

REPORT NUMBER: TO1-MGA-2004-011

**OBLIQUE RIGID SIDE POLE IMPACT
ES-2RE DRIVER POSITION
TEST DATE: MAY 4, 2005
Task Order #T0001 / RFP #0004**

**2005 CHEVY COLORADO EXT CAB
NHTSA NUMBER: R50165**

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FINAL REPORT SUBMITTED:

**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.

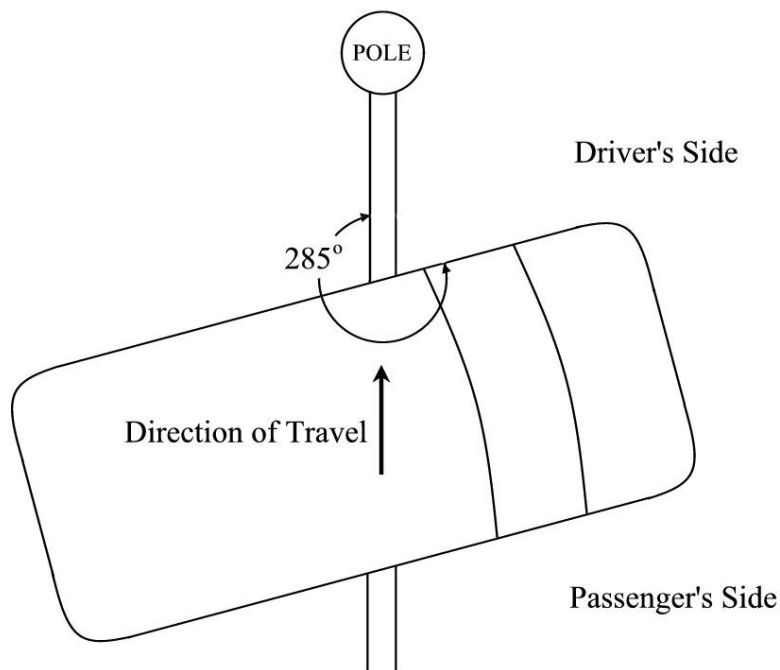
SECTION 2

SUMMARY OF SIDE IMPACT TEST

An oblique rigid side pole impact test at 75 degrees was performed on a 2005 Chevy Colorado Ext Cab. 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 1858.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on May 4, 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. Appendix E contains dummy peak responses.



SECTION 2...continued
SUMMARY OF SIDE IMPACT TEST

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

		Requirement	Left Front
HIC 36 (CFC 1000)	T1 (msec)		42.3
	T2 (msec)		63.3
	HIC 36	< 1000	784.9
Thorax (CFC 180)			
Chest Deflection	Upper Rib Deflection	< 42	-46.0
	Mid Rib Deflection	< 42	-41.4
	Lower Rib Deflection	< 42	-43.8
Lower Spine (CFC 180)			
	Lower Spine Resultant	< 82	90.4
Abdomen (CFC 600)			
	Front Abdominal Force		413
	Mid Abdominal Force		1024
	Rear Abdominal Force		1221
	Sum of Abdominal Force	< 2500	2655
Pelvis (CFC 600)			
	Pubic Symphysis Force	< 6000	-3373

Contact Times	Left Front
Head (msec)	**
Arm (msec)	24.4
Rib (msec)	39.3
Pelvis (msec)	32.3

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

TEST NOTES

Right Front Sill Z – No valid data collected
Left Front Sill Y – No valid data collected after 110 msec
Left A-Post @ Sill Y – No valid data collected after 35 msec
Left B-Post @ Sill Y – No valid data collected after 60 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 Chevy Colorado Ext Cab

Test Date: May 4, 2005

TEST VEHICLE INFORMATION

Make	Chevrolet
Model	Colorado
Body Style	Pick Up Truck with Extended Cab
VIN	1GCCS196358235571
Color	Black
Odometer Reading (mile)	191
Transmission	Automatic
Final Drive	Rear
Number of Cylinders	5
Engine Displacement (L)	3.5
Engine Placement	Longitudinal

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Yes
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	General Motors Corporation	GVWR (kg)	2268
Date of Manufacture	02/05	GAWR Front (kg)	1149
		GAWR Rear (kg)	1314

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/75R15	P225/75R15
Tire Size on Vehicle	P225/75R15	P225/75R15
Tire Manufacturer	General	General

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Split Bench	Bucket		
Number Of Occupants	3	2		5
Capacity Wt. (VCW) (kg)				630
Cargo Wt. (RCLW) (kg)				136.1

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Chevy Colorado Ext CabTest Date: May 4, 2005**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	490.8	353.8		514.8	438.2	
Right	kg	446.8	351.1		465.8	440.0	
Ratio	%	57.1	42.9		52.8	47.2	
Totals	kg	937.6	704.9	1642.5	980.6	878.2	1858.8

TARGET TEST WEIGHT

Measured Parameter	Units	Value
As Delivered Vehicle Weight	kg	1642.5
Weight of 1 ES-2	kg	80.7
Rated Cargo Weight	kg	136.1
Vehicle Target Weight (TVTW)	kg	1859.3

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	1.0 NU	0.4 ND	0.7 ND
Left Door Sill Angle	Deg	1.4 ND	0.6 NU	0.7 ND
Front Bumper Angle	Deg	0.2 RD	0.0	0.2 RD
Rear Bumper Angle	Deg	0.1 LD	0.3 LD	0.3 LD

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

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	3202
Weight of Ballast in Cargo Area	kg	0
Amount of Water in Fuel Tank	liters	56.8

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Impact Reference Line from Front Axle	mm	1402
Impact Point	mm	16 rear
Impact Angle Difference	deg	1°

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 22.5° measured from the upright position

SEAT FORE/AFT POSITIONS

The driver seat was manual.

Driver seat fore/aft total travel: 24 detents

Driver seat fore/aft position: 11 detents (with the forward-most detent defined as 0)

STEERING COLUMN ADJUSTMENT

The steering column was non adjustable.

ADJUSTABLE D-RING POSITION

The vehicle was equipped with adjustable D-ring.

Range of travel: 55mm (4 detents)

Distance from the upper-most position to the test position: 20mm (1st detent; with the upper-most detent defined as 0)

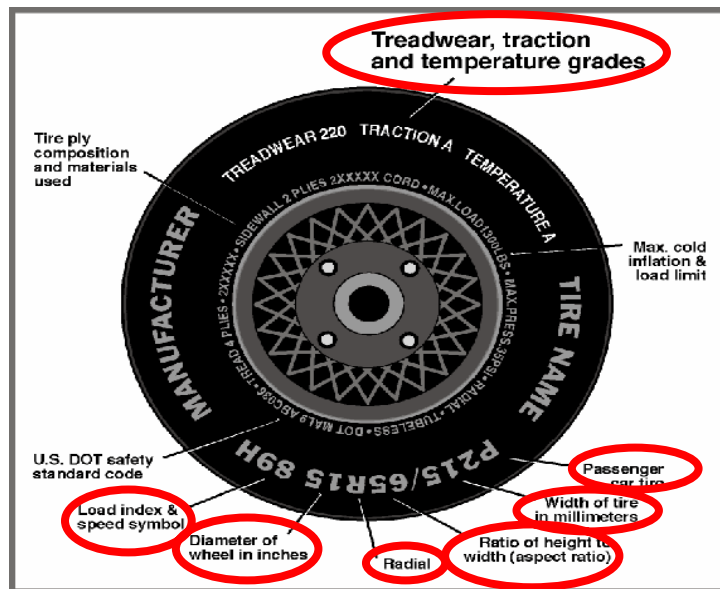
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005

Vehicle Year	2005	Vehicle Make	Chevrolet
VIN	1GCCS196358235571	Vehicle Model	Colorado Ext Cab



	Front	Rear
Tire Manufacturer	General	General
Tire Name	Ameri GS60	Ameri GS60
Tire Type	Tubeless Radial	Tubeless Radial
Tire Width (mm)	225	225
Ratio of Height to Width (aspect ratio)	75	75
Radial	R	R
Wheel Diameter	15	15
Load Index & Speed Symbol	102 S	102 S
Treadwear	520	520
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 3
POST TEST OBSERVATIONS

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

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

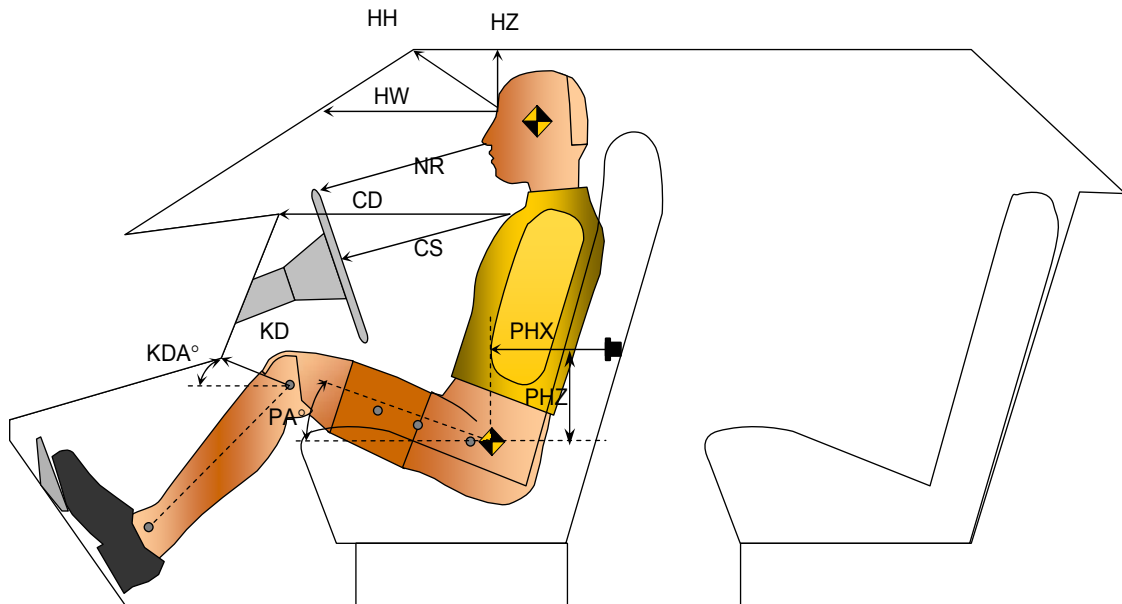
	Driver
Front	No
Side	N/A
Curtain	Yes

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

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

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005

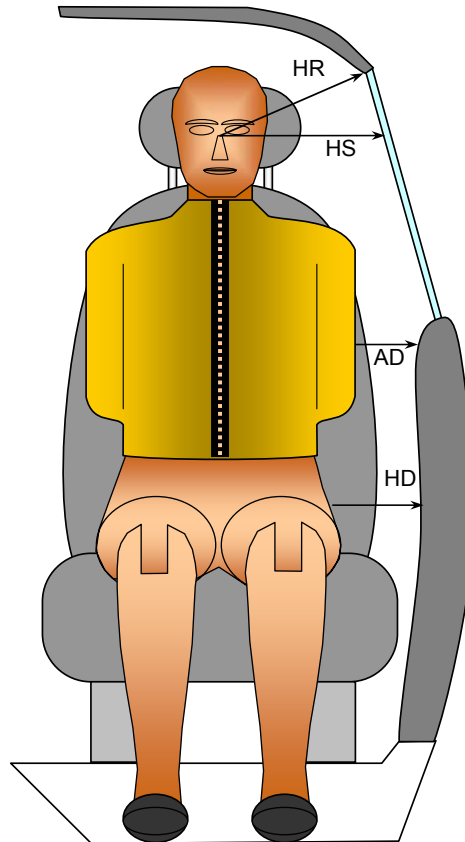


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	441	
HW	Head to Windshield	598	
HZ	Head to Roof	161	
NR	Nose to Rim	489	
CD	Chest to Dash (Top of Rib)	578	
CS	Chest to Steering Wheel (Top of Rib)	379	
KDL	Left Knee to Dash	161	23.1
KDR	Right Knee to Dash	168	27.5
PA	Pelvic Angle (Longitudinal)		23.8
PA	Pelvic Angle (Lateral)		7.3
SA	Spine Angle (Longitudinal)		27.0
SA	Spine Angle (Lateral)		2.5
PHX	H-Point to Striker (X-Axis)	284	
PHZ	H-Point to Striker (Z-Axis)	73	

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

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005



FRONT VIEW OF DUMMY

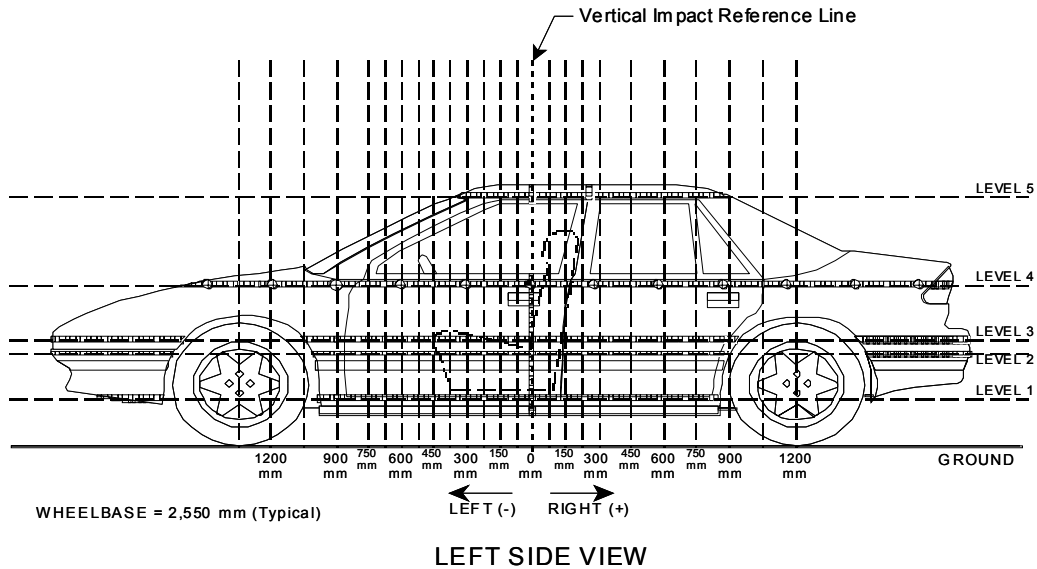
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	196
HS	Head to Side Window	mm	312
AD	Arm to Door	mm	91
HD	H-Point to Door	mm	159

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

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 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	1604
4	Window Sill	1108
3	Mid Door	877
2	Occupant H-Point	783
1	Sill Top	474

DATA SHEET NO. 7
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 2005

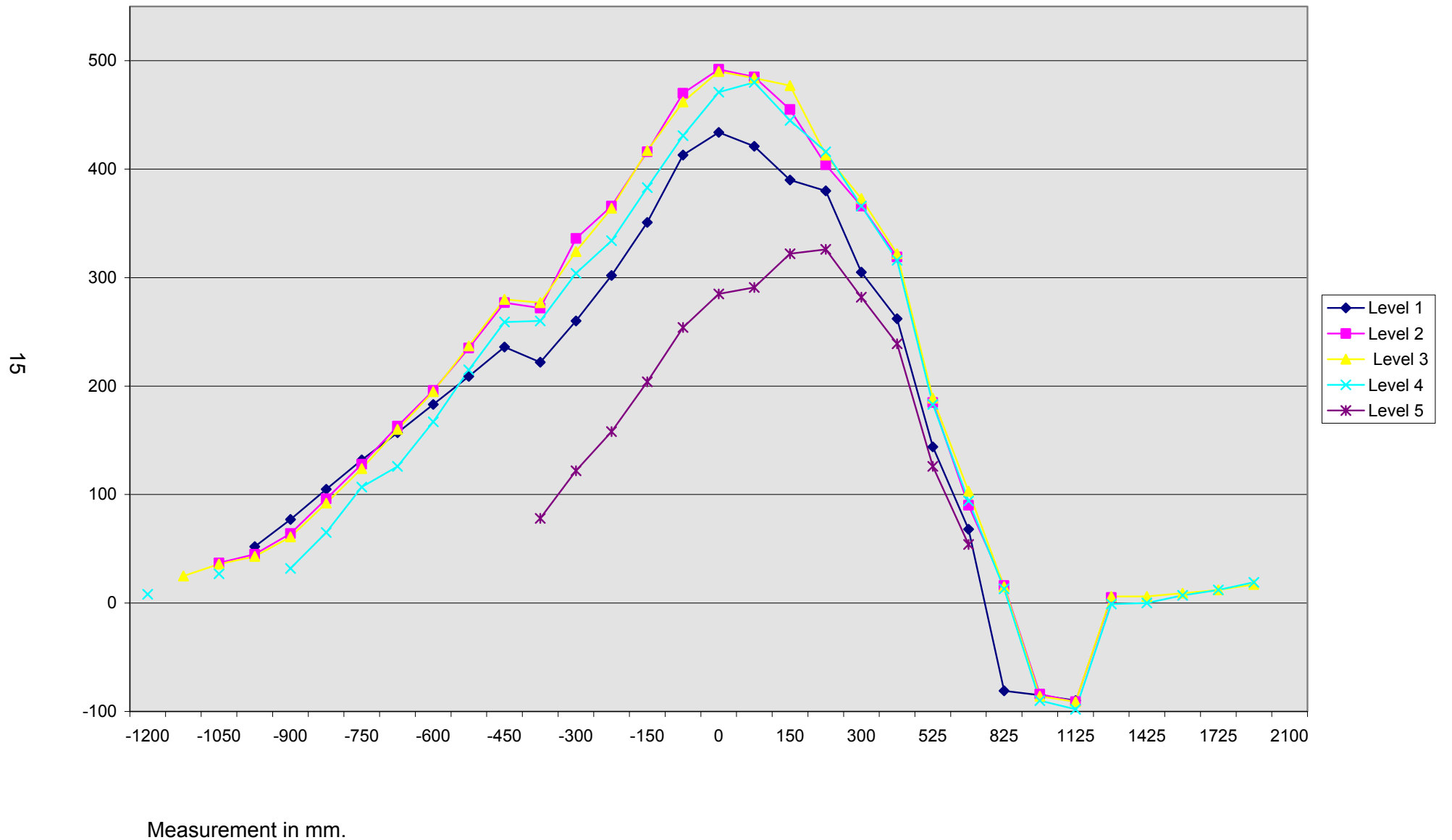
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1575															
-1425															
-1275															
-1200				295					303					8	
-1125			243					268					25		
-1050		246	246	293			283	282	320			37	36	27	
-975	273	254	251			325	299	294			52	45	43		
-900	295	255	252	292		372	319	313	324		77	64	61	32	
-825	297	253	252	290		402	349	344	355		105	96	92	65	
-750	297	252	250	289		429	380	374	396		132	128	124	107	
-675	296	250	249	288		453	413	409	414		157	163	160	126	
-600	296	250	248	287		479	446	443	454		183	196	195	167	
-525	296	248	246	283		505	483	483	498		209	235	237	215	
-450	295	247	245	284		531	524	525	543		236	277	280	259	
-375	295	246	245	283	488	517	518	522	543	566	222	272	277	260	78
-300	295	245	244	282	483	555	581	568	586	605	260	336	324	304	122
-225	294	244	243	282	480	596	610	607	616	638	302	366	364	334	158
-150	294	244	242	282	480	645	660	659	665	684	351	416	417	383	204
-75	293	243	242	281	480	706	713	704	712	734	413	470	462	431	254
0	293	243	242	282	480	727	735	732	753	765	434	492	490	471	285
75	292	242	240	282	479	713	727	724	762	770	421	485	484	480	291
150	292	242	240	282	481	682	697	717	727	803	390	455	477	445	322
225	291	242	241	282	480	671	646	654	698	806	380	404	413	416	326
300	291	242	241	283	481	596	608	614	649	763	305	366	373	366	282
375	293	242	241	283	482	555	561	563	599	721	262	319	322	316	239
450															
525	294	243	242	283	481	438	428	431	466	607	144	185	189	183	126
600															
675	296	245	243	285	484	364	335	346	379	538	68	90	103	94	54
750															
825	308	250	248	287		227	266	263	300		-81	16	15	13	
900															
975	303	250	250	292		218	166	164	202		-85	-84	-86	-90	
1050															
1125	288	250	249	294		198	159	158	196		-90	-91	-91	-98	
1275		245	254	295			250	260	294			5	6	-1	
1425			244	295				250	295				6	0	
1575			238	296				247	303				9	7	
1725			238	297				250	309				12	12	
1875			237	297				254	316				17	19	
1950															
2100															

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 Chevy Colorado Ext Cab

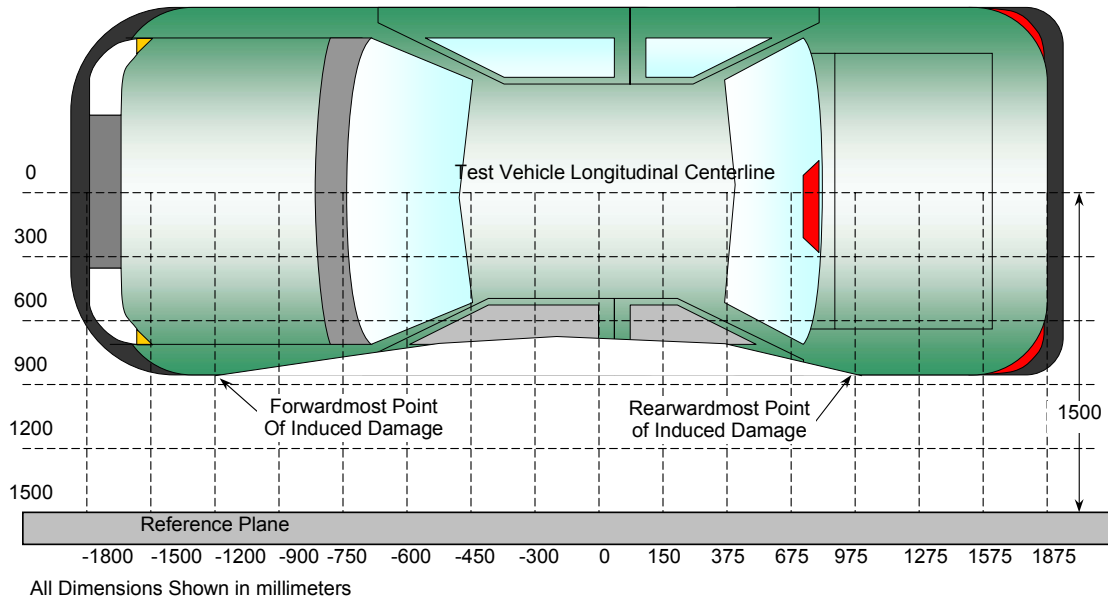
Test Date: May 4, 2005



DATA SHEET NO. 8
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 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	1725 mm	4	297	309	12
2	1040 mm	4	292	198	-94
3	330 mm	4	283	625	342
4	-370 mm	4	283	543	260
5	-1090 mm	4	293	320	27
6	-1800 mm	4	297	316	19

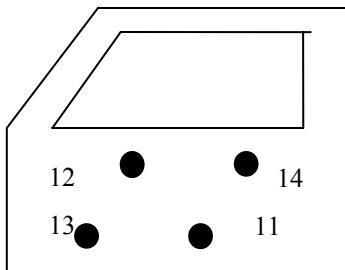
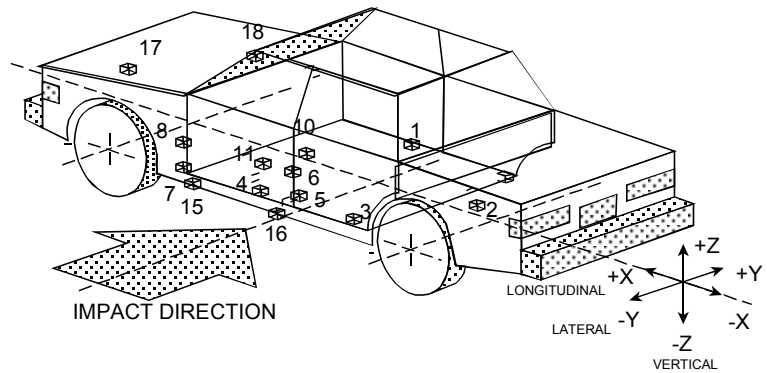
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body.

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

Test Vehicle: 2005 Chevy Colorado Ext Cab

Test Date: May 4, 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 Chevy Colorado Ext Cab

Test Date: May 4, 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	4.0	-4.4	25.8	-4.0	*	*	*
2	Rear Floorpan Above Axle	3.0	-4.3	12.1	-1.1	6.7	-10.5	13.5
3	Left Side Sill at Rear Door			32.8	-15.5			
4	Left Side Sill at Front Door			**	**			
5	Left Lower B-Post			93.1	-22.8			
6	Left Mid B-Post			83.7	-103.9			
7	Left Lower A-Post			18.1	-3.7			
8	Left Mid A-Post			12.5	-2.6			
9	Driver Left Seat Track			43.4	-37.0			
10	Vehicle CG	5.4	-7.5	19.8	-0.8	17.2	-14.9	26.1
11	Left Front Door at Pelvis			174.4	-88.5			
12	Left Front Door at Arm			87.0	-51.8			
13	Left Front Door at Knee			73.2	-73.7			
14	Left Front Door at Rib			94.3	-45.7			
15	Left A-Post @ Sill			***	***			
16	Left B-Post @ Sill			****	****			
17	Upper Engine	3.4	-9.6	12.7	-2.2			
18	Firewall			11.5	-2.2			

* No valid data collected

** No valid data collected after 110 msec

*** No valid data collected after 35 msec

**** No valid data collected after 60 msec

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

DATA SHEET NO. 9... (continued)**VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**Test Vehicle: 2005 Chevy Colorado Ext CabTest Date: May 4, 2005**VEHICLE ACCELEROMETER COORDINATES**

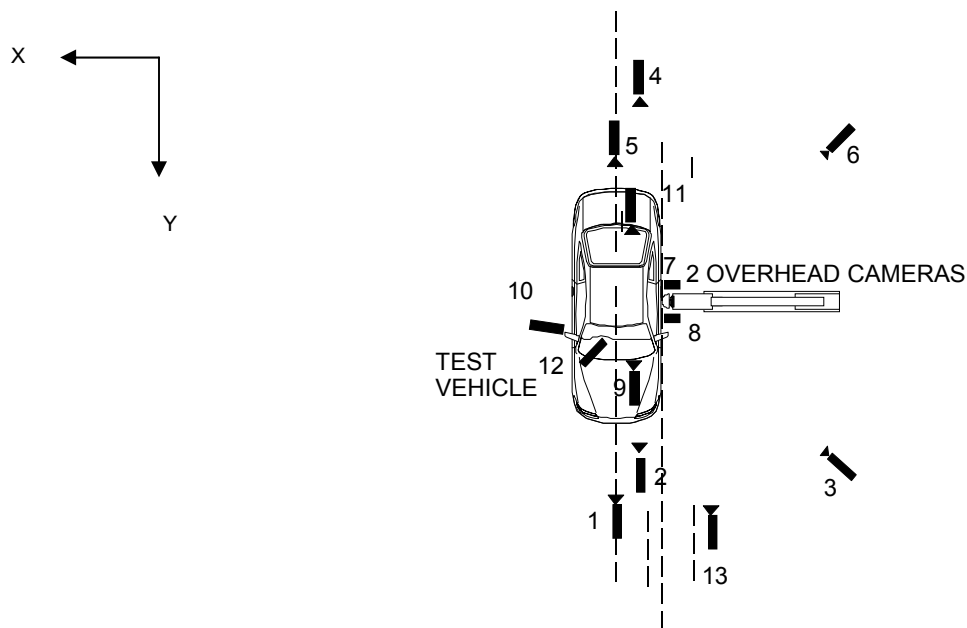
Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2972	705	342
2	Rear Floorpan Above Axle	1224	0	681
3	Left Side Sill at Rear Door	2351	-718	350
4	Left Side Sill at Front Door	3186	-685	341
5	Left Lower B-Post	2706	-697	1030
6	Left Mid B-Post	2733	0	1030
7	Left Lower A-Post	3798	-727	705
8	Left Mid A-Post	3812	-792	598
9	Driver Left Seat Track			
10	Vehicle CG	3145	0	1127
11	Left Door @ Pelvis	3017	-731	825
12	Left Door @ Arm	3185	-752	1105
13	Left Door @ Knee	3422	-746	870
14	Left Door @ Rib	2923	-752	1120
15	Left A Pillar Sill	3609	-690	336
16	Left B Pillar Sill	2669	-720	345
17	Engine	4646	-10	1013
18	Firewall	4107	-24	1084

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 Chevy Colorado Ext Cab

Test Date: May 4, 2005



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	2285	10145	1485	24	1000
2	Front Close Up	2195	7385	1350	24	1000
3	Front Angle	-2430	2965	1485	24	1000
4	Rear Overall	2960	-6110	1460	24	1000
5	Rear Close Up	3030	-9725	1525	35	1000
6	Rear Angle	-2240	-3105	1380	19	1000
7	Overhead View	-725	460	5340	14	1000
8	Overhead Close Up	60	65	5050	19	1000
9	Onboard Driver Front				16	1000
10	Onboard Driver				13	1000
11	Onboard Curtain				8	1000
12	Onboard Hip to Door				8	1000
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 ¾ Front View of Test Vehicle



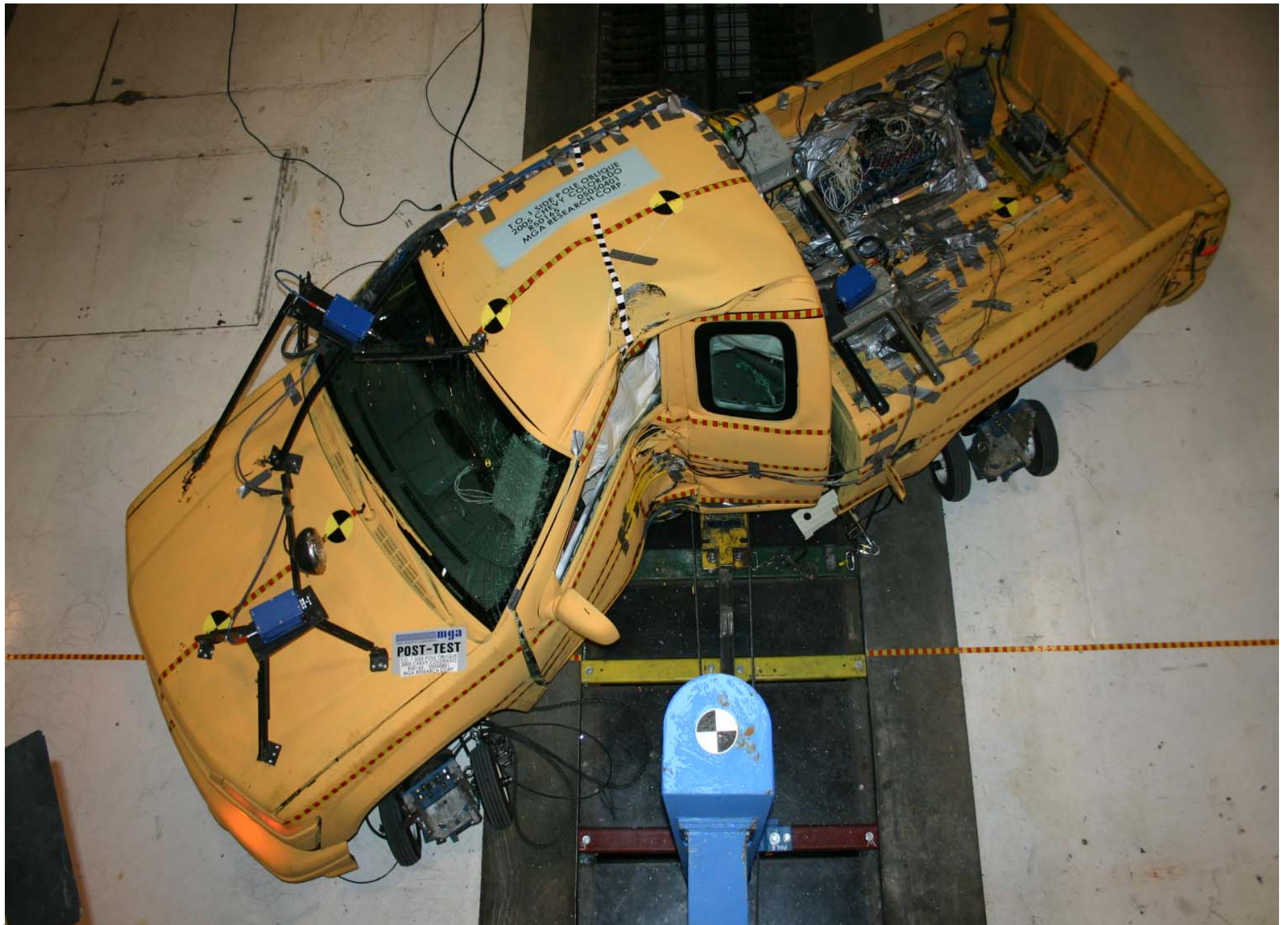
Pre-Test Left $\frac{3}{4}$ Rear View of Test Vehicle



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



Post-Test Driver Dummy Contact

A-23.



Post-Test Driver Dummy Contact



Post-Test Driver Dummy Head Contact



Post-Test Impact Point on Vehicle



TIRE AND LOADING INFORMATION

SEATING CAPACITY | TOTAL 5 | FRONT 3 |

The combined weight of occupants and cargo should never exceed

ORIGINAL TIRE SIZE		COLD TIRE INFLATION PRESSURE
P225/75R15	FRONT	230 kPa, 33 PSI
P225/75R15	REAR	230 kPa, 33 PSI
T155/90R16	SPARE	420 kPa, 60 PSI

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

Tire Placard

MPD BY GENERAL MOTORS CORPORATION

GM GVWR 2268KG / 5000LB GAWR FRT 1149KG / 2533LB GAWR RR 1314KG / 2896LB

THIS VEHICLE CONFORMS TO ALL MODEL S15653
APPLICABLE FEDERAL MOTOR
VEHICLE SAFETY AND THEFT
PREVENTION STANDARDS IN
EFFECT ON THE DATE OF
MANUFACTURE SHOWN ABOVE.

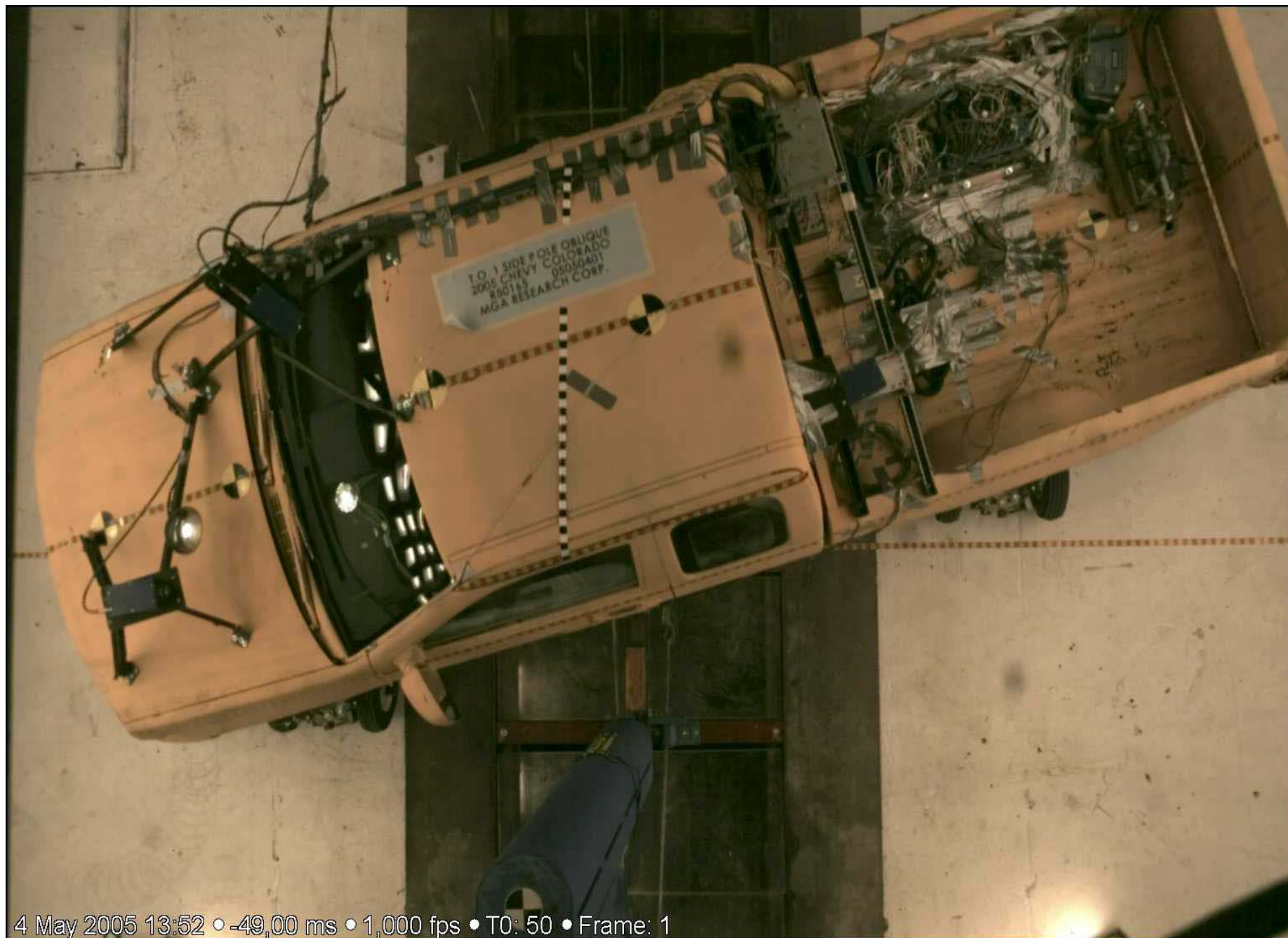
SPGR	TIRE SIZE	SPEED RTG	RIM	COLD TIRE PRESSURE
FRT	P225/75R15	S	15X6.5J	230 KPA 33 PSI
RR	P225/75R15	S	15X6.5J	230 KPA 33 PSI
SPA	T155/90R16	M	16X4T	420 KPA 60 PSI

1GCCS196358235571
TYPE: TRUCK





Pre-Test Point of Impact View



Post-Test Point of Impact View



Post-Test Roof Separation View



APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA

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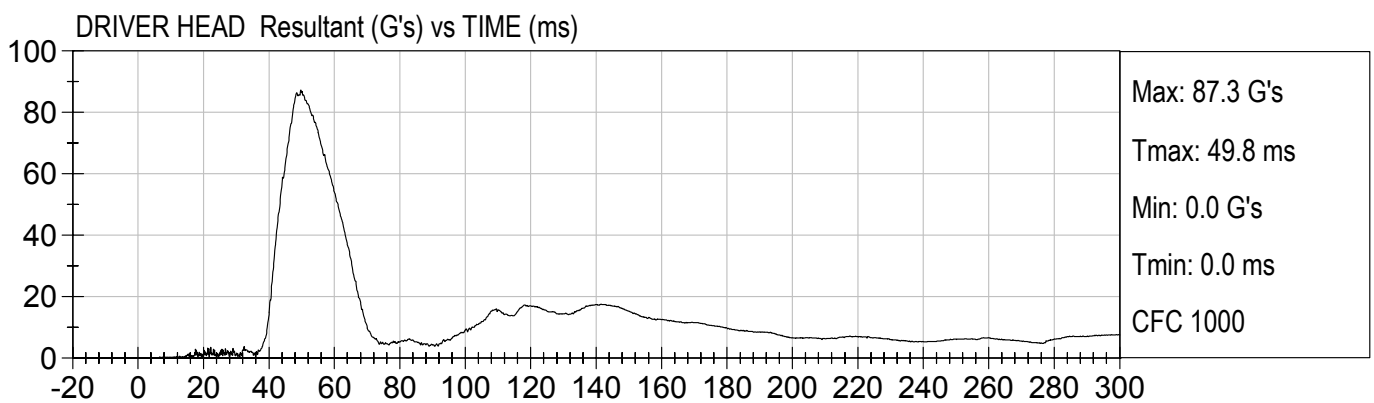
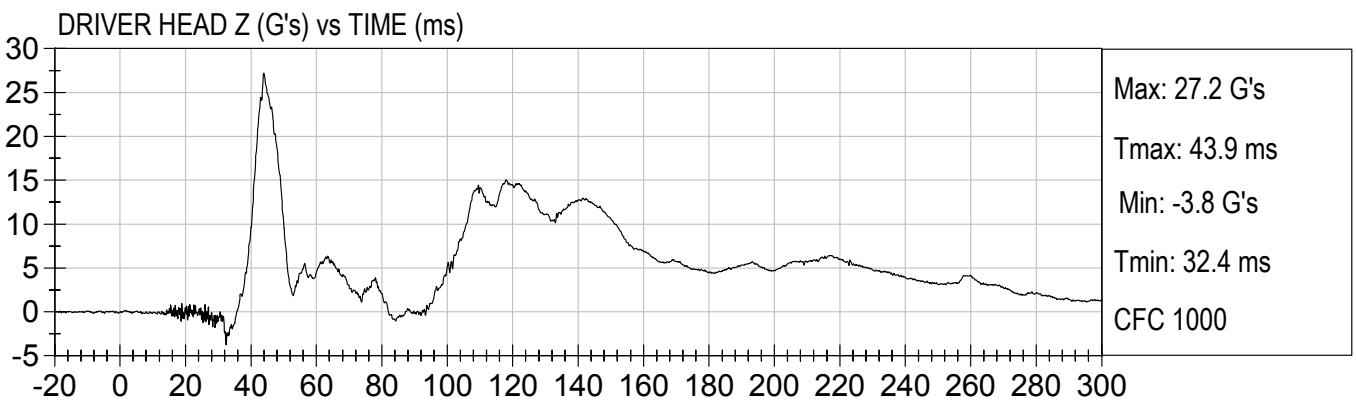
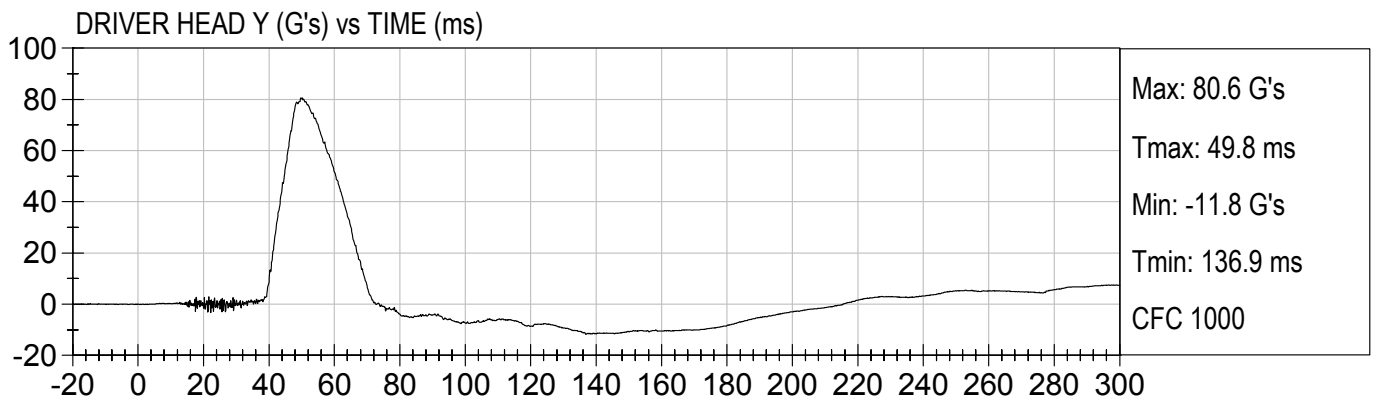
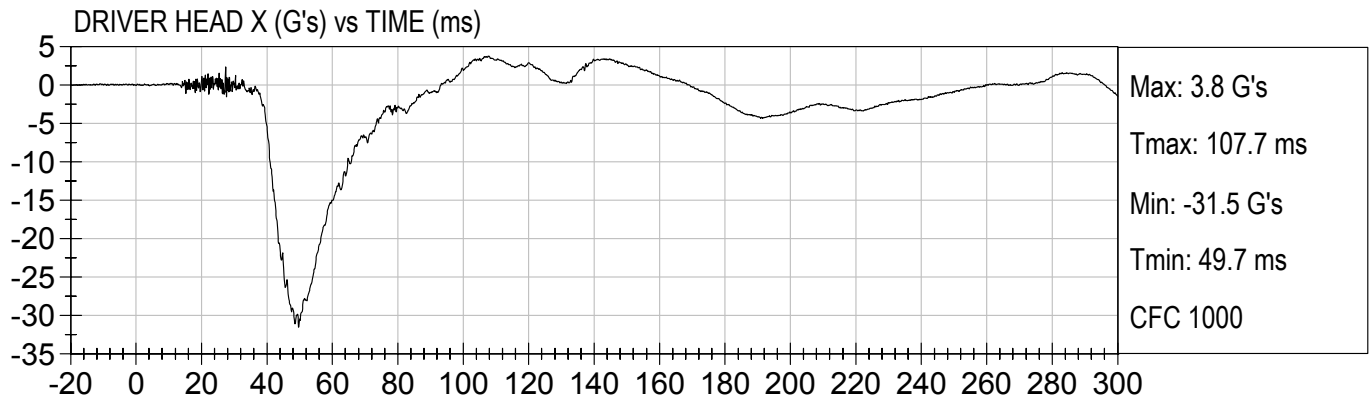
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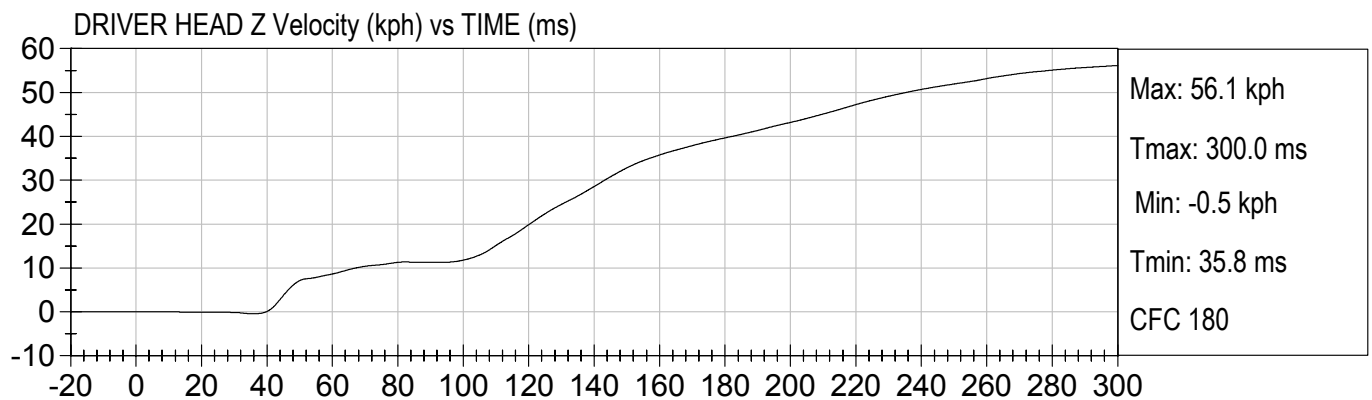
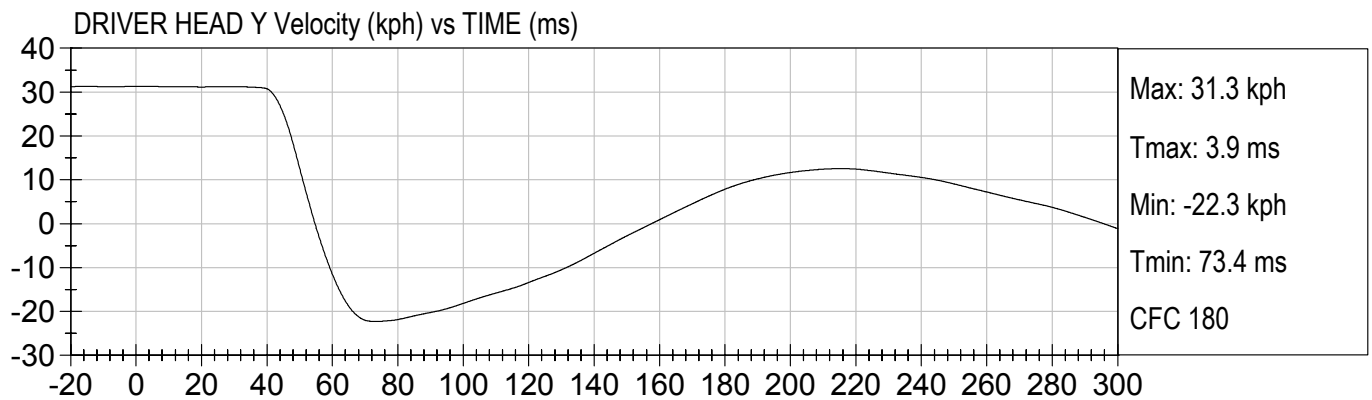
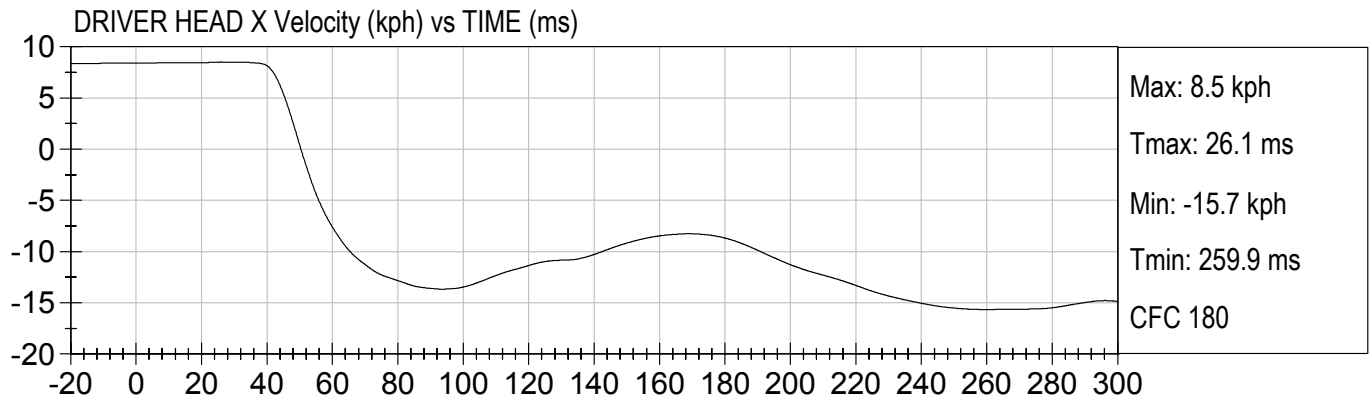
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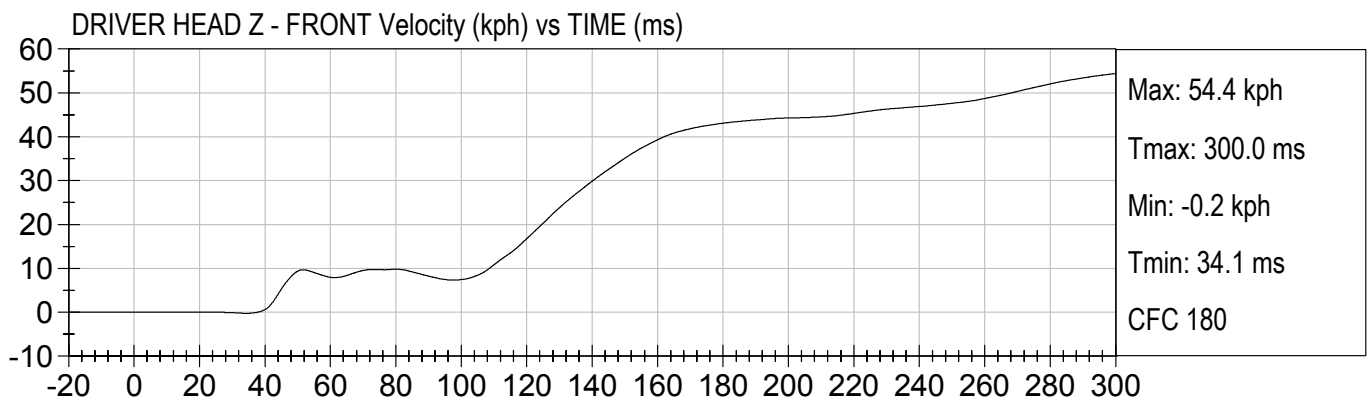
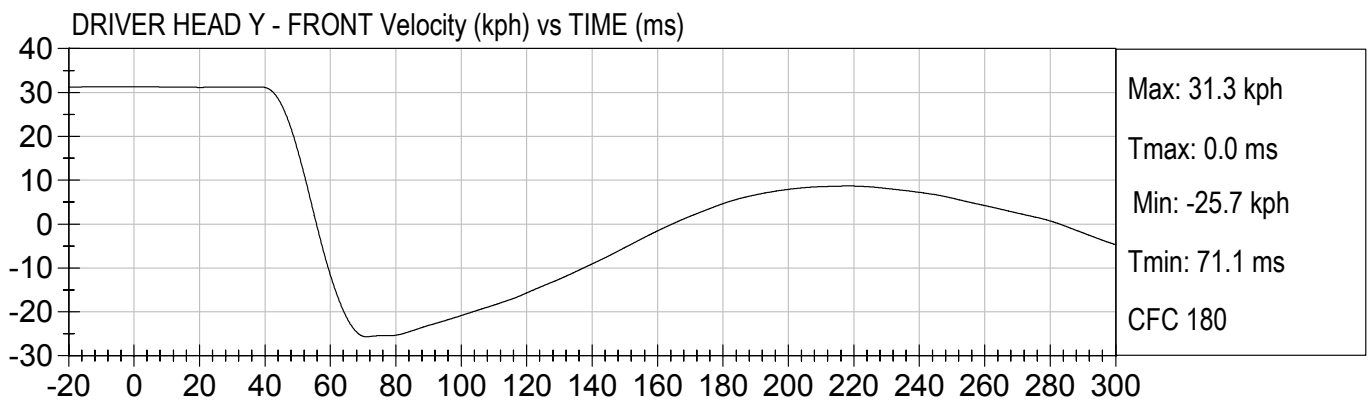
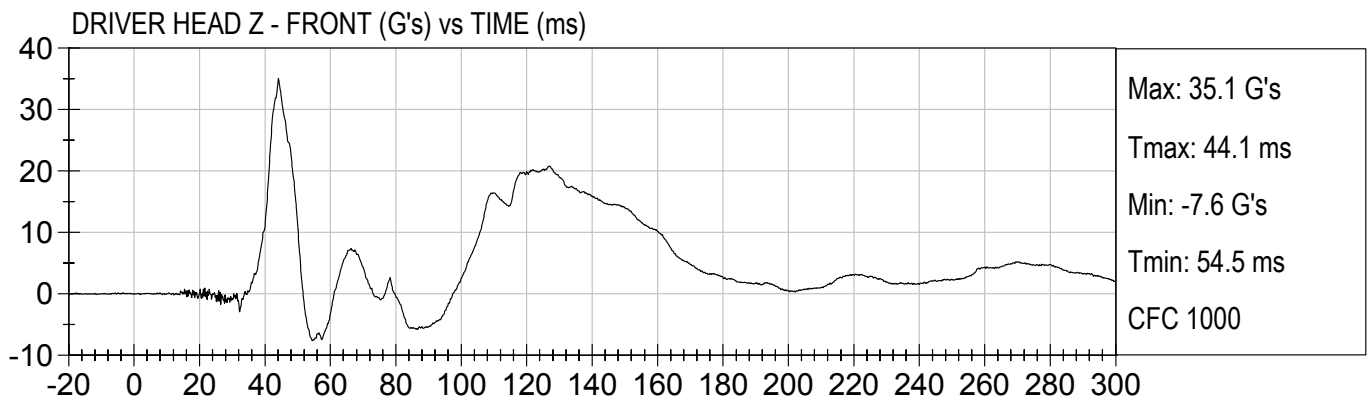
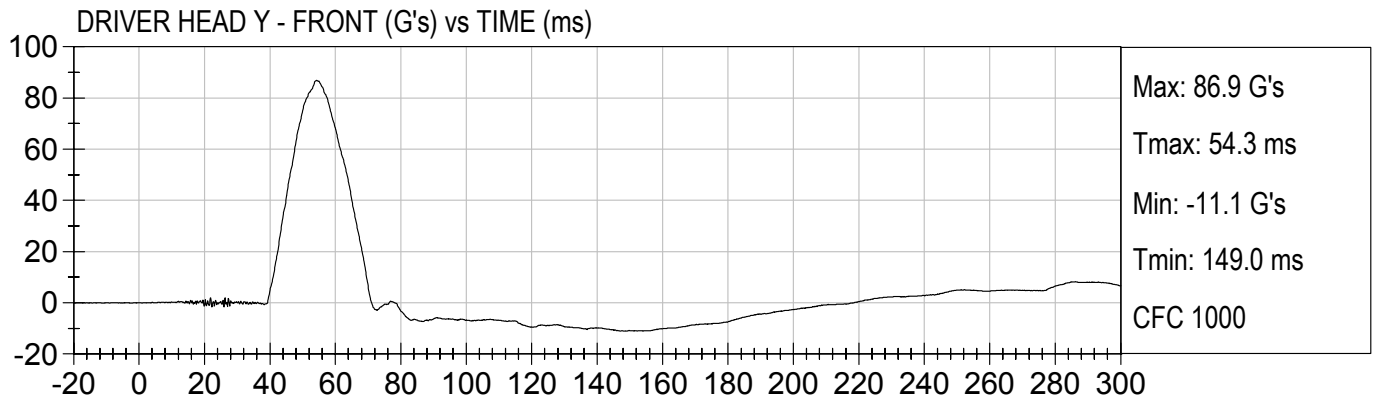
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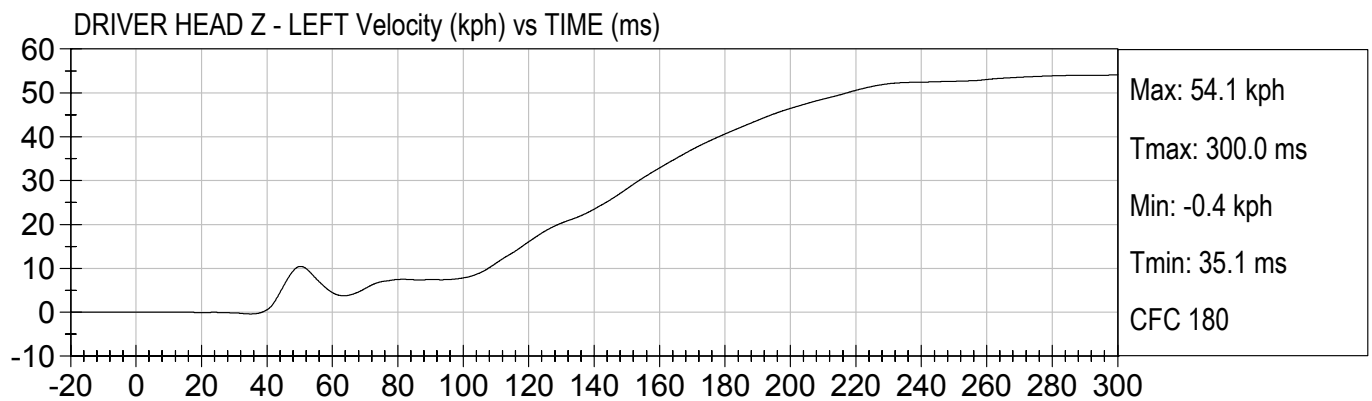
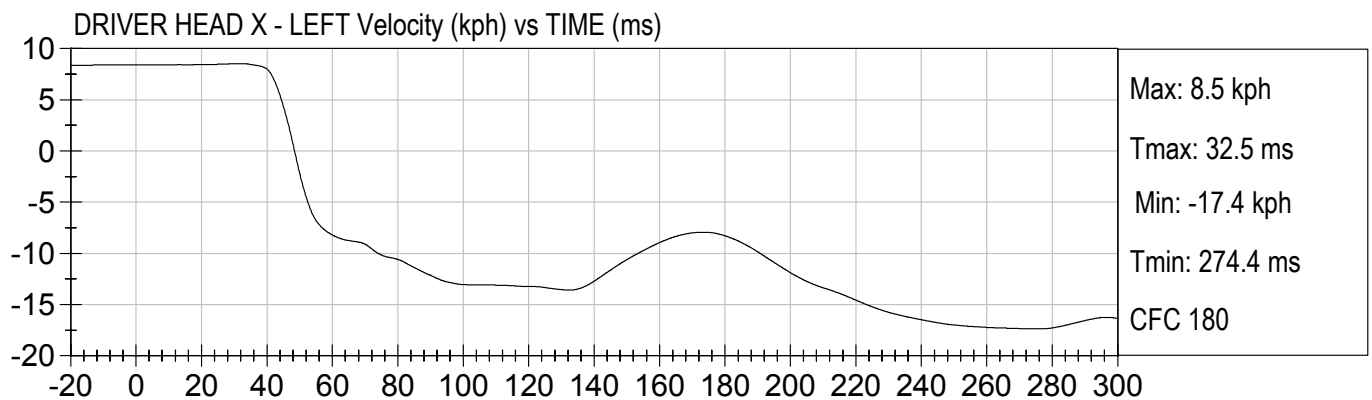
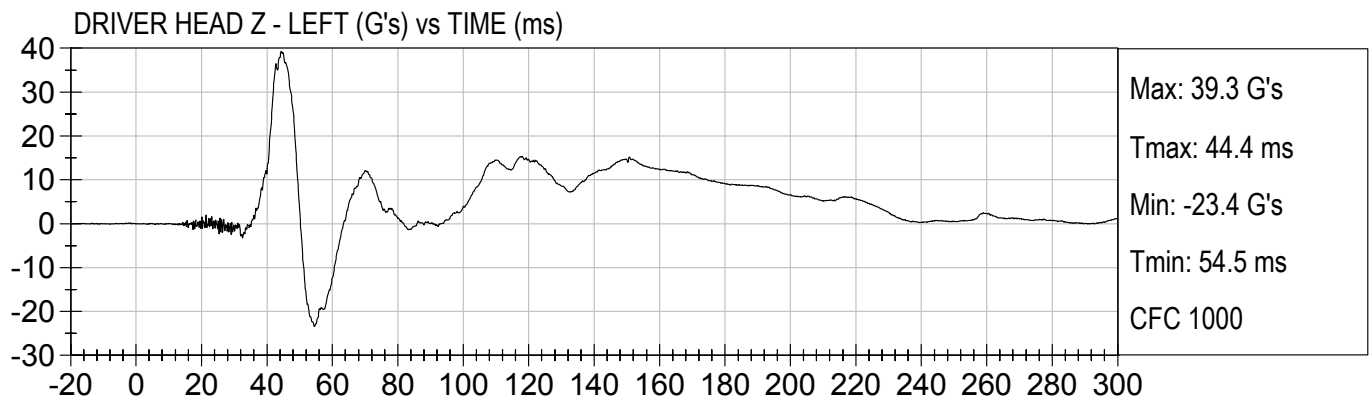
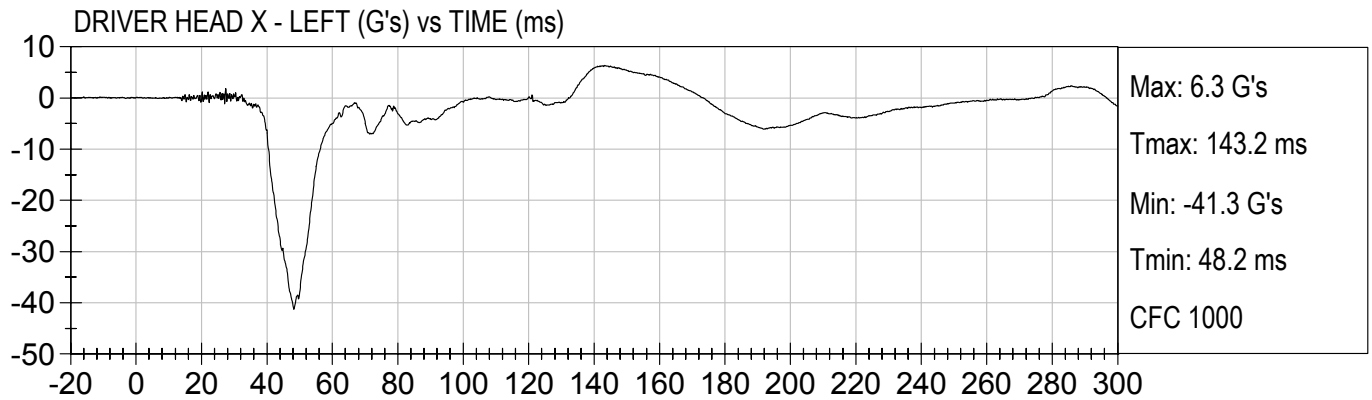
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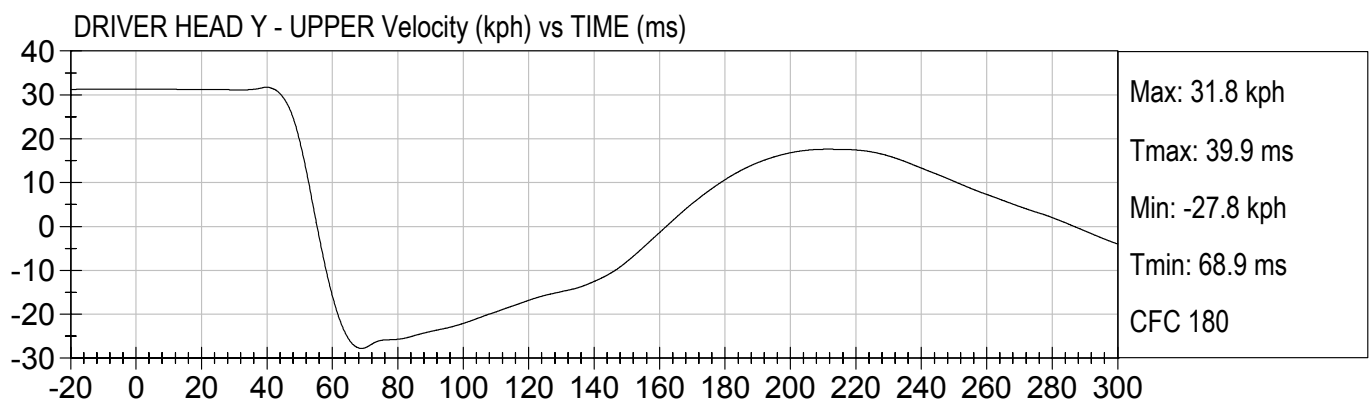
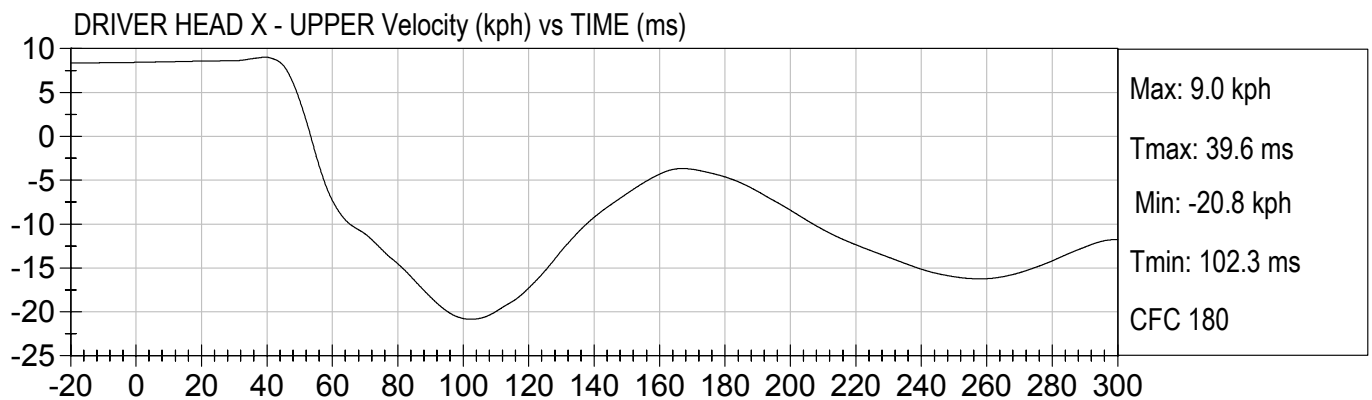
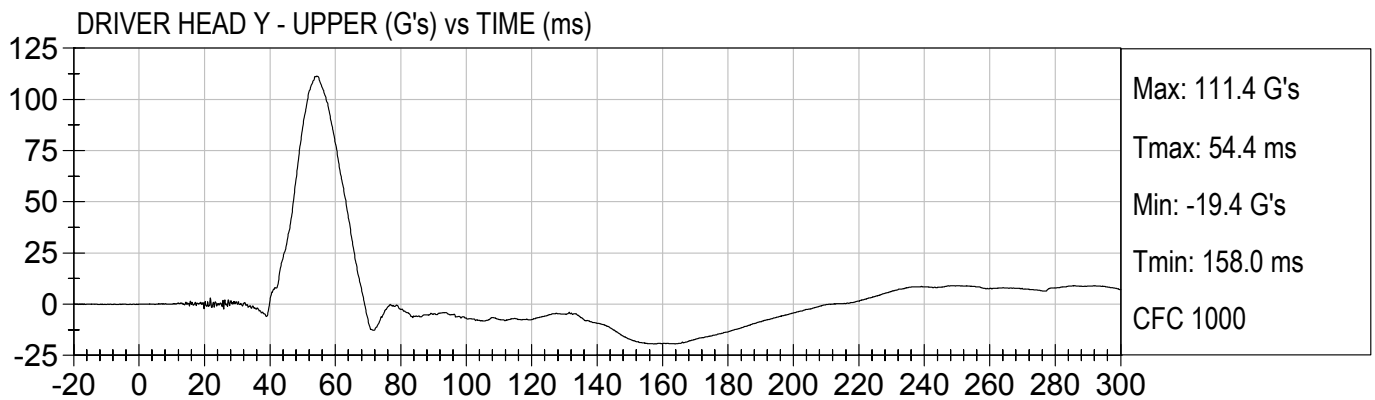
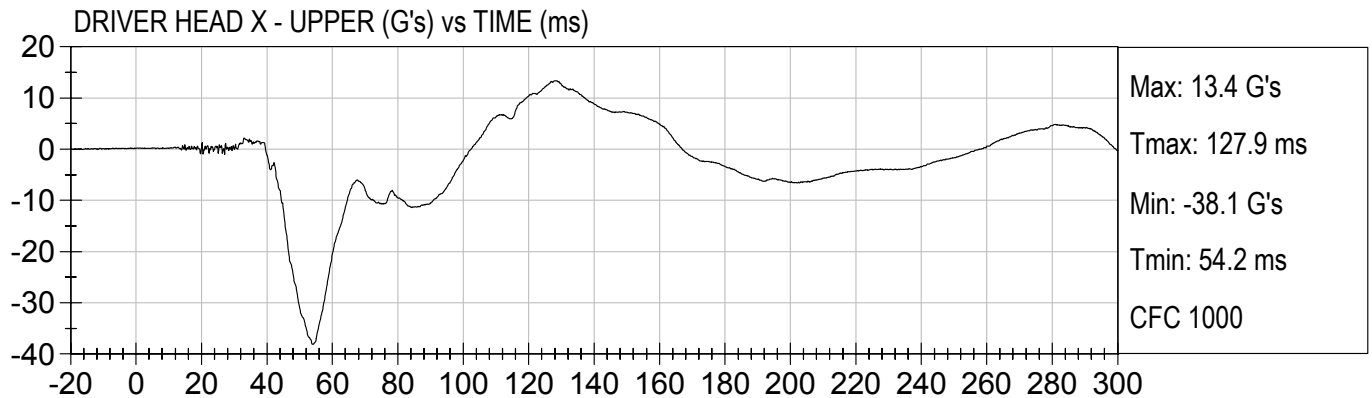
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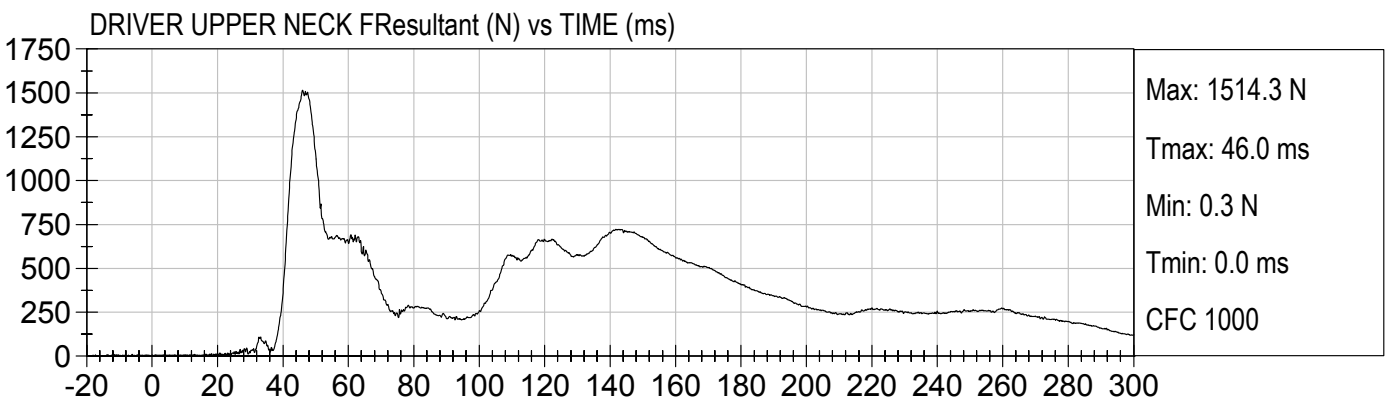
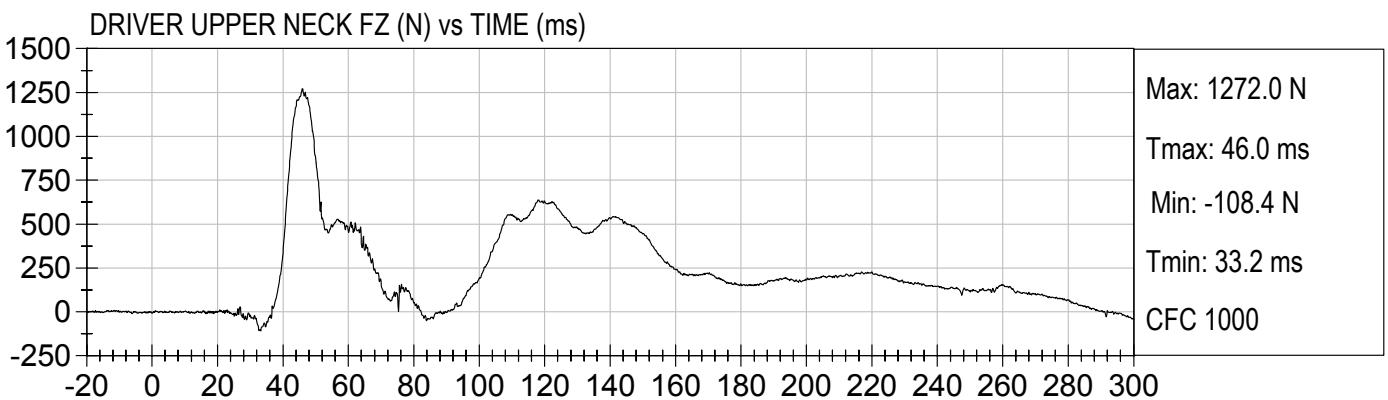
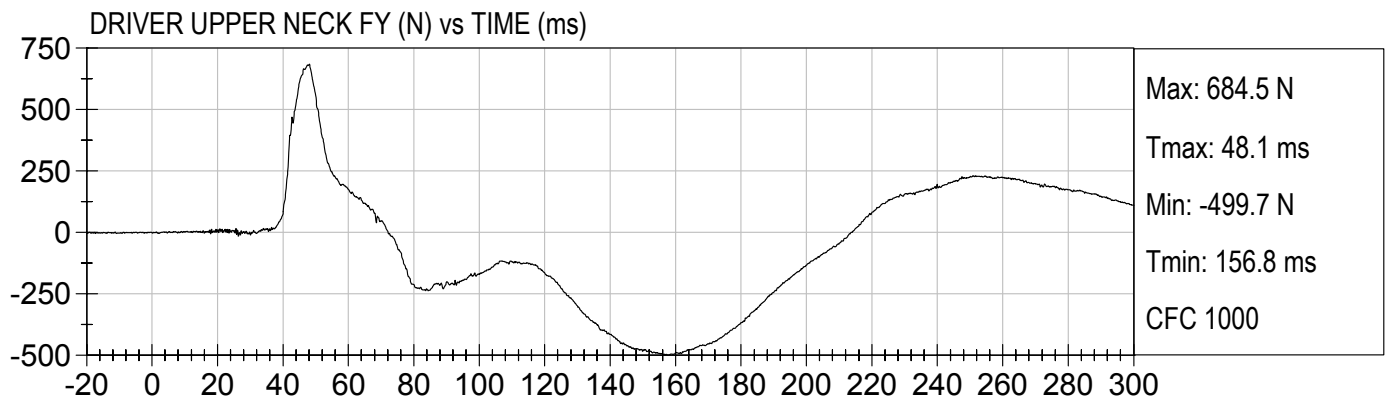
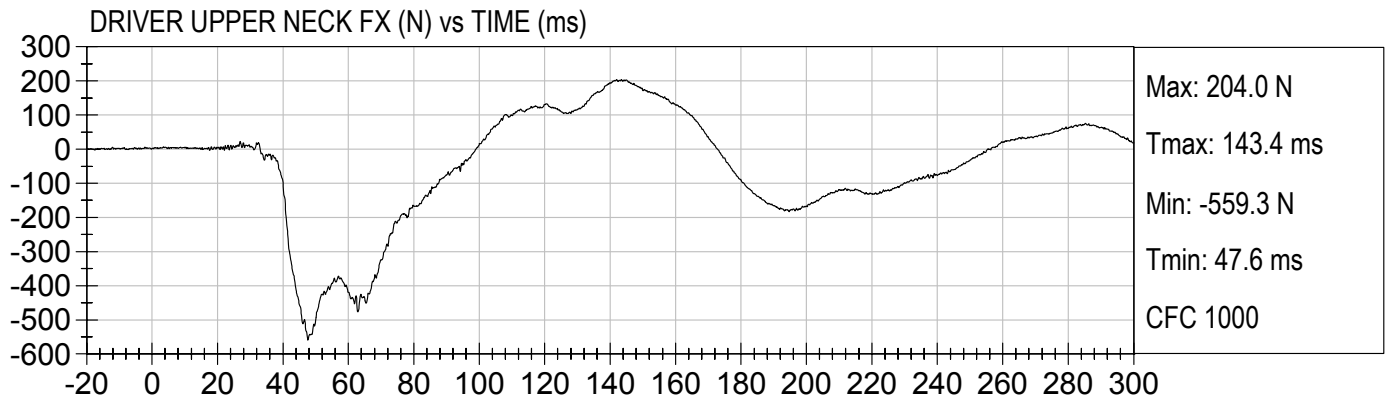


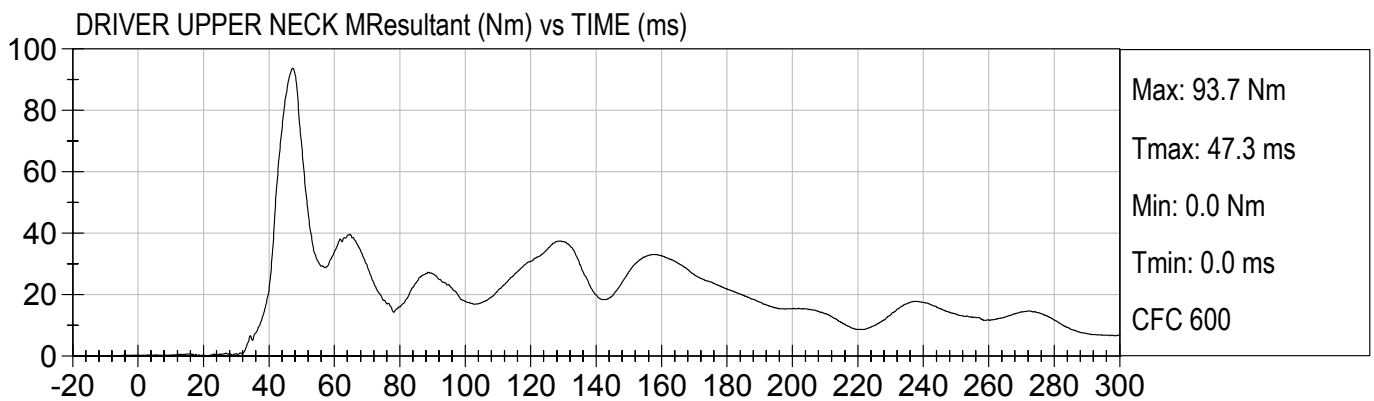
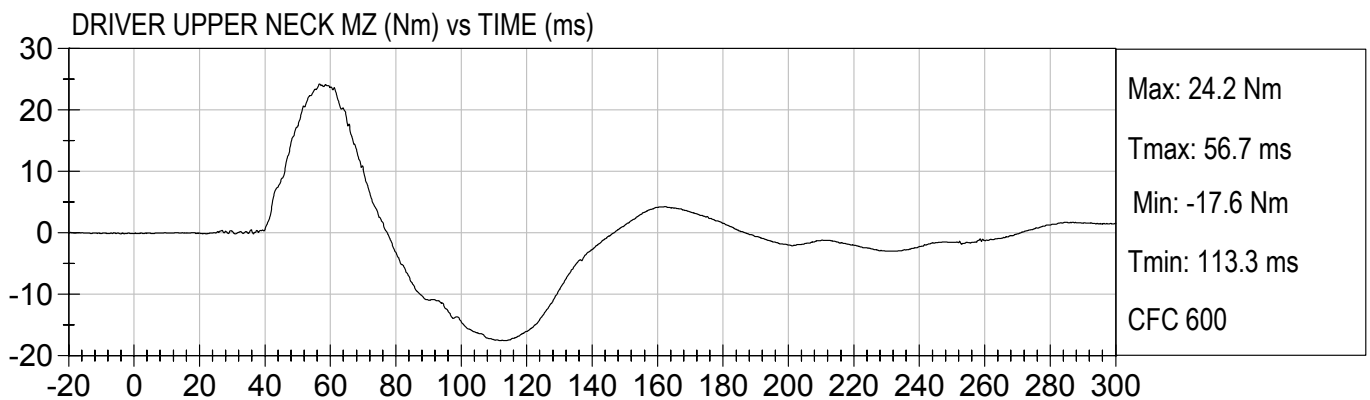
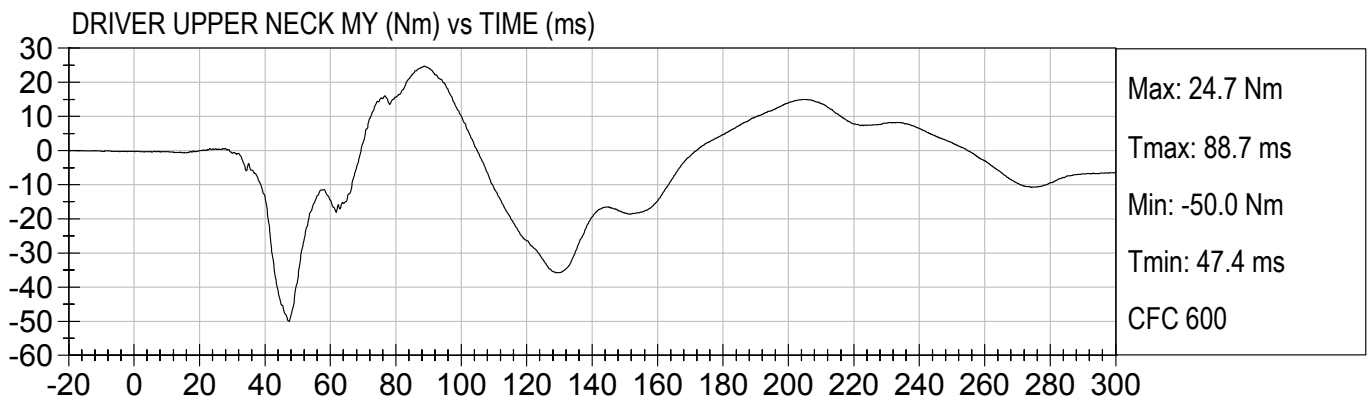
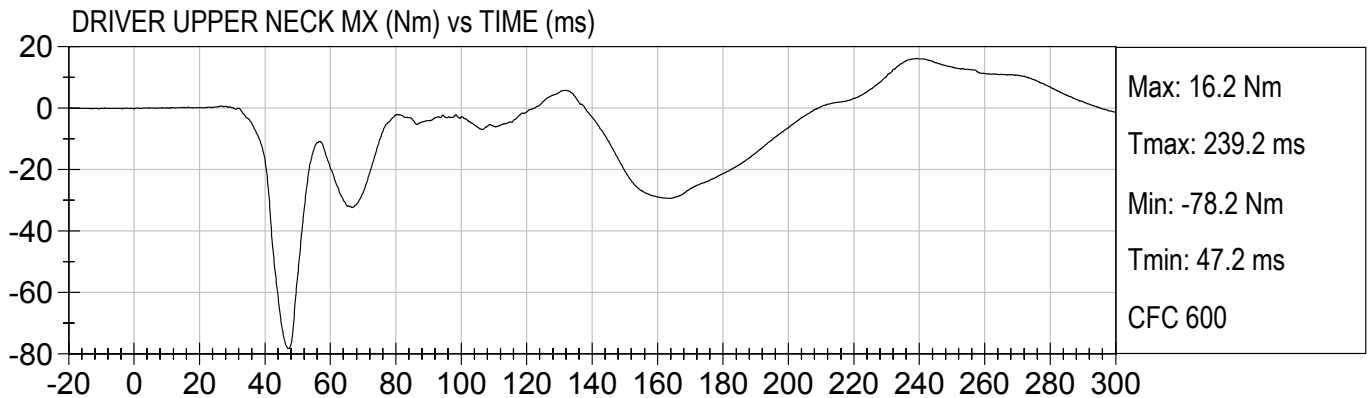


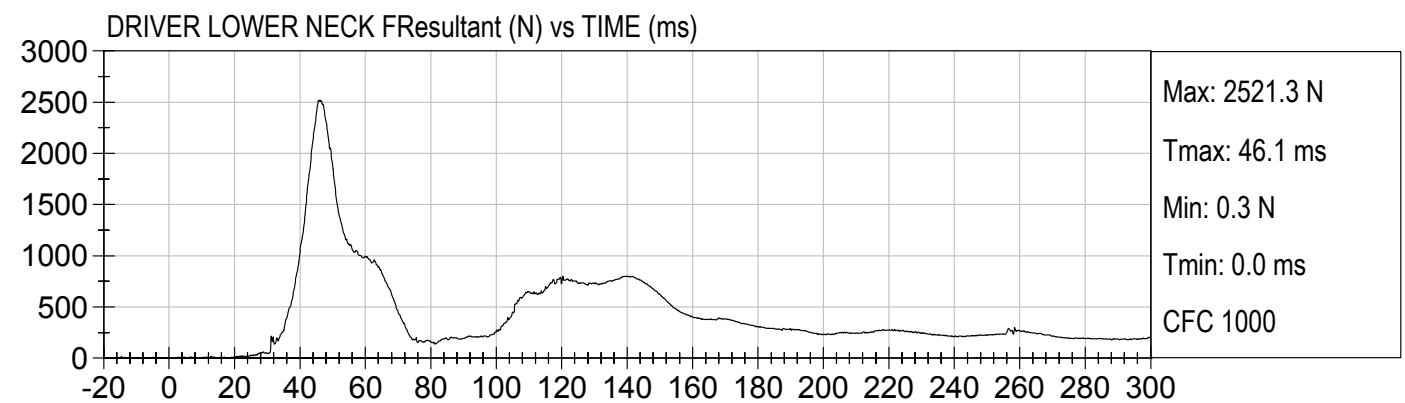
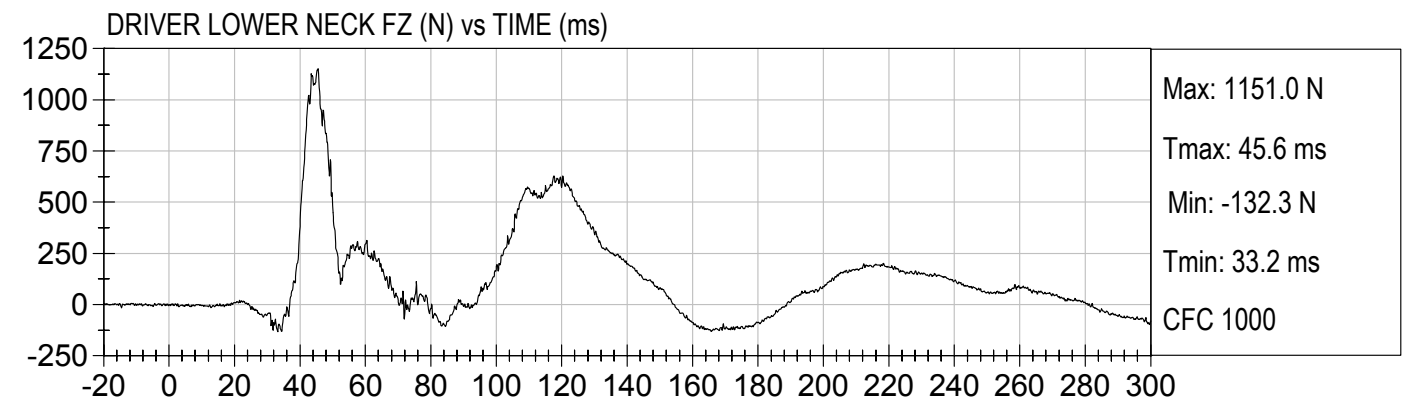
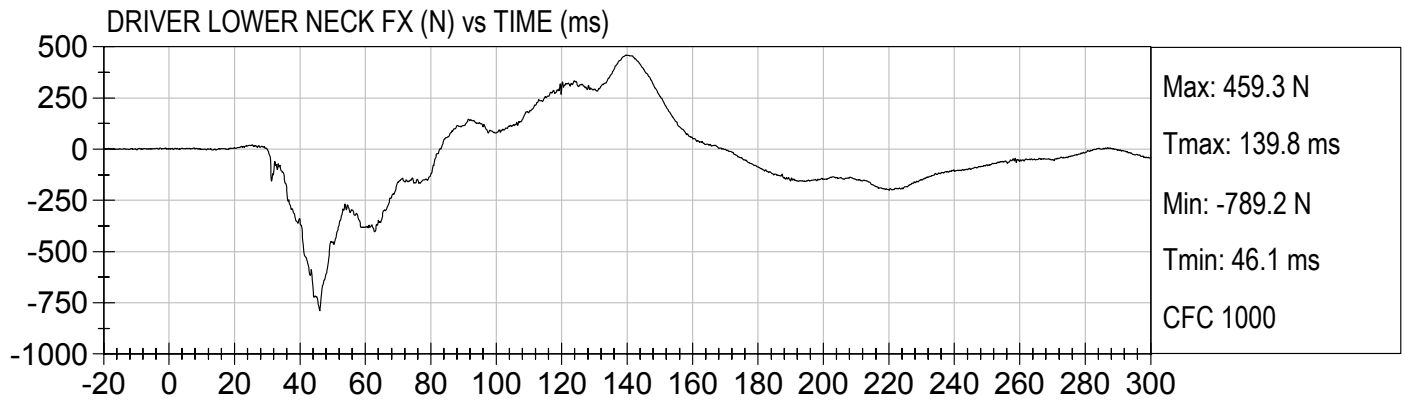


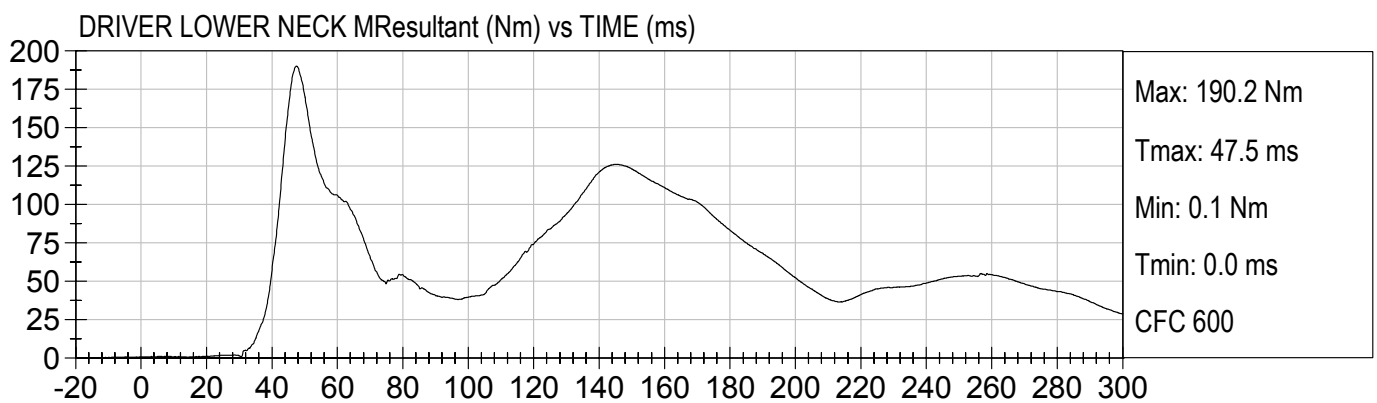
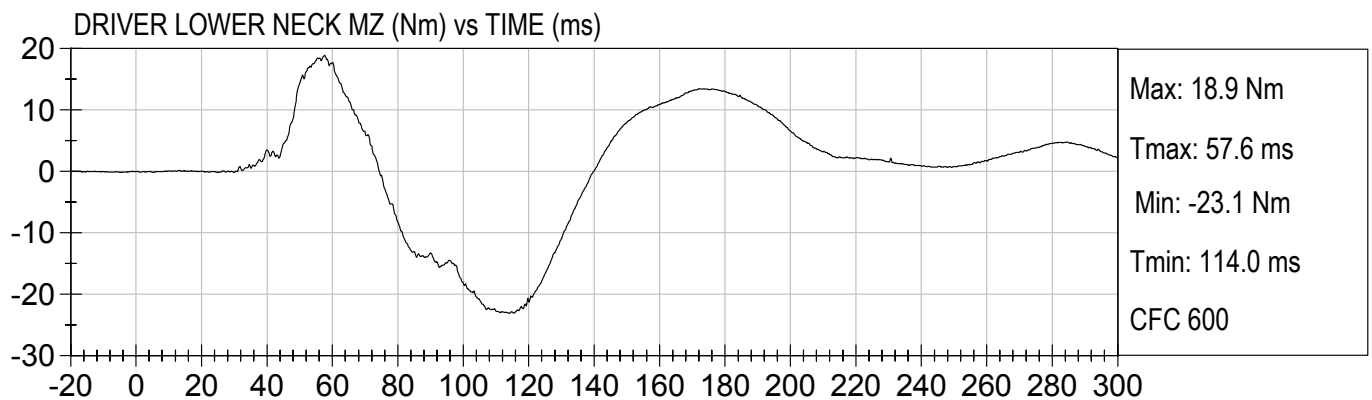
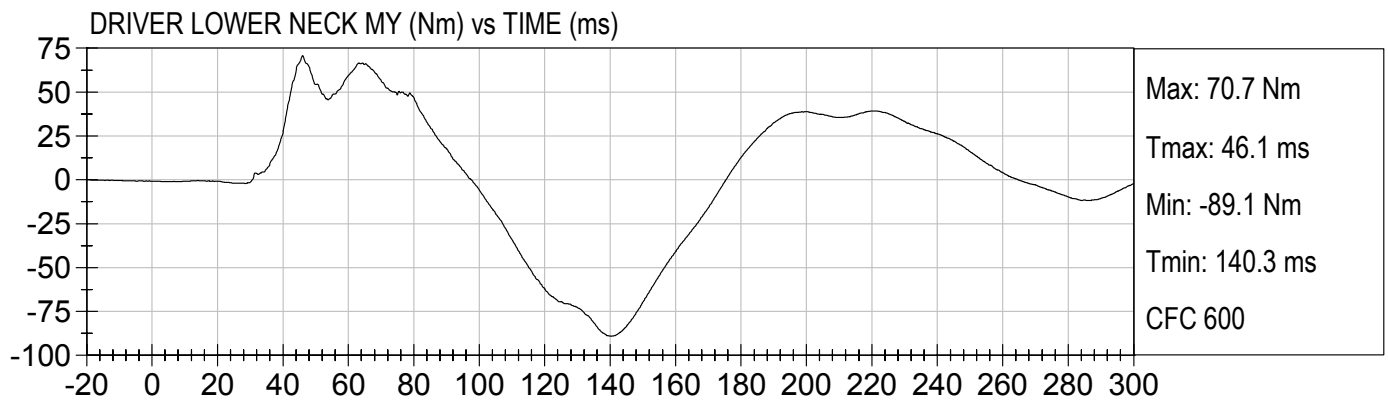
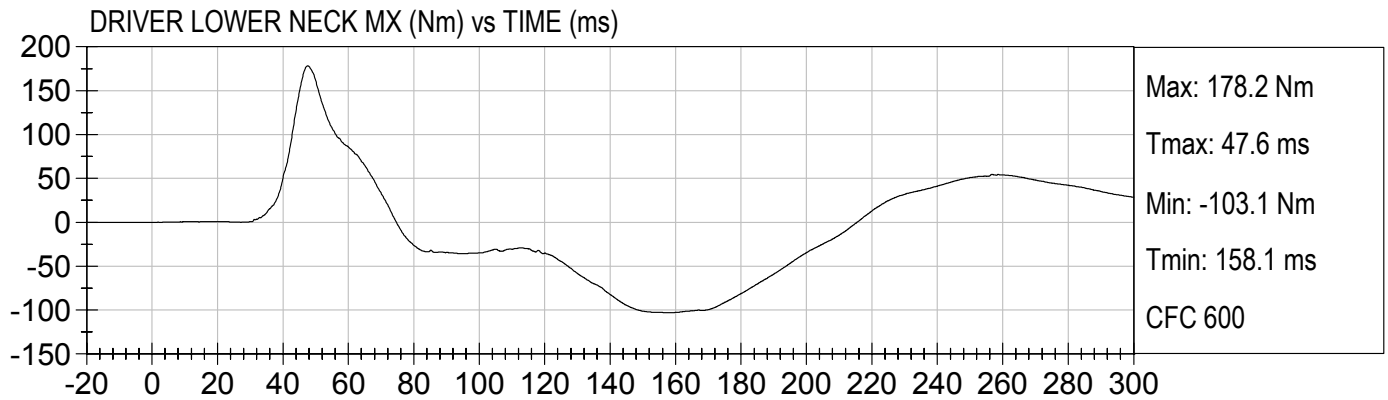


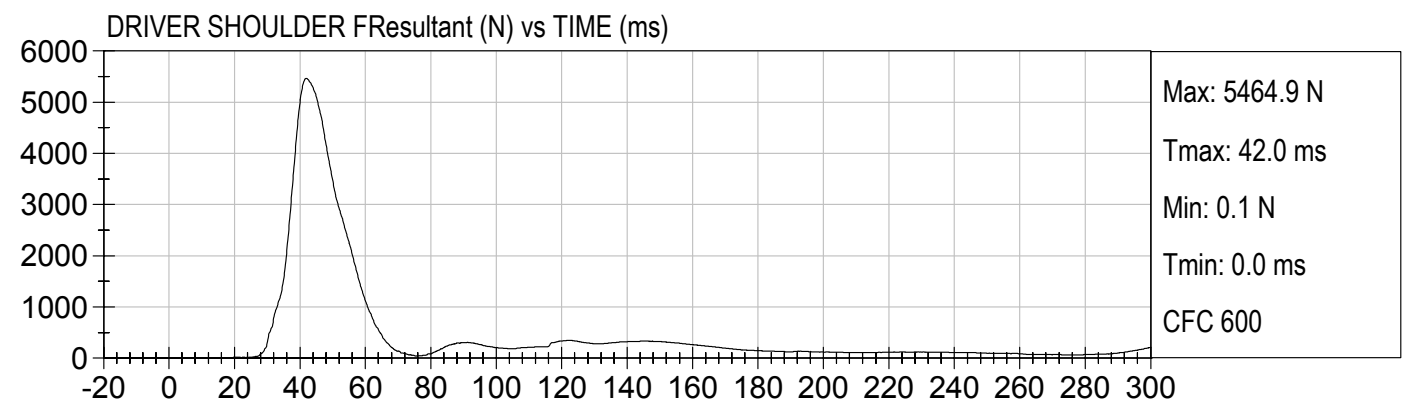
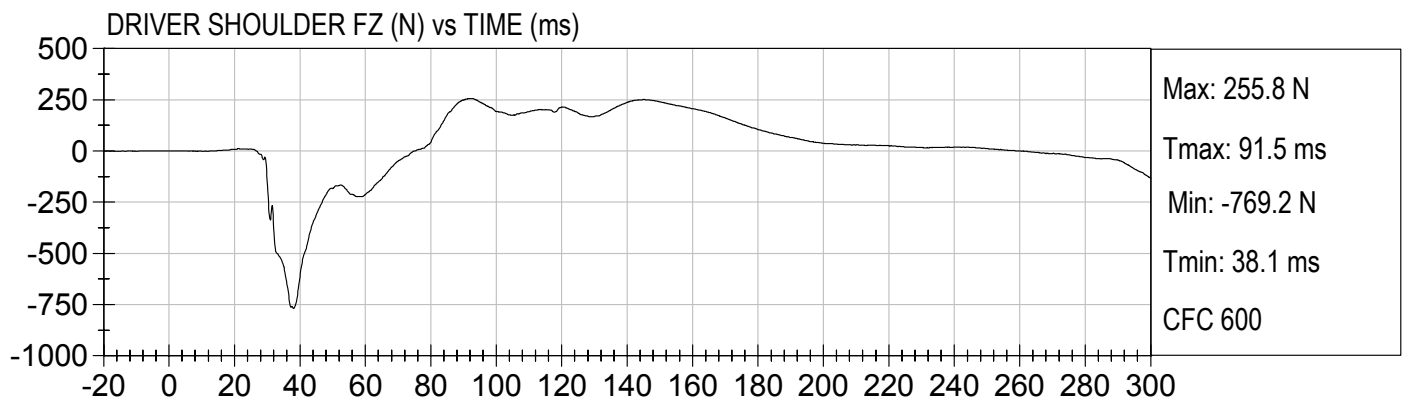
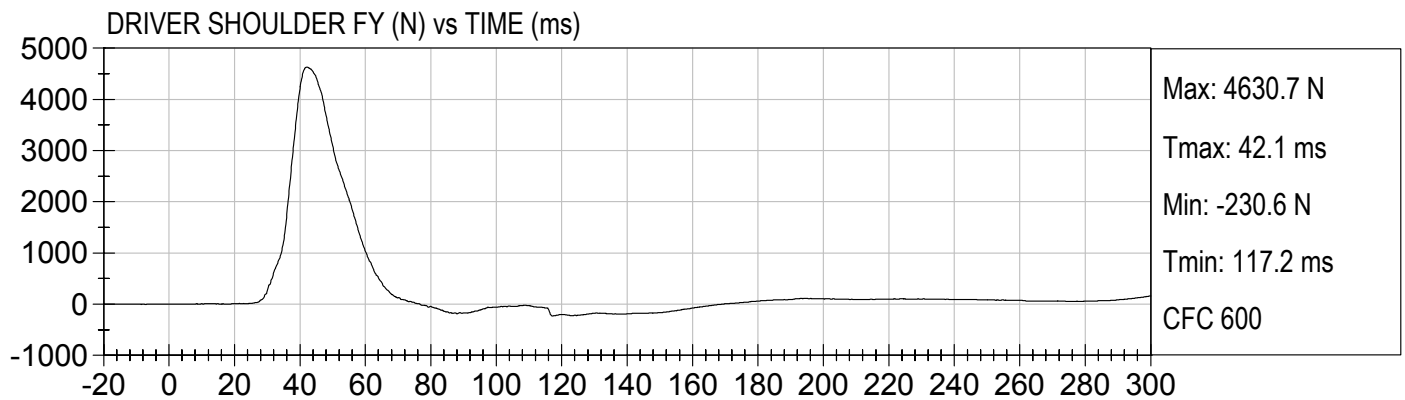
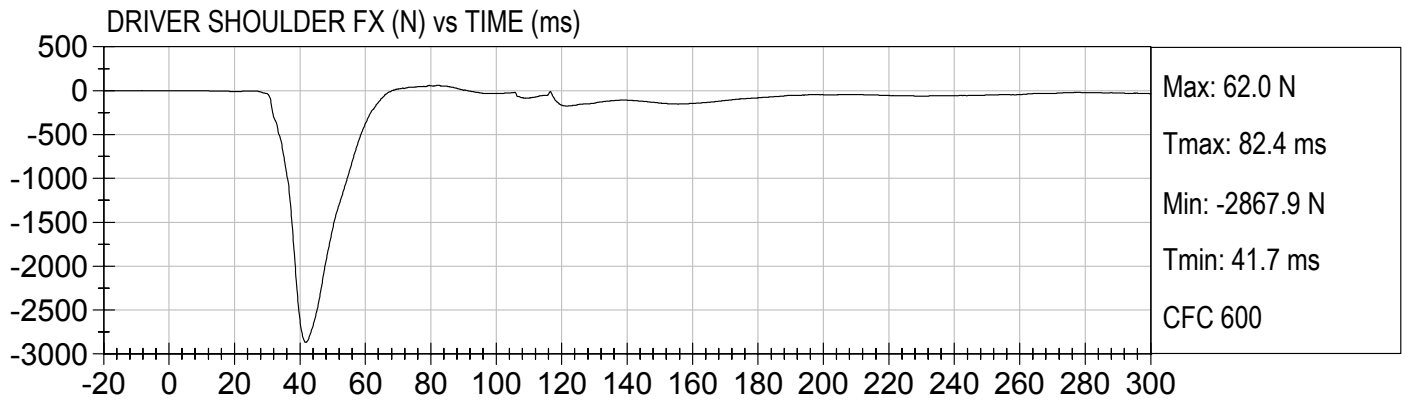


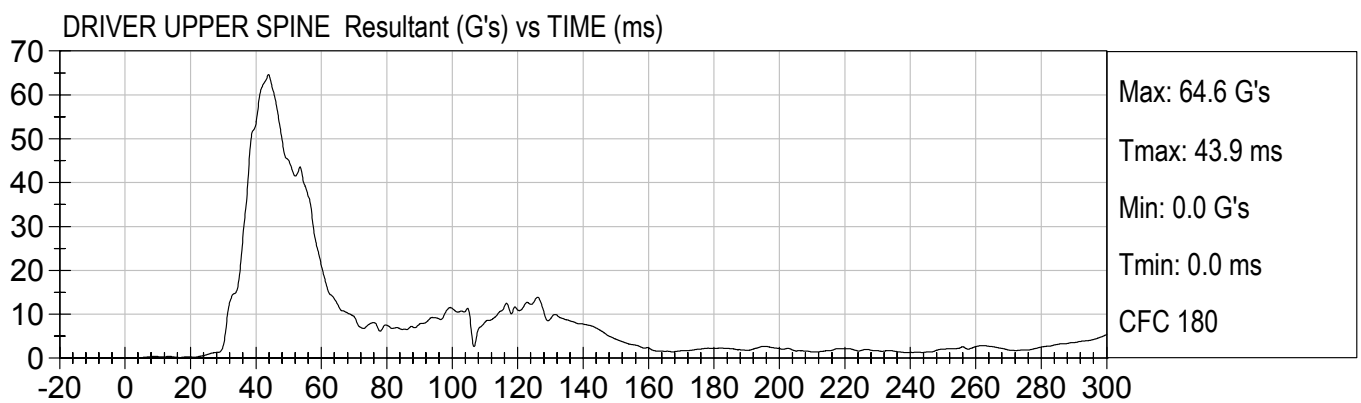
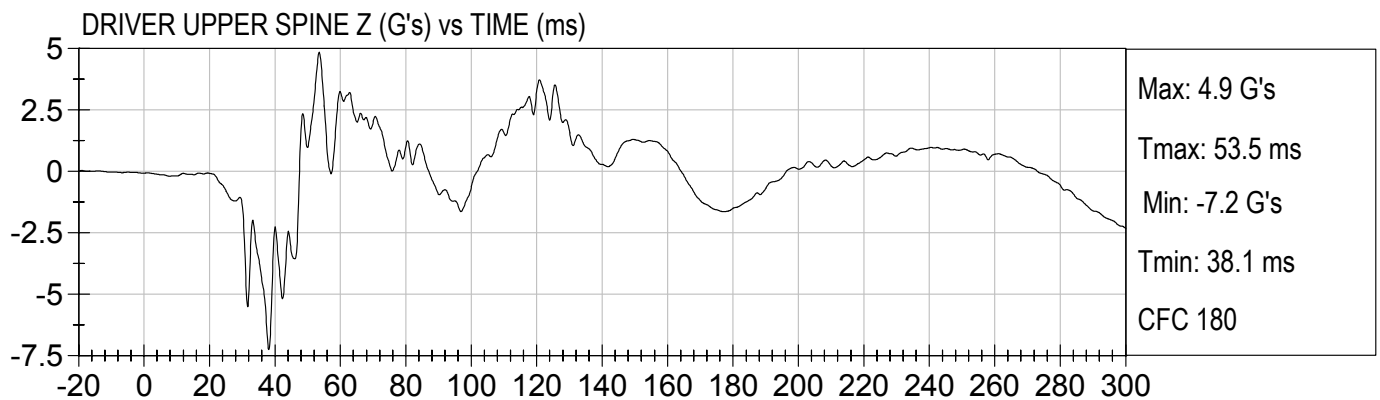
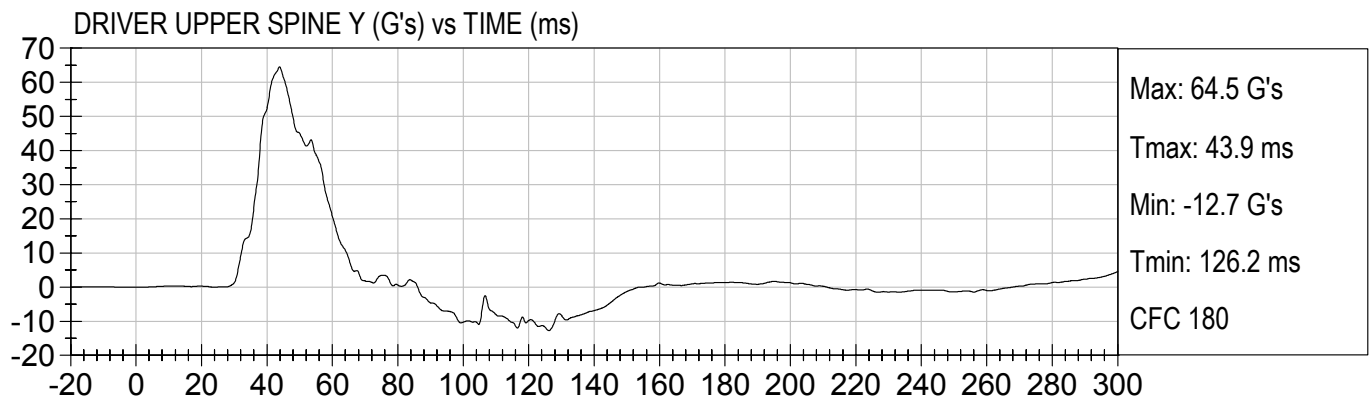
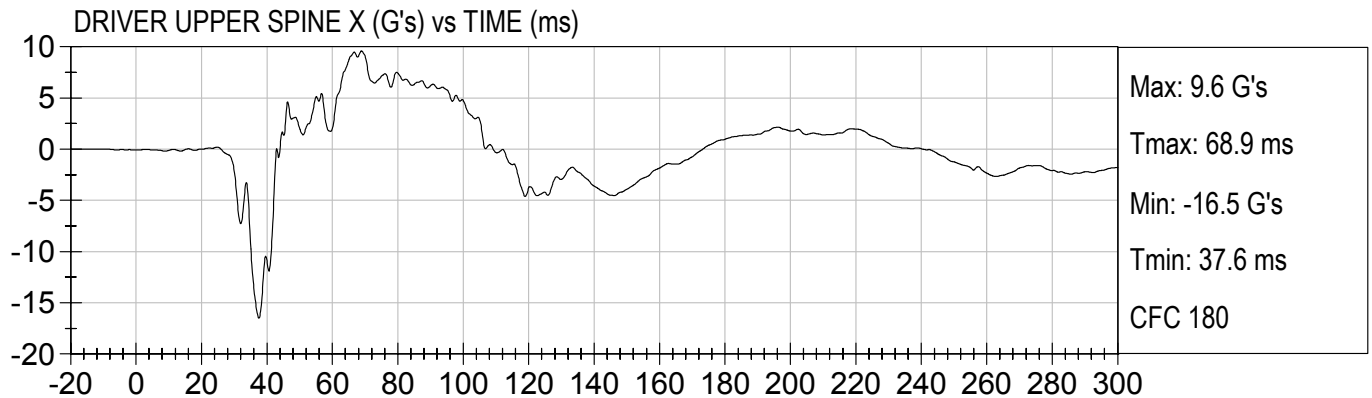






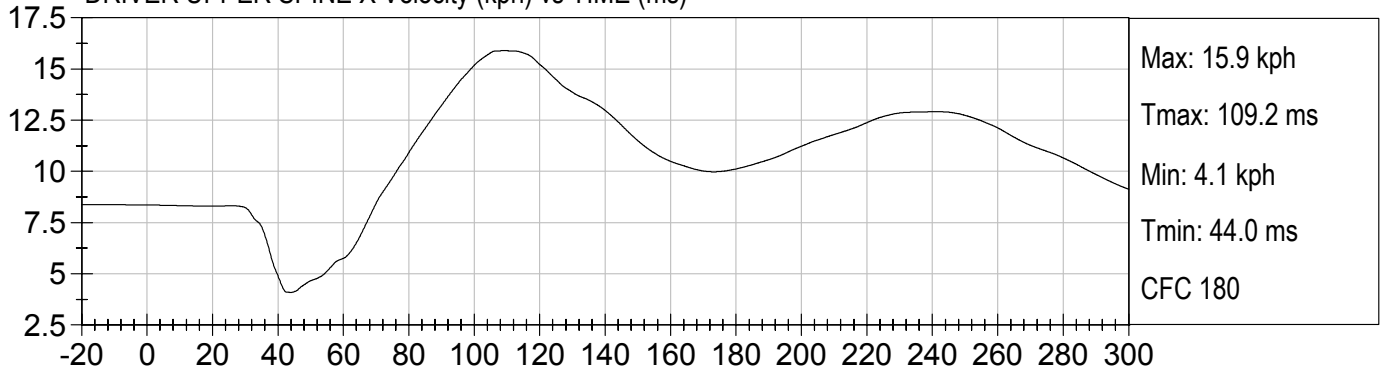




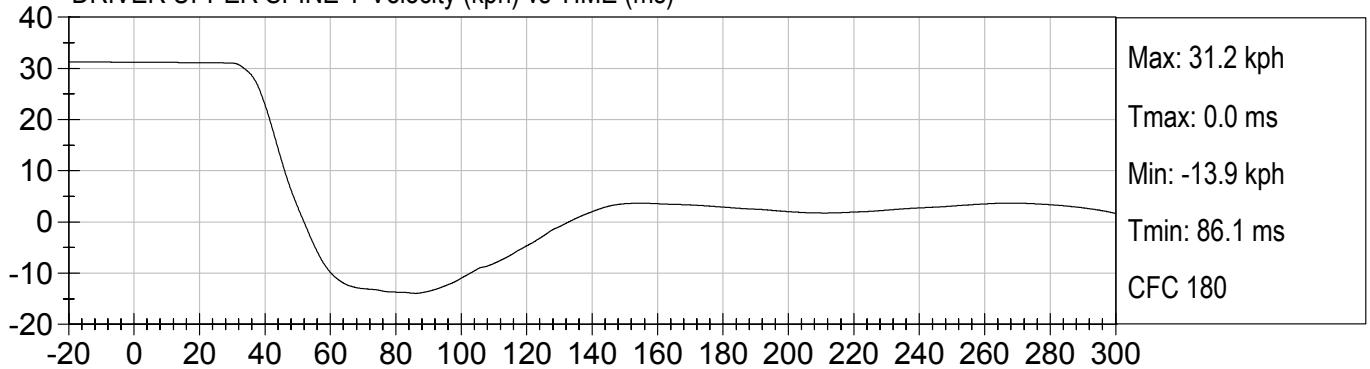




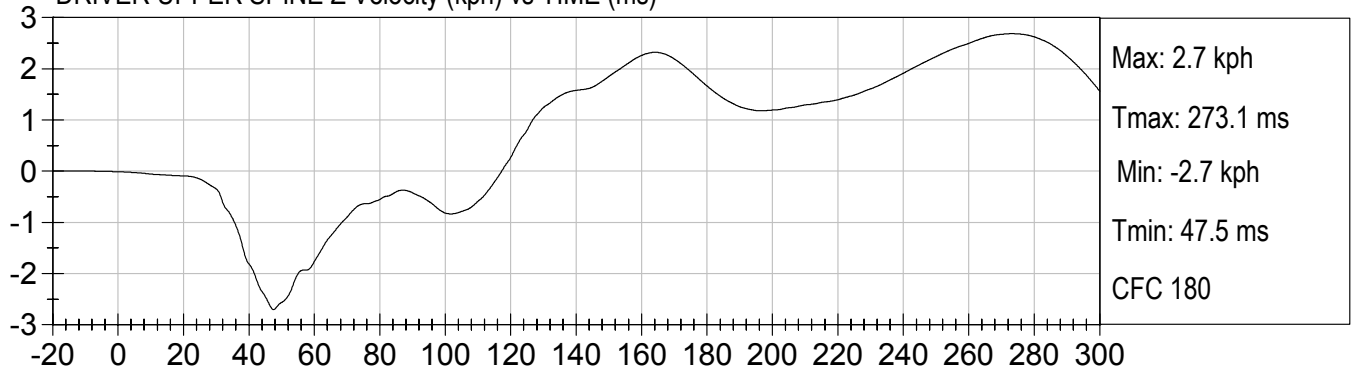
DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)

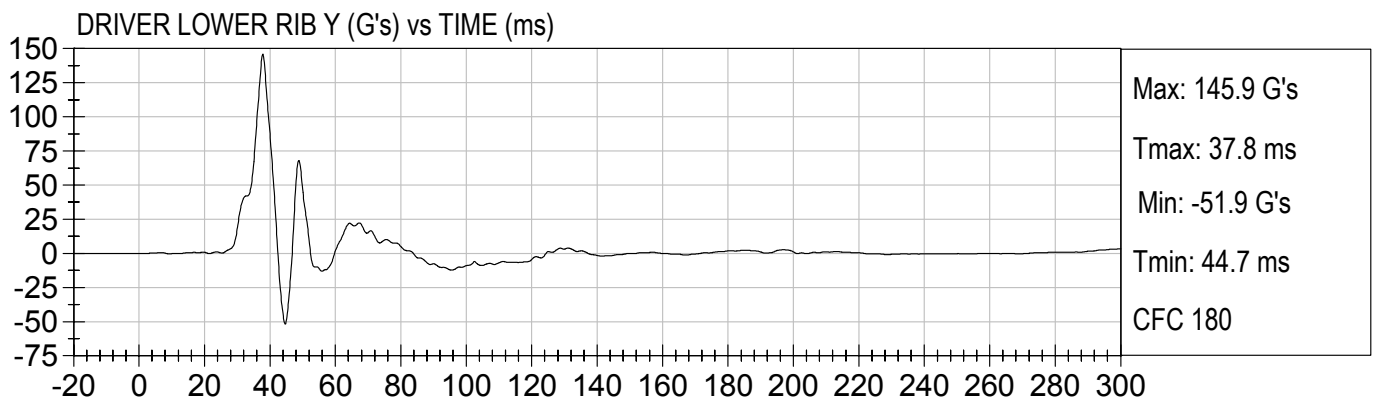
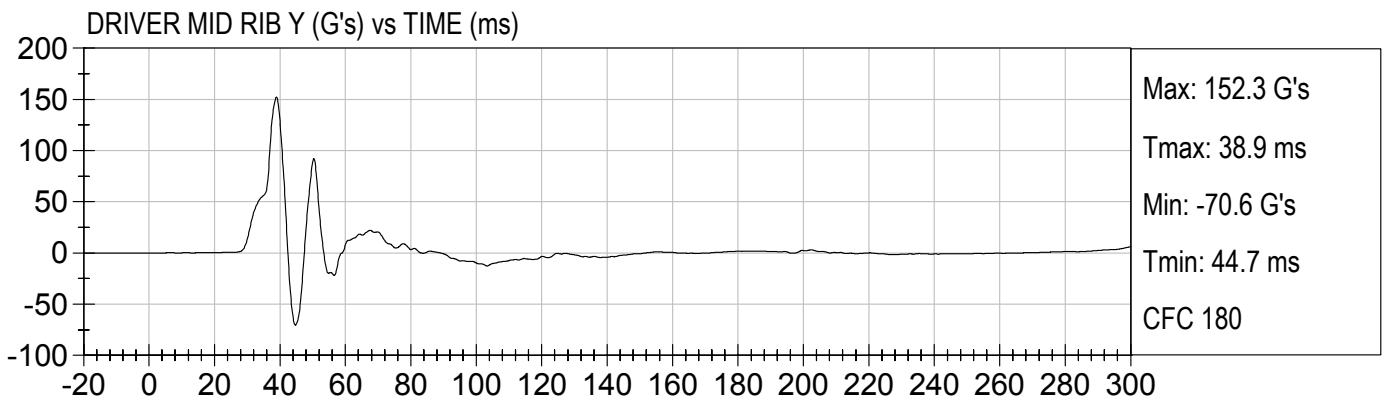
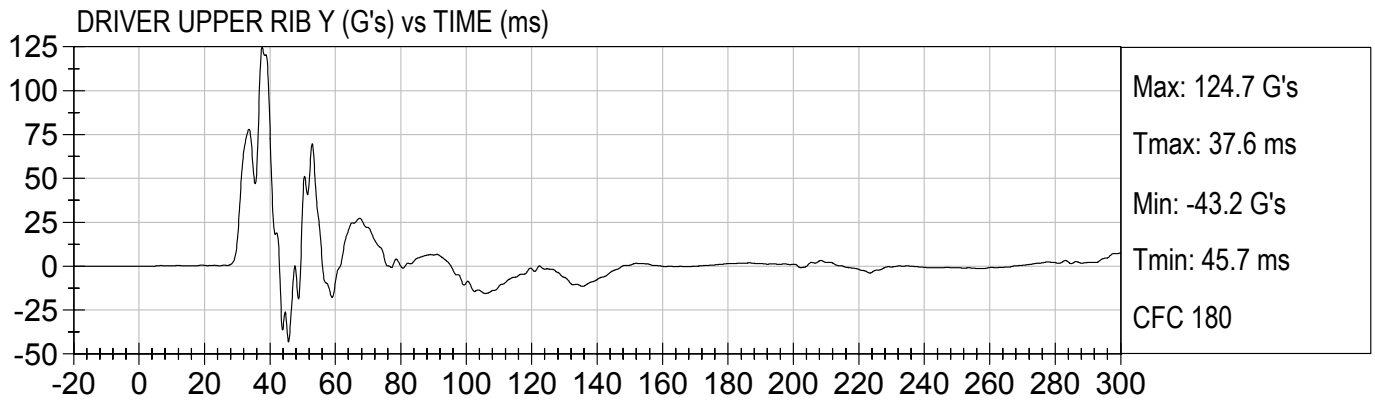


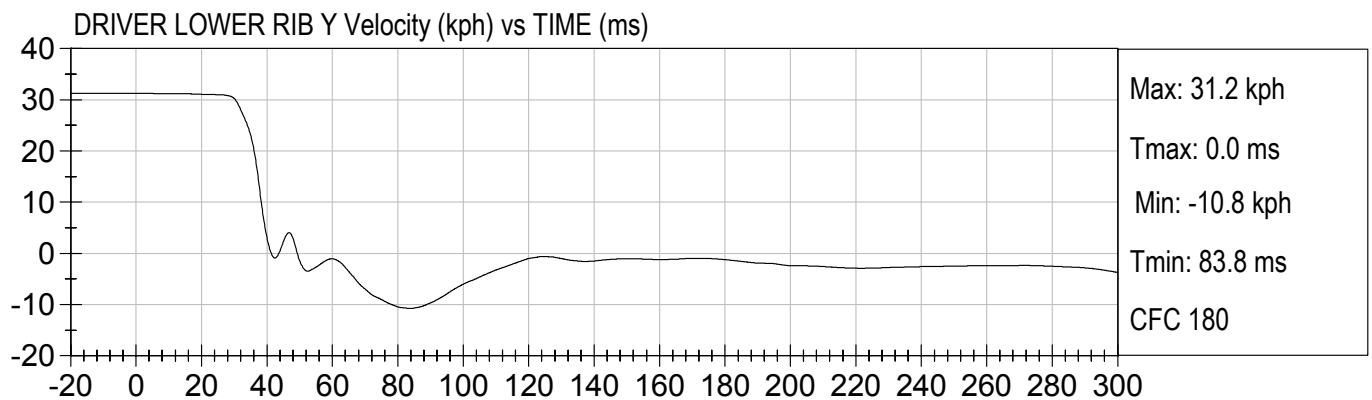
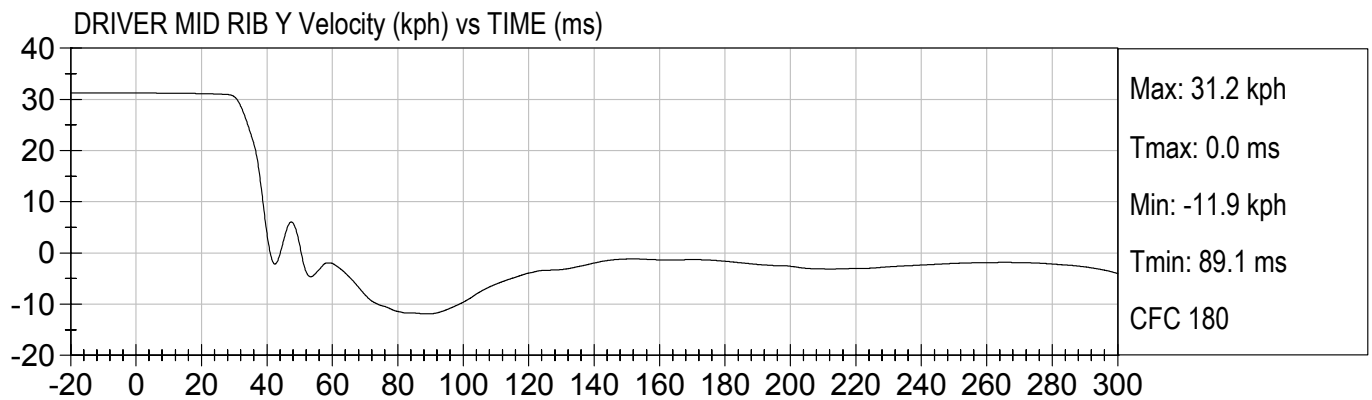
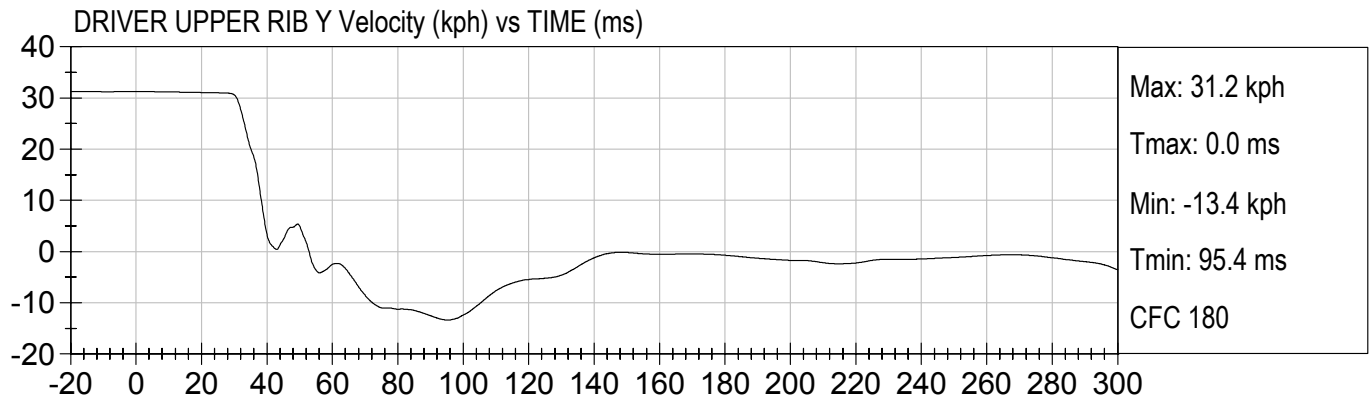
DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)

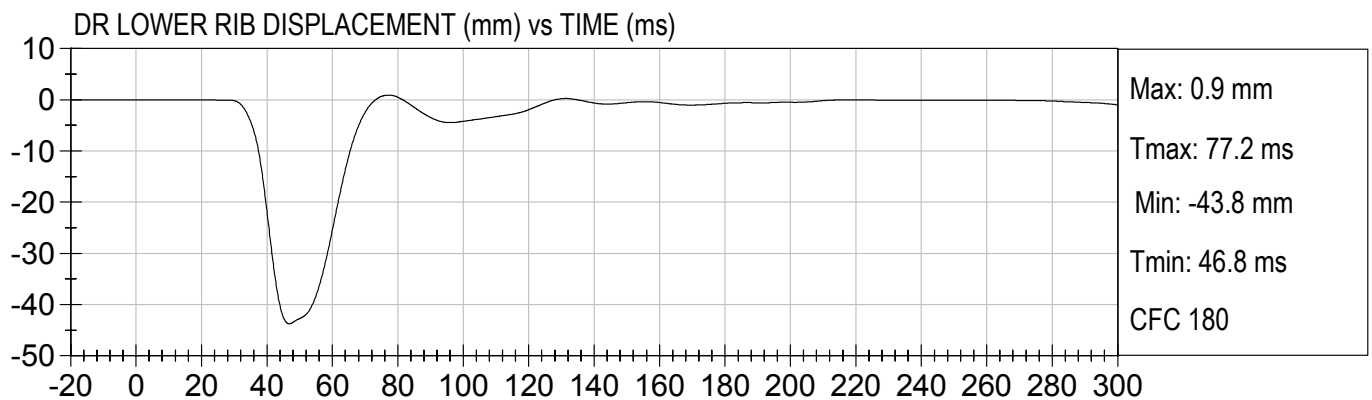
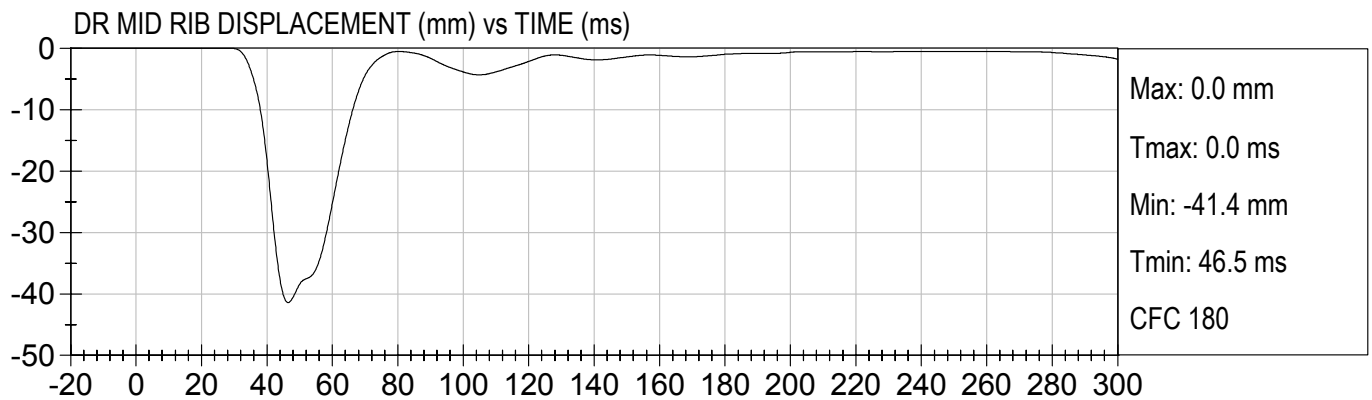
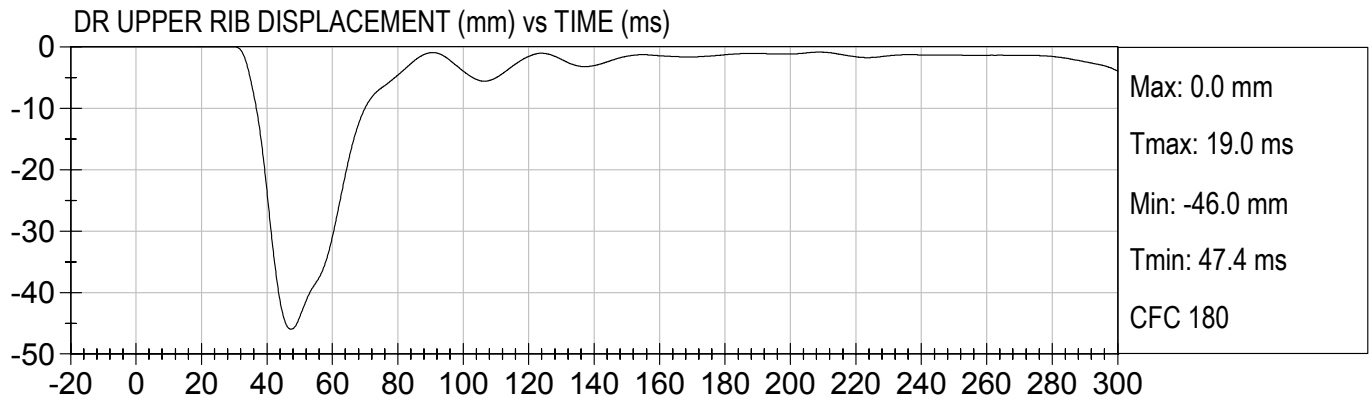


DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)





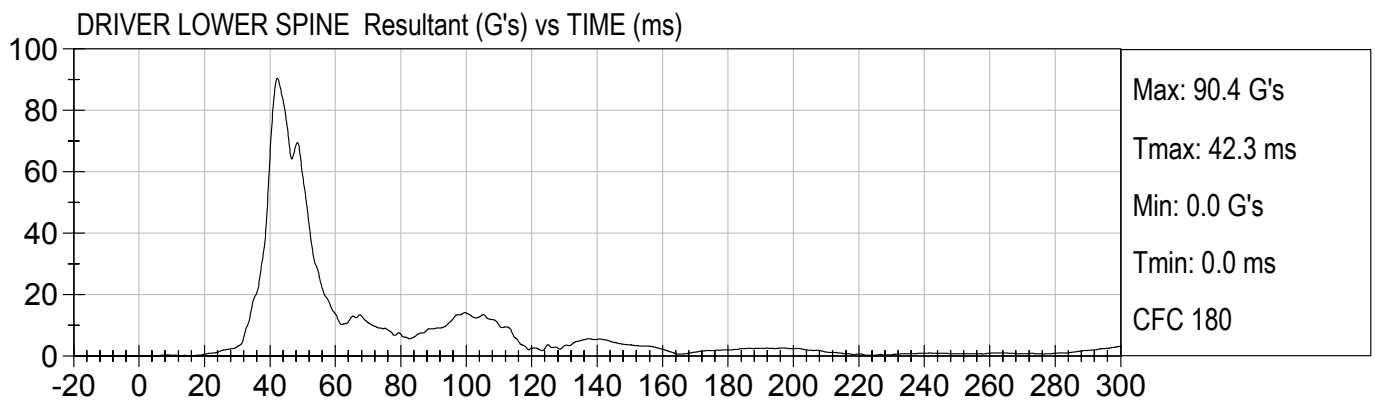
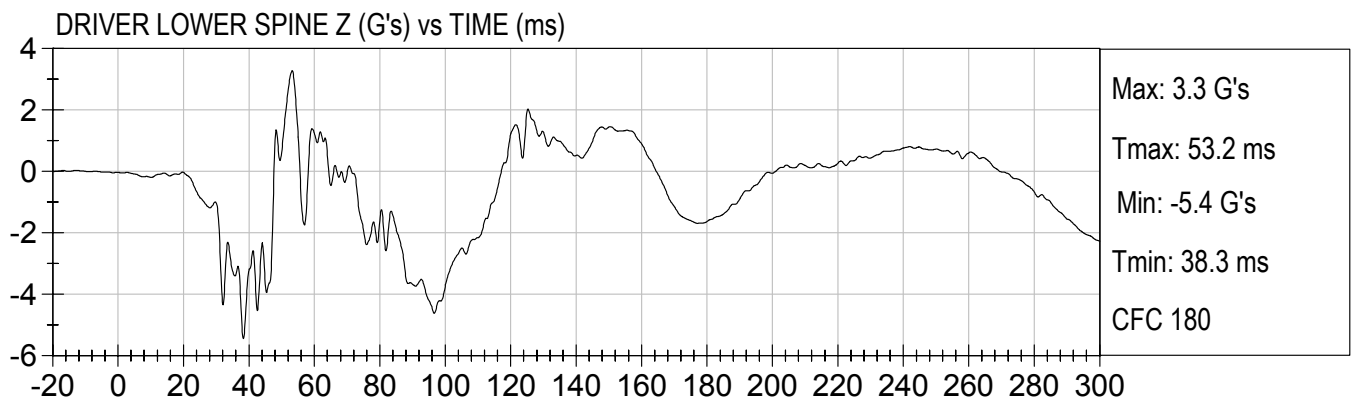
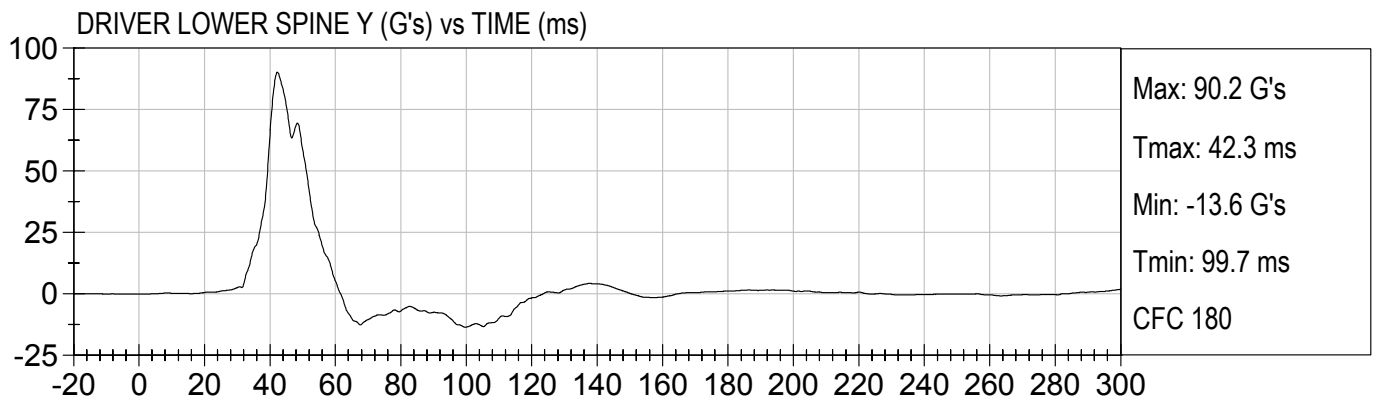
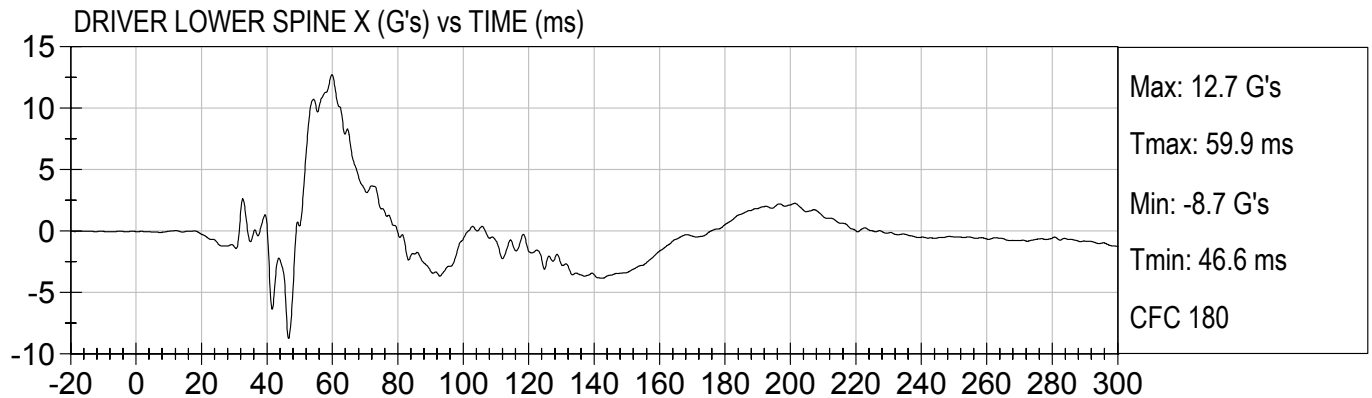






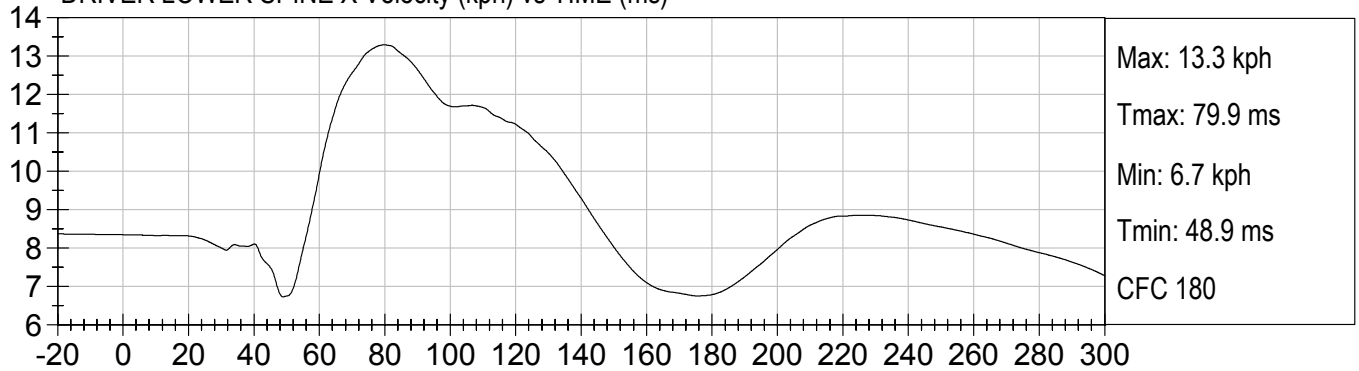
T.O.1 SIDE OBLIQUE POLE
2005 CHEVY COLORADO (R50165)

Test Date: 05/04/05
Speed: 20.1 mph (32.3 km/h)

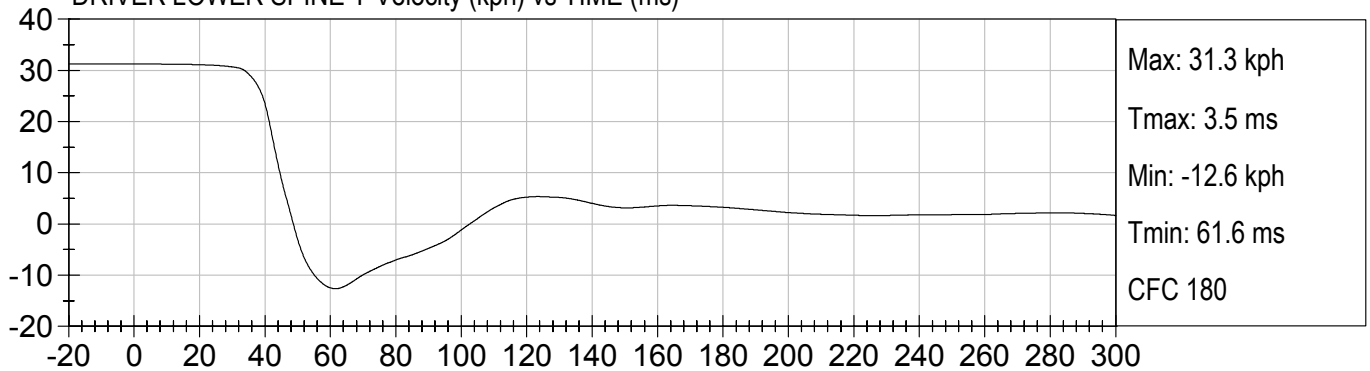




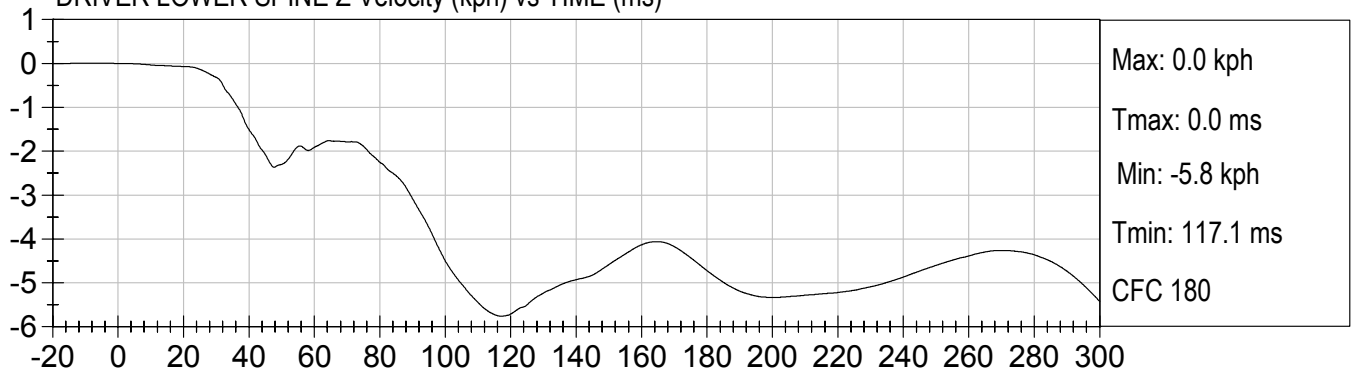
DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)

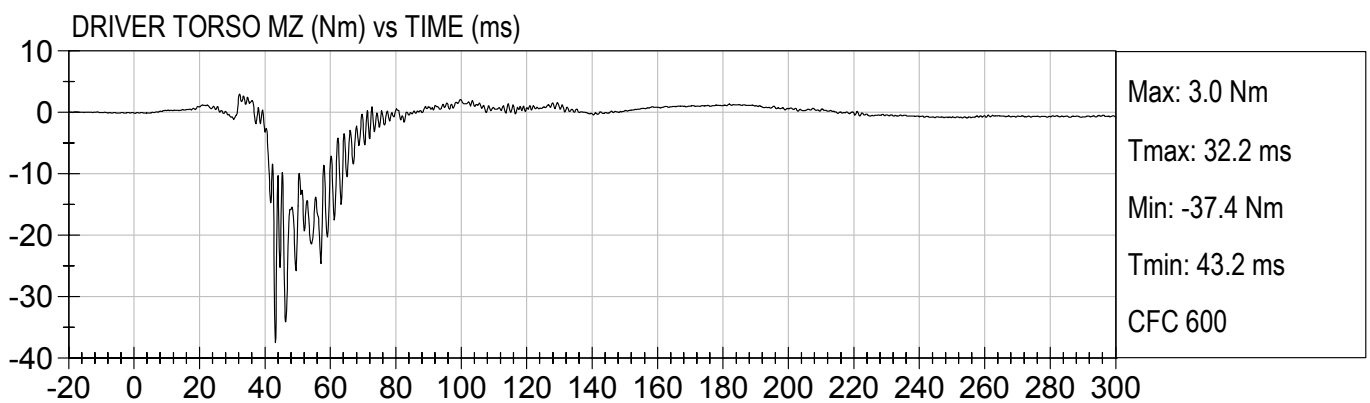
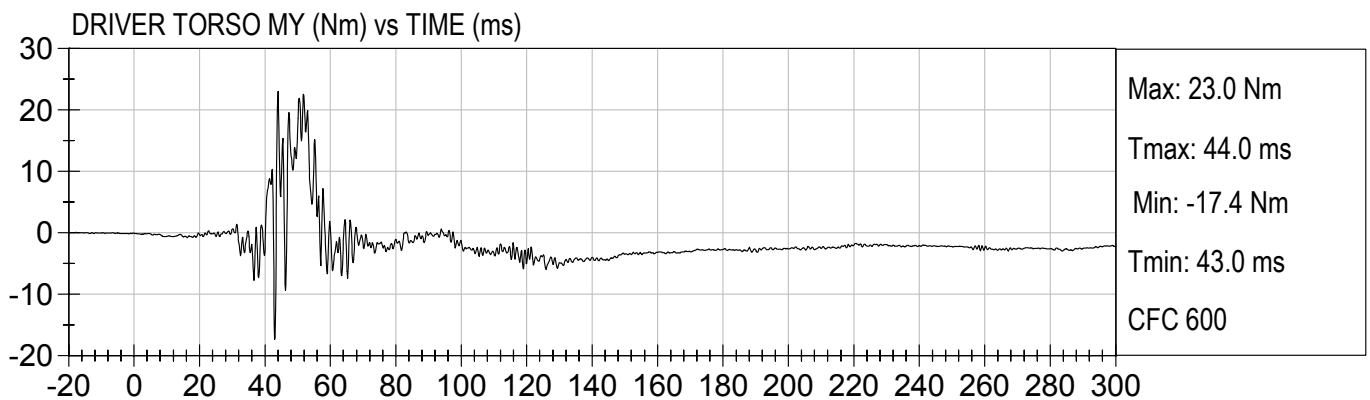
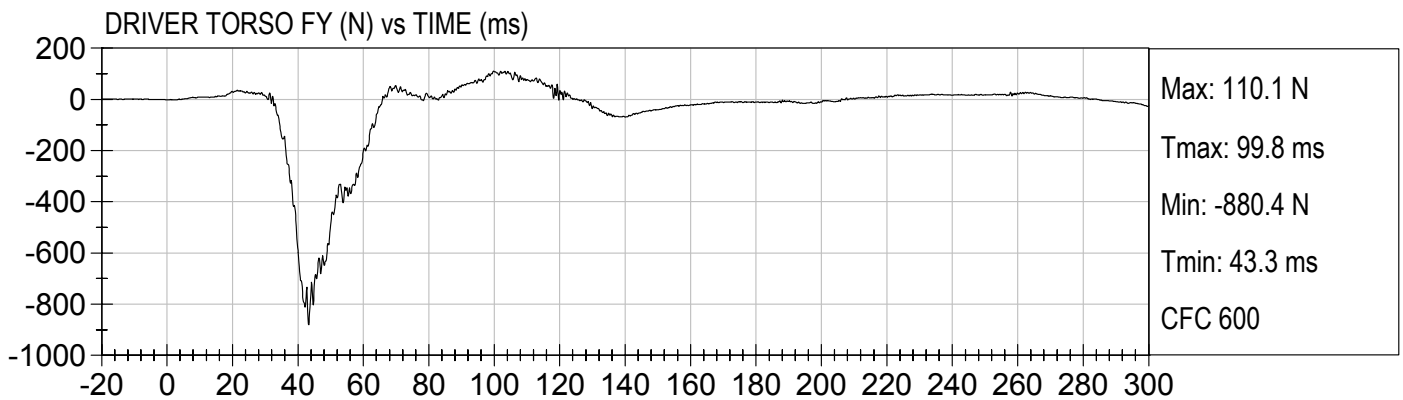
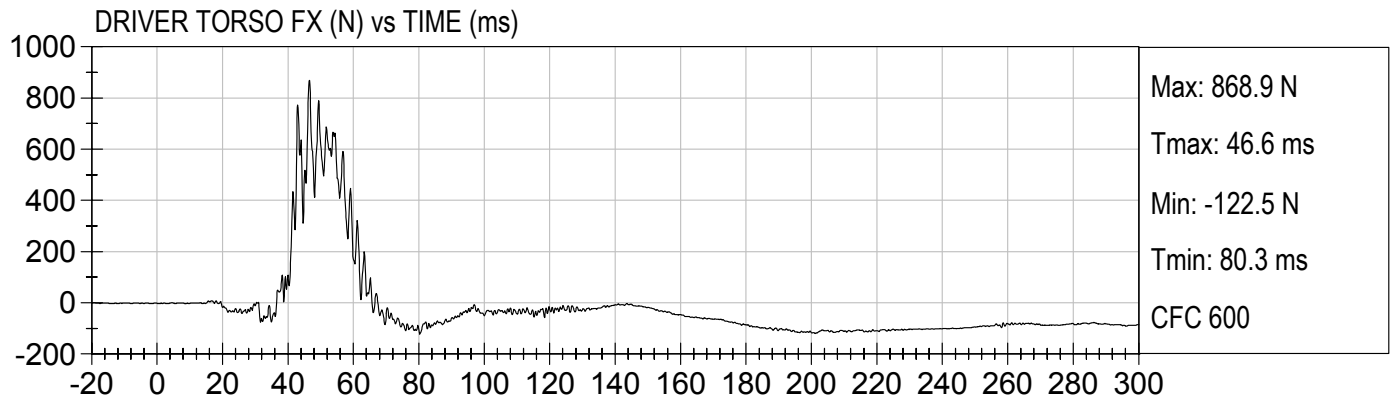


DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



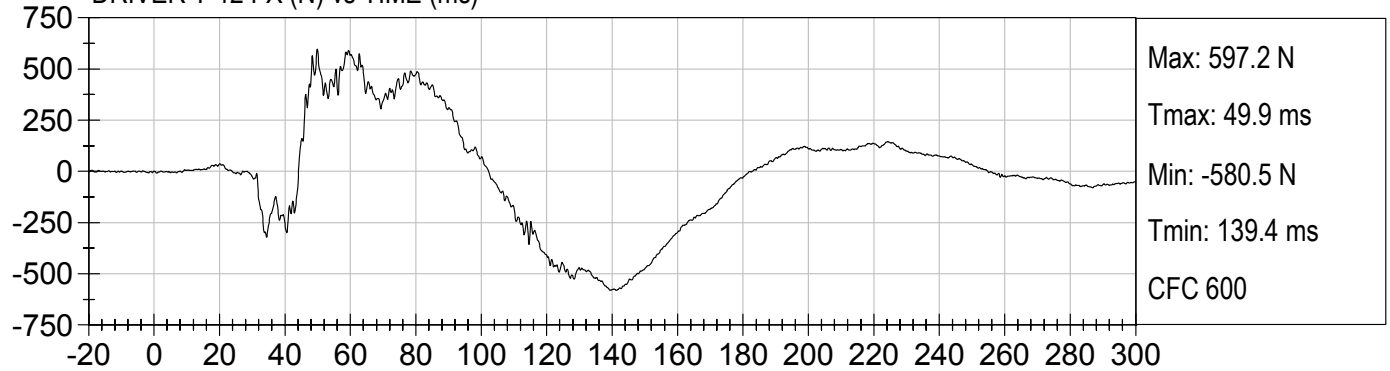
DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)



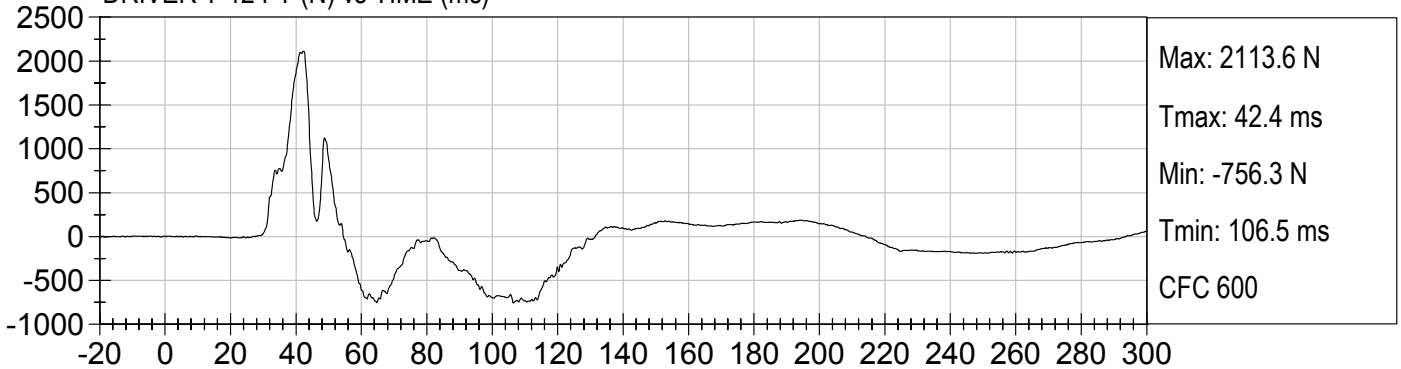




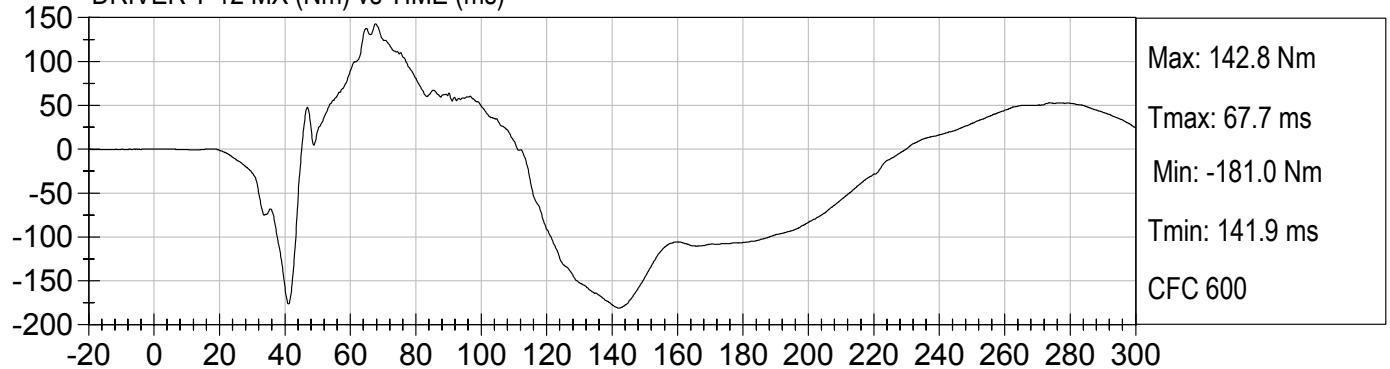
DRIVER T-12 FX (N) vs TIME (ms)



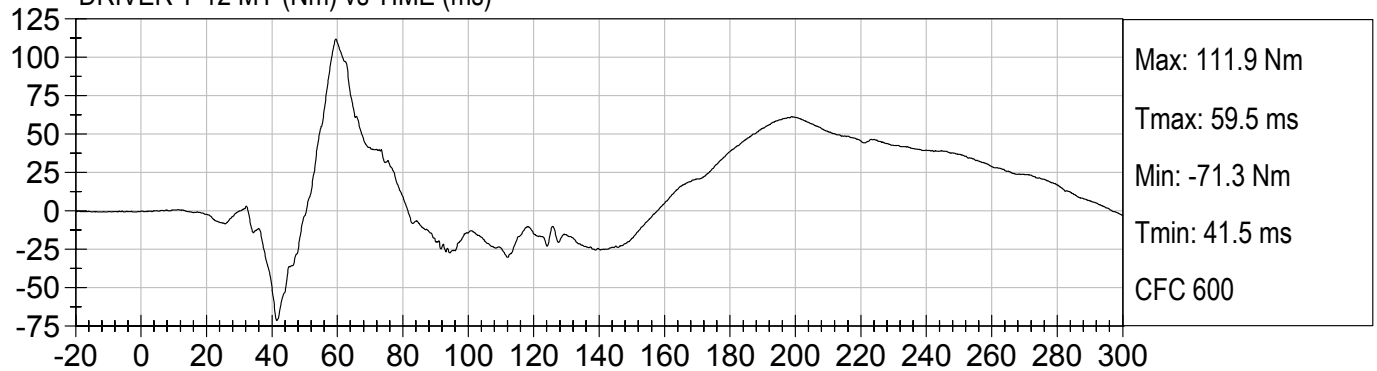
DRIVER T-12 FY (N) vs TIME (ms)

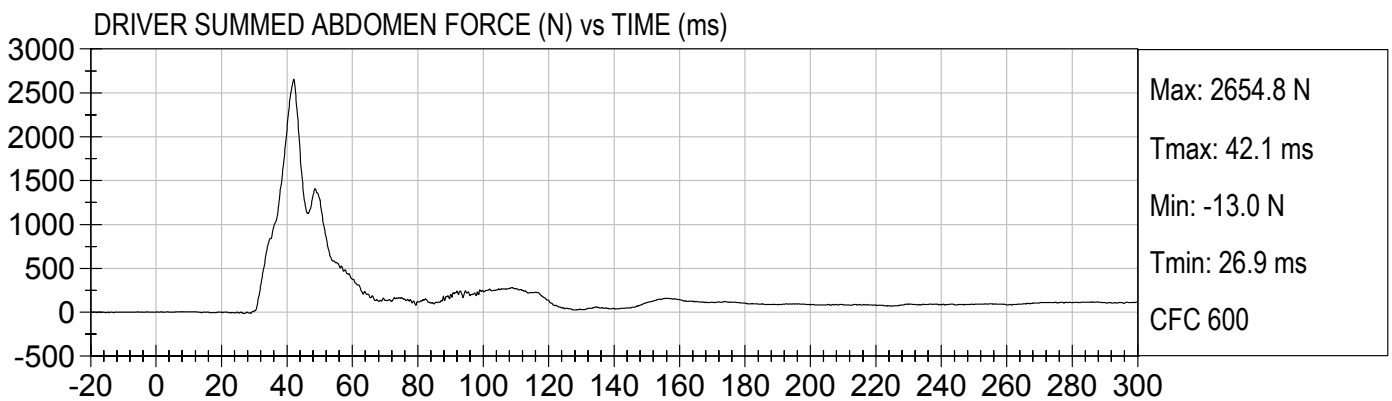
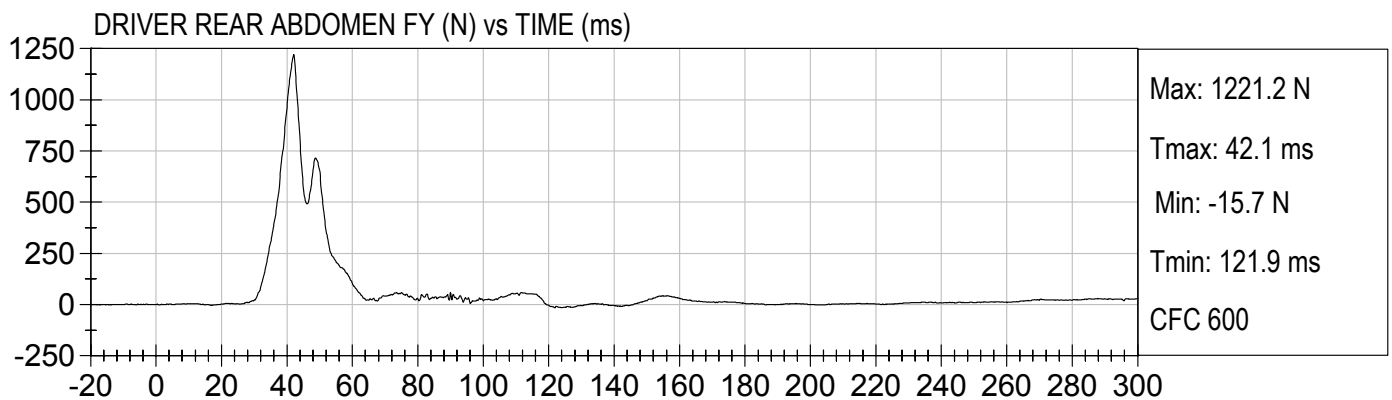
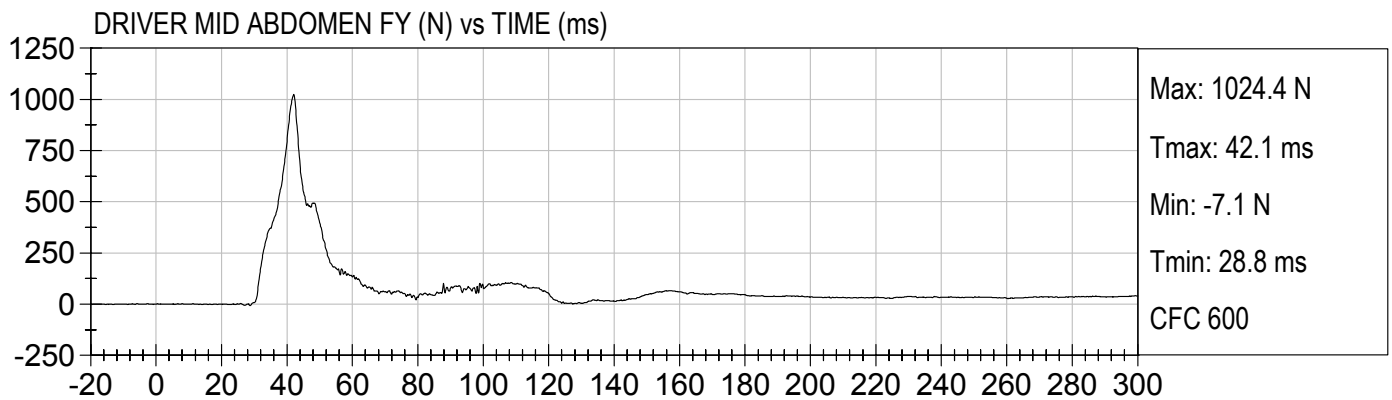
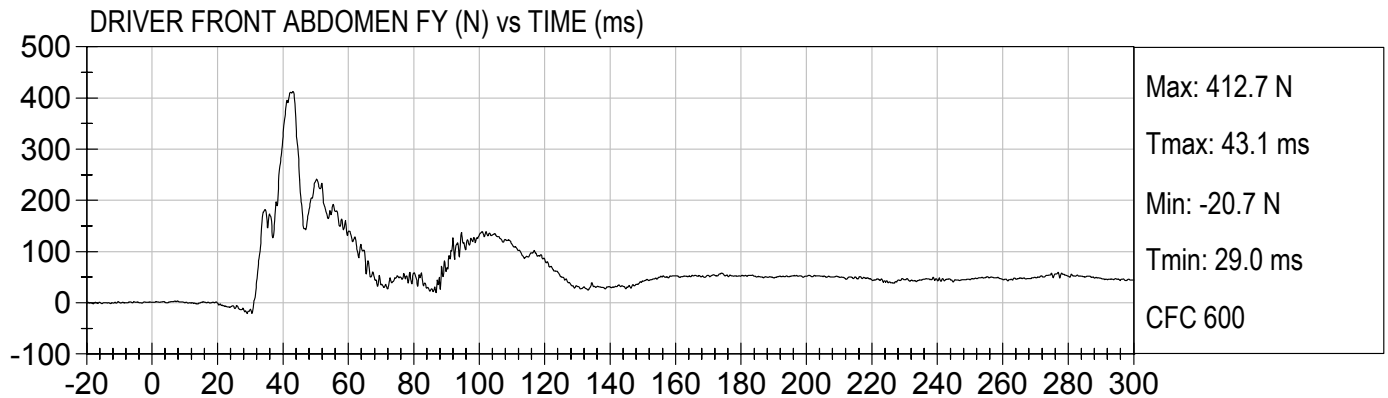


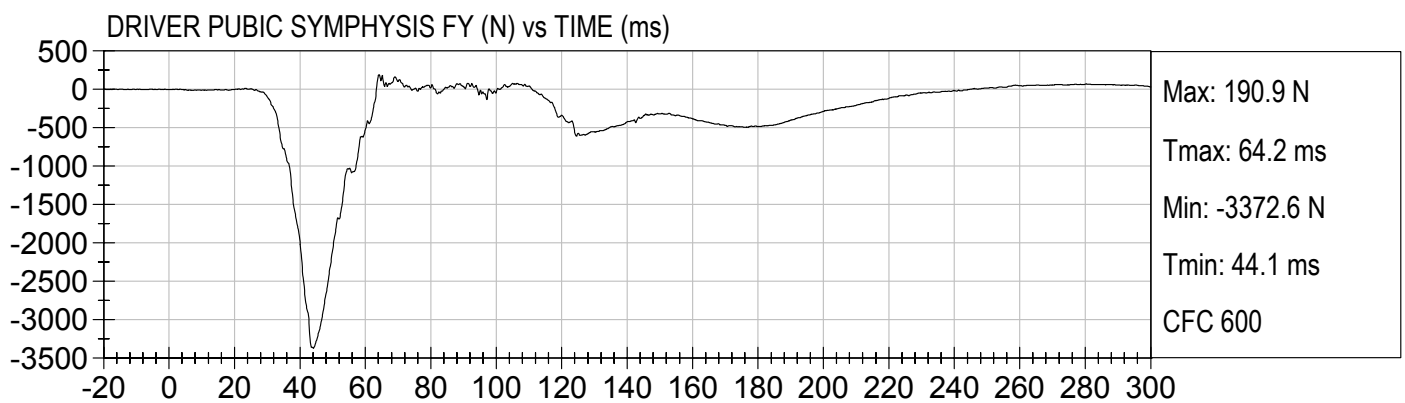
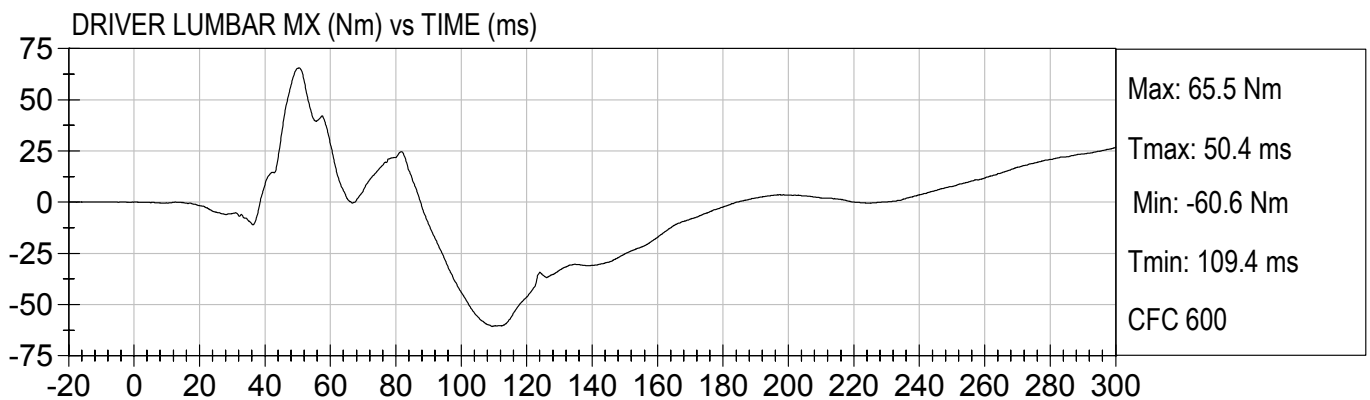
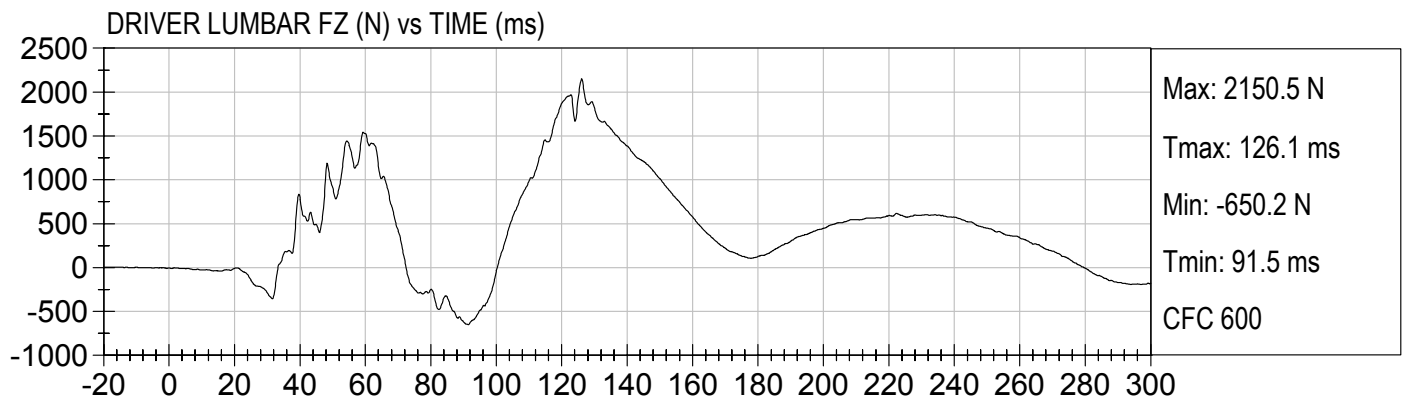
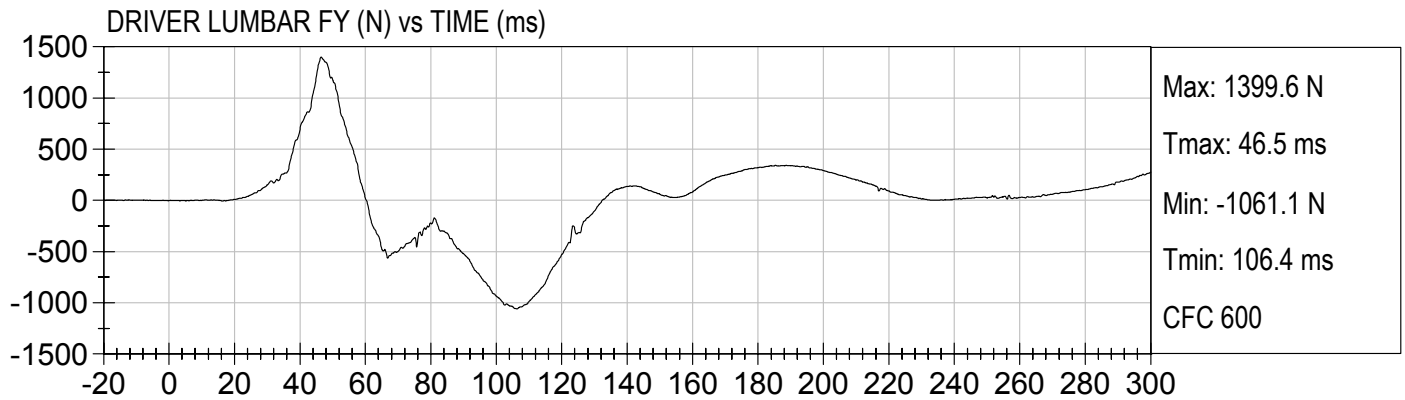
DRIVER T-12 MX (Nm) vs TIME (ms)

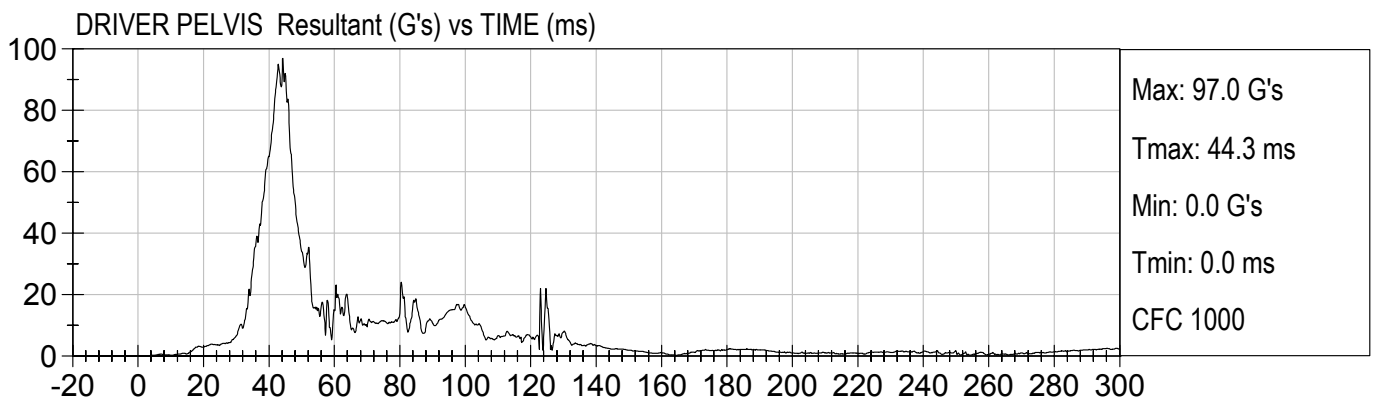
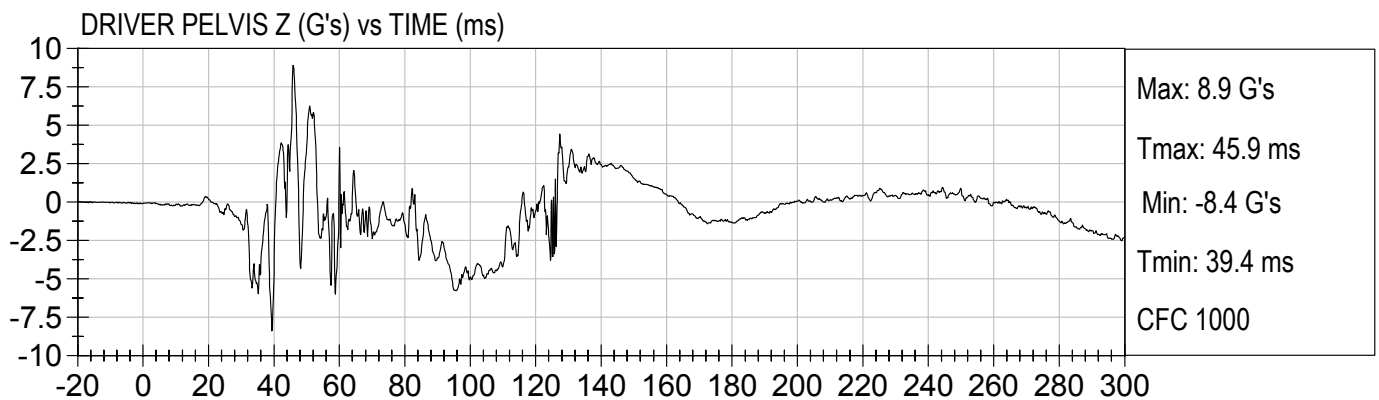
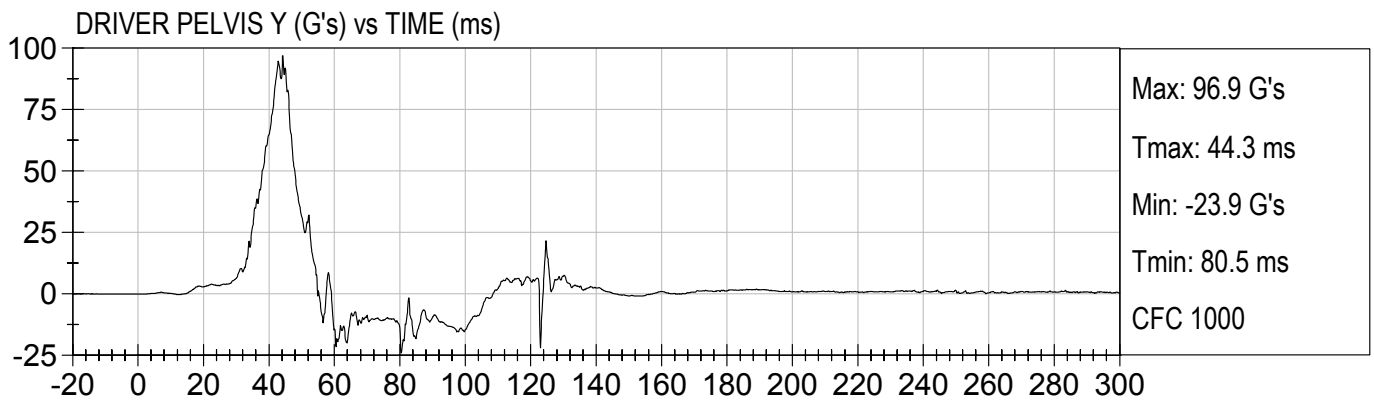
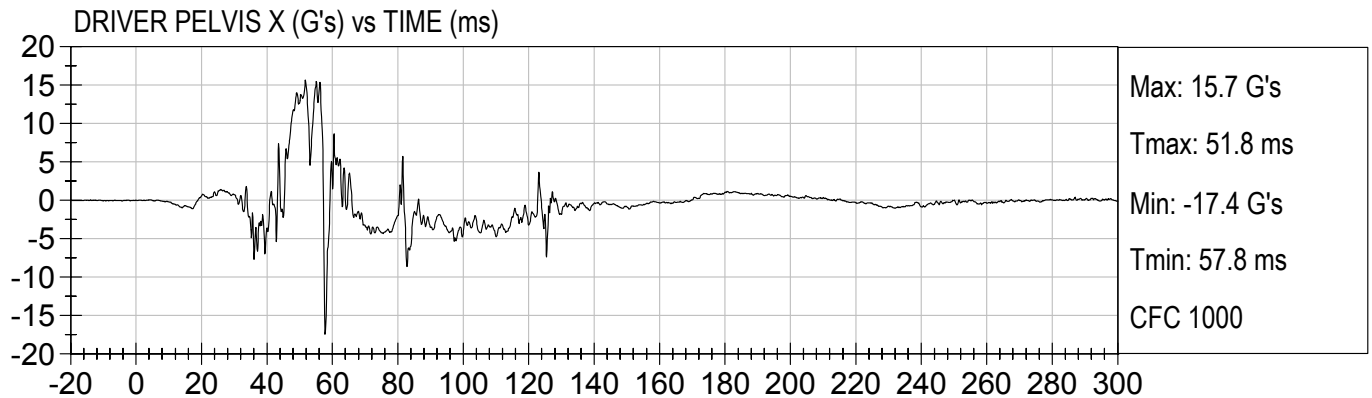


DRIVER T-12 MY (Nm) vs TIME (ms)



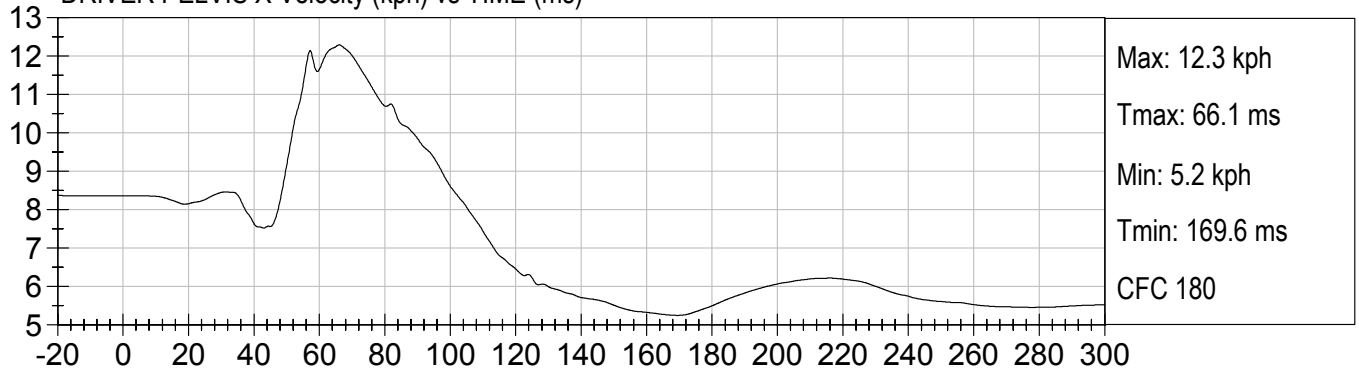




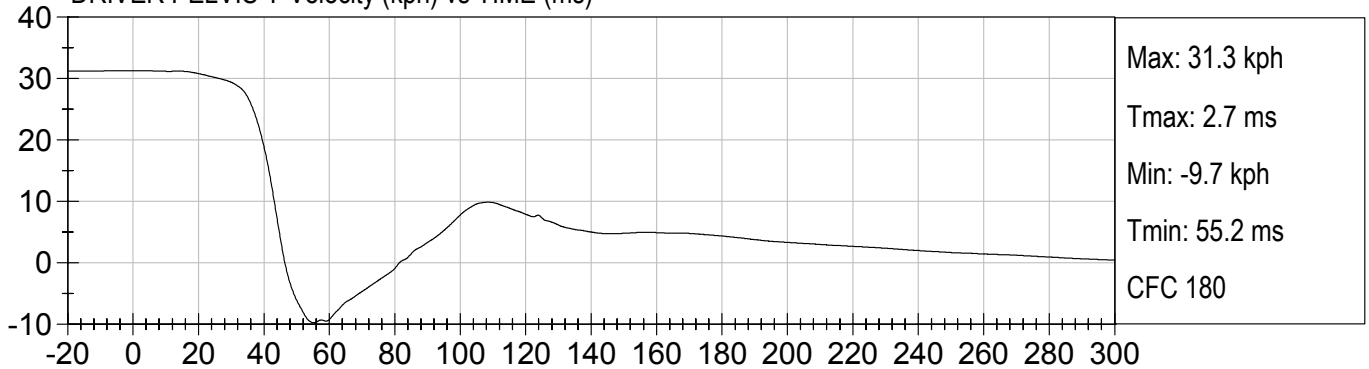




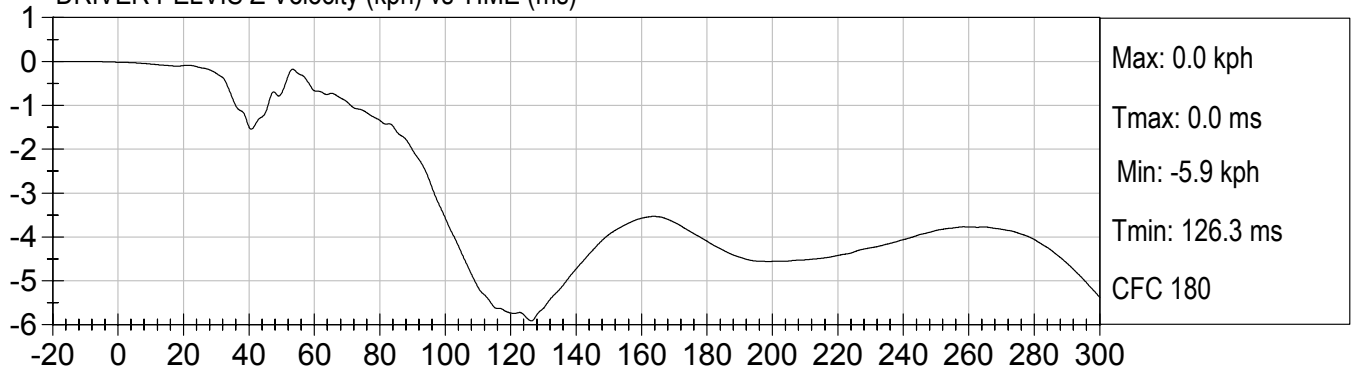
DRIVER PELVIS X Velocity (kph) vs TIME (ms)



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

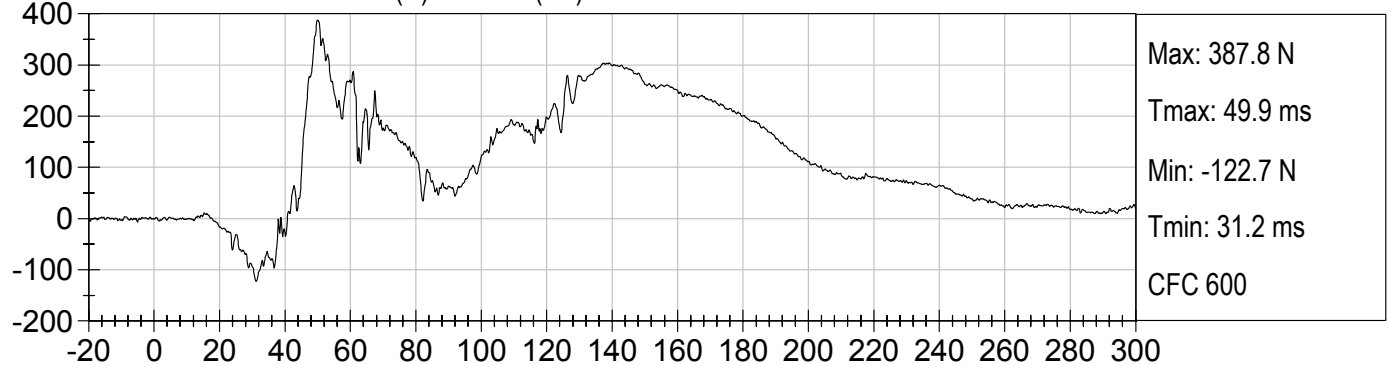


DRIVER PELVIS Z Velocity (kph) vs TIME (ms)

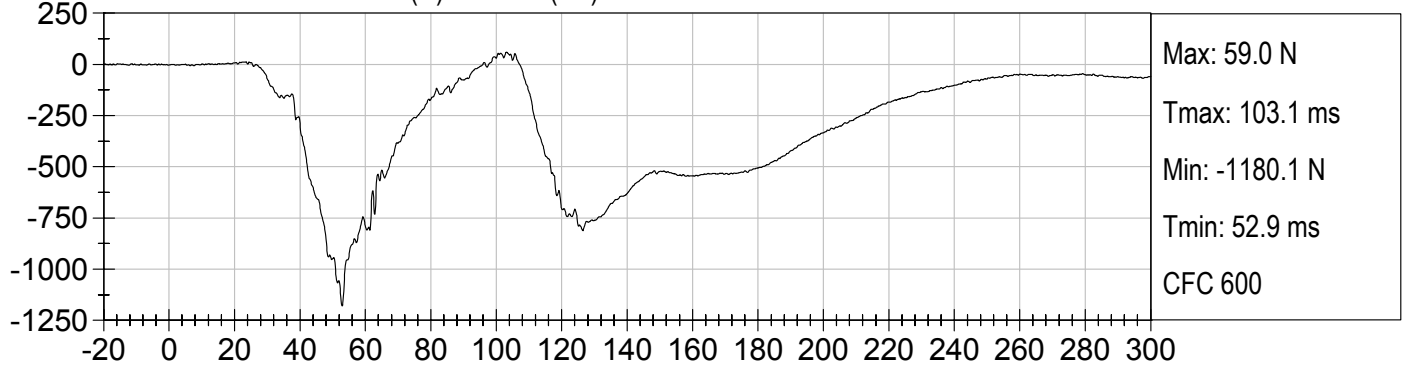




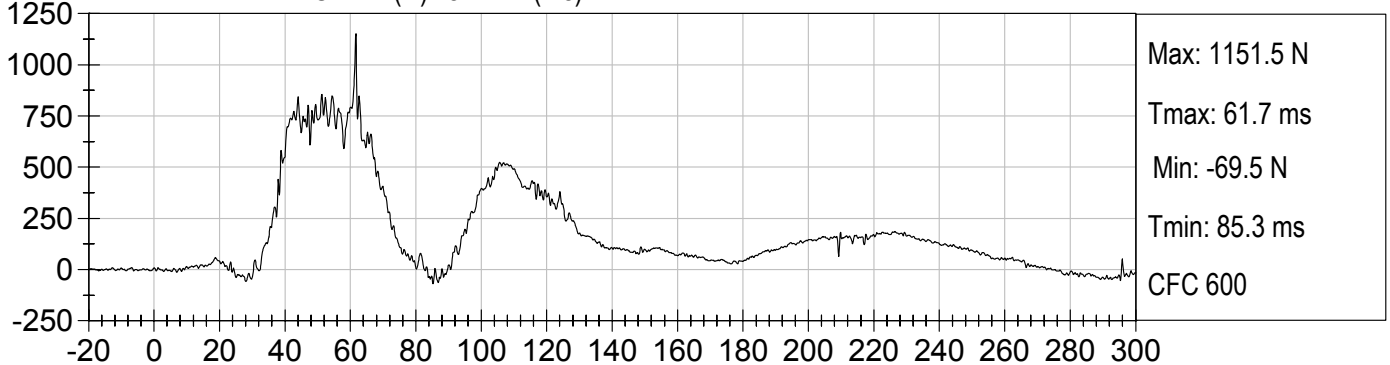
DRIVER LEFT FEMUR FX (N) vs TIME (ms)



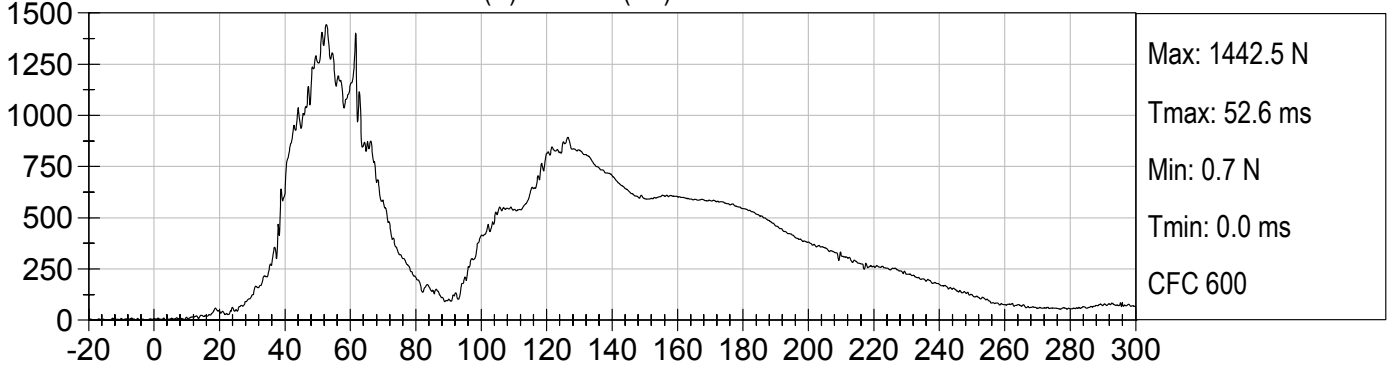
DRIVER LEFT FEMUR FY (N) vs TIME (ms)

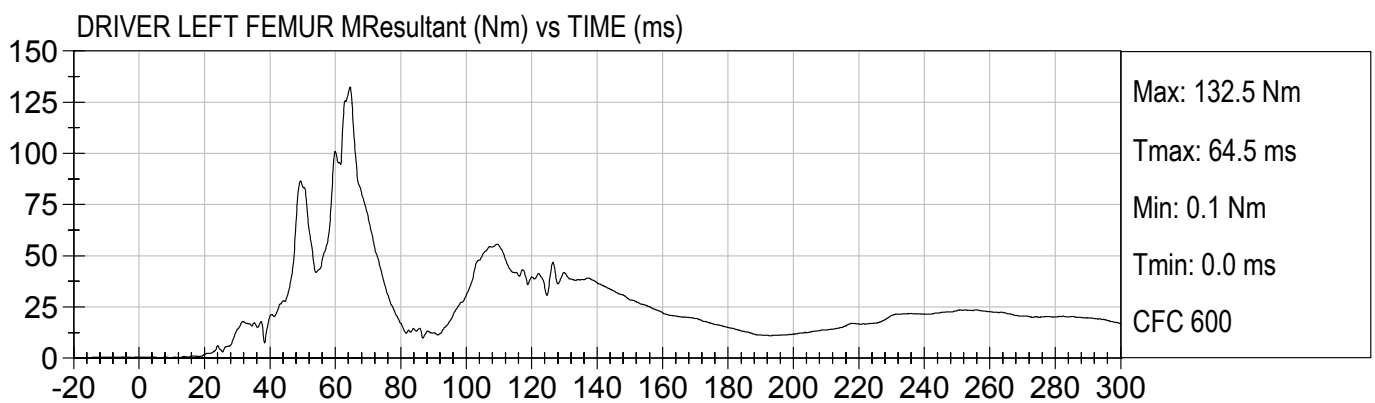
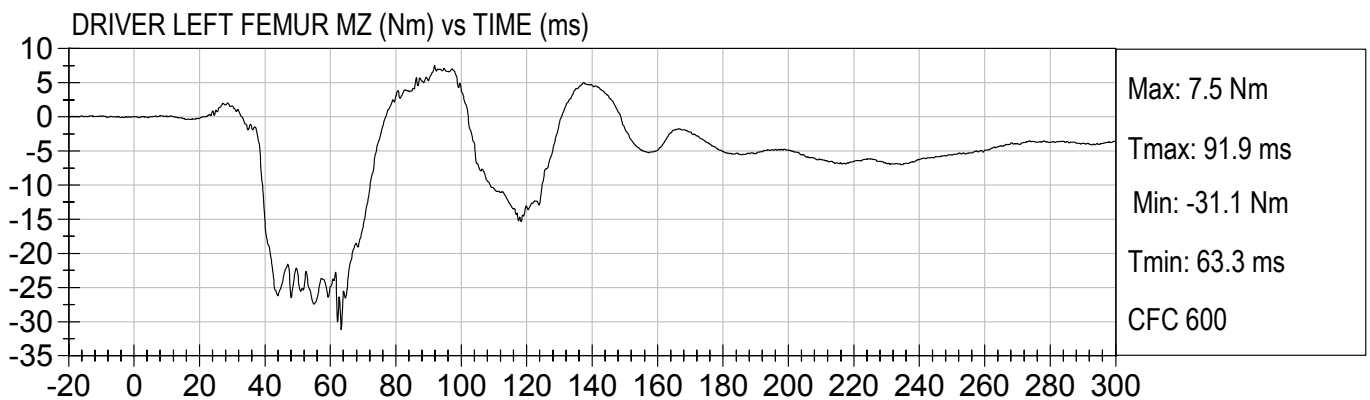
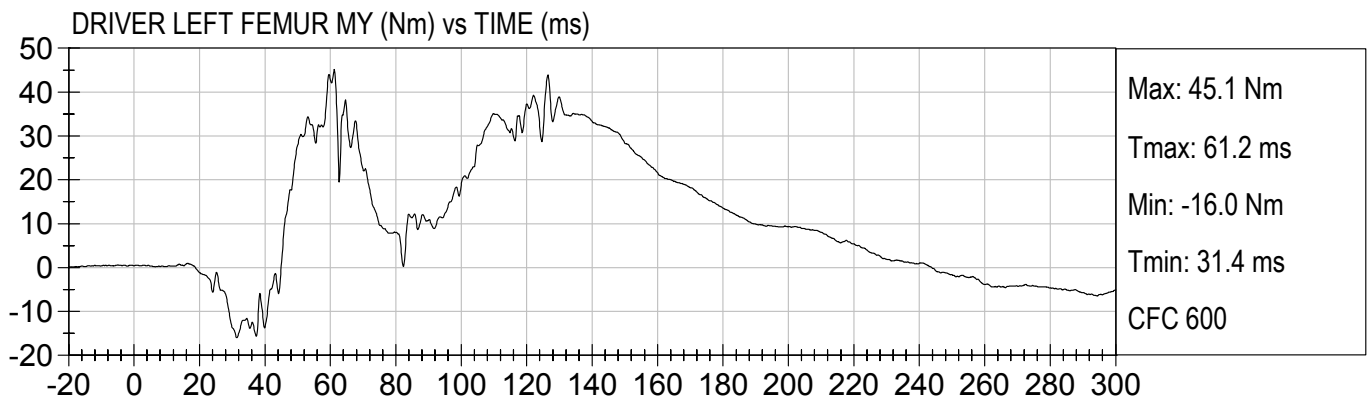
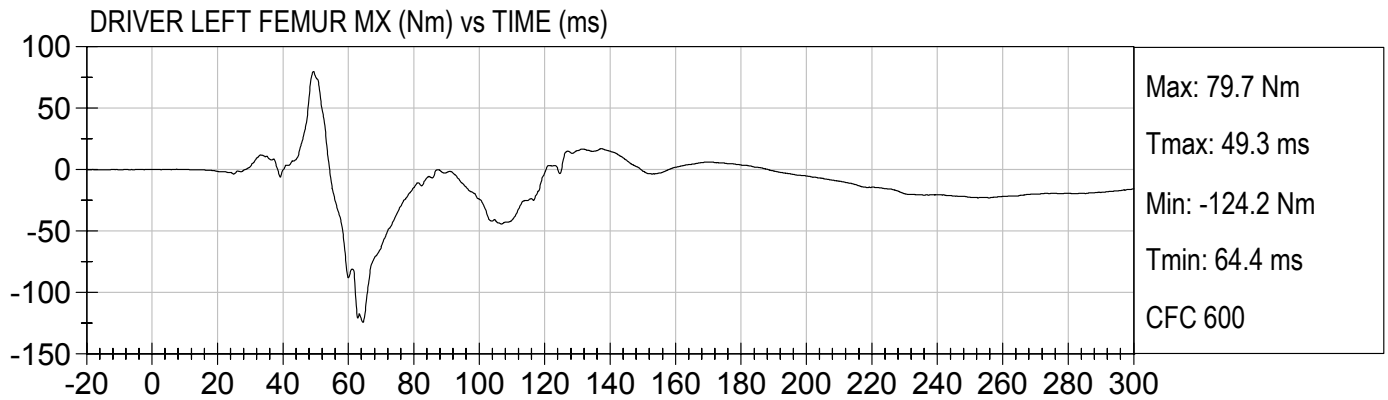


DRIVER LEFT FEMUR FZ (N) vs TIME (ms)



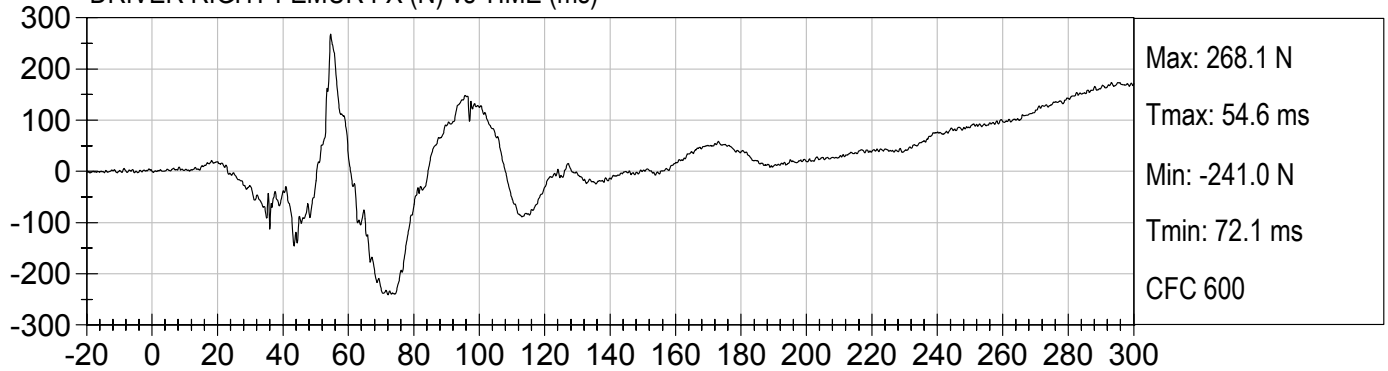
DRIVER LEFT FEMUR FResultant (N) vs TIME (ms)



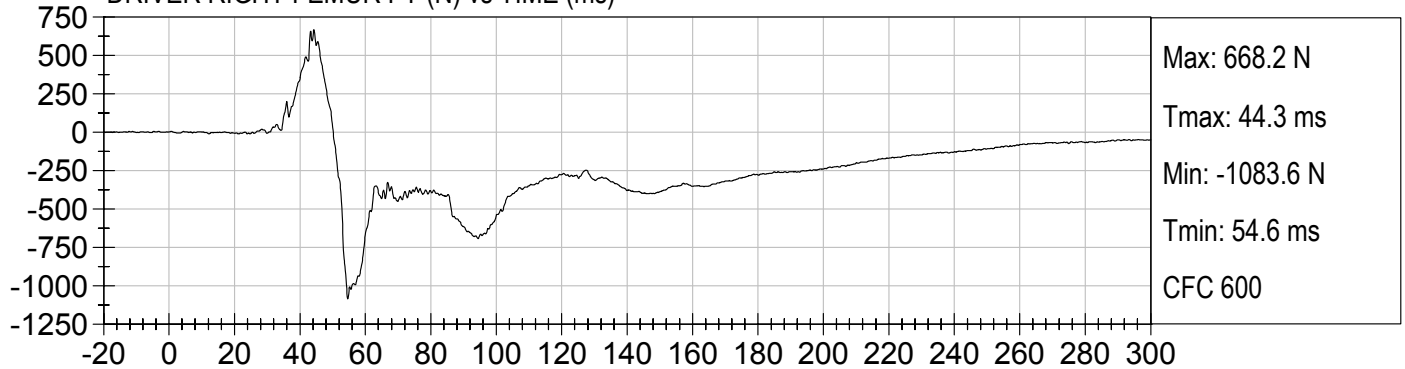




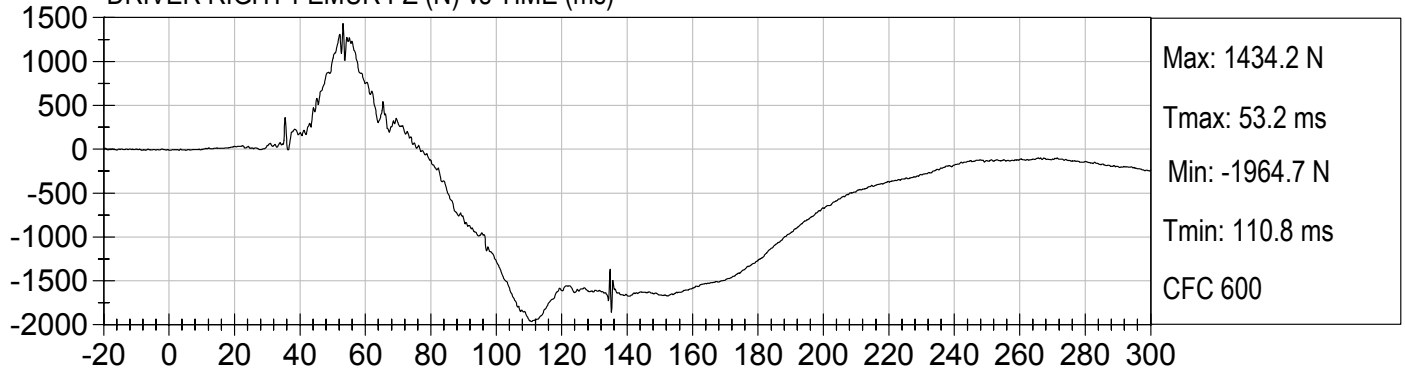
DRIVER RIGHT FEMUR FX (N) vs TIME (ms)



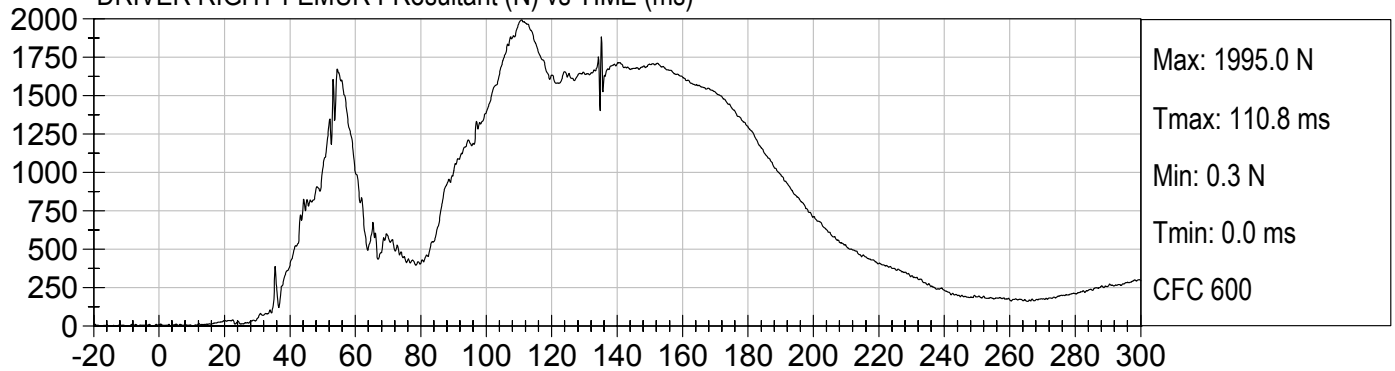
DRIVER RIGHT FEMUR FY (N) vs TIME (ms)

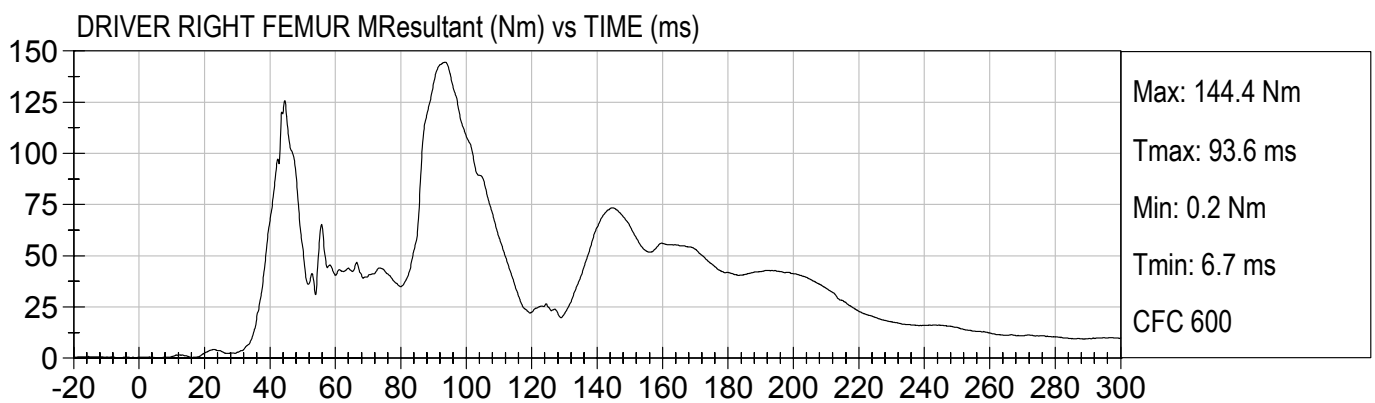
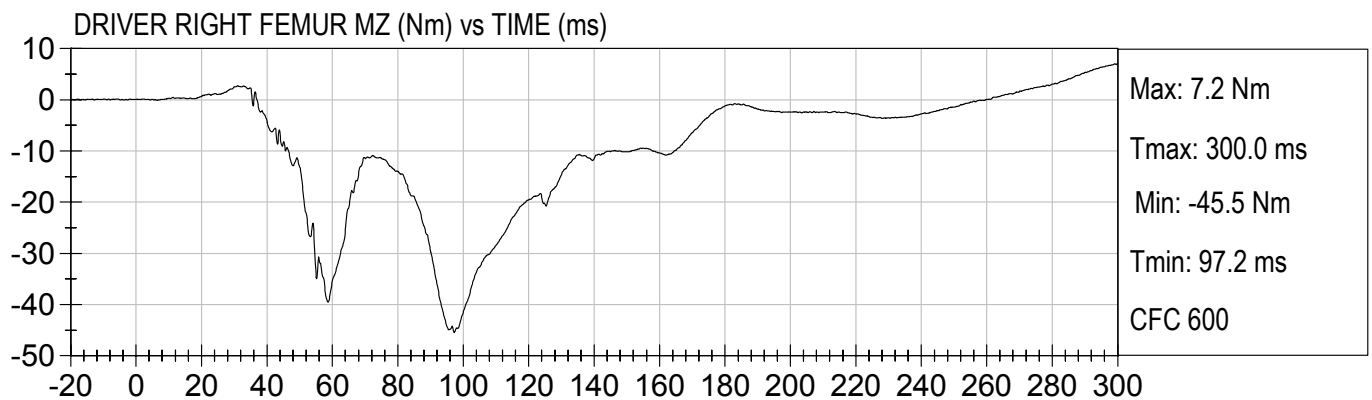
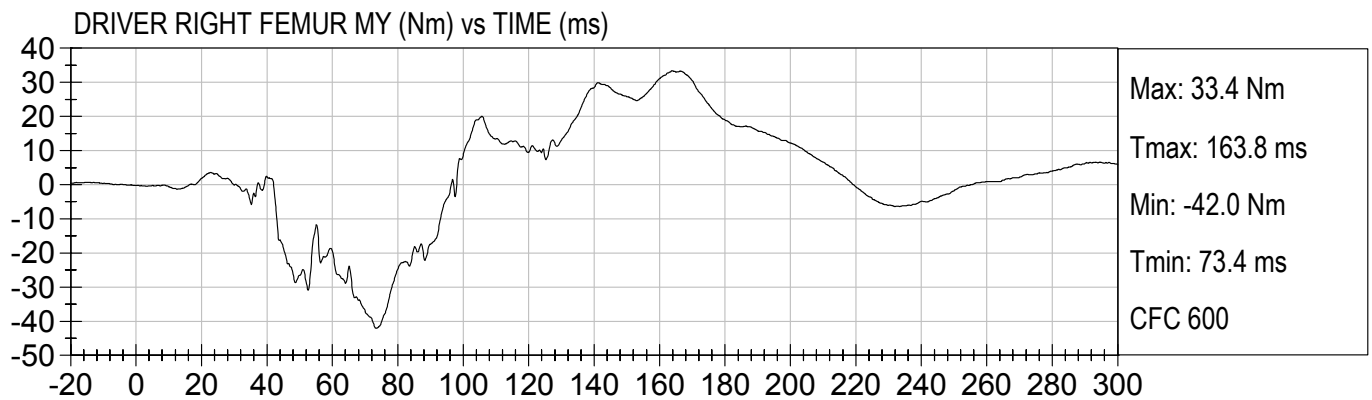
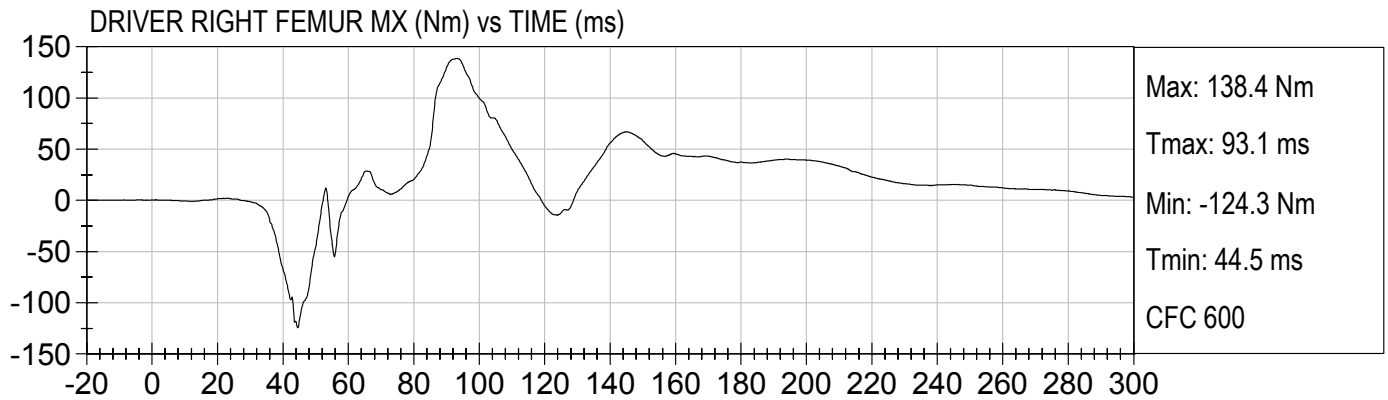


DRIVER RIGHT FEMUR FZ (N) vs TIME (ms)



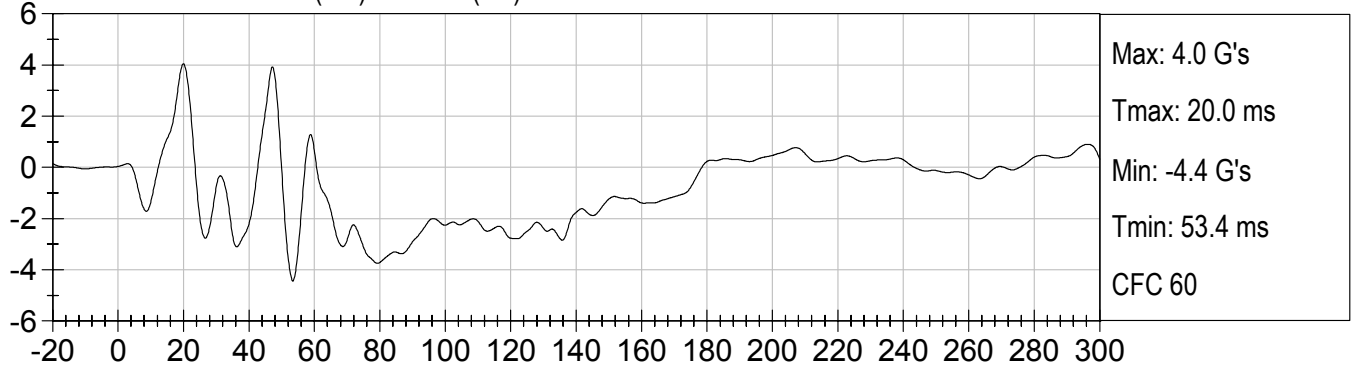
DRIVER RIGHT FEMUR FResultant (N) vs TIME (ms)



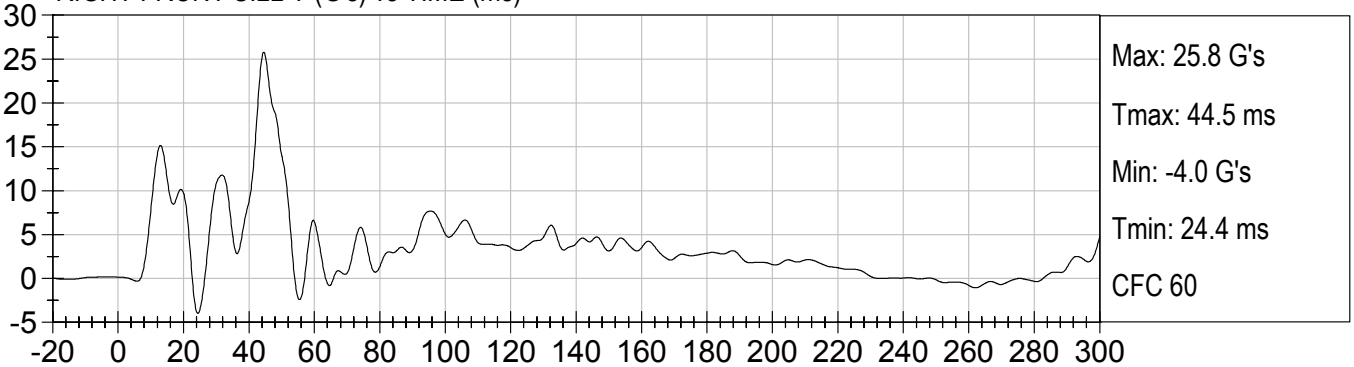




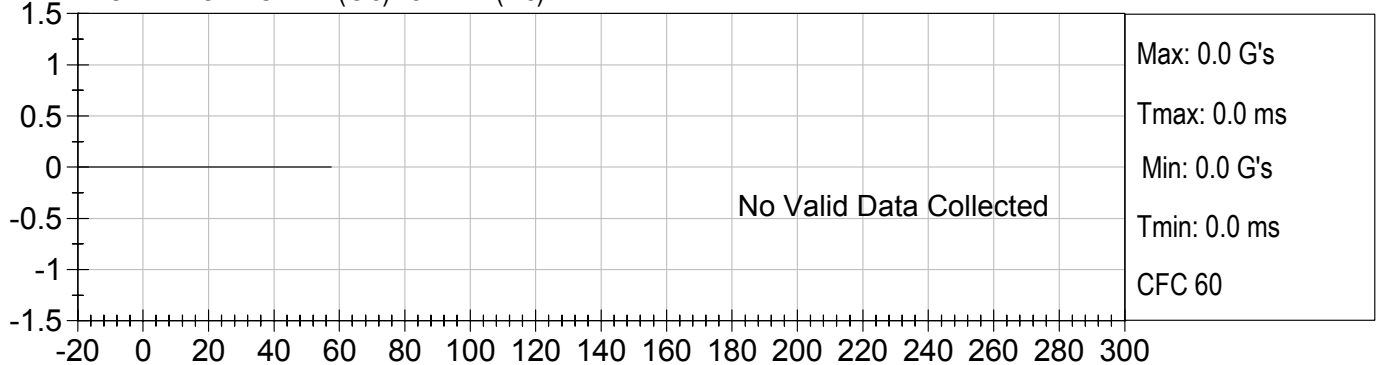
RIGHT FRONT SILL X (G's) vs TIME (ms)



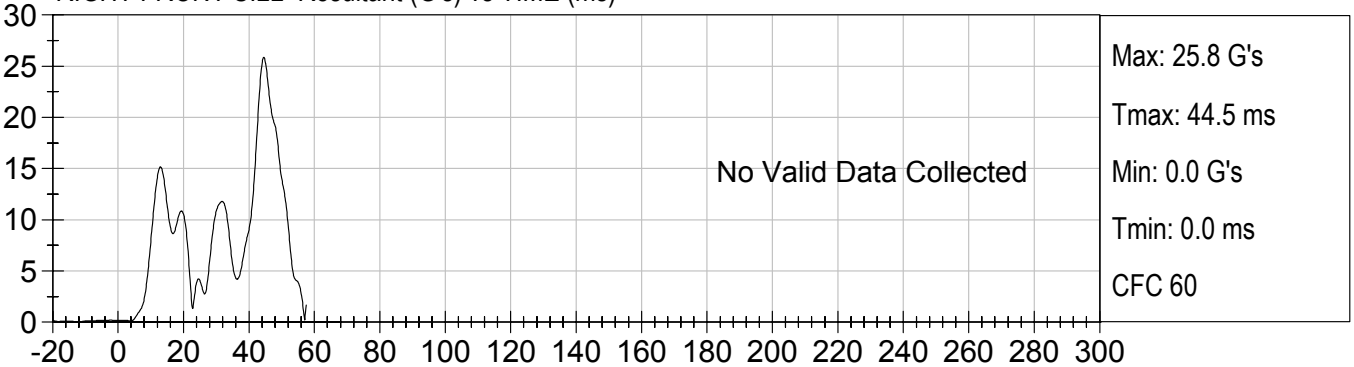
RIGHT FRONT SILL Y (G's) vs TIME (ms)

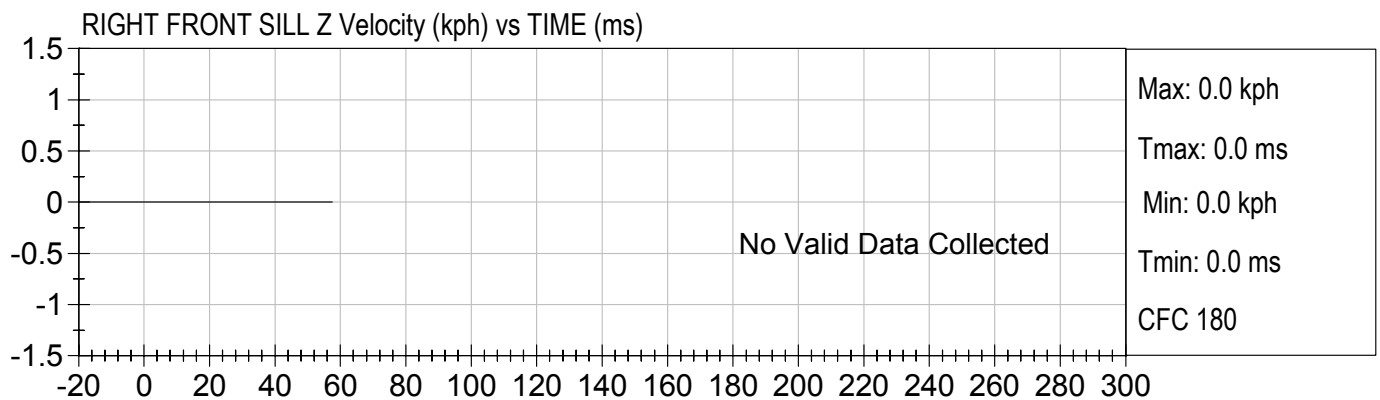
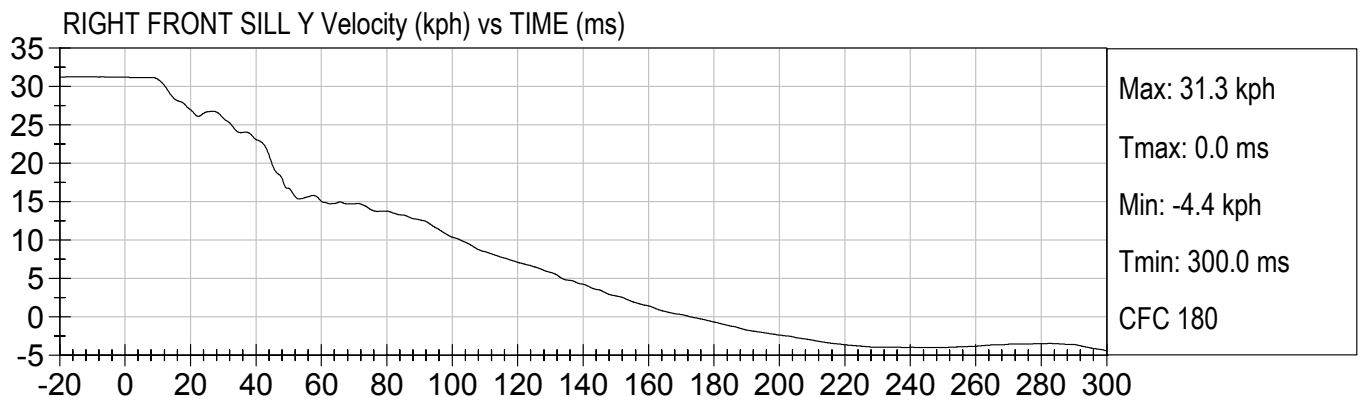
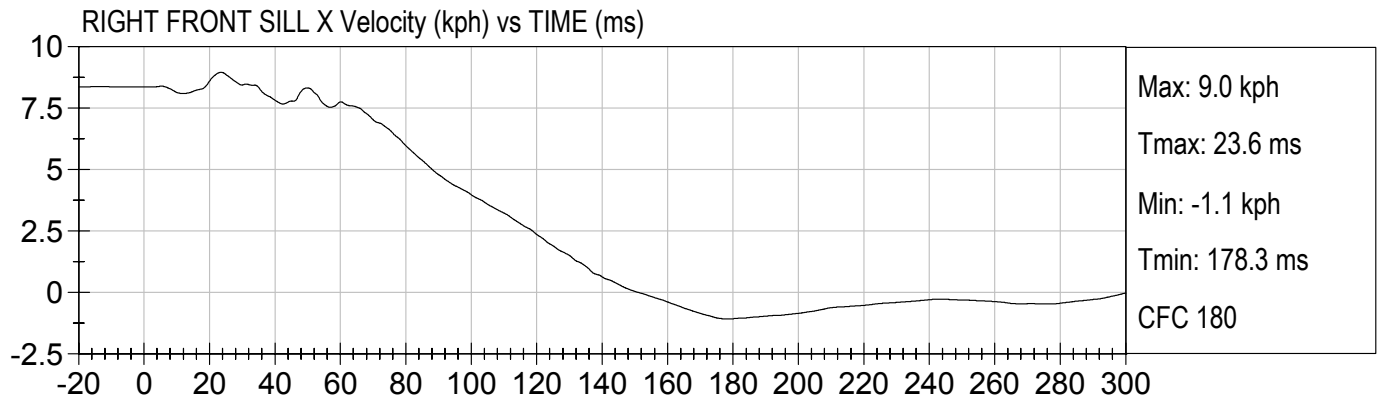


RIGHT FRONT SILL Z (G's) vs TIME (ms)



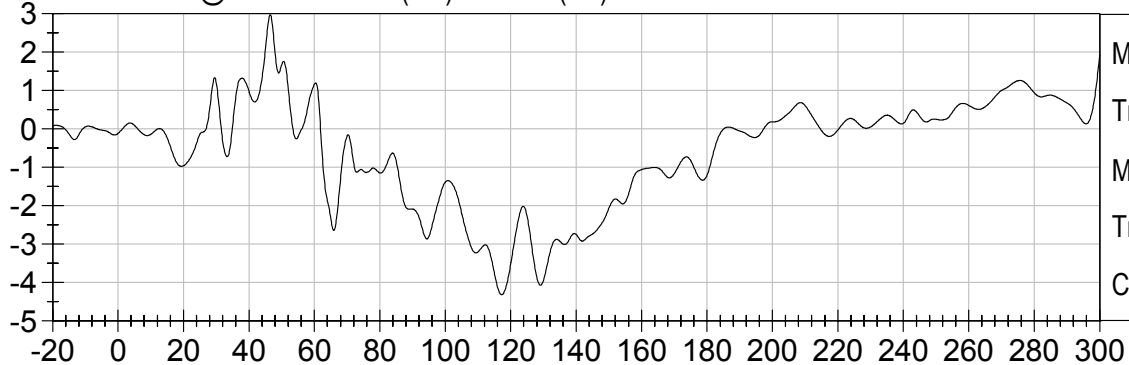
RIGHT FRONT SILL Resultant (G's) vs TIME (ms)



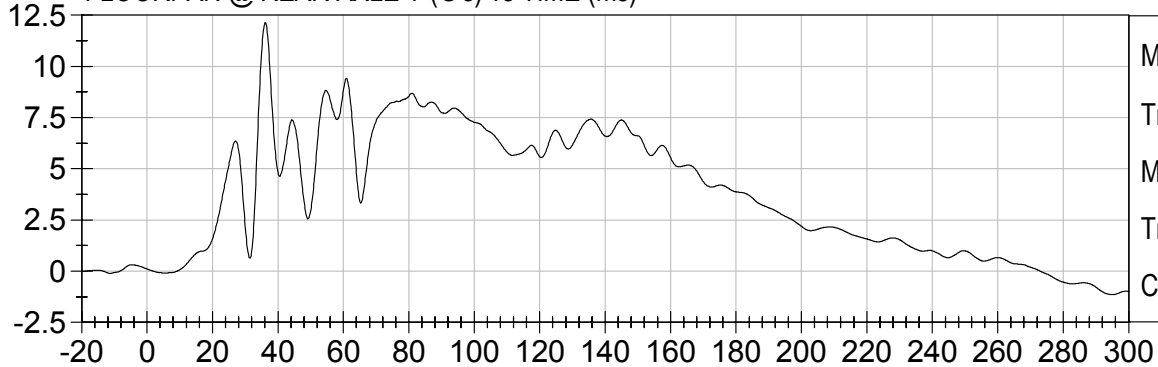




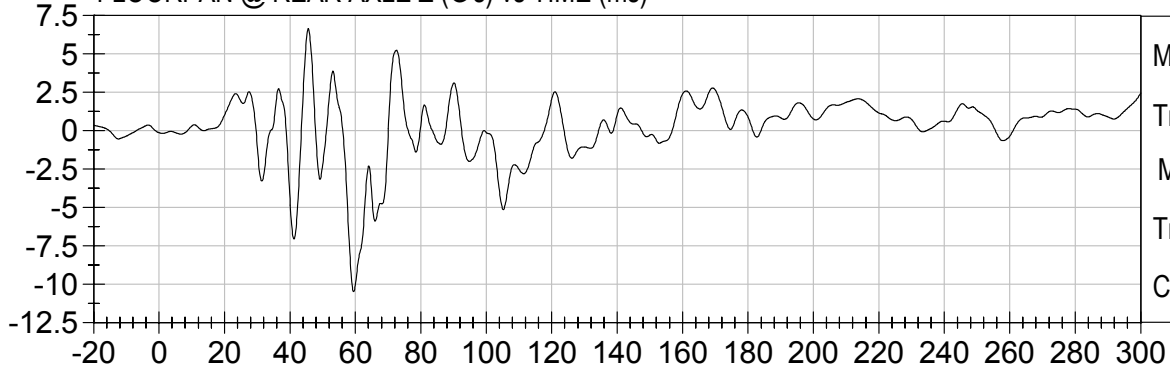
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



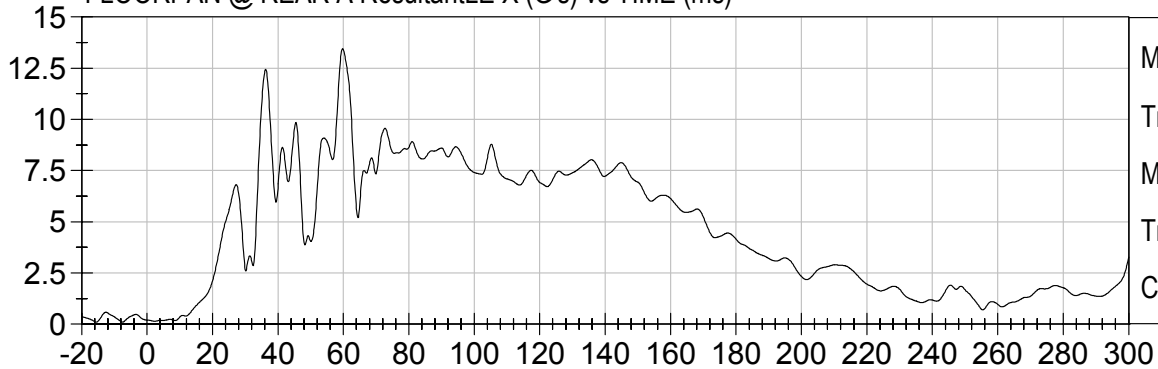
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)



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

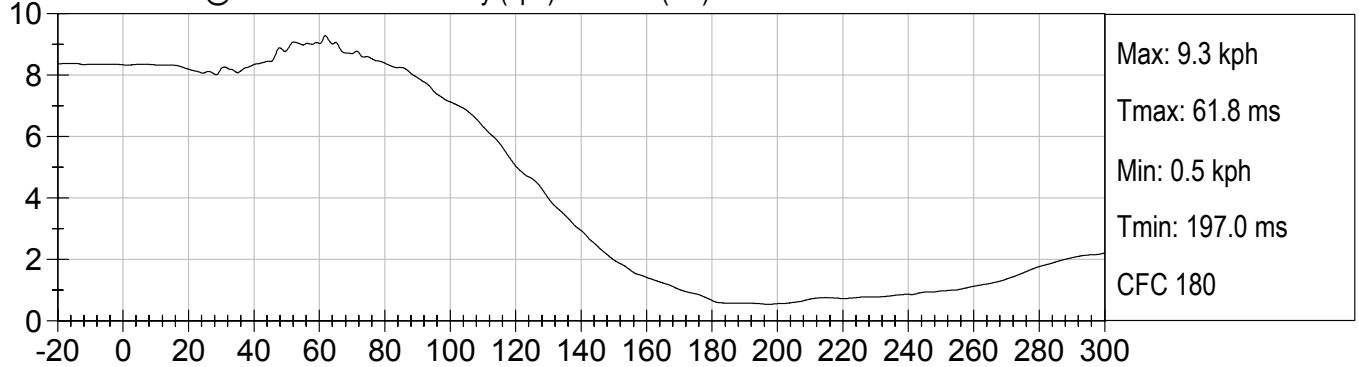


FLOORPAN @ REAR A ResultantLE X (G's) vs TIME (ms)

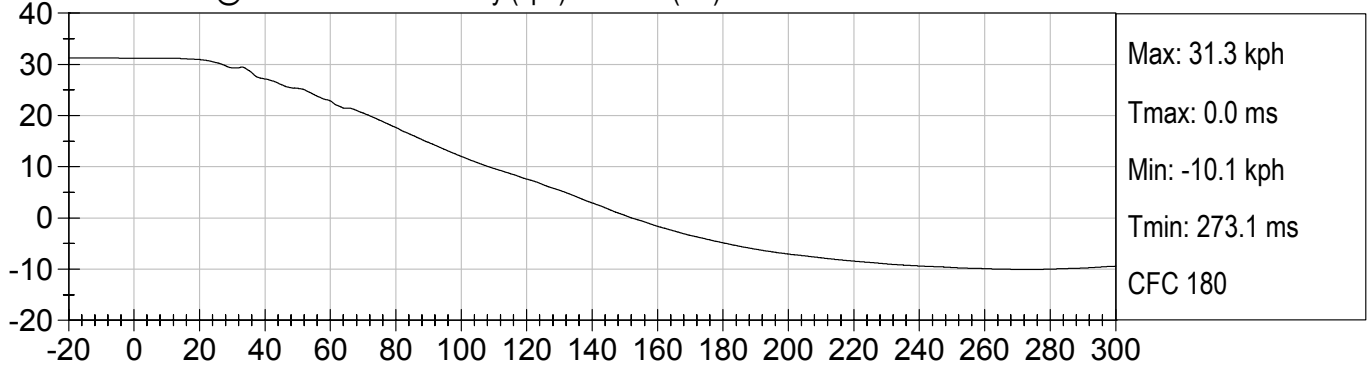




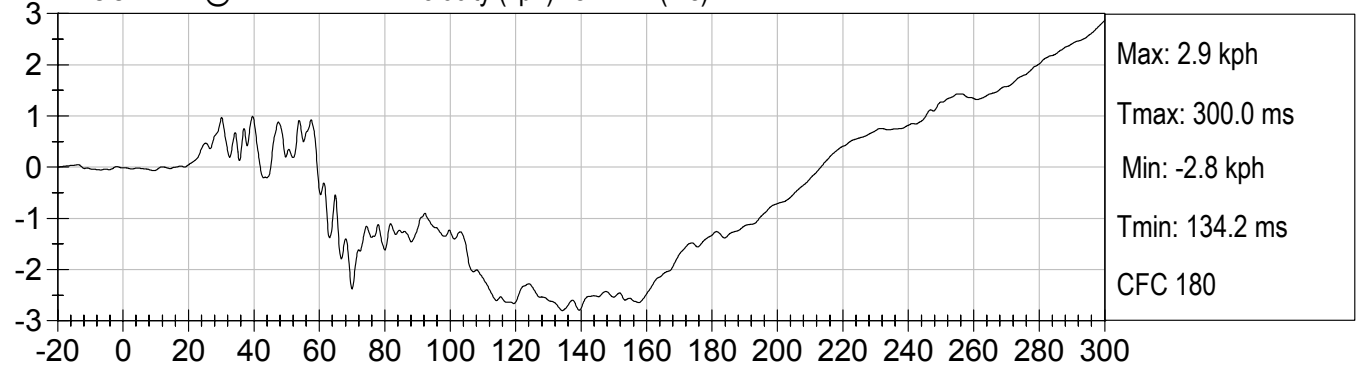
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)

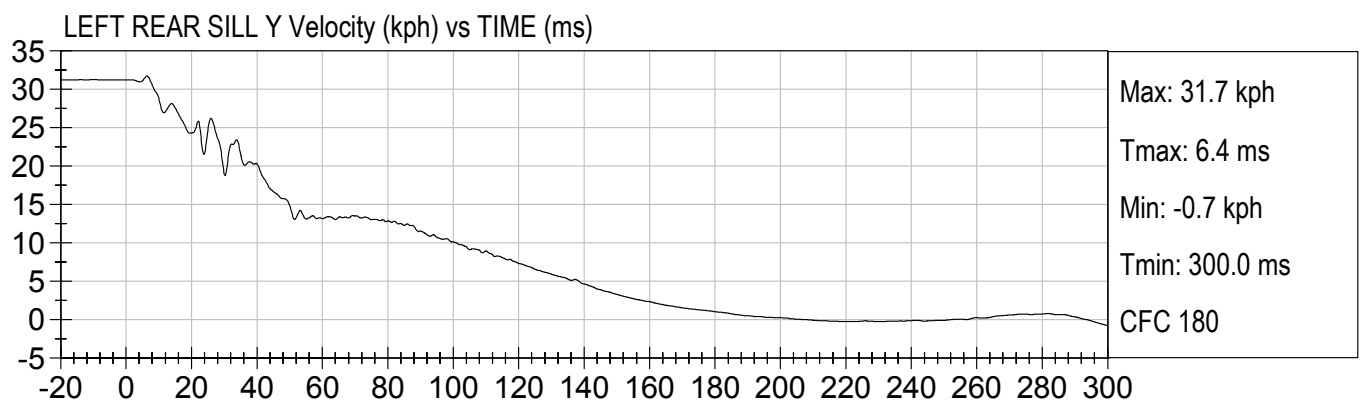
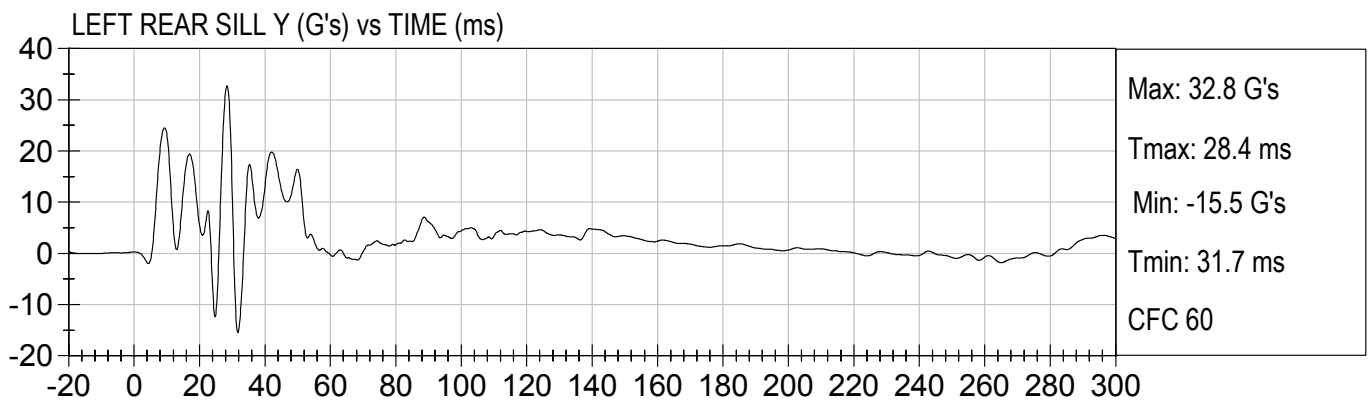
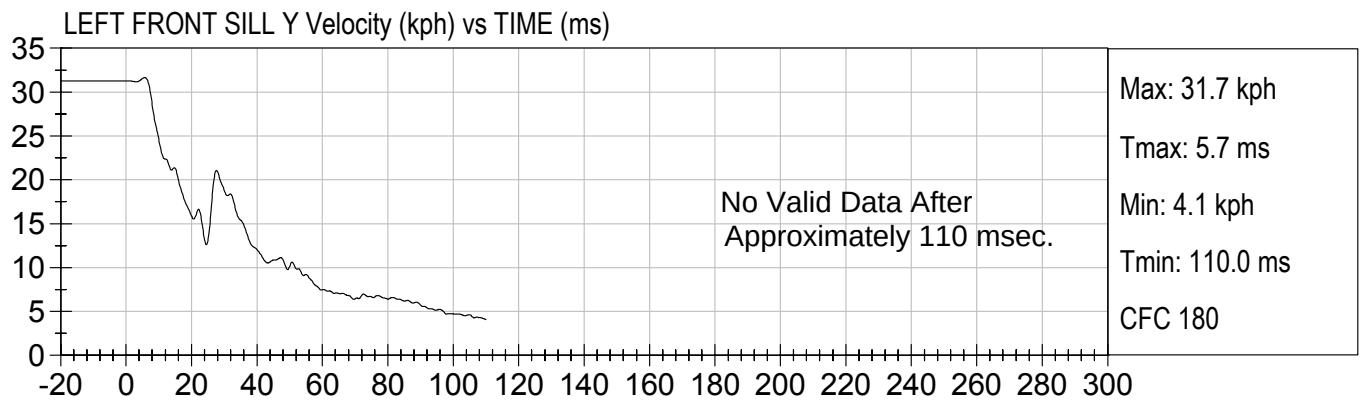
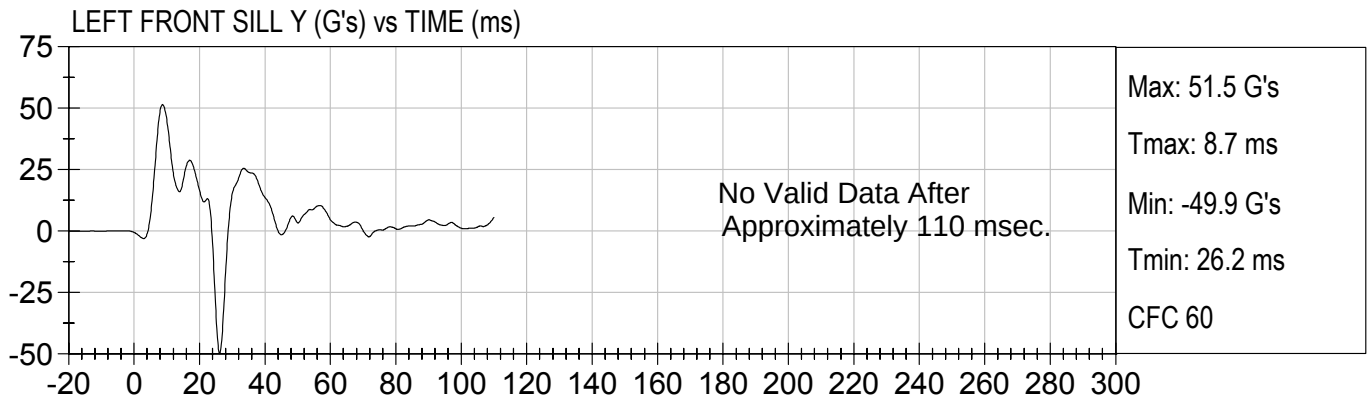


FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)



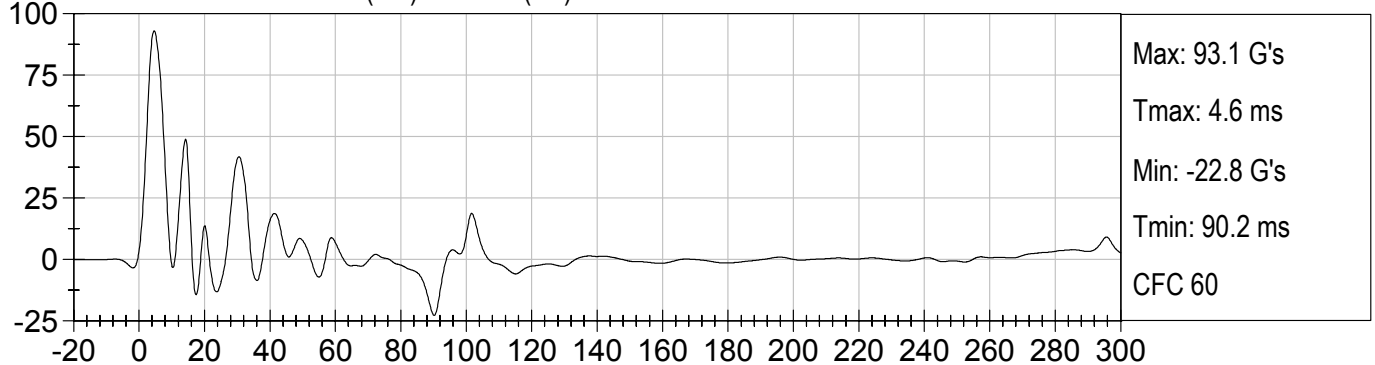
FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)



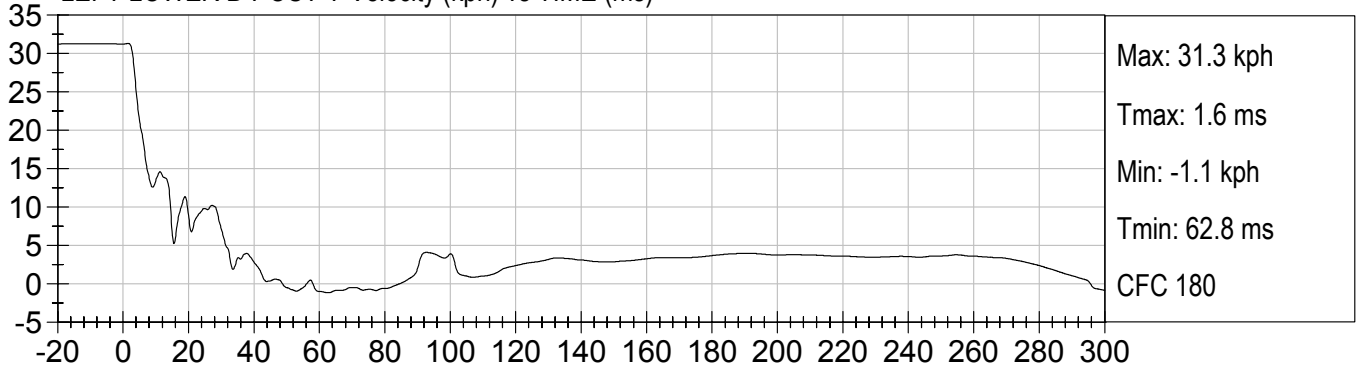




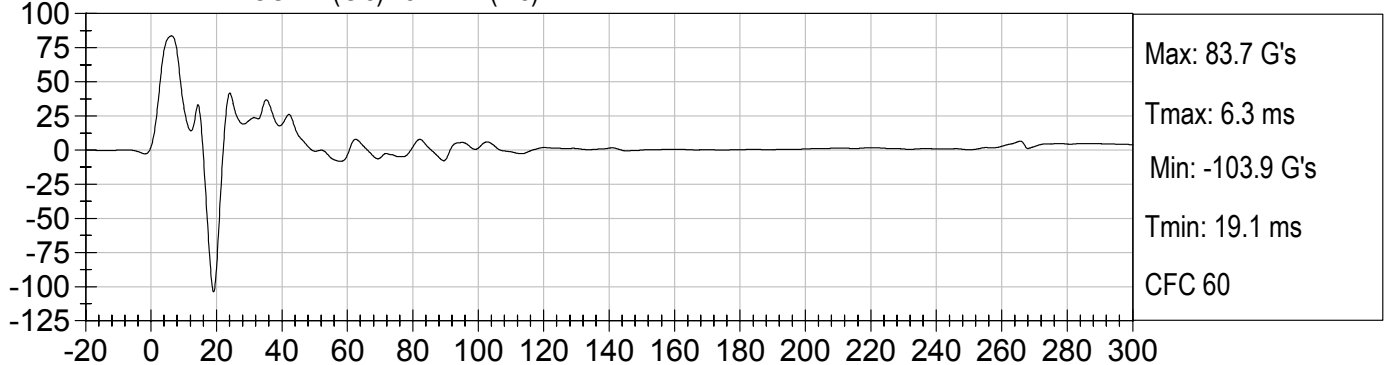
LEFT LOWER B-POST Y (G's) vs TIME (ms)



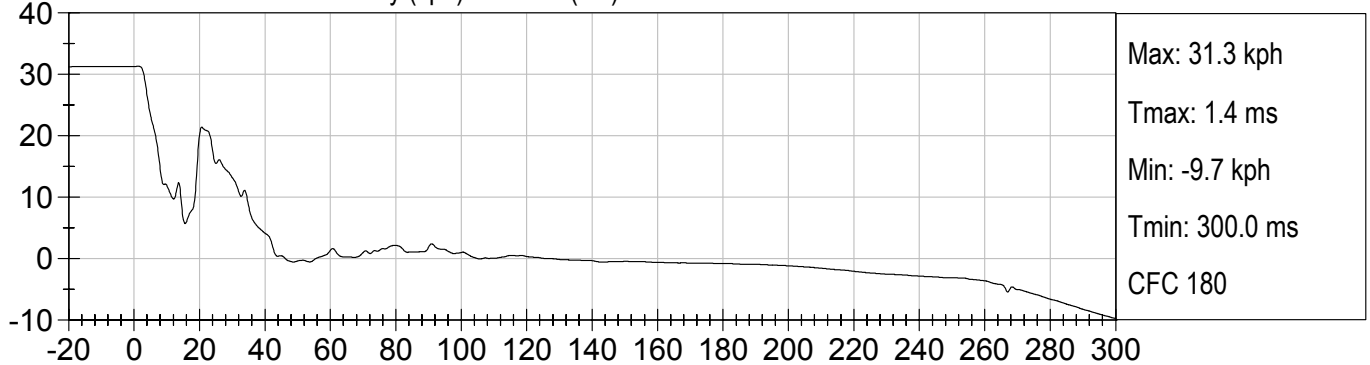
LEFT LOWER B-POST Y Velocity (kph) vs TIME (ms)



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

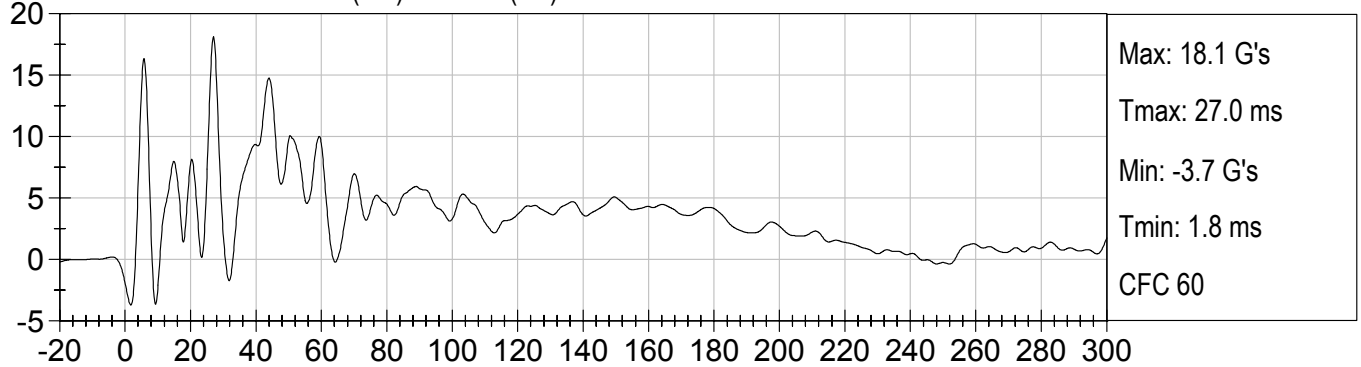


LEFT MID B-POST Y Velocity (kph) vs TIME (ms)

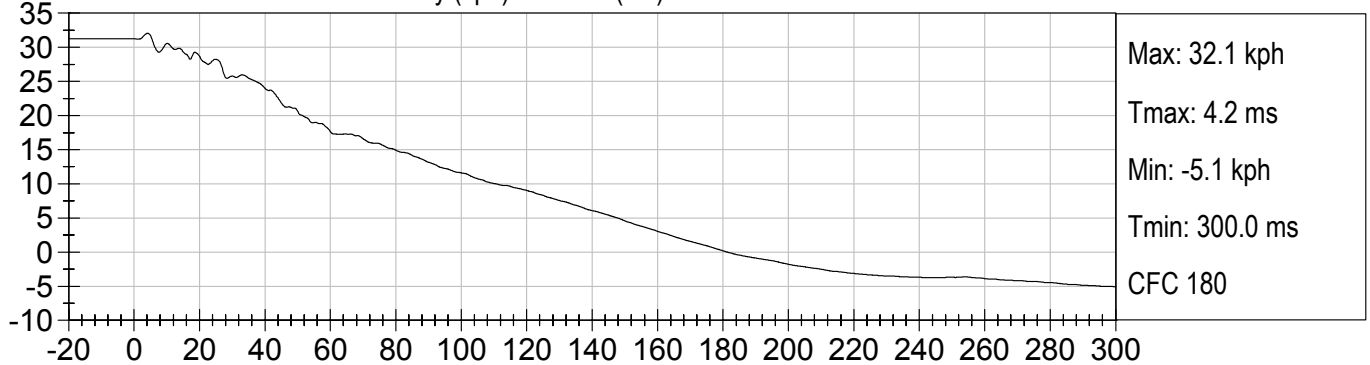




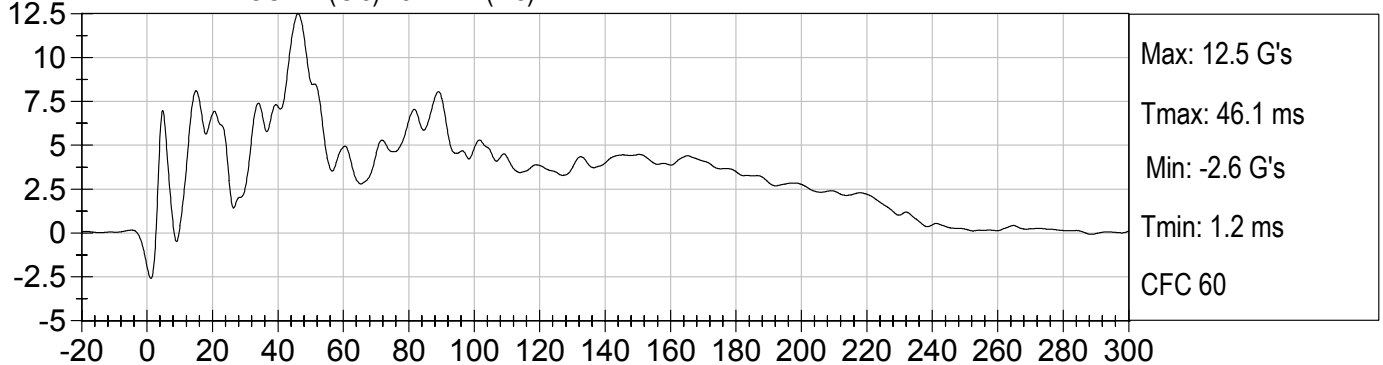
LEFT LOWER A-POST Y (G's) vs TIME (ms)



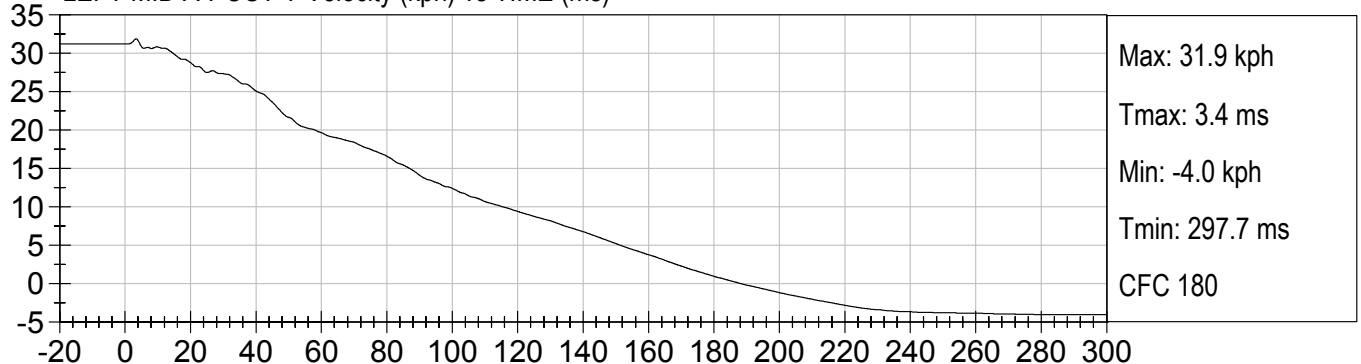
LEFT LOWER A-POST Y Velocity (kph) vs TIME (ms)

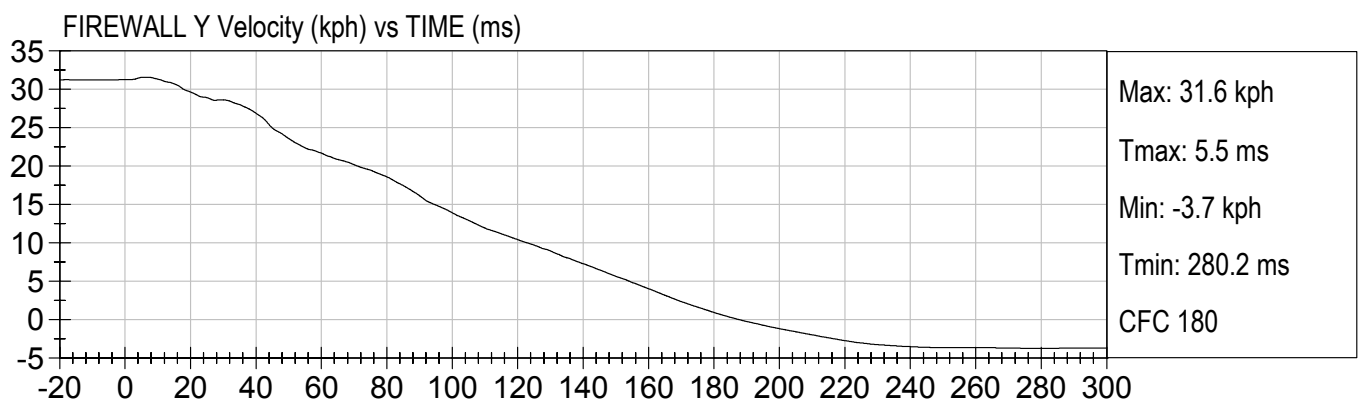
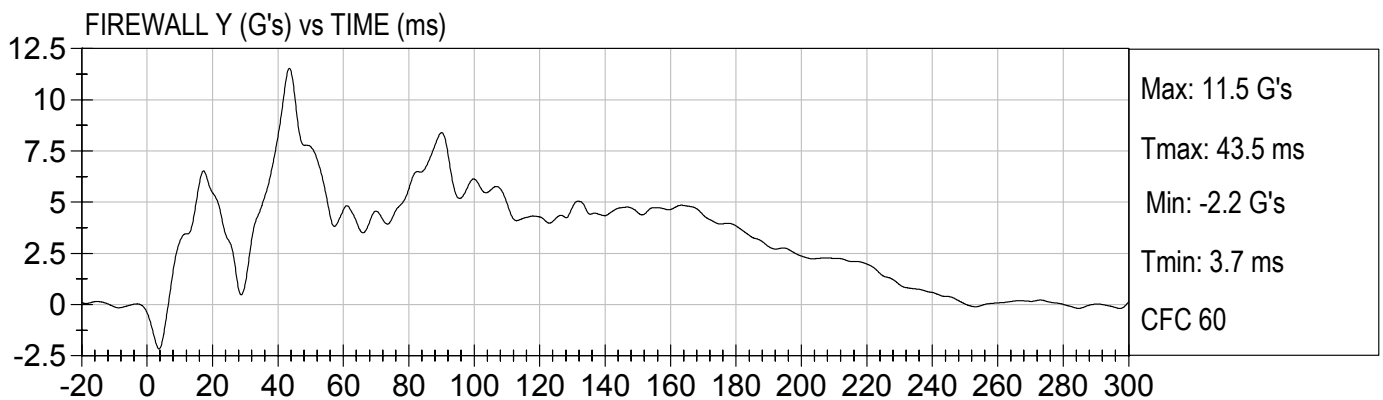
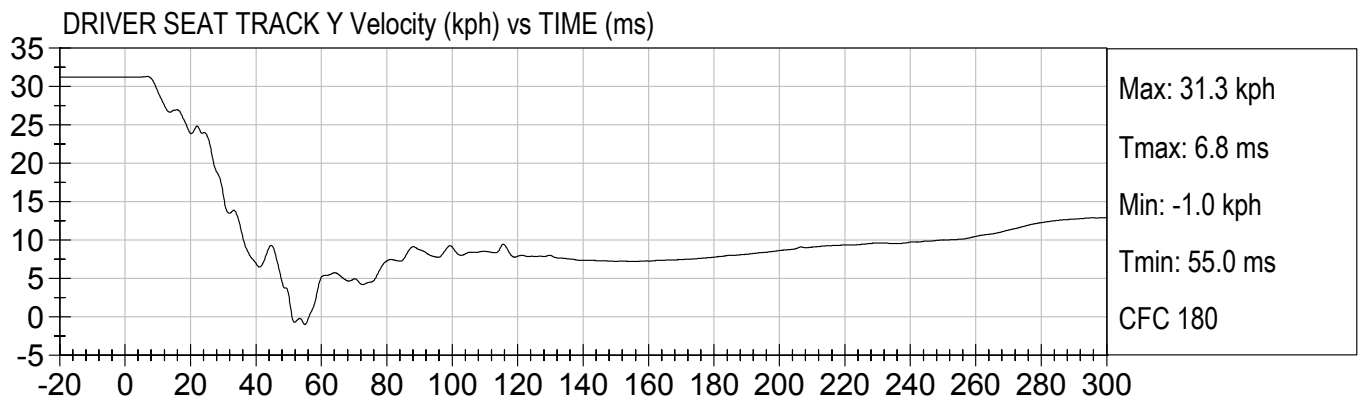
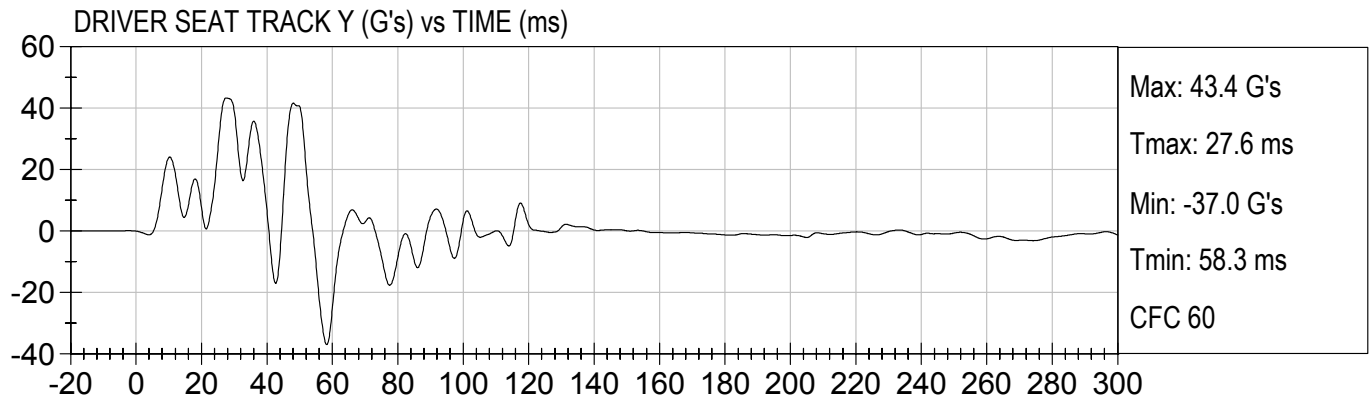


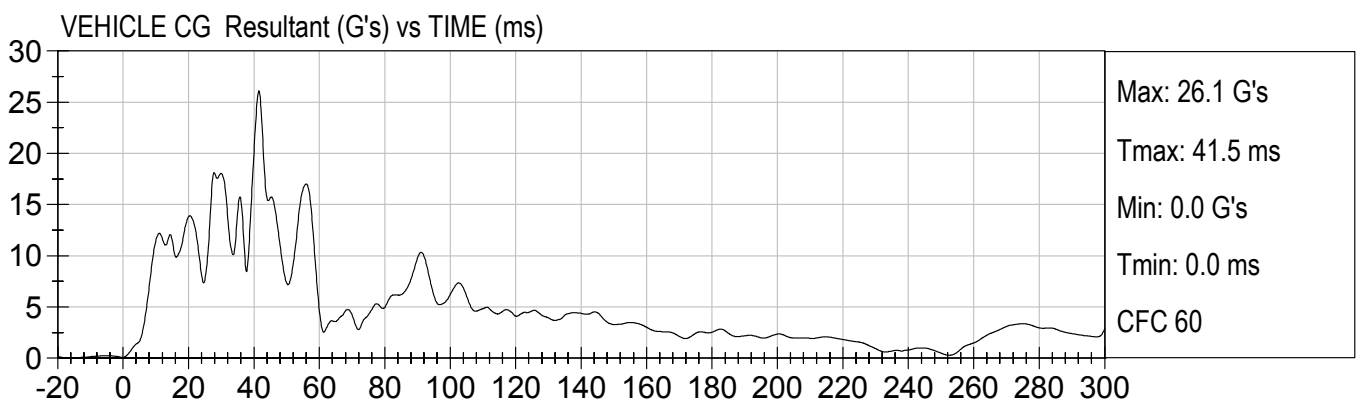
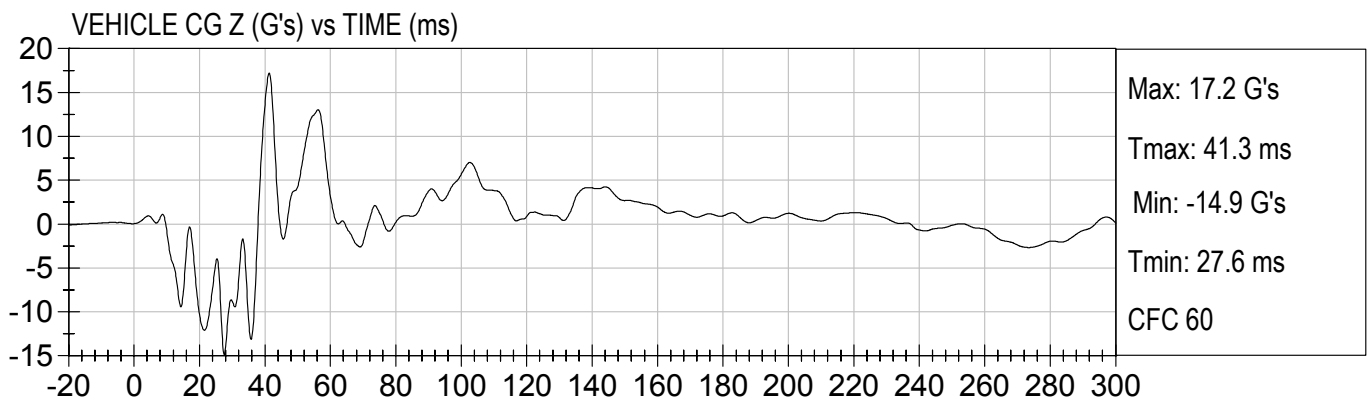
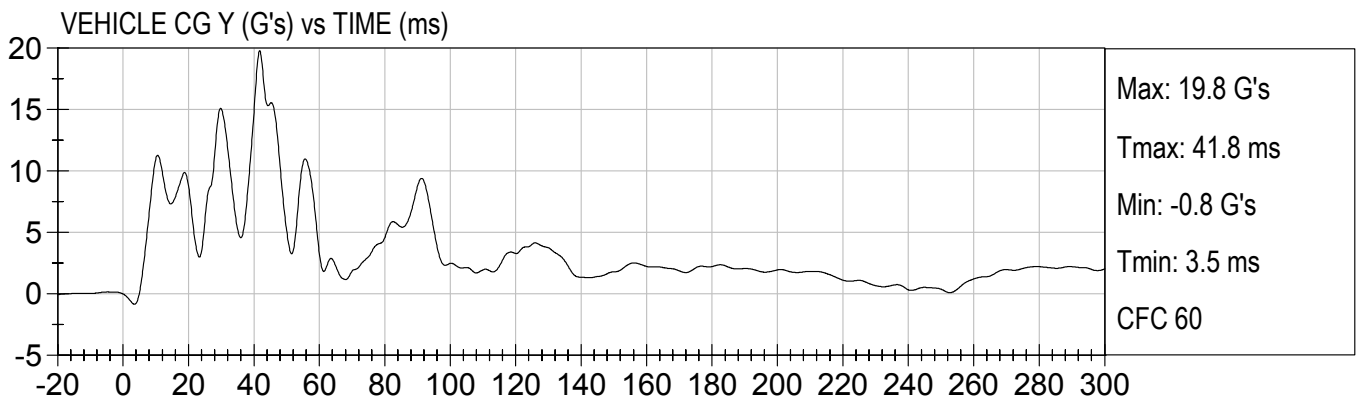
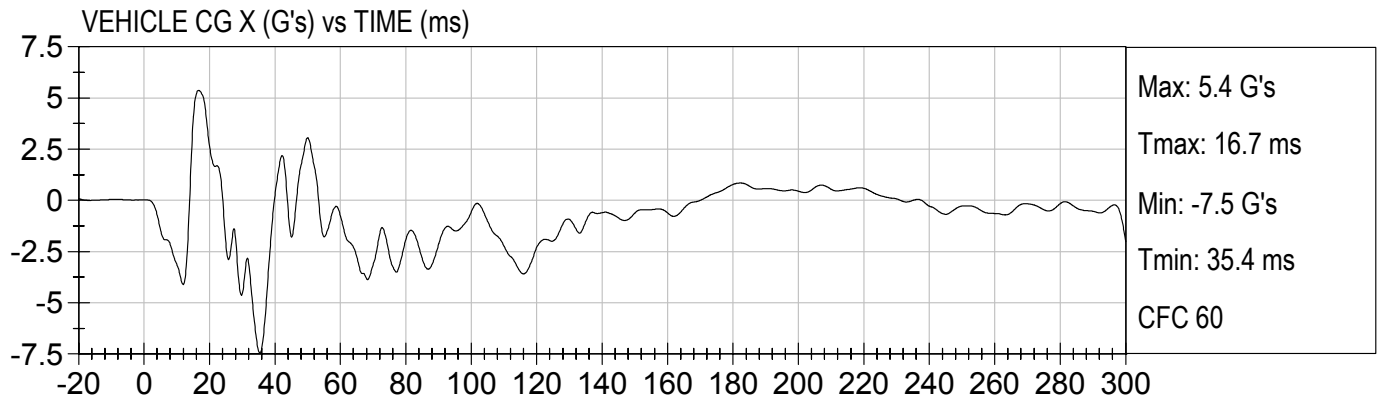
LEFT MID A-POST Y (G's) vs TIME (ms)



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

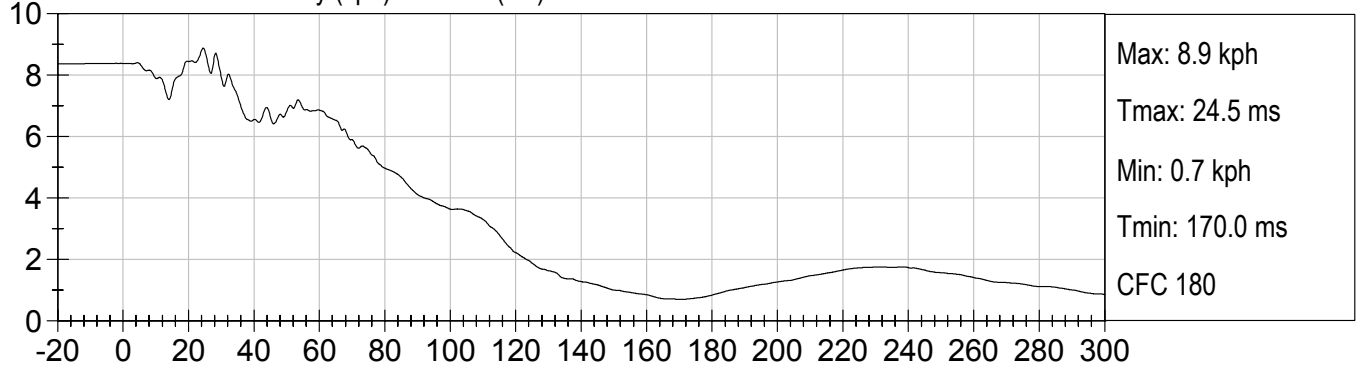




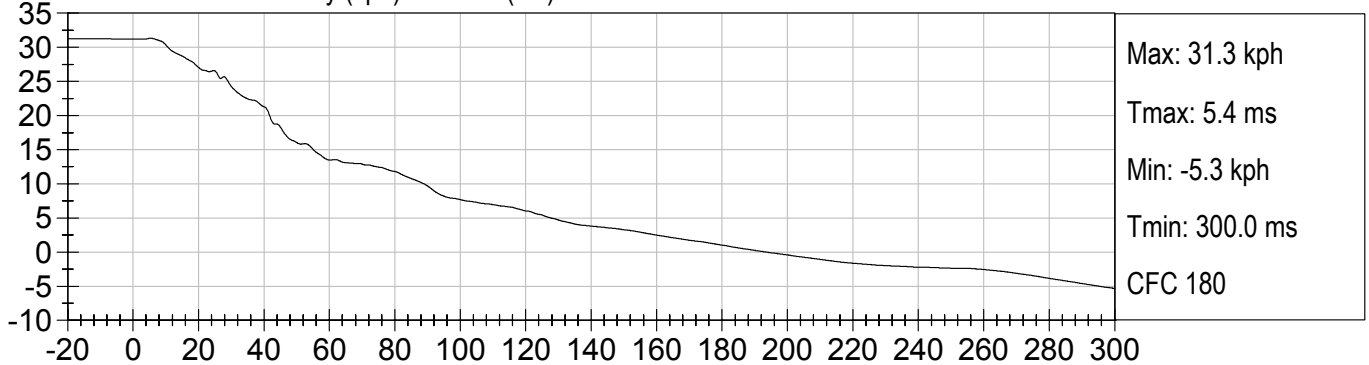




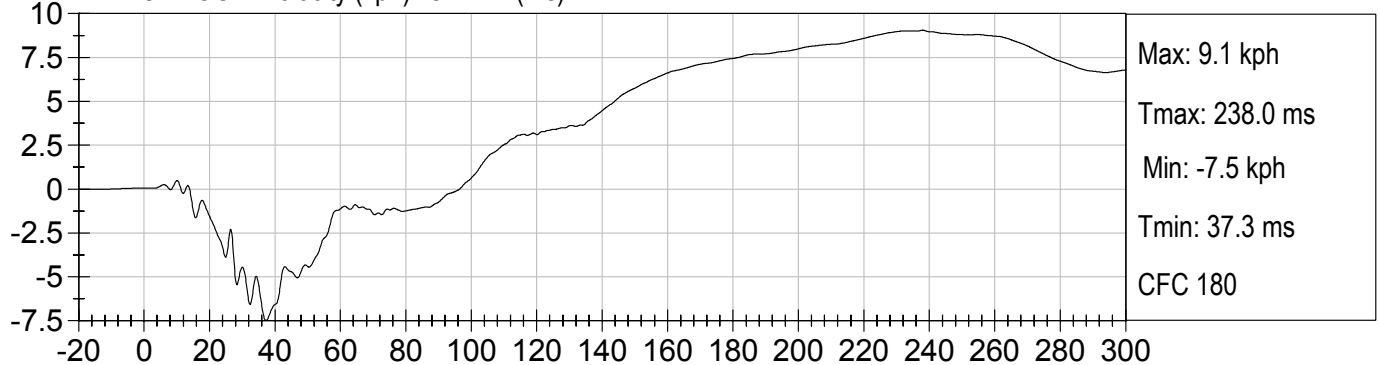
VEHICLE CG X Velocity (kph) vs TIME (ms)



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

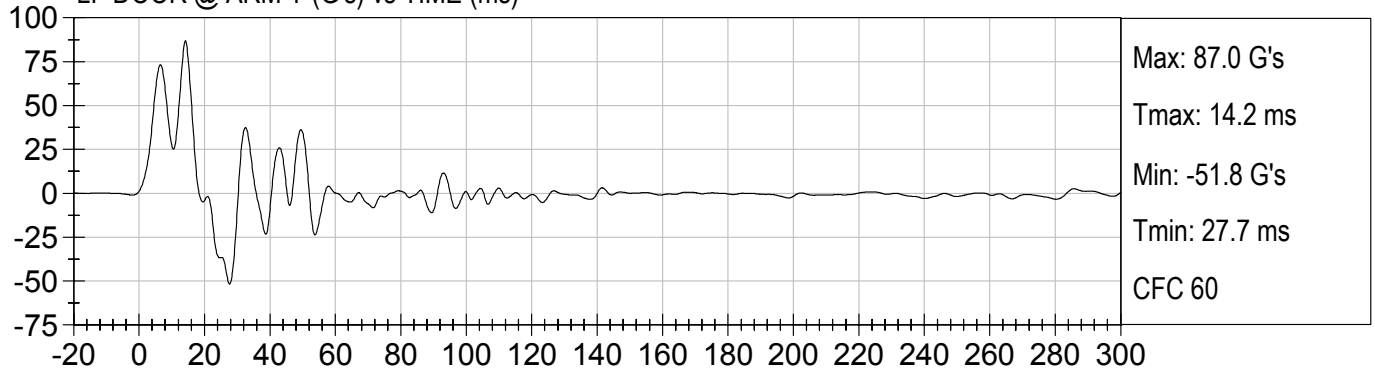


VEHICLE CG Z Velocity (kph) vs TIME (ms)

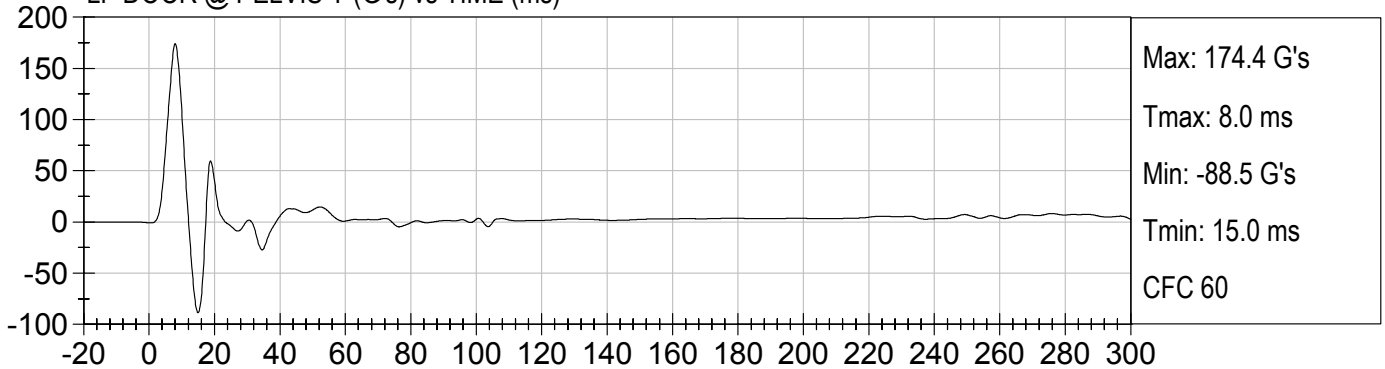




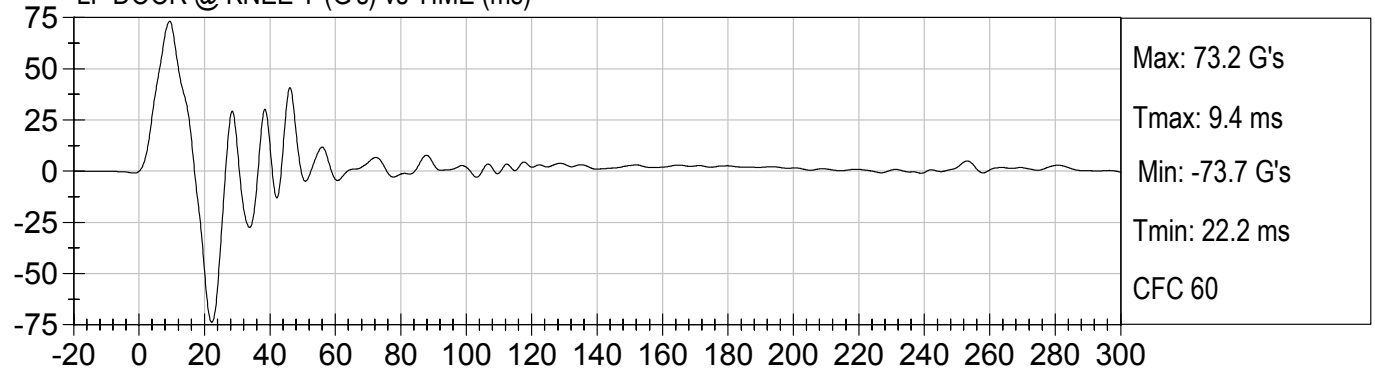
LF DOOR @ ARM Y (G's) vs TIME (ms)



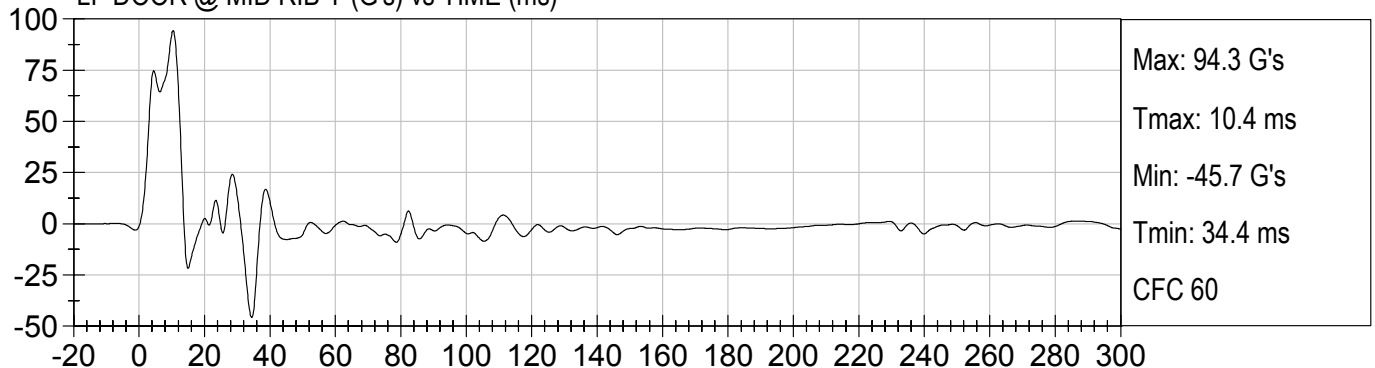
LF DOOR @ PELVIS Y (G's) vs TIME (ms)

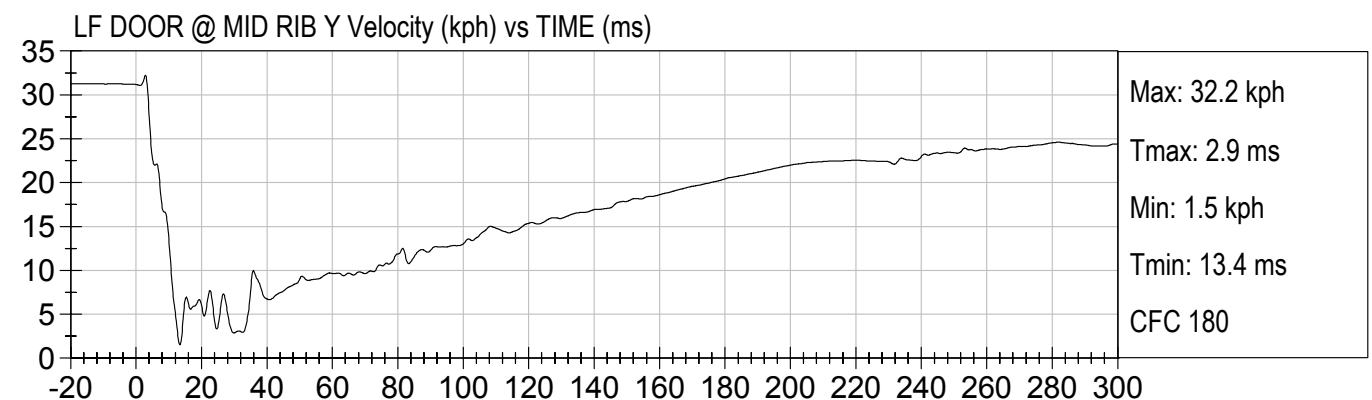
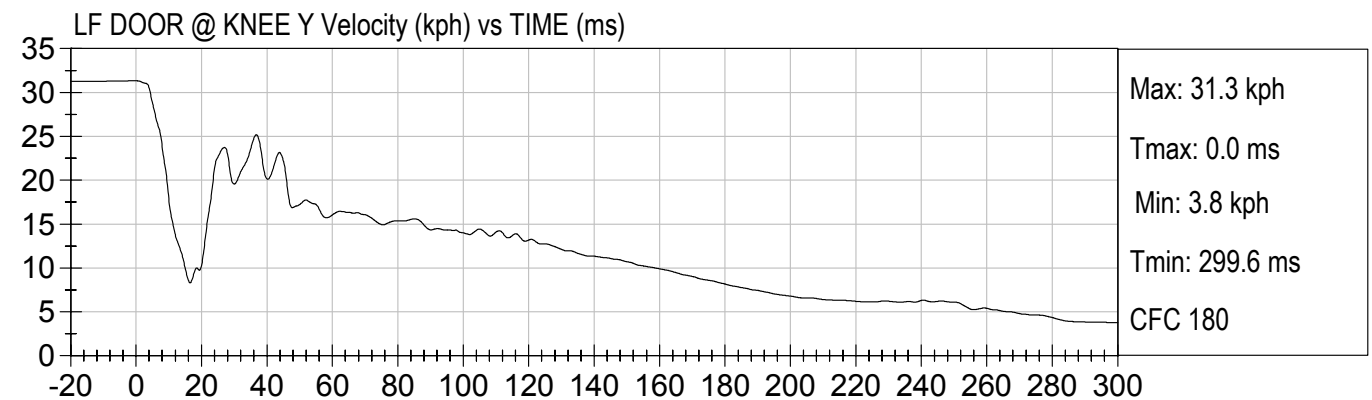
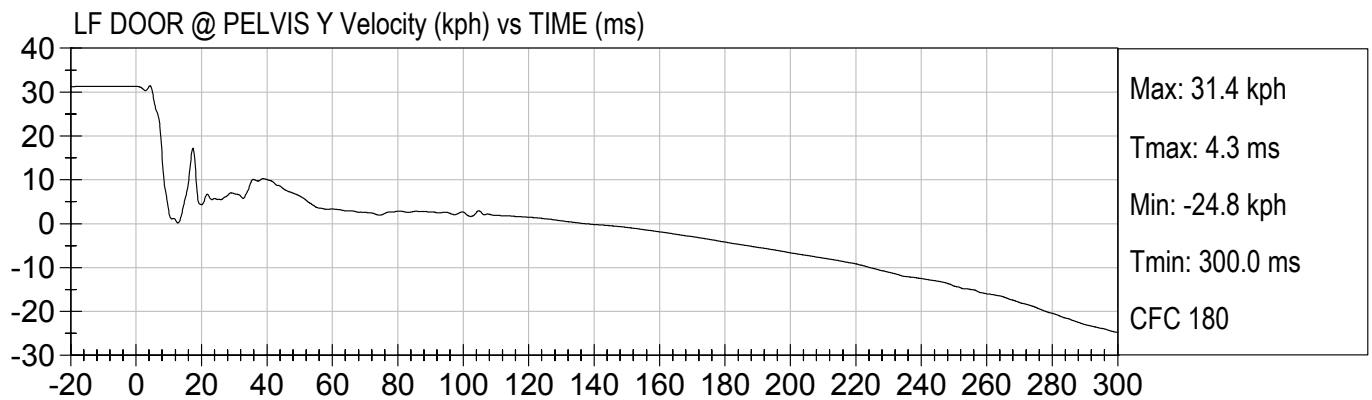
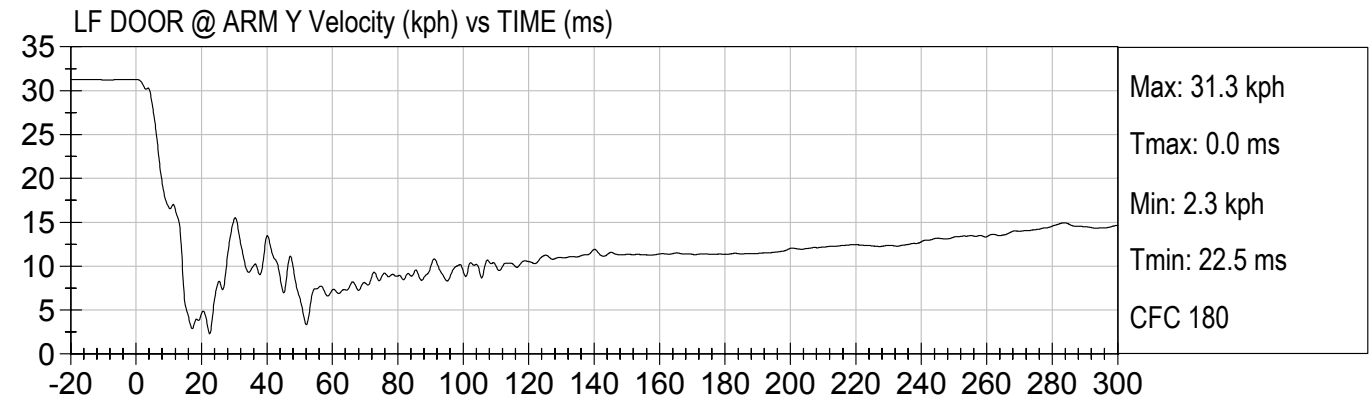


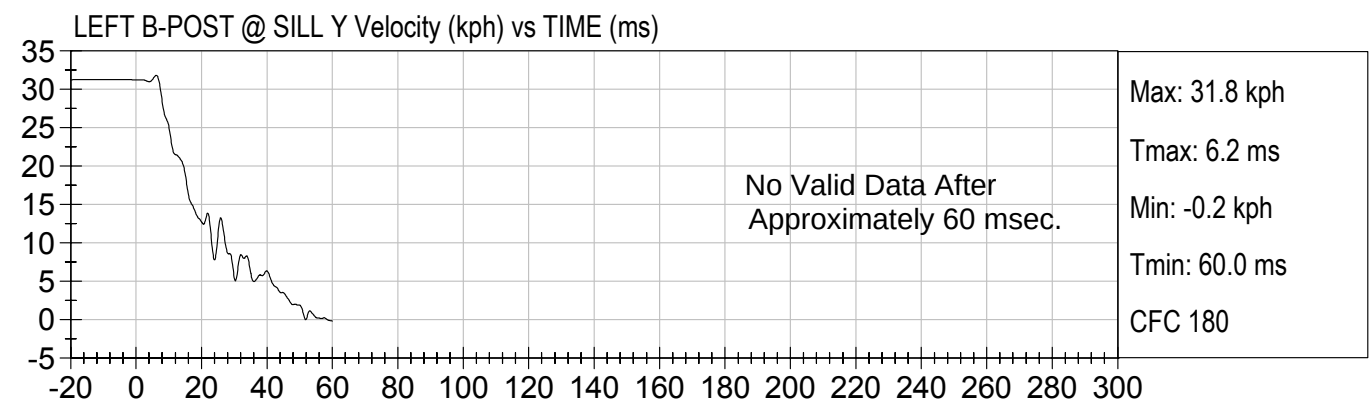
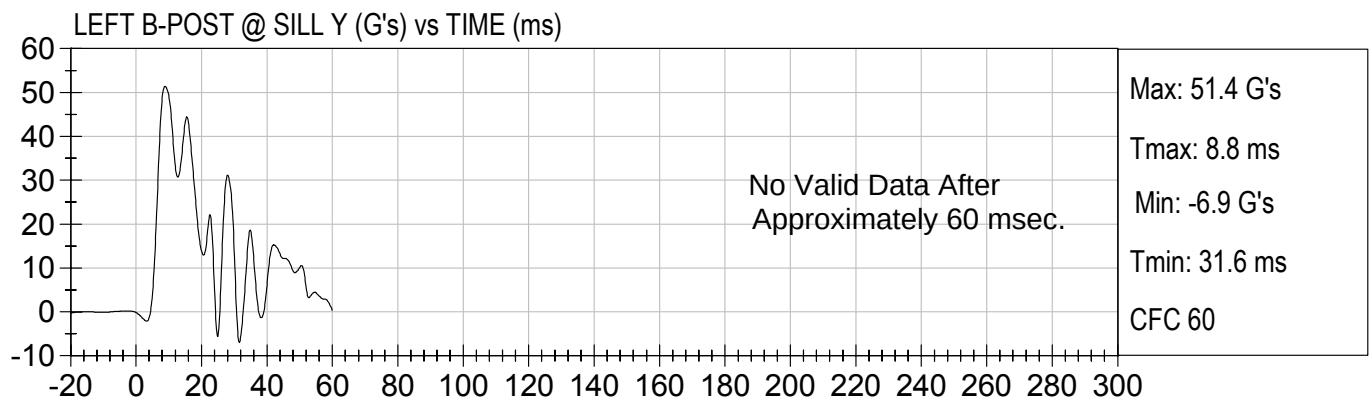
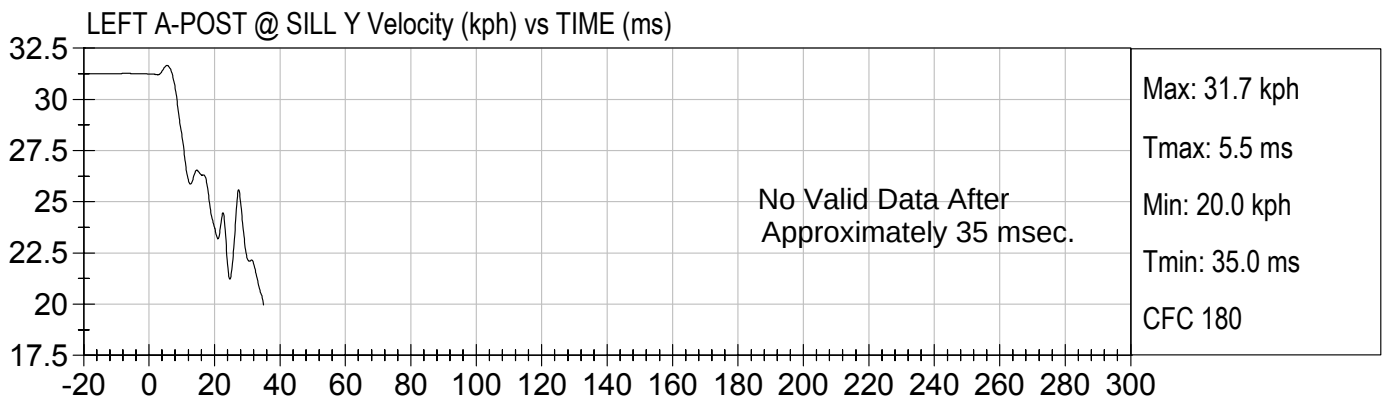
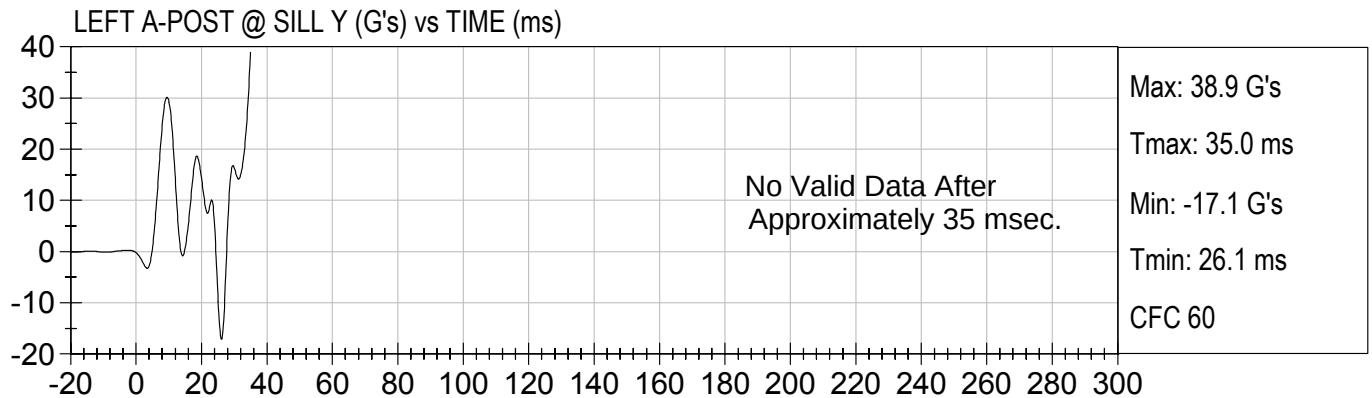
LF DOOR @ KNEE Y (G's) vs TIME (ms)

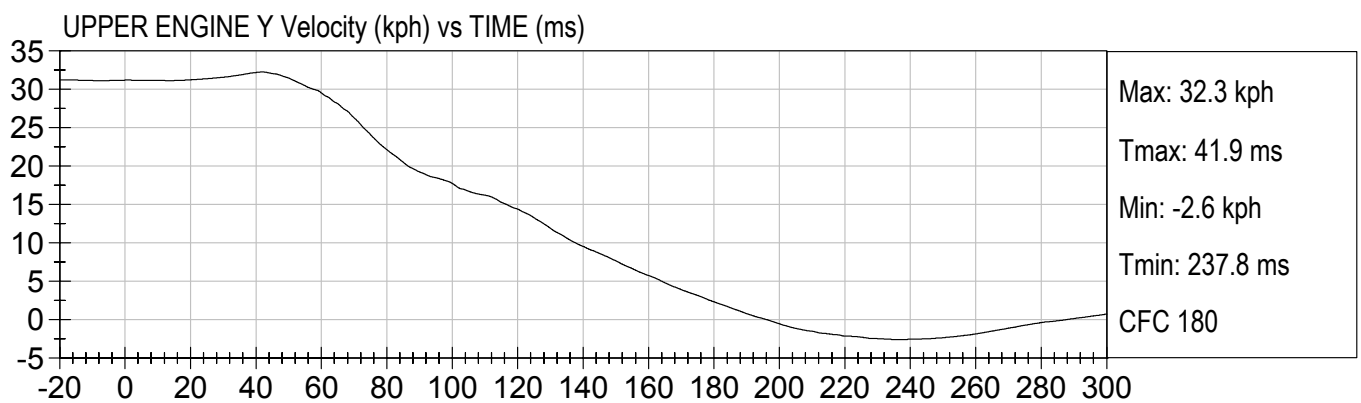
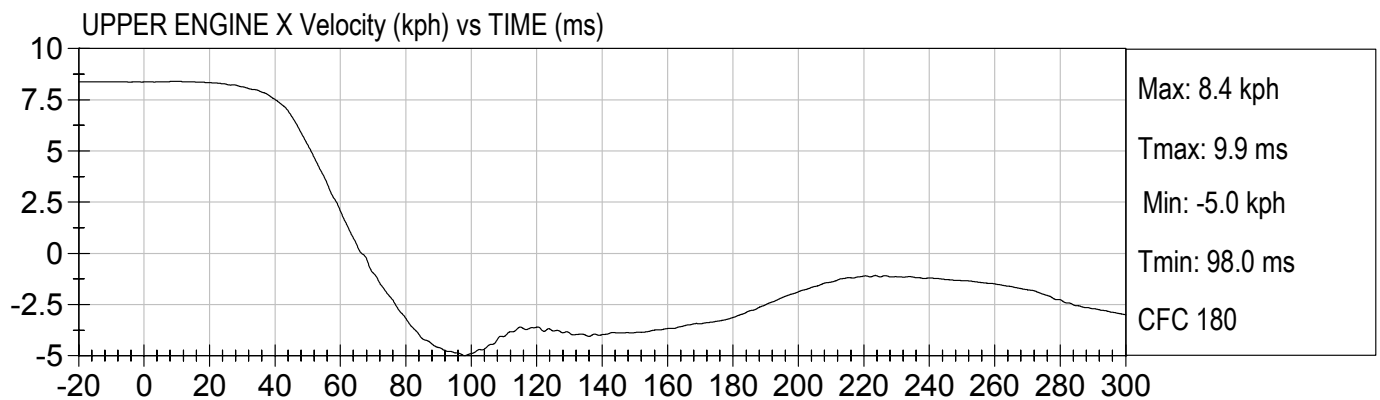
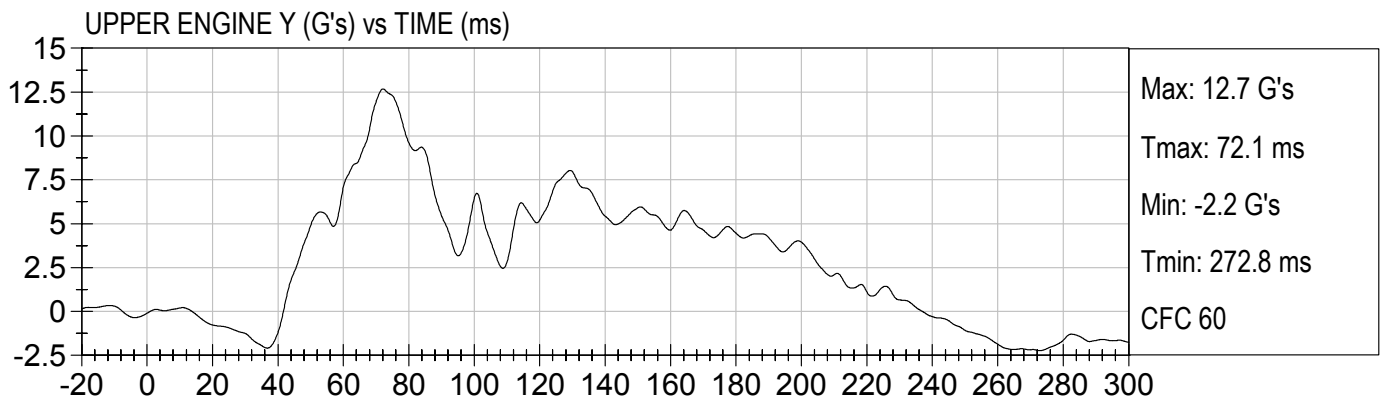
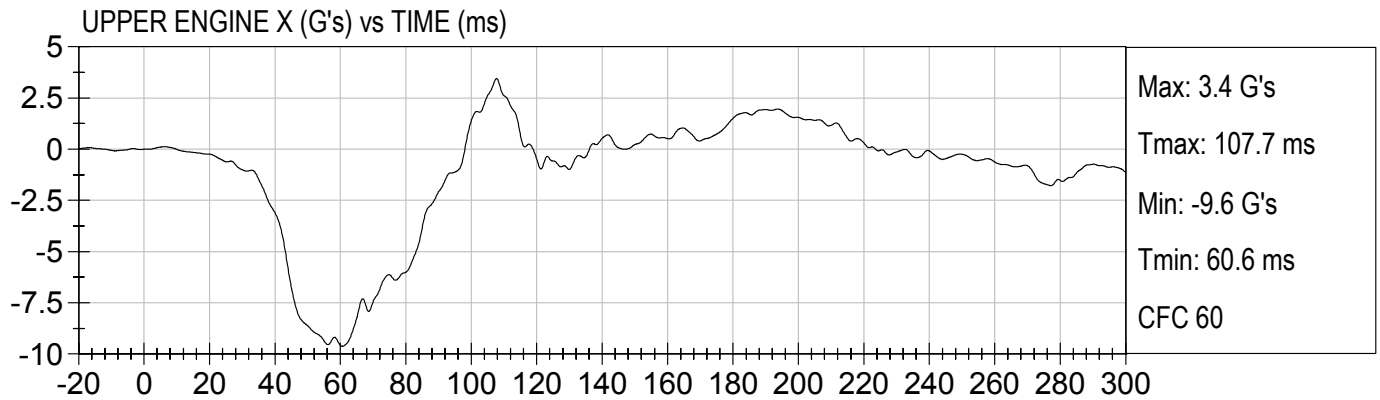


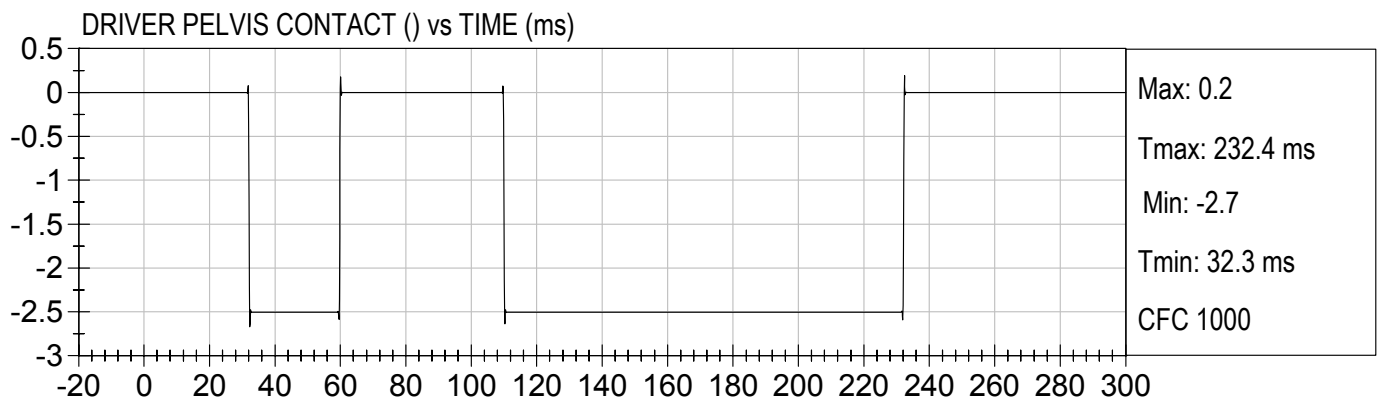
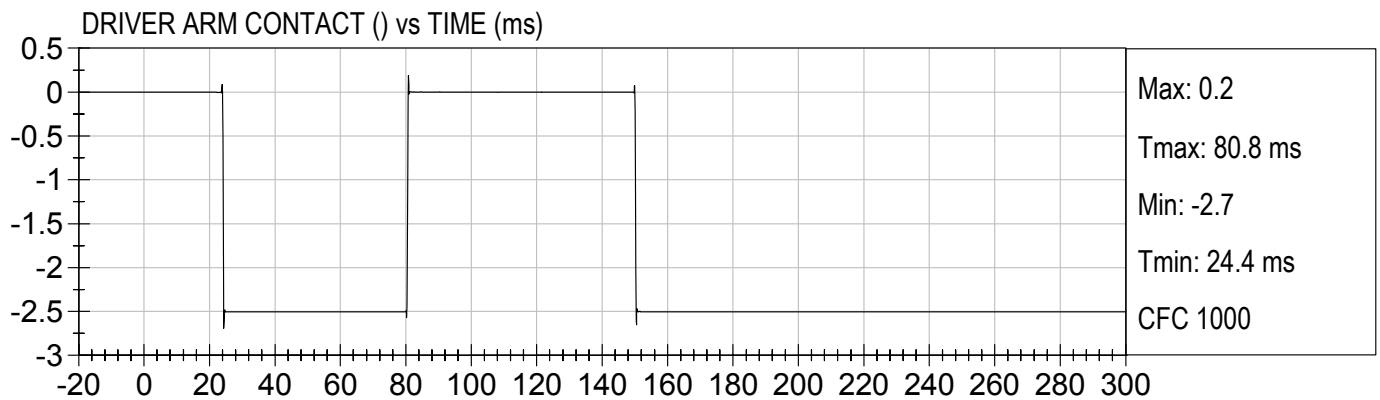
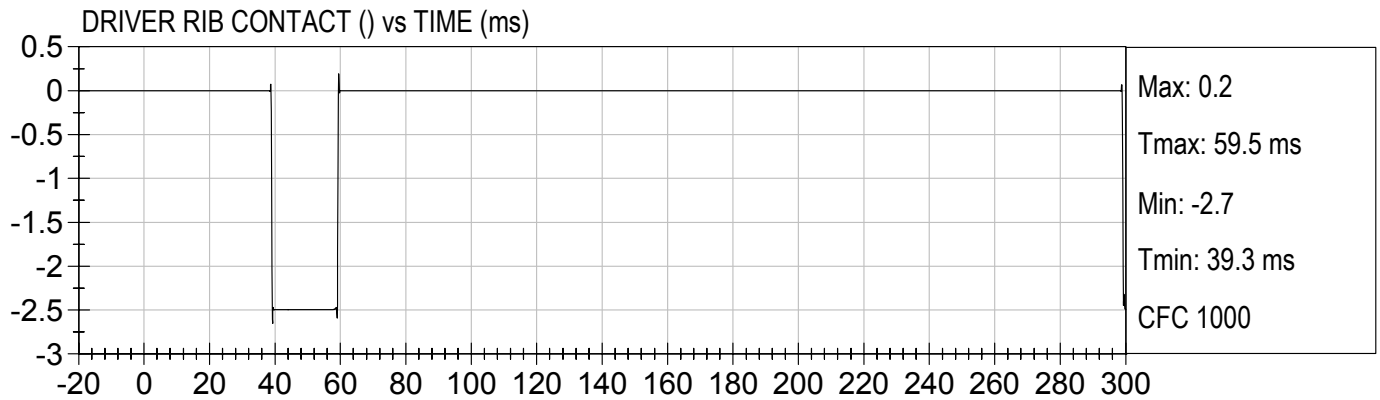
LF DOOR @ MID RIB Y (G's) vs TIME (ms)











APPENDIX C

ES-2RE CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Pre-Test Calibration

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

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

Date: 5/2/05
Dummy Serial Number: 009
Test Number: D051181

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	22
Peak Resultant Acceleration	100 – 150 g's	144
Time of Max. Res. Acceleration	msec	33.1

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

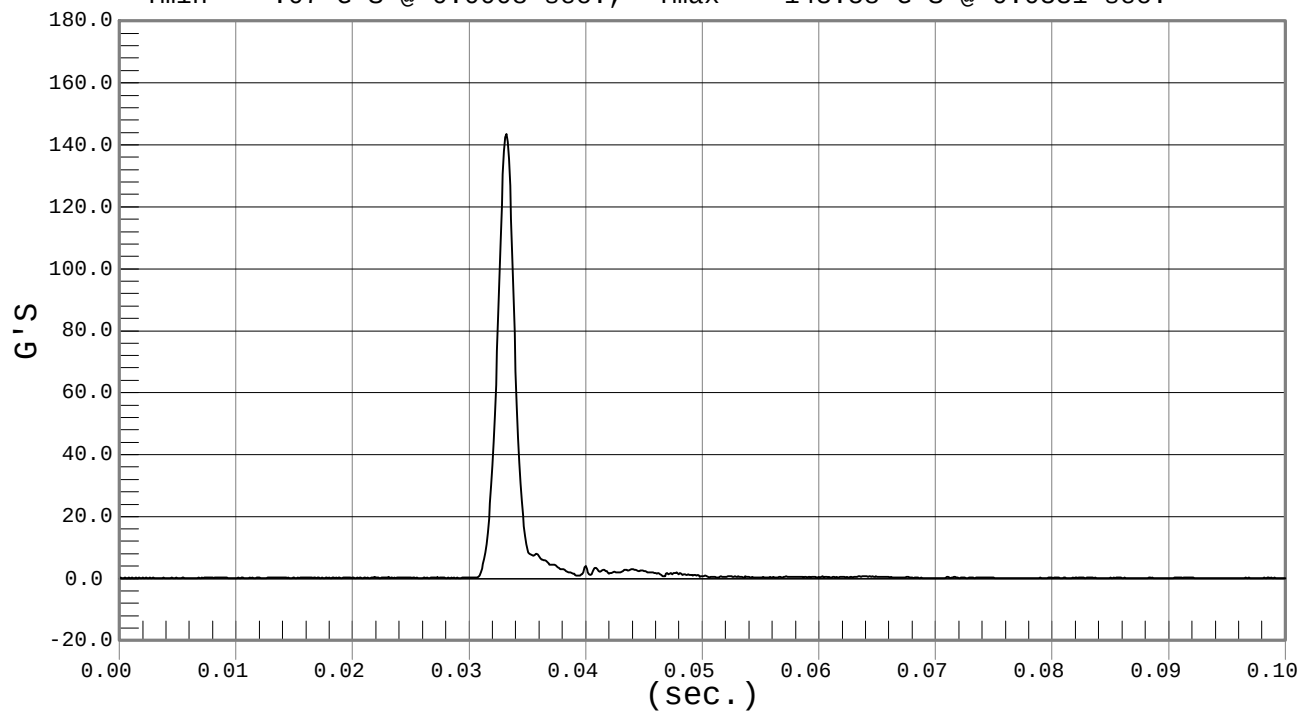


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 05-02-05
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ 0.0008 sec., Ymax = 143.58 G'S @ 0.0331 sec.



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 009
Test Number: D051182

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.6
Relative Humidity (%)		10 – 70	22
Pendulum Speed		3.3 - 3.5	3.5
Pendulum Deceleration	3 msec	1.25 - 1.53 m/sec	-.32
	8 msec	1.59 - 2.04 m/sec	-1.68
	14 msec	3.20 - 3.85 m/sec	-3.44
Maximum Flexion Angle		49.0 – 59.0 deg	53.0
Time of Max. Flexion Angle		54.0 – 66.0 ms	55.7
Maximum Angle Theta (A)		32.0 – 37.0 deg	33.3
Time of Max. Theta (A)		53.0 – 63.0 ms	55.2
Maximum Angle Theta (B)		28.7 – 31.23 deg	30.1
Time of Max. Theta (B)		54.0 – 64.0 ms	55.3

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Gall

Approved By: _____

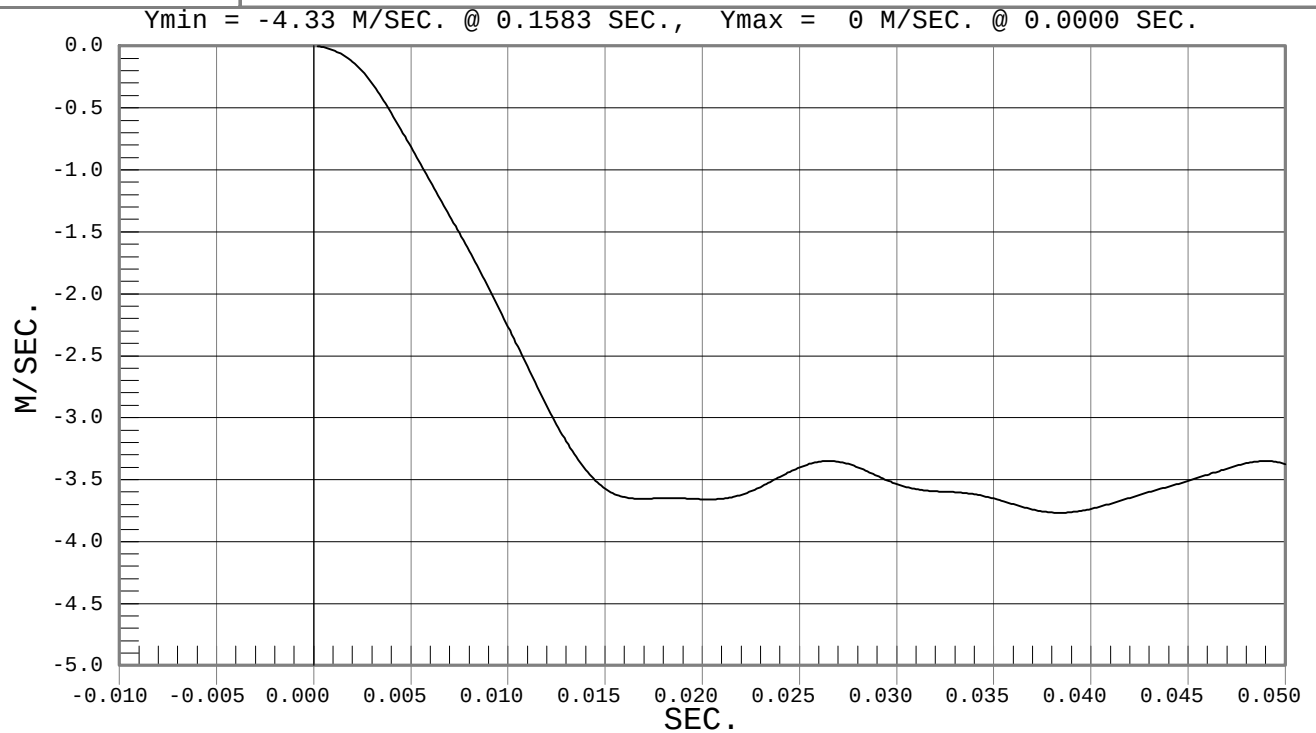
David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

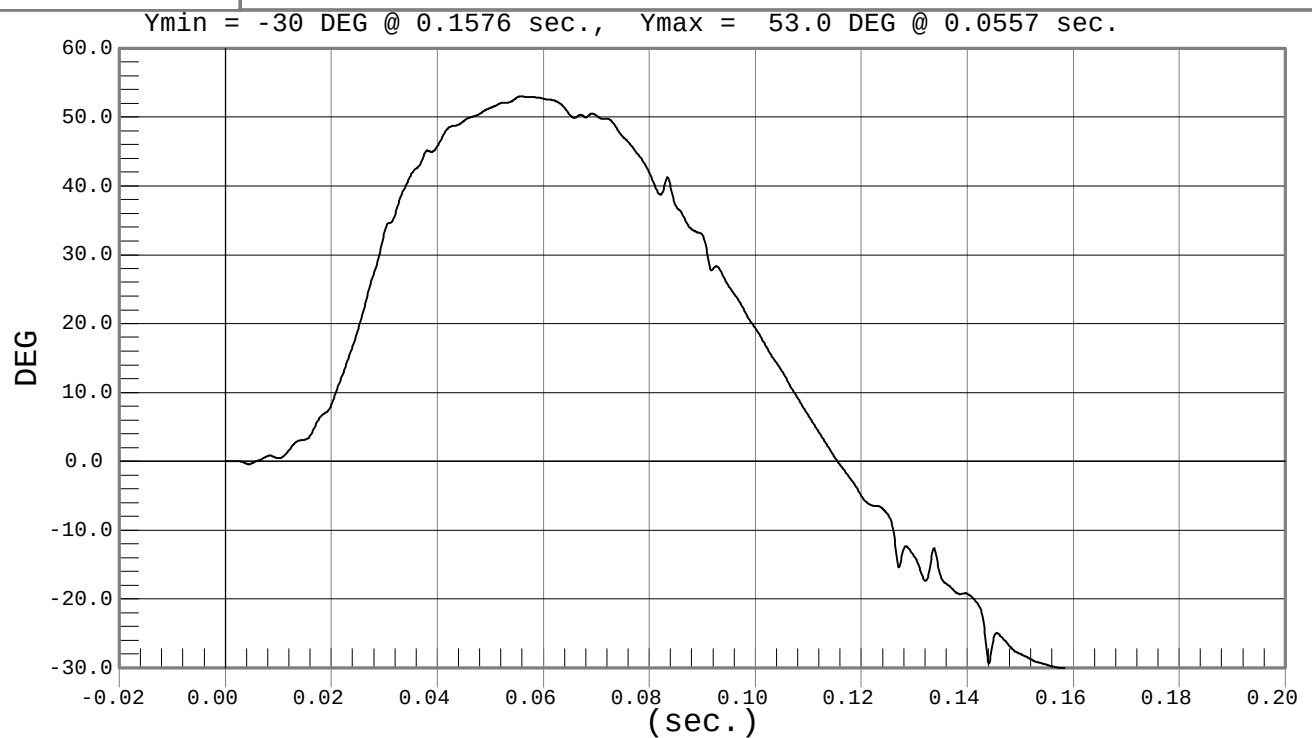
Test Date: 05-03-05
Speed: 11.4 fps, 3.48 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 05-03-05
Speed: 11.4 fps, 3.48 M/s



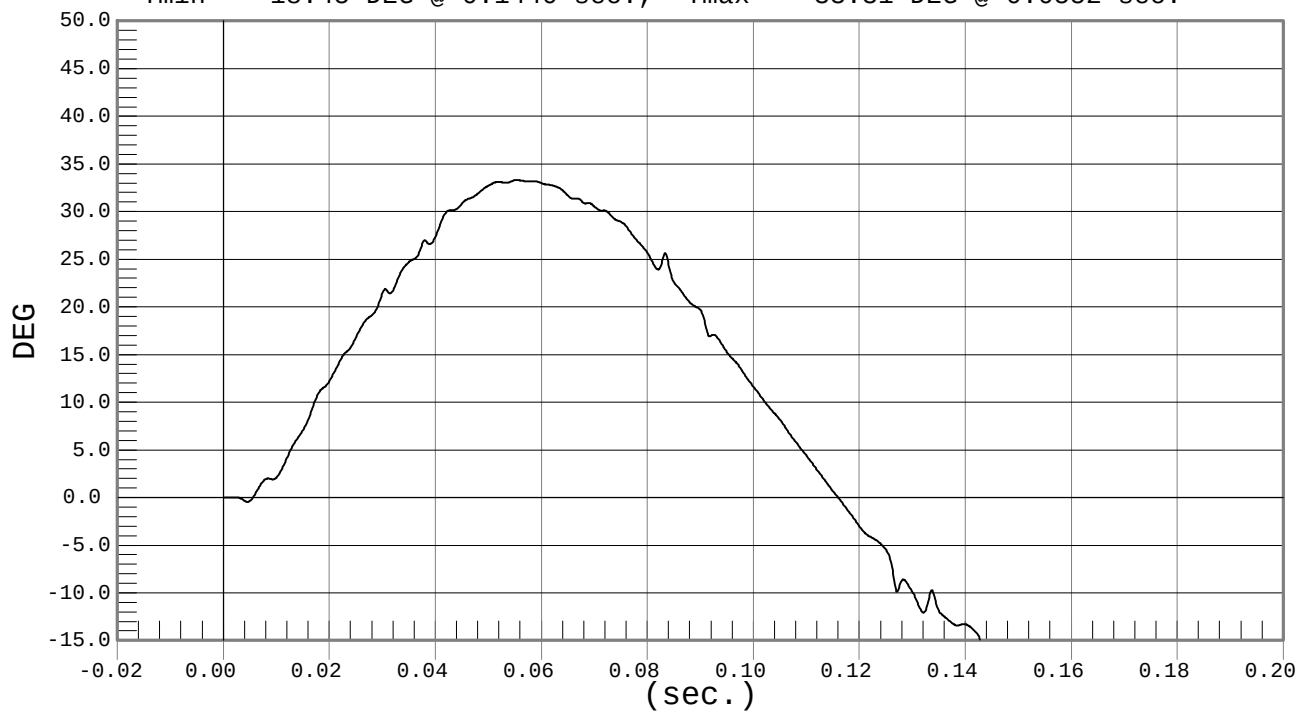


Test Desc.: Neck Bending
Component: Dummy #009

THETA A

Test Date: 05-03-05
Speed: 11.4 fps, 3.48 M/s

Ymin = -18.45 DEG @ 0.1440 sec., Ymax = 33.31 DEG @ 0.0552 sec.

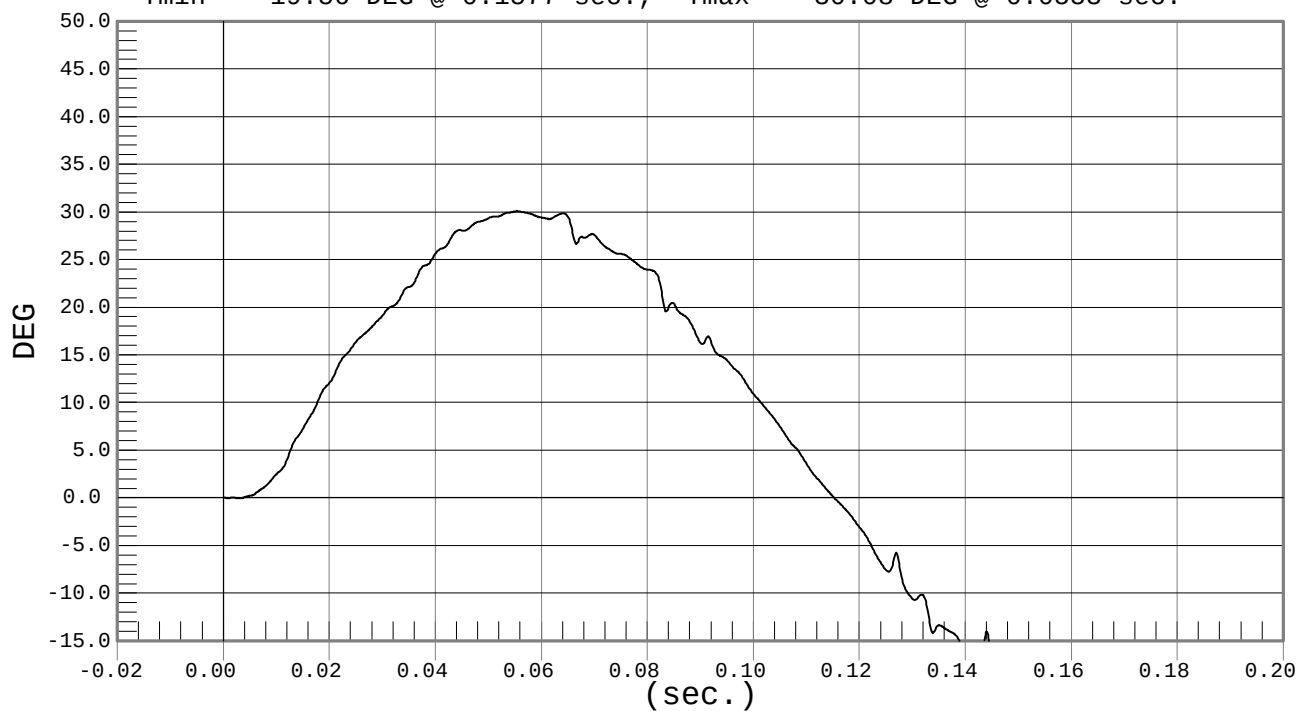


Test Desc.: Neck Bending
Component: Dummy #009

THETA B

Test Date: 05-03-05
Speed: 11.4 fps, 3.48 M/s

Ymin = -19.56 DEG @ 0.1577 sec., Ymax = 30.08 DEG @ 0.0553 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 009
Test Number: D051183

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.4
Relative Humidity (%)	10 – 70	22
Pendulum Speed	4.2 – 4.4 m/s	4.4
Max. Resultant Acceleration	7.5 – 10.5 g's	10.2
Time of Max. Pendulum Acceleration	msec	53.6

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

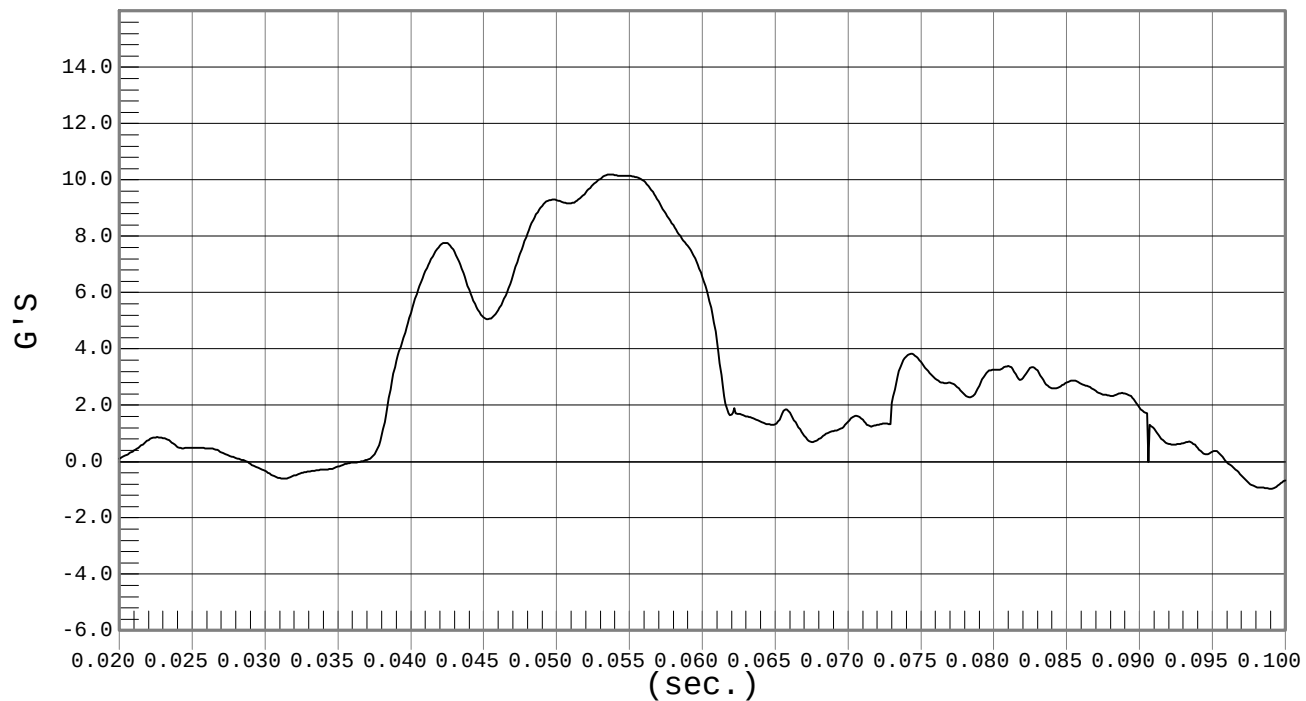


SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 05-03-05
Speed: 14.3 fps, 4.35 M/s

Ymin = -1.52 G'S @ 0.1530 sec., Ymax = 10.19 G'S @ 0.0536 sec.



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

Date: 5/2/05
Dummy Serial Number: 009
Test Number: D051184, D051185, D051186

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	26.7
Displacement at 3 m/s	36.0 – 40.0 mm	37.9
Displacement at 4 m/s	46.0 – 51.0 mm	48.6

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	26.4
Displacement at 3 m/s	36.0 – 40.0 mm	37.7
Displacement at 4 m/s	46.0 – 51.0 mm	48.5

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	23
Displacement at 2 m/s	23.5 – 27.5 mm	26.6
Displacement at 3 m/s	36.0 – 40.0 mm	38.4
Displacement at 4 m/s	46.0 – 51.0 mm	49.5

TEST MEETS SPECIFICATIONS

Technician: Jessica Gall

Approved By: David Winkelbauer

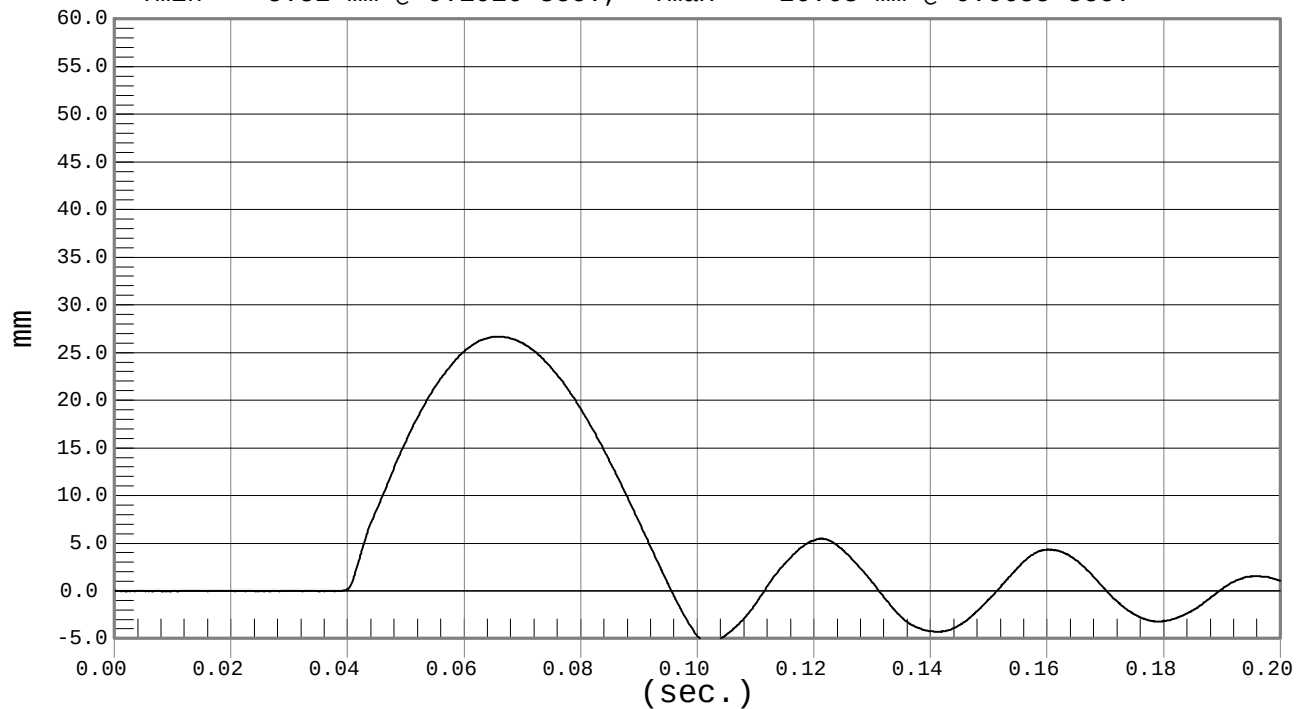


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.52 mm @ 0.1016 sec., Ymax = 26.68 mm @ 0.0655 sec.

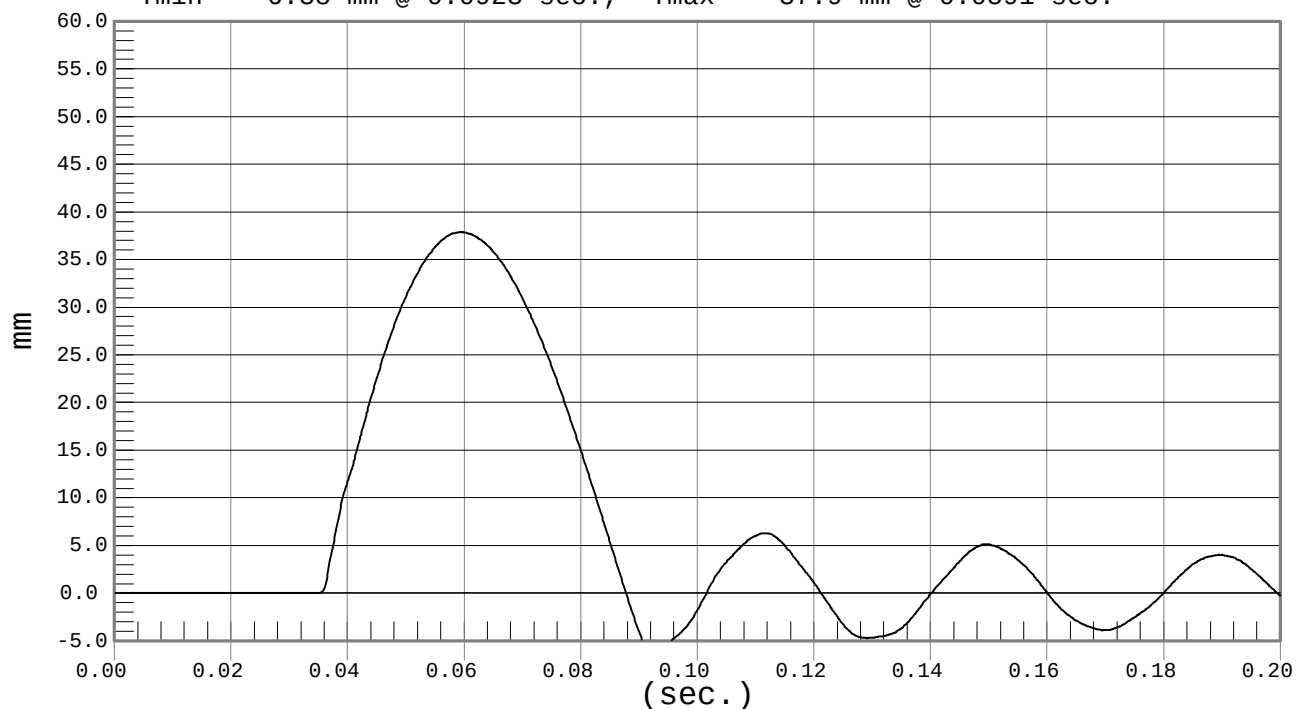


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.38 mm @ 0.0923 sec., Ymax = 37.9 mm @ 0.0591 sec.



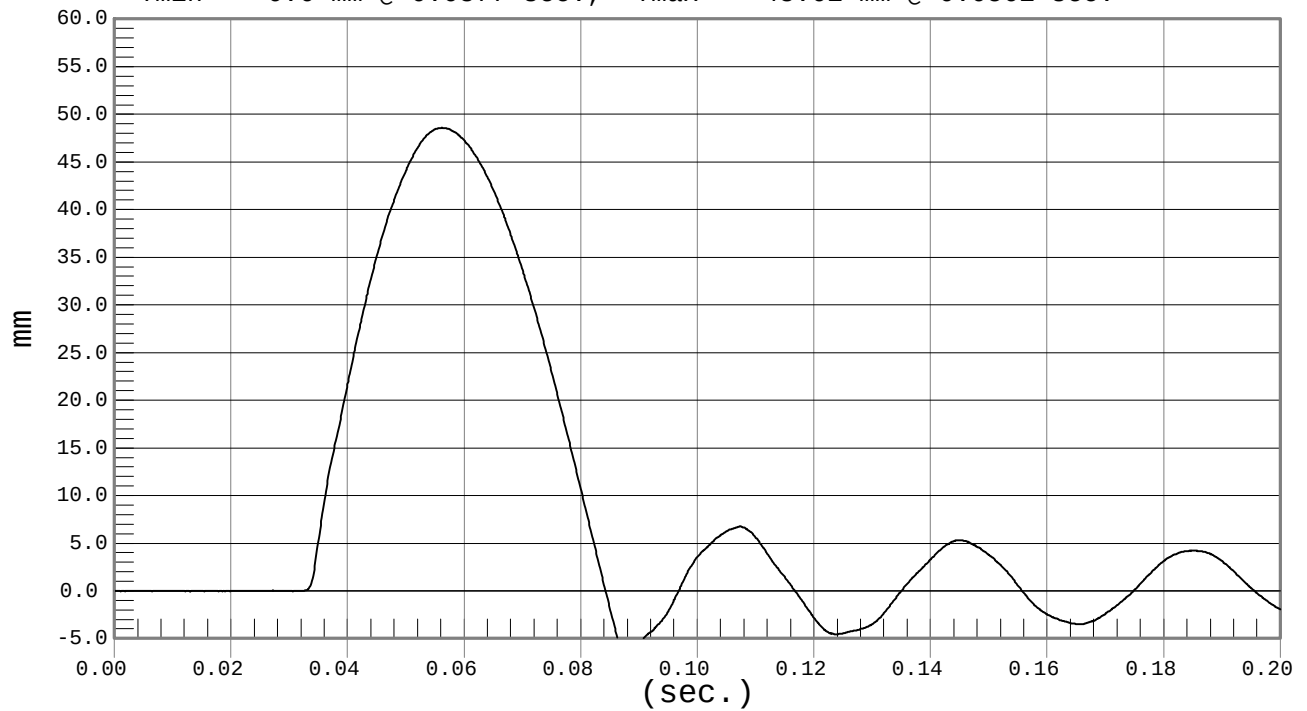


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -6.6 mm @ 0.0877 sec., Ymax = 48.61 mm @ 0.0561 sec.



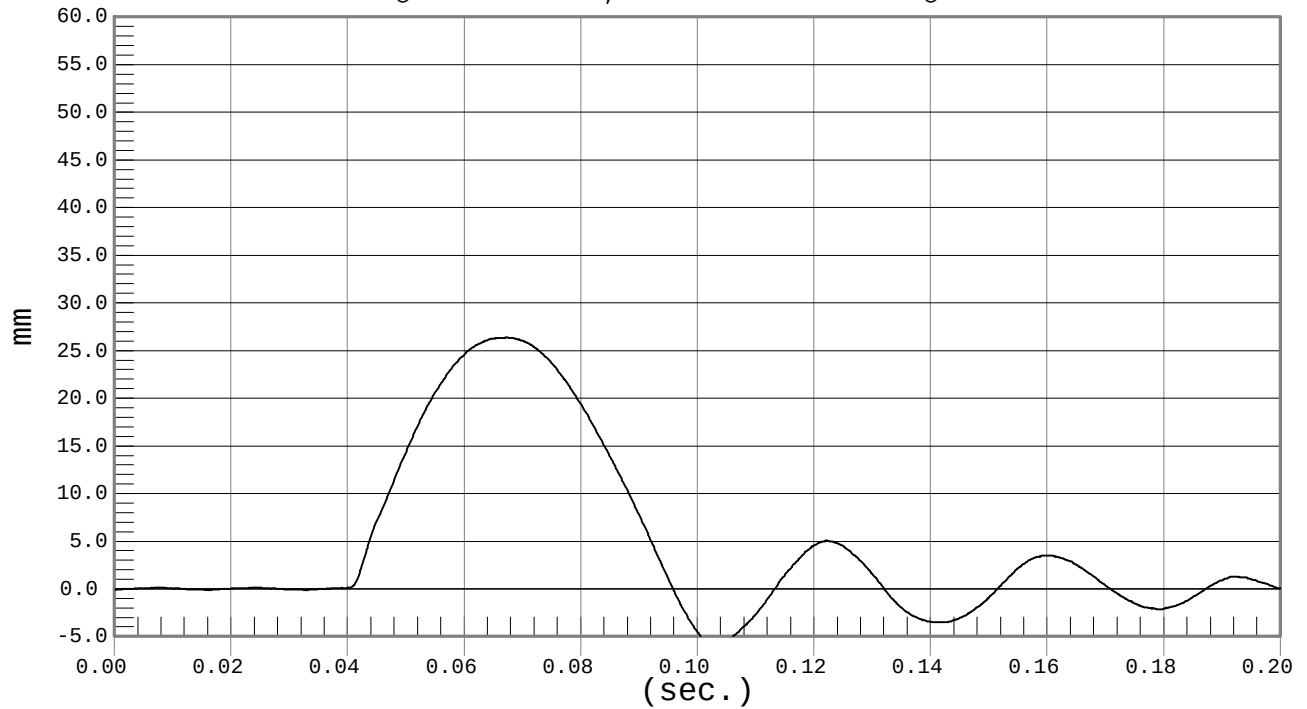


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.97 mm @ 0.1025 sec., Ymax = 26.39 mm @ 0.0670 sec.

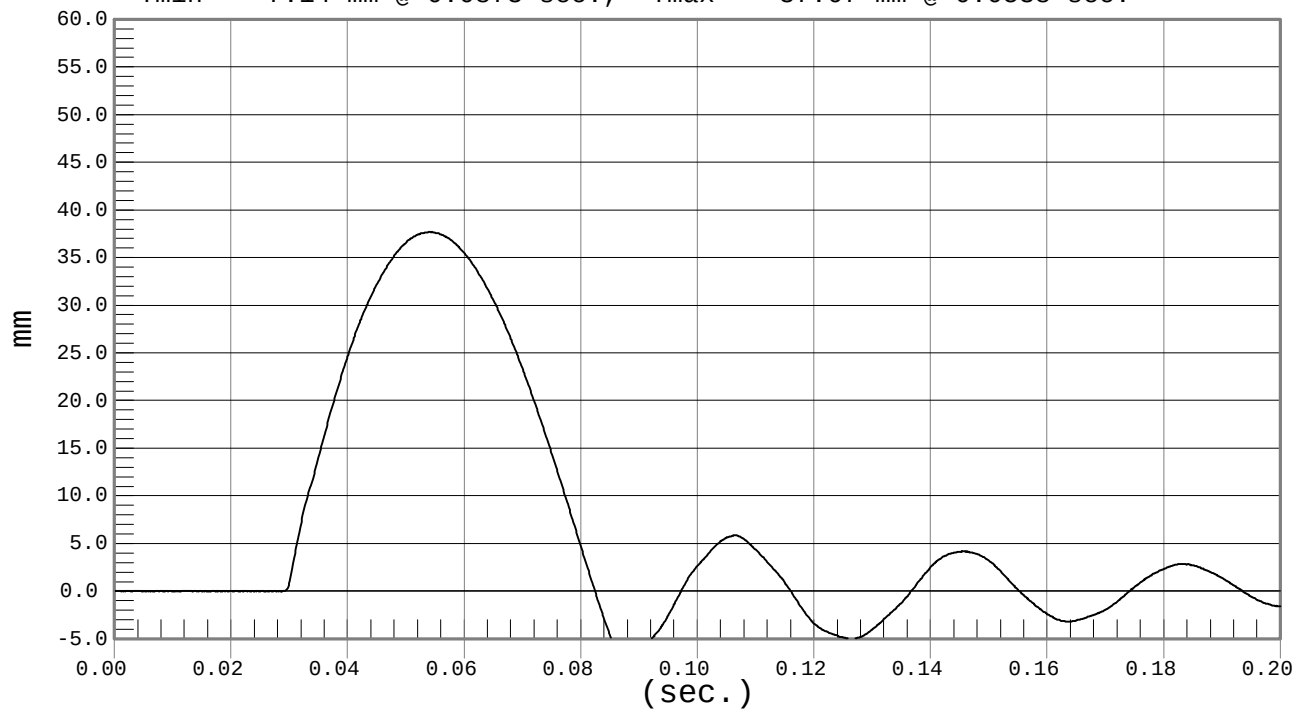


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -7.14 mm @ 0.0873 sec., Ymax = 37.67 mm @ 0.0538 sec.



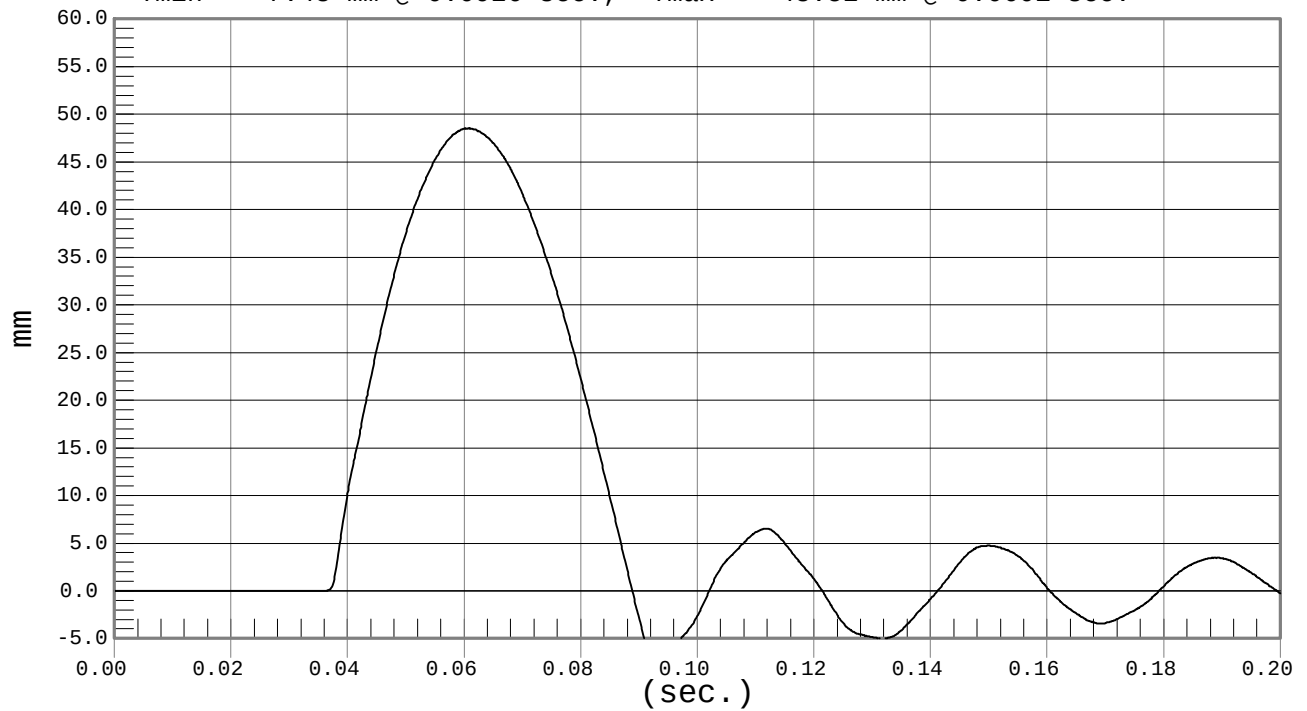


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -7.43 mm @ 0.0926 sec., Ymax = 48.52 mm @ 0.0601 sec.



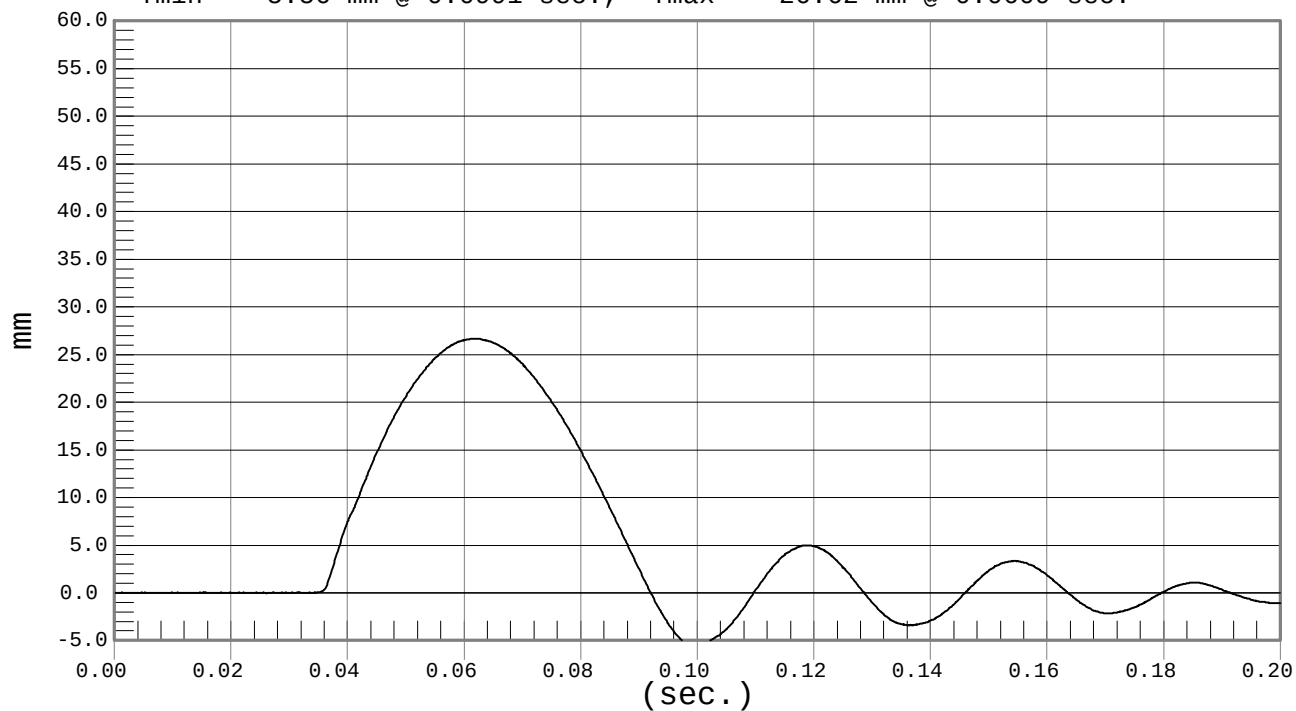


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.56 mm @ 0.0991 sec., Ymax = 26.62 mm @ 0.0609 sec.

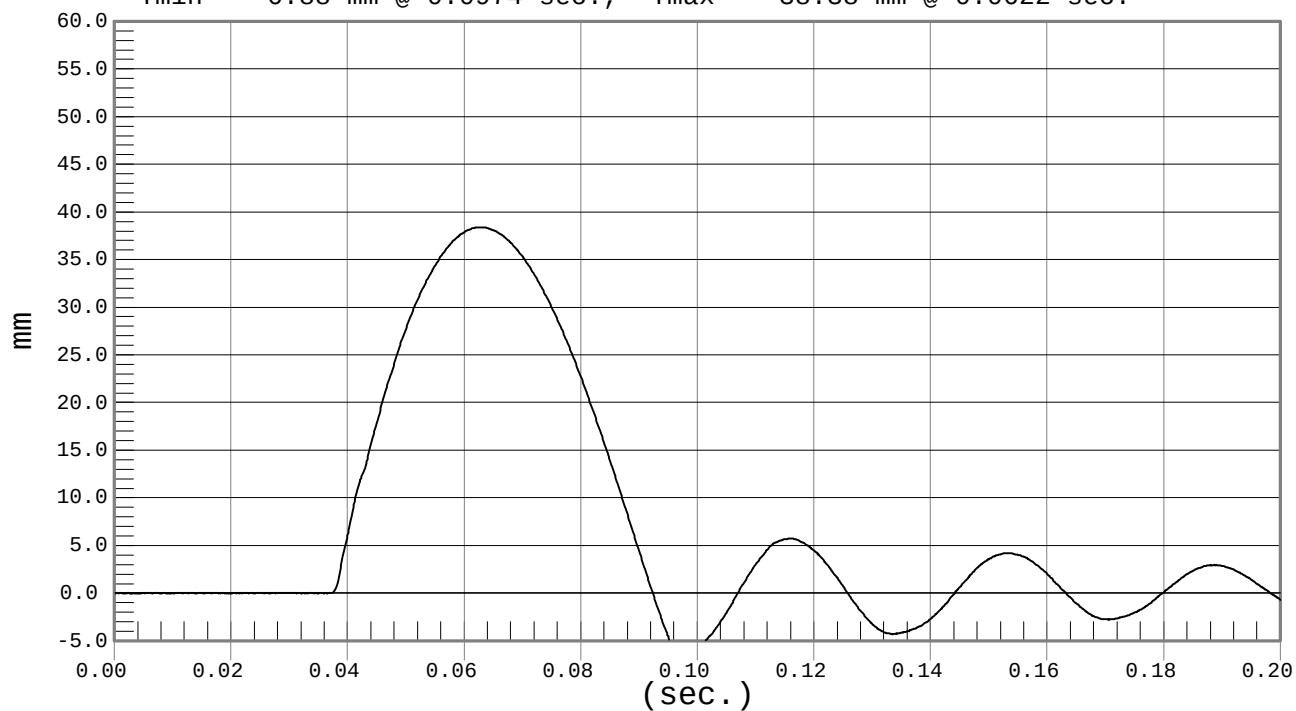


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.88 mm @ 0.0974 sec., Ymax = 38.38 mm @ 0.0622 sec.



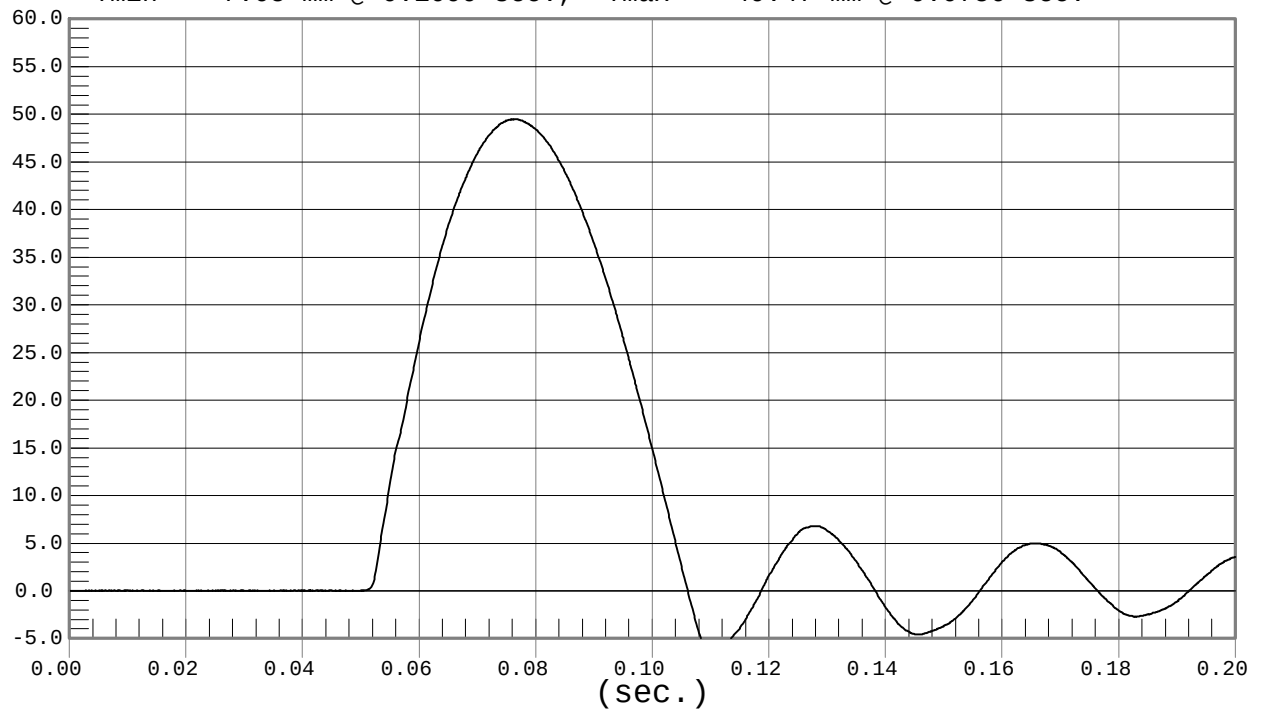


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

Test Date: 05-02-05
Speed: 13.1 fps, 4.00 M/s

Ymin = -7.05 mm @ 0.1099 sec., Ymax = 49.47 mm @ 0.0756 sec.



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 009
Test Number: D051187

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	22
Probe Speed (m/s)	3.90 – 4.10	4.08
Maximum Impact Force	4.00 – 4.80 kN	4.48
Time of Maximum Force	10.60 – 13.00 ms	10.70
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.21
Time of Max. Total Force	10.00 – 12.30 ms	10.40

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

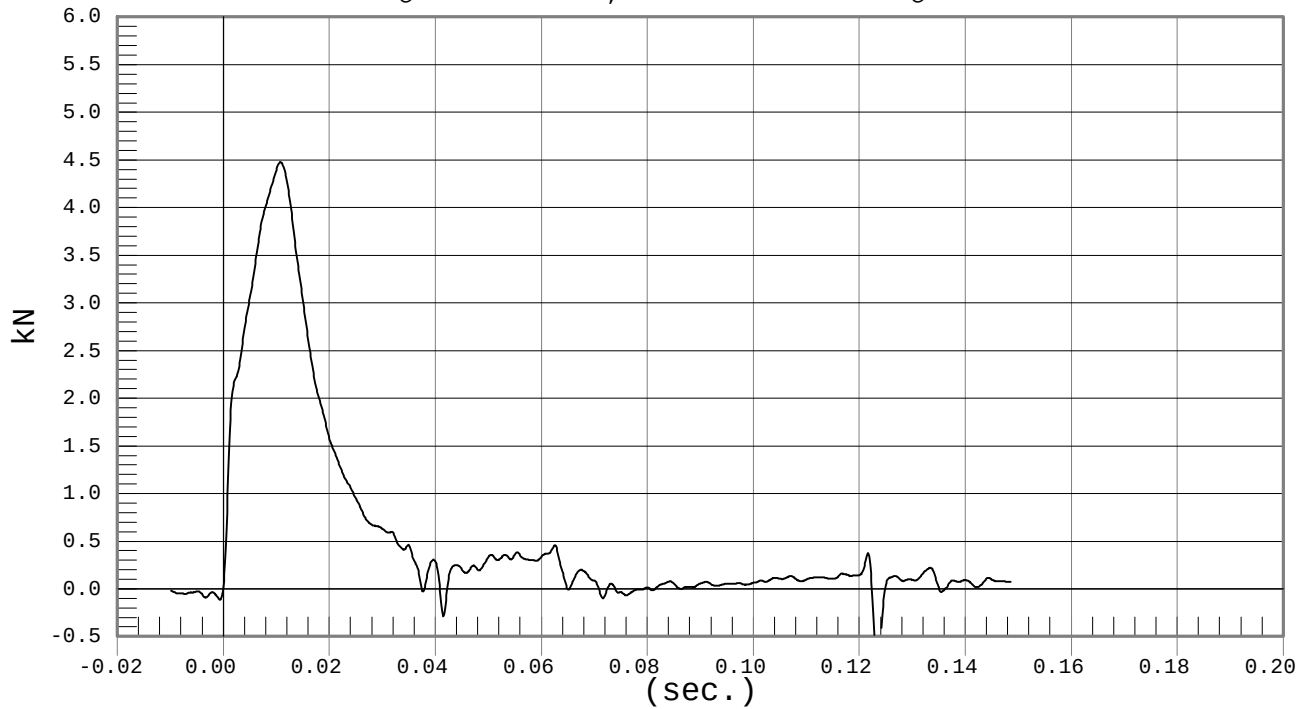


IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 05-03-05
Speed: 13.4 fps, 4.08 M/s

Ymin = -1.02 kN @ 0.1233 sec., Ymax = 4.48 kN @ 0.0107 sec.

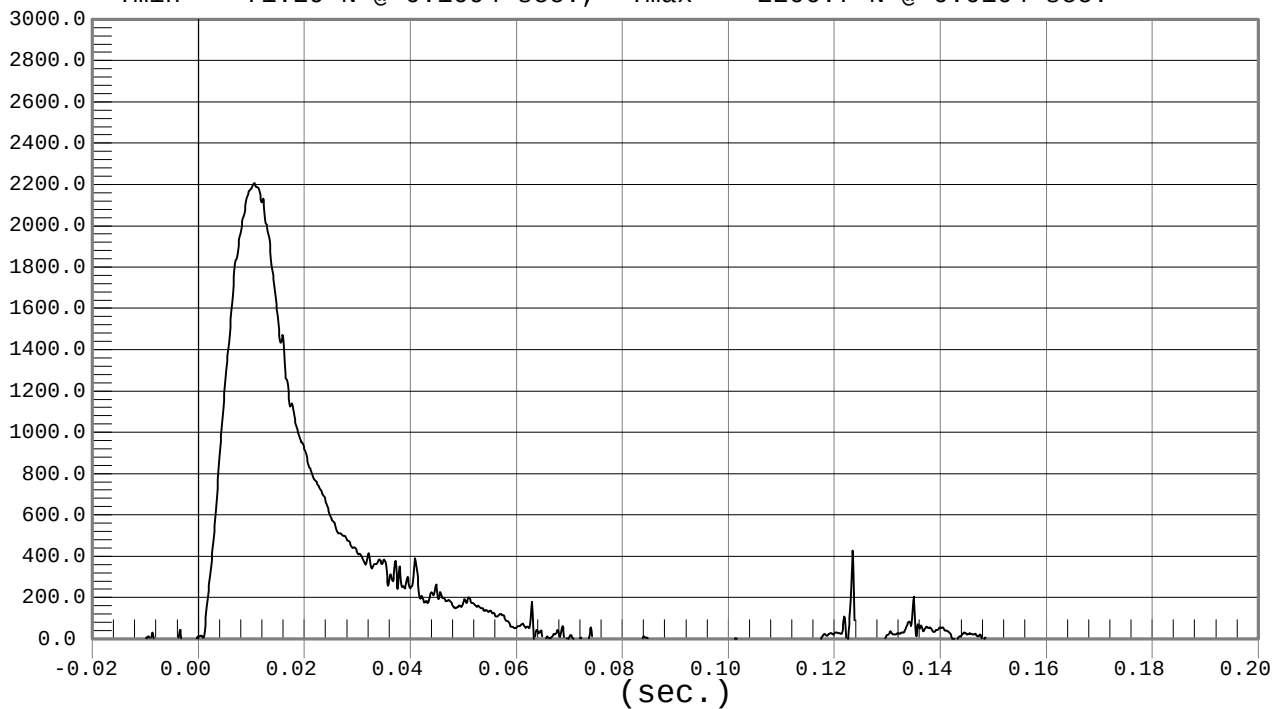


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 05-03-05
Speed: 13.4 fps, 4.08 M/s

Ymin = -71.29 N @ 0.1094 sec., Ymax = 2206.7 N @ 0.0104 sec.



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 009
Test Number: D051188

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.7
Relative Humidity (%)		10 – 70	22
Pendulum Speed		5.95 – 6.15	6.15
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-2.28
	20 msec	-5.25 - -4.07 m/sec	-5.17
	25 msec	-6.64 - -5.30 m/sec	-6.11
	30 msec	≥ -6.5 m/sec	-6.14
Maximum Flexion Angle		45.0 – 55.0 deg	54.6
Time of Max. Flexion Angle		39.0 – 53.0 ms	45.5
Maximum Angle Theta (A)		31.0 – 35.0 deg	33.7
Time of Max. Theta (A)		44.0 – 52.0 ms	45.2
Maximum Angle Theta (B)		28.9 – 31.5 deg	30.9
Time of Max. Theta (B)		44.0 – 52.0 ms	47.3

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

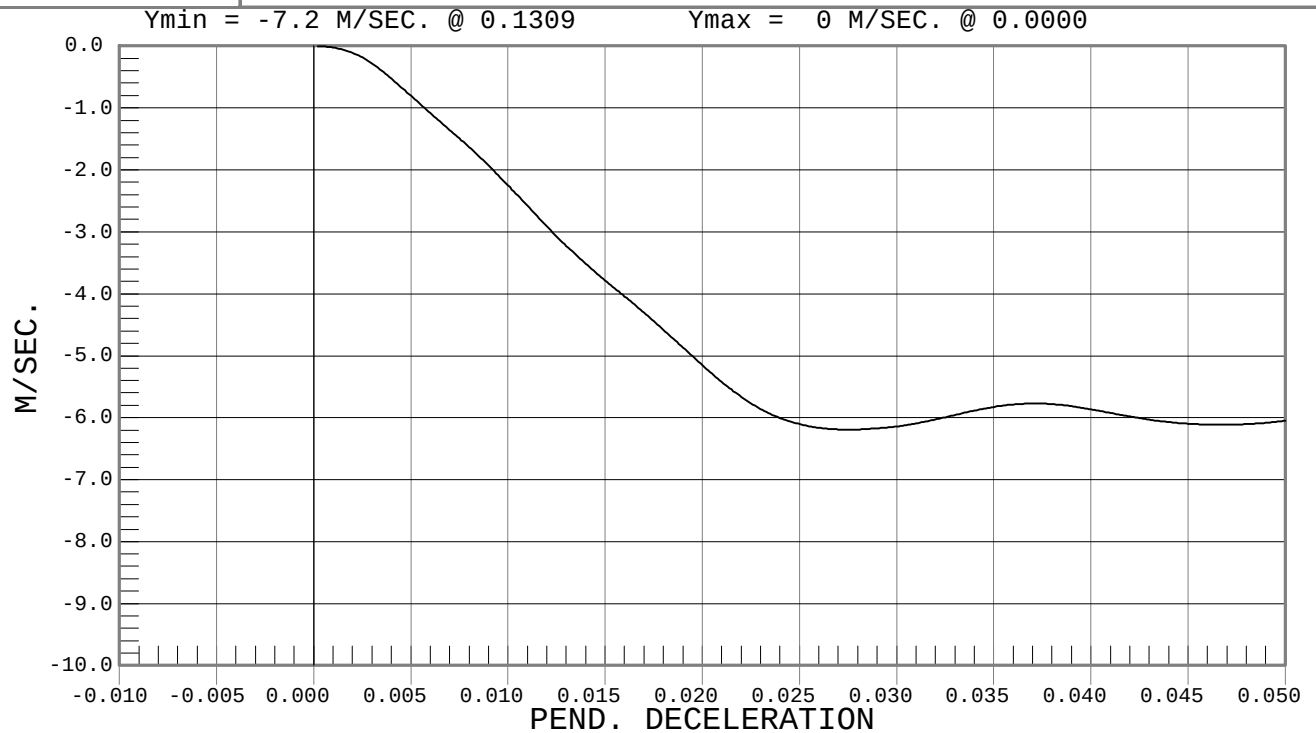
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Lumbar Bending
Component: Dummy #009

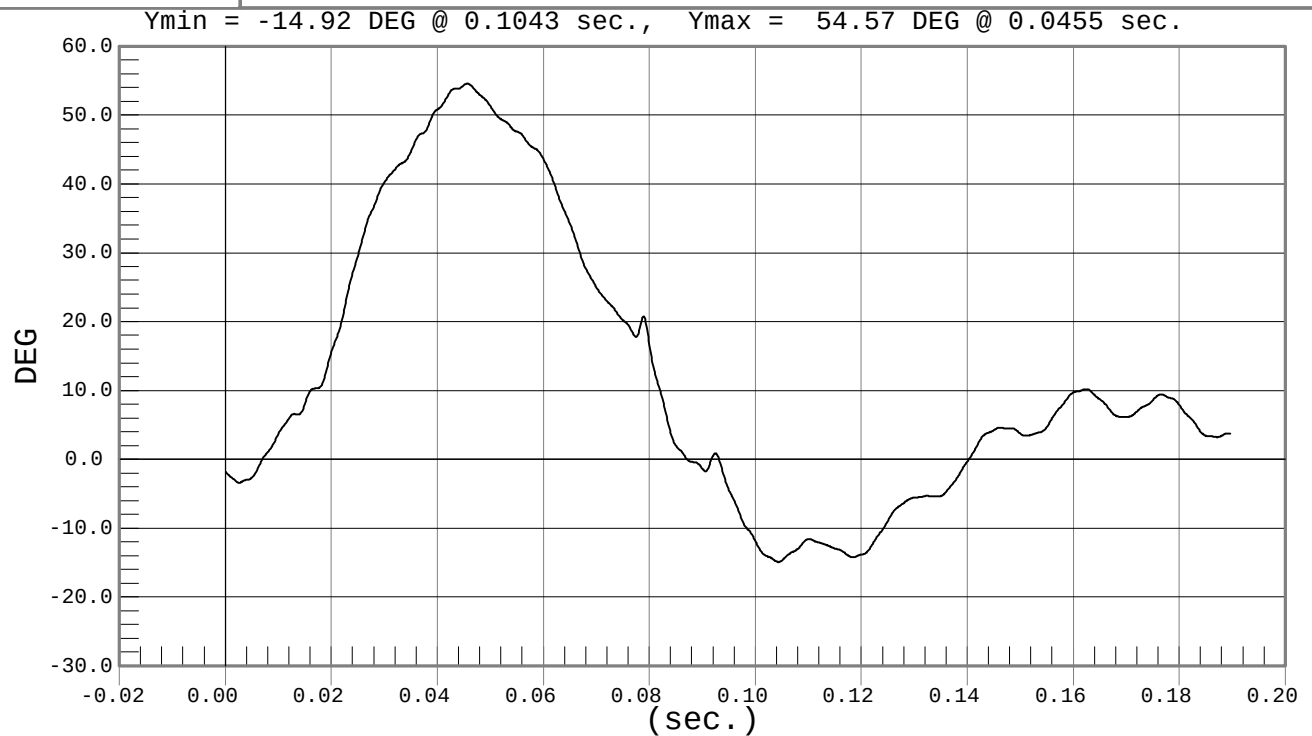
Test Date: 05-03-05
Speed: 20.2 fps, 6.15 M/s



FLEXION ANGLE

Test Desc.: Lumbar Bending
Component: Dummy #009

Test Date: 05-03-05
Speed: 20.2 fps, 6.15 M/s



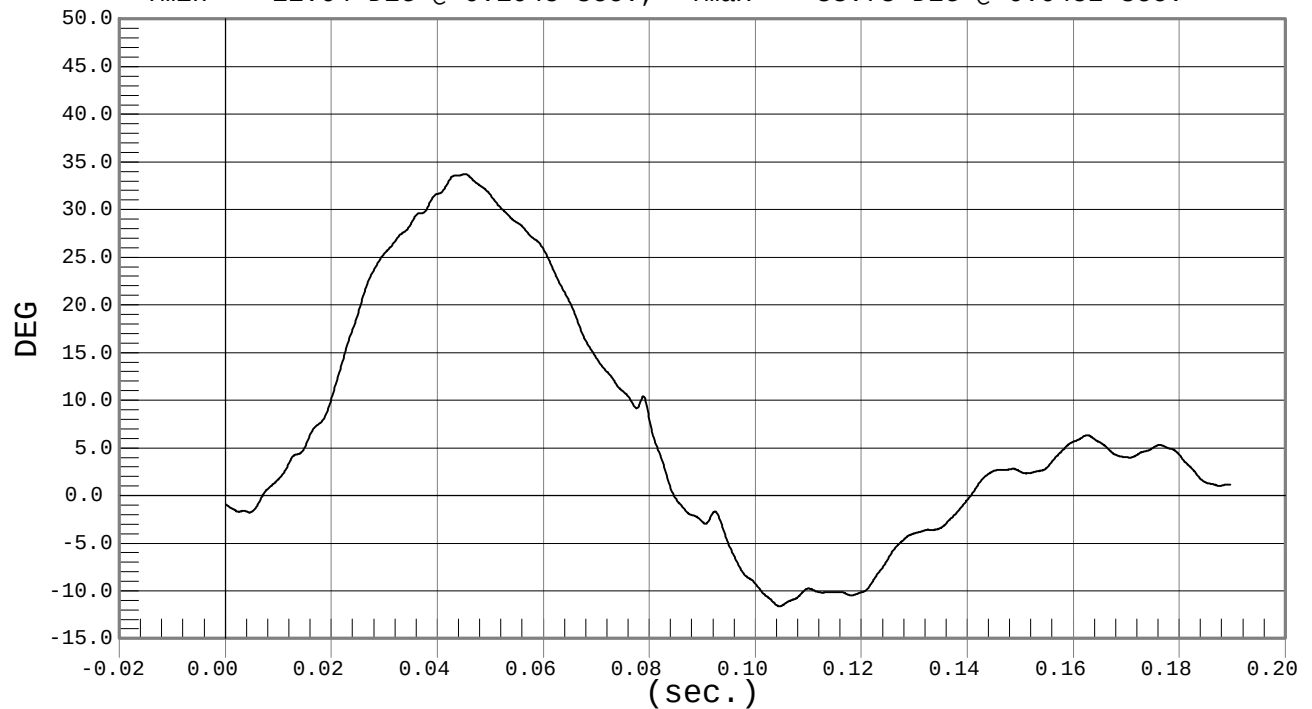


Test Desc.: Lumbar Bending
Component: Dummy #009

THETA A

Test Date: 05-03-05
Speed: 20.2 fps, 6.15 M/s

Ymin = -11.64 DEG @ 0.1045 sec., Ymax = 33.73 DEG @ 0.0452 sec.

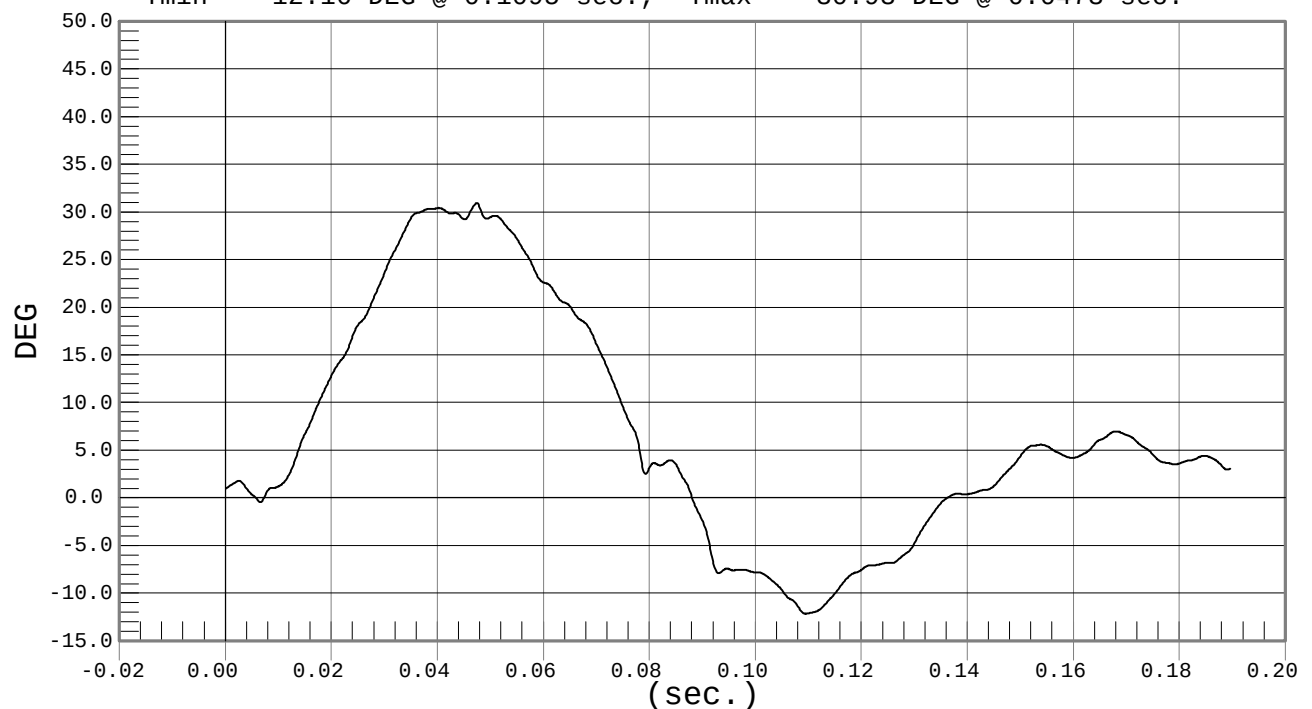


Test Desc.: Lumbar Bending
Component: Dummy #009

THETA B

Test Date: 05-03-05
Speed: 20.2 fps, 6.15 M/s

Ymin = -12.16 DEG @ 0.1095 sec., Ymax = 30.93 DEG @ 0.0473 sec.



MGA RESEARCH CORPORATION
PELVIS TEST
EUROSID 2 DUMMY

Date: 5/3/05
Dummy Serial Number: 009
Test Number: D051189

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.5
Relative Humidity (%)	10 – 70	22
Pendulum Speed	4.20 – 4.40 m/s	4.35
Maximum Impactor Force	4.40 – 5.40 kN	4.69
Time of Max. Impactor Force	10.30 – 15.50 ms	13.60
Maximum Pubic Force	1.04 – 1.64 kN	1.43
Time of Max. Pubic Force	9.90 – 15.90 ms	14.50

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

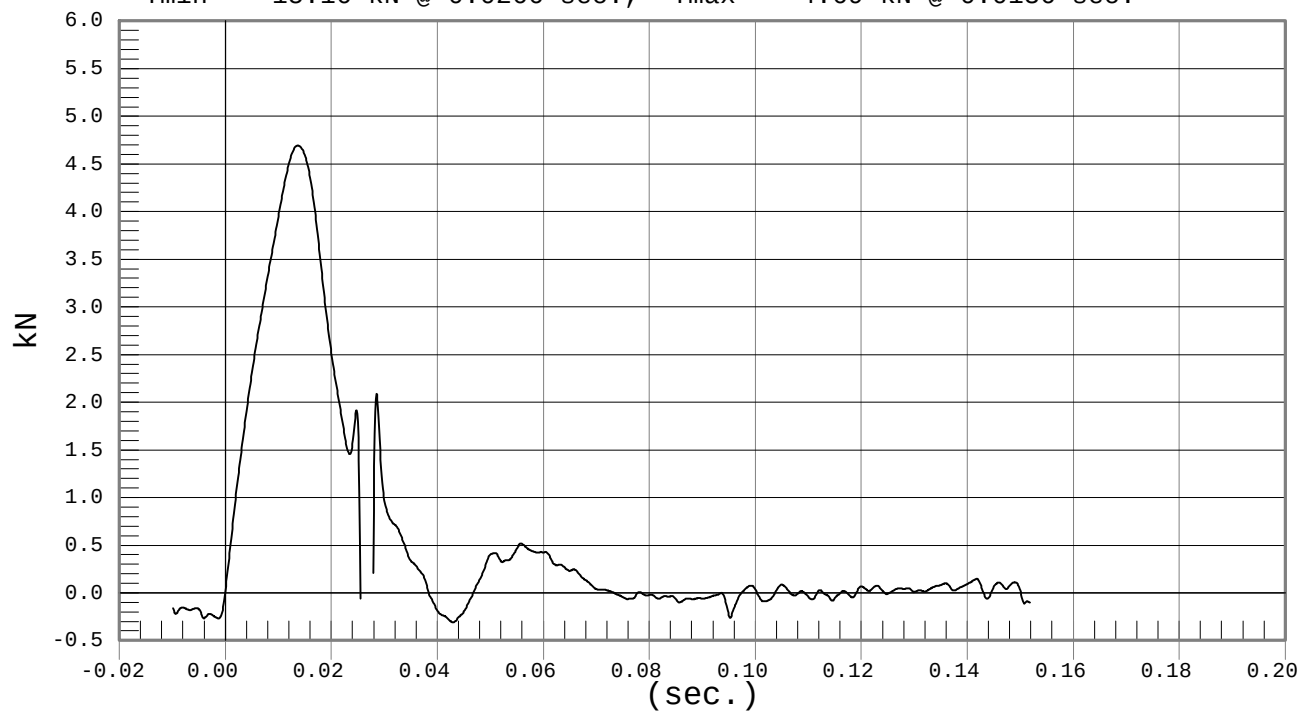


IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 05-03-05
Speed: 14.3 fps, 4.35 M/s

Ymin = -15.16 kN @ 0.0266 sec., Ymax = 4.69 kN @ 0.0136 sec.

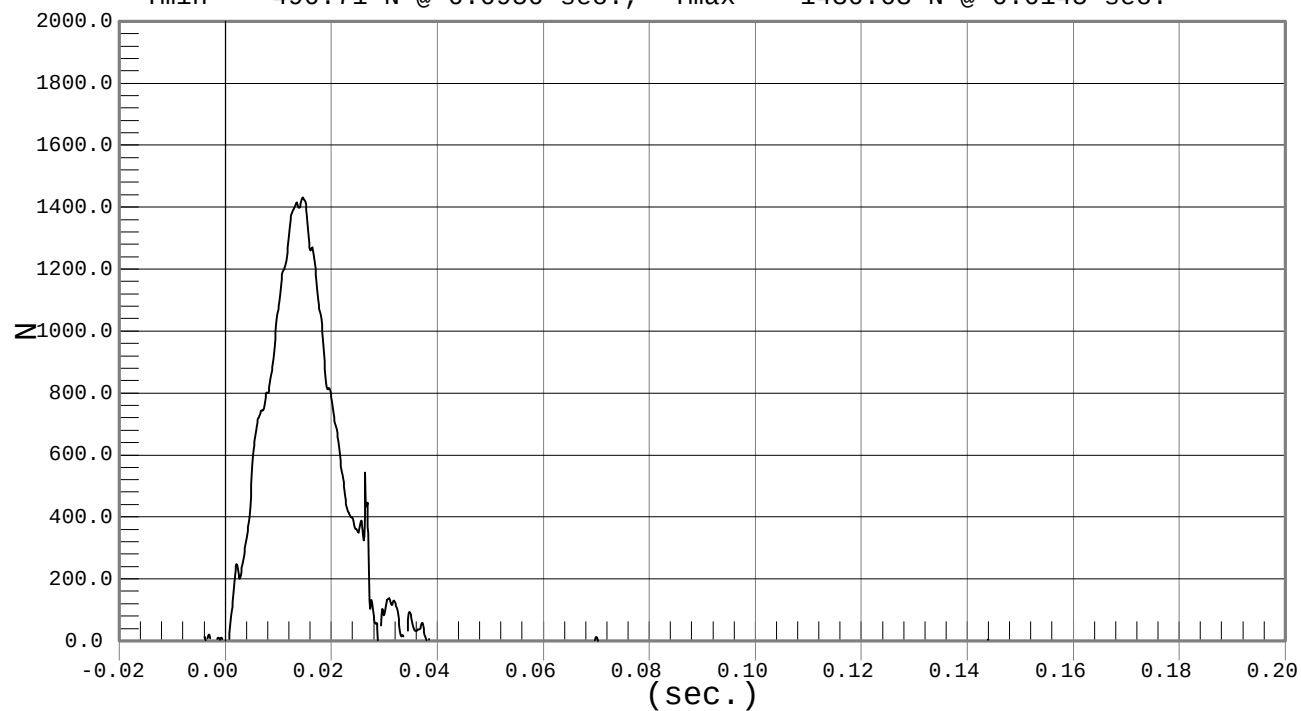


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 05-03-05
Speed: 14.3 fps, 4.35 M/s

Ymin = -490.71 N @ 0.0950 sec., Ymax = 1430.63 N @ 0.0145 sec.



CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Post-Test Calibration

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

MGA RESEARCH CORPORATION
HEAD DROP TEST
EUROSID 2 DUMMY

Date: 5/5/05
Dummy Serial Number: 009
Test Number: D051221

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	20
Peak Resultant Acceleration	100 – 150 g's	145
Time of Max. Res. Acceleration	msec	29.7

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

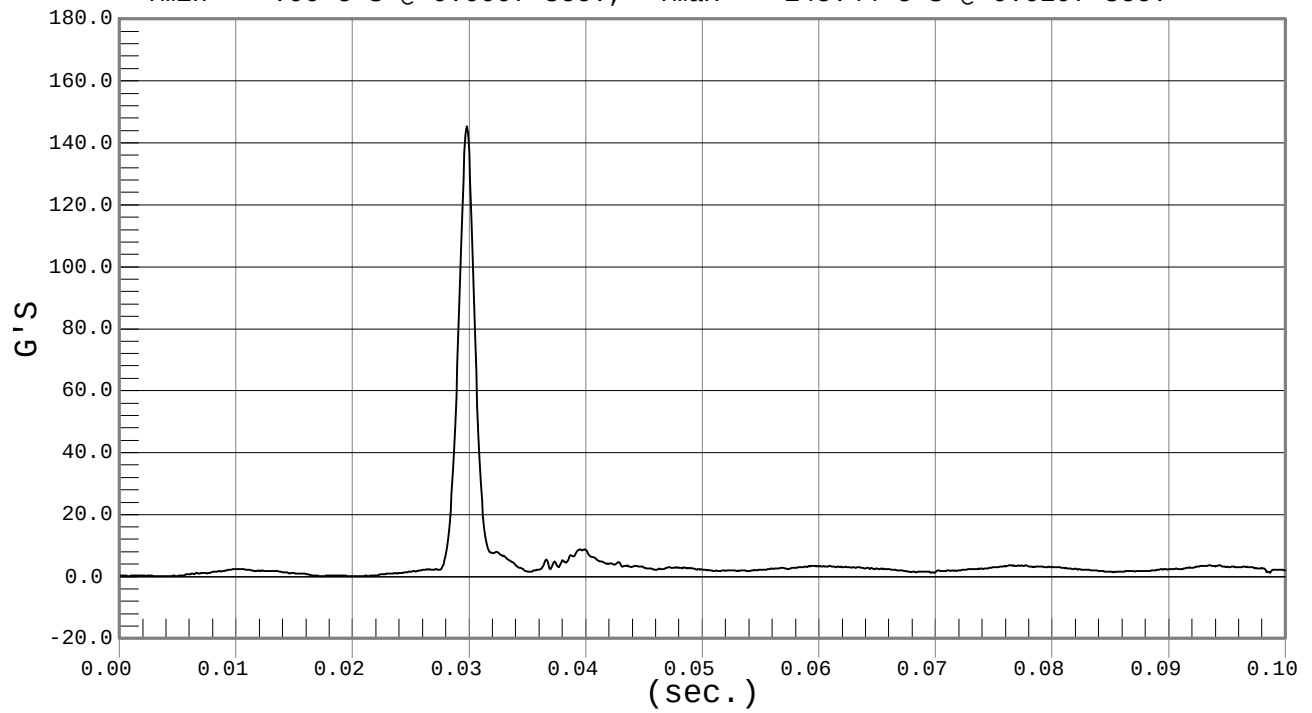


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

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

Ymin = .06 G'S @ 0.0007 sec., Ymax = 145.44 G'S @ 0.0297 sec.



MGA RESEARCH CORPORATION
NECK PENDULUM TEST
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 009
Test Number: D051222

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.9
Relative Humidity (%)		10 – 70	22
Pendulum Speed		3.3 - 3.5	3.5
Pendulum Deceleration	3 msec	1.25 - 1.53 m/sec	-.36
	8 msec	1.59 - 2.04 m/sec	-1.96
	14 msec	3.20 - 3.85 m/sec	-3.65
Maximum Flexion Angle		49.0 – 59.0 deg	53.3
Time of Max. Flexion Angle		54.0 – 66.0 ms	59.2
Maximum Angle Theta (A)		32.0 – 37.0 deg	32.4
Time of Max. Theta (A)		53.0 – 63.0 ms	56.5
Maximum Angle Theta (B)		28.0 – 30.5	30.1
Time of Max. Theta (B)		54.0 – 64.0 ms	61.4

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

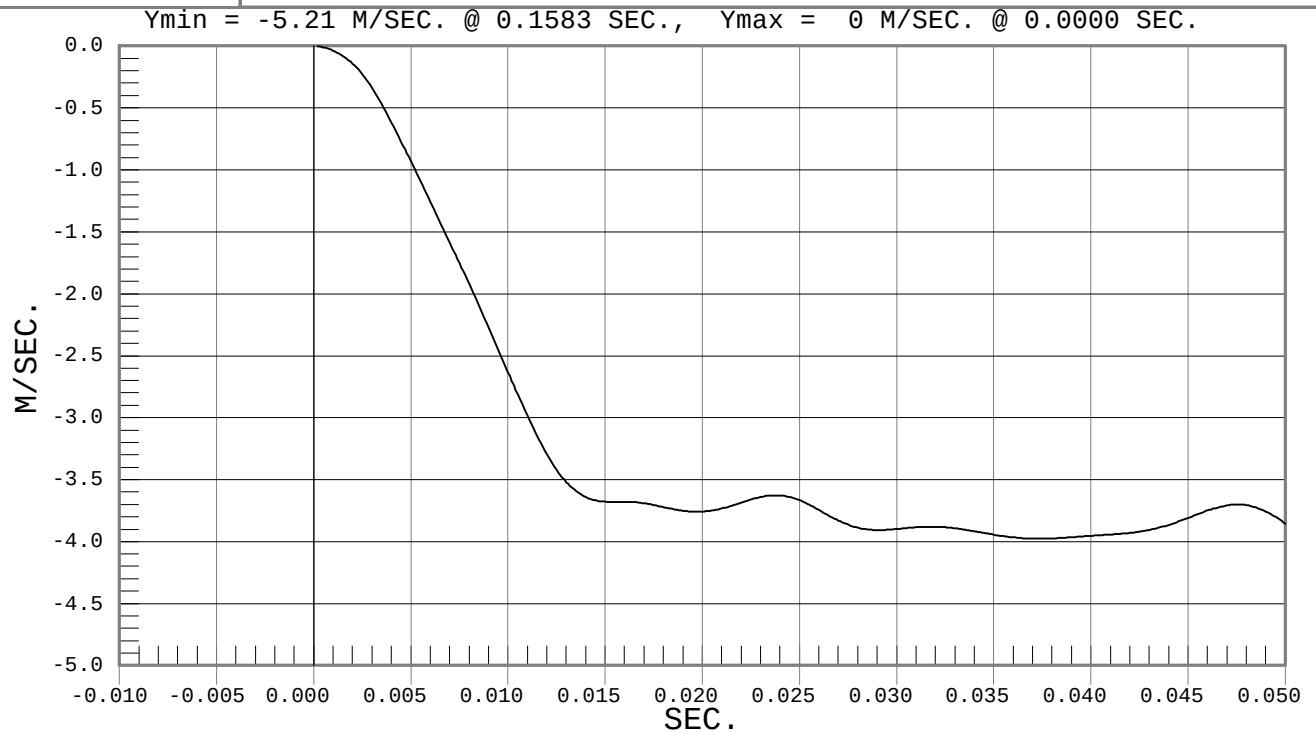
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

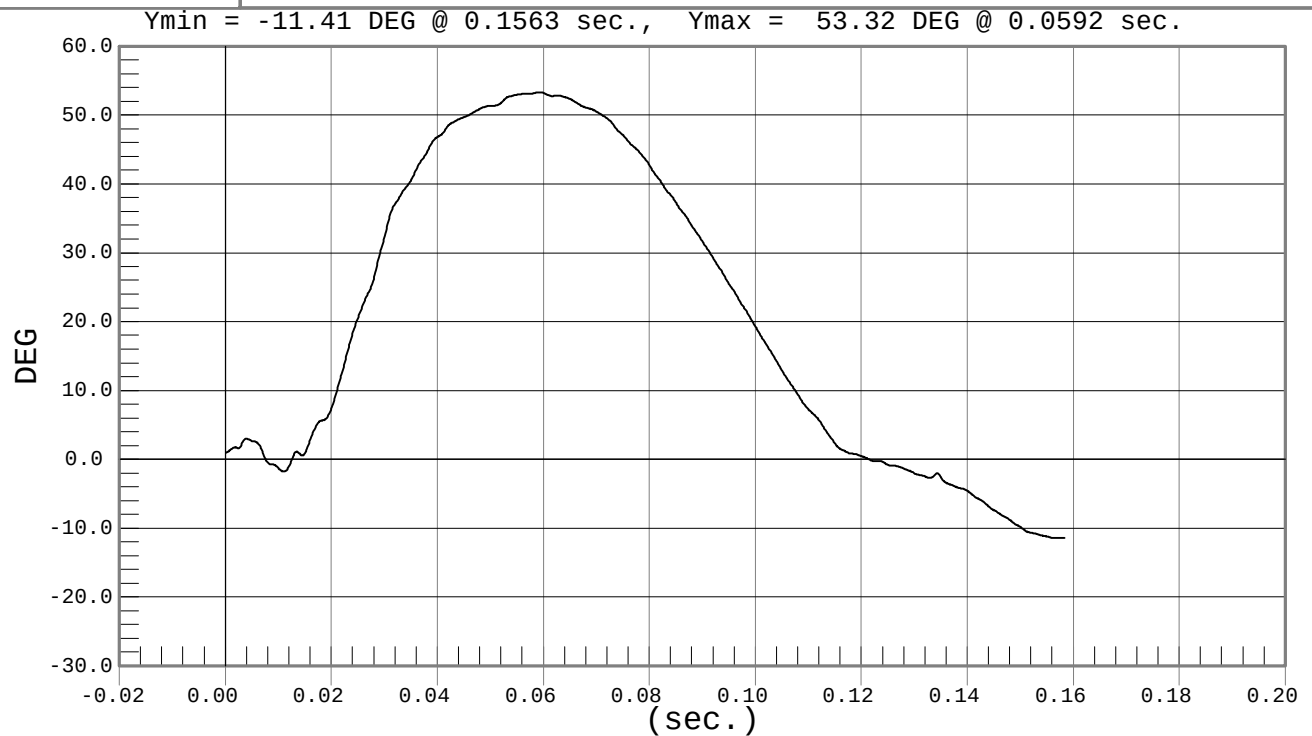
Test Date: 05-06-05
Speed: 11.4 fps, 3.47 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 05-06-05
Speed: 11.4 fps, 3.47 M/s



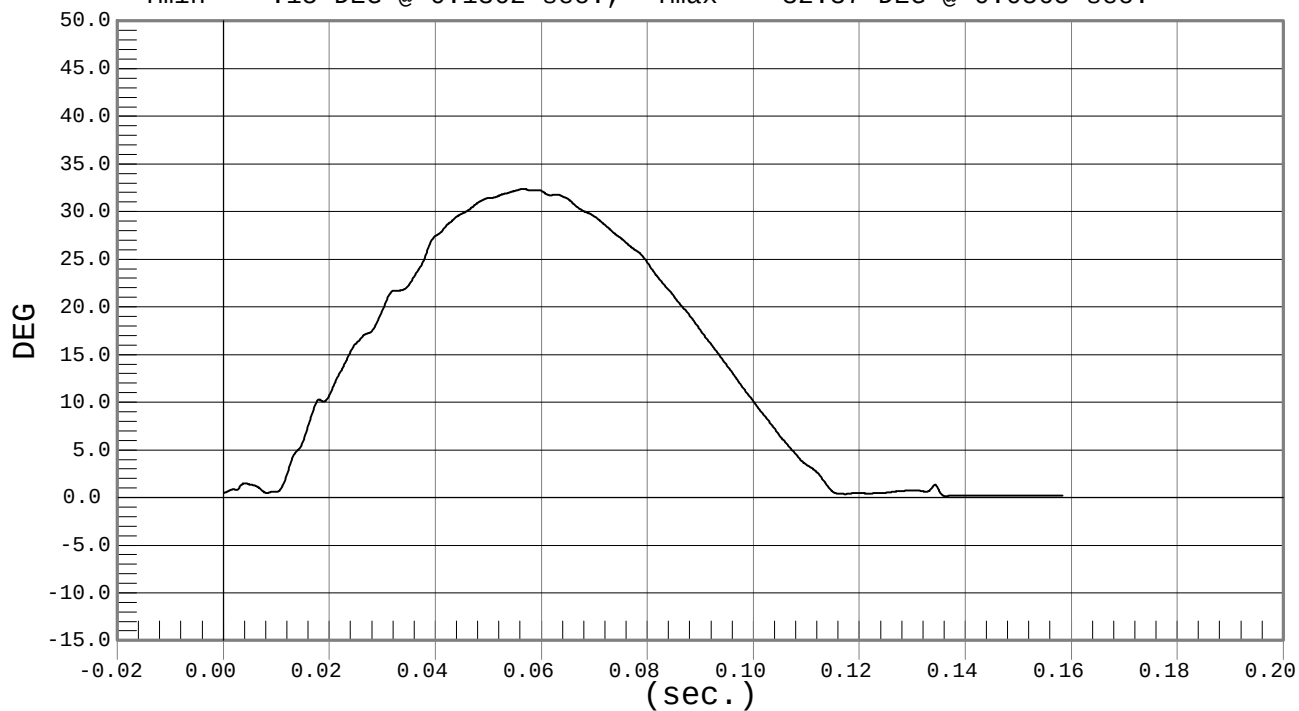


Test Desc.: Neck Bending
Component: Dummy #009

THETA A

Test Date: 05-06-05
Speed: 11.4 fps, 3.47 M/s

Ymin = .15 DEG @ 0.1362 sec., Ymax = 32.37 DEG @ 0.0565 sec.

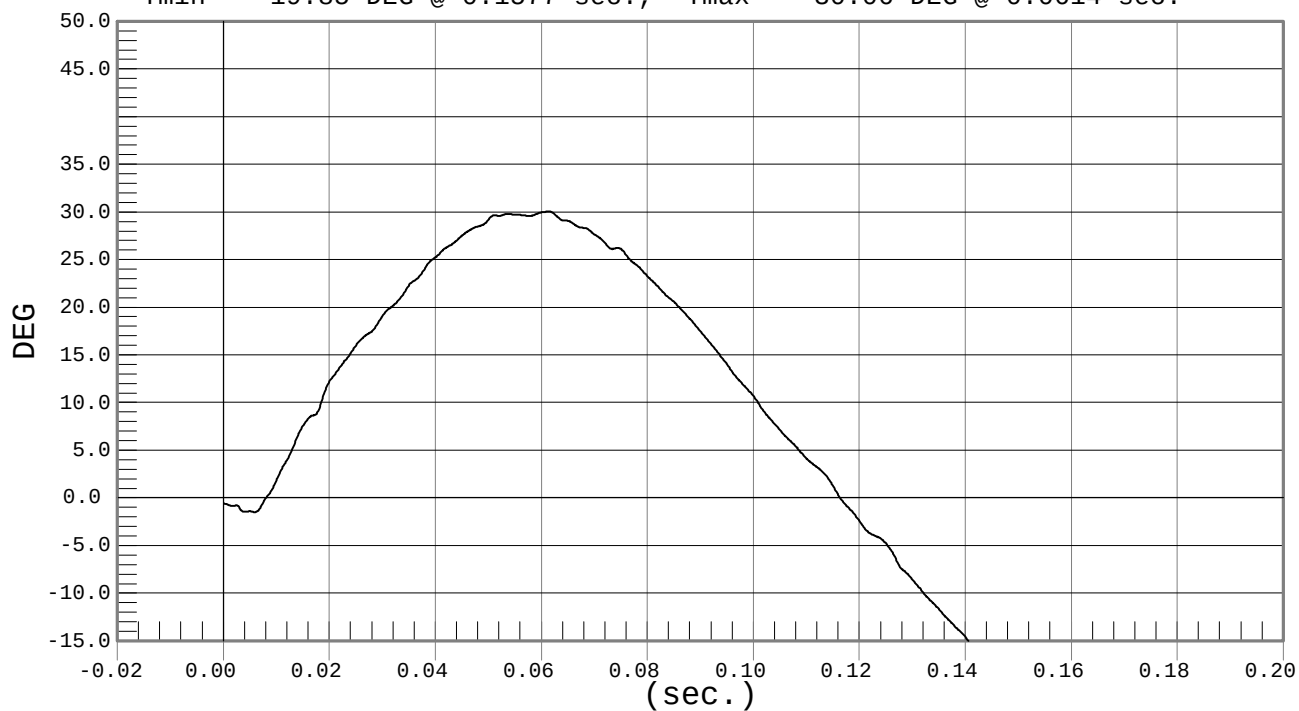


Test Desc.: Neck Bending
Component: Dummy #009

THETA B

Test Date: 05-06-05
Speed: 11.4 fps, 3.47 M/s

Ymin = -19.85 DEG @ 0.1577 sec., Ymax = 30.06 DEG @ 0.0614 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 009
Test Number: D051223

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.2
Relative Humidity (%)	10 – 70	31
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.8
Time of Max. Pendulum Acceleration	msec	50.9

TEST MEETS SPECIFICATIONS

Technician: Jessica Gall

Approved By: David Winkelbauer

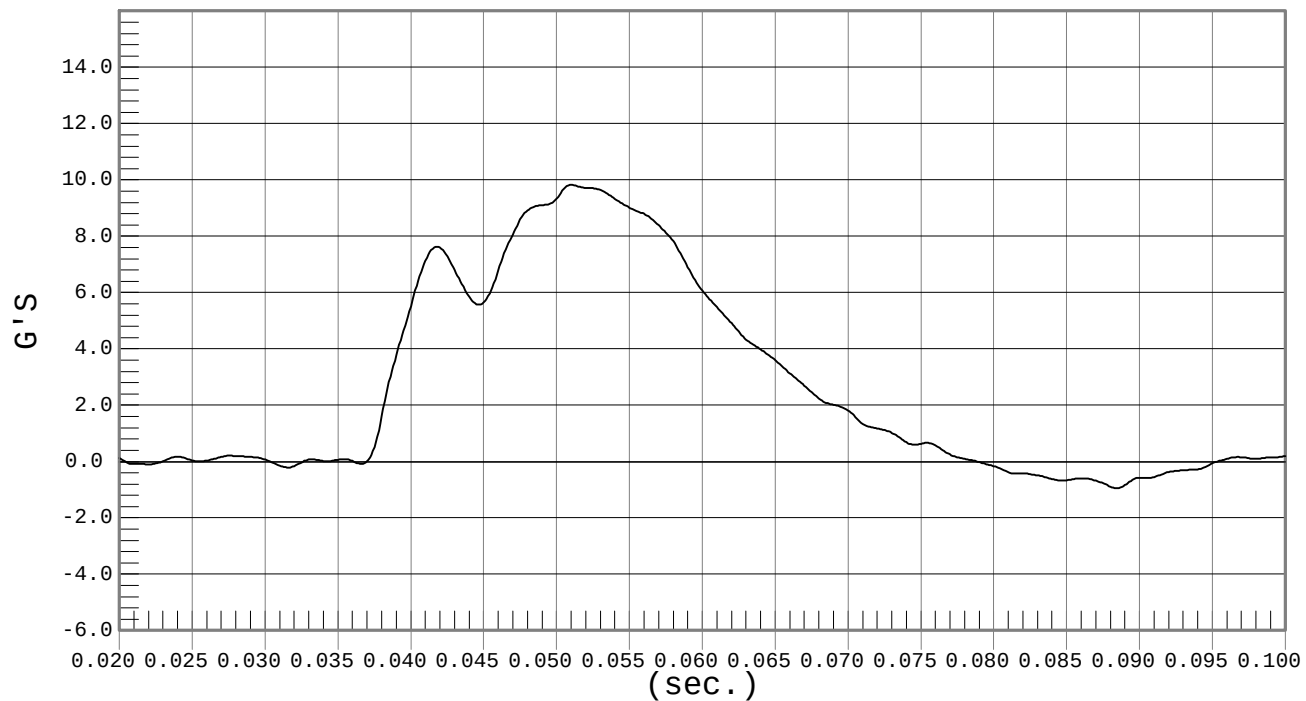


SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 05-06-05
Speed: 14.1 fps, 4.30 M/s

Ymin = -.95 G'S @ 0.0883 sec., Ymax = 9.82 G'S @ 0.0509 sec.



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

Date: 5/5/05
Dummy Serial Number: 009
Test Number: D051224, D051225, D051226

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	21
Displacement at 2 m/s	23.5 – 27.5 mm	26.4
Displacement at 3 m/s	36.0 – 40.0 mm	37.8
Displacement at 4 m/s	46.0 – 51.0 mm	49.3

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	21
Displacement at 2 m/s	23.5 – 27.5 mm	26.3
Displacement at 3 m/s	36.0 – 40.0 mm	37.5
Displacement at 4 m/s	46.0 – 51.0 mm	48.7

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.4
Relative Humidity (%)	10 – 70	21
Displacement at 2 m/s	23.5 – 27.5 mm	27.3
Displacement at 3 m/s	36.0 – 40.0 mm	38.2
Displacement at 4 m/s	46.0 – 51.0 mm	49.9

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

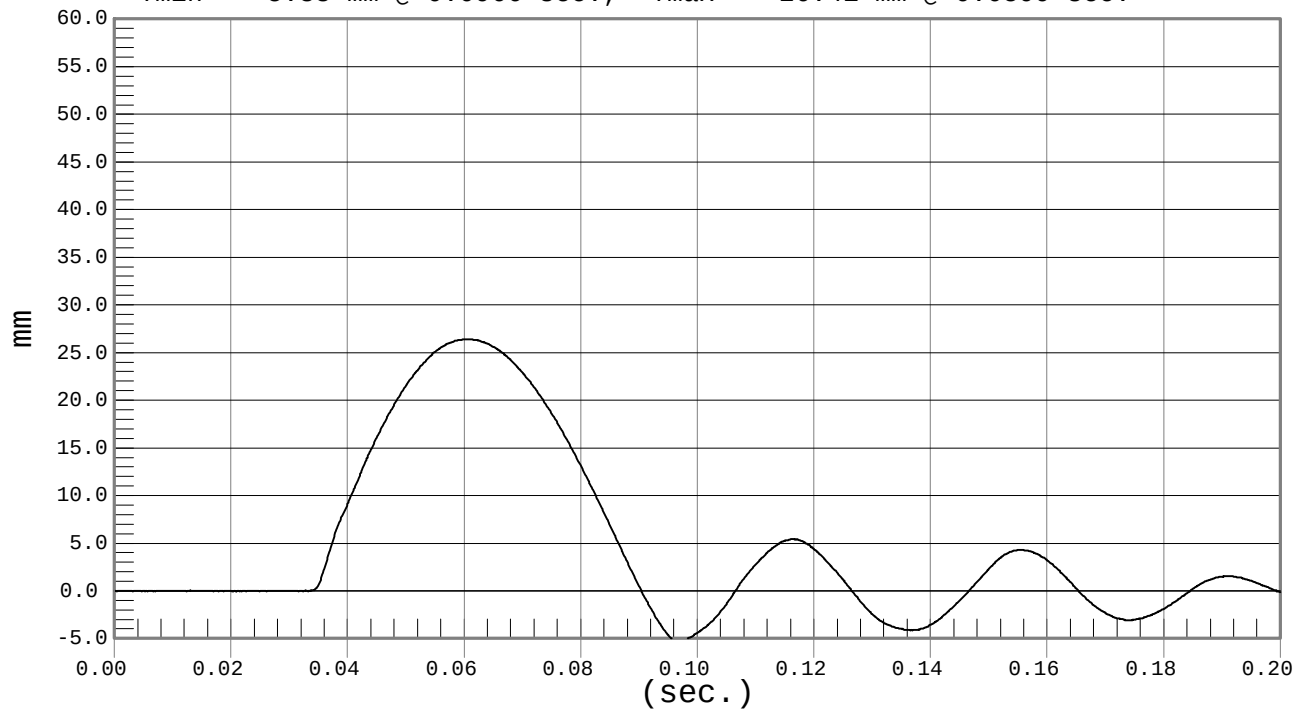


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -5.33 mm @ 0.0966 sec., Ymax = 26.41 mm @ 0.0599 sec.

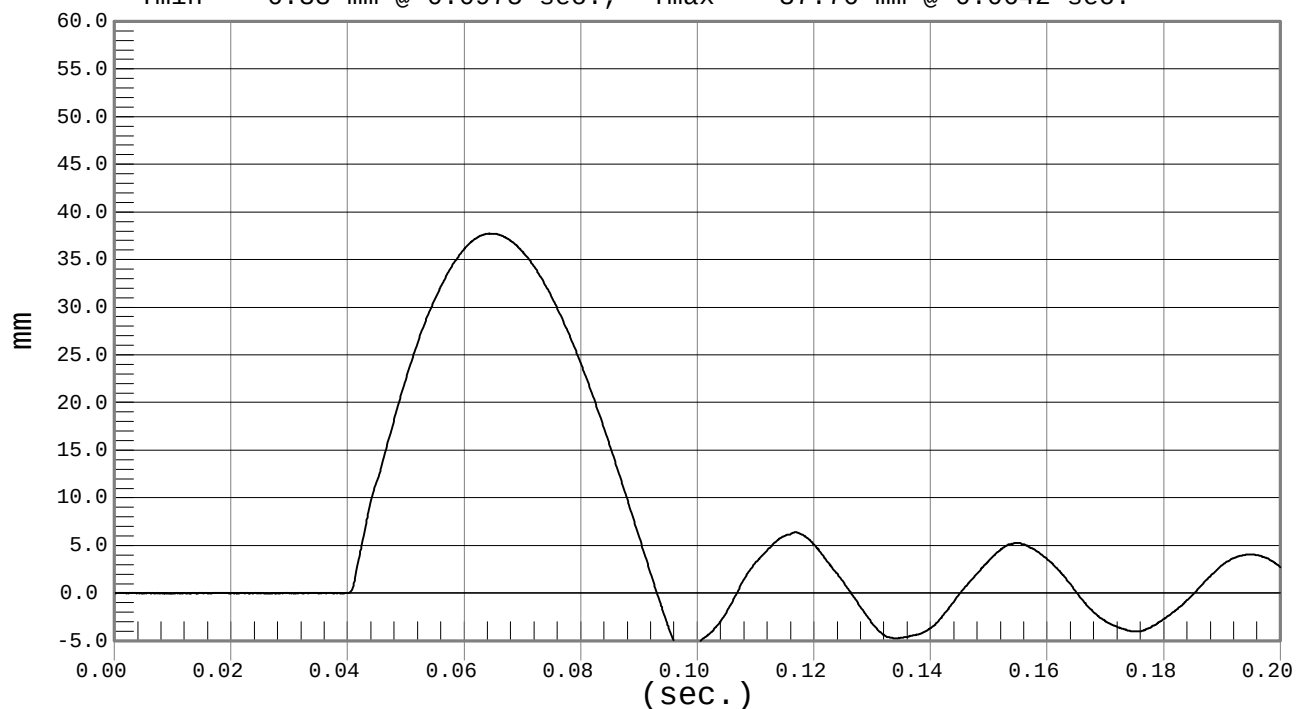


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -6.33 mm @ 0.0975 sec., Ymax = 37.76 mm @ 0.0642 sec.



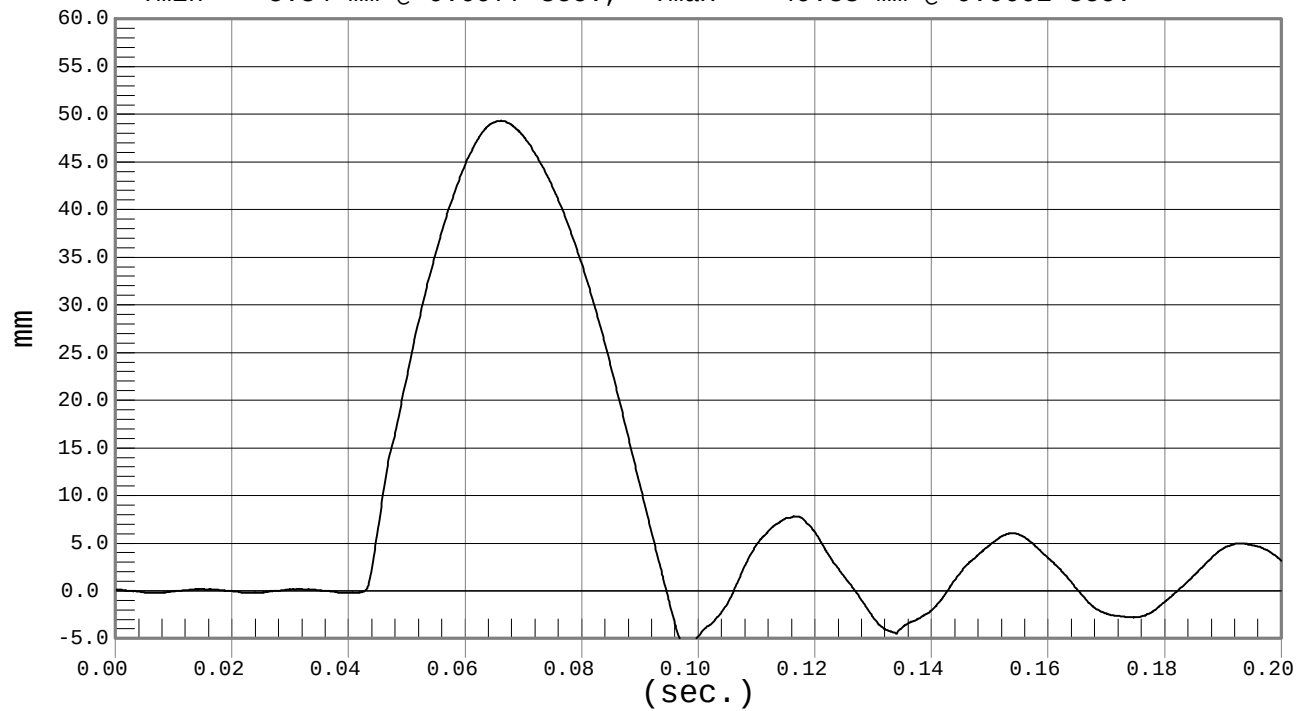


UPPER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -5.84 mm @ 0.0977 sec., Ymax = 49.33 mm @ 0.0661 sec.



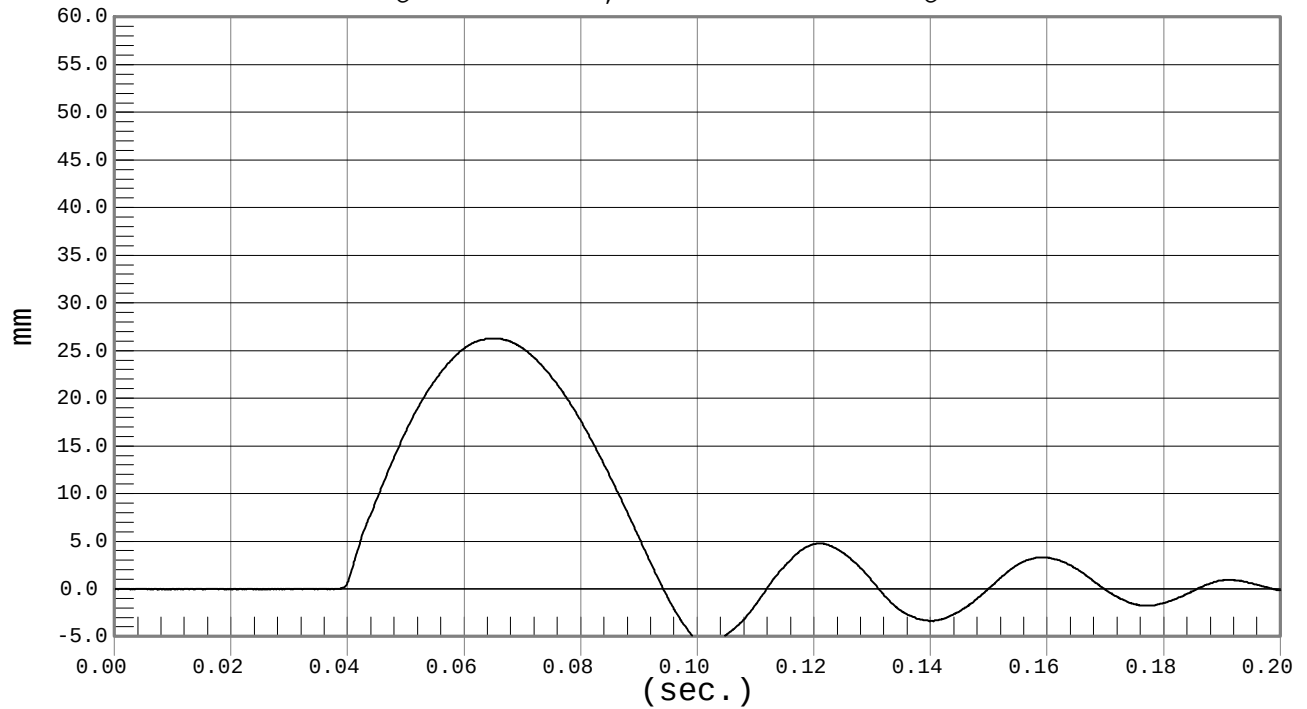


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -5.87 mm @ 0.1013 sec., Ymax = 26.26 mm @ 0.0637 sec.

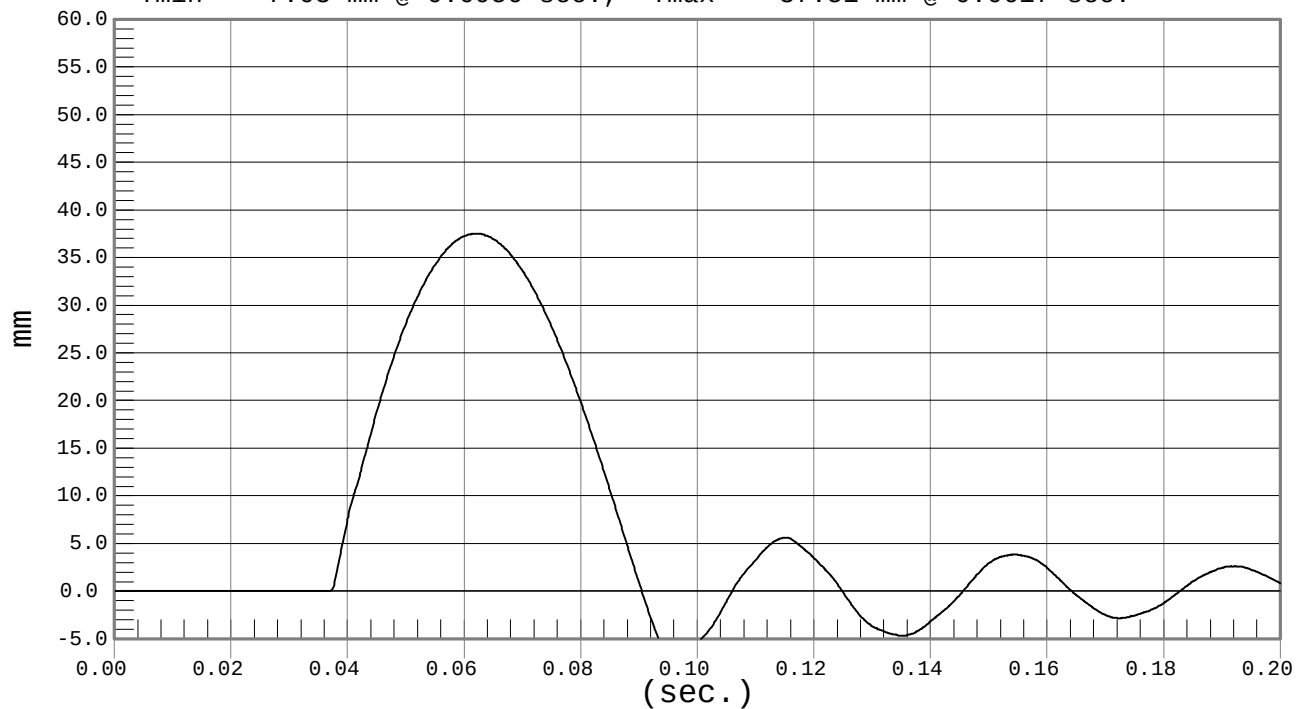


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -7.03 mm @ 0.0956 sec., Ymax = 37.51 mm @ 0.0617 sec.



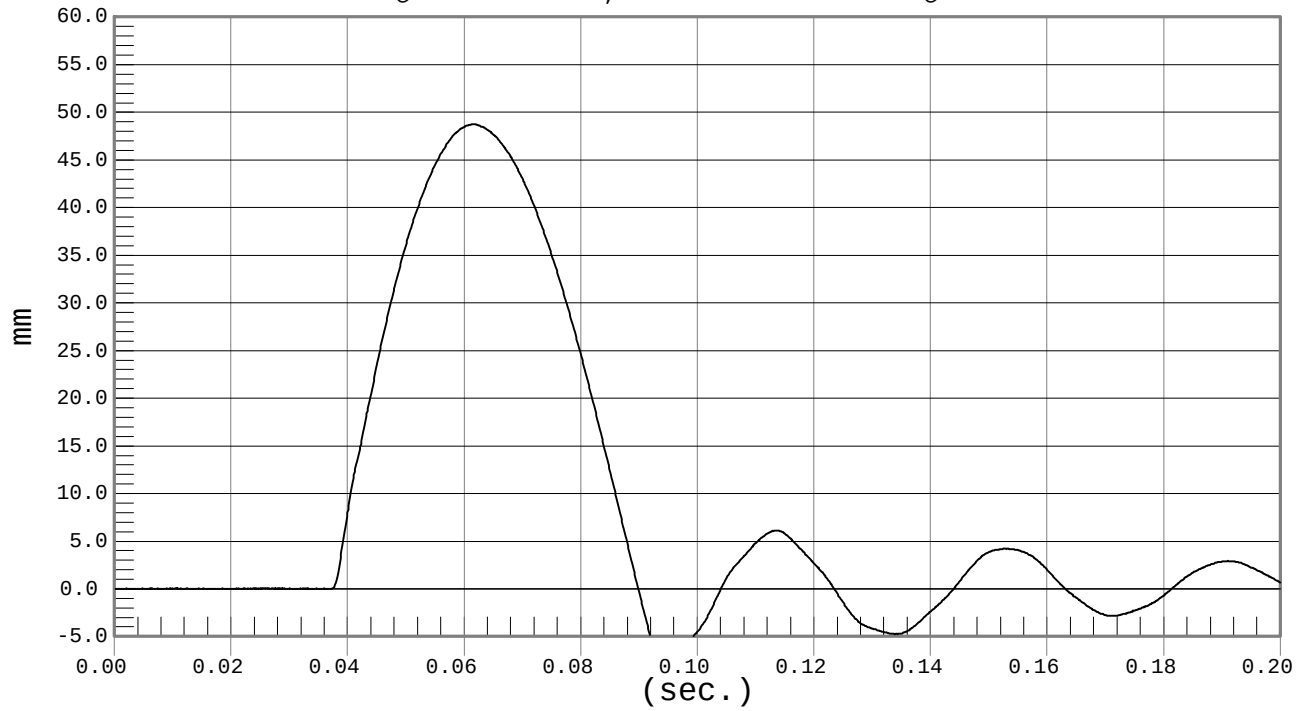


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -7.44 mm @ 0.0937 sec., Ymax = 48.74 mm @ 0.0611 sec.



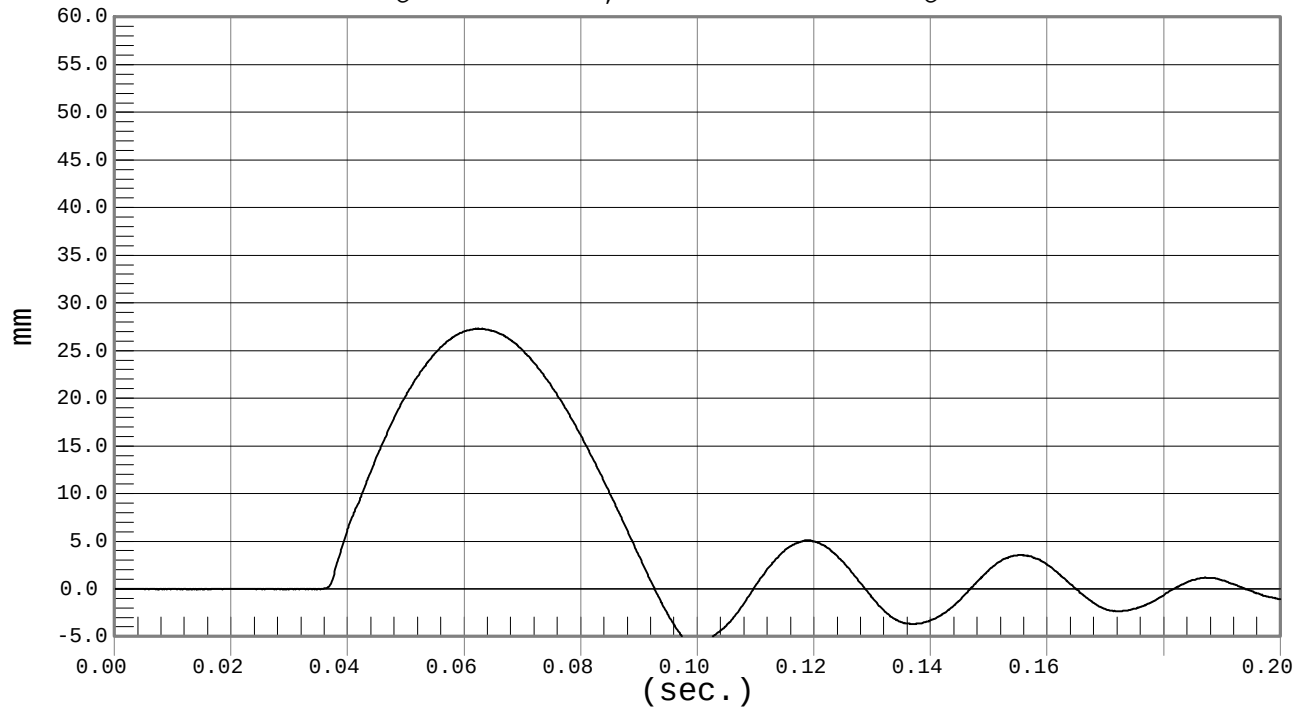


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -5.85 mm @ 0.0992 sec., Ymax = 27.29 mm @ 0.0619 sec.

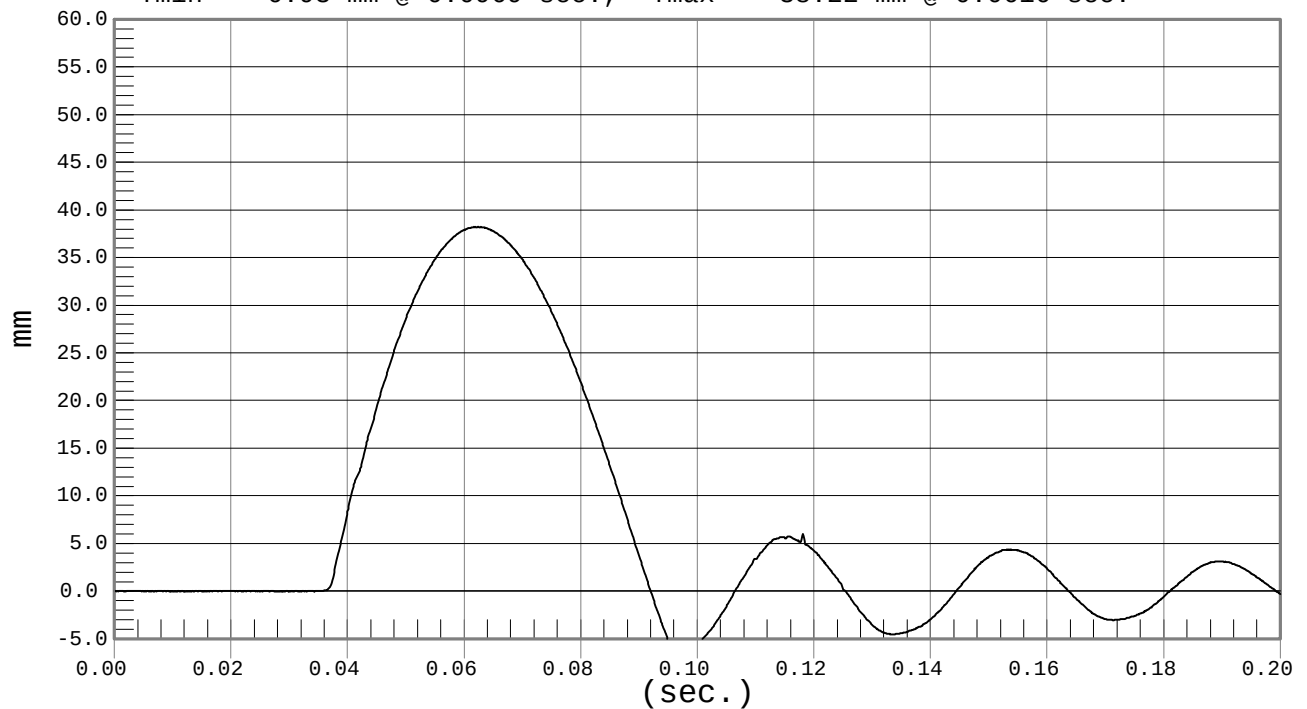


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -6.93 mm @ 0.0969 sec., Ymax = 38.22 mm @ 0.0616 sec.



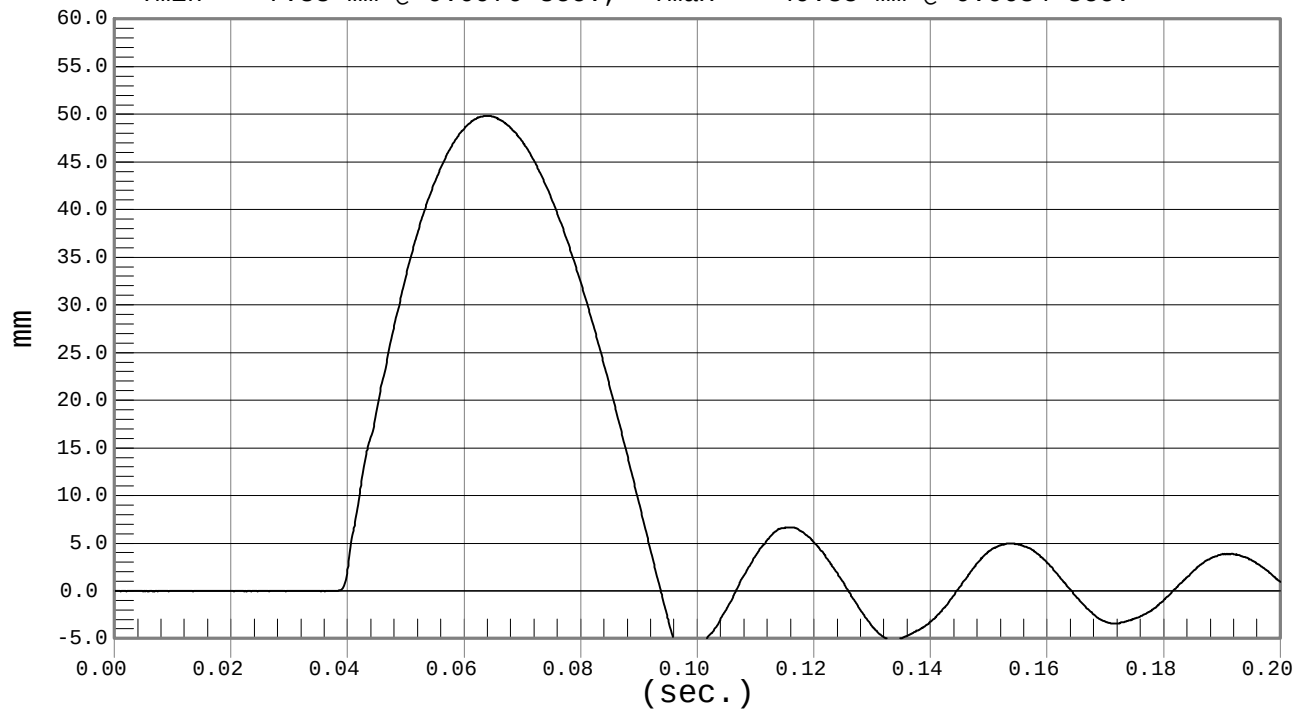


LOWER RIB DISPLACEMENT

Test Desc.: Rib Displacement
Component: Dummy #009

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

Ymin = -7.38 mm @ 0.0976 sec., Ymax = 49.85 mm @ 0.0634 sec.



MGA RESEARCH CORPORATION
ABDOMEN TEST
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 009
Test Number: D051227

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.2
Relative Humidity (%)	10 – 70	36
Probe Speed (m/s)	3.90 – 4.10	4.10
Maximum Impact Force	4.00 – 4.80 kN	4.79
Time of Maximum Force	10.60 – 13.00 ms	10.80
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.45
Time of Max. Total Force	10.00 – 12.30 ms	10.50

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Gall

Approved By: _____

David Winkelbauer

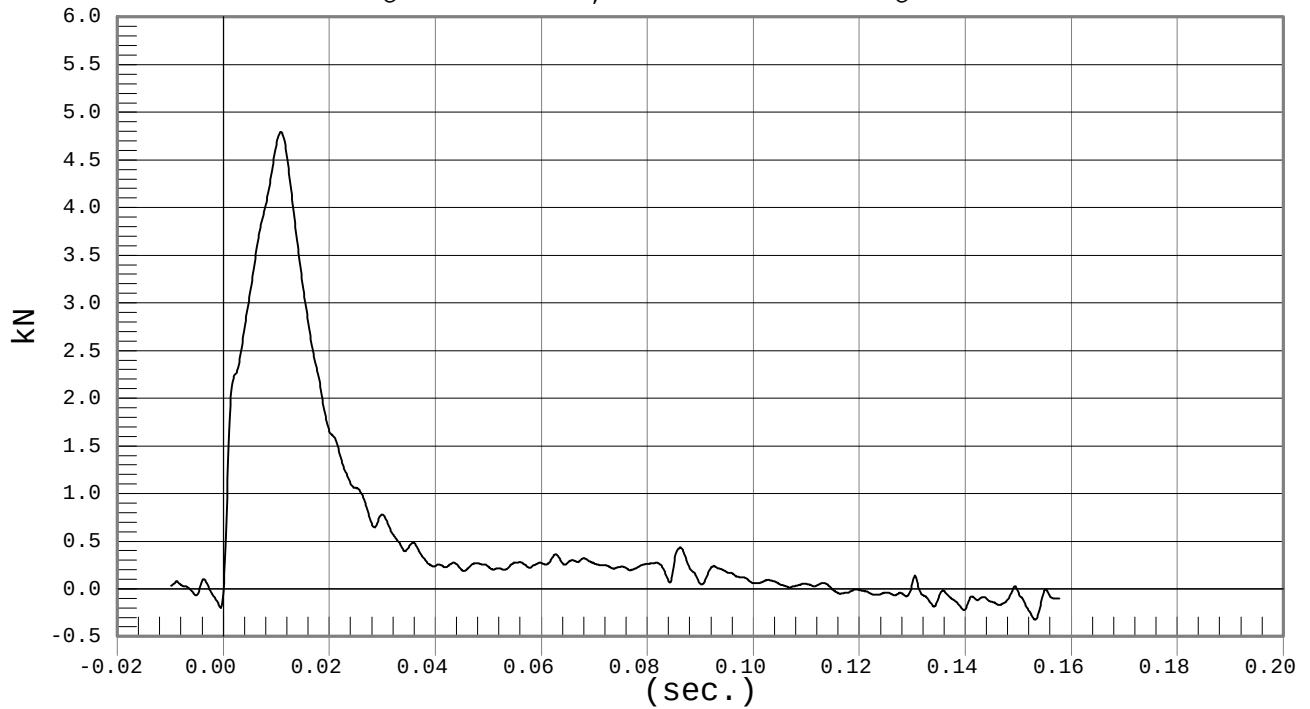


IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 05-06-05
Speed: 13.4 fps, 4.10 M/s

Ymin = -.32 kN @ 0.1531 sec., Ymax = 4.79 kN @ 0.0108 sec.

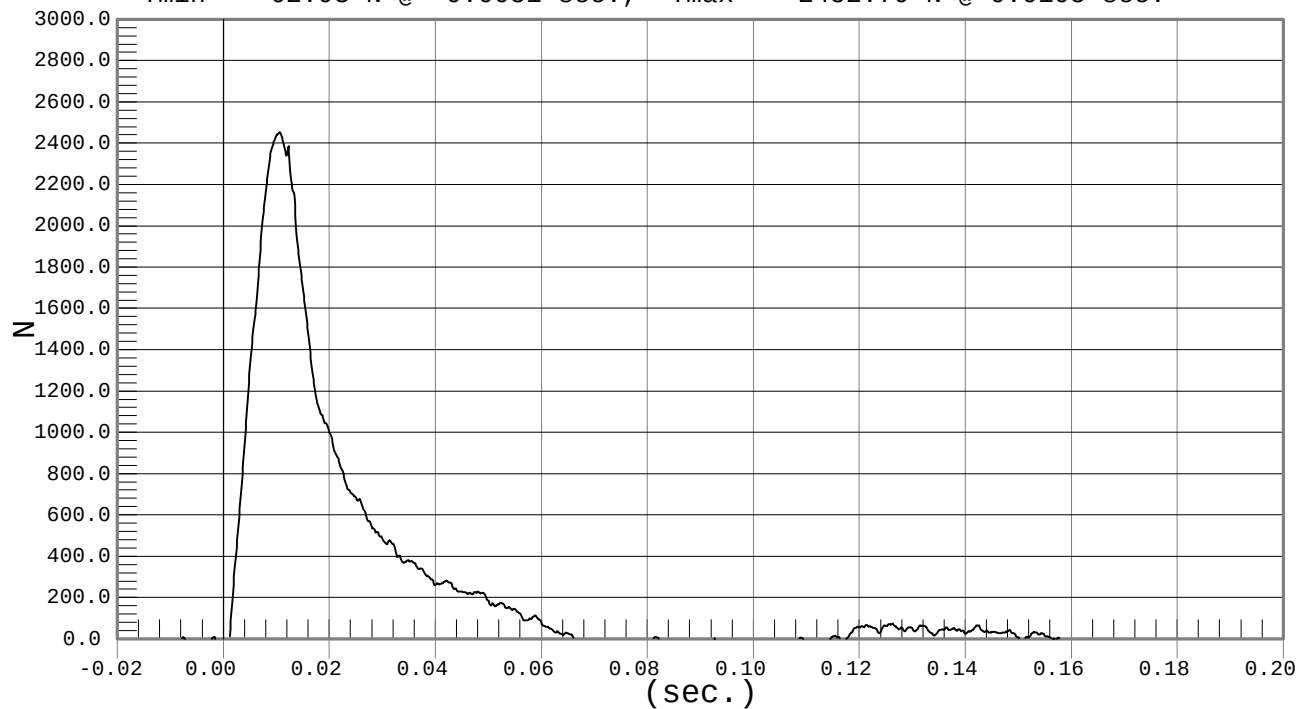


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 05-06-05
Speed: 13.4 fps, 4.10 M/s

Ymin = -62.93 N @ -0.0051 sec., Ymax = 2452.79 N @ 0.0105 sec.



MGA RESEARCH CORPORATION
LUMBAR SPINE TEST
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 009
Test Number: D051228

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	21.8
Relative Humidity (%)		10 – 70	33
Pendulum Speed		5.95 – 6.15	6.14
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-2.20
	20 msec	-5.25 - -4.07 m/sec	-5.09
	25 msec	-6.64 - -5.30 m/sec	-6.19
	30 msec	≥ -6.5 m/sec	-6.3
Maximum Flexion Angle		45.0 – 55.0 deg	53.7
Time of Max. Flexion Angle		39.0 – 53.0 ms	47.1
Maximum Angle Theta (A)		31.0 – 35.0 deg	34.4
Time of Max. Theta (A)		44.0 – 52.0 ms	44.4
Maximum Angle Theta (B)		29.5 – 32.0 deg	30.6
Time of Max. Theta (B)		44.0 – 52.0 ms	44.0

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

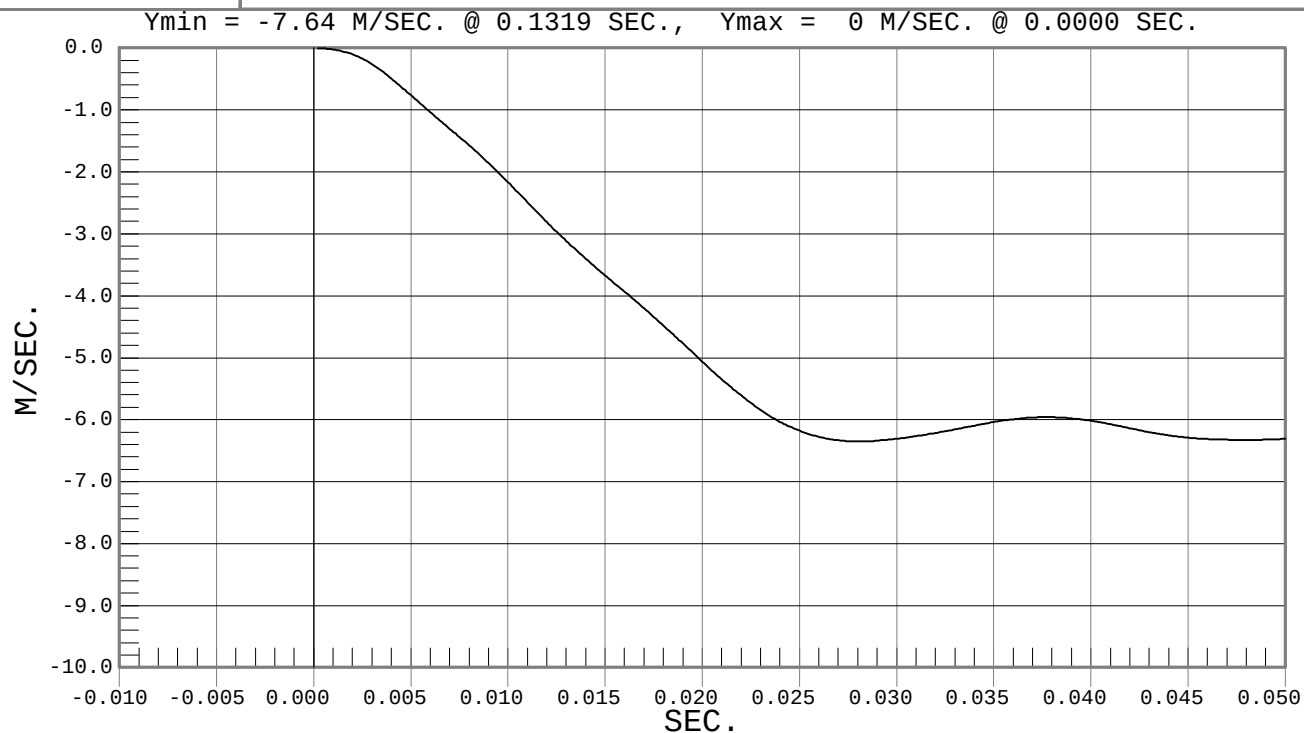
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Lumbar Bending
Component: Dummy #009

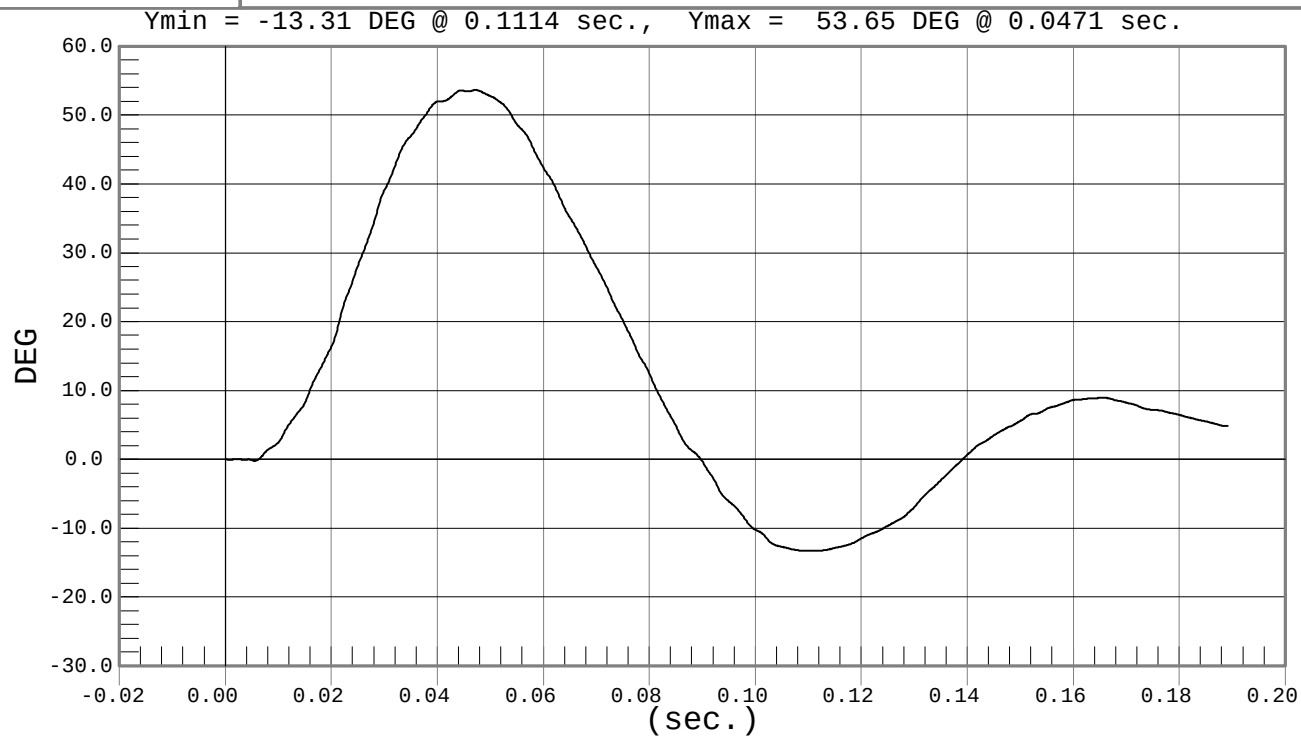
Test Date: 05-06-05
Speed: 20.2 fps, 6.14 M/s



FLEXION ANGLE

Test Desc.: Lumbar Bending
Component: Dummy #009

Test Date: 05-06-05
Speed: 20.2 fps, 6.14 M/s



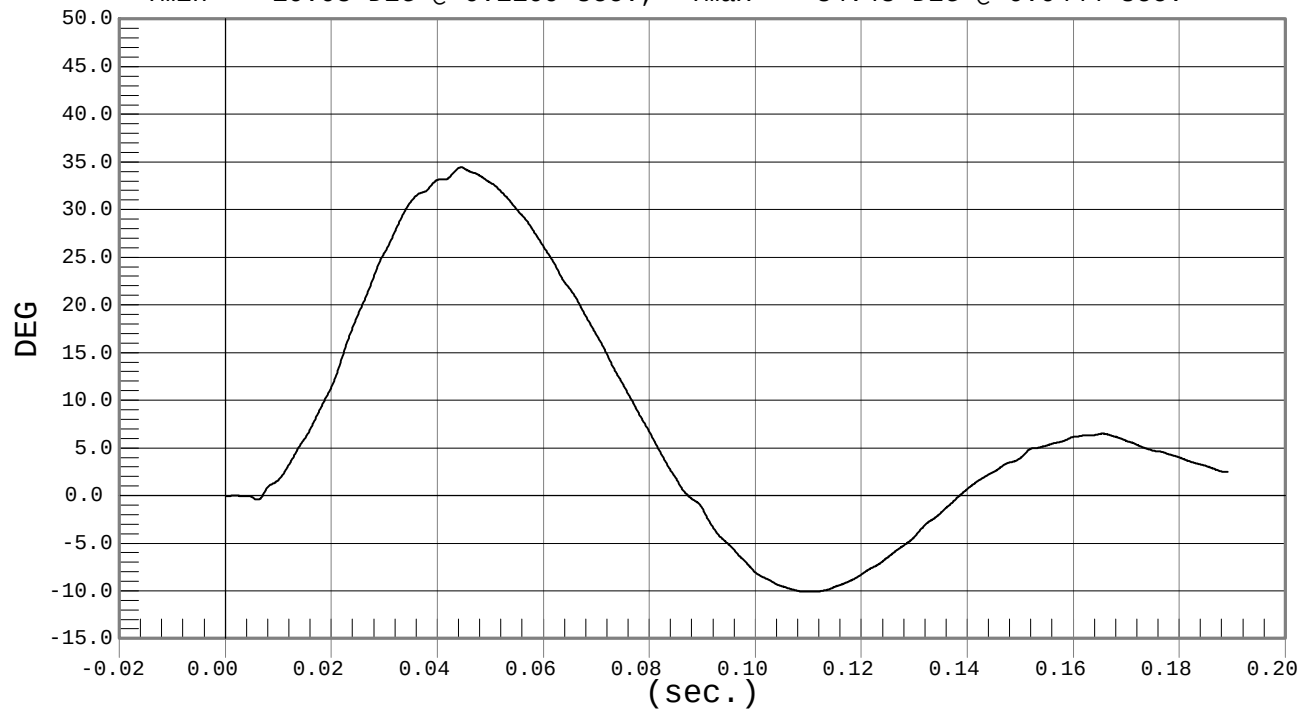


Test Desc.: Lumbar Bending
Component: Dummy #009

THETA A

Test Date: 05-06-05
Speed: 20.2 fps, 6.14 M/s

Ymin = -10.08 DEG @ 0.1109 sec., Ymax = 34.43 DEG @ 0.0444 sec.

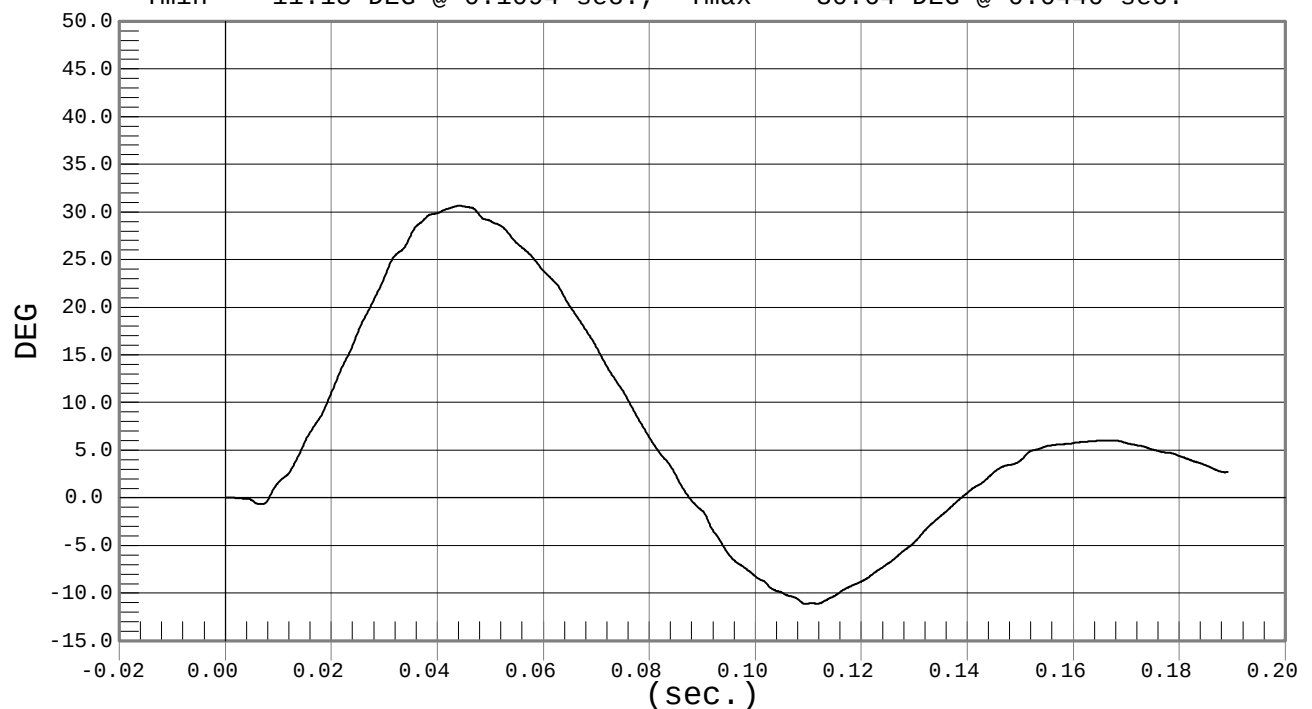


Test Desc.: Lumbar Bending
Component: Dummy #009

THETA B

Test Date: 05-06-05
Speed: 20.2 fps, 6.14 M/s

Ymin = -11.15 DEG @ 0.1094 sec., Ymax = 30.64 DEG @ 0.0440 sec.



MGA RESEARCH CORPORATION
PELVIS TEST
EUROSID 2 DUMMY

Date: 5/6/05
Dummy Serial Number: 009
Test Number: D051229

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.3
Relative Humidity (%)	10 – 70	32
Pendulum Speed	4.20 – 4.40 m/s	4.30
Maximum Impactor Force	4.40 – 5.40 kN	4.75
Time of Max. Impactor Force	10.30 – 15.50 ms	14.40
Maximum Pubic Force	1.04 – 1.64 kN	1.32
Time of Max. Pubic Force	9.90 – 15.90 ms	14.60

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

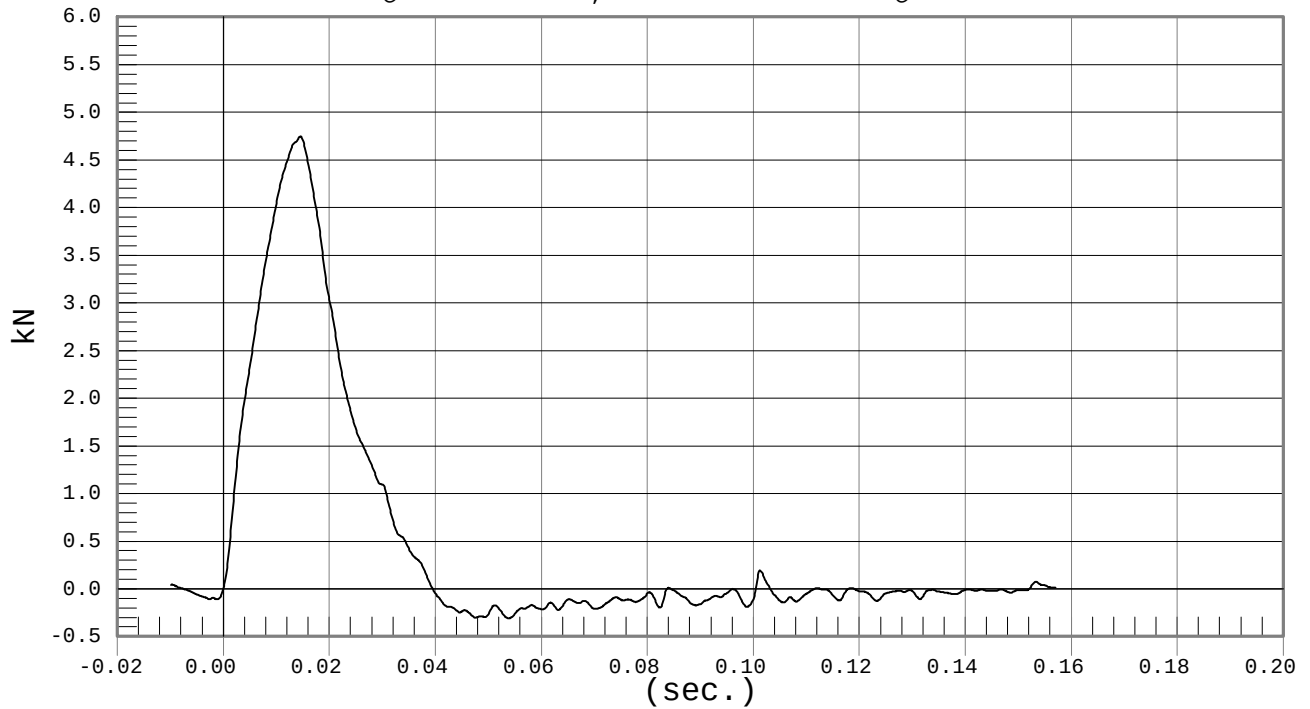


IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 05-06-05
Speed: 14.1 fps, 4.30 M/s

Ymin = -.31 kN @ 0.0538 sec., Ymax = 4.75 kN @ 0.0144 sec.

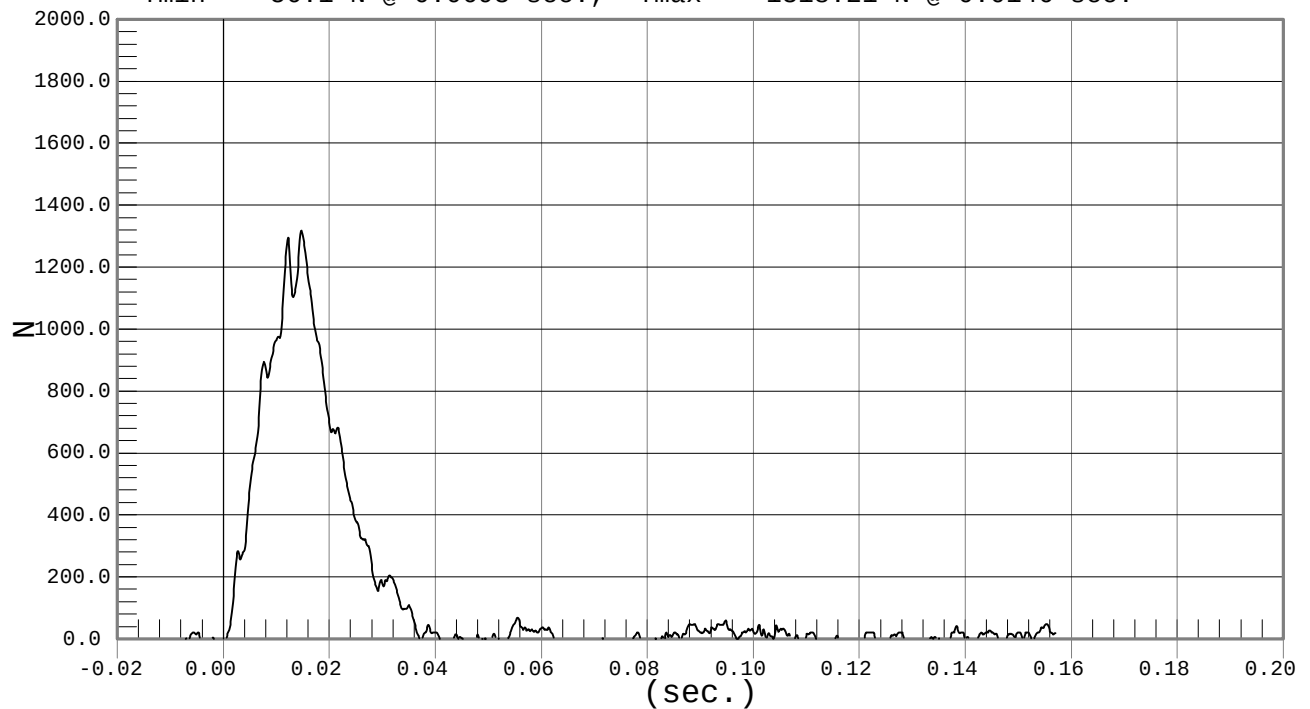


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 05-06-05
Speed: 14.1 fps, 4.30 M/s

Ymin = -56.1 N @ 0.0693 sec., Ymax = 1318.21 N @ 0.0146 sec.



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY ES2: 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	AGTB5	Endevco	1/03/05
Head Y Accelerometer	ANAN3	Endevco	1/03/05
Head Z Accelerometer	ANAN6	Endevco	1/03/05
Head Y - Front	F16-F14	Entran	11/23/04
Head Z - Front	F28-N03	Entran	11/23/04
Head X – Left	AH0D1	Endevco	11/16/04
Head Z – Left	J11014	Endevco	11/16/04
Head X – Upper	J10730	Endevco	11/16/04
Head Y – Upper	AP2G9	Endevco	11/16/04
Upper Neck Load Cell	105	FTSS	9/27/04
Lower Neck Load Cell	110	FTSS	9/27/04
Shoulder Load Cell	119	Endevco	9/24/04
T12 Load Cell	103	Endevco	9/24/04
Upper Spine X	J22034	Endevco	11/16/04
Upper Spine Y	AJ9T6	Endevco	1/03/05
Upper Spine Z	AH0M0	Endevco	11/16/04
Lower Spine X	AGM47	Endevco	1/03/05
Lower Spine Y	AJ9D9	Endevco	1/03/05
Lower Spine Z	AJ820	Endevco	1/03/05
Torso Load Cell	102	FTSS	9/29/04
Upper Rib Y	AN8D5	Endevco	1/03/05
Mid Rib Y	AC913	Endevco	1/03/05
Lower Rib Y	J12450	Endevco	1/03/05
Rib Displacement	009	Honeywell	1/03/05
Front Abdomen FY	ABG122FY	FTSS	9/30/04
Mid Abdomen FY	ABG123FY	FTSS	9/30/04
Rear Abdomen FY	ABG124FY	FTSS	9/30/04
Pubic Symphysis FY	PG115FY	FTSS	9/24/04
Pelvis X	C17-J01	Entran	3/11/05
Pelvis Y	A12-Z12	Entran	3/11/05
Pelvis Z	C15-Z02	Entran	3/11/05
Right Femur Load Cell	135	FTSS	9/28/04
Left Femur Load Cell	136	FTSS	9/28/04
Lumbar Load Cell	104	FTSS	9/27/04

VEHICLE INSTRUMENTS CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	K20-J09	Entran	3/09/05
Left Lower A-Post Y	C10-Z04	Entran	4/22/05
Left Mid B-Post Y	L17-D09	Entran	3/09/05
Left Lower B-Post Y	I16-B06	Entran	3/09/05
Left A-Post @ Sill Y	I25-F09	Entran	3/09/05
Left B-Post @ Sill Y	B19-Z13	Entran	3/03/05
Driver Seat Track Y	G10-F04	Entran	3/09/05
Right Front Sill X	B16-Z07	Entran	3/03/05
Right Front Sill Y	B19-Z03	Entran	3/03/05
Right Front Sill Z	B16-Z25	Entran	3/03/05
Left Rear Sill Y	B26-Z15	Entran	3/17/05
Left Front Sill Y	L18-N10	Entran	3/09/05
Floorpan @ Rear Axle X	C06-L06	Entran	3/24/05
Floorpan @ Rear Axle Y	C06-L07	Entran	3/24/05
Floorpan @ Rear Axle Z	C06-L05	Entran	3/24/05
Vehicle CG X	B28-Z07	Entran	3/17/05
Vehicle CG Y	B16-Z22	Entran	3/24/05
Vehicle CG Z	B23-Z01	Entran	3/24/05
Left Front Door @ Pelvis	B26-Z16	Entran	3/17/05
Left Front Door @ Arm	C04-L06	Entran	3/24/05
Left Front Door @ Knee	B16-Z12	Entran	3/03/05
Left Front Door @ Mid Rib	C09-Y04	Entran	4/22/05
Upper Engine X	C09-Y09	Entran	3/31/05
Upper Engine Y	C11-Z13	Entran	3/31/05
Firewall Y	B28-Z10	Entran	3/17/05

APPENDIX E
DUMMY PEAK RESPONSES

DRIVER (ES-2) PEAK RESPONSE TABLE

Location	Peak Response				
				2005 Chevrolet Colorado 5/4/2005	
	Class	Axis	Units	Peak	Time
Head	1000	X	G	-31.5	50
	1000	Y	G	80.6	50
	1000	Z	G	27	44
	1000	RES	G	87.3	50
Head Injury Criteria (HIC)				784.9	
t1					42.3
t2					63.3
Upper Neck Force	1000	X	N	-559	48
	1000	Y	N	685	48
	1000	Z	N	1272	46
	1000	RES	N	1514	46
Upper Neck Moment	600	X	Nm	-78.2	47
	600	Y	Nm	-50	47
	600	Z	Nm	24.2	57
	600	RES	Nm	93.7	47
Lower Neck Force	1000	X	N	-789	46
	1000	Y	N	-630	142
	1000	Z	N	1151	46
	1000	RES	N	2521	46

Location	Peak Response				
				2005 Chevrolet Colorado 5/4/2005	
	Class	Axis	Units	Peak	Time
Lower Neck Moment	600	X	Nm	178	48
	600	Y	Nm	-89.1	140
	600	Z	Nm	-23.1	114
	600	RES	Nm	-190.2	48
Shoulder Force	600	X	N	-2868	42
	600	Y	N	4631	42
	600	Z	N	-769	38
Upper Spine	180	X	G	-16.5	38
	180	Y	G	64.5	44
	180	Z	G	-7.2	38
	180	Res	G	64.6	44
Lower Spine	180	X	G	12.7	60
	180	Y	G	90.2	42
	180	Z	G	-5.4	38
	180	Res	G	90.4	42
Upper Rib	180	Y	G	124.7	38
Mid Rib	180	Y	G	152.3	39
Lower Rib	180	Y	G	145.9	38
Upper Rib Deflection	180	Y	mm	-46	47

Location	Peak Response				
				2005 Chevrolet Colorado 5/4/2005	
	Class	Axis	Units	Peak	Time
Mid Rib Deflection	180	Y	mm	-41.4	47
Lower Rib Deflection	180	Y	mm	-43.8	47
Torso Force	600	X	N	869	47
	600	Y	N	-880	43
Torso Moment	600	Y	Nm	23	44
	600	Z	Nm	-37.4	43
T12 Force	600	X	N	597	50
	600	Y	N	2114	42
T12 Moment	600	X	Nm	-181	142
	600	Y	Nm	111.9	60
Abdomen Front Force	600	Y	N	413	43
Abdomen Mid Force	600	Y	N	1024	42
Abdomen Rear Force	600	Y	N	1221	42
Abdomen Summed Force	600	Y	N	2655	42
Pubic Symphysis Force	600	Y	N	-3373	44

Location	Peak Response				
				2005 Chevrolet Colorado 5/4/2005	
	Class	Axis	Units	Peak	Time
Right Femur Force	600	X	N	268	55
	600	Y	N	-1084	55
	600	Z	N	-1965	111
	600	RES	N	1995	111
Right Femur Moment	600	X	Nm	138.4	93
	600	Y	Nm	-42	73
	600	Z	Nm	-45.5	97
	600	RES	Nm	144.4	94
Left Femur Force	600	X	N	388	50
	600	Y	N	-1180	53
	600	Z	N	1152	62
	600	RES	N	1443	53
Left Femur Moment	600	X	Nm	-124.2	64
	600	Y	Nm	45.1	61
	600	Z	Nm	-31.1	63
	600	RES	Nm	132.5	65
Pelvis	1000	X	G	-17.4	58
	1000	Y	G	96.9	44
	1000	Z	G	8.9	46

Location	Peak Response				
				2005 Chevrolet Colorado 5/4/2005	
	Class	Axis	Units	Peak	Time
AR (Arm to Door)			mm	91	
HP (H-Point to Door)			mm	159	
HR (Head to Roof)			mm	196	
HS (Head to Side)			mm	312	
Vehicle Weight			Kg	1858.8	
Impact Speed			kph	32.3	
Impact Point Rearward			mm	16	