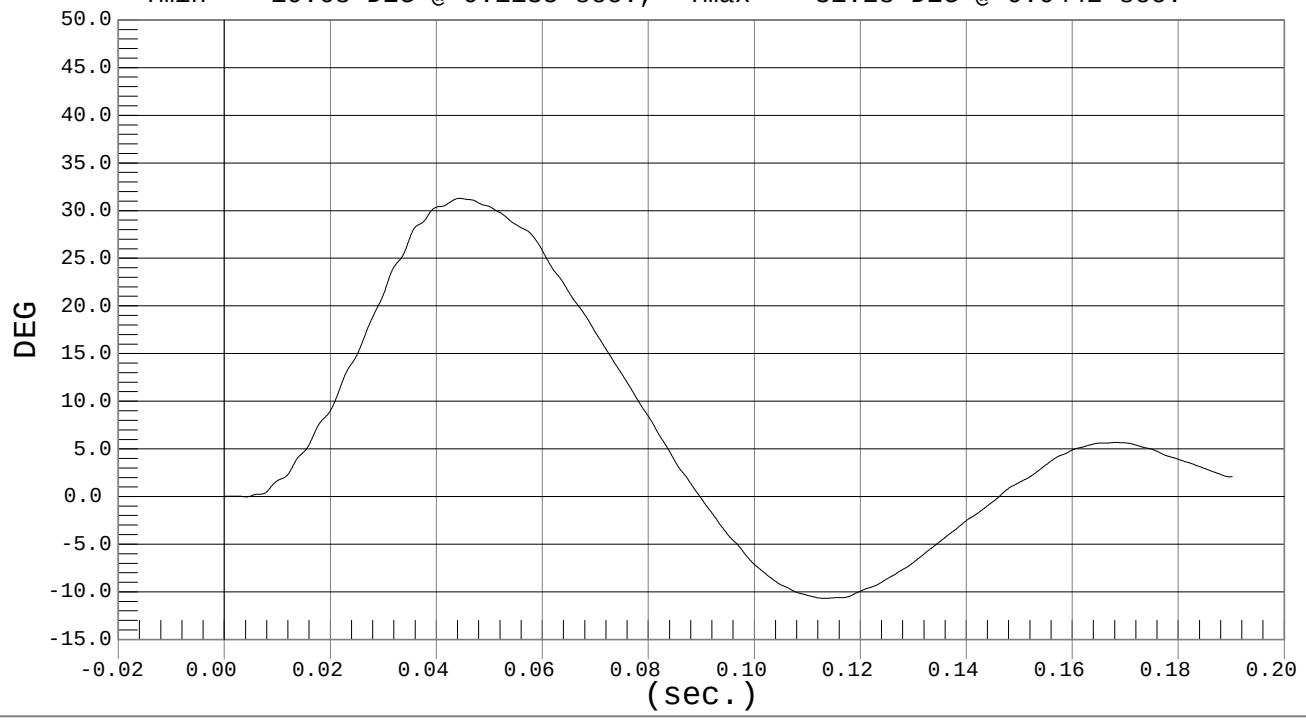


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-04-02
Speed: 20.0 fps, 6.11 M/s

Ymin = -10.68 DEG @ 0.1135 sec., Ymax = 31.28 DEG @ 0.0442 sec.

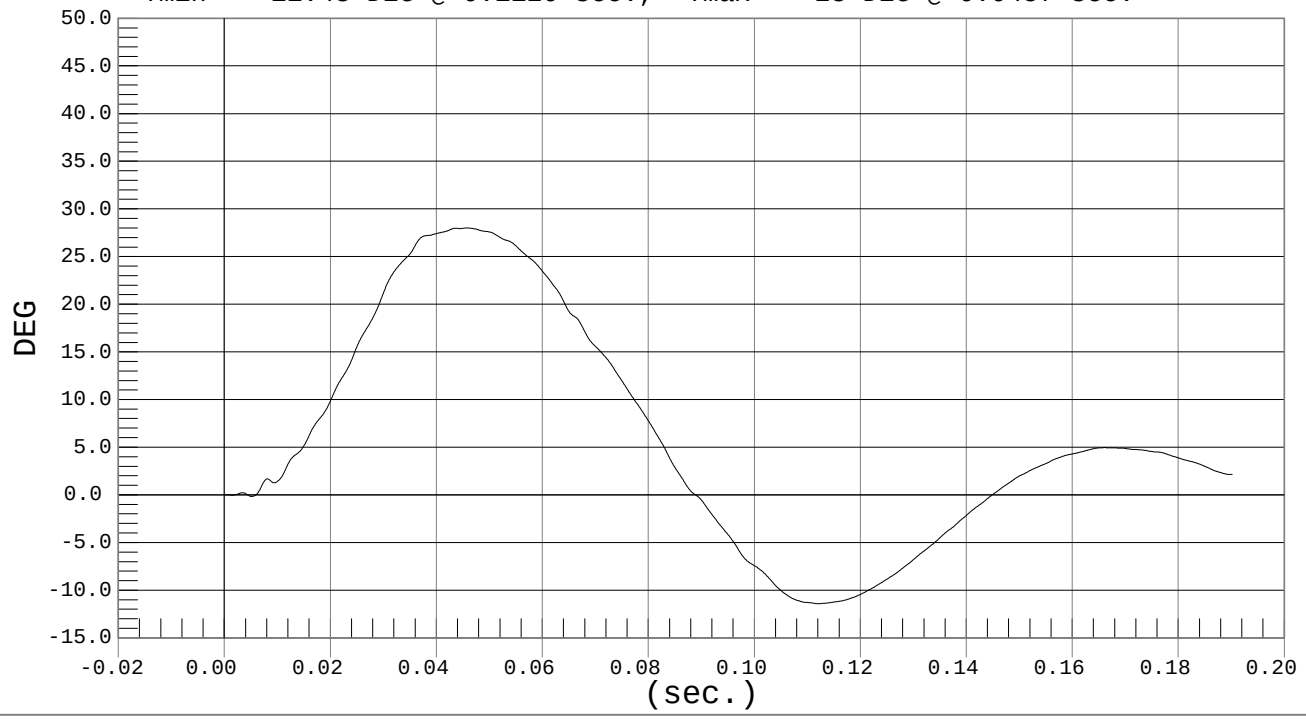


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-04-02
Speed: 20.0 fps, 6.11 M/s

Ymin = -11.43 DEG @ 0.1120 sec., Ymax = 28 DEG @ 0.0457 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 9/5/02

Dummy Serial Number: 009

Test Number: D021189

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.9
Relative Humidity (%)	10 – 70	51
Pendulum Speed	4.20 – 4.40 m/s	4.28
Maximum Impactor Force	4.40 – 5.40 kN	4.89
Time of Max. Impactor Force	10.30 – 15.50 ms	15.1
Maximum Pubic Force	1.04 – 1.64 kN	1.36
Time of Max. Pubic Force	9.90 – 15.90 ms	15.50

TEST MEETS SPECIFICATIONS

Technician: _____

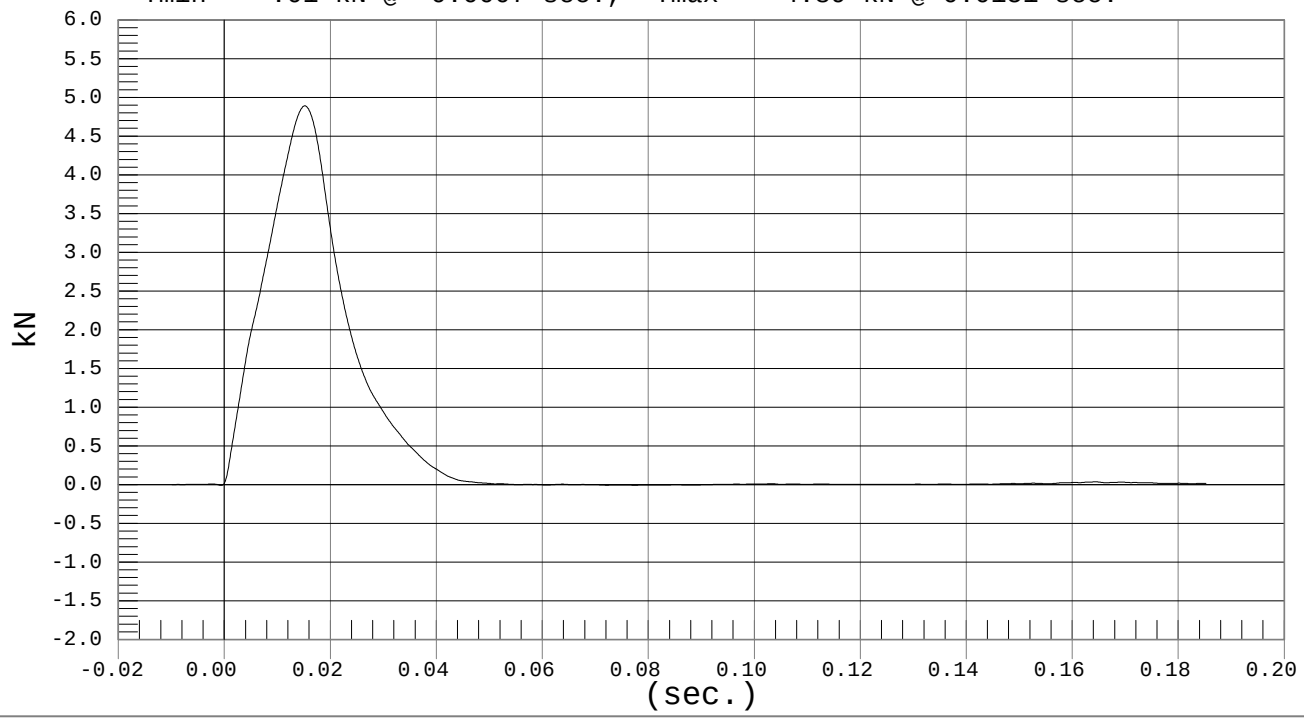
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 09-05-02
Speed: 14.1 fps, 4.28 M/s

Ymin = -.01 kN @ -0.0007 sec., Ymax = 4.89 kN @ 0.0151 sec.

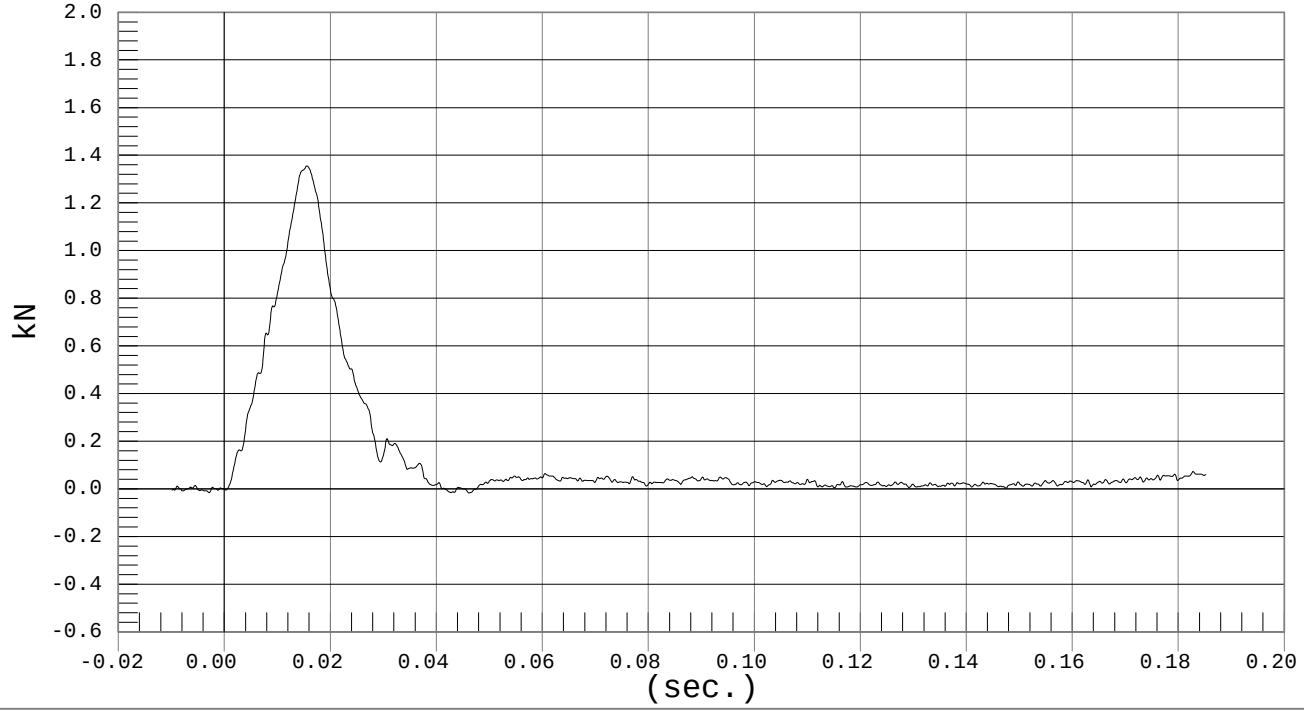


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 09-05-02
Speed: 14.1 fps, 4.28 M/s

Ymin = -.02 kN @ 0.0460 sec., Ymax = 1.36 kN @ 0.0155 sec.



CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Post-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

Date: 9/27/02

Dummy Serial Number: 009

Test Number: D021261

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.2
Relative Humidity (%)	10 – 70	54
Peak Resultant Acceleration	100 – 150 g's	146
Time of Max. Res. Acceleration	msec	2.4

TEST MEETS SPECIFICATIONS

Technician: _____

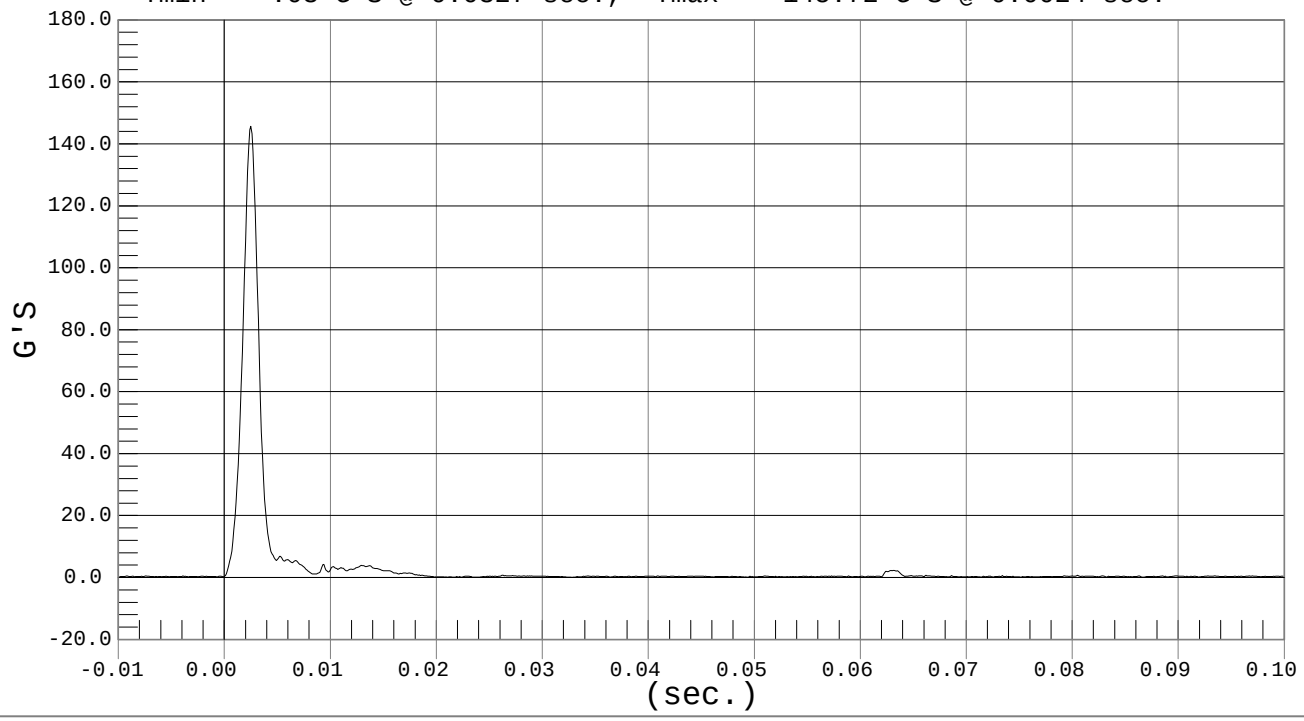
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 09-27-02
Speed: 0.0 fps, 0.00 M/s

Ymin = .03 G'S @ 0.0327 sec., Ymax = 145.72 G'S @ 0.0024 sec.



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021262

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.8
Relative Humidity (%)		10 – 70	44
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.32
	8 msec	¯1.59 - ¯2.04 m/sec	-1.71
	14 msec	¯3.20 - ¯3.85 m/sec	-3.34
Maximum Flexion Angle		49.0 – 59.0 deg	52.3
Time of Max. Flexion Angle		54.0 – 66.0 ms	57.8
Maximum Angle Theta (A)		32.0 – 37.0 deg	34.0
Time of Max. Theta (A)		53.0 – 63.0 ms	57.7
Maximum Angle Theta (B)		29.29– 31.79 deg	30.26
Time of Max. Theta (B)		54.0 – 64.0 ms	56.9

TEST MEETS SPECIFICATIONS

Technician: _____

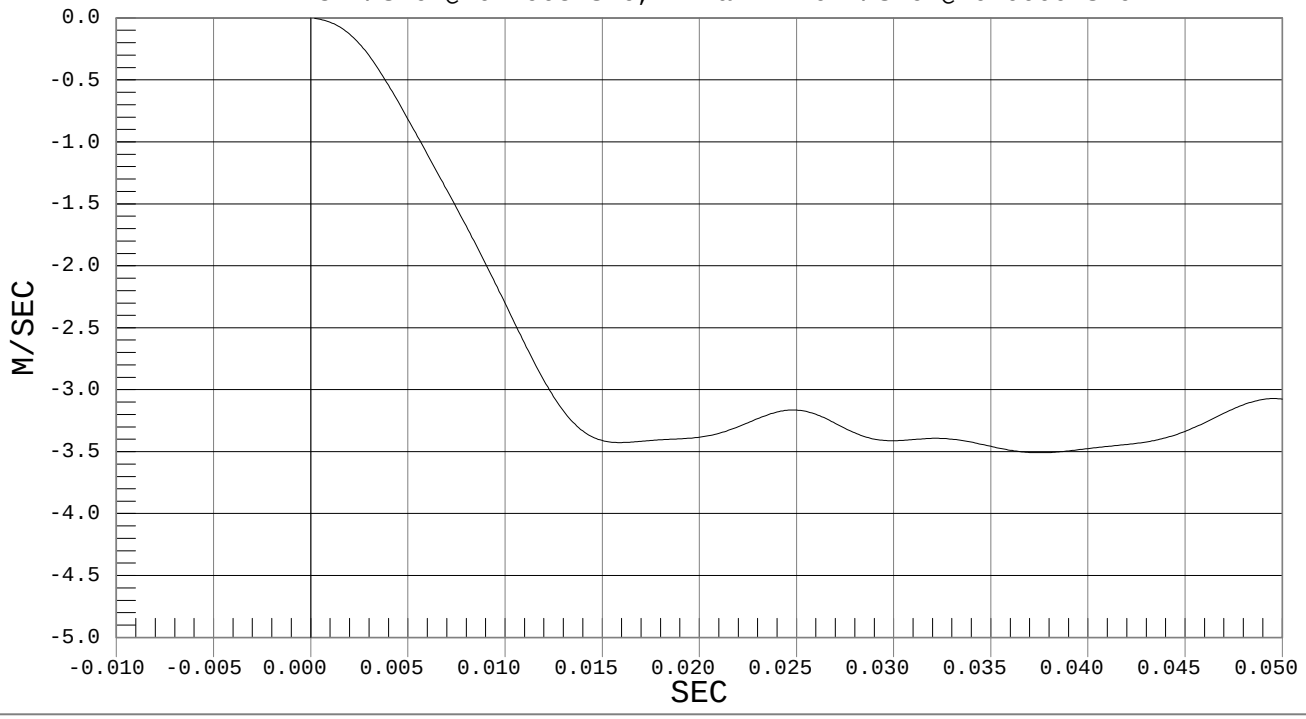
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-26-02
Speed: 11.1 fps, 3.37 M/s

Ymin = -4.48 M/SEC @ 0.1903 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

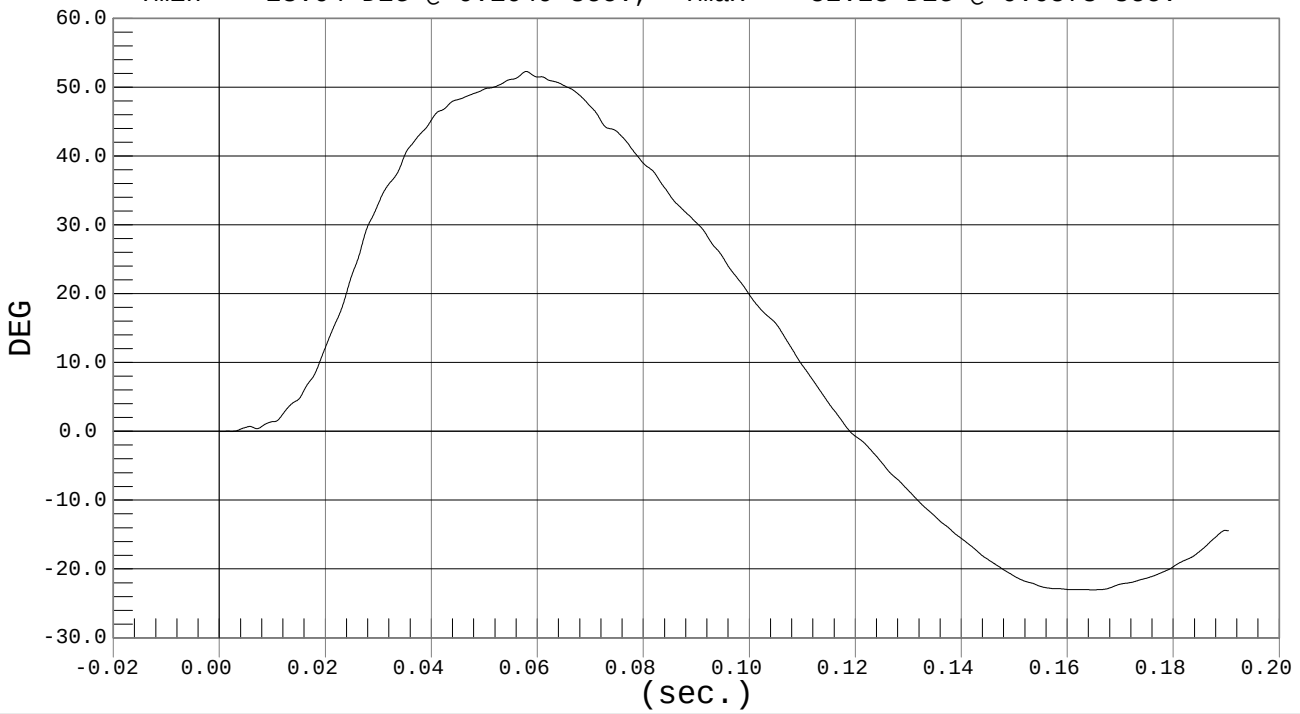


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-26-02
Speed: 11.1 fps, 3.37 M/s

Ymin = -23.04 DEG @ 0.1649 sec., Ymax = 52.28 DEG @ 0.0578 sec.

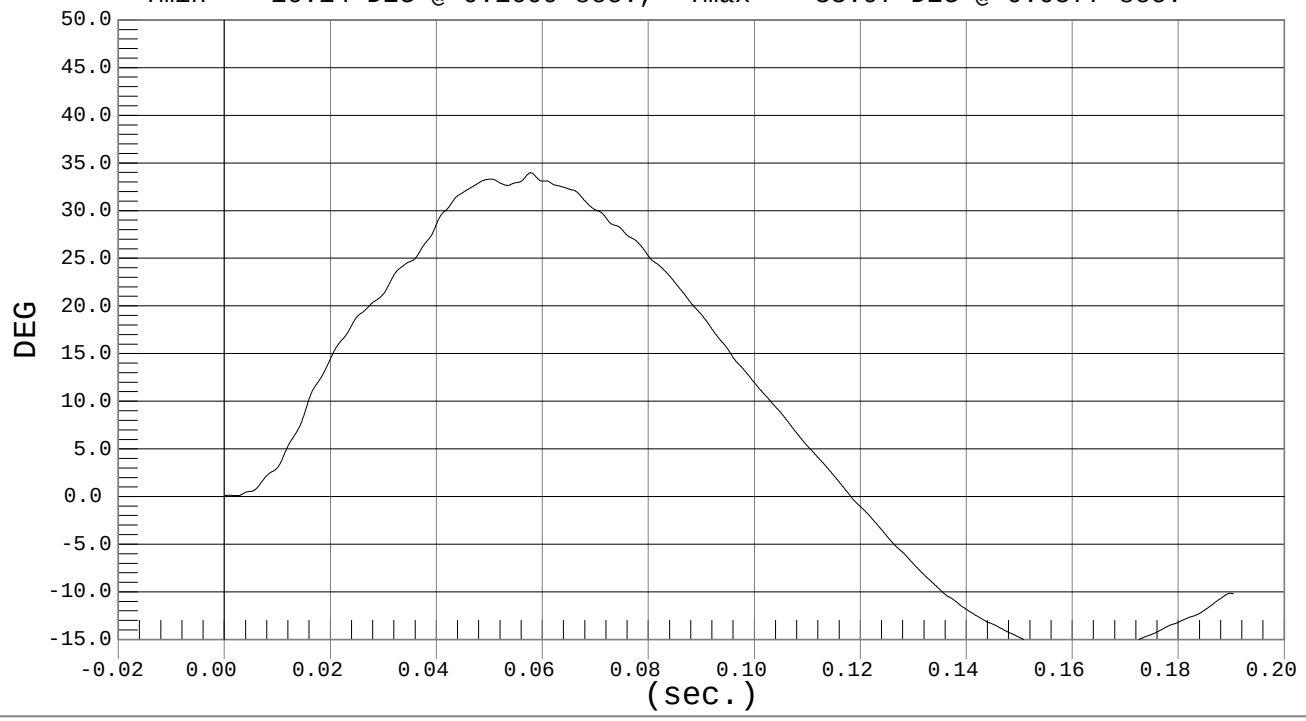


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-26-02
Speed: 11.1 fps, 3.37 M/s

Ymin = -16.14 DEG @ 0.1609 sec., Ymax = 33.97 DEG @ 0.0577 sec.

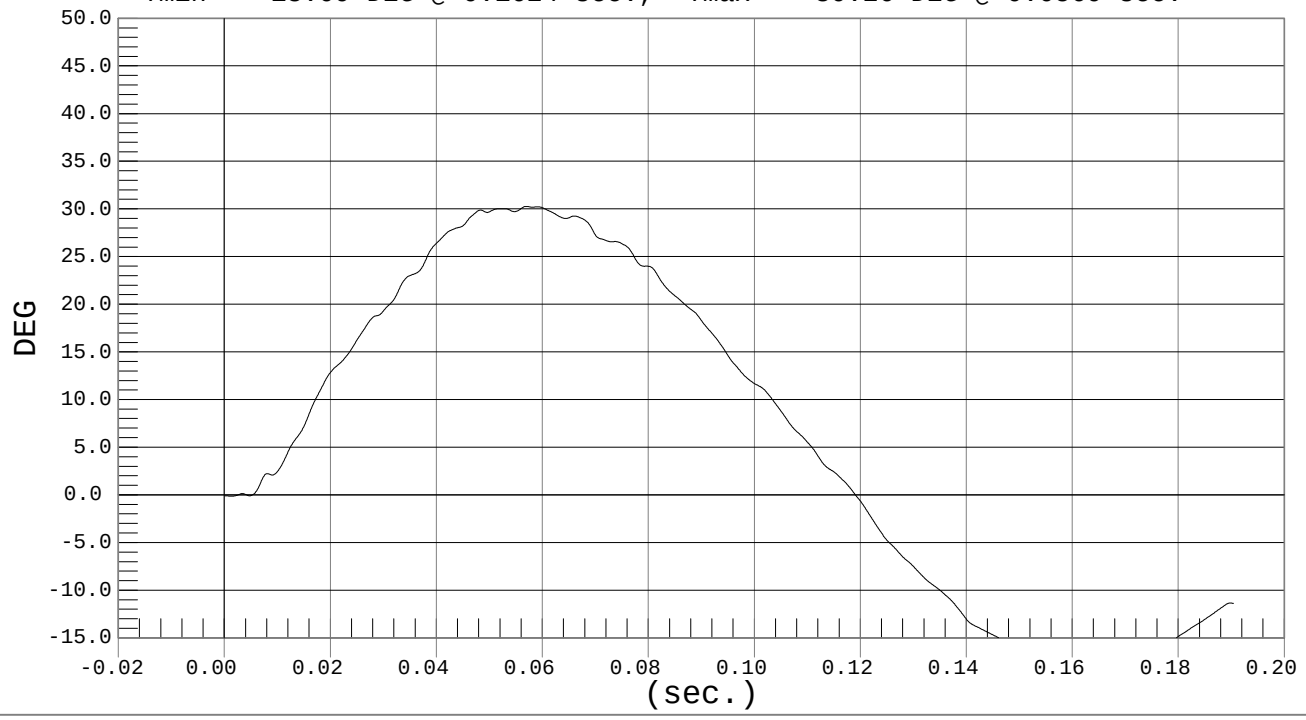


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 09-26-02
Speed: 11.1 fps, 3.37 M/s

Ymin = -18.09 DEG @ 0.1624 sec., Ymax = 30.26 DEG @ 0.0569 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021263

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.8
Relative Humidity (%)	10 – 70	46
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.1
Time of Max. Pendulum Acceleration	msec	12.1

TEST MEETS SPECIFICATIONS

Technician: _____

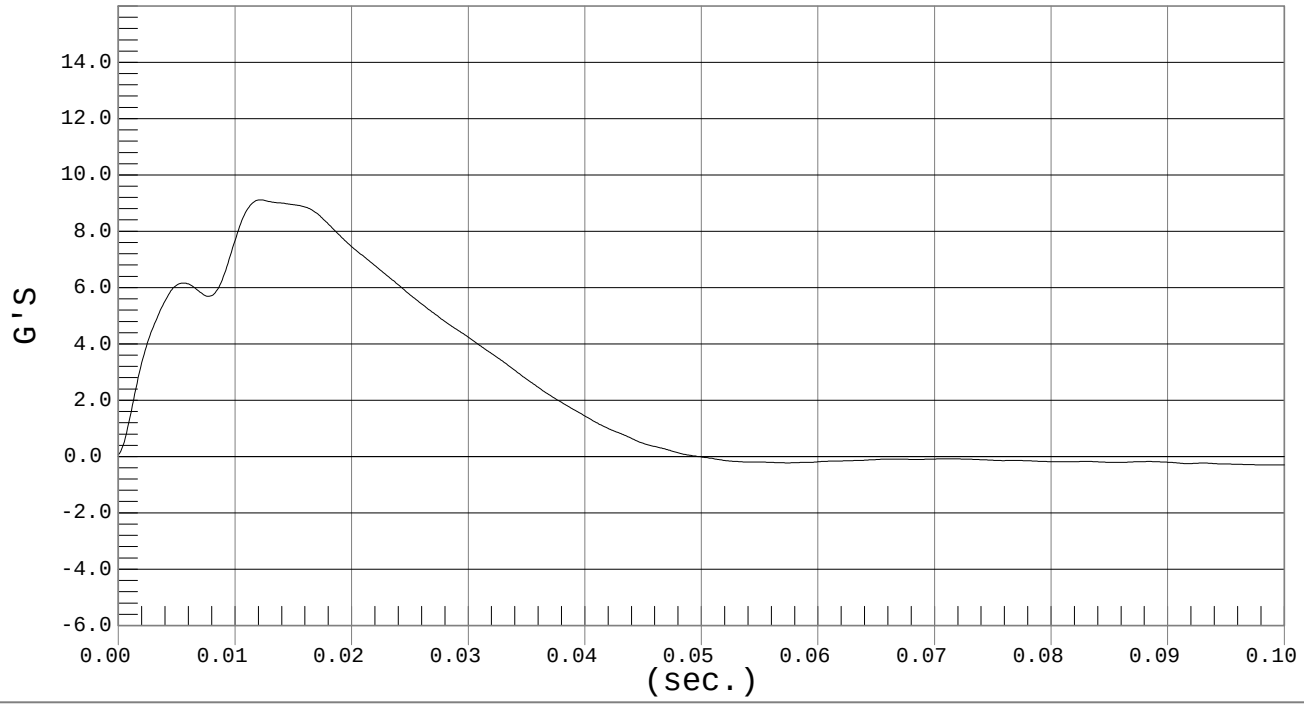
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 09-26-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -.33 G'S @ 0.1016 sec., Ymax = 9.11 G'S @ 0.0121 sec.



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UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021264/5/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	44
Displacement at 2 m/s	23.5 – 27.5 mm	26.1
Displacement at 3 m/s	36.0 – 40.0 mm	38.8
Displacement at 4 m/s	46.0 – 51.0 mm	50.6

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	44
Displacement at 2 m/s	23.5 – 27.5 mm	25.6
Displacement at 3 m/s	36.0 – 40.0 mm	38.9
Displacement at 4 m/s	46.0 – 51.0 mm	50.6

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	44
Displacement at 2 m/s	23.5 – 27.5 mm	23.7
Displacement at 3 m/s	36.0 – 40.0 mm	36.5
Displacement at 4 m/s	46.0 – 51.0 mm	47.3

TEST MEETS SPECIFICATIONS

Technician: _____

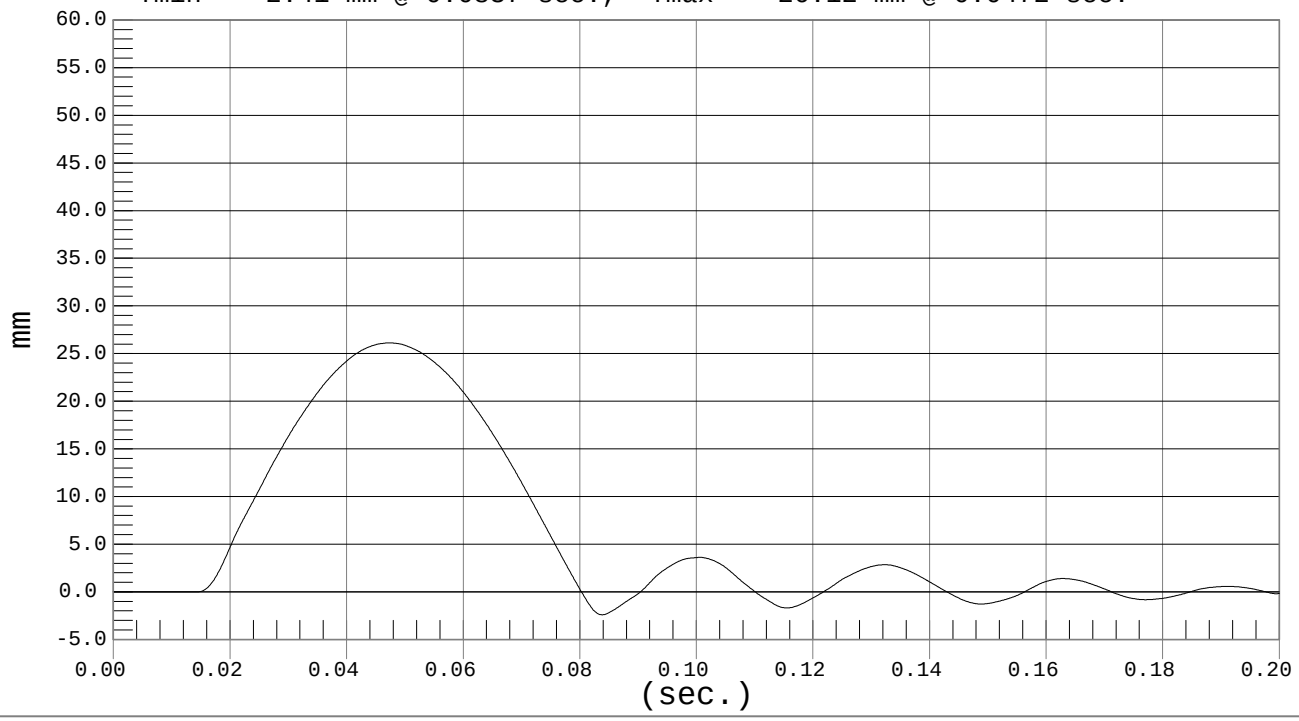
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 09-26-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -2.41 mm @ 0.0837 sec., Ymax = 26.12 mm @ 0.0472 sec.

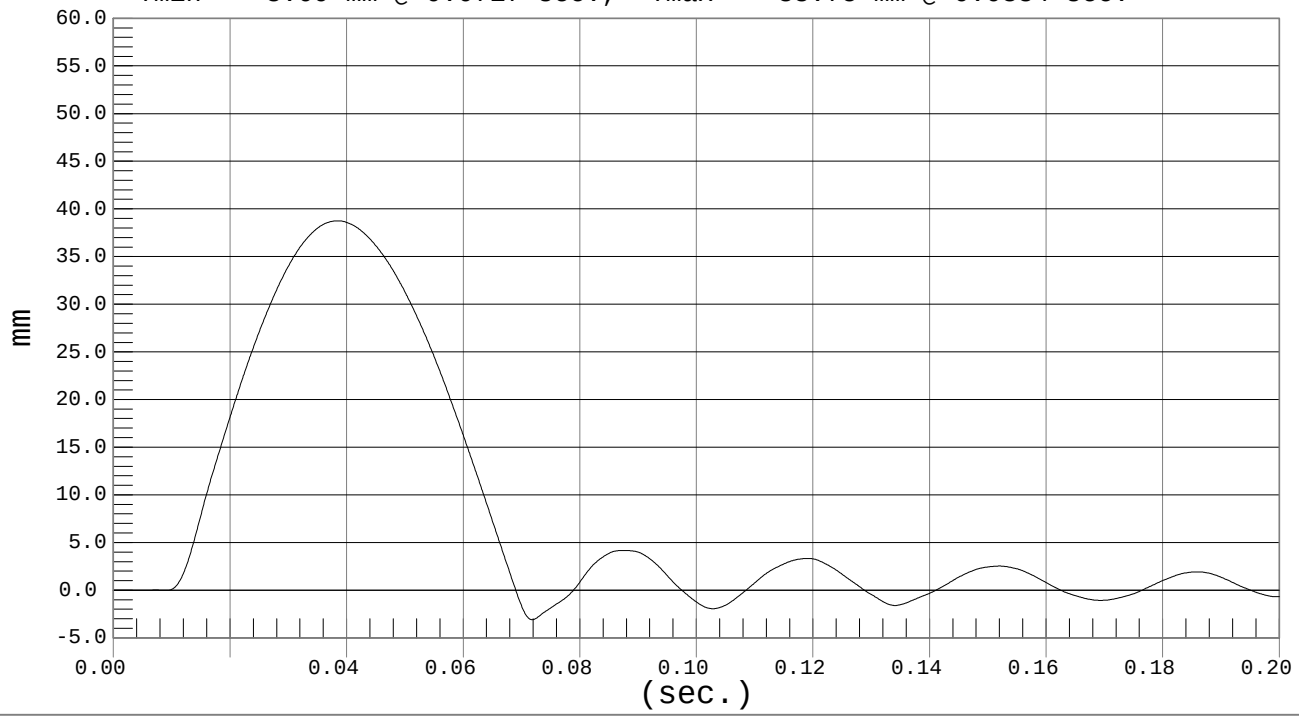


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 09-26-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -3.09 mm @ 0.0717 sec., Ymax = 38.75 mm @ 0.0384 sec.

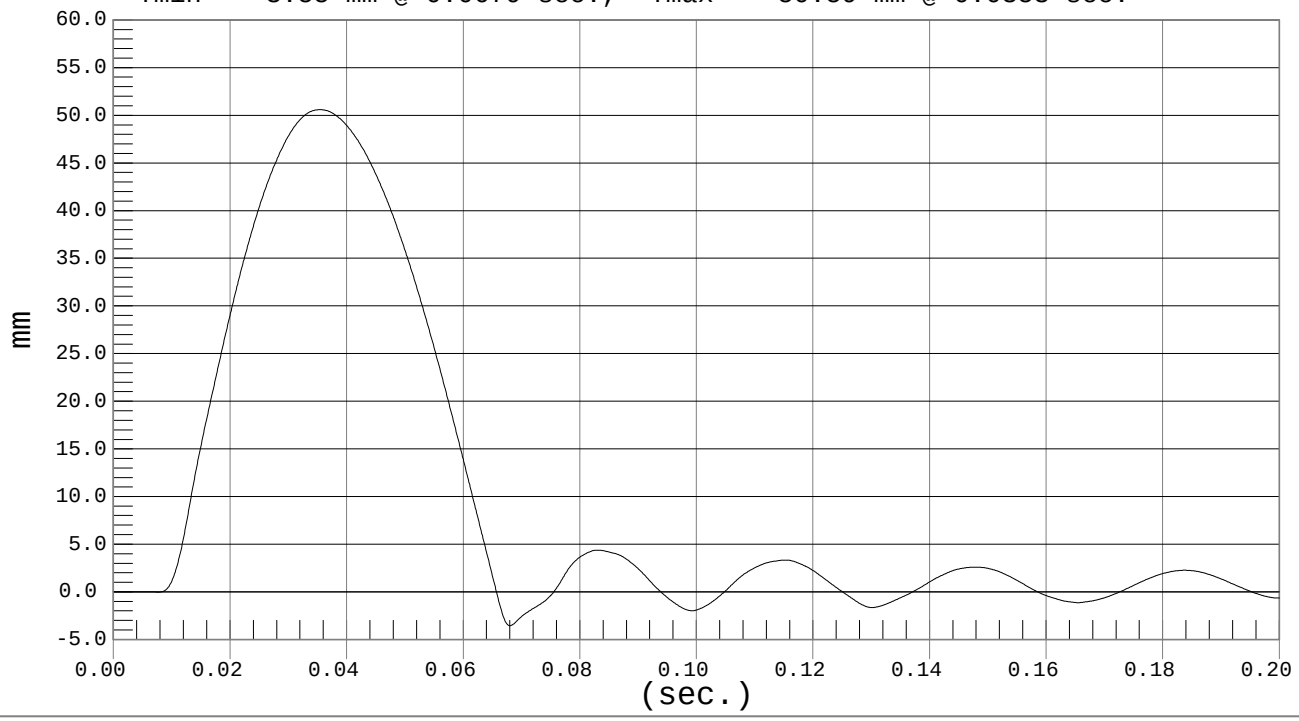


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 09-26-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -3.55 mm @ 0.0679 sec., Ymax = 50.59 mm @ 0.0353 sec.

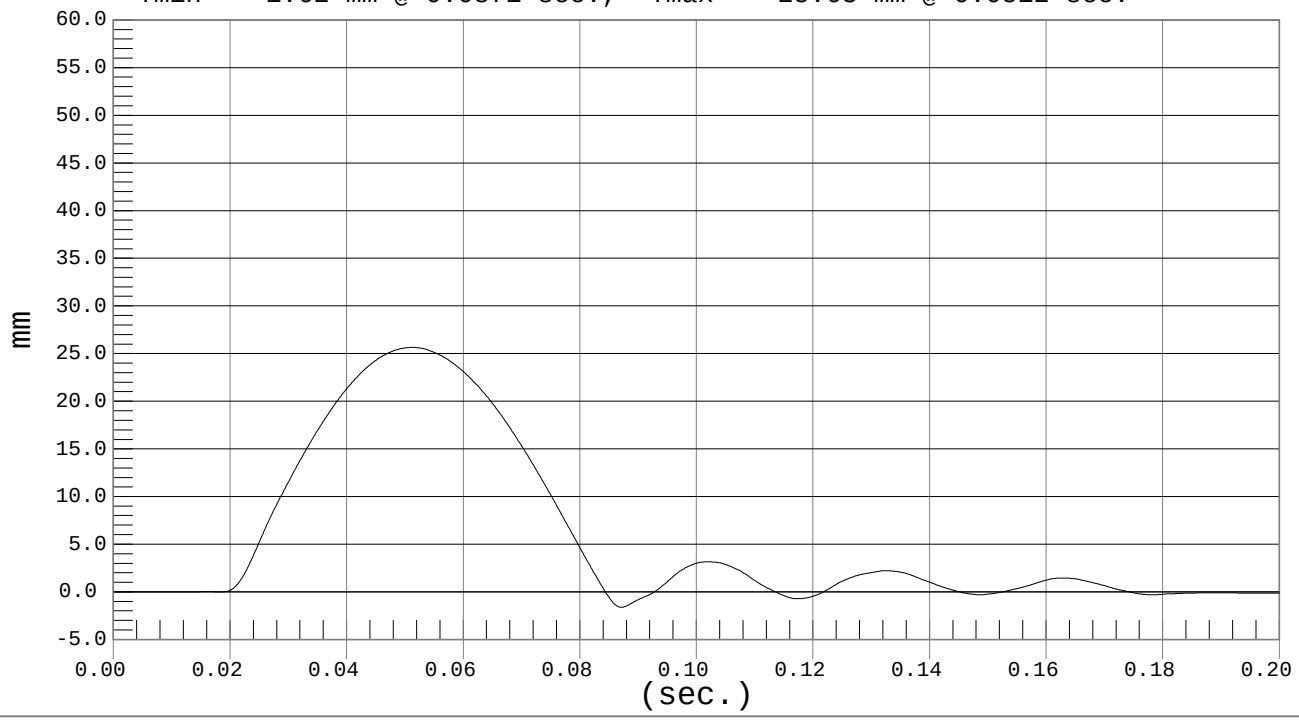


MIDDLE RIB DISPLACEMENT

Test Desc.: rib module
Component: Dummy #009

Test Date: 09-26-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -1.62 mm @ 0.0871 sec., Ymax = 25.63 mm @ 0.0512 sec.

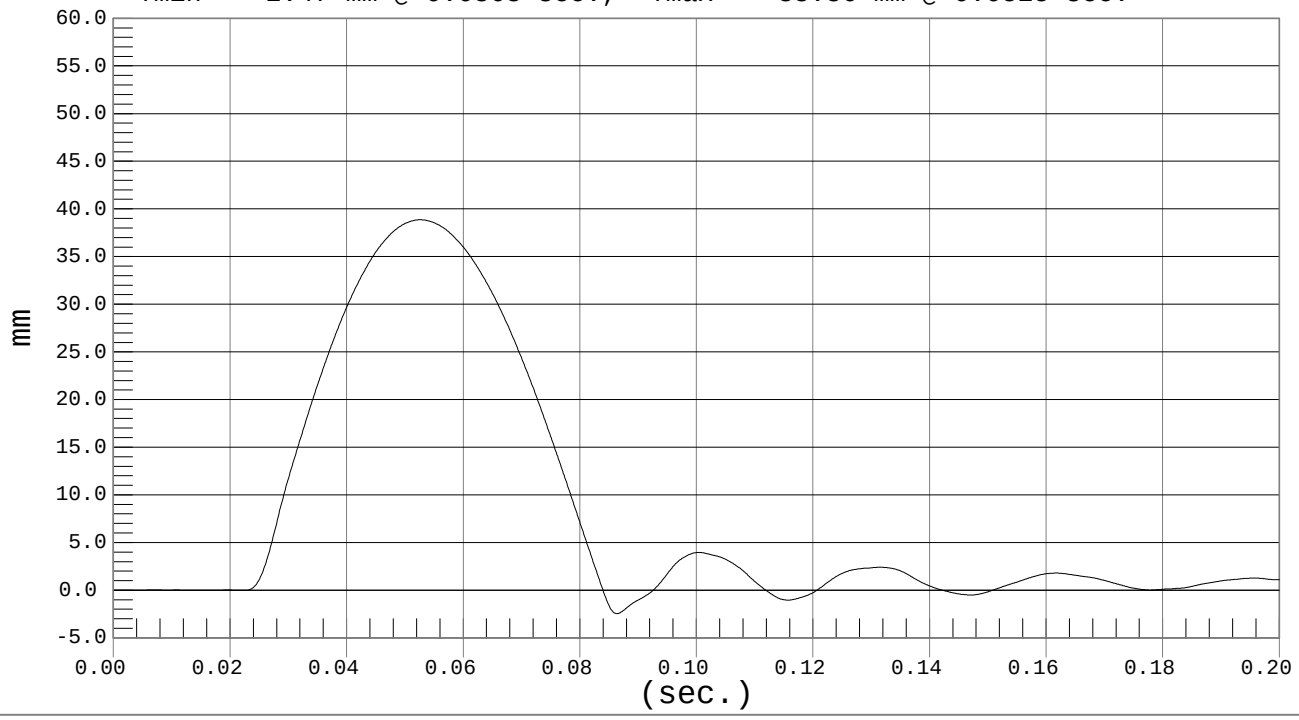


MIDDLE RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 09-26-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -2.47 mm @ 0.0863 sec., Ymax = 38.86 mm @ 0.0525 sec.

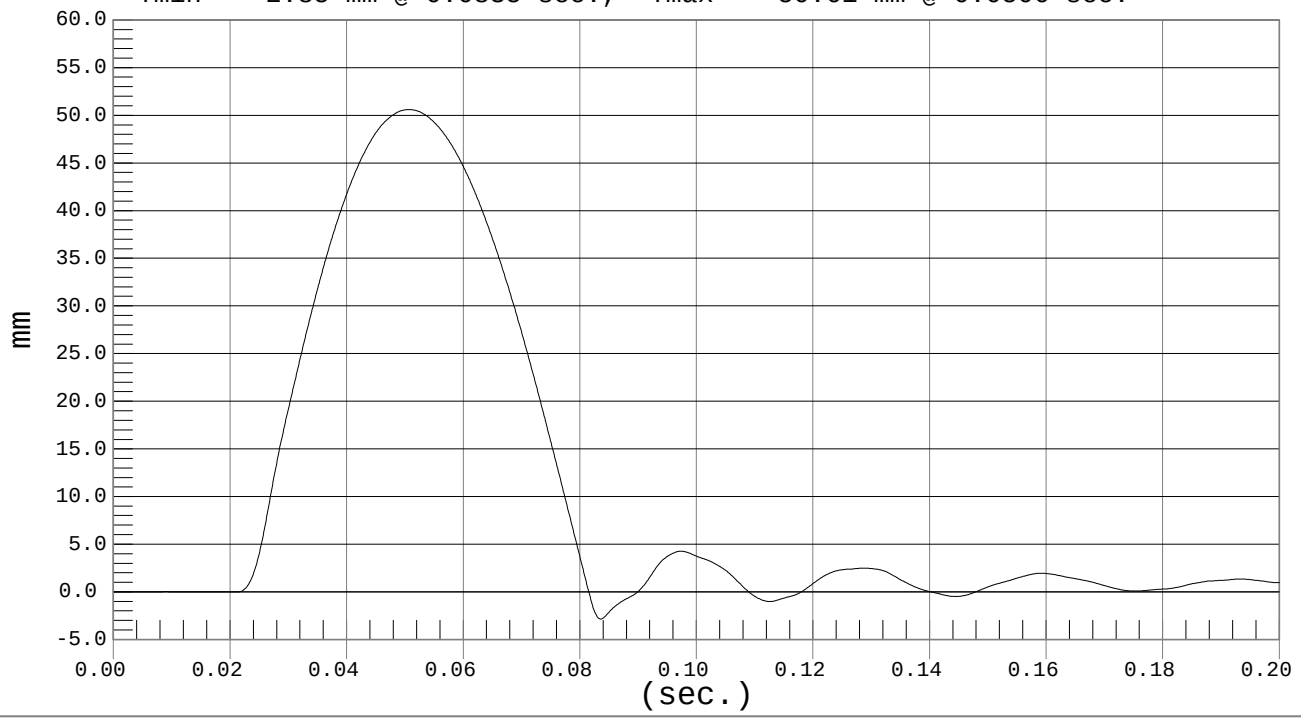


MIDDLE RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 09-26-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -2.85 mm @ 0.0835 sec., Ymax = 50.61 mm @ 0.0506 sec.

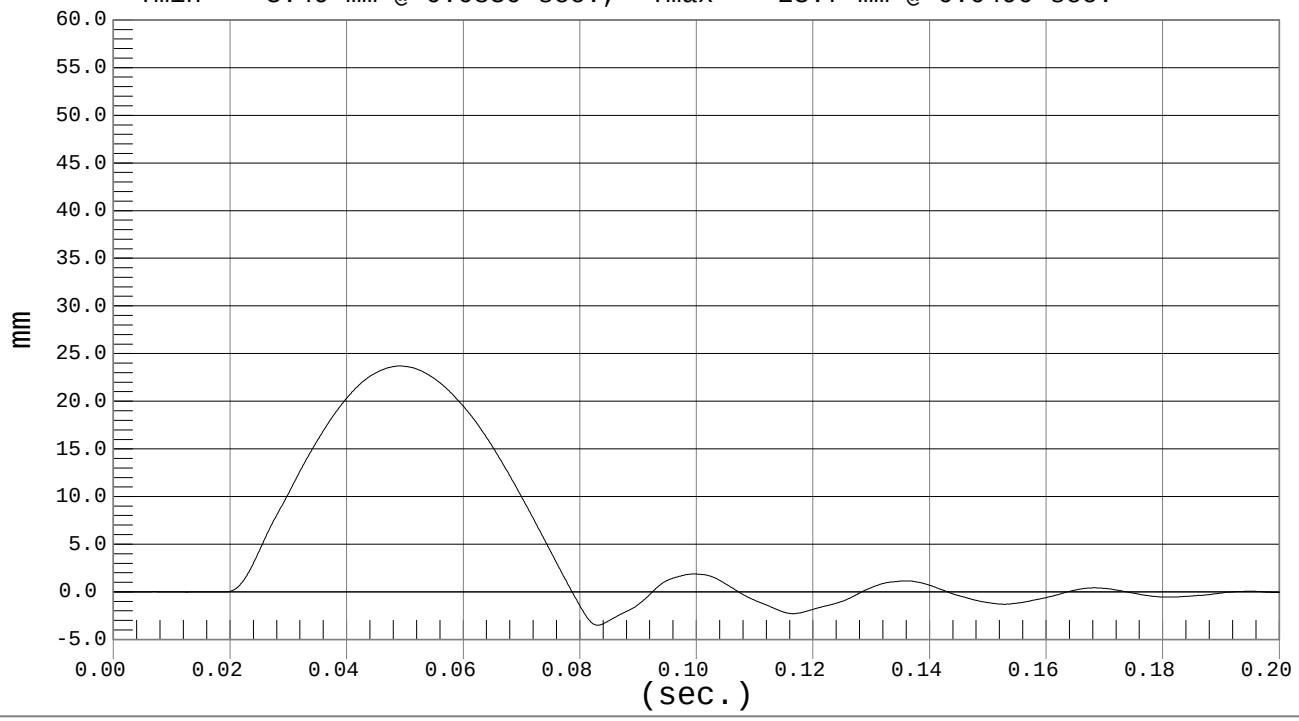


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 09-26-02
Speed: 6.6 fps, 2.00 M/s

Ymin = -3.49 mm @ 0.0830 sec., Ymax = 23.7 mm @ 0.0490 sec.

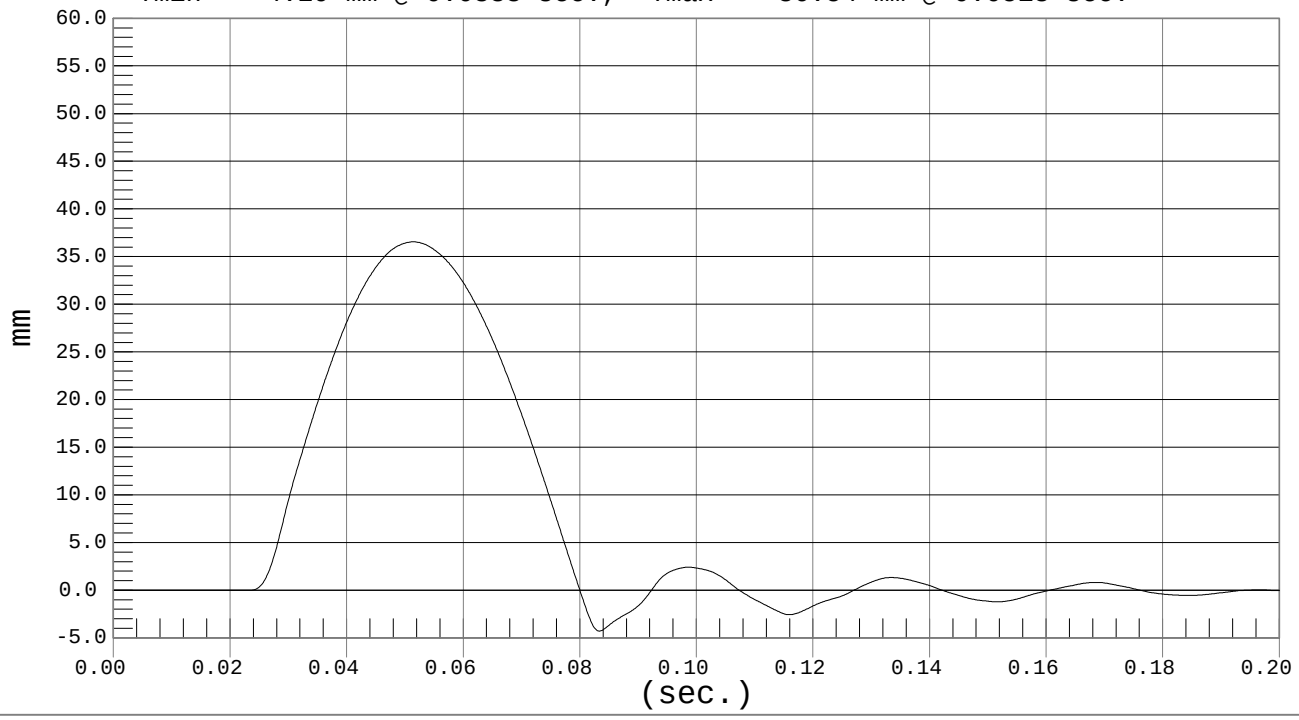


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 09-26-02
Speed: 9.8 fps, 3.00 M/s

Ymin = -4.29 mm @ 0.0833 sec., Ymax = 36.54 mm @ 0.0513 sec.

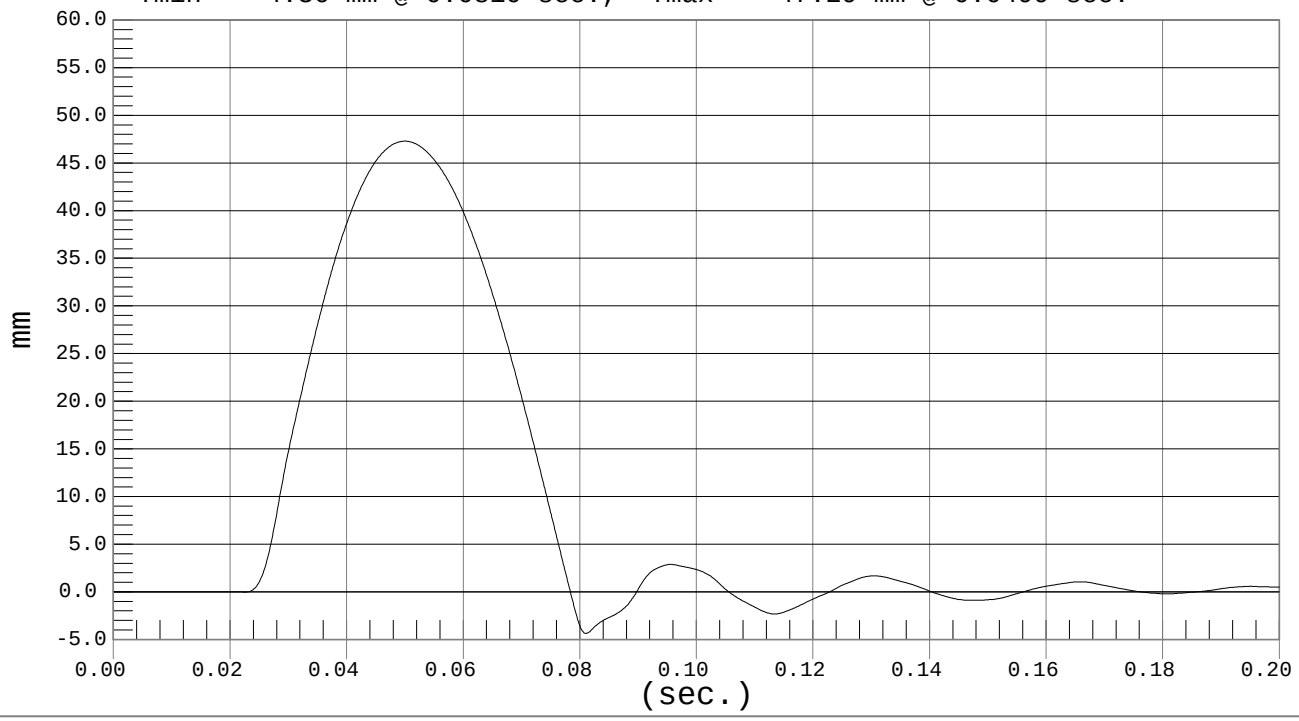


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 09-26-02
Speed: 13.1 fps, 4.00 M/s

Ymin = -4.36 mm @ 0.0810 sec., Ymax = 47.29 mm @ 0.0499 sec.



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021267

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.7
Relative Humidity (%)	10 – 70	47
Probe Speed (m/s)	3.90 – 4.10	3.99
Maximum Impact Force	4.00 – 4.80 kN	4.71
Time of Maximum Force	10.60 – 13.00 ms	11.10
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.27
Time of Max. Total Force	10.00 – 12.30 ms	11.00

TEST MEETS SPECIFICATIONS

Technician: _____

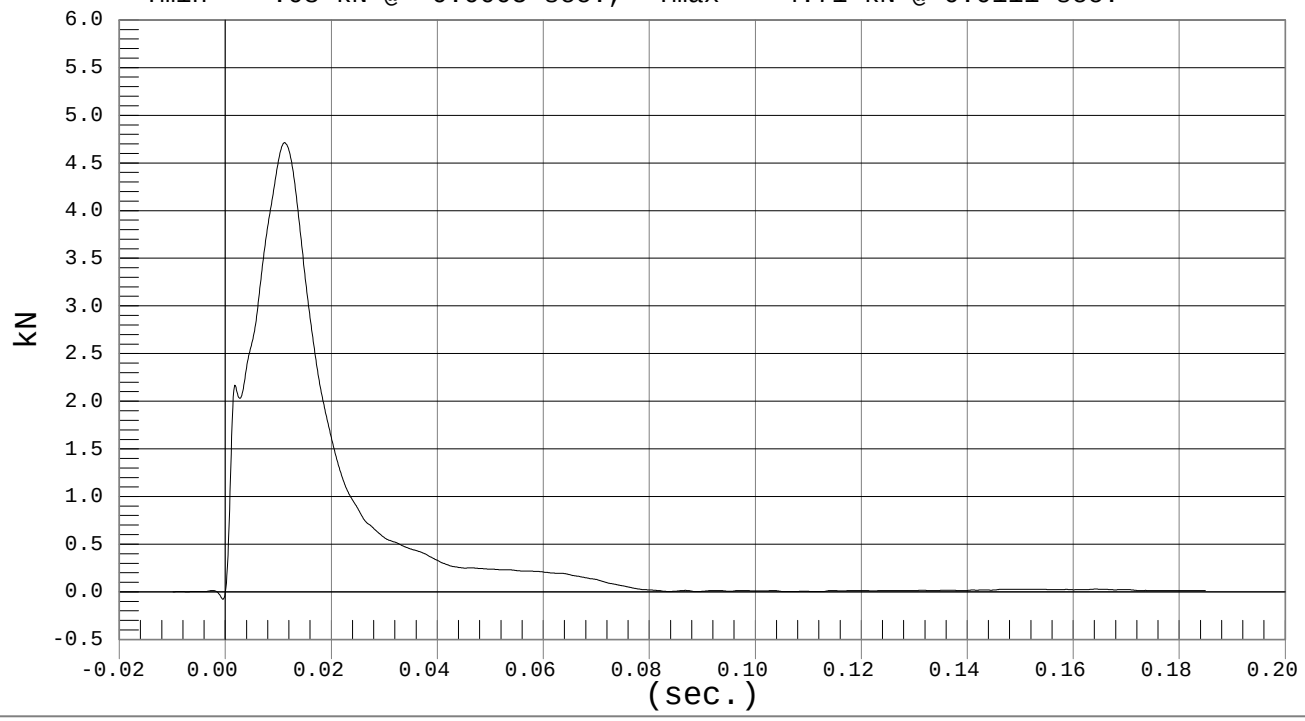
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 09-26-02
Speed: 13.1 fps, 3.99 M/s

Ymin = -.08 kN @ -0.0005 sec., Ymax = 4.71 kN @ 0.0111 sec.

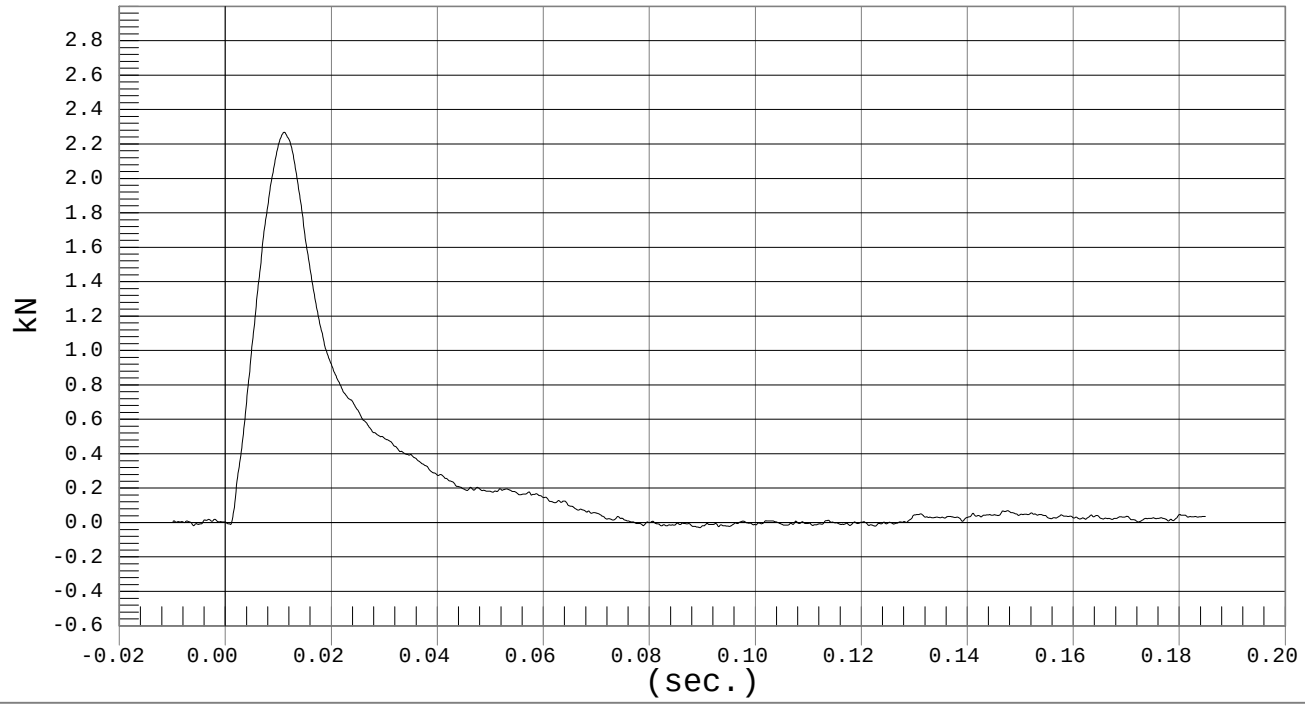


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 09-26-02
Speed: 13.1 fps, 3.99 M/s

Ymin = -.03 kN @ 0.0894 sec., Ymax = 2.27 kN @ 0.0110 sec.



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021268

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.8
Relative Humidity (%)		10 – 70	44
Pendulum Speed		5.95 – 6.15	6.07
Pendulum Deceleration	10 msec	$^{-}$2.46 - $^{-}$1.59 m/sec	-1.94
	20 msec	$^{-}$5.25 - $^{-}$4.07 m/sec	-4.50
	25 msec	$^{-}$6.64 - $^{-}$5.30 m/sec	-5.64
	30 msec	$\geq$ -6.5 m/sec	-6.24
Maximum Flexion Angle		45.0 – 55.0 deg	53.12
Time of Max. Flexion Angle		39.0 – 53.0 ms	44.8
Maximum Angle Theta (A)		31.0 – 35.0 deg	34.1
Time of Max. Theta (A)		44.0 – 52.0 ms	45.1
Maximum Angle Theta (B)		29.28– 31.78 deg	31.71
Time of Max. Theta (B)		44.0 – 52.0 ms	47.9

TEST MEETS SPECIFICATIONS

Technician: _____

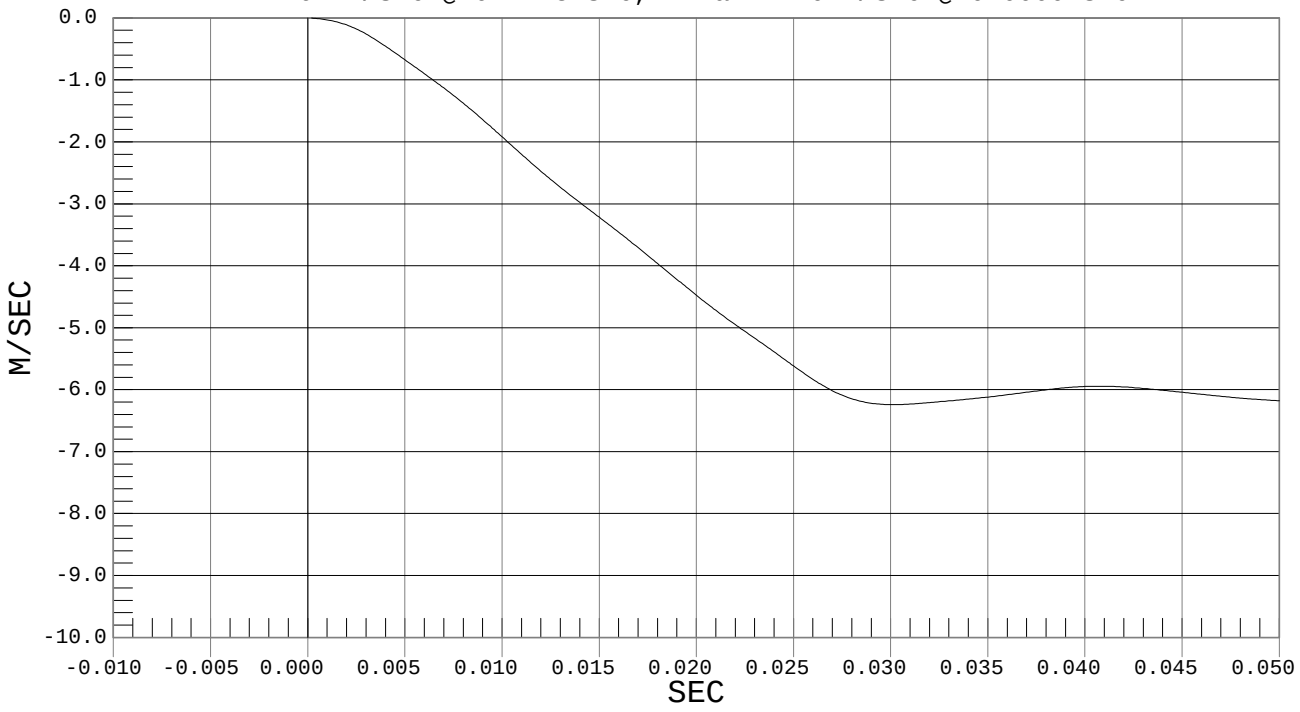
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-26-02
Speed: 19.9 fps, 6.07 M/s

Ymin = -7.62 M/SEC @ 0.1473 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

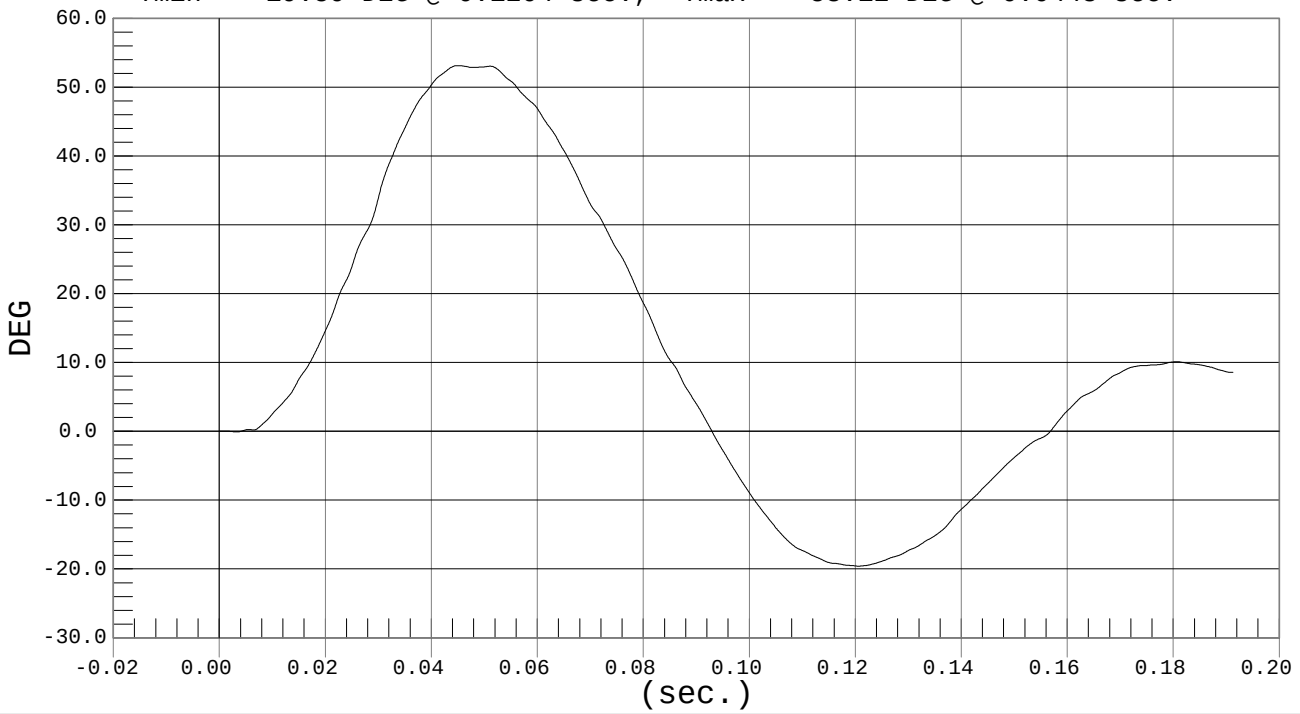


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-26-02
Speed: 19.9 fps, 6.07 M/s

Ymin = -19.59 DEG @ 0.1204 sec., Ymax = 53.12 DEG @ 0.0448 sec.

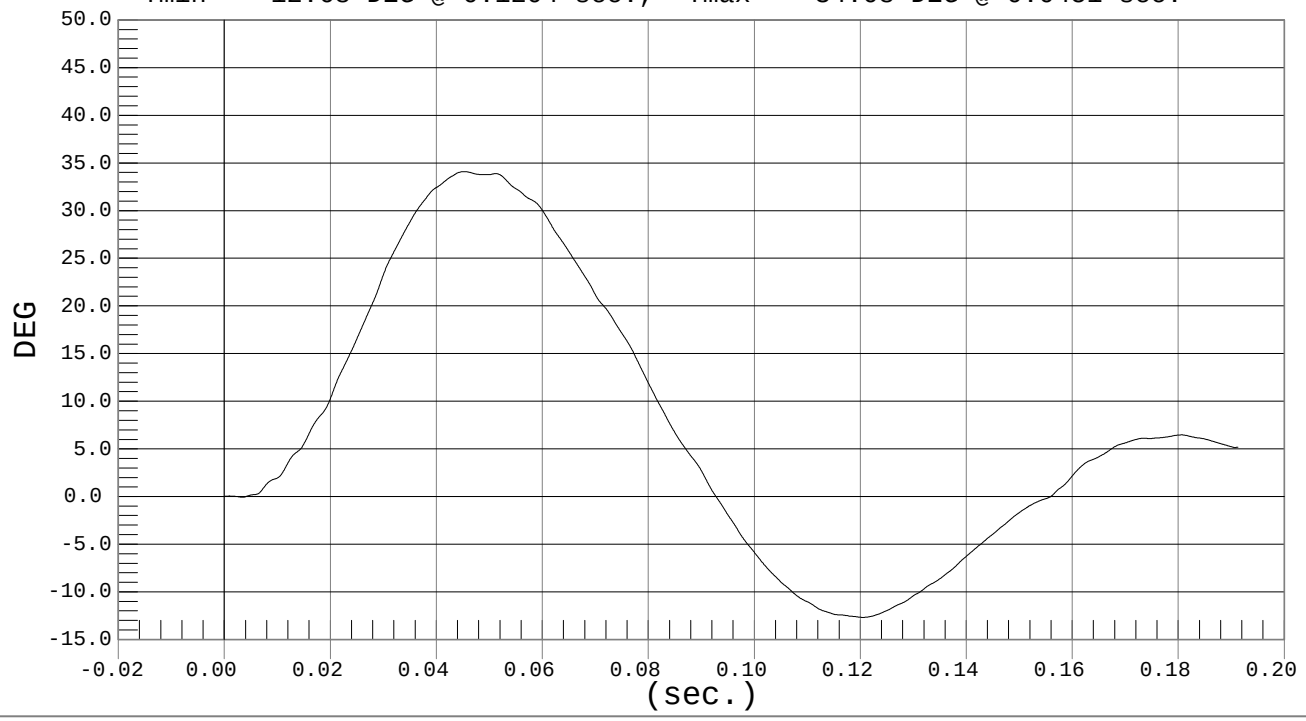


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-26-02
Speed: 19.9 fps, 6.07 M/s

Ymin = -12.68 DEG @ 0.1204 sec., Ymax = 34.08 DEG @ 0.0451 sec.

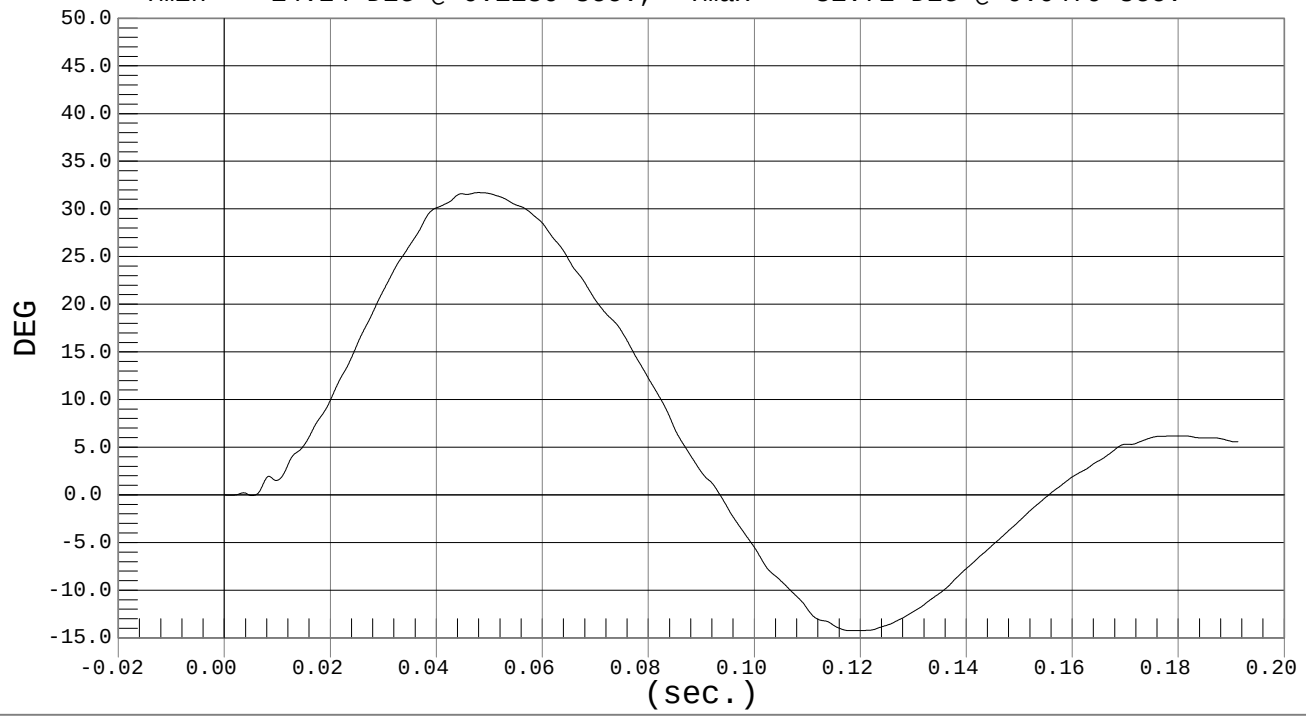


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 09-26-02
Speed: 19.9 fps, 6.07 M/s

Ymin = -14.24 DEG @ 0.1186 sec., Ymax = 31.71 DEG @ 0.0479 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 9/26/02

Dummy Serial Number: 009

Test Number: D021269

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.8
Relative Humidity (%)	10 – 70	47
Pendulum Speed	4.20 – 4.40 m/s	4.30
Maximum Impactor Force	4.40 – 5.40 kN	4.80
Time of Max. Impactor Force	10.30 – 15.50 ms	14.9
Maximum Pubic Force	1.04 – 1.64 kN	1.28
Time of Max. Pubic Force	9.90 – 15.90 ms	15.20

TEST MEETS SPECIFICATIONS

Technician: _____

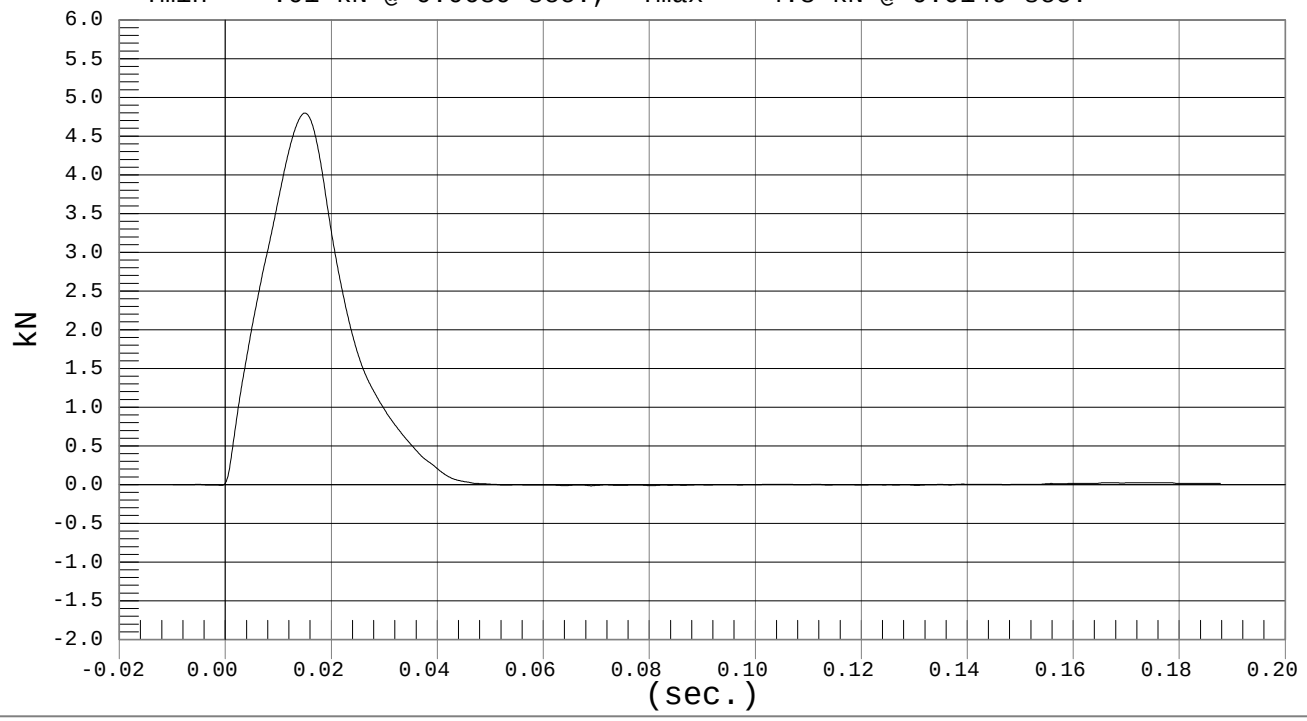
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 09-26-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -.01 kN @ 0.0689 sec., Ymax = 4.8 kN @ 0.0149 sec.

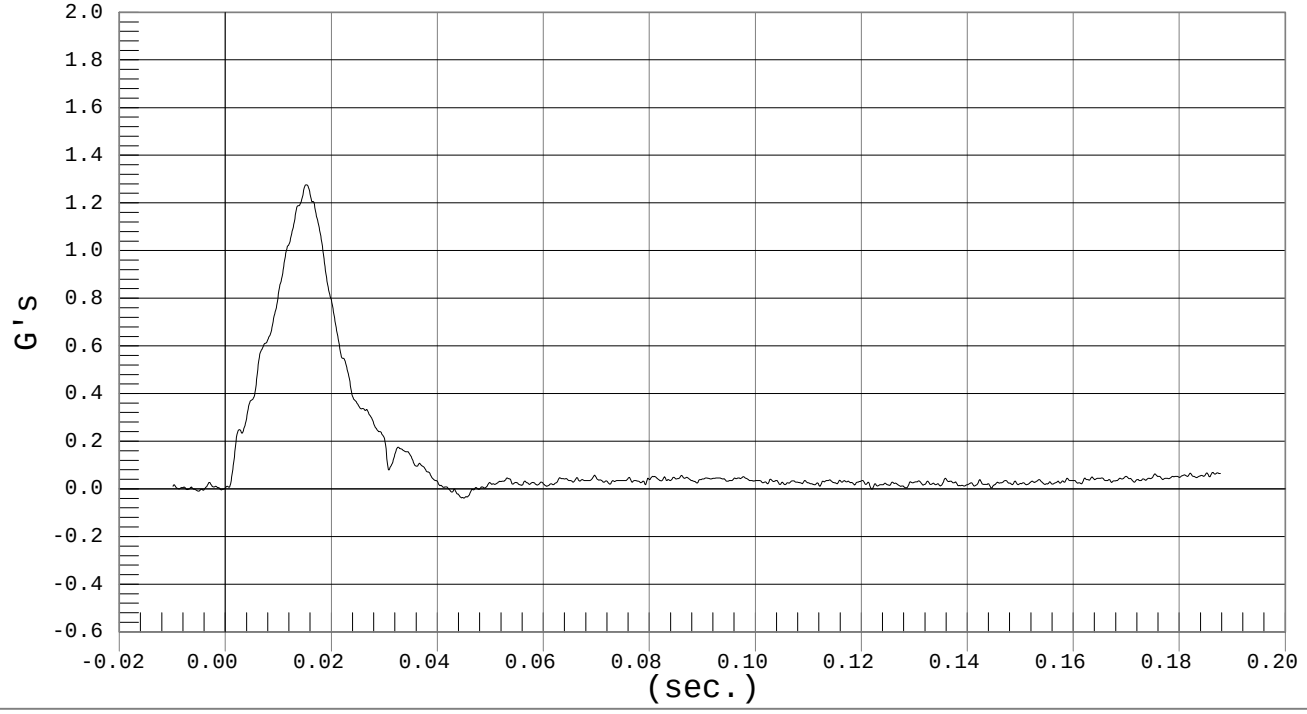


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 09-26-02
Speed: 14.1 fps, 4.30 M/s

Ymin = -.04 G's @ 0.0449 sec., Ymax = 1.28 G's @ 0.0152 sec.



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	P22180	Endevco	7/23/02
Head Y Accelerometer	P22805	Endevco	7/23/02
Head Z Accelerometer	P23012	Endevco	7/23/02
Upper Neck Force X Load Cell	N105FX	FTSS	5/13/02
Upper Neck Force Y Load Cell	N105FY	FTSS	5/13/02
Upper Neck Force Z Load Cell	N105FZ	FTSS	5/13/02
Upper Neck Moment X	N105MX	FTSS	5/13/02
Upper Neck Moment Y	N105MY	FTSS	5/13/02
Upper Neck Moment Z	N105MZ	FTSS	5/13/02
Lower Neck Force X Load Cell	N110FX	FTSS	5/16/02
Lower Neck Force Y Load Cell	N110FY	FTSS	5/16/02
Lower Neck Force Z Load Cell	N110FZ	FTSS	5/16/02
Lower Neck Moment X	N110MX	FTSS	5/16/02
Lower Neck Moment Y	N110MY	FTSS	5/16/02
Lower Neck Moment Z	N110MZ	FTSS	5/16/02
Shoulder Force X Load Cell	S119FX	FTSS	5/10/02
Shoulder Force Y Load Cell	S119FY	FTSS	5/10/02
Shoulder Force Z Load Cell	S119FZ	FTSS	5/10/02
Upper Spine X Accelerometer	P24216	Endevco	7/22/02
Upper Spine Y Accelerometer	P24226	Endevco	7/22/02
Upper Spine Z Accelerometer	P23059	Endevco	7/22/02
Upper Rib Y Accelerometer	P22107	Endevco	7/22/02
Mid Rib Y Accelerometer	P22687	Endevco	7/22/02
Lower Rib Y Accelerometer	P22454	Endevco	7/22/02
Upper Rib Displacement	009U	Honeywell	5/22/02
Mid Rib Displacement	009M	Honeywell	5/22/02
Lower Rib Displacement	009L	Honeywell	5/22/02
Lower Spine X Accelerometer	P21352	Endevco	7/22/02
Lower Spine Y Accelerometer	P22695	Endevco	7/22/02
Lower Spine Z Accelerometer	P22659	Endevco	7/22/02
Torso Force X Load Cell	ET122FX	FTSS	5/13/02
Torso Force Y Load Cell	ET122FY	FTSS	5/13/02
Torso Moment Y Load Cell	ET122MY	FTSS	5/13/02
Torso Moment Z Load Cell	ET122MZ	FTSS	5/13/02
T-12 Force X Load Cell	LS103FX	FTSS	5/13/02
T-12 Force Y Load Cell	LS103FY	FTSS	5/13/02
T-12 Moment X Load Cell	LS103MX	FTSS	5/13/02
T-12 Moment Y Load Cell	LS103MY	FTSS	5/13/02
Front Abdomen Load Cell	A122FY	FTSS	5/16/02
Mid Abdomen Load Cell	A123FY	FTSS	5/16/02
Rear Abdomen Load Cell	A124FY	FTSS	5/16/02

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Pelvis X Accelerometer	P22084	Endevco	7/23/02
Pelvis Y Accelerometer	P22099	Endevco	7/23/02
Pelvis Z Accelerometer	P22972	Endevco	7/23/02
Right Femur Force X Load Cell	F135FX	FTSS	5/13/02
Right Femur Force Y Load Cell	F135FY	FTSS	5/13/02
Right Femur Force Z Load Cell	F135FZ	FTSS	5/16/02
Right Femur Moment X	F135MX	FTSS	5/13/02
Right Femur Moment Y	F135MY	FTSS	5/13/02
Right Femur Moment Z	F135MZ	FTSS	5/16/02
Left Femur Force X Load Cell	F136FX	FTSS	5/13/02
Left Femur Force Y Load Cell	F136FY	FTSS	5/13/02
Left Femur Force Z Load Cell	F136FZ	FTSS	5/16/02
Left Femur Moment X	F136MX	FTSS	5/13/02
Left Femur Moment Y	F136MY	FTSS	5/13/02
Left Femur Moment Z	F136MZ	FTSS	5/16/02
Lumbar Force Y Load Cell	L104FY	FTSS	8/15/02
Lumbar Force Z Load Cell	L104FZ	FTSS	8/15/02
Lumbar Moment X Load Cell	L104MX	FTSS	8/15/02

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	G03-N08	ENTRAN	9/6/02
Left Lower A-Post Y	I12-F03	ENTRAN	6/17/02
Left Upper B-Post Y	G01-N04	ENTRAN	7/23/02
Left A-Post @ Roof Y	D11-F05	ENTRAN	9/6/02
Left Lower B-Post Y	K21-N12	ENTRAN	9/6/02
Rear Floorpan Above Axle X	AJ9D8	ENDEVCO	5/10/02
Rear Floorpan Above Axle Y	AJ9D6	ENDEVCO	5/10/02
Rear Floorpan Above Axle Z	I12-F01	ENTRAN	5/29/02
Driver Seat Track Y	K21-N07	ENTRAN	6/26/02
Right Side Sill at Front Seat X	G01-N01	ENTRAN	7/31/02
Right Side Sill at Front Seat Y	K21-N18	ENTRAN	8/7/02
Right Side Sill at Front Seat Z	G03-N06	ENTRAN	7/31/02
Right Side Sill at Rear Seat X	H14-N07	ENTRAN	5/30/02
Right Side Sill at Rear Seat Y	H14-N11	ENTRAN	5/30/02
Right Side Sill at Rear Seat Z	K21-N11	ENTRAN	6/25/02
Left Side Sill at Front Seat Y	I12-F10	ENTRAN	5/29/02
Left Side Sill at Rear Seat Y	99F348	ENTRAN	4/22/02
Vehicle CG X	L23-A03	ENTRAN	5/30/02
Vehicle CG Y	I12-F09	ENTRAN	6/17/02
Vehicle CG Z	I25-F02	ENTRAN	6/24/02
Left Front Door @ Pelvis Y	99F251	ENTRAN	4/22/02
Left Front Door @ Arm Y	K21-N08	ENTRAN	6/25/02
Lower Center Radiator Support X	K21-N09	ENTRAN	6/25/02
Lower Center Radiator Support Y	K21-N17	ENTRAN	6/24/02
Lower Center Radiator Support Z	K21-N01	ENTRAN	6/25/02

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

APPENDIX E
PROCEDURE USED FOR ES-2 POSITIONING

Installation of the Side Impact Dummy (recommended practice)

1. GENERAL

1.1 The dummy to be used for the following installation procedure is described in Annex 6 to this regulation.
1.2 Adjust the knee joints so that they just support the leg when it is extended horizontally (1 to 2 g).
1.3 Clothe the dummy in form fitting cotton stretch mid-calf length pants. Each foot is equipped with a shoe.

2. INSTALLATION

2.1 Place the dummy in the outboard front seat of the impact side as described in the test specifications.
2.2 The mid-sagittal plane of the dummy shall coincide with the centerplane of the occupant (as determined according to Annex 3, paragraph 2.8) with a tolerance of 2°.
2.3 The pelvis of the dummy shall be positioned according to the following:
2.3.1 The pelvis pitch angle shall be 20.0° +/- 2.5°.
2.3.2 A line passing through the dummy H-points shall pass through an imaginary circle in the mid-sagittal plane of the dummy. This circle has a radius of 10 mm and is located 20 mm horizontally forward and 5 mm vertically above the reference H-point, determined by the 3D H-point machine.
2.4 The upper torso of the dummy shall be positioned according to the following:
2.4.1 The upper torso shall be bent forward and then laid back against the seat back. The shoulder of the dummy shall be set fully rearward.
2.4.2 The torso reference line pitch angle shall be 25.0° +/- 2.5°. The torso reference line is defined as the thoracic spine center line.
2.5 The arms shall be positioned in such as way that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40° +/- 5°.

2.6 For the driver's seating position, without inducing pelvis or torso movement, place the right foot of the dummy on the undepressed accelerator pedal with the heel resting as far forward as possible on the floorpan. Set the left foot perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel. Set the knees of the dummy such that their outside surfaces are 150 +/- 10mm from the plane of symmetry of the dummy. If possible, within these constraints, place the thighs of the dummy in contact with the seat cushion.
2.7 For other seating positions, without inducing pelvis or torso movement, place the heels of the dummy as far forward as possible on the floorpan without compressing the seat cushion more than the compression due to the weight of the leg. Set the knees of the dummy such that their outside surfaces are 150 +/- 10 mm from the plane of symmetry of the dummy.

APPENDIX F
ES-2 PEAK RESPONSES

DRIVER (ES-2) PEAK RESPONSE TABLE

Location	Peak Response						
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2	
	Class	Axis	Units	Peak	Time (ms)	Peak	Time (ms)
Head	1000	X	G	-8.2	63	-60.8	64.3
	1000	Y	G	31.9	58	100.9	64.2
	1000	Z	G	13.9	58	25.9	63.8
	1000	RES	G	35.0	58	119.6	64.2
Head Injury Criteria (HIC)				114		243	
t1				42.8		50.8	
t2				69.9		66.2	
Upper Neck Force	1000	X	N	-211	63	-424	62.8
	1000	Y	N	-258	186	-328	167.2
	1000	Z	N	476	46	512	62
	1000	RES	N	481	46	674	62.4
Upper Neck Moment	600	X	Nm	-23.5	173	-28.3	157.1
	600	Y	Nm	17.6	104	-41.2	62.9
	600	Z	Nm	18.8	69	27.4	70.4
	600	RES	Nm	27.4	175	47.7	62.9
Lower Neck Force	1000	X	N	-209	60	-679	63.1
	1000	Y	N	286	29	-500	52.7
	1000	Z	N	438	46	517	54.5
	1000	RES	N	443	46	789	63.0
Lower Neck Moment	600	X	Nm	-60.0	189	-67.8	168.0
	600	Y	Nm	32.2	81	74.1	63.9
	600	Z	Nm	14.7	73	29.4	59.8
	600	RES	Nm	67.7	189	89.2	64.0
Shoulder Force	600	X	N	381	21	-615	20.0
	600	Y	N	1161	21	1295	20.4
	600	Z	N	386	22	-379	19.1
	600	RES	N				

DRIVER (ES-2) PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Values						
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2	
	Class	Axis	Units	Peak	Time (ms)	Peak	Time (ms)
Upper Spine	180	X	G	7.1	53	-10.7	44.2
	180	Y	G	37.7	55	57.6	54.6
	180	Z	G	4.7	68	4.9	53.2
	180	Res	G	38.4	55	57.8	54.5
Lower Spine	180	X	G	8.1	45	-5.9	85.5
	180	Y	G	39.7	53	58.3	52.3
	180	Z	G	4.3	68	-5.2	92.4
	180	Res	G	40.2	51	58.3	52.3
Upper Rib	180	Y	G	97.9	49	180.9	48.2
Mid Rib	180	Y	G	122.5	15	148.8	46.2
Lower Rib	180	Y	G	136.5	14	106.2	48.4
Upper Rib Deflection	180	Y	mm	37.8	58	-49.9	59.4
Mid Rib Deflection	180	Y	mm	29.4	57	-43	55.6
Lower Rib Deflection	180	Y	mm	29.1	56	-33.2	55.3
Upper Rib VC	180	Y	m/sec	0.50	51	1.3	51.0
Mid Rib VC	180	Y	m/sec	0.31	53	0.9	50.7
Lower Rib VC	180	Y	m/sec	0.29	52	0.5	51.4
Torso Force	600	X	N	534	49	286	57.9
	600	Y	N	-225	63	-423	50.8
Torso Moment	600	Y	Nm	13.4	47	-7	61.8
	600	Z	Nm	22.4	50	16.9	57.6
T12 Force	600	X	N	619	58	893	61.3
	600	Y	N	1172	50	1975	48.6
T12 Moment	600	X	Nm			-124.3	48.5
	600	Y	Nm	84.0	58	126	67.8

* No valid data collected

DRIVER (ES-2) PEAK RESPONSE TABLE (CONTINUED)

Location	Peak Values						
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2	
	Class	Axis	Units	Peak	Time (ms)	Peak	Time (ms)
Abdomen Front Force	600	Y	N	103	71	219	48.8
Abdomen Mid Force	600	Y	N	255	50	466	47.5
Abdomen Rear Force	600	Y	N	556	49	702	48.4
Abdomen Summed Force	600	Y	N	849	50	1382	48.6
Pubic Symphysis Force	600	Y	N	1733	55	-2673	46.6
Right Femur Force	600	X	N	352	59	330	59.2
	600	Y	N	-1207	63	1080	55.5
	600	Z	N	680	79	1061	70.4
	600	RES	N	1237	63	1435	55.6
Right Femur Moment	600	X	Nm	-105.0	44	-123.8	51.1
	600	Y	Nm	-28.3	69	-33.8	90.1
	600	Z	Nm	-30.0	56	-33.4	62.0
	600	RES	Nm	106.9	44	125.4	51.1
Left Femur Force	600	X	N	472	73	459	67.9
	600	Y	N	-795	58	701	52.3
	600	Z	N	1046	60	1207	51.3
	600	RES	N	1298	60	1393	52.3
Left Femur Moment	600	X	Nm	-82.2	40	75.9	54.1
	600	Y	Nm	-25.6	49	-40.4	124.1
	600	Z	Nm	-30.1	62	25.6	113.6
	600	RES	Nm	82.6	40	78.1	54.0
Pelvis	1000	X	G	18.9	59	-11.3	39.7
	1000	Y	G	50.2	42	79.2	42.4
	1000	Z	G	-6.6	18	-9.2	95.7