

REPORT NUMBER: TO1-MGA-2004-012

**OBLIQUE RIGID SIDE POLE IMPACT
ES-2RE DRIVER POSITION
TEST DATE: May 5, 2005
Task Order #T0001 / RFP #0004**

**2005 VOLKSWAGEN JETTA
NHTSA NUMBER: R55801**

**PREPARED BY:
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**FINAL REPORT SUBMITTED:
April 12, 2006**

**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.

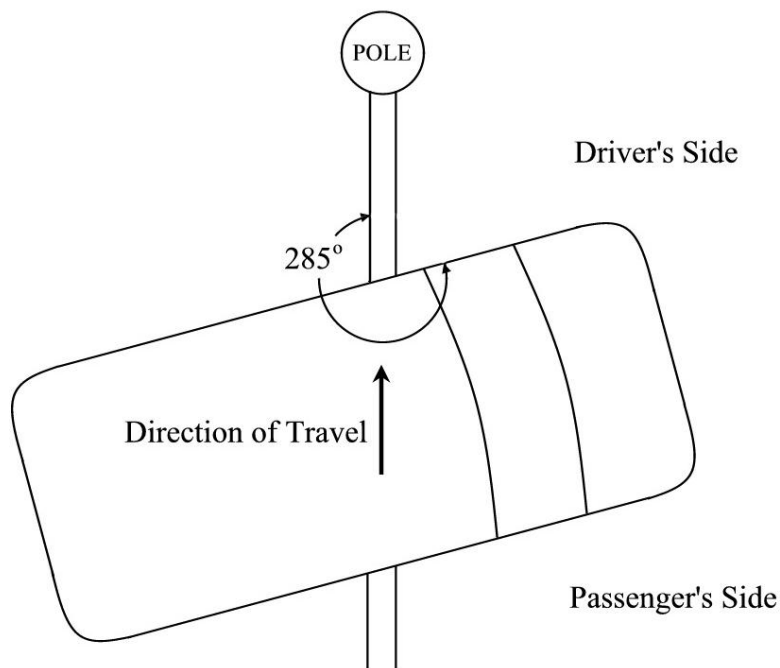
SECTION 2

SUMMARY OF SIDE IMPACT TEST

An oblique rigid side pole impact test at 75 degrees was performed on a 2005 Volkswagen Jetta. 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 1641.1 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on May 5, 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 twelve 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)	48.4
	T2 (msec)	63.4
	HIC 15	570
HIC 36 (CFC 1000)	T1 (msec)	44.1
	T2 (msec)	67.6
	HIC 36	652
Thorax (CFC 180)		
Chest Deflection	Upper Rib Deflection	-36
	Mid Rib Deflection	-26
	Lower Rib Deflection	-20
Lower Spine (CFC 180)		
	Lower Spine Resultant	60
Abdomen (CFC 600)		
	Front Abdominal Force	308
	Mid Abdominal Force	581
	Rear Abdominal Force	793
	Sum of Abdominal Force	1663
Pelvis (CFC 600)		
	Pubic Symphysis Force	-3372

Contact Times	Left Front
Head (msec)	**
Arm (msec)	25
Rib (msec)	20
Pelvis (msec)	17

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

TEST NOTES

Driver Seat Track Y – No valid data after 40 msec
Vehicle CG X – No valid data after 55 msec
LF Door @ Mid Rib Y – No valid data after 10 msec
Upper Engine 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 Volkswagen Jetta

Test Date: May 5, 2005

TEST VEHICLE INFORMATION

Make	Volkswagen
Model	Jetta 2.5
Body Style	Sedan
VIN	3VWPF71K25M614264
Color	Blue Graphite
Odometer Reading (mile)	63
Transmission	Automatic
Final Drive	Front
Number of Cylinders	5
Engine Displacement (L)	2.5
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain & Thorax
Power Windows	Yes
Power Steering	Yes
Power Door Lock	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	Volkswagen De Mexico	GVWR (kg)	1970
Date of Manufacture	03/05	GAWR Front (kg)	1060
		GAWR Rear (kg)	960

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Cold Pressure (kPa)	230	230
Recommended Tire Size	P195/65/R15	P195/65/R15
Tire Size on Vehicle	P195/65/R15	P195/65/R15
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket		
Number Of Occupants	2	2		5
Capacity Wt. (VCW) (kg)				441
Cargo Wt. (RCLW) (kg)				100.7

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Volkswagen JettaTest Date: May 5, 2005**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	441.8	288.0		475.4	356.5	
Right	kg	431.8	302.6		446.3	362.9	
Ratio	%	59.7	40.4		56.2	43.8	
Totals	kg	873.6	590.6	1464.2	921.7	719.4	1641.1

TARGET TEST WEIGHT

Measured Parameter	Units	Value
As Delivered Vehicle Weight	kg	1464.2
Weight of 1 ES-2RE	kg	80.7
Rated Cargo Weight	kg	100.7
Vehicle Target Weight (TVTW)	kg	1645.6

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	1.0° ND	1.0° ND	1.1° ND
Left Door Sill Angle	Deg	1.2° ND	1.1° ND	1.0° ND
Front Bumper Angle	Deg	0.1° LU	0.1° LU	0.1° LU
Rear Bumper Angle	Deg	0.1° RU	0.3° RU	0.1° RU

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	2580
Total Vehicle Length at Centerline	mm	4513
Total Vehicle Width	mm	1758
Weight of Ballast in Cargo Area	kg	0.0
Amount of Water in Fuel Tank	liters	54.9

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Impact Reference Line from Front Axle	mm	1234
Impact Point	mm	0
Impact Angle Difference	deg	0.0°

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 21°, on H-point machine

SEAT FORE/AFT POSITIONS

The driver's seat was power operated.

Driver seat fore/aft total travel: 290mm

Driver seat fore/aft position: 145 of 290 mm

SEAT BELT UPPER ANCHORAGE

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

STEERING COLUMN ADJUSTMENT

The column was placed in the mid position of travel.

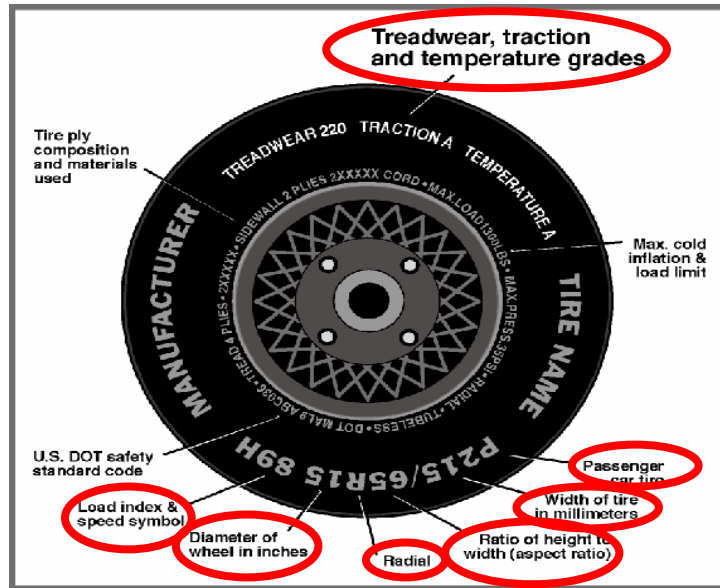
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

Vehicle Year	2005	Vehicle Make	Volkswagen
VIN	3VWPF71K25M614264	Vehicle Model	Jetta 2.5



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV458	Energy MXV458
Tire Type	Tubeless Radial	Tubeless Radial
Tire Width (mm)	195	195
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	91H	91H
Treadwear	440	440
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3
POST TEST OBSERVATIONS

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES-2RE
Head Contact	Curtain bag, Headrest
Upper Torso Contact	Door Panel
Lower Torso Contact	Side Airbag
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

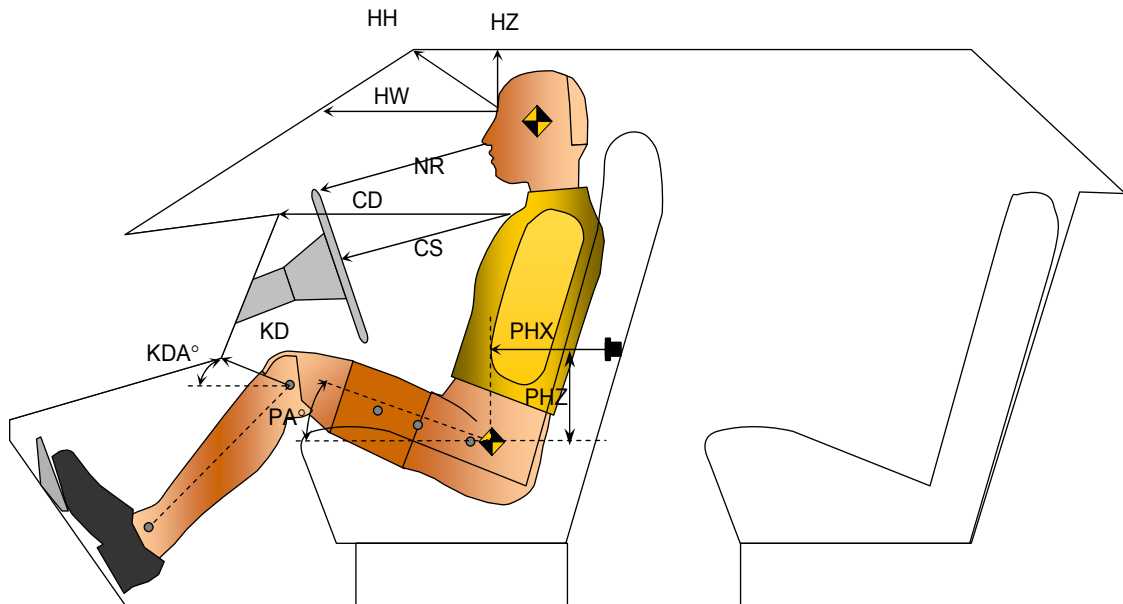
	Driver
Front	No
Side	Yes
Curtain	Yes

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

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

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

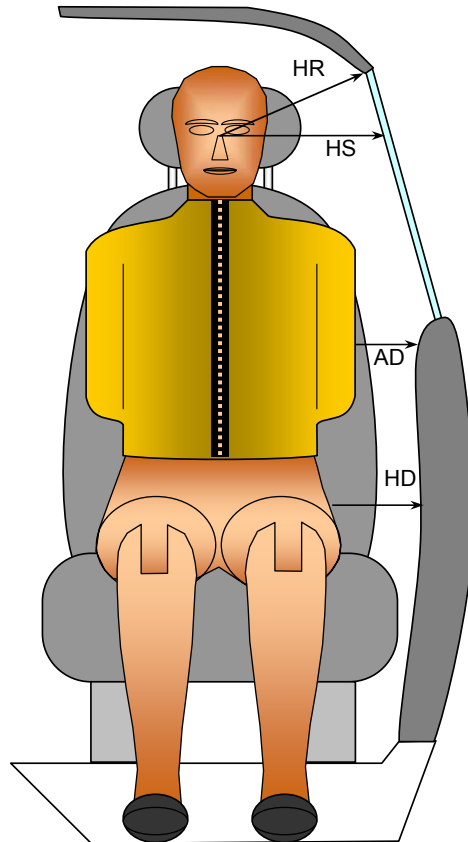


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	406	
HW	Head to Windshield	667	
HZ	Head to Roof	174	
NR	Nose to Rim	443	
CD	Chest to Dash (Top of Rib)	549	
CS	Chest to Steering Wheel (Top of Rib)	342	
KDL	Left Knee to Dash	203	33.2
KDR	Right Knee to Dash	161	28.7
PA	Pelvic Angle (Longitudinal)		24.0
PA	Pelvic Angle (Lateral)		0.8
SA	Spine Angle (Longitudinal)		22.6
SA	Spine Angle (Lateral)		0.7
PHX	H-Point to Striker (X-Axis)	174	
PHZ	H-Point to Striker (Z-Axis)	207	

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

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005



FRONT VIEW OF DUMMY

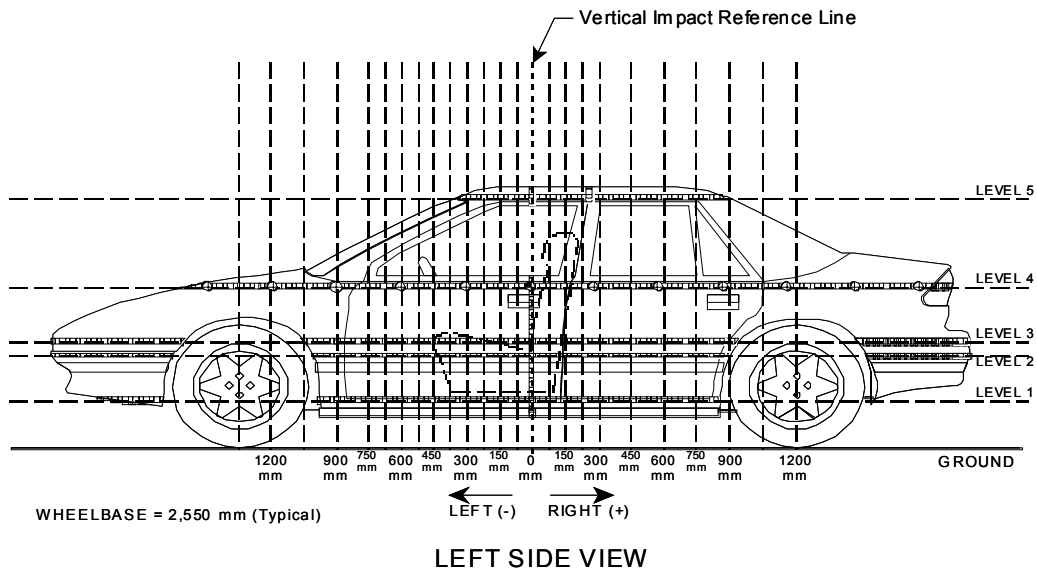
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	207
HS	Head to Side Window	mm	349
AD	Arm to Door	mm	111
HD	H-Point to Door	mm	182

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

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 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	1446
4	Window Sill	1008
3	Mid Door	702
2	Occupant H-Point	560
1	Sill Top	369

DATA SHEET NO. 7
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

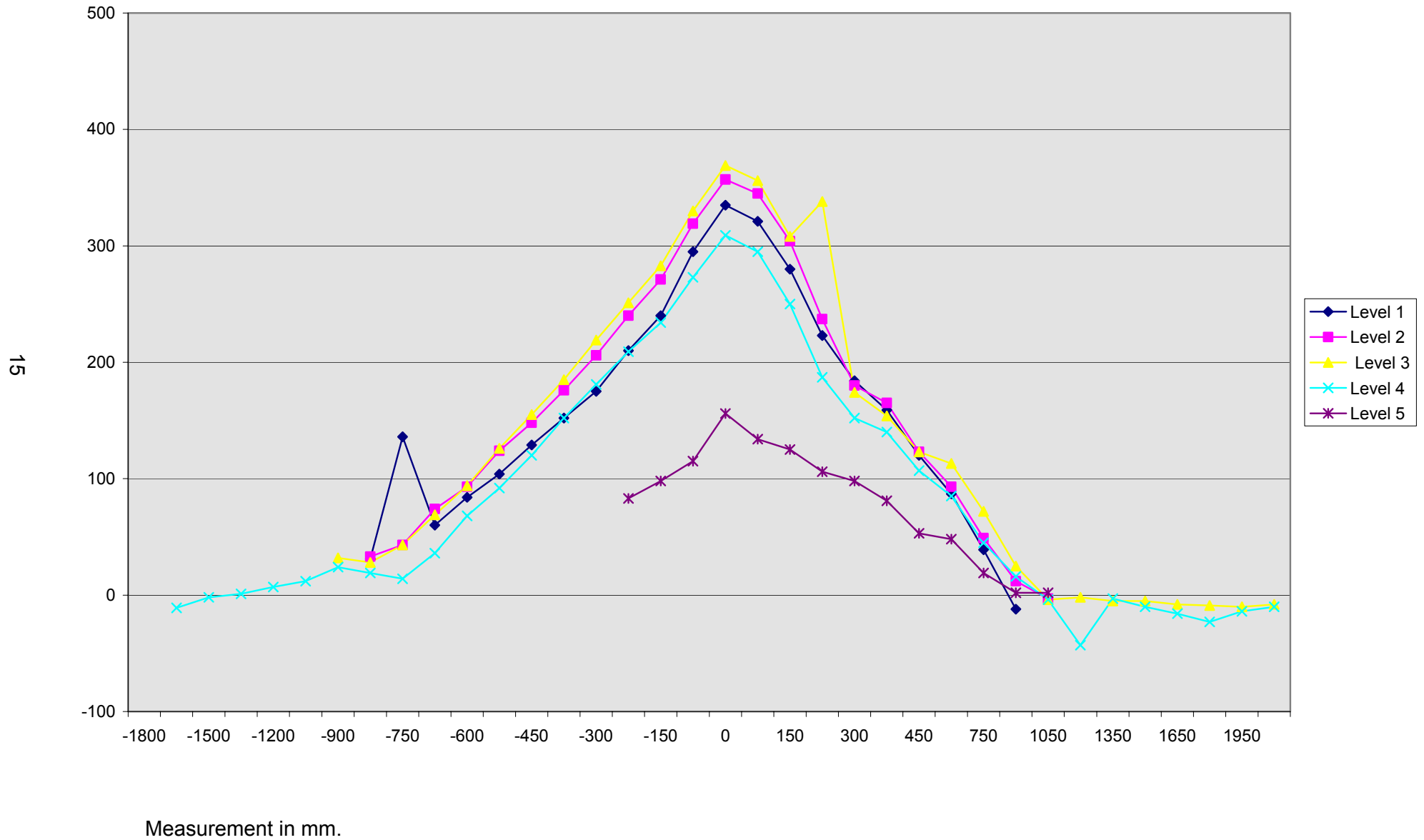
Pre-Test						Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1800															
-1650				363					352					-11	
-1500				341					339					-2	
-1350				318					319					1	
-1200				307					314					7	
-1050				300					312					12	
-900			225	291				257	315				32	24	
-825	250	230	230	292		281	263	258	311		31	33	28	19	
-750	251	235	230	292		287	278	273	306		36	43	43	14	
-675	249	235	229	289		309	309	298	325		60	74	69	36	
-600	248	235	228	288		332	328	322	356		84	93	94	68	
-525	247	234	227	287		351	358	353	379		104	124	126	92	
-450	245	232	225	287		374	380	380	407		129	148	155	120	
-375	245	232	225	286		397	408	410	438		152	176	185	152	
-300	245	232	224	287		420	438	443	468		175	206	219	181	
-225	244	231	224	287	508	454	471	475	496	591	210	240	251	209	83
-150	243	231	223	288	503	483	502	506	522	601	240	271	283	234	98
-75	244	230	222	289	503	539	549	552	562	618	295	319	330	273	115
0	243	230	223	290	500	578	587	592	599	656	335	357	369	309	156
75	243	230	223	290	505	564	575	579	585	639	321	345	356	295	134
150	243	231	224	292	505	523	535	532	542	630	280	304	308	250	125
225	245	232	224	295	508	468	469	562	482	614	223	237	338	187	106
300	246	232	224	297	510	430	412	398	449	608	184	180	174	152	98
375	247	233	225	298	510	406	398	379	438	591	159	165	154	140	81
450	248	235	226	300	512	368	358	349	407	565	120	123	123	107	53
525															
600	251	237	230	306	518	338	330	343	391	566	87	93	113	85	48
750	255	240	235	313	525	294	289	307	358	544	39	49	72	45	19
900	253	242	240	320	533	241	254	265	336	535	-12	12	25	16	2
1050		232	238	325	546		229	234	321	548		-3	-4	-4	2
1200			233	335				231	292				-2	-43	
1350			235	343				230	340				-5	-3	
1500			238	354				233	344				-5	-10	
1650			267	367				259	351				-8	-16	
1800			290	388				281	365				-9	-23	
1950			312	394				302	380				-10	-14	
2100			335	414				327	404				-8	-10	

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 Volkswagen Jetta

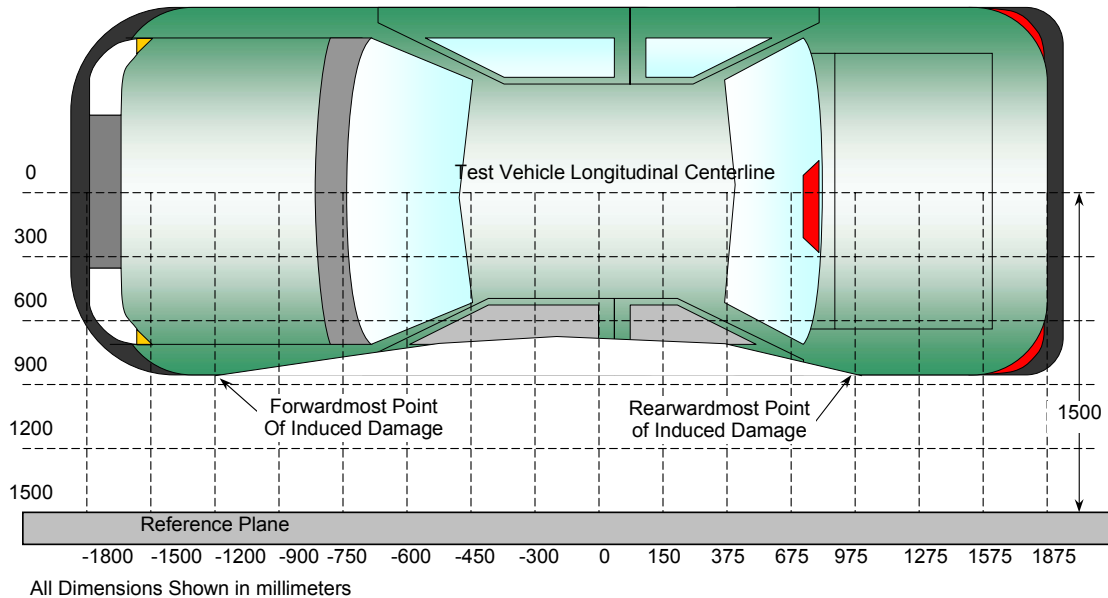
Test Date: May 5, 2005



DATA SHEET NO. 8 **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 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	2100 mm	4	414	404	-10
2	1387 mm	3	236	230	-6
3	673 mm	3	232	326	94
4	-150 mm	2	231	502	271
5	-917 mm	4	292	314	22
6	-1650 mm	4	363	352	-11

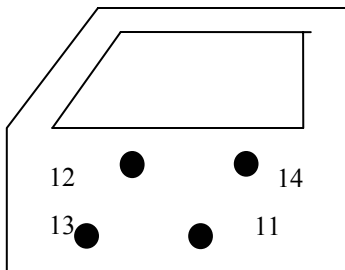
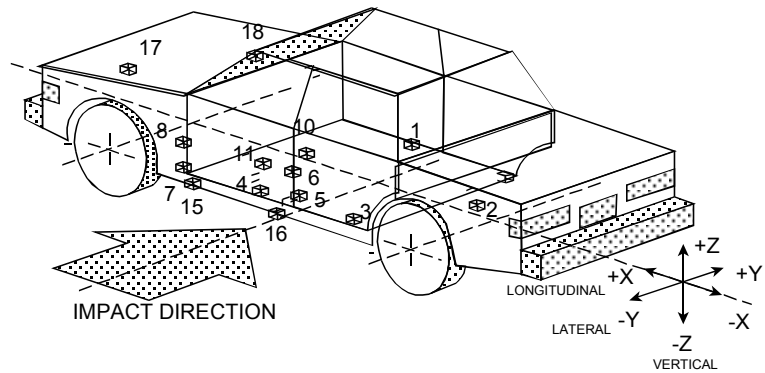
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body.

DATA SHEET NO. 9 **VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 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 Volkswagen Jetta

Test Date: May 5, 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	1.8	-5.6	15.4	-1.5	5.3	-3.3	15.9
2	Rear Floorpan Above Axle	2.7	-8.1	18.4	-1.9	6.4	-7.8	18.6
3	Left Side Sill at Rear Door			48.8	-25.0			
4	Left Side Sill at Front Door			65.0	-1.2			
5	Left Lower B-Post			34.6	-9.7			
6	Left Mid B-Post			65.8	-19.9			
7	Left Lower A-Post			20.9	-12.4			
8	Left Mid A-Post			34.2	-10.1			
9	Driver Left Seat Track			*	*			
10	Vehicle CG	**	**	45.2	-17.9	22.6	-5.3	**
11	Left Front Door at Pelvis			73.4	-42.3			
12	Left Front Door at Arm			86.2	-24.0			
13	Left Front Door at Knee			65.6	-50.9			
14	Left Front Door at Rib			***	***			
15	Left A-Post @ Sill			28.6	-4.9			
16	Left B-Post @ Sill			83.8	-7.2			
17	Upper Engine	6.1	-12.8	****	****			
18	Firewall			11.1	-0.8			

* No valid data collected after 40 msec

** No valid data collected after 55 msec

***No valid data collected after 10 msec

****No valid data collected

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

DATA SHEET NO. 9... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Volkswagen Jetta

Test Date: May 5, 2005

VEHICLE ACCELEROMETER COORDINATES

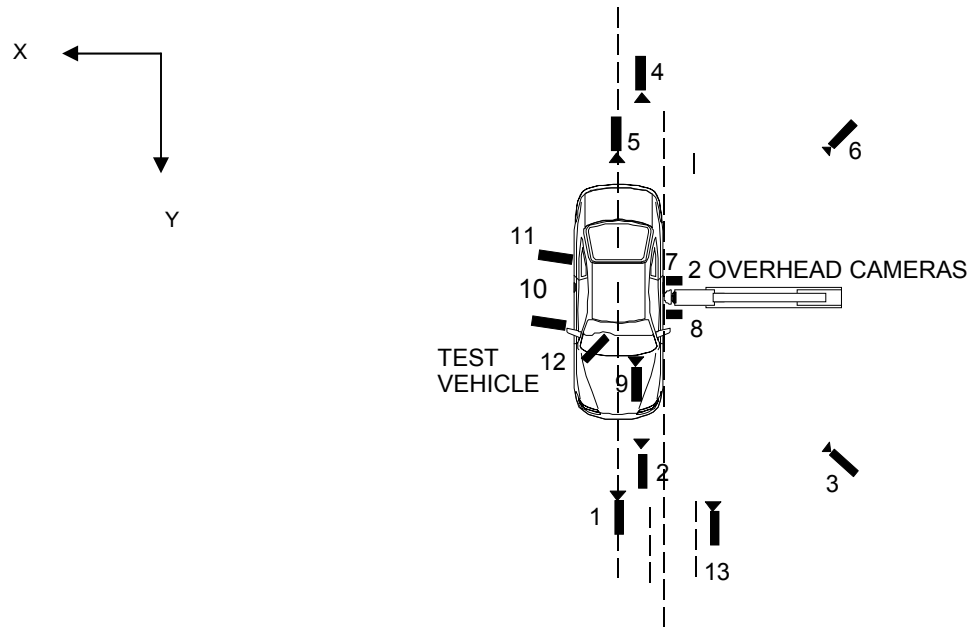
Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2241	720	230
2	Rear Floorpan Above Axle	1050	0	560
3	Left Side Sill at Rear Door	1824	-710	235
4	Left Side Sill at Front Door	2706	-713	215
5	Left Lower B-Post	2085	-747	430
6	Left Mid B-Post	2072	-695	910
7	Left Lower A-Post	3173	-724	420
8	Left Mid A-Post	3147	-782	866
9	Driver Left Seat Track			
10	Vehicle CG	2580	0	480
11	Left Door @ Pelvis	2300	-785	557
12	Left Door @ Arm	2546	-735	880
13	Left Door @ Knee	2777	-780	692
14	Left Door @ Rib	2284	-760	908
15	Left A Pillar Sill	3048	-720	210
16	Left B Pillar Sill	2203	-710	230
17	Engine	3794	0	872
18	Firewall	3496	0	838

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 Volkswagen Jetta

Test Date: May 5, 2005



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	1970	9835	1480	24	1000
2	Front Close Up	1930	6650	1345	24	1000
3	Front Angle	-2390	2995	1490	24	1000
4	Rear Overall	2950	-5870	1465	24	1000
5	Rear Close Up	3360	-8680	1530	35	1000
6	Rear Angle	-2245	-2610	1375	19	1000
7	Overhead View	-570	330	5340	14	1000
8	Overhead Close Up	60	150	5050	19	1000
9	Onboard Driver Front				16	500
10	Onboard Driver				13	500
11	Onboard Curtain				8	500
12	Onboard Hip to Door				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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A-1.



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle

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Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle

A-7.



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



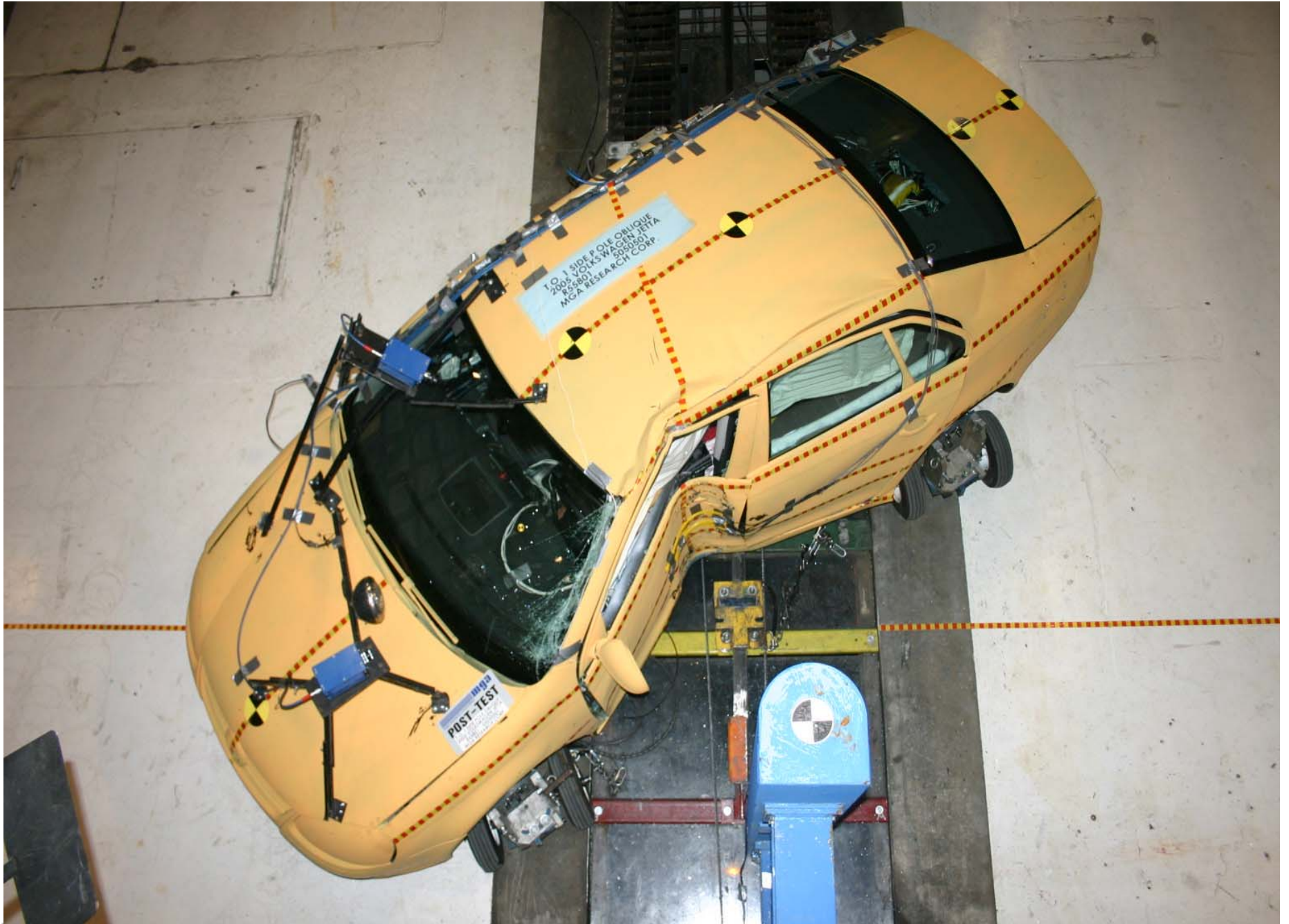
Pre-Test Left $\frac{3}{4}$ Rear View of Test Vehicle



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



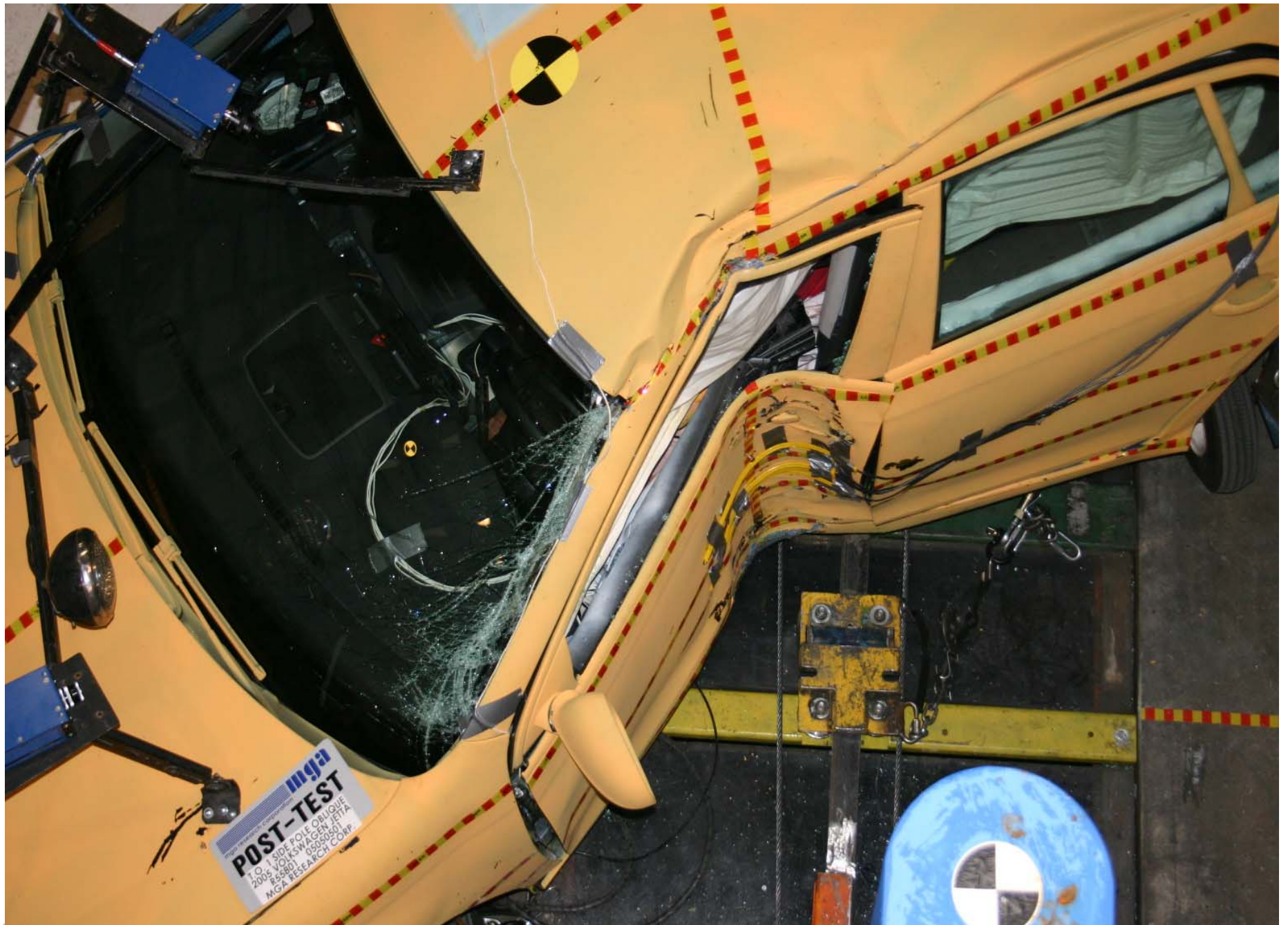
Pre-Test Vehicle Overhead View Positioned Against Pole



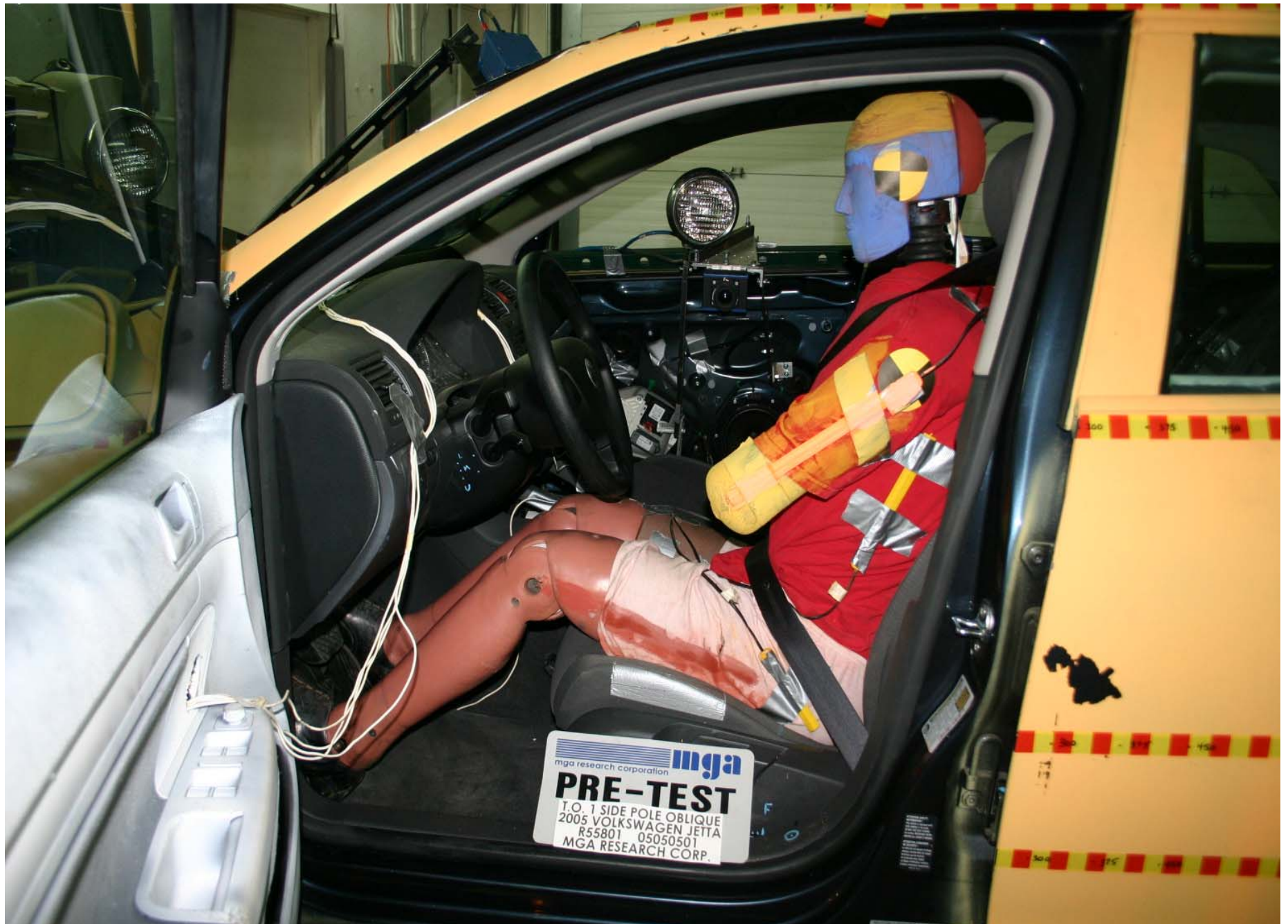
Post-Test Pole and Vehicle Overhead View



Pre-Test Vehicle Overhead View Positioned Against Pole (Close-Up)



Post-Test Pole and Vehicle Overhead View (Close-Up)



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 Dummy Contact



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Head Contact



Post-Test Impact Point on Vehicle



TIRE AND LOADING INFORMATION

SEATING CAPACITY : TOTAL 5 : FRONT 2 : REAR 3

THE COMBINED WEIGHT OF OCCUPANTS AND CARGO SHOULD NEVER EXCEED 441 KG OR 972 LBS

ORIGINAL SIZE	COLD TIRE INFLATION PRESSURE	
195/65 R15 91H	FRONT	230 KPA, 33 PSI
	REAR	230 KPA, 33 PSI
SPARE TIRE	COLD TIRE INFLATION PRESSURE	
195/65 R15 91H	230 KPA, 33 PSI	

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

C: 2

/04

MANUFACTURED BY VOLKSWAGEN DE MEXICO S.A. DE C.V.

GVWR 4343 LBS GAWR FRONT 2337 LBS

DATE 03.05 GAWR REAR 2116 LBS

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

VEHICLE I.D. NO. 3VWPF71K25M614264

TYPE: PASSENGER CAR



COUNTRY OF ORIGIN: MEXICO



Pre-Test Point of Impact View



5 May 2005 10:22 • -51,00 ms • 1,000 fps • T0: 52 • Frame: 1

Post-Test Point of Impact View



5 May 2005 10:22 • 31,00 ms • 1,000 fps • T0: 1 • Frame: 32

Impact

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

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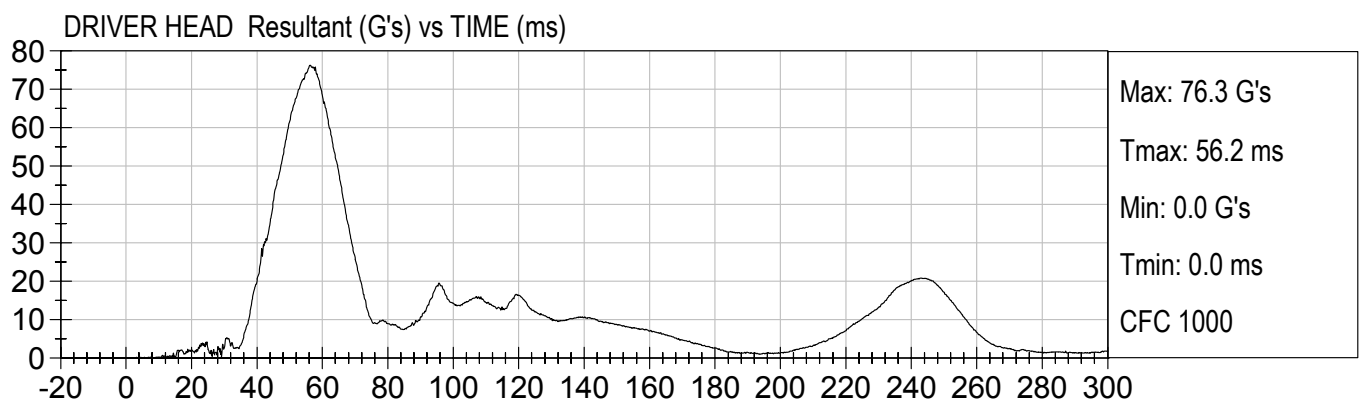
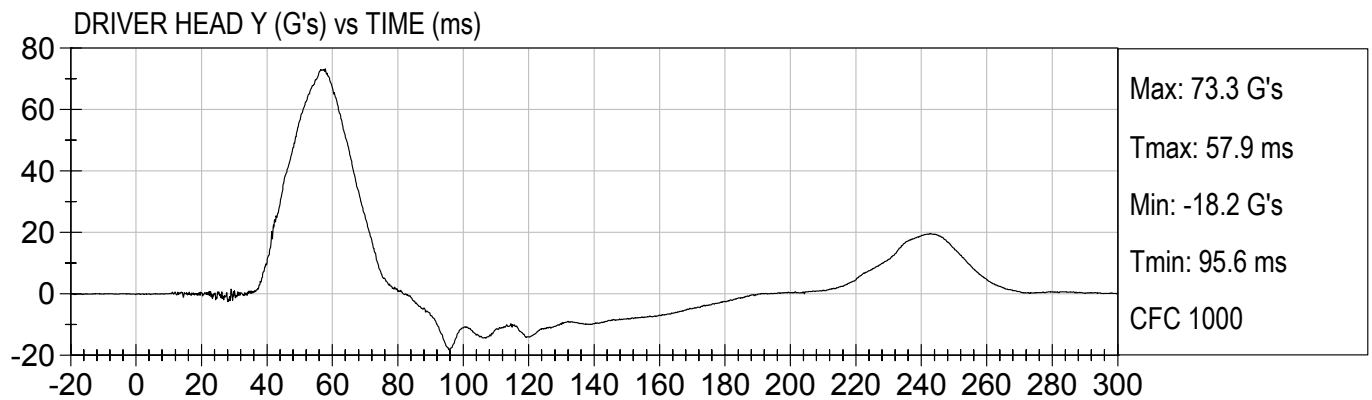
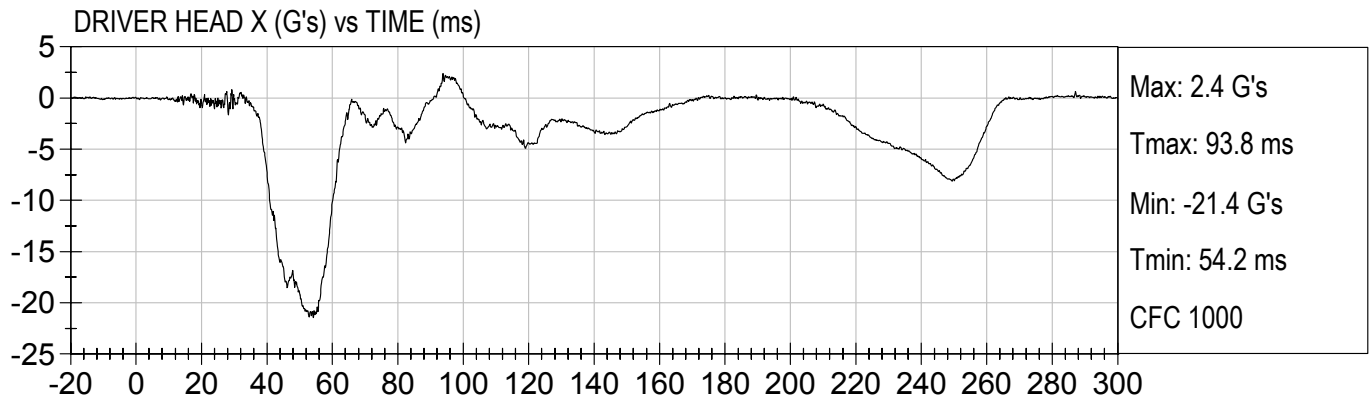
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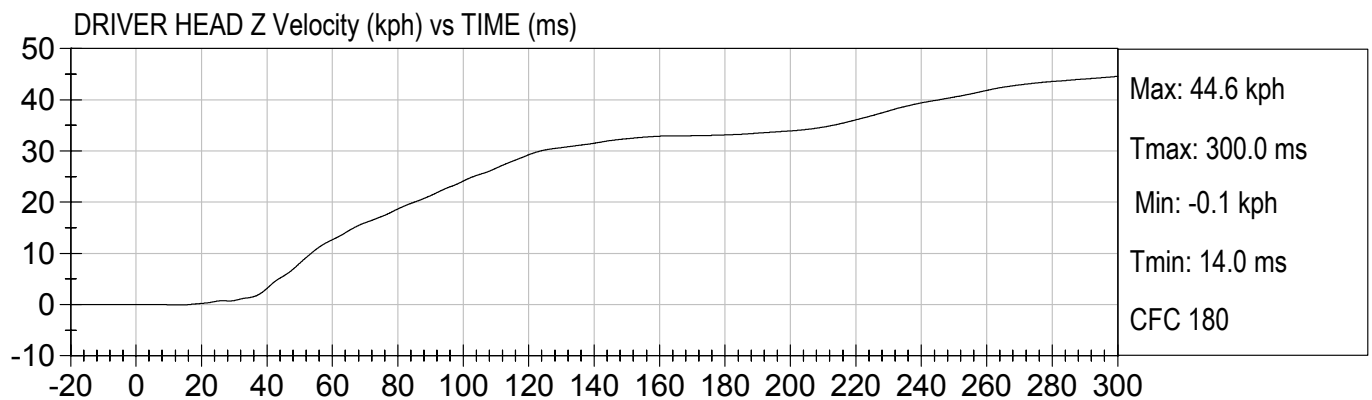
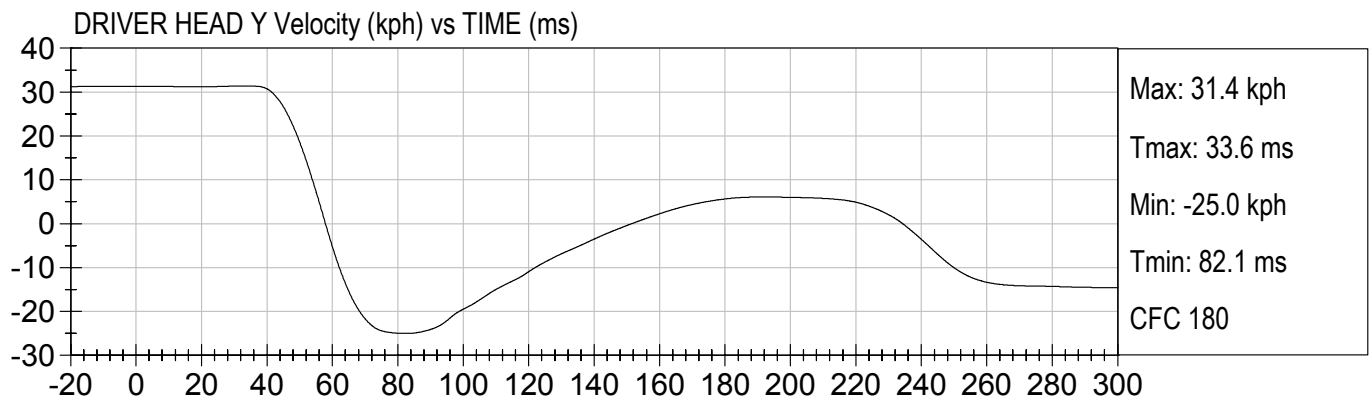
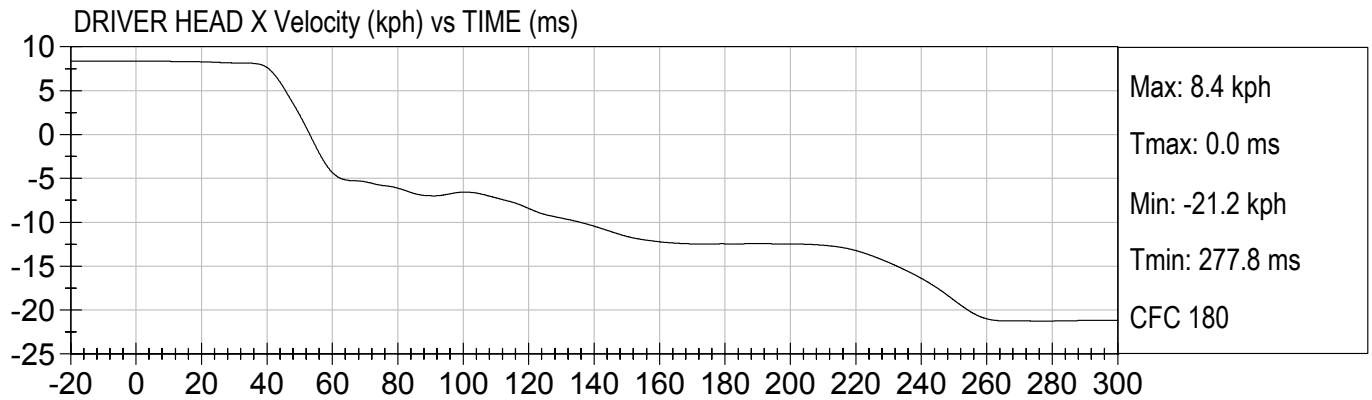
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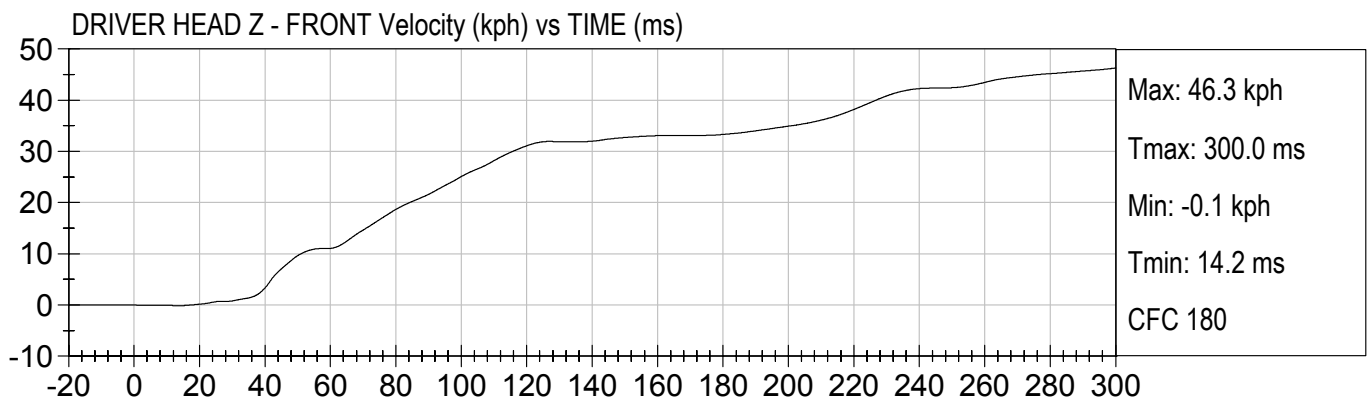
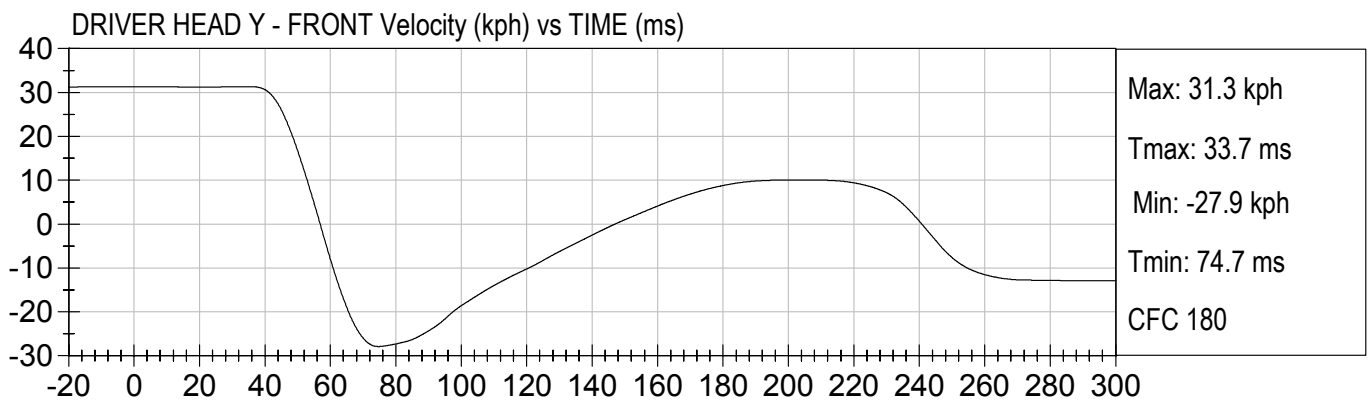
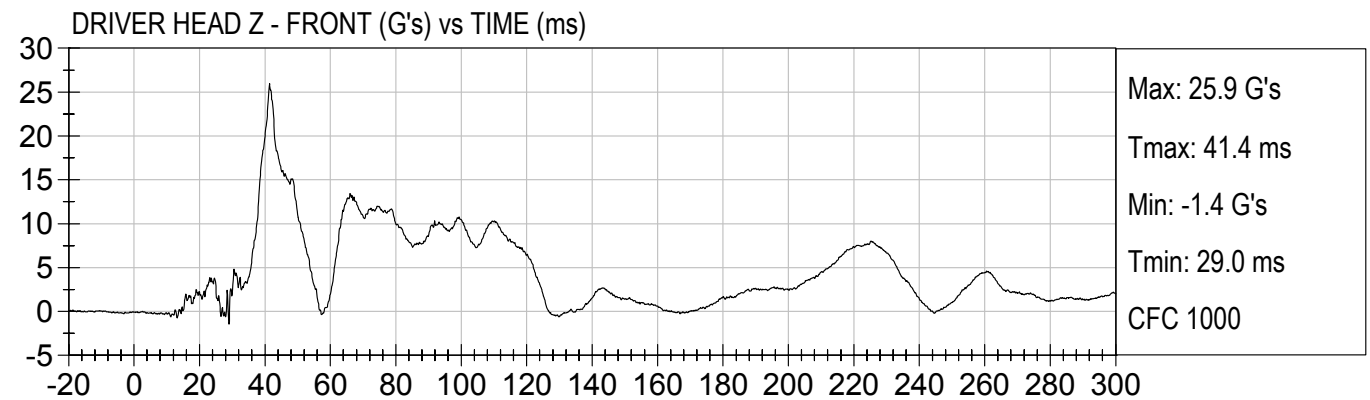
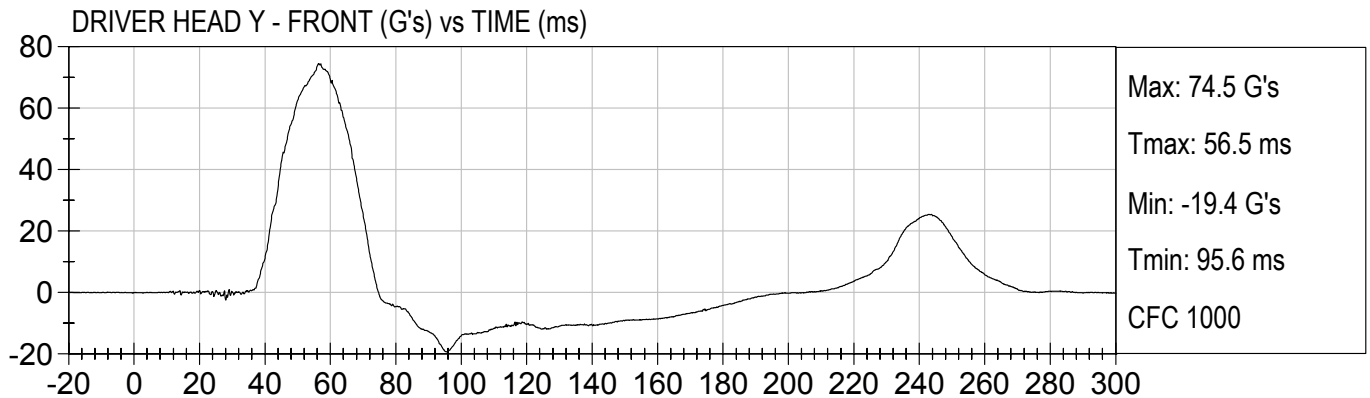
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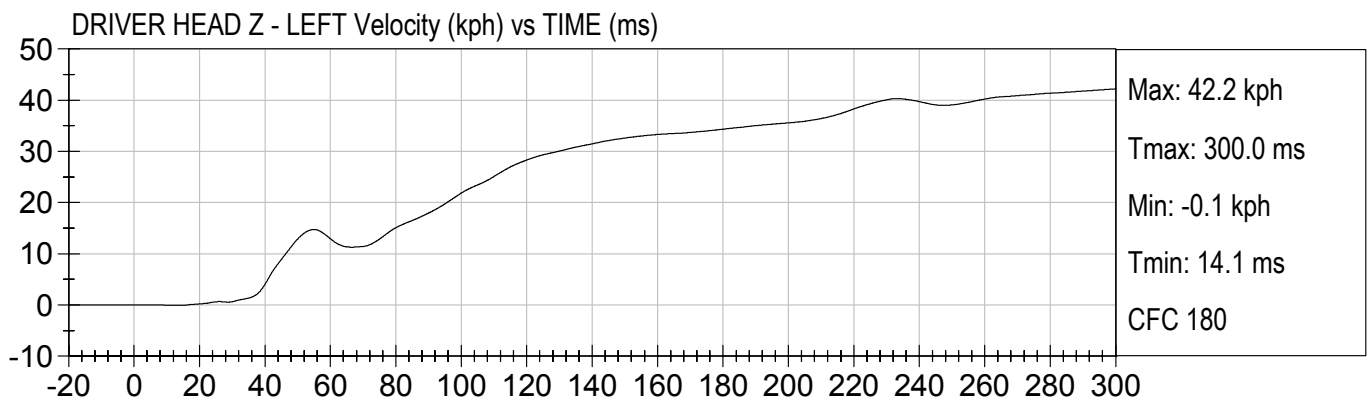
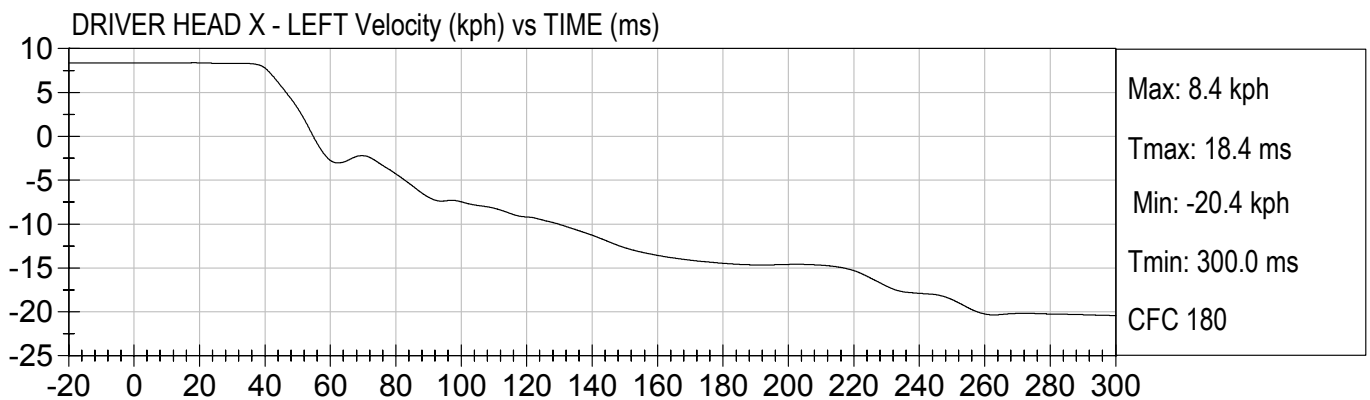
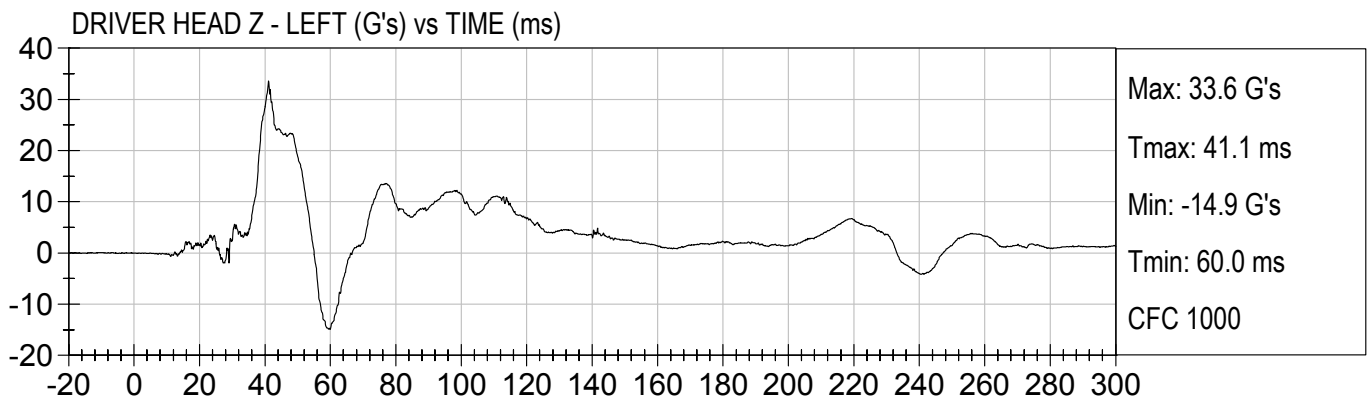
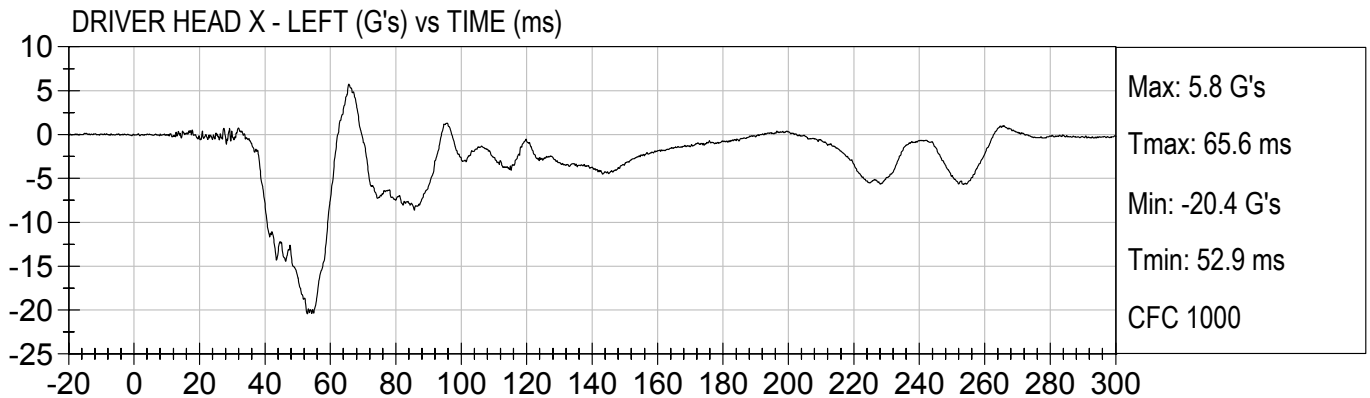
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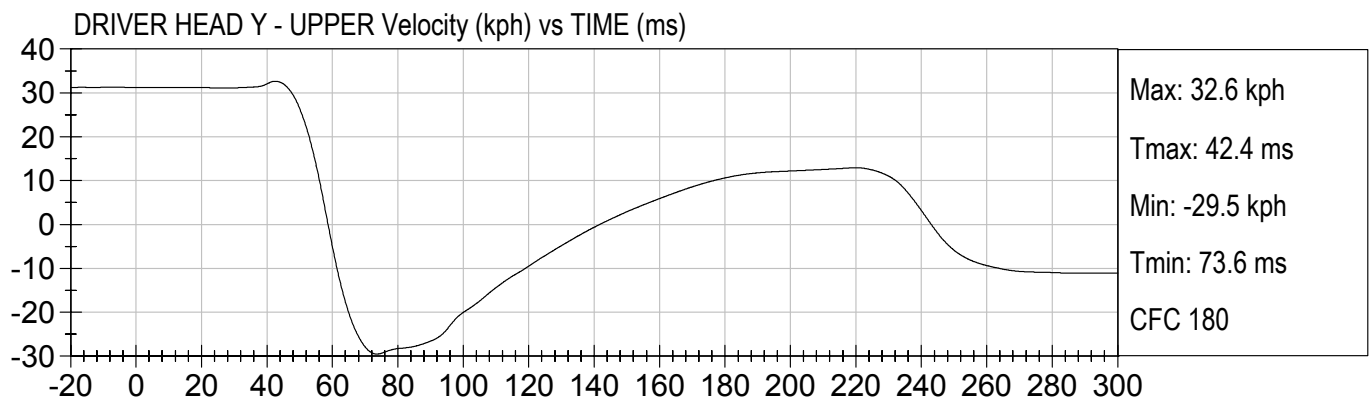
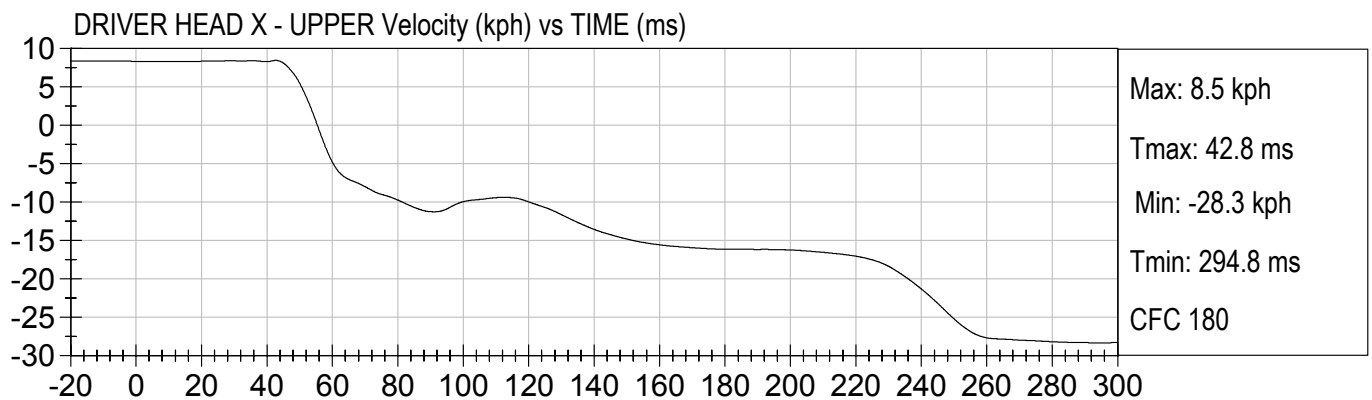
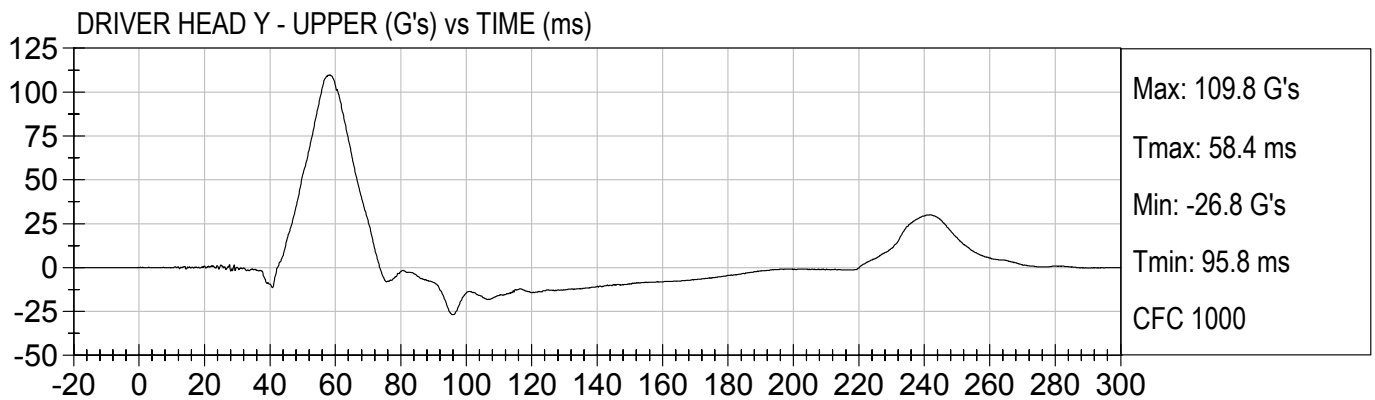
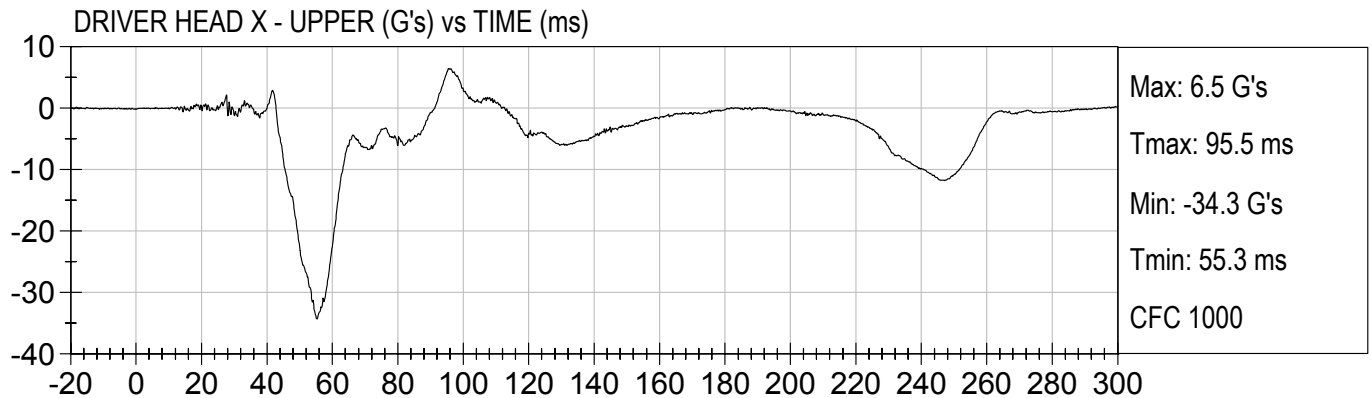
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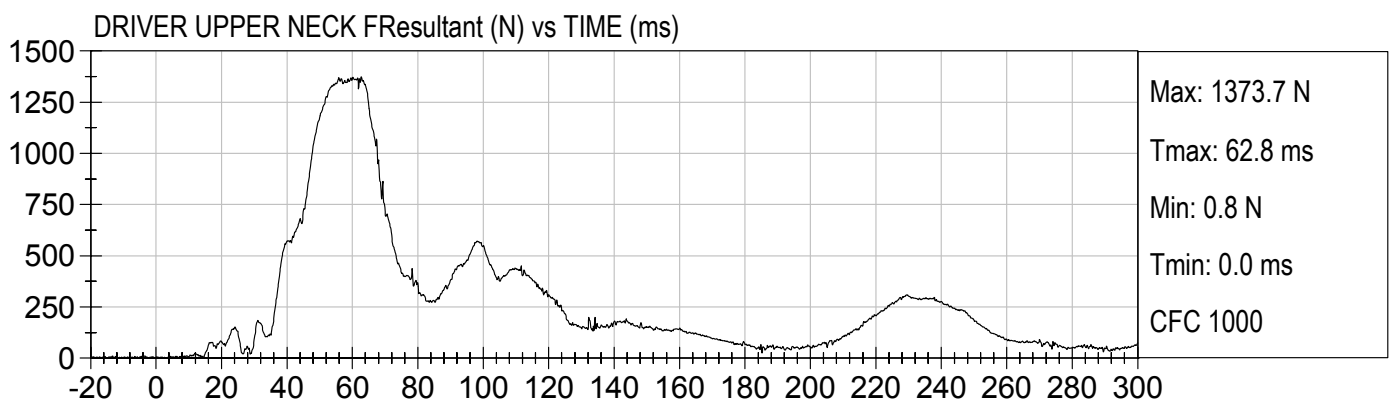
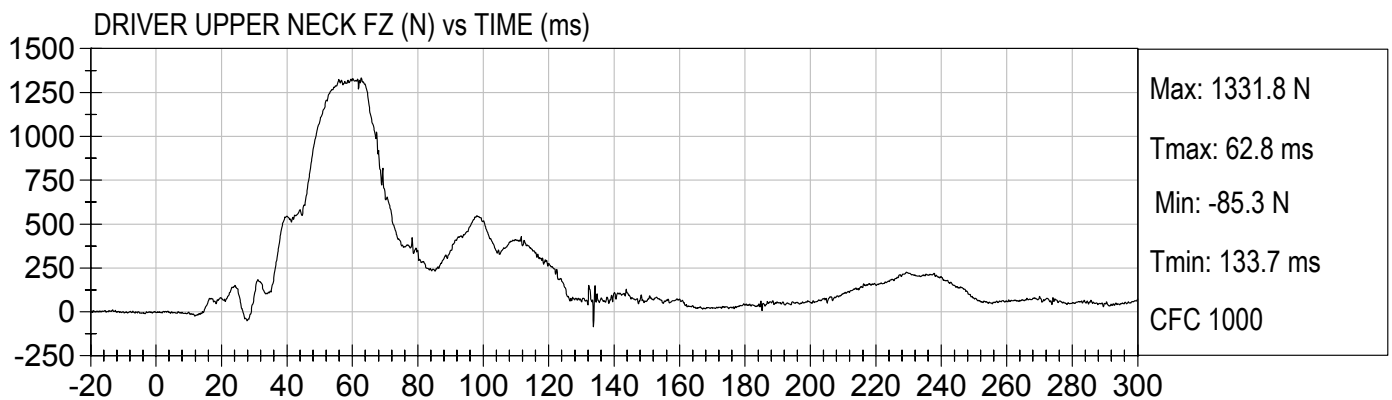
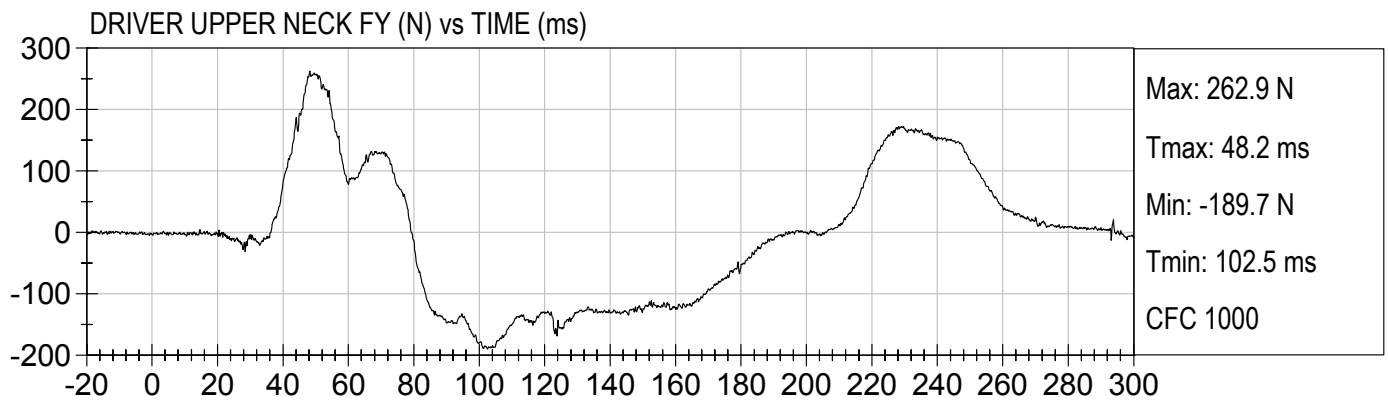
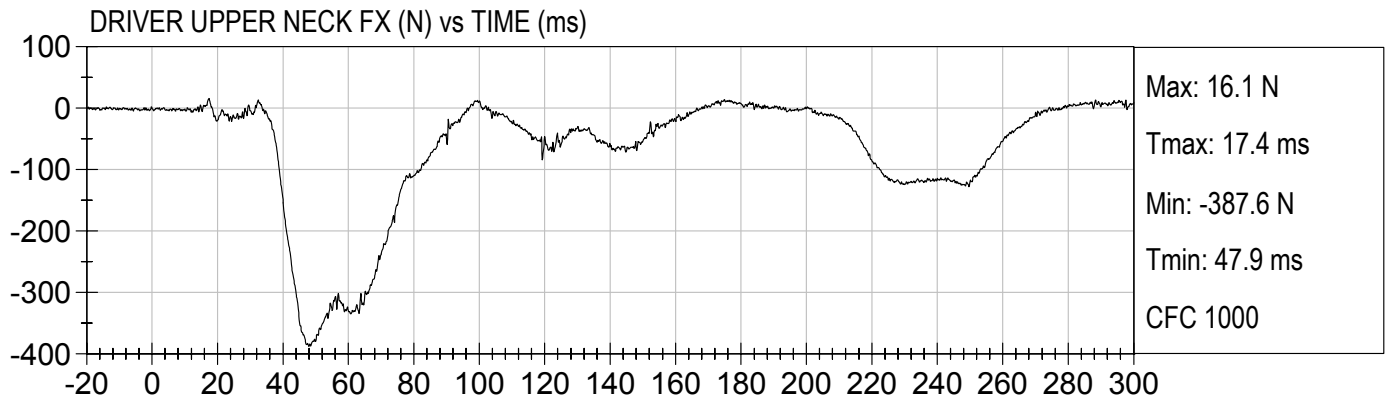


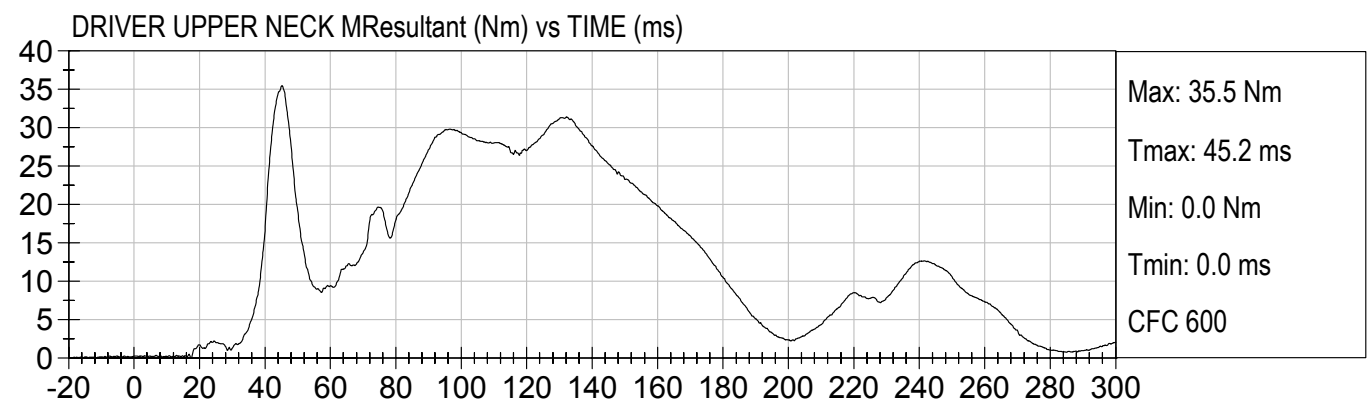
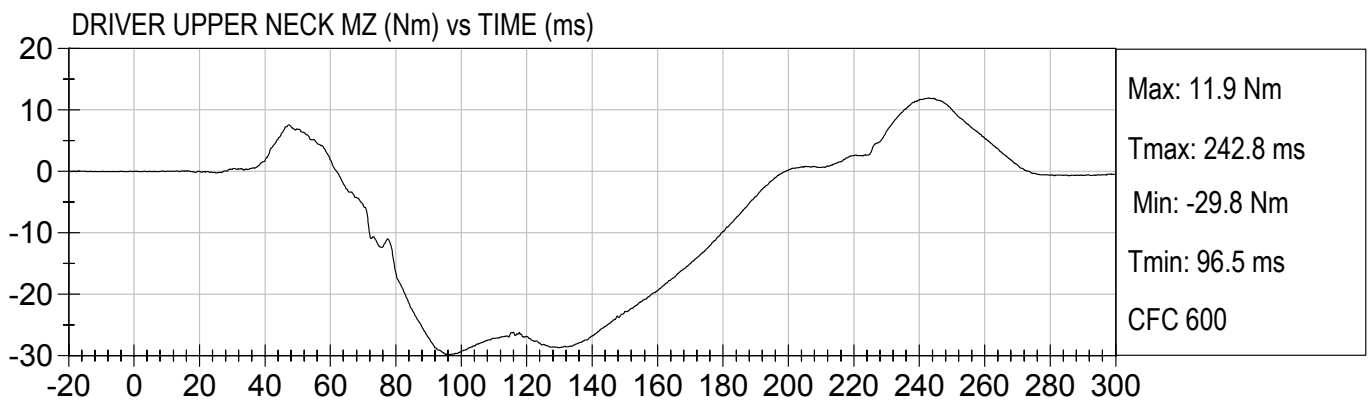
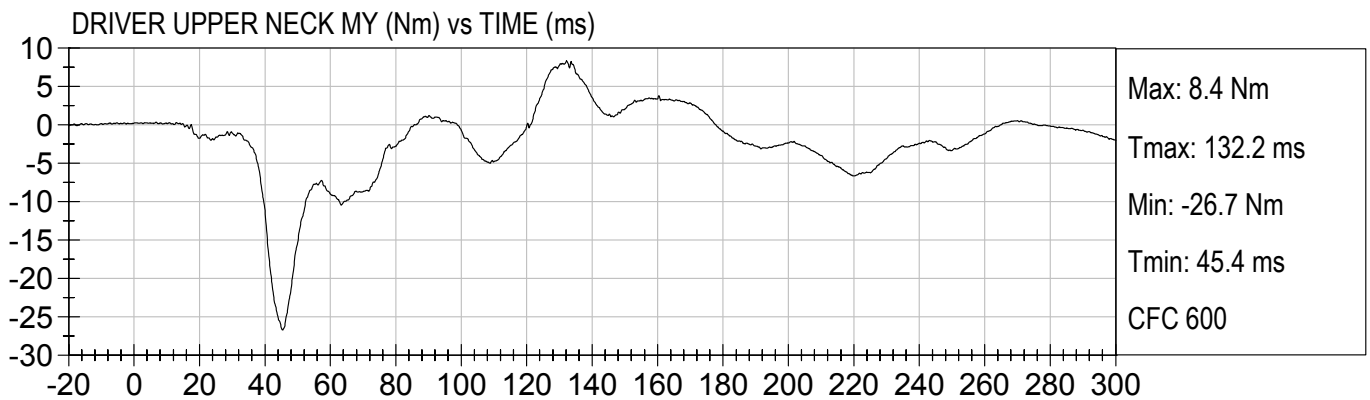
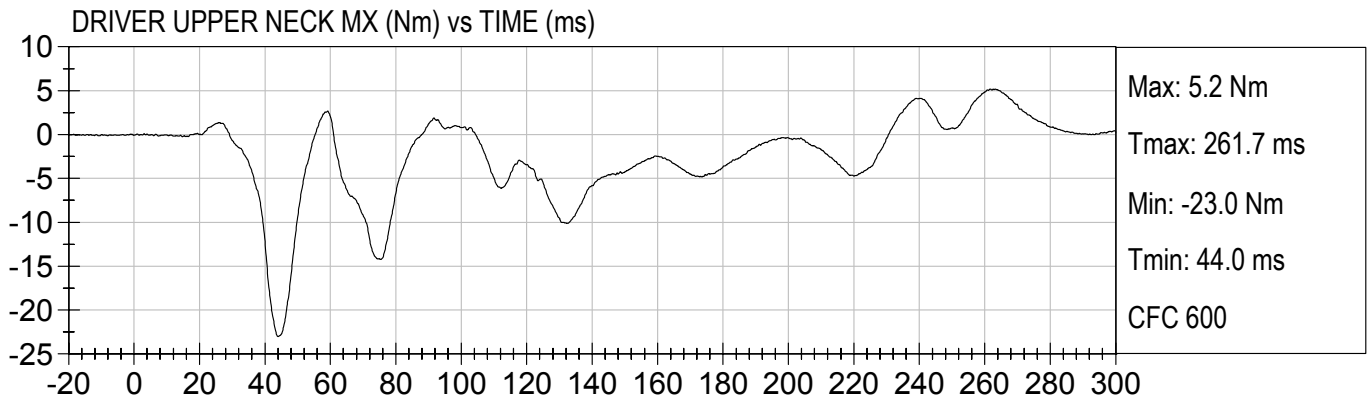


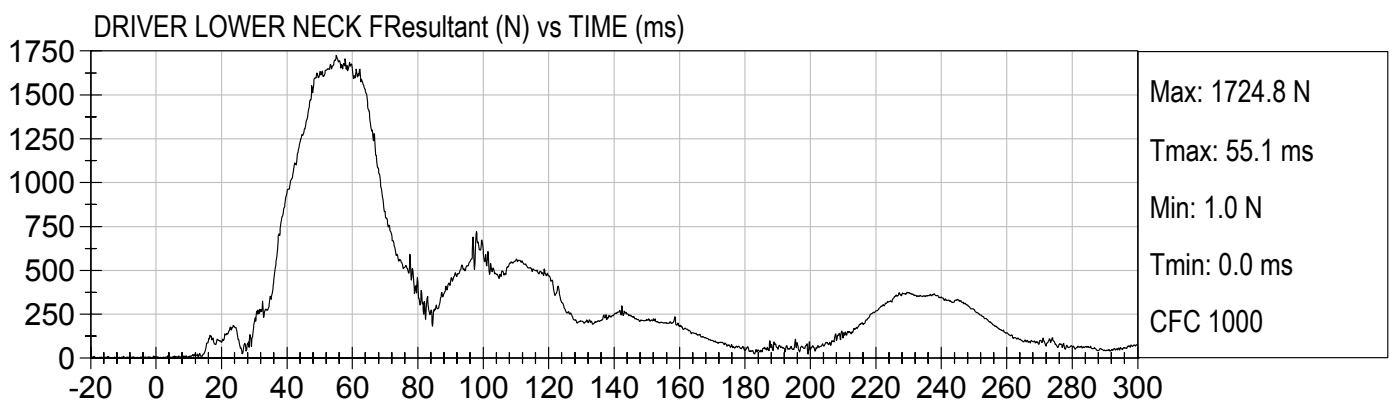
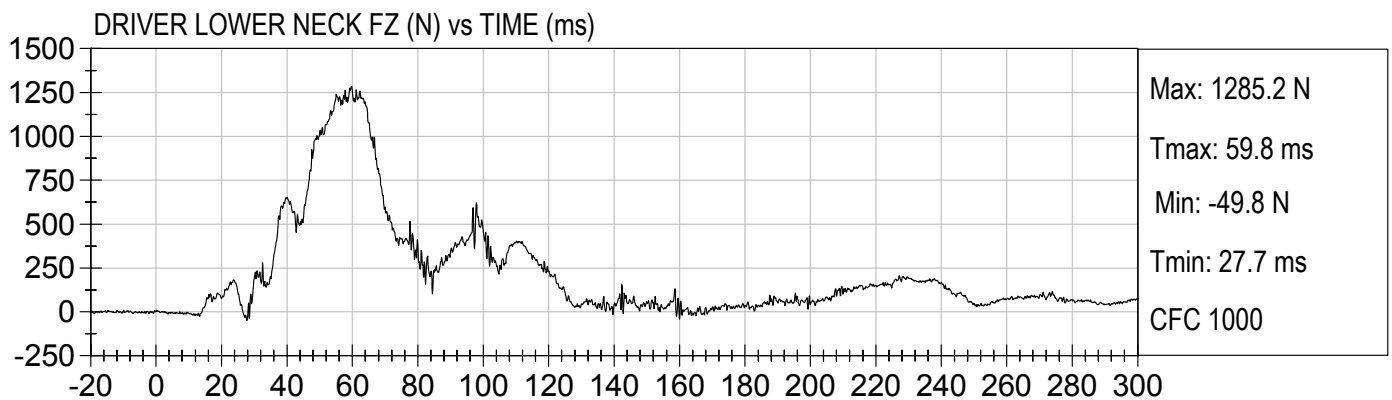
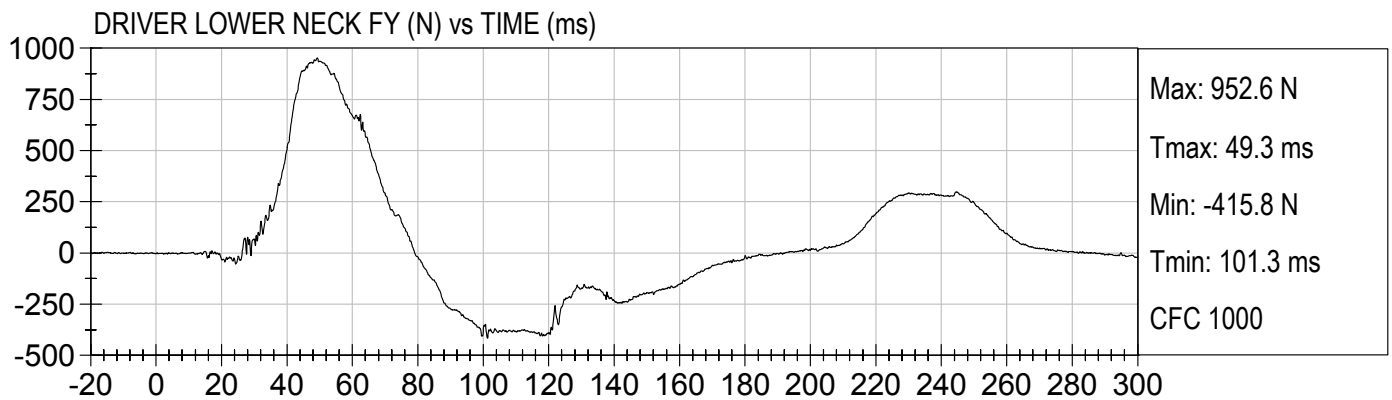
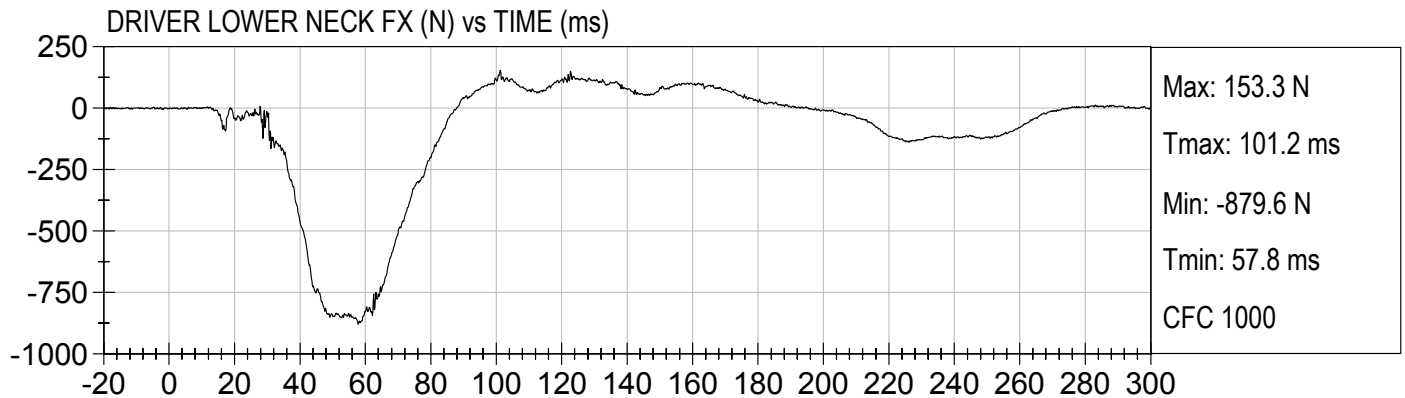


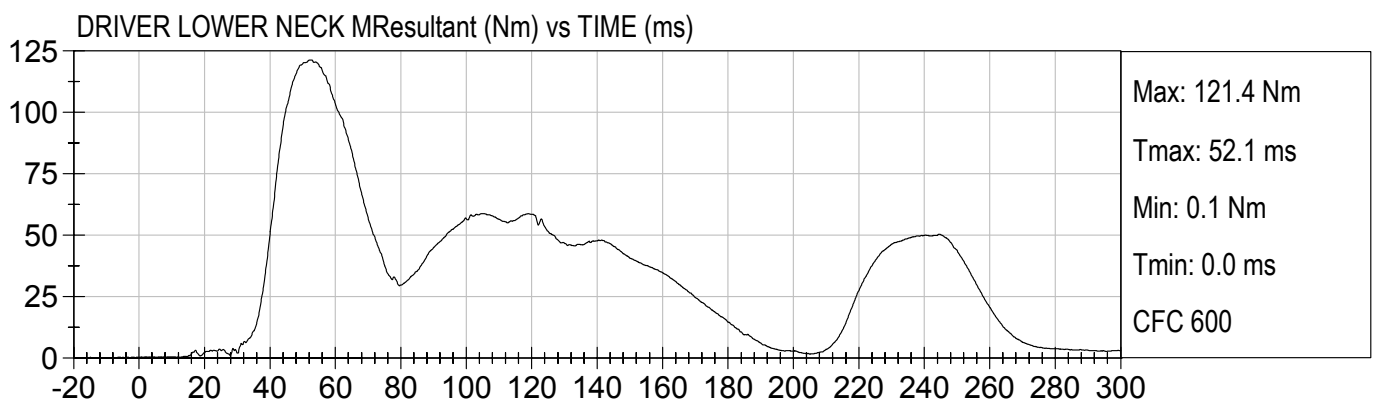
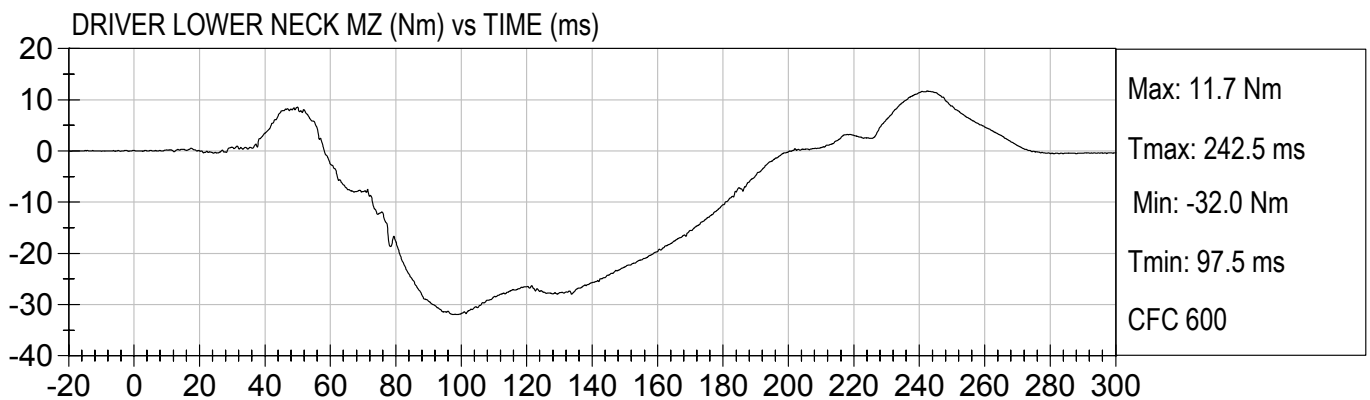
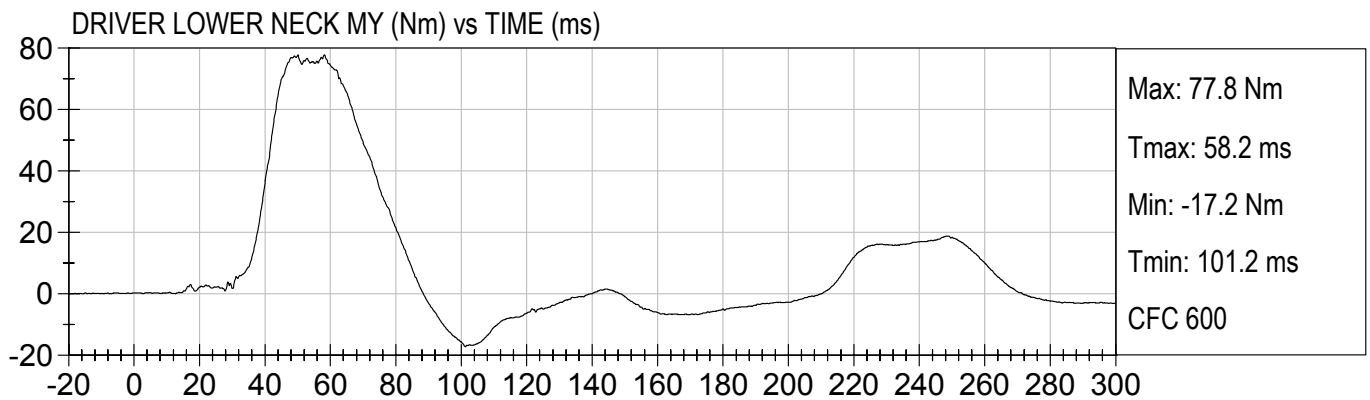
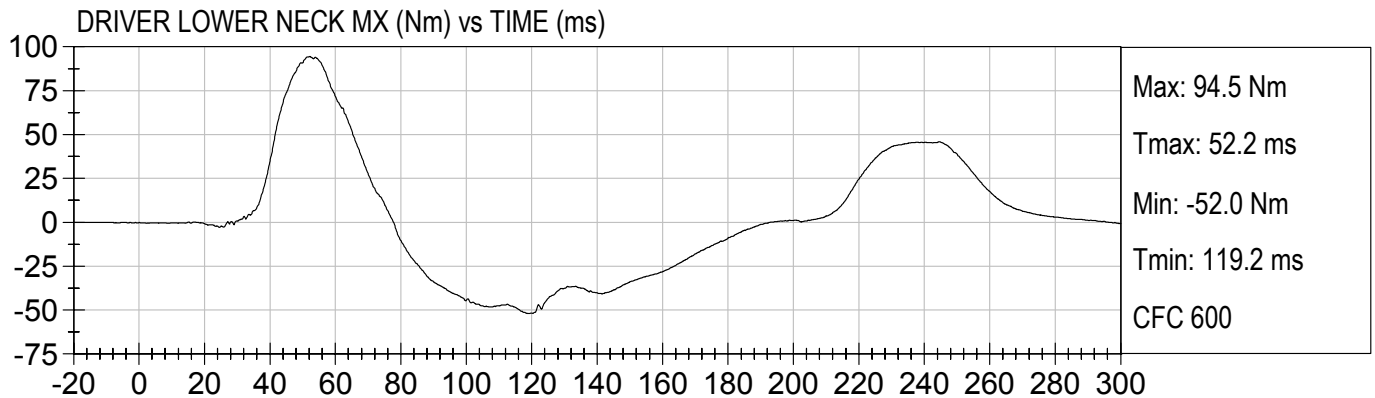


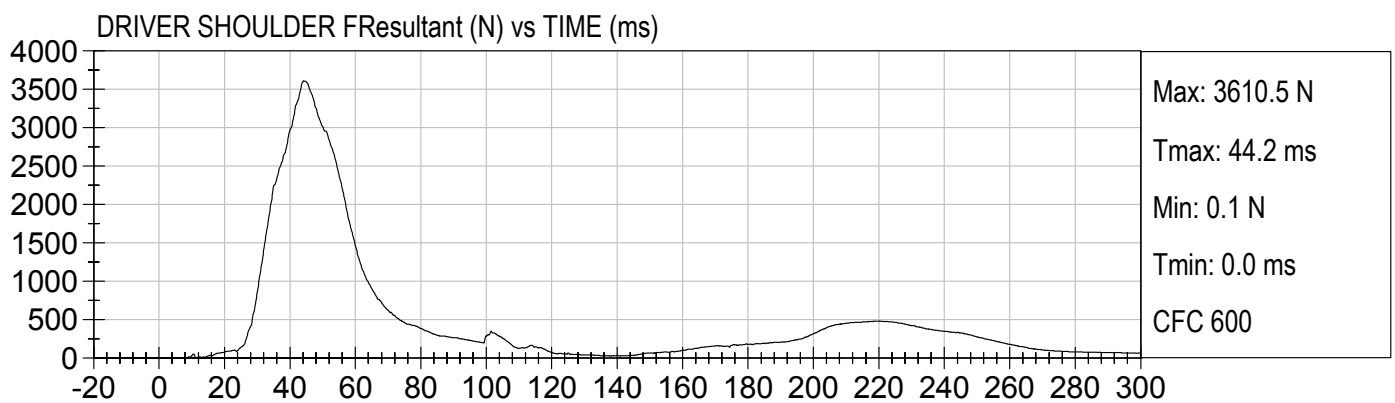
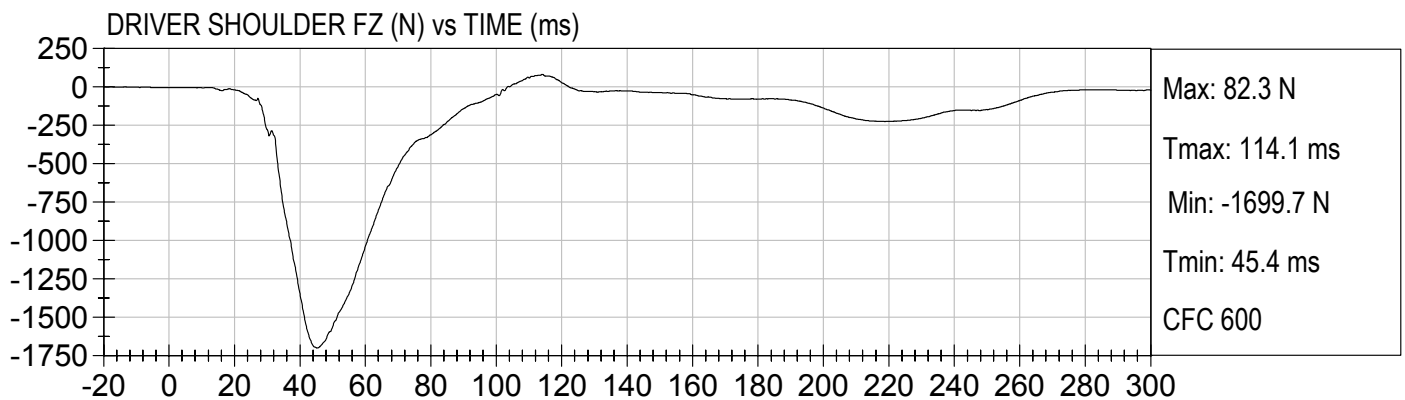
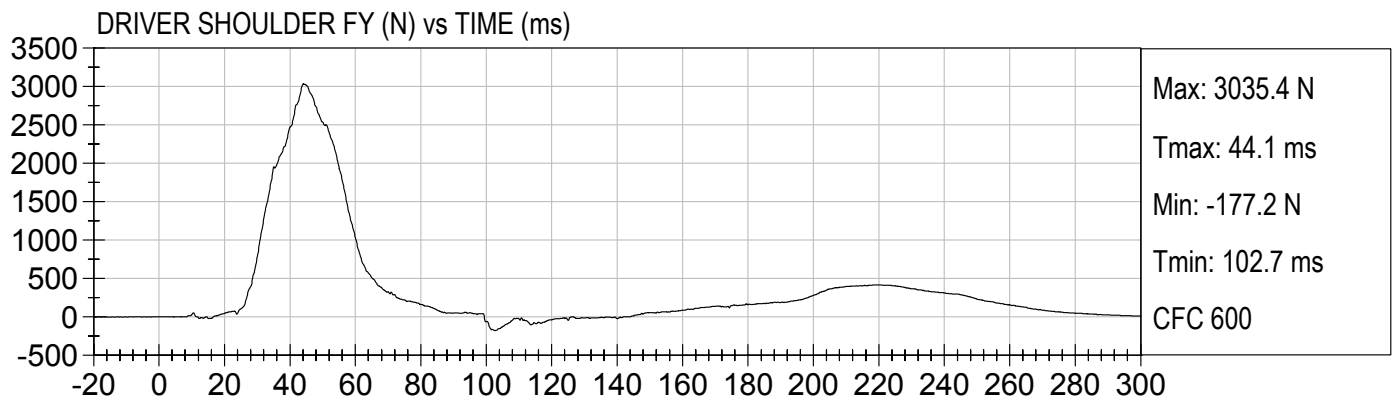
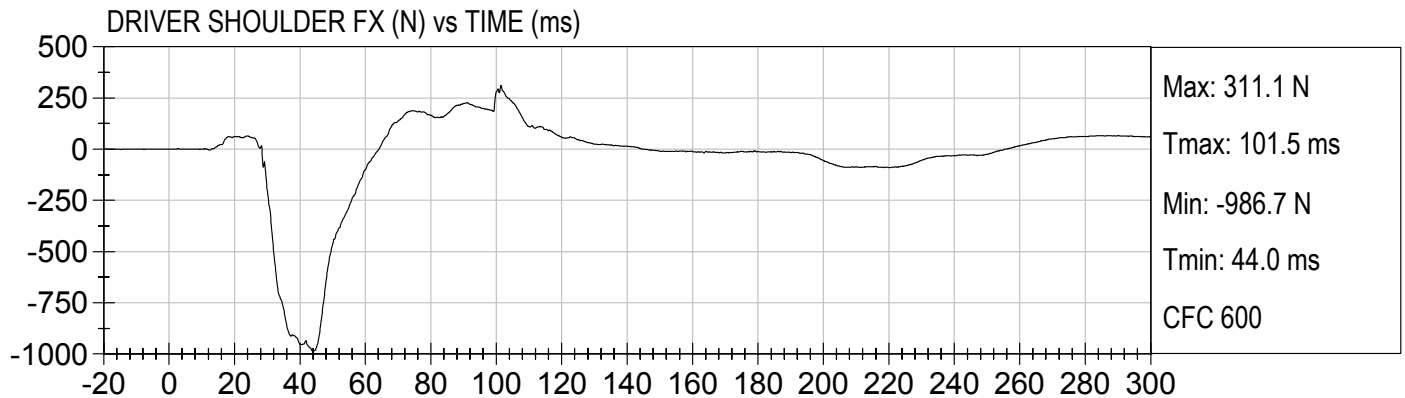


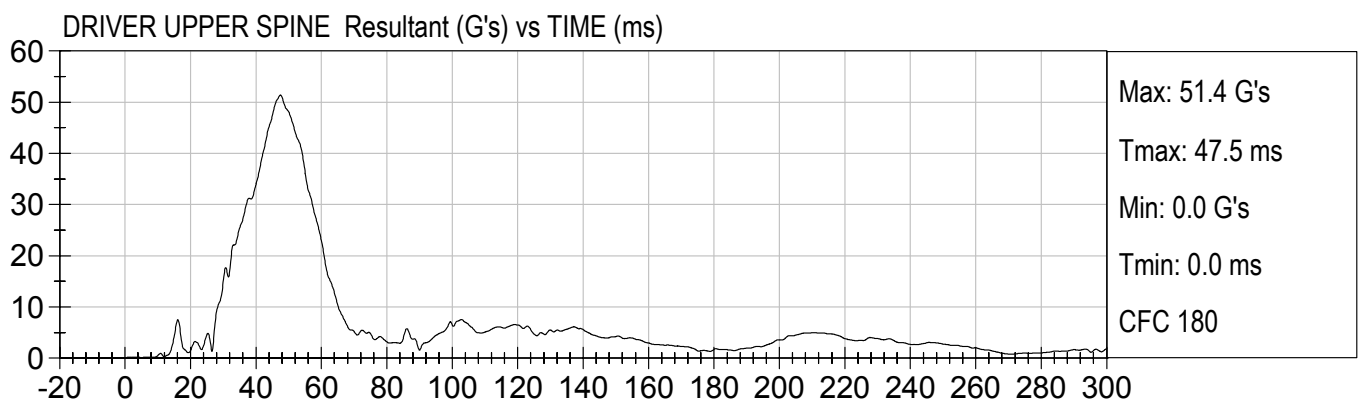
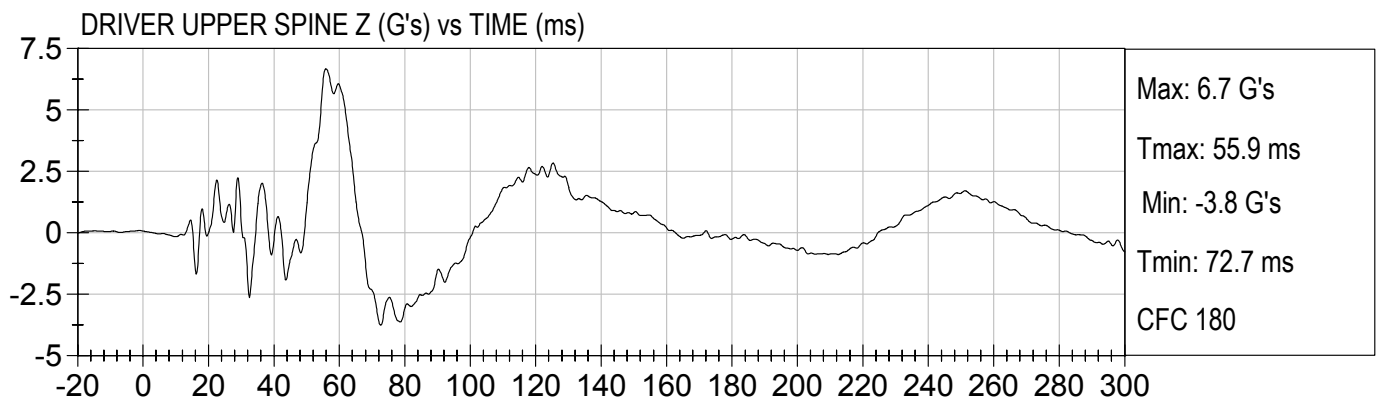
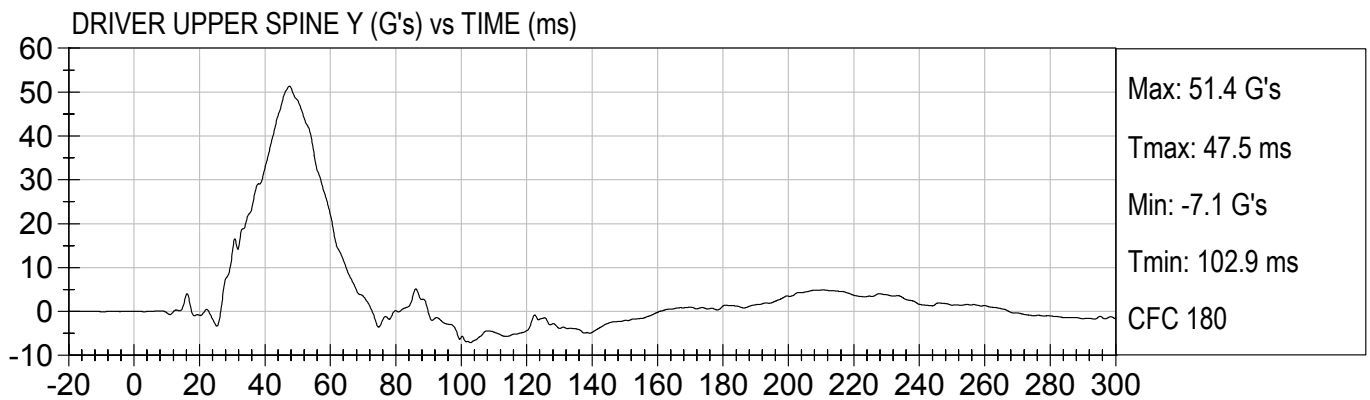
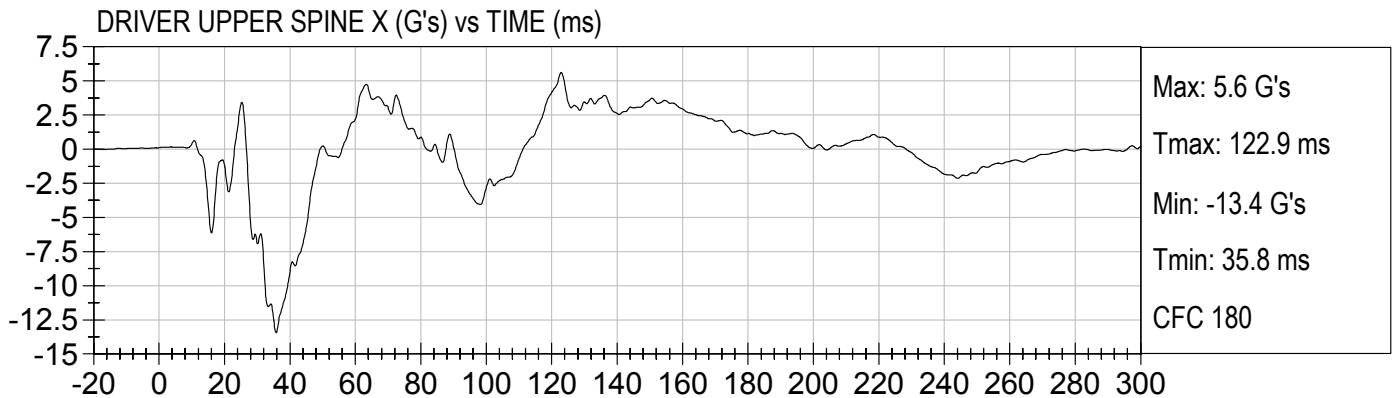






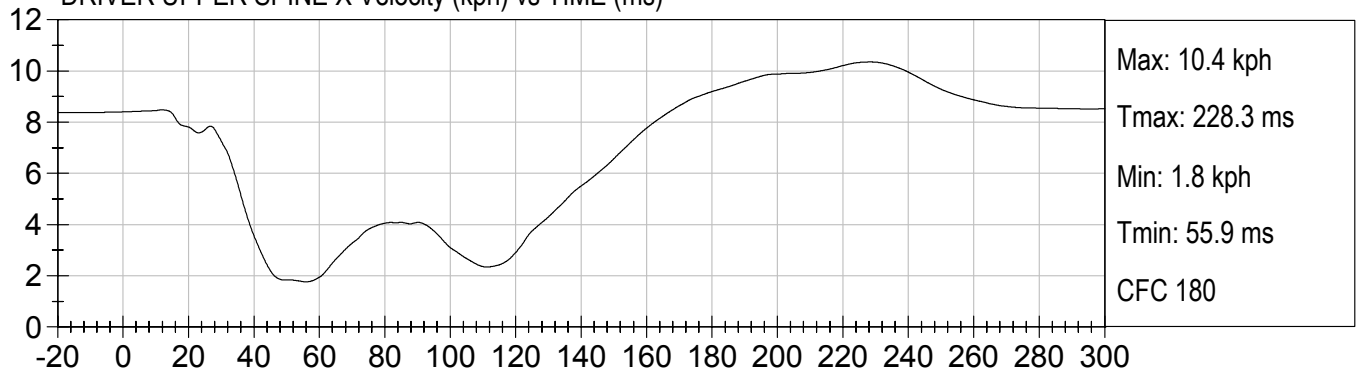




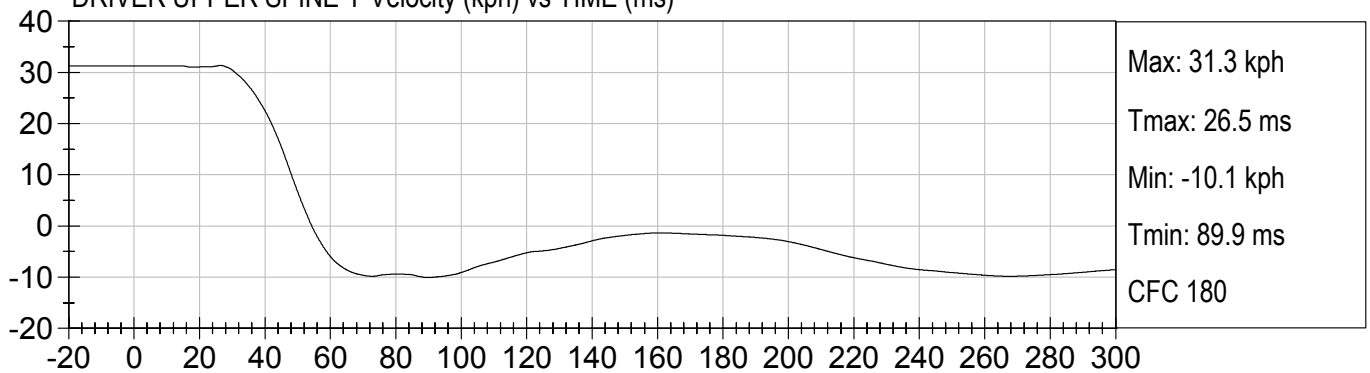




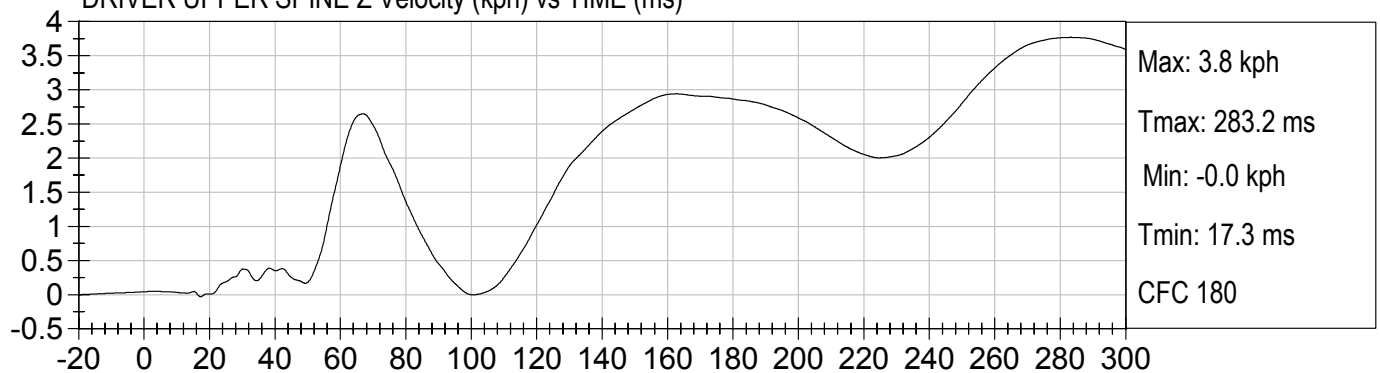
DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)

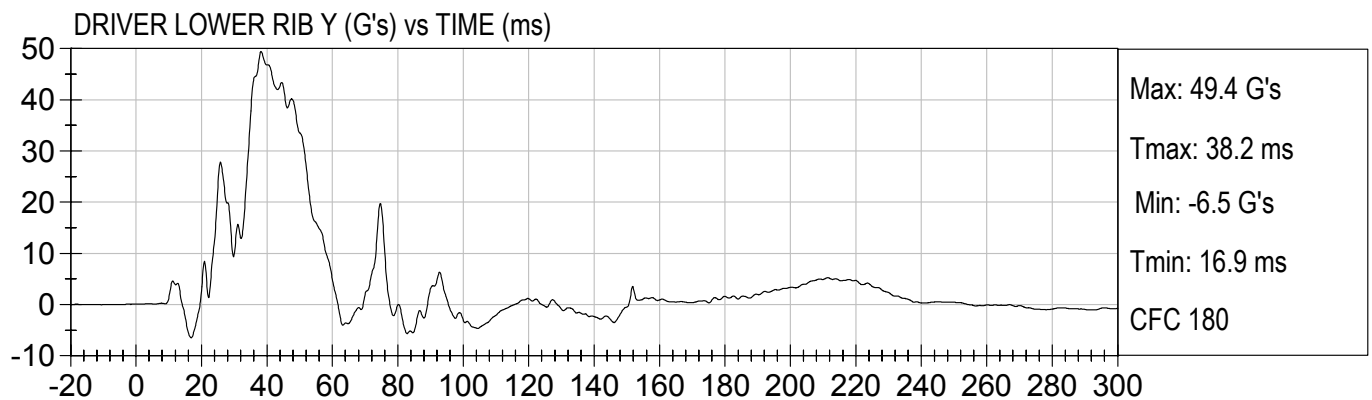
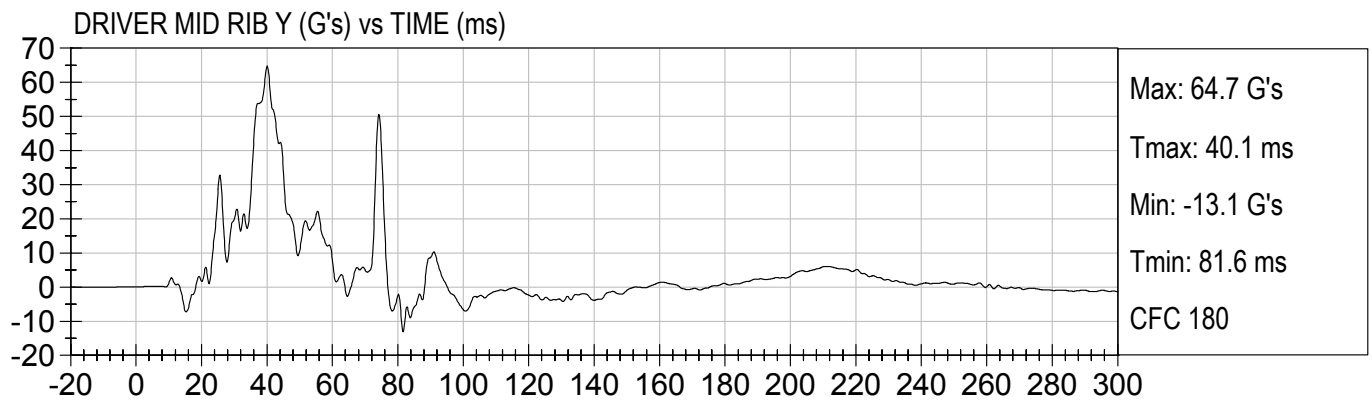
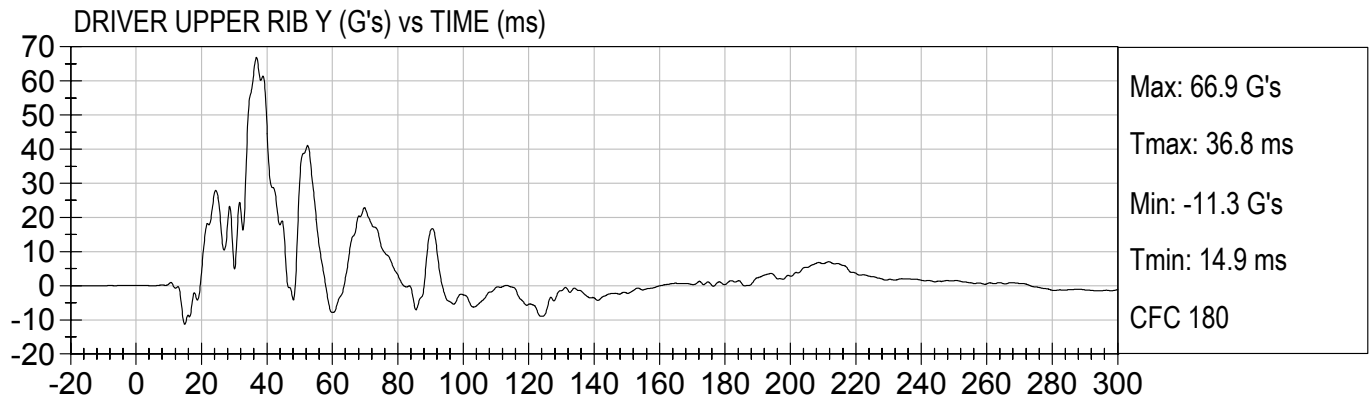


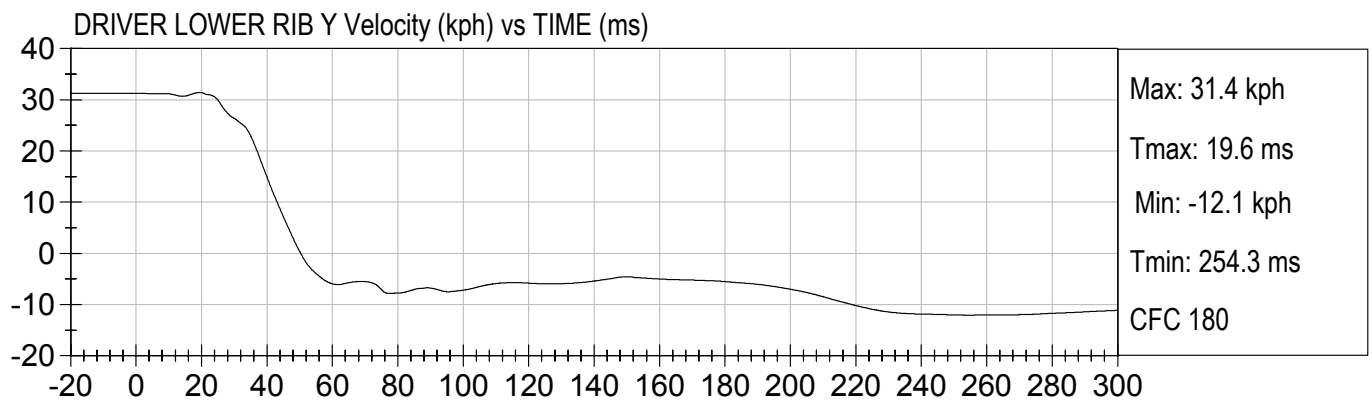
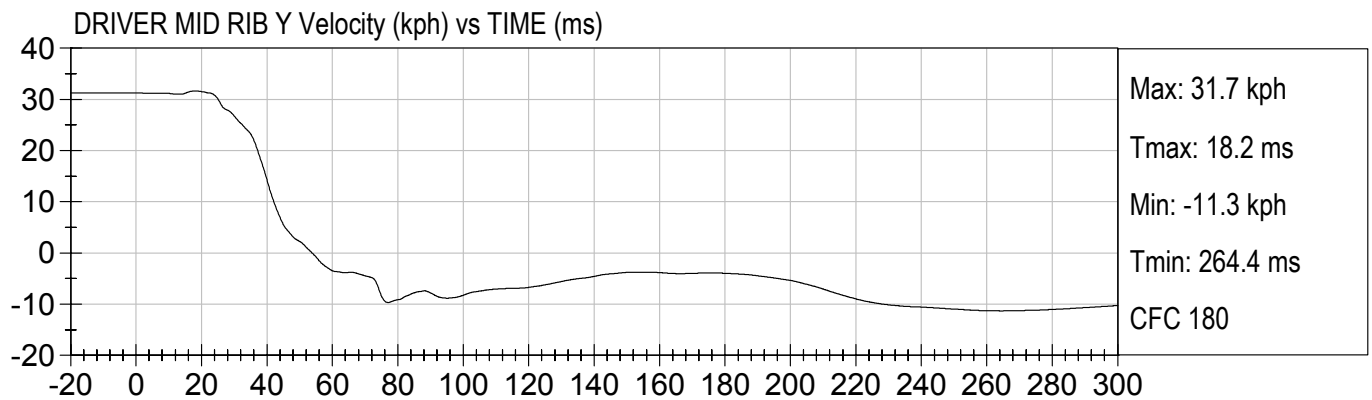
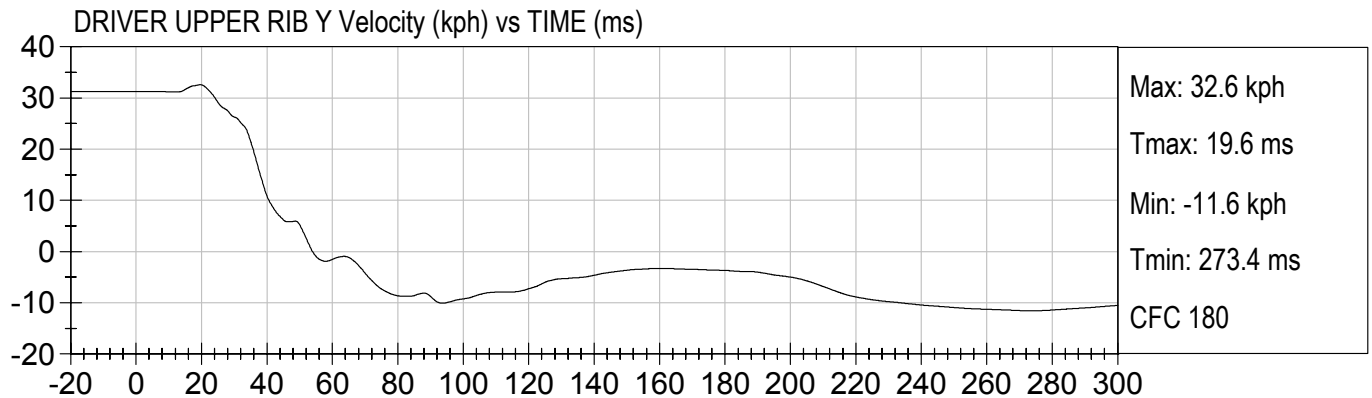
DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)

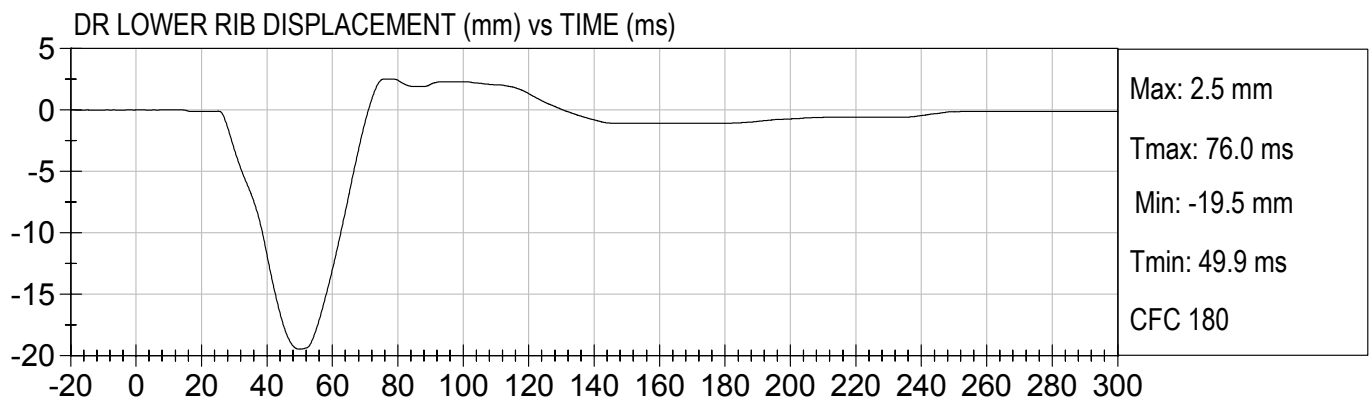
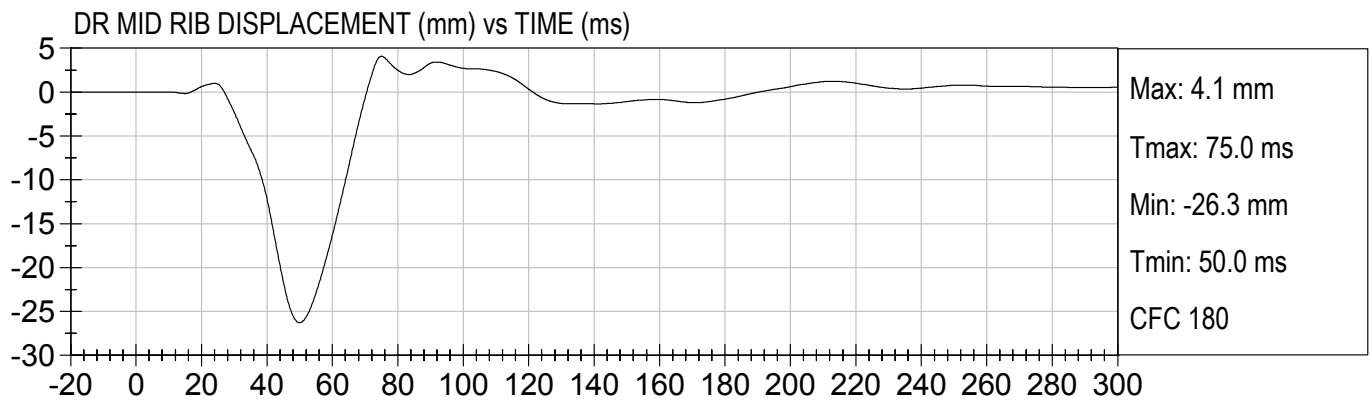
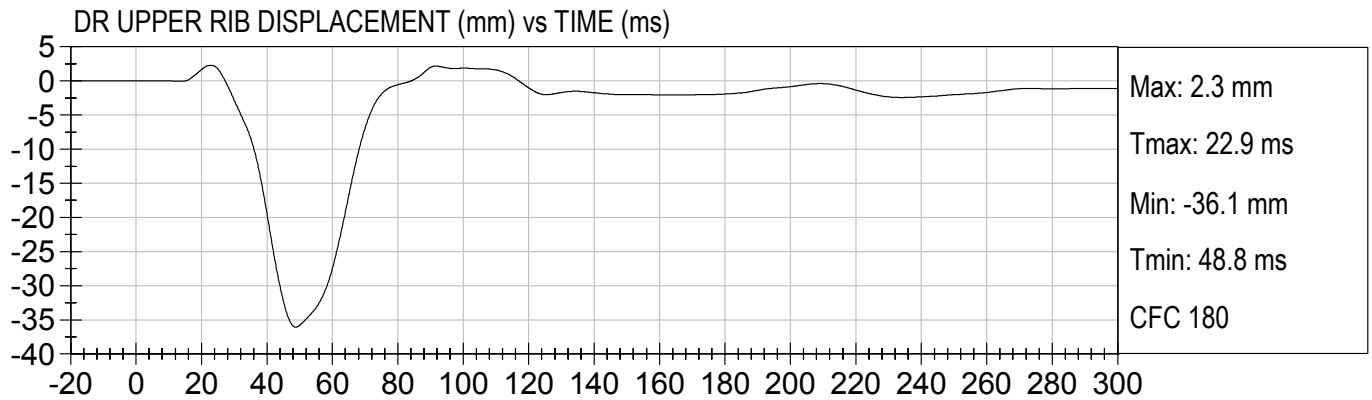


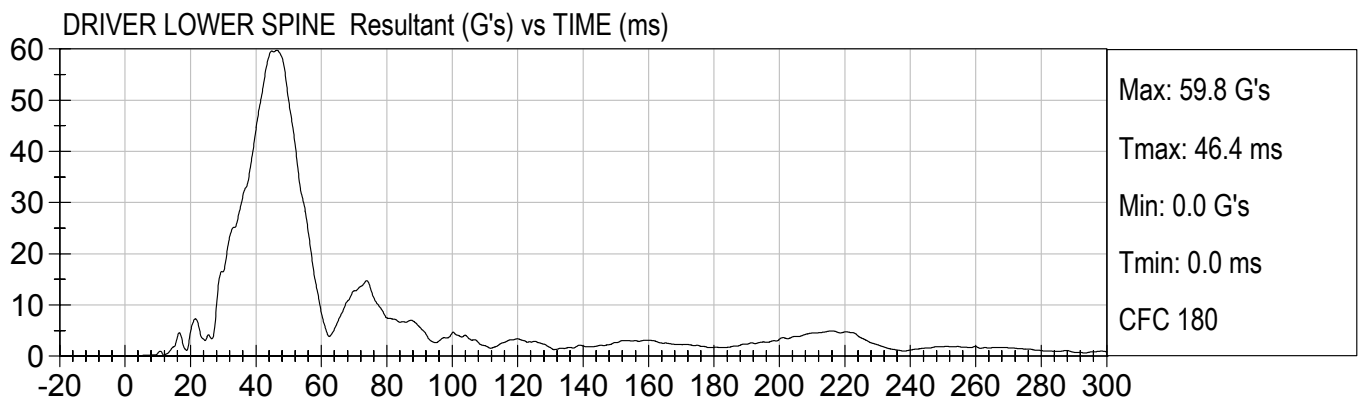
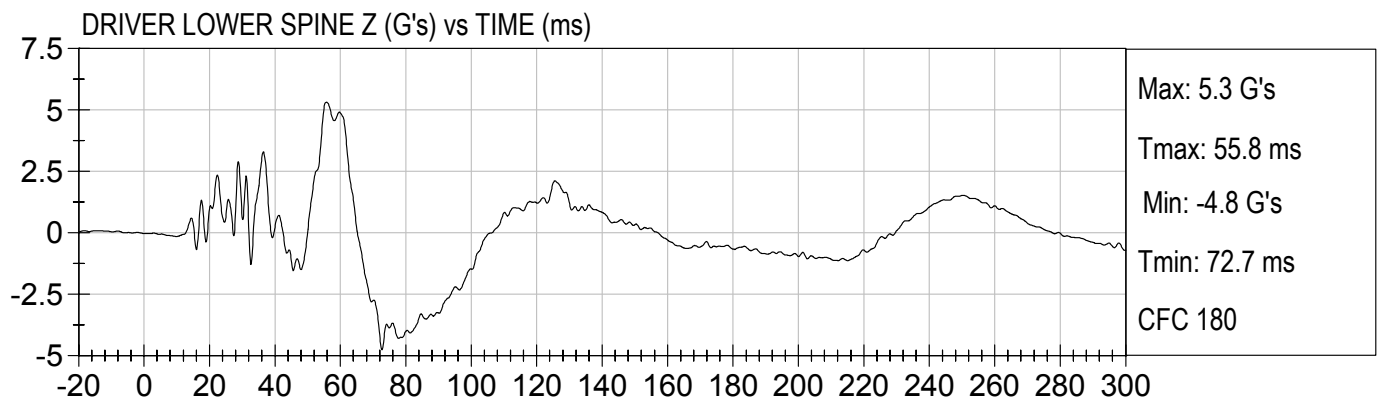
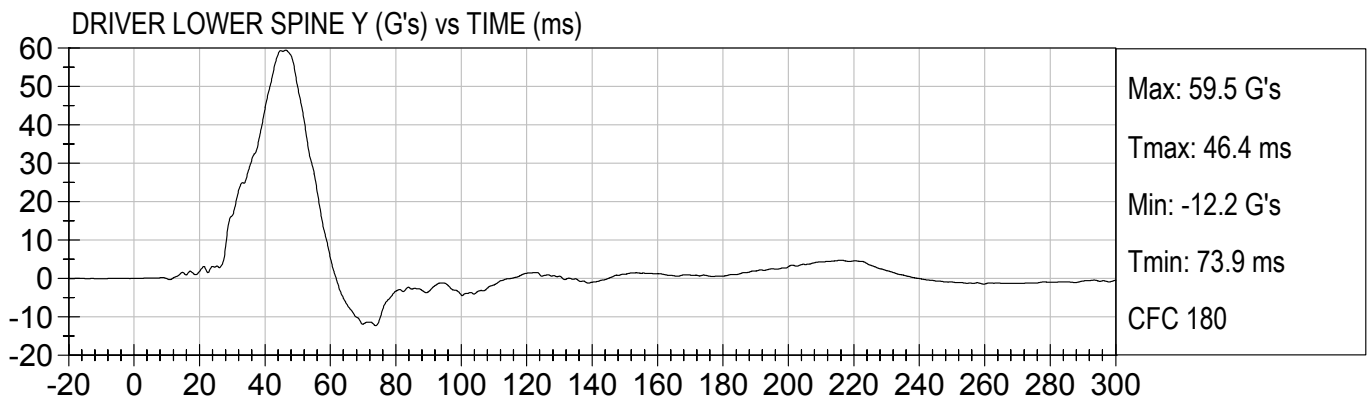
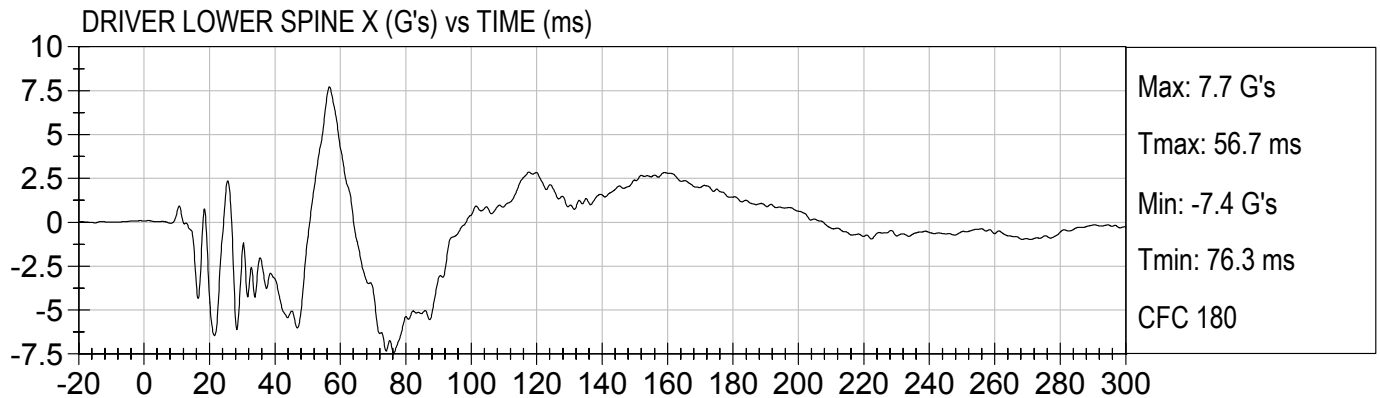
DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)





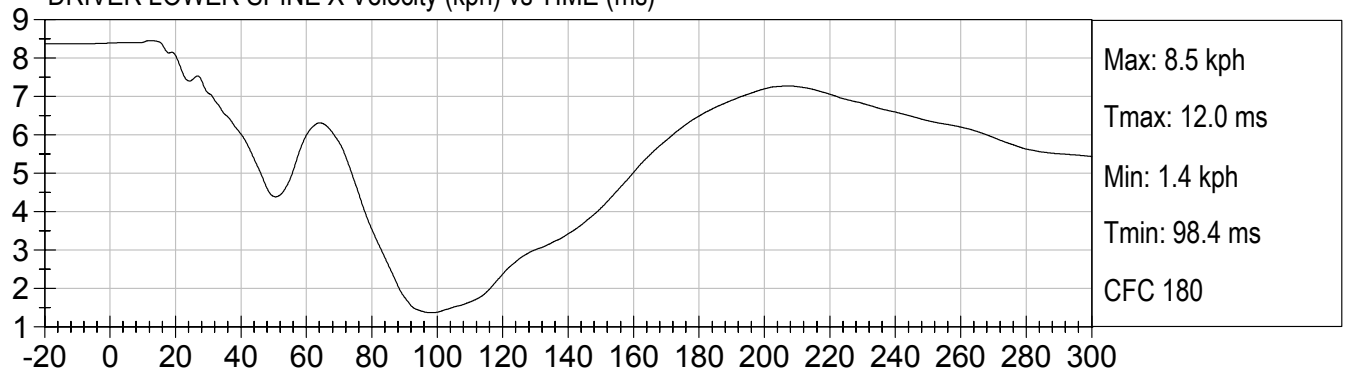




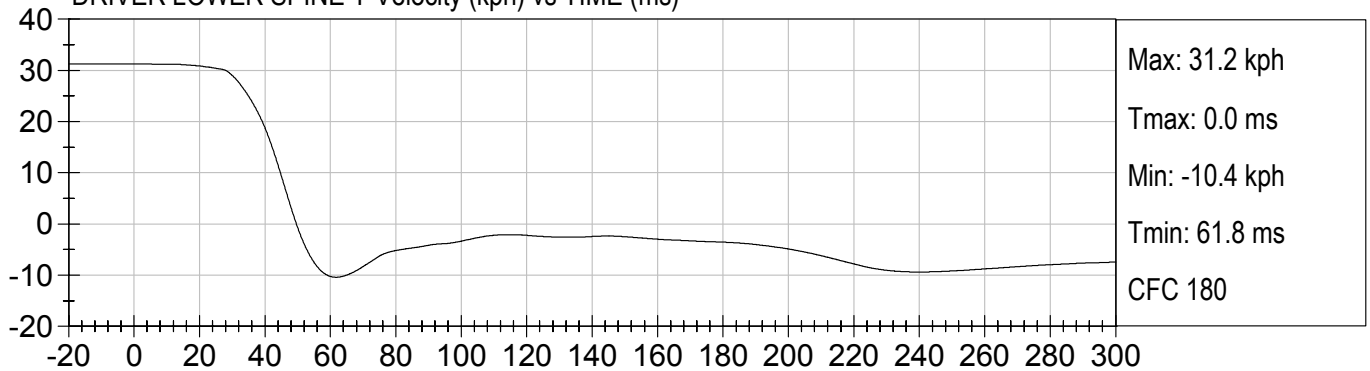




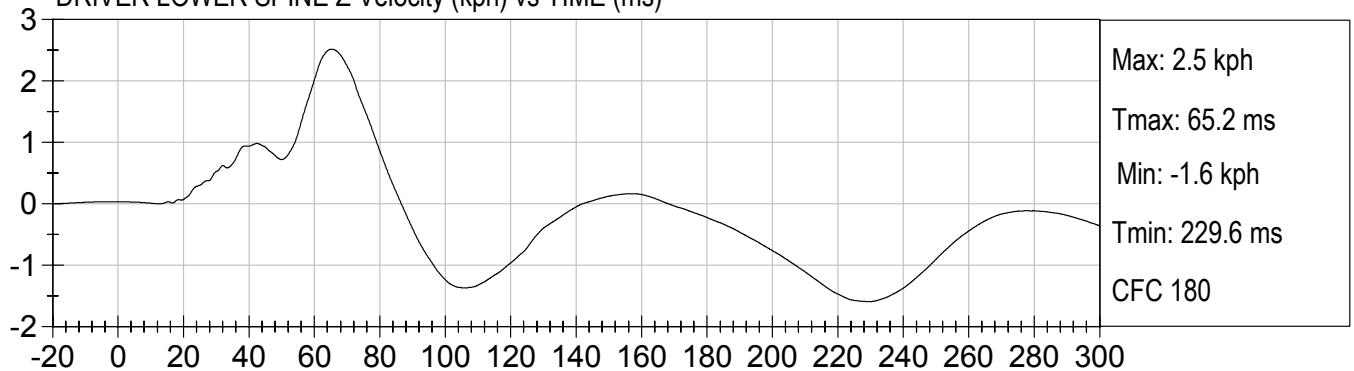
DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)

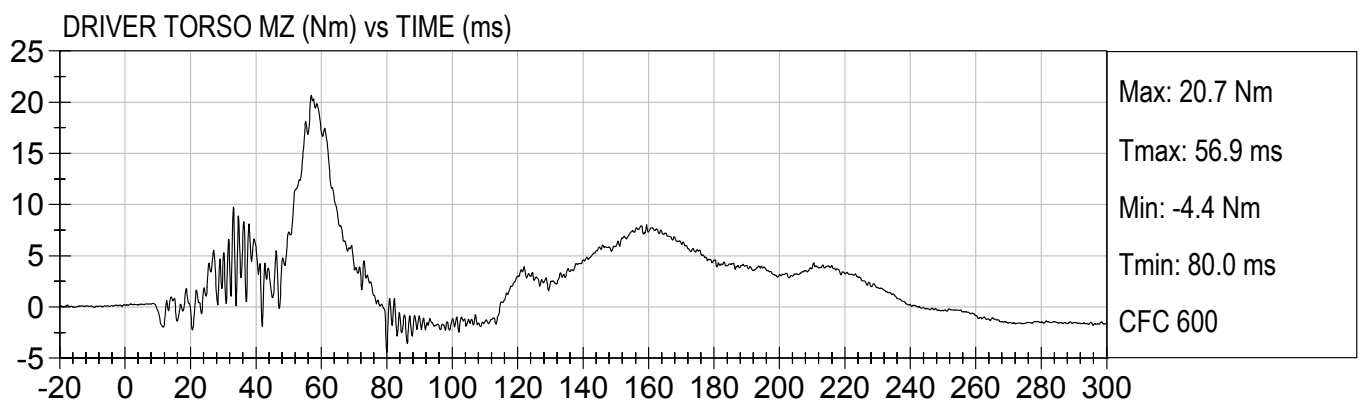
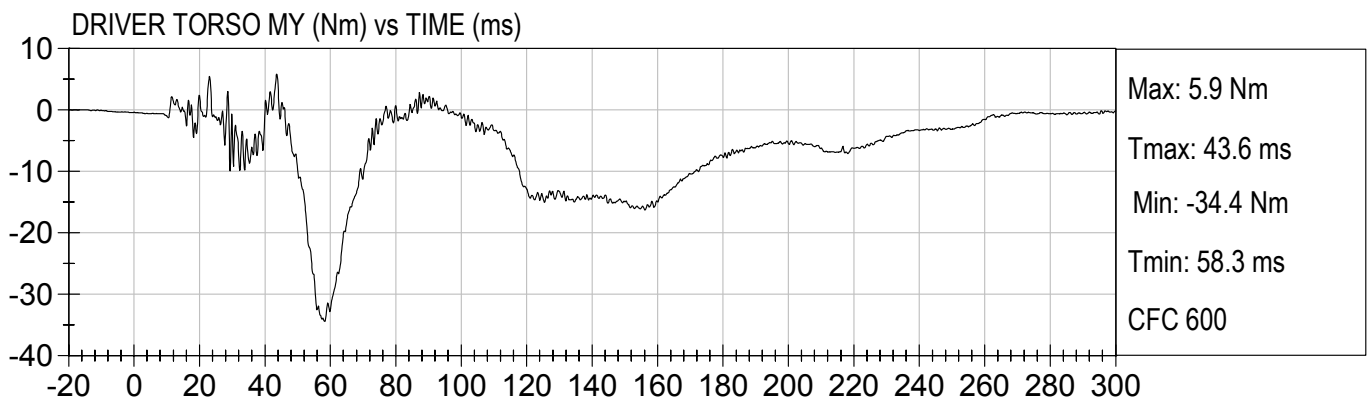
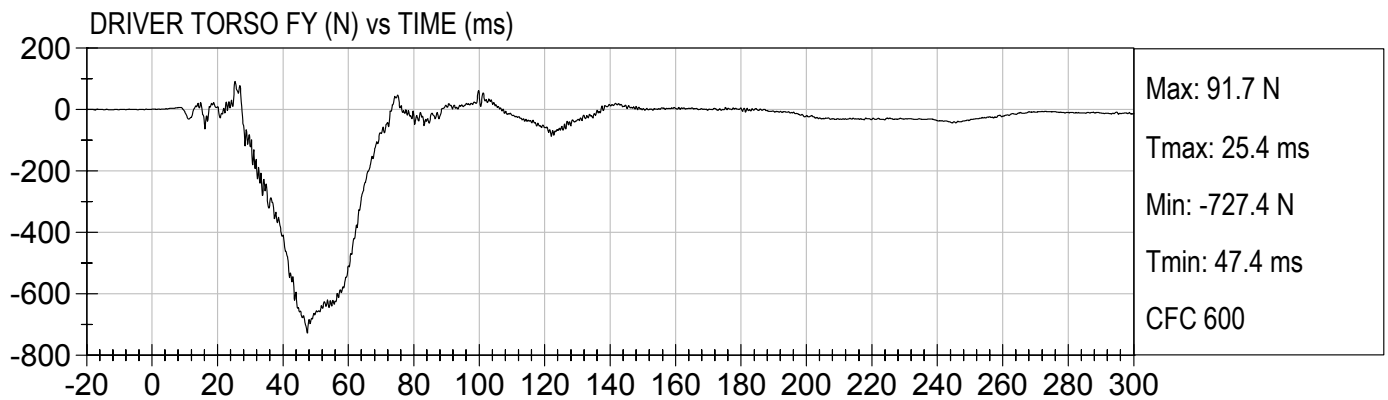
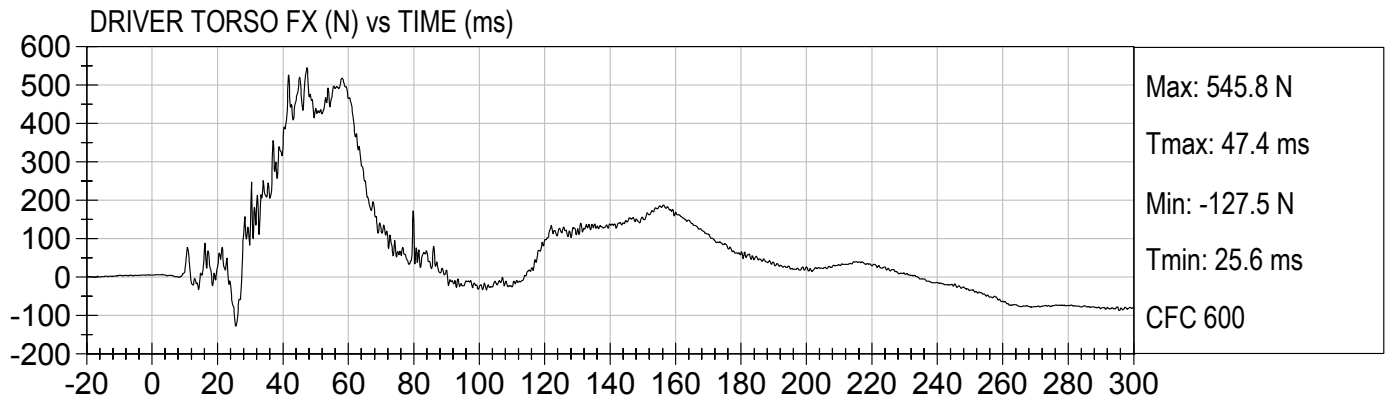


DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



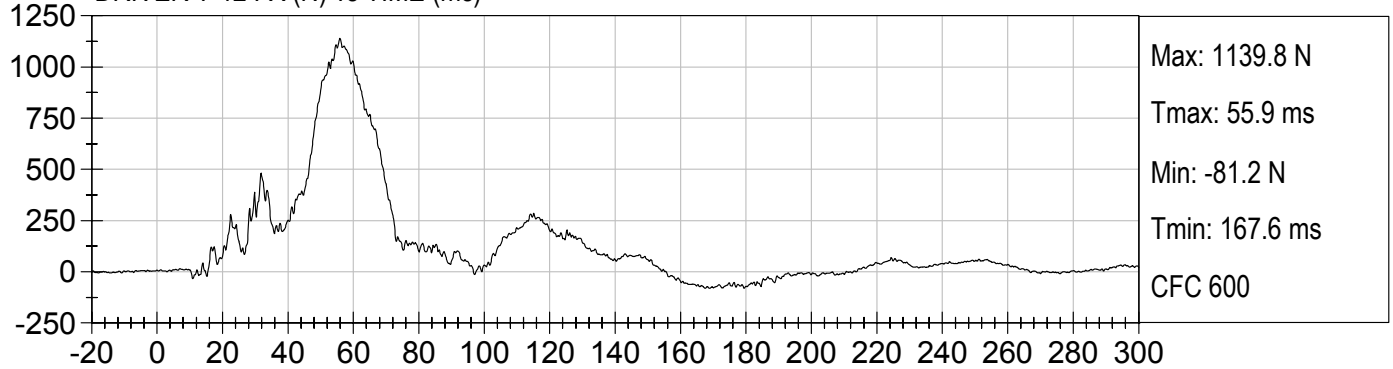
DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)



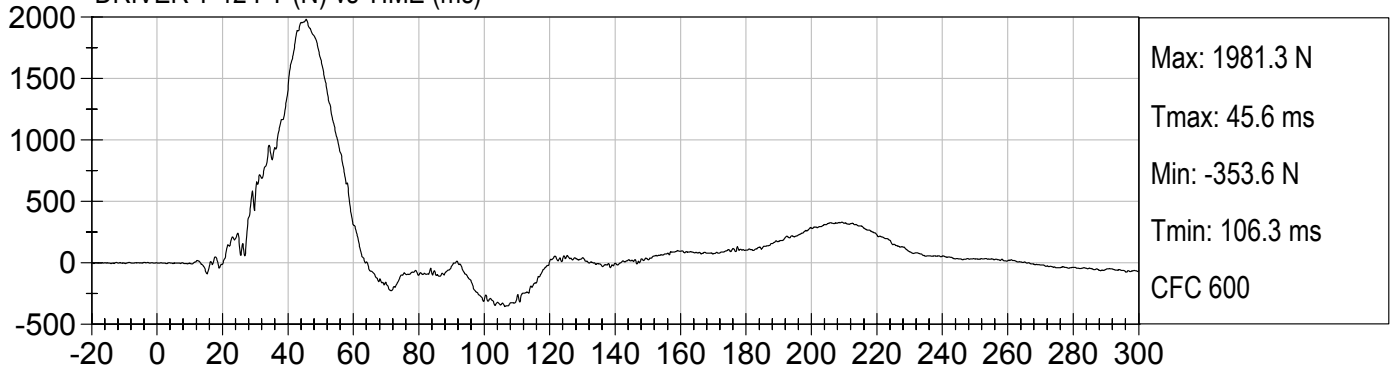




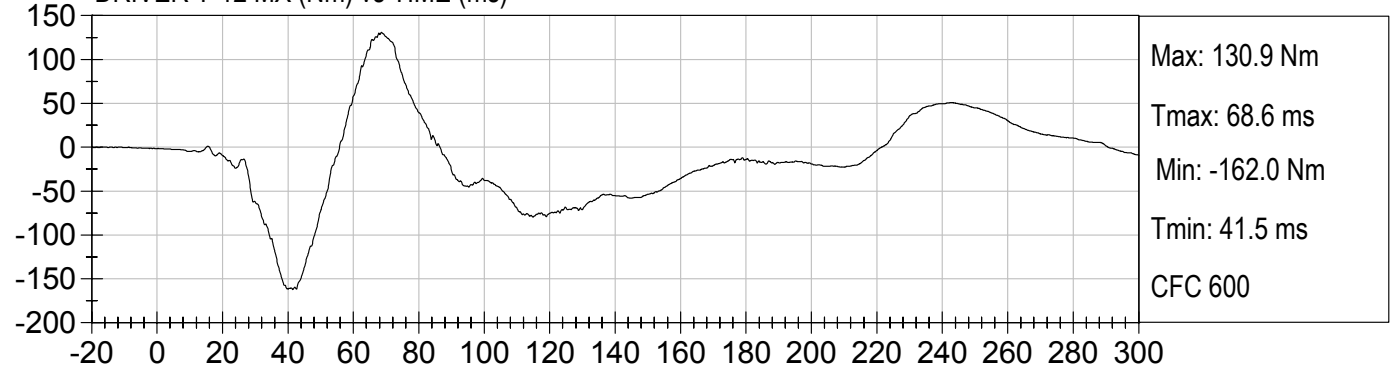
DRIVER T-12 FX (N) vs TIME (ms)



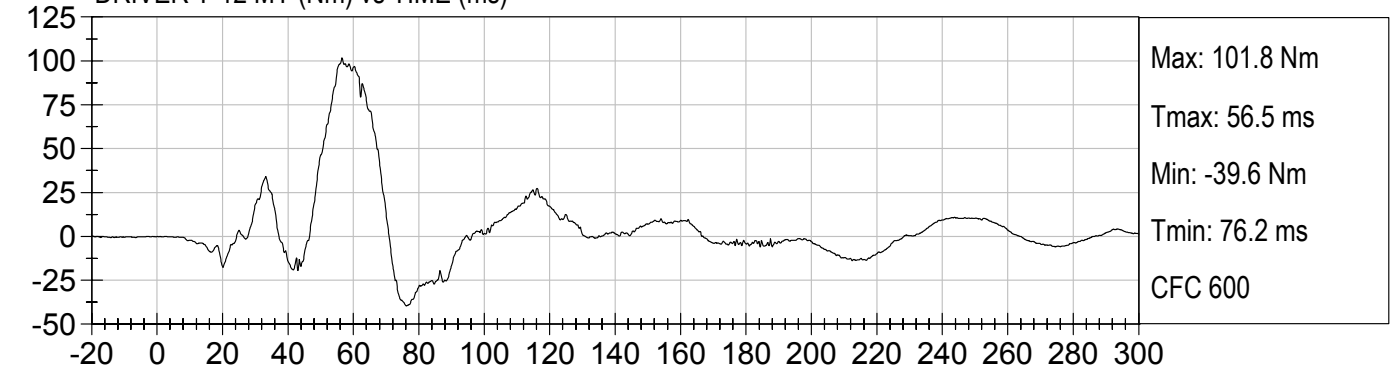
DRIVER T-12 FY (N) vs TIME (ms)



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

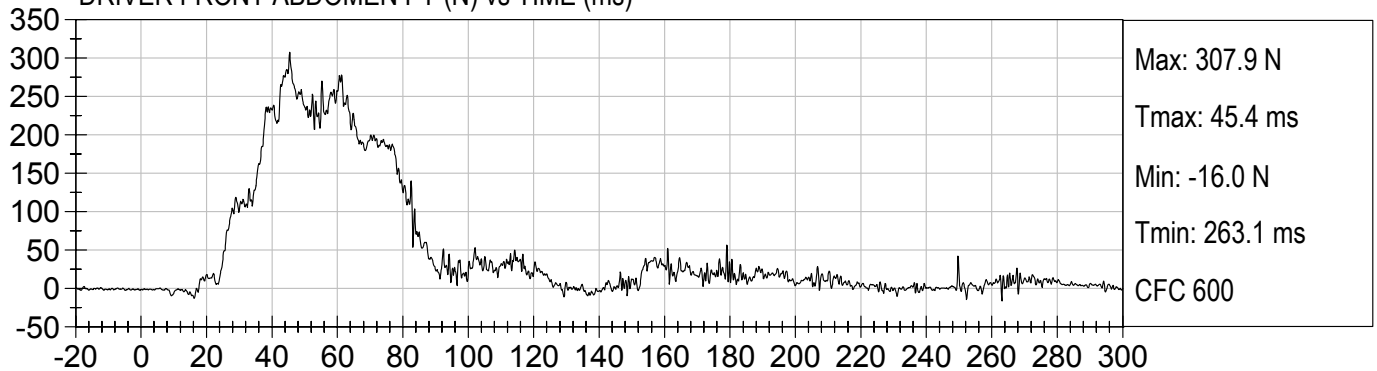


DRIVER T-12 MY (Nm) vs TIME (ms)

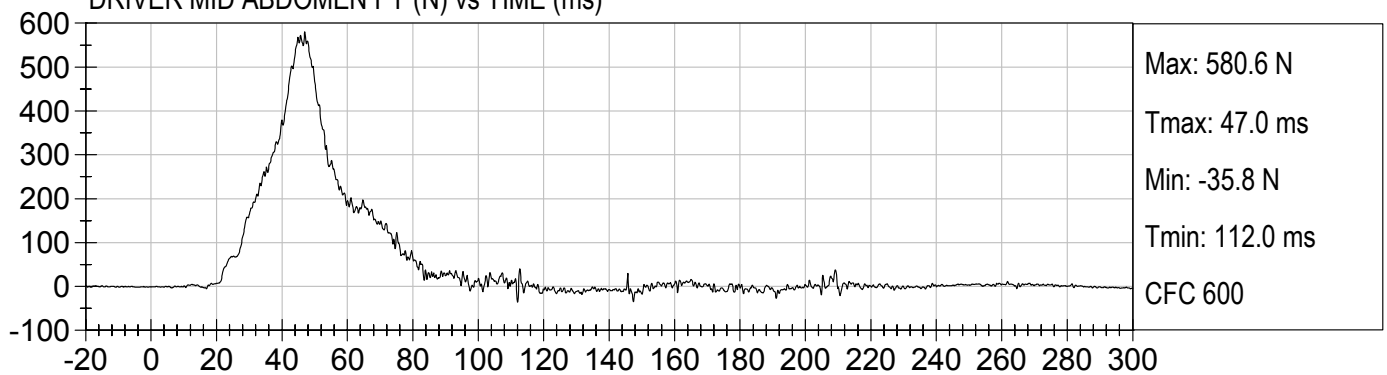




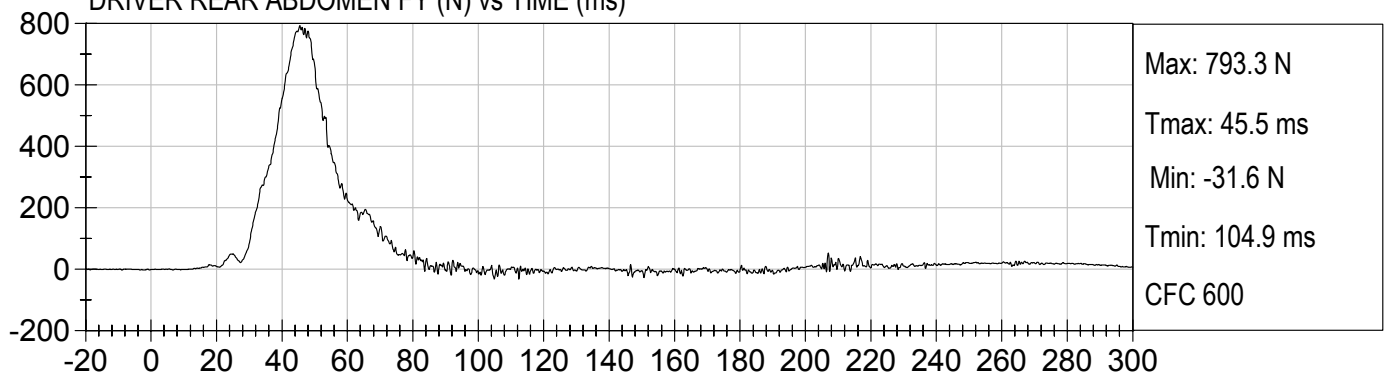
DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)



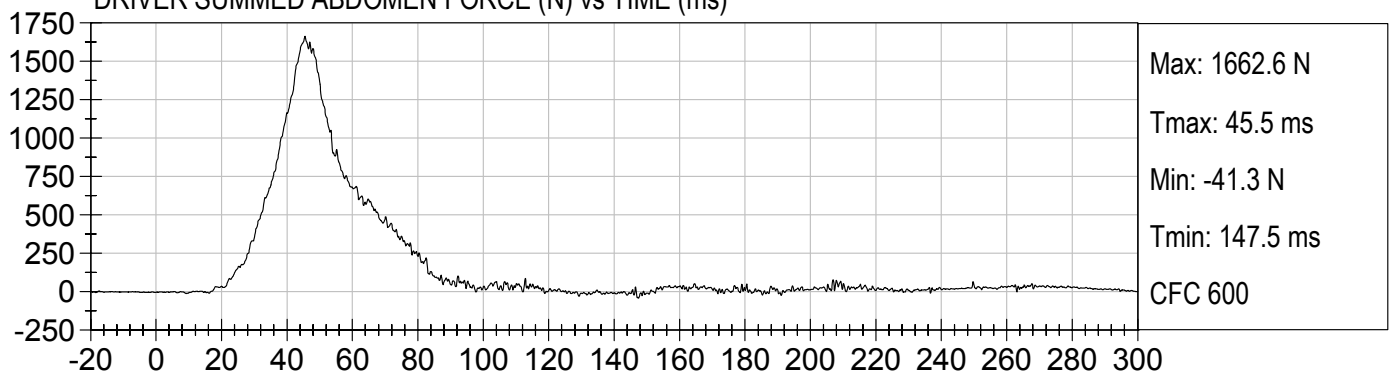
DRIVER MID ABDOMEN FY (N) vs TIME (ms)



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

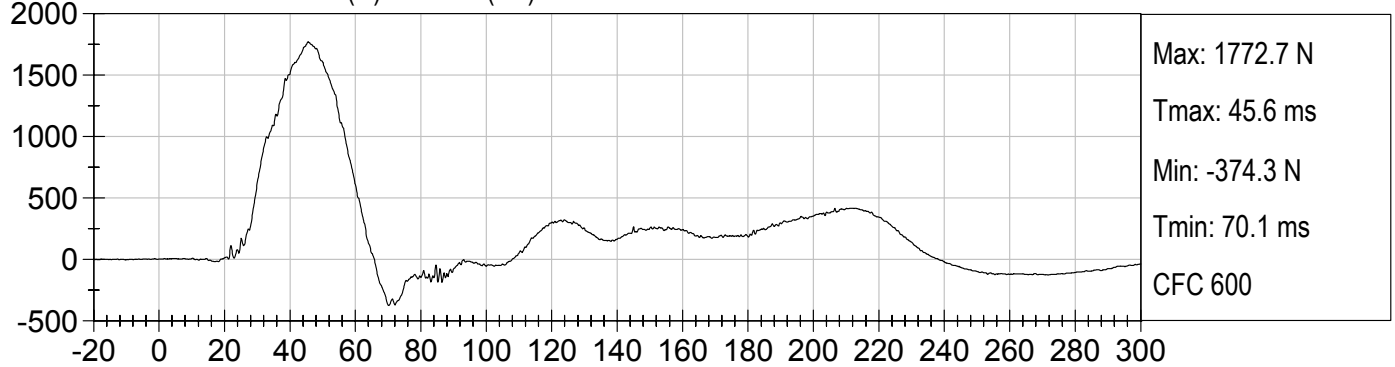


DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

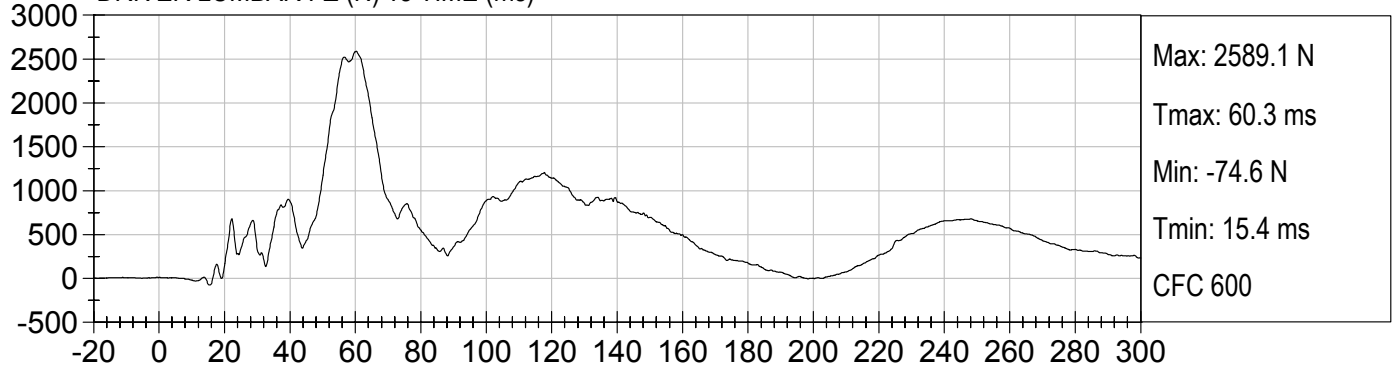




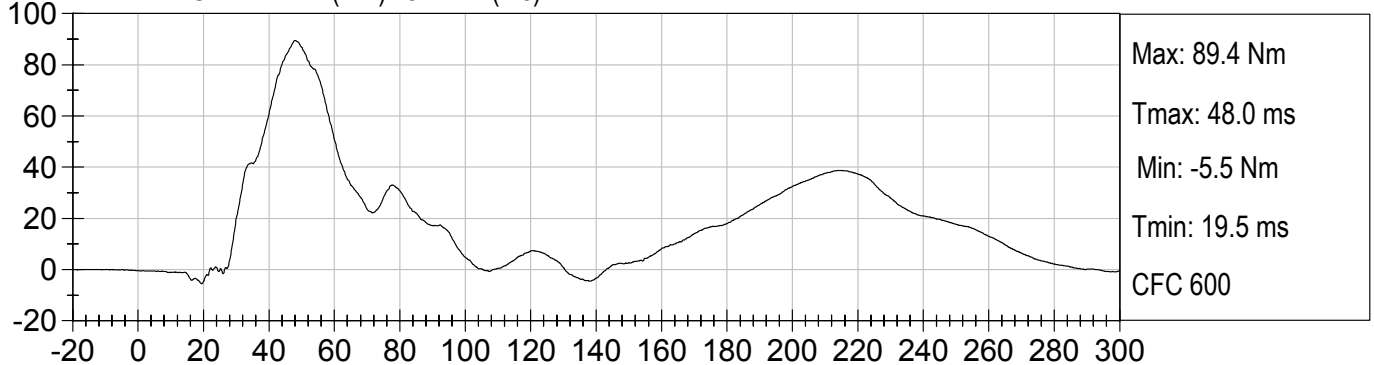
DRIVER LUMBAR FY (N) vs TIME (ms)



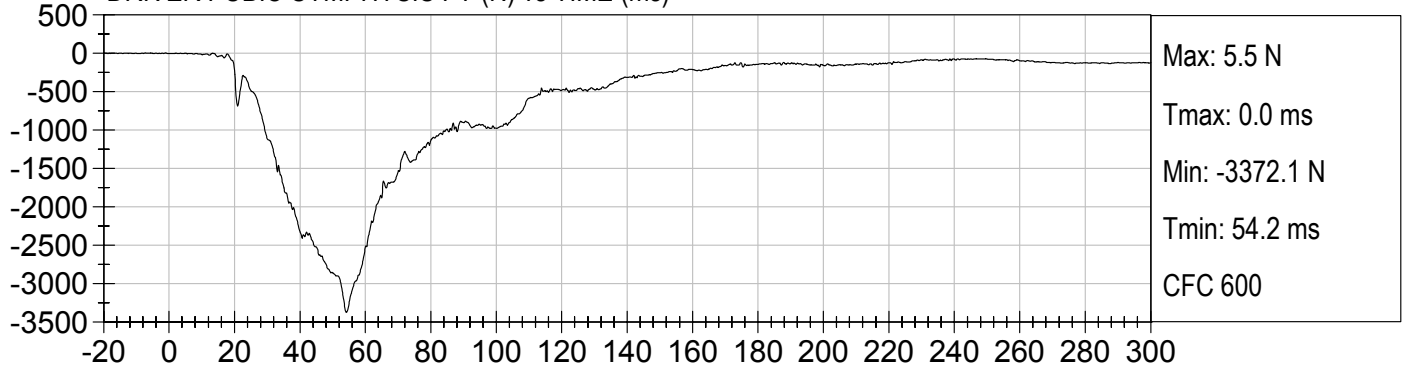
DRIVER LUMBAR FZ (N) vs TIME (ms)

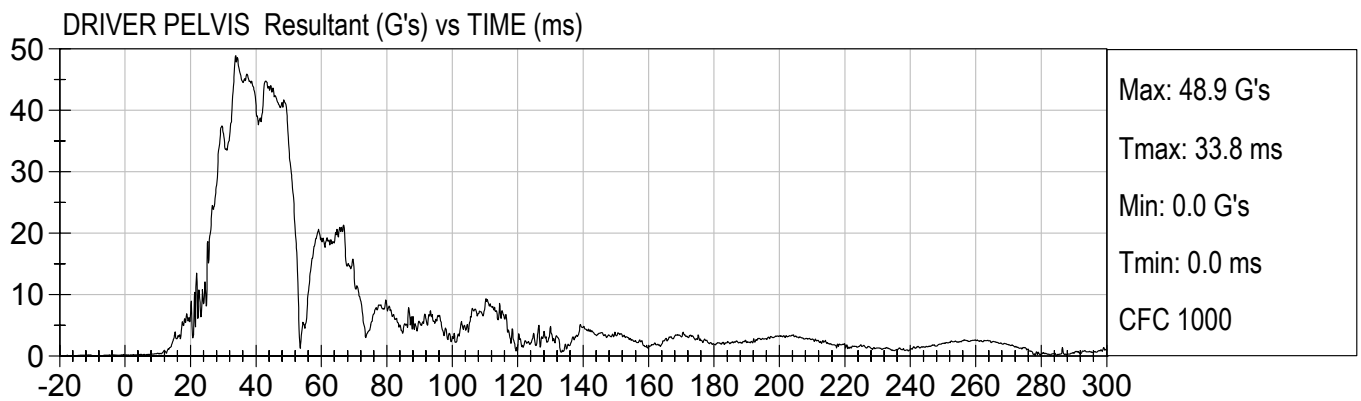
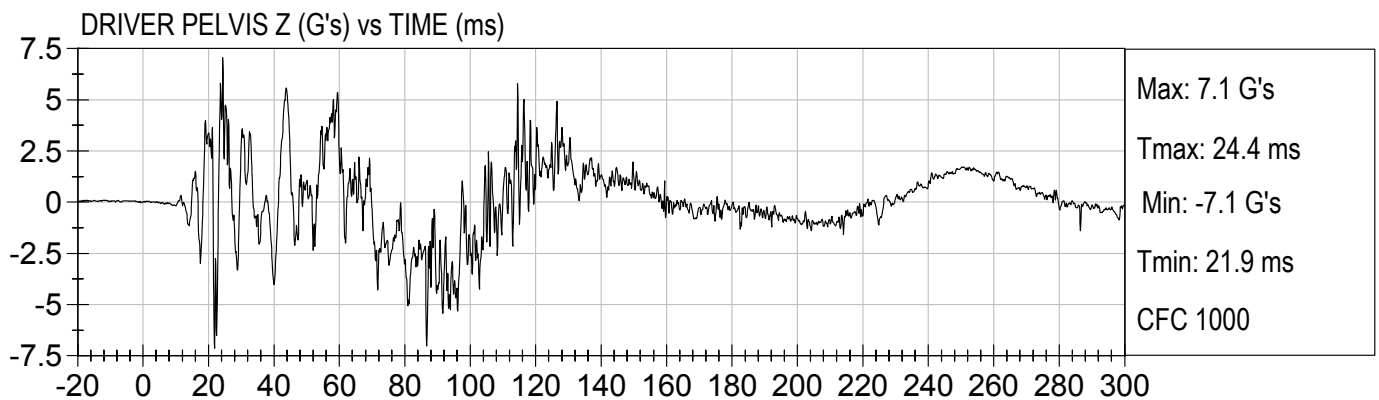
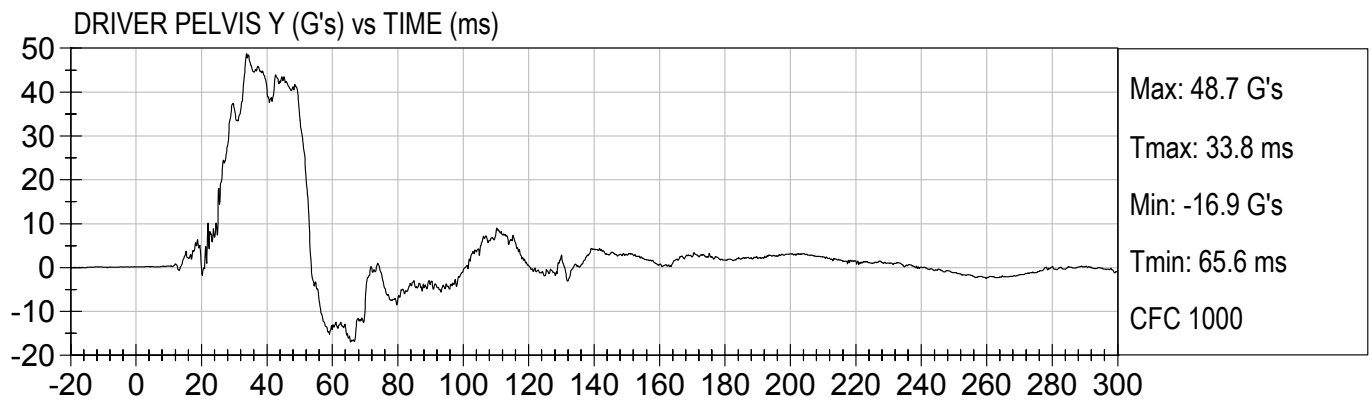
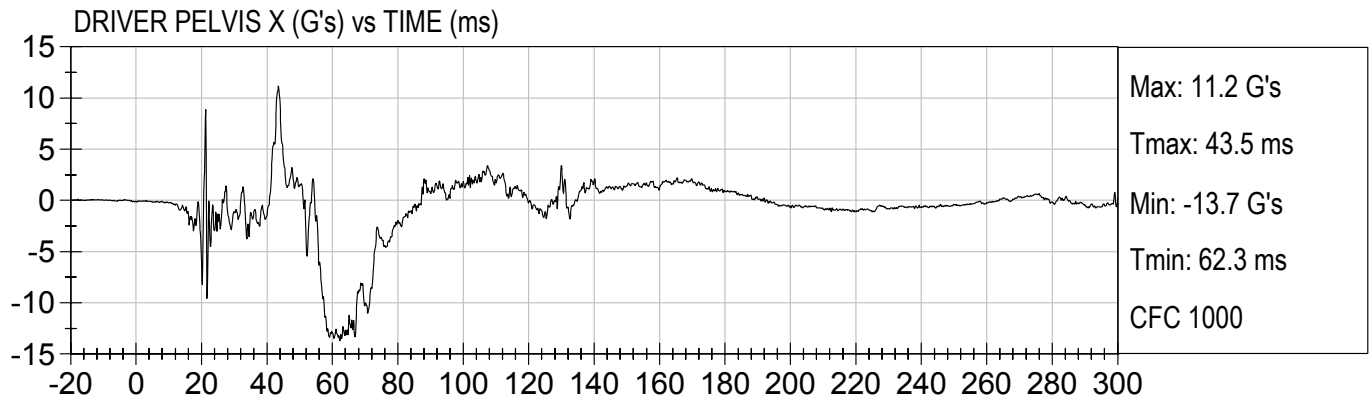


DRIVER LUMBAR MX (Nm) vs TIME (ms)



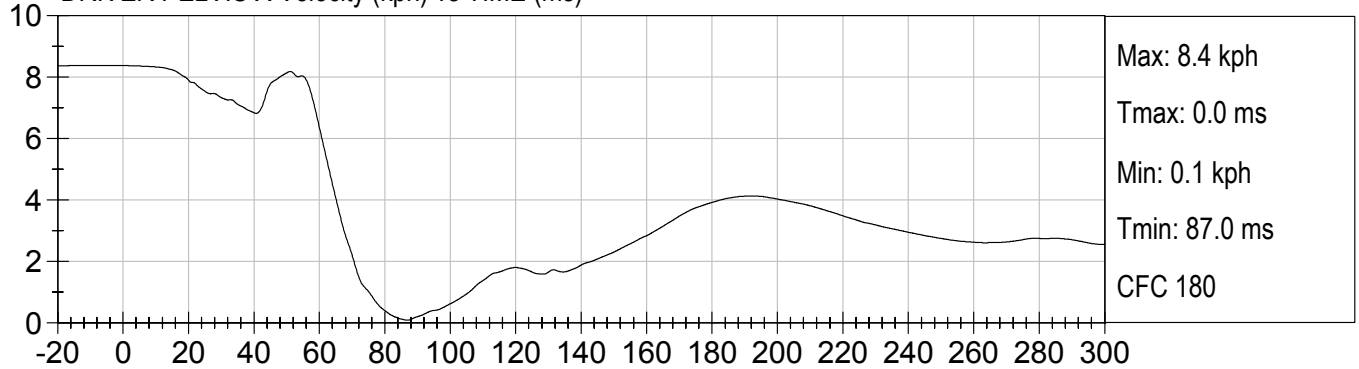
DRIVER PUBIC SYMPHYSIS FY (N) vs TIME (ms)



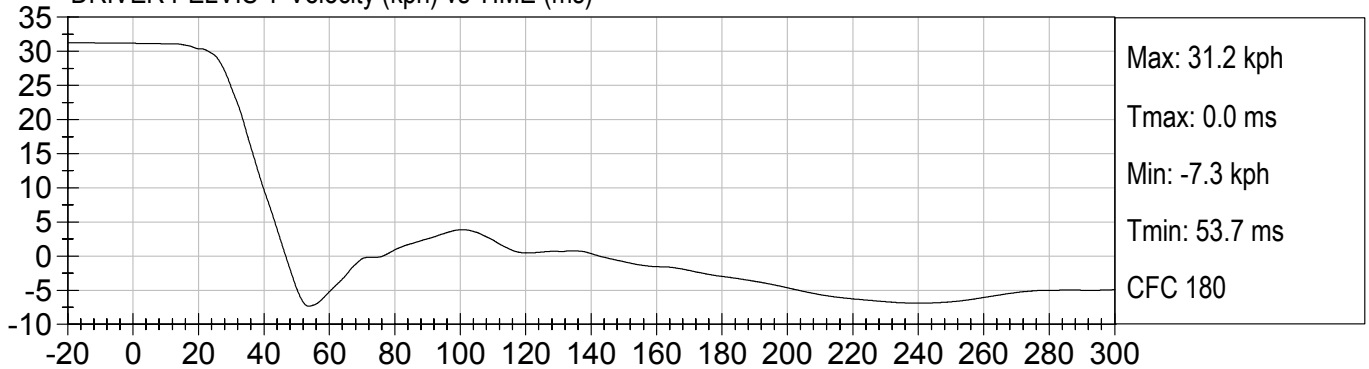




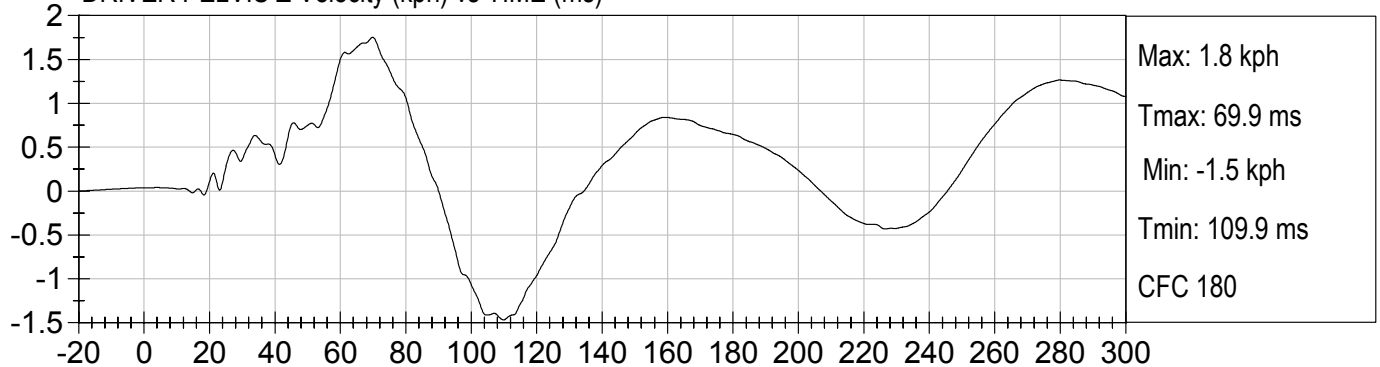
DRIVER PELVIS X Velocity (kph) vs TIME (ms)

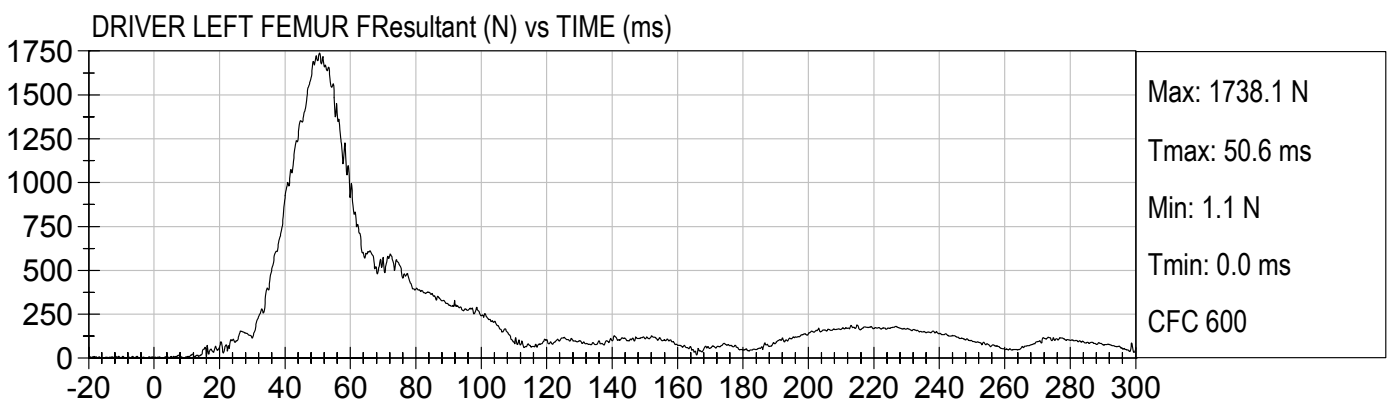
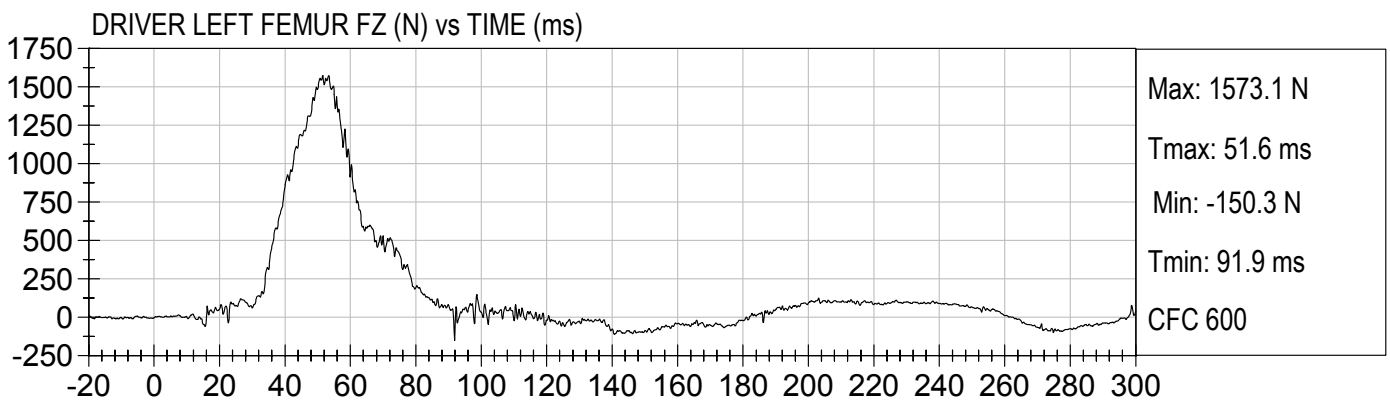
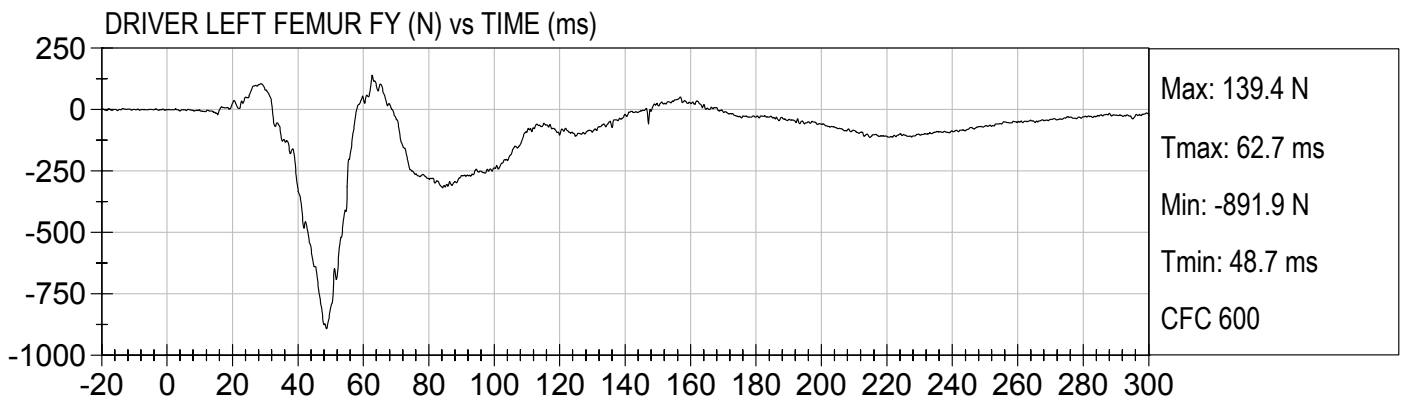
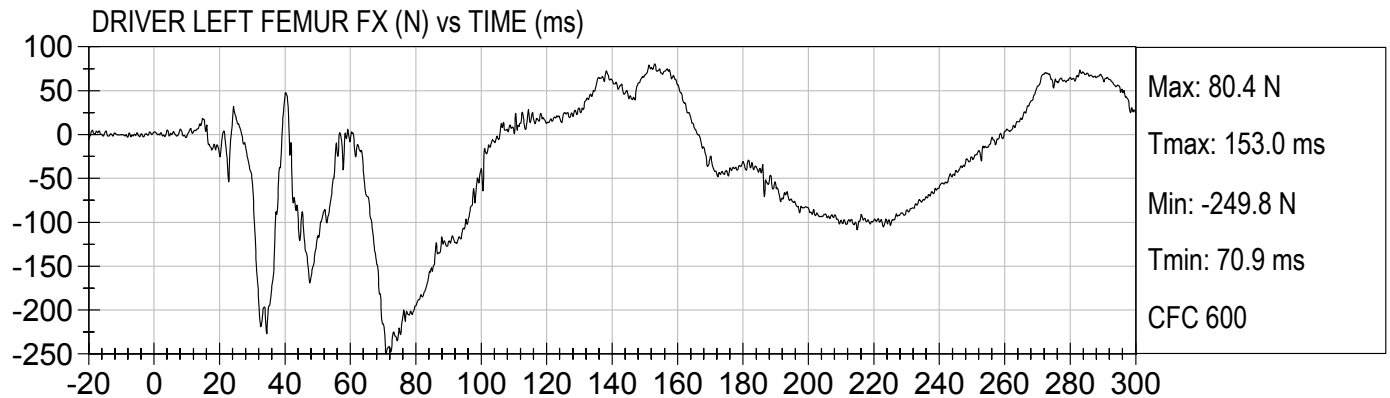


DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



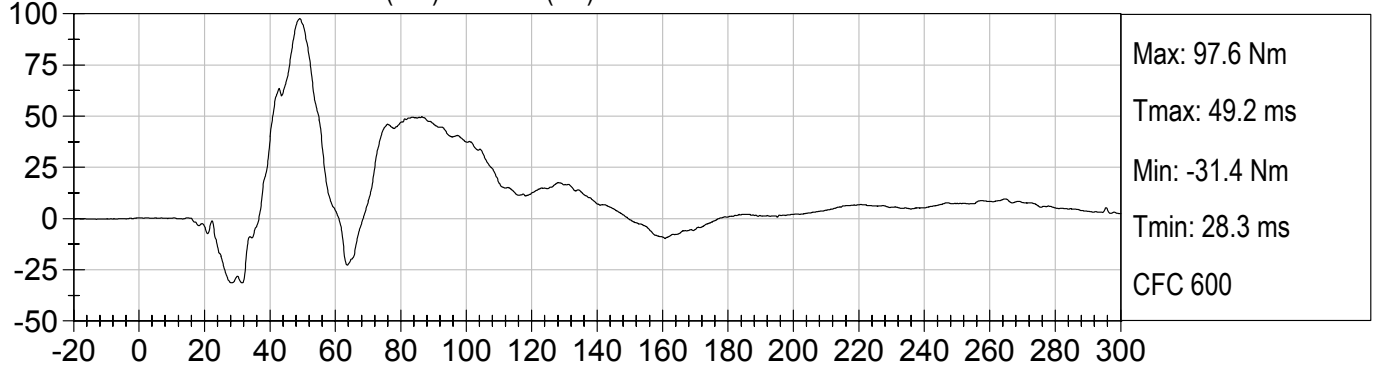
DRIVER PELVIS Z Velocity (kph) vs TIME (ms)



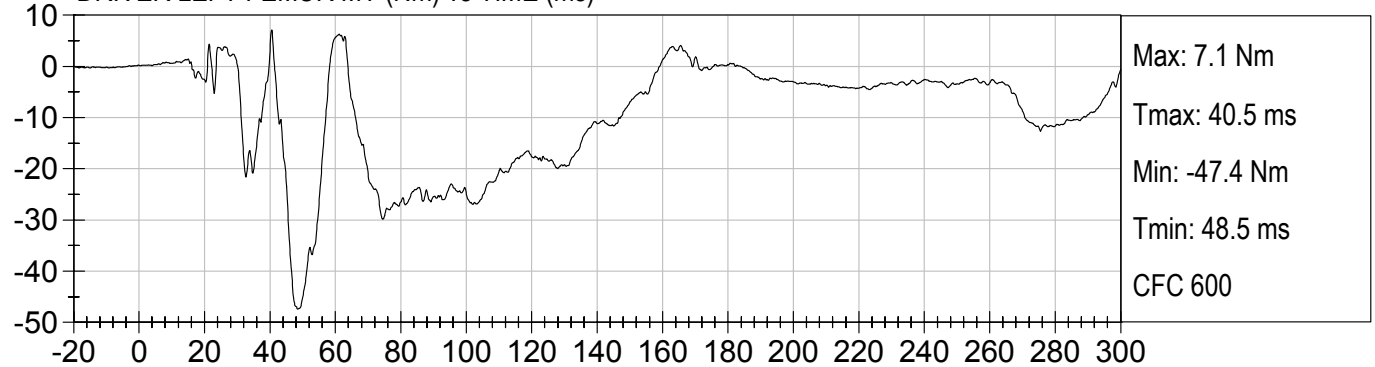




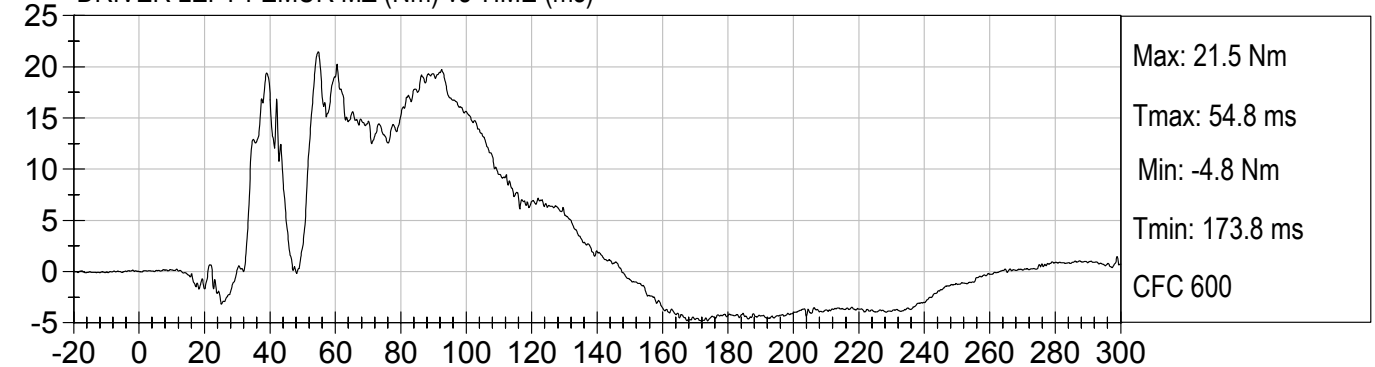
DRIVER LEFT FEMUR MX (Nm) vs TIME (ms)



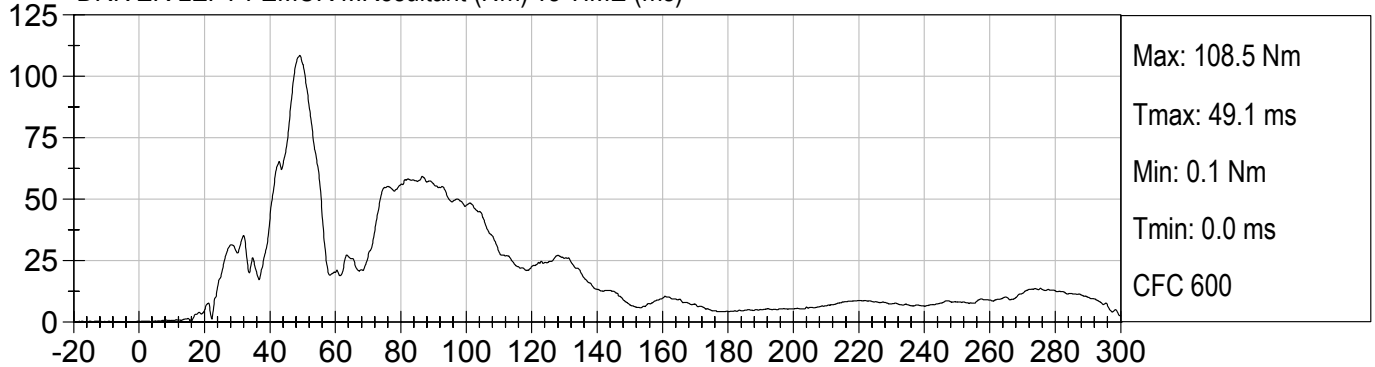
DRIVER LEFT FEMUR MY (Nm) vs TIME (ms)



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

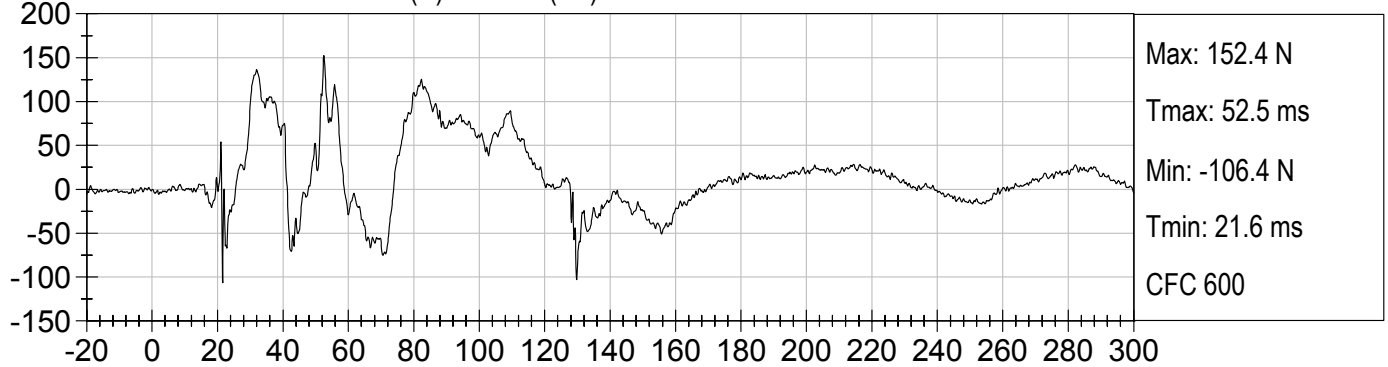


DRIVER LEFT FEMUR MResultant (Nm) vs TIME (ms)

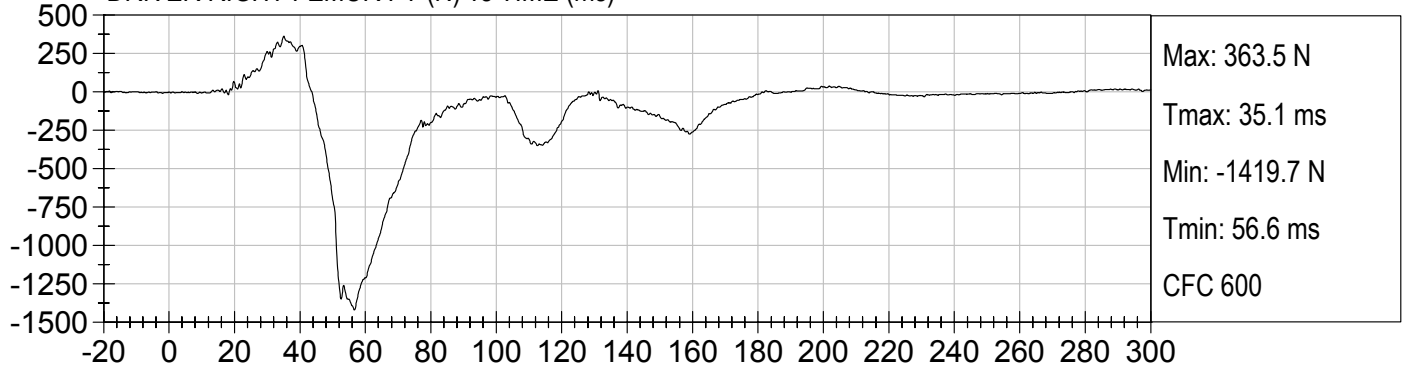




DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



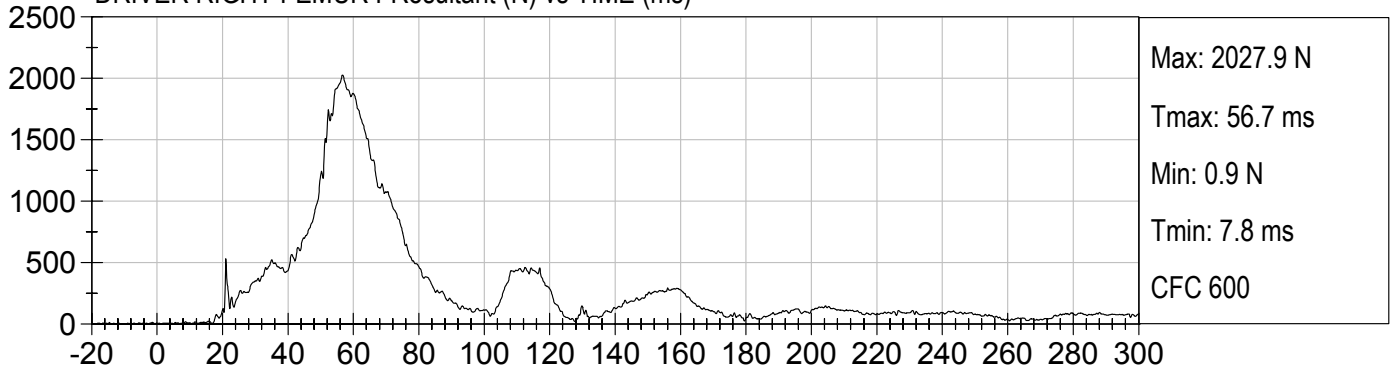
DRIVER RIGHT FEMUR FY (N) vs TIME (ms)

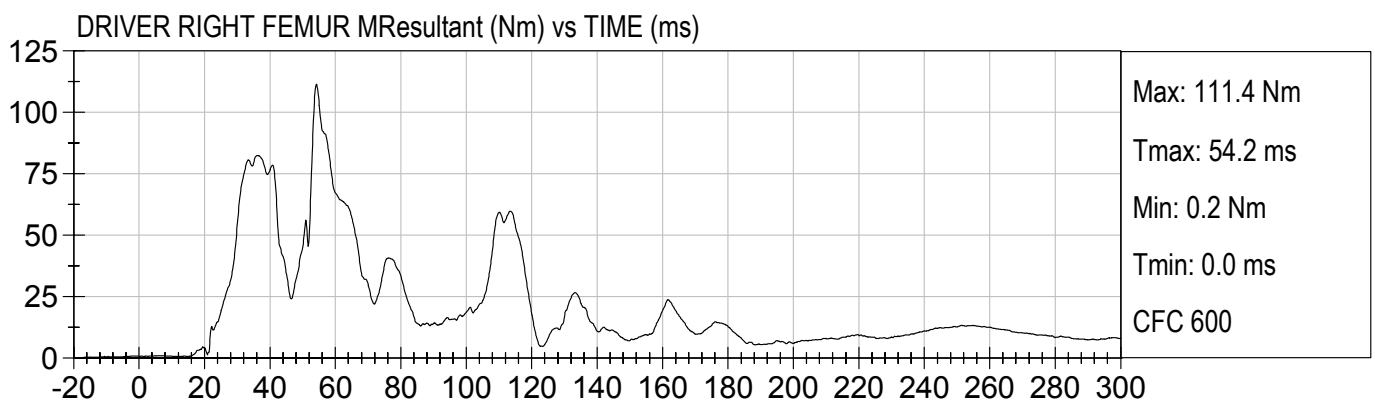
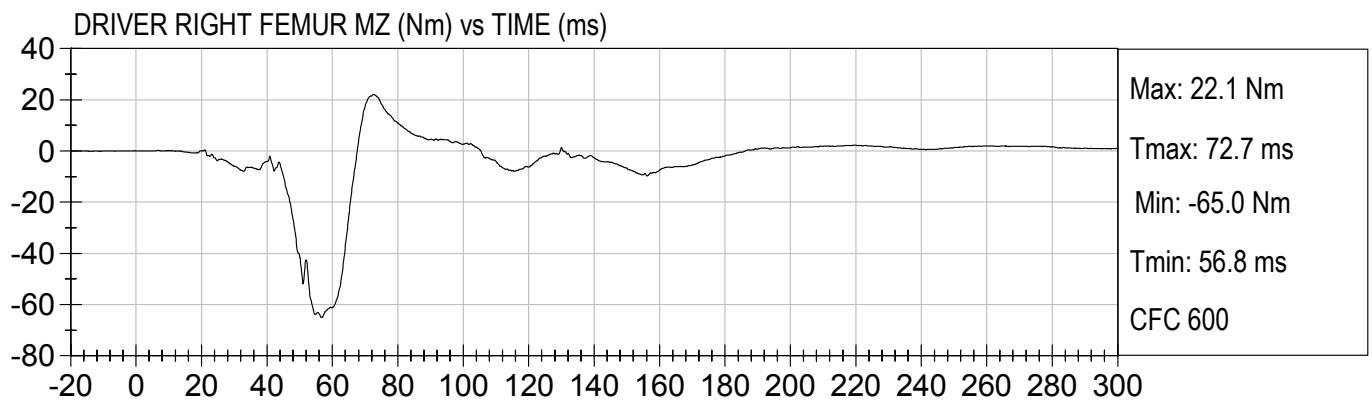
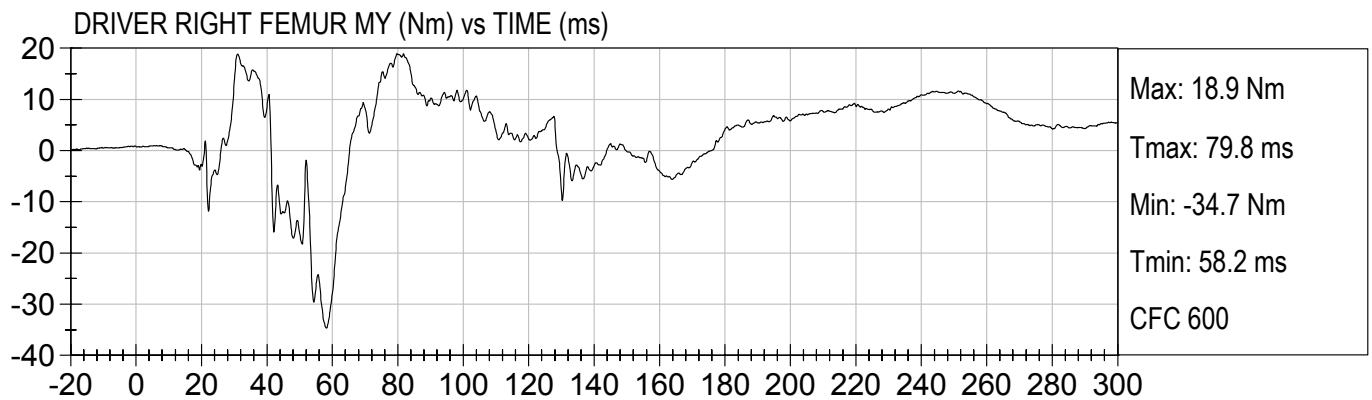
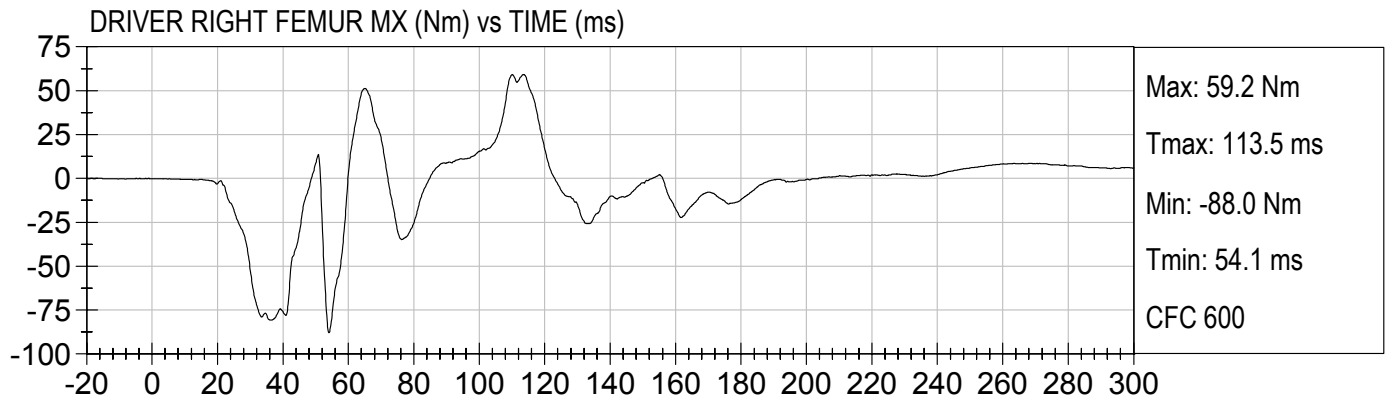


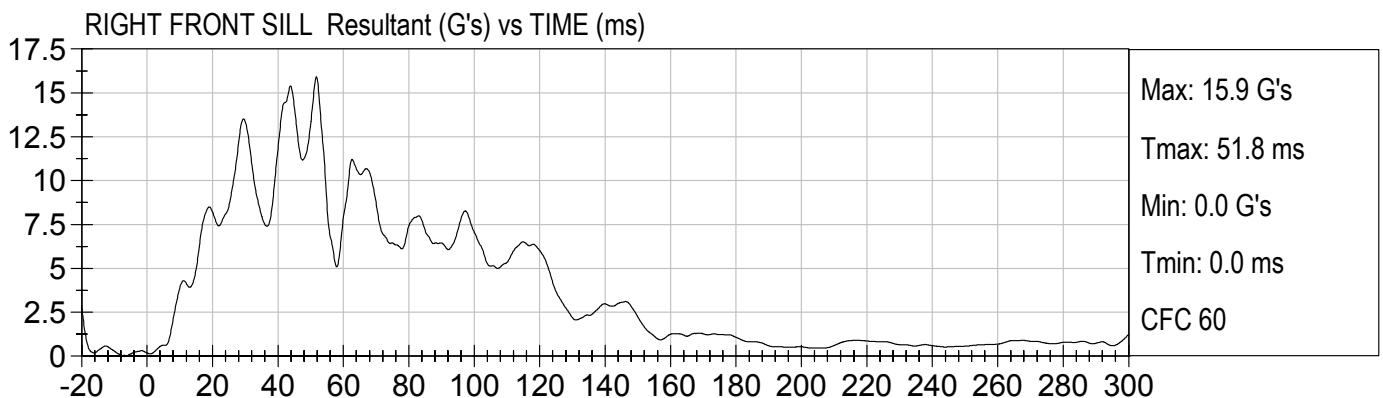
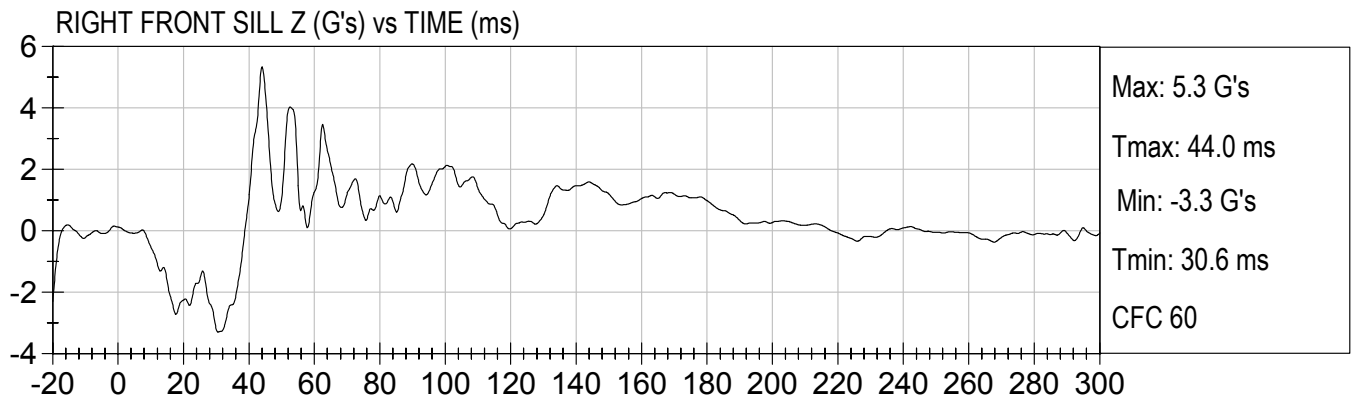
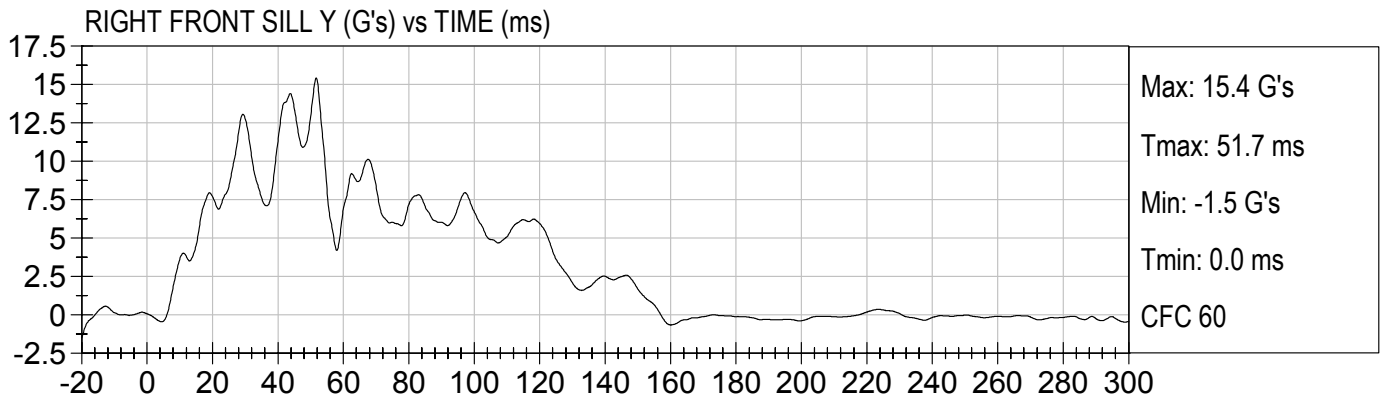
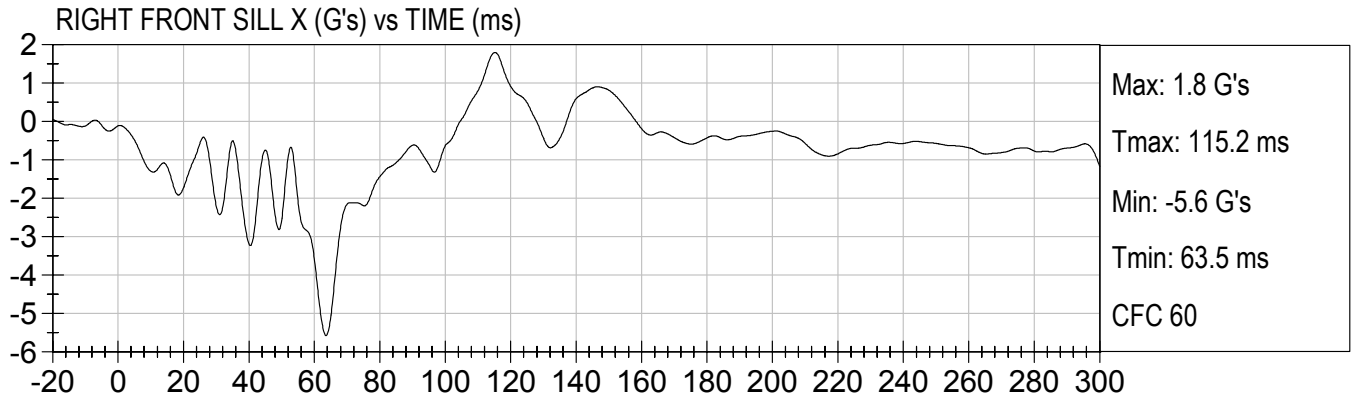
DRIVER RIGHT FEMUR FZ (N) vs TIME (ms)

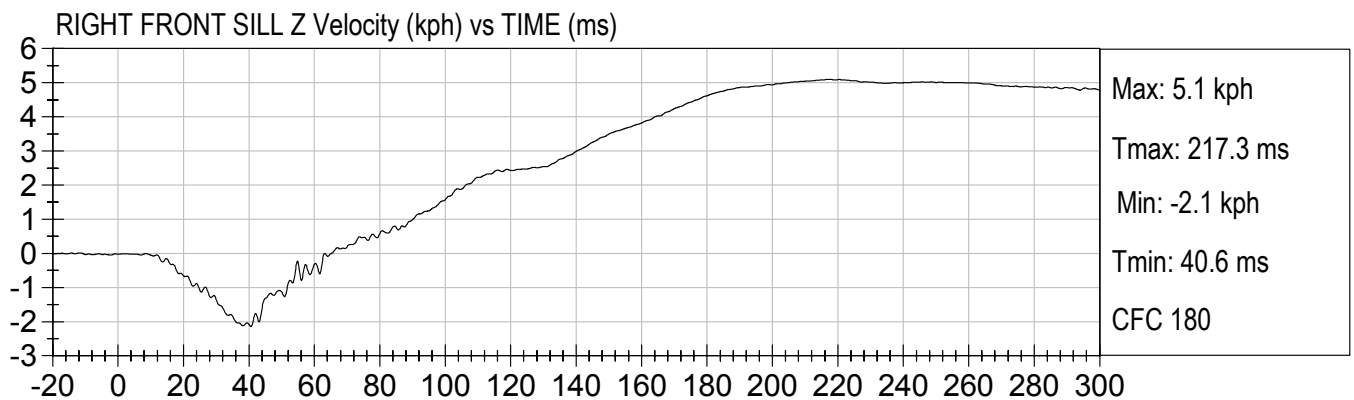
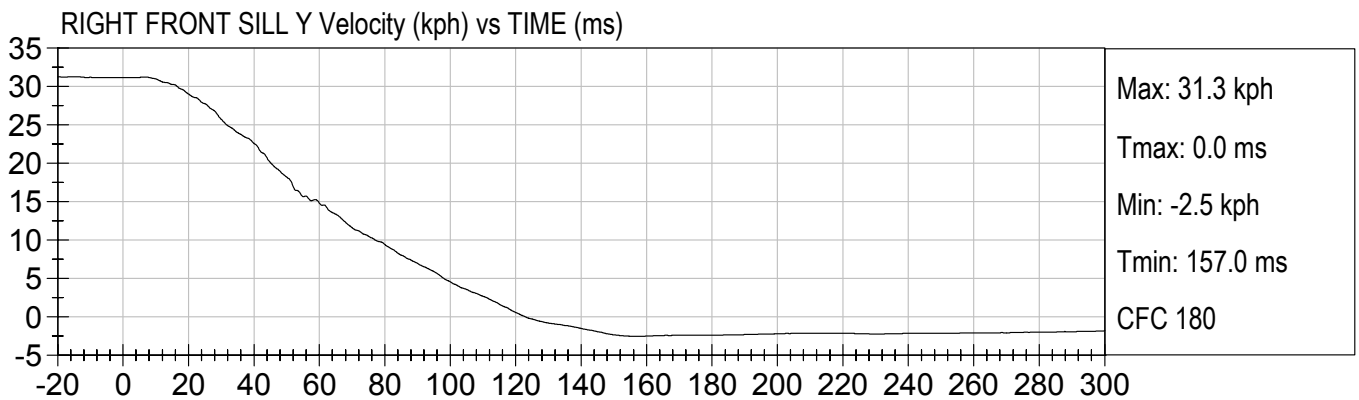
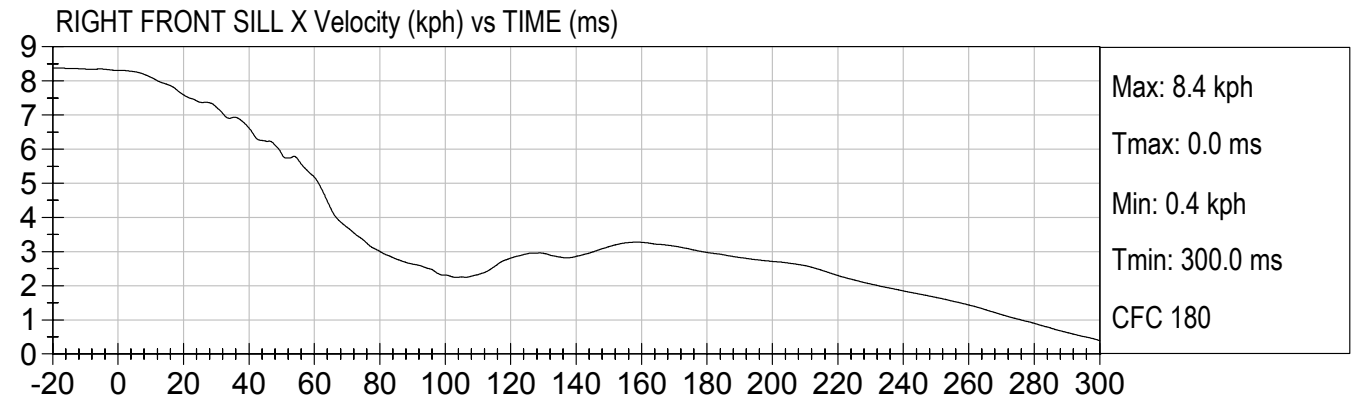


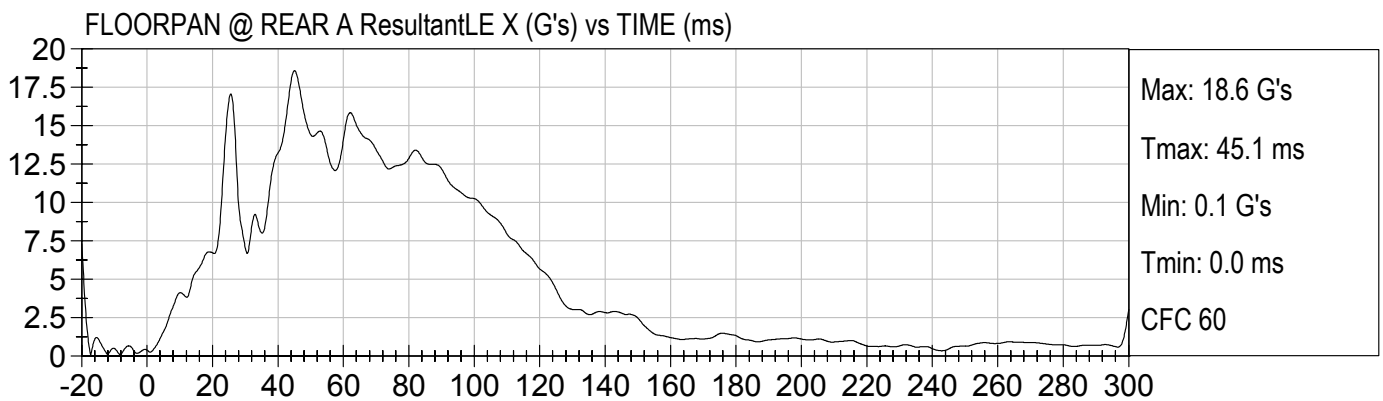
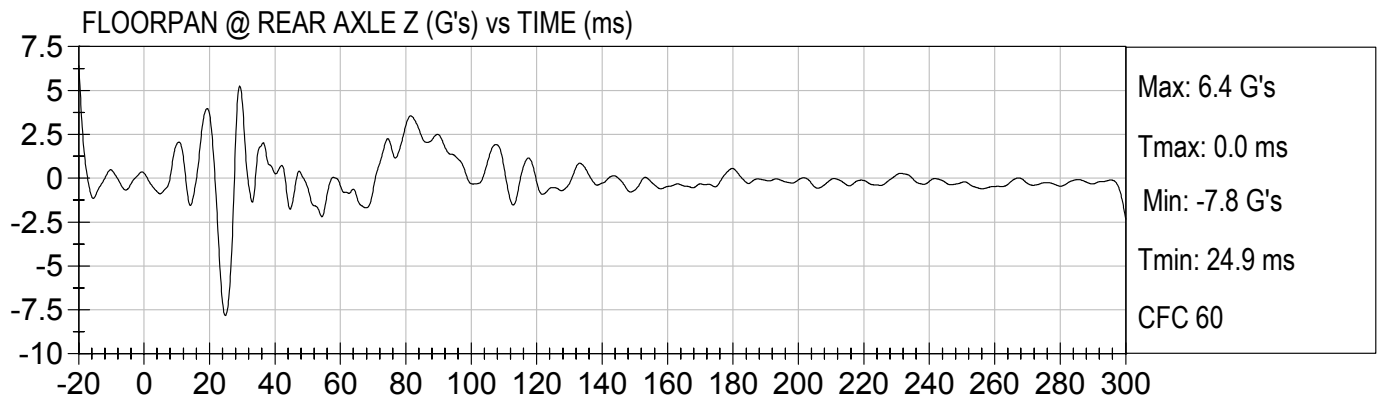
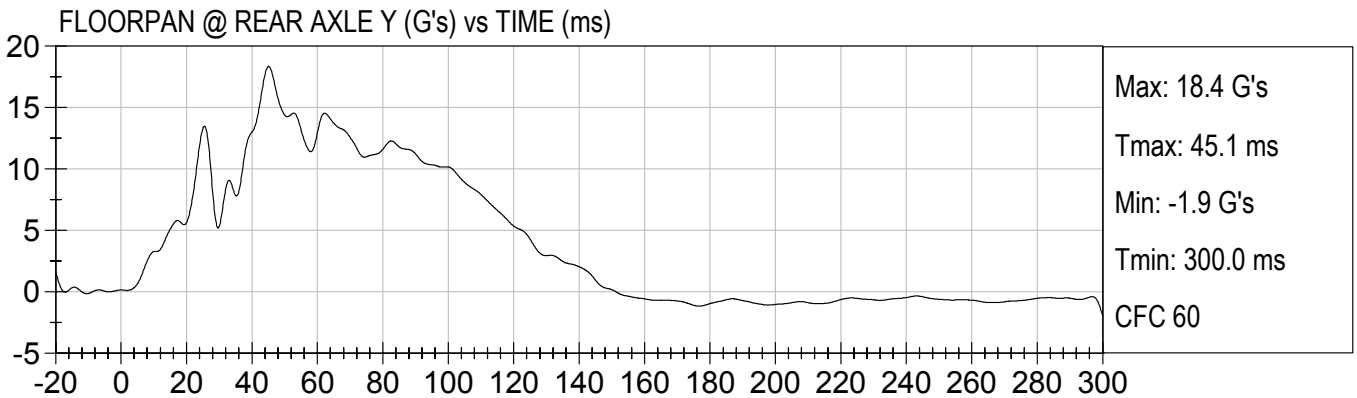
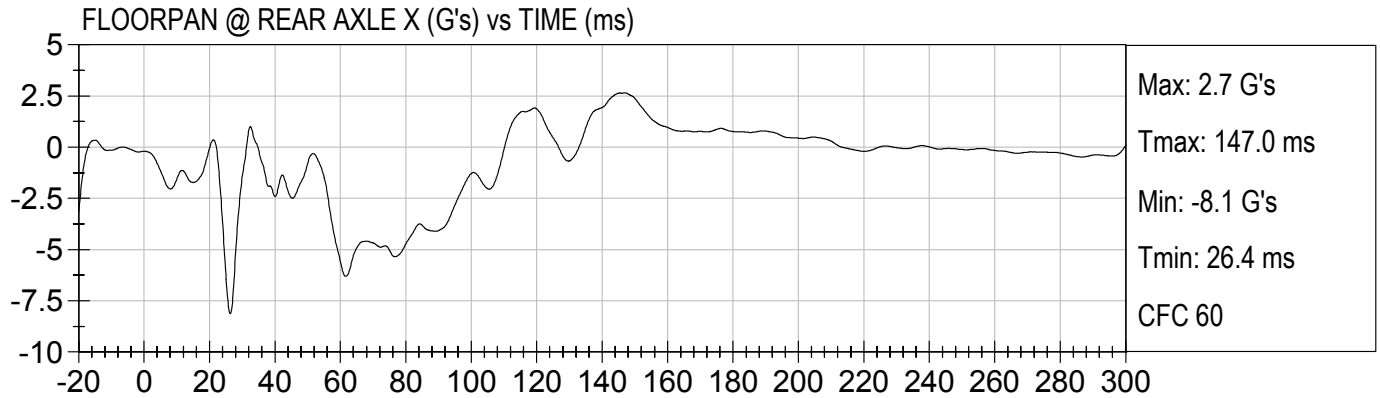
DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)

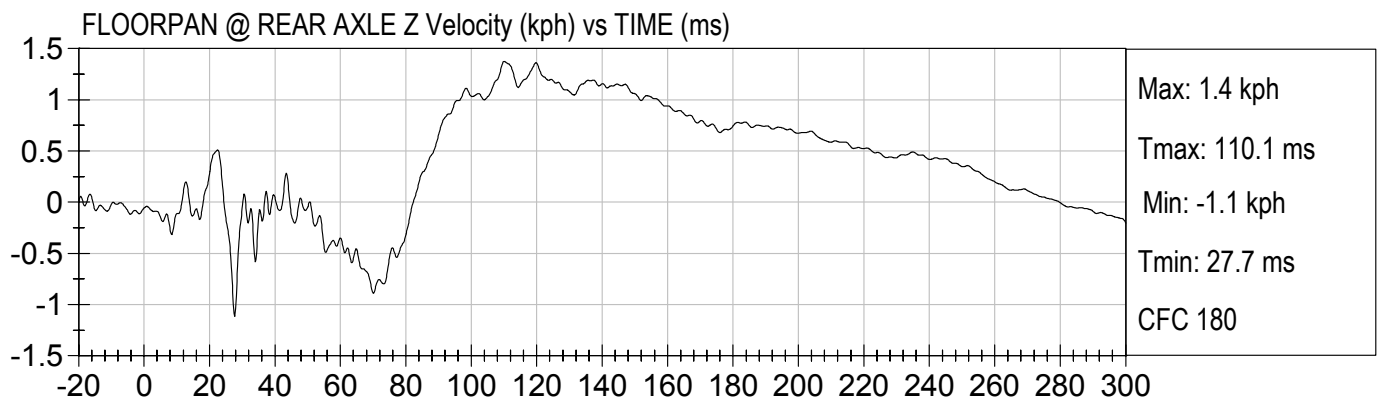
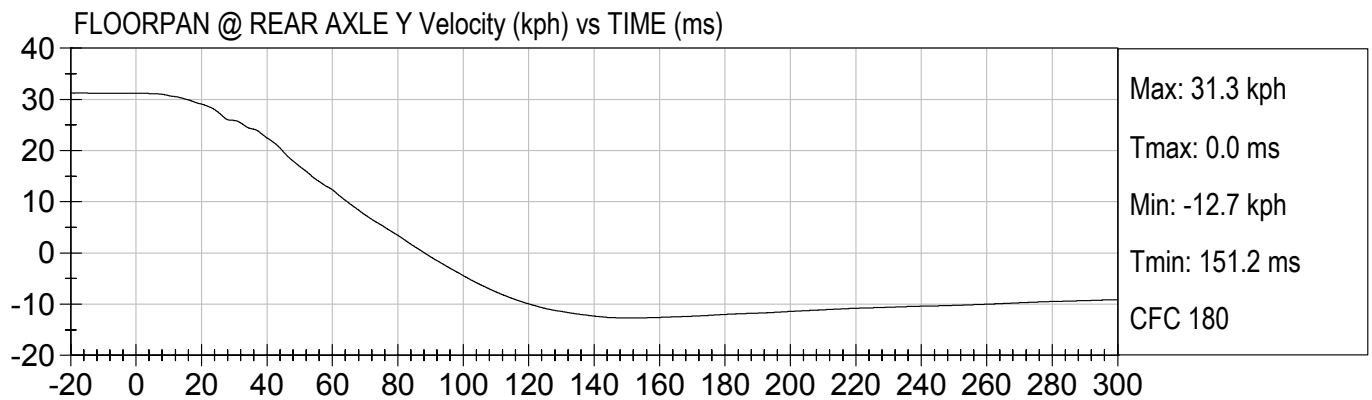
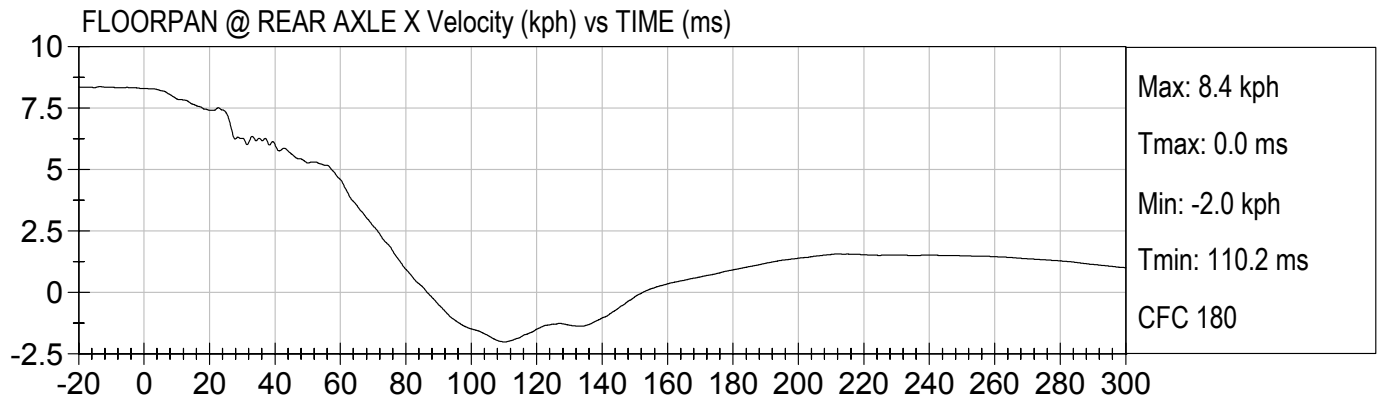


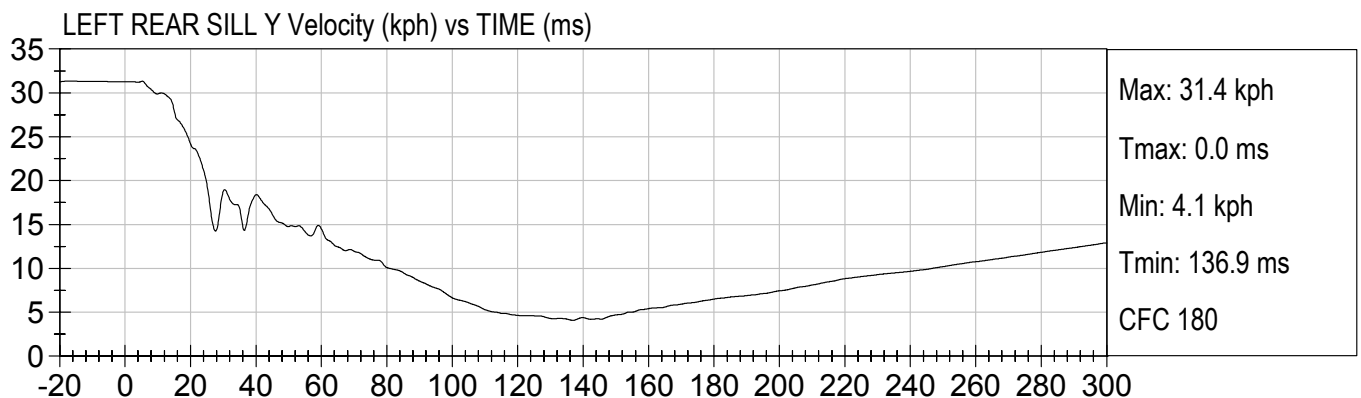
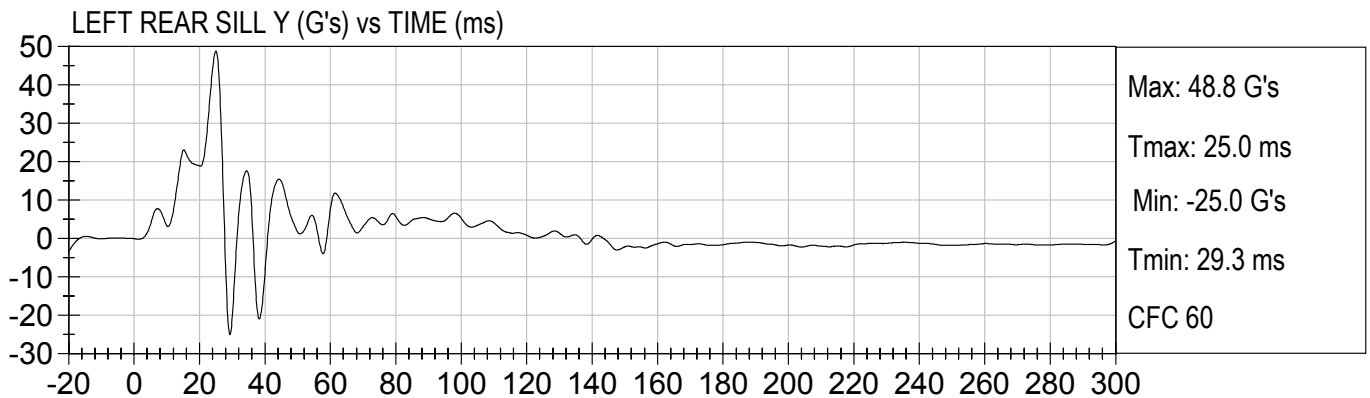
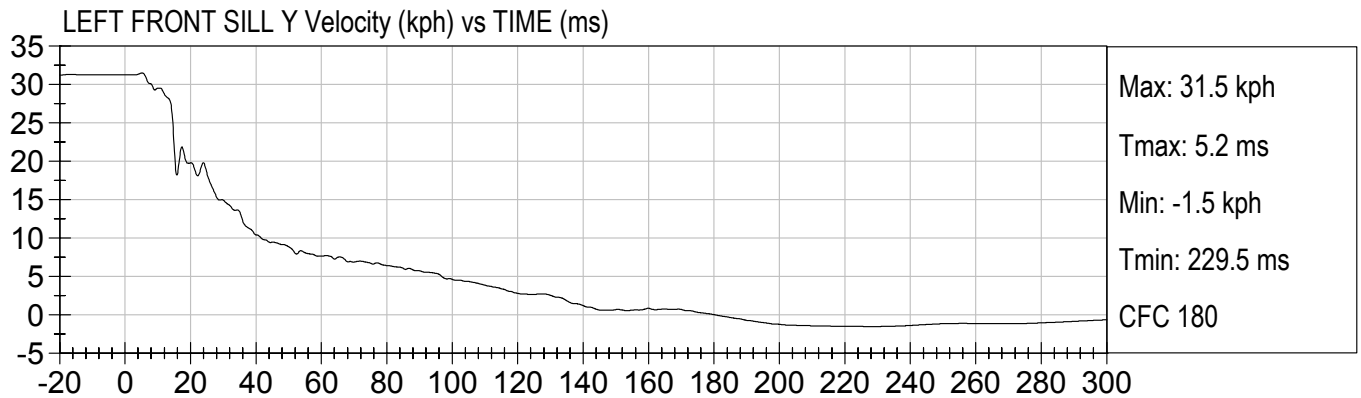
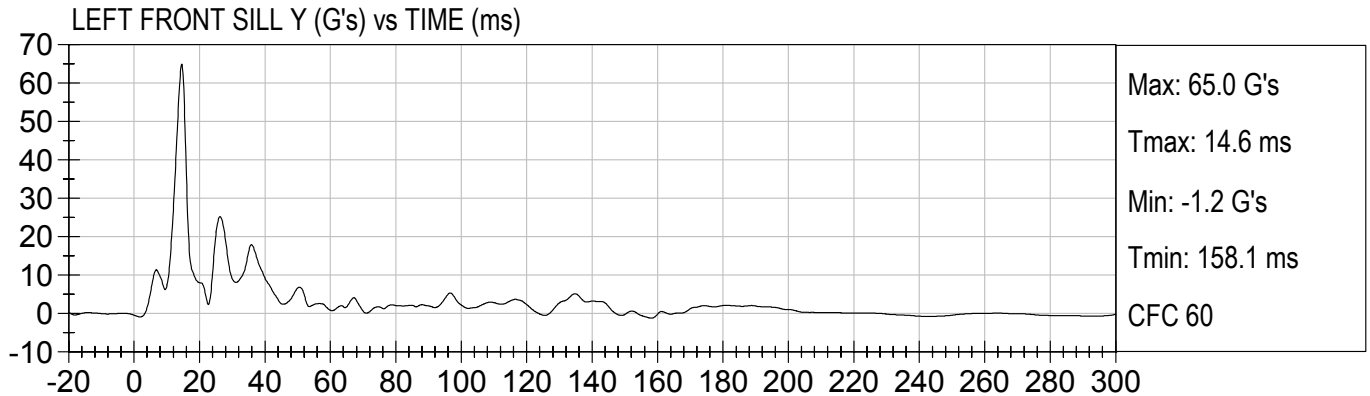


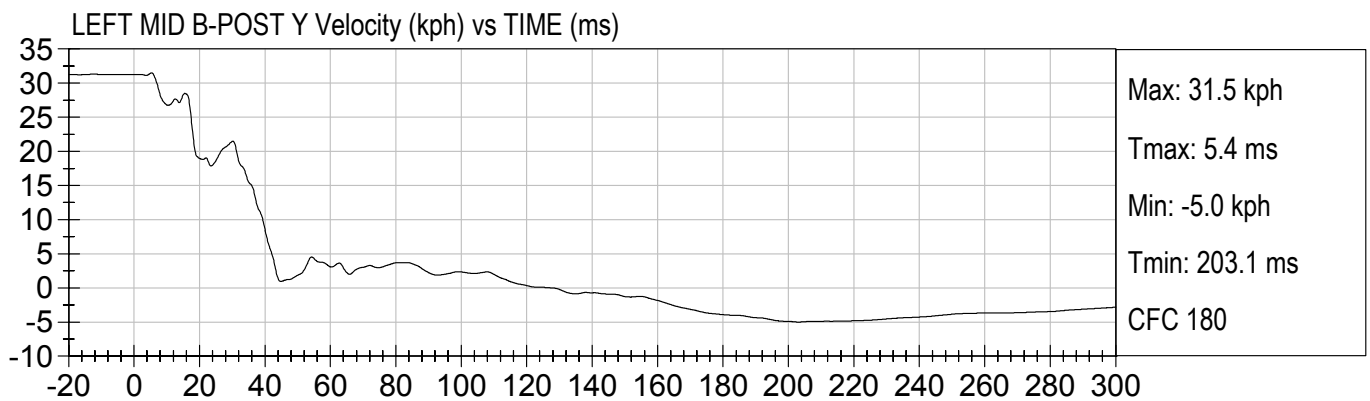
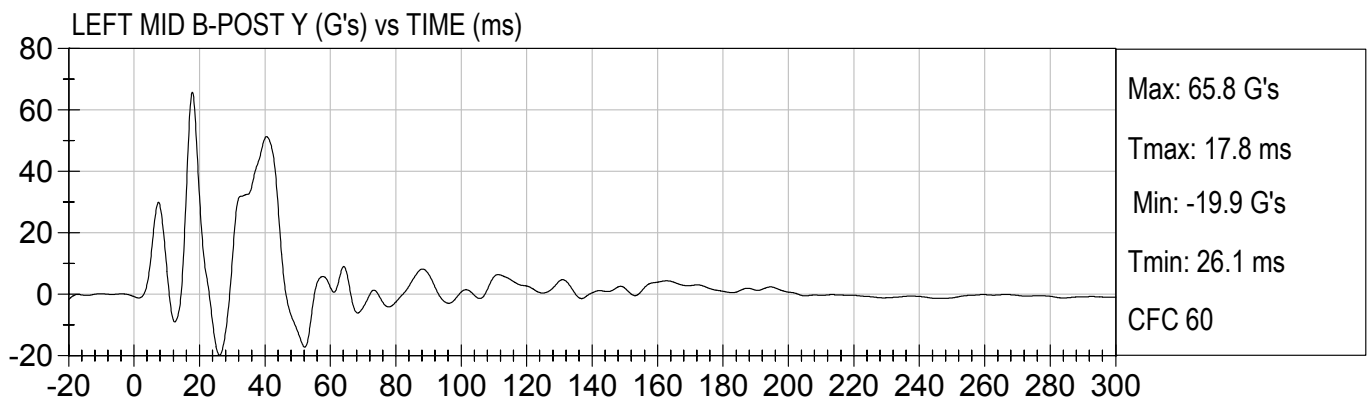
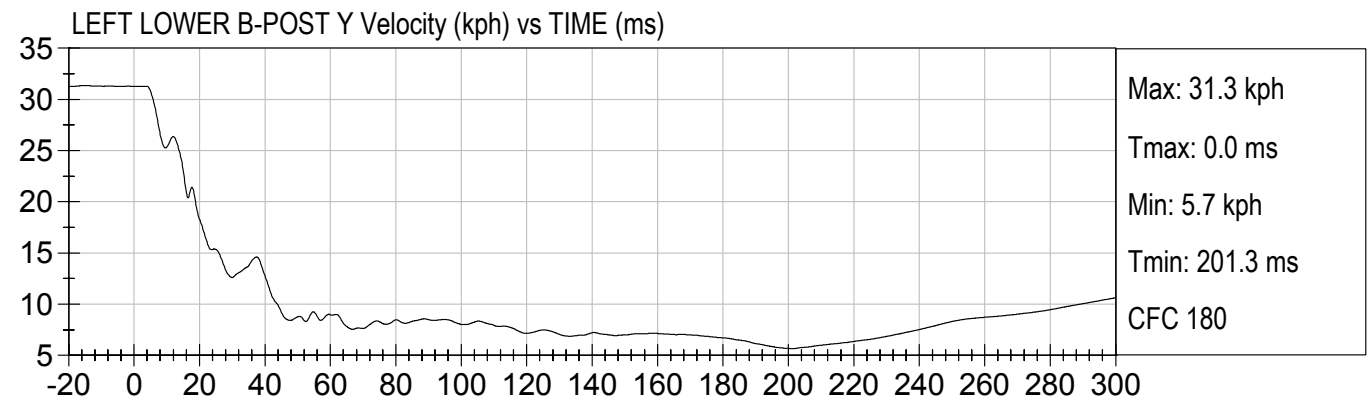
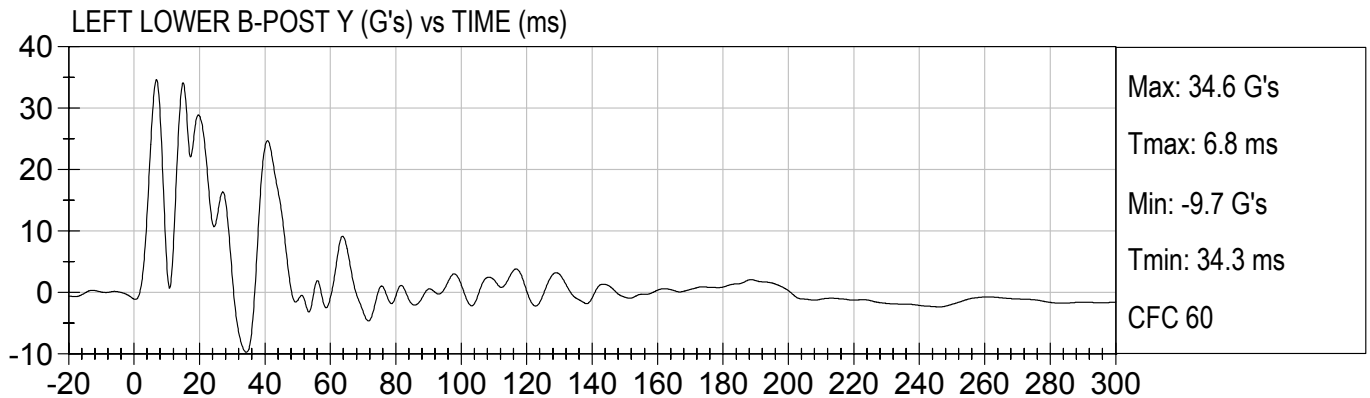


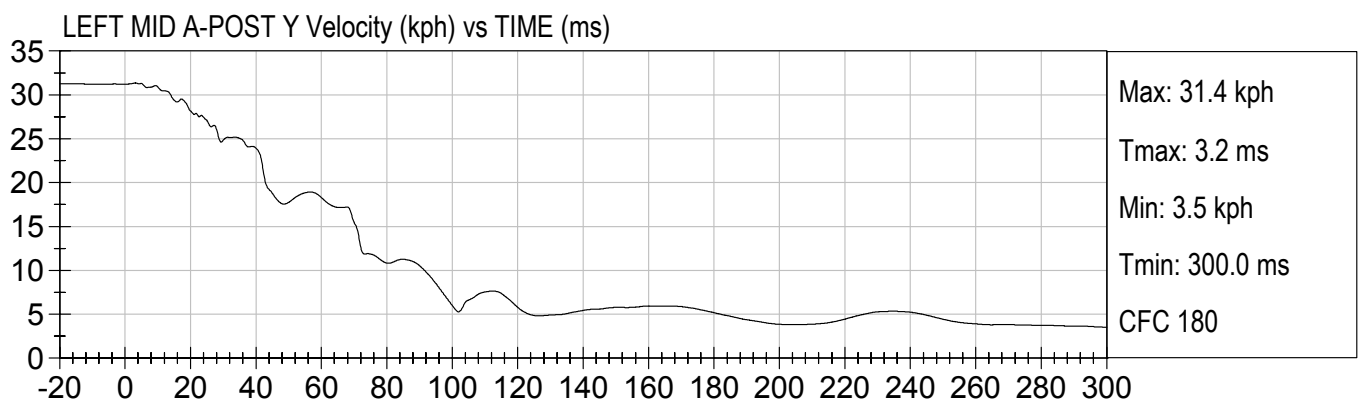
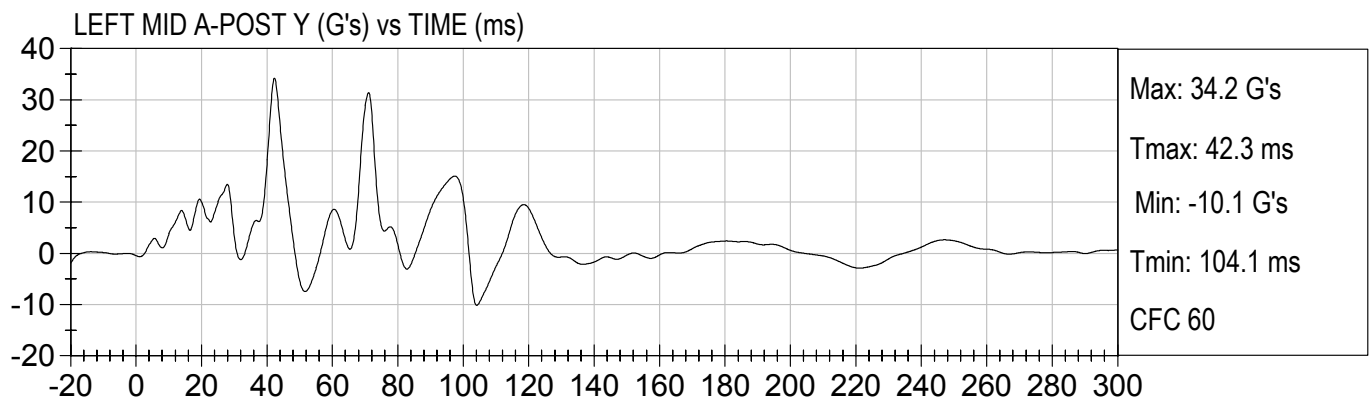
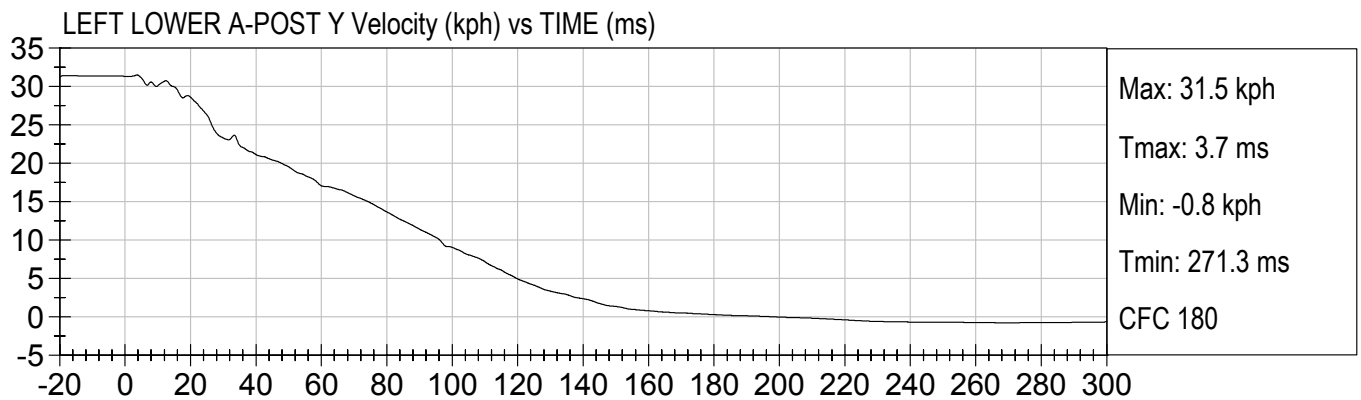
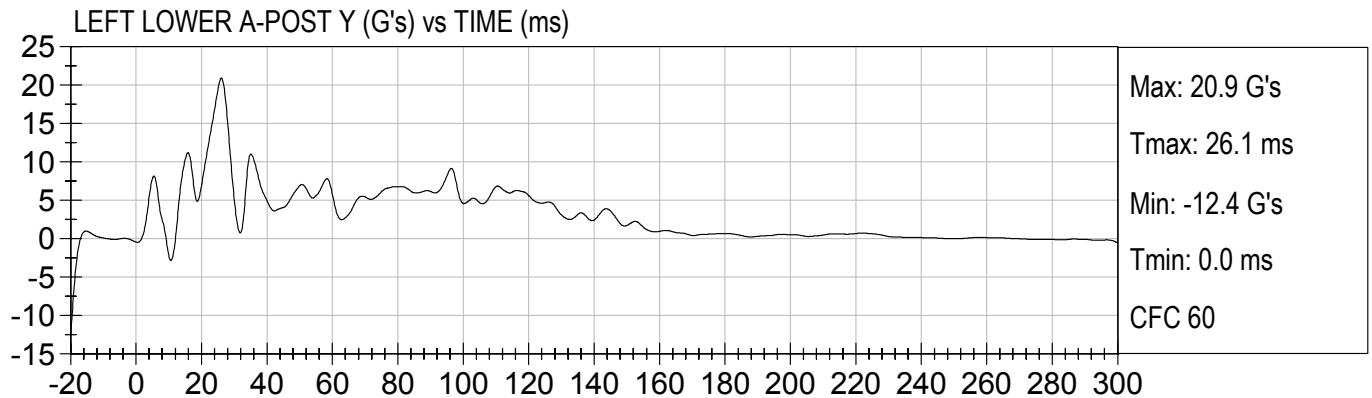






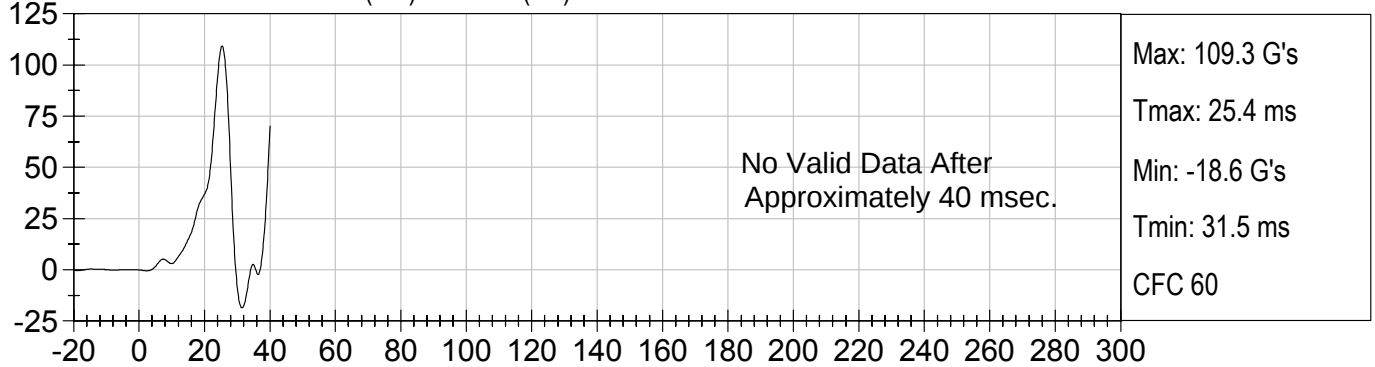




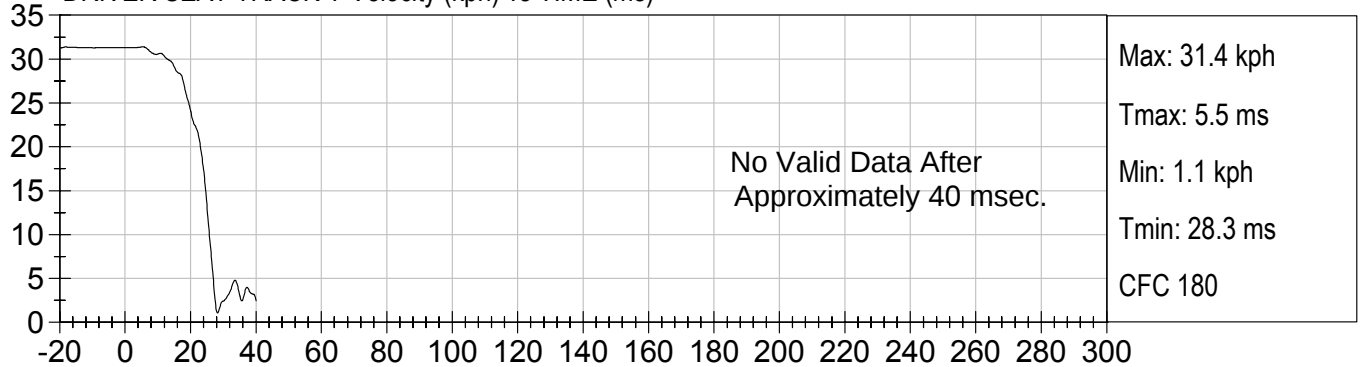




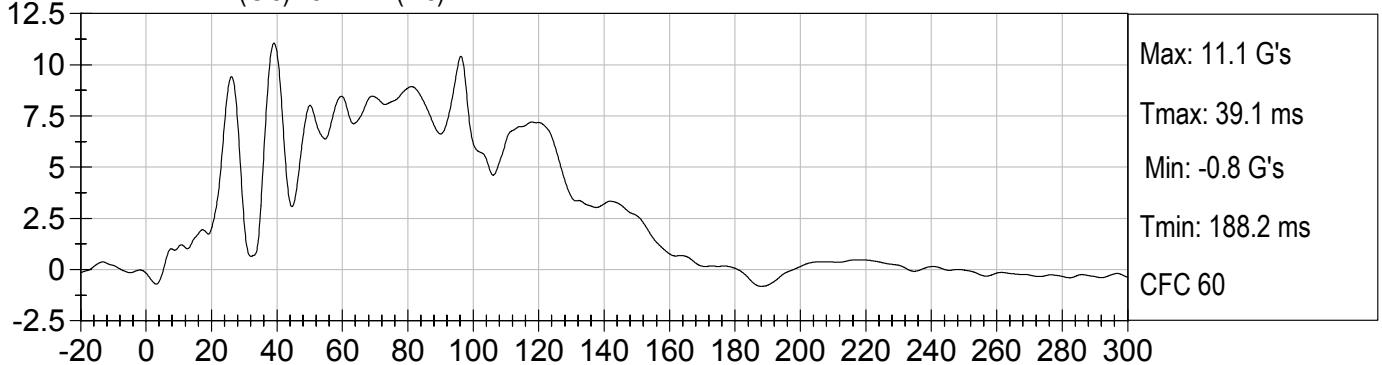
DRIVER SEAT TRACK Y (G's) vs TIME (ms)



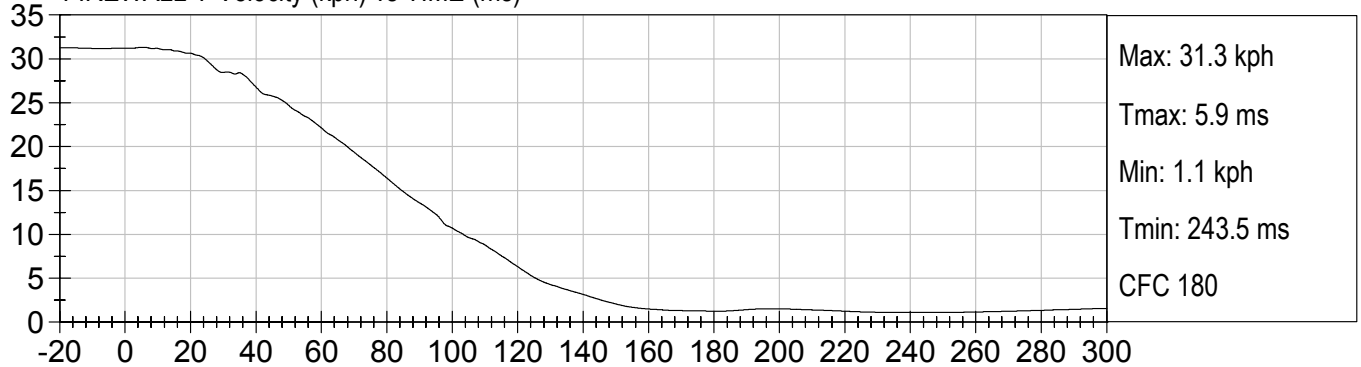
DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)

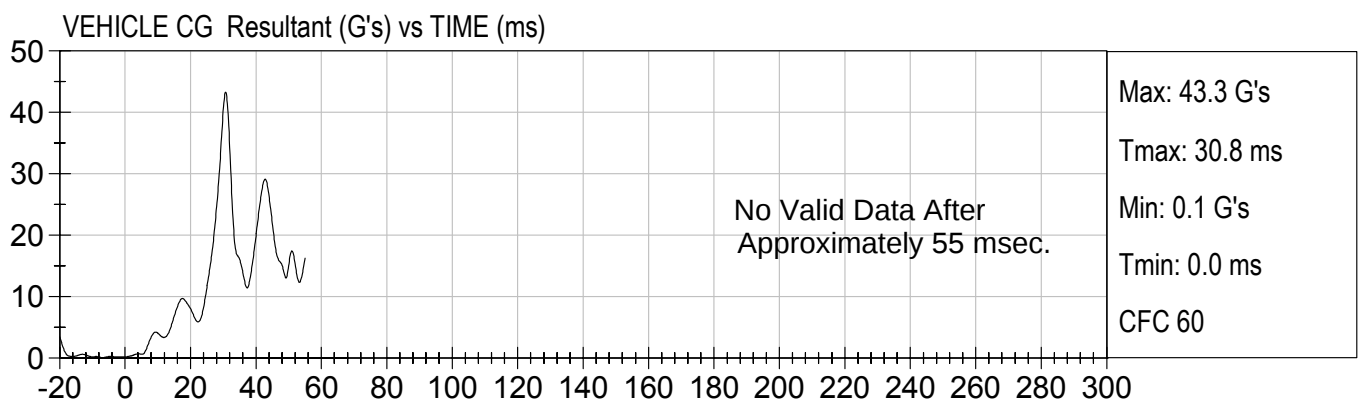
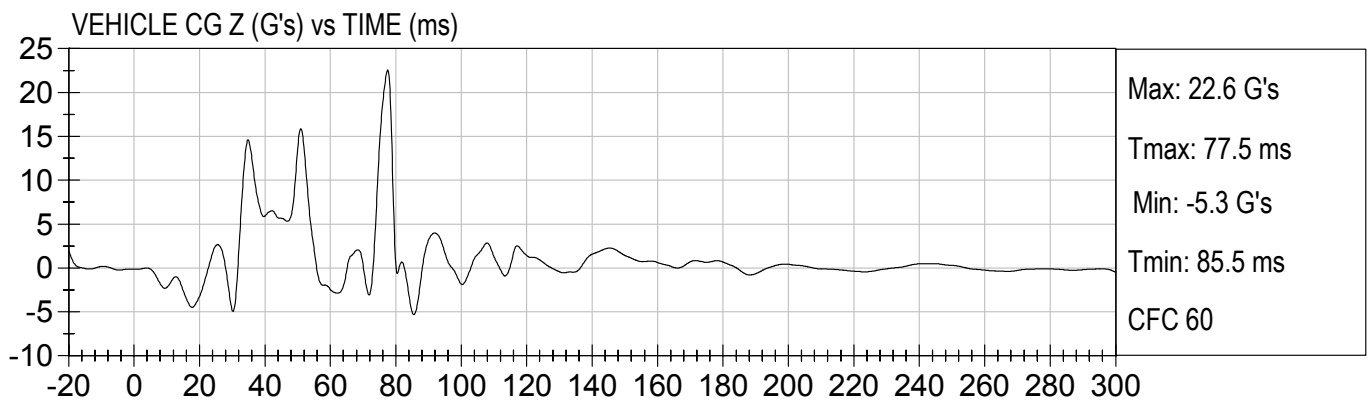
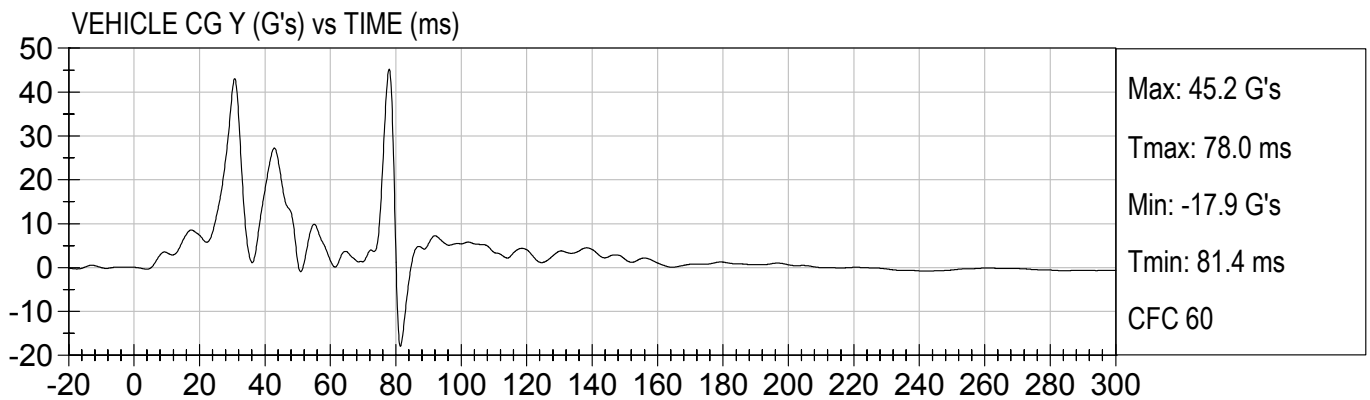
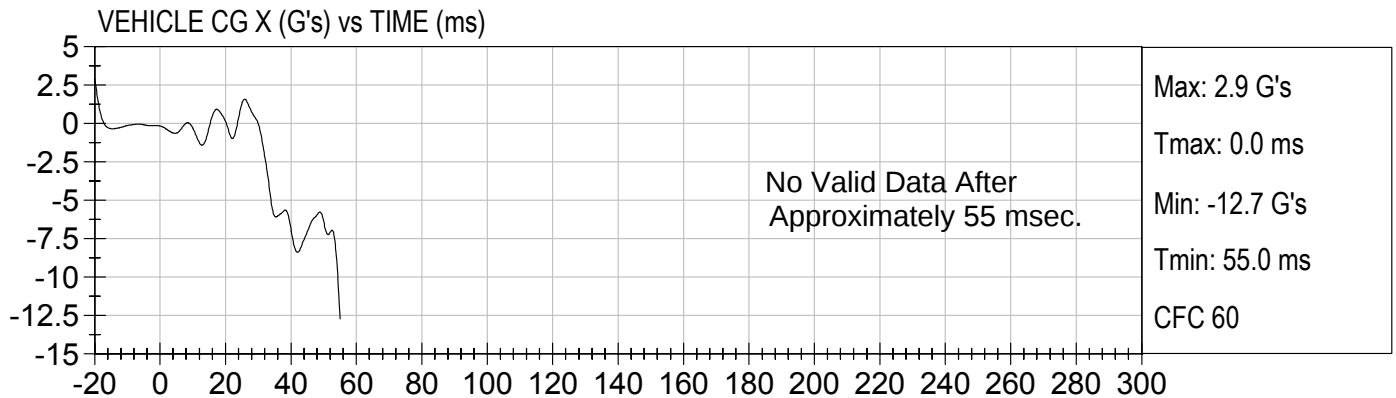


FIREWALL Y (G's) vs TIME (ms)



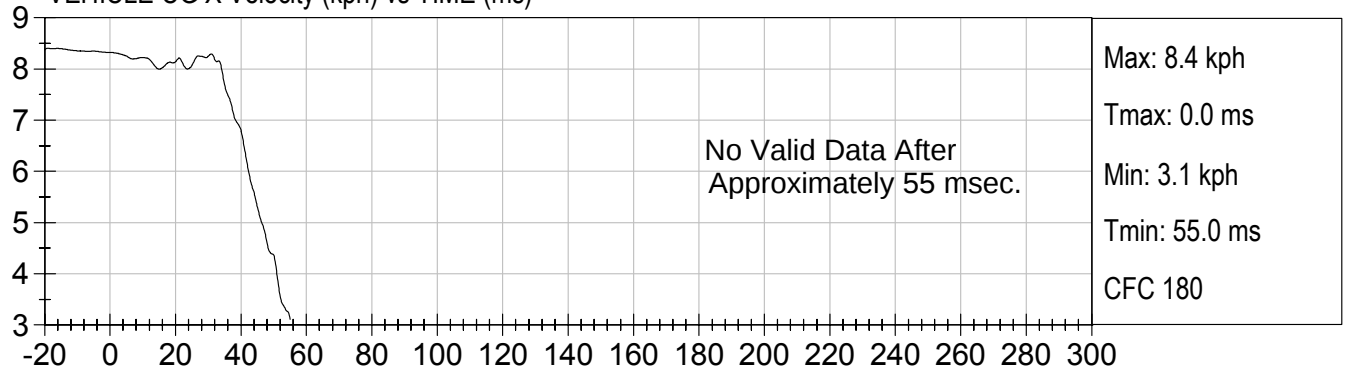
FIREWALL Y Velocity (kph) vs TIME (ms)



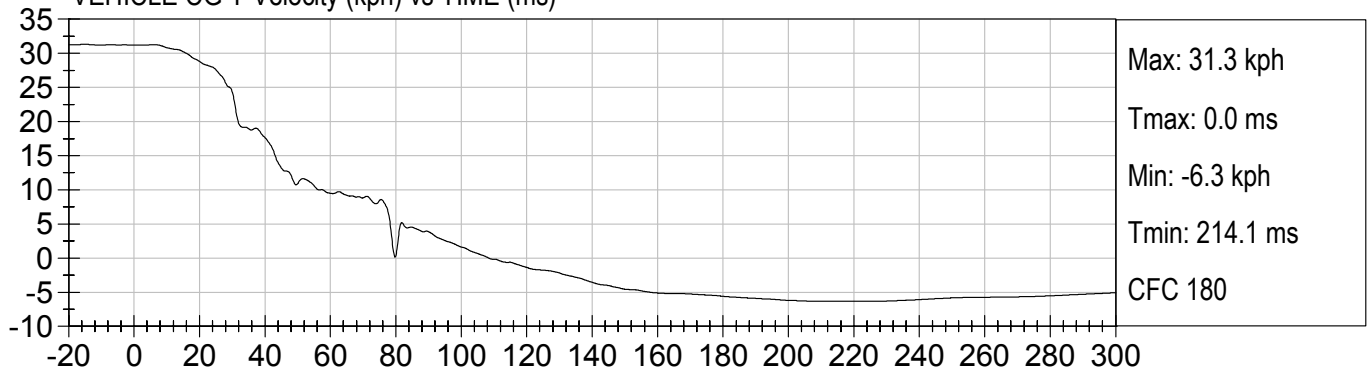




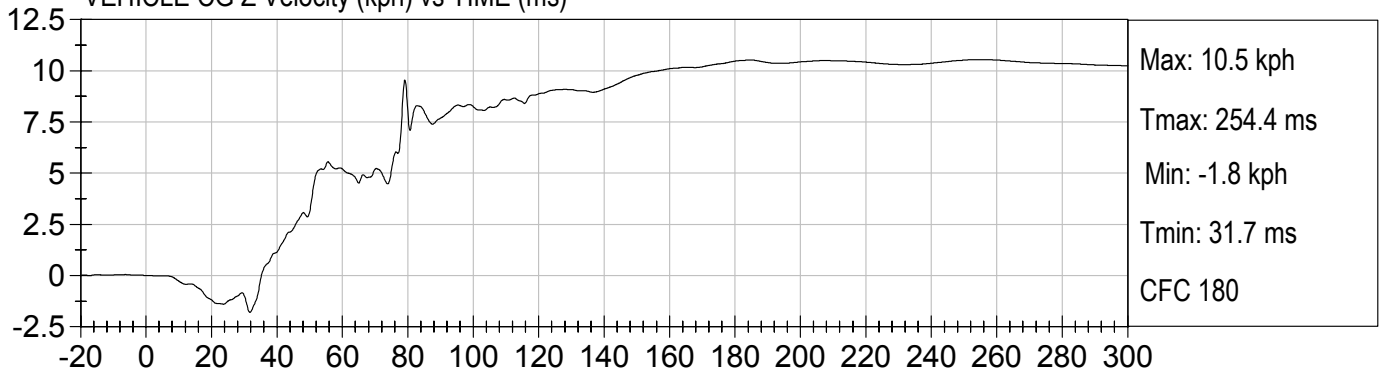
VEHICLE CG X Velocity (kph) vs TIME (ms)



VEHICLE CG Y Velocity (kph) vs TIME (ms)

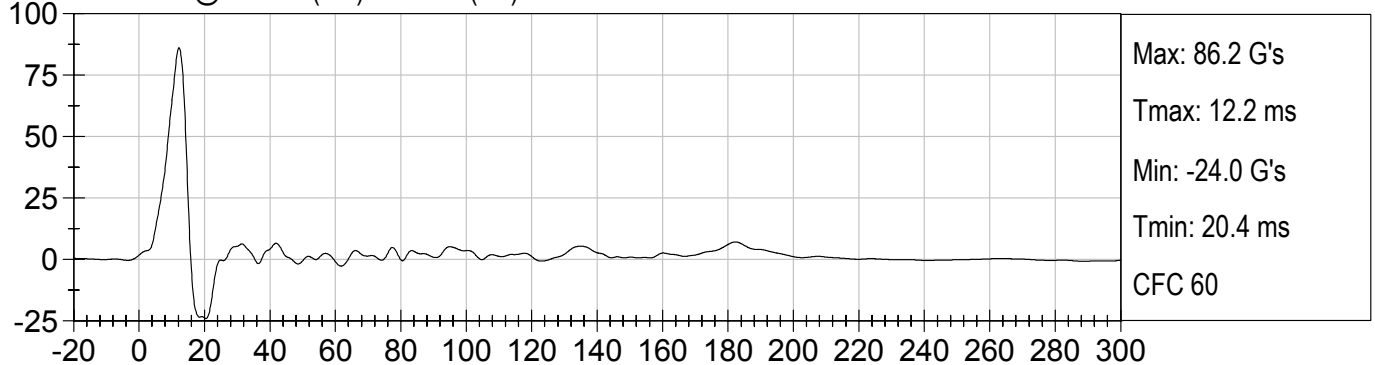


VEHICLE CG Z Velocity (kph) vs TIME (ms)

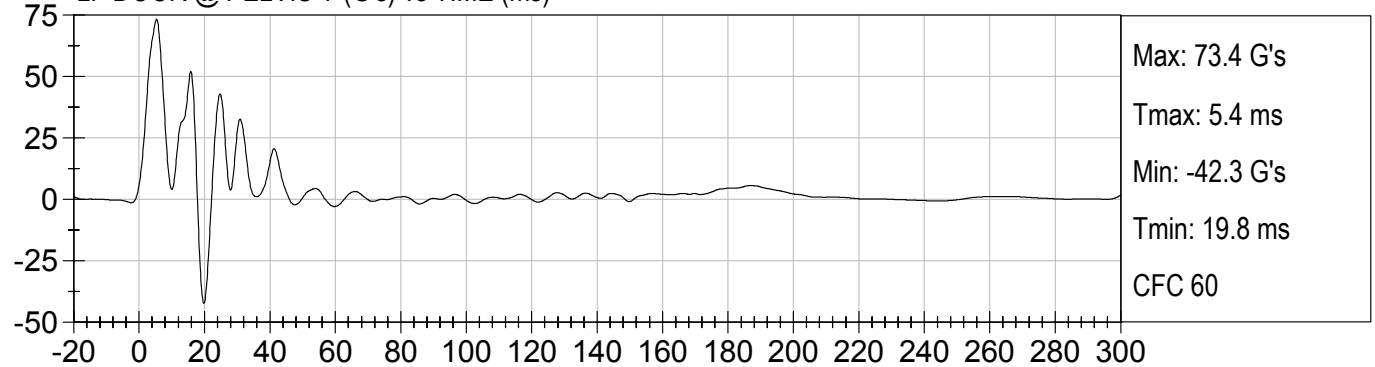




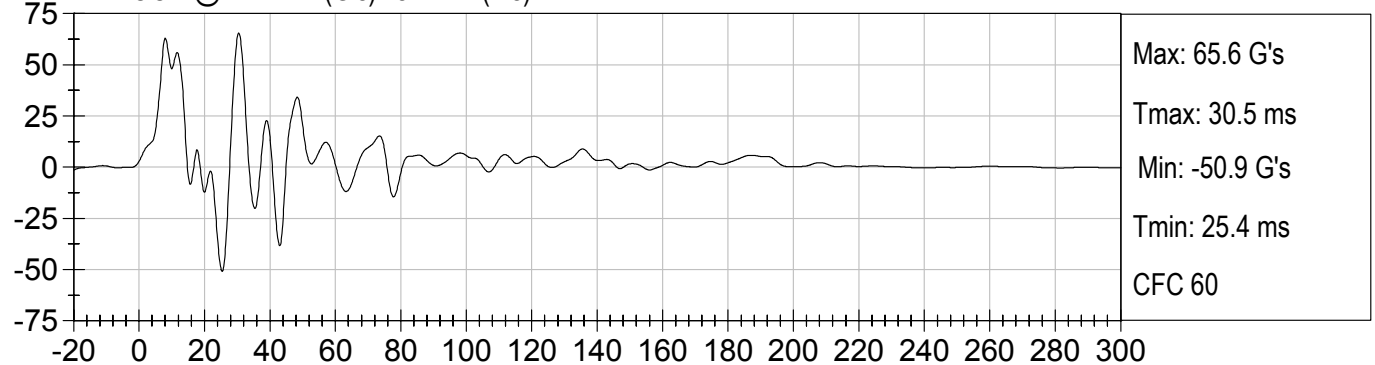
LF DOOR @ ARM Y (G's) vs TIME (ms)



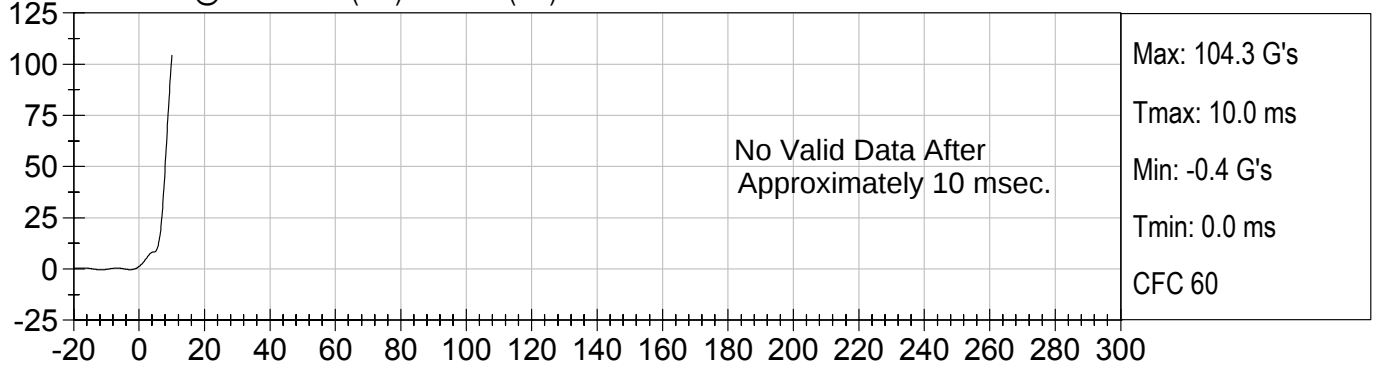
LF DOOR @ PELVIS Y (G's) vs TIME (ms)



LF DOOR @ KNEE Y (G's) vs TIME (ms)

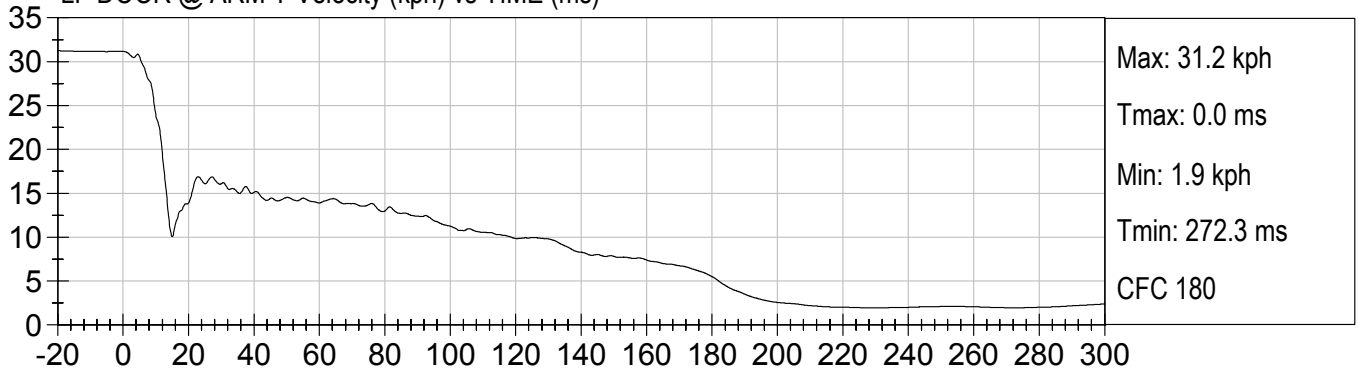


LF DOOR @ MID RIB Y (G's) vs TIME (ms)

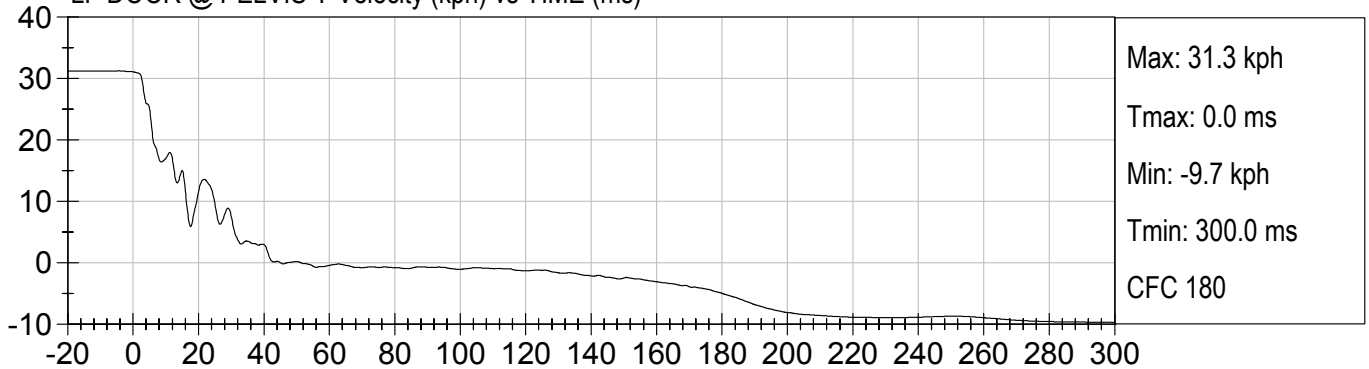




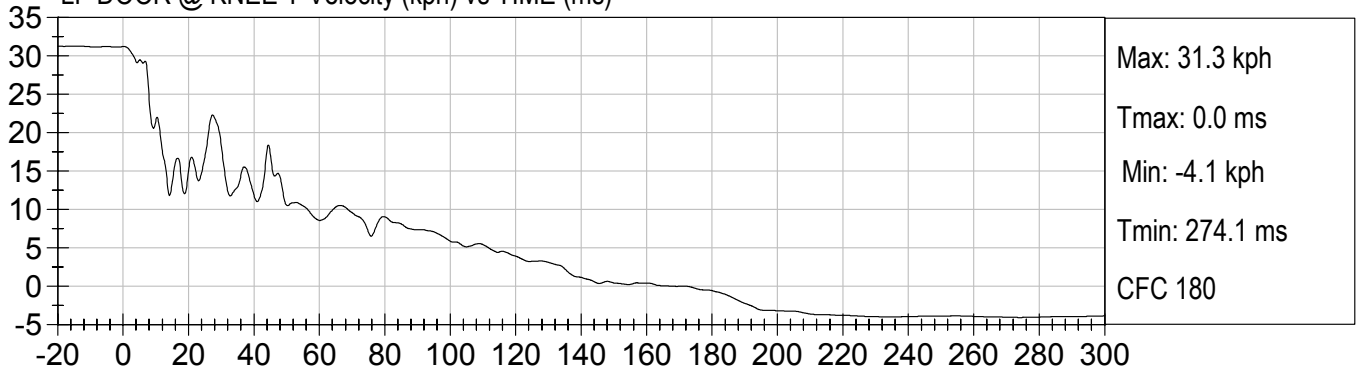
LF DOOR @ ARM Y Velocity (kph) vs TIME (ms)



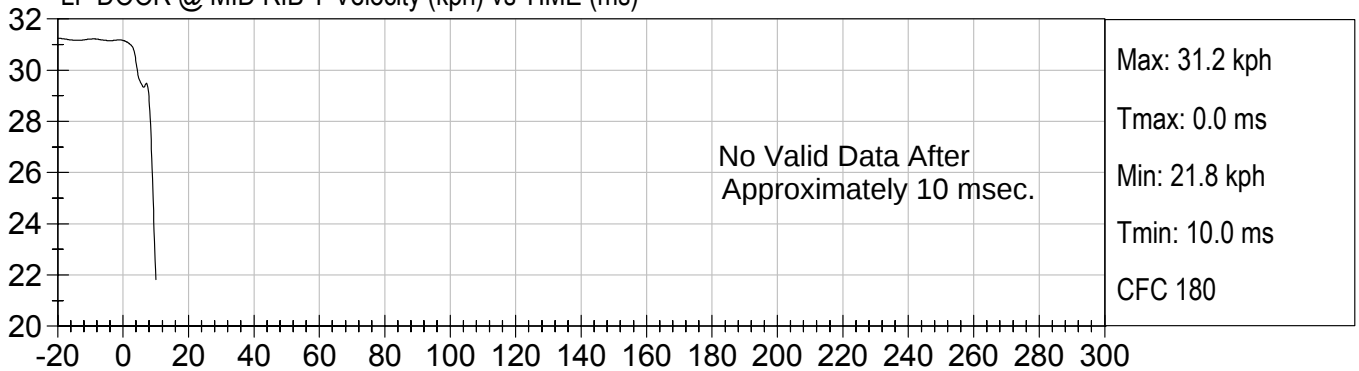
LF DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)



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

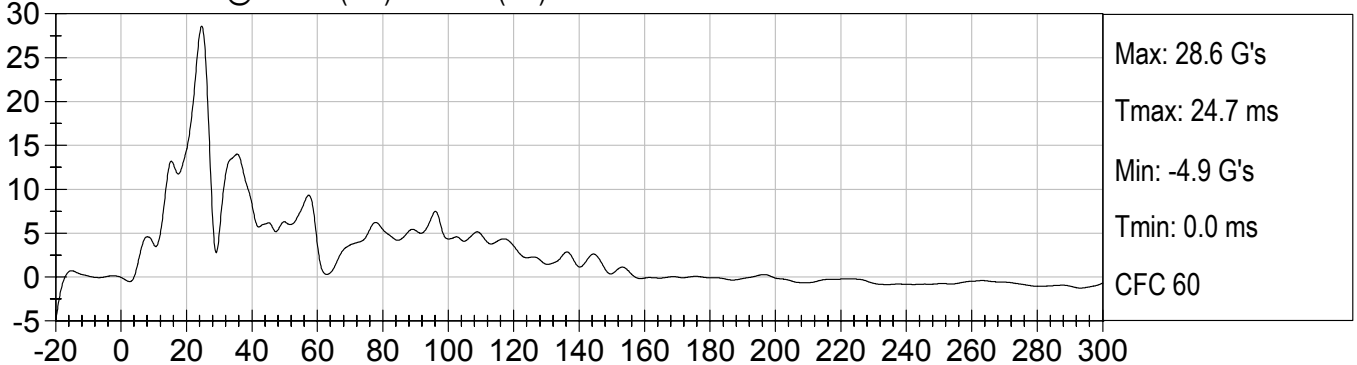


LF DOOR @ MID RIB Y Velocity (kph) vs TIME (ms)

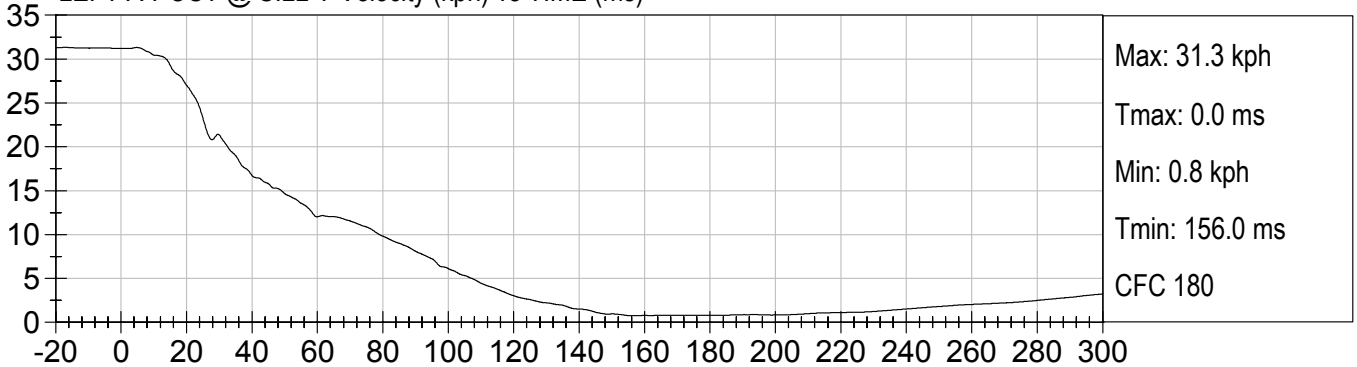




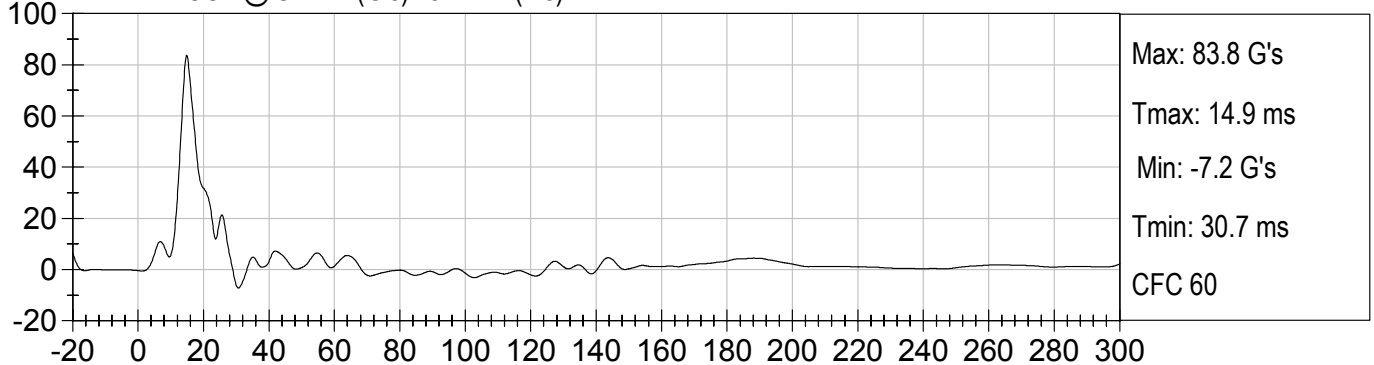
LEFT A-POST @ SILL Y (G's) vs TIME (ms)



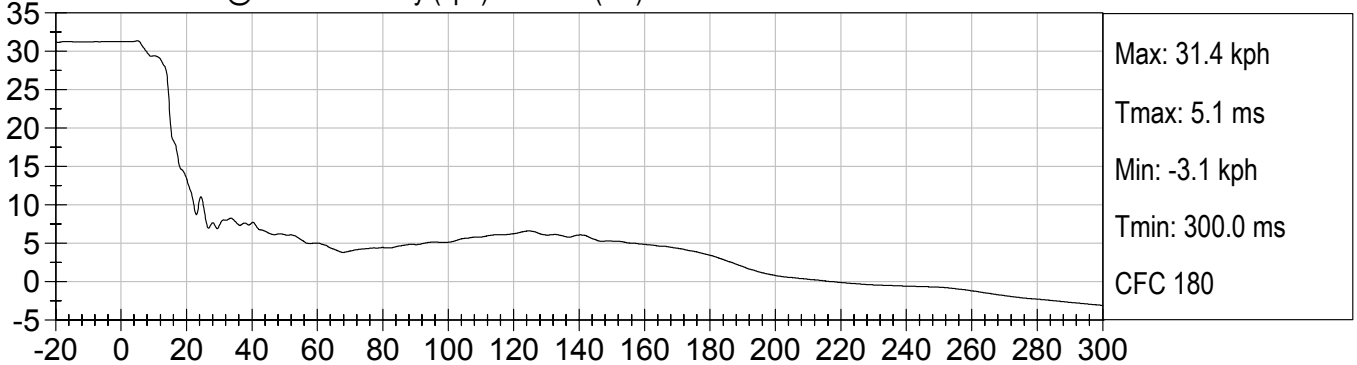
LEFT A-POST @ SILL Y Velocity (kph) vs TIME (ms)

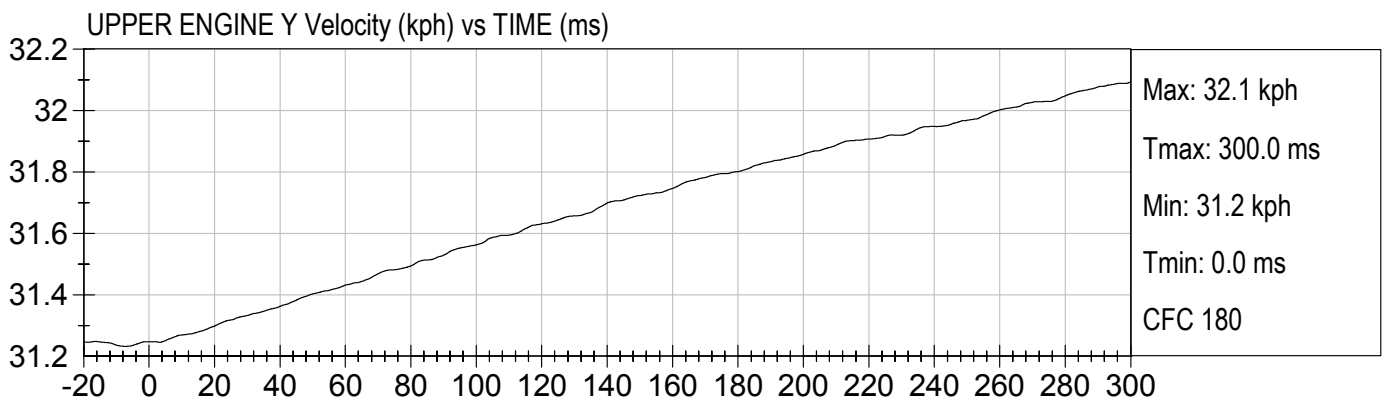
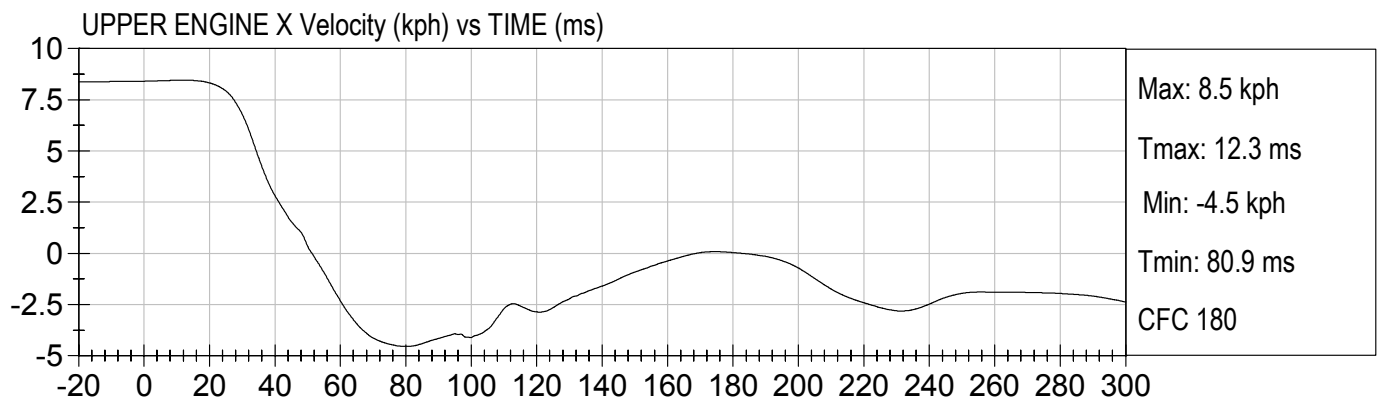
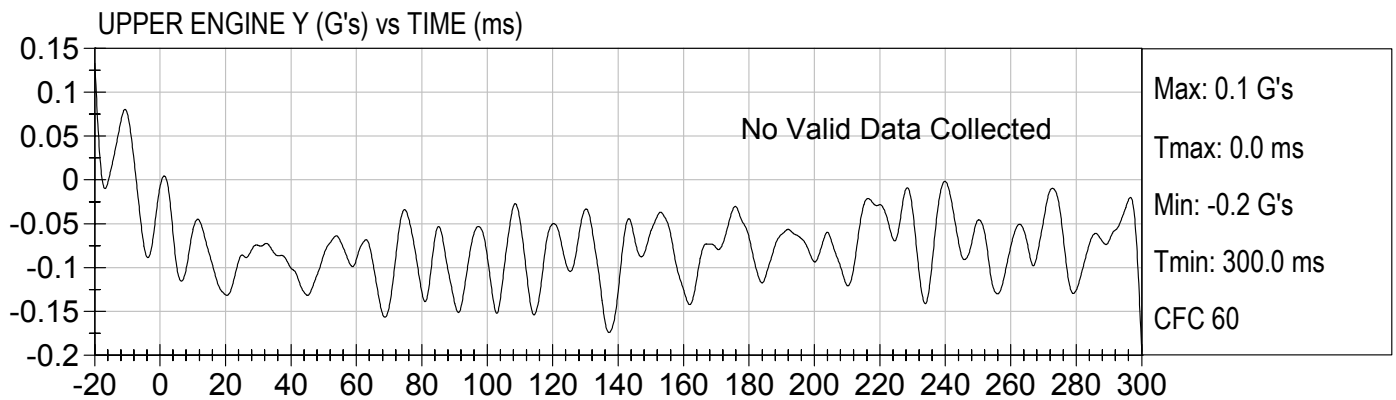
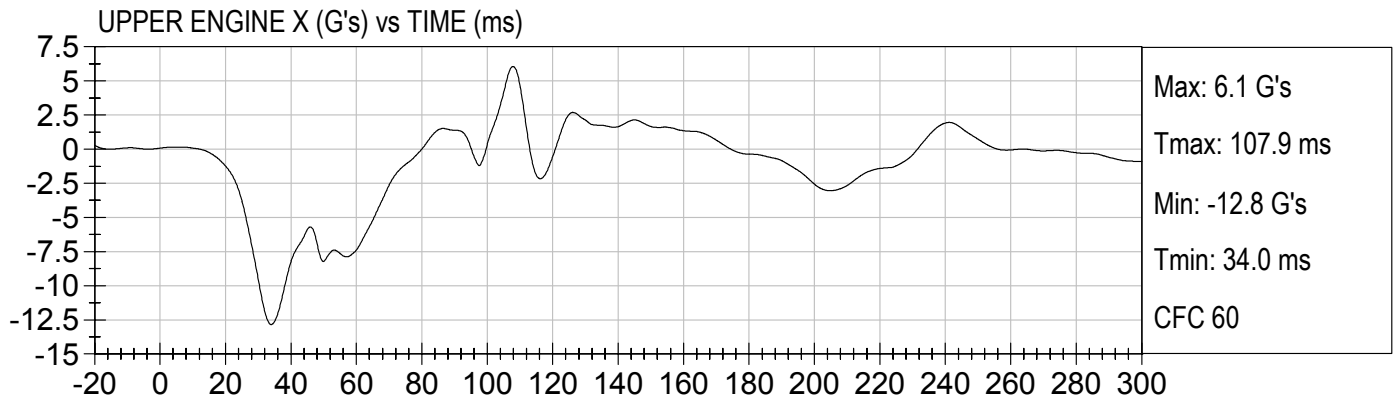


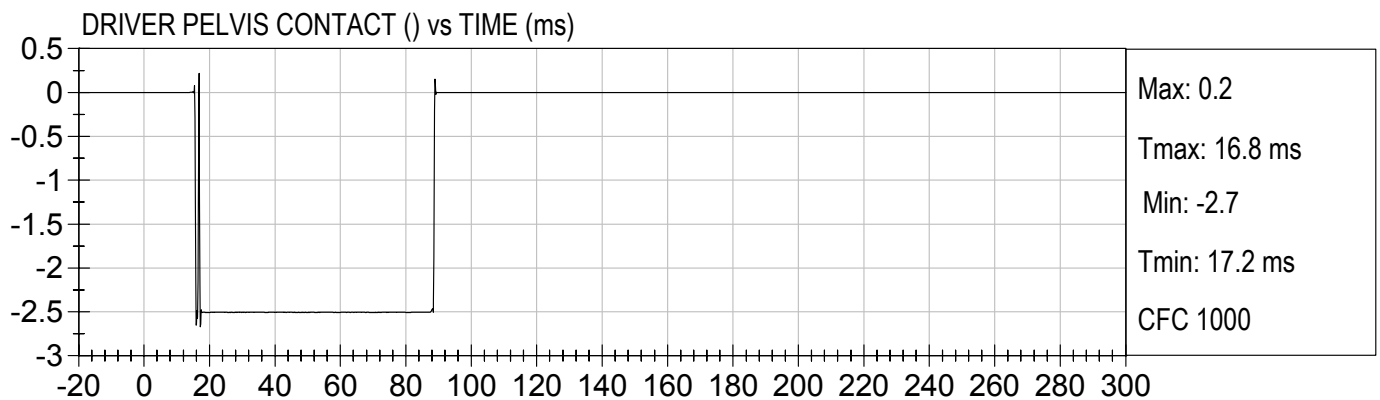
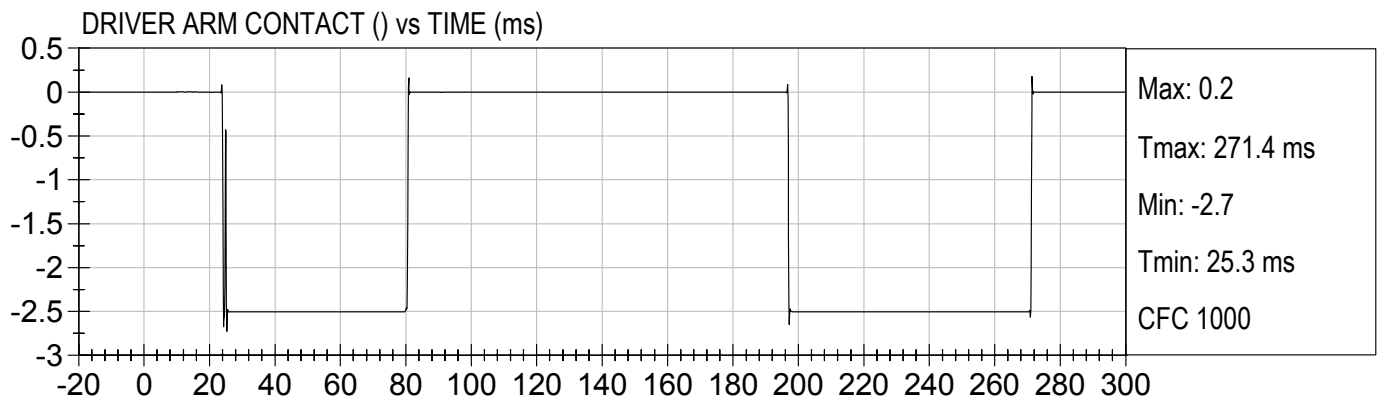
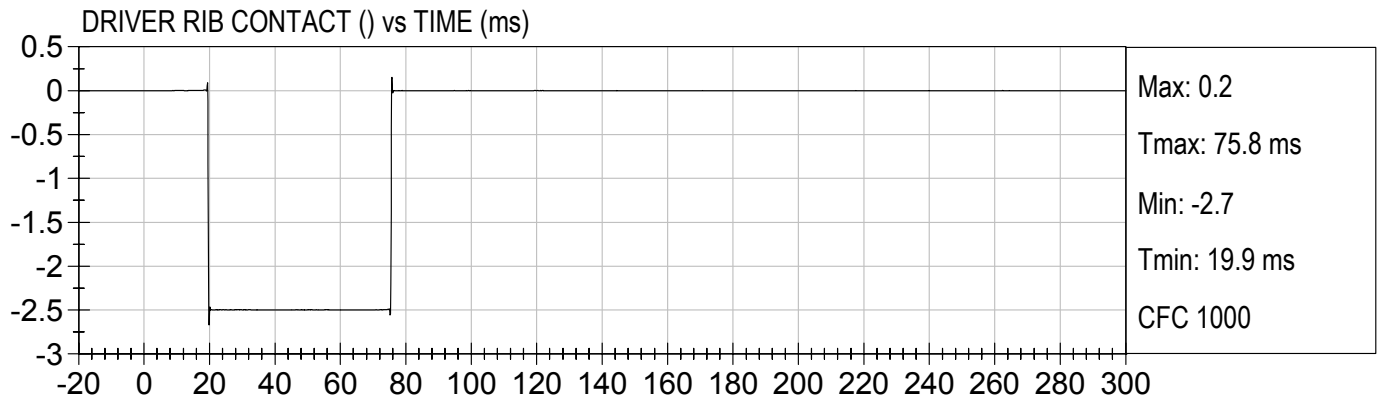
LEFT B-POST @ SILL Y (G's) vs TIME (ms)



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







APPENDIX C

ES-2RE CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 010

Calibration Test Results Summary

Dummy Serial Number: 010

Pre-Test Calibration

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

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 010
Test Number: D051191

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.7
Relative Humidity (%)	10 – 70	22
Peak Resultant Acceleration	100 – 150 g's	142
Time of Max. Res. Acceleration	msec	29.9

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

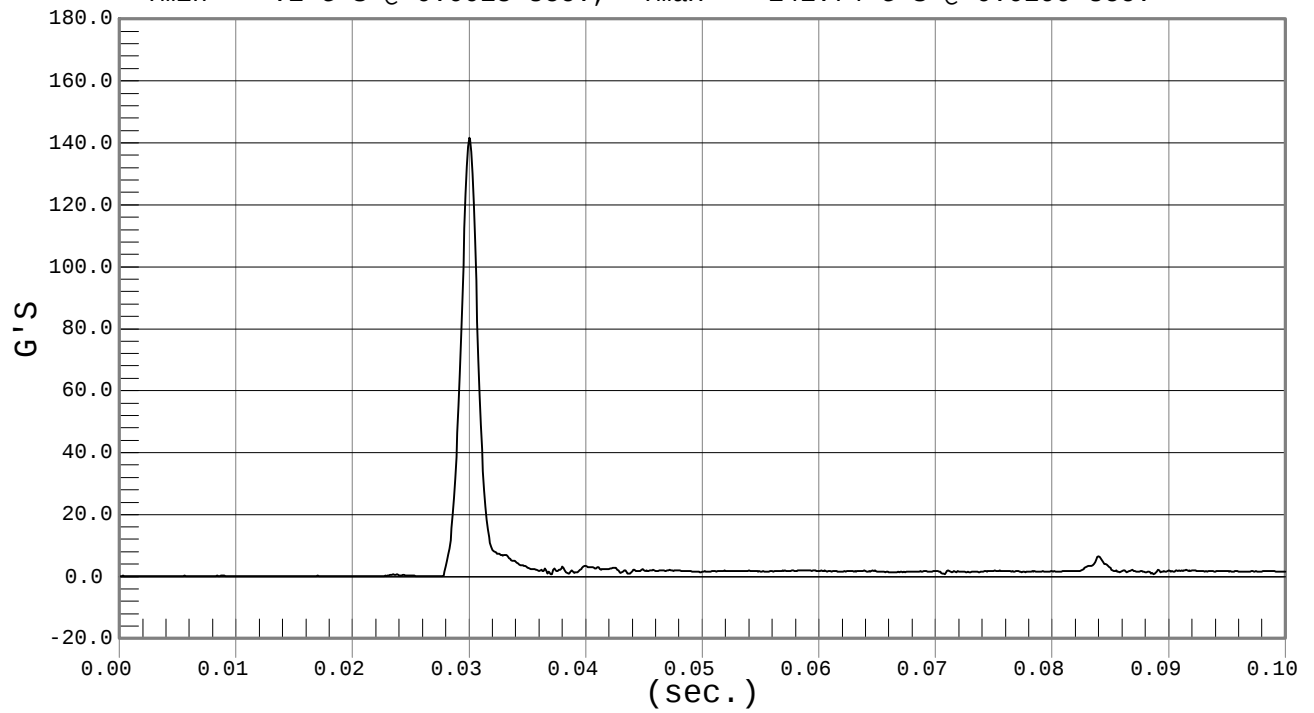


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #010

Test Date: 05-03-05
Speed: 0.0 fps, 0.00 M/s

Ymin = .1 G'S @ 0.0013 sec., Ymax = 141.74 G'S @ 0.0299 sec.



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
EUROSID 2 DUMMY

Date: 5/4/05
Dummy Serial Number: 010
Test Number: D051192

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.1
Relative Humidity (%)		10 – 70	20
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	1.25 - 1.53 m/sec	-.37
	8 msec	1.59 - 2.04 m/sec	-1.90
	14 msec	3.20 - 3.85 m/sec	-3.51
Maximum Flexion Angle		49.0 – 59.0 deg	58.9
Time of Max. Flexion Angle		54.0 – 66.0 ms	60.7
Maximum Angle Theta (A)		32.0 – 37.0 deg	35.4
Time of Max. Theta (A)		53.0 – 63.0 ms	60.7
Maximum Angle Theta (B)		30.4 – 32.9 deg	31.7
Time of Max. Theta (B)		54.0 – 64.0 ms	57.9

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

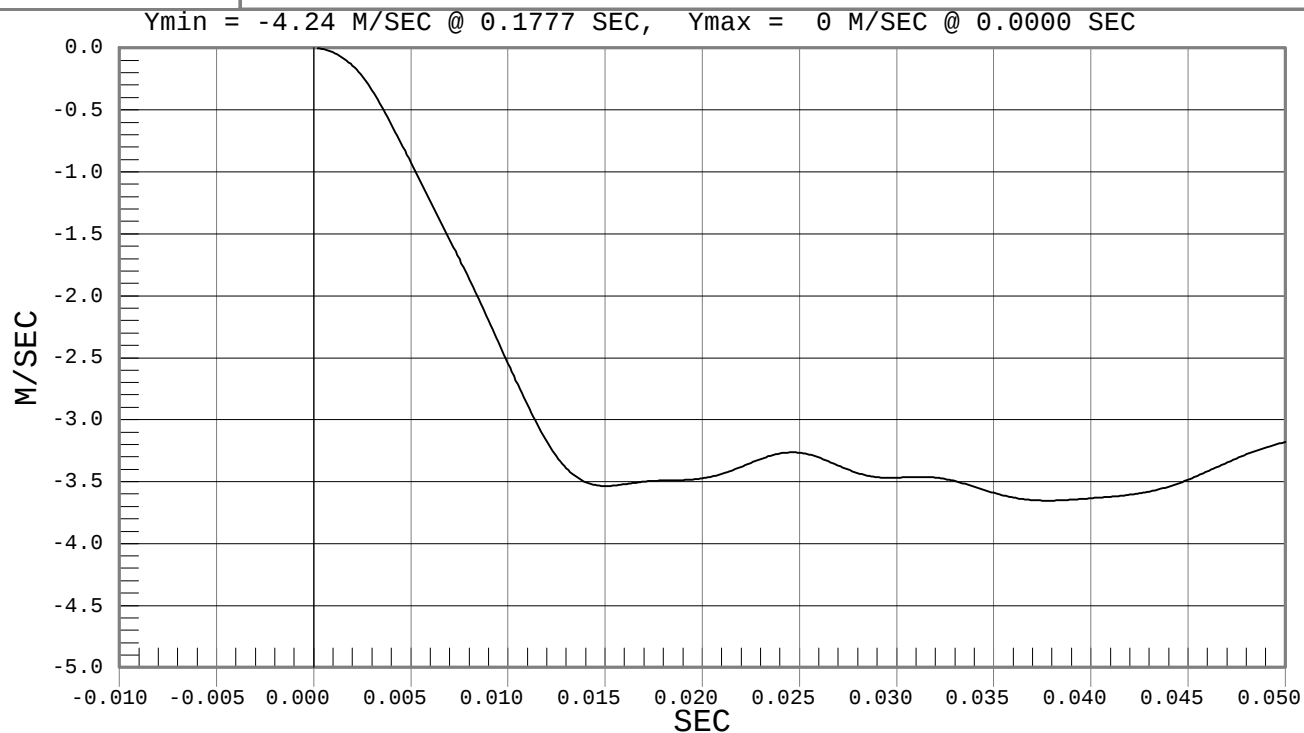
David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #010

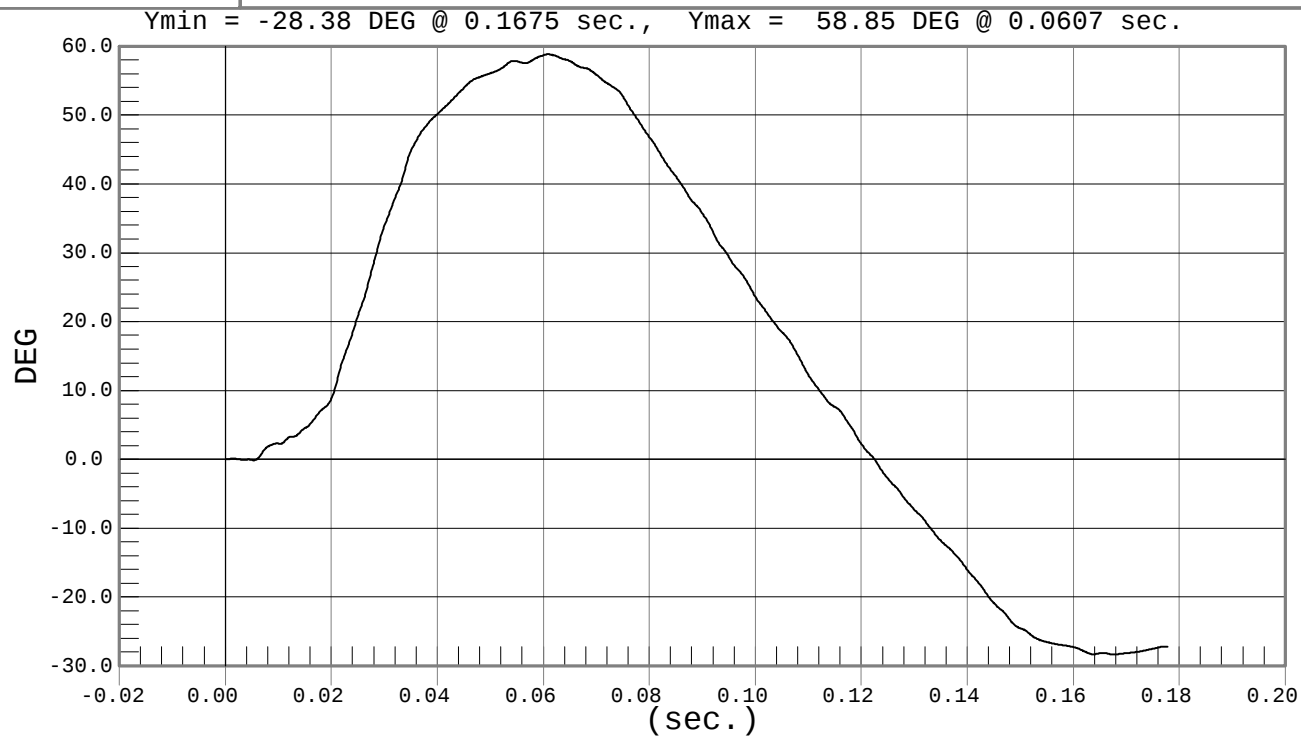
Test Date: 05-04-05
Speed: 11.2 fps, 3.41 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #010

Test Date: 05-04-05
Speed: 11.2 fps, 3.41 M/s



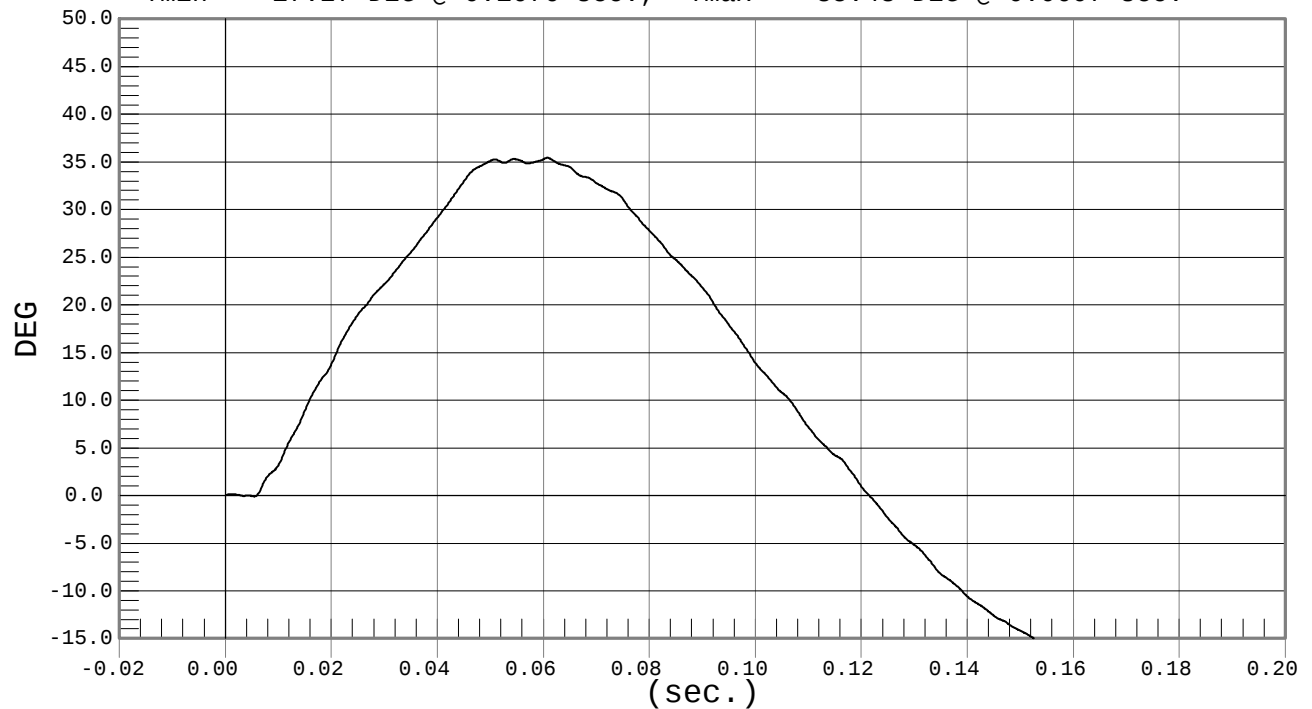


Test Desc.: Neck Bending
Component: Dummy #010

THETA A

Test Date: 05-04-05
Speed: 11.2 fps, 3.41 M/s

Ymin = -17.27 DEG @ 0.1676 sec., Ymax = 35.43 DEG @ 0.0607 sec.

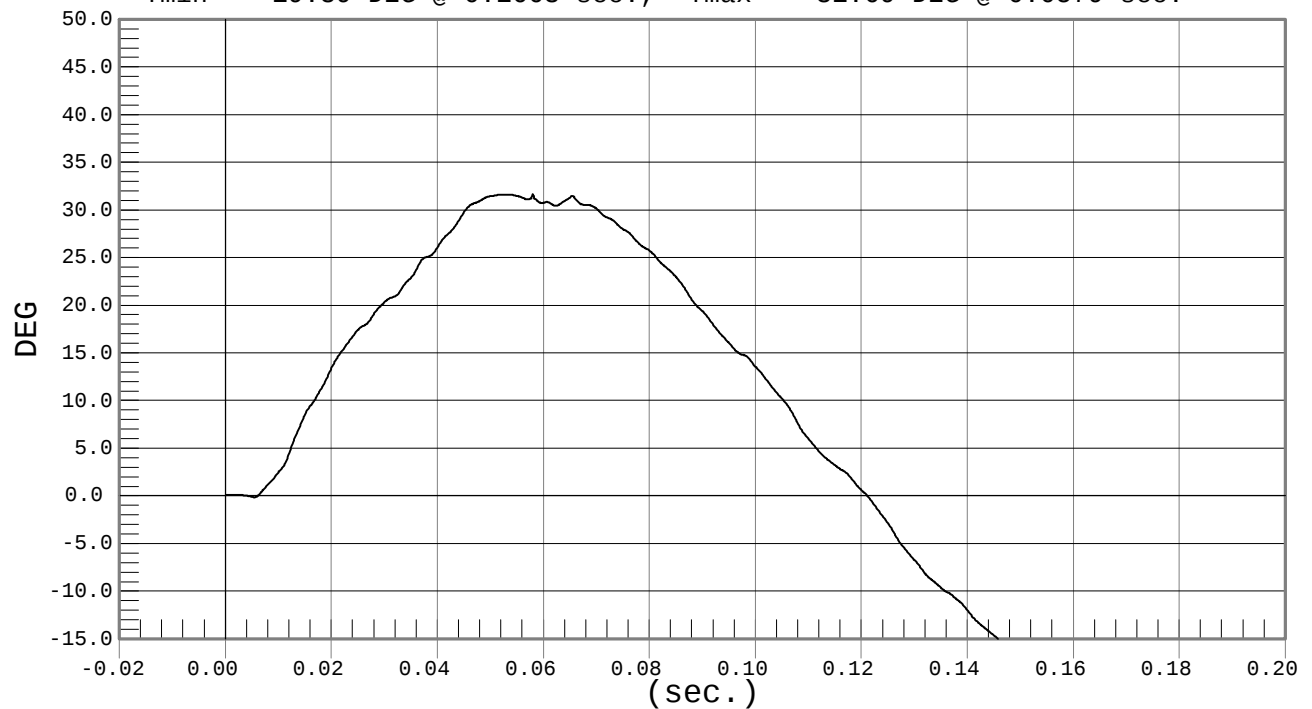


Test Desc.: Neck Bending
Component: Dummy #010

THETA B

Test Date: 05-04-05
Speed: 11.2 fps, 3.41 M/s

Ymin = -19.89 DEG @ 0.1663 sec., Ymax = 31.69 DEG @ 0.0579 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

Date: 5/4/05
Dummy Serial Number: 010
Test Number: D051193

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.3
Relative Humidity (%)	10 – 70	19
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	10.5
Time of Max. Pendulum Acceleration	msec	55.1

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

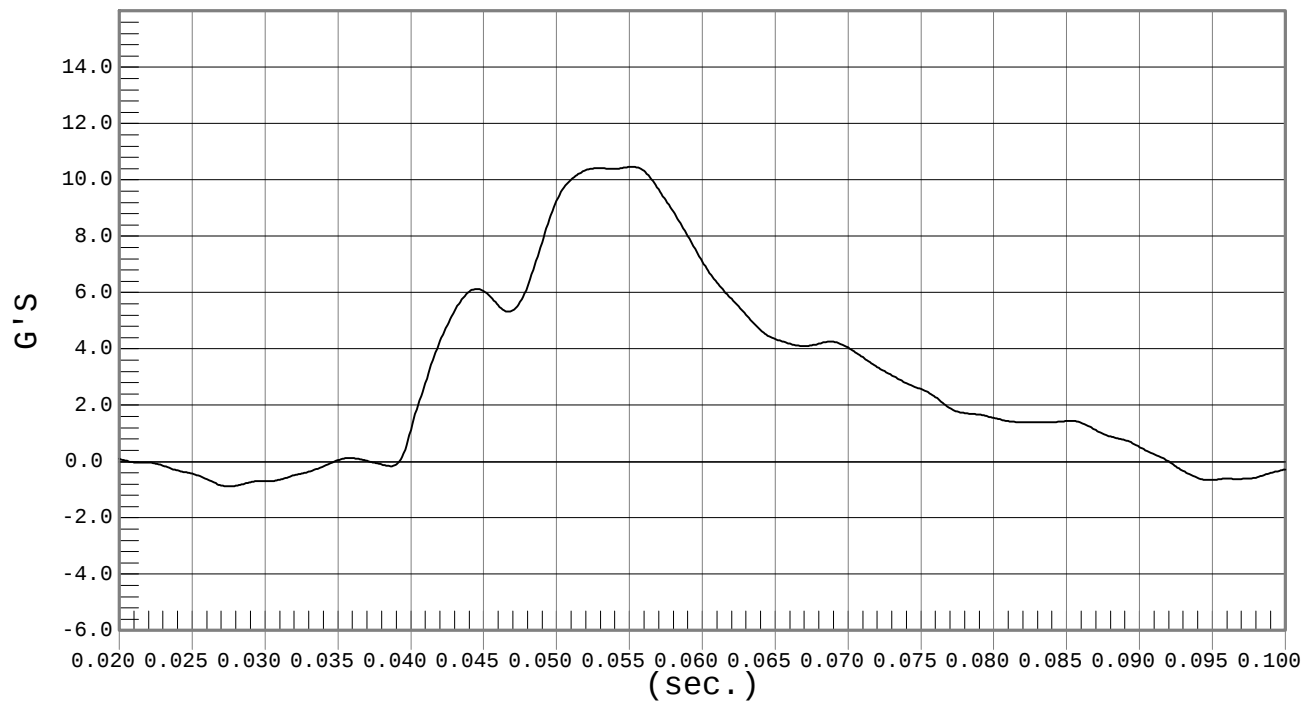


SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #010

Test Date: 05-04-05
Speed: 14.0 fps, 4.28 M/s

Ymin = -1.18 G'S @ 0.1606 sec., Ymax = 10.47 G'S @ 0.0551 sec.



MGA RESEARCH CORPORATION
UPPER/MIDDLE/LOWER RIB TESTS
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 010
Test Number: D051194, D051195, D051196

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.7
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	25.7
Displacement at 3 m/s	36.0 – 40.0 mm	37.7
Displacement at 4 m/s	46.0 – 51.0 mm	48.1

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.7
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	26.5
Displacement at 3 m/s	36.0 – 40.0 mm	39.1
Displacement at 4 m/s	46.0 – 51.0 mm	50.5

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.7
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	26.2
Displacement at 3 m/s	36.0 – 40.0 mm	37.7
Displacement at 4 m/s	46.0 – 51.0 mm	48.0

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

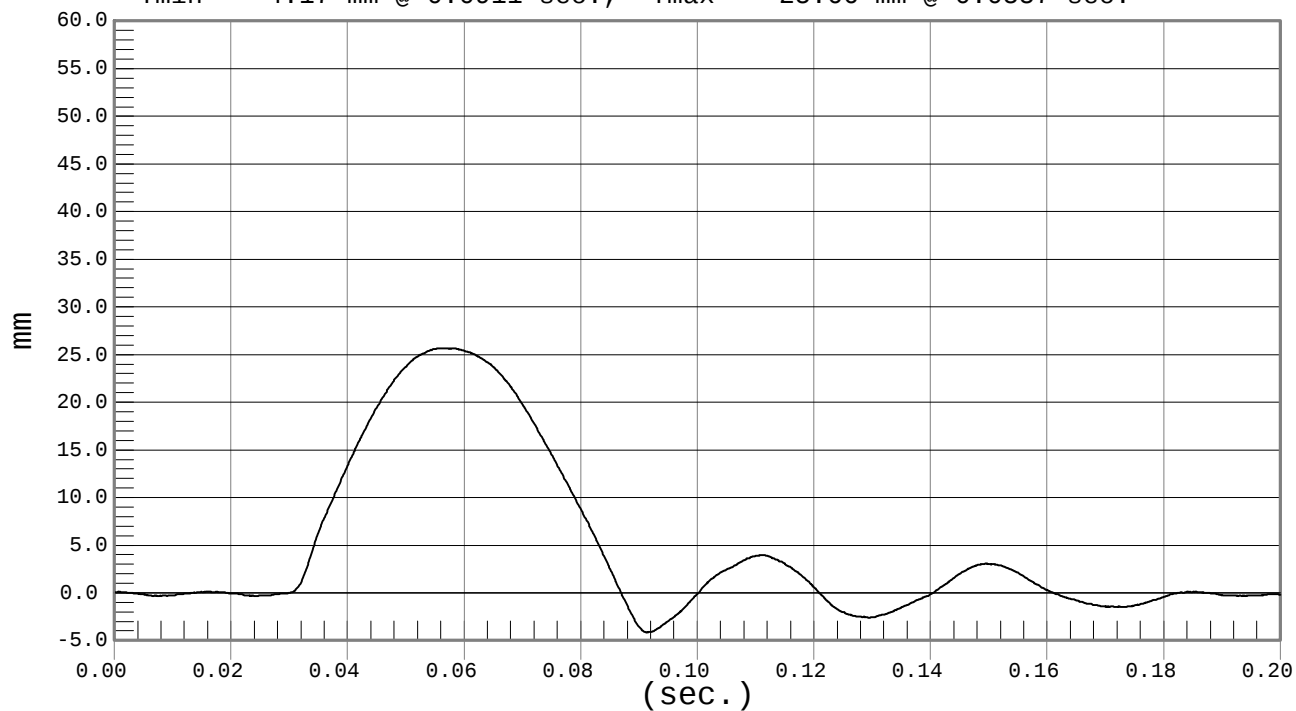


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.17 mm @ 0.0911 sec., Ymax = 25.66 mm @ 0.0557 sec.

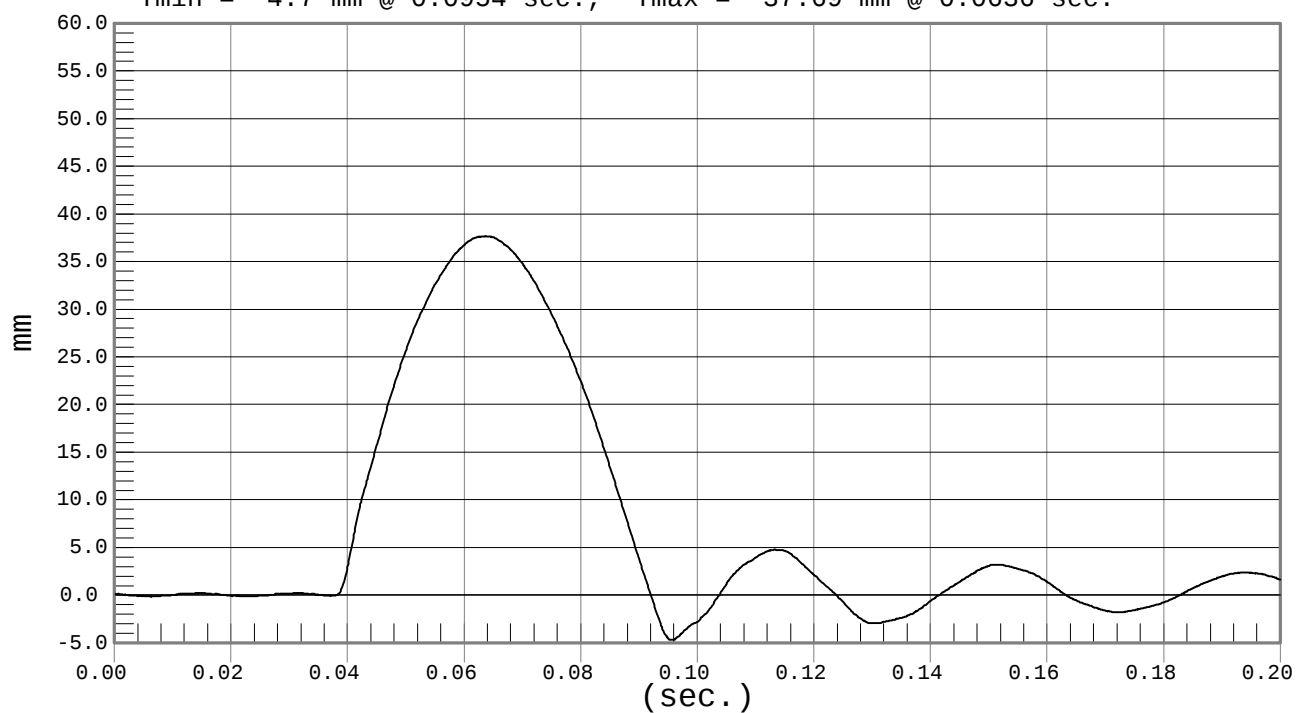


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -4.7 mm @ 0.0954 sec., Ymax = 37.69 mm @ 0.0636 sec.



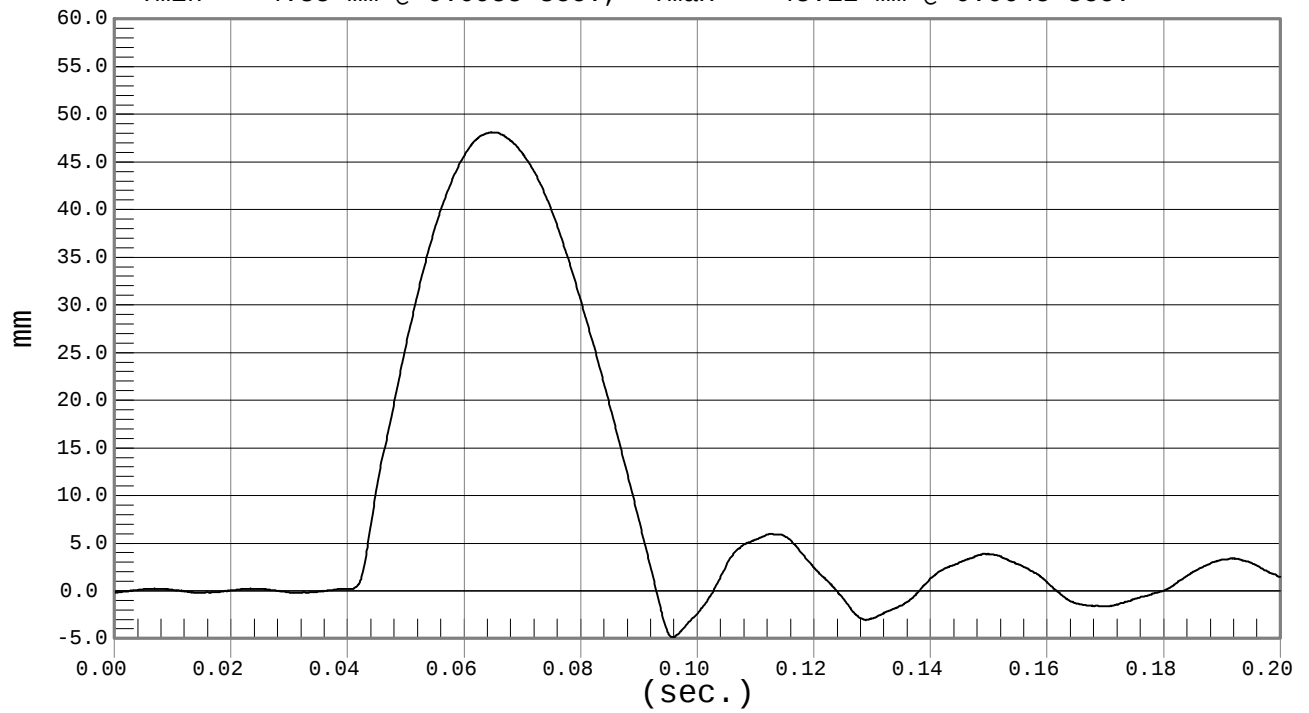


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -4.85 mm @ 0.0955 sec., Ymax = 48.12 mm @ 0.0645 sec.



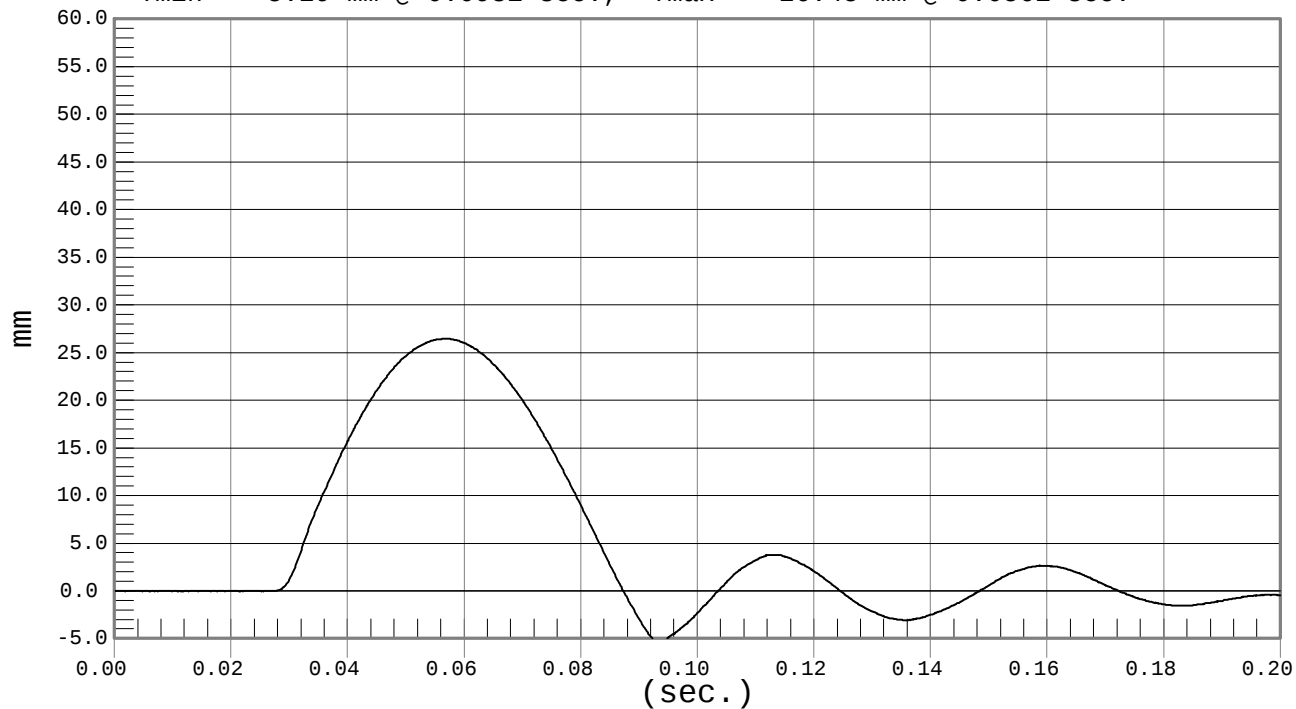


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.29 mm @ 0.0931 sec., Ymax = 26.45 mm @ 0.0561 sec.

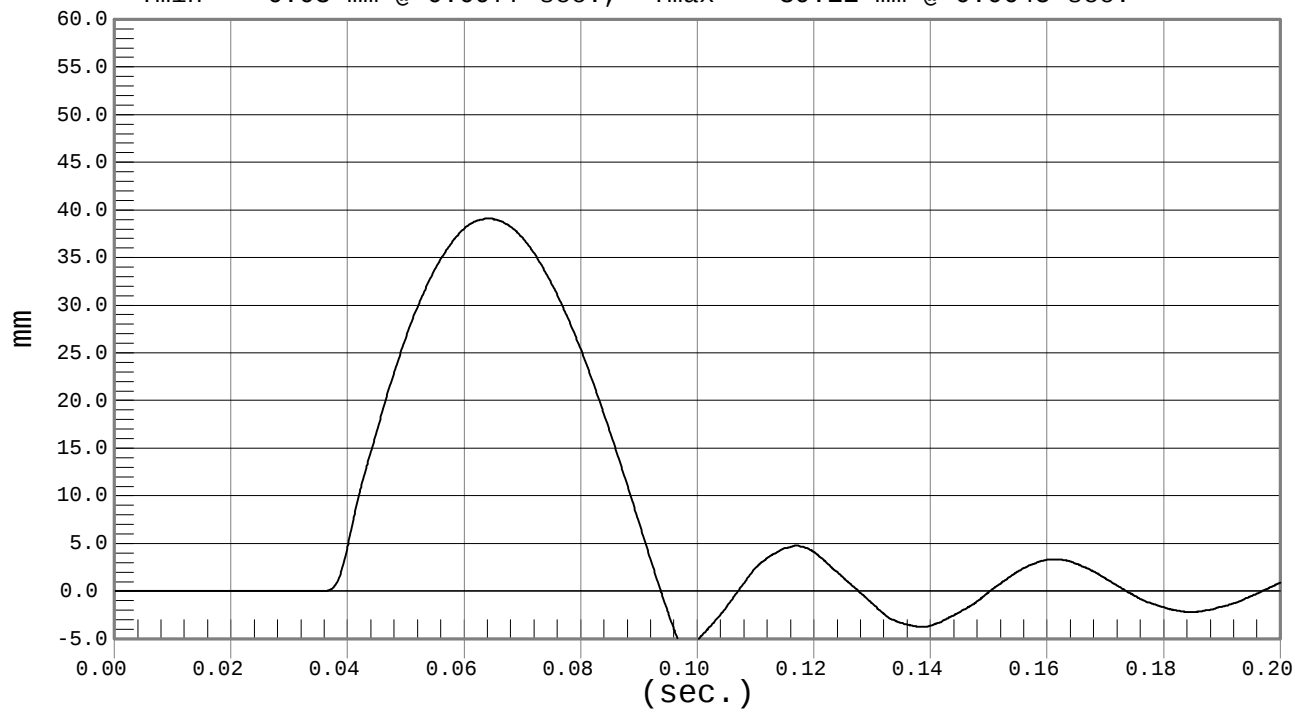


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.03 mm @ 0.0977 sec., Ymax = 39.11 mm @ 0.0645 sec.



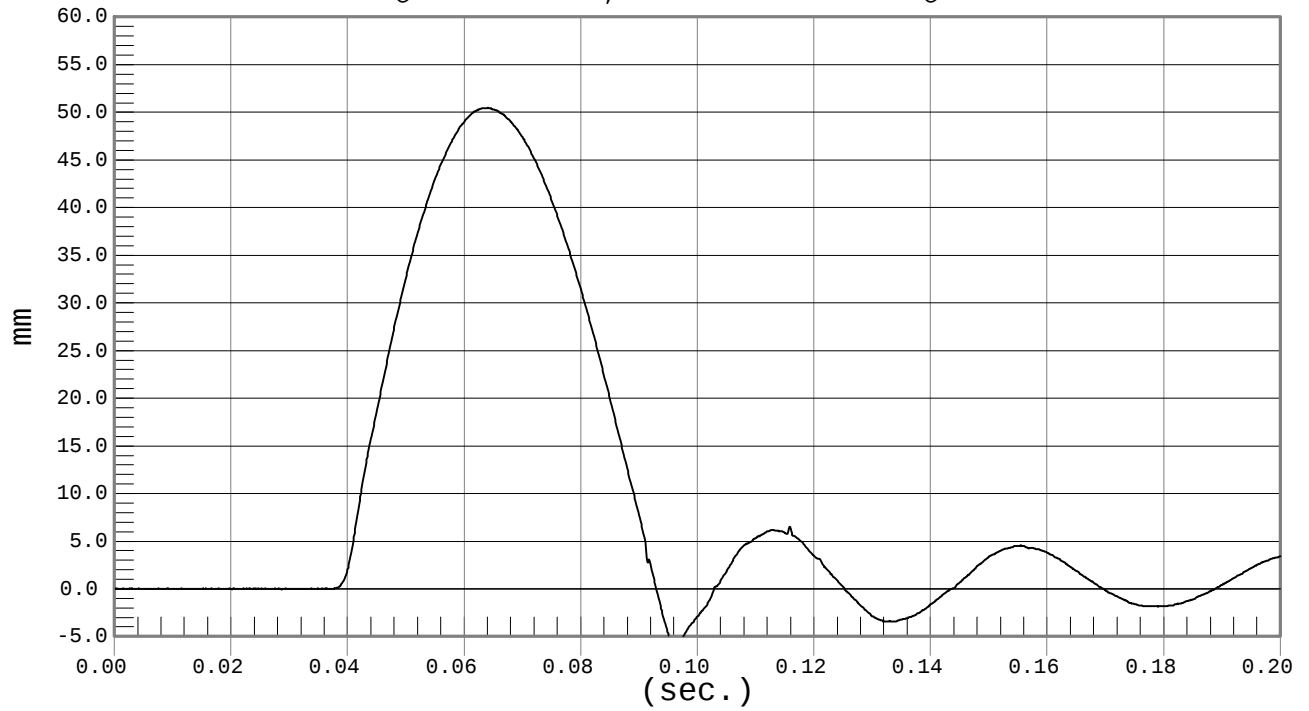


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.78 mm @ 0.0960 sec., Ymax = 50.47 mm @ 0.0640 sec.



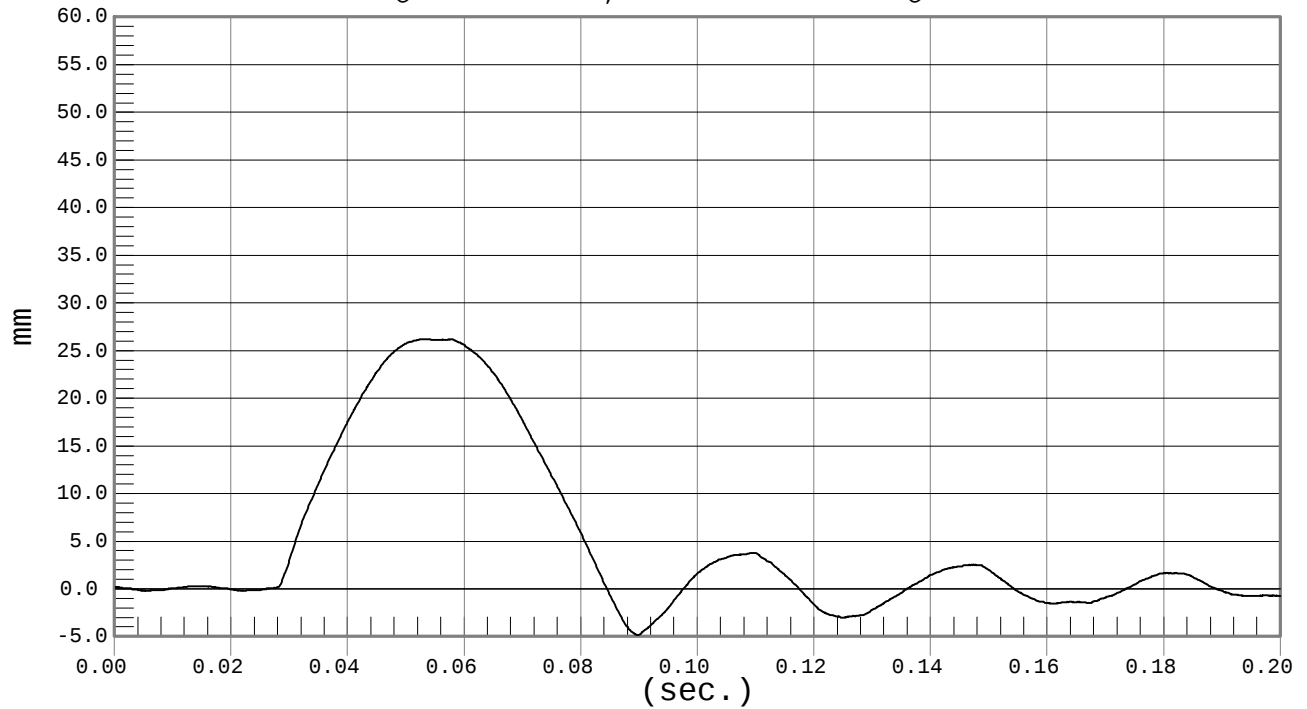


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.81 mm @ 0.0895 sec., Ymax = 26.2 mm @ 0.0525 sec.

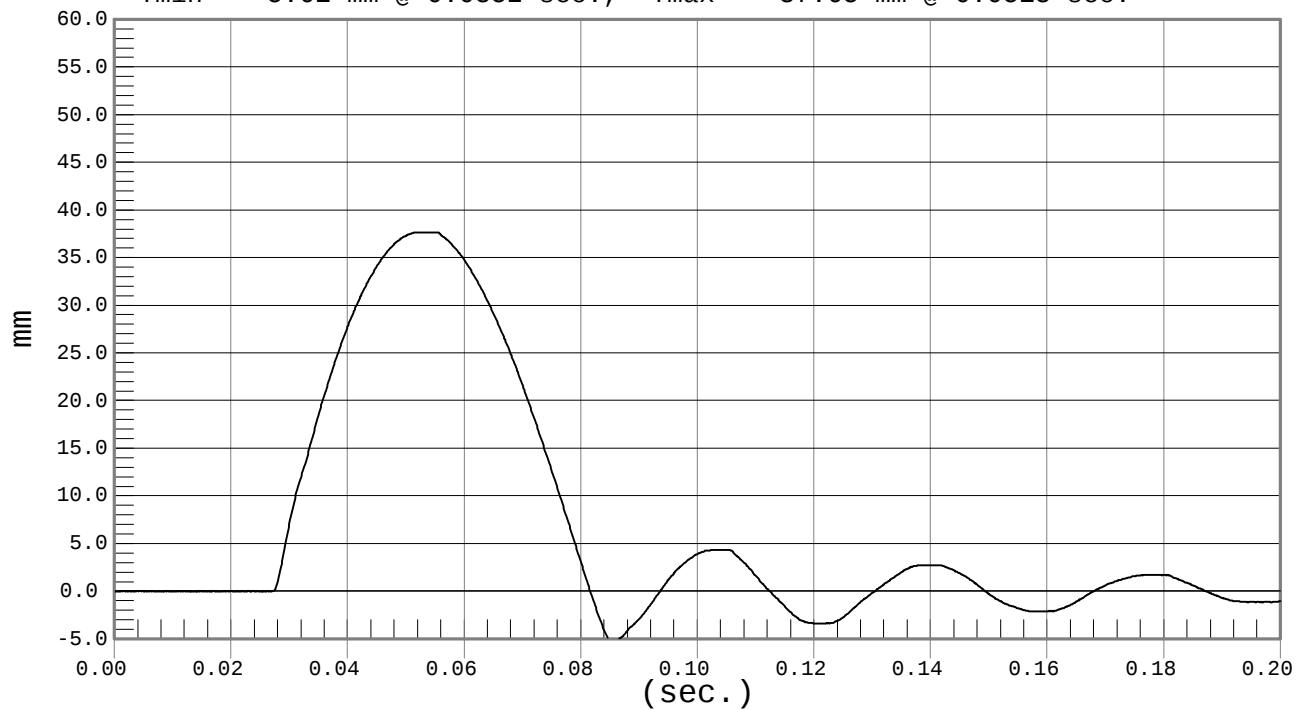


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.61 mm @ 0.0852 sec., Ymax = 37.65 mm @ 0.0518 sec.



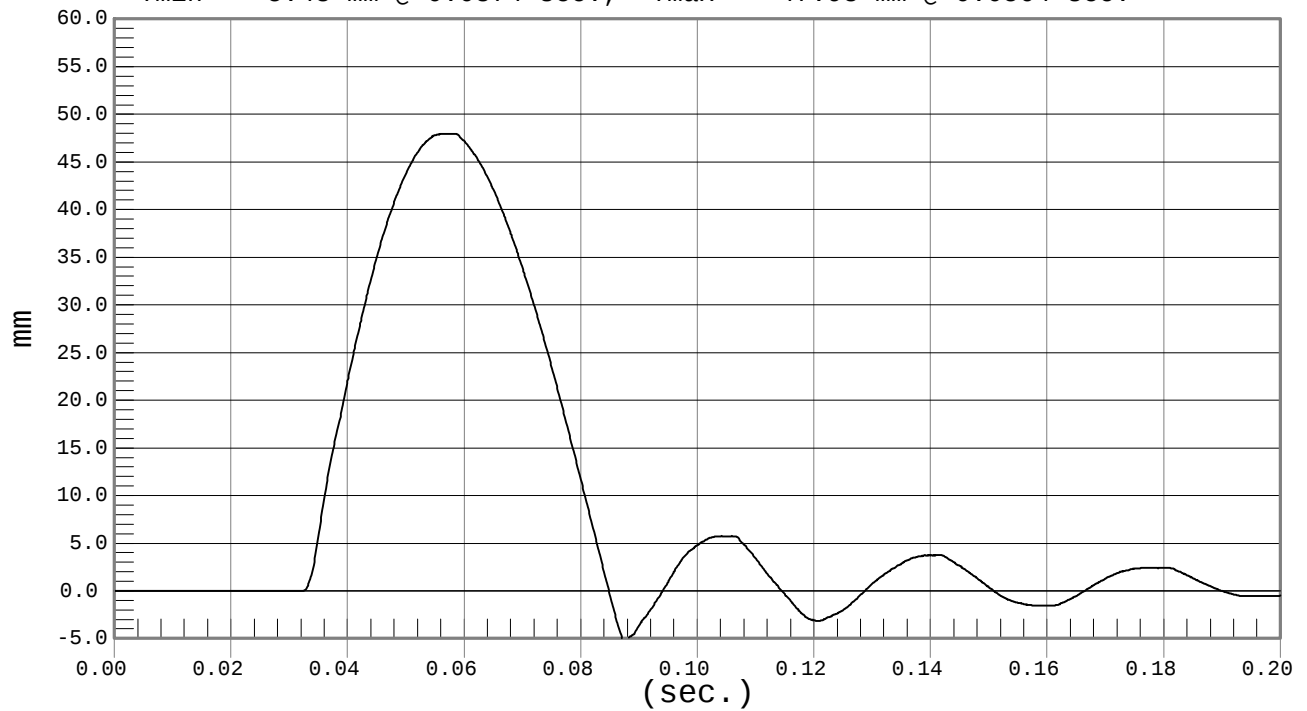


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-03-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.43 mm @ 0.0874 sec., Ymax = 47.98 mm @ 0.0564 sec.



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

Date: 5/4/05
Dummy Serial Number: 010
Test Number: D051197

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.2
Relative Humidity (%)	10 – 70	19
Probe Speed (m/s)	3.90 – 4.10	3.96
Maximum Impact Force	4.00 – 4.80 kN	4.78
Time of Maximum Force	10.60 – 13.00 ms	11.60
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.51
Time of Max. Total Force	10.00 – 12.30 ms	10.80

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

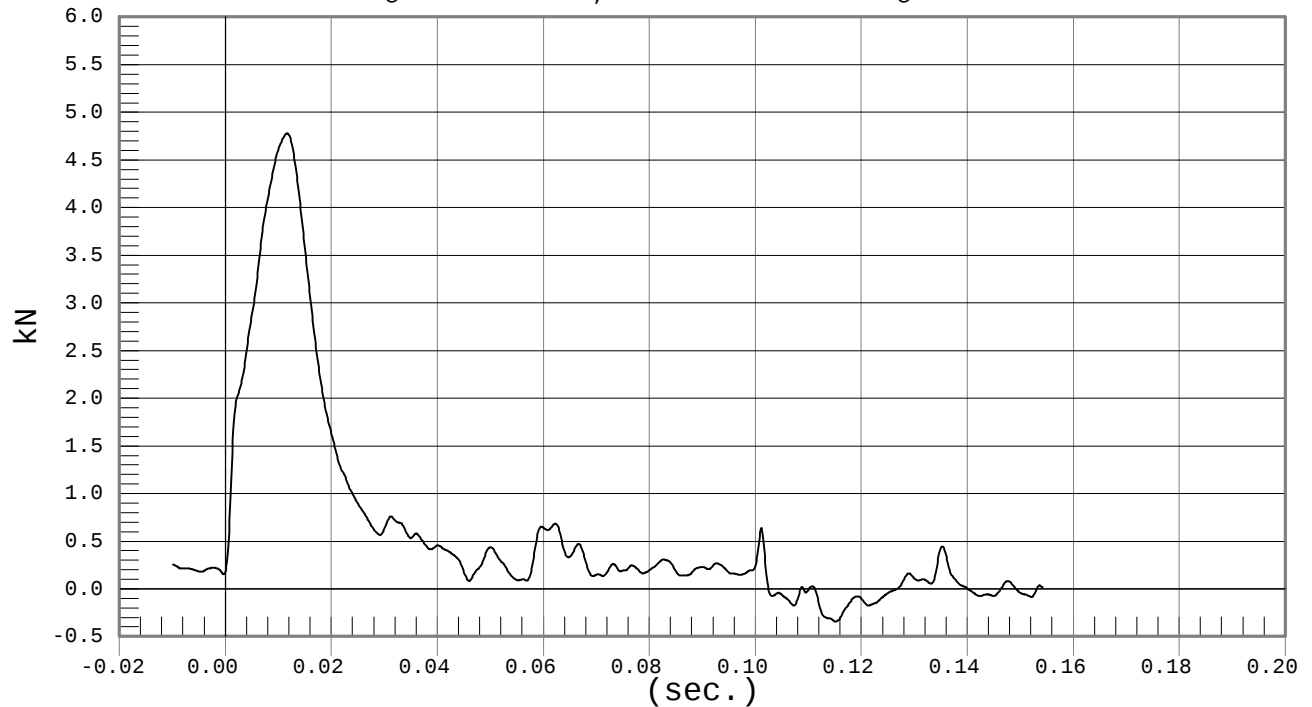


IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #010

Test Date: 05-04-05
Speed: 13.0 fps, 3.96 M/s

Ymin = -.34 kN @ 0.1151 sec., Ymax = 4.78 kN @ 0.0116 sec.

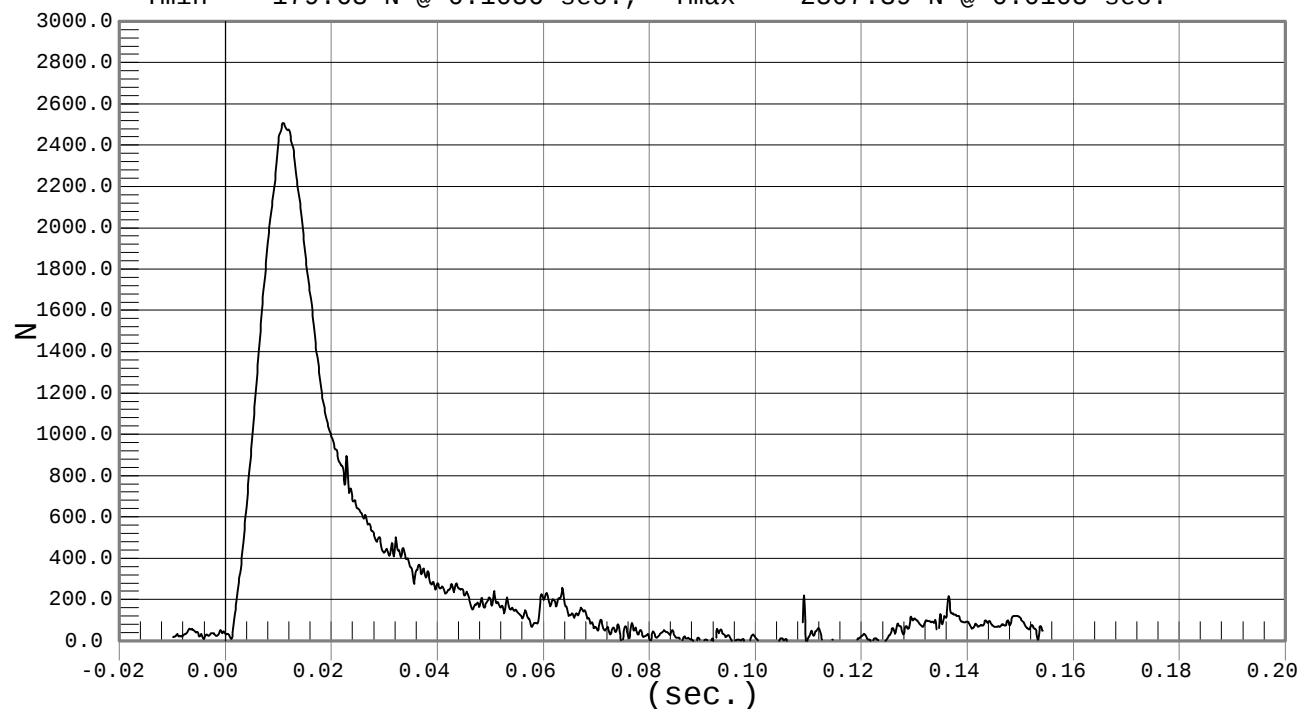


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #010

Test Date: 05-04-05
Speed: 13.0 fps, 3.96 M/s

Ymin = -179.68 N @ 0.1086 sec., Ymax = 2507.39 N @ 0.0108 sec.



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

Date: 5/4/05
Dummy Serial Number: 010
Test Number: D051198

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.2
Relative Humidity (%)		10 – 70	21
Pendulum Speed		5.95 – 6.15	6.15
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-2.11
	20 msec	-5.25 - -4.07 m/sec	-4.75
	25 msec	-6.64 - -5.30 m/sec	-5.95
	30 msec	≥ -6.5 m/sec	-6.31
Maximum Flexion Angle		45.0 – 55.0 deg	45.7
Time of Max. Flexion Angle		39.0 – 53.0 ms	44.1
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.4
Time of Max. Theta (A)		44.0 – 52.0 ms	44.4
Maximum Angle Theta (B)		27.1 – 29.6 deg	27.5
Time of Max. Theta (B)		44.0 – 52.0 ms	44.3

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

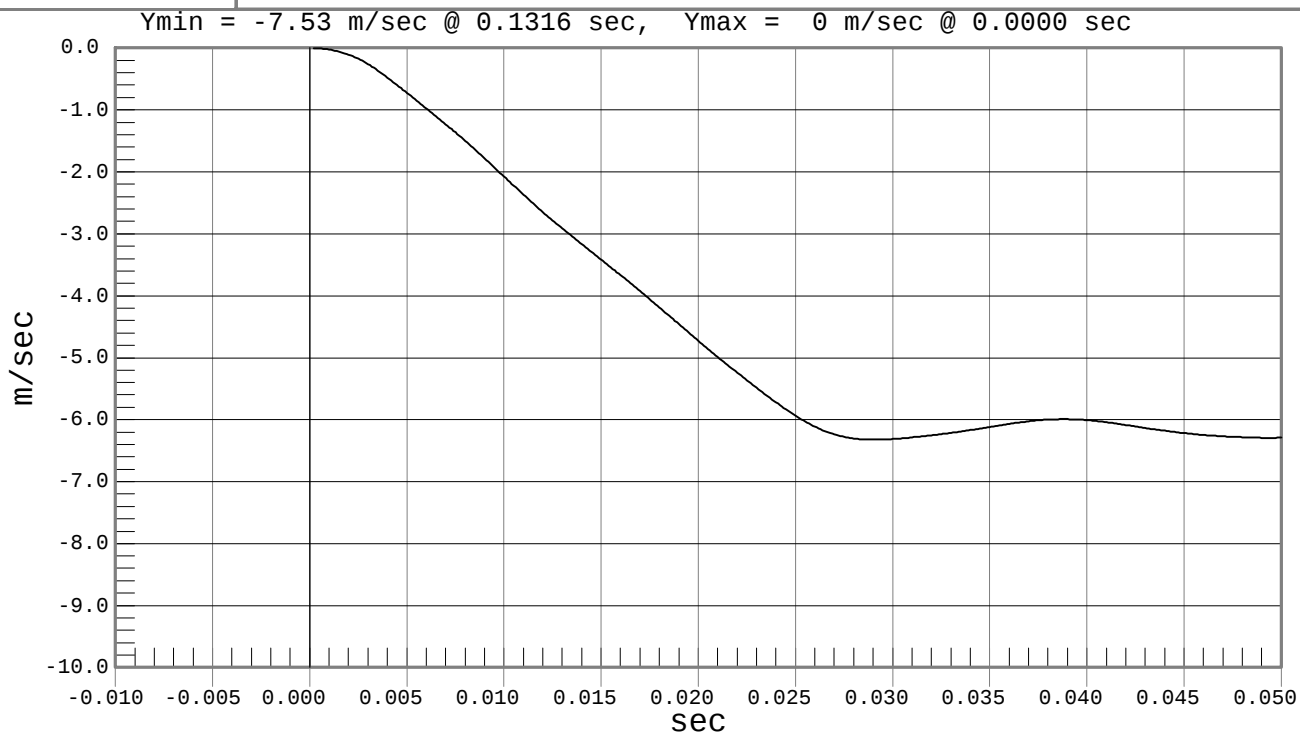
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Lumbar Bending
Component: Dummy #010

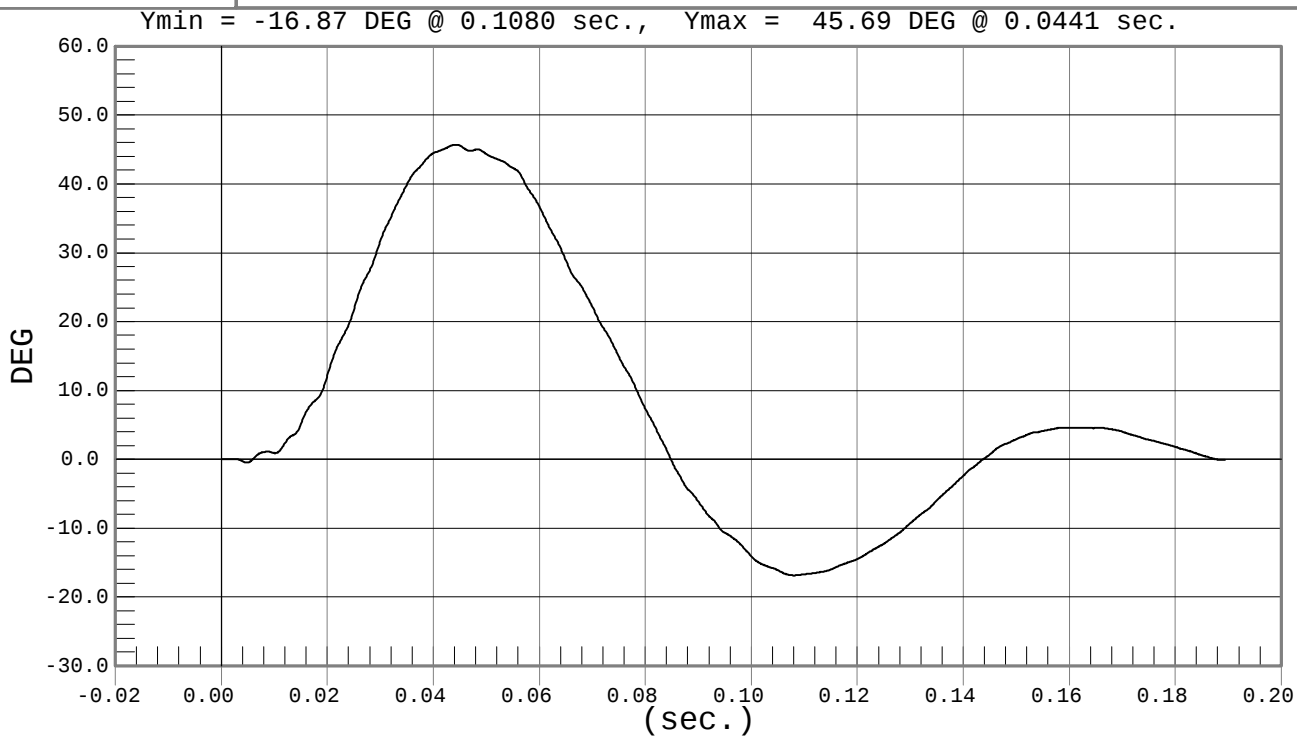
Test Date: 05-04-05
Speed: 20.1 fps, 6.15 M/s



FLEXION ANGLE

Test Desc.: Lumbar Bending
Component: Dummy #010

Test Date: 05-04-05
Speed: 20.1 fps, 6.15 M/s



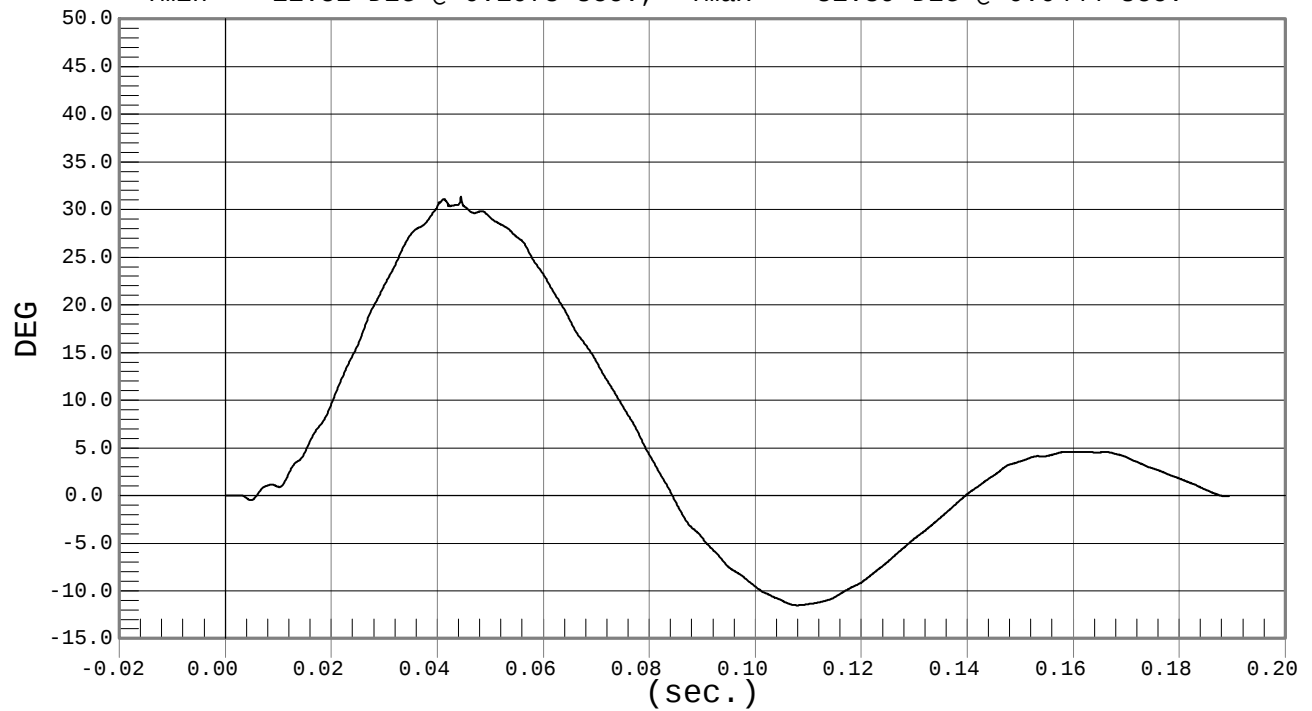


Test Desc.: Lumbar Bending
Component: Dummy #010

THETA A

Test Date: 05-04-05
Speed: 20.1 fps, 6.15 M/s

Ymin = -11.52 DEG @ 0.1078 sec., Ymax = 31.39 DEG @ 0.0444 sec.

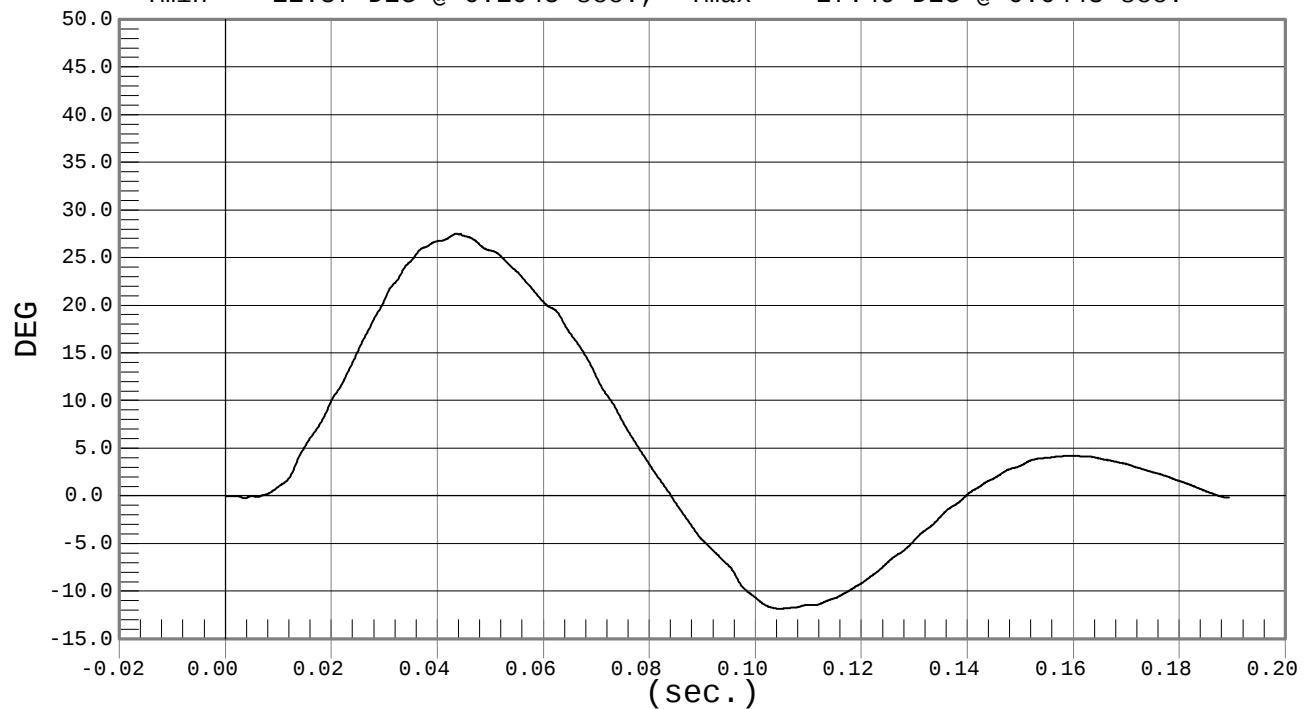


Test Desc.: Lumbar Bending
Component: Dummy #010

THETA B

Test Date: 05-04-05
Speed: 20.1 fps, 6.15 M/s

Ymin = -11.87 DEG @ 0.1045 sec., Ymax = 27.49 DEG @ 0.0443 sec.



MGA RESEARCH CORPORATION
PELVIS TEST
EUROSID 2 DUMMY

Date: 5/4/05
Dummy Serial Number: 010
Test Number: D051199

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.8
Relative Humidity (%)	10 – 70	19
Pendulum Speed	4.20 – 4.40 m/s	4.26
Maximum Impactor Force	4.40 – 5.40 kN	5.10
Time of Max. Impactor Force	10.30 – 15.50 ms	13.80
Maximum Pubic Force	1.04 – 1.64 kN	1.42
Time of Max. Pubic Force	9.90 – 15.90 ms	14.50

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

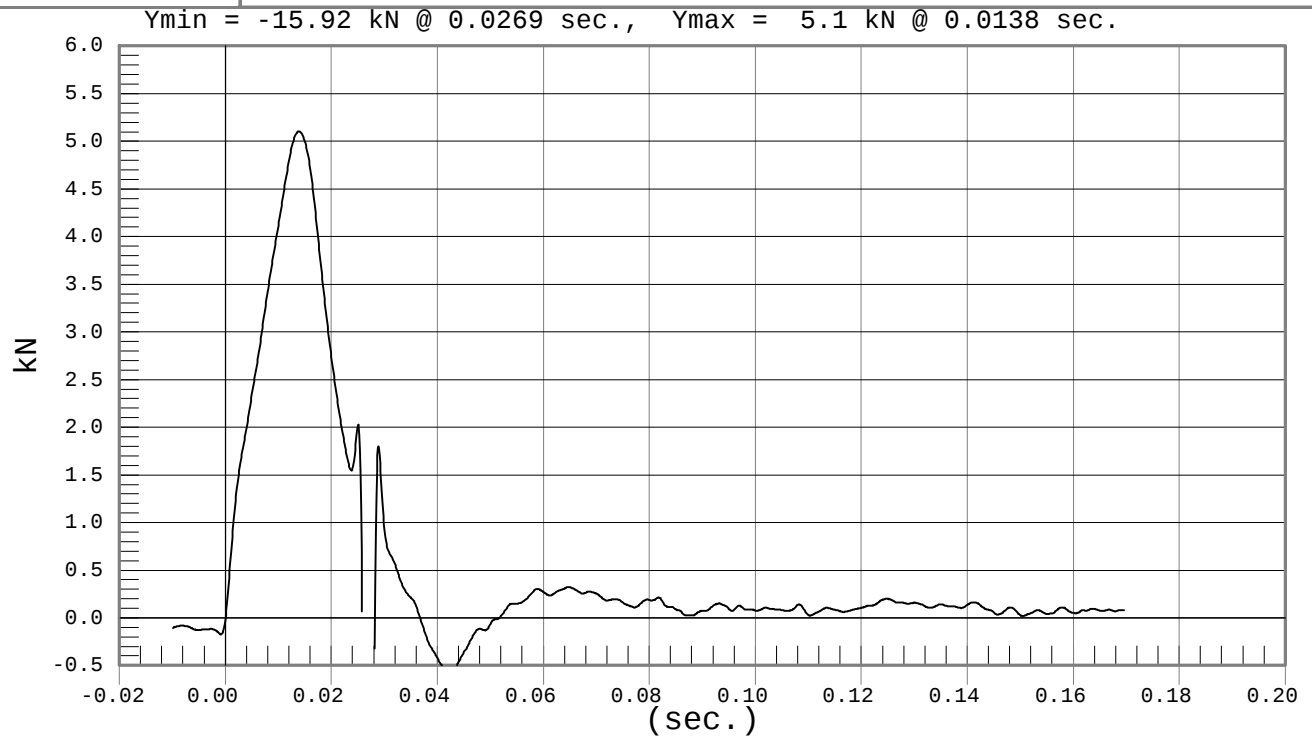
Approved By: David Winkelbauer



IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #010

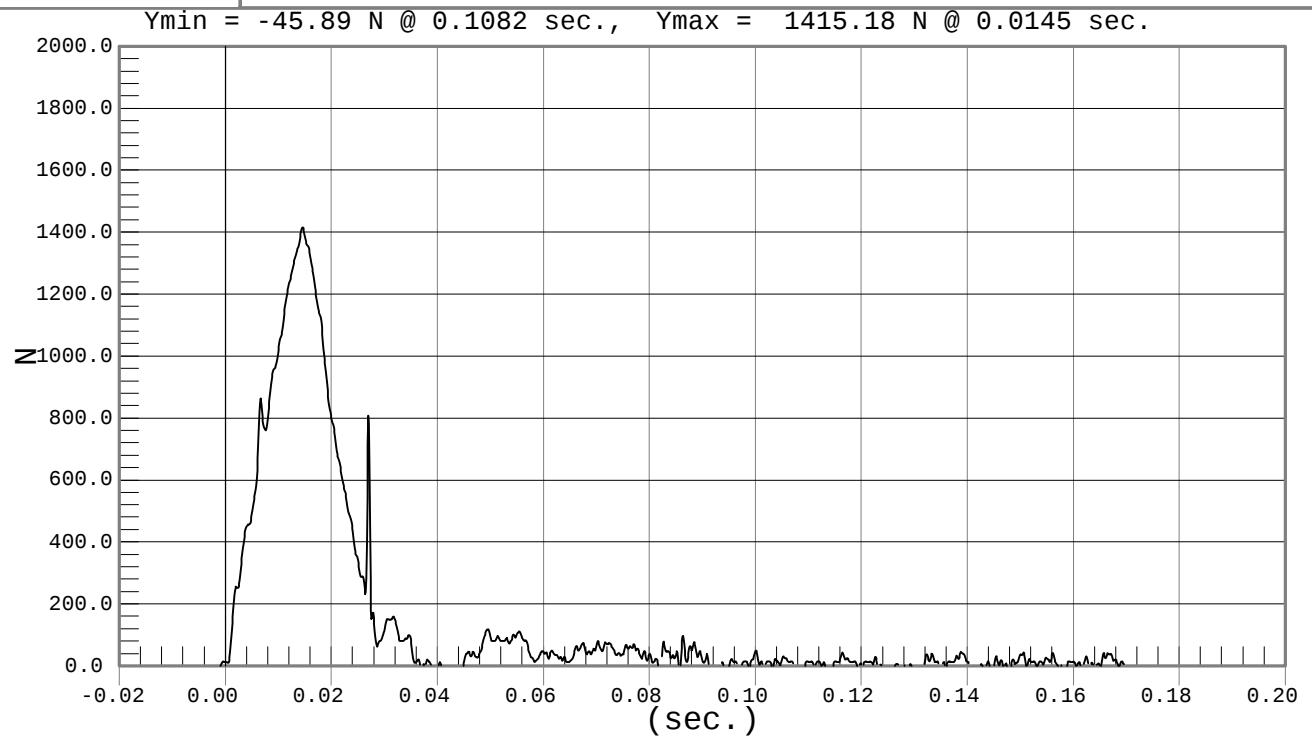
Test Date: 05-04-05
Speed: 14.0 fps, 4.26 M/s



PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #010

Test Date: 05-04-05
Speed: 14.0 fps, 4.26 M/s



CERTIFICATION DATA

Dummy Serial Number: 010

Calibration Test Results Summary

Dummy Serial Number: 010

Post-Test Calibration

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

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

Date: 5/9/05
Dummy Serial Number: 010
Test Number: D051251

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	46
Peak Resultant Acceleration	100 – 150 g's	132
Time of Max. Res. Acceleration	msec	33.5

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

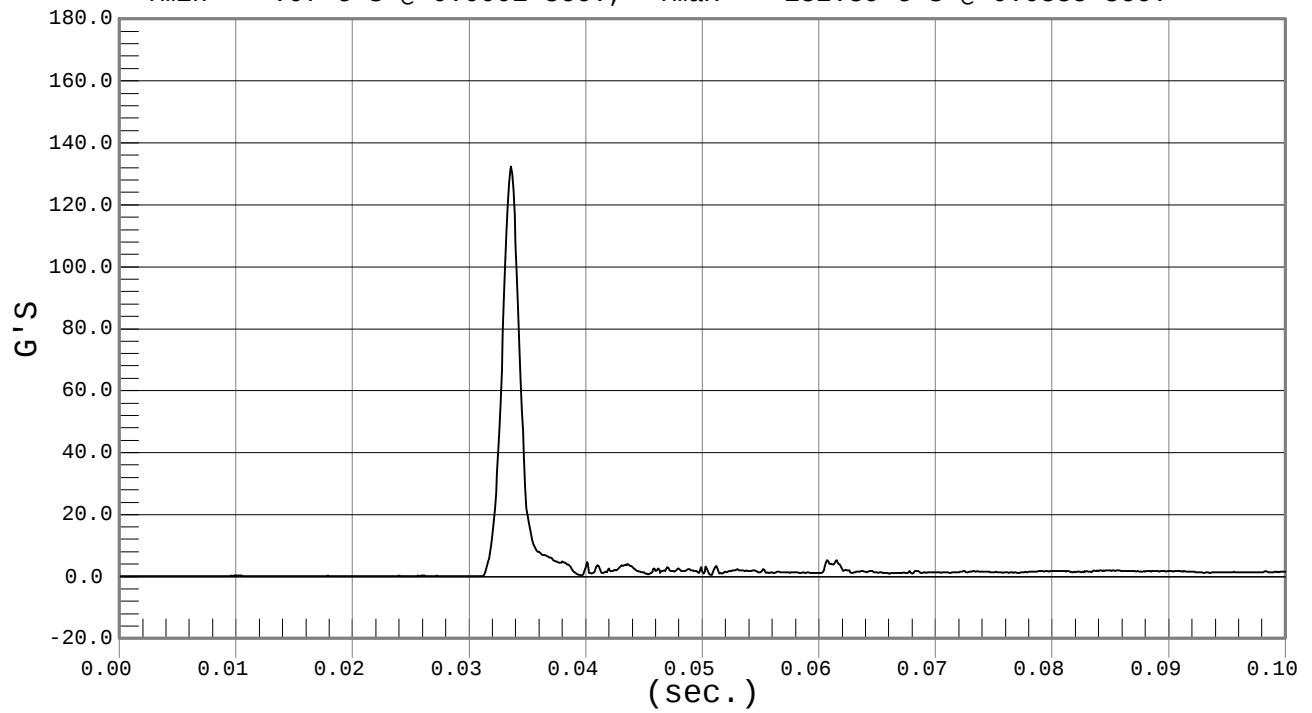


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #010

Test Date: 05-09-05
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0001 sec., Ymax = 132.39 G'S @ 0.0335 sec.



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
EUROSID 2 DUMMY

Date: 5/9/05
Dummy Serial Number: 010
Test Number: D051252

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.3
Relative Humidity (%)		10 – 70	47
Pendulum Speed		3.3 - 3.5	3.3
Pendulum Deceleration	3 msec	1.25 - 1.53 m/sec	-.33
	8 msec	1.59 - 2.04 m/sec	-1.73
	14 msec	3.20 - 3.85 m/sec	-3.34
Maximum Flexion Angle		49.0 – 59.0 deg	57.8
Time of Max. Flexion Angle		54.0 – 66.0 ms	62.1
Maximum Angle Theta (A)		32.0 – 37.0 deg	34.9
Time of Max. Theta (A)		53.0 – 63.0 ms	62.3
Maximum Angle Theta (B)		30.0 – 32.5 deg	31.5
Time of Max. Theta (B)		54.0 – 64.0 ms	55.7

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

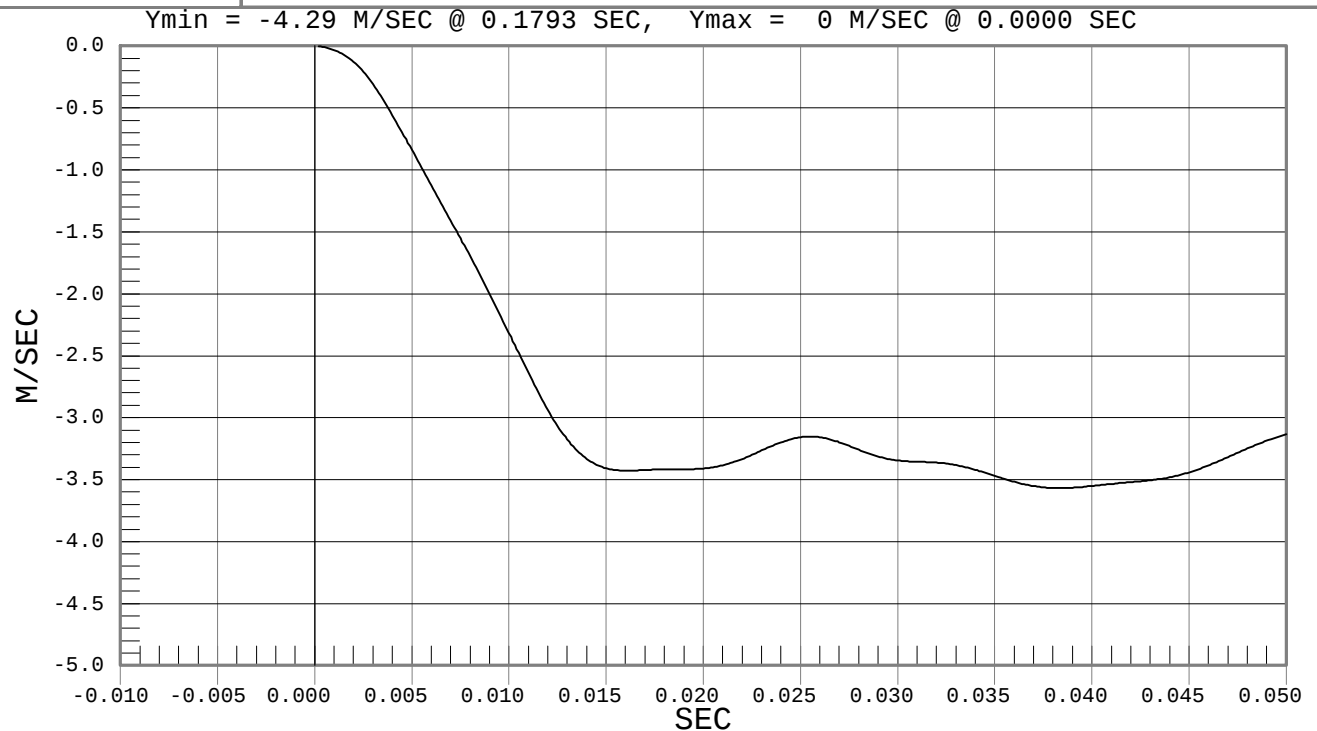
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #010

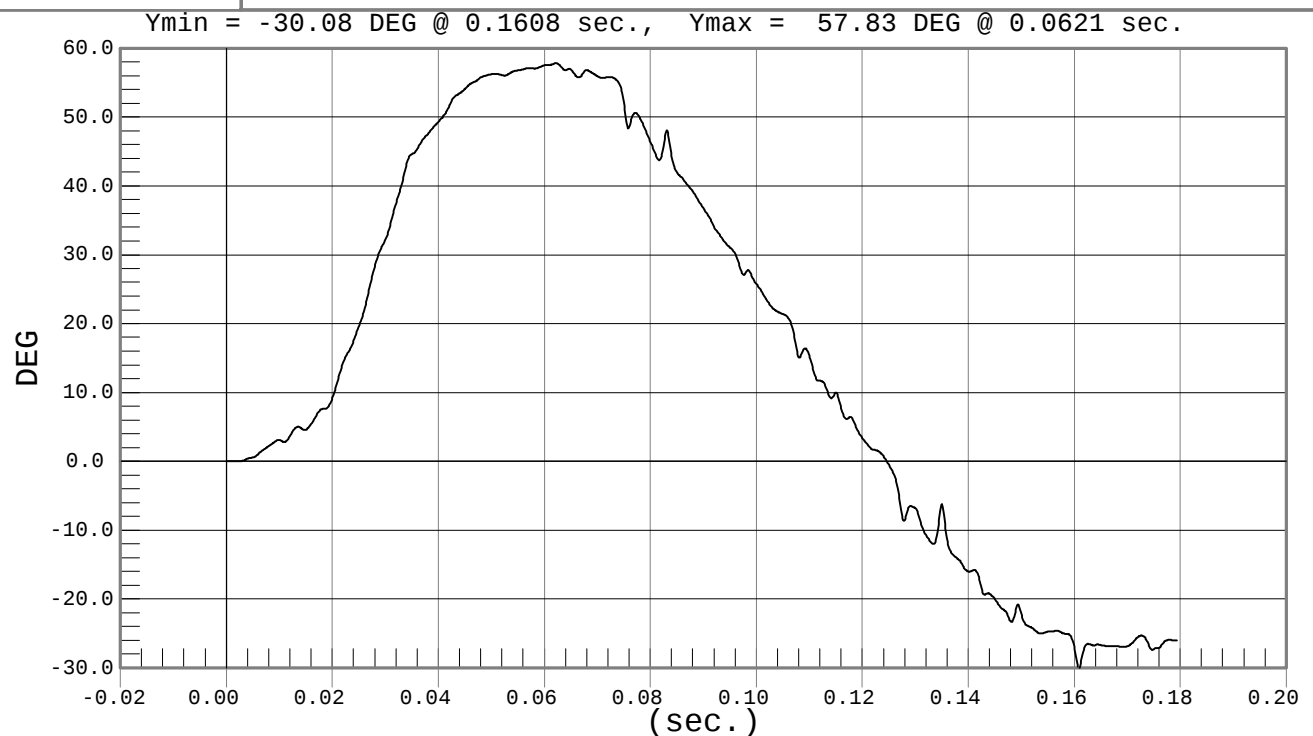
Test Date: 05-09-05
Speed: 10.8 fps, 3.30 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #010

Test Date: 05-09-05
Speed: 10.8 fps, 3.30 M/s



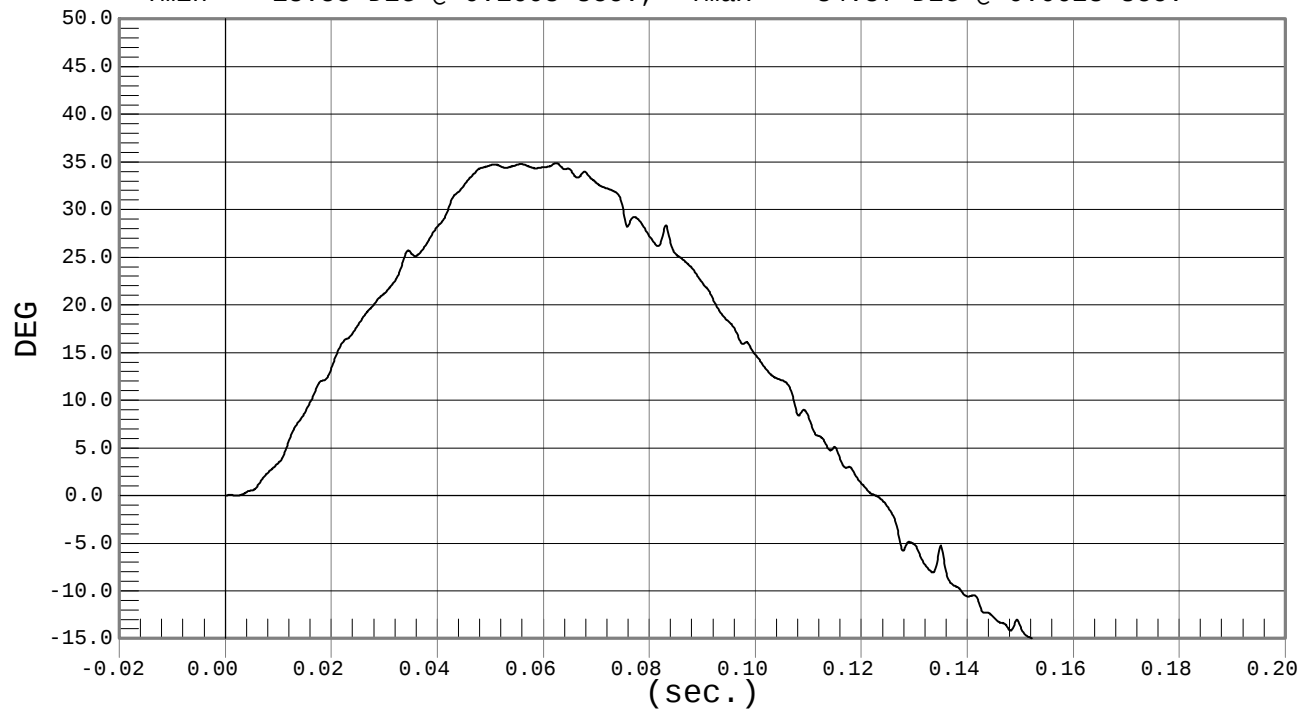


Test Desc.: Neck Bending
Component: Dummy #010

THETA A

Test Date: 05-09-05
Speed: 10.8 fps, 3.30 M/s

Ymin = -18.55 DEG @ 0.1608 sec., Ymax = 34.87 DEG @ 0.0623 sec.

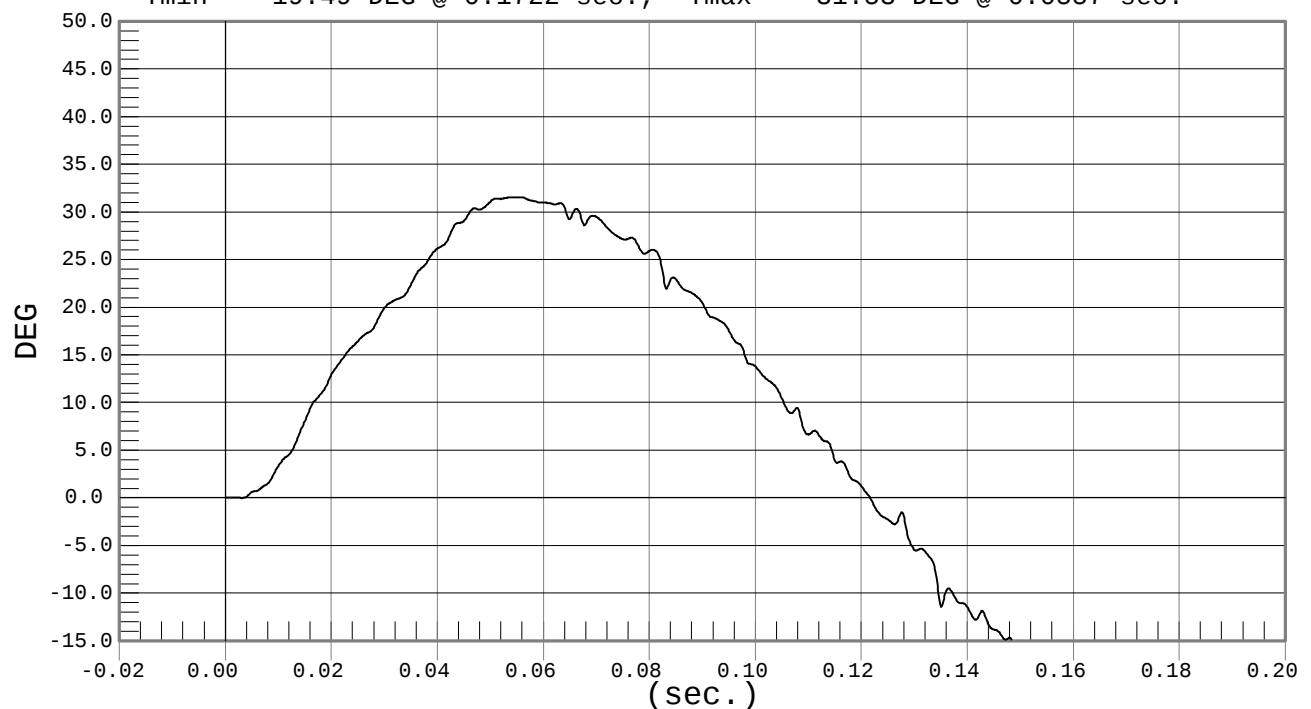


Test Desc.: Neck Bending
Component: Dummy #010

THETA B

Test Date: 05-09-05
Speed: 10.8 fps, 3.30 M/s

Ymin = -19.49 DEG @ 0.1722 sec., Ymax = 31.53 DEG @ 0.0557 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

Date: 5/9/05
Dummy Serial Number: 010
Test Number: D051253

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	48
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	10.5
Time of Max. Pendulum Acceleration	msec	49.5

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Gall

Approved By: _____

David Winkelbauer

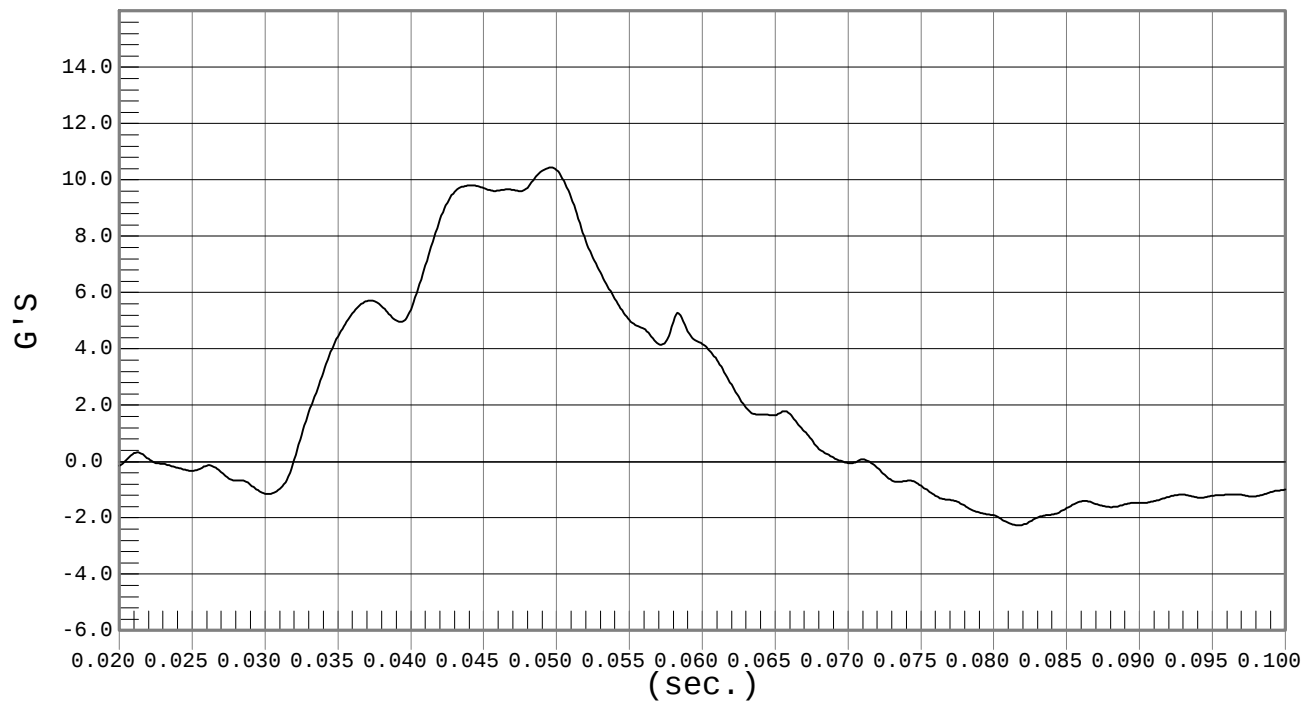


SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #010

Test Date: 05-09-05
Speed: 14.1 fps, 4.29 M/s

Ymin = -2.27 G'S @ 0.0816 sec., Ymax = 10.45 G'S @ 0.0495 sec.



MGA RESEARCH CORPORATION
UPPER/MIDDLE/LOWER RIB TESTS
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 010
Test Number: D051254, D051255, D051256

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.6
Relative Humidity (%)	10 – 70	34
Displacement at 2 m/s	23.5 – 27.5 mm	26.1
Displacement at 3 m/s	36.0 – 40.0 mm	37.4
Displacement at 4 m/s	46.0 – 51.0 mm	47.8

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.6
Relative Humidity (%)	10 – 70	34
Displacement at 2 m/s	23.5 – 27.5 mm	27.1
Displacement at 3 m/s	36.0 – 40.0 mm	39.8
Displacement at 4 m/s	46.0 – 51.0 mm	50.9

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.6
Relative Humidity (%)	10 – 70	34
Displacement at 2 m/s	23.5 – 27.5 mm	26.2
Displacement at 3 m/s	36.0 – 40.0 mm	37.6
Displacement at 4 m/s	46.0 – 51.0 mm	48.4

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

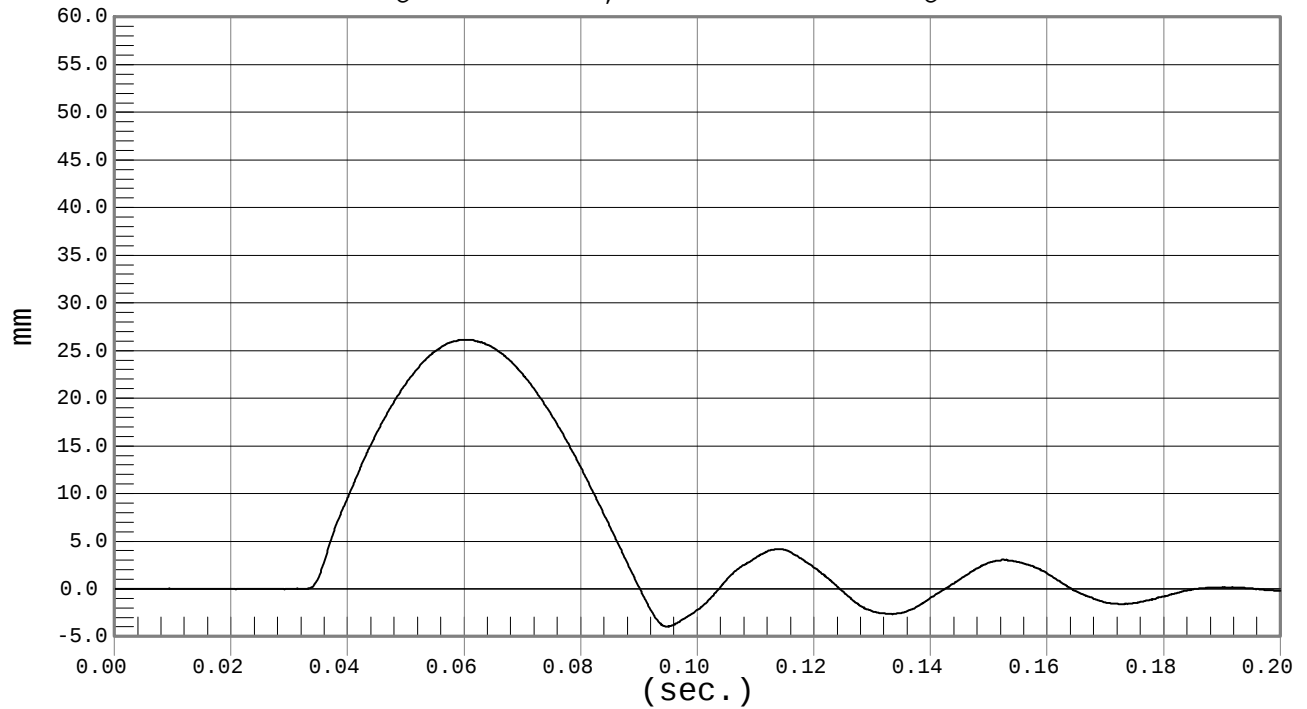


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -3.96 mm @ 0.0944 sec., Ymax = 26.13 mm @ 0.0594 sec.

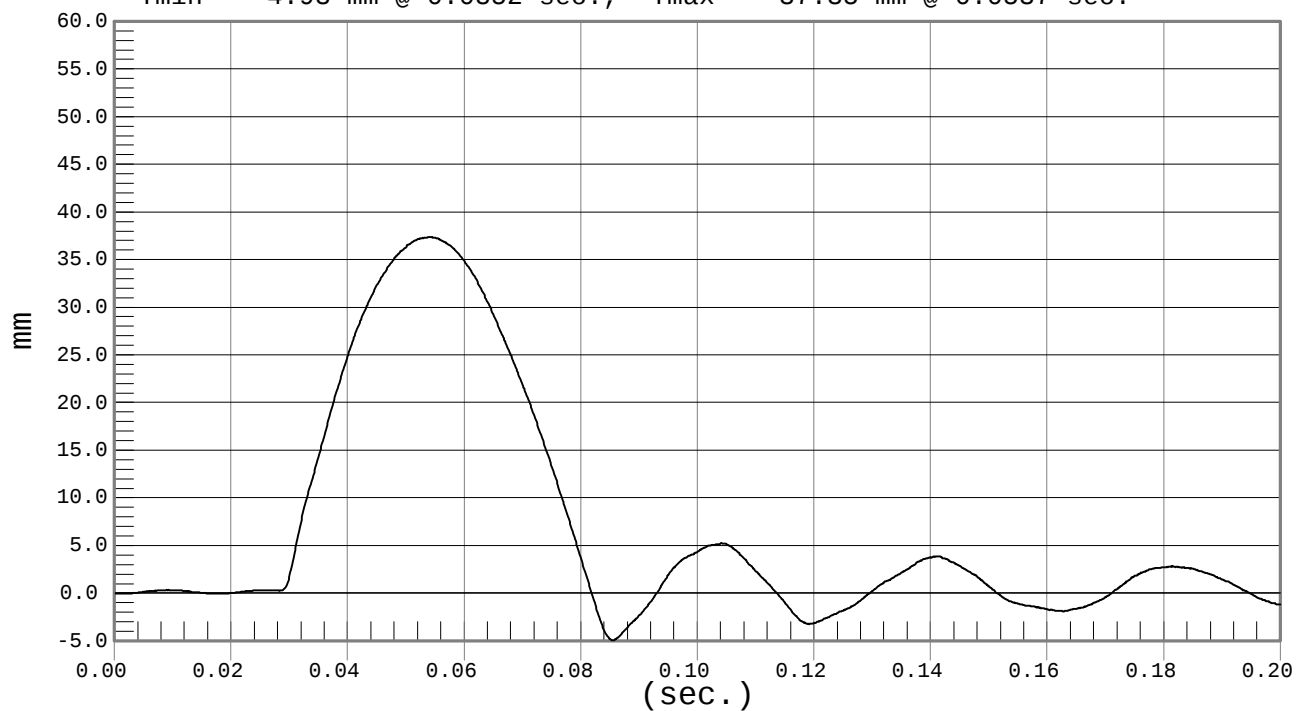


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -4.93 mm @ 0.0852 sec., Ymax = 37.35 mm @ 0.0537 sec.



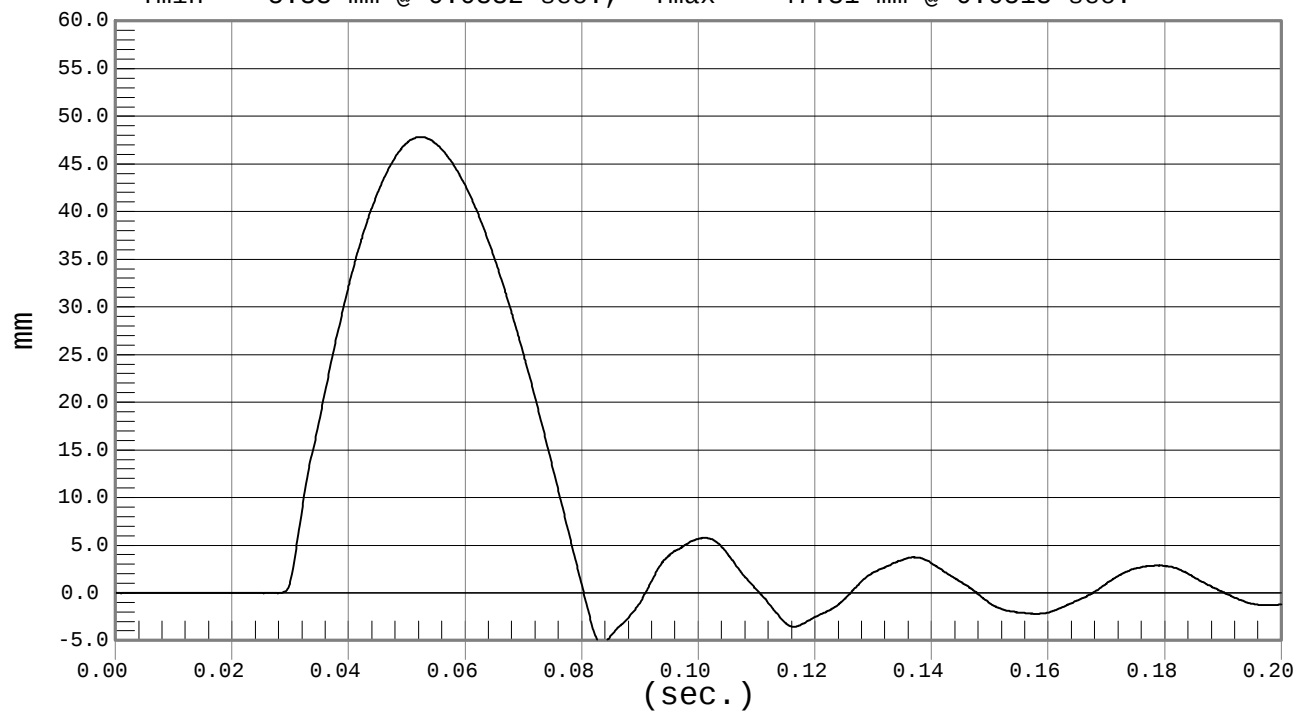


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.38 mm @ 0.0832 sec., Ymax = 47.81 mm @ 0.0518 sec.



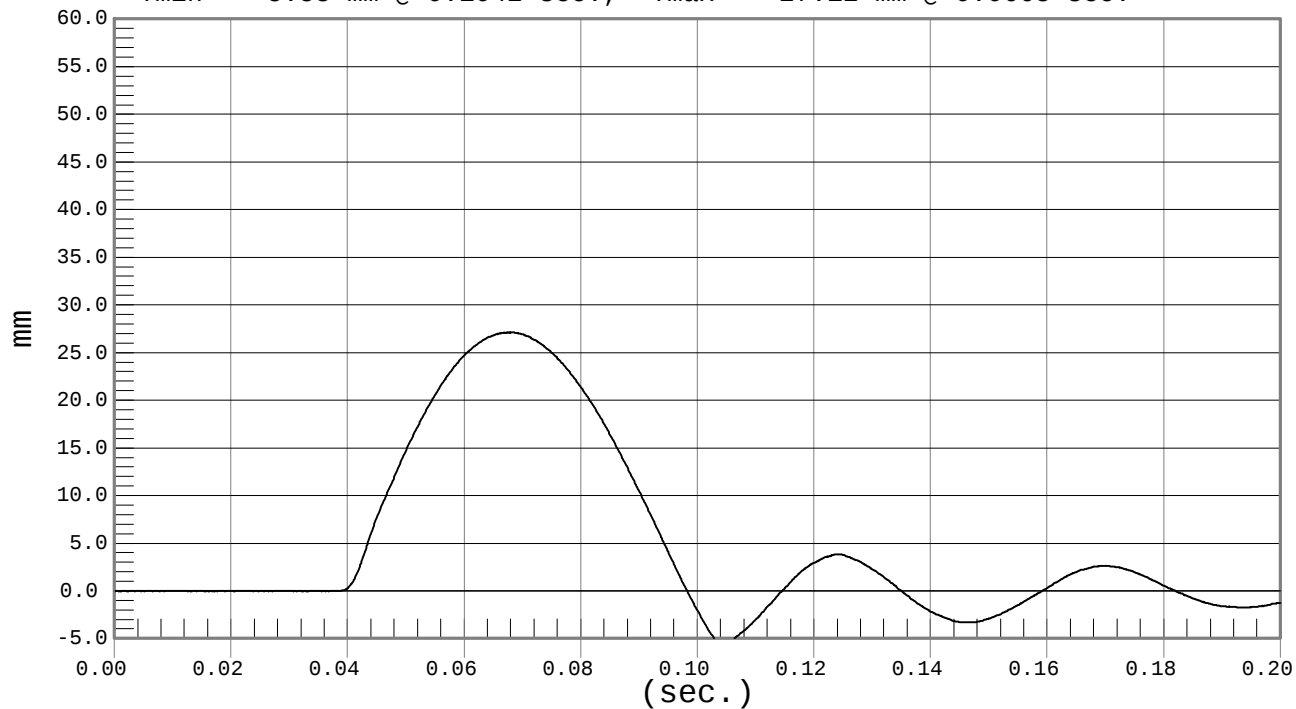


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.58 mm @ 0.1042 sec., Ymax = 27.12 mm @ 0.0668 sec.

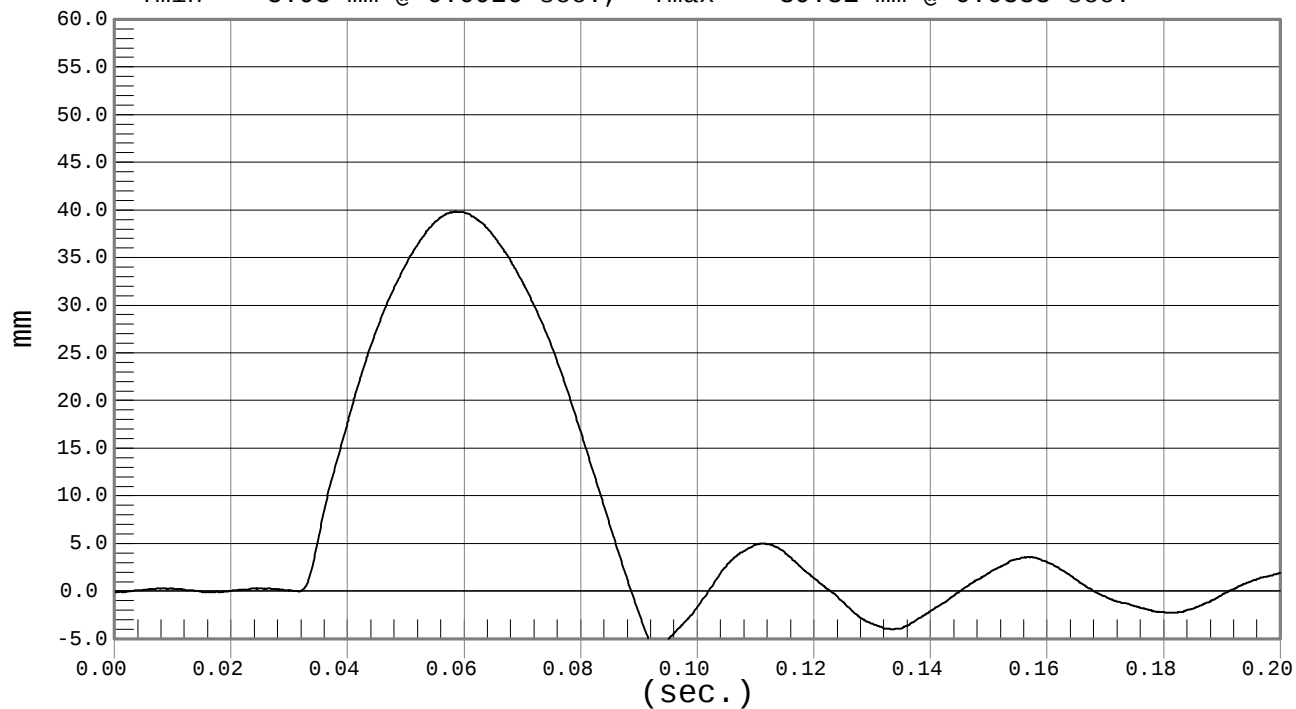


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.93 mm @ 0.0926 sec., Ymax = 39.81 mm @ 0.0583 sec.



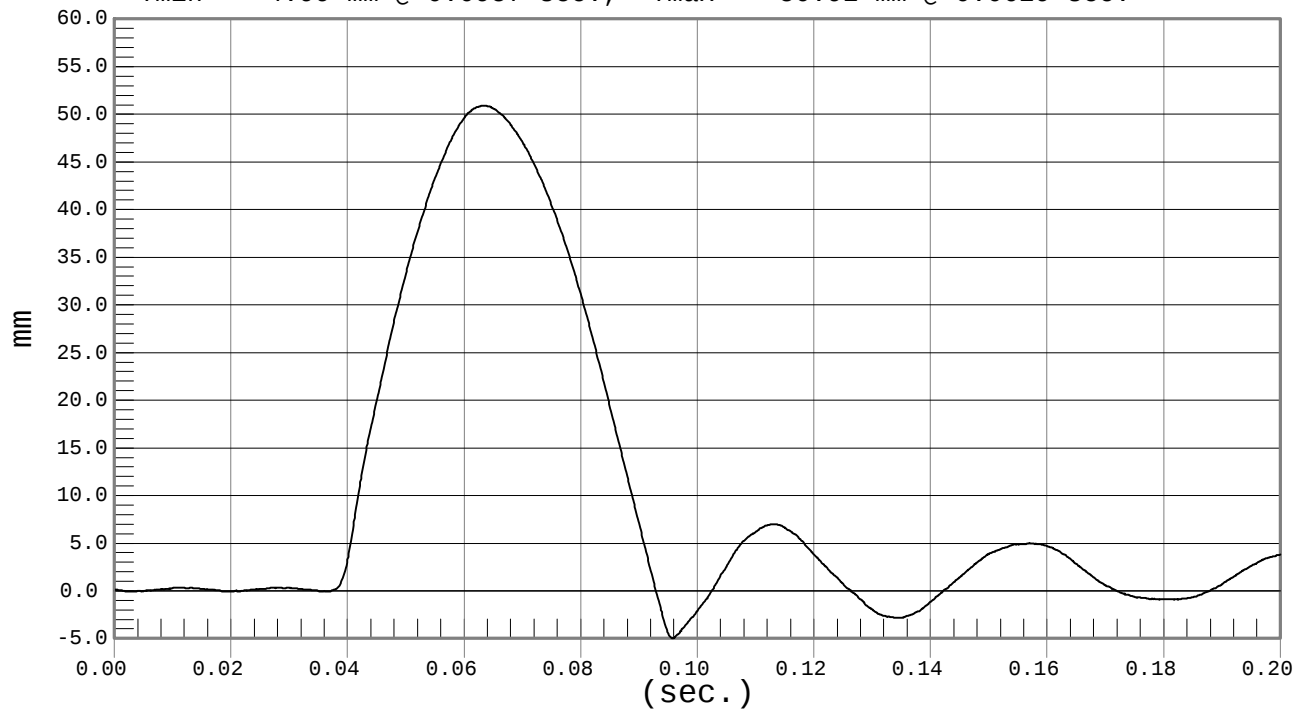


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -4.99 mm @ 0.0957 sec., Ymax = 50.92 mm @ 0.0629 sec.



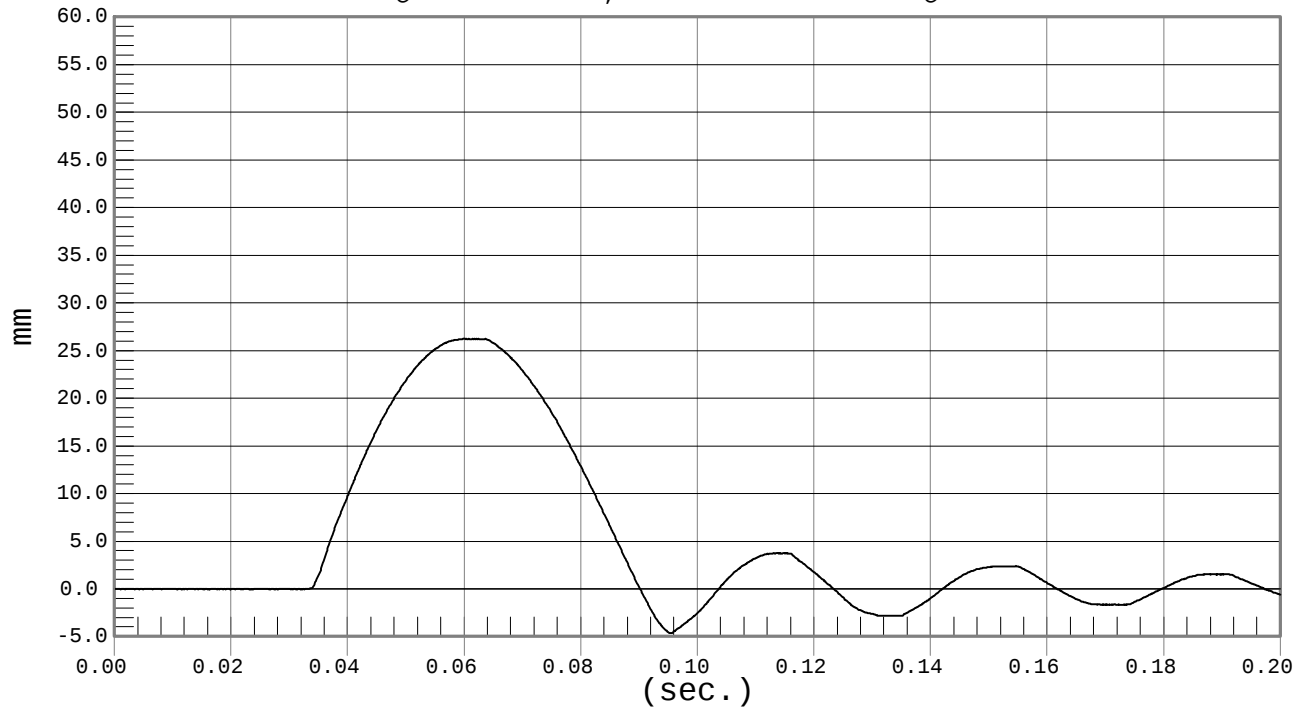


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.65 mm @ 0.0952 sec., Ymax = 26.21 mm @ 0.0597 sec.

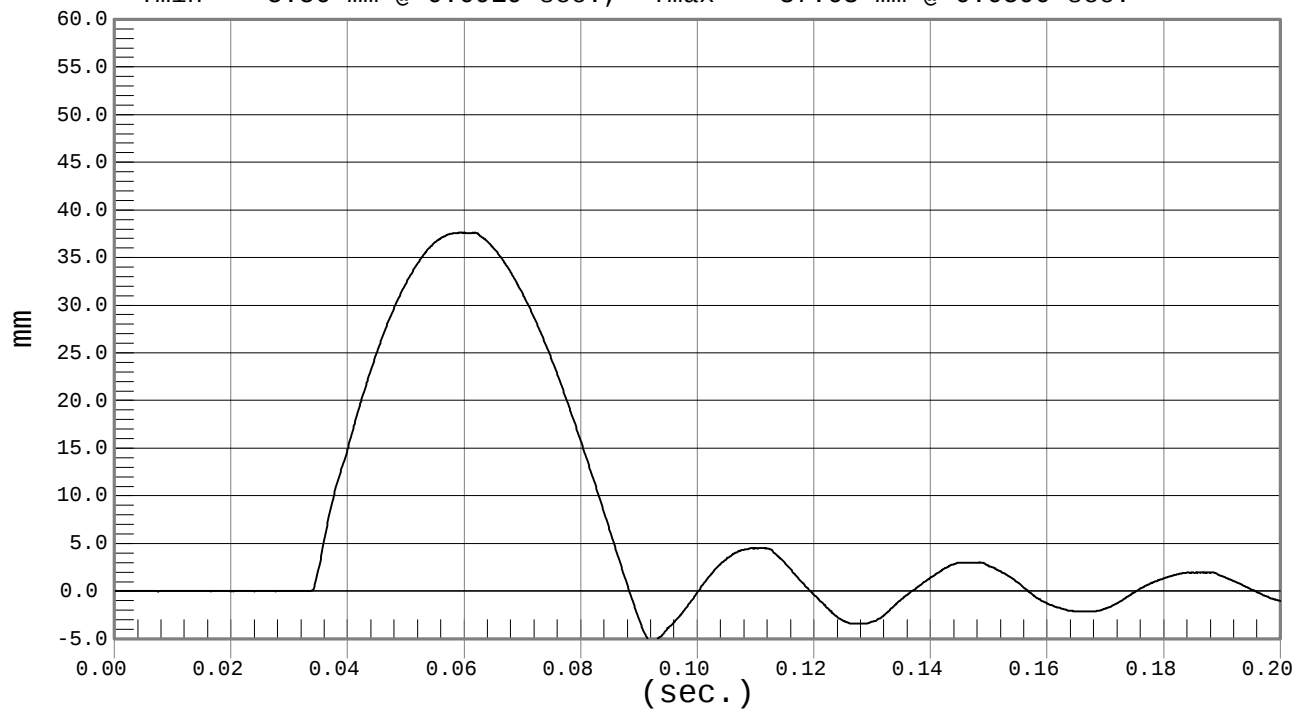


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.56 mm @ 0.0919 sec., Ymax = 37.63 mm @ 0.0590 sec.



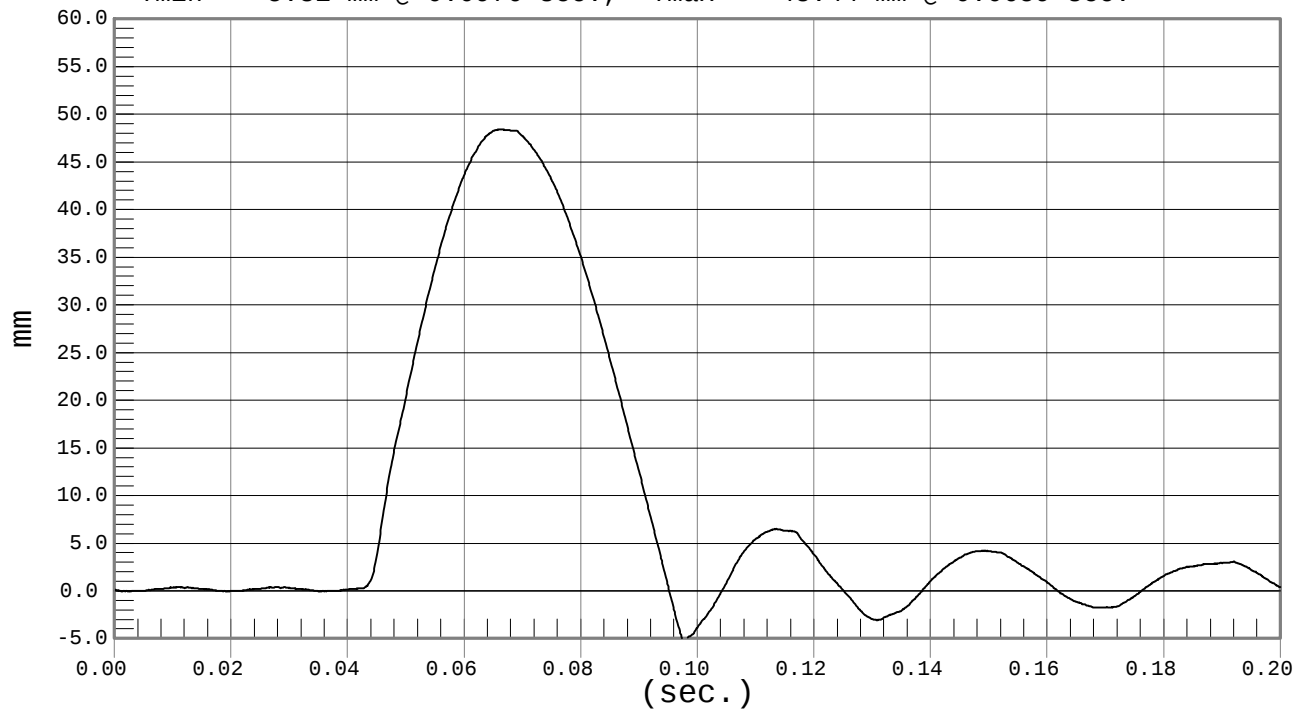


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #010

Test Date: 05-06-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.31 mm @ 0.0976 sec., Ymax = 48.44 mm @ 0.0659 sec.



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

Date: 5/9/05
Dummy Serial Number: 010
Test Number: D051257

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.5
Relative Humidity (%)	10 – 70	49
Probe Speed (m/s)	3.90 – 4.10	3.94
Maximum Impact Force	4.00 – 4.80 kN	4.63
Time of Maximum Force	10.60 – 13.00 ms	12.00
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.53
Time of Max. Total Force	10.00 – 12.30 ms	12.20

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

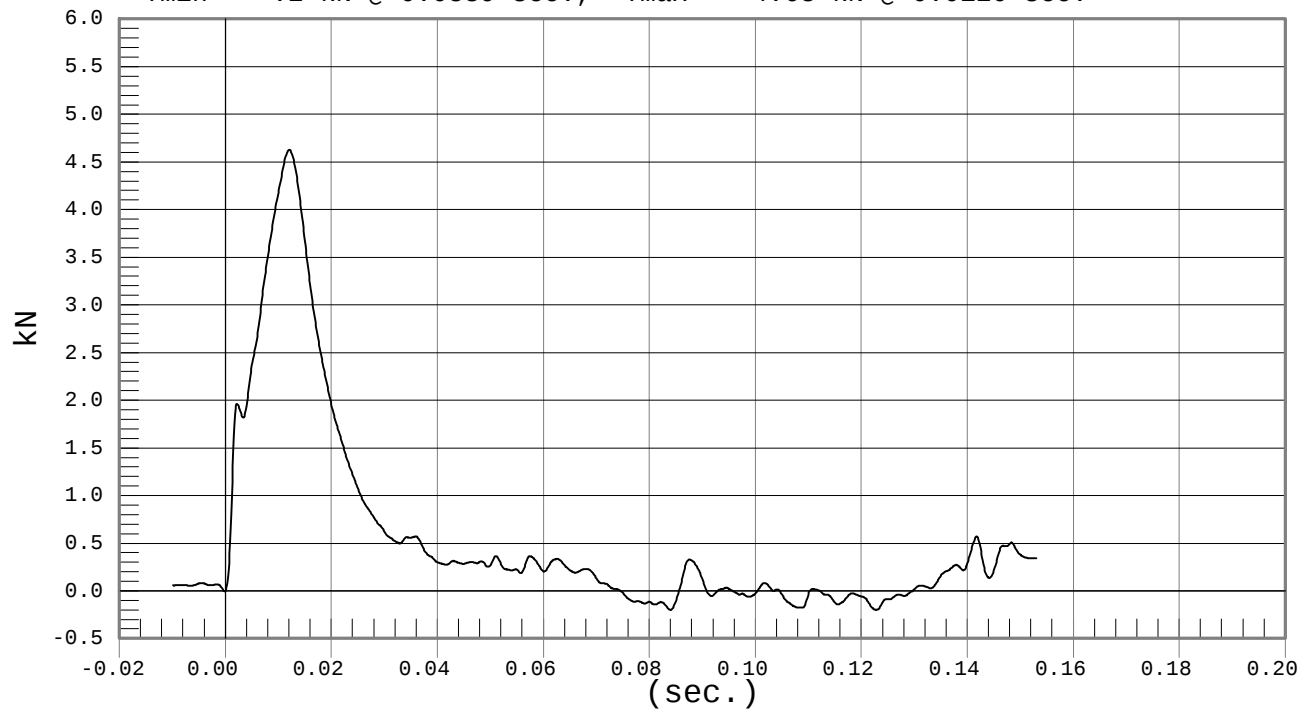


IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #010

Test Date: 05-09-05
Speed: 12.9 fps, 3.94 M/s

Ymin = -.2 kN @ 0.0839 sec., Ymax = 4.63 kN @ 0.0120 sec.

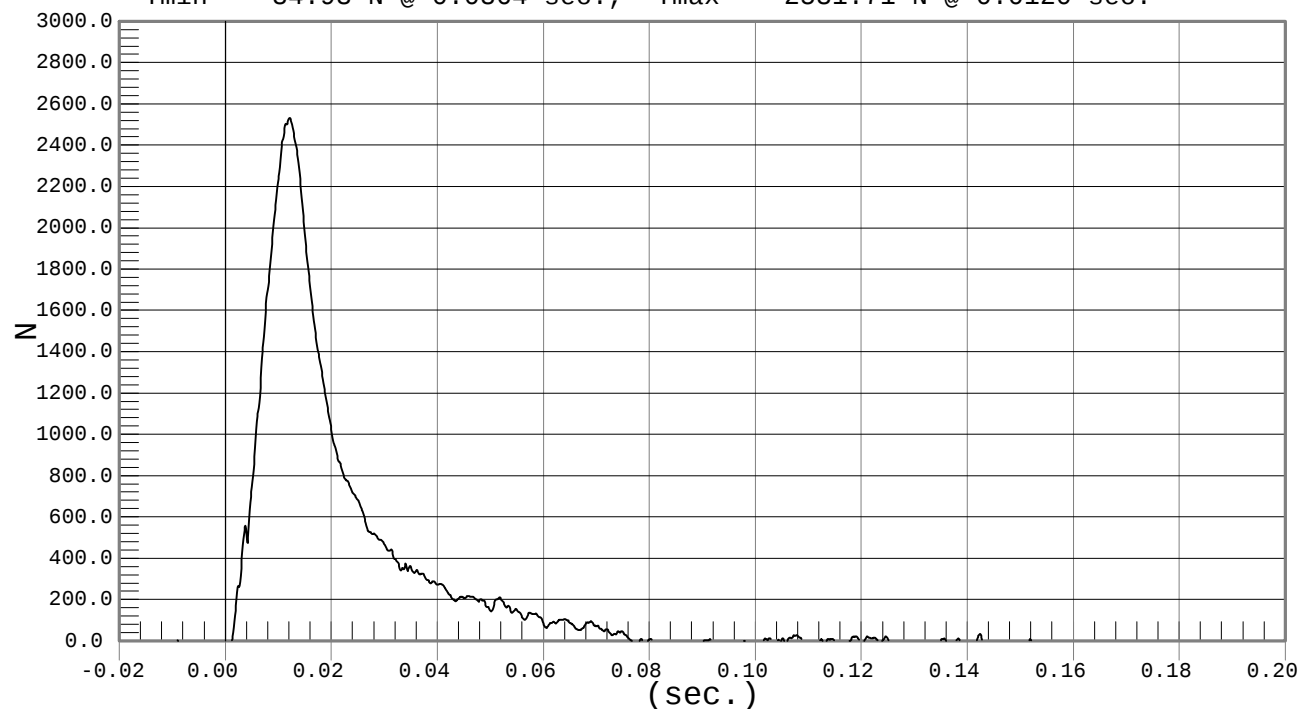


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #010

Test Date: 05-09-05
Speed: 12.9 fps, 3.94 M/s

Ymin = -84.93 N @ 0.0864 sec., Ymax = 2531.71 N @ 0.0120 sec.



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

Date: 5/9/05
Dummy Serial Number: 010
Test Number: D051258

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.5
Relative Humidity (%)		10 – 70	46
Pendulum Speed		5.95 – 6.15	6.15
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-2.31
	20 msec	-5.25 - -4.07 m/sec	-5.10
	25 msec	-6.64 - -5.30 m/sec	-6.11
	30 msec	≥ -6.5 m/sec	-6.17
Maximum Flexion Angle		45.0 – 55.0 deg	48.0
Time of Max. Flexion Angle		39.0 – 53.0 ms	43.3
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.3
Time of Max. Theta (A)		44.0 – 52.0 ms	44.5
Maximum Angle Theta (B)		27.0– 29.5 deg	28.2
Time of Max. Theta (B)		44.0 – 52.0 ms	46.0

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

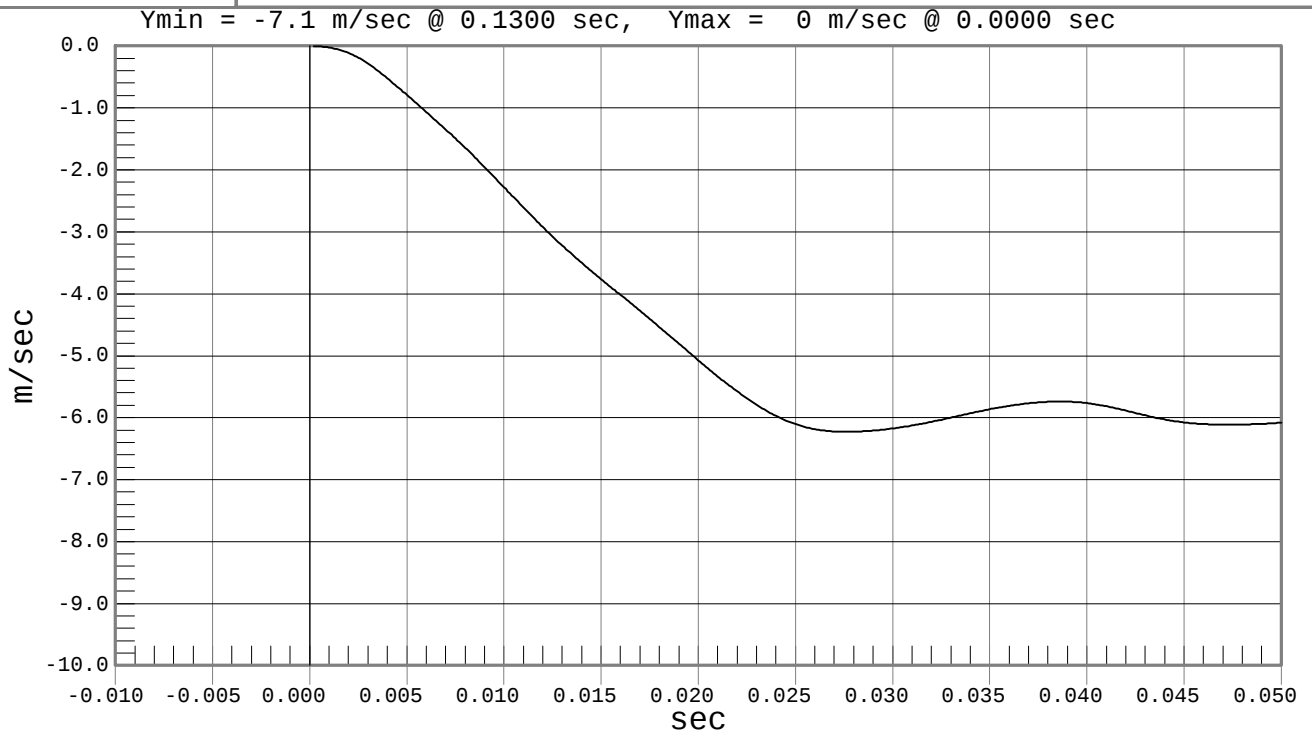
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Lumbar Bending
Component: Dummy #010

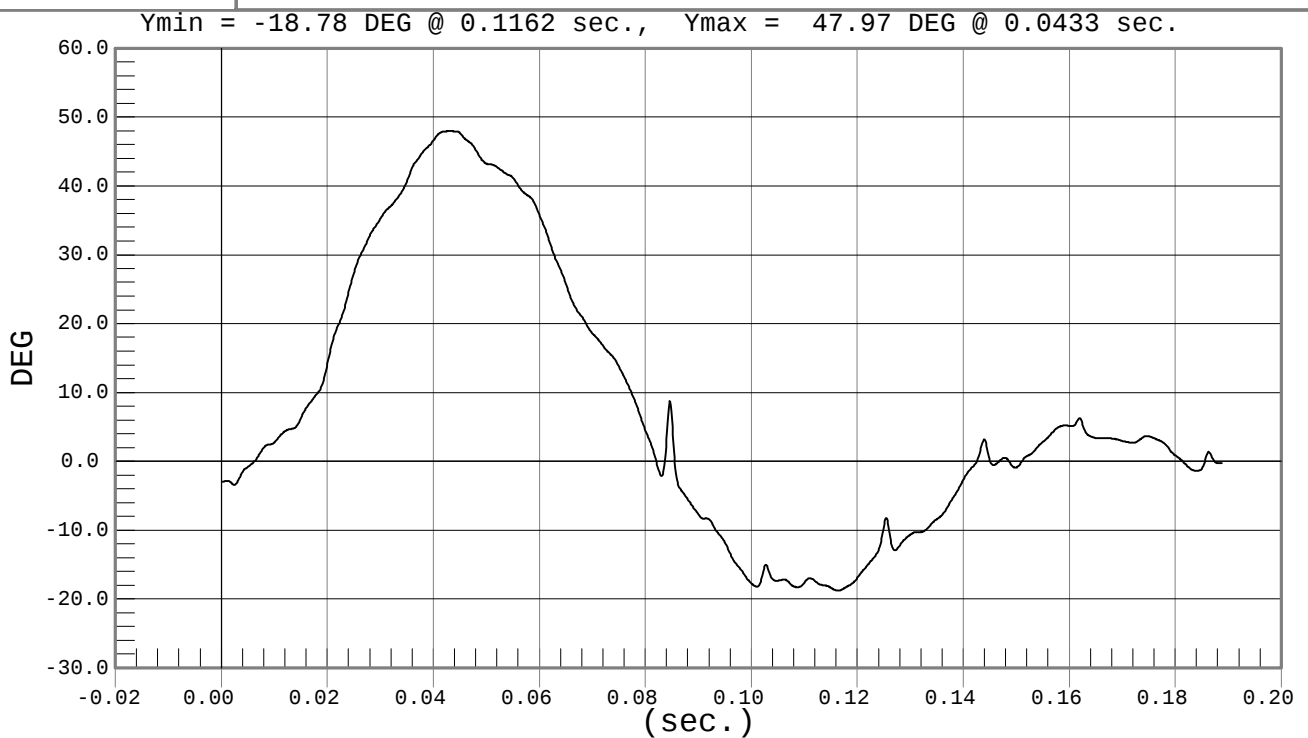
Test Date: 05-09-05
Speed: 20.2 fps, 6.15 M/s



FLEXION ANGLE

Test Desc.: Lumbar Bending
Component: Dummy #010

Test Date: 05-09-05
Speed: 20.2 fps, 6.15 M/s



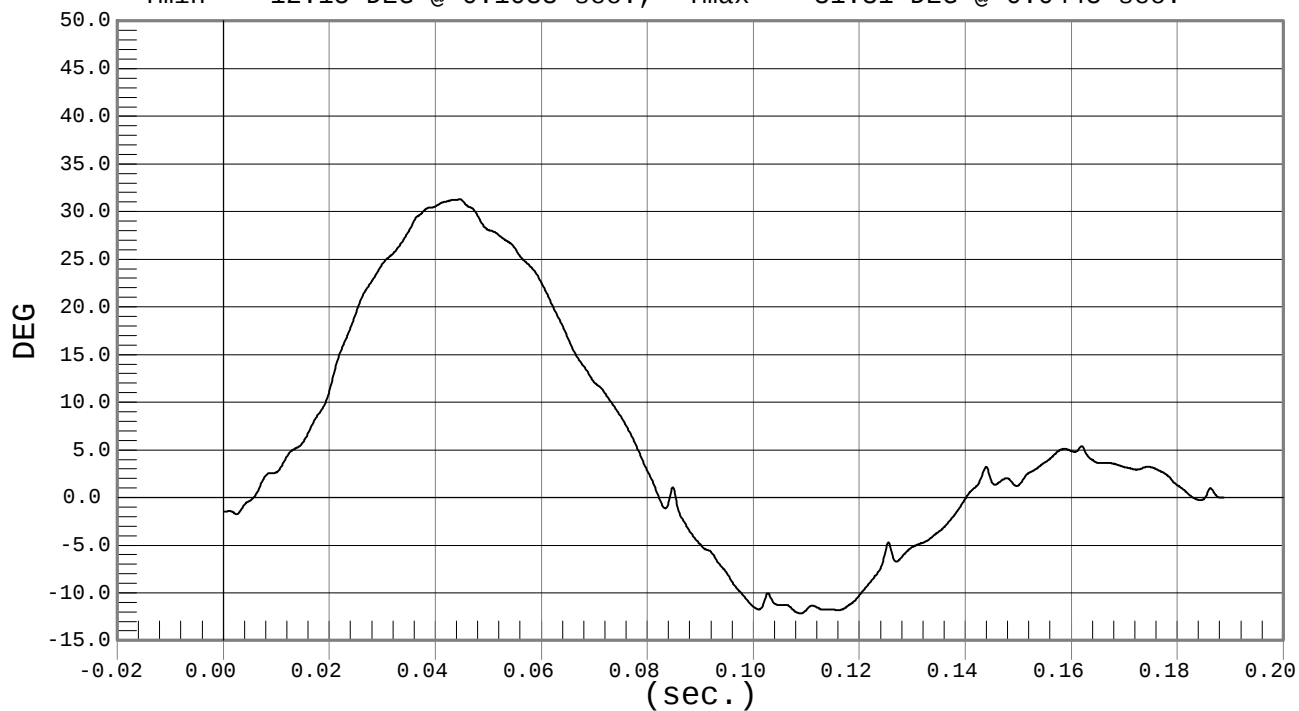


Test Desc.: Lumbar Bending
Component: Dummy #010

THETA A

Test Date: 05-09-05
Speed: 20.2 fps, 6.15 M/s

Ymin = -12.15 DEG @ 0.1088 sec., Ymax = 31.31 DEG @ 0.0445 sec.

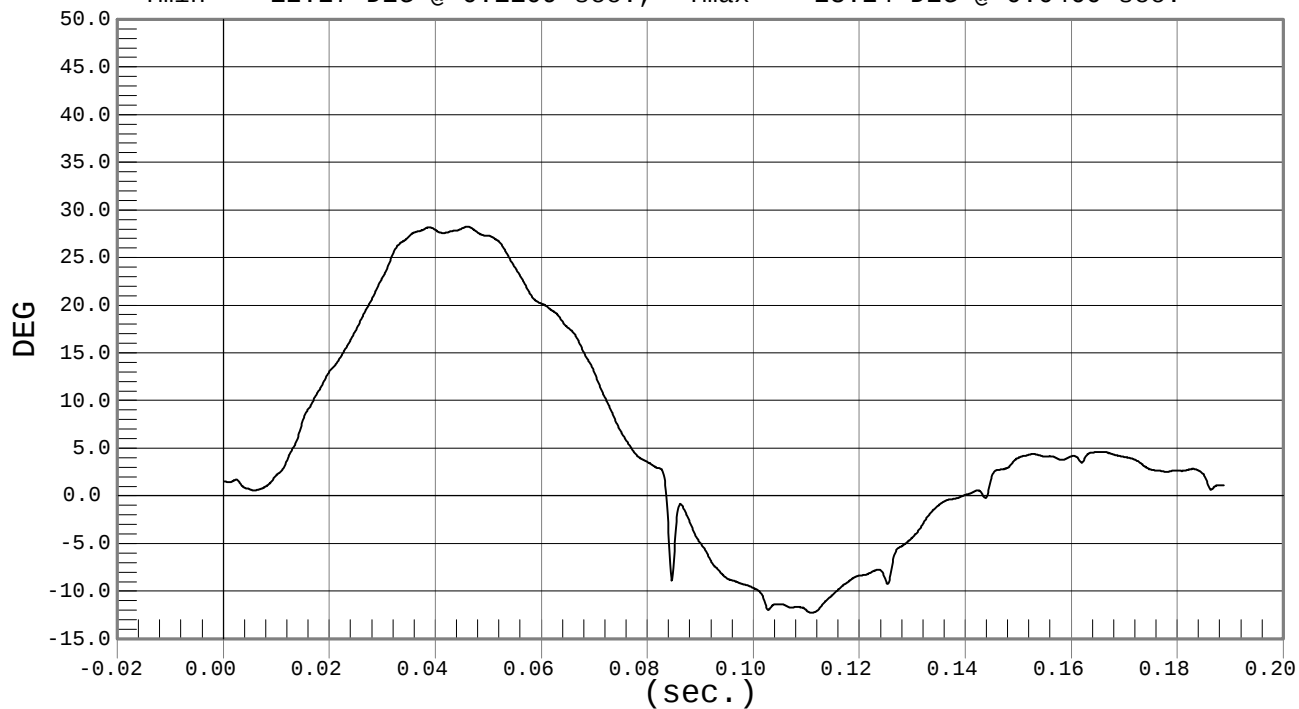


Test Desc.: Lumbar Bending
Component: Dummy #010

THETA B

Test Date: 05-09-05
Speed: 20.2 fps, 6.15 M/s

Ymin = -12.27 DEG @ 0.1109 sec., Ymax = 28.24 DEG @ 0.0460 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 5/9/05

Dummy Serial Number: 010

Test Number: D051259

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.5
Relative Humidity (%)	10 – 70	47
Pendulum Speed	4.20 – 4.40 m/s	4.32
Maximum Impactor Force	4.40 – 5.40 kN	4.09
Time of Max. Impactor Force	10.30 – 15.50 ms	13.80
Maximum Pubic Force	1.04 – 1.64 kN	1.30
Time of Max. Pubic Force	9.90 – 15.90 ms	15.00

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Gall

Approved By: _____

David Winkelbauer

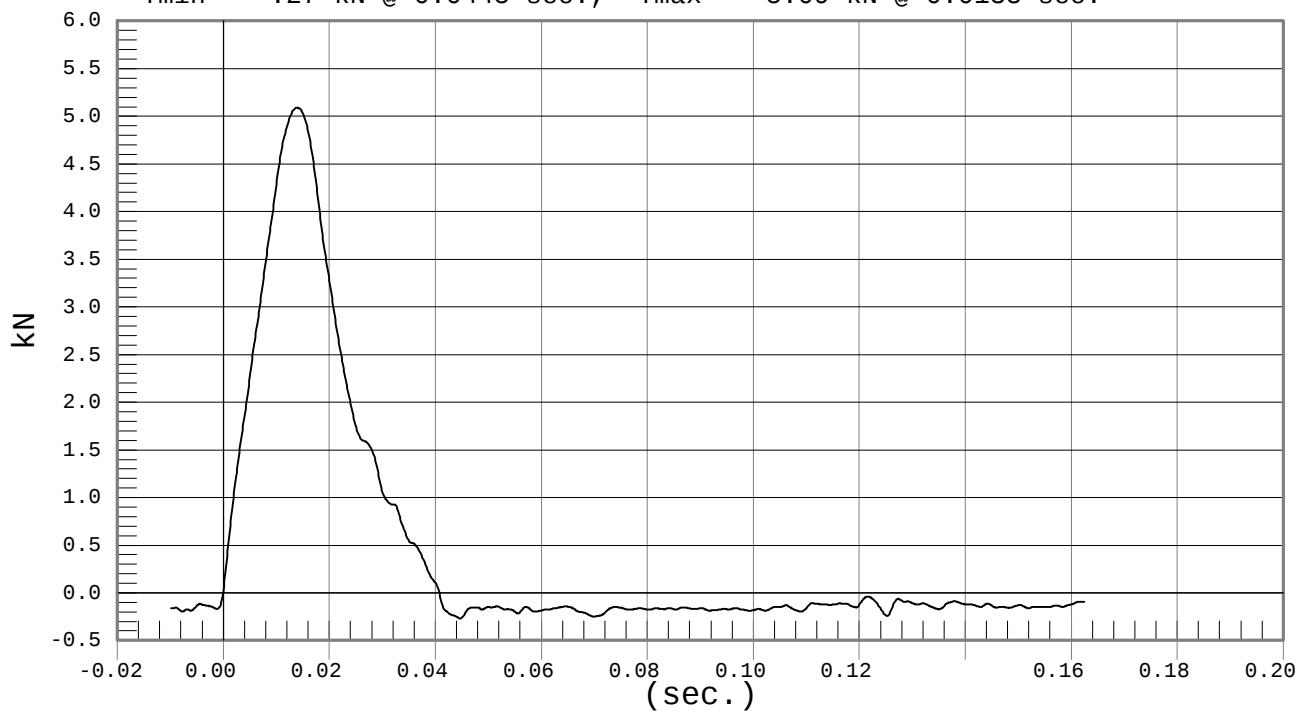


IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #010

Test Date: 05-09-05
Speed: 14.2 fps, 4.32 M/s

Ymin = -.27 kN @ 0.0445 sec., Ymax = 5.09 kN @ 0.0138 sec.

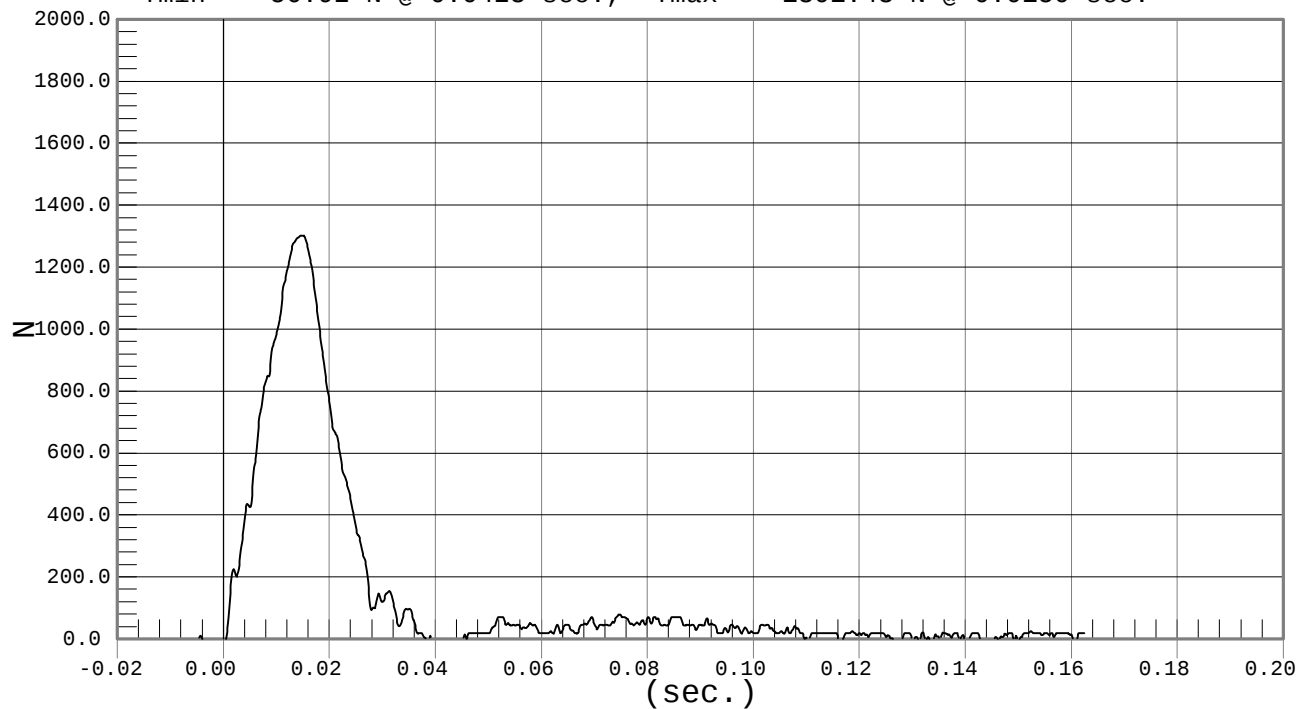


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #010

Test Date: 05-09-05
Speed: 14.2 fps, 4.32 M/s

Ymin = -56.92 N @ 0.0428 sec., Ymax = 1301.43 N @ 0.0150 sec.



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	J14-J11	Entran	3/02/05
Head Y Accelerometer	A12-Z22	Entran	3/02/05
Head Z Accelerometer	A12-Z08	Entran	3/02/05
Head Y - Front	C29-N21	Entran	3/02/05
Head Z - Front	B10-Z10	Entran	3/02/05
Head X – Left	C29-N24	Entran	3/02/05
Head Z – Left	F15-M11	Entran	3/02/05
Head X – Upper	F08-Z15	Entran	3/02/05
Head Y – Upper	F09-N03	Entran	3/02/05
Upper Neck Load Cell	106	FTSS	9/23/04
Lower Neck Load Cell	111	FTSS	9/23/04
Shoulder Load Cell	120	Endevco	9/29/04
T12 Load Cell	102	Endevco	9/24/04
Upper Spine X	G16-Z10	Entran	4/27/05
Upper Spine Y	G16-Z09	Entran	4/27/05
Upper Spine Z	F22-Z01	Entran	4/27/05
Lower Spine X	G22-D21	Entran	4/27/05
Lower Spine Y	G22-D20	Entran	4/27/05
Lower Spine Z	F17-Y04	Entran	4/27/05
Torso Load Cell	104	FTSS	9/29/04
Upper Rib Y	A27-Z02	Entran	4/12/05
Mid Rib Y	A27-Z17	Entran	4/12/05
Lower Rib Y	AGAY0	Endevco	4/12/05
Rib Displacement	010	Honeywell	1/07/05
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	P22454	Endevco	3/29/05
Pelvis Y	P22972	Endevco	3/29/05
Pelvis Z	P22688	Endevco	3/29/05
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	J25-R14	Entran	12/01/04
Left Lower A-Post Y	C12-R25	Entran	4/28/05
Left Mid B-Post Y	J25-R17	Entran	12/01/04
Left Lower B-Post Y	K07-R06	Entran	12/02/04
Left A-Post @ Sill Y	C06-L04	Entran	3/24/05
Left B-Post @ Sill Y	C06-L20	Entran	3/24/05
Driver Seat Track Y	J07-M16	Entran	4/28/05
Right Front Sill X	K07-R24	Entran	12/02/04
Right Front Sill Y	K20-J06	Entran	12/02/04
Right Front Sill Z	K18-D13	Entran	12/02/04
Left Rear Sill Y	C06-L02	Entran	3/24/05
Left Front Sill Y	C06-L01	Entran	3/24/05
Floorpan @ Rear Axle X	B19-Z15	Entran	3/09/05
Floorpan @ Rear Axle Y	B19-Z04	Entran	3/09/05
Floorpan @ Rear Axle Z	B16-Z17	Entran	3/09/05
Vehicle CG X	C09-Y05	Entran	3/31/05
Vehicle CG Y	C11-L01	Entran	3/31/05
Vehicle CG Z	B28-Z23	Entran	3/17/05
Left Front Door @ Pelvis	A28-L03	Entran	3/24/05
Left Front Door @ Arm	B16-Z03	Entran	3/03/05
Left Front Door @ Knee	F16-J19	Entran	12/02/04
Left Front Door @ Mid Rib	B19-Z05	Entran	3/09/05
Upper Engine X	K03-J05	Entran	1/21/05
Upper Engine Y	A29-F14	Entran	4/28/05
Firewall Y	B19-Z14	Entran	3/03/05