

REPORT NUMBER: TO1-MGA-2004-016

**OBLIQUE RIGID SIDE POLE IMPACT
SID IIS (BUILD LEVEL D) DRIVER POSITION
TEST DATE: June 10, 2005
Task Order #T0001 / RFP #0004**

**2005 Subaru Forester
NHTSA NUMBER: R55505**

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



FINAL REPORT SUBMITTED:

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

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

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its content or use thereof.

Prepared by: Shefalika Naik
Shefalika Naik, Project Engineer

Reviewed by: David Winkelbauer
David Winkelbauer, Project Engineer

Approval Date: June 16, 2005

Technicians: Wayne Dahlke
Jordan Haynes
Erik Nelson
Chris Novak
Charles Carlson
Nick Kosinski
Daniel Sienko Jr.
Adam Savino
Eric Peschman

Engineers: Jay Nutting
Kristin Ebert

Photographic: Matt Jacobson
Alan Raguse

Instrumentation/
Calibration: Jamie Aide
Jessica Gall
Tom Miller
Tim Bratz

Secretary: Cyndy Kline

FINAL REPORT ACCEPTED BY:

Accepted By: _____
Contract Technical Manager

Acceptance Date: _____

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Test Procedure	1
2	Summary of Side Impact Test	2
3	Side Impact Dummy (SID IIs) and Test Vehicle Data	4
4	Occupant and Vehicle Information	10
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	5
2	Test Vehicle Tire Information	8
3	Post Test Observations	9
4	SID IIs Clearance Dimensions	11
5	Vehicle Side Measurements	13
6	Vehicle Exterior Crush Profiles	14
7	Vehicle Damage Profile Distances	16
8	Vehicle Accelerometer Locations and Data Summary	17
9	High Speed Camera Locations and Data	20
<u>Appendix</u>		
A	Photographs	A
B	Vehicle and Dummy Response Data Traces	B
C	Dummy Configuration and Performance Verification Data	C
D	Test Equipment List and Calibration Information	D
E	Dummy Peak Responses	E

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 responses of the SID IIs Build Level D in a 2005 Subaru Forester, when subjected to a rigid pole side impact at 285 degrees.

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

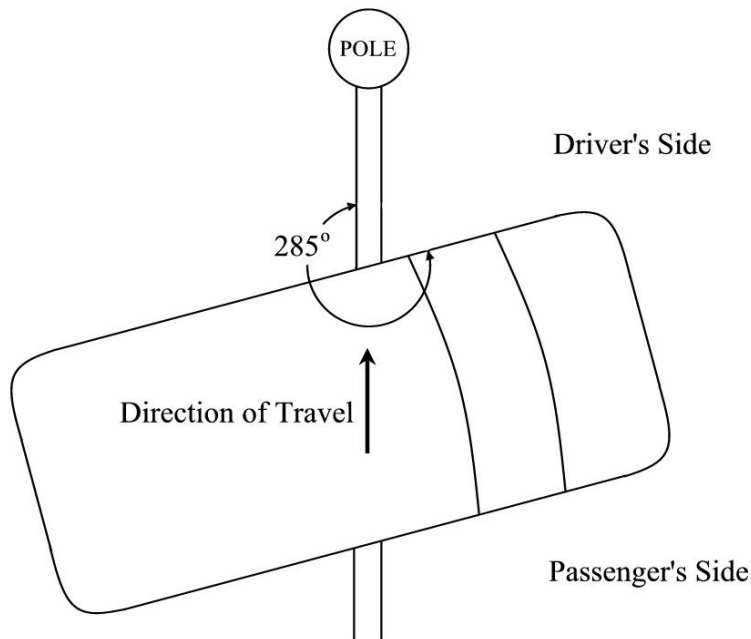
SECTION 2

SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 2005 Subaru Forester. The subject vehicle was towed into a rigid pole at a velocity of 32.0 km/h. The weight of the vehicle as tested was 1545.8 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on June 10, 2005. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One SID IIS Build Level D side impact dummy was placed in the left front designated seating position according to instructions specified in 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 traces. A summary of the dummy configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report. Appendix E contains the dummy peak responses.



SECTION 2...continued
SUMMARY OF SIDE IMPACT TEST

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

Rib Deflection (mm) CFC 180	
Upper Thorax Rib	-31.1
Mid Thorax Rib	-25.0
Lower Thorax Rib	-19.5
Upper Abdominal Rib	-28.1
Lower Abdominal Rib	-44.5

Abdominal Forces (N) CFC 600	
Left Acetabulum Force	3421
Left Ilium Crest Force	1317
Sum of Left Acetabulum and Left Ilium	4707

Lower Spine (CFC180)	
Lower Spine Resultant	54.6

HIC 15		Left Front
	T1 (msec)	53.9
	T2 (msec)	68.9
	T2 – T1 (msec)	15.0
	HIC	122.7

TEST NOTES

Driver Upper Neck MX – No valid data collected after 100 msec
 Driver Seat Track Y – No valid data collected after 30 msec
 LF Door @ Pelvis Y – No valid data collected after 50 msec
 LF Door @ Arm Y – No valid data collected after 20 msec
 LF Door @ Mid Rib Y – No valid data collected after 22 msec

SECTION 3
SIDE IMPACT DUMMY (SID IIs) AND TEST VEHICLE DATA

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005

TEST VEHICLE INFORMATION

Make	Subaru
Model	Forester
Body Style	Passenger Car
VIN	JF1SG63665G728272
Color	Dark Green
Odometer Reading (mile)	74
Transmission	Manual
Final Drive	4 wheel
Number of Cylinders	4
Engine Displacement (L)	2.5
Engine Placement	Longitudinal

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Yes
Power Windows	Yes
Power Steering	Yes
Power Door Locks	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	Fuji Heavy Ind. Japan	GVWR (kg)	1880
Date of Manufacture	09-04	GAWR Front (kg)	930
		GAWR Rear (kg)	1000

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Cold Pressure (kPa)	200	190
Recommended Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Yokohama	Yokohama

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				68

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Subaru ForesterTest Date: June 10, 2005**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	408.7	316.2		420.0	355.6	
Right	kg	384.6	320.7		412.3	357.9	
Ratio	%	55.5	44.5		53.8	46.2	
Totals	kg	793.3	636.9	1430.2	832.3	713.5	1545.8

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1430.2
Weight of SID IIs Side Impact Dummy	kg	54.4
Rated Cargo/Luggage Weight (RCLW)	kg	68.0
Calculated Vehicle Target Weight (TVTW)	kg	1552.6

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.2 BD	0.5 BD	0.4 BD
Left Door Sill Angle	Deg	0.3 ND	0.3 BD	0.3 BD
Front Bumper Angle	Deg	0.3 ND	0.1 RD	0.1 RD
Rear Bumper Angle	Deg	0.5 ND	0.2 LD	0.3 LD

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

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2520
Total Vehicle Length at Centerline	mm	4453
Total Vehicle Width	mm	1734
Weight of Ballast in Cargo Area	kg	0
Amount of Water in Fuel Tank	liters	60.0

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Impact Reference Line From Front Axle	mm	1254
Impact Point	mm	10 forward
Impact Angle Difference	deg	1°

DATA SHEET NO. 1... (continued)

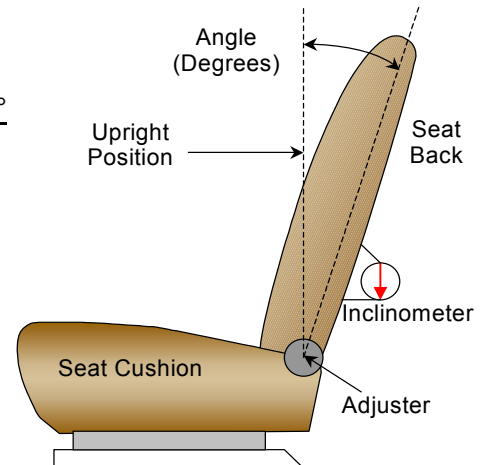
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005

SID II's RIDING POSITION

Driver seat back angle: Full forward seat back position (3.5°
on head rest post)



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver's seat is manually operated.

Driver seat fore/aft total travel: 17 notches

Driver seat fore/aft position: Full forward

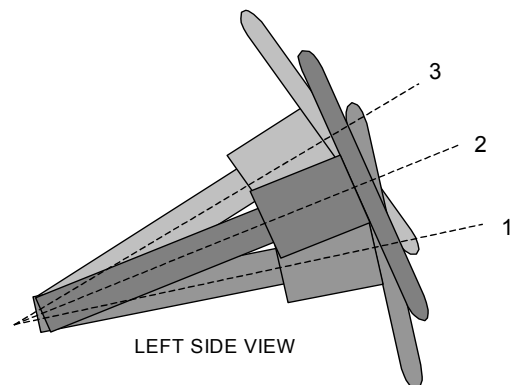
SEAT BELT UPPER ANCHORAGE

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

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position of travel.

Steering column position: 23.8°



STEERING COLUMN ASSEMBLY

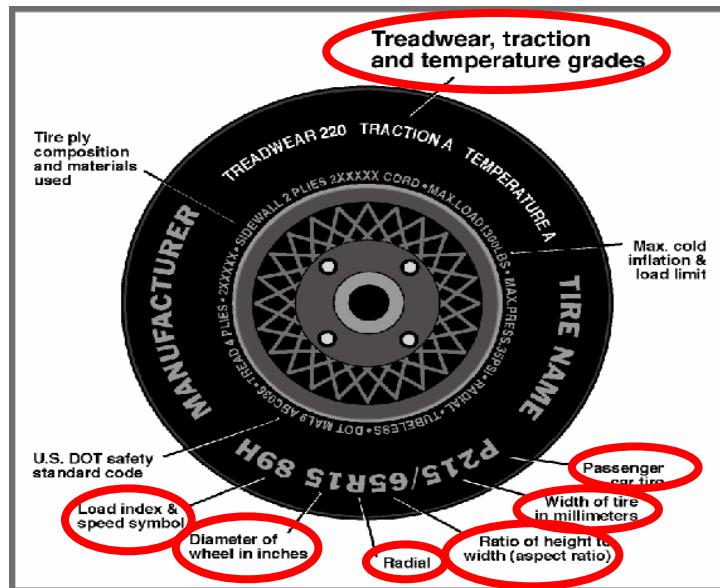
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005

Vehicle Year	2005	Vehicle Make	Subaru
VIN	JF1SG63665G728272	Vehicle Model	Forester



	Front	Rear
Tire Manufacturer	Yokohama	Yokohama
Tire Name	Geolander 6900	Geolander 6900
Tire Type	M+S	M+S
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	94H	94H
Treadwear	320	320
Traction Grade	B	B
Temperature Grade	A	A

DATA SHEET NO. 3
POST TEST OBSERVATIONS

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	SID IIS/056
Head Contact	Side air bag, Headrest
Upper Torso Contact	Side air bag
Lower Torso Contact	Side air bag
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 failures
Sill Separation	None
Windshield Damage	Windshield broke
Window Damage	Left side windows up for test, left front broke
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	No
Side	Yes
Curtain	NA

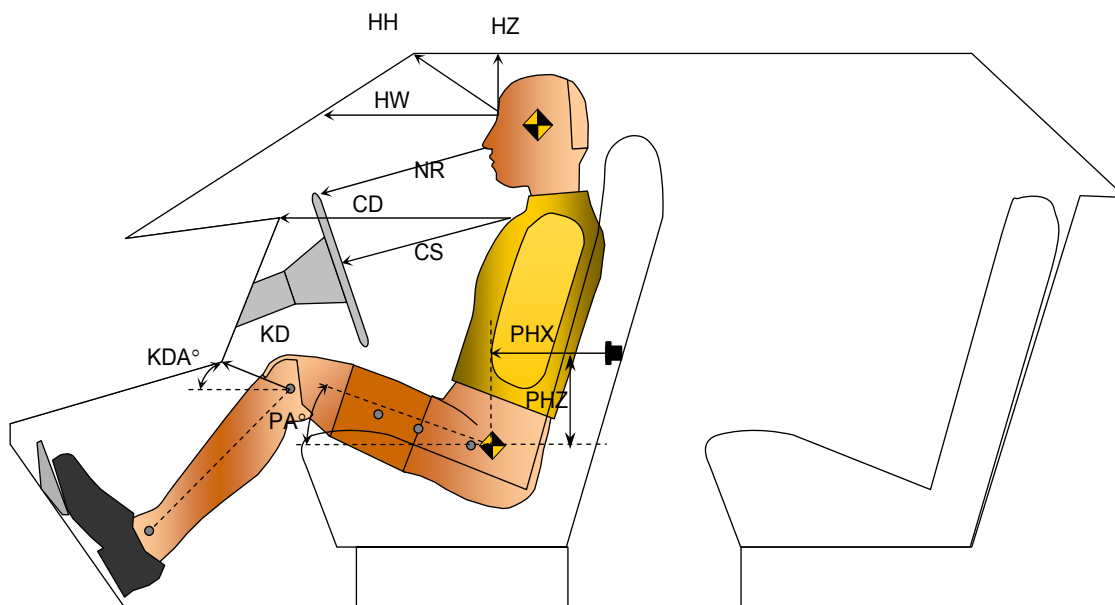
SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

SID IIs CLEARANCE DIMENSIONS

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005



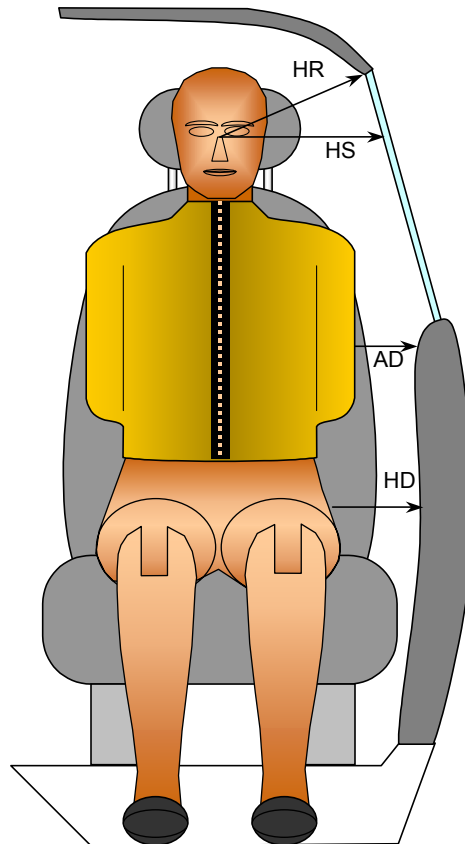
Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	285	
HW	Head to Windshield	470	
HZ	Head to Roof	197	
NR	Nose to Rim	227	
CD	Chest to Dash (Top of Rib)	365	
CS	Chest to Steering Wheel (Top of Rib)	167	
KDL	Left Knee to Dash	102	27.7
KDR	Right Knee to Dash	98	28.1
PA	Pelvic Angle (Longitudinal)		20.0
PHX	H-Point to Striker (X-Axis)	274	
PHZ	H-Point to Striker (Z-Axis)	42	

DATA SHEET NO. 4 (continued...)

SID IIs CLEARANCE DIMENSIONS

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005



FRONT VIEW OF DUMMY

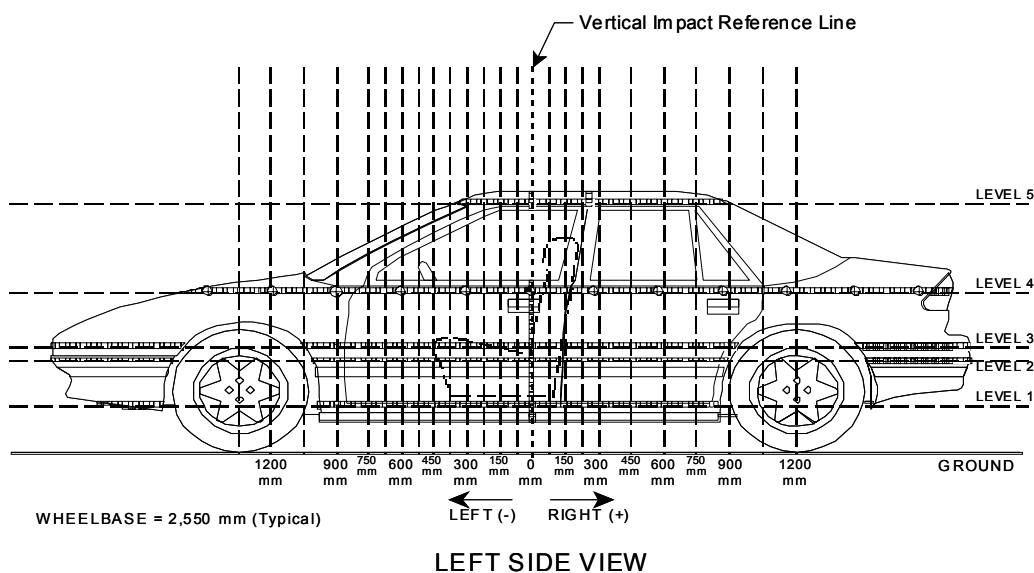
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	342
HS	Head to Side Window	mm	245
AD	Arm to Door	mm	125
HD	H-Point to Door	mm	132

DATA SHEET NO. 5 **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2005 Subaru Forester

Test Date: May 16, 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	1570
4	Window Sill	995
3	Mid Door	710
2	Occupant H-Point	610
1	Sill Top	375

DATA SHEET NO. 6
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Subaru Forester

Test Date: May 16, 2005

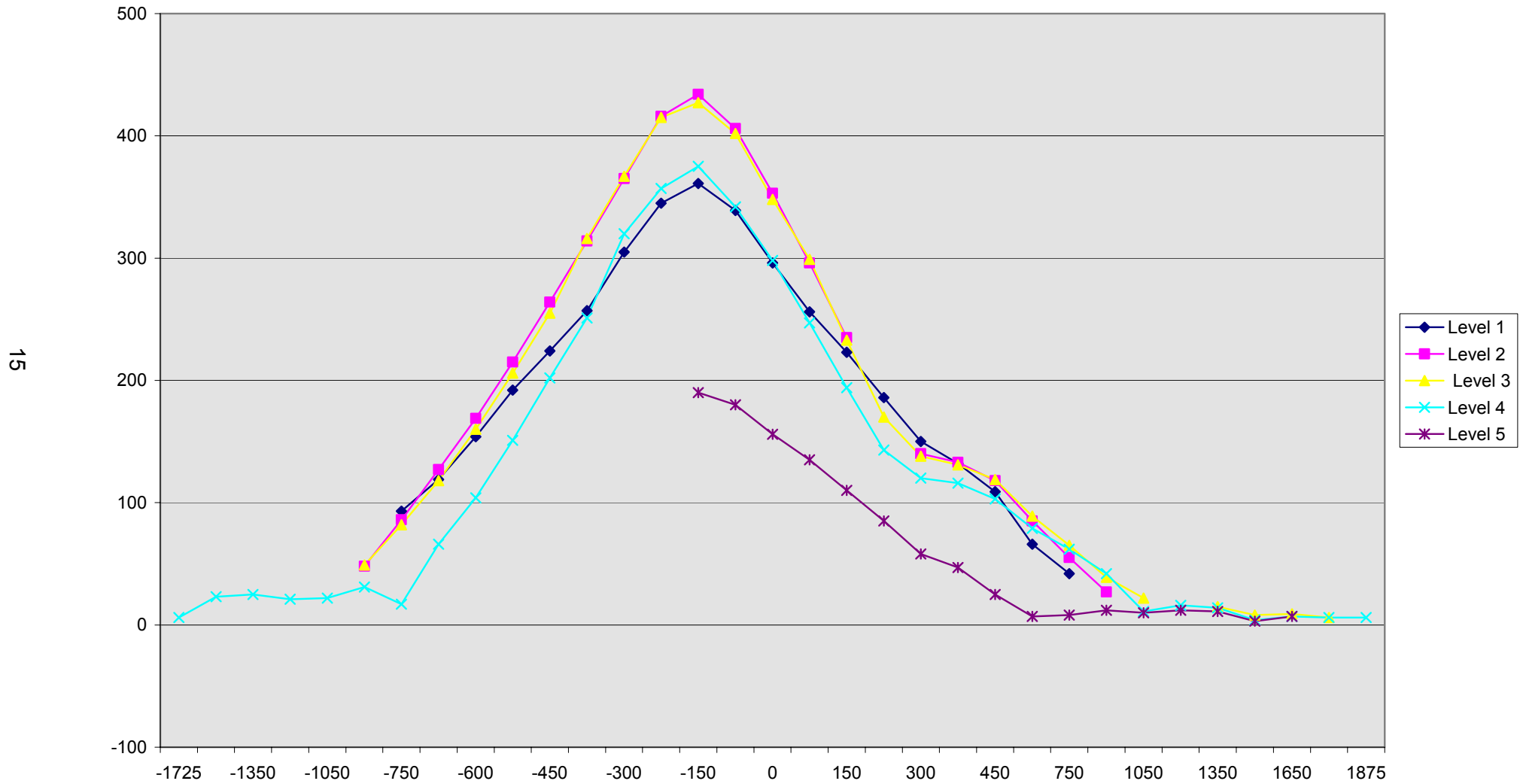
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1725				339					345					6	
-1500				321					344					23	
-1350				315					340					25	
-1200				309					330					21	
-1050				307					329					22	
-900		243	240	304			291	289	335			48	49	31	
-750	315	250	253	301		408	336	335	318		93	86	82	17	
-675	323	251	253	300		442	378	371	366		119	127	118	66	
-600	323	251	251	301		477	420	411	405		154	169	160	104	
-525	317	250	250	297		509	465	456	448		192	215	206	151	
-450	319	250	250	299		543	514	505	501		224	264	255	202	
-375	320	249	249	299		577	563	565	550		257	314	316	251	
-300	316	249	249	300		621	614	616	620		305	365	367	320	
-225	319	248	249	301		664	664	664	658		345	416	415	357	
-150	317	248	249	301	518	678	682	676	676	708	361	434	427	375	190
-75	318	248	249	300	512	657	654	651	642	692	339	406	402	342	180
0	318	248	249	300	511	614	601	597	598	667	296	353	348	298	156
75	318	247	249	301	511	574	543	548	548	646	256	296	299	247	135
150	318	247	250	302	511	541	482	483	496	621	223	235	233	194	110
225	318		250	302	512	504		420	445	597	186		170	143	85
300	318	248	250	303	513	468	388	388	423	571	150	140	138	120	58
375	318	248	251	303	515	450	381	382	419	562	132	133	131	116	47
450	318	248	251	305	518	427	366	370	408	543	109	118	119	103	25
600	318	249	253	308	520	384	334	342	387	527	66	85	89	79	7
750	311	250	255	311	523	353	305	320	373	531	42	55	65	62	8
900		247	254	312	526		274	293	354	538		27	39	42	12
1050			237	319	529			259	330	539			22	11	10
1200				323	532				339	544				16	12
1350			238	326	537			253	340	548			15	14	11
1500			247	332	543			255	336	546			8	4	3
1650			264	340	552			273	347	559			9	7	7
1800			283	350				289	356				6	6	
1875				350					356					6	
1950															
2100															

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

DATA SHEET NO. 6... (continued)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005

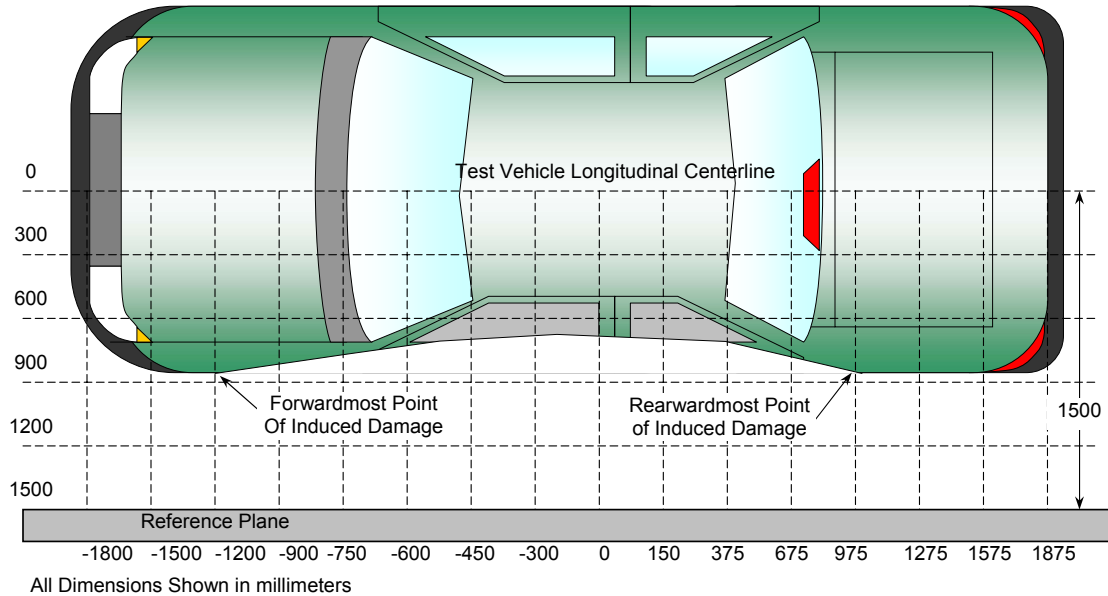


Measurement in mm.

DATA SHEET NO. 7 **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 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	1875 mm	4	350	356	6
2	1050 mm	4	319	330	11
3	285 mm	3	250	410	160
4	-565 mm	3	250	456	206
5	-1202 mm	4	309	330	21
6	-1725 mm	4	339	345	6

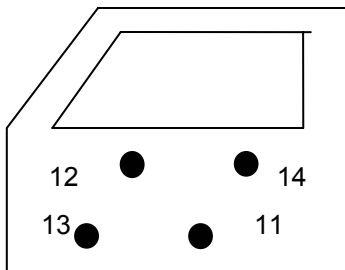
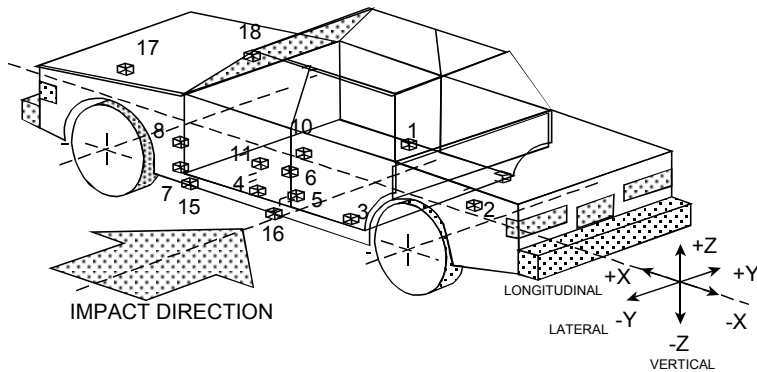
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body.

DATA SHEET NO. 8 **VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 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. 8... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 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	0.6	-4.7	13.8	-0.4	4.7	-2.1	13.9
2	Rear Floorpan Above Axle	1.7	-5.4	11.3	-1.0	3.1	-4.3	11.9
3	Left Side Sill at Rear Door			19.1	-7.7			
4	Left Side Sill at Front Door			106.2	-18.6			
5	Left Lower B-Post			44.2	-19.5			
6	Left Mid B-Post			49.6	-23.6			
7	Left Lower A-Post			24.6	-9.0			
8	Left Mid A-Post			17.9	-5.2			
9	Driver Left Seat Track			*	*			
10	Vehicle CG	2.3	-11.3	20.0	-3.6	16.8	-12.4	23.4
11	Left Front Door at Pelvis			**	**			
12	Left Front Door at Arm			***	***			
13	Left Front Door at Knee			119.3	-61.9			
14	Left Front Door at Rib			****	****			
15	Left A-post @ Sill			22.8	-5.0			
16	Left B-post @ Sill			46.8	-0.9			
17	Upper Engine	9.9	-11.5	14.3	-4.2			
18	Firewall			12.7	-1.1			

* No valid data after 30 msec

** No valid data after 50 msec

*** No valid data after 20 msec

**** No valid data after 22 msec

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

DATA SHEET NO. 8... (continued)**VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY**Test Vehicle: 2005 Subaru ForesterTest Date: June 10, 2005**VEHICLE ACCELEROMETER COORDINATES**

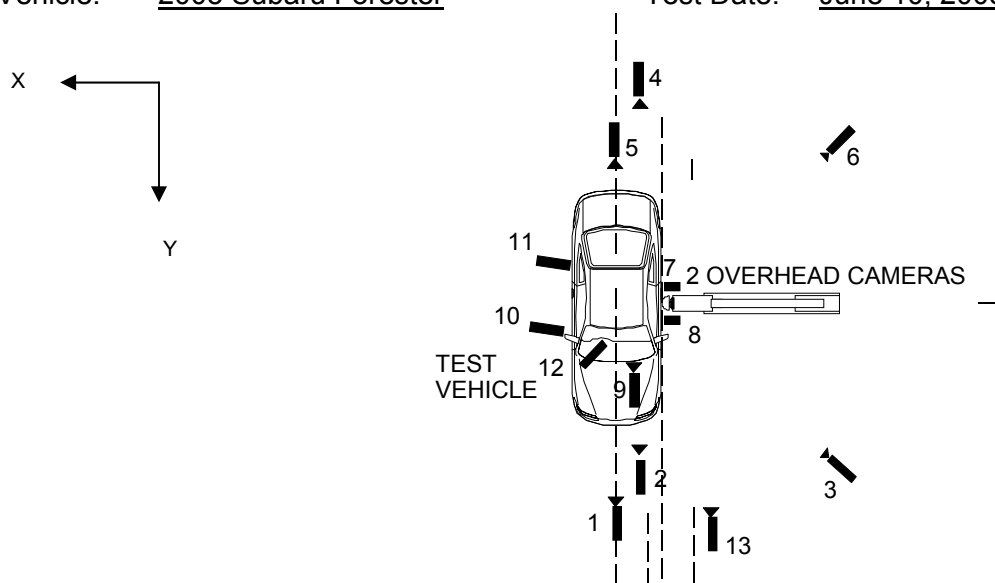
Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2276	714	298
2	Rear Floorpan Above Axle	1009	0	522
3	Left Side Sill at Rear Door	1605	-715	290
4	Left Side Sill at Front Door	2564	-718	286
5	Left Lower B-Post	1997	-675	840
6	Left Mid B-Post	2000	-672	995
7	Left Lower A-Post	3002	-720	500
8	Left Mid A-Post	3023	-785	930
9	Driver Left Seat Track			
10	Vehicle CG	2384	0	580
11	Left Door @ Pelvis	2382	-722	704
12	Left Door @ Arm	2417	-716	880
13	Left Door @ Knee	2701	-720	747
14	Left Door @ Rib	2300	-715	896
15	Left A Pillar Sill	3071	-716	285
16	Left B Pillar Sill	1972	-716	285
17	Engine	3697	0	892
18	Firewall	3351	0	943

Sign Convention X – Rear Bumper (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ up)

DATA SHEET NO. 9
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2005 Subaru Forester

Test Date: June 10, 2005



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	690	5215	1470	24	1000
2	Front Close Up	1290	5685	1495	24	1000
3	Front Angle	-2530	2605	1460	24	1000
4	Rear Overall	3385	-9131	1590	25	1000
5	Rear Close Up	2200	-7215	1485	35	1000
6	Rear Angle	-2445	-3195	1495	24	1000
7	Overhead View	-575	1175	5725	14	1000
8	Overhead Close Up	5	0	5050	19	1000
9	Onboard Driver Front				10	1000
10	Onboard Driver				13	1000
11	Onboard Curtain				8	1000
12	Onboard Hip to Door				8	1000
13	Real Time				12	24

Reference Points

X - + Forward of Impact

Y - + Right of Impact

Z - + Up from Ground

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	Pre-Test Front View of Test Vehicle	A-1
Photo No. 2.	Post-Test Front View of Test Vehicle	A-2
Photo No. 3.	Pre-Test Rear View of Test Vehicle	A-3
Photo No. 4.	Post-Test Rear View of Test Vehicle	A-4
Photo No. 5.	Pre-Test Left Side View of Test Vehicle	A-5
Photo No. 6.	Post-Test Left Side View of Test Vehicle	A-6
Photo No. 7.	Post-Test Left Side View of Test Vehicle (Close Up)	A-7
Photo No. 8.	Pre-Test Left $\frac{3}{4}$ Front View of Test Vehicle	A-8
Photo No. 9.	Post-Test Left $\frac{3}{4}$ Front View of Test Vehicle	A-9
Photo No. 10.	Pre-Test Left $\frac{3}{4}$ Rear View of Test Vehicle	A-10
Photo No. 11.	Post-Test Left $\frac{3}{4}$ Rear View of Test Vehicle	A-11
Photo No. 12.	Pre-Test Vehicle Overhead View Positioned Against Pole	A-12
Photo No. 13.	Post-Test Vehicle Overhead View	A-13
Photo No. 14.	Pre-Test Vehicle Overhead View Positioned Against Pole (Close Up)	A-14
Photo No. 15.	Post-Test Vehicle Overhead View (Close Up)	A-15
Photo No. 16.	Pre-Test Driver Seat Position	A-16
Photo No. 17.	Pre-Test Driver Dummy Left Side View (Door open)	A-17
Photo No. 18.	Pre-Test Driver Dummy Left Side View	A-18
Photo No. 19.	Post-Test Driver Dummy Left Side View	A-19
Photo No. 20.	Pre-Test Driver Dummy Right Side View	A-20
Photo No. 21.	Post-Test Driver Dummy Right Side View	A-21
Photo No. 22.	Pre-Test Driver Shoulder and Door Top View	A-22
Photo No. 23.	Post-Test Driver Shoulder and Door Top View	A-23
Photo No. 24.	Post-Test Driver Dummy Contact	A-24
Photo No. 25.	Post-Test Driver Dummy Lower Body Contact	A-25
Photo No. 26.	Post-Test Impact Point on Vehicle	A-26
Photo No. 27.	Vehicle Certification Label	A-27
Photo No. 28.	Tire Placard	A-28
Photo No. 29.	Pre-Test Point of Impact View	A-29
Photo No. 30.	Post-Test Point of Impact View	A-30
Photo No. 31.	Impact	A-31

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

A-5.



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



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



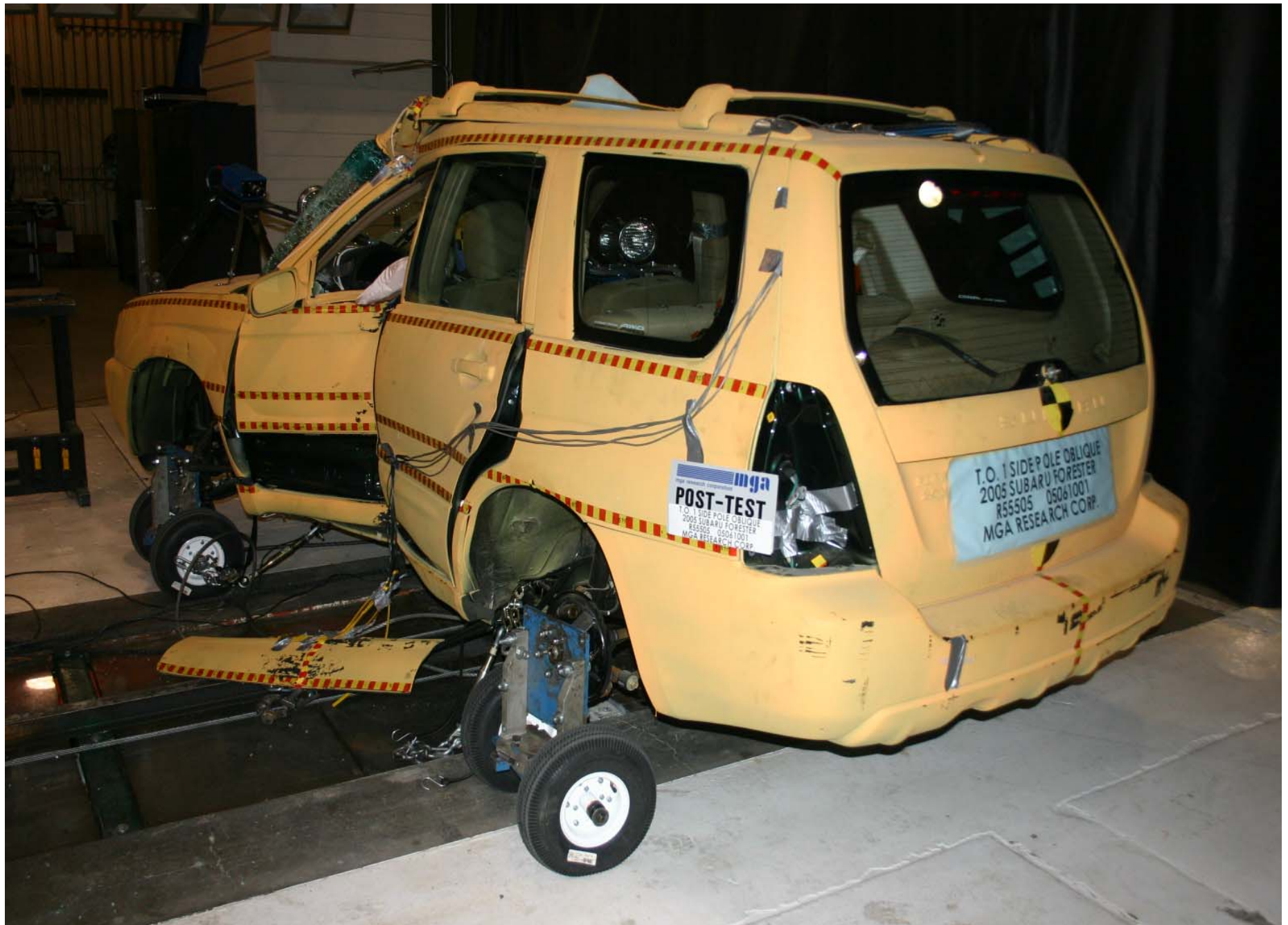
Pre-Test Left $\frac{3}{4}$ Front View of Test Vehicle



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



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



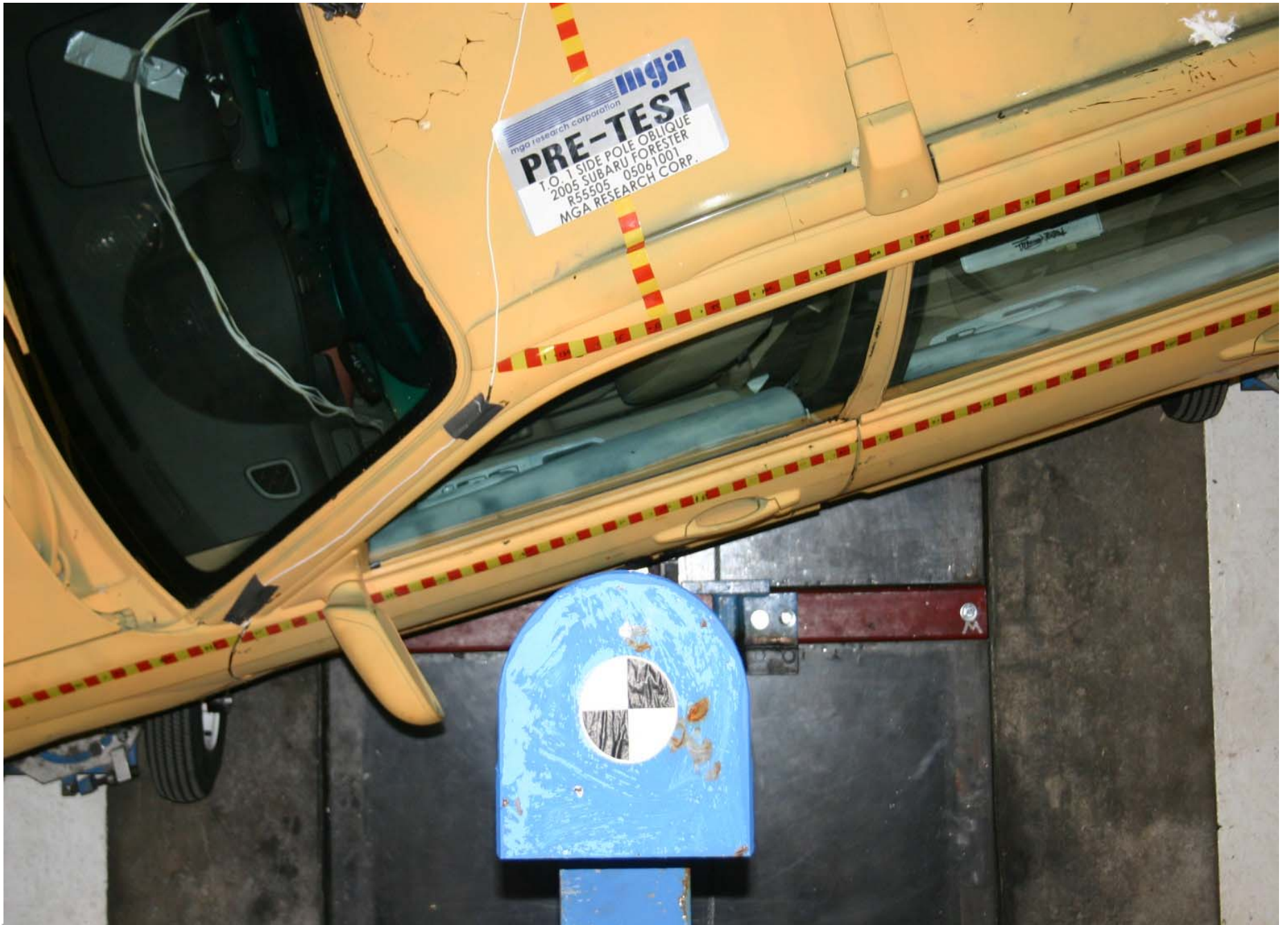
Post-Test Left $\frac{3}{4}$ Rear View of Test Vehicle



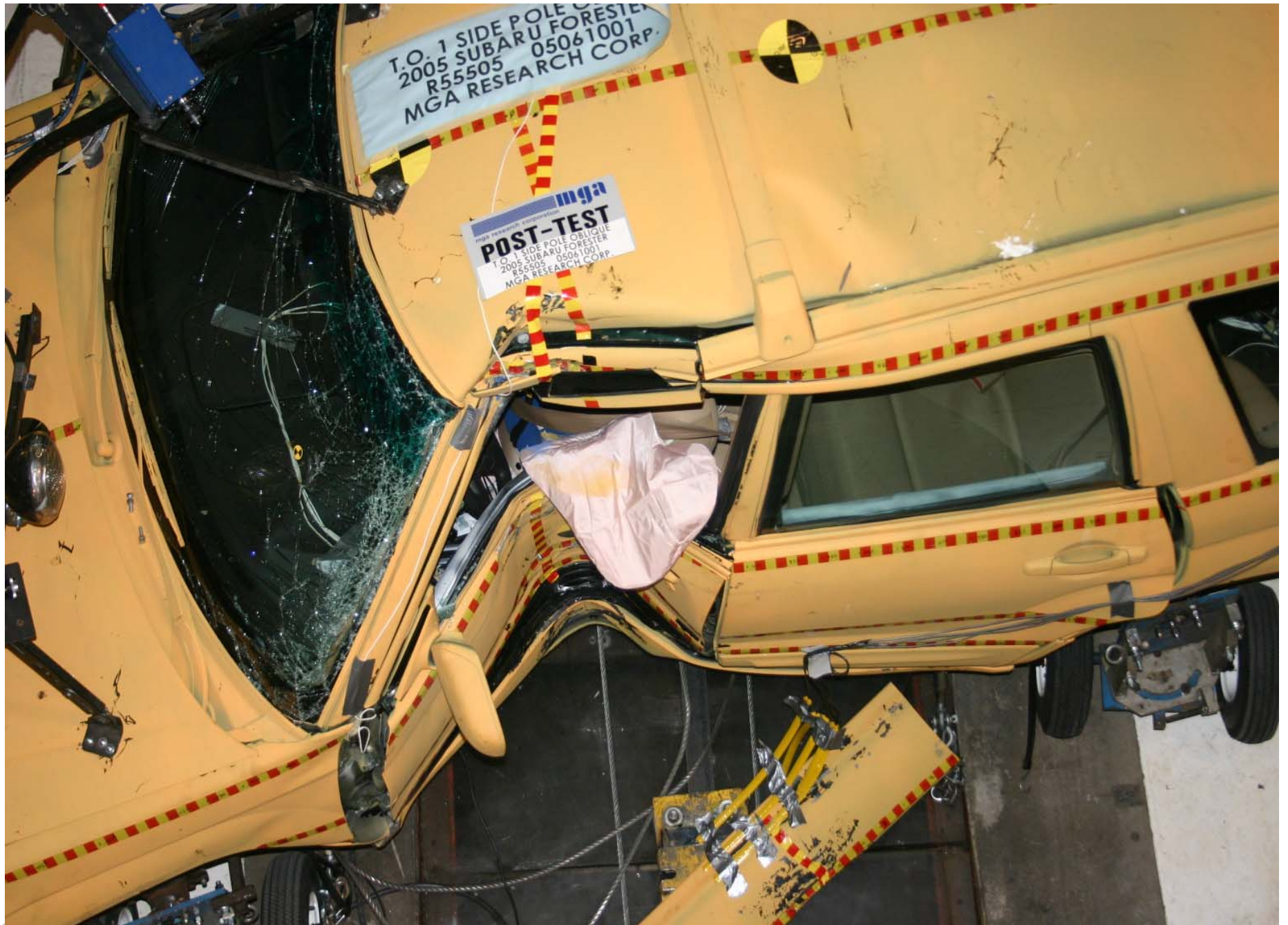
Pre-Test Vehicle Overhead View Positioned Against Pole



Post-Test Vehicle Overhead View



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



Post-Test Vehicle Overhead View (Close Up)



Pre-Test Driver Seat Position



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



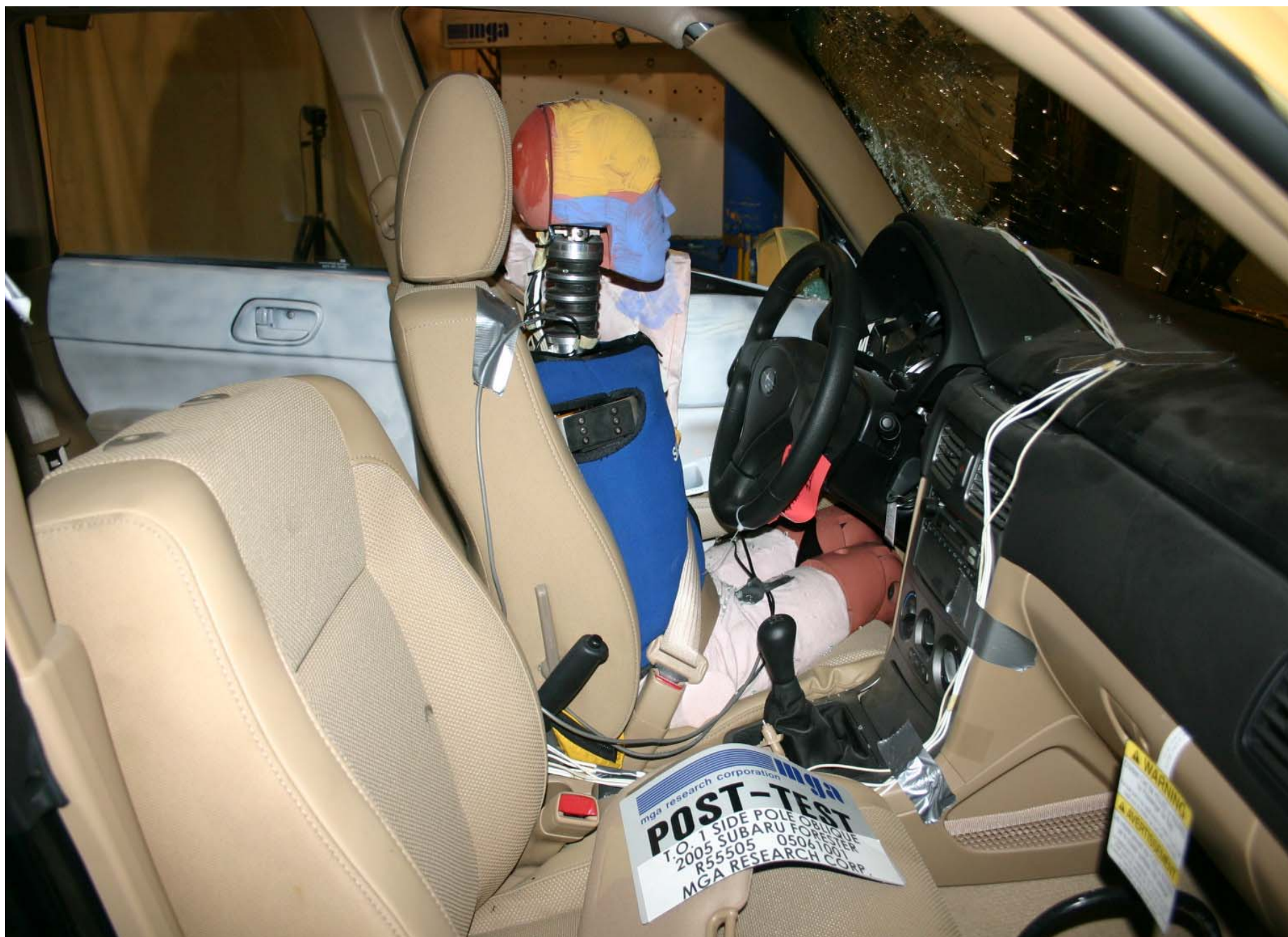
Pre-Test Driver Dummy Left Side View



Post-Test Driver Dummy Left Side View



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View

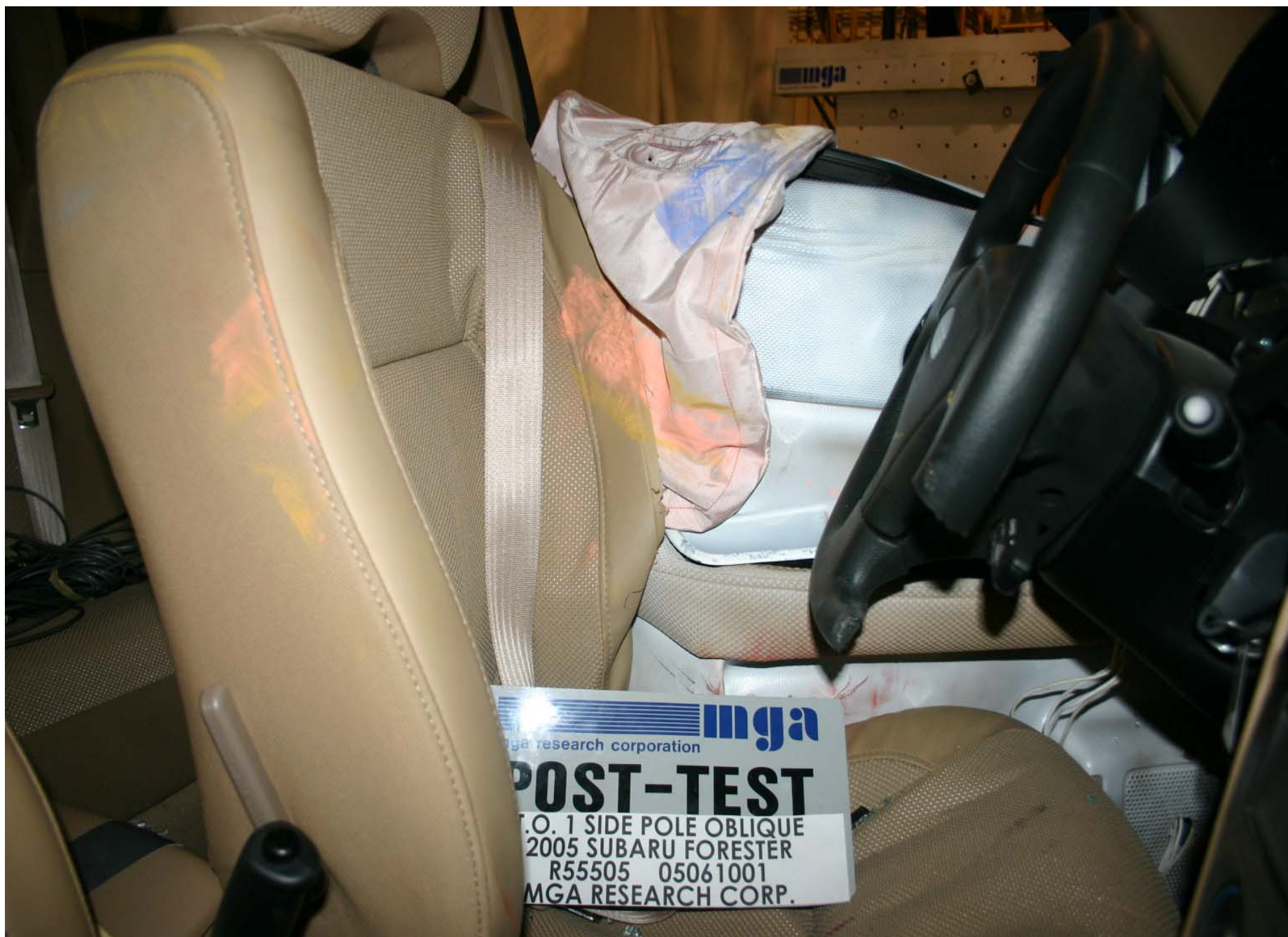


Pre-Test Driver Shoulder and Door Top View



Post-Test Driver Dummy Contact

A-25.



Post-Test Driver Dummy Lower Body Contact



Post-Test Impact Point on Vehicle

MFD BY FUJI HEAVY IND. LTD., JAPAN

MFD IN 09/04

GVWR/PNBV: 4150LB(1880KG)

GAWR/PNBE: FRONT-2050LB(930KG)

REAR -2200LB(1000KG)

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

VIN JF1SG6B36567232T2

(VK)

PASSENGER CAR
TYPE: PC/VT



TIRE AND LOADING INFORMATION

SEATING CAPACITY : TOTAL 5
FRONT 2 : REAR 3

The combined weight of occupants and cargo should never exceed 408kg or 900lbs.

ORIGINAL TIRE SIZE	COLD TIRE INFLATION PRESSURE	
P215/60R16	FRONT	200kPa, 29PSI
	REAR	190kPa, 28PSI
SPARE TIRE	COLD TIRE INFLATION PRESSURE	
P215/60R16	200kPa, 29PSI	

SEE OWNER'S MANUAL FOR
ADDITIONAL INFORMATION

KL



Pre-Test Point of Impact View



Post-Test Point of Impact View



54,00 ms • 10 Jun 2005 12:45 • T0: -49 • 1,000 fps • Frame: 5

Impact

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

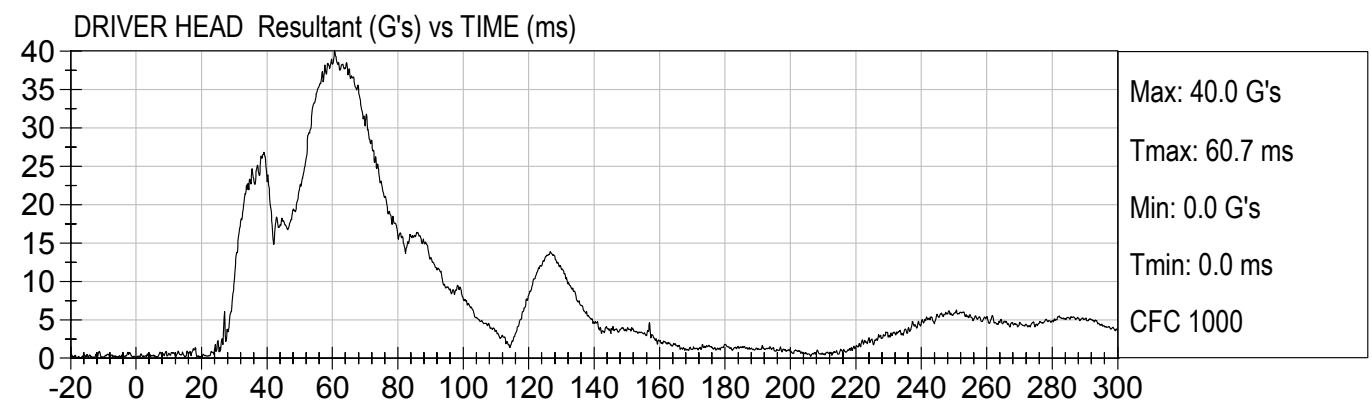
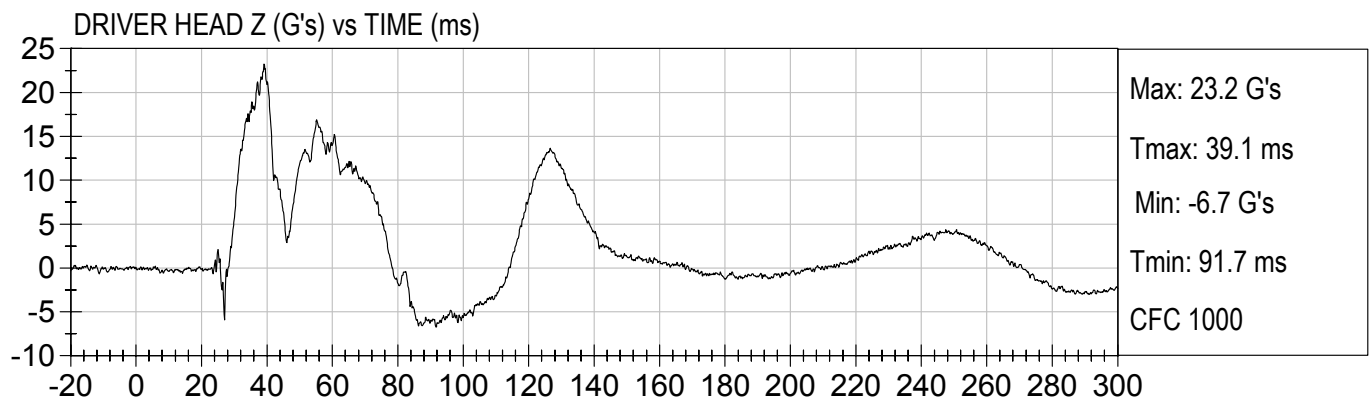
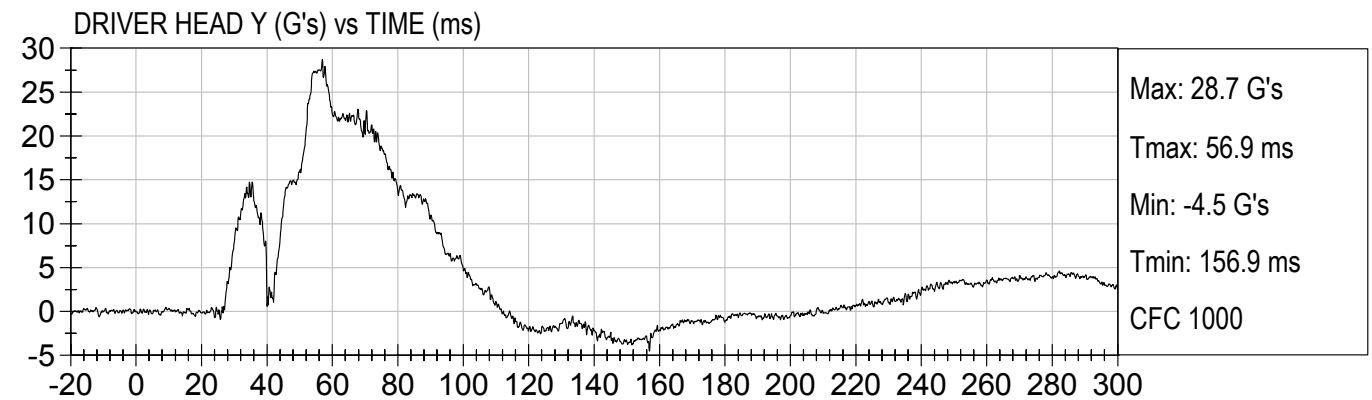
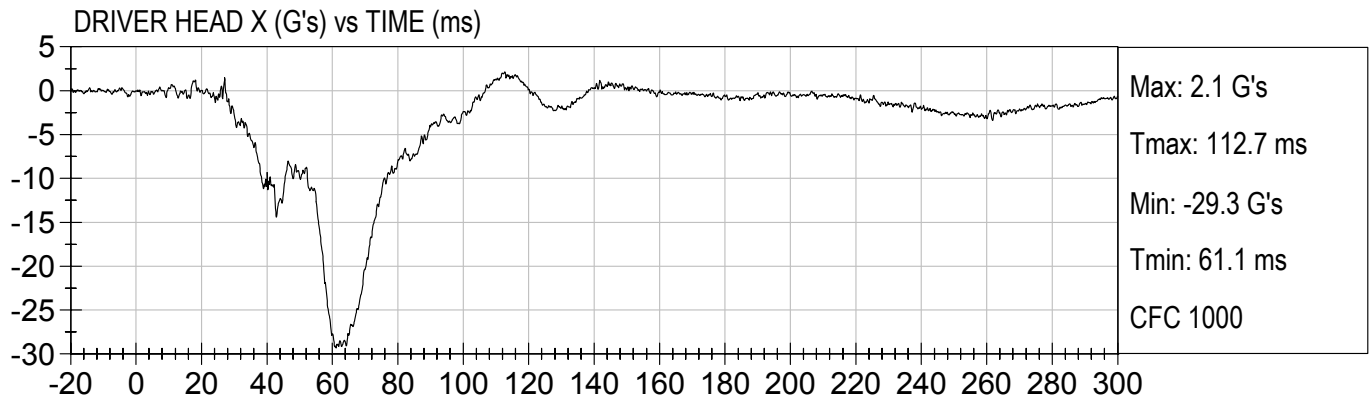
Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Head X Velocity vs. Time	B-2
Figure No. 6.	Driver Head Y Velocity vs. Time	B-2
Figure No. 7.	Driver Head Z Velocity vs. Time	B-2
Figure No. 8.	Driver Upper Neck Force X vs. Time	B-3
Figure No. 9.	Driver Upper Neck Force Y vs. Time	B-3
Figure No. 10.	Driver Upper Neck Force Z vs. Time	B-3
Figure No. 11.	Driver Upper Neck Force Resultant vs. Time	B-3
Figure No. 12.	Driver Upper Neck Moment X vs. Time	B-4
Figure No. 13.	Driver Upper Neck Moment Y vs. Time	B-4
Figure No. 14.	Driver Upper Neck Moment Z vs. Time	B-4
Figure No. 15.	Driver Upper Neck Moment Resultant vs. Time	B-4
Figure No. 16.	Driver Shoulder Force X vs. Time	B-5
Figure No. 17.	Driver Shoulder Force Y vs. Time	B-5
Figure No. 18.	Driver Shoulder Force Z vs. Time	B-5
Figure No. 19.	Driver Shoulder Force Resultant vs. Time	B-5
Figure No. 20.	Driver Upper Spine X Acceleration vs. Time	B-6
Figure No. 21.	Driver Upper Spine Y Acceleration vs. Time	B-6
Figure No. 22.	Driver Upper Spine Z Acceleration vs. Time	B-6
Figure No. 23.	Driver Upper Spine Resultant Acceleration vs. Time	B-6
Figure No. 24.	Driver Upper Spine X Velocity vs. Time	B-7
Figure No. 25.	Driver Upper Spine Y Velocity vs. Time	B-7
Figure No. 26.	Driver Upper Spine Z Velocity vs. Time	B-7
Figure No. 27.	Driver Upper Arm X Acceleration vs. Time	B-8
Figure No. 28.	Driver Upper Arm Y Acceleration vs. Time	B-8
Figure No. 29.	Driver Upper Arm Z Acceleration vs. Time	B-8
Figure No. 30.	Driver Upper Arm Resultant Acceleration vs. Time	B-8

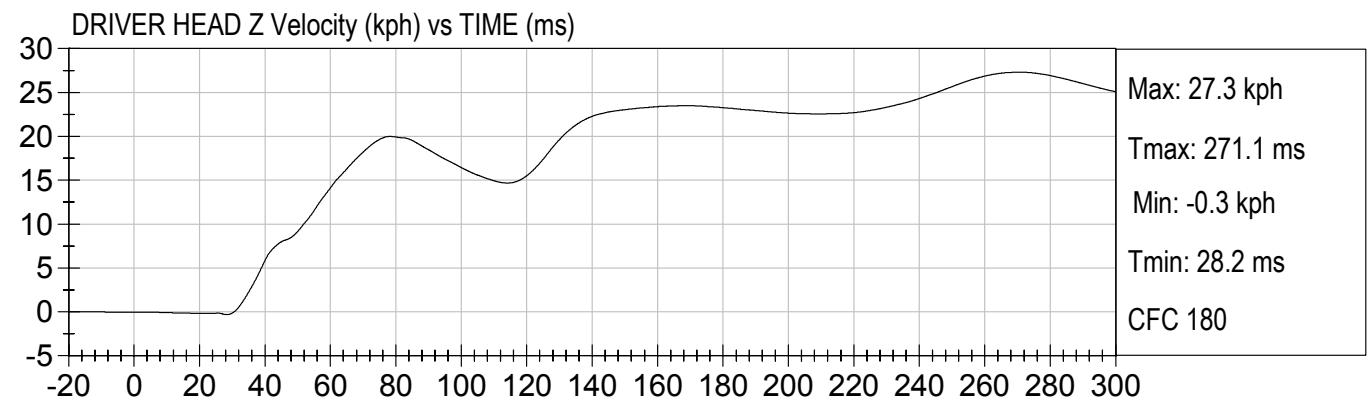
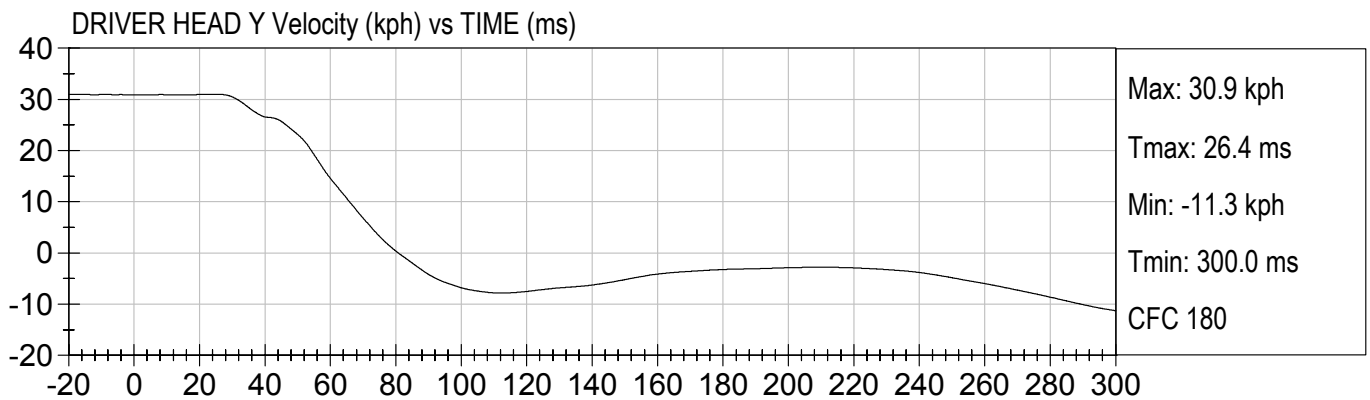
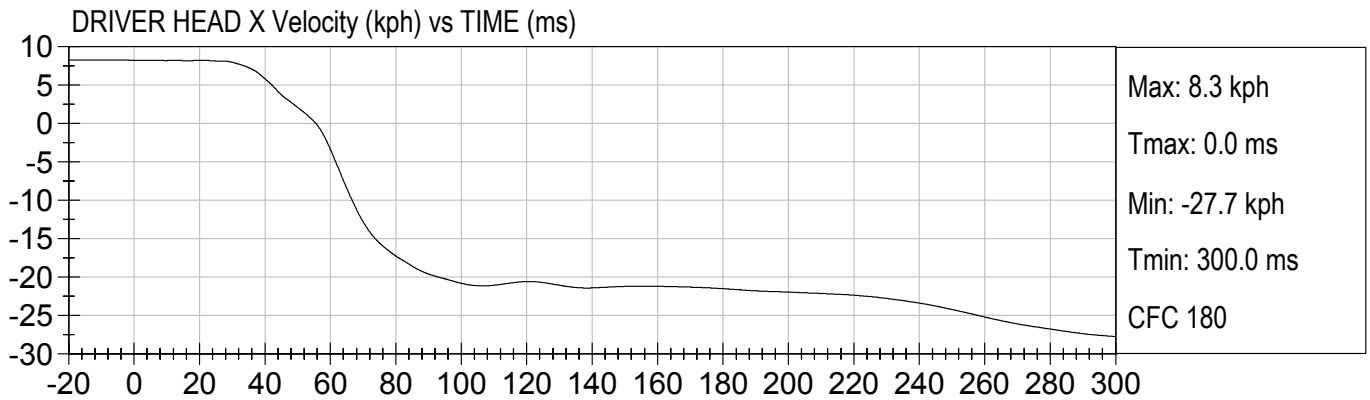
Figure No. 31.	Driver Upper Arm X Velocity vs. Time	B-9
Figure No. 32.	Driver Upper Arm Y Velocity vs. Time	B-9
Figure No. 33.	Driver Upper Arm Z Velocity vs. Time	B-9
Figure No. 34.	Driver Lower Spine X Acceleration vs. Time	B-10
Figure No. 35.	Driver Lower Spine Y Acceleration vs. Time	B-10
Figure No. 36.	Driver Lower Spine Z Acceleration vs. Time	B-10
Figure No. 37.	Driver Lower Spine Resultant Acceleration vs. Time	B-10
Figure No. 38.	Driver Lower Spine X Velocity vs. Time	B-11
Figure No. 39.	Driver Lower Spine Y Velocity vs. Time	B-11
Figure No. 40.	Driver Lower Spine Z Velocity vs. Time	B-11
Figure No. 41.	Driver Shoulder DY vs. Time	B-12
Figure No. 42.	Driver Shoulder Deflection Rate vs. Time	B-12
Figure No. 43.	Driver Upper Thorax Rib DY vs. Time	B-12
Figure No. 44.	Driver Upper Thorax Rib Deflection Rate	B-12
Figure No. 45.	Driver Mid Thorax Rib DY vs. Time	B-13
Figure No. 46.	Driver Mid Thorax Rib Deflection Rate vs. Time	B-13
Figure No. 47.	Driver Lower Thorax Rib DY vs. Time	B-13
Figure No. 48.	Driver Lower Thorax Rib Deflection Rate vs. Time	B-13
Figure No. 49.	Driver Upper Abdominal Rib DY vs. Time	B-14
Figure No. 50.	Driver Upper Abdominal Rib Deflection Rate vs. Time	B-14
Figure No. 51.	Driver Lower Abdominal Rib DY vs. Time	B-14
Figure No. 52.	Driver Lower Abdominal Rib Deflection Rate vs. Time	B-14
Figure No. 53.	Driver Left Acetabulum Force Y vs. Time	B-15
Figure No. 54.	Driver Left Ilium Crest Force Y vs. Time	B-15
Figure No. 55.	Lateral Pelvic Force vs. Time	B-15
Figure No. 56.	Driver Pelvis X Acceleration vs. Time	B-16
Figure No. 57.	Driver Pelvis Y Acceleration vs. Time	B-16
Figure No. 58.	Driver Pelvis Z Acceleration vs. Time	B-16
Figure No. 59.	Driver Pelvis Resultant Acceleration vs. Time	B-16
Figure No. 60.	Driver Pelvis X Velocity vs. Time	B-17
Figure No. 61.	Driver Pelvis Y Velocity vs. Time	B-17

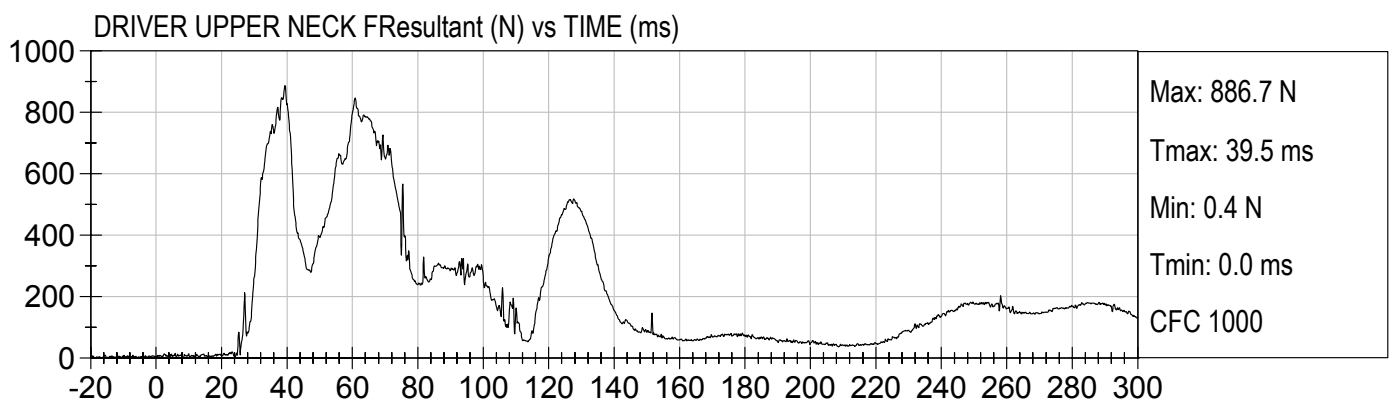
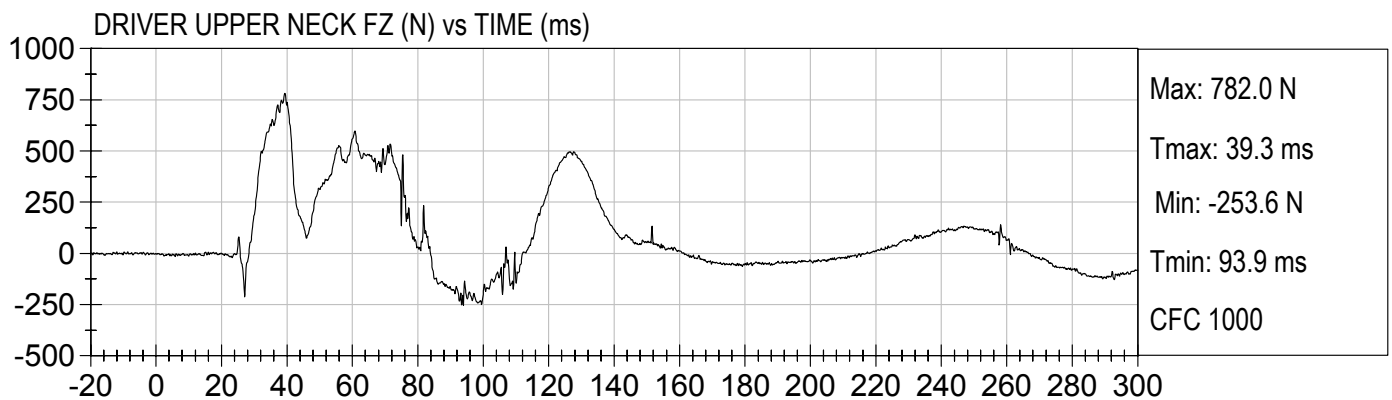
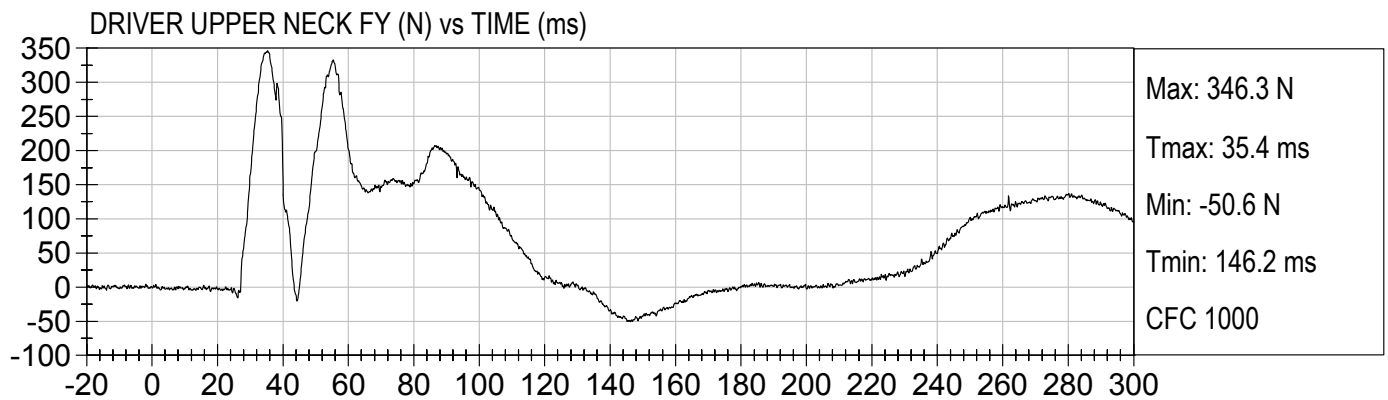
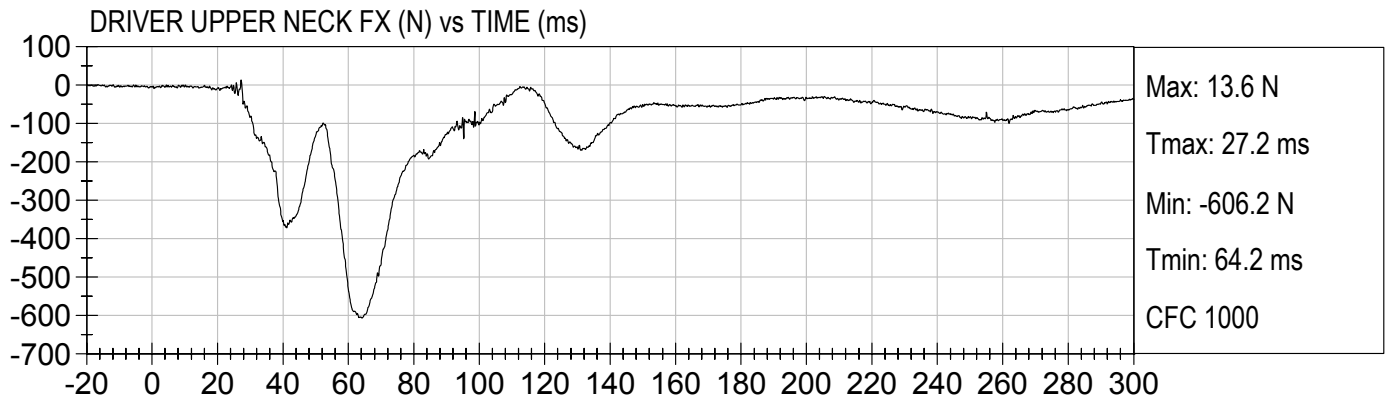
Figure No. 62.	Driver Pelvis Z Velocity vs. Time	B-17
Figure No. 63.	Driver Lumbar Force X vs. Time	B-18
Figure No. 64.	Driver Lumbar Force Y vs. Time	B-18
Figure No. 65.	Driver Lumbar Force Z vs. Time	B-18
Figure No. 66.	Driver Lumbar Force Resultant vs. Time	B-18
Figure No. 67.	Driver Lumbar Moment Force X vs. Time	B-19
Figure No. 68.	Driver Lumbar Moment Force Y vs. Time	B-19
Figure No. 69.	Driver Lumbar Moment Force Z vs. Time	B-19
Figure No. 70.	Driver Lumbar Moment Force Resultant vs. Time	B-19
Figure No. 71.	Driver Head X Redundant Acceleration vs. Time	B-20
Figure No. 72.	Driver Head Y Redundant Acceleration vs. Time	B-20
Figure No. 73.	Driver Head Z Redundant Acceleration vs. Time	B-20
Figure No. 74.	Driver Head Resultant Redundant Acceleration vs. Time	B-20
Figure No. 75.	Driver Head X Redundant Velocity vs. Time	B-21
Figure No. 76.	Driver Head Y Redundant Velocity vs. Time	B-21
Figure No. 77.	Driver Head Z Redundant Velocity vs. Time	B-21
Figure No. 78.	Right Front Sill X Acceleration vs. Time	B-22
Figure No. 79.	Right Front Sill Y Acceleration vs. Time	B-22
Figure No. 80.	Right Front Sill Z Acceleration vs. Time	B-22
Figure No. 81.	Right Front Sill Resultant vs. Time	B-22
Figure No. 82.	Right Front Sill X Velocity vs. Time	B-23
Figure No. 83.	Right Front Sill Y Velocity vs. Time	B-23
Figure No. 84.	Right Front Sill Z Velocity vs. Time	B-23
Figure No. 85.	Floorpan @ Rear Axle X Acceleration vs. Time	B-24
Figure No. 86.	Floorpan @ Rear Axle Y Acceleration vs. Time	B-24
Figure No. 87.	Floorpan @ Rear Axle Z Acceleration vs. Time	B-24
Figure No. 88.	Floorpan @ Rear Axle Resultant Acceleration vs. Time	B-24
Figure No. 89.	Floorpan @ Rear Axle X Velocity vs. Time	B-25
Figure No. 90.	Floorpan @ Rear Axle Y Velocity vs. Time	B-25
Figure No. 91.	Floorpan @ Rear Axle Z Velocity vs. Time	B-25
Figure No. 92.	Left Front Sill Y Acceleration vs. Time	B-26

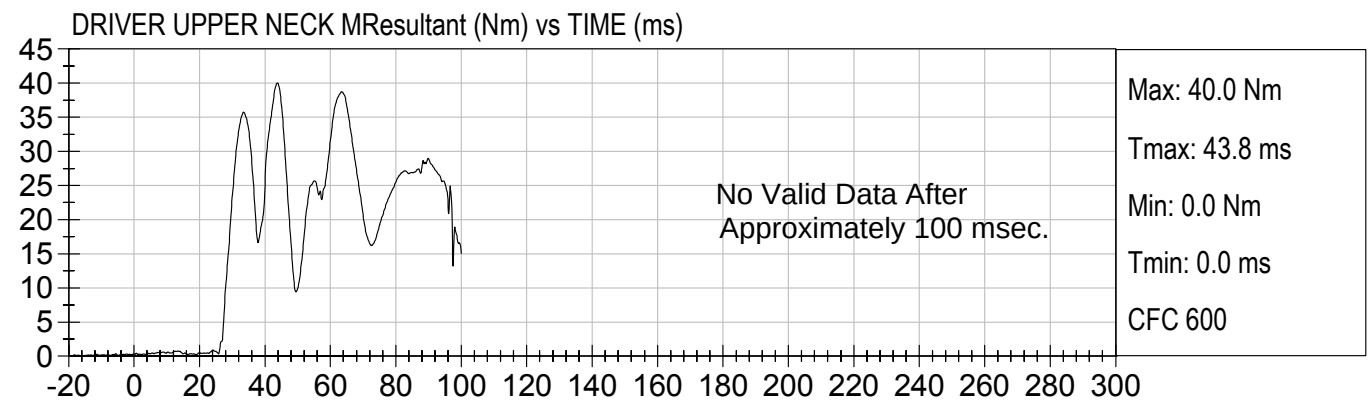
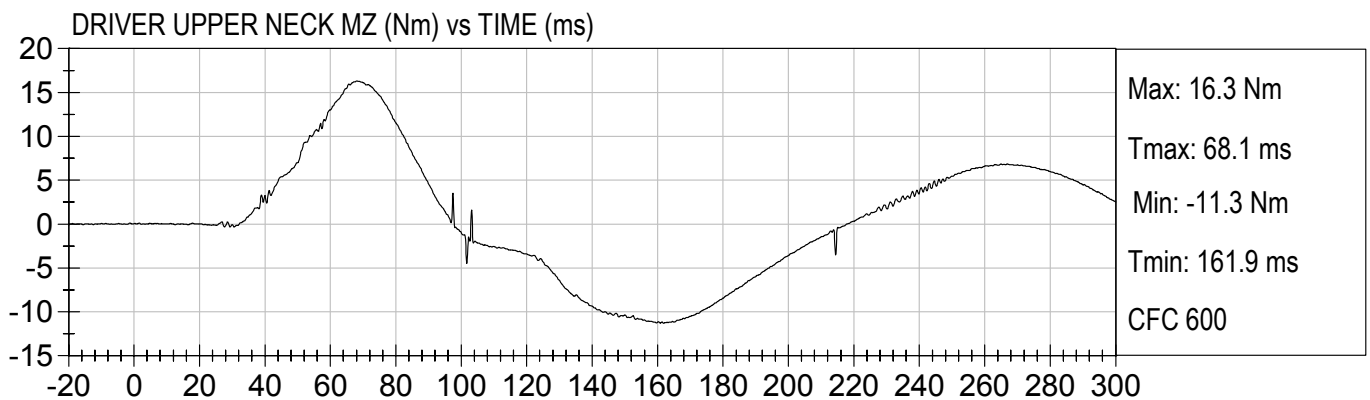
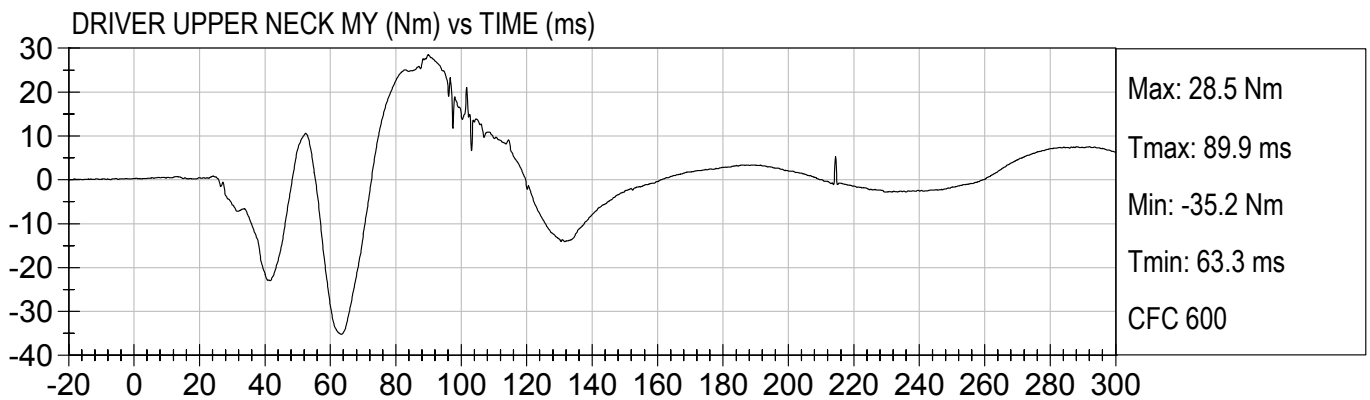
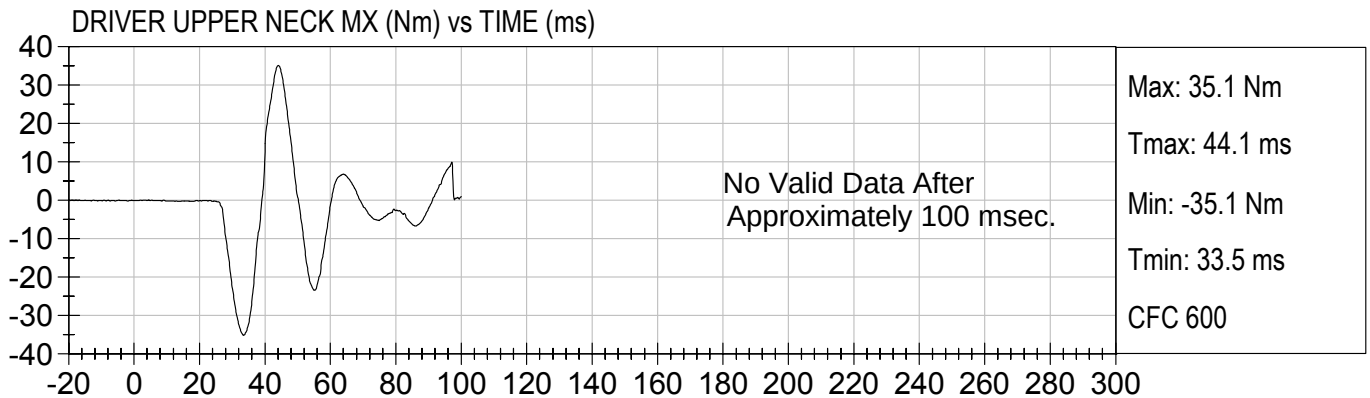
Figure No. 93.	Left Front Sill Y Velocity vs. Time	B-26
Figure No. 94.	Left Rear Sill Y Acceleration vs. Time	B-26
Figure No. 95.	Left Rear Sill Y Velocity vs. Time	B-26
Figure No. 96.	Left Lower B-Post Y Acceleration vs. Time	B-27
Figure No. 97.	Left Lower B-Post Y Velocity vs. Time	B-27
Figure No. 98.	Left Mid B-Post Y Acceleration vs. Time	B-27
Figure No. 99.	Left Mid B-Post Y Velocity vs. Time	B-27
Figure No. 100.	Left Lower A-Post Y Acceleration vs. Time	B-28
Figure No. 101.	Left Lower A-Post Y Velocity vs. Time	B-28
Figure No. 102.	Left Mid A-Post Y Acceleration vs. Time	B-28
Figure No. 103.	Left Mid A-Post Y Velocity vs. Time	B-28
Figure No. 104.	Driver Seat Track Y Acceleration vs. Time	B-29
Figure No. 105.	Driver Seat Track Y Velocity vs. Time	B-29
Figure No. 106.	Firewall Y Acceleration vs. Time	B-29
Figure No. 107.	Firewall Y Velocity vs. Time	B-29
Figure No. 108.	Vehicle CG X Acceleration vs. Time	B-30
Figure No. 109.	Vehicle CG Y Acceleration vs. Time	B-30
Figure No. 110.	Vehicle CG Z Acceleration vs. Time	B-30
Figure No. 111.	Vehicle CG Resultant Acceleration vs. Time	B-30
Figure No. 112.	Vehicle CG X Velocity vs. Time	B-31
Figure No. 113.	Vehicle CG Y Velocity vs. Time	B-31
Figure No. 114.	Vehicle CG Z Velocity vs. Time	B-31
Figure No. 115.	Left Front Door @ Arm Y Acceleration vs. Time	B-32
Figure No. 116.	Left Front Door @ Pelvis Y Acceleration vs. Time	B-32
Figure No. 117.	Left Front Door @ Knee Y Acceleration vs. Time	B-32
Figure No. 118.	Left Front Door @ Mid Rib Y Acceleration vs. Time	B-32
Figure No. 119.	Left Front Door @ Arm Y Velocity vs. Time	B-33
Figure No. 120.	Left Front Door @ Pelvis Y Velocity vs. Time	B-33
Figure No. 121.	Left Front Door @ Knee Y Velocity vs. Time	B-33
Figure No. 122.	Left Front Door @ Mid Rib Y Velocity vs. Time	B-33
Figure No. 123.	Left A-Post @ Sill Y Acceleration vs. Time	B-34

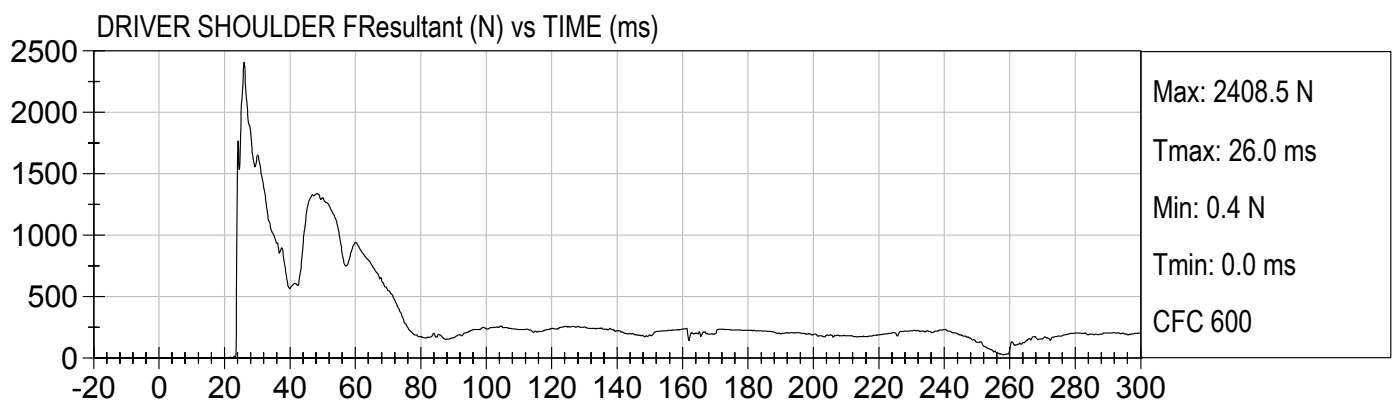
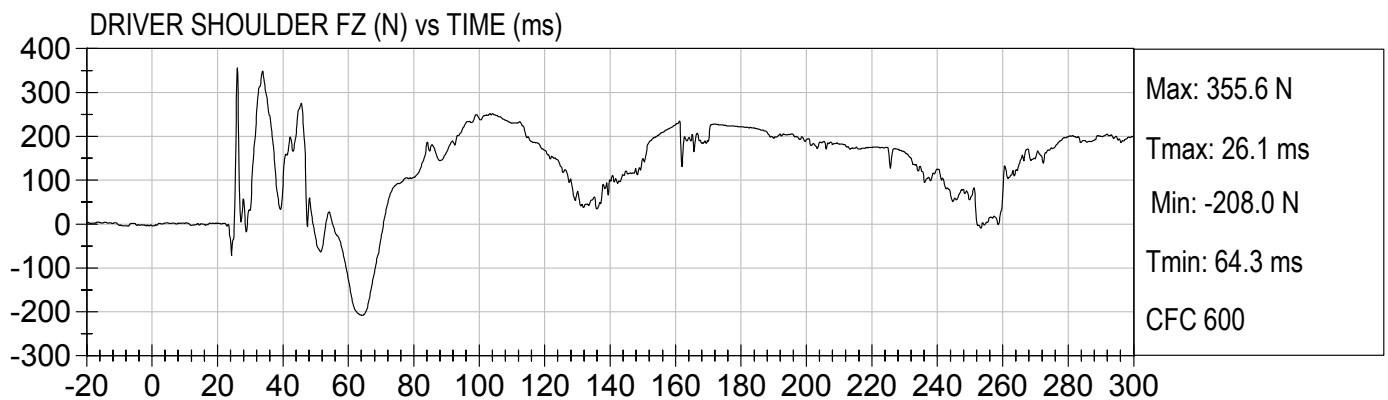
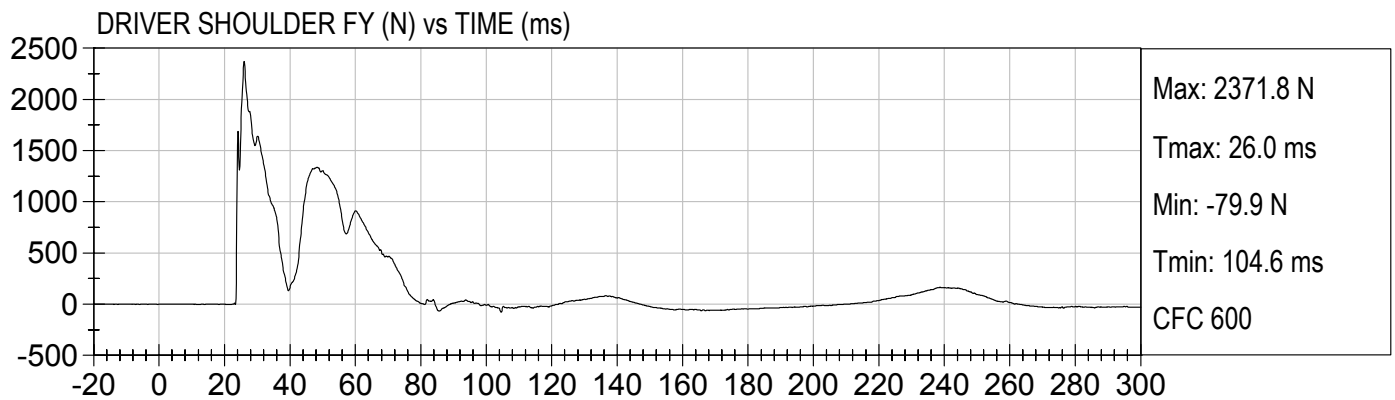
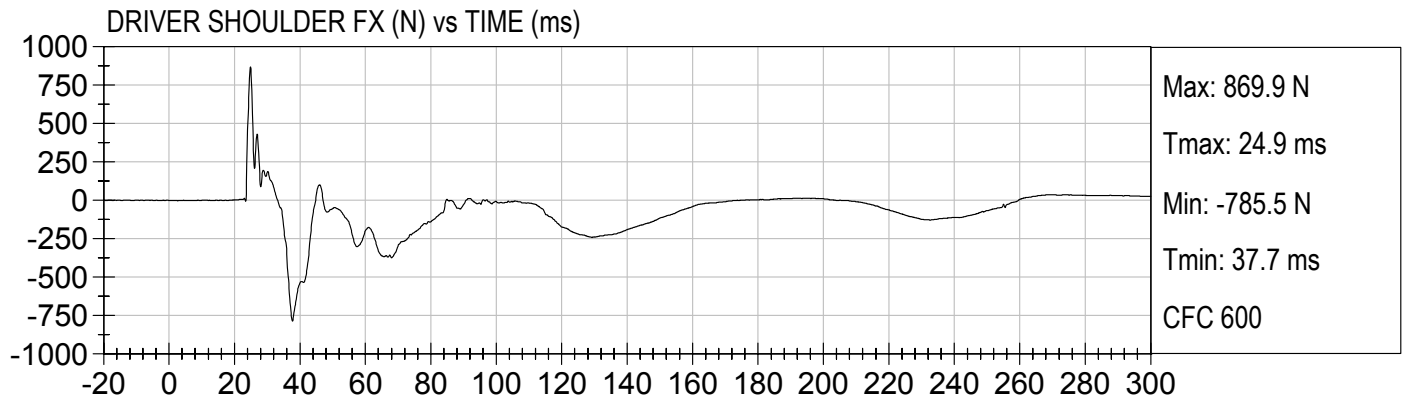
Figure No. 124.	Left A-Post @ Sill Y Velocity vs. Time	B-34
Figure No. 125.	Left B-Post @ Sill Y Acceleration vs. Time	B-34
Figure No. 126.	Left B-Post @ Sill Y Velocity vs. Time	B-34
Figure No. 127.	Upper Engine X Acceleration vs. Time	B-35
Figure No. 128.	Upper Engine Y Acceleration vs. Time	B-35
Figure No. 129.	Upper Engine X Velocity vs. Time	B-35
Figure No. 130.	Upper Engine Y Velocity vs. Time	B-35
Figure No. 131.	Driver Rib Contact vs. Time	B-36
Figure No. 132.	Driver Arm Contact vs. Time	B-36
Figure No. 133.	Driver Pelvis Contact vs. Time	B-36

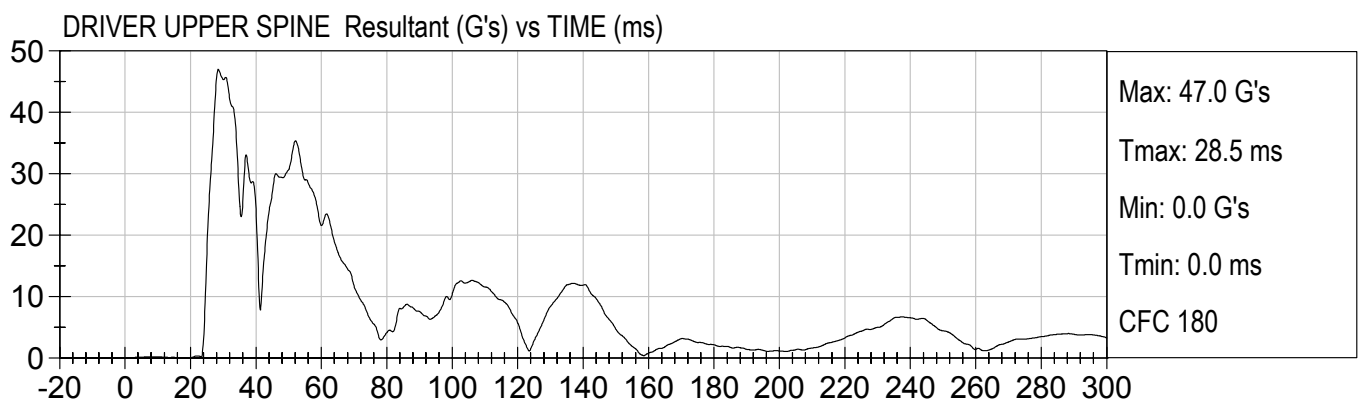
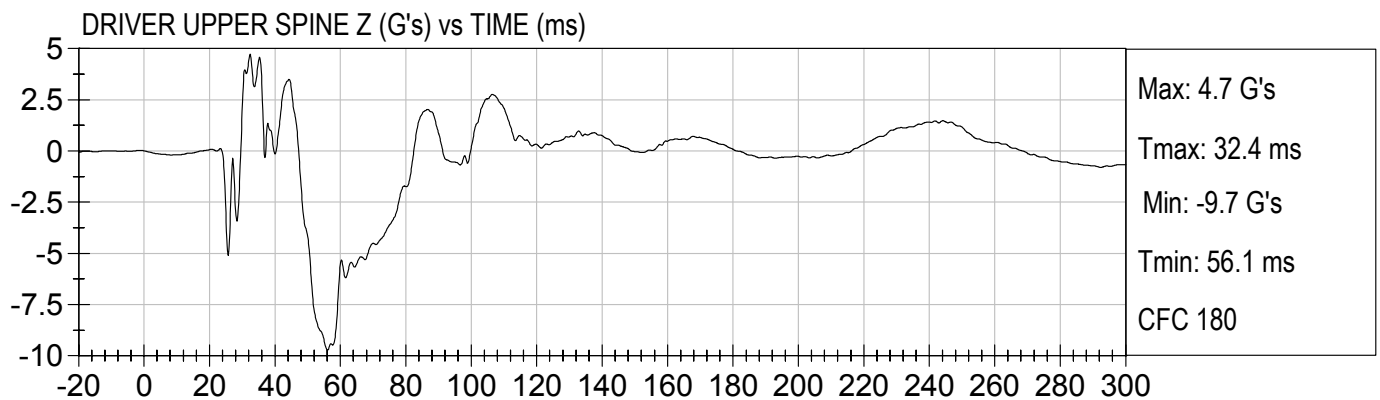
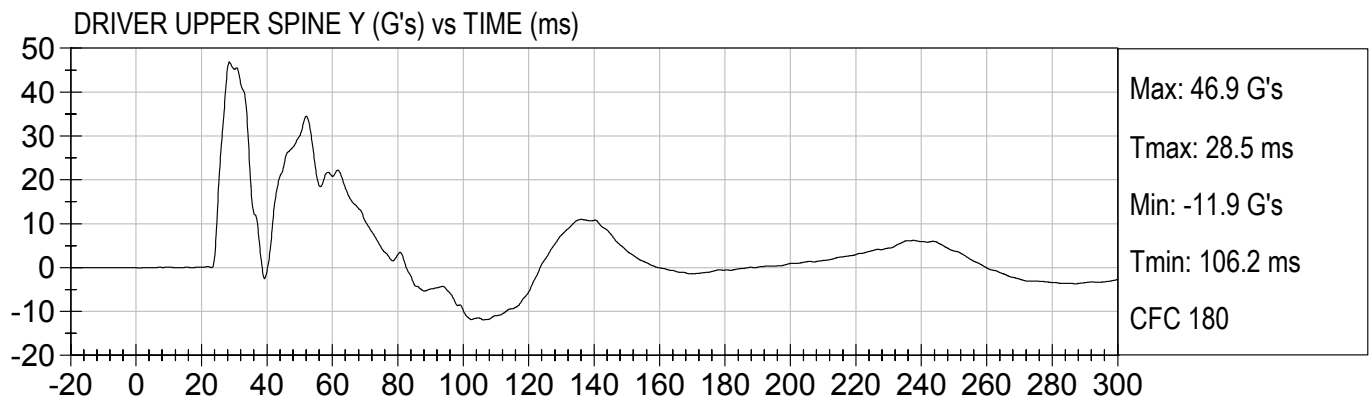
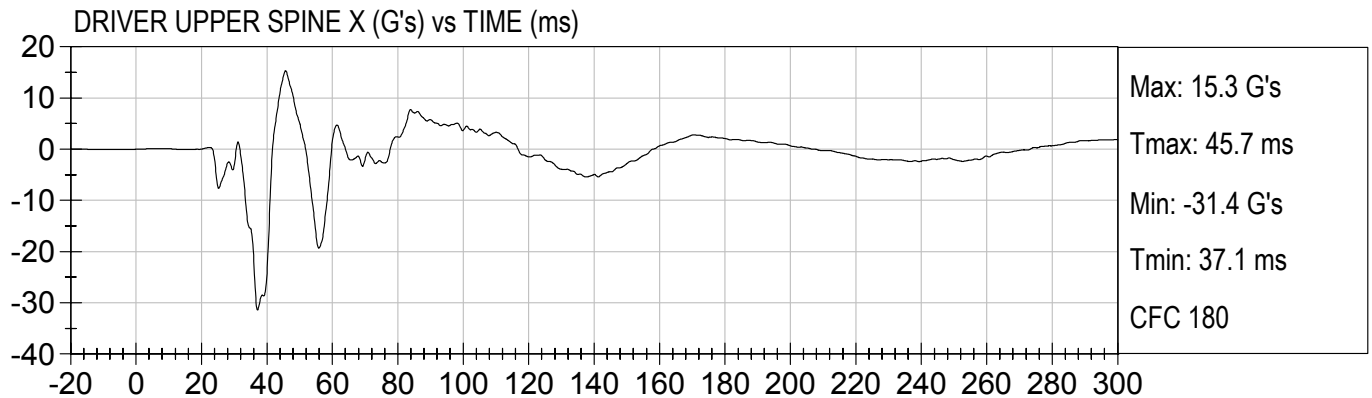






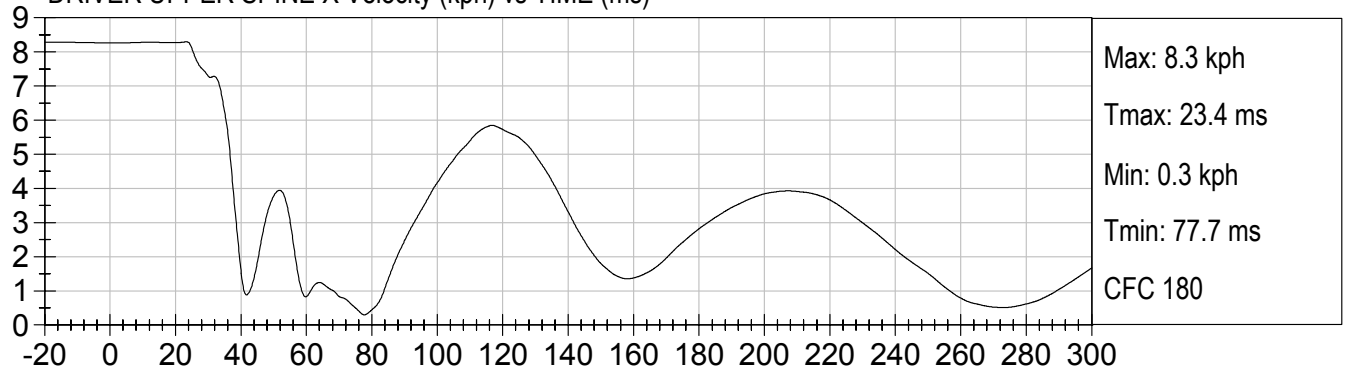




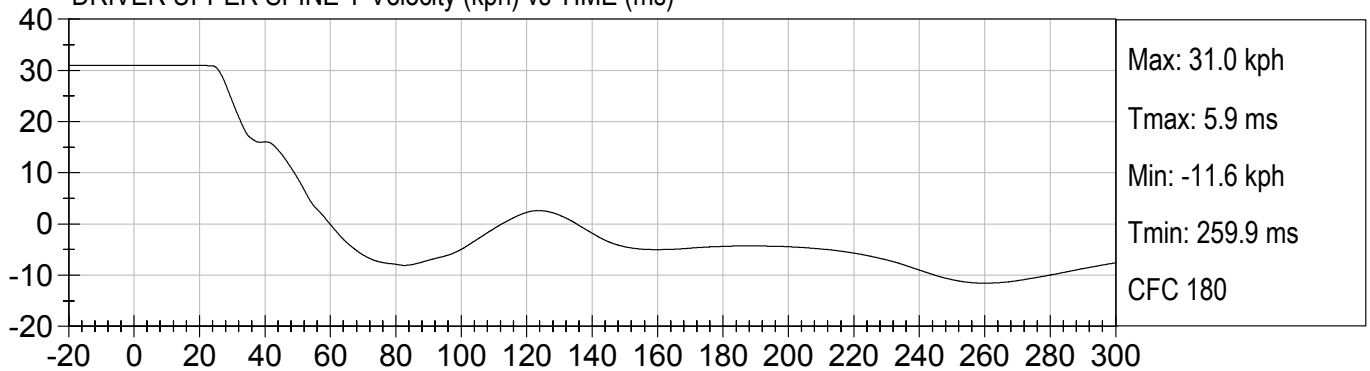




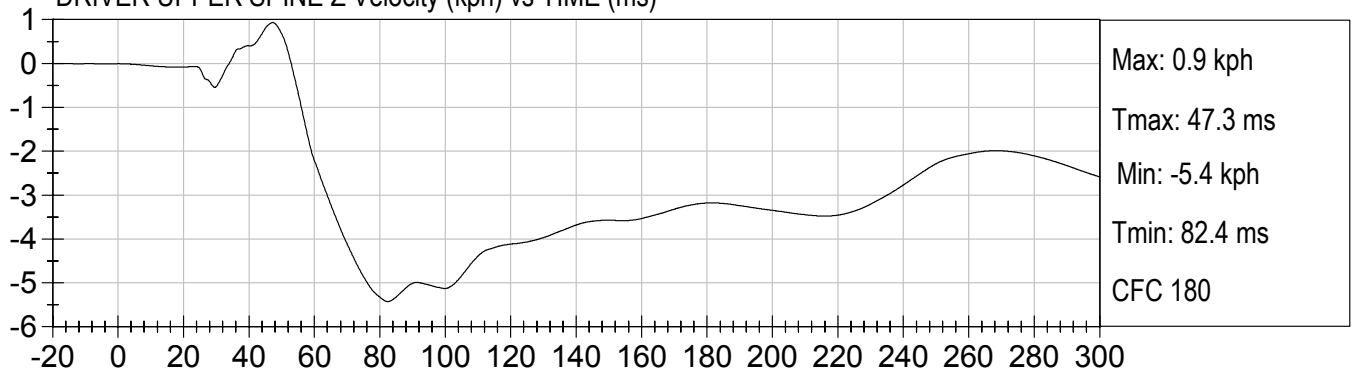
DRIVER UPPER SPINE X Velocity (kph) vs TIME (ms)

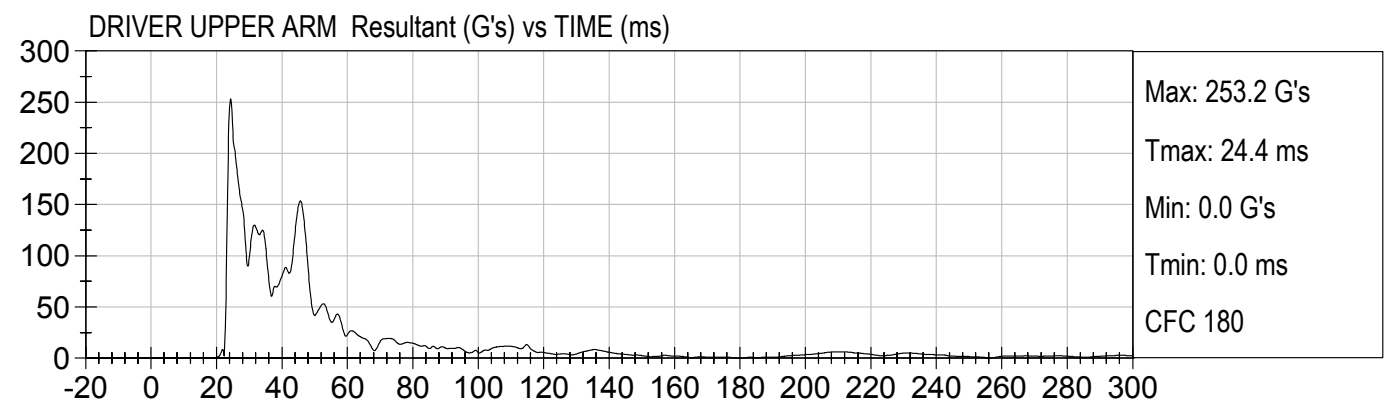
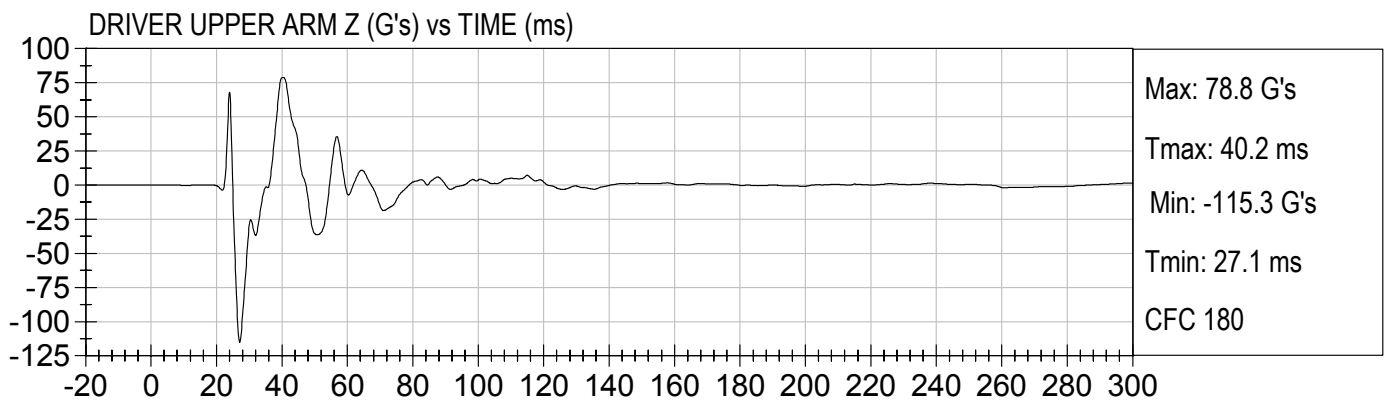
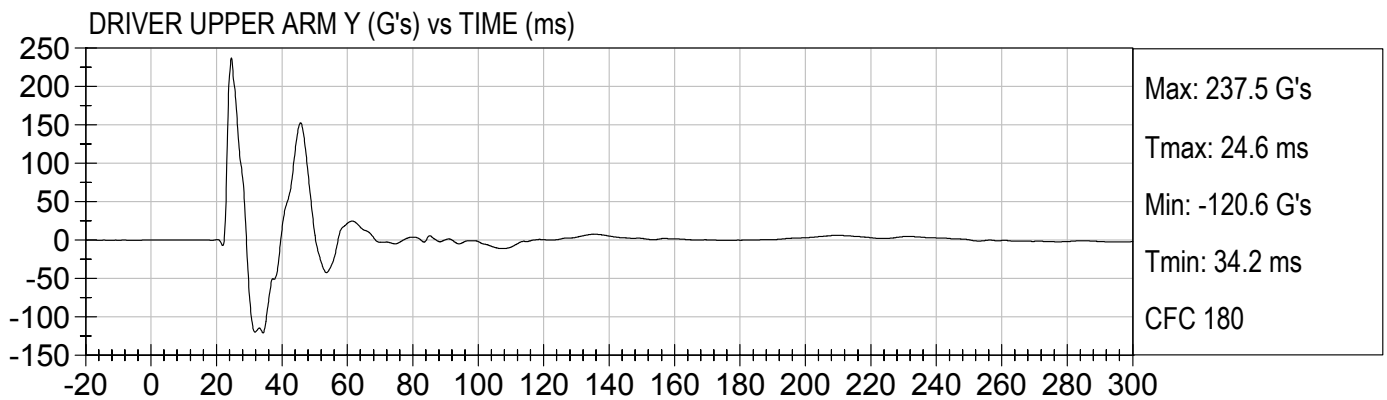
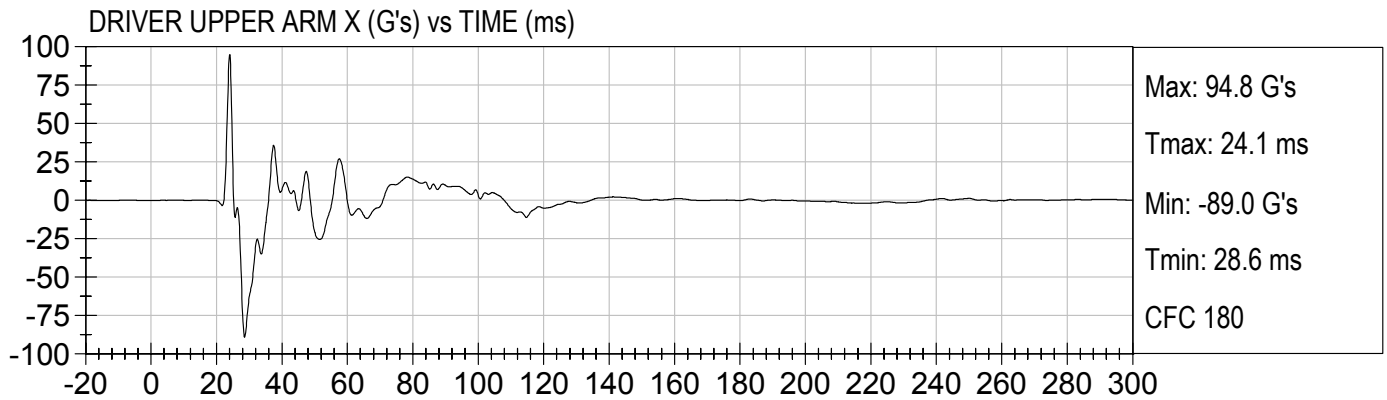


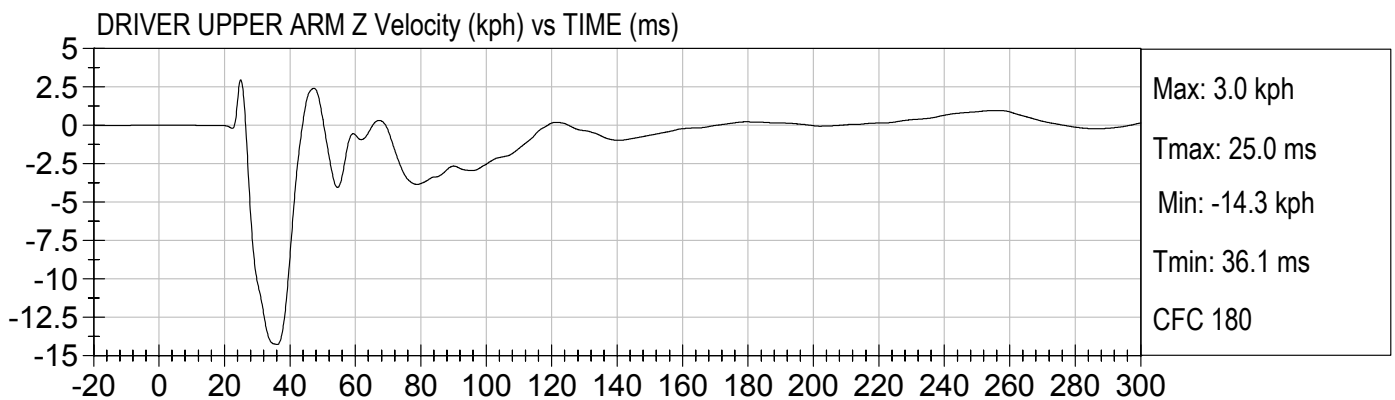
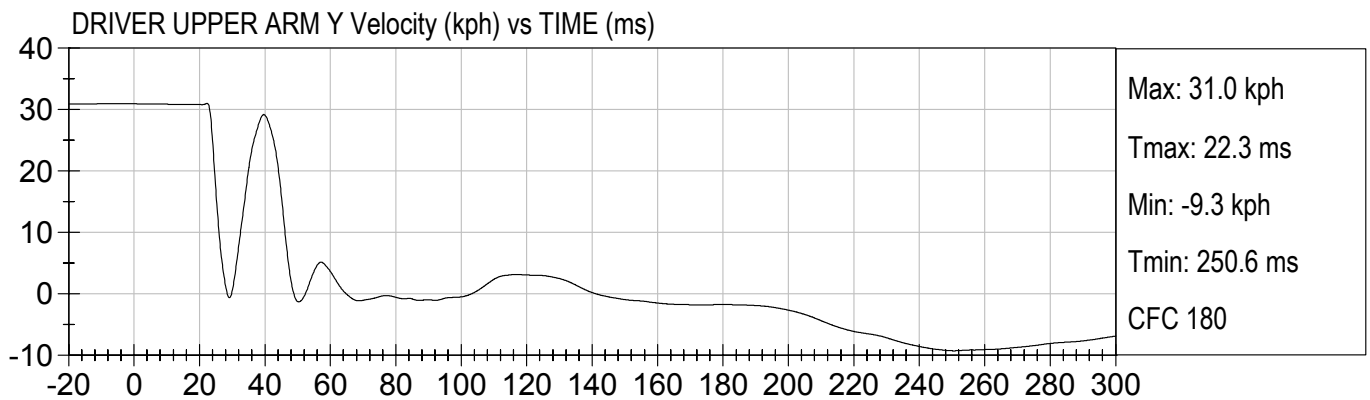
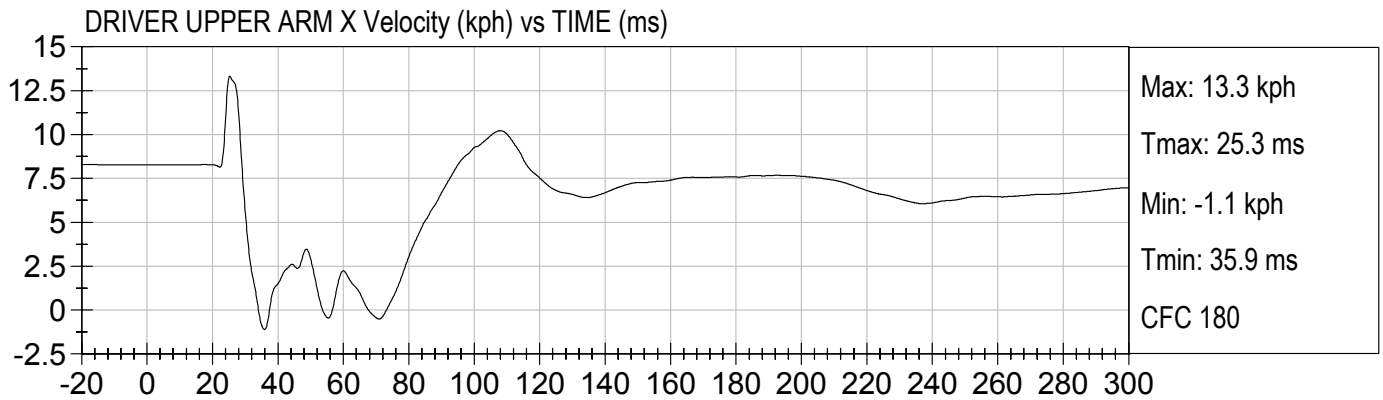
DRIVER UPPER SPINE Y Velocity (kph) vs TIME (ms)

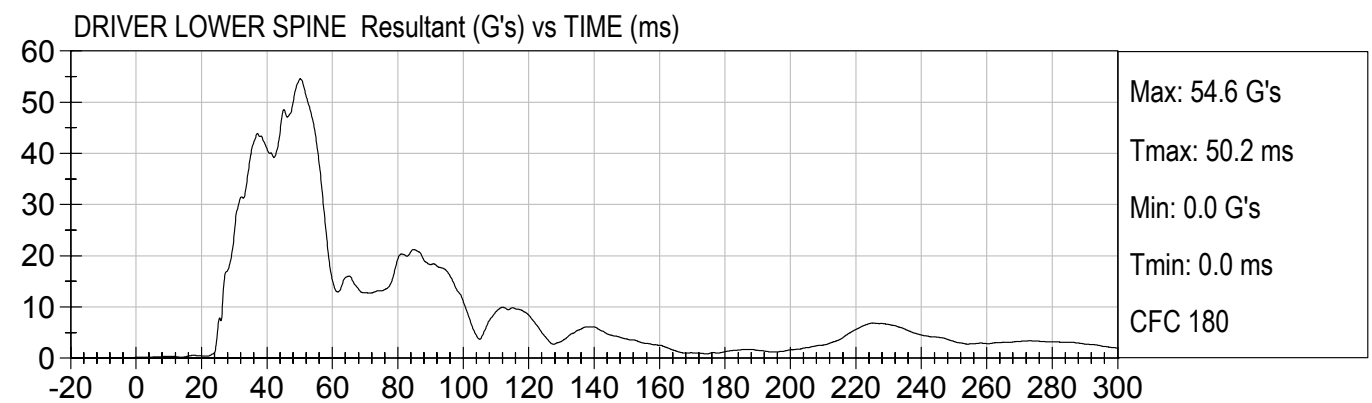
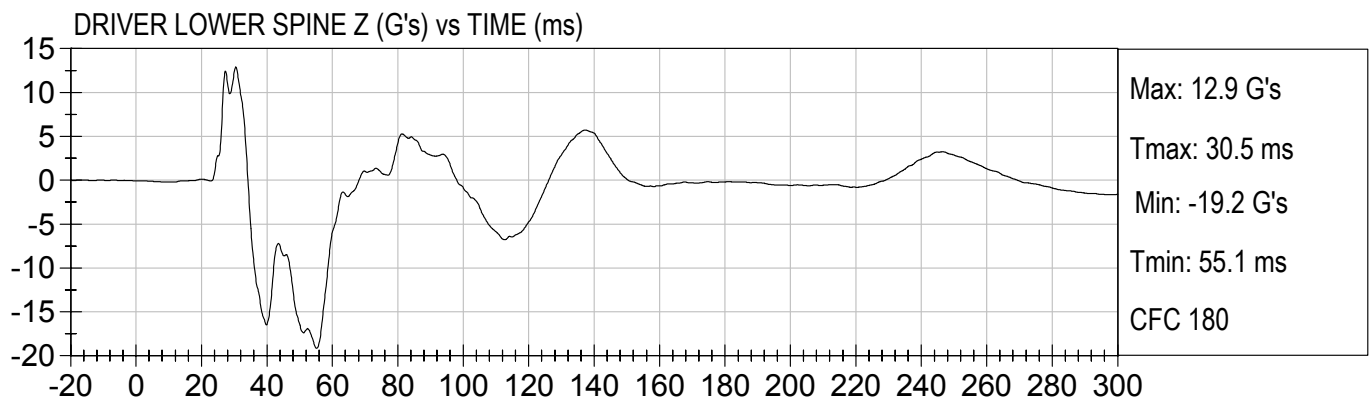
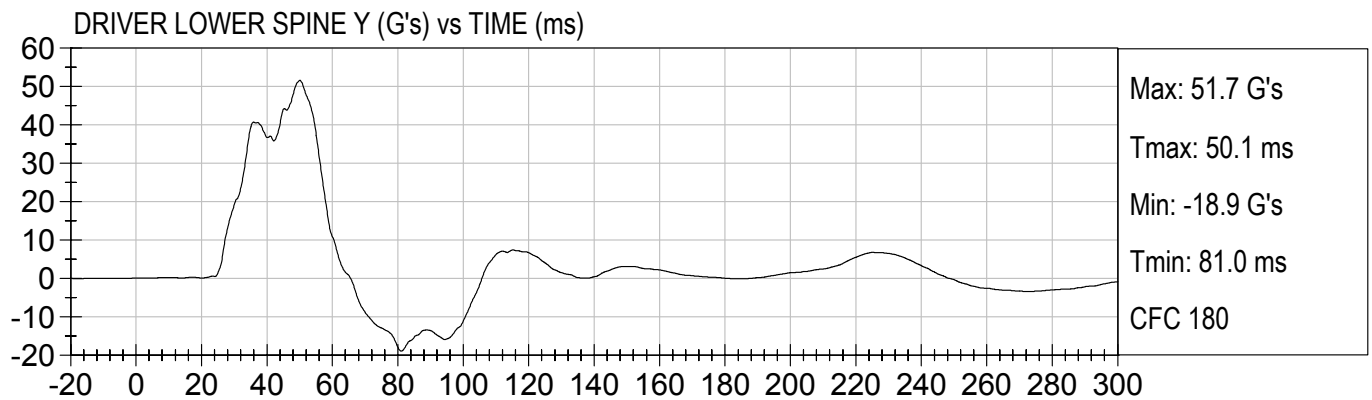
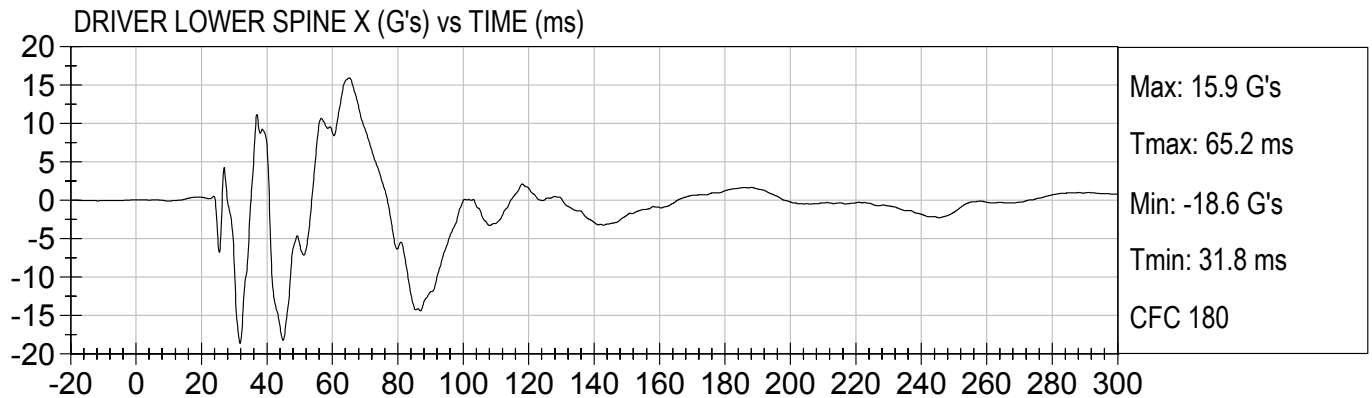


DRIVER UPPER SPINE Z Velocity (kph) vs TIME (ms)



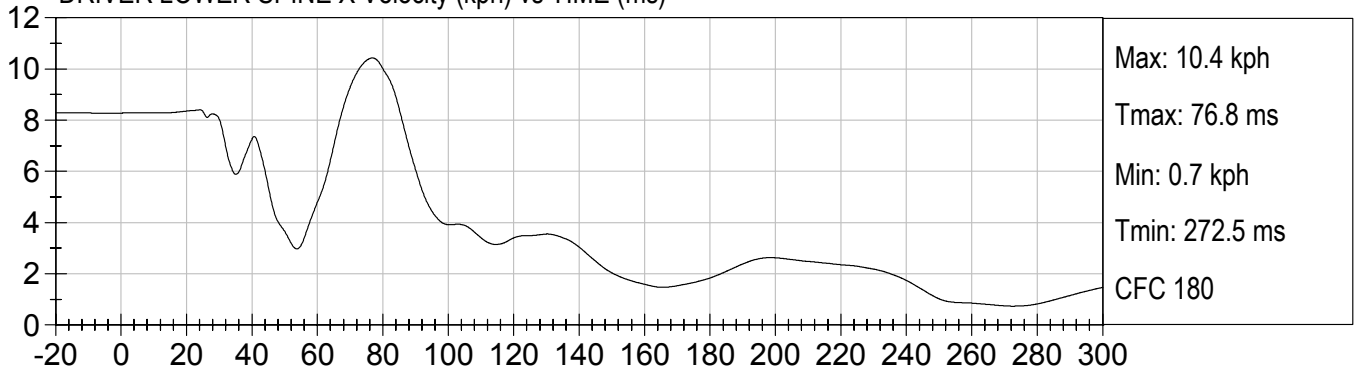




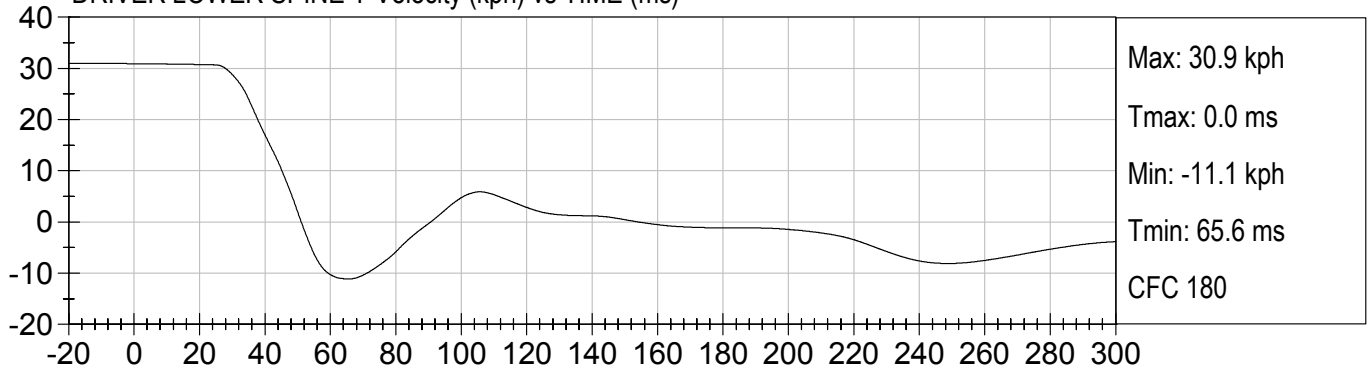




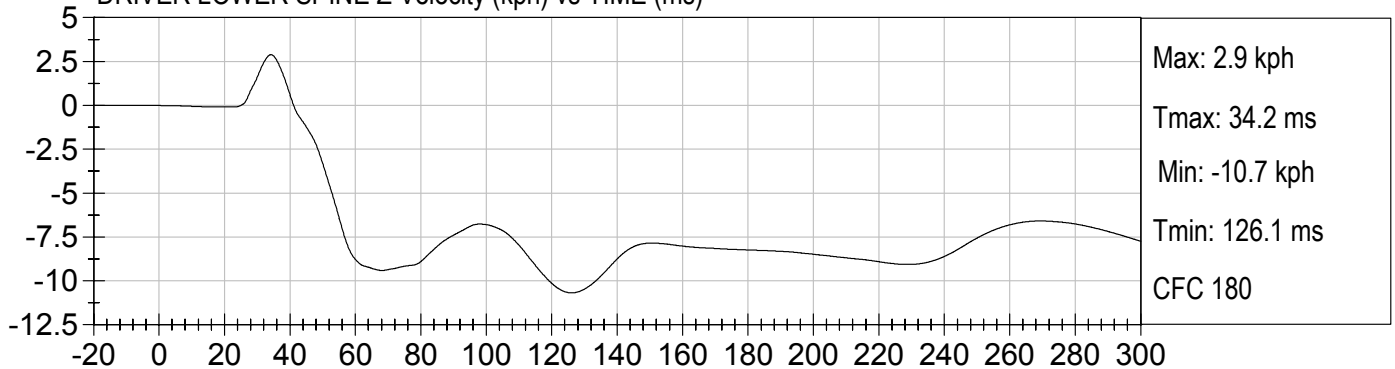
DRIVER LOWER SPINE X Velocity (kph) vs TIME (ms)

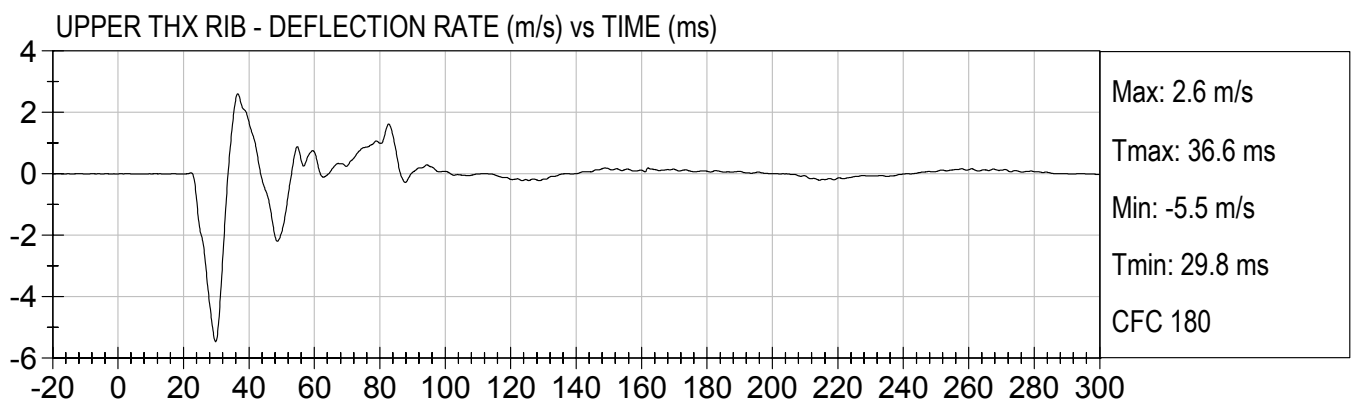
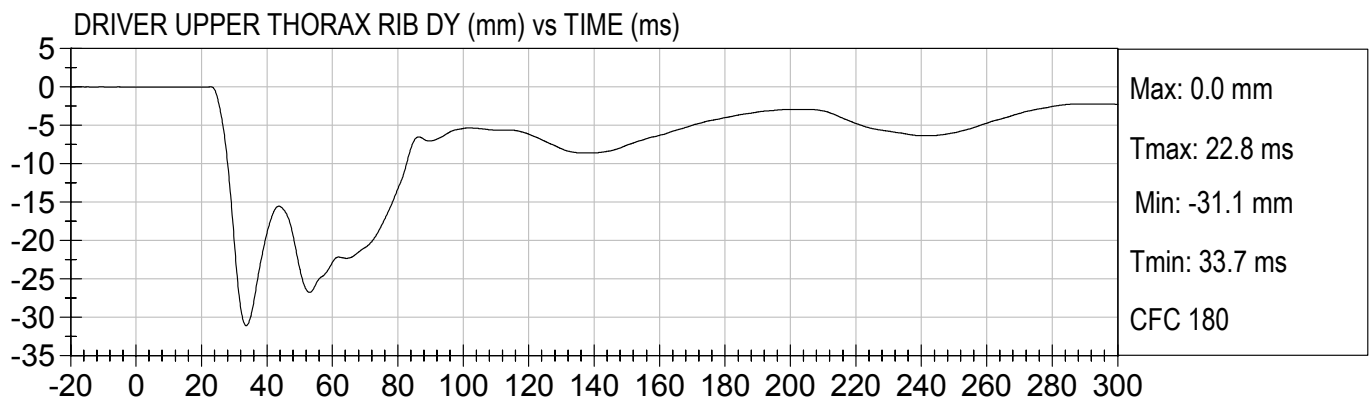
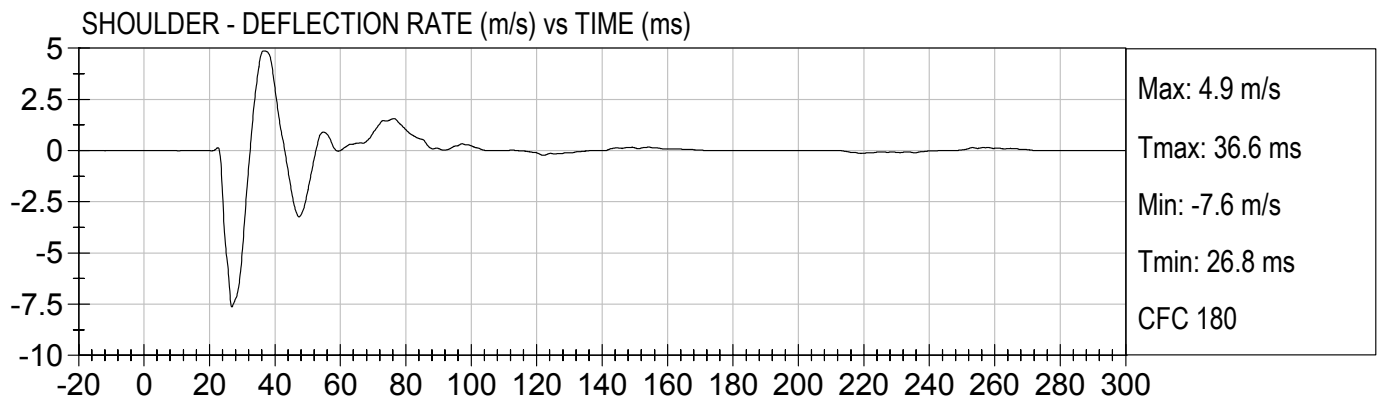
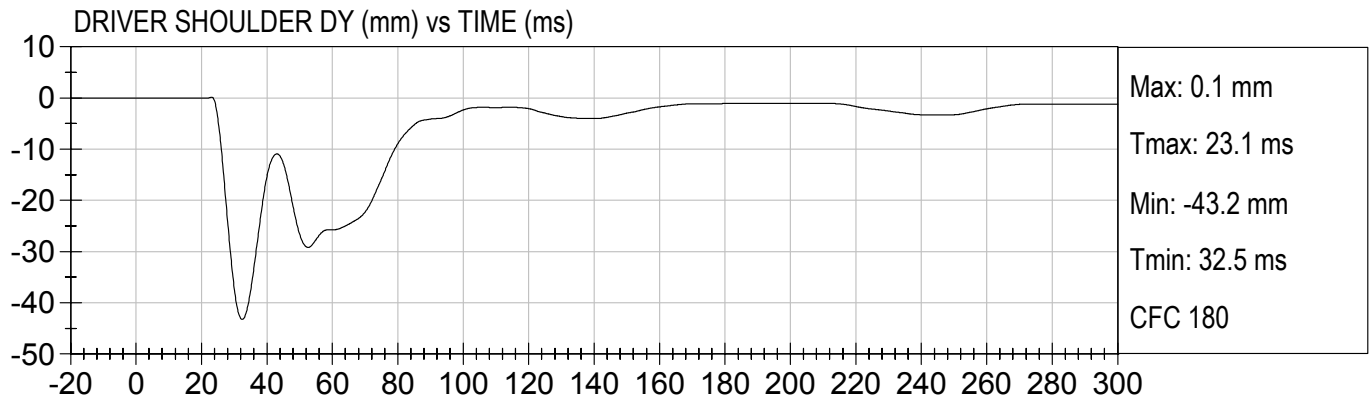


DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



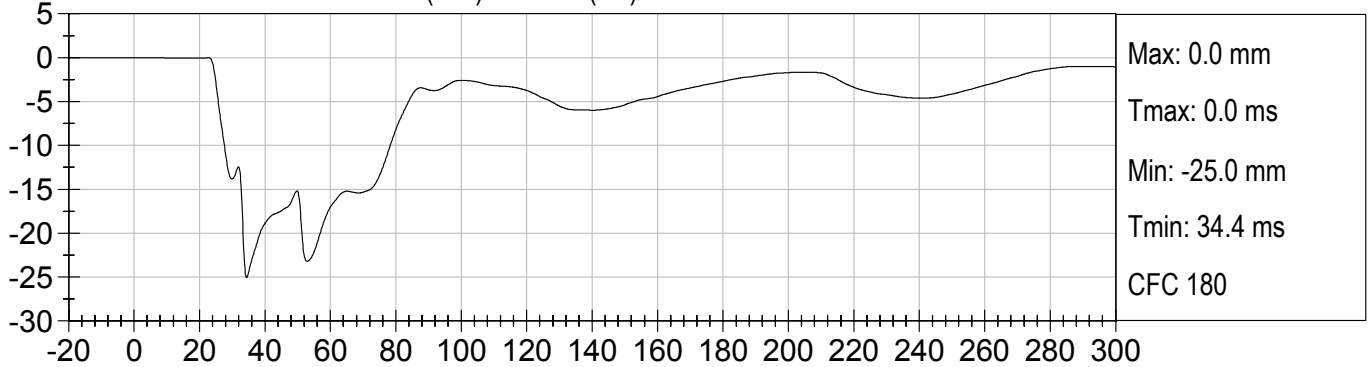
DRIVER LOWER SPINE Z Velocity (kph) vs TIME (ms)



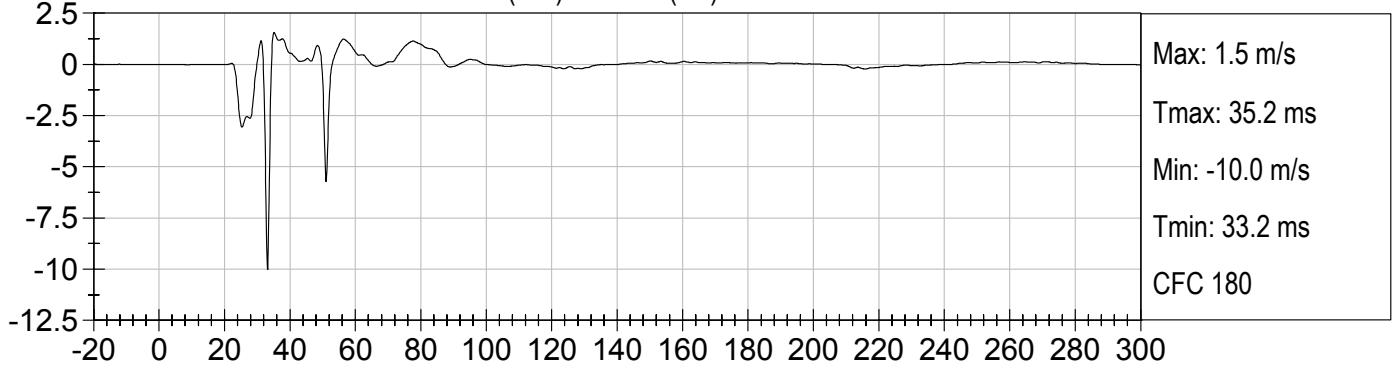




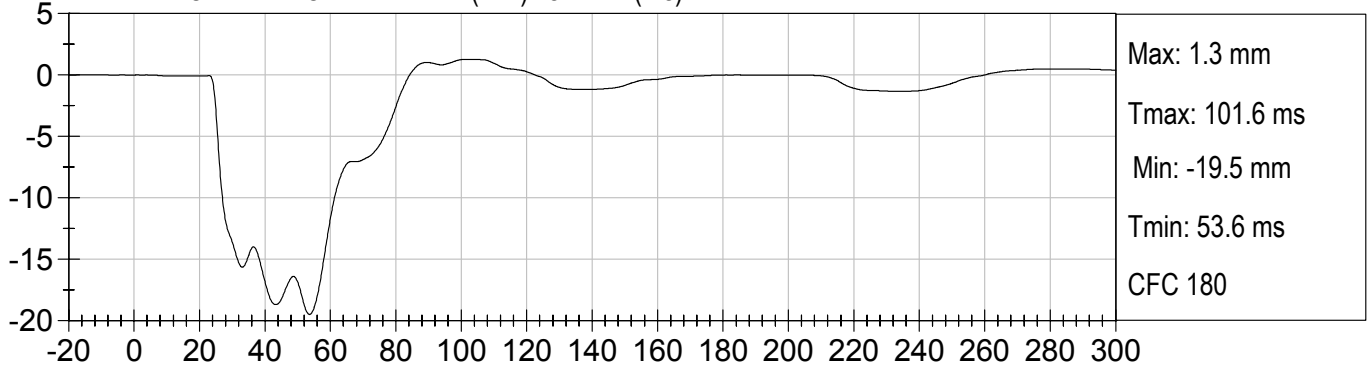
DRIVER MID THORAX RIB DY (mm) vs TIME (ms)



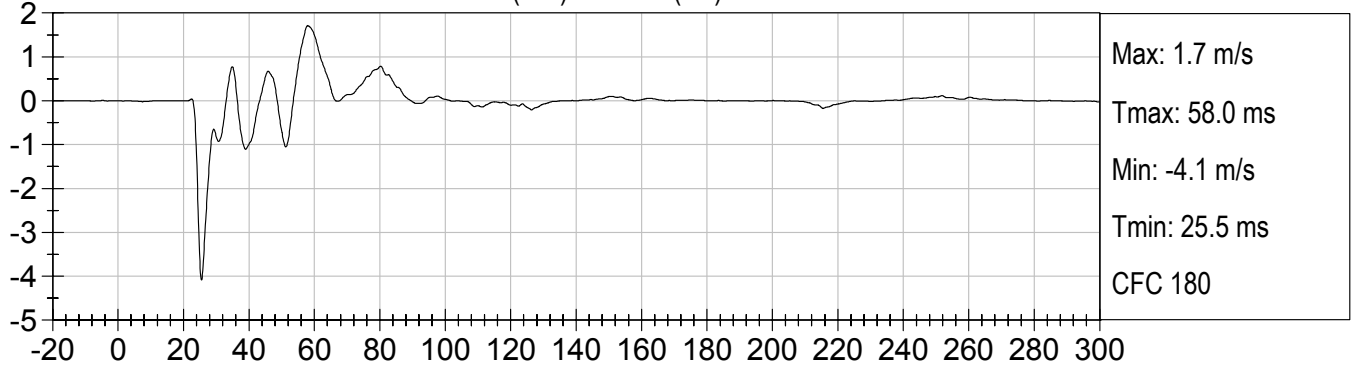
MID THX RIB - DEFLECTION RATE (m/s) vs TIME (ms)

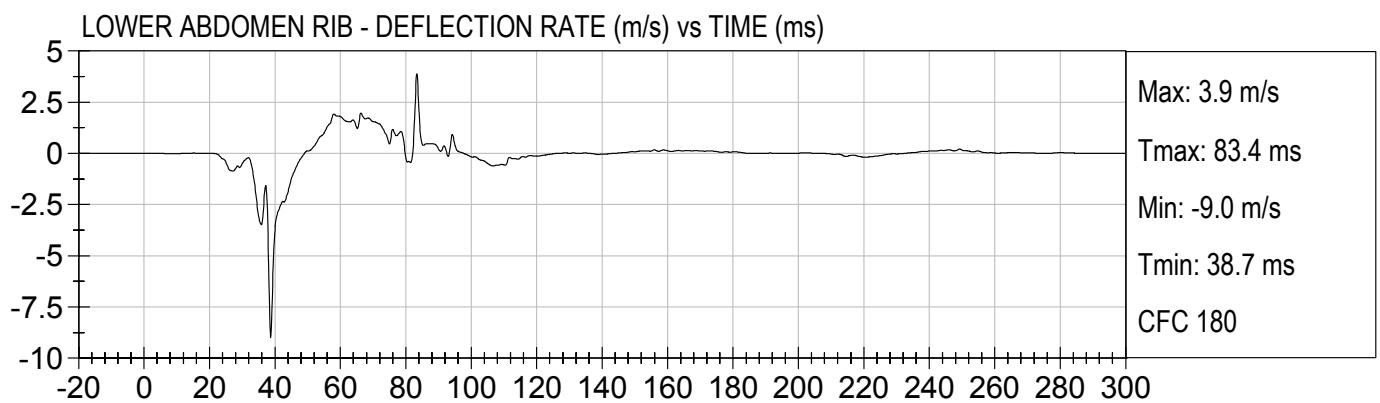
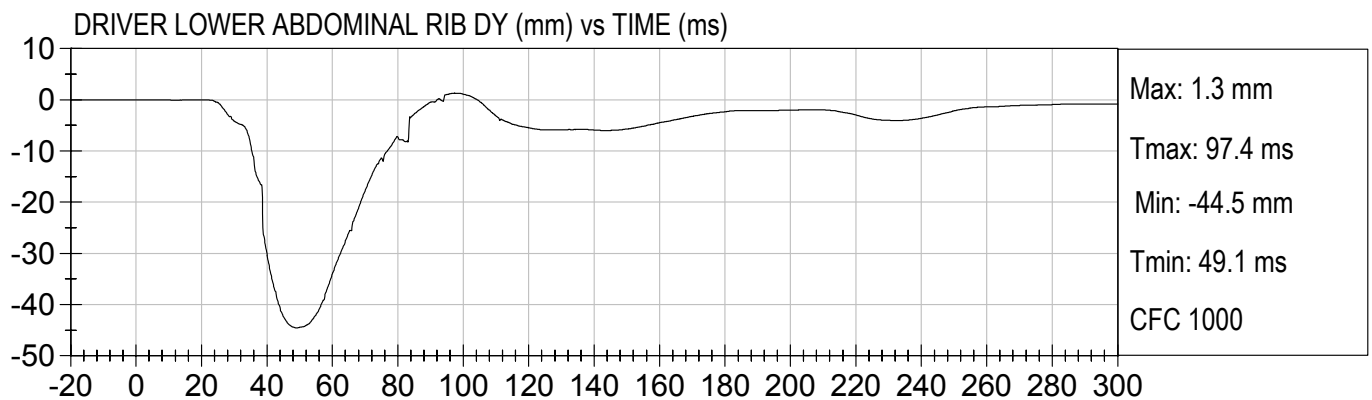
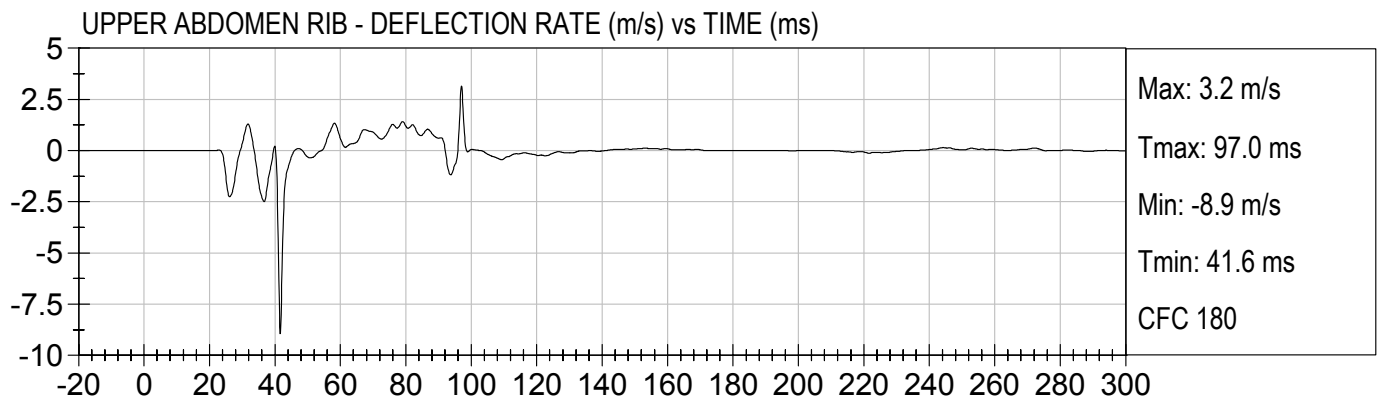
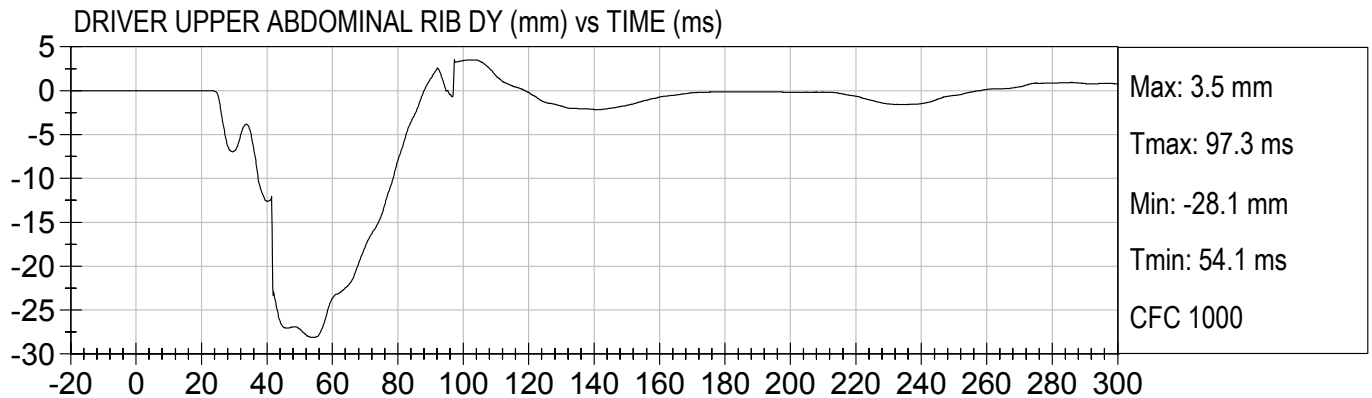


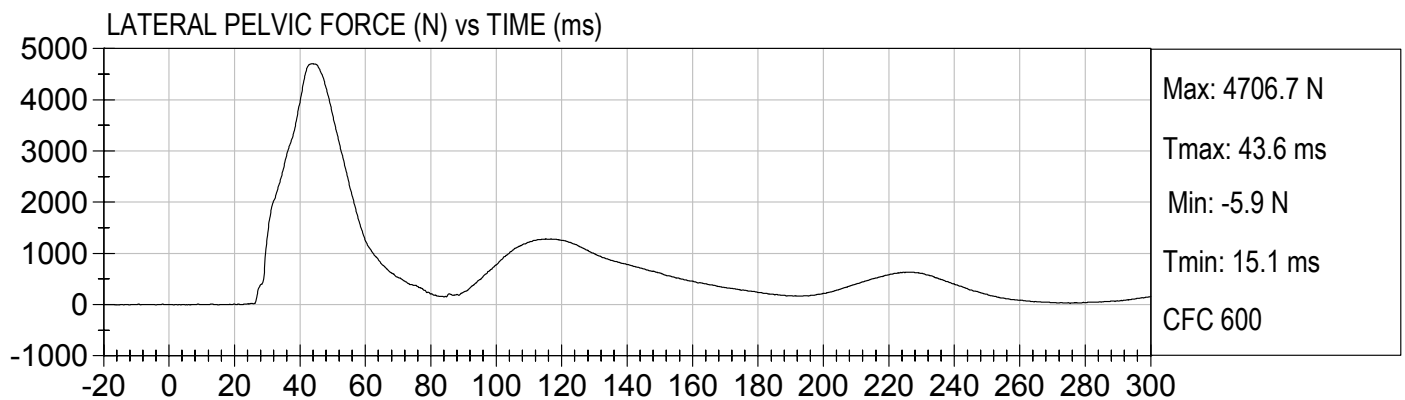
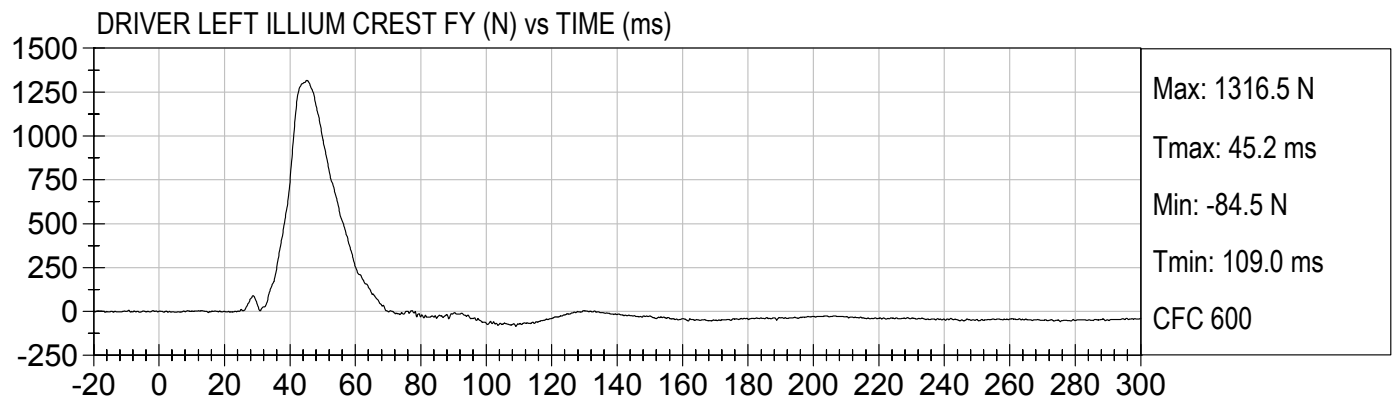
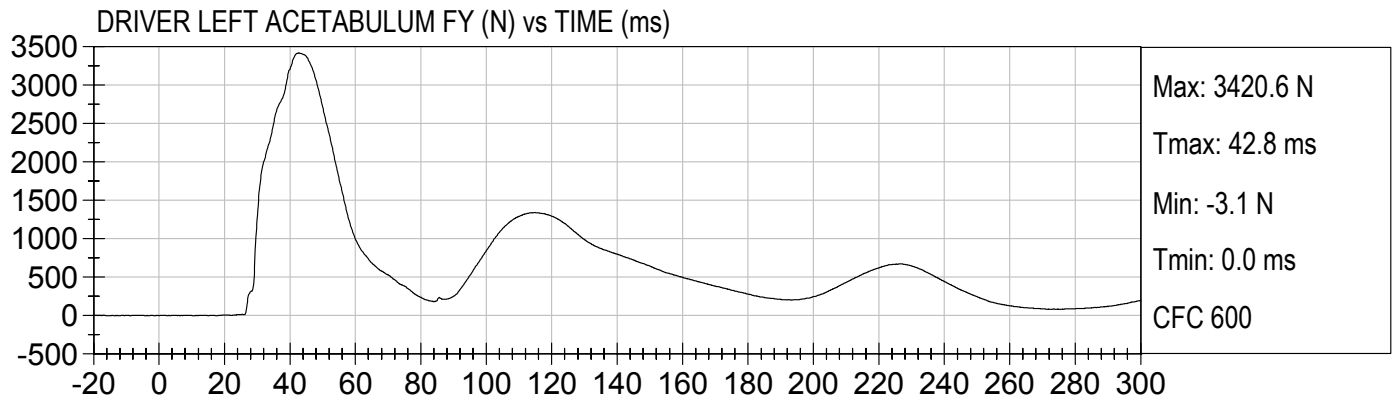
DRIVER LOWER THORAX RIB DY (mm) vs TIME (ms)

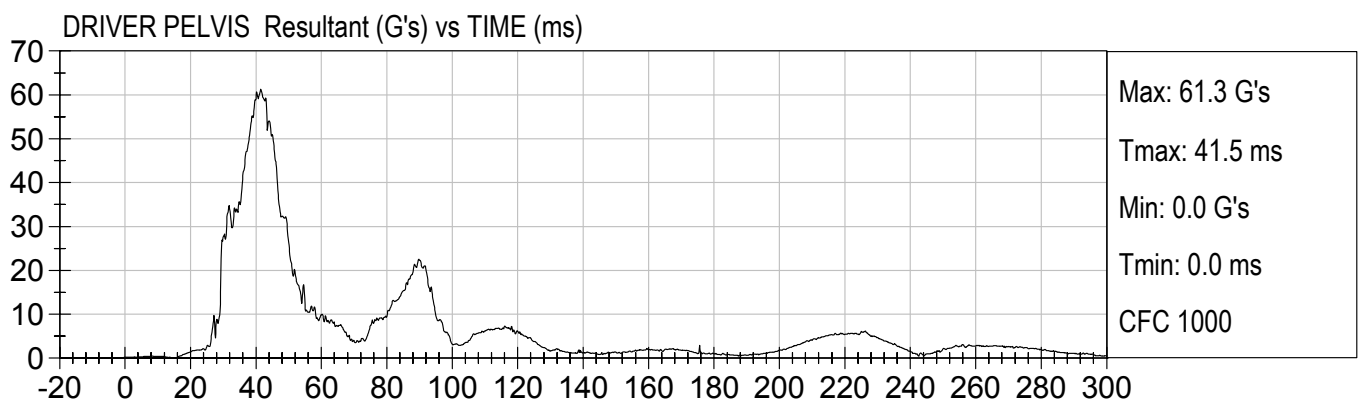
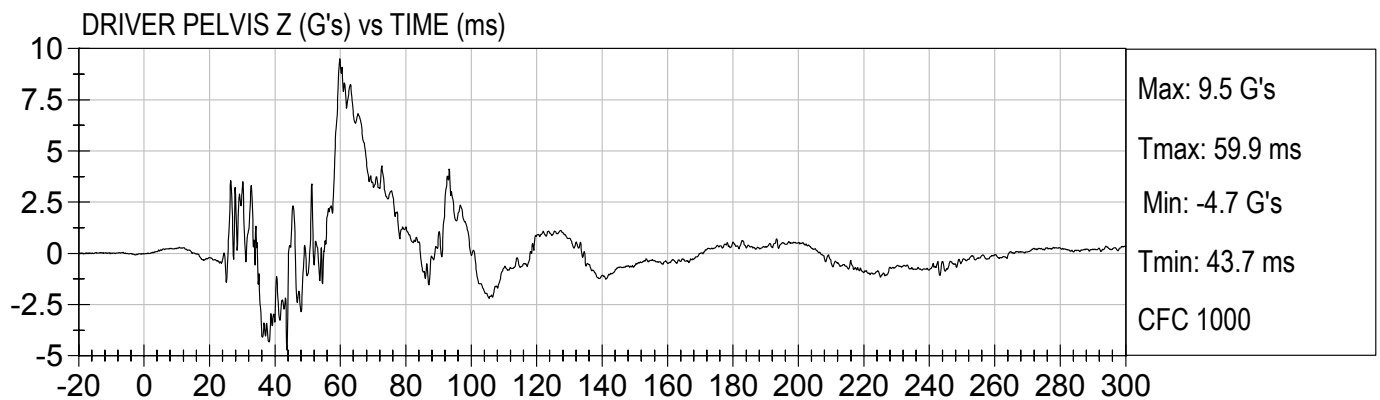
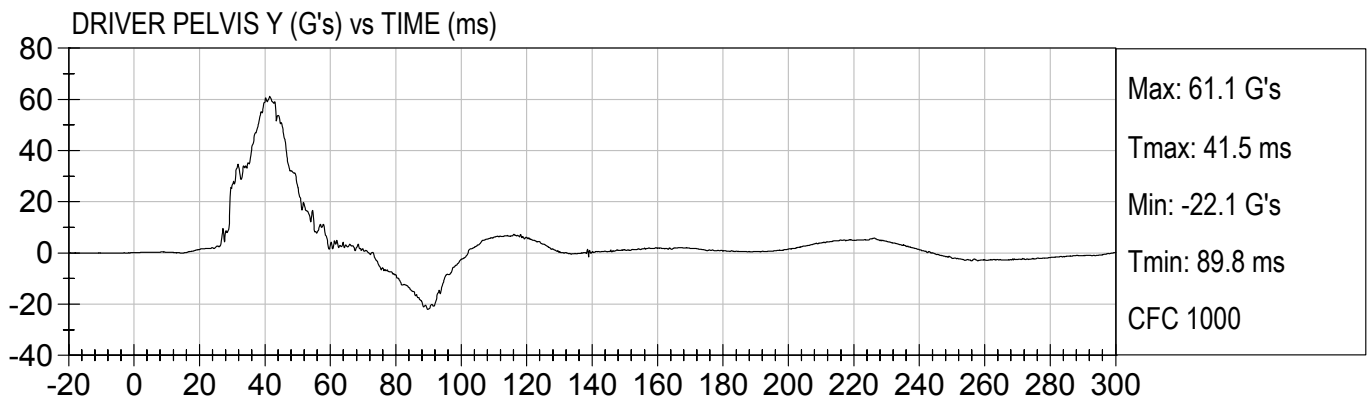
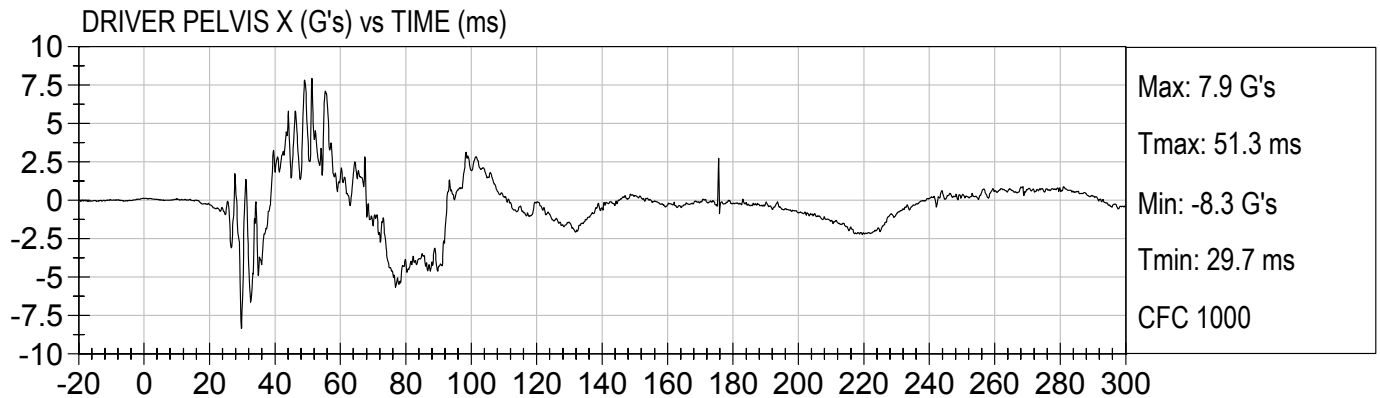


LOWER THX RIB - DEFLECTION RATE (m/s) vs TIME (ms)



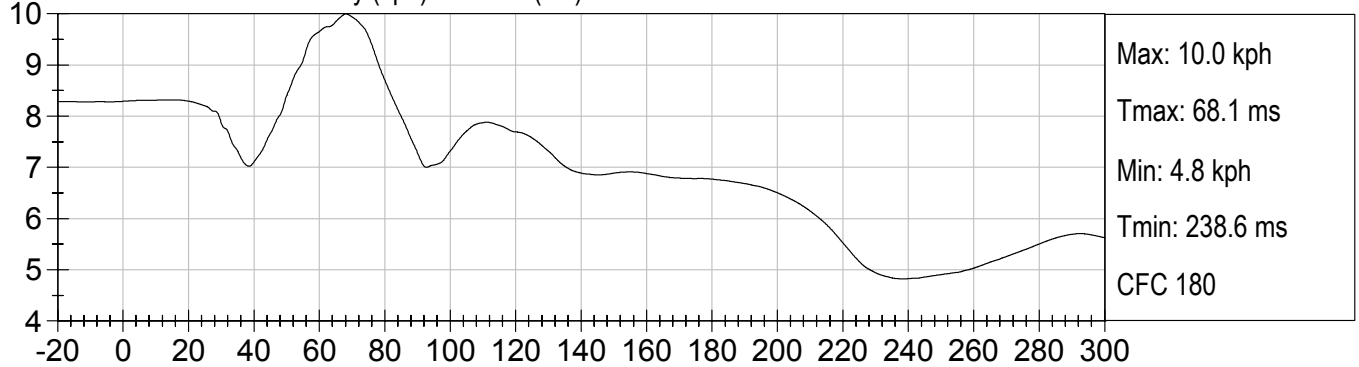




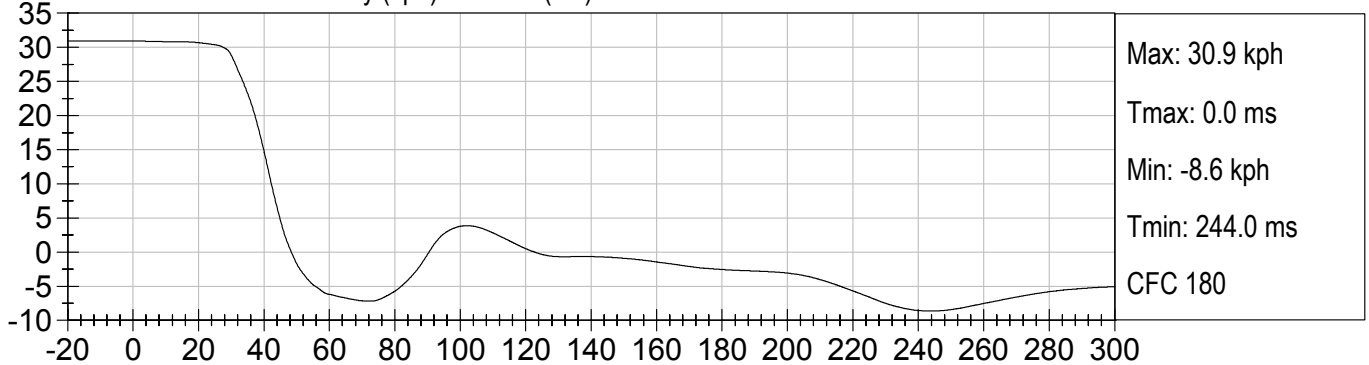




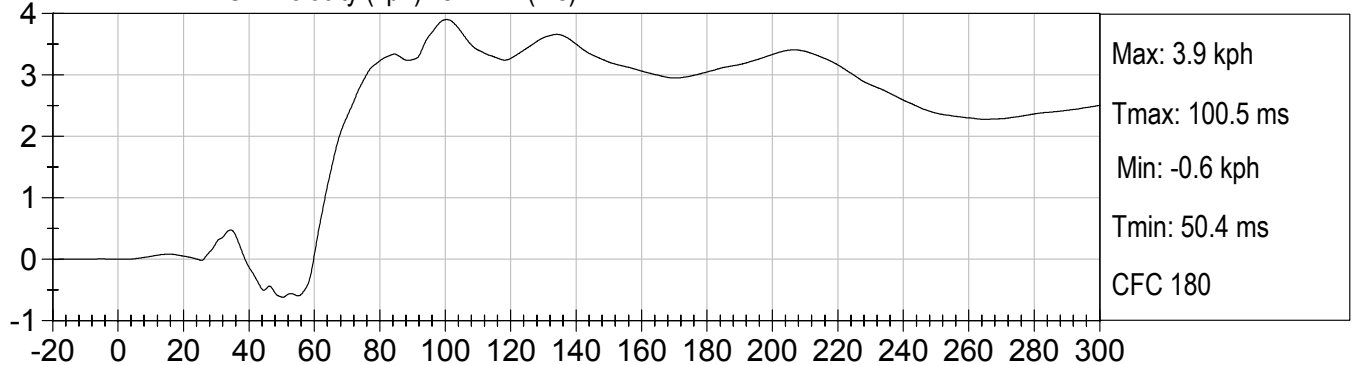
DRIVER PELVIS X Velocity (kph) vs TIME (ms)

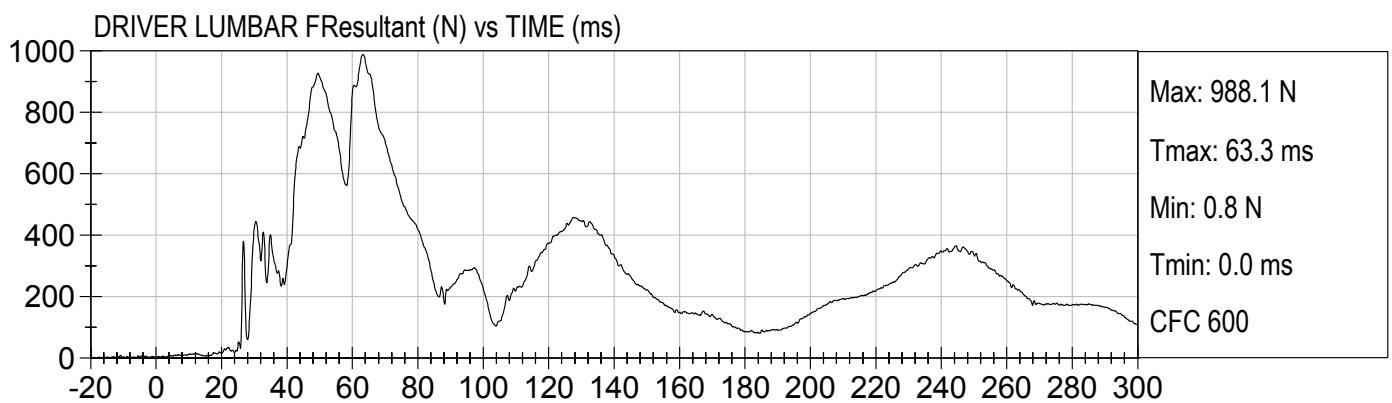
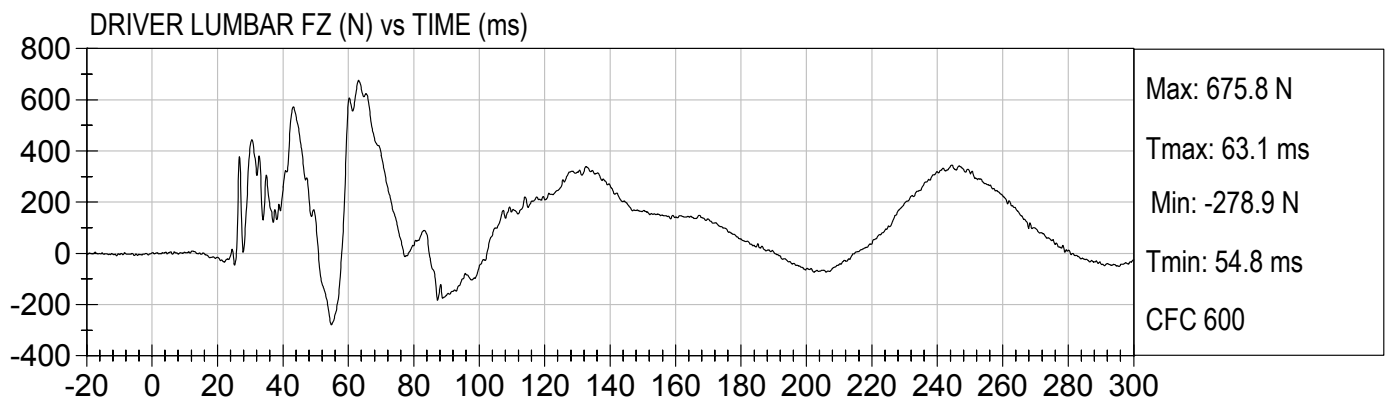
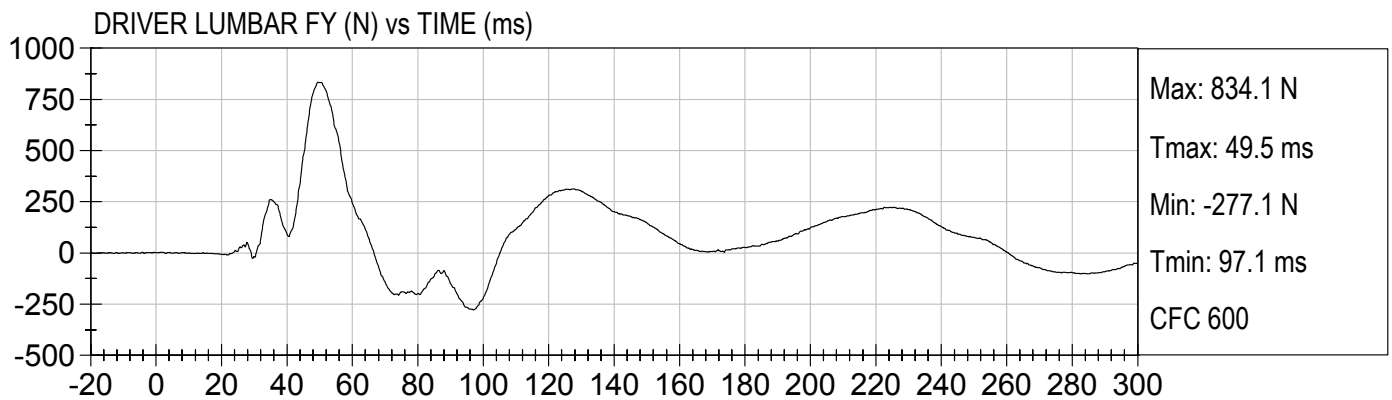
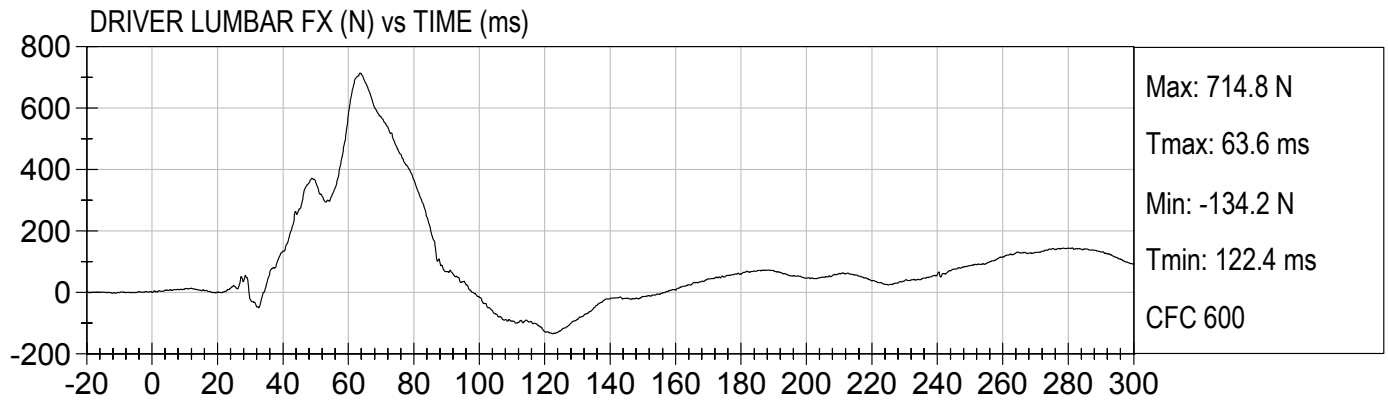


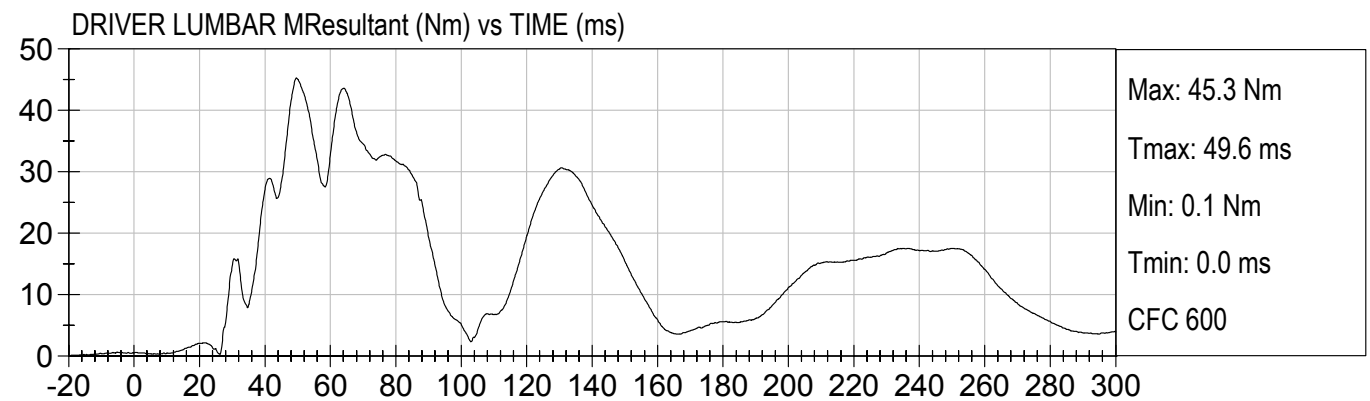
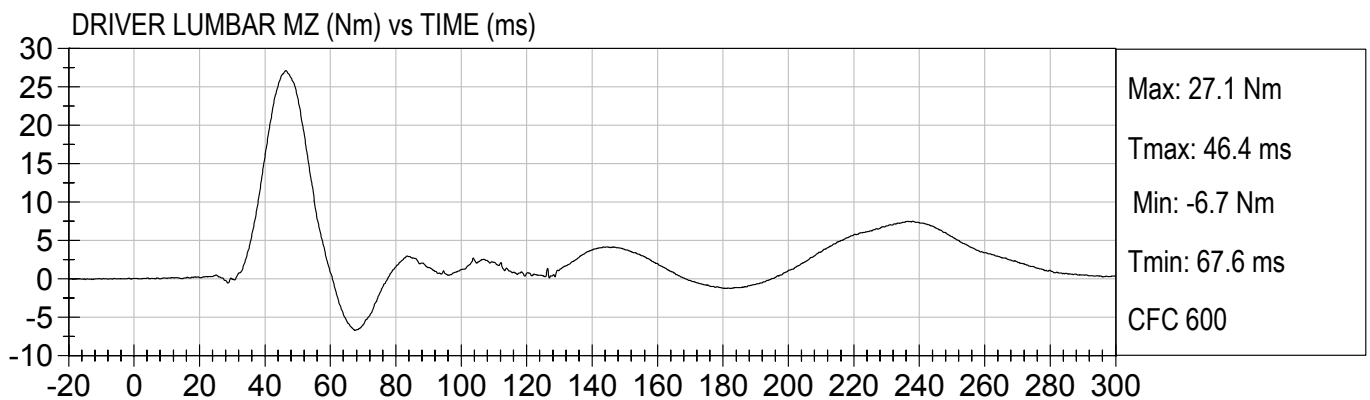
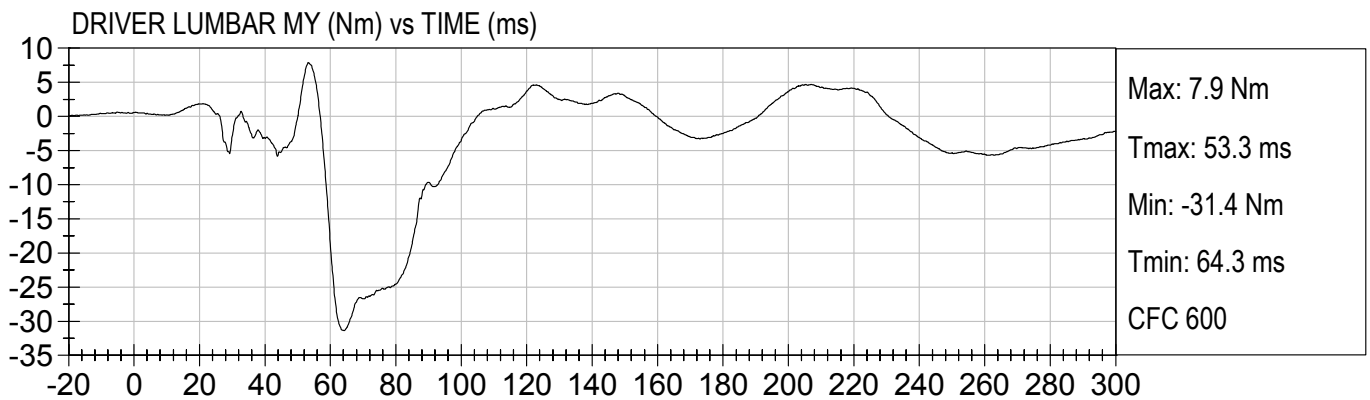
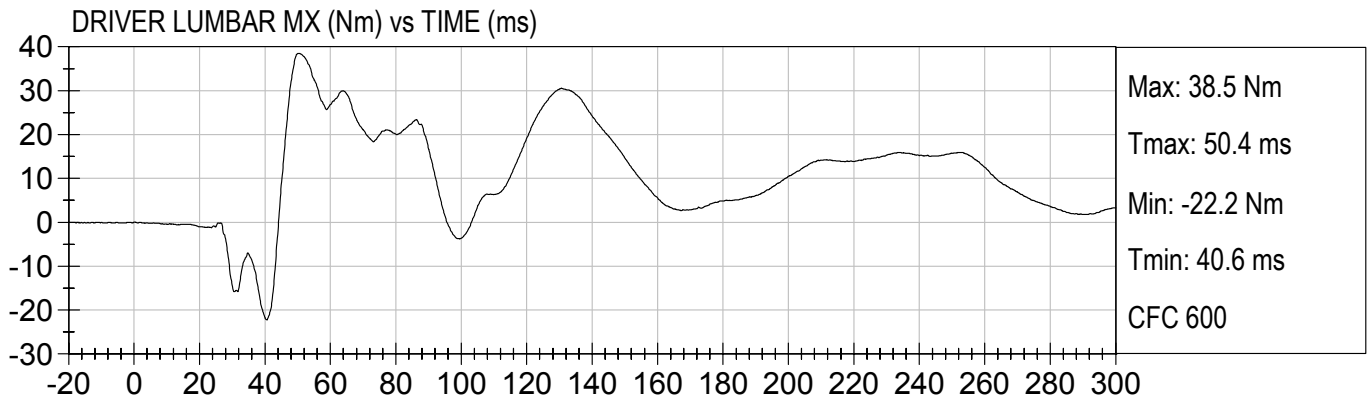
DRIVER PELVIS Y Velocity (kph) vs TIME (ms)

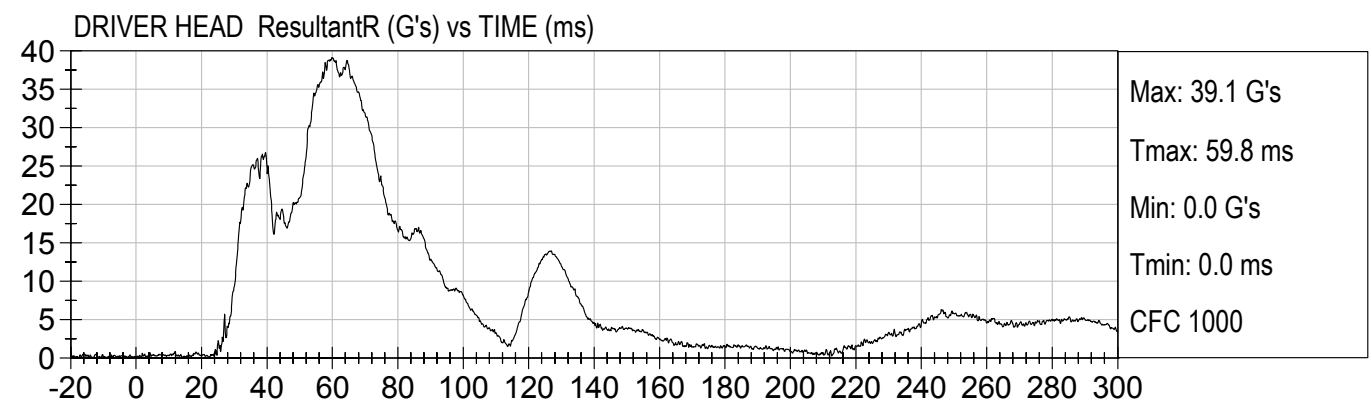
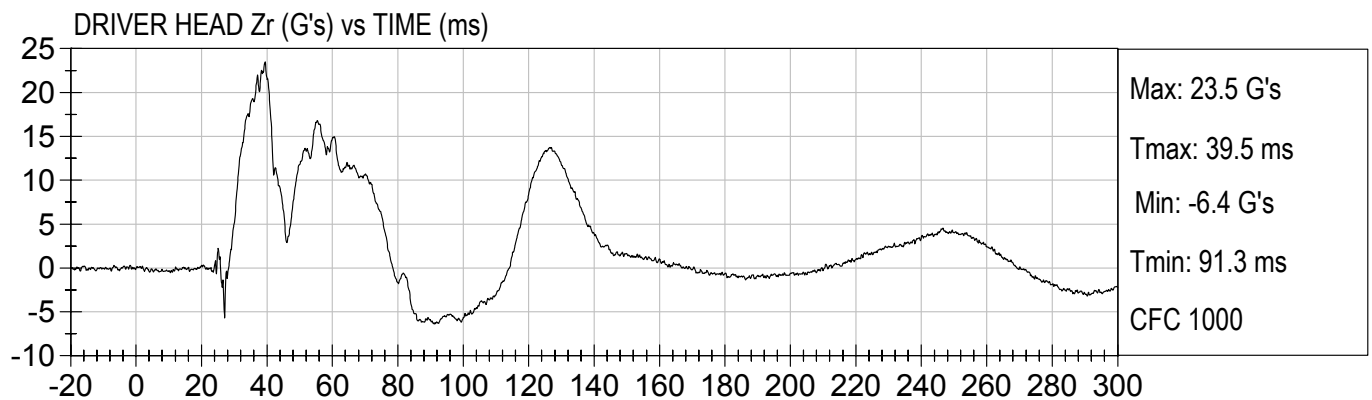
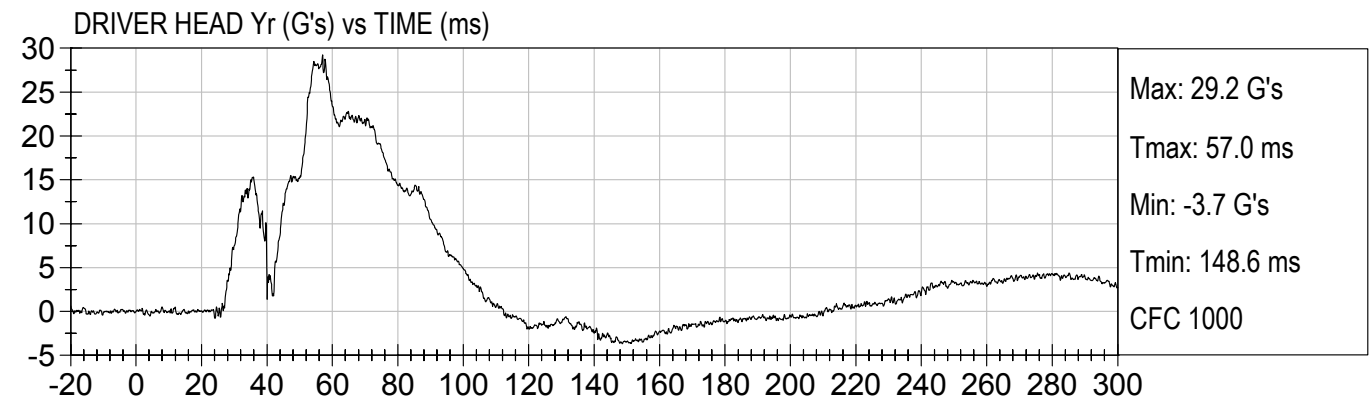
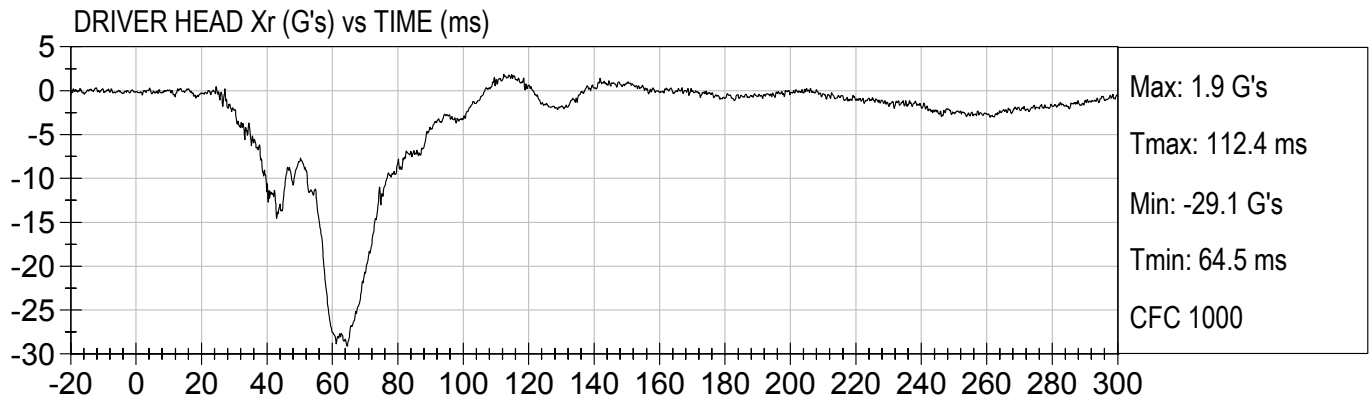


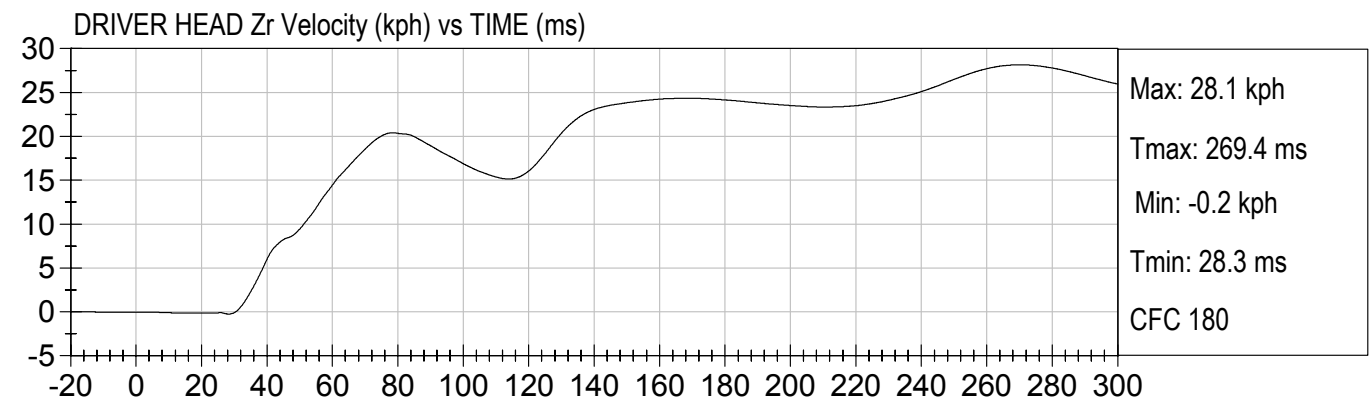
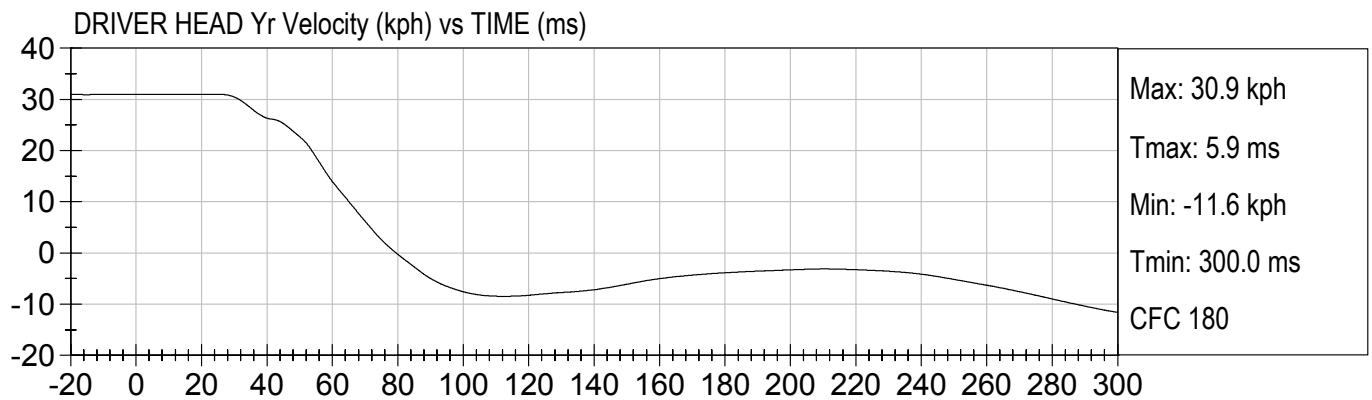
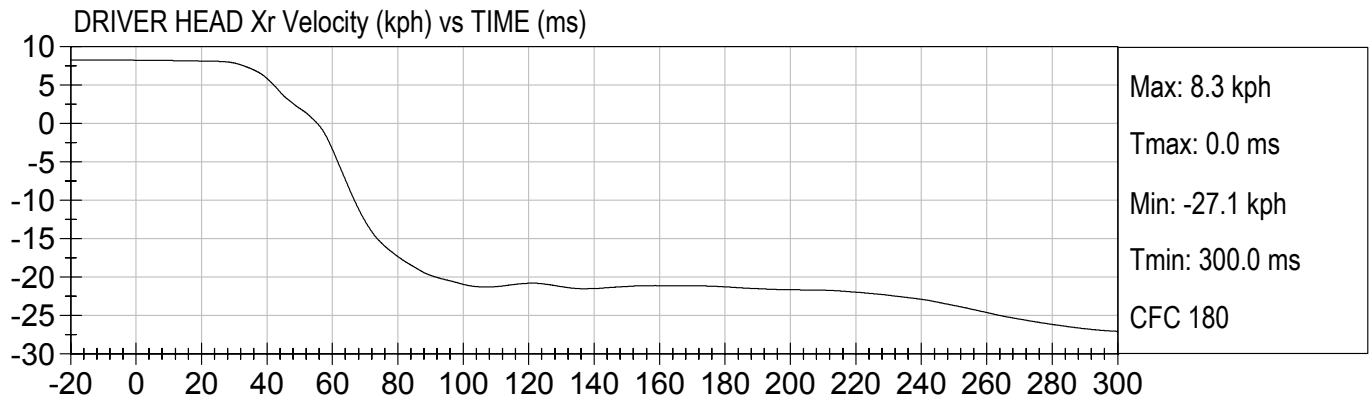
DRIVER PELVIS Z Velocity (kph) vs TIME (ms)





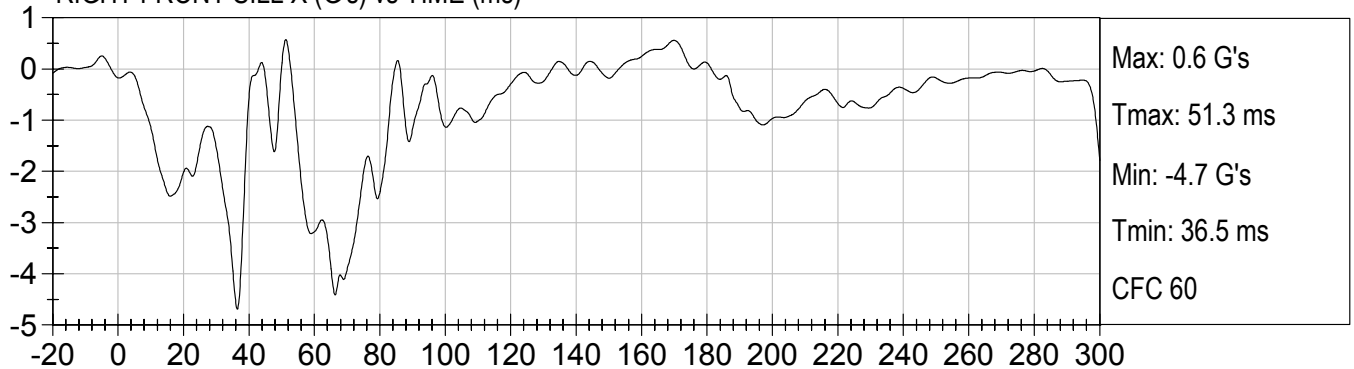




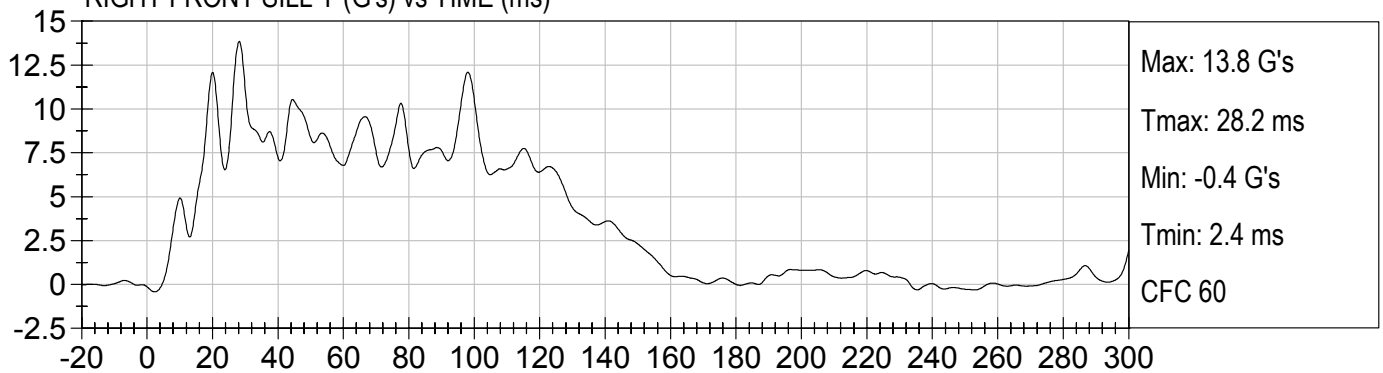




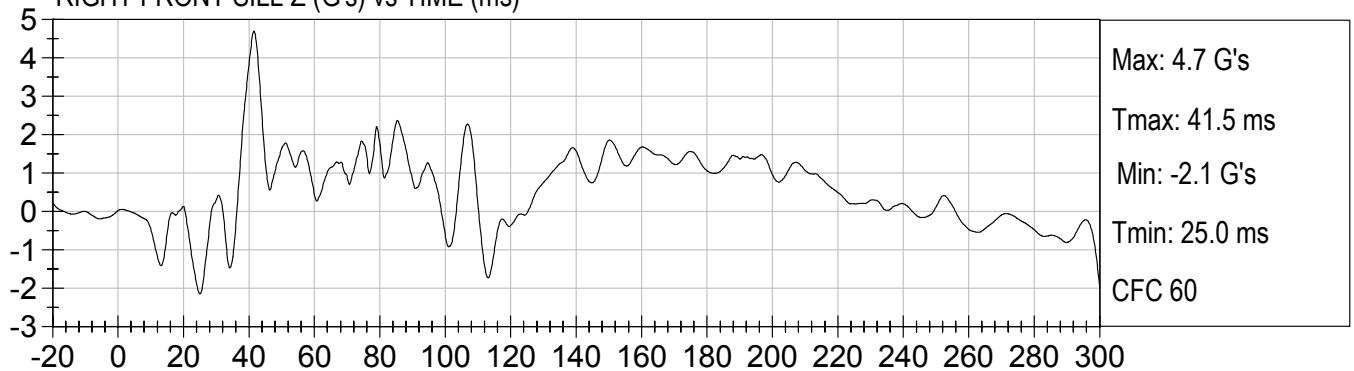
RIGHT FRONT SILL X (G's) vs TIME (ms)



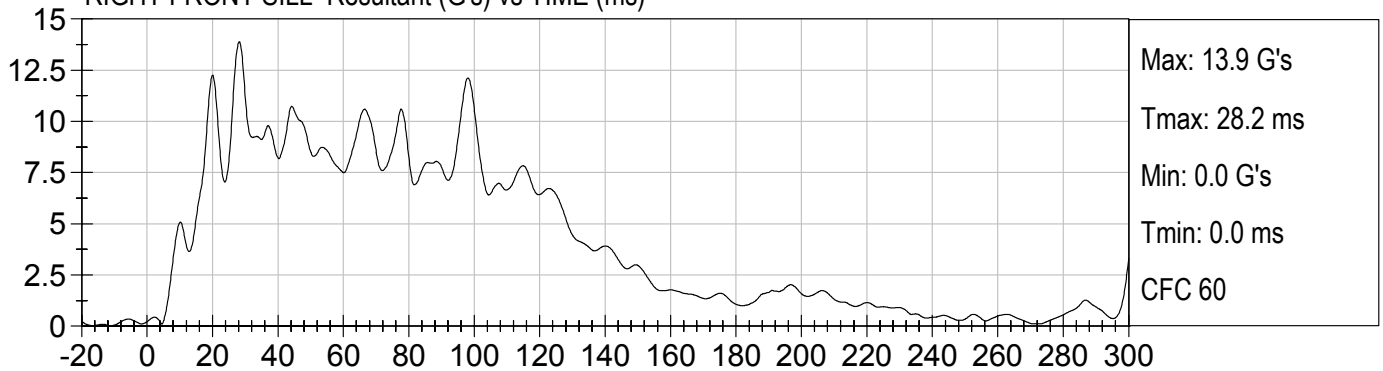
RIGHT FRONT SILL Y (G's) vs TIME (ms)



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

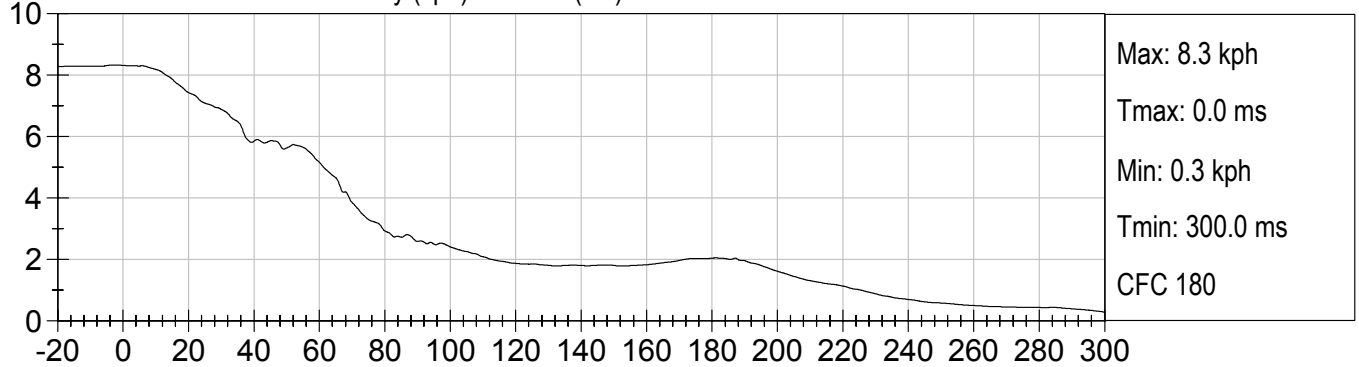


RIGHT FRONT SILL Resultant (G's) vs TIME (ms)

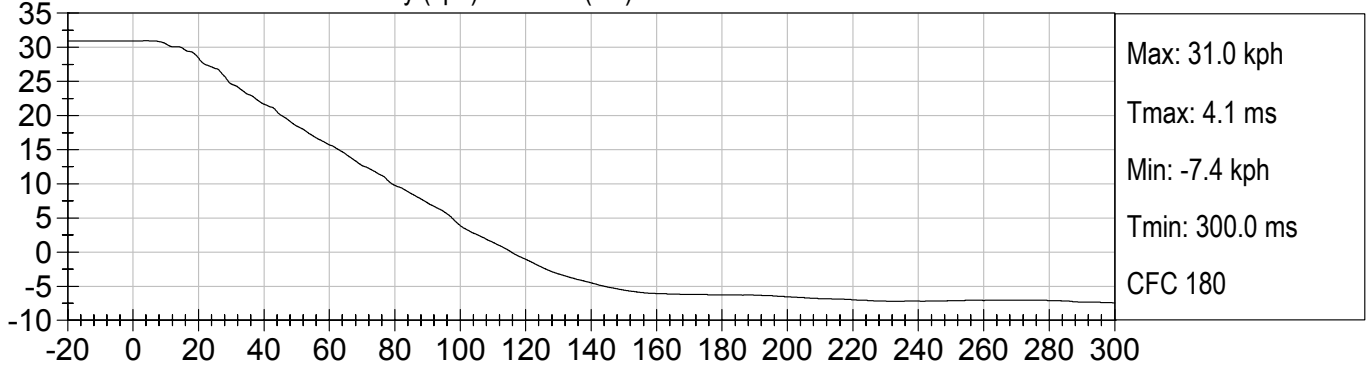




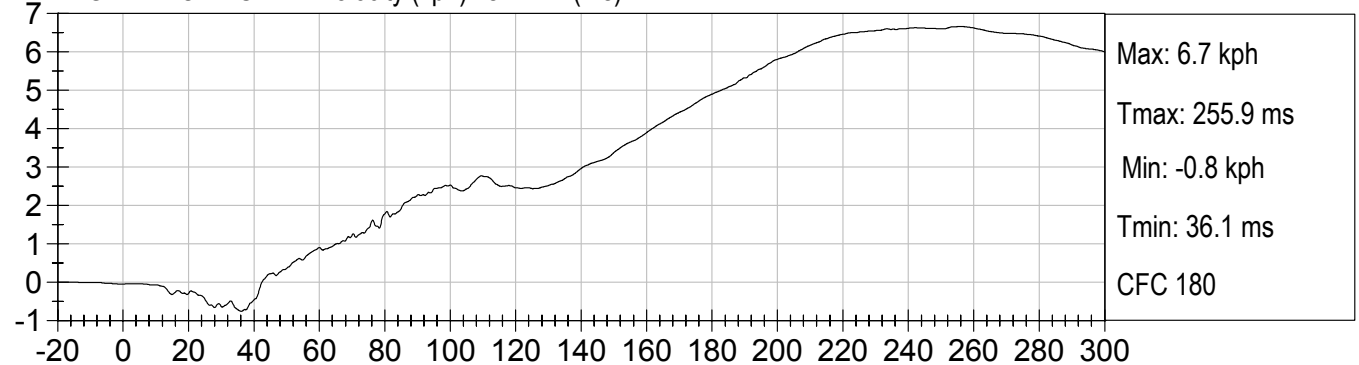
RIGHT FRONT SILL X Velocity (kph) vs TIME (ms)



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

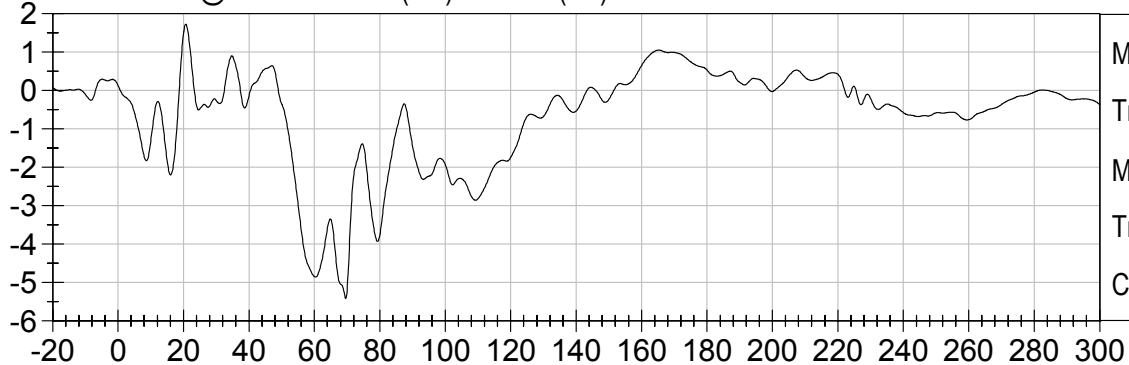


RIGHT FRONT SILL Z Velocity (kph) vs TIME (ms)

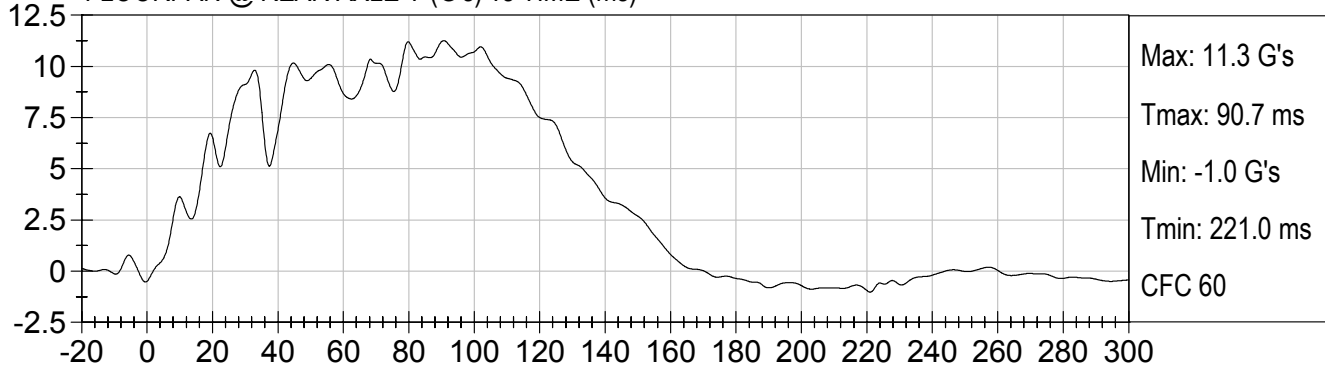




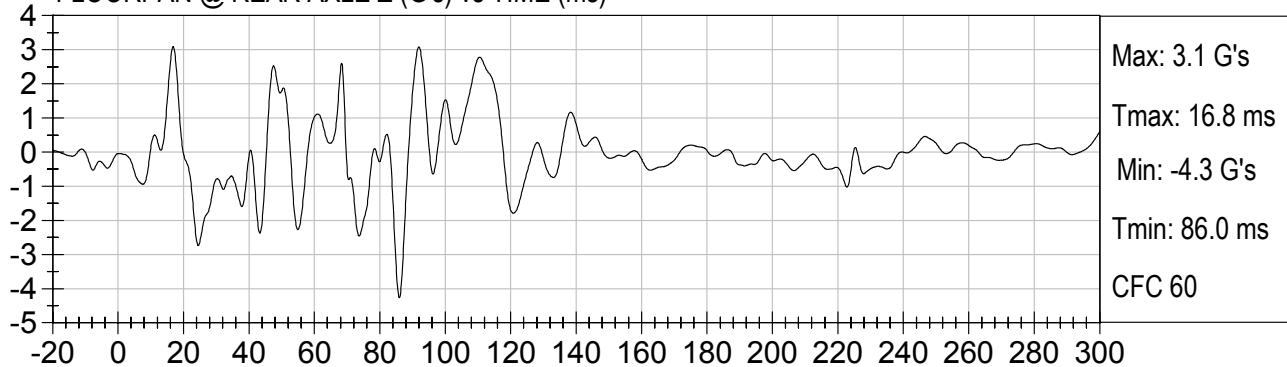
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



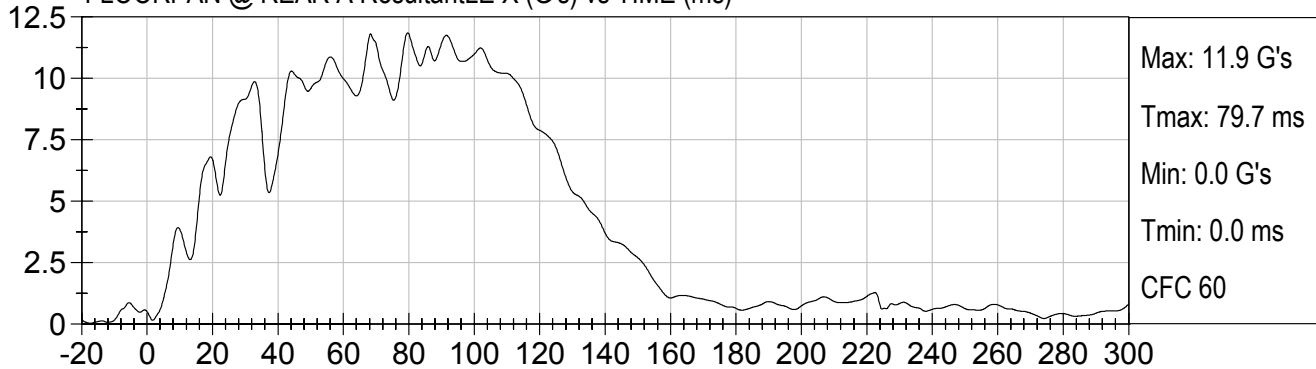
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)



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

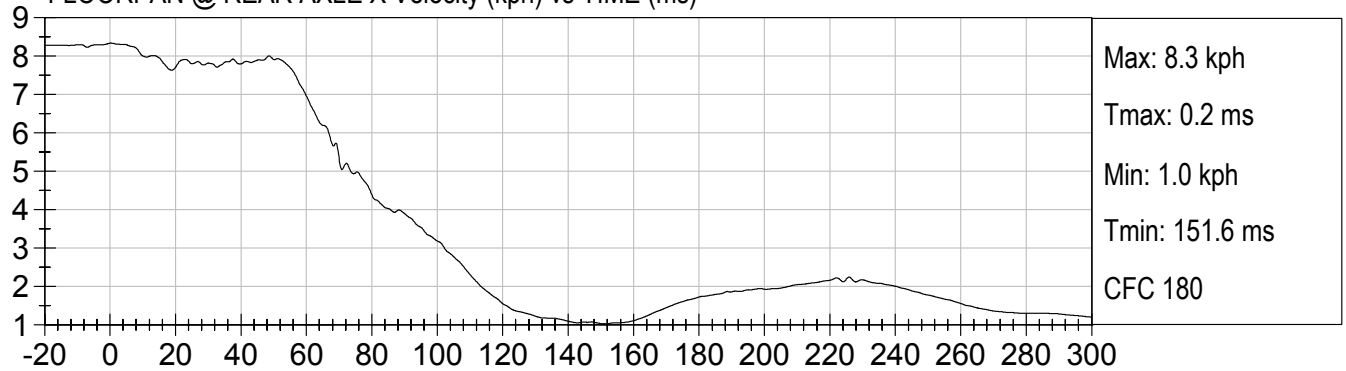


FLOORPAN @ REAR A ResultantLE X (G's) vs TIME (ms)

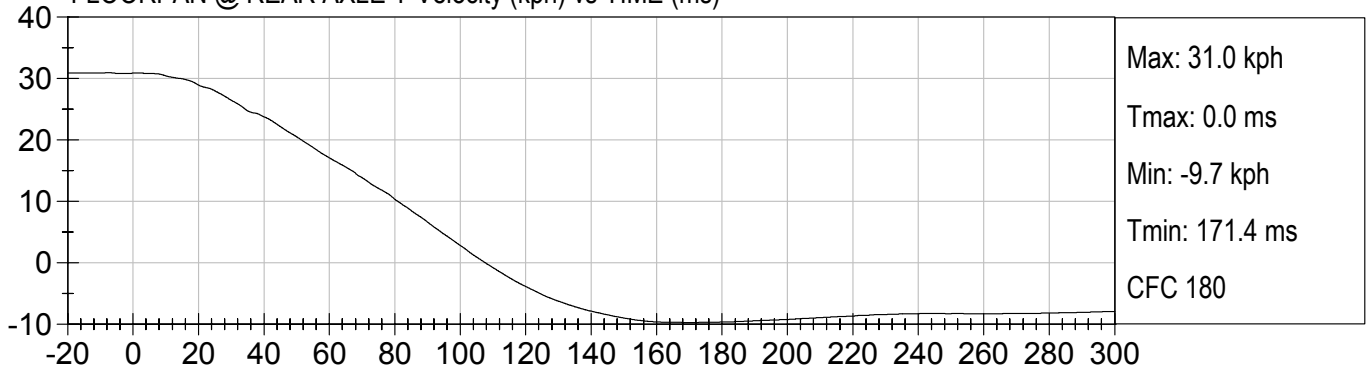




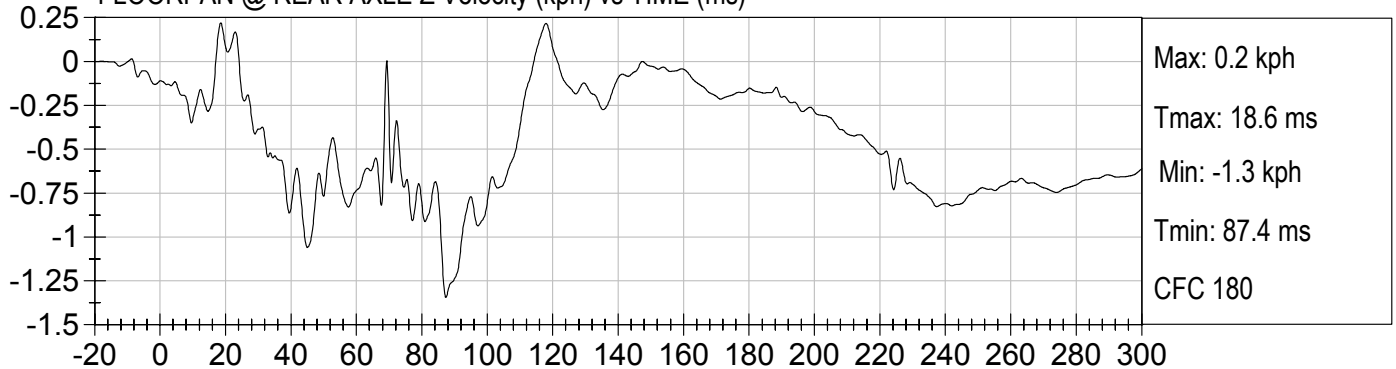
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)



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

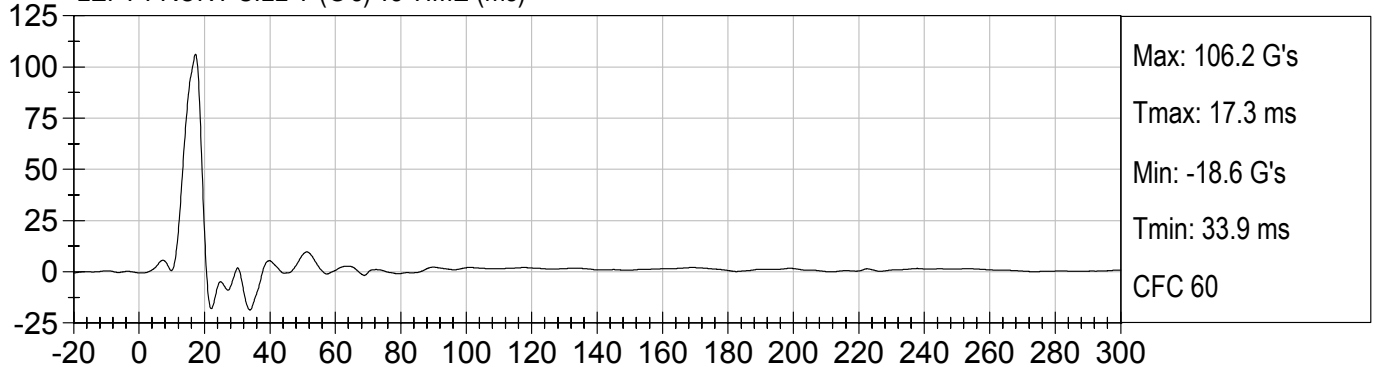


FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)

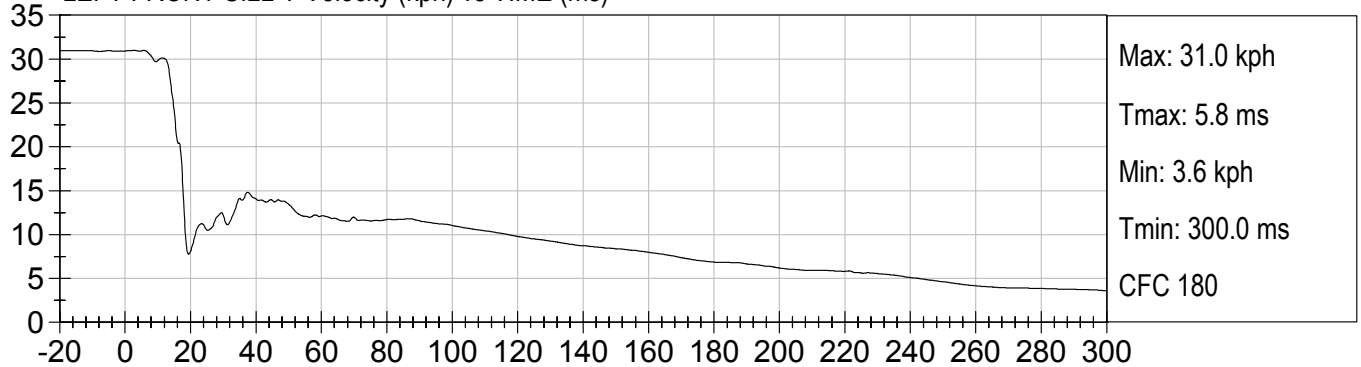




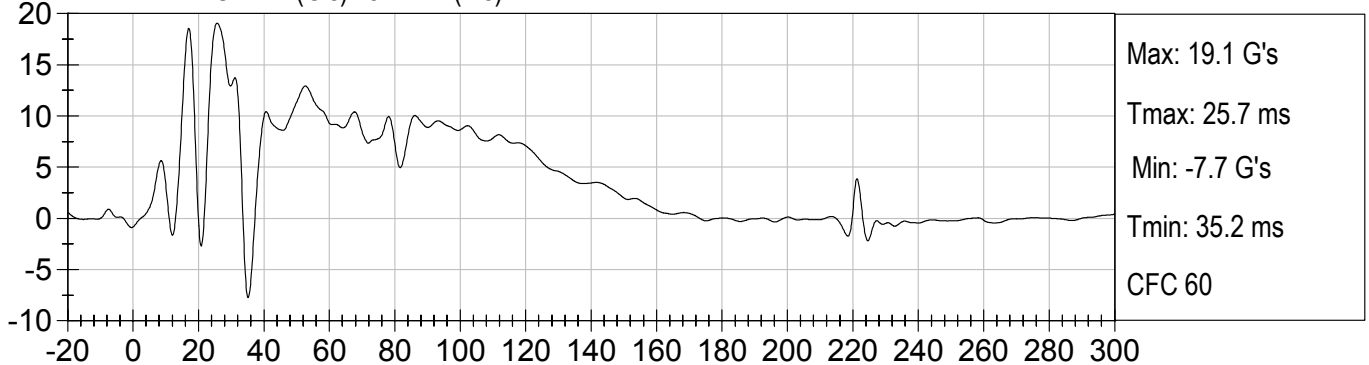
LEFT FRONT SILL Y (G's) vs TIME (ms)



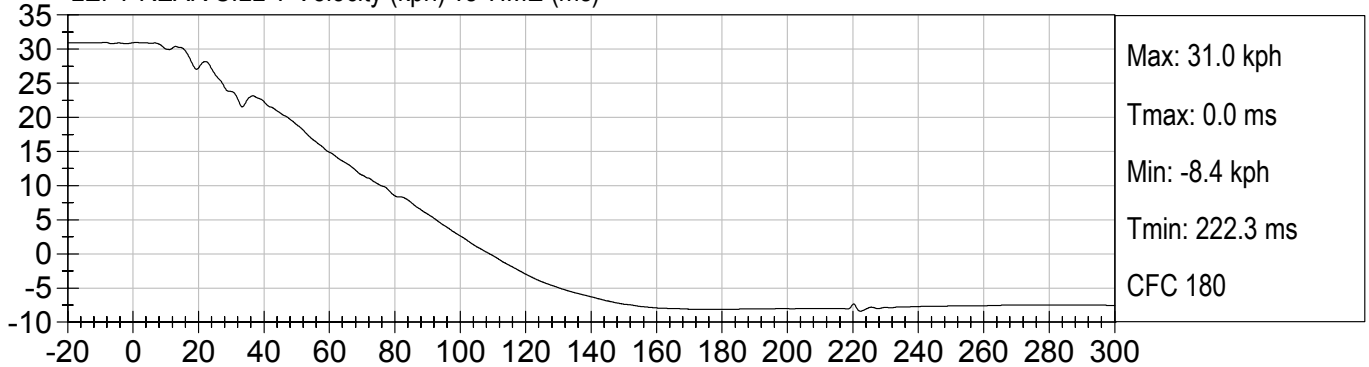
LEFT FRONT SILL Y Velocity (kph) vs TIME (ms)

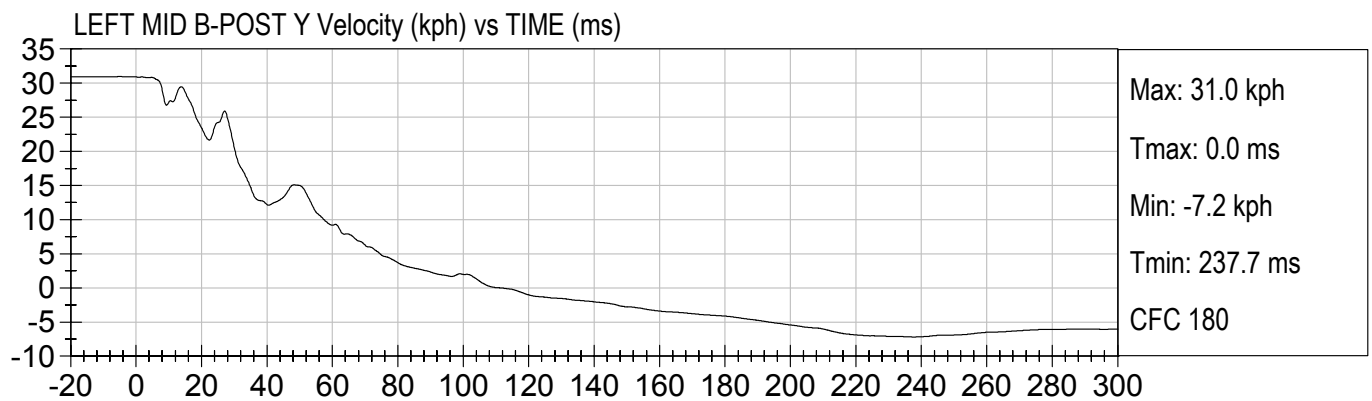
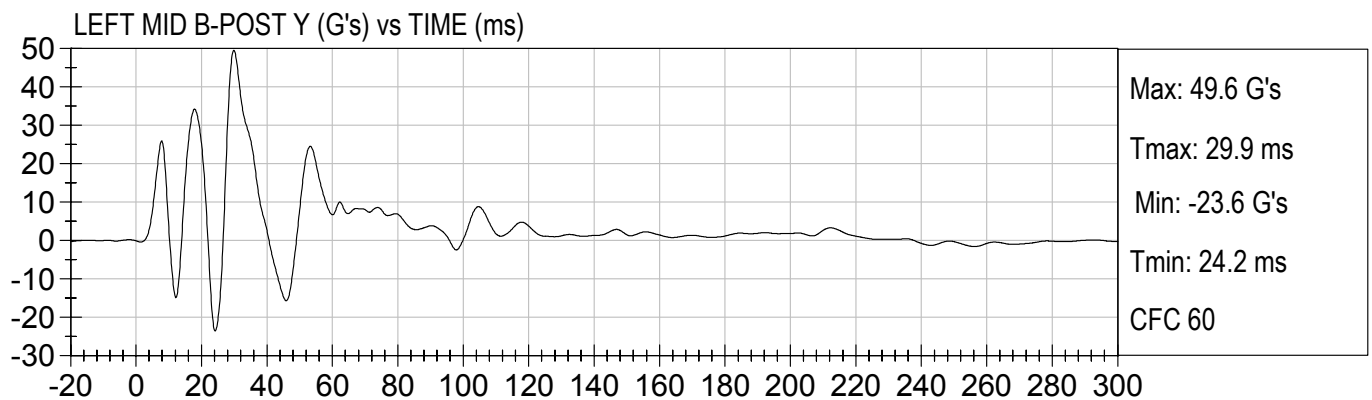
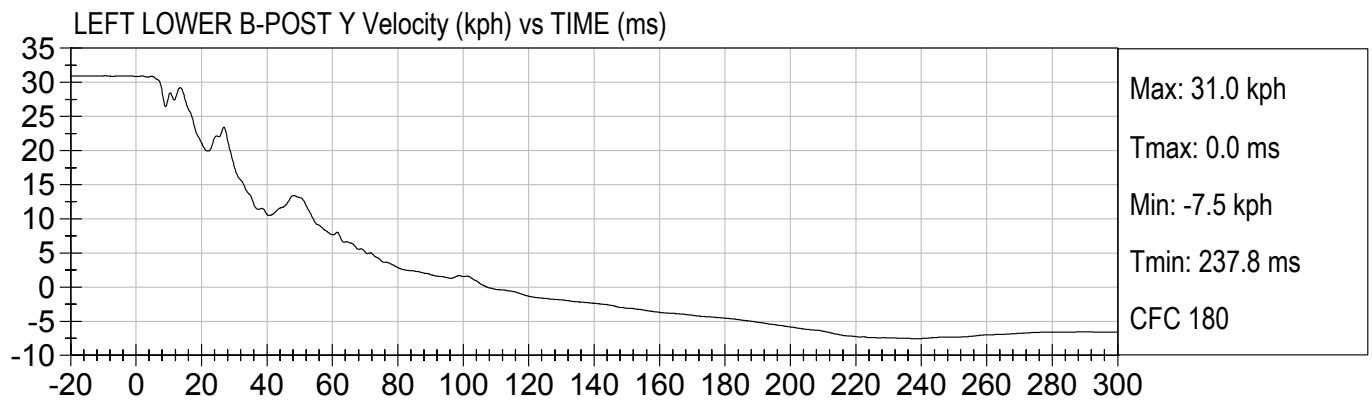
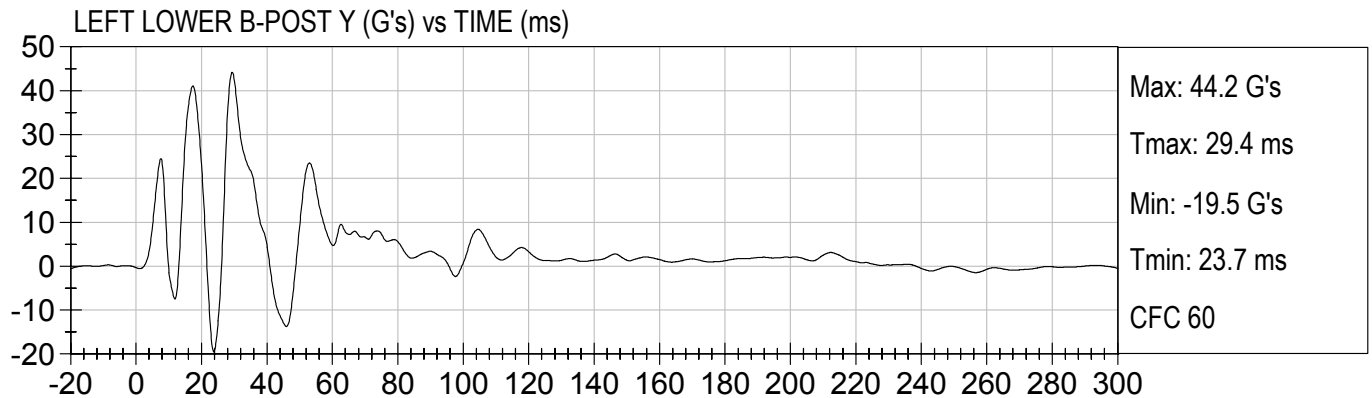


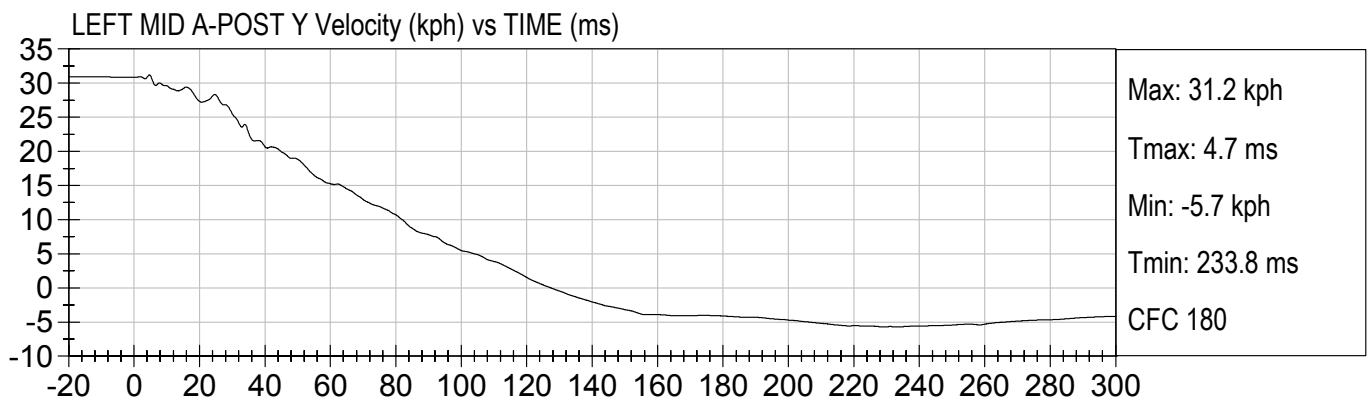
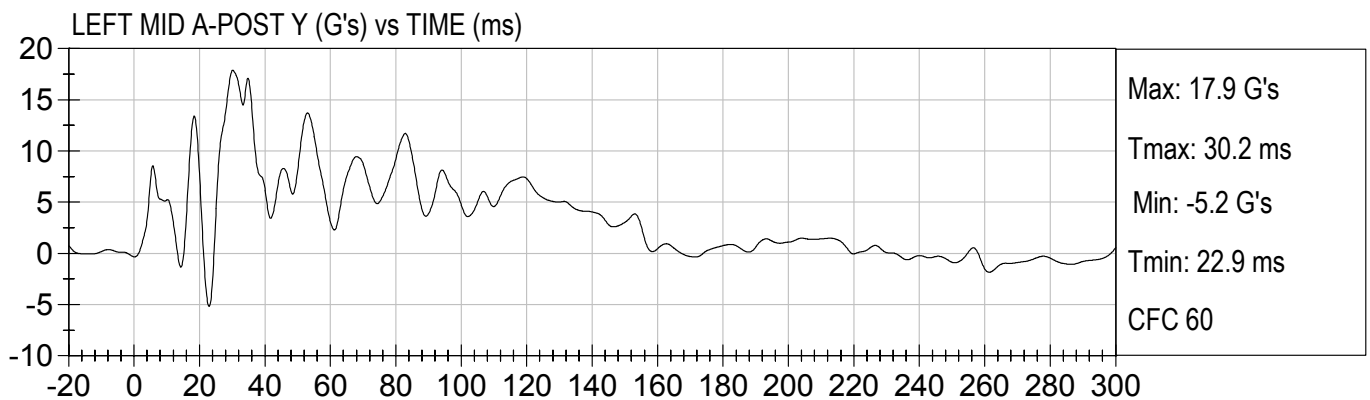
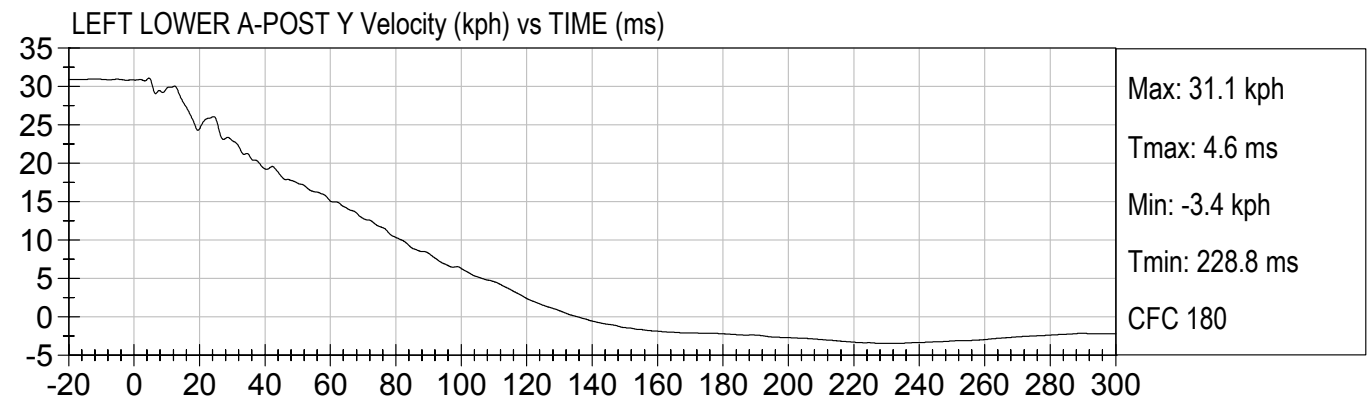
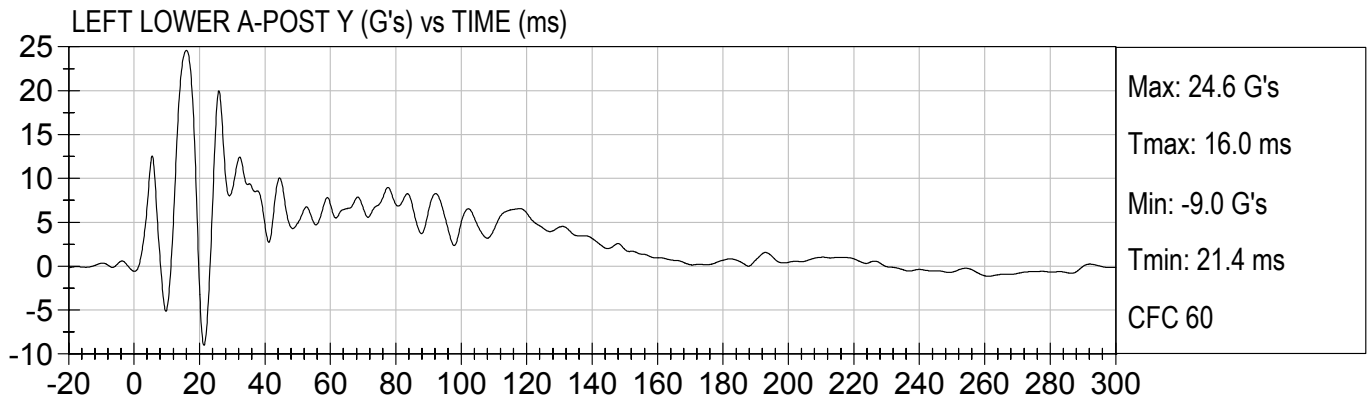
LEFT REAR SILL Y (G's) vs TIME (ms)



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

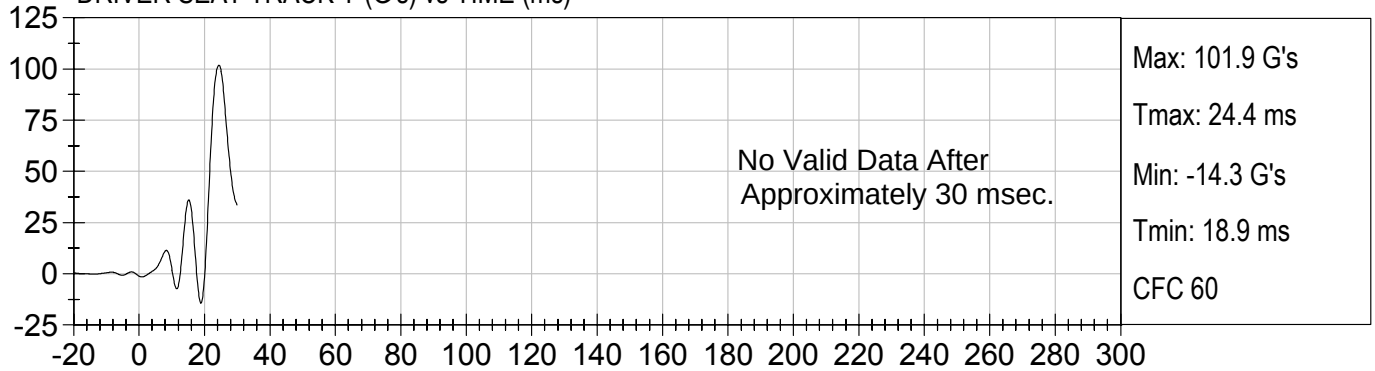




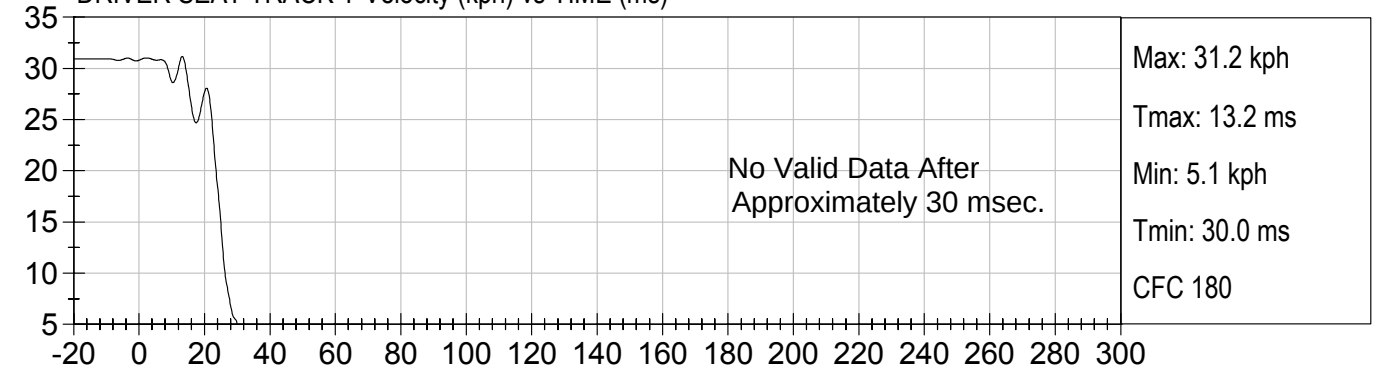




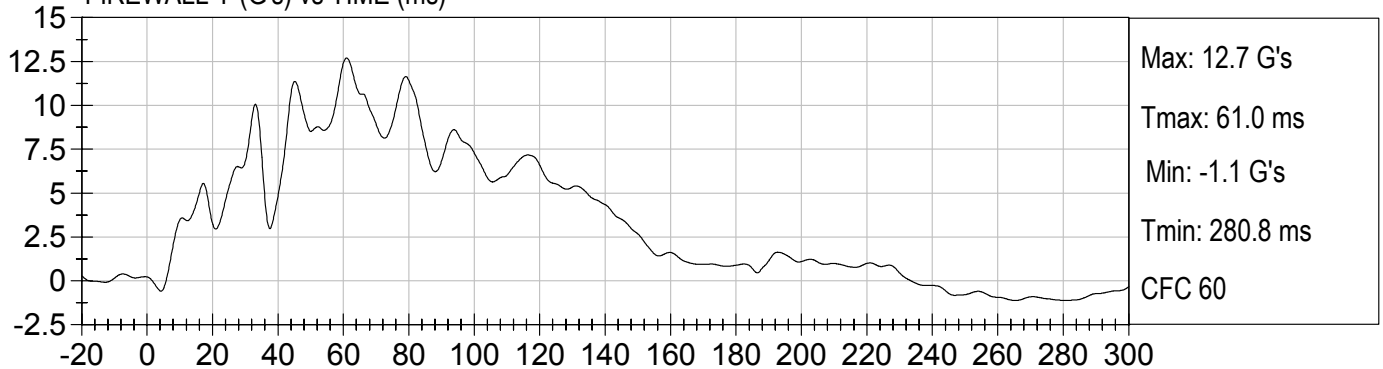
DRIVER SEAT TRACK Y (G's) vs TIME (ms)



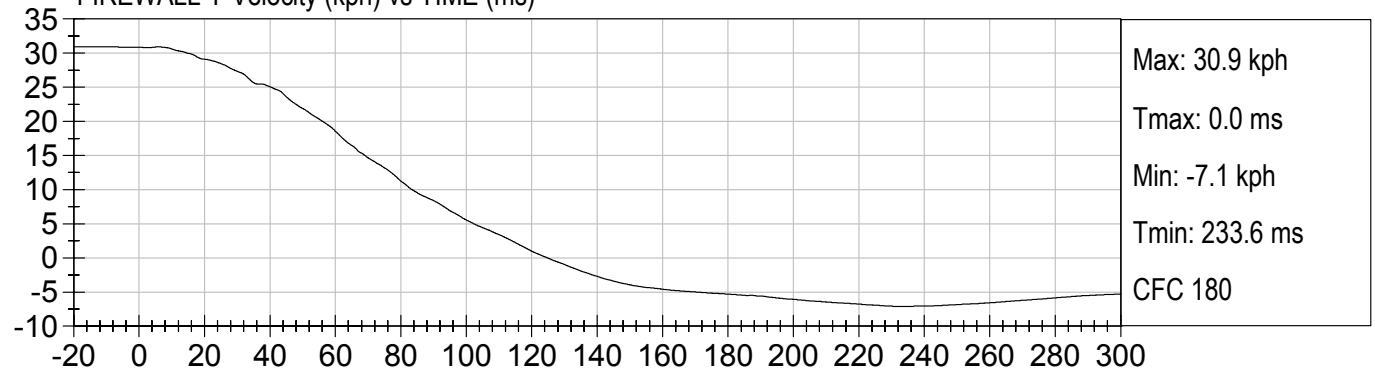
DRIVER SEAT TRACK Y Velocity (kph) vs TIME (ms)

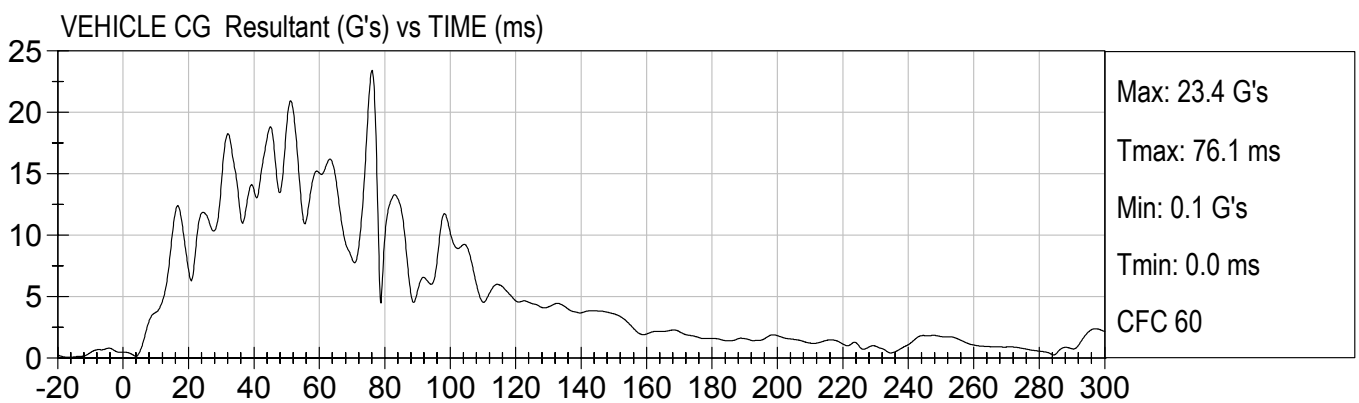
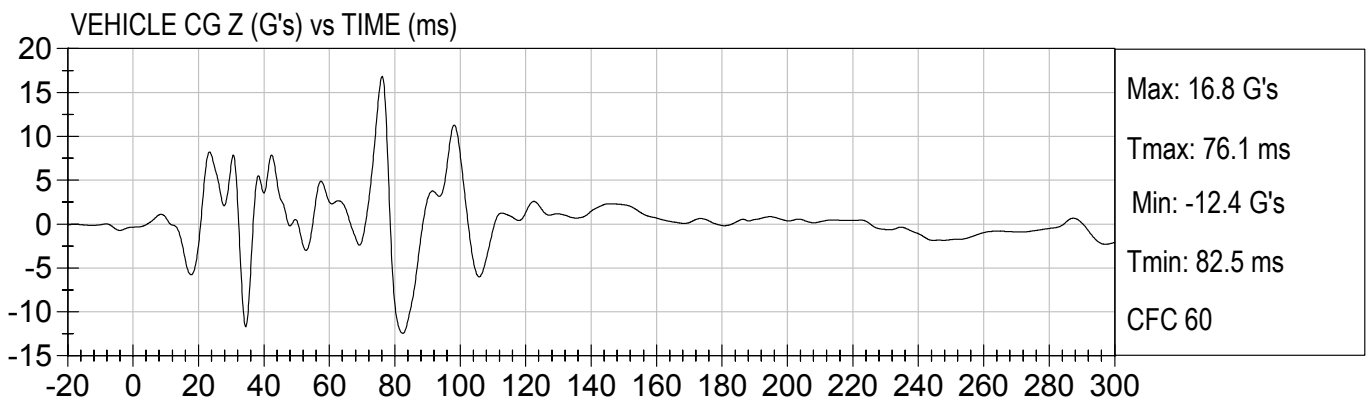
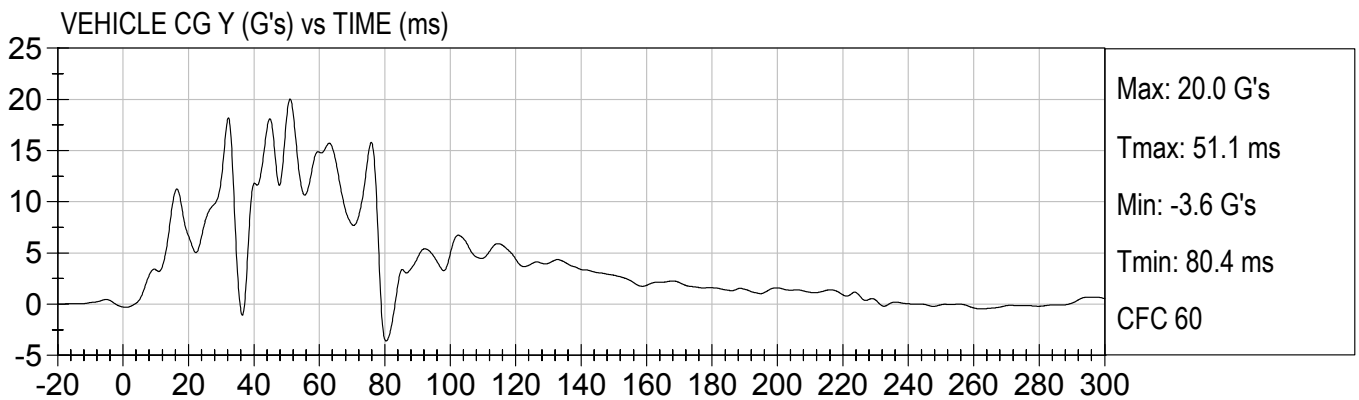
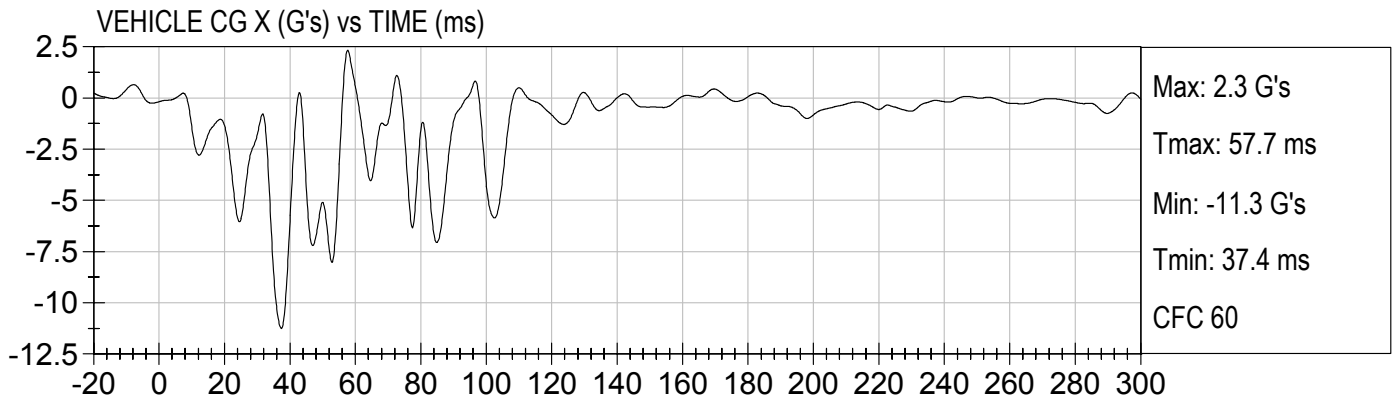


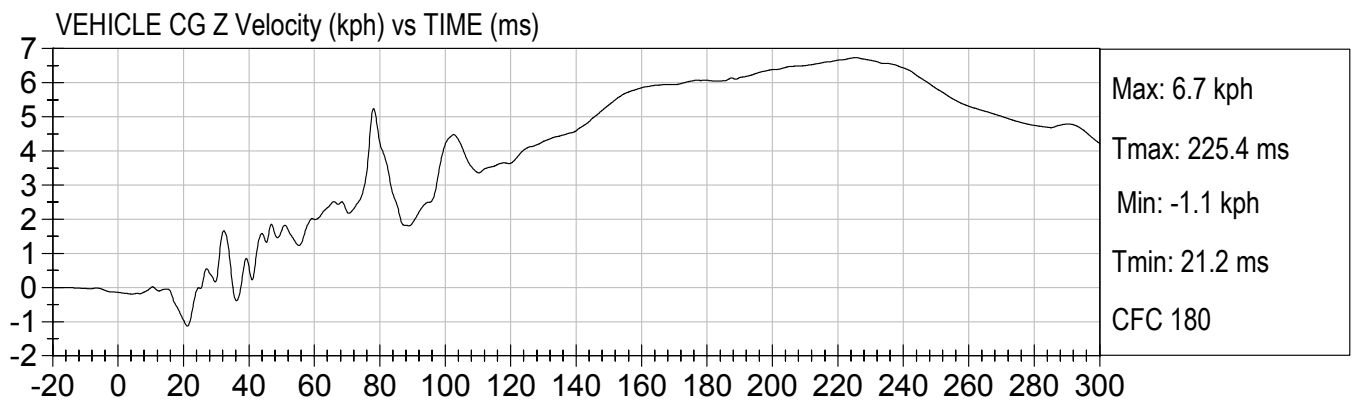
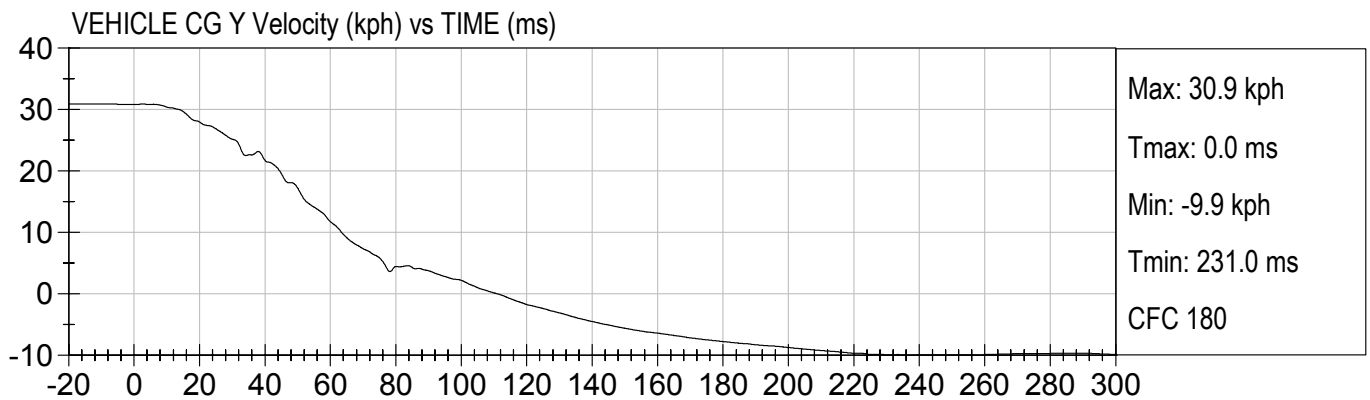
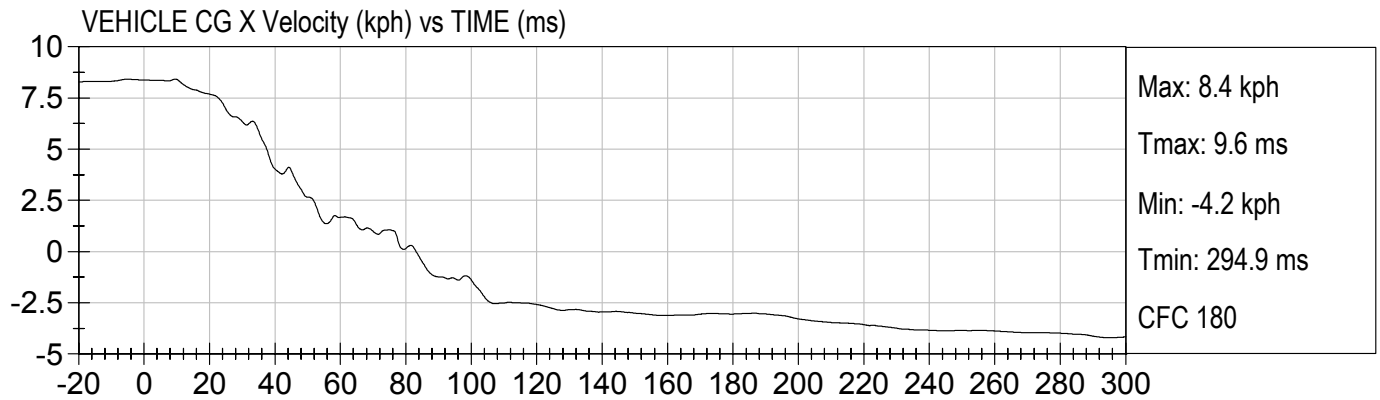
FIREWALL Y (G's) vs TIME (ms)

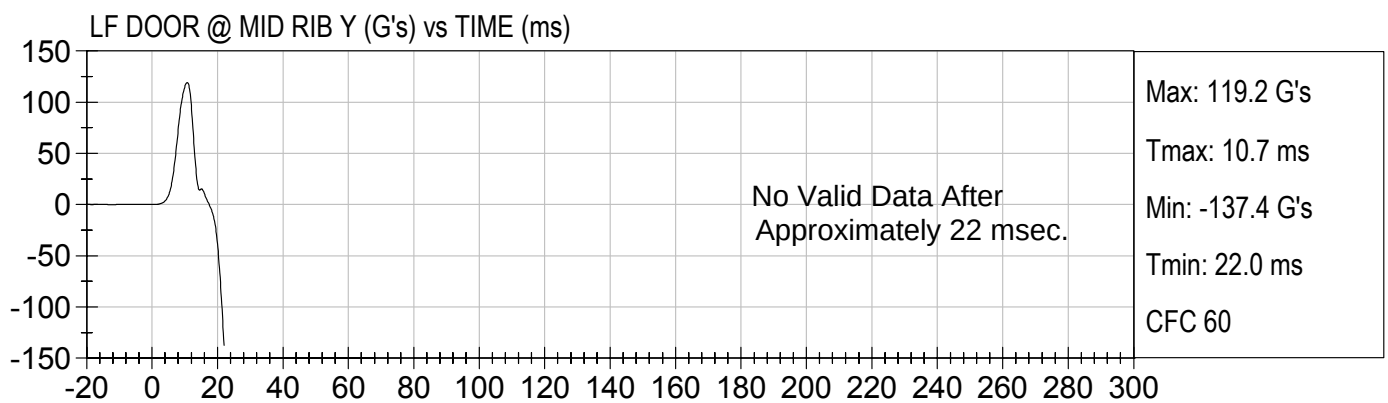
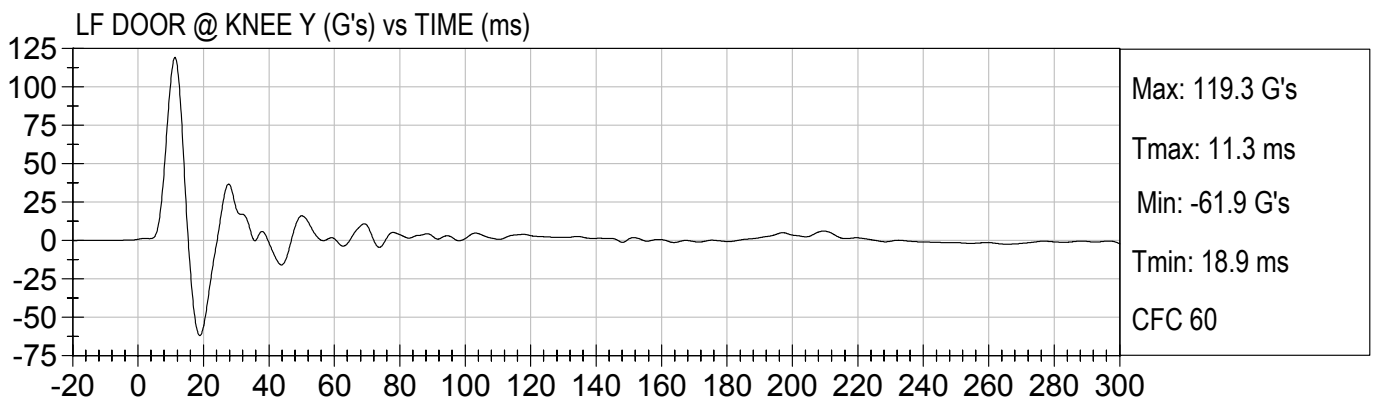
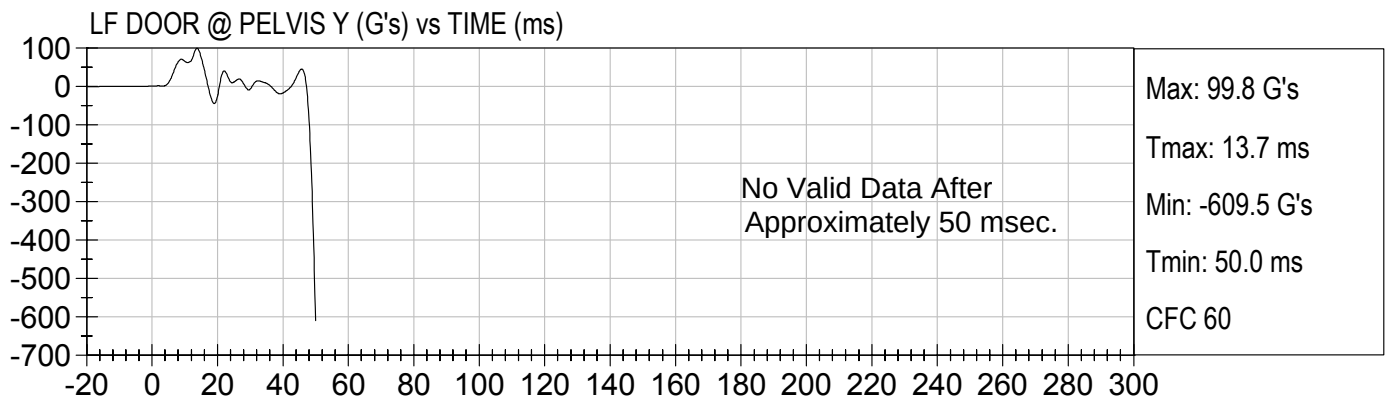
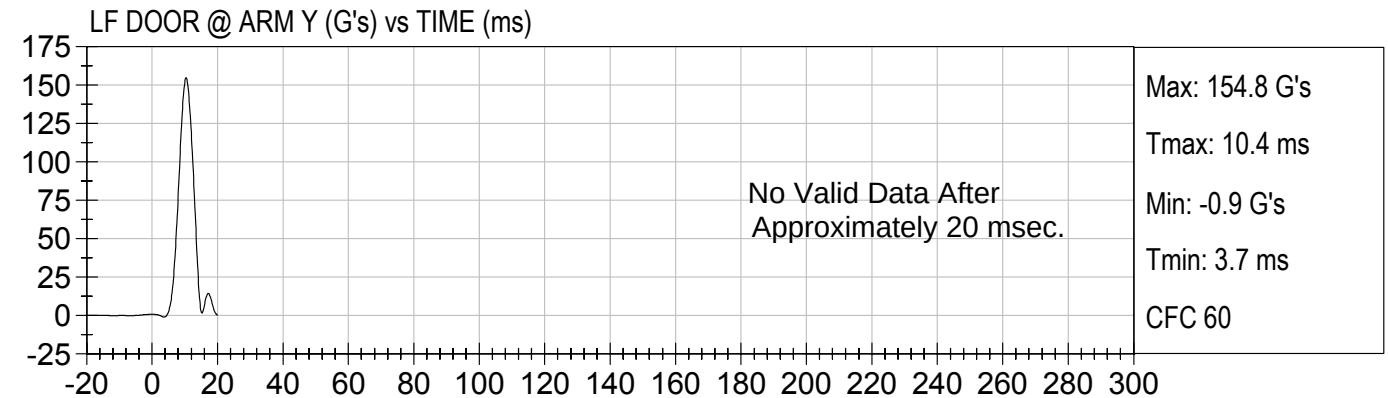


FIREWALL Y Velocity (kph) vs TIME (ms)



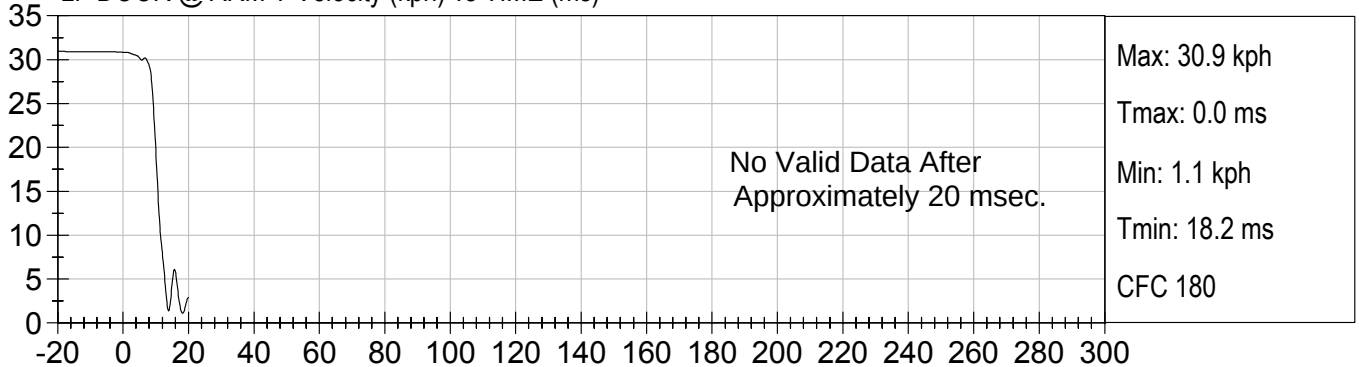




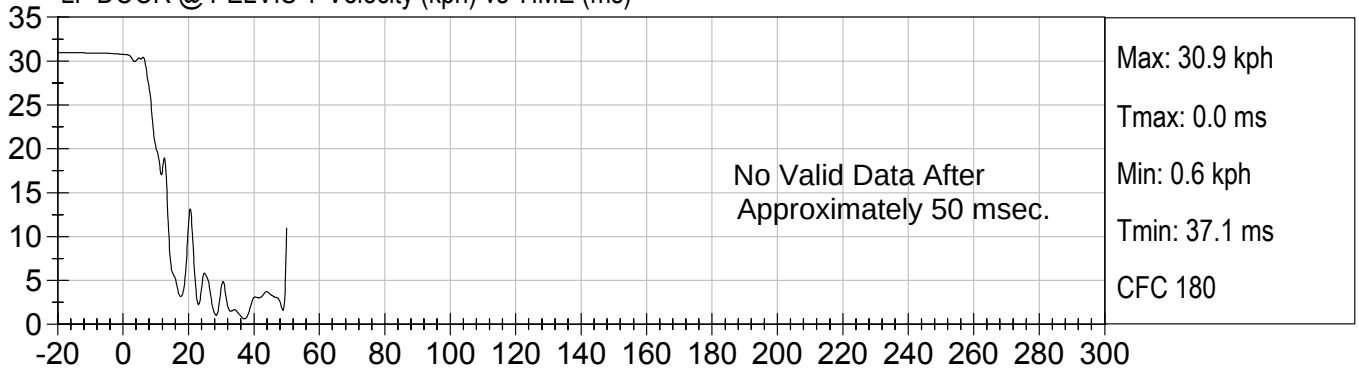




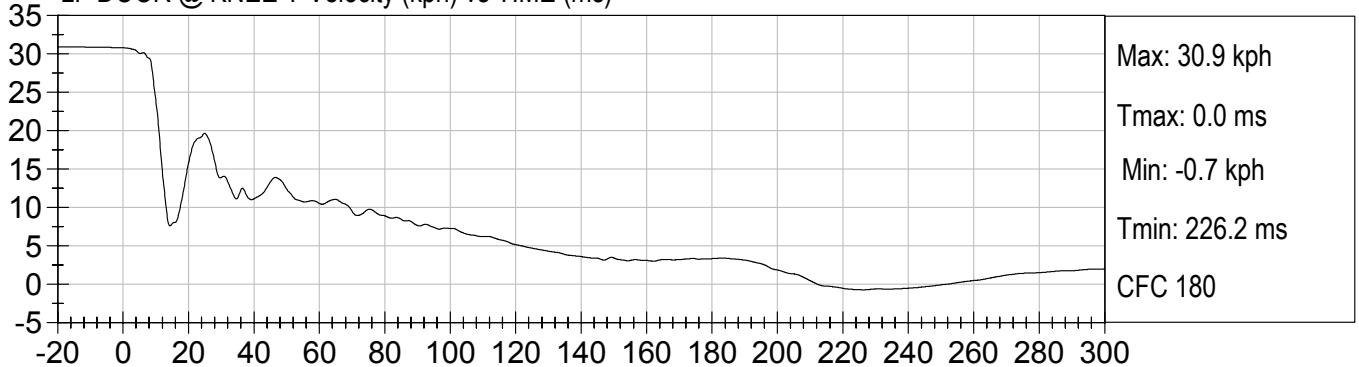
LF DOOR @ ARM Y Velocity (kph) vs TIME (ms)



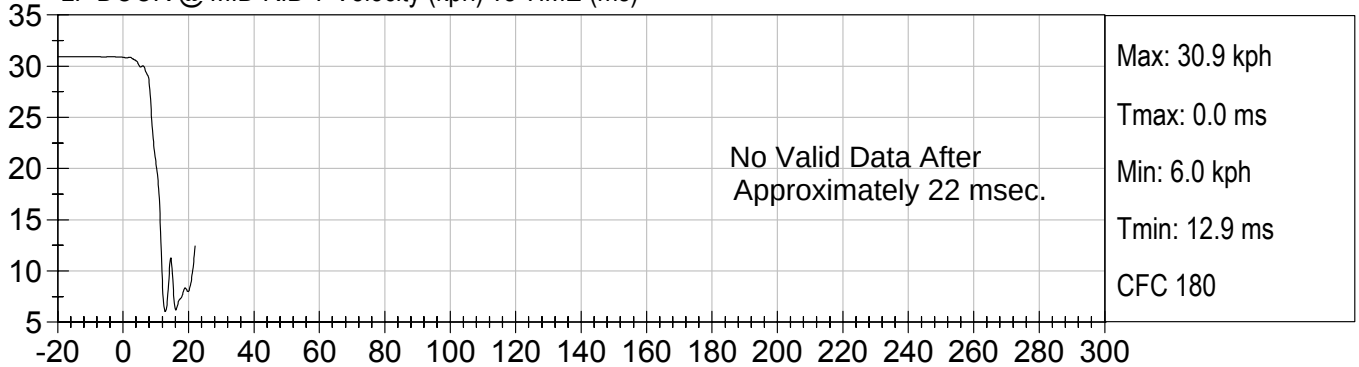
LF DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)



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

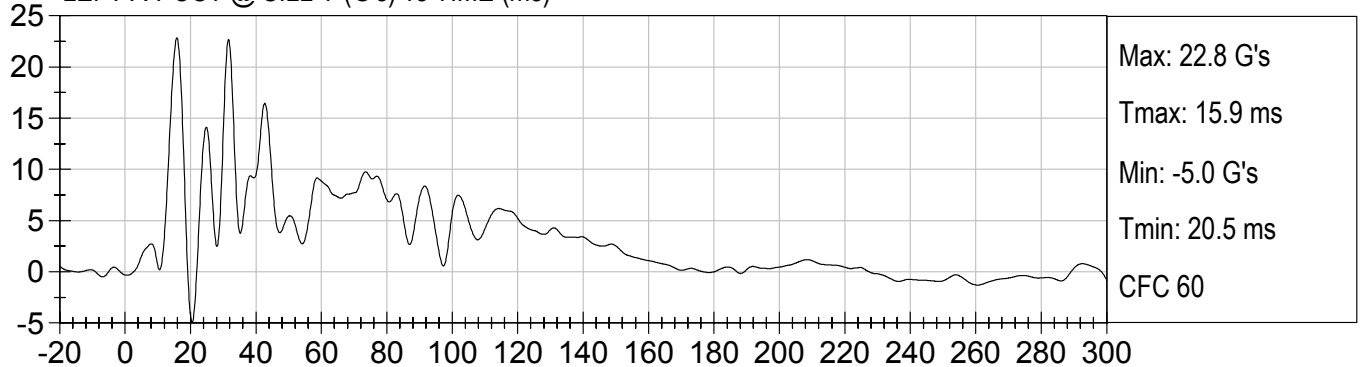


LF DOOR @ MID RIB Y Velocity (kph) vs TIME (ms)

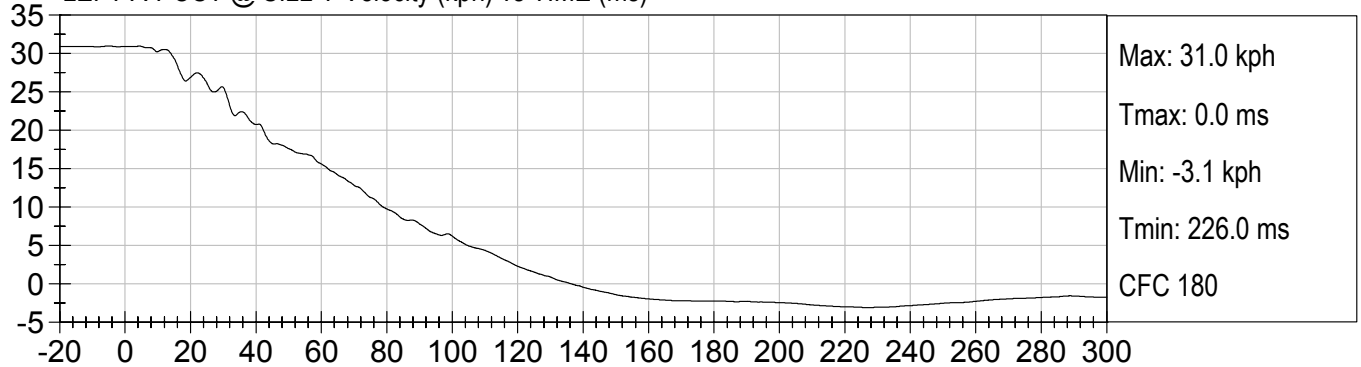




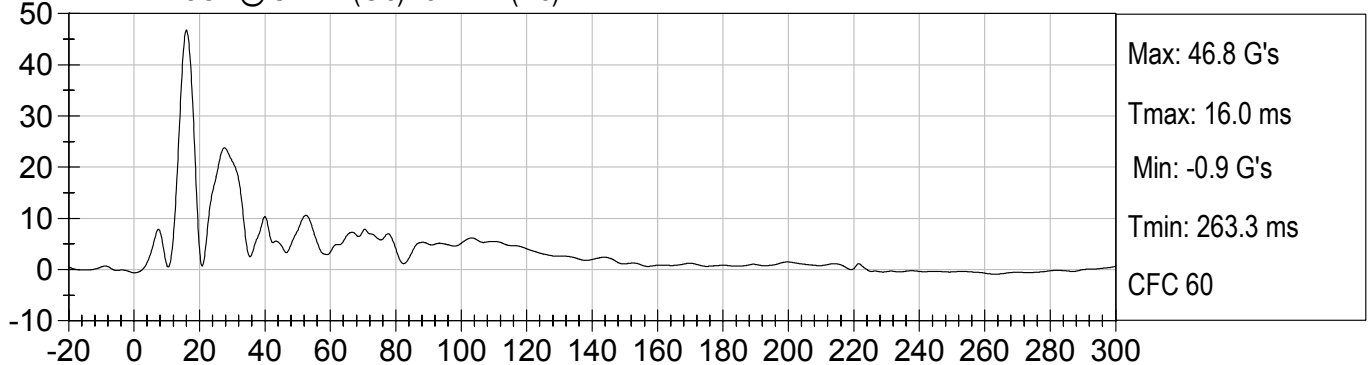
LEFT A-POST @ SILL Y (G's) vs TIME (ms)



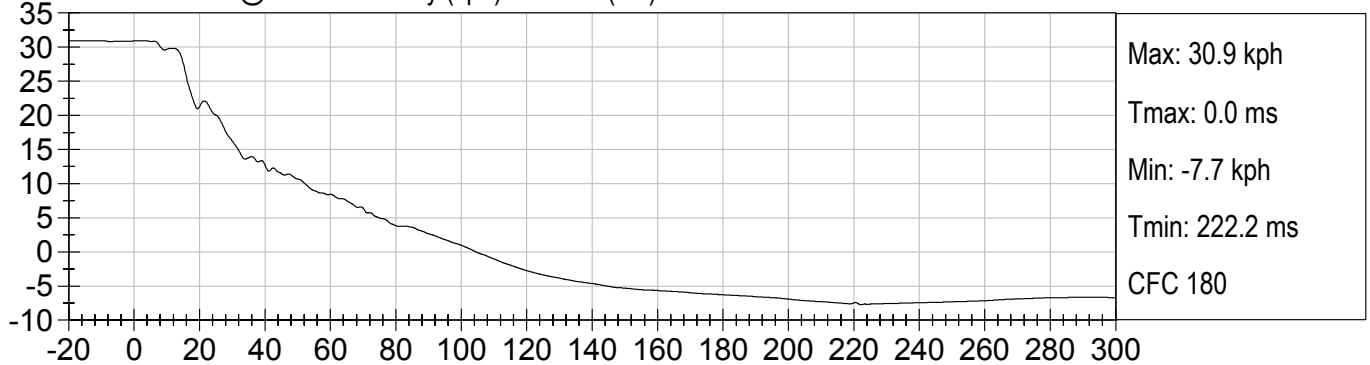
LEFT A-POST @ SILL Y Velocity (kph) vs TIME (ms)

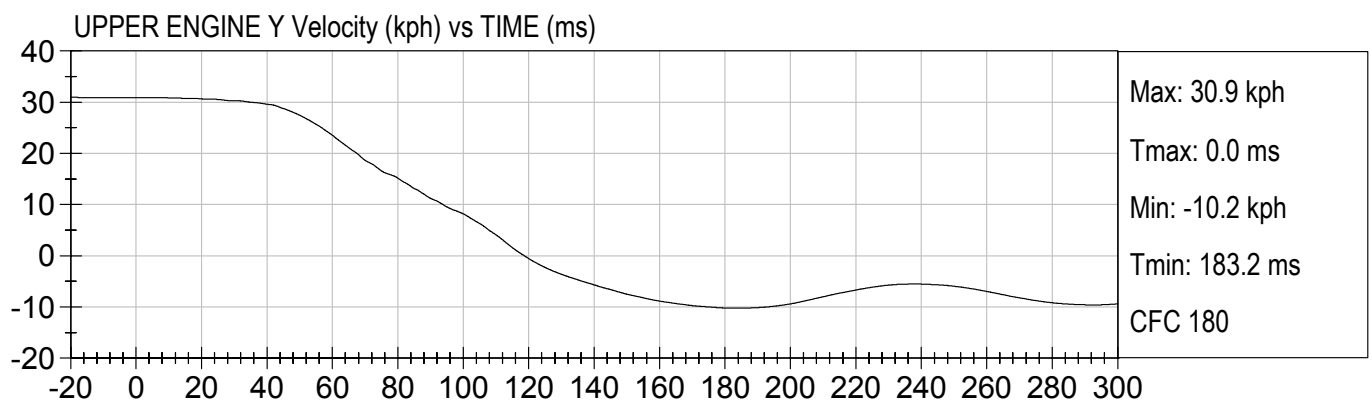
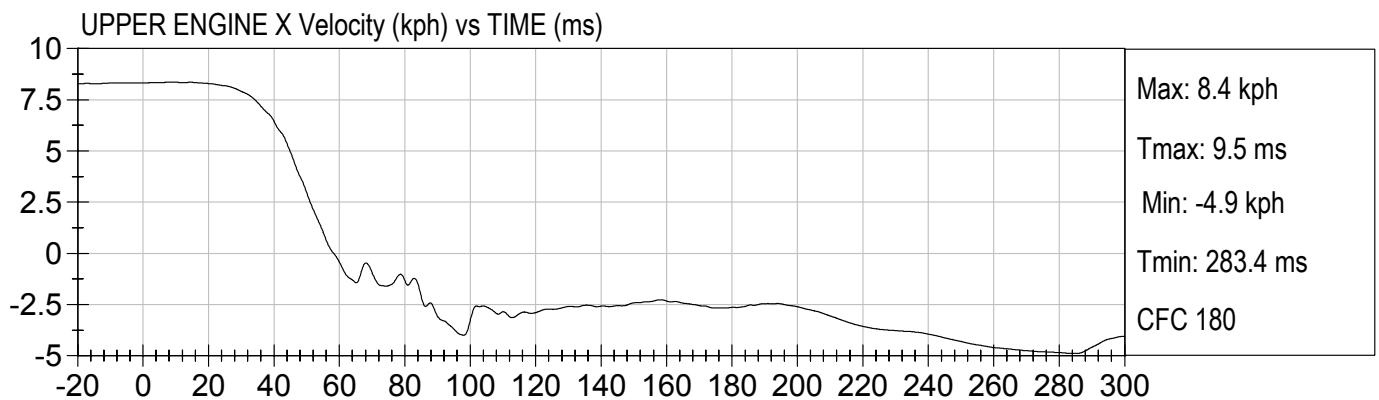
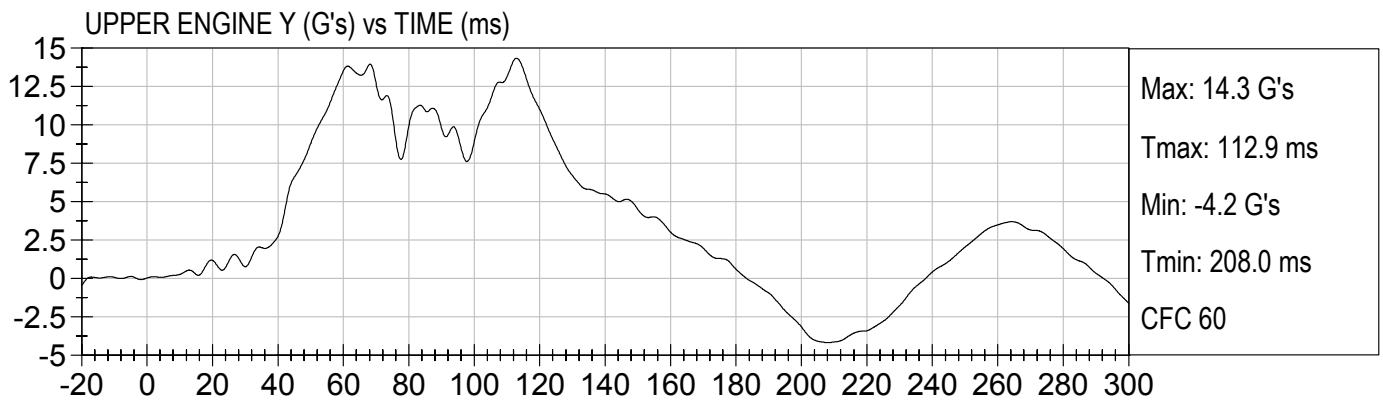
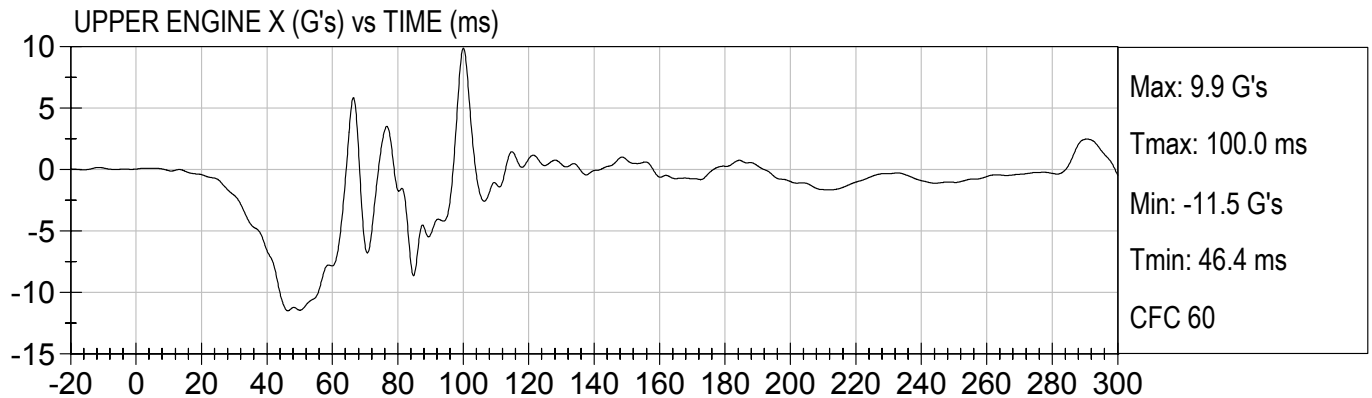


LEFT B-POST @ SILL Y (G's) vs TIME (ms)



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





APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 020

PRE-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

Date: 6/3/05
Dummy Serial Number: 020
Test Number: D051491

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	22.0
Humidity	10% - 70%	45
Resultant Acceleration	125 - 145 g's	125
Peak Longitudinal Acceleration	(-15) – (+ 15) g's	8
Unimodal	<10%	YES

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

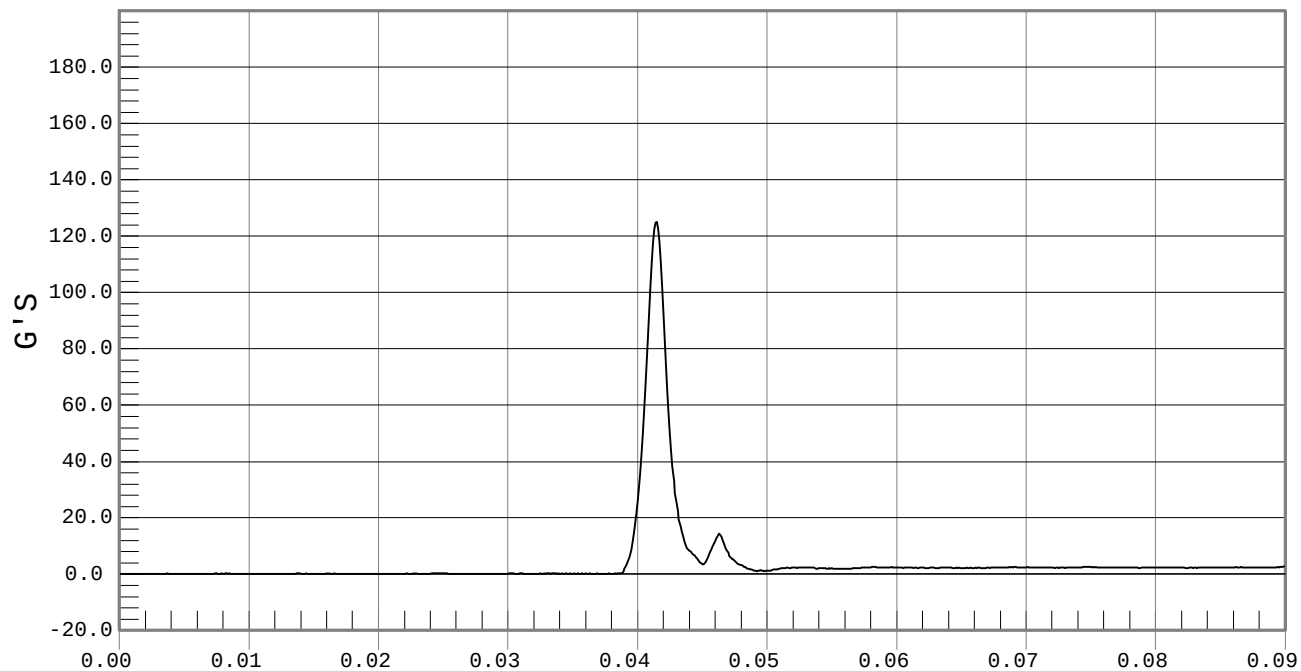


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #020

Test Date: 06-03-05
Speed: 0.0 fps, 0.00 M/s

Ymin = .06 G'S @ 0.0004 sec., Ymax = 125.04 G'S @ 0.0414 sec.

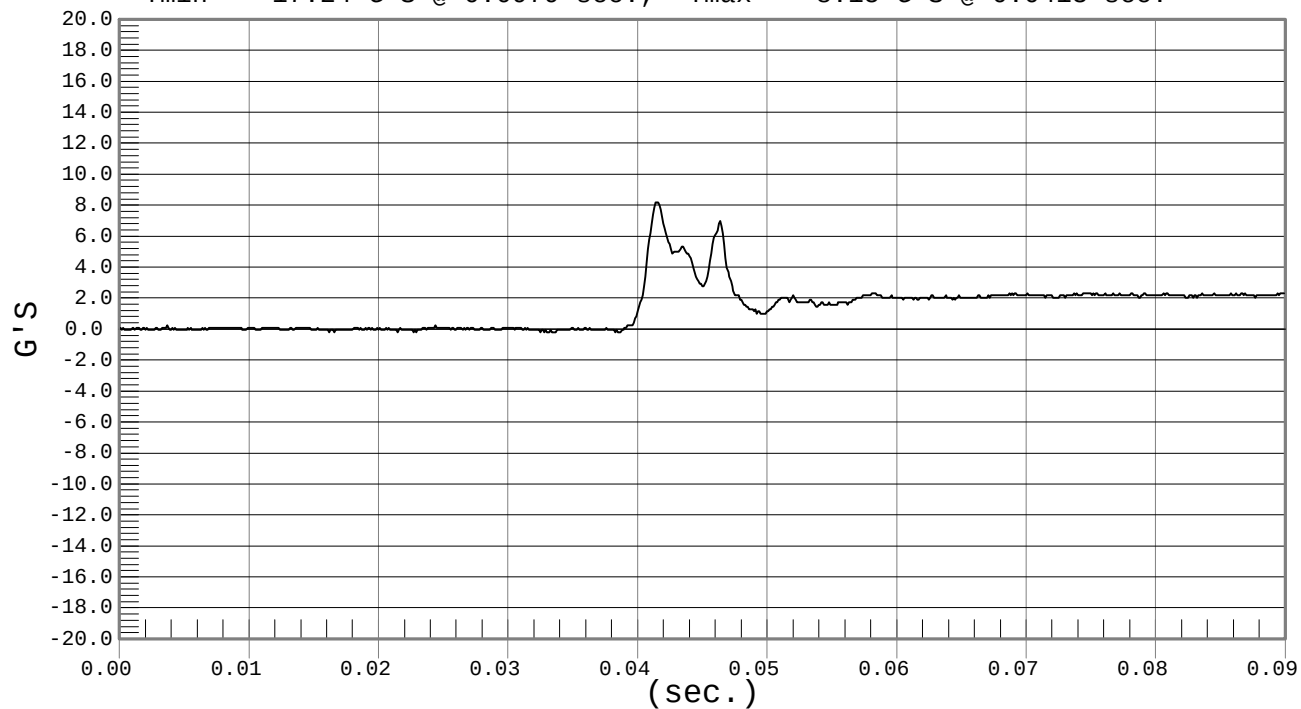


PEAK LONGITUDINAL ACCELARATION

Test Desc.: Head Drop
Component: Dummy #020

Test Date: 06-03-05
Speed: 0.0 fps, 0.00 M/s

Ymin = -17.24 G'S @ 0.0979 sec., Ymax = 8.15 G'S @ 0.0413 sec.



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

Date: 6/3/05
Dummy Serial Number: 020
Test Number: D051492

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		20.6° – 22.2°	21.9
Humidity		10% - 70%	46
Impact Velocity (m/s)		5.51-5.63	5.59
Delta Velocity (m/s)	10 ms	2.20-2.80	2.63
	15 ms	3.40-4.10	3.85
	20 ms	4.50-5.40	5.13
	25 ms	5.50-6.10	5.82
	25-100 ms	5.20-6.20	5.83
Maximum D-Plane Rotation (deg)		74 - 79	75
Time of Maximum D-Plane Rotation		50-70	60
Maximum Occipital Condyle Moment during Rotation Interval (Nm)		(-45) – (-40)	-43
Time of Moment Decay to 0 Nm		113-123	114

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

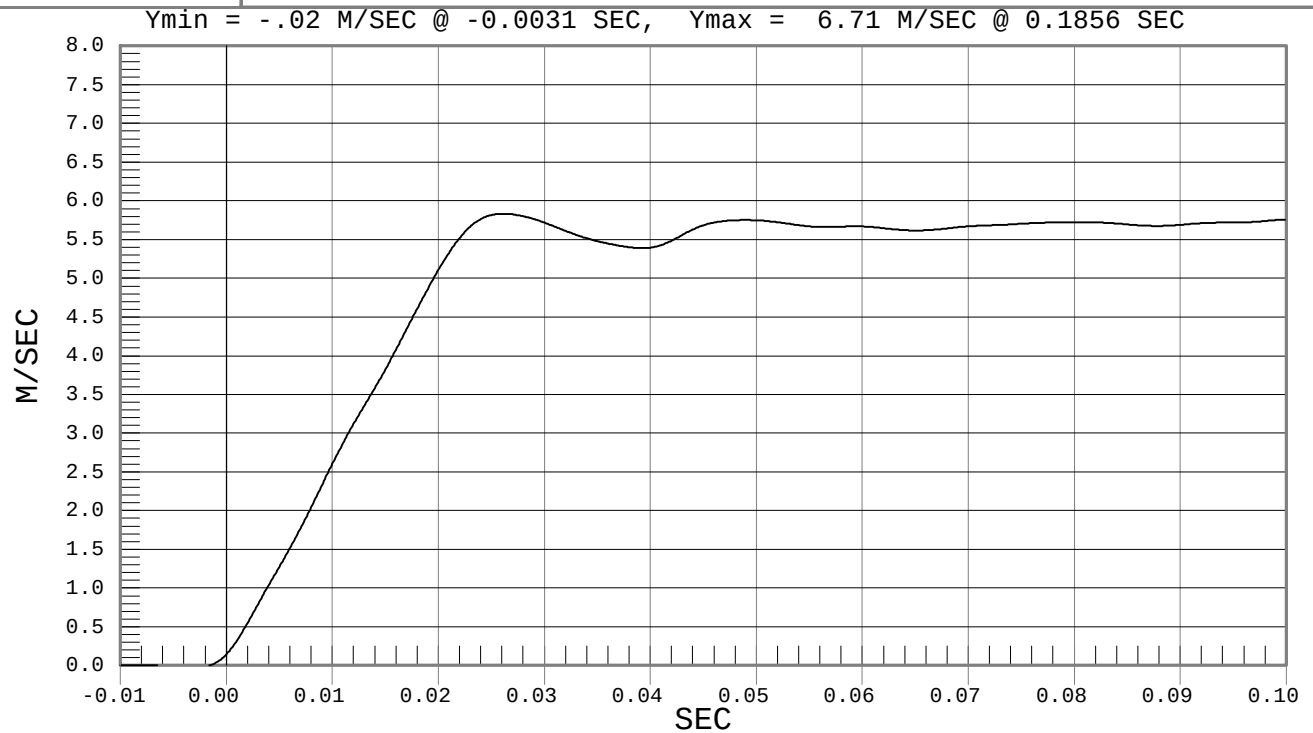
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #020

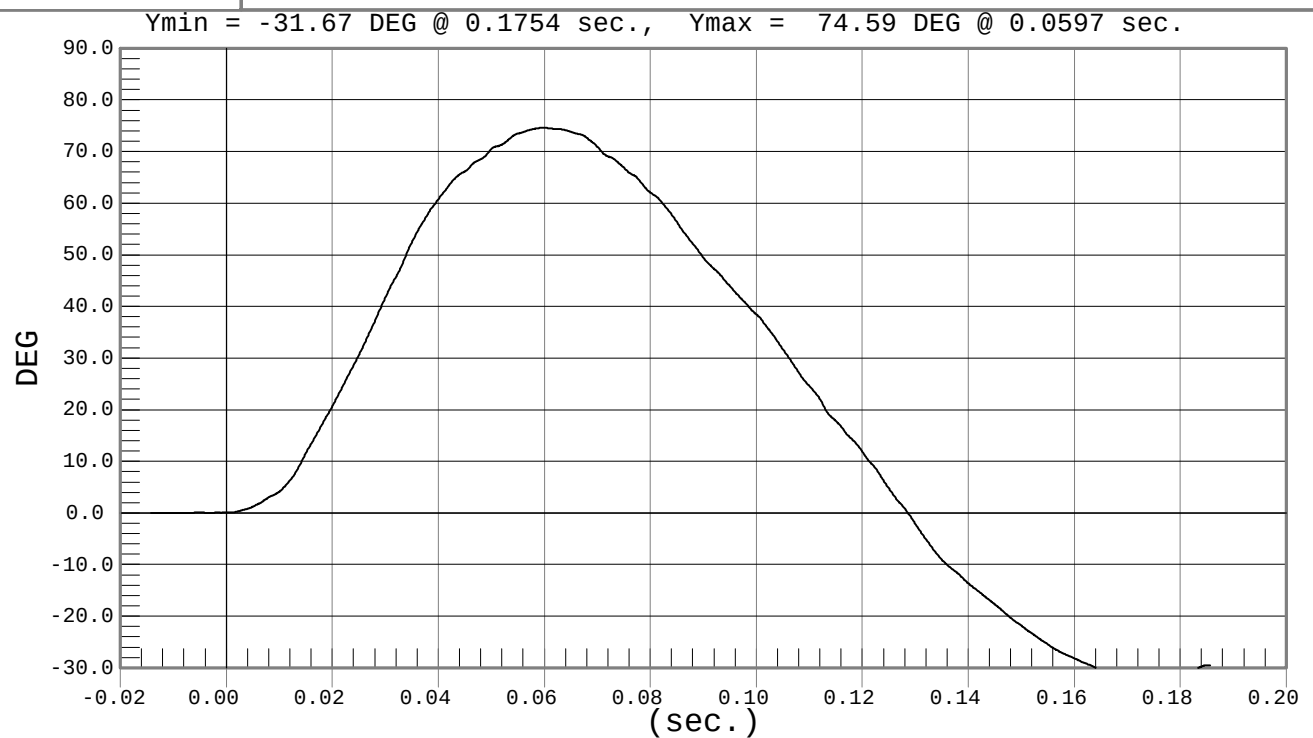
Test Date: 06-03-05
Speed: 18.4 fps, 5.59 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #020

Test Date: 06-03-05
Speed: 18.4 fps, 5.59 M/s



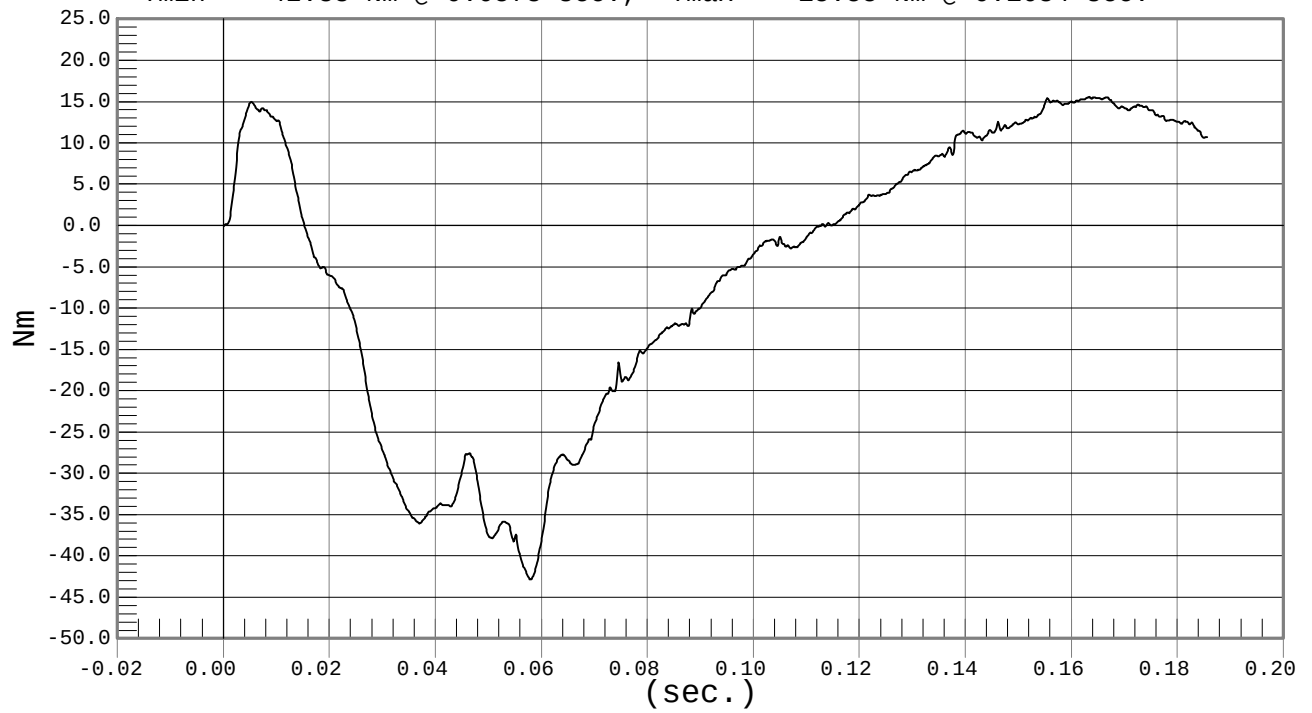


Test Desc.: Neck Bending
Component: Dummy #020

OCCIPITAL MOMENT

Test Date: 06-03-05
Speed: 18.4 fps, 5.59 M/s

Ymin = -42.88 Nm @ 0.0578 sec., Ymax = 15.55 Nm @ 0.1634 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

Date: 6/6/05
Dummy Serial Number: 020
Test Number: D051493

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	20.8
Humidity	10% - 70%	43
Impact Velocity	4.41 - 4.59 m/s	4.50
Maximum Probe Force	1.6 - 2.4 kN	2.3
Shoulder Displacement	27 - 39 mm	33

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

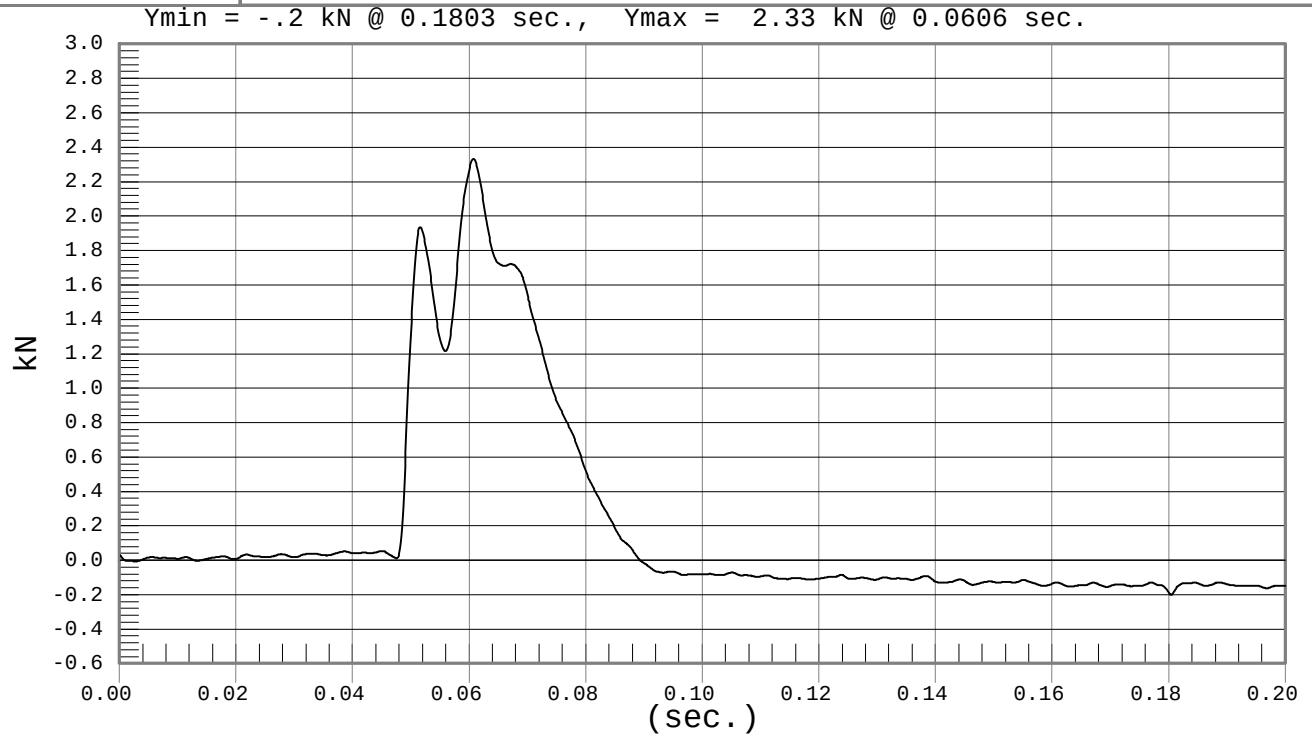
Approved By: David Winkelbauer



PROBE FORCE

Test Desc.: Shoulder Impact
Component: Dummy #020

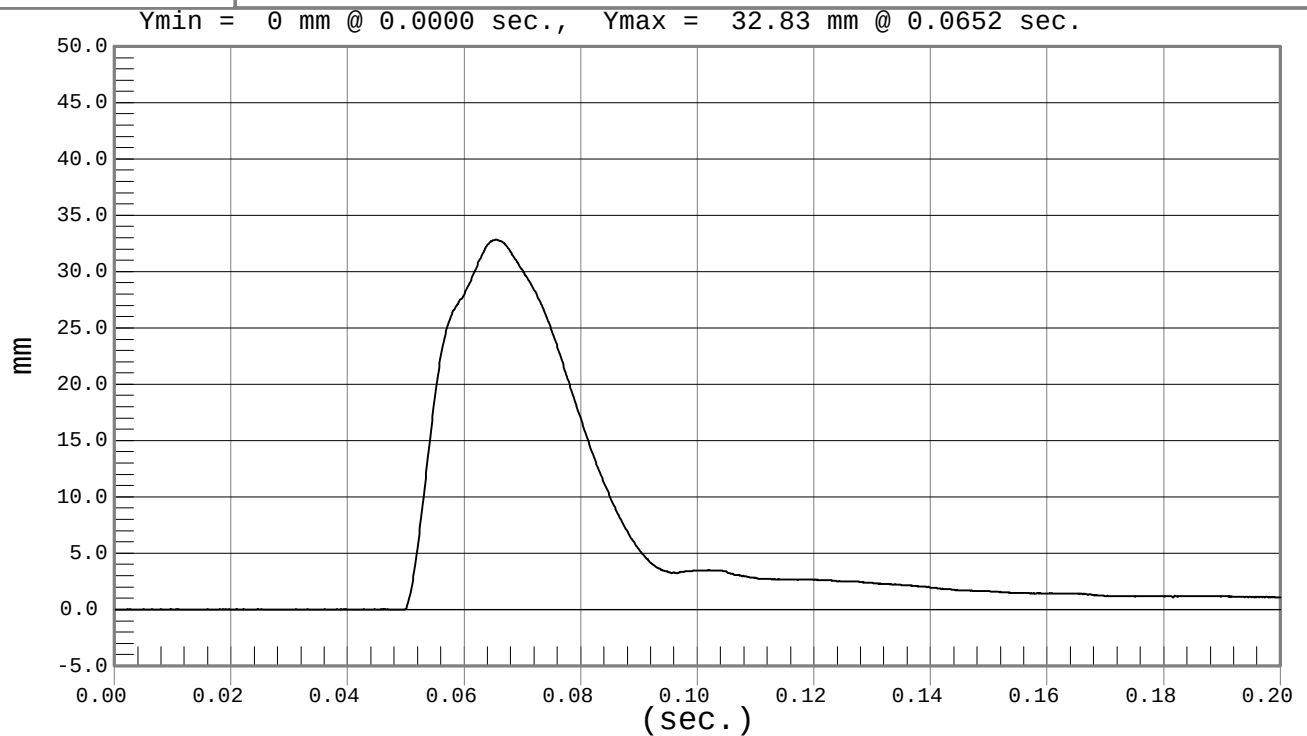
Test Date: 06-06-05
Speed: 14.7 fps, 4.50 M/s



SHOULDER DISPLACEMENT

Test Desc.: Shoulder Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.50 M/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID IIs DUMMY

Date: 6/7/05
Dummy Serial Number: 020
Test Number: D051494

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.6
Humidity	10% - 70%	48
Impact Velocity	6.57 - 6.84 m/s	6.60
Peak Probe Force	4.1 – 4.7 kN	4.6
Shoulder Displacement	30 - 42 mm	34
Upper Rib Displacement	23 - 35 mm	27
Middle Rib Displacement	29 - 44 mm	33
Lower Rib Displacement	33 - 40 mm	36
Upper Spine (T1) Y Acceleration	34 – 48 g's	40
Lower Spine (T12) Y Acceleration	30 - 38 g's	32

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

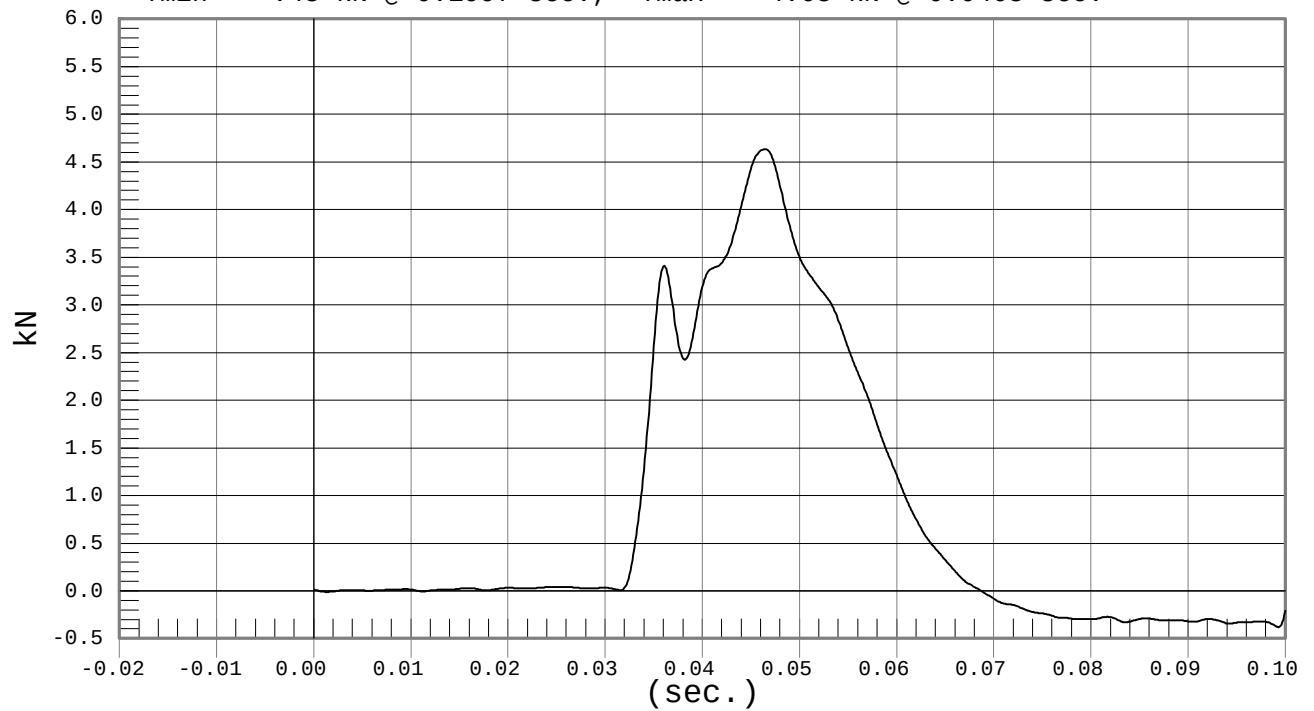


PROBE FORCE

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s

Ymin = -.43 kN @ 0.1997 sec., Ymax = 4.63 kN @ 0.0463 sec.



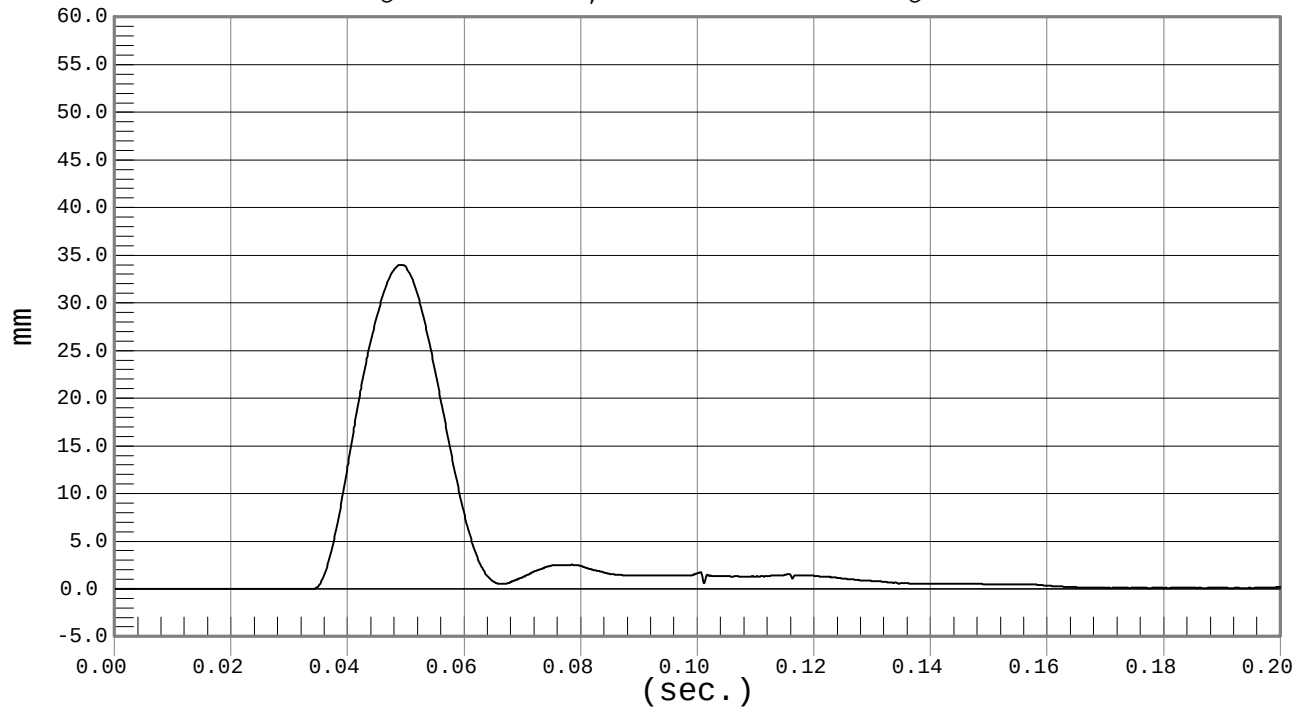


SHOULDER DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s

Ymin = -.02 mm @ 0.0115 sec., Ymax = 33.95 mm @ 0.0488 sec.

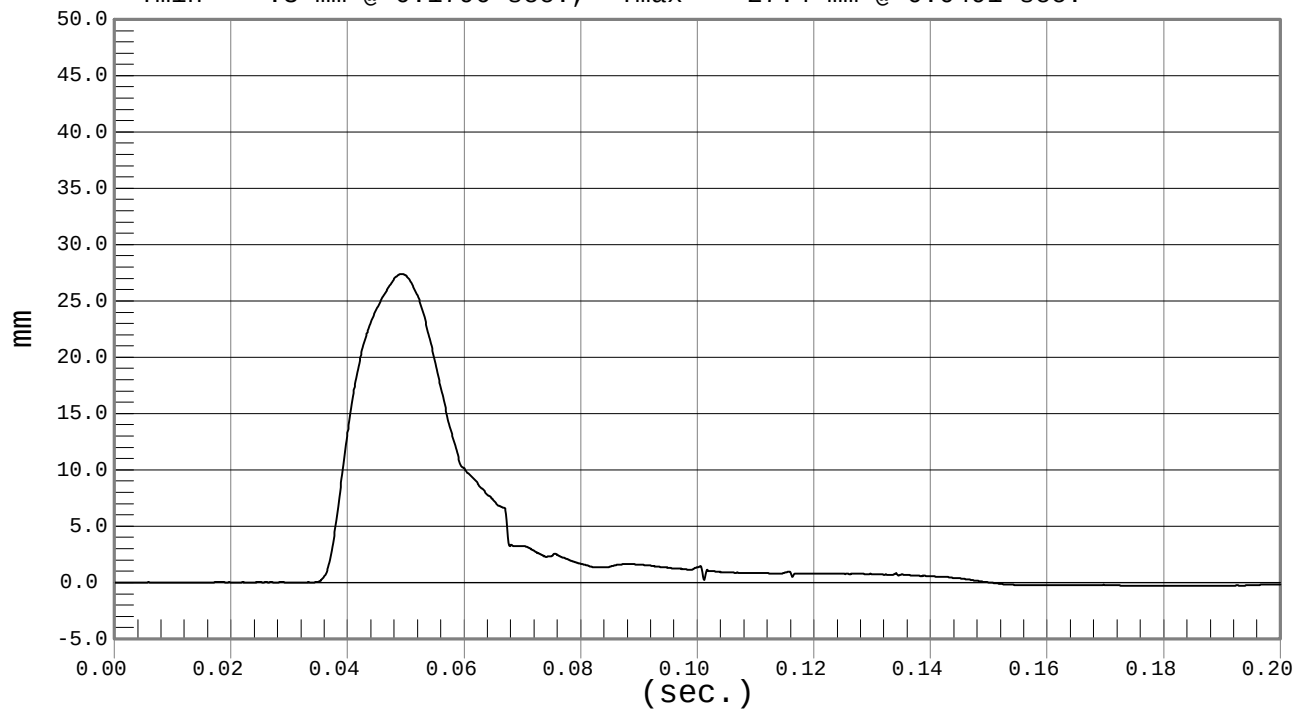


UPPER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s

Ymin = -.3 mm @ 0.1796 sec., Ymax = 27.4 mm @ 0.0491 sec.



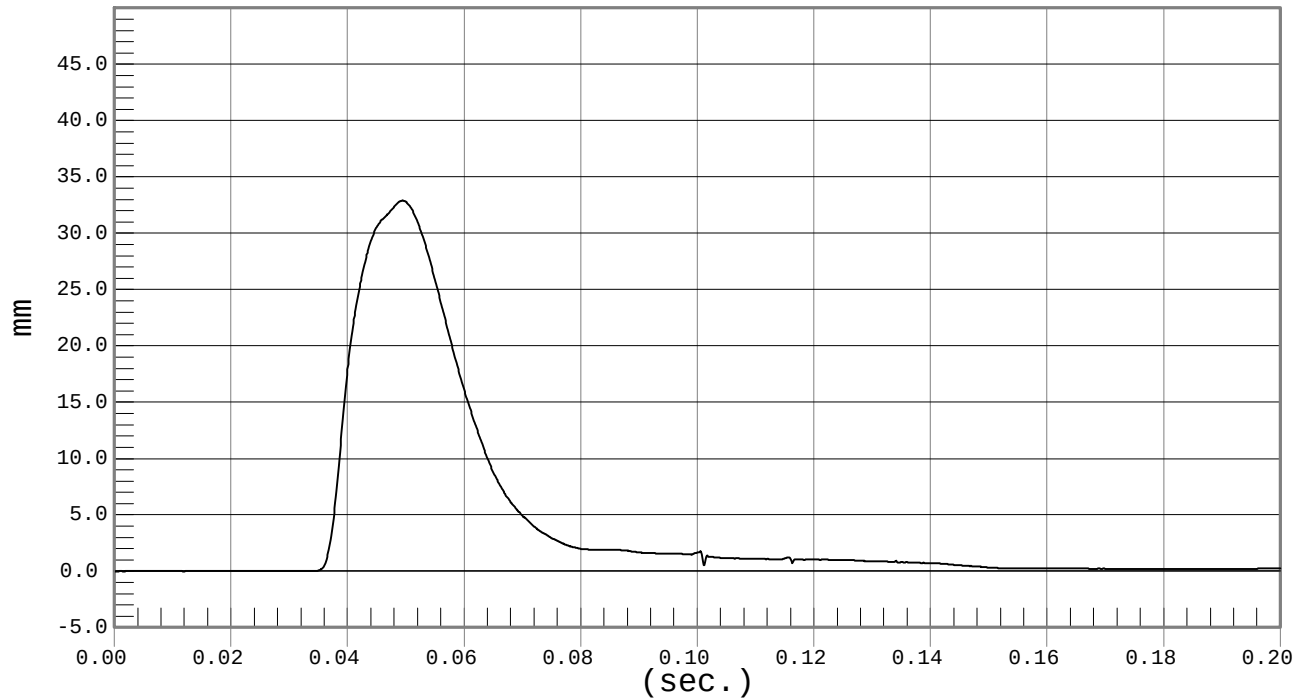


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s

Ymin = -.01 mm @ 0.0004 sec., Ymax = 32.89 mm @ 0.0493 sec.

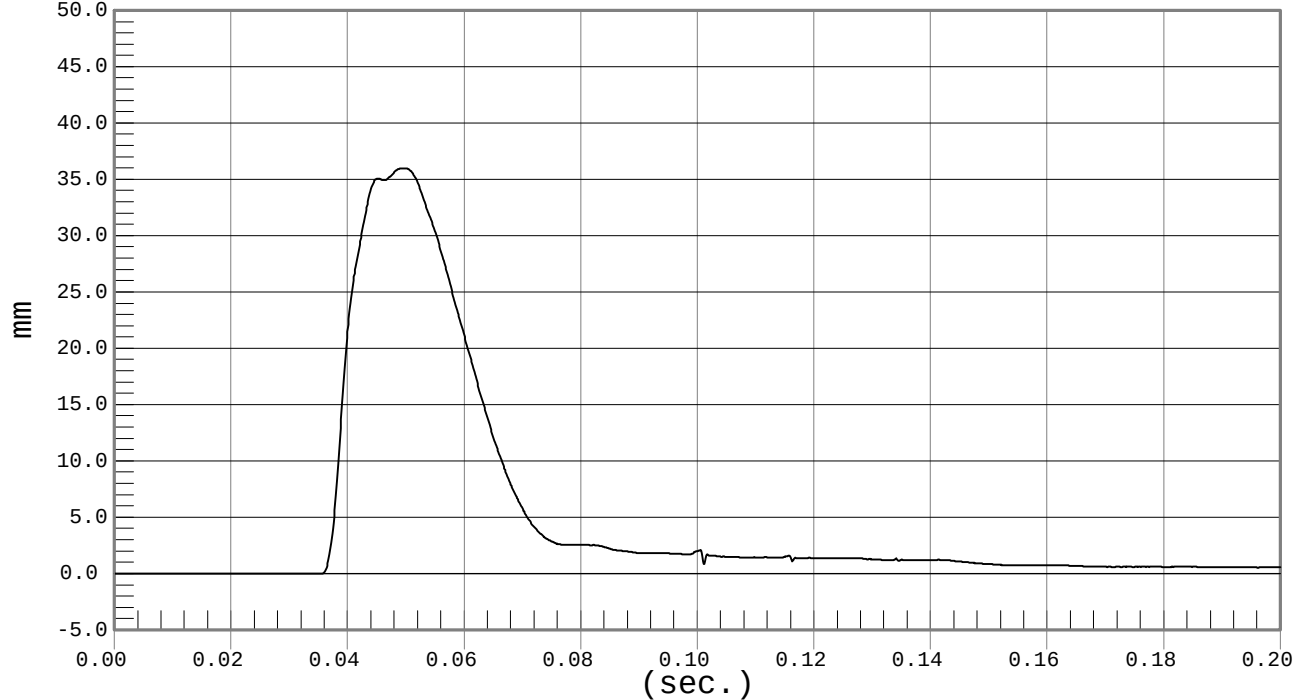


LOWER RIB DISPLACEMENT

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s

Ymin = -.01 mm @ 0.0217 sec., Ymax = 35.97 mm @ 0.0496 sec.

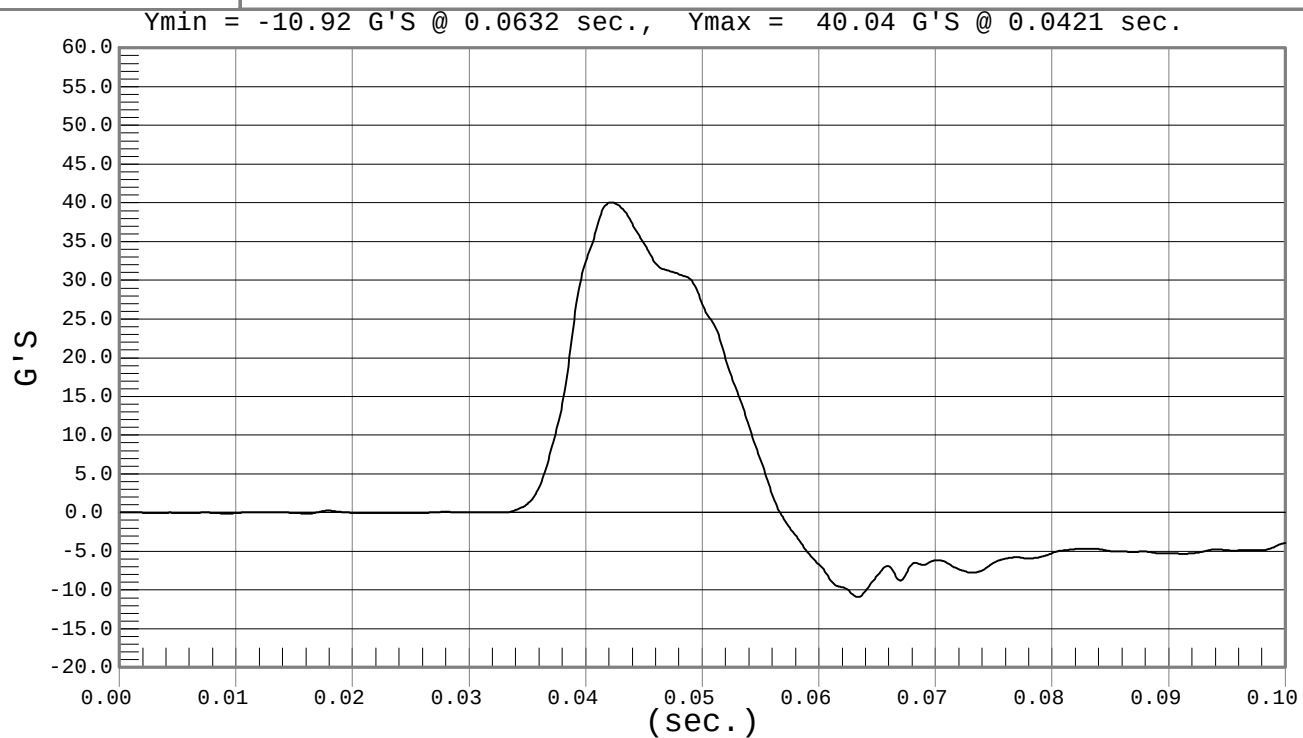




UPPER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #020

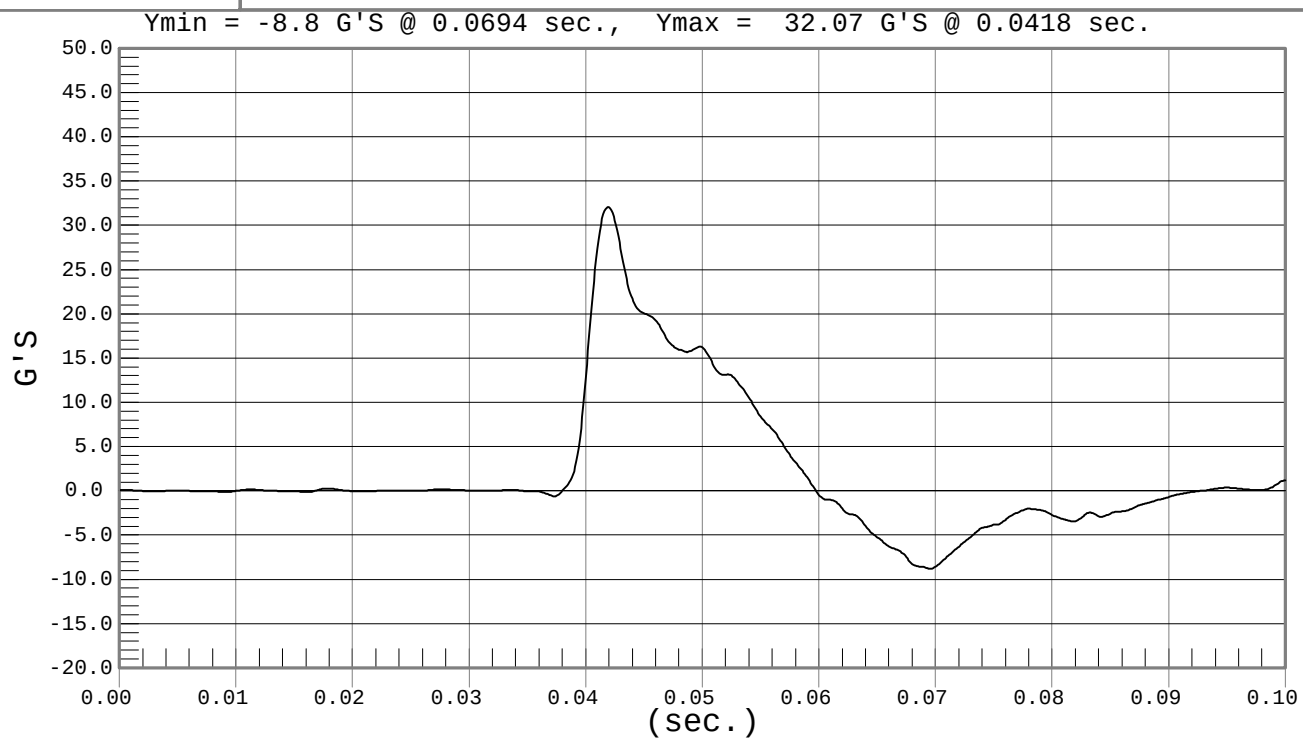
Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s



LOWER SPINE ACCELERATION

Test Desc.: Thorax With Arm
Component: Dummy #020

Test Date: 06-07-05
Speed: 21.7 fps, 6.60 M/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID IIs DUMMY

Date: 6/6/05
Dummy Serial Number: 020
Test Number: D051495

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	22.1
Humidity	10% - 70%	52
Impact Velocity	4.20 - 4.40 m/s	4.26
Peak Probe Force	1.8 - 2.3 kN	2.3
Upper Rib Displacement	32 - 41 mm	36
Middle Rib Displacement	40 - 51 mm	41
Lower Rib Displacement	34 - 47 mm	39
Upper Spine (T1) Acceleration	13 - 18 g's	16
Lower Spine (T12) Acceleration	8 – 13 g's	9

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

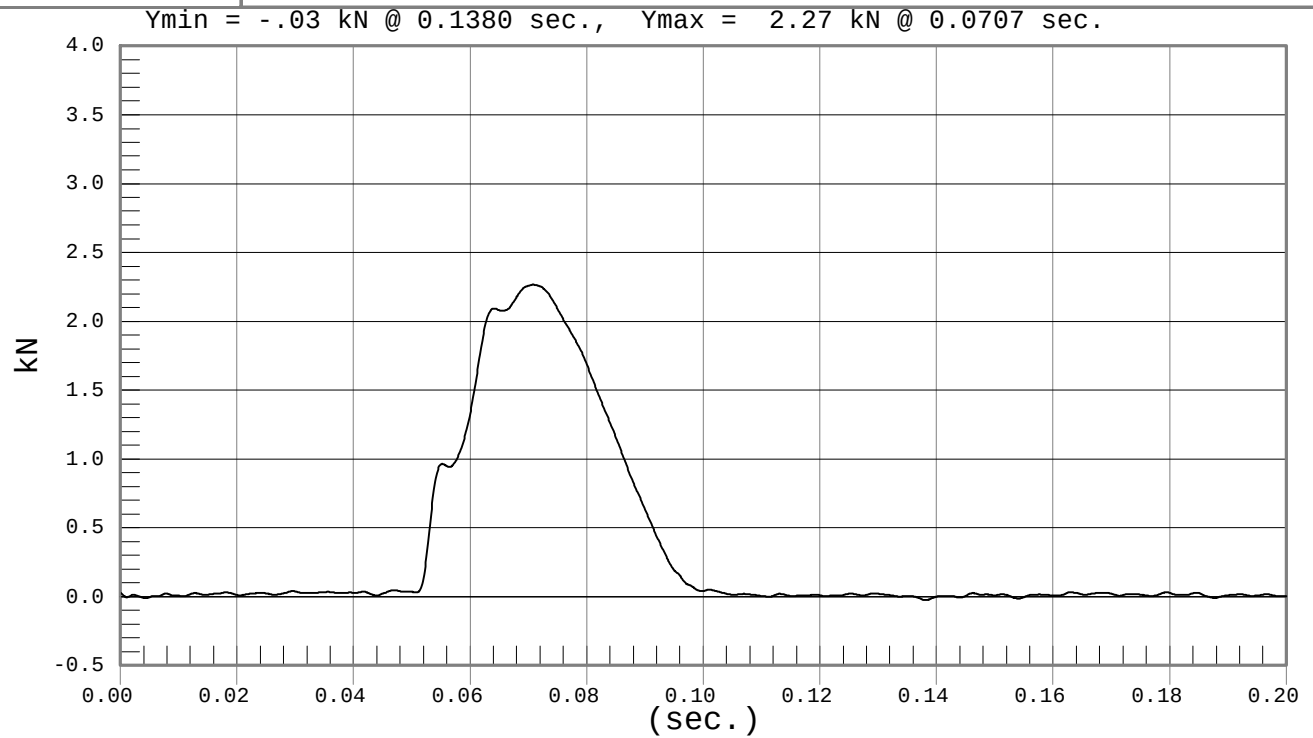
Approved By: David Winkelbauer



PROBE FORCE

Test Desc.: Thorax Without Arm
Component: Dummy #020

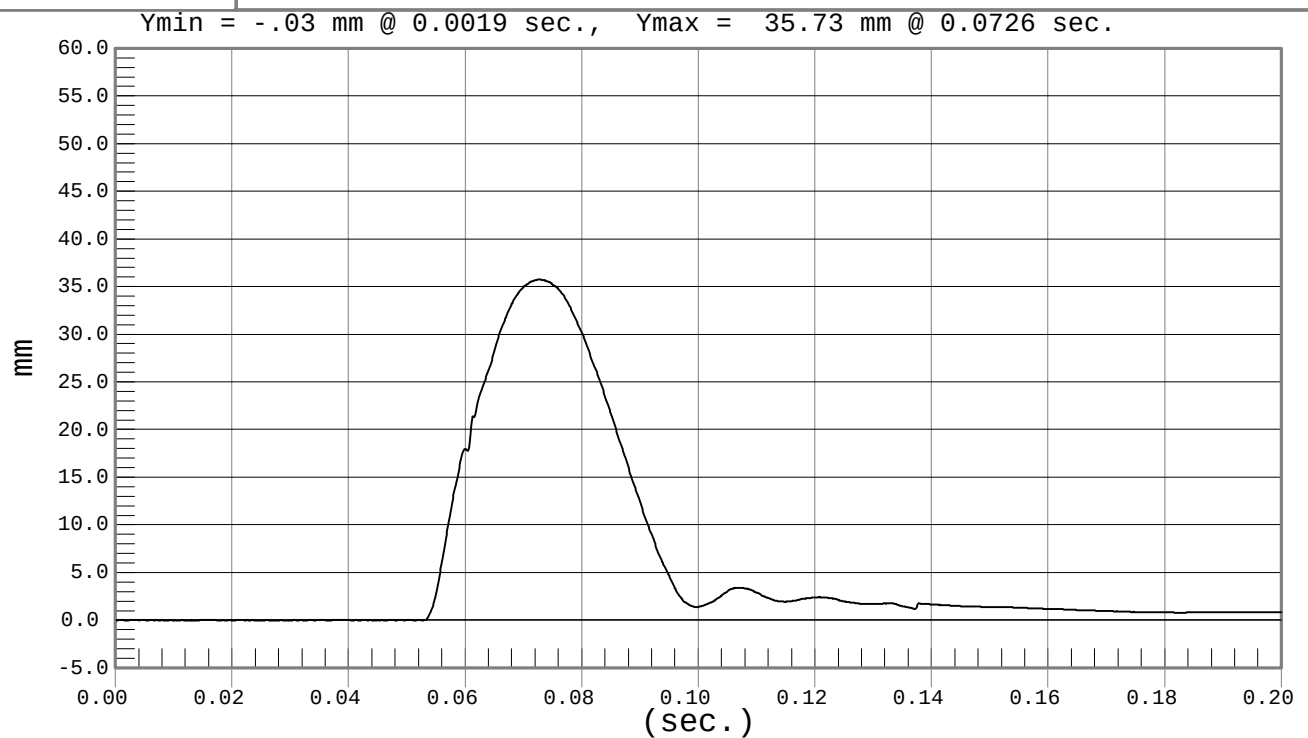
Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s



UPPER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s



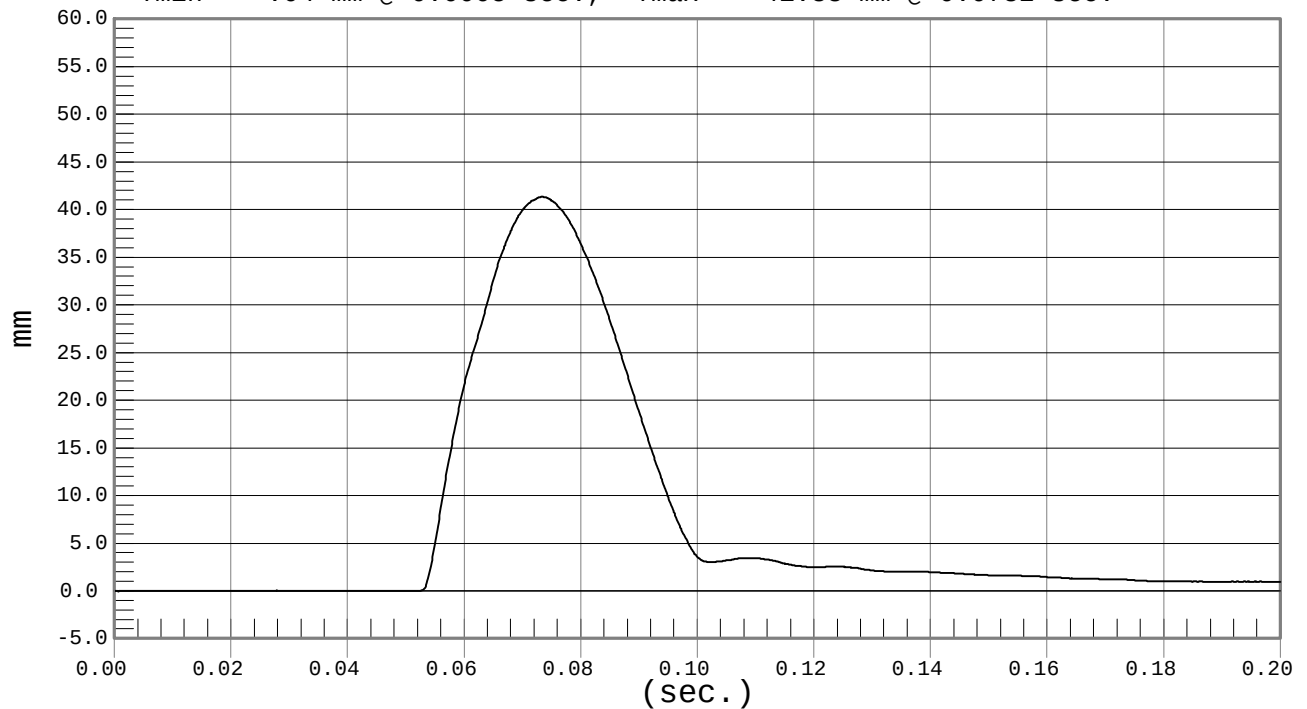


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s

Ymin = -.04 mm @ 0.0005 sec., Ymax = 41.33 mm @ 0.0732 sec.

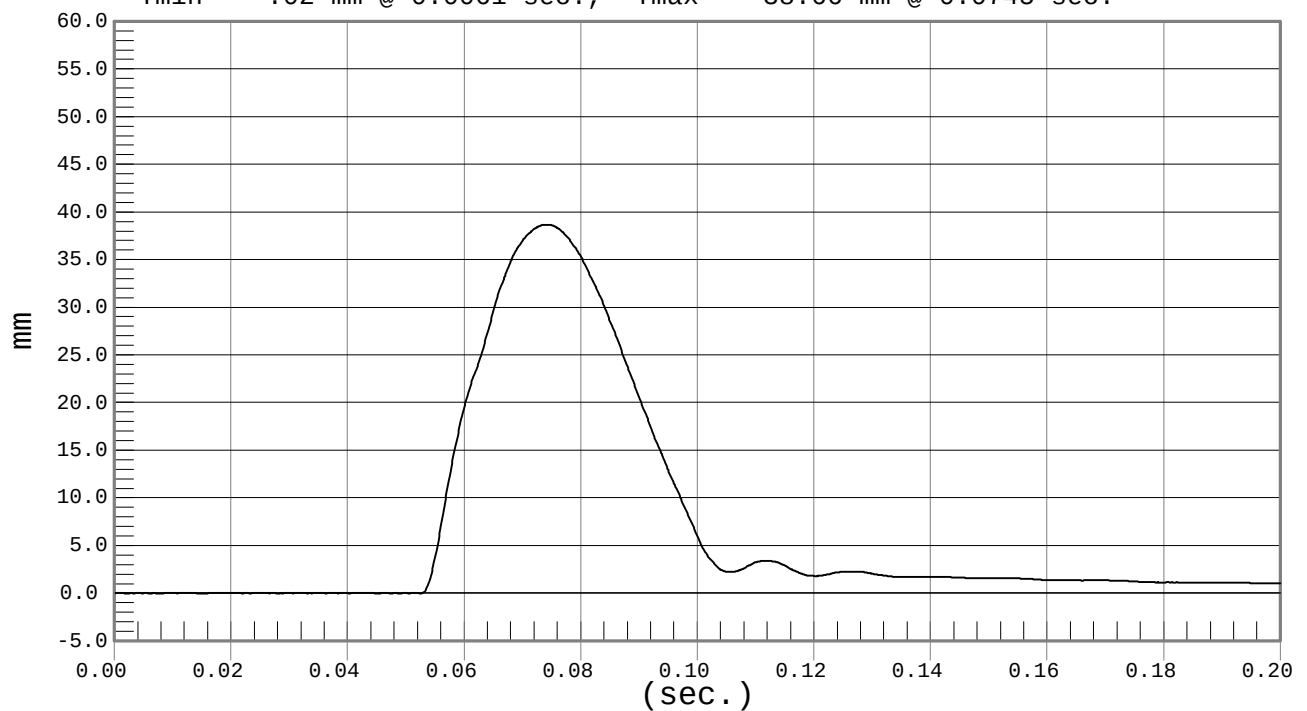


LOWER RIB DISPLACEMENT

Test Desc.: Thorax Without Arm
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s

Ymin = -.02 mm @ 0.0061 sec., Ymax = 38.66 mm @ 0.0745 sec.



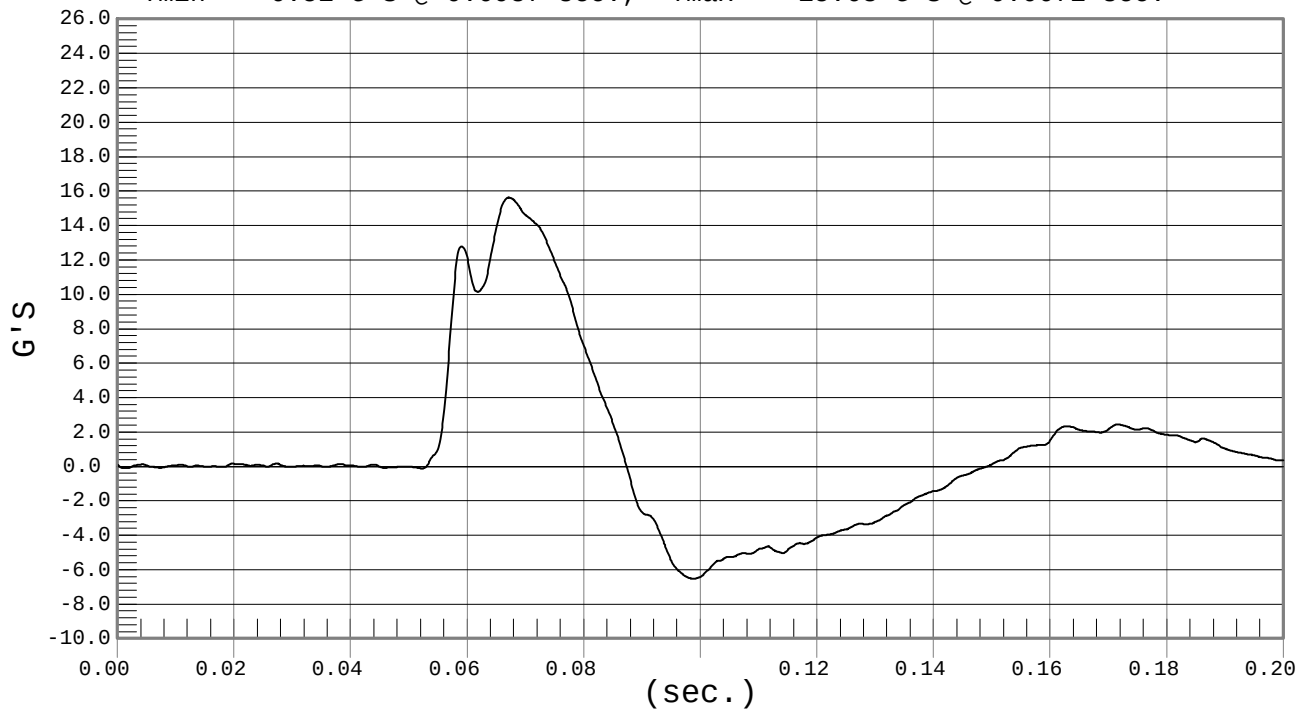


UPPER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s

Ymin = -6.51 G'S @ 0.0987 sec., Ymax = 15.63 G'S @ 0.0671 sec.

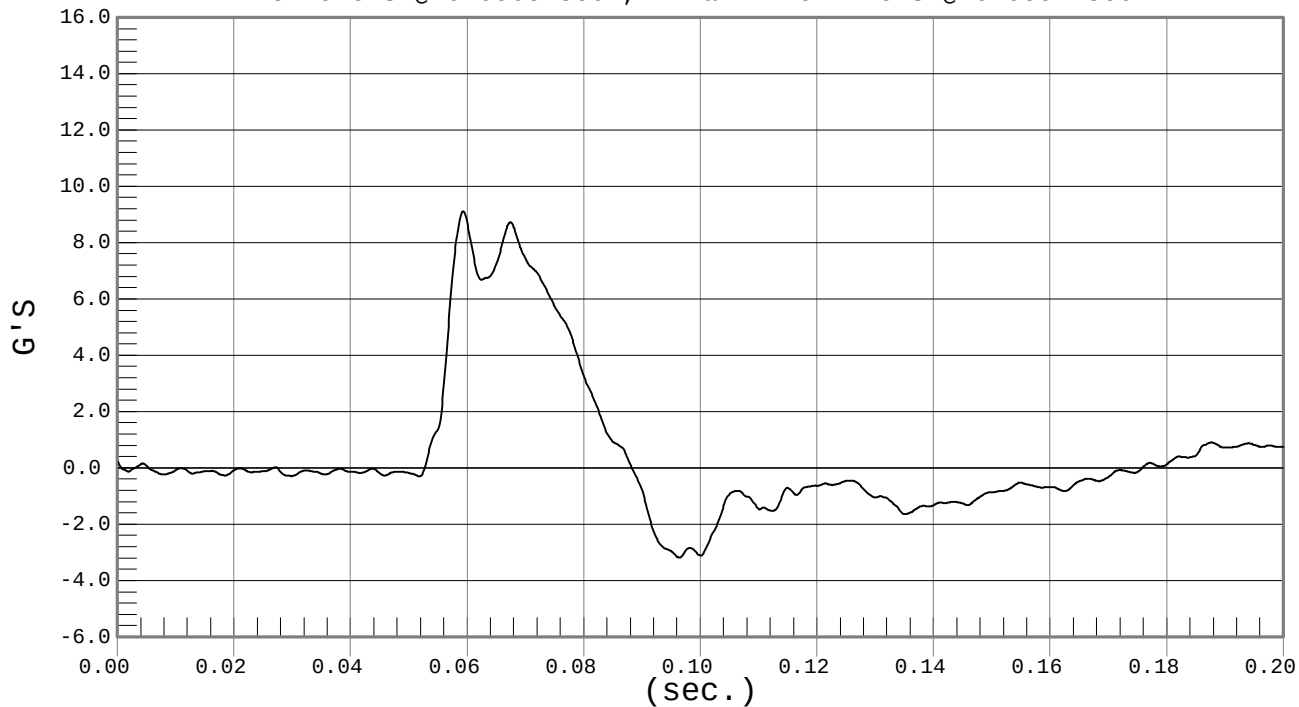


LOWER SPINE ACCELERATION

Test Desc.: Thorax Without Arm
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.0 fps, 4.26 M/s

Ymin = -3.19 G'S @ 0.0963 sec., Ymax = 9.11 G'S @ 0.0592 sec.



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

Date: 6/6/05
Dummy Serial Number: 020
Test Number: D051496

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.8
Humidity	10% - 70%	49
Impact Velocity	4.41 - 4.59 m/s	4.48
Probe Force	1.3 - 1.9 kN	1.9
Upper Rib Displacement	44 - 55 mm	41*
Lower Rib Displacement	44 - 56 mm	41*
Upper Spine (T1) Y Acceleration	5 - 9 g's	7
Lower Spine (T12) Y Acceleration	9 - 13 g's	13

*TEST DOES NOT MEET SPECIFICATIONS

Technician: _____

Jessica Hall

Approved By: _____

David Winkelbauer

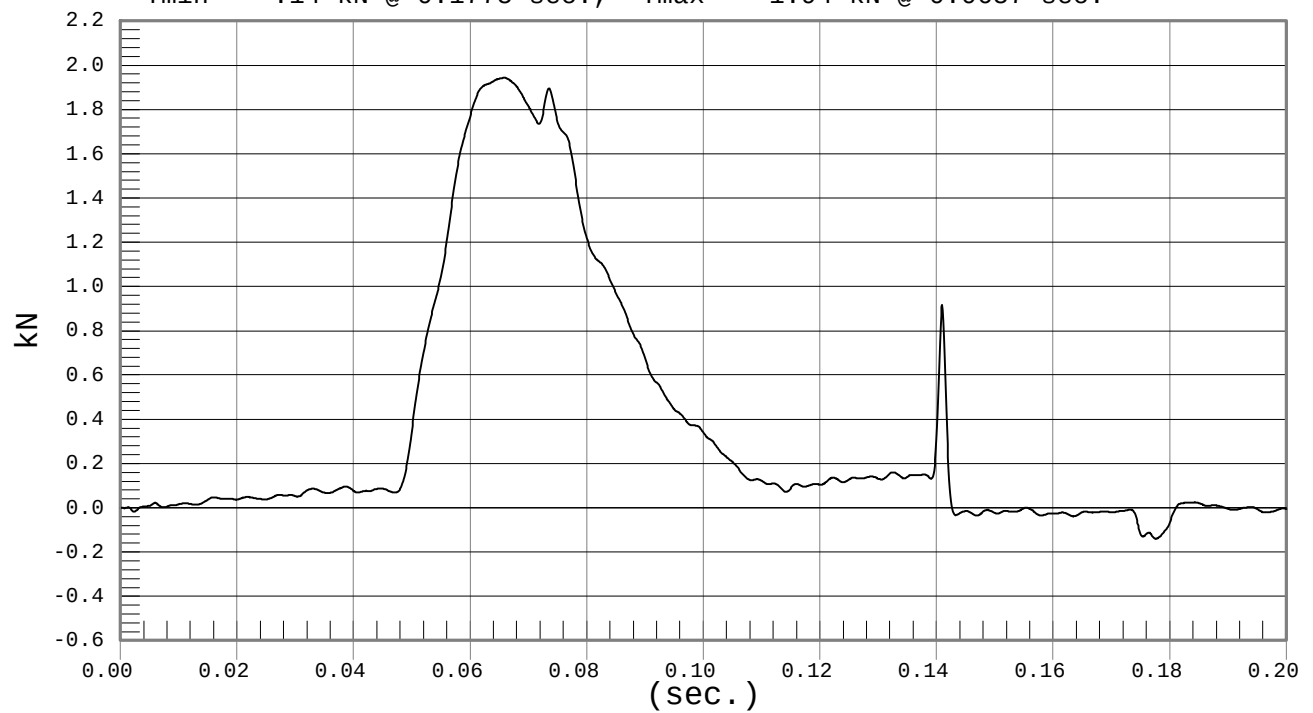


PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.48 M/s

Ymin = -.14 kN @ 0.1775 sec., Ymax = 1.94 kN @ 0.0657 sec.



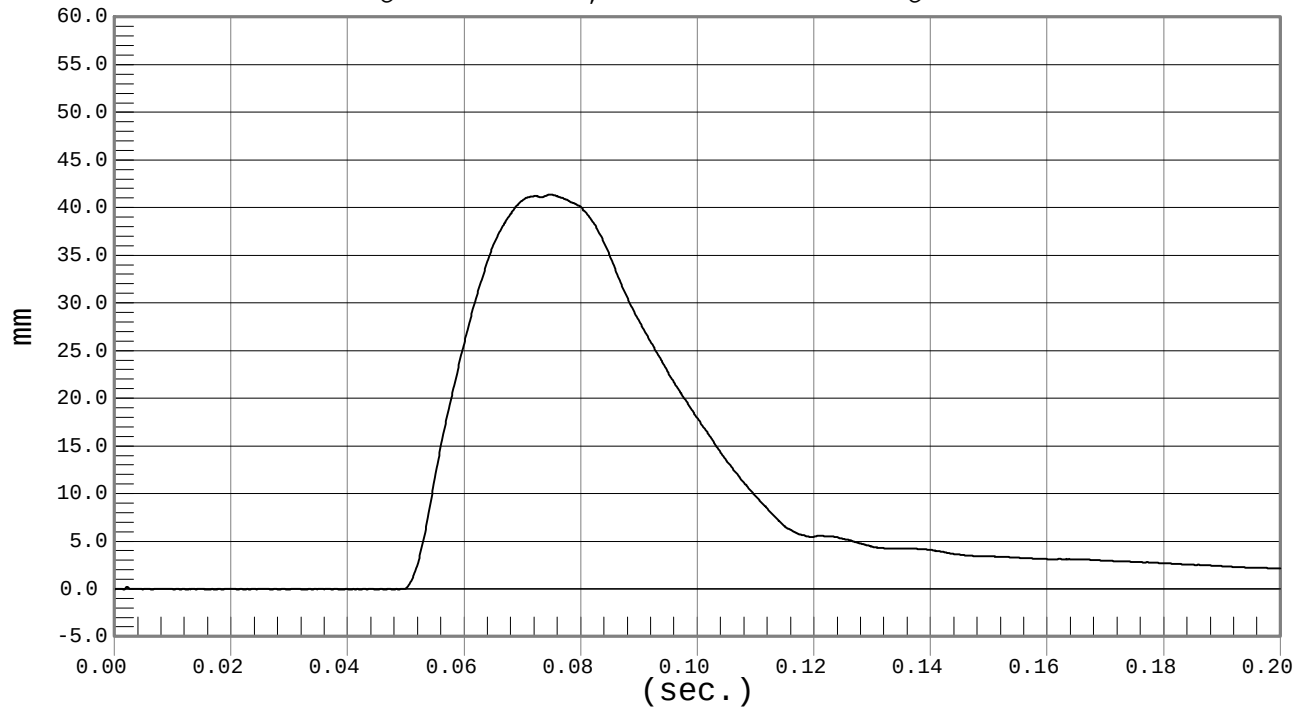


UPPER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.48 M/s

Ymin = -.04 mm @ 0.0015 sec., Ymax = 41.35 mm @ 0.0747 sec.

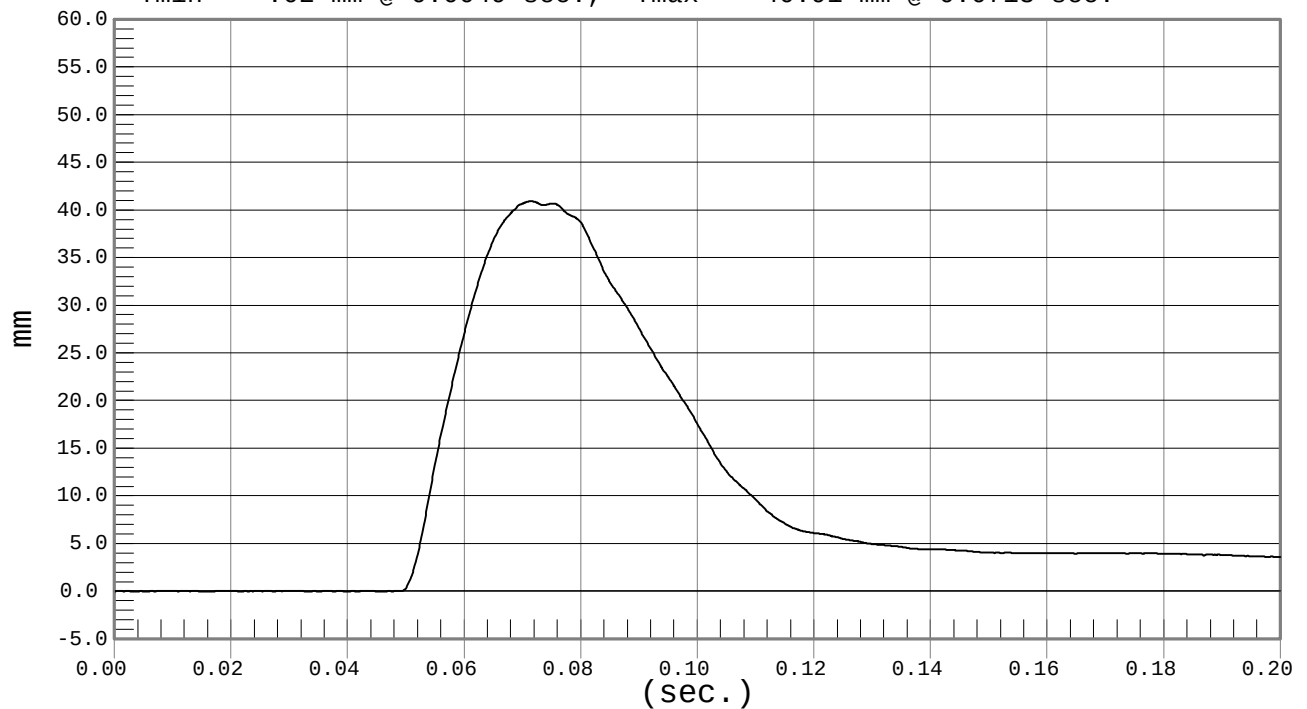


LOWER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.48 M/s

Ymin = -.02 mm @ 0.0049 sec., Ymax = 40.91 mm @ 0.0713 sec.



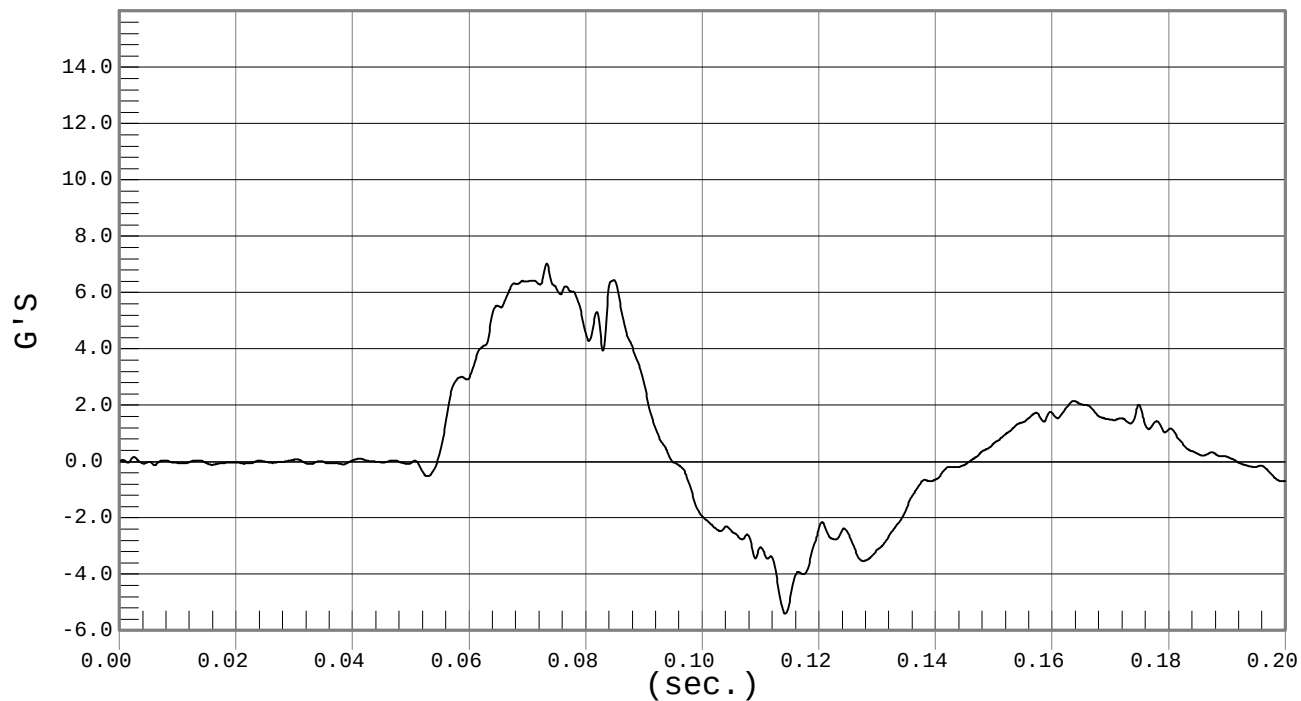


UPPER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.48 M/s

Ymin = -5.4 G'S @ 0.1141 sec., Ymax = 7.03 G'S @ 0.0732 sec.

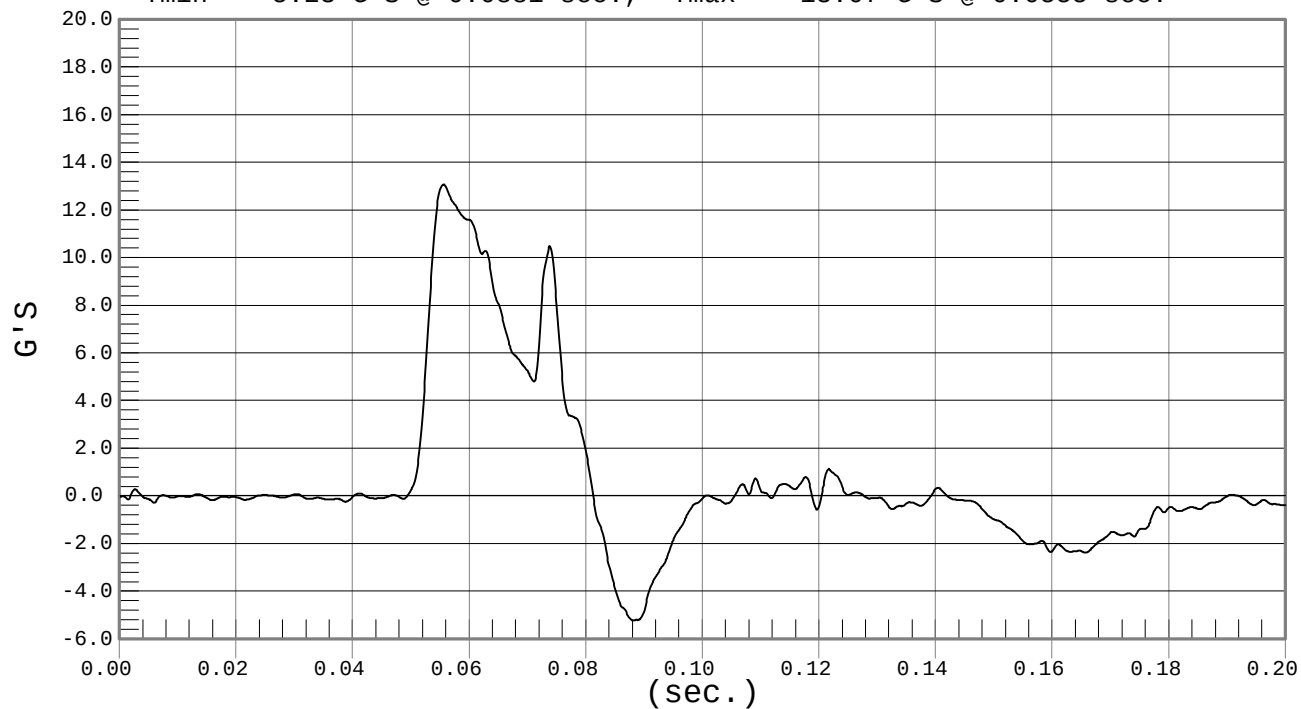


LOWER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 14.7 fps, 4.48 M/s

Ymin = -5.23 G'S @ 0.0881 sec., Ymax = 13.07 G'S @ 0.0555 sec.



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

Date: 6/6/05
Dummy Serial Number: 020
Test Number: D051497

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.4
Humidity	10% - 70%	48
Impact Velocity	6.60 - 6.80 m/s	6.68
Peak Impactor Acceleration	40 – 48 g's	41
Pelvis Y Acceleration	40 – 48 g's	47
Peak Pelvis Acetabulum Force	3803 – 4505 N	4008

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

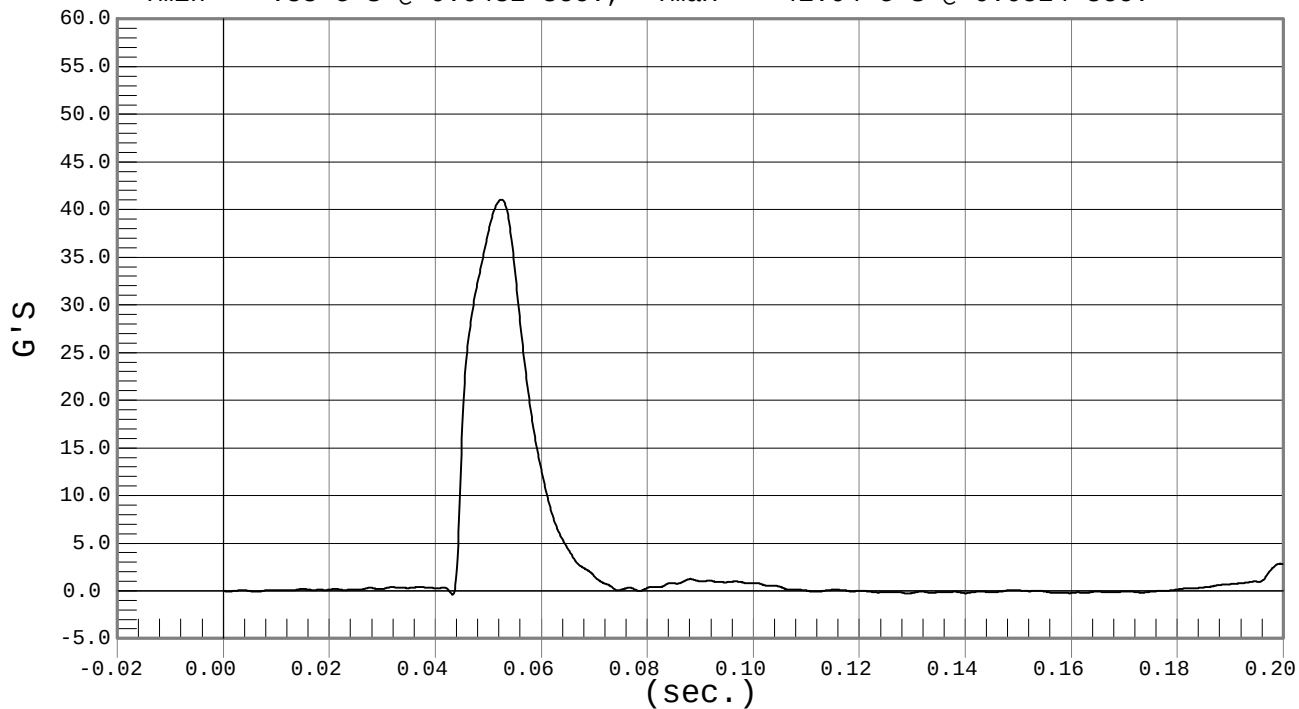


IMPACTOR ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -.38 G'S @ 0.0432 sec., Ymax = 41.04 G'S @ 0.0524 sec.

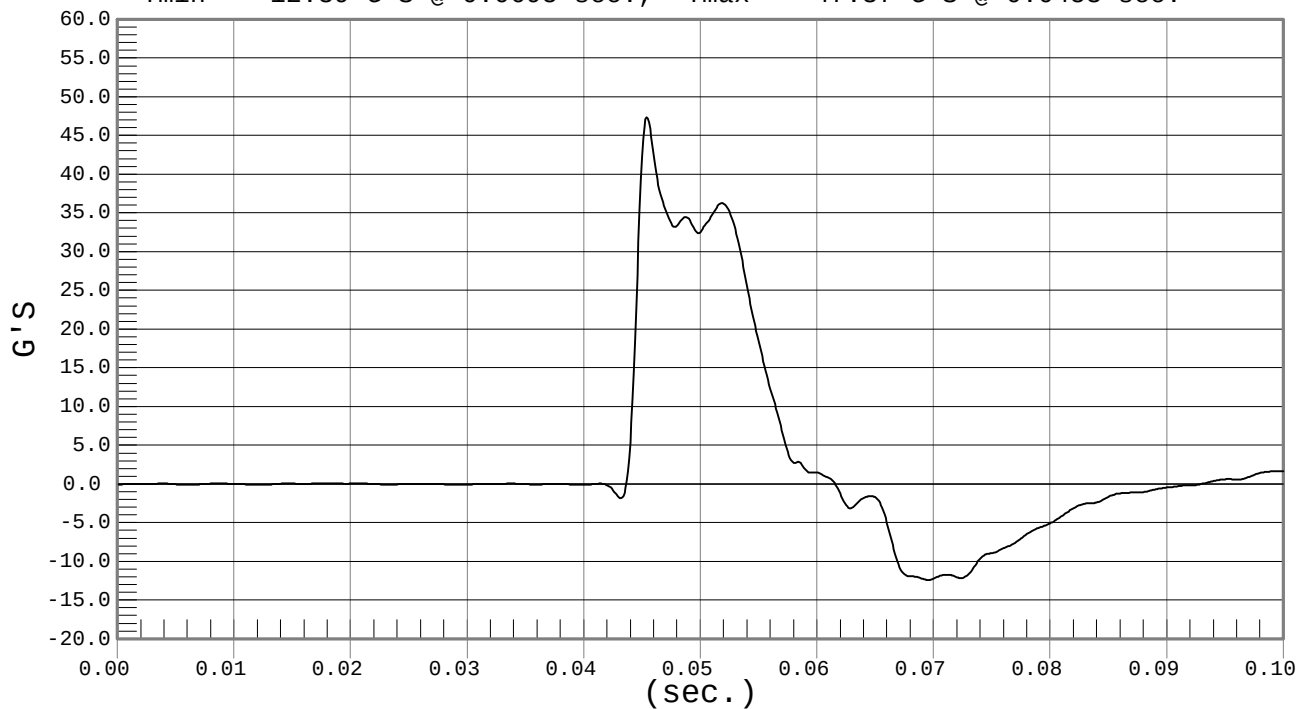


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #020

Test Date: 06-06-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -12.39 G'S @ 0.0695 sec., Ymax = 47.37 G'S @ 0.0453 sec.



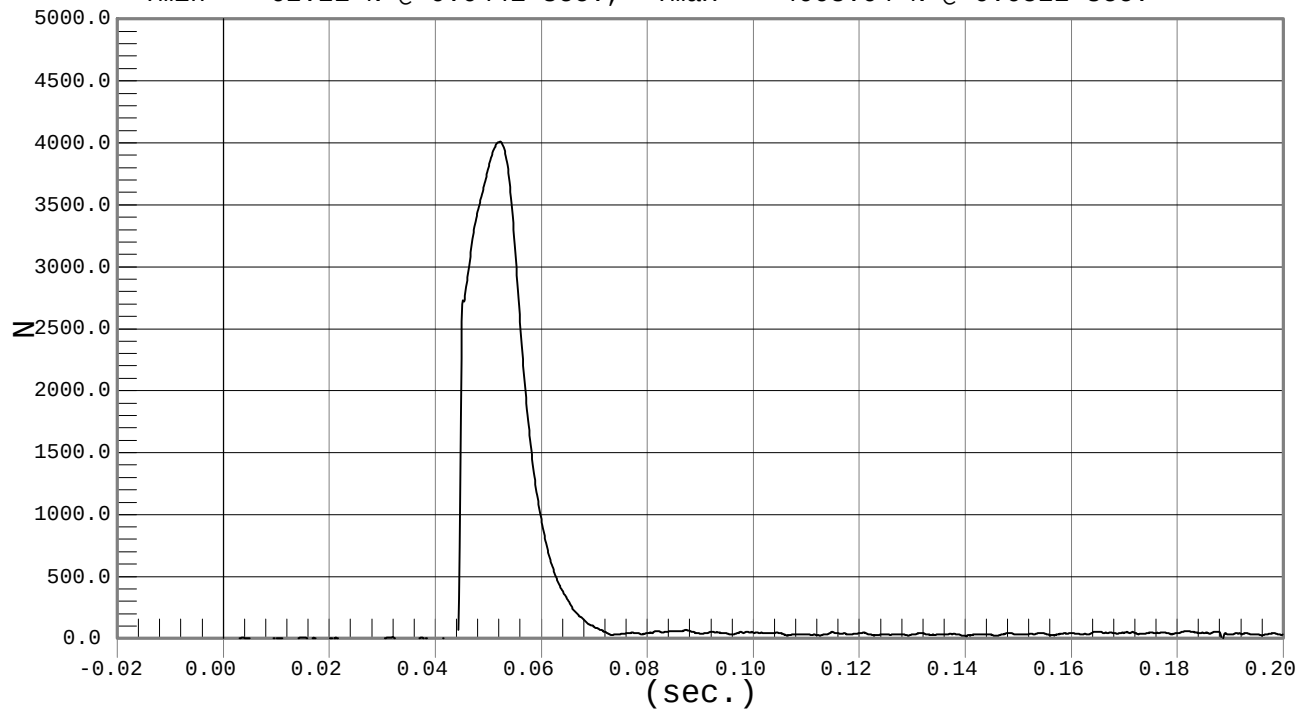


Test Desc.: Pelvis Impact
Component: Dummy #020

ACETABULUM FORCE

Test Date: 06-06-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -62.21 N @ 0.0441 sec., Ymax = 4008.04 N @ 0.0522 sec.



CERTIFICATION DATA

Dummy Serial Number: 056

POST-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051641

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	22.1
Humidity	10% - 70%	48
Resultant Acceleration	125 - 145 g's	126
Peak Longitudinal Acceleration	(-15) – (+ 15) g's	9
Unimodal	<10%	YES

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

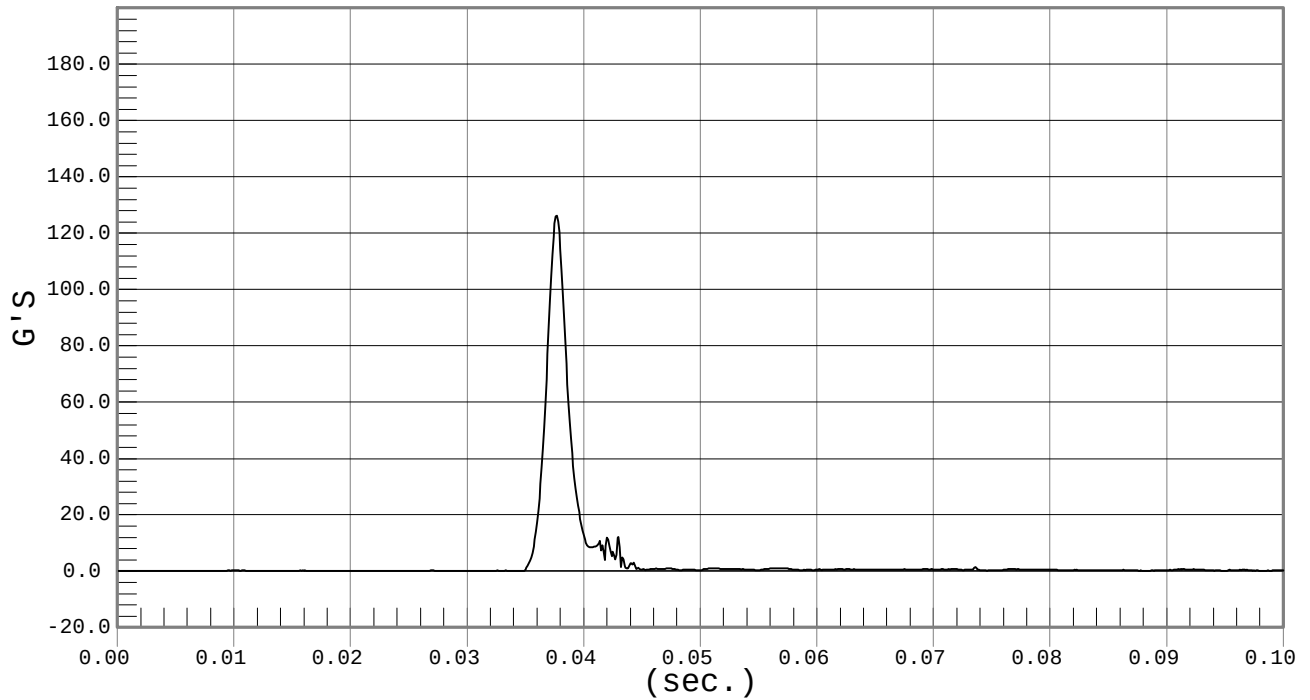


PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #056

Test Date: 06-15-05
Speed: 0.0 fps, 0.00 M/s

Ymin = .03 G'S @ 0.0003 sec., Ymax = 126.23 G'S @ 0.0376 sec.

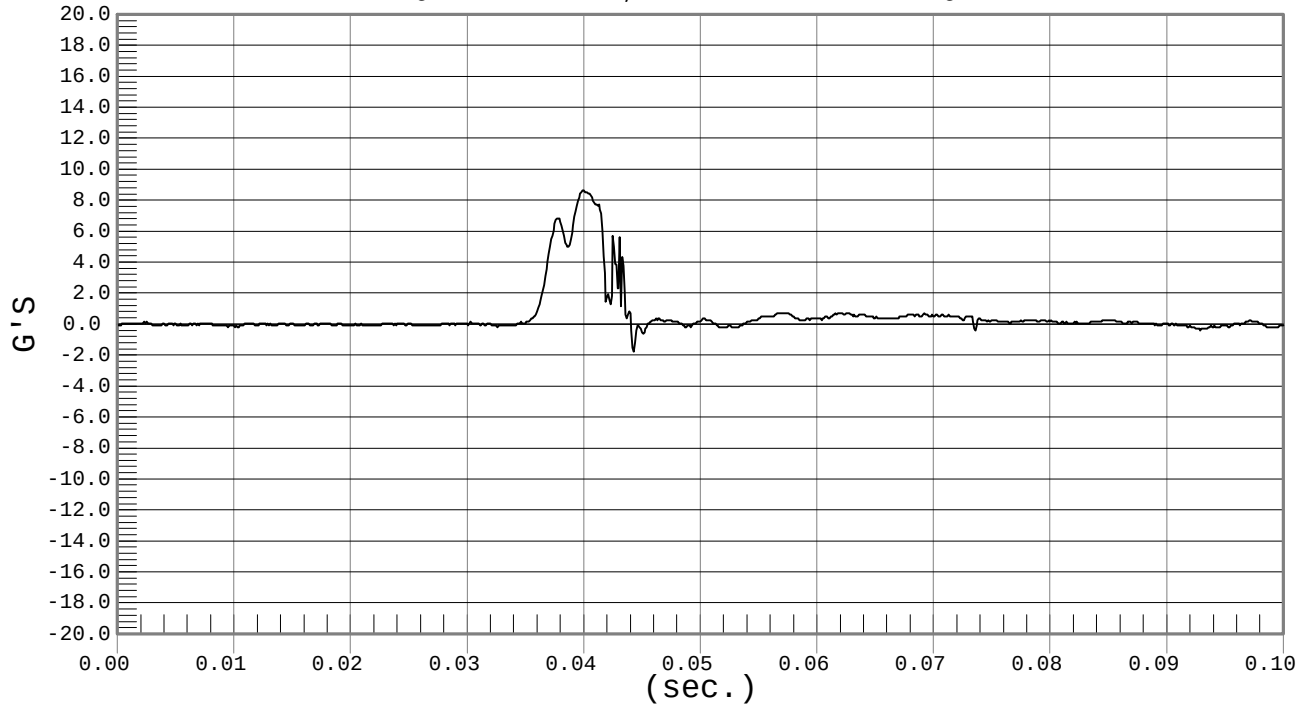


PEAK LONGITUDINAL ACCELARATION

Test Desc.: Head Drop
Component: Dummy #056

Test Date: 06-15-05
Speed: 0.0 fps, 0.00 M/s

Ymin = -2.34 G'S @ 0.1738 sec., Ymax = 8.64 G'S @ 0.0398 sec.



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051642

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		20.6° – 22.2°	21.3
Humidity		10% - 70%	43
Impact Velocity (m/s)		5.51-5.63	5.62
Delta Velocity (m/s)	10 ms	2.20-2.80	2.61
	15 ms	3.40-4.10	3.79
	20 ms	4.50-5.40	5.05
	25 ms	5.50-6.10	5.77
	25-100 ms	5.20-6.20	5.80
Maximum D-Plane Rotation (deg)		74 - 79	75
Time of Maximum D-Plane Rotation		50-70	59
Maximum Occipital Condyle Moment during Rotation Interval (Nm)		(-45) – (-40)	-43
Time of Moment Decay to 0 Nm		113-123	113

TEST MEETS SPECIFICATIONS

Technician: Jessica Gall

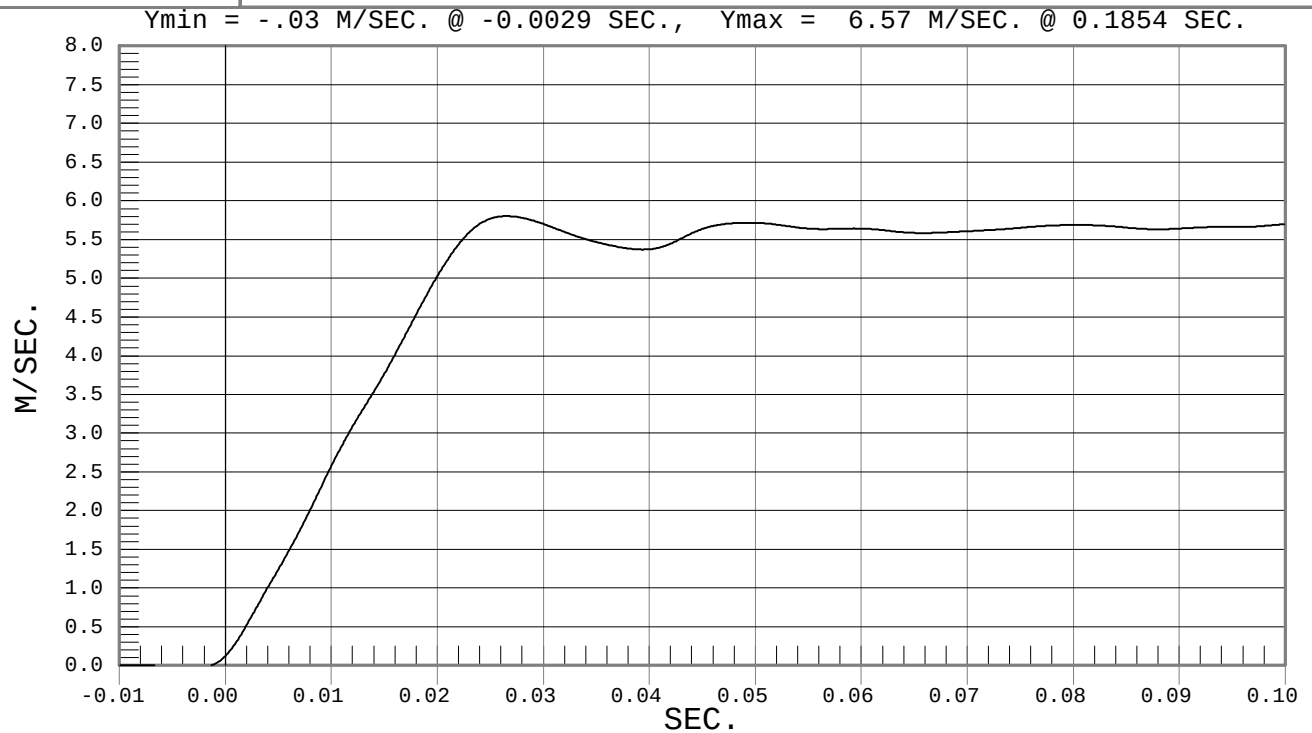
Approved By: David Winkelbauer



PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #056

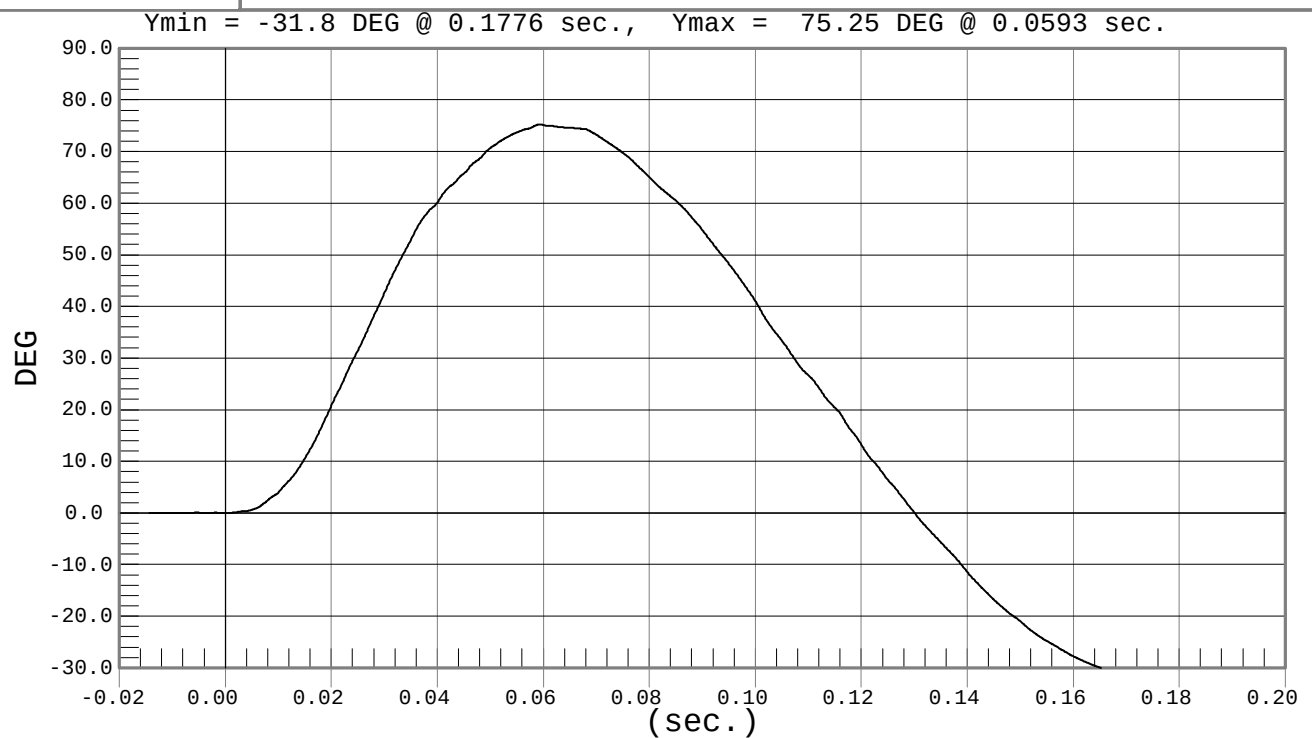
Test Date: 06-15-05
Speed: 18.4 fps, 5.62 M/s



FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #056

Test Date: 06-15-05
Speed: 18.4 fps, 5.62 M/s



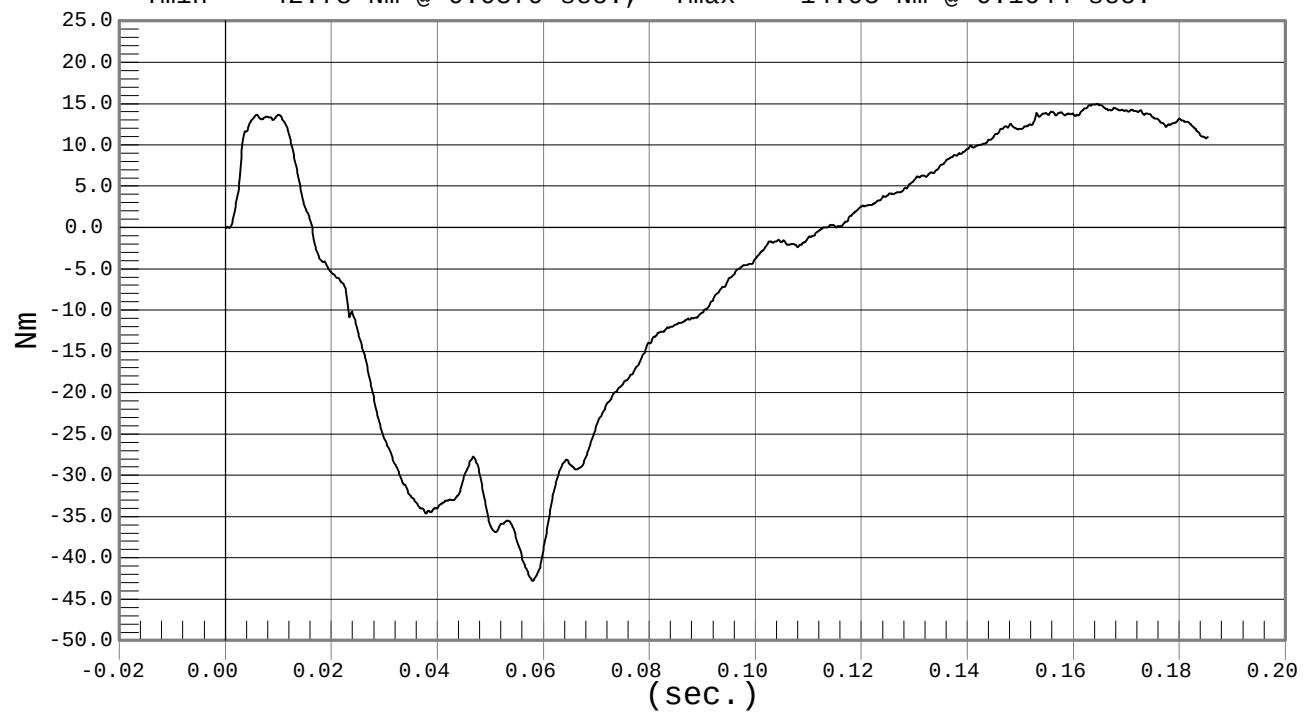


Test Desc.: Neck Bending
Component: Dummy #056

OCCIPITAL MOMENT

Test Date: 06-15-05
Speed: 18.4 fps, 5.62 M/s

Ymin = -42.78 Nm @ 0.0579 sec., Ymax = 14.95 Nm @ 0.1644 sec.



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

Date: 6/15/5
Dummy Serial Number: 056
Test Number: D051643

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	22.0
Humidity	10% - 70%	44
Impact Velocity	4.41 - 4.59 m/s	4.51
Maximum Probe Force	1.6 - 2.4 kN	2.3
Shoulder Displacement	27 - 39 mm	32

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

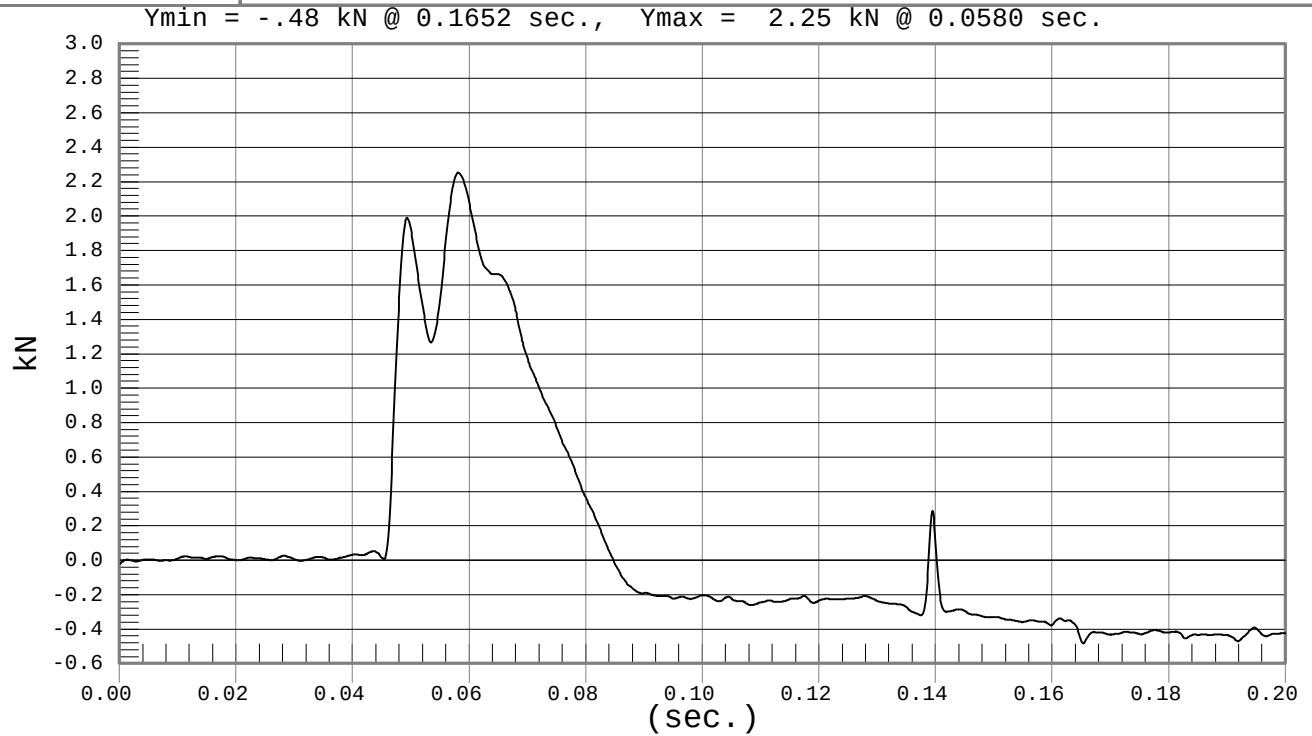
Approved By: David Winkelbauer



PROBE FORCE

Test Desc.: Shoulder Impact
Component: Dummy #056

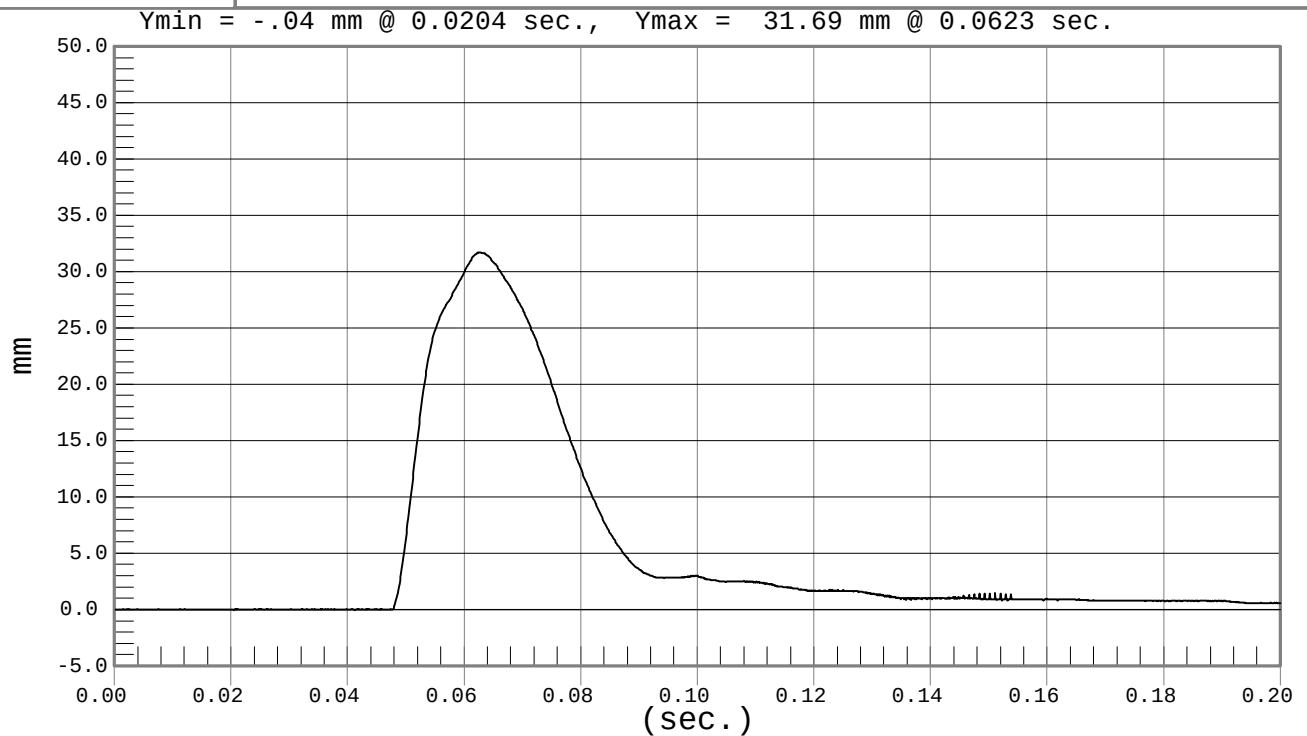
Test Date: 06-15-05
Speed: 14.8 fps, 4.51 M/s



SHOULDER DISPLACEMENT

Test Desc.: Shoulder Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.51 M/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051644

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.3
Humidity	10% - 70%	39
Impact Velocity	6.57 - 6.84 m/s	6.75
Peak Probe Force	4.1 – 4.7 kN	4.5
Shoulder Displacement	30 - 42 mm	34
Upper Rib Displacement	23 - 35 mm	27
Middle Rib Displacement	29 - 44 mm	31
Lower Rib Displacement	33 - 40 mm	34
Upper Spine (T1) Y Acceleration	34 – 48 g's	39
Lower Spine (T12) Y Acceleration	30 - 38 g's	30

TEST MEETS SPECIFICATIONS

Technician: Jessica Gall

Approved By: David Winkelbauer

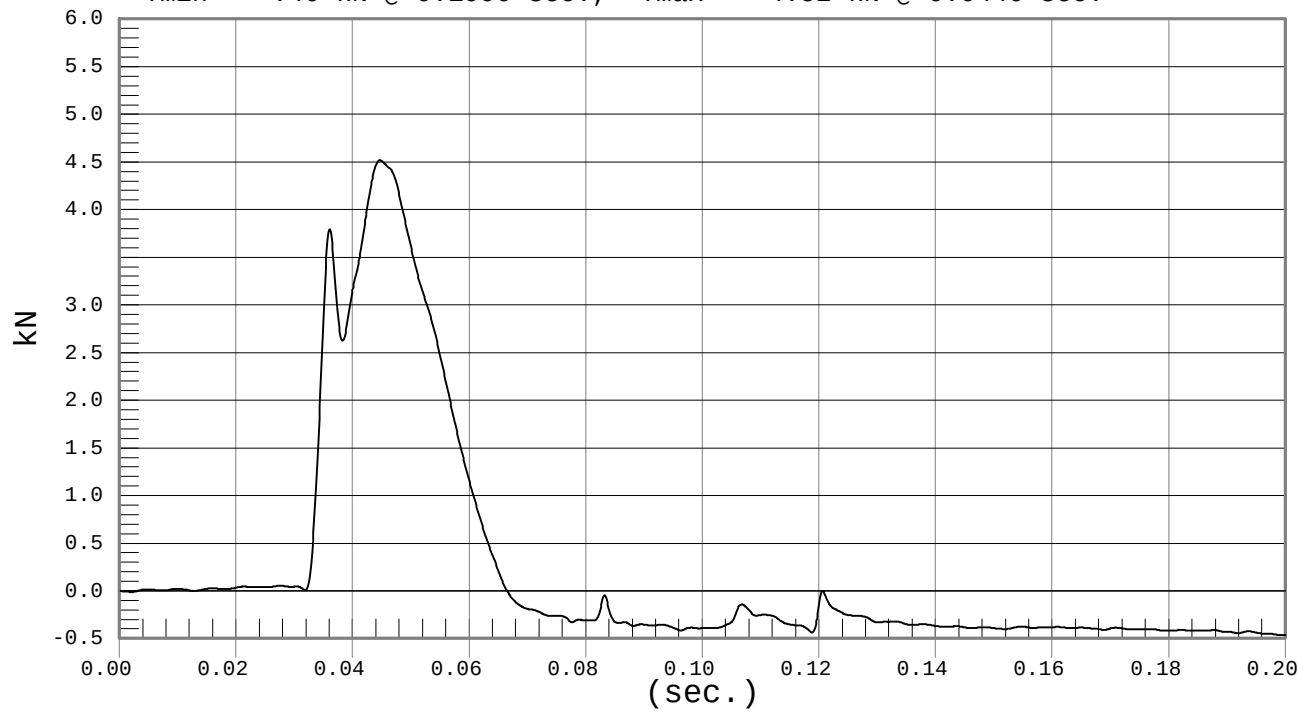


PROBE FORCE

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -.46 kN @ 0.1990 sec., Ymax = 4.52 kN @ 0.0446 sec.



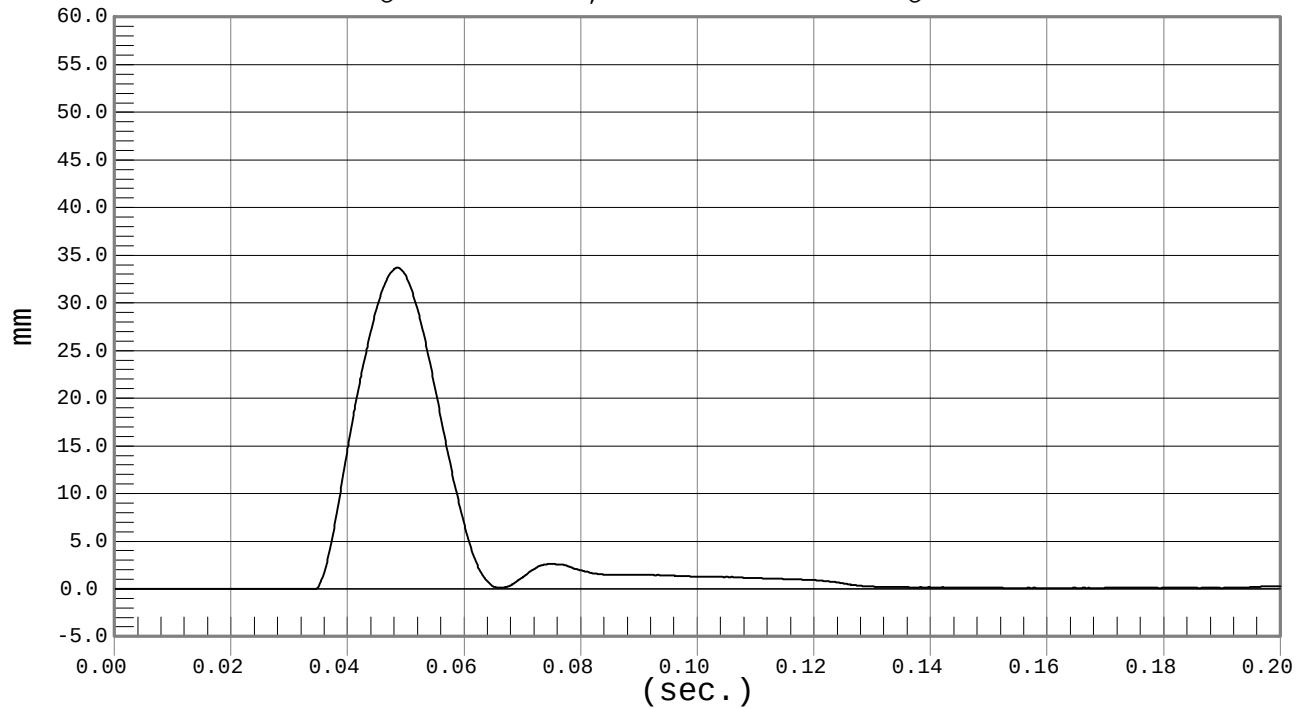


SHOULDER DISPLACEMENT

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -.02 mm @ 0.0343 sec., Ymax = 33.69 mm @ 0.0484 sec.

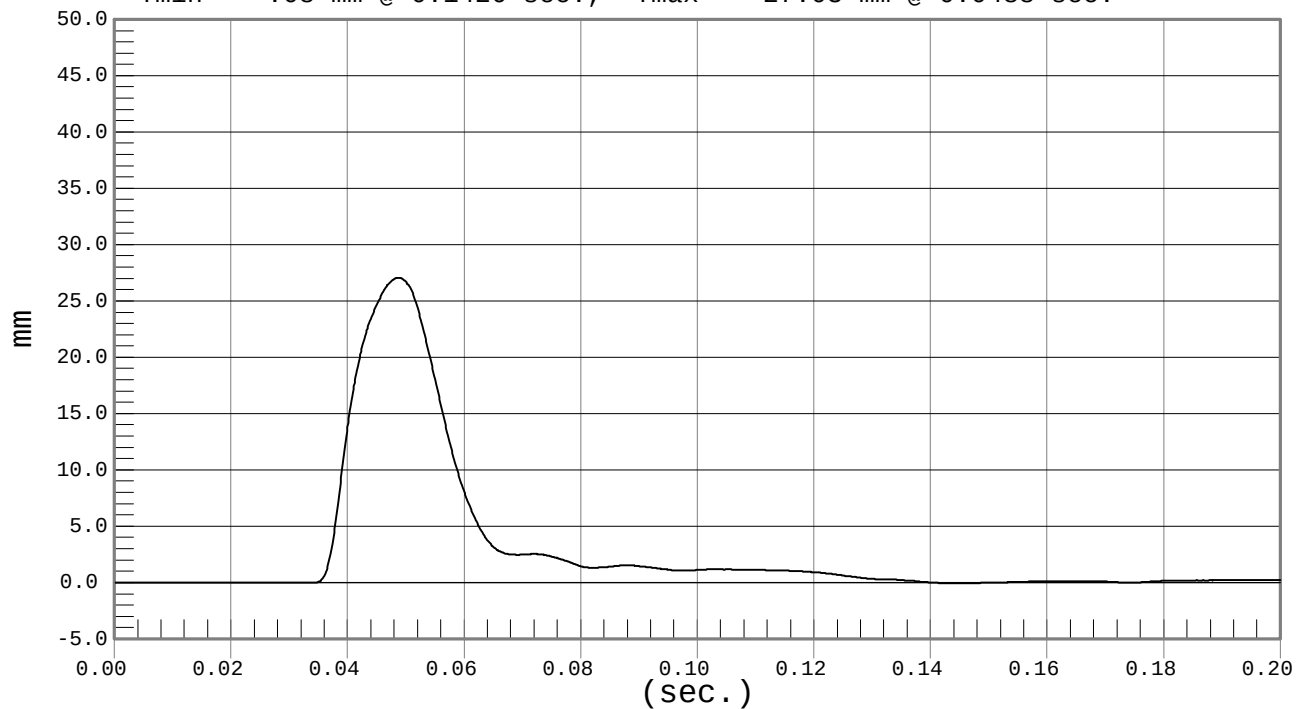


UPPER RIB DISPLACEMENT

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -.08 mm @ 0.1426 sec., Ymax = 27.03 mm @ 0.0488 sec.



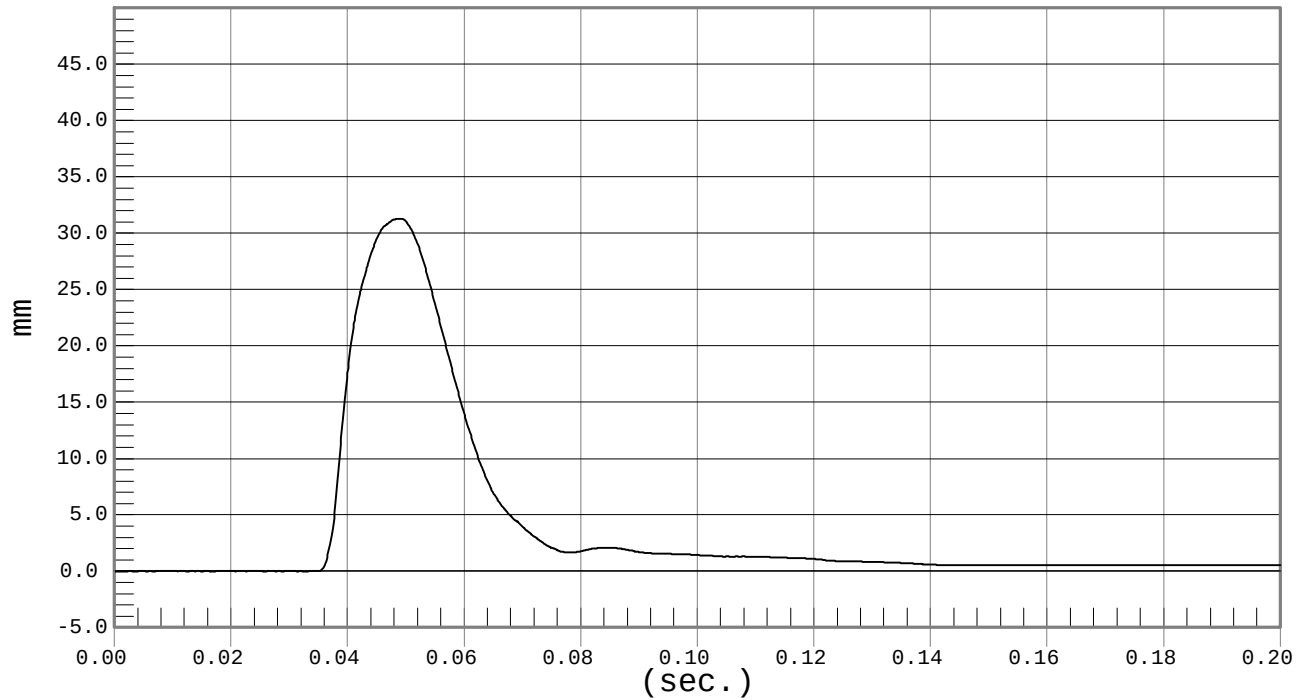


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = 0 mm @ 0.0066 sec., Ymax = 31.29 mm @ 0.0490 sec.

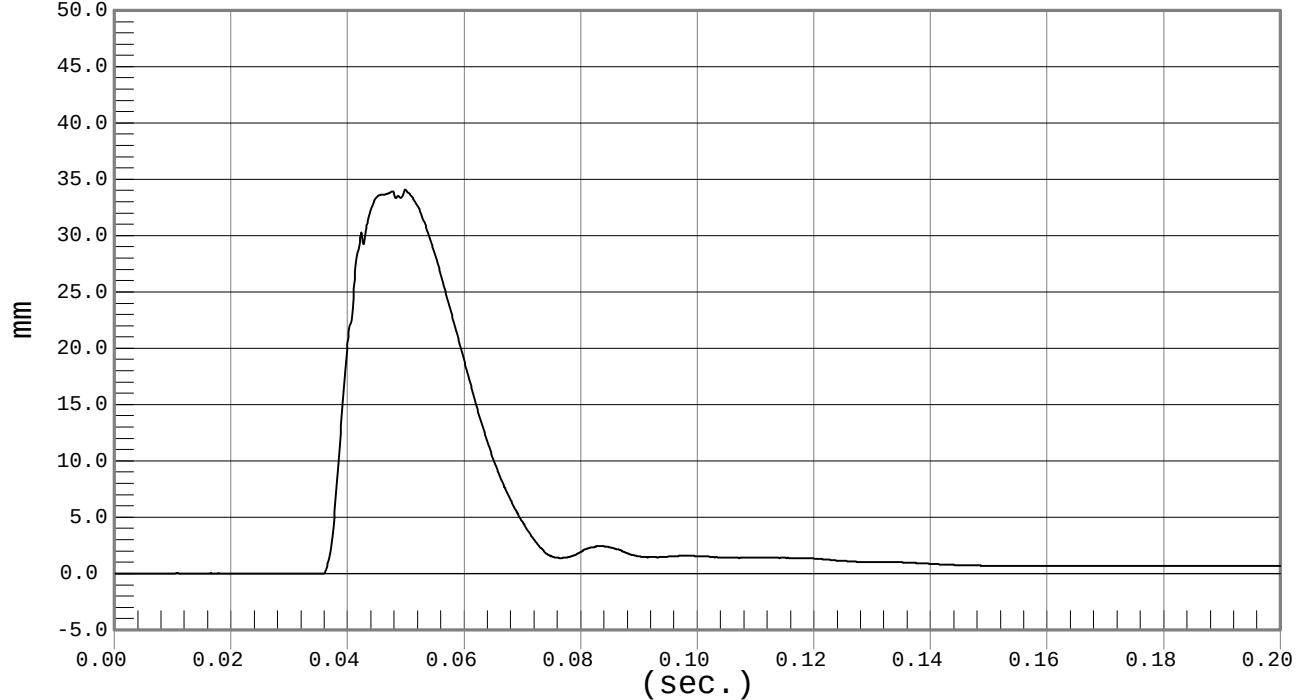


LOWER RIB DISPLACEMENT

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -.02 mm @ 0.0357 sec., Ymax = 34.08 mm @ 0.0498 sec.



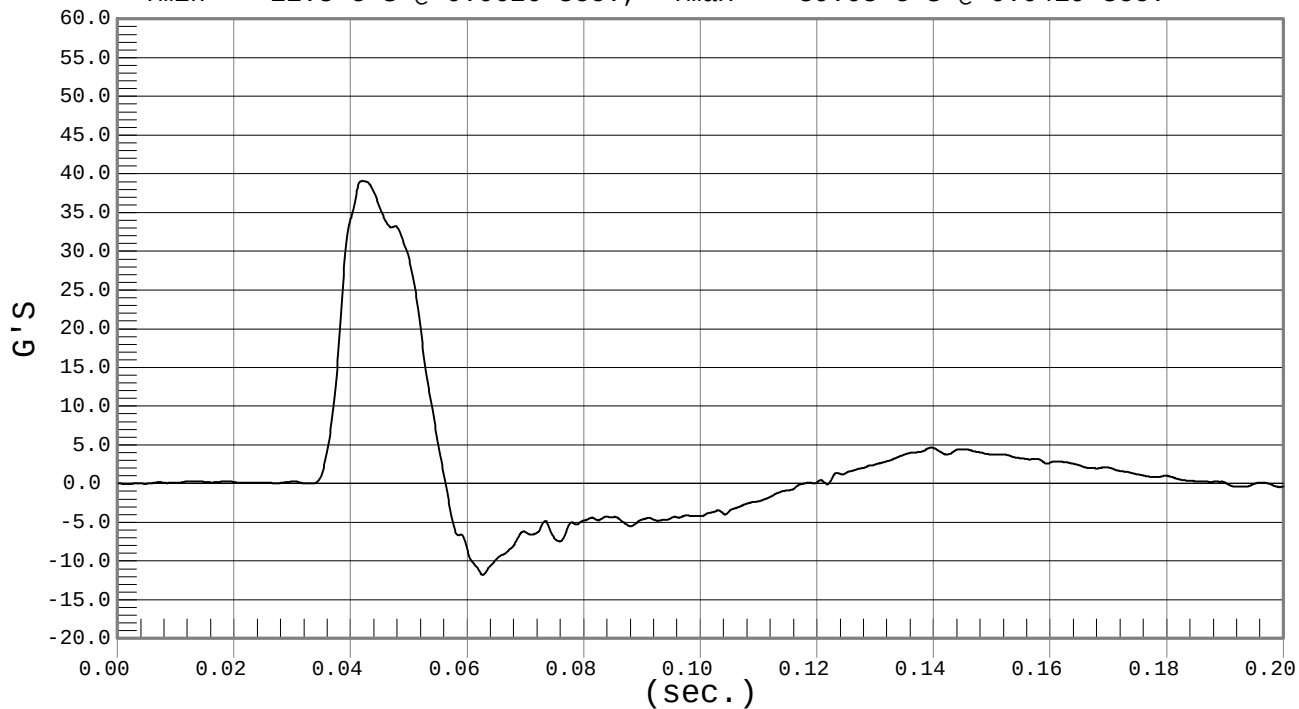


UPPER SPINE ACCELERATION

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -11.8 G'S @ 0.0626 sec., Ymax = 39.08 G'S @ 0.0419 sec.

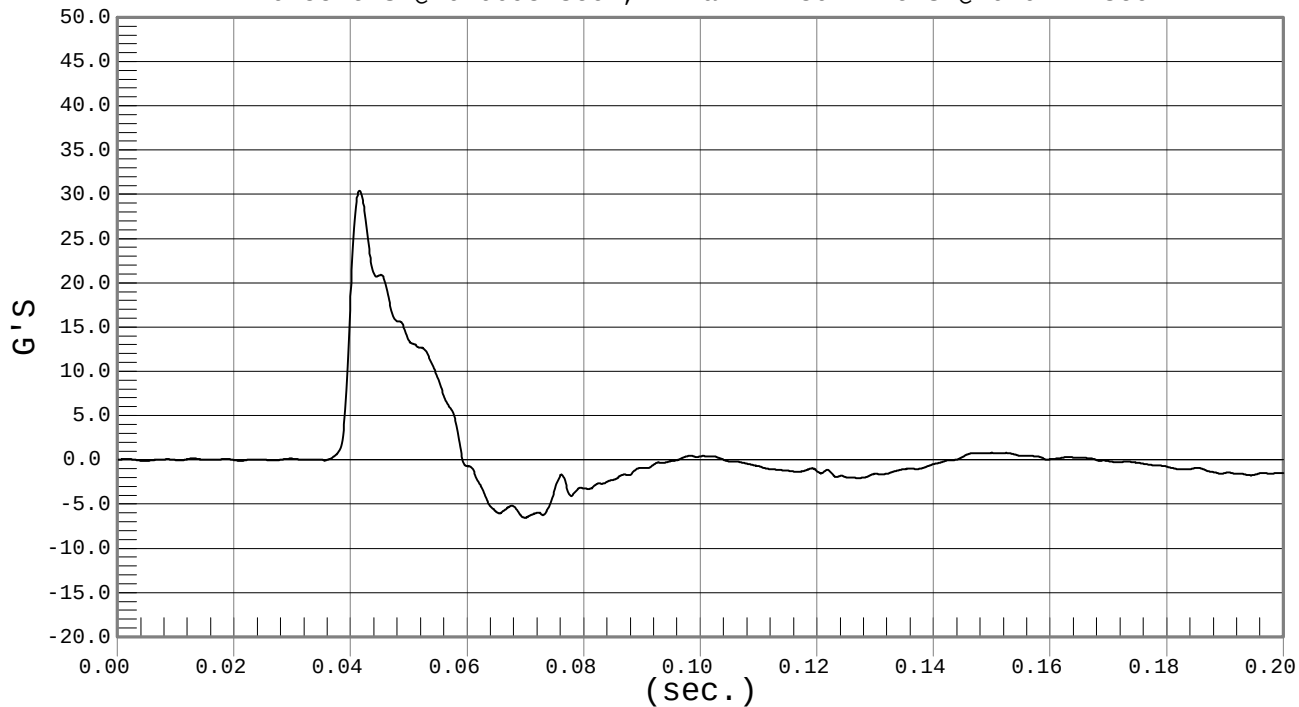


LOWER SPINE ACCELERATION

Test Desc.: Thorax with Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 22.1 fps, 6.75 M/s

Ymin = -6.55 G'S @ 0.0698 sec., Ymax = 30.42 G'S @ 0.0414 sec.



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051645

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.3
Humidity	10% - 70%	41
Impact Velocity	4.20 - 4.40 m/s	4.29
Peak Probe Force	1.8 - 2.3 kN	2.2
Upper Rib Displacement	32 - 41 mm	36
Middle Rib Displacement	40 - 51 mm	41
Lower Rib Displacement	34 - 47 mm	39
Upper Spine (T1) Acceleration	13 - 18 g's	15
Lower Spine (T12) Acceleration	8 – 13 g's	9

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

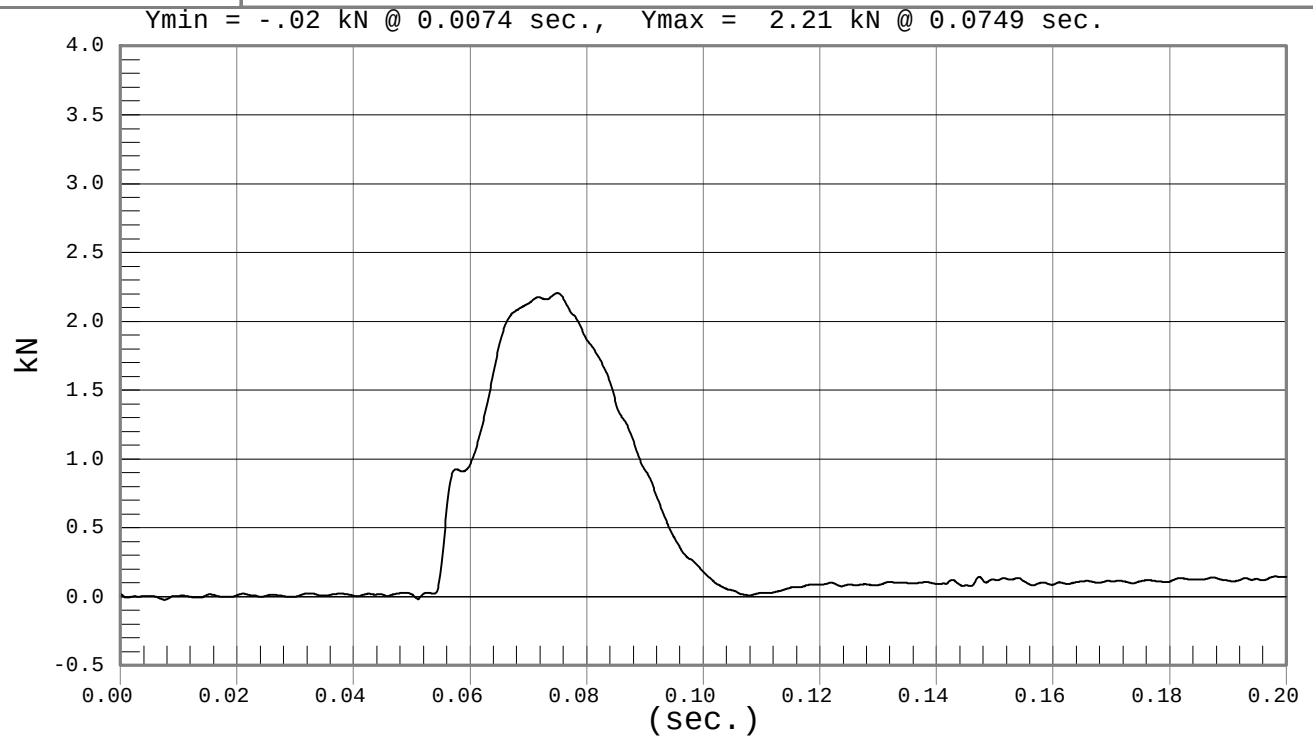
Approved By: David Winkelbauer



PROBE FORCE

Test Desc.: Thorax without Arm
Component: Dummy #056

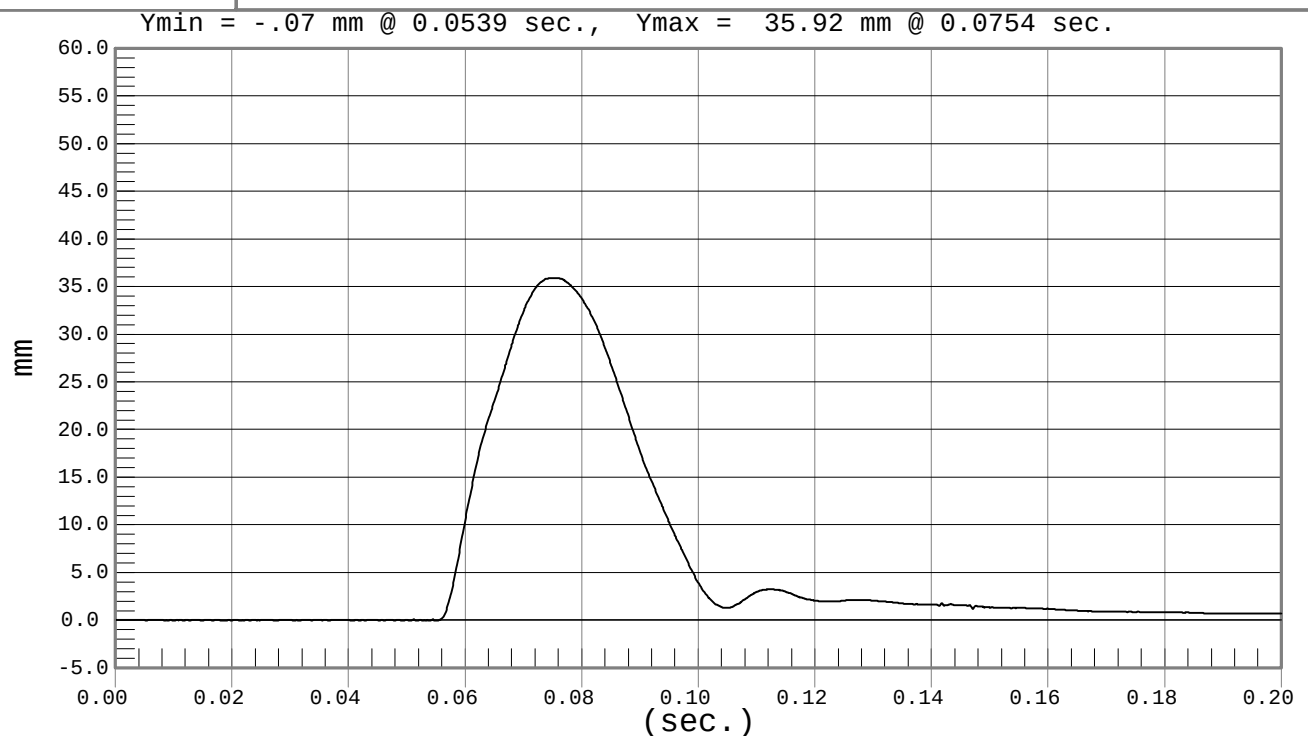
Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s



UPPER RIB DISPLACEMENT

Test Desc.: Thorax without Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s



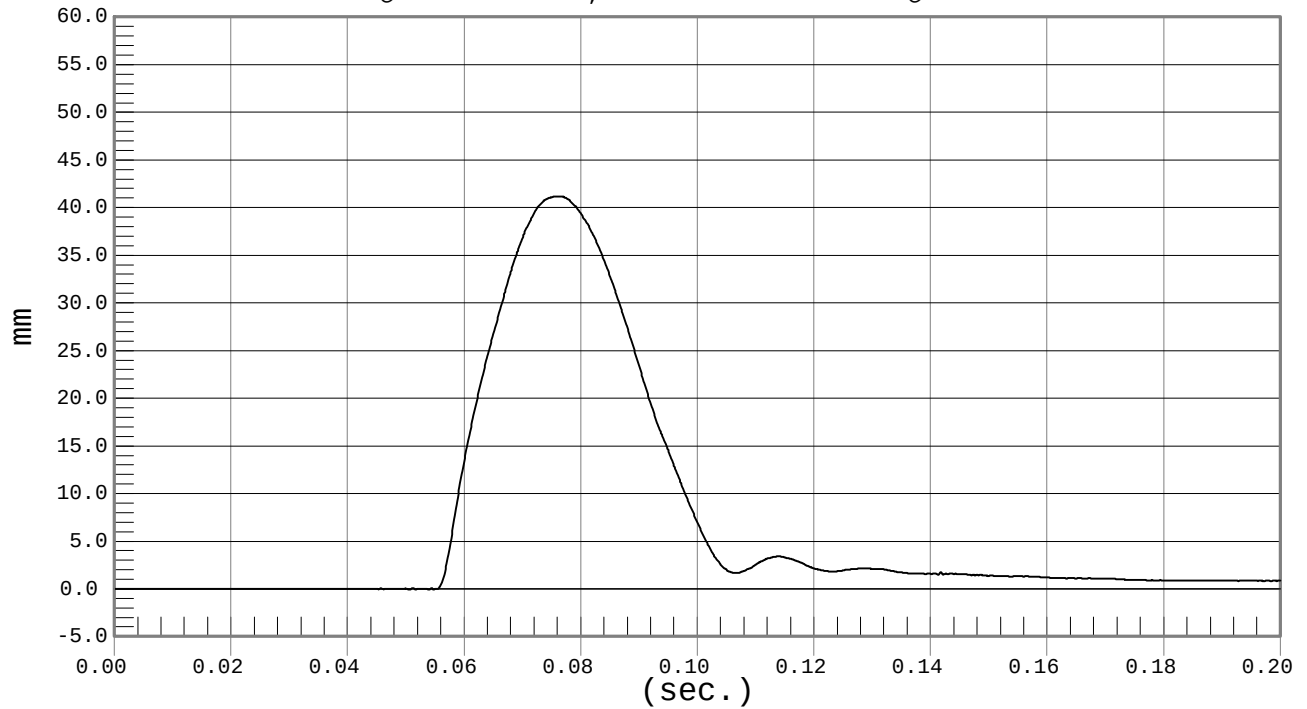


MIDDLE RIB DISPLACEMENT

Test Desc.: Thorax without Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s

Ymin = -.08 mm @ 0.0505 sec., Ymax = 41.18 mm @ 0.0761 sec.

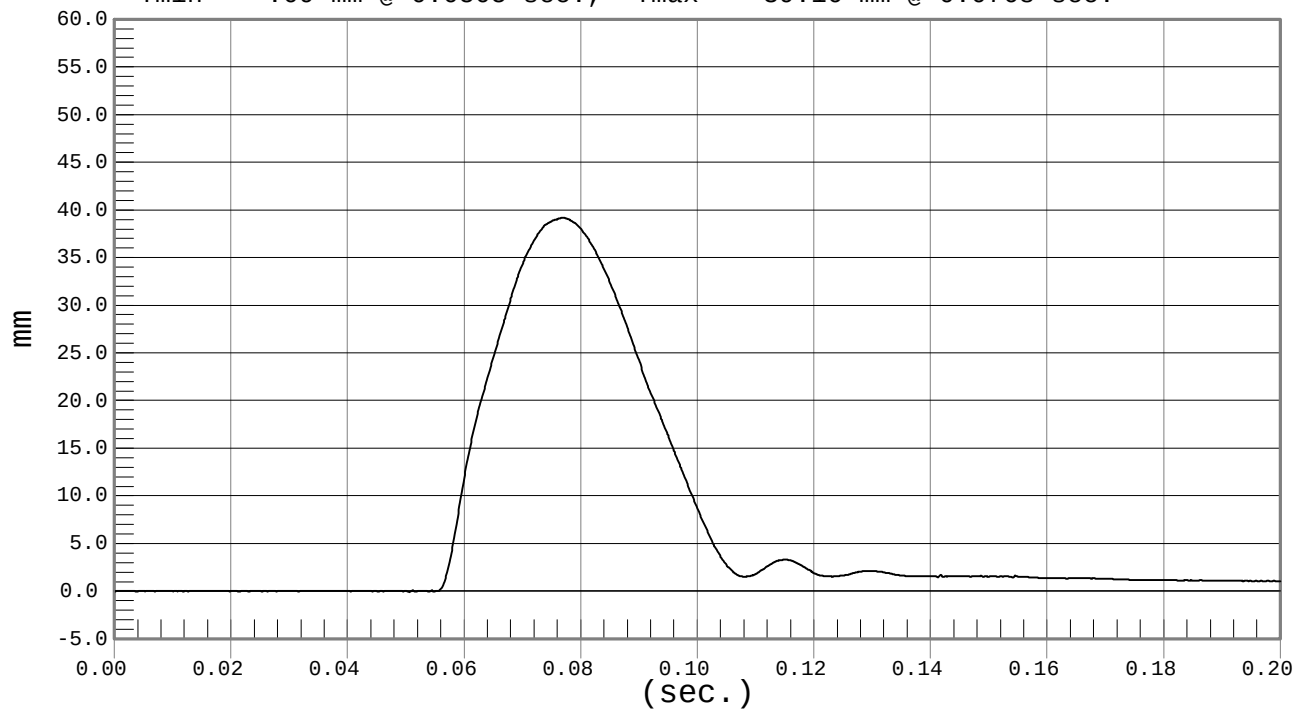


LOWER RIB DISPLACEMENT

Test Desc.: Thorax without Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s

Ymin = -.09 mm @ 0.0505 sec., Ymax = 39.16 mm @ 0.0768 sec.



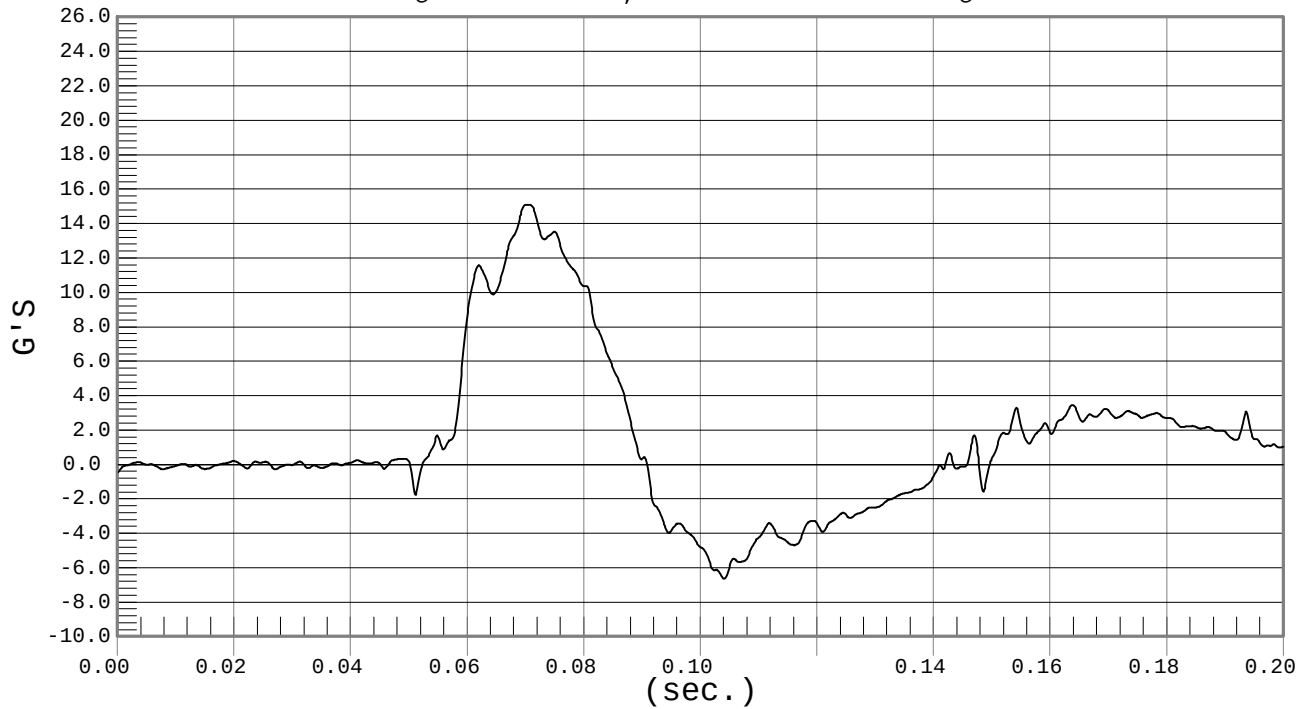


UPPER SPINE ACCELERATION

Test Desc.: Thorax without Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s

Ymin = -6.66 G'S @ 0.1040 sec., Ymax = 15.09 G'S @ 0.0706 sec.

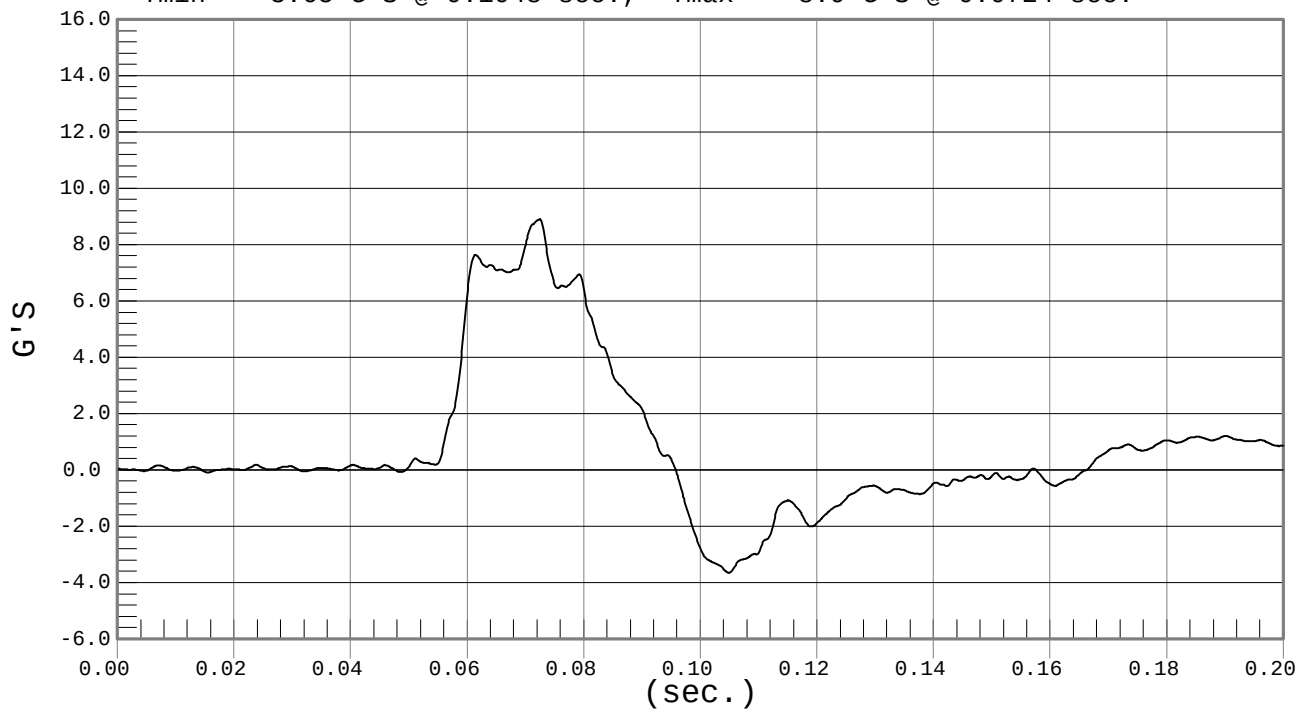


LOWER SPINE ACCELERATION

Test Desc.: Thorax without Arm
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.1 fps, 4.29 M/s

Ymin = -3.65 G'S @ 0.1048 sec., Ymax = 8.9 G'S @ 0.0724 sec.



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051646

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	21.3
Humidity	10% - 70%	43
Impact Velocity	4.41 - 4.59 m/s	4.50
Probe Force	1.3 - 1.9 kN	1.9
Upper Rib Displacement	44 - 55 mm	40
Lower Rib Displacement	44 - 56 mm	39
Upper Spine (T1) Y Acceleration	5 - 9 g's	8
Lower Spine (T12) Y Acceleration	9 - 13 g's	13

TEST MEETS SPECIFICATIONS

Technician: _____

Jessica Gall

Approved By: _____

David Winkelbauer

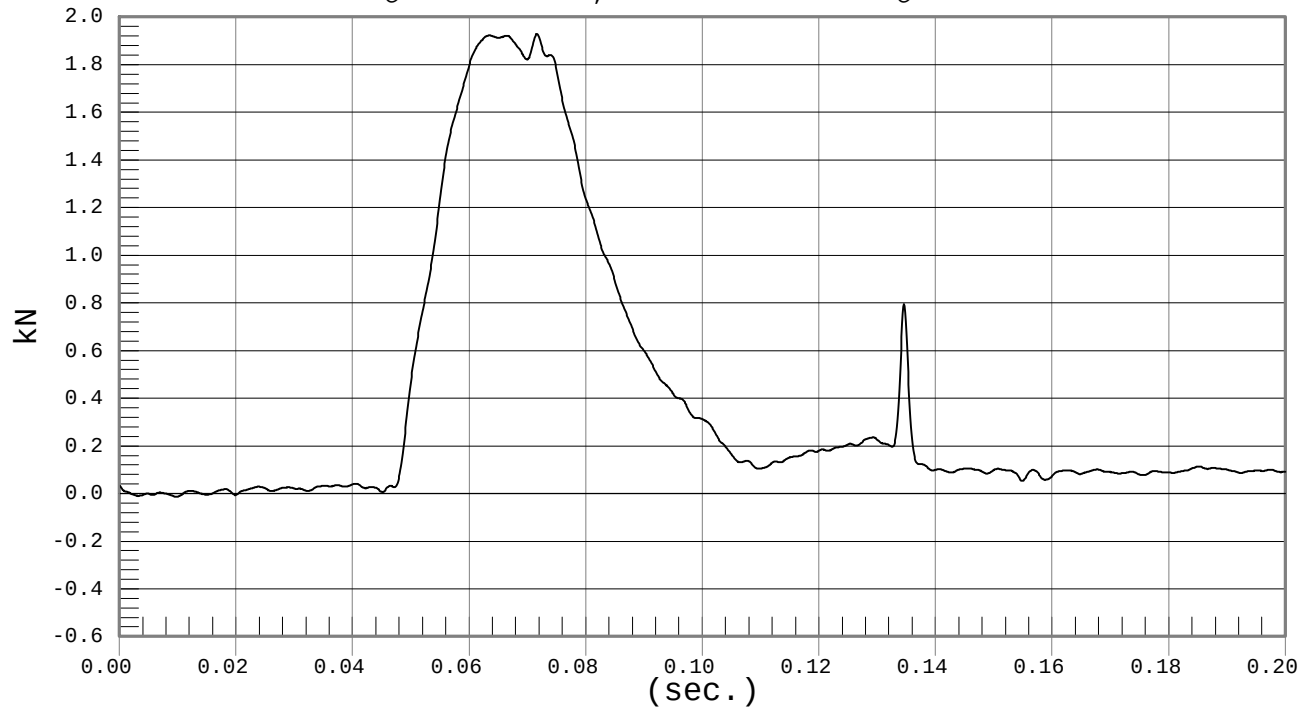


PROBE FORCE

Test Desc.: Abdomen Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.50 M/s

Ymin = -.01 kN @ 0.0097 sec., Ymax = 1.93 kN @ 0.0715 sec.



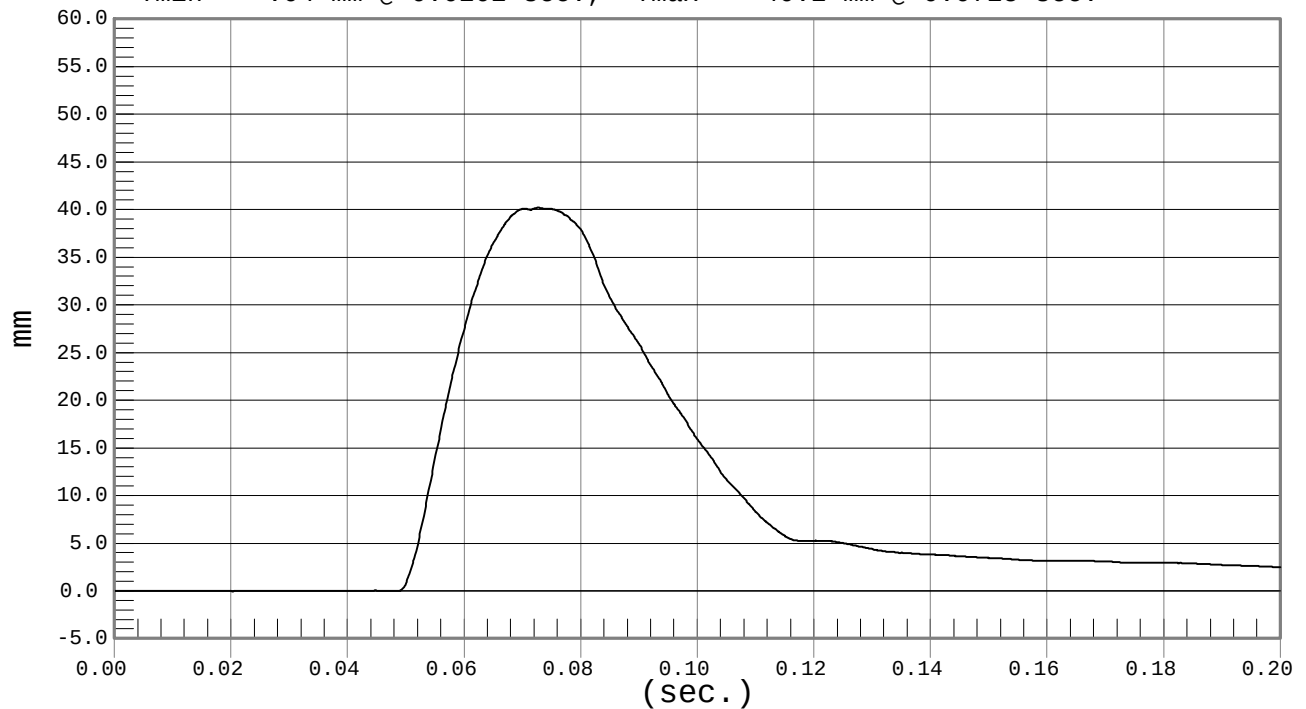


UPPER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.50 M/s

Ymin = -.04 mm @ 0.0202 sec., Ymax = 40.2 mm @ 0.0725 sec.

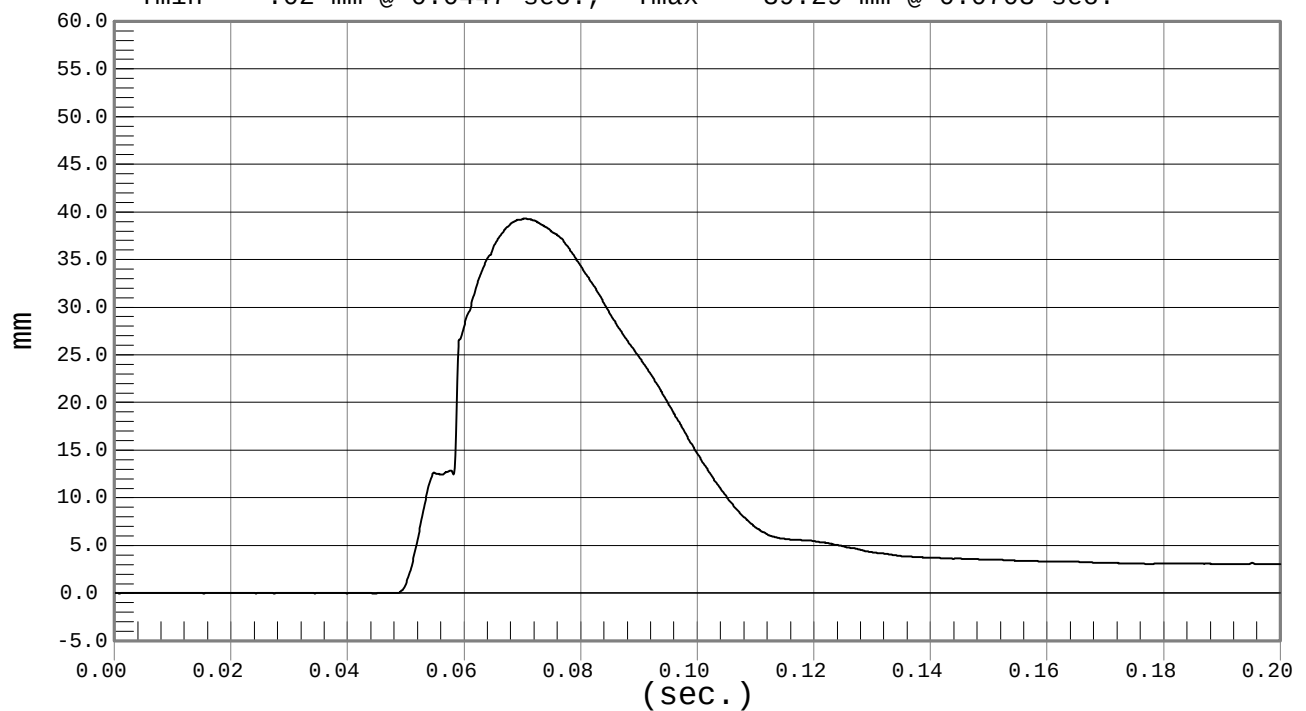


LOWER RIB DISPLACEMENT

Test Desc.: Abdomen Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.50 M/s

Ymin = -.02 mm @ 0.0447 sec., Ymax = 39.29 mm @ 0.0703 sec.



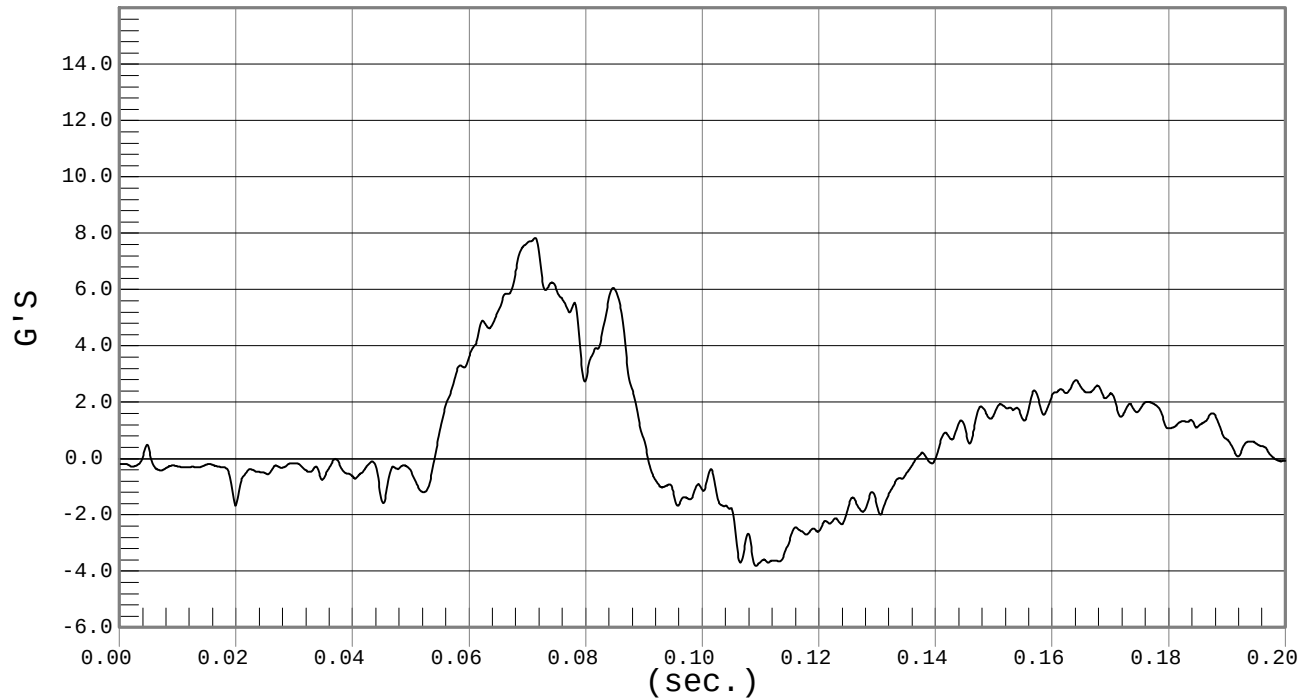


UPPER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.50 M/s

Ymin = -3.81 G'S @ 0.1091 sec., Ymax = 7.84 G'S @ 0.0713 sec.

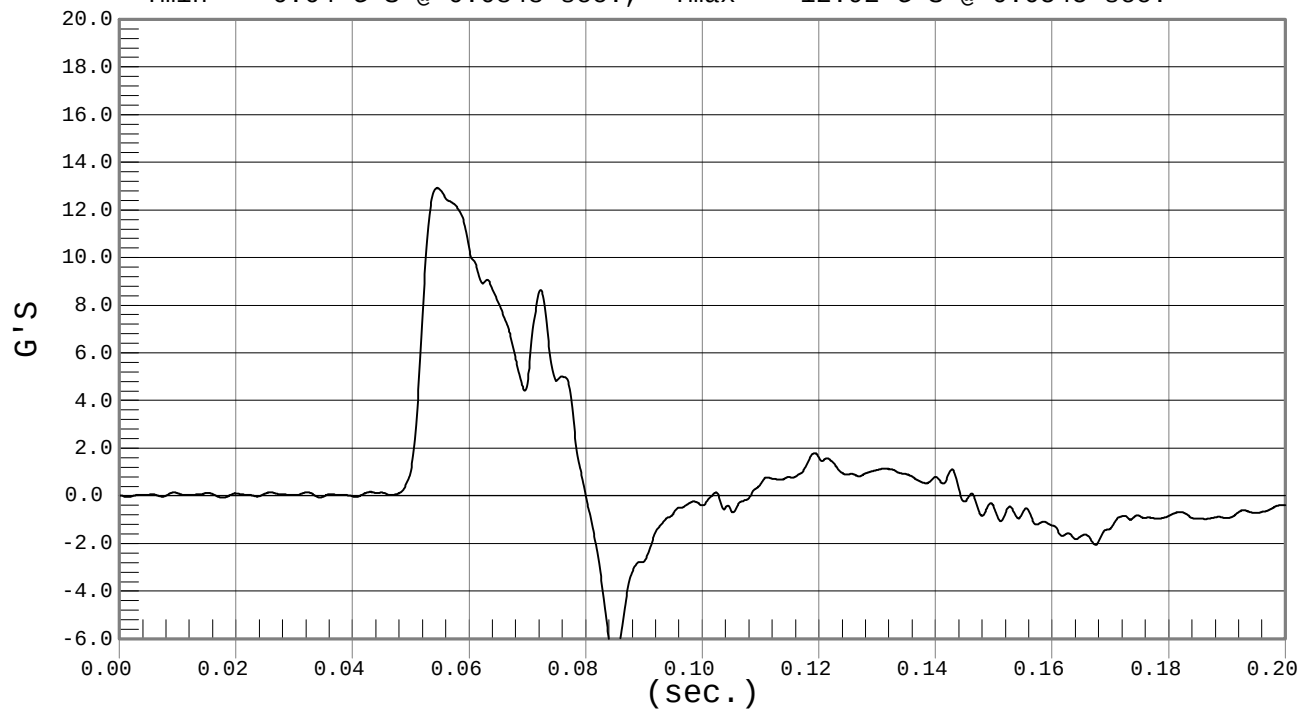


LOWER SPINE ACCELERATION

Test Desc.: Abdomen Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 14.8 fps, 4.50 M/s

Ymin = -6.64 G'S @ 0.0848 sec., Ymax = 12.92 G'S @ 0.0545 sec.



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

Date: 6/15/05
Dummy Serial Number: 056
Test Number: D051647

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	20.6° – 22.2°	210
Humidity	10% - 70%	41
Impact Velocity	6.60 - 6.80 m/s	6.68
Peak Impactor Acceleration	40 – 48 g's	40
Pelvis Y Acceleration	40 – 48 g's	48
Peak Pelvis Acetabulum Force	3803 – 4505 N	3970

TEST MEETS SPECIFICATIONS

Technician: Jessica Hall

Approved By: David Winkelbauer

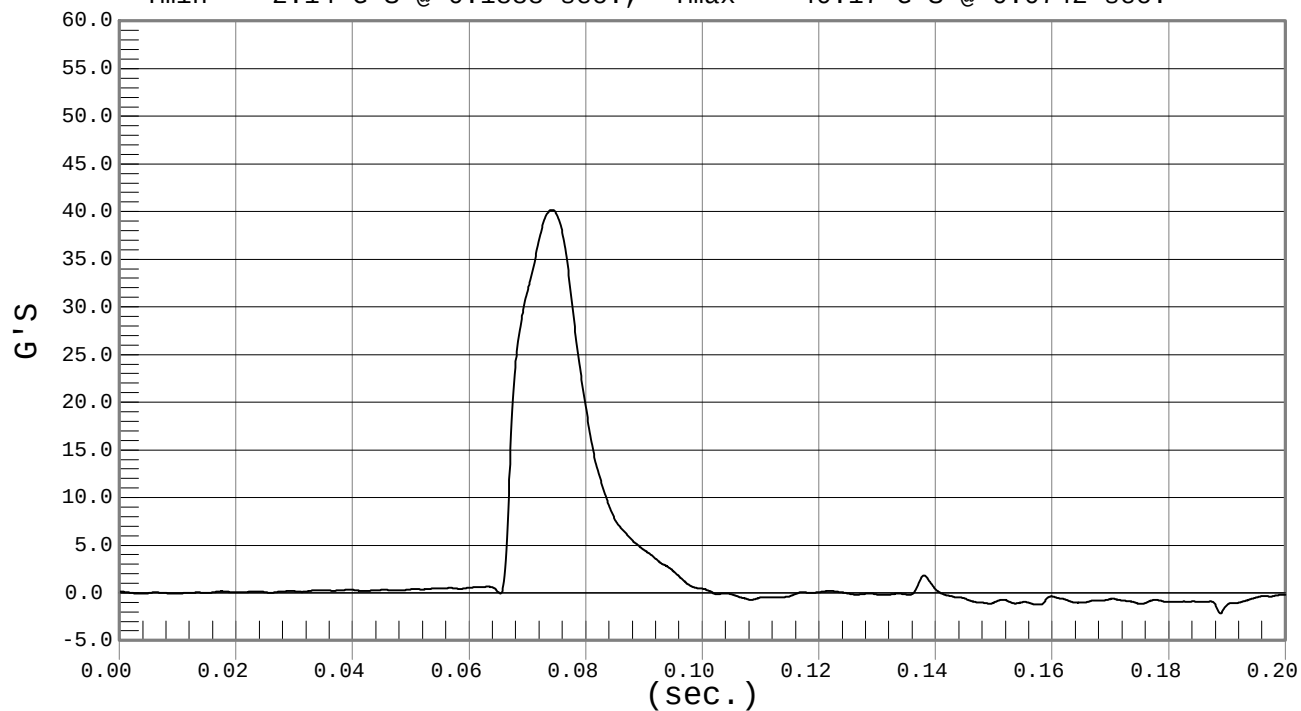


IMPACTOR ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -2.14 G'S @ 0.1888 sec., Ymax = 40.17 G'S @ 0.0742 sec.

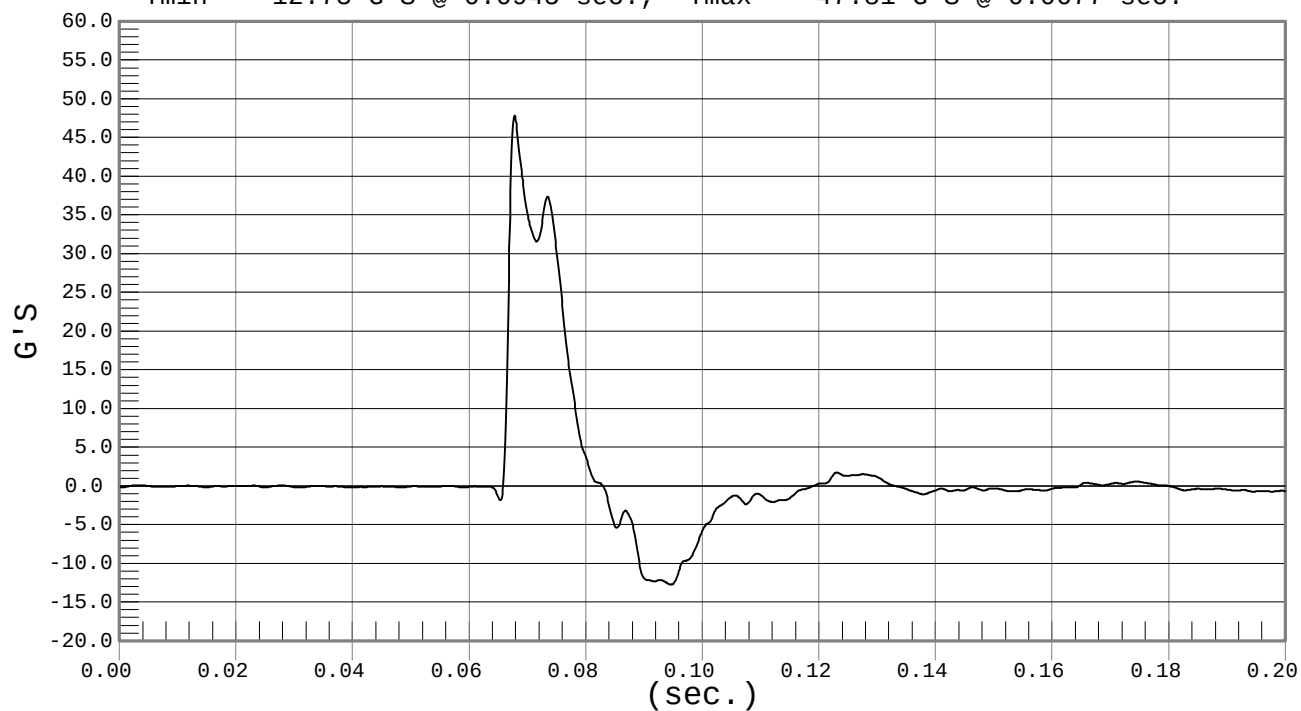


PELVIS ACCELERATION

Test Desc.: Pelvis Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -12.73 G'S @ 0.0945 sec., Ymax = 47.81 G'S @ 0.0677 sec.



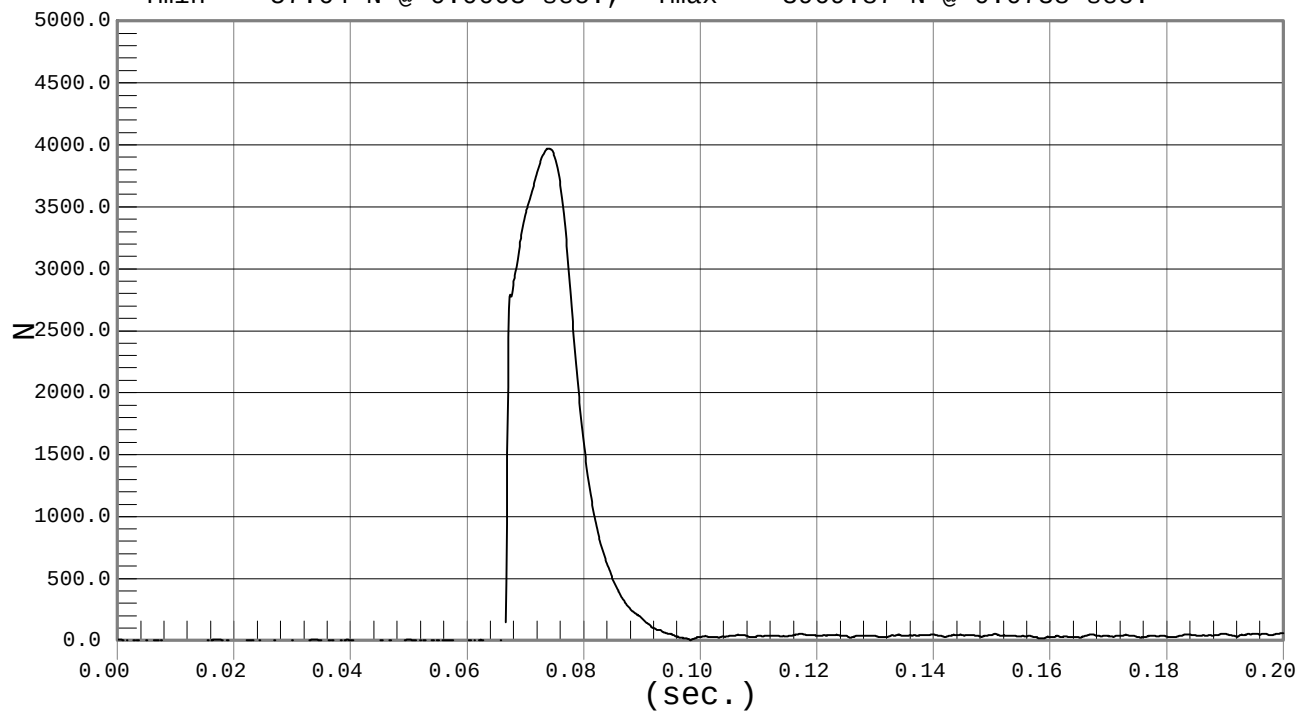


ACETABULUM FORCE

Test Desc.: Pelvis Impact
Component: Dummy #056

Test Date: 06-15-05
Speed: 21.9 fps, 6.68 M/s

Ymin = -57.64 N @ 0.0663 sec., Ymax = 3969.87 N @ 0.0738 sec.



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY SID IIS: 056		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	J13547	Endevco	3/02/05
Head Y Accelerometer	ALFJ7	Endevco	3/02/05
Head Z Accelerometer	APYN0	Endevco	3/02/05
Head X Redundant	AJ9H0	Endevco	3/02/05
Head Y Redundant	APYN3	Endevco	3/02/05
Head Z Redundant	J13710	Endevco	3/02/05
Upper Neck Load Cell	283	FTSS	5/03/05
Upper Arm X	B05-J15	Entran	3/11/05
Upper Arm Y	J13642	Endevco	3/11/05
Upper Arm Z	ALCH7	Endevco	3/11/05
Shoulder DY	056SHLD	Servo	5/24/05
Shoulder Force Load Cell	142	FTSS	5/13/05
Upper Thorax Rib DY	056RIB1	Servo	5/24/05
Mid Thorax Rib DY	056RIB2	Servo	5/24/05
Lower Thorax Rib Y	056RIB3	Servo	5/24/05
Upper Abdominal Rib DY	056RIB4	Servo	5/24/05
Lower Abdominal Rib DY	056RIB5	Servo	2/28/05
Upper Spine X	ALDD6	Endevco	3/11/05
Upper Spine Y	AGT18	Endevco	3/11/05
Upper Spine Z	J20392	Endevco	3/11/05
Lower Spine X	P22454	Endevco	3/29/05
Lower Spine Y	A27-Z07	Entran	3/15/05
Lower Spine Z	A27-Z19	Entran	3/15/05
Left Acetabulum FY	ACG102FY	FTSS	5/02/05
Left Ilium Crest FY	IWG101FY	FTSS	5/02/05
Pelvis X Accelerometer	J13713	Endevco	3/15/05
Pelvis Y Accelerometer	J13653	Endevco	3/15/05
Pelvis Z Accelerometer	J13649	Endevco	3/15/05
Lumbar Load Cell	101	FTSS	5/03/05

VEHICLE INSTRUMENTS CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Lower A-Post Y	B28-Z09	Entran	3/17/05
Left Mid A-Post Y	C04-L16	Entran	3/24/05
Left Lower B-Post Y	C10-Z03	Entran	3/31/05
Left Mid B-Post Y	C04-L14	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
Driver Seat Track Y	C06-L09	Entran	3/24/05
Right Front Sill X	C21-G24	Entran	4/22/05
Right Front Sill Y	D03-Z31	Entran	4/22/05
Right Front Sill Z	D03-Z17	Entran	4/22/05
Left Rear Sill Y	C21-G10	Entran	4/28/05
Left Front Sill Y	E01-F13	Entran	4/28/05
Vehicle CG X	D03-Z20	Entran	4/22/05
Vehicle CG Y	D03-Z26	Entran	4/22/05
Vehicle CG Z	D04-Z01	Entran	4/22/05
Left Front Door @ Pelvis	C06-L12	Entran	3/24/05
Left Front Door @ Arm	A08-M10	Entran	3/24/05
Left Front Door @ Knee	K20-J09	Entran	3/09/05
Left Front Door @ Mid Rib	C06-L14	Entran	3/24/05
Left A-Post @ Sill Y	C06-L11	Entran	3/24/05
Left B-Post @ Sill Y	C21-G12	Entran	4/28/05
Upper Engine X	B26-Z12	Entran	3/17/05
Upper Engine Y	B26-Z02	Entran	3/17/05
Firewall Y	C04-L15	Entran	3/24/05

APPENDIX E
DUMMY PEAK RESPONSES

DRIVER (SIDIIS) PEAK RESPONSE TABLE

Location	Peak Response				
				2005 Subaru Forester 6/10/2005	
	Class	Axis	Units	Peak	Time
Head	1000	X	G	-29.3	61
	1000	Y	G	28.7	57
	1000	Z	G	23.2	39
	1000	RES	G	40	61
HIC 15				122.7	
t1					53.9
t2					68.9
HIC 36				160.4	
t1					38
t2					74
Upper Neck Force	1000	X	N	-606	64
	1000	Y	N	346	35
	1000	Z	N	782	39
	1000	RES	N	887	40
Upper Neck Moment	600	X	Nm	*	*
	600	Y	Nm	-35.2	63
	600	Z	Nm	16.3	68
	600	RES	Nm	40	44

* No valid data collected after 100 msec

Location	Peak Response				
				2005 Subaru Forester 6/10/2005	
	Class	Axis	Units	Peak	Time
Shoulder Force	600	X	N	870	25
	600	Y	N	2372	26
	600	Z	N	356	26
Upper Spine	180	X	G	-31.4	37
	180	Y	G	46.9	39
	180	Z	G	-9.7	56
	180	Res	G	47	29
Lower Spine	180	X	G	-18.6	32
	180	Y	G	51.7	50
	180	Z	G	-19.2	55
	180	Res	G	54.6	50
Upper Arm	180	X	G	94.8	24
	180	Y	G	237.5	25
	180	X	G	78.8	40
	180	Res	G	253.2	24
Upper Thorax Rib*	180	Y	G		
Mid Thorax Rib*	180	Y	G		
Lower Thorax Rib*	180	Y	G		
Upper Abdominal Rib*	180	Y	G		
Lower Abdominal Rib*	180	Y	G		

* No Data Collected

Location	Peak Response				
				2005 Subaru Forester 6/10/2005	
	Class	Axis	Units	Peak	Time
Shoulder Deflection	180	Y	mm	-43.2	33
Upper Thorax Rib Deflection	180	Y	mm	-31.1	34
Middle Thorax Rib Deflection	180	Y	mm	-25	34
Lower Thorax Rib Deflection	180	Y	mm	-19.5	54
Upper Abdominal Rib Deflection	180	Y	mm	-28.1	54
Lower Abdominal Rib Deflection	180	Y	mm	-44.5	49
Shoulder Deflection Rate	180	Y	m/s	-7.6	27
Upper Thorax Rib Deflection Rate	180	Y	m/s	-5.5	30
Mid Thorax Rib Deflection Rate	180	Y	m/s	-10	33
Lower Thorax Rib Deflection Rate	180	Y	m/s	-4.1	26
Upper Abdominal Rib Deflection Rate	180	Y	m/s	-8.9	42
Lower Abdominal Rib Deflection Rate	180	Y	m/s	-9	39
Left Acetabulum Force	600	Y	N	3421	43
Left Ilium Crest Force	600	Y	N	1317	45
Sum of Acetabulum and Ilium Crest	600	Y	N	4707	44

Location	Peak Response				
				2005 Subaru Forester 6/10/2005	
	Class	Axis	Units	Peak	Time
Right Femur Force*	600	X	N		
	600	Y	N		
	600	Z	N		
	600	RES	N		
Right Femur Moment*	600	X	Nm		
	600	Y	Nm		
	600	Z	Nm		
	600	RES	Nm		
Left Femur Force*	600	X	N		
	600	Y	N		
	600	Z	N		
	600	RES	N		
Left Femur Moment*	600	X	Nm		
	600	Y	Nm		
	600	Z	Nm		
	600	RES	Nm		
Pelvis	1000	X	G	-8.3	30
	1000	Y	G	61.1	42
	1000	Z	G	-.5	60

* No Data Collected

Location	Peak Response				
				2005 Subaru Forester 6/10/2005	
	Class	Axis	Units	Peak	Time
AR (Arm to Door)			mm	125	
HP (H-Point to Door)			mm	132	
HR (Head to Roof)			mm	342	
HS (Head to Side)			mm	245	
Vehicle Weight			kg	1546.6	
Impact Speed			kph	32	
Impact Point Forward			mm	10	