

REPORT NUMBER: 214P-MGA-2012-001

**SAFETY COMPLIANCE TESTING FOR FMVSS 214
DYNAMIC SIDE IMPACT PROTECTION
RIGID POLE**

**GENERAL MOTORS LLC
2012 CHEVROLET VOLT 5-DR HATCHBACK
NHTSA NUMBER: CC0102**

**PREPARED BY:
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BURLINGTON, WI 53105**



Test Date: December 22, 2011

Report Date: January 3, 2012

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Accepted by: _____

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16. Abstract A 32 km/h (20 mph), 75° oblique impact compliance test was conducted on the subject 2012 Chevrolet Volt 5-Dr Hatchback in accordance with the specifications of the Office of Vehicle Safety Compliance TP-214P-01 for the determination of FMVSS No. 214 Side Impact Protection compliance. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on December 22, 2011. The impact velocity was 32.0 km/h, and the ambient temperature at the struck (driver's) side of the test vehicle at the time of impact was 21.4°C. The test vehicle post-test maximum crush was 350 mm at level 3. The test vehicle's performance follows: <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="text-align: left;">Measurement Description</th> <th>Units</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td style="text-align: left;">Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>212</td> </tr> <tr> <td style="text-align: left;">Resultant Lower Spine Acceleration</td> <td>G</td> <td>40</td> </tr> <tr> <td style="text-align: left;">Combined Acetabular and Iliac Pelvic Force</td> <td>N</td> <td>2916</td> </tr> </tbody> </table> The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite side doors did not open during the side impact event.				Measurement Description	Units	Result	Head Injury Criteria (HIC ₃₆)	N/A	212	Resultant Lower Spine Acceleration	G	40	Combined Acetabular and Iliac Pelvic Force	N	2916
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Combined Acetabular and Iliac Pelvic Force	N	2916													
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test is part of the MY 2012 FMVSS 214 Side Impact Protection Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-07-D-00062. The purpose of this test was to evaluate side impact protection in a 2012 Chevrolet Volt 5-Dr Hatchback. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-214P-01, dated January 2010).

SUMMARY

A rigid pole side impact test was conducted on a 2012 Chevrolet Volt 5-Dr Hatchback. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.0 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin, on December 22, 2011. Pre-test and post-test photographs of the test vehicle and side impact dummy are included in Appendix A of this report.

One Part 572V dummy was placed in the left front outboard designated seating position according to instructions specified in TP-214P-01, dated January 2010. The side impact event was documented by eleven (11) cameras.

The SID-II's female dummy was instrumented with a triaxial accelerometer pack located in the head, 5 rib displacement transducers located in the thorax and abdomen, triaxial accelerometer pack located in the lower spine, a Iliac load cell, and an acetabulum load cell.

A summary of the test results follows:

DUMMY INJURY VALUES

Dummy	HIC (36ms)	Resultant Lower Spine Acceleration (G)	Pelvic Force (N)	
SID-IIs 5 th Percentile Feale	212	40	Iliac Wing	1295
			Acetabular	1624
			Sum	2916

GENERAL COMMENTS

There was no valid data collected for:
Left Floor Sill Y after 10 msec.
Left Lower A-Post Y after 10 msec.
Left Mid A-Post Y after 40 msec.
Left Mid B-Post Y after 10 msec.
Driver Seat Track Y after 15 msec.

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

SECTION 2
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1

TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
Test Program: FMVSS 214 Pole

NHTSA No. CC0102
Test Date: 12/22/2011

VEHICLE INFORMATION	
Make	Chevrolet
Model	Volt
Body Style	5-Dr Hatchback
VIN	1G1RA6E46CU112777
Body Color	Summit White
Engine Displacement (L)	1.4
# of Cylinders	4
Engine Placement	Lateral
Transmission Type	Automatic
Transmission Speeds	1
Overdrive	No
Final Drive	Front
Odometer Reading	9 miles

OPTIONS	
ESC	Yes
All Wheel Drive	No
Power Steering	Yes
Tilt Steering Wheel	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso/Pelvis Airbag	Yes
Driver Knee Bag	Yes
Driver Seat Belt Pretensioners	Yes
Driver Seat Belt Load Limiters	Yes
Driver Power Seat	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Side Torso/Pelvis Airbag	No
Rear Pass. Seat Belt Pretensioners	No
Rear Pass. Seat Belt Load Limiters	No
Rear Pass. Power Seats	No
Power Windows	Yes
Air Conditioning	Yes
XM Radio	Yes
Automatic Door Locks (ADL)	Yes
Does owner's manual provide instructions to disable ADL's?	No
Anti-Lock Brakes	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC
Date of Manufacture	12/11

GVWR (kg)	2052
GAWR Front (kg)	1135
GAWR Rear (kg)	917

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	2		4
Capacity Weight (VCW) (kg)				340
Cargo Weight (RCLW) (kg)				68

DATA SHEET NO. 2**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2012 Chevrolet Volt 5-Dr HatchbackNHTSA No. CC0102Test Program: FMVSS 214 PoleTest Date: 12/22/2011**TIRE PRESSURES**

	Units	LF	RF	RR	LR
As Delivered	kPa	260	260	260	260
As Tested	kPa	260	260	260	260

TEST VEHICLE WEIGHTS

	Units	As Delivered			Fully Loaded			As Tested		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	535.7	327.1		555.2	380.5		557.9	359.2	
Right	kg	507.6	326.1		512.6	367.9		533.5	358.8	
Ratio	%	61.5	38.5		58.8	41.2		60.3	39.7	
Totals	kg	1043.3	653.2	1696.5	1067.8	748.4	1816.2	1091.4	718.0	1809.4

TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

Measured Parameter	Units	Value
As Delivered Weight	kg	1696.5
Weight of 1 P572V ATD (SID-IIs) Dummy	kg	52.2
Rated Cargo/Luggage Weight (RCLW)	kg	68
Calculated Target Vehicle Test Weight (TVTW)	kg	1816.7

TEST VEHICLE ATTITUDES

	Units	LF	RF	RR	LR
Fully Loaded	mm	698	703	698	690
As Tested	mm	698	703	702	706
Difference	mm	0	0	-4	-16

CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE

Measurement Parameter	Units	Value
Test Vehicle Wheel Base	mm	2688
Vertical Impact Reference Line (Aft of Front Axle)	mm	1117

**WEIGHT of BALLAST and VEHICLE COMPONENTS
REMOVED TO MEET VEHICLE TEST WEIGHT**

Description of Component	Weight (kg)
Ballast	0
Right tail light, trunk plastic and lid, air pump, battery charger, front passenger floor mats, rear floor mats.	16.3

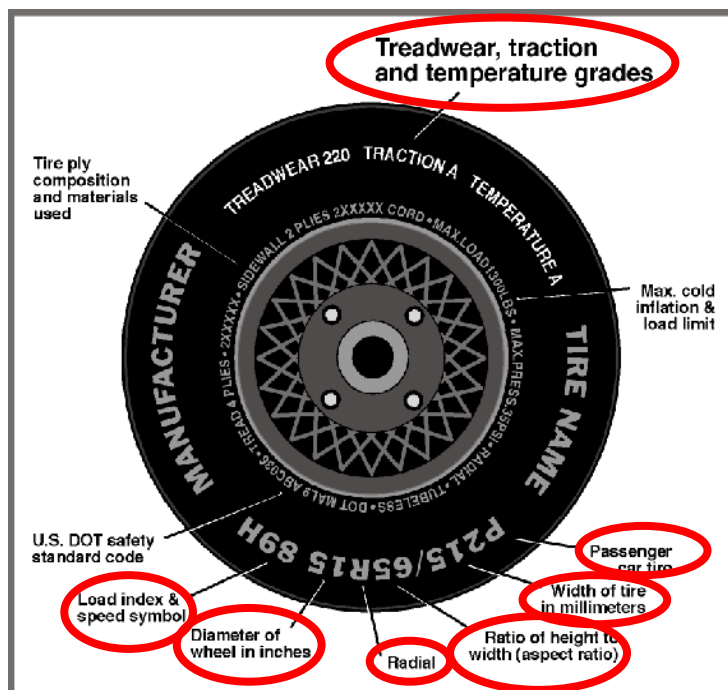
DATA SHEET NO. 3

VEHICLE TIRE INFORMATION

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	260	260
Recommended Tire Size	P215/55R17	P215/55R17
Tire Size on Vehicle	P215/55R17	P215/55R17
Tire Manufacturer	Goodyear	Goodyear
Tire Name	Assurance	Assurance
Tire Type	Passenger	Passenger
Tire Width	215	215
Aspect Ratio	55	55
Radial	Yes	Yes
Wheel Diameter	17	17
Load Index/Speed Symbol	94V	94V
Treadwear	580	580
Traction Grade	A	A
Temperature Grade	A	A

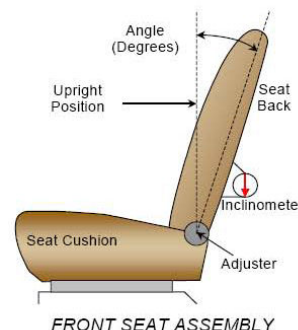
DATA SHEET NO. 4
SEAT AND SEAT BELT ADJUSTMENT DATA

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

NORMAL DESIGN RIDING POSITION

The driver seat was a manual adjustable seat with manual angle adjustment. The seat travel was set as specified in Appendix A of the TP dated January 2010. The right front passenger seat was set to match the driver seat. The rear passenger seats were fixed.



SEAT BACK ANGLE

	Degrees	Detents
Driver with Seated Dummy	-18.8° at headrest post	

SEAT FORE/AFT POSITION

The seat back was set as specified in Appendix A of the TP dated January 2010. For the front seats, the seat back angle measurement was made relative to the door sill on the headrest post.

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Front Seat	54 detents (1 st as 0)	0 mm (forward-most as 0)

SEAT BELT UPPER ANCHORAGE

The method of positioning the seat belt upper anchorage is as follows: Detents to the nominal design position are measured with respect to the uppermost detent. The seat belt upper anchorages were non-adjustable.

SEAT BELT UPPER ANCHORAGE

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	Fixed

HEADREST RESTRAINT

The headrest was placed in the full down position.

DATA SHEET NO. 5

FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

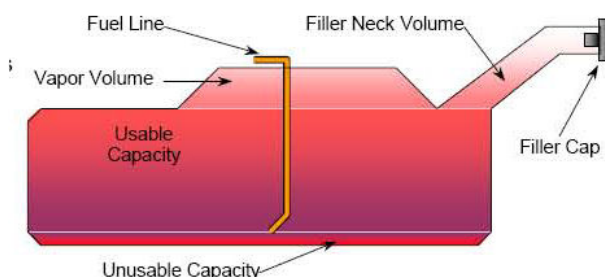
NHTSA No. CC0102
 Test Date: 12/22/2011

FUEL TANK CAPACITY

	Liters
Usable Capacity (Form 1)	35.2
Useable Capacity (Owner's Manual)	35.2
92-94% of Usable Capacity	32.4 to 33.1
Actual Amount of Solvent Used	32.7

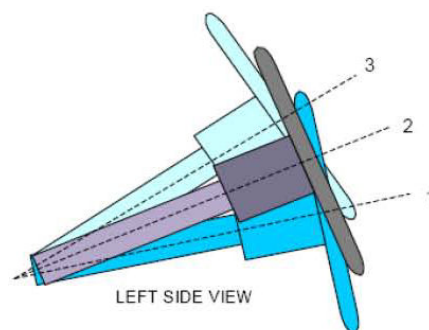
FUEL PUMP

Describe the fuel pump type, its behavior, and the location of the fuel filler pipe. The test vehicle is equipped with an electric fuel pump. Fuel pump will run when the gasoline generator is commanded to start. The fuel pipe is on the right side.



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



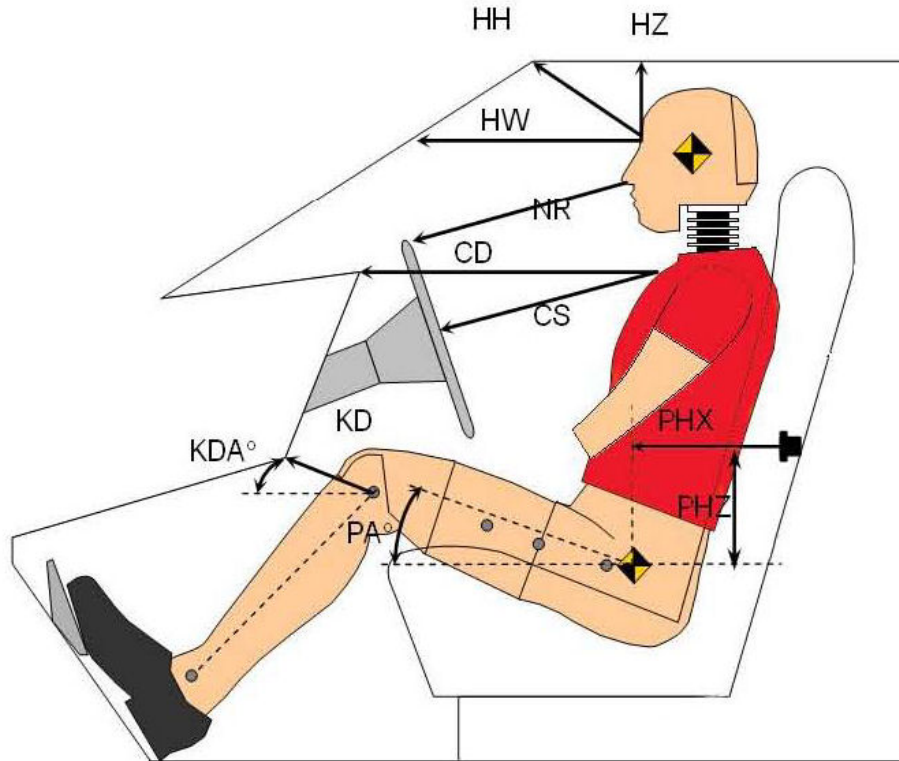
STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	70.2	220
Geometric Center – Position 2	68.2	193
Uppermost – Position 3	66.2	165
Telescoping Steering Wheel Travel		55
Test Position	68.2	193

.DATA SHEET NO. 6
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

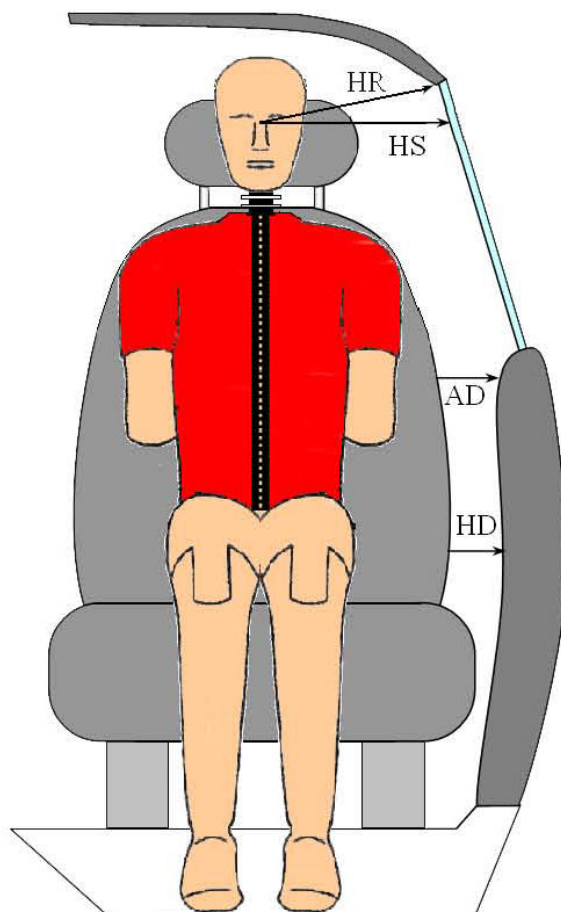


Driver Code	Measurement Description	Length (mm)	Angle (°)
HH	Head to Header	306	
HW	Head to Windshield	712	
HZ	Head to Roof	211	
NR	Nose to Rim	242	
CD	Chest to Dash	428	
CS	Chest to Steering Wheel	197	
KDL	Left Knee to Dash	164	29.5
KDR	Right Knee to Dash	165	24.1
PA	Pelvis Angle X		20.5
	Torso Angle Y		0.8
PHX	H-Point to Striker (X-Axis)	284	
PHZ	H-Point to Striker (Z-Axis)	147	

DATA SHEET NO. 7
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
Test Program: FMVSS 214 Pole

NHTSA No. CC0102
Test Date: 12/22/2011

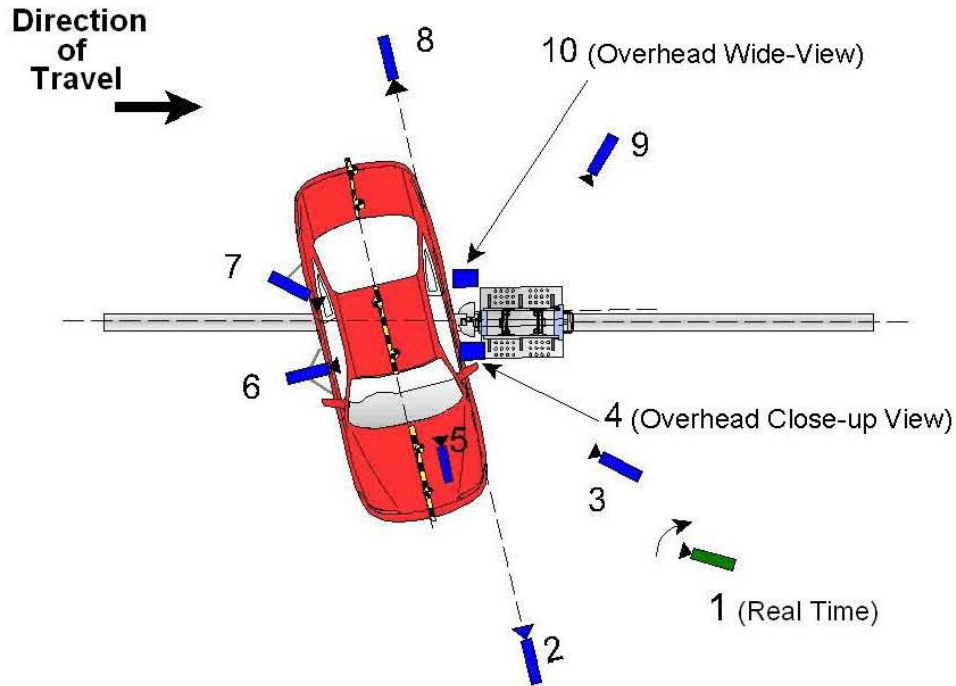


Code	Measurement Description	Units	Front Occupant
HR	Head to Side Header	mm	220
HS	Head to Side Window	mm	359
AD	Arm to Door	mm	165
HD	H-Point to Door	mm	160

DATA SHEET NO. 8
HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011



Reference: From Point of Impact for X and Y; from Ground for Z):
 +X = Right of Impact, + Y = Forward of Impact, +Z = Up

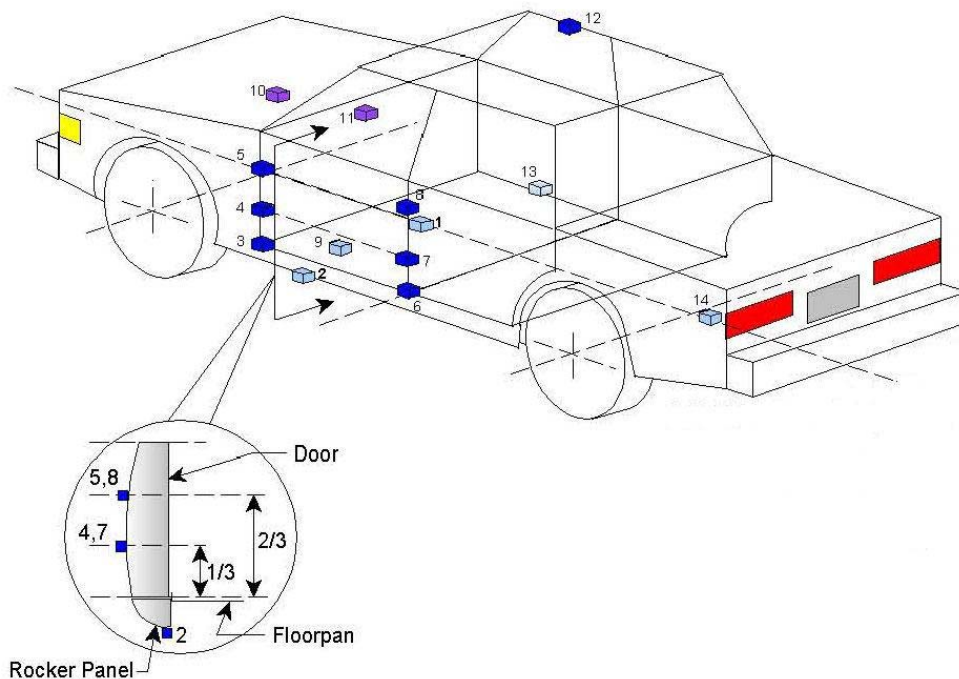
Camera No.	View	Coordinates (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Real-Time					30
2	Front Ground Level	5570	50	1760	24	1000
3	Impact Side 45° Forward	4270	2340	1930	20	1000
4	Overhead Closeup	0	-90	4520	50	1000
5	Onboard – Driver Front				16	1000
6	Onboard – Driver Side				8	1000
7	Onboard – Driver Rear				8	1000
8	Rear Ground Level	-5720	60	1720	24	1000
9	Impact Side 45° Rearward	-4270	3710	1840	20	1000
10	Overhead Wide	0	-290	4610	14	1000

DATA SHEET NO. 9

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011



Loc. No.	Accelerometer Location			
	ID	Coordinates (mm)		
		X	Y	Z
0	CG Rotation	2423	399	-155
1	Vehicle CG	2598	399	-152
2	Left Floor Sill	2561	-725	-185
3	A Pillar Sill	3033	-725	-180
4	A Pillar Low	2461	-686	-510
5	A Pillar Mid	2974	-815	-770
6	B Pillar Sill	1947	-725	-187
7	B Pillar Low	1842	-704	-453
8	B Pillar Mid	1842	-704	-708
9	Driver Seat Track	2006	-554	-290
10	Top of Engine	3659	74	-783
11	Firewall	3429	26	-896
12	Right Roof	2034	574	-1401
13	Right Sill	2024	725	-203
14	Floorpan @ Rear Axle	253	0	-367

Reference: X – Test Vehicle Rear Bumper (+ forward)
 Y – Test Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

DATA SHEET NO. 10
TEST VEHICLE ACCELEROMETER DATA SUMMARY

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

Loc. No.	Description	Peak Values (g's)			
		Max	Time (ms)	Min	Time (ms)
1	Vehicle CG (X)	3.3	99.3	-5.0	35.8
	Vehicle CG (Y)	18.6	33.1	-0.7	154.1
	Vehicle CG (Z)	3.5	47.0	-3.0	53.3
	Resultant	18.8	33.2		
2	Left Floor Sill (Y)	(1)	(1)	(1)	(1)
3	A Pillar Sill (Y)	23.7	26.0	-7.6	20.8
4	A Pillar Low (Y)	(1)	(1)	(1)	(1)
5	A Pillar Mid (Y)	(2)	(2)	(2)	(2)
6	B Pillar Sill (Y)	56.2	25.7	-32.9	39.1
7	B Pillar Low (Y)	80.5	16.2	-23.7	21.6
8	B Pillar Mid (Y)	(1)	(1)	(1)	(1)
9	Driver Seat Track (Y)	(3)	(3)	(3)	(3)
10	Top of Engine (X)	10.0	93.5	-10.6	49.0
	Top of Engine (Y)	2.3	208.9	-14.6	44.5
11	Firewall (Y)	15.0	35.0	-6.6	30.8
12	Right Roof (Y)	33.2	36.7	-6.4	28.7
13	Right Sill (Y)	20.7	32.9	-0.6	171.8
14	Floorpan @ Rear Axle (X)	4.6	104.3	-7.9	39.6
	Floorpan @ Rear Axle (Y)	25.8	48.5	-2.0	162.6

(1) No valid data collected after 10 msec.

(2) No valid data collected after 40 msec.

(3) No valid data collected after 15 msec.

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
Test Program: FMVSS 214 Pole

NHTSA No. CC0102
Test Date: 12/22/2011

Reference:	Positive Direction	-Longitudinal (X) = forward
		-Lateral (Y) = to right
		-Vertical (Z) = down

DATA SHEET NO. 12
POST TEST OBSERVATIONS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
Test Program: FMVSS 214 Pole

NHTSA No. CC0102
Test Date: 12/22/2011

TEST DUMMY INFORMATION AND CONTACT

Description	Front Occupant
Dummy Type / Serial No.	SID-IIs / 304
Head Contact	Curtain Airbag, Headrest, Door Panel
Upper Torso Contact	Side Airbag
Lower Torso Contact	Side Airbag
Left Knee Contact	None
Right Knee Contact	None

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Doors	Remained closed and jammed shut	Remained closed and jammed shut
Right Side Doors	Remained closed and operational	Remained closed and operational
Hatch and Other Doors		Remained closed and operational
Seat Movement	0	0
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Cracked
Window Damage	Left Front Window Broke
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Front Occupant	
	Installed	Operated
Frontal Airbag	Yes	No
Side Torso/Abdomen/Pelvis Airbag	Yes	Yes
Head Airbag	No	
Curtain Airbag	Yes	Yes
Knee Airbag	Yes	No
Seat Belt Pretensioner	Yes	Yes
Seat Belt Load Limiter	Yes	

DATA SHEET NO. 13

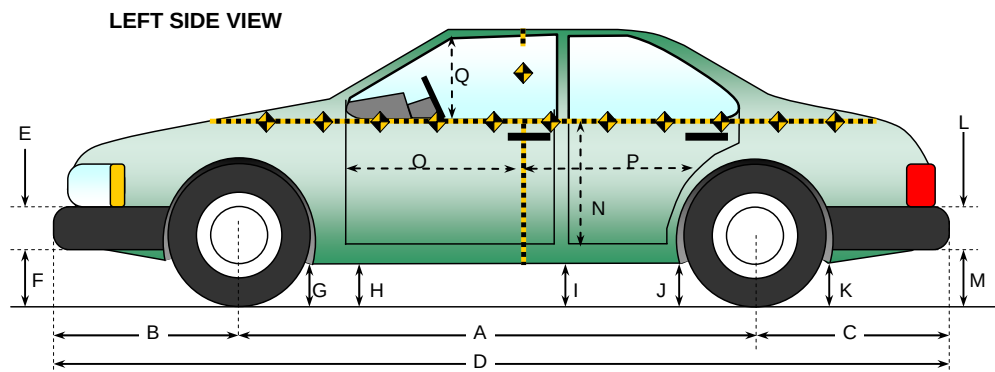
VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback

NHTSA No. CC0102

Test Program: FMVSS 214 Pole

Test Date: 12/22/2011

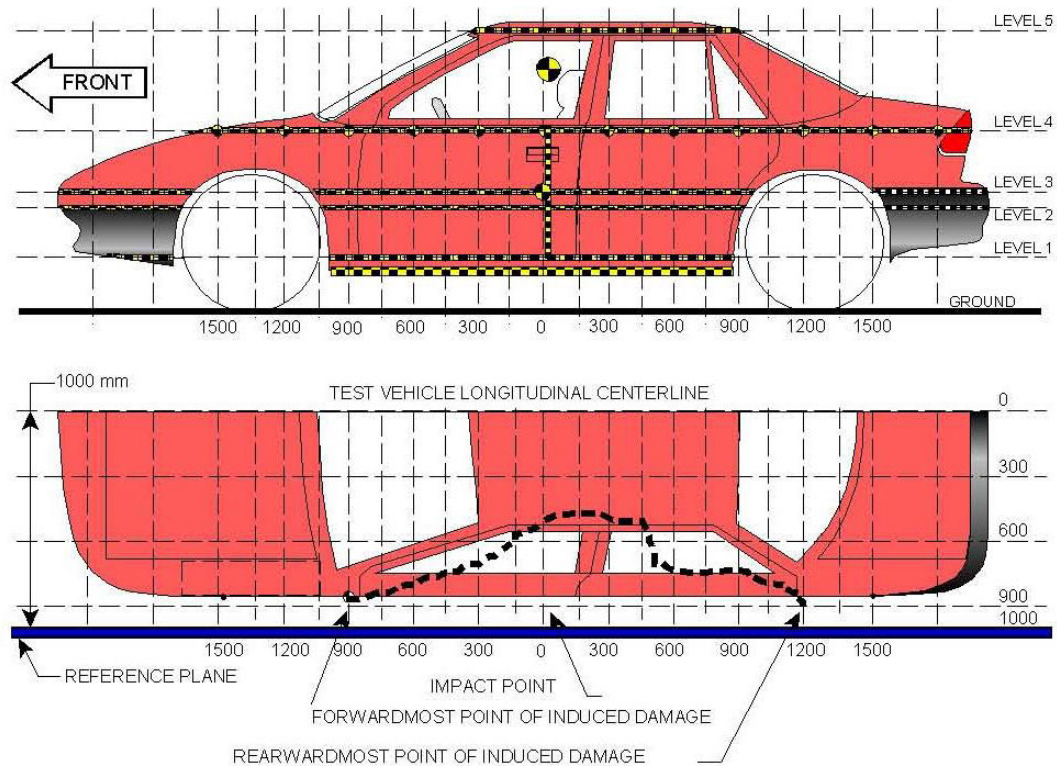


Code	Measurement Description	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
A	Wheelbase	2688	2629	59
B	Front Axle to FSOV	991	966	25
C	Rear Axle to RSOV	816	808	8
D	Total Vehicle Length at Centerline	4495	4403	92
E	Front Bumper Thickness	150	150	0
F	Front Bumper Bottom to Ground	211	241	-30
G	Sill Height at Front Wheel Well	173	175	-2
H	Sill Height at Front Door Leading Edge	173	183	-10
I	Sill Height at B Pillar	175	177	-2
J1	Sill Height at Rear Wheel Well	179	192	-13
J2	Pinch Weld Height at Rear Wheel Well	177	192	-15
K	Sill Height Aft of Rear Wheel Well	242	241	1
L	Rear Bumper Thickness	100	100	0
M	Rear Bumper Bottom to Ground	254	258	-4
N	Sill Height to Window Bottom Sill	756	779	-23
O	Front Door Leading Edge to Impact CL	619	617	2
P	Rear Door Trailing Edge to Impact CL	1286	1310	-24
Q	Front Window Opening	362	329	33
R	Right Side Length	3070	3080	-10
S	Left Side Length	3070	2984	86
T	Vehicle Width at B Post	1780	1712	68

DATA SHEET NO. 14 **EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011



NOTE: All measurements are in millimeters (mm)

Maximum Exterior Crush Measurements

Level	Measurement Description	Maximum Exterior Static Crush	Distance from Impact	Height Above Ground (mm)
1	Sill Top	319	0	224
2	Occupant H-Point	344	75	515
3	Mid-Door	350	75	620
4	Window Sill	341	0	859
5	Window Top	126	0	1352

DATA SHEET NO. 15

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

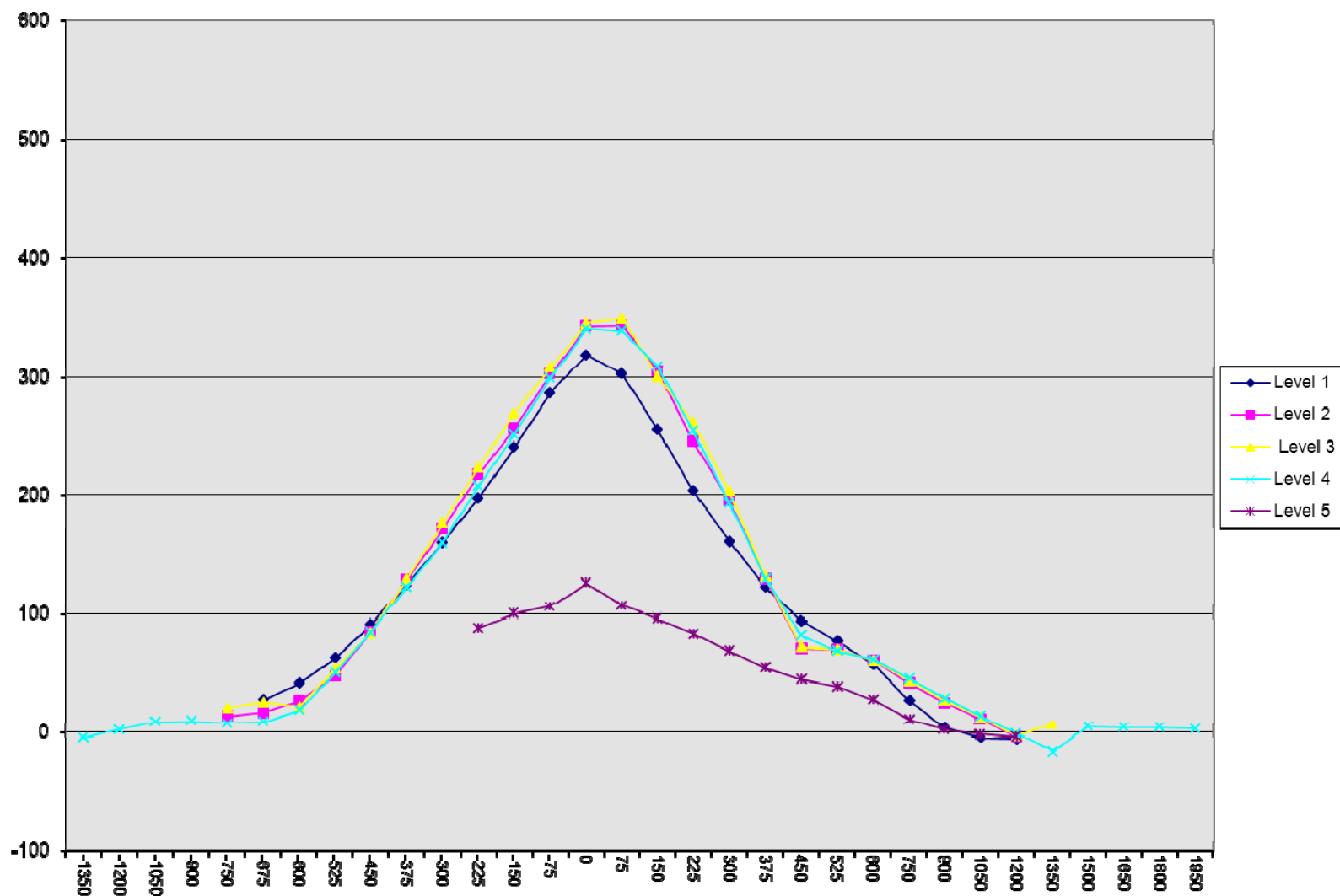
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	319	344	350	341	126
Distance From Impact (mm)	0	75	75	0	0

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1350				277					272					-5	
-1200				254					256					2	
-1050				244					253					9	
-900				244					254					10	
-750		212	211	243			226	232	251			14	21	8	
-675	235	213	217	242		263	230	243	251		28	17	26	9	
-600	236	217	223	239		278	244	245	258		42	27	22	19	
-525	235	225	223	237		298	273	277	288		63	48	54	51	
-450	235	226	224	237		326	311	308	322		91	85	84	85	
-375	234	227	222	237		359	356	352	360		125	129	130	123	
-300	234	225	221	237		394	396	397	397		160	171	176	160	
-225	234	223	220	236	513	431	440	443	443	601	197	217	223	207	88
-150	234	222	219	236	510	474	478	488	487	610	240	256	269	251	100
-75	234	221	218	235	509	520	523	526	534	615	286	302	308	299	106
0	234	220	217	234	507	553	563	565	575	633	319	343	346	341	126
75	233	218	216	234	505	535	562	566	573	612	302	344	350	339	107
150	233	218	215	235	505	488	523	515	544	601	255	305	300	309	96
225	232	217	214	235	507	435	462	475	489	590	203	245	261	254	83
300	232	216	213	236	509	393	411	416	429	578	161	195	203	193	69
375	232	215	213	238	509	355	345	345	368	564	123	130	132	130	55
450	231	215	214	238	510	325	286	286	320	555	94	71	72	82	45
525	231	214	213	240	512	308	284	283	309	551	77	70	70	69	39
600	231	213	212	241	514	289	274	273	303	542	58	61	61	62	28
750	230	212	212	243	515	257	254	256	289	526	27	42	44	46	11
900	229	212	212	247	518	233	237	239	276	520	4	25	27	29	2
1050	230	211	212	251	521	225	222	225	265	519	-5	11	13	14	-2
1200	228	209	211	256	531	222	205	208	255	527	-6	-4	-3	-1	-4
1350			205	261				212	245				7	-16	
1500				267					272					5	
1650				277					281					4	
1800				287					291					4	
1950				299					302					3	

DATA SHEET NO. 15 (CONTINUED)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
Test Program: FMVSS 214 Pole

NHTSA No. CC0102
Test Date: 12/22/2011



DATA SHEET NO. 16

SUMMARY OF FMVSS 301 FUEL SYSTEM DATA

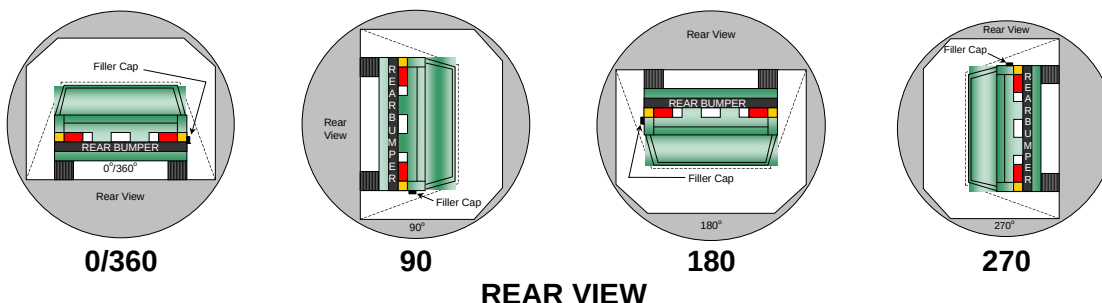
Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

FUEL SYSTEM INTEGRITY POST IMPACT DATA

Time Interval	FMVSS 301 Maximum Allowable Spillage	Spillage (g)
Impact Until Motion Ceases	28 g	0
First Five Minutes Following Impact	142 g	0
Next 25 Minutes	28 g / 1 minute	0

STATIC ROLLOVER DATA



Rollover Stage	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	2	minutes	42	seconds	5	minutes	7	minutes	42	seconds	8	minutes
90° - 180°	2	minutes	40	seconds	5	minutes	7	minutes	40	seconds	8	minutes
180° - 270°	2	minutes	14	seconds	5	minutes	7	minutes	14	seconds	8	minutes
270° - 360°	2	minutes	45	seconds	5	minutes	7	minutes	45	seconds	8	minutes

Rollover Stage	Spillage (g)			
	First 5 min. from onset of rotation	6 th min.	7 th min.	8 th min. (if required)
0° - 90°	0	0	0	
90° - 180°	0	0	0	
180° - 270°	0	0	0	
270° - 360°	0	0	0	
FMVSS 301 Maximum Allowable (for each 90° stage)	142	28	28	28

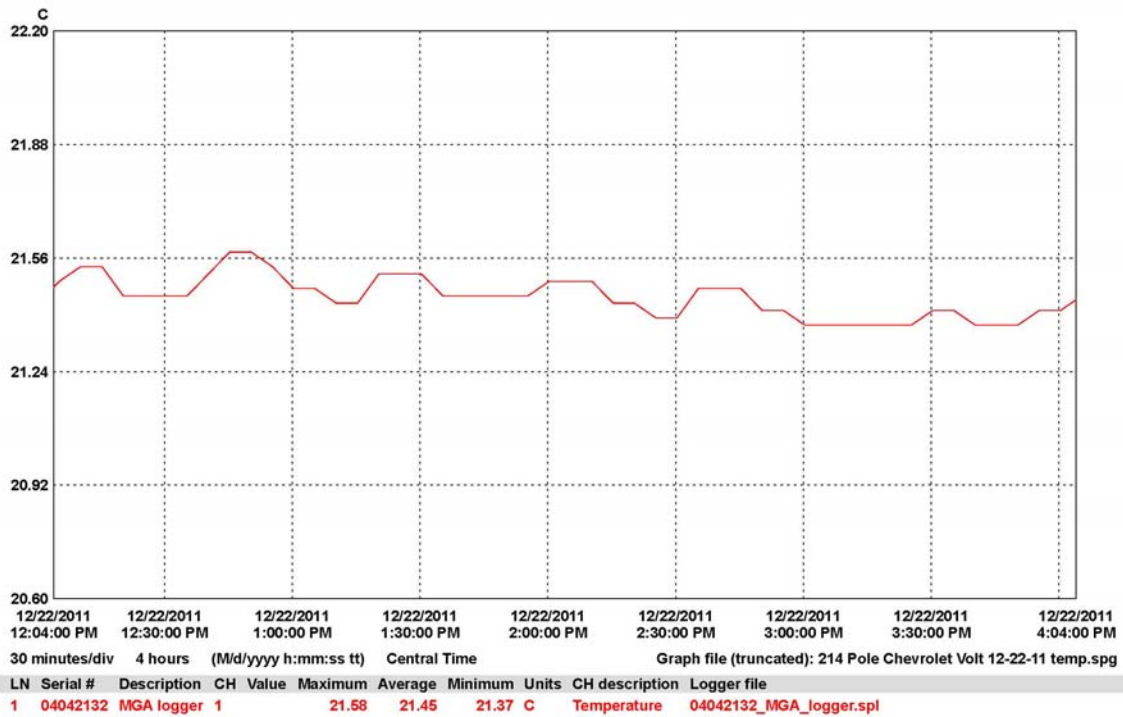
Rollover Stage	Spillage Location(s)
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17 **TEMPERATURE AND HUMIDITY TRACES**

Test Vehicle: 2012 Chevrolet Volt 5-Dr Hatchback
 Test Program: FMVSS 214 Pole

NHTSA No. CC0102
 Test Date: 12/22/2011

Time of Impact: 4:04 pm



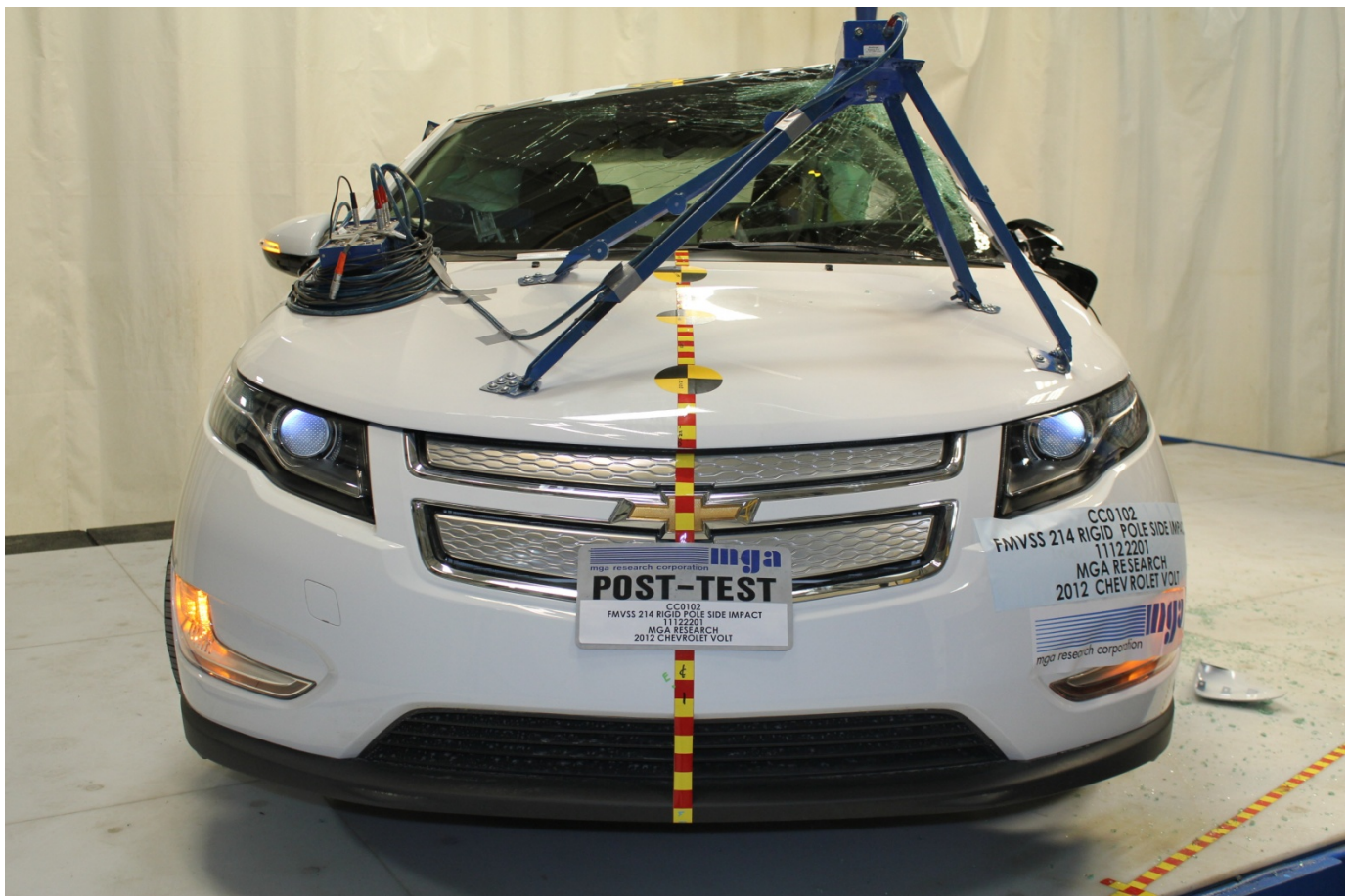
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Pre-Test Frontal View of Test Vehicle



Post-Test Frontal View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



Pre-Test Impacted Side View of Test Vehicle



Post-Test Impacted Side View of Test Vehicle



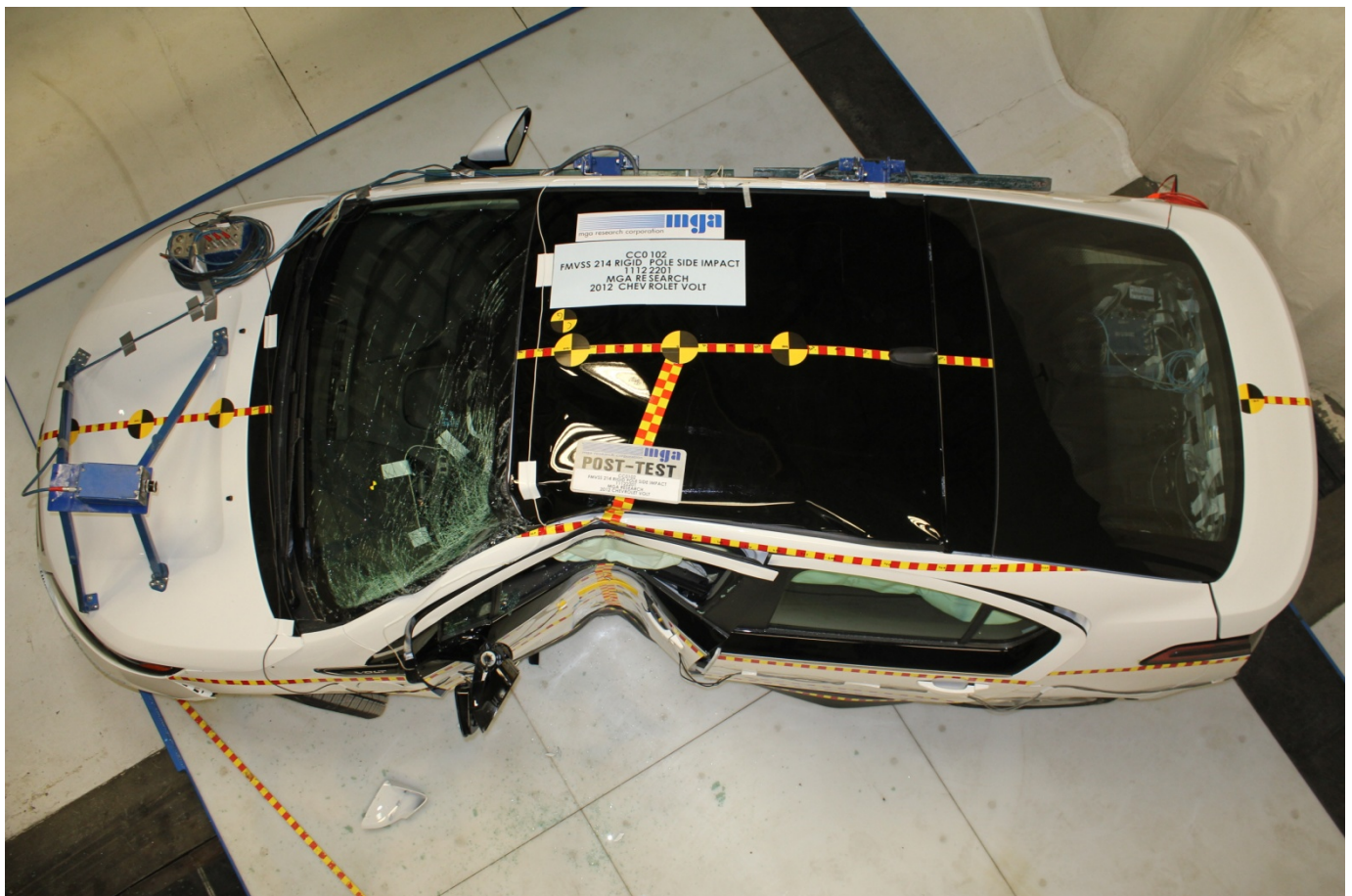
Pre-Test Left $\frac{3}{4}$ Front View of Vehicle and Pole



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



Pre-Test Overhead View of Test Vehicle



Post-Test Overhead View of Test Vehicle



Pre-Test Dummy Through Opposite Window



Post-Test Dummy Through Opposite Window



Pre-Test Close-up of Dummy with Door Closed (Impact Side)



Post-Test Dummy with Door Closed (Impact Side)



Pre-Test Dummy Door Open



Pre-Test Dummy Shoulder and Door Top View



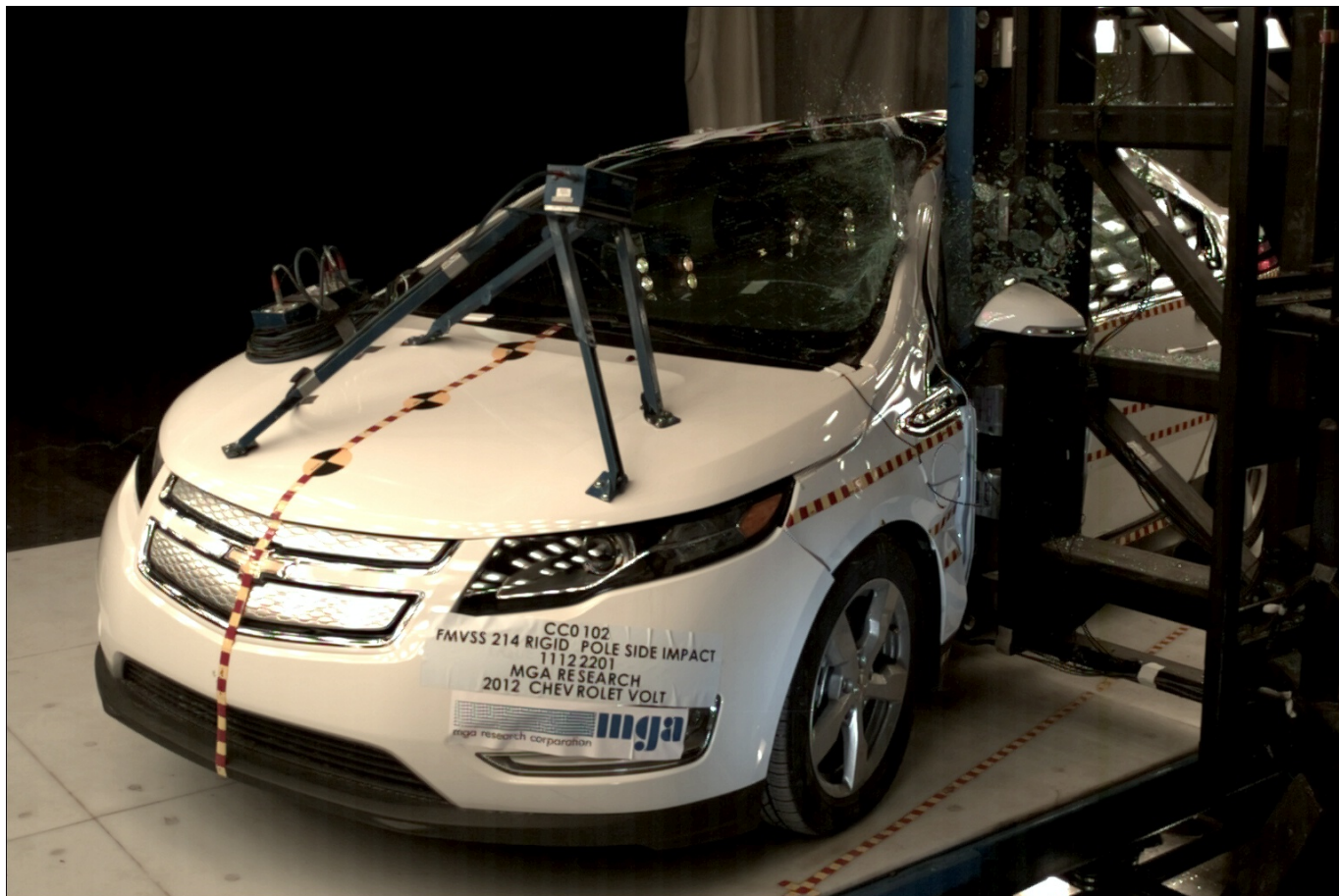
Post-Test Dummy Shoulder and Door Top View



Pre-Test Interior of Front Door Closed



Post-Test Interior of Front Door Showing Dummy Impact Locations



Impact Event



Post-Test Impact Zone Close-up View



Post-Test $\frac{3}{4}$ Front View of Impact Zone



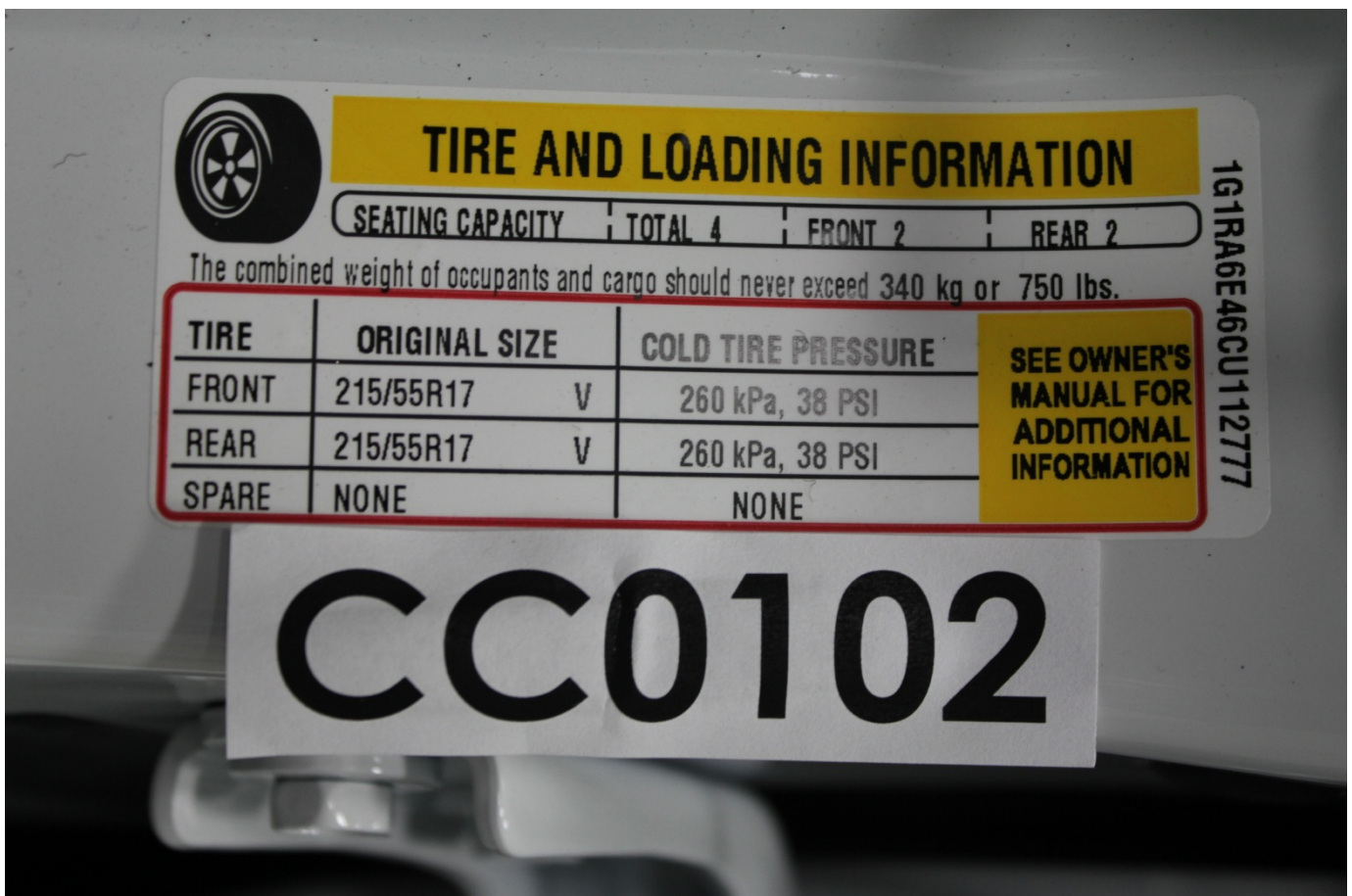
Post-Test $\frac{3}{4}$ Rear View of Impact Zone



Post-Test Close-up View of Impact Point Target



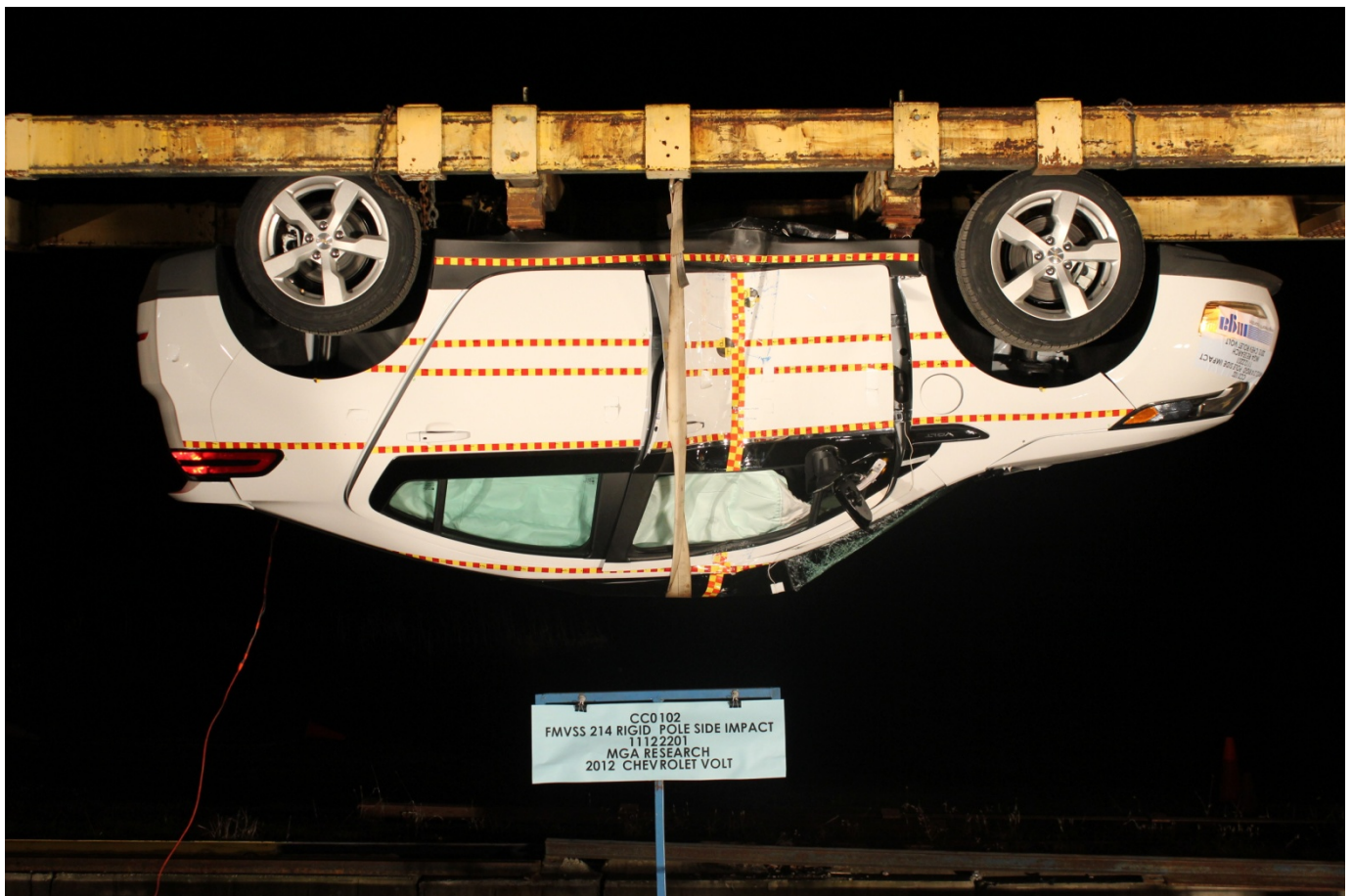
Close-up View of Vehicle's Certification Label



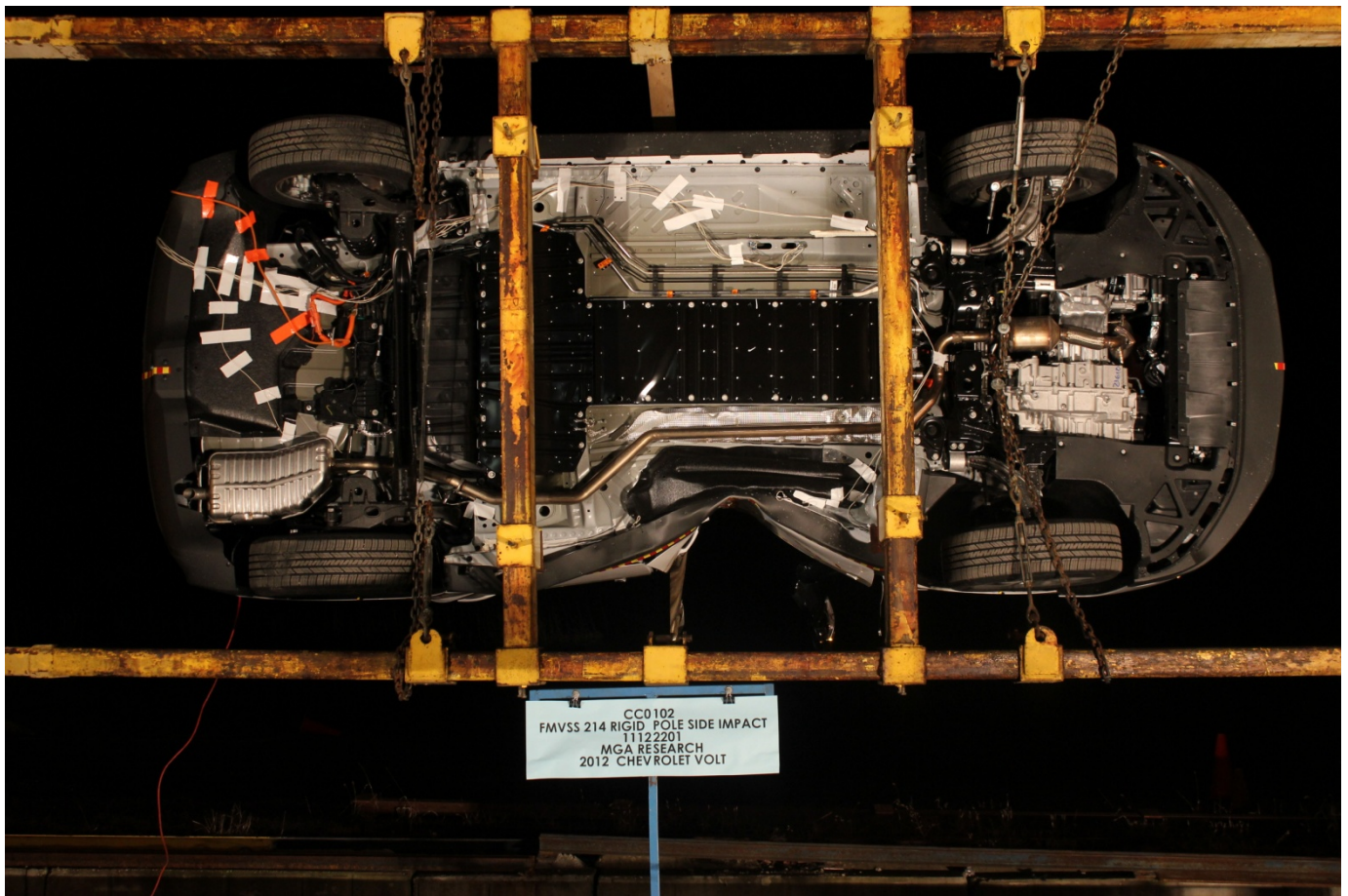
Close-up View of Vehicle's Tire Placard Label



Post-Test Vehicle at 90 Degree Rollover



Post-Test Vehicle at 180 Degree Rollover



Post-Test Vehicle at 270 Degree Rollover



Post-Test Vehicle at 360 Degree Rollover

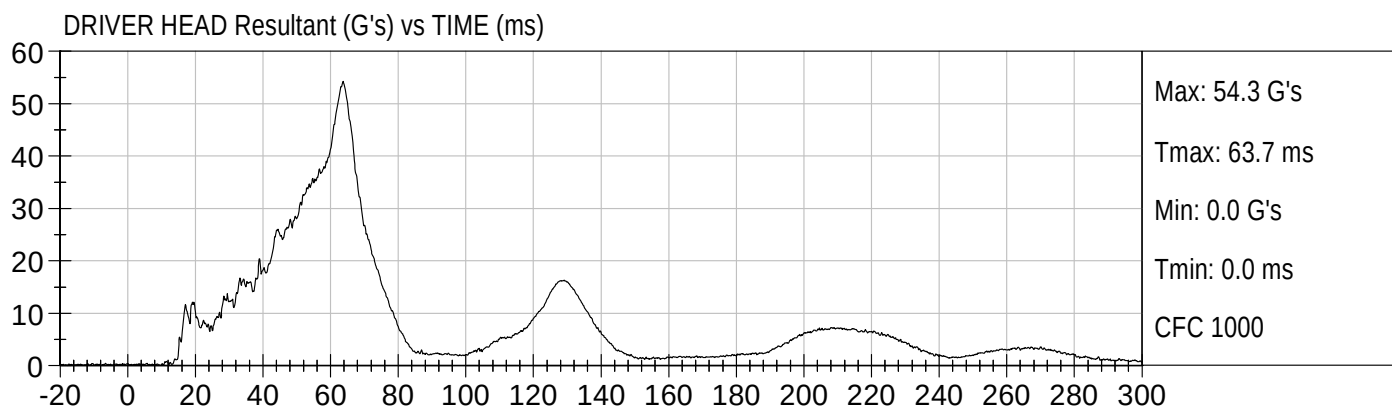
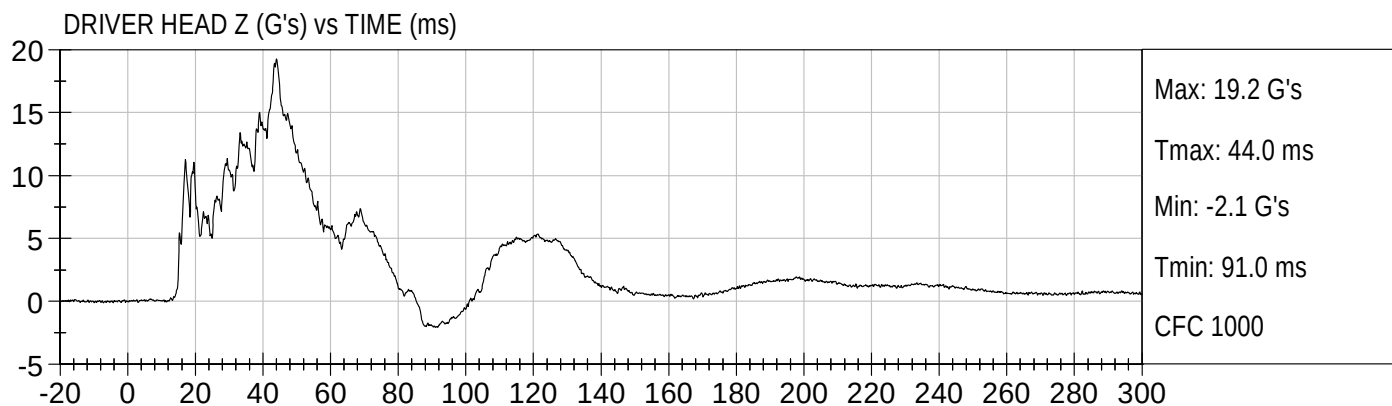
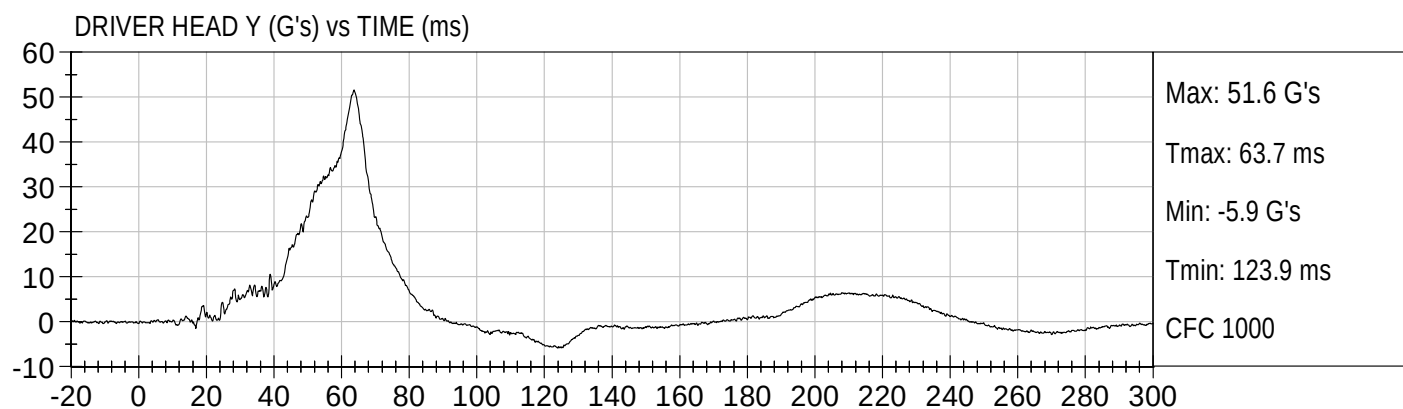
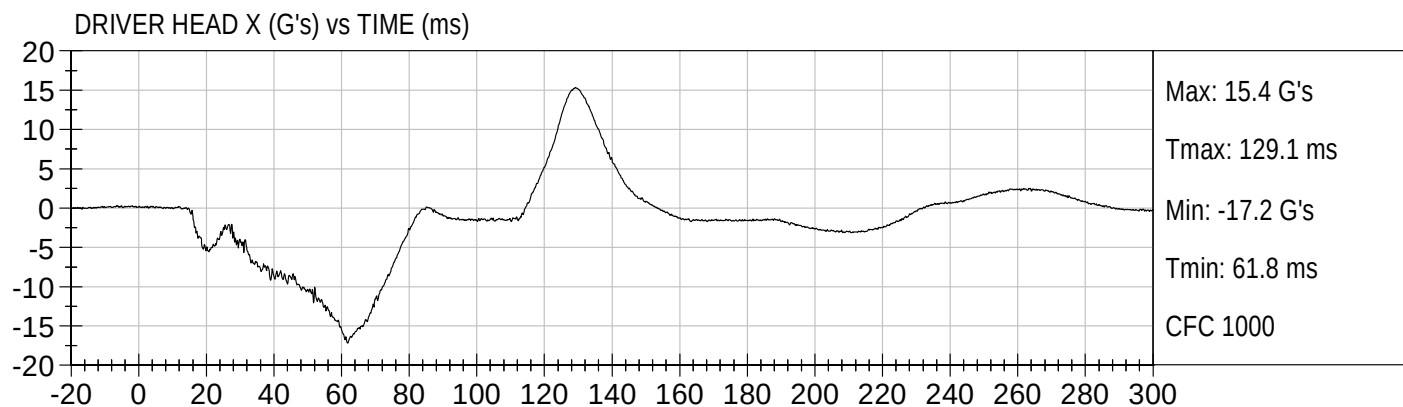
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DUMMY RESPONSE DATA

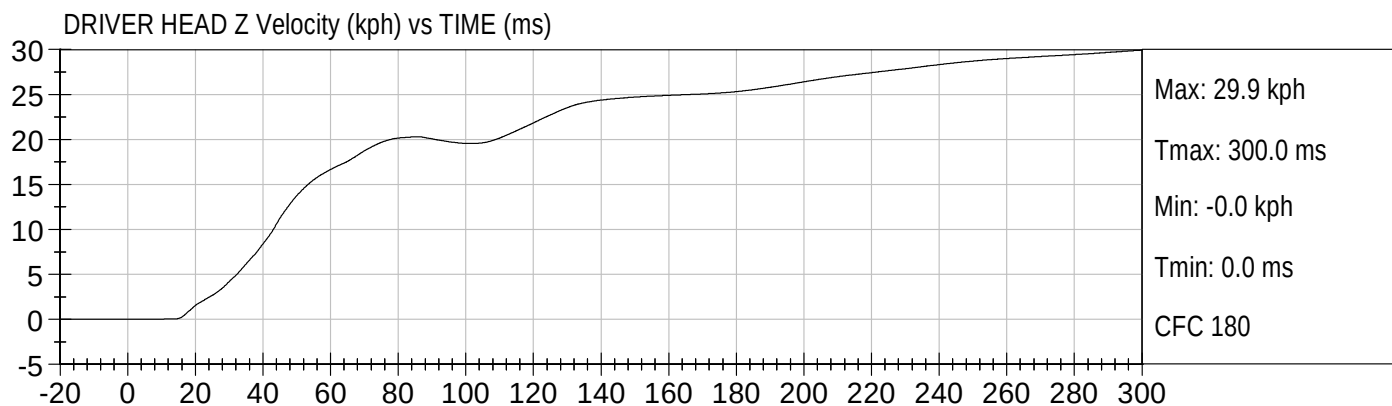
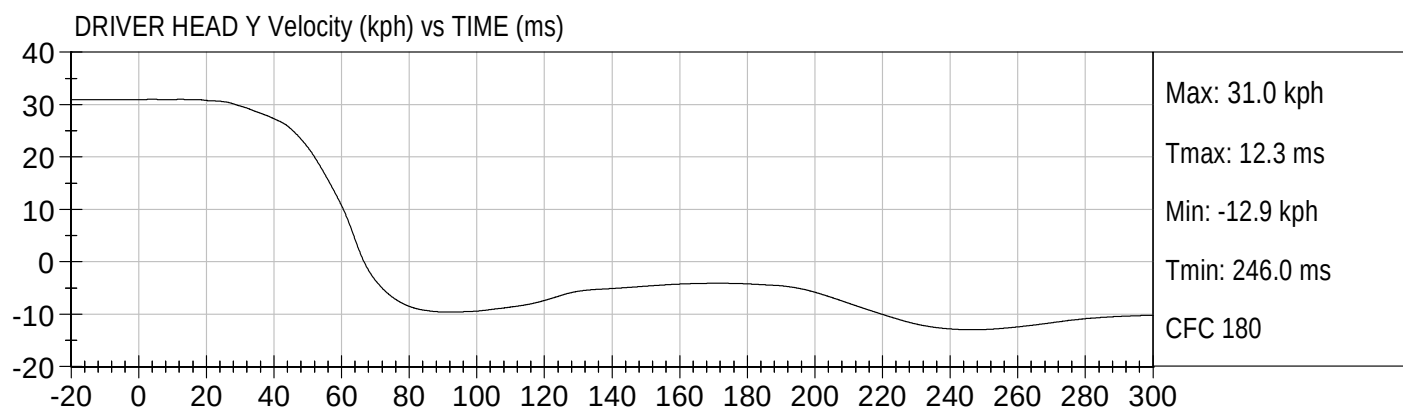
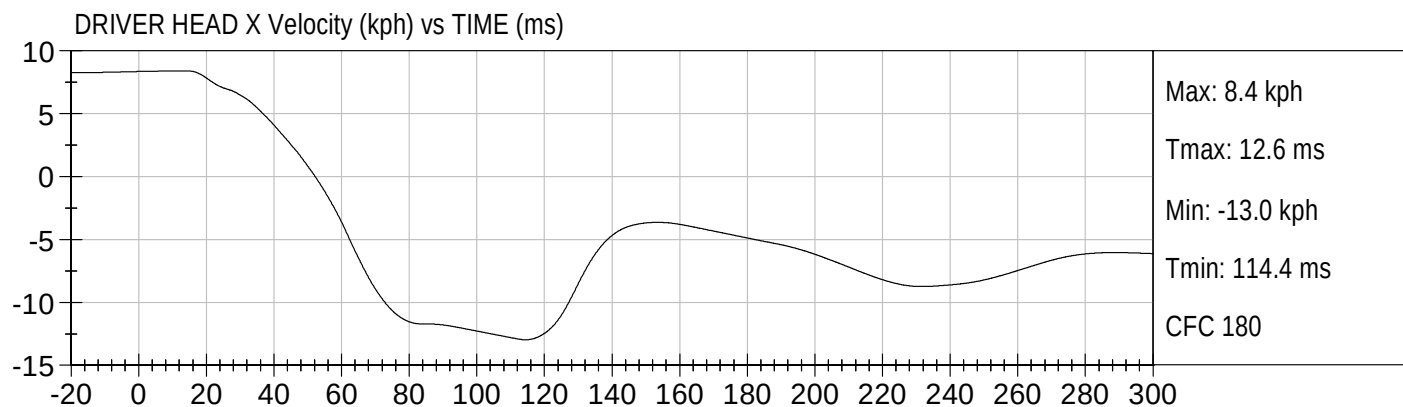
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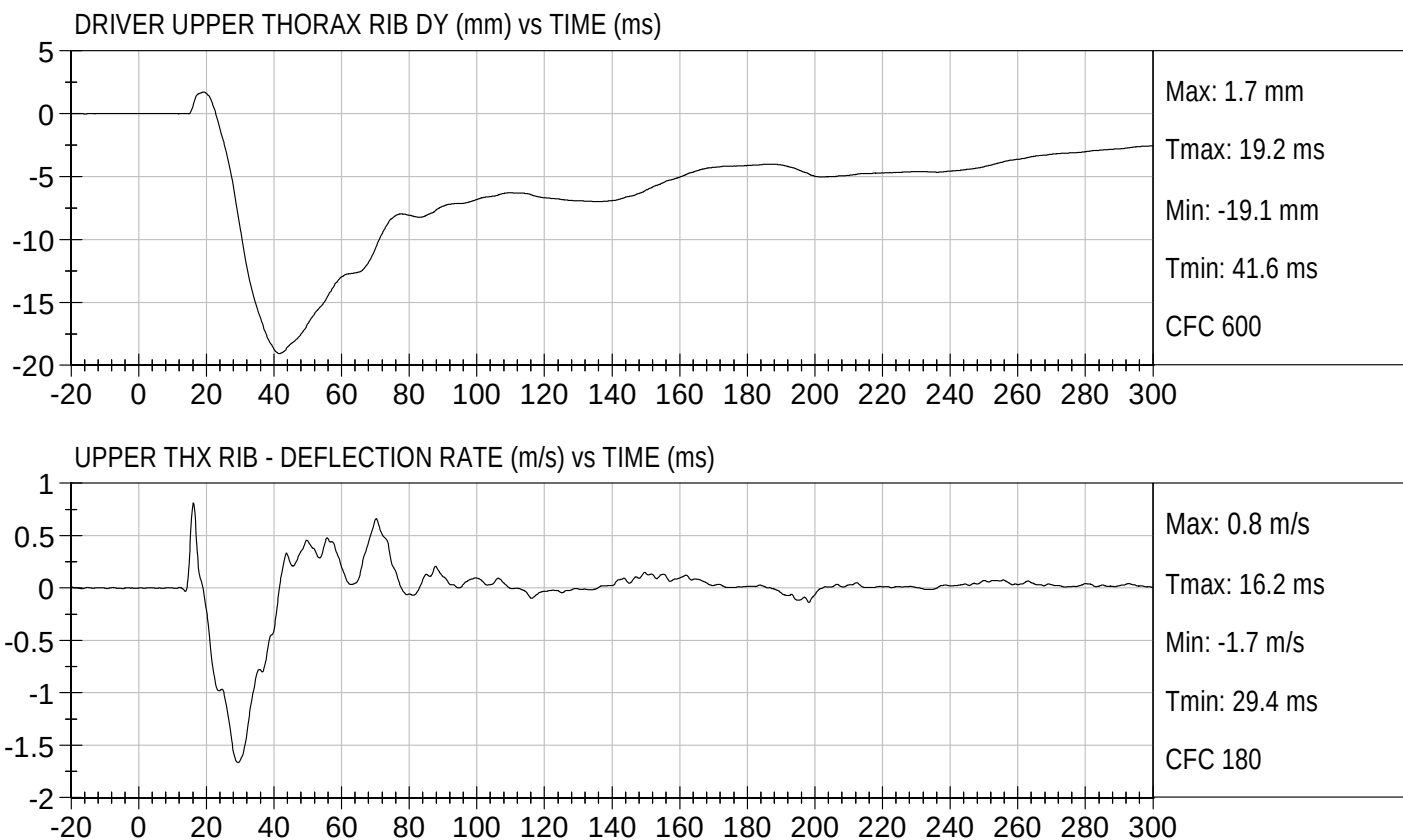
Dummy Instrumentation Plots FILTERED DATA

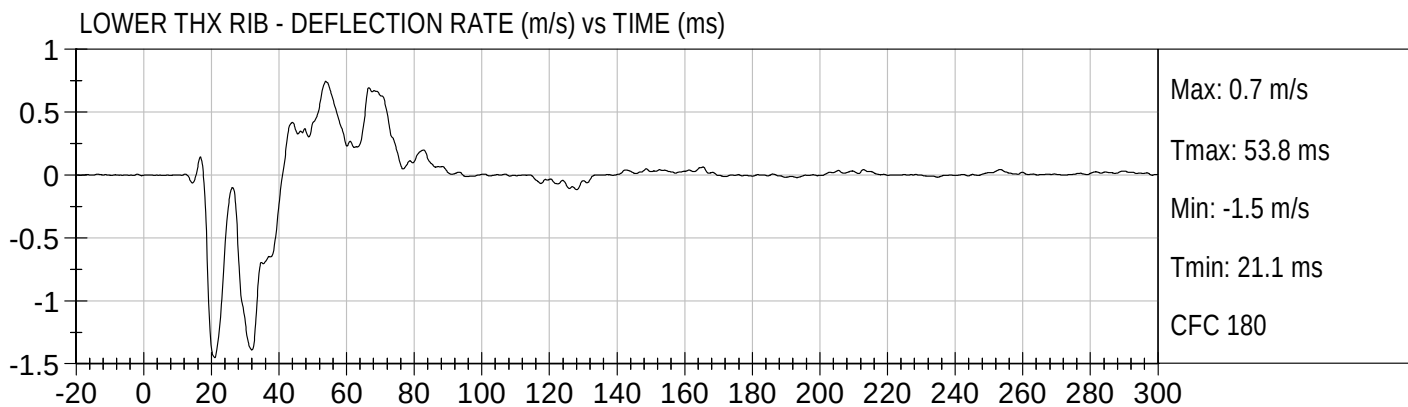
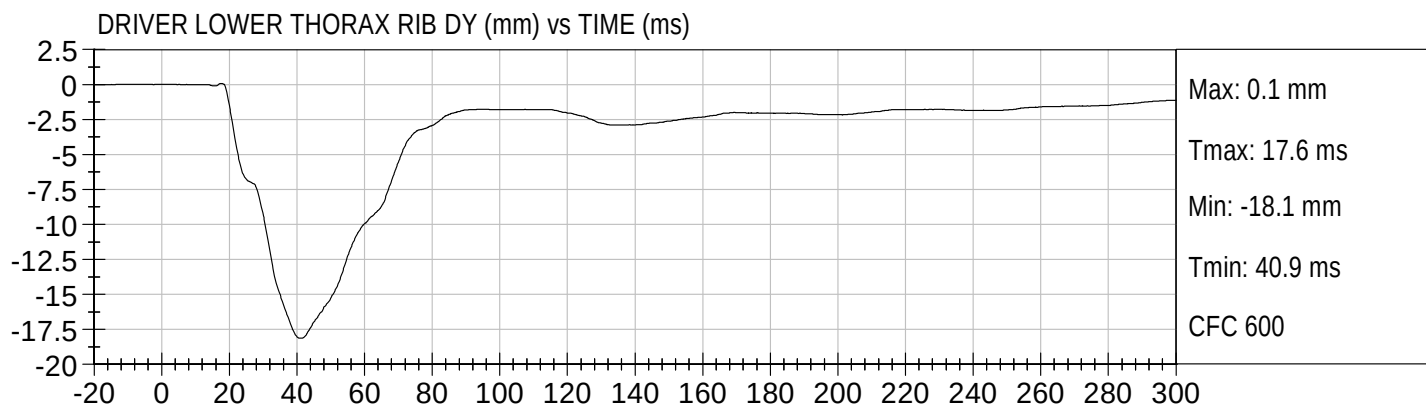
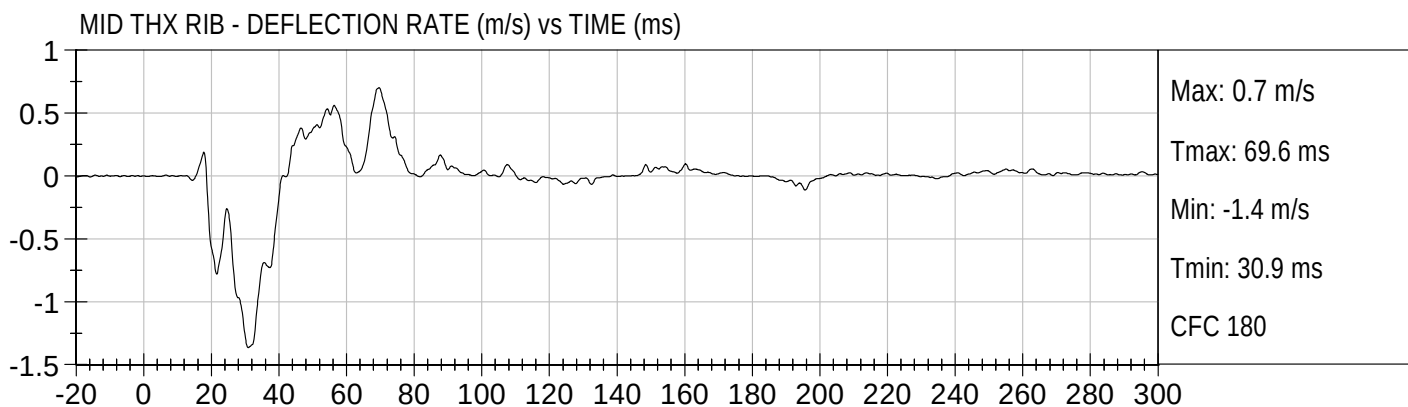
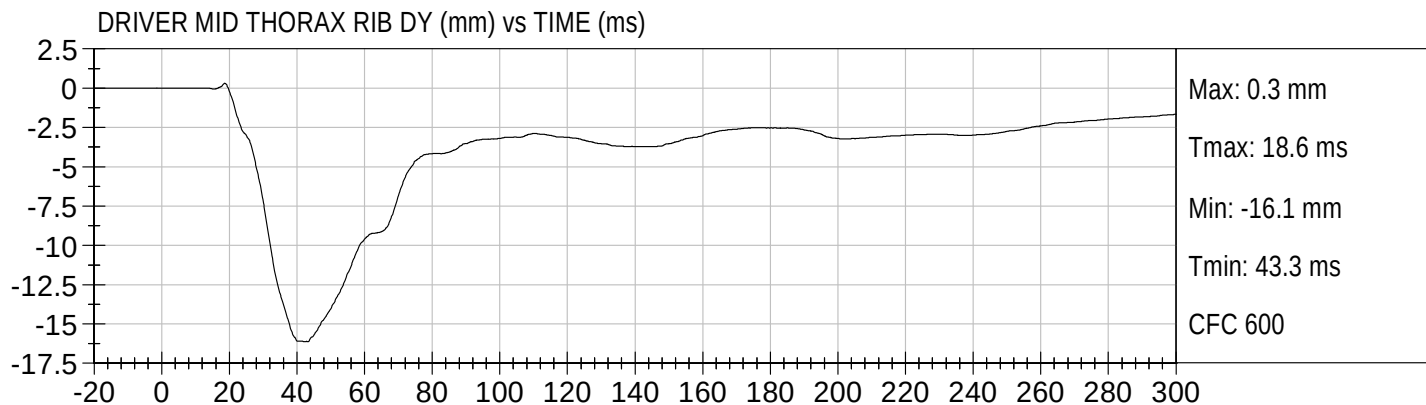
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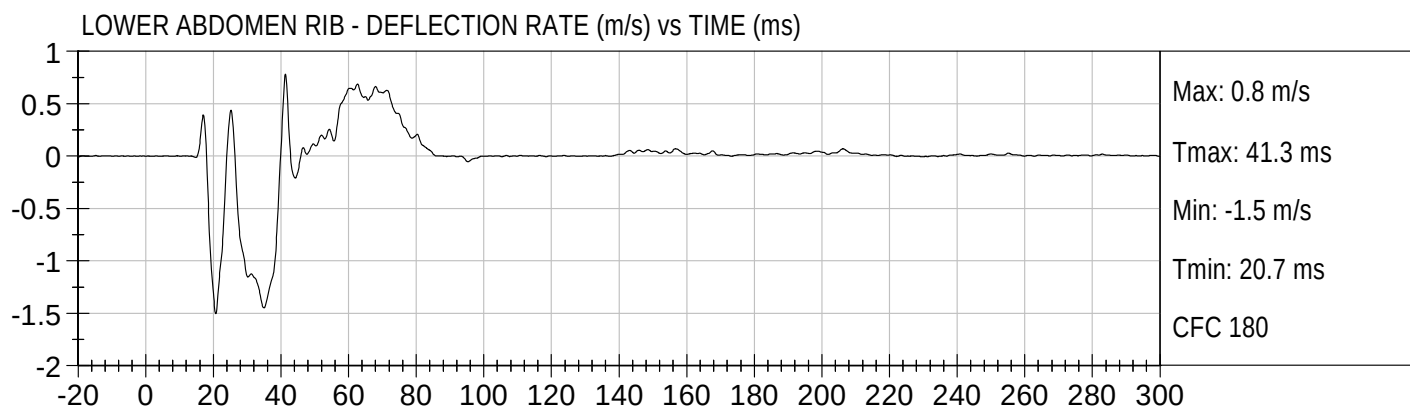
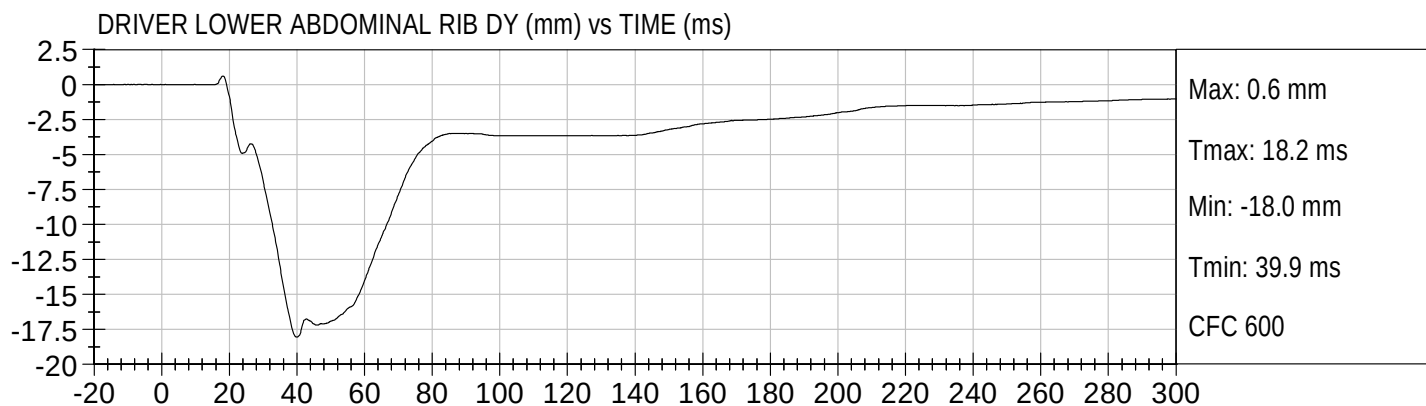
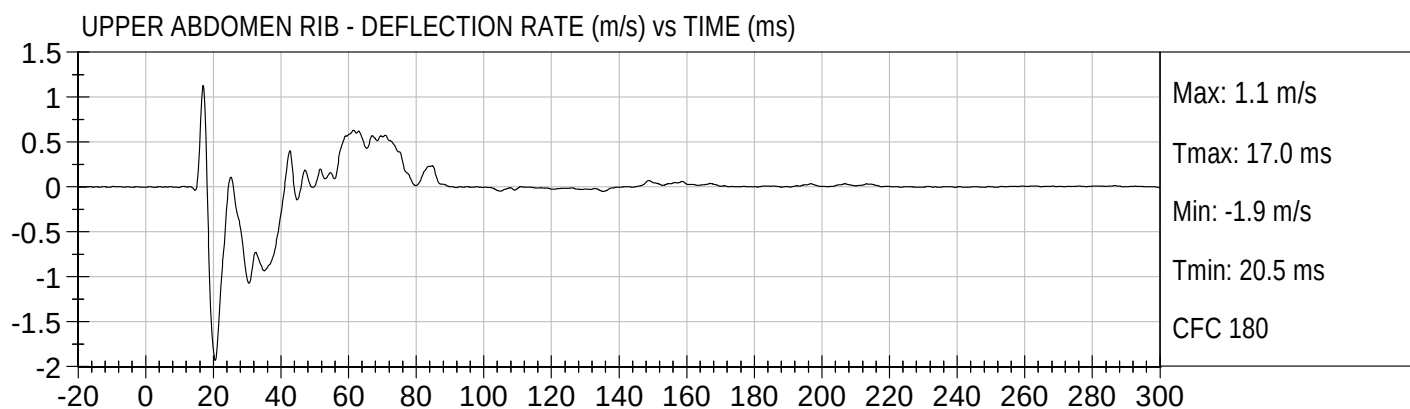
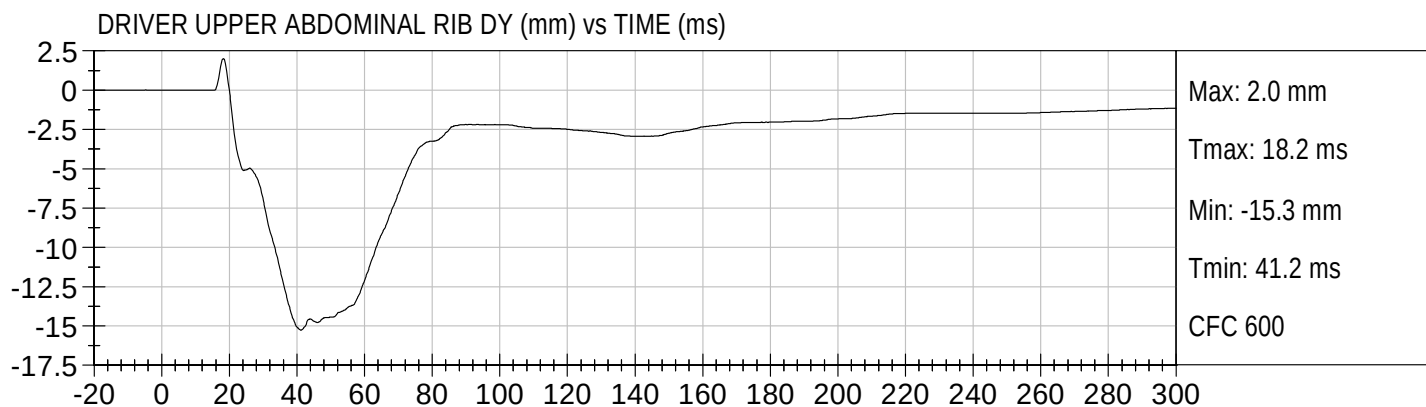
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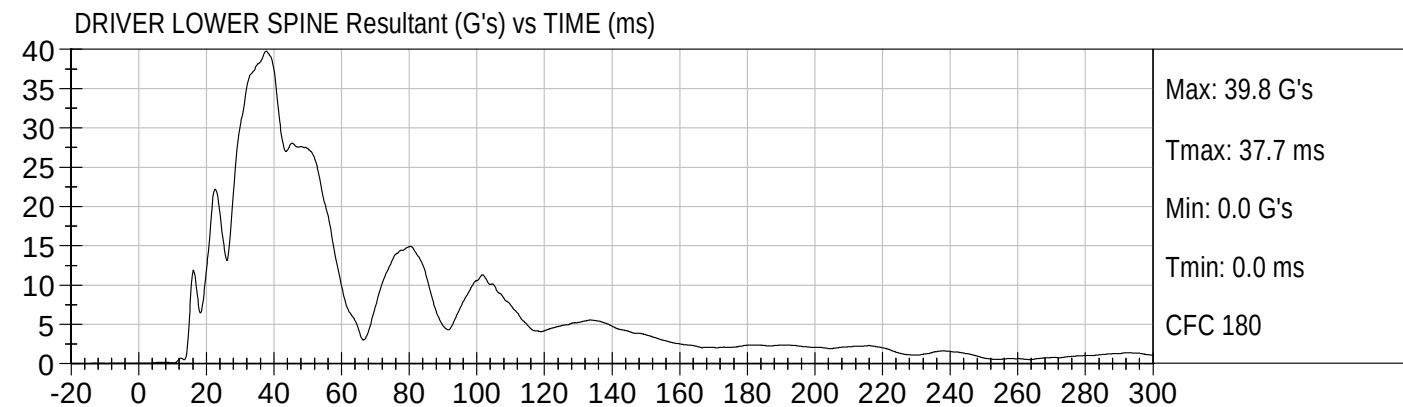
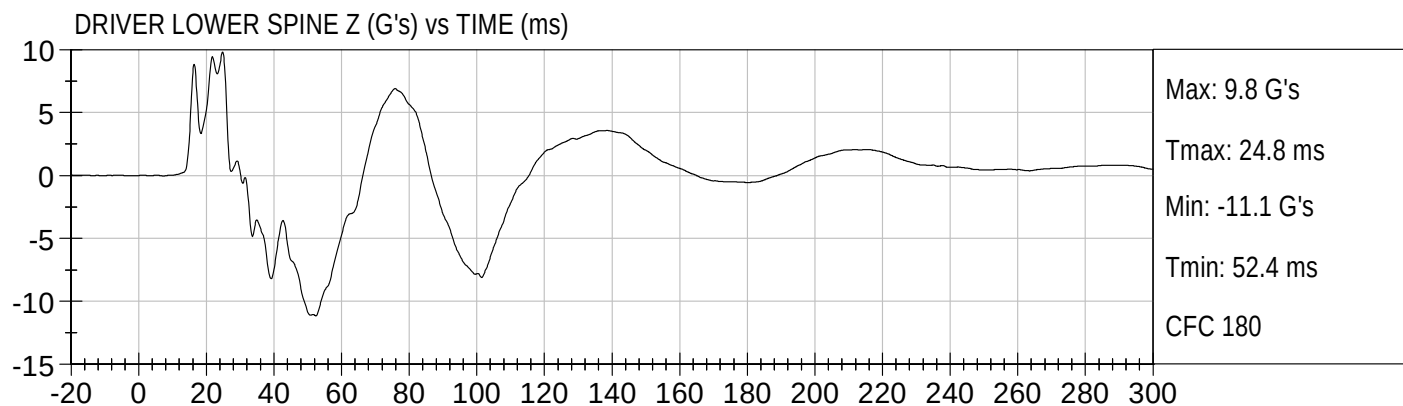
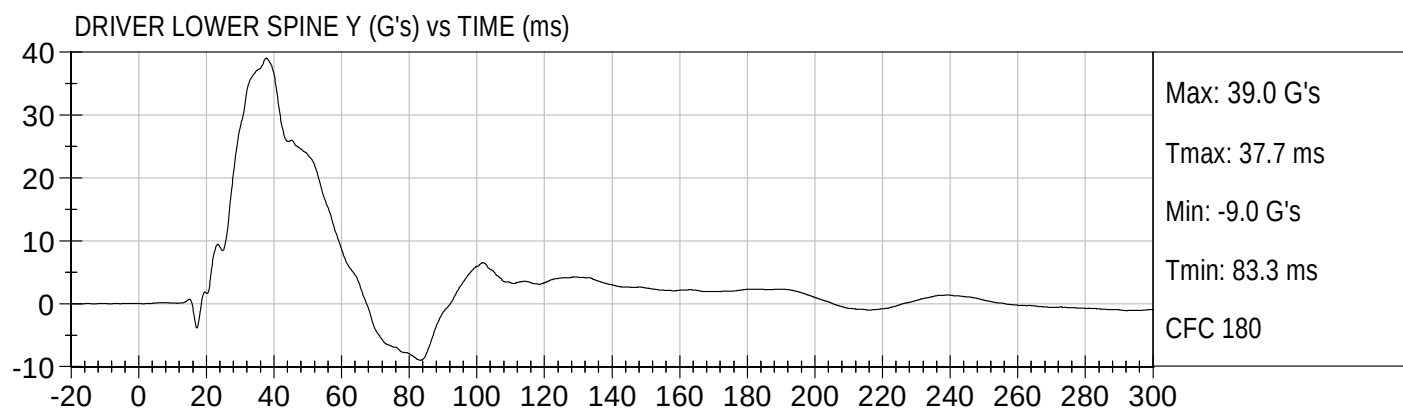
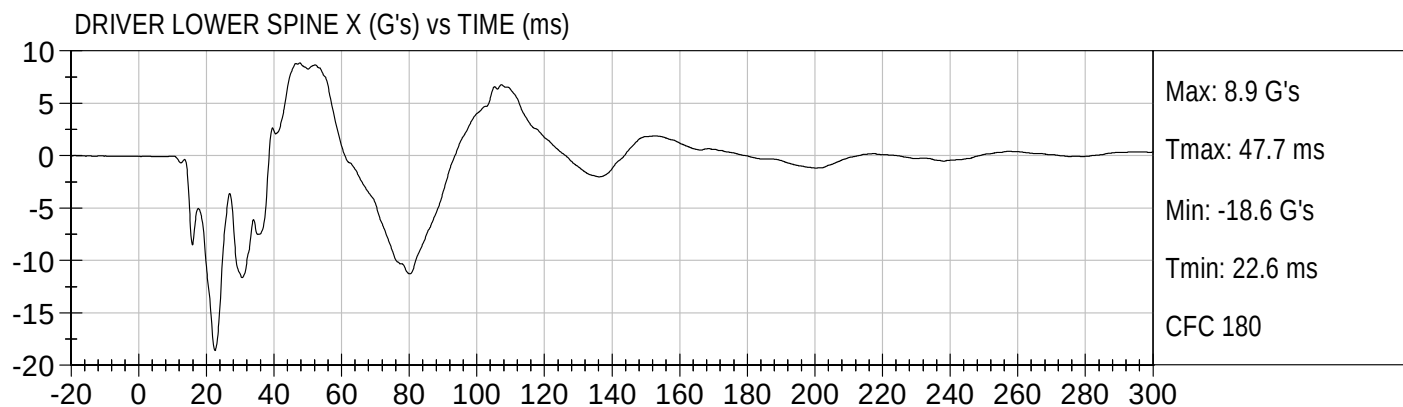


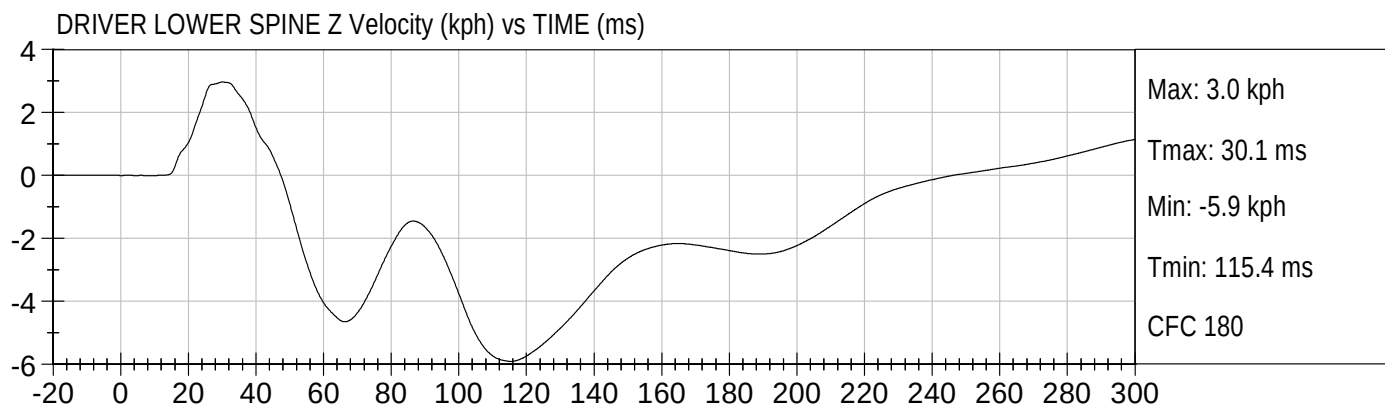
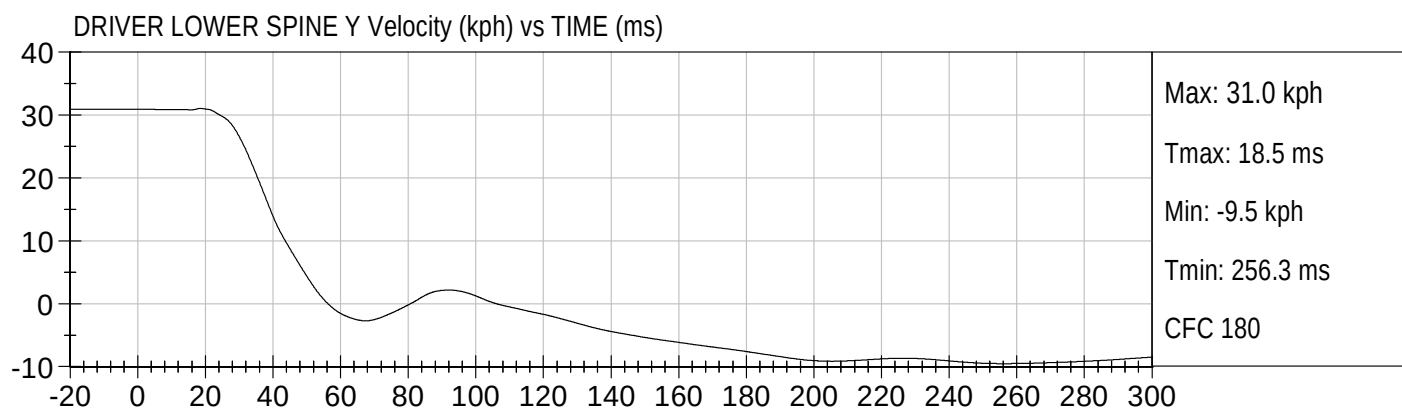
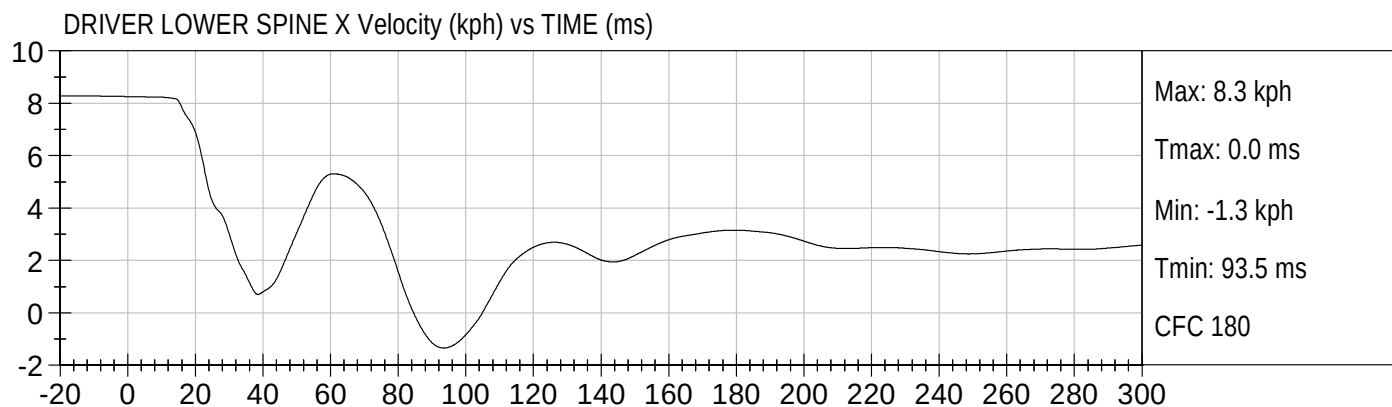


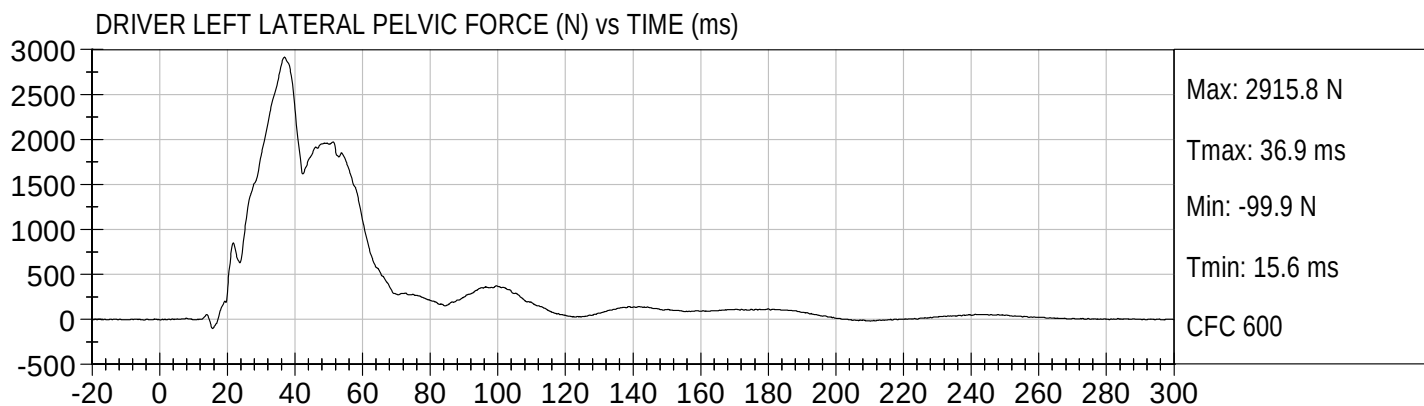
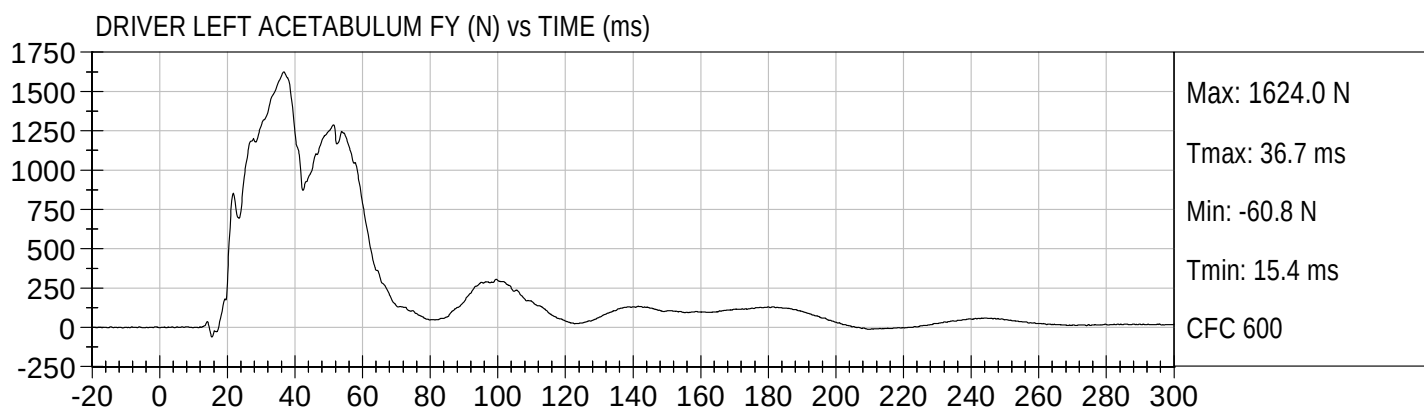
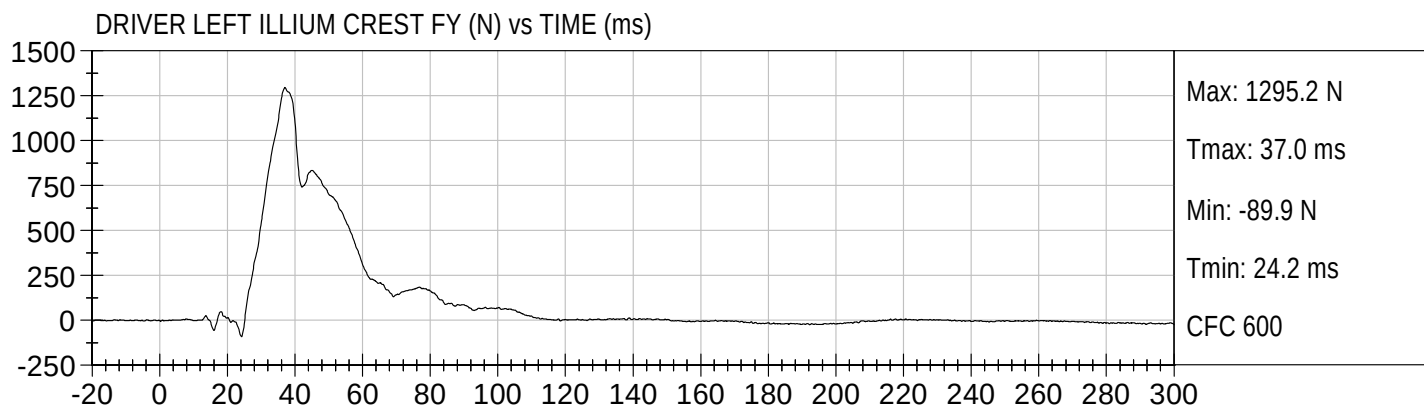












APPENDIX C

VEHICLE AND POLE ACCELEROMETER RESPONSE DATA

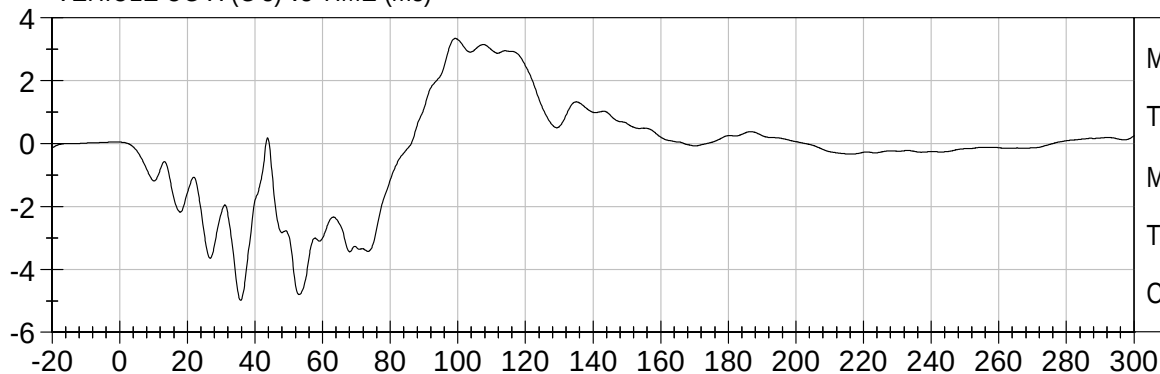
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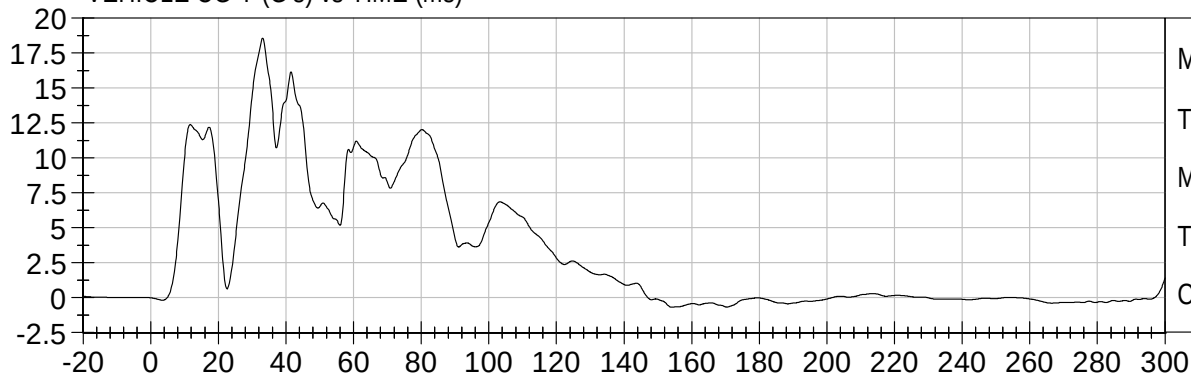


VEHICLE CG X (G's) vs TIME (ms)



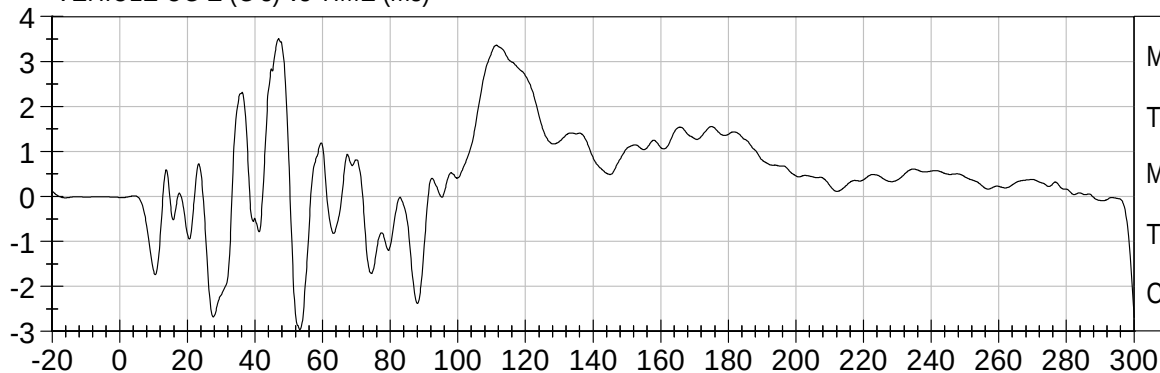
Max: 3.3 G's
Tmax: 99.3 ms
Min: -5.0 G's
Tmin: 35.8 ms
CFC 60

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



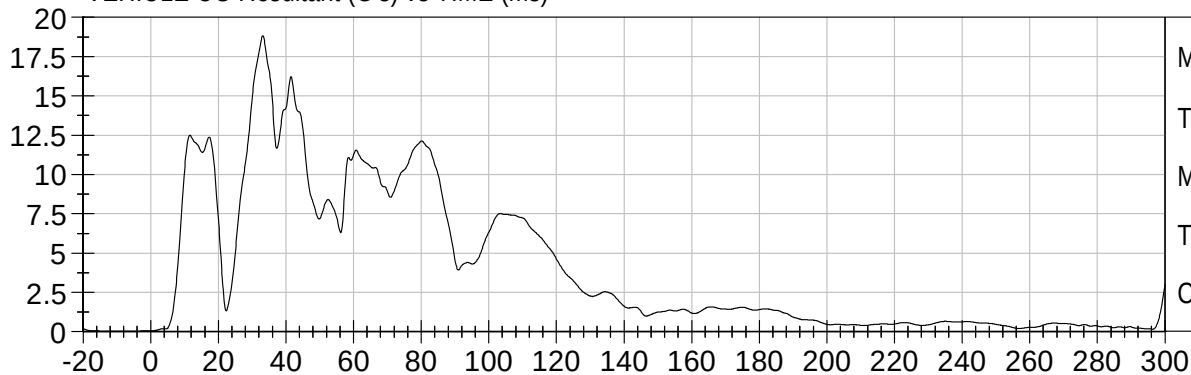
Max: 18.6 G's
Tmax: 33.1 ms
Min: -0.7 G's
Tmin: 154.1 ms
CFC 60

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

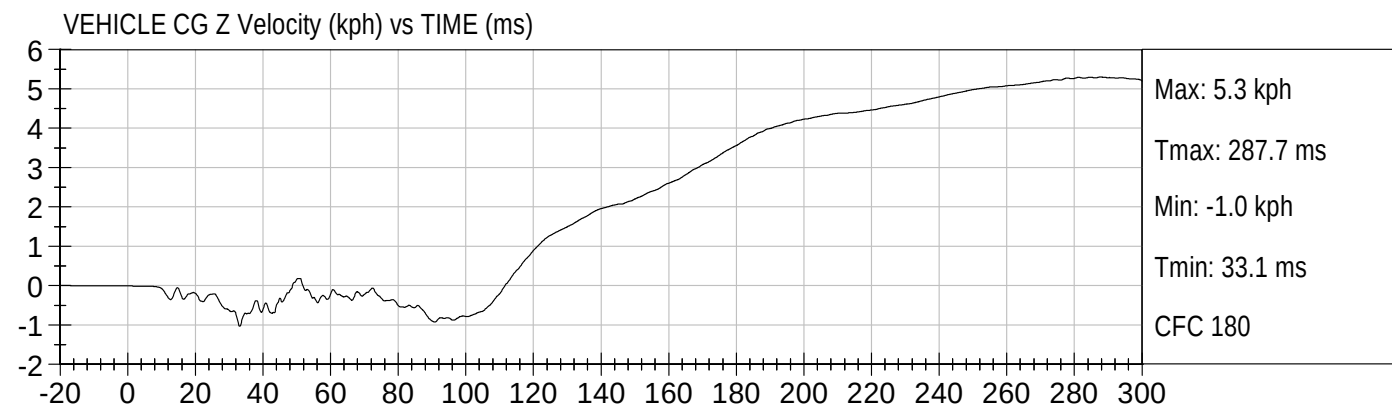
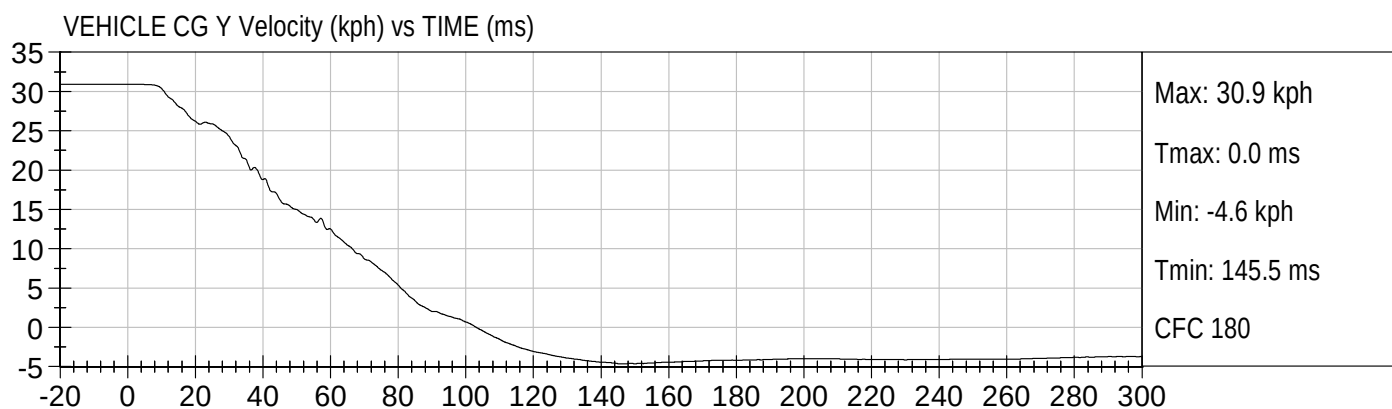
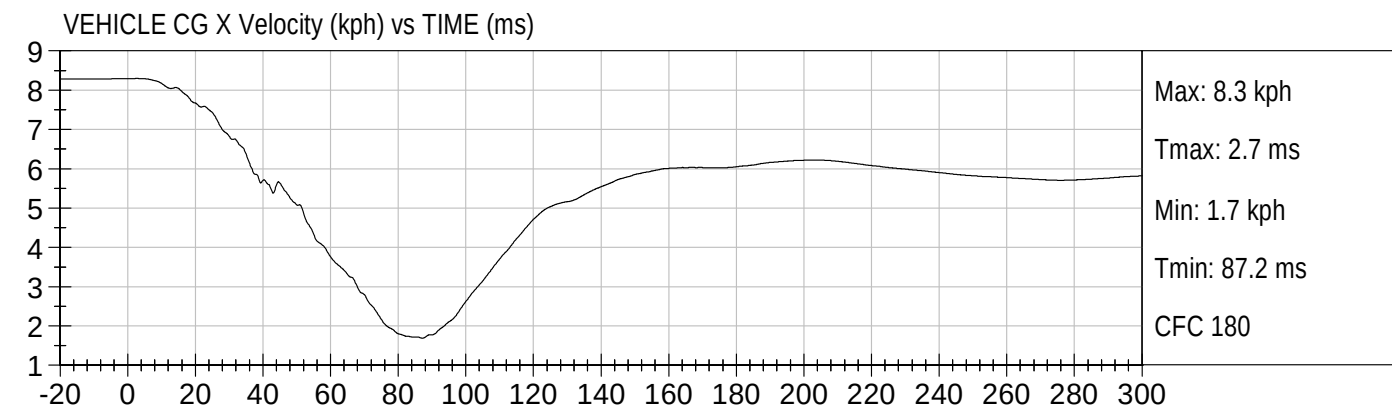


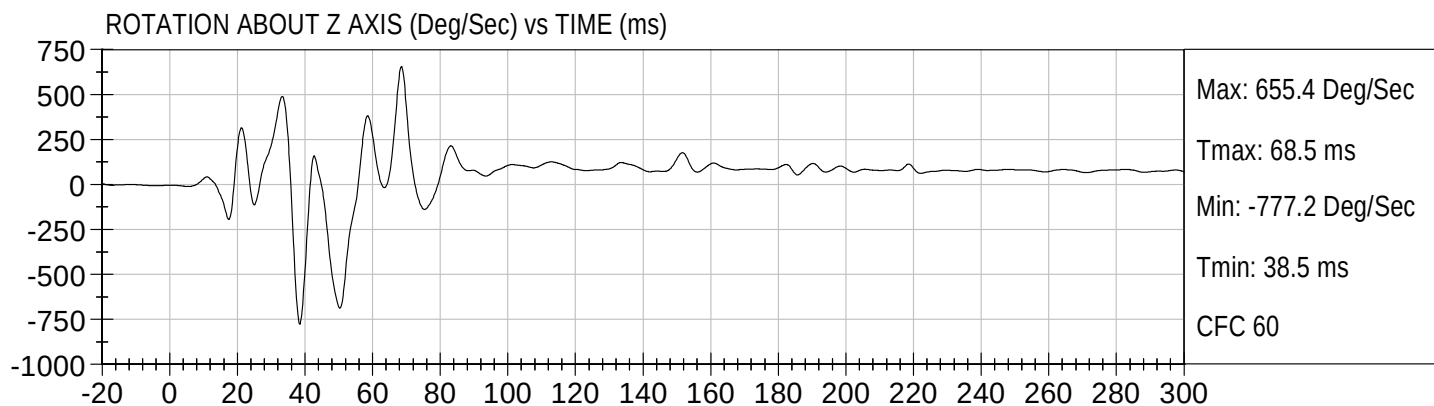
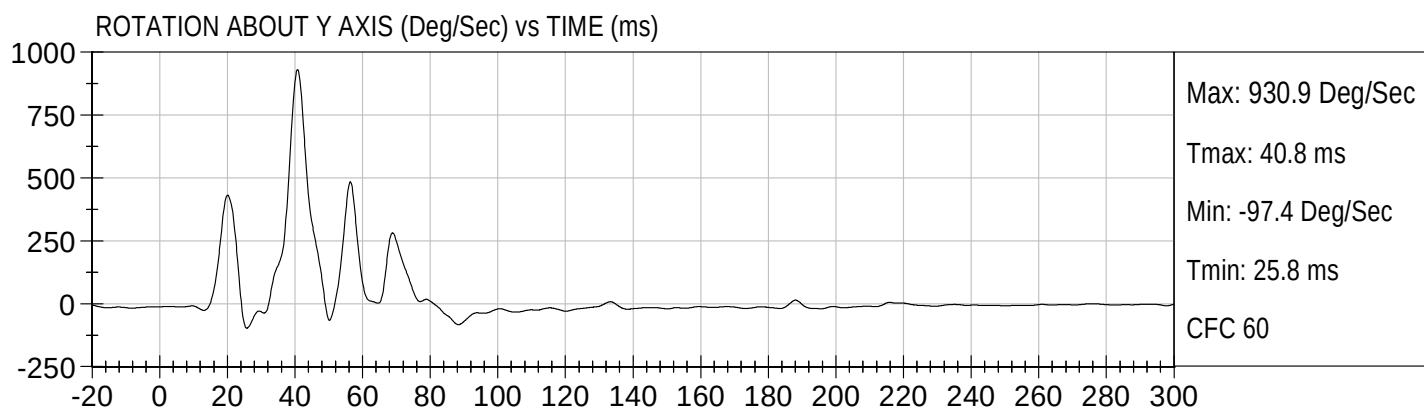
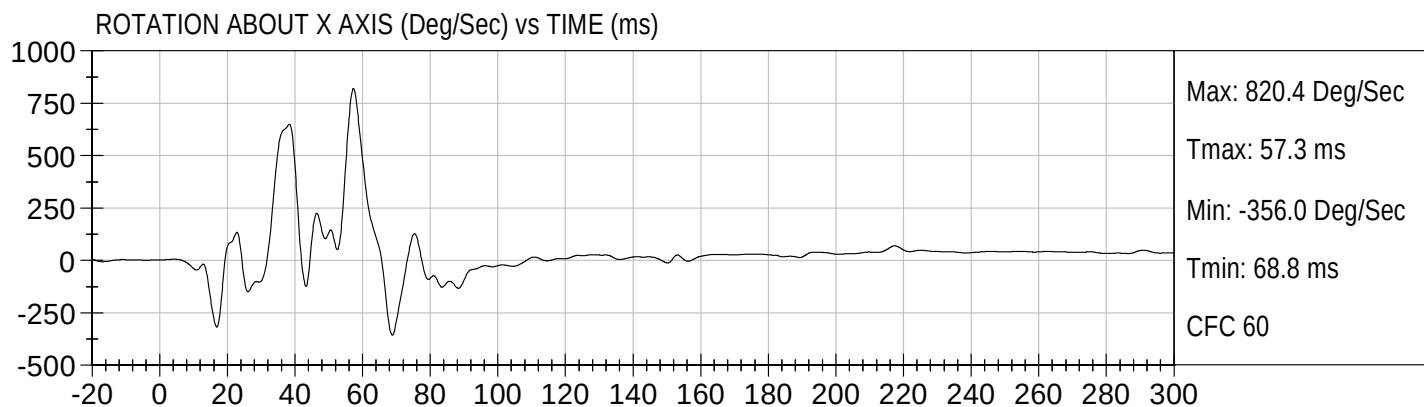
Max: 3.5 G's
Tmax: 47.0 ms
Min: -3.0 G's
Tmin: 53.3 ms
CFC 60

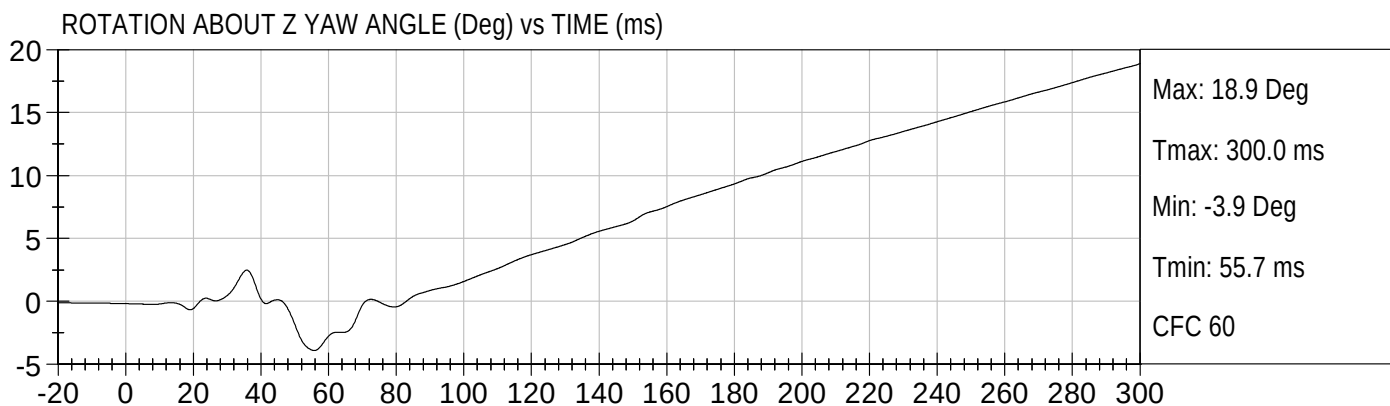
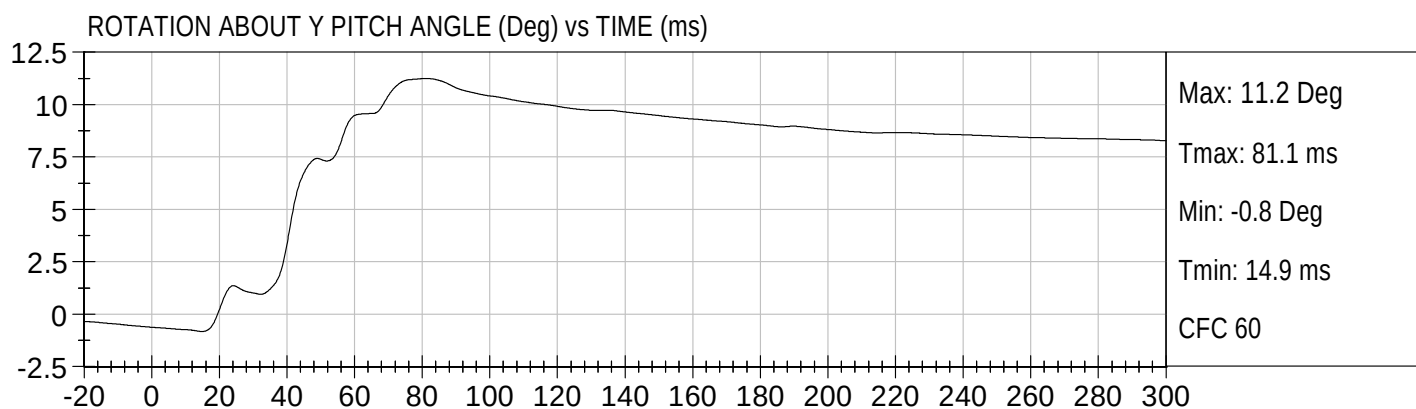
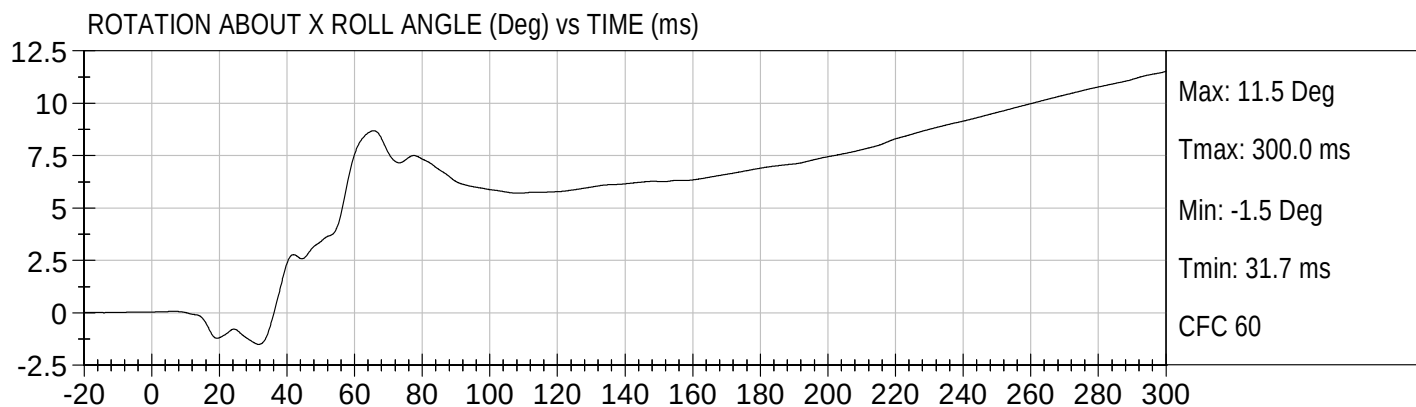
VEHICLE CG Resultant (G's) vs TIME (ms)



Max: 18.8 G's
Tmax: 33.2 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 60

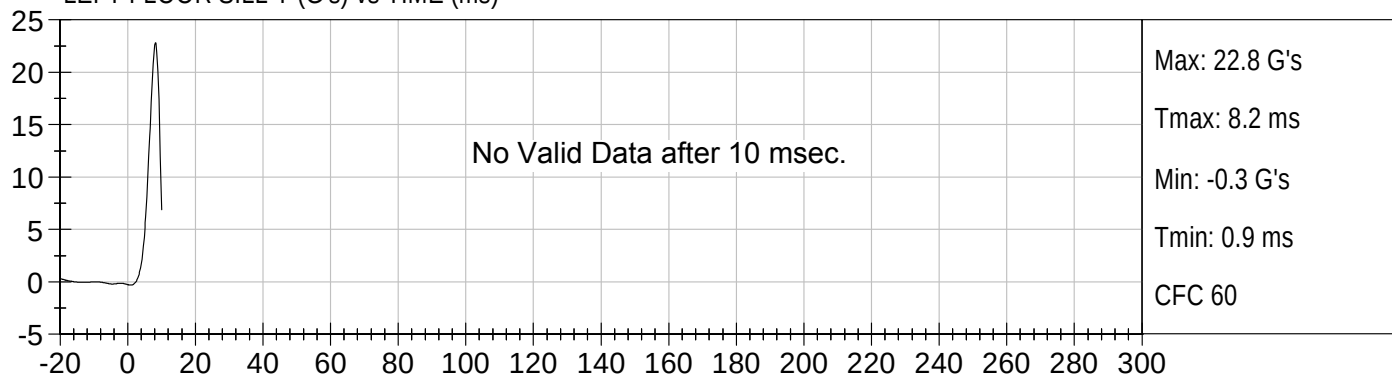




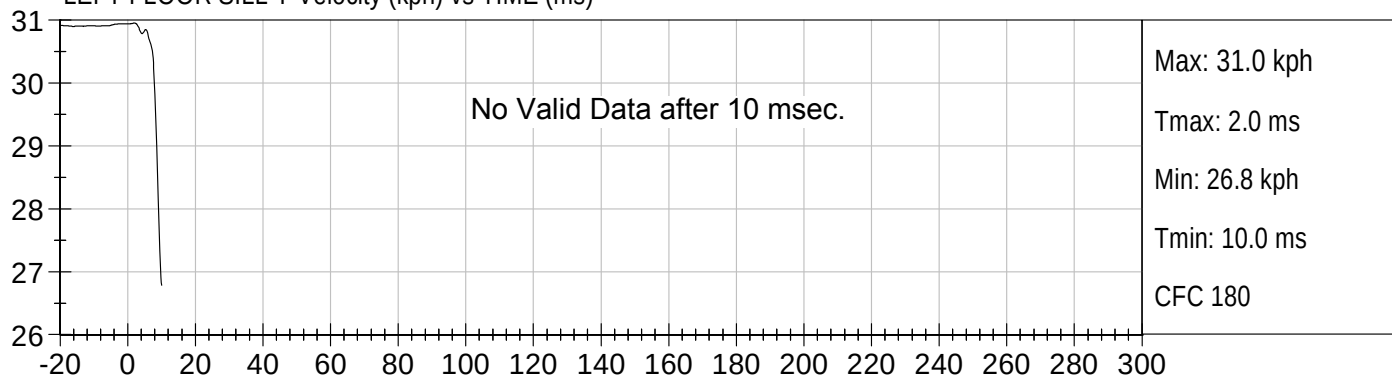




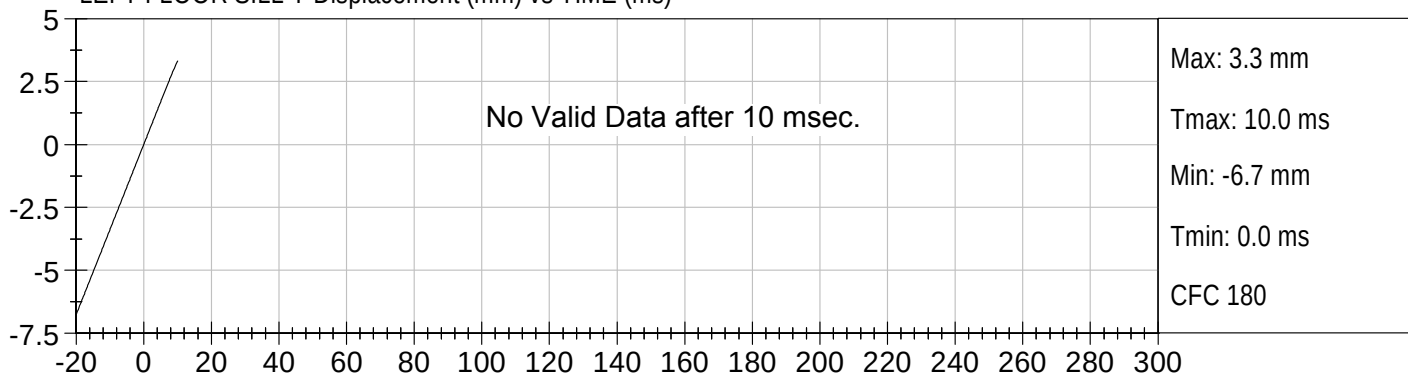
LEFT FLOOR SILL Y (G's) vs TIME (ms)

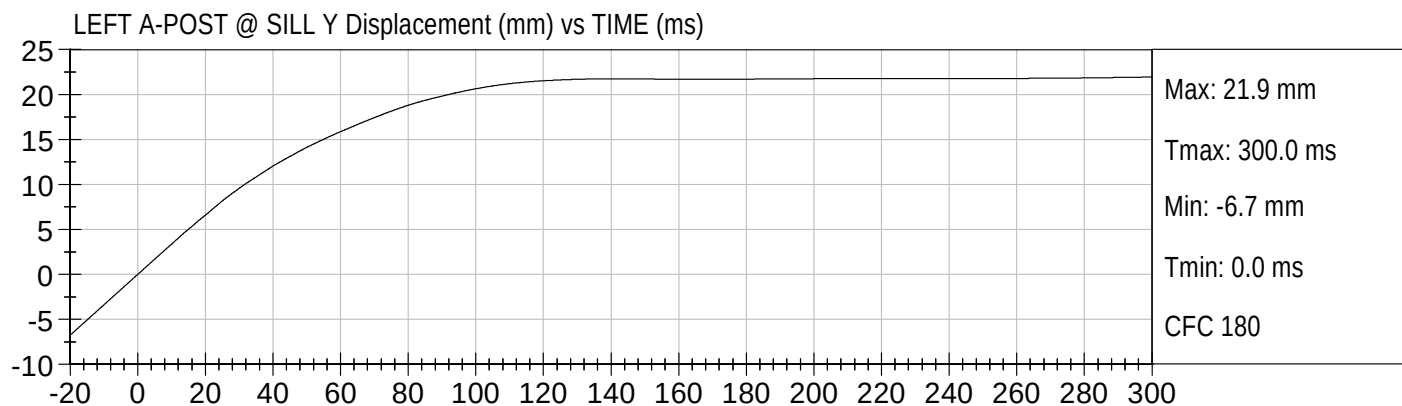
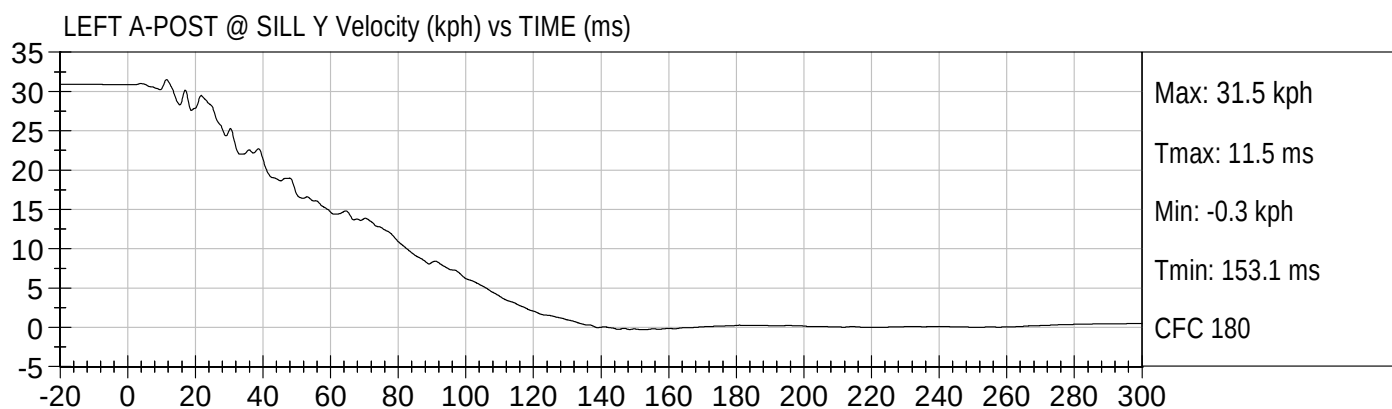
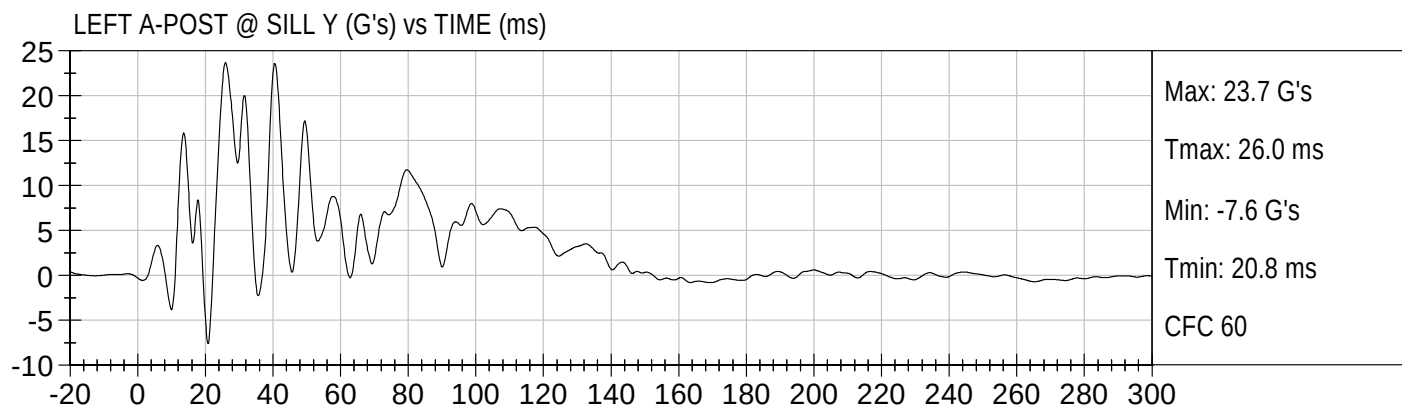


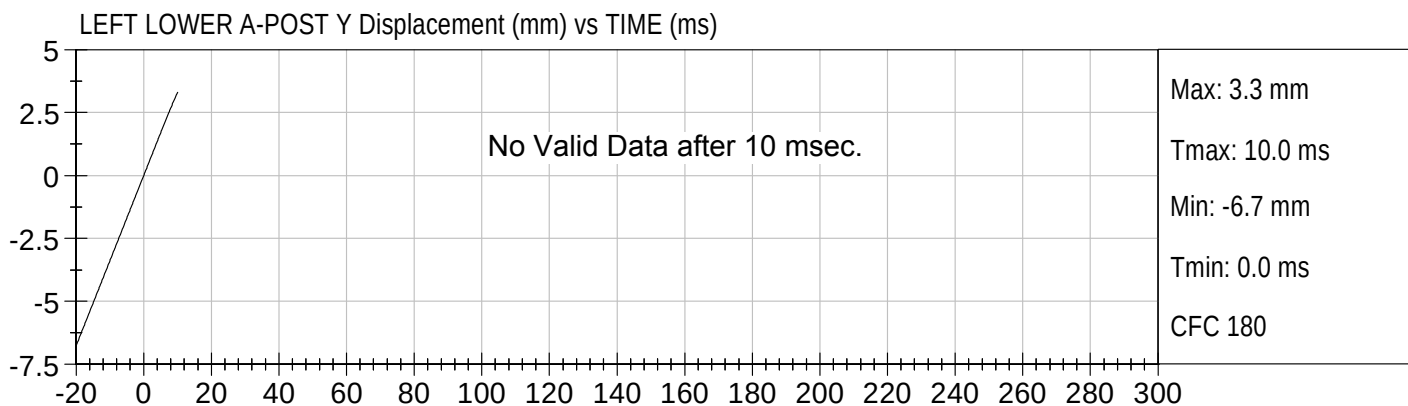
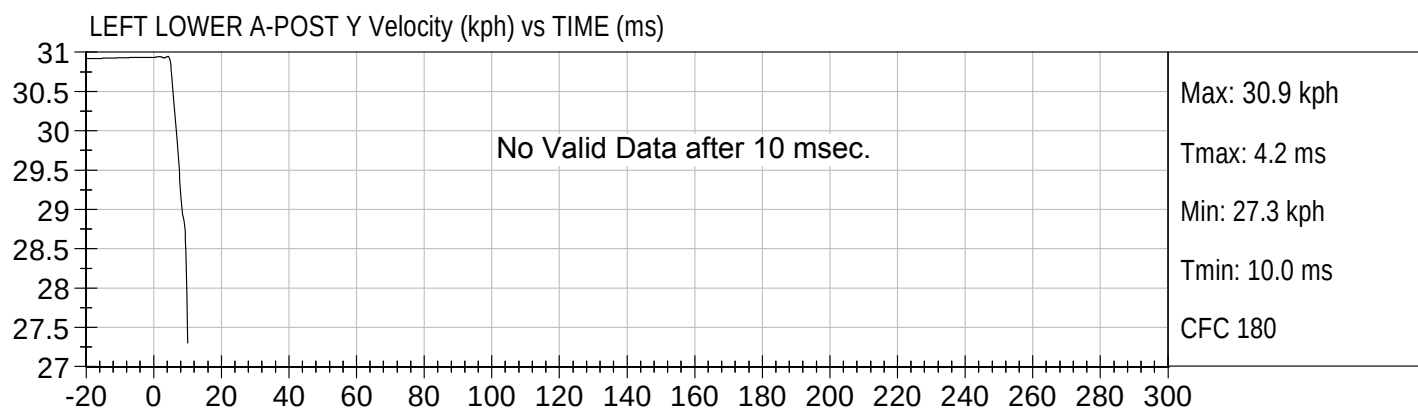
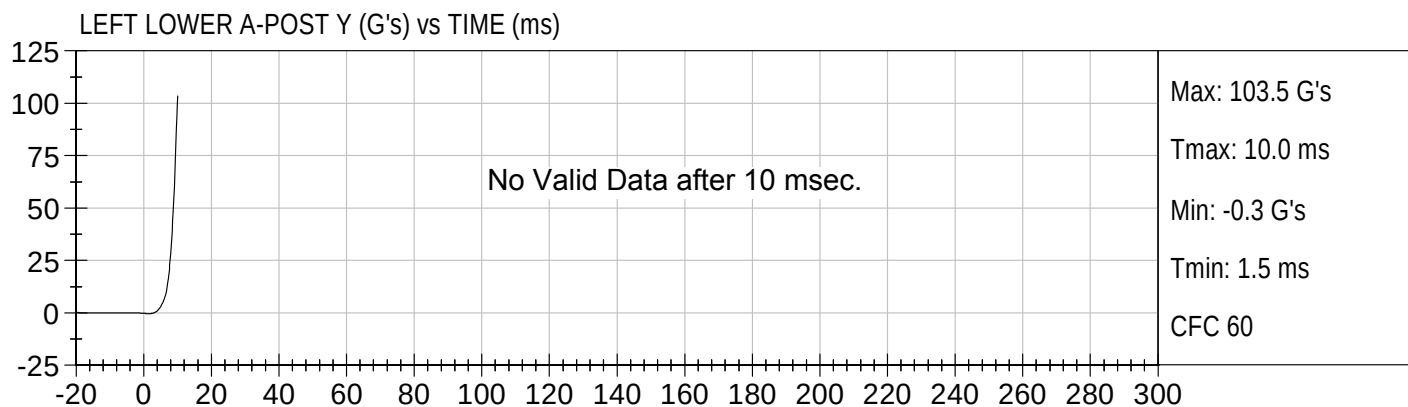
LEFT FLOOR SILL Y Velocity (kph) vs TIME (ms)

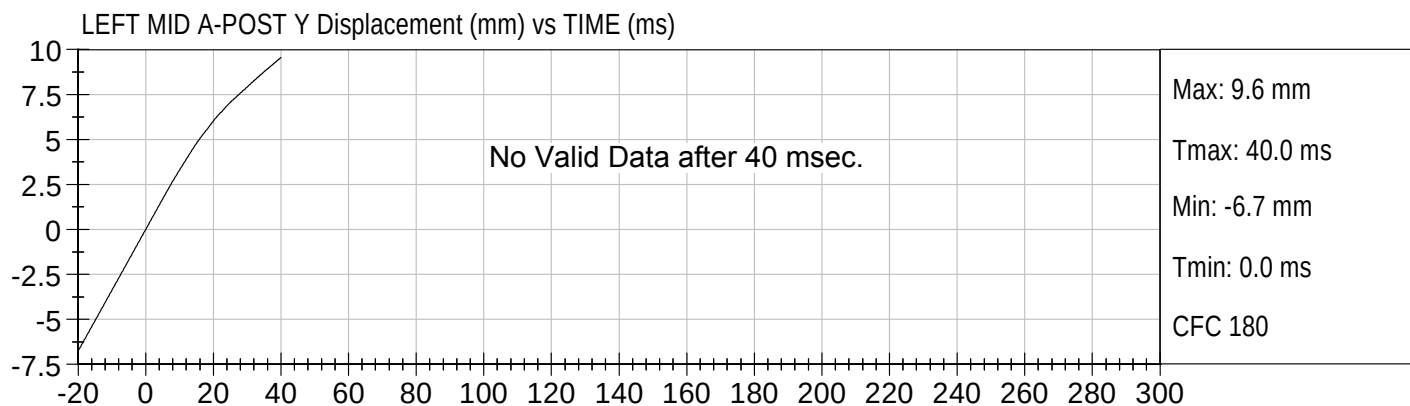
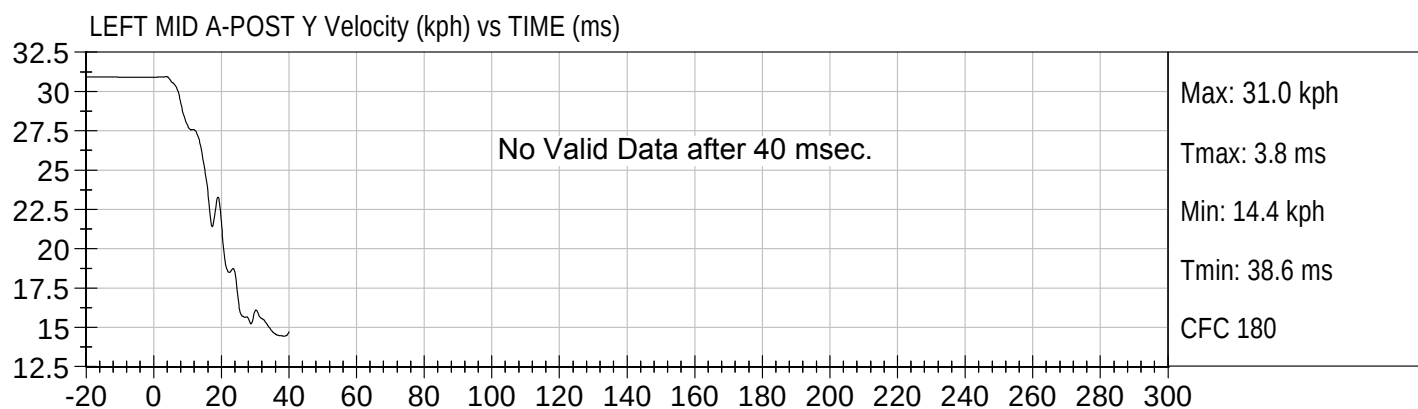
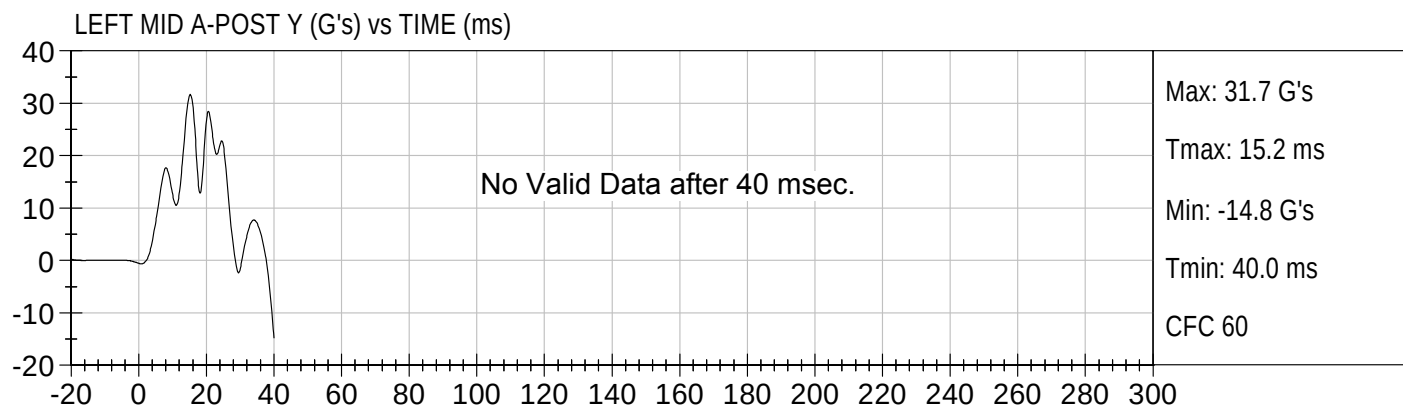


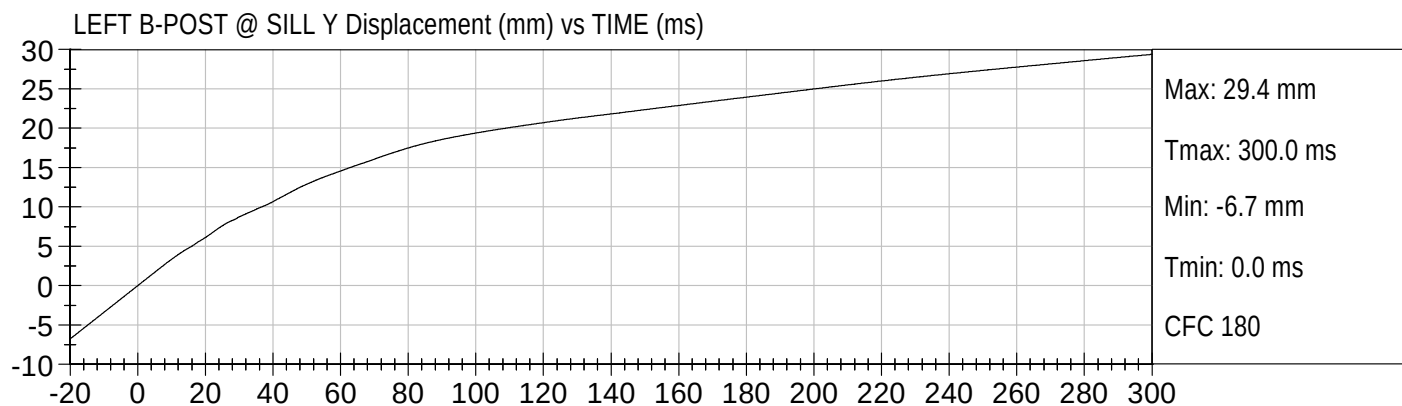
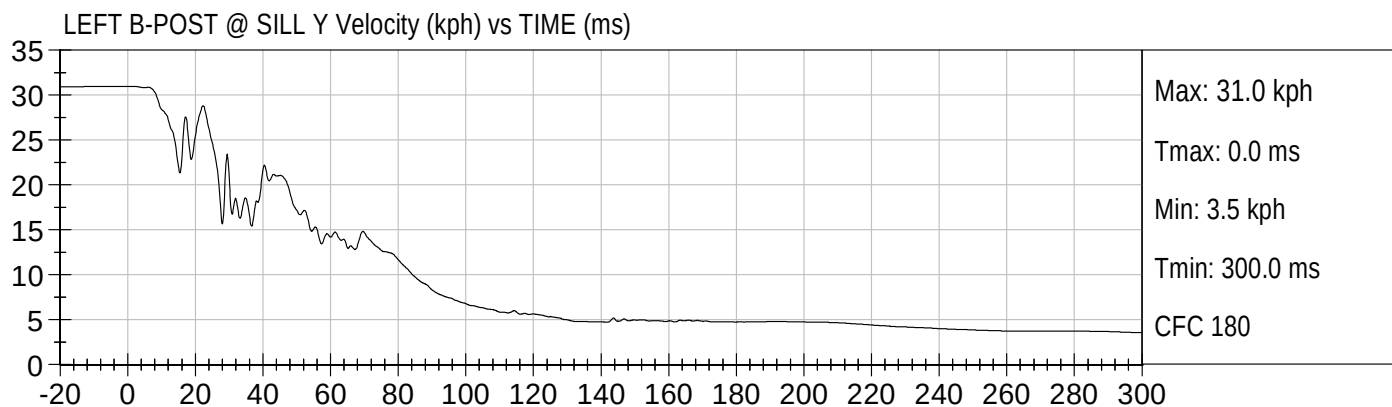
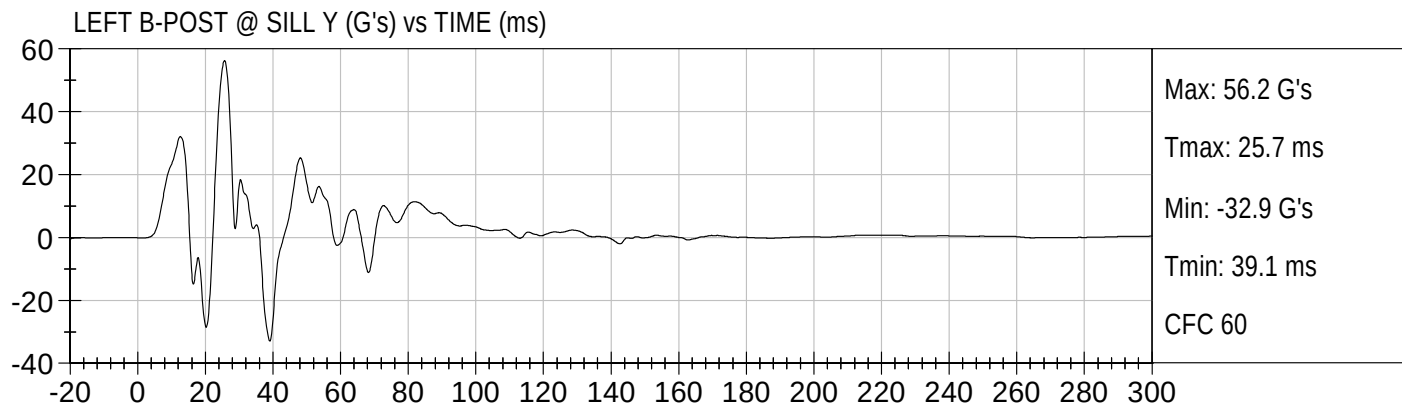
LEFT FLOOR SILL Y Displacement (mm) vs TIME (ms)

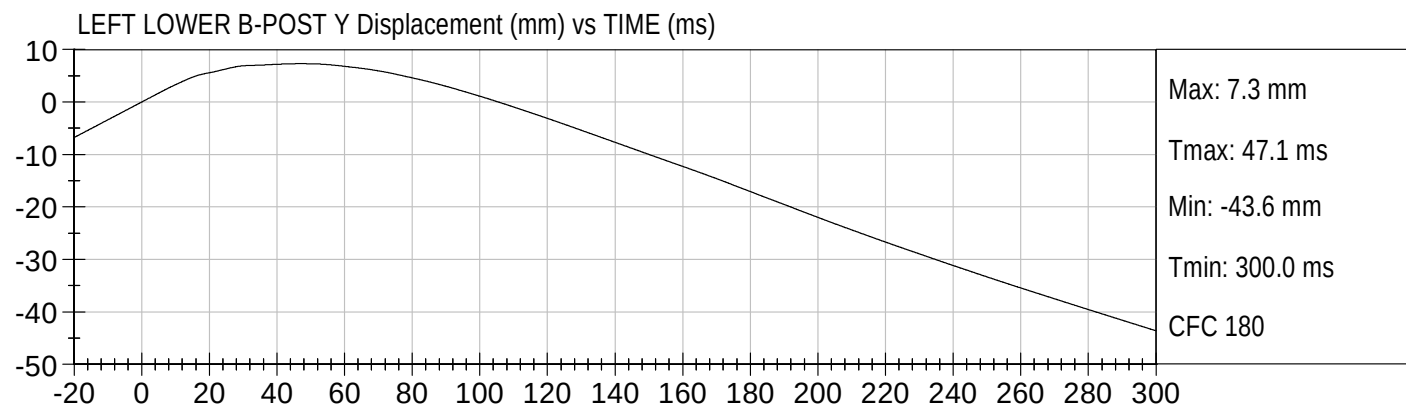
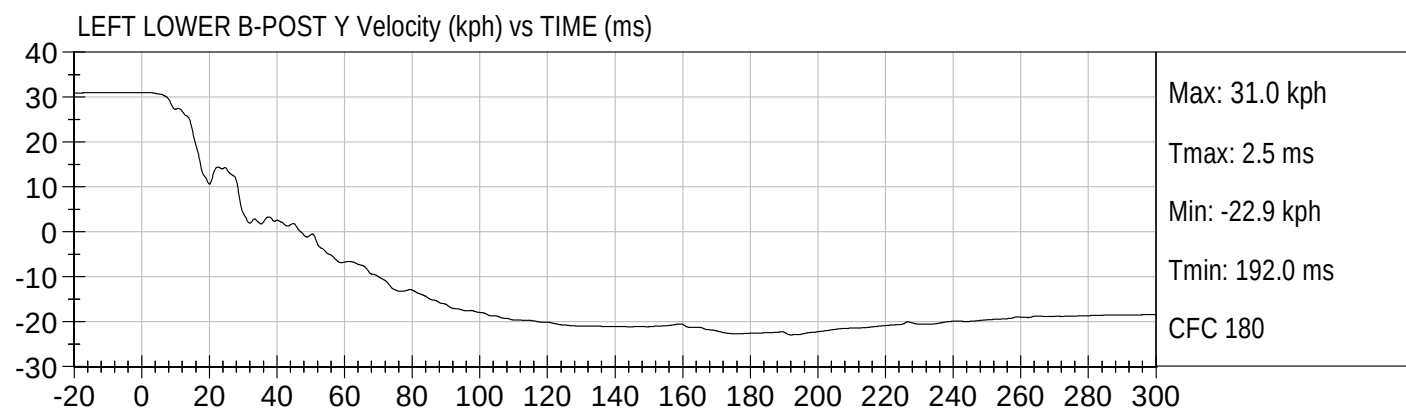
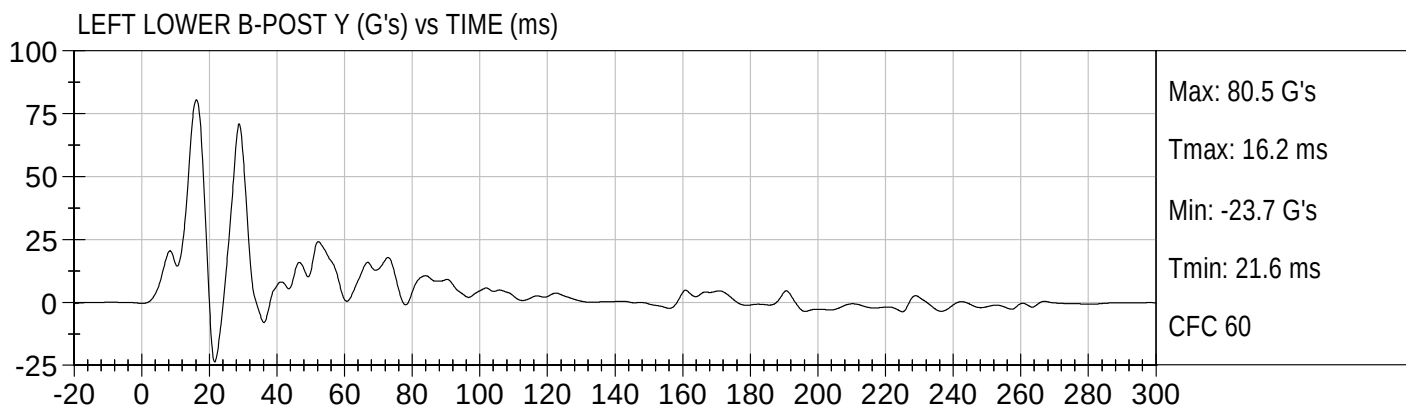


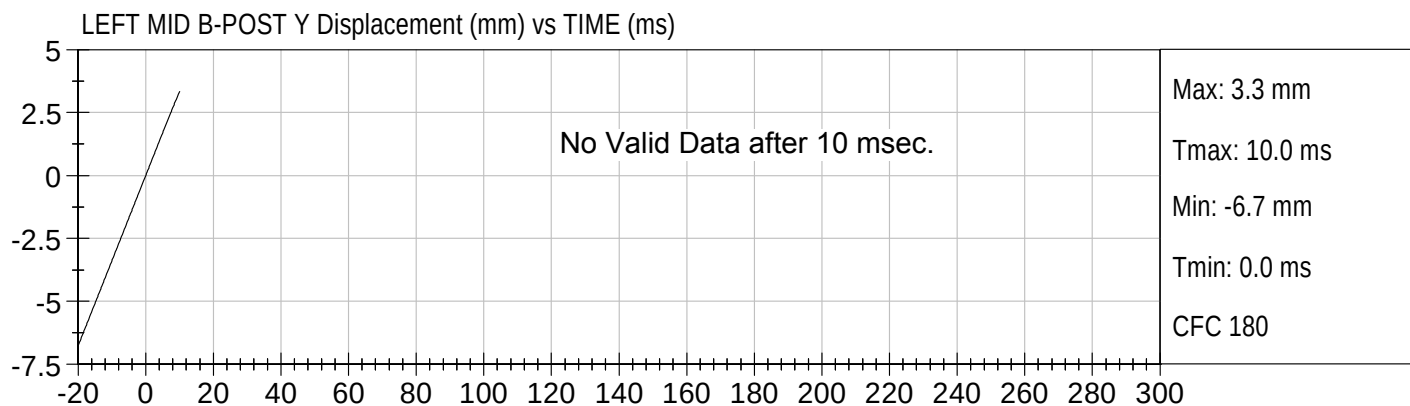
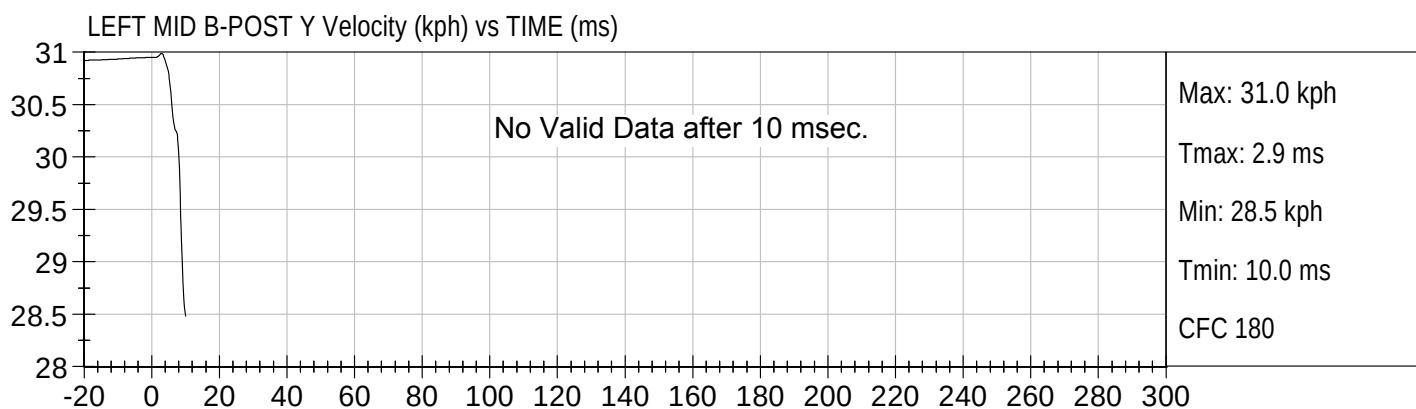
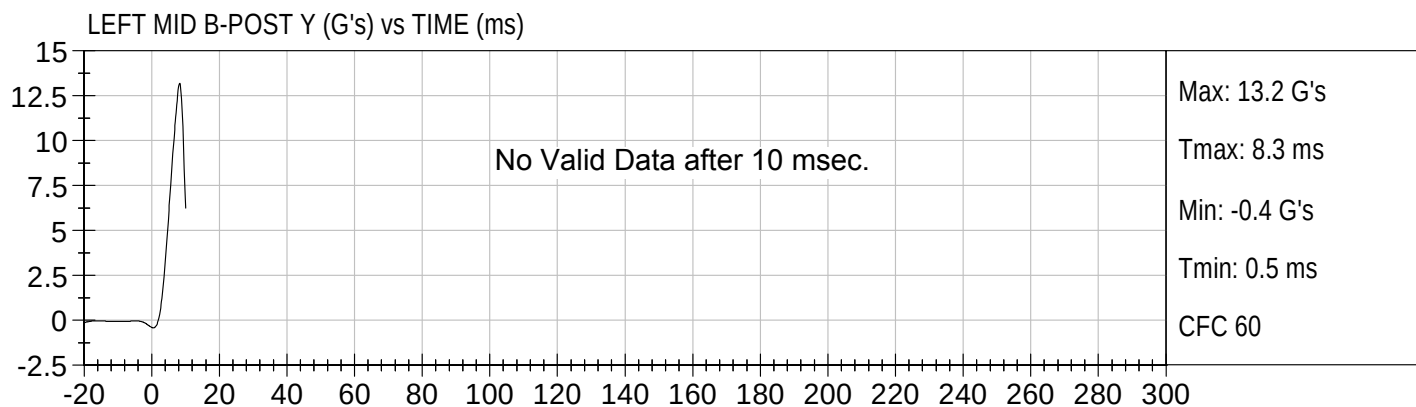


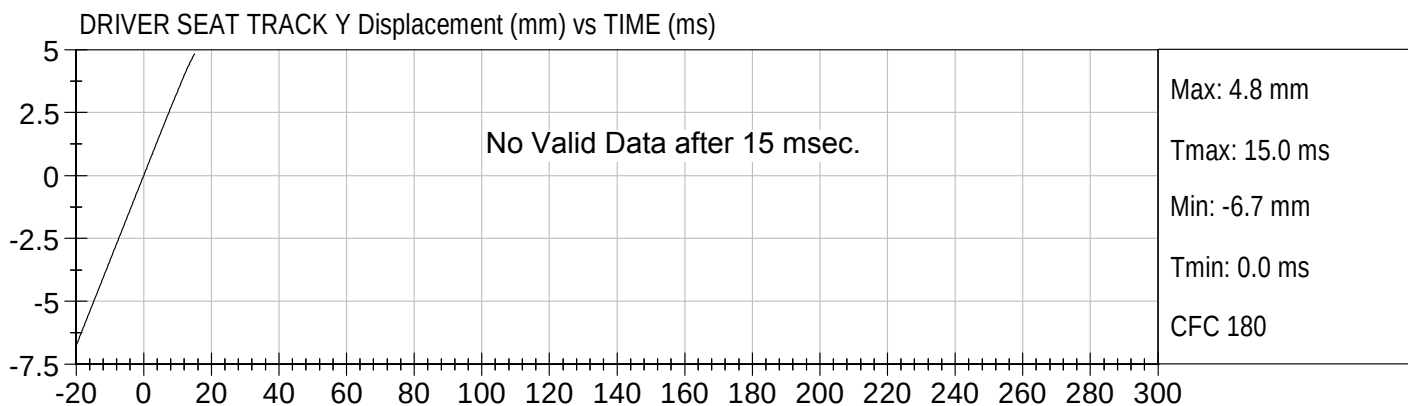
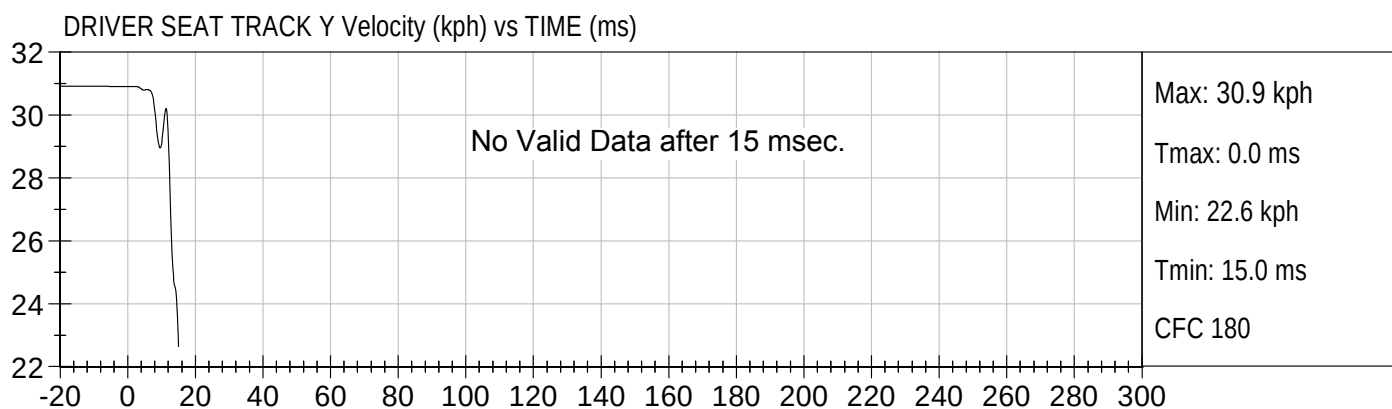
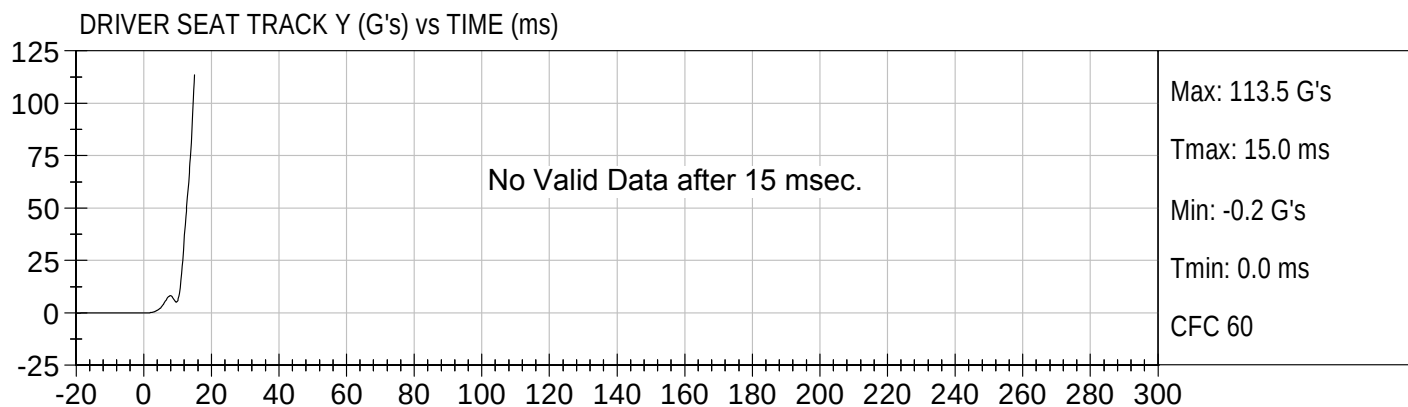


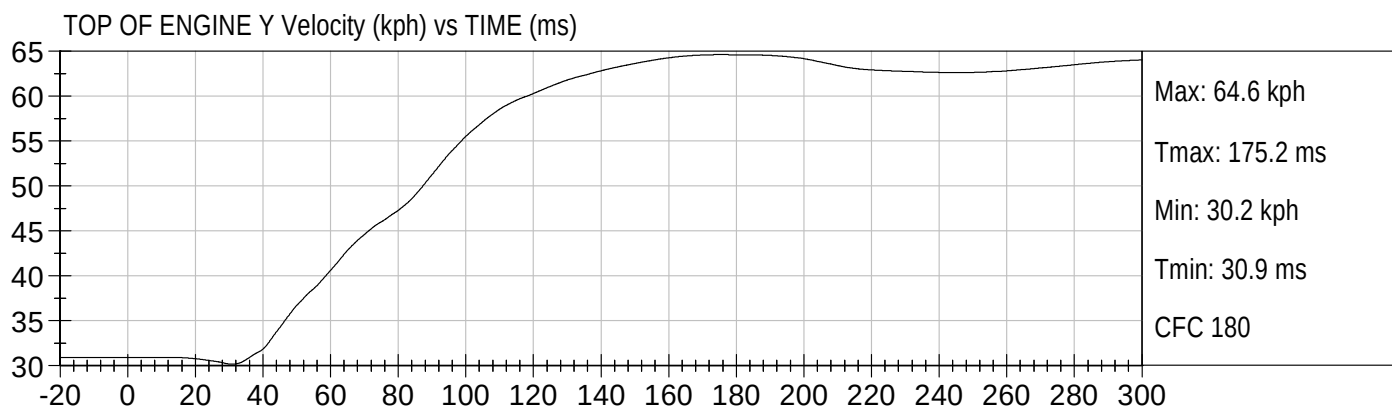
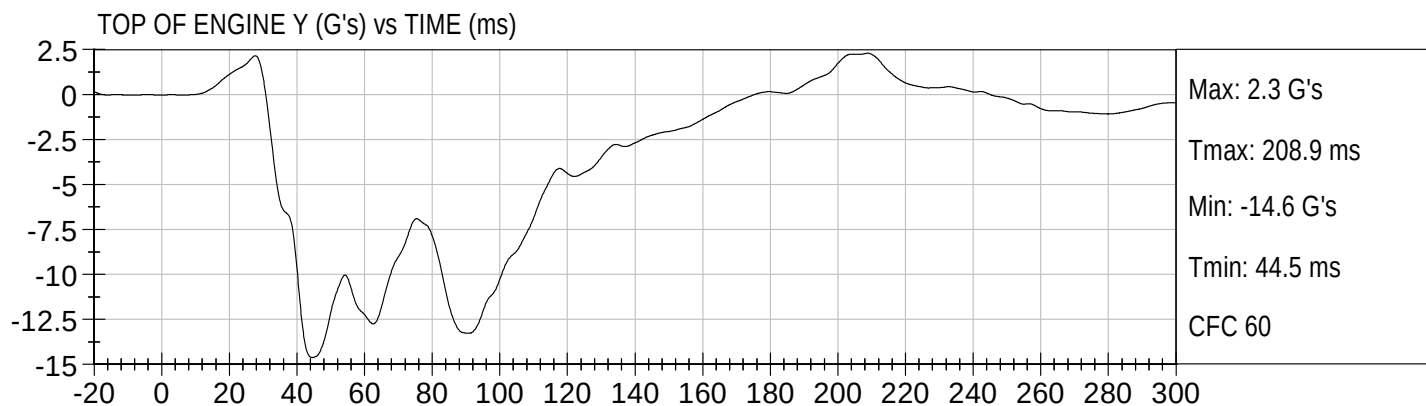
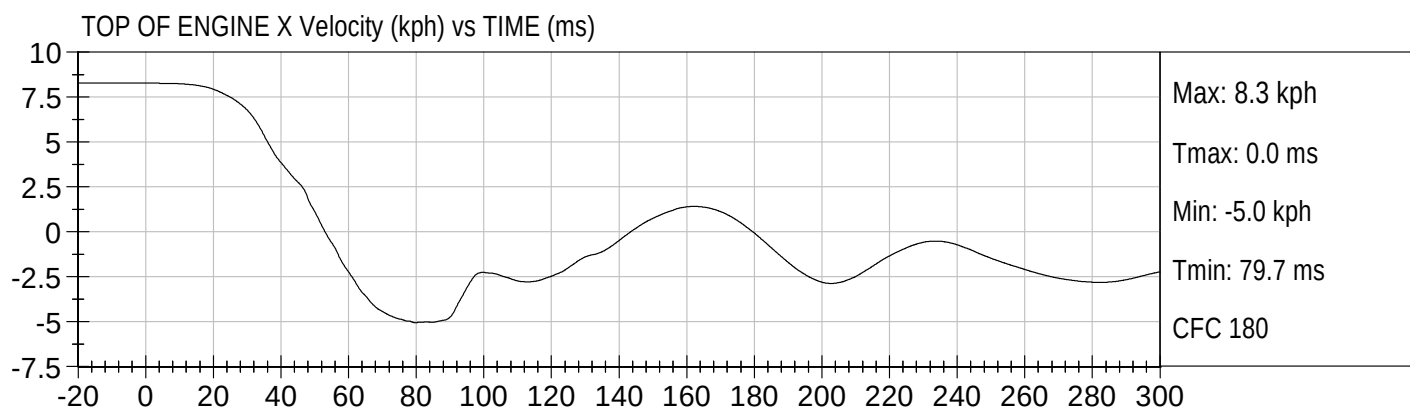
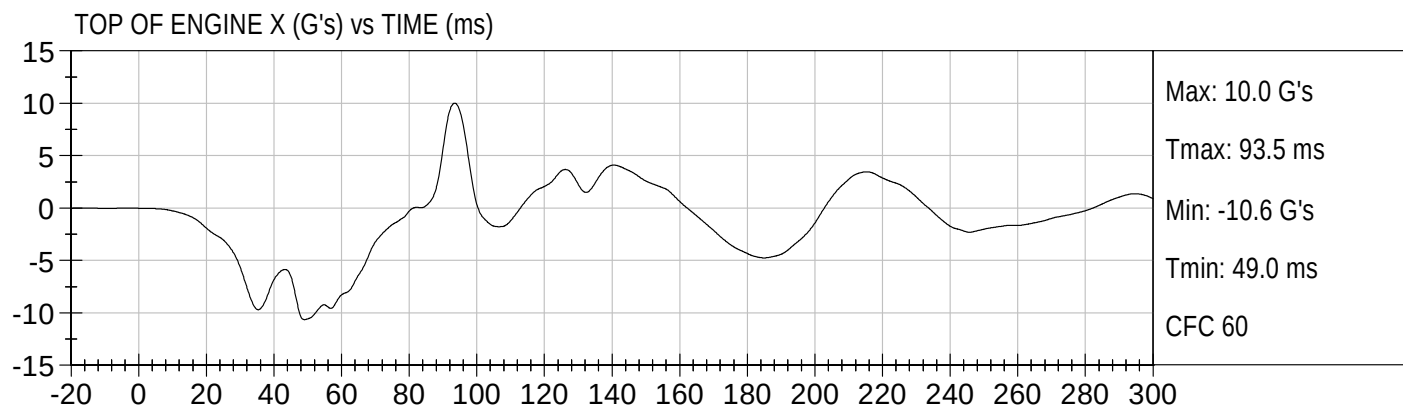


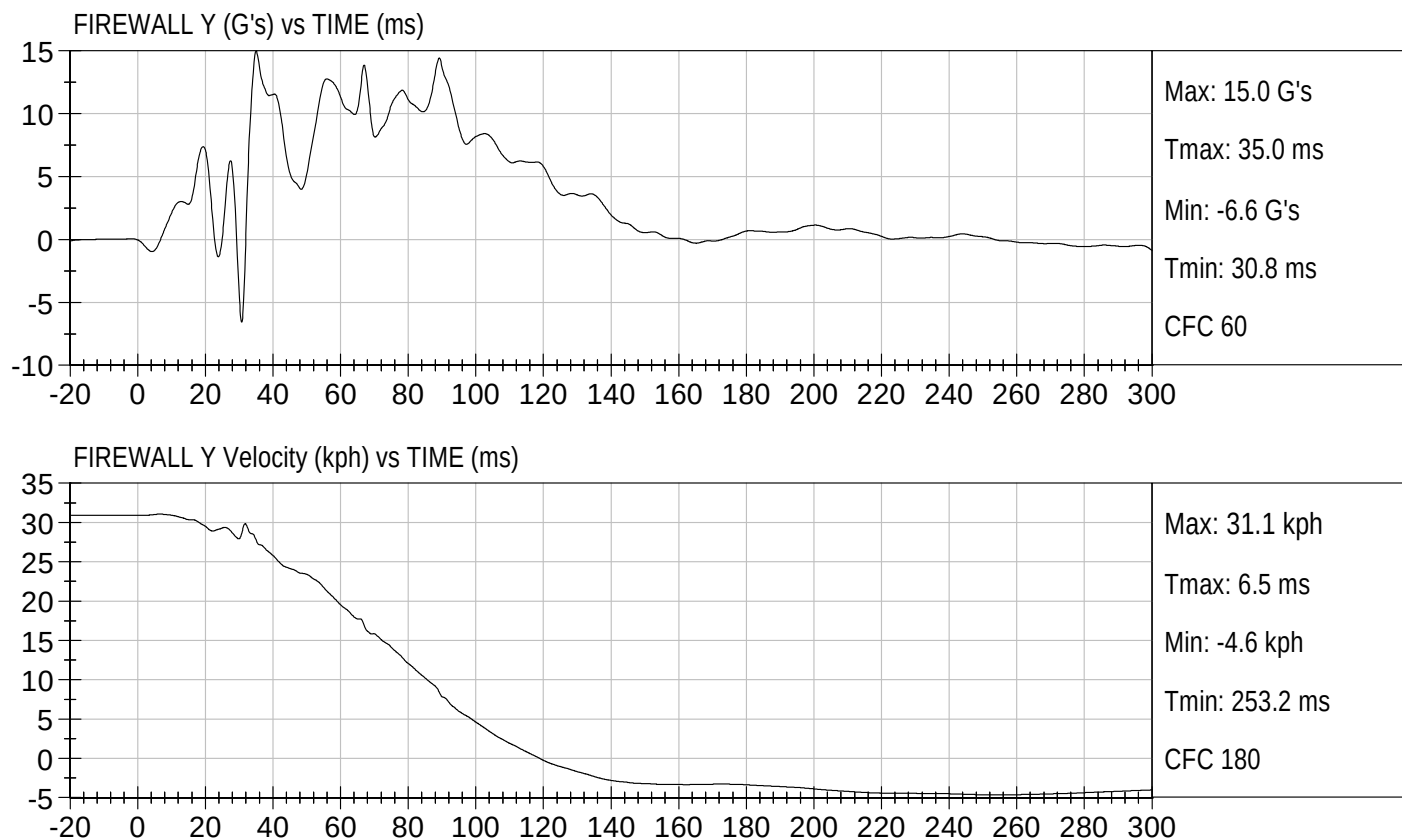


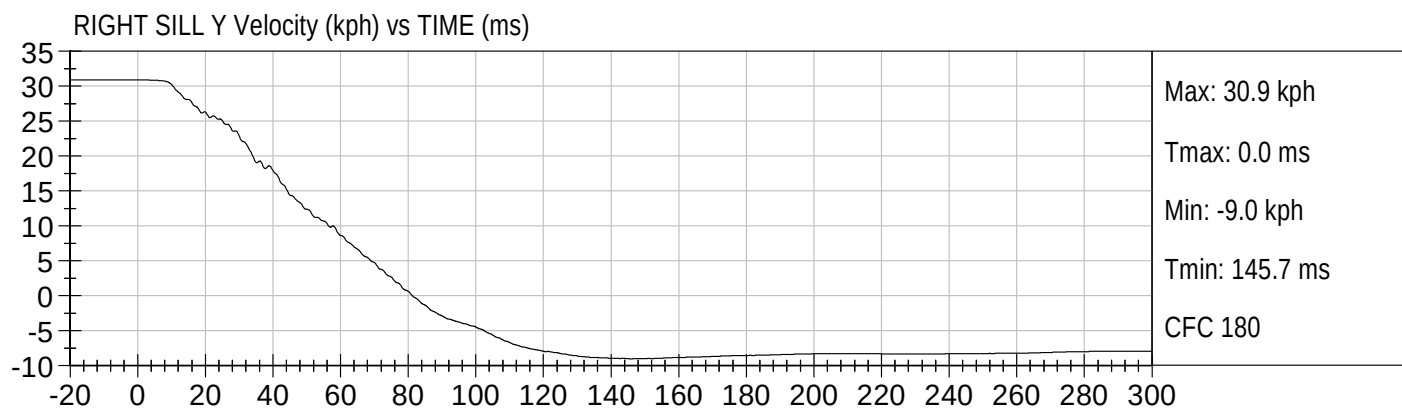
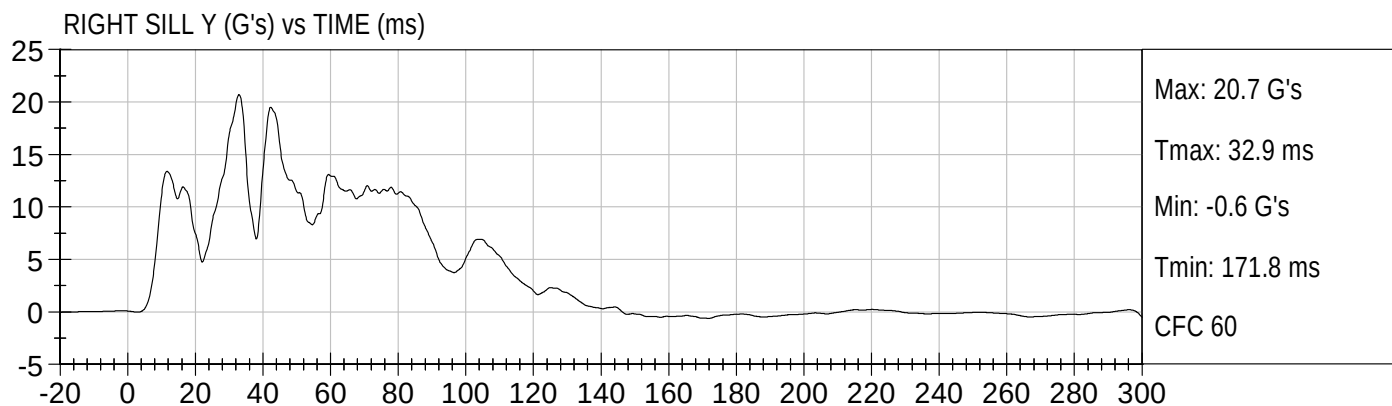
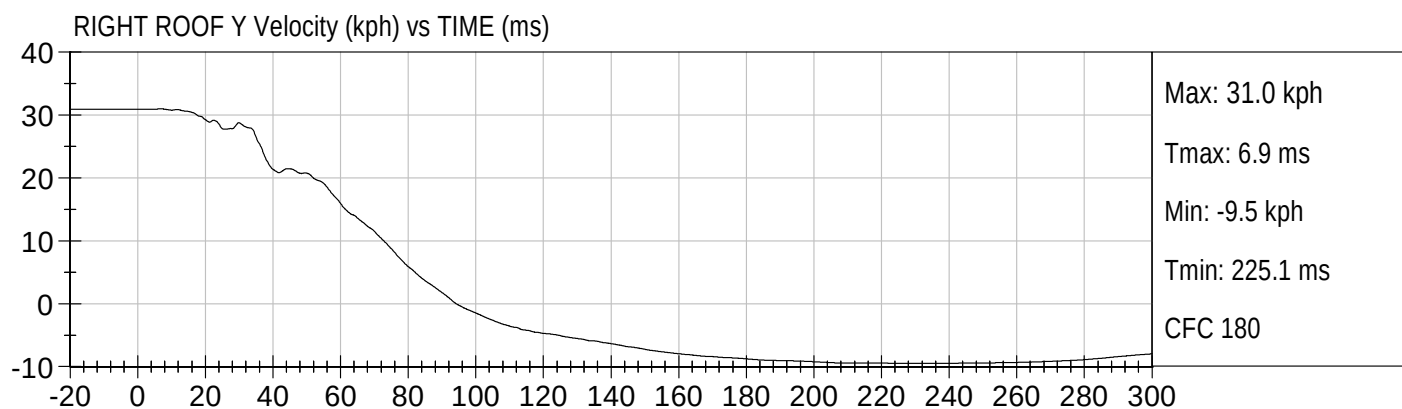
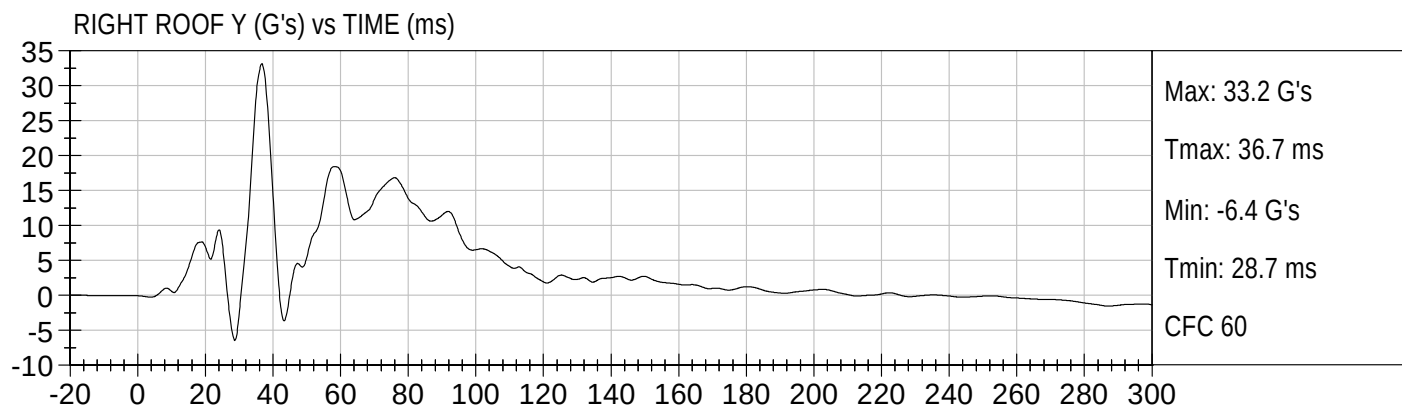


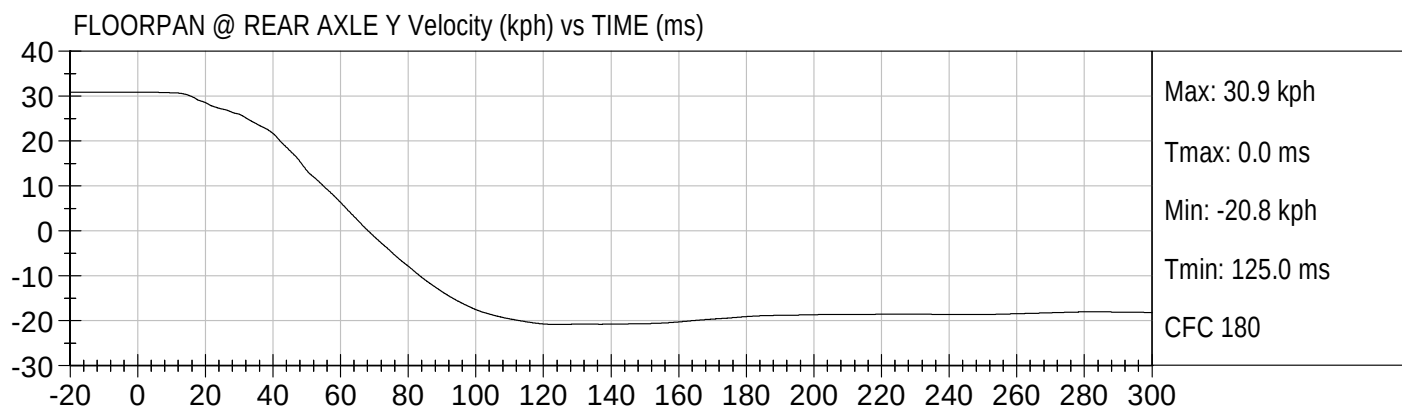
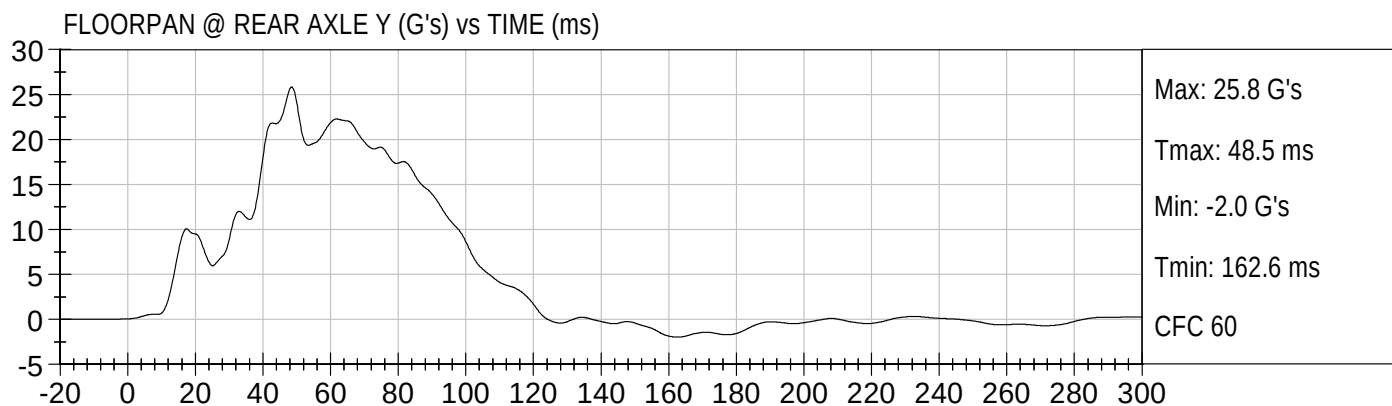
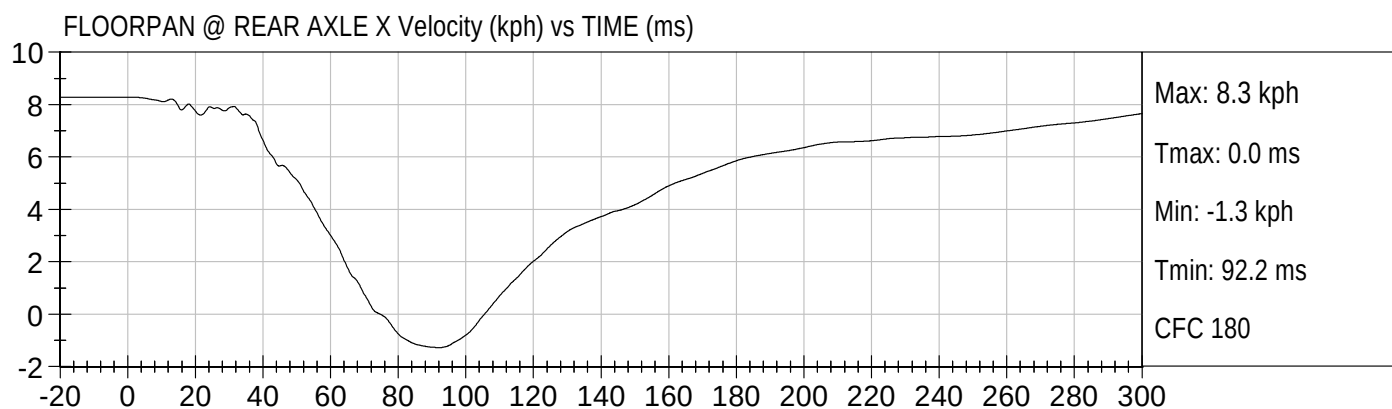
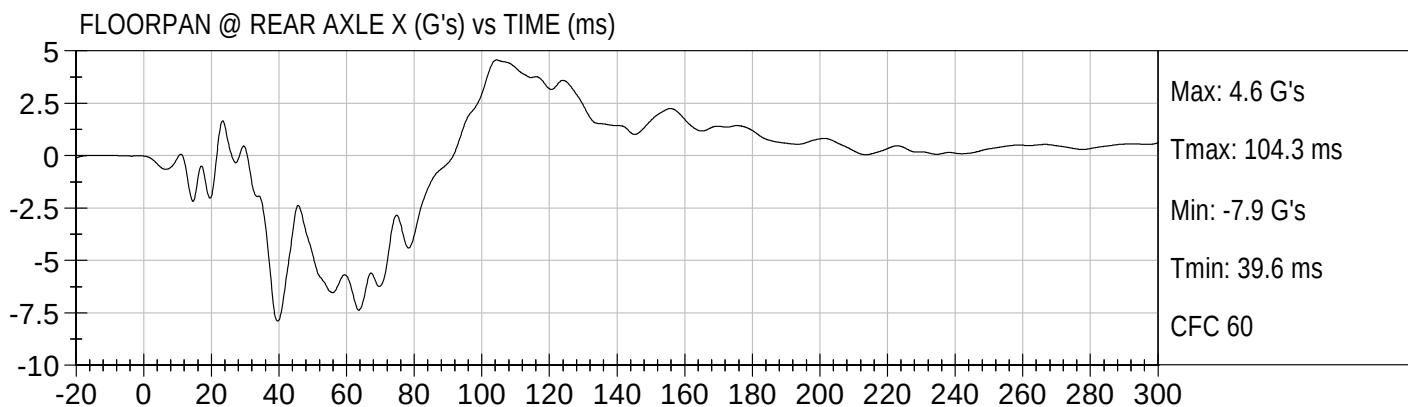


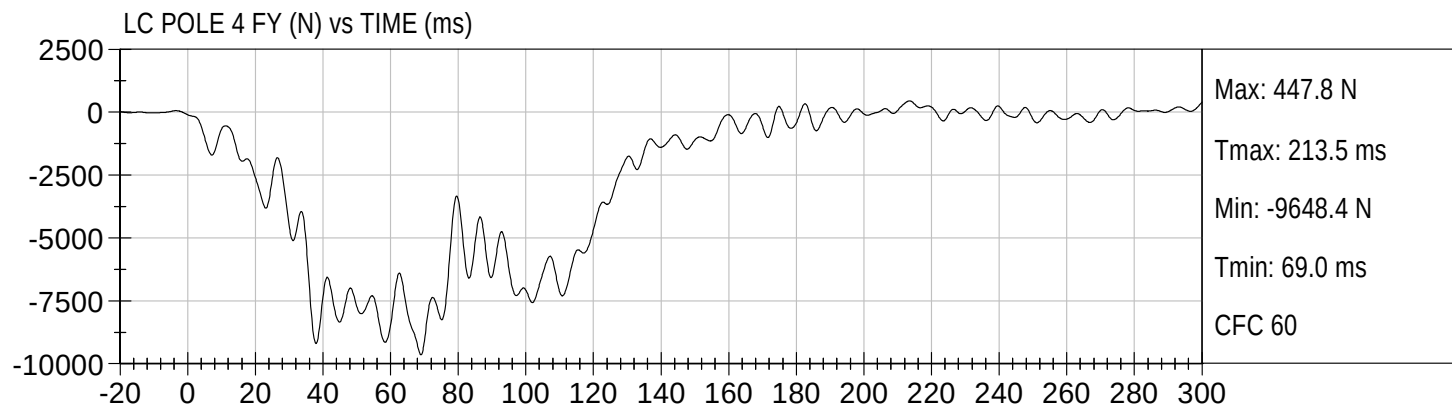
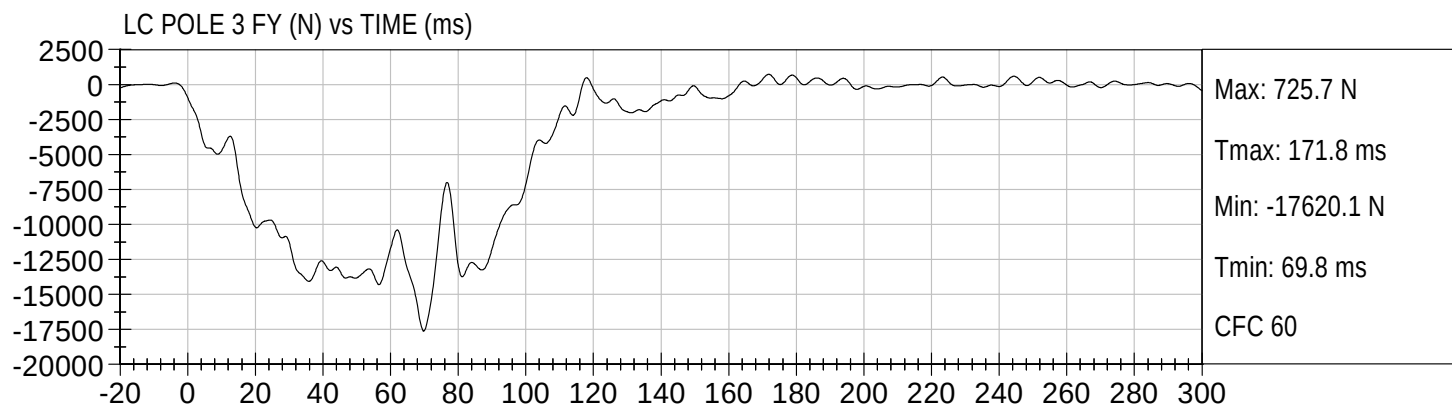
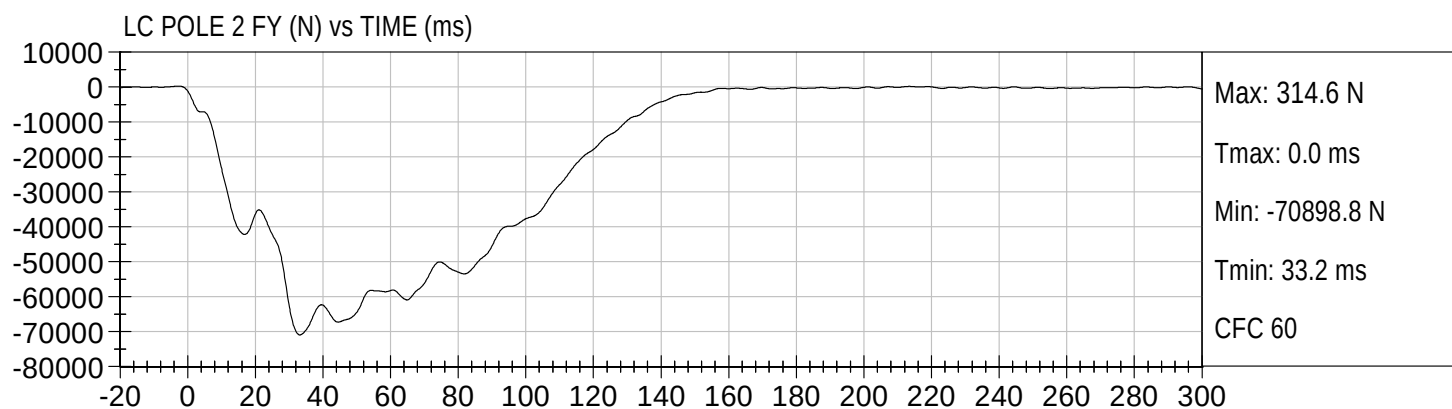
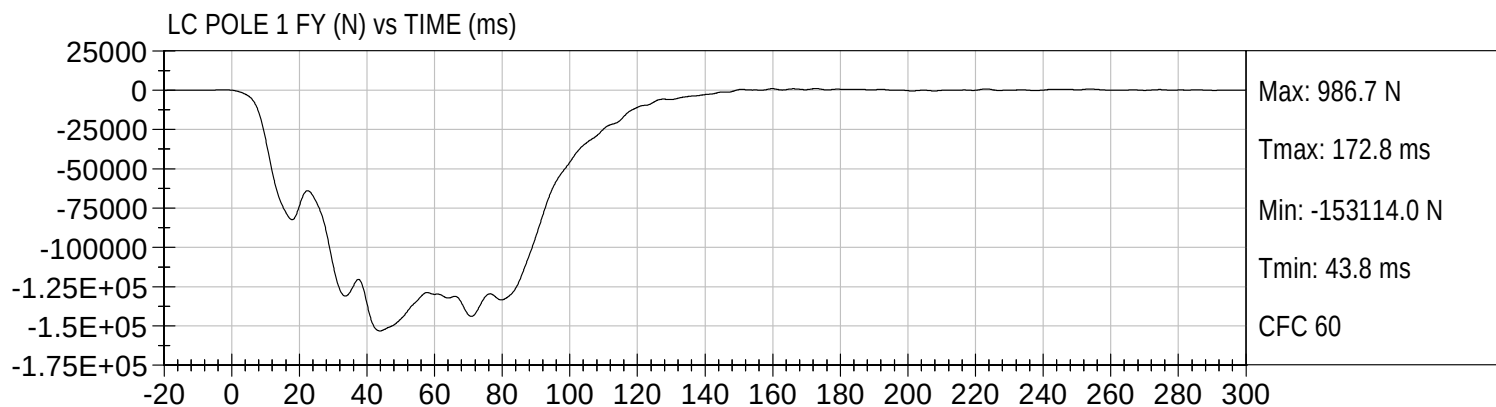


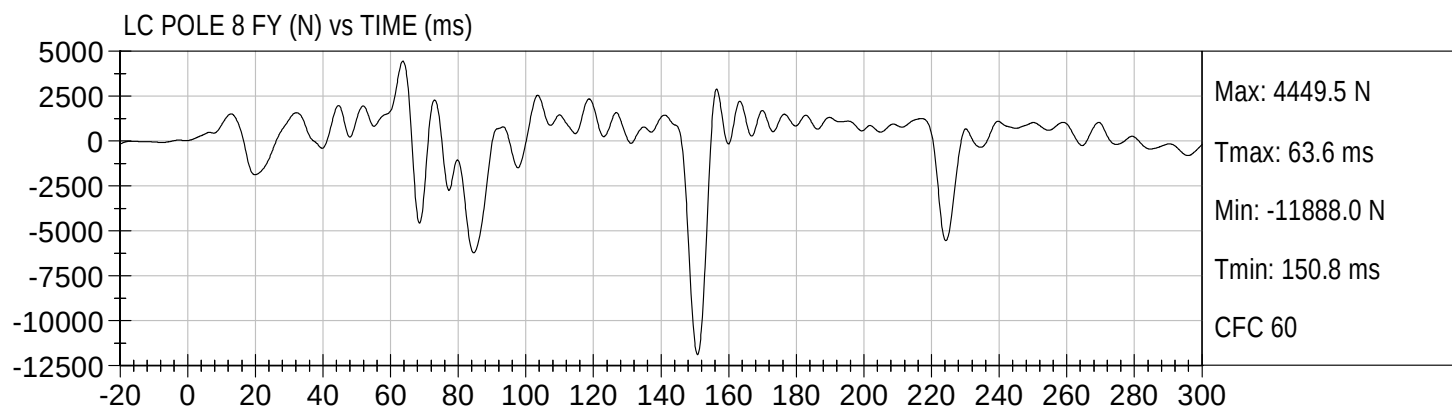
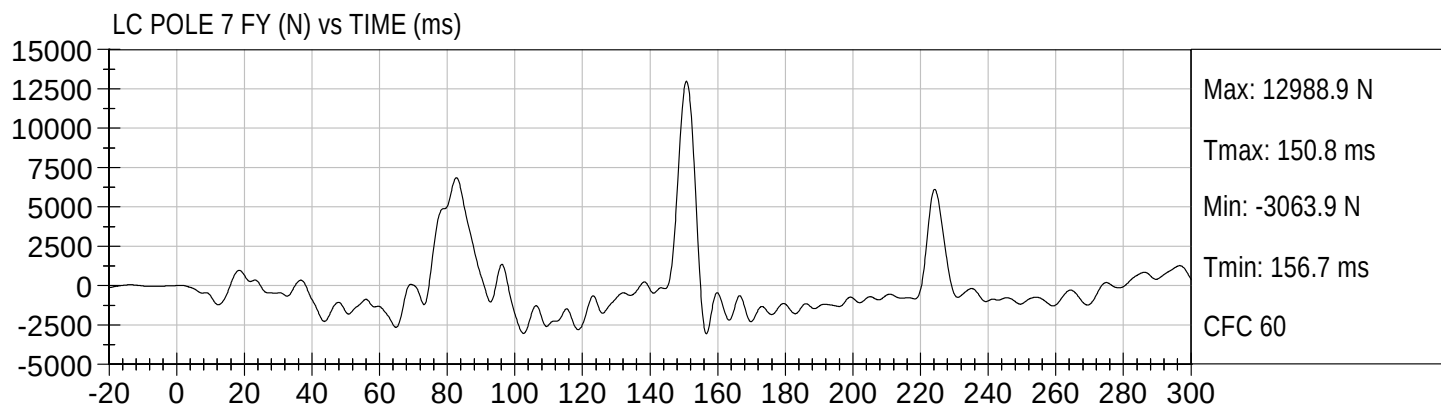
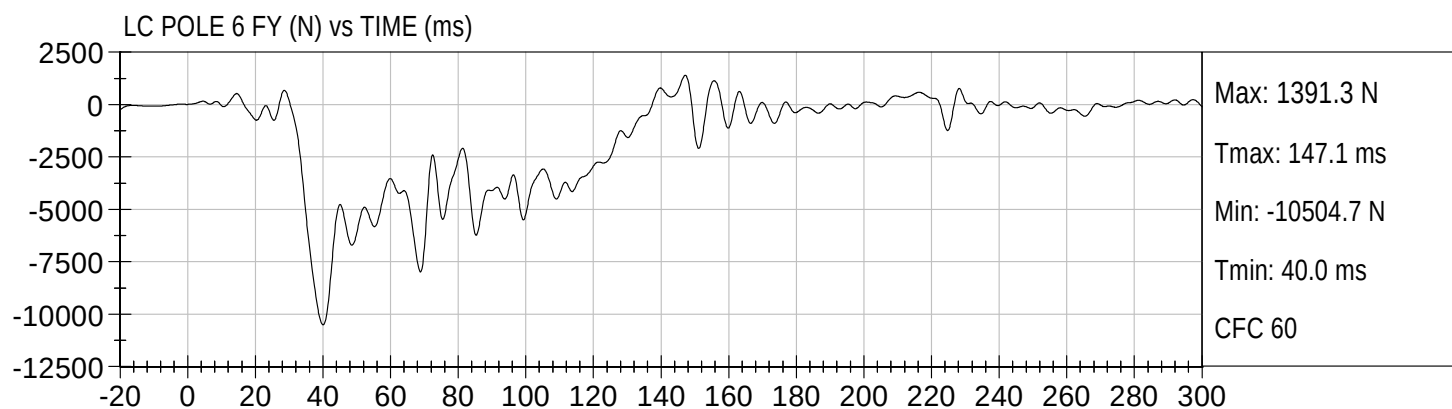
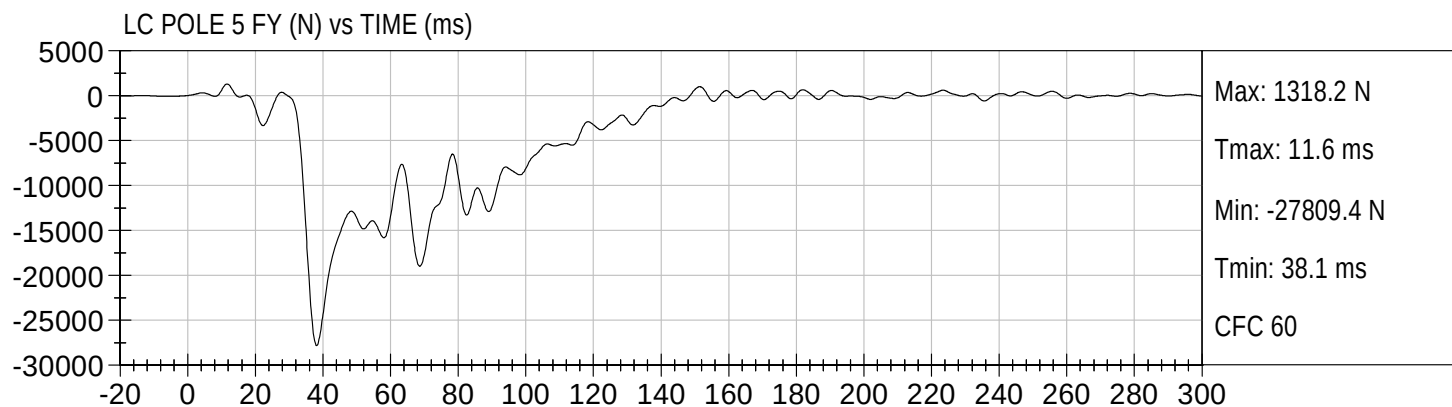












APPENDIX D

DUMMY PERFORMANCE CALIBRATION TEST DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 304

Test ID: D114301

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	115 to 137	123	Pass
Peak Longitudinal Acceleration	G's	+/- 15	4.5	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Gall
Laboratory Technician

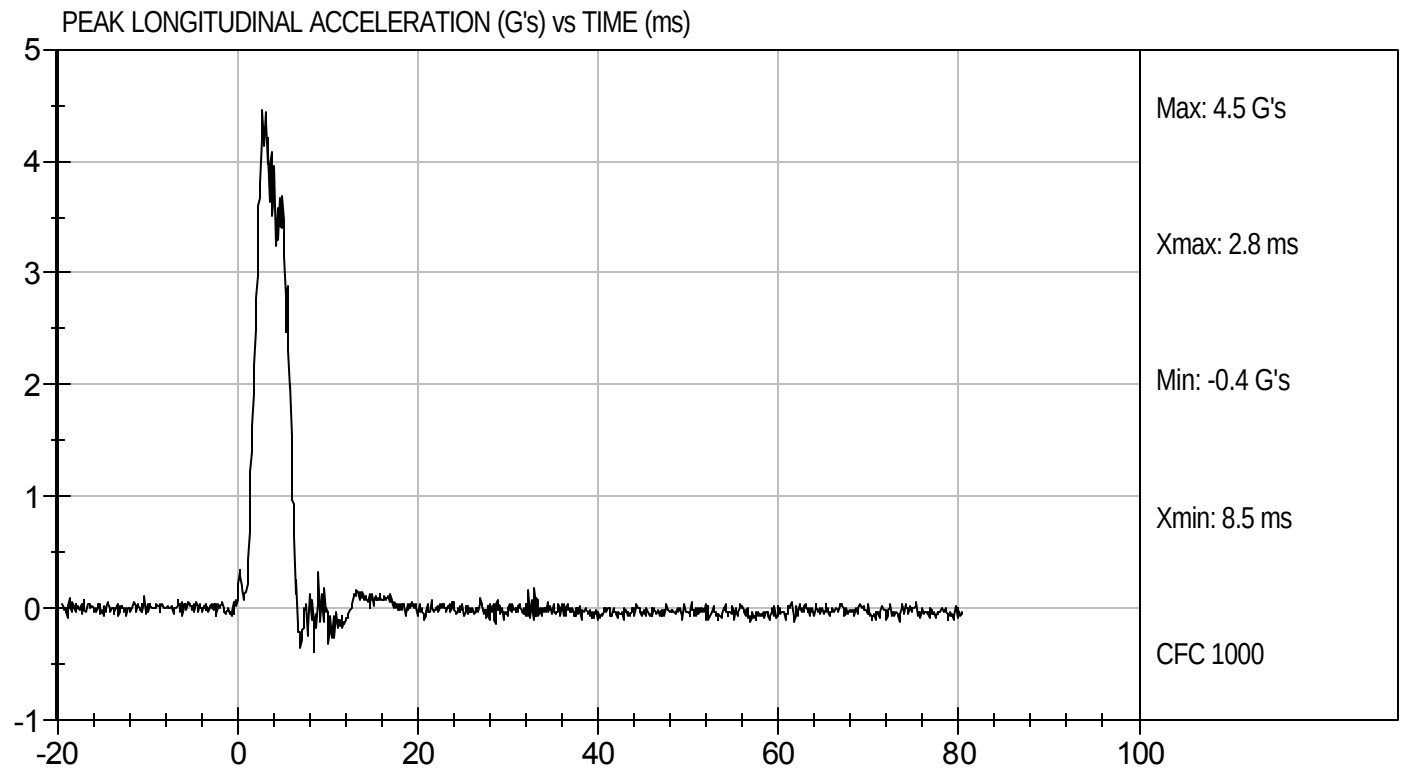
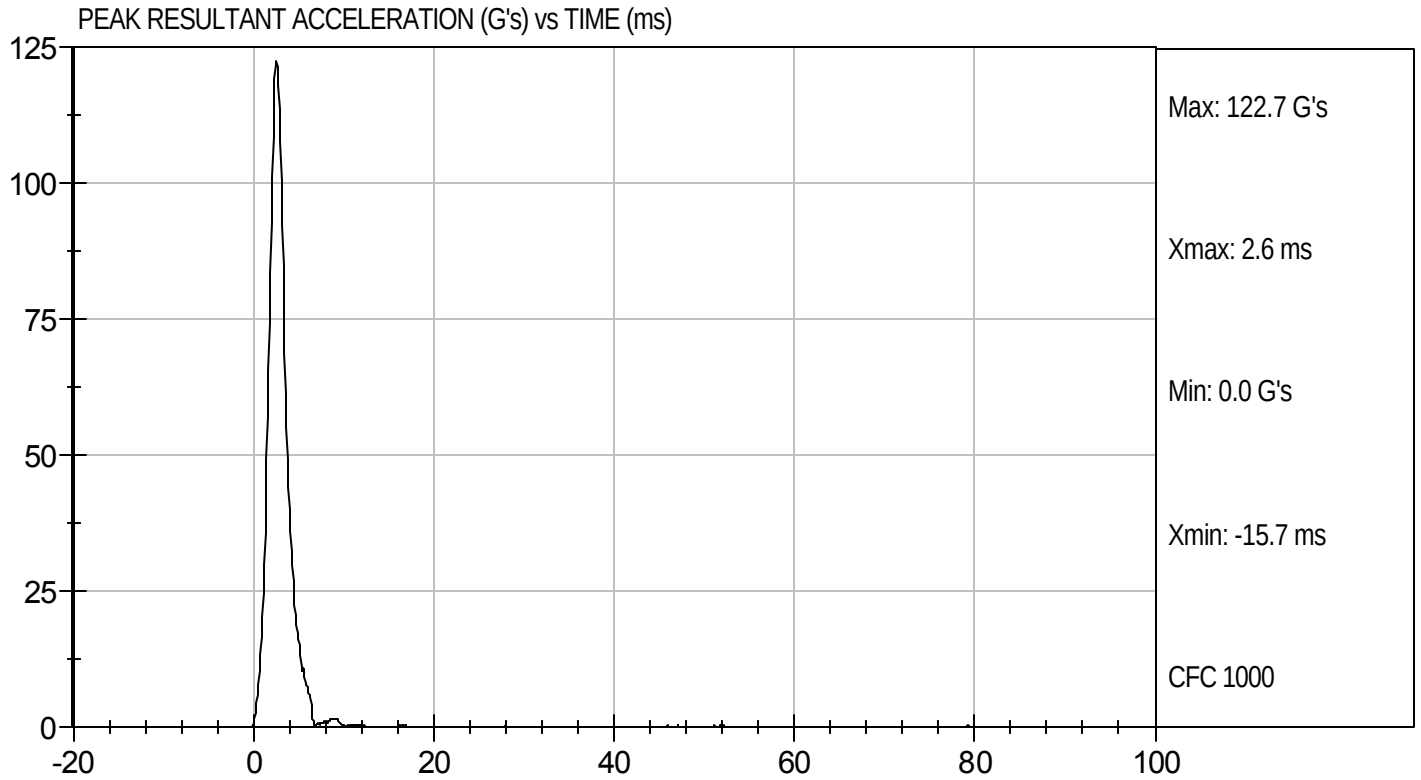
12/20/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D114301

Test Date: 12/20/11
Velocity: 0 ft/s, 0 m/s

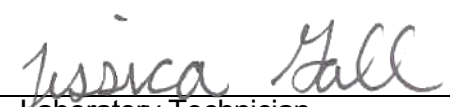


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114302

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	20.8	Pass
Humidity		%	10 to 70	25	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.59	Pass
	15 ms	m/s	3.30 to 4.10	3.67	Pass
	20 ms	m/s	4.40 to 5.40	4.85	Pass
	25 ms	m/s	5.40 to 6.10	5.49	Pass
	25-100 ms	m/s	5.50 to 6.20	5.56	Pass
Maximum D-Plane Rotation		deg	71 to 81	72	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	60	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	116	Pass
Overall Test Results				Pass	


 Laboratory Technician

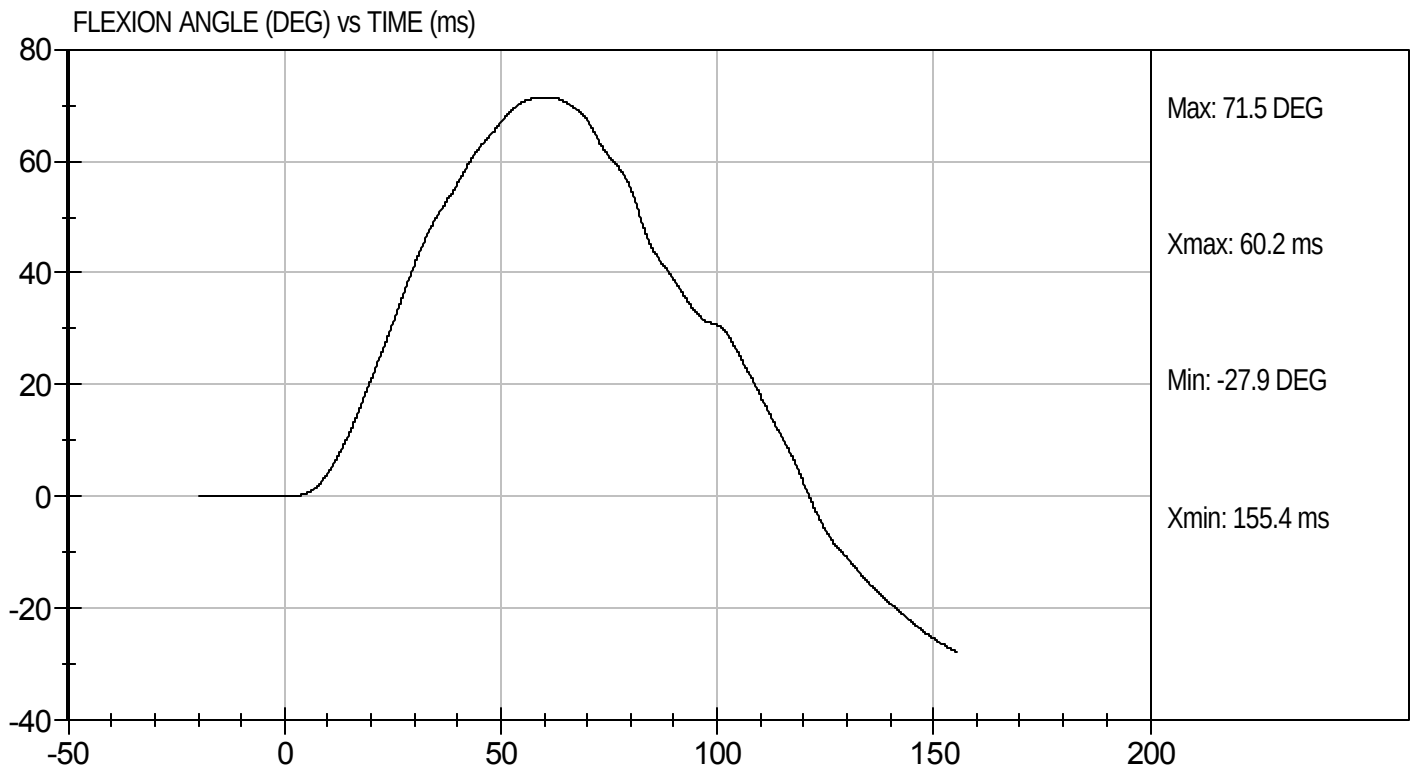
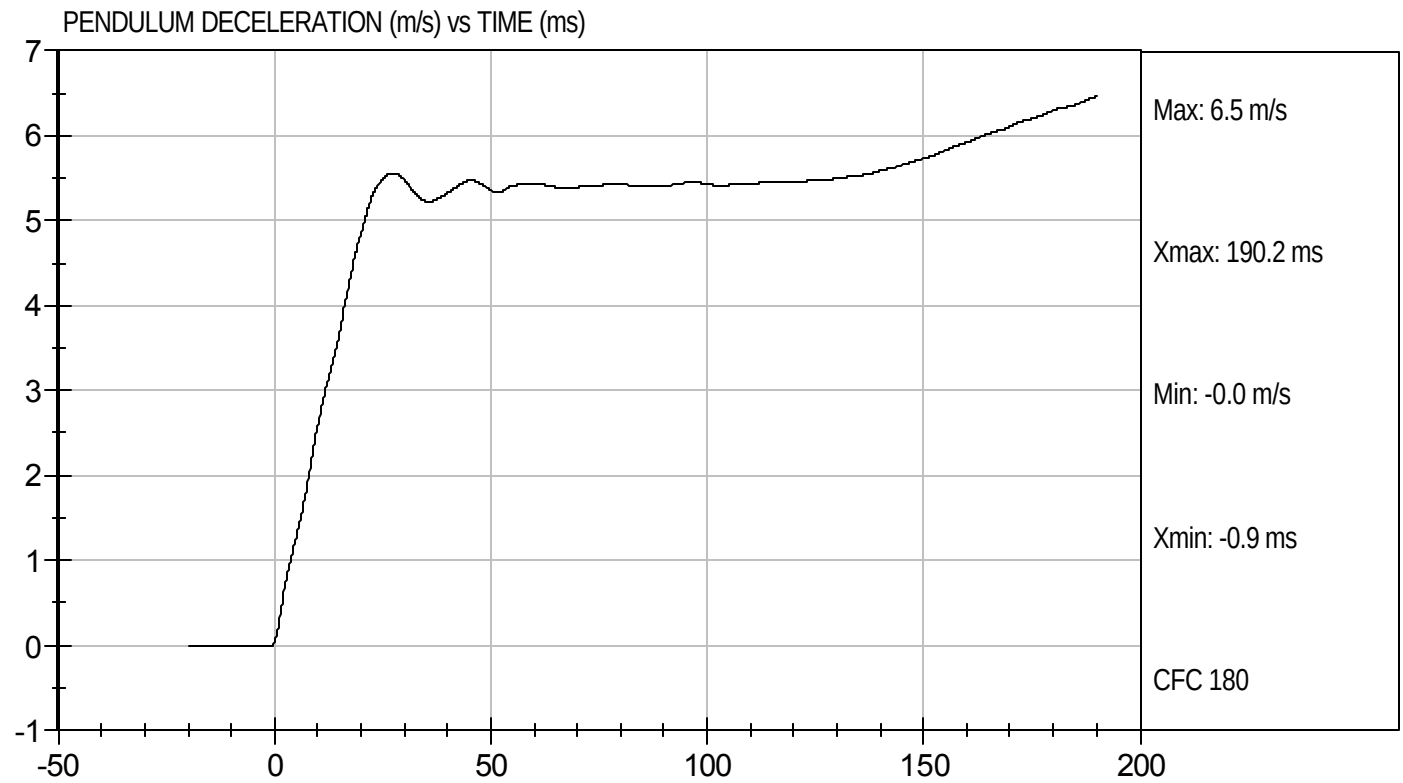
12/20/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D114302

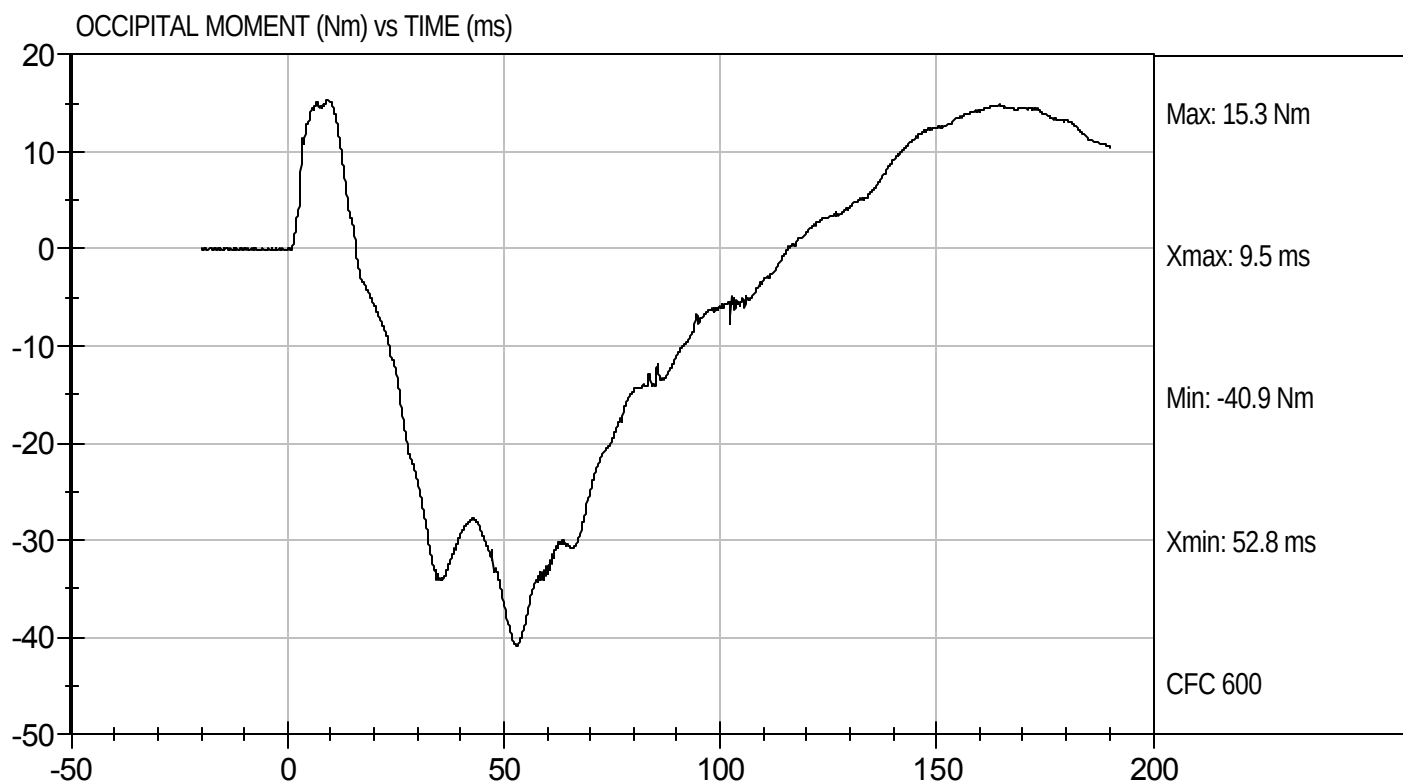
Test Date: 12/20/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D114302

Test Date: 12/20/11
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-11s BUILD LEVEL D DUMMY

ATD Serial No: 304

Test ID: D114303

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	29	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	20	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

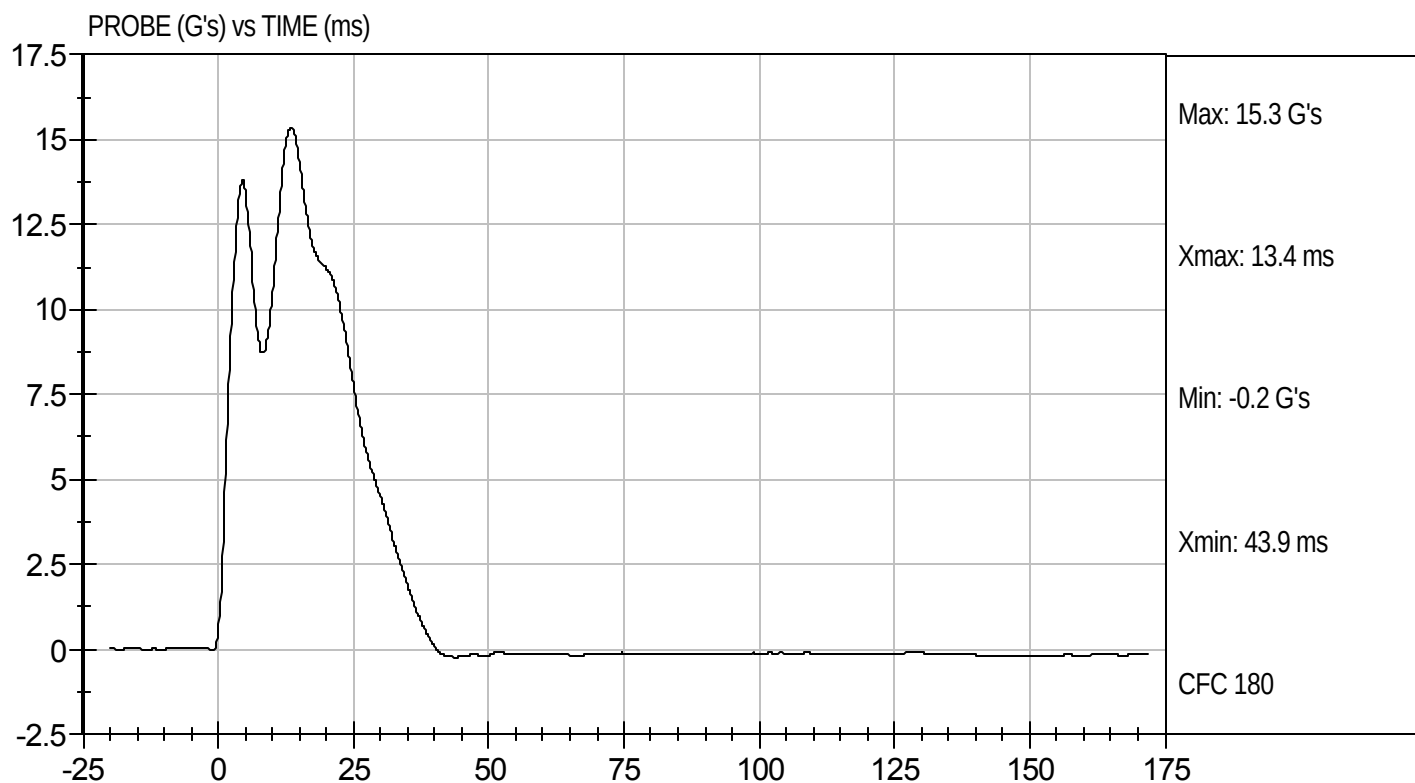
12/20/11
Test Date

David Winkelbauer
Approved By



Test Desc: Shoulder Impact
Component ID: D114303

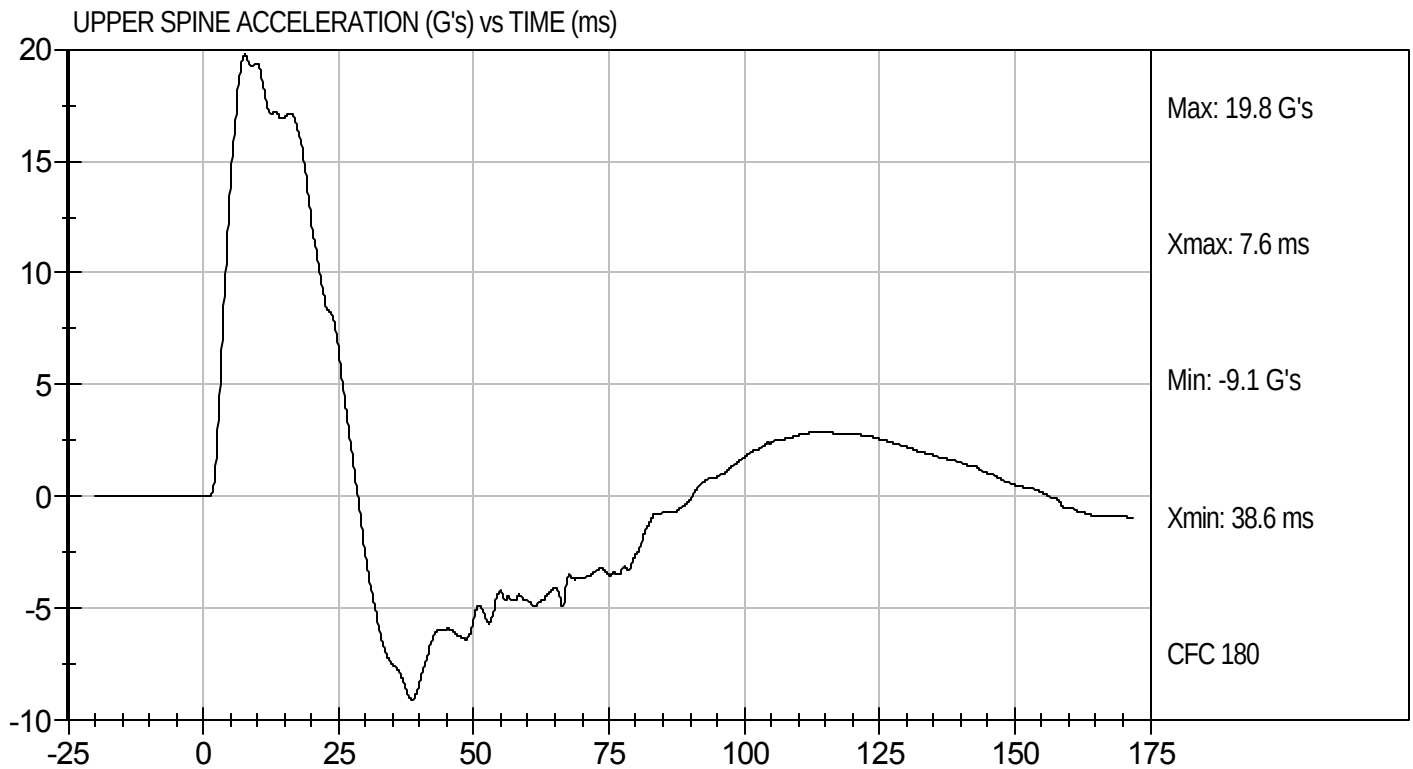
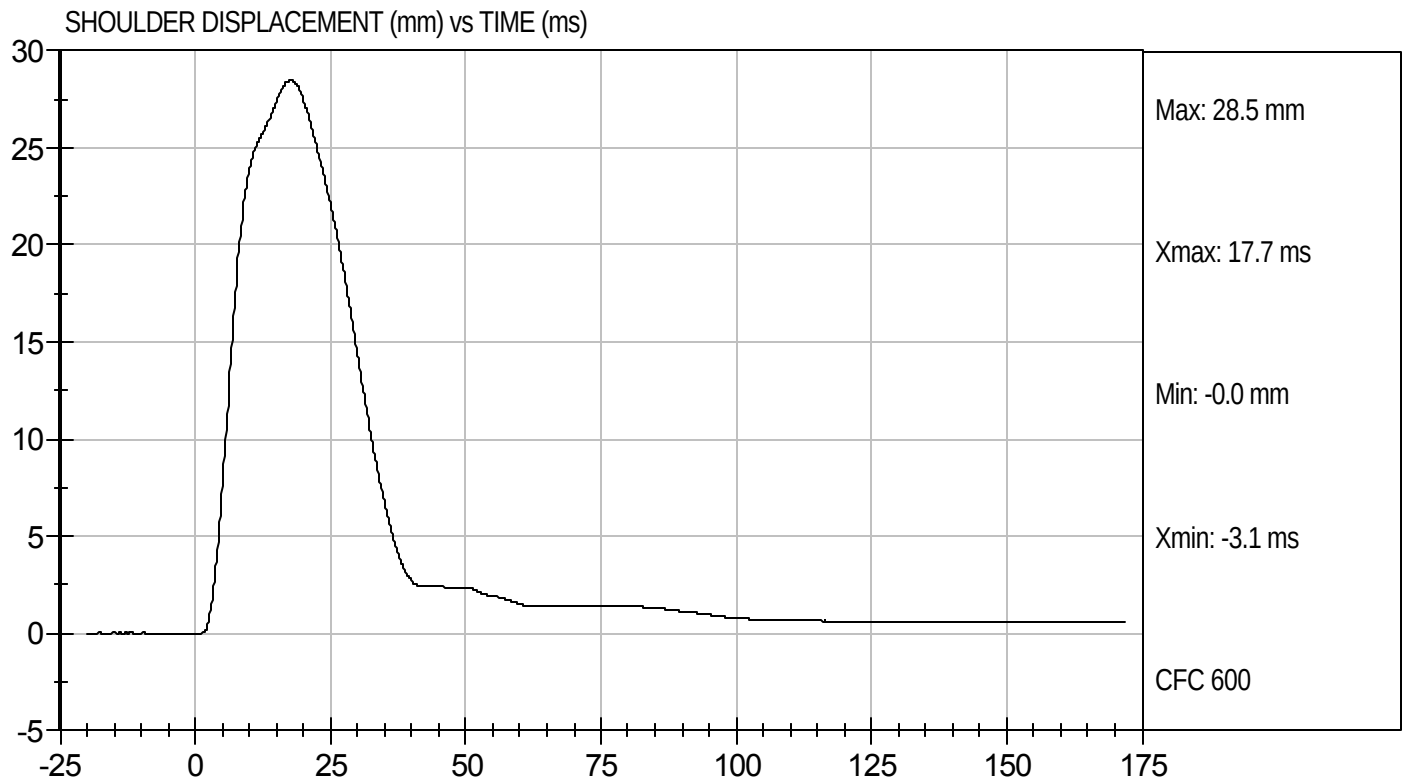
Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Shoulder Impact
Component ID: D114303

Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114304

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.7	Pass
Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	35	Pass
Shoulder Displacement	mm	31 to 40	33	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	41	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	33	Pass
Overall Test Results				Pass


 Laboratory Technician

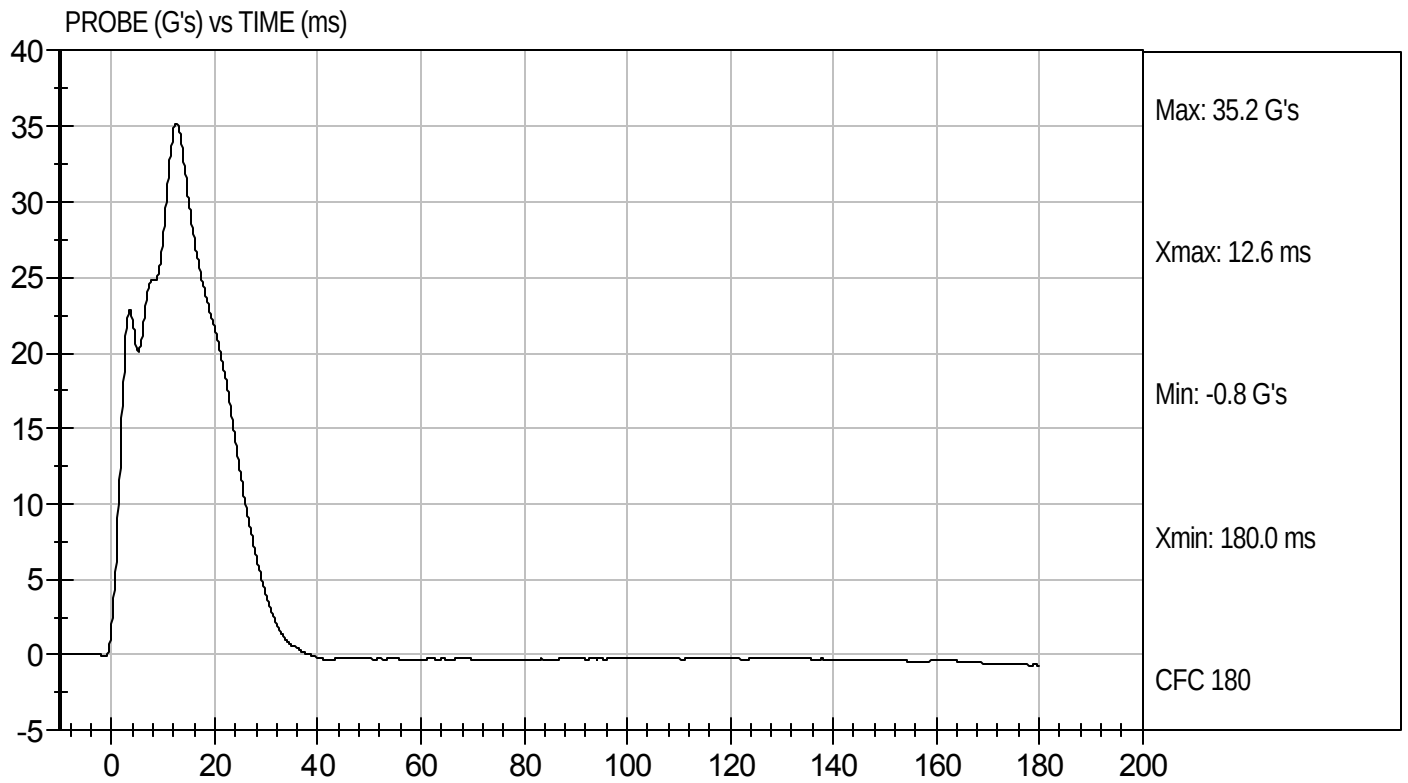
12/20/11
 Test Date


 Approved By



Test Desc: Thorax With Arm
Component ID: D114304

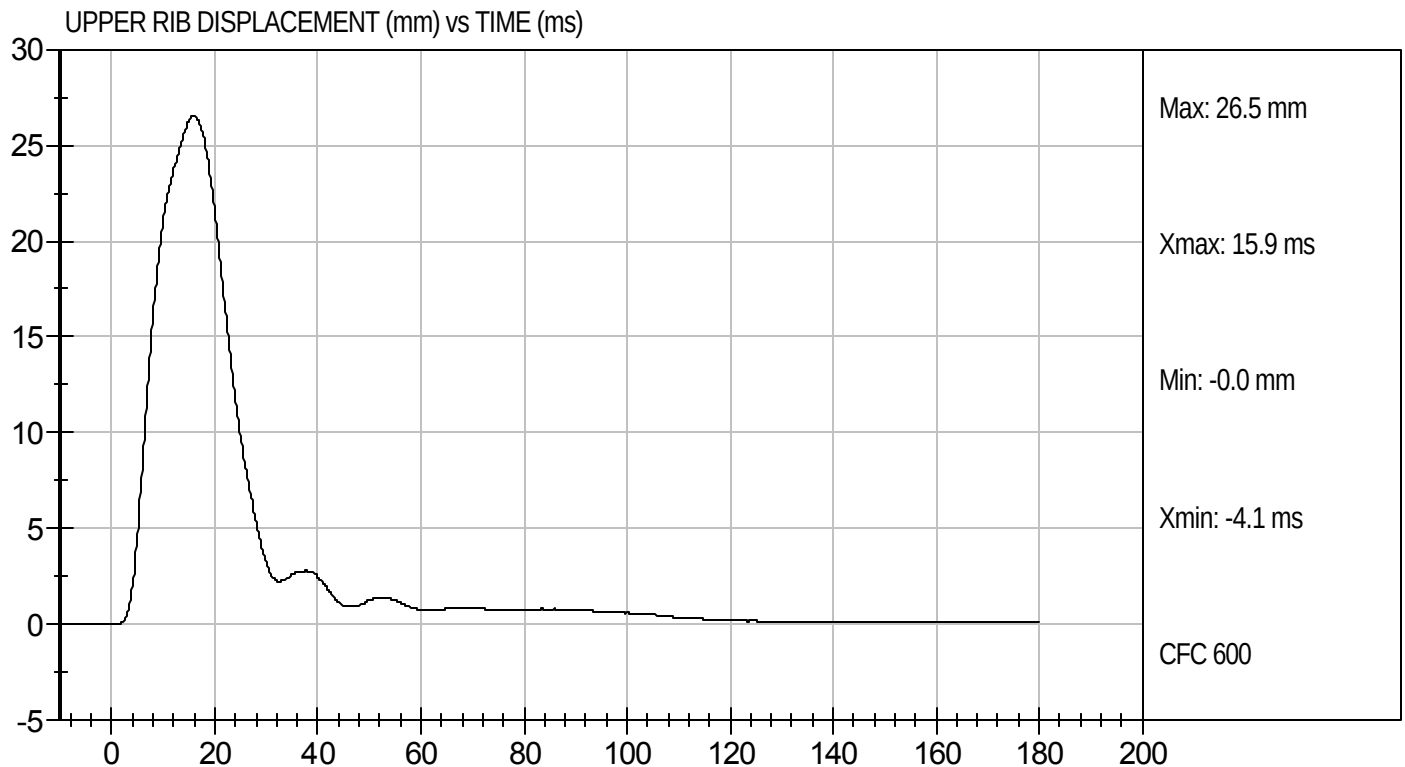
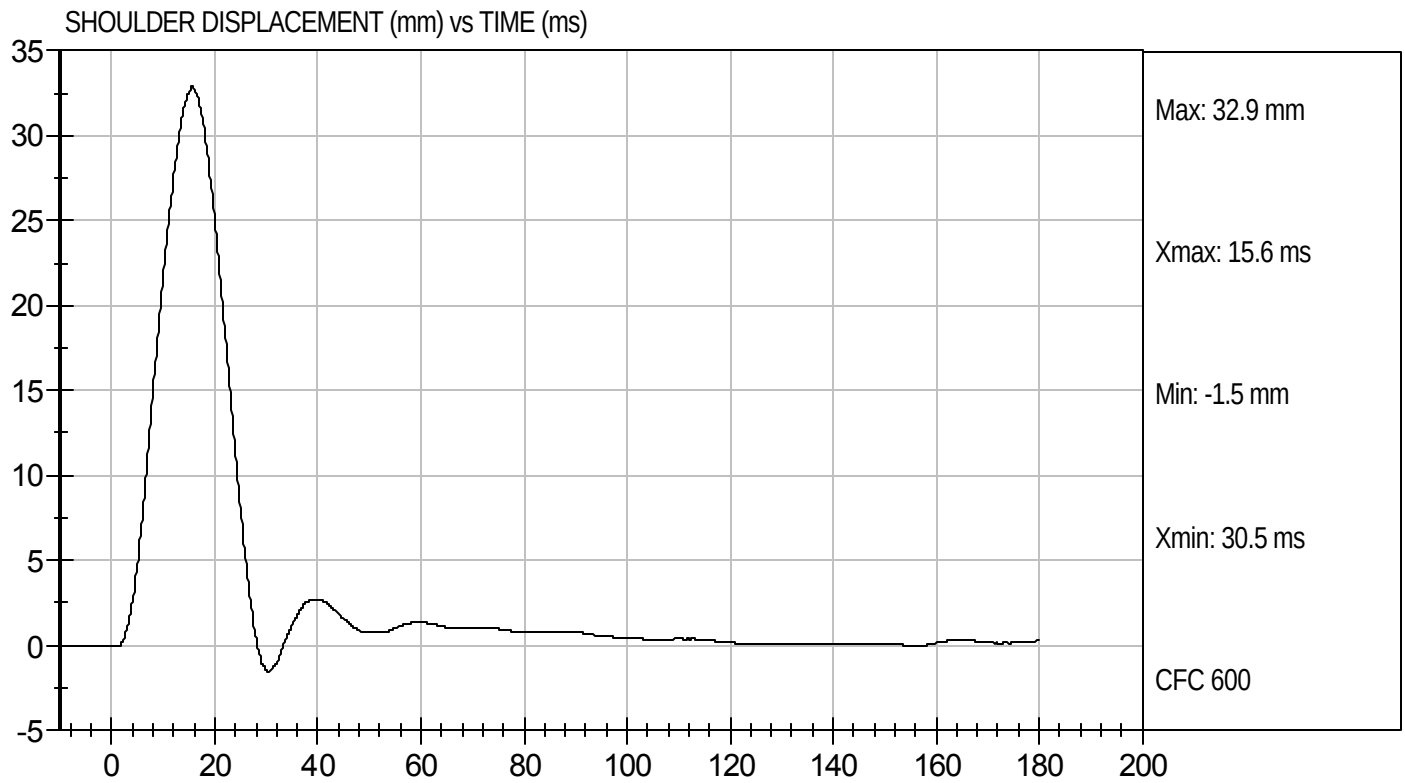
Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114304

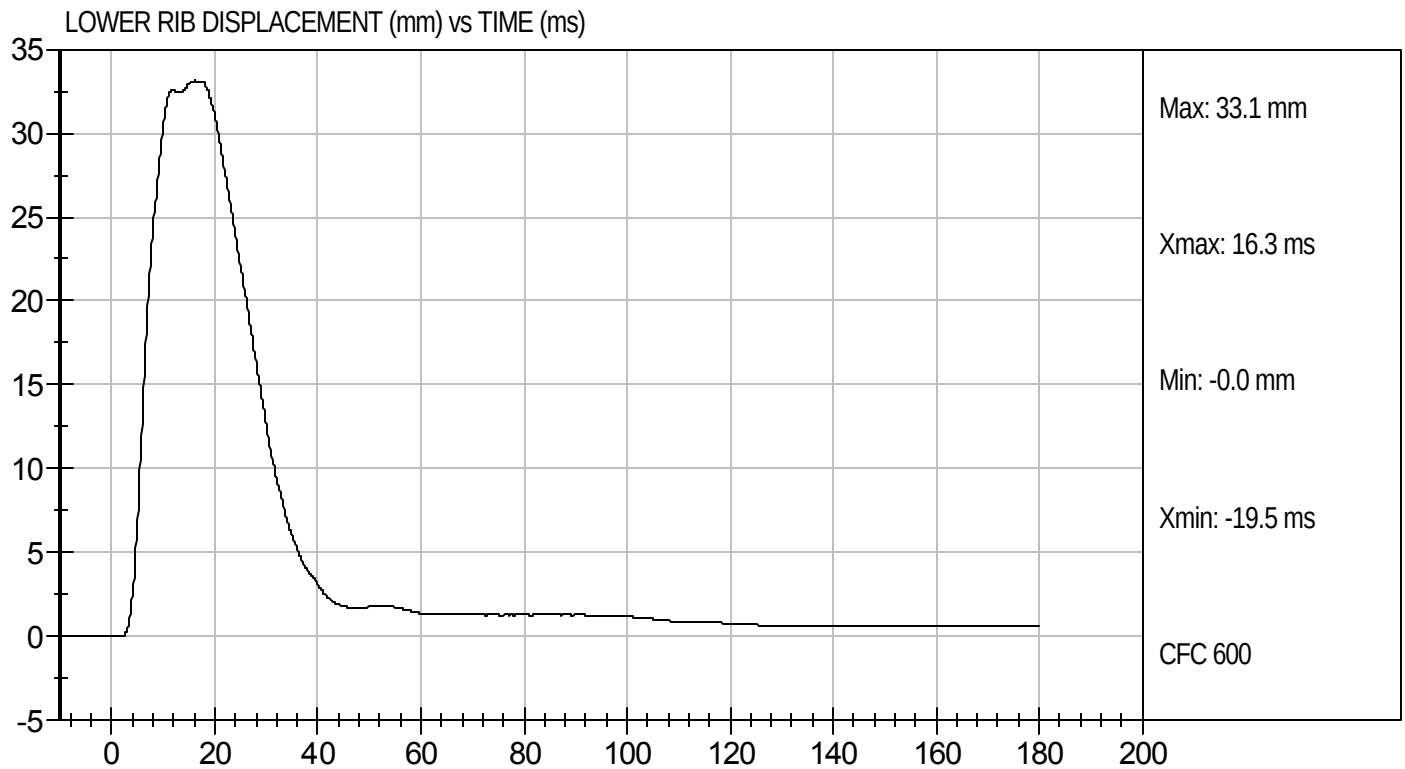
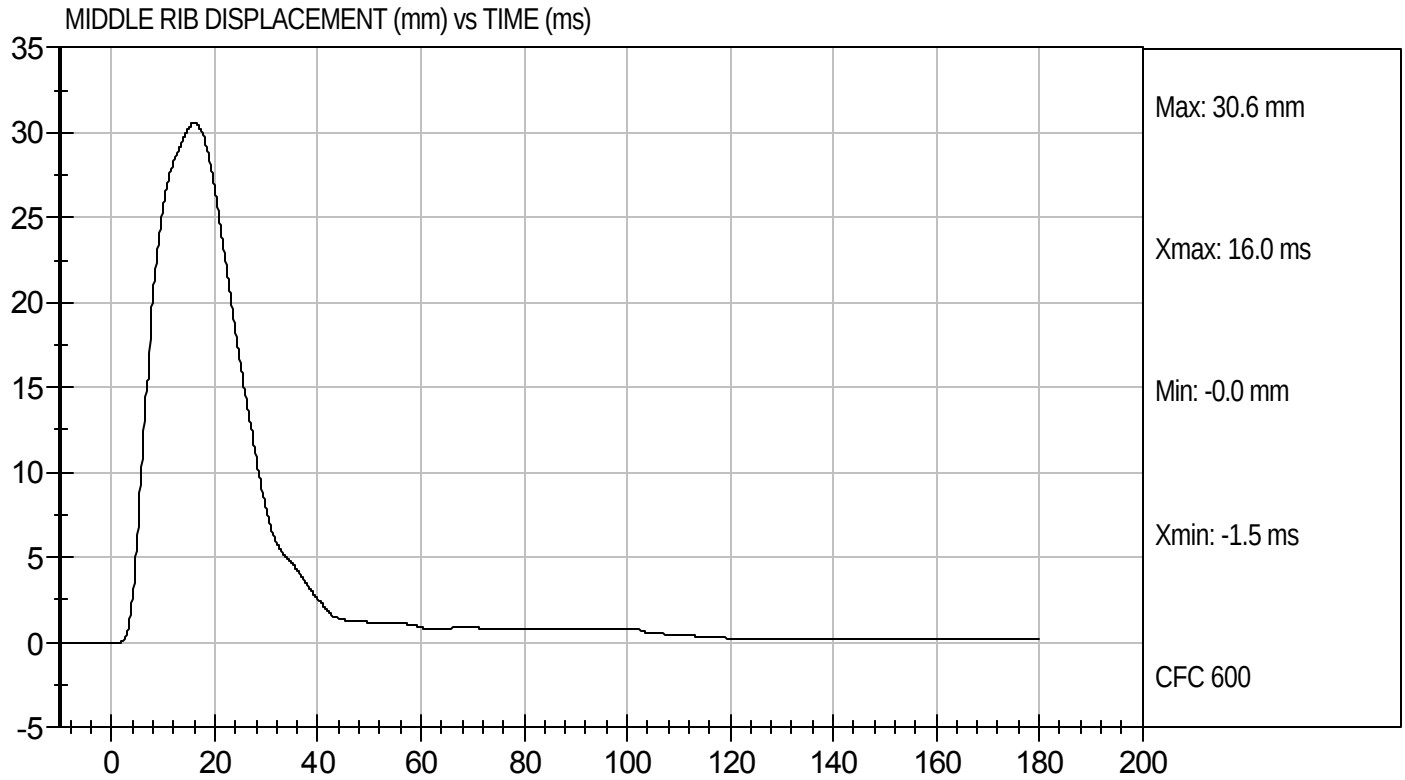
Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114304

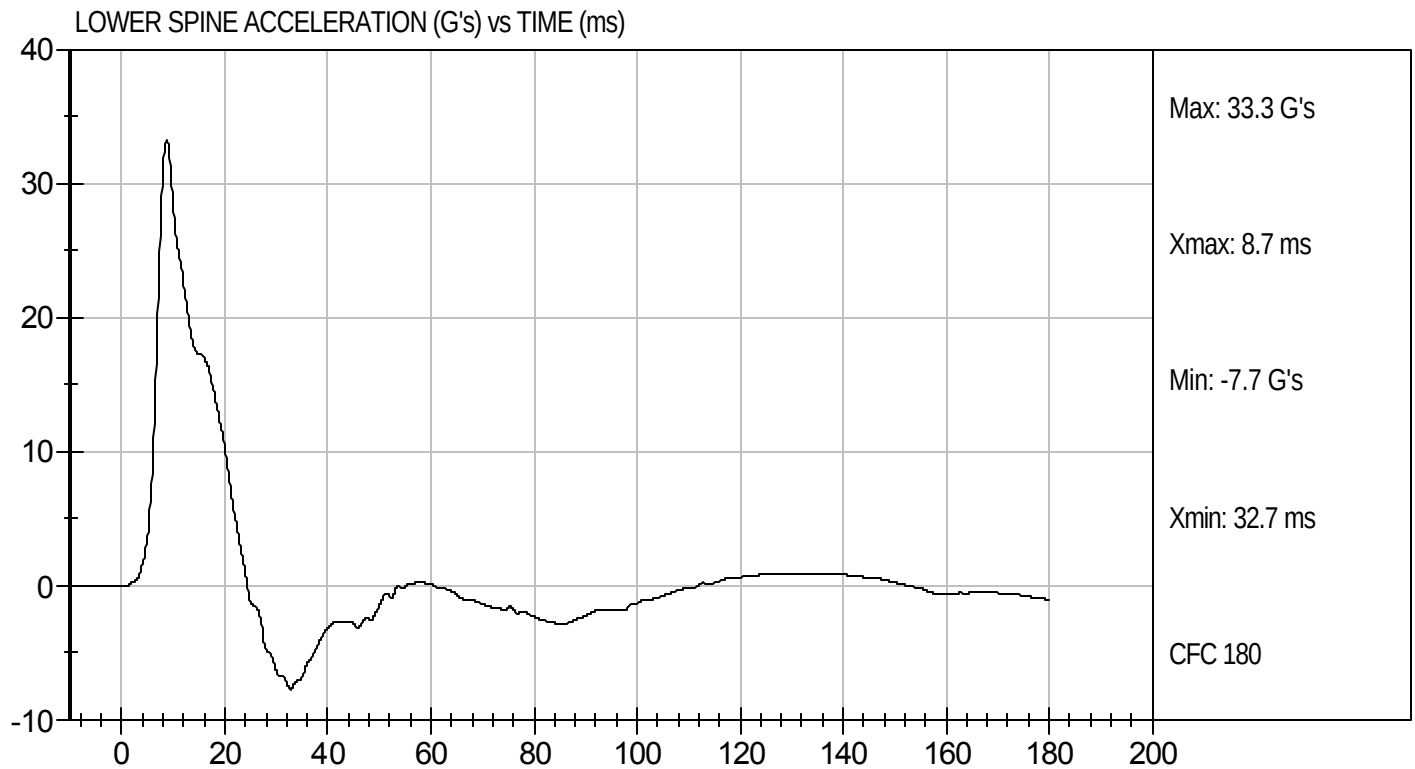
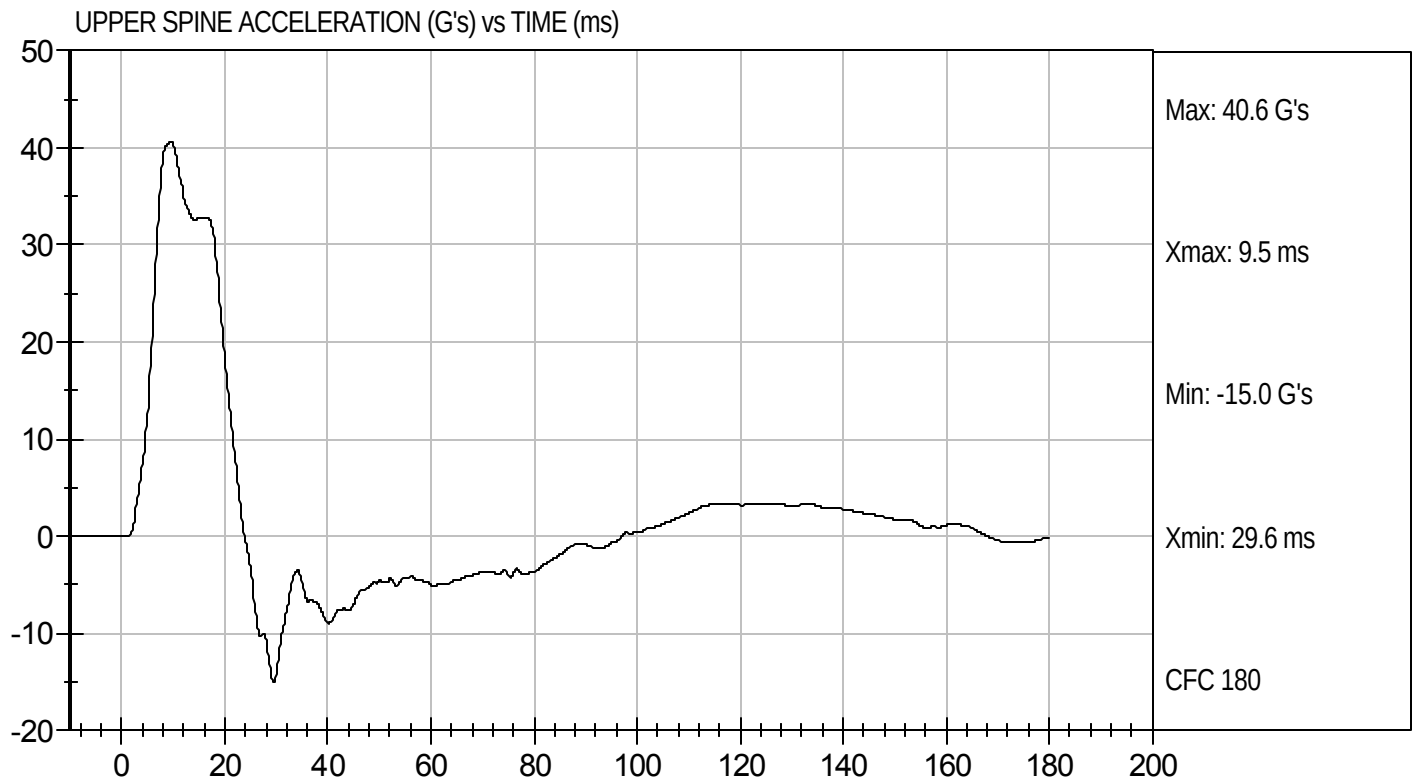
Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114304

Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114305

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	28	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Force	G's	14 to 18	17	Pass
Upper Rib Displacement	mm	32 to 40	35	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	16	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
Overall Test Results			Pass	


Laboratory Technician

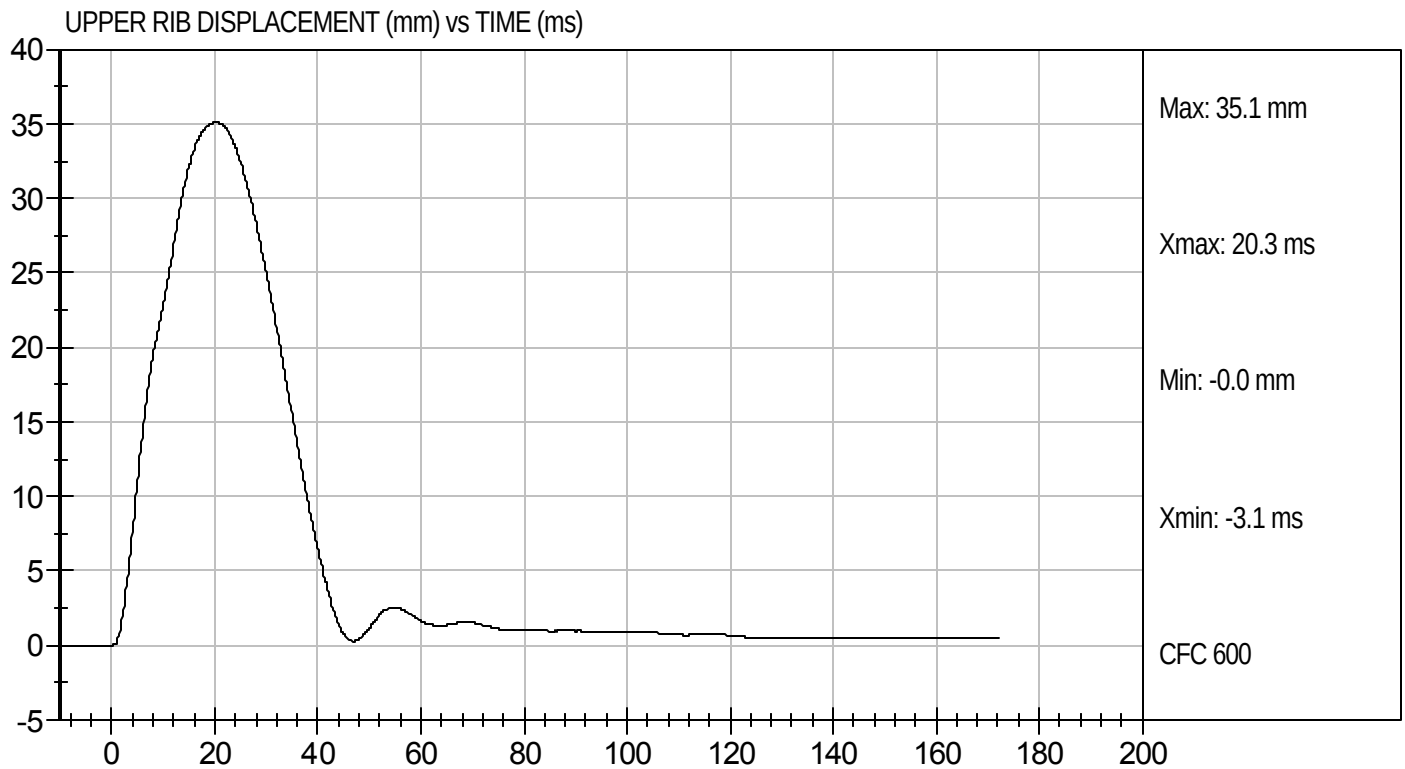
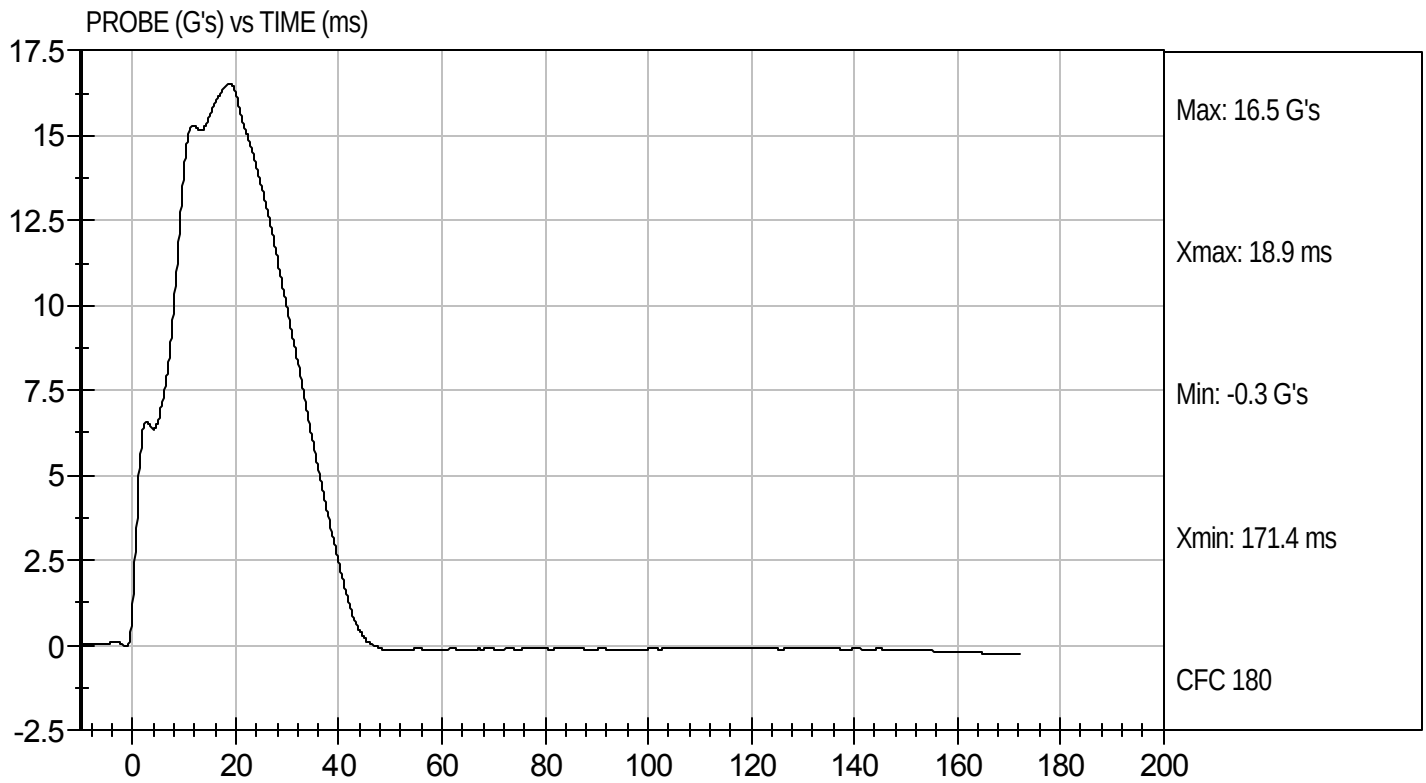
12/20/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D114305

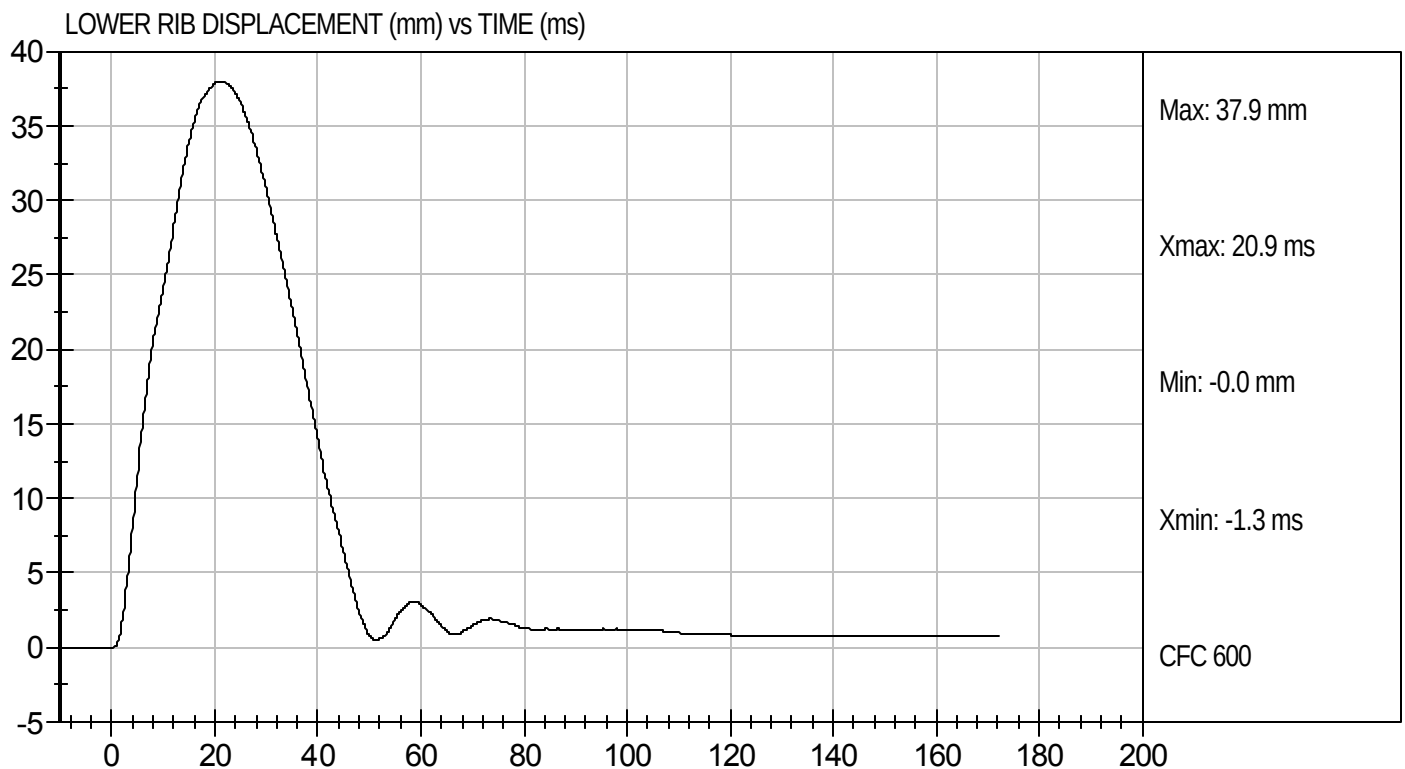
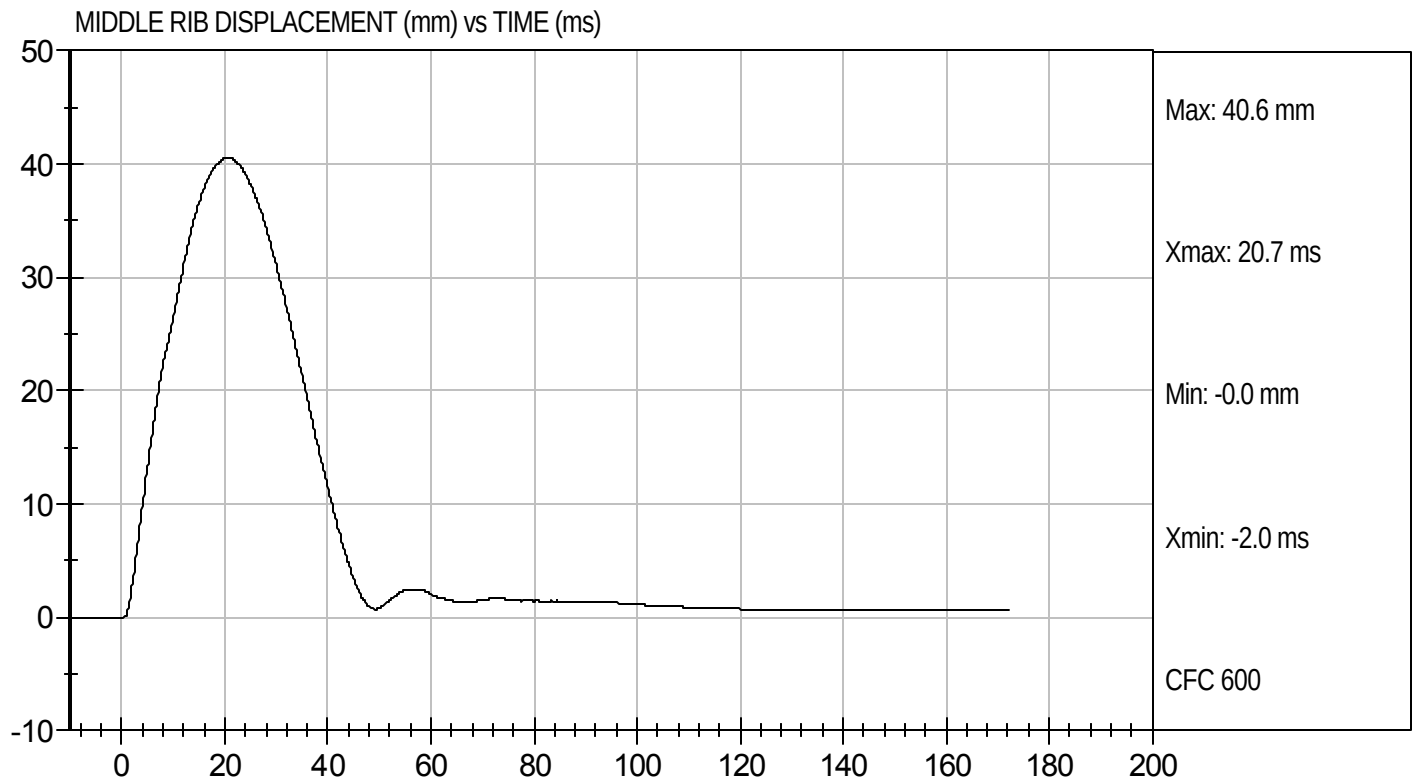
Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D114305

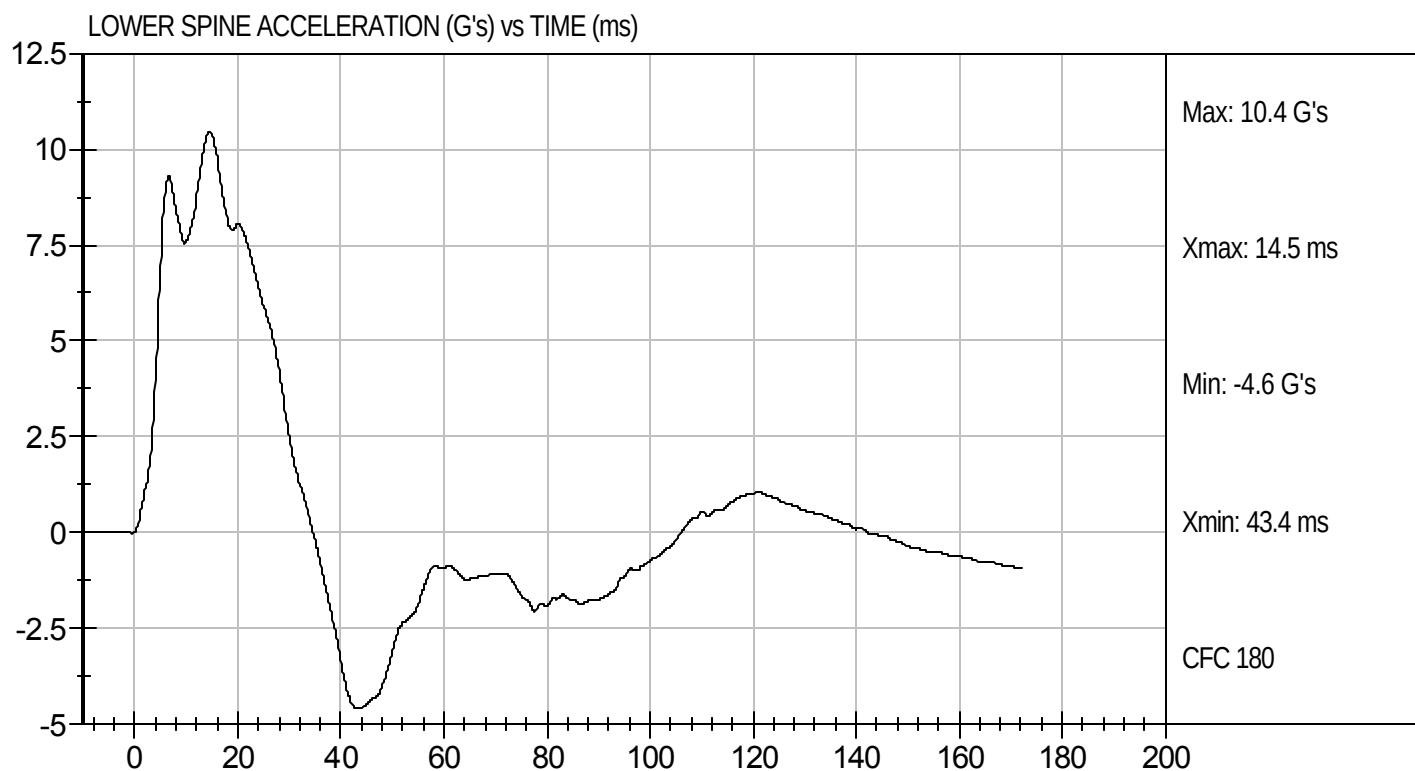
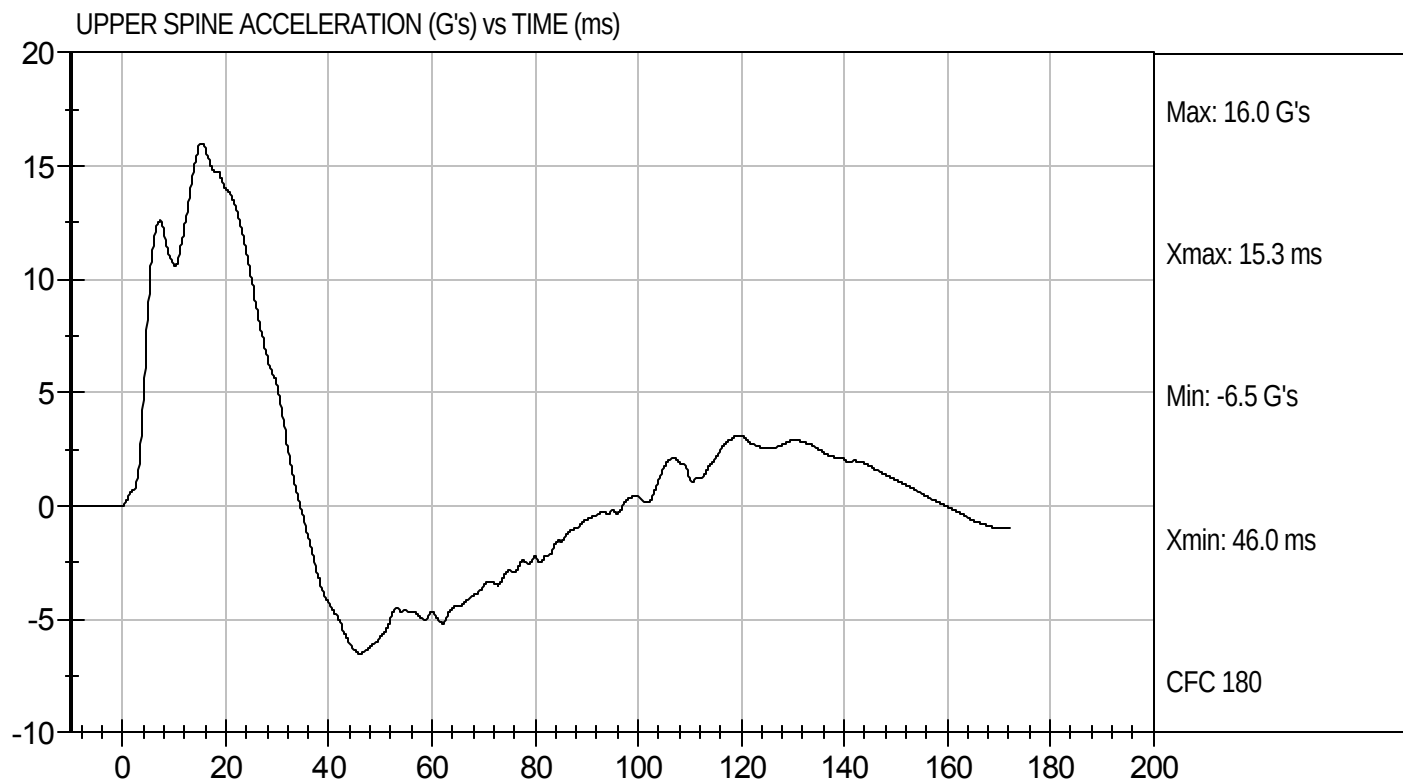
Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Thorax Without Arm
Component ID: D114305

Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

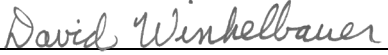
ATD Serial No: 304

Test I.D: D114306

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.8	Pass
Humidity	%	10 to 70	25	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	12 to 16	15	Pass
Upper Rib Displacement	mm	36 to 47	38	Pass
Lower Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	12	Pass
			Overall Test Results	Pass


Laboratory Technician

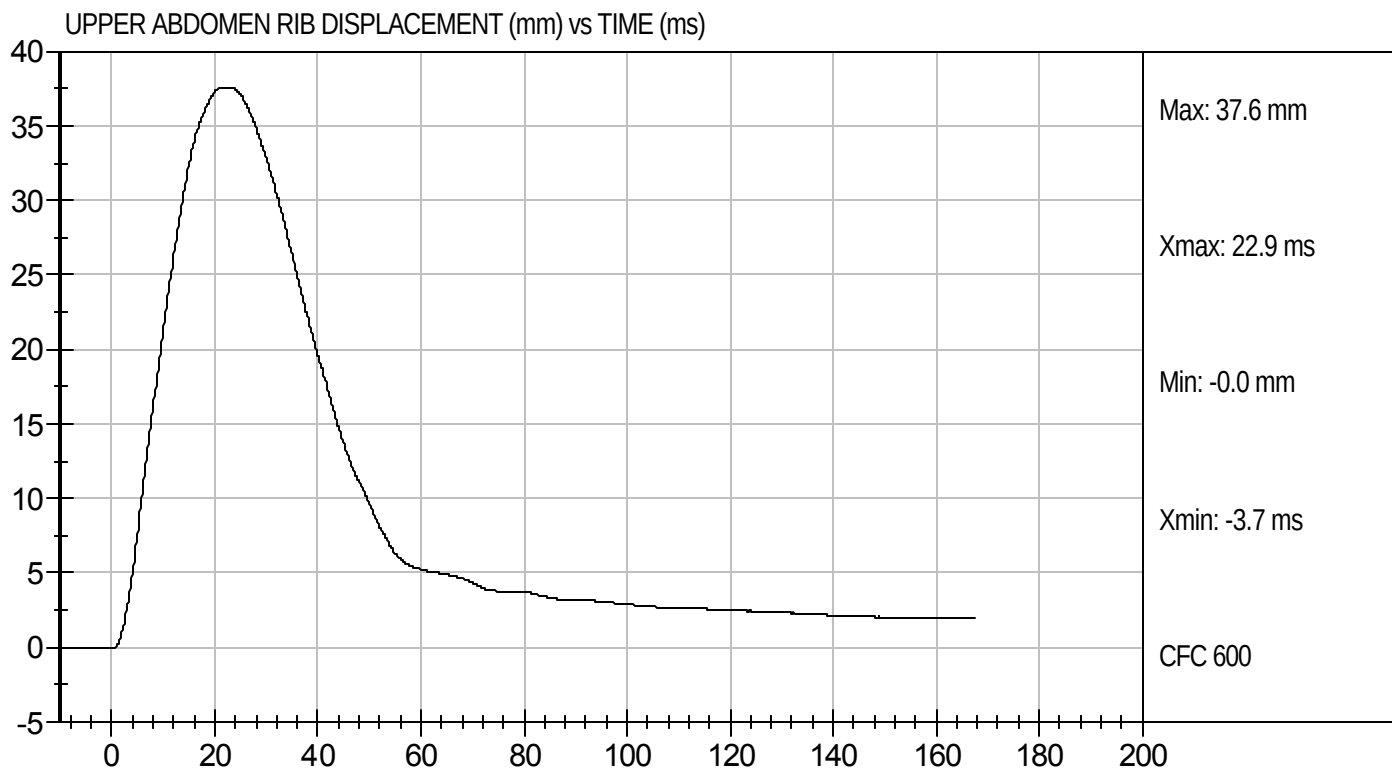
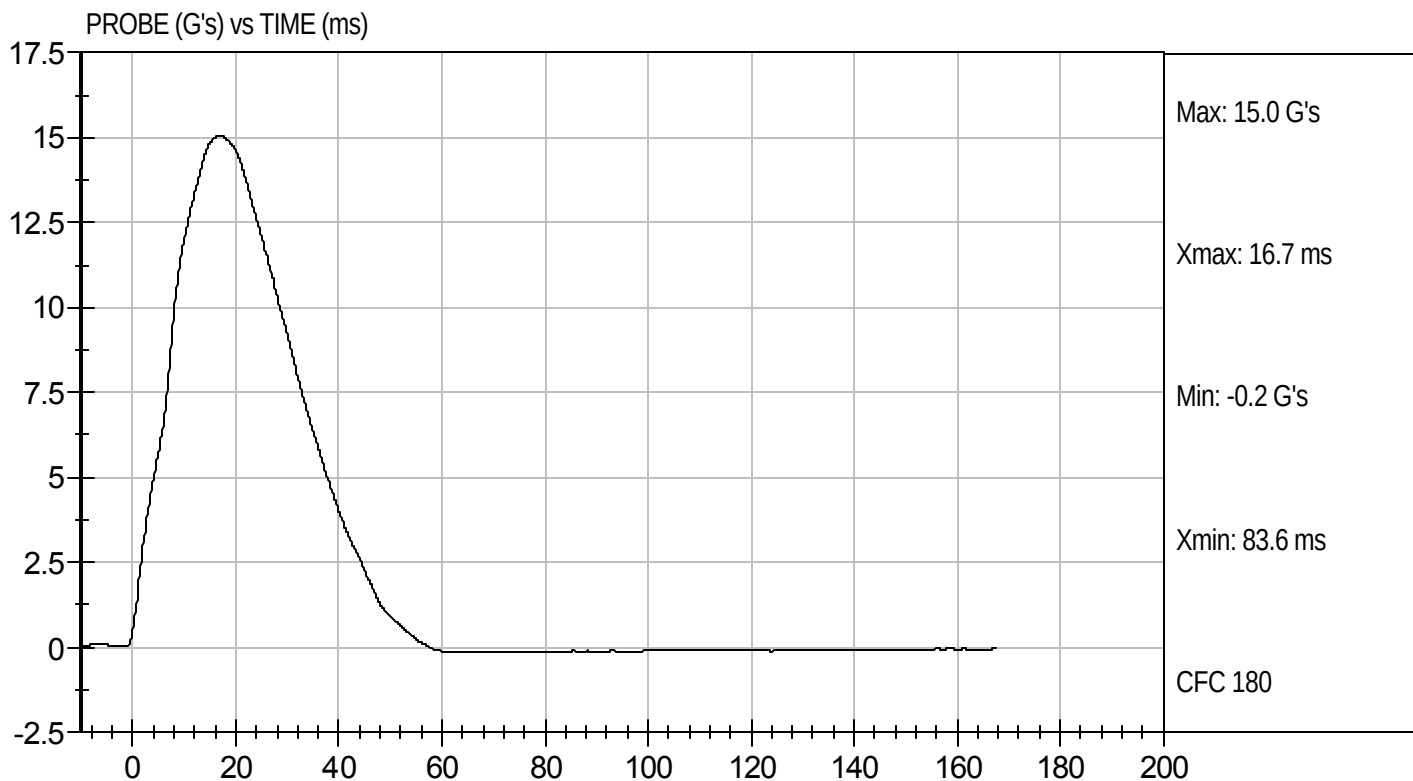
12/20/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D114306

Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s

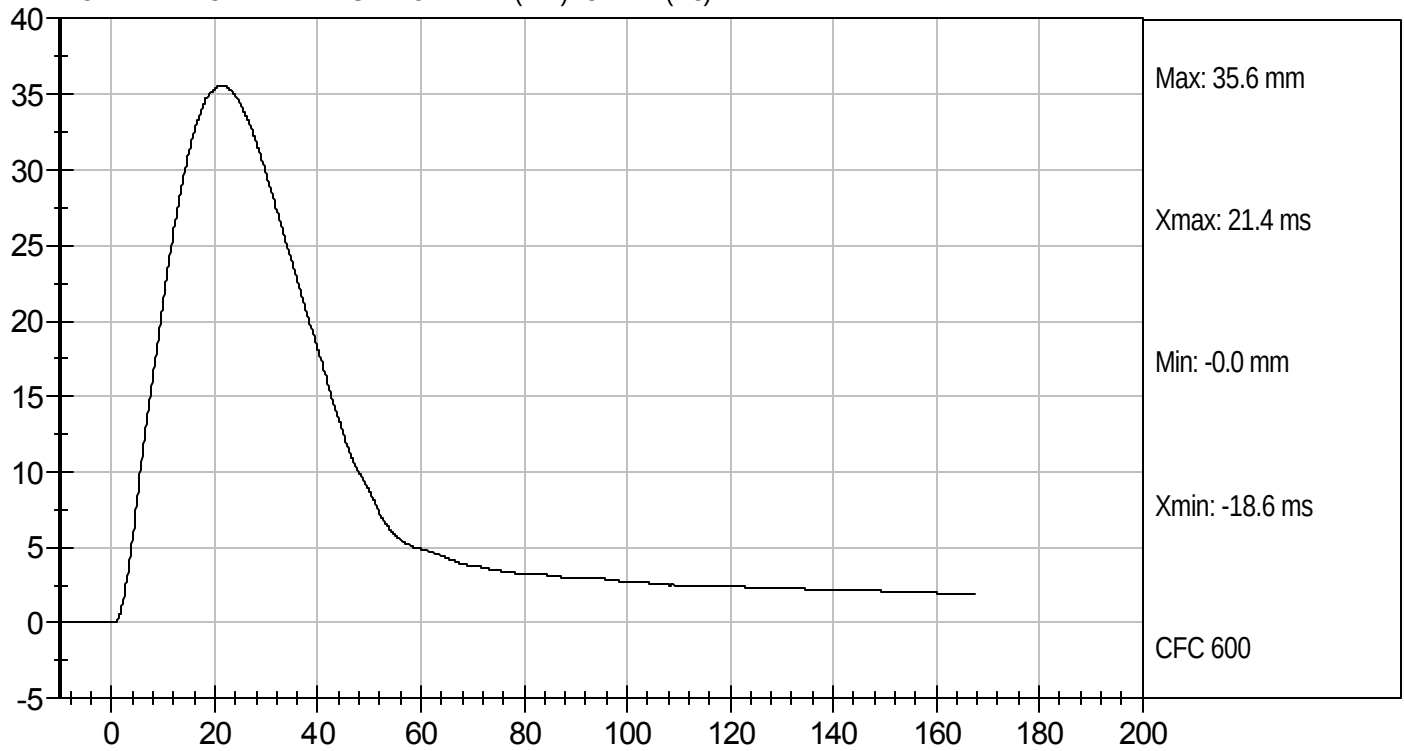




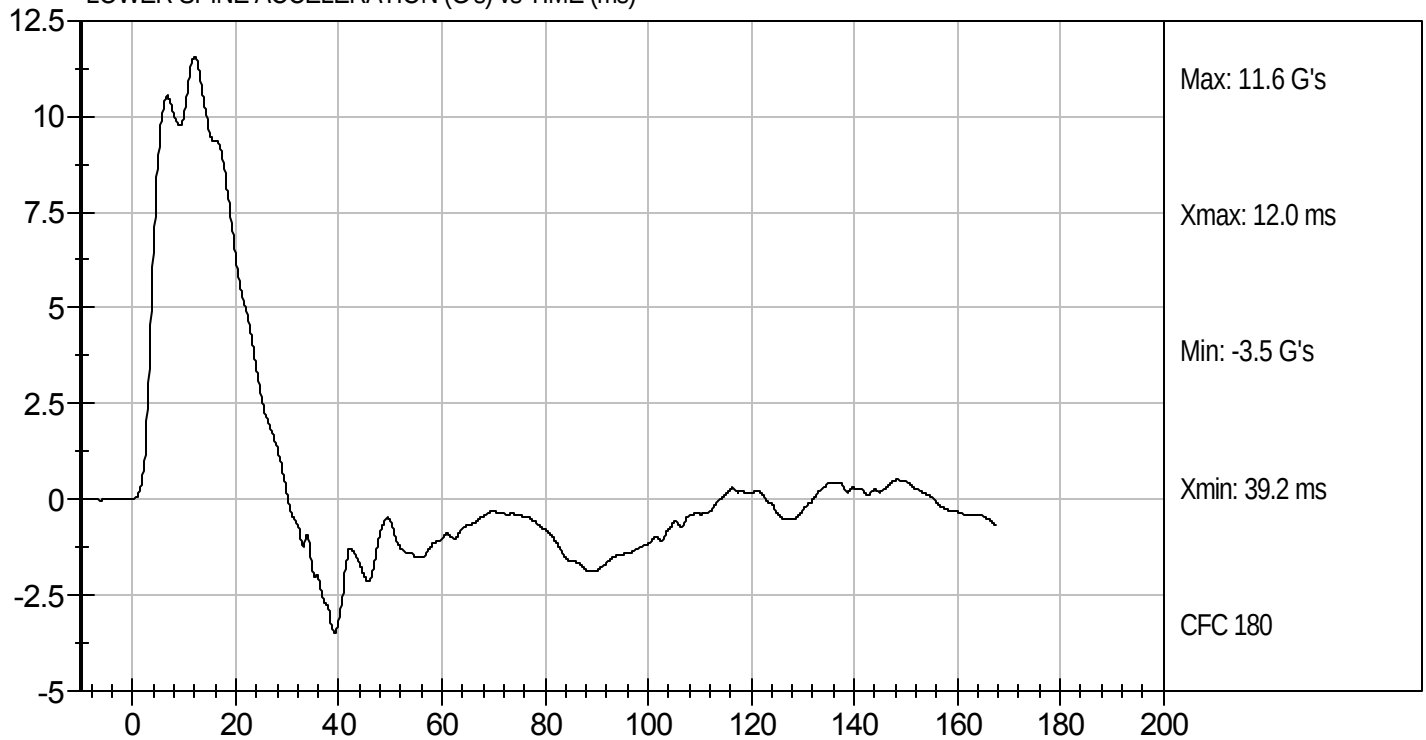
Test Desc: Abdomen Impact
Component ID: D114306

Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s

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



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114307

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.6	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	38 to 47	43	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	37	Pass
Peak Acetabulum Force	N	3600 to 4300	4011	Pass
Overall Test Results				Pass


Laboratory Technician

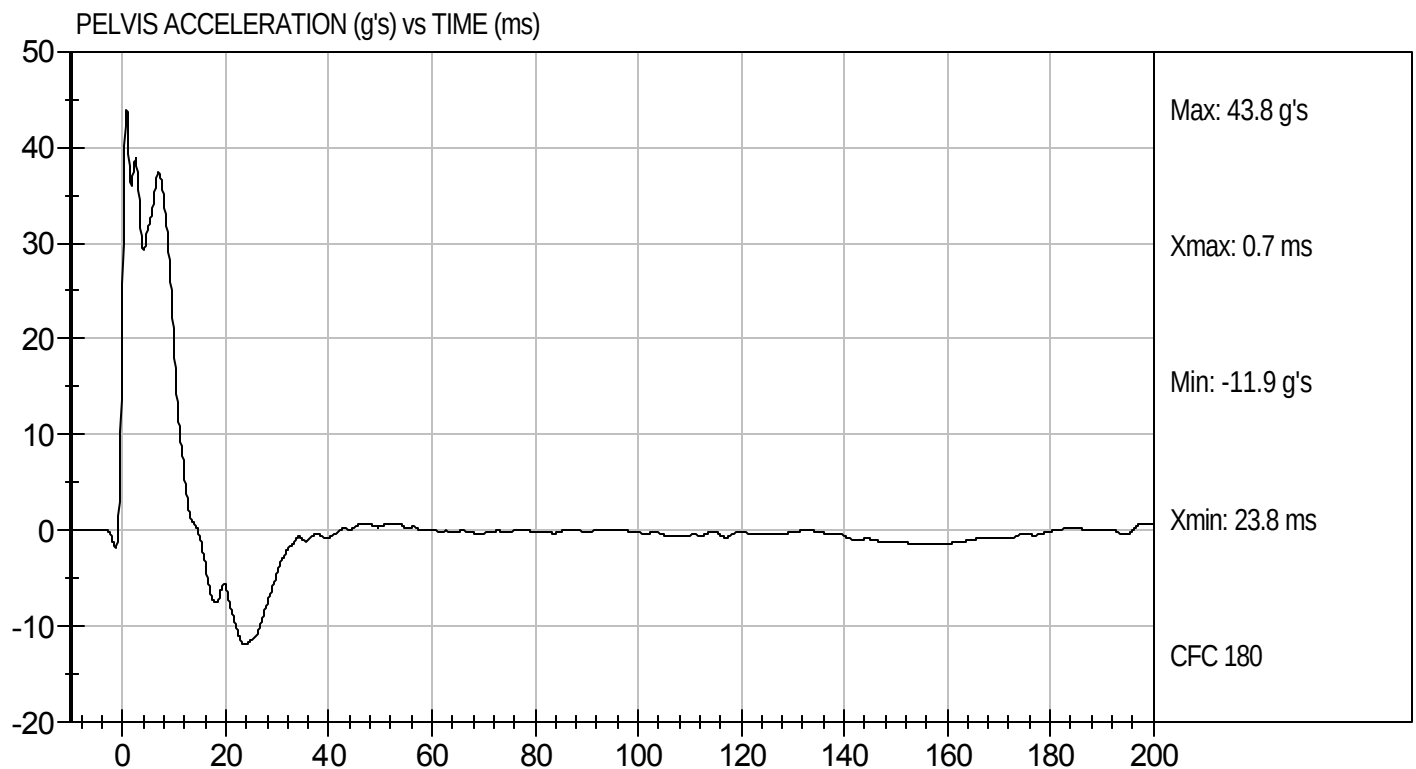
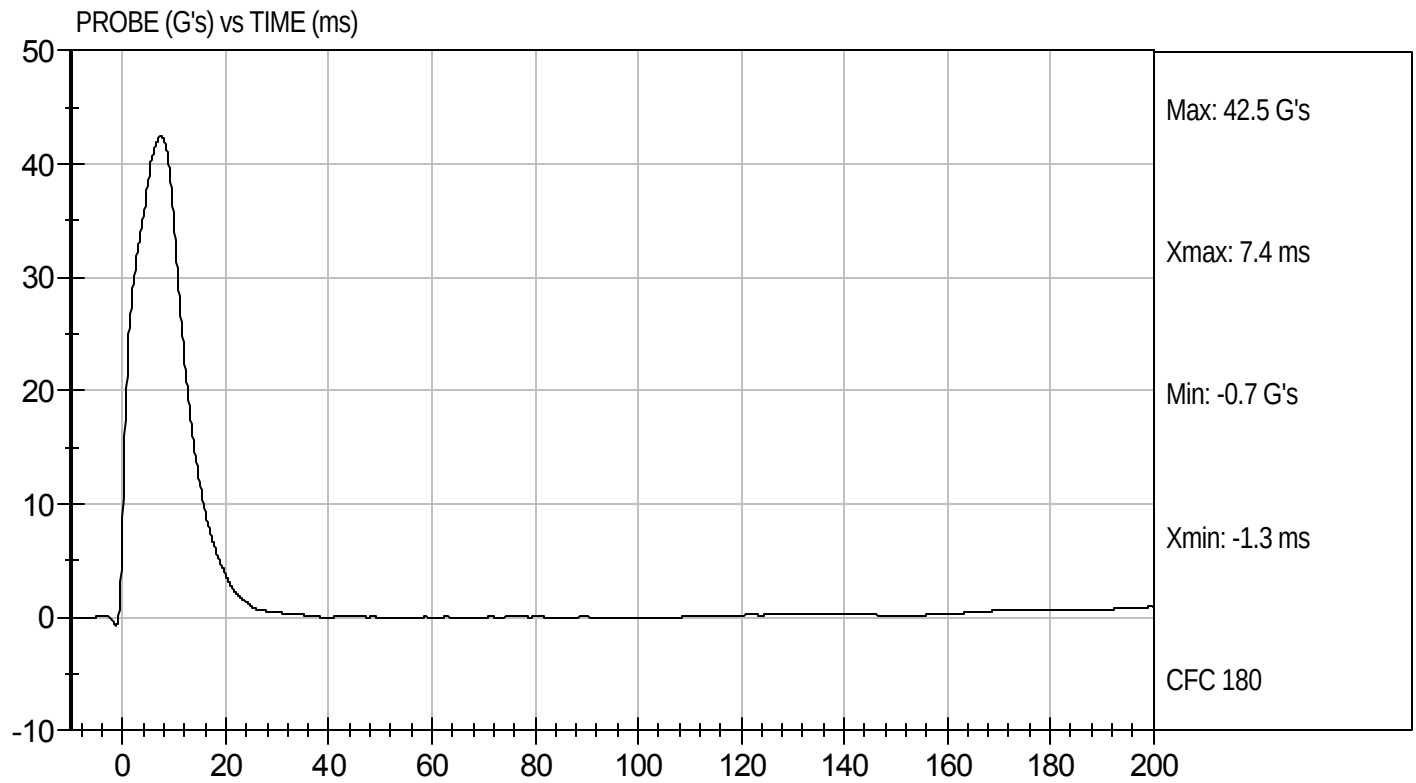
12/20/11
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D114307

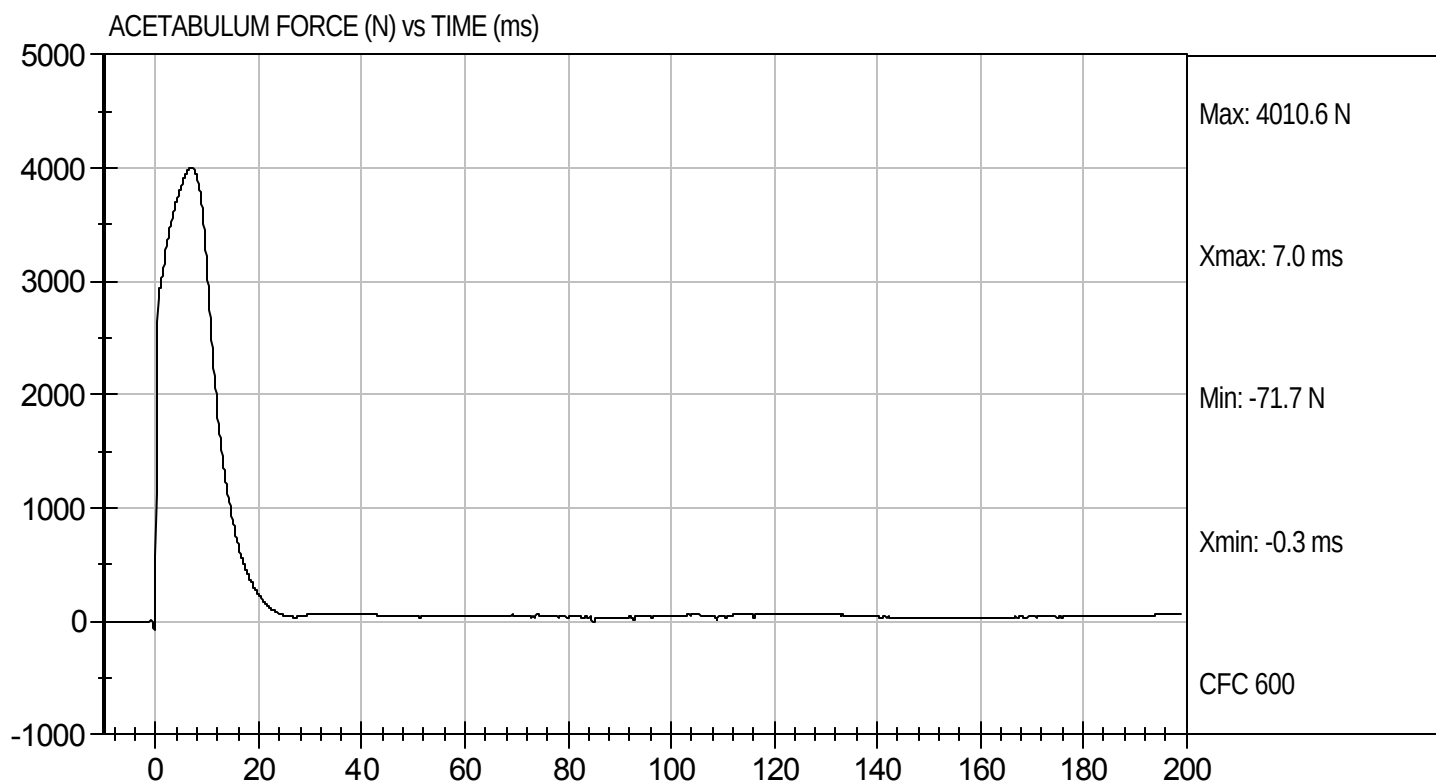
Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Pelvis Impact
Component ID: D114307

Test Date: 12/20/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114308

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.6	Pass
Humidity	%	10 to 70	24	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Peak Impactor Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4582	Pass
Overall Test Results				Pass


Laboratory Technician

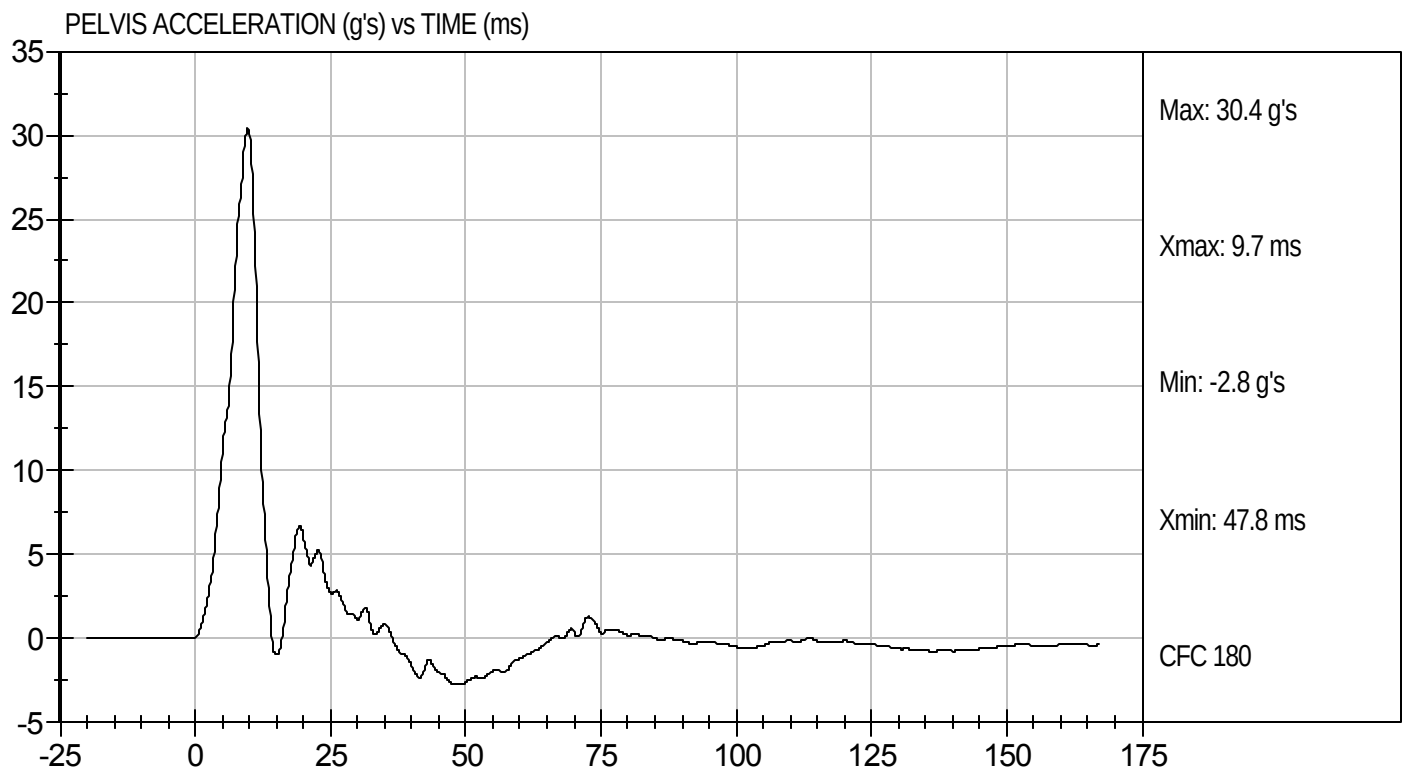
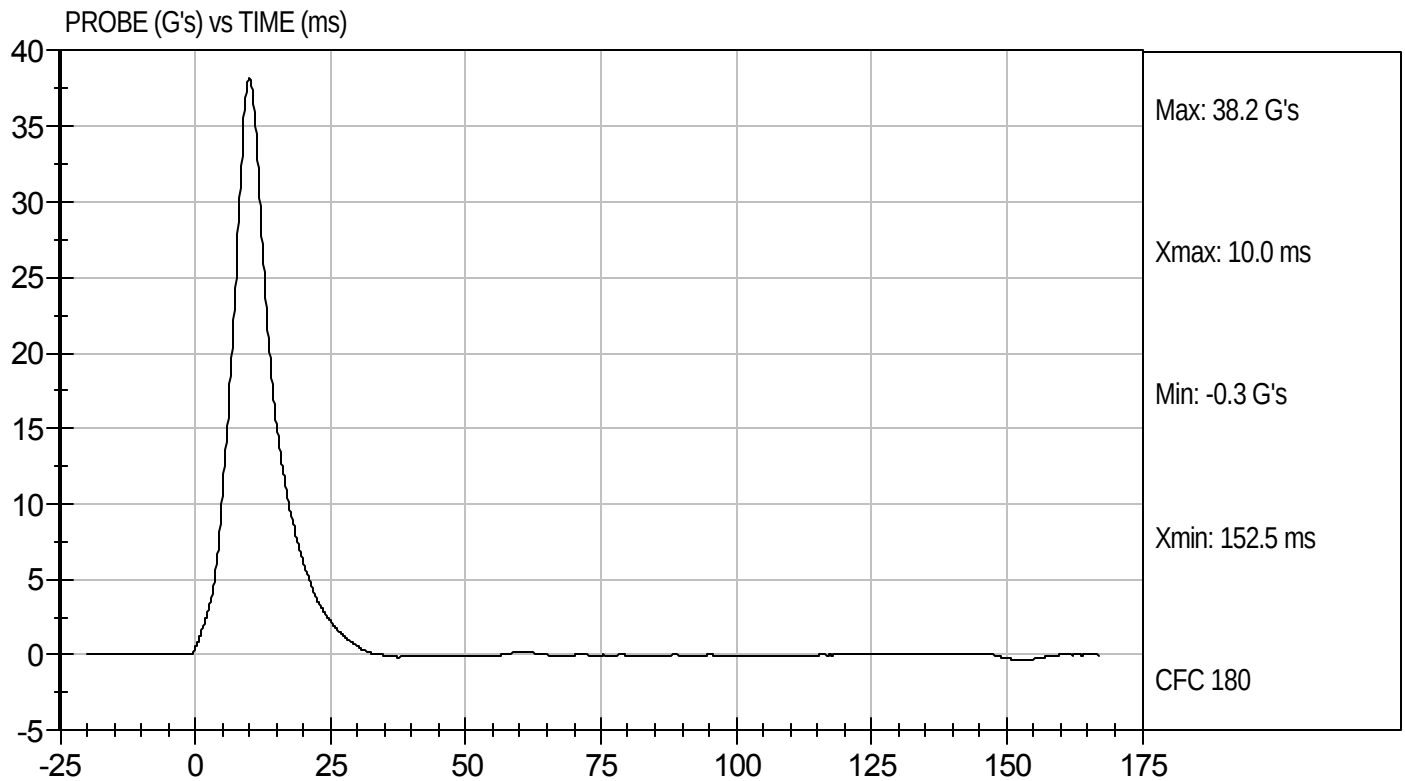
12/20/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D114308

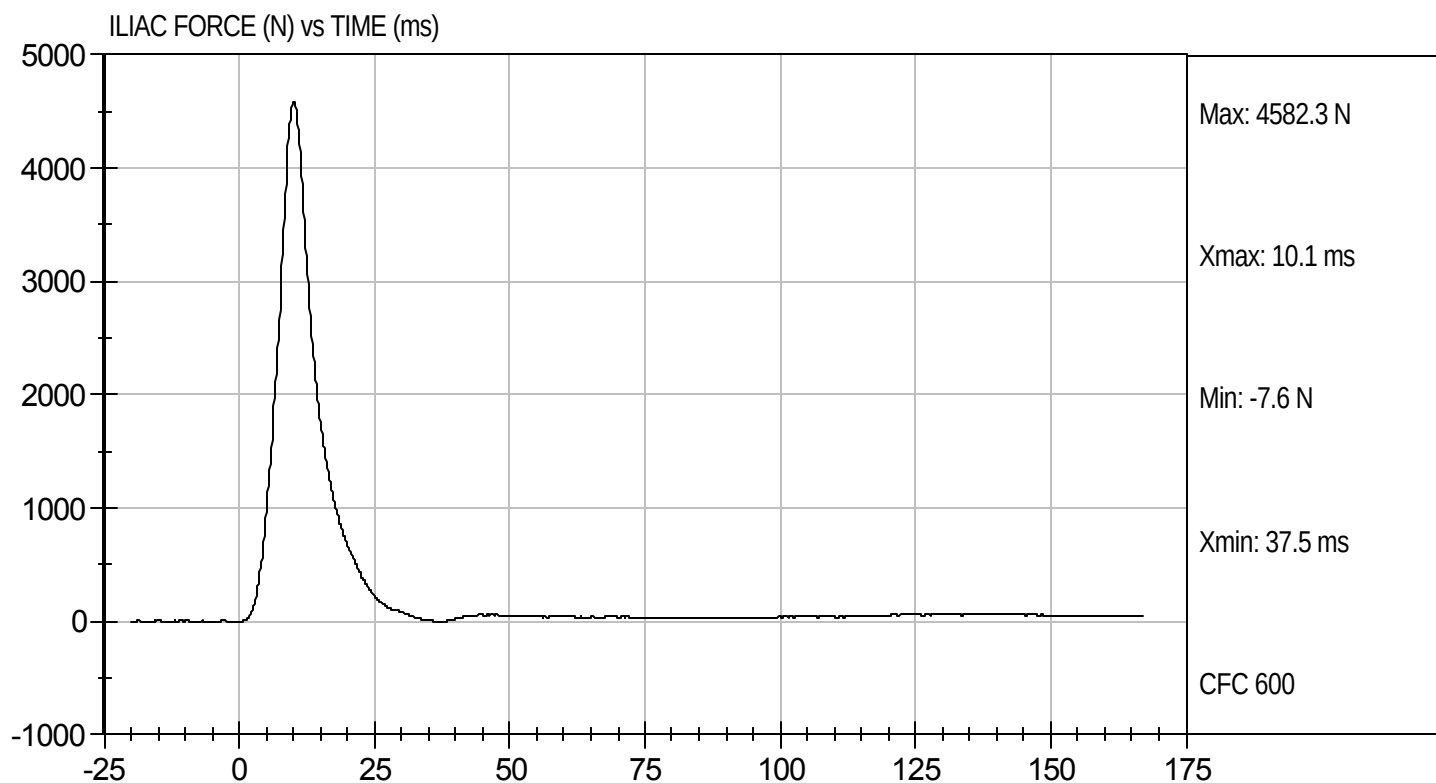
Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s





Test Desc: Iliac Impact
Component ID: D114308

Test Date: 12/20/11
Velocity: 14.25 ft/s, 4.34 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 304

Test ID: D114381

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Peak Resultant Acceleration	G's	115 to 137	117	Pass
Peak Longitudinal Acceleration	G's	+/- 15	2.1	Pass
Unimodal	N/A	<15%	Yes	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

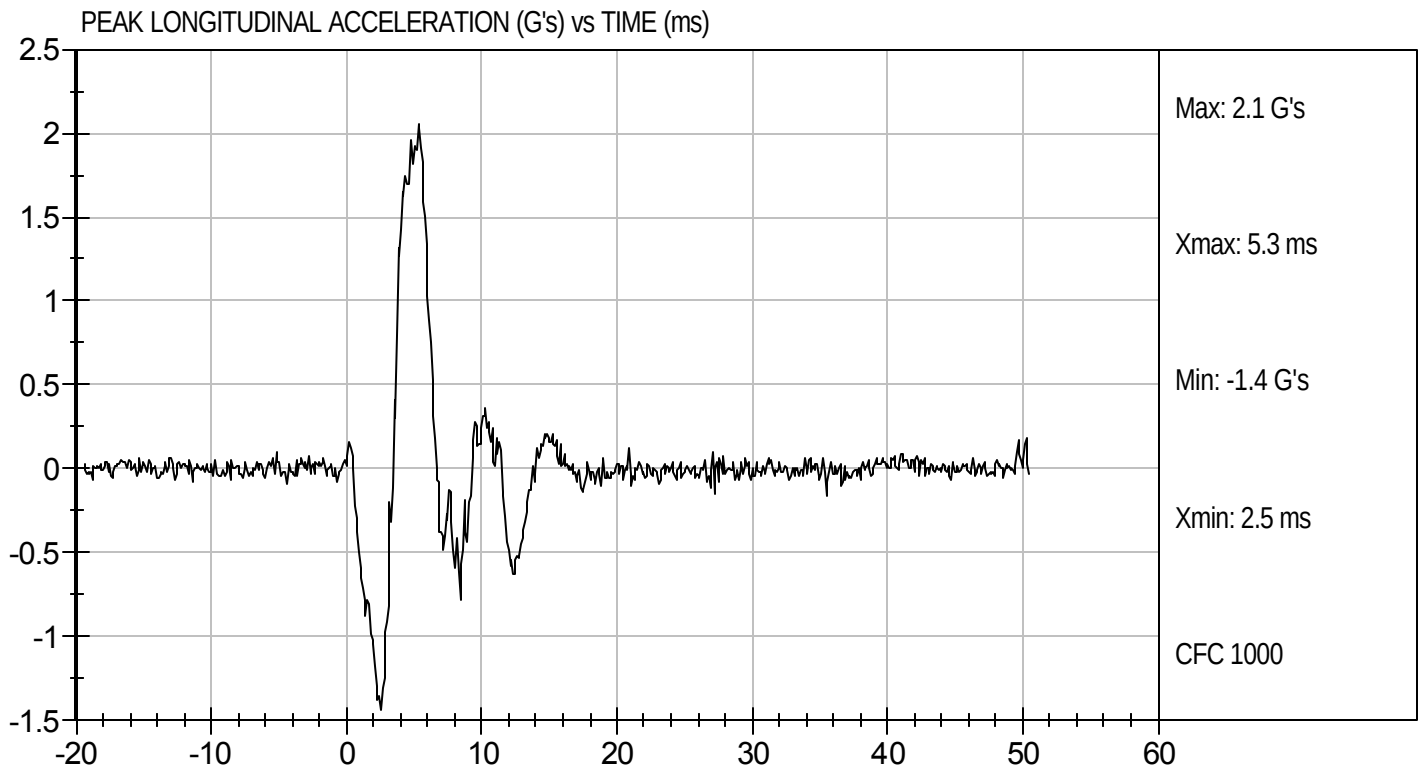
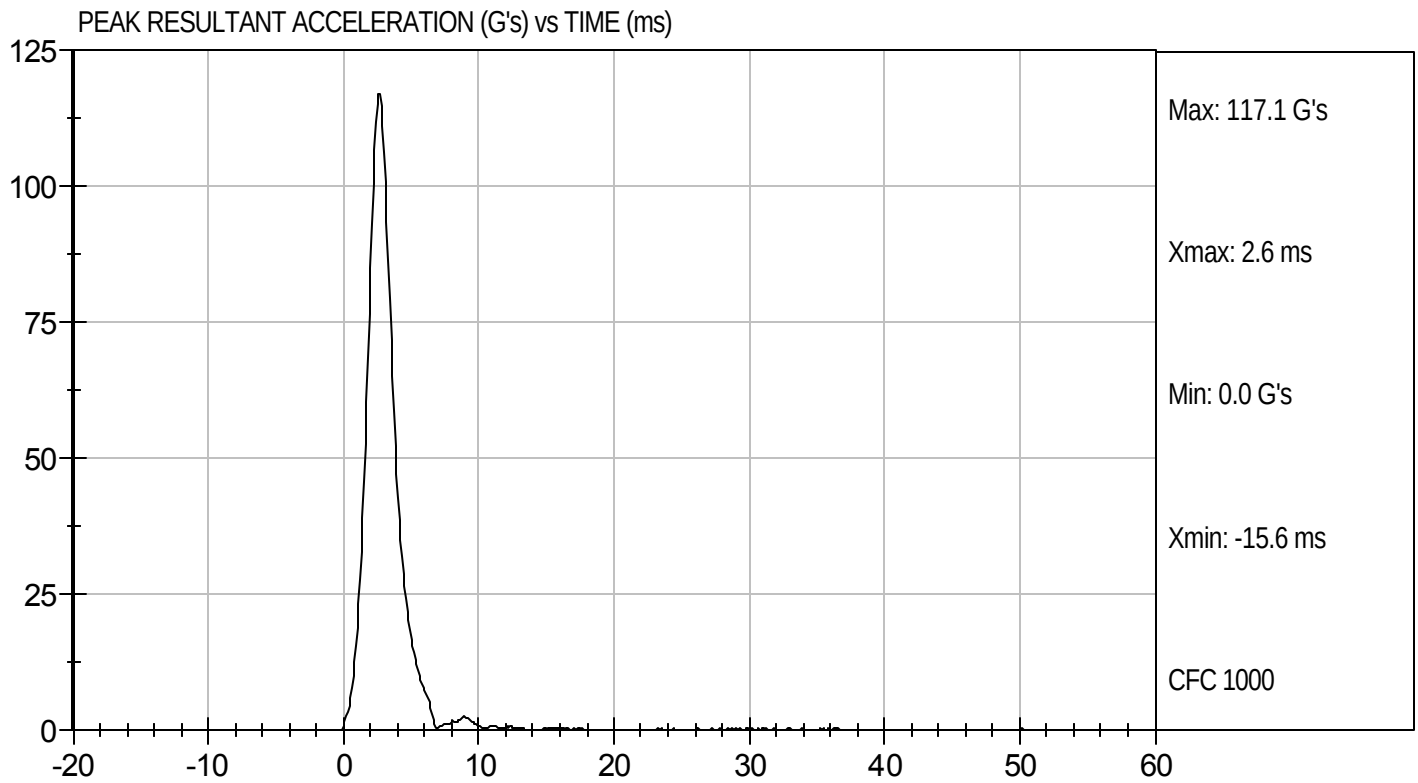
12/23/11
Test Date

David Winkelbauer
Approved By



Test Desc: Head Drop
Component ID: D114381

Test Date: 12/23/11
Velocity: 0 ft/s, 0 m/s

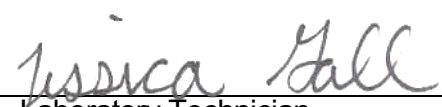


MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114382

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.6	Pass
Humidity		%	10 to 70	18	Pass
Impact Velocity		m/s	5.51 to 5.63	5.58	Pass
Delta Velocity	10 ms	m/s	2.20 to 2.80	2.74	Pass
	15 ms	m/s	3.30 to 4.10	3.83	Pass
	20 ms	m/s	4.40 to 5.40	5.07	Pass
	25 ms	m/s	5.40 to 6.10	5.50	Pass
	25-100 ms	m/s	5.50 to 6.20	5.53	Pass
Maximum D-Plane Rotation		deg	71 to 81	77	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment during Rotation Interval Nm			-44 to -36	-42	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	119	Pass
Overall Test Results				Pass	


 Laboratory Technician

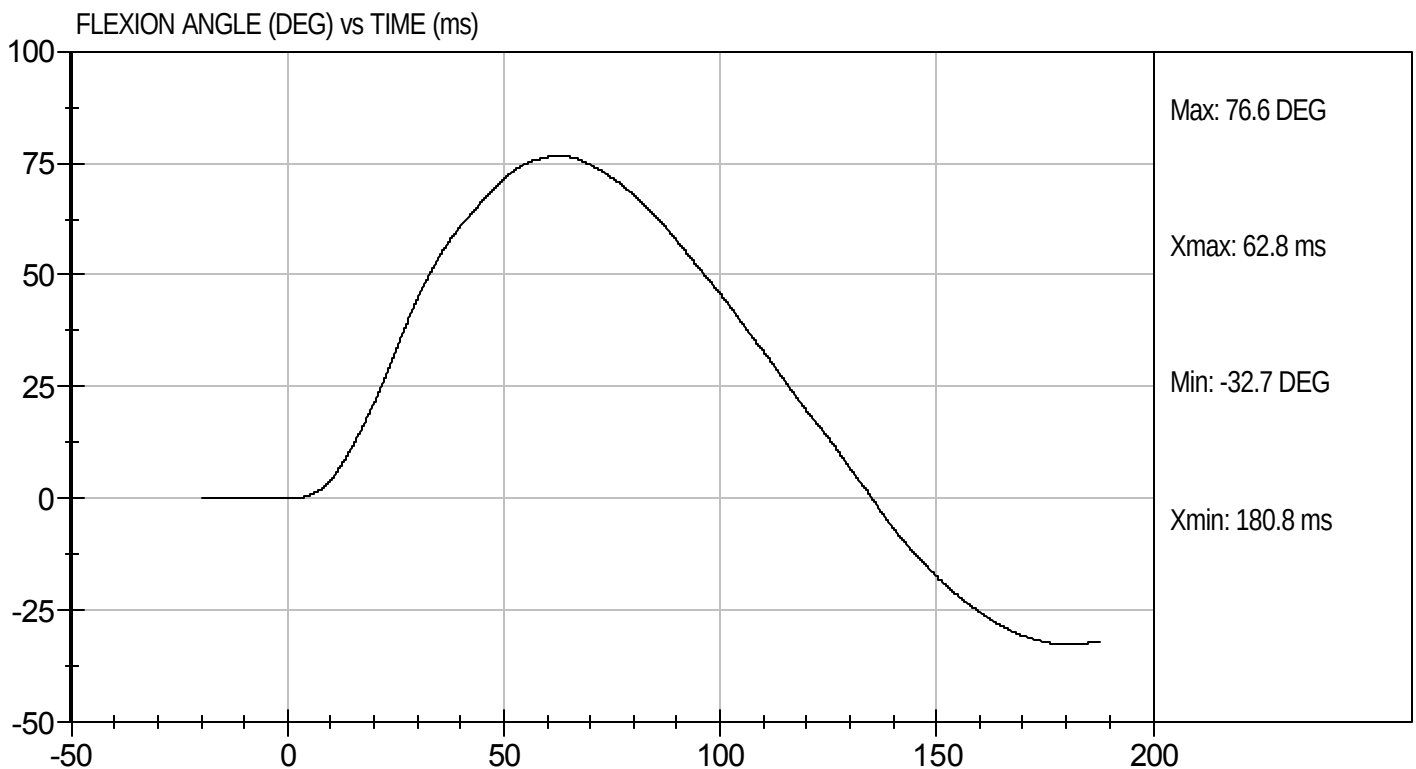
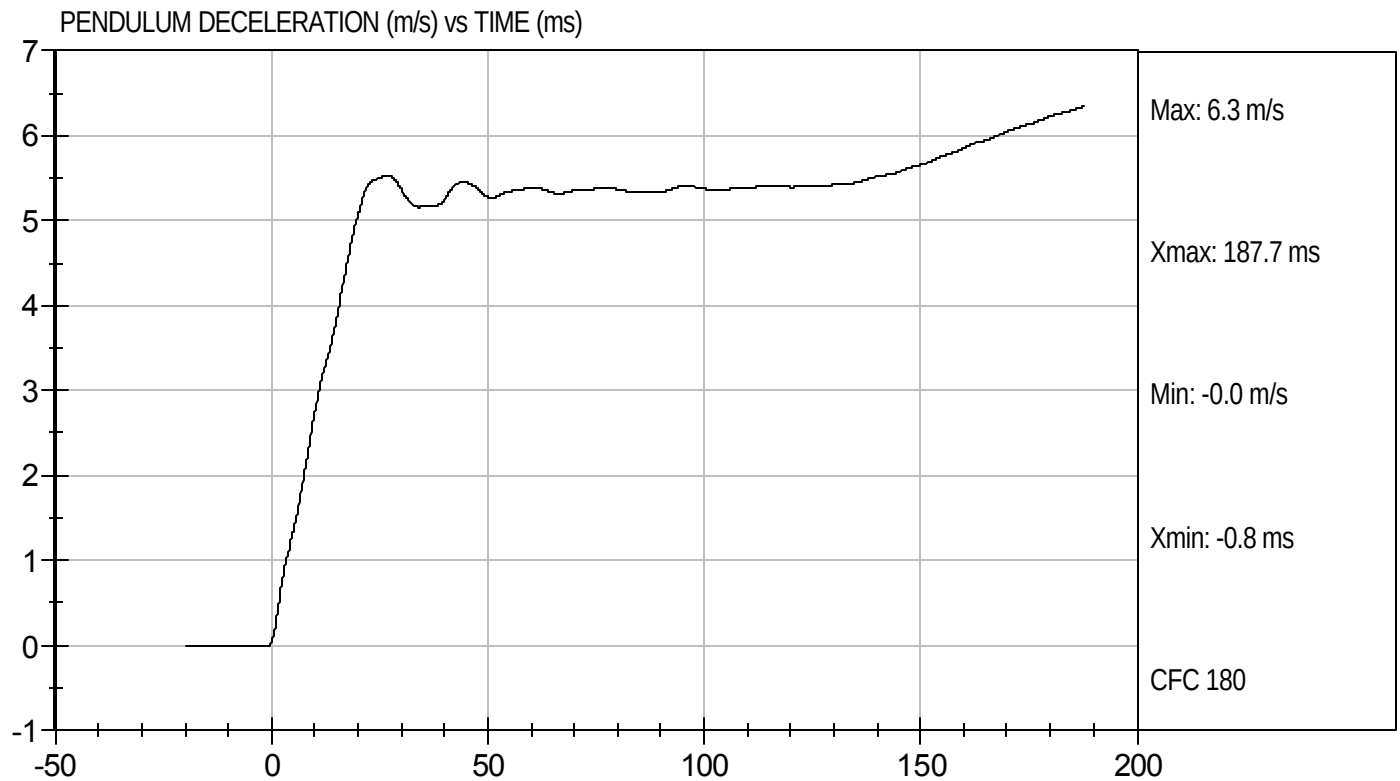
12/23/11
 Test Date


 Approved By



Test Desc: Neck Bending
Component ID: D114382

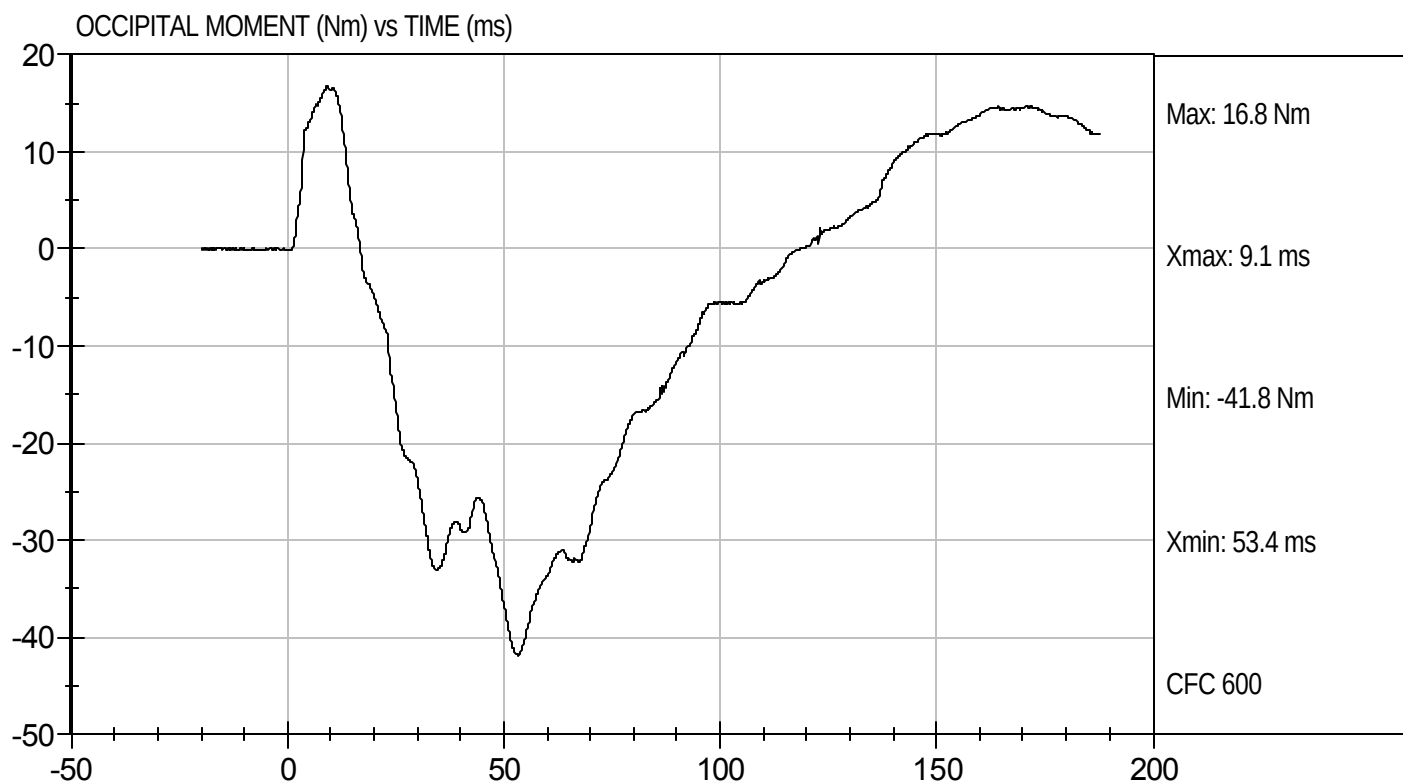
Test Date: 12/23/11
Velocity: 18.32 ft/s, 5.58 m/s





Test Desc: Neck Bending
Component ID: D114382

Test Date: 12/23/11
Velocity: 18.32 ft/s, 5.58 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 304

Test ID: D114383

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
Overall Test Results				Pass


Laboratory Technician

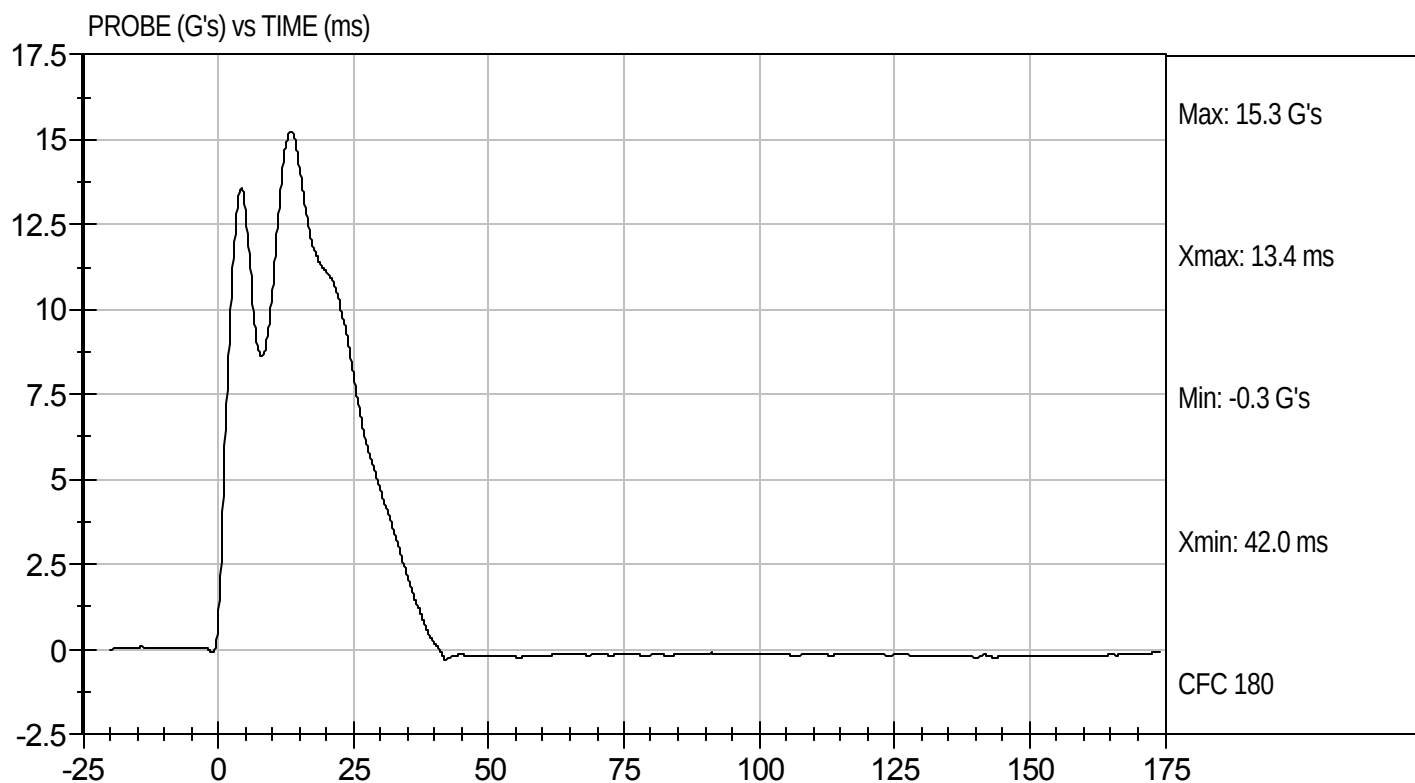
12/23/11
Test Date


Approved By



Test Desc: Shoulder Impact
Component ID: D114383

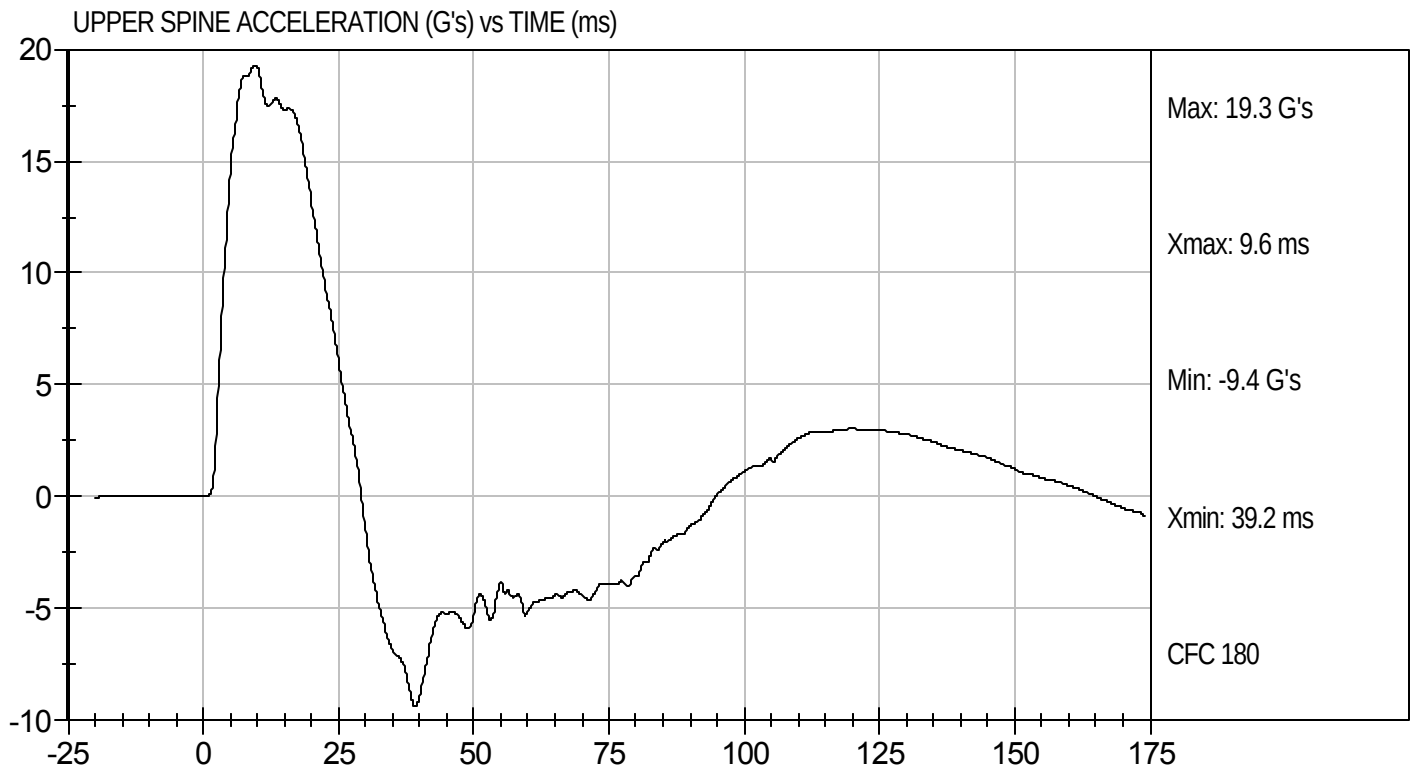
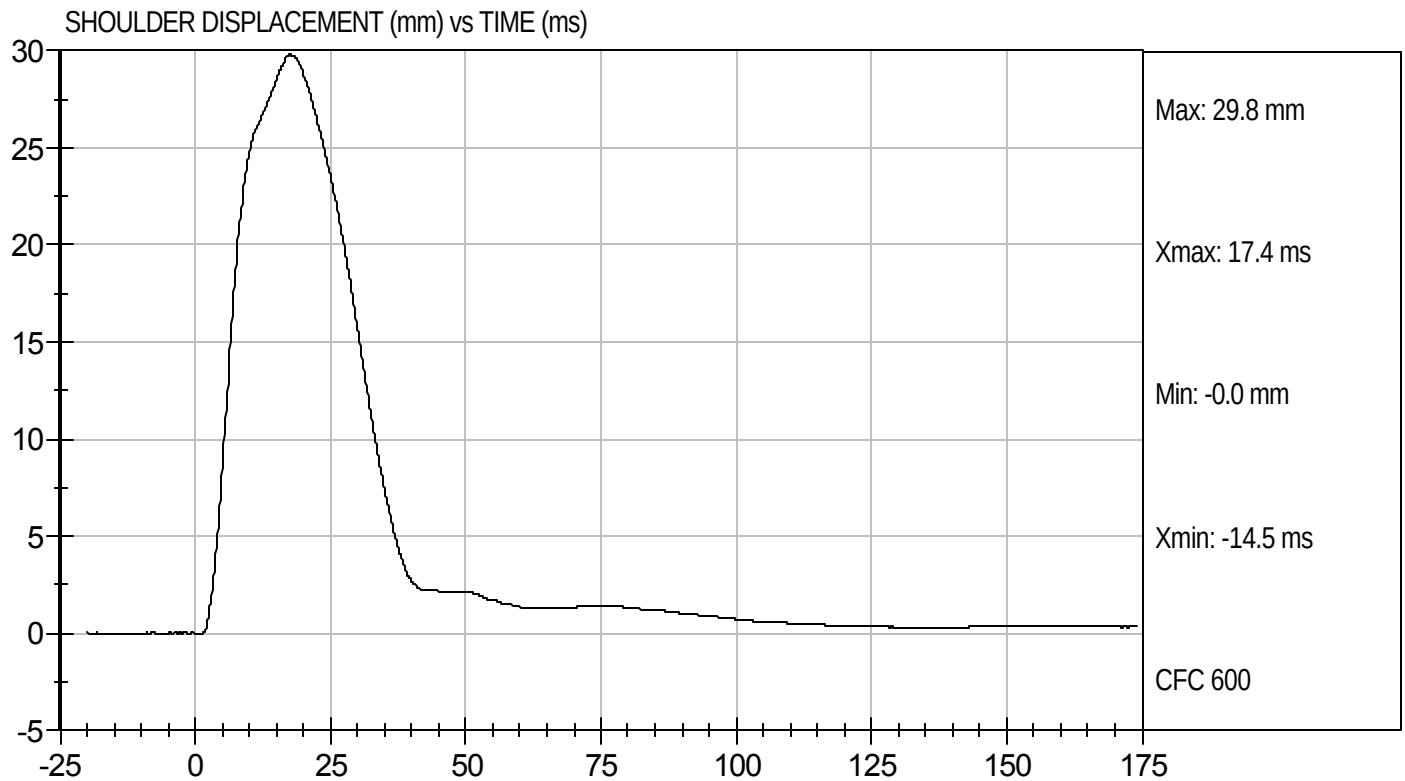
Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Shoulder Impact
Component ID: D114383

Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s

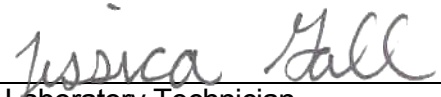


MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114384

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Peak Impactor Acceleration	G's	30 to 36	35	Pass
Shoulder Displacement	mm	31 to 40	32	Pass
Upper Rib Displacement	mm	25 to 32	26	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	41	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	32	Pass
Overall Test Results			Pass	


Laboratory Technician

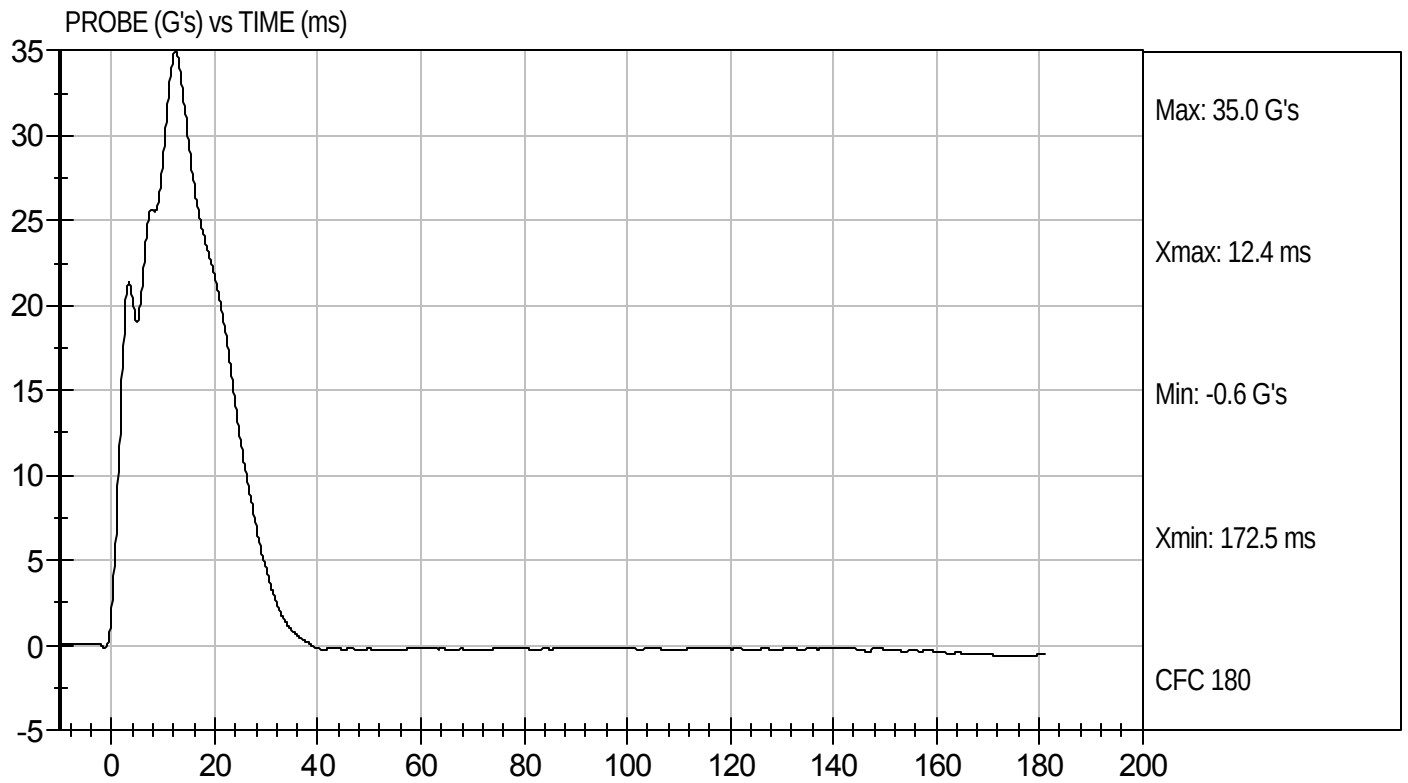
12/23/11
Test Date


Approved By



Test Desc: Thorax With Arm
Component ID: D114384

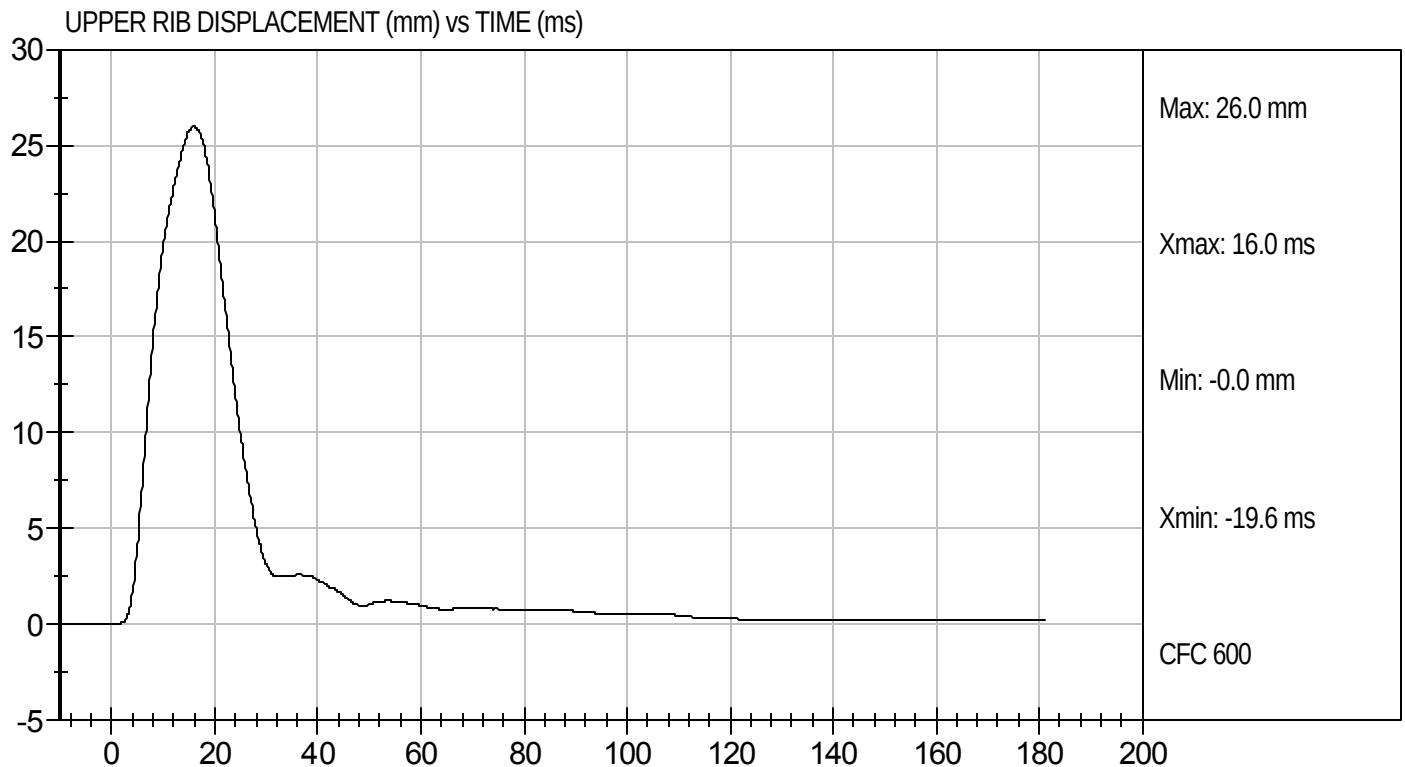
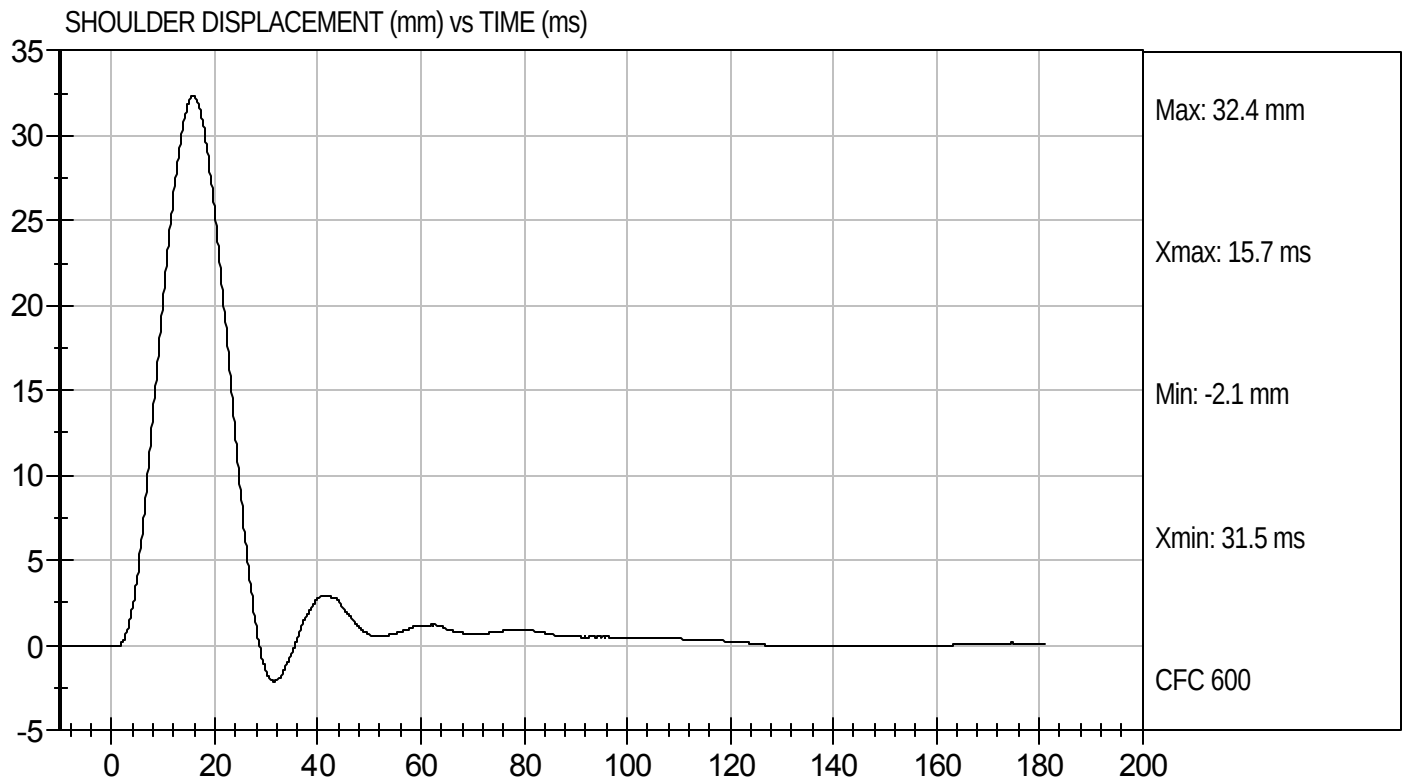
Test Date: 12/23/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114384

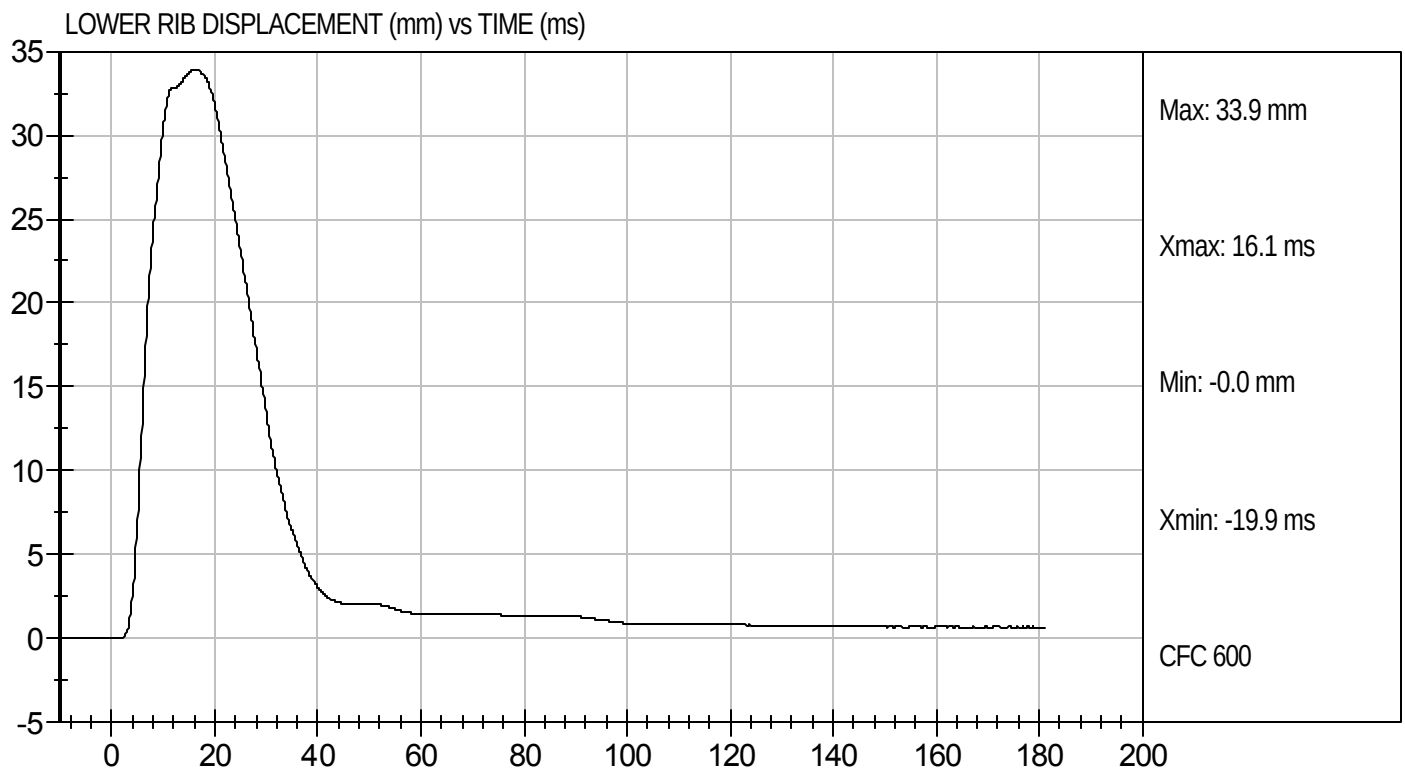
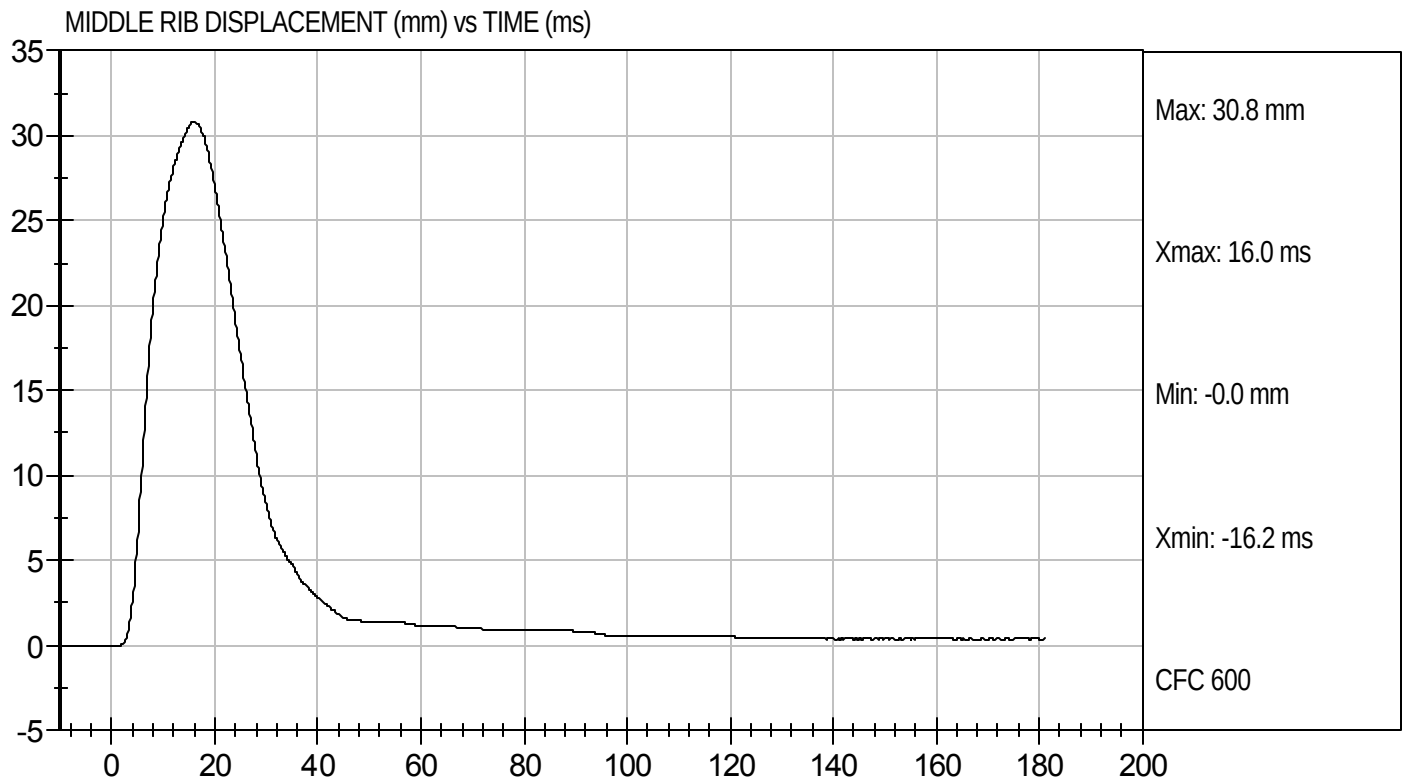
Test Date: 12/23/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114384

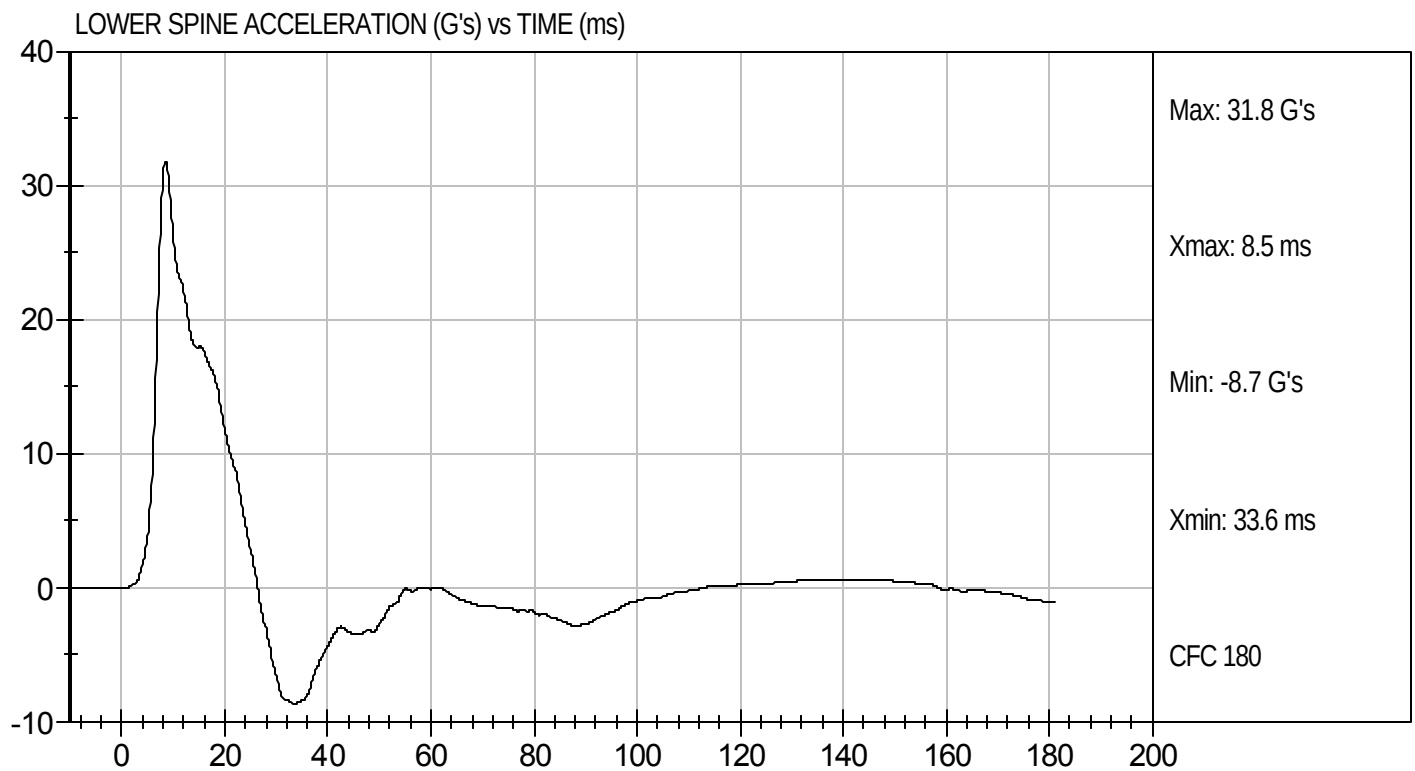
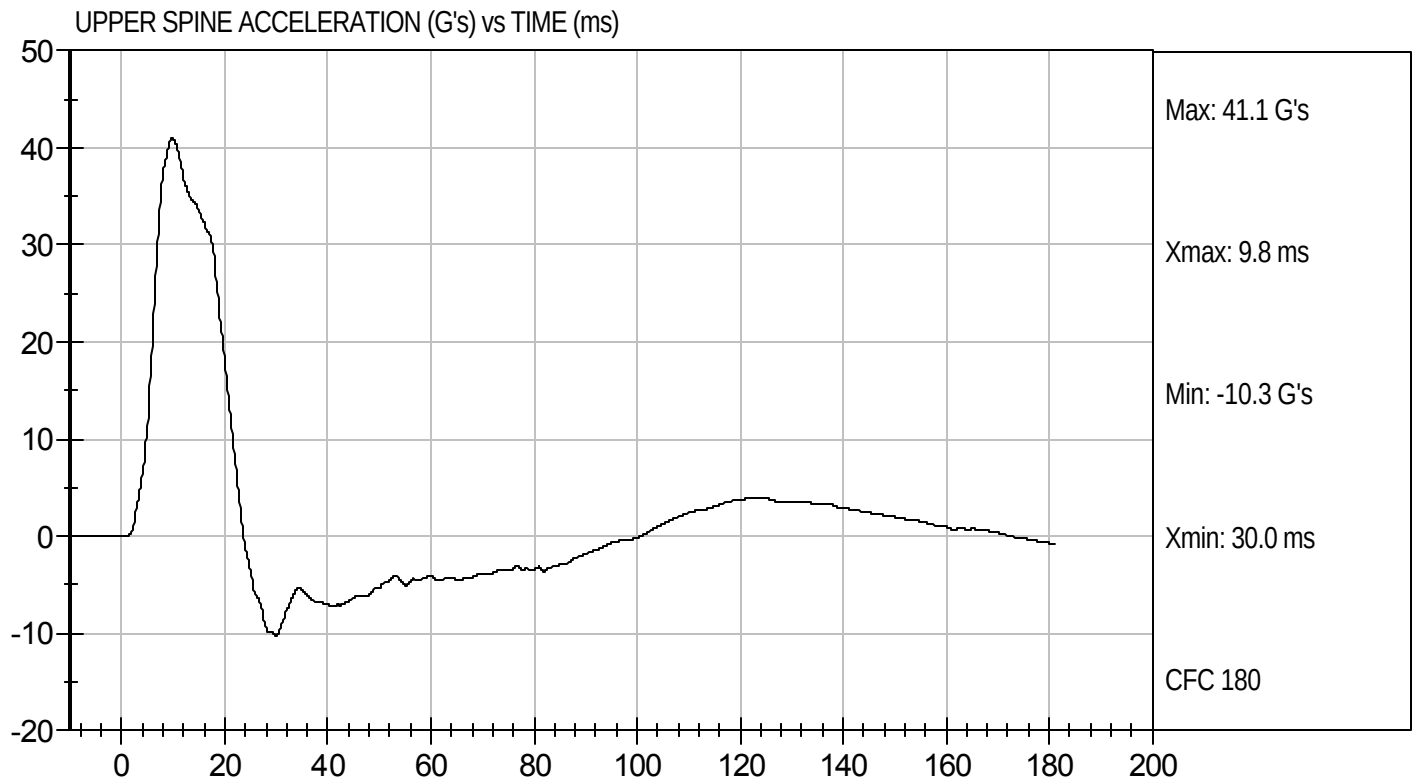
Test Date: 12/23/11
Velocity: 22.22 ft/s, 6.77 m/s





Test Desc: Thorax With Arm
Component ID: D114384

Test Date: 12/23/11
Velocity: 22.22 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114385

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Force	G's	14 to 18	17	Pass
Upper Rib Displacement	mm	32 to 40	33	Pass
Middle Rib Displacement	mm	39 to 45	39	Pass
Lower Rib Displacement	mm	35 to 43	37	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	16	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
Overall Test Results			Pass	


Laboratory Technician

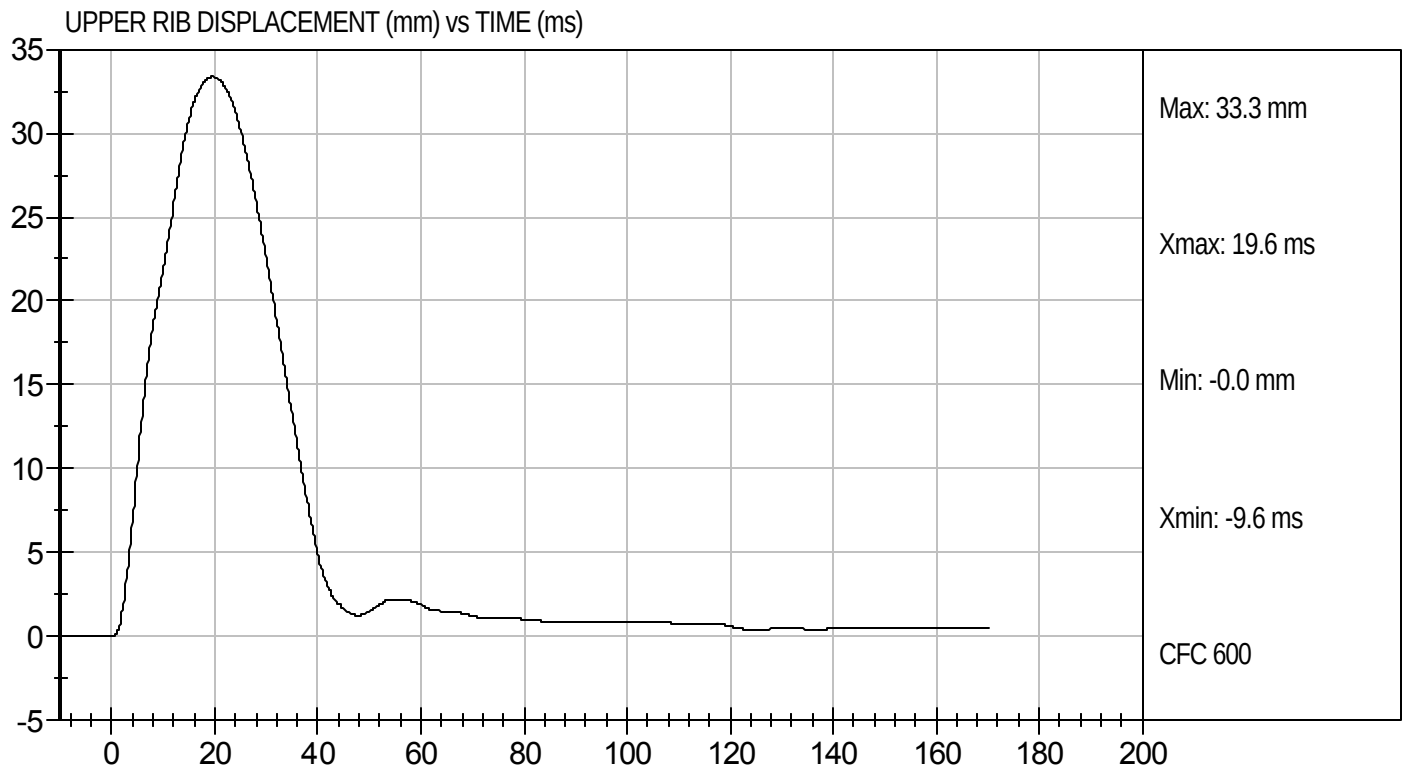
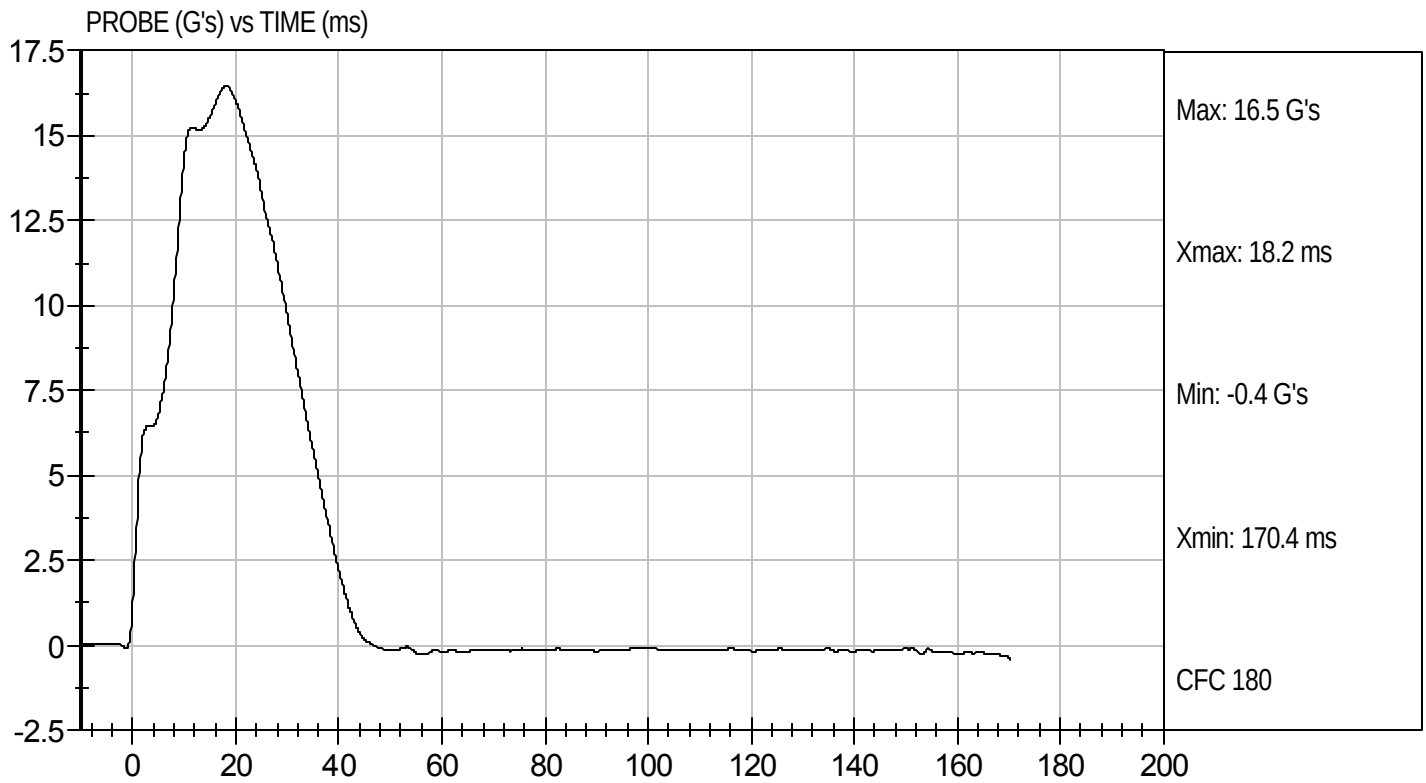
12/23/11
Test Date


Approved By



Test Desc: Thorax Without Arm
Component ID: D114385

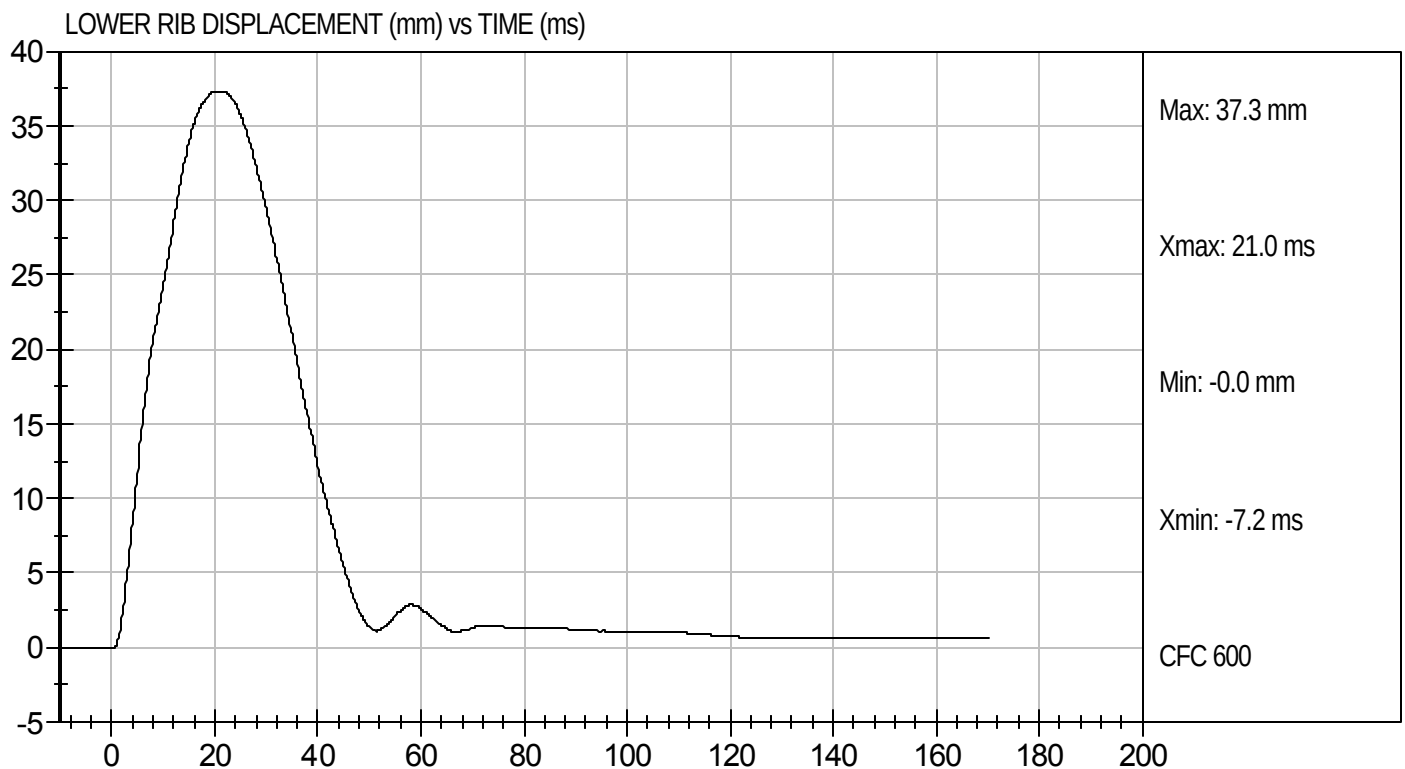
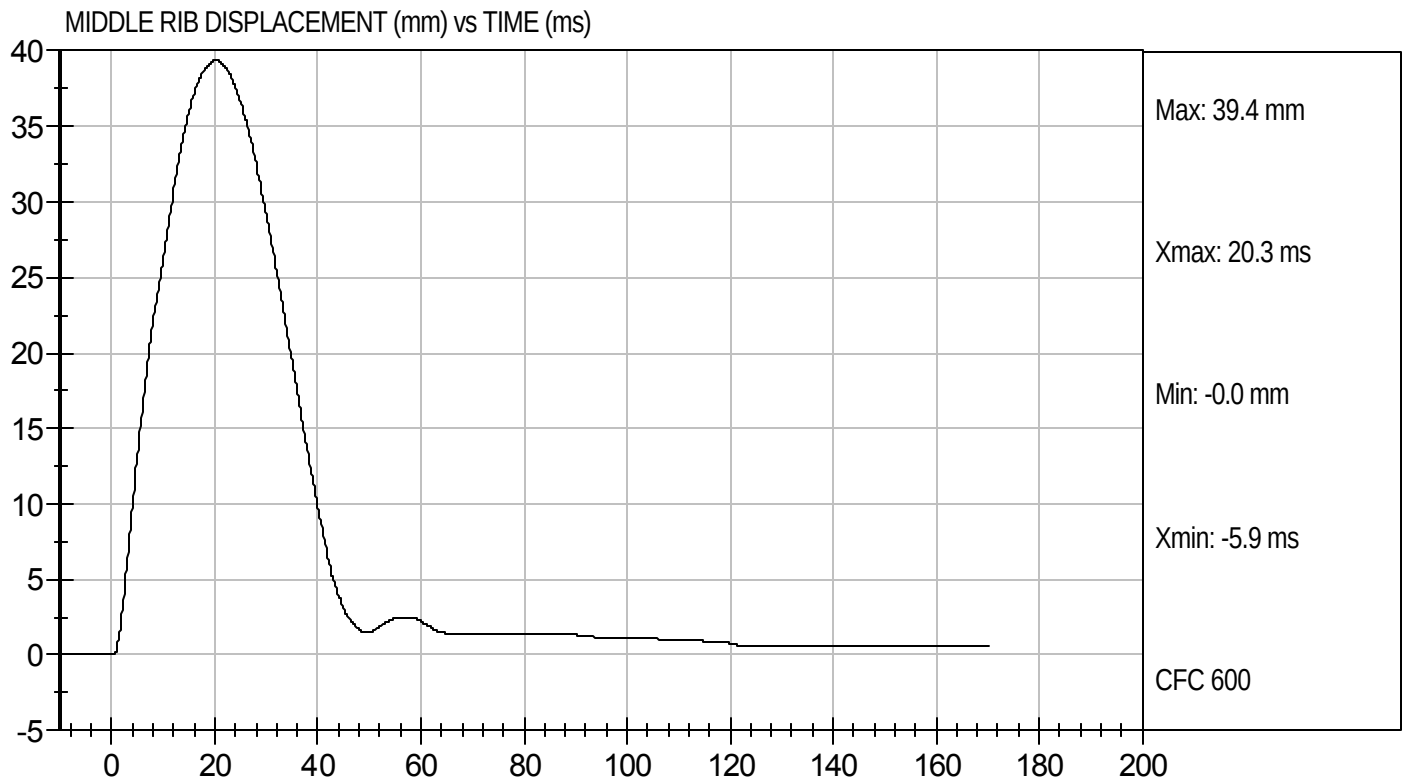
Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D114385

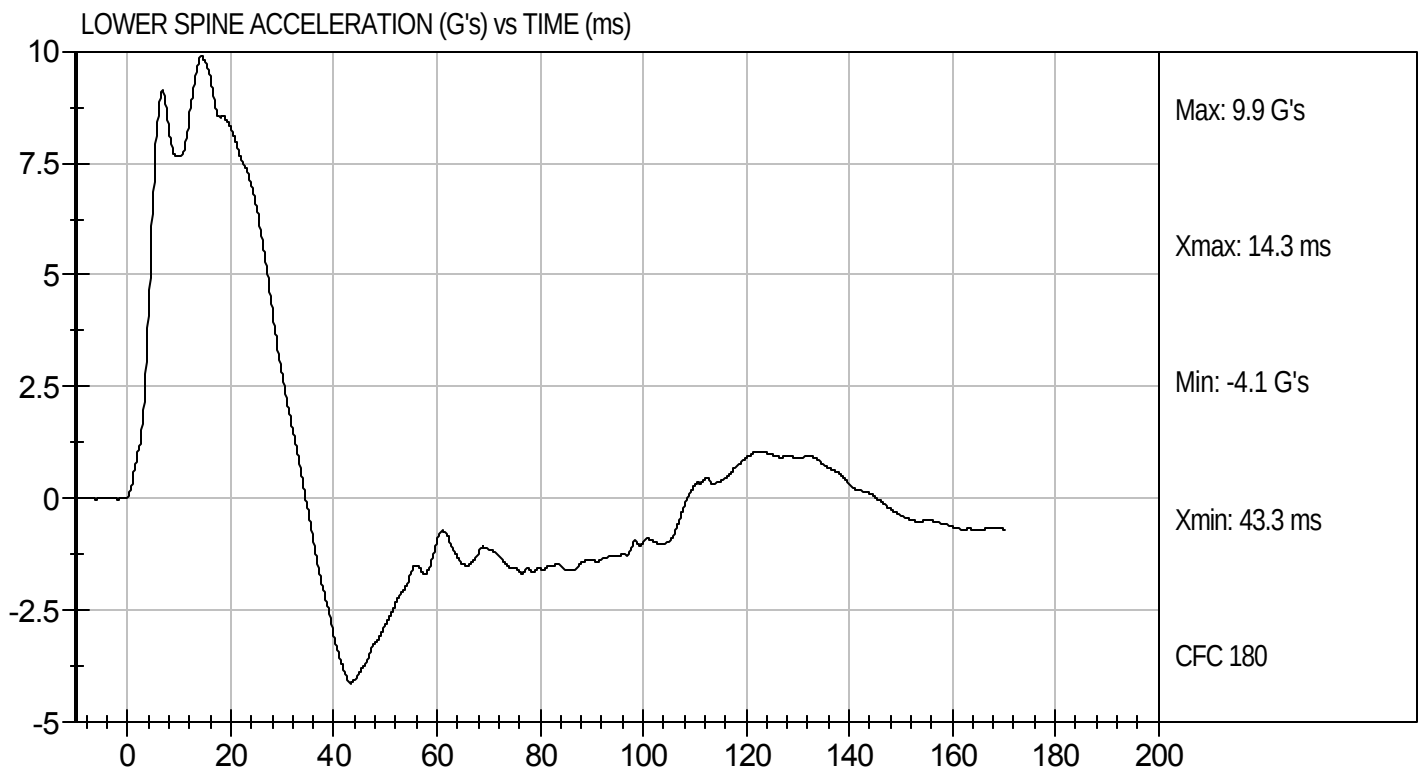
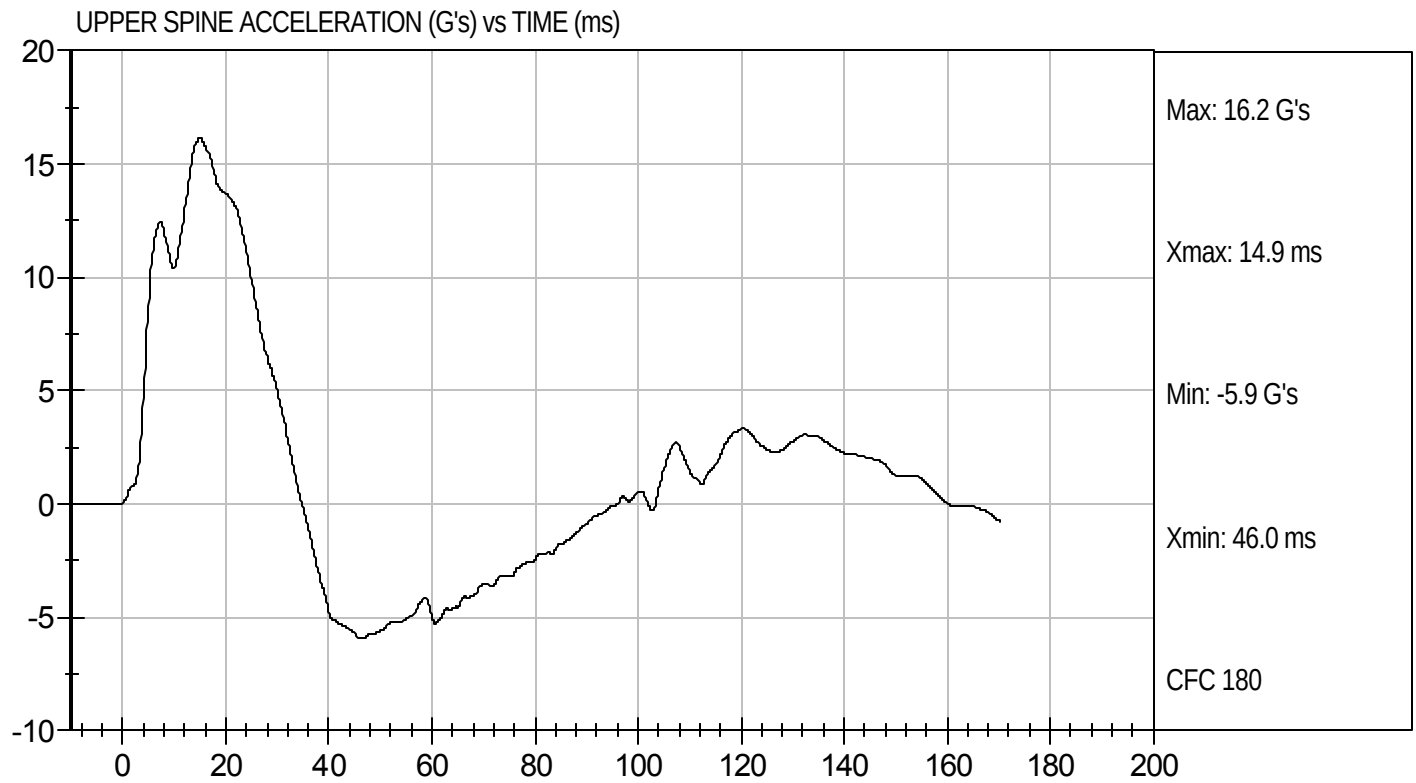
Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Thorax Without Arm
Component ID: D114385

Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114386

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Peak Impactor Acceleration	G's	12 to 16	15	Pass
Upper Rib Displacement	mm	36 to 47	38	Pass
Lower Rib Displacement	mm	33 to 44	35	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	12	Pass
Overall Test Results			Pass	


Laboratory Technician

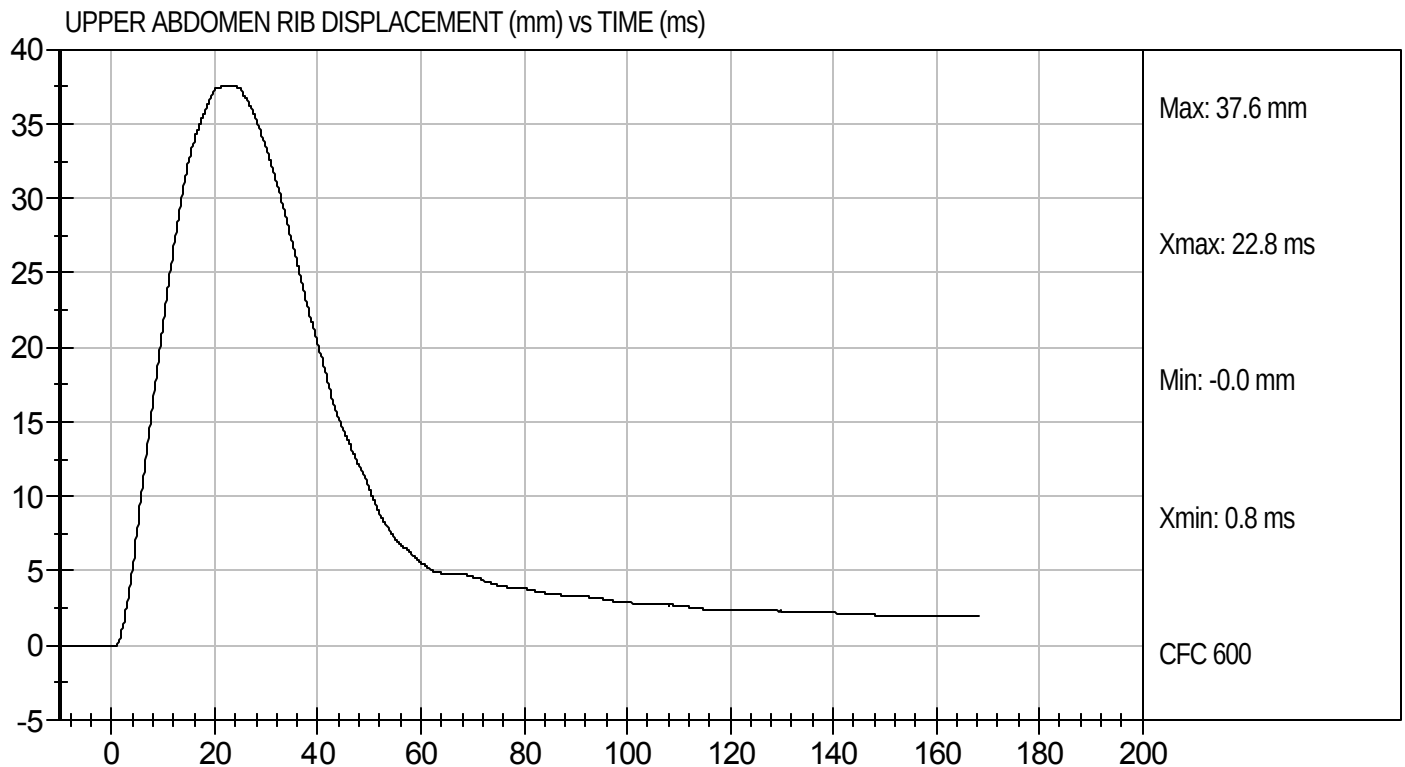
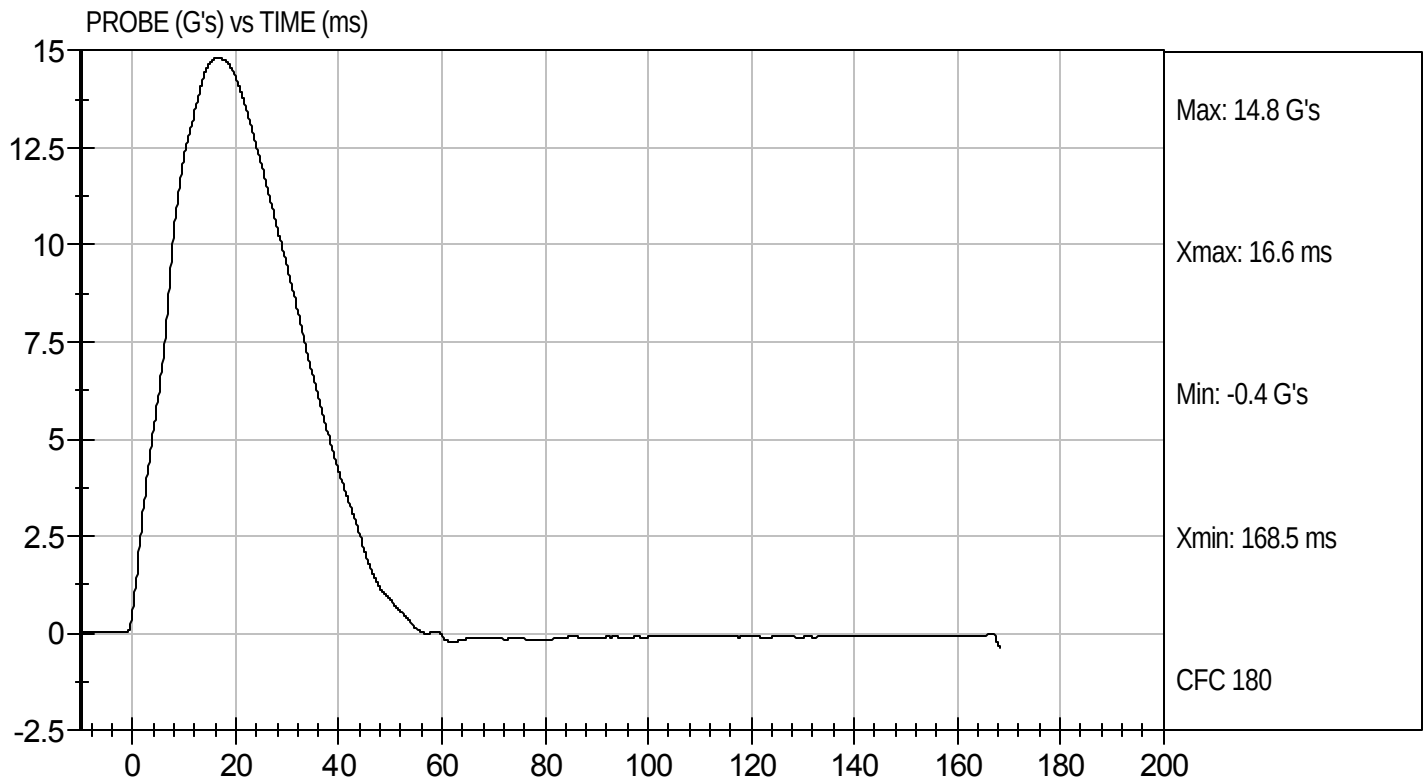
12/23/11
Test Date


Approved By



Test Desc: Abdomen Impact
Component ID: D114386

Test Date: 12/23/11
Velocity: 14.12 ft/s, 4.30 m/s

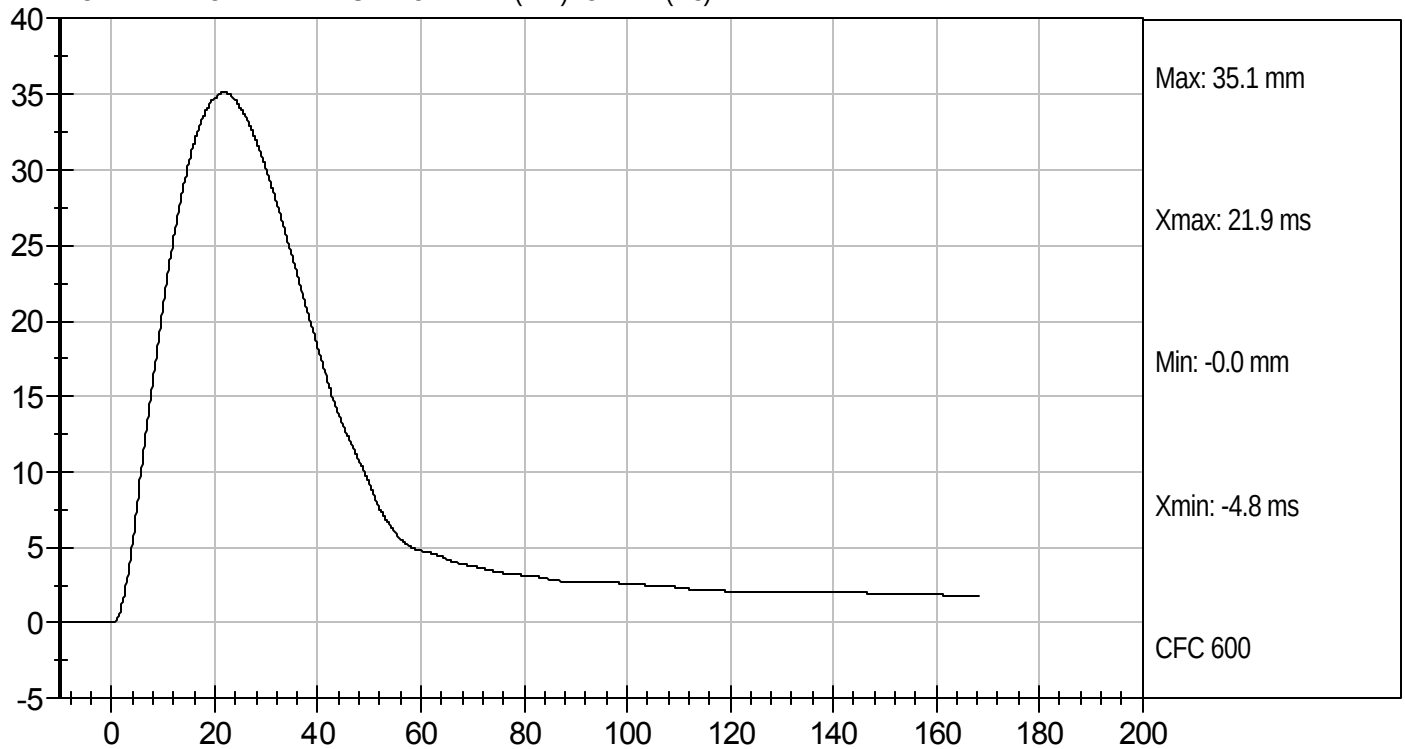




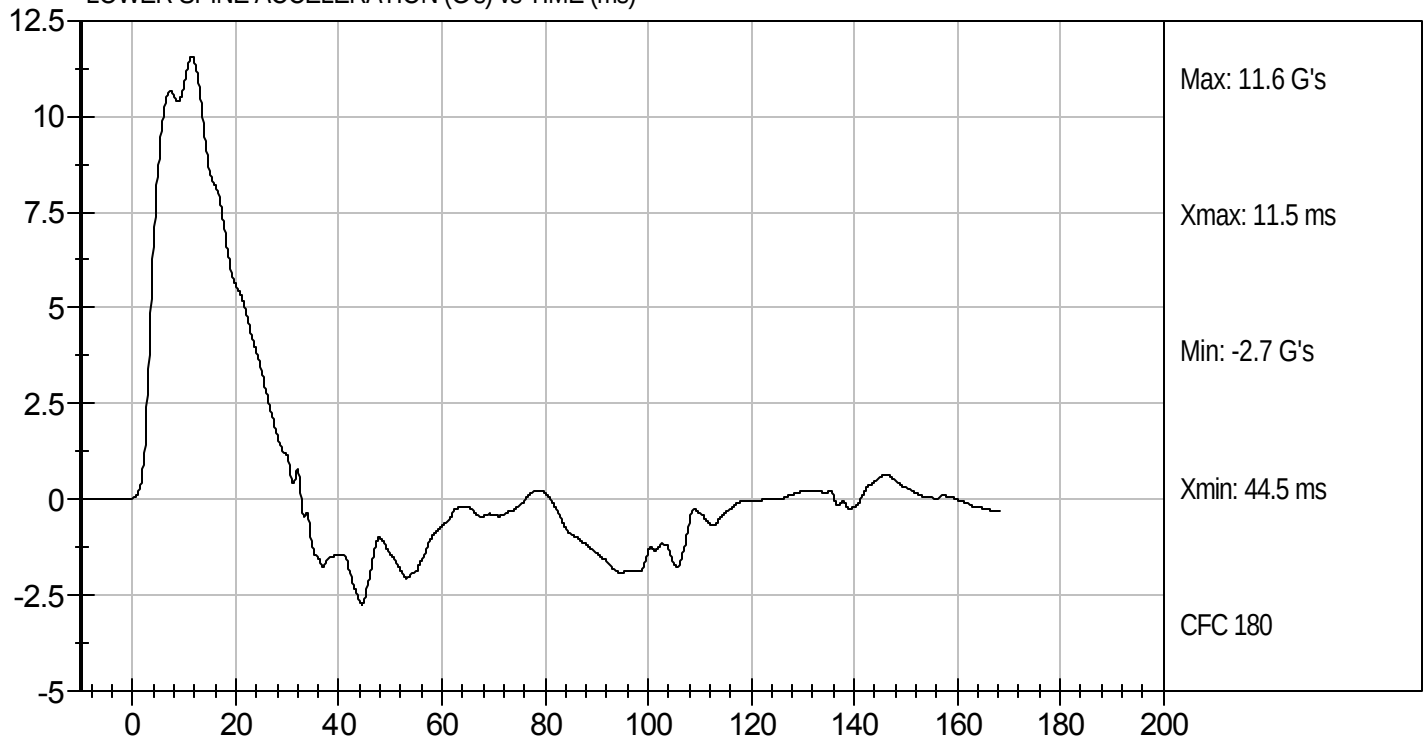
Test Desc: Abdomen Impact
Component ID: D114386

Test Date: 12/23/11
Velocity: 14.12 ft/s, 4.30 m/s

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



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114387

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration after 6 ms	G's	34 to 42	38	Pass
Peak Acetabulum Force	N	3600 to 4300	3958	Pass
Overall Test Results				Pass


Laboratory Technician

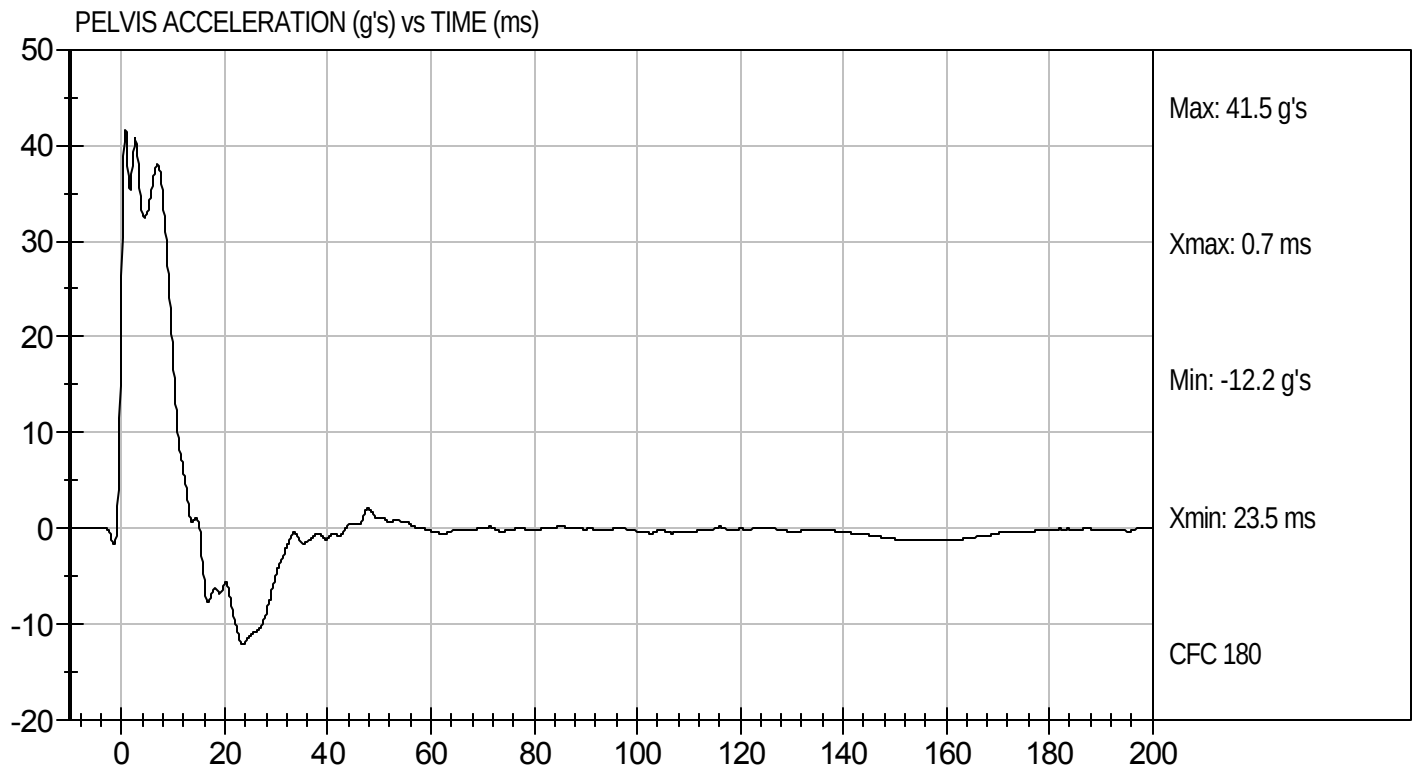
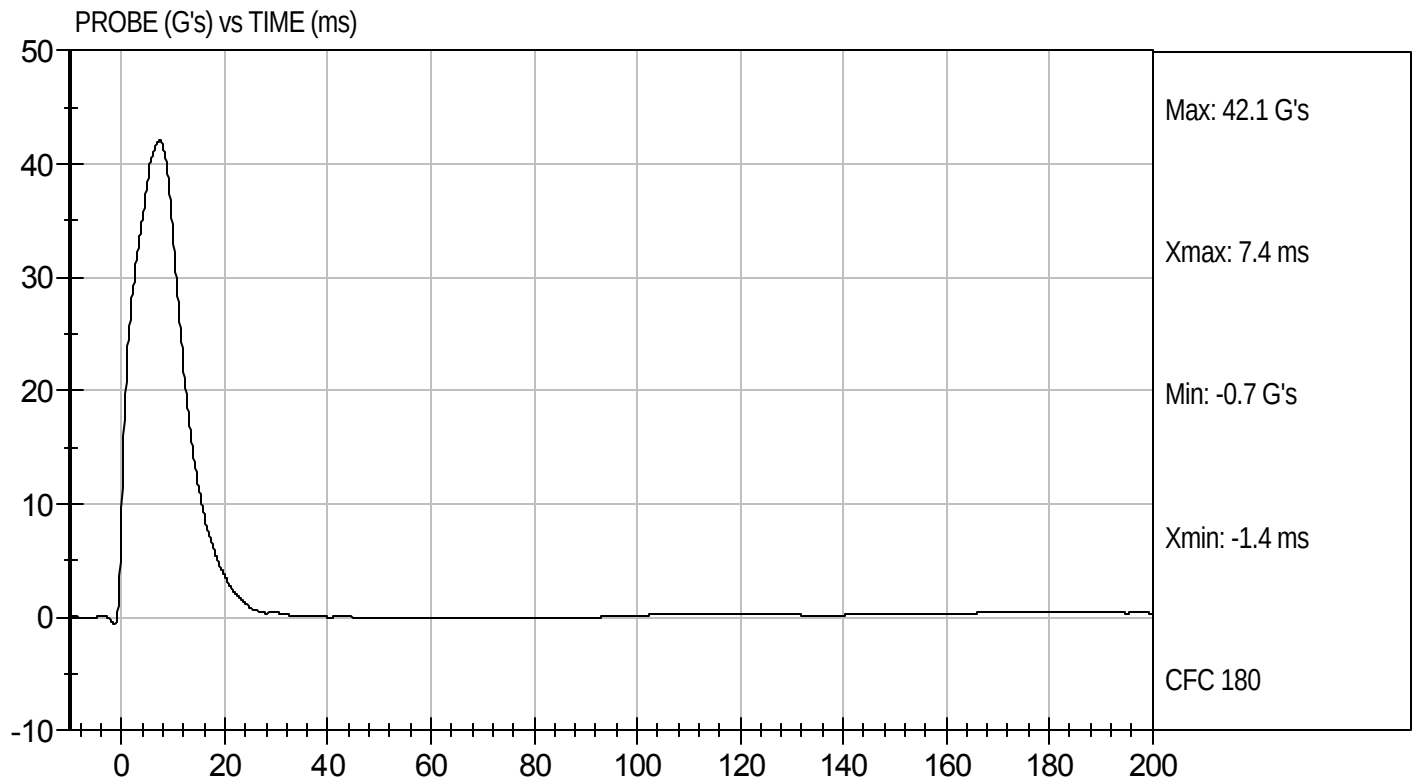
12/23/11
Test Date


Approved By



Test Desc: Pelvis Impact
Component ID: D114387

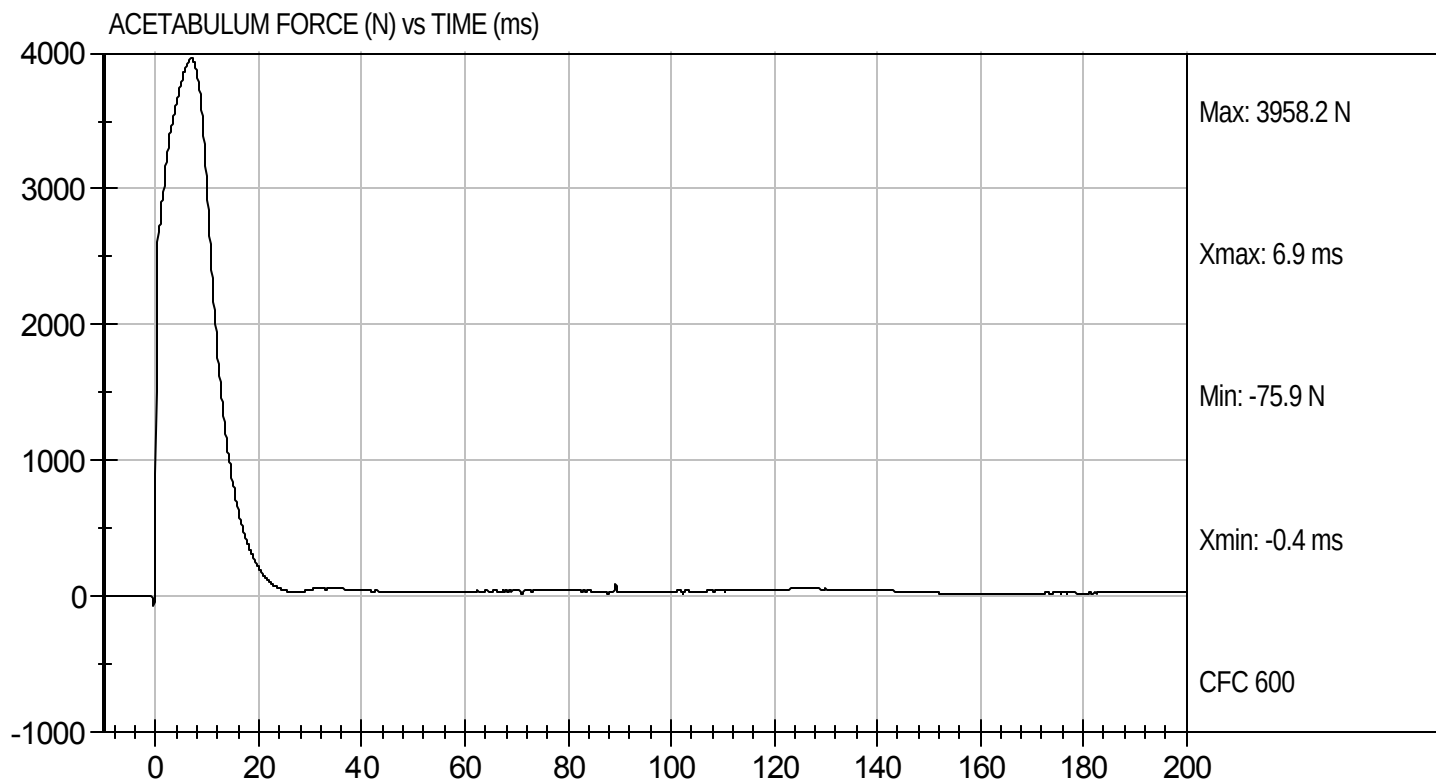
Test Date: 12/23/11
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Component ID: D114387

Test Date: 12/23/11
Velocity: 21.9 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 304

Test I.D: D114388

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	18	Pass
Impact Velocity	m/s	4.20 to 4.40	4.38	Pass
Peak Impactor Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	34	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4848	Pass
Overall Test Results			Pass	


Laboratory Technician

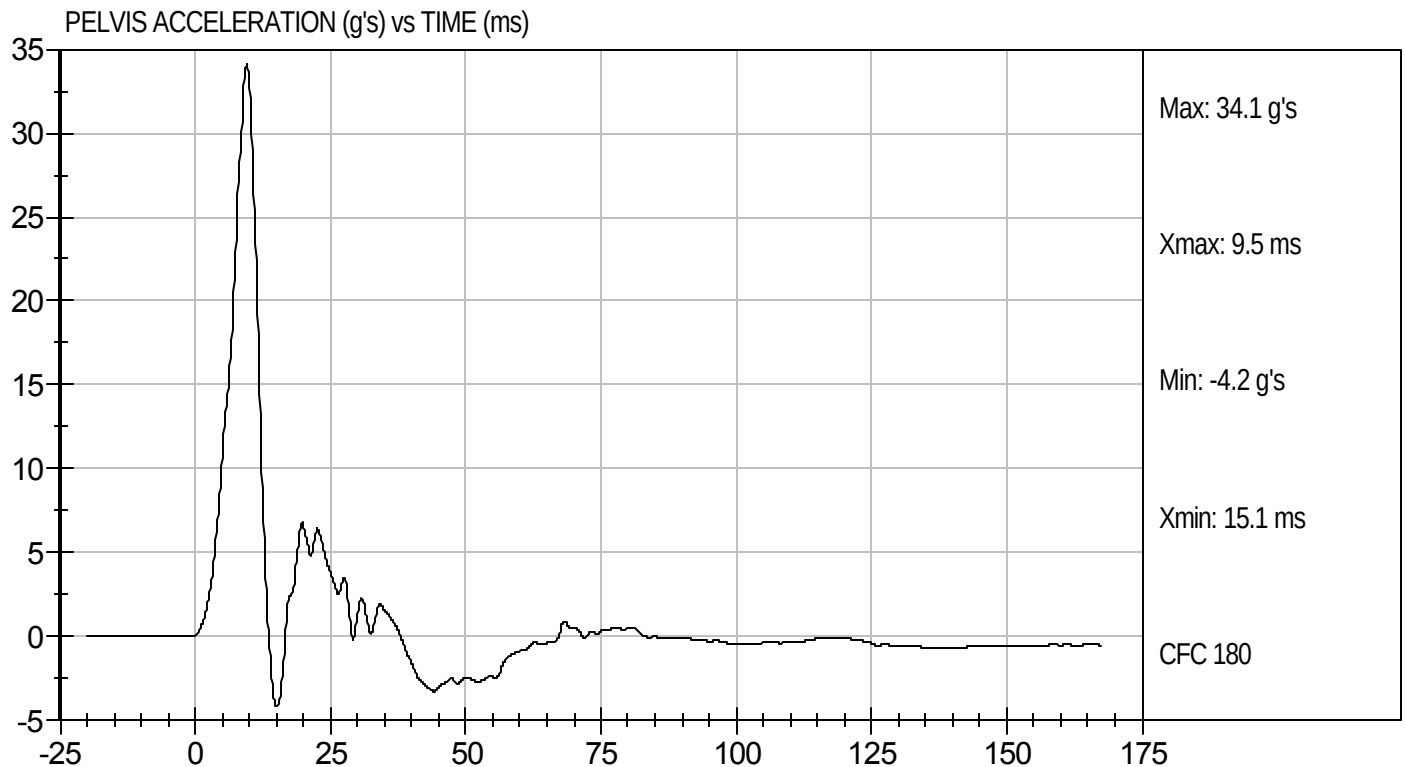
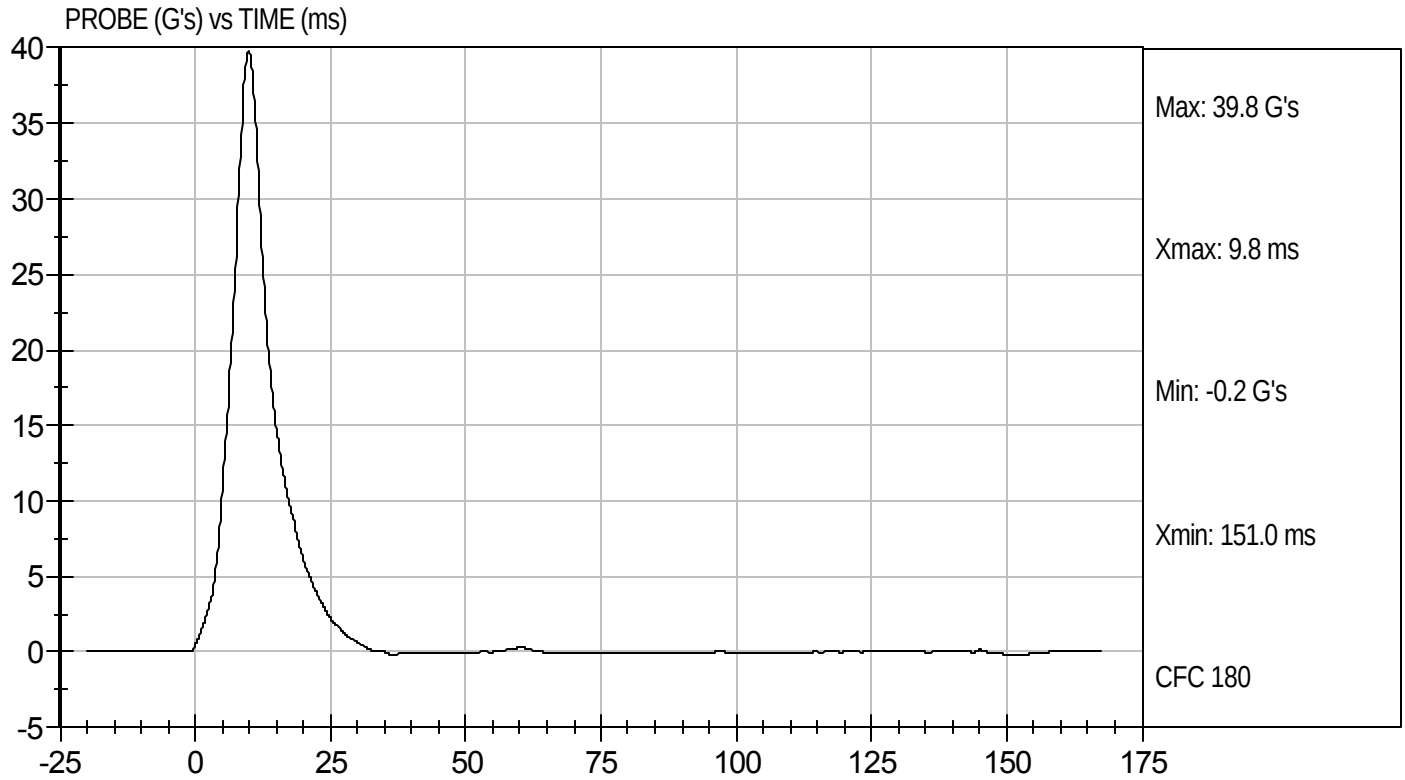
12/23/11
Test Date


Approved By



Test Desc: Iliac Impact
Component ID: D114388

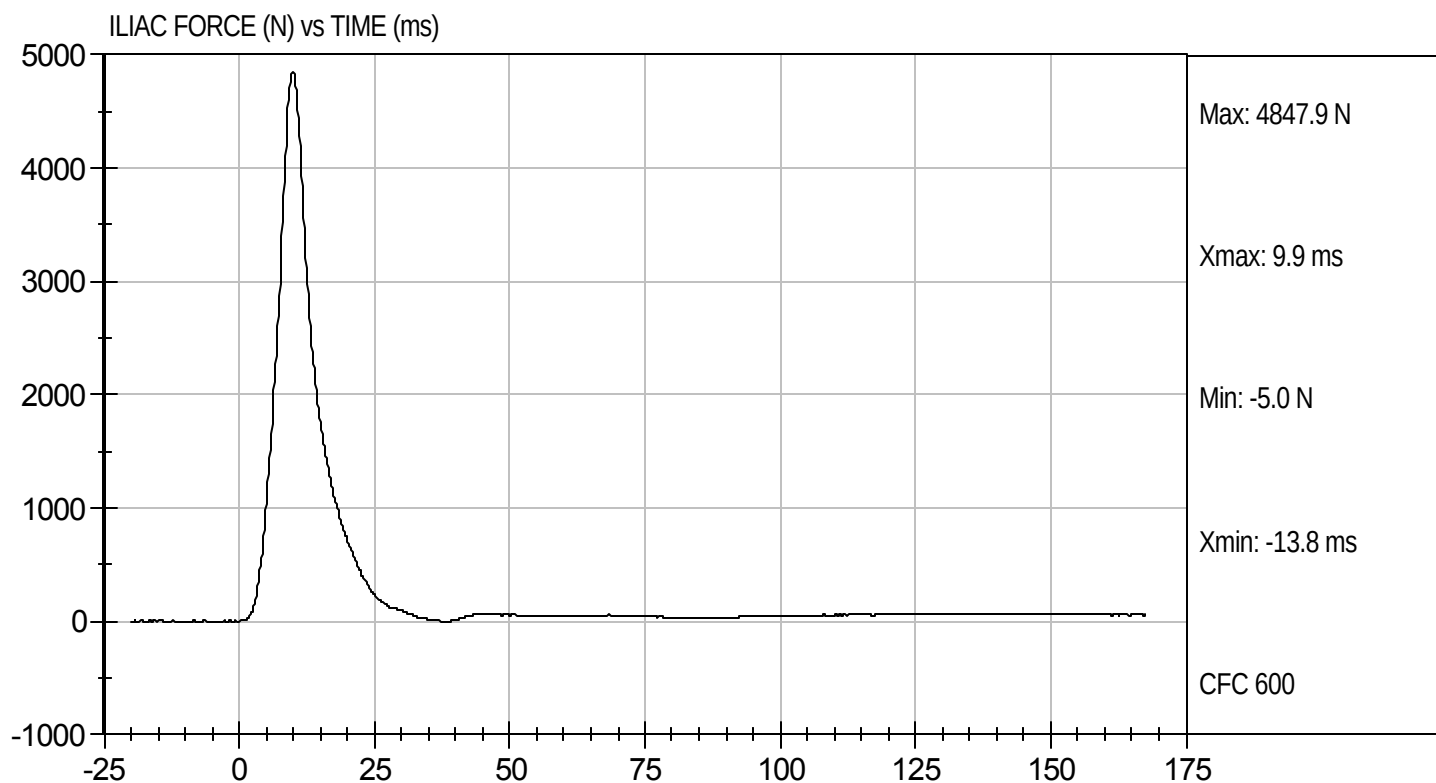
Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s





Test Desc: Iliac Impact
Component ID: D114388

Test Date: 12/23/11
Velocity: 14.36 ft/s, 4.38 m/s



APPENDIX E

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

Table 1 – Dummy Instrumentation

			SID-IIs S/N: 304		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers		X	P66804	Endevco	08/24/11
		Y	P66805	Endevco	08/24/11
		Z	P66806	Endevco	08/24/11
Rib Displacement Transducers	Thorax	Upper	G1188	FTSS	08/22/11
		Middle	G1269	FTSS	08/22/11
		Lower	G1260	FTSS	08/22/11
	Abdominal	Upper	G1207	FTSS	08/22/11
		Lower	G1204	FTSS	08/22/11
Lower Spine Accelerometers (T12)		X	P66574	Endevco	09/28/11
		Y	P66578	Endevco	09/28/11
		Z	P73119	Endevco	08/04/11
Acetabulum Load Cell		Y	ACG266	Denton	06/16/11
Illiatic Wing Load Cell		Y	IWG286	Denton	06/16/11

Table 2 – Vehicle Instrumentation

	Serial Number	Manufacturer	Calibration Date
Vehicle CG (X)	P59628	Endevco	07/01/11
Vehicle CG (Y)	P59630	Endevco	07/01/11
Vehicle CG (Z)	P59629	Endevco	07/01/11
Rotation About X Axis	ARS2606	DTS	07/13/11
Rotation About Y Axis	ARS2607	DTS	07/13/11
Rotation About Z Axis	ARS2608	DTS	07/13/11
Left Floor Sill (Y)	P63277	Endevco	11/04/11
A Pillar Sill (Y)	P63550	Endevco	09/12/11
A Pillar Low (Y)	P63282	Endevco	11/04/11
A Pillar Mid (Y)	P59631	Endevco	12/13/11
B Pillar Sill (Y)	P52215	Endevco	12/13/11
B Pillar Low (Y)	P48390	Endevco	09/12/11
B Pillar Mid (Y)	P48166	Endevco	12/13/11
Driver Seat Track (Y)	P48389	Endevco	09/12/11
Top of Engine (X)	P63343	Endevco	11/04/11
Top of Engine (Y)	P63342	Endevco	11/04/11
Firewall (Y)	P59362	Endevco	07/07/11
Right Roof (Y)	P59230	Endevco	10/20/11
Right Sill (Y)	P63516	Endevco	11/04/11
Floorpan @ Rear Axle (X)	P63389	Endevco	09/13/11
Floorpan @ Rear Axle (Y)	P63390	Endevco	09/13/11

Table 3 – Pole Instrumentation

	Serial Number	Manufacturer	Calibration Date
Load Cell 1	DG6277	FTSS	09/15/11
Load Cell 2	DG6278	FTSS	09/15/11
Load Cell 3	DG6279	FTSS	09/15/11
Load Cell 4	DG6280	FTSS	09/15/11
Load Cell 5	DG6281	FTSS	09/15/11
Load Cell 6	DG6283	FTSS	09/15/11
Load Cell 7	DG6284	FTSS	09/15/11
Load Cell 8	DG6582	FTSS	09/15/11