

REPORT NUMBER: TO1-MGA-2004-030

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

**2005 SATURN ION 4 DOOR
NHTSA NUMBER: R50169**

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**PREPARED FOR:
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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.

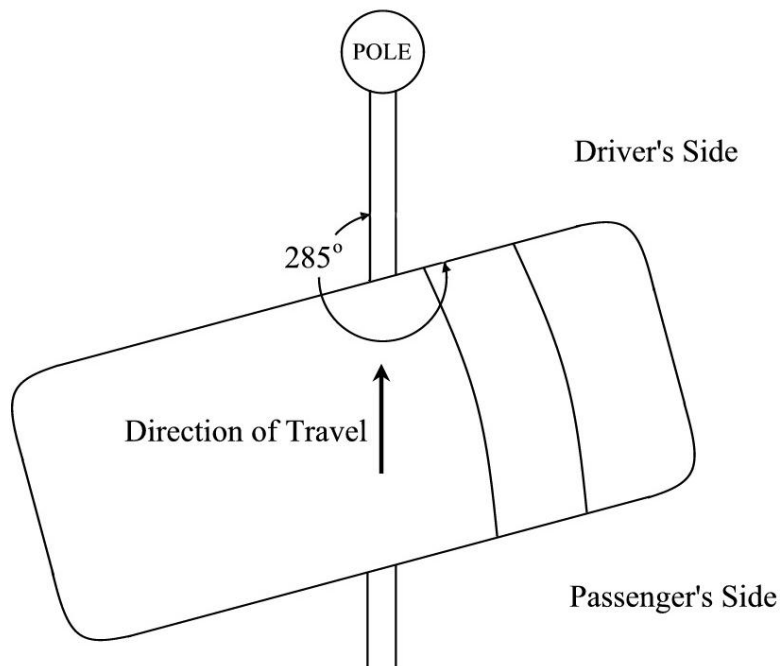
SECTION 2

SUMMARY OF SIDE IMPACT TEST

An oblique rigid side pole impact test at 75 degrees was performed on a 2005 Saturn Ion. The subject vehicle was towed into an oblique rigid pole at a velocity of 32.3 km/h. The weight of the vehicle as tested was 1428.5 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on September 2, 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)	44.1
	T2 (msec)	59.1
	HIC 15	791.8
HIC 36 (CFC 1000)	T1 (msec)	43.1
	T2 (msec)	60.4
	HIC 36	805.7
Thorax (CFC 180)		
Chest Deflection	Upper Rib Deflection	-46.4
	Mid Rib Deflection	-49.7
	Lower Rib Deflection	-48.4
Lower Spine (CFC 180)		
	Lower Spine Resultant	75.7
Abdomen (CFC 600)		
	Front Abdominal Force	253
	Mid Abdominal Force	401
	Rear Abdominal Force	1134
	Sum of Abdominal Force	1494
Pelvis (CFC 600)		
	Pubic Symphysis Force	-1585

Contact Times	Left Front
Head (msec)	**
Arm (msec)	19
Rib (msec)	30
Pelvis (msec)	24

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

TEST NOTES

Left Front Sill Y – No valid data collected after 24 msec
Upper Engine X – No valid data collected after 38 msec

SECTION 3
ES-2RE SIDE IMPACT DUMMY AND VEHICLE TEST DATA

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

TEST VEHICLE INFORMATION

Make	Saturn
Model	Ion
Body Style	4 door
VIN	1G8AJ54F35Z170654
Odometer Reading (mile)	182
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.2
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain
Power Windows / Locks	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	Saturn Corporation	GVWR (kg)	1717
Date of Manufacture	04/05	GAWR Front (kg)	898
		GAWR Rear (kg)	819

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Cold Pressure (kPa)	210	210
Recommended Tire Size	P195/60R15	P195/60R15
Tire Size on Vehicle	P195/60R15	P195/60R15
Tire Manufacturer	Firestone	Firestone

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				67.6

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Saturn IonTest Date: September 2, 2005**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	396.0	246.0		425.5	292.0	
Right	kg	381.5	263.5		407.5	303.5	
Ratio	%	60.4	39.6		58.3	41.7	
Totals	kg	777.5	509.5	1287.0	833.0	595.5	1428.5

TARGET TEST WEIGHT

Measured Parameter	Units	Value
As Delivered Vehicle Weight	kg	1287.0
Weight of 1 ES-2	kg	80.7
Rated Cargo Weight	kg	67.6
Vehicle Target Weight (TVTW)	kg	1435.3

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.1 ND	0.4 NU	0.3 NU
Left Door Sill Angle	Deg	0.6 ND	0.0	0.2 ND
Front Bumper Angle	Deg	0.2 RD	0.0	0.0
Rear Bumper Angle	Deg	0.3 LD	0.5 LD	0.5 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	2632
Total Vehicle Length at Centerline	mm	4681
Total Vehicle Width	mm	1709
Weight of Ballast in Cargo Area	kg	0
Amount of Water in Fuel Tank	liters	49.2

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Impact Reference Line from Front Axle	mm	1336
Impact Point	mm	4mm forward
Impact Angle Difference	deg	1

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

SEAT BACK POSITION

Driver seat back angle: 9.1°, on headrest post

SEAT FORE/AFT POSITIONS

The driver's seat was manually operated.

Driver seat fore/aft total travel: 27 detents

Driver seat fore/aft position: 14th detent of 27 (1st as one)

SEAT BELT UPPER ANCHORAGE

The test vehicle "D" ring anchorage for the driver's seat position was placed two down from the upper most position.

STEERING COLUMN ADJUSTMENT

The column was placed in the mid position of travel.

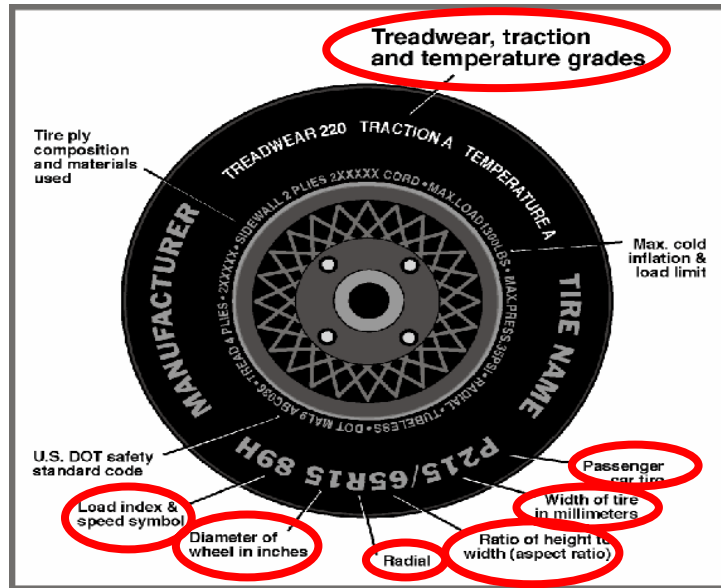
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

Vehicle Year	2005	Vehicle Make	Saturn
VIN	1G8AJ54F35Z170654	Vehicle Model	Ion



	Front	Rear
Tire Manufacturer	Firestone	Firestone
Tire Name	Affinity	Affinity
Tire Type	M+S	M+S
Tire Width (mm)	195	195
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	875	875
Treadwear	500	500
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 3
POST TEST OBSERVATIONS

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES-2RE
Head Contact	Curtain Airbag, Passenger Headrest, Headliner
Upper Torso Contact	Door Panel
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

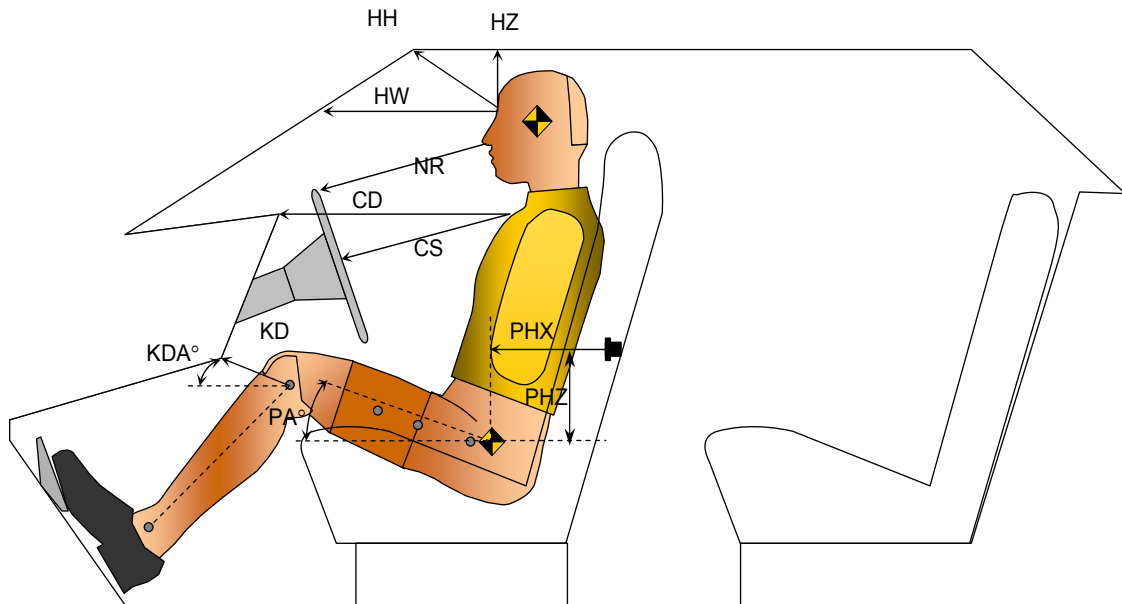
	Driver
Front	No
Side	NA
Curtain	Yes

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4
ES-2RE LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

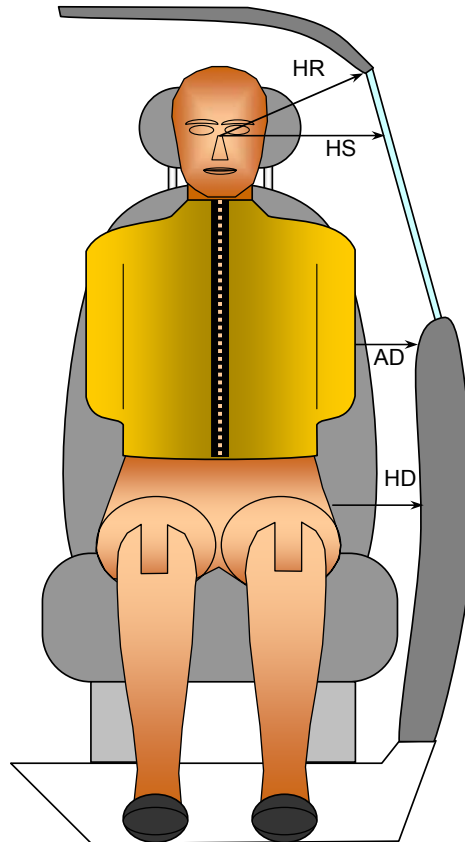


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	445	
HW	Head to Windshield	617	
HZ	Head to Roof	163	
NR	Nose to Rim	482	
CD	Chest to Dash (Top of Rib)	772	
CS	Chest to Steering Wheel (Top of Rib)	392	
KDL	Left Knee to Dash	152	21
KDR	Right Knee to Dash	162	32
PA	Pelvic Angle (Longitudinal)		27.0
PA	Pelvic Angle (Lateral)		-0.8
SA	Spine Angle (Longitudinal)		28.2
SA	Spine Angle (Lateral)		1.1
PHX	H-Point to Striker (X-Axis)	204	
PHZ	H-Point to Striker (Z-Axis)	89	

DATA SHEET NO. 5
ES-2RE LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005



FRONT VIEW OF DUMMY

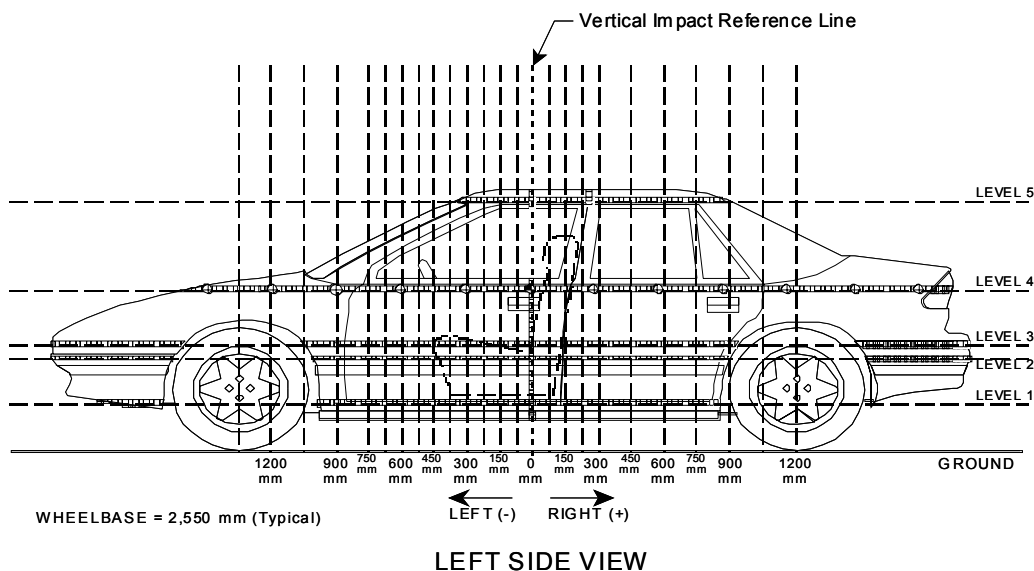
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	160
HS	Head to Side Window	mm	315
AD	Arm to Door	mm	82
HD	H-Point to Door	mm	119

DATA SHEET NO. 6 **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2005 Saturn Ion

Test Date: September 2,
2005

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



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

Level	Measurement Description	Height Above Ground
5	Window	1452
4	Window Sill	910
3	Mid Door	642
2	Occupant H-Point	546
1	Sill Top	305

DATA SHEET NO. 7
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 2005

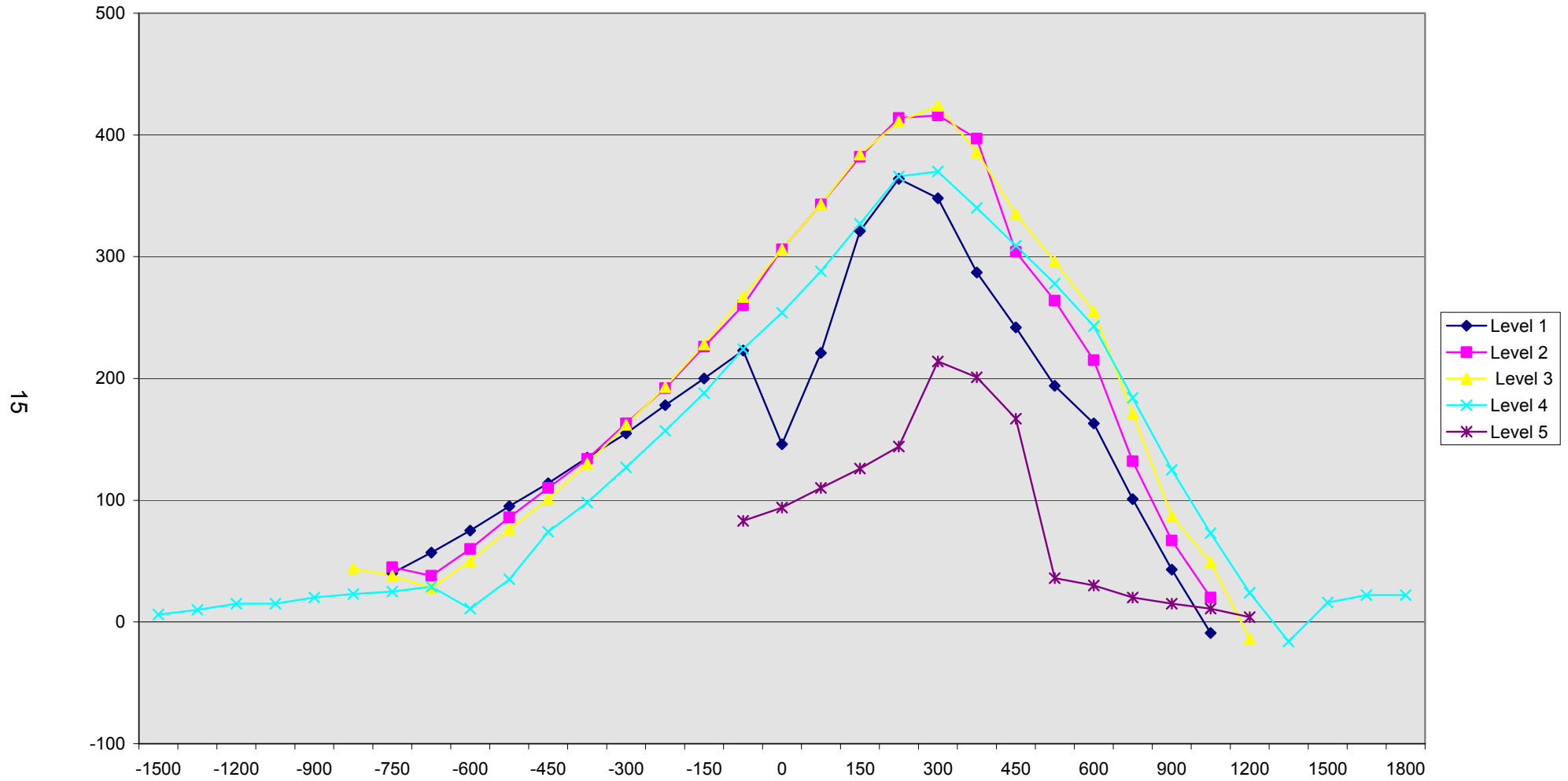
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500				330					336					6	
-1350				322					332					10	
-1200				317					327					15	
-1050				314					329					15	
-900				309					329					20	
-825			249	307				293	330				44	23	
-750	290	254	254	305		330	299	292	330		40	45	38	25	
-675	291	255	256	304		348	293	284	333		57	38	28	29	
-600	291	254	254	302		366	314	304	313		75	60	50	11	
-525	290	250	252	304		385	336	328	339		95	86	76	35	
-450	290	249	250	299		404	359	351	373		114	110	101	74	
-375	288	248	248	300		423	382	378	398		135	134	130	98	
-300	288	246	246	302		443	409	408	429		155	163	162	127	
-225	288	245	246	303		466	437	439	460		178	192	193	157	
-150	287	245	245	303		487	471	473	491		200	226	228	188	
-75	286	245	244	304	513	509	505	511	528	596	223	260	267	224	83
0	285	244	244	302	508	431	550	550	556	602	146	306	306	254	94
75	286	244	244	302	505	507	587	587	590	615	221	343	343	288	110
150	285	244	244	302	503	606	626	628	629	629	321	382	384	327	126
225	285	245	245	304	505	649	659	656	670	649	364	414	411	366	144
300	285	245	244	305	504	633	661	668	675	718	348	416	424	370	214
375	286	245	245	305	504	573	642	631	645	705	287	397	386	340	201
450	286	244	244	305	507	528	548	579	614	674	242	304	335	309	167
525	286	245	244	307	505	480	509	540	585	541	194	264	296	278	36
600	287	246	245	309	505	450	461	500	552	535	163	215	255	243	30
750	288	247	247	311	506	389	379	418	495	526	101	132	171	184	20
900	291	248	246	313	504	334	315	333	438	519	43	67	87	125	15
1050	291	248	238	316	504	282	268	287	389	515	-9	20	49	73	11
1200			243	318	510			229	342	514			-14	24	4
1350				323					307					-16	
1500				328					344					16	
1650				333					355					22	
1800				340					362					22	

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 Saturn Ion

Test Date: September 2, 2005

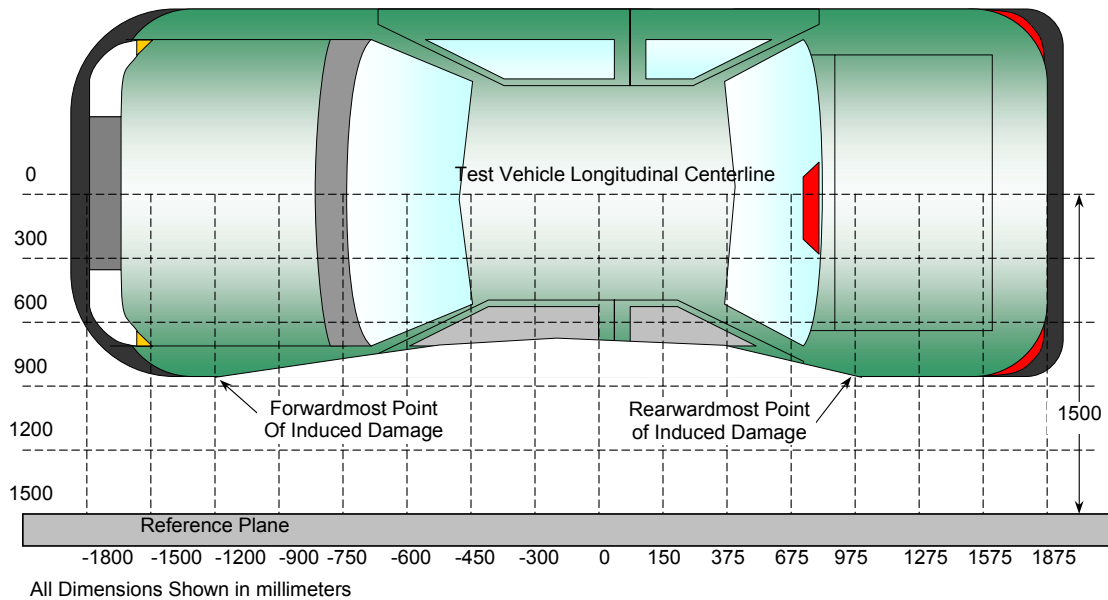


Measurement in mm.

DATA SHEET NO. 8
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 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	1800 mm	4	340	362	22
2	1179 mm	4	318	349	31
3	470 mm	3	305	606	301
4	-230 mm	2	245	434	189
5	-872 mm	4	308	330	22
6	-1500 mm	4	330	336	6

Reference plane is parallel to test vehicle longitudinal centerline.

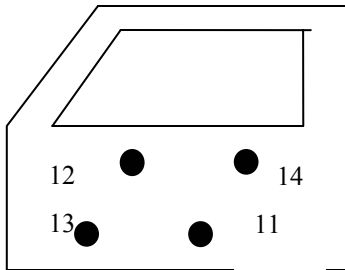
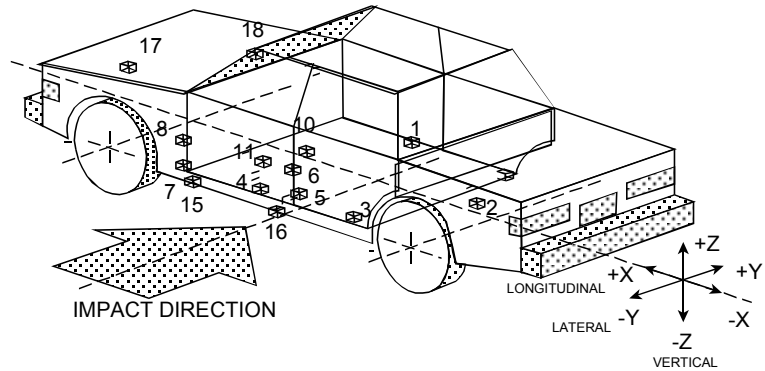
Given dimensions = Reference plane to car body.

DATA SHEET NO. 9

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Saturn Ion

Test Date: September 2, 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 Saturn Ion

Test Date: September 2, 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	-2.4	14.2	-1.1	4.1	-3.7	14.6
2	Rear Floorpan Above Axle	2.1	-4.2	13.4	-1.1	6.3	-4.2	13.9
3	Left Side Sill at Rear Door			21.8	-1.0			
4	Left Side Sill at Front Door			*	*			
5	Left Lower B-Post			80.8	-8.3			
6	Left Mid B-Post			75.0	-3.1			
7	Left Lower A-Post			32.6	-33.5			
8	Left Mid A-Post			16.0	-7.1			
9	Driver Left Seat Track			72.0	-44.7			
10	Vehicle CG	15.3	-20.4	28.0	-28.3	24.1	-8.4	32.6
11	Left Front Door at Pelvis			120.8	-29.5			
12	Left Front Door at Arm			140.5	-37.2			
13	Left Front Door at Knee			97.8	-31.4			
14	Left Front Door at Rib			115.9	-26.1			
15	Left A-Post @ Sill			17.0	-10.1			
16	Left B-Post @ Sill			40.3	-9.5			
17	Upper Engine	**	**	10.3	-2.3			
18	Firewall			10.5	-1.4			

*No valid data collected after 24 msec

** No valid data collected after 38 msec

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

DATA SHEET NO. 9... (continued)**VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**Test Vehicle: 2005 Saturn IonTest Date: September 2, 2005**VEHICLE ACCELEROMETER COORDINATES**

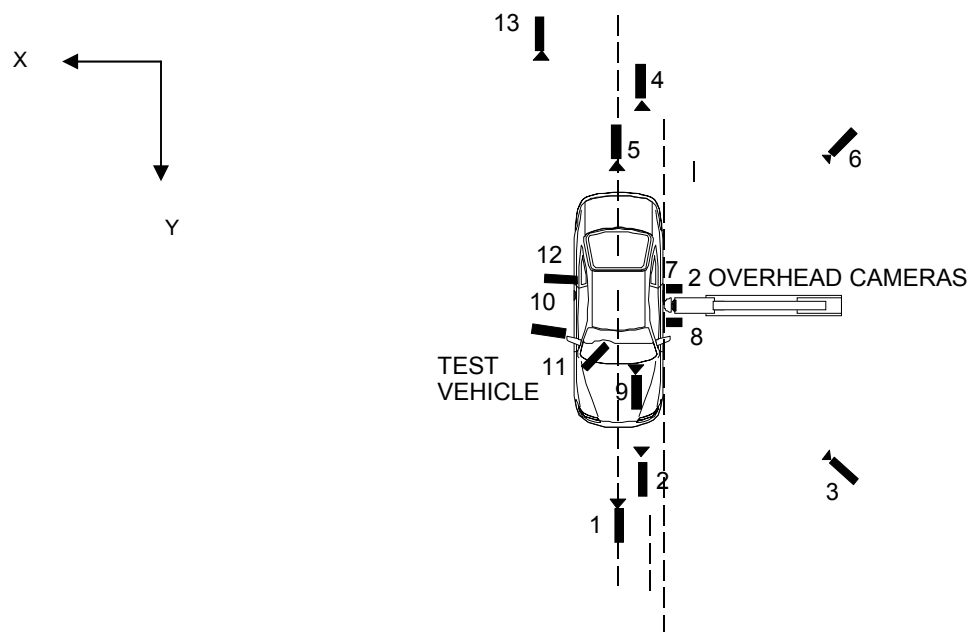
Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2534	701	230
2	Rear Floorpan Above Axle	1179	0	519
3	Left Side Sill at Rear Door	1817	-705	232
4	Left Side Sill at Front Door	2501	-700	228
5	Left Lower B-Post	2072	-688	579
6	Left Mid B-Post	2049	-682	849
7	Left Lower A-Post	3179	-758	514
8	Left Mid A-Post	3162	-753	829
9	Driver Left Seat Track	2121	-532	634
10	Vehicle CG	2441	0	422
11	Left Door @ Pelvis	2523	-703	582
12	Left Door @ Arm	2564	-705	808
13	Left Door @ Knee	2868	-701	646
14	Left Door @ Rib	2435	-711	846
15	Left A Pillar Sill	3256	-689	228
16	Left B Pillar Sill	2119	-703	228
17	Engine	3851	0	807
18	Firewall	3612	0	849

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 Saturn Ion

Test Date: September 2, 2005



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	930	5955	1465	24	1000
2	Front Close Up	1710	6675	1375	35	1000
3	Front Angle	-2170	2885	1400	24	1000
4	Rear Overall	2930	-8795	1505	24	1000
5	Rear Close Up	1780	-6515	1475	35	1000
6	Rear Angle	-2295	-2055	1415	24	1000
7	Overhead View	-575	740	5125	14	1000
8	Overhead Close Up	0	0	5050	19	1000
9	Onboard Driver Front				13	500
10	Onboard Driver Side				8	1000
11	Onboard Hip to Door				10	500
12	Onboard Curtain				8	500
13	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

A-5.



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 $\frac{3}{4}$ Front View of Test Vehicle



Post-Test Left $\frac{3}{4}$ Front View of Test Vehicle



Pre-Test Left $\frac{3}{4}$ Rear View of Test Vehicle



Pre-Test Pole and Vehicle Overhead View



Post-Test Pole and 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

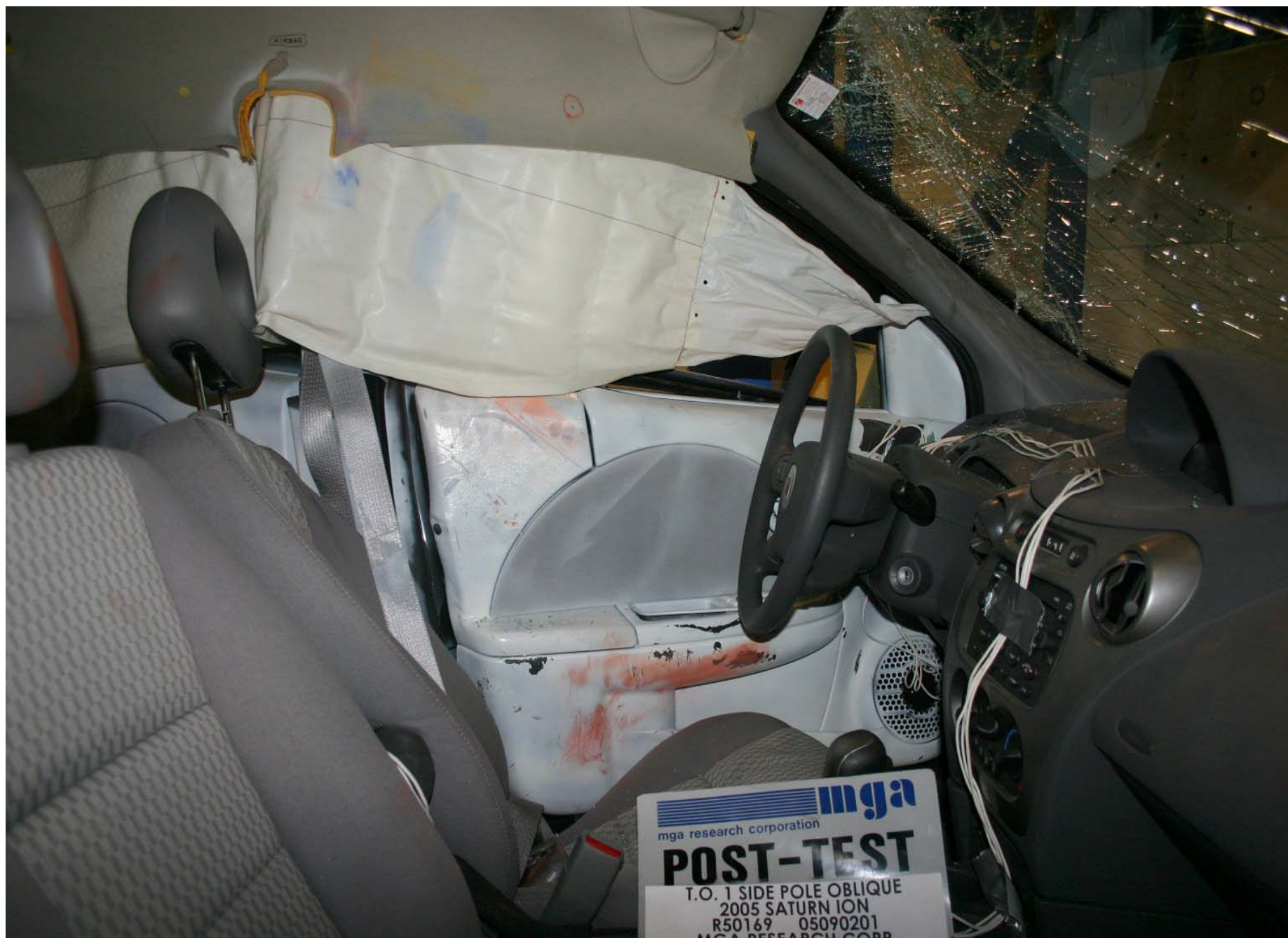


Pre-Test Driver Shoulder and Door Top View



Post-Test Driver Shoulder and Door Top View

A-23.



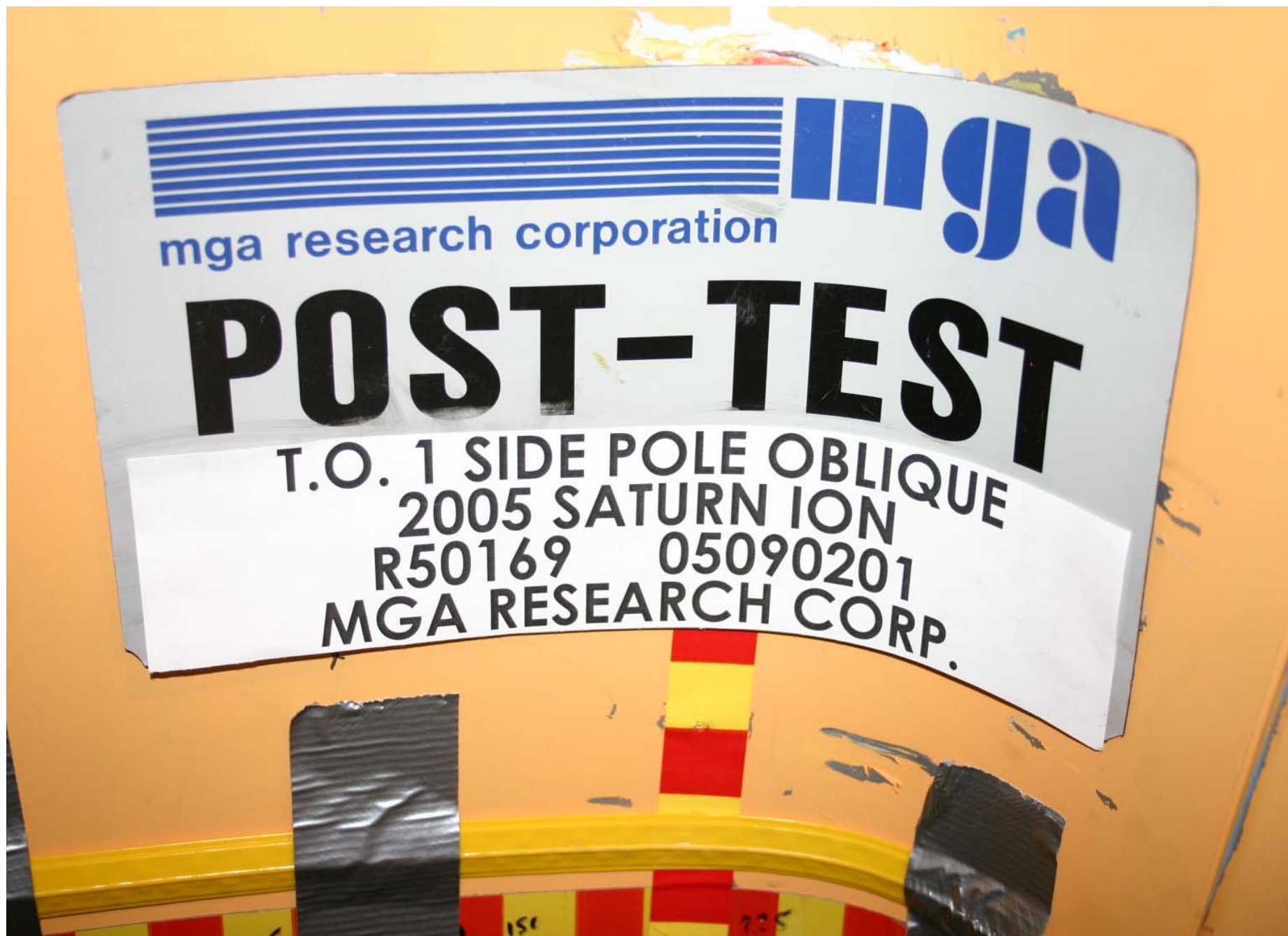
Post-Test Driver Dummy Contact



Post-Test Driver Dummy Lower Body Contact



Post-Test Driver Dummy Head Contact



Post-Test Impact Point on Vehicle



TIRE AND LOADING INFORMATION

SEATING CAPACITY | TOTAL 5 | FRONT 2 | CENTER 0 | REAR 3

The combined weight of occupants and cargo should never exceed 408 kg or 899 lbs.

ORIGINAL TIRE SIZE	COLD TIRE INFLATION PRESSURE	
P195/60R15	FRONT	210 kPa, 30 PSI
P195/60R15	REAR	210 kPa, 30 PSI
T115/70R14	SPARE	420 kPa, 60 PSI

**SEE OWNER'S
MANUAL FOR
ADDITIONAL
INFORMATION**

Tire Placard



MFD BY SATURN CORPORATION

DATE

GVWR

GAWR FRT

GAWR RR

04/05

3785LB

1980LB

1805LB

1717KG

0898KG

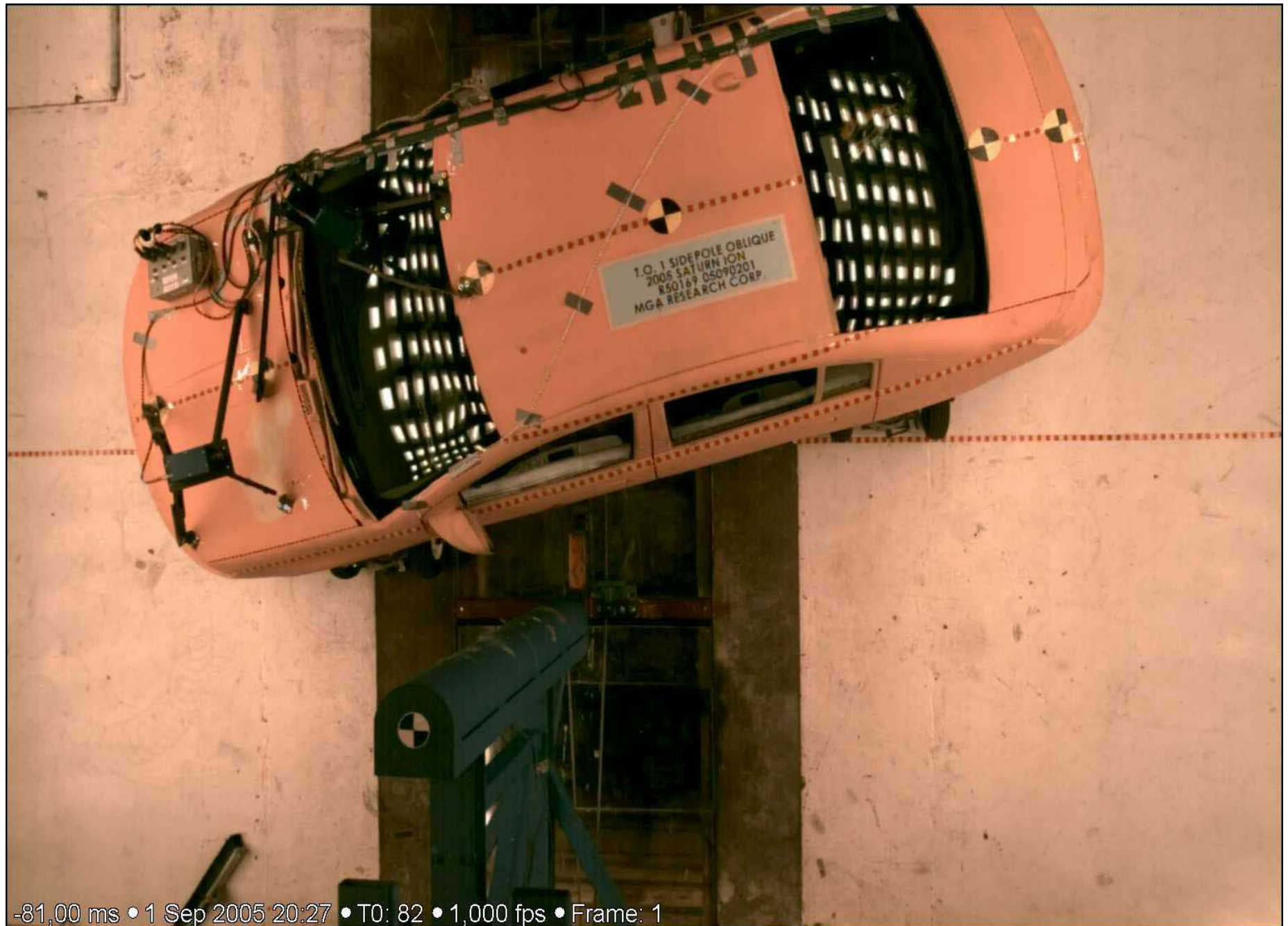
0819KG

THIS VEHICLE CONFORMS TO ALL APPLI-
CABLE U.S. FEDERAL MOTOR VEHICLE
SAFETY, BUMPER, AND THEFT PREVENTION
STANDARDS IN EFFECT ON THE DATE OF
MANUFACTURE SHOWN ABOVE.

1G8AJ54F35Z170654

PASS CAR





Pre-Test Point of Impact View



Post-Test Point of Impact View



100,00 ms • 2 Sep 2005 09:45 • T0: 1 • 1,000 fps • Frame: 101

Vehicle Impact

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

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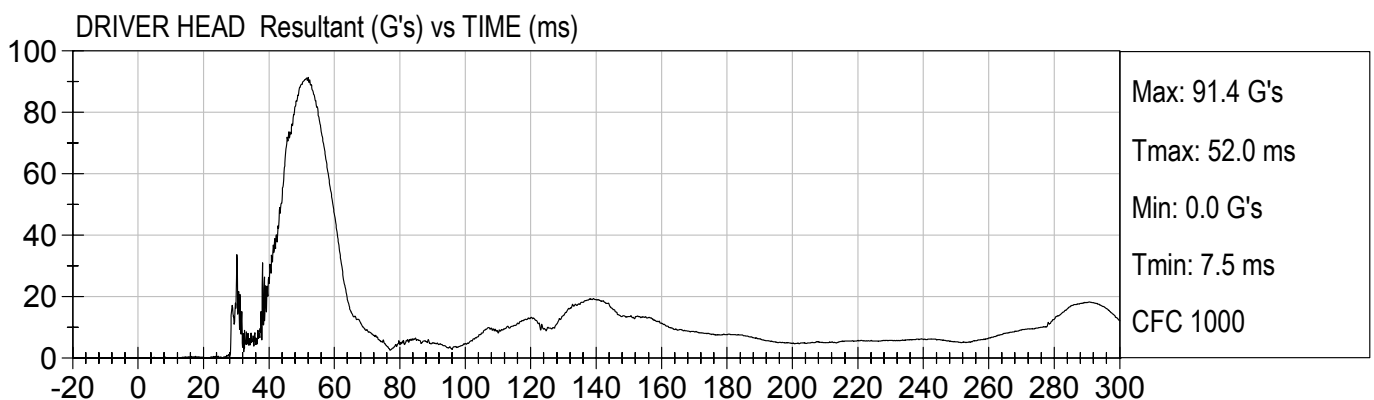
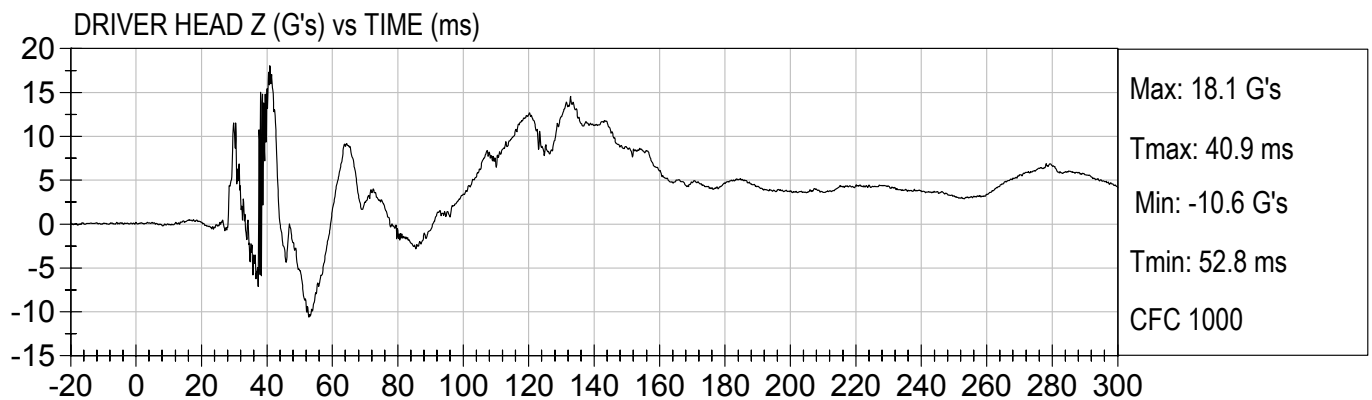
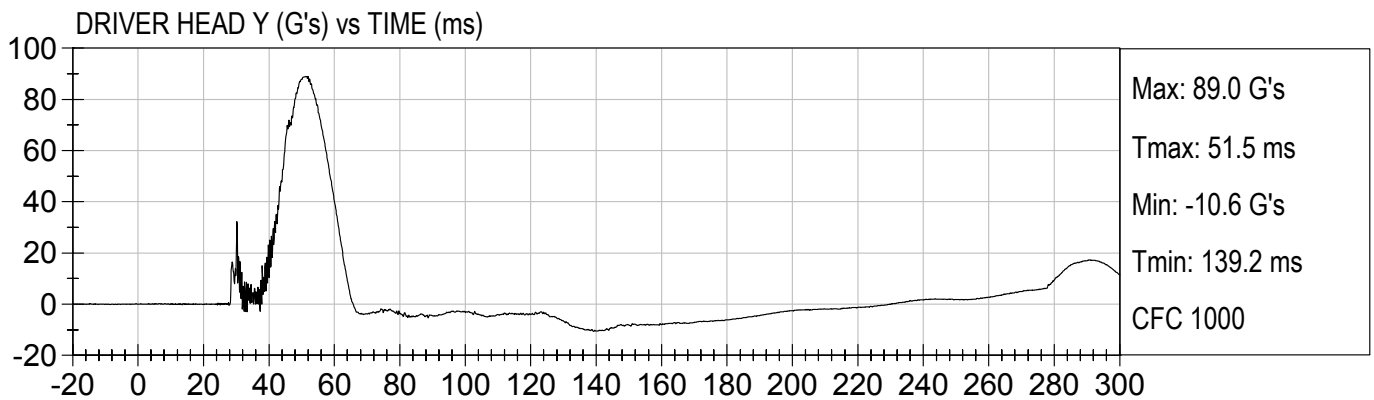
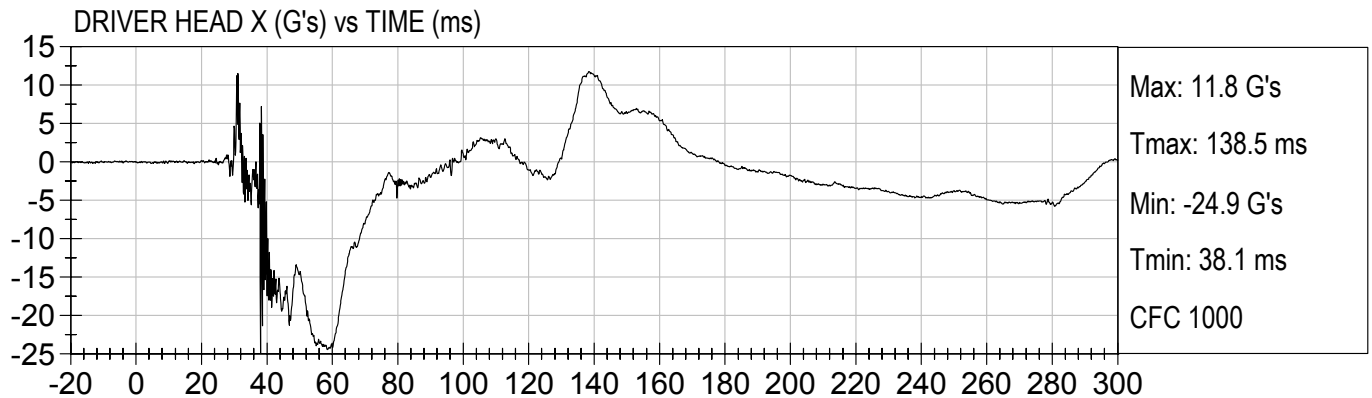
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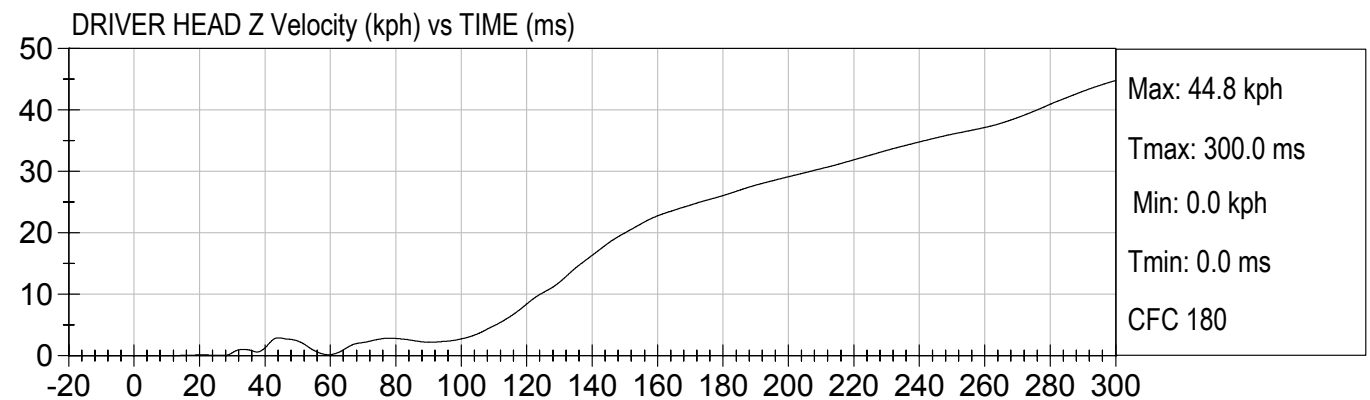
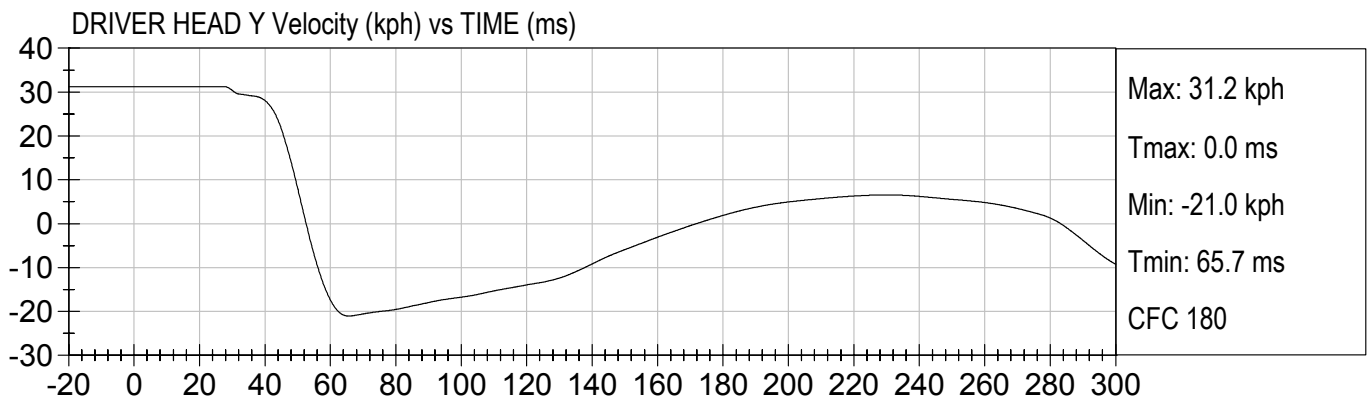
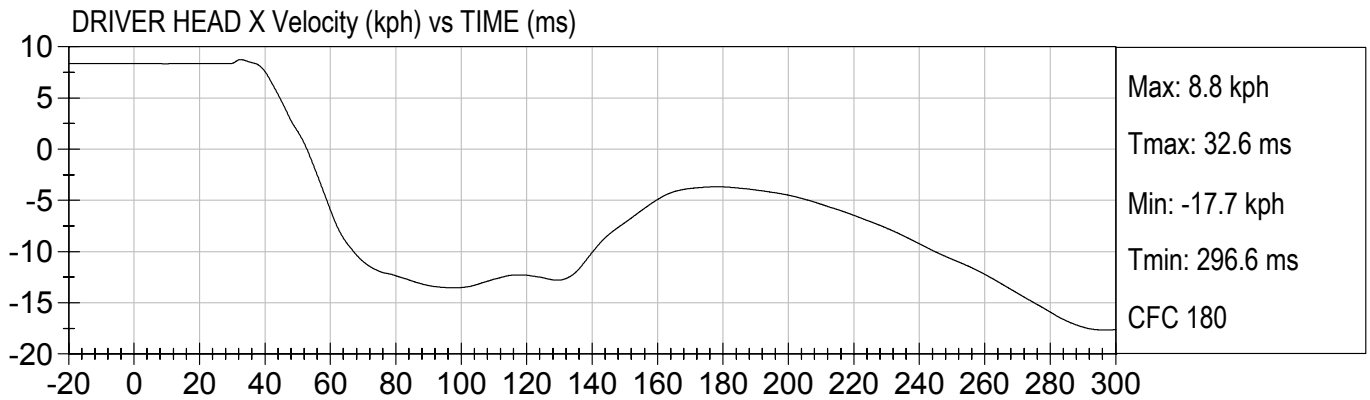
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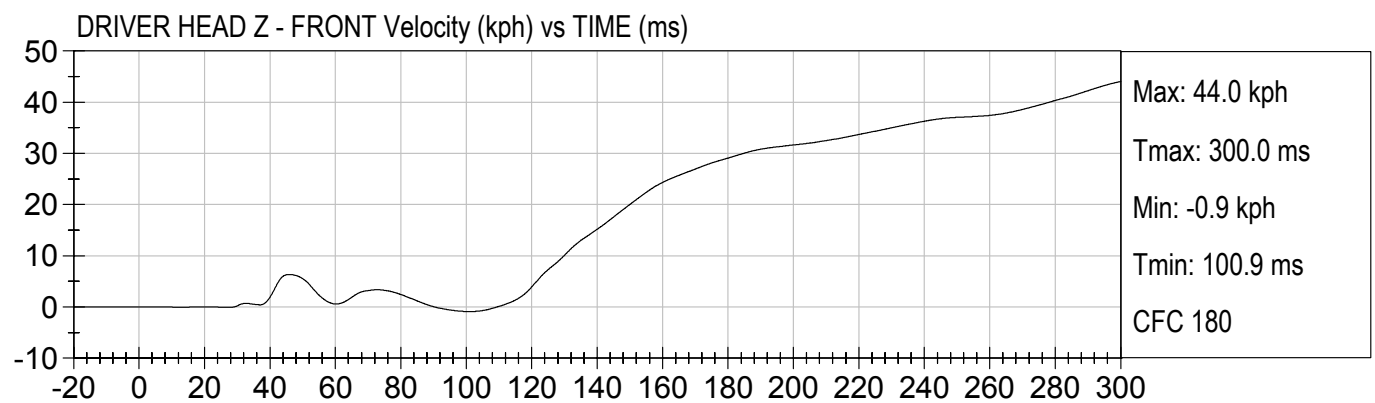
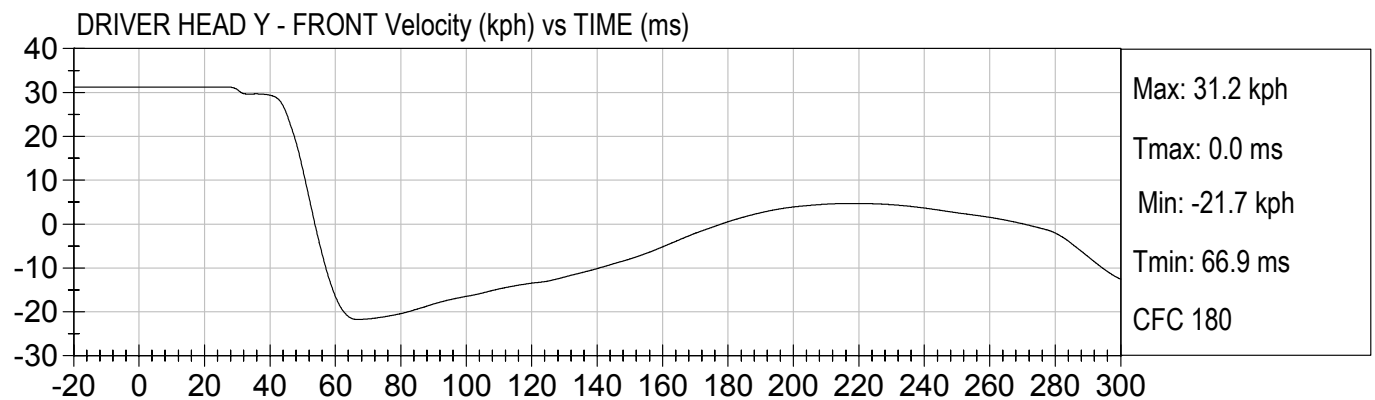
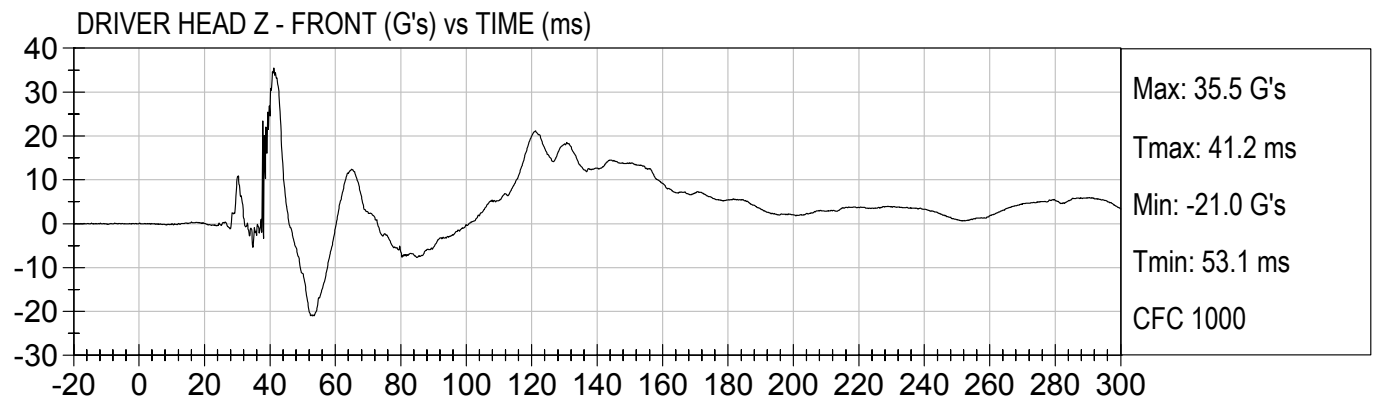
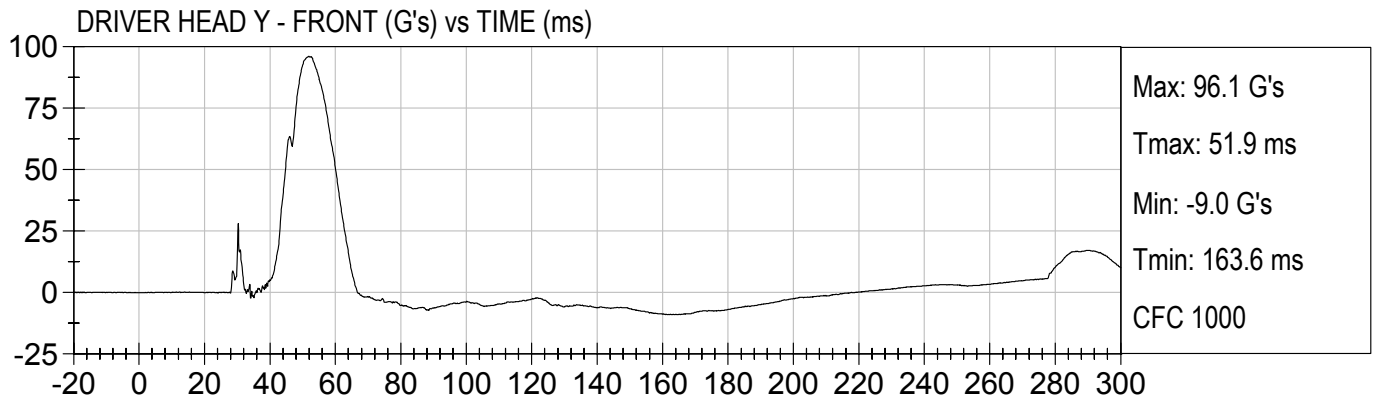
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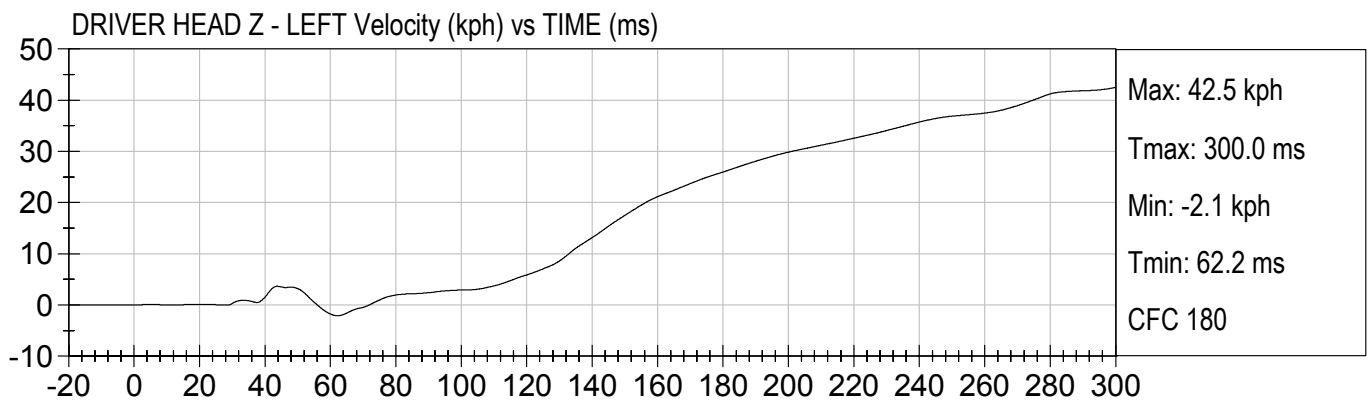
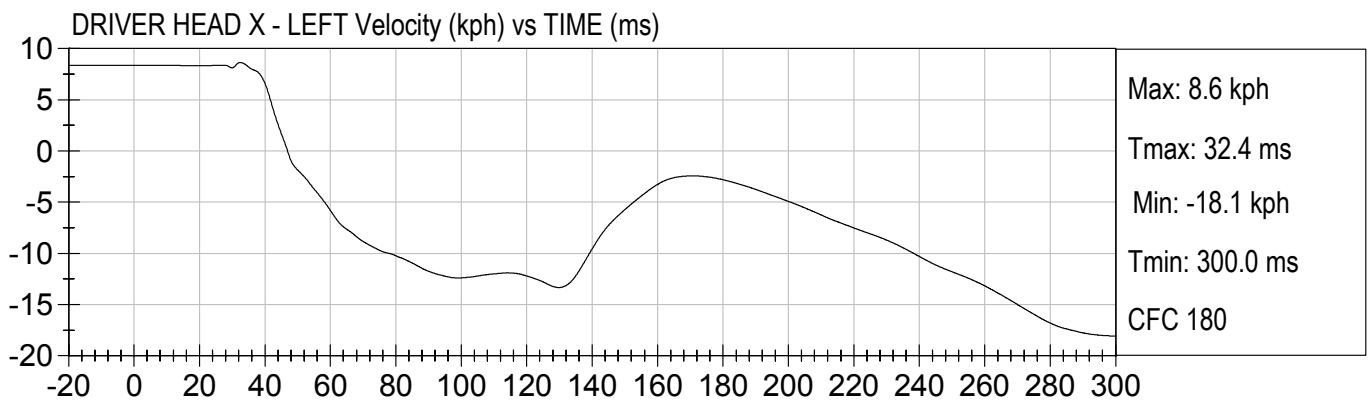
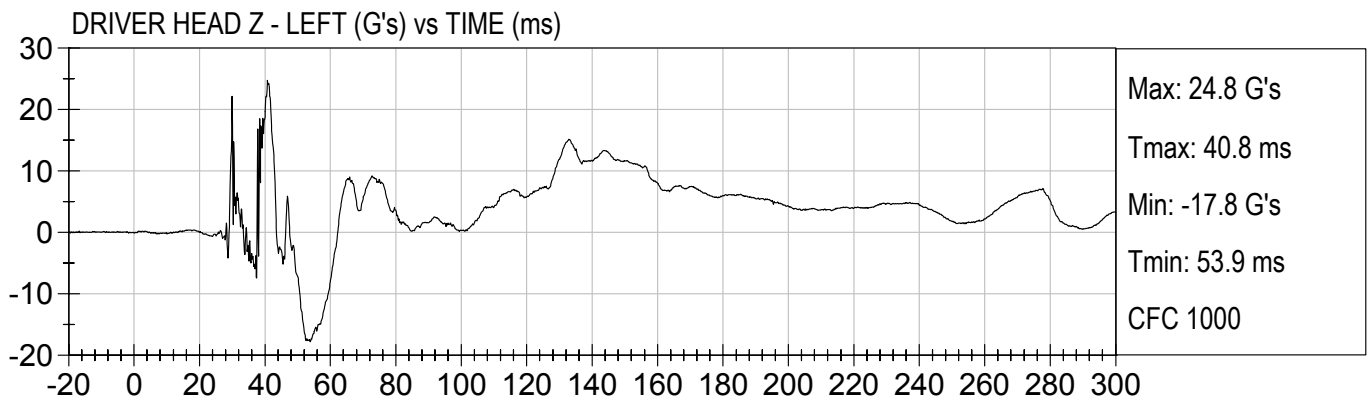
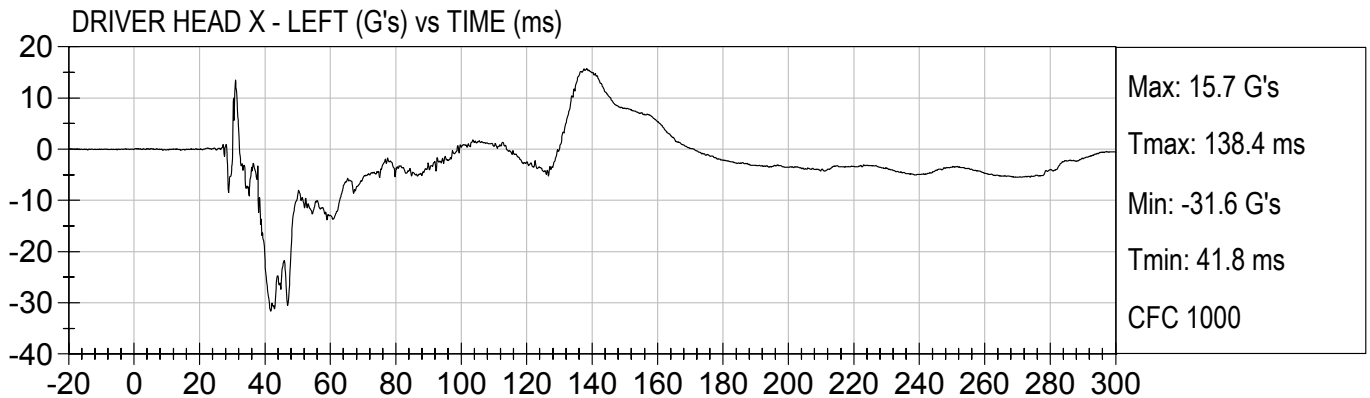
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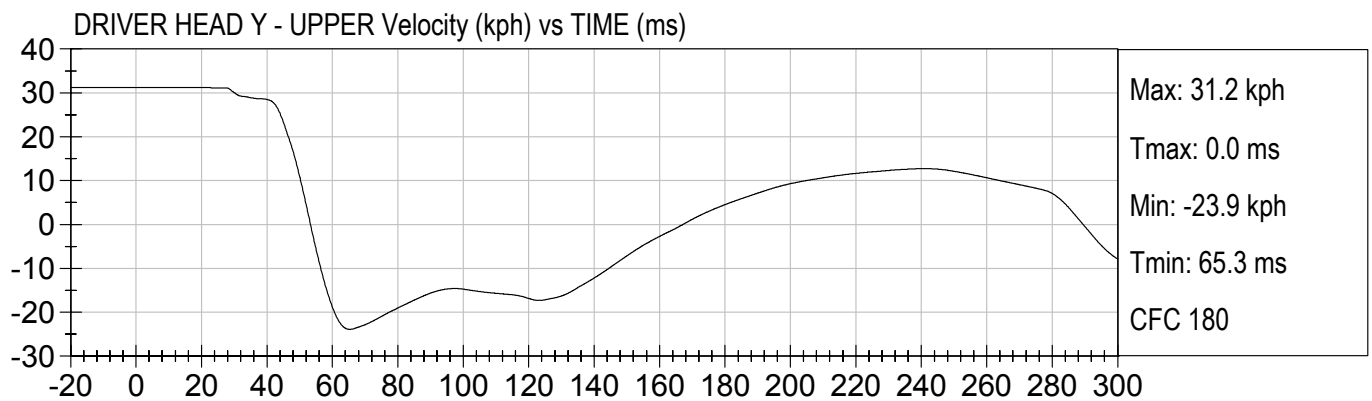
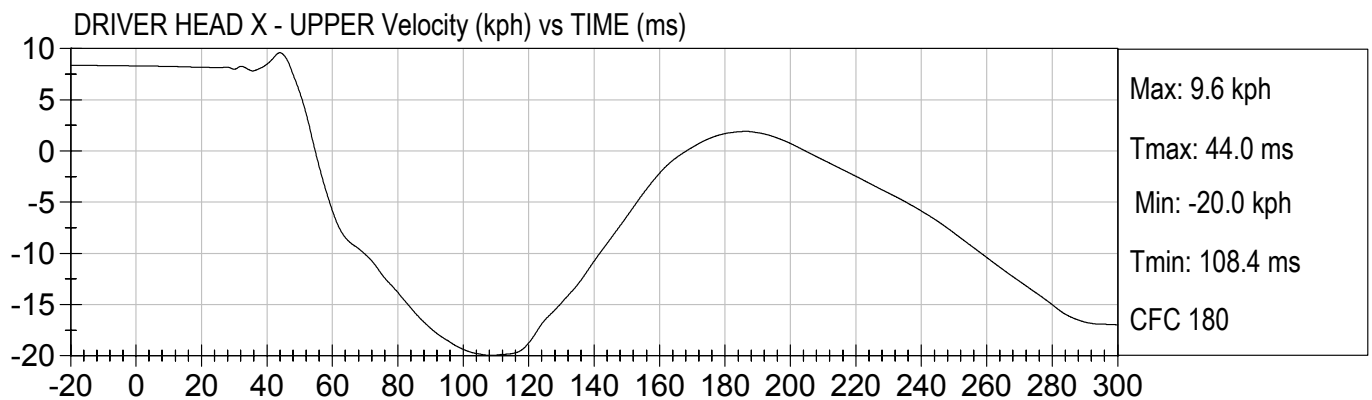
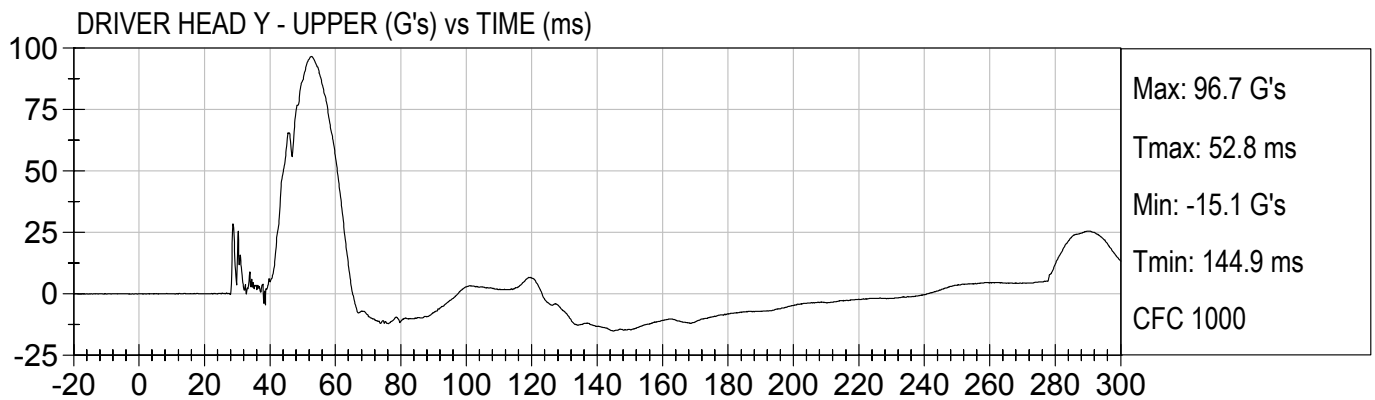
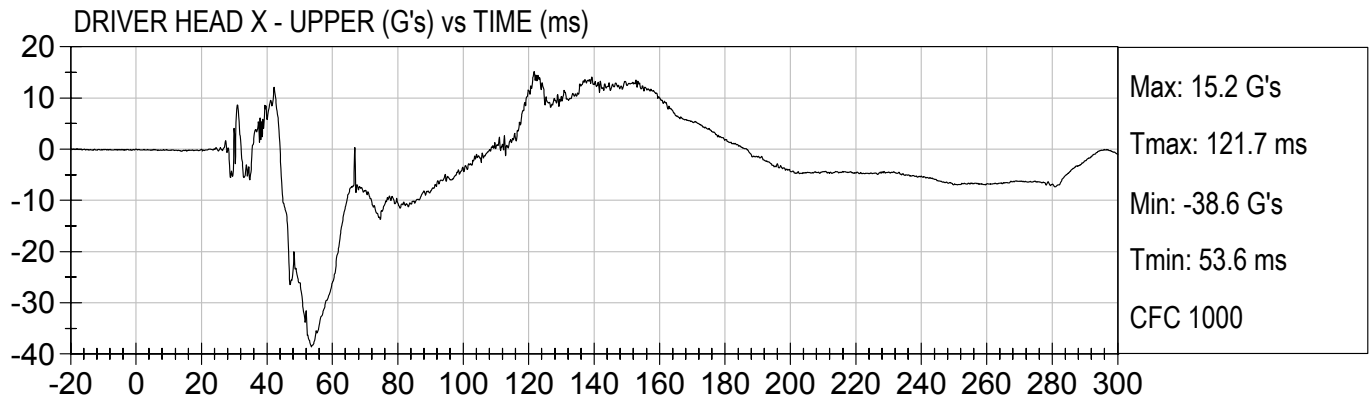
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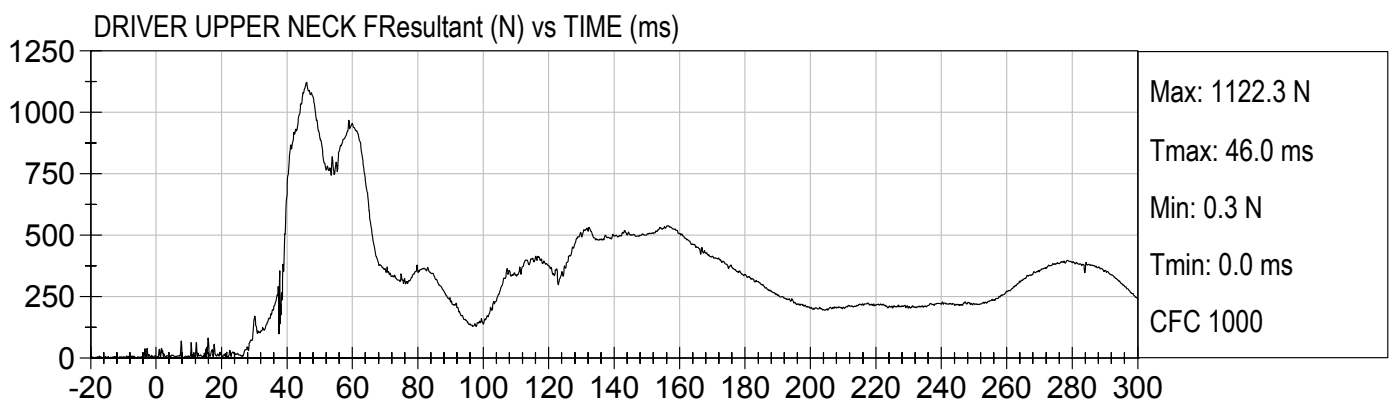
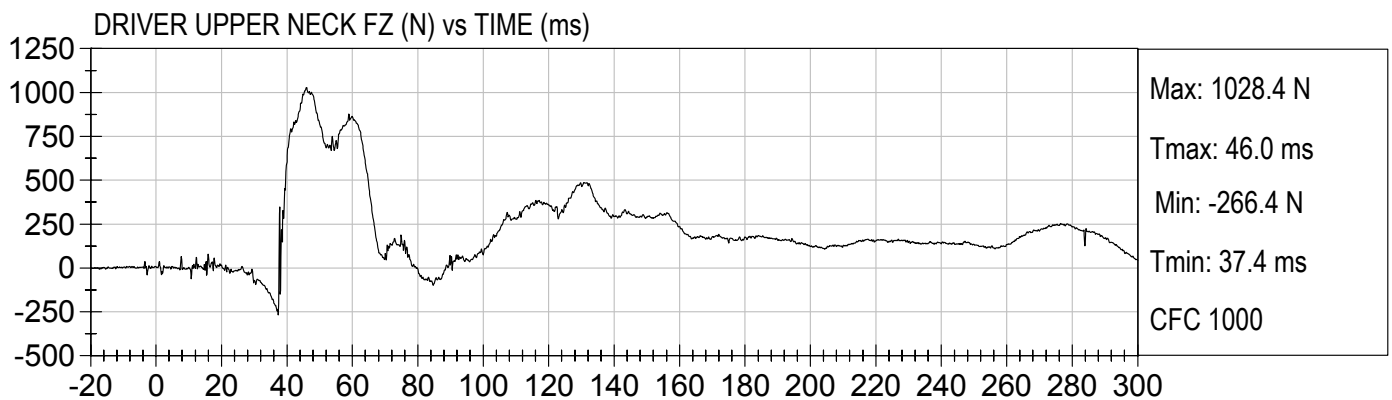
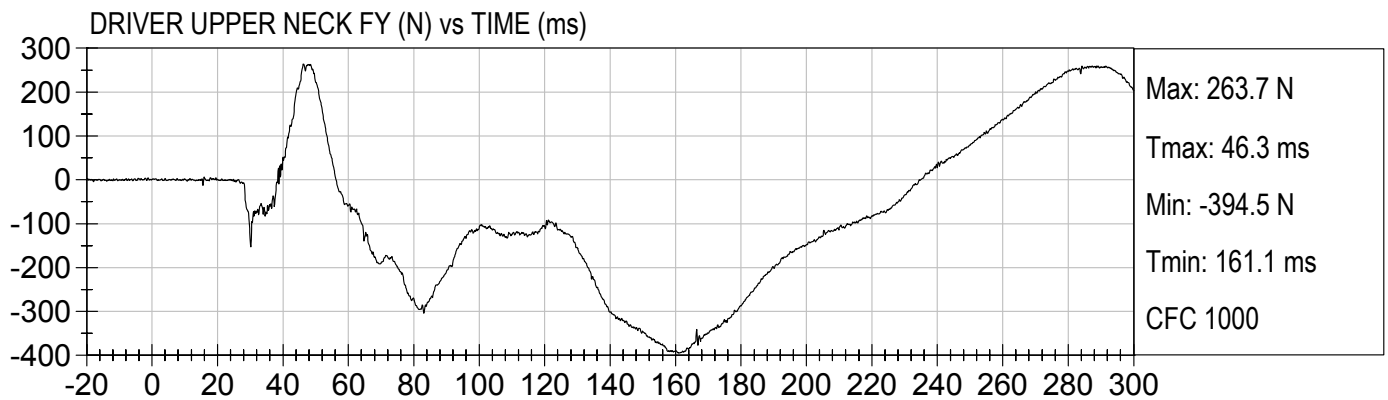
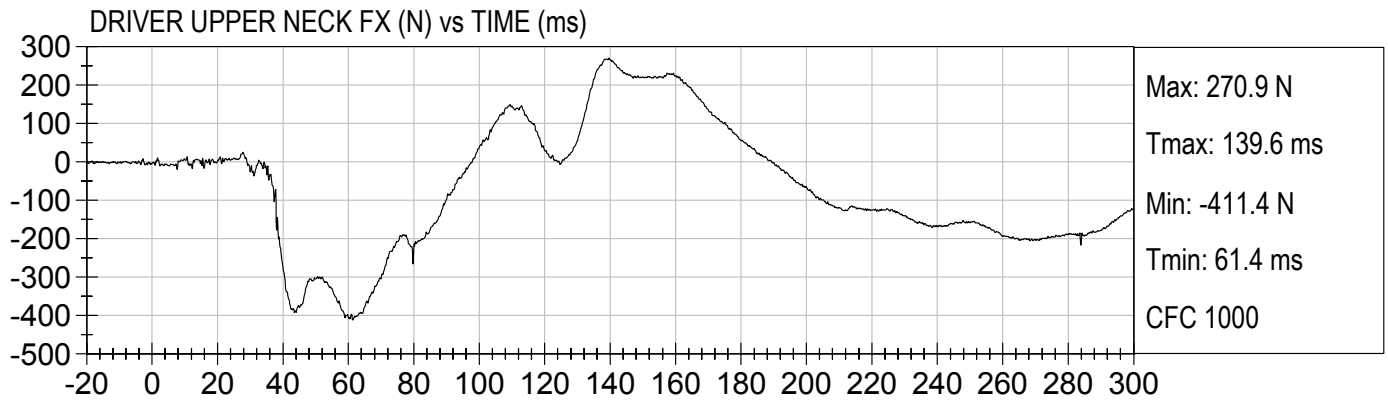


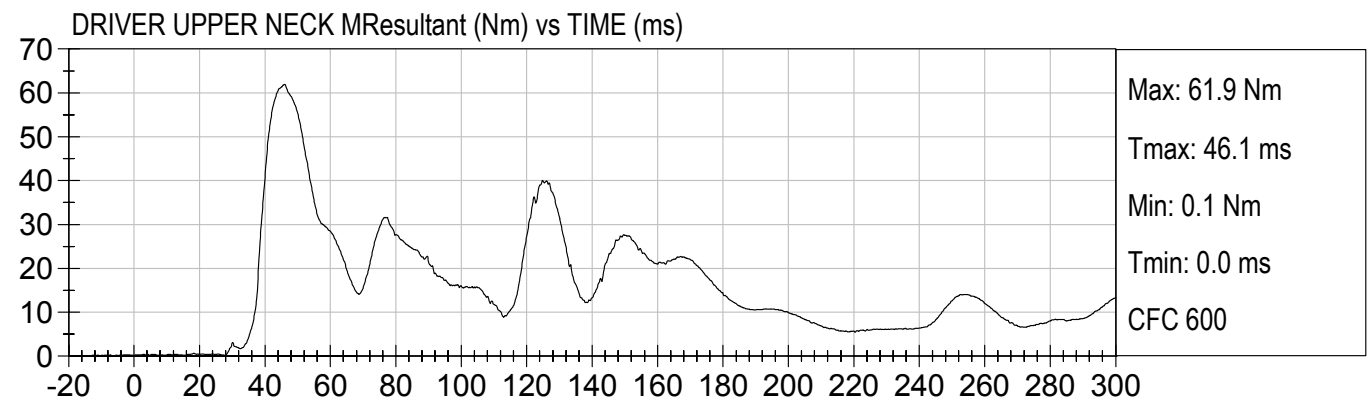
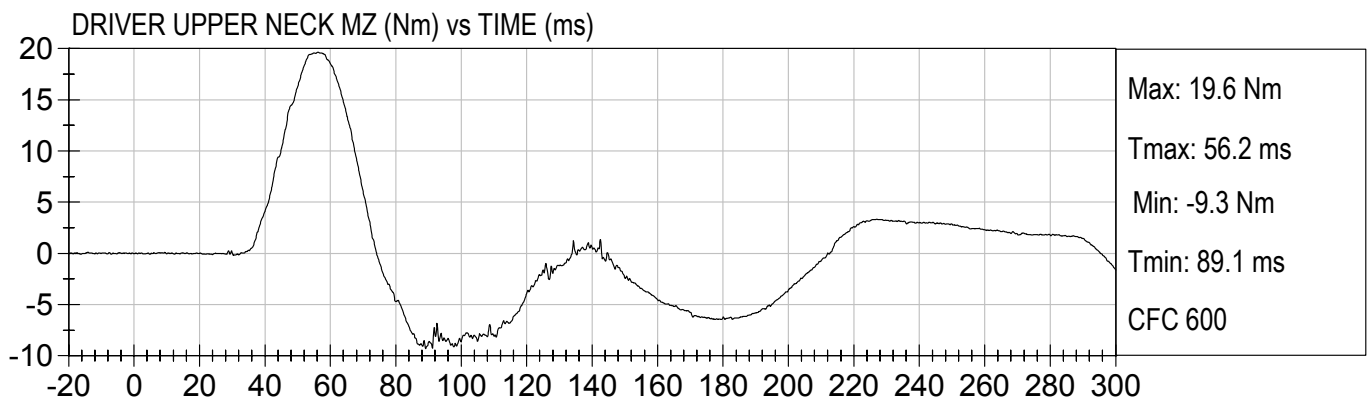
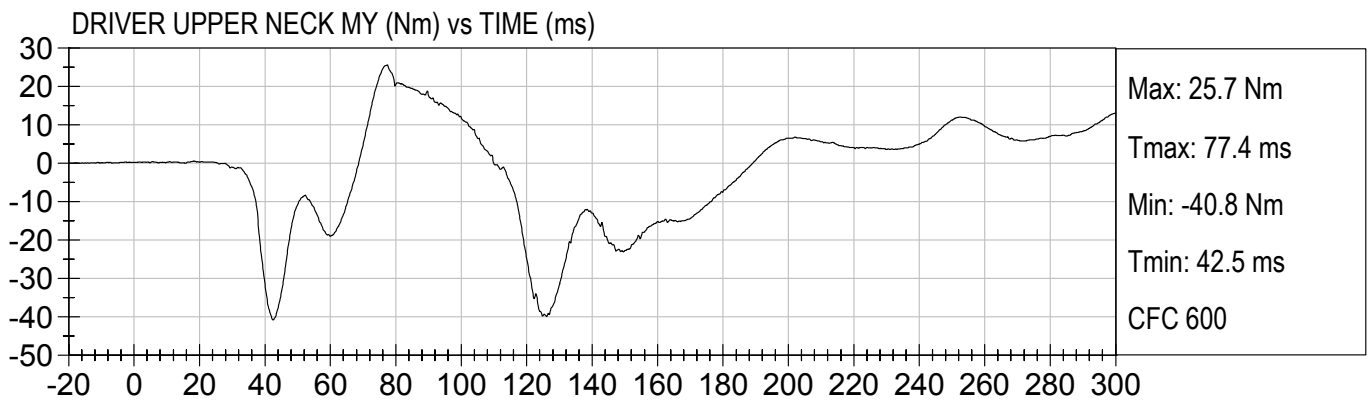
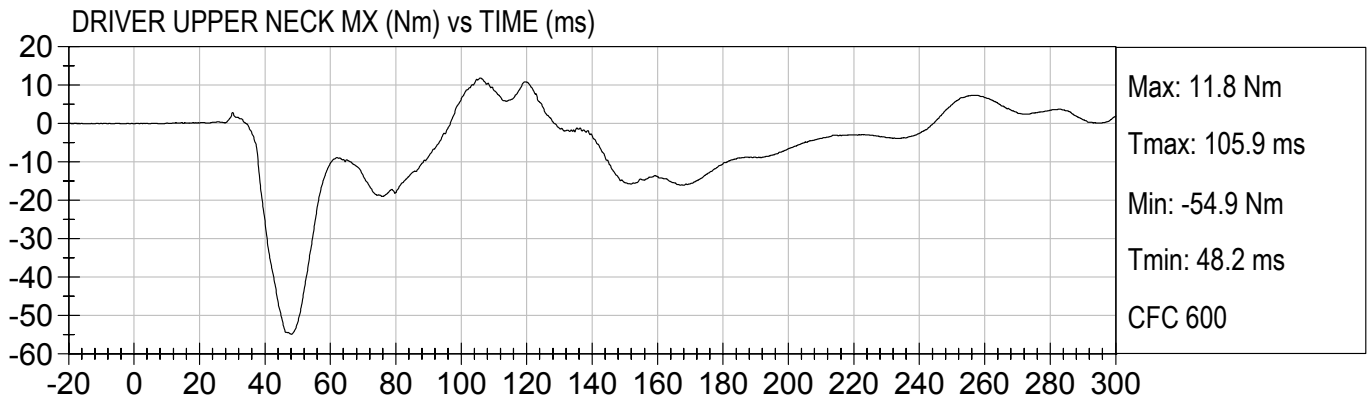


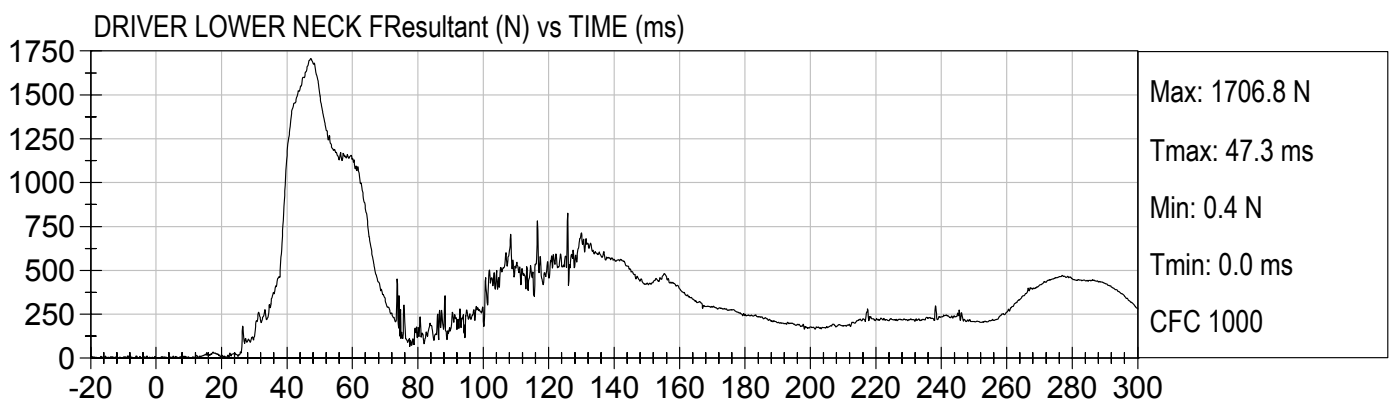
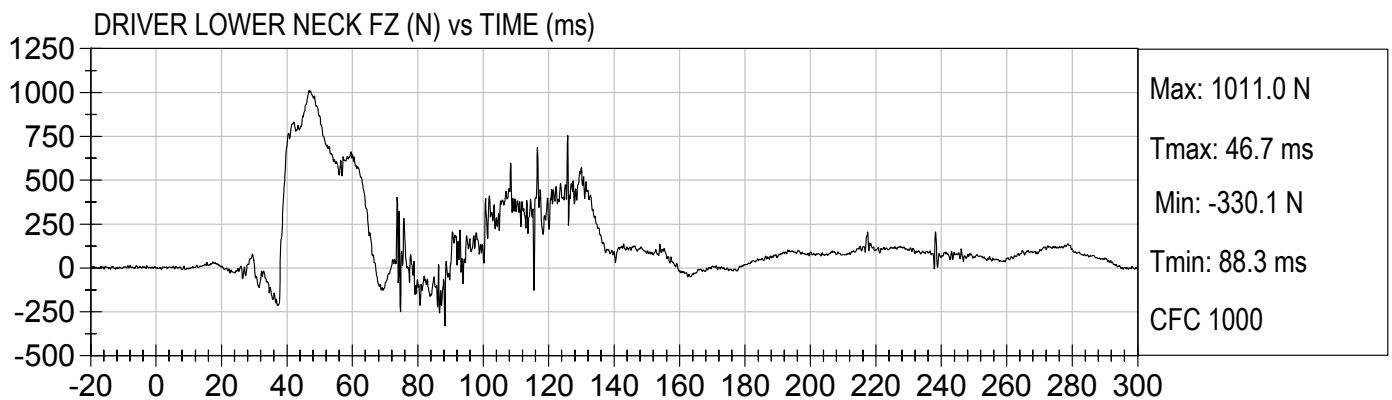
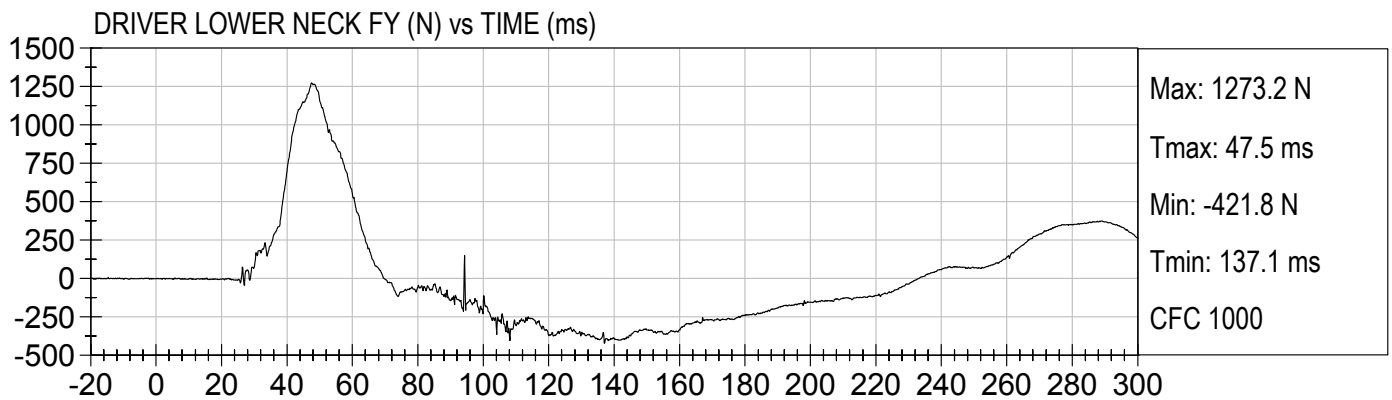
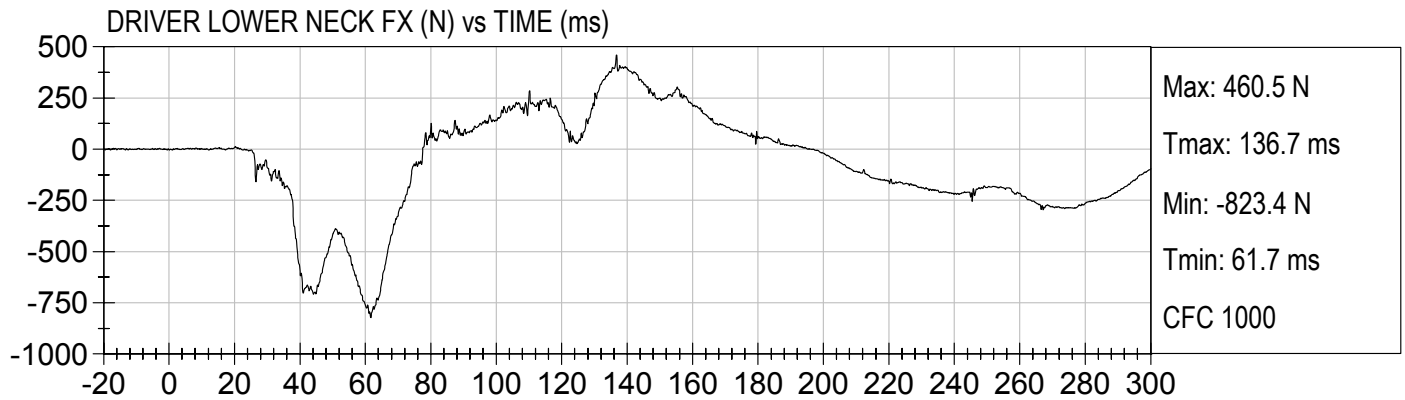


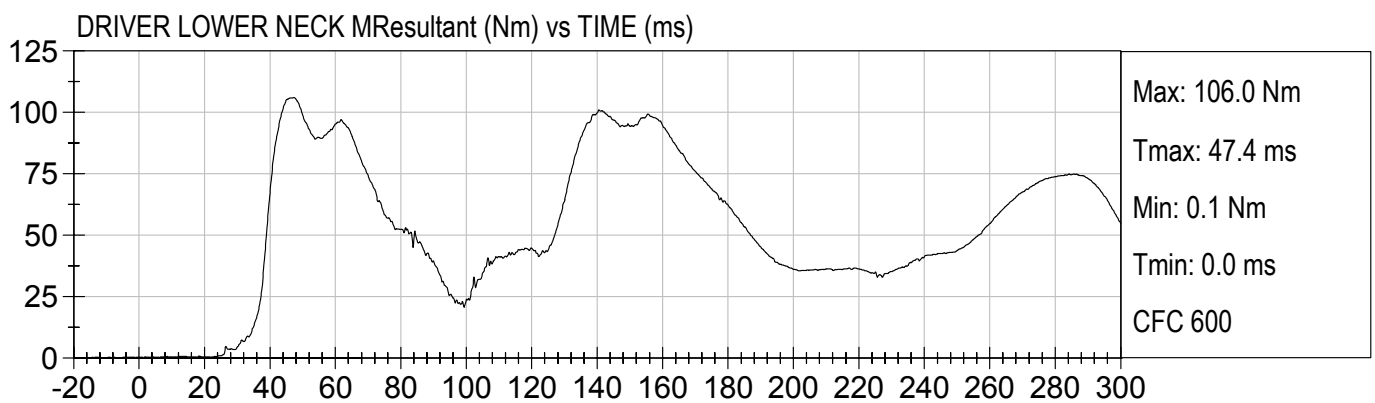
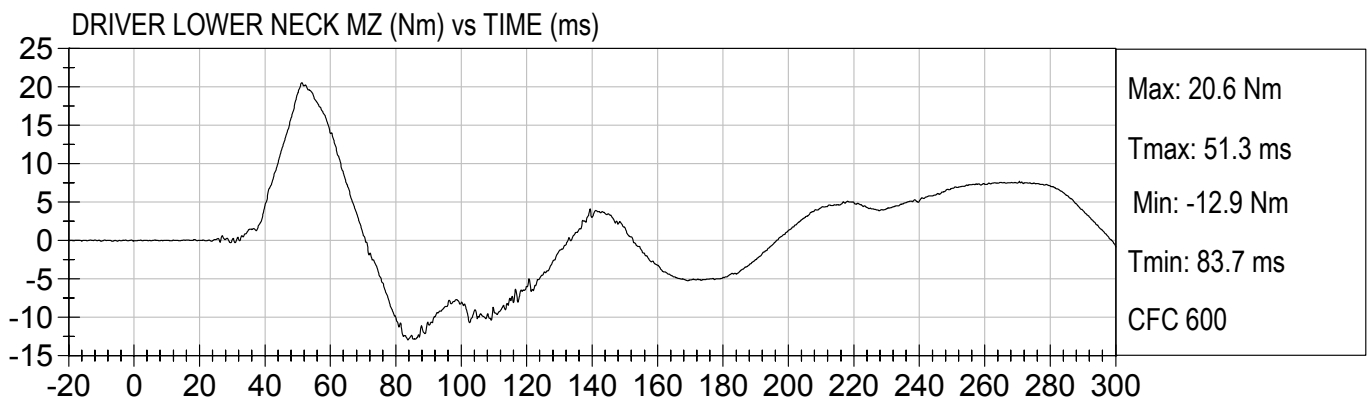
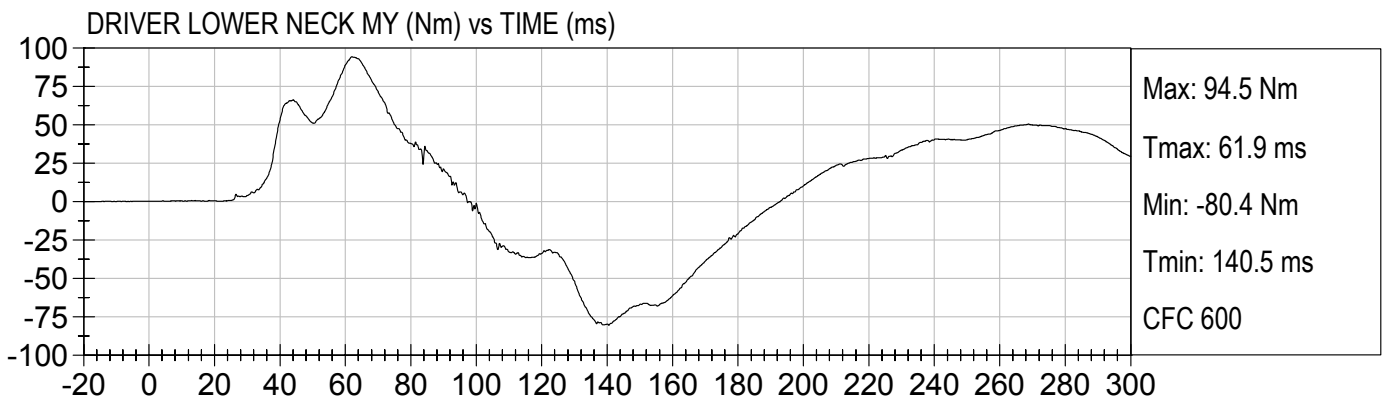
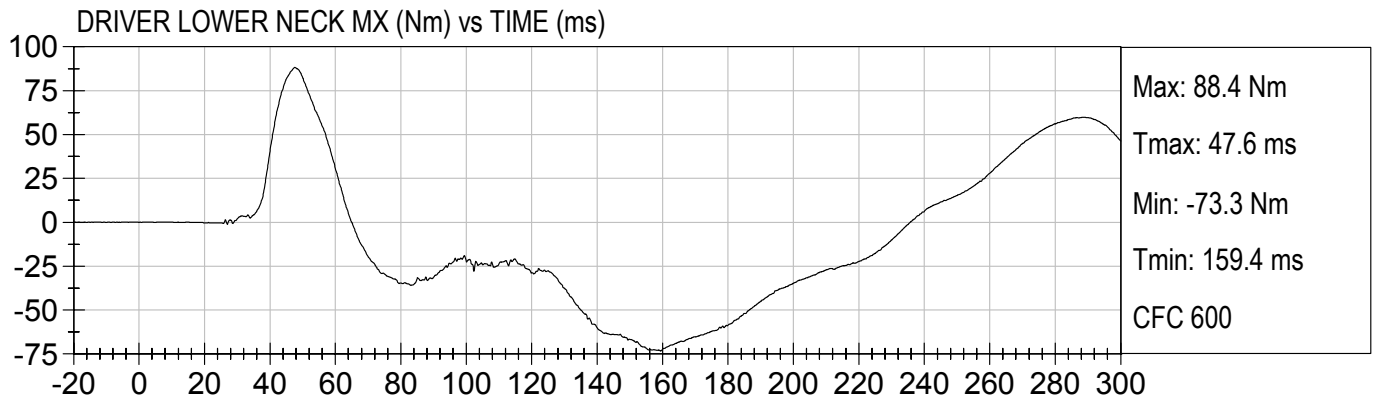


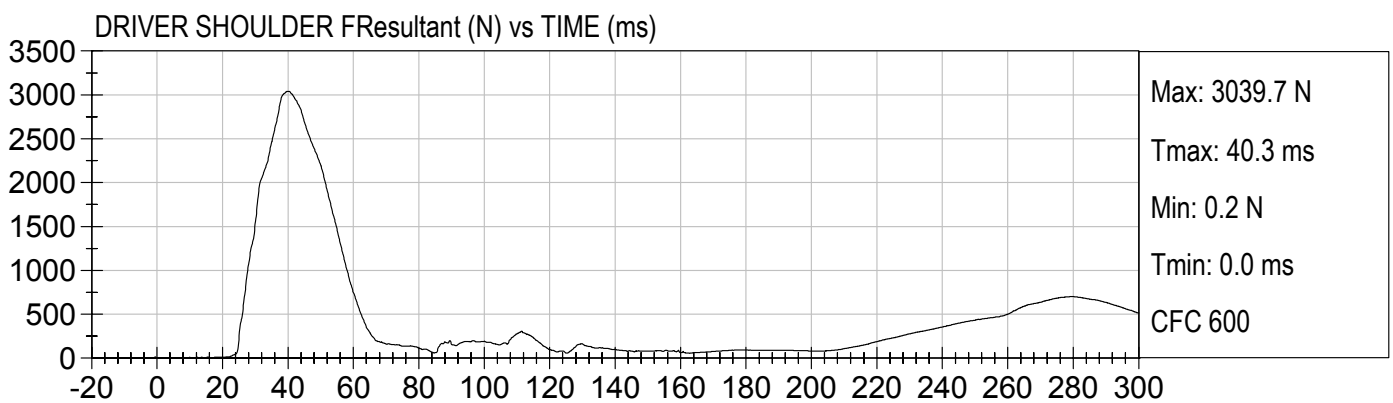
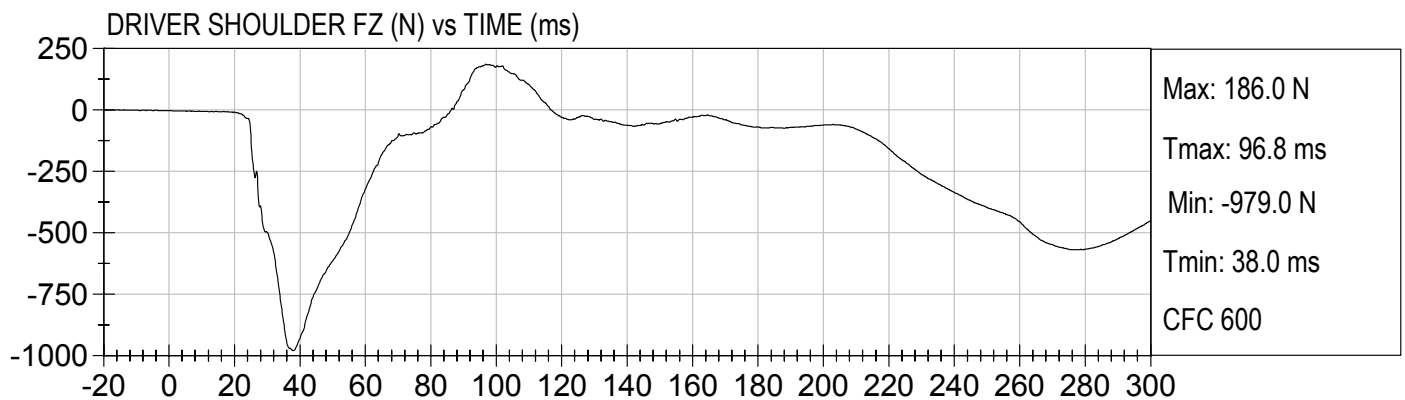
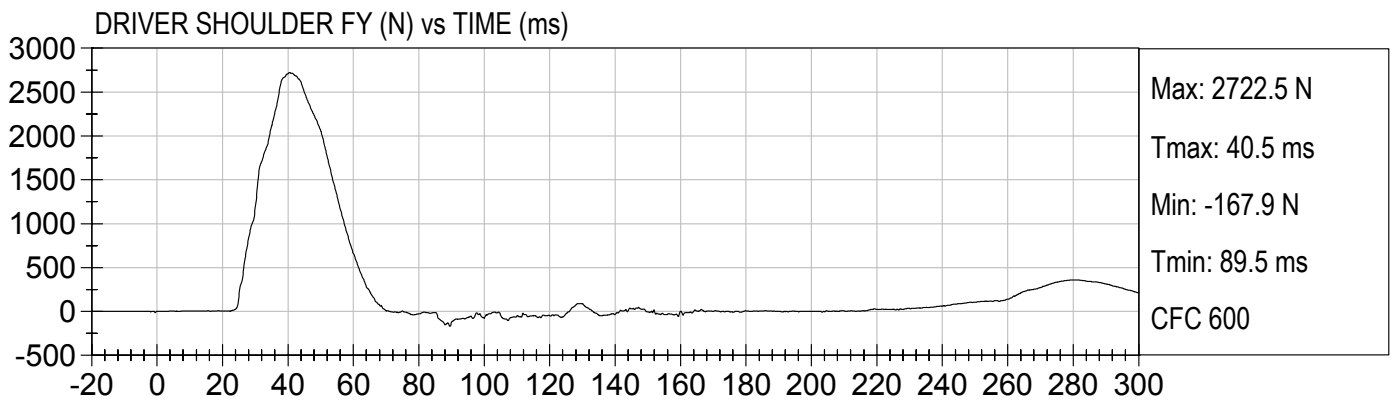
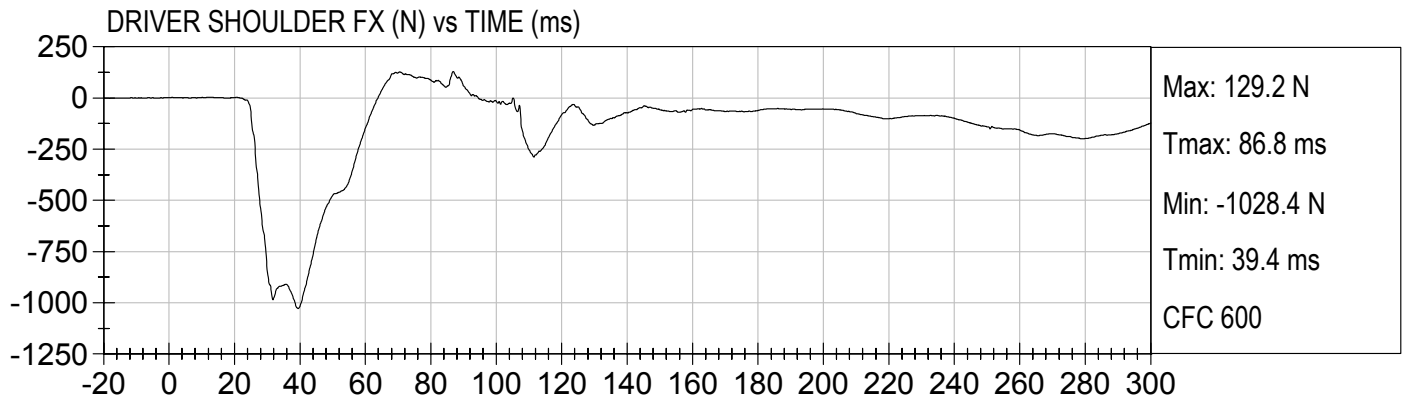


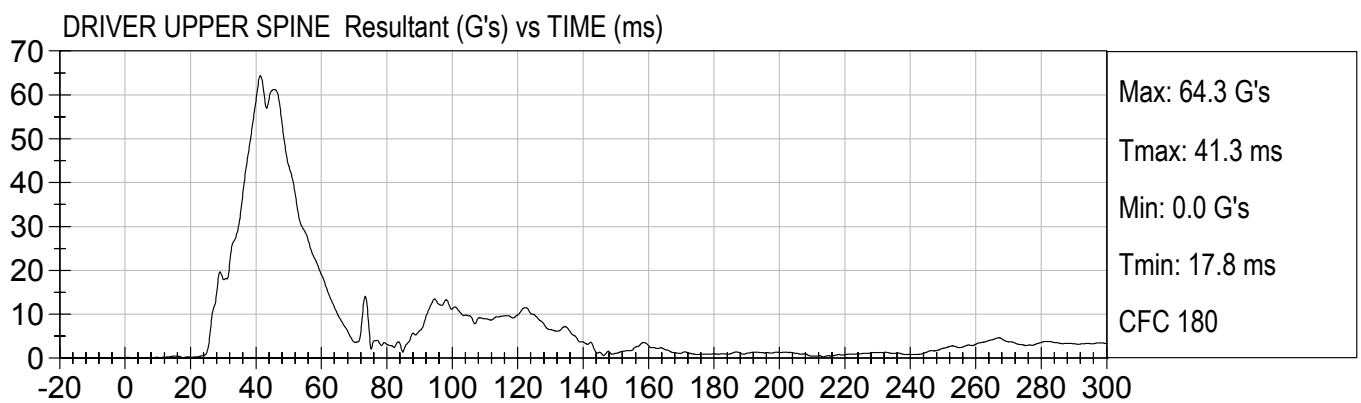
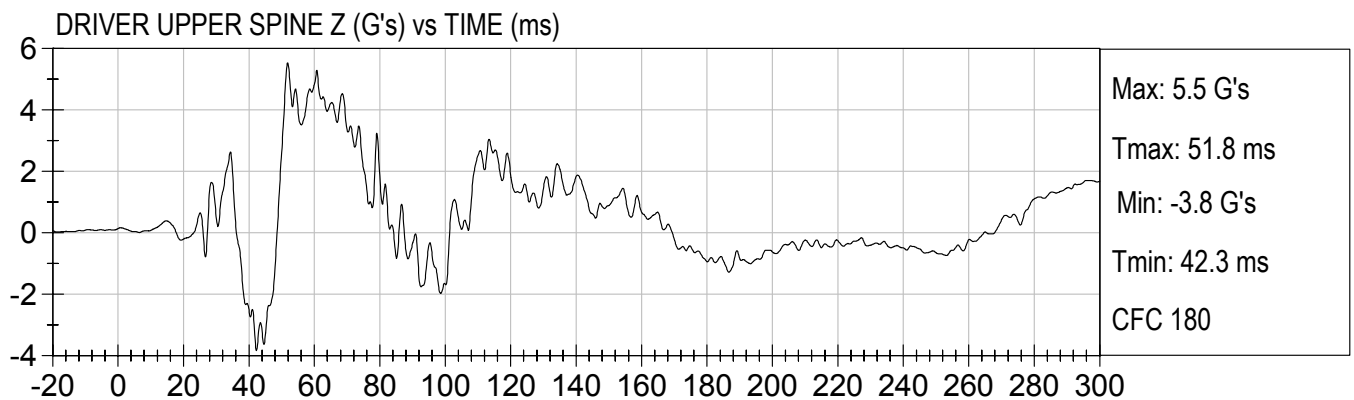
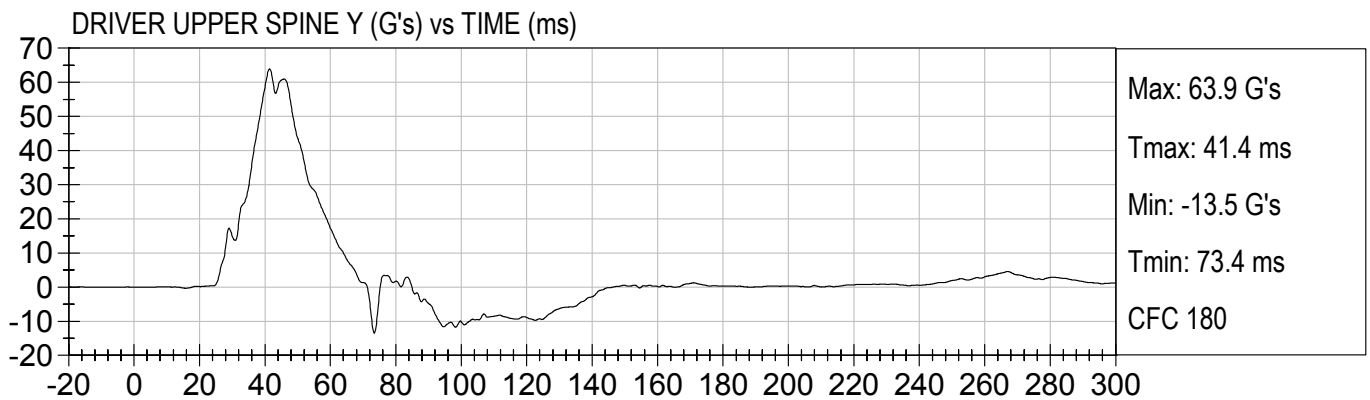
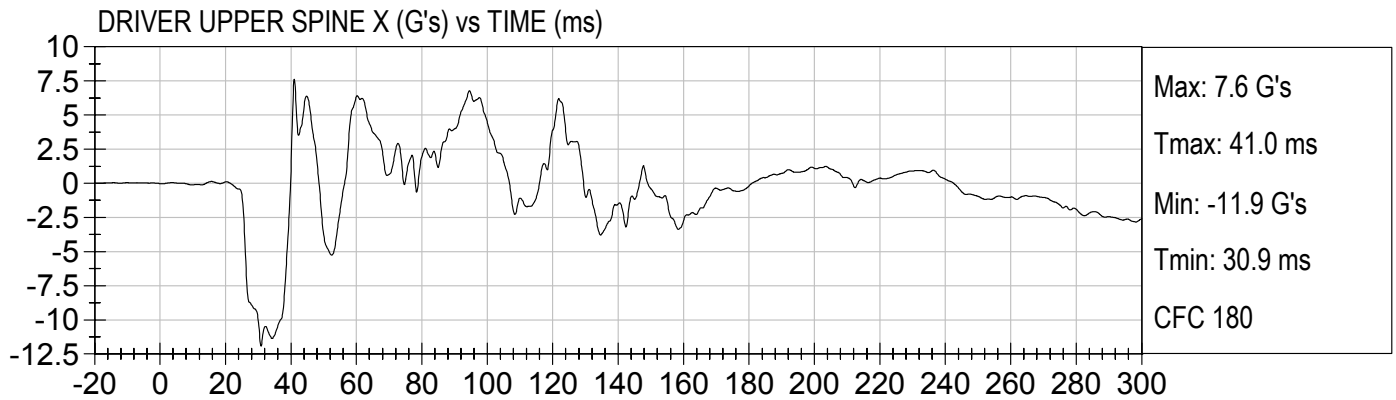


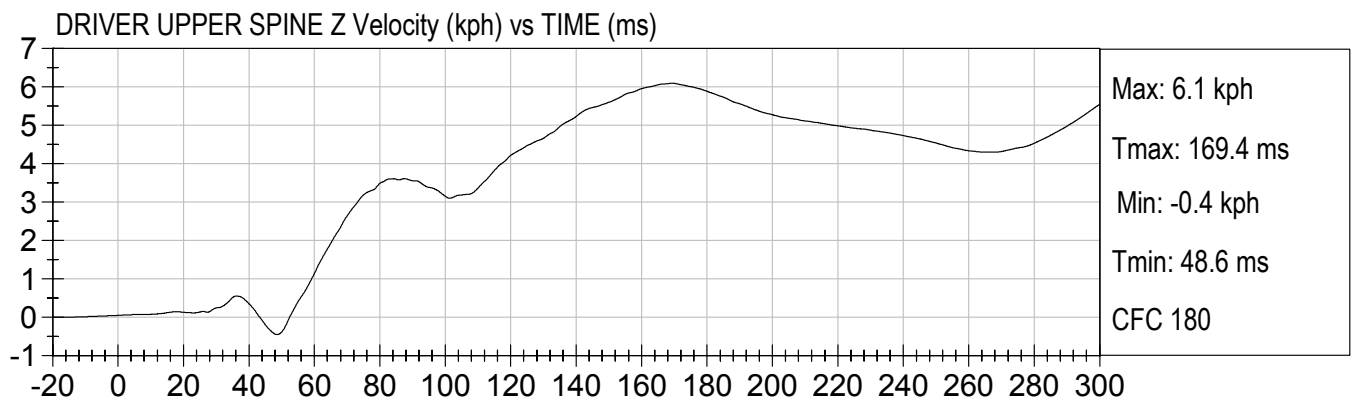
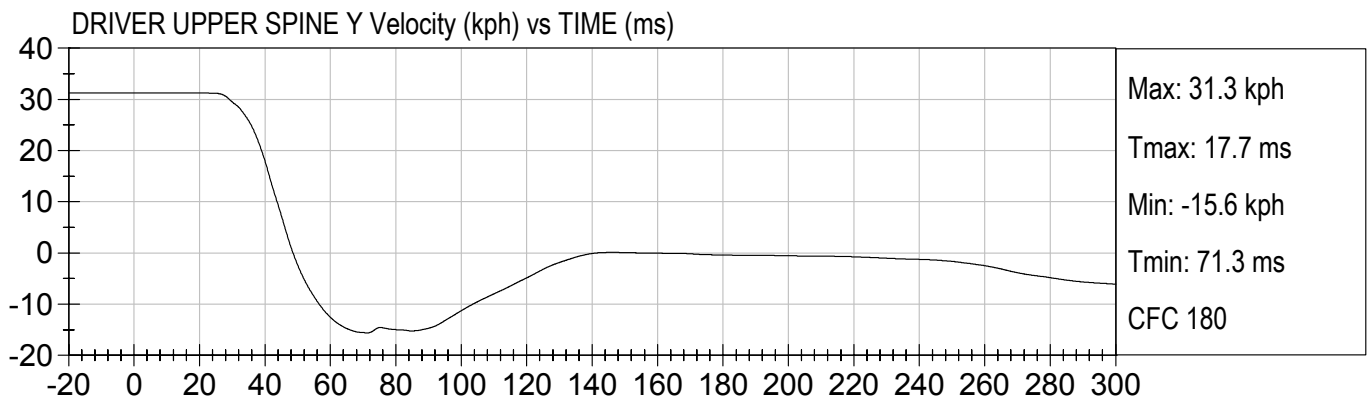
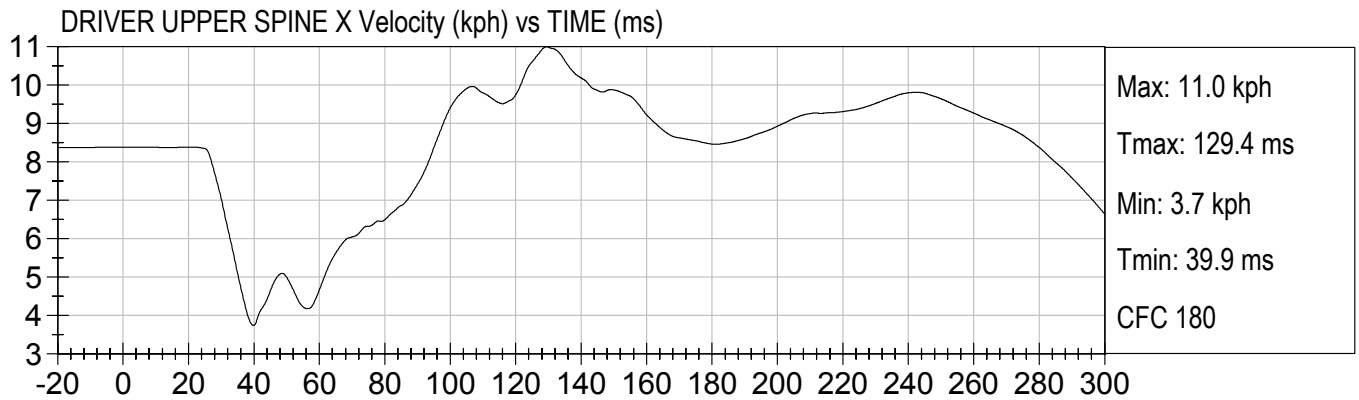


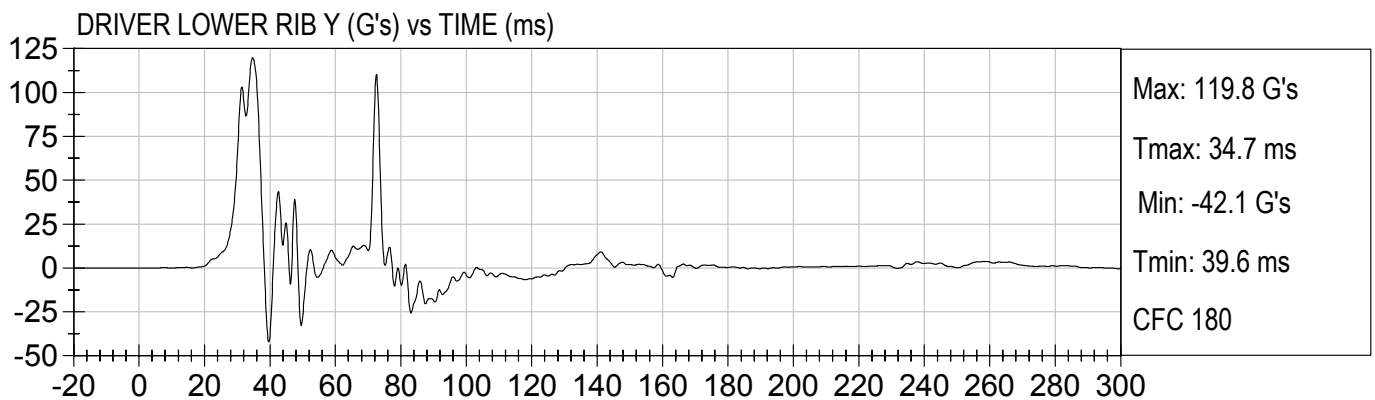
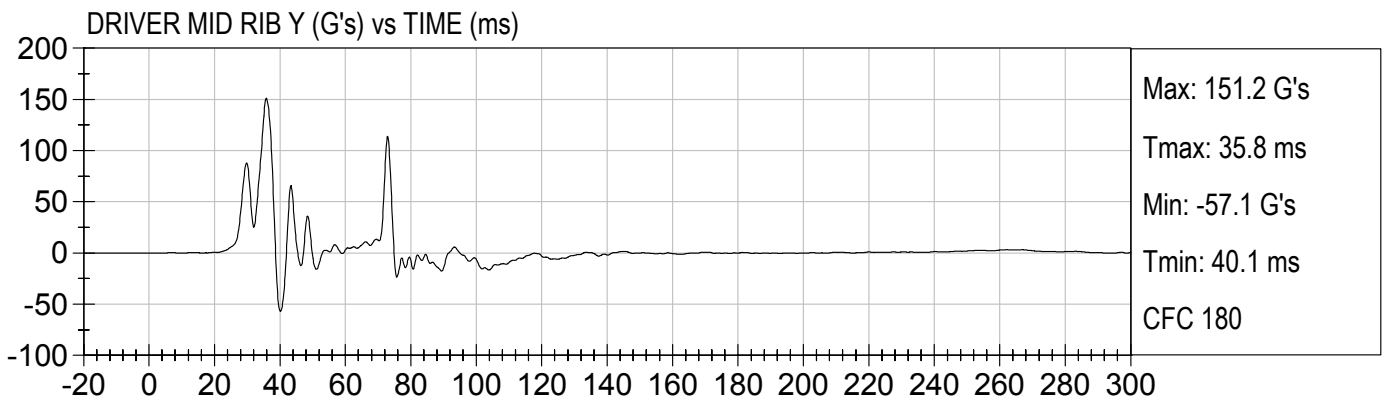
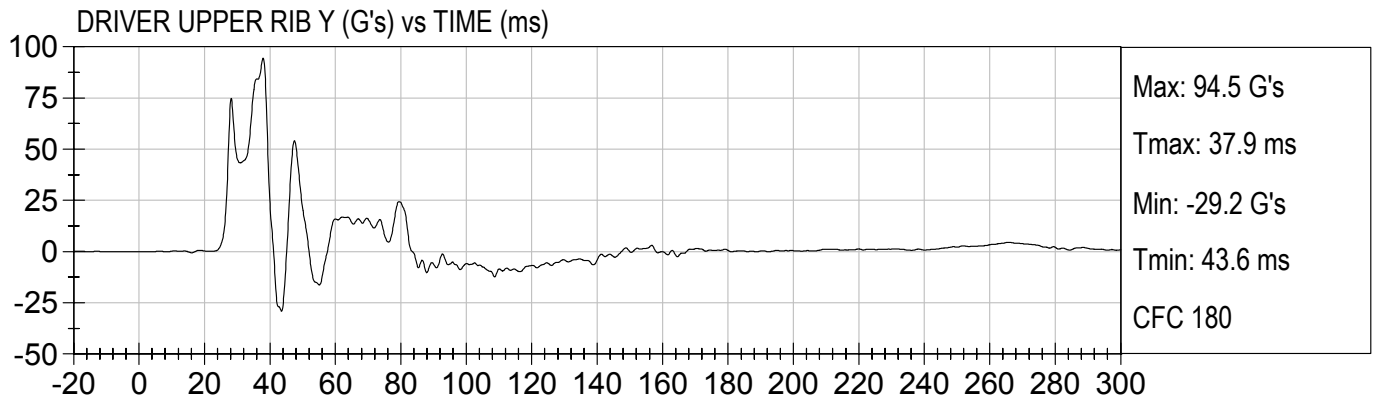


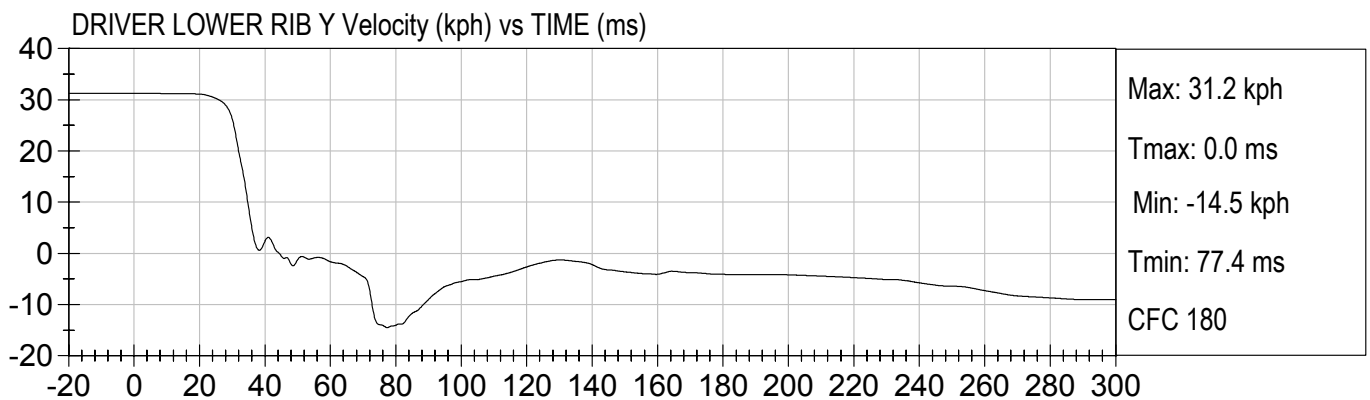
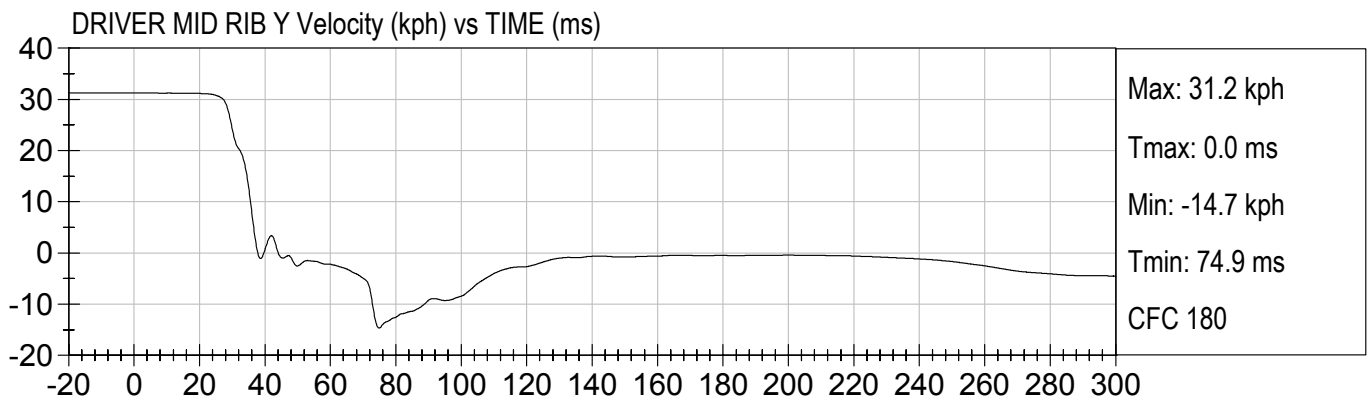
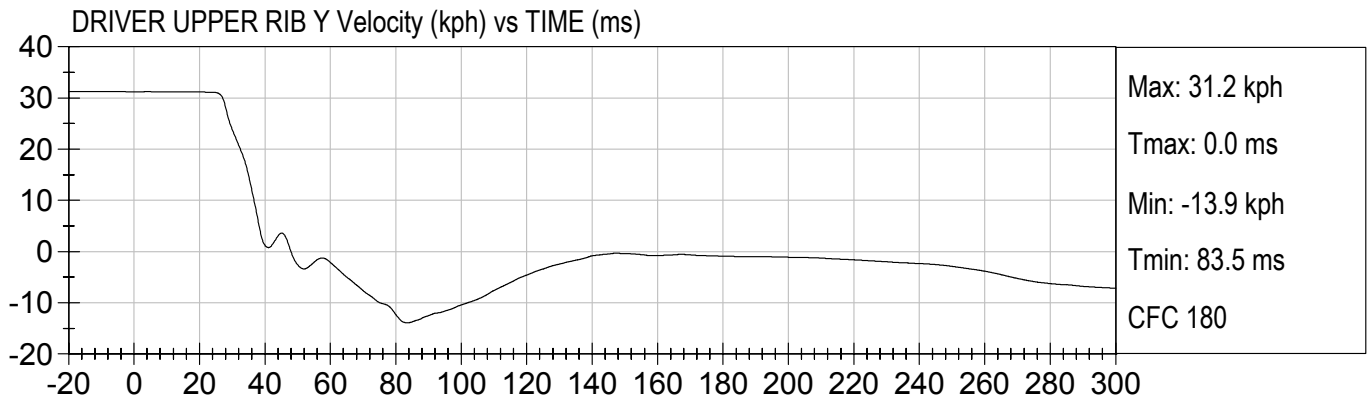


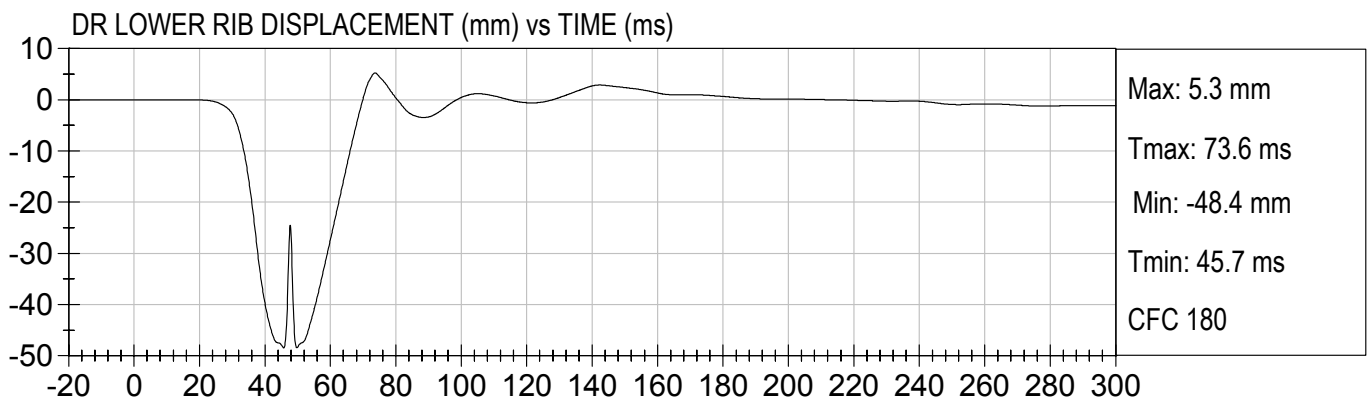
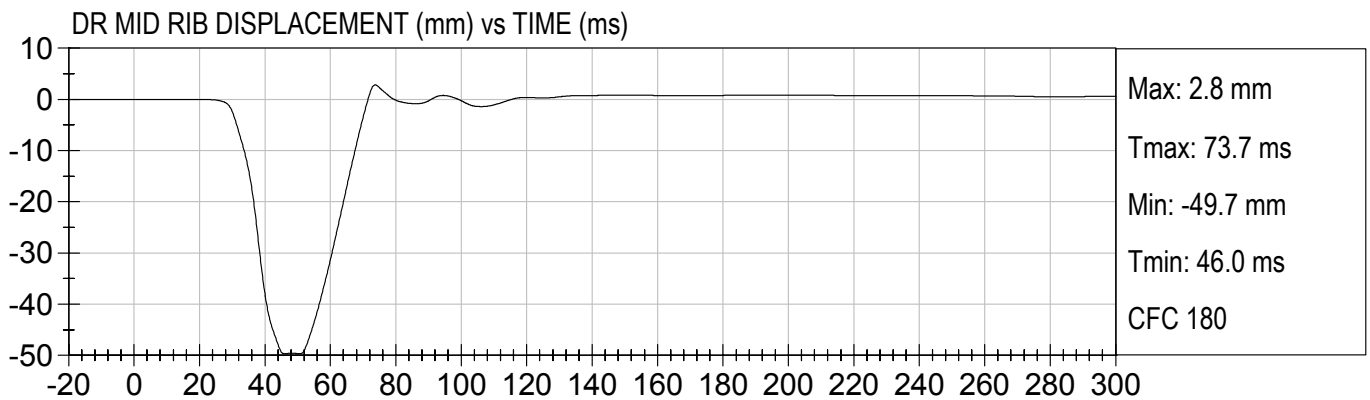
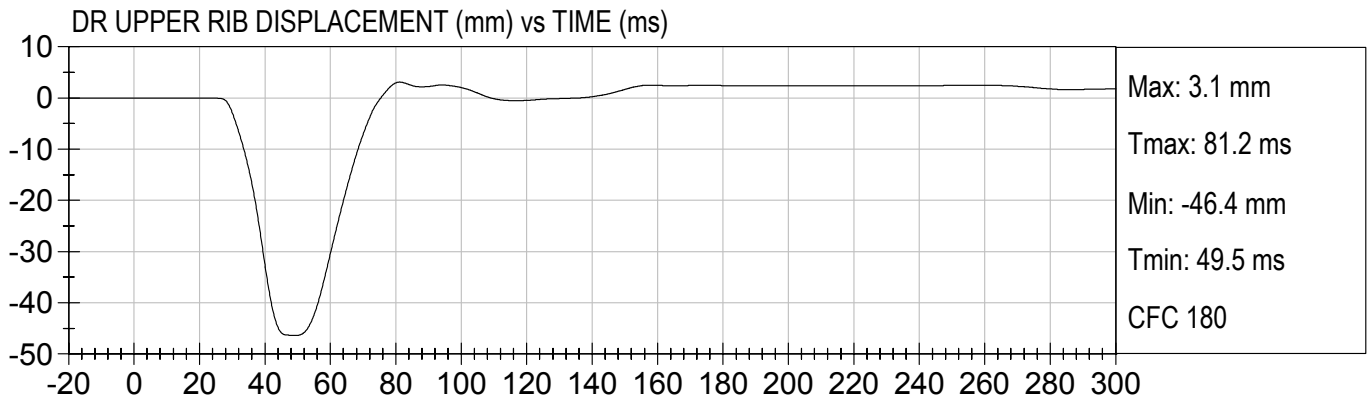


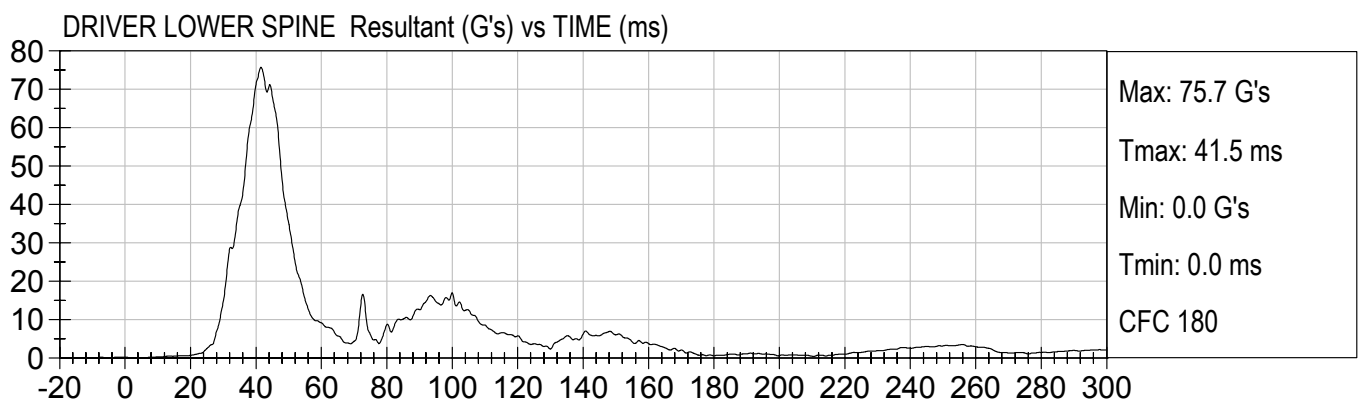
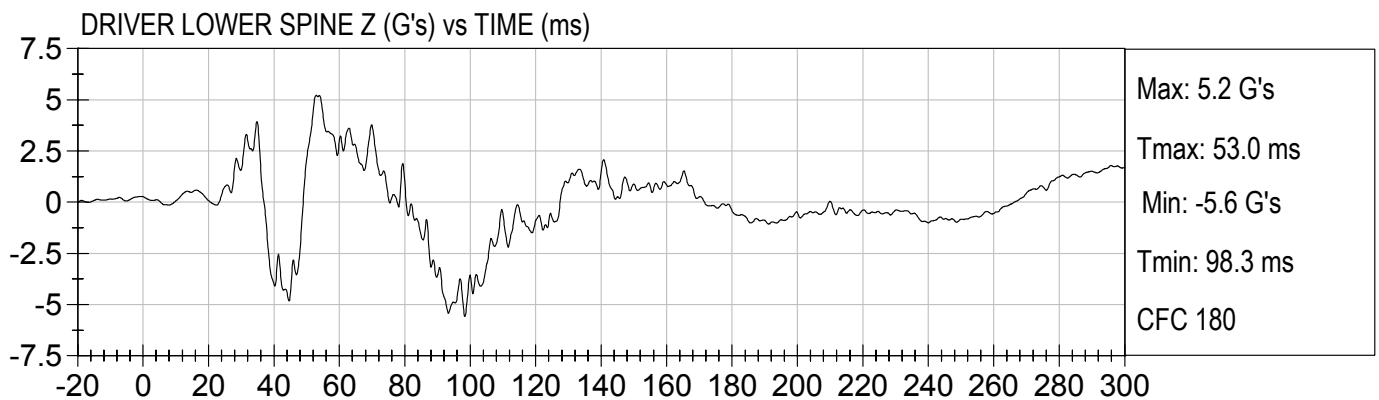
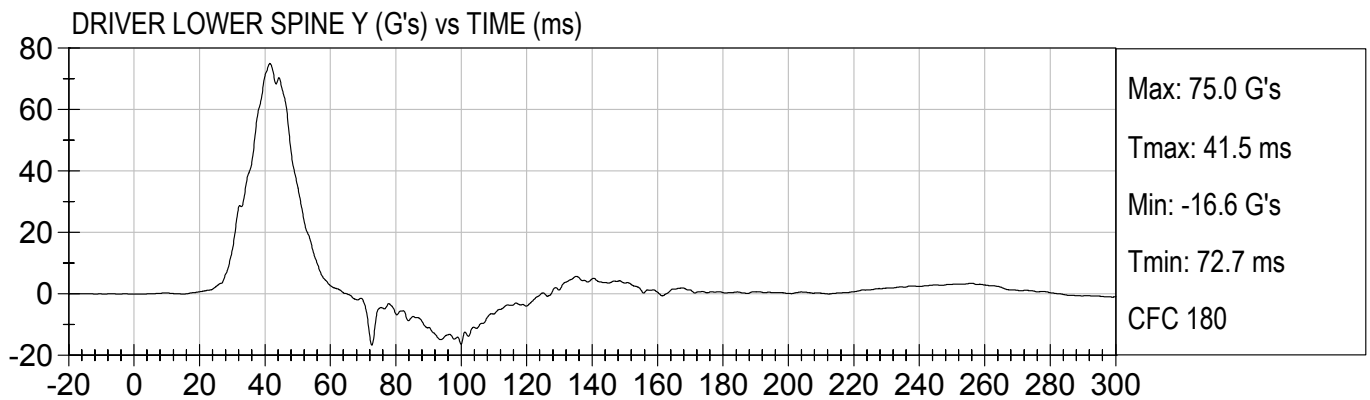
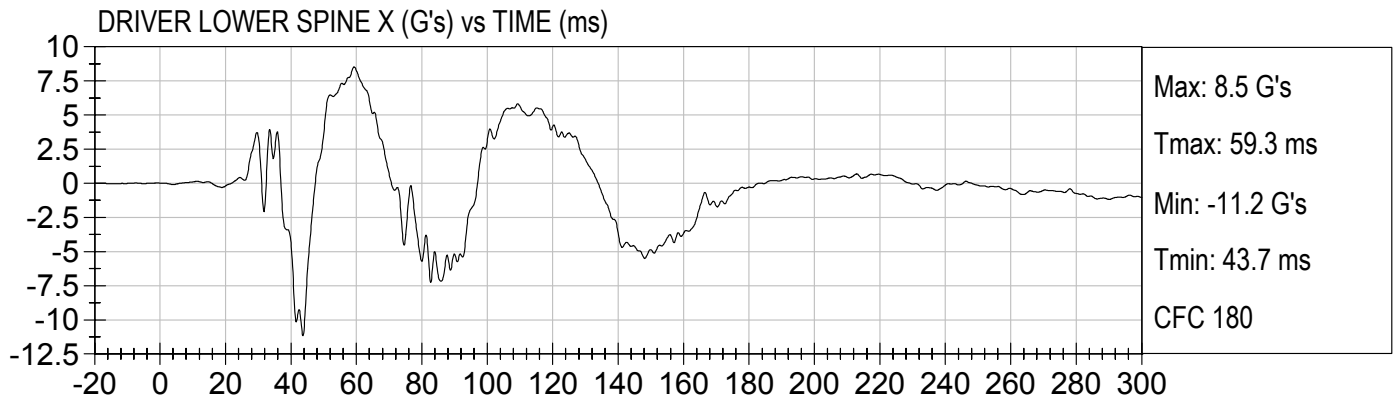






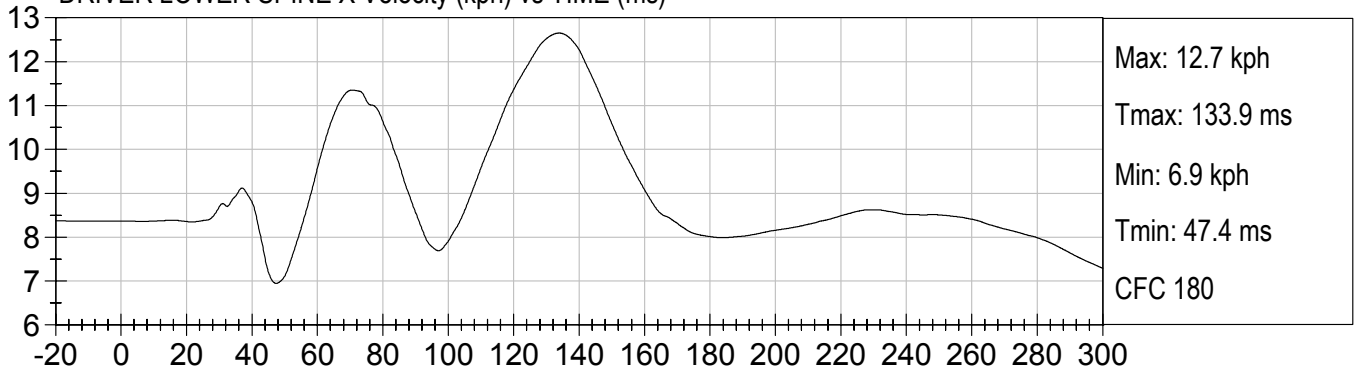




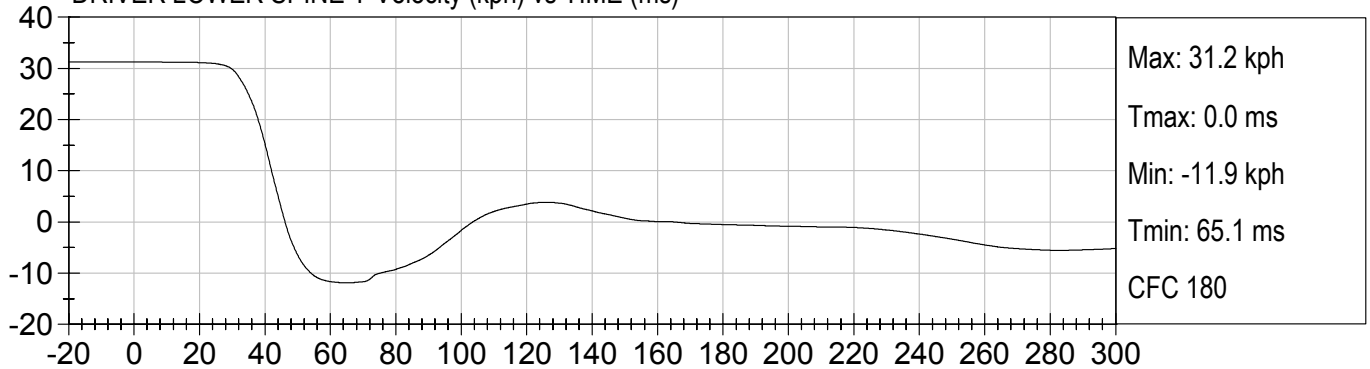




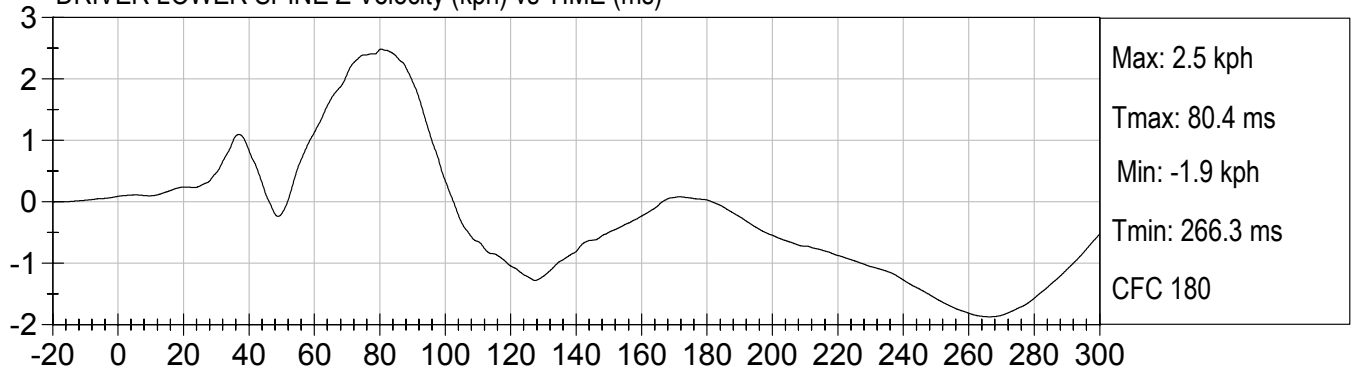
DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)

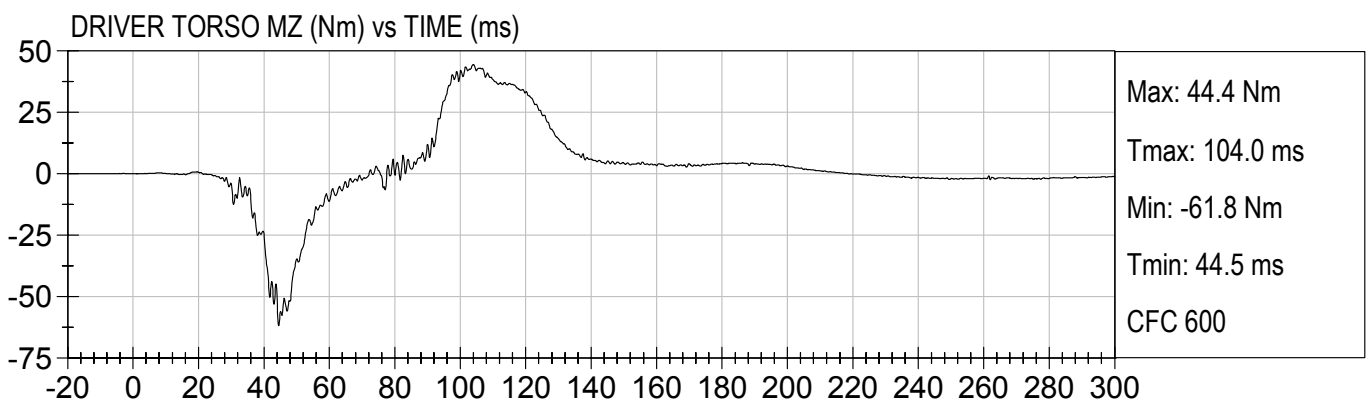
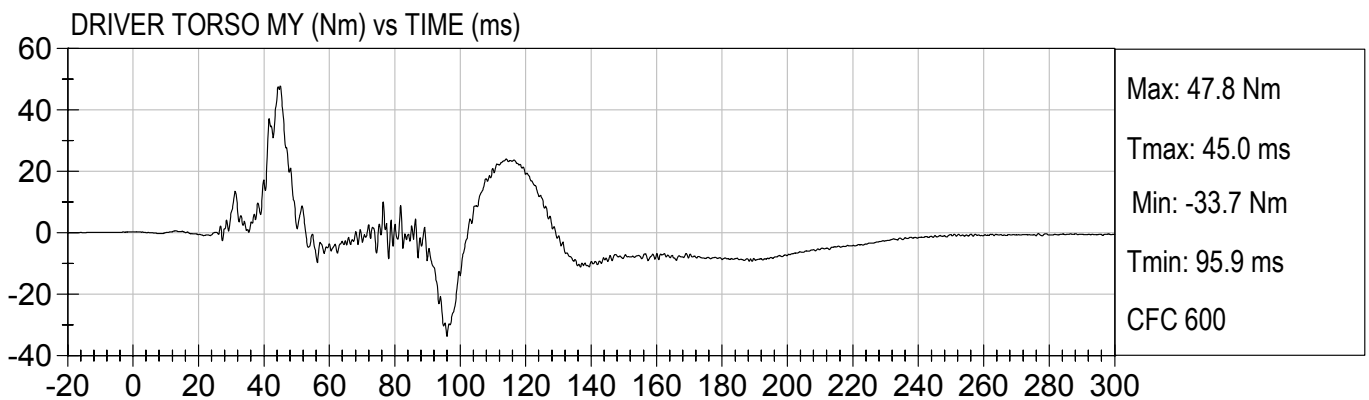
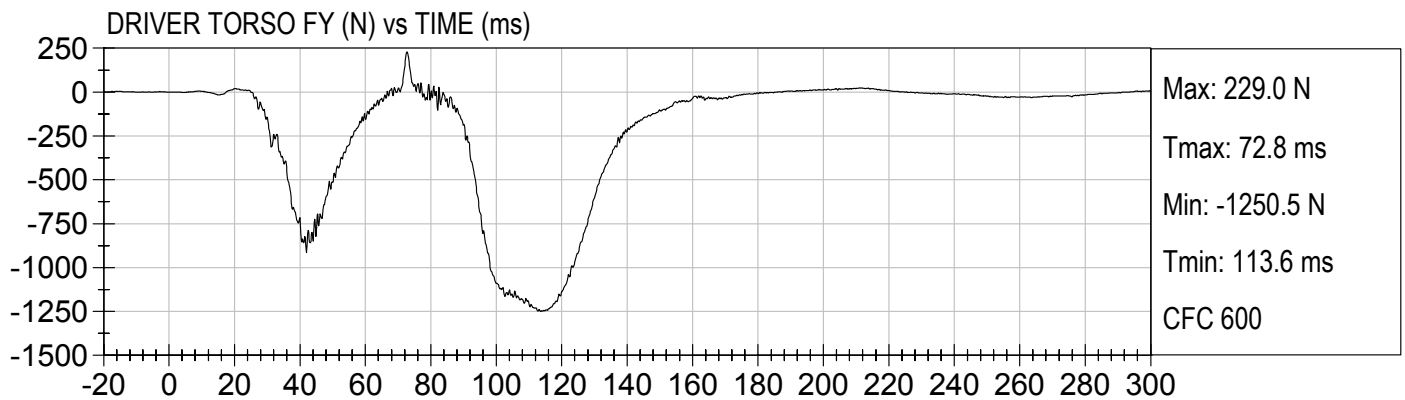
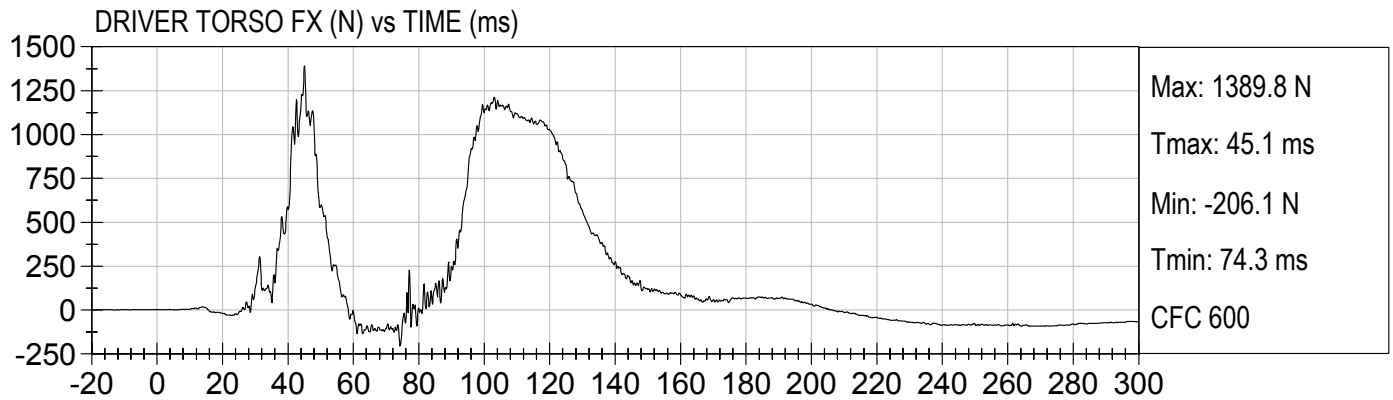


DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



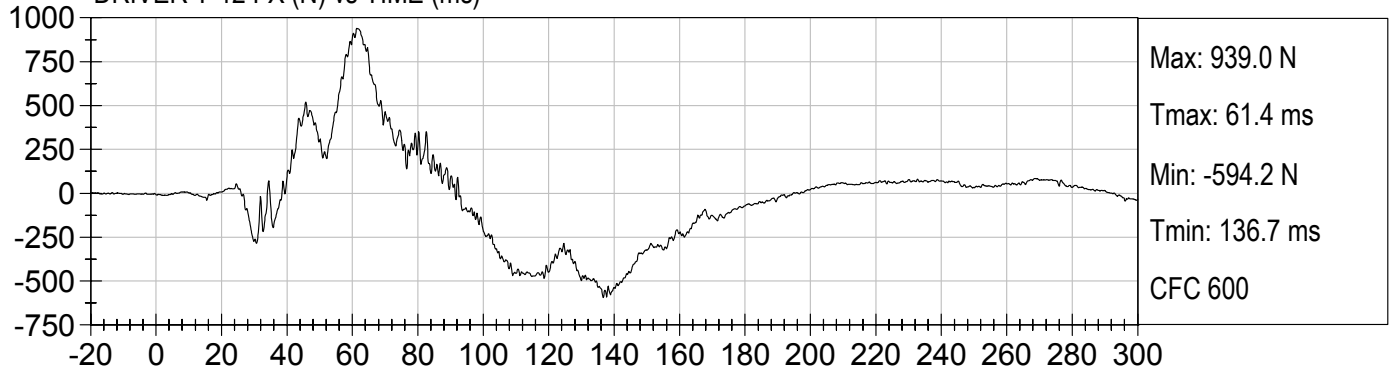
DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)



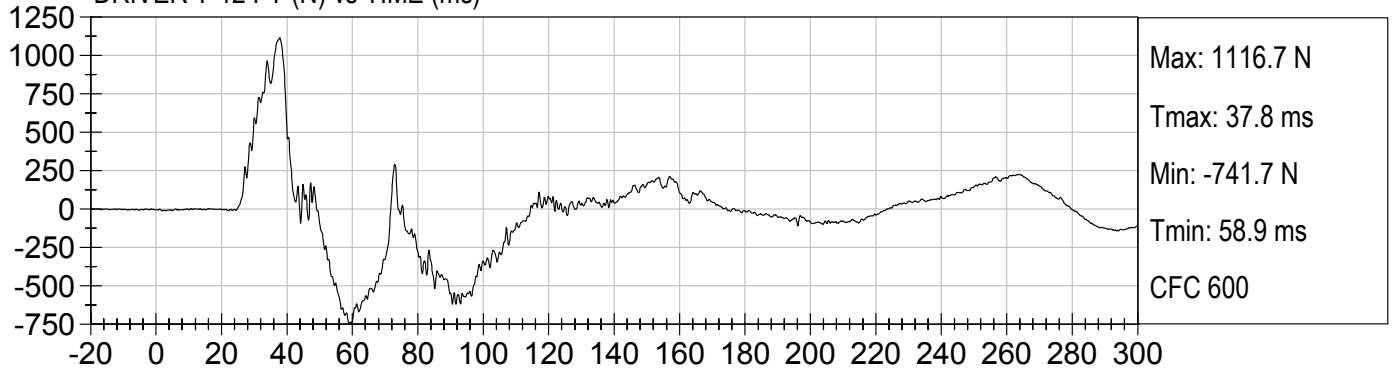




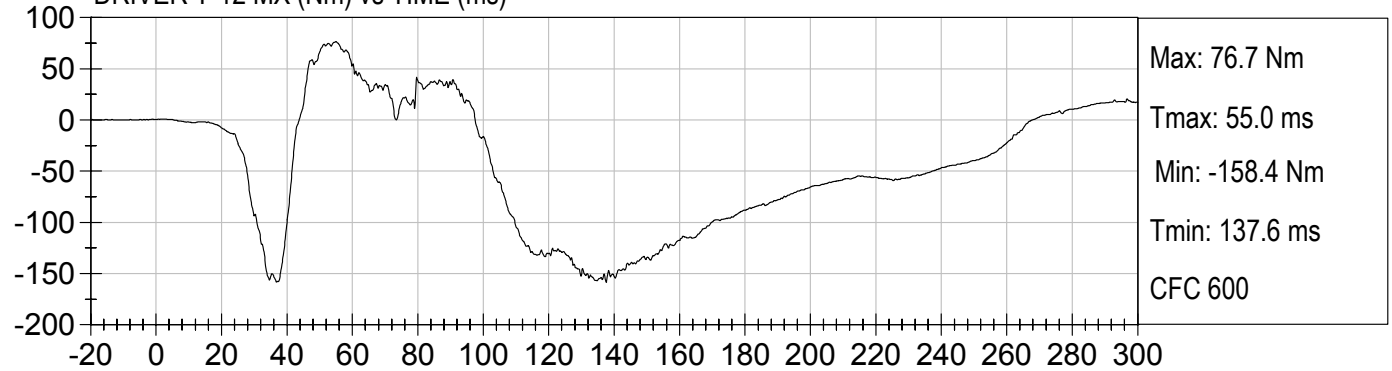
DRIVER T-12 FX (N) vs TIME (ms)



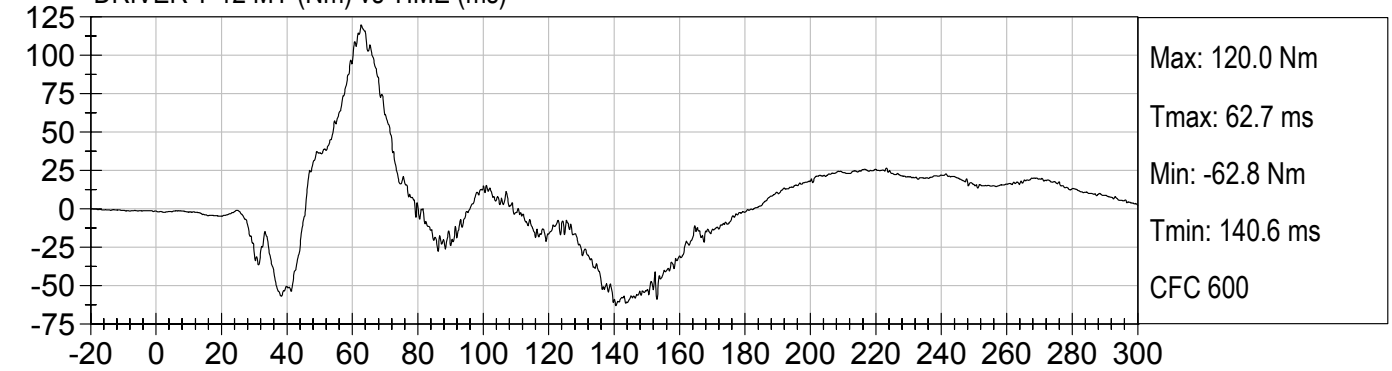
DRIVER T-12 FY (N) vs TIME (ms)

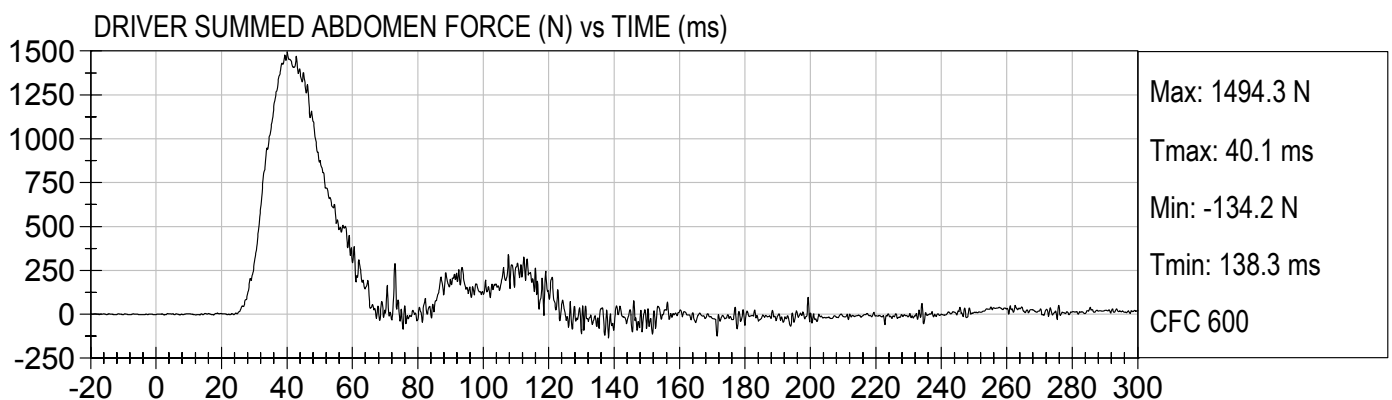
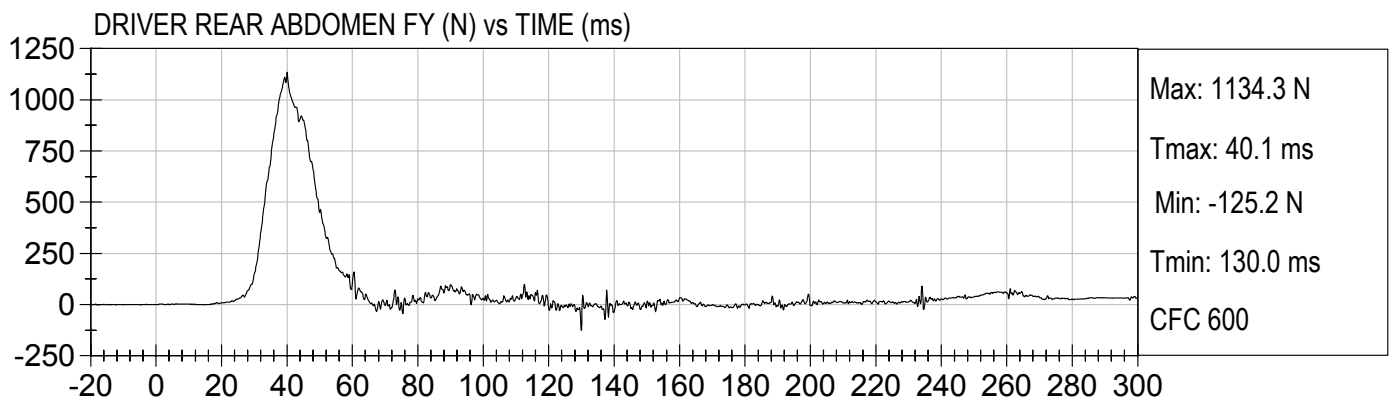
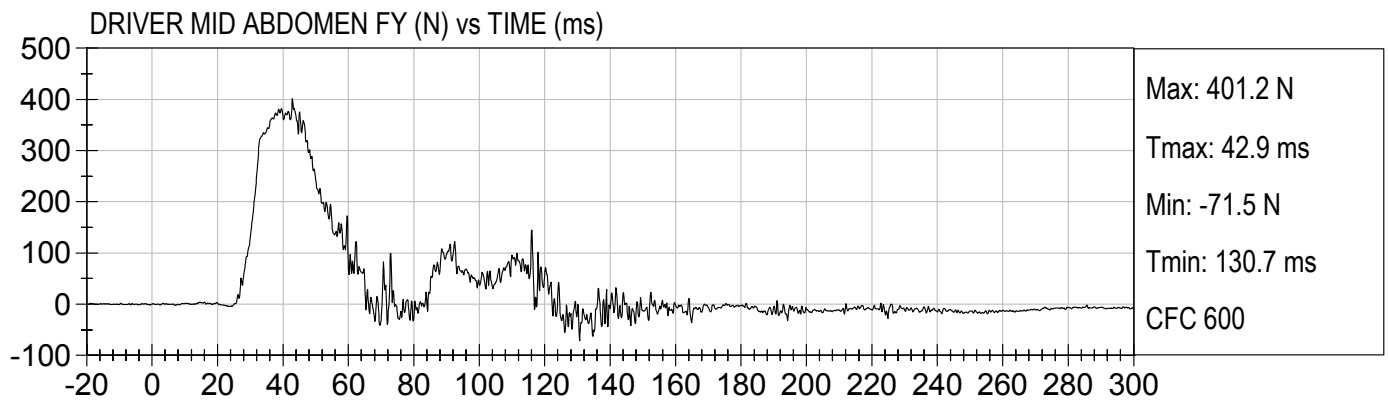
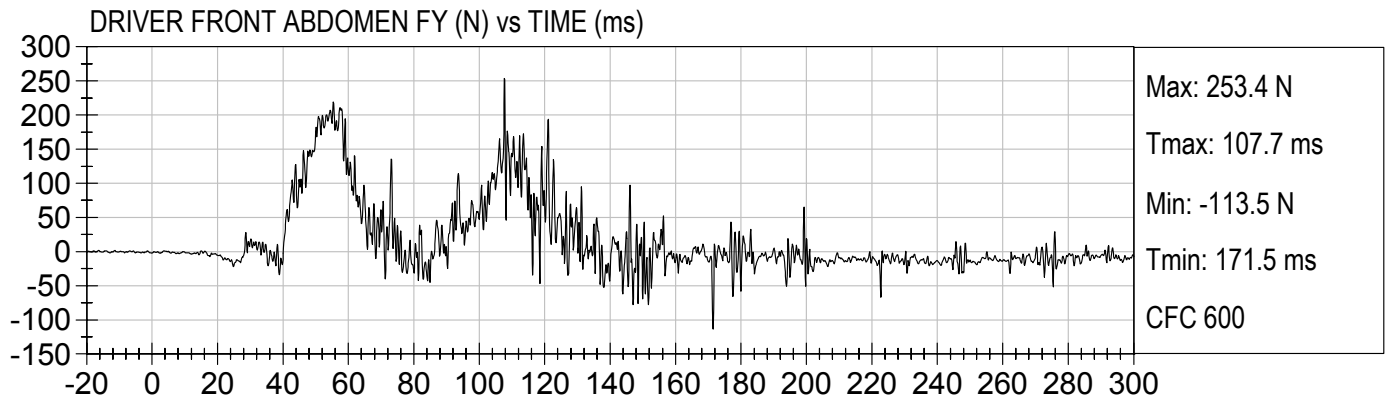


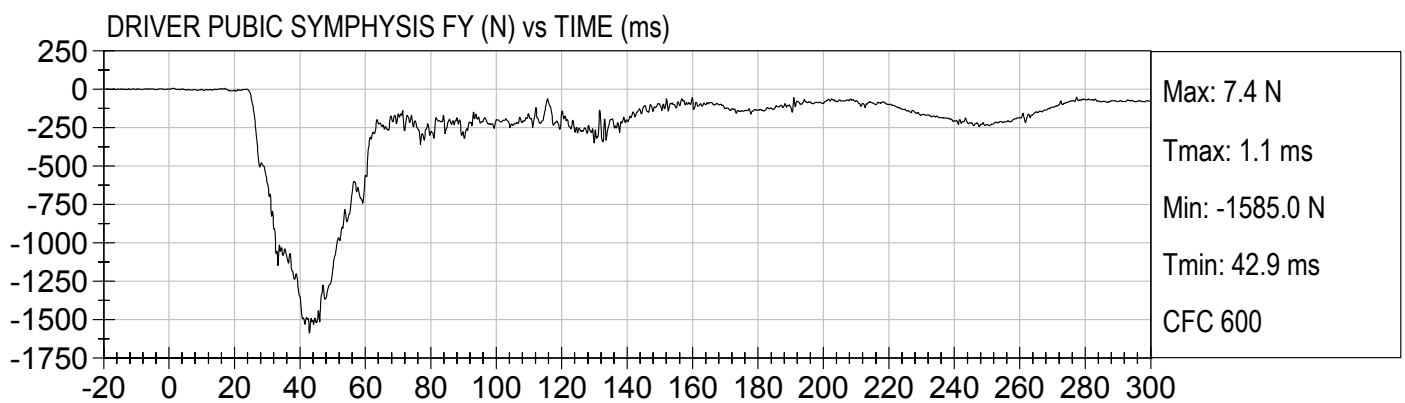
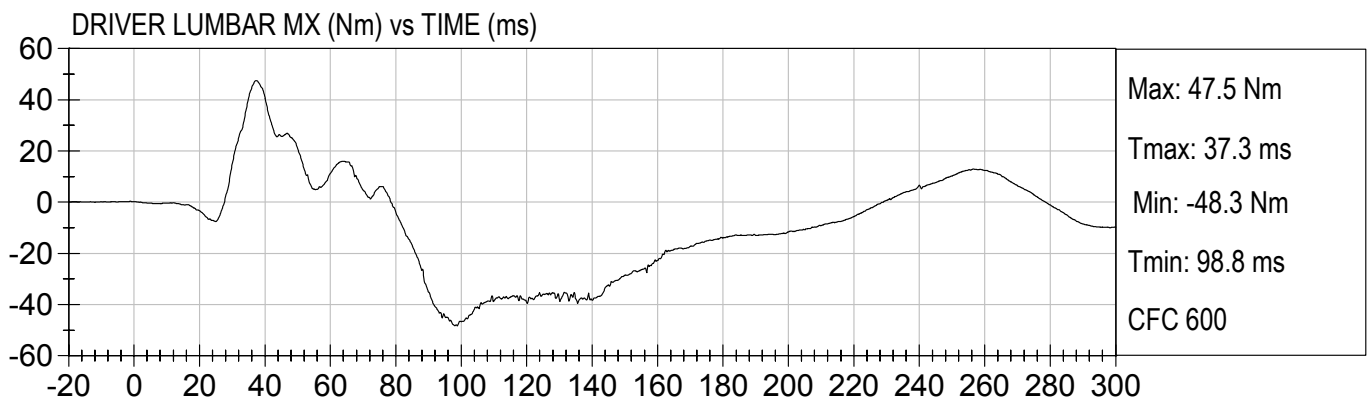
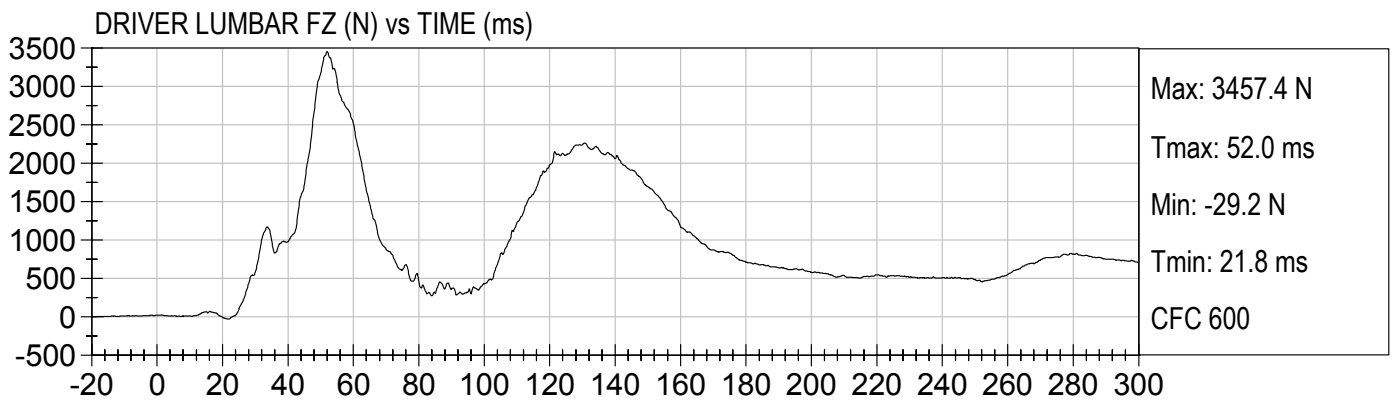
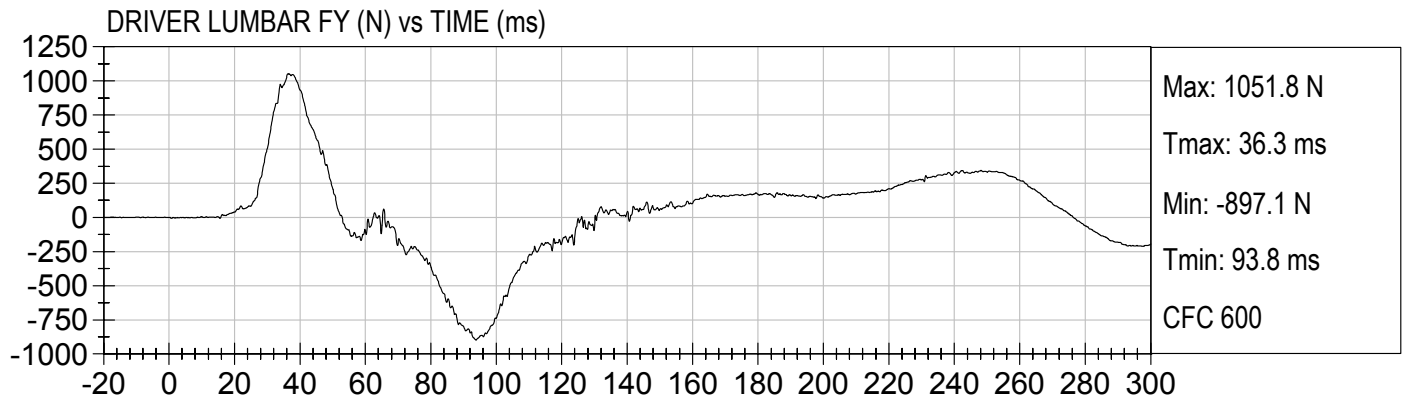
DRIVER T-12 MX (Nm) vs TIME (ms)

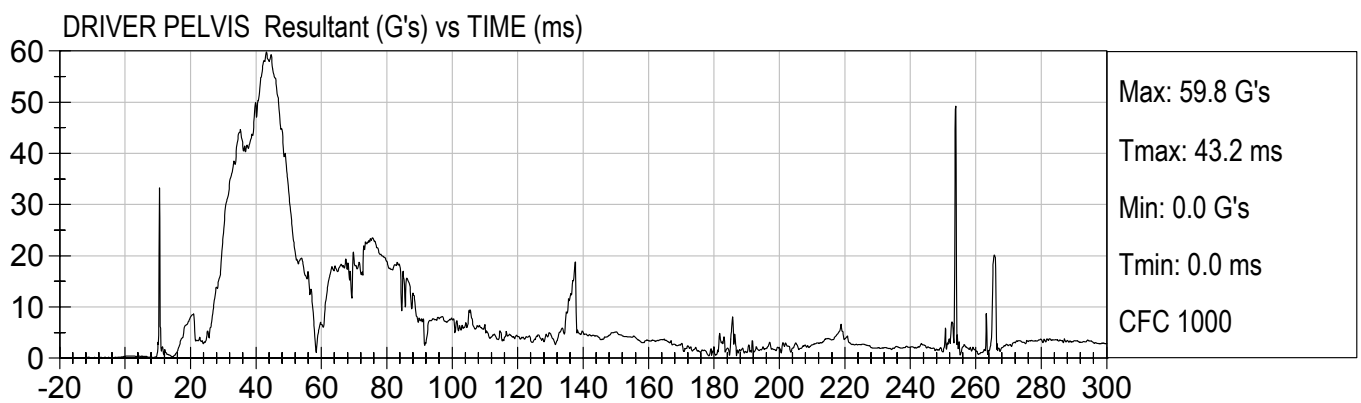
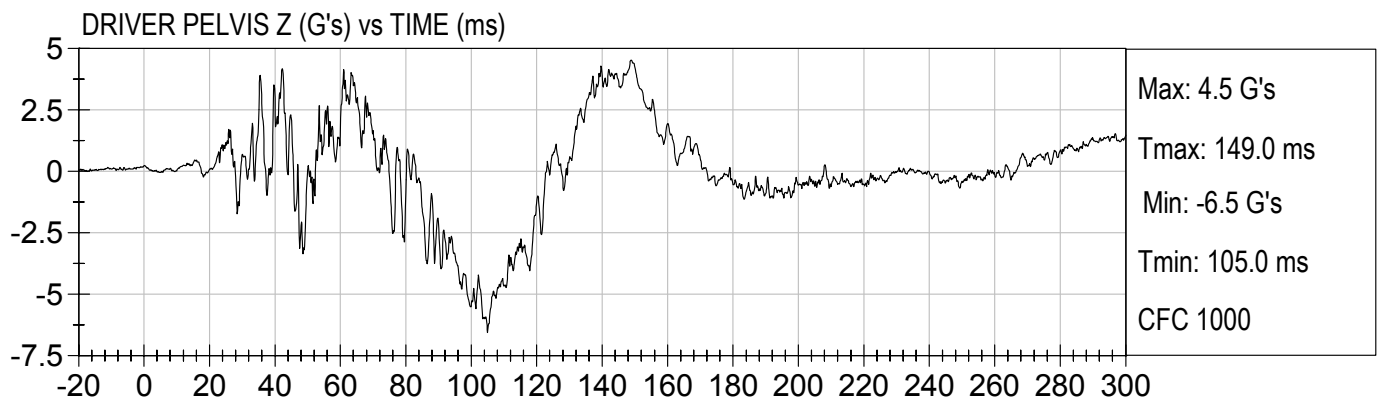
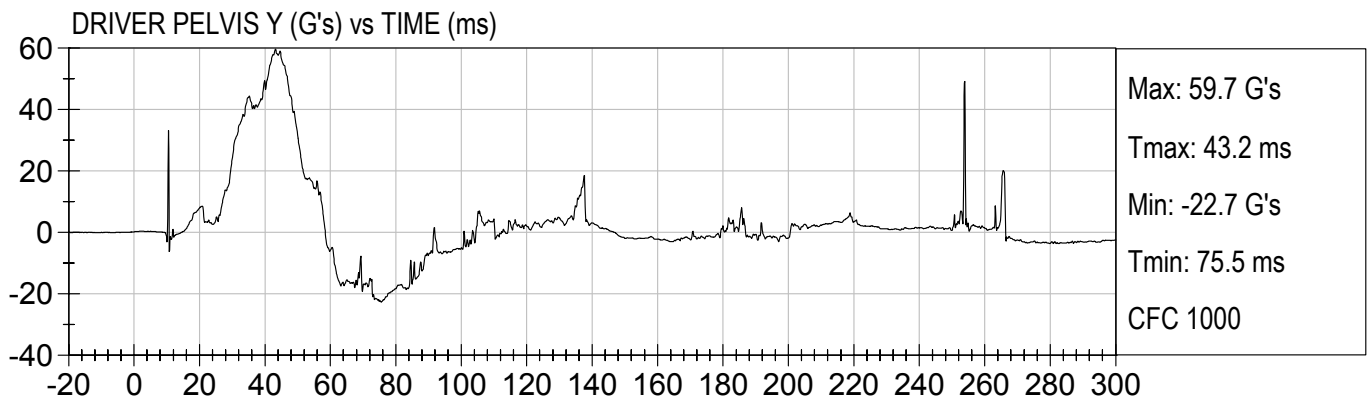


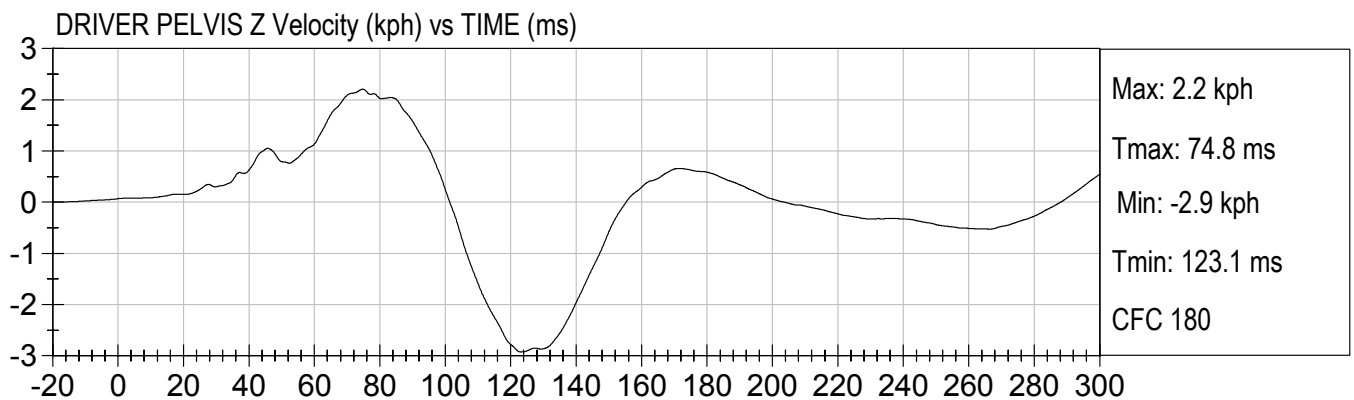
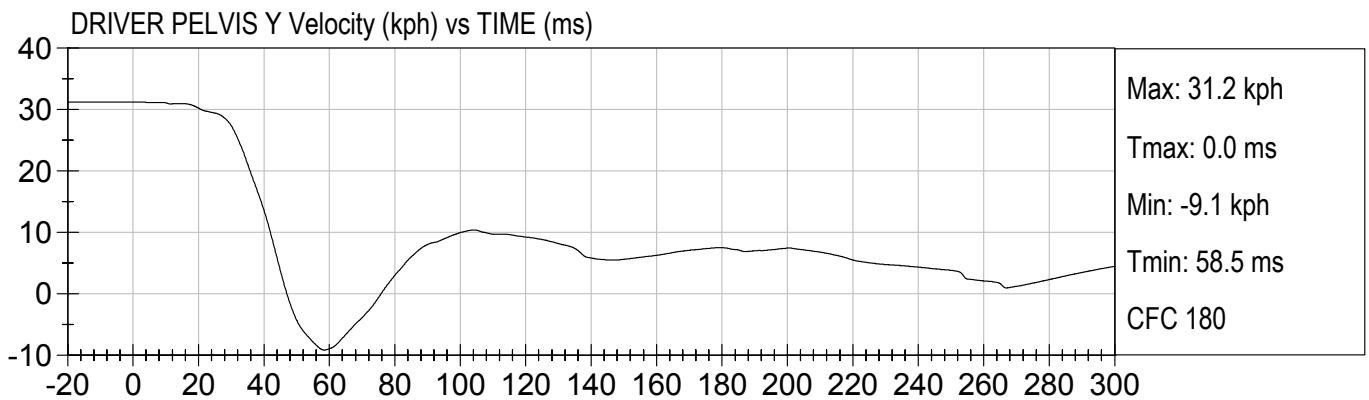
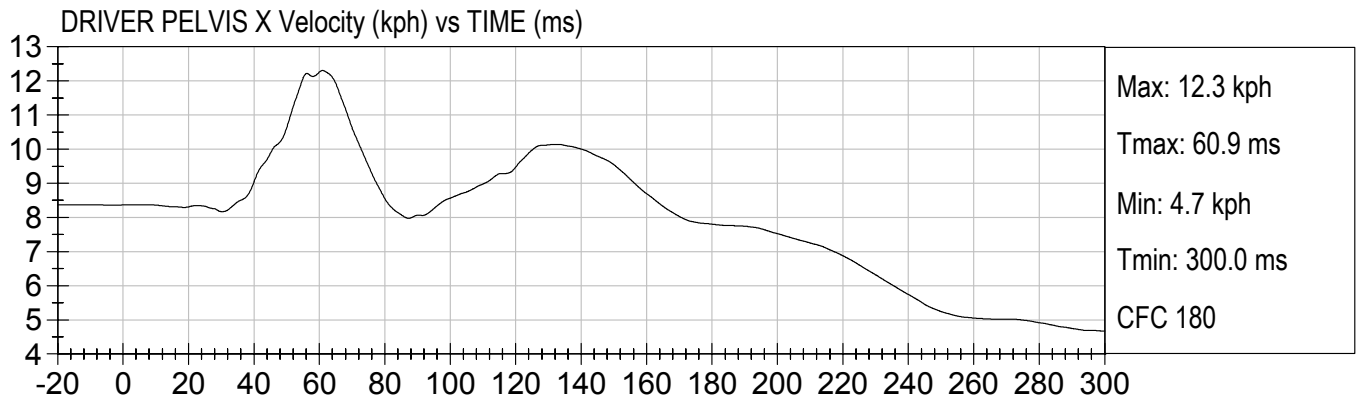
DRIVER T-12 MY (Nm) vs TIME (ms)









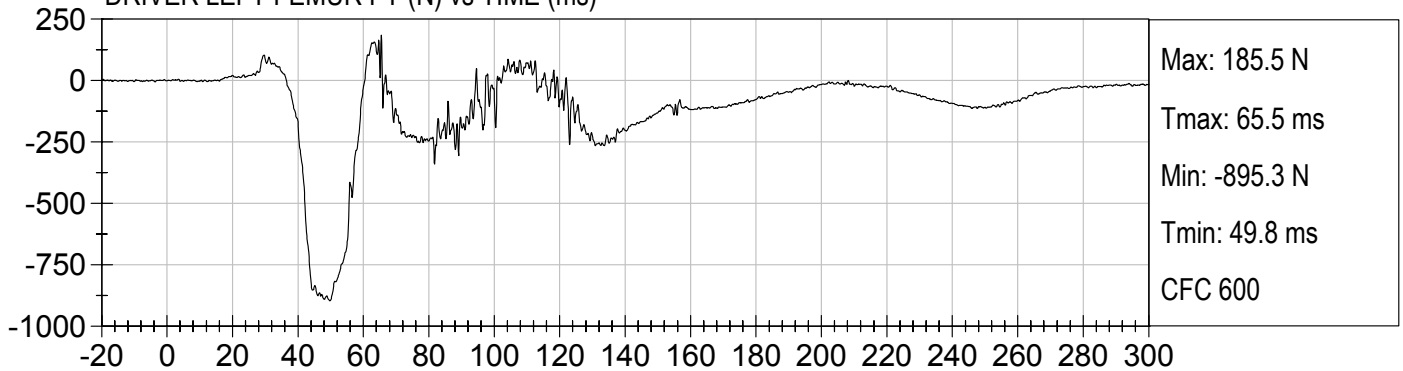




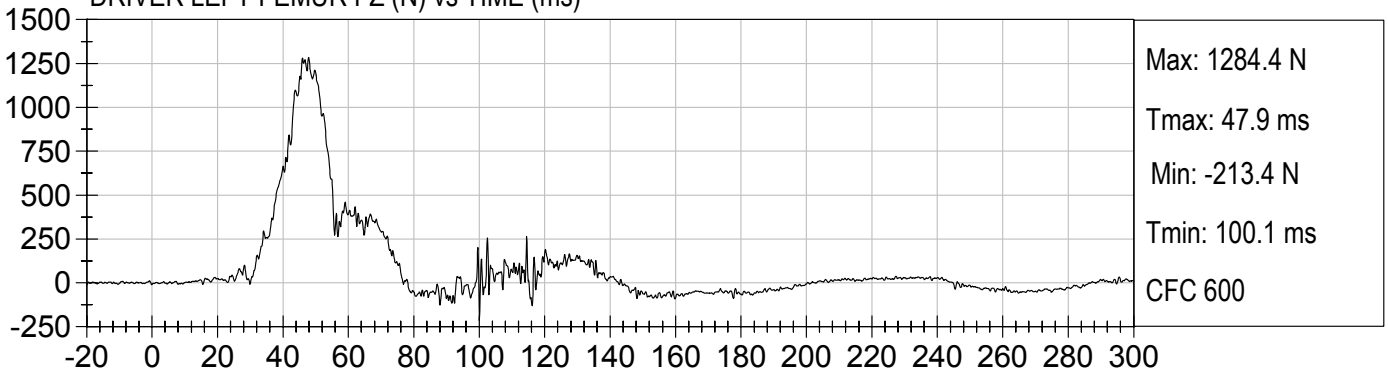
DRIVER LEFT FEMUR FX (N) vs TIME (ms)



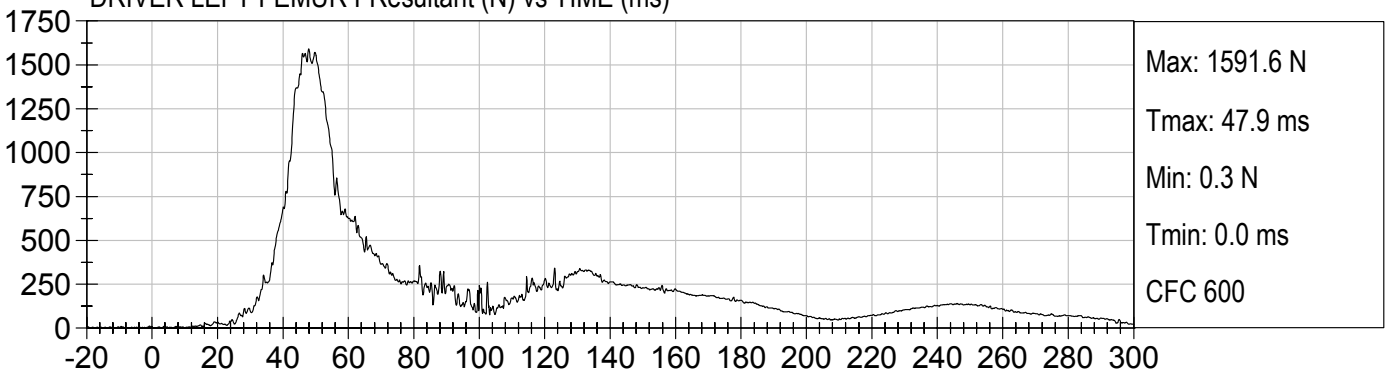
DRIVER LEFT FEMUR FY (N) vs TIME (ms)

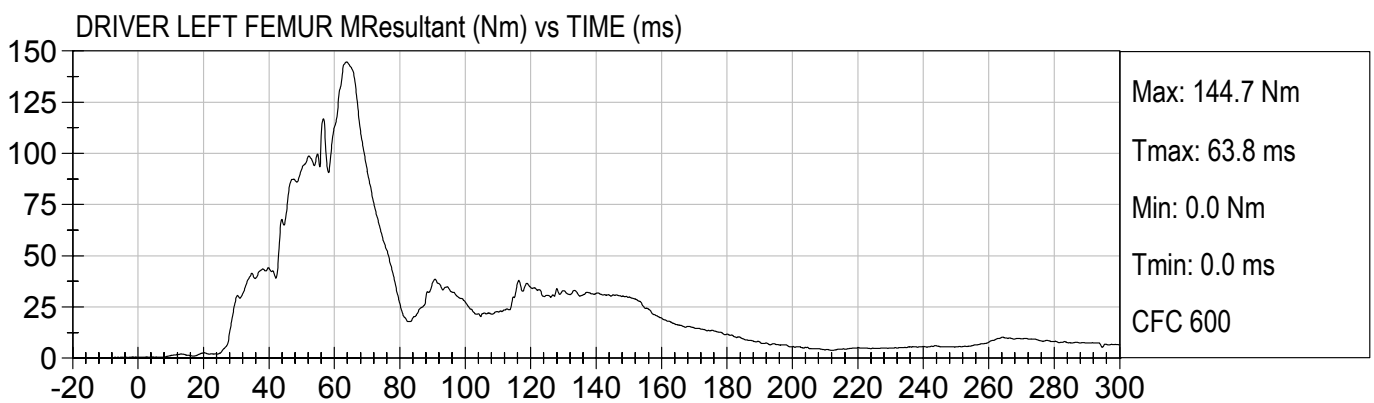
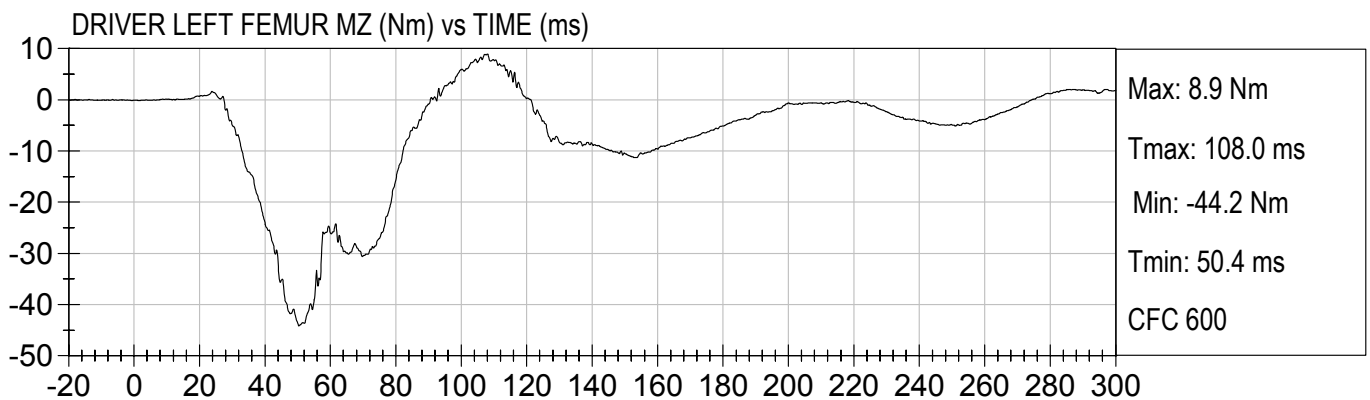
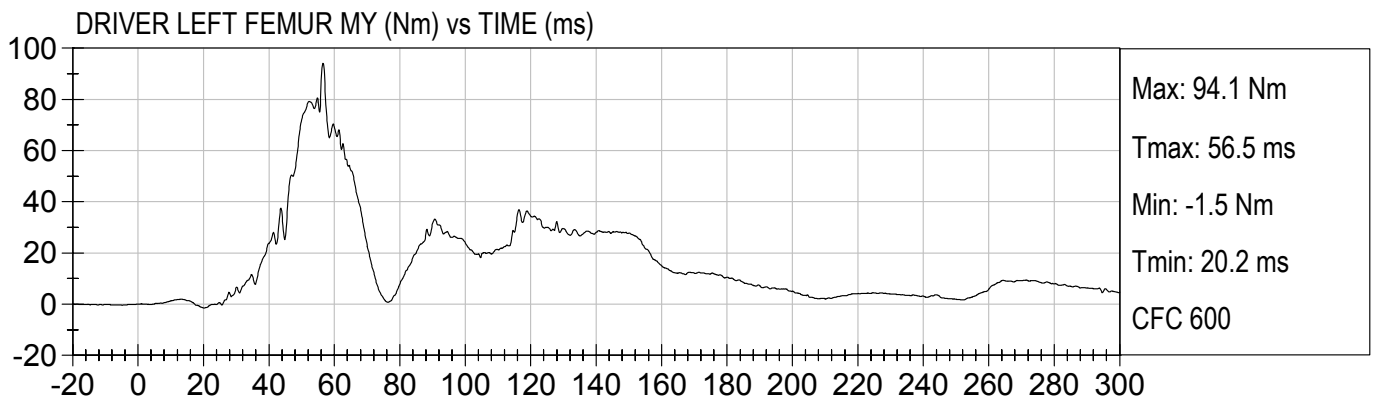
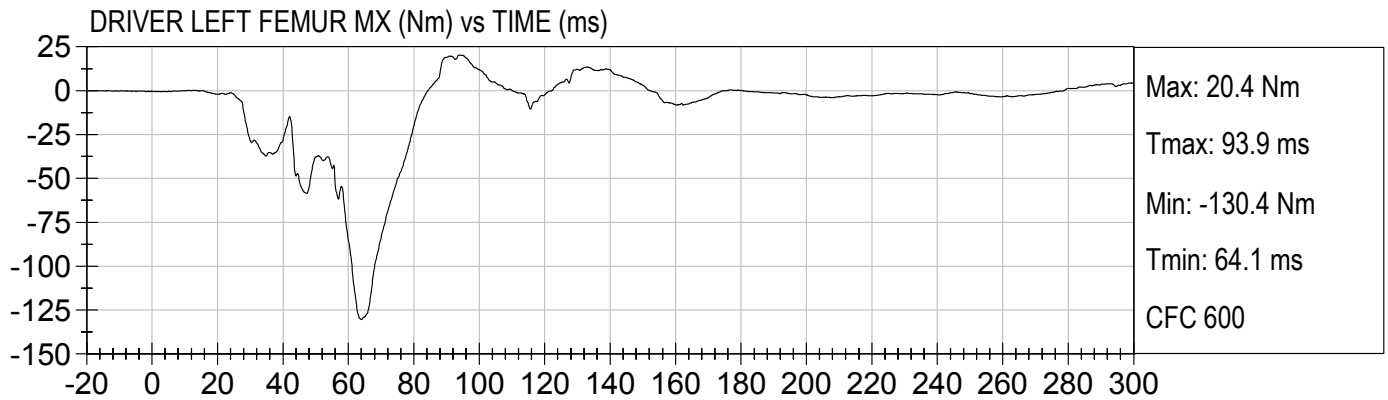


DRIVER LEFT FEMUR FZ (N) vs TIME (ms)



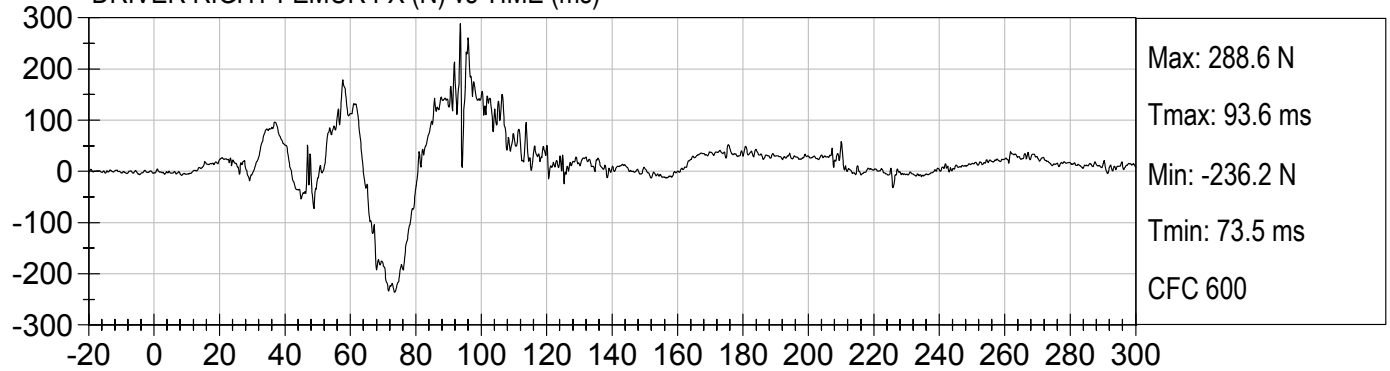
DRIVER LEFT FEMUR FResultant (N) vs TIME (ms)



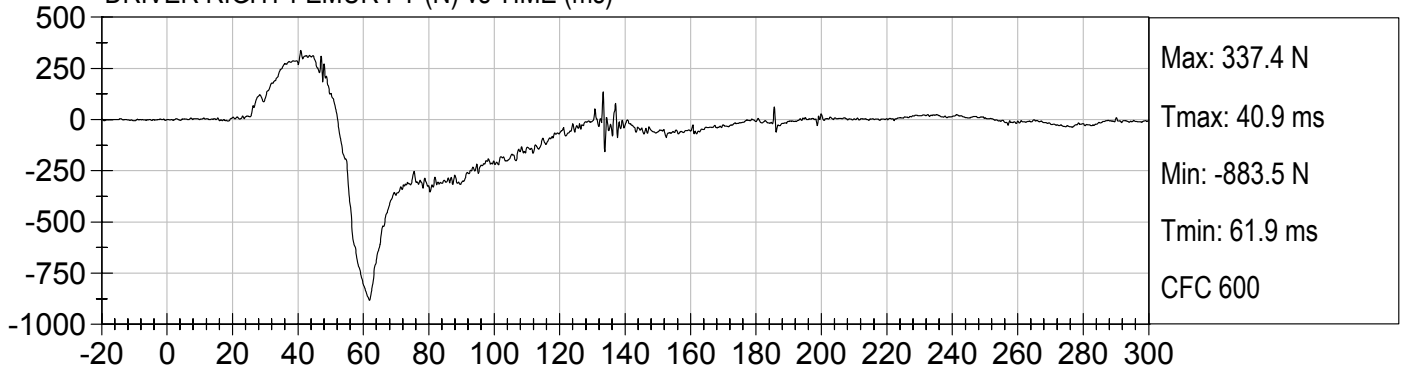




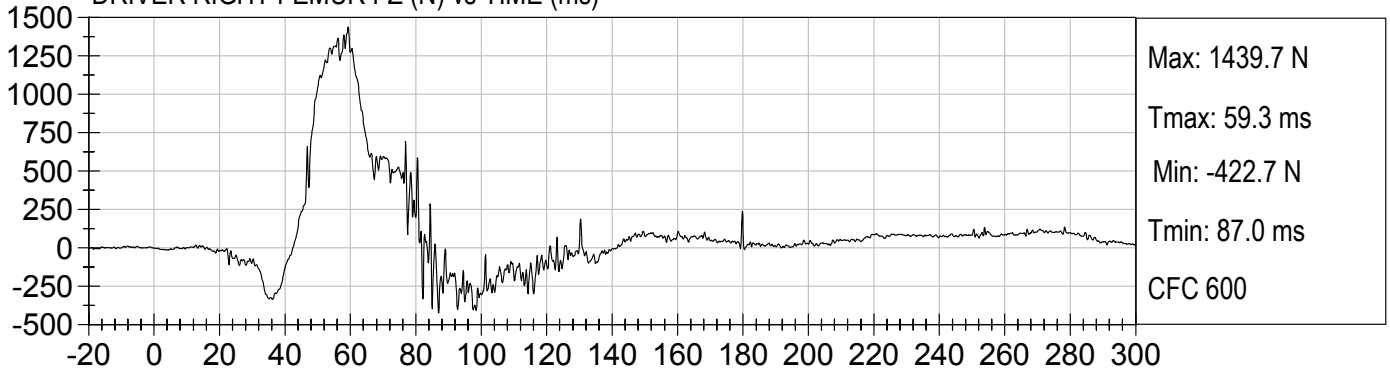
DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



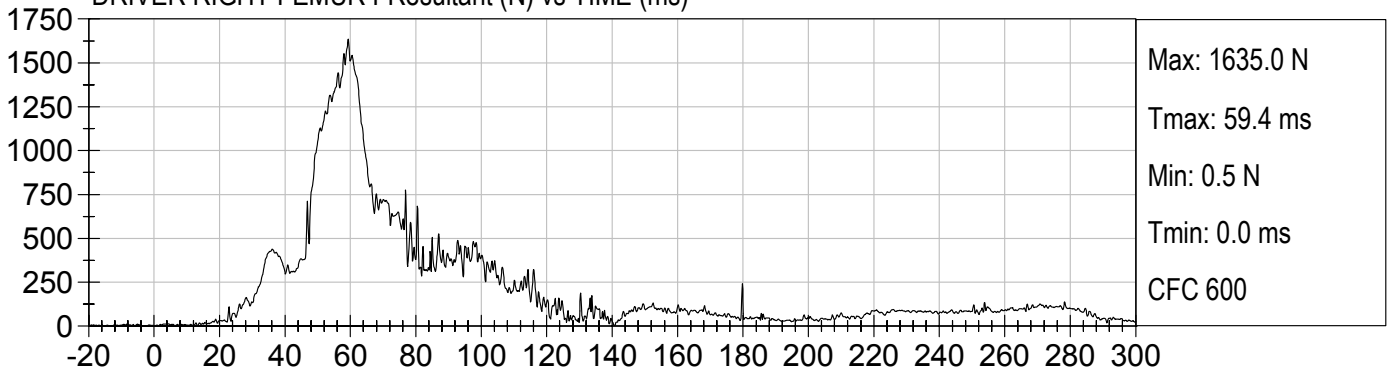
DRIVER RIGHT FEMUR FY (N) vs TIME (ms)

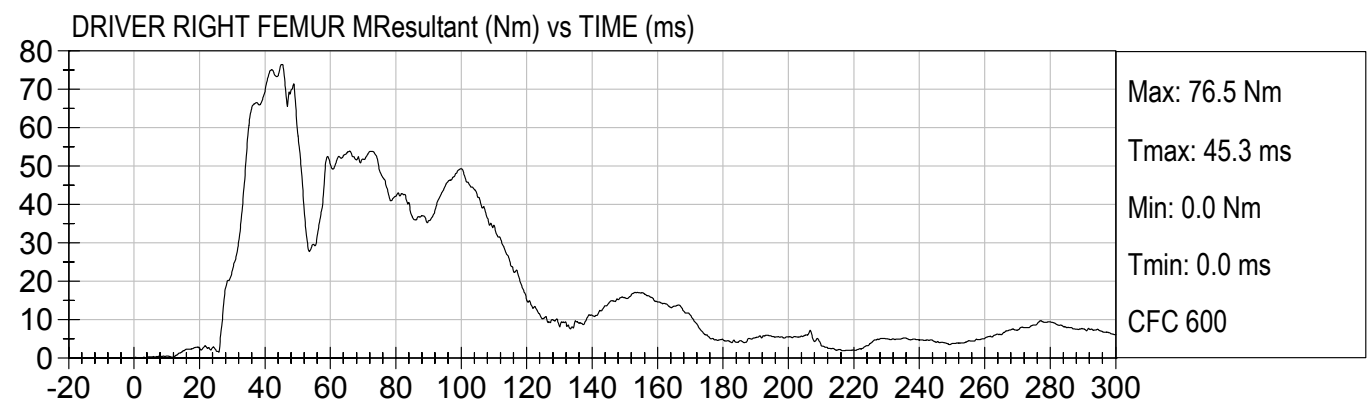
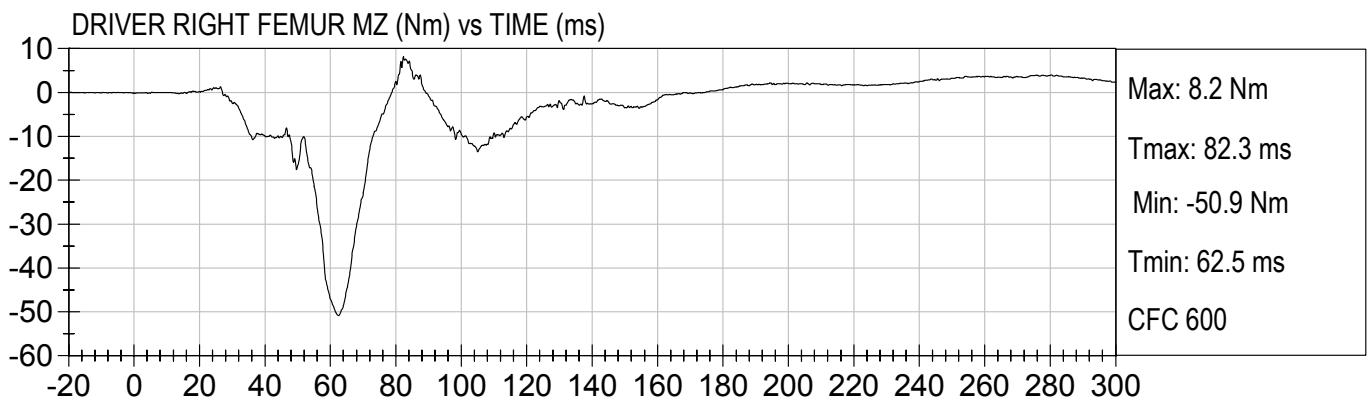
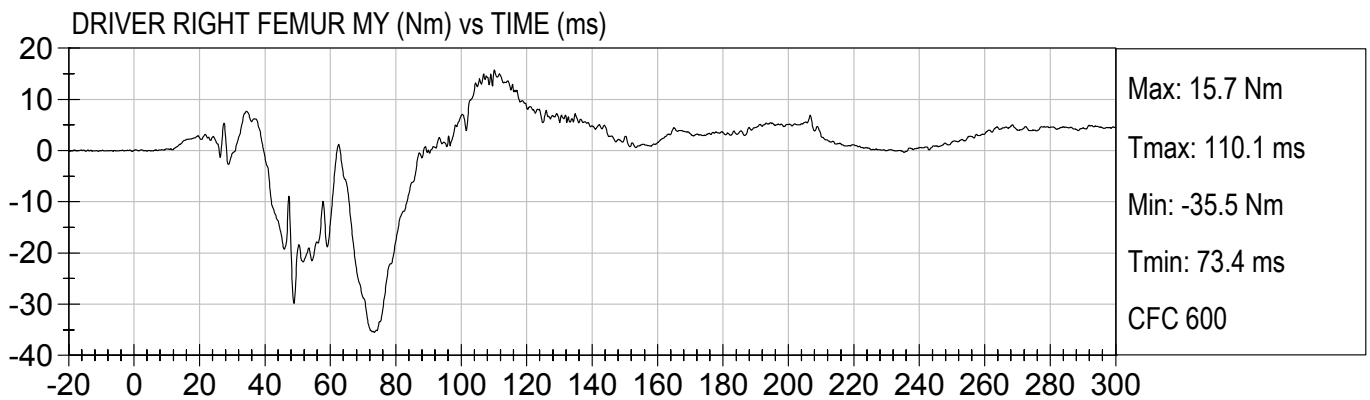
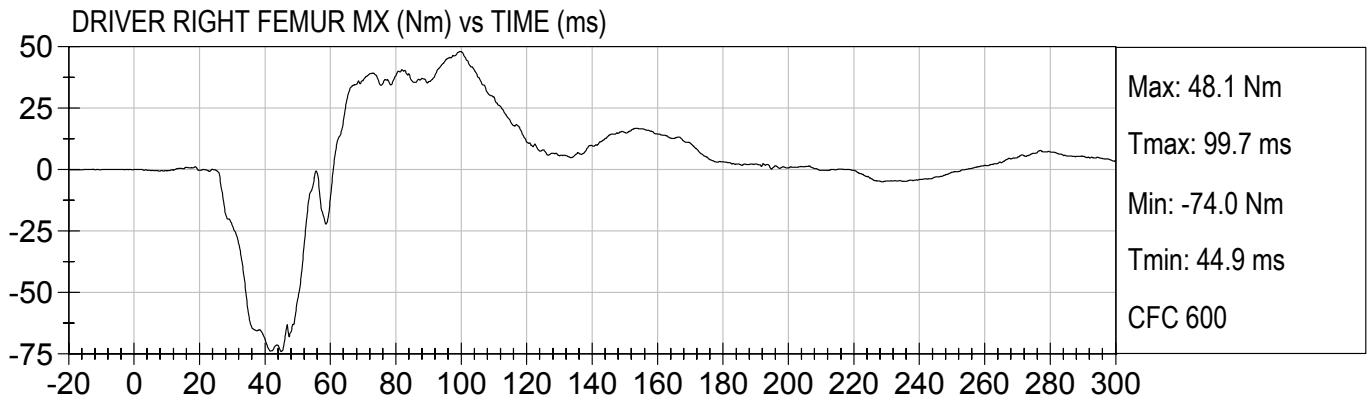


DRIVER RIGHT FEMUR FZ (N) vs TIME (ms)



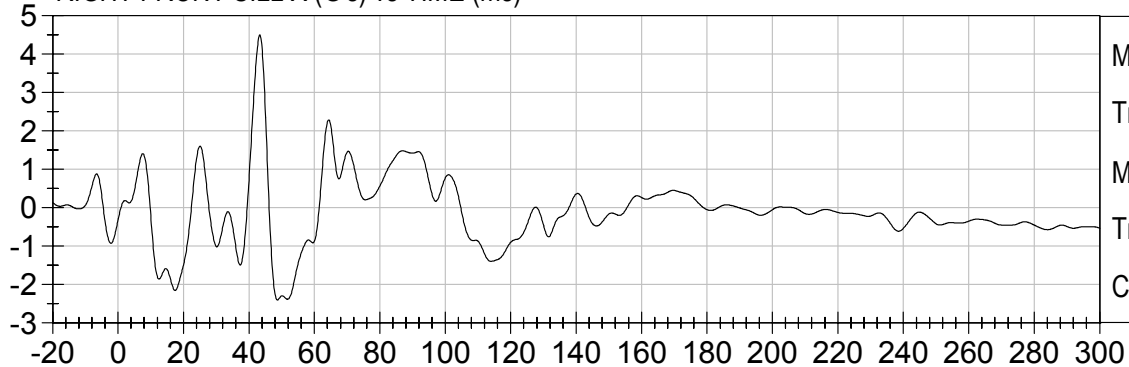
DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)



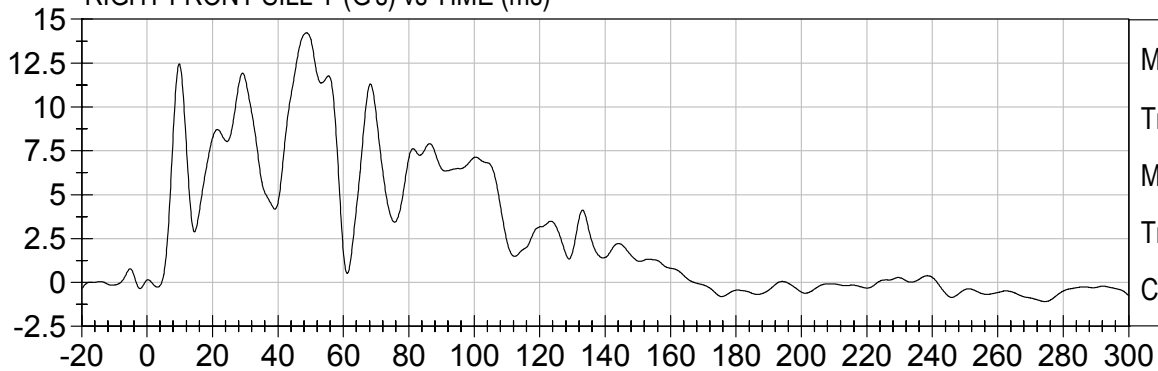




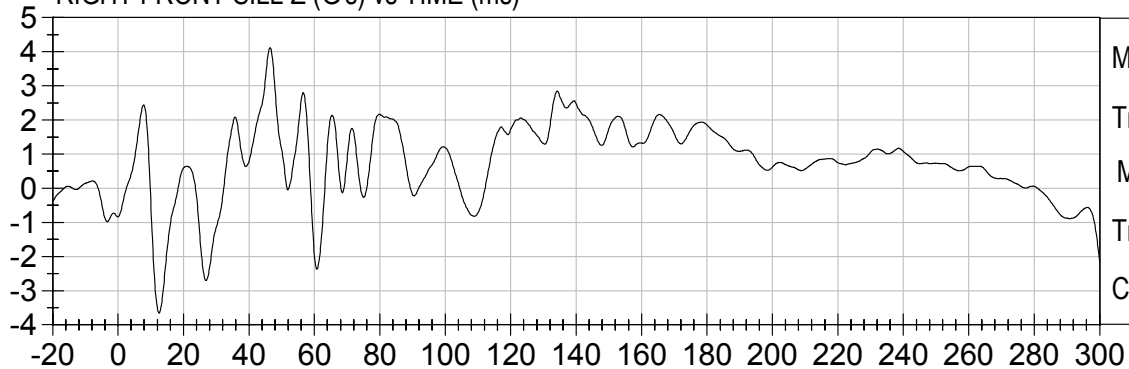
RIGHT FRONT SILL X (G's) vs TIME (ms)



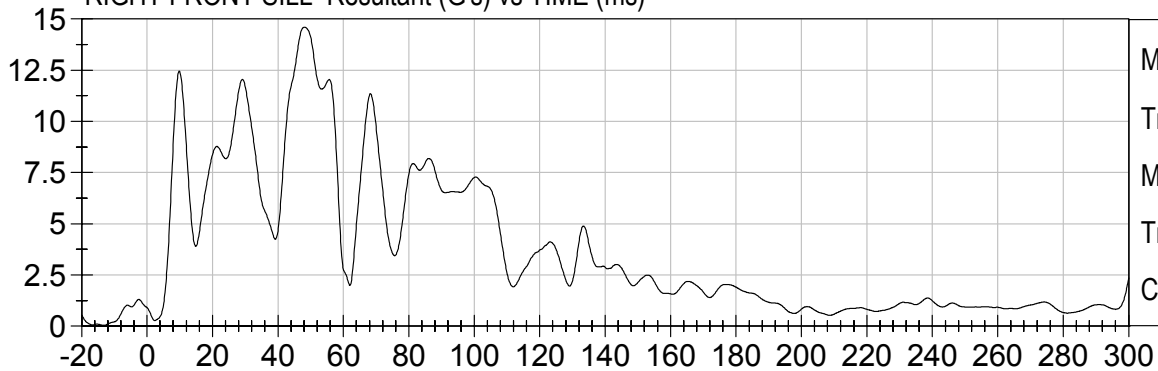
RIGHT FRONT SILL Y (G's) vs TIME (ms)



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

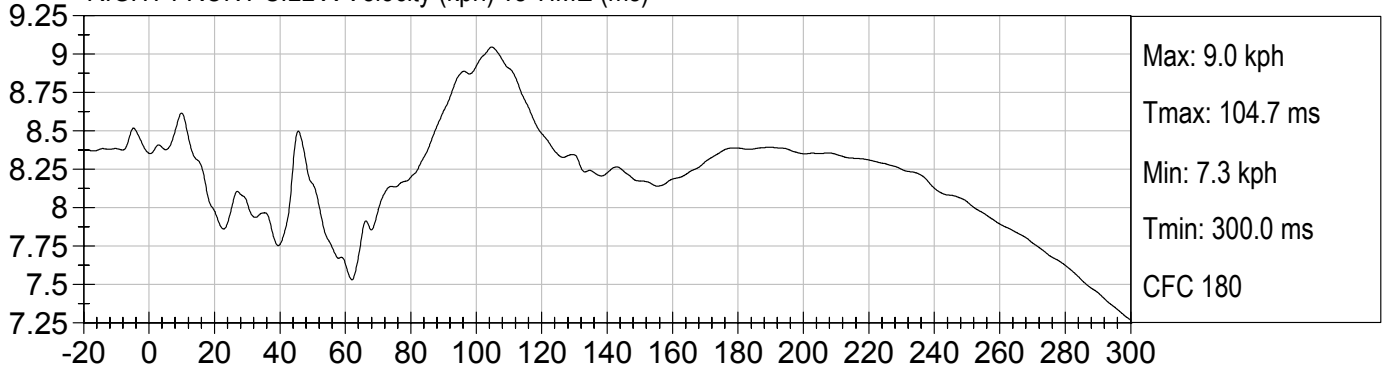


RIGHT FRONT SILL Resultant (G's) vs TIME (ms)

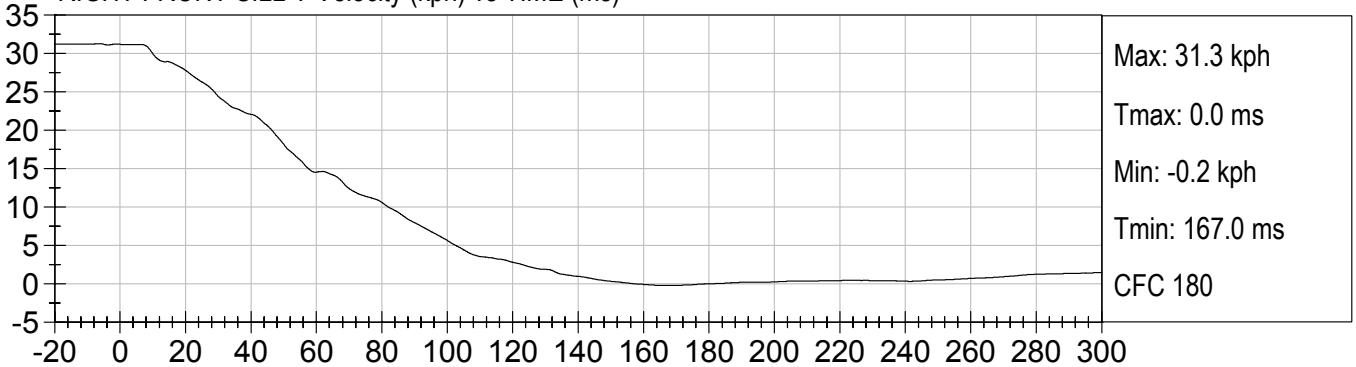




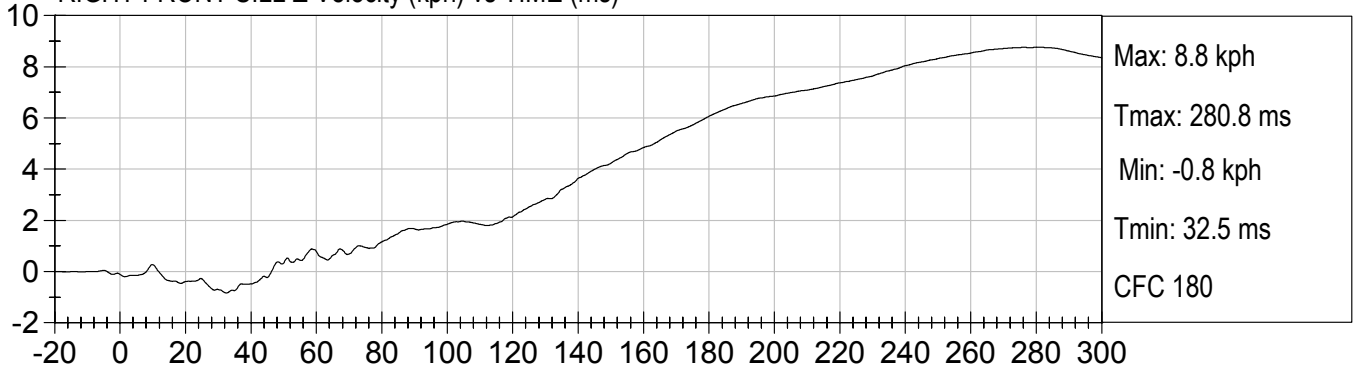
RIGHT FRONT SILL X Velocity (kph) vs TIME (ms)



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

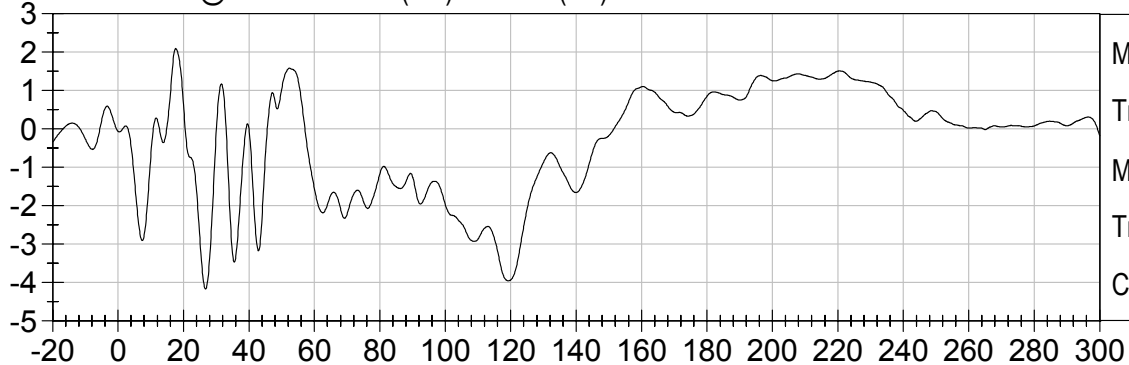


RIGHT FRONT SILL Z Velocity (kph) vs TIME (ms)

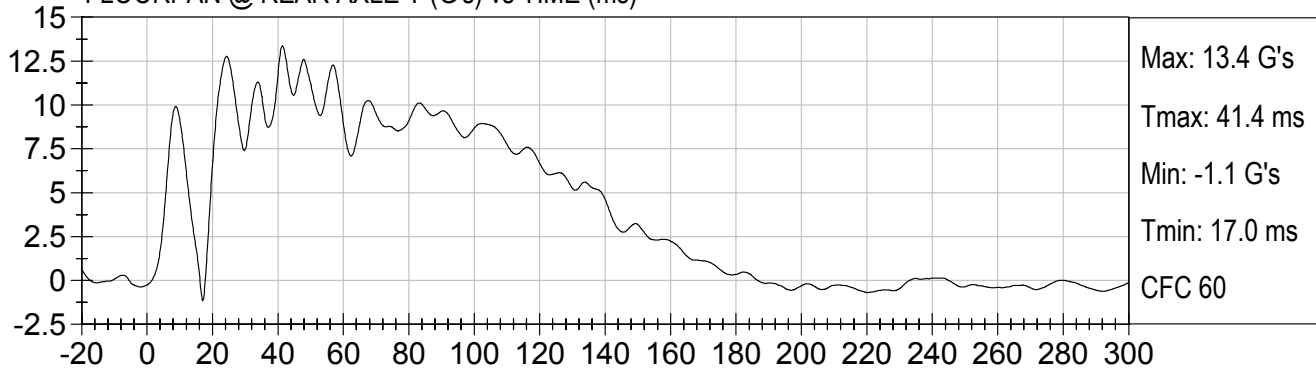




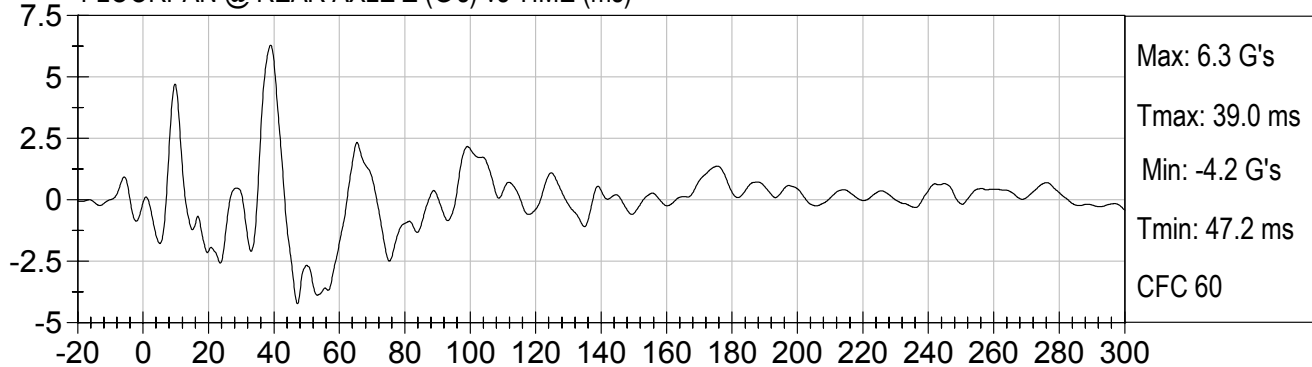
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



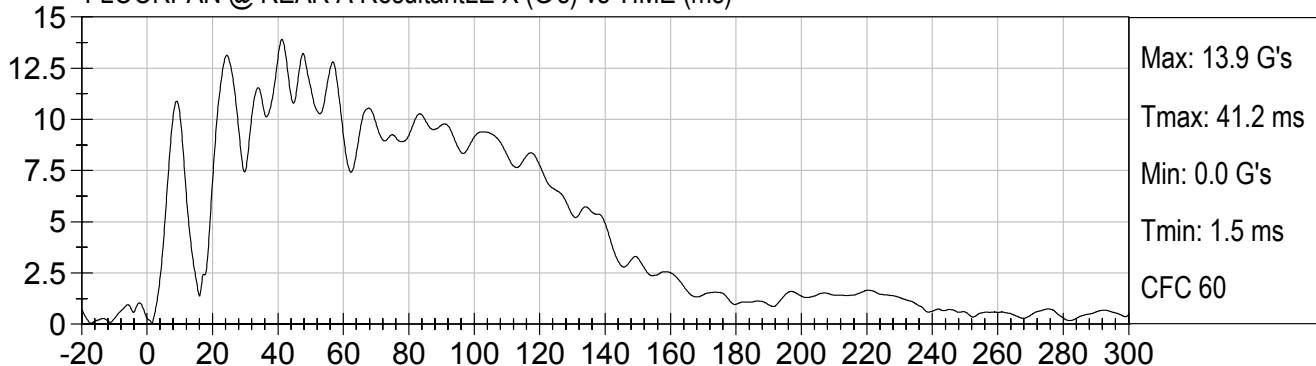
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)



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

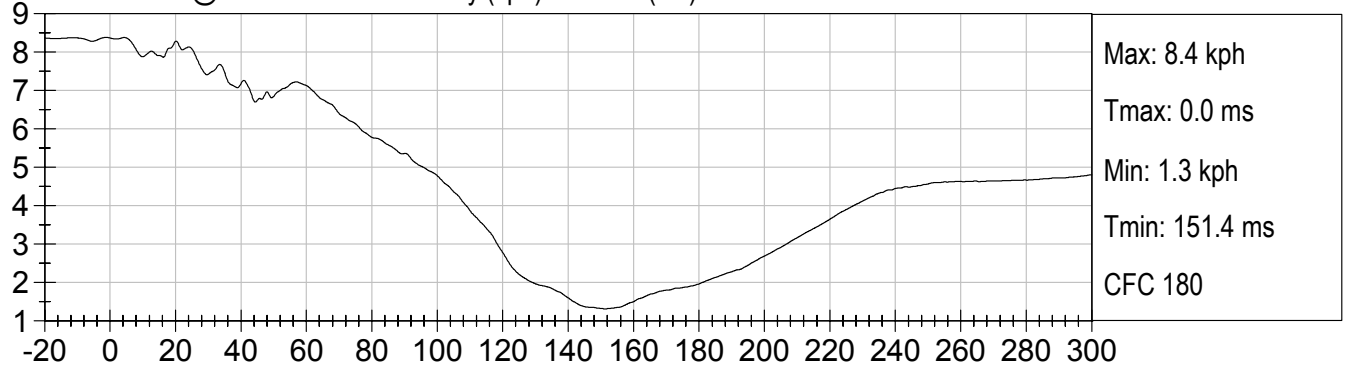


FLOORPAN @ REAR A ResultantLE X (G's) vs TIME (ms)

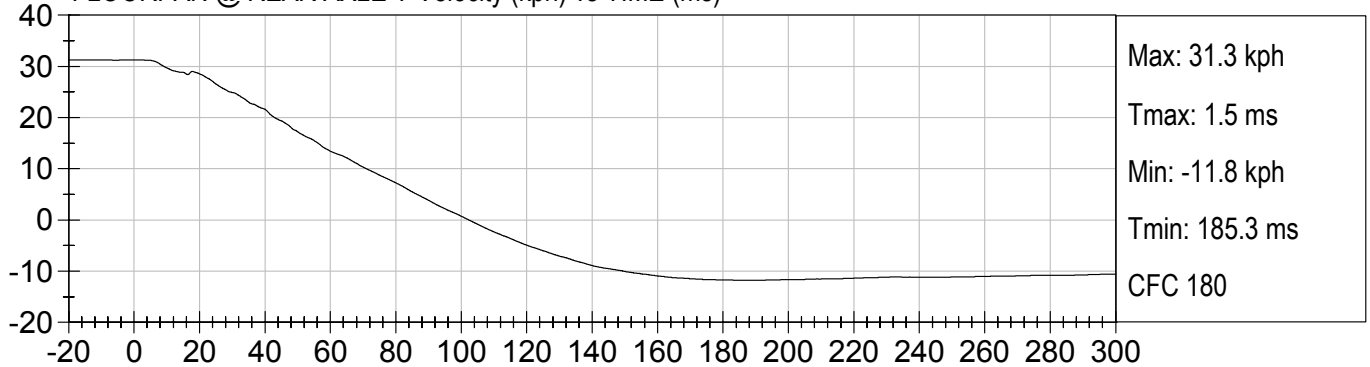




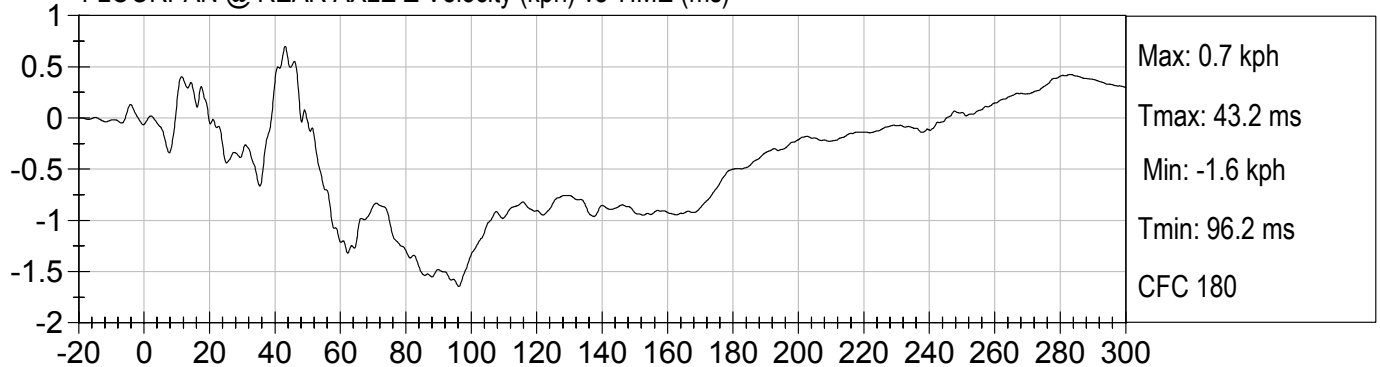
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)

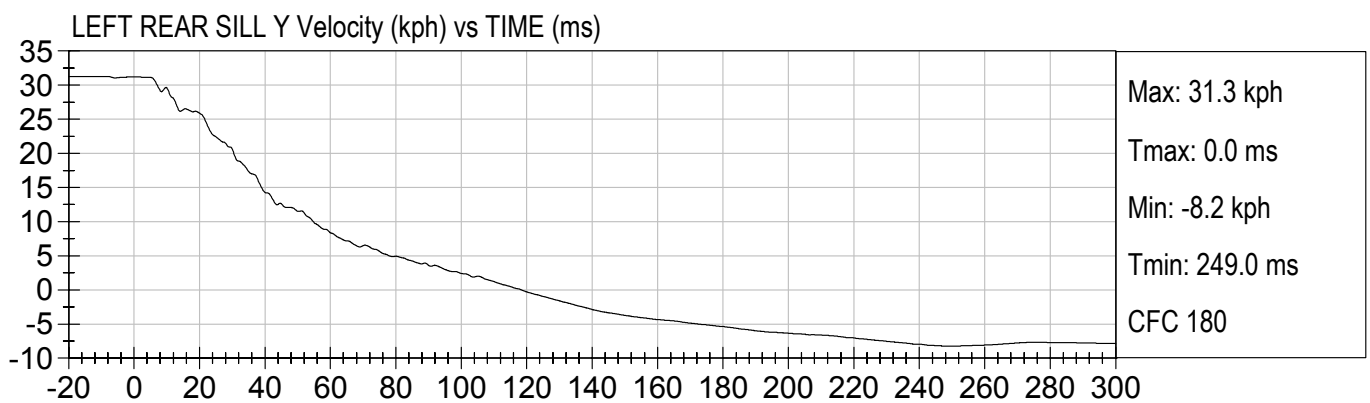
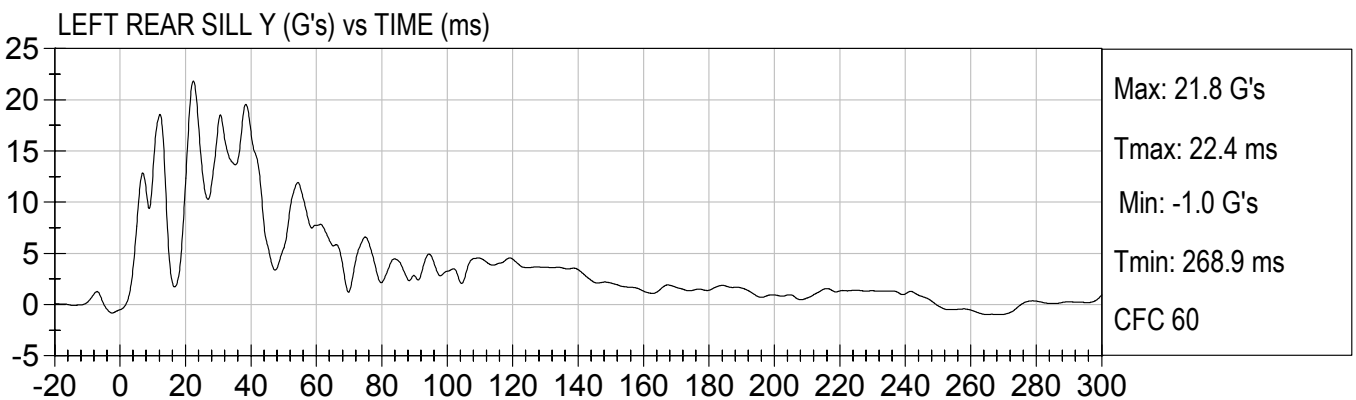
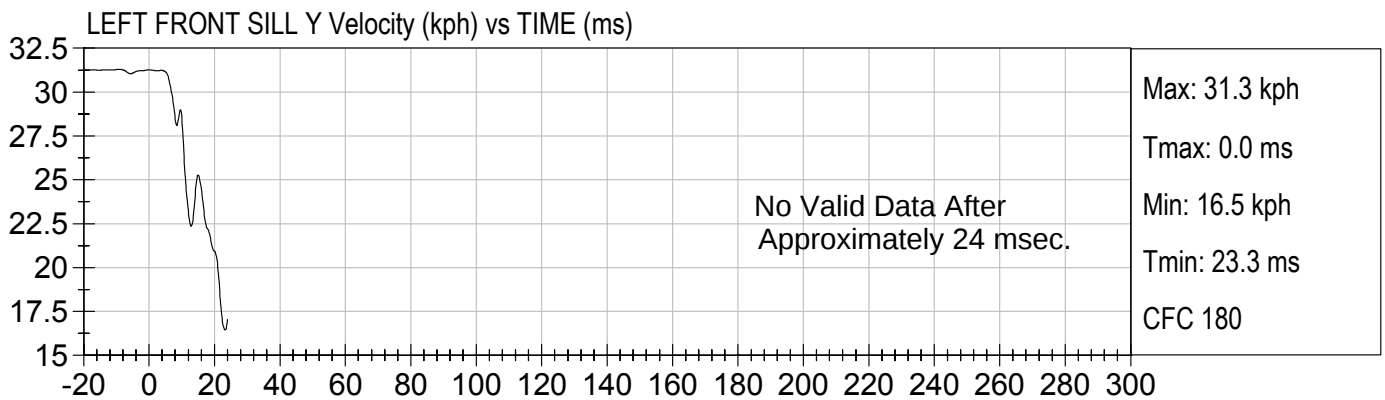
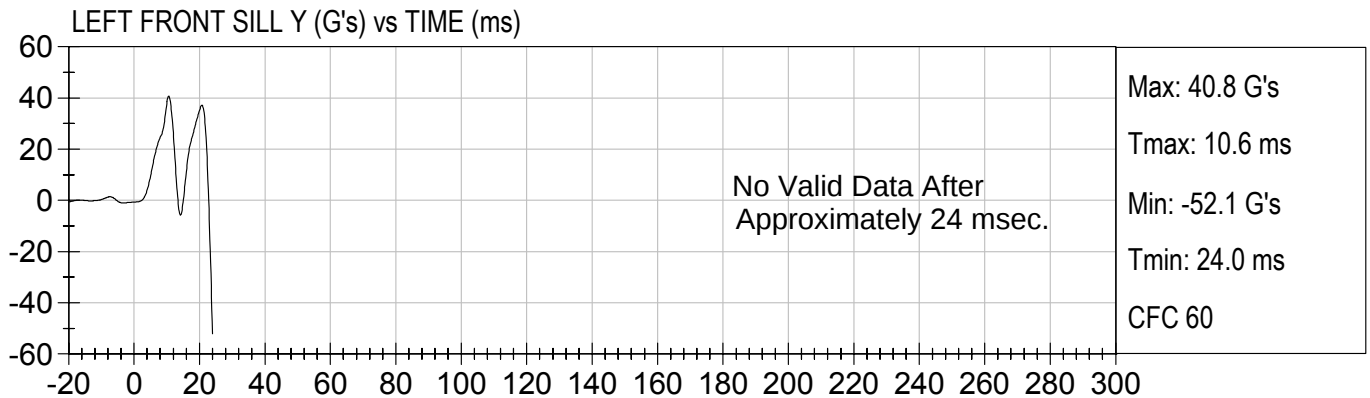


FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)



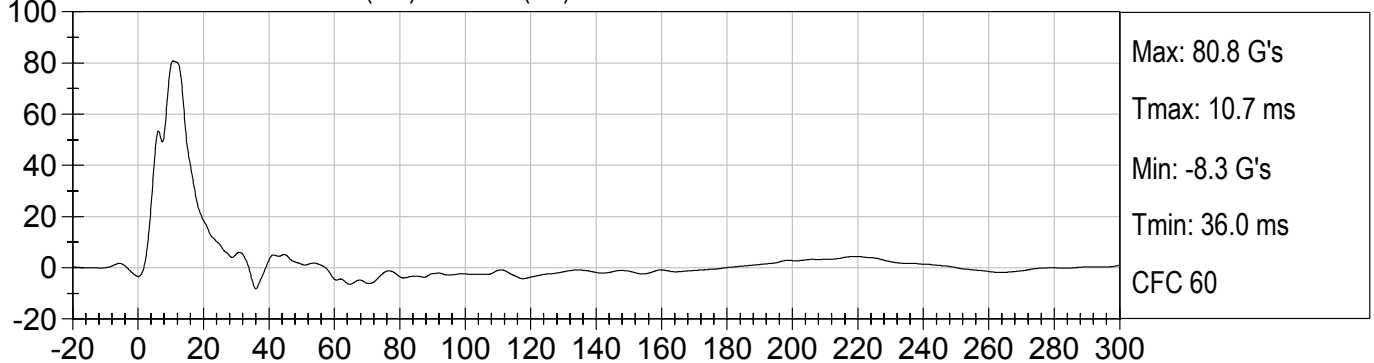
FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)



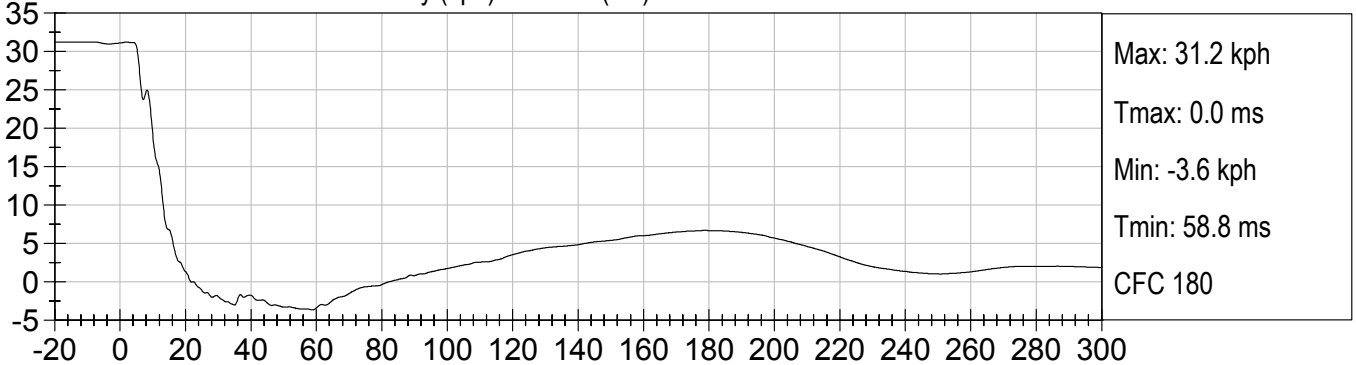




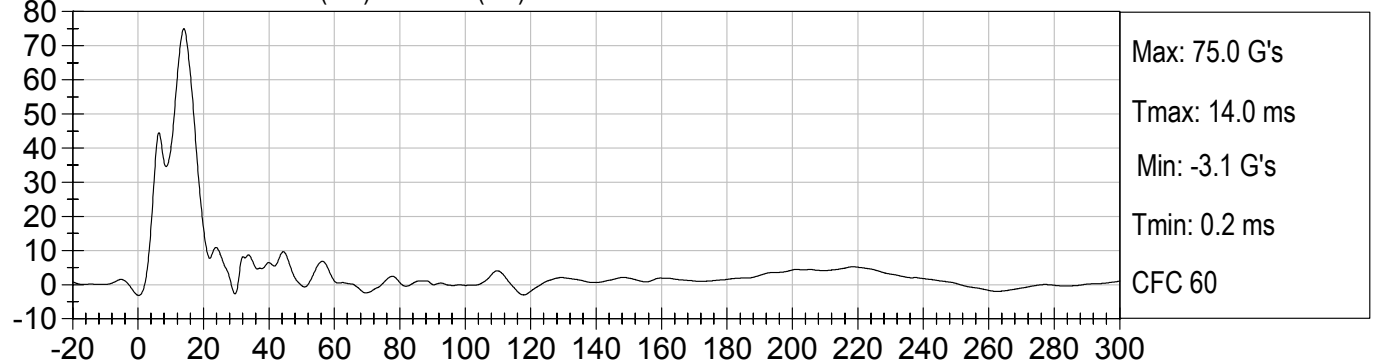
LEFT LOWER B-POST Y (G's) vs TIME (ms)



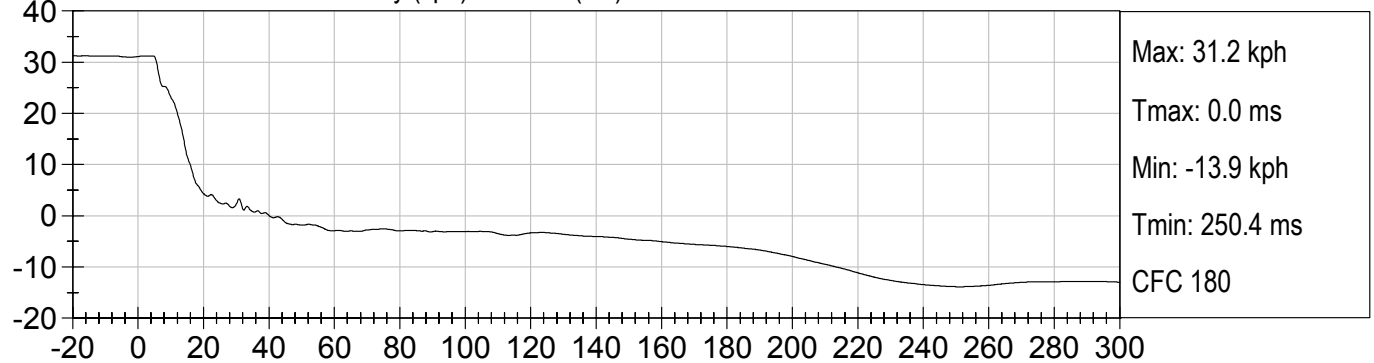
LEFT LOWER B-POST Y Velocity (kph) vs TIME (ms)

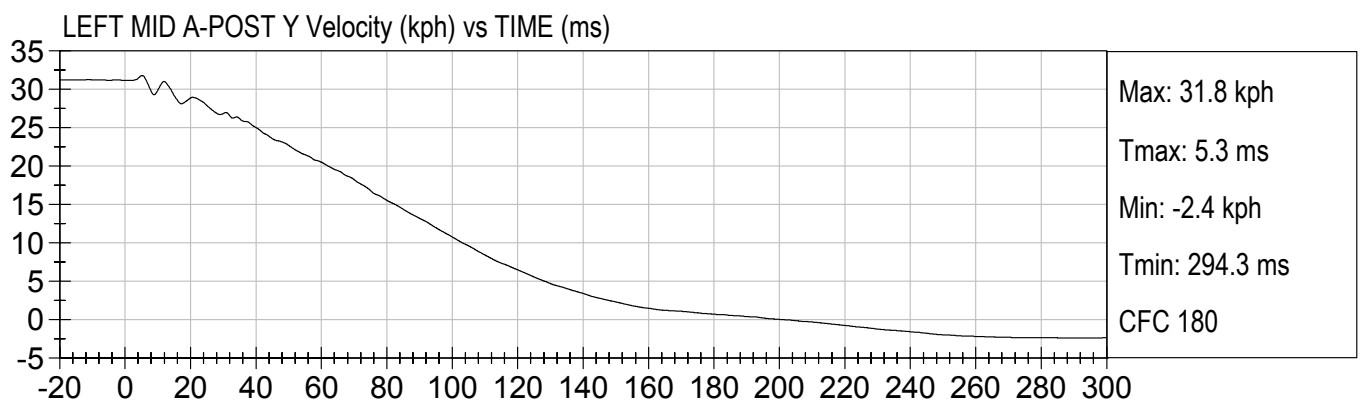
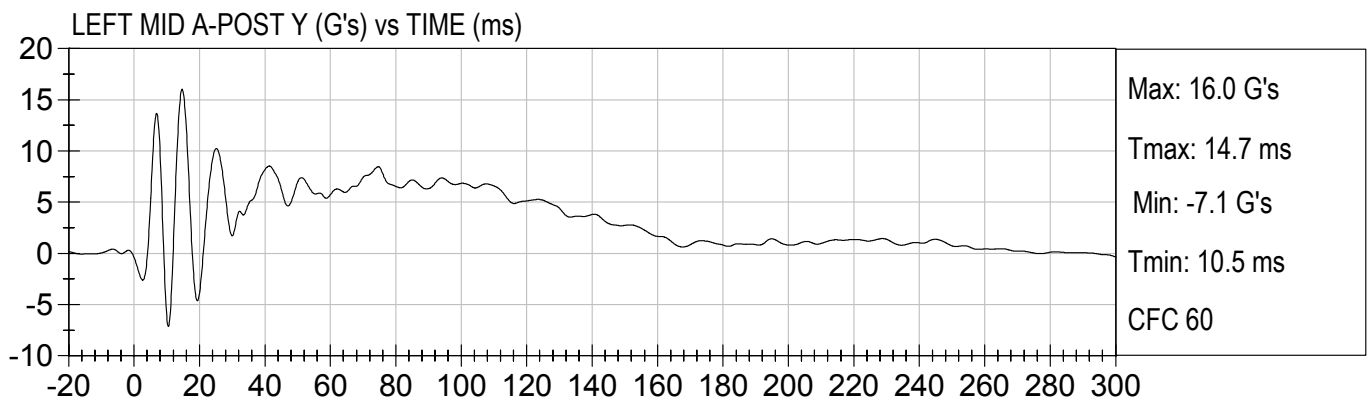
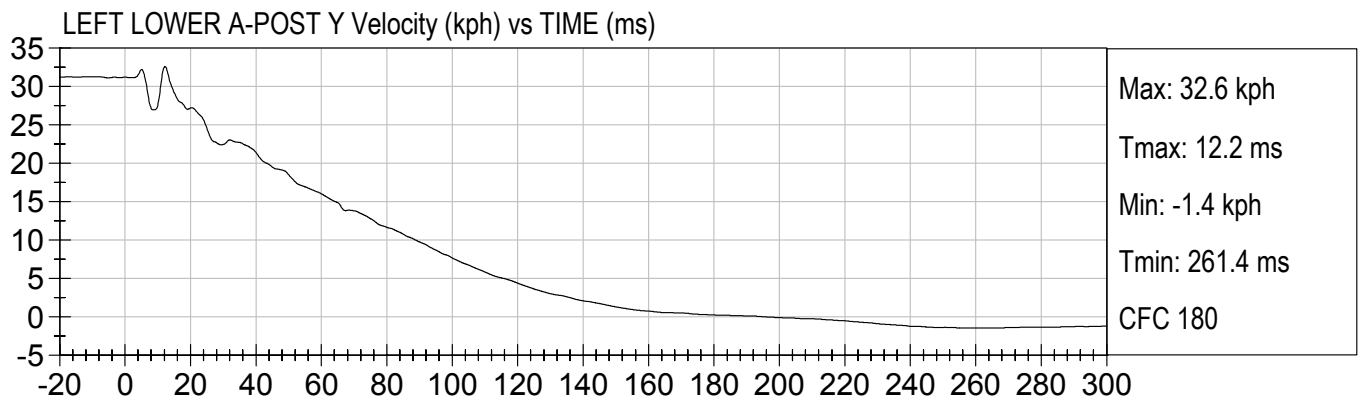
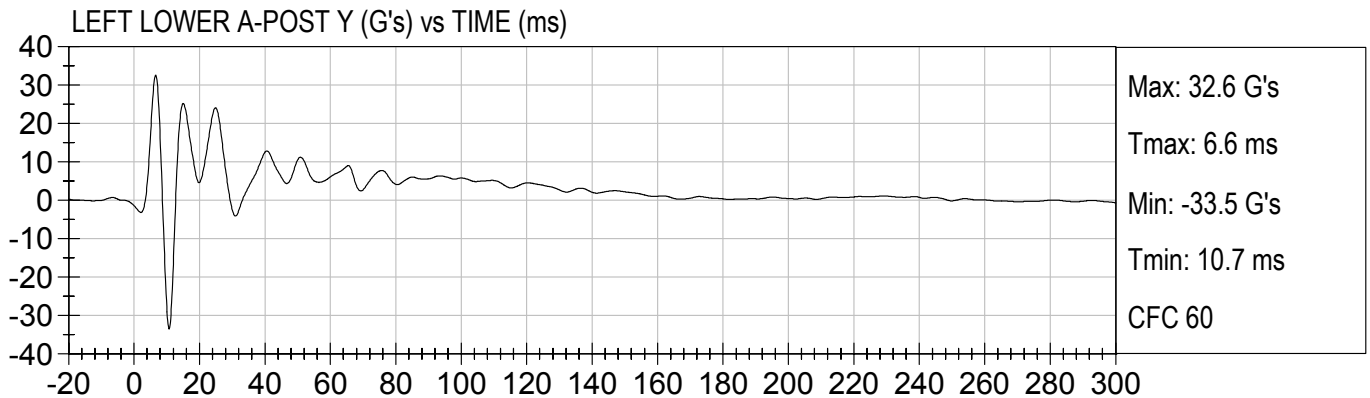


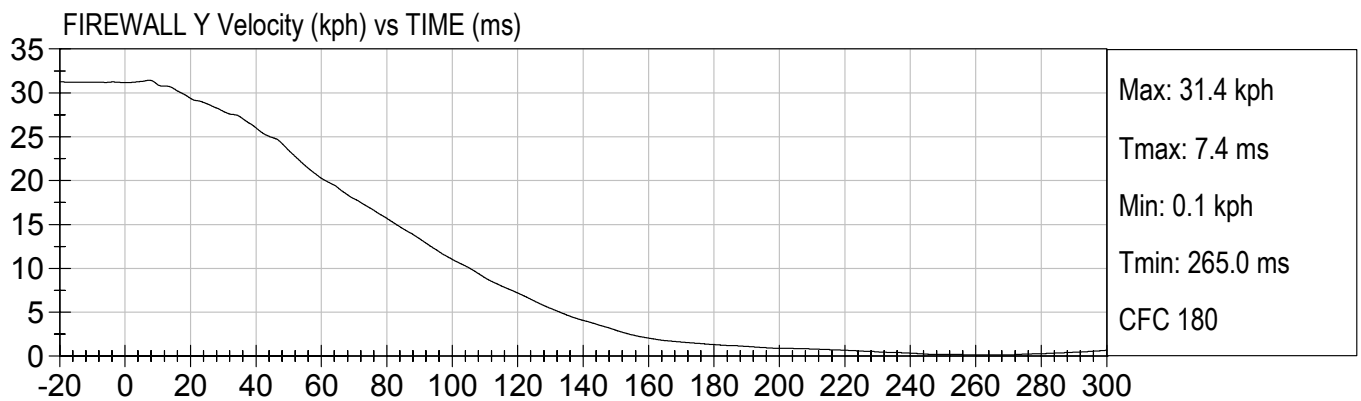
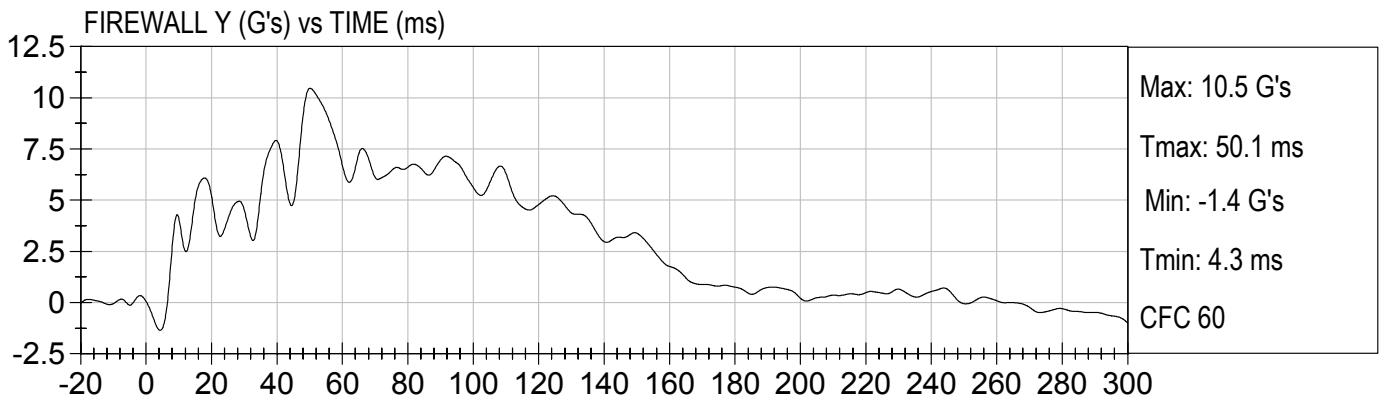
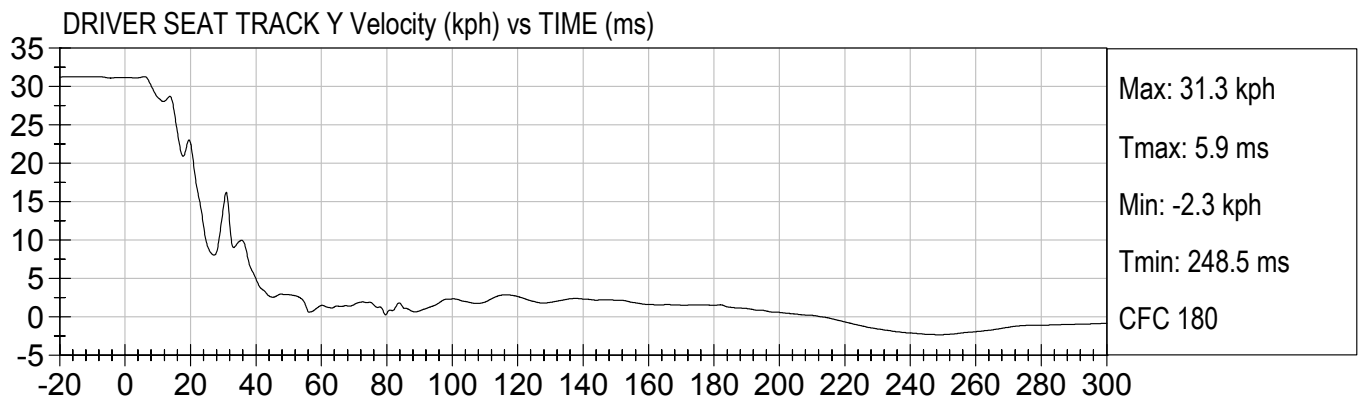
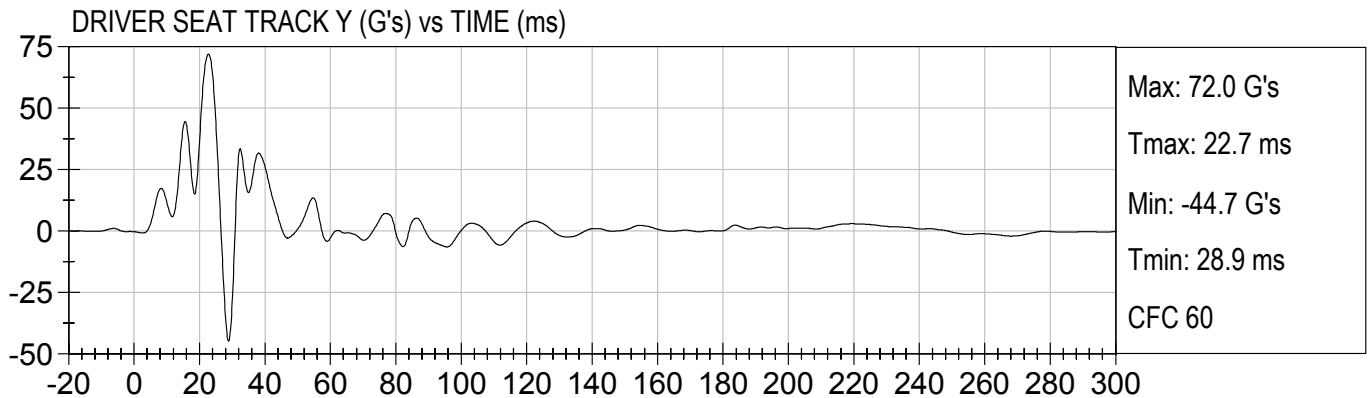
LEFT MID B-POST Y (G's) vs TIME (ms)

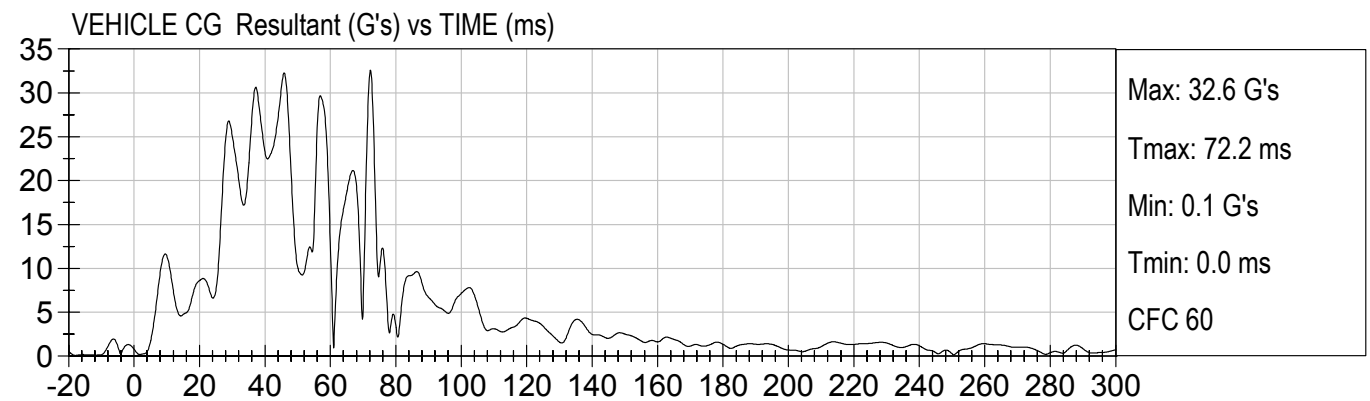
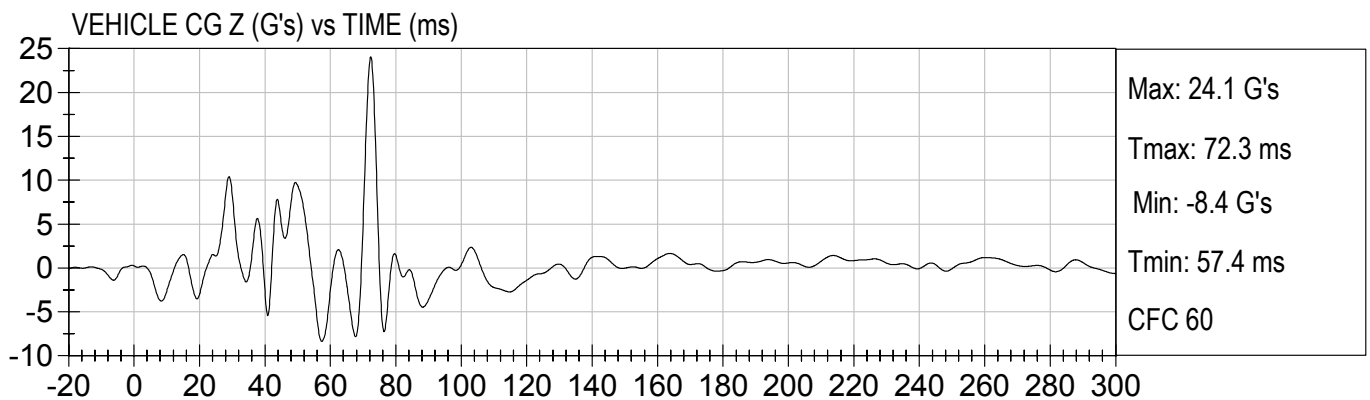
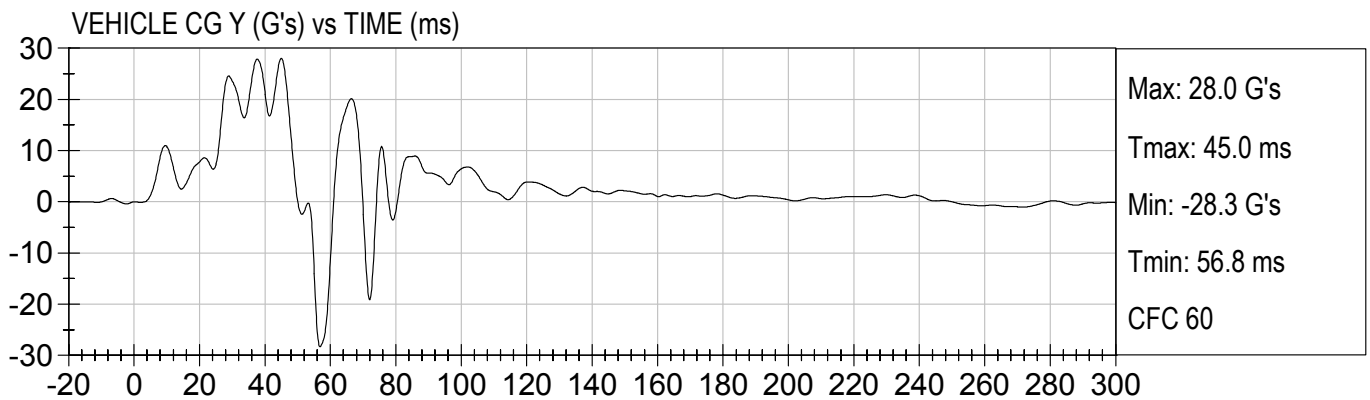
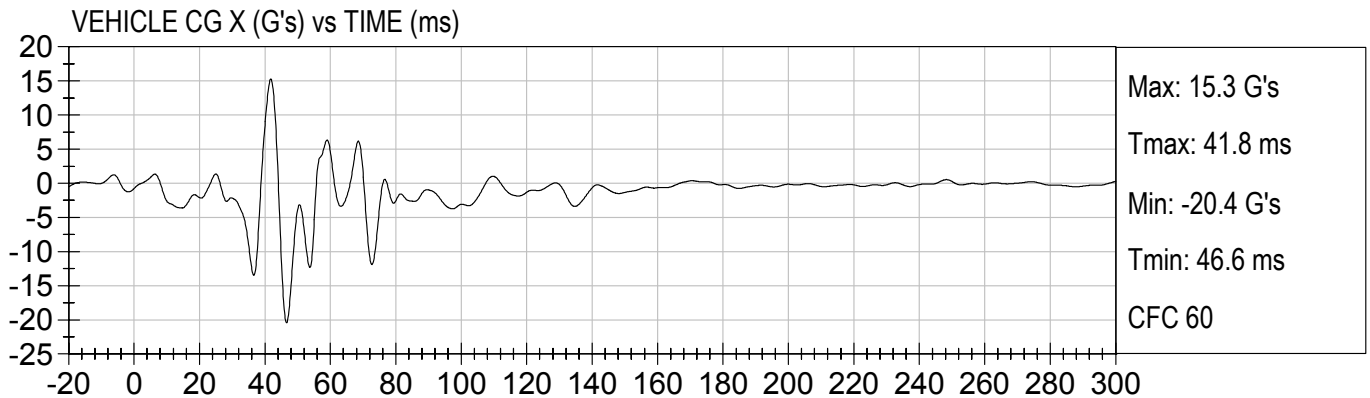


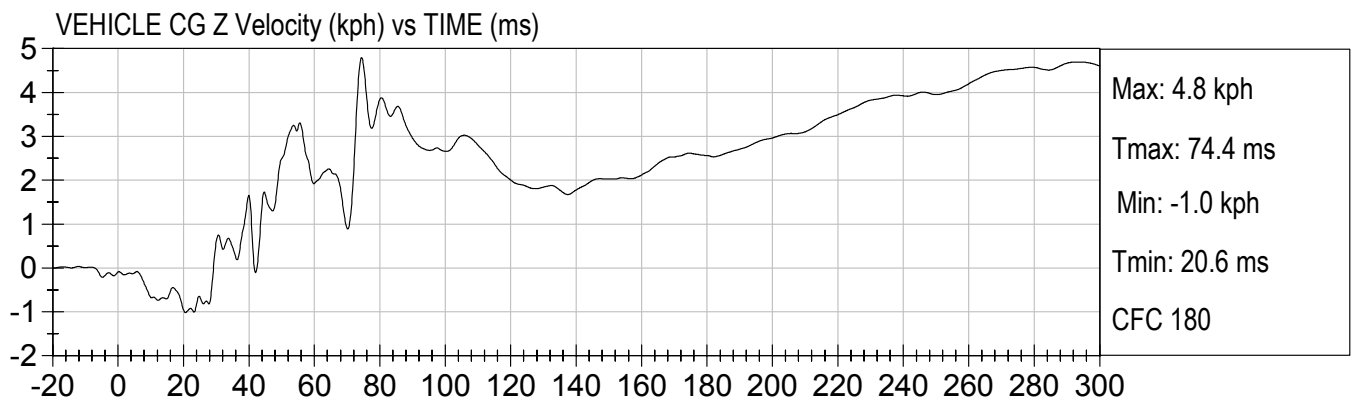
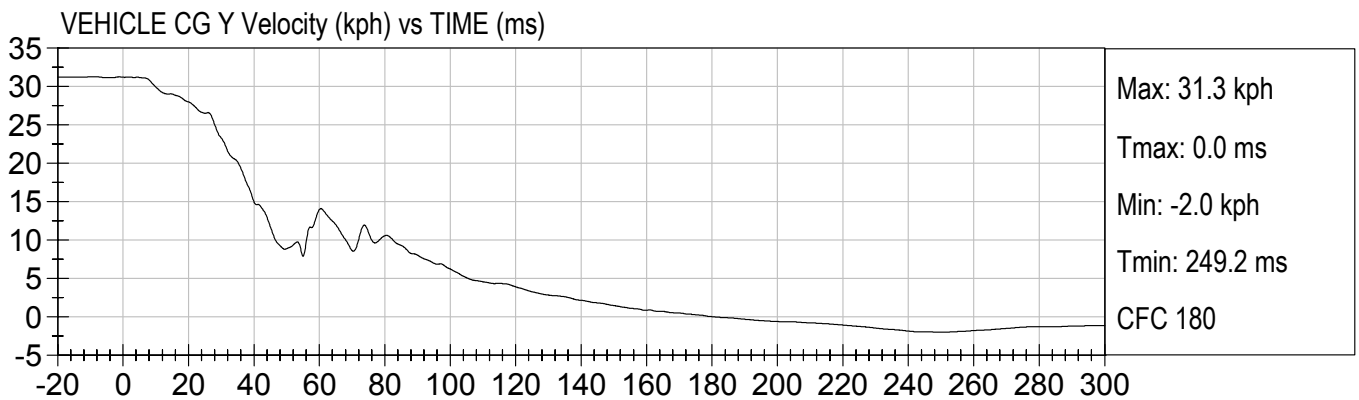
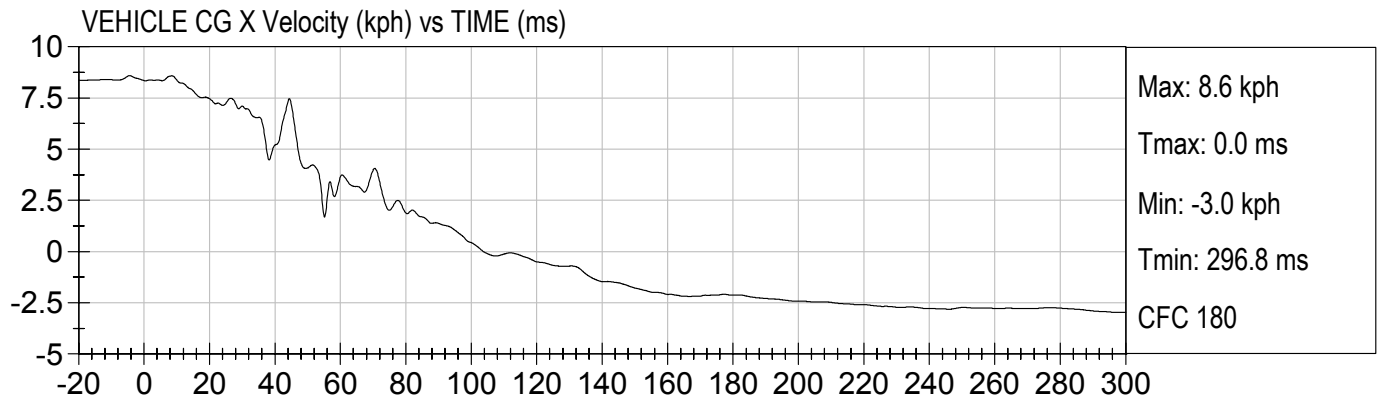
LEFT MID B-POST Y Velocity (kph) vs TIME (ms)

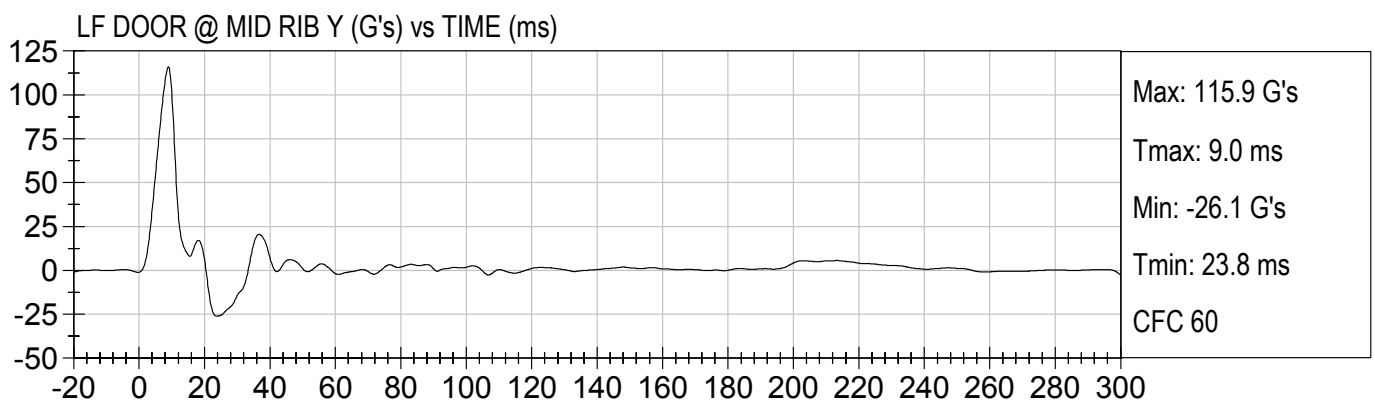
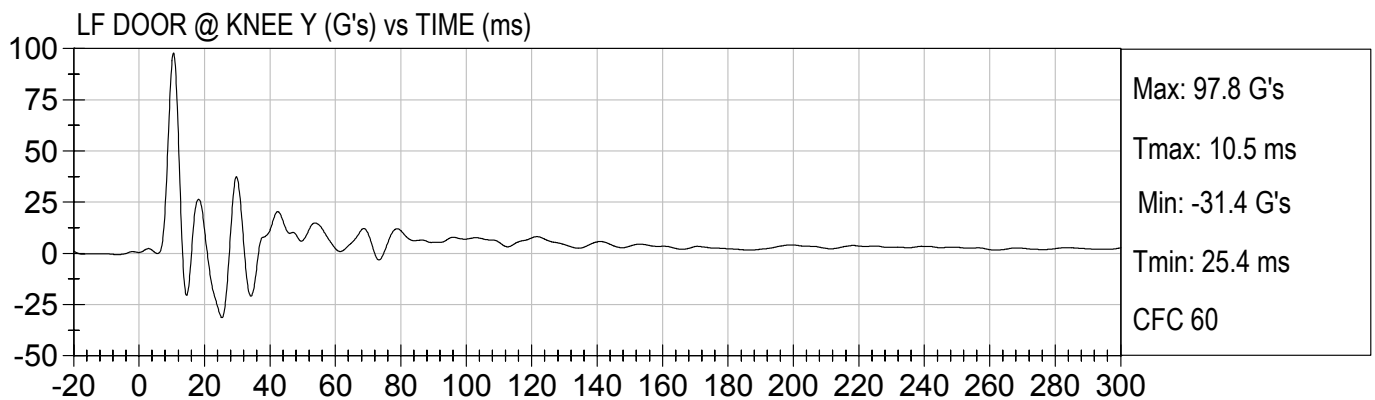
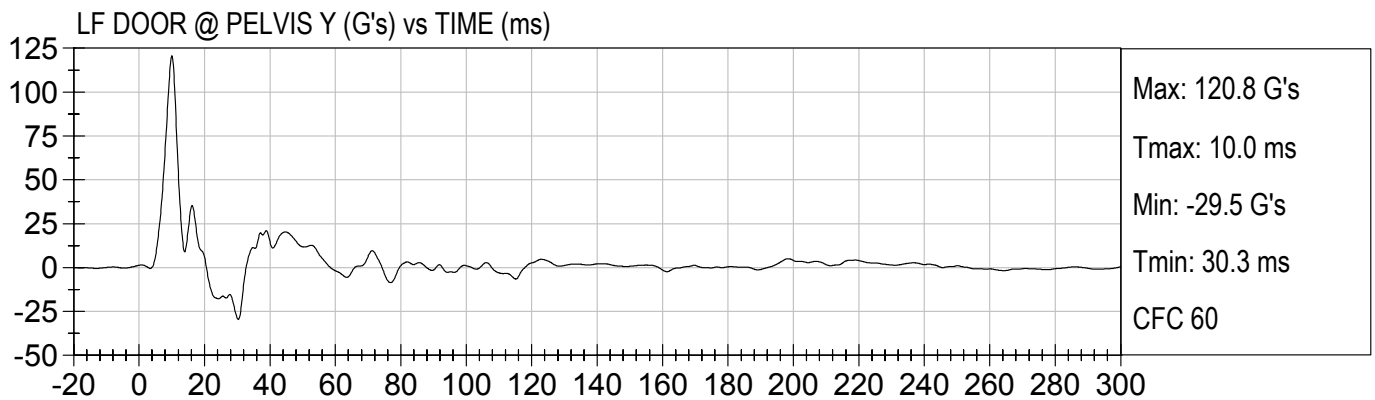
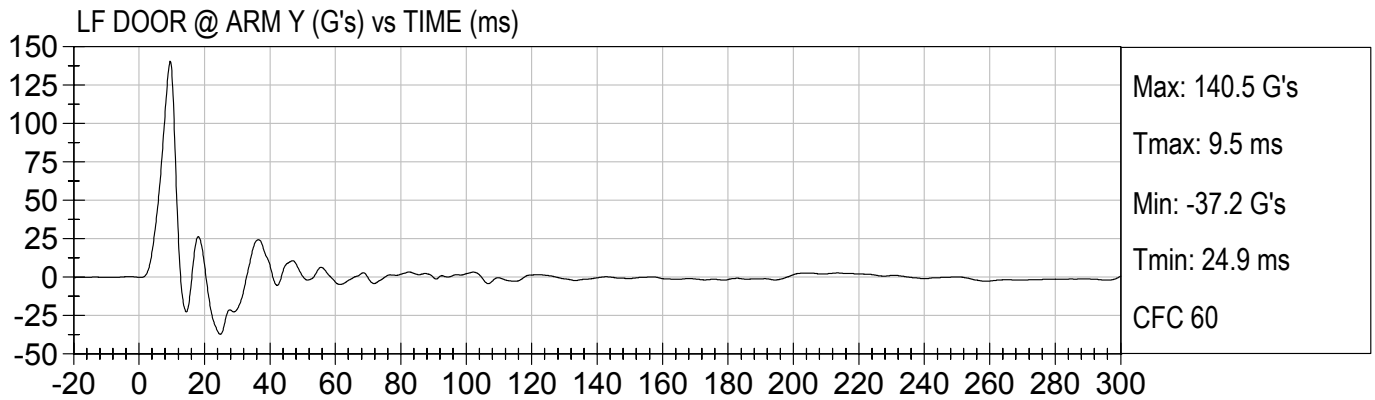


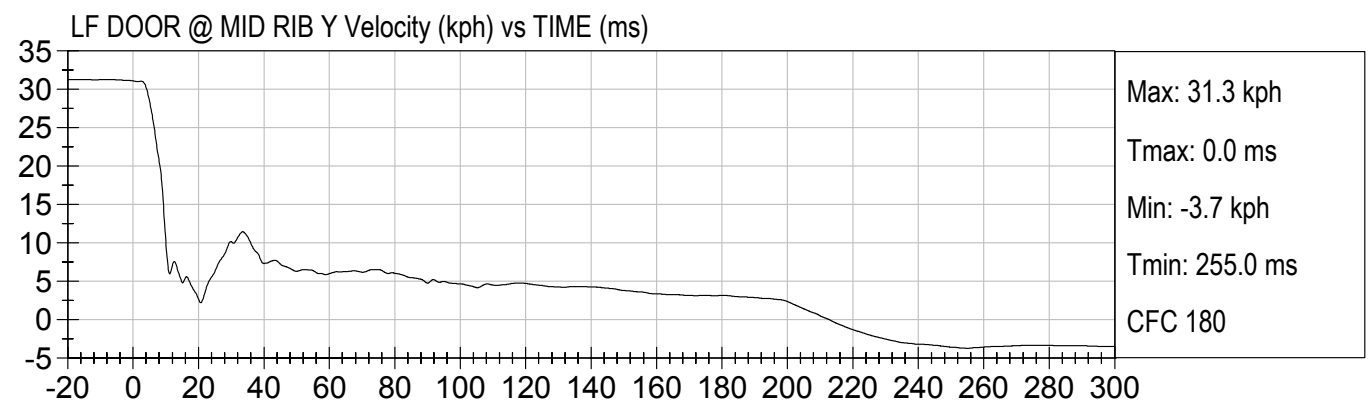
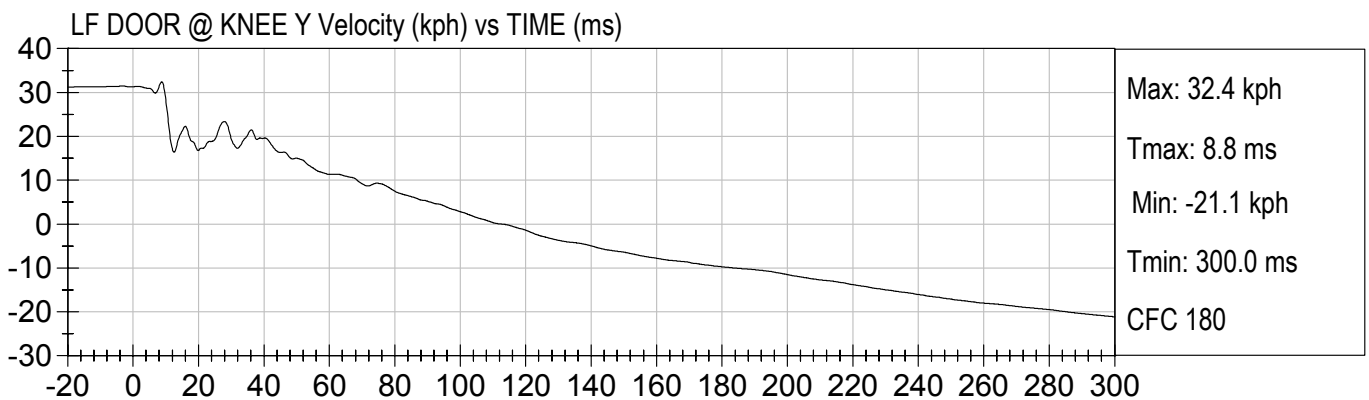
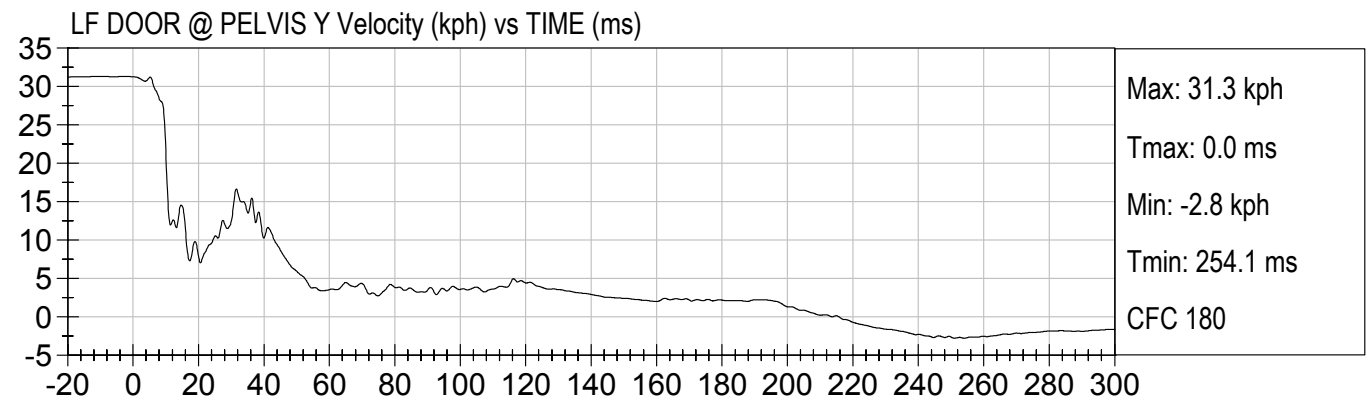
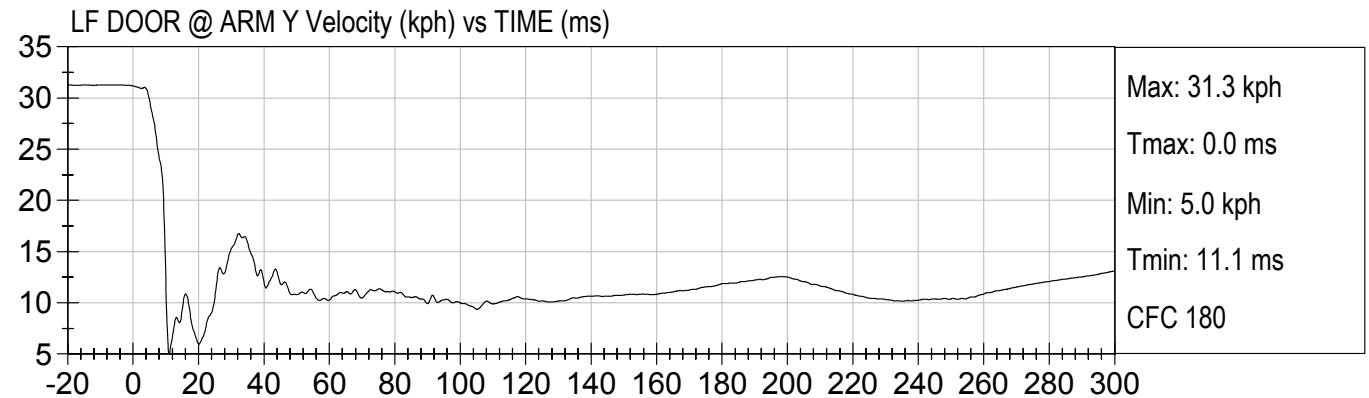


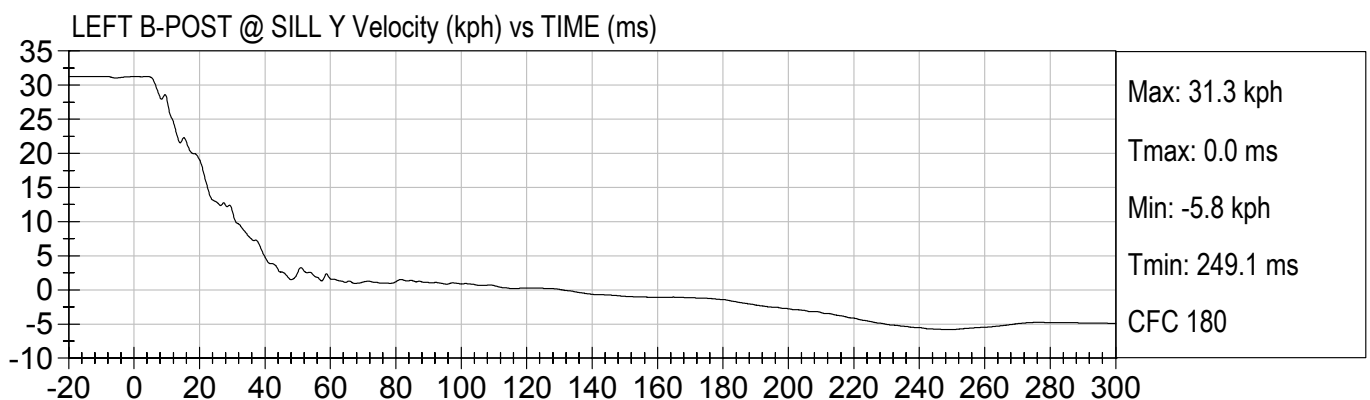
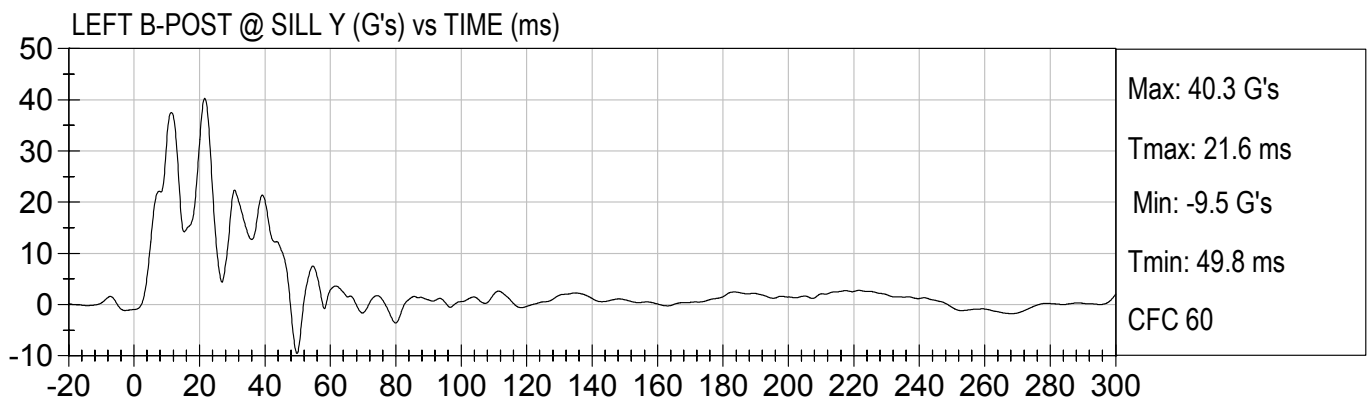
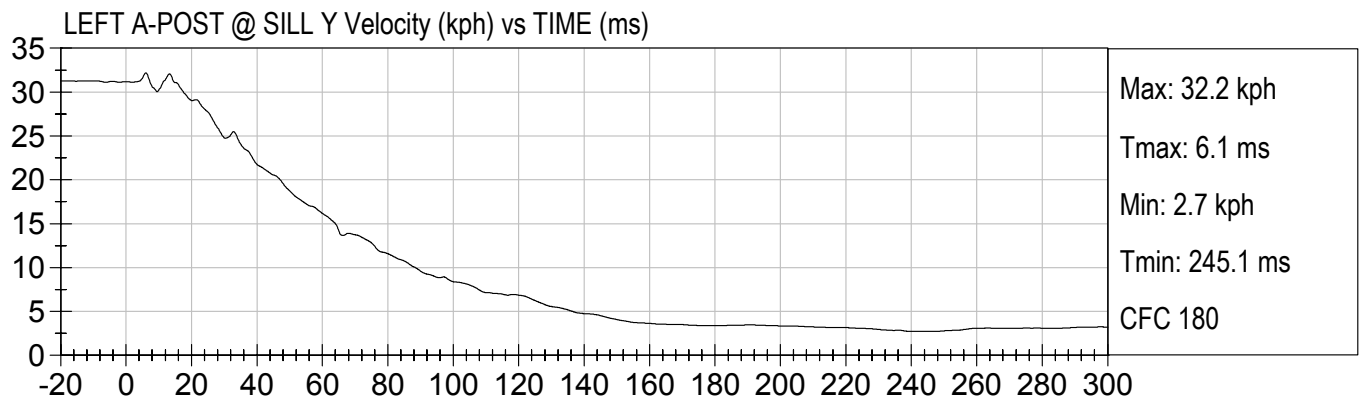
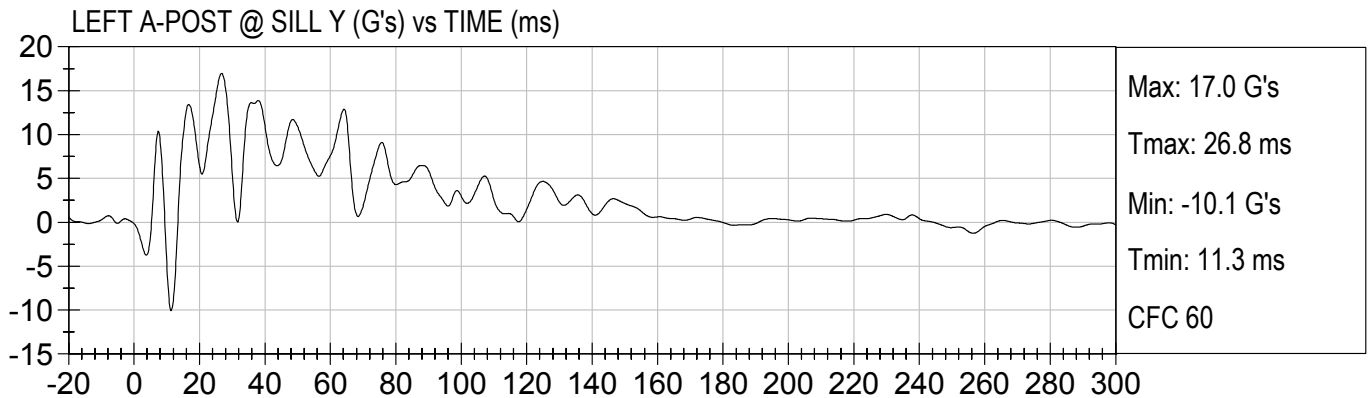


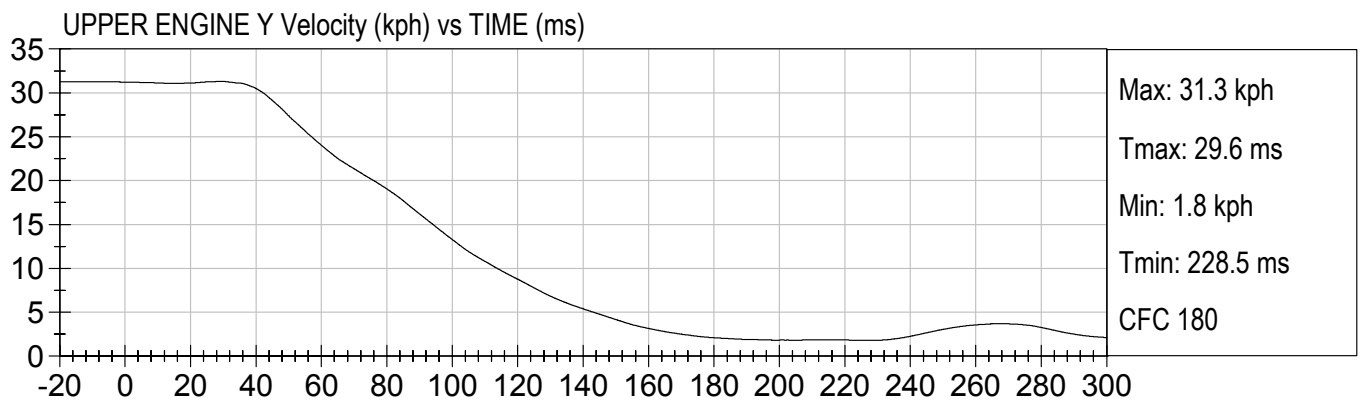
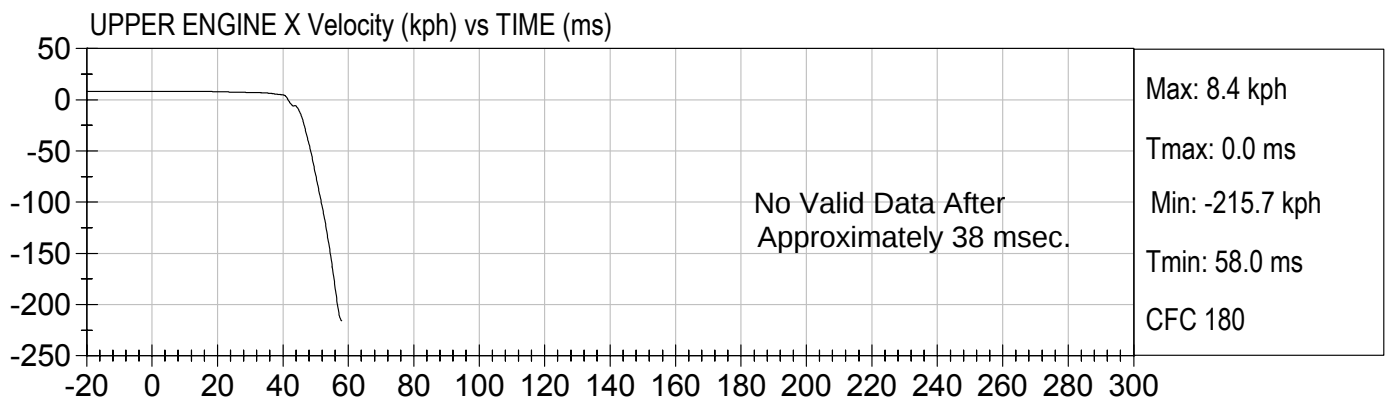
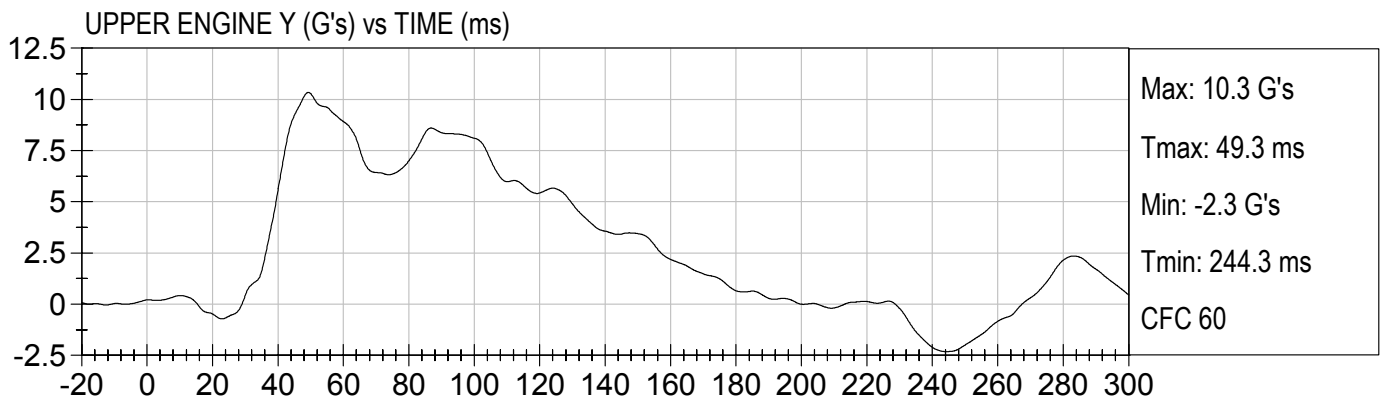
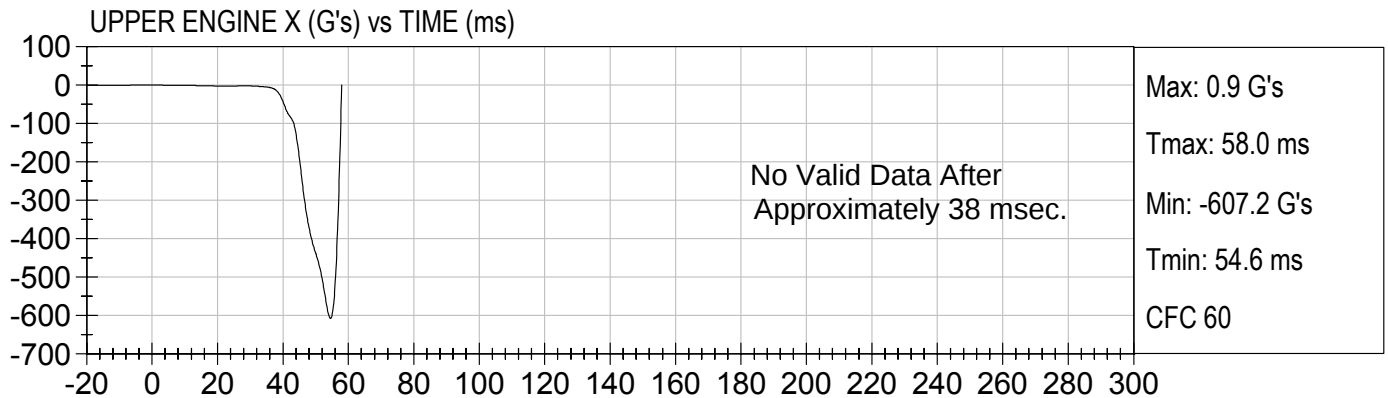


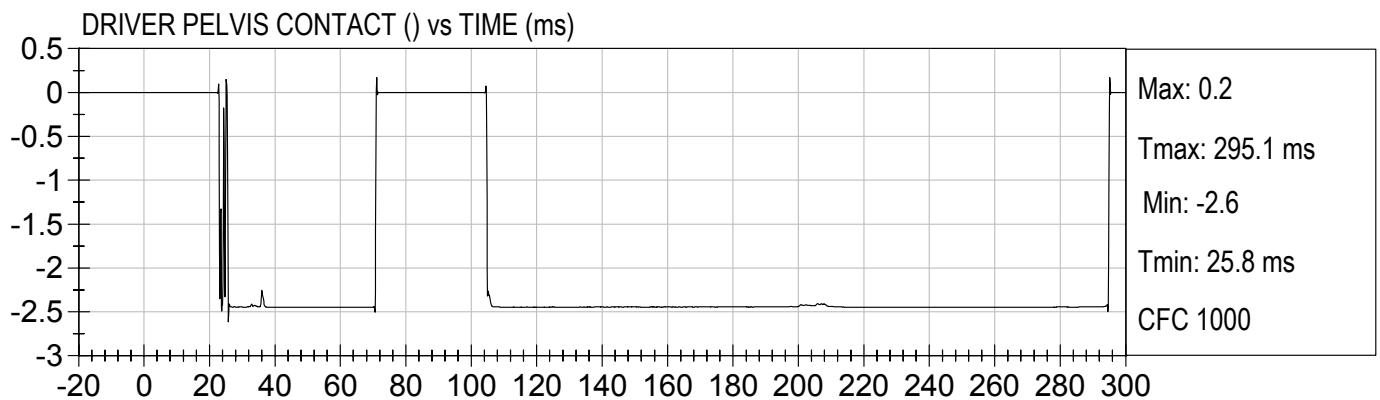
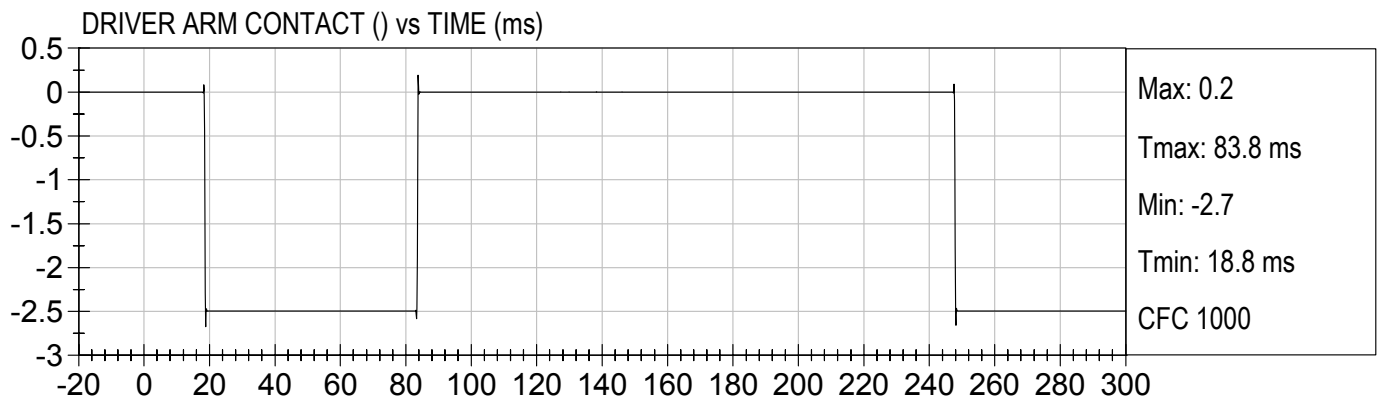
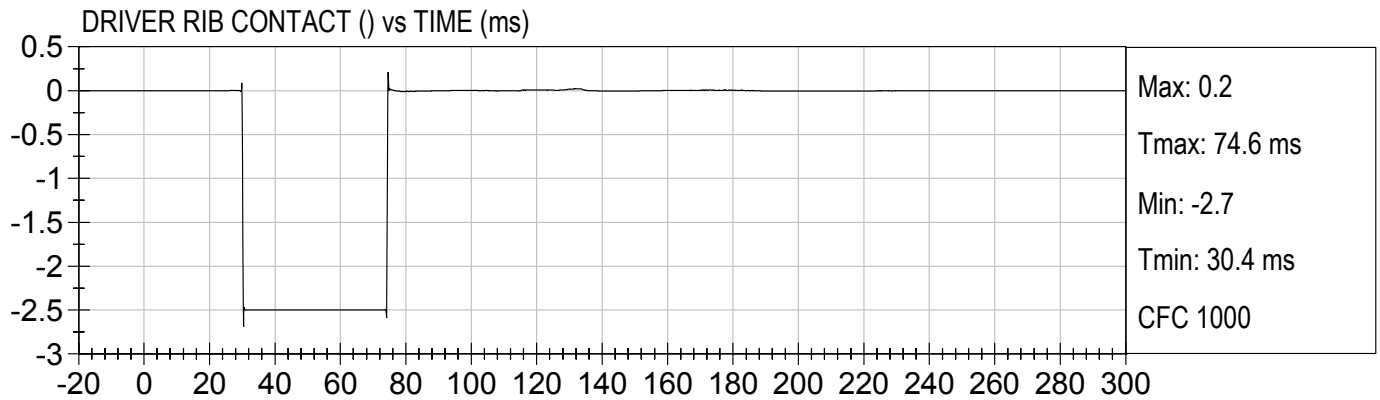












APPENDIX C

ES-2RE CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 010

PRE-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test ID: D052261

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	140	Pass
Time of Maximum Resultant Acceleration	msec	NA	36.1	Pass
Overall Test Results				Pass



Laboratory Technician

08/12/2005

Test Date

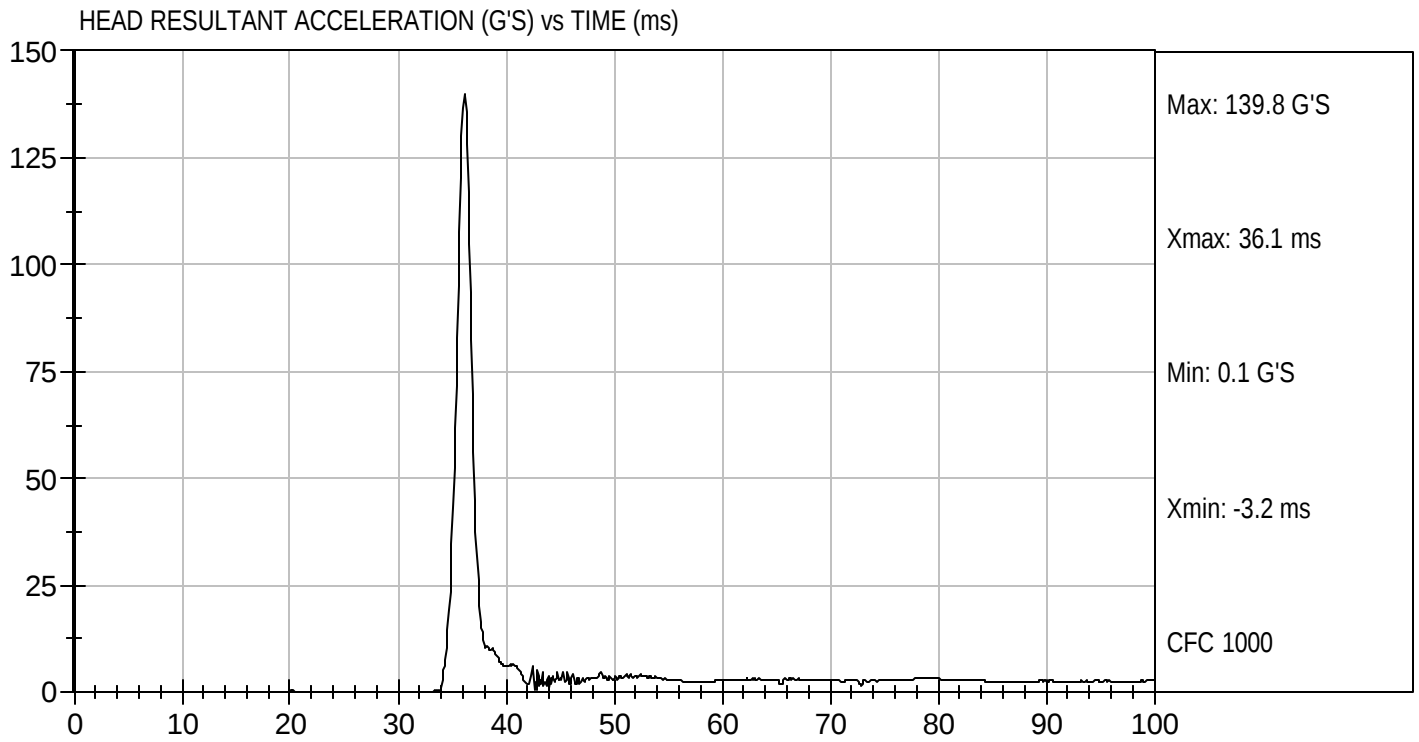


Approved By



Test Desc: Head Drop
Componet ID: D052261

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: 010

Test I.D: D052262

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	42	Pass
Pendulum Speed		m/s	3.3 to 3.5	3.3	Pass
Pendulum Deceleration	3 msec	G's	-0.25 to -0.53	-0.39	Pass
	8 msec	G's	-1.59 to -2.04	-1.92	Pass
	14 msec	G's	-3.20 to -3.85	-3.42	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	55.5	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	57.7	Pass
Maximum Angle Theta (A)		deg	32.7 to 37.0	35.7	Pass
Time of Maximum Theta (A)		msec	53.0 to 63.0	57.4	Pass
Maximum Angle Theta (B)		deg	30.70 to 33.20	32.90	Pass
Time of Maximum Theta (B)		msec	54.0 to 64.0	55.2	Pass
Overall Test Results				Pass	


 Laboratory Technician

 Approved By

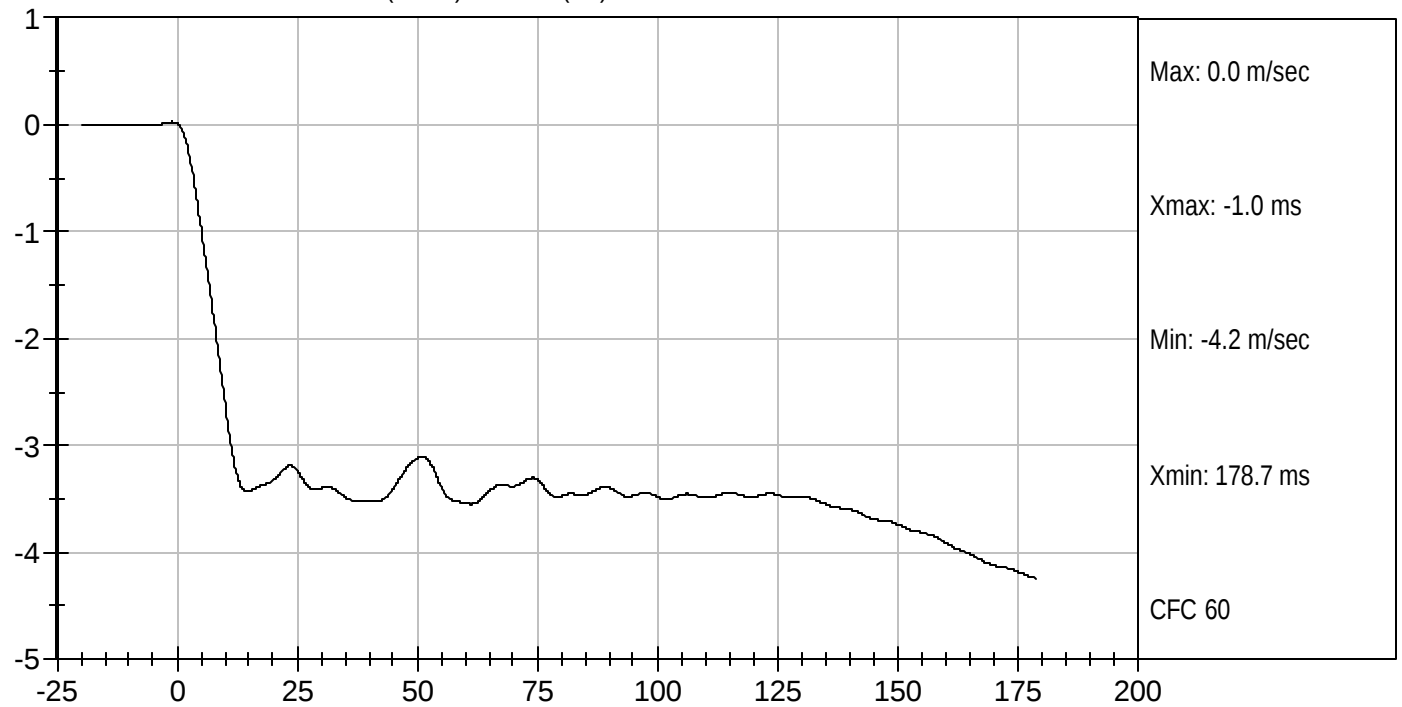
08/11/2005
 Test Date



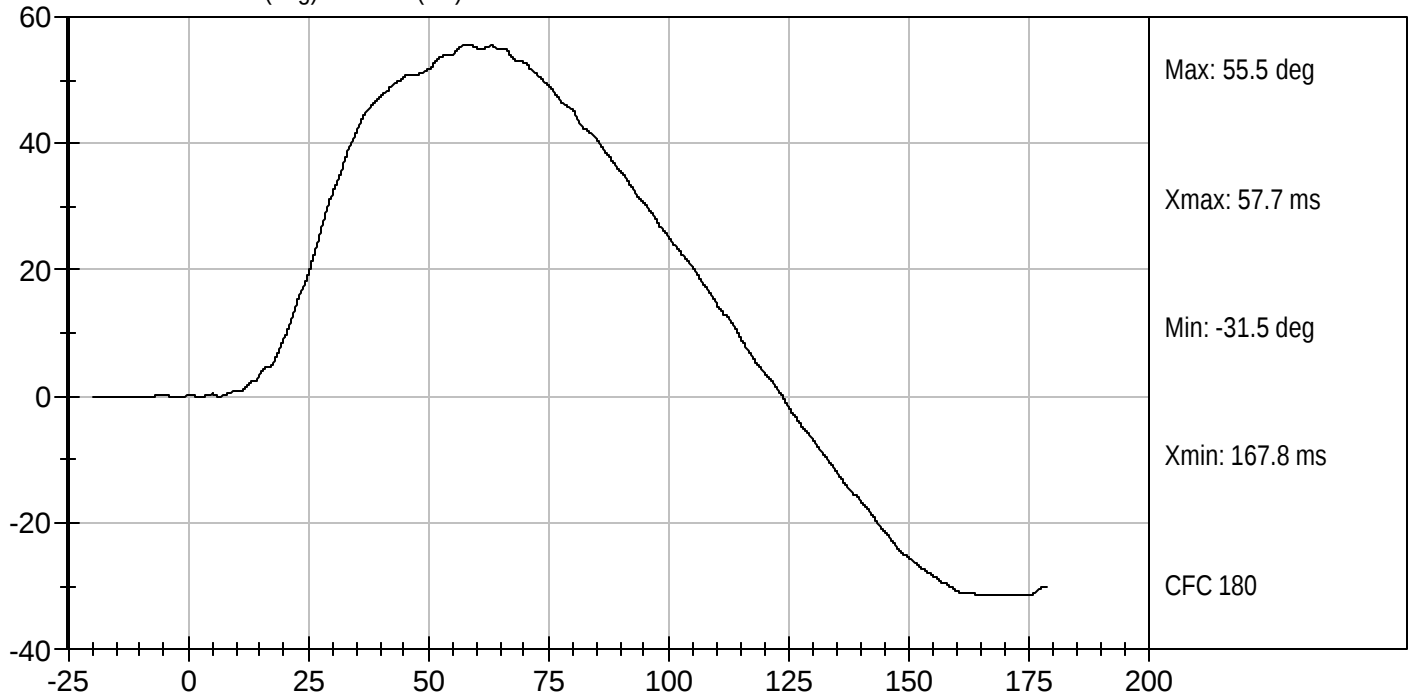
Test Desc: Neck Bending
Componet ID: D052262

Test Date: 08/11/2005
Velocity: 10.85 ft/s, 3.3 m/s

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



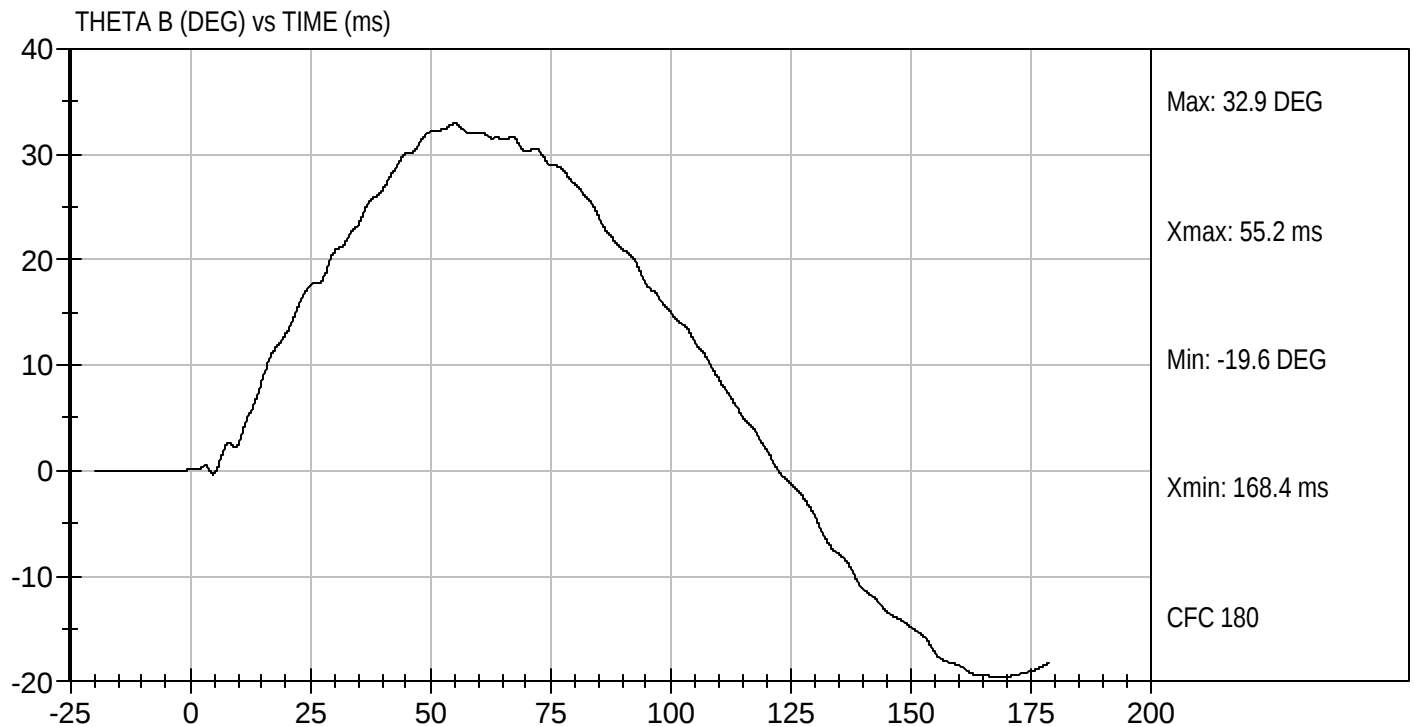
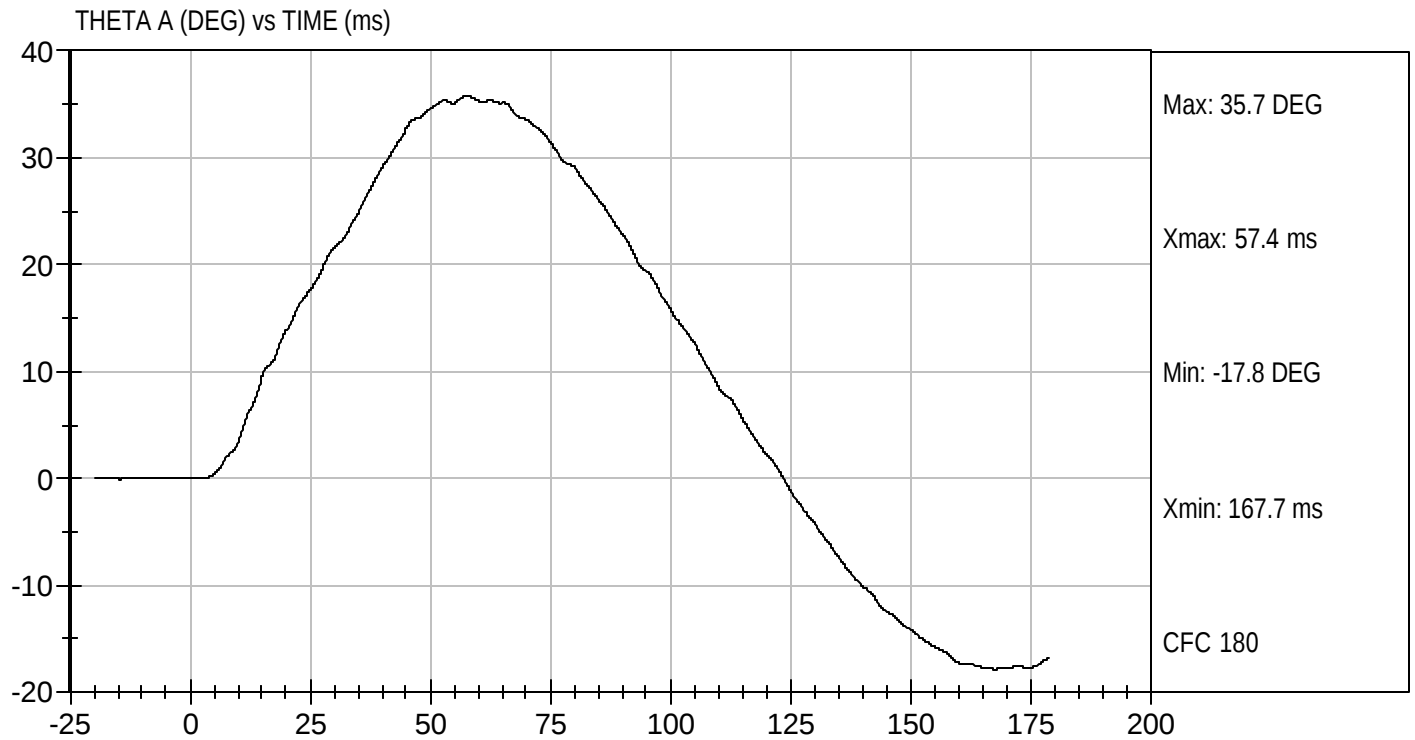
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Neck Bending
Componet ID: D052262

Test Date: 08/11/2005
Velocity: 10.85 ft/s, 3.3 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052263

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/s	4.2 to 4.4	4.3	Pass
Peak Shoulder Acceleration	G's	7.5 to 10.5	8.9	Pass
Time of Peak Shoulder Acceleration	msec	NA	17.3	Pass
Overall Test Results			Pass	



Laboratory Technician

08/10/2005

Test Date

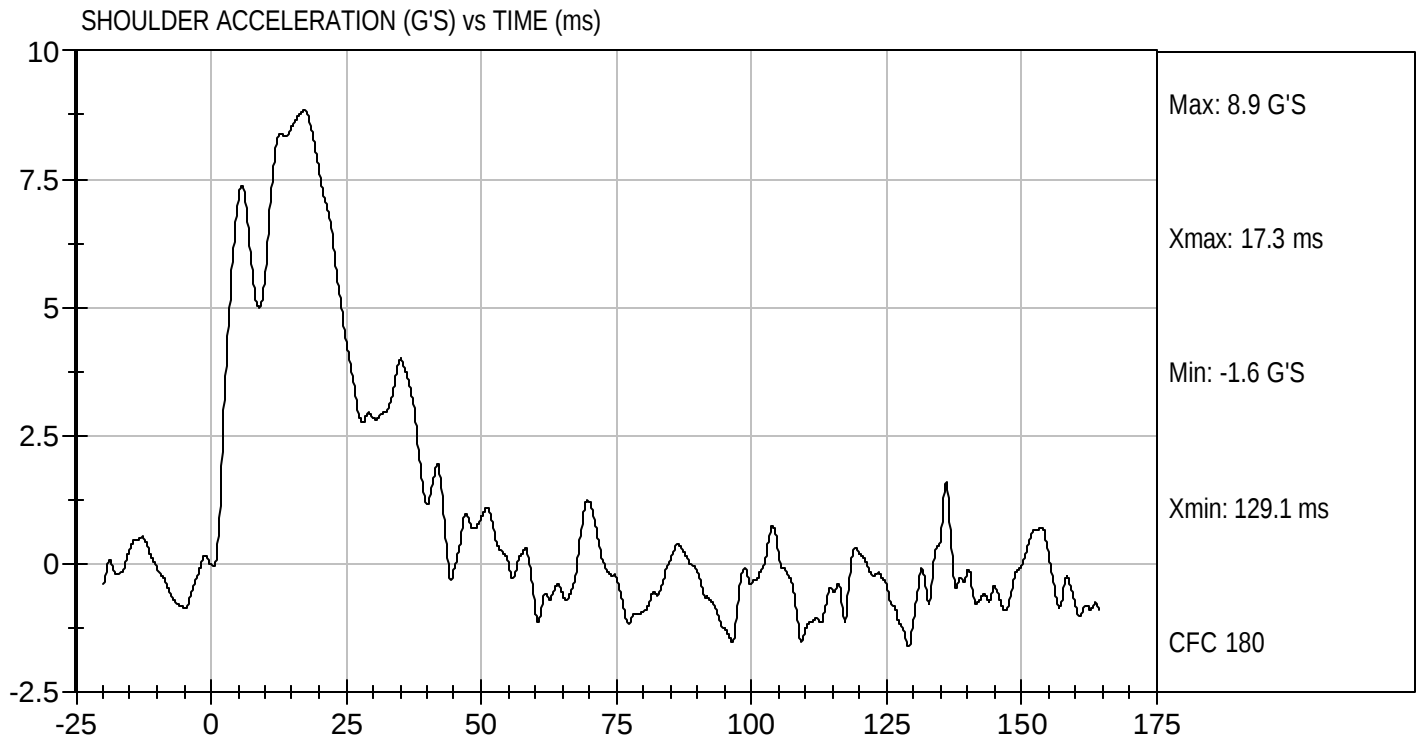


Approved By



Test Desc: Shoulder Impact
Componet ID: D052263

Test Date: 08/10/2005
Velocity: 14.07 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION
UPPER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052264

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	26.3	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	37.1	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	47.1	Pass
Overall Test Results				Pass



Laboratory Technician

08/11/2005

Test Date



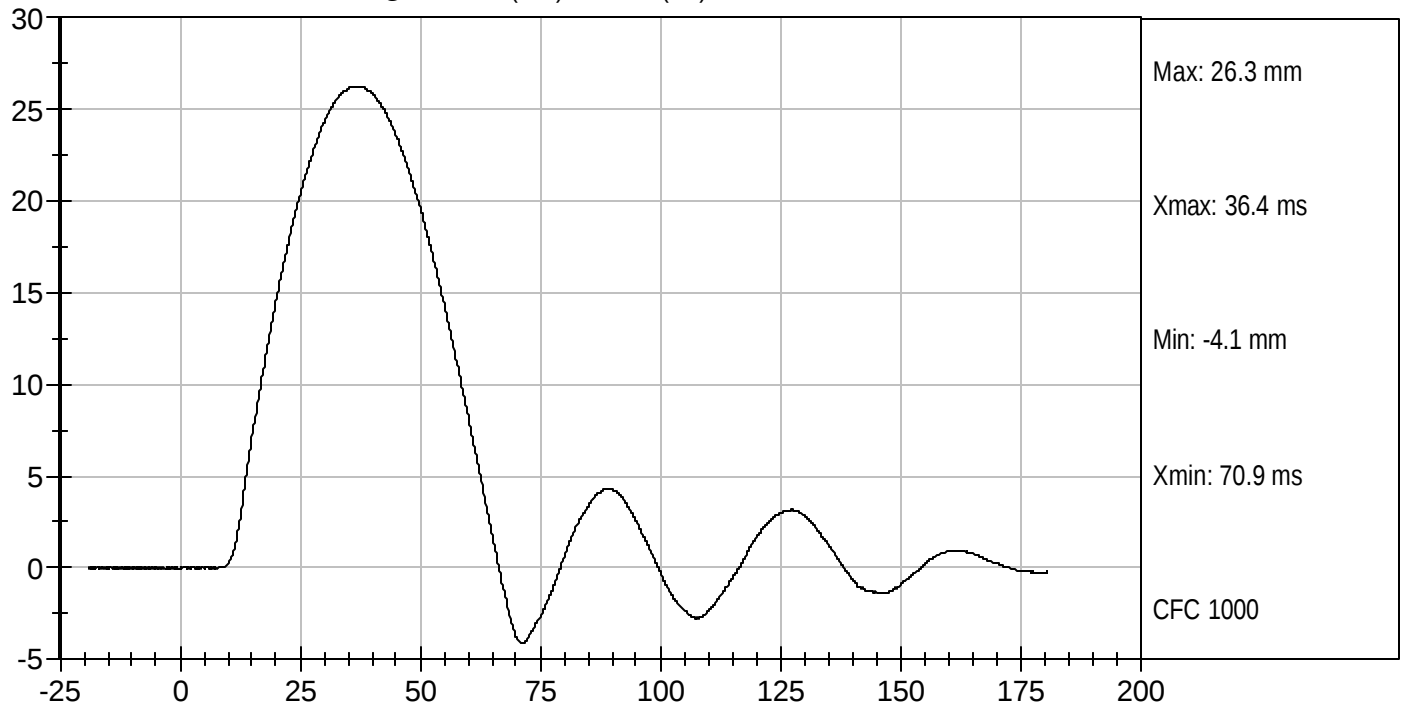
Approved By



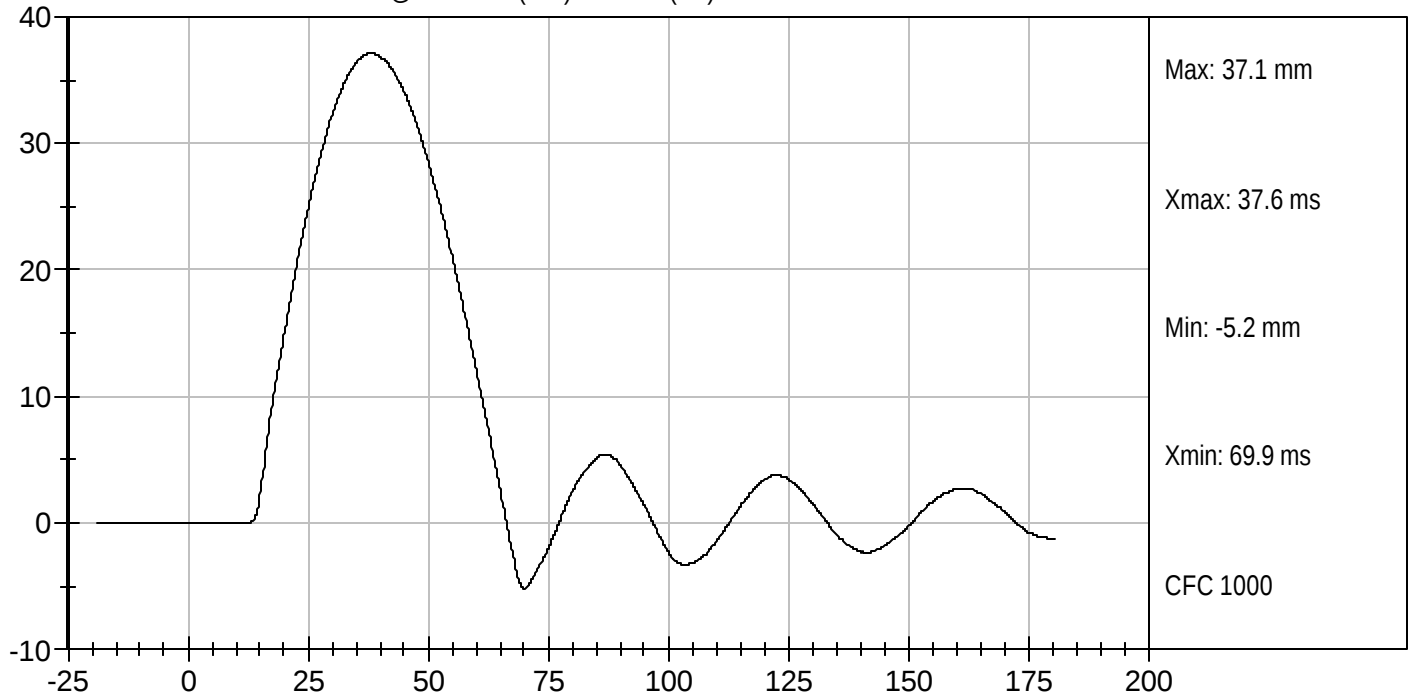
Test Desc: Rib Impact - Upper
Componet ID: D052264

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

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



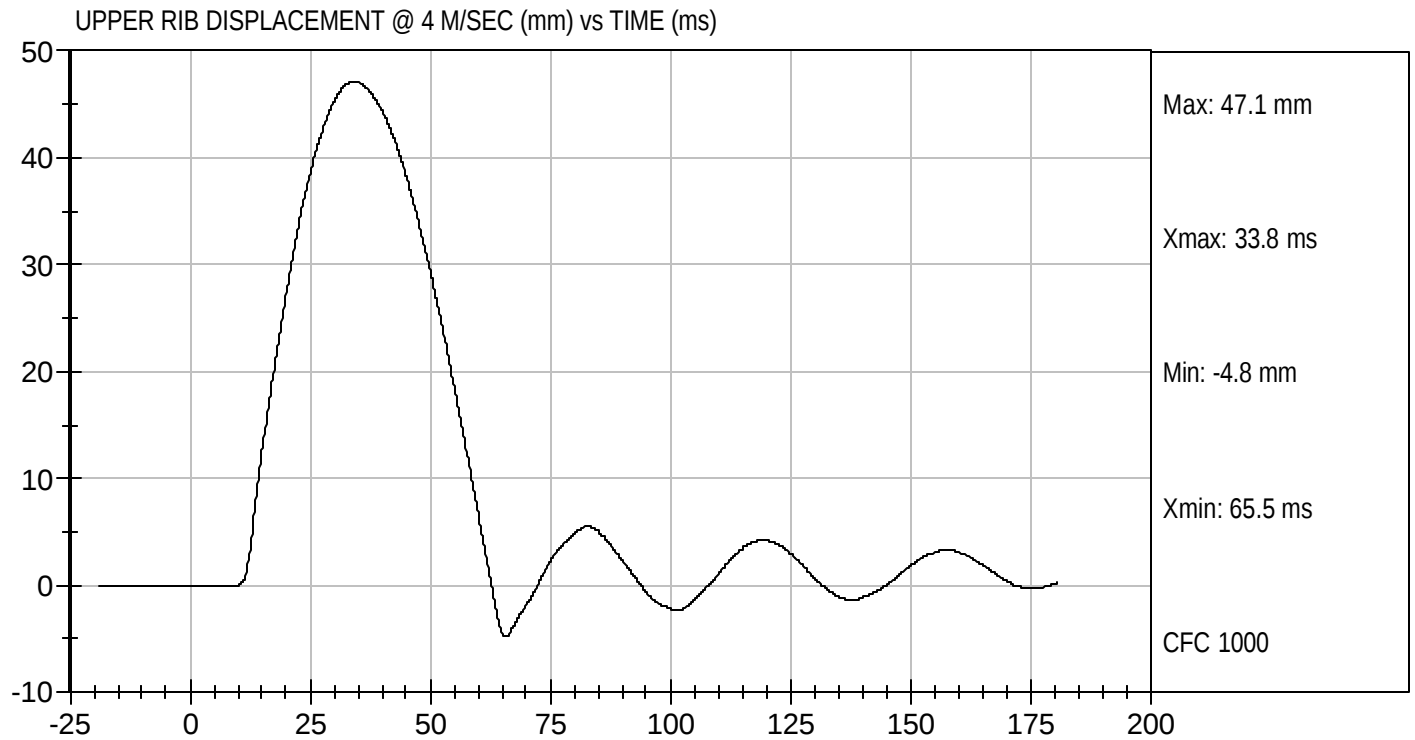
UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)





Test Desc: Rib Impact - Upper
Componet ID: D052264

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



MGA RESEARCH CORPORATION
MID RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052265

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	26.8	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	39.1	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	48.6	Pass
Overall Test Results			Pass	



Laboratory Technician

08/11/2005

Test Date

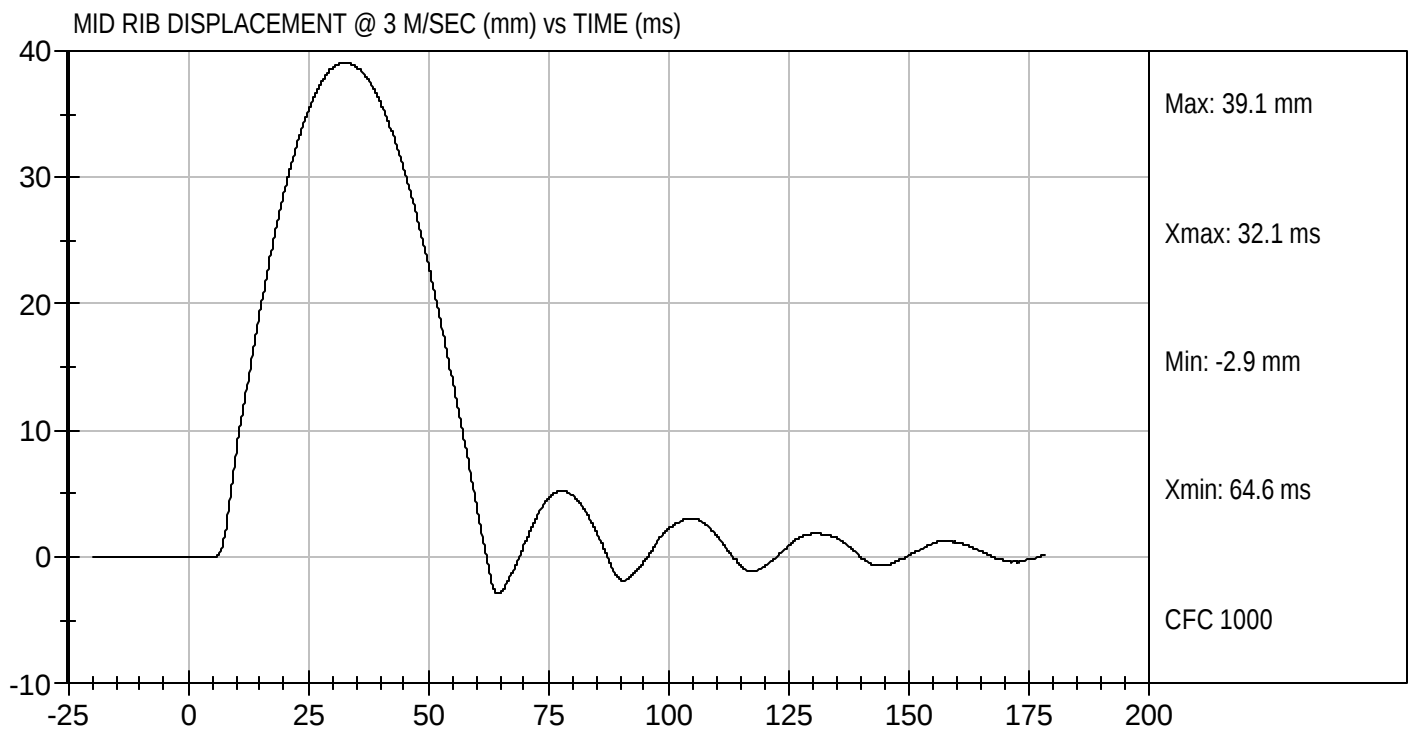
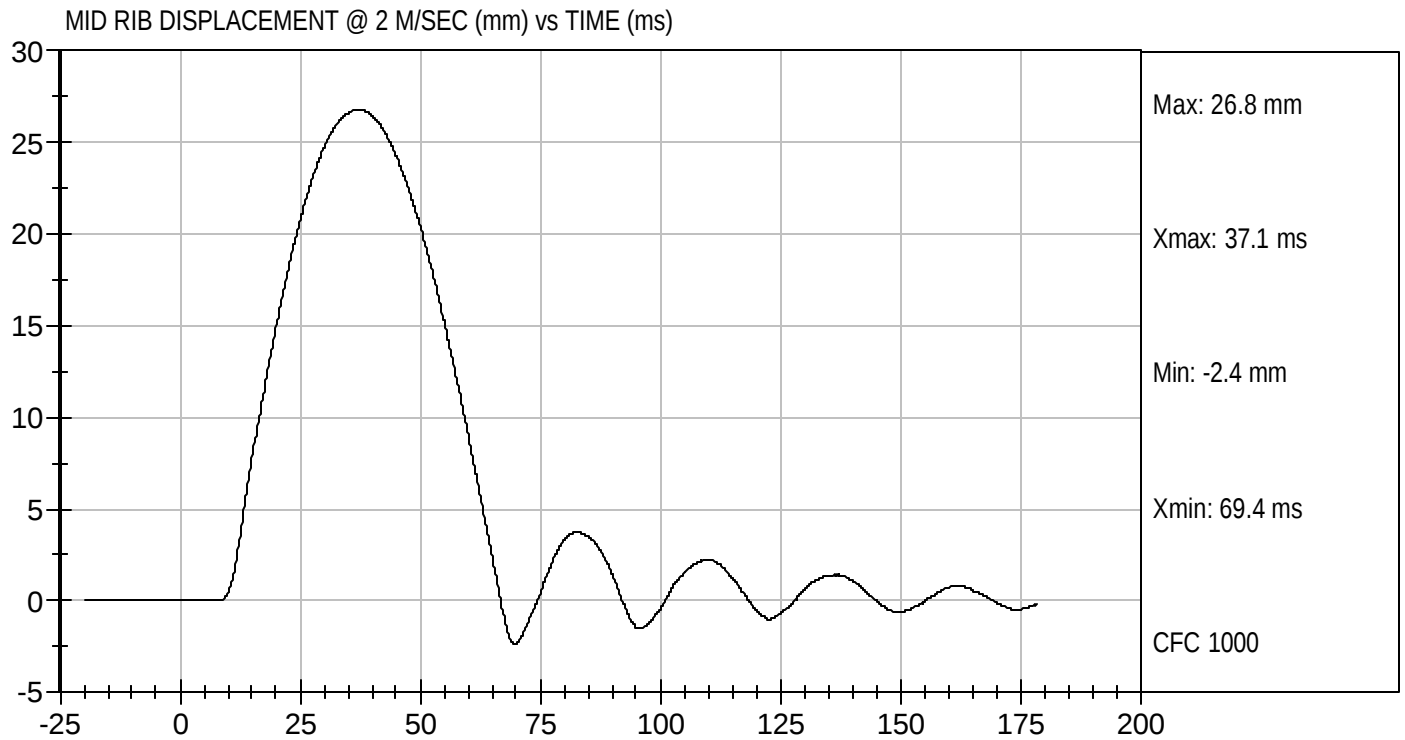


Approved By



Test Desc: Rib Impact - Mid
Componet ID: D052265

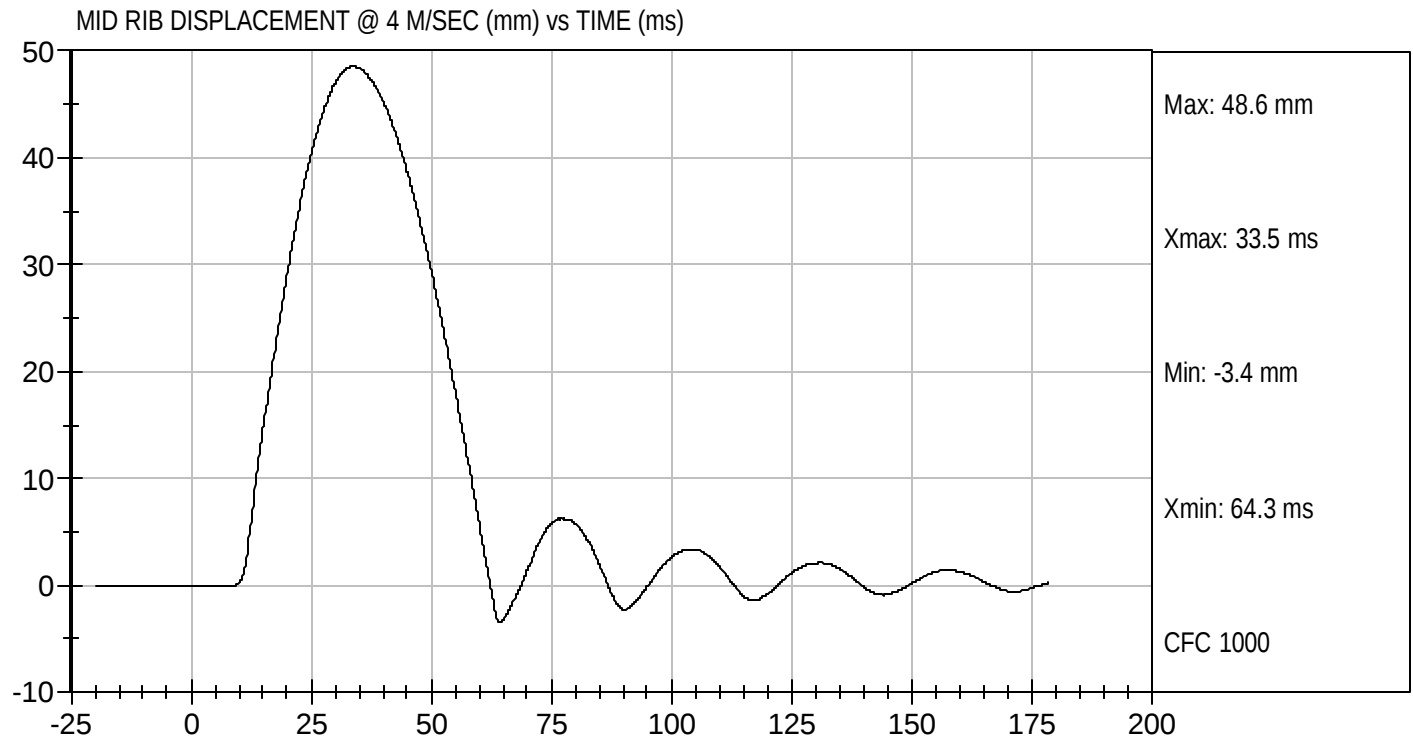
Test Date: 08/11/2005
Velocity: 6.56 ft/s, 2 m/s





Test Desc: Rib Impact - Mid
Componet ID: D052265

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



MGA RESEARCH CORPORATION
LOWER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052266

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	42	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	26.8	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	38.2	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	46.9	Pass
Overall Test Results			Pass	



Laboratory Technician

08/11/2005

Test Date

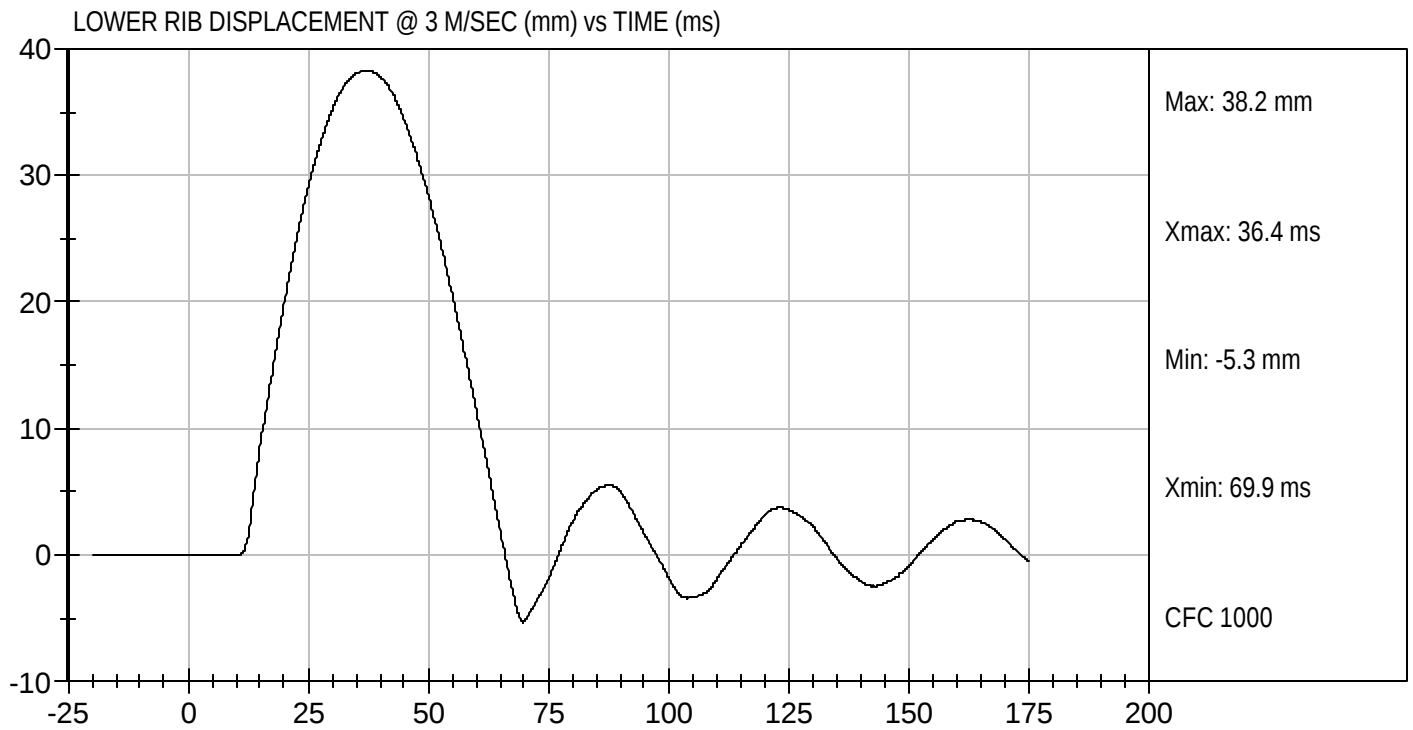
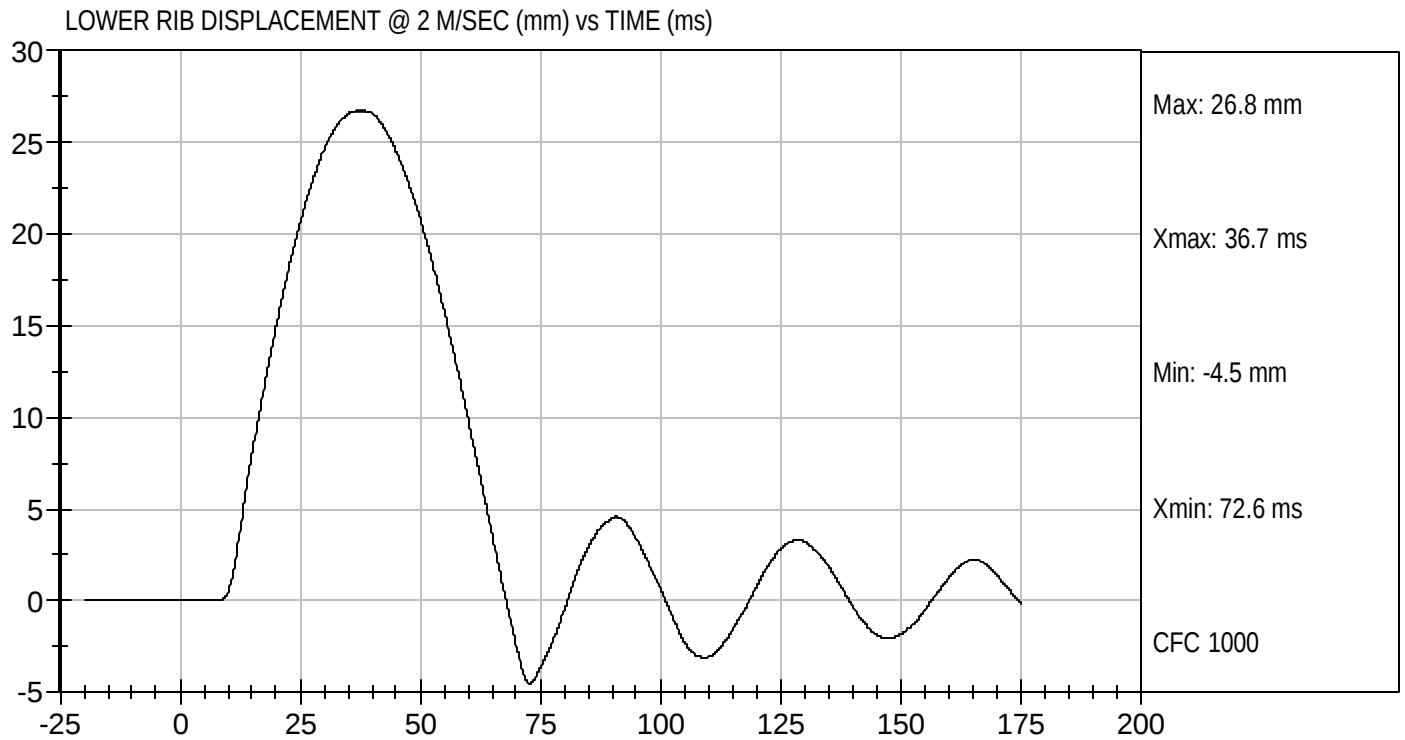


Approved By



Test Desc: Rib Impact - Lower
Componet ID: D052266

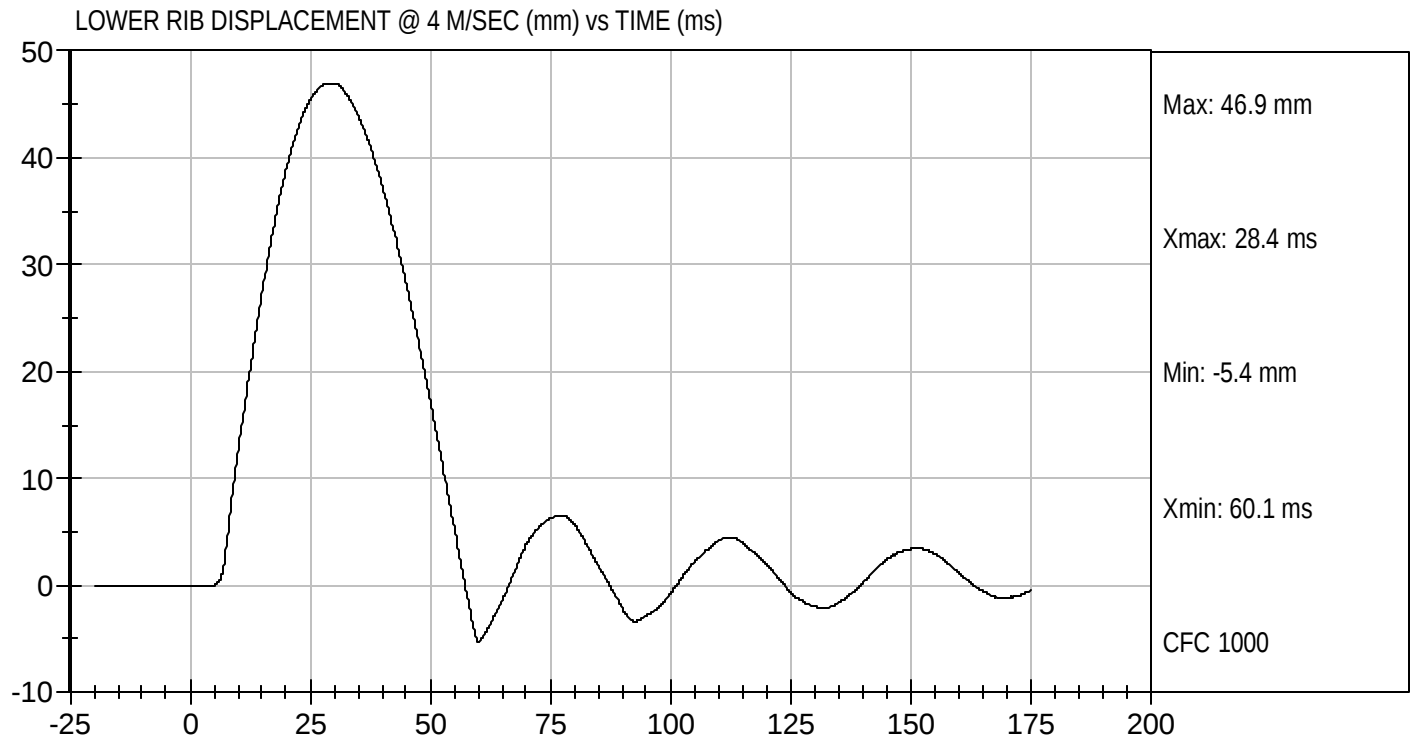
Test Date: 08/11/2005
Velocity: 6.56 ft/s, 2 m/s





Test Desc: Rib Impact - Lower
Componet ID: D052266

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



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052267

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Probe Speed	m/s	3.90 to 4.10	3.91	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.45	Pass
Time of Maximum Impact Force	msec	10.60 to 13.00	12.70	Pass
Maximum Total Abdomen Force	kN	2.20 to 2.70	2.36	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	11.20	Pass
Overall Test Results				Pass


Laboratory Technician

08/11/2005

Test Date

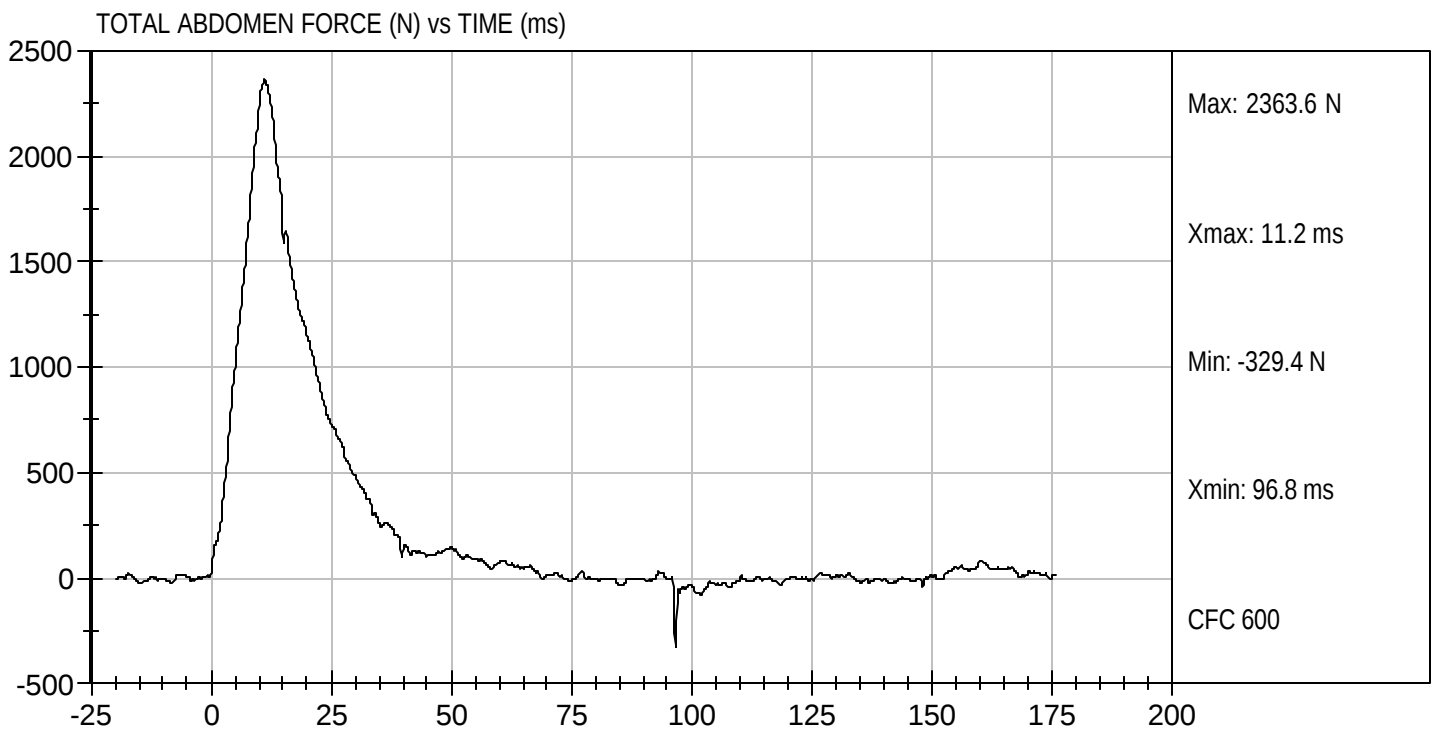
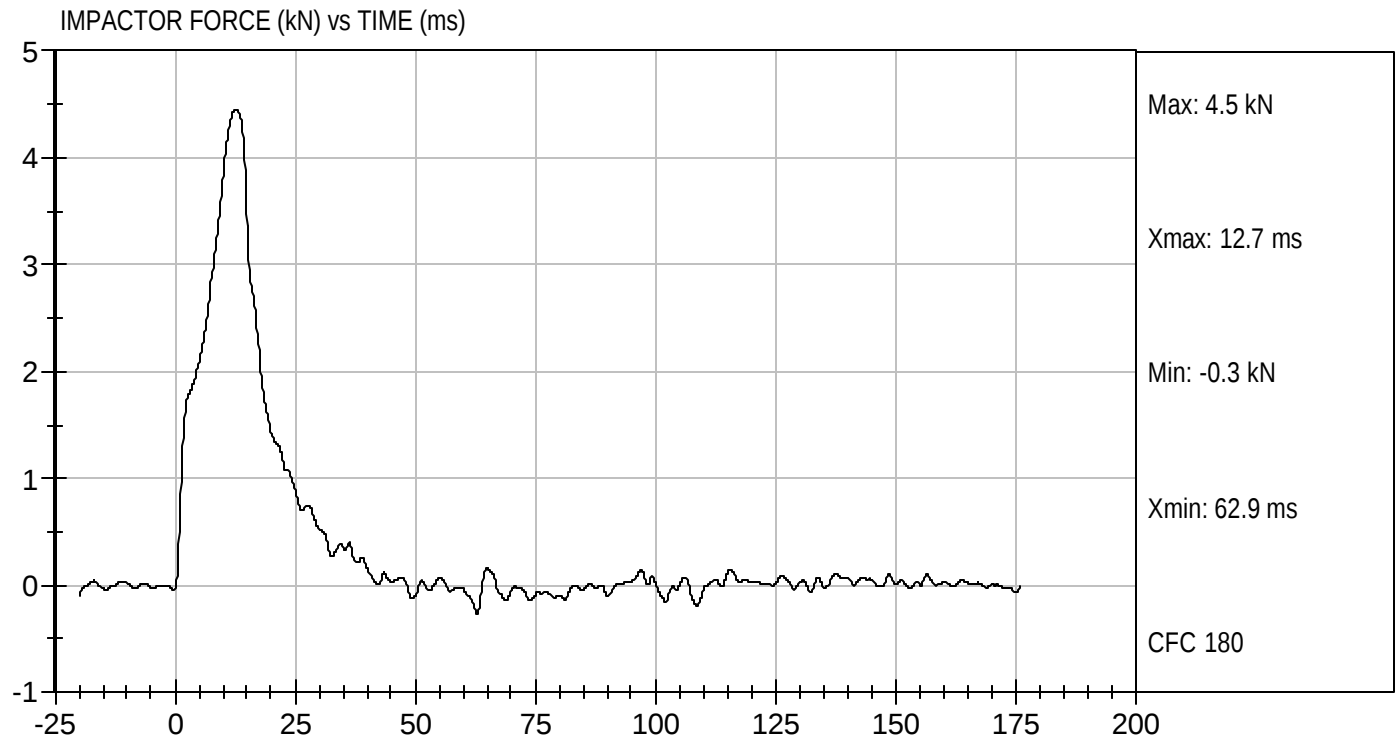


Approved By



Test Desc: Abdomen Impact
Componet ID: D052267

Test Date: 08/11/2005
Velocity: 12.84 ft/s, 3.91 m/s



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052268

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	6.10	Pass
Pendulum Deceleration	10 msec	m/sec	-2.46 to -1.59	-2.24	Pass
	20 msec	m/sec	-5.25 to -4.07	-5.14	Pass
	25 msec	m/sec	-6.64 to -5.30	-6.18	Pass
	30 msec	m/sec	>= -6.5	-6.3	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	48.5	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	44.2	Pass
Maximum Theta (A)		deg	31.0 to 35.0	32.3	Pass
Time of Maximum Theta (A)		msec	44.0 to 52.0	44.2	Pass
Maximum Theta (B)		deg	27.81 to 30.31	29.71	Pass
Time of Maximum Theta (B)		msec	44.0 to 52.0	47.0	Pass
Overall Results					Pass


 Laboratory Technician

08/12/2005
 Test Date

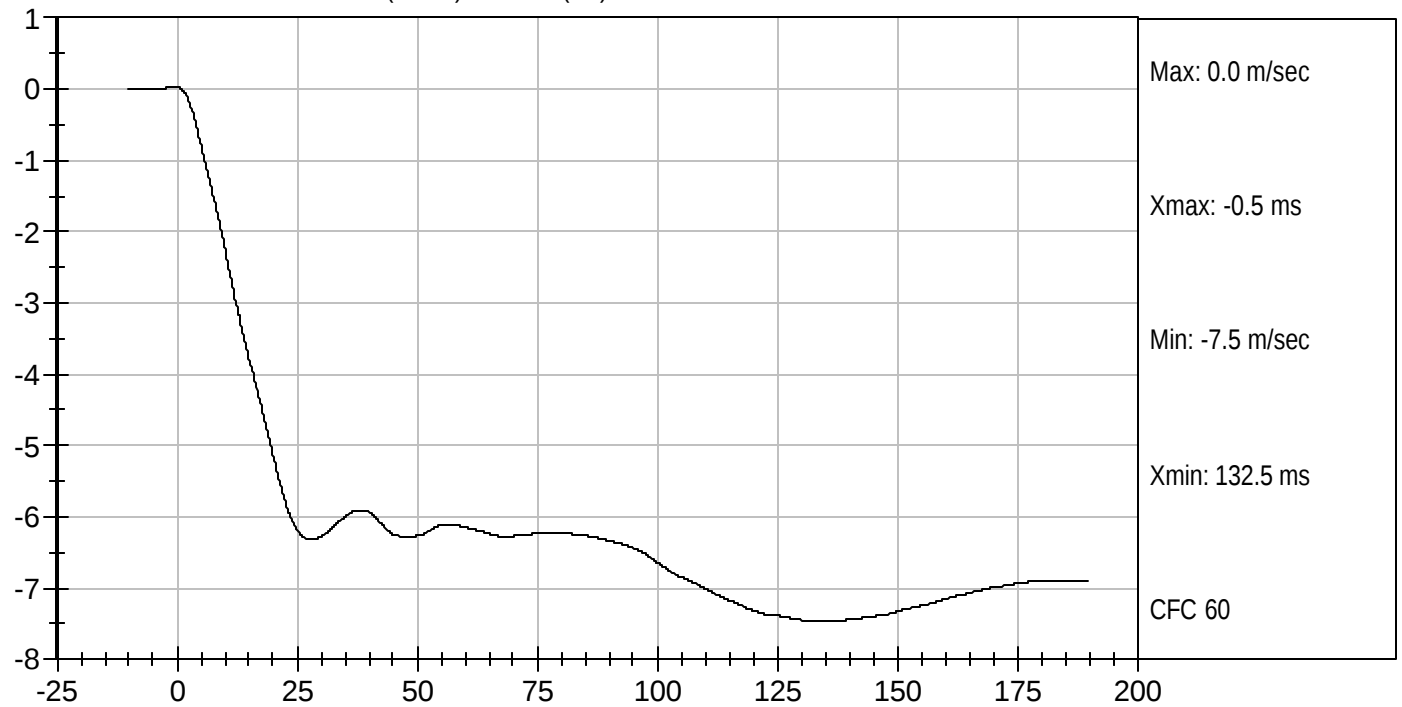

 Approved By



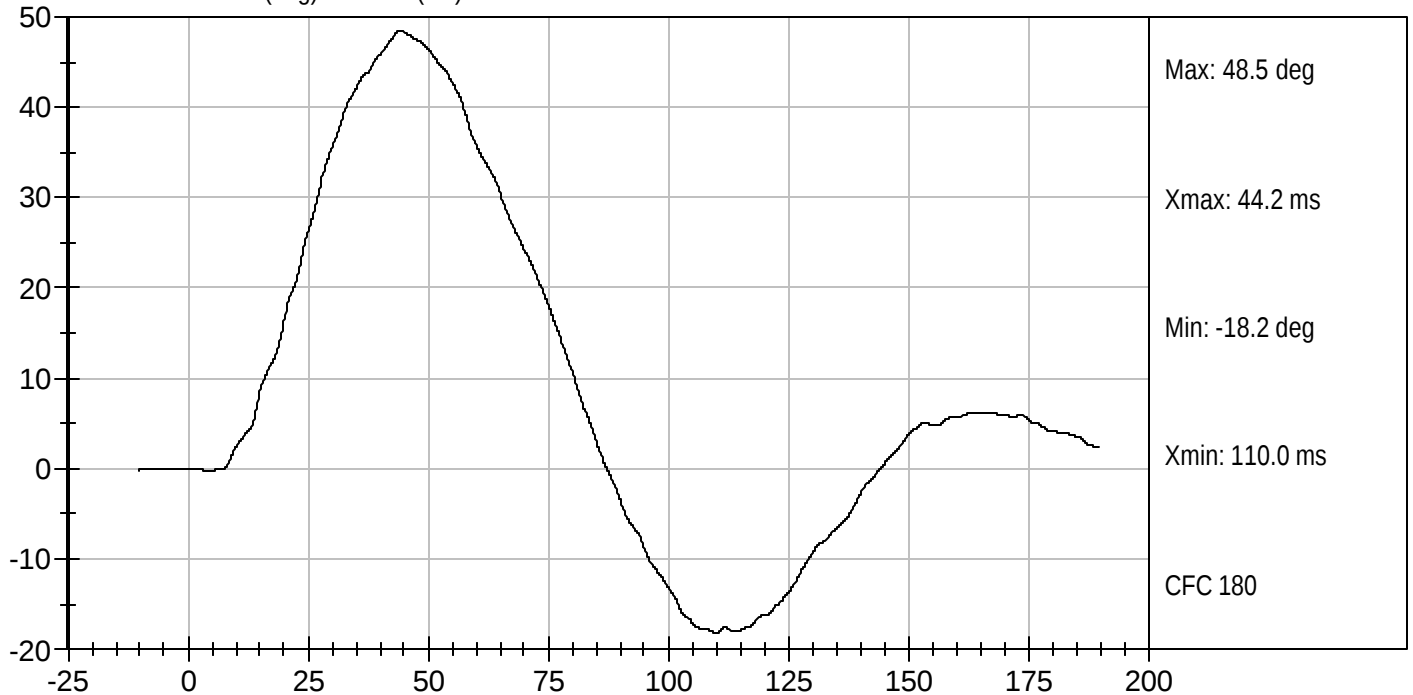
Test Desc: Lumbar Bending
Componet ID: D052268

Test Date: 08/12/2005
Velocity: 20.02 ft/s, 6.10 m/s

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



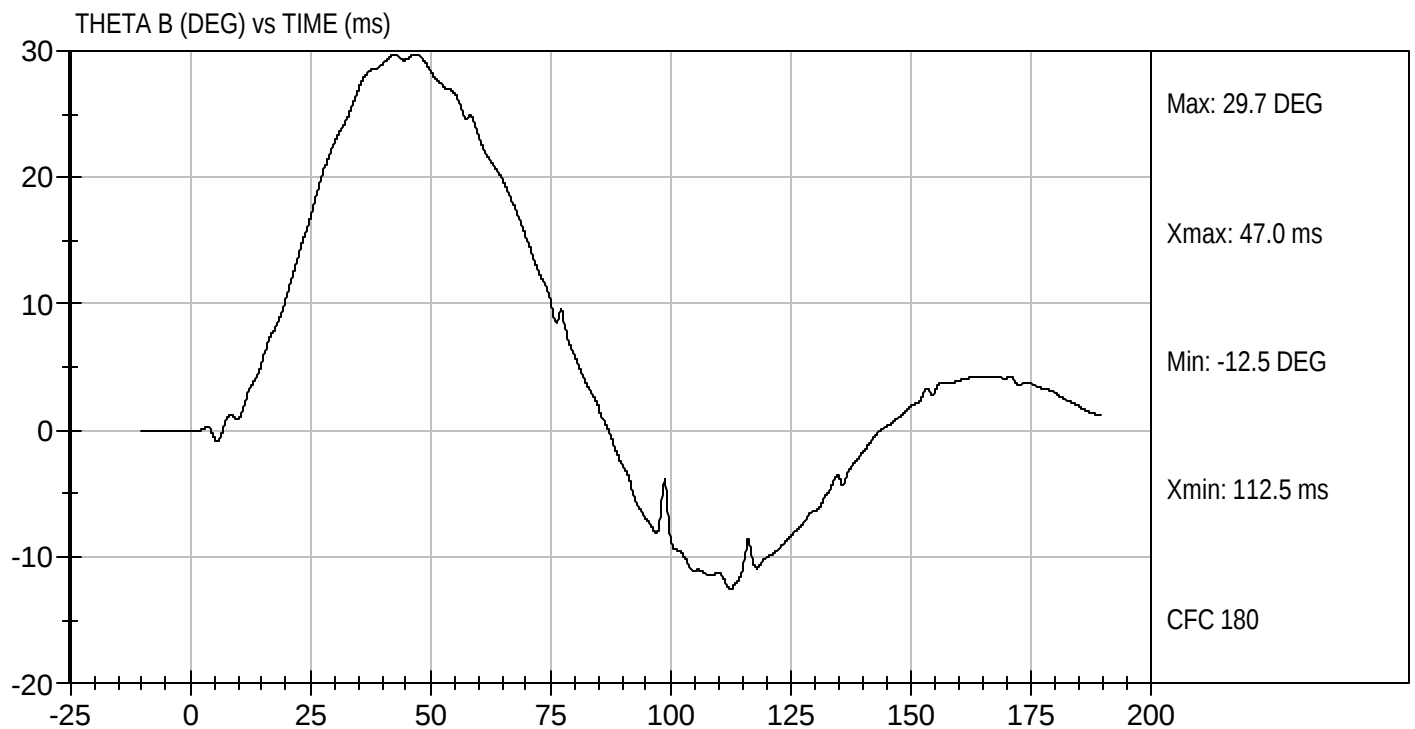
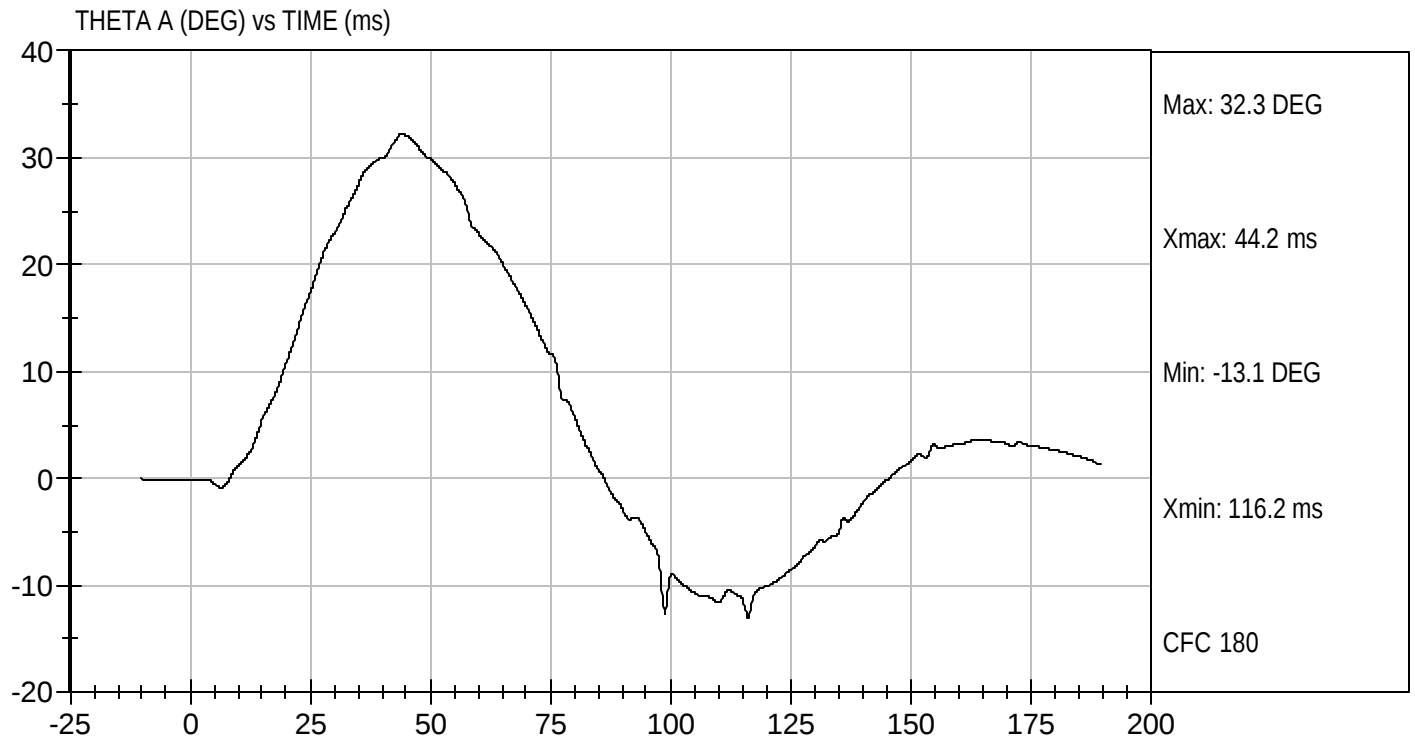
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Lumbar Bending
Componet ID: D052268

Test Date: 08/12/2005
Velocity: 20.02 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION
PELVIS TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052269

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	45	Pass
Probe Speed	m/s	4.20 to 4.40	4.30	Pass
Maximum Impactor Force	kN	4.40 to 5.40	5.15	Pass
Time of Maximum Impactor Force	msec	10.30 to 15.50	14.70	Pass
Maximum Pubic Force	kN	1.04 to 1.64	1.33	Pass
Time of Maximum Pubic Force	msec	9.90 to 15.90	15.80	Pass
Overall Test Results			Pass	


Laboratory Technician

08/10/2005

Test Date

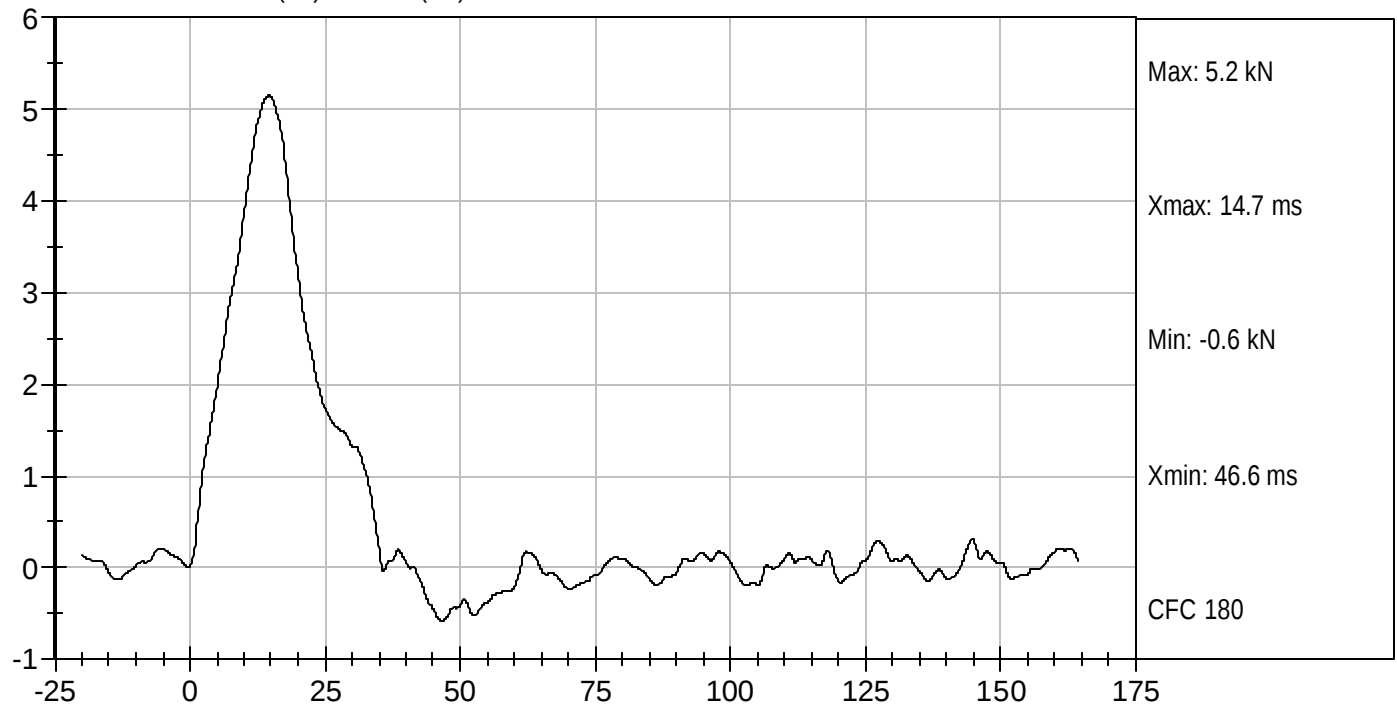

Approved By



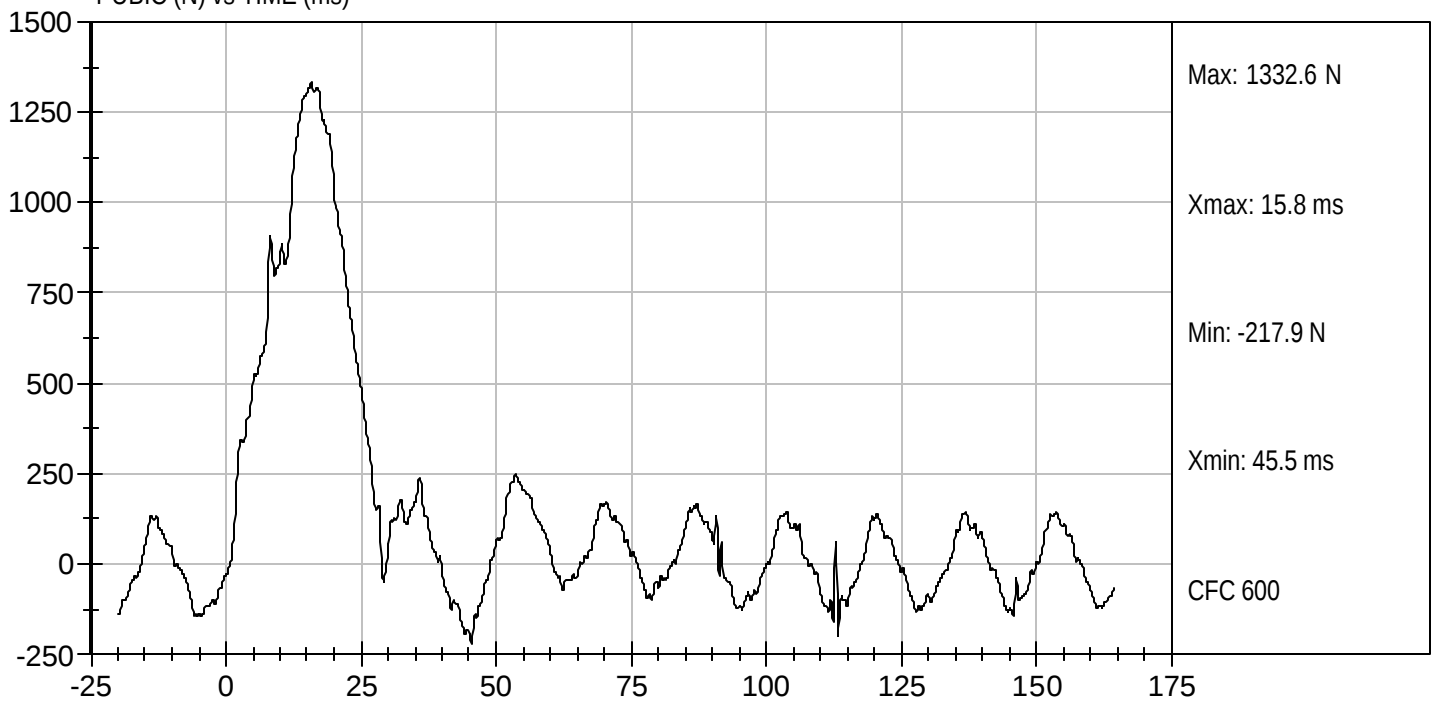
Test Desc: Pelvis Impact
Componet ID: D052269

Test Date: 08/10/2005
Velocity: 14.11 ft/s, 4.3 m/s

IMPACTOR FORCE (kN) vs TIME (ms)



PUBIC (N) vs TIME (ms)



CERTIFICATION DATA

Dummy Serial Number: 010

POST-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test ID: D052461

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	150	Pass
Time of Maximum Resultant Acceleration	msec	NA	26.5	Pass
Overall Test Results				Pass



Laboratory Technician

09/06/2005

Test Date

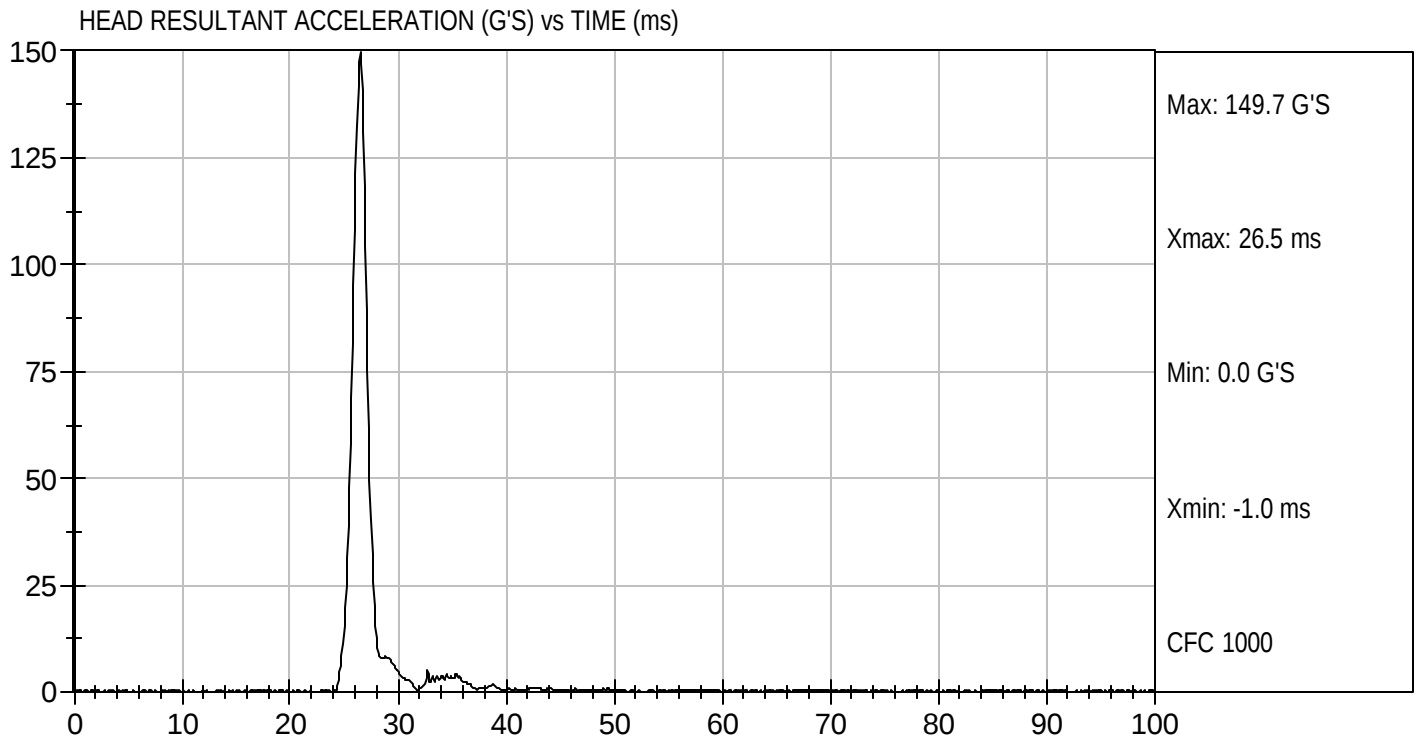


Approved By



Test Desc: Head Drop
Componet ID: D052461

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: 010

Test I.D: D052462

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	3.3 to 3.5	3.4	Pass
Pendulum Deceleration	3 msec	G's	-0.25 to -0.53	-0.47	Pass
	8 msec	G's	-1.59 to -2.04	-1.98	Pass
	14 msec	G's	-3.20 to -3.85	-3.52	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	56.0	Pass
Time of Maximum Flexion Angle		msec	54.0 to 66.0	55.5	Pass
Maximum Angle Theta (A)		deg	32.7 to 37.0	36.2	Pass
Time of Maximum Theta (A)		msec	53.0 to 63.0	55.3	Pass
Maximum Angle Theta (B)		deg	31.05 to 33.55	33.55	Pass
Time of Maximum Theta (B)		msec	54.0 to 64.0	59.0	Pass
Overall Test Results				Pass	


 Laboratory Technician



Approved By

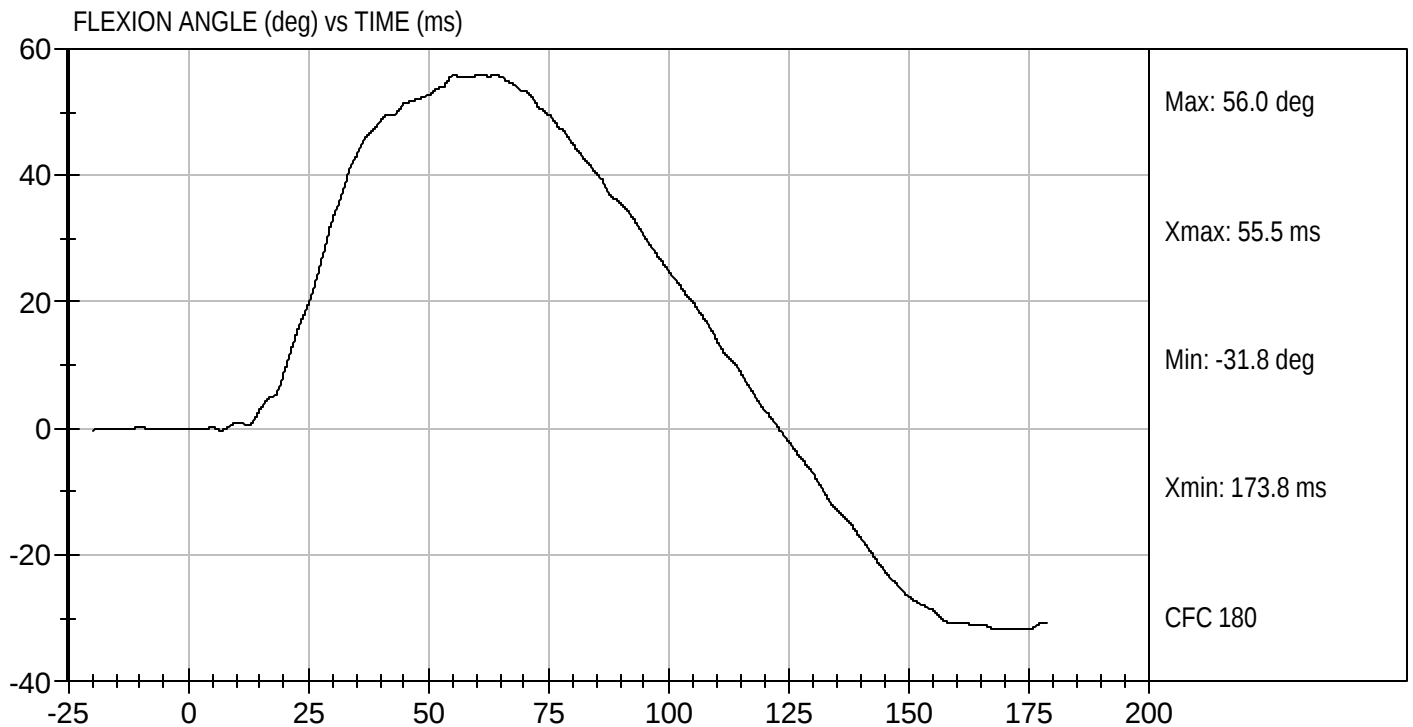
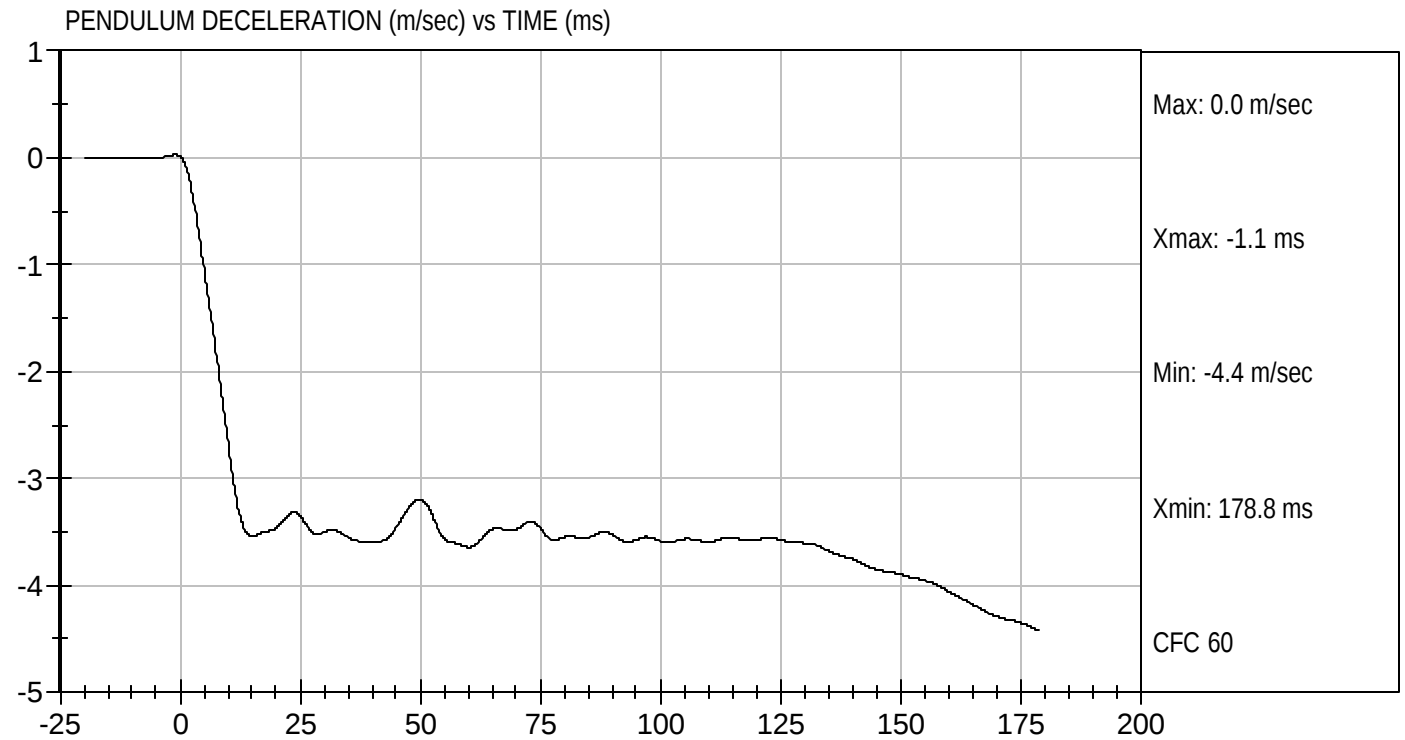
09/06/2005

Test Date



Test Desc: Neck Bending
Componet ID: D052462

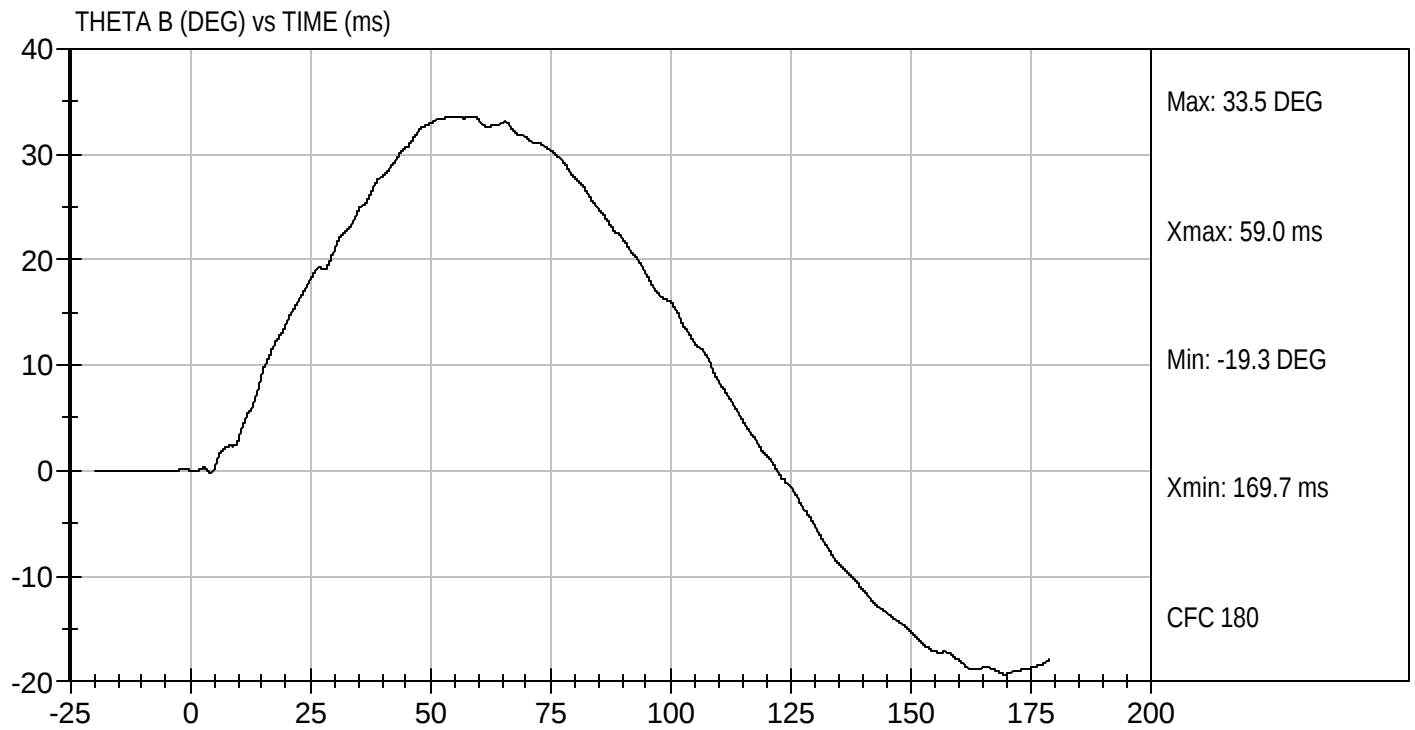
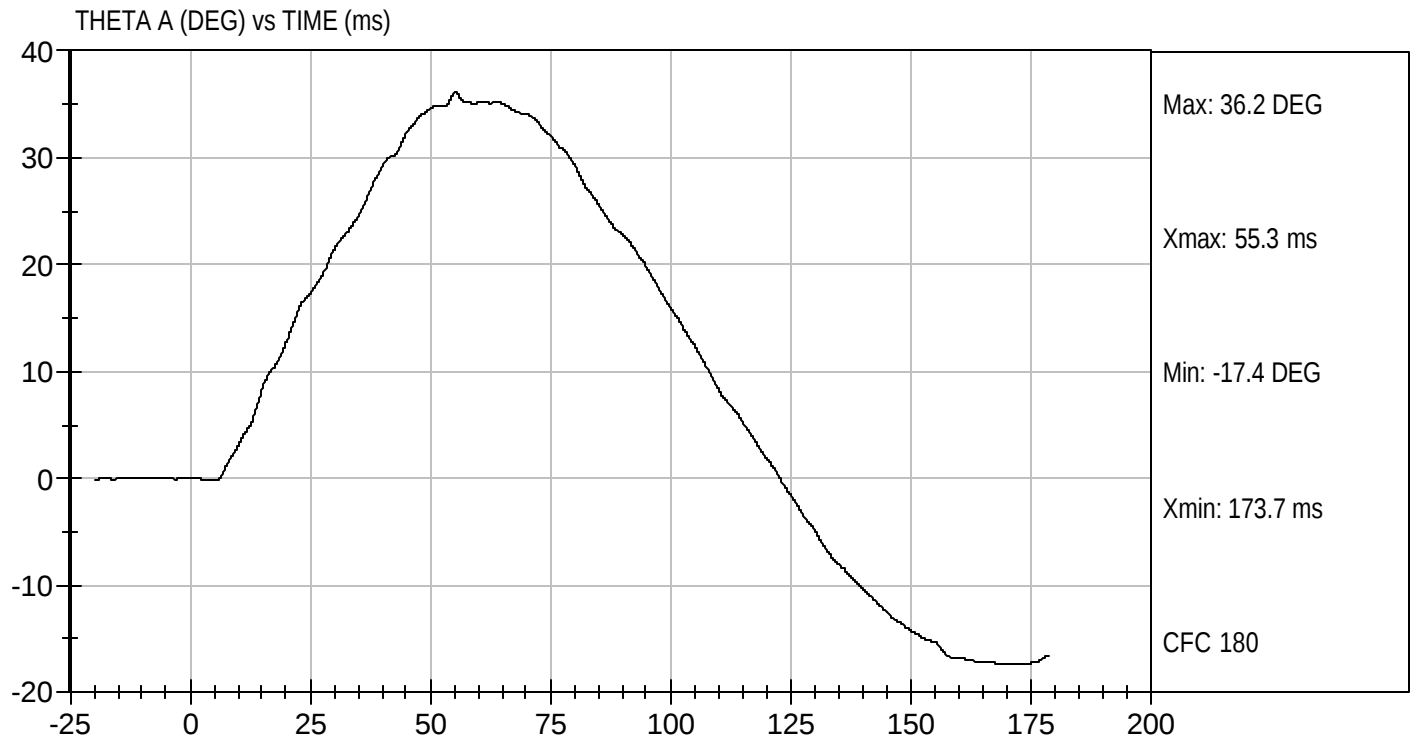
Test Date: 09/06/2005
Velocity: 11.25 ft/s, 3.4 m/s





Test Desc: Neck Bending
Componet ID: D052462

Test Date: 09/06/2005
Velocity: 11.25 ft/s, 3.4 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052463

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	10.5	Pass
Time of Peak Shoulder Acceleration	msec	NA	13.2	Pass
Overall Test Results			Pass	


Laboratory Technician

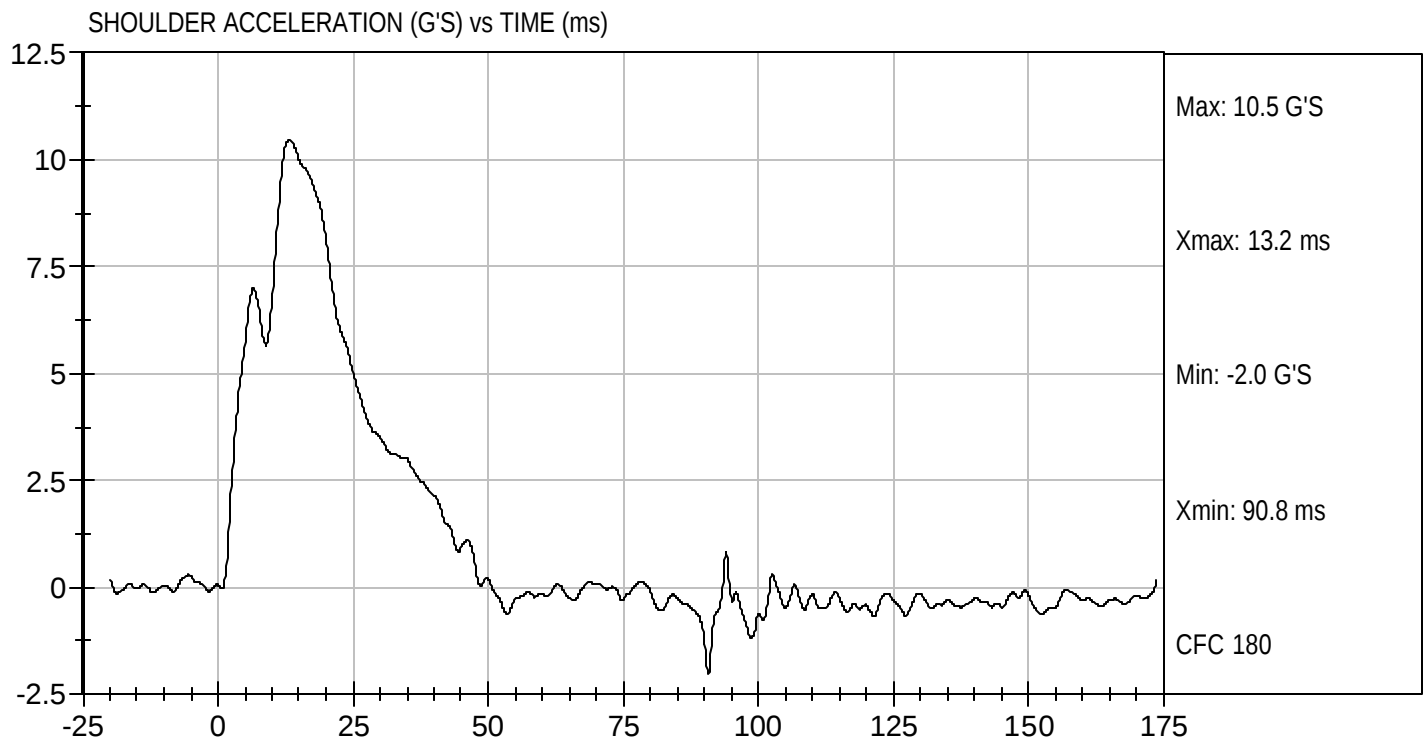

Approved By

09/02/2005
Test Date



Test Desc: Shoulder Impact
Componet ID: D052463

Test Date: 09/02/2005
Velocity: 14.13 ft/s, 4.3 m/s



MGA RESEARCH CORPORATION
UPPER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052464

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	48	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	36.5	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	46.7	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

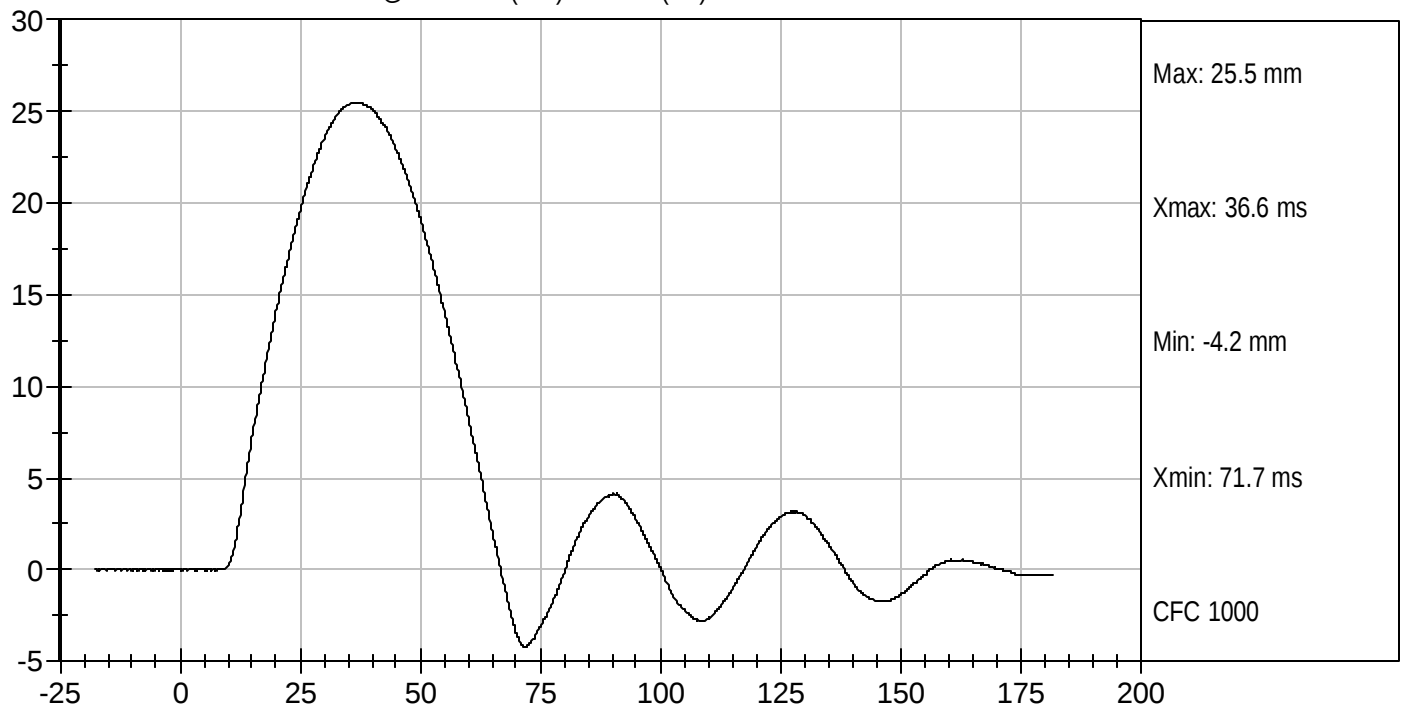
09/06/2005
Test Date



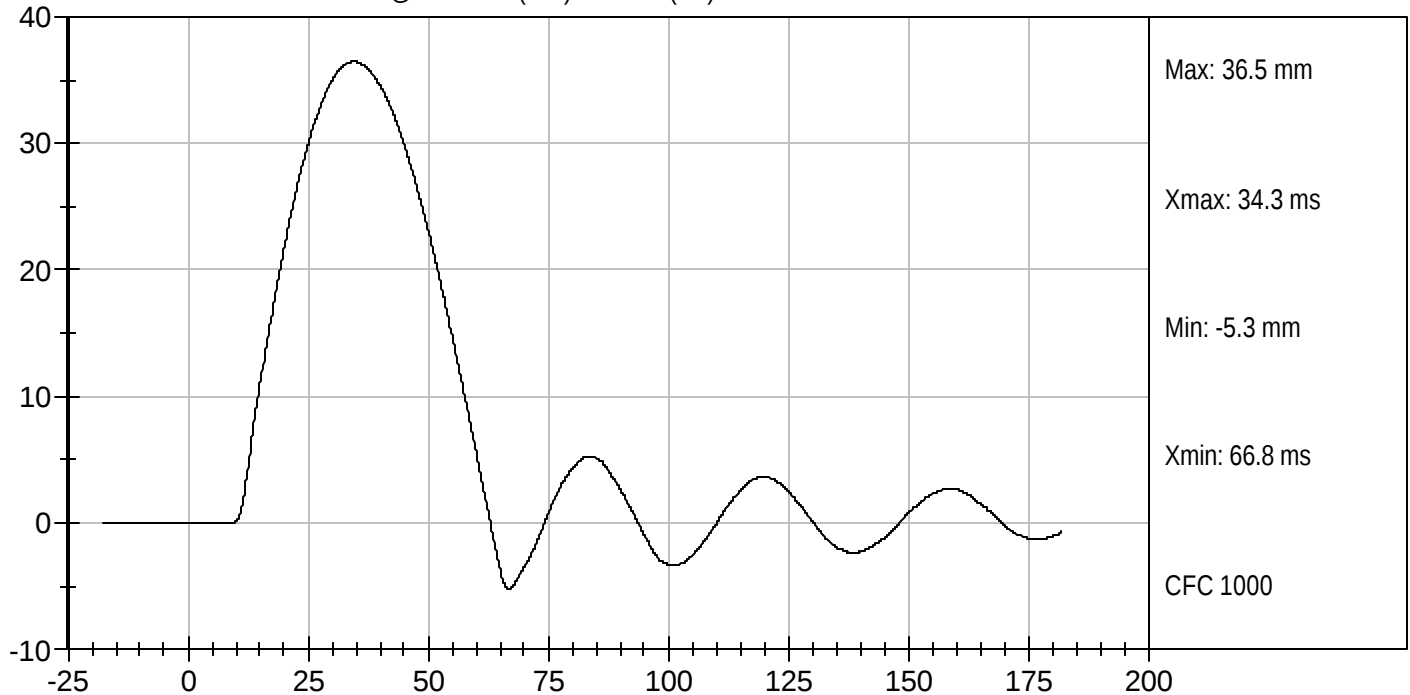
Test Desc: Rib Impact - Upper
Componet ID: D052464

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

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



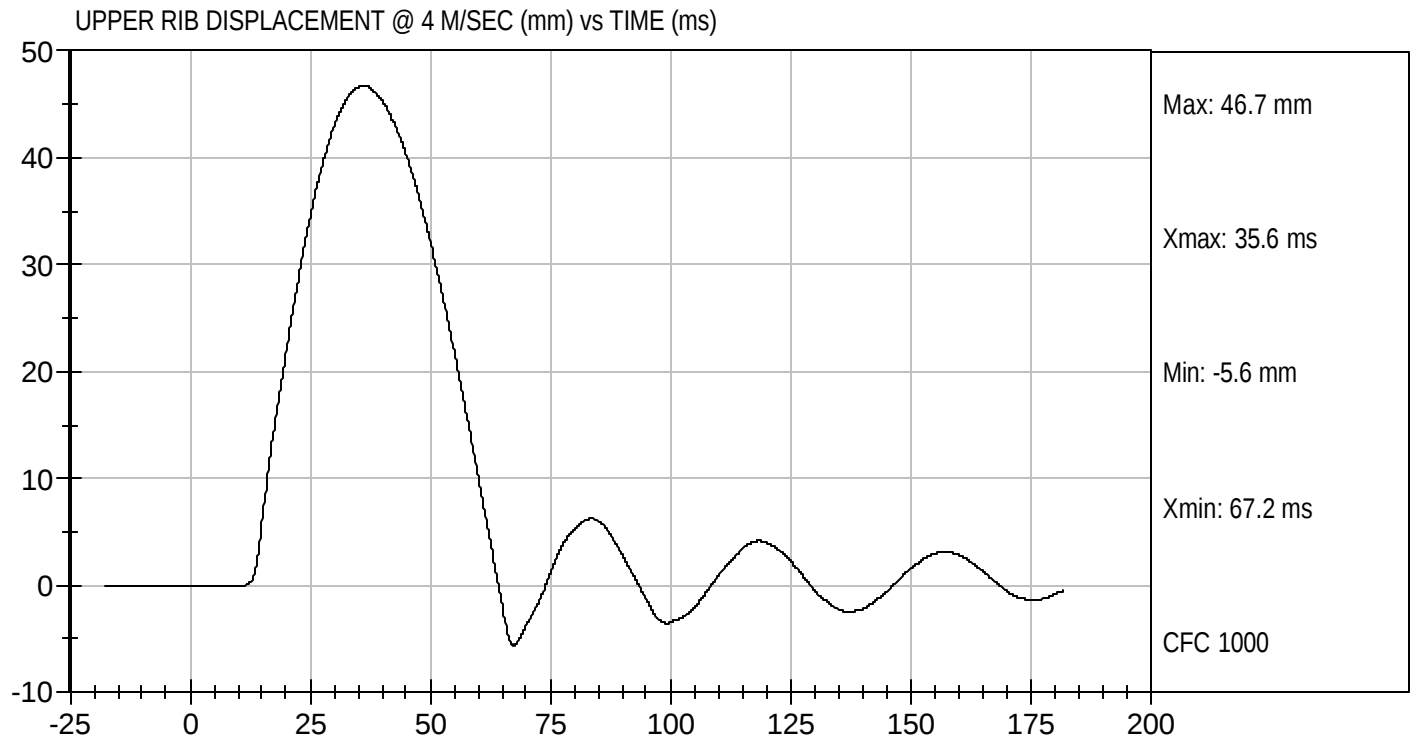
UPPER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)





Test Desc: Rib Impact - Upper
Componet ID: D052464

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



MGA RESEARCH CORPORATION
MID RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052465

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	45	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	37.3	Pass
Displacement at 4 m/s	mm	46.0 to 51.0	47.4	Pass
Overall Test Results			Pass	


Laboratory Technician

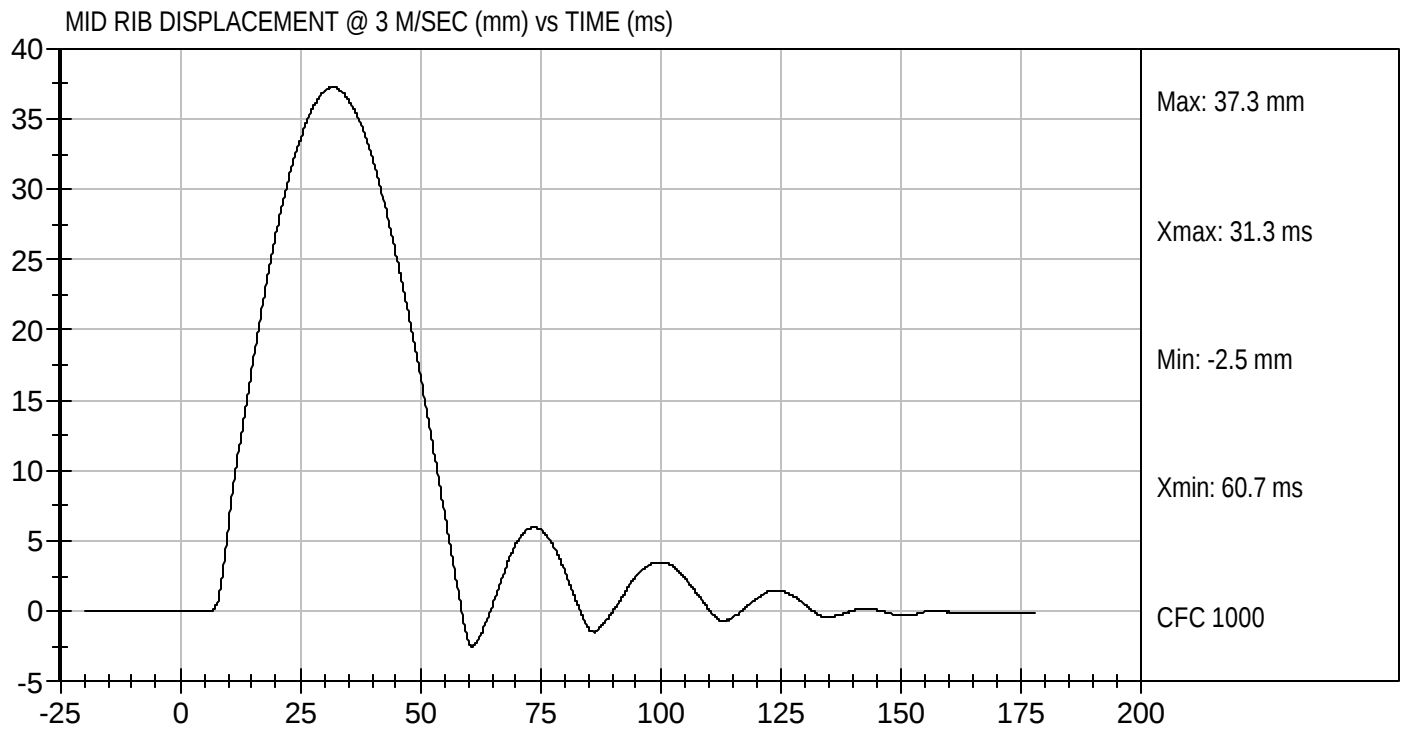
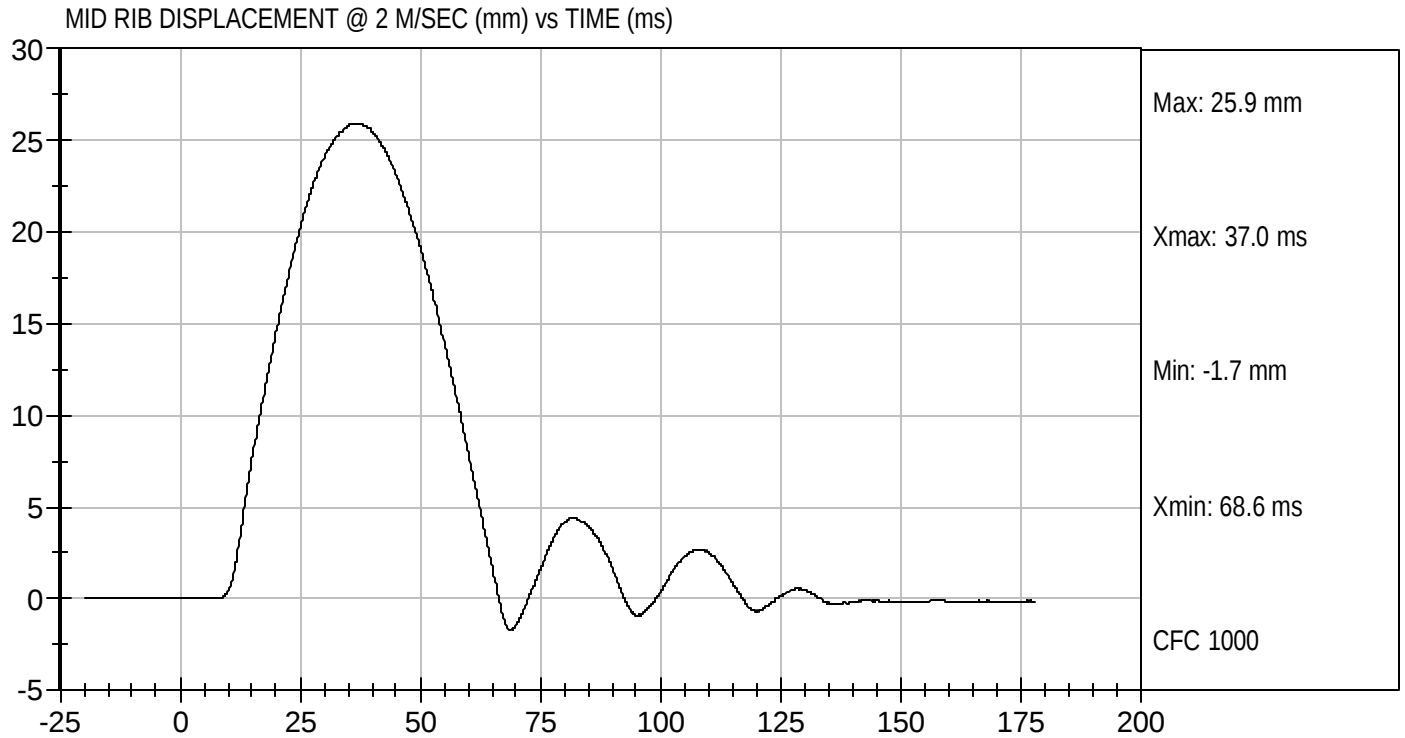

Approved By

09/06/2005
Test Date



Test Desc: Rib Impact - Mid
Componet ID: D052465

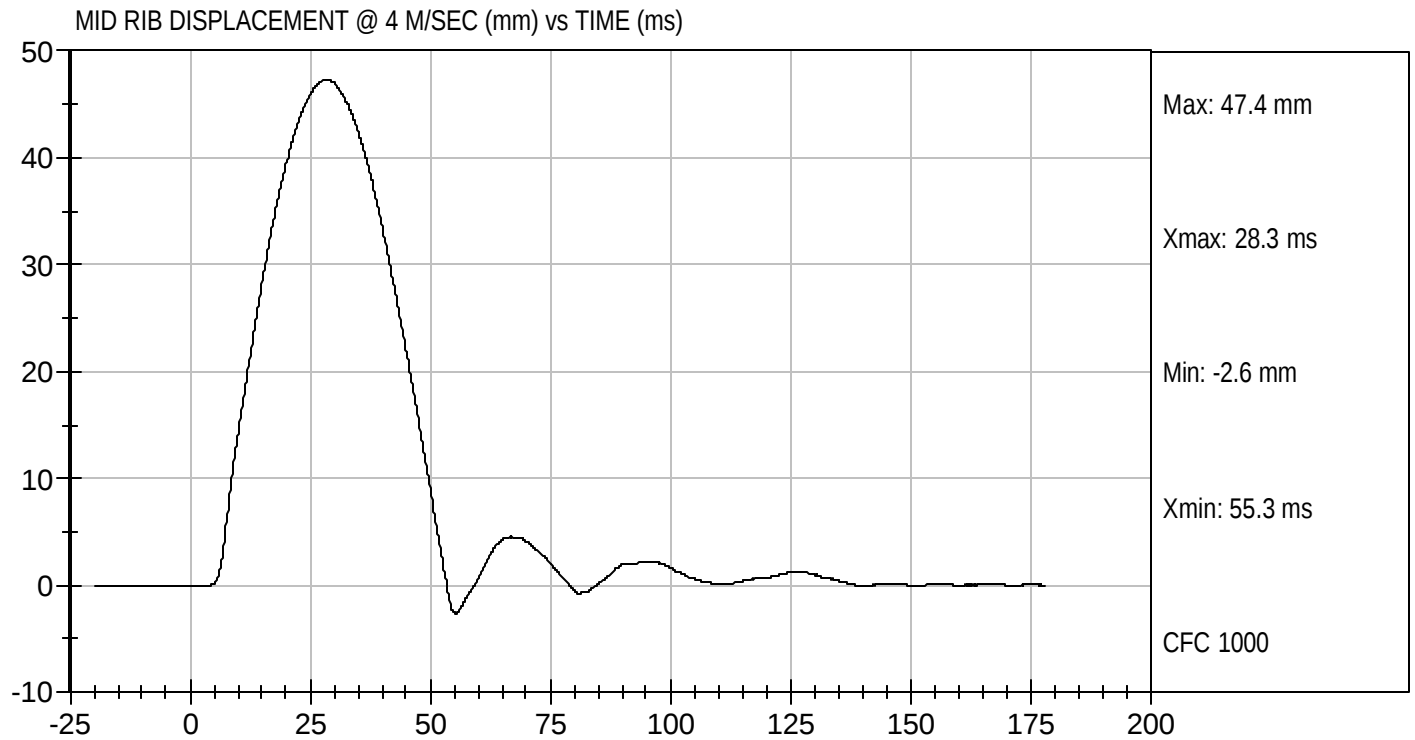
Test Date: 09/06/2005
Velocity: 6.56 ft/s, 2 m/s





Test Desc: Rib Impact - Mid
Componet ID: D052465

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



MGA RESEARCH CORPORATION
LOWER RIB TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052466

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	46	Pass
Displacement at 2 m/s	m/s	23.5 to 27.5	26.6	Pass
Displacement at 3 m/s	G's	36.0 to 40.0	37.9	Pass
Displacement at 4 m/s	msec	46.0 to 51.0	47.5	Pass
Overall Test Results			Pass	


Laboratory Technician


Approved By

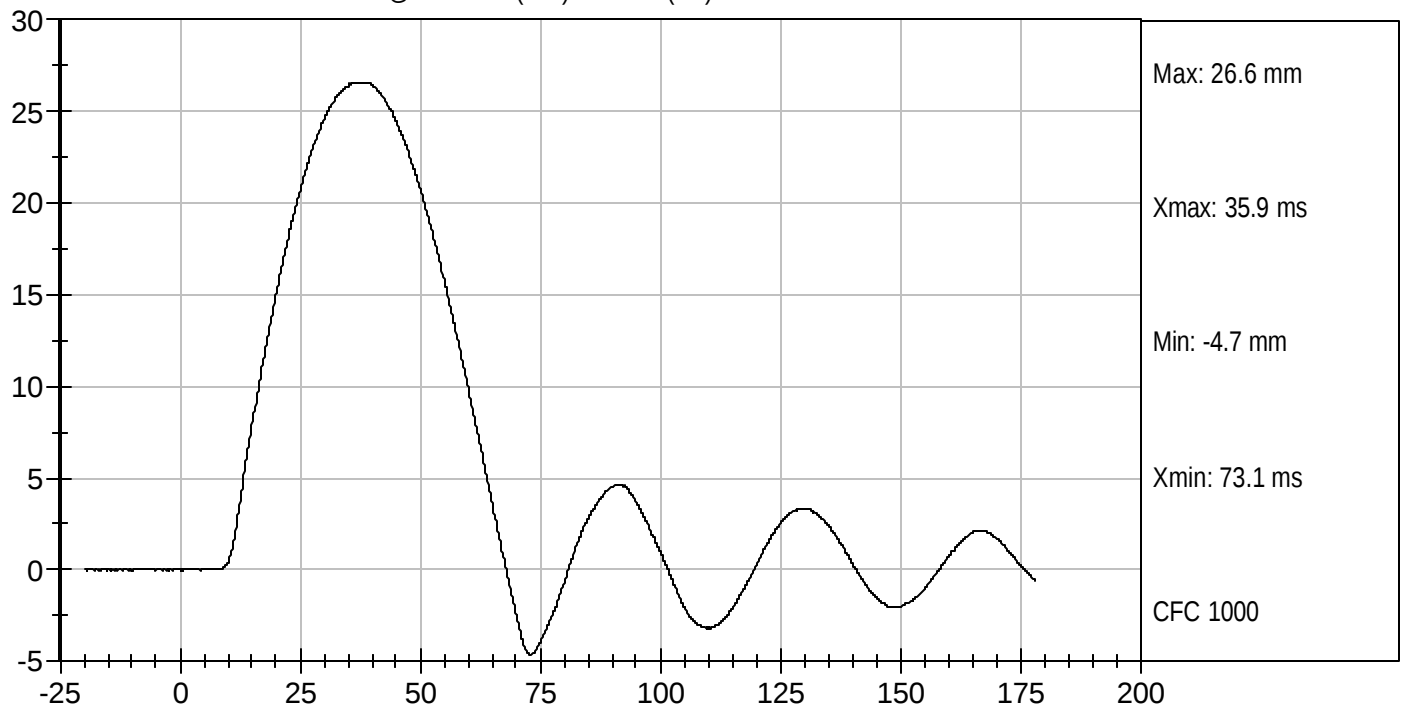
09/06/2005
Test Date



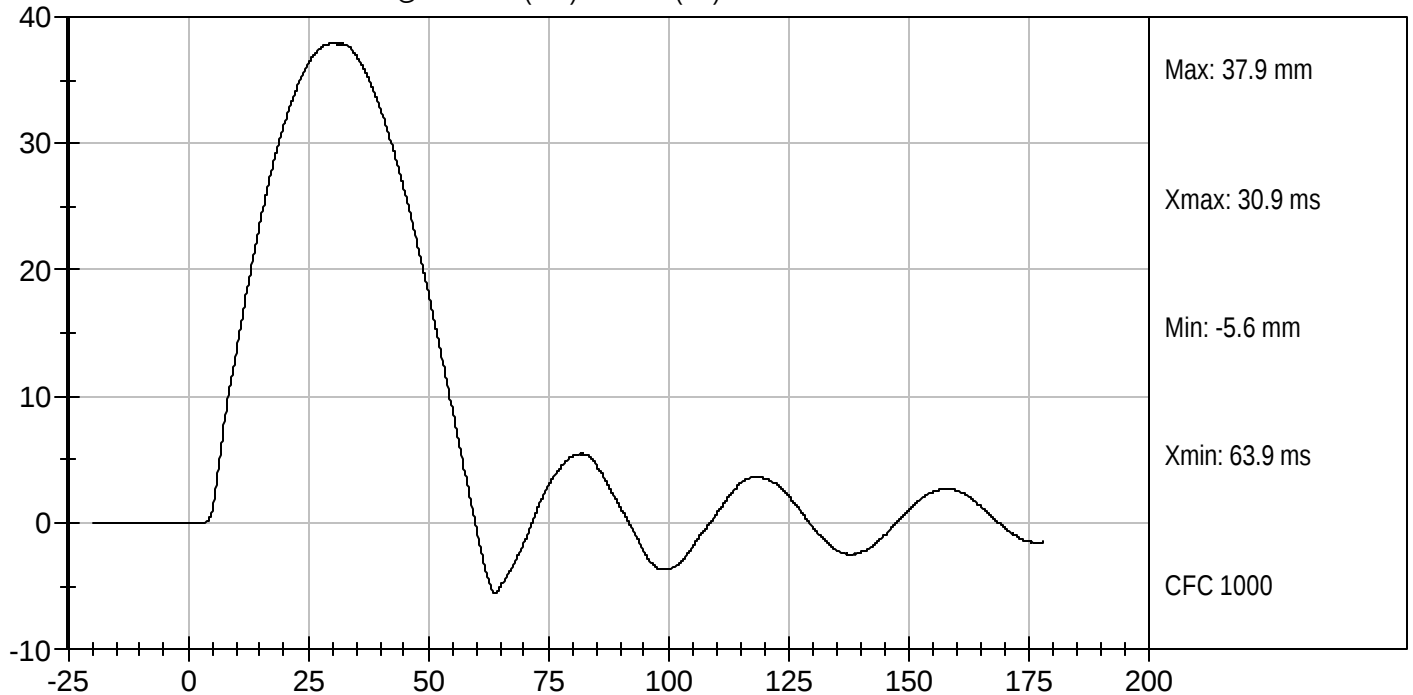
Test Desc: Rib Impact - Lower
Componet ID: D052466

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

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



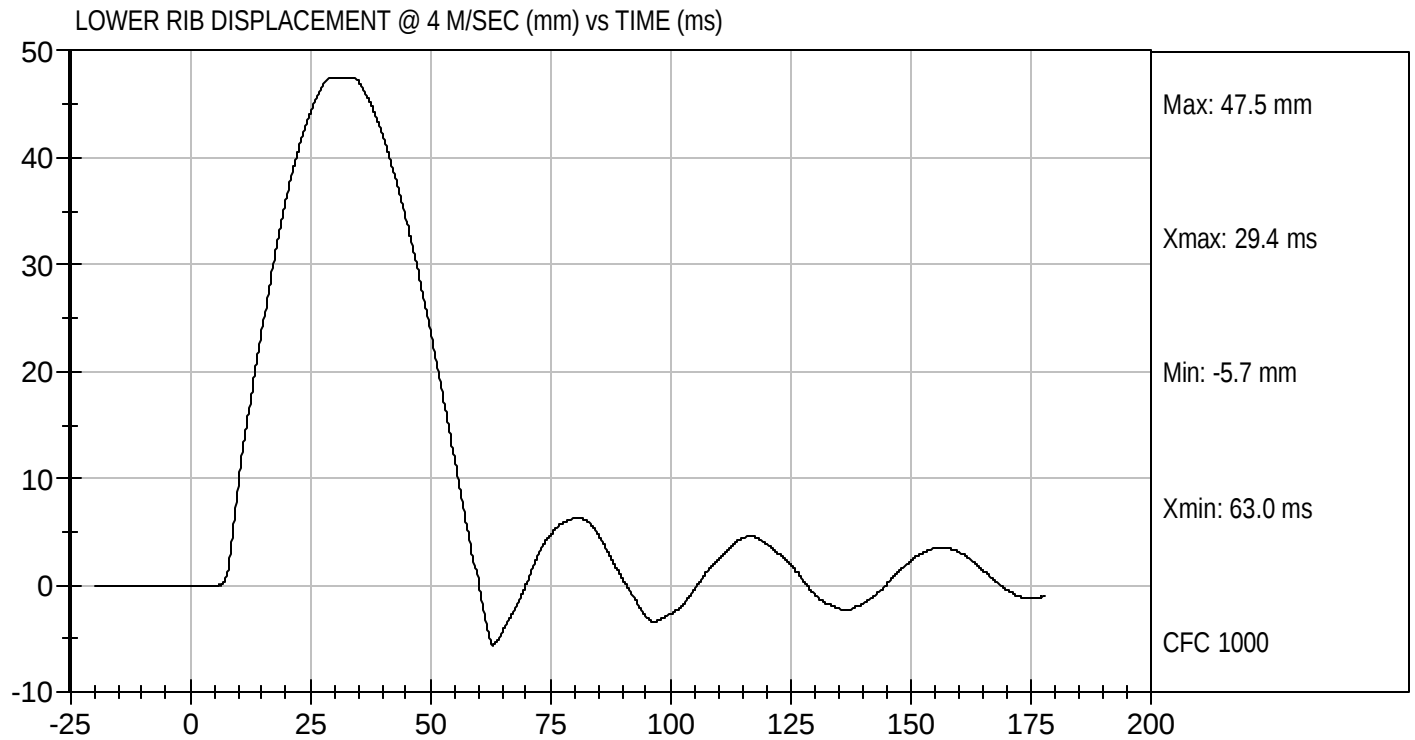
LOWER RIB DISPLACEMENT @ 3 M/SEC (mm) vs TIME (ms)





Test Desc: Rib Impact - Lower
Componet ID: D052466

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



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052467

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.0 to 22.0	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	3.90 to 4.10	4.05	Pass
Maximum Impact Force	kN	4.00 to 4.80	4.56	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	2.64	Pass
Time of Maximum Abdomen Force	msec	10.00 to 12.30	12.20	Pass
Overall Test Results				Pass


Laboratory Technician



Approved By

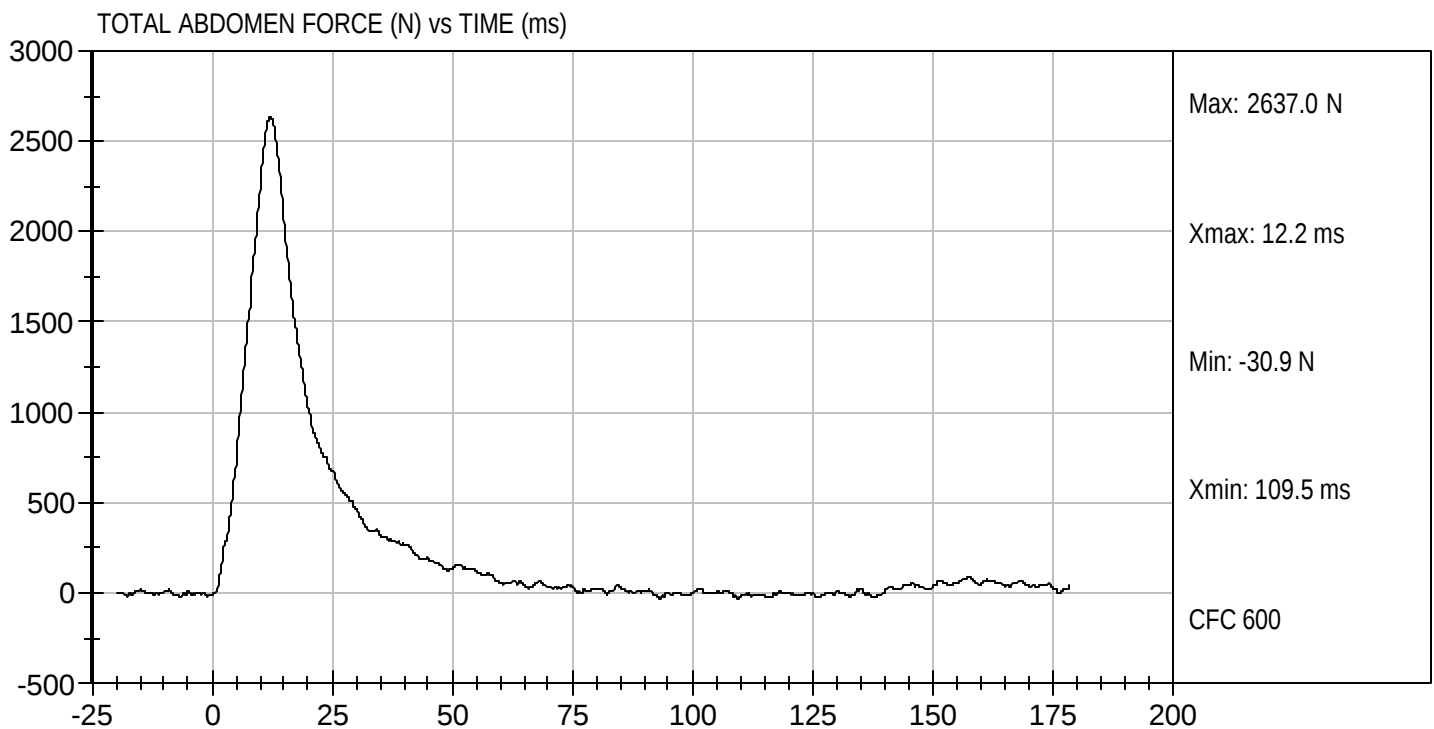
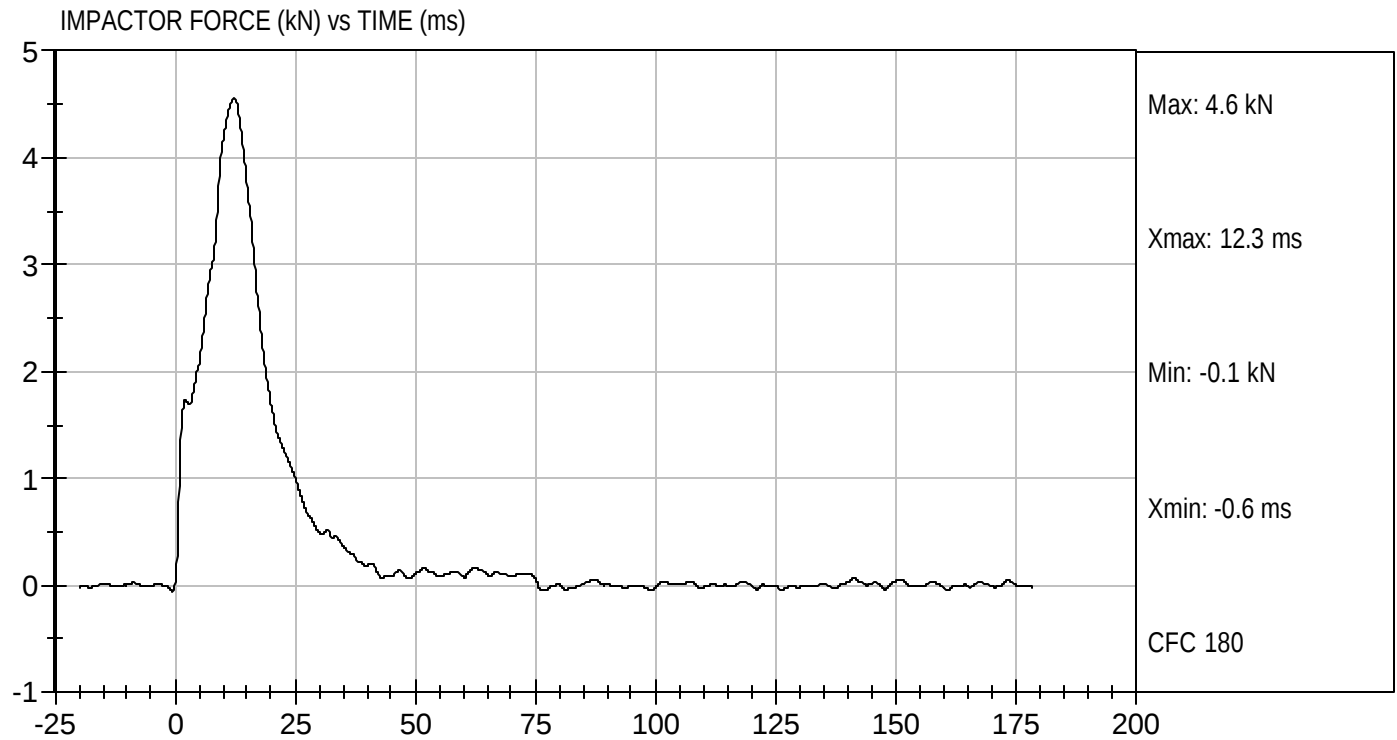
09/02/2005

Test Date



Test Desc: Abdomen Impact
Componet ID: D052467

Test Date: 09/02/2005
Velocity: 13.29 ft/s, 4.05 m/s



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052468

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	6.10	Pass
Pendulum Deceleration	10 msec	m/sec	-2.46 to -1.59	-2.24	Pass
	20 msec	m/sec	-5.25 to -4.07	-5.08	Pass
	25 msec	m/sec	-6.64 to -5.30	-6.16	Pass
	30 msec	m/sec	>= -6.5	-6.2	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	50.0	Pass
Time of Maximum Flexion Angle		msec	39.0 to 53.0	47.1	Pass
Maximum Theta (A)		deg	31.0 to 35.0	33.3	Pass
Time of Maximum Theta (A)		msec	44.0 to 52.0	44.1	Pass
Maximum Theta (B)		deg	28.62 to 31.12	30.48	Pass
Time of Maximum Theta (B)		msec	44.0 to 52.0	49.1	Pass
Overall Results					Pass


 Laboratory Technician



Approved By

09/06/2005

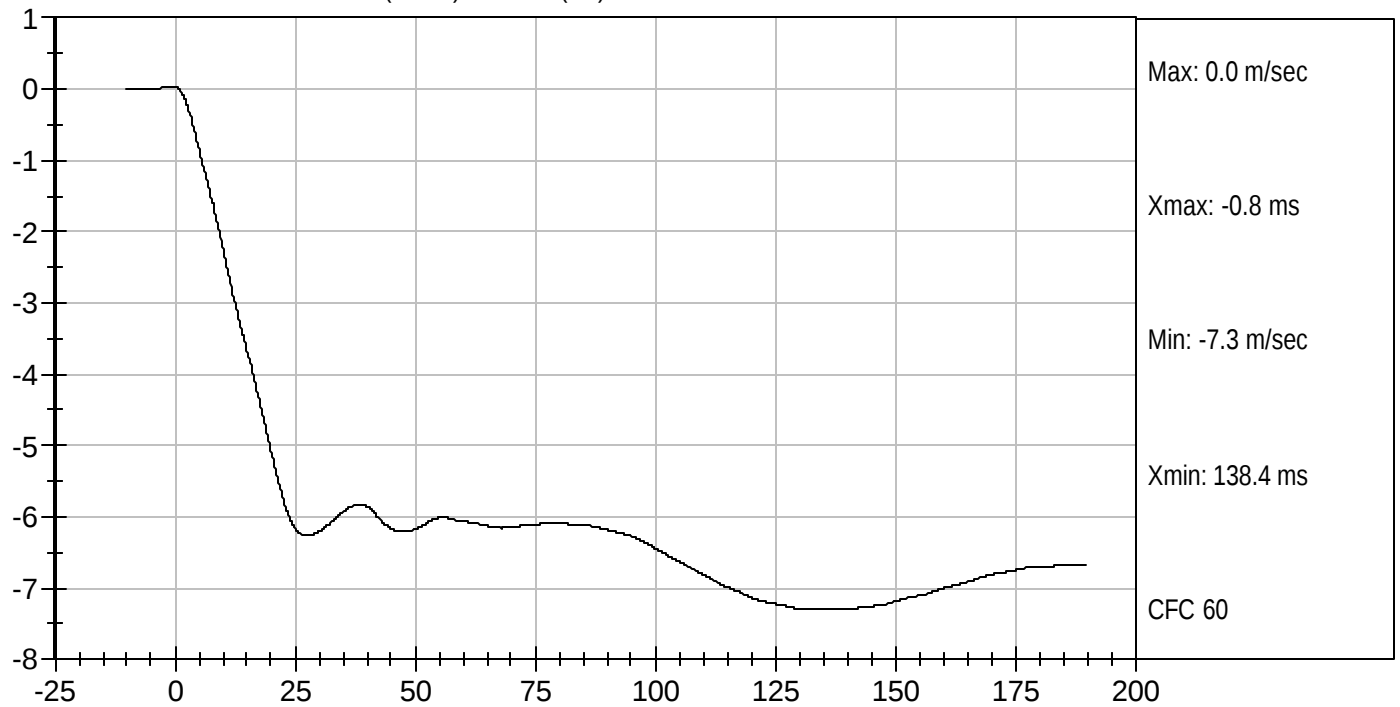
Test Date



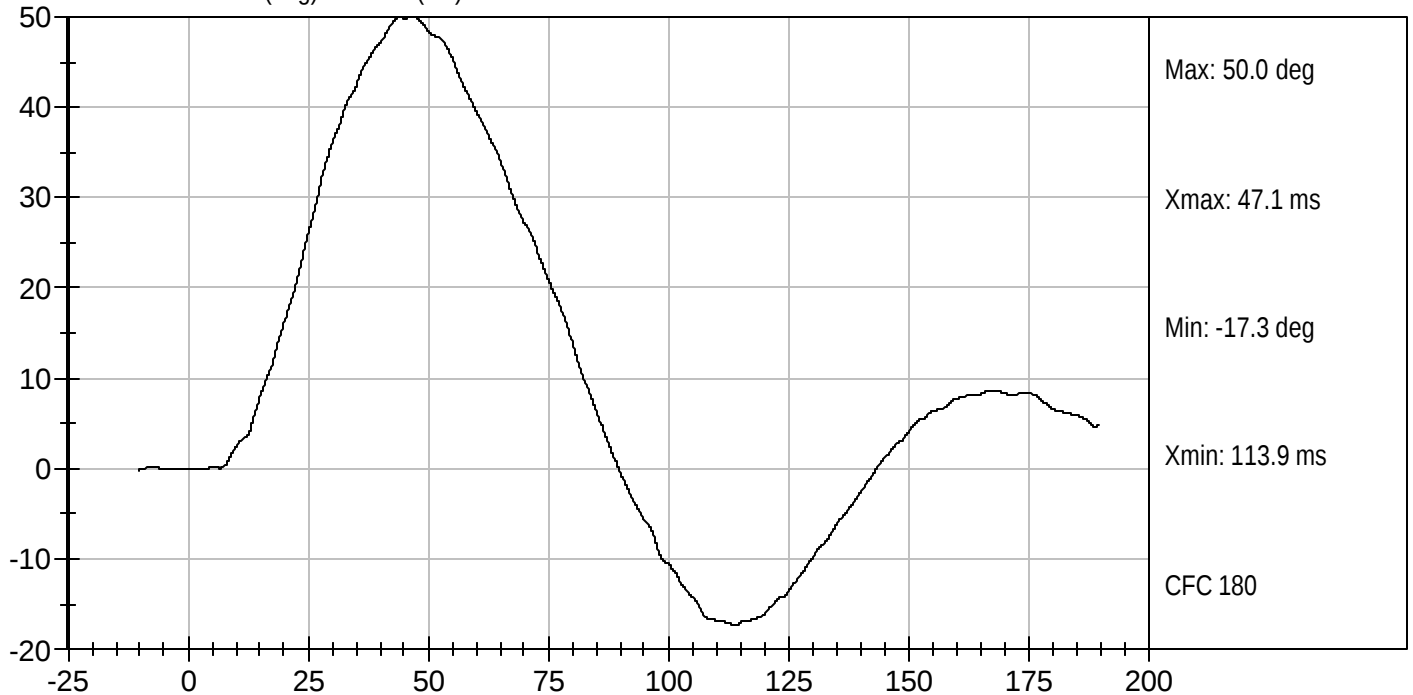
Test Desc: Lumbar Bending
Componet ID: D052468

Test Date: 09/06/2005
Velocity: 20.01 ft/s, 6.10 m/s

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



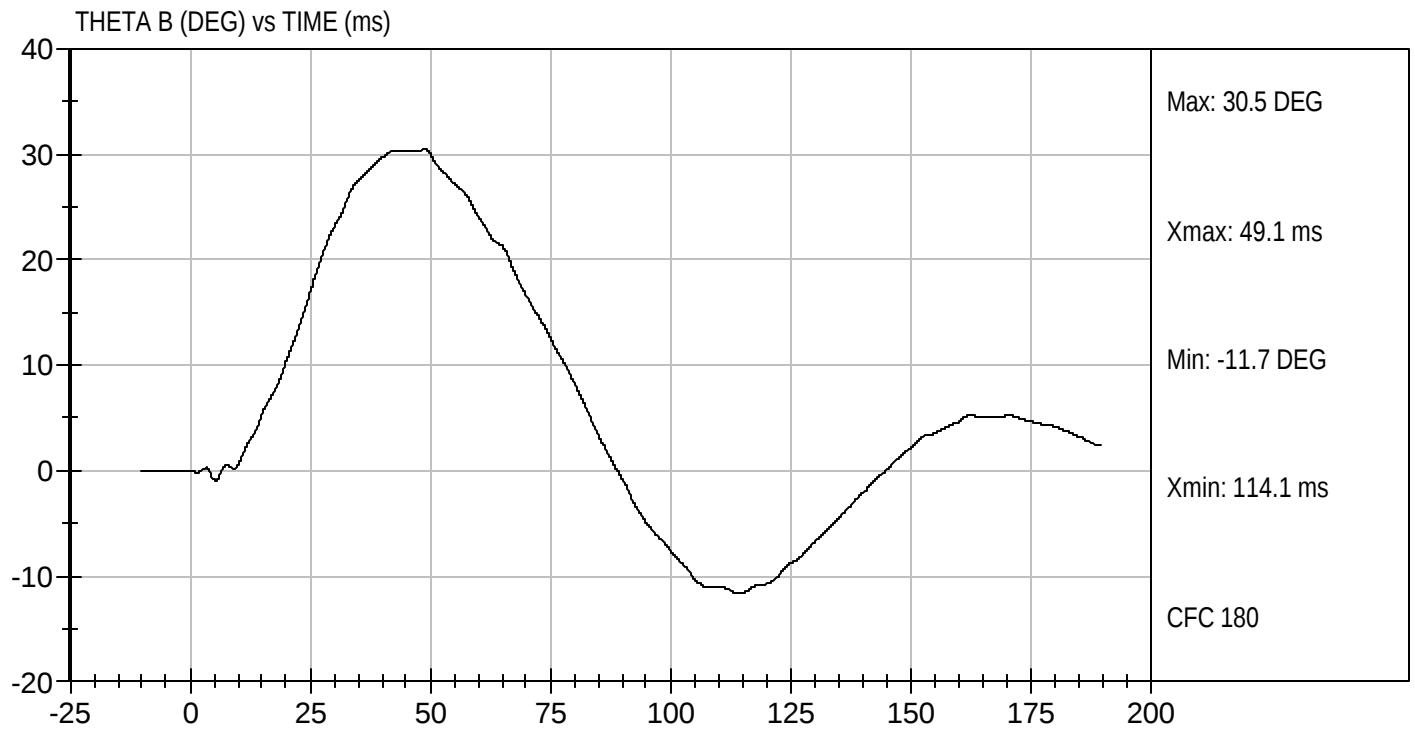
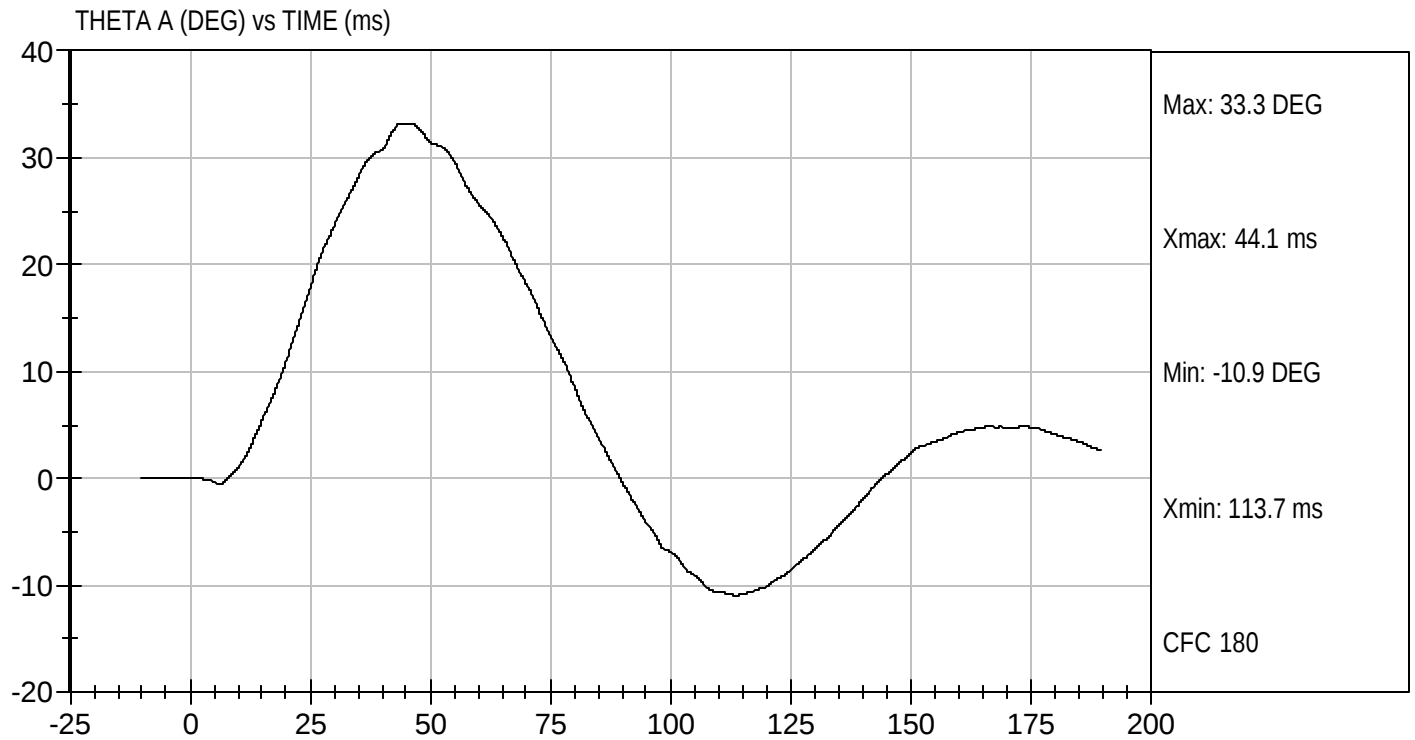
FLEXION ANGLE (deg) vs TIME (ms)





Test Desc: Lumbar Bending
Componet ID: D052468

Test Date: 09/06/2005
Velocity: 20.01 ft/s, 6.10 m/s



MGA RESEARCH CORPORATION
PELVIS TEST
EUROSID 2 DUMMY

ATD Serial No: 010

Test I.D: D052469

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
Probe Speed	m/s	4.20 to 4.40	4.31	Pass
Maximum Impactor Force	kN	4.40 to 5.40	5.02	Pass
Time of Maximum Impactor Force	msec	10.30 to 15.50	14.70	Pass
Maximum Pubic Force	kN	1.04 to 1.64	1.38	Pass
Time of Maximum Pubic Force	msec	9.90 to 15.90	14.90	Pass
Overall Test Results			Pass	


Laboratory Technician

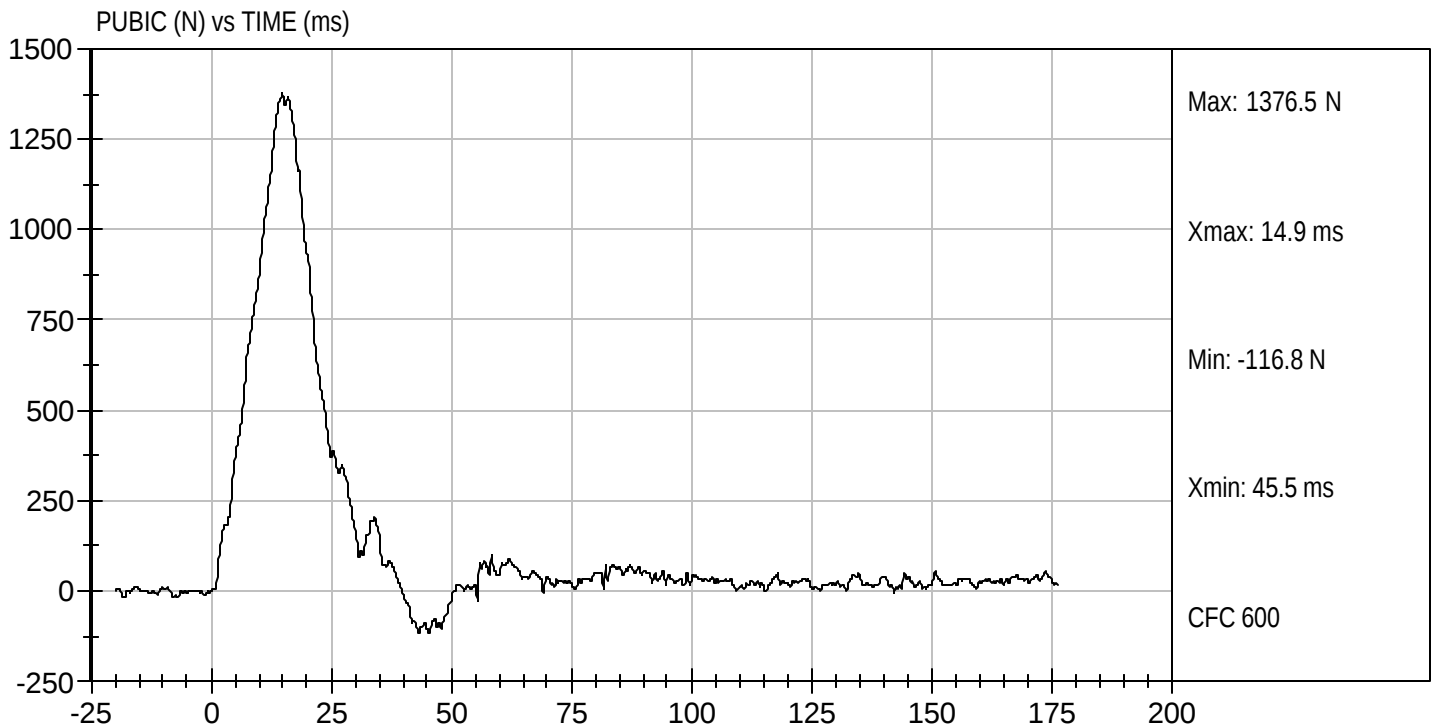
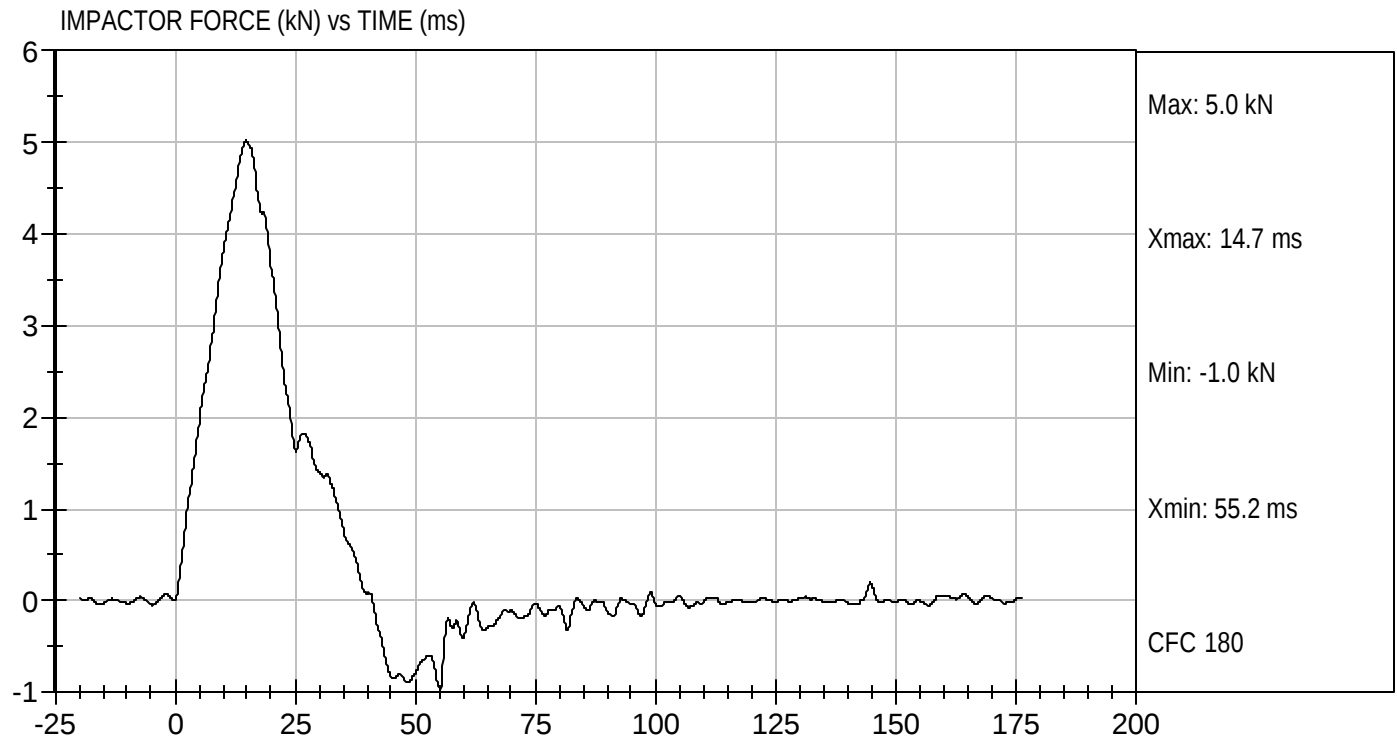

Approved By

09/02/2005
Test Date



Test Desc: Abdomen Impact
Componet ID: D052469

Test Date: 09/02/2005
Velocity: 14.13 ft/s, 4.31 m/s



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY ES-2RE: 010		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	J12425	Endevco	7/28/05
Head Y Accelerometer	J12462	Endevco	7/28/05
Head Z Accelerometer	J14006	Endevco	7/28/05
Head Y - Front	04J14-J10	Entran	5/24/05
Head Z - Front	04J14-J16	Entran	5/24/05
Head X – Left	AP0G2	Endevco	4/12/05
Head Z – Left	P22454	Endevco	7/07/05
Head X – Upper	ALB87	Endevco	7/06/05
Head Y – Upper	A28-H04	Entran	4/12/05
Upper Neck Load Cell	106	FTSS	9/23/04
Lower Neck Load Cell	111	FTSS	9/23/04
Shoulder Load Cell	120	FTSS	8/10/05
T12 Load Cell	102	FTSS	9/24/04
Upper Spine X	P22652	Endevco	7/28/05
Upper Spine Y	P22150	Endevco	7/28/05
Upper Spine Z	AJ417	Endevco	7/28/05
Lower Spine X	AMR94	Endevco	4/27/05
Lower Spine Y	AN8P9	Endevco	4/27/05
Lower Spine Z	AMP95	Endevco	4/27/05
Torso Load Cell	104	FTSS	9/29/04
Upper Rib Y	AHTT2	Endevco	7/07/05
Mid Rib Y	J26-H13	Entran	7/06/05
Lower Rib Y	AC9B7	Endevco	4/27/05
Rib Displacement	010	Honeywell	7/26/05
Front Abdomen FY	ABG119FY	FTSS	9/30/04
Mid Abdomen FY	ABG120FY	FTSS	9/30/04
Rear Abdomen FY	ABG121FY	FTSS	9/30/04
Pubic Symphysis FY	PG113FY	FTSS	9/24/04
Pelvis X	P22180	Endevco	7/07/05
Pelvis Y	P22805	Endevco	7/07/05
Pelvis Z	P22190	Endevco	7/07/05
Right Femur Load Cell	137	FTSS	9/28/04
Left Femur Load Cell	109	FTSS	9/20/04
Lumbar Load Cell	105	FTSS	9/27/04

VEHICLE INSTRUMENTS CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	B28-Z10	Entran	3/17/05
Left Lower A-Post Y	D03-Z20	Entran	4/22/05
Left Mid B-Post Y	C29-L24	Entran	4/25/05
Left Lower B-Post Y	B28-Z15	Entran	3/17/05
Left A-Post @ Sill Y	C29-L19	Entran	4/25/05
Left B-Post @ Sill Y	B26-Z16	Entran	3/17/05
Driver Seat Track Y	B16-Z03	Entran	3/03/05
Right Front Sill X	D03-Z17	Entran	4/22/05
Right Front Sill Y	C21-G24	Entran	4/22/05
Right Front Sill Z	D03-Z31	Entran	4/22/05
Left Rear Sill Y	B19-Z13	Entran	3/03/05
Left Front Sill Y	B28-Z22	Entran	3/17/05
Floorpan @ Rear Axle X	C31-Z03	Entran	4/28/05
Floorpan @ Rear Axle Y	C21-G29	Entran	4/28/05
Floorpan @ Rear Axle Z	C21-G28	Entran	4/28/05
Vehicle CG X	C15-L10	Entran	4/22/05
Vehicle CG Y	C15-L07	Entran	4/22/05
Vehicle CG Z	C21-G09	Entran	4/22/05
Left Front Door @ Pelvis	I28-H41	Entran	4/28/05
Left Front Door @ Arm	B21-Z02	Entran	3/03/05
Left Front Door @ Knee	E05-Z51	Entran	6/28/05
Left Front Door @ Mid Rib	C21-G03	Entran	4/28/05
Upper Engine X	C21-G11	Entran	4/28/05
Upper Engine Y	C15-L21	Entran	4/22/05
Firewall Y	C06-L18	Entran	3/24/05