REPORT NUMBER: TO1-MGA-2004-029

OBLIQUE RIGID SIDE POLE IMPACT
ES-2RE DRIVER POSITION
TEST DATE: September 1, 2005
Task Order #T0001 / RFP #0004

2005 DODGE RAM 2500
NHTSA NUMBER: R50327

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This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, in response to Contract Number DTRS57-04-D-30001.

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-04-D-30001, RFP 4, task order 1, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test is to evaluate the performance of the vehicle and restraint system when subjected to an oblique rigid pole side impact (75 degrees at 32 km/h impact speed). The ES-2RE dummy was positioned in the driver seat. (ES-2RE is an ES-2 with rib extensions including a modified back plate with linear bearings)

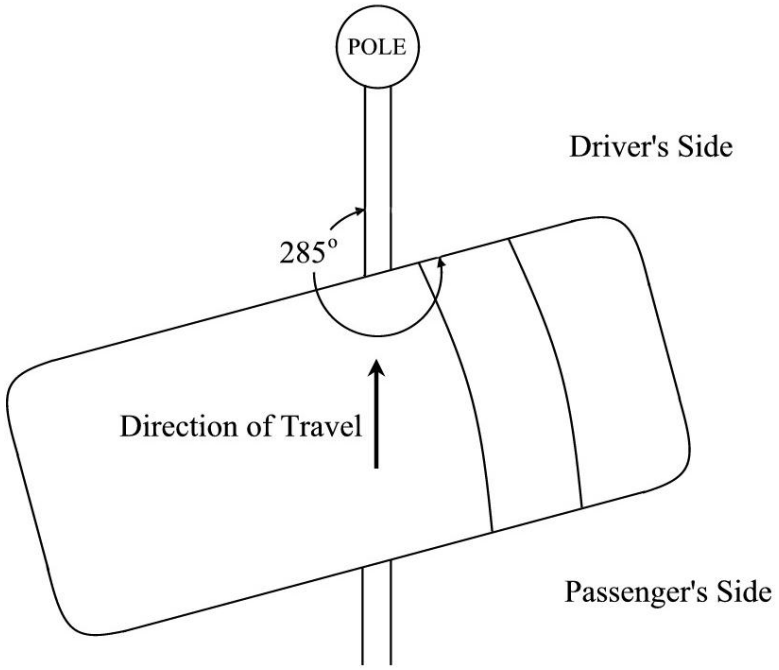
MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

An oblique rigid side pole impact test at 75 degrees was performed on a 2005 Dodge Ram 2500. The subject vehicle was towed into an oblique rigid pole at a velocity of 32.2 km/h. The weight of the vehicle as tested was 3159.5 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on September 1, 2005. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One ES-2RE side impact dummy was placed in the left front designated seating position according to Appendix B of the draft test procedure TP-214P-00 dated May 21, 2004. The side impact event was documented by eleven high speed cameras and one real time camera. Camera locations and other pertinent camera information can be found in this report.

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



SECTION 2…continued

SUMMARY OF SIDE IMPACT TEST

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

		Left Front
HIC 15 (CFC 1000)	T1 (msec)	54.4
	T2 (msec	55.3
	HIC 15	5748
HIC 36 (CFC 1000)	T1 (msec)	54.4
	T2 (msec)	55.3
	HIC 36	5748
Thorax (CFC 180)		
Chest Deflection	Upper Rib Deflection	-39.9
	Mid Rib Deflection	-35.7
	Lower Rib Deflection	-47.0
Lower Spine (CFC 180)		
	Lower Spine Resultant	86.4
Abdomen (CFC 600)		
	Front Abdominal Force	220
	Mid Abdominal Force	717
	Rear Abdominal Force	953
	Sum of Abdominal Force	1846
Pelvis (CFC 600)		
	Pubic Symphysis Force	*

*No valid data collected

Contact Times	Left Front
Head (msec)	**
Arm (msec)	22
Rib (msec)	36
Pelvis (msec)	32

** Not collected during test (due to side airbags)

TEST NOTES

The driver side airbag curtain did not deploy.

Driver Torso FY – No valid data collected after 188 msec
Driver Public Symphysis – No valid data collected
Left Rear Sill Y – No valid data colleted after 164 msec
Left Front Sill Y – No valid collected after 76 msec
LF Door @ Arm Y – No valid data collected after 36 msec
Left A-Post @ Sill Y – No valid data collected after 80 msec
Left B-Post @ Sill Y – No valid dat collected after120 msec
LF Door @ Mid Rib Y – No valid data collected

SECTION 3

ES-2RE SIDE IMPACT DUMMY AND VEHICLE TEST DATA

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

TEST VEHICLE INFORMATION

Make	Dodge
Model	Ram 2500
Body Style	Truck
VIN	3D3KS26C55G813294
Odometer Reading (mile)	56
Transmission	Automatic
Final Drive	4WD
Number of Cylinders	6
Engine Displacement (L)	5.9
Engine Placement	Longitudinal

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain
Power Windows	Yes
Power Steering	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	DaimlerChrysler Corporation
Date of Manufacture	02/05

GVWR (kg)	4083
GAWR Front (kg)	2359
GAWR Rear (kg)	2722

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Cold Pressure (kPa)	70	80
Recommended Tire Size	LT245/70R17E	LT245/70R17E
Tire Size on Vehicle	LT245/70R17E	LT245/70R17E
Tire Manufacturer	Michelin	Michelin

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	946.5	572.5		971.0	654.5	
Right	kg	858.5	571.5		907.5	626.5	
Ratio	%	61.2	38.8		59.5	40.5	
Totals	kg	1805.0	1144.0	2949.0	1878.5	1281.0	3159.5

TARGET TEST WEIGHT

Measured Parameter	Units	Value
As Delivered Vehicle Weight	kg	2949.0
Weight of 1 ES-2RE	kg	80.7
Rated Cargo Weight	kg	136.1
Vehicle Target Weight (TVTW)	kg	3165.8

TEST VEHICLE ATTITUDES

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

ND=Nose down, NU = Nose Up, LD = Left Down, RD = Right Down, LU = Left Up

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	3562
Total Vehicle Length at Centerline	mm	5834
Total Vehicle Width	mm	2029
Weight of Ballast in Cargo Area	kg	20.4
Amount of Water in Fuel Tank	liters	132.5

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Impact Reference Line from Front Axle	mm	1410
Impact Point	mm	12mm forward
Impact Angle Difference	deg	1

DATA SHEET NO. 1… (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 22.4°, on left seatback frame

SEAT FORE/AFT POSITIONS

The driver's seat was manually operated.

Driver seat fore/aft total travel: 24 positions

Driver seat fore/aft position: 12th position

SEAT BELT UPPER ANCHORAGE

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

STEERING COLUMN ADJUSTMENT

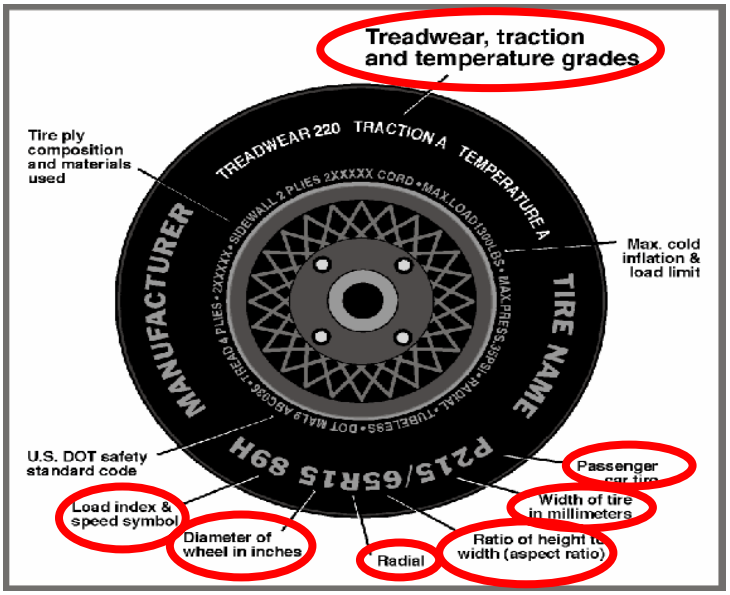
The column was placed in the mid position of travel.

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

Vehicle Year	2005	Vehicle Make	Dodge
VIN	3D3KS26C55G813294	Vehicle Model	Ram 2500



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	LTX A/S	LTX A/S
Tire Type	LT	LT
Tire Width (mm)	245	245
Ratio of Height to Width (aspect ratio)	70	70
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	119/116R	119/116R
Treadwear	N/A	N/A
Traction Grade	N/A	N/A
Temperature Grade	N/A	N/A

DATA SHEET NO. 3

POST TEST OBSERVATIONS

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES-2RE
Head Contact	Side Header, Headrest, Pole
Upper Torso Contact	Door Panel, Pole
Lower Torso Contact	Door Panel
Left Knee Contact	Door panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING

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

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No failure
Sill Separation	None
Windshield Damage	Windshield Broke
Window Damage	Left side up for test, Left front broke
Other Notable Effects	None

AIRBAG DEPLOYMENT

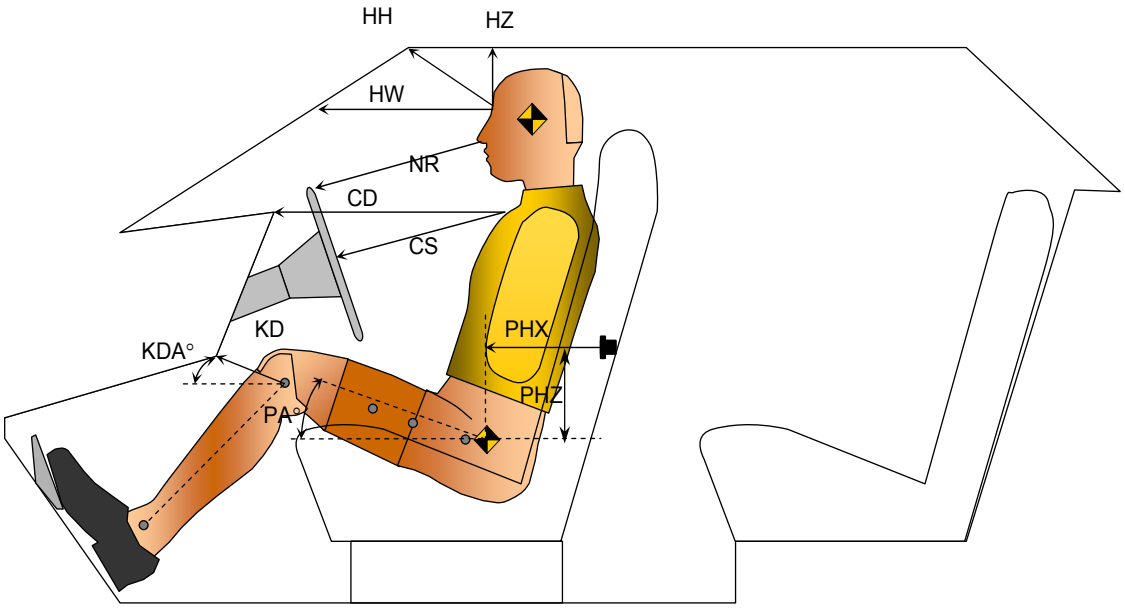
	Driver
Front	No
Side	NA
Curtain	No

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

ES-2RE LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

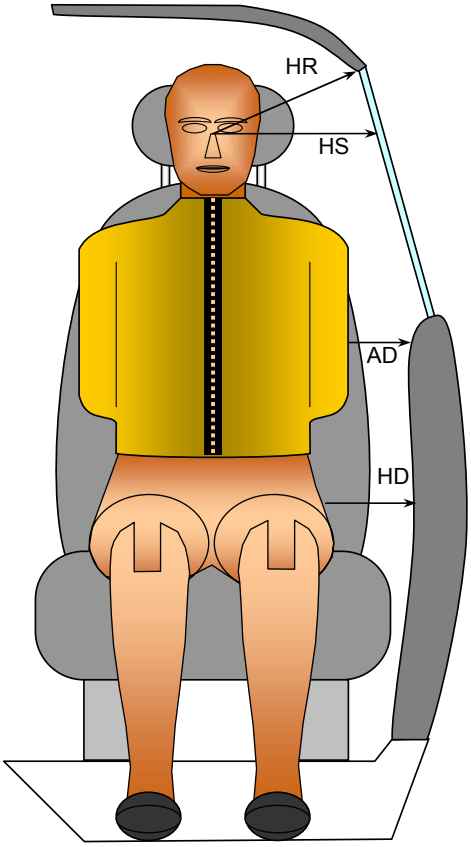


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	412	
HW	Head to Windshield	615	
HZ	Head to Roof	186	
NR	Nose to Rim	446	
CD	Chest to Dash (Top of Rib)	563	
CS	Chest to Steering Wheel (Top of Rib)	302	
KDL	Left Knee to Dash	182	33.3
KDR	Right Knee to Dash	183	34.1
PA	Pelvic Angle (Longitudinal)		20.2
PA	Pelvic Angle (Lateral)		0.2
SA	Spine Angle (Longitudinal)		24.1
SA	Spine Angle (Lateral)		0.3
PHX	H-Point to Striker (X-Axis)	374	
PHZ	H-Point to Striker (Z-Axis)	2	

DATA SHEET NO. 5

ES-2RE LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005



FRONT VIEW OF DUMMY

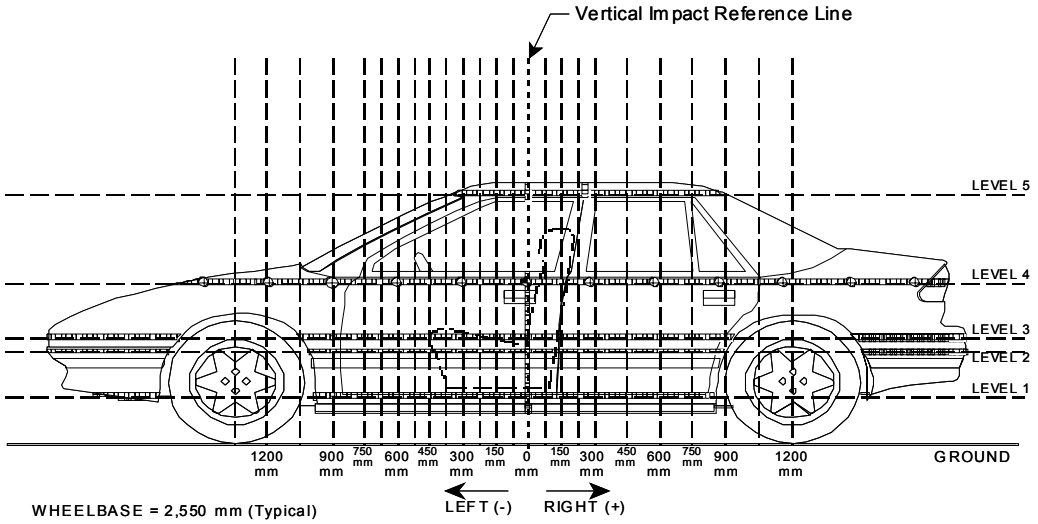
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	169
HS	Head to Side Window	mm	300
AD	Arm to Door	mm	104
HD	H-Point to Door	mm	165

DATA SHEET NO. 6

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

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	1928
4	Window Sill	1336
3	Mid Door	1021
2	Occupant H-Point	907
1	Sill Top	504

DATA SHEET NO. 7

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

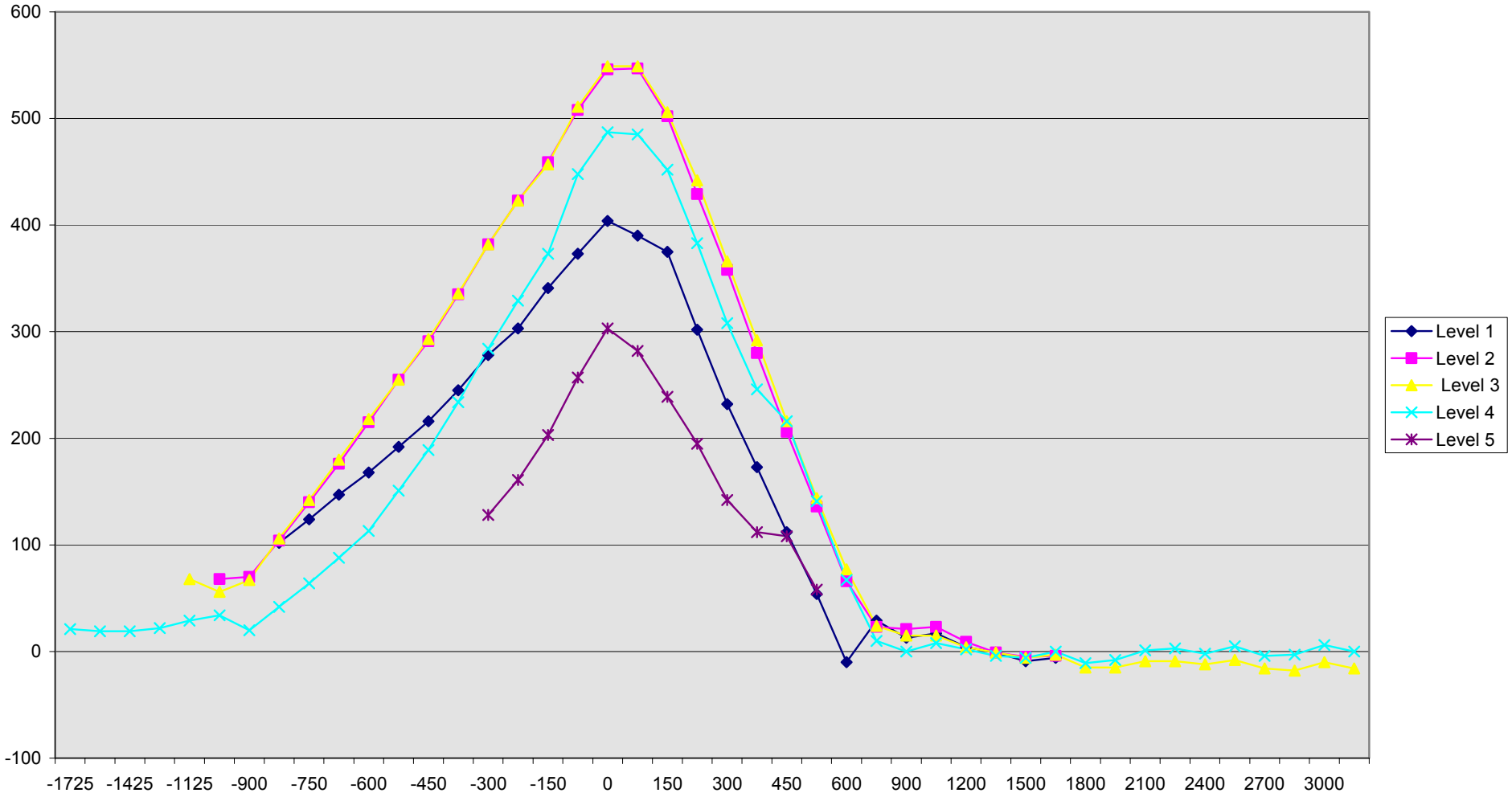
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2175				445					458					13	
-2025				389					400					11	
-1875				341					356					15	
-1725				297					318					21	
-1575				262					281					19	
-1425				233					252					19	
-1275				209					231					22	
-1125			84	188				152	217				68	29	
-975		88	82	171			156	138	205			68	56	34	
-900		88	82	166			158	149	186			70	67	20	
-825	230	88	81	162		332	192	187	204		102	104	106	42	
-750	230	89	82	159		354	229	224	223		124	140	142	64	
-675	230	90	84	155		377	266	264	243		147	176	180	88	
-600	232	91	85	155		400	306	303	268		168	215	218	113	
-525	232	91	86	153		424	346	341	304		192	255	255	151	
-450	232	93	86	152		448	384	379	341		216	291	293	189	
-375	232	93	88	152		477	428	424	386		245	335	336	234	
-300	235	94	89	151	389	513	476	471	435	517	278	382	382	284	128
-225	237	94	89	150	382	540	517	512	479	543	303	423	423	329	161
-150	237	94	90	150	380	578	553	547	523	583	341	459	457	373	203
-75	239	94	89	150	379	612	602	600	598	636	373	508	511	448	257
0	238	94	89	150	379	642	640	638	637	682	404	546	549	487	303
75	240	93	90	153	377	630	640	639	638	659	390	547	549	485	282
150	240	94	90	153	378	615	596	596	605	617	375	502	506	452	239
225	240	95	90	155	379	542	524	532	538	574	302	429	442	383	195
300	239	95	91	157	377	471	453	457	465	519	232	358	366	308	142
375	233	96	91	155	376	406	376	383	401	488	173	280	292	246	112
450	230	96	92	155	375	342	302	308	371	483	112	206	216	216	108
525	225	98	94	157	375	279	234	238	298	433	54	136	144	141	58
600	225	100	95	159		215	166	172	226		-10	66	77	67	
750	223	108	105	170		252	131	129	180		29	23	24	10	
900	222	107	104	171		235	128	119	171		13	21	15	0	
1050	220	107	104	170		237	130	119	178		17	23	15	8	
1200	217	105	101	170		221	114	105	172		4	9	4	2	
1350	213	104	99	174		212	103	98	170		-1	-1	-1	-4	
1500	212	100	96	176		203	95	90	170		-9	-5	-6	-6	
1650	210	98	94	178		204	94	91	178		-6	-4	-3	0	
1800			91	182				76	171				-15	-11	
1950			88	185				73	177				-15	-8	
2100			87	188				78	189				-9	1	
2250			87	191				78	194				-9	3	
2400			89	197				77	195				-12	-2	
2550			92	201				84	206				-8	5	
2700			95	208				79	204				-16	-4	
2850			101	212				83	209				-18	-3	
3000			108	218				98	224				-10	6	
3150			120	227				104	227				-16	0	

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

DATA SHEET NO. 7... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

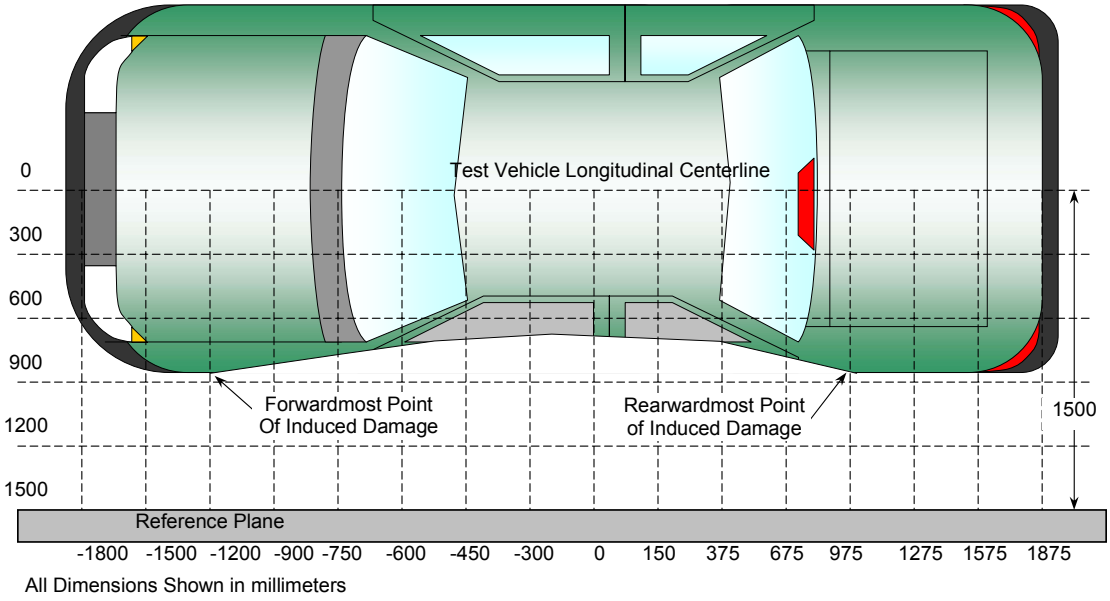


Measurement in mm.

DATA SHEET NO. 8

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	3150 mm	4	227	227	0
2	2128 mm	4	189	191	2
3	1114 mm	2	106	123	17
4	-128 mm	3	89	565	476
5	-1273 mm	4	209	231	22
6	-2175 mm	4	445	458	13

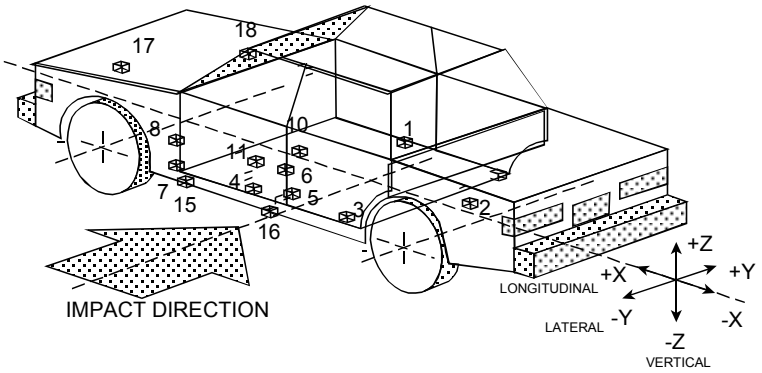
Reference plane is parallel to test vehicle longitudinal centerline.

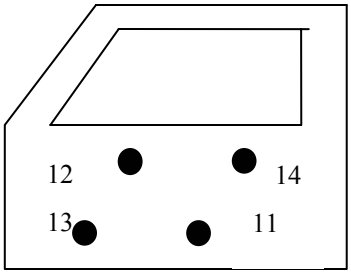
Given dimensions = Reference plane to car body.

DATA SHEET NO. 9

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005





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

No.	Location
12	Left Front Door @ Arm
13	Left Front Door @ Knee
14	Left Front Door @ Mid Rib
15	Left A-Post @ Sill
16	Left B-Post @ Sill
17	Upper Engine
18	Firewall

DATA SHEET NO. 9... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

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	4.5	-5.1	32.2	-6.2	22.1	-4.1	32.4
2	Rear Floorpan Above Axle	5.8	-4.7	9.1	-1.7	13.1	-12.6	15.7
3	Left Side Sill at Rear Door			*	*			
4	Left Side Sill at Front Door			**	**			
5	Left Lower B-Post			41.9	-10.0			
6	Left Mid B-Post			49.1	-8.2			
7	Left Lower A-Post			21.5	-8.8			
8	Left Mid A-Post			14.5	-5.0			
9	Driver Left Seat Track			56.2	-12.3			
10	Vehicle CG	9.2	-17.0	20.8	-4.6	35.2	-40.3	43.5
11	Left Front Door at Pelvis			226.9	-115.5			
12	Left Front Door at Arm			***	***			
13	Left Front Door at Knee			94.6	-34.0			
14	Left Front Door at Rib			****	****			
15	Left A-Post @ Sill			*****	*****			
16	Left B-Post @ Sill			******	******			
17	Upper Engine	2.0	-10.8	11.2	-3.5			
18	Firewall			12.5	-1.8			

*No valid data collected after 164msec
**No valid data collected after 76msec
***No valid data collected after 36msec
****No valid data collected
*****No valid data collected after 80msec
******No valid data collected after 120msec

Sign Convention X - (+ forward)
Y - (+ to right)
Z - (+ down)

DATA SHEET NO. 9... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	3442	830	488
2	Rear Floorpan Above Axle	1176	0	915
3	Left Side Sill at Rear Door	2784	-834	502
4	Left Side Sill at Front Door	3739	-831	496
5	Left Lower B-Post	2937	-860	893
6	Left Mid B-Post	3016	-853	1368
7	Left Lower A-Post	4253	-972	709
8	Left Mid A-Post	4291	-885	1115
9	Driver Left Seat Track	1969	-671	799
10	Vehicle CG	3419	-113	778
11	Left Door @ Pelvis	3292	-920	1094
12	Left Door @ Arm	3331	-905	1338
13	Left Door @ Knee	3682	-921	1120
14	Left Door @ Rib	3165	-903	1323
15	Left A Pillar Sill	4260	-840	490
16	Left B Pillar Sill	3026	-832	502
17	Engine	4931	-20	1310
18	Firewall	4713	-13	1460

Sign Convention X – Rear Bumper (+ forward)

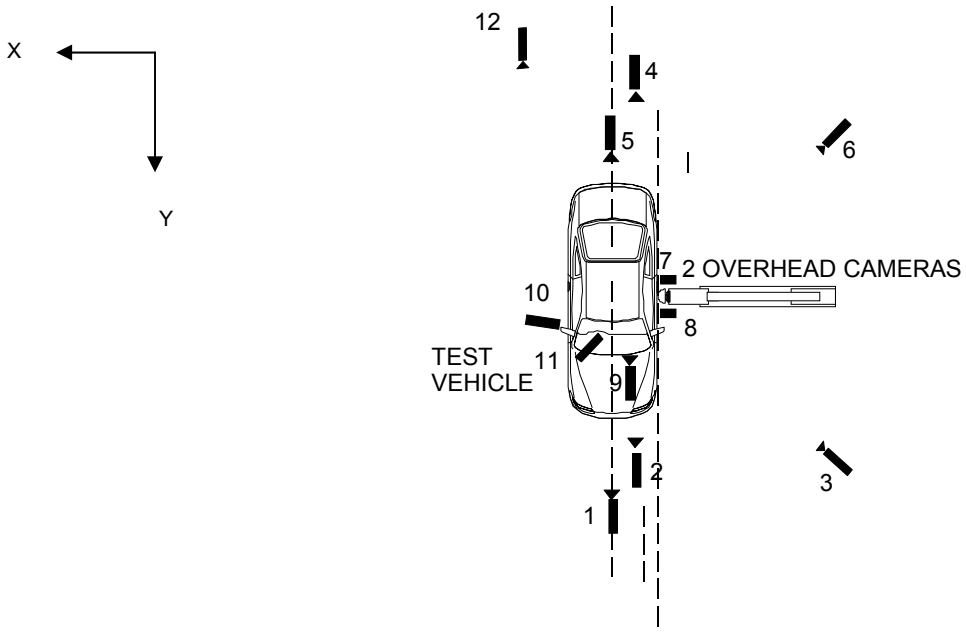
Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ up)

DATA SHEET NO. 10

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2005 Dodge Ram 2500 Test Date: September 1, 2005



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	880	6220	1470	24	1000
2	Front Close Up	1710	6505	1490	35	1000
3	Front Angle	-2200	2550	1585	24	1000
4	Rear Overall	2845	-6930	1510	24	1000
5	Rear Close Up	2270	-7975	1720	35	1000
6	Rear Angle	-2270	-2565	1520	24	1000
7	Overhead View	-595	1000	5725	14	1000
8	Overhead Close Up	0	0	5050	19	1000
9	Onboard Driver Front				13	500
10	Onboard Driver Side				8	500
11	Onboard Hip to Door				10	500
12	Real Time				13	24

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

APPENDIX A

PHOTOGRAPHS

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Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle

Post-Test Left Side View of Test Vehicle (Close-Up)

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 Pole and Vehicle Overhead View

Post-Test Vehicle Overhead View

Pre-Test Vehicle Overhead View (Close-Up)

Post-Test Vehicle Overhead View (Close-Up)

Pre-Test Driver Seat Position View

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

Pre-Test Driver Dummy Left Side View

Post-Test Driver Dummy Left Side View

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Pre-Test Driver Shoulder and Door Top View

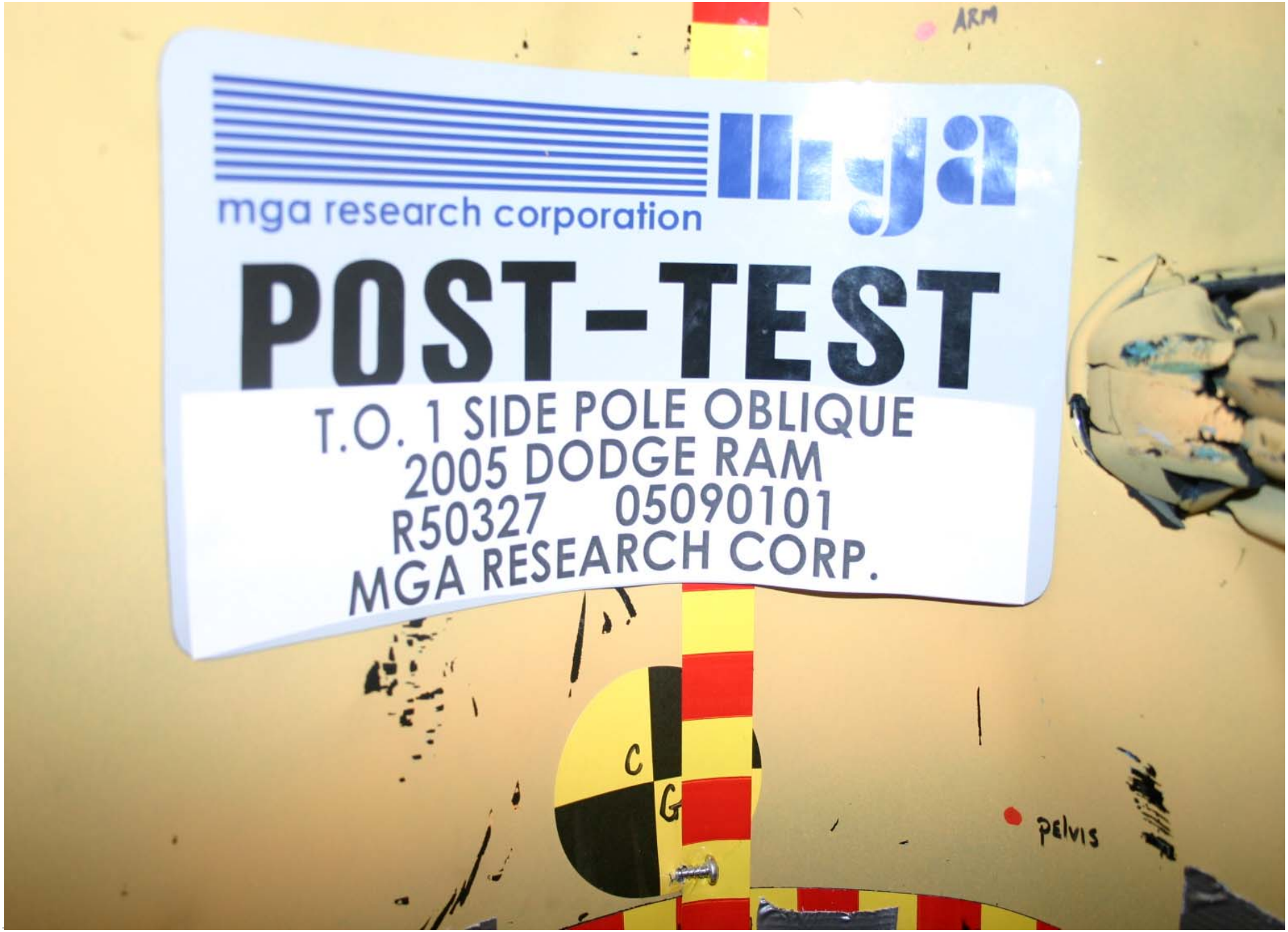
Post-Test Driver Shoulder and Door Top View

Post-Test Driver Dummy Contact

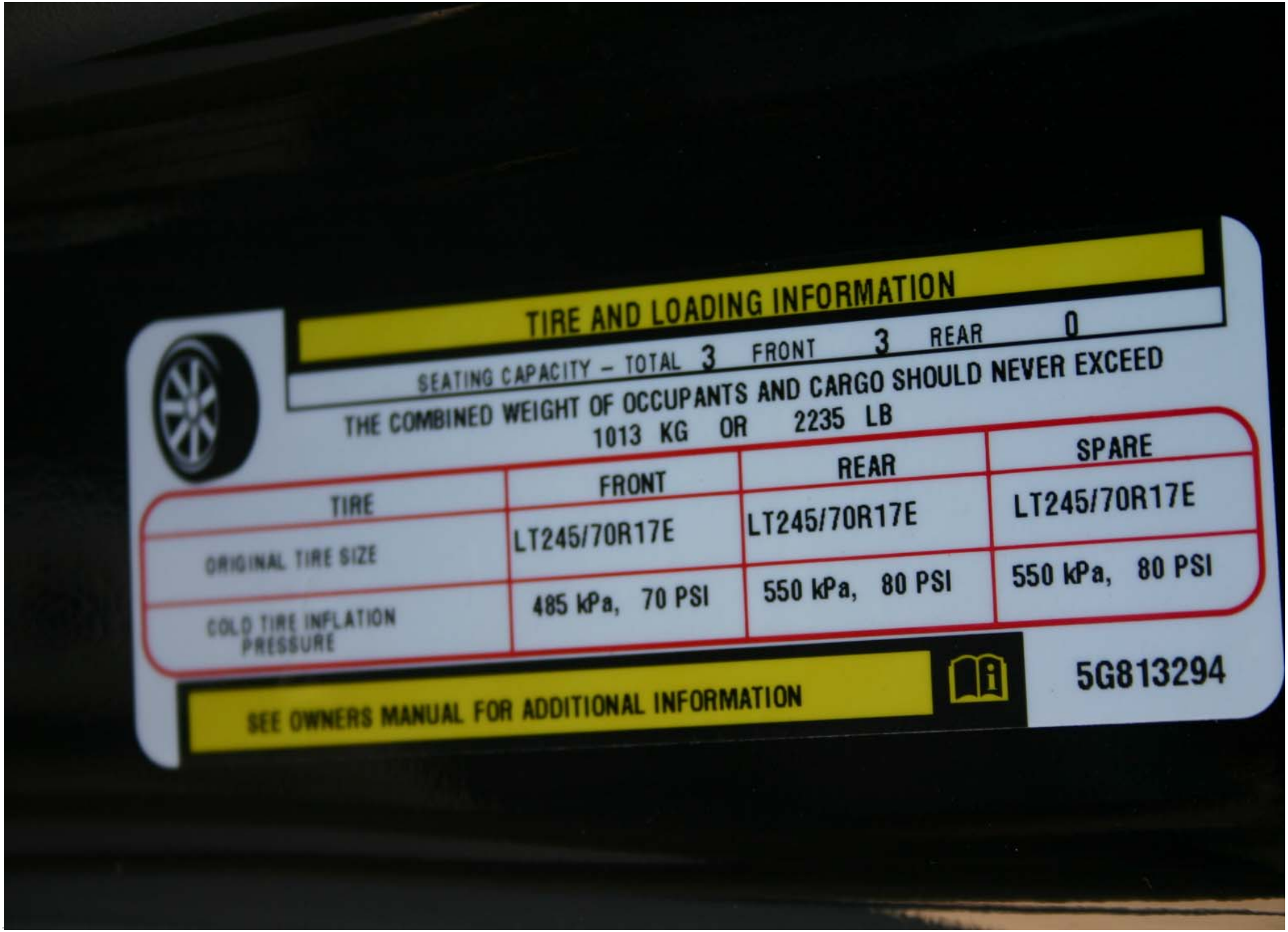
Post-Test Driver Dummy Lower Body Contact

Post-Test Driver Dummy Head Contact

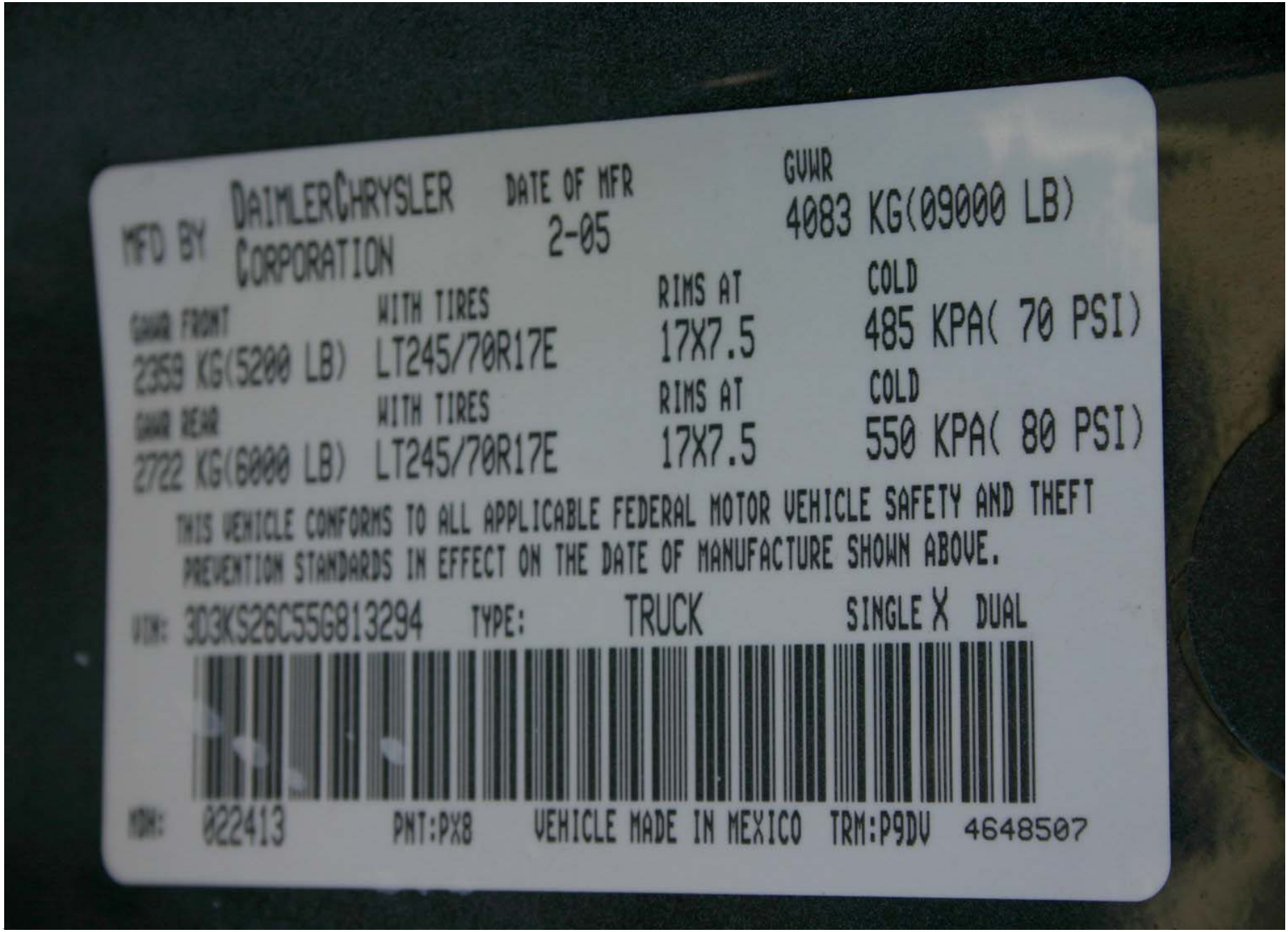
Post-Test Driver Dummy Head Contact With Pole



Post-Test Impact Point on Vehicle

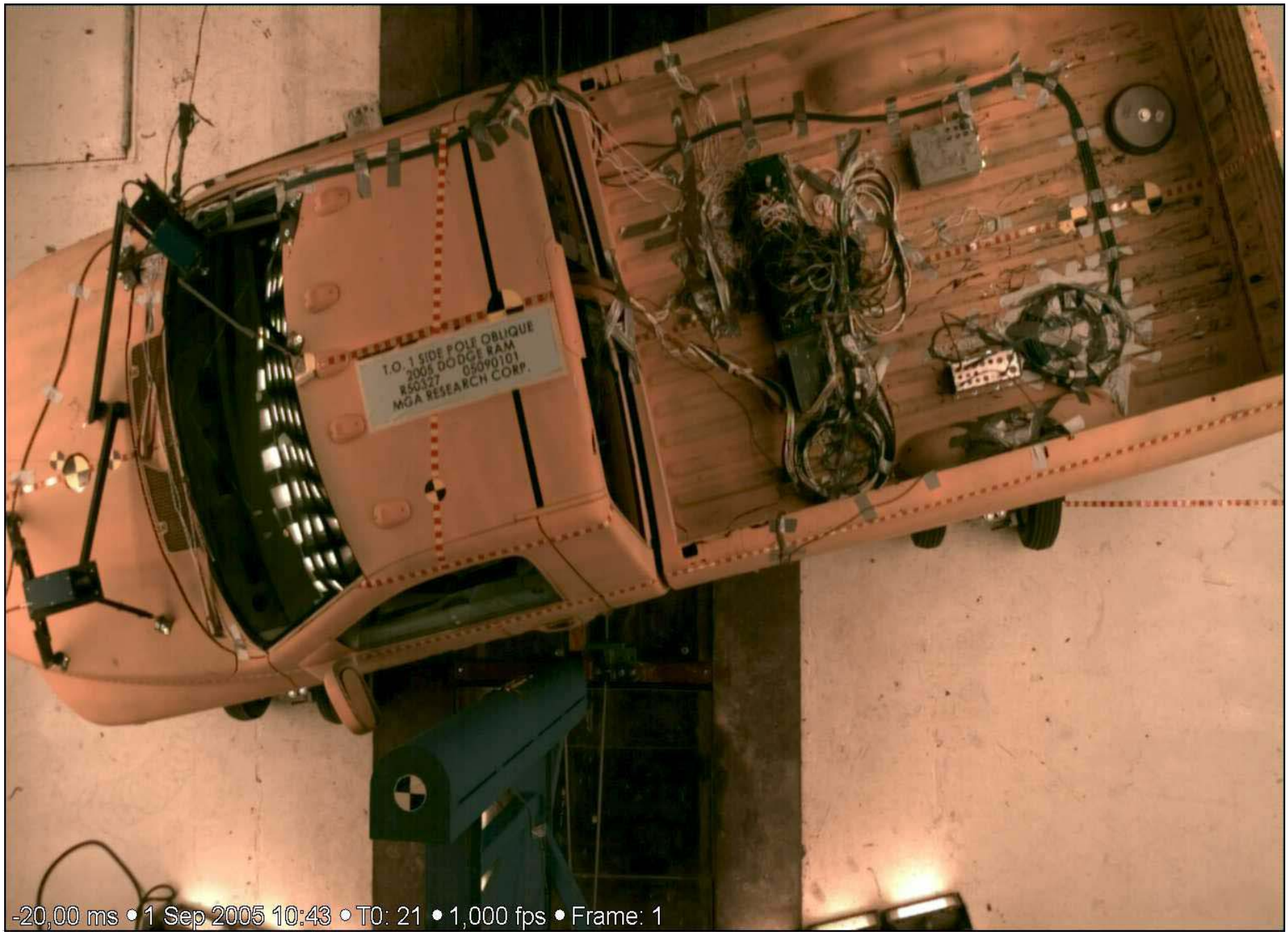


Tire Placard



Vehicle Certification

Pre-Test Point of Impact View



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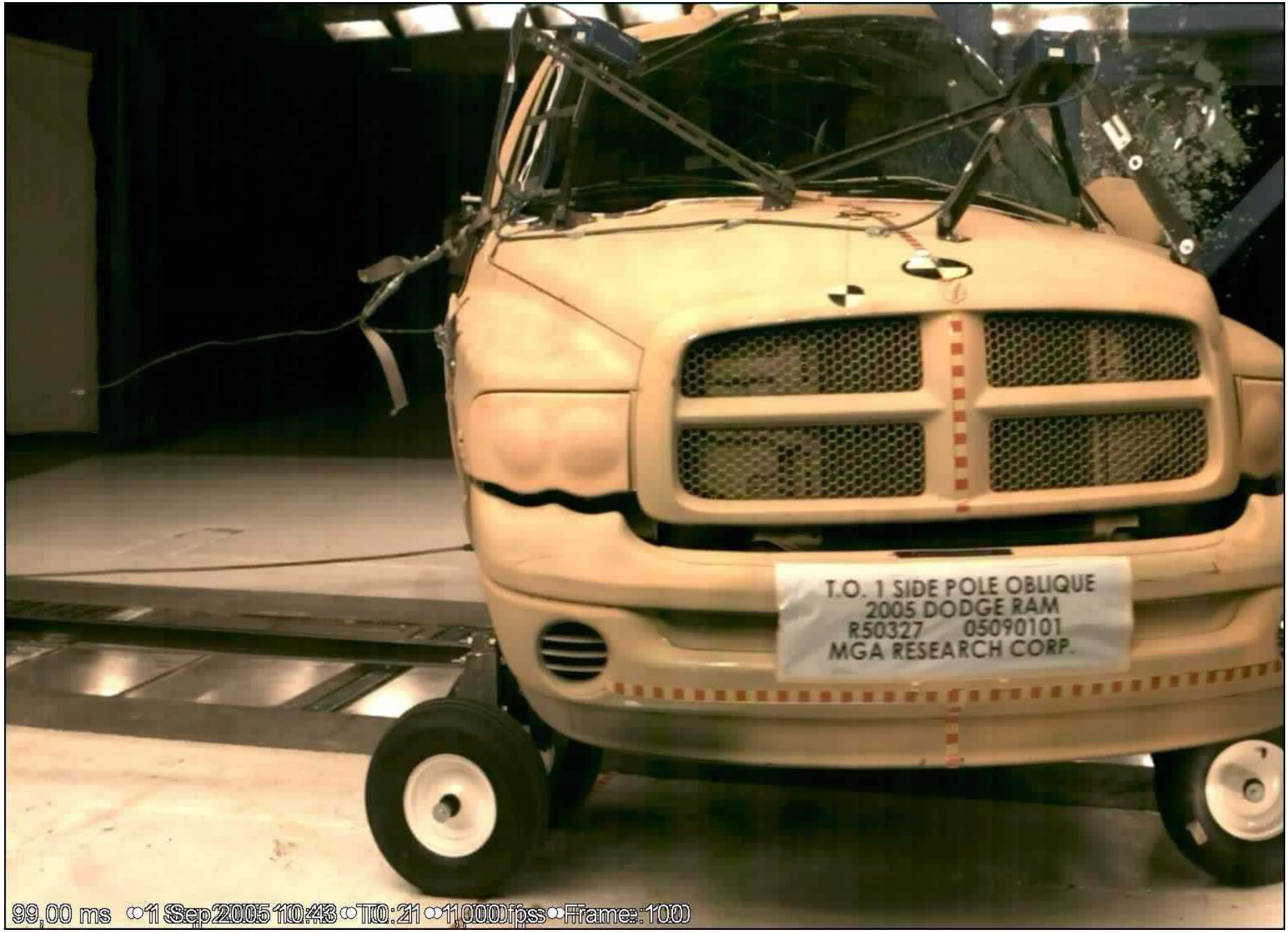

Vehicle Impact

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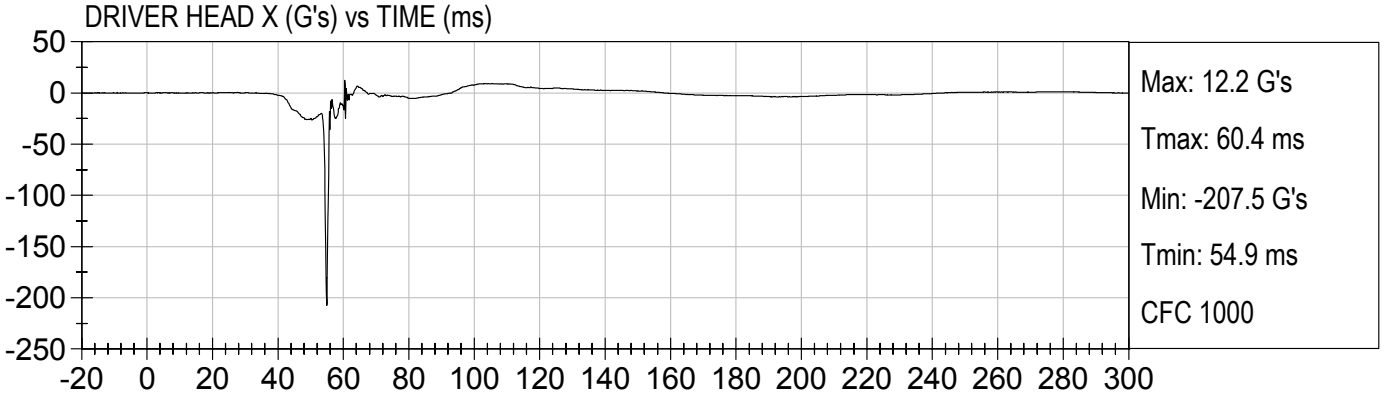
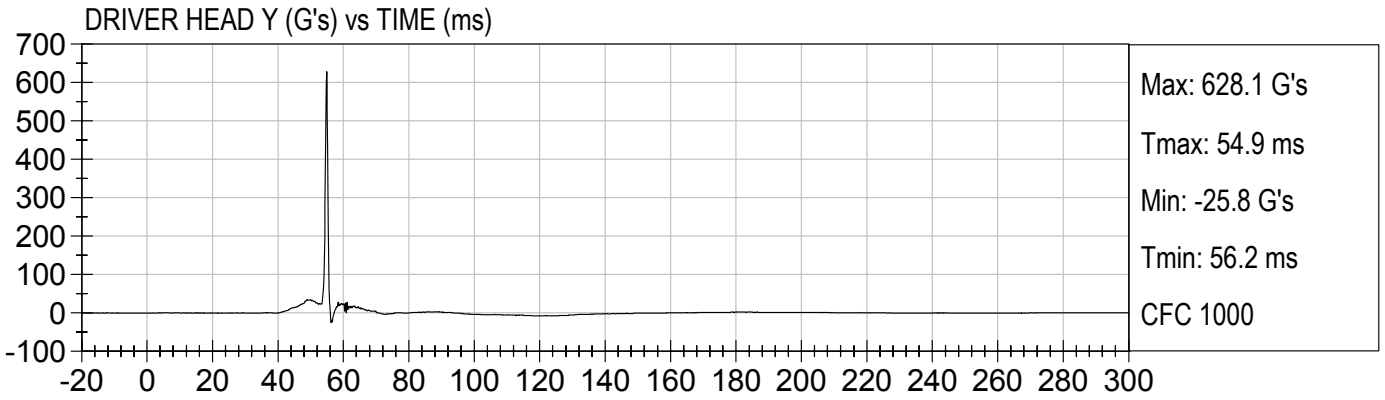
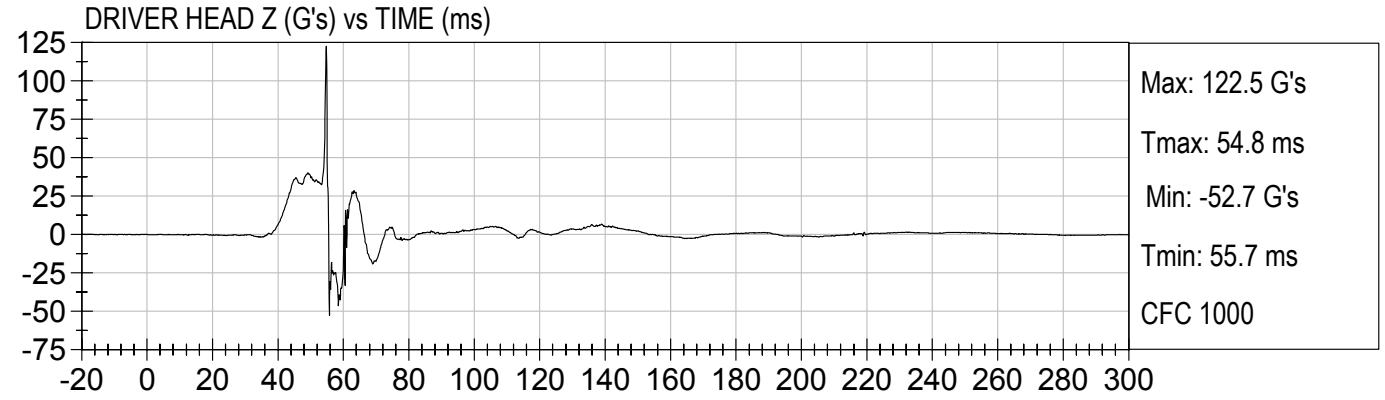
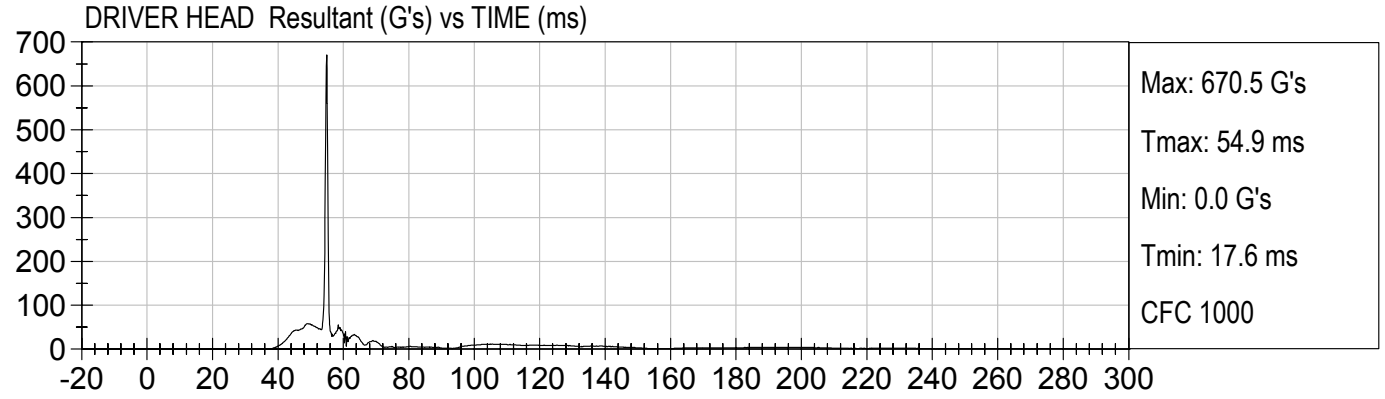
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)





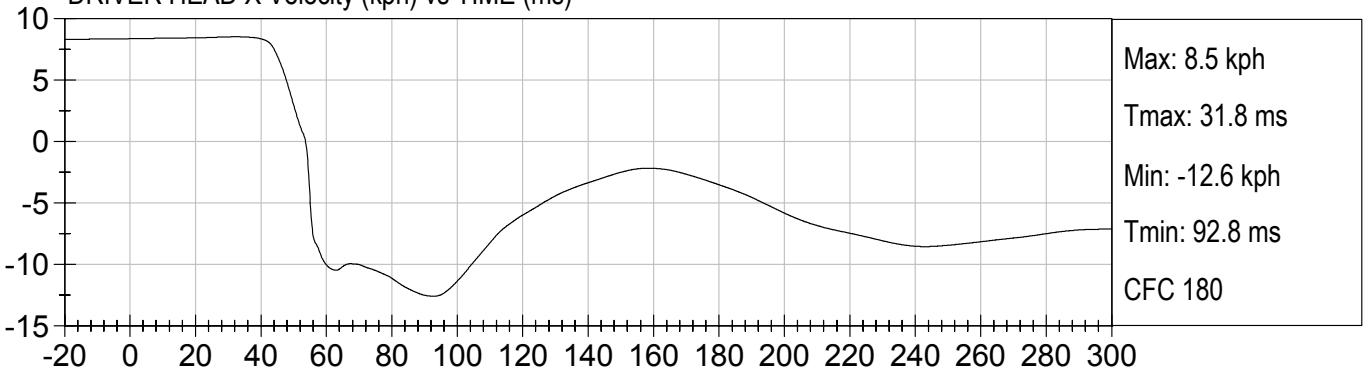




TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

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



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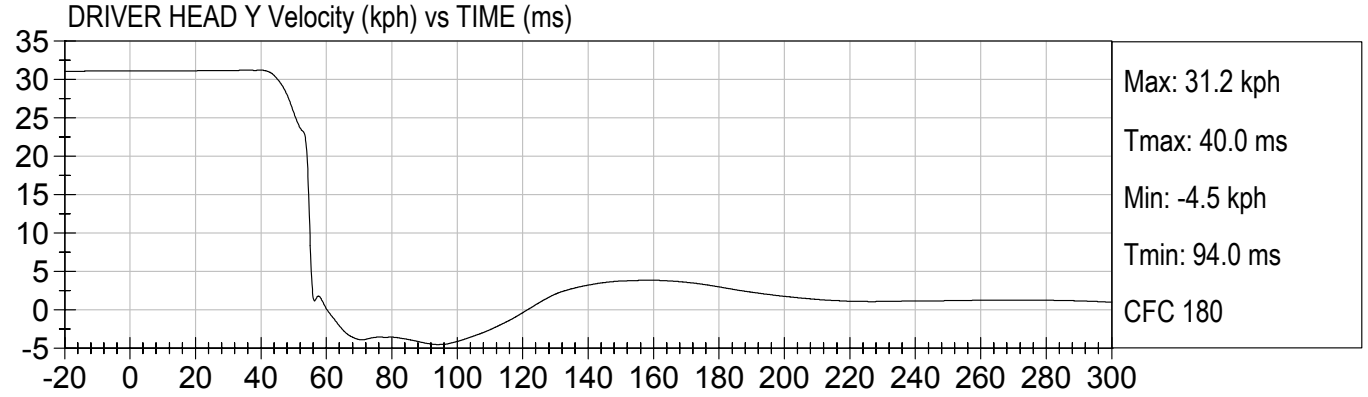

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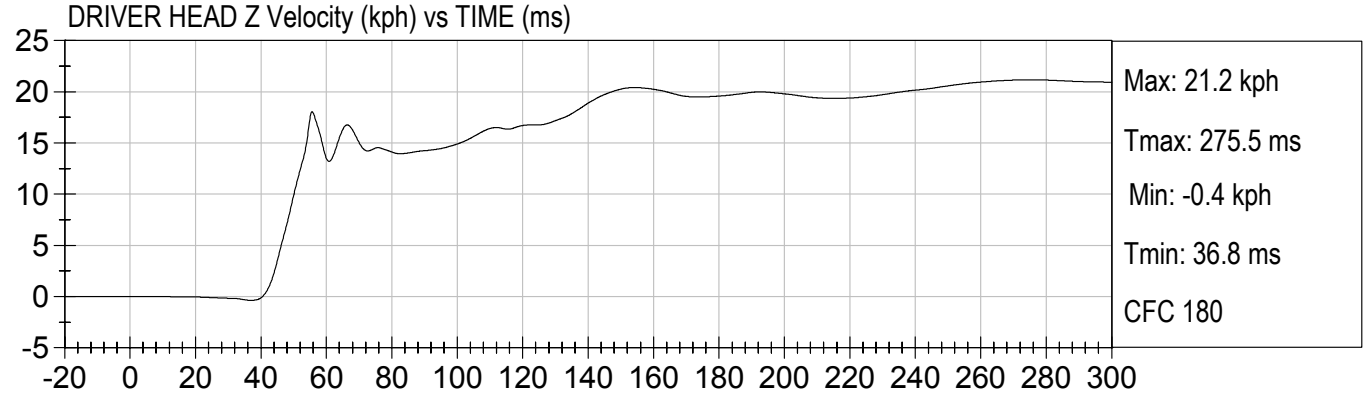
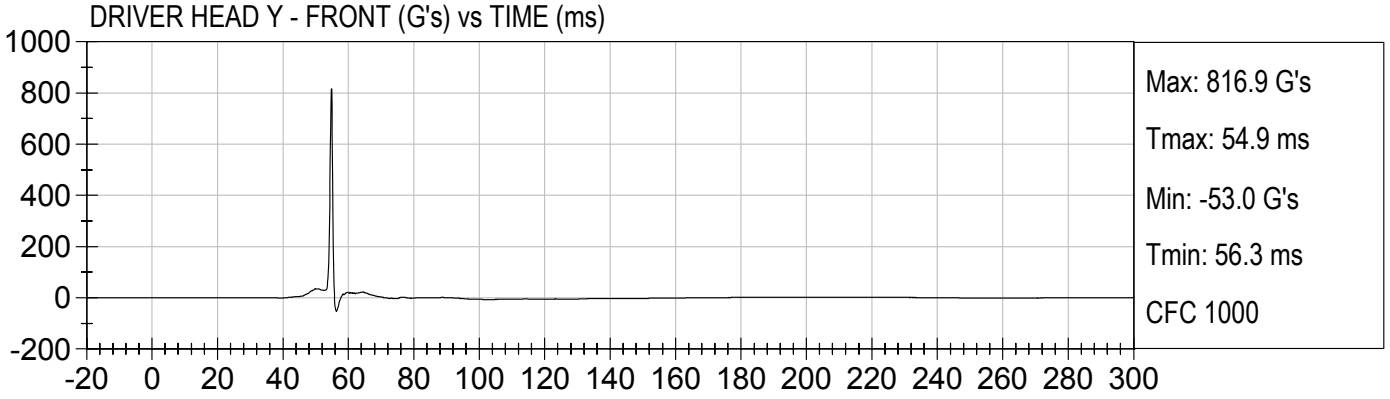
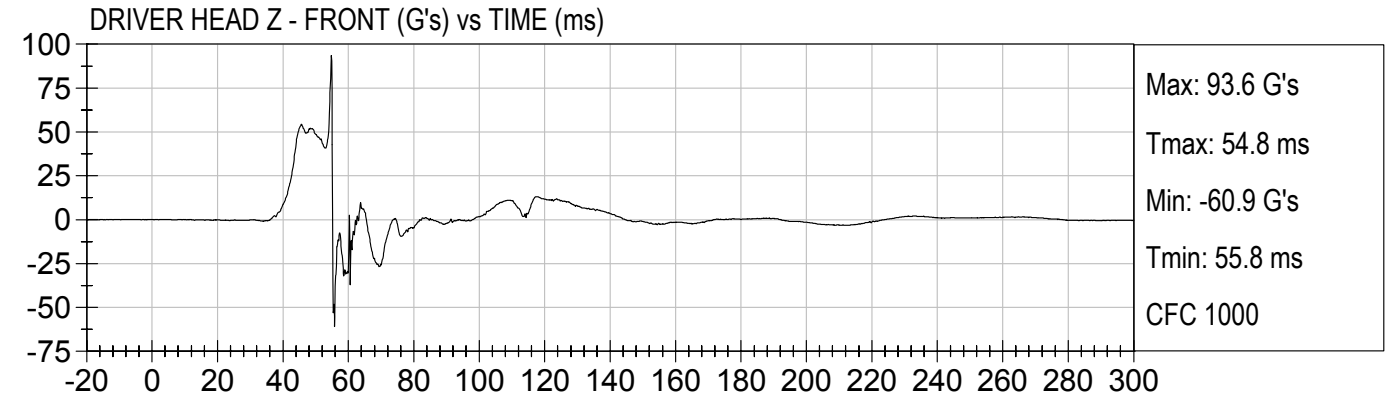
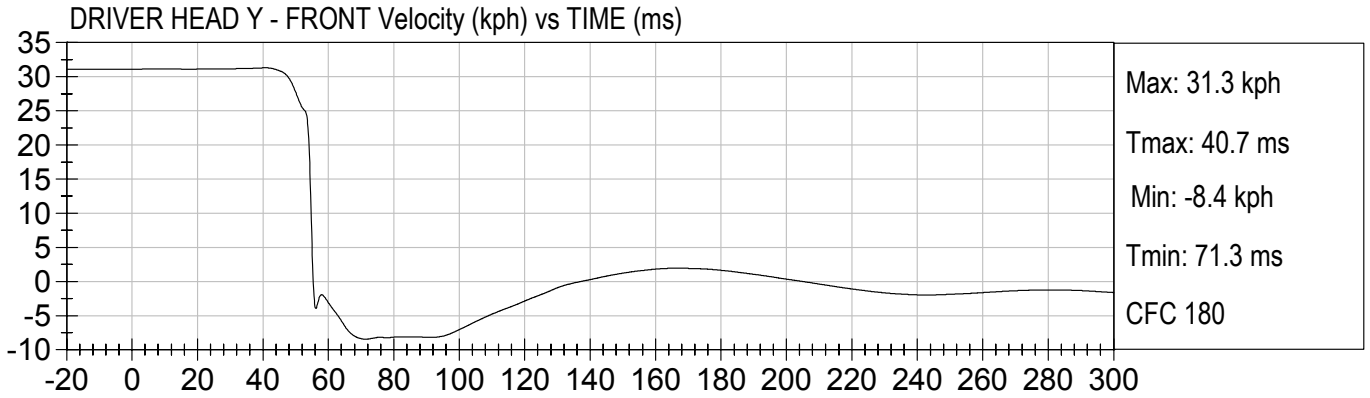


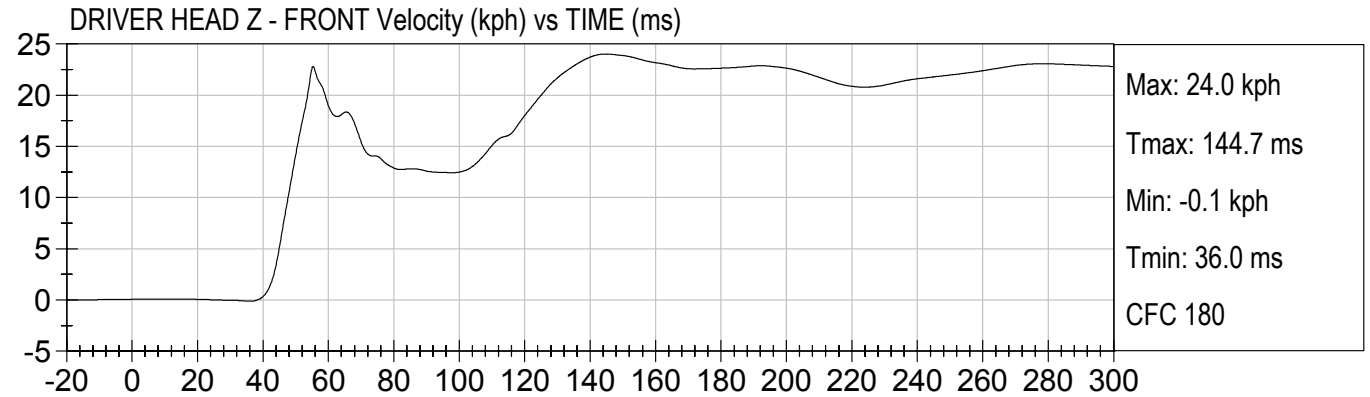
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)





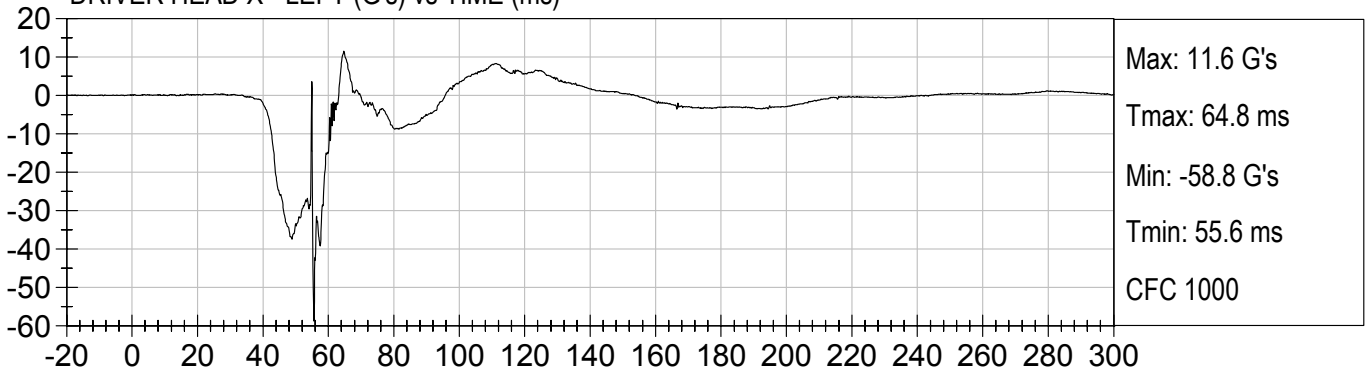




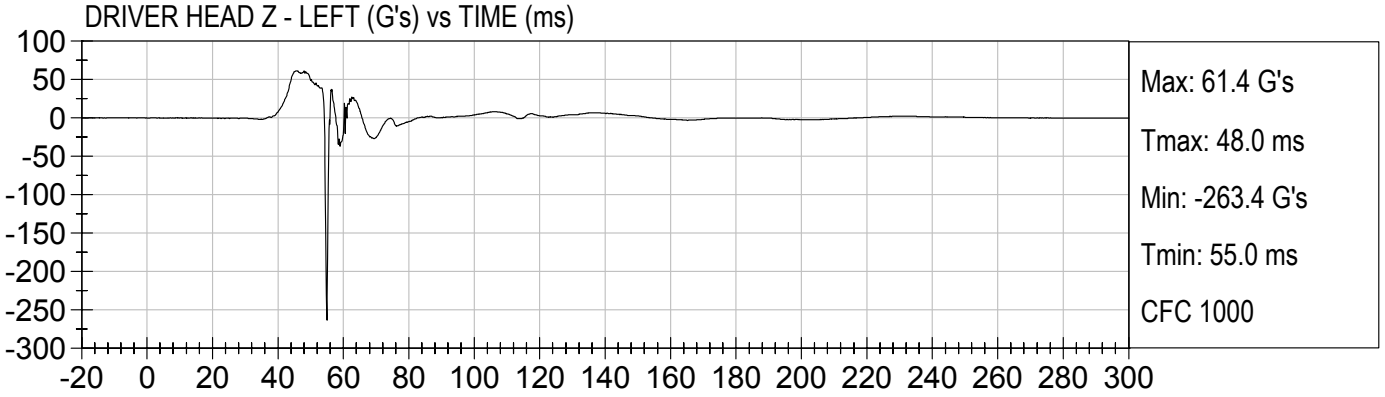
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

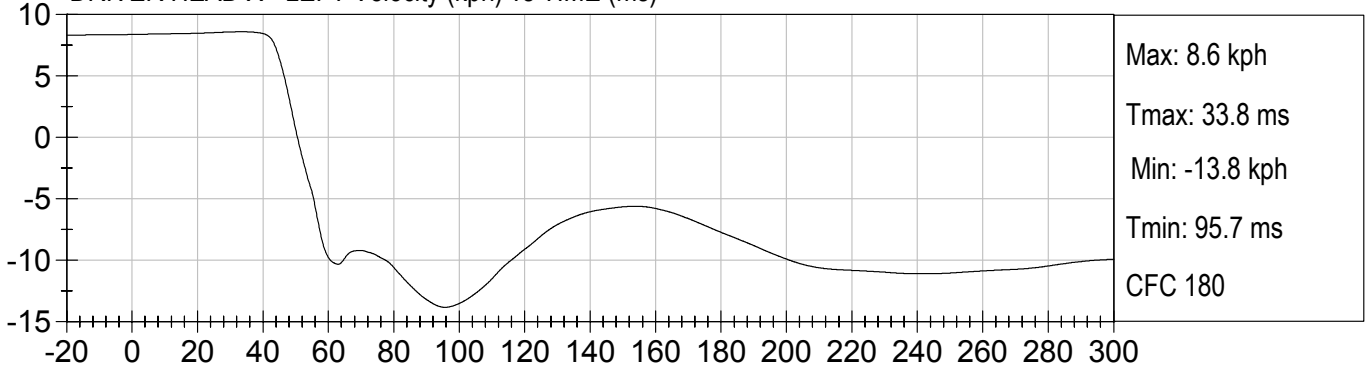
DRIVER HEAD X - LEFT (G's) vs TIME (ms)



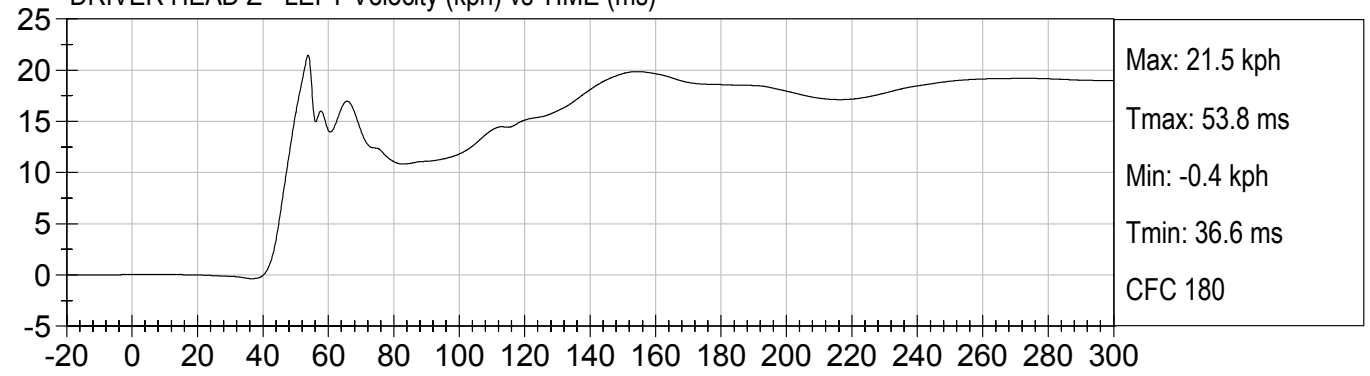
DRIVER HEAD Z - LEFT (G's) vs TIME (ms)



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

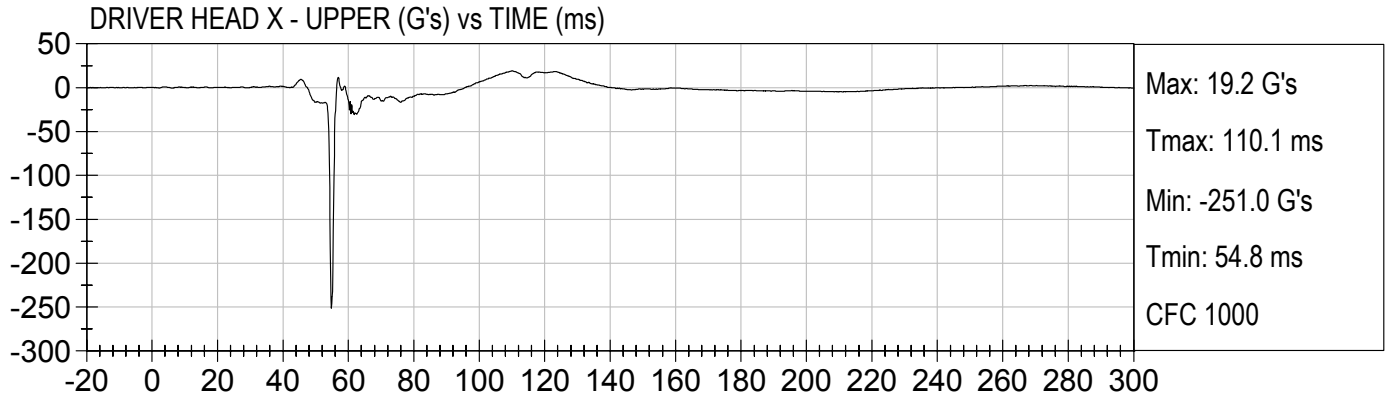


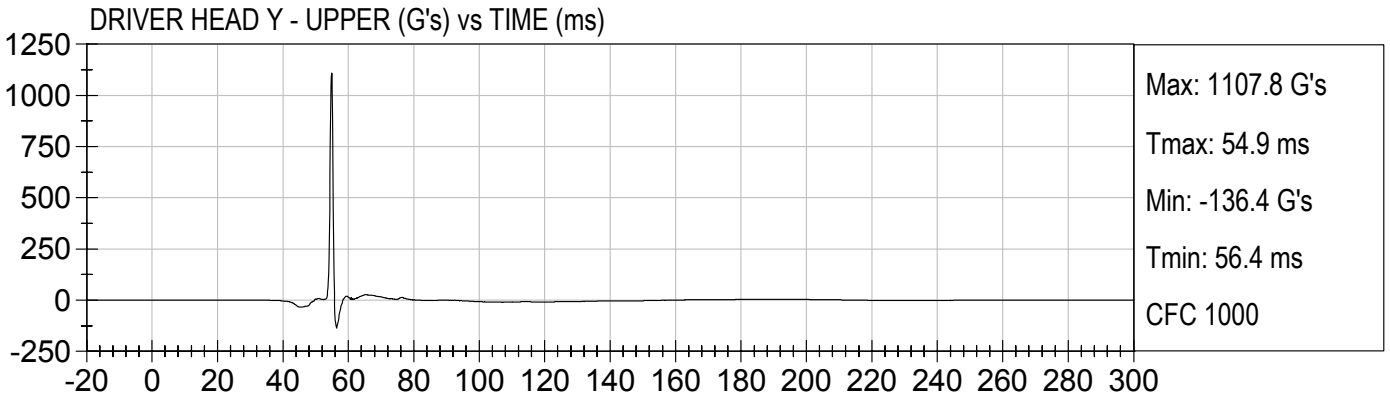
DRIVER HEAD Z - LEFT Velocity (kph) vs TIME (ms)

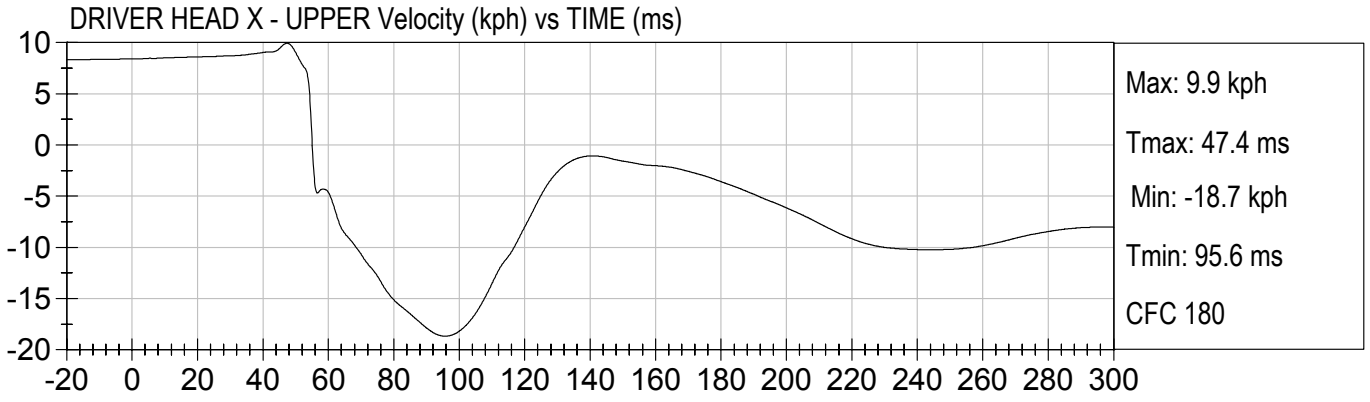


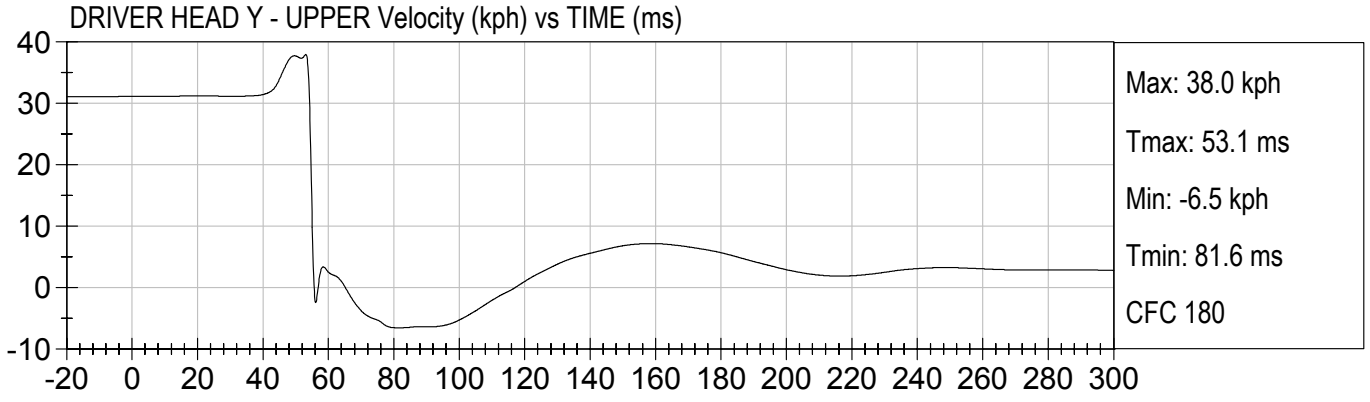
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)



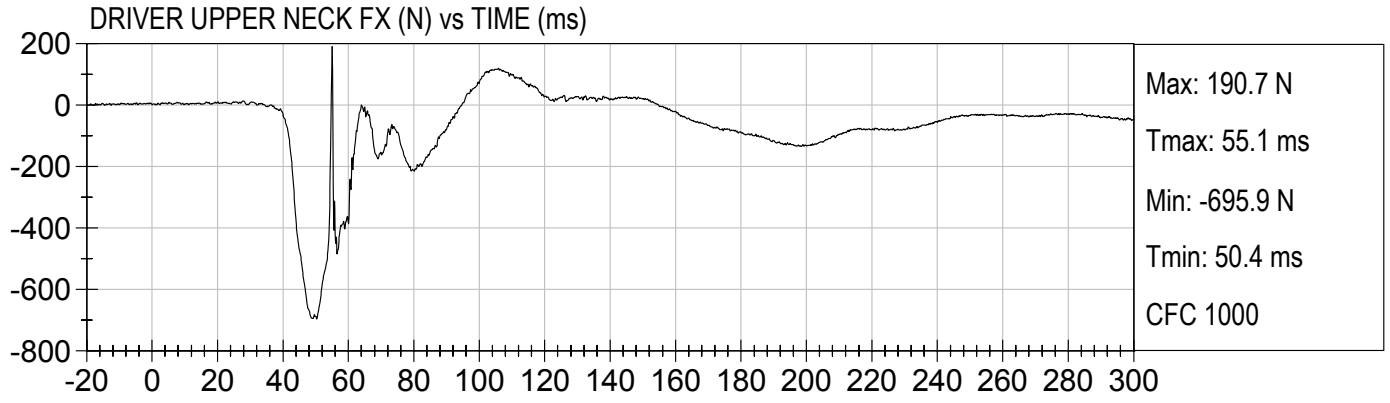


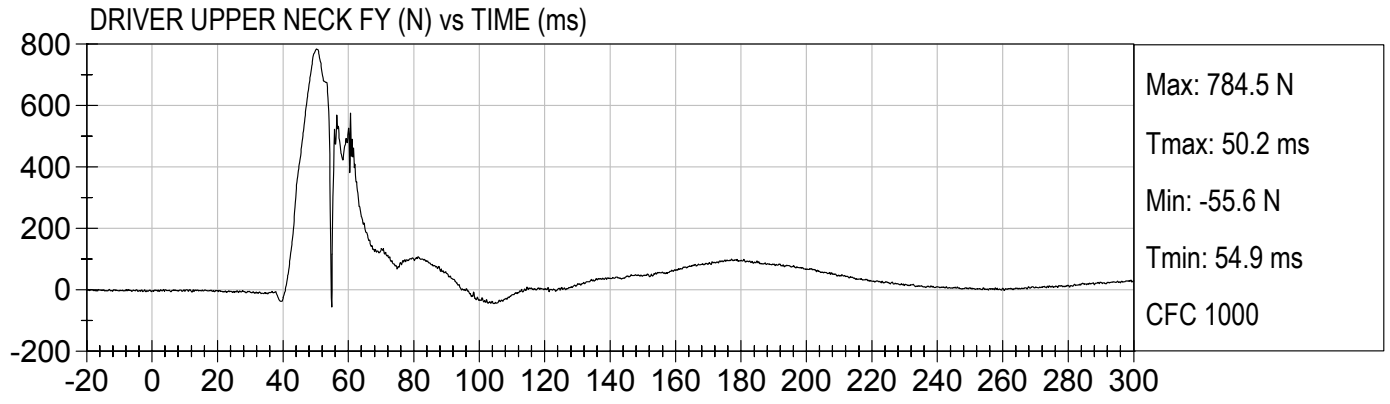


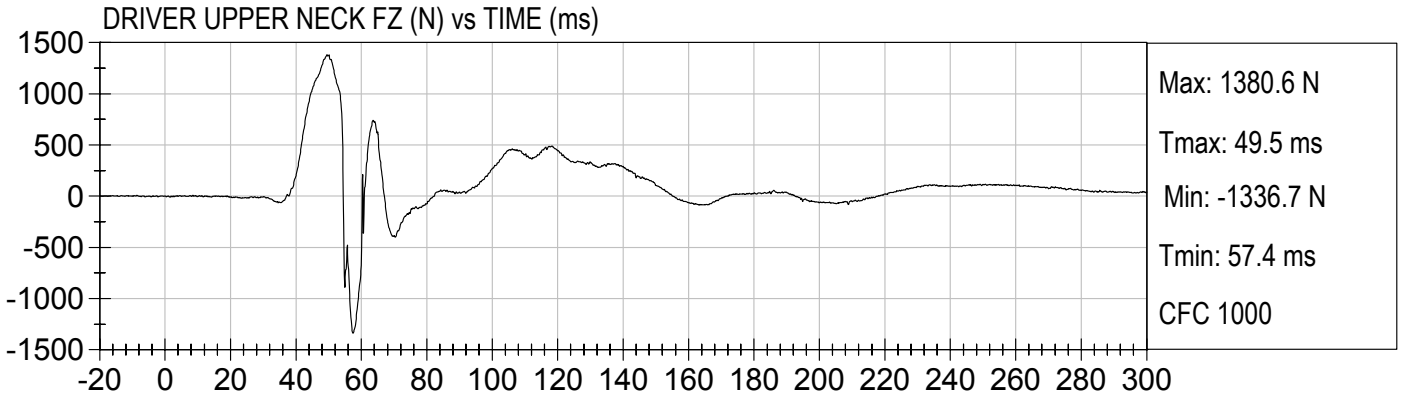


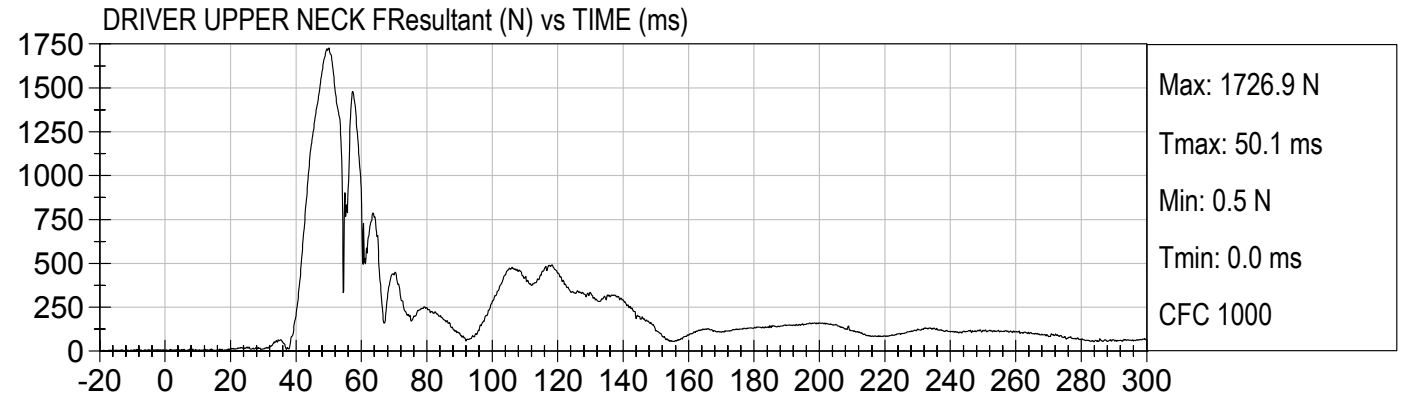
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)





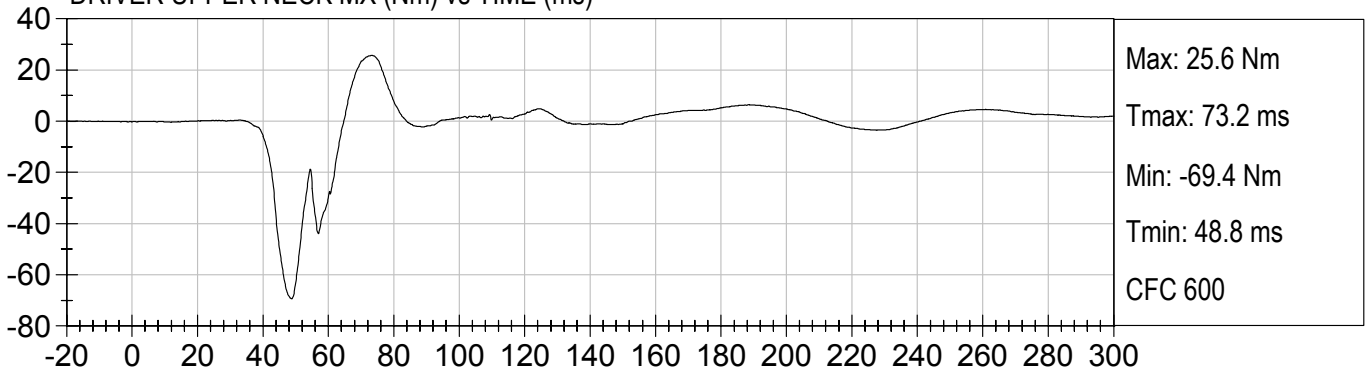




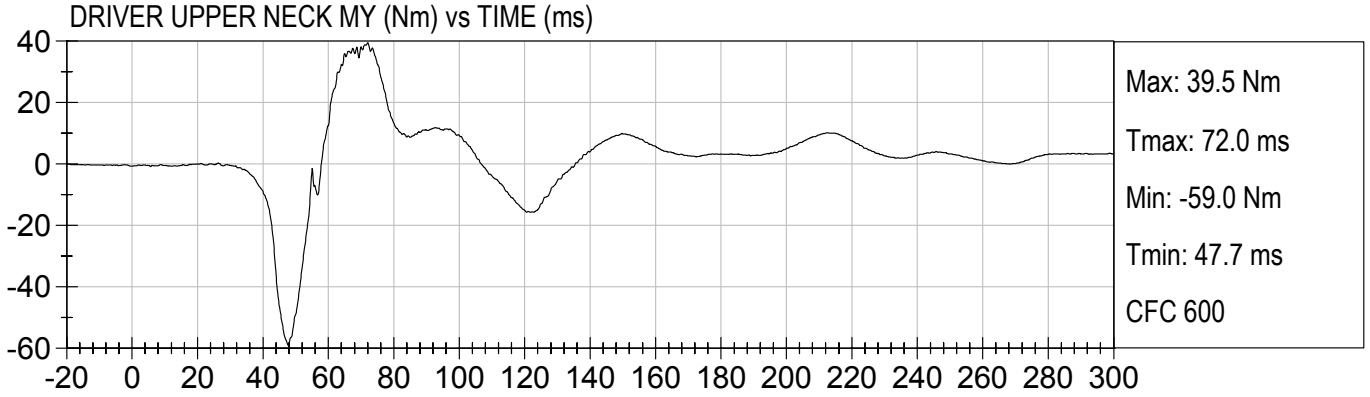
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

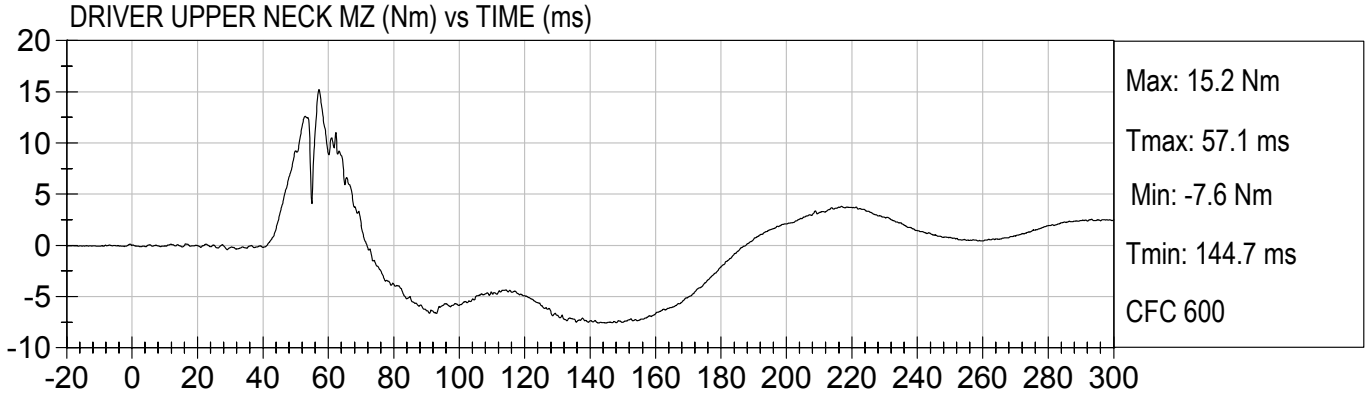
DRIVER UPPER NECK MX (Nm) vs TIME (ms)



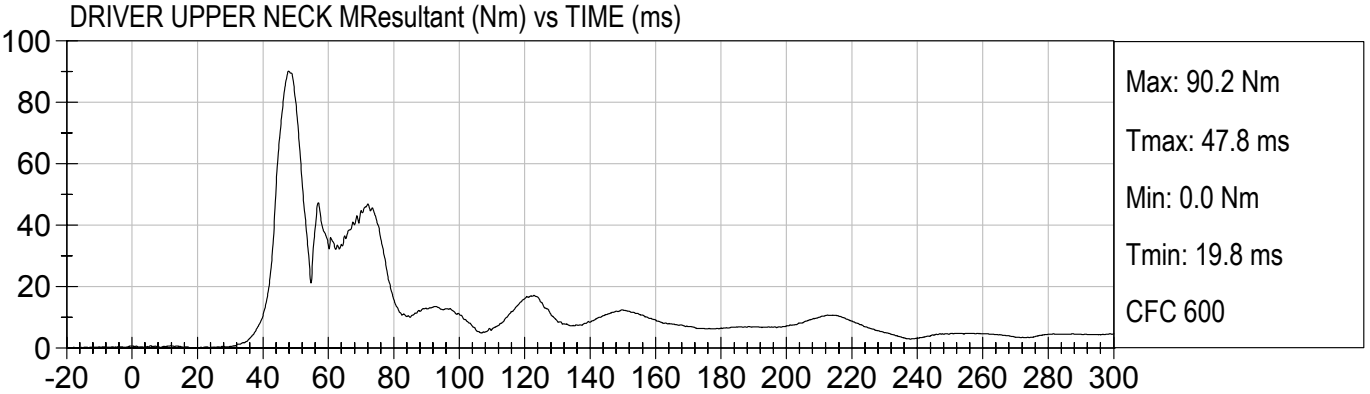
DRIVER UPPER NECK MY (Nm) vs TIME (ms)



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



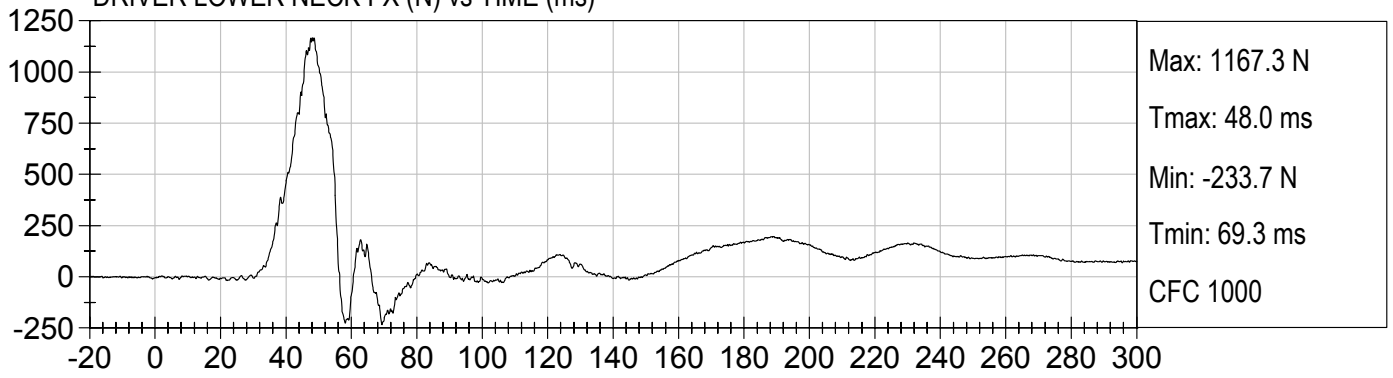
DRIVER UPPER NECK MResultant (Nm) vs TIME (ms)



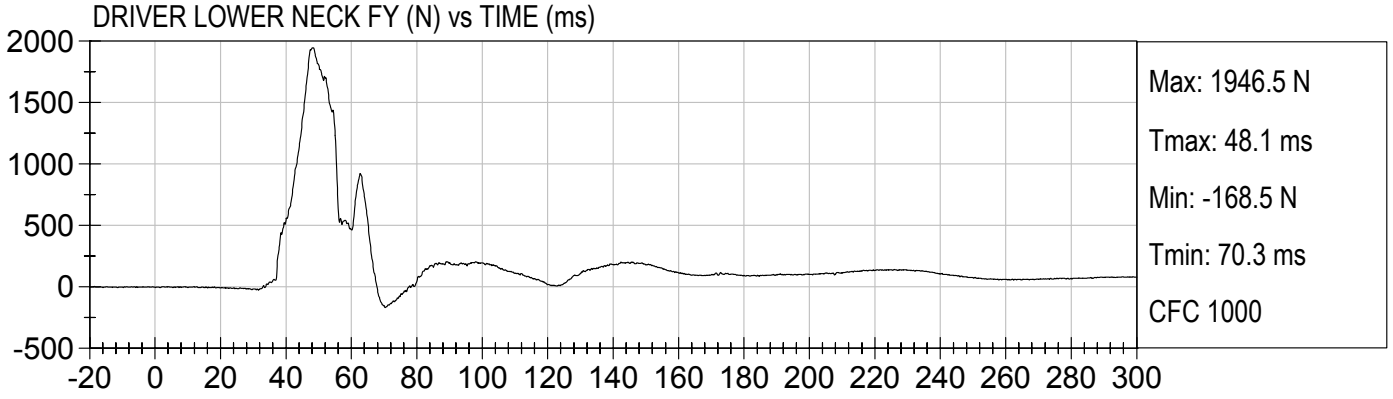
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

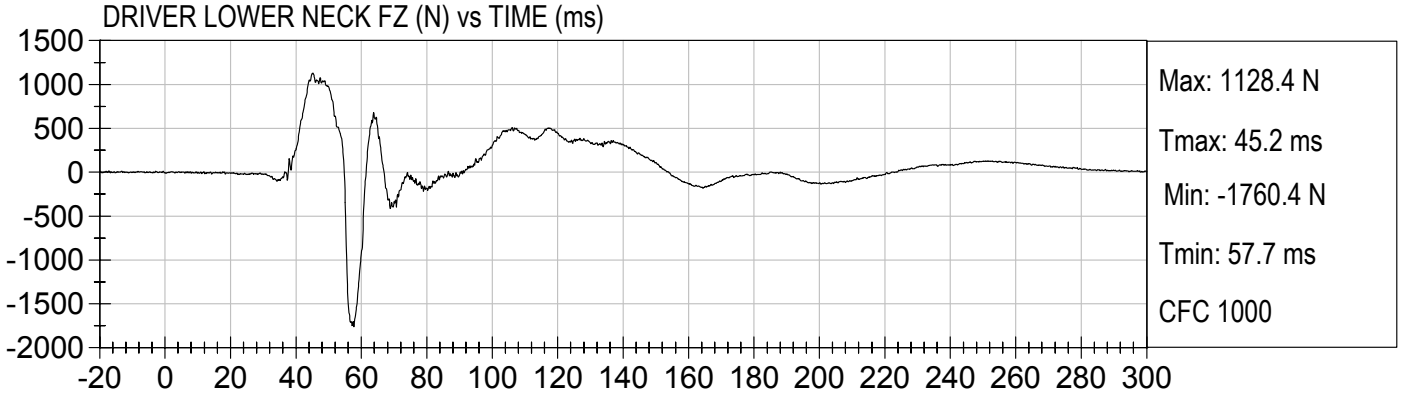
DRIVER LOWER NECK FX (N) vs TIME (ms)



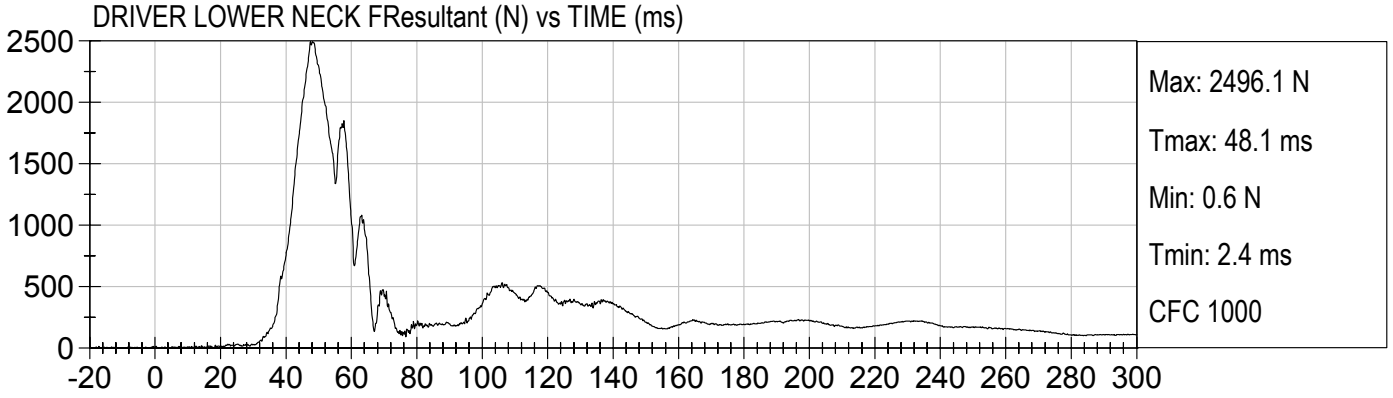
DRIVER LOWER NECK FY (N) vs TIME (ms)



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



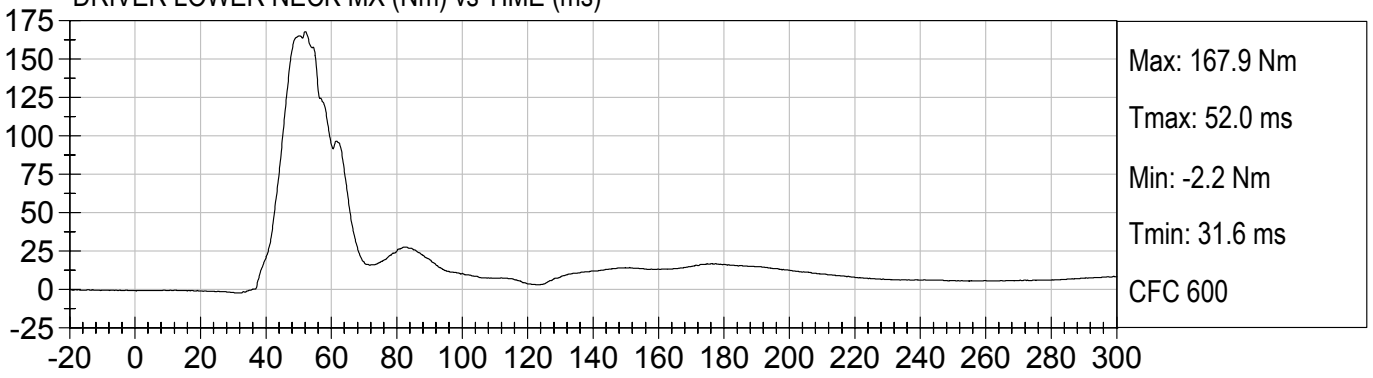
DRIVER LOWER NECK FResultant (N) vs TIME (ms)



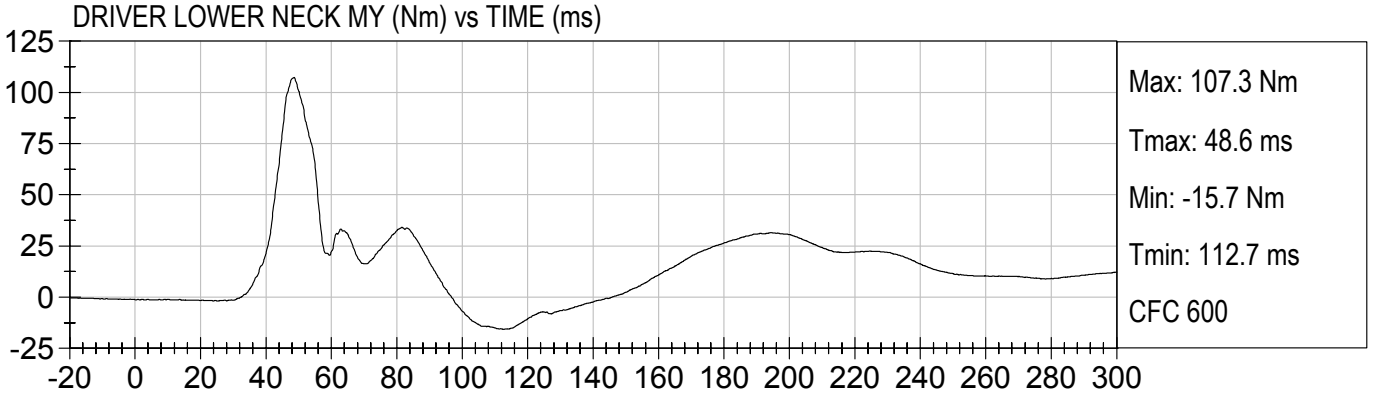
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

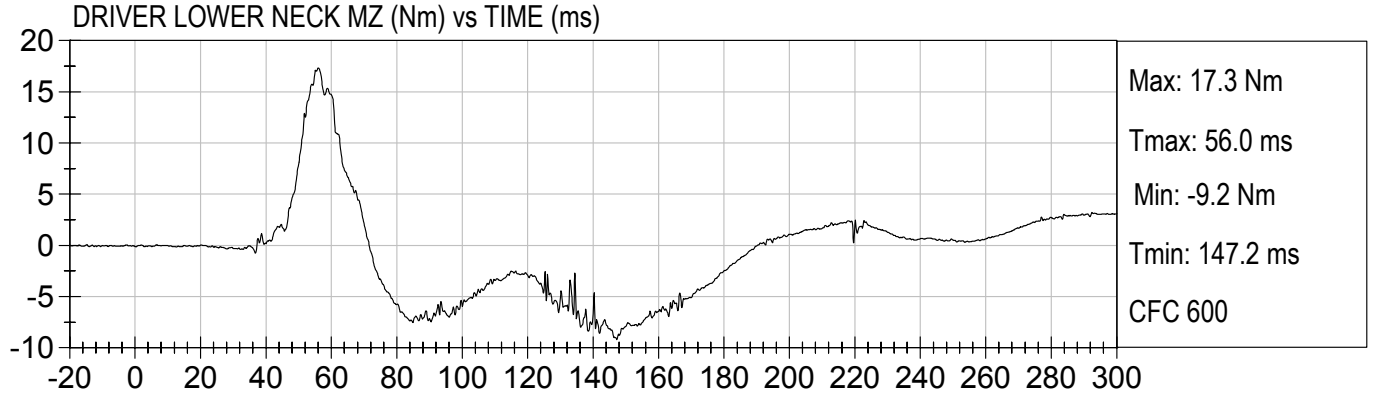
DRIVER LOWER NECK MX (Nm) vs TIME (ms)



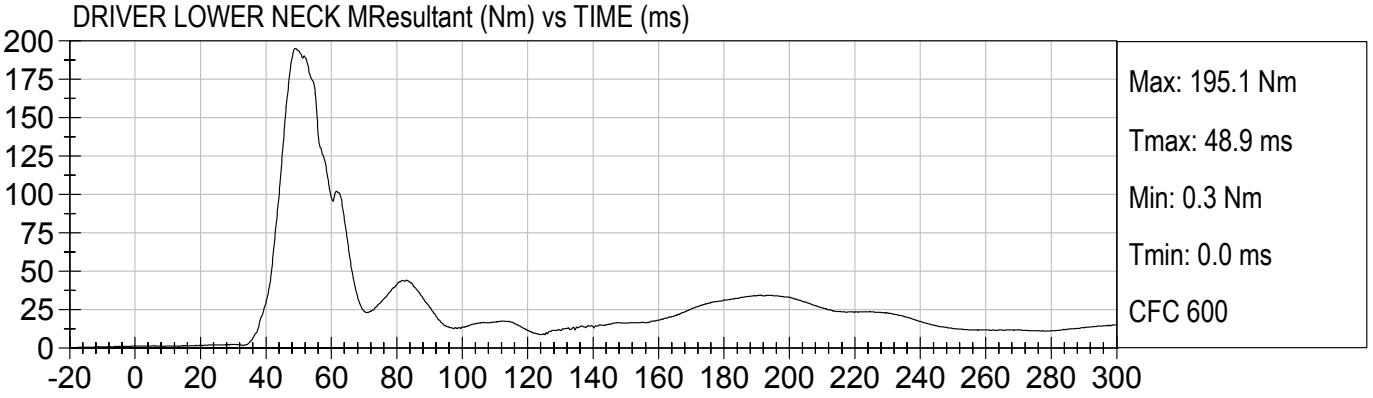
DRIVER LOWER NECK MY (Nm) vs TIME (ms)



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



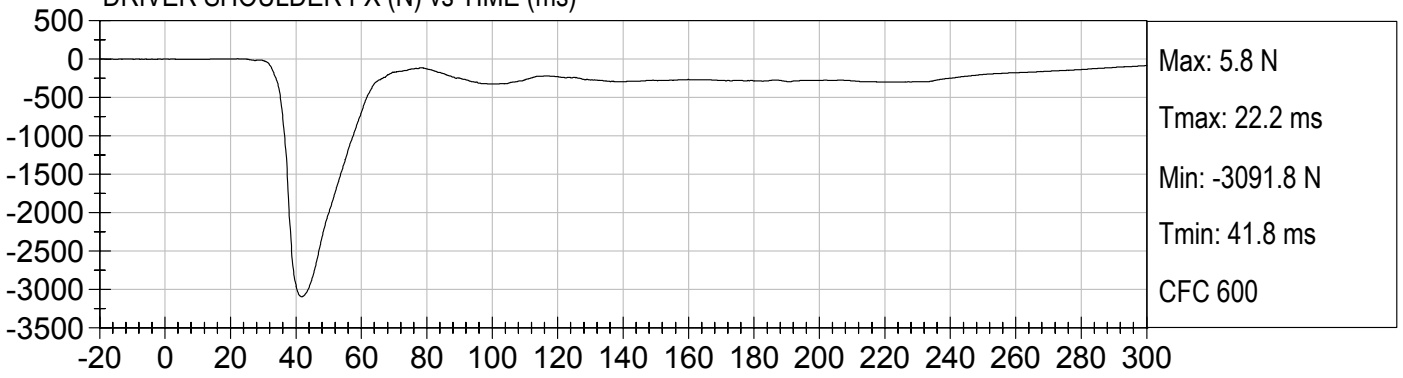
DRIVER LOWER NECK MResultant (Nm) vs TIME (ms)



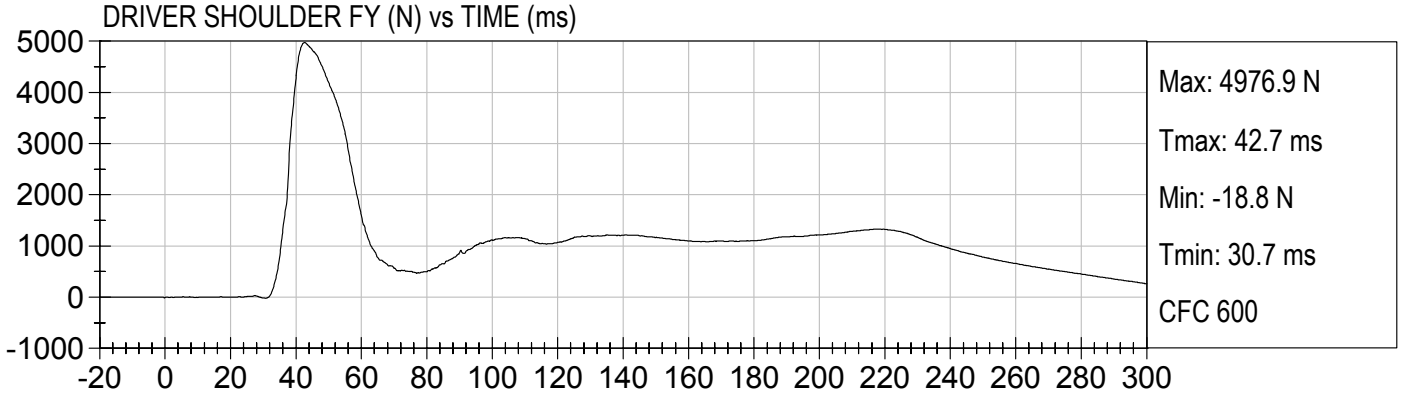
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

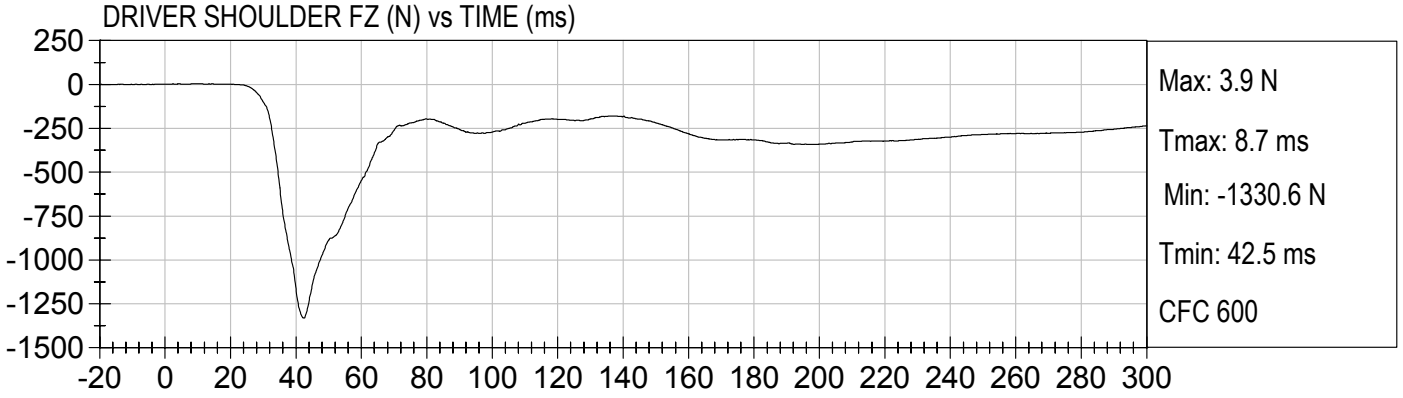
DRIVER SHOULDER FX (N) vs TIME (ms)



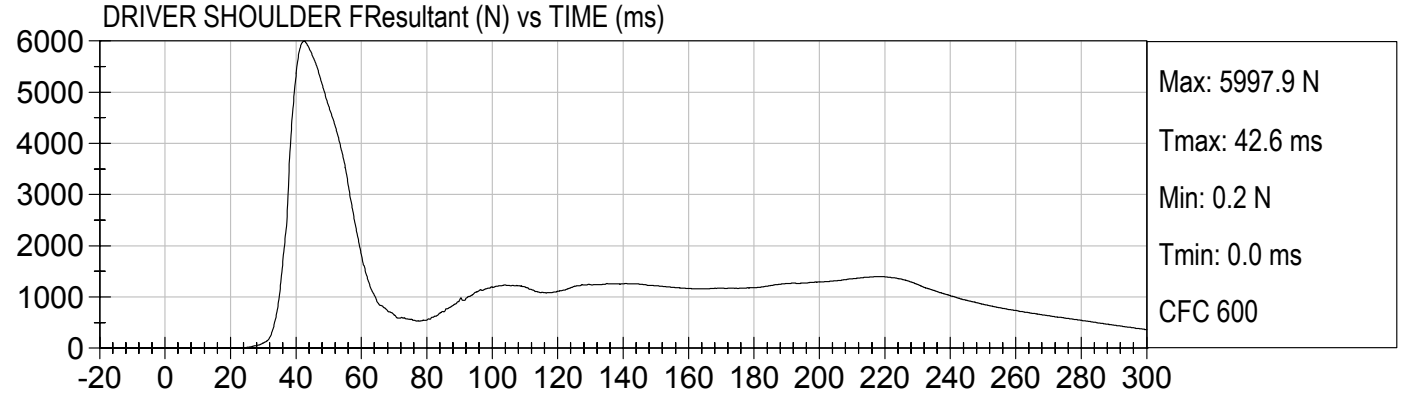
DRIVER SHOULDER FY (N) vs TIME (ms)



DRIVER SHOULDER FZ (N) vs TIME (ms)



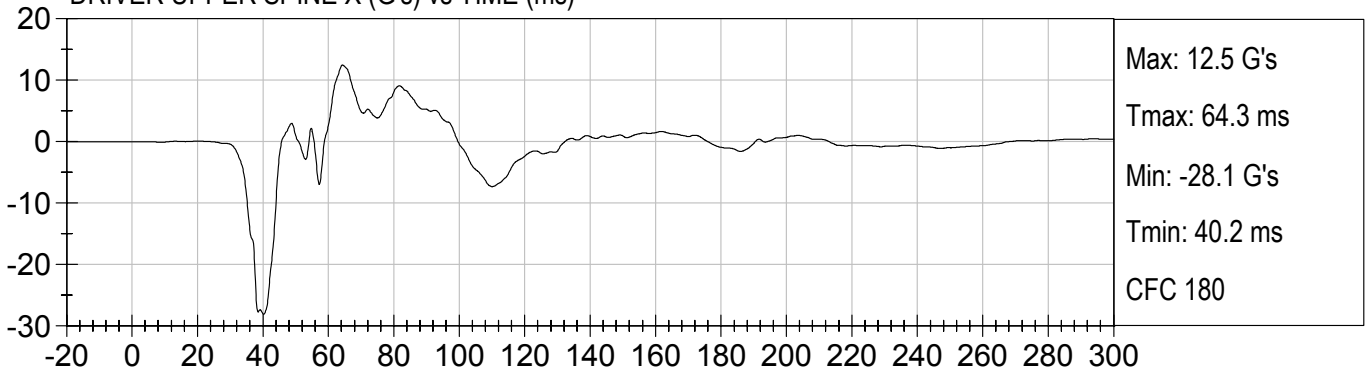
DRIVER SHOULDER FResultant (N) vs TIME (ms)



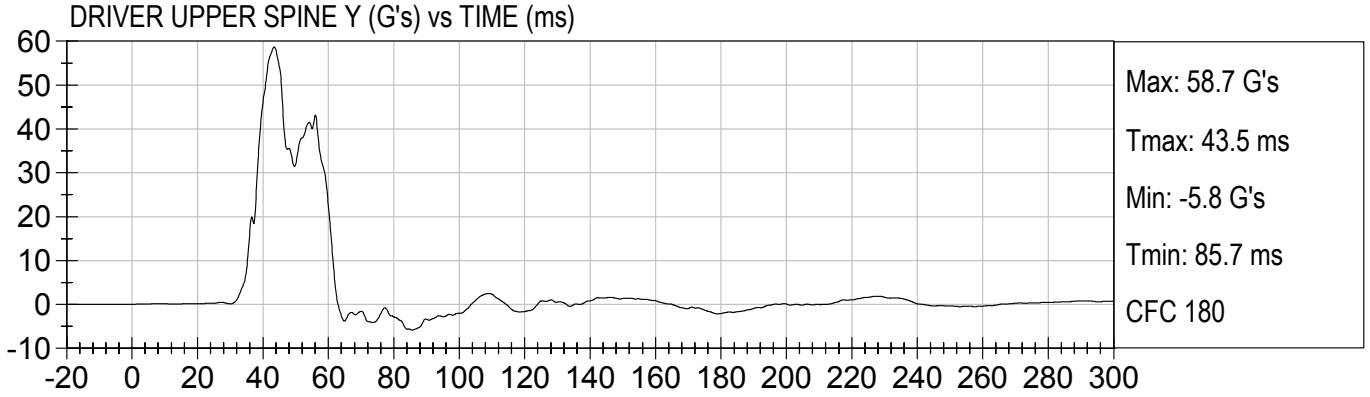
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

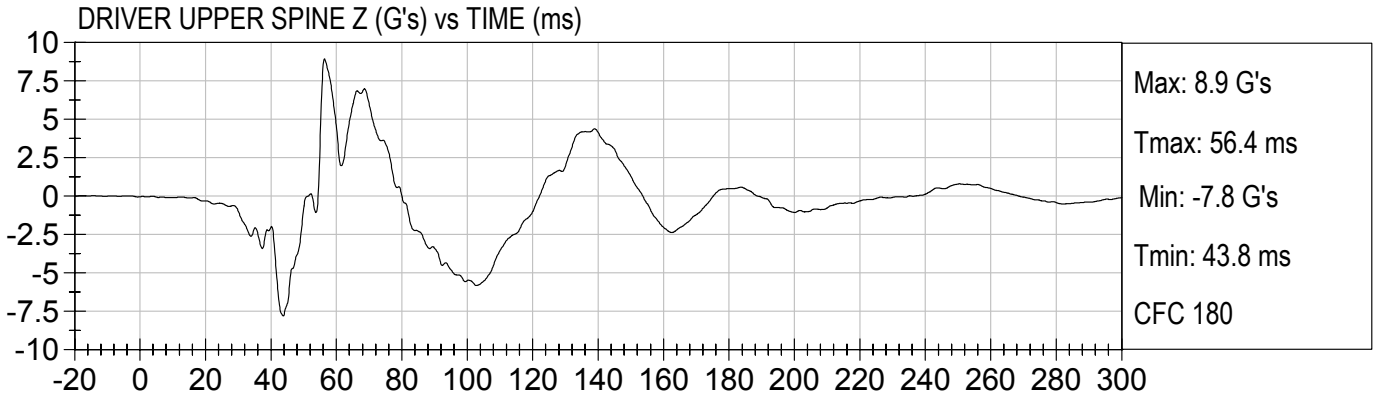
DRIVER UPPER SPINE X (G's) vs TIME (ms)



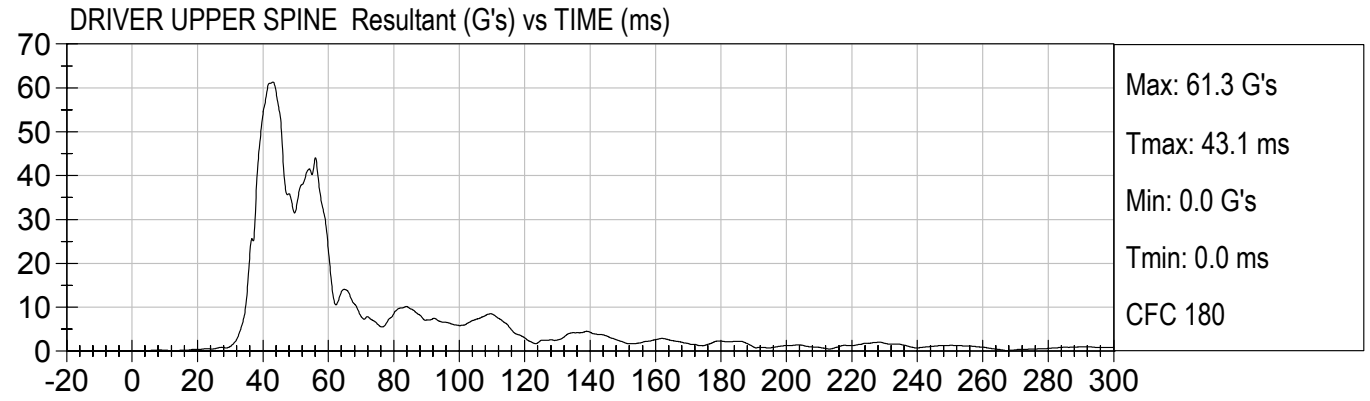
DRIVER UPPER SPINE Y (G's) vs TIME (ms)

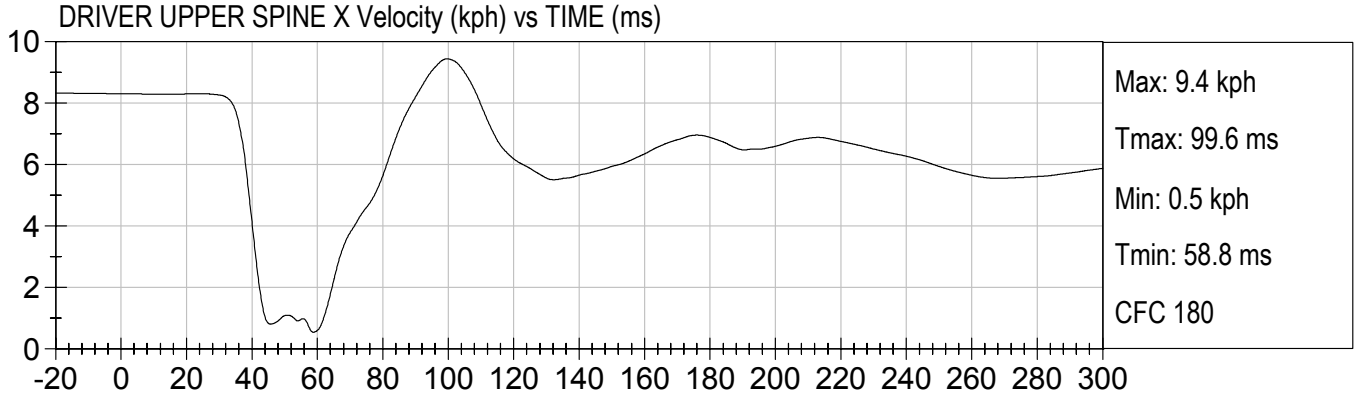


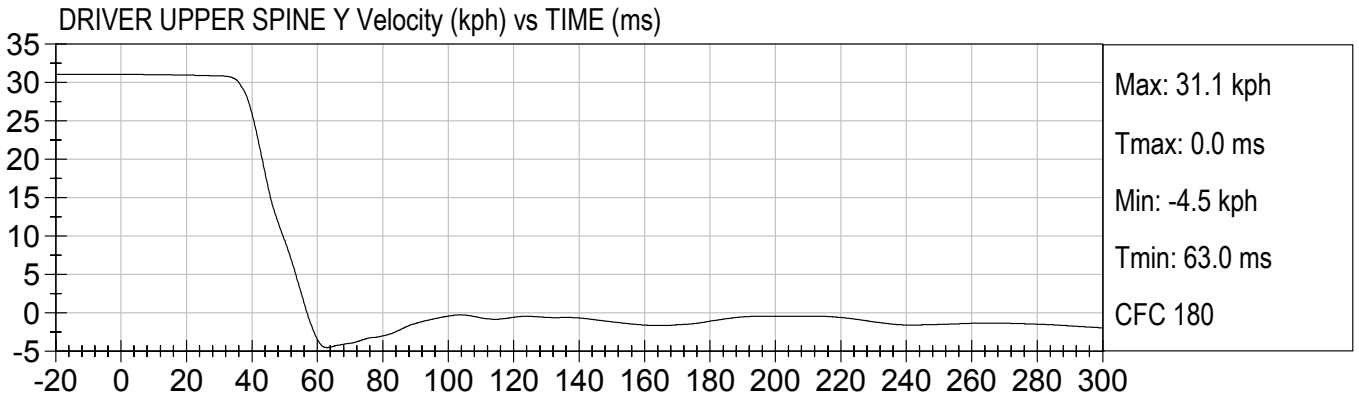
DRIVER UPPER SPINE Z (G's) vs TIME (ms)

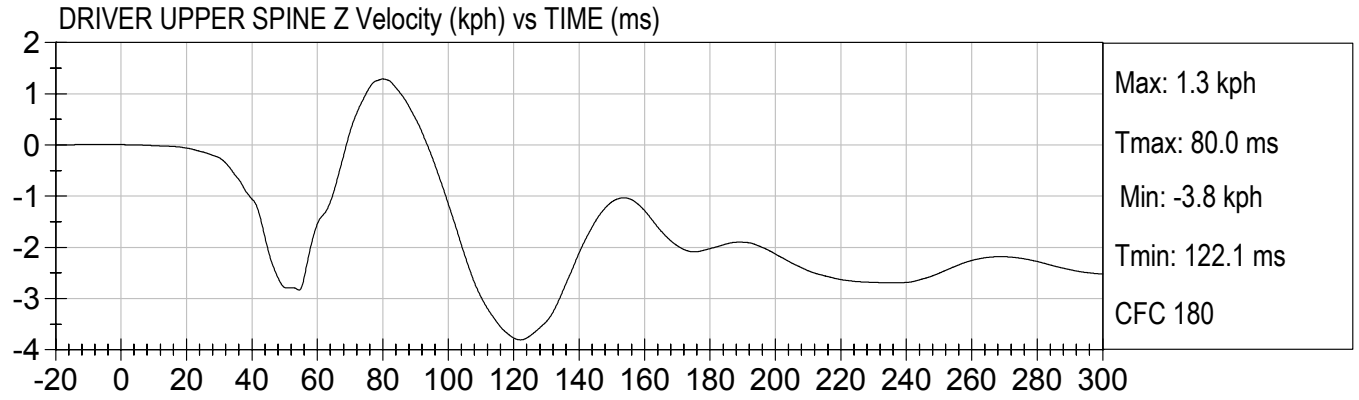


DRIVER UPPER SPINE Resultant (G's) vs TIME (ms)




DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)
10
8
6
4
2
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 9.4 kph
Tmax: 99.6 ms
Min: 0.5 kph
Tmin: 58.8 ms
CFC 180

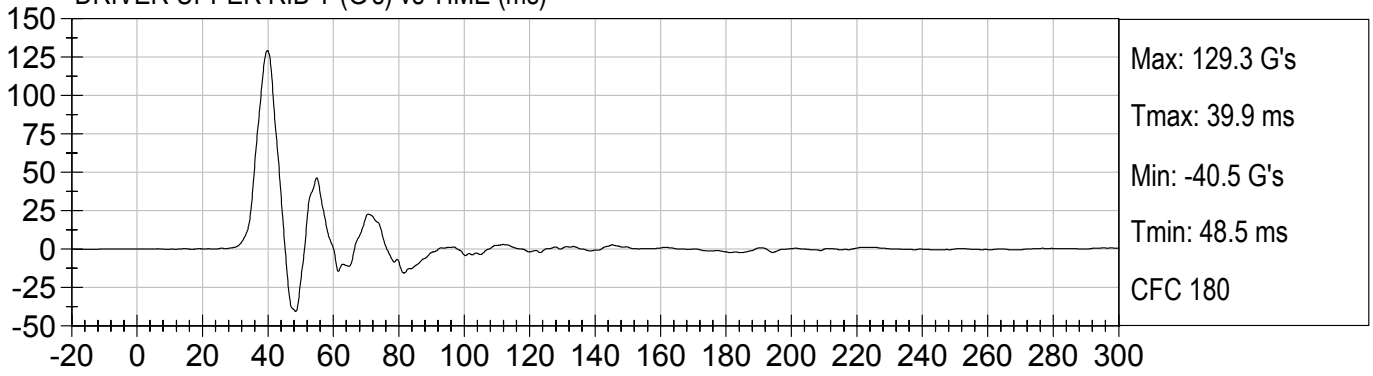

DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 31.1 kph
Tmax: 0.0 ms
Min: -4.5 kph
Tmin: 63.0 ms
CFC 180


DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)
2
1
0
-1
-2
-3
-4
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.3 kph
Tmax: 80.0 ms
Min: -3.8 kph
Tmin: 122.1 ms
CFC 180

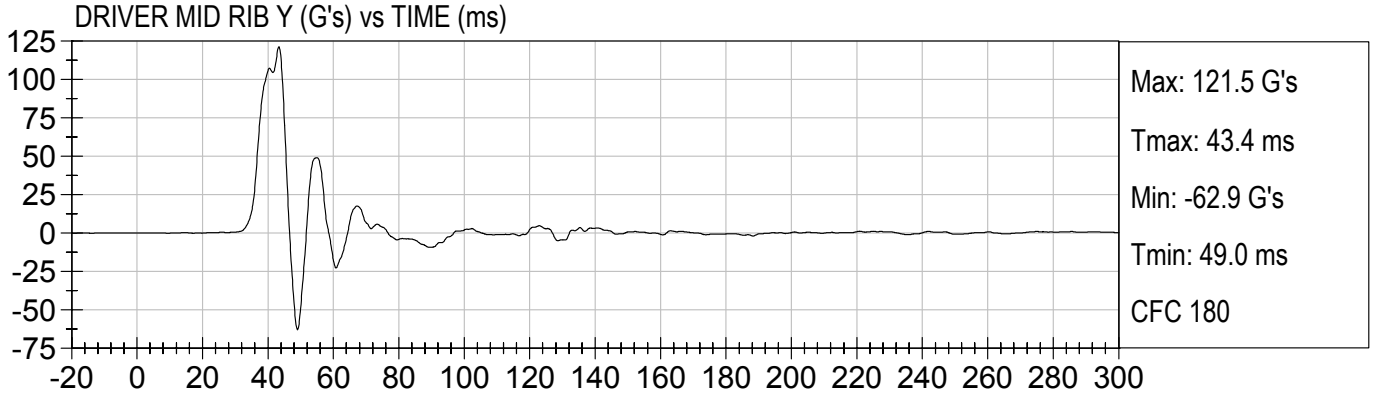
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

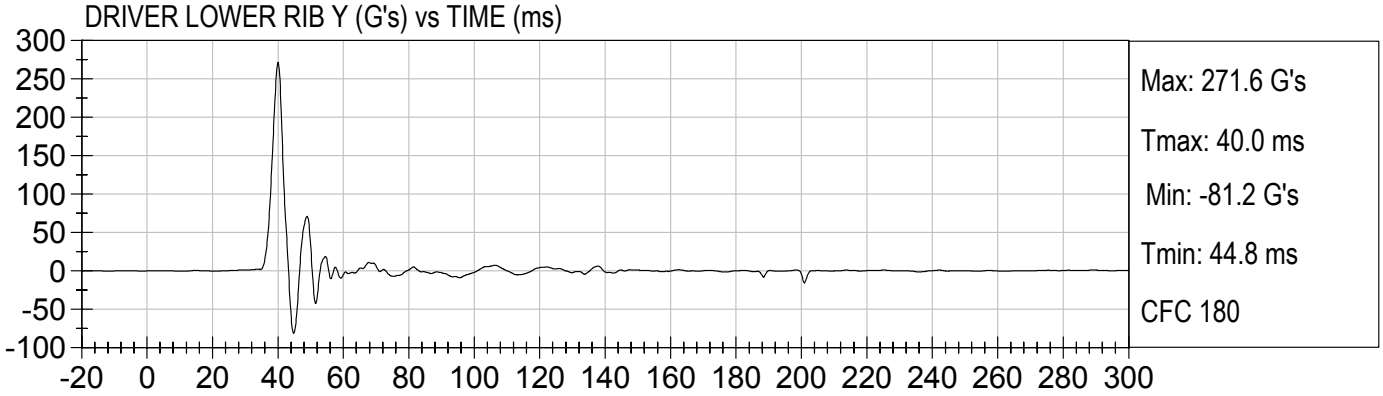
DRIVER UPPER RIB Y (G's) vs TIME (ms)



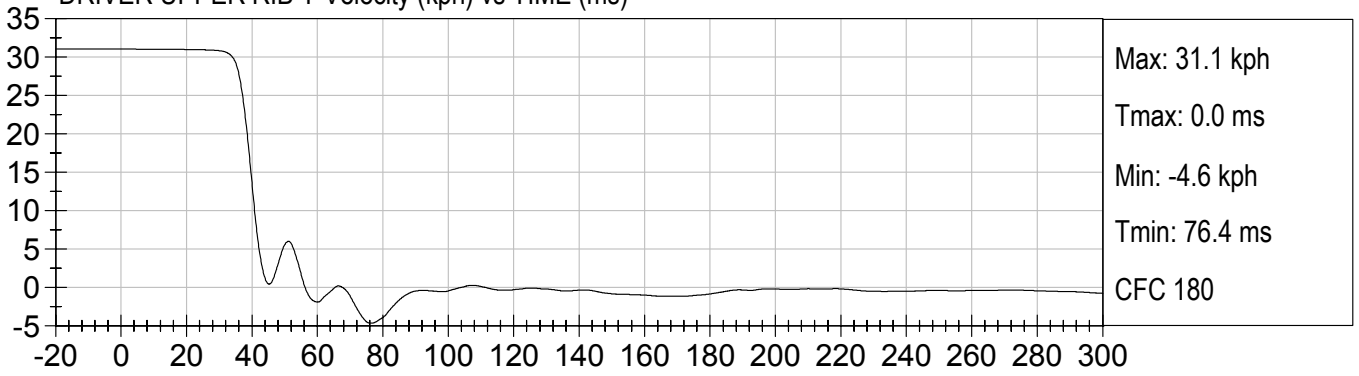
DRIVER MID RIB Y (G's) vs TIME (ms)



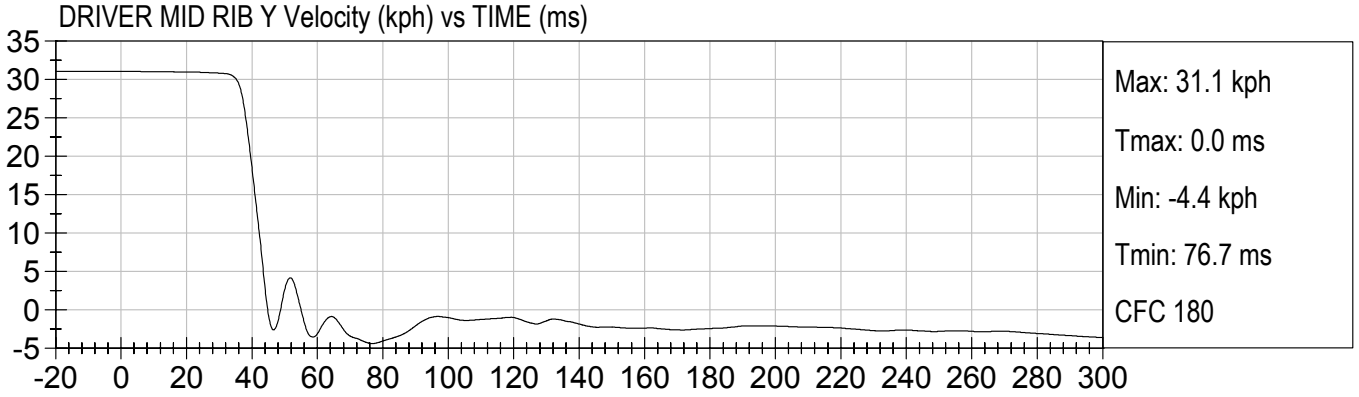
DRIVER LOWER RIB Y (G's) vs TIME (ms)



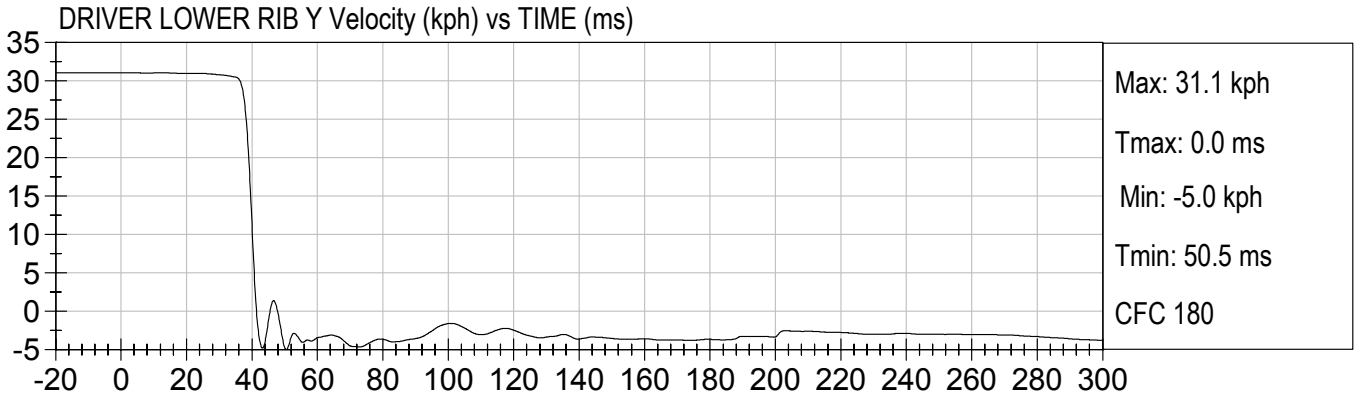
DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)



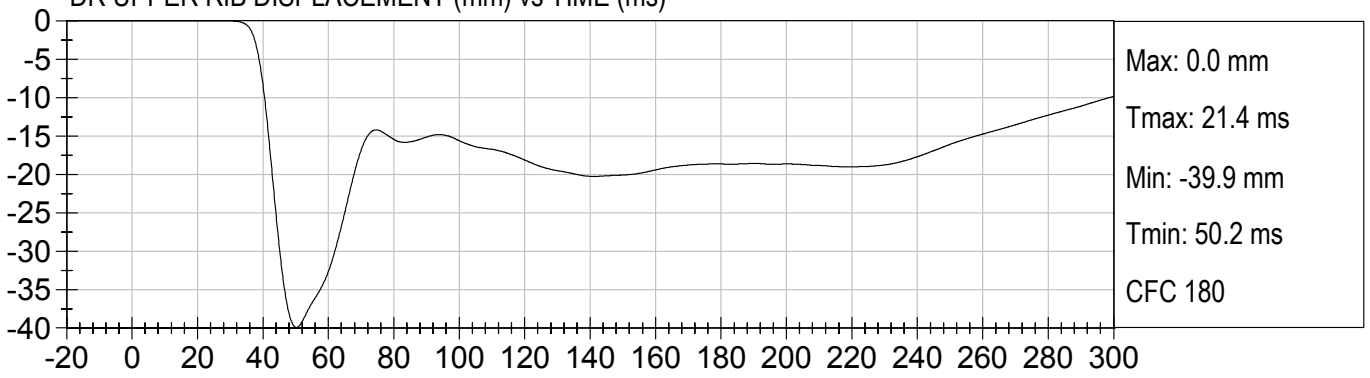
DRIVER MID RIB Y Velocity (kph) vs TIME (ms)



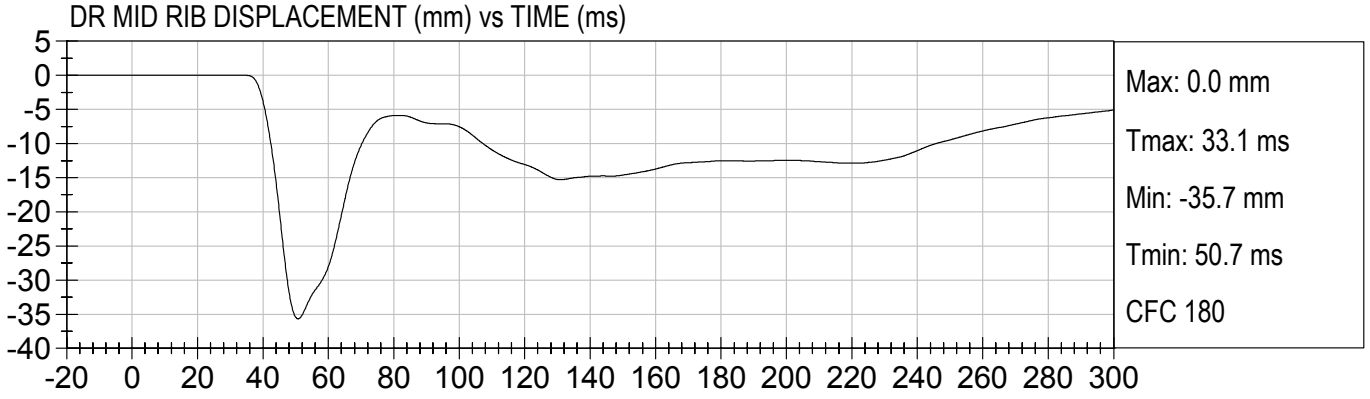
DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)



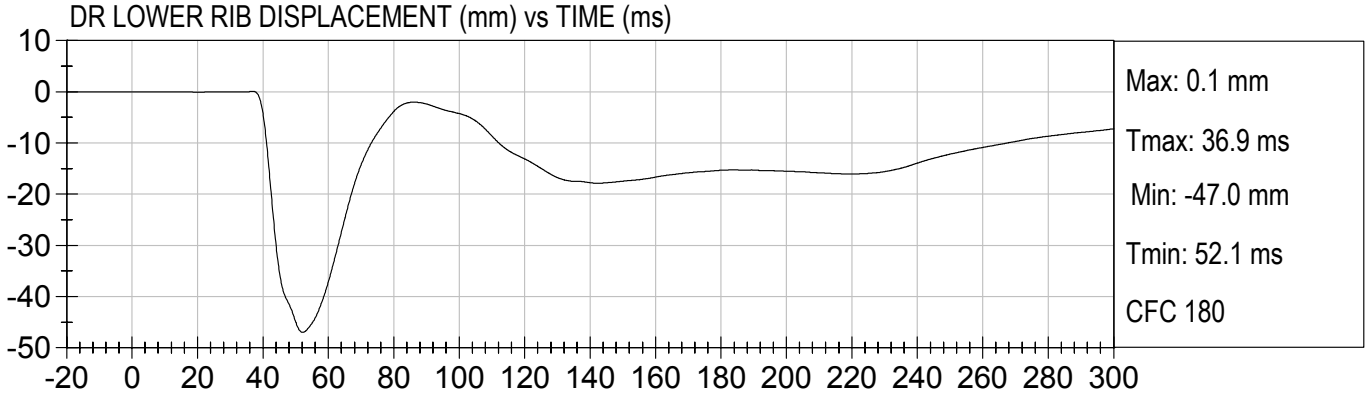
DR UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



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



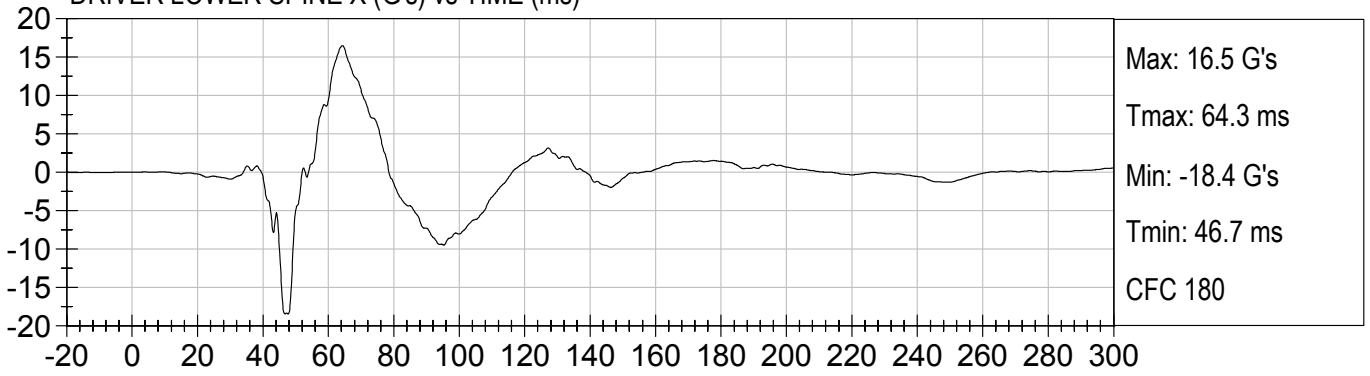
DR LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



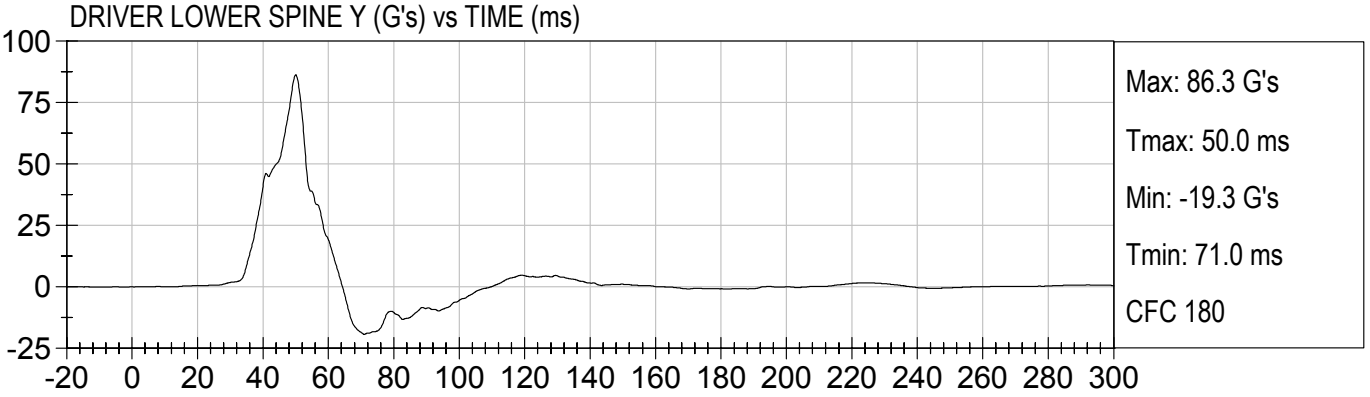
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

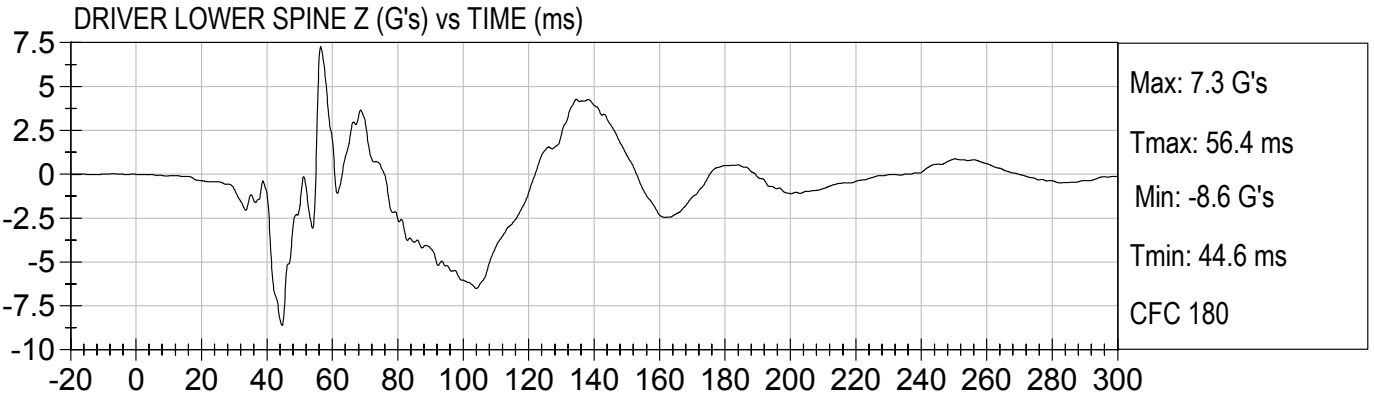
DRIVER LOWER SPINE X (G's) vs TIME (ms)



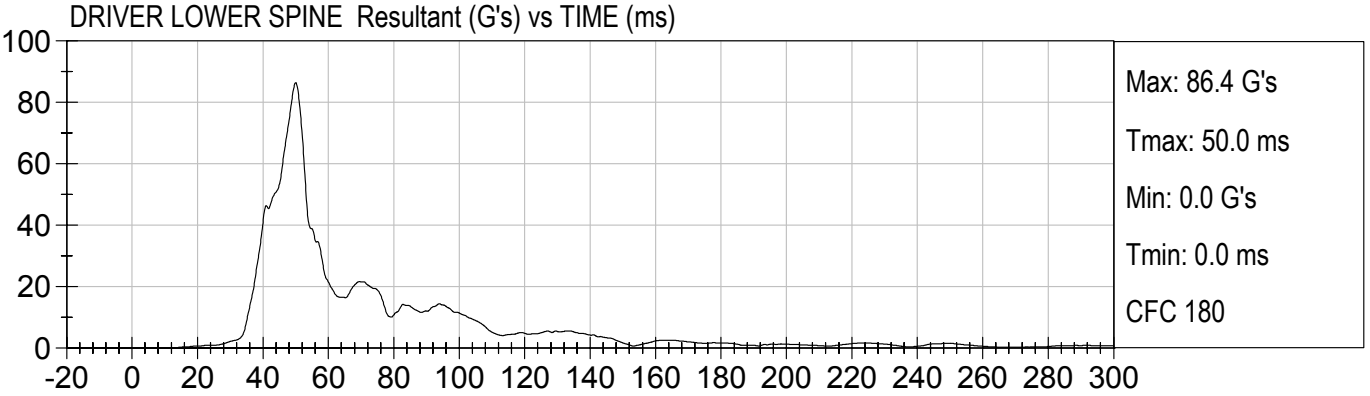
DRIVER LOWER SPINE Y (G's) vs TIME (ms)



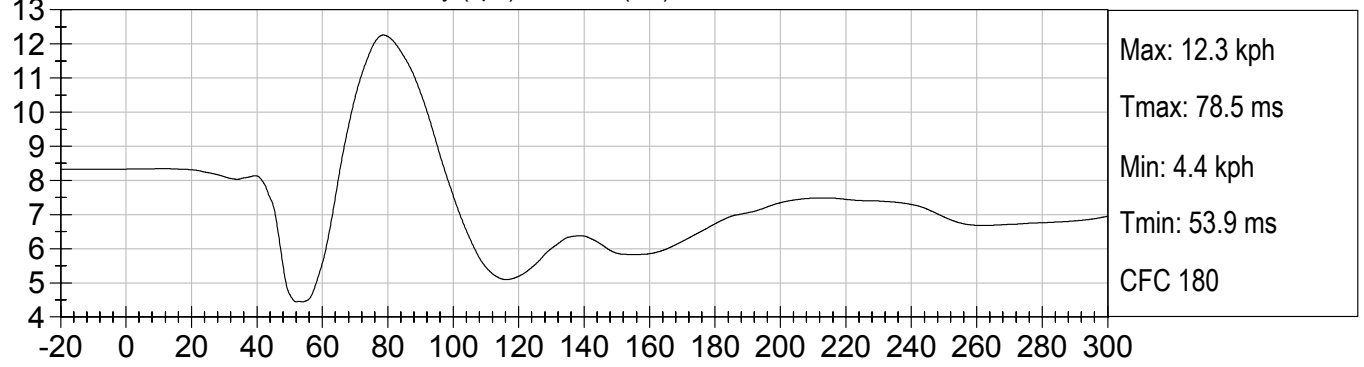
DRIVER LOWER SPINE Z (G's) vs TIME (ms)



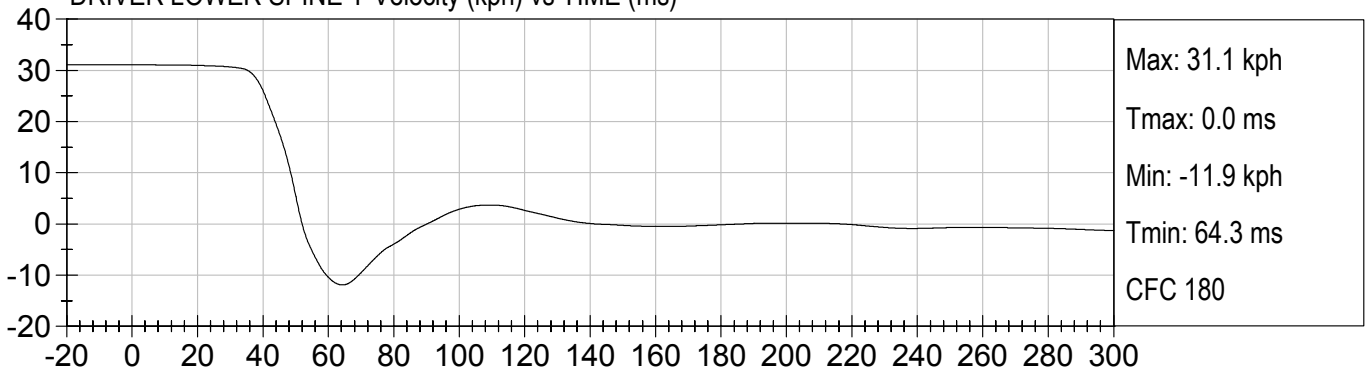
DRIVER LOWER SPINE Resultant (G's) vs TIME (ms)



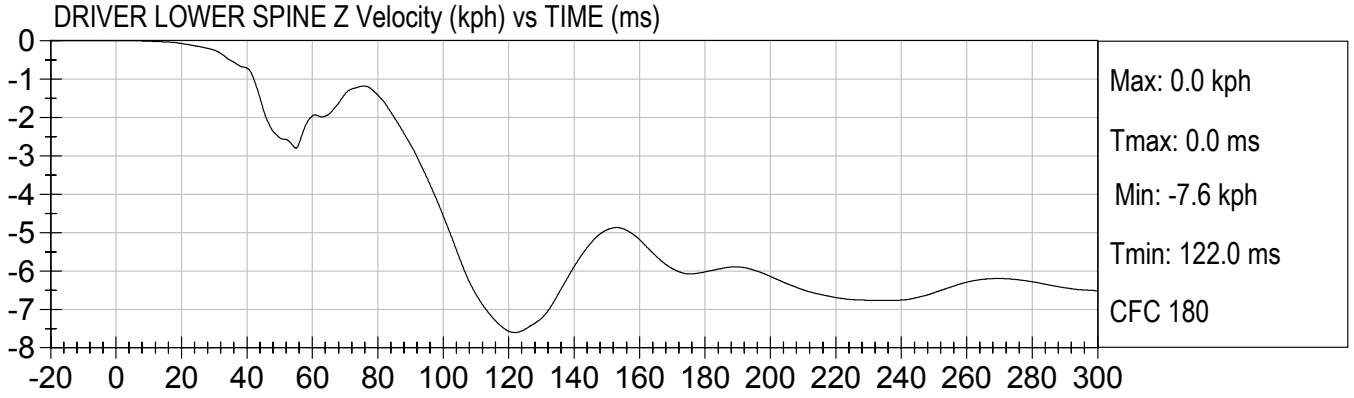
DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)



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



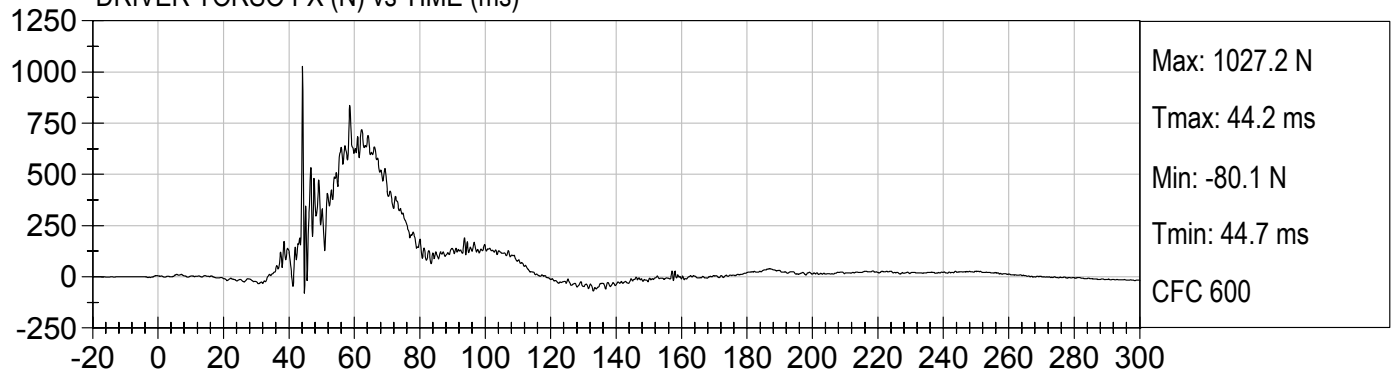
DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)



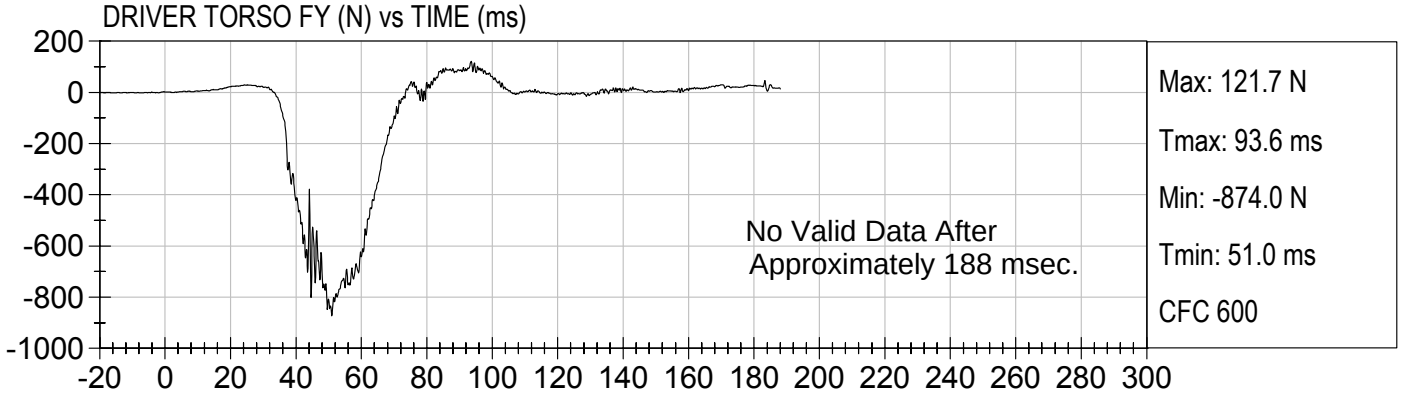
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

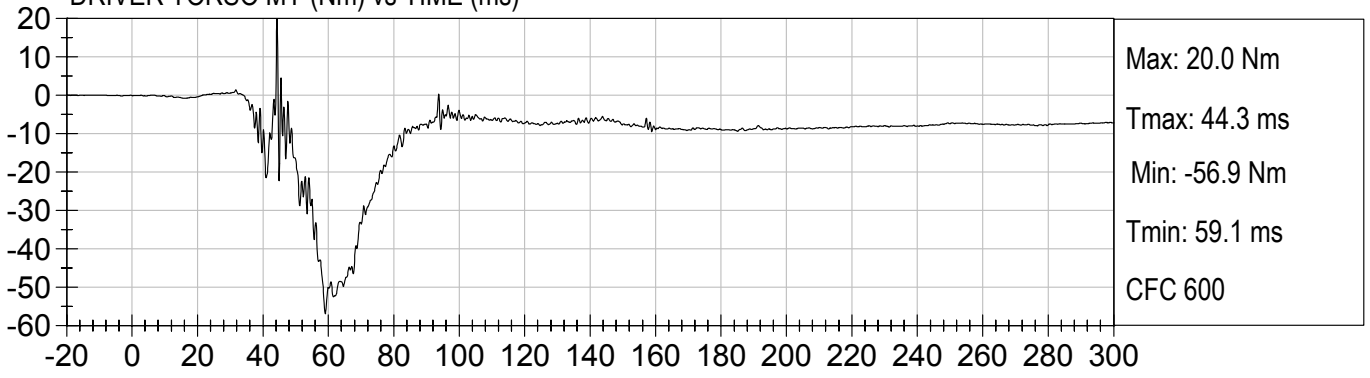
DRIVER TORSO FX (N) vs TIME (ms)



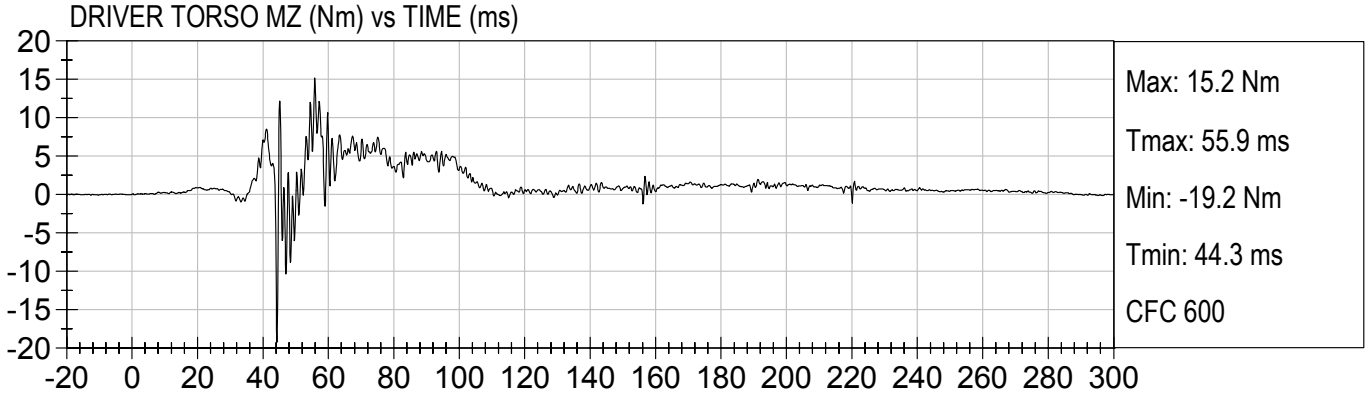
DRIVER TORSO FY (N) vs TIME (ms)



DRIVER TORSO MY (Nm) vs TIME (ms)

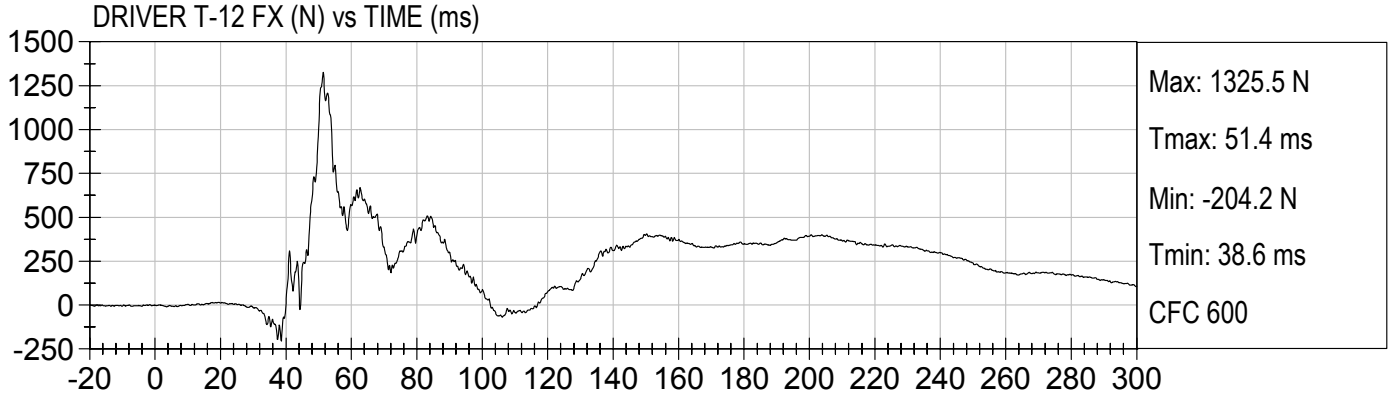


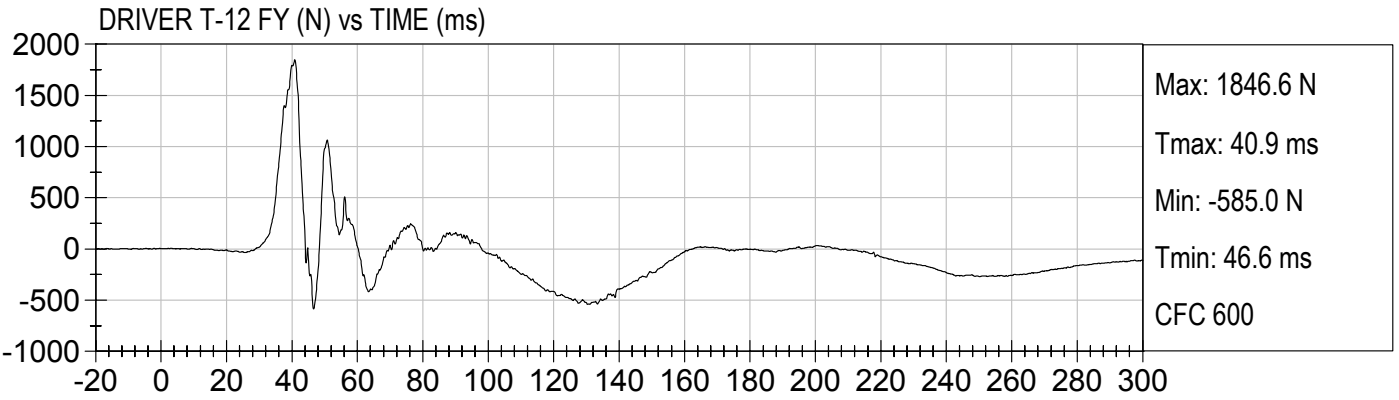
DRIVER TORSO MZ (Nm) vs TIME (ms)

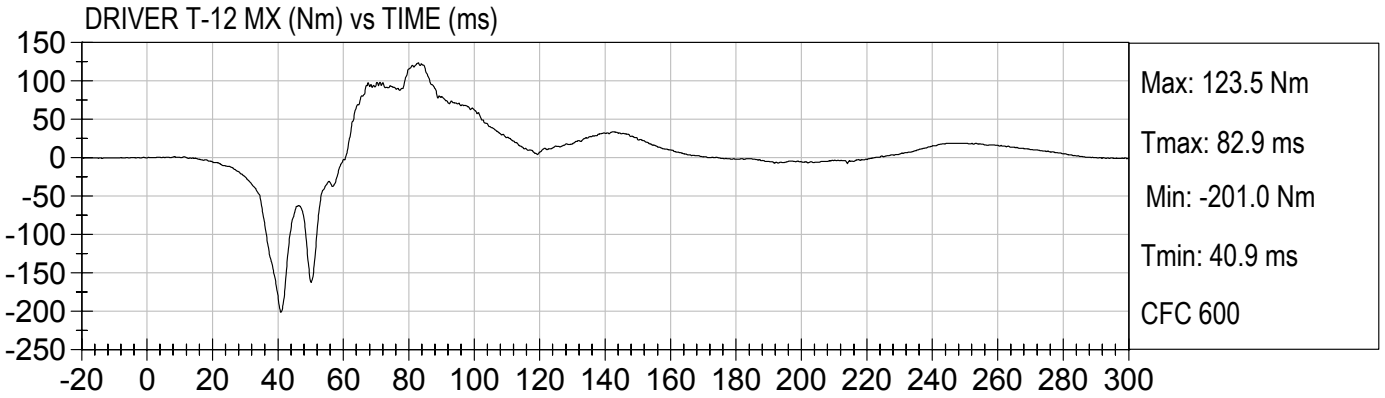


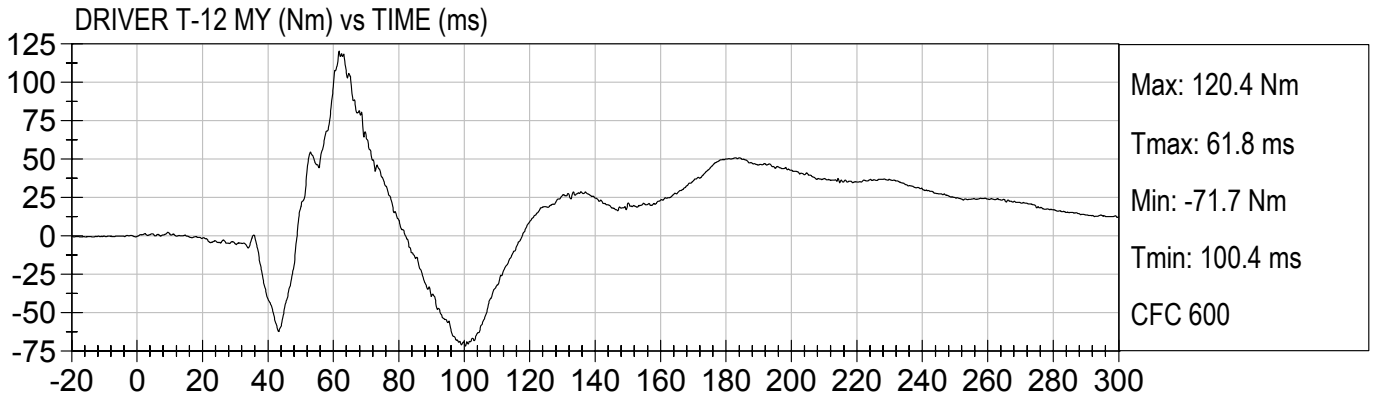
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)





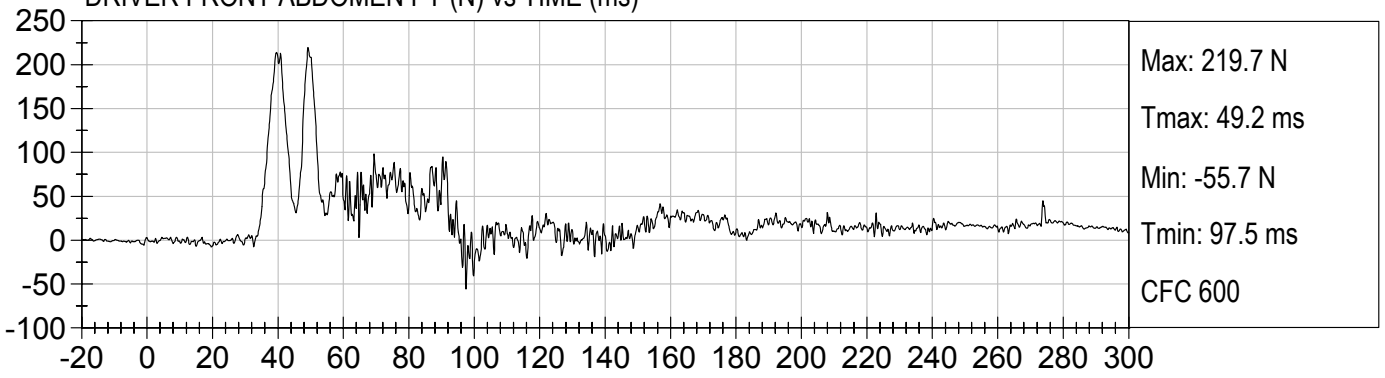




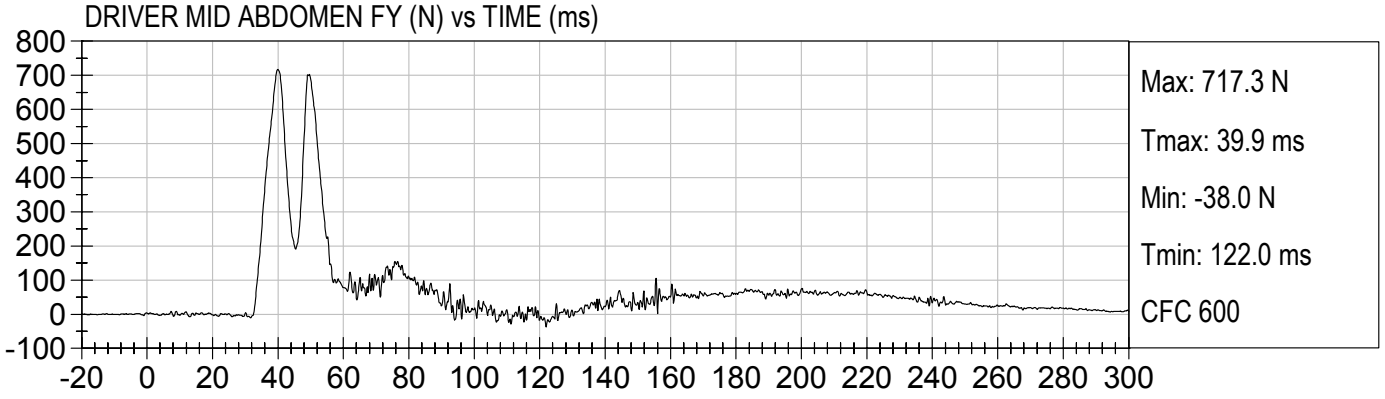
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

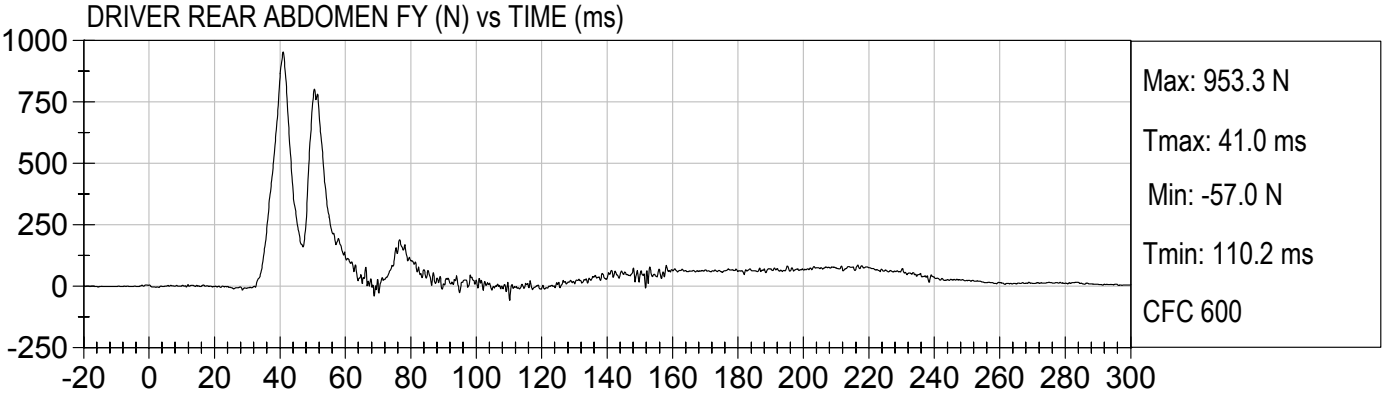
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



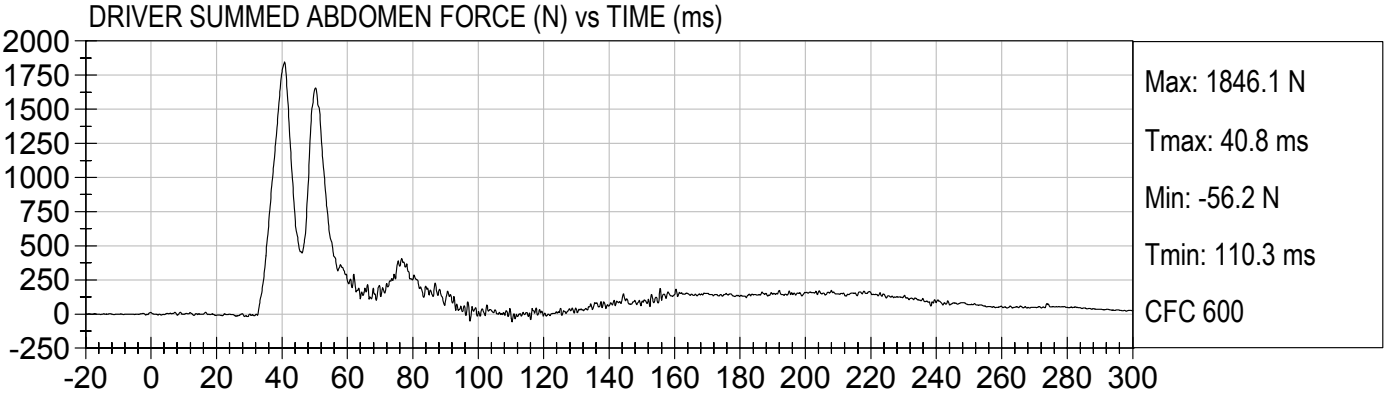
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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



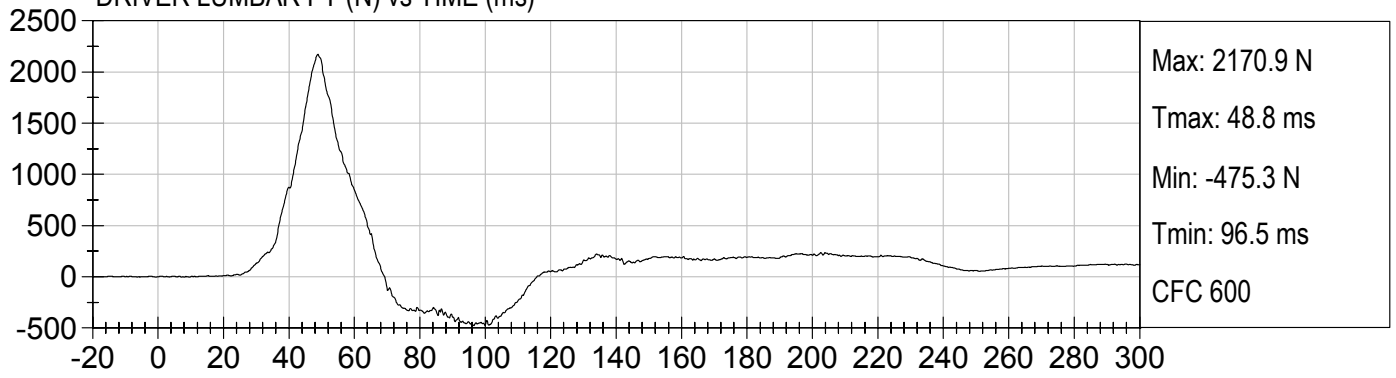
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)



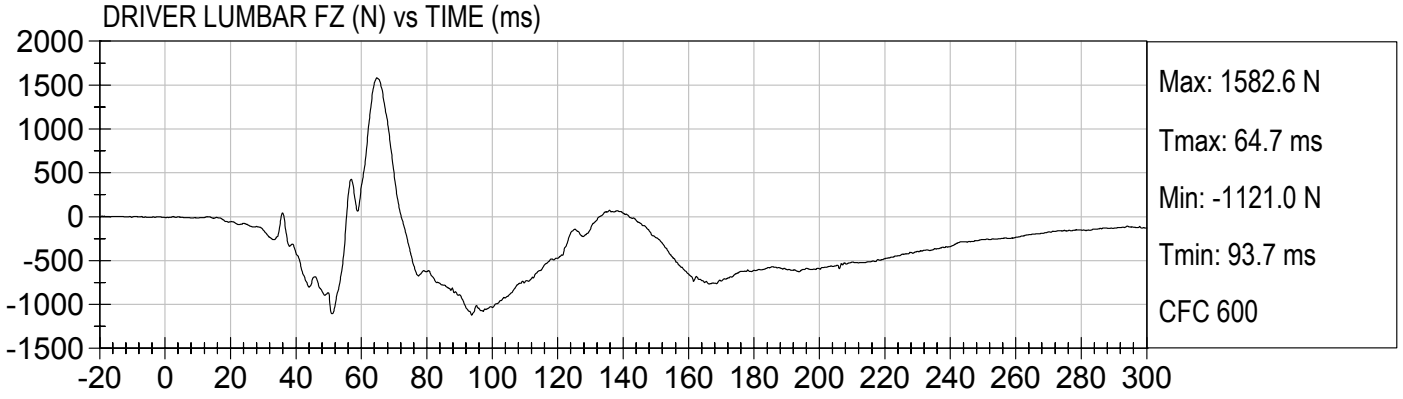
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

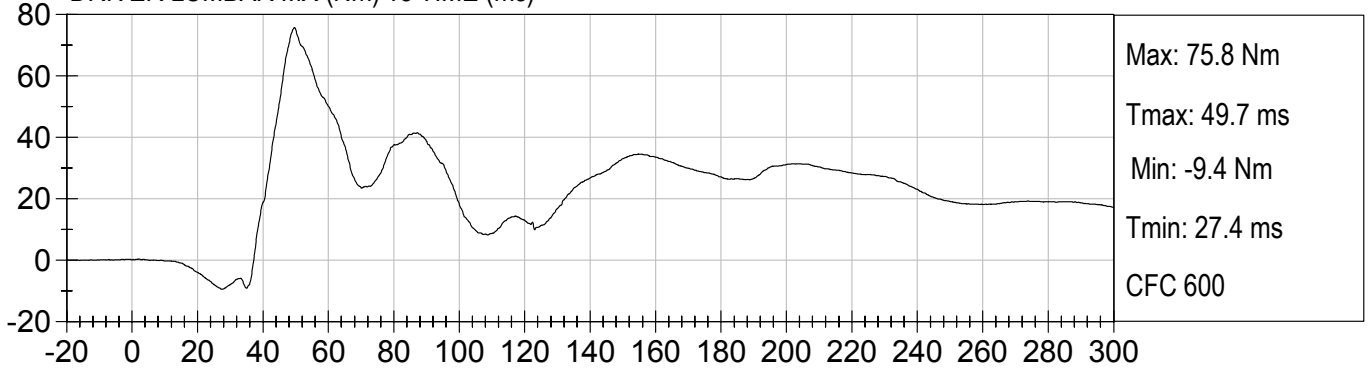
DRIVER LUMBAR FY (N) vs TIME (ms)



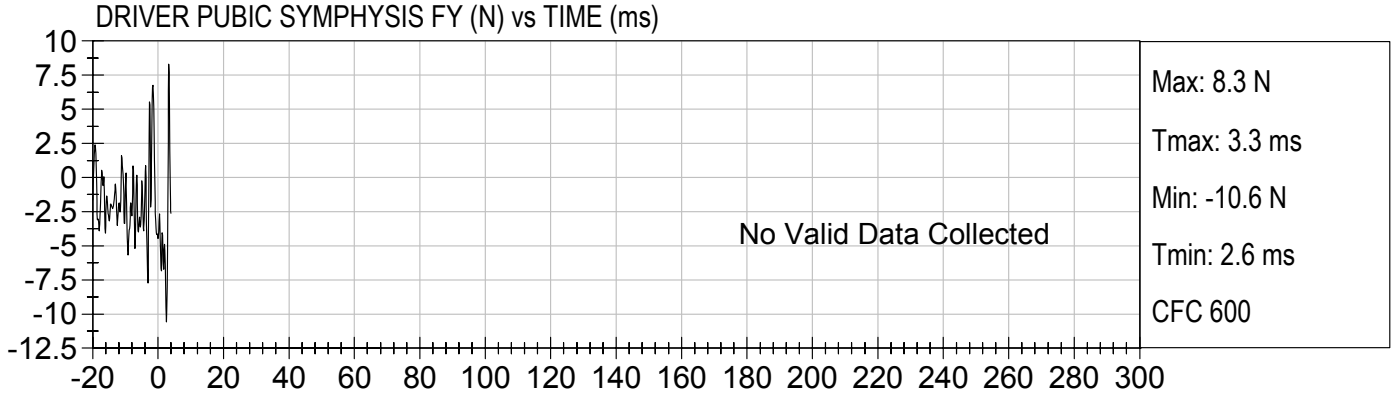
DRIVER LUMBAR FZ (N) vs TIME (ms)



DRIVER LUMBAR MX (Nm) vs TIME (ms)

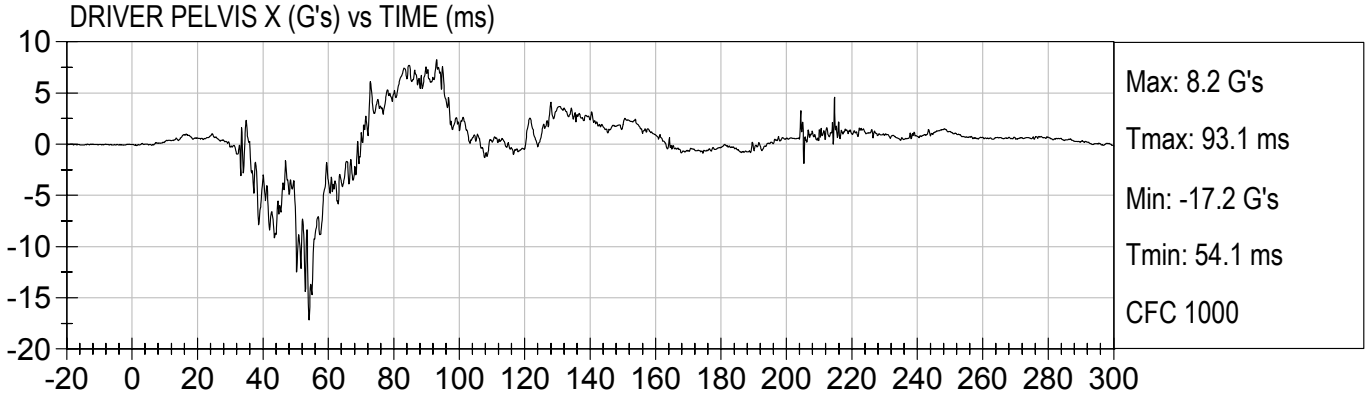


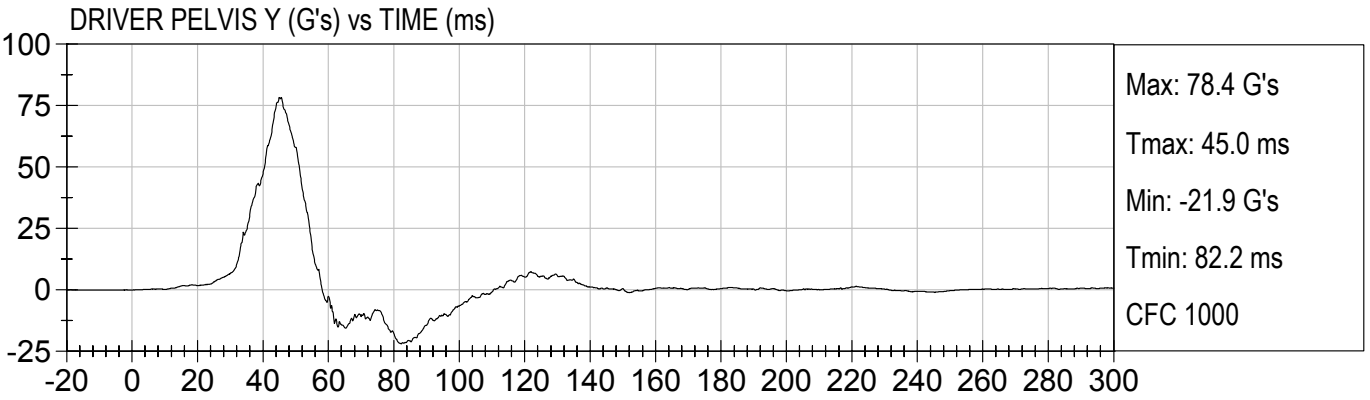
DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)

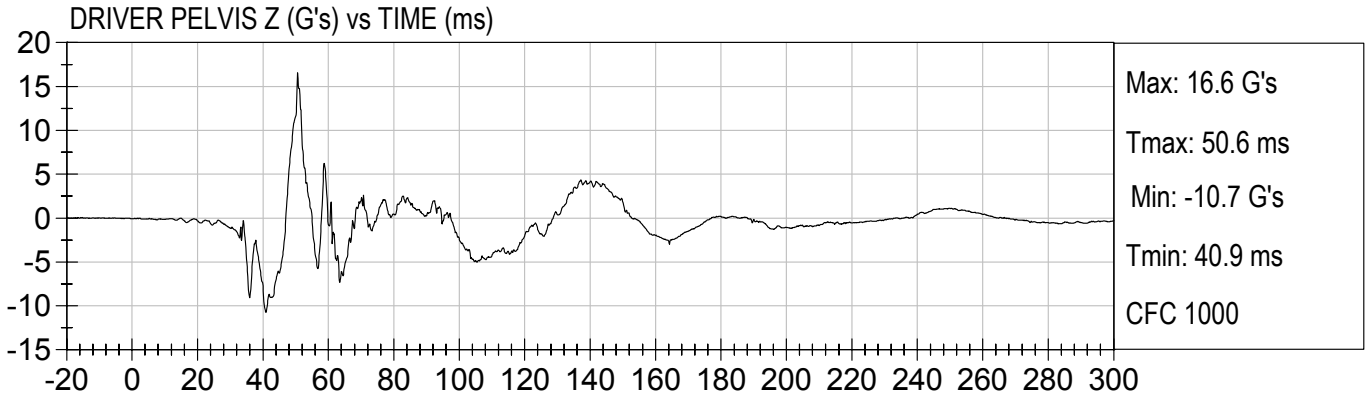


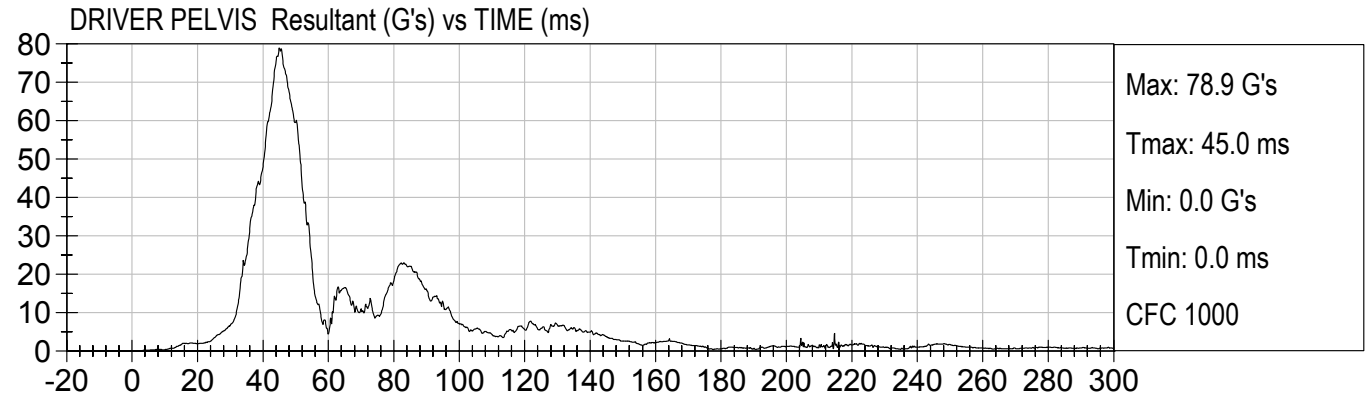
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

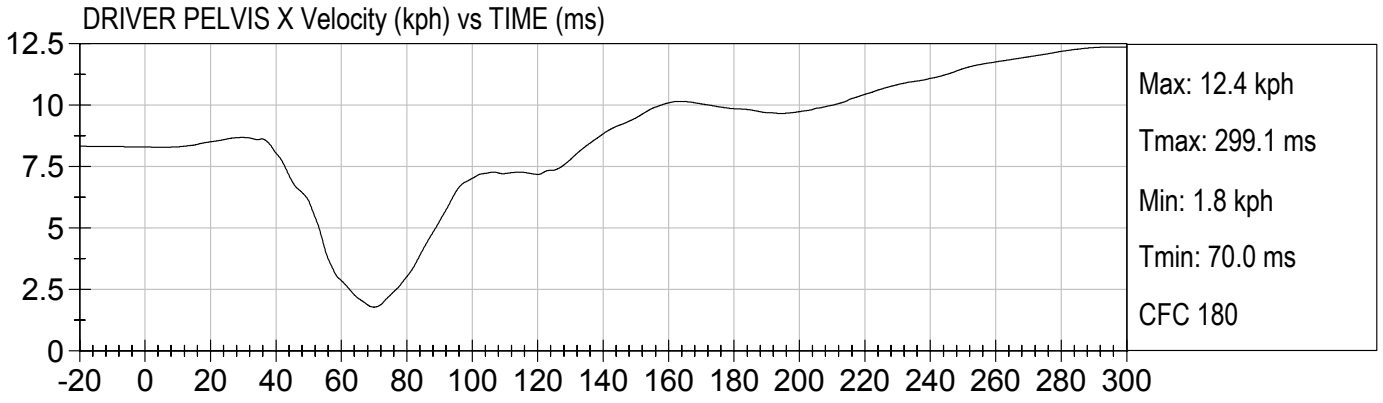
Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

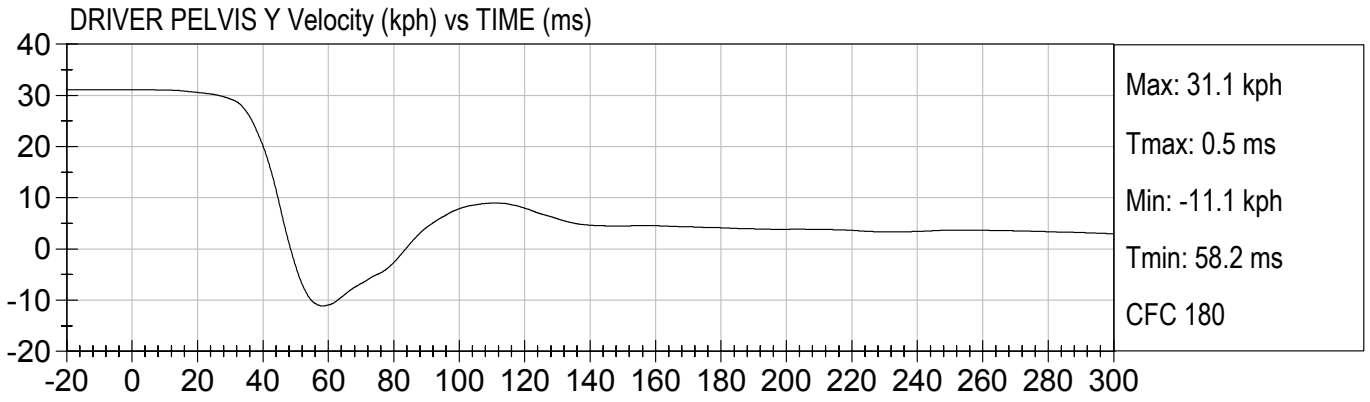


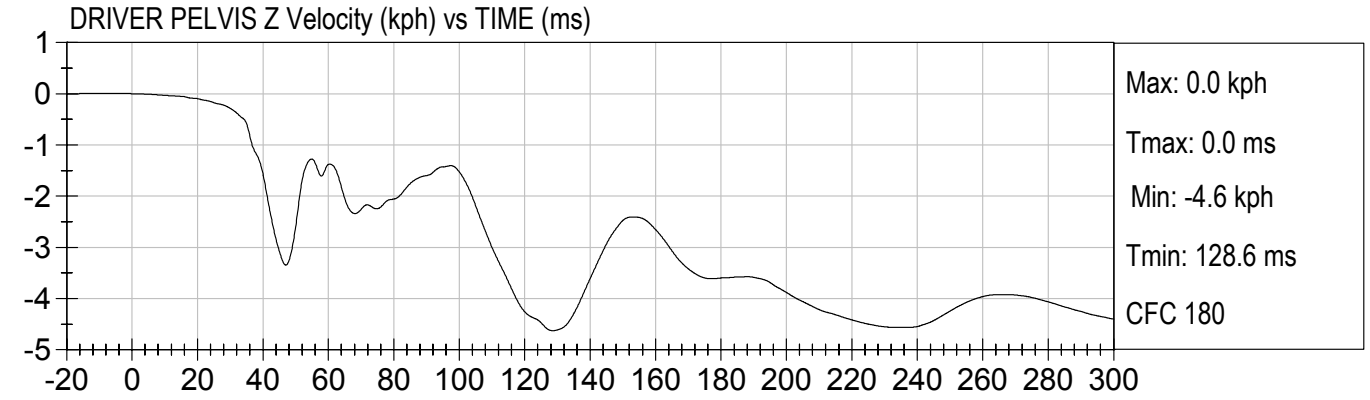







DRIVER PELVIS X Velocity (kph) vs TIME (ms)
12.5
10
7.5
5
2.5
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 12.4 kph
Tmax: 299.1 ms
Min: 1.8 kph
Tmin: 70.0 ms
CFC 180

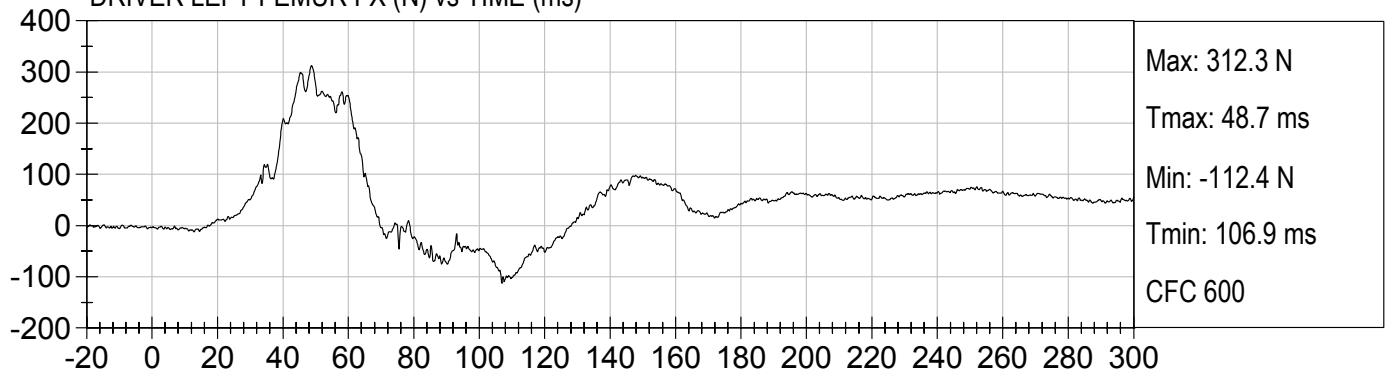

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 31.1 kph
Tmax: 0.5 ms
Min: -11.1 kph
Tmin: 58.2 ms
CFC 180


DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.0 kph
Tmax: 0.0 ms
Min: -4.6 kph
Tmin: 128.6 ms
CFC 180

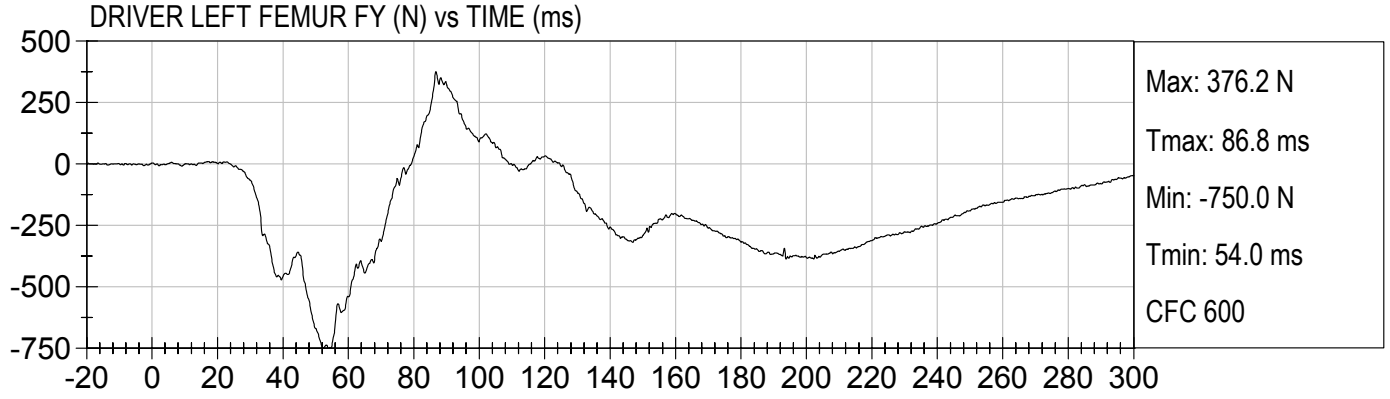
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

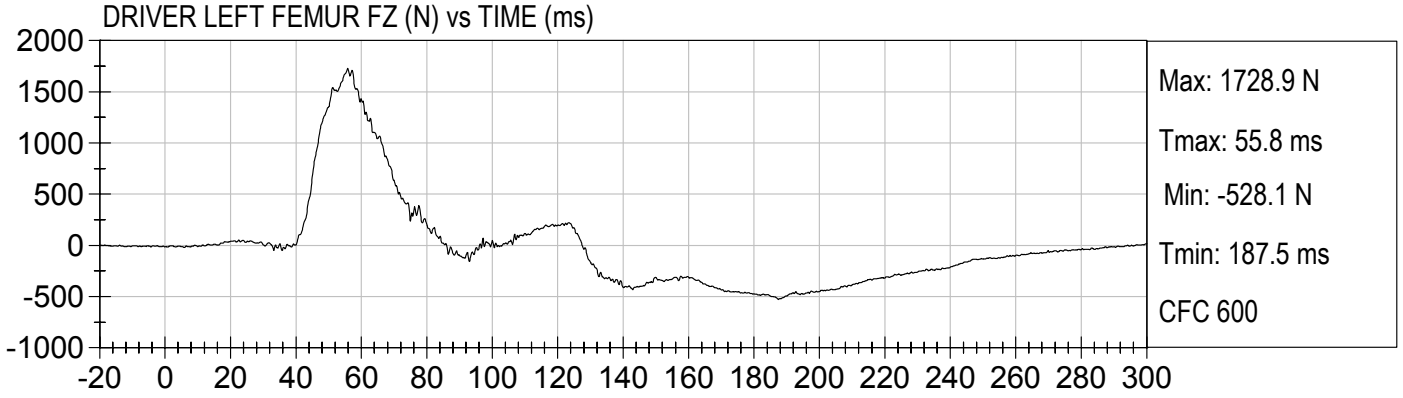
DRIVER LEFT FEMUR FX (N) vs TIME (ms)



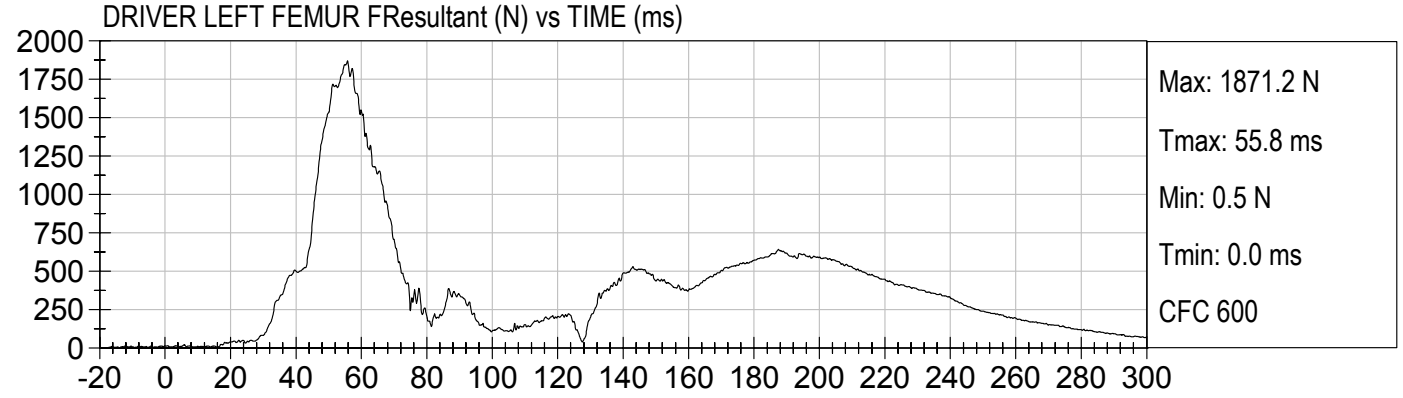
DRIVER LEFT FEMUR FY (N) vs TIME (ms)



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



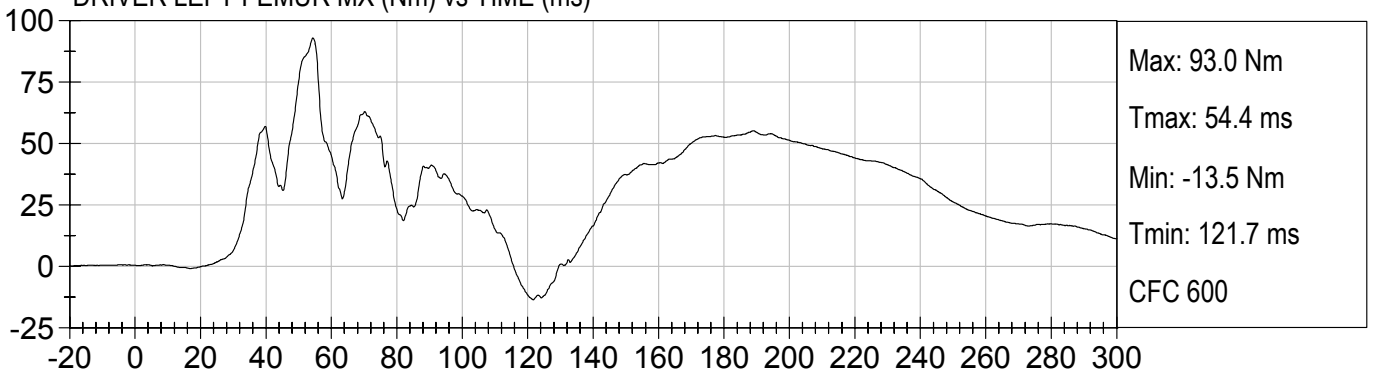
DRIVER LEFT FEMUR FResultant (N) vs TIME (ms)



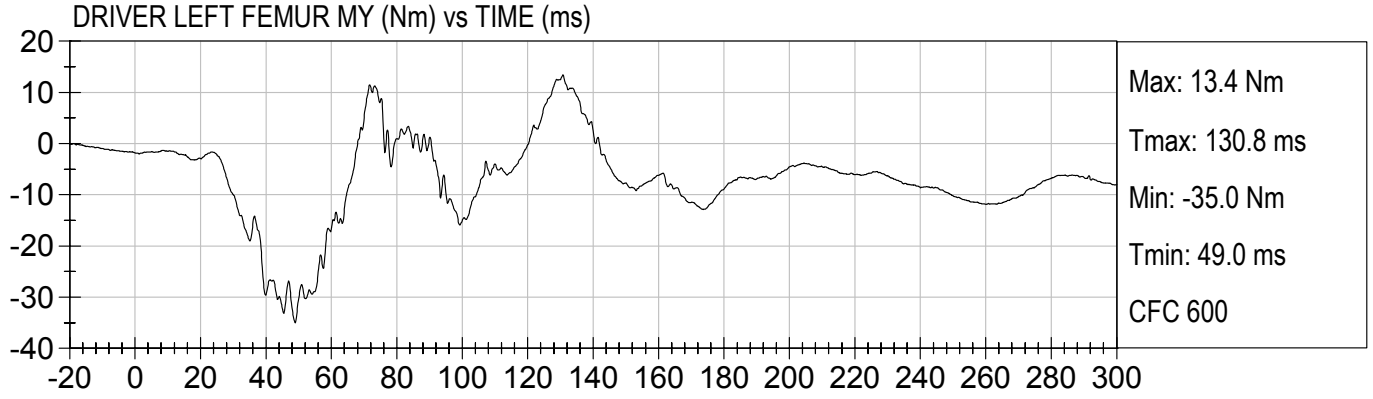
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

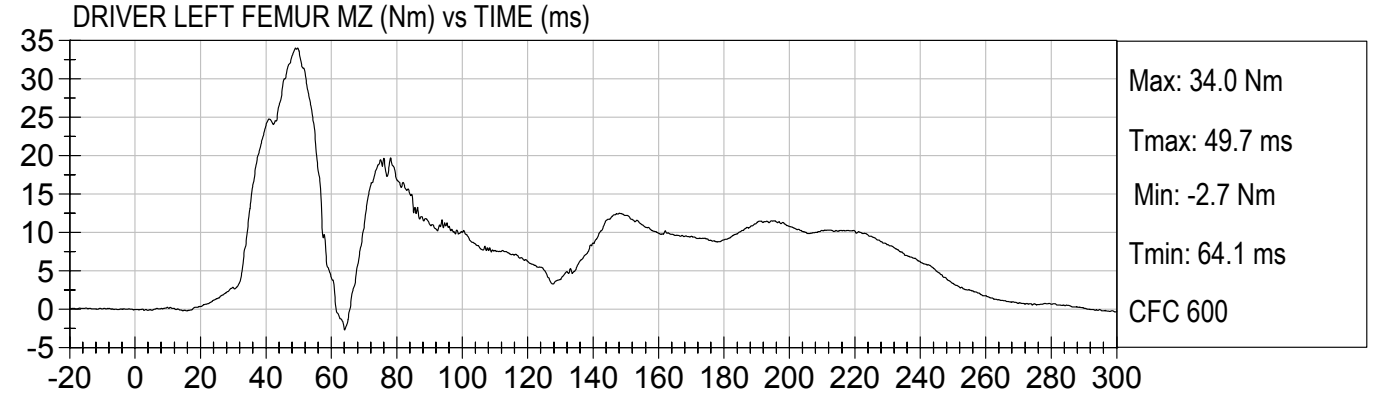
DRIVER LEFT FEMUR MX (Nm) vs TIME (ms)



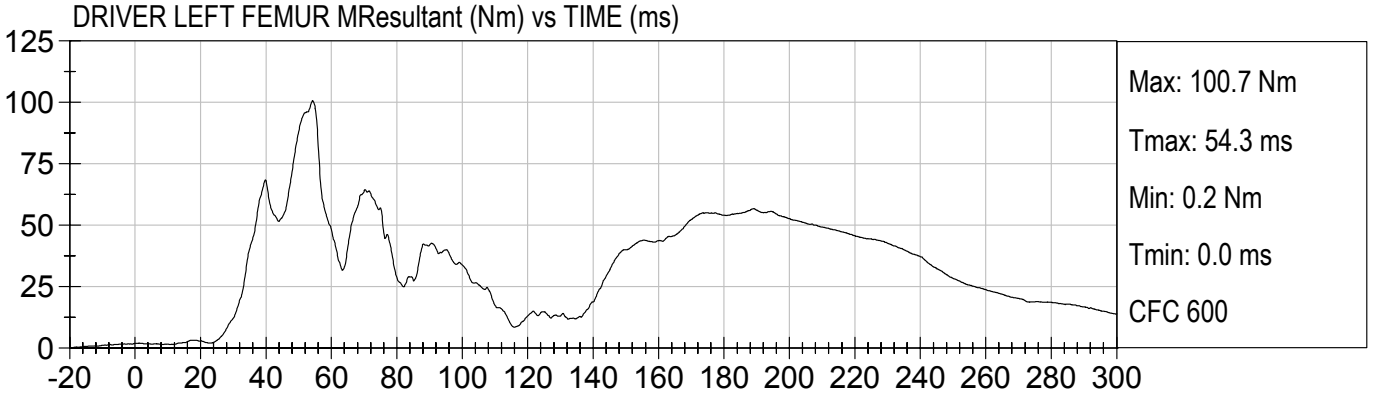
DRIVER LEFT FEMUR MY (Nm) vs TIME (ms)



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



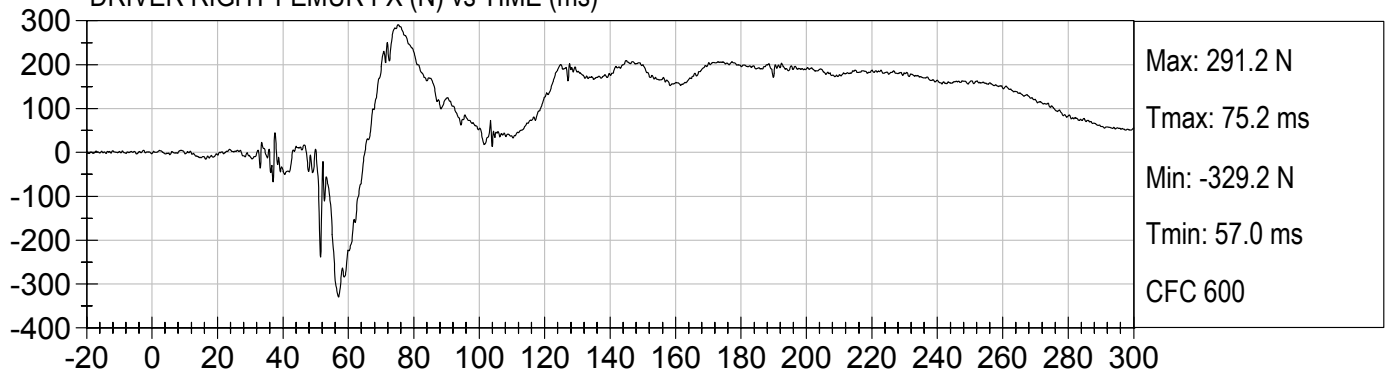
DRIVER LEFT FEMUR MResultant (Nm) vs TIME (ms)



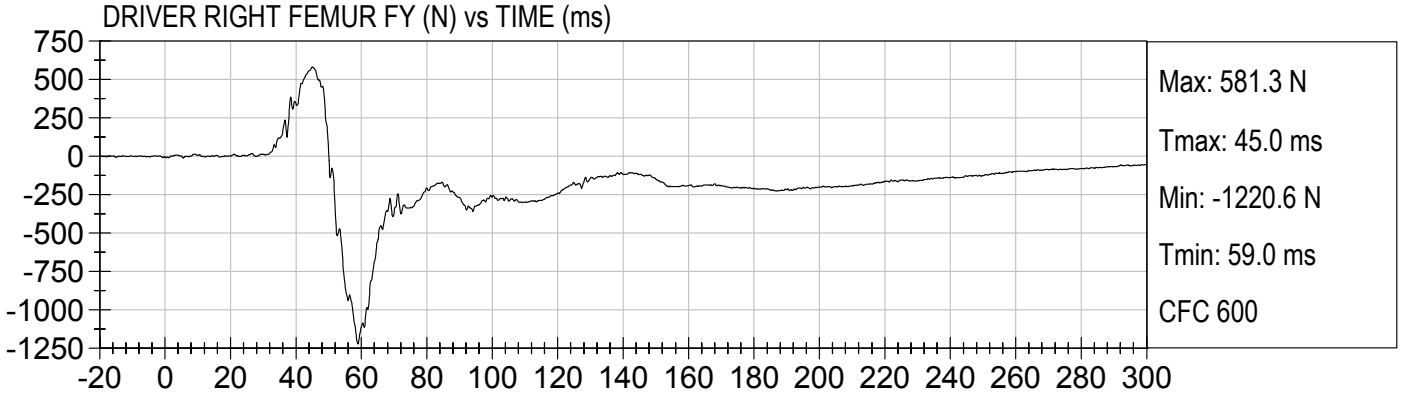
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

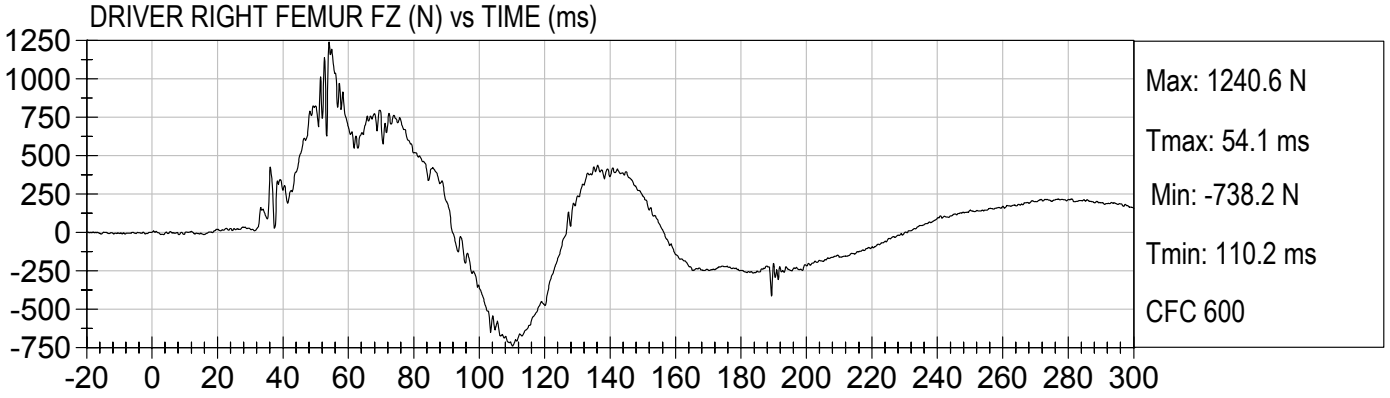
DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



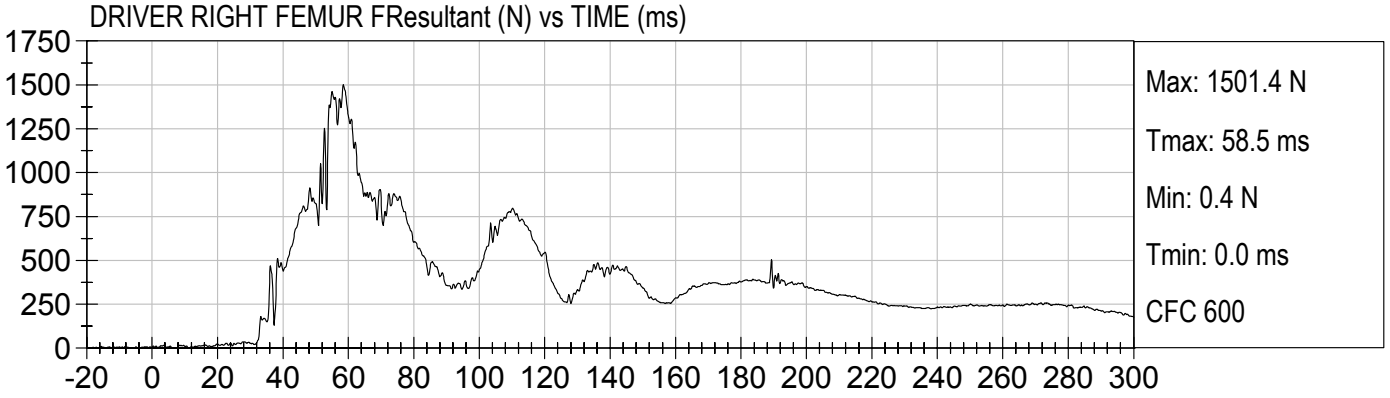
DRIVER RIGHT FEMUR FY (N) vs TIME (ms)



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



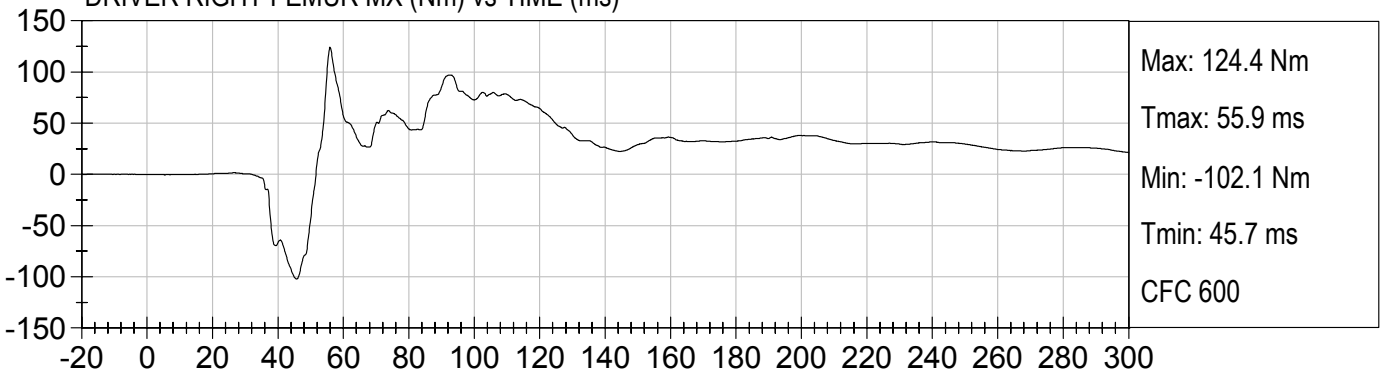
DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)



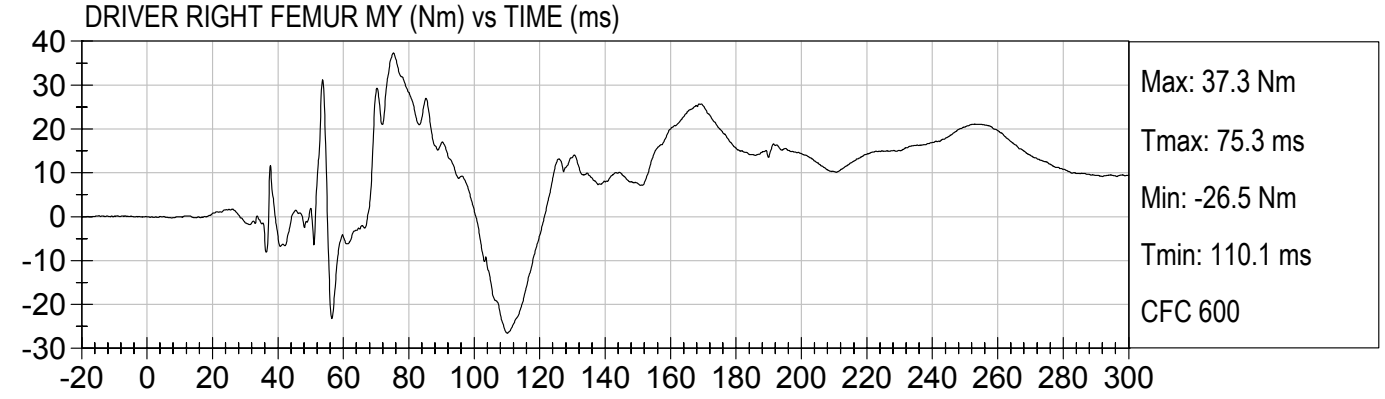
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

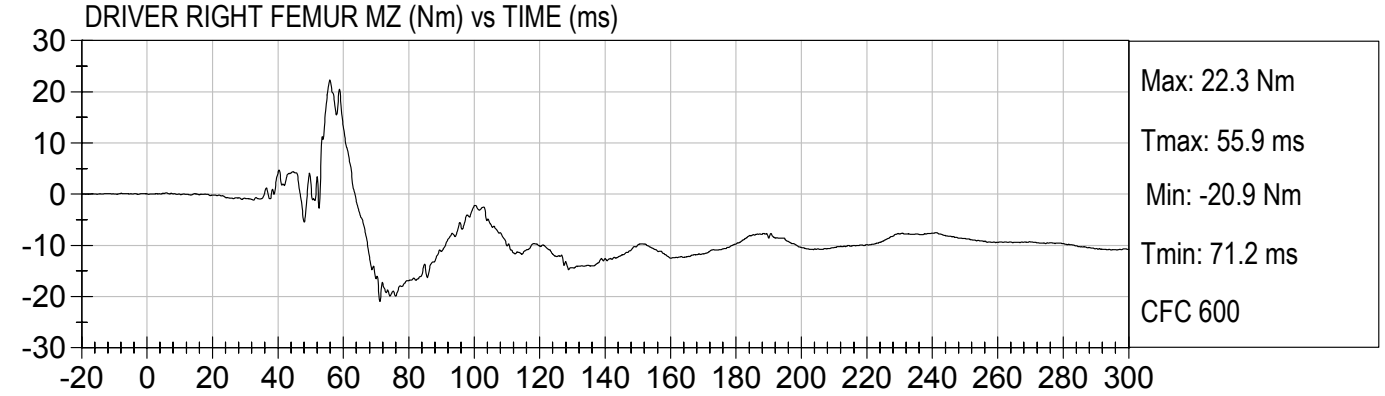
DRIVER RIGHT FEMUR MX (Nm) vs TIME (ms)



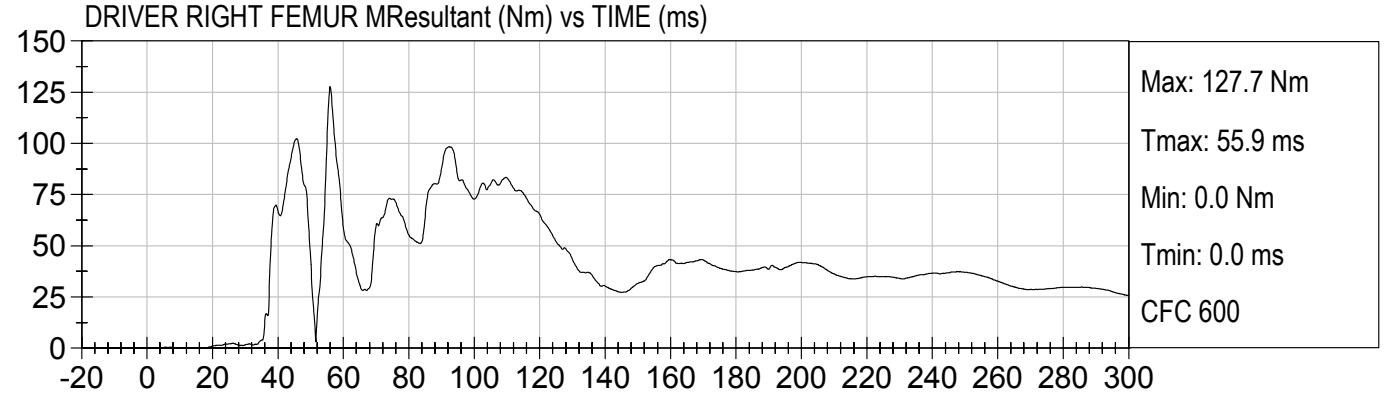
DRIVER RIGHT FEMUR MY (Nm) vs TIME (ms)



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

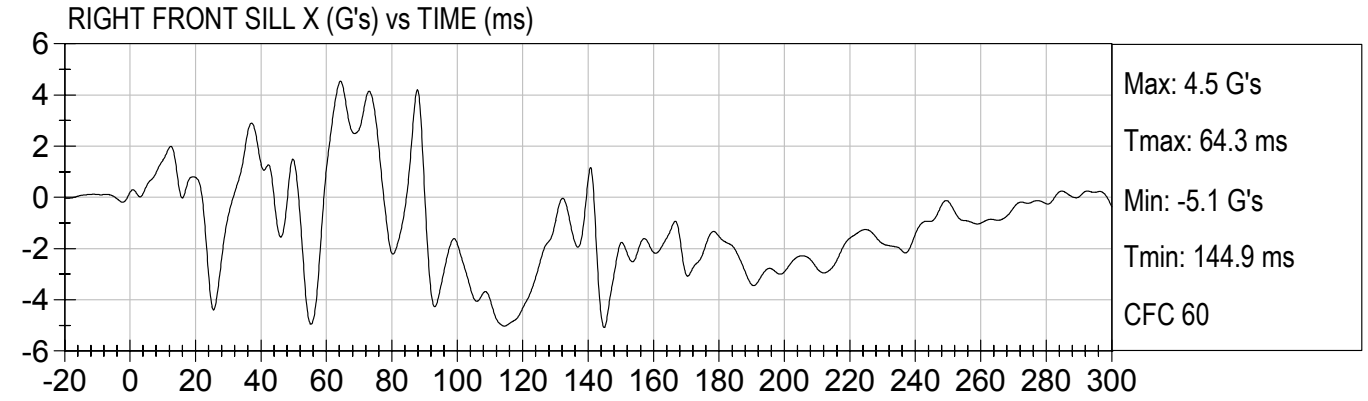


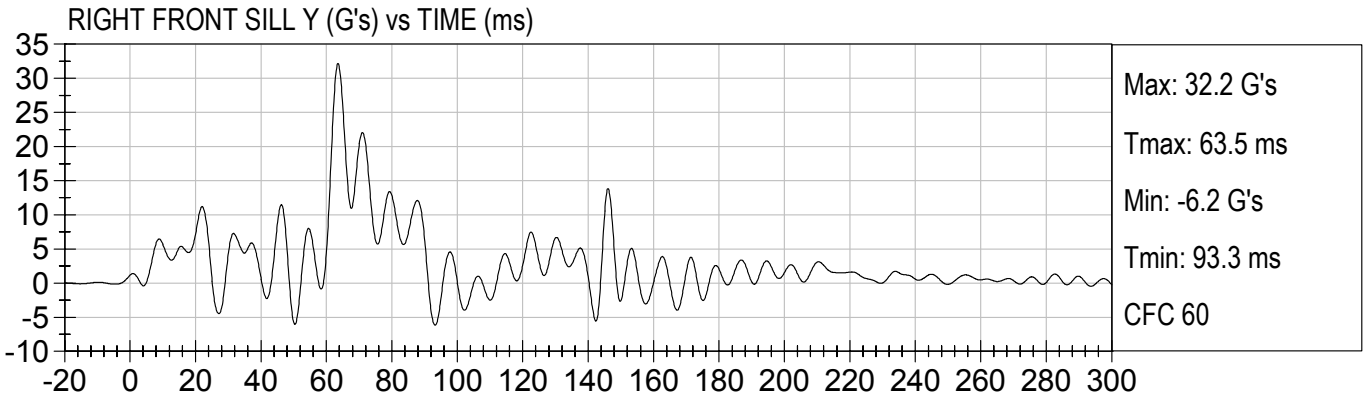
DRIVER RIGHT FEMUR MResultant (Nm) vs TIME (ms)

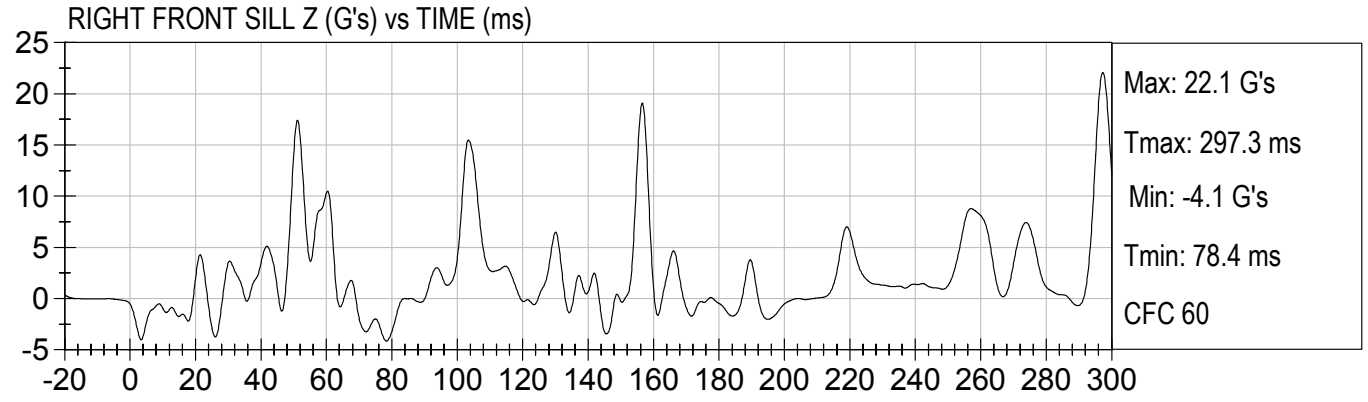


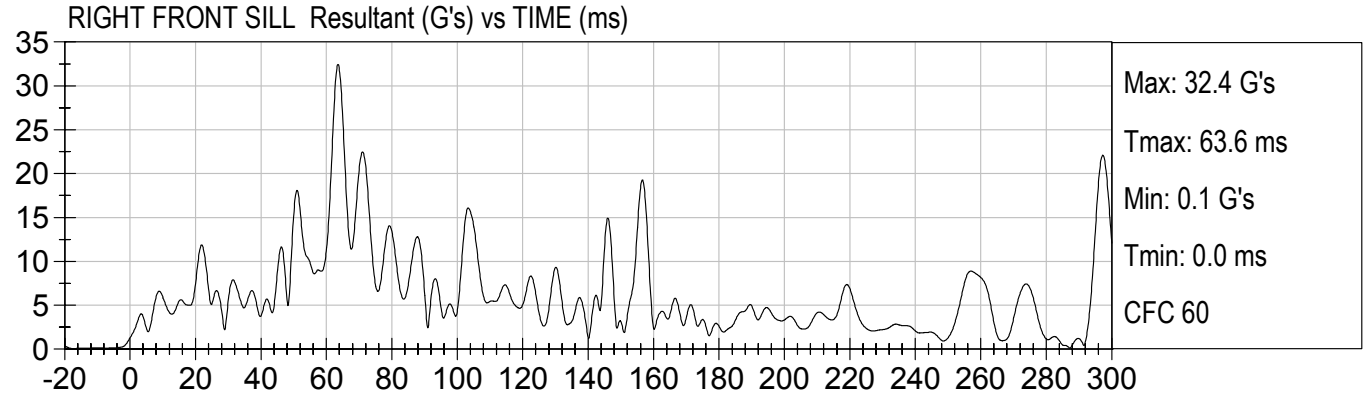
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

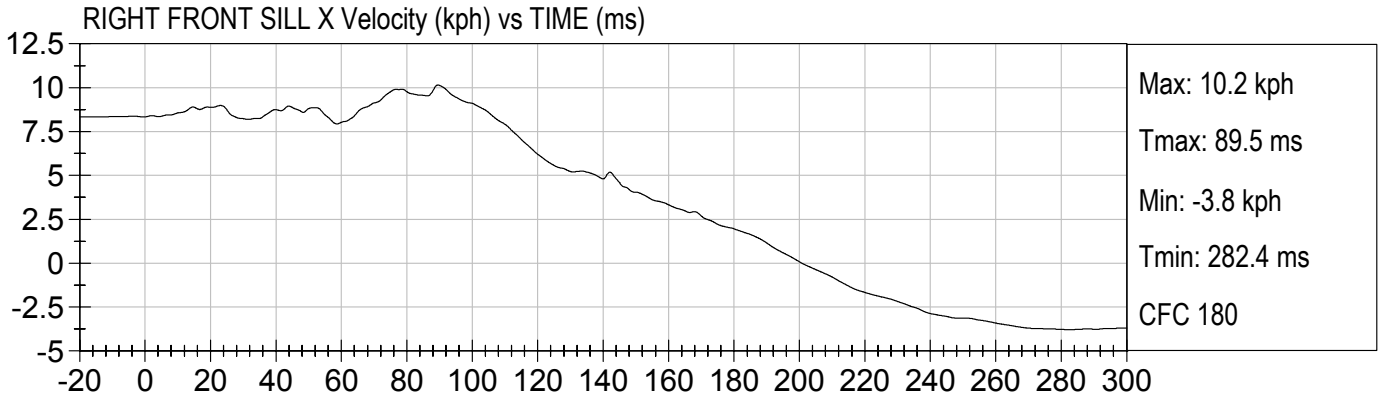
Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

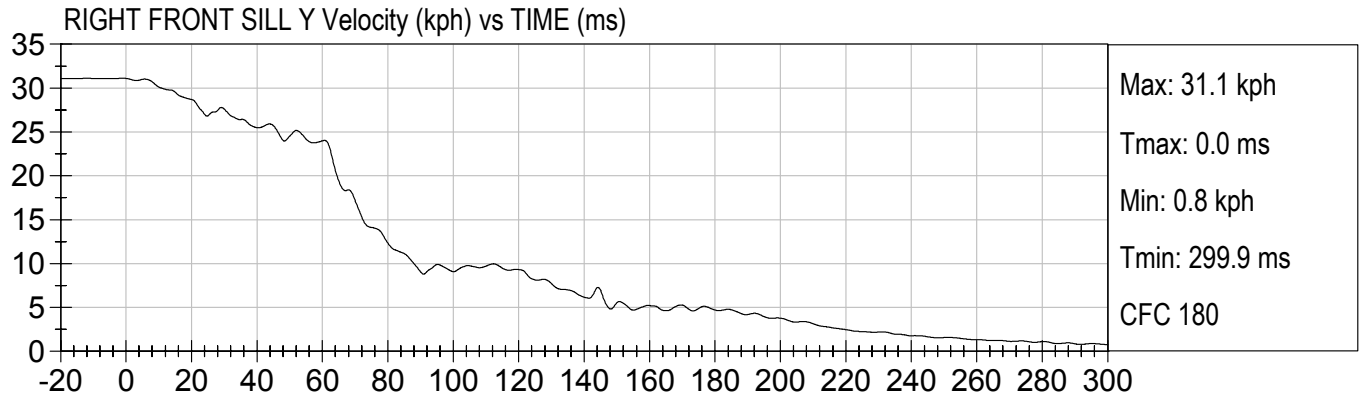


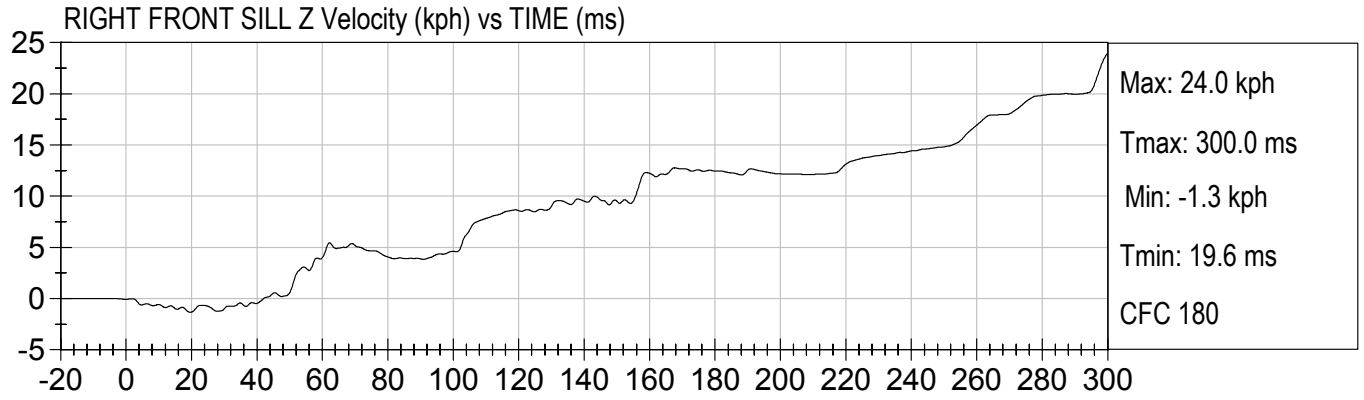






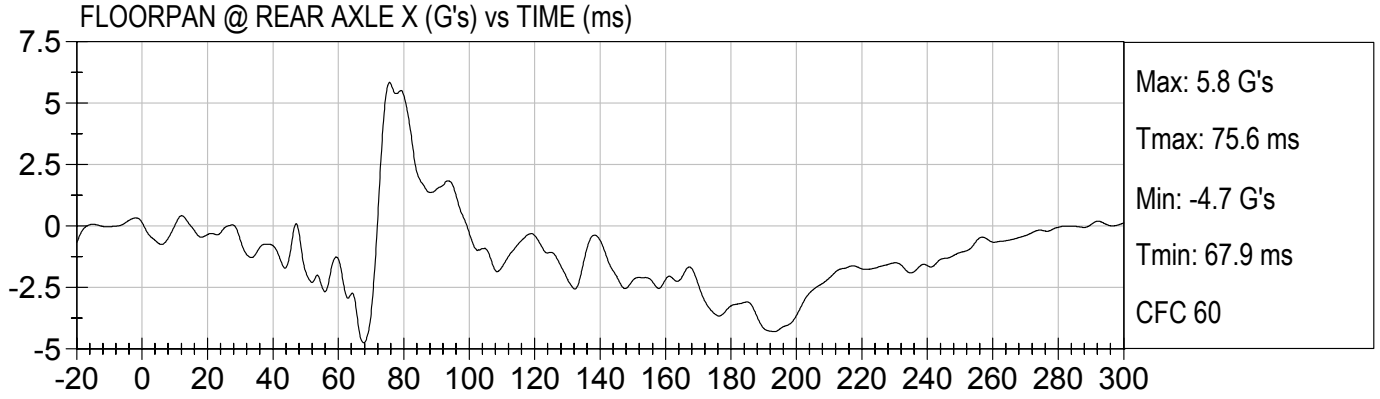

RIGHT FRONT SILL X Velocity (kph) vs TIME (ms)
12.5
10
7.5
5
2.5
0
-2.5
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 10.2 kph
Tmax: 89.5 ms
Min: -3.8 kph
Tmin: 282.4 ms
CFC 180

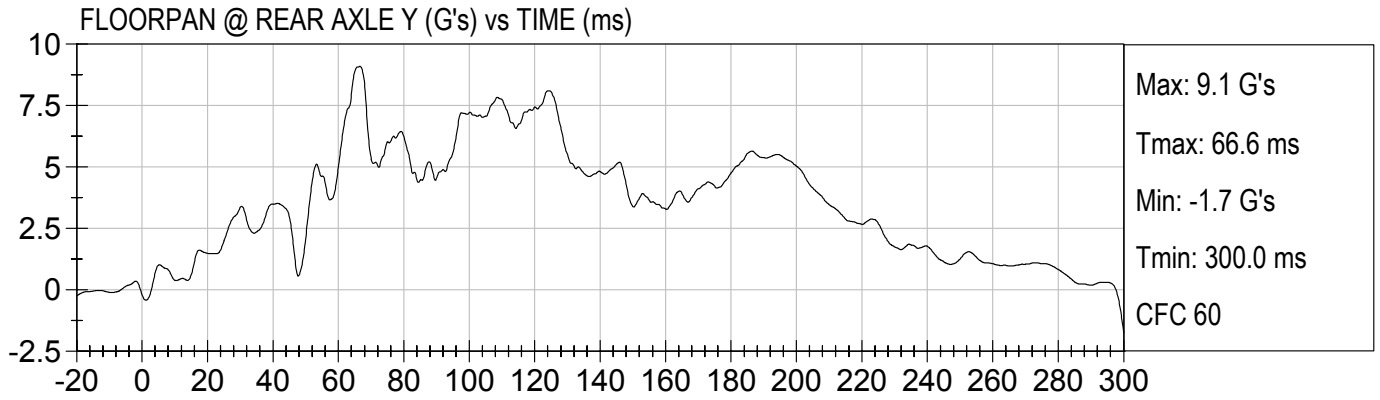

RIGHT FRONT SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 31.1 kph
Tmax: 0.0 ms
Min: 0.8 kph
Tmin: 299.9 ms
CFC 180

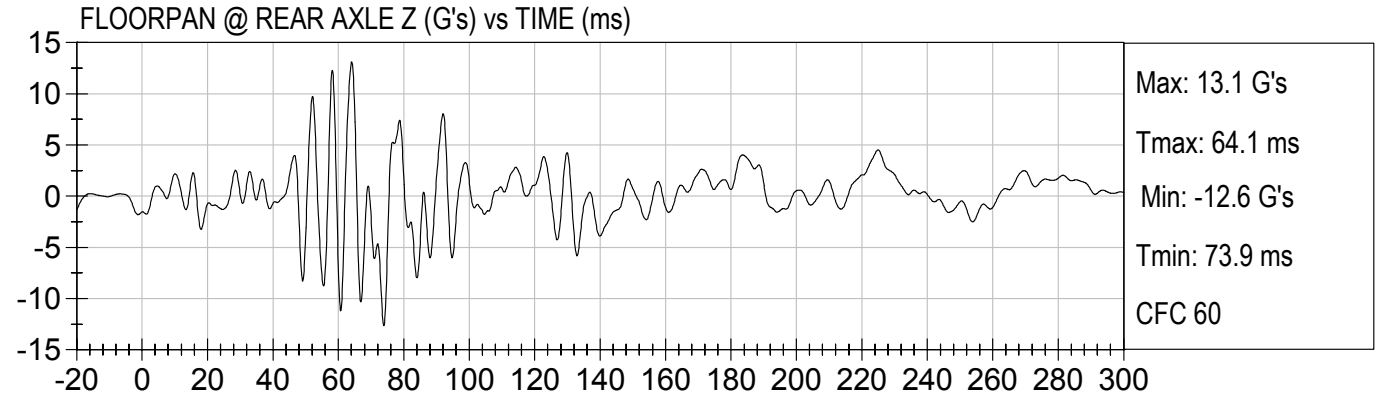

RIGHT FRONT SILL Z Velocity (kph) vs TIME (ms)
25
20
15
10
5
0
-5
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 24.0 kph
Tmax: 300.0 ms
Min: -1.3 kph
Tmin: 19.6 ms
CFC 180

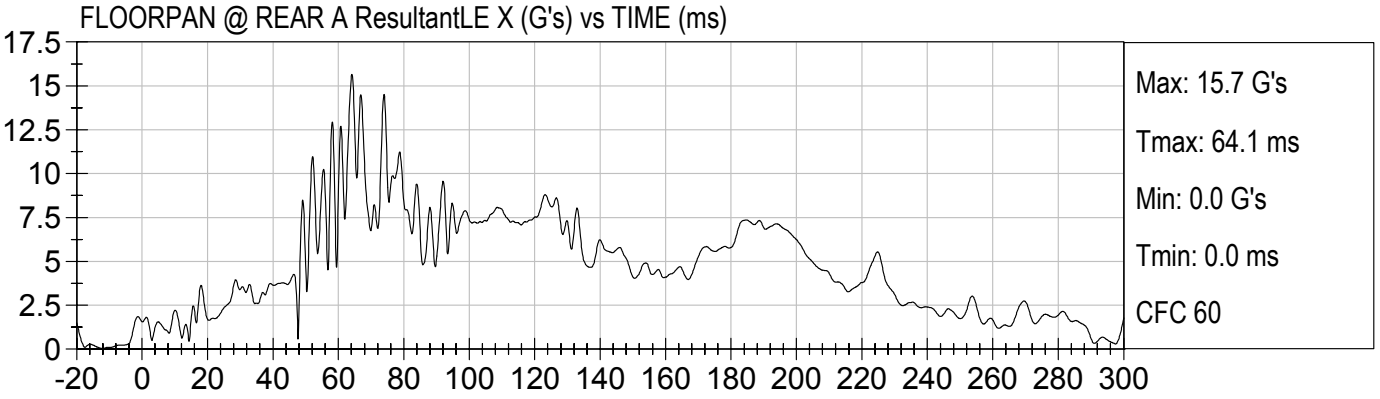
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

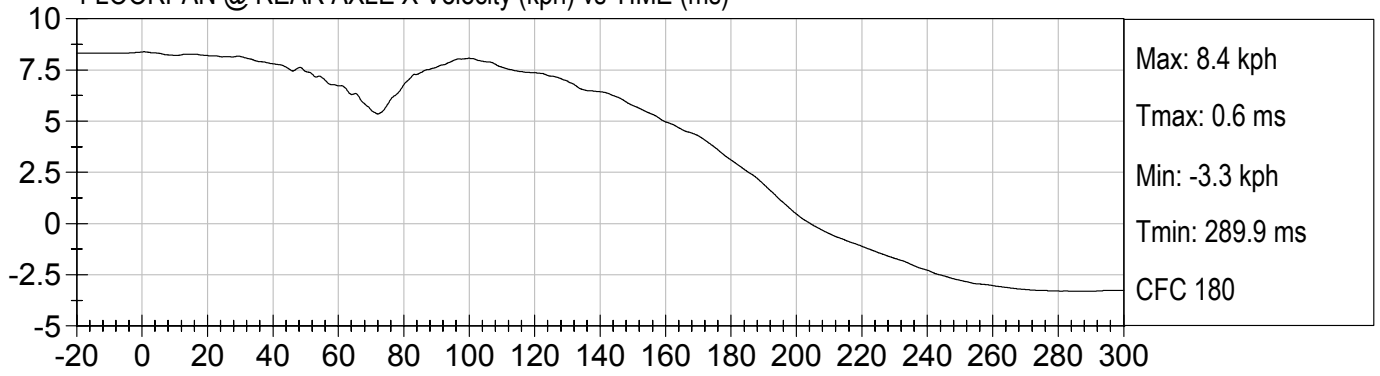




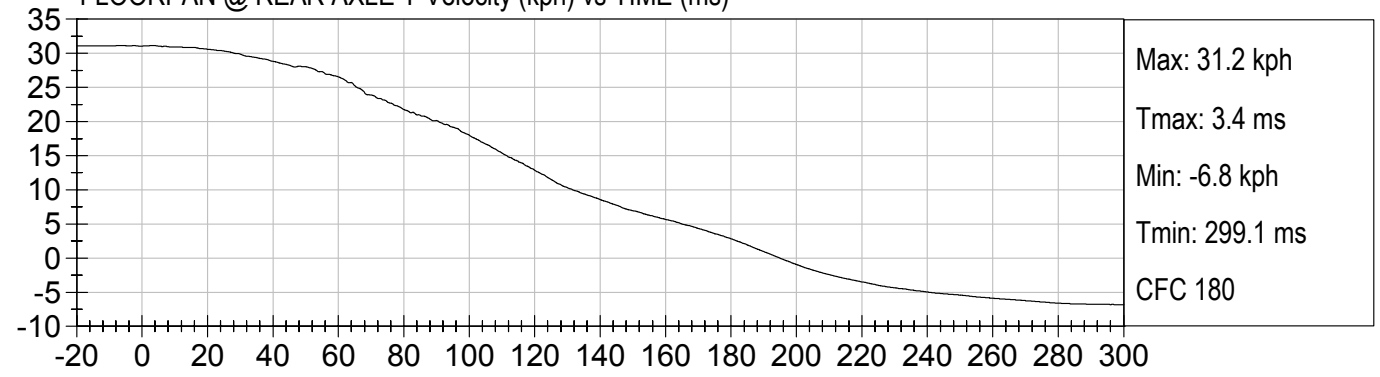




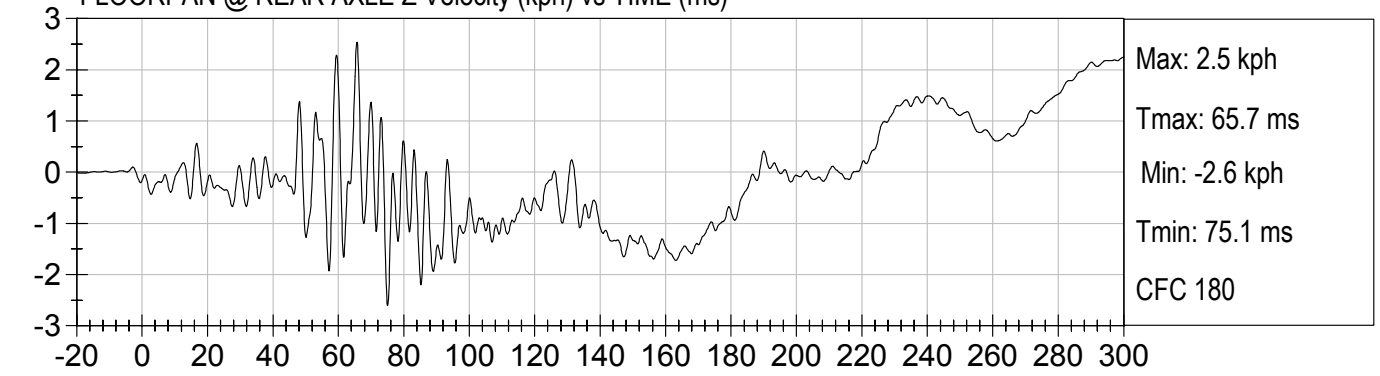
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)



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

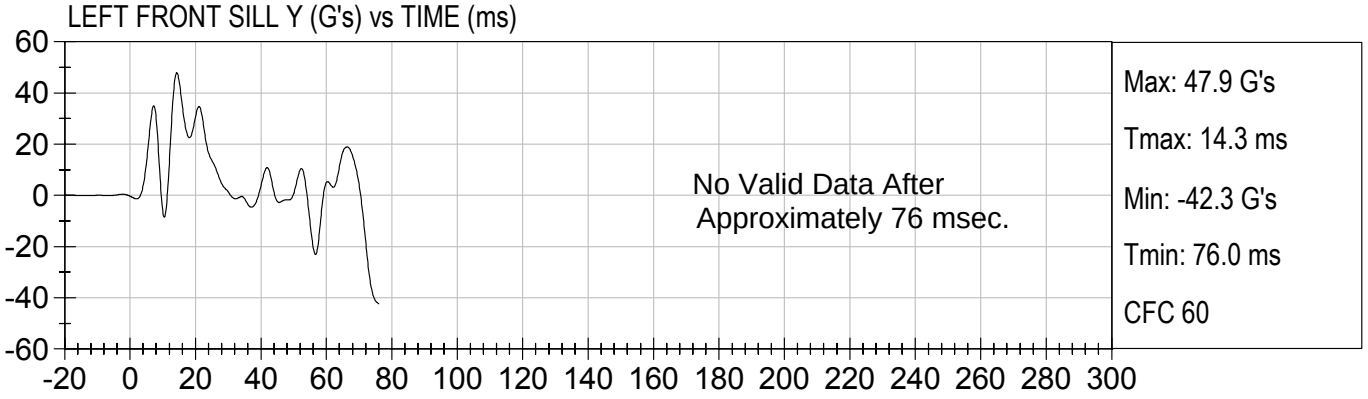


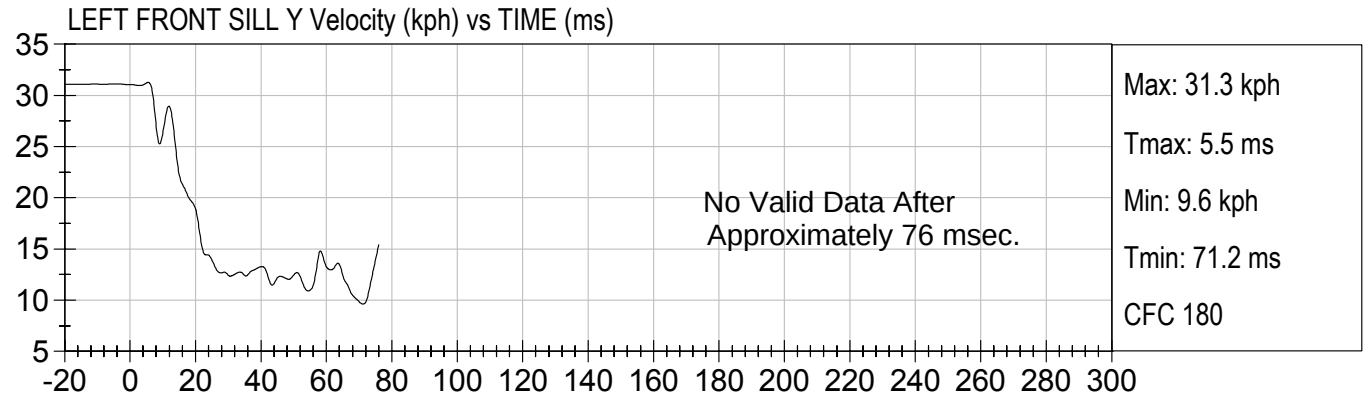
FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)

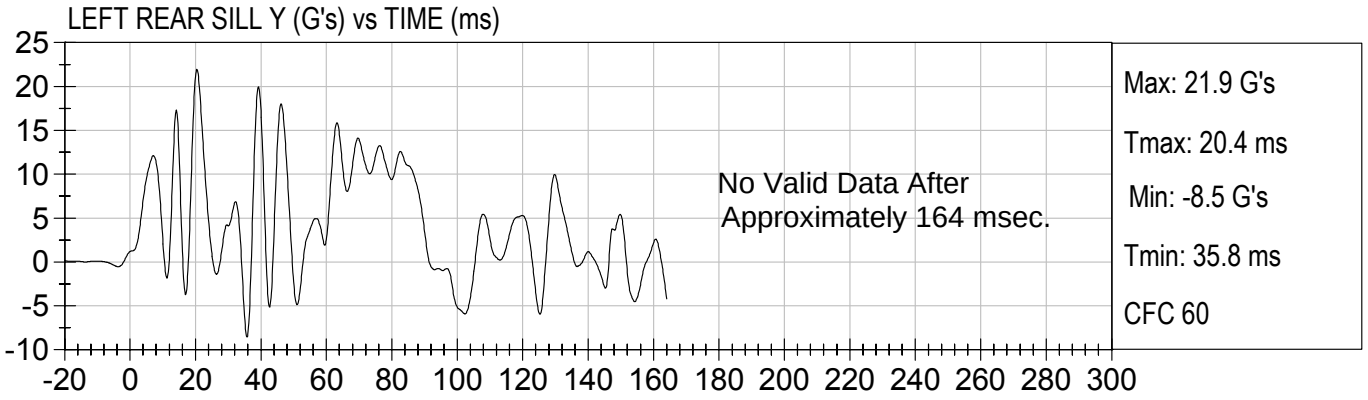


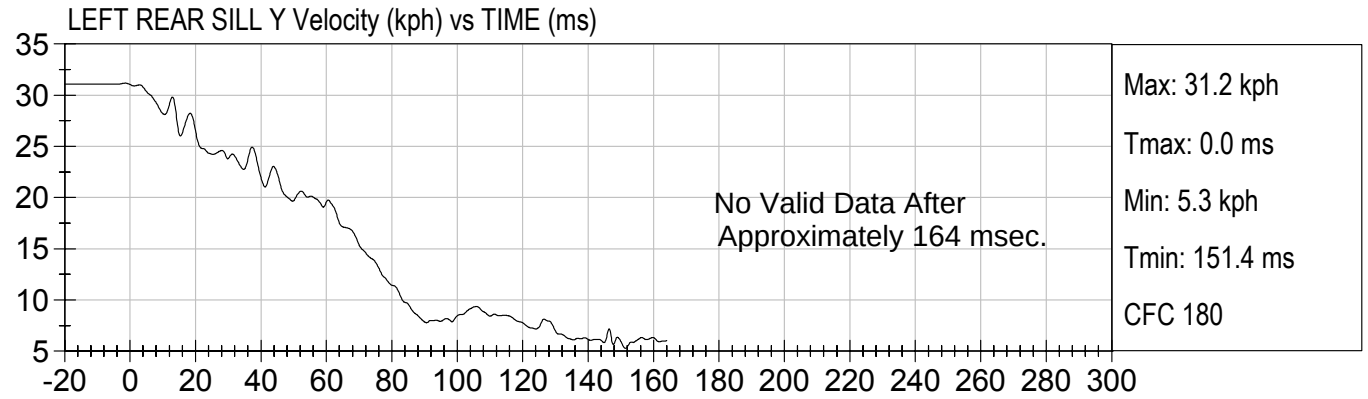
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)



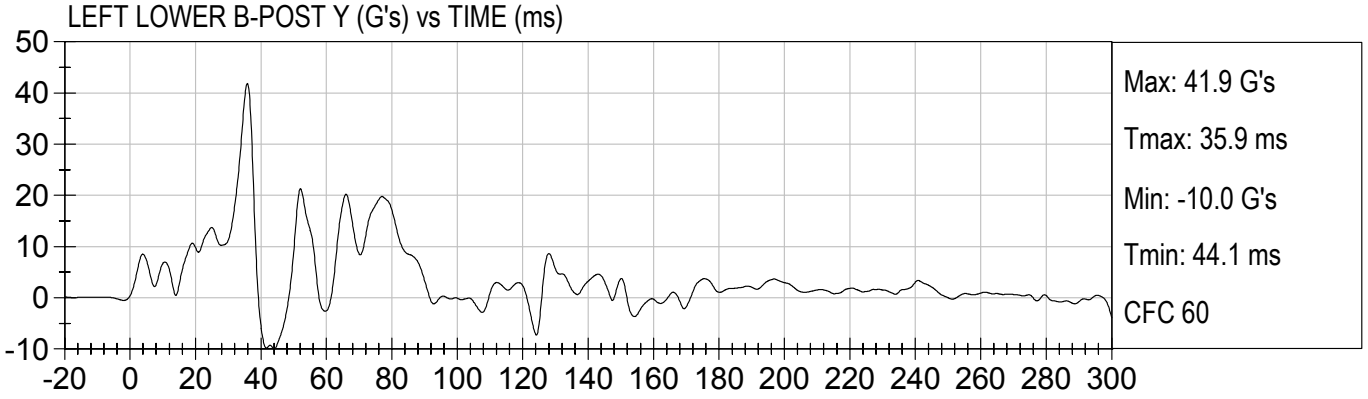


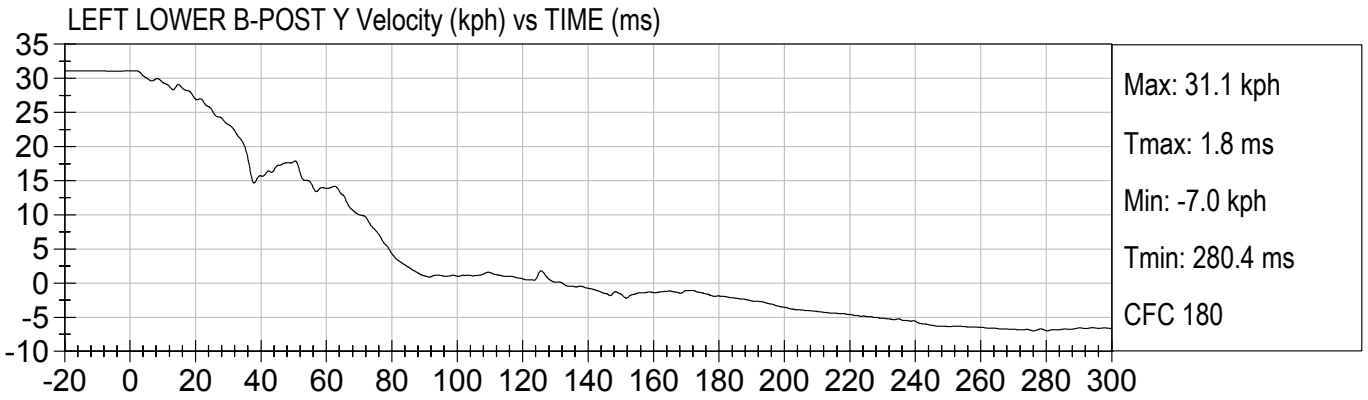


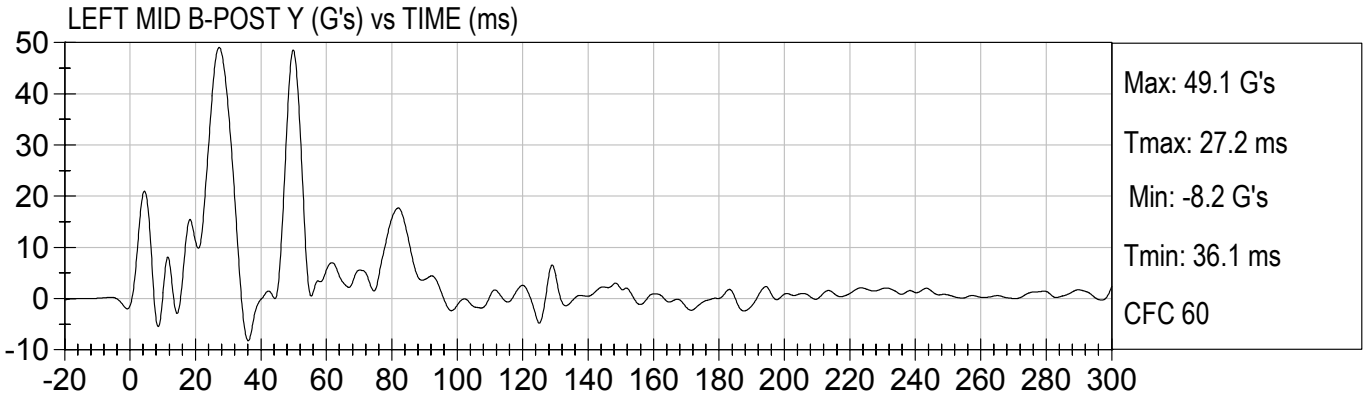


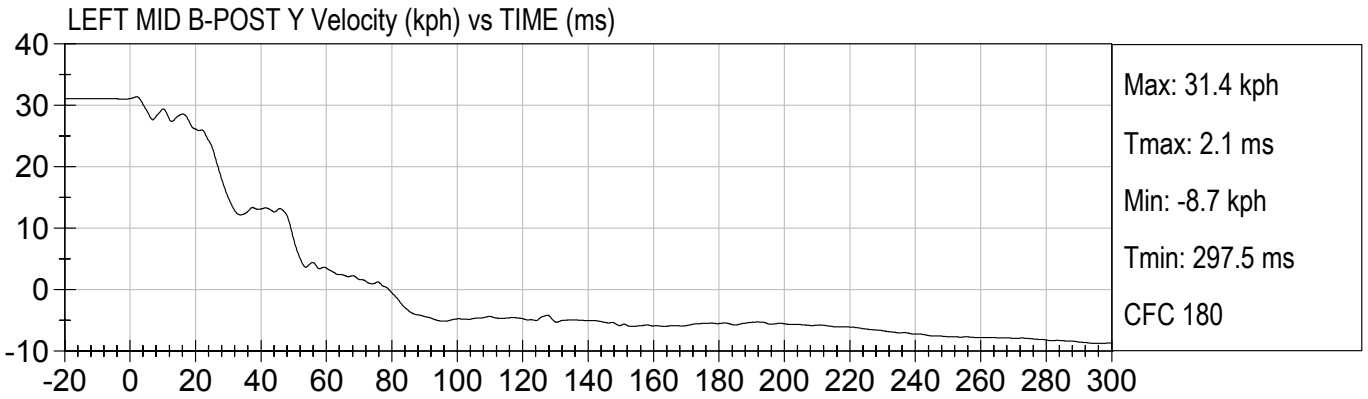
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)





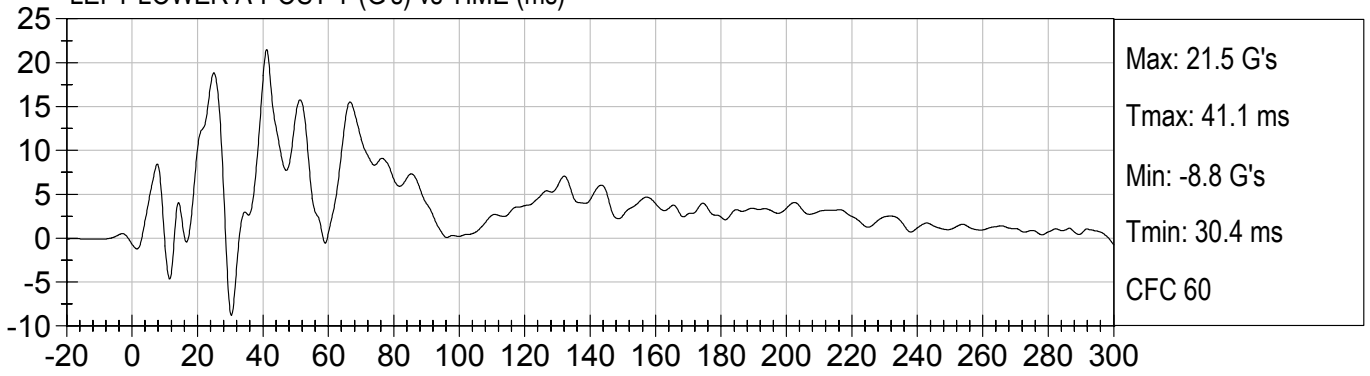




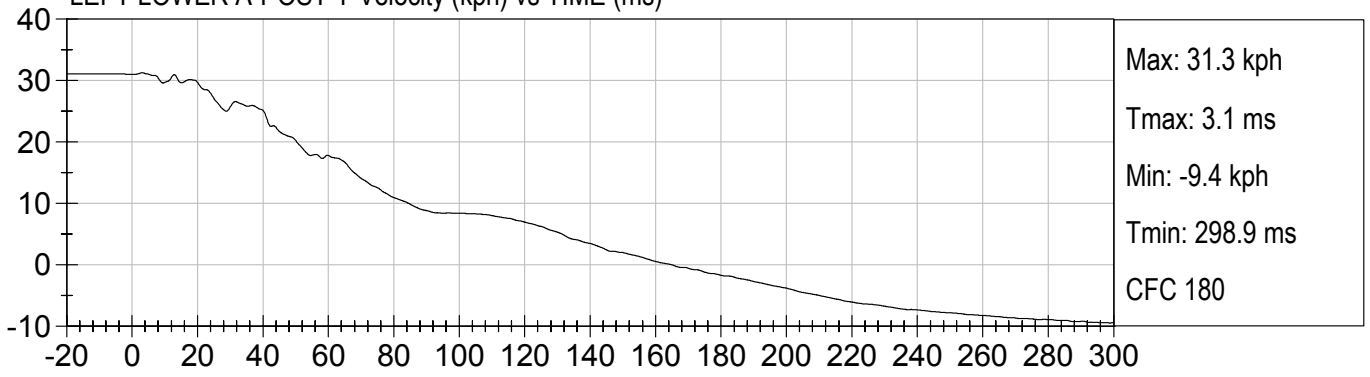
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

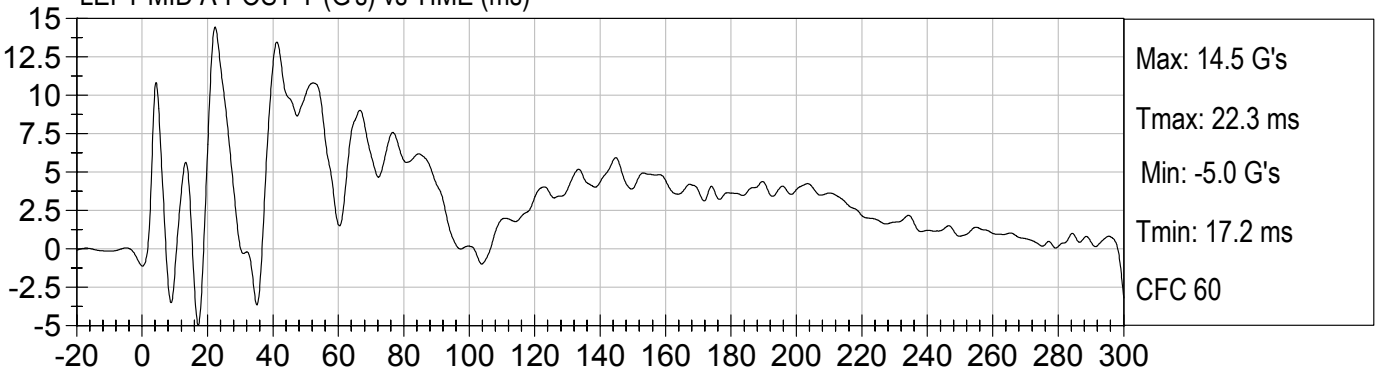
LEFT LOWER A-POST Y (G's) vs TIME (ms)



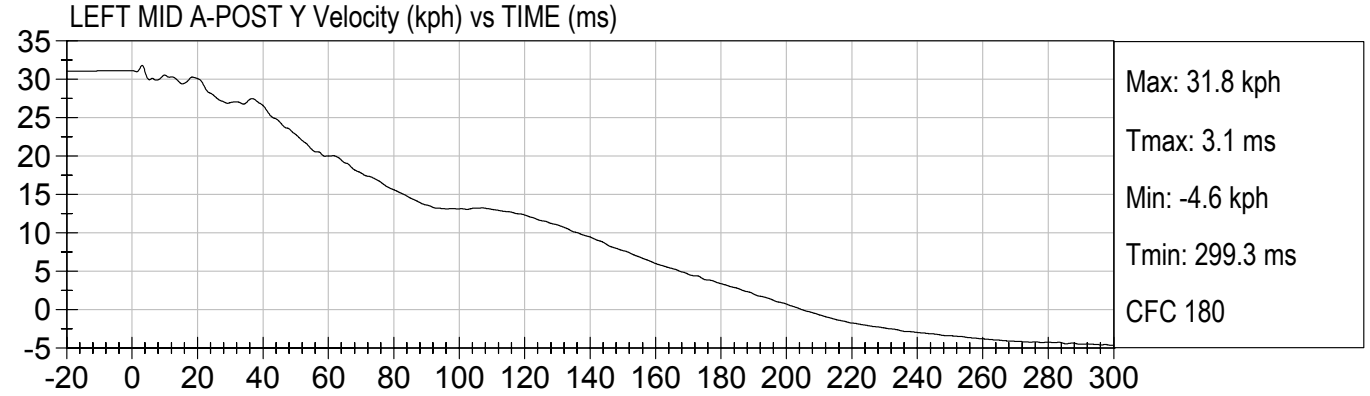
LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)



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



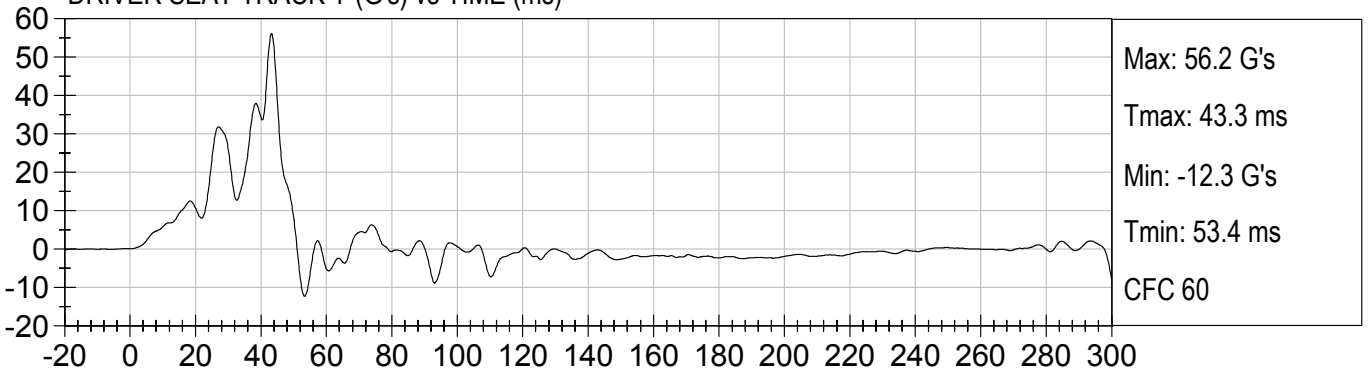
LEFT MID A-POST Y Velocity (kph) vs TIME (ms)



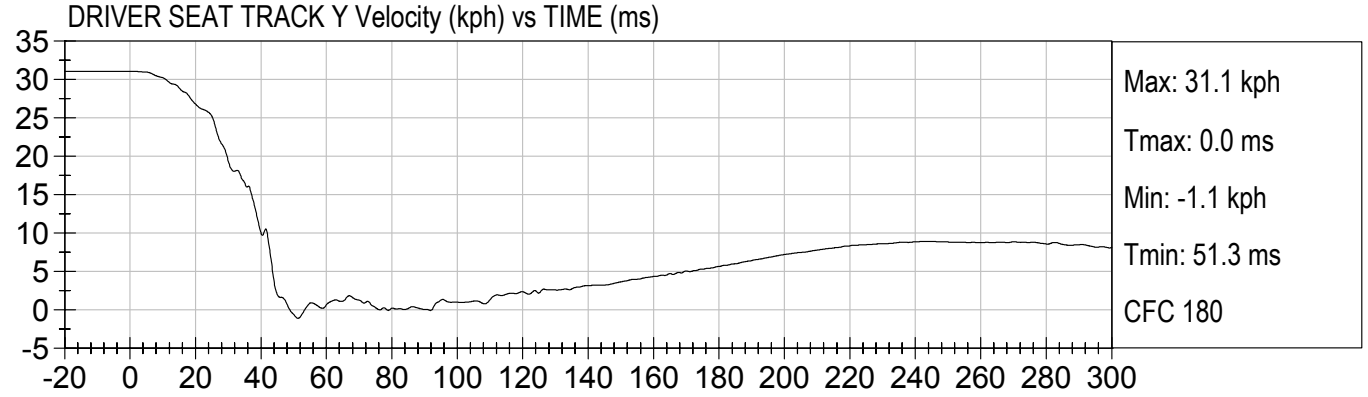
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

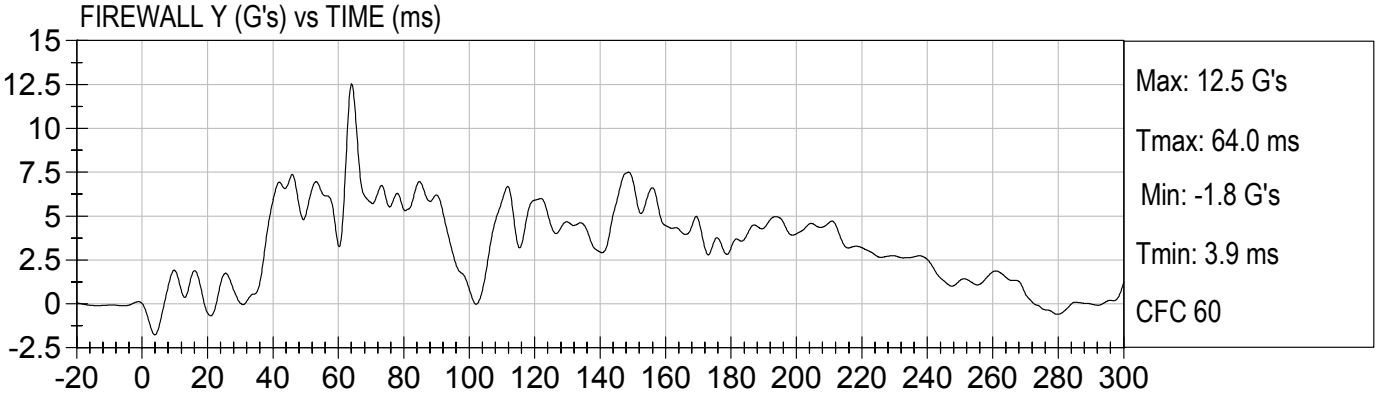
DRIVER SEAT TRACK Y (G's) vs TIME (ms)



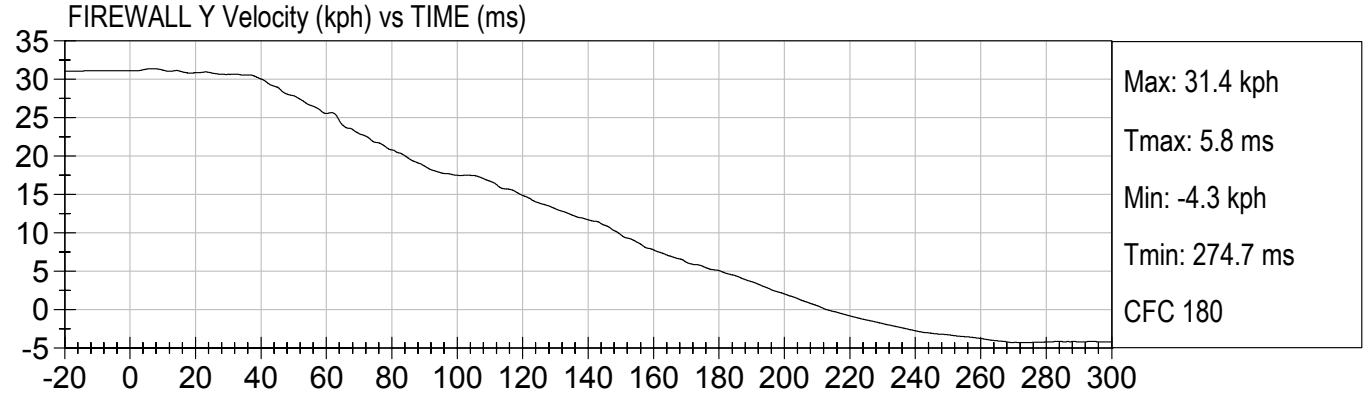
DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)



FIREWALL Y (G's) vs TIME (ms)



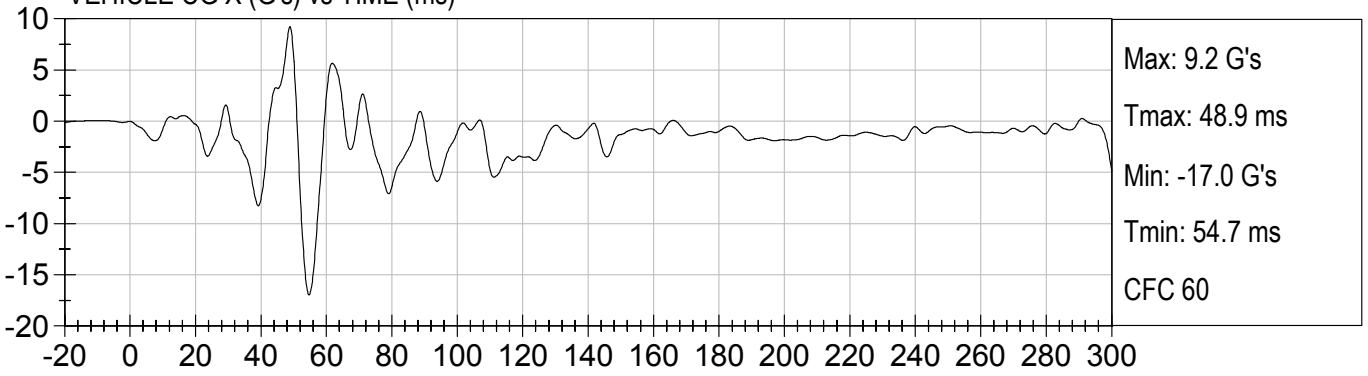
FIREWALL Y Velocity (kph) vs TIME (ms)



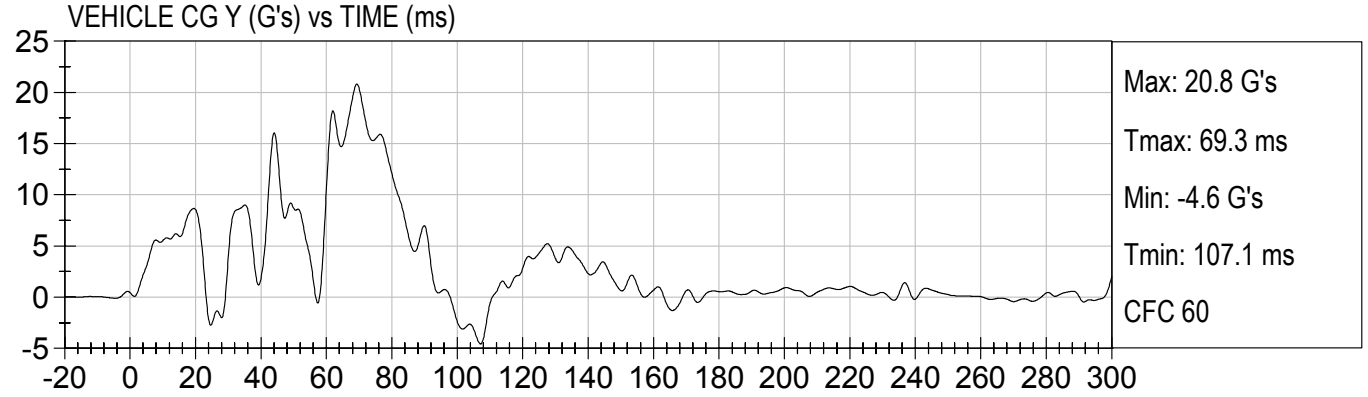
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

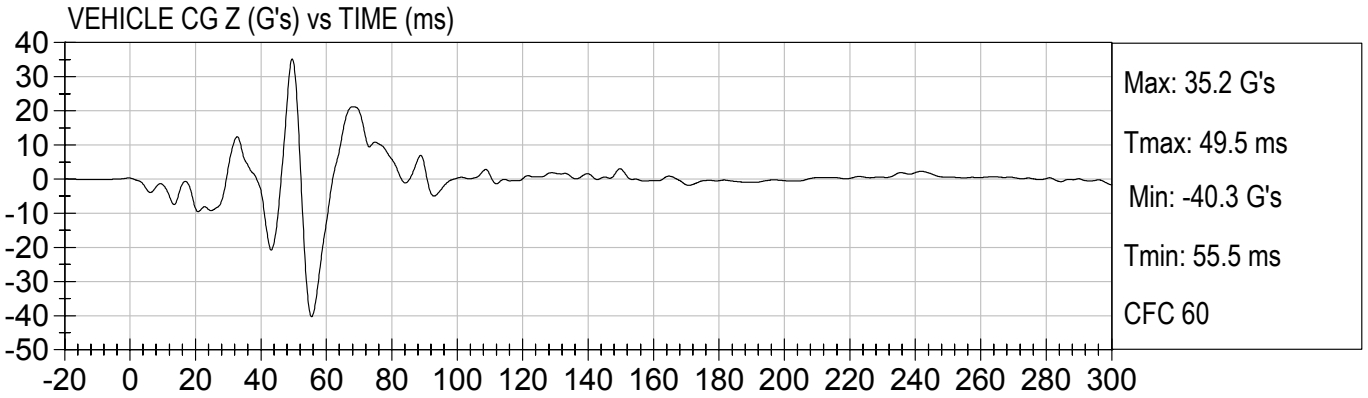
VEHICLE CG X (G's) vs TIME (ms)



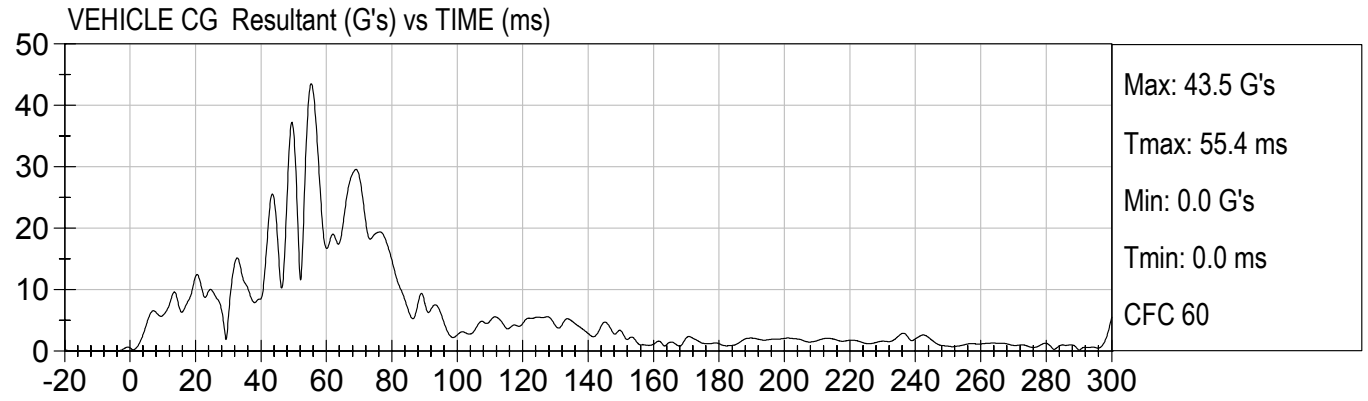
VEHICLE CG Y (G's) vs TIME (ms)

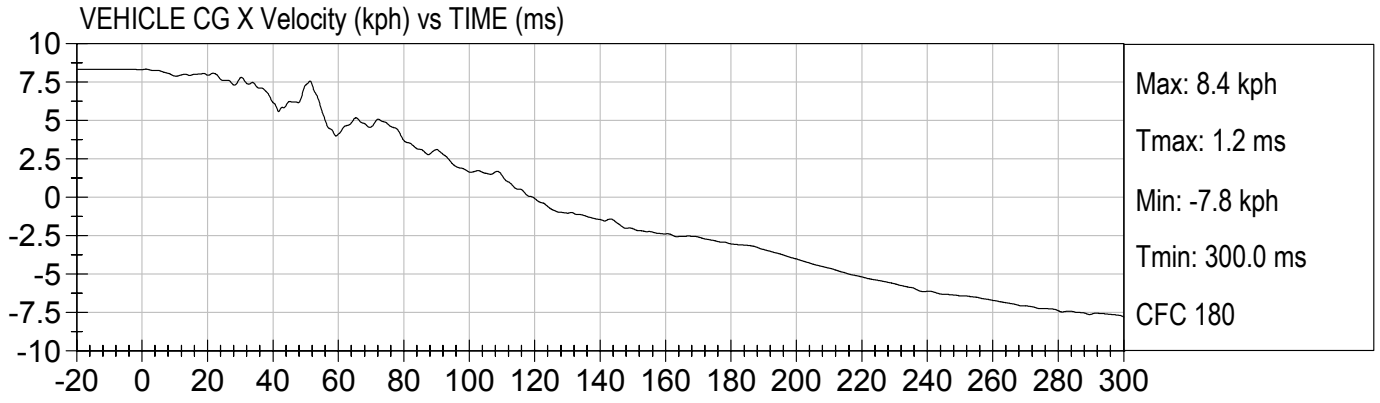


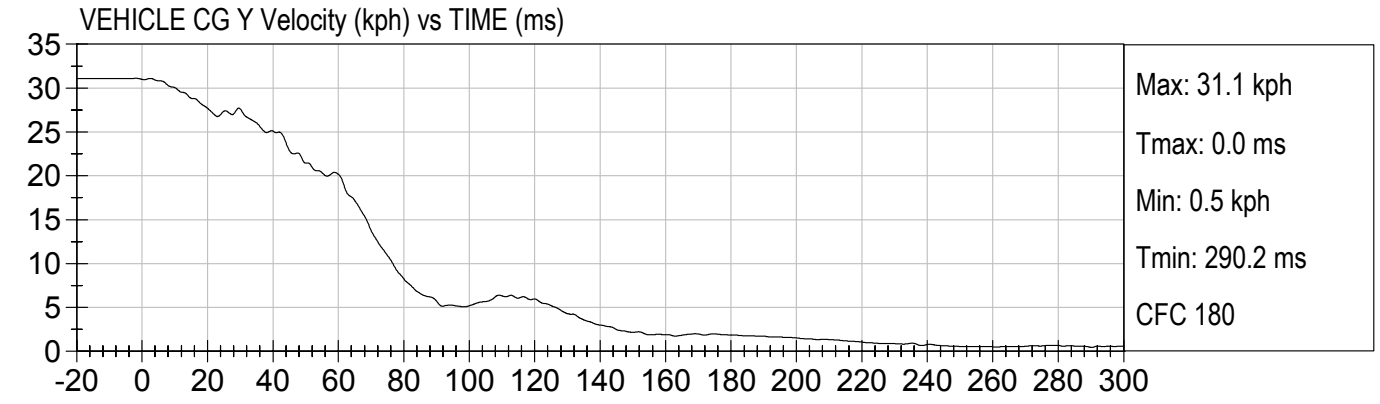
VEHICLE CG Z (G's) vs TIME (ms)

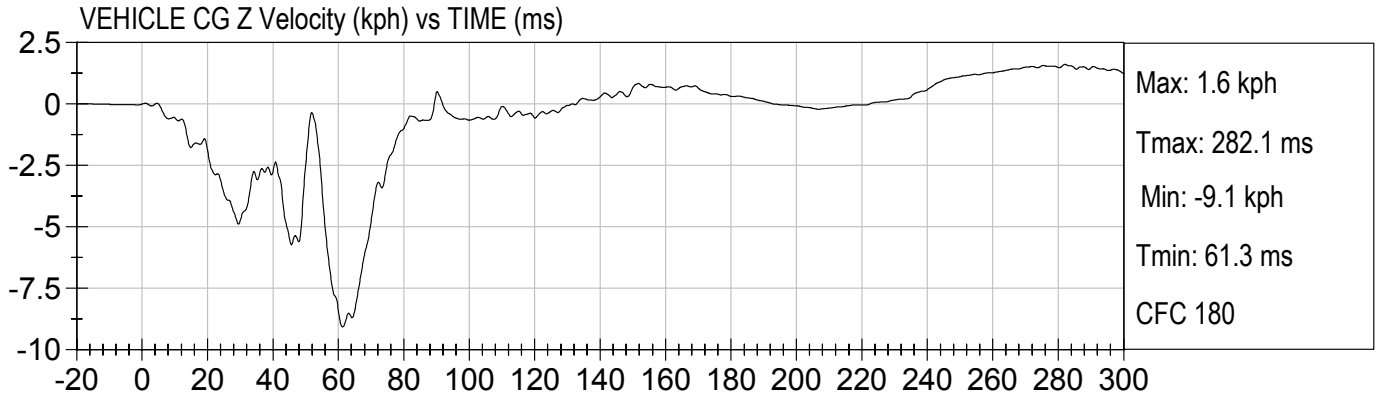


VEHICLE CG Resultant (G's) vs TIME (ms)



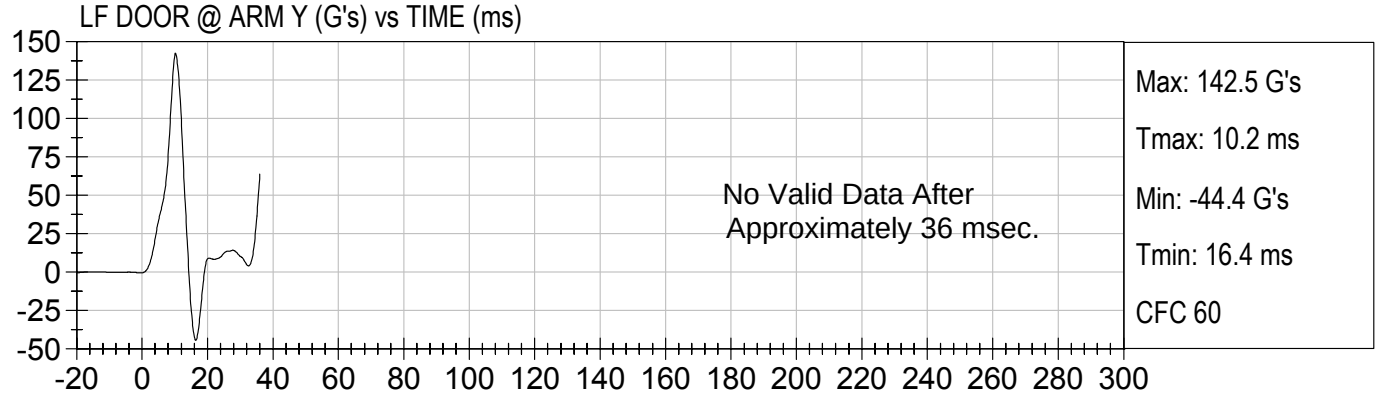

VEHICLE CG X Velocity (kph) vs TIME (ms)
10
7.5
5
2.5
0
-2.5
-5
-7.5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 8.4 kph
Tmax: 1.2 ms
Min: -7.8 kph
Tmin: 300.0 ms
CFC 180

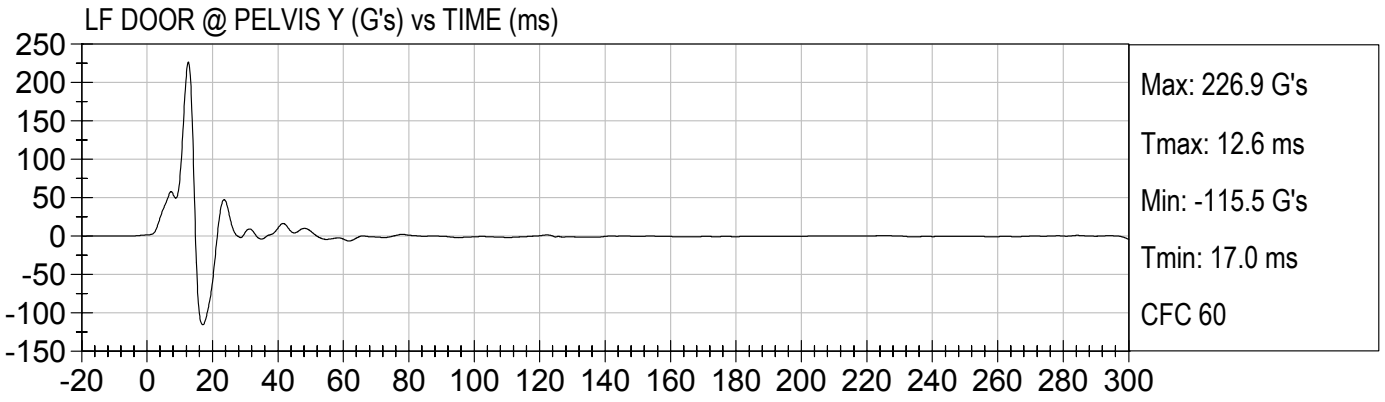

VEHICLE CG Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 31.1 kph
Tmax: 0.0 ms
Min: 0.5 kph
Tmin: 290.2 ms
CFC 180

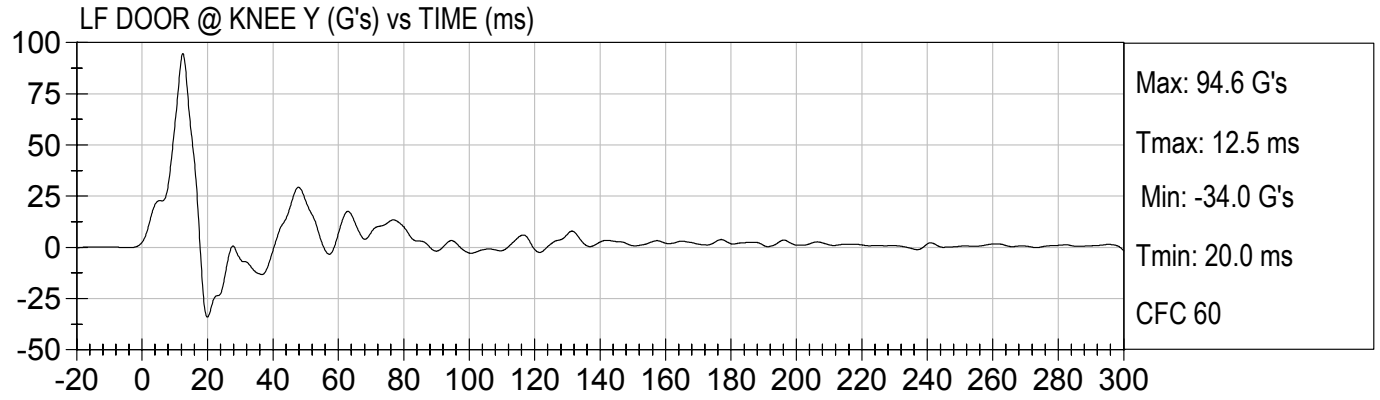

VEHICLE CG Z Velocity (kph) vs TIME (ms)
2.5
0
-2.5
-5
-7.5
-10
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 1.6 kph
Tmax: 282.1 ms
Min: -9.1 kph
Tmin: 61.3 ms
CFC 180

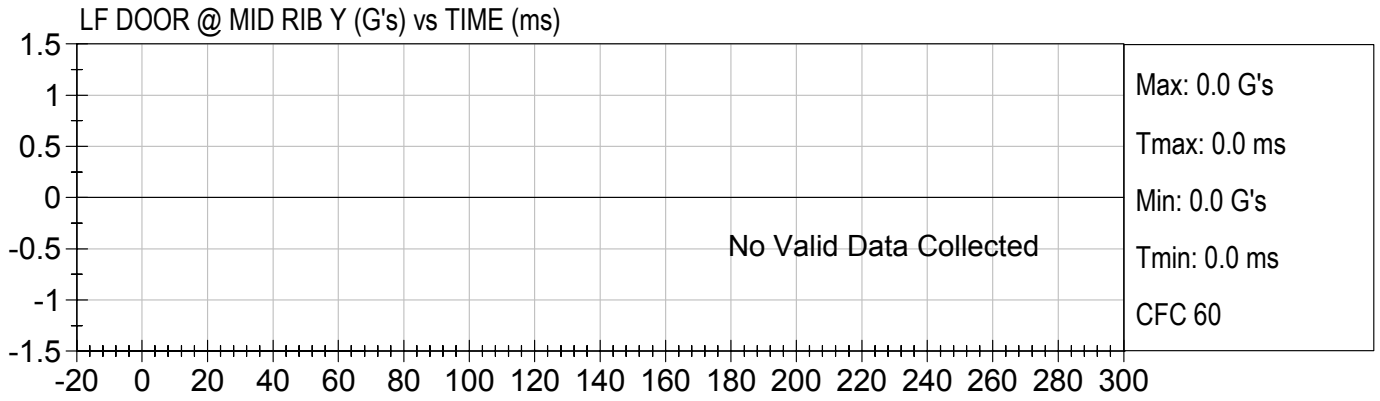
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)



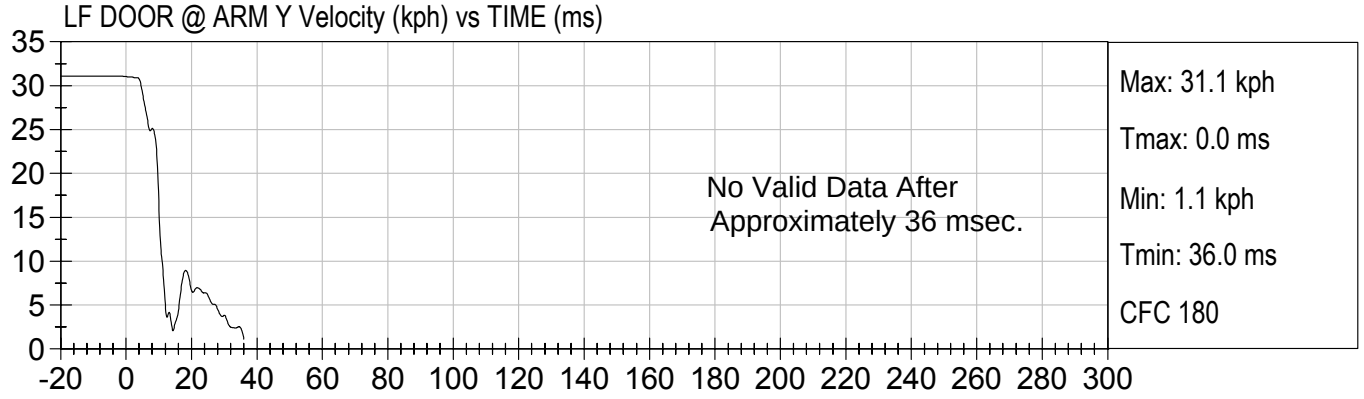


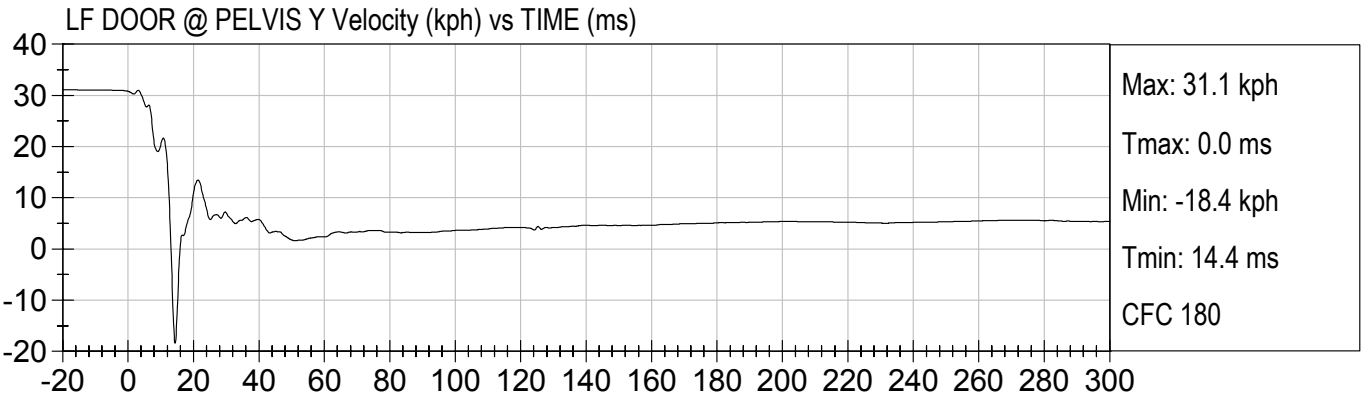


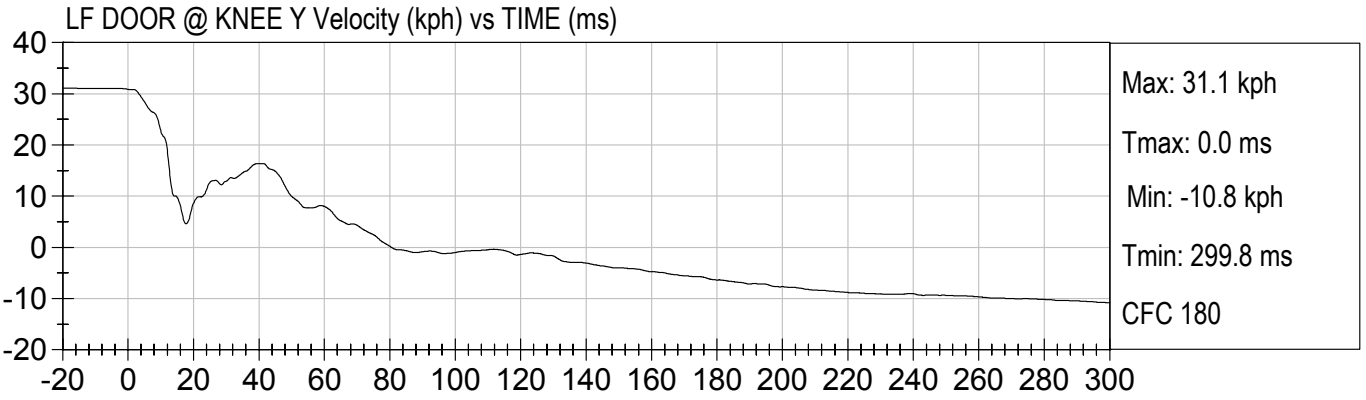


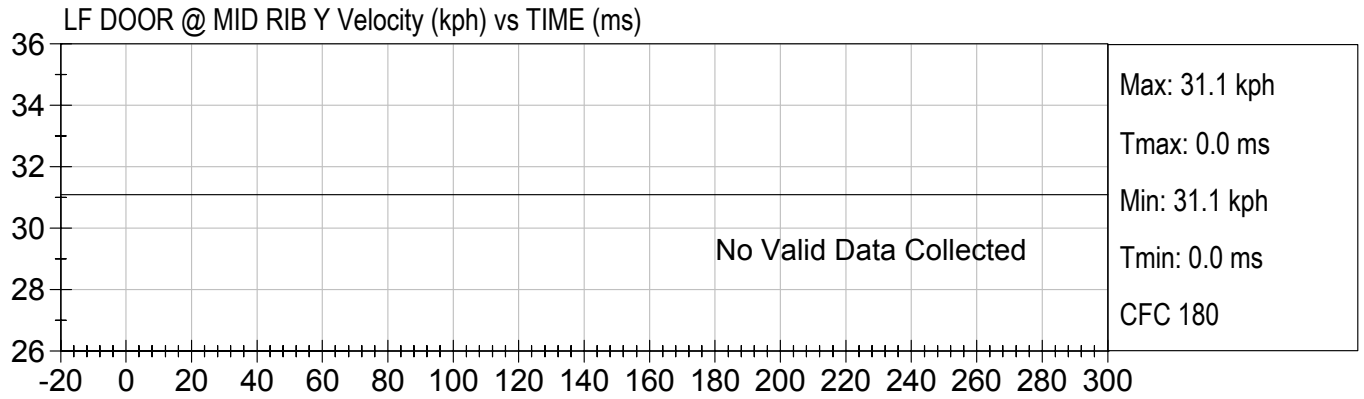
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)



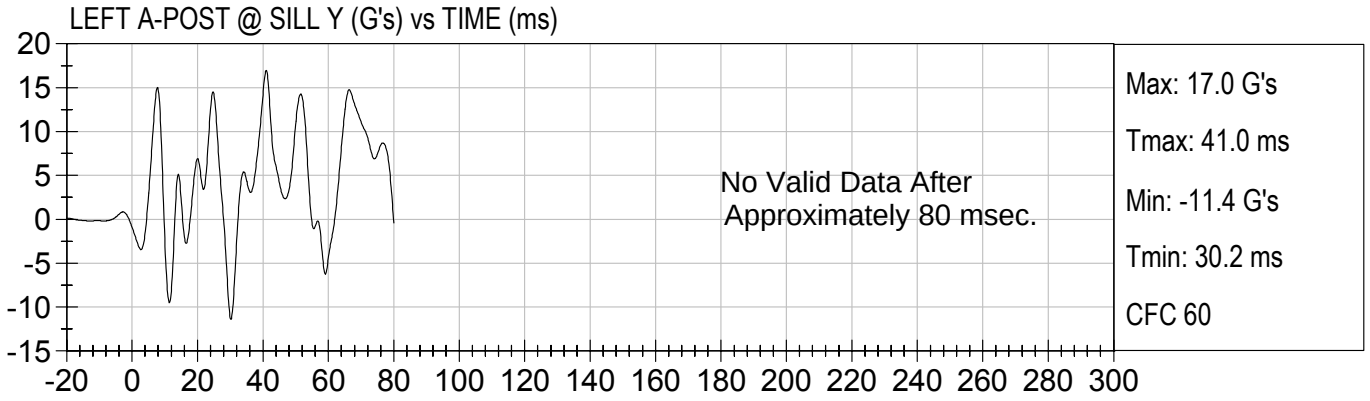


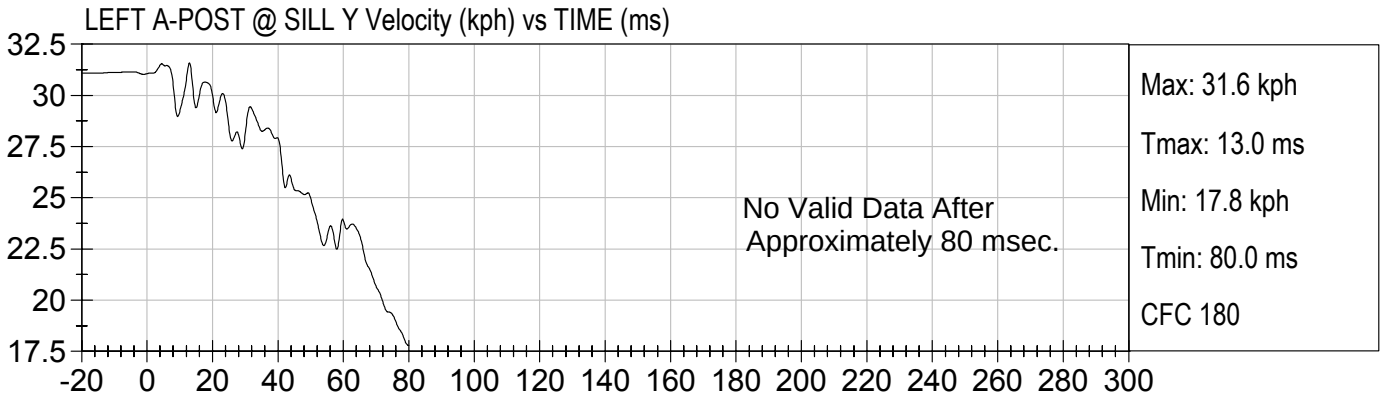


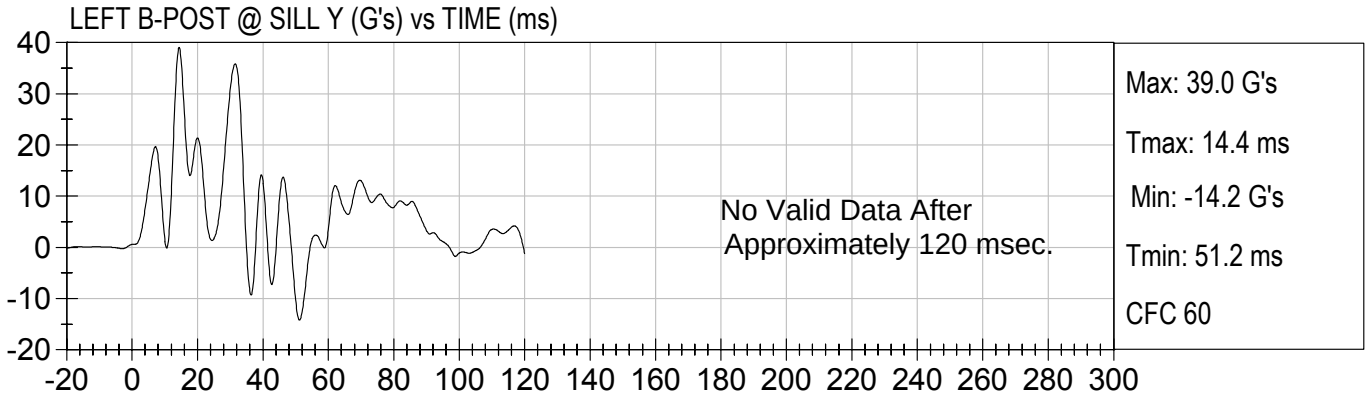


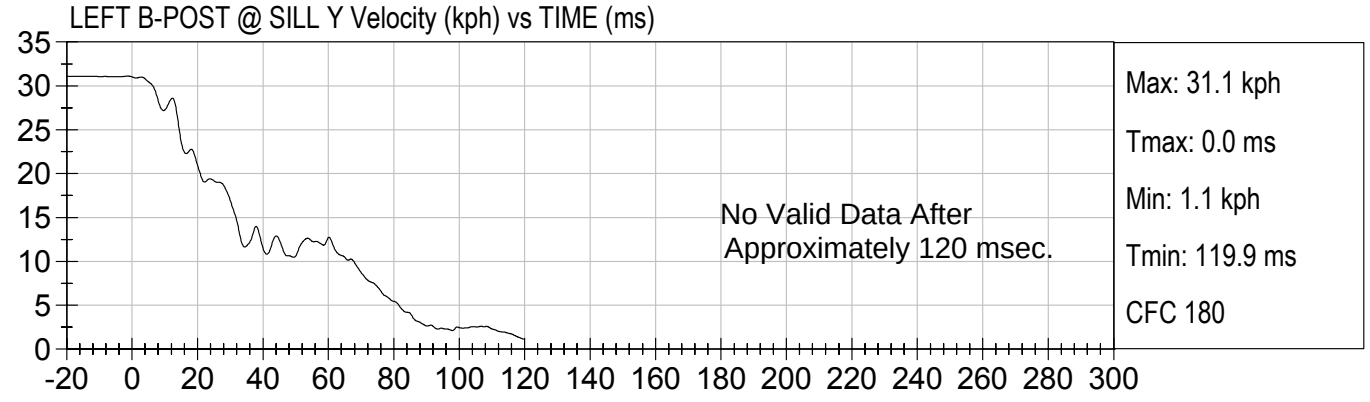
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)



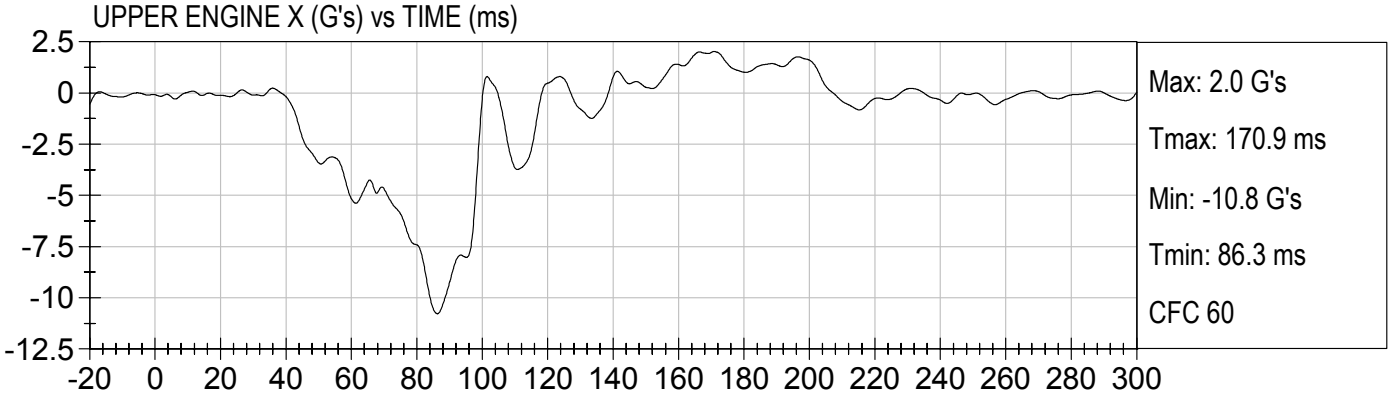


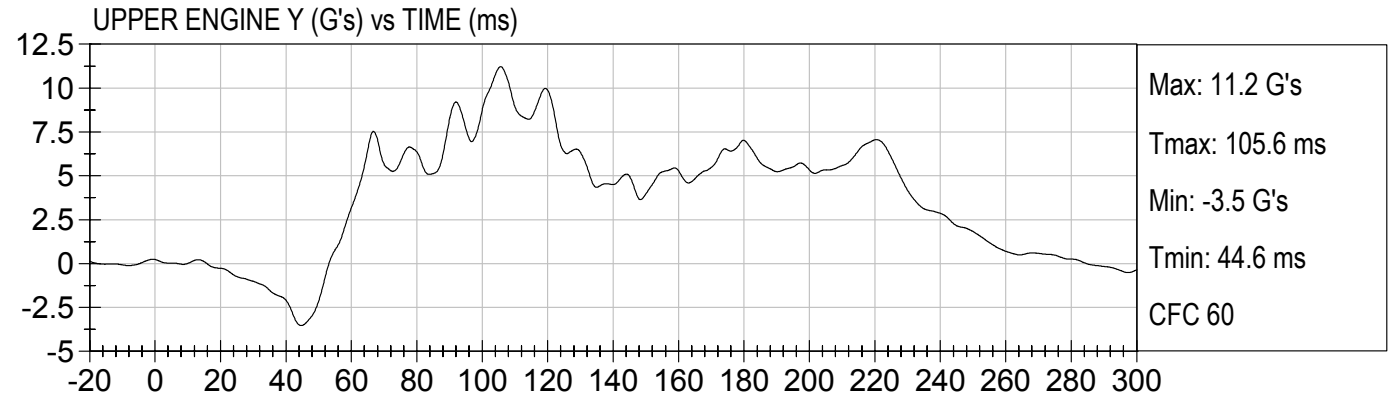


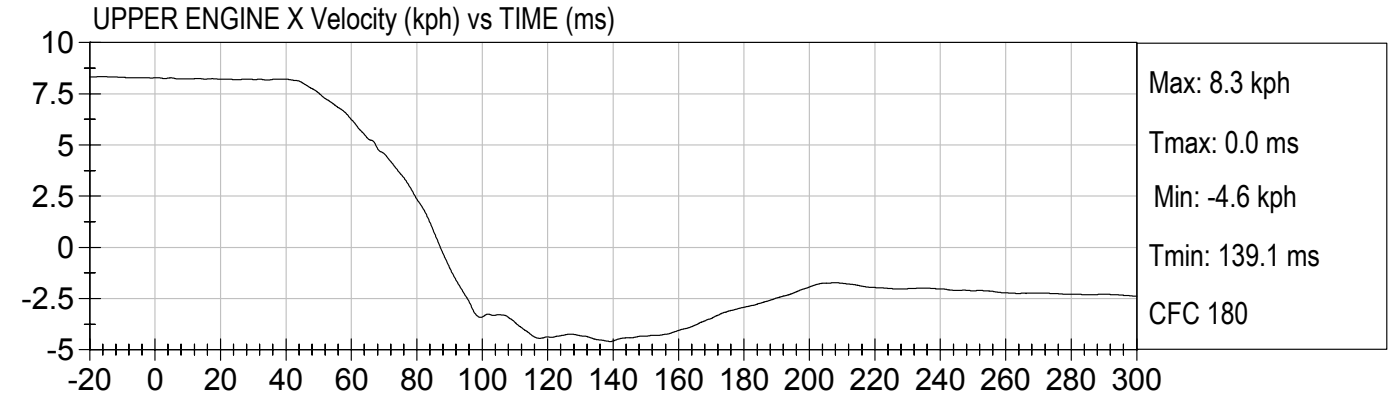


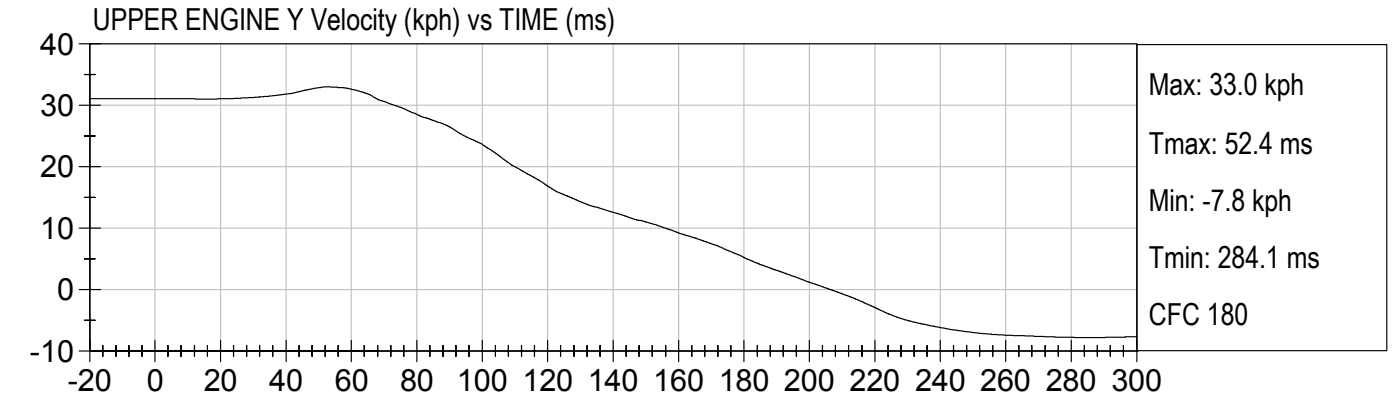
TO1 SIDE POLE OBLIQUE
2005 DODGE RAM 2500 (R50327)

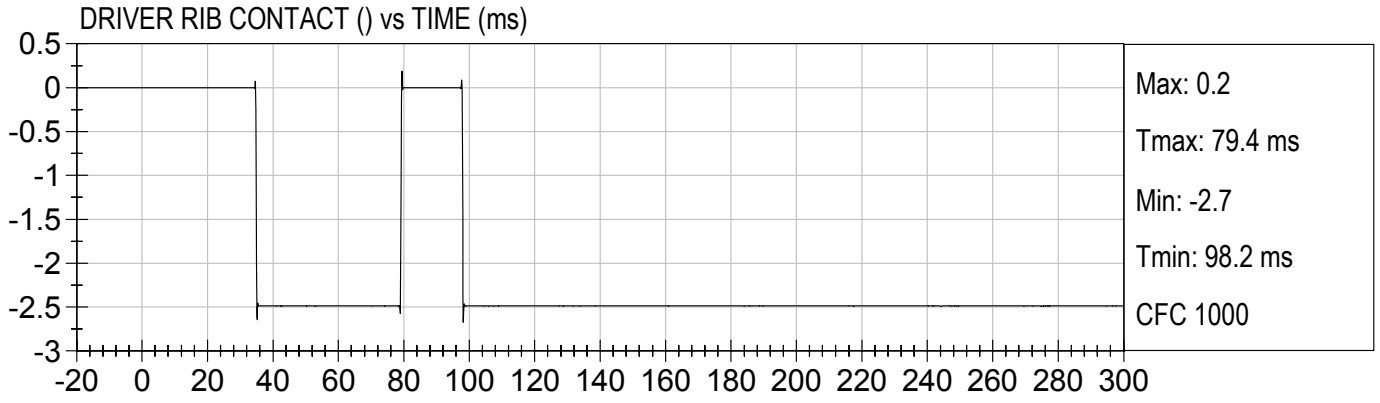
Test Date: 9/1/2005
Speed: 20.0 mph (32.2 km/h)

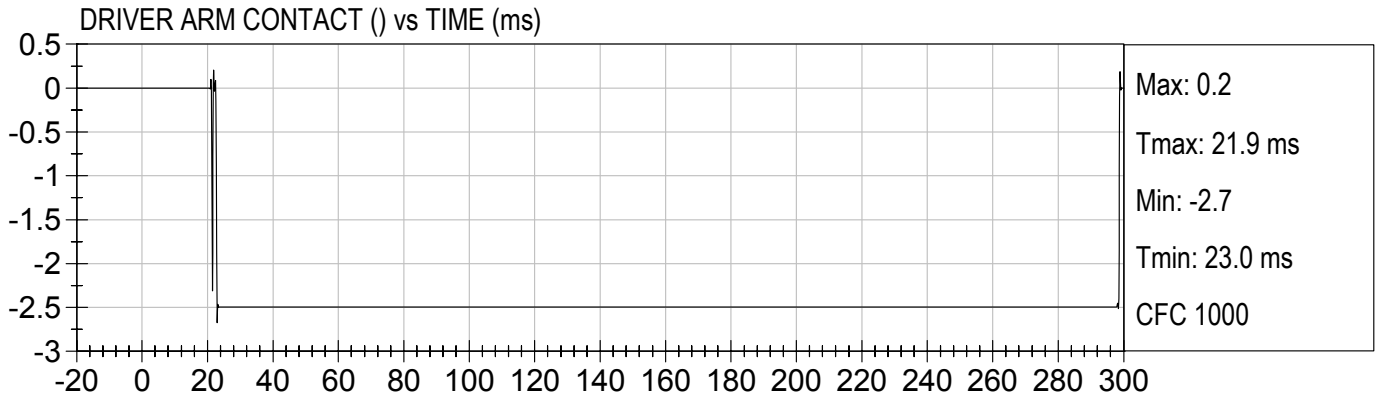


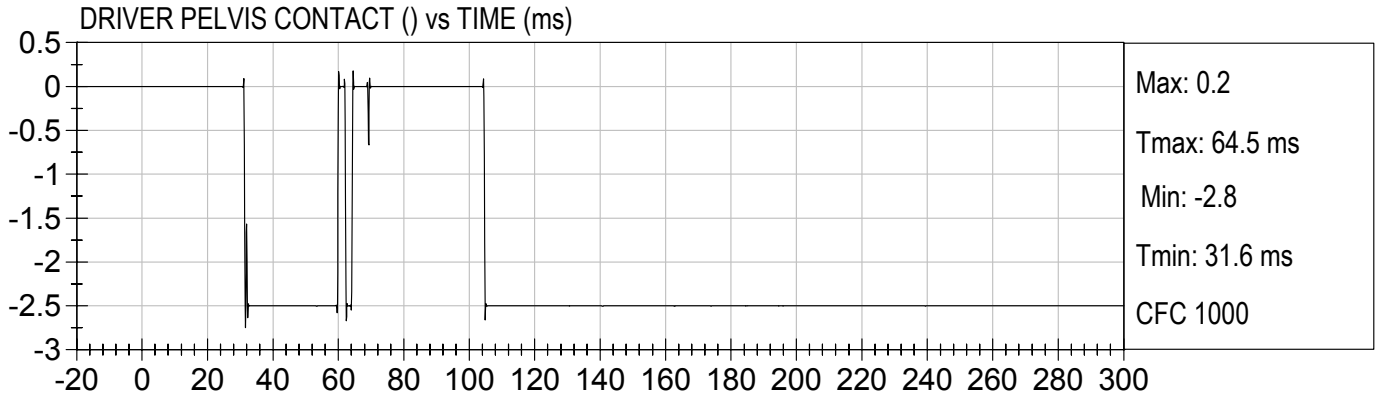







DRIVER RIB CONTACT () vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.2
Tmax: 79.4 ms
Min: -2.7
Tmin: 98.2 ms
CFC 1000


DRIVER ARM CONTACT () vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.2
Tmax: 21.9 ms
Min: -2.7
Tmin: 23.0 ms
CFC 1000


DRIVER PELVIS CONTACT () vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
Max: 0.2
Tmax: 64.5 ms
Min: -2.8
Tmin: 31.6 ms
CFC 1000

APPENDIX C

ES-2RE CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 009

PRE-TEST CALIBRATION

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test ID:** D052251

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 - 22.0	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	100 - 150	142	Pass
Time of Maximum Resultant Acceleration	msec	NA	27.7	Pass
		Overall Test Results		Pass

Joe Fleck

Laboratory Technician

08/12/2005

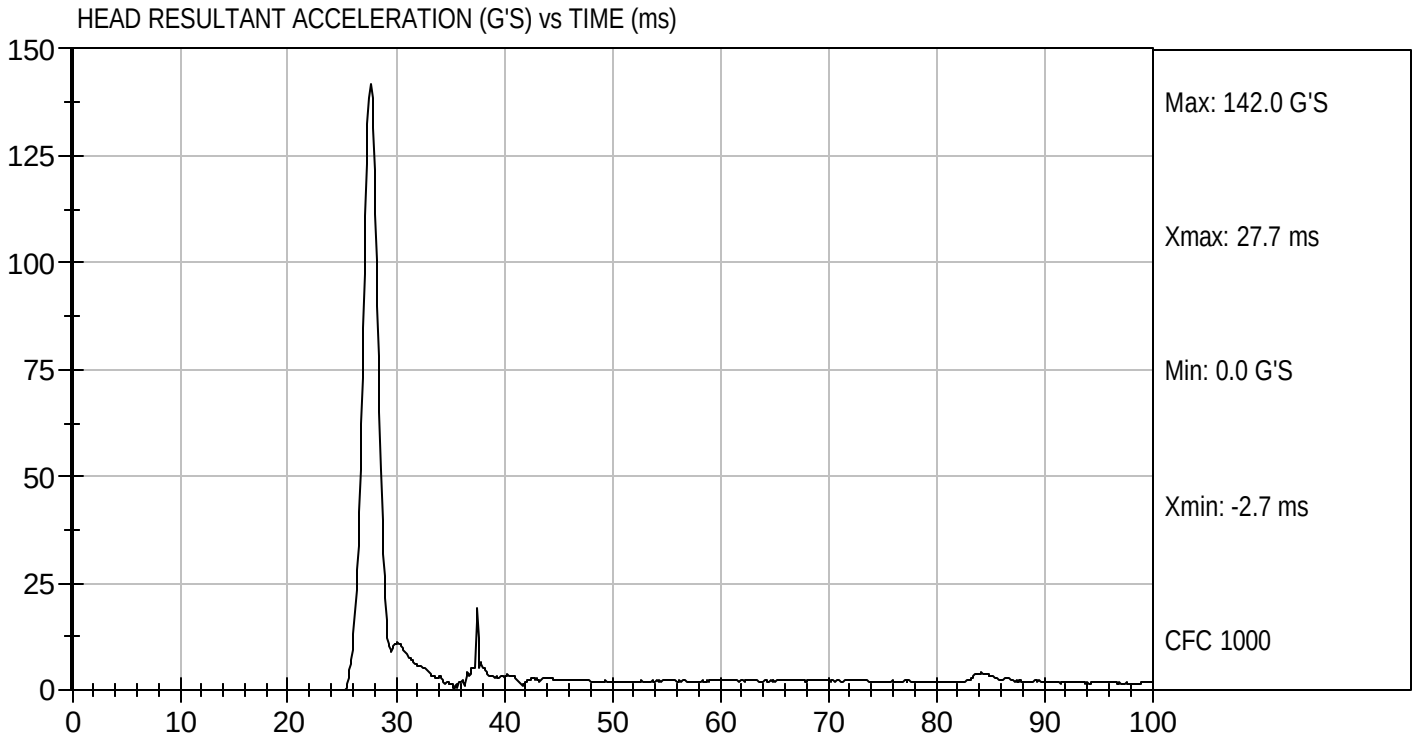
Test Date

David Winkelbauer

Approved By

Test Desc: Head Drop
Componet ID: D052251

Test Date: 08/12/2005
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052252

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	3 msec	G's	-0.25 to -0.53	-0.41	Pass
	8 msec	G's	-1.59 to -2.04	-1.76	Pass
	14 msec	G's	-3.20 to -3.85	-3.46	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	52.0	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	54.6	Pass
Maximum Angle Theta (A)		deg	32.7 to 37.0	34.1	Pass
Time of Maximum Theta (A)		msec	53.0 to 63.0	60.7	Pass
Maximum Angle Theta (B)		deg	29.34 to 31.84	30.76	Pass
Time of Maximum Theta (B)		msec	54.0 to 64.0	55.7	Pass
			Overall Test Results		Pass

Ian Fleck

Laboratory Technician

08/11/2005

Test Date

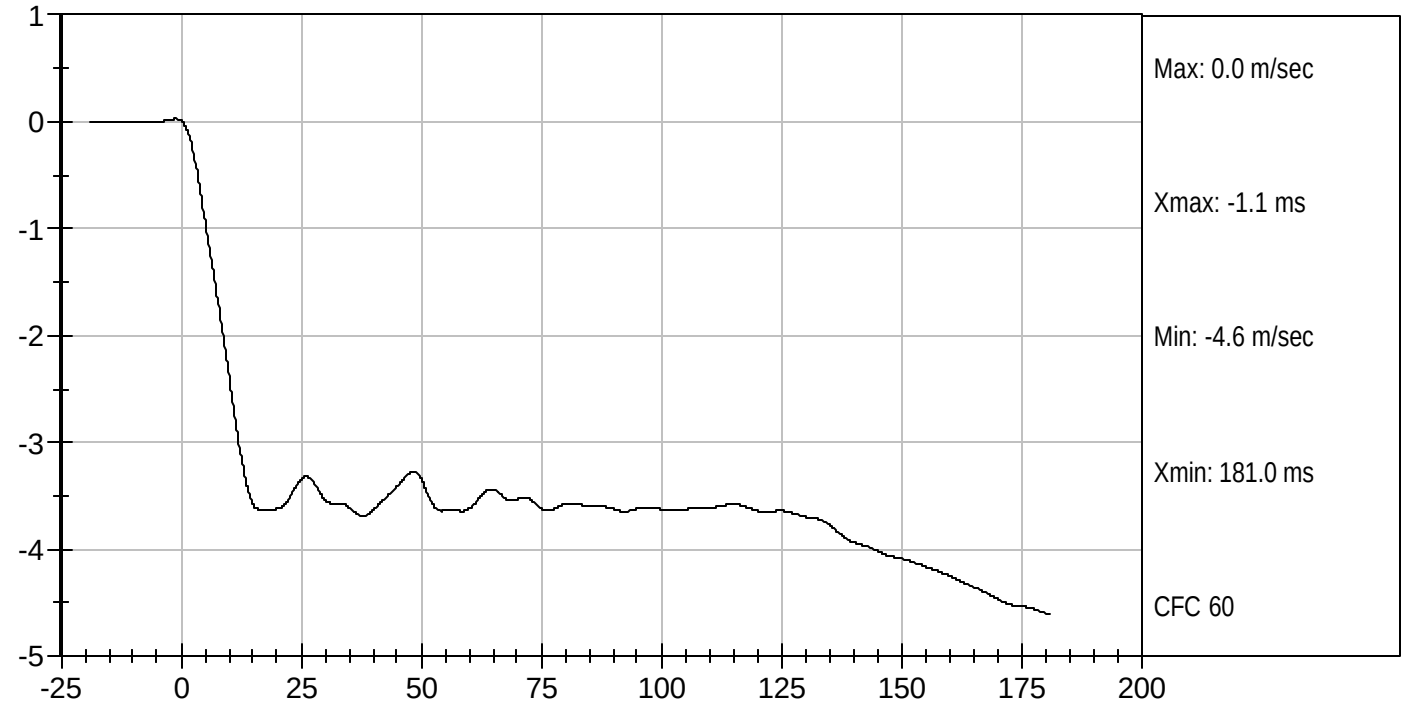
David Winkelbauer

Approved By

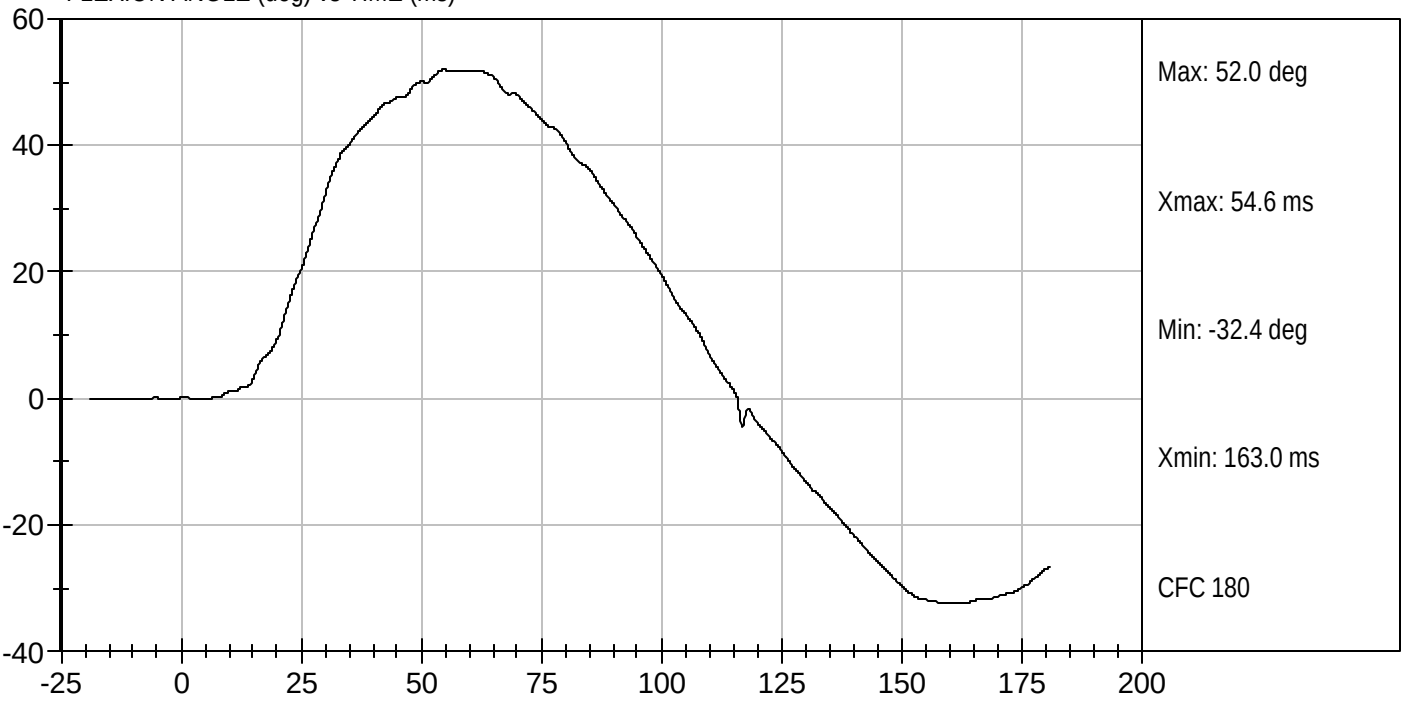
Test Desc: Neck Bending
Componet ID: D052252

Test Date: 08/11/2005
Velocity: 11.42 ft/s, 3.5 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

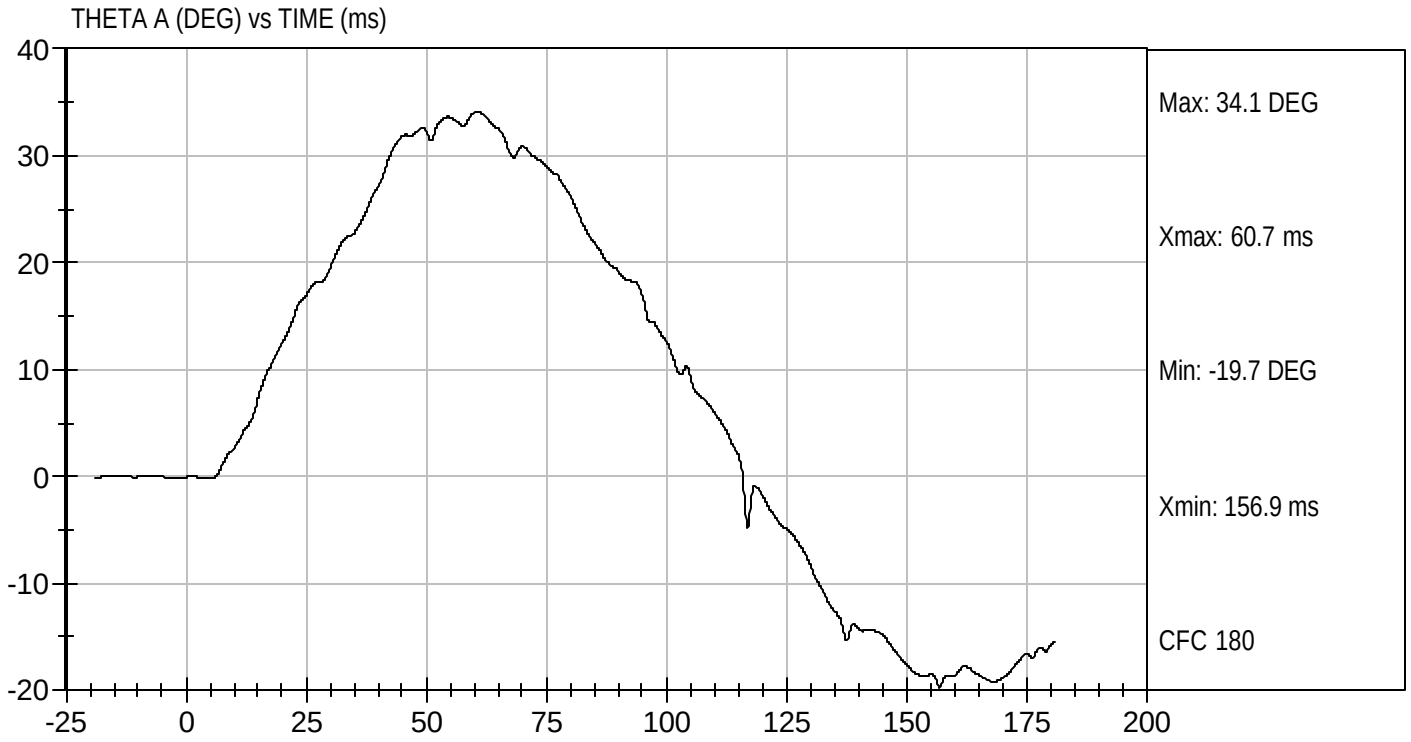


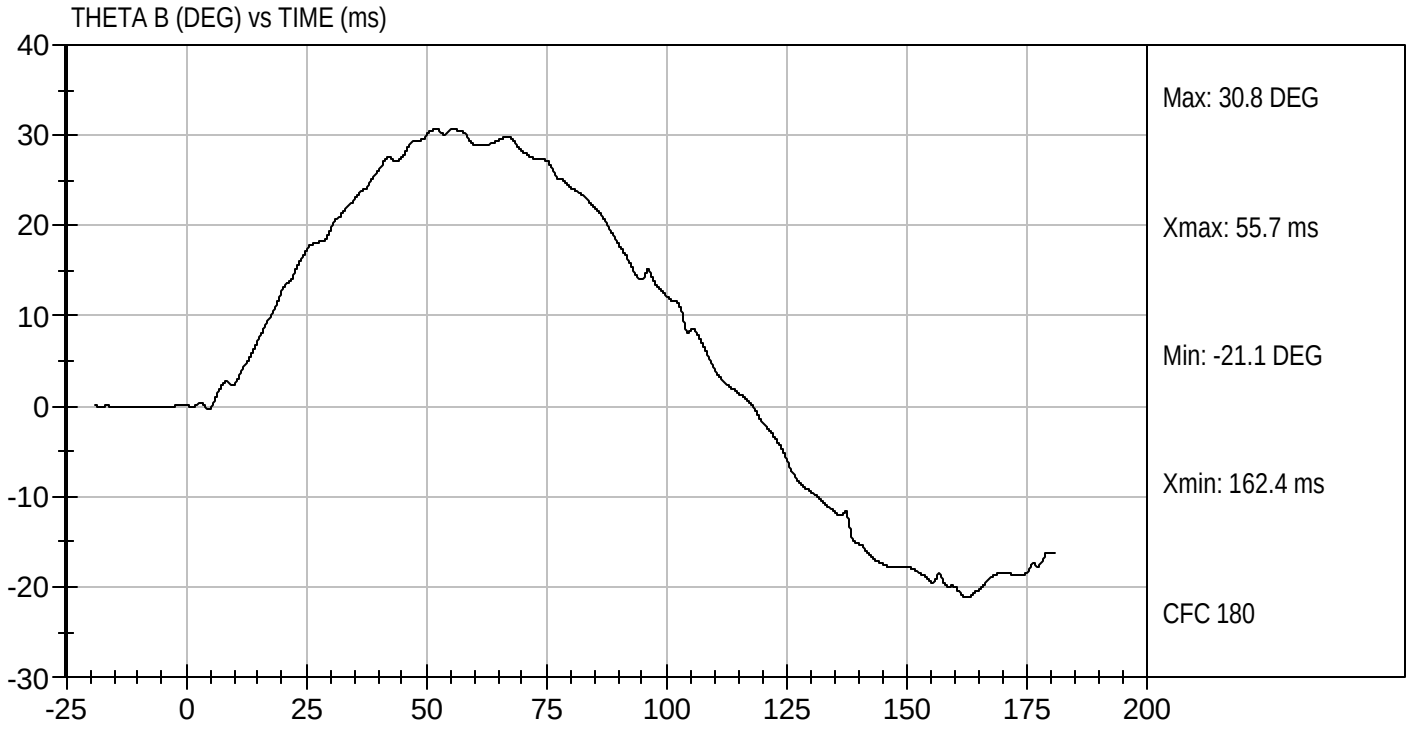
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Neck Bending
Componet ID: D052252

Test Date: 08/11/2005
Velocity: 11.42 ft/s, 3.5 m/s





MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052253

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	8.2	Pass
Time of Peak Shoulder Acceleration	msec	NA	37.2	Pass
		Overall Test Results		Pass

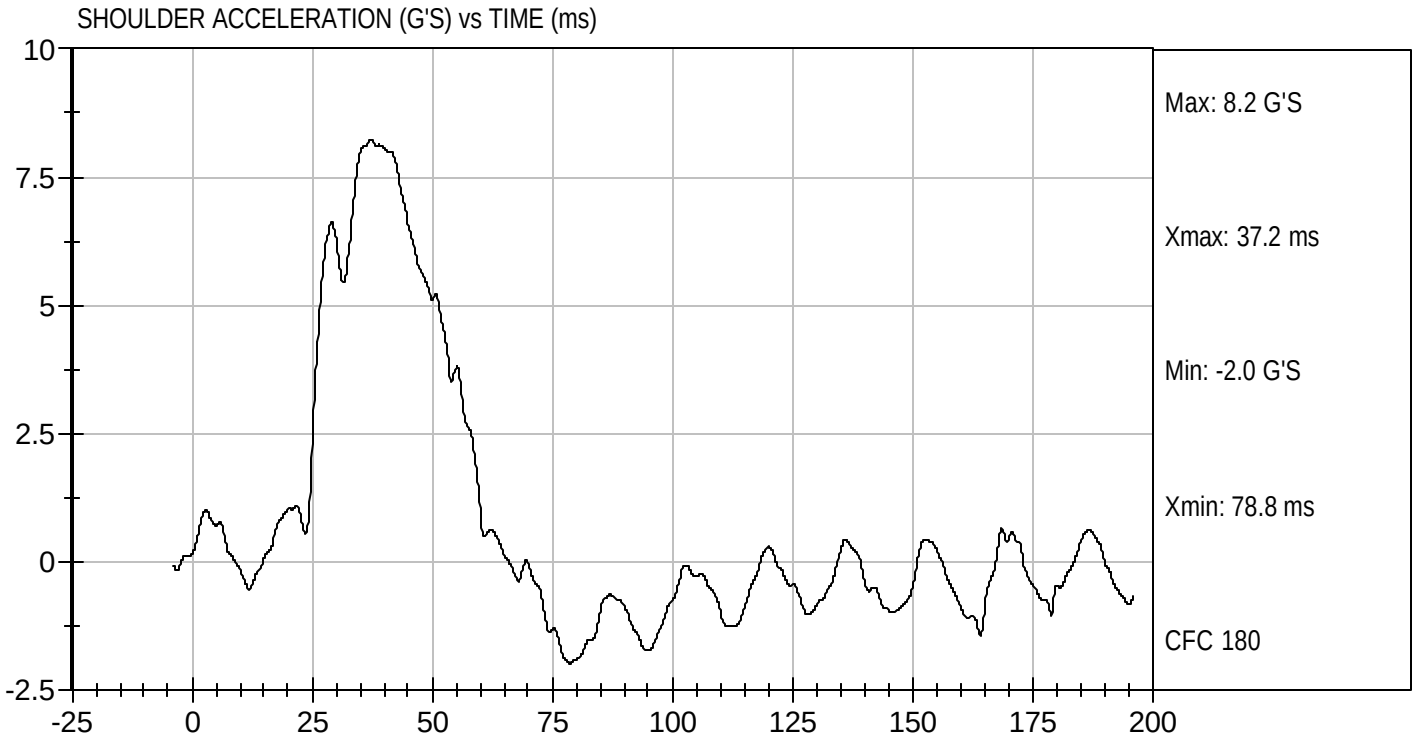
Jessica Hall
Laboratory Technician

08/10/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Componet ID: D052253

Test Date: 08/10/2005
Velocity: 14.06 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION

UPPER RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052254

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	25.7	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	48.8	Pass
		Overall Test Results		Pass

Laboratory Technician

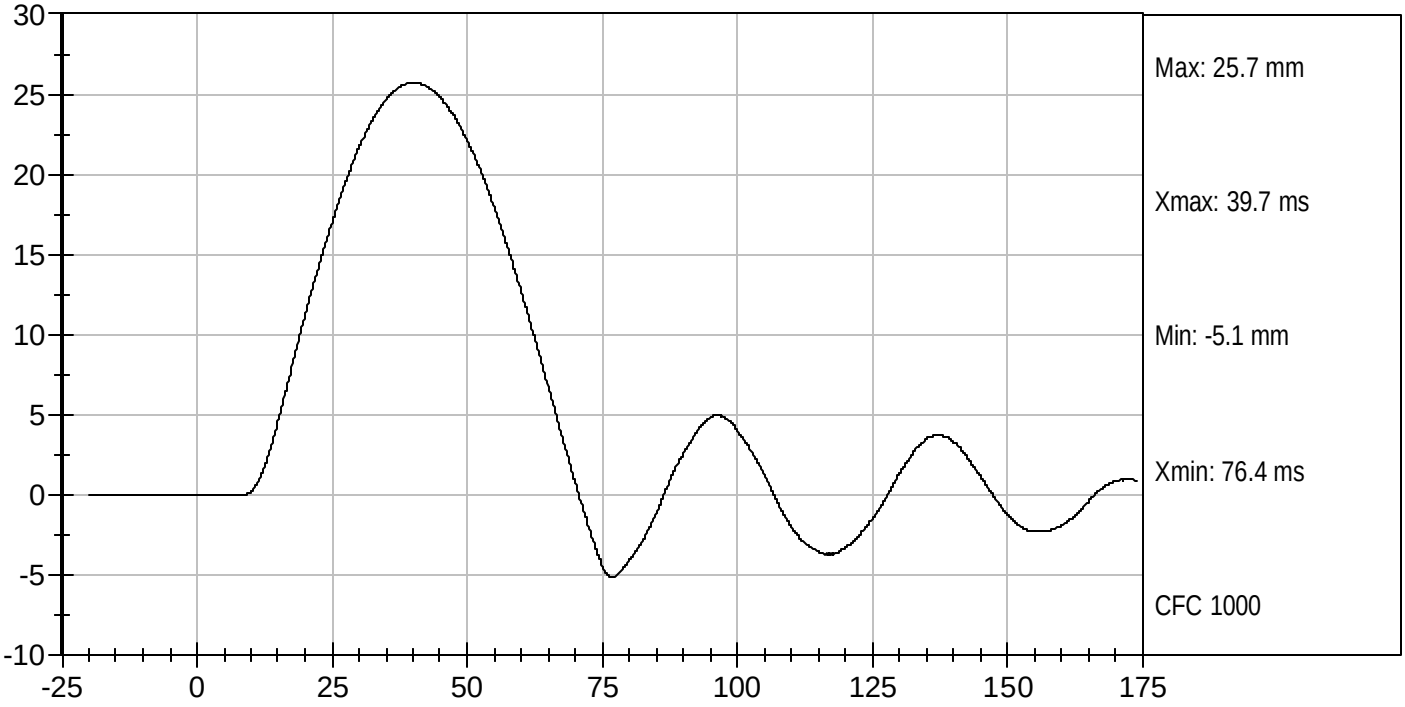
08/11/2005
Test Date

David Winkelbauer
Approved By

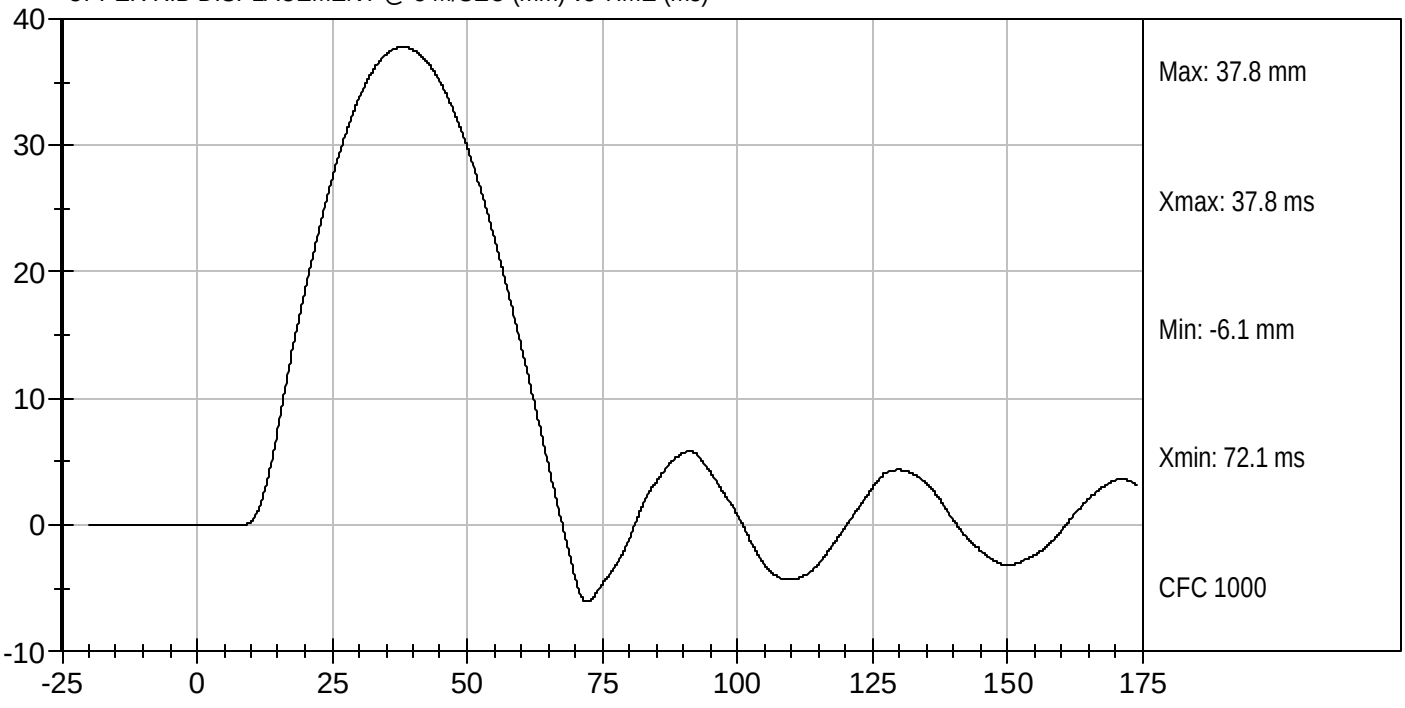
Test Desc: Rib Impact - Upper
Componet ID: D052254

Test Date: 08/11/2005
Velocity: 6.56 ft/s, 2 m/s

UPPER RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



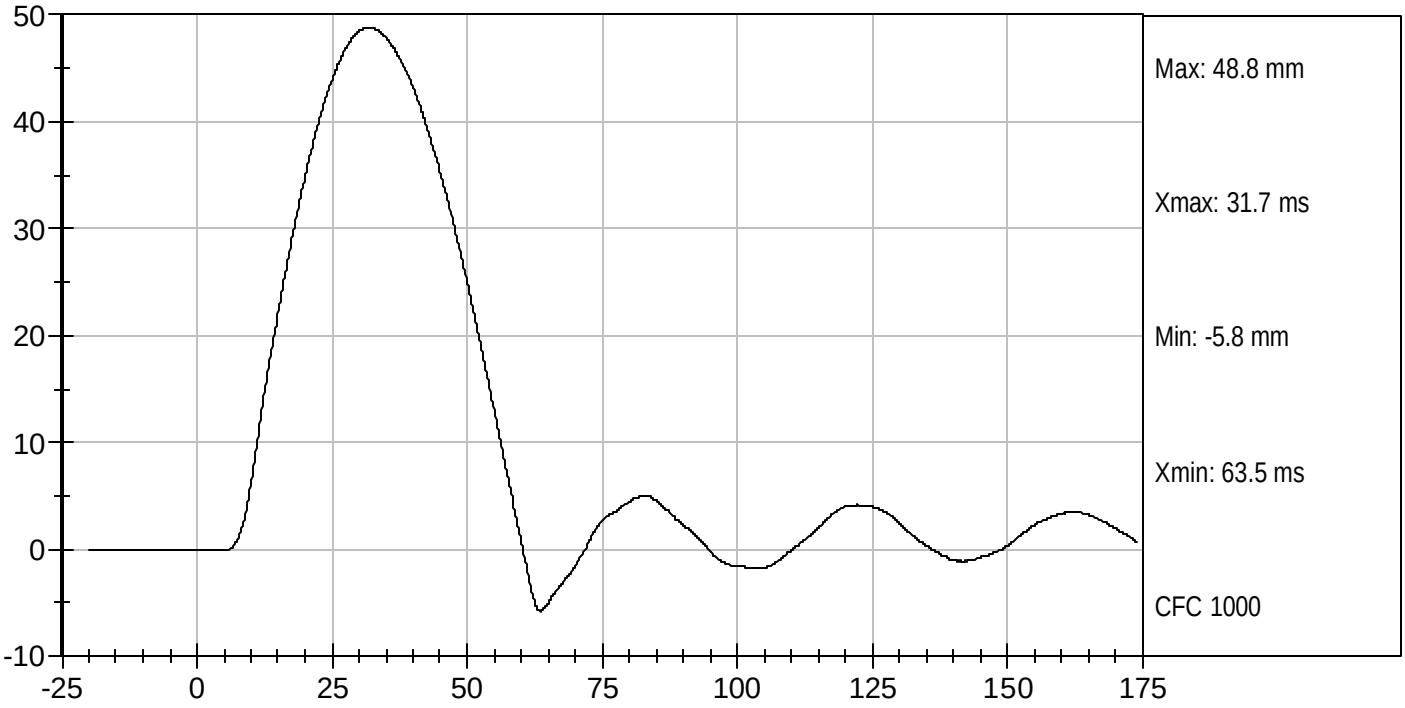
UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Rib Impact - Upper
Componet ID: D052254

Test Date: 08/11/2005
Velocity: 13.12 ft/s, 4 m/s

UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052255

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	25.3	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	37.4	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	49.3	Pass
		Overall Test Results		Pass

Laboratory Technician

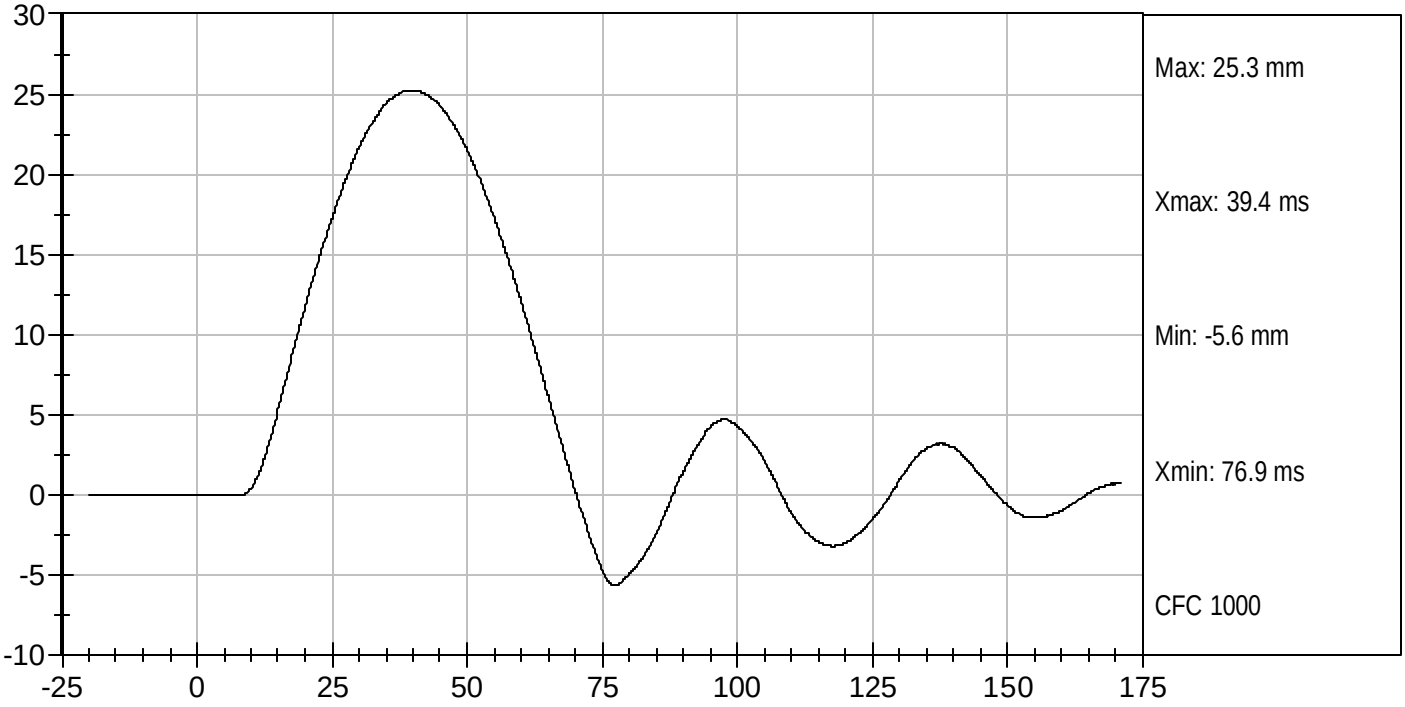
08/12/2005
Test Date

David Winkelbauer
Approved By

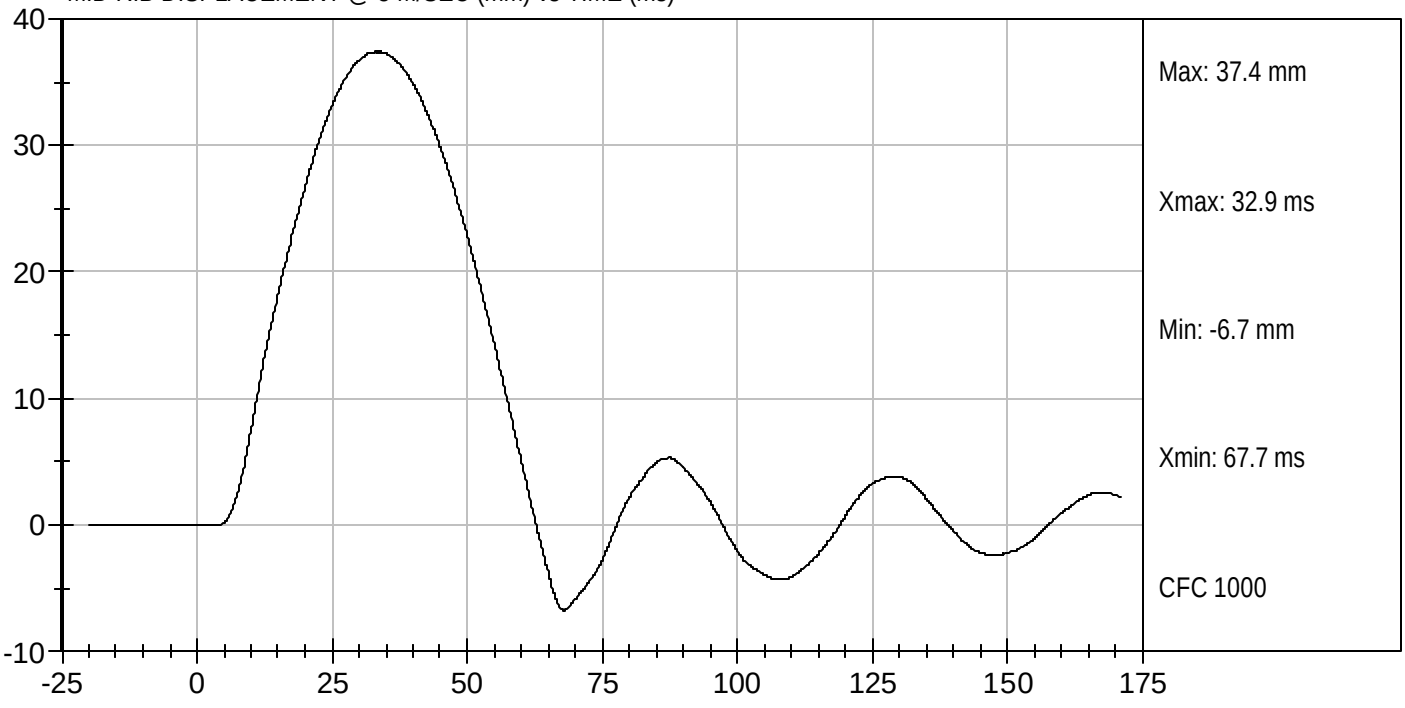
Test Desc: Rib Impact - Mid
Componet ID: D052255

Test Date: 08/12/2005
Velocity: 6.56 ft/s, 2 m/s

MID RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



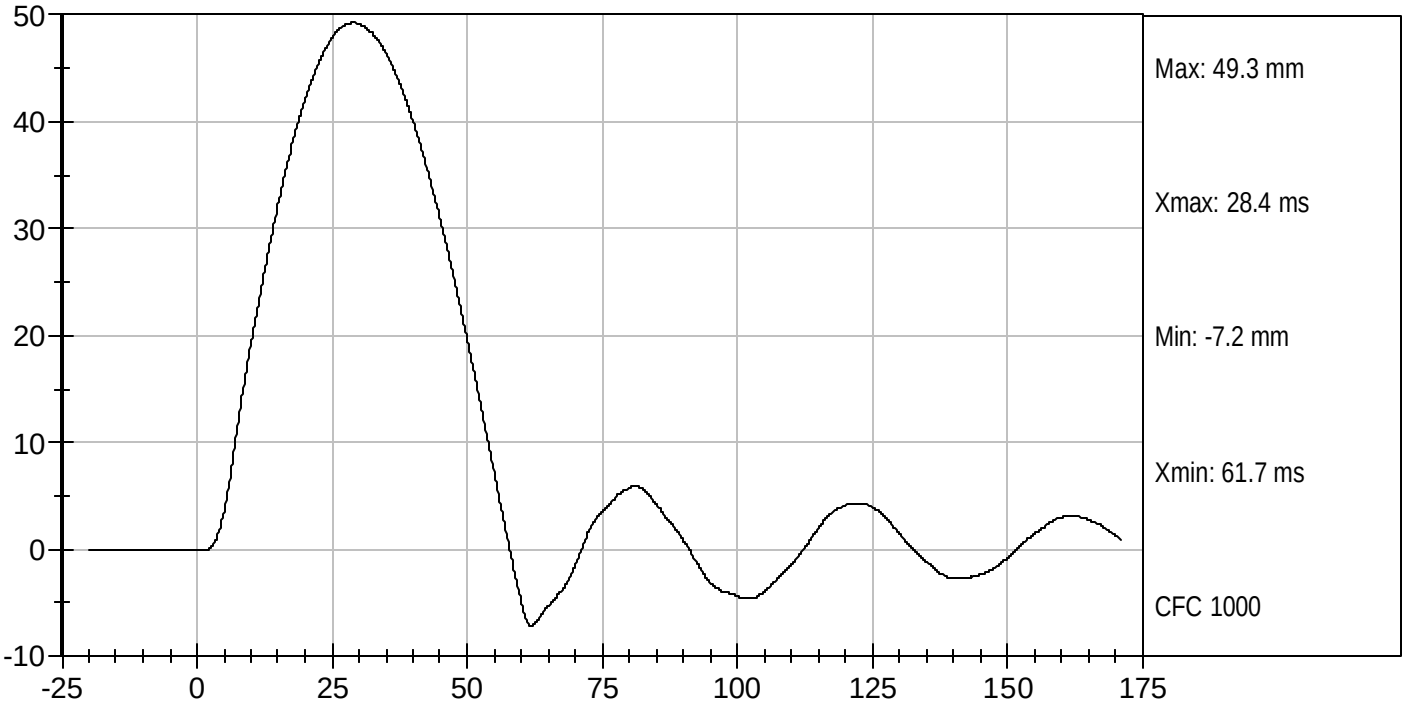
MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Rib Impact - Mid
Componet ID: D052255

Test Date: 08/12/2005
Velocity: 13.12 ft/s, 4 m/s

MID RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052256

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	25.4	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	37.7	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	48.2	Pass
		Overall Test Results		Pass

Joe Fleck
Laboratory Technician

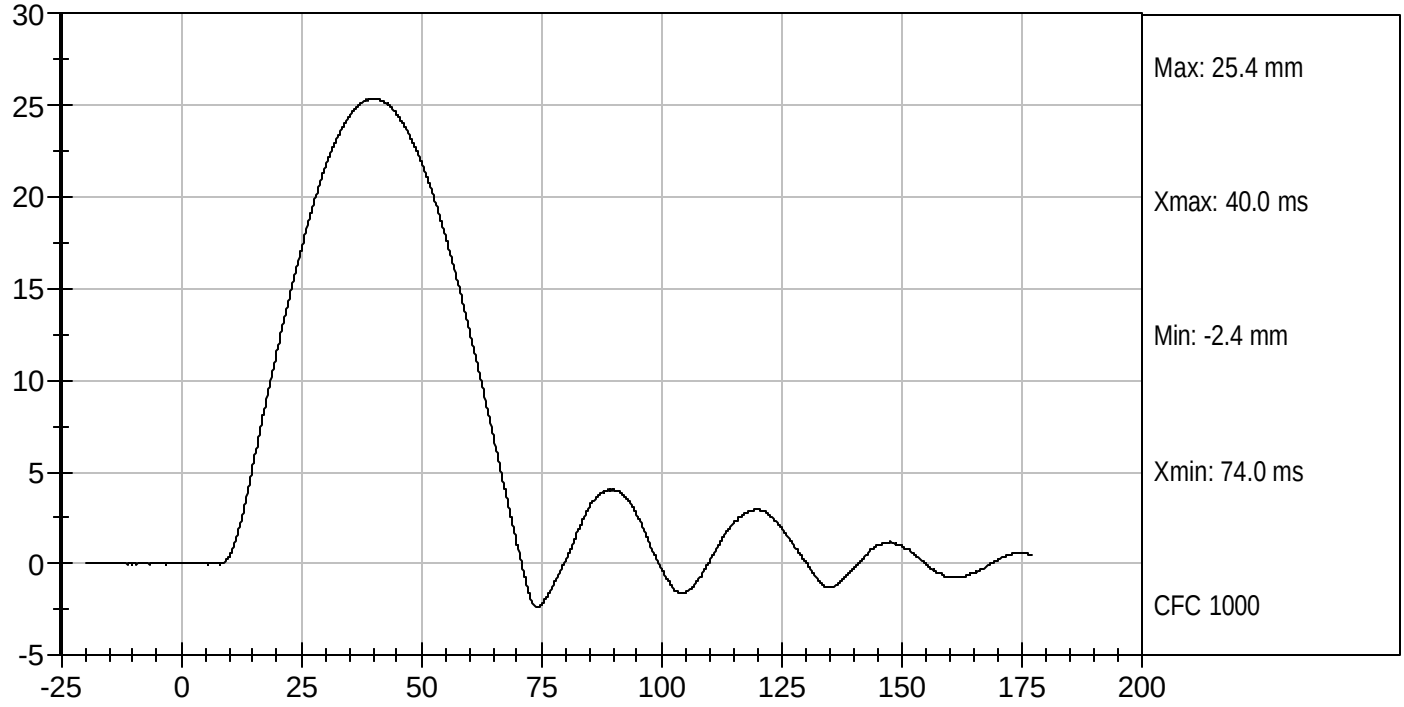
08/12/2005
Test Date

David Winkelbauer
Approved By

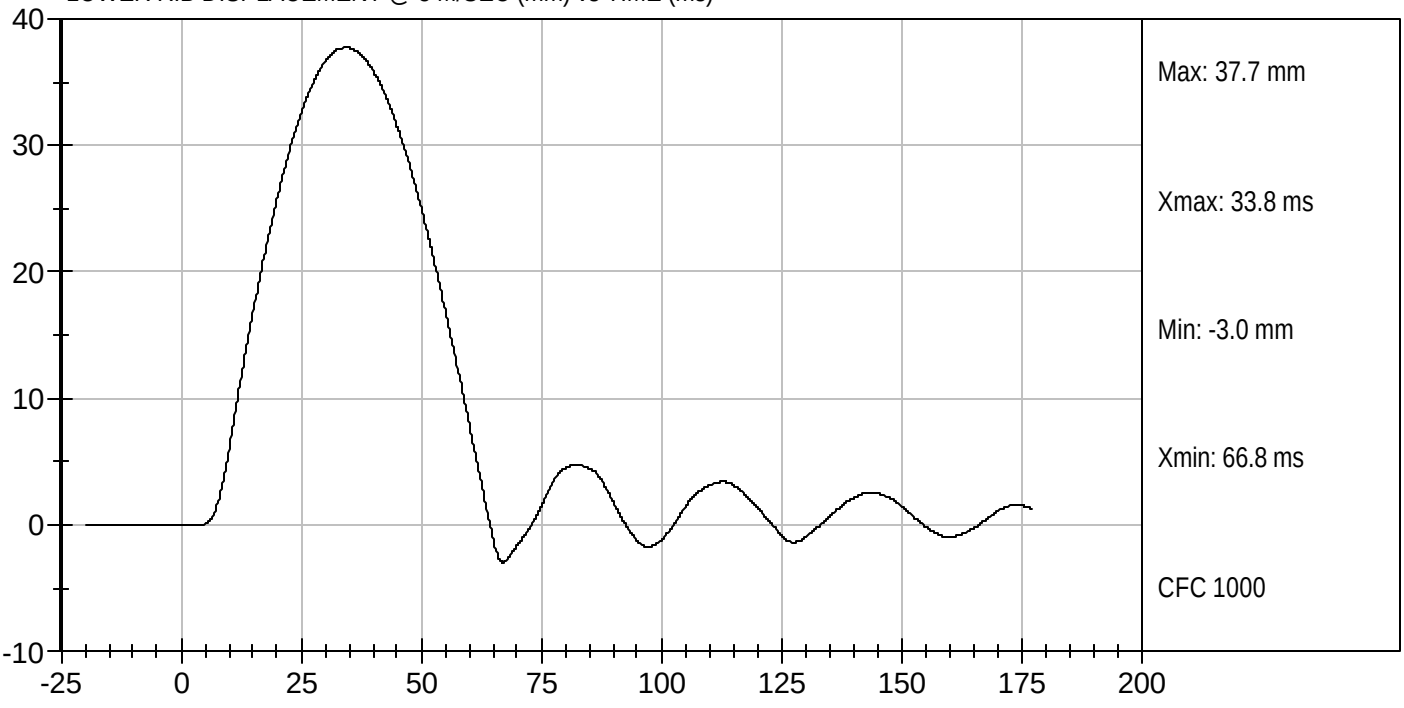
Test Desc: Rib Impact - Lower
Componet ID: D052256

Test Date: 08/12/2005
Velocity: 6.56 ft/s, 2 m/s

LOWER RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



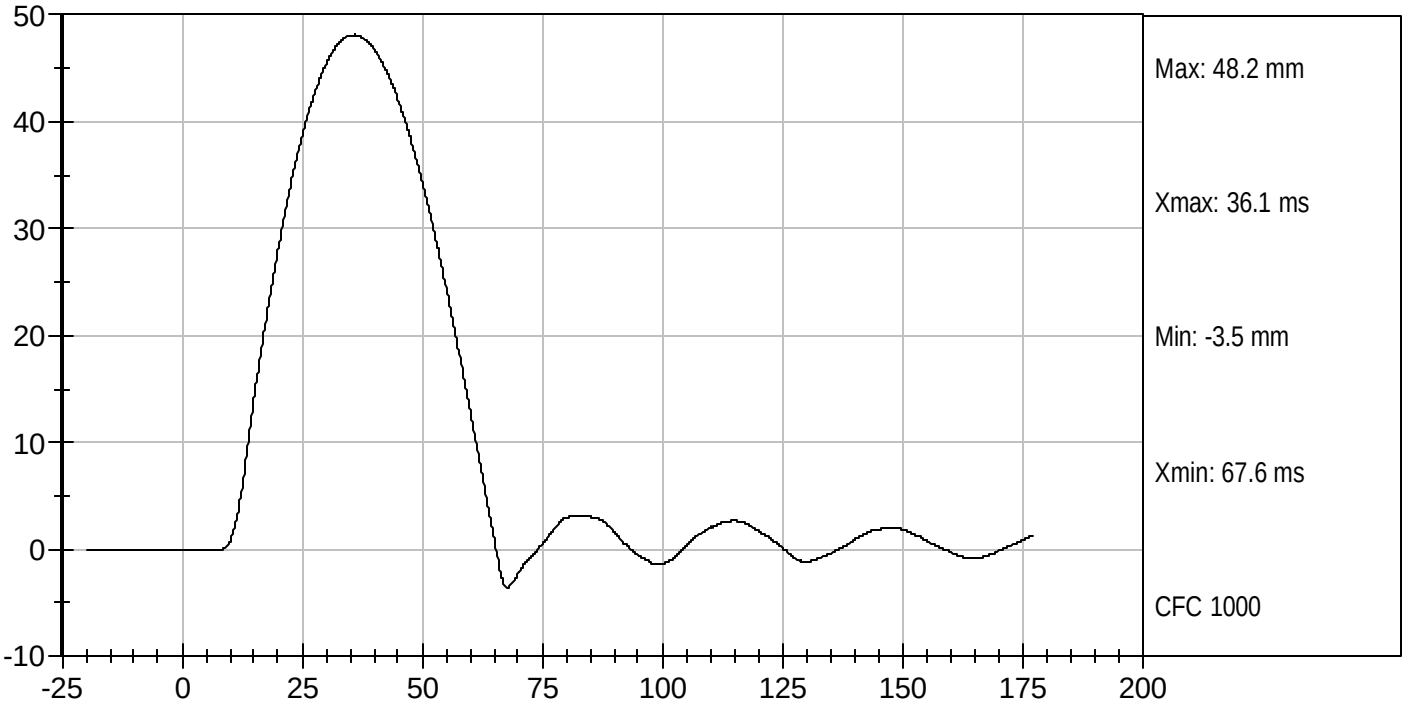
LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Rib Impact - Lower
Componet ID: D052256

Test Date: 08/12/2005
Velocity: 13.12 ft/s, 4 m/s

LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052257

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	3.90 to 4.10	4.04	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.43	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	12.30	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.49	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	11.40	Pass
		Overall Test Results		Pass

Laboratory Technician

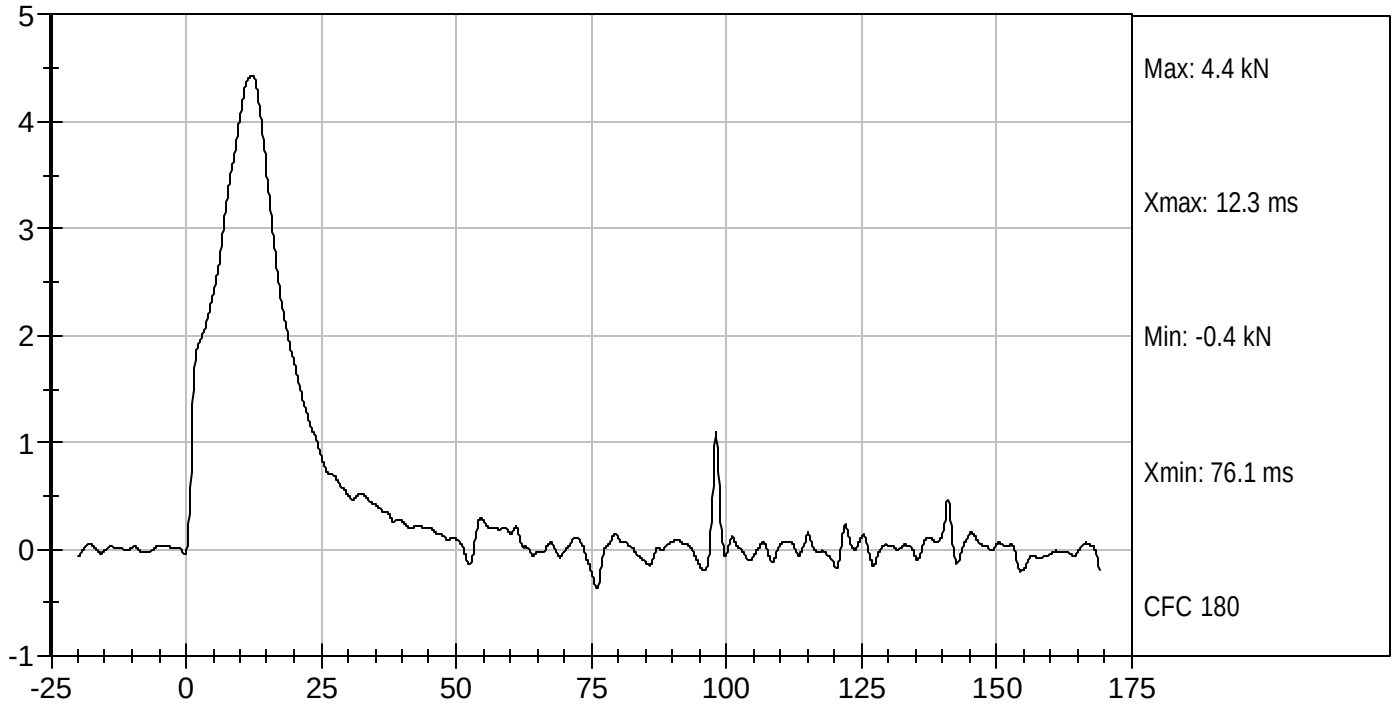
08/10/2005
Test Date

David Winkelbauer
Approved By

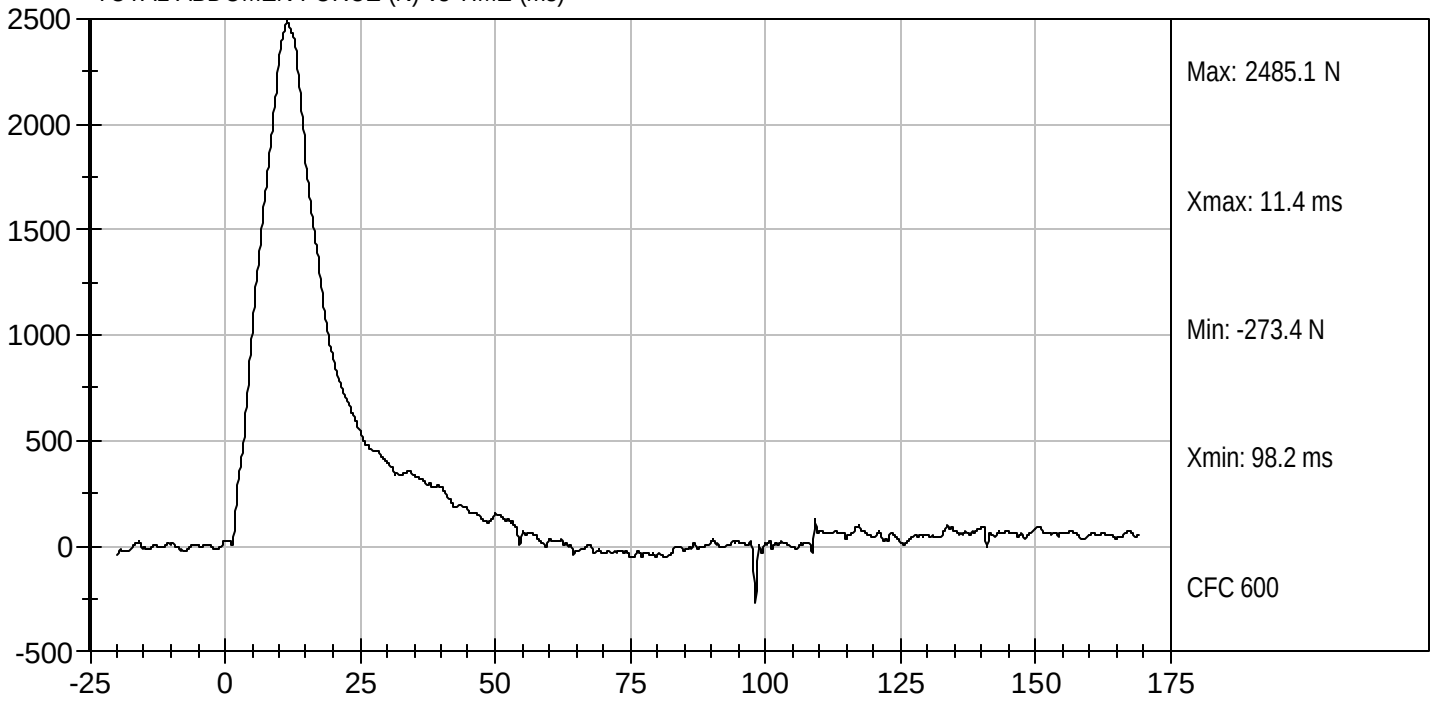
Test Desc: Abdomen Impact
Componet ID: D052257

Test Date: 08/10/2005
Velocity: 13.25 ft/s, 4.04 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052258

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.11	Pass
Pendulum Deceleration	10 msec	m/sec	-2.46 to -1.59	-2.26	Pass
	20 msec	m/sec	-5.25 to -4.07	-5.19	Pass
	25 msec	m/sec	-6.64 to -5.30	-6.22	Pass
	30 msec	m/sec	>= -6.5	-6.3	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	47.8	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	45.3	Pass
Maximum Theta (A)		deg	31.0 to 35.0	32.8	Pass
Time of Maximum Theta (A)		msec	44.0 to 52.0	44.6	Pass
Maximum Theta (B)		deg	28.27 to 30.77	30.23	Pass
Time of Maximum Theta (B)		msec	44.0 to 52.0	46.4	Pass
			Overall Results		Pass

Laboratory Technician

08/12/2005
Test Date

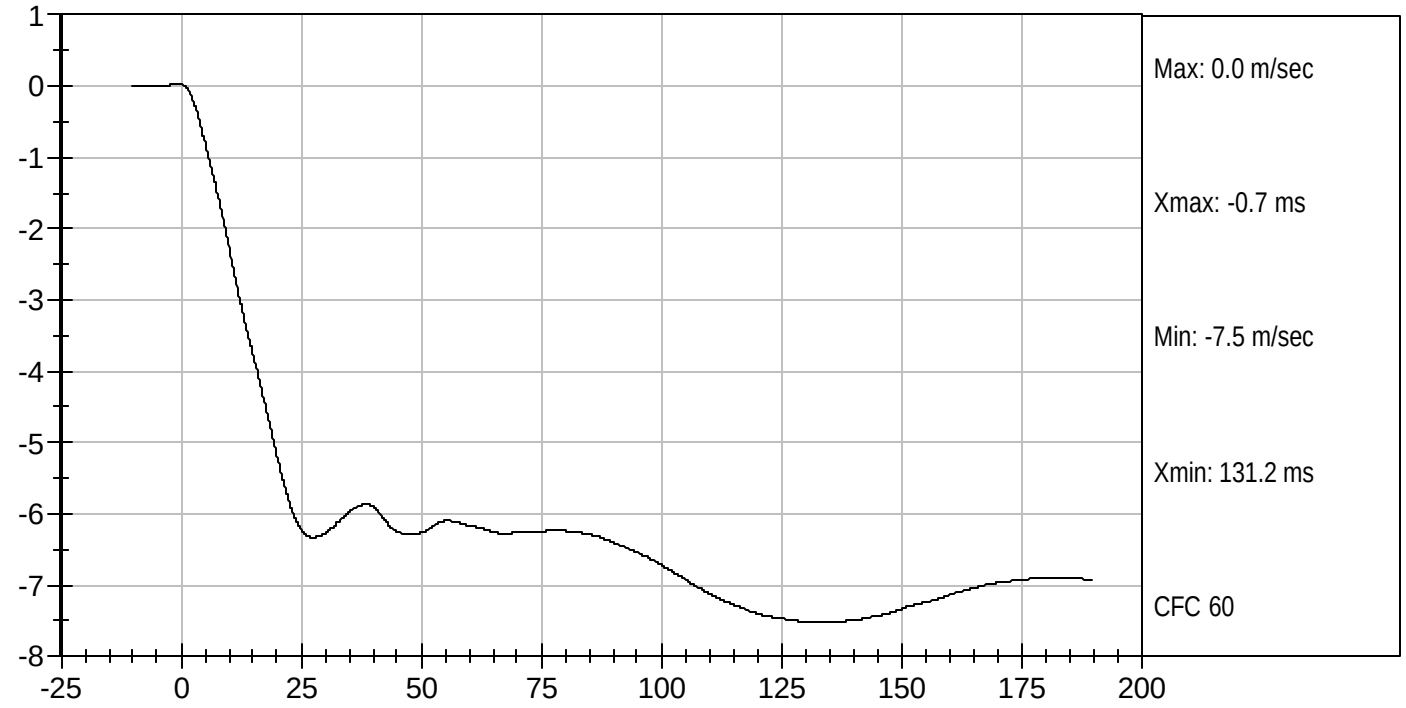
David Winkelbauer

Approved By

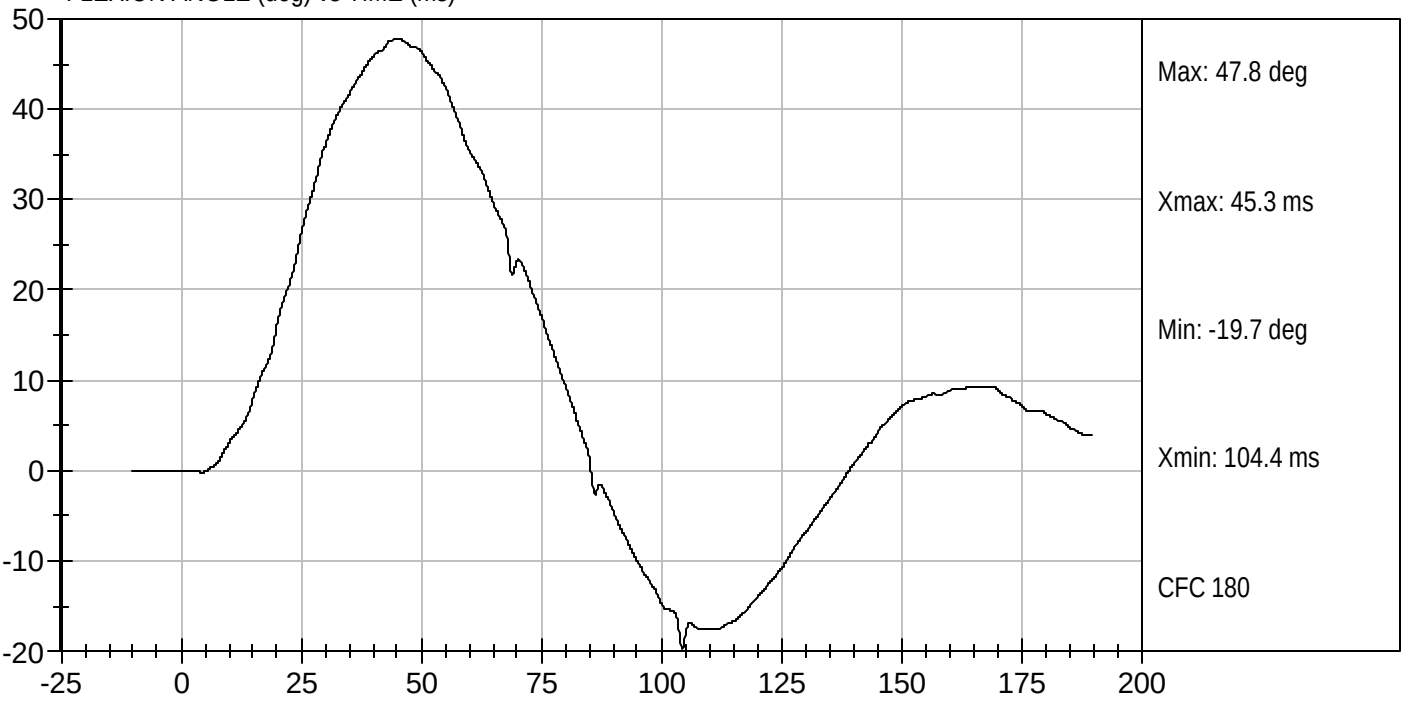
Test Desc: Lumbar Bending
Componet ID: D052258

Test Date: 08/12/2005
Velocity: 20.05 ft/s, 6.11 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

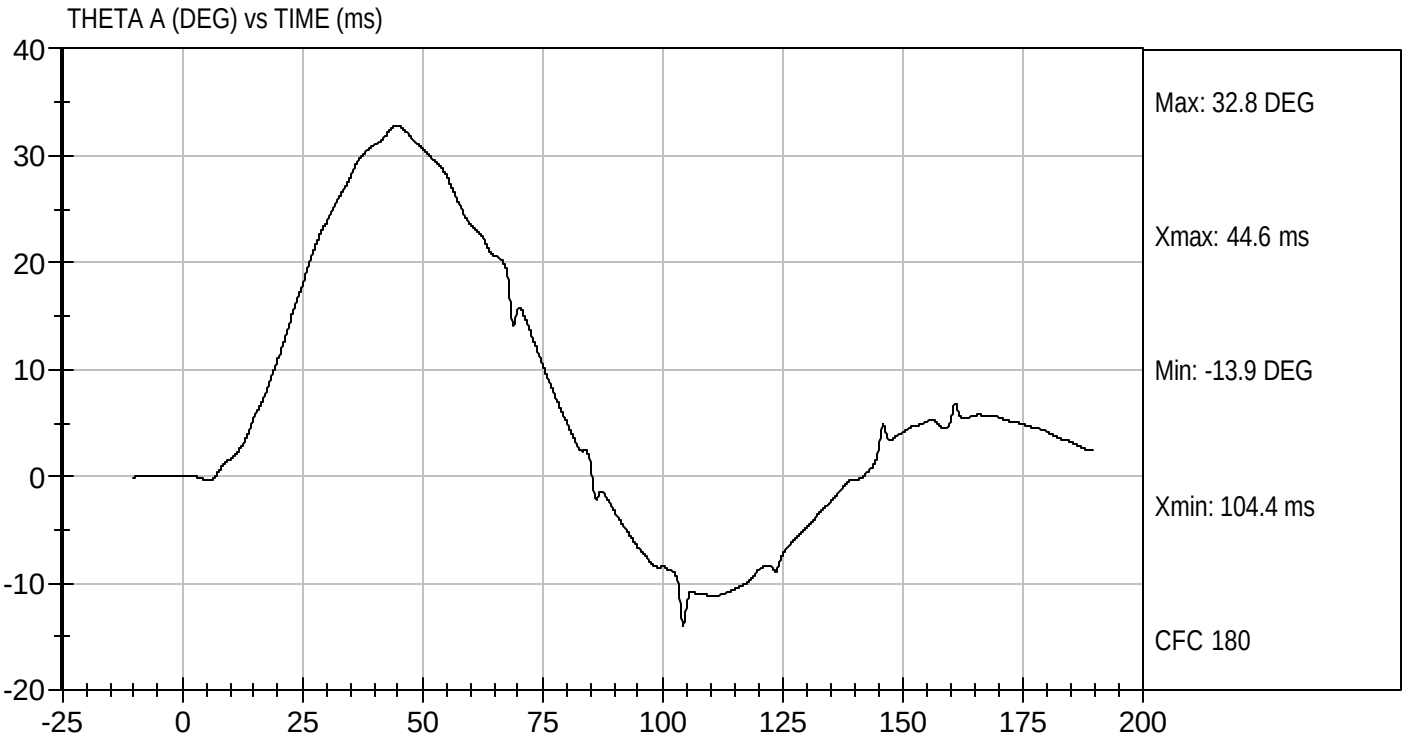


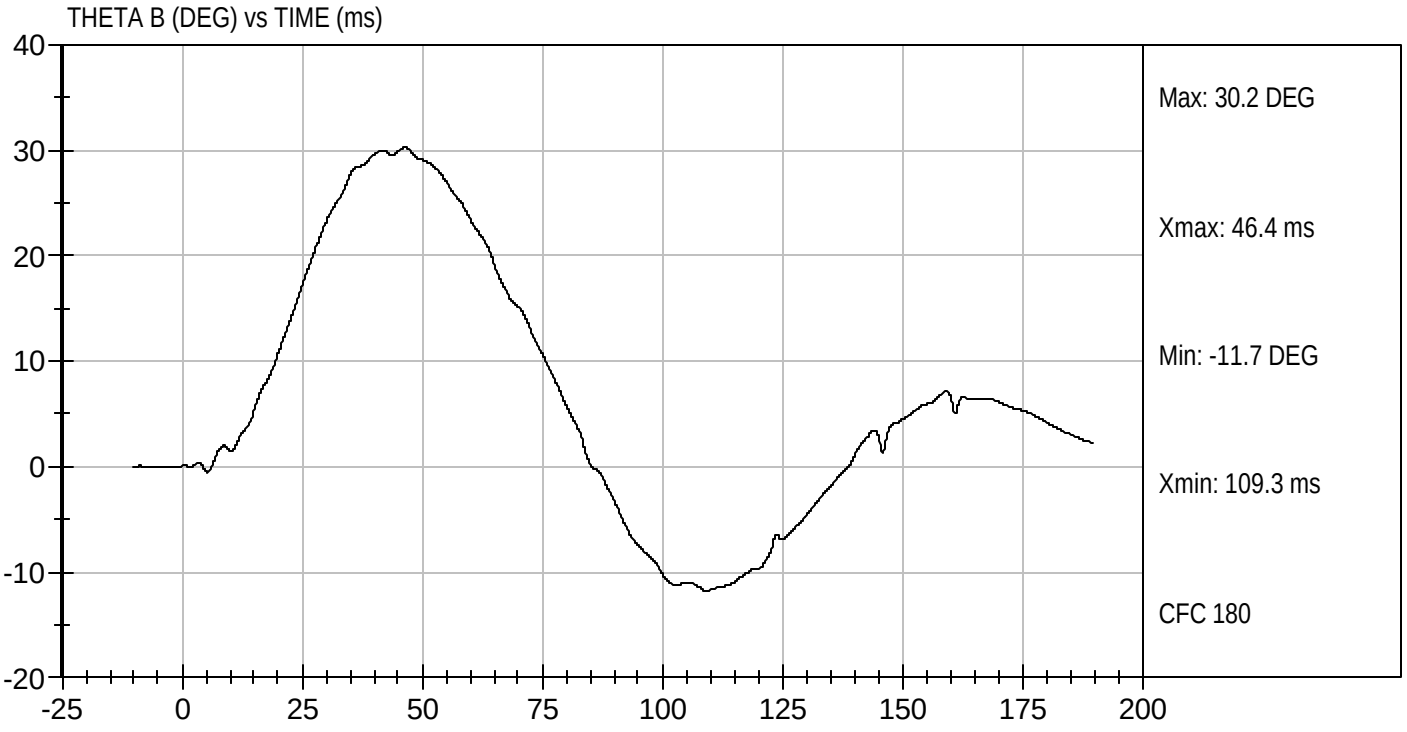
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Componet ID: D052258

Test Date: 08/12/2005
Velocity: 20.05 ft/s, 6.11 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052259

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Probe Speed	m/s	4.20 to 4.40	4.29	Pass
Maximum Impactor Force	kN	4.40 to 5.40	5.18	Pass
Time of Maximum Impactor Force	msec	10.30 to 15.50	14.40	Pass
Maximum Pubic Force	kN	1.04 to 1.64	1.44	Pass
Time of Maximum Pubic Force	msec	9.90 to 15.90	15.30	Pass
		Overall Test Results		Pass

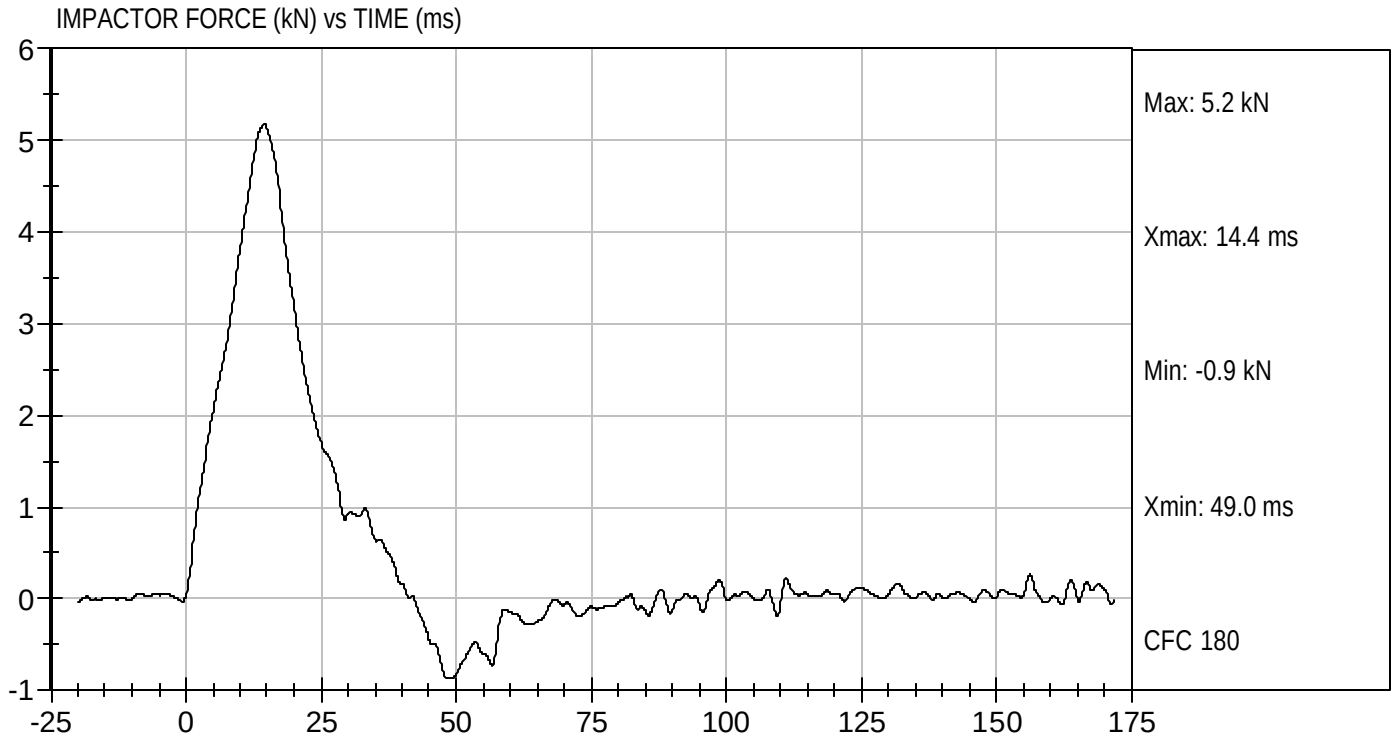
Joe Fleck
Laboratory Technician

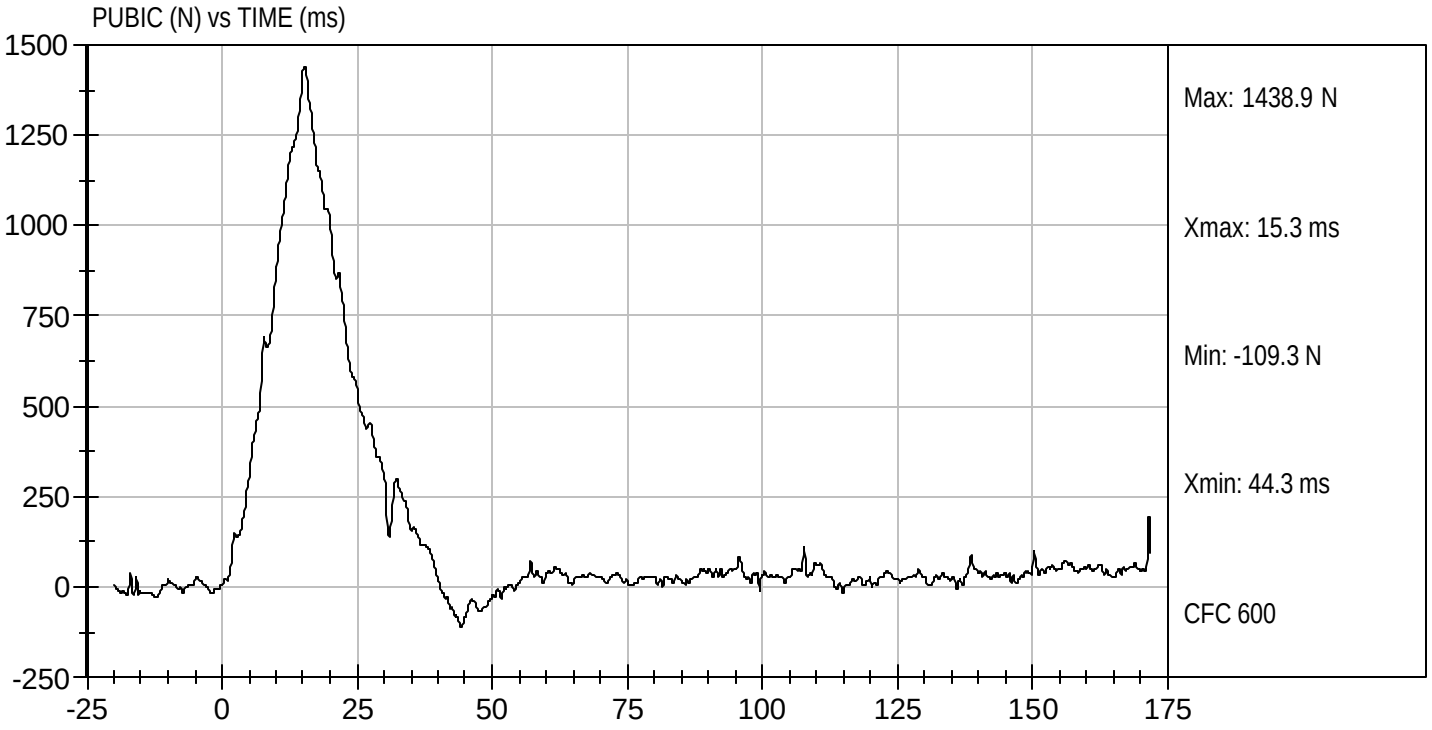
08/10/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Pelvis Impact
Componet ID: D052259

Test Date: 08/10/2005
Velocity: 14.08 ft/s, 4.3 m/s





CERTIFICATION DATA

Dummy Serial Number: 009

POST-TEST CALIBRATION

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test ID:** D052441

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 - 22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	100 - 150	136	Pass
Time of Maximum Resultant Acceleration	msec	NA	27.3	Pass
		Overall Test Results		Pass

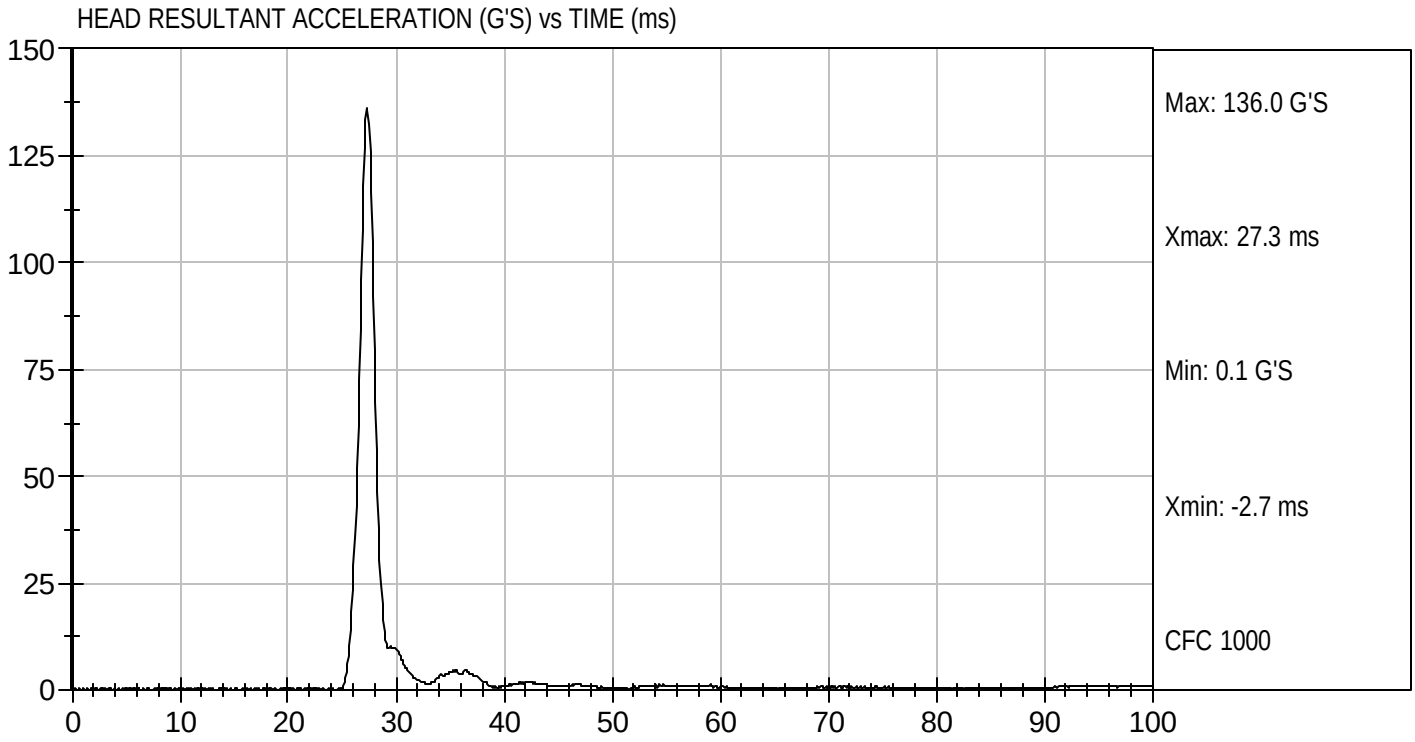
Jessica Hall
Laboratory Technician

09/06/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Head Drop
Componet ID: D052441

Test Date: 09/06/2005
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052442

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity		%	10 to 70	44	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.5	Pass
Pendulum Deceleration	3 msec	G's	-0.25 to -0.53	-0.44	Pass
	8 msec	G's	-1.59 to -2.04	-2.02	Pass
	14 msec	G's	-3.20 to -3.85	-3.57	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	51.5	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	54.3	Pass
Maximum Angle Theta (A)		deg	32.7 to 37.0	33.7	Pass
Time of Maximum Theta (A)		msec	53.0 to 63.0	54.1	Pass
Maximum Angle Theta (B)		deg	29.04 to 31.54	30.67	Pass
Time of Maximum Theta (B)		msec	54.0 to 64.0	56.9	Pass
			Overall Test Results		Pass

Laboratory Technician

09/06/2005
Test Date

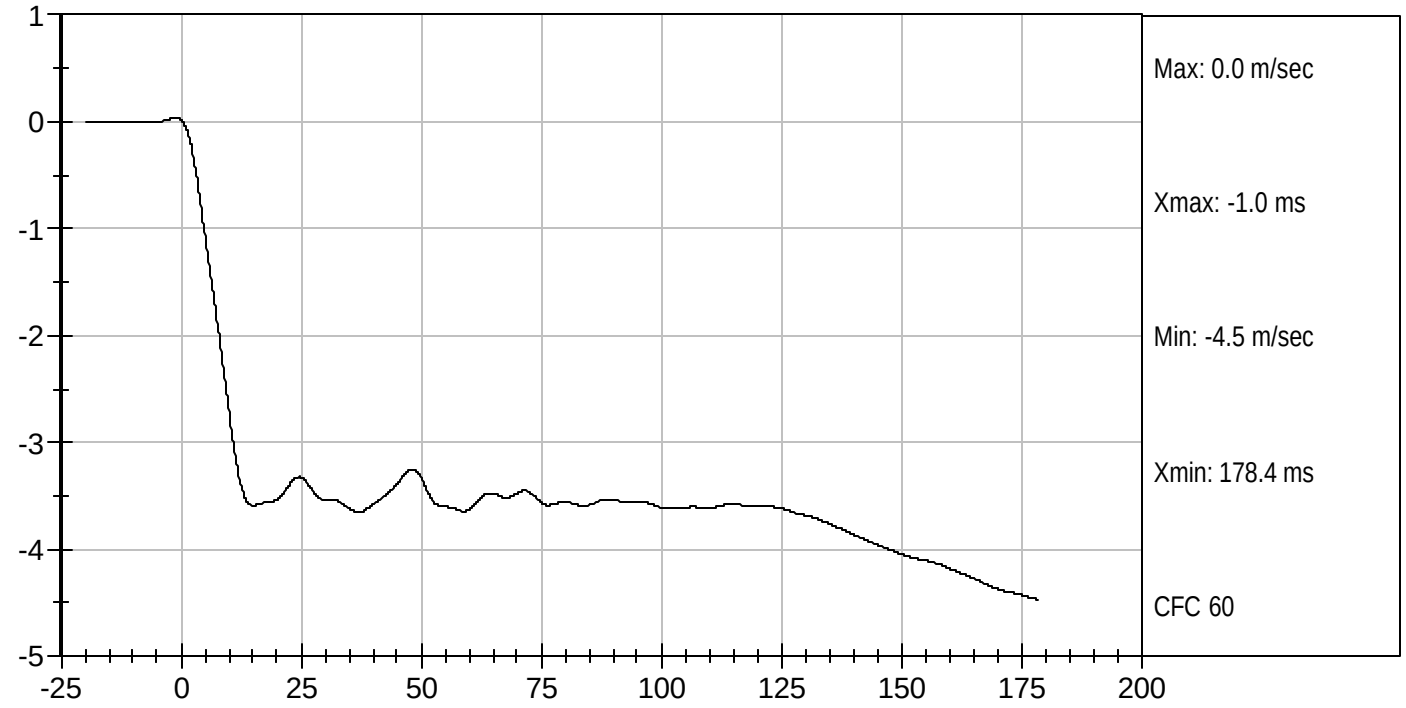
David Winkelbauer

Approved By

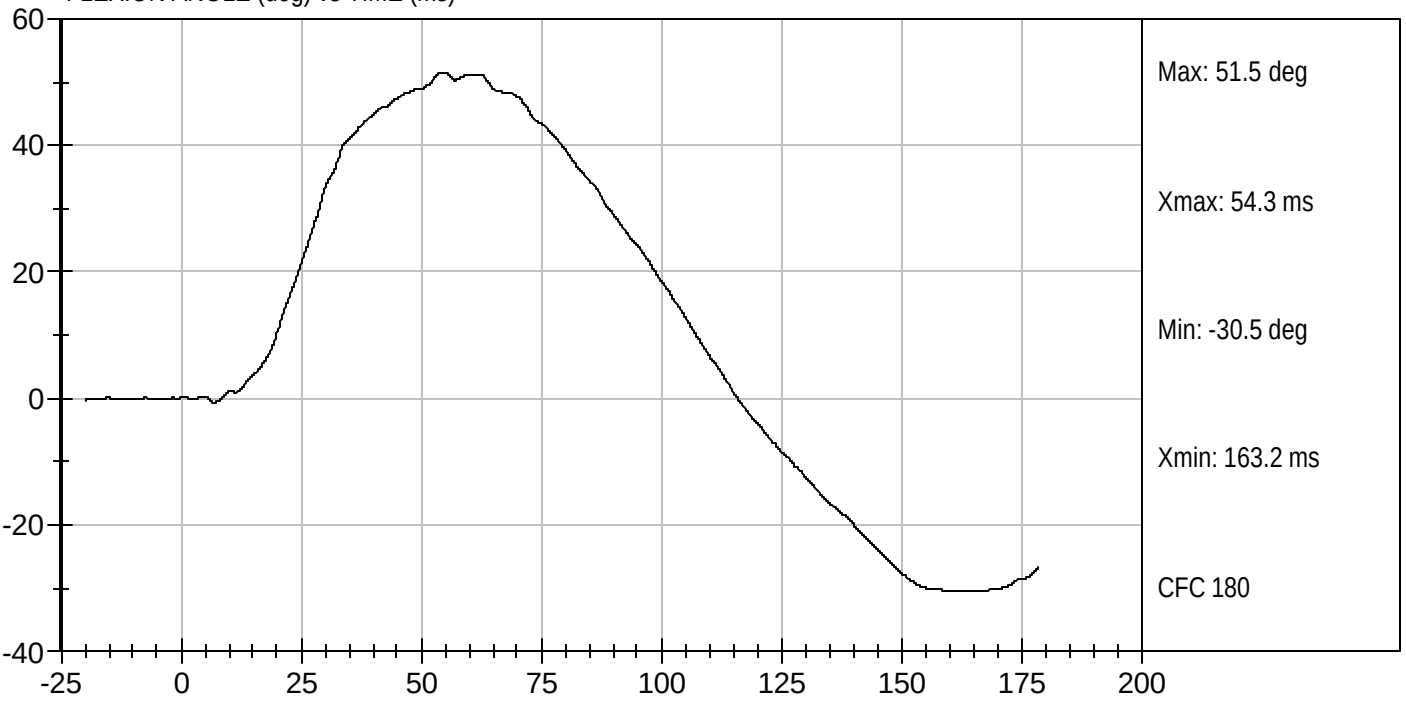
Test Desc: Neck Bending
Componet ID: D052442

Test Date: 09/06/2005
Velocity: 11.35 ft/s, 3.46 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)



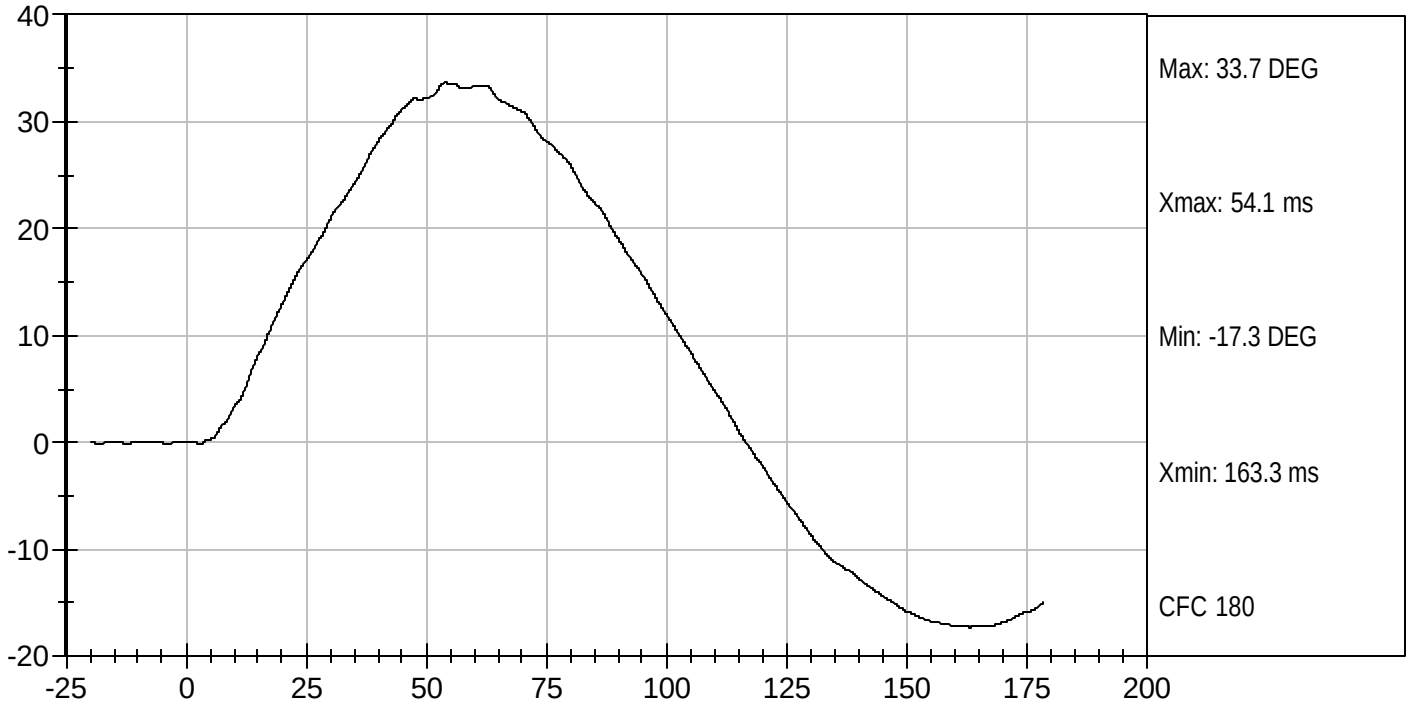
FLEXION ANGLE (deg) vs TIME (ms)



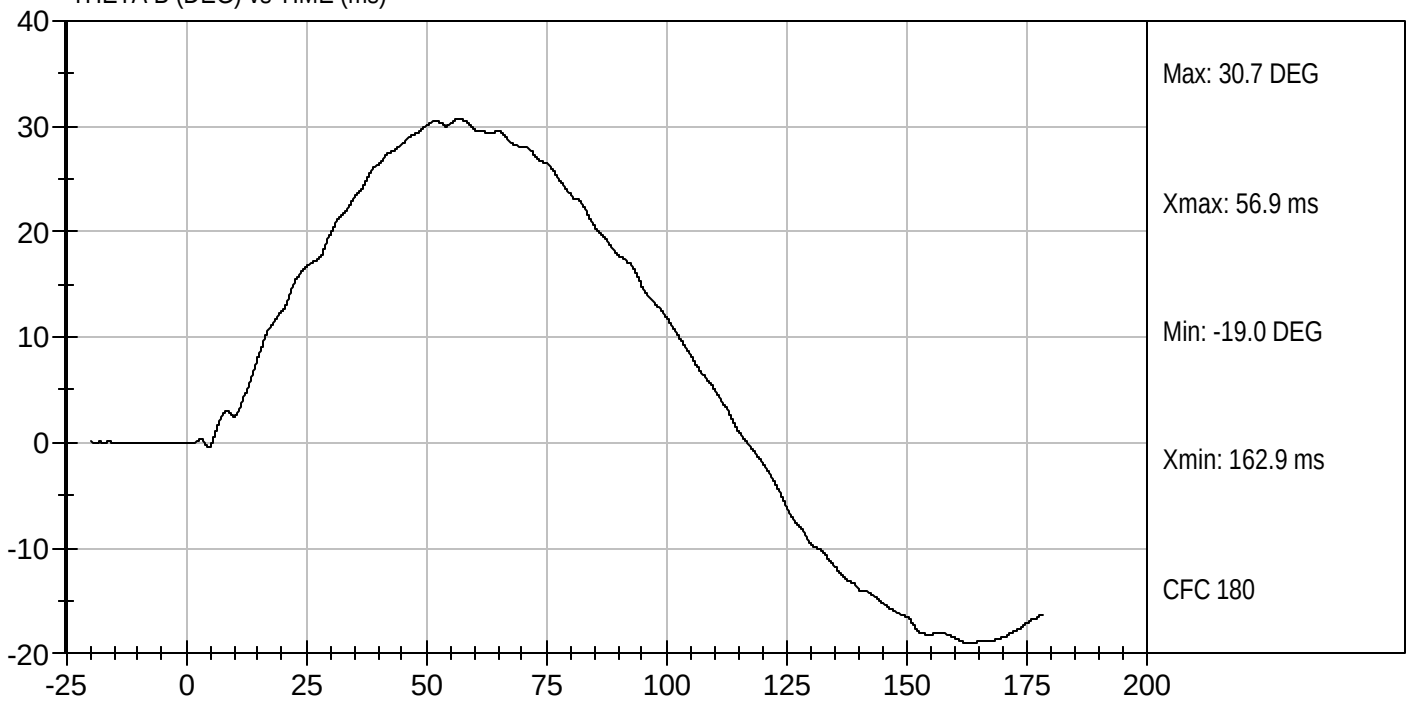
Test Desc: Neck Bending
Componet ID: D052442

Test Date: 09/06/2005
Velocity: 11.35 ft/s, 3.46 m/s

THETA A (DEG) vs TIME (ms)



THETA B (DEG) vs TIME (ms)



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052443

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Pendulum Speed	m/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	9.4	Pass
Time of Peak Shoulder Acceleration	msec	NA	13.2	Pass
		Overall Test Results		Pass

Laboratory Technician

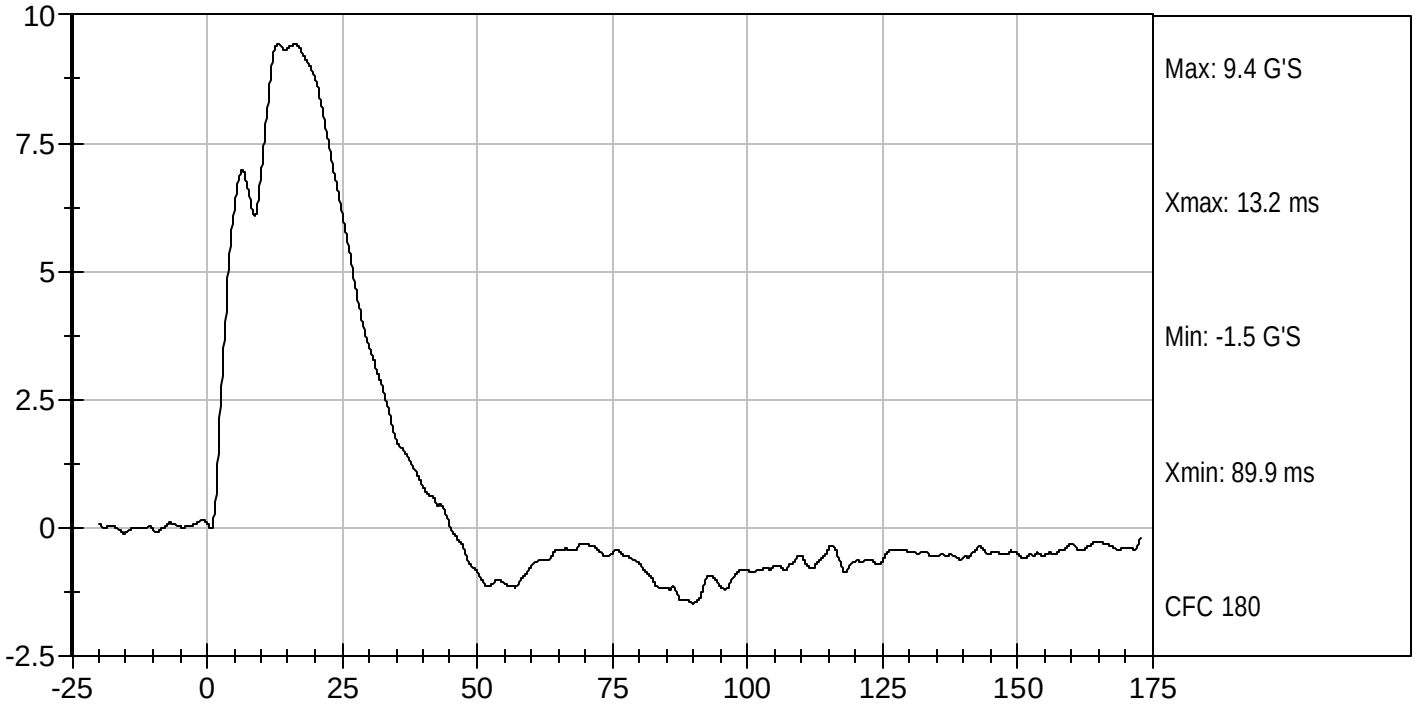
09/02/2005
Test Date

David Winkelbauer
Approved By

Test Desc: Shoulder Impact
Componet ID: D052443

Test Date: 09/02/2005
Velocity: 14.07 ft/s, 4.3 m/s

SHOULDER ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION

UPPER RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052444

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Displacement at 2 m/s	mm	23.5 to 27.5	25.5	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.9	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.7	Pass
		Overall Test Results		Pass

Laboratory Technician

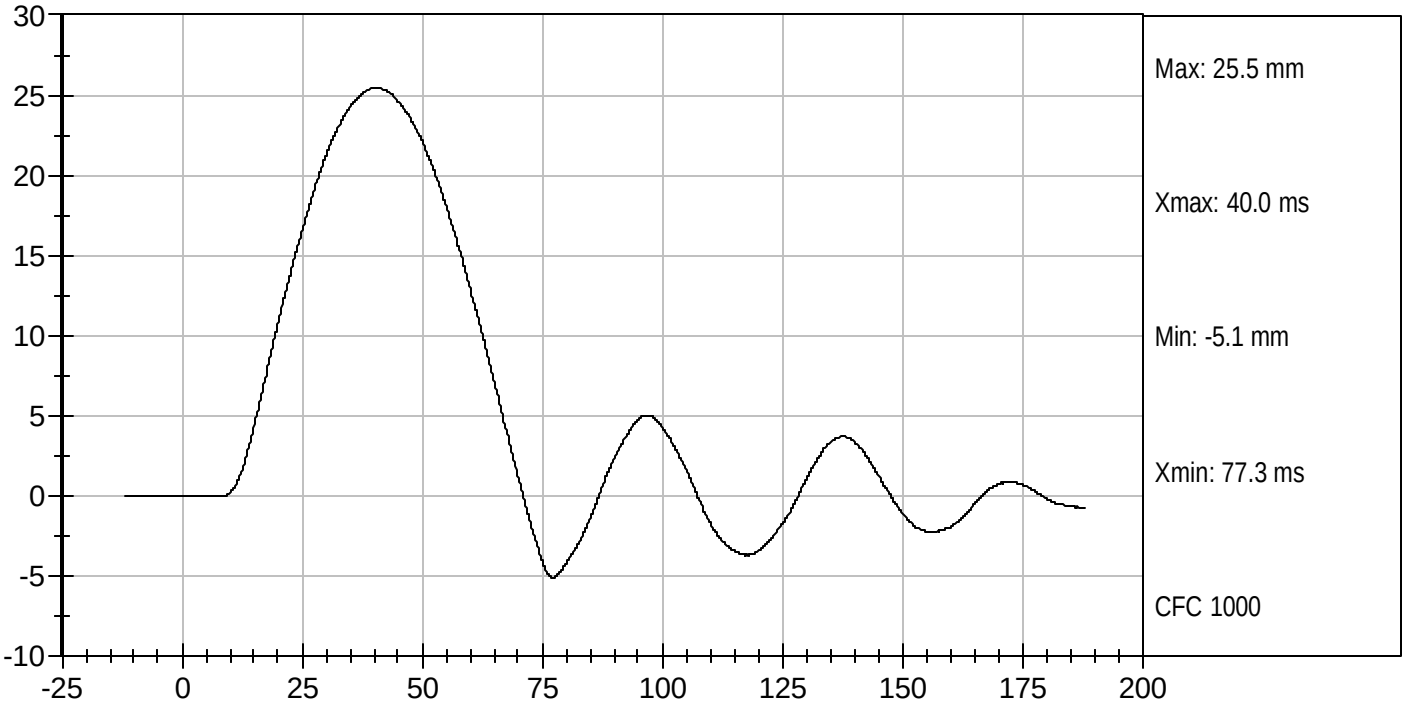
09/06/2005
Test Date

David Winkelbauer
Approved By

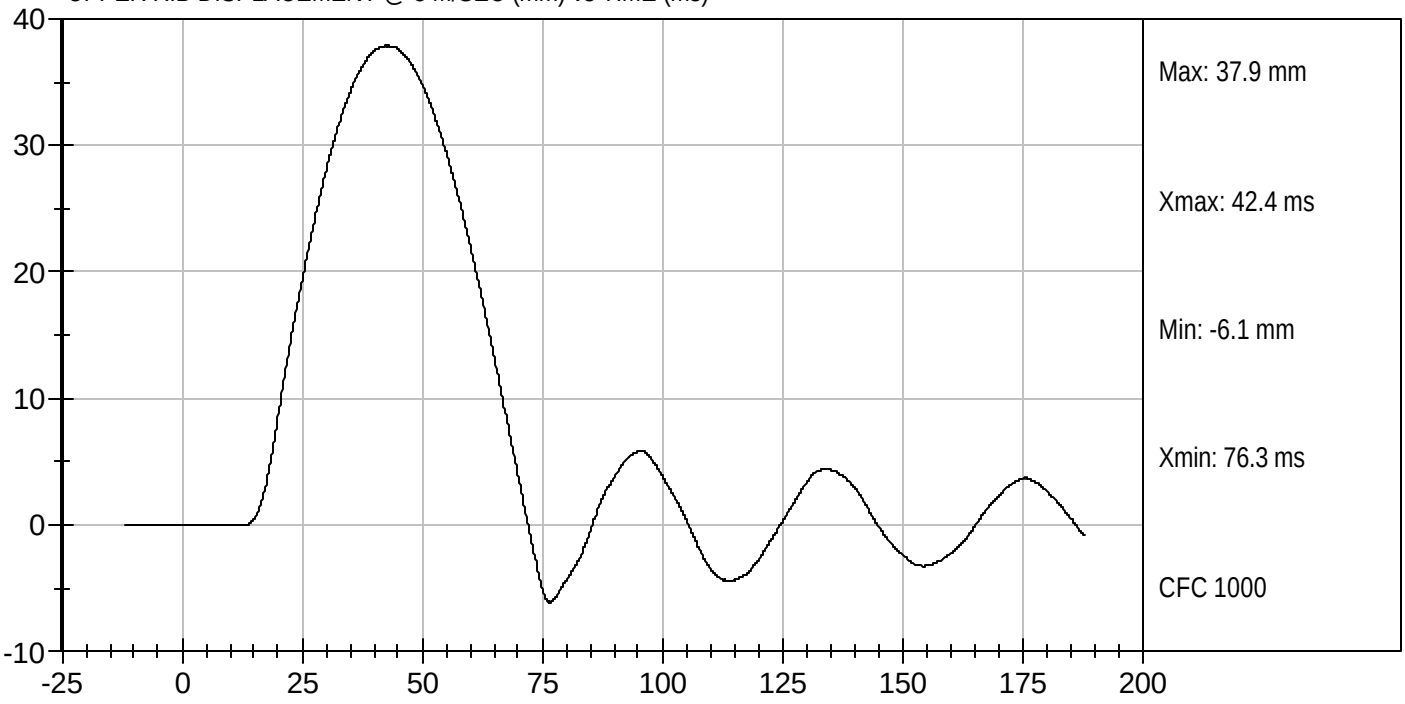
Test Desc: Rib Impact - Upper
Componet ID: D052444

Test Date: 09/06/2005
Velocity: 6.56 ft/s, 2 m/s

UPPER RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



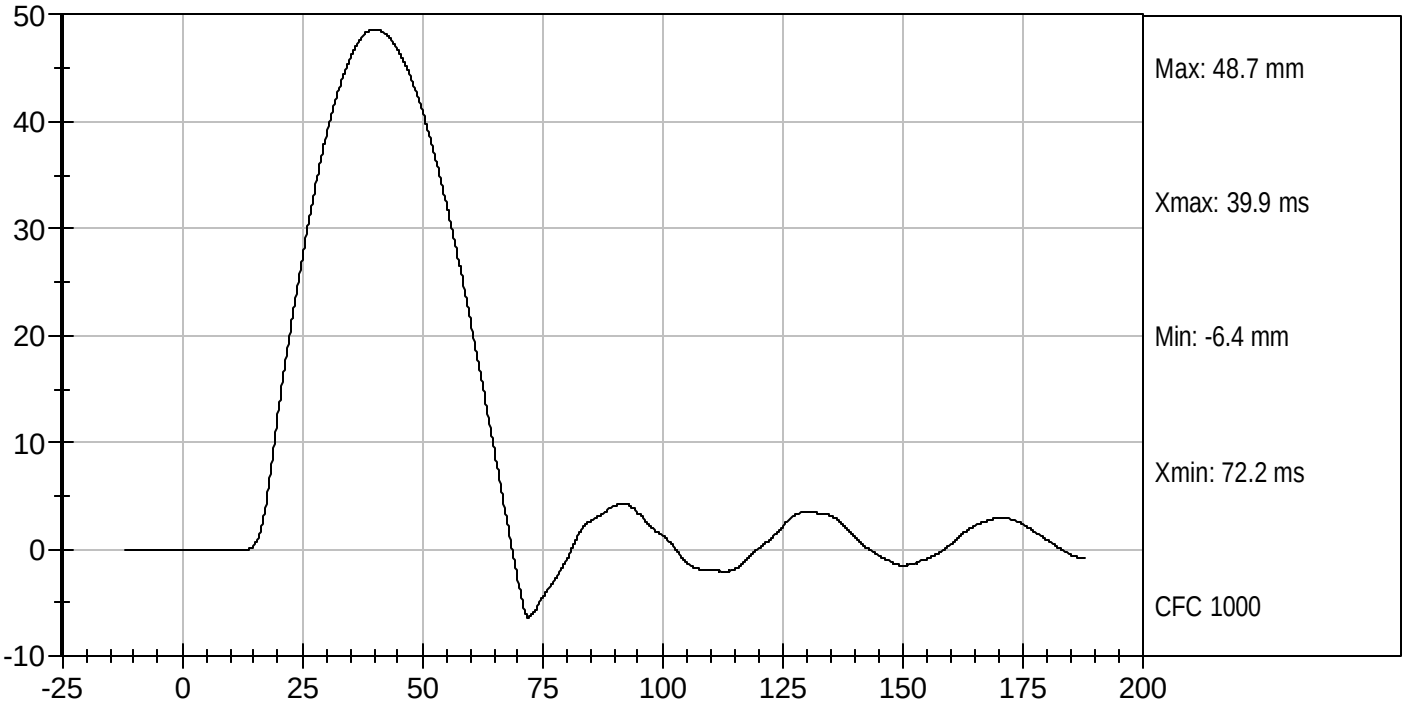
UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Rib Impact - Upper
Componet ID: D052444

Test Date: 09/06/2005
Velocity: 13.12 ft/s, 4 m/s

UPPER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052445

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Displacement at 2 m/s	mm	23.5 to 27.5	24.6	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	36.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.5	Pass
		Overall Test Results		Pass

Laboratory Technician

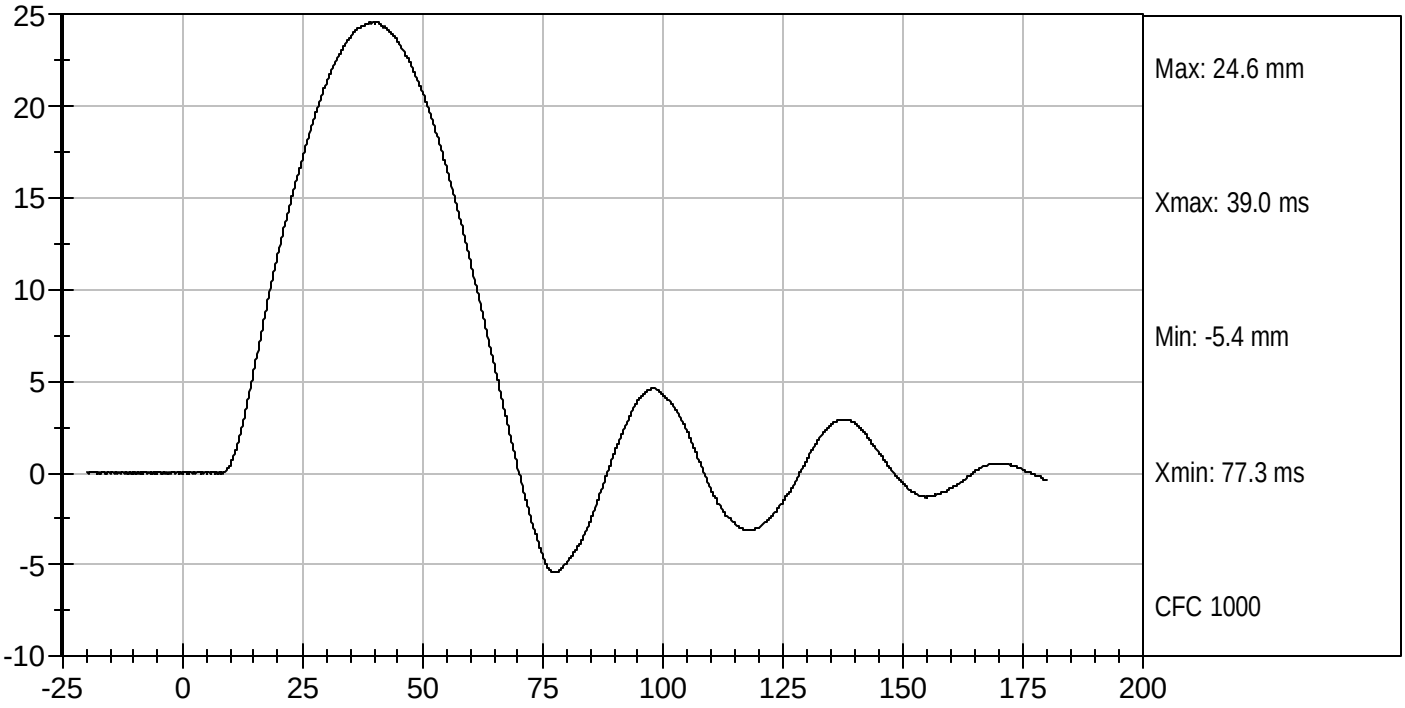
09/06/2005
Test Date

David Winkelbauer
Approved By

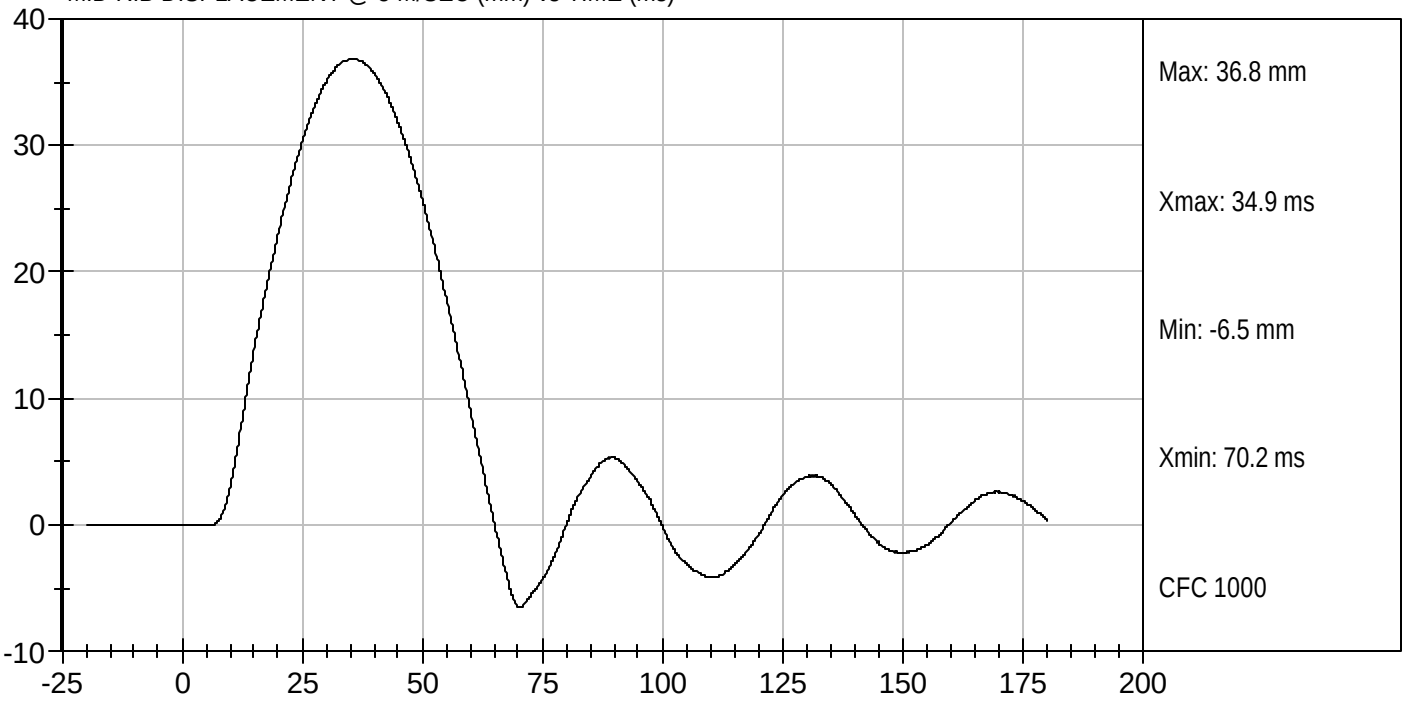
Test Desc: Neck Bending
Componet ID: D052445

Test Date: 09/06/2005
Velocity: 6.56 ft/s, 2 m/s

MID RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



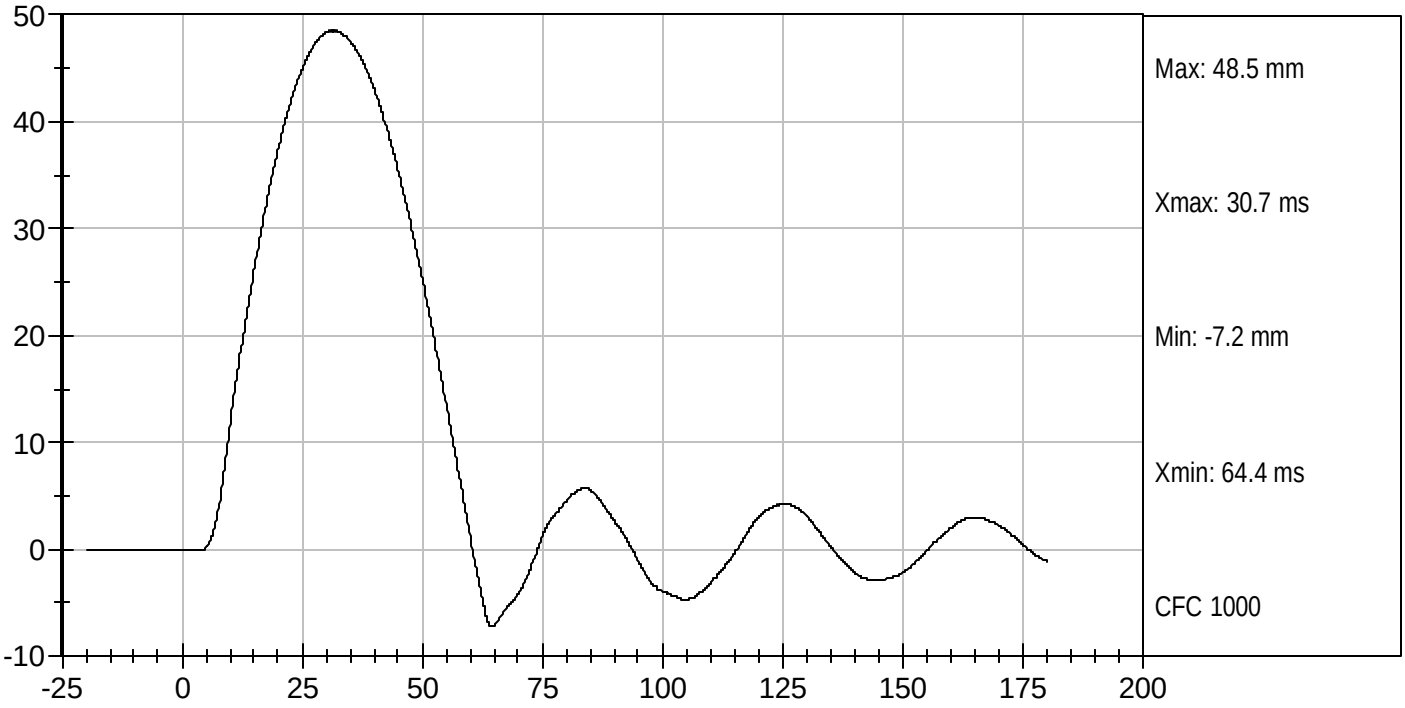
MID RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Neck Bending
Componet ID: D052445

Test Date: 09/06/2005
Velocity: 13.12 ft/s, 4m/s

MID RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

LOWER RIB TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052446

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	47	Pass
Displacement at 2 m/s	mm	23.5 to 27.5	25.9	Pass
Displacement at 3 m/s	mm	36.0 to 40.0	37.8	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	48.6	Pass
		Overall Test Results		Pass

Laboratory Technician

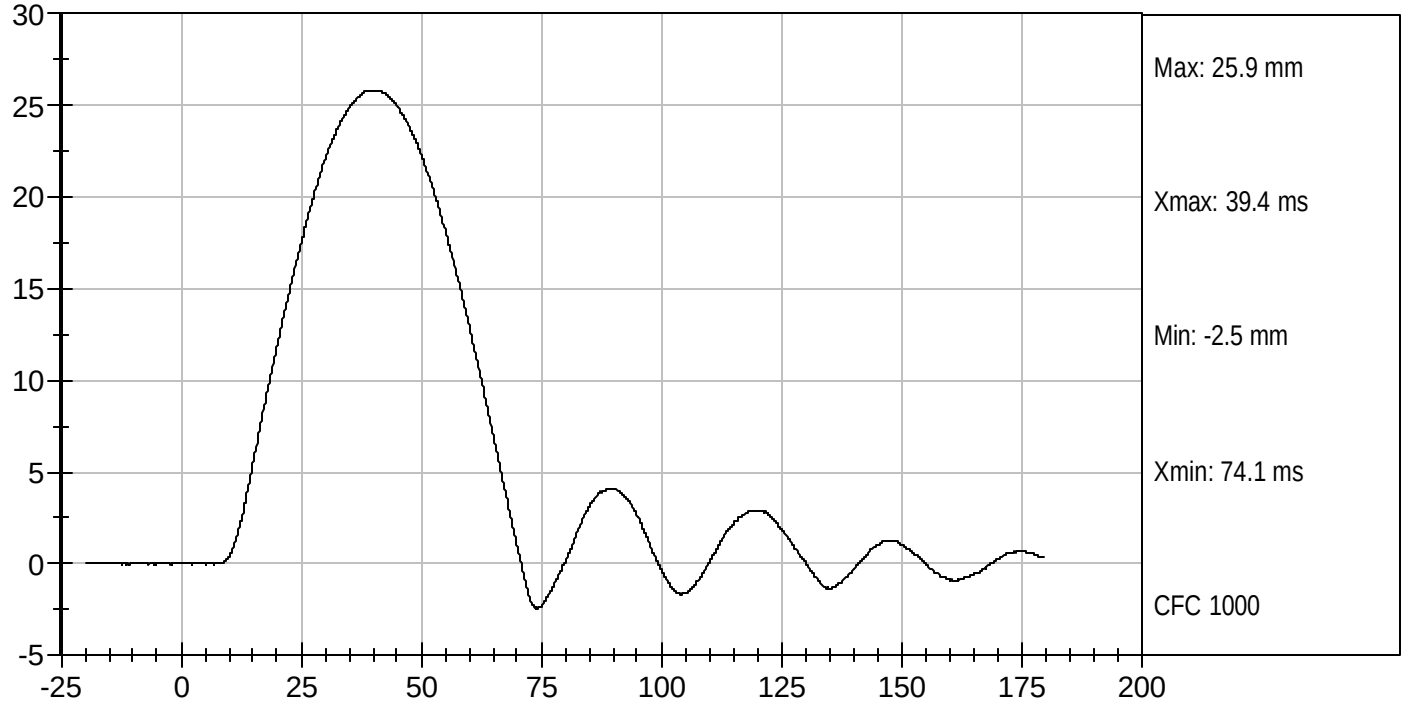
09/06/2005
Test Date

David Winkelbauer
Approved By

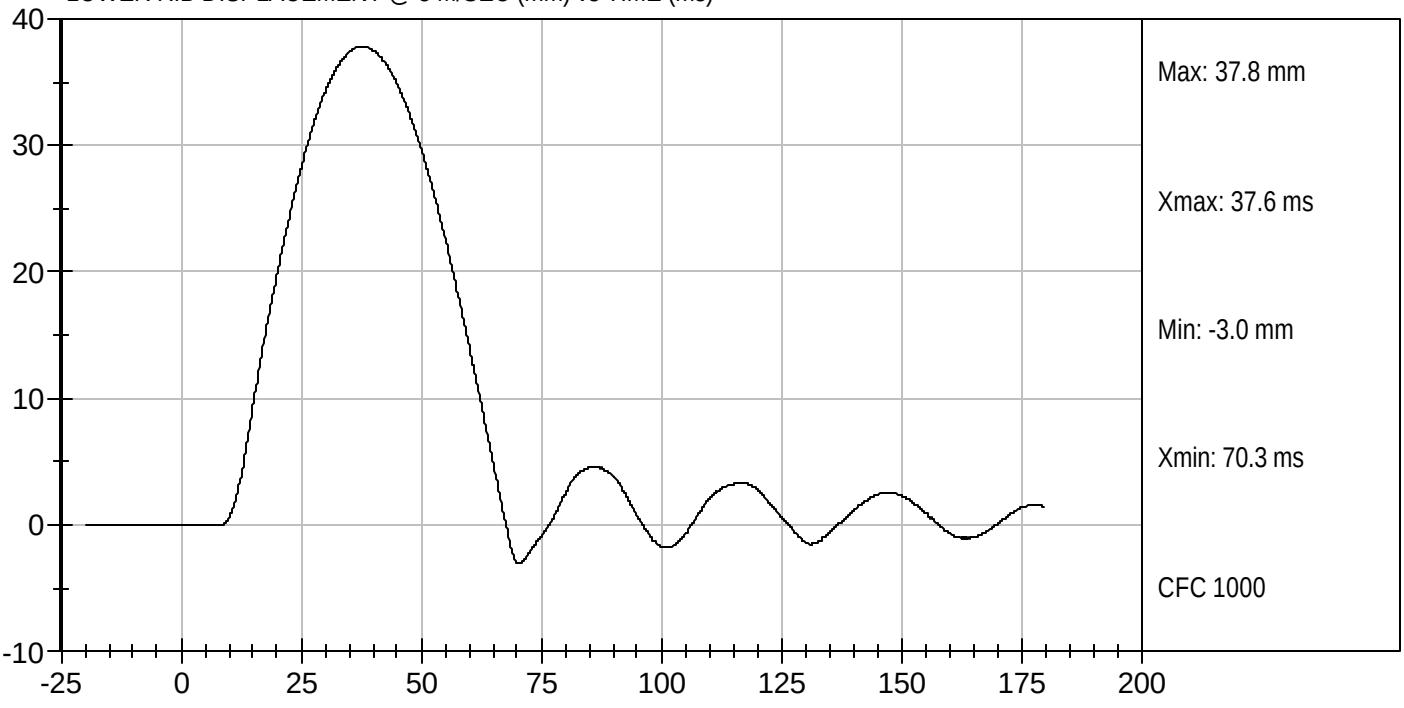
Test Desc: Rib Impact - Lower
Componet ID: D052446

Test Date: 09/06/2005
Velocity: 6.56 ft/s, 2 m/s

LOWER RIB DISPLACEMENT @ 2 M/SEC (mm) vs TIME (ms)



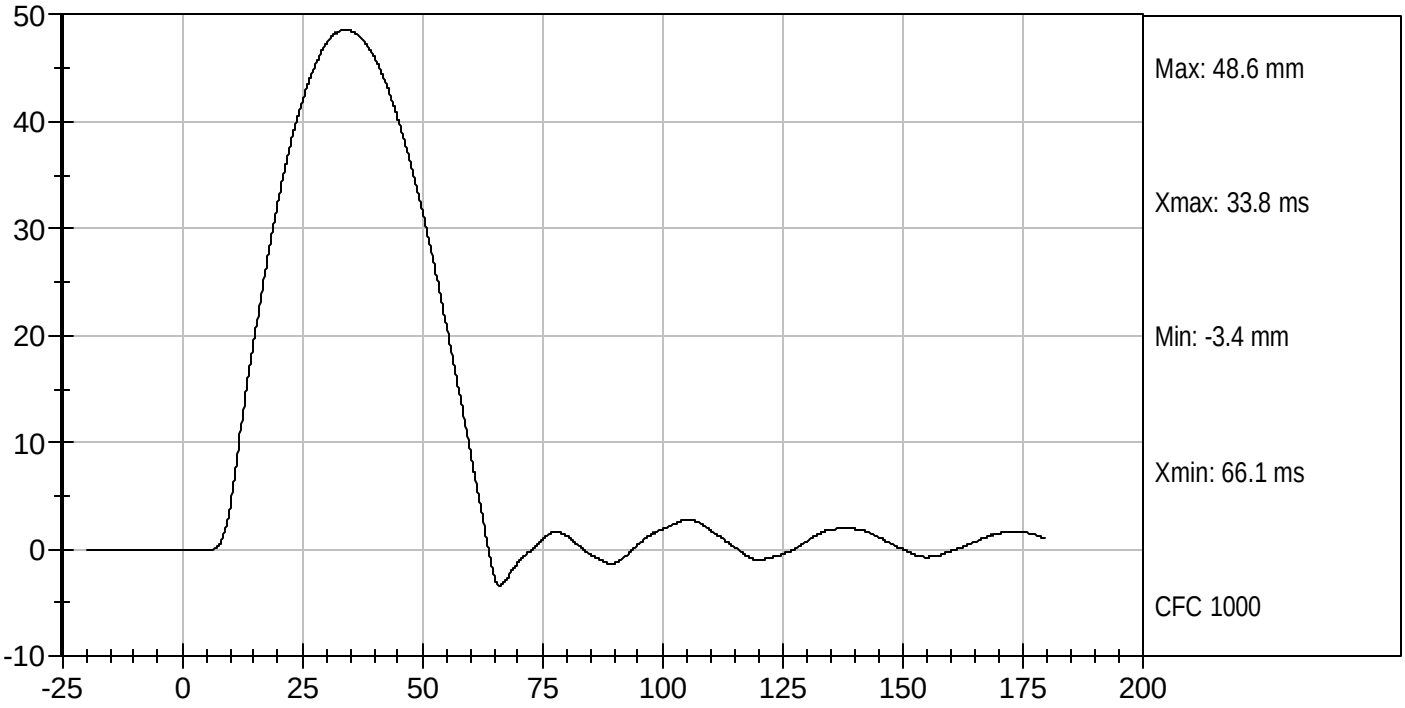
LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)



Test Desc: Rib Impact - Lower
Componet ID: D052446

Test Date: 09/06/2005
Velocity: 13.12 ft/s, 4 m/s

LOWER RIB DISPLACEMENT @ 4 M/SEC (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052447

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	3.90 to 4.10	4.01	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.67	Pass
Time of Maximum Impactor Force	msec	10.60 to 13.00	11.60	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.48	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	11.50	Pass
		Overall Test Results		Pass

Laboratory Technician

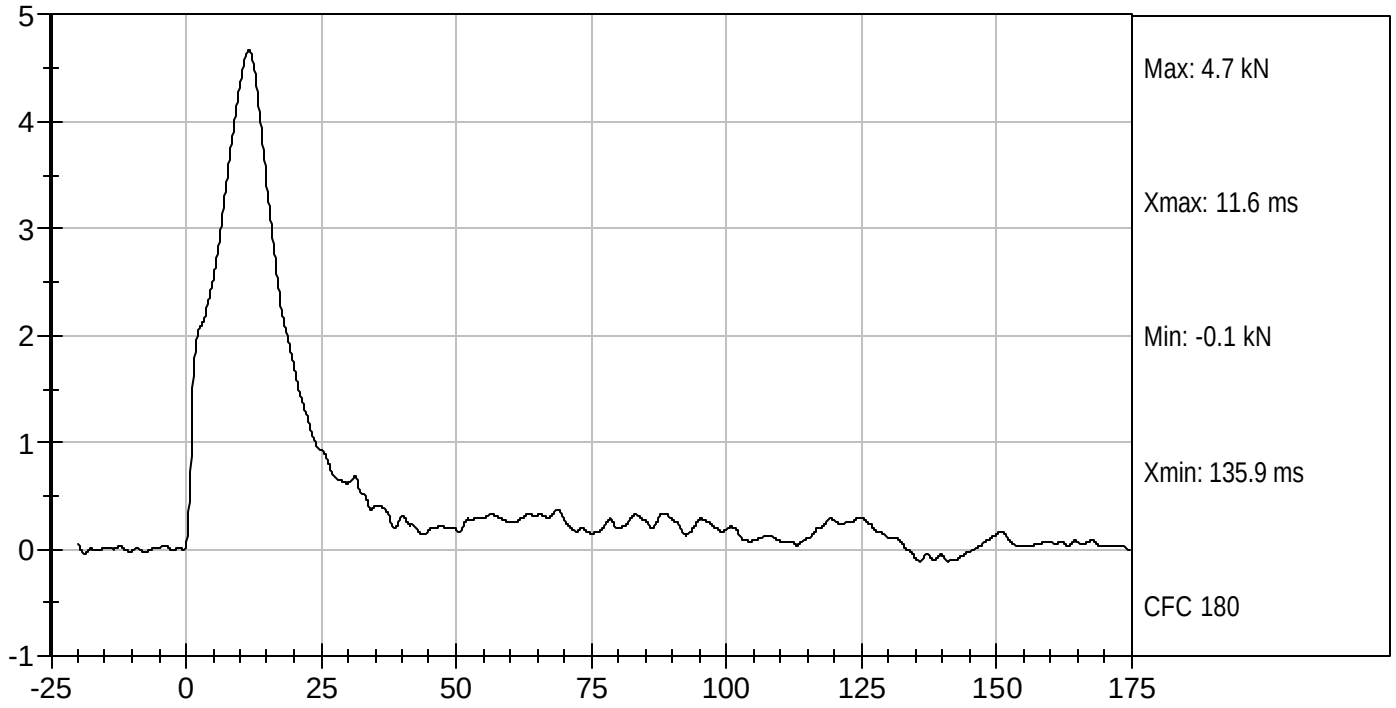
09/02/2005
Test Date

David Winkelbauer
Approved By

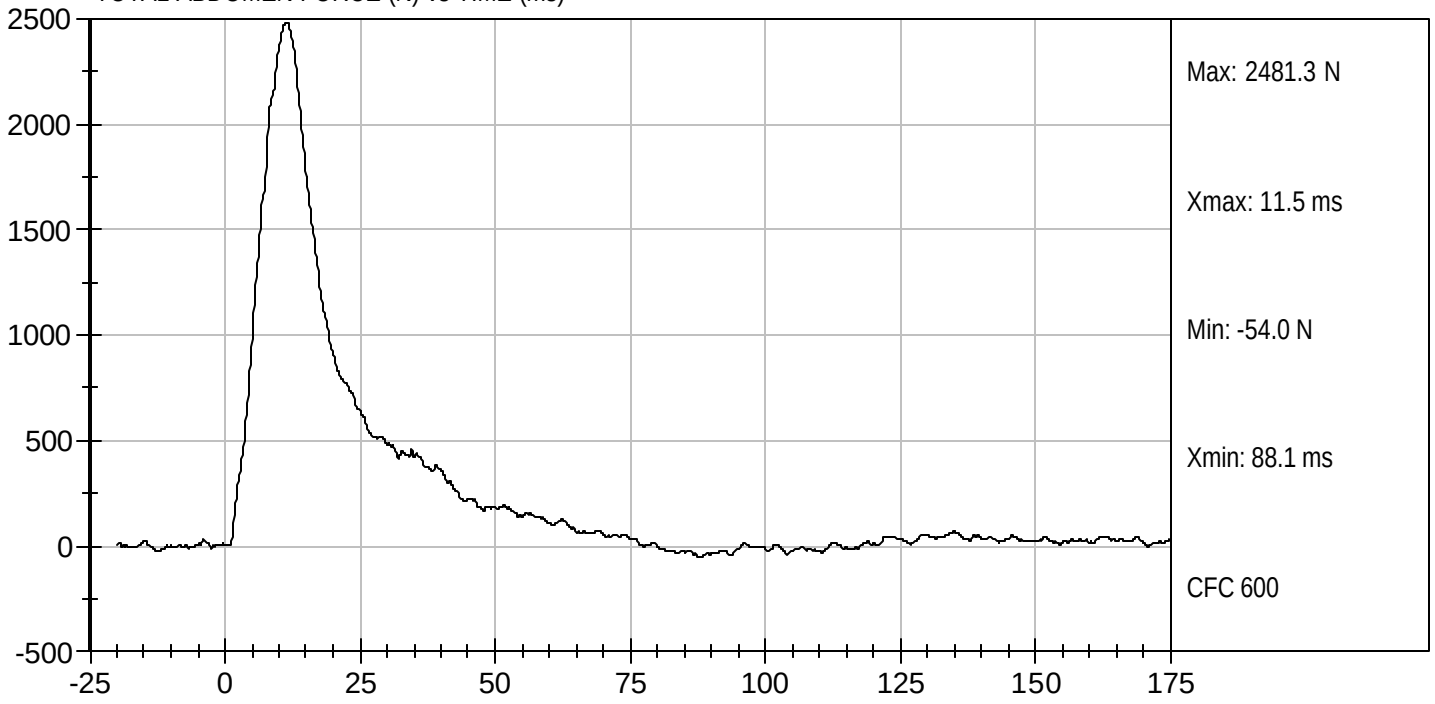
Test Desc: Abdomen Impact
Componet ID: D052447

Test Date: 09/02/2005
Velocity: 13.16 ft/s, 4.0 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



TOTAL ABDOMEN FORCE (N) vs TIME (ms)



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052448

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	18.0 to 22.0	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	43	Pass
Pendulum Speed		m/sec	5.95 to 6.15	6.12	Pass
Pendulum Deceleration	10 msec	m/sec	-2.46 to -1.59	-2.31	Pass
	20 msec	m/sec	-5.25 to -4.07	-5.20	Pass
	25 msec	m/sec	-6.64 to -5.30	-6.24	Pass
	30 msec	m/sec	>= -6.5	-6.3	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	46.7	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	42.6	Pass
Maximum Theta (A)		deg	31.0 to 35.0	31.1	Pass
Time of Maximum Theta (A)		msec	44.0 to 52.0	45.4	Pass
Maximum Theta (B)		deg	26.90 to 29.40	29.38	Pass
Time of Maximum Theta (B)		msec	44.0 to 52.0	45.5	Pass
			Overall Results		Pass

Laboratory Technician

09/06/2005
Test Date

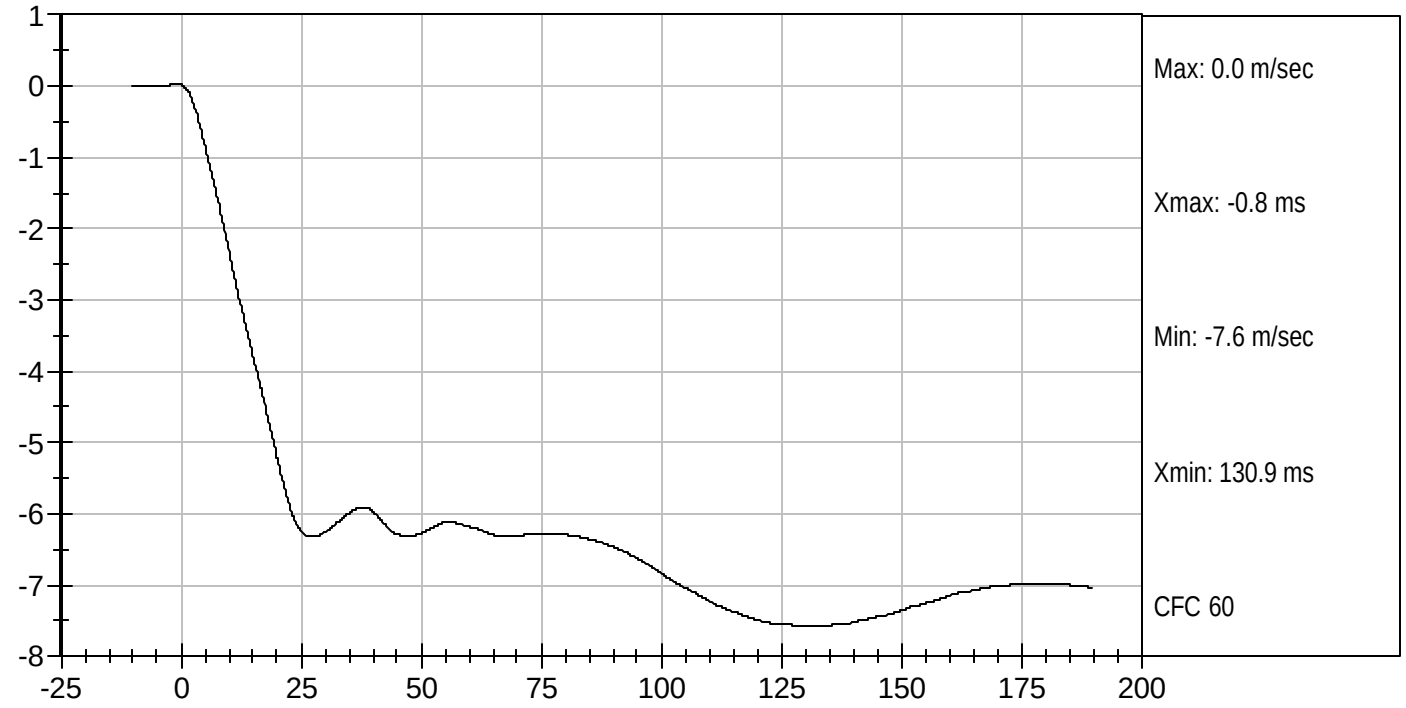
David Winkelbauer

Approved By

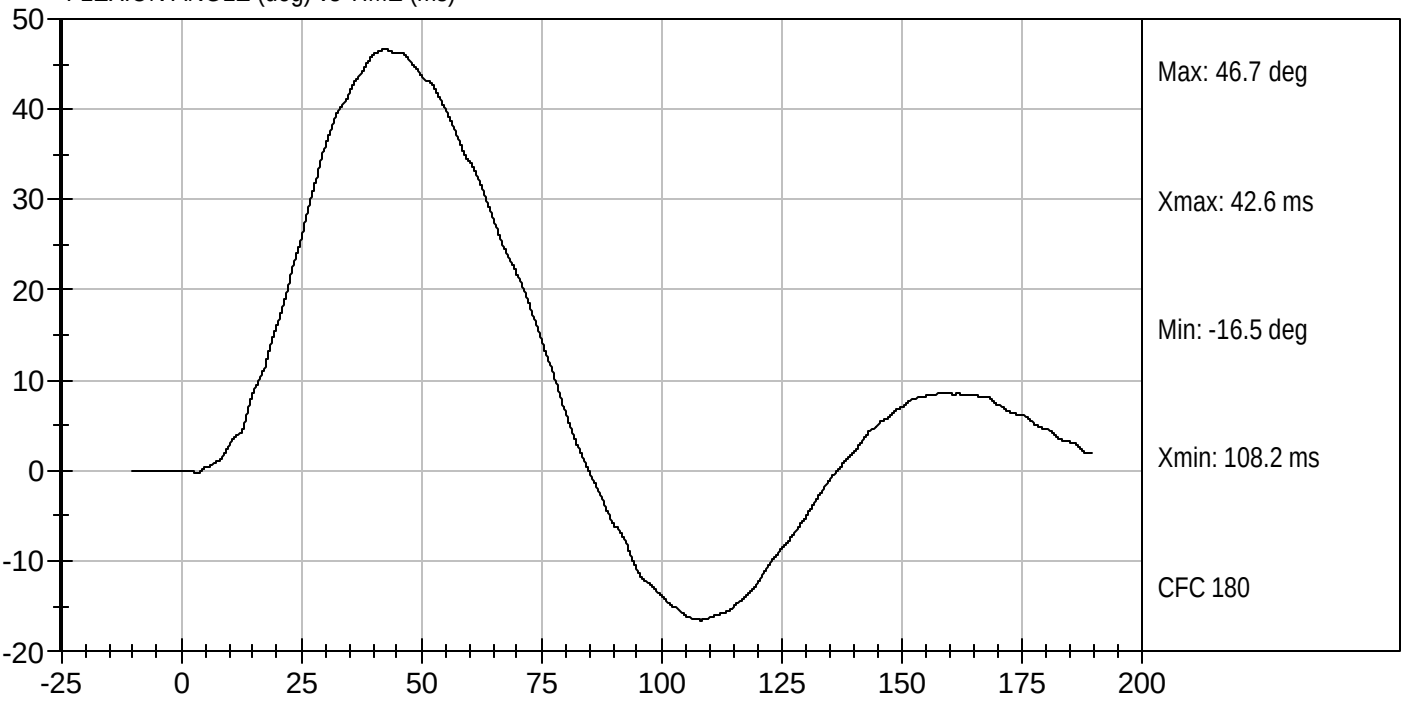
Test Desc: Lumbar Bending
Componet ID: D052448

Test Date: 09/06/2005
Velocity: 20.09 ft/s, 6.12 m/s

PENDULUM DECELERATION (m/sec) vs TIME (ms)

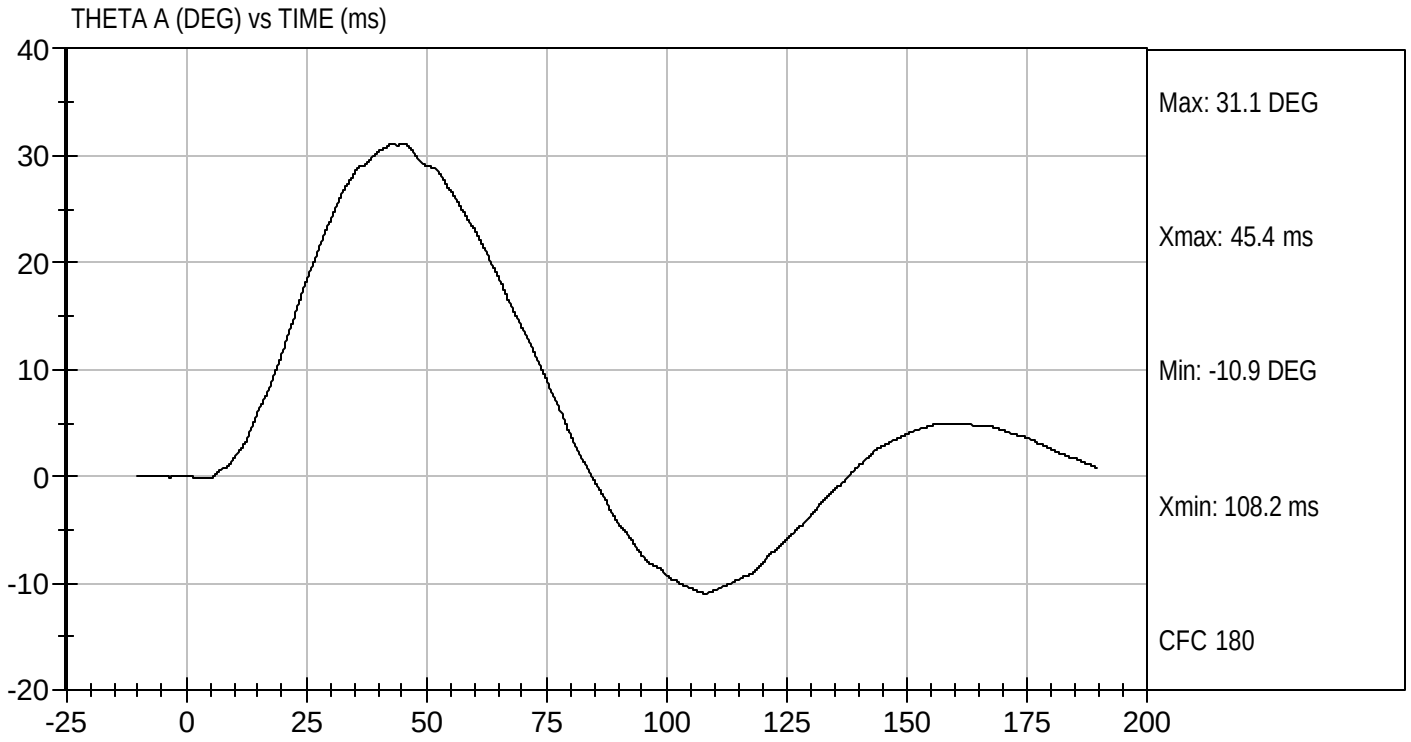


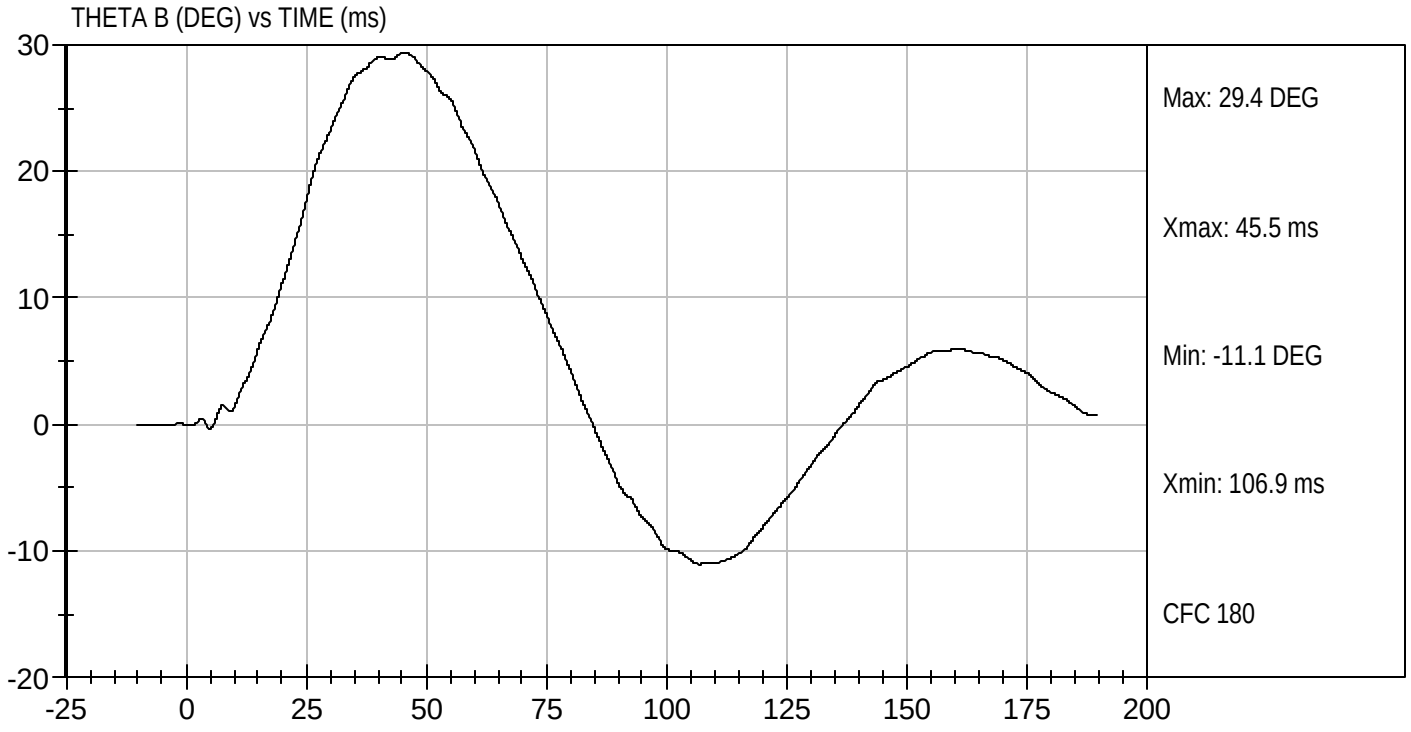
FLEXION ANGLE (deg) vs TIME (ms)



Test Desc: Lumbar Bending
Componet ID: D052448

Test Date: 09/06/2005
Velocity: 20.09 ft/s, 6.12 m/s





MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

ATD Serial No: 009 **Test I.D:** D052449

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	4.20 to 4.40	4.29	Pass
Maximum Impactor Force	kN	4.40 to 5.40	4.97	Pass
Time of Maximum Impactor Force	msec	10.30 to 15.50	14.10	Pass
Maximum Pubic Force	kN	1.04 to 1.64	1.43	Pass
Time of Maximum Pubic Force	msec	9.90 to 15.90	14.40	Pass
		Overall Test Results		Pass

Laboratory Technician

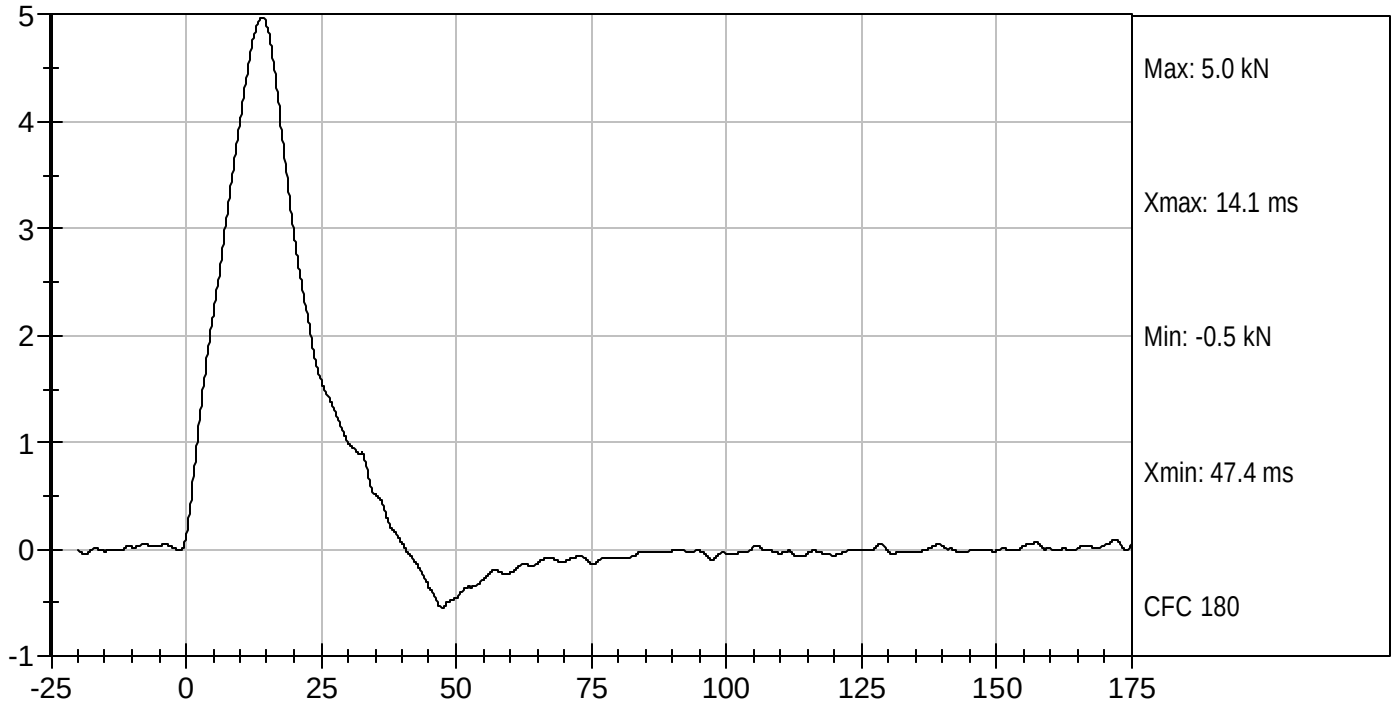
09/02/2005
Test Date

David Winkelbauer
Approved By

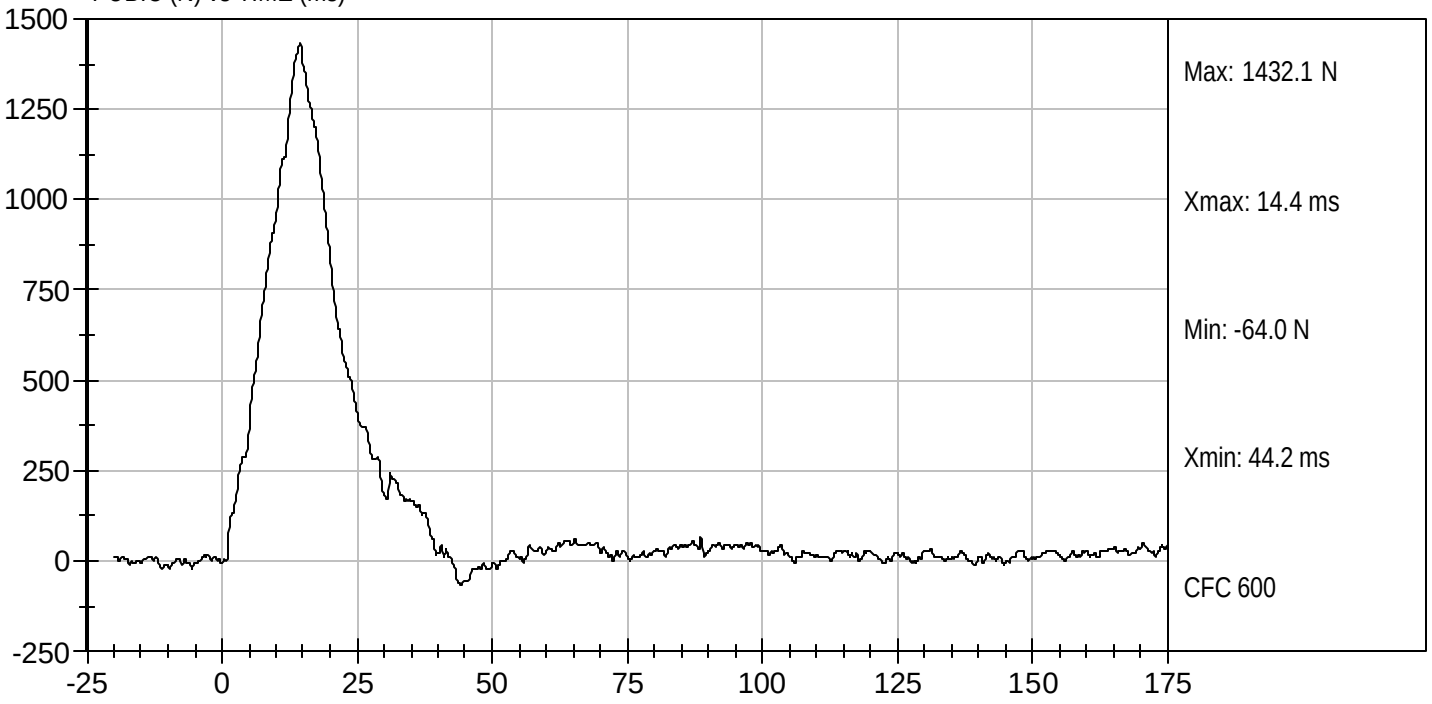
Test Desc: Pelvis Impact
Componet ID: D052449

Test Date: 09/02/2005
Velocity: 14.07 ft/s, 4.29 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY ES-2RE: 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	P24154	Endevco	7/29/05
Head Y Accelerometer	AKAA6	Endevco	7/29/05
Head Z Accelerometer	ALBA7	Endevco	7/29/05
Head Y - Front	ALCR0	Endevco	7/29/05
Head Z - Front	P21352	Endevco	7/29/05
Head X – Left	P24261	Endevco	7/29/05
Head Z – Left	AGTM2	Endevco	7/29/05
Head X – Upper	J13535	Endevco	7/29/05
Head Y – Upper	AH097	Endevco	7/29/05
Upper Neck Load Cell	105	FTSS	9/27/05
Lower Neck Load Cell	110	FTSS	9/27/05
Shoulder Load Cell	119	FTSS	9/24/05
T12 Load Cell	103	FTSS	9/24/04
Upper Spine X	P22694	Endevco	7/29/05
Upper Spine Y	P22084	Endevco	7/29/05
Upper Spine Z	P24226	Endevco	7/29/05
Lower Spine X	A27-Z07	Entran	7/29/05
Lower Spine Y	A12-A11	Entran	7/29/05
Lower Spine Z	A27-Z19	Entran	7/29/05
Torso Load Cell	102	FTSS	9/29/04
Upper Rib Y	AJ9P7	Endevco	7/29/05
Mid Rib Y	AP2C4	Endevco	7/29/05
Lower Rib Y	P22107	Endevco	7/29/05
Rib Displacement	009	Honeywell	7/26/05
Front Abdomen FY	ABG122FY	FTSS	9/30/04
Mid Abdomen FY	ABG123FY	FTSS	9/30/04
Rear Abdomen FY	ABG124FY	FTSS	9/30/04
Pubic Symphysis FY	PG115FY	FTSS	9/24/04
Pelvis X	AGP20	Endevco	7/29/05
Pelvis Y	AM751	Endevco	7/29/05
Pelvis Z	AKAC4	Endevco	7/29/05
Right Femur Load Cell	135	FTSS	9/28/04
Left Femur Load Cell	136	FTSS	9/28/05
Lumbar Load Cell	104	FTSS	9/27/05

VEHICLE INSTRUMENTS CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	E05-Z37	Entran	7/20/05
Left Lower A-Post Y	E05-Z35	Entran	7/20/05
Left Mid B-Post Y	E05-Z75	Entran	7/20/05
Left Lower B-Post Y	E05-Z41	Entran	7/20/05
Left A-Post @ Sill Y	B26-Z19	Entran	3/17/05
Left B-Post @ Sill Y	C21-G40	Entran	4/28/05
Driver Seat Track Y	I16-B06	Entran	3/09/05
Right Front Sill X	F29-X07	Entran	7/26/05
Right Front Sill Y	F29-X19	Entran	7/26/05
Right Front Sill Z	F29-X02	Entran	7/29/05
Left Rear Sill Y	C29-L11	Entran	4/28/05
Left Front Sill Y	B26-Z06	Entran	3/17/05
Floorpan @ Rear Axle X	C04-L10	Entran	3/24/05
Floorpan @ Rear Axle Y	C06-L19	Entran	3/24/05
Floorpan @ Rear Axle Z	C06-L16	Entran	3/24/05
Vehicle CG X	C09-Y13	Entran	3/31/05
Vehicle CG Y	C06-L04	Entran	3/24/05
Vehicle CG Z	C06-L01	Entran	3/24/05
Left Front Door @ Pelvis	E05-Z69	Entran	6/28/05
Left Front Door @ Arm	E05-Z68	Entran	6/28/05
Left Front Door @ Knee	J07-M09	Entran	4/28/05
Left Front Door @ Mid Rib	E05-Z60	Entran	6/28/05
Upper Engine X	E05-Z52	Entran	7/20/05
Upper Engine Y	E05-Z34	Entran	7/20/05
Firewall Y	E05-Z65	Entran	7/20/05