

REPORT NUMBER: TO1-MGA-2004-026

FULL SCALE SIDE IMPACT TESTS

**214 LEFT SIDE IMPACT
DRIVER SIDIIIsD
PASSENGER SIDIIIsD
TEST DATE: August 9, 2005
Task Order # T0001 / RFP # 0004**

**2005 SATURN ION
NHTSA NUMBER # R50168**



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This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, under Contract No. DTRS57-04-D-30001.

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-04-D-30001, RFP 4, Task Order 1, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test was to study the response of a SIDIIIsD.

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

SECTION 2

SUMMARY OF SIDE IMPACT TEST

A 2005 Saturn Ion 4 door was impacted on the left side by a Moving Deformable Barrier (MDB) which was moving forward in a 27 degree position to the tow road guidance system at a velocity of 53.1 kph (33.0 mph). The target vehicle was stationary and positioned at an angle of 63 degrees to the line of forward motion. The side impact test was conducted by MGA Research Corporation in Burlington, WI on August 9, 2005. Pre- and post-test photographs of the test vehicle, the MDB and the side impact dummies are included in Appendix A.

Two SIDIIIsD side impact dummies were placed in the left front and left rear (SIDIIIsD) designated seating positions according to instructions specified in TP-214P-00 dated May 21, 2004. The side impact event was documented by ten 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 side impact dummy (SIDIIIsD) 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.

SECTION 2... (continued)
SUMMARY OF SIDE IMPACT TEST

Rib Deflection (mm) CFC 180	Driver	Passenger
Upper Thorax Rib	-19.1	-31.6
Mid Thorax Rib	-11.4	-40.5
Lower Thorax Rib	-14.7	-46.7
Upper Abdominal Rib	-39.3	-51.7
Lower Abdominal Rib	-37.4	-32.0

Abdominal Forces (N) CFC 600	Driver	Passenger
Left Acetabulum Force	6298	3659
Left Ilium Crest Force	2699	487
Sum of Left Acetabulum and Left Ilium	8993	3964

Lower Spine (CFC180)	Driver	Passenger
Lower Spine Resultant	53.2	73.1

HIC 15		Driver	Passenger
	T1 (msec)	41.5	57.4
	T2 (msec)	56.5	72.4
	T2 – T1 (msec)	15.0	15.0
	HIC	148	173

HIC 36		Driver	Passenger
	T1 (msec)	38.4	50.8
	T2 (msec)	74.4	81.0
	T2 – T1 (msec)	36.0	30.2
	HIC	189	220

TEST NOTES

Passenger Head Xr – No valid data collected after 40 msec
Right Front Sill Y – No valid data collected
Left Lower A-Post Y - No valid data collected

SECTION 3
SIDE IMPACT DUMMY (SIDIIsD) AND VEHICLE TEST DATA

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

TEST VEHICLE INFORMATION

Make / Model	Saturn Ion
Body Style	4 door
NHTSA No.	R50168
VIN	1G8AJ54F35Z166135
Odometer Reading	158
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.2
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Curtain
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
AM/FM/CD	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Saturn Corporation
Date of Manufacture	04/05

GVWR (kg)	1717
GAWR Front (kg)	898
GAWR Rear (kg)	819

DATA FROM TIRE PLACARD

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

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

DATA SHEET NO. 1... (continued)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2005 Saturn Ion 4 doorTest Date: August 9, 2005**TEST VEHICLE WEIGHTS**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	396.0	246.5		439.0	320.5	
Right	kg	382.0	262.5		385.0	311.5	
Ratio	%	60.4	39.6		56.6	43.4	
Totals	kg	778.0	509.0	1287.0	824.0	632.0	1456.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1287.0
Weight of 2 SIDIISD Side Impact Dummy	kg	108.8
Rated Cargo/Luggage Weight (RCLW)	kg	67.6
Calculated Vehicle Target Weight (TVTW)	kg	1463.4

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	687	689	705	700	1041
As Tested	mm	679	689	671	673	1143
Fully Loaded	mm	679	688	669	673	

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2632
Target Impact Point Aft of Front Axle	mm	376
Actual Impact Point Aft of Front Axle	mm	383

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 6.1° on head rest post

Rear passenger seat back angle: Not Adjustable

SEAT FORE/AFT POSITIONS

Driver seat fore/aft total travel: 27 Positions

Rear passenger seat fore/aft total travel: Not Adjustable

Driver seat fore/aft position: Full Forward

Rear passenger seat fore/aft position: Not Adjustable

HEAD RESTRAINT POSITION

The head restraint was placed in the lowest position.

SEAT BELT UPPER ANCHORAGE

The D ring was placed in the lowest position.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position.

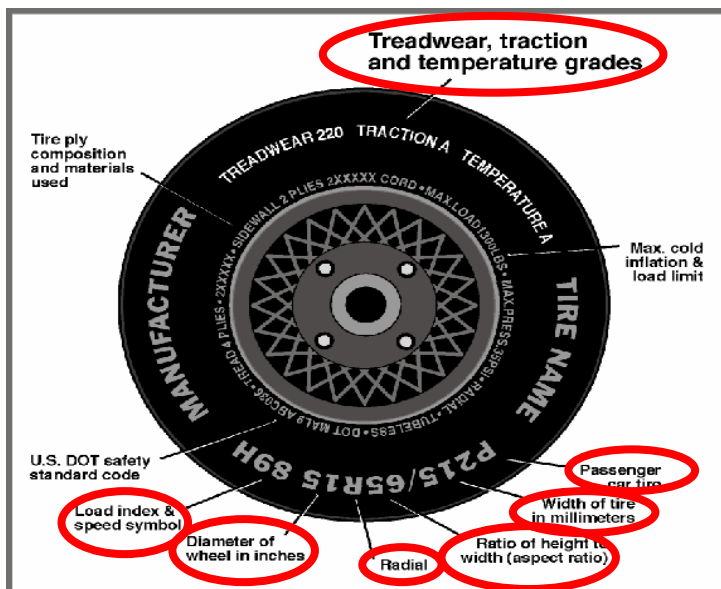
DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

Vehicle Year	2005	Vehicle Make	Saturn
VIN	1G8AJ54F35Z166135	Vehicle Model	Ion



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

DATA SHEET NO. 3
MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1252
Overall Length Including Honeycomb Face	4115
Wheel base of Framework Carriage	2590
C.G. Location aft of Front Axle	1127

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	473.5	219.5	
Right	kg	308.3	359.5	
Ratio	%	57.5	42.5	
Totals	kg	781.8	579.0	1360.8

SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	53.1
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	53.1
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

Vertical Location			From Centerline		Max. Crush
Level	Description	Height	Distance	Direction	
1	Center of Bumper (mm)	432	800	Right	119
2	Top of Bumper (mm)	533	800	Right	66
3	Mid Level (mm)	686	800	Left	89
4	Top of Stack (mm)	813	800	Left	128

MDB INSTRUMENTATION AND CAMERAS

Accelerometers	6
Contact Switches	2
High Speed Cameras	2

DATA SHEET NO. 4
POST TEST OBSERVATIONS

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat	Rear Seat
Dummy Type / Serial No.	SIDIIsD / 033	SIDIIsD / 032
Head Contact	Curtain airbag, Headrest	Curtain airbag, Headliner, Seatback
Upper Torso Contact	Door panel	Door panel
Lower Torso Contact	Door panel	Door panel
Left Knee Contact	Door panel	Door panel
Right Knee Contact	Left knee	Left knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Door Opening	Remained closed and latched	Remained closed and latched
Right Side Door Opening	Remained closed and latched	Remained closed and latched
Left Side Seat Movement	None	None
Left Side Seat Back Failure	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No failures
Sill Separation	None
Windshield Damage	Broke
Window Damage	Left side driver and passenger broke
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver	Rear Passenger
Front	Yes	NA
Side	NA	NA
Curtain	Yes	Yes

MDB LEFT EDGE IMPACT POINT DATA

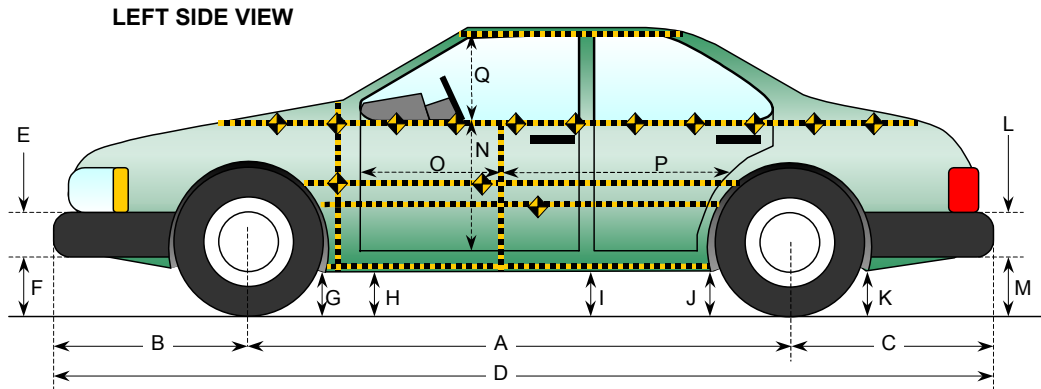
Measured Parameter	Units	Requirement	Value
Horizontal Offset	Mm	+/- 50	7 mm rear
Vertical Offset	Mm	+/-20	4 mm down

SECTION 4
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 5
VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



All Measurements in mm

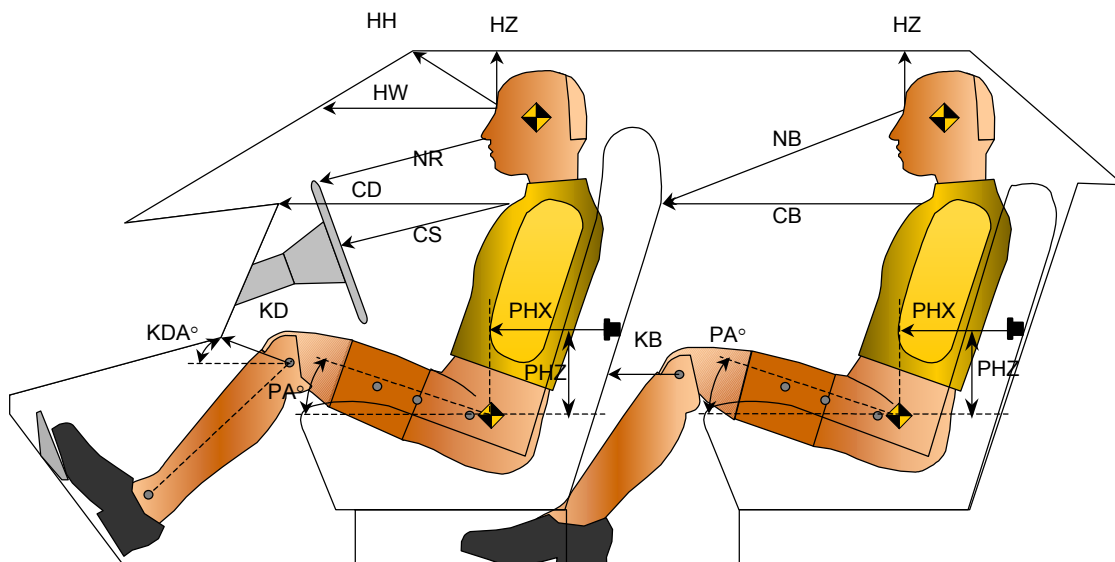
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2632	2613	19
B	Front Axle to FSOV	1001	958	43
C	Rear Axle to RSOV	1048	1030	18
D	Total Length at Centerline	4681	4601	80
E	Front Bumper Thickness	172	172	0
F	Front Bumper Bottom to Ground	257	270	-13
G	Sill Height at Front Wheel Well	190	227	-37
H	Sill Height at Front Door Leading Edge	191	222	-31
I	Sill Height at "B" Pillar	192	203	-11
J1	Sill Height at Rear Wheel Well	185	194	-9
J2	Pinch Weld Height at Rear Wheel Well	185	192	-7
K	Sill Height Aft of Rear Wheel Well	230	229	1
L	Rear Bumper Thickness	310	310	0
M	Rear Bumper Bottom to Ground	325	342	-17
N	Sill Height to Window Bottom Sill	685	614	71
O	Front Door Leading Edge to Impact CL	743	742	1
P	Rear Door Trailing Edge to Impact CL	1265	1161	104
Q	Front Window Opening	433	405	28
R	Right Side Length	3920	3928	-8
S	Left Side Length	3920	3904	16
T	Vehicle Width at "B" Post	1709	1527	182

DATA SHEET NO. 6

SIDIIIsD LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



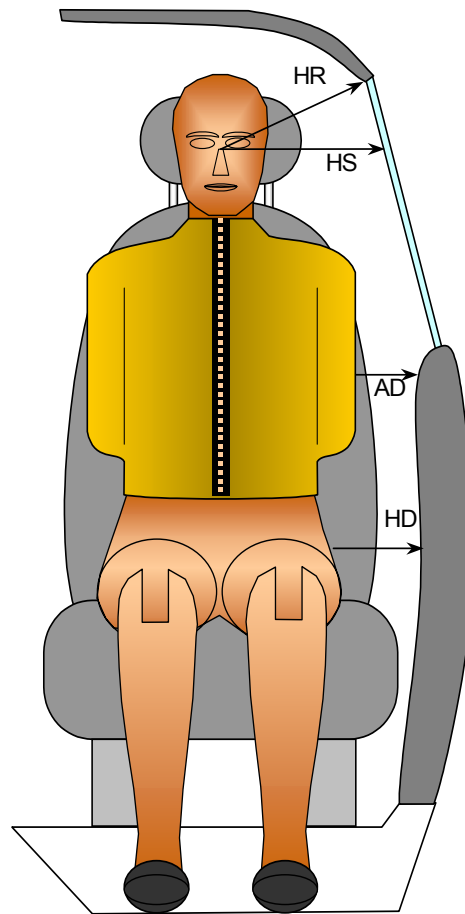
Driver Code	Pass. Code	Measurement Description	Driver S/N 033		Passenger S/N 032	
			Length(mm)	Angle(°)	Length(mm)	Angle(°)
HH		Head to Header	257			
HW		Head to Windshield	593			
HZ	HZ	Head to Roof	178		221	
NR	NB	Nose to Rim/Nose to Seatback	180		808	
CD	CB	Chest to Dash or Seatback	556		794	
CS		Chest to Steering Wheel	151			
KDL	KBL	Left Knee to Dash or Seatback	114	44.8	421	0.0
KDR	KBR	Right Knee to Dash or Seatback	98	20.2	418	0.0
PA	PA	Pelvic Angle		19.1		28.5
PHX	PHX	H-Point to Striker (X-Axis)	334		220	
PHZ	PHZ	H-Point to Striker (Z-Axis)	120		275	

DATA SHEET NO. 7

SIDIIsD LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



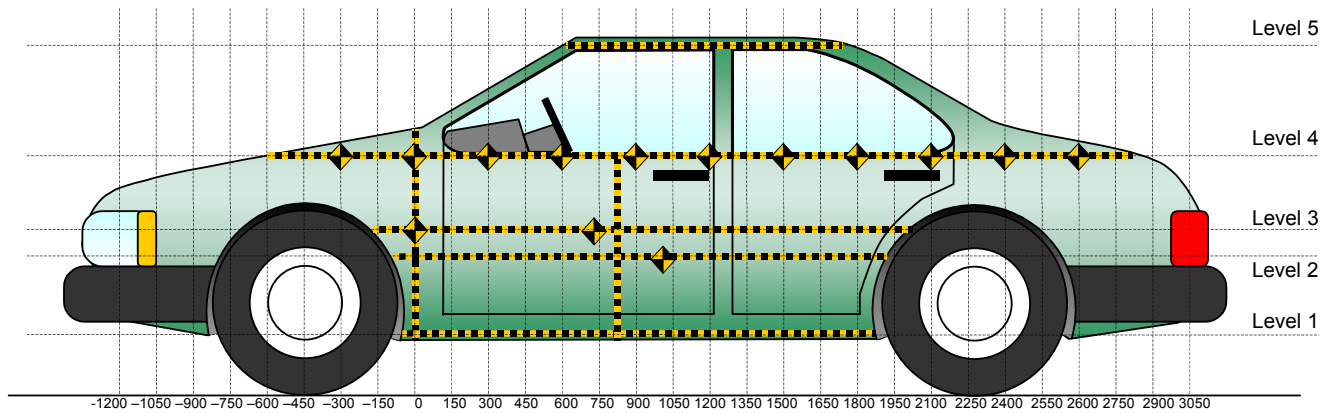
FRONT VIEW OF DUMMY

Code	Measurement Description	Units	Driver S/N 033	Passenger S/N 032
HR	Head to Side Header	mm	236	232
HS	Head to Side Window	mm	279	386
AD	Arm to Door	mm	139	80
HD	H-Point to Door	mm	207	154

DATA SHEET NO. 8 **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



All Measurements Shown in mm

LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
 Measurements along the vertical 800 mm.
 All measurements below in mm.

Level	Measurement Description	Height Above Ground
5	Window	1358
4	Window Sill	904
3	Mid Door	630
2	Occupant H-Point	542
1	Sill Top	255

DATA SHEET NO. 9
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1050															
-900															
-750				328					328					0	
-600				318					319					1	
-450				311					311					0	
-300				305					301					-4	
-150				300					294					-6	
0	288	254	256	296		363	225	232	289		75	-29	-24	-7	
150	291	255	256	293		370	465	416	327		79	210	160	34	
300	289	250	251	294		383	472	421	354		94	222	170	60	
450	288	247	247	292		388	476	427	371		100	229	180	79	
600	287	245	245	288		396	480	434	395		109	235	189	107	
750	286	244	245	289	508	404	481	440	420	525	118	237	195	131	17
900	286	244	245	290	502	413	484	447	446	522	127	240	202	156	20
1050	286	245	246	290	501	423	483	454	461	525	137	238	208	171	24
1200	287	244	245	294	506	424	531	494	477	528	137	287	249	183	22
1350	288	244	245	295	508	399	489	447	457	529	111	245	202	162	21
1500	289	244	246	297	509	368	434	398	433	528	79	190	152	136	19
1650	291	246	247	299	513	337	484	363	421	532	46	238	116	122	19
1800	291	247	250	301	521	310	360	357	410	539	19	113	107	109	18
1950		240	247	307	531		276	272	348	549		36	25	41	18
2100			236	312				238	299				2	-13	

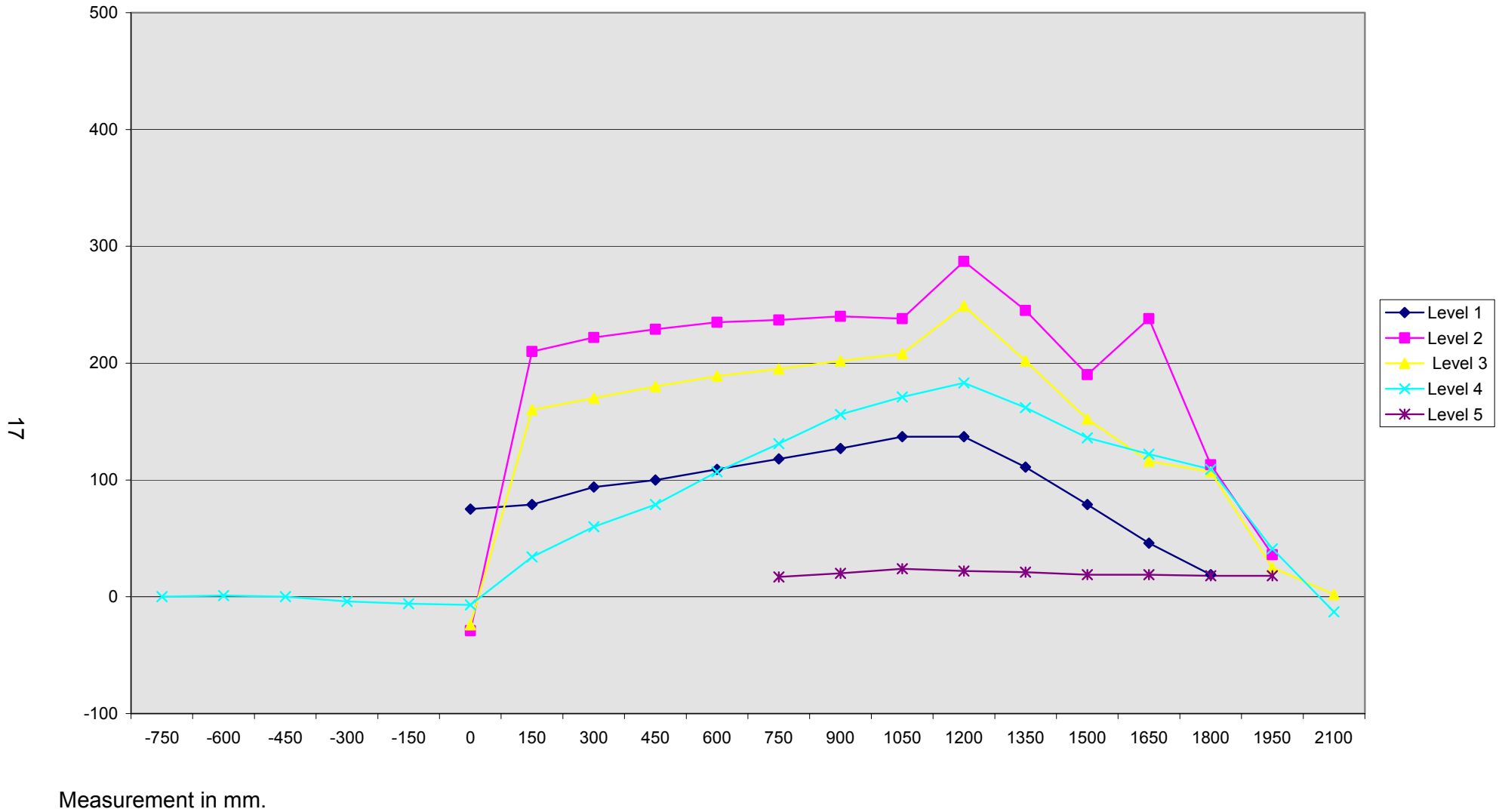
Reference plane is parallel to test vehicle longitudinal centerline.

Given dimensions = Reference plane to car body

DATA SHEET NO. 9... (continued)
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2005 Saturn Ion 4 door

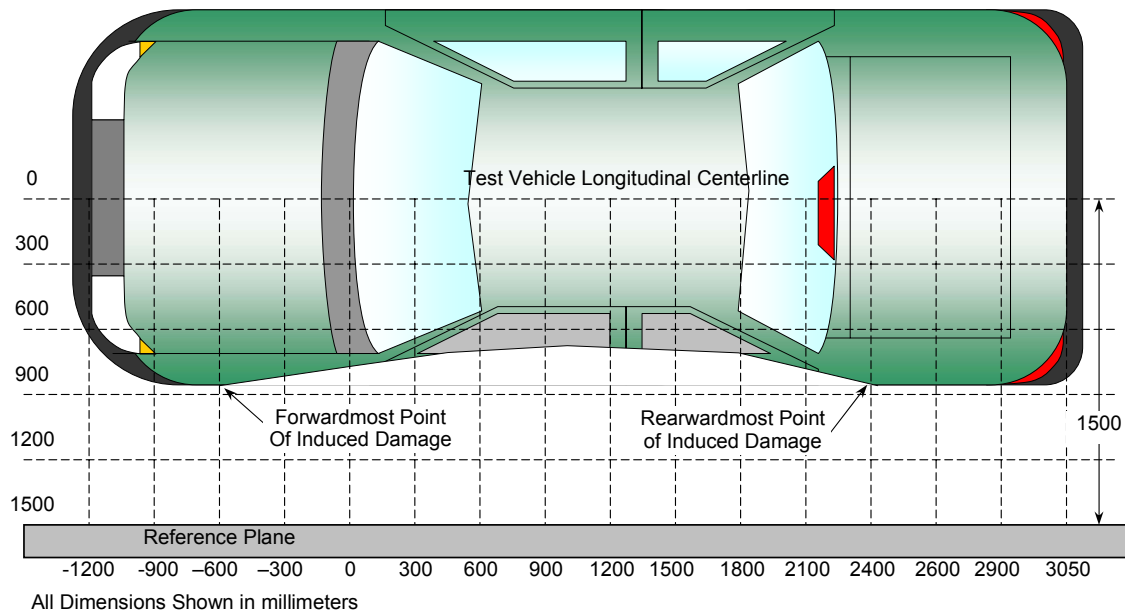
Test Date: August 9, 2005



DATA SHEET NO. 10
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2100 mm	3	236	238	2
2	1485 mm	2	244	440	196
3	900 mm	2	244	484	240
4	325 mm	2	250	472	222
5	-196 mm	4	302	296	6
6	-750 mm	4	328	328	0

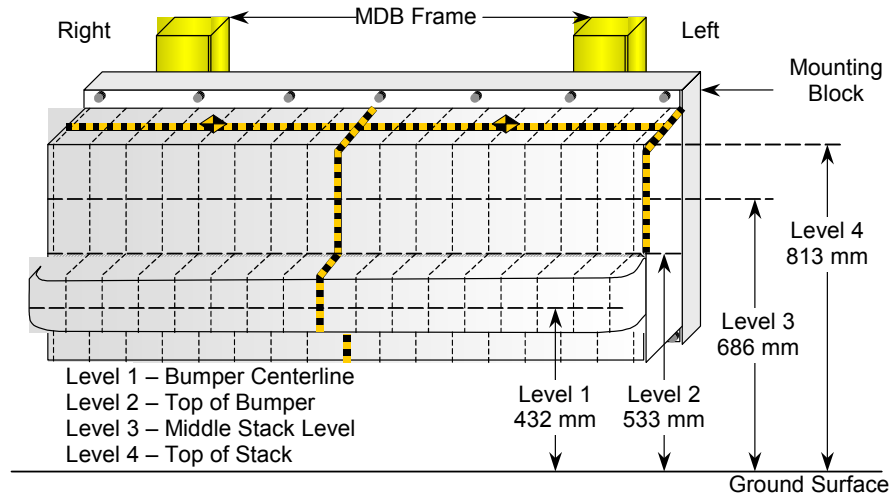
Reference plane is parallel to test vehicle longitudinal centerline.
 Given dimensions = Reference plane to car body.

DATA SHEET NO. 11

DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



DEFORMABLE BARRIER STATIC CRUSH

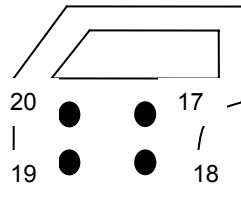
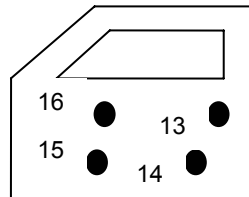
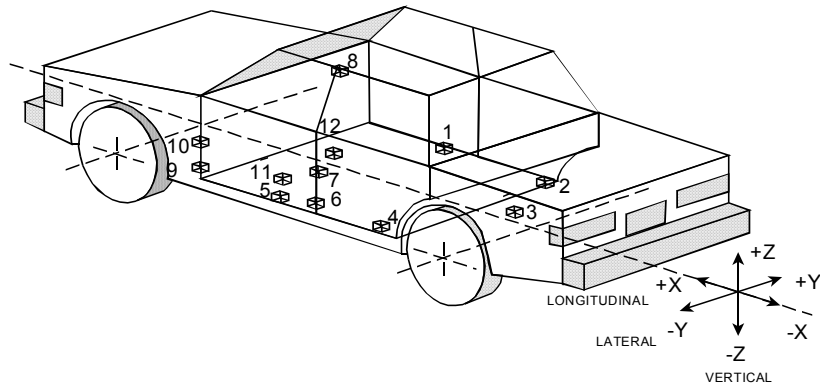
Stack Level	Distance Right of Center								C _L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	119	88	55	37	34	40	37	37	38	42	45	52	52	56	63	78	92
2	66	43	21	9	10	12	13	13	15	18	22	25	29	32	36	43	48
3	13	9	2	-1	-1	0	1	2	3	3	4	4	4	6	9	40	89
4	24	-4	-7	-6	-4	1	1	2	0	4	7	10	15	18	30	81	128

All Dimensions in mm

DATA SHEET NO. 12
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



No.	Location
1	Right Sill at Front Seat
2	Right Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Sill at Rear Door
5	Left Sill at Front Door
6	Left Lower B Post
7	Left Mid B Post
8	Left Upper B Post
9	Left Lower A Post
10	Left Mid A Post
11	Driver Seat Track
12	Vehicle CG

No.	Location
13	Left Front Door @ Mid Rib
14	Left Front Door @ Pelvis
15	Left Front Door @ Knee
16	Left Front Door @ Arm
17	Left Rear Door @ Mid Rib
18	Left Rear Door @ Pelvis
19	Left Rear Door @ Knee
20	Left Rear Door @ Arm
21	Left Driver Seat Frame
22	Right Driver Seat Frame
23	Right Rear Occupant Compartment

DATA SHEET NO. 12... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

VEHICLE ACCELEROMETER PEAK DATA

Loc. No.	Accelerometer Location	Longitudinal (X) Maximum (g's) (CFC 60)		Lateral (Y) Maximum (g's) (CFC 60)		Vertical (Z) Maximum (g's) (CFC 60)		Result. (g's) (CFC 60)
		Pos	Neg	Pos	Neg	Pos	Neg	Max
1	Right Sill at Front Seat	3.1	-4.6	*	*	5.3	-6.3	*
2	Right Sill at Rear Seat	3.4	-6.2	23.4	-2.5	4.5	-4.9	23.5
3	Rear Floorpan Above Axle	5.2	-8.4	29.8	-2.4	5.3	-11.1	31.9
4	Left Sill at Rear Door			37.6	-2.9			
5	Left Sill at Front Door			36.1	-33.0			
6	Left Lower B Post			170.1	-87.4			
7	Left Mid B Post			33.6	-1.3			
8	Left Upper B Post			****	****			
9	Left Lower A Post			*	*			
10	Left Mid A Post			50.9	-19.6			
11	Driver Seat Track			36.4	-14.6			
12	Vehicle CG	5.1	-7.1	26.3	-2.7	10.7	-7.9	26.4
13	Left Front Door @ Rib			114.3	-69.3			
14	Left Front Door @ Pelvis			181.2	-85.2			
15	Left Front Door @ Knee			92.7	-36.8			
16	Left Front Door @ Arm			97.9	-63.7			
17	Left Rear Door @ Rib			82.1	-8.0			
18	Left Rear Door @ Pelvis			220.7	-41.9			
19	Left Rear Door @ Knee			165.4	-97.5			
20	Left Rear Door @ Arm			92.5	-47.9			
21	Left Driver Seat Frame			****	****			
22	Right Driver Seat Frame			****	****			
23	Right Rear Occupant Compartment			24.5	-2.2			

* No valid data collected

**** Not used to avoid interference with side airbag

DATA SHEET NO. 12... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2858	707	236
2	Right Sill at Rear Seat	1937	700	236
3	Rear Floorpan Above Axle	1176	0	452
4	Left Sill at Rear Door	1798	-710	235
5	Left Sill at Front Door	2543	-707	240
6	Left Lower B Post	2132	-752	456
7	Left Mid B Post	2097	-680	887
8	Left Upper B Post	*	*	*
9	Left Lower A Post	3167	-766	364
10	Left Mid A Post	3178	-761	846
11	Driver Seat Track	2296	-552	317
12	Vehicle CG	2420	0	420
13	Left Front Door @ Mid Rib	2403	-740	862
14	Left Front Door @ Pelvis	2509	-752	590
15	Left Front Door @ Knee	2885	-708	655
16	Left Front Door @ Arm	2549	-737	810
17	Left Rear Door @ Mid Rib	1384	-832	880
18	Left Rear Door @ Pelvis	1540	-840	554
19	Left Rear Door @ Knee	1894	-690	700
20	Left Rear Door @ Arm	1528	-850	897
21	Left Driver Seat Frame	*	*	*
22	Right Driver Seat Frame	*	*	*
23	Right Rear Occupant Compartment	1892	300	442

Reference Points X – Rear Bumper (+forward)
 Y – Vehicle Centerline (+ right)
 Z – Ground Level (+ up)

* Not used to avoid interference with side airbag

DATA SHEET NO. 13

MDB ACCELEROMETER LOCATIONS AND DATA SUMMARY

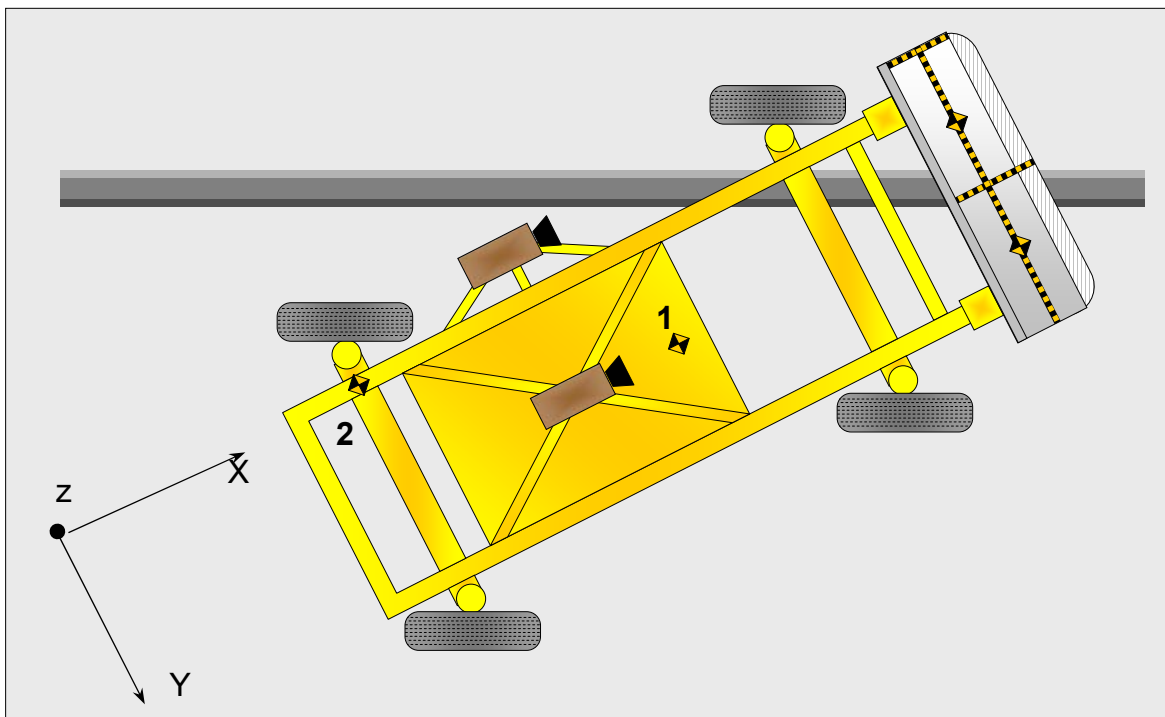
Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005

MDB ACCELEROMETER PEAK DATA AND LOCATIONS

Loc. No.	Accelerometer Location	Measurement (mm)			Peak Values (G's)				
		X	Y	Z	Axis	Max	Time	Min	Time
1	MDB CG	-1092	0	483	X	0.8	0	-17.0	42
					Y	0.7	65	-9.0	27
					Z	10.4	42	-12.9	24
					RES	20.5	42		
2	MDB Rear	-2591	-625	622	X	1.0	100	-18.2	31
					Y	5.9	27	-2.2	196
					Z	7.2	22	-1.4	67
					RES	18.8	24		

Reference Points X - MDB Front Axle (+ forward)
 Y - MDB Centerline (+ to right)
 Z - Ground Plane (+ down)

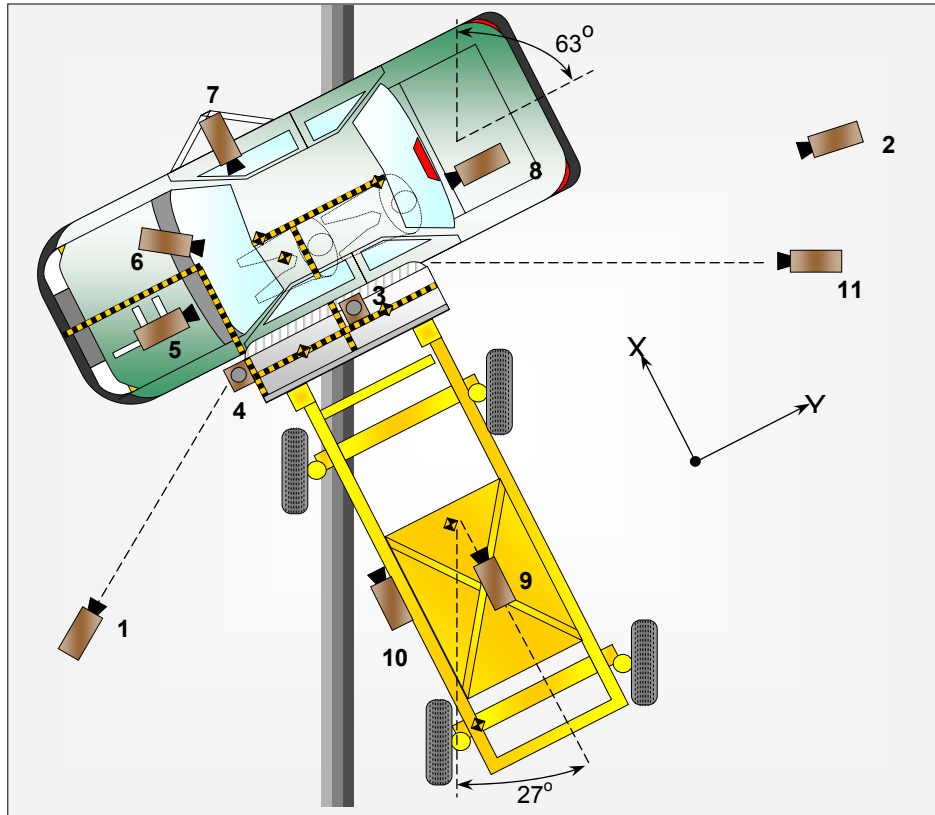


DATA SHEET NO. 14

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2005 Saturn Ion 4 door

Test Date: August 9, 2005



No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Front Overall	2650	-4505	1360	24	1000
2	Rear Overall	-300	7380	1480	24	1000
3	Overhead Overall	10	-100	5460	14	1000
4	Overhead Close Up	670	45	4240	50	1000
5	Onboard Driver Front				13	500
6	Onboard Driver Hip				10	500
7	Onboard Driver Side				8	500
8	Onboard Passenger Rear				13	500
9	Cart Overall				25	500
10	Cart Close Up				50	500
11	Real Time Coverage				13	24

Reference Points X - + Forward of Impact
Y - MDB Left Edge Impact Point (+ right)
Z - Ground Plane (+ up)

APPENDIX A
PHOTOGRAPHS

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A-1.



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle

A-5.



Pre-Test Left Side View of Test Vehicle

A-6.



Post-Test Left Side View of Test Vehicle



Pre-Test MDB Positioned Against Vehicle (right side)



Pre-Test MDB Positioned Against Vehicle (left side)



Post-Test MDB and Vehicle

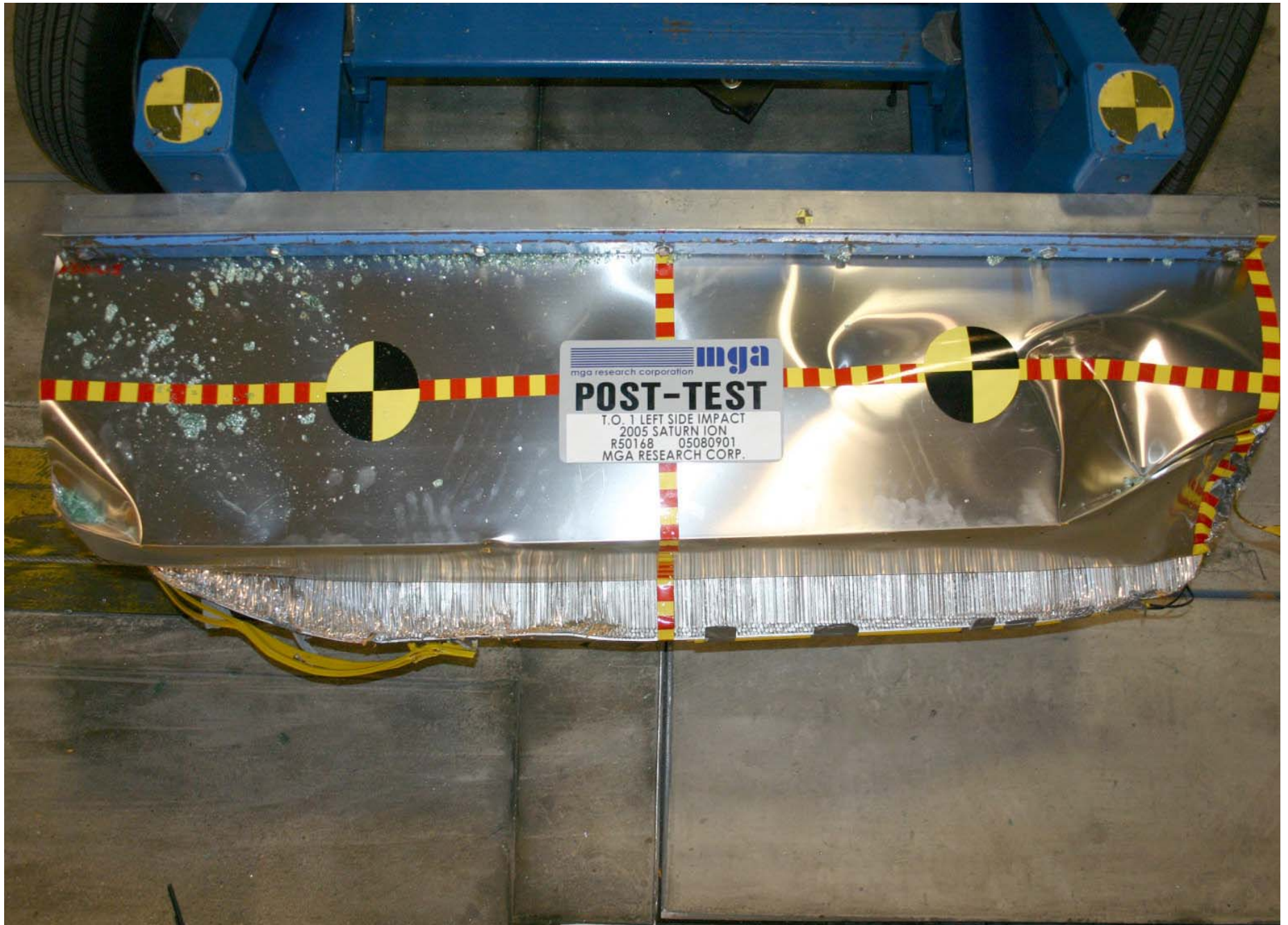


Pre-Test MDB Positioned Against Vehicle (overhead view)

A-11.



Pre-Test MDB Top View



Post-Test MDB Top View



Pre-Test MDB Front View



Post-Test MDB Front View



Pre-Test MDB Left Side View



Post-Test MDB Left Side View



Pre-Test MDB Right Side View



Post-Test MDB Right Side View



Pre-Test Driver Dummy Left Side View



Post-Test Driver Dummy Left Side View



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



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



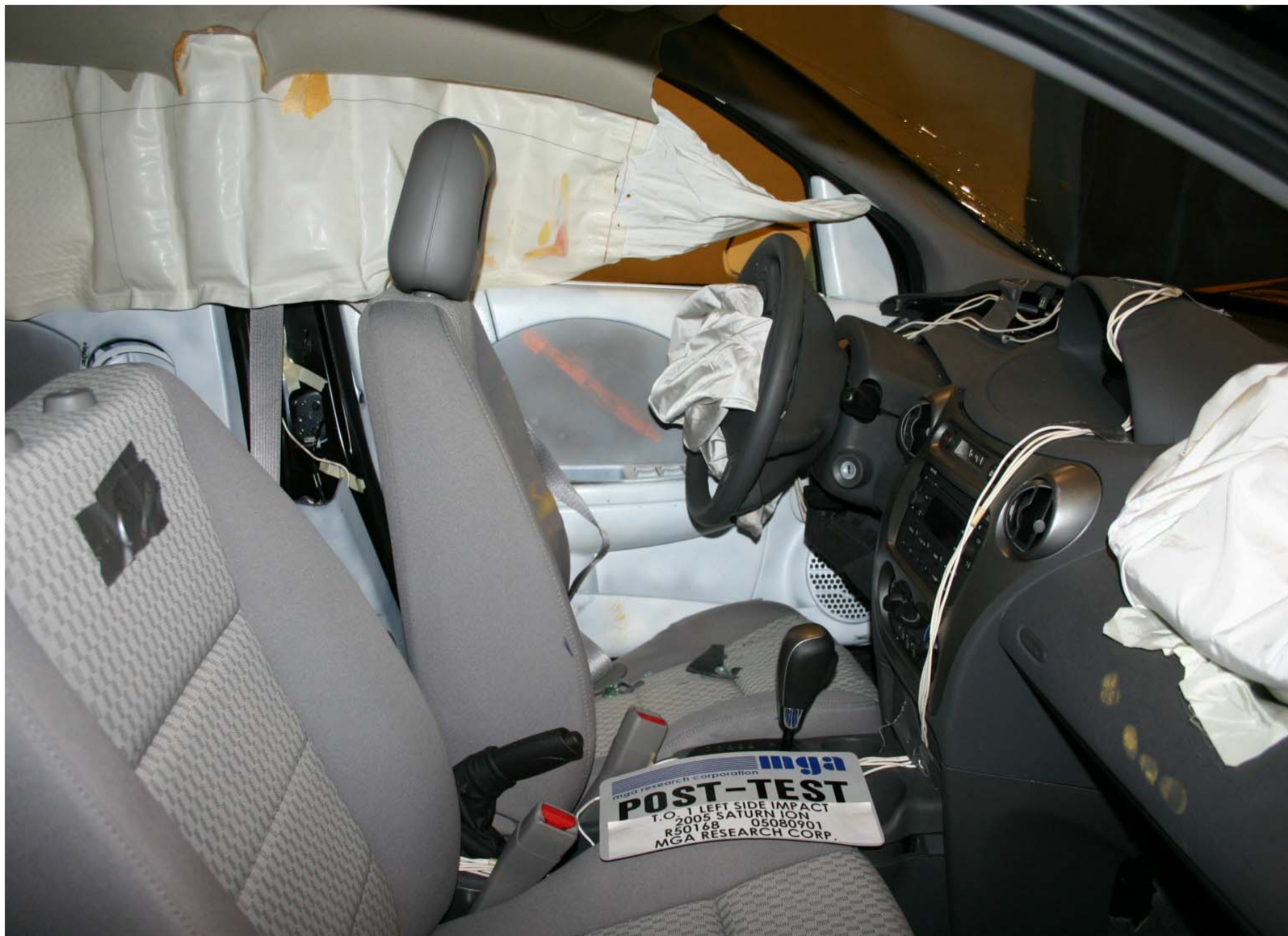
Pre-Test Driver Dummy Shoulder and Door Top View



Post-Test Driver Dummy Shoulder and Door Top View



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Contact



Post-Test Driver Dummy Lower Body Contact



Pre-Test Passenger Dummy Left Side View

A-30.



Post-Test Passenger Dummy Left Side View



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



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View



Pre-Test Passenger Dummy Shoulder and Door Top View

A-35.



Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Contact



Post-Test Passenger Dummy Lower Body Contact



Pre-Test Impact Point View



Post-Test Impact Point View



MFD BY SATURN CORPORATION

DATE	GVWR	GAWR FRT	GAWR RR
04/05	3785LB 1717KG	1980LB 0898KG	1805LB 0819KG

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

1G8AJ54F35Z166135 PASS CAR





TIRE AND LOADING INFORMATION

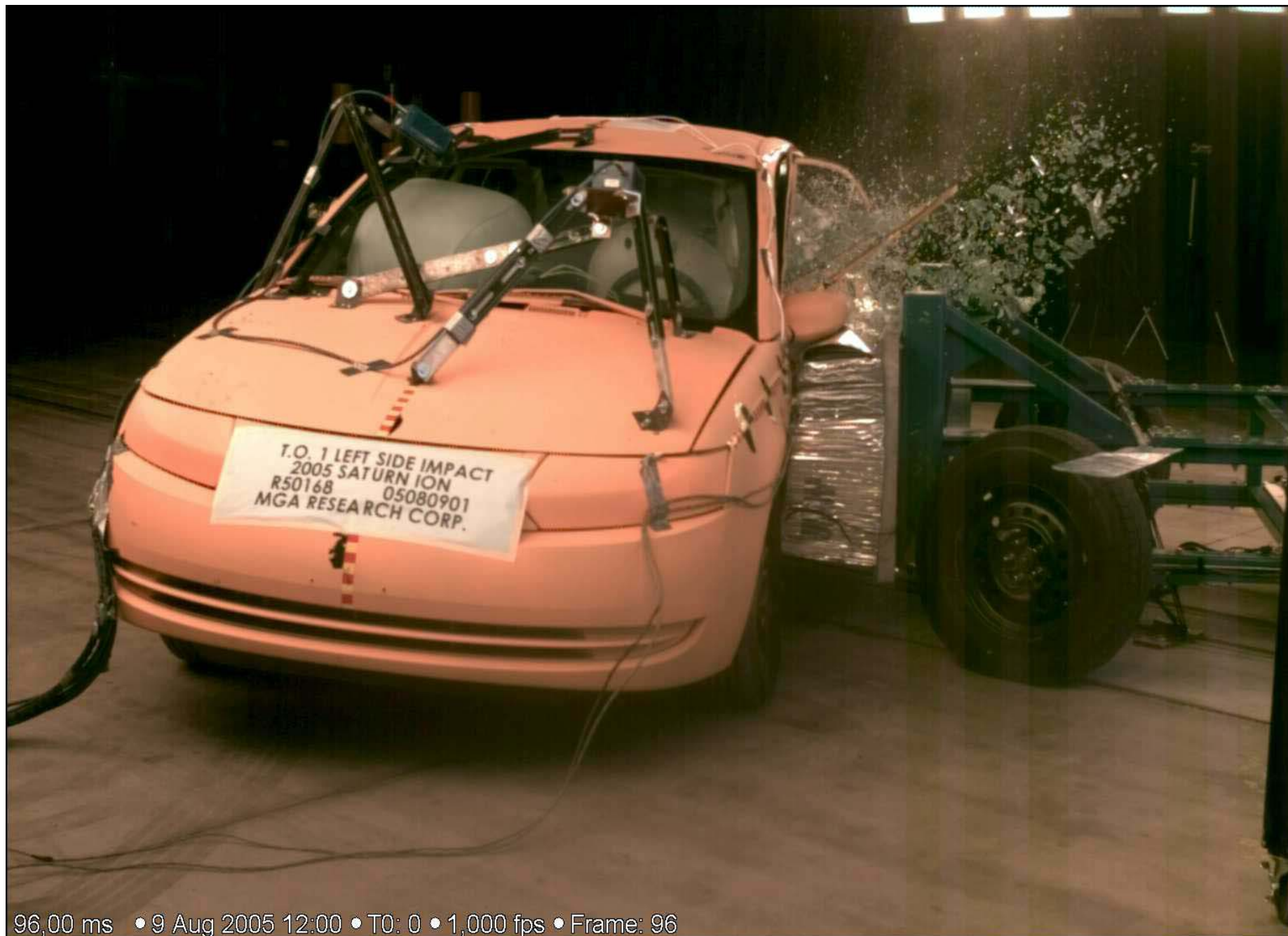
SEATING CAPACITY: TOTAL 5, FRONT 2, CENTER 0, REAR 3

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

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

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

Tire Placard



96,00 ms • 9 Aug 2005 12:00 • T0: 0 • 1,000 fps • Frame: 96

Vehicle Impact

APPENDIX B

SIDIIsD, VEHICLE, AND MDB RESPONSE DATA

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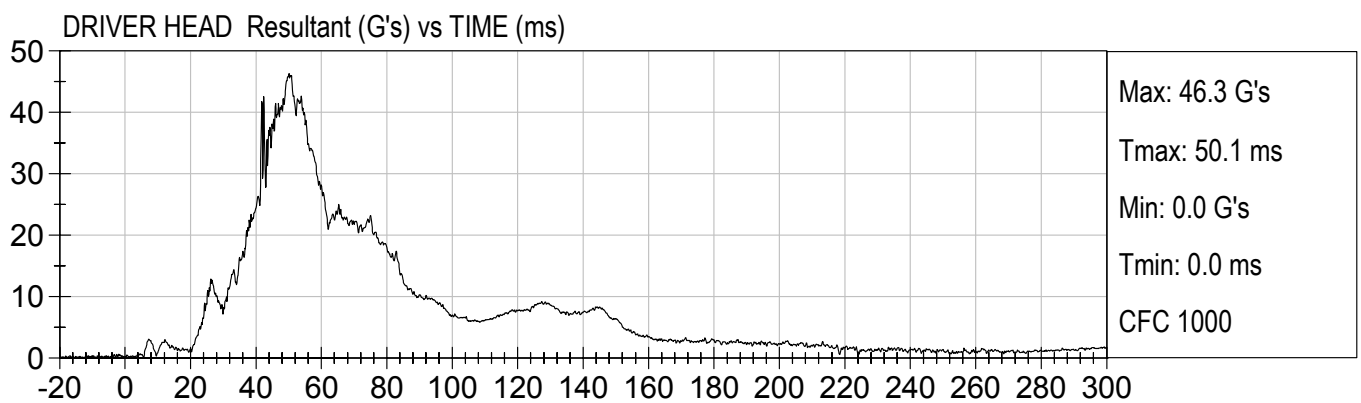
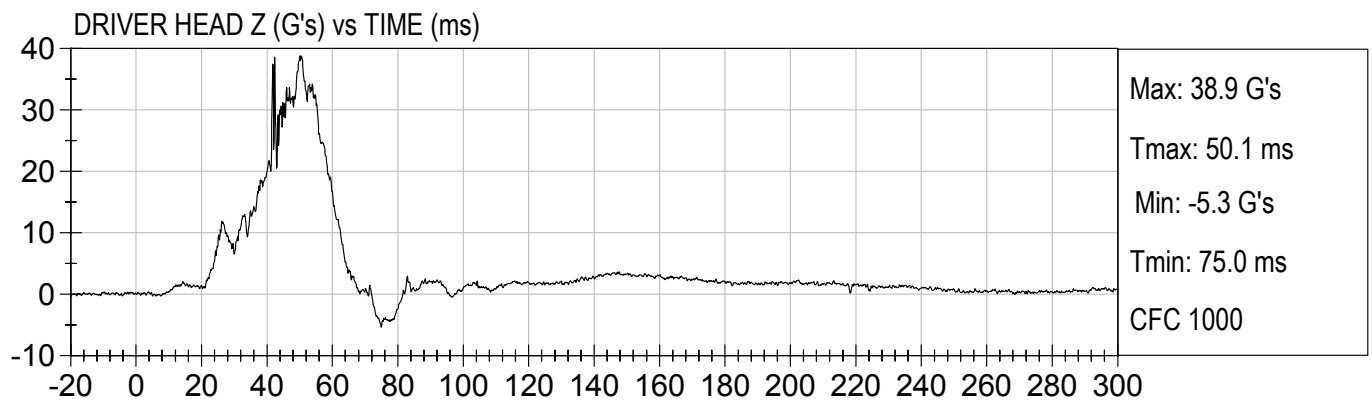
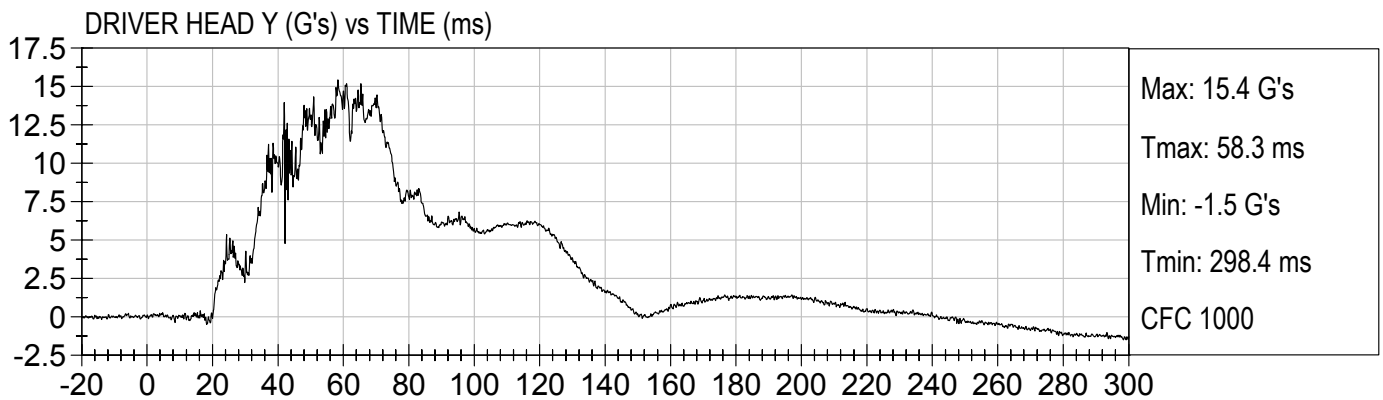
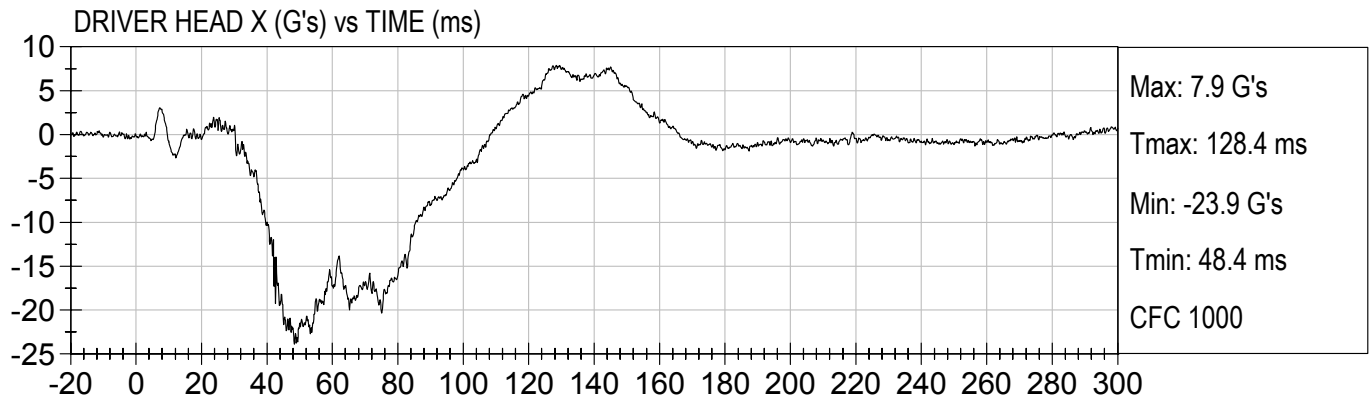
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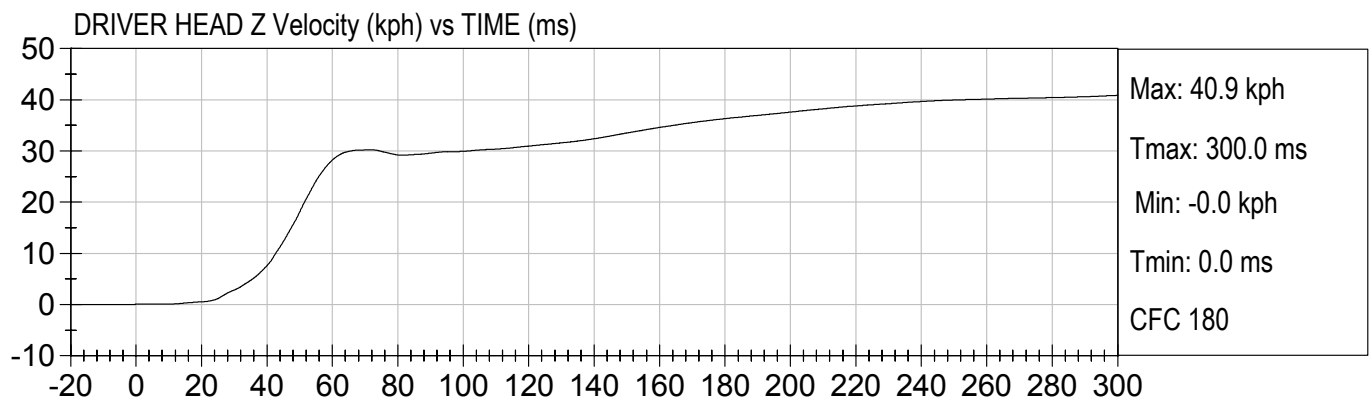
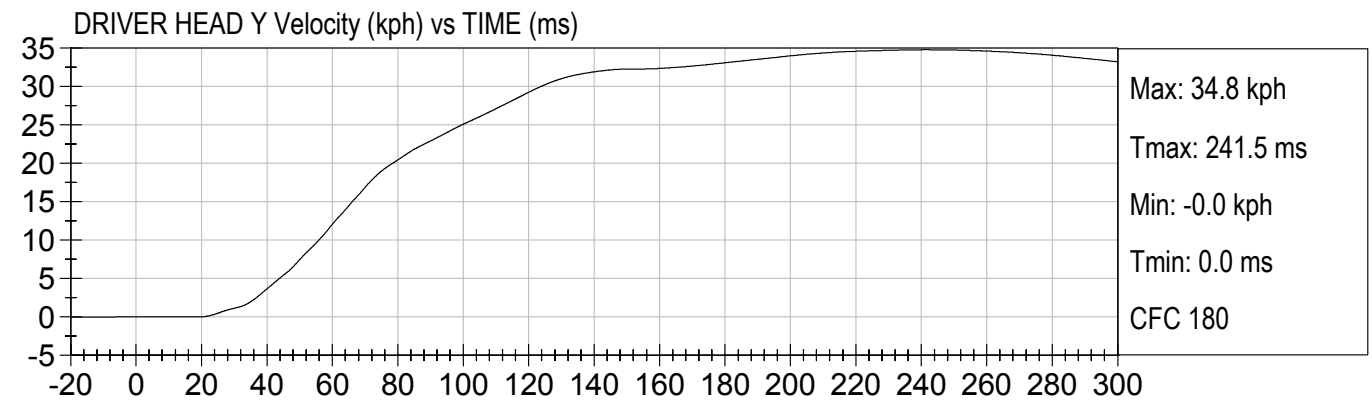
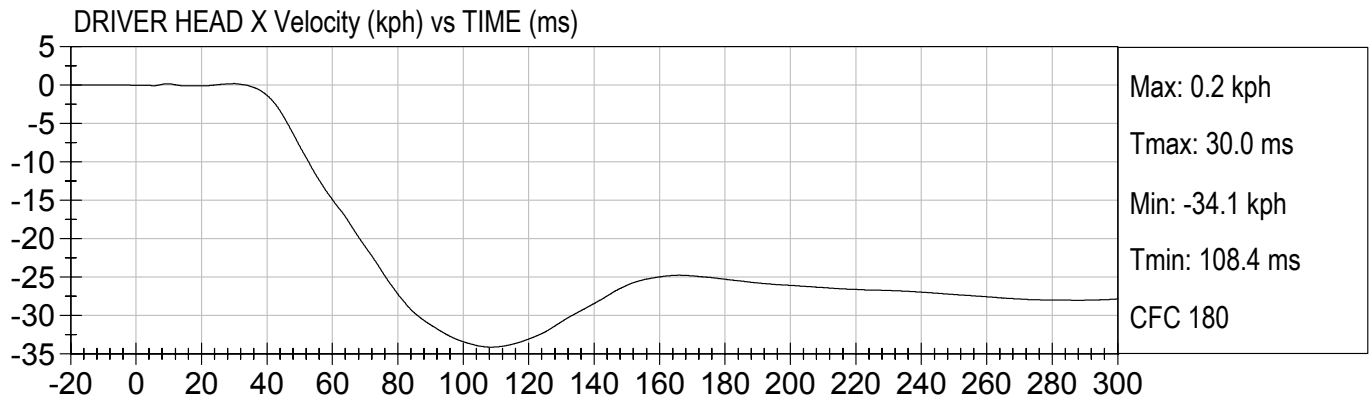
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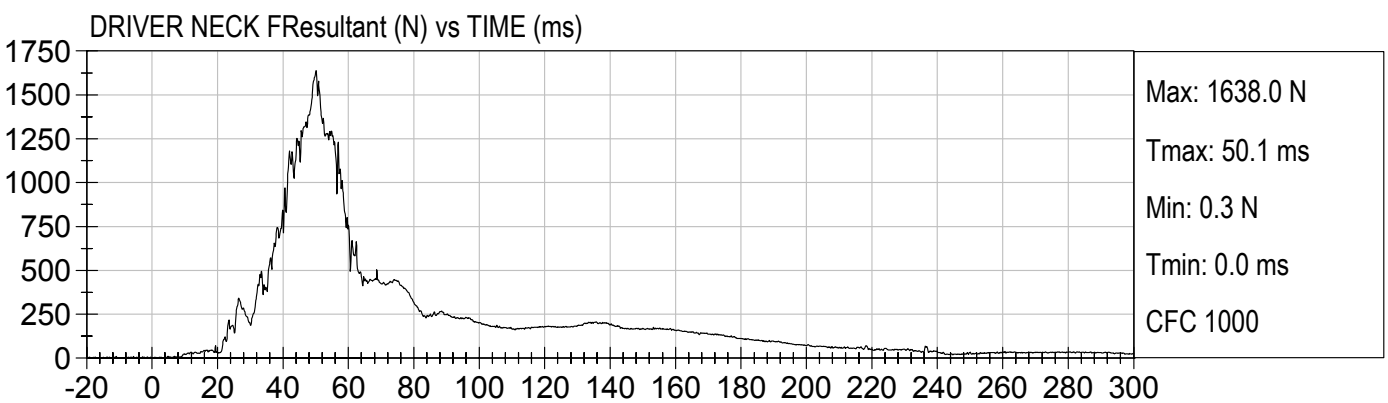
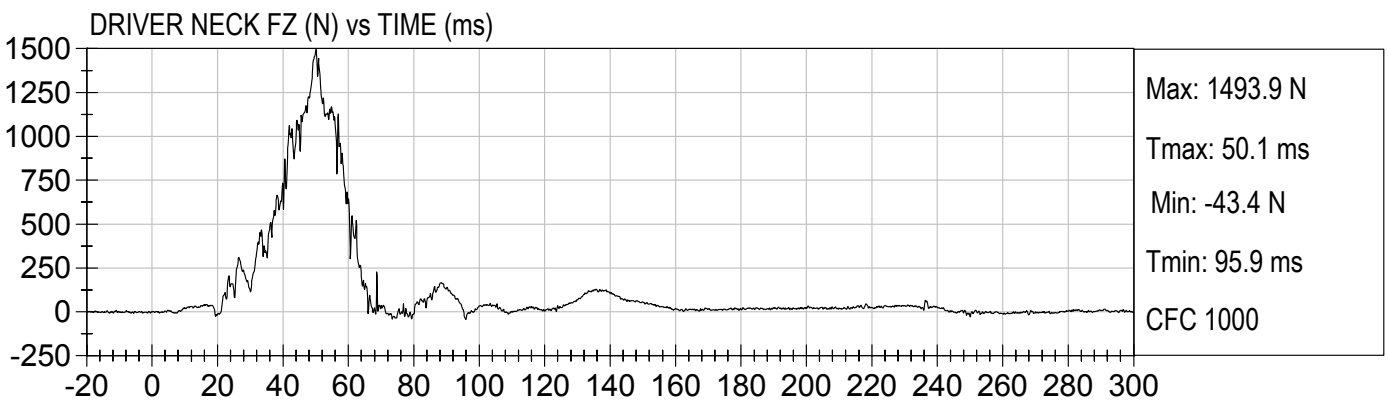
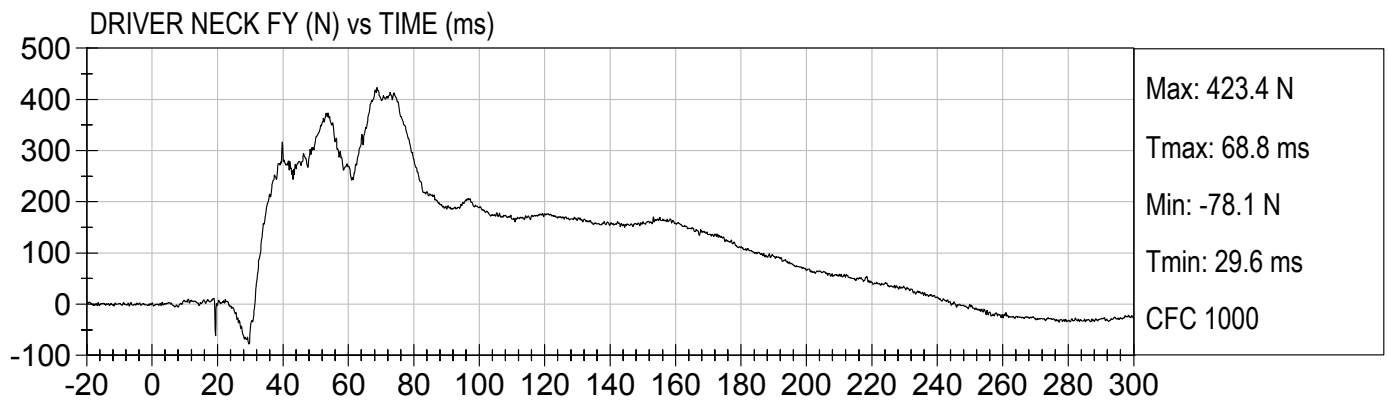
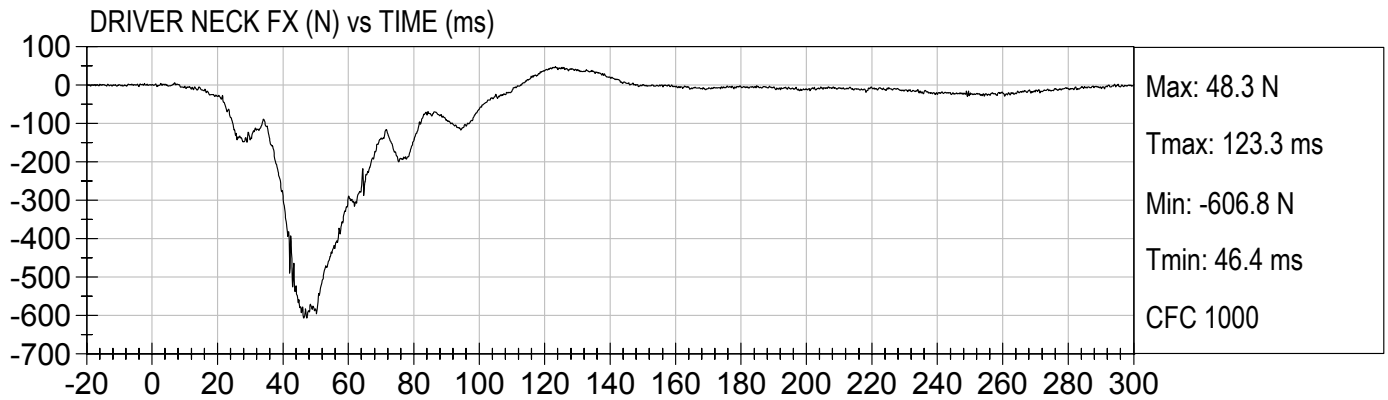
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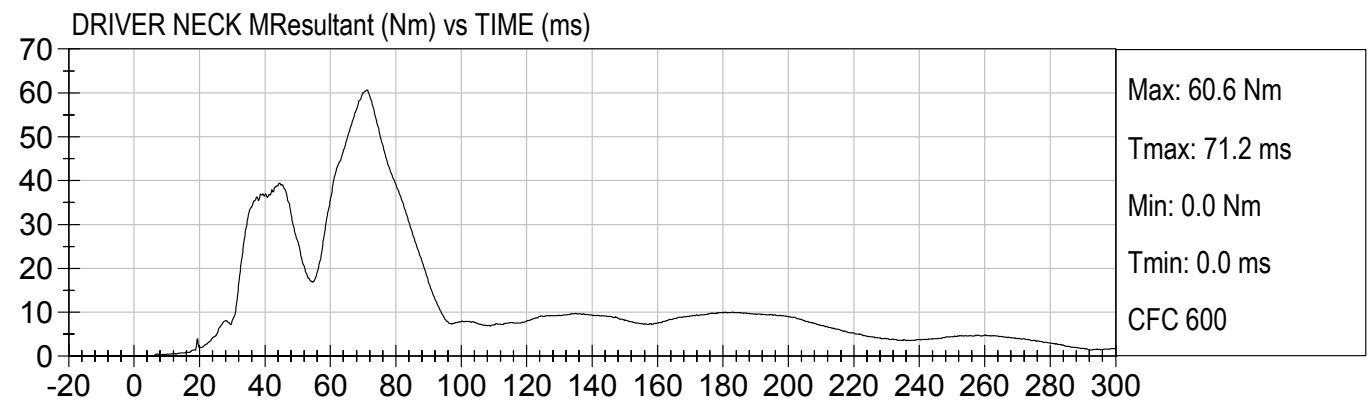
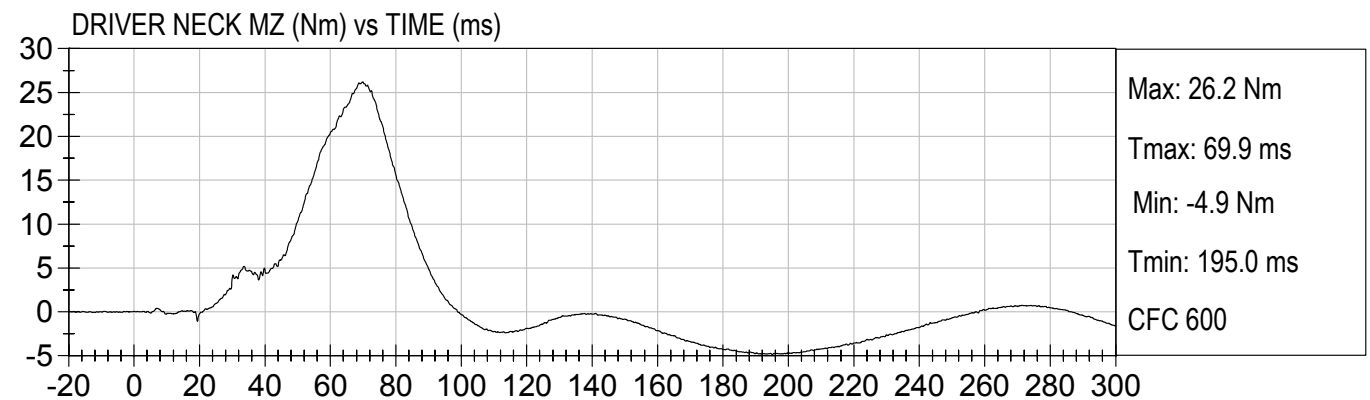
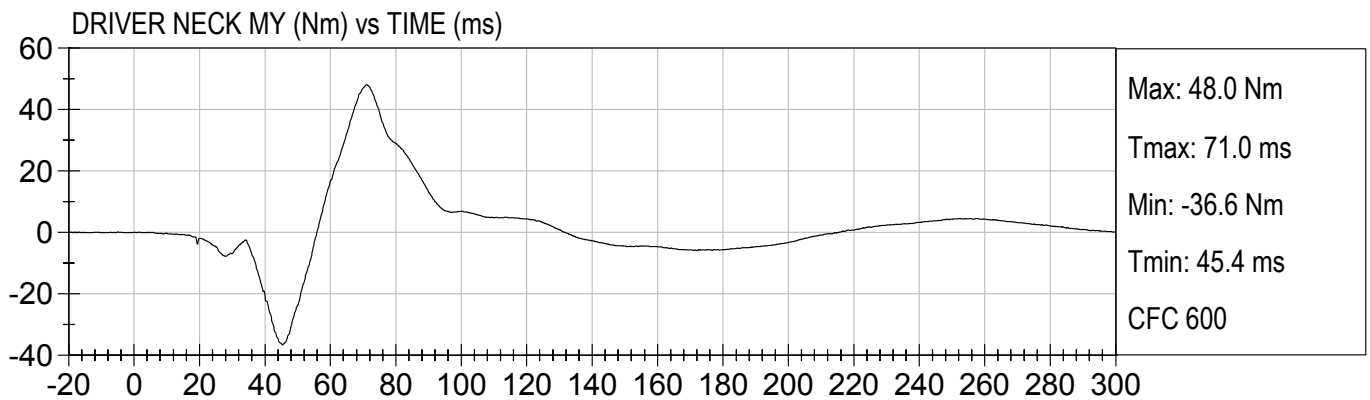
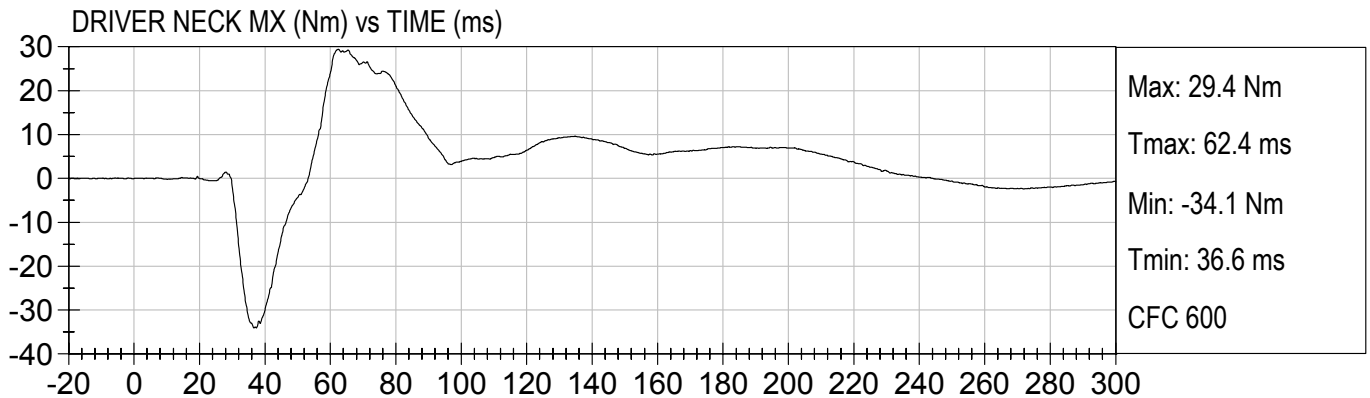
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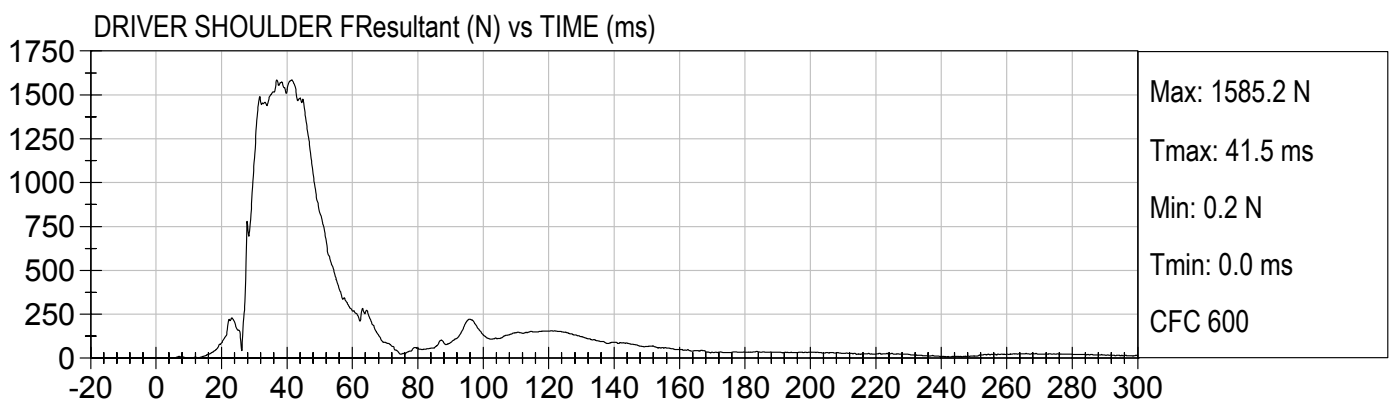
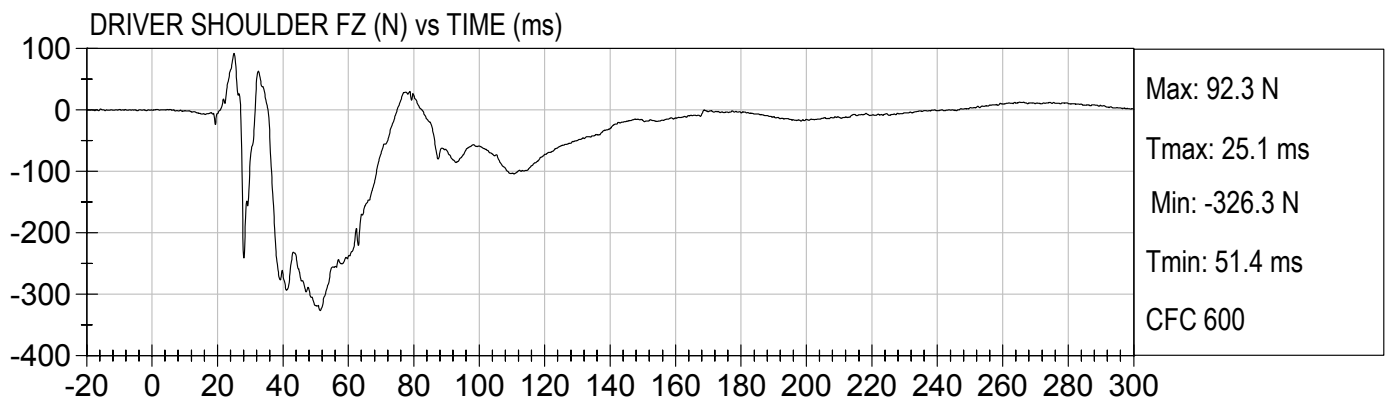
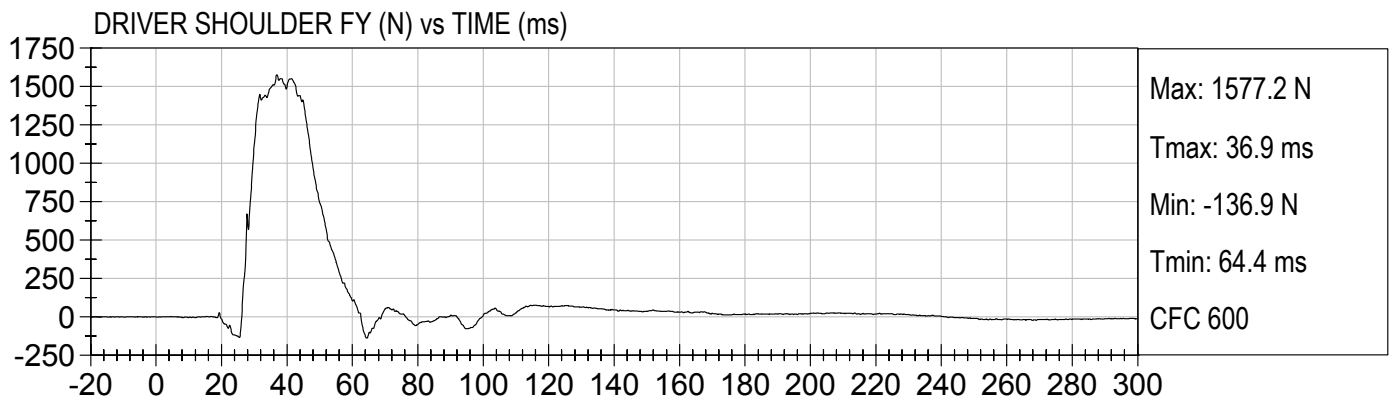
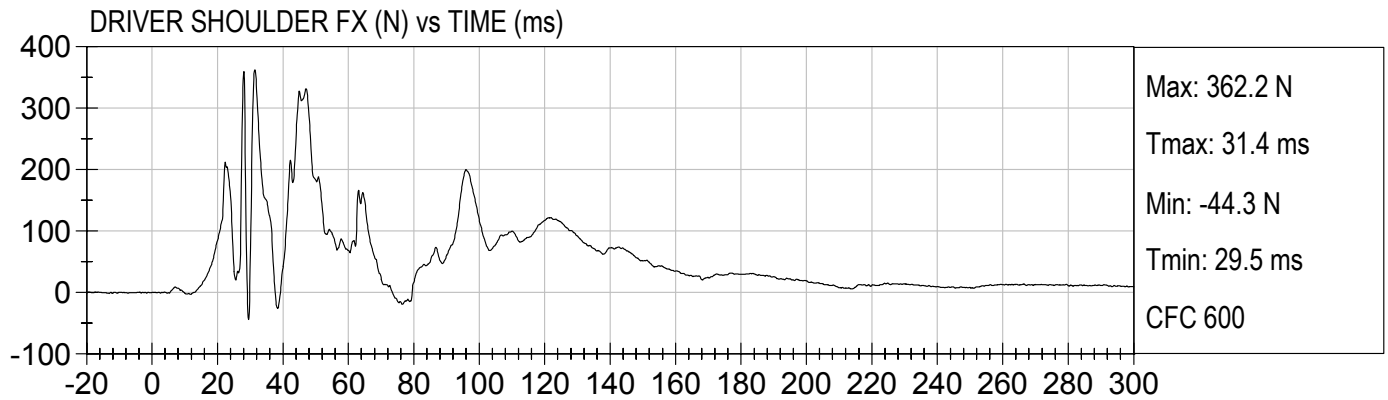
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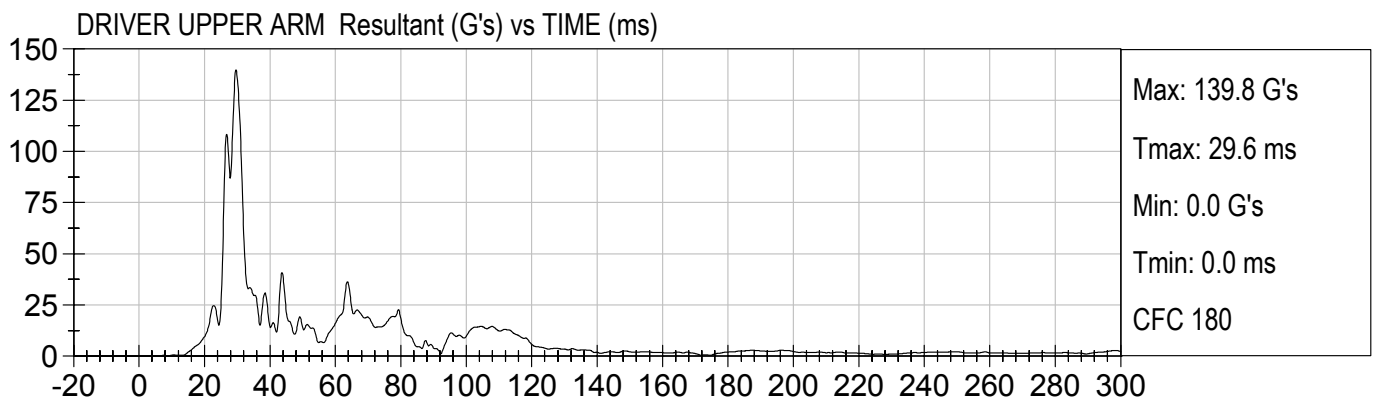
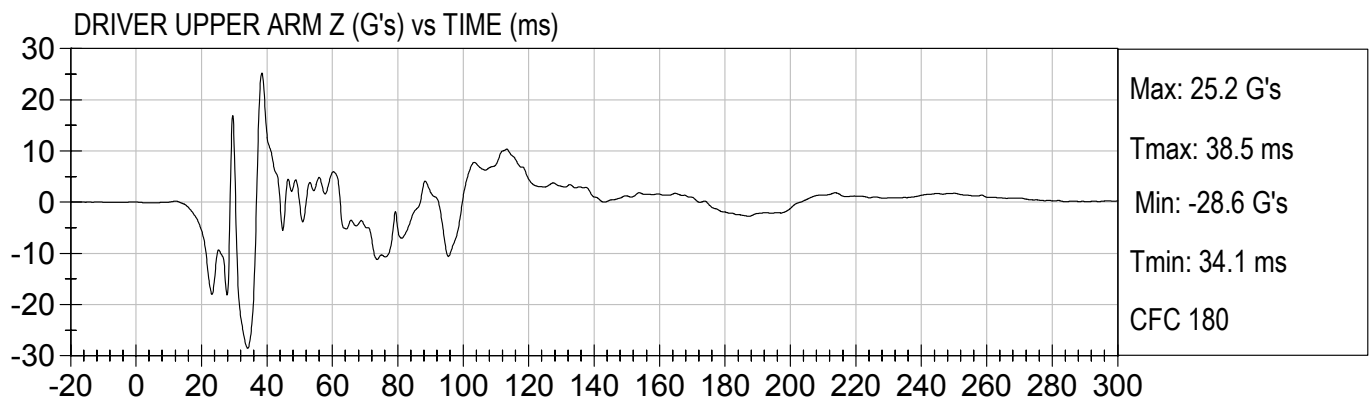
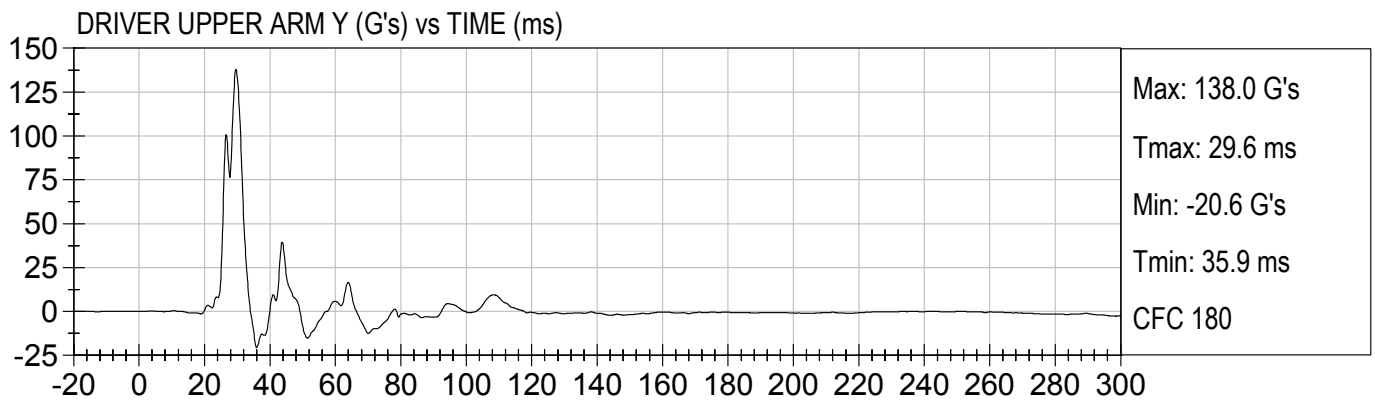
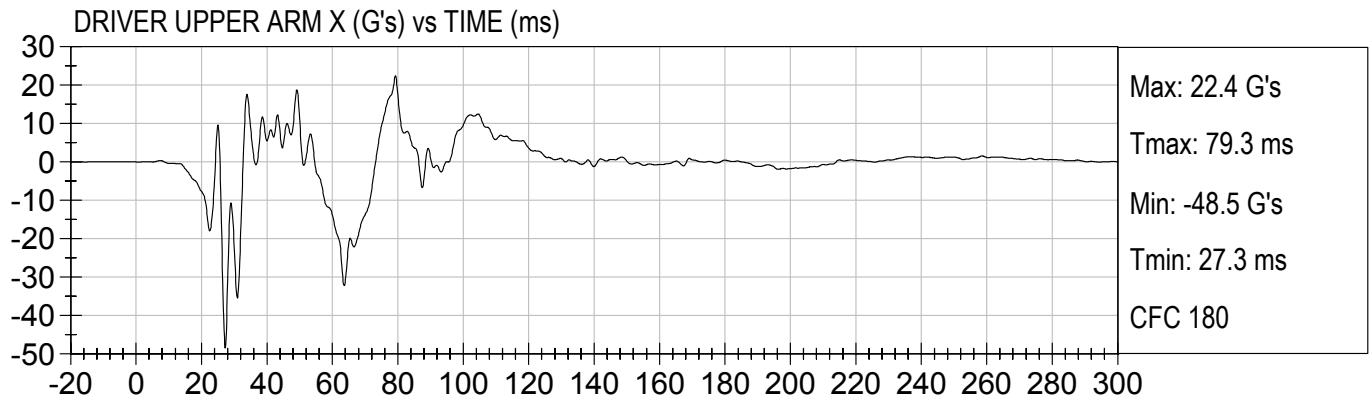


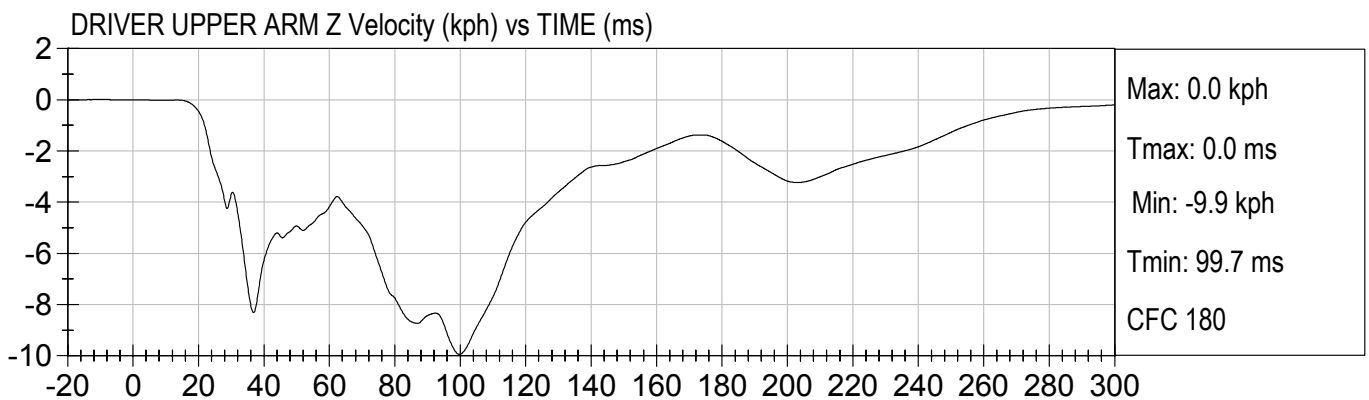
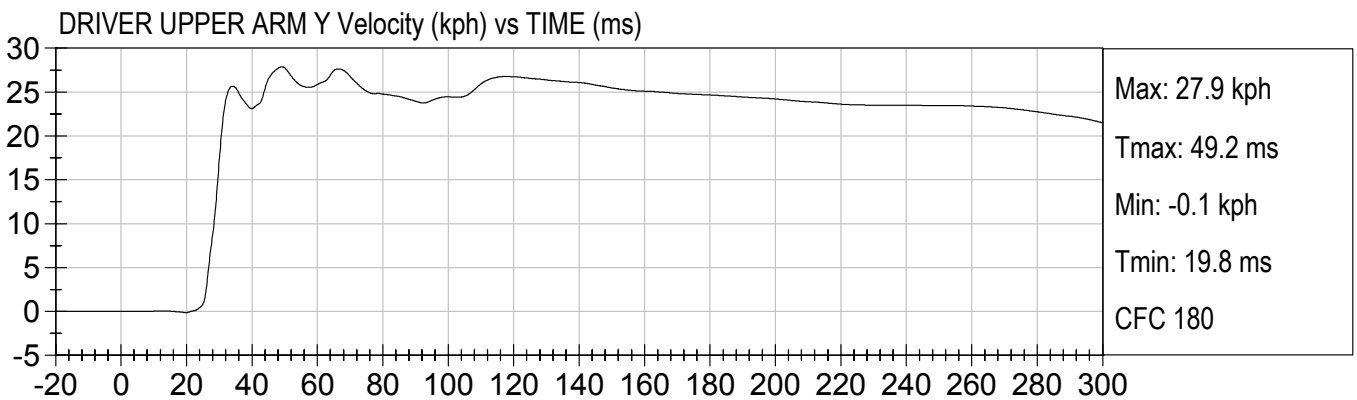
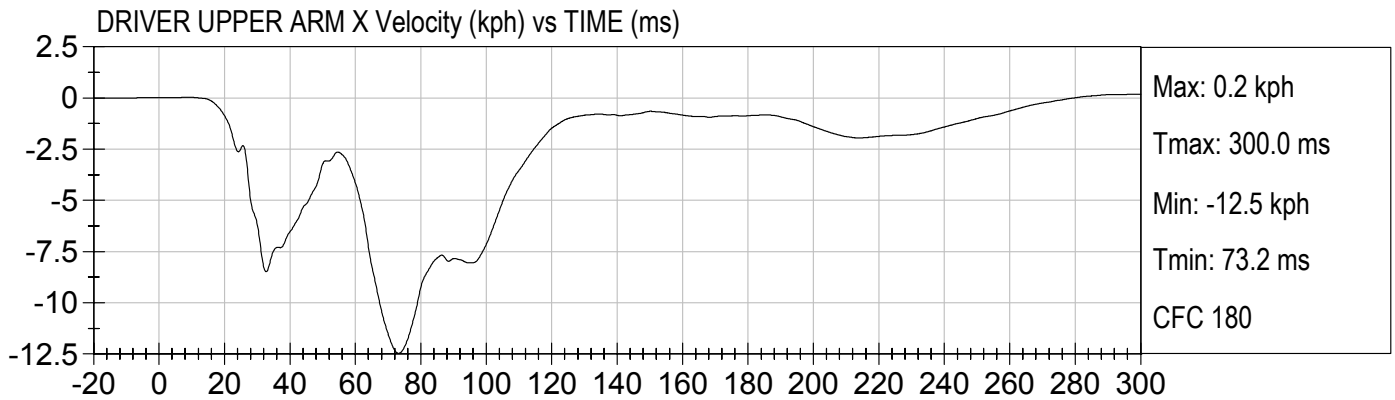


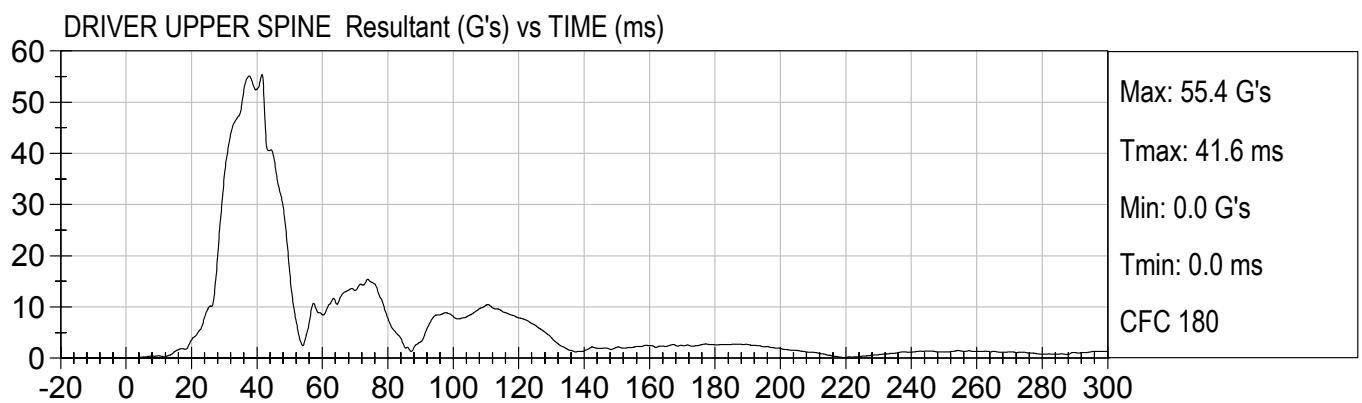
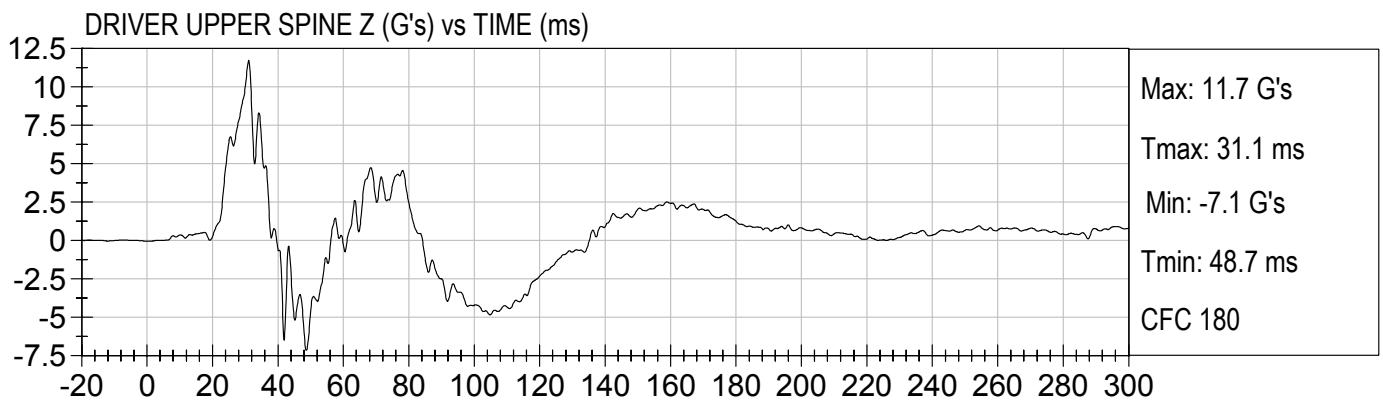
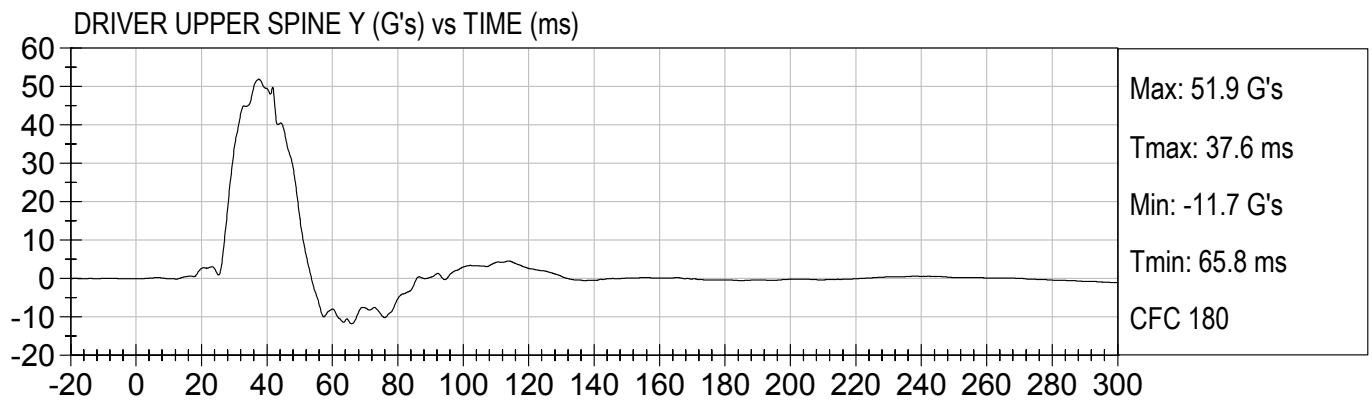
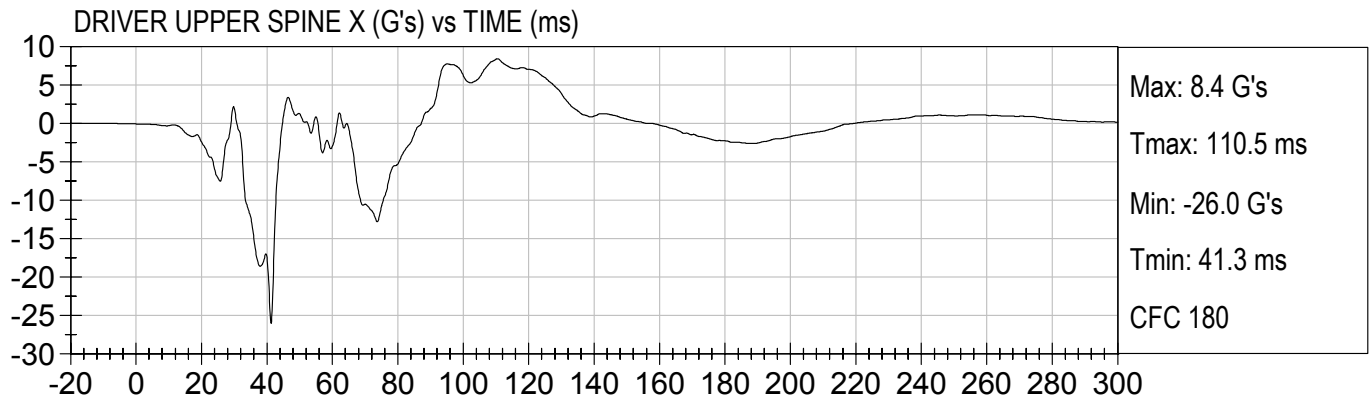


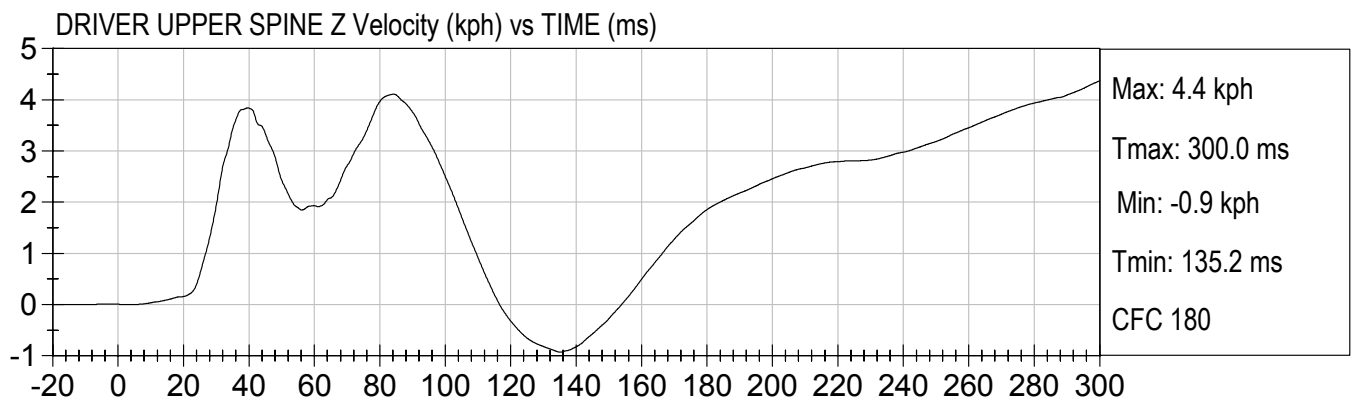
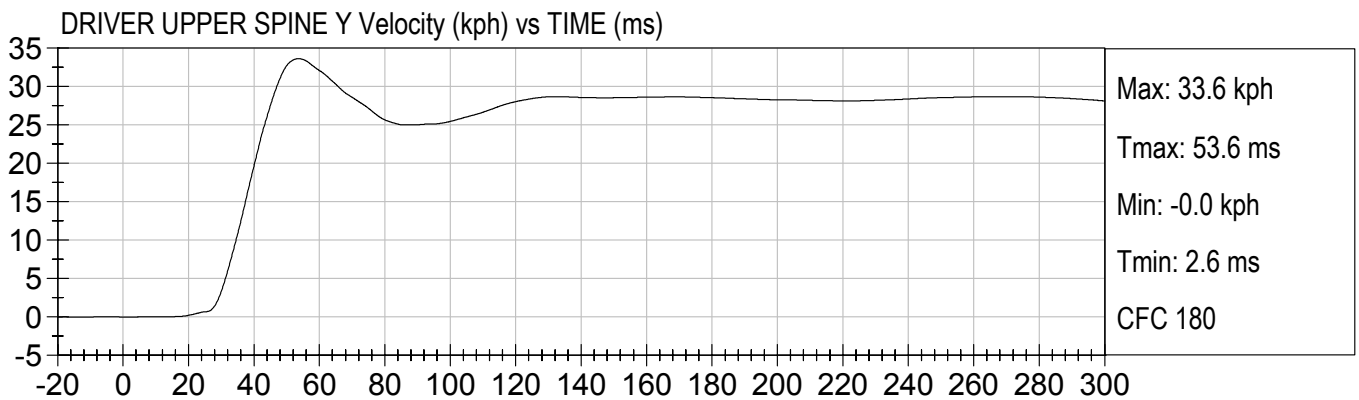
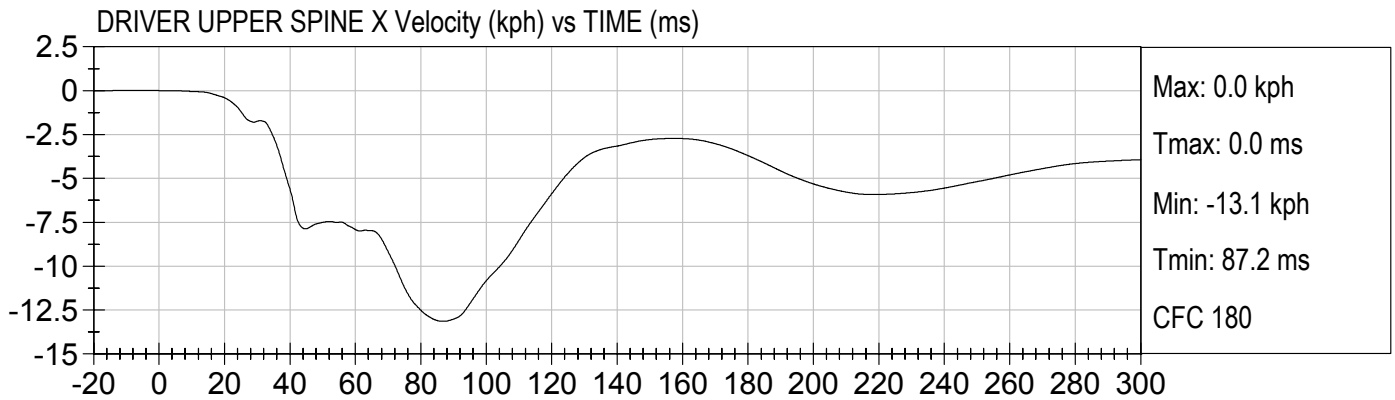


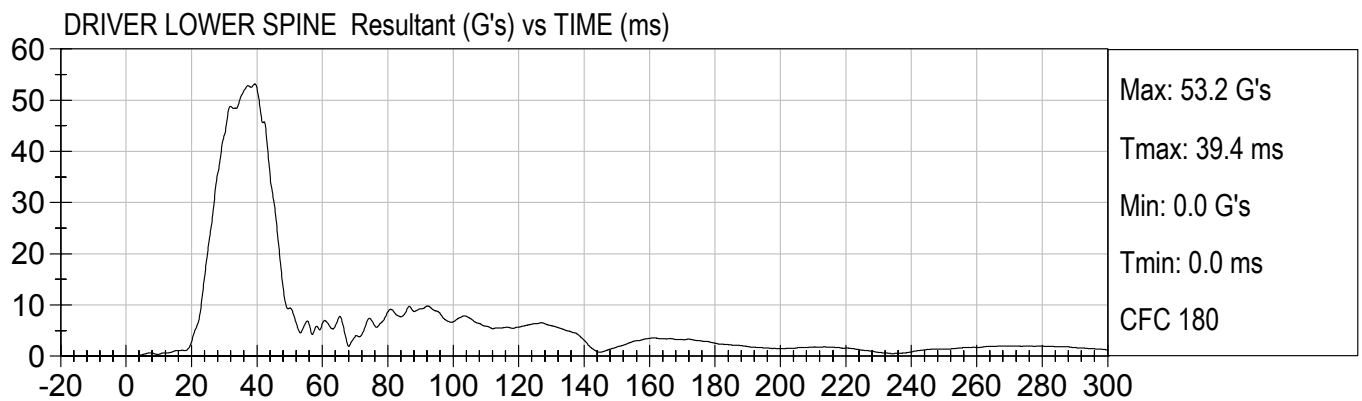
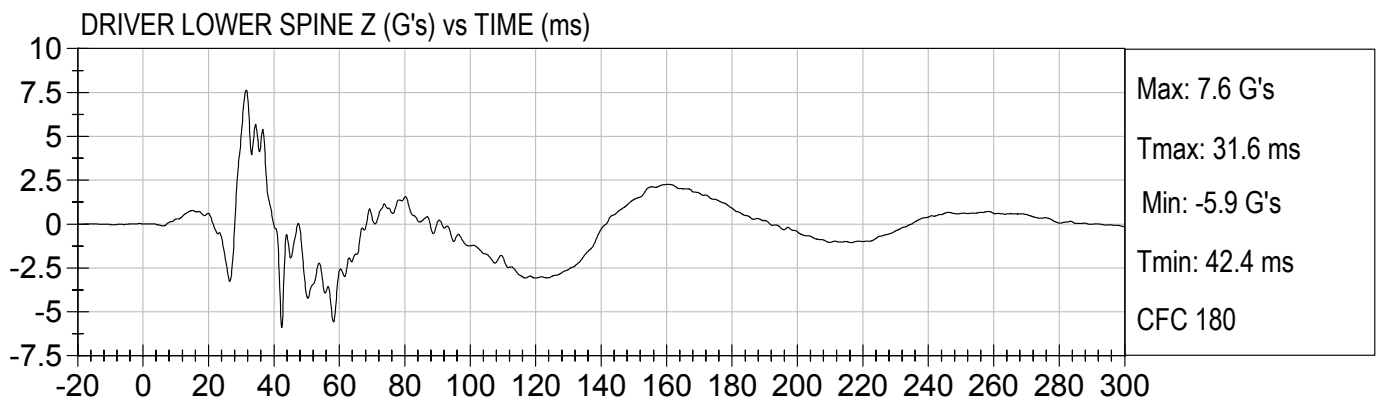
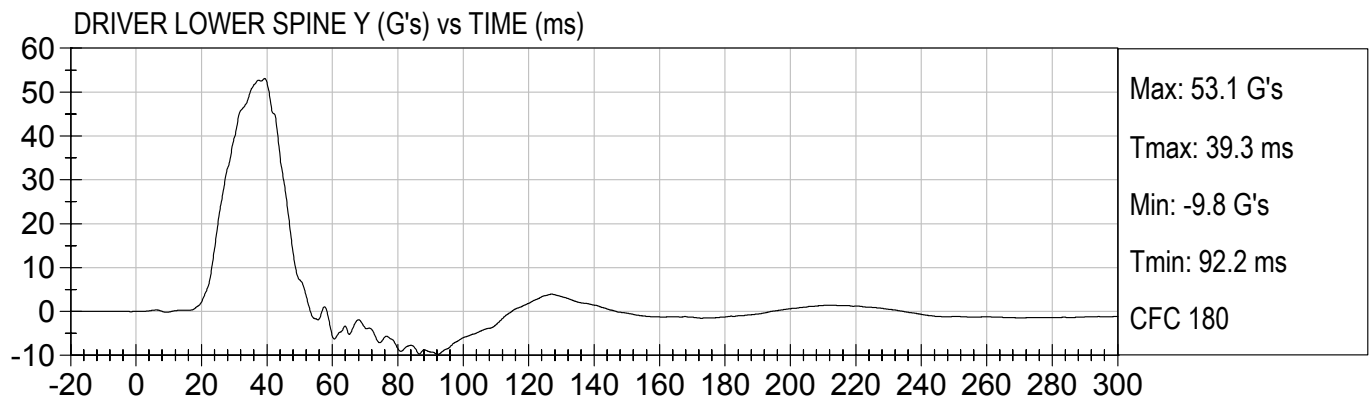
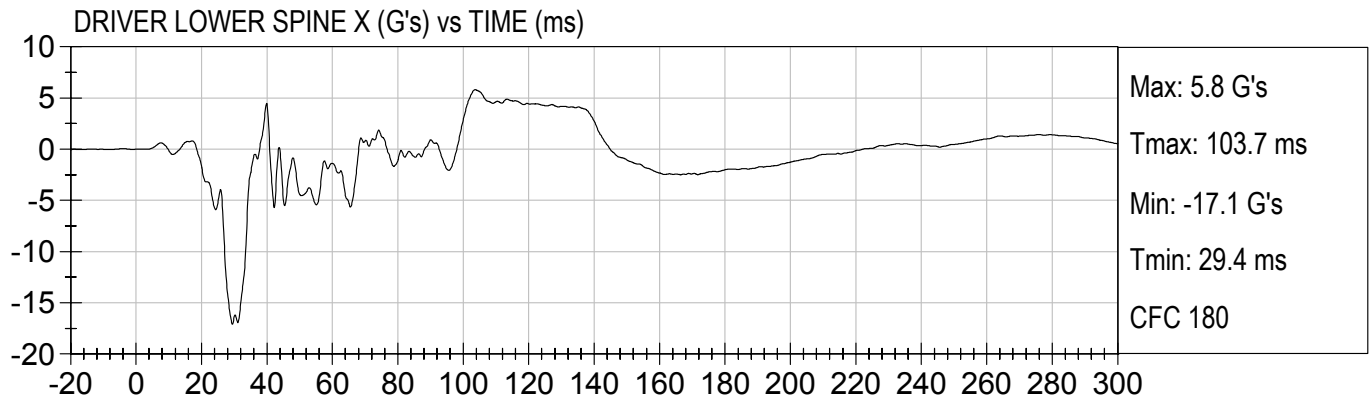


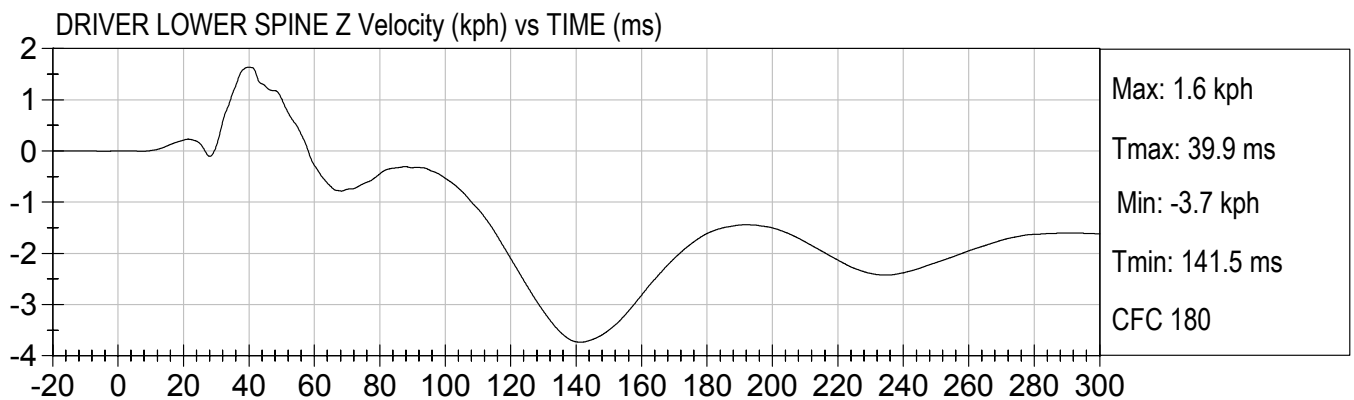
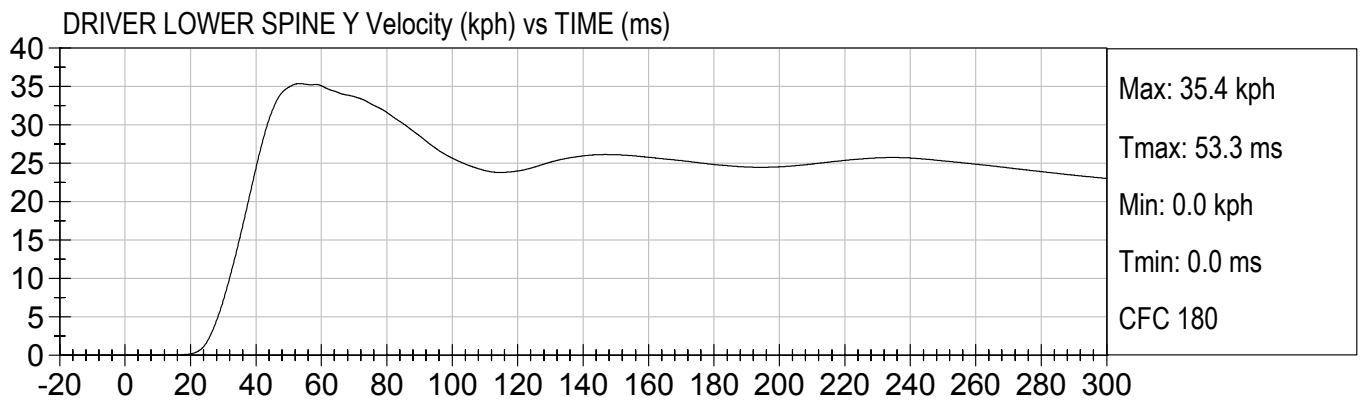
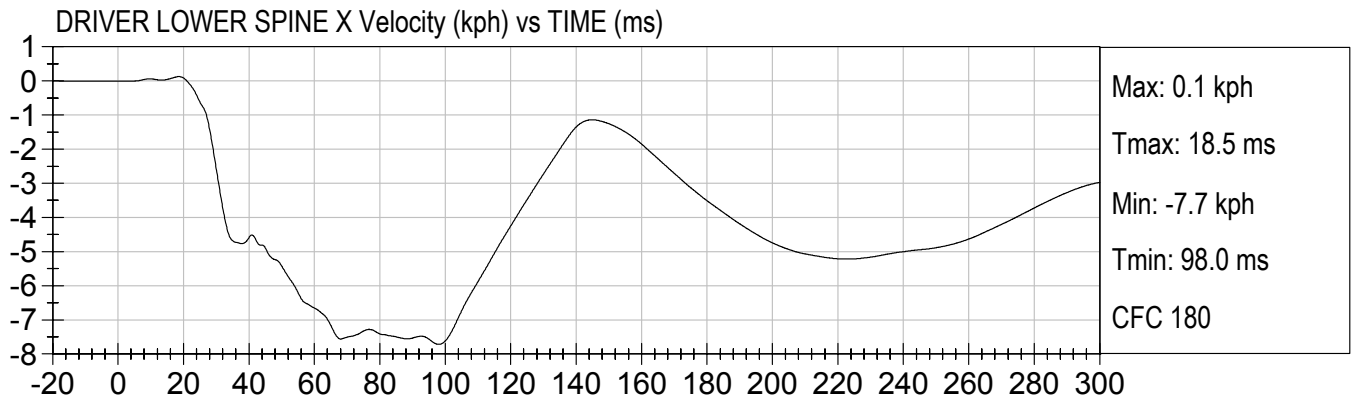


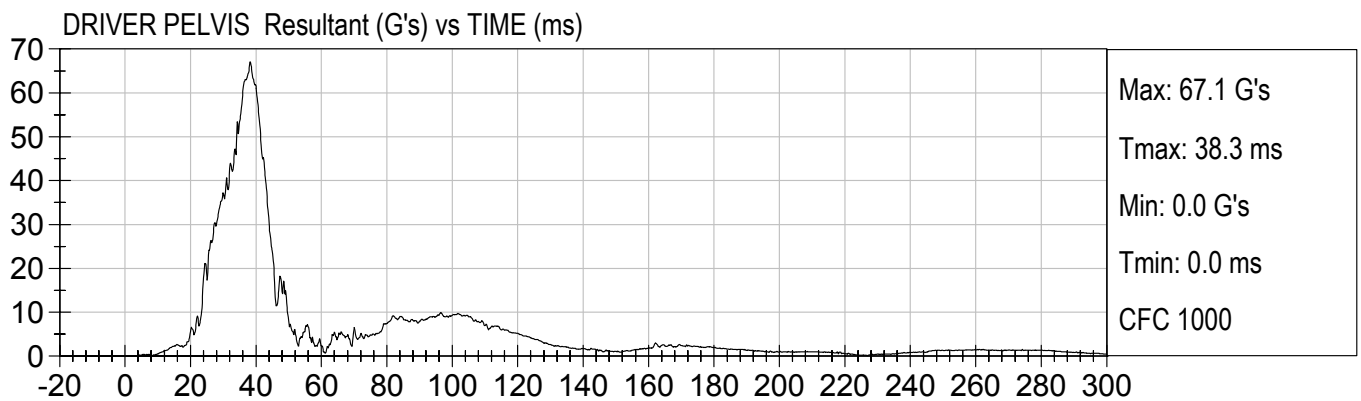
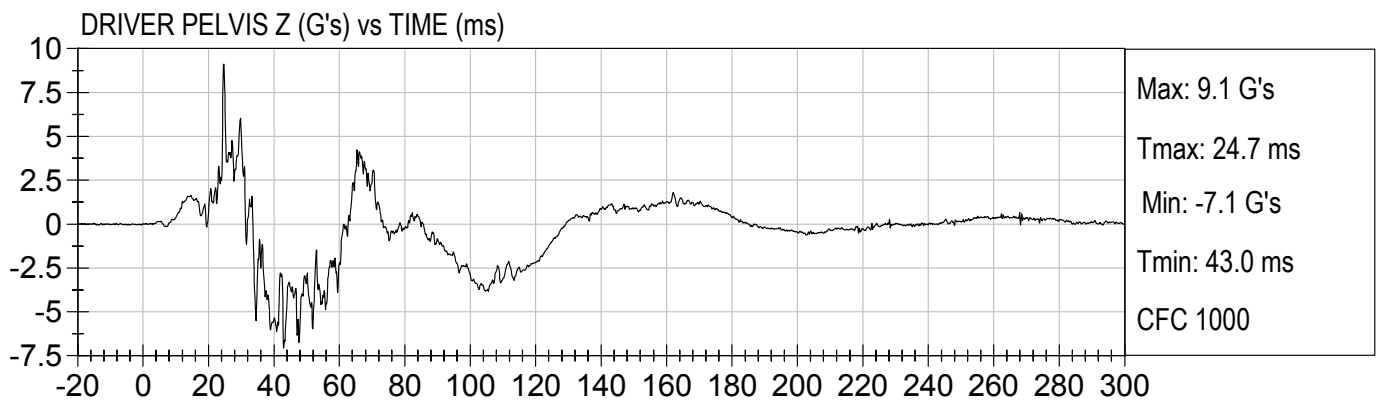
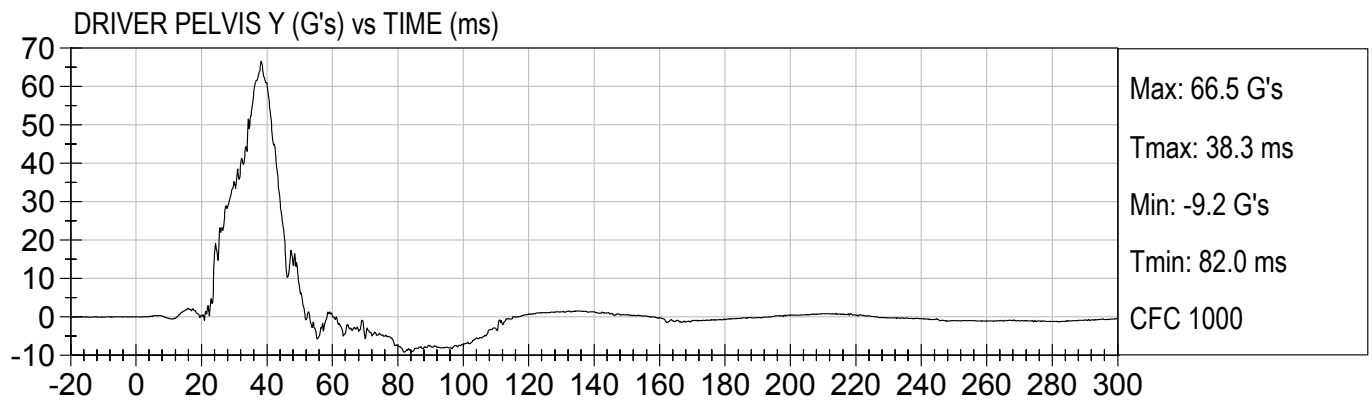
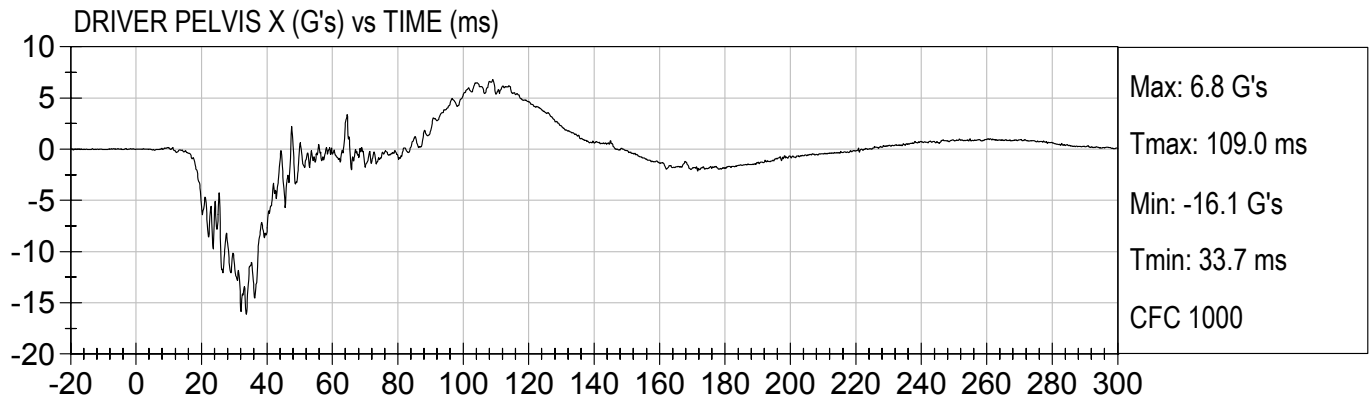


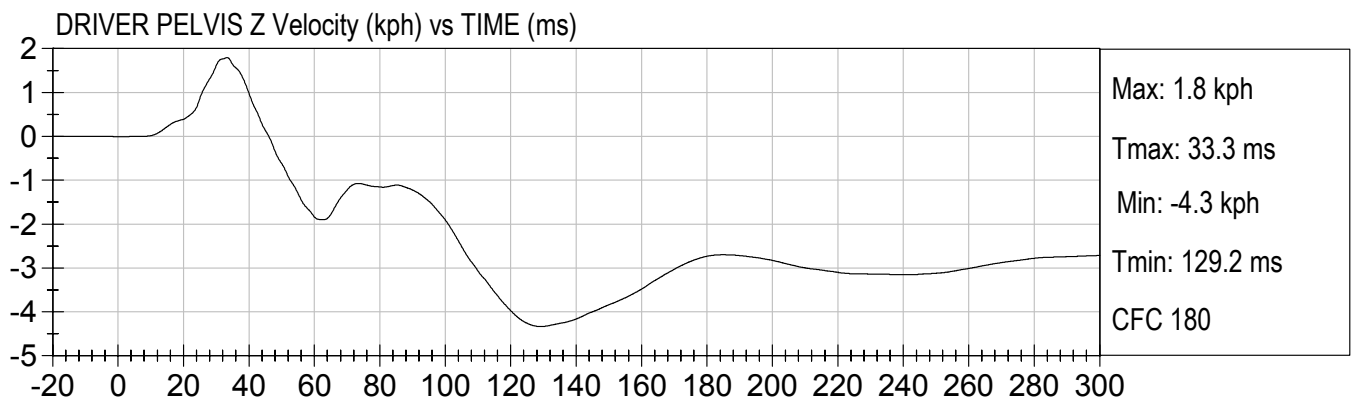
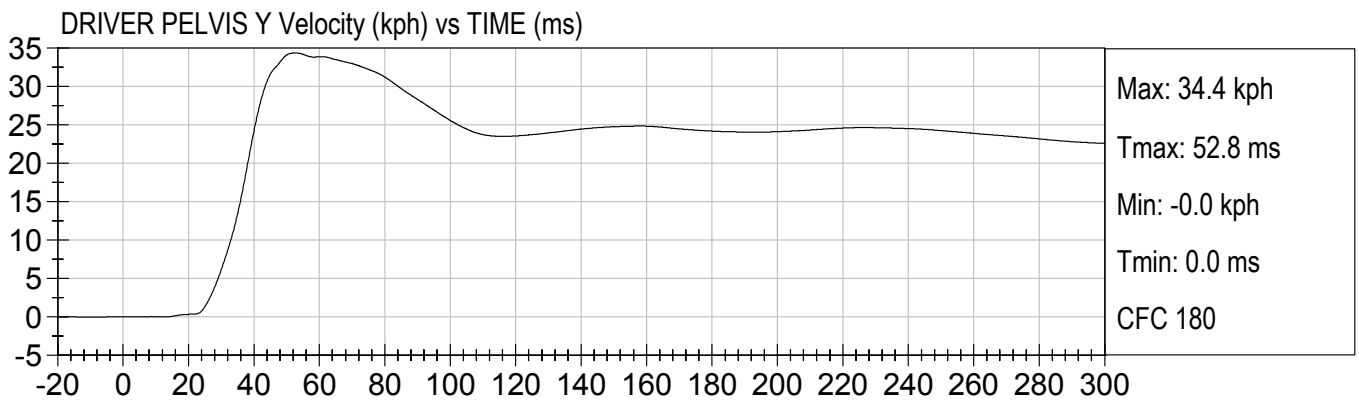
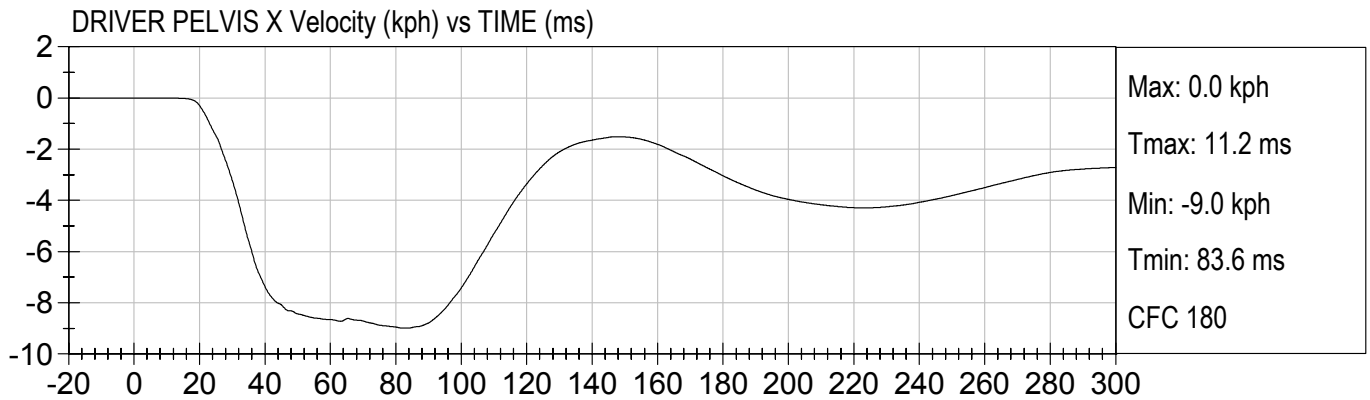


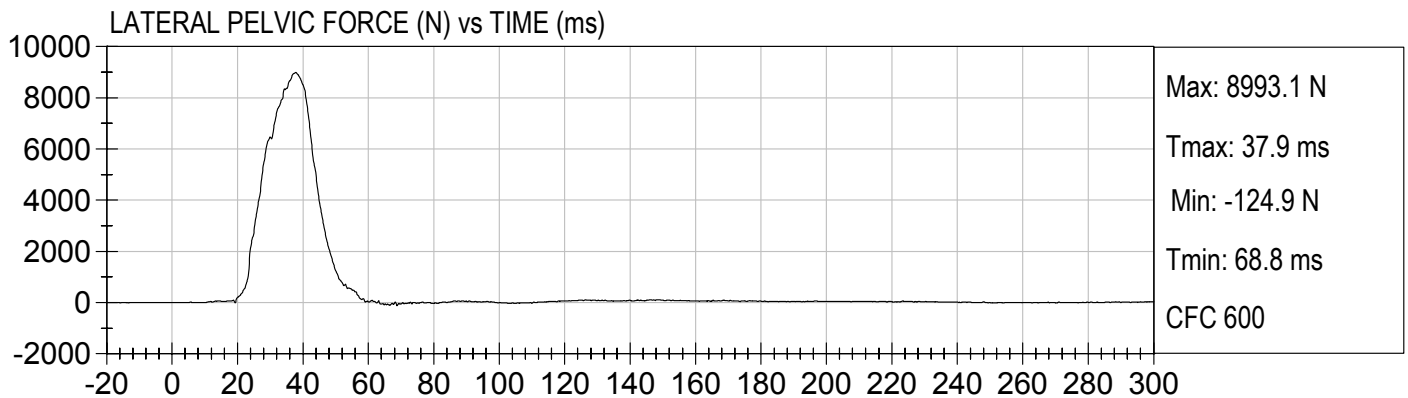
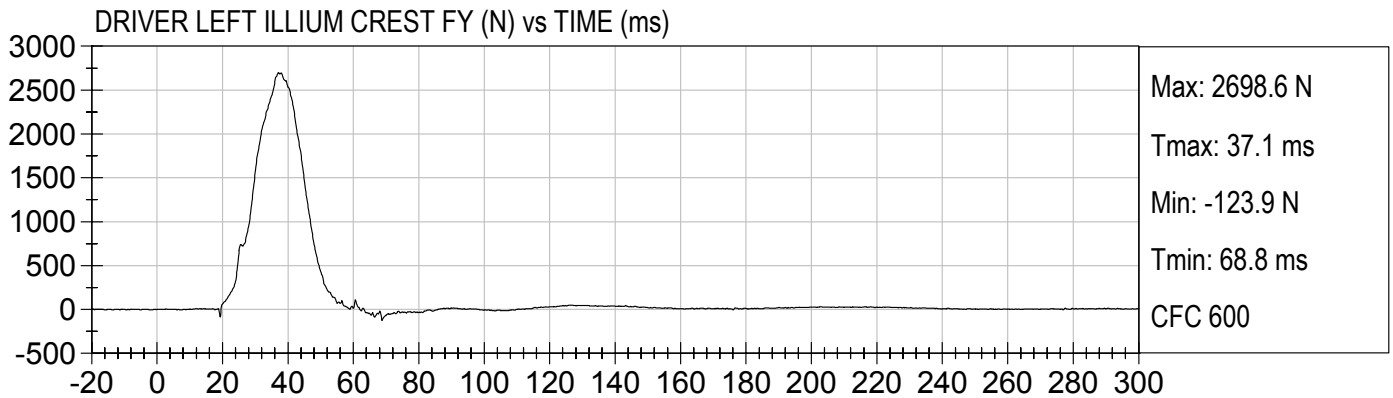
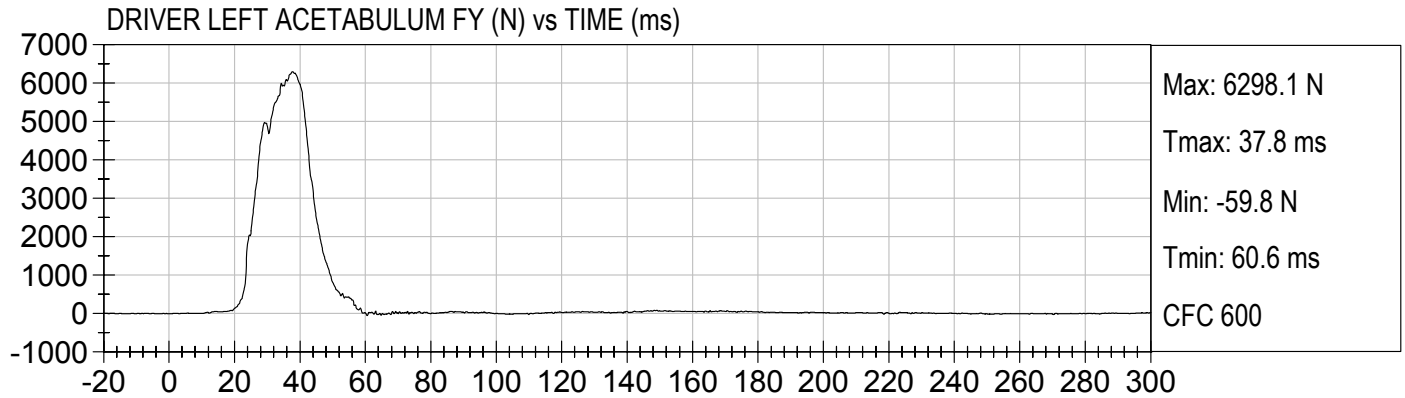


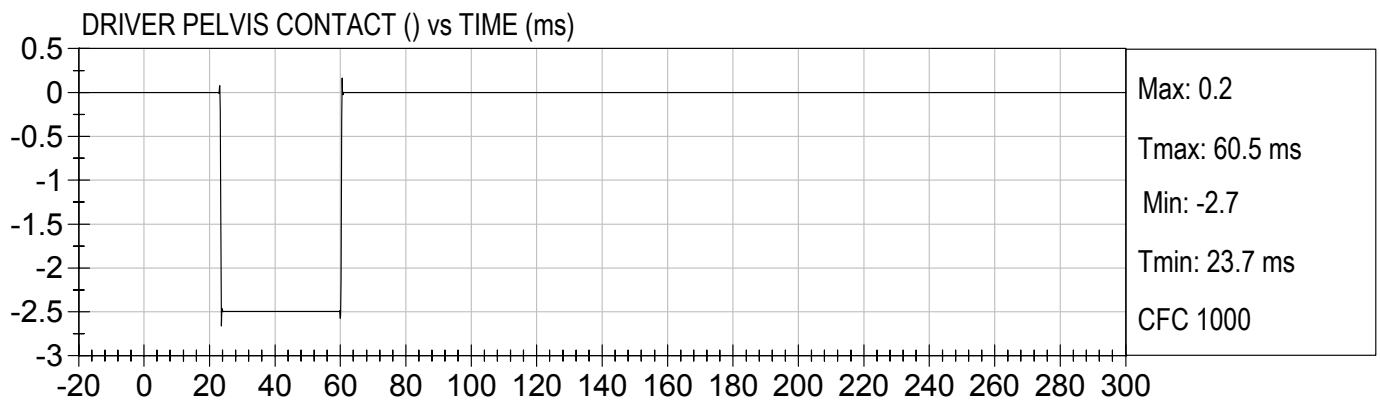
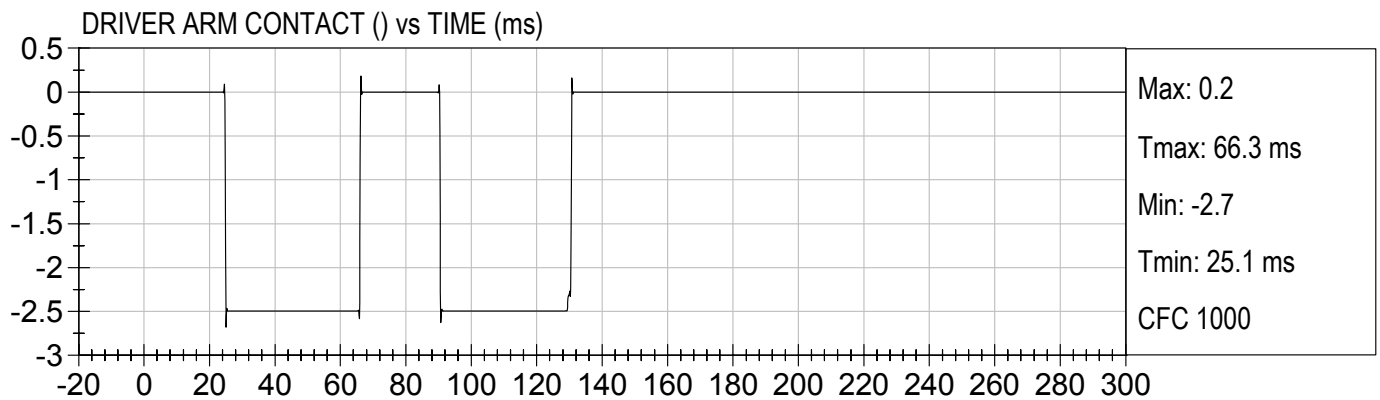
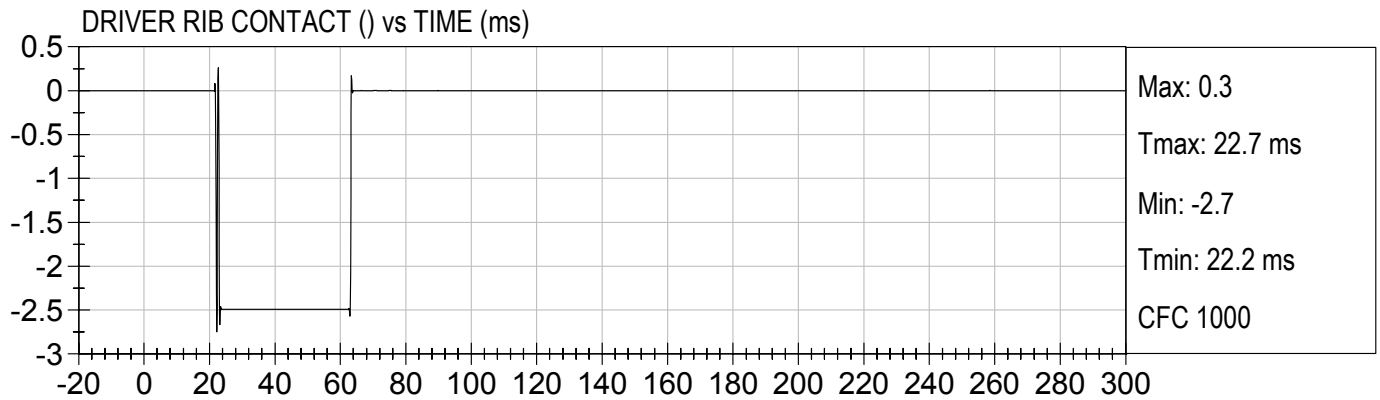


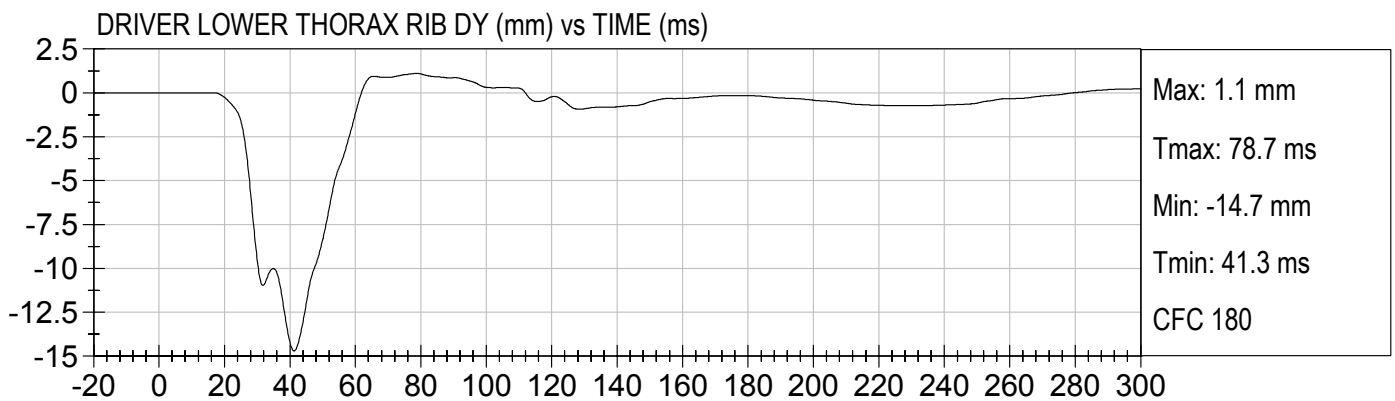
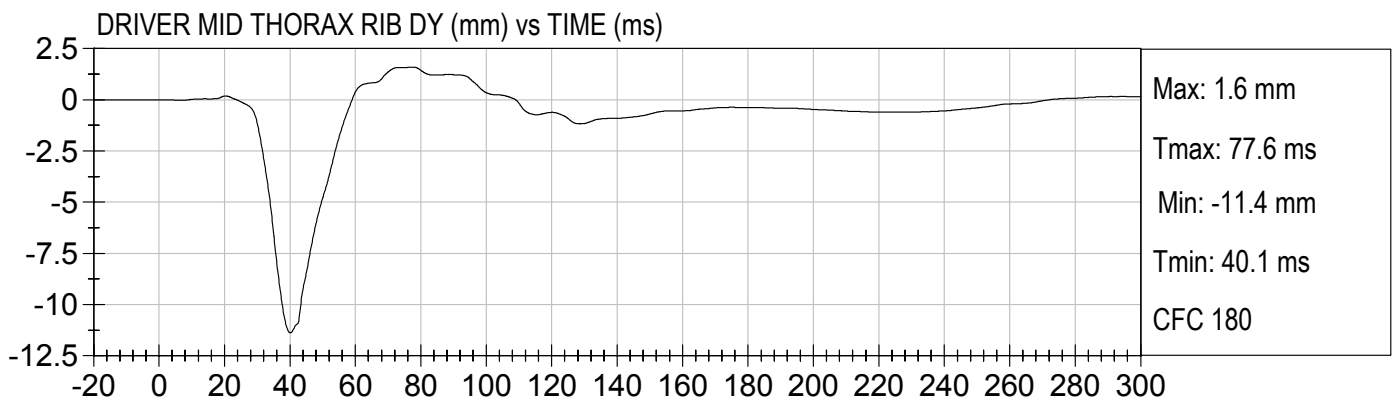
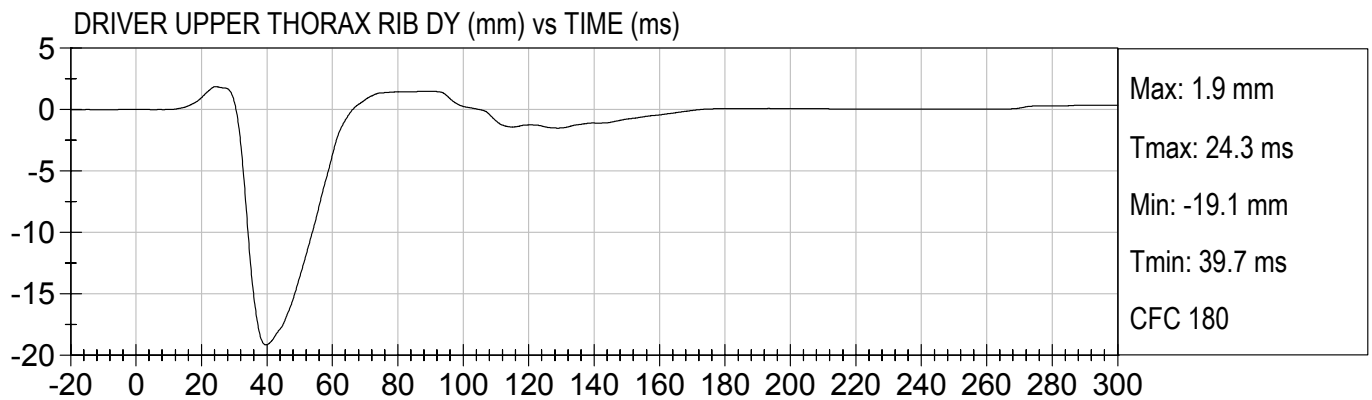
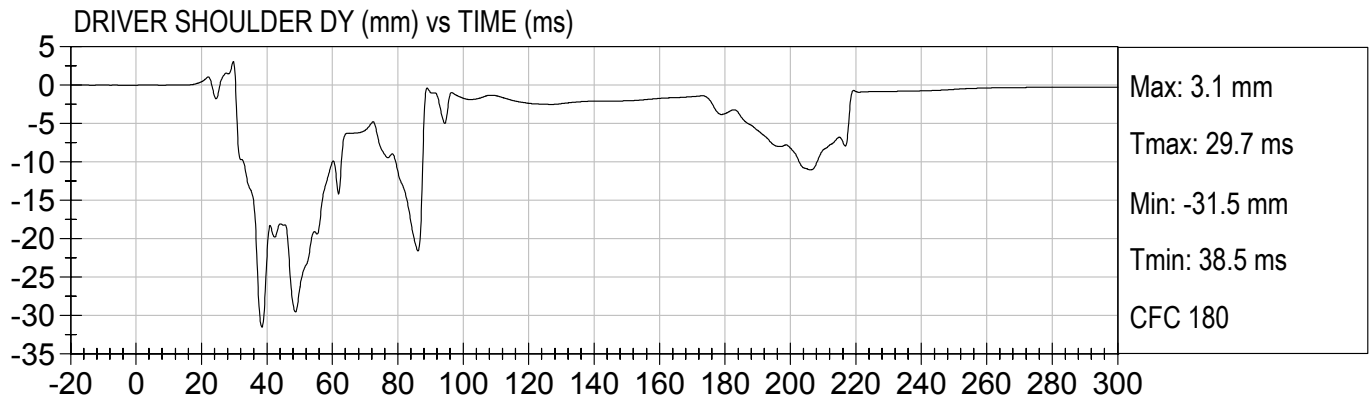


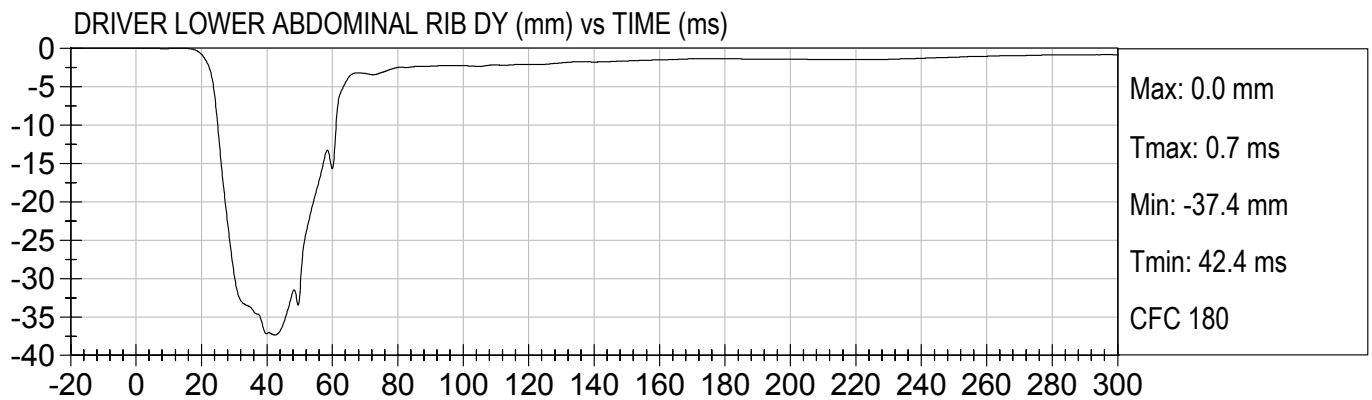
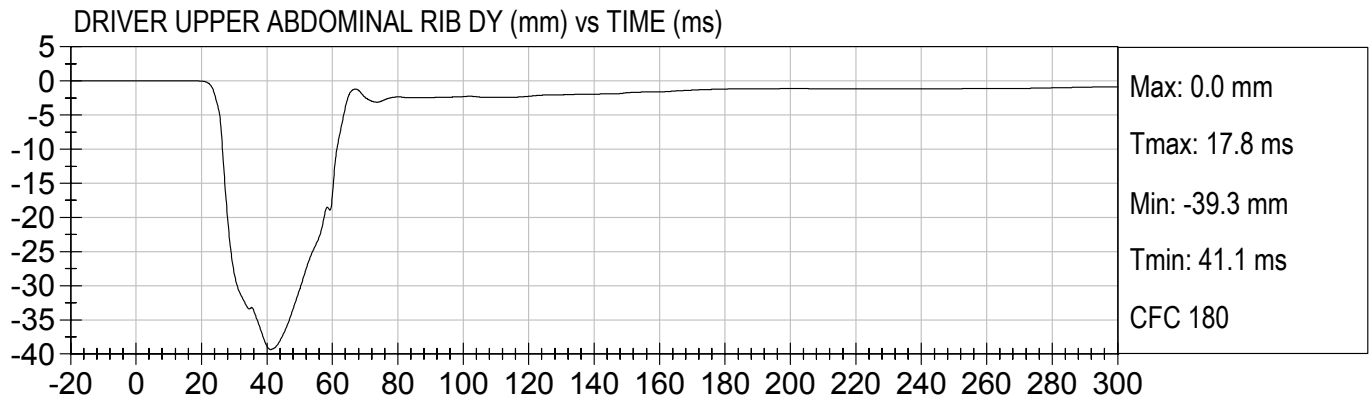






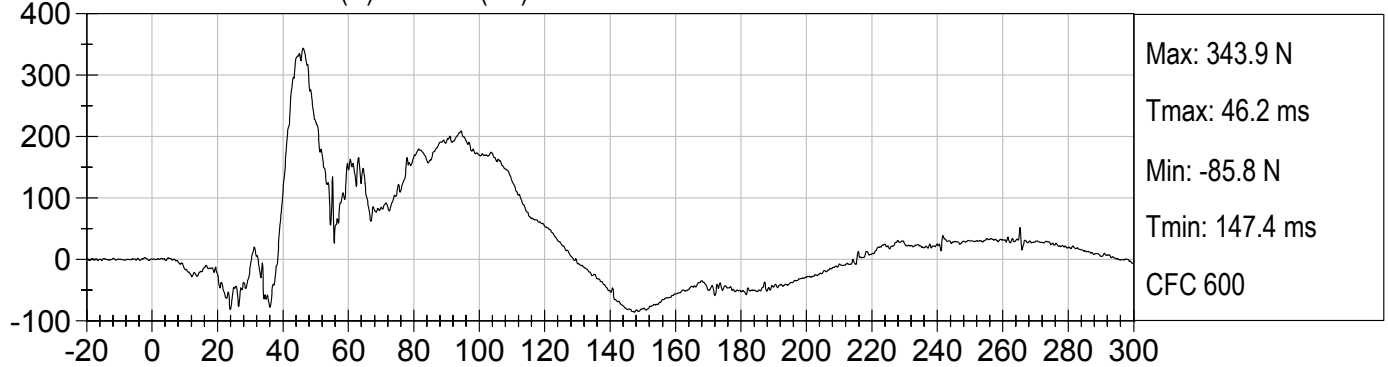




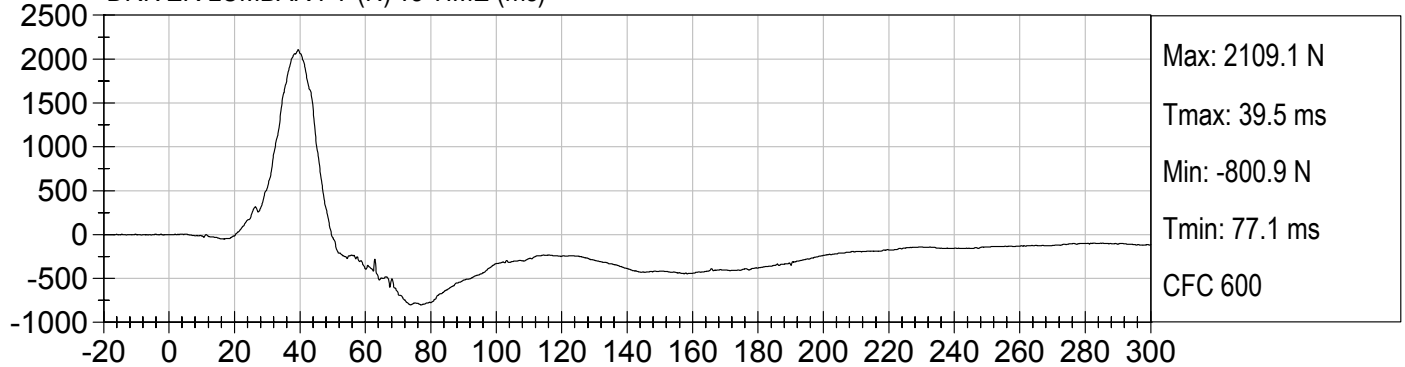




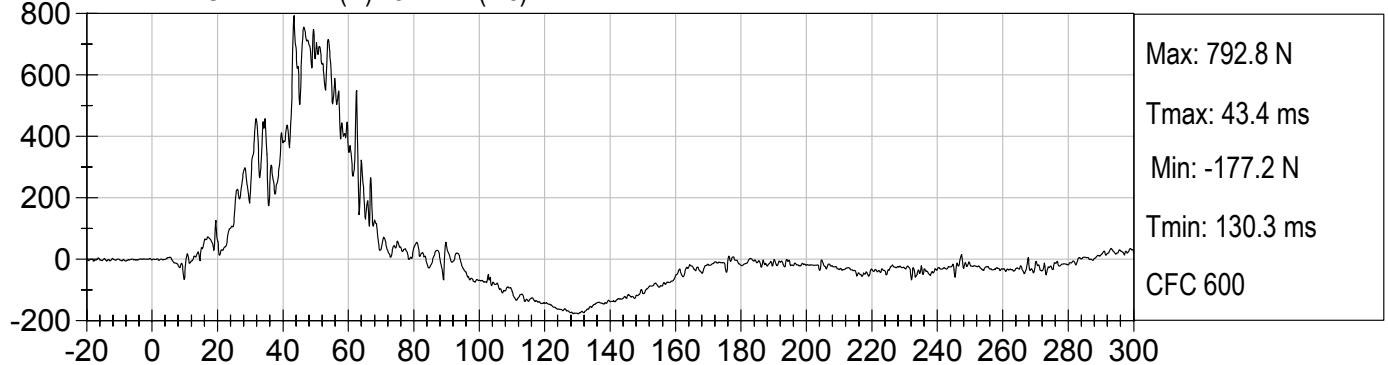
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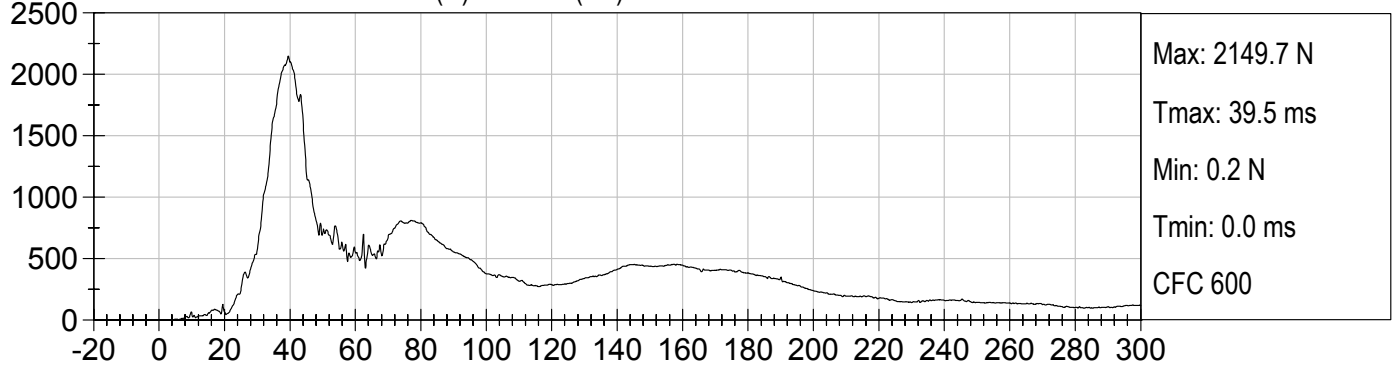
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DRIVER LUMBAR FZ (N) vs TIME (ms)

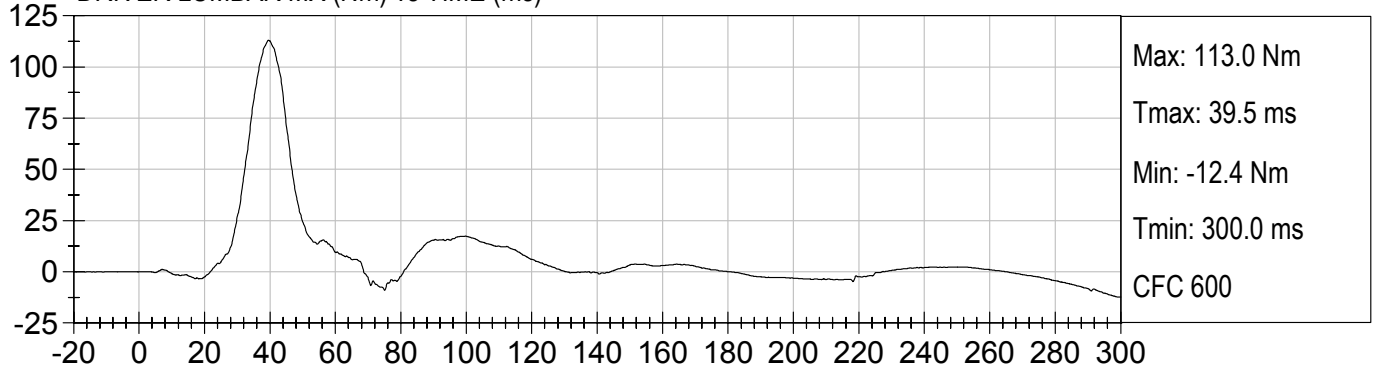


DRIVER LUMBAR FResultant (N) vs TIME (ms)

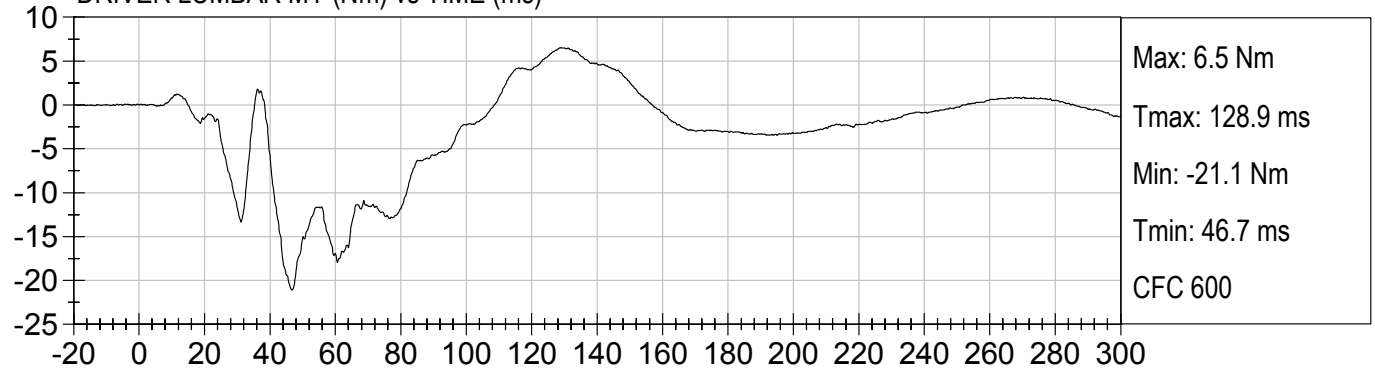




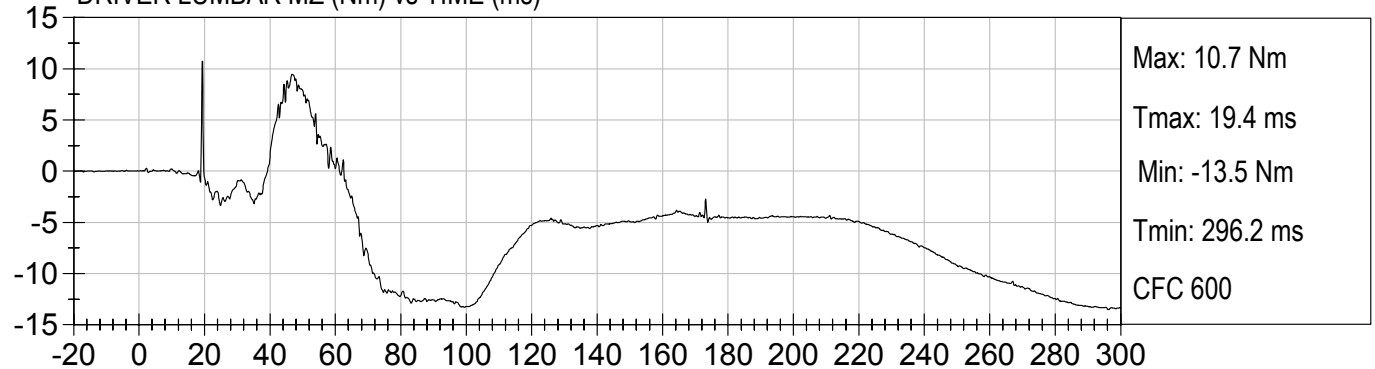
DRIVER LUMBAR MX (Nm) vs TIME (ms)



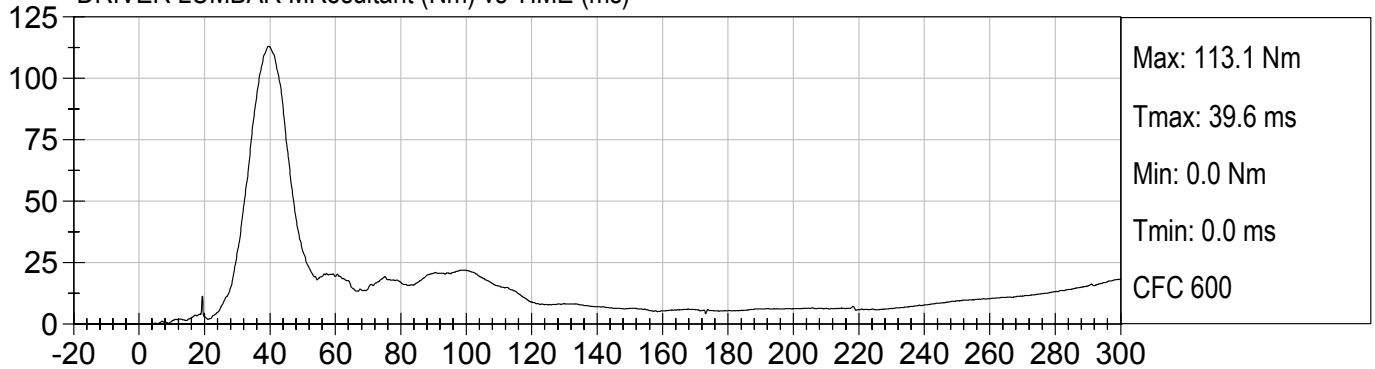
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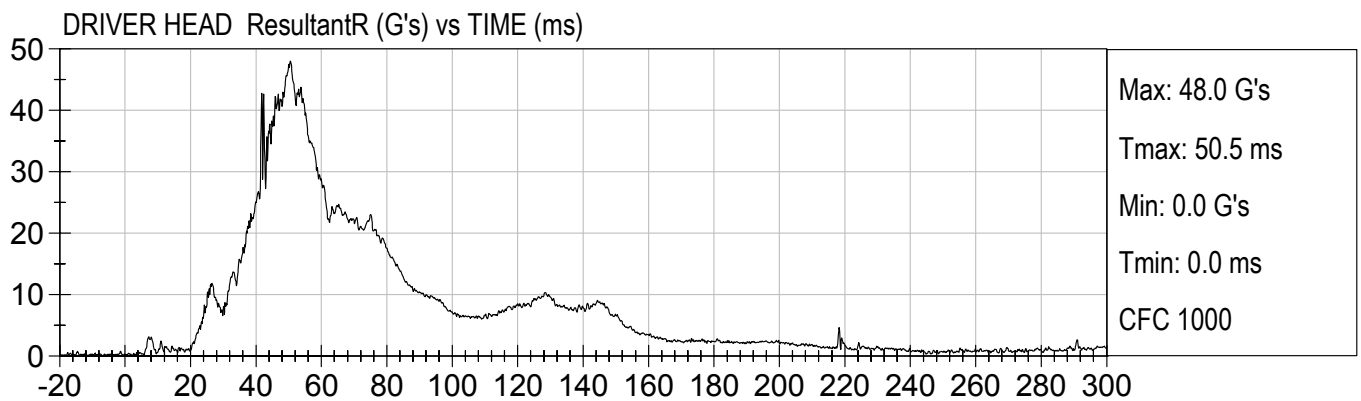
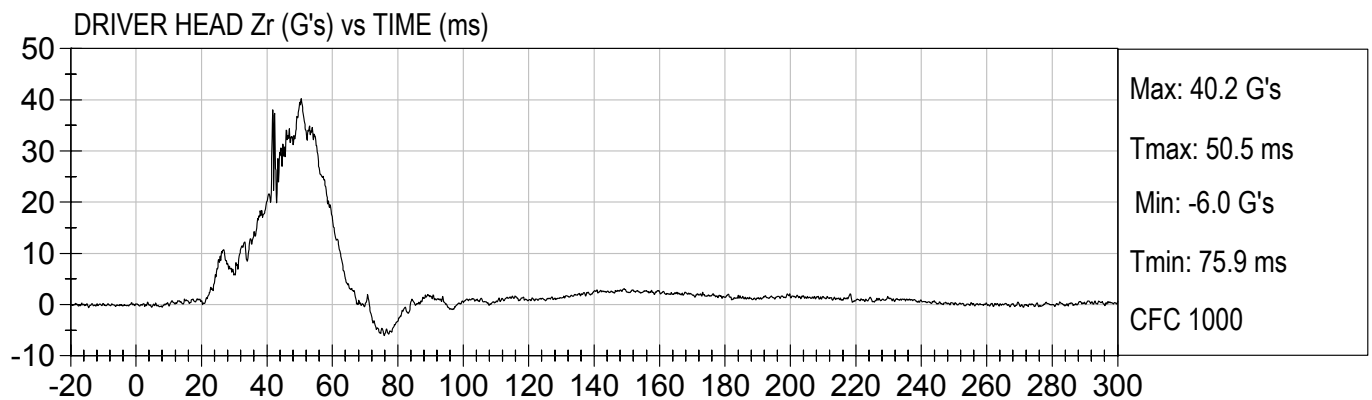
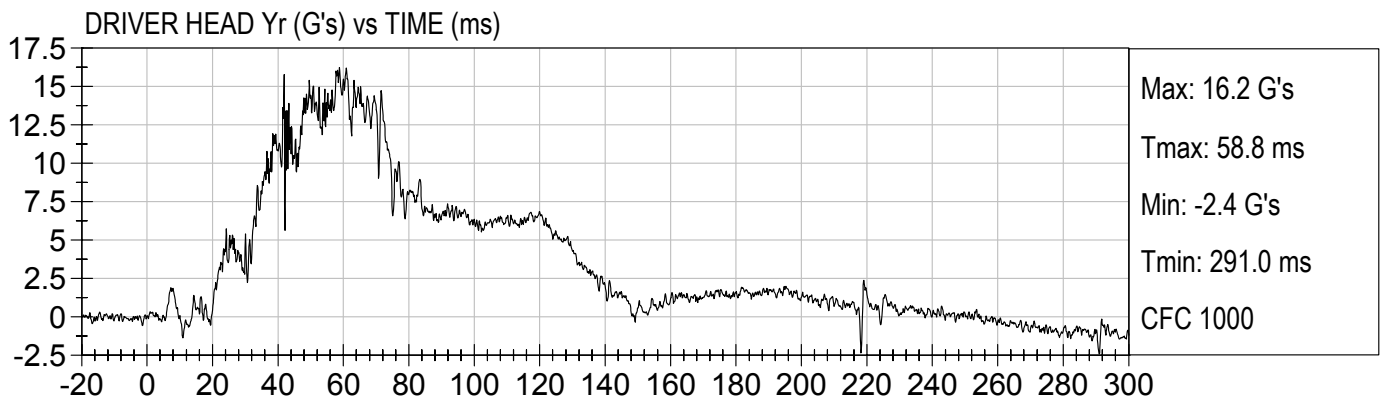
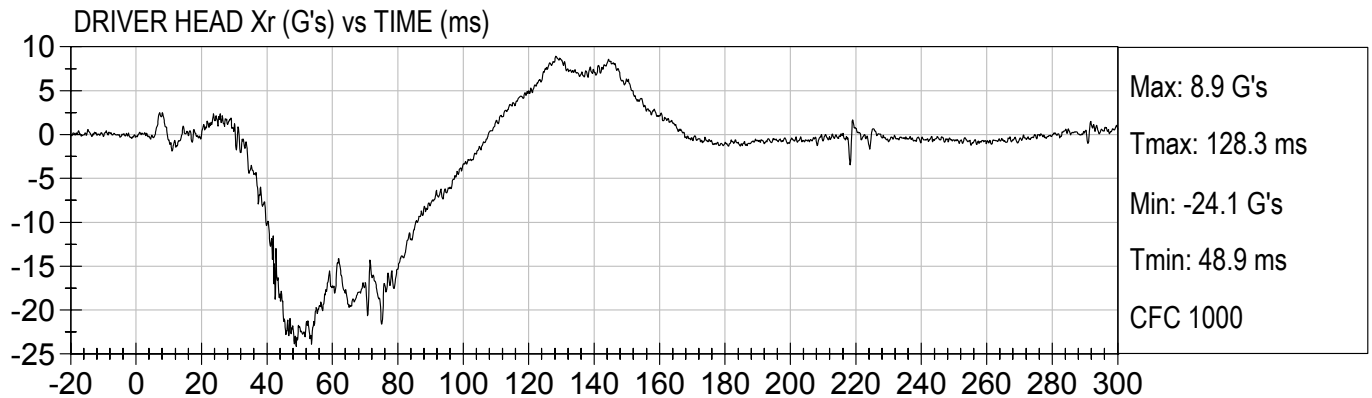


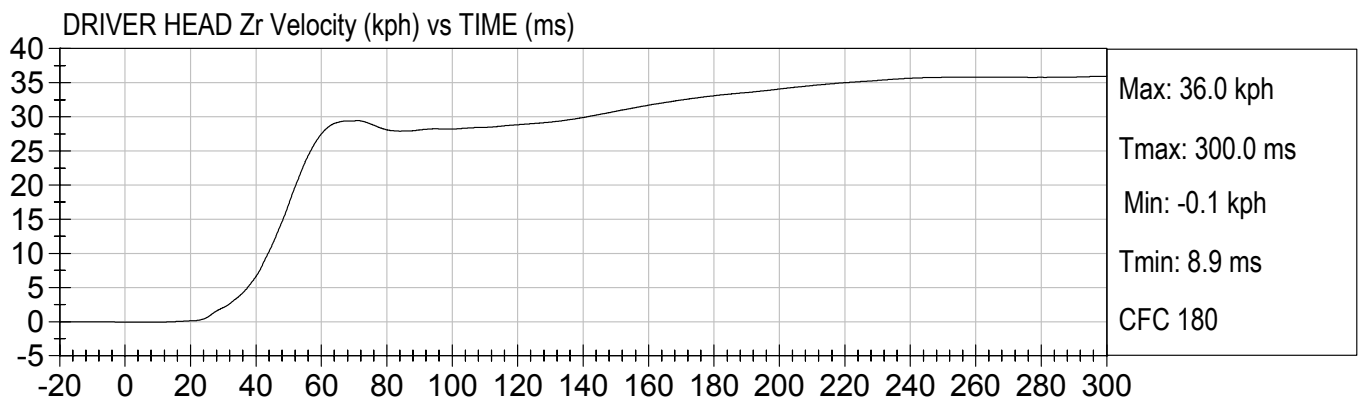
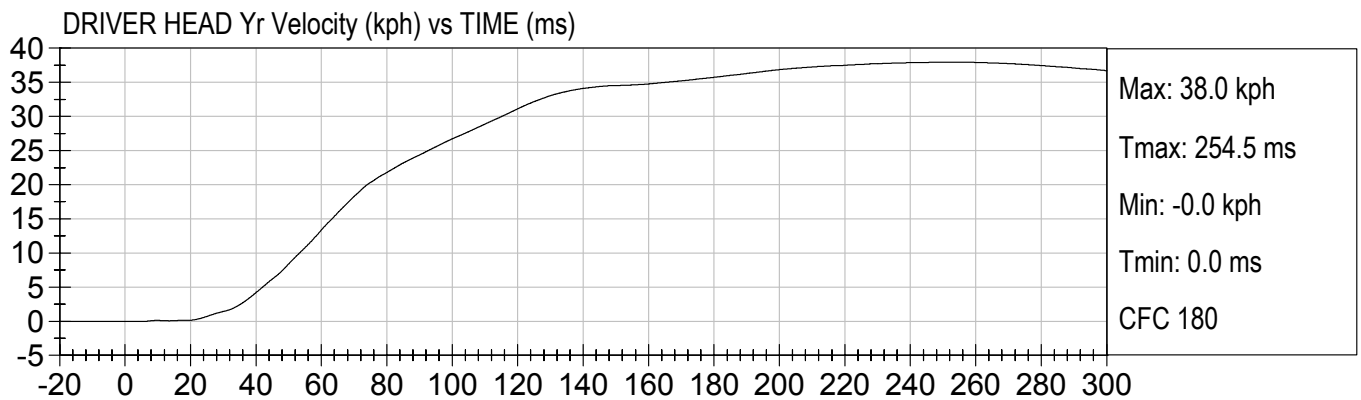
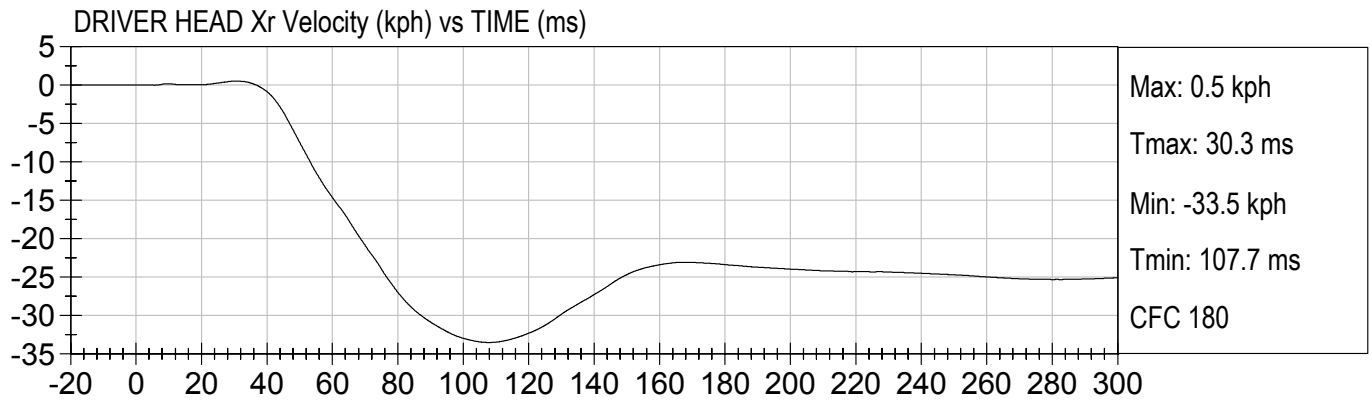
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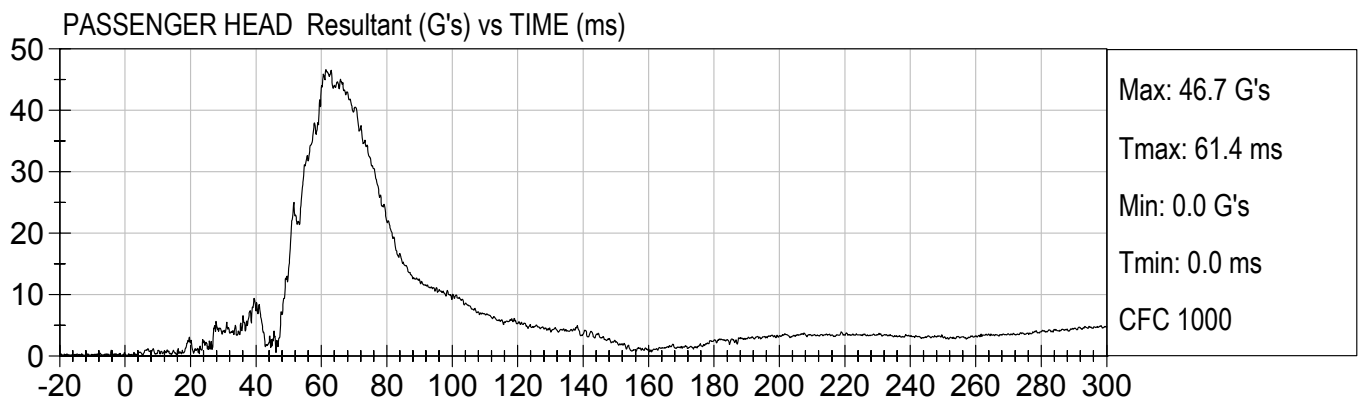
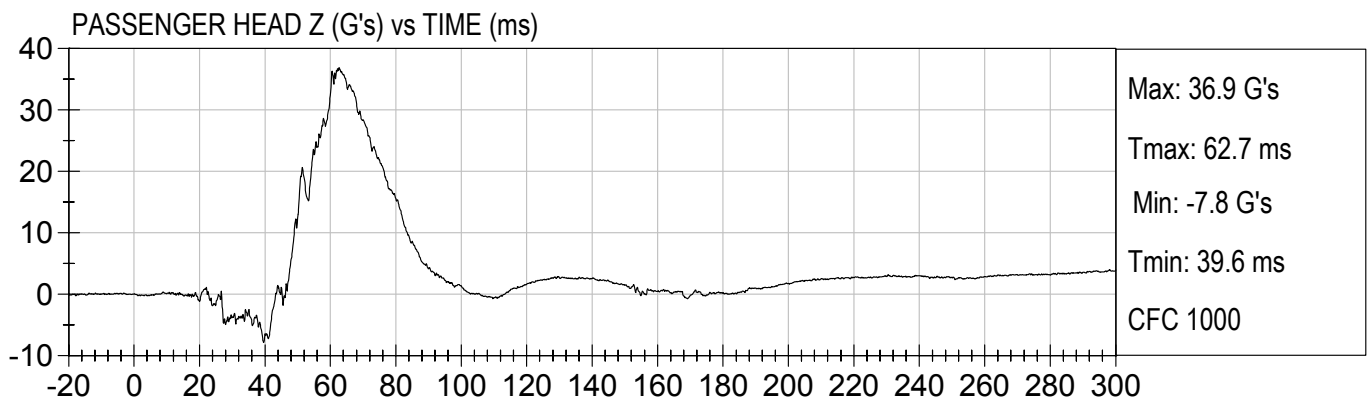
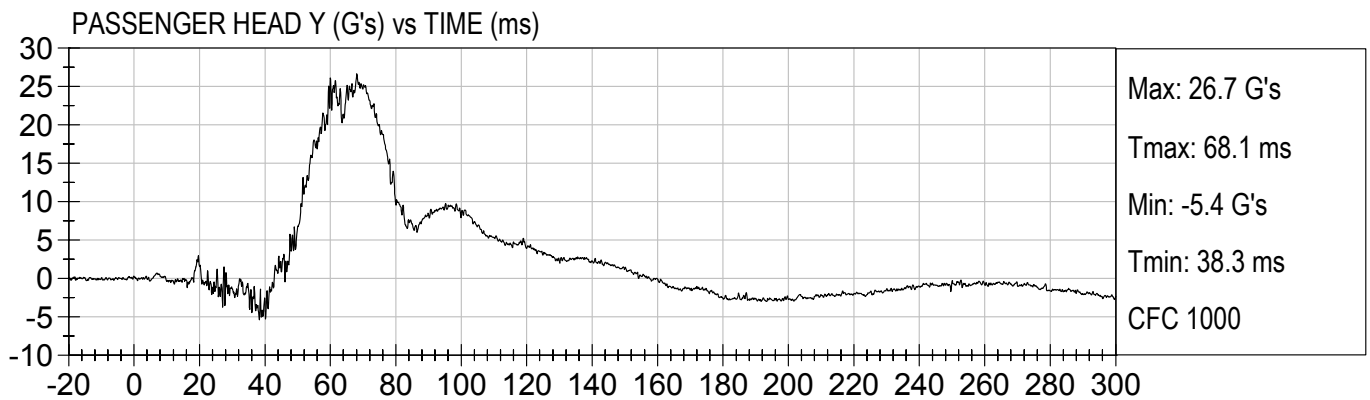
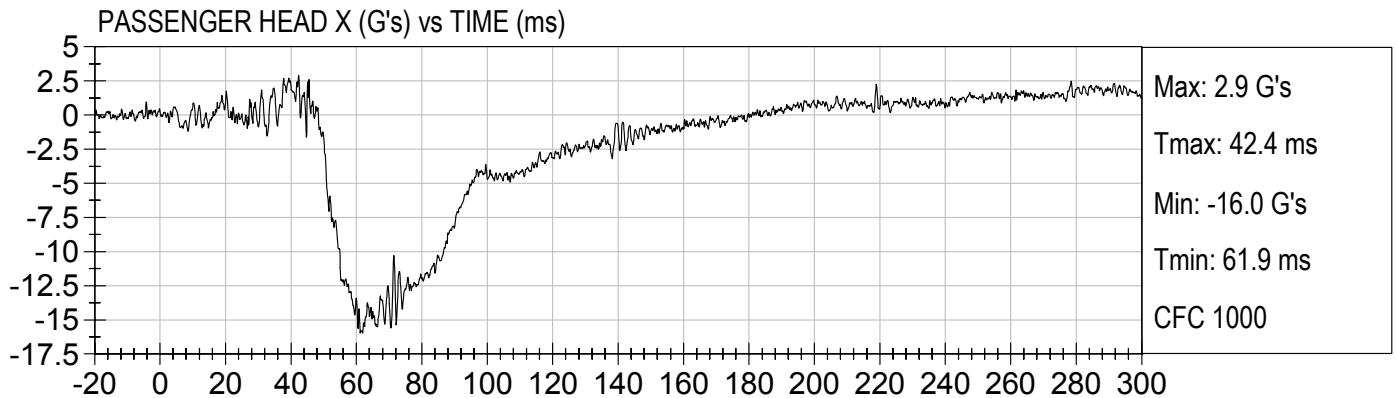


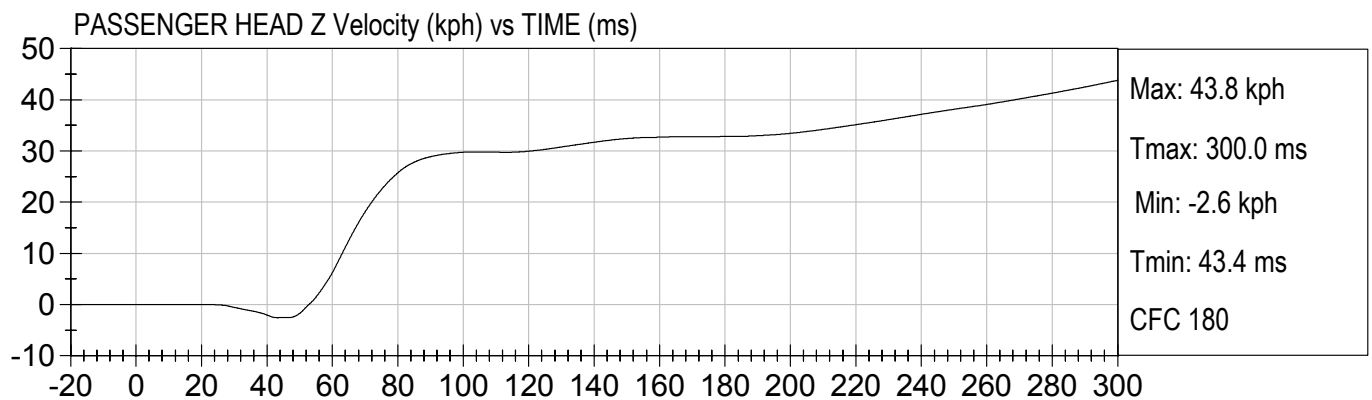
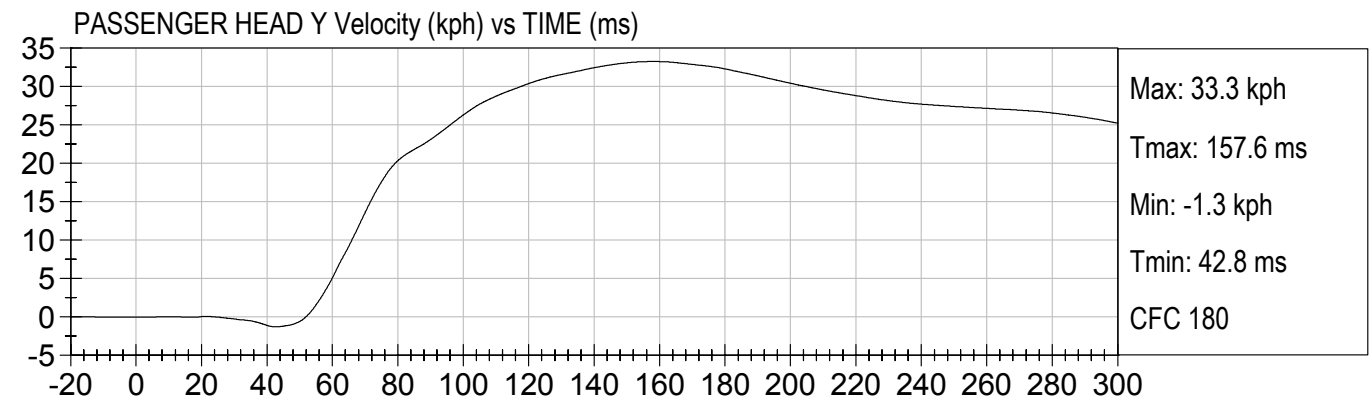
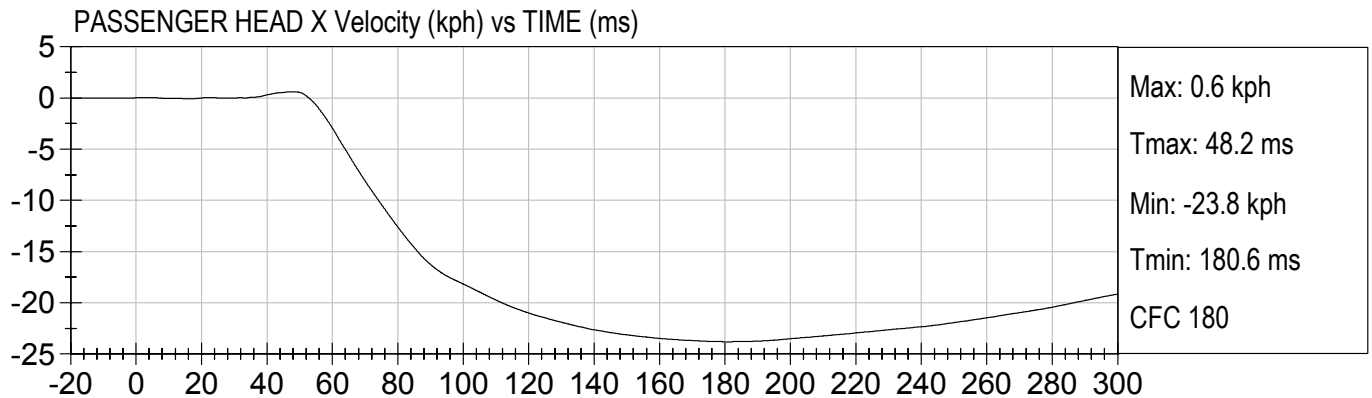
DRIVER LUMBAR MResultant (Nm) vs TIME (ms)

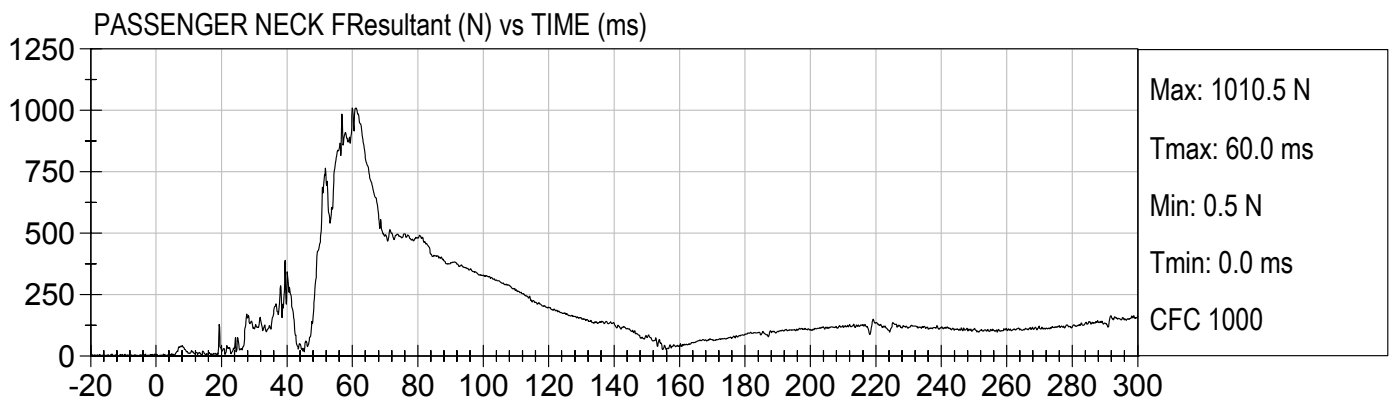
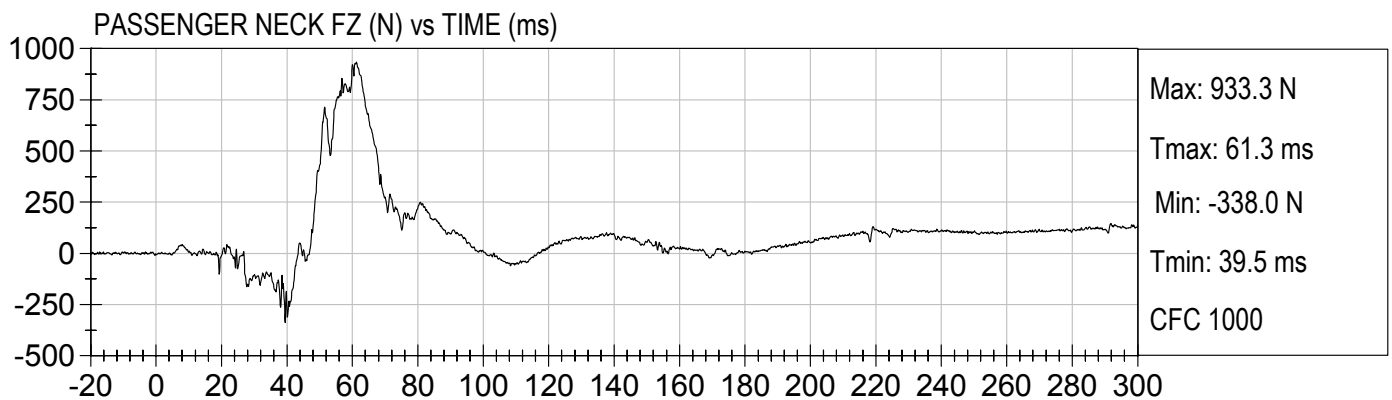
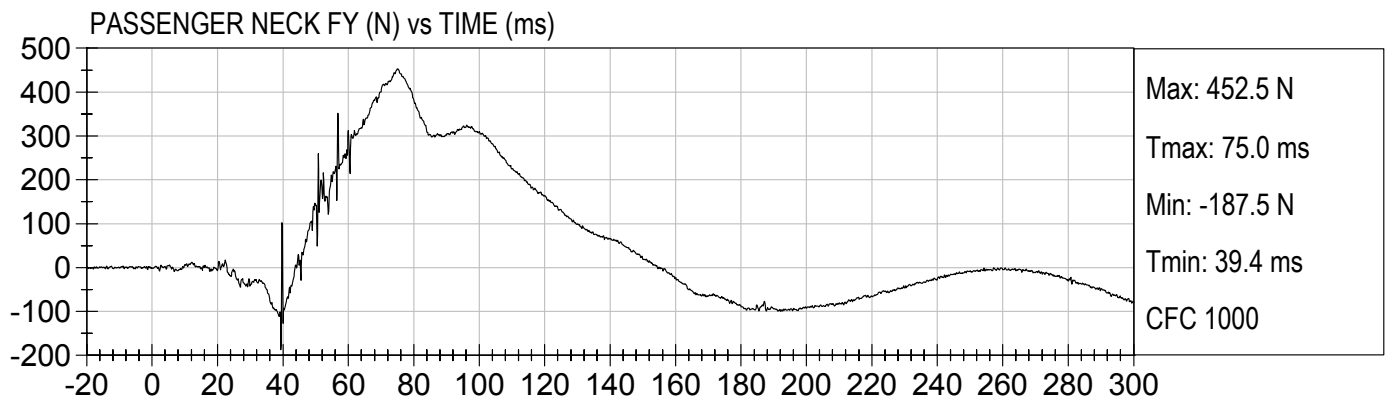
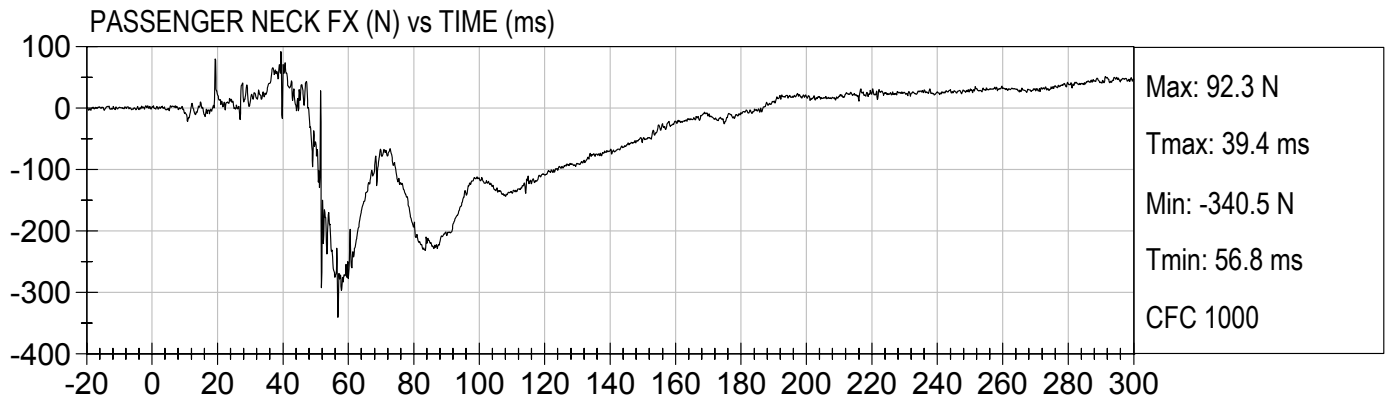


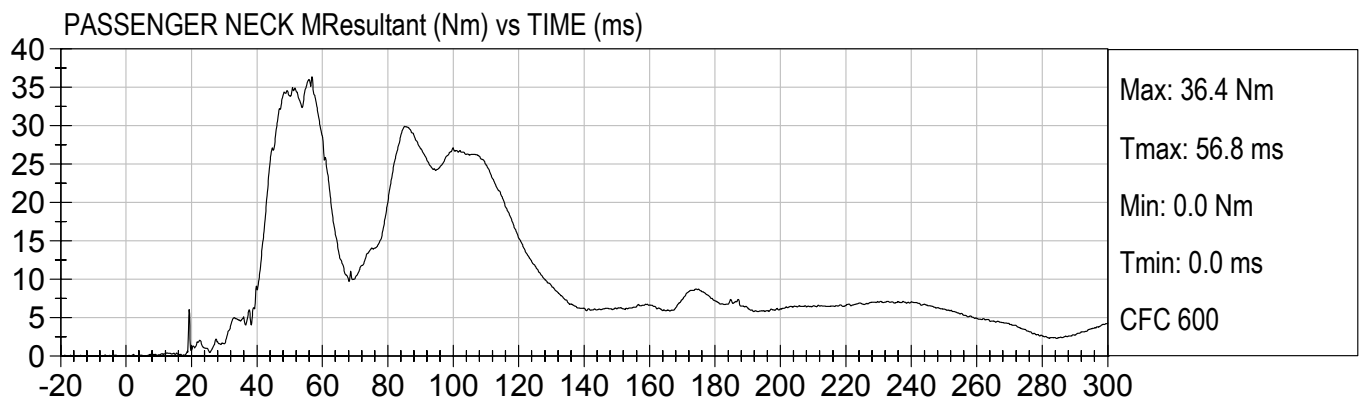
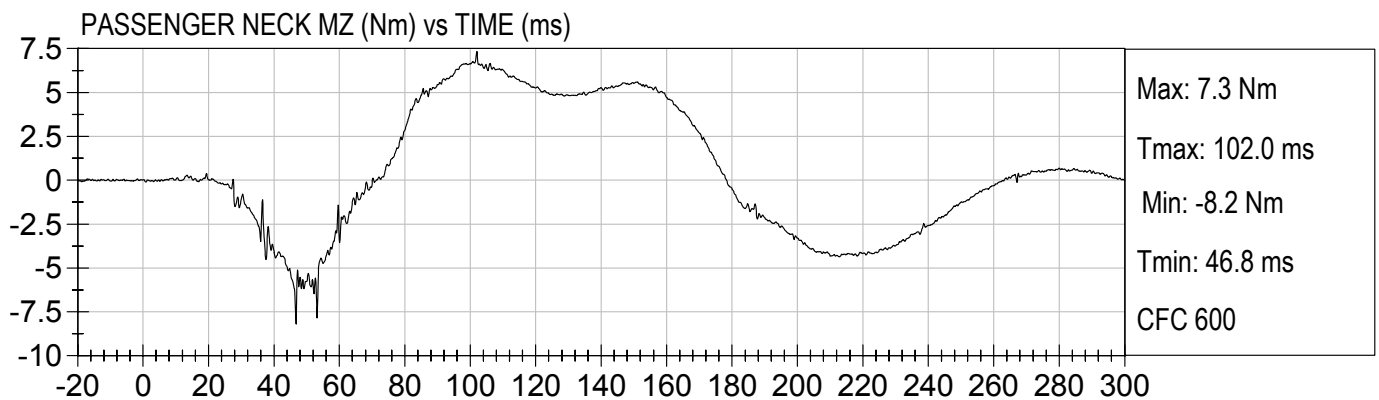
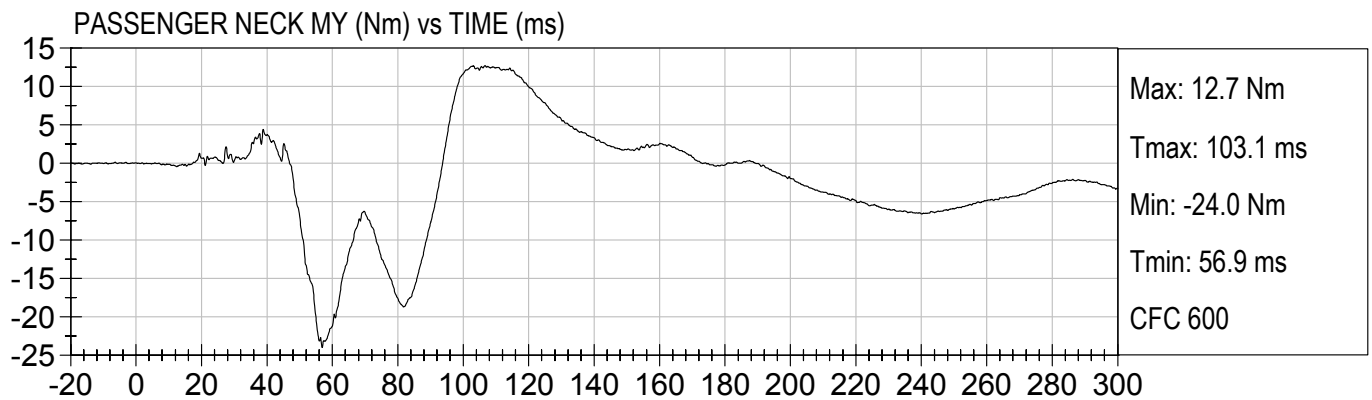
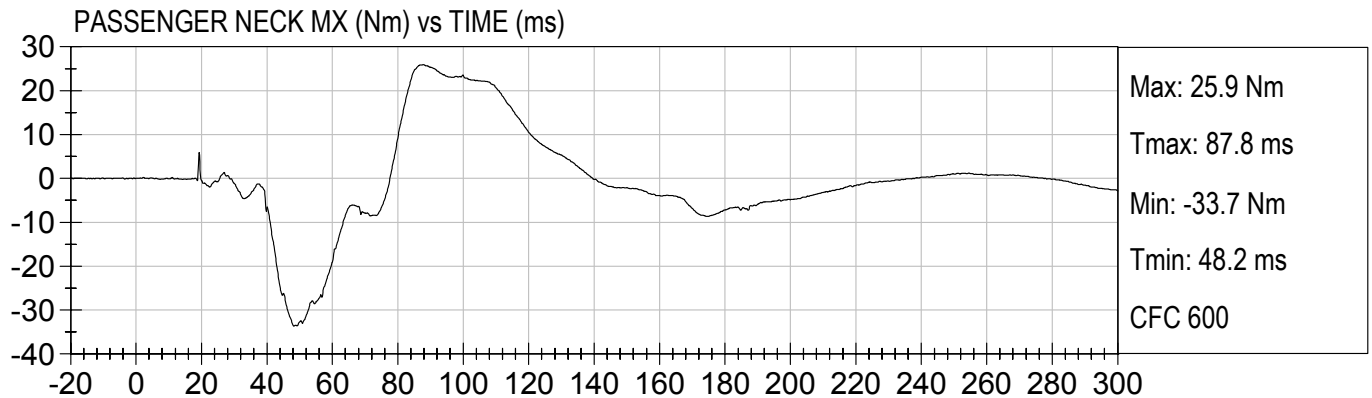


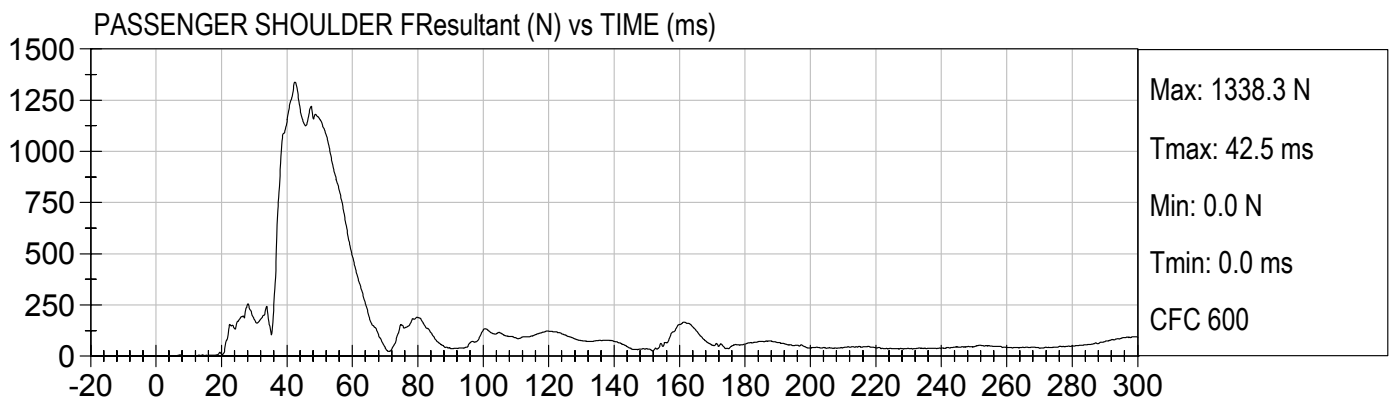
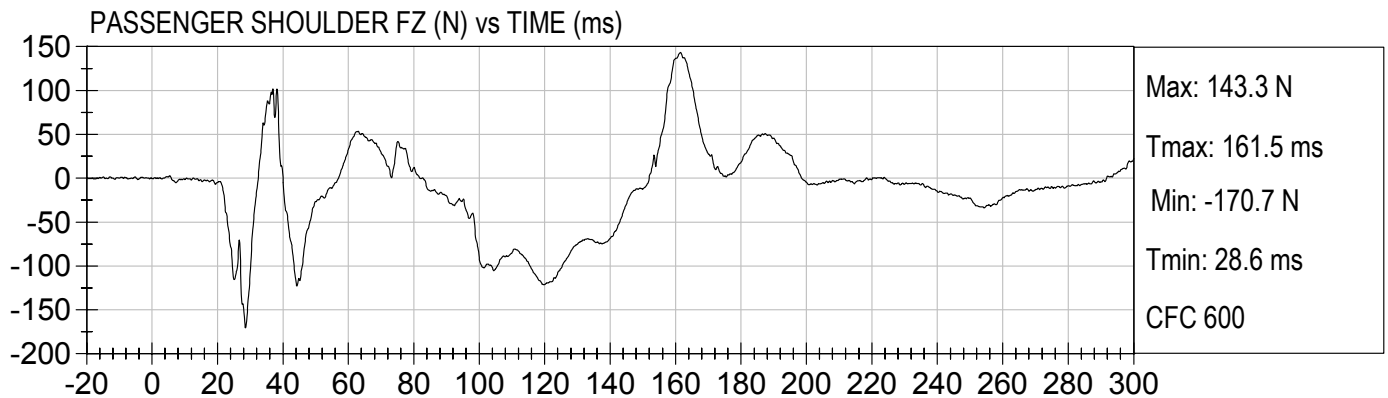
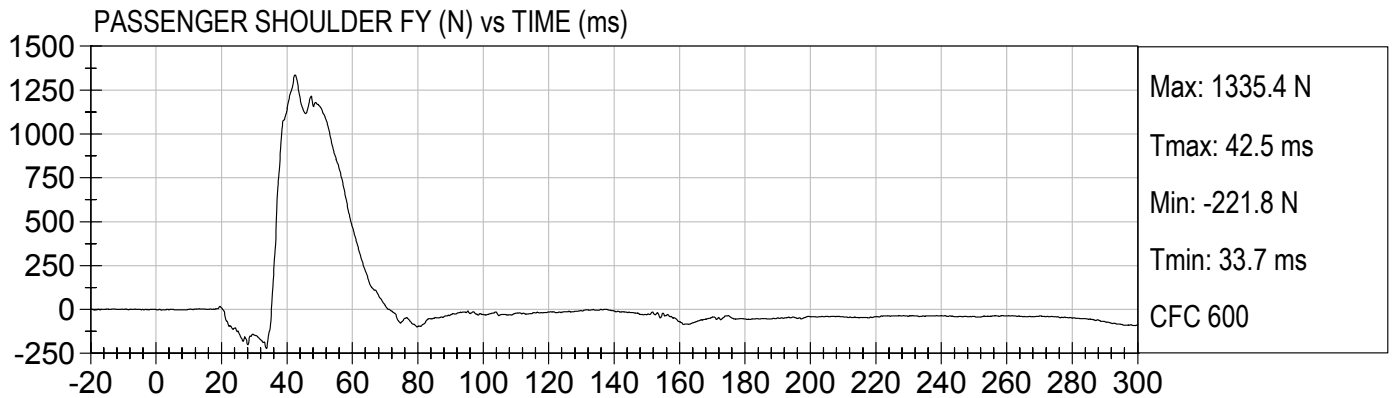
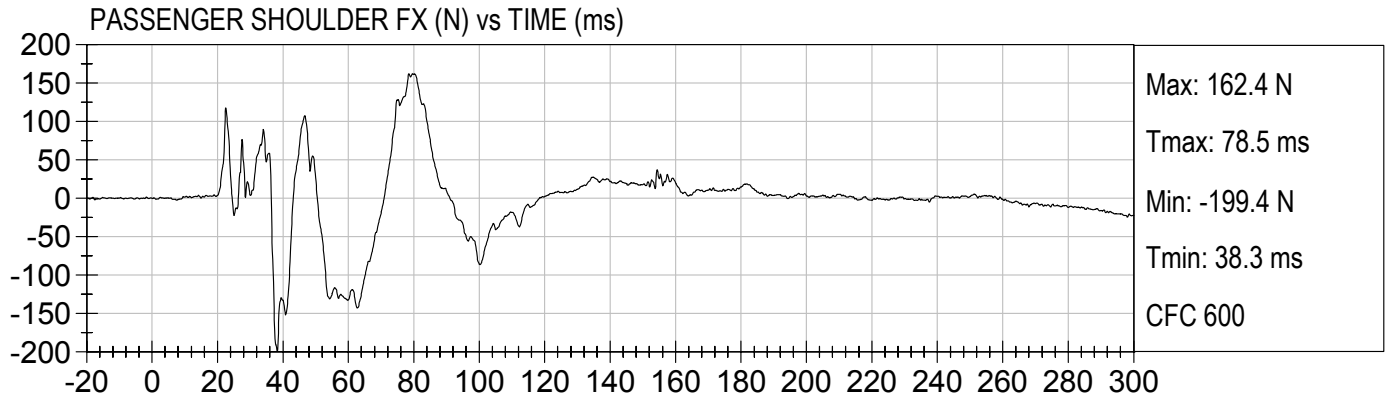


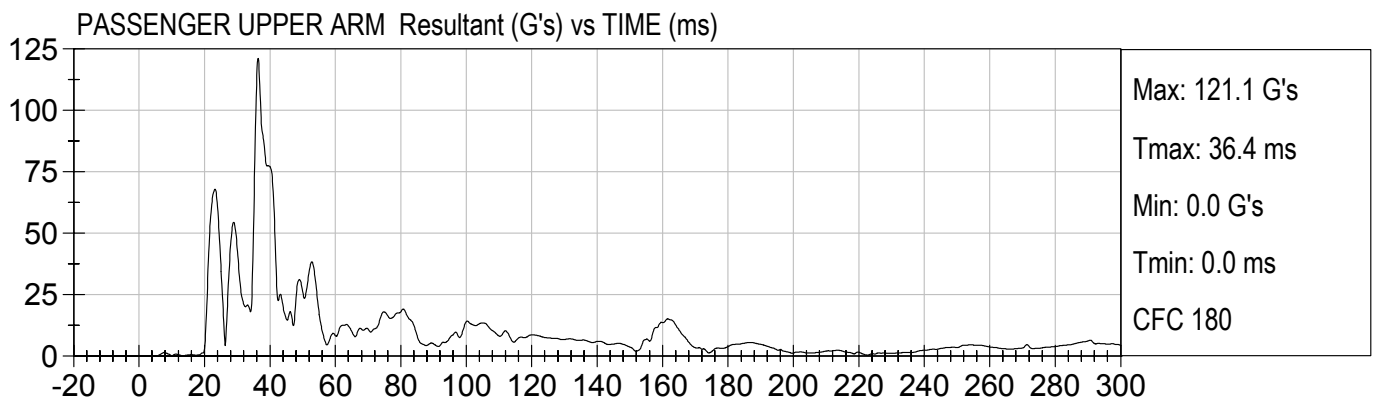
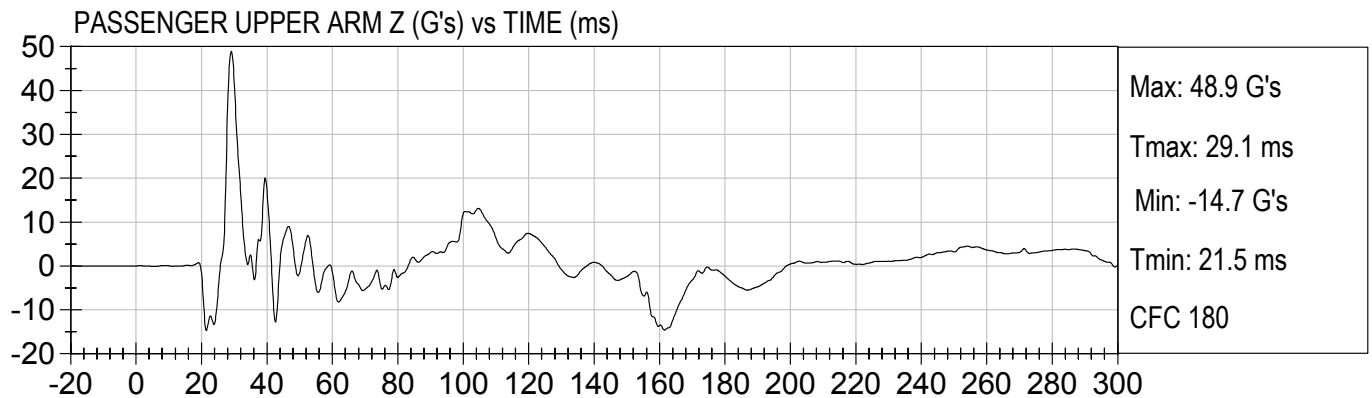
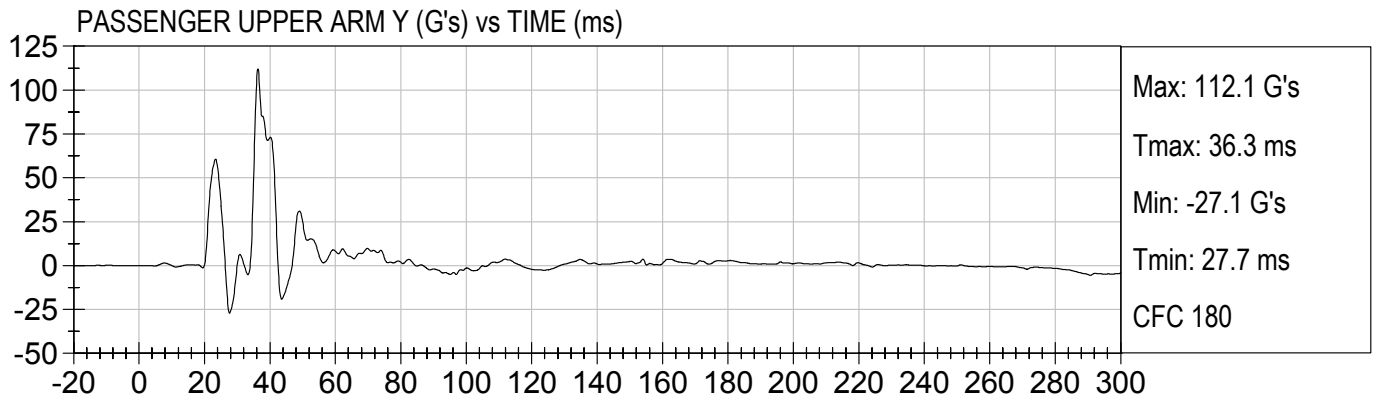
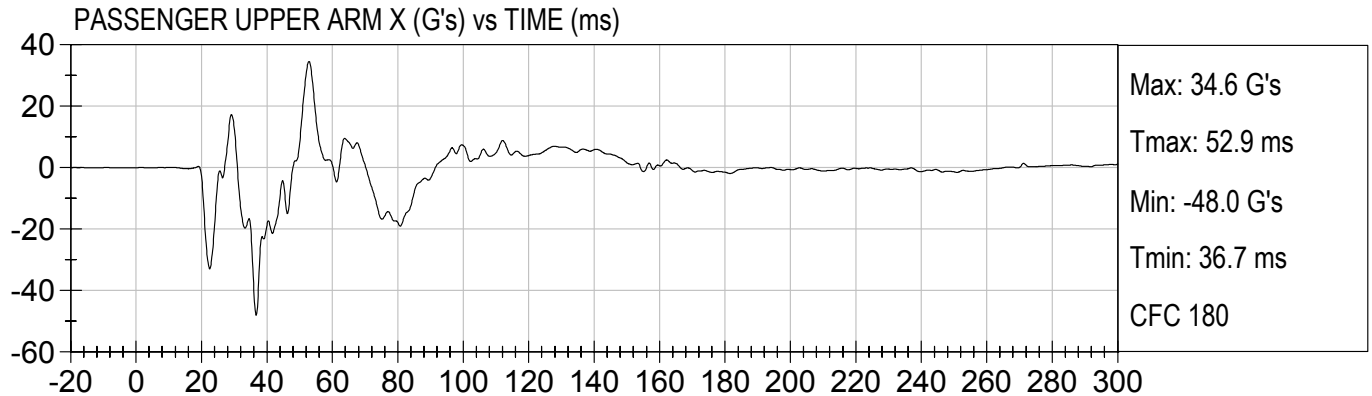


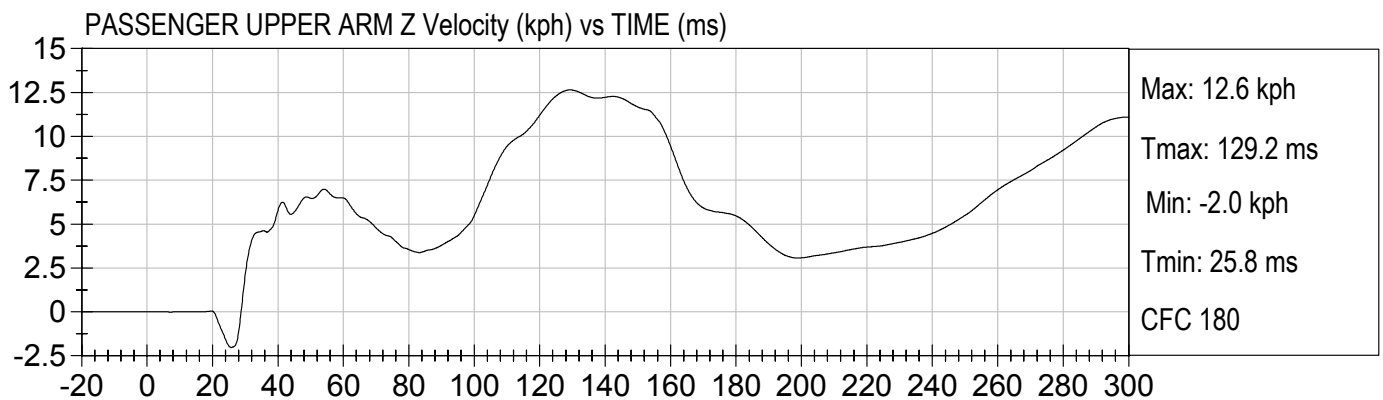
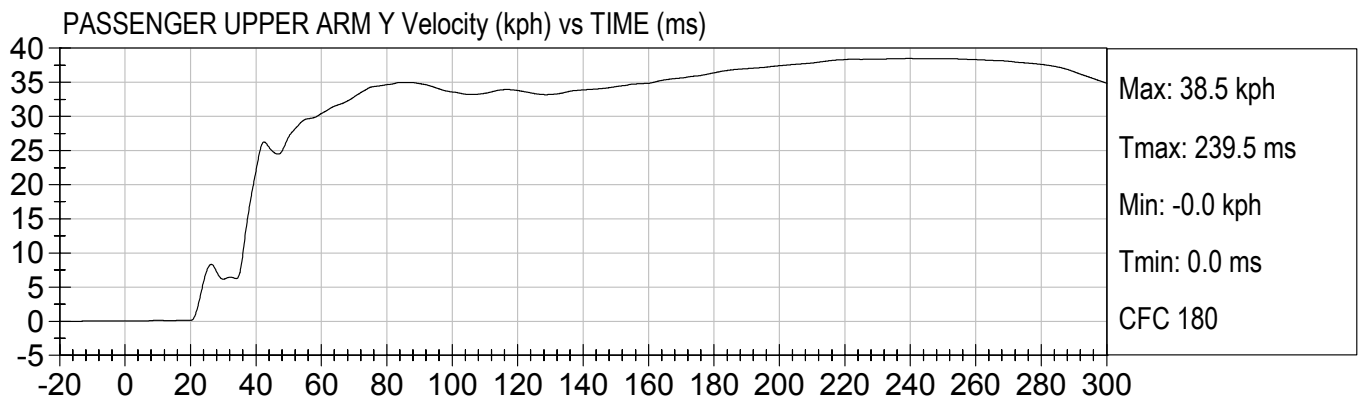
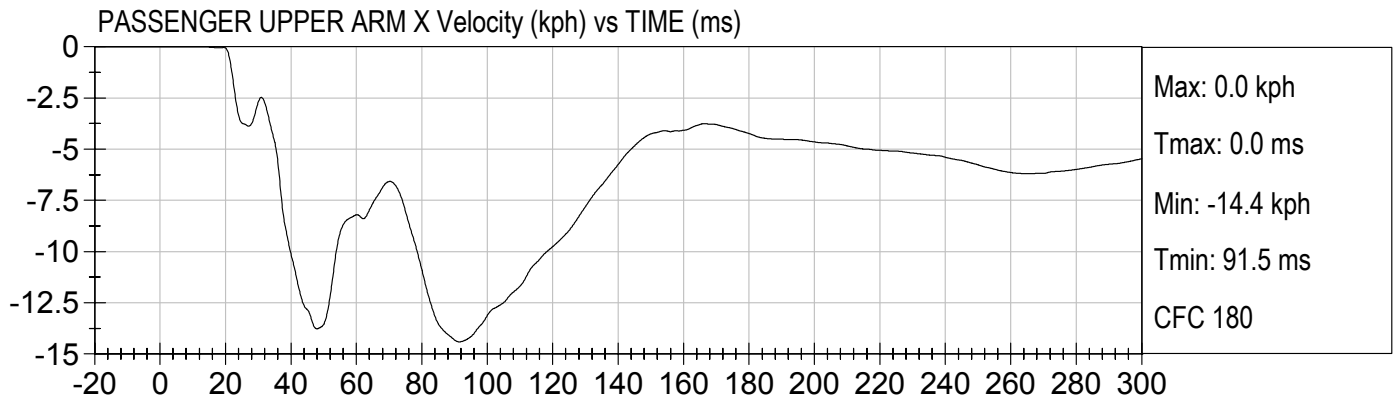


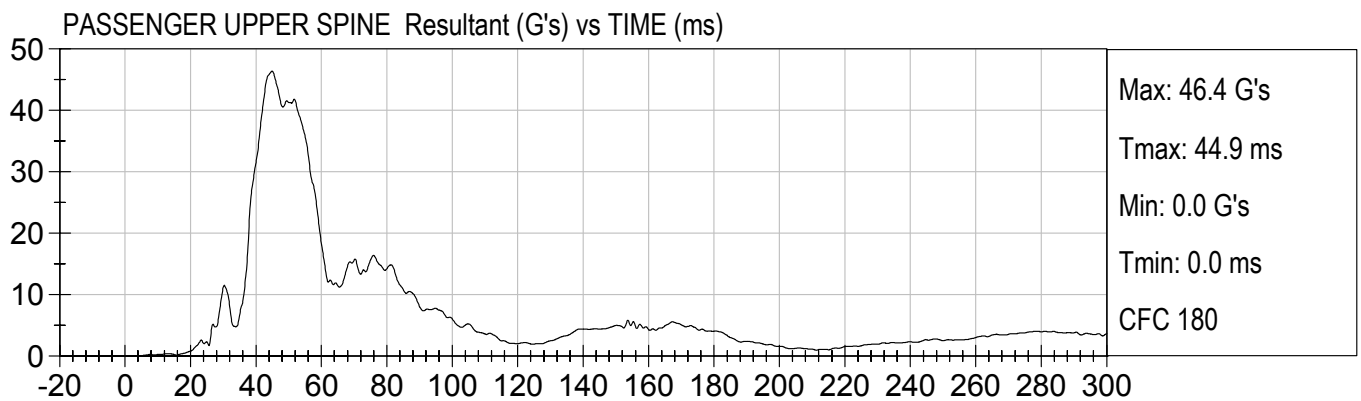
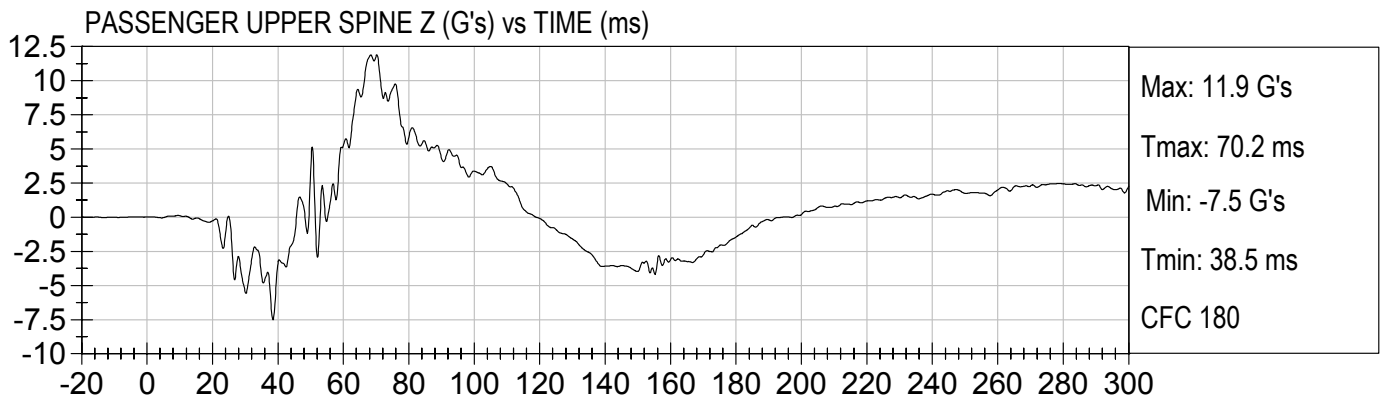
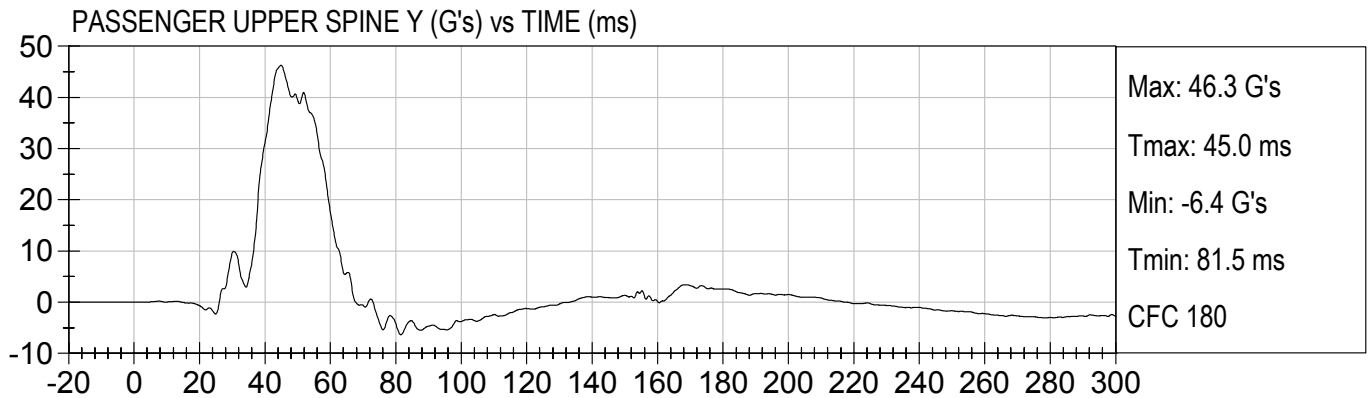
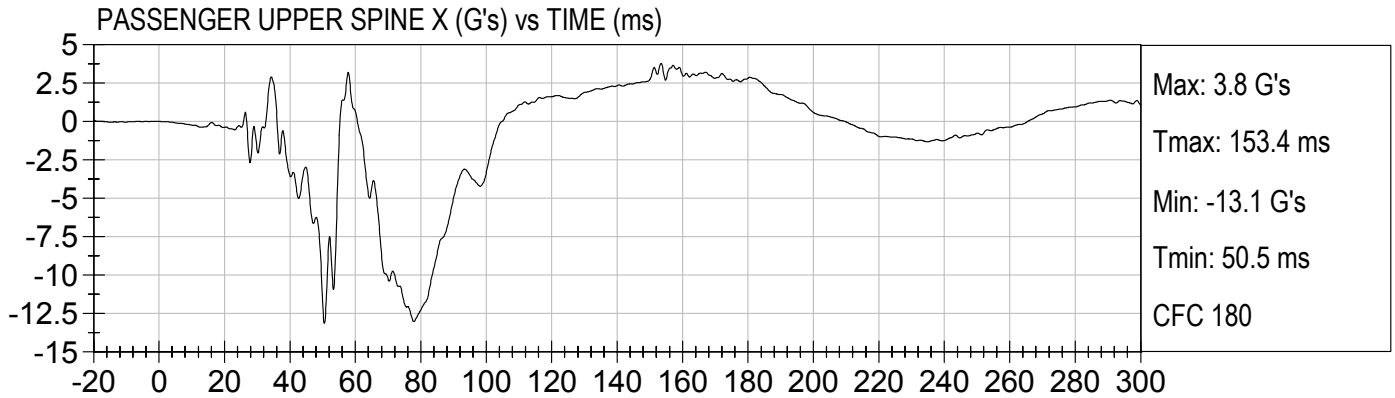


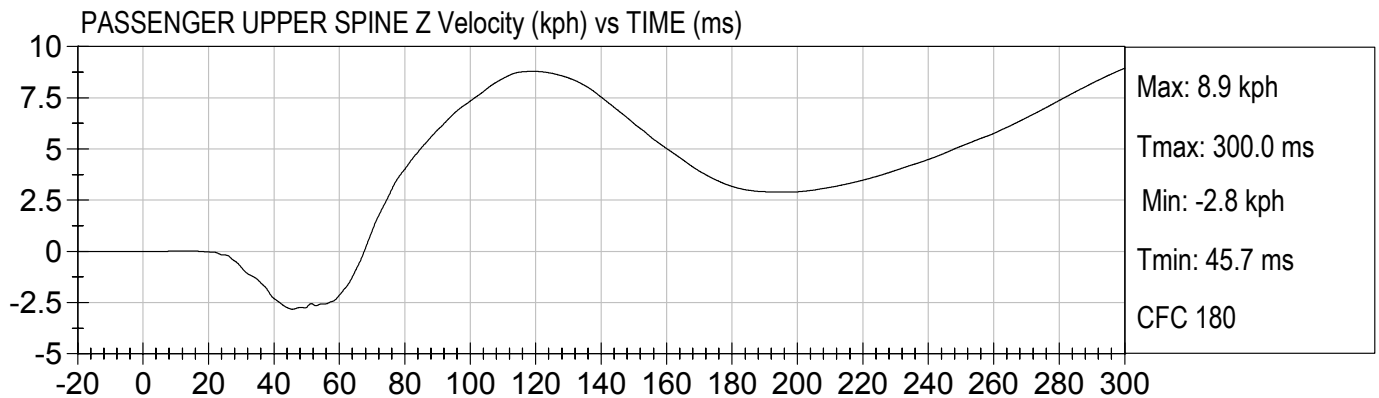
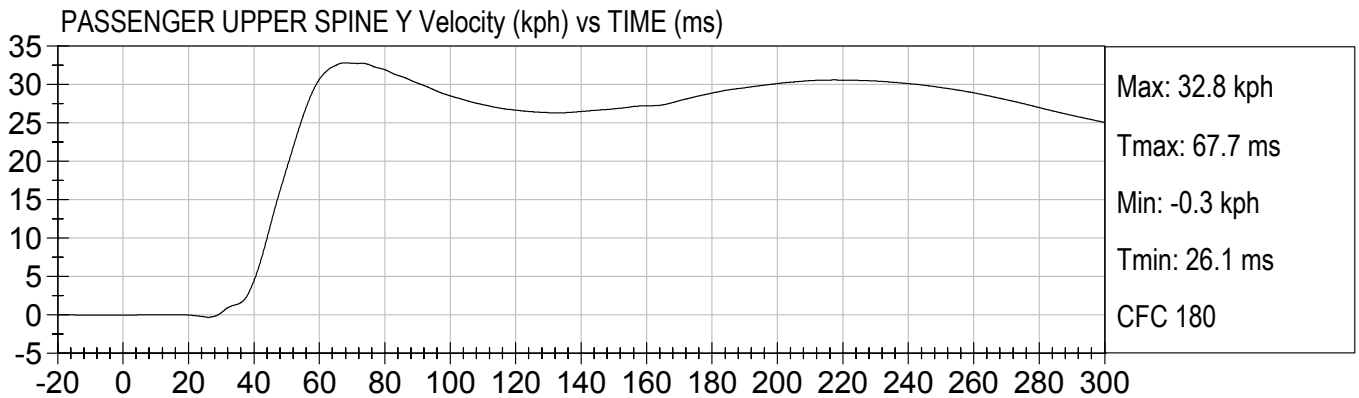
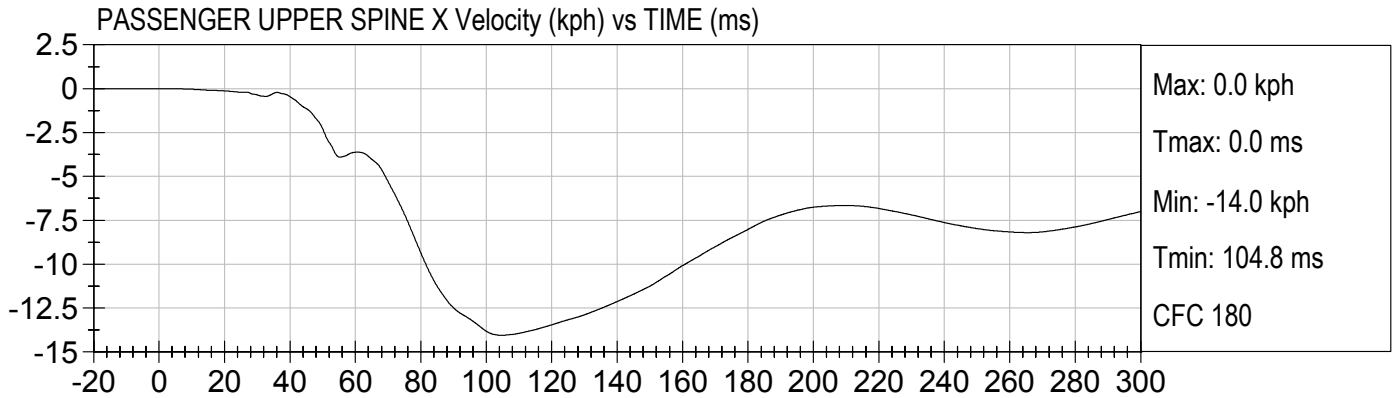


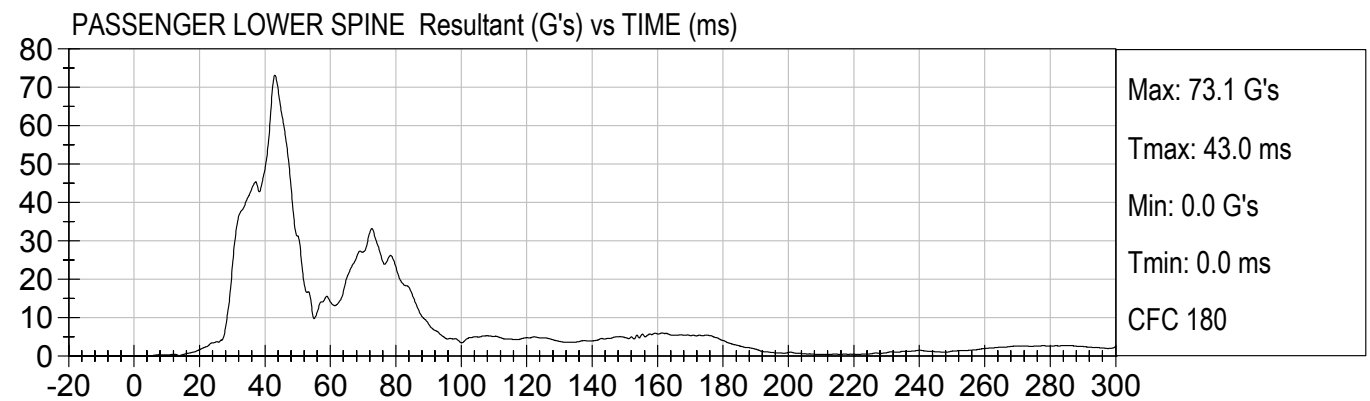
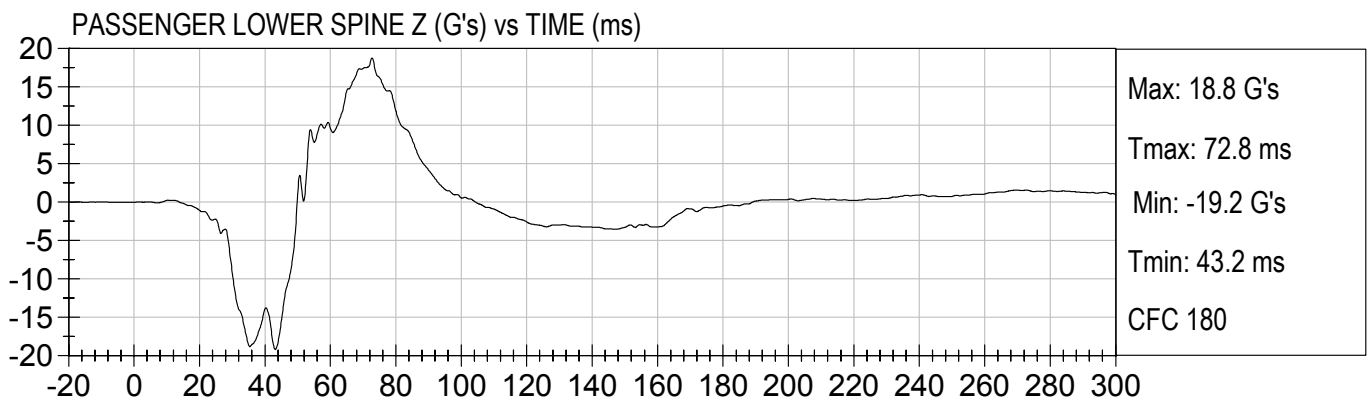
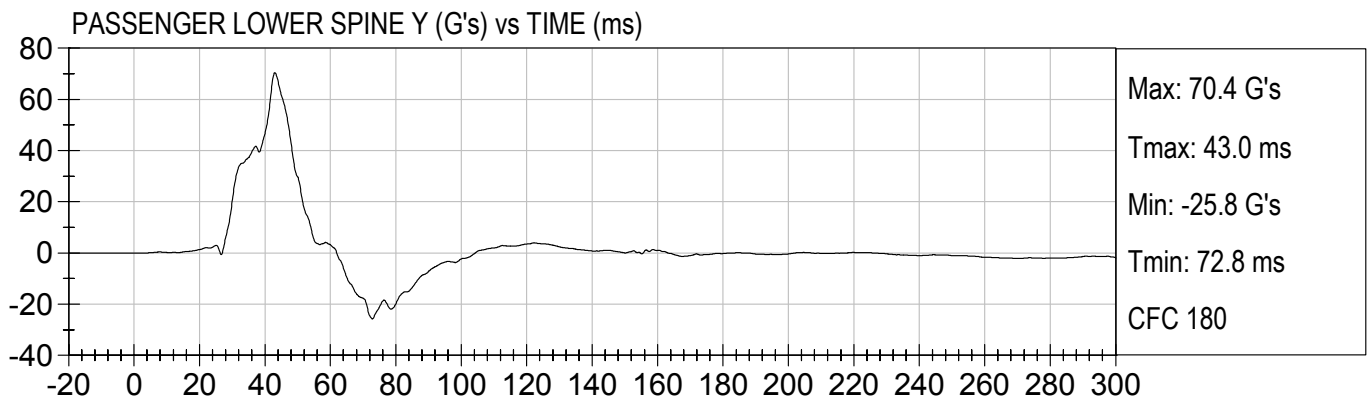
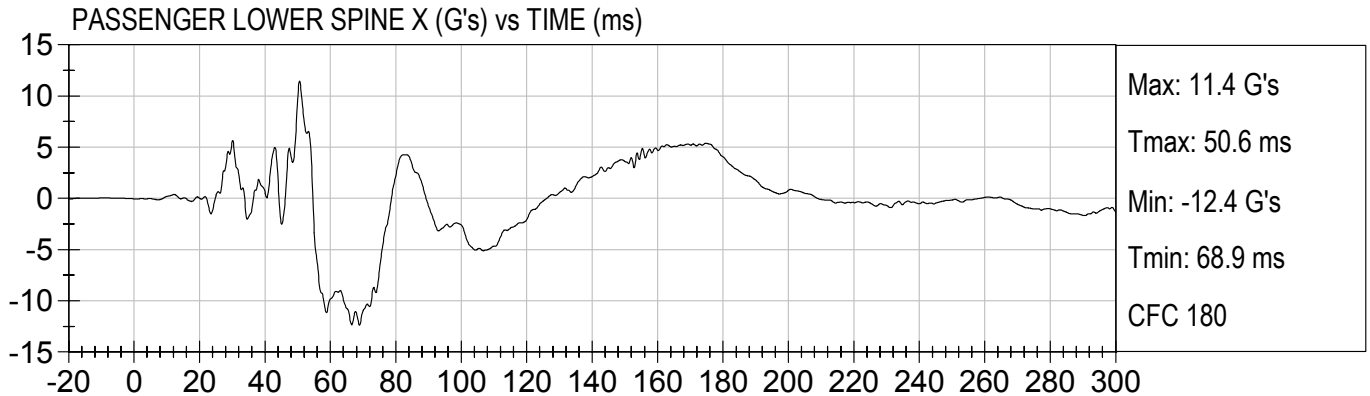


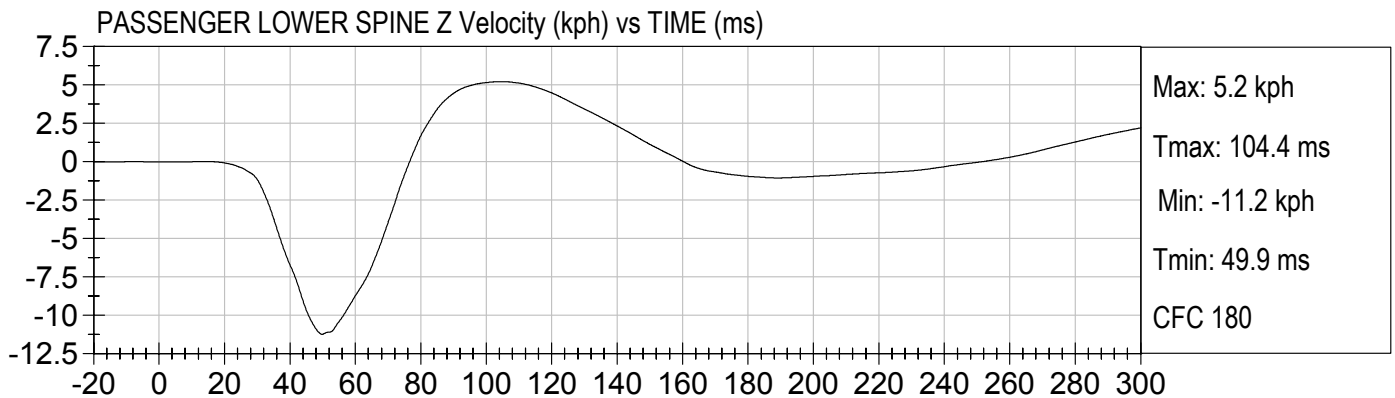
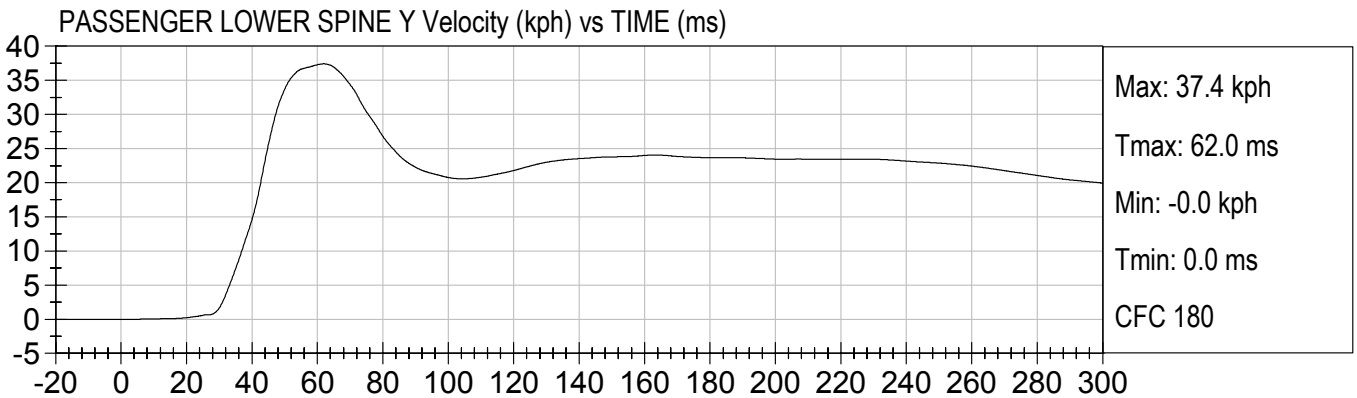
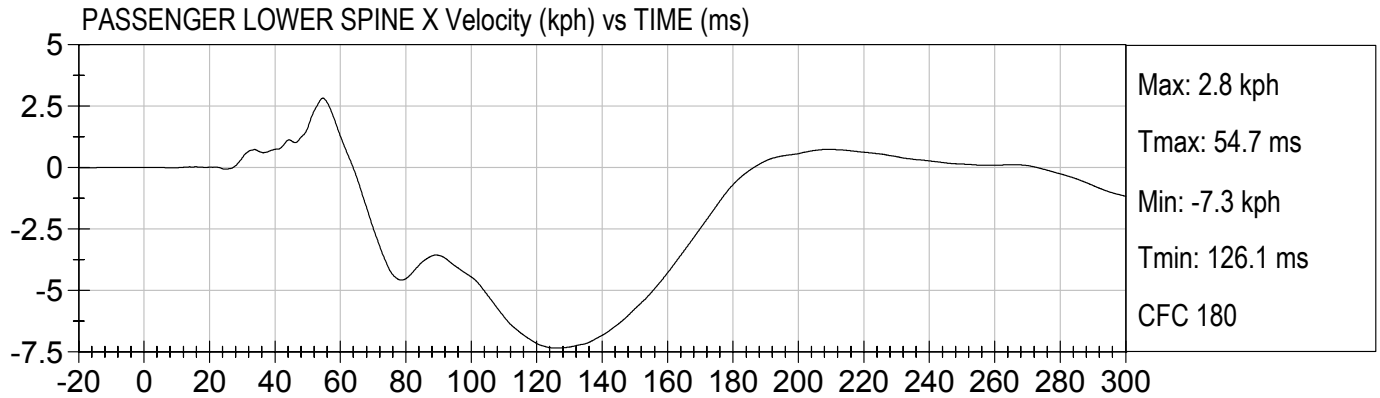


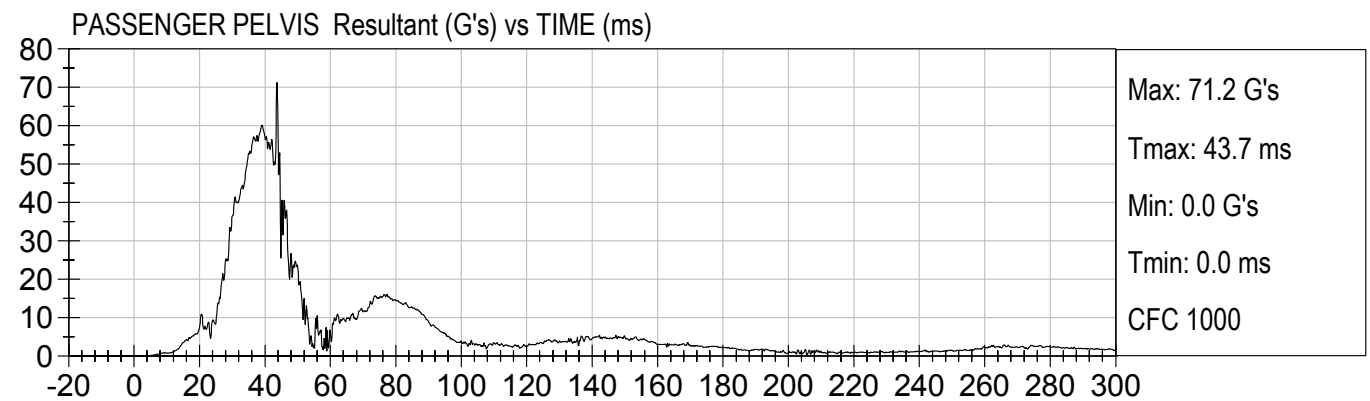
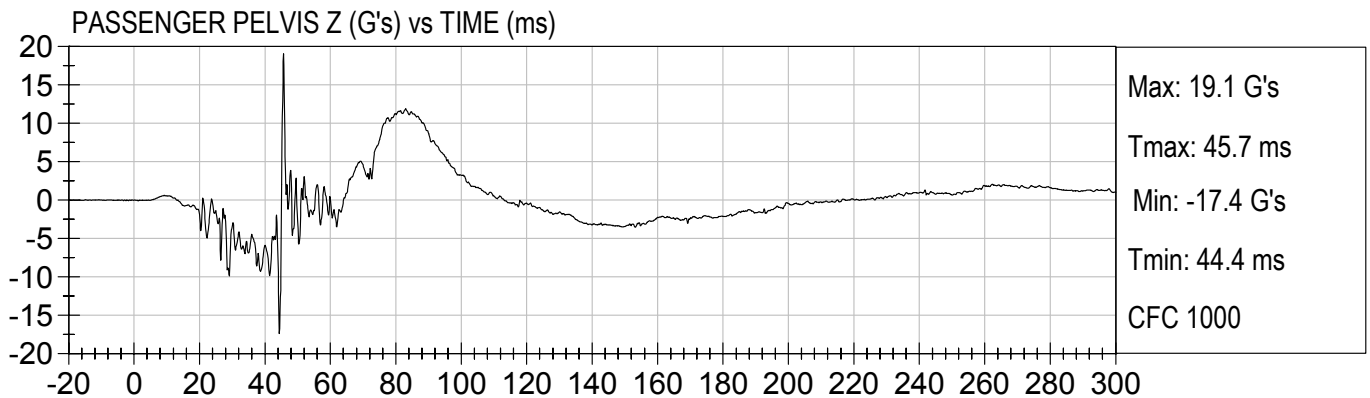
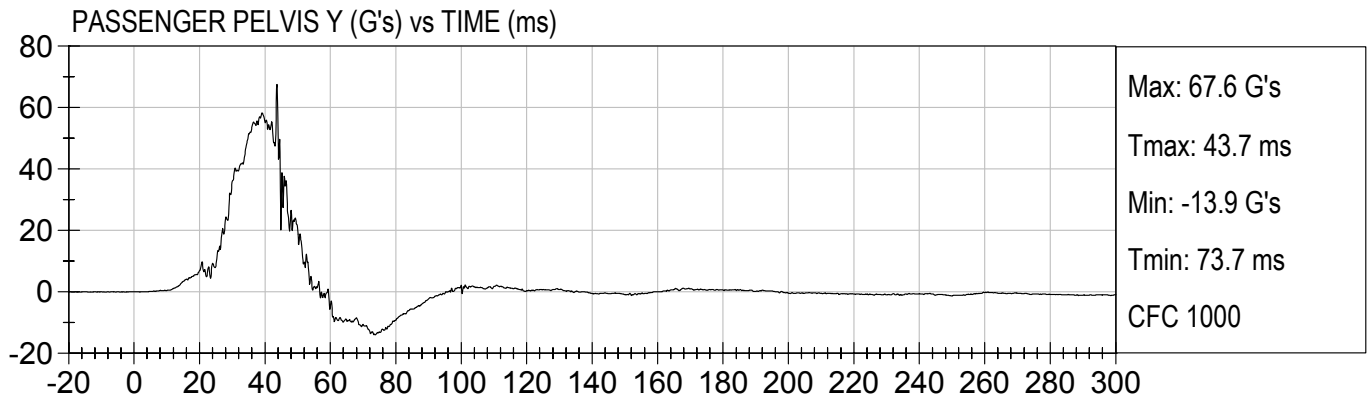
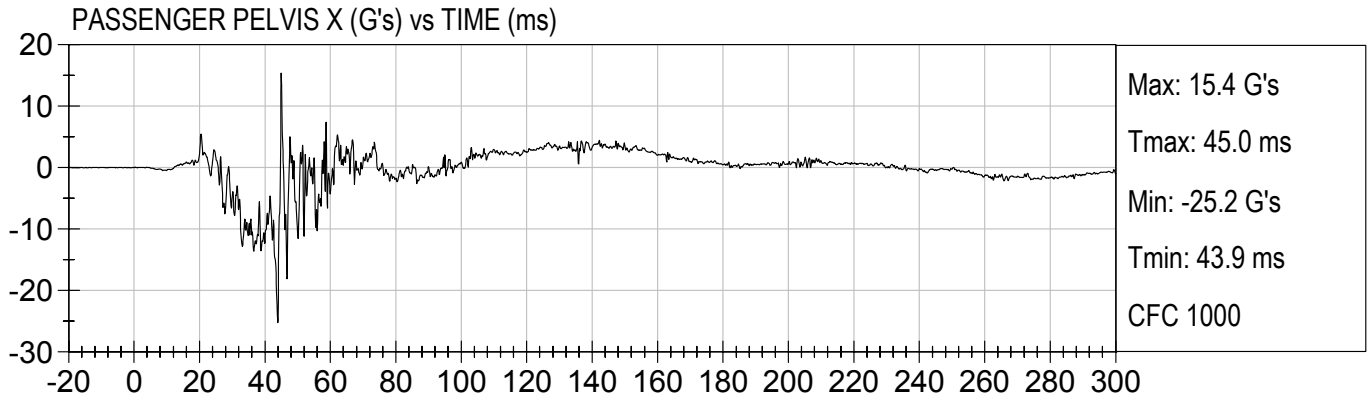


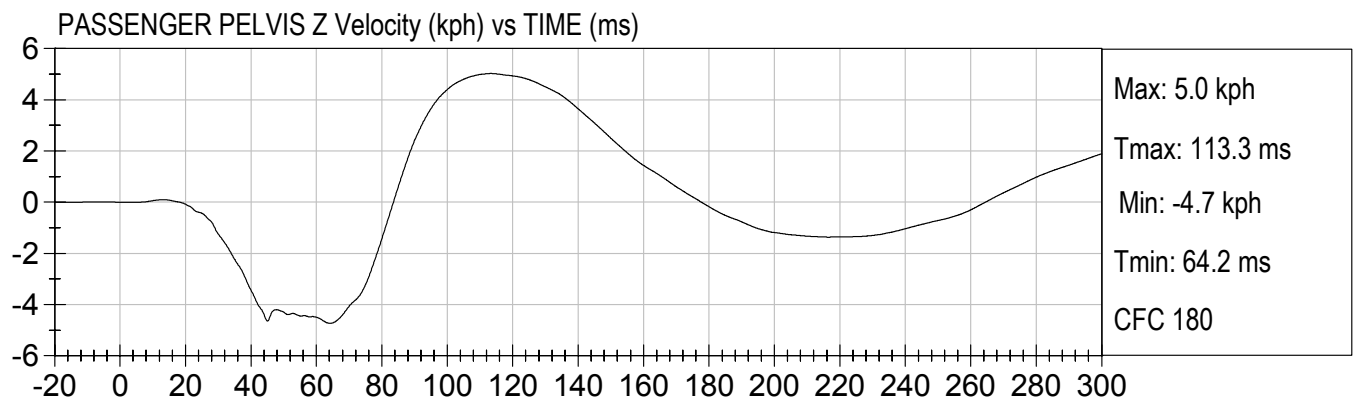
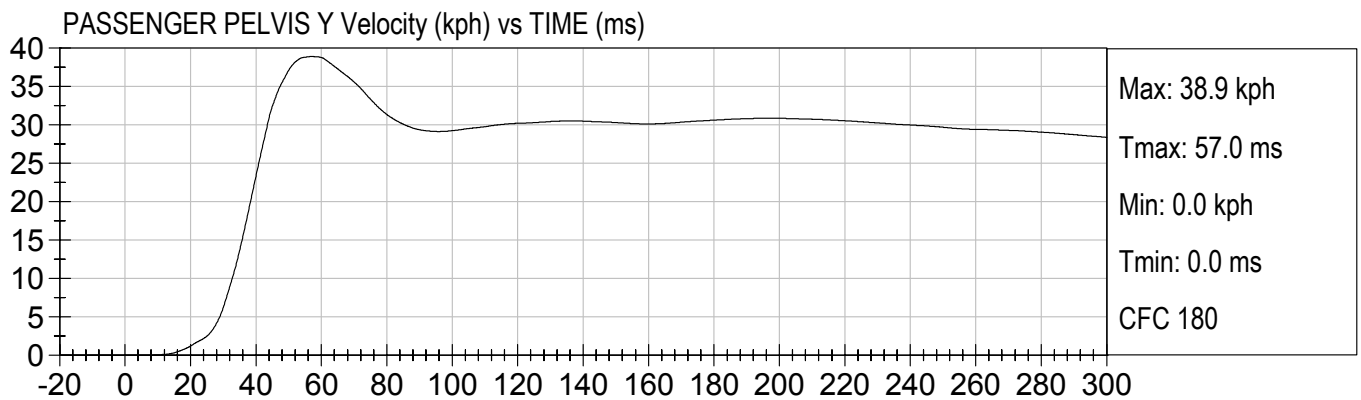
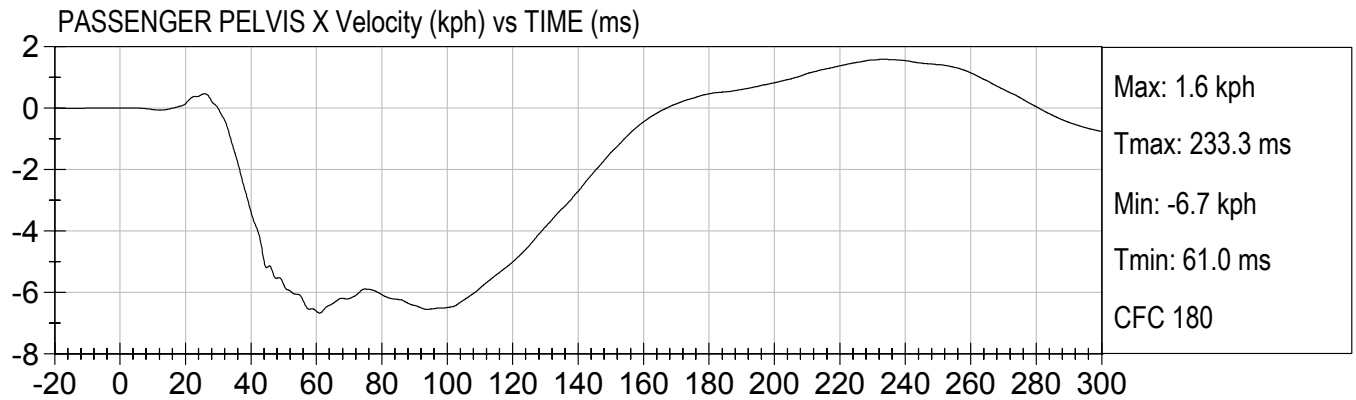






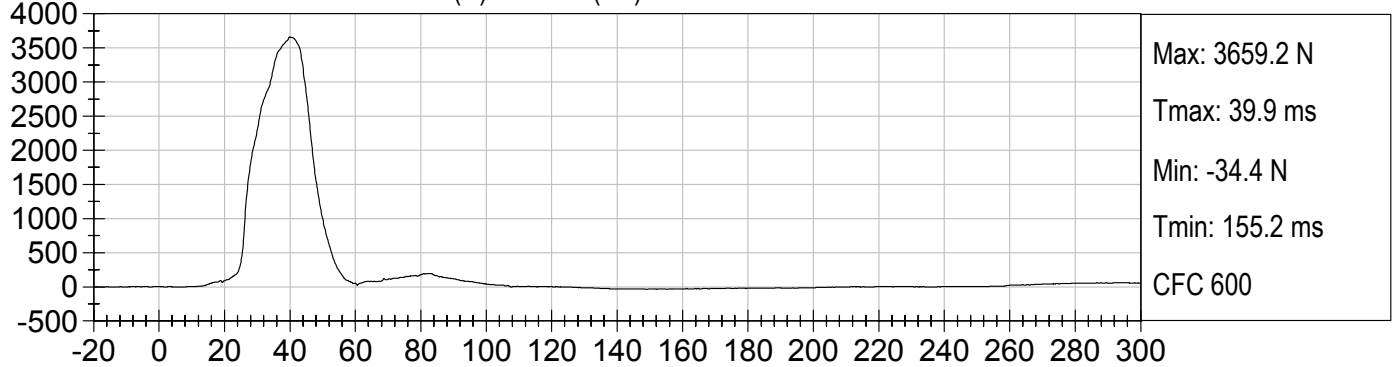




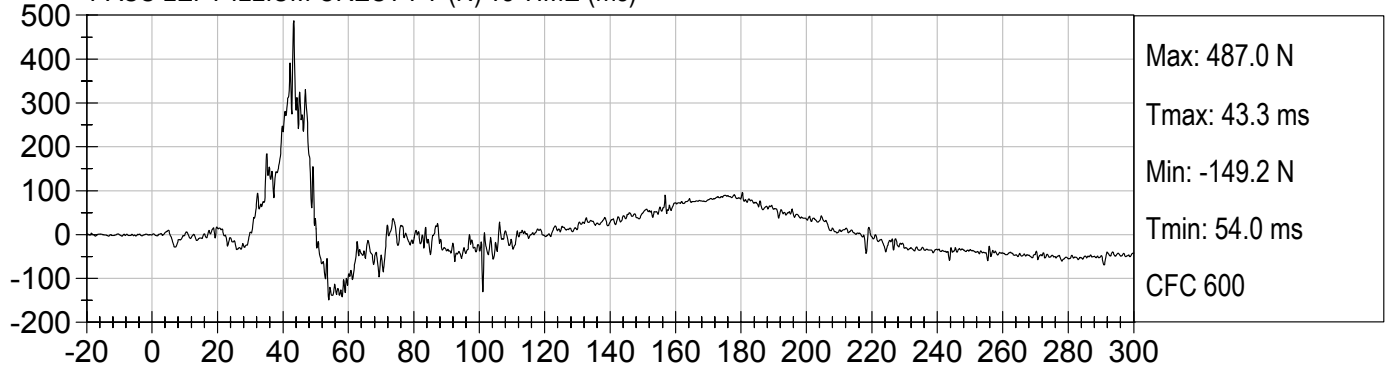




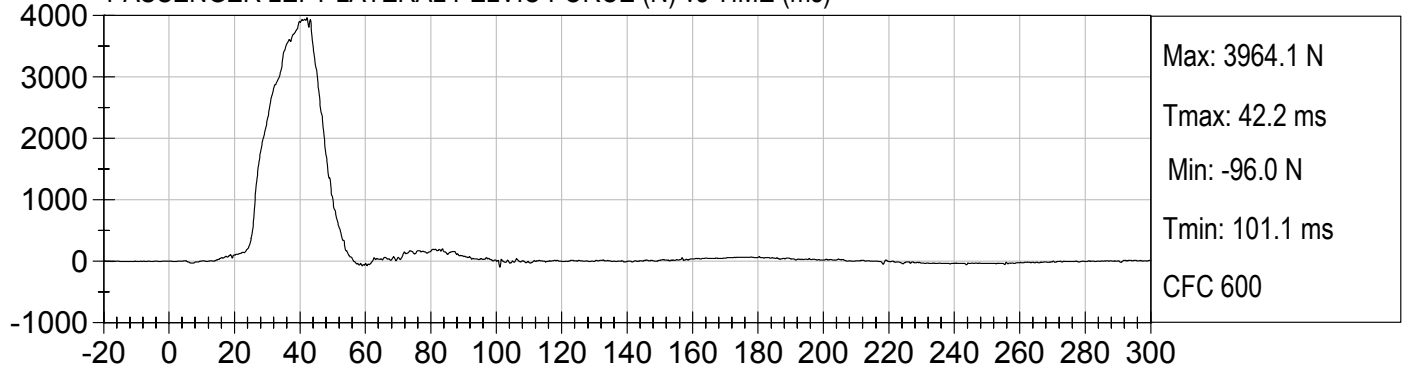
PASS LEFT ACETABULUM FY (N) vs TIME (ms)

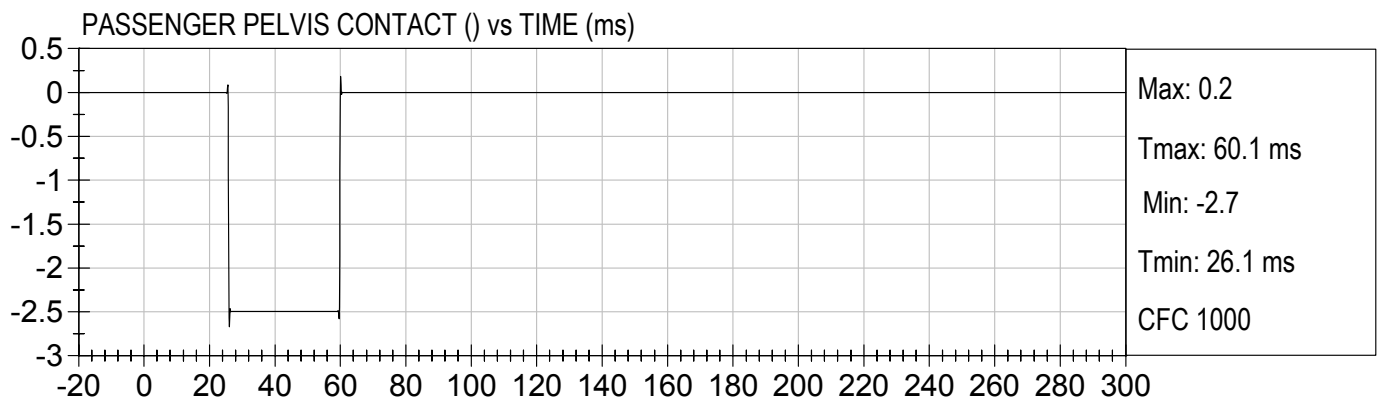
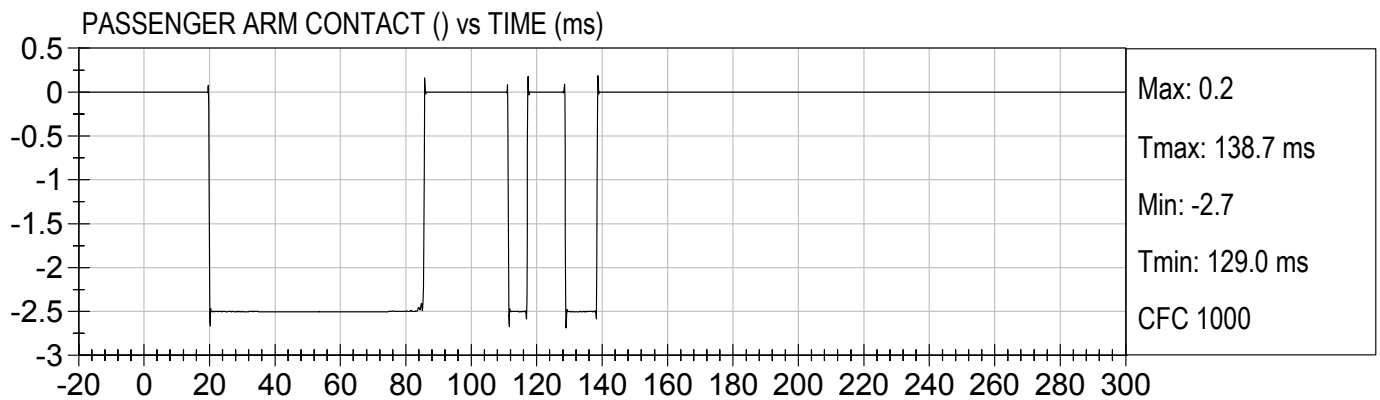
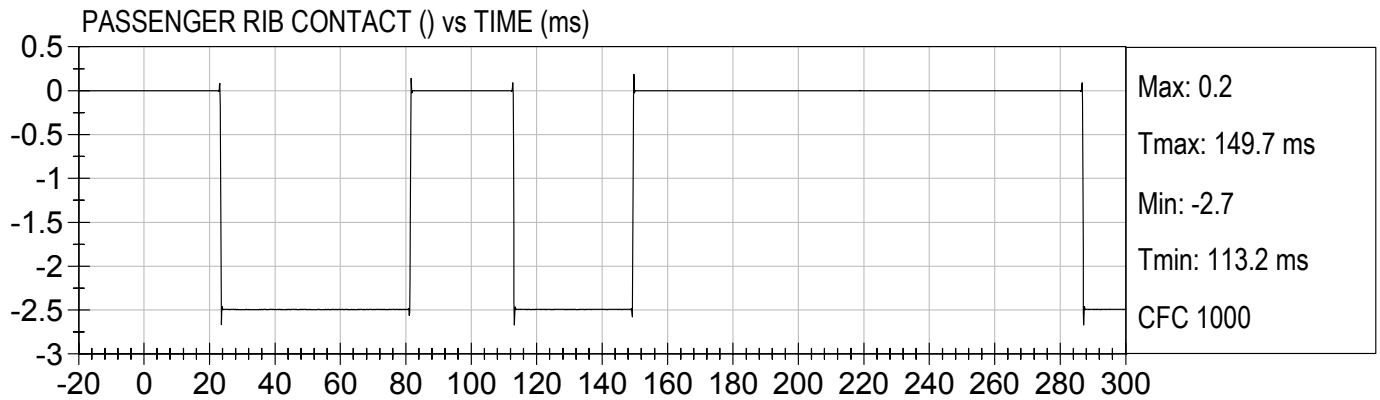


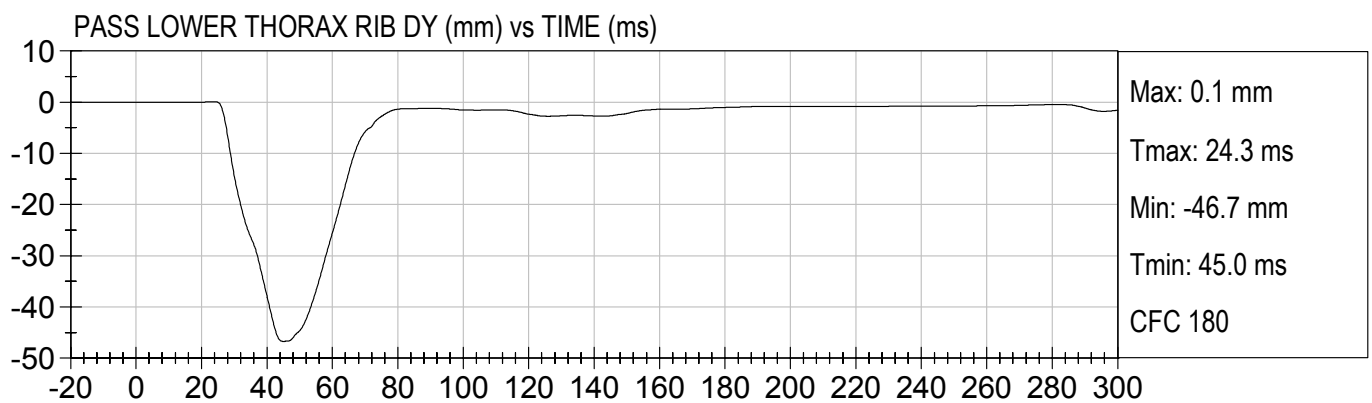
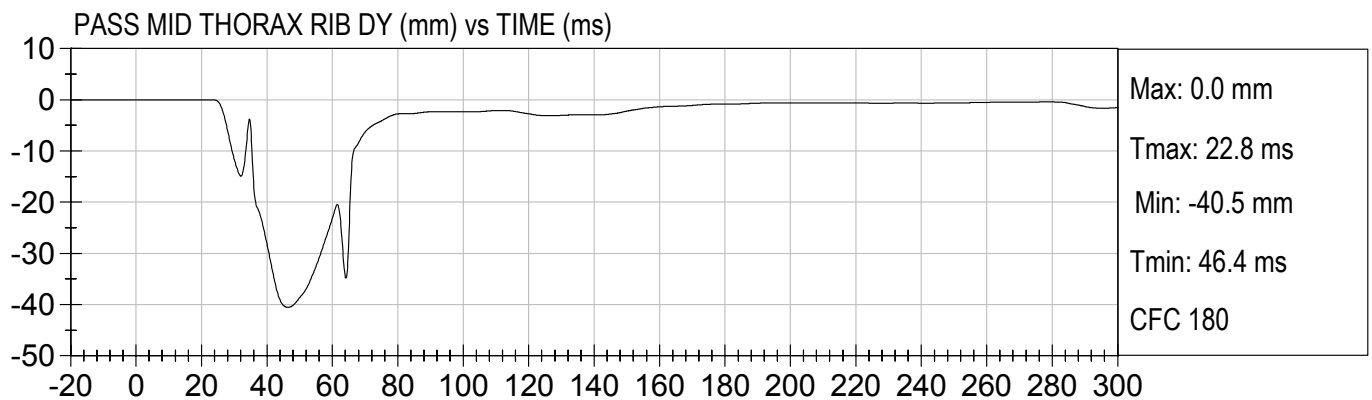
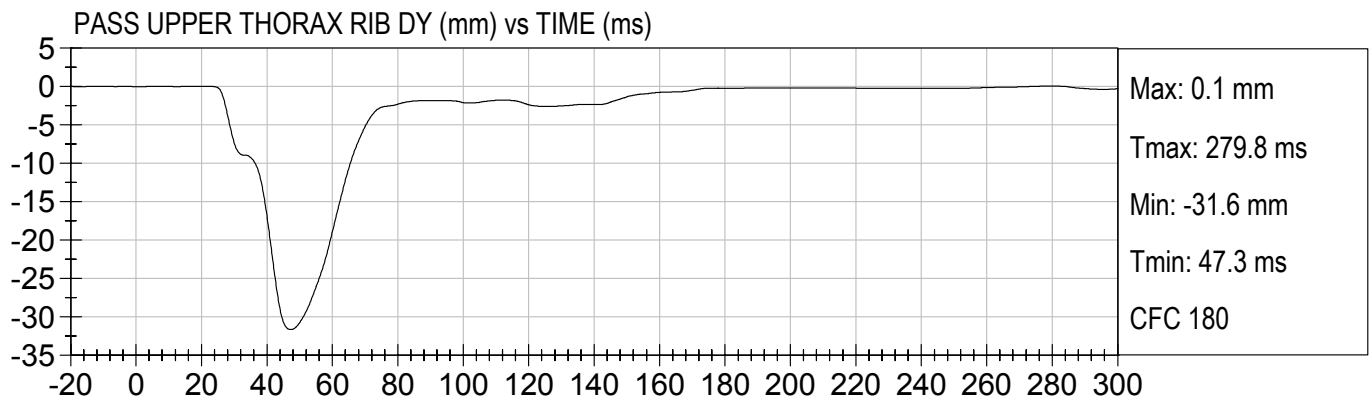
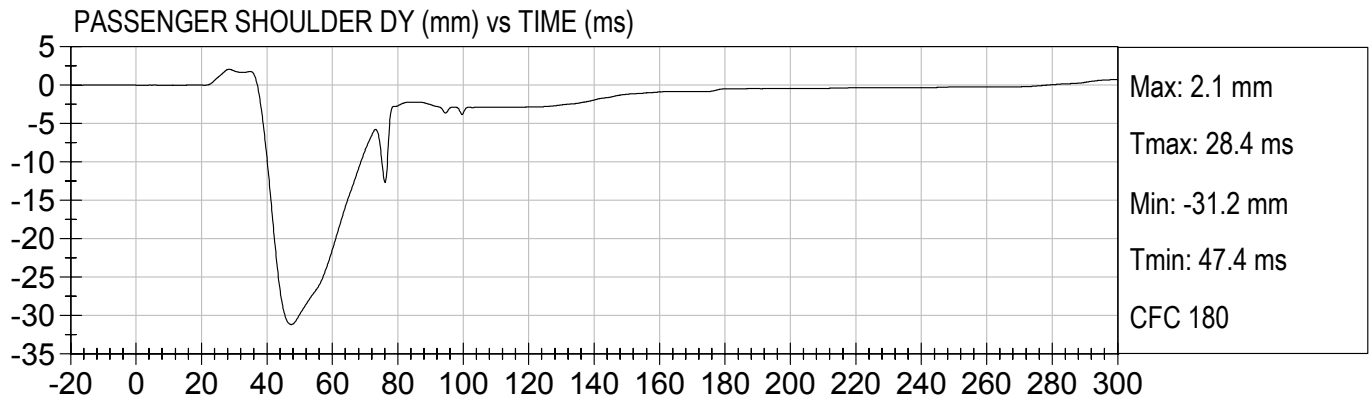
PASS LEFT ILLIUM CREST FY (N) vs TIME (ms)

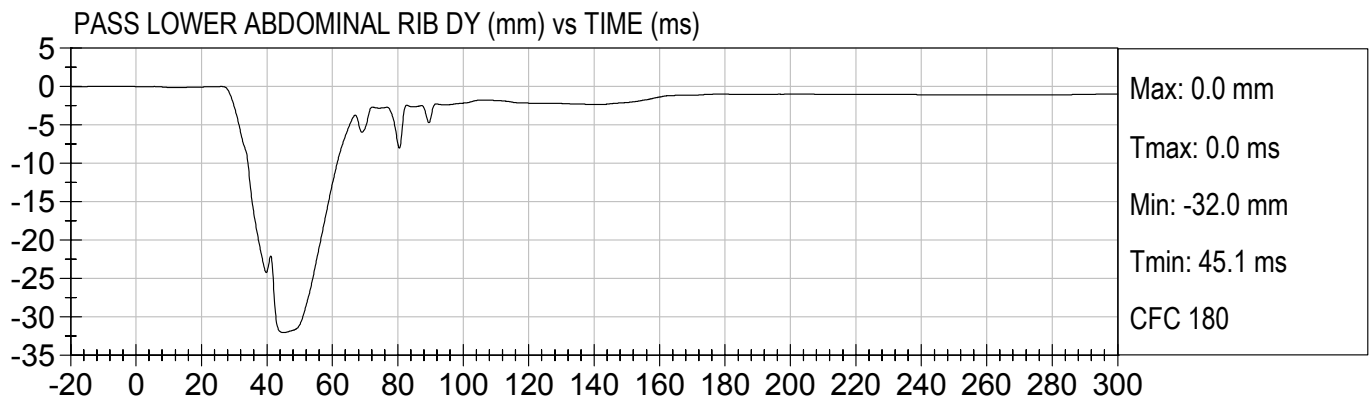
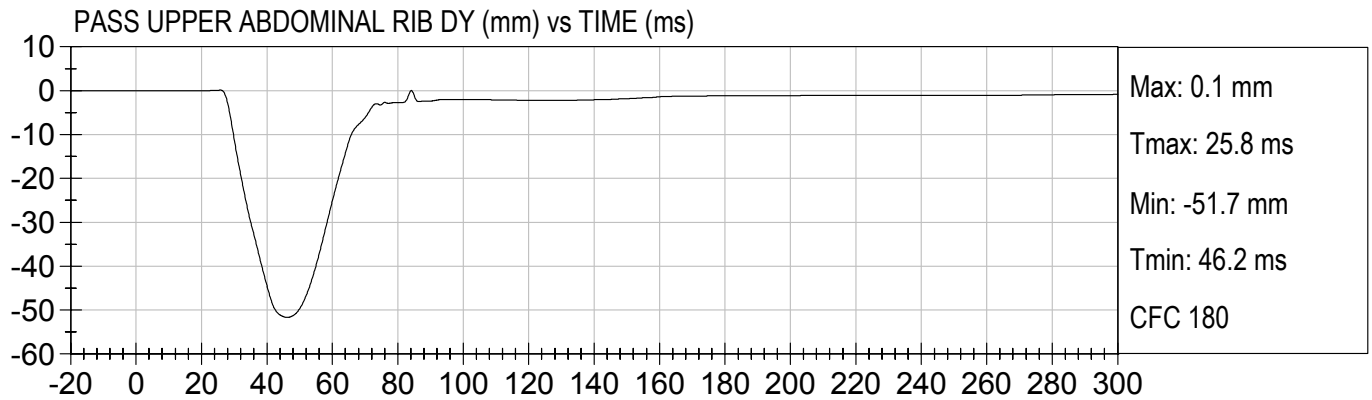


PASSENGER LEFT LATERAL PELVIC FORCE (N) vs TIME (ms)



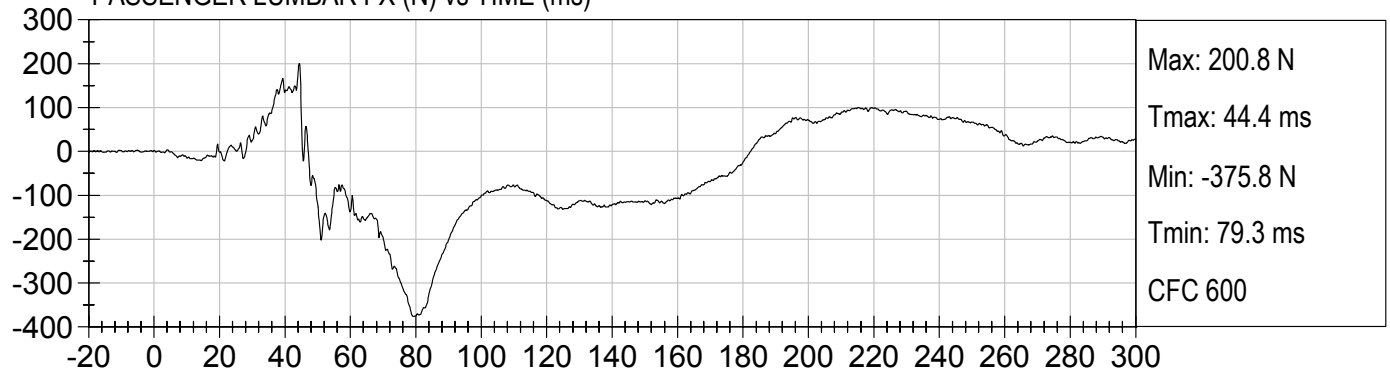




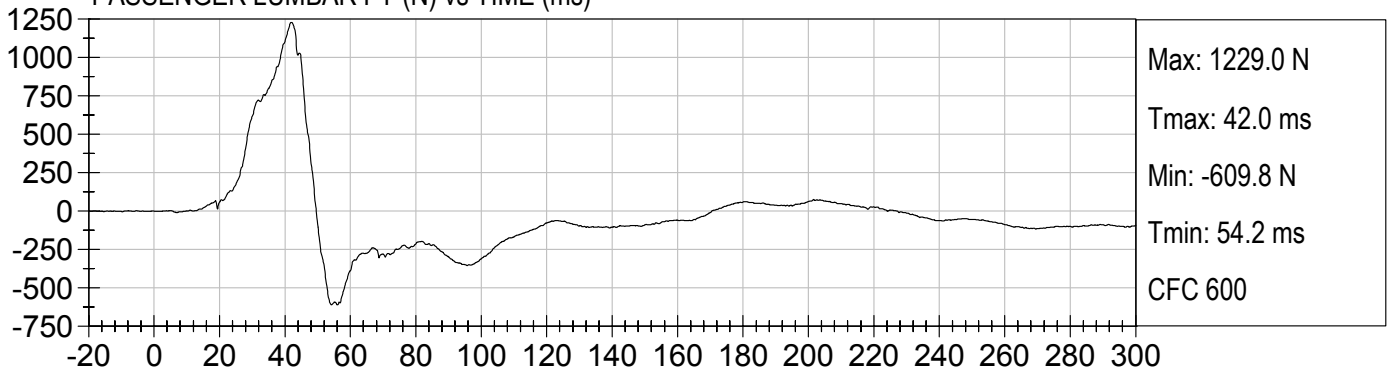




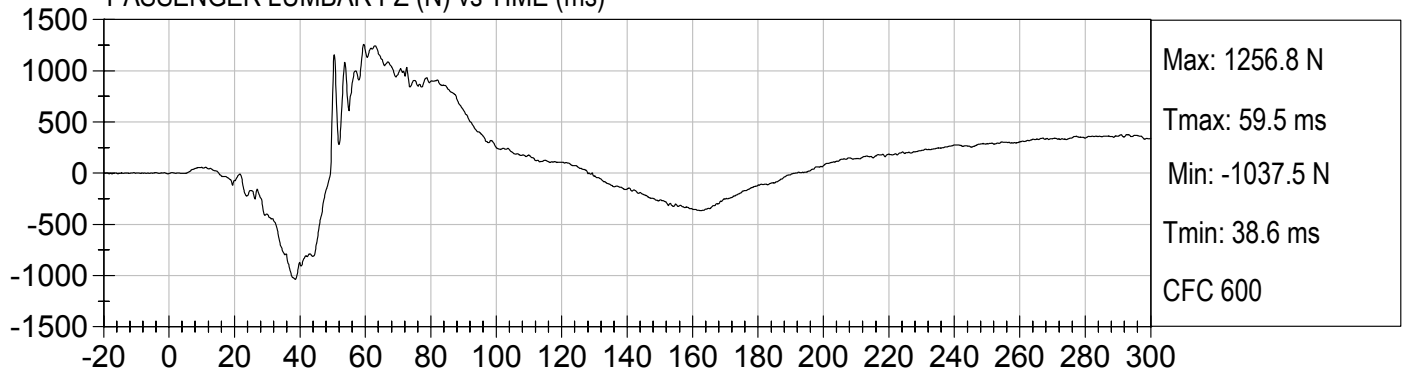
PASSENGER LUMBAR FX (N) vs TIME (ms)



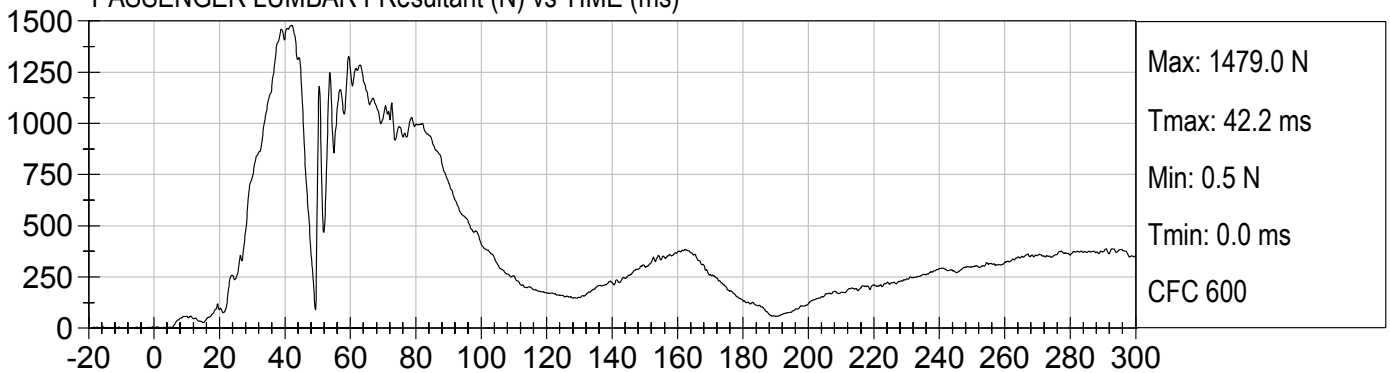
PASSENGER LUMBAR FY (N) vs TIME (ms)

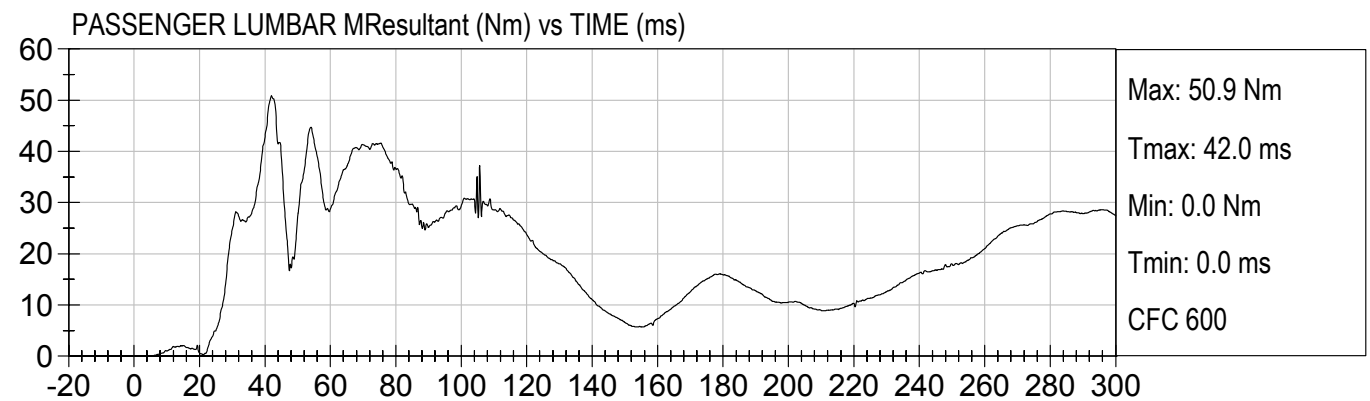
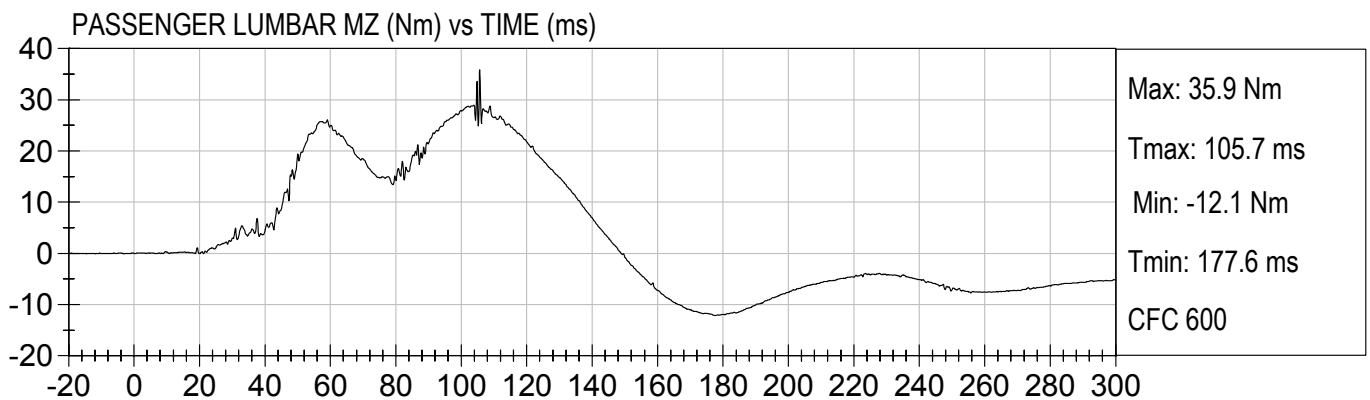
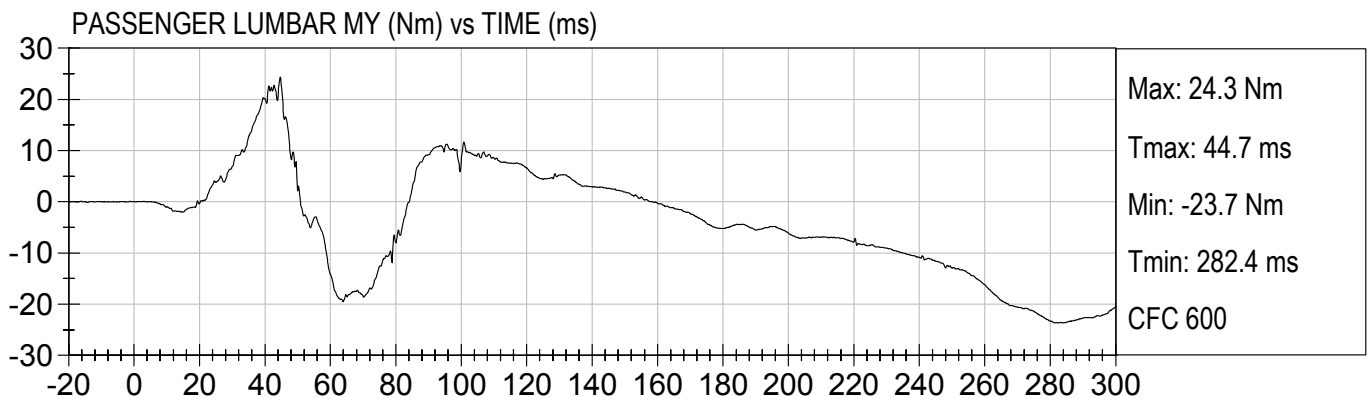
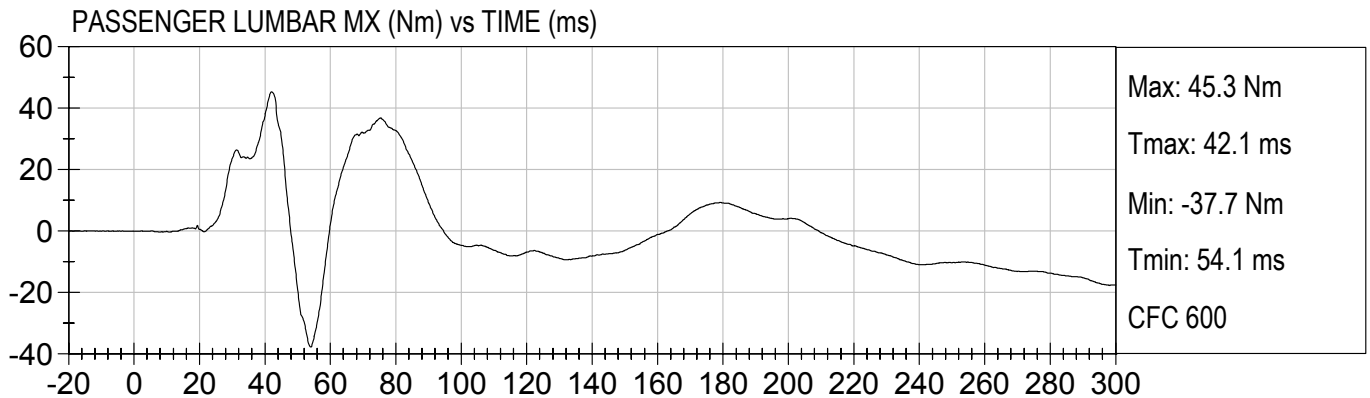


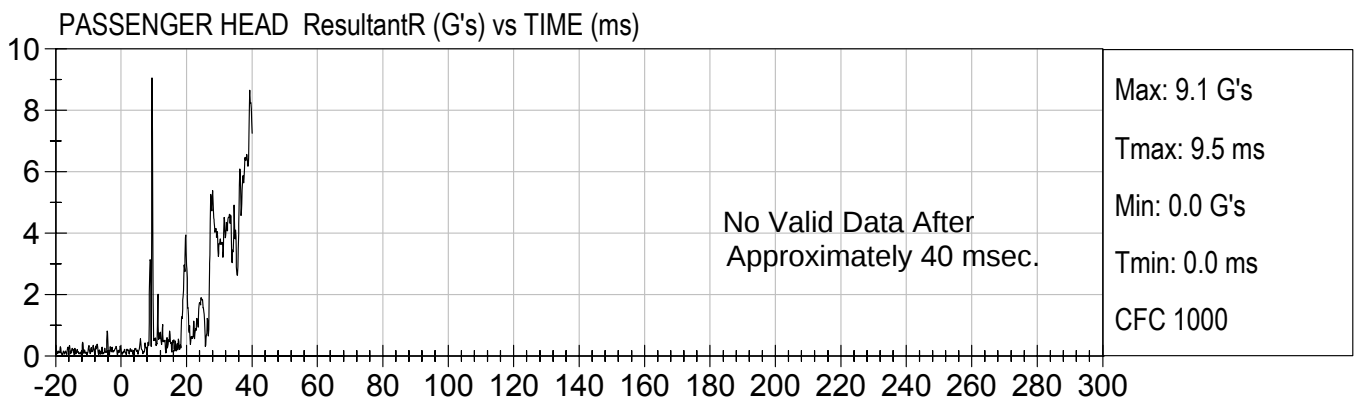
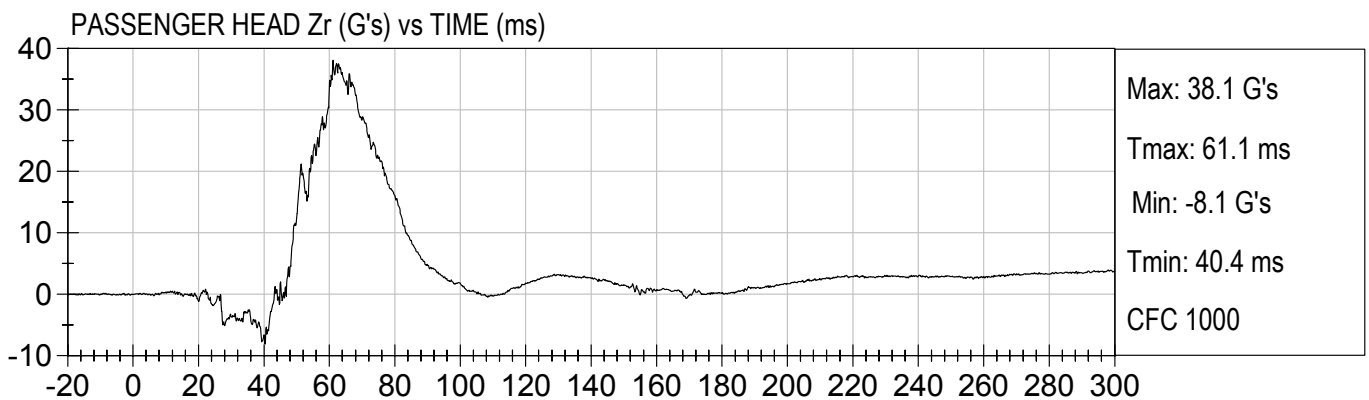
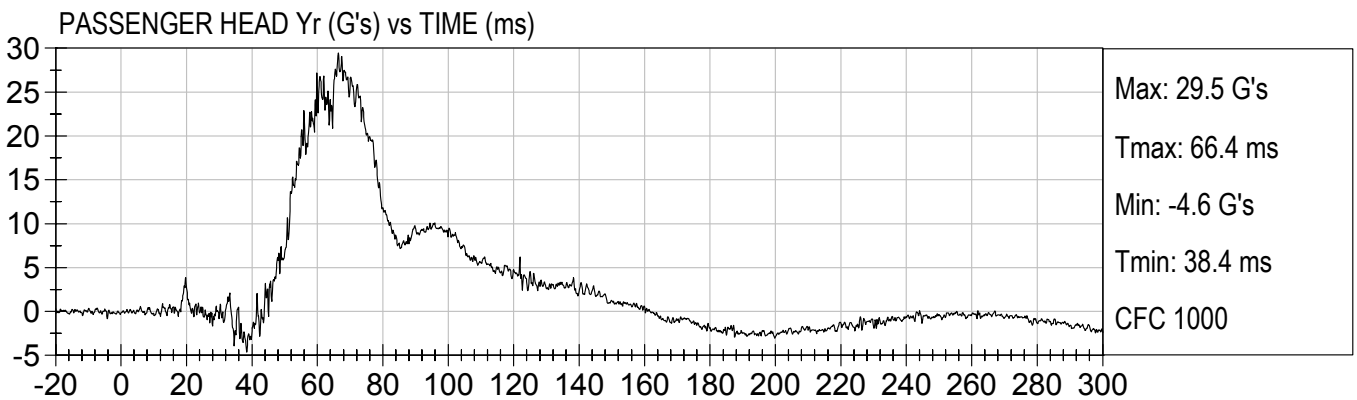
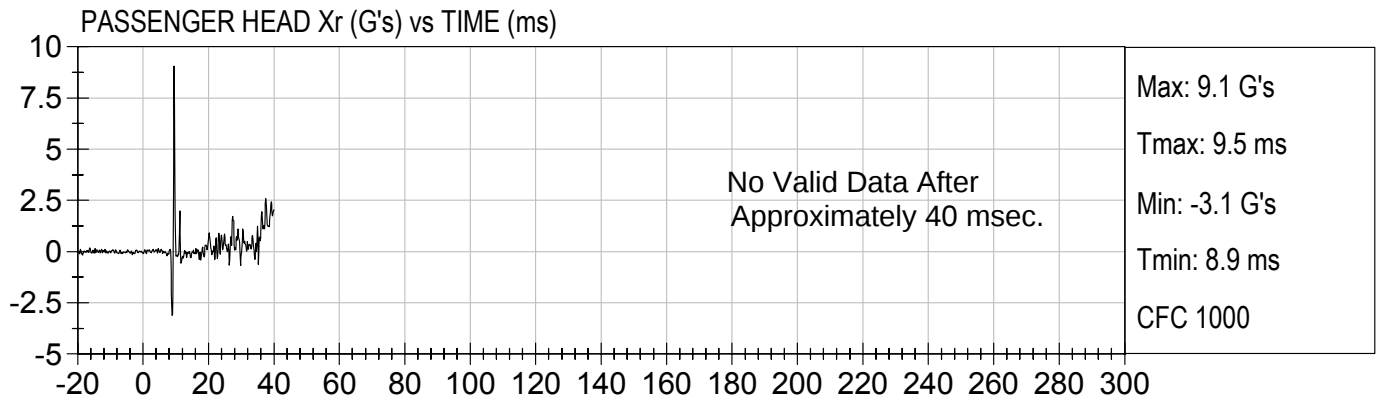
PASSENGER LUMBAR FZ (N) vs TIME (ms)

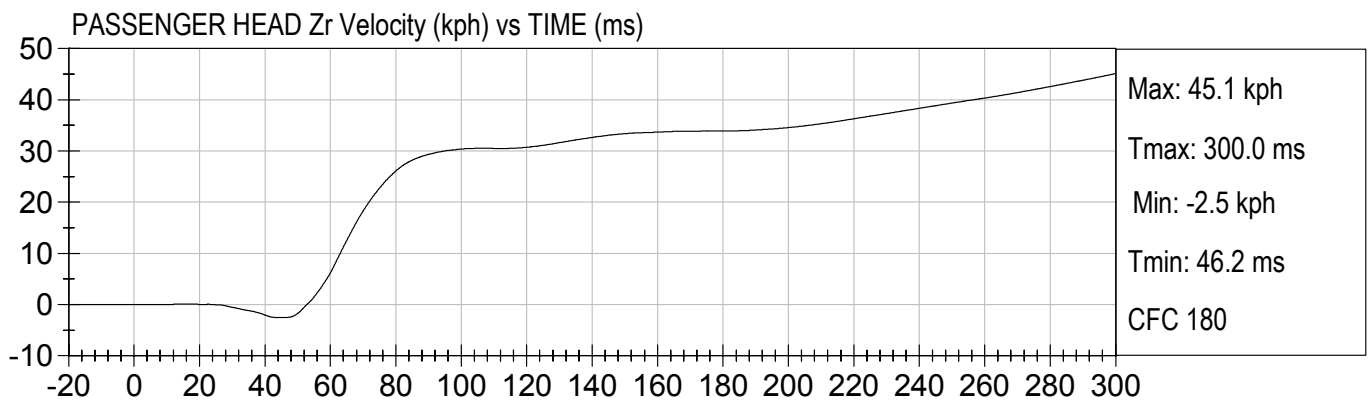
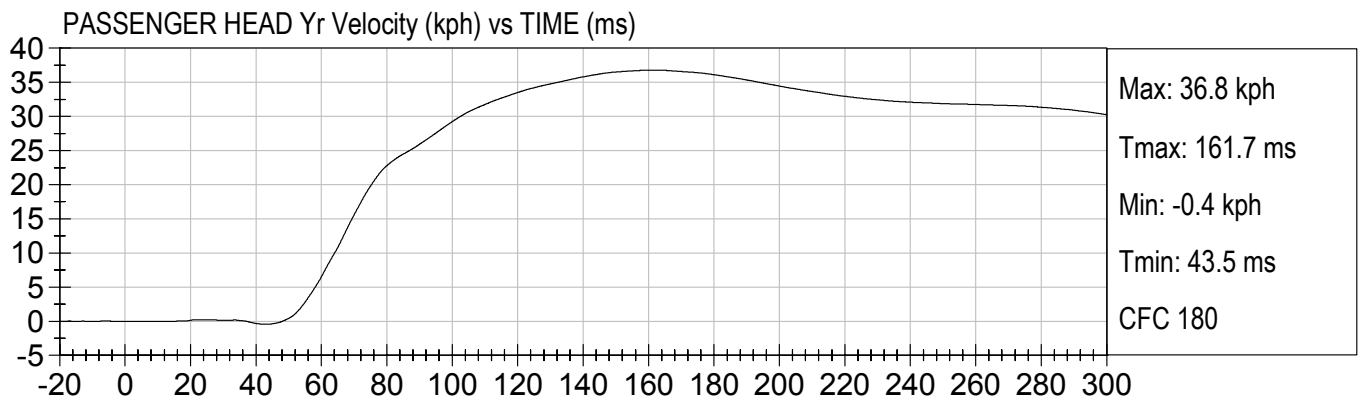
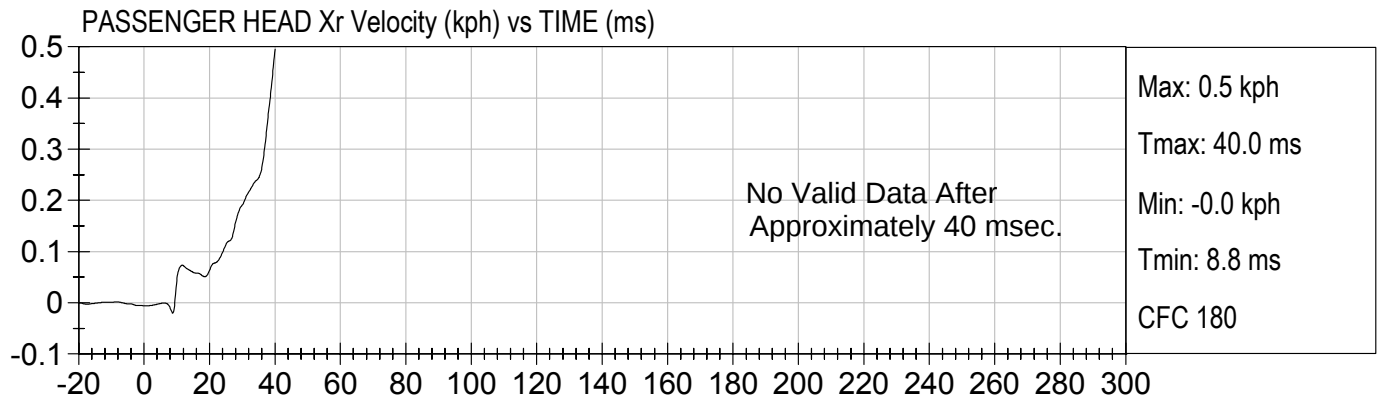


PASSENGER LUMBAR FResultant (N) vs TIME (ms)



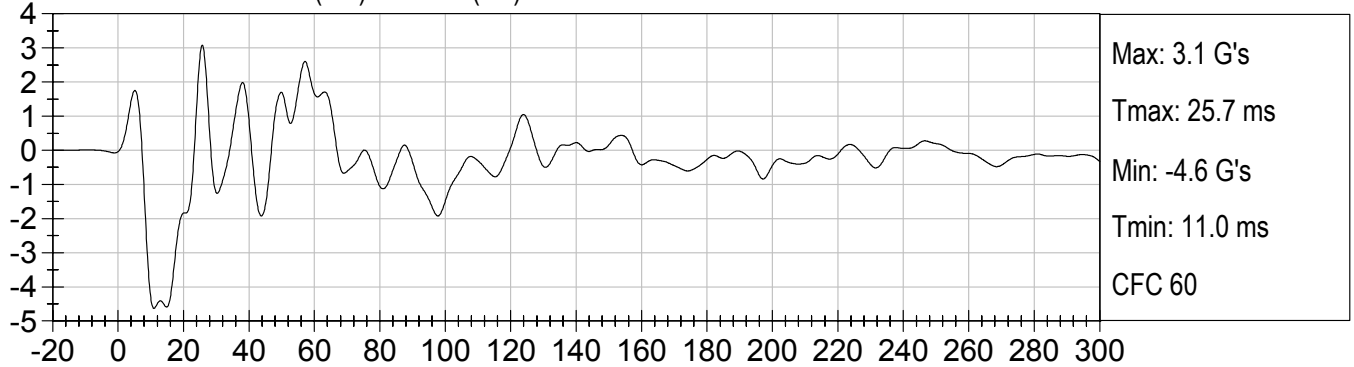




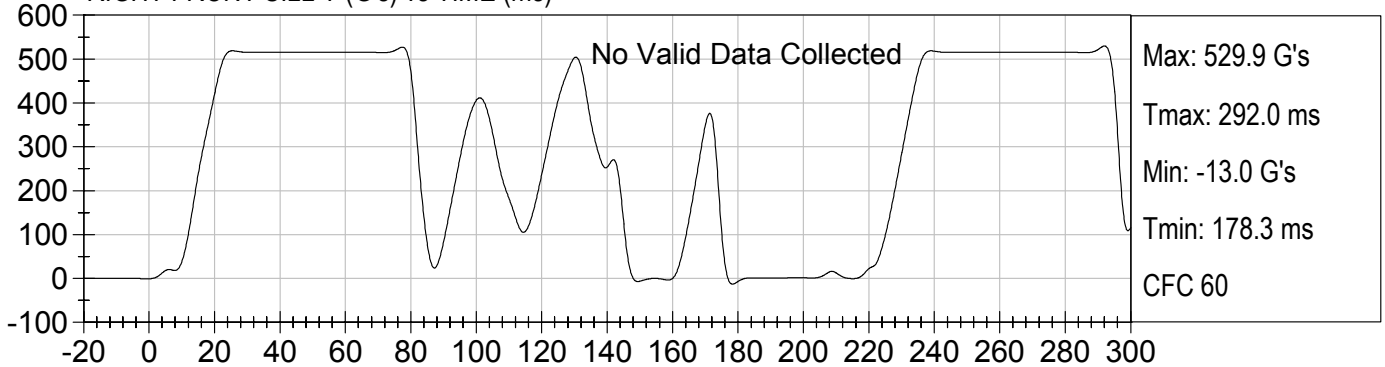




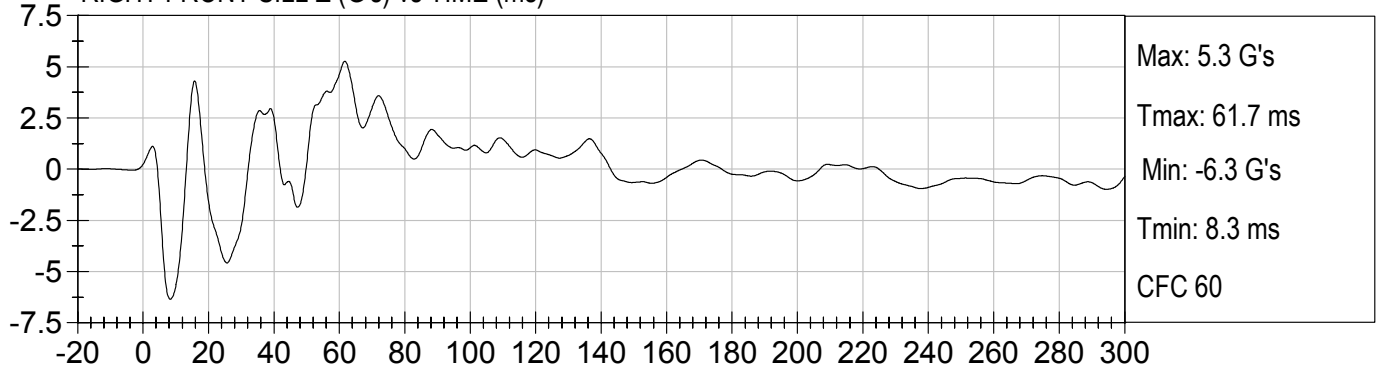
RIGHT FRONT SILL X (G's) vs TIME (ms)



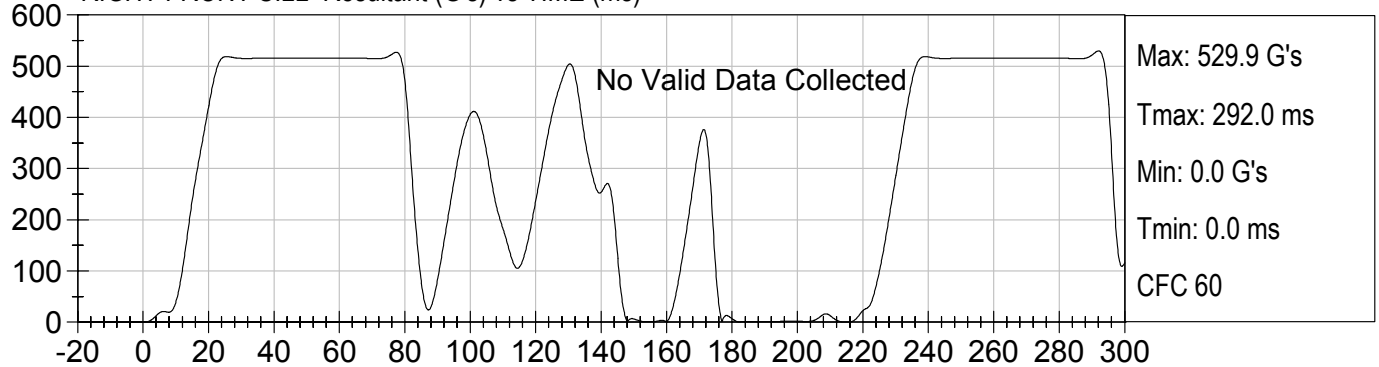
RIGHT FRONT SILL Y (G's) vs TIME (ms)

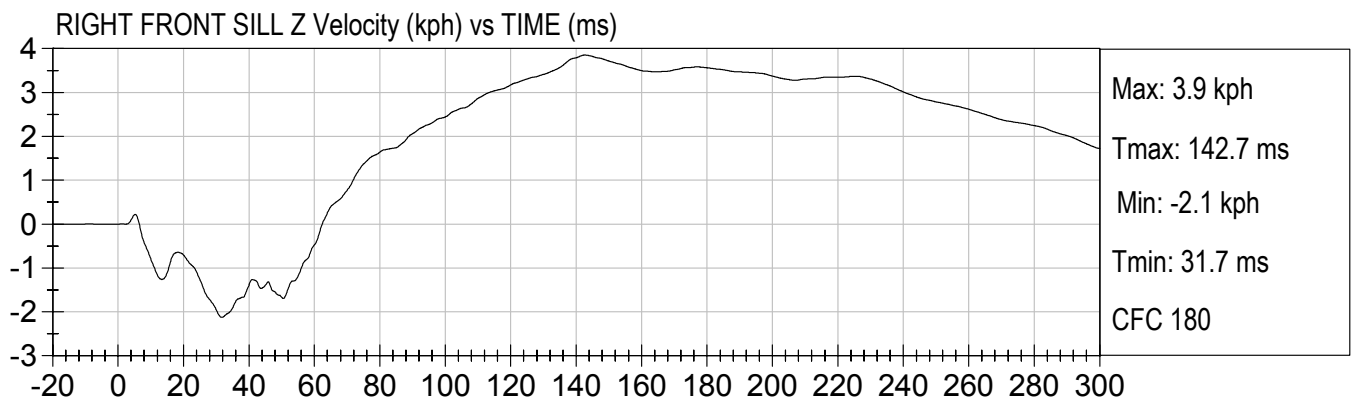
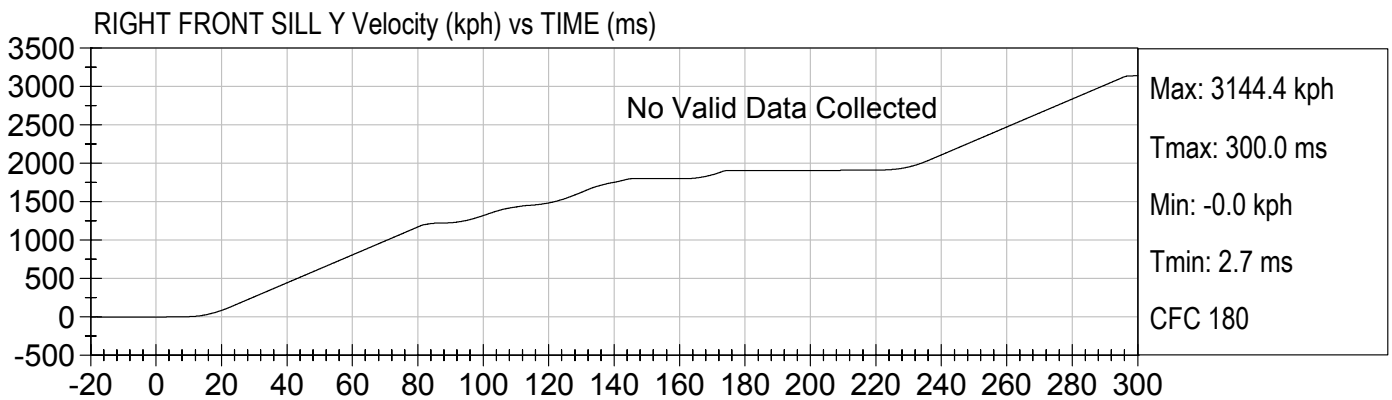
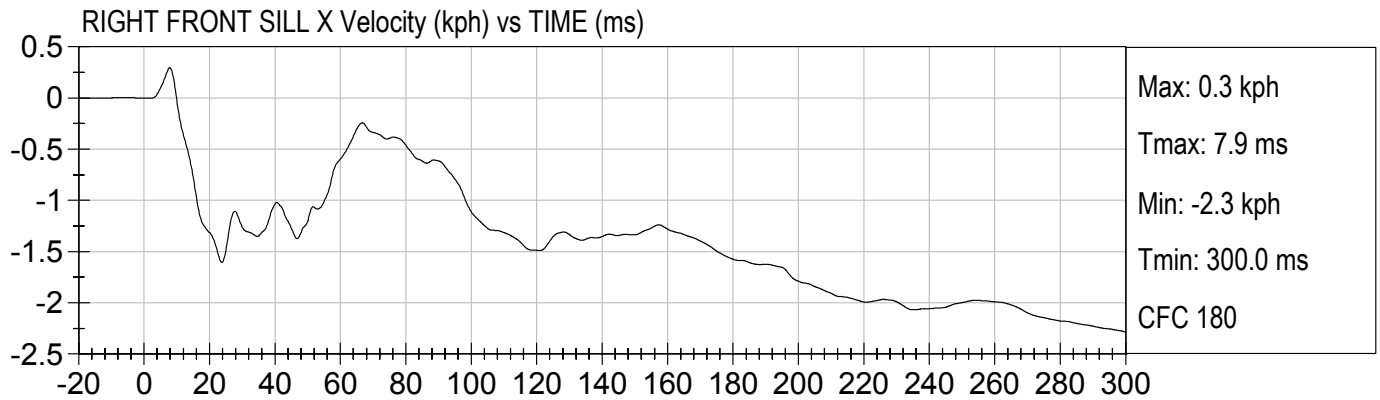


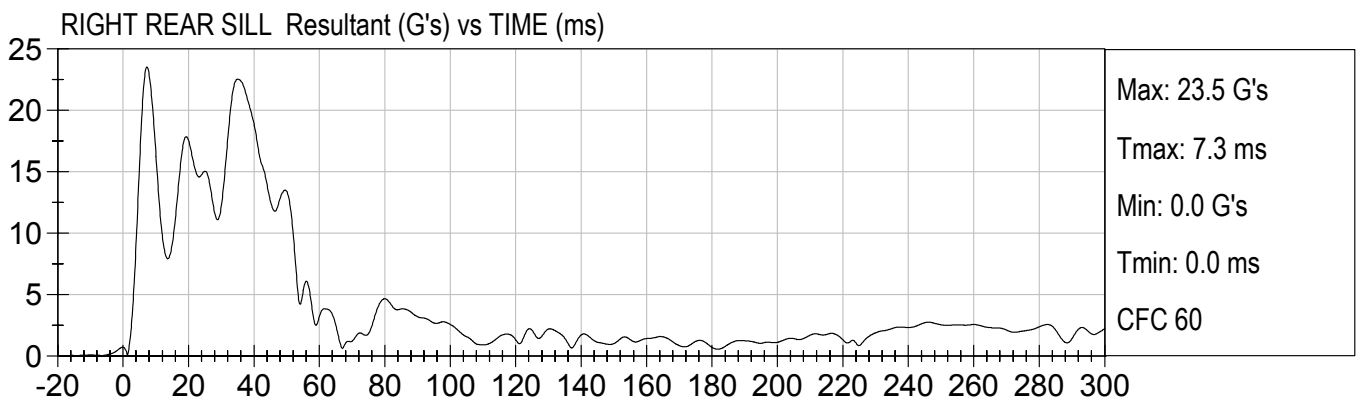
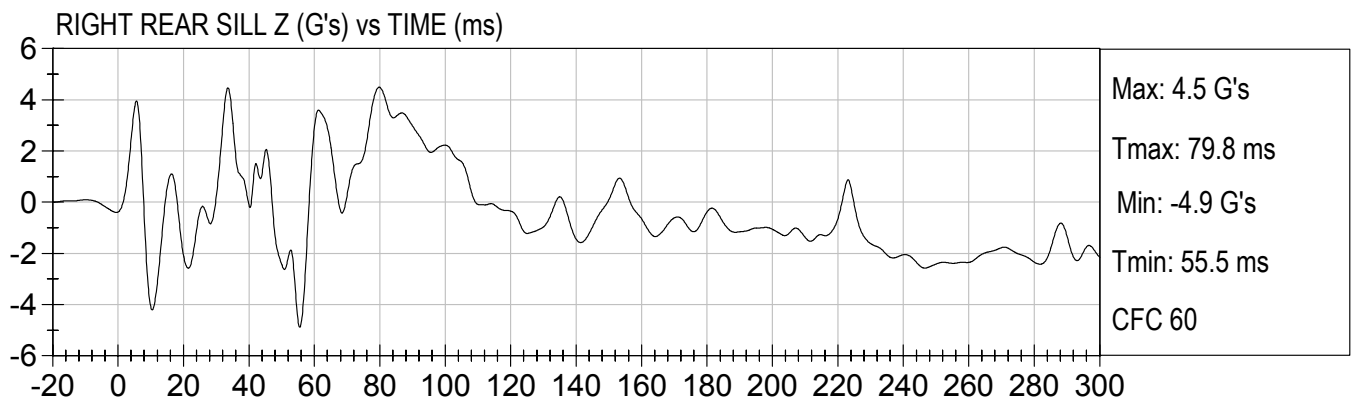
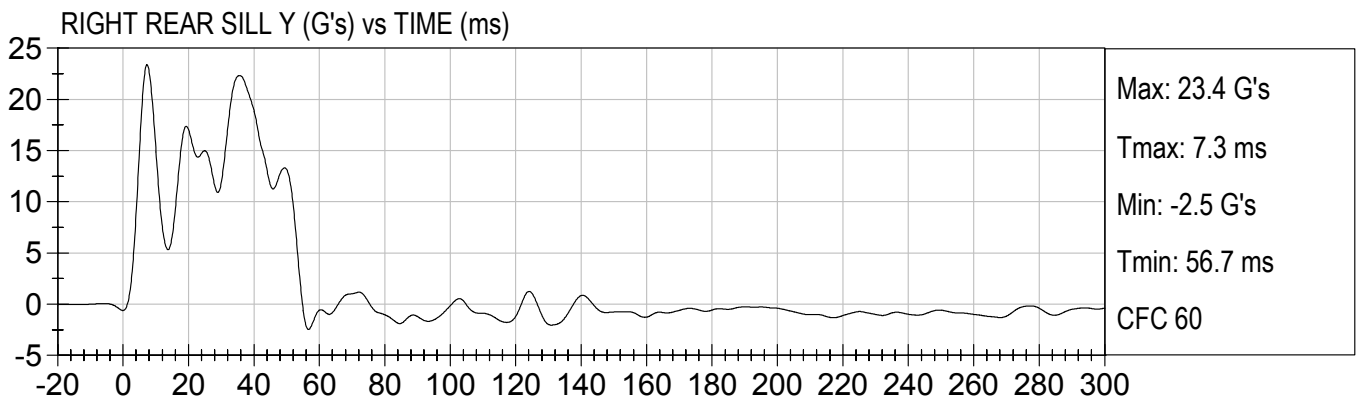
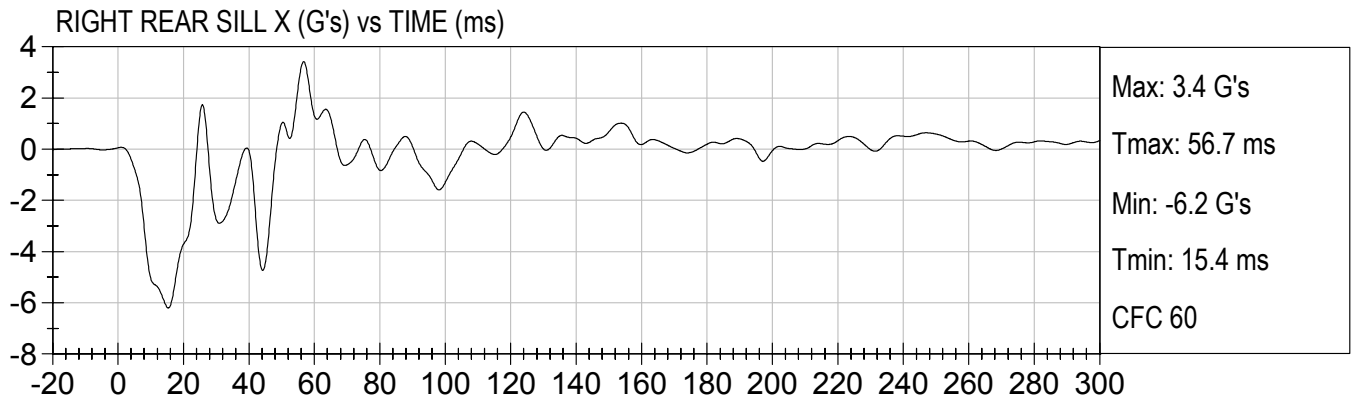
RIGHT FRONT SILL Z (G's) vs TIME (ms)

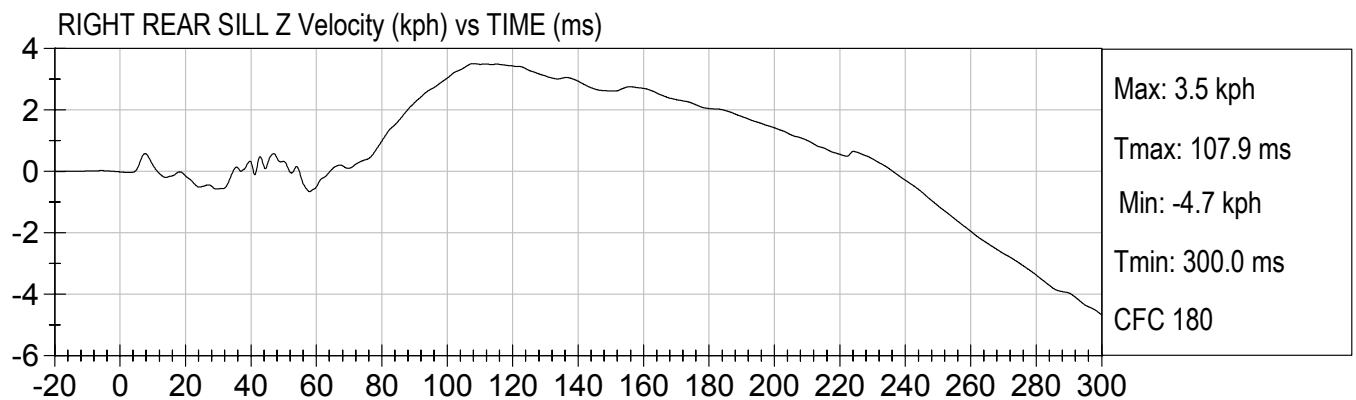
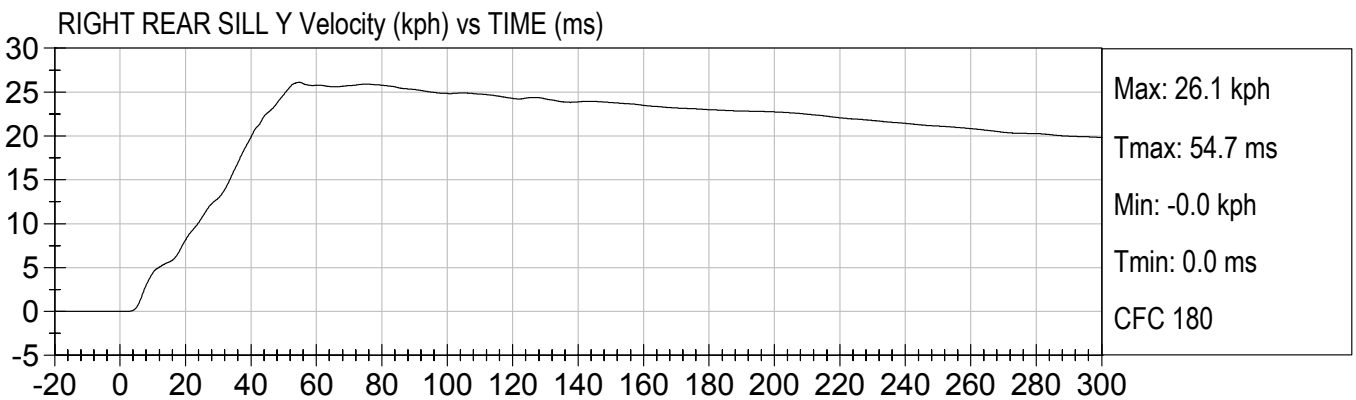
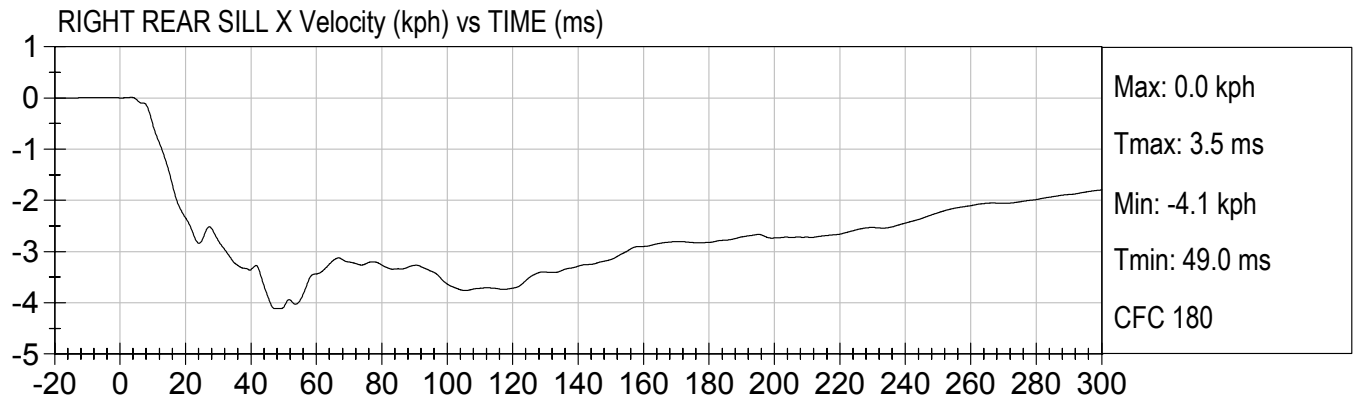


RIGHT FRONT SILL Resultant (G's) vs TIME (ms)



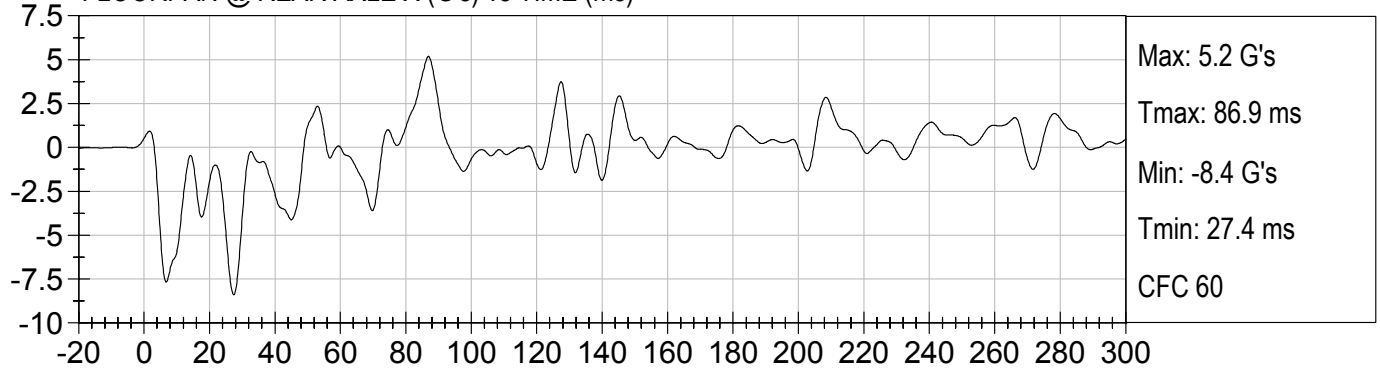




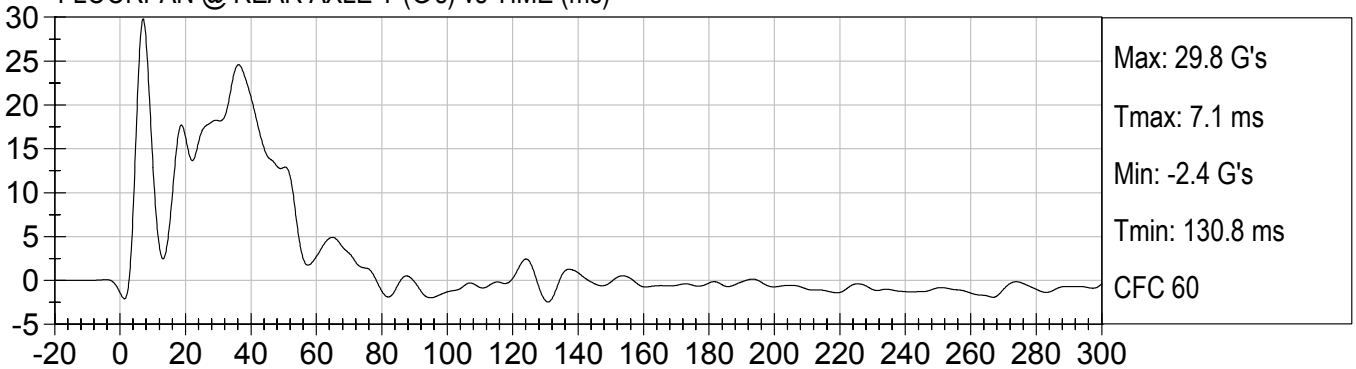




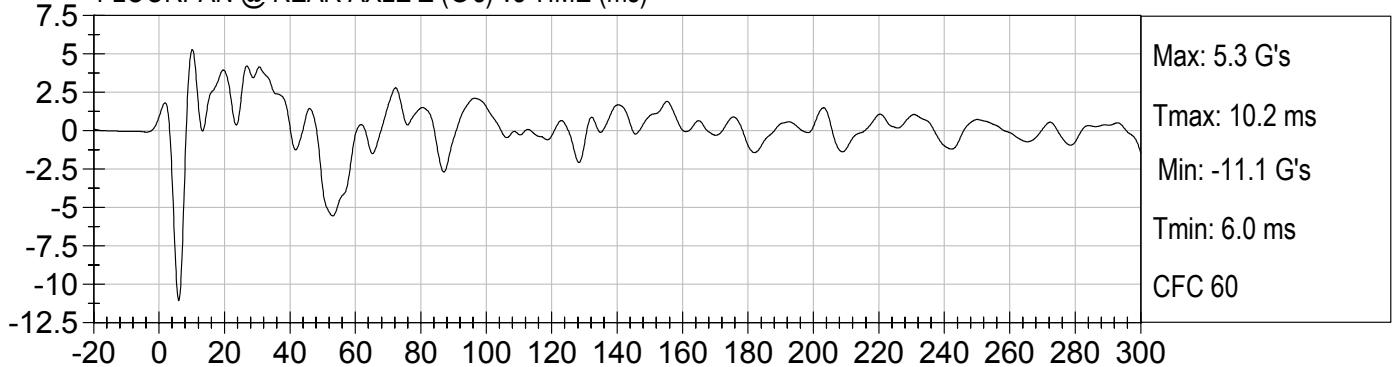
FLOORPAN @ REAR AXLE X (G's) vs TIME (ms)



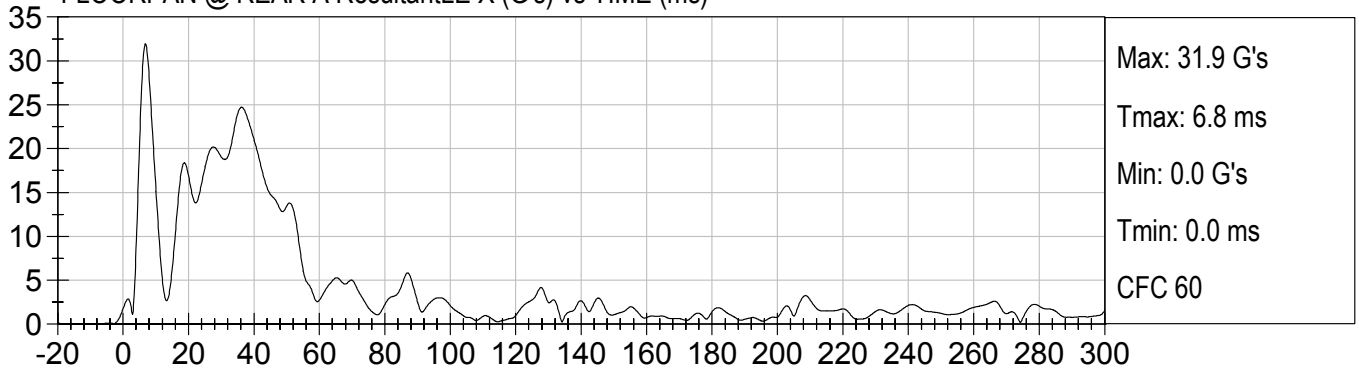
FLOORPAN @ REAR AXLE Y (G's) vs TIME (ms)



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

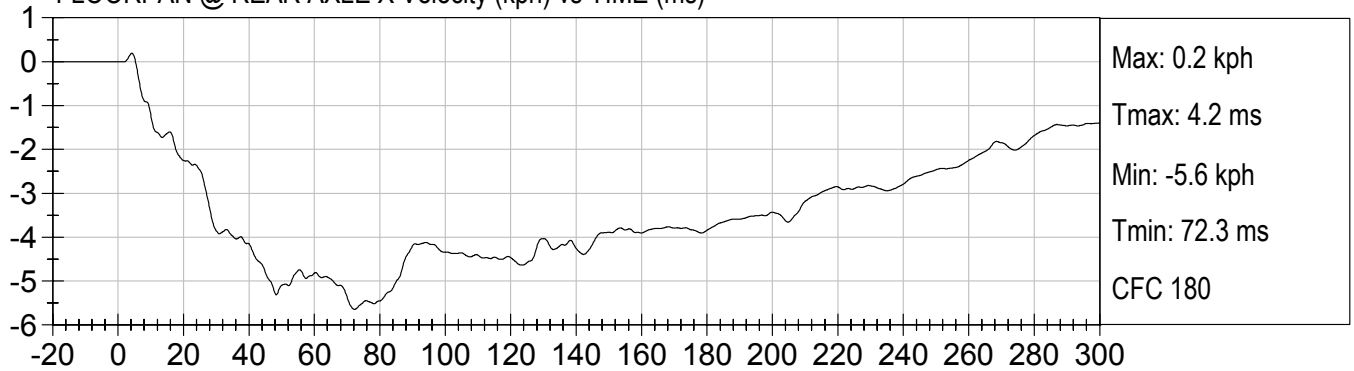


FLOORPAN @ REAR A ResultantLE X (G's) vs TIME (ms)

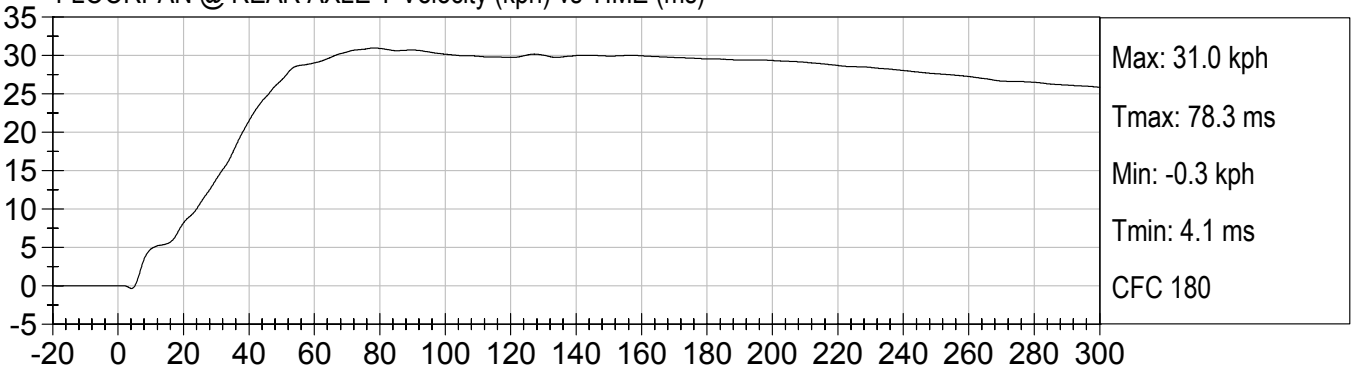




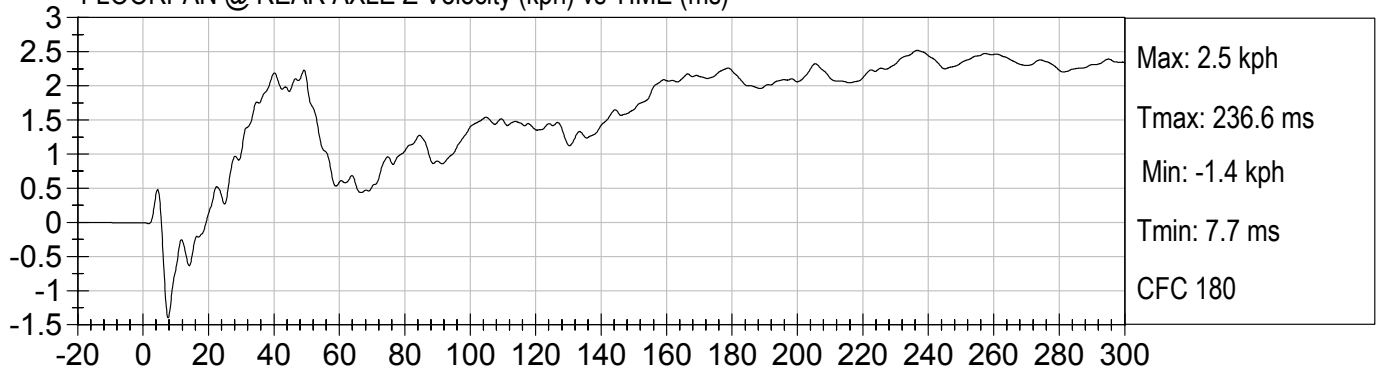
FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)

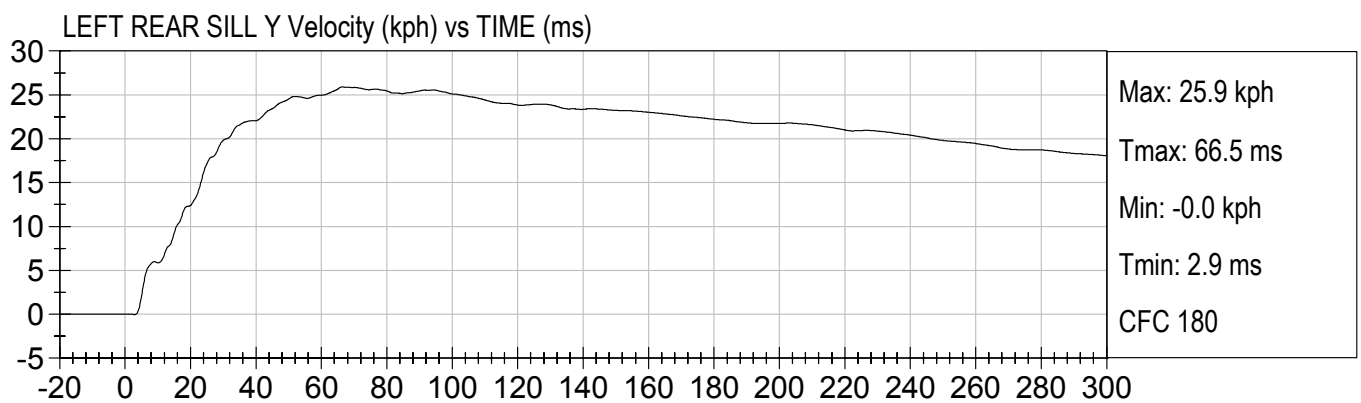
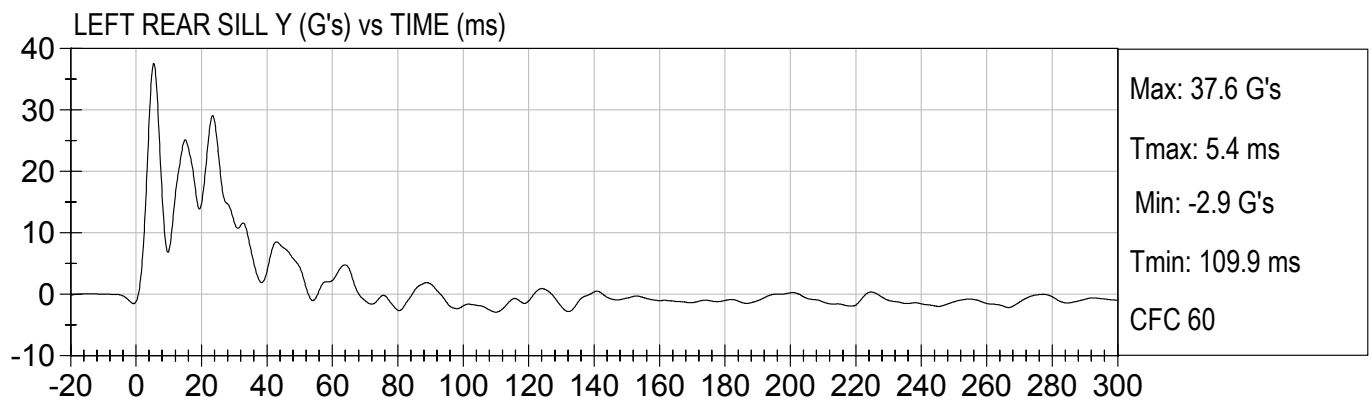
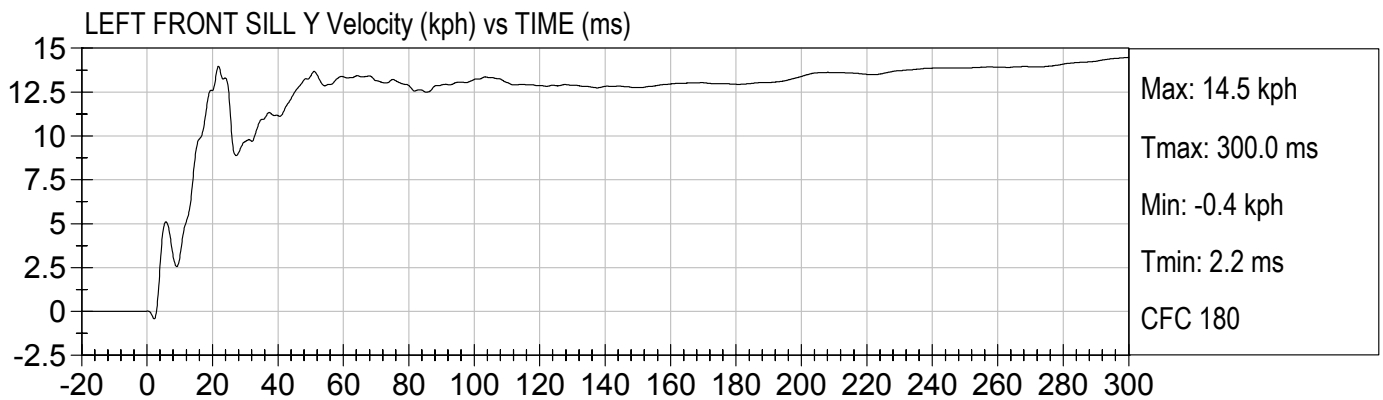
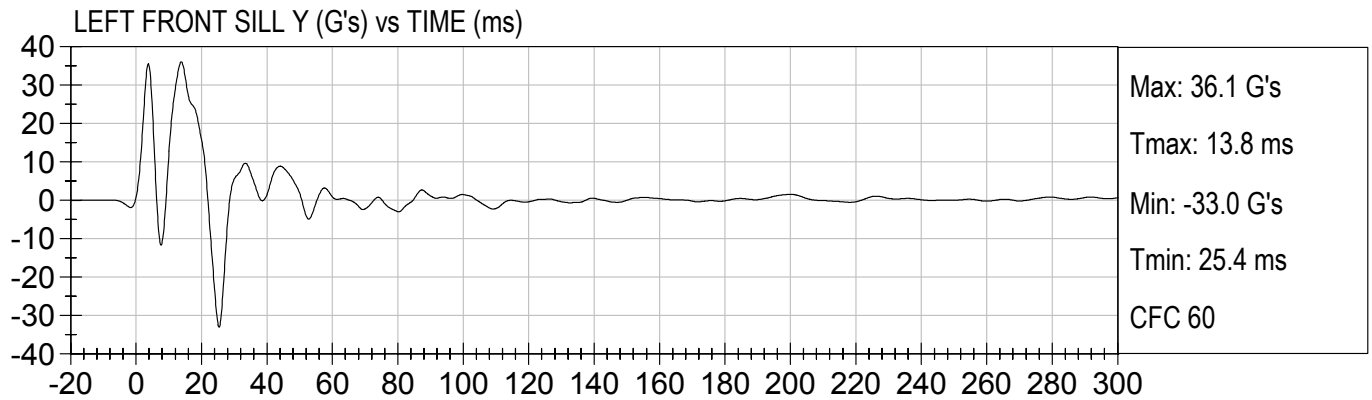


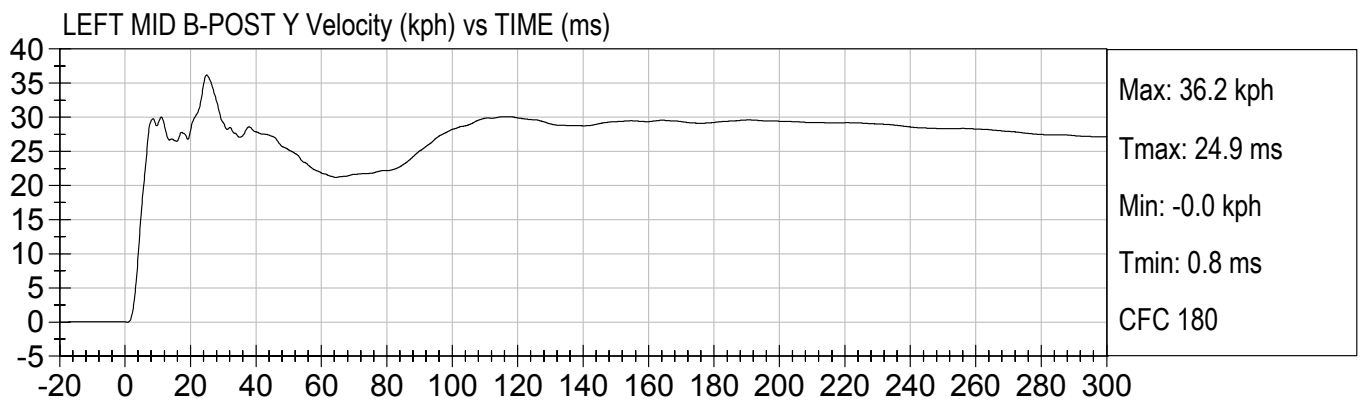
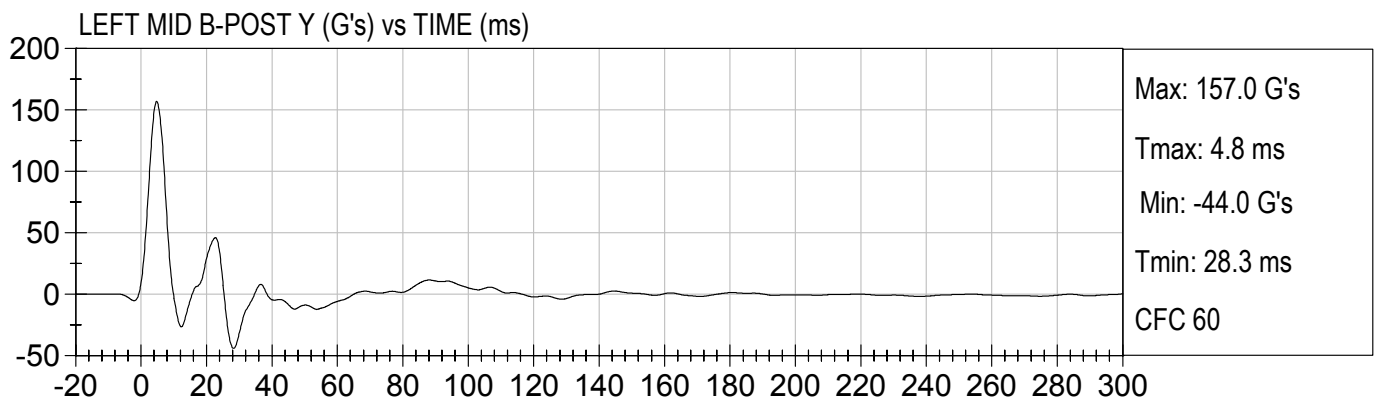
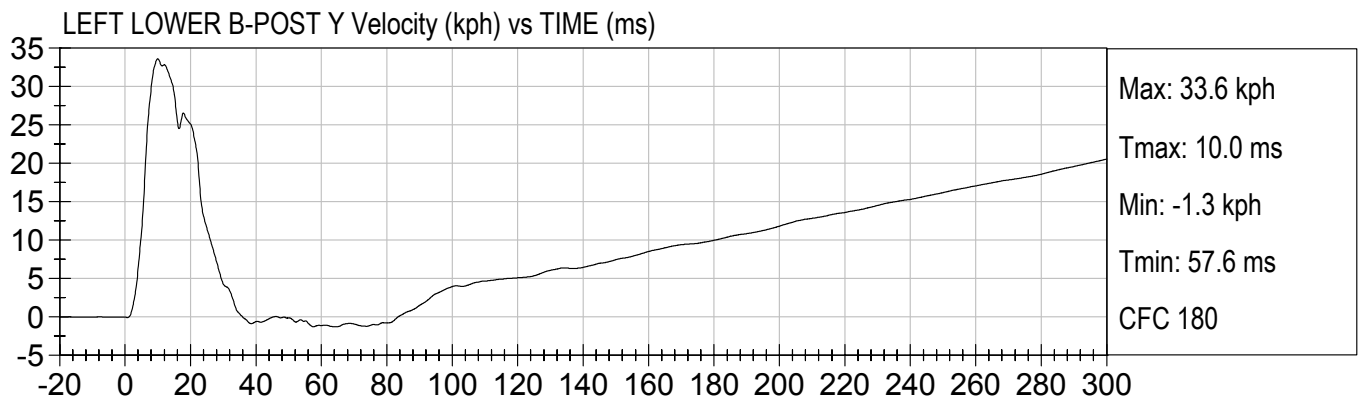
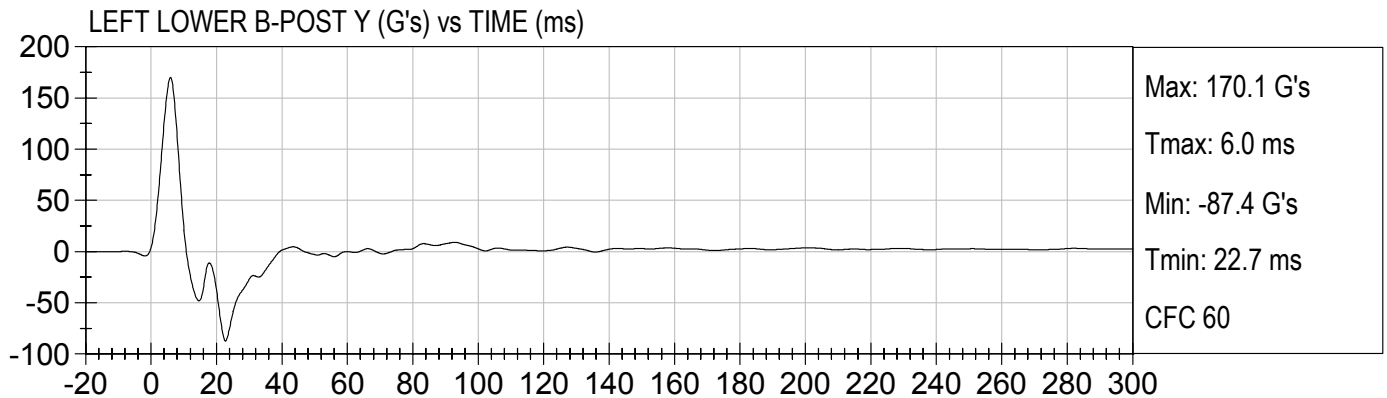
FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)

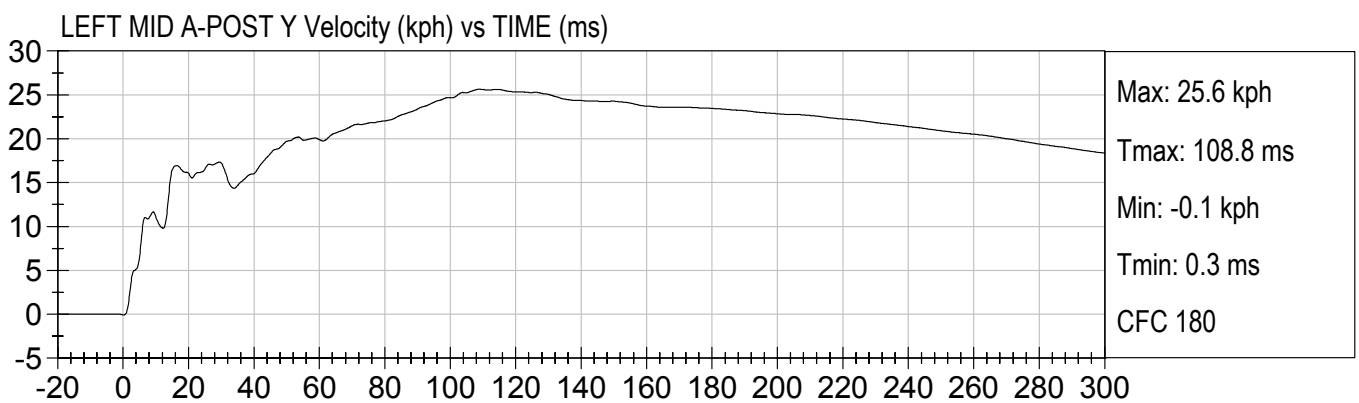
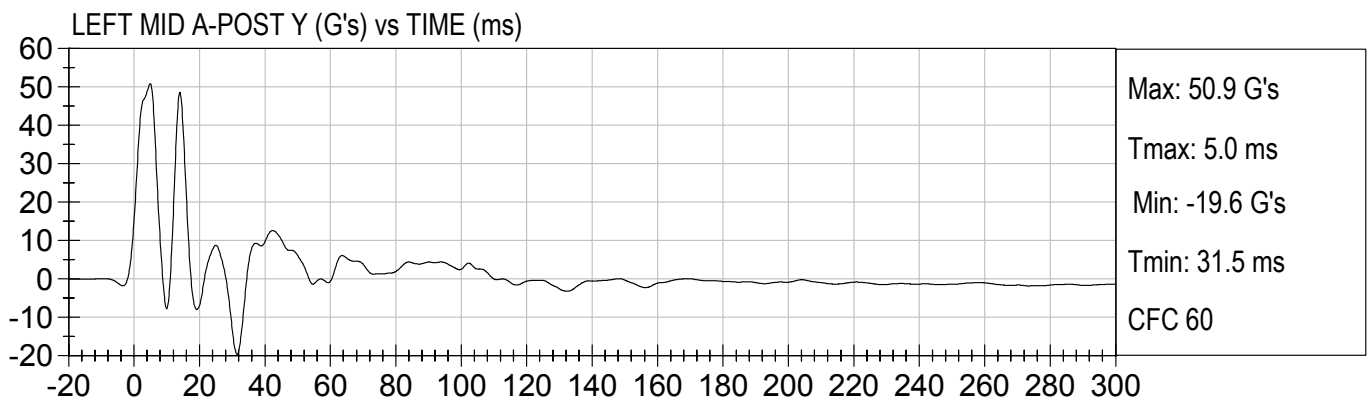
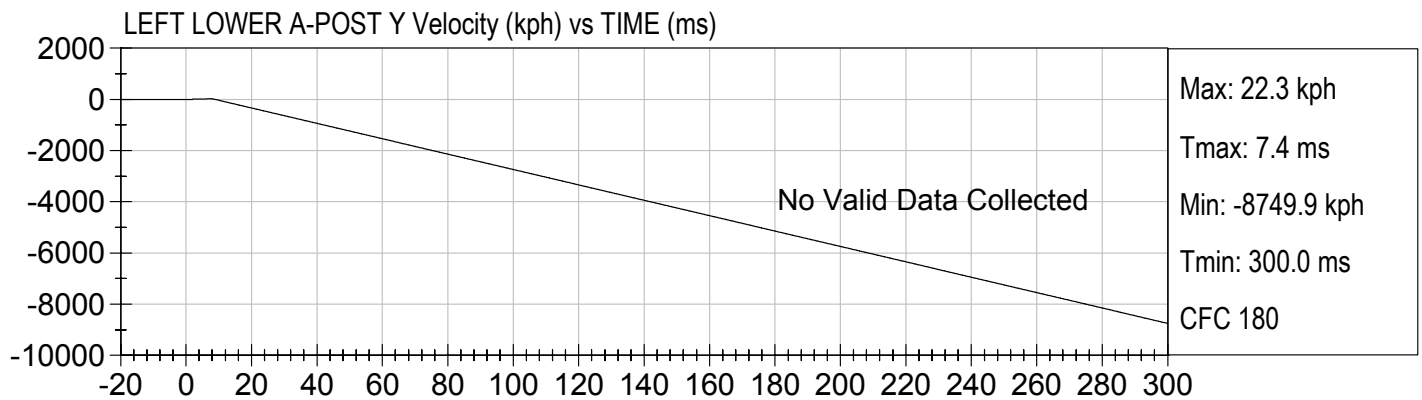
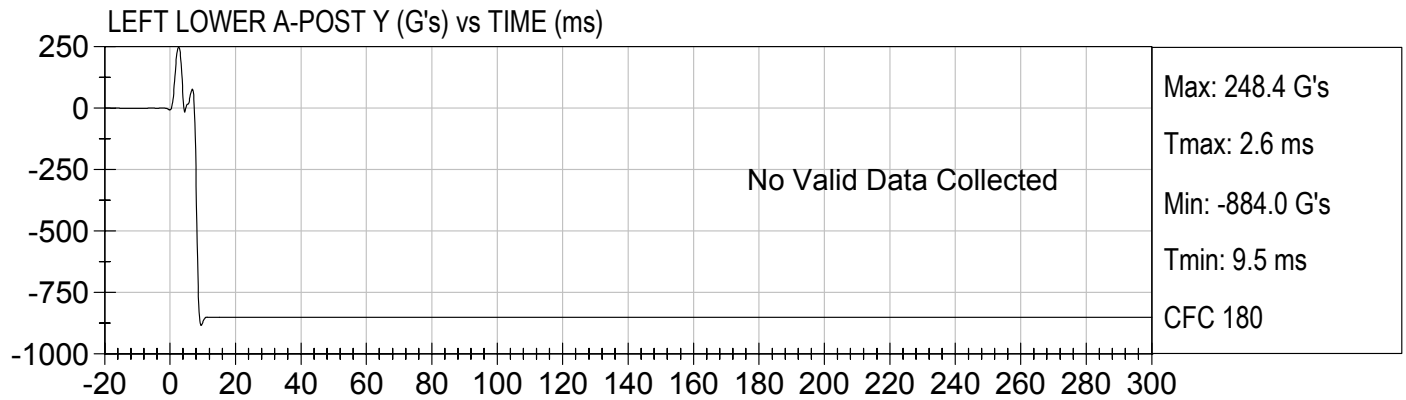


FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)



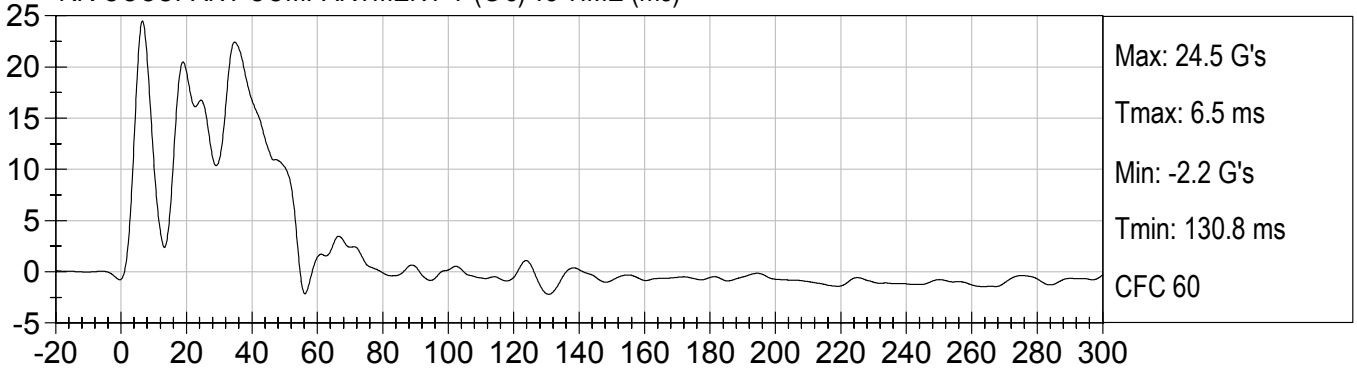




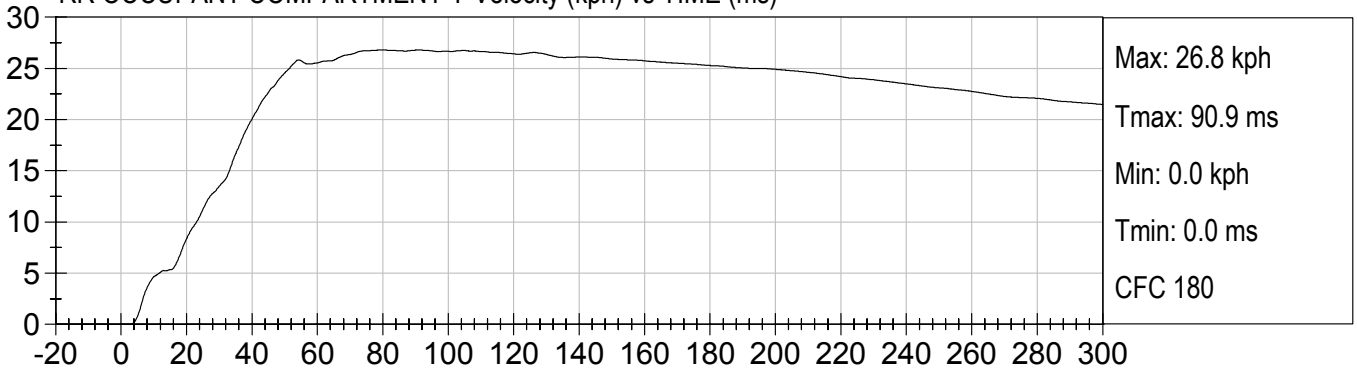




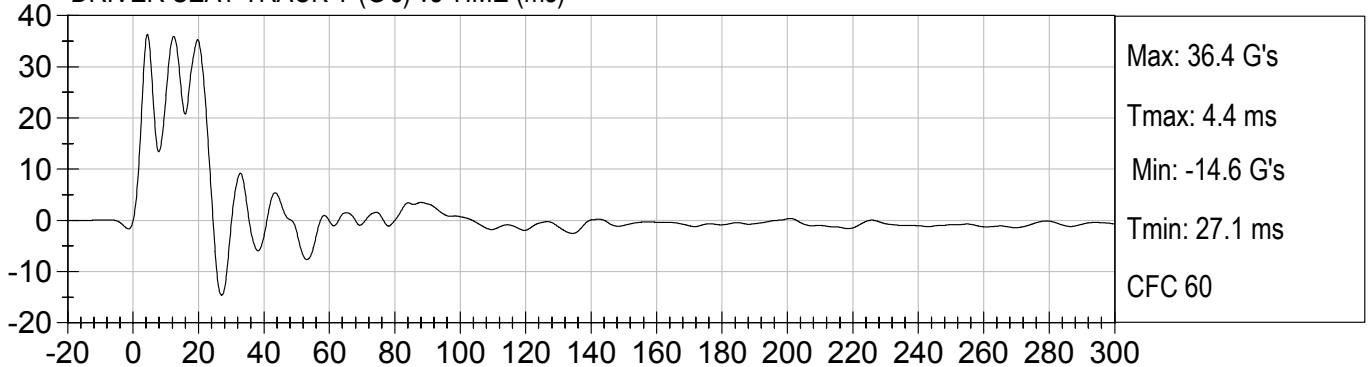
RR OCCUPANT COMPARTMENT Y (G's) vs TIME (ms)



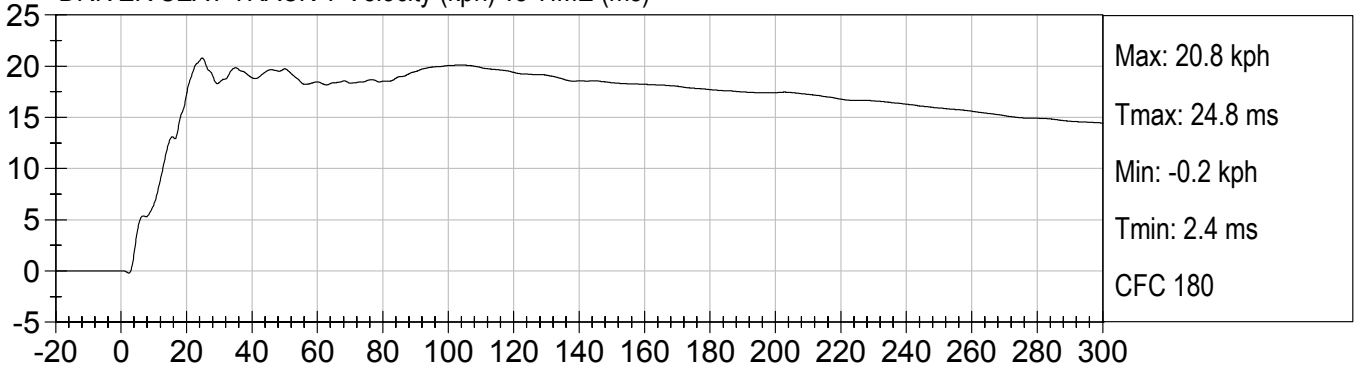
RR OCCUPANT COMPARTMENT Y Velocity (kph) vs TIME (ms)

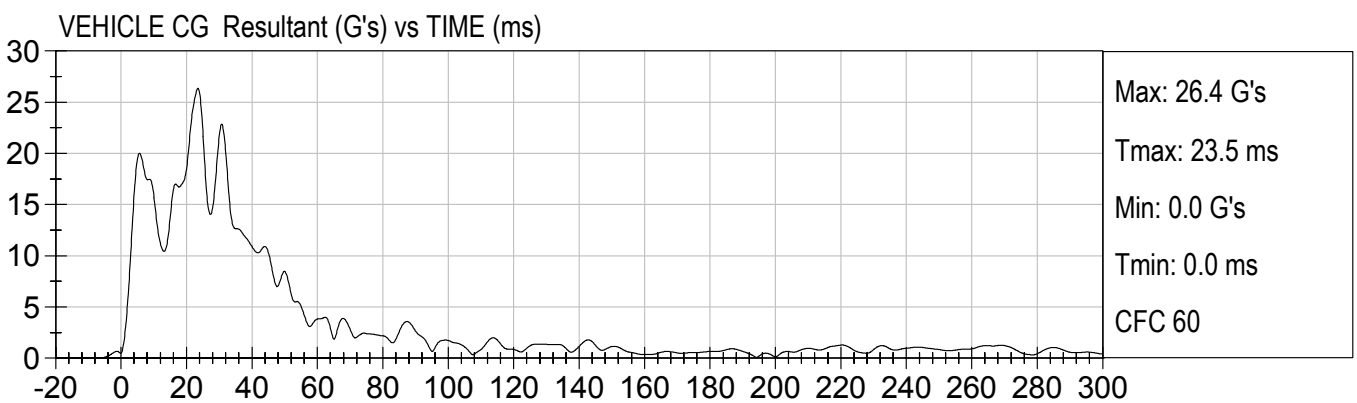
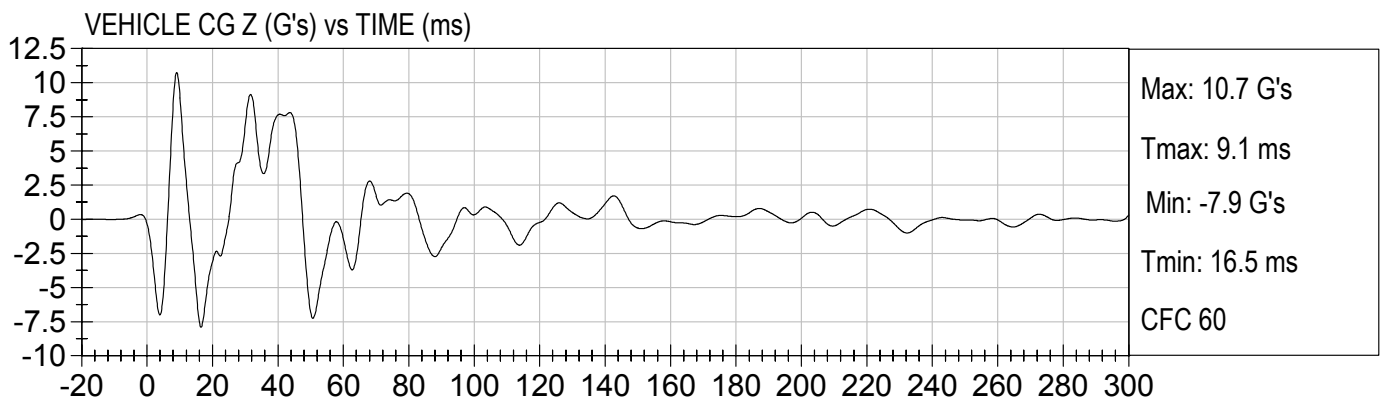
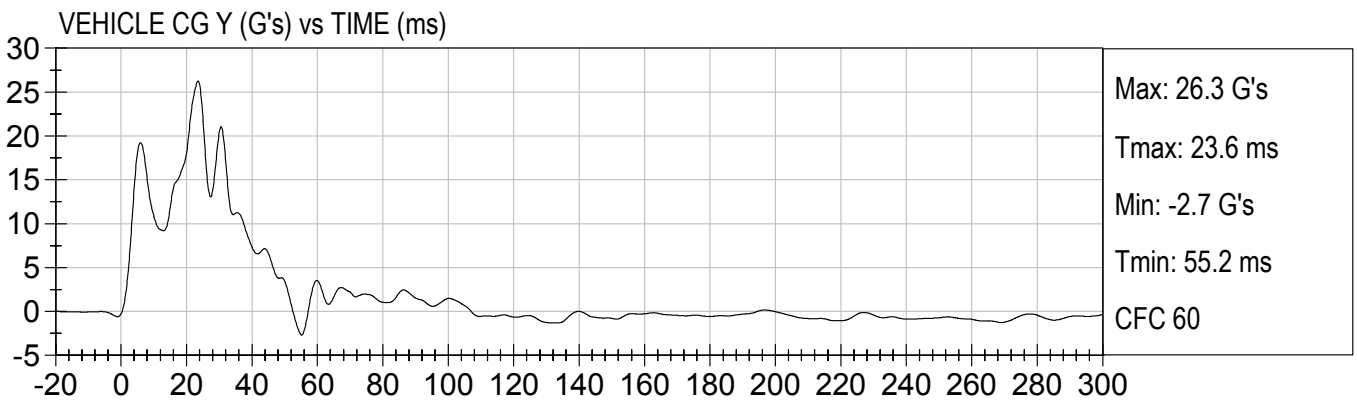
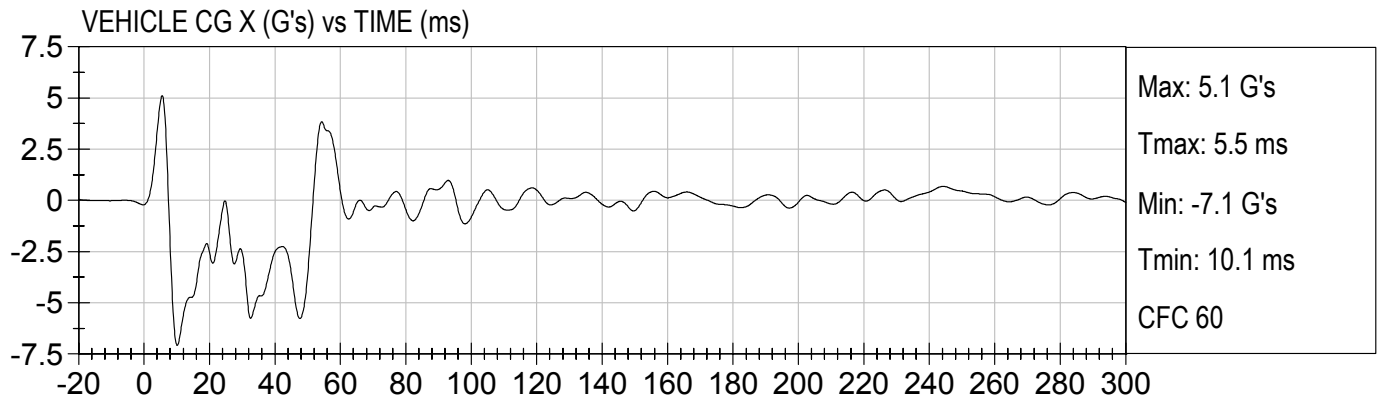


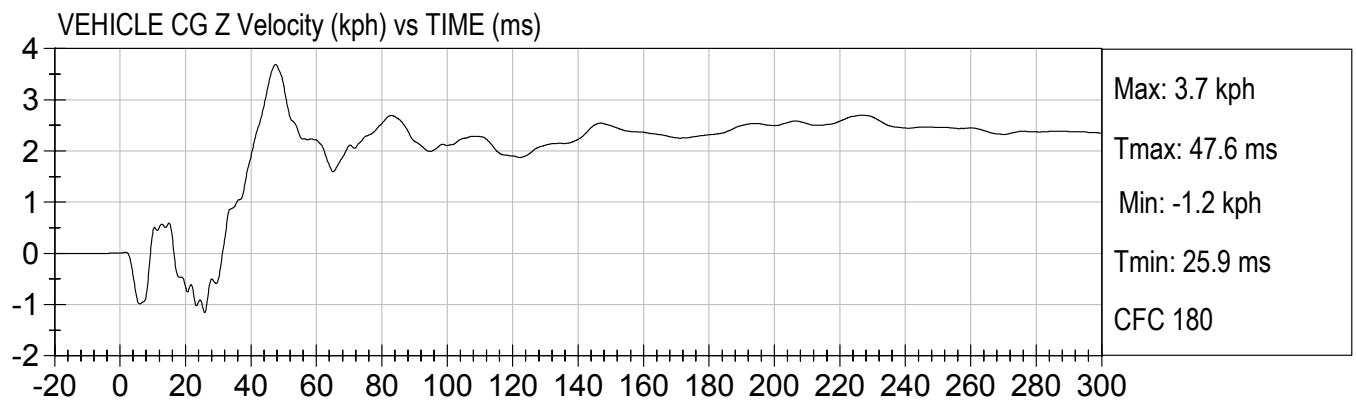
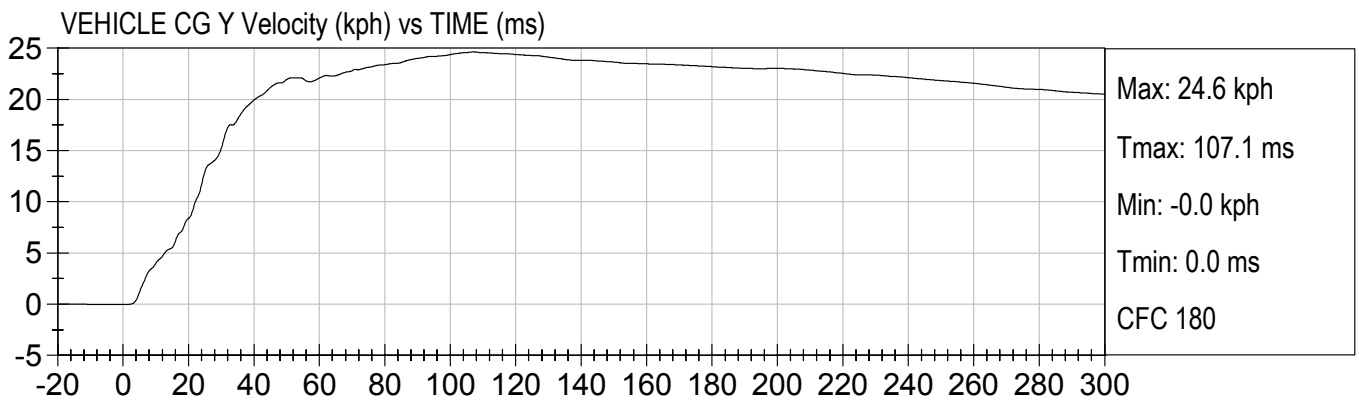
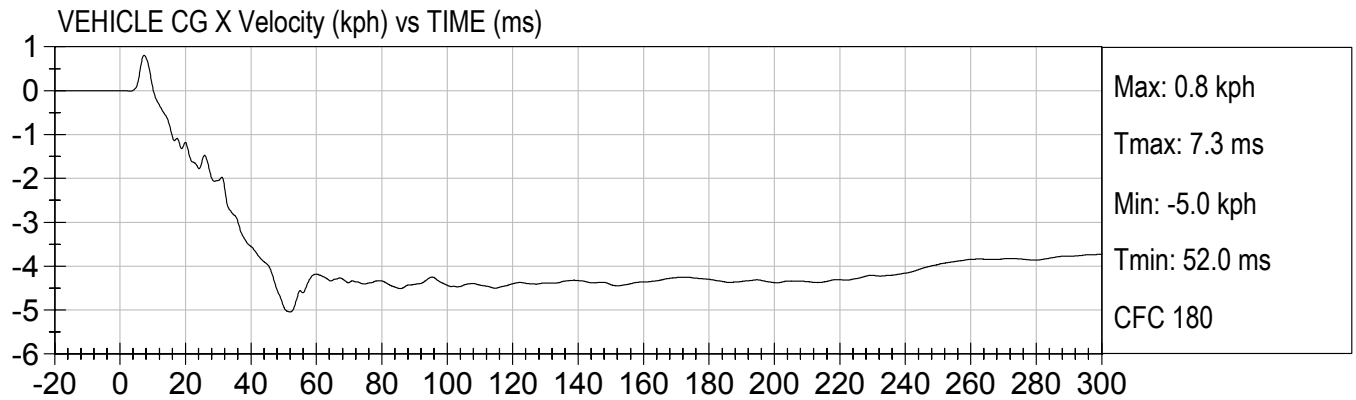
DRIVER SEAT TRACK Y (G's) vs TIME (ms)



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

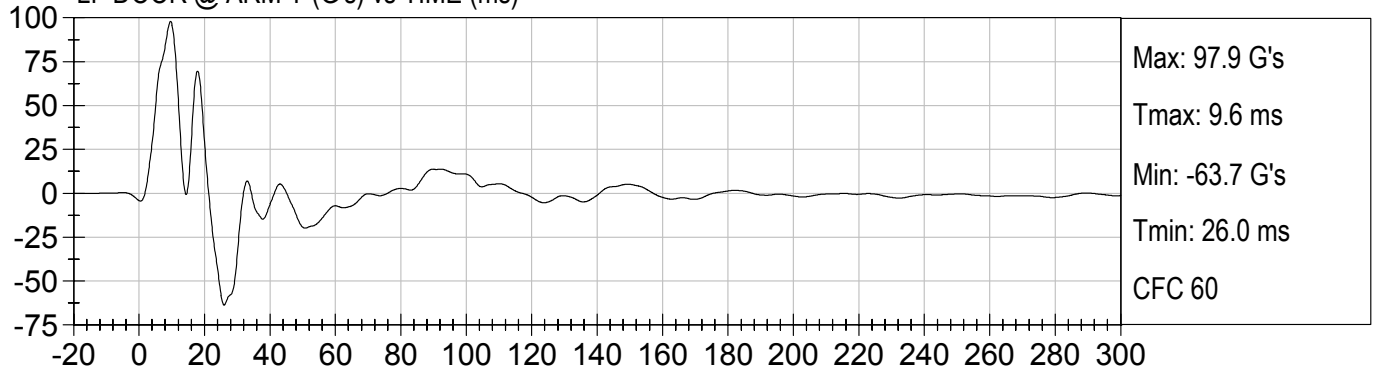




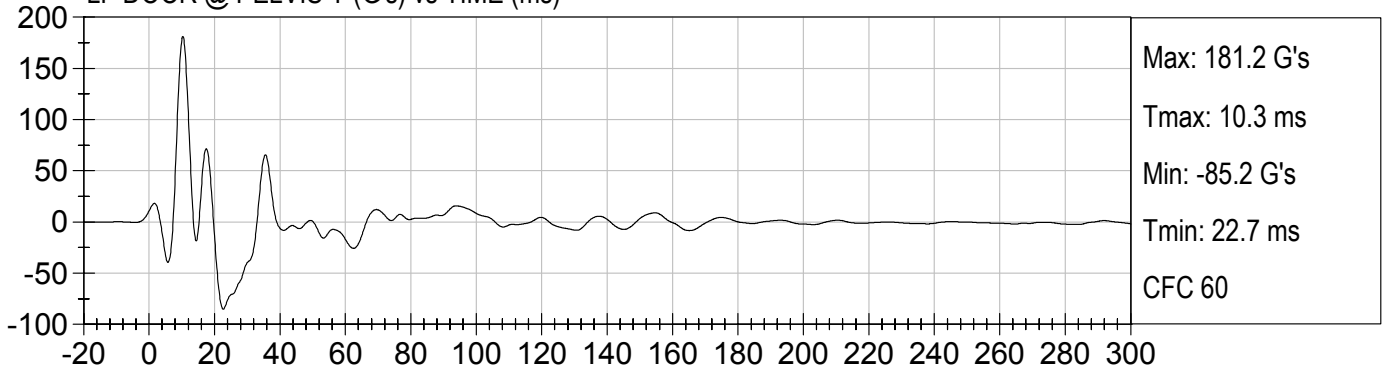




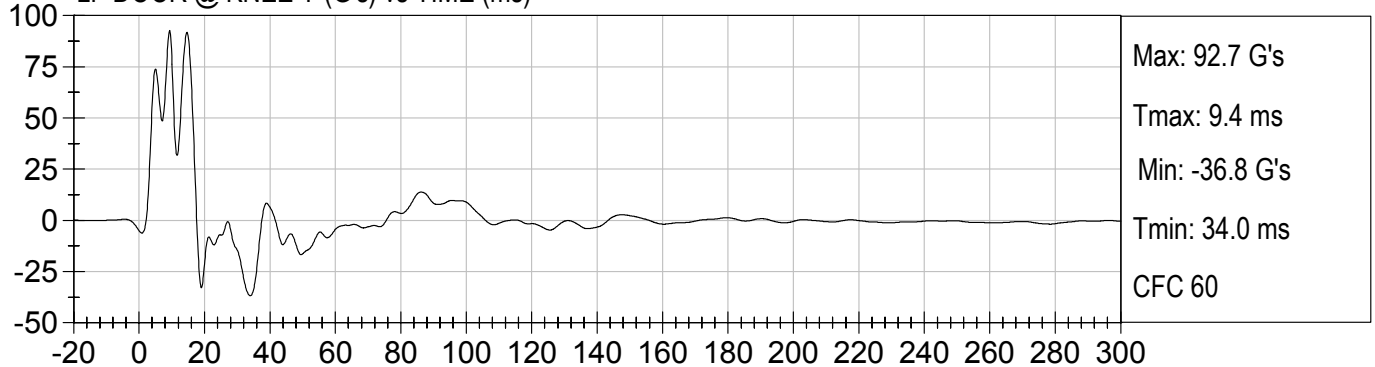
LF DOOR @ ARM Y (G's) vs TIME (ms)



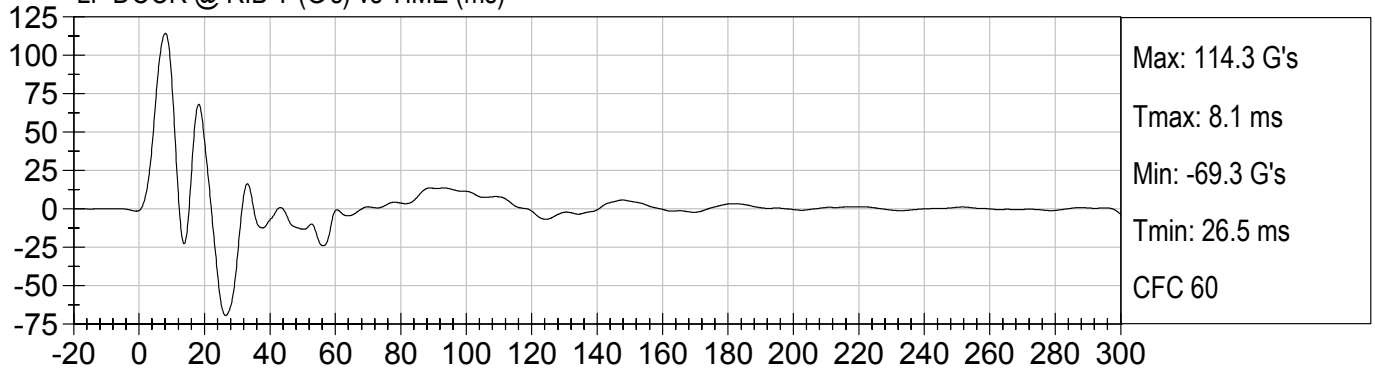
LF DOOR @ PELVIS Y (G's) vs TIME (ms)



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

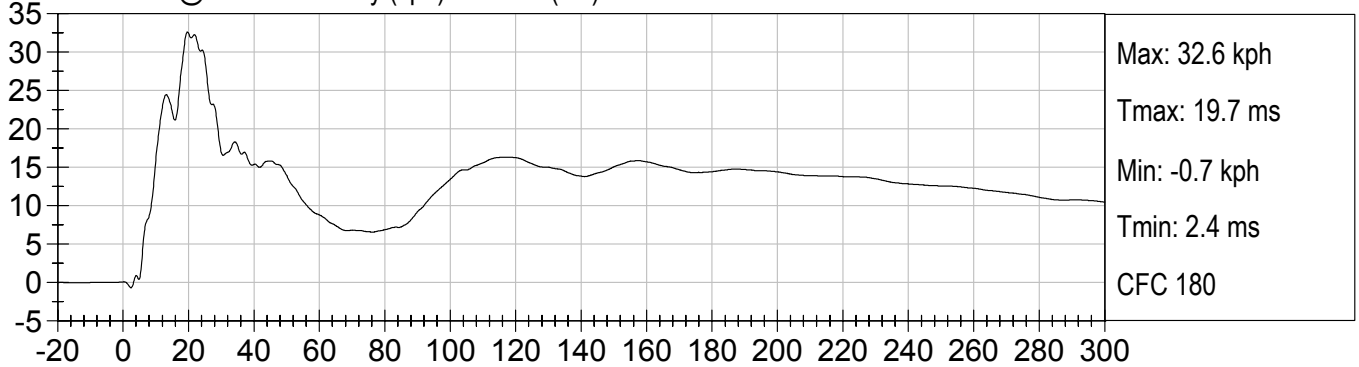


LF DOOR @ RIB Y (G's) vs TIME (ms)

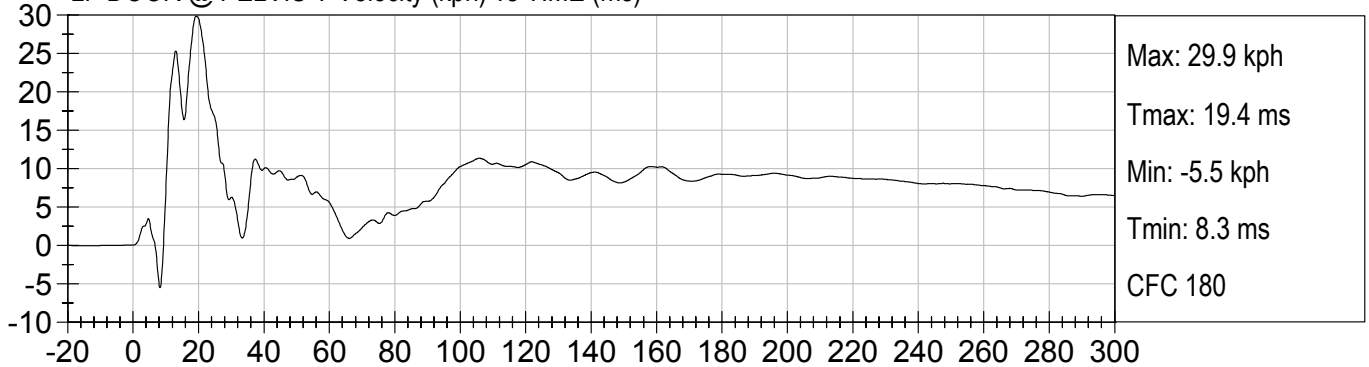




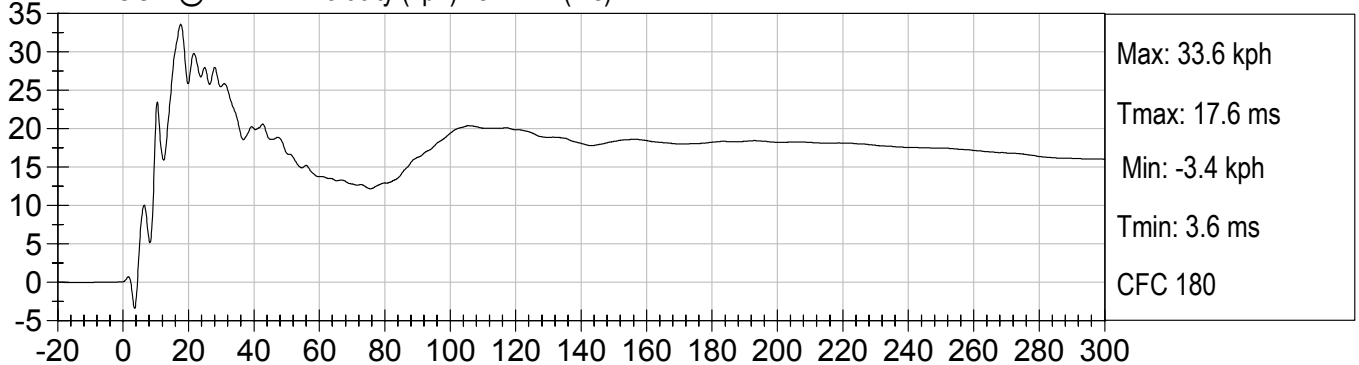
LF DOOR @ ARM Y Velocity (kph) vs TIME (ms)



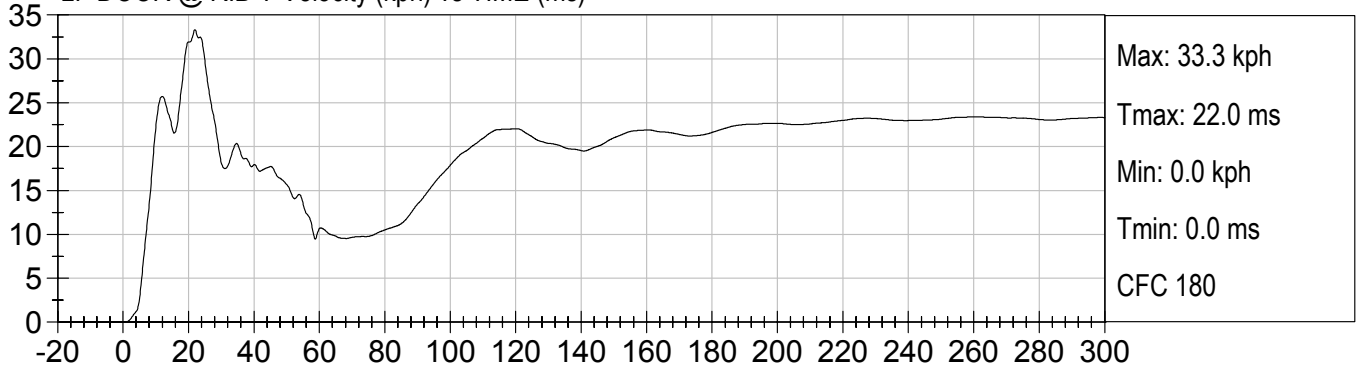
LF DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)



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

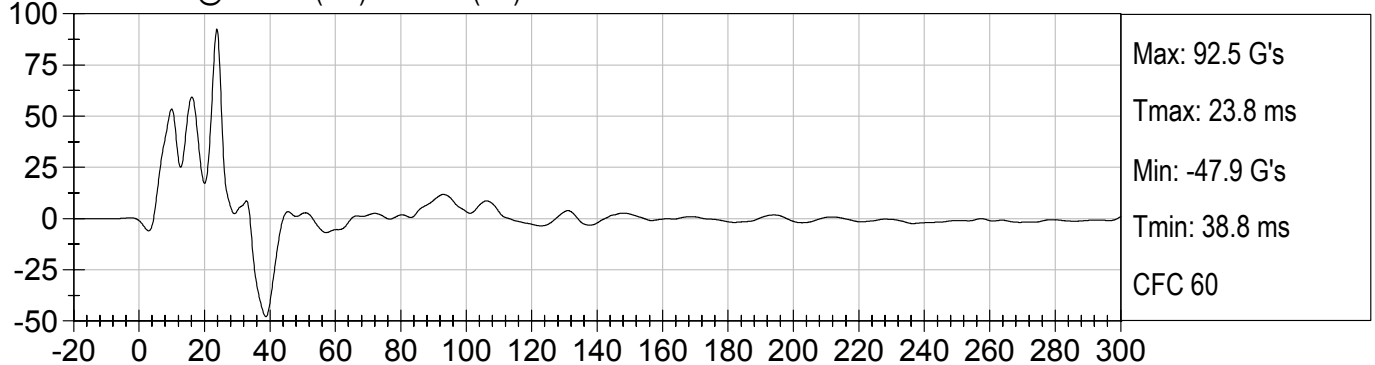


LF DOOR @ RIB Y Velocity (kph) vs TIME (ms)

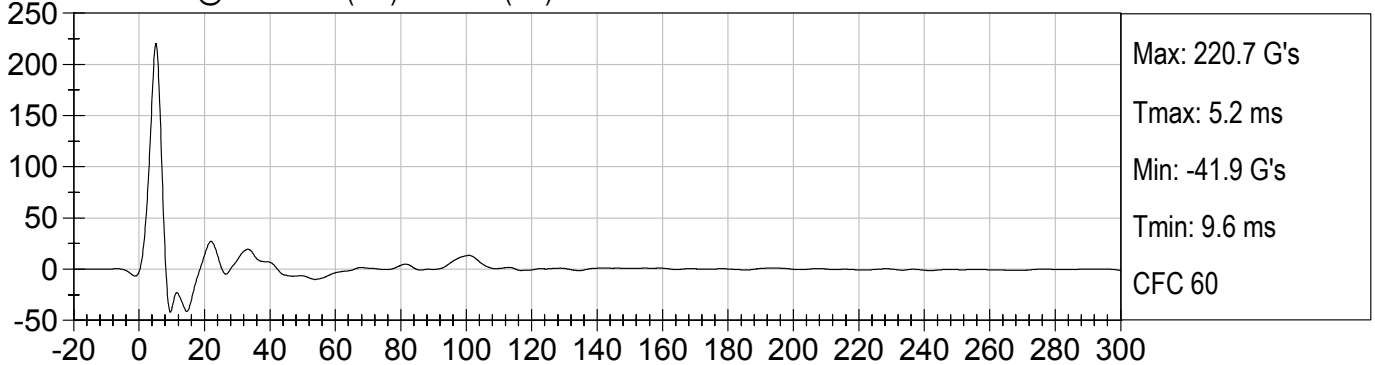




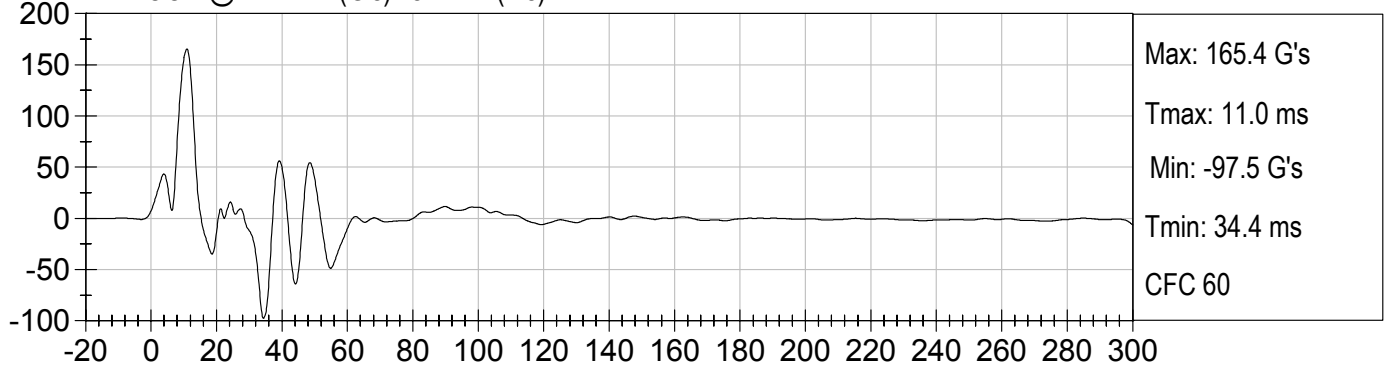
LR DOOR @ ARM Y (G's) vs TIME (ms)



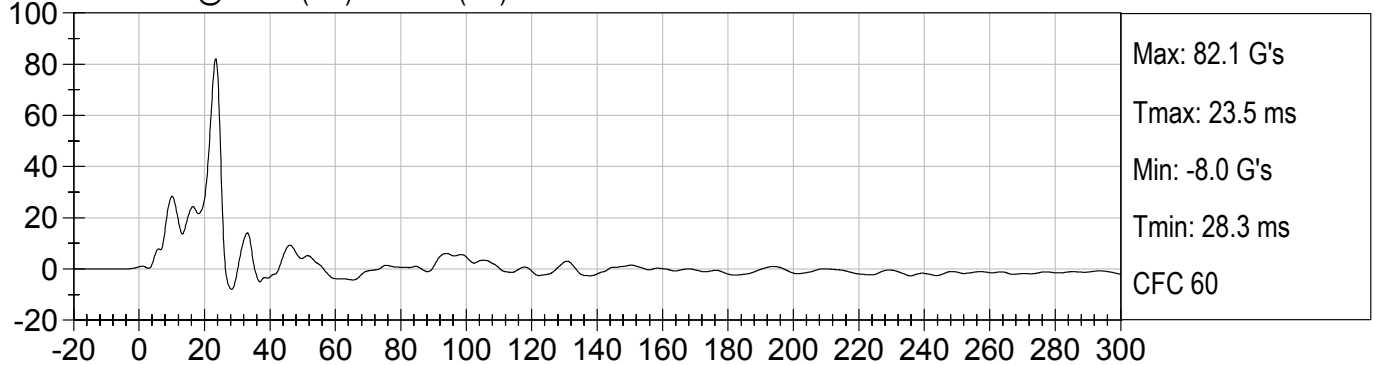
LR DOOR @ PELVIS Y (G's) vs TIME (ms)



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

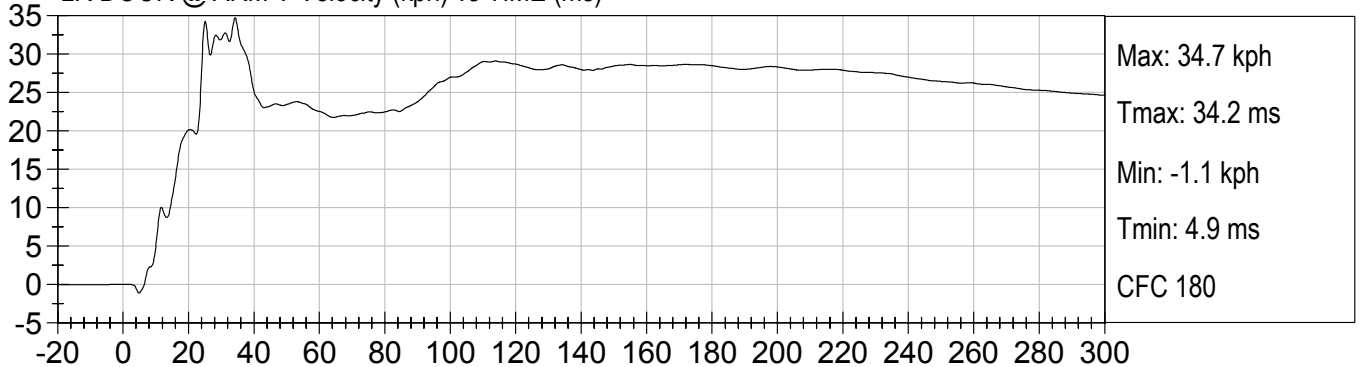


LR DOOR @ RIB Y (G's) vs TIME (ms)

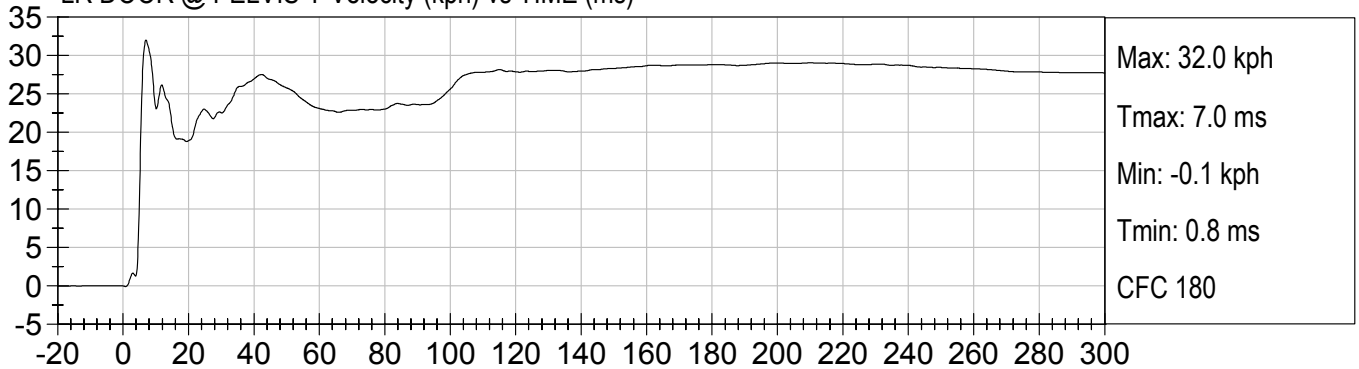




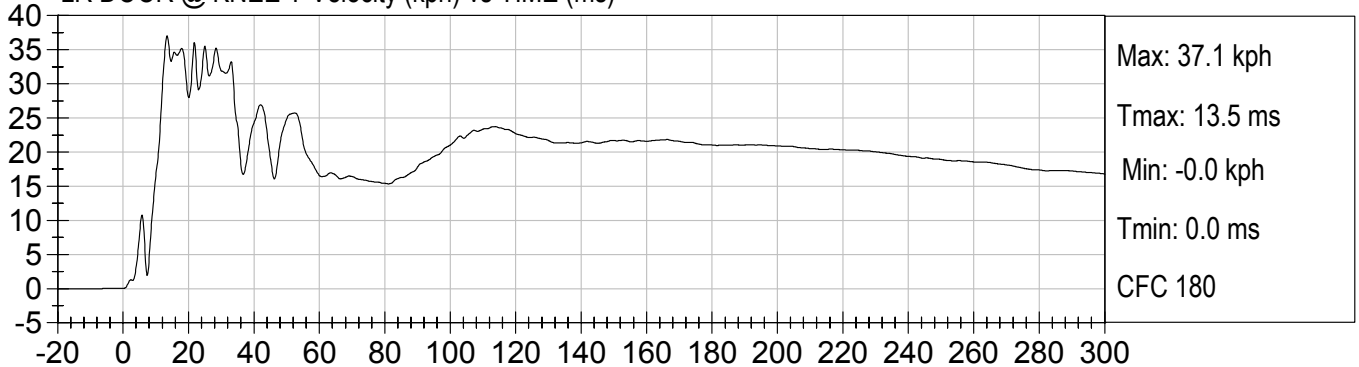
LR DOOR @ ARM Y Velocity (kph) vs TIME (ms)



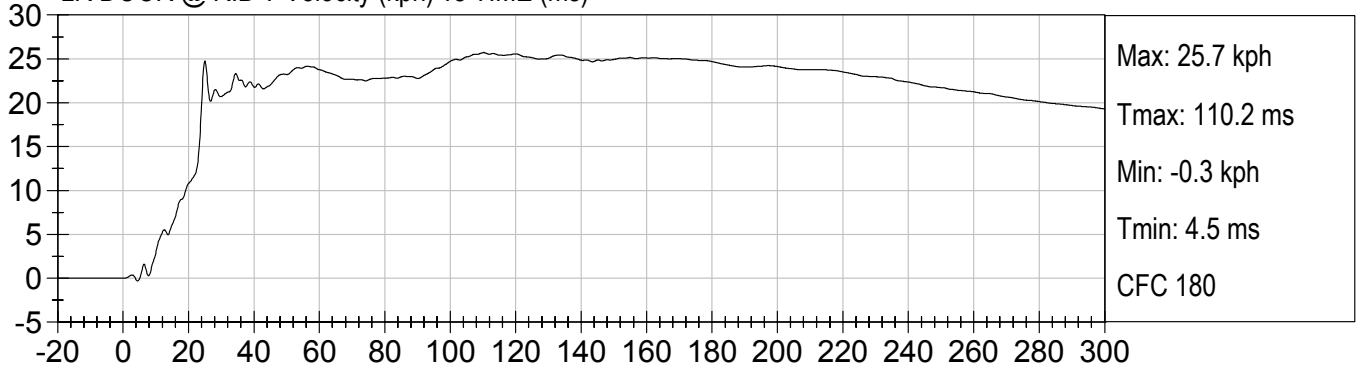
LR DOOR @ PELVIS Y Velocity (kph) vs TIME (ms)

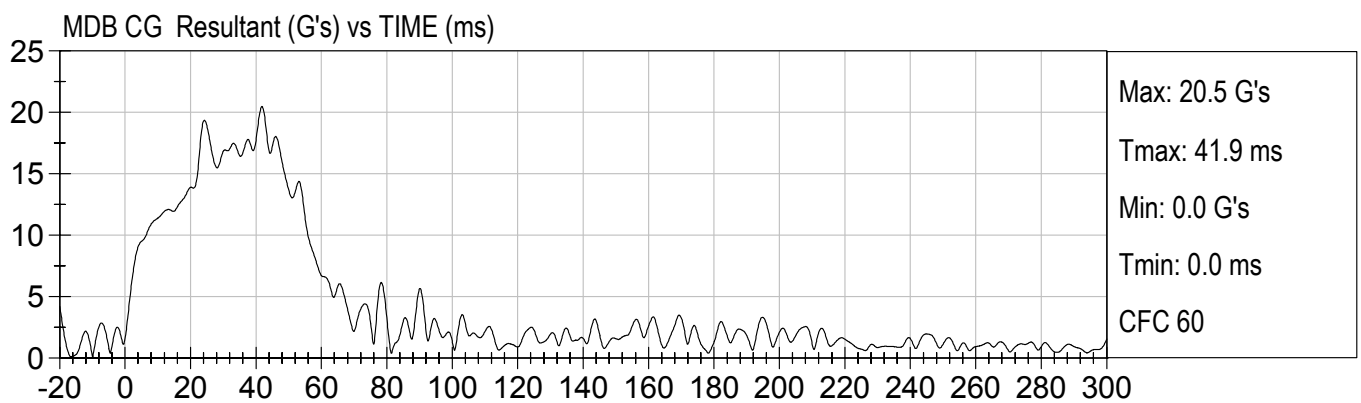
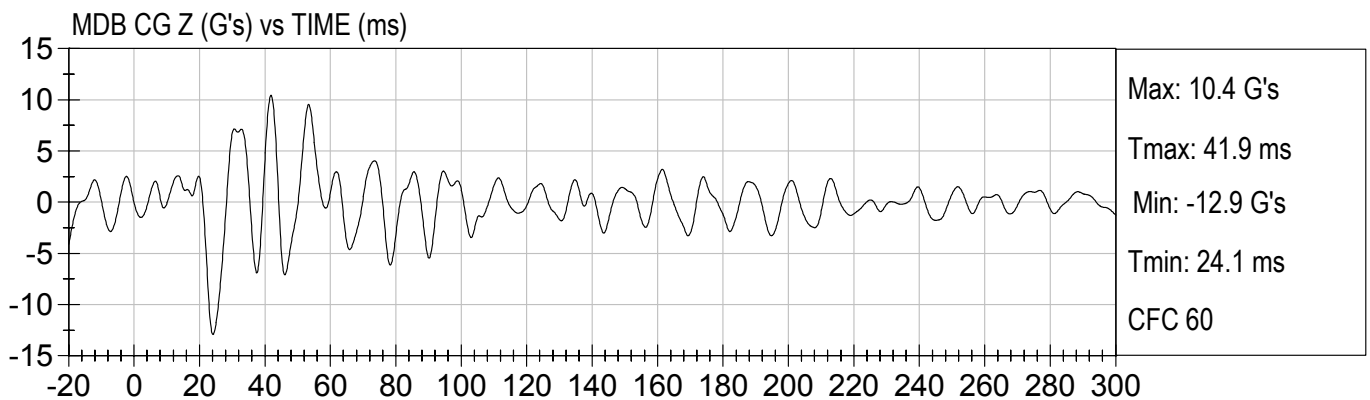
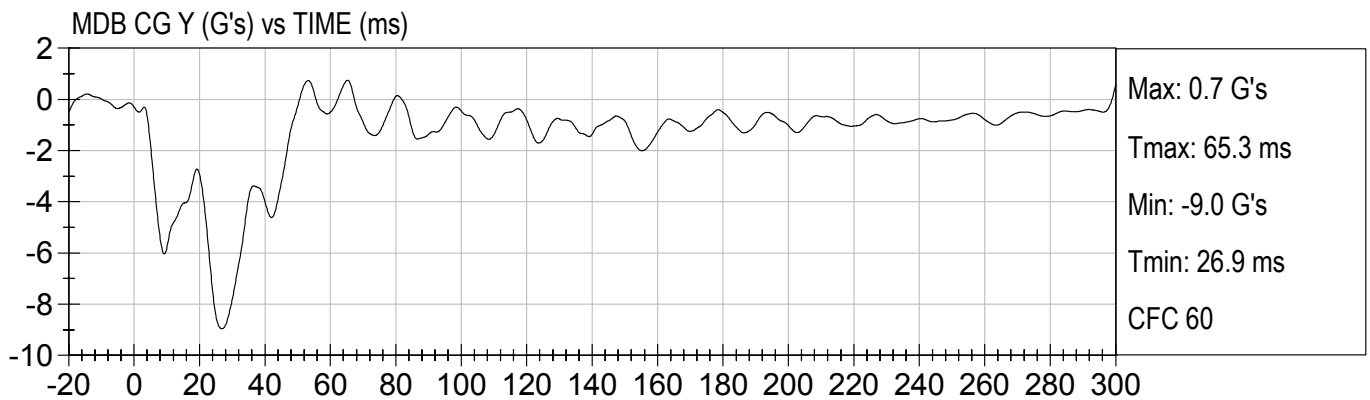
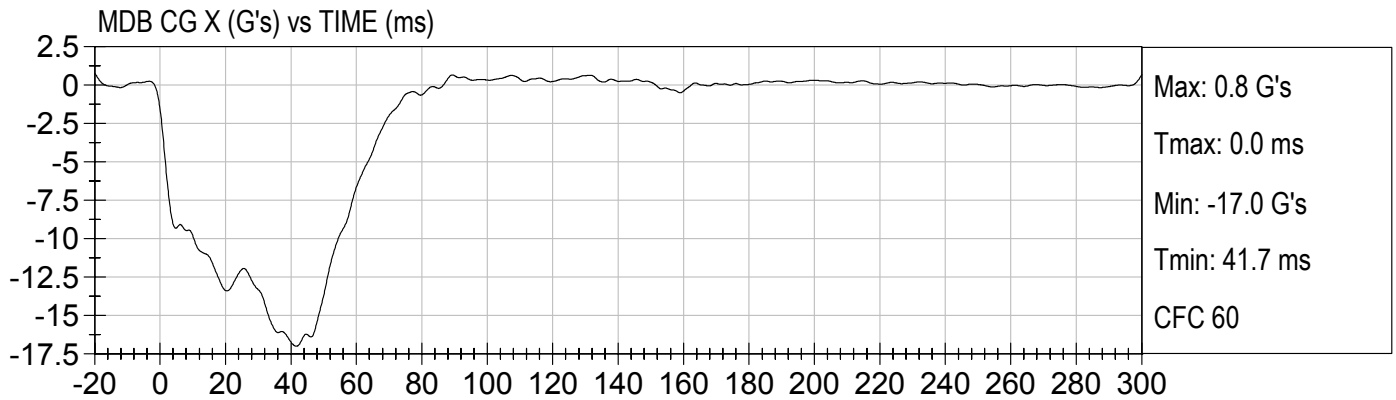


LR DOOR @ KNEE Y Velocity (kph) vs TIME (ms)



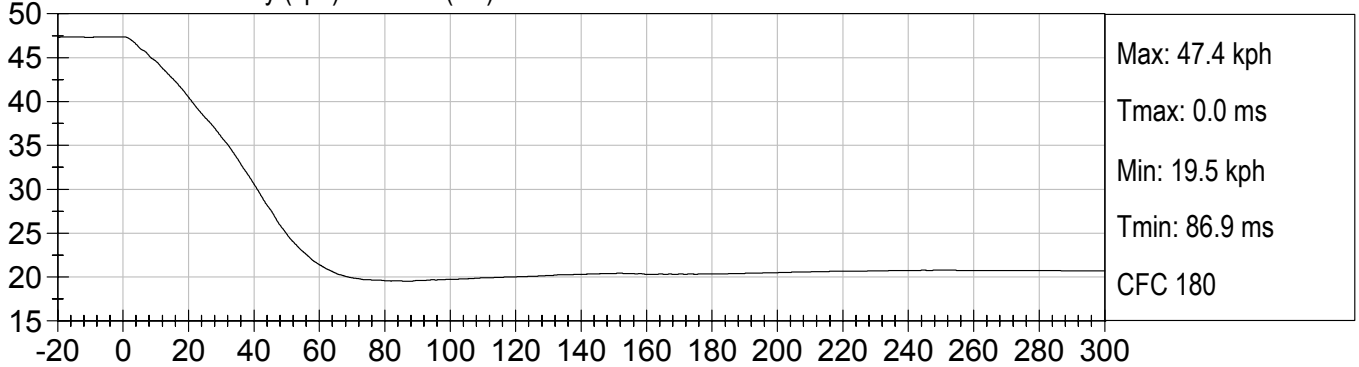
LR DOOR @ RIB Y Velocity (kph) vs TIME (ms)



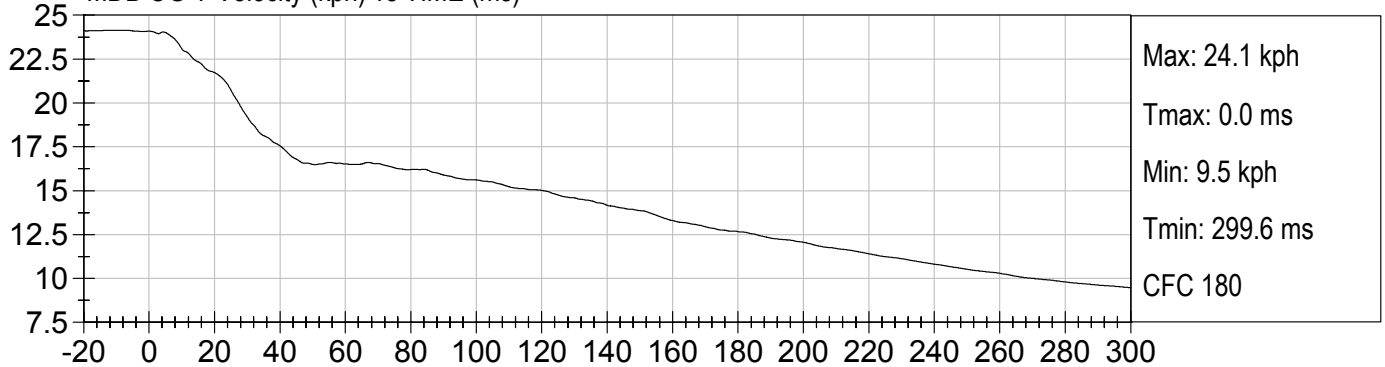




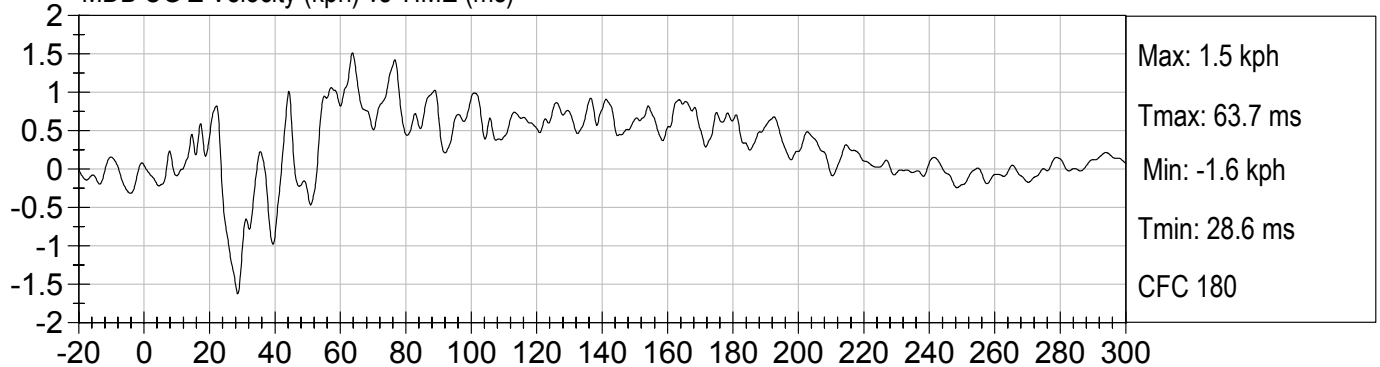
MDB CG X Velocity (kph) vs TIME (ms)



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



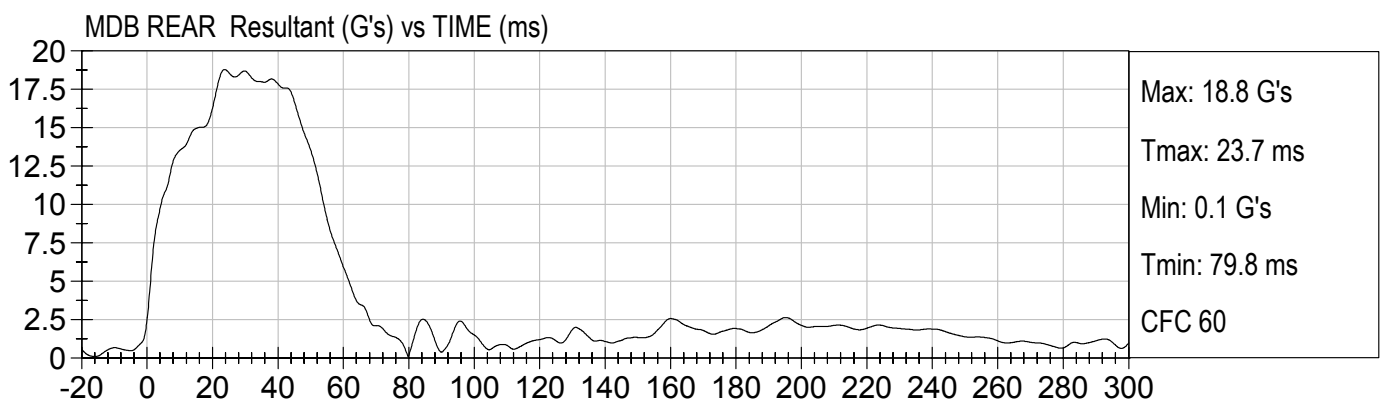
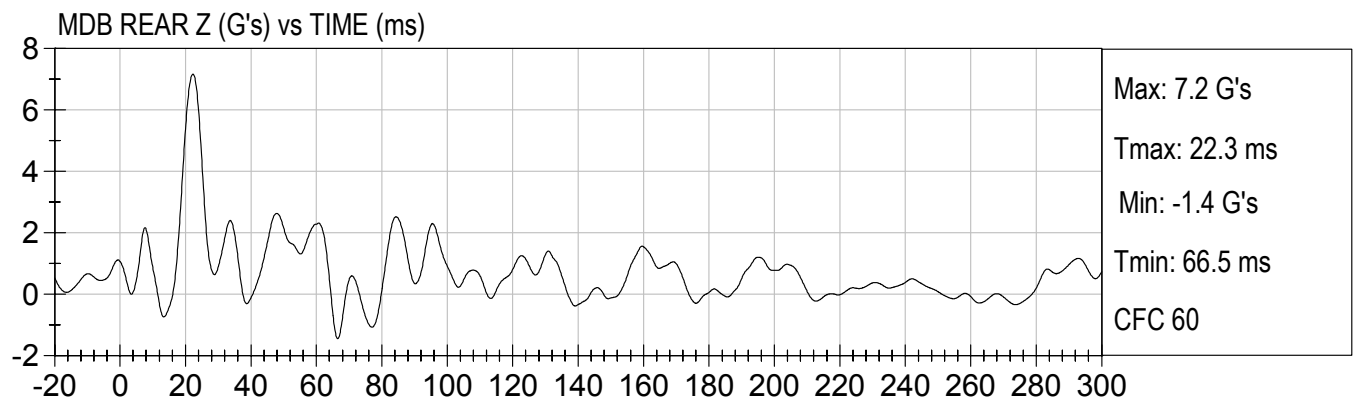
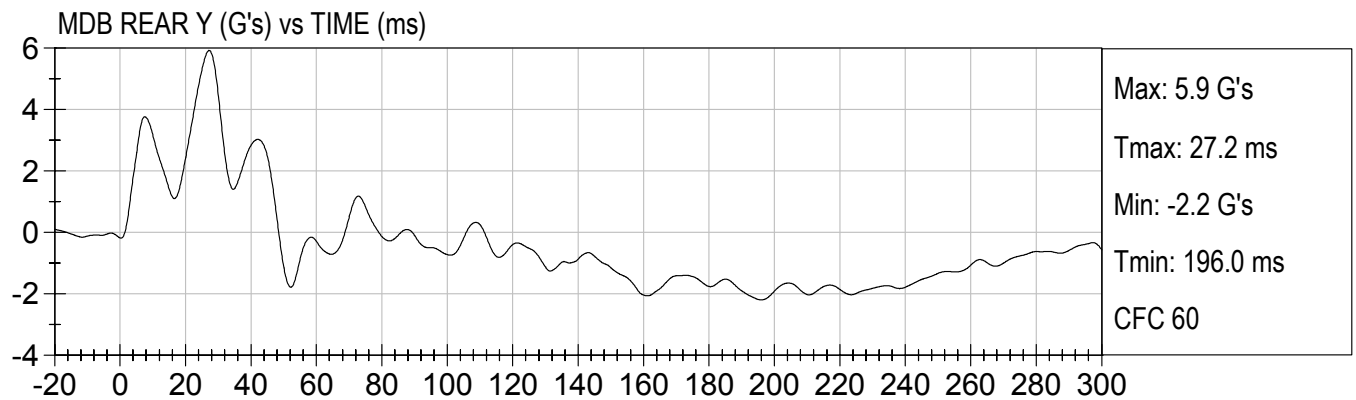
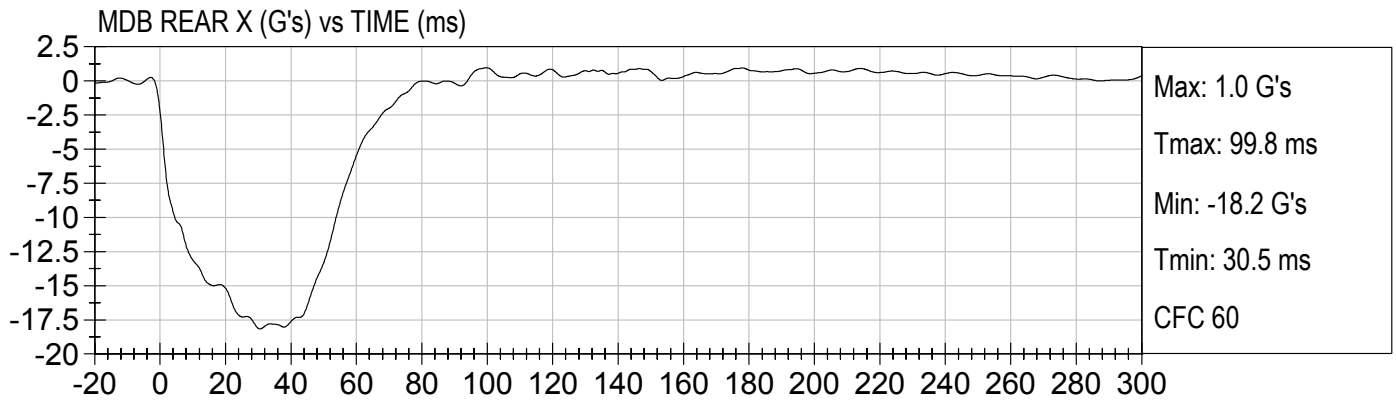
MDB CG Z Velocity (kph) vs TIME (ms)





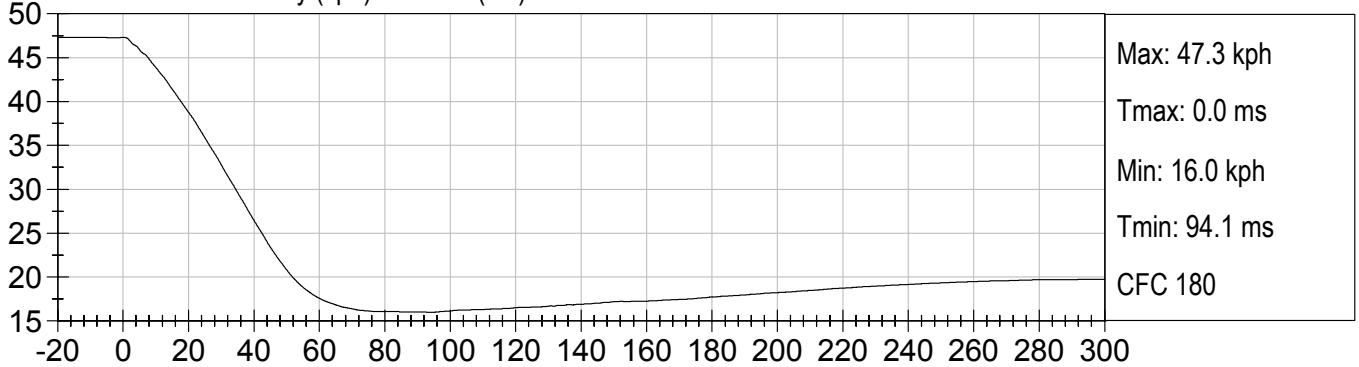
T.O 1 LEFT SIDE IMPACT
2005 SATRUN ION (R50168)

Test Date: 08/09/05
Speed: 33.0 mph (53.1 km/h)

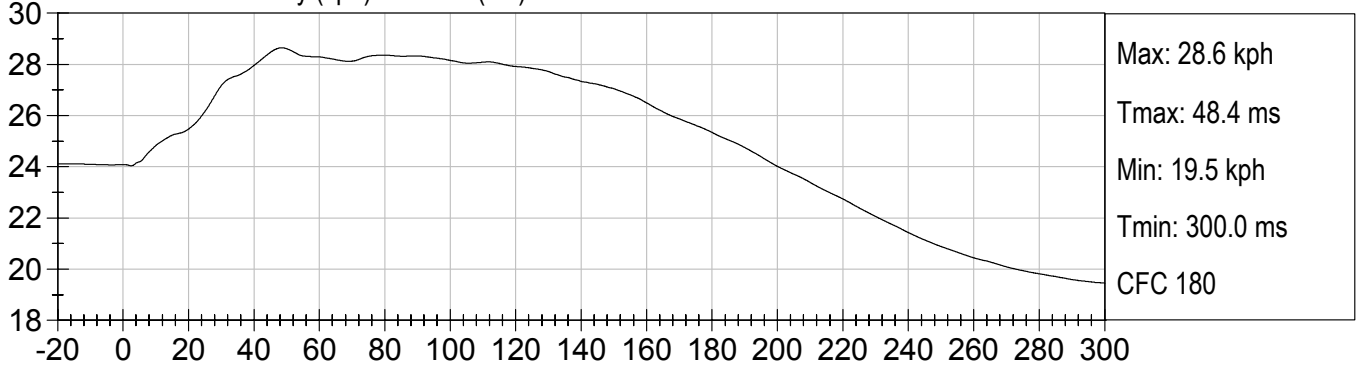




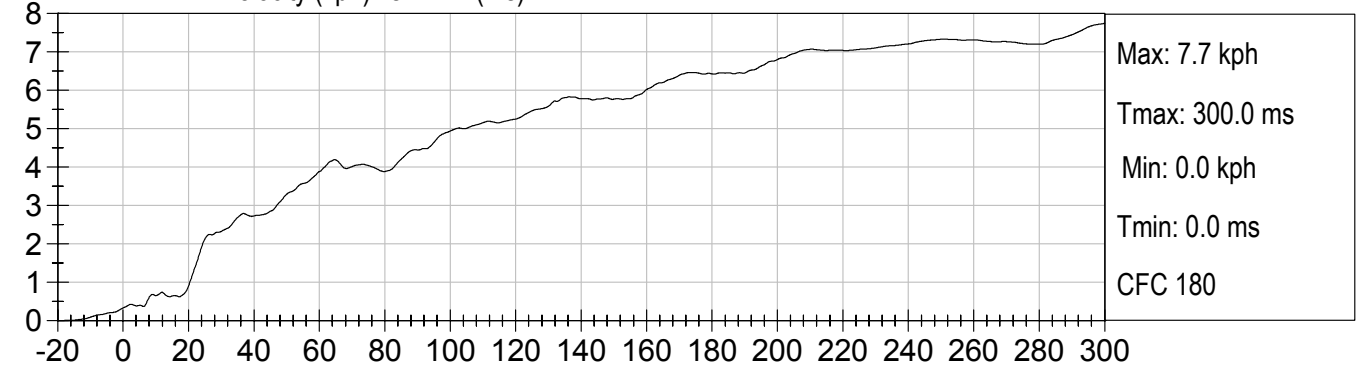
MDB REAR X Velocity (kph) vs TIME (ms)

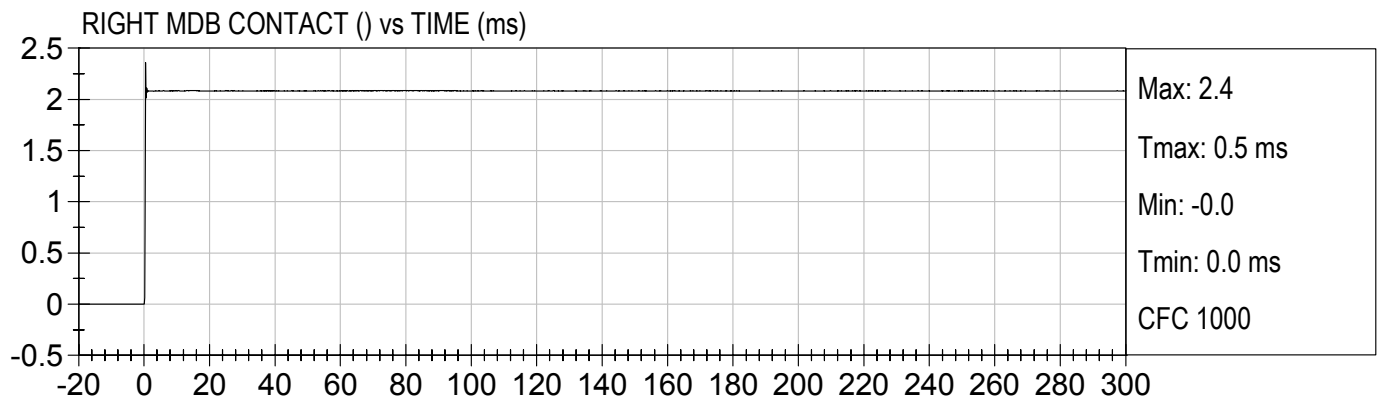
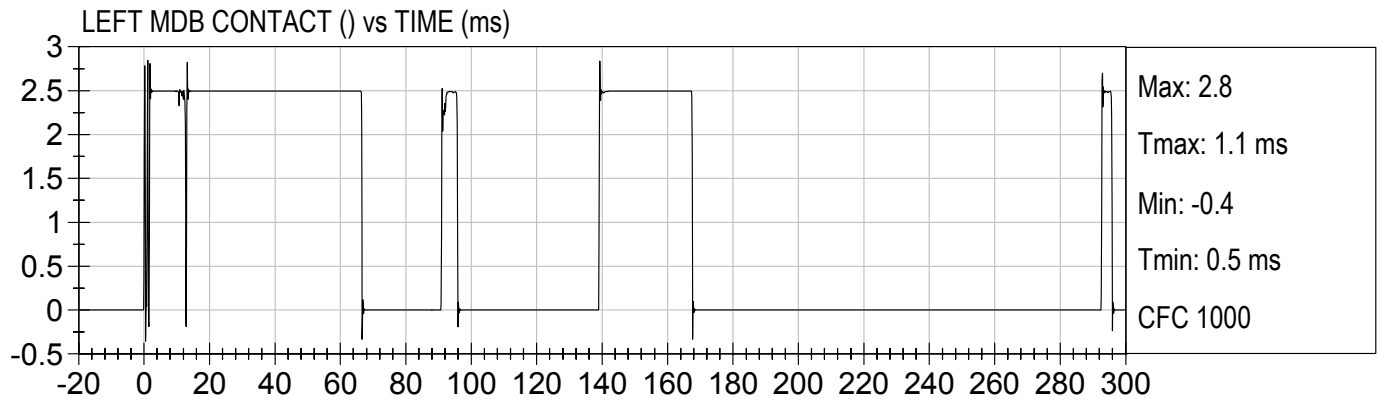


MDB REAR Y Velocity (kph) vs TIME (ms)



MDB REAR Z Velocity (kph) vs TIME (ms)





APPENDIX C

SIDIIsD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 033

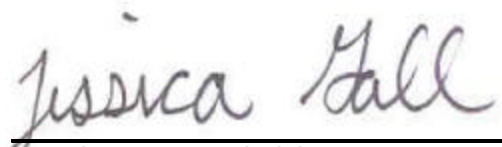
PRE-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

ATD Serial No: 033

Test ID: D052181

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	125 to 145	130	Pass
Peak Lateral Acceleration	G's	+/- 15	8	Pass
Unimodal	Yes/No	<10%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

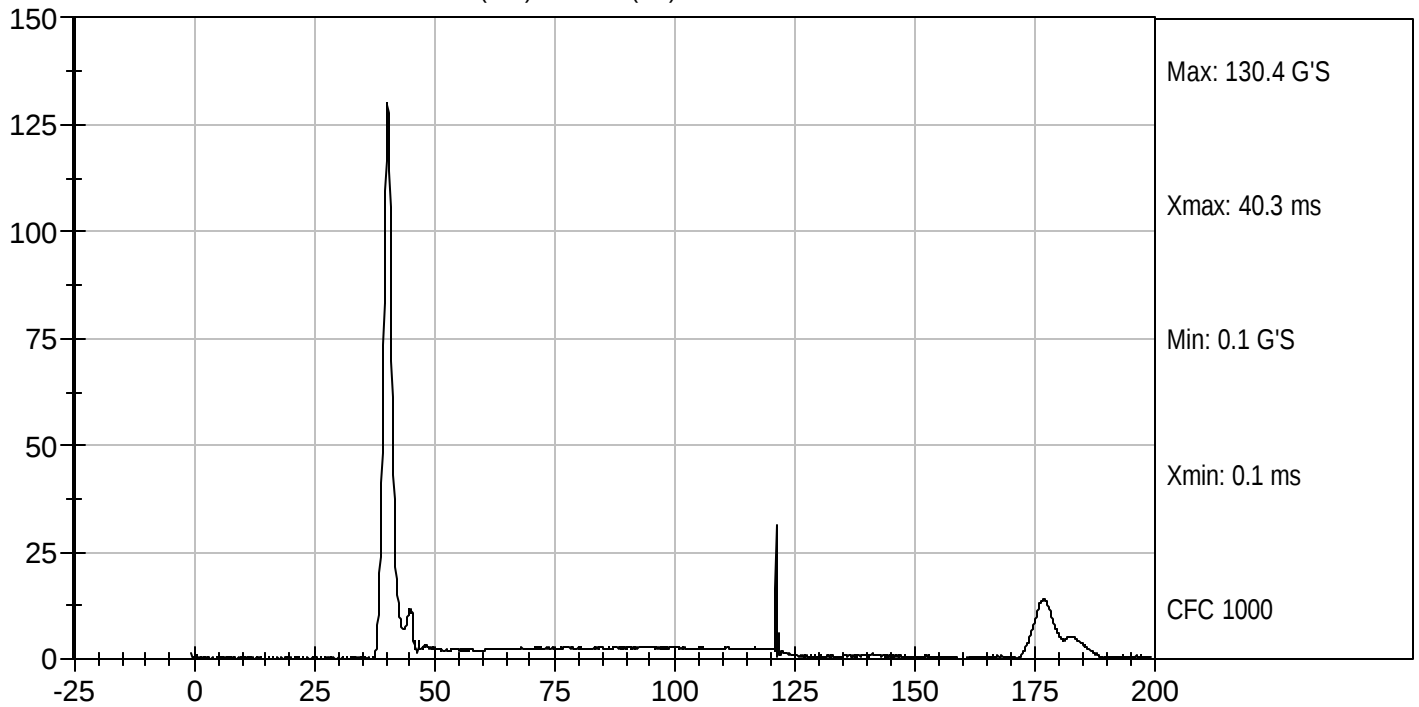
08/05/2005
Test Date



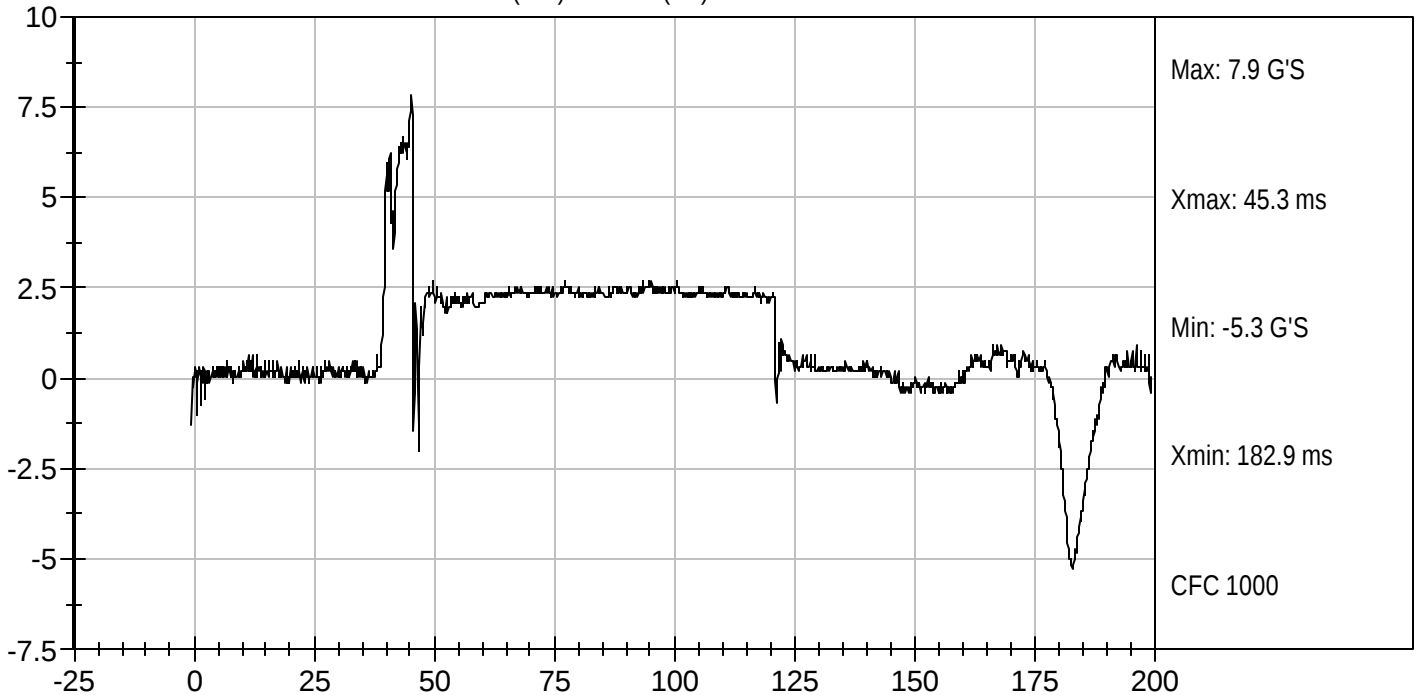
Test Desc: Head Drop
Componet ID: D052181

Test Date: 08/05/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052182

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.8	Pass
Humidity		%	10 to 70	43	Pass
Impact Velocity		m/s	5.51 to 5.63	5.62	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.60	Pass
	15 msec	m/s	3.40 to 4.10	3.69	Pass
	20 msec	m/s	4.50 to 5.40	4.87	Pass
	25 msec	m/s	5.50 to 6.10	5.80	Pass
	25-100 msec	m/s	5.20 to 6.20	5.88	Pass
Maximum D-Plane Rotation		deg	74 to 79	74	Pass
Time of Maximum D-Plane Rotation		Nm	50 to 70	65	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-45 to -40	-42	Pass
Time of Moment Decay to 0 Nm		msec	113 to 123	117	Pass
Overall Test Results				Pass	

Jessica Hall
 Laboratory Technician

David Winkelbauer

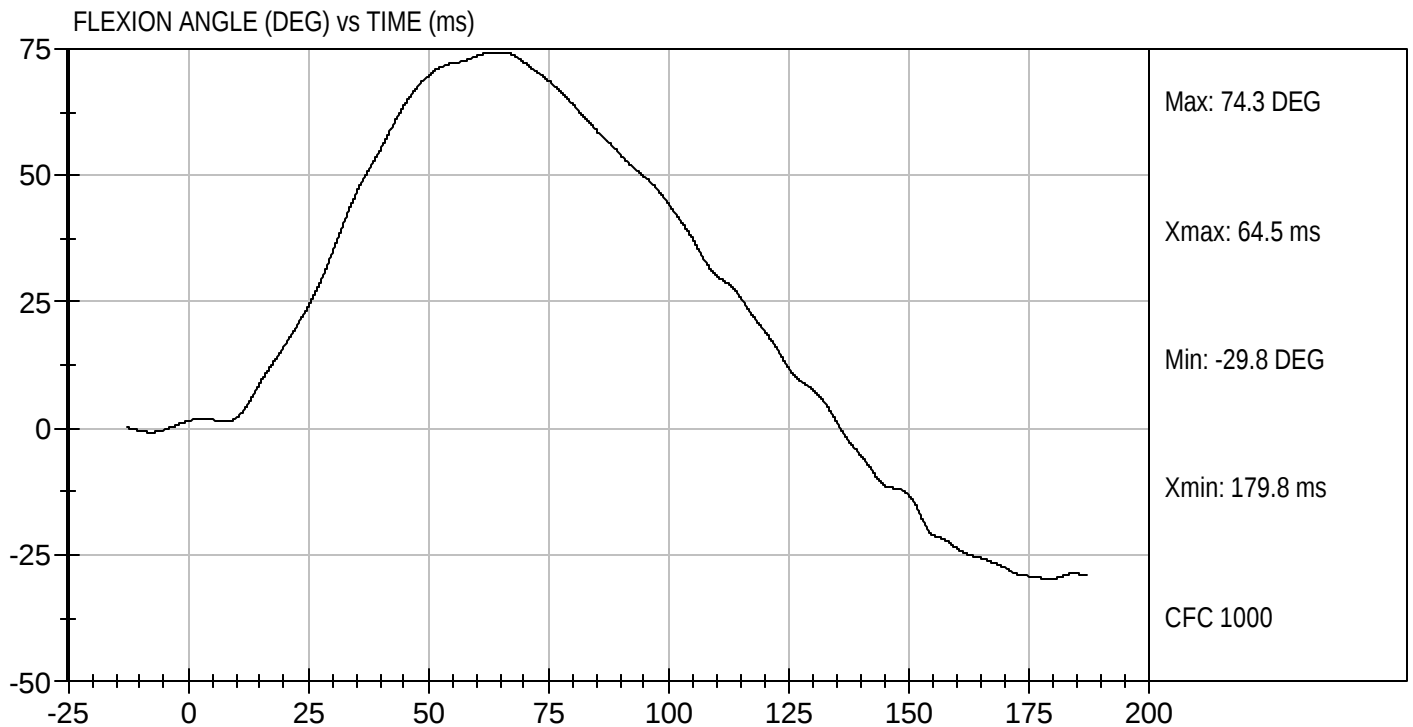
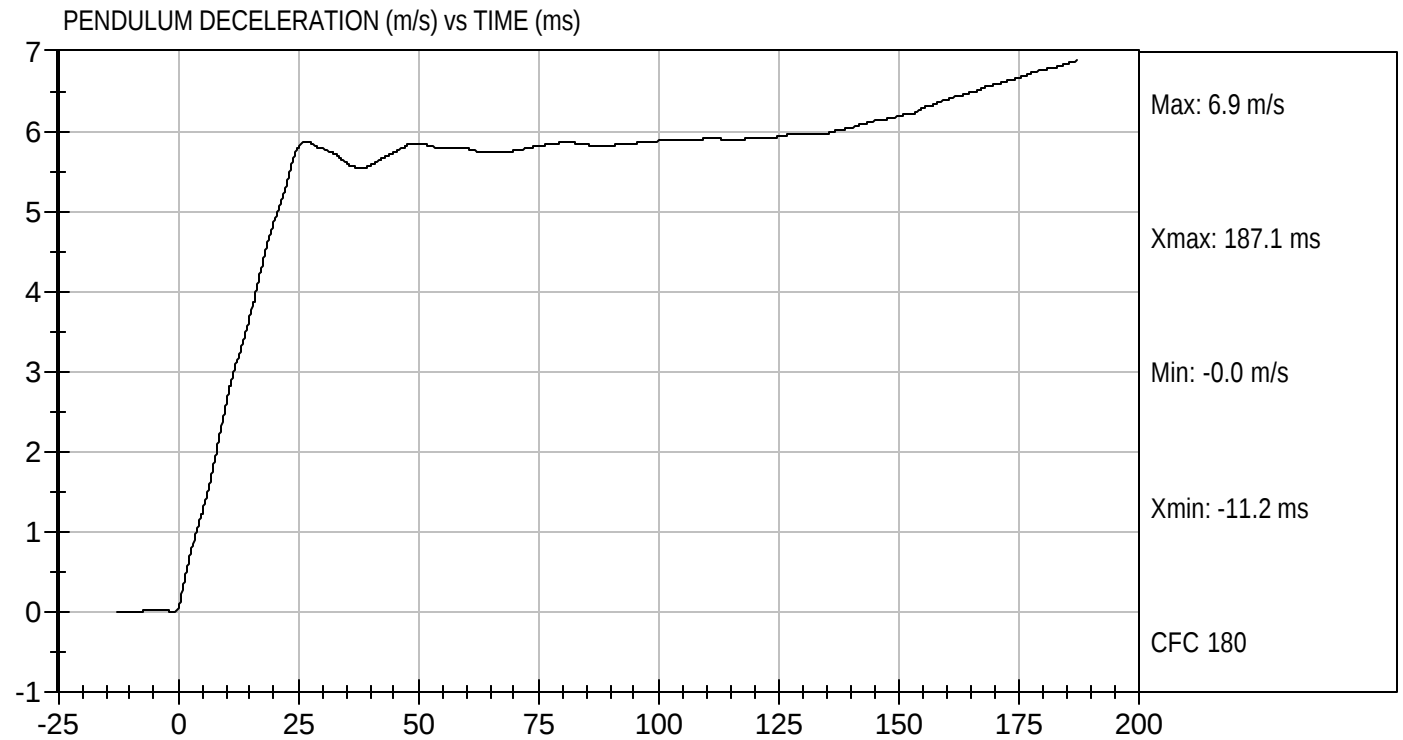
Approved By

08/05/2005
 Test Date



Test Desc: Neck Bending
Componet ID: D052182

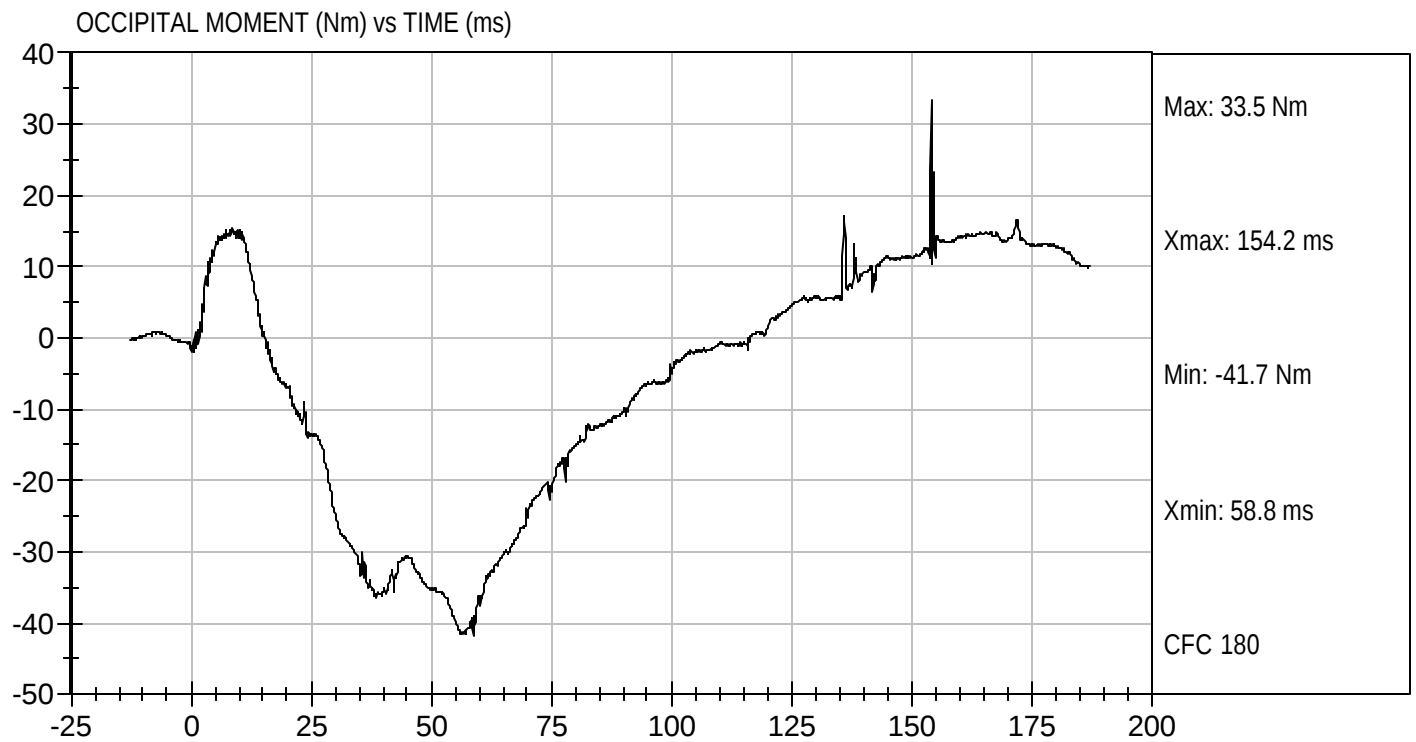
Test Date: 08/05/2005
Velocity: 18.45 ft/s, 5.62 m/s





Test Desc: Neck Bending
Componet ID: D052182

Test Date: 08/05/2005
Velocity: 18.45 ft/s, 5.62 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test ID: D052183

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.0	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.41 to 4.59	4.49	Pass
Maximum Probe Force	kN	1.6 to 2.4	2.2	Pass
Shoulder Displacement	mm	27 to 39	34	Pass
Overall Test Results				Pass



Laboratory Technician

08/04/2005

Test Date

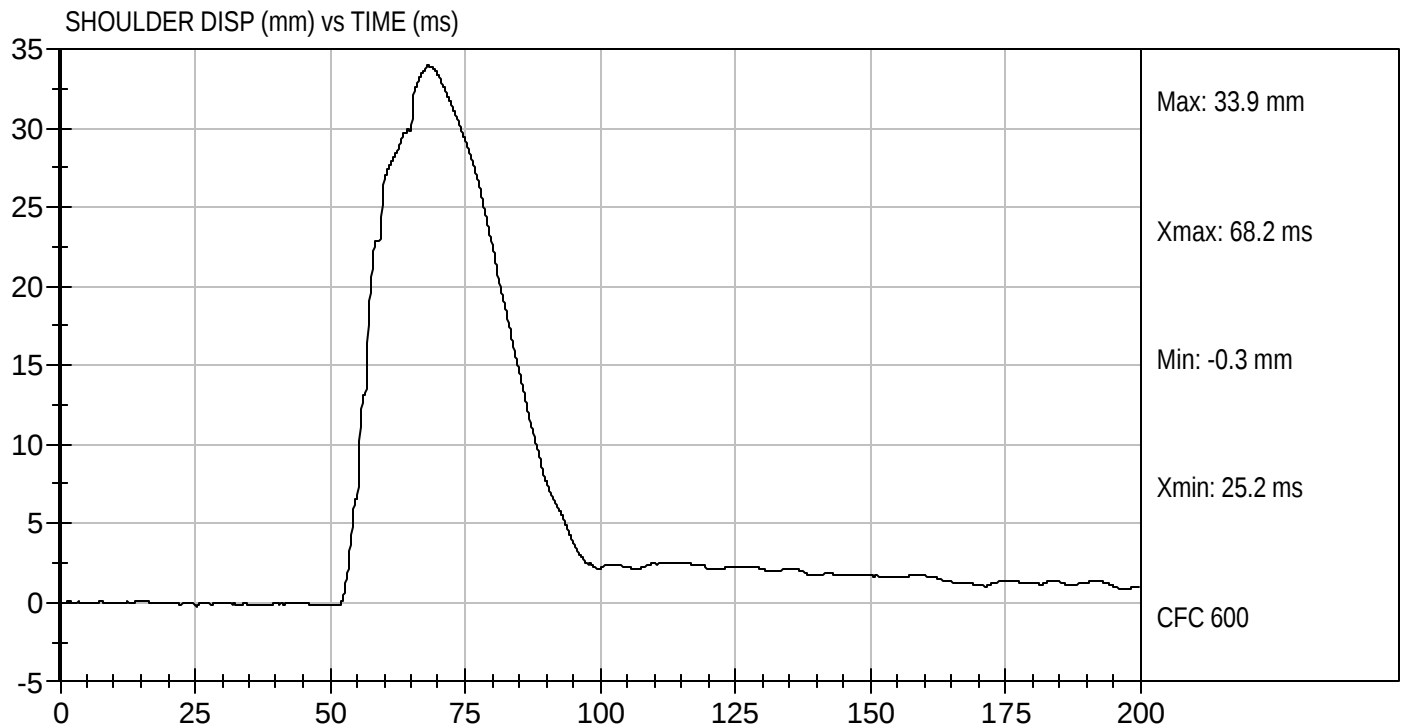
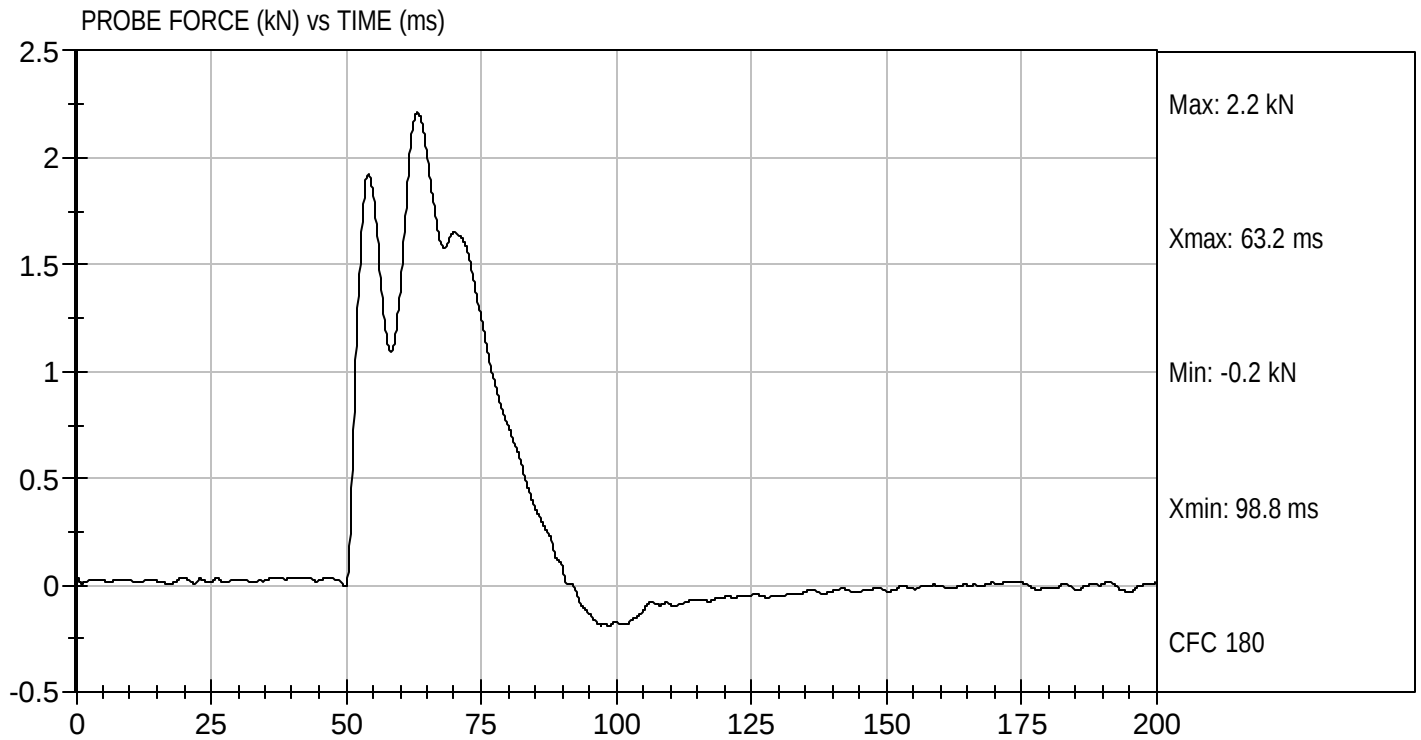


Approved By



Test Desc: Shoulder Impact
Componet ID: D052183

Test Date: 08/04/2005
Velocity: 14.73 ft/s, 4.49 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 033

Test I.D: D052184

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	6.57 to 6.84	6.78	Pass
Peak Impactor Force	kN	4.1 to 4.7	4.6	Pass
Shoulder Displacement	mm	30 to 42	38	Pass
Upper Rib Displacement	mm	23 to 35	30	Pass
Middle Rib Displacement	mm	29 to 44	32	Pass
Lower Rib Displacement	mm	33 to 40	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 48	39	Pass
Lower Spine (T12) Y Acceleration	G's	30 to 38	31	Pass
Overall Test Results			Pass	


 Laboratory Technician

08/04/2005

Test Date

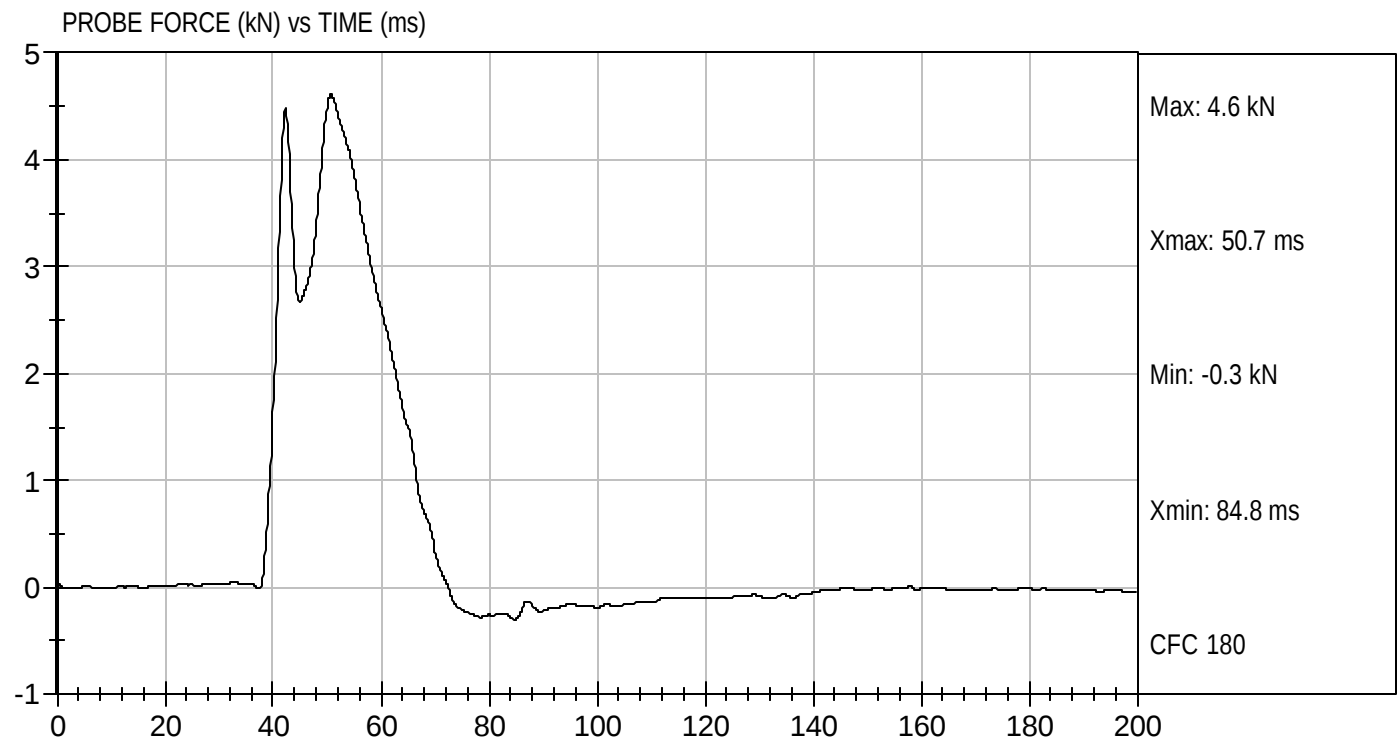


Approved By



Test Desc: Thorax With Arm
Componet ID: D052184

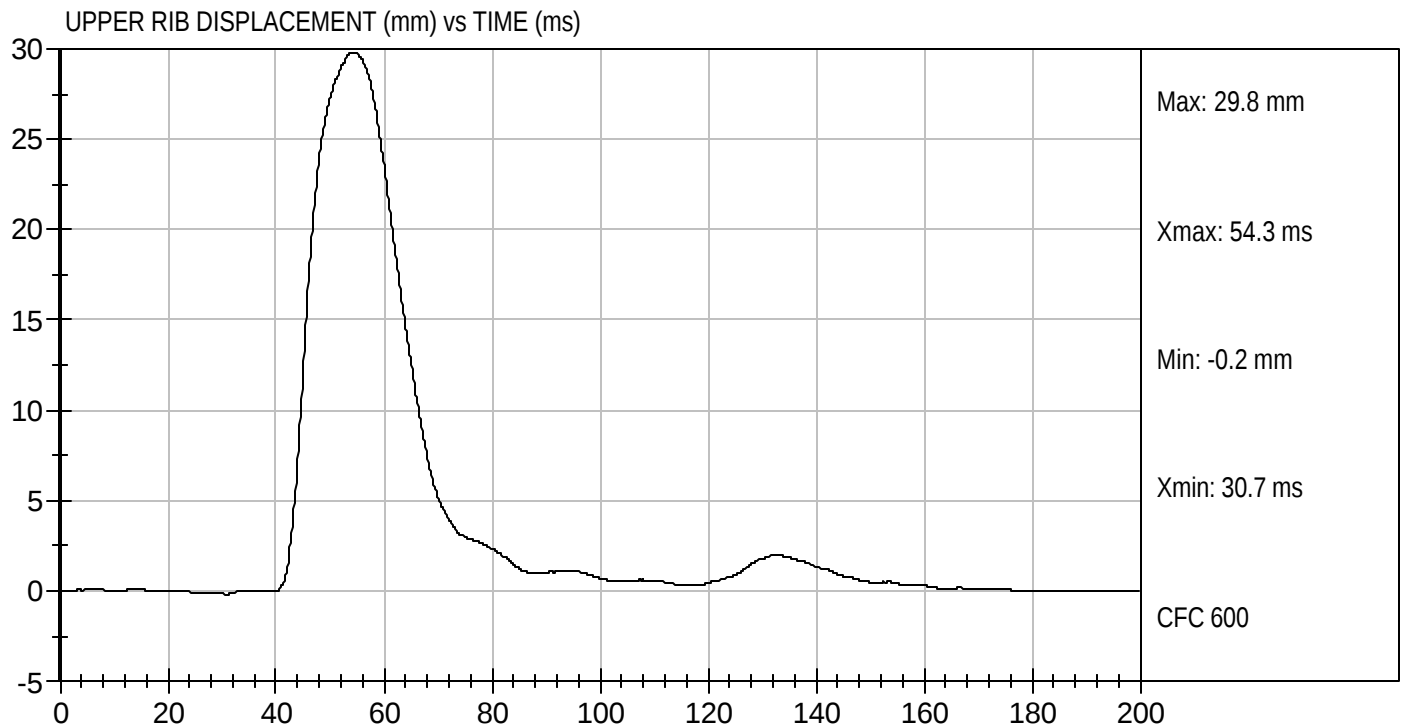
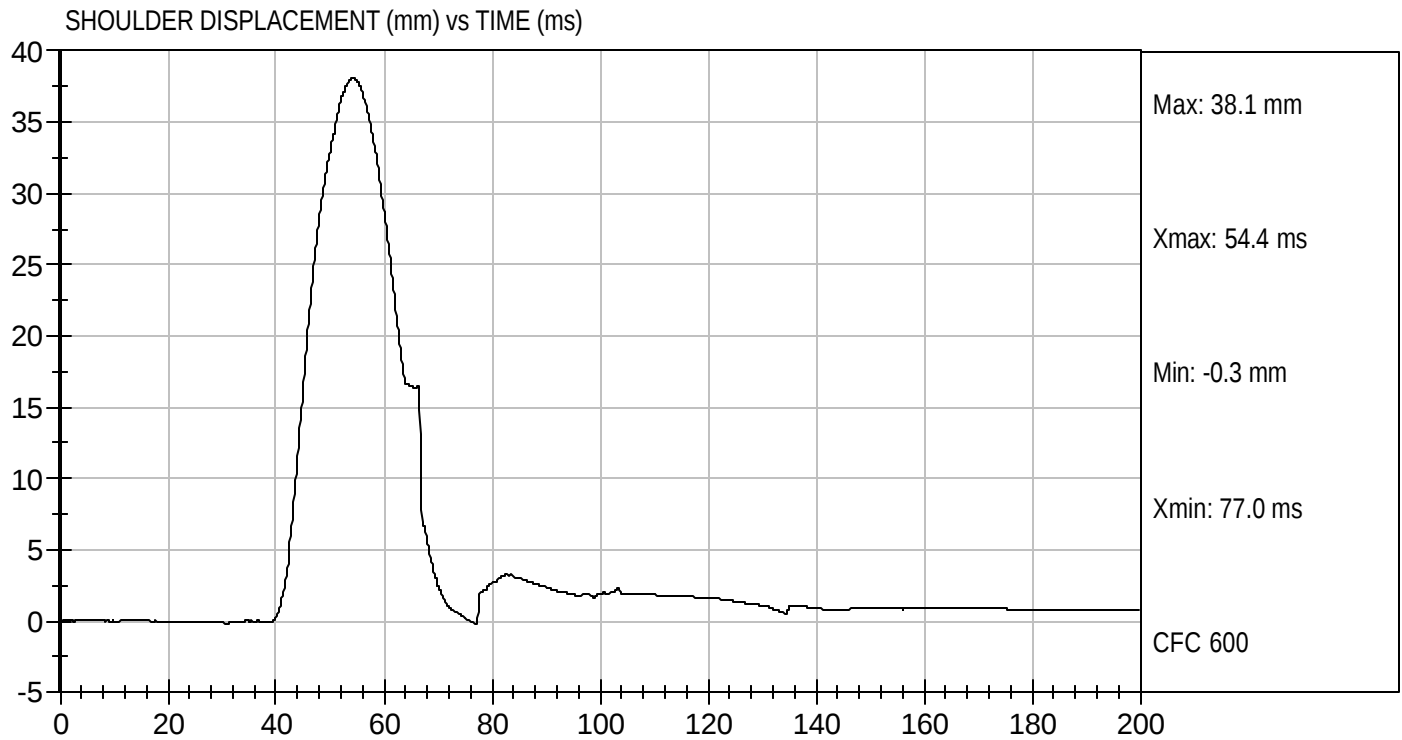
Test Date: 08/04/2005
Velocity: 22.25 ft/s, 6.78 m/s





Test Desc: Thorax With Arm
Componet ID: D052184

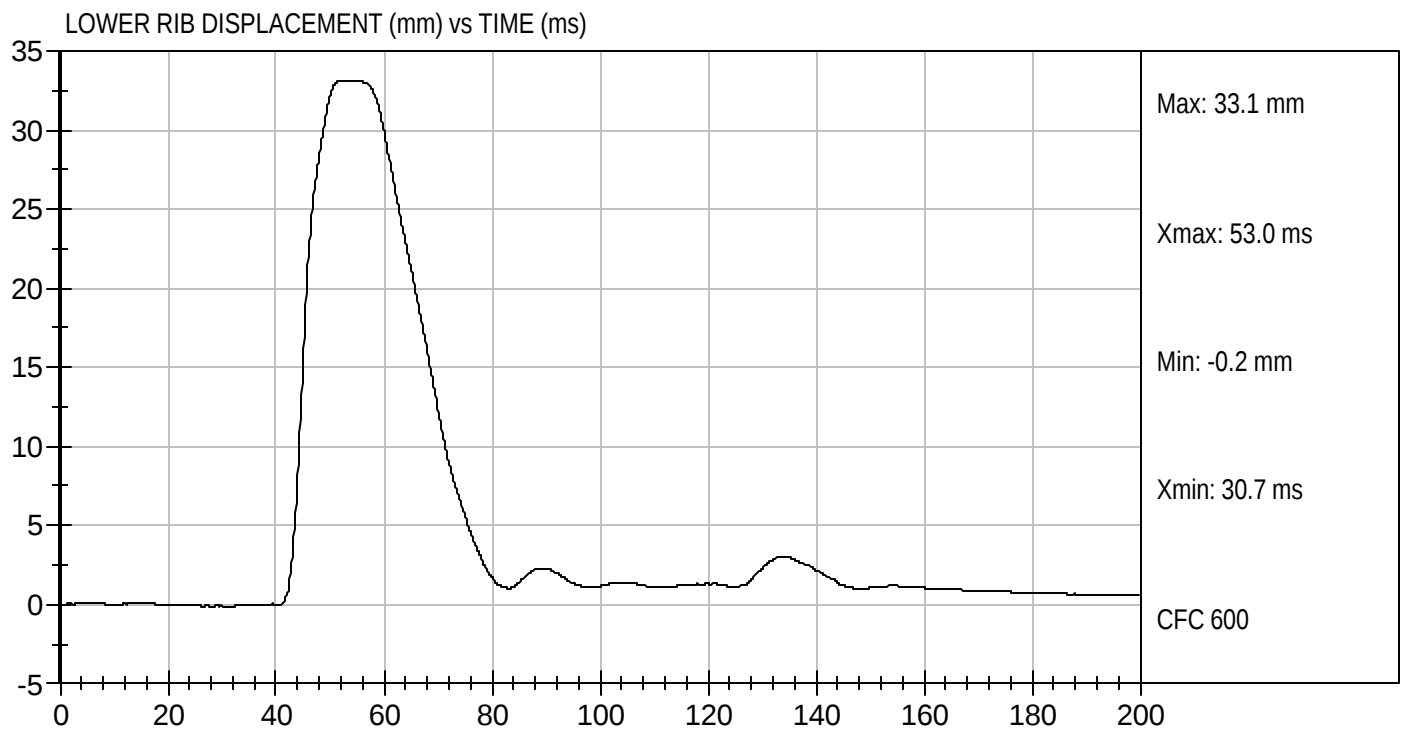
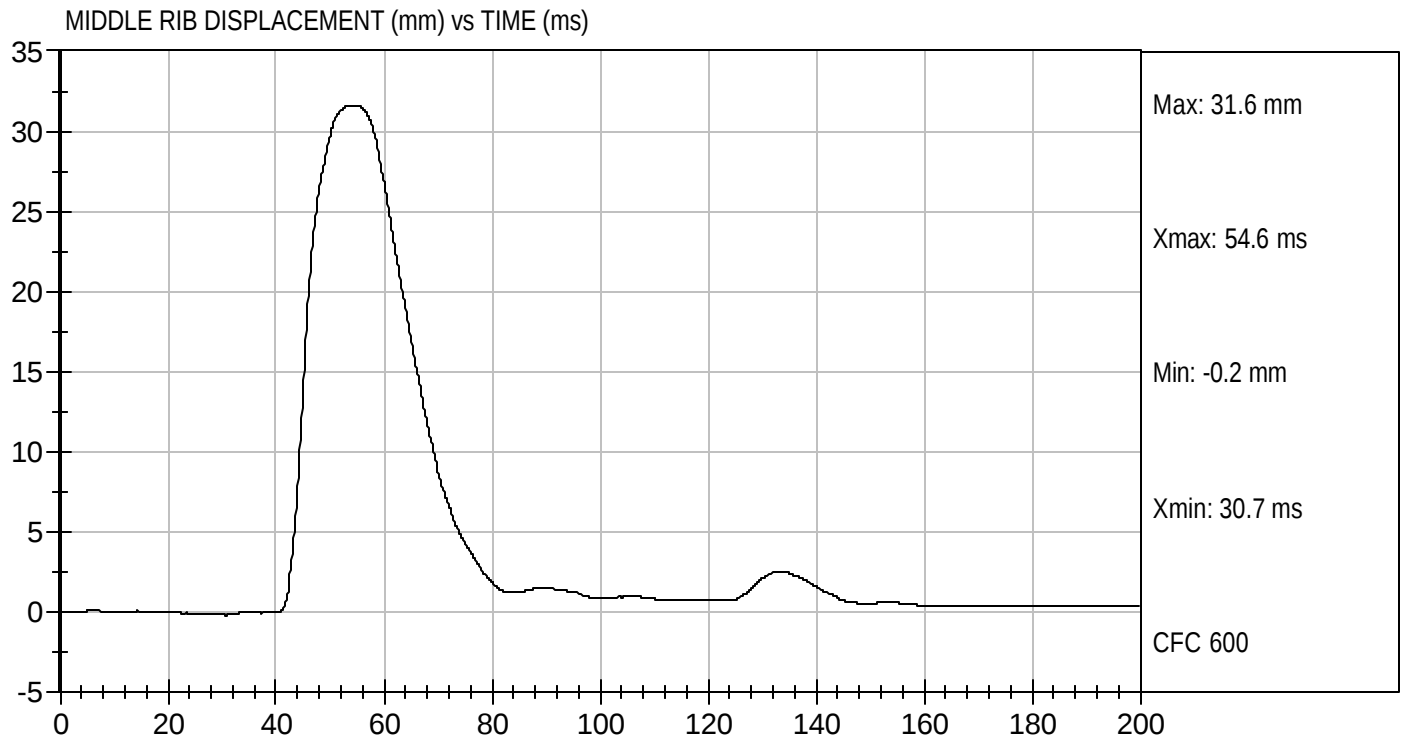
Test Date: 08/04/2005
Velocity: 22.25 ft/s, 6.78 m/s





Test Desc: Thorax With Arm
Componet ID: D052184

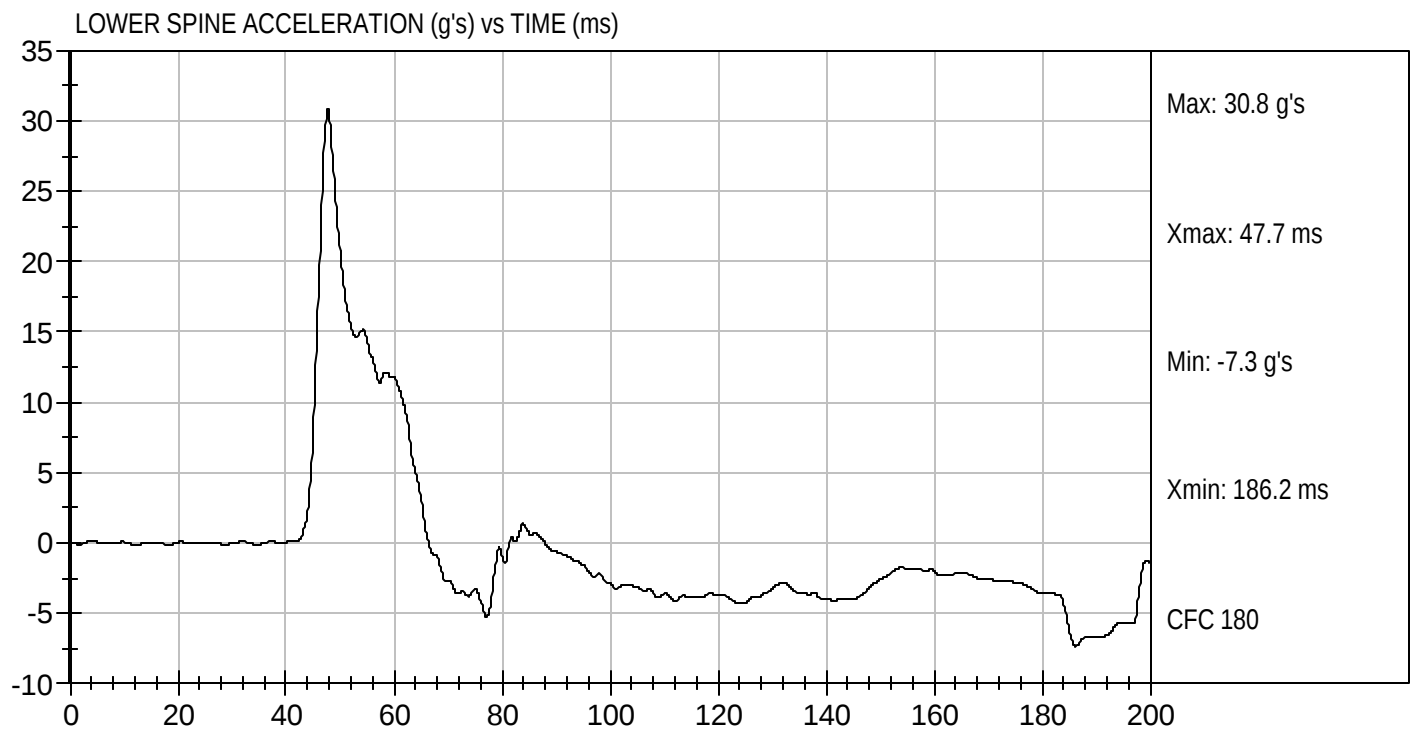
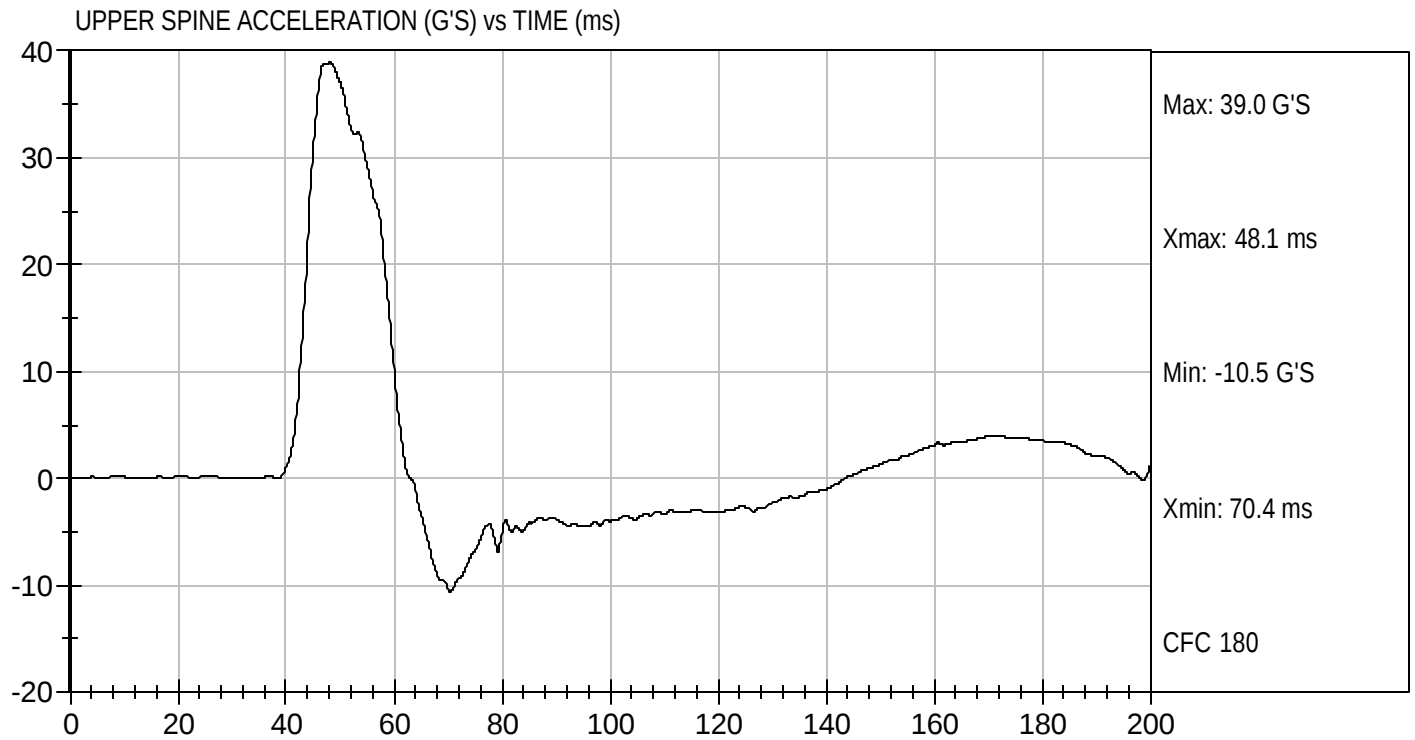
Test Date: 08/04/2005
Velocity: 22.25 ft/s, 6.78 m/s





Test Desc: Thorax With Arm
Componet ID: D052184

Test Date: 08/04/2005
Velocity: 22.25 ft/s, 6.78 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 033

Test I.D: D052185

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.37	Pass
Peak Impactor Force	kN	1.8 to 2.3	2.1	Pass
Upper Rib Displacement	mm	32 to 41	37	Pass
Middle Rib Displacement	mm	40 to 51	41	Pass
Lower Rib Displacement	mm	34 to 47	40	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 18	14	Pass
Lower Spine (T12) Y Acceleration	G's	8 to 13	8	Pass
Overall Test Results				Pass


Laboratory Technician

08/04/2005

Test Date

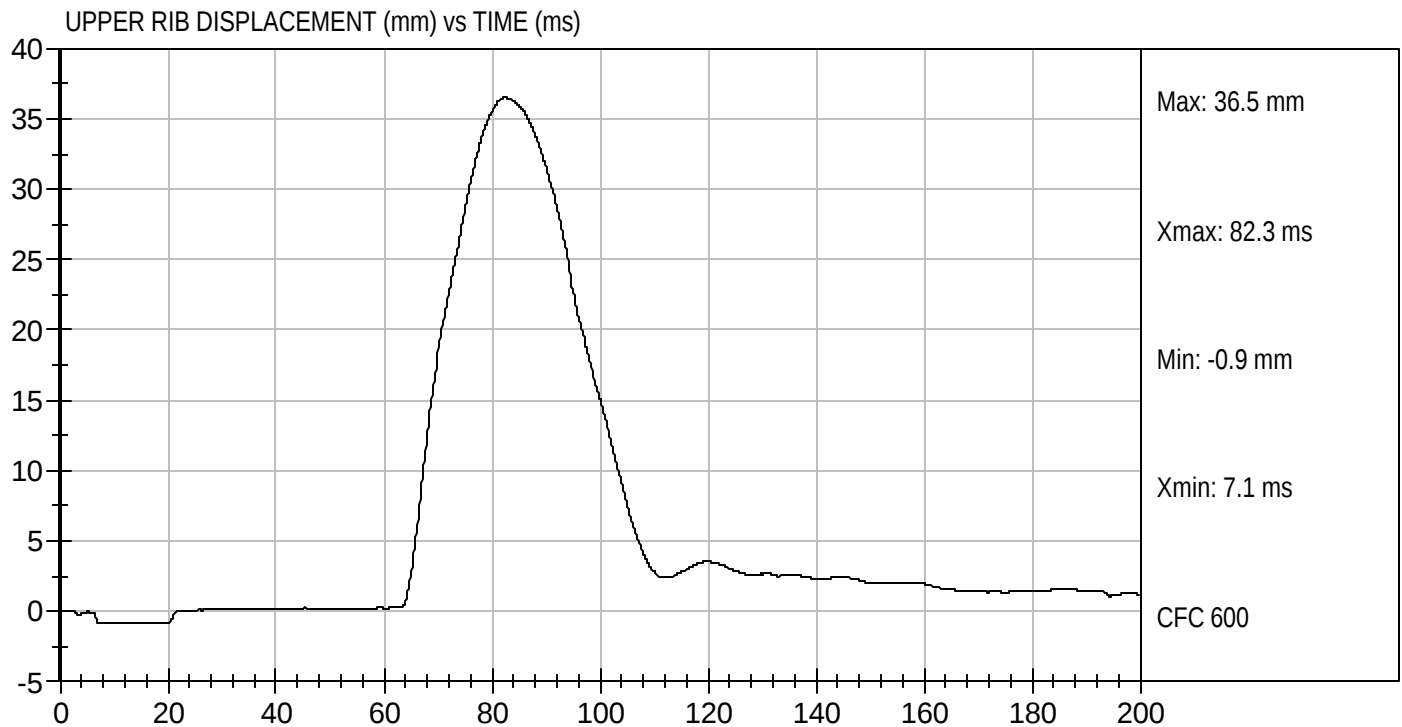
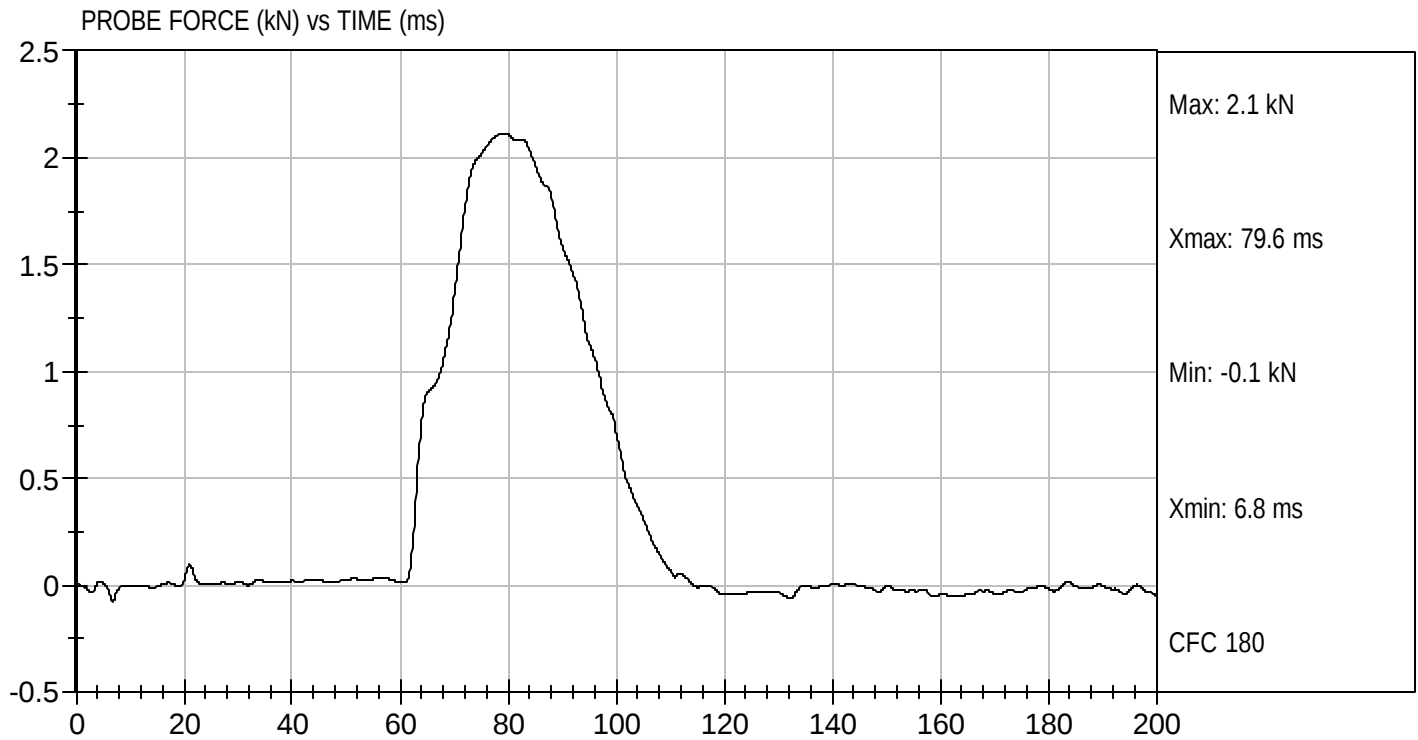


Approved By



Test Desc: Thorax Without Arm
Componet ID: D052185

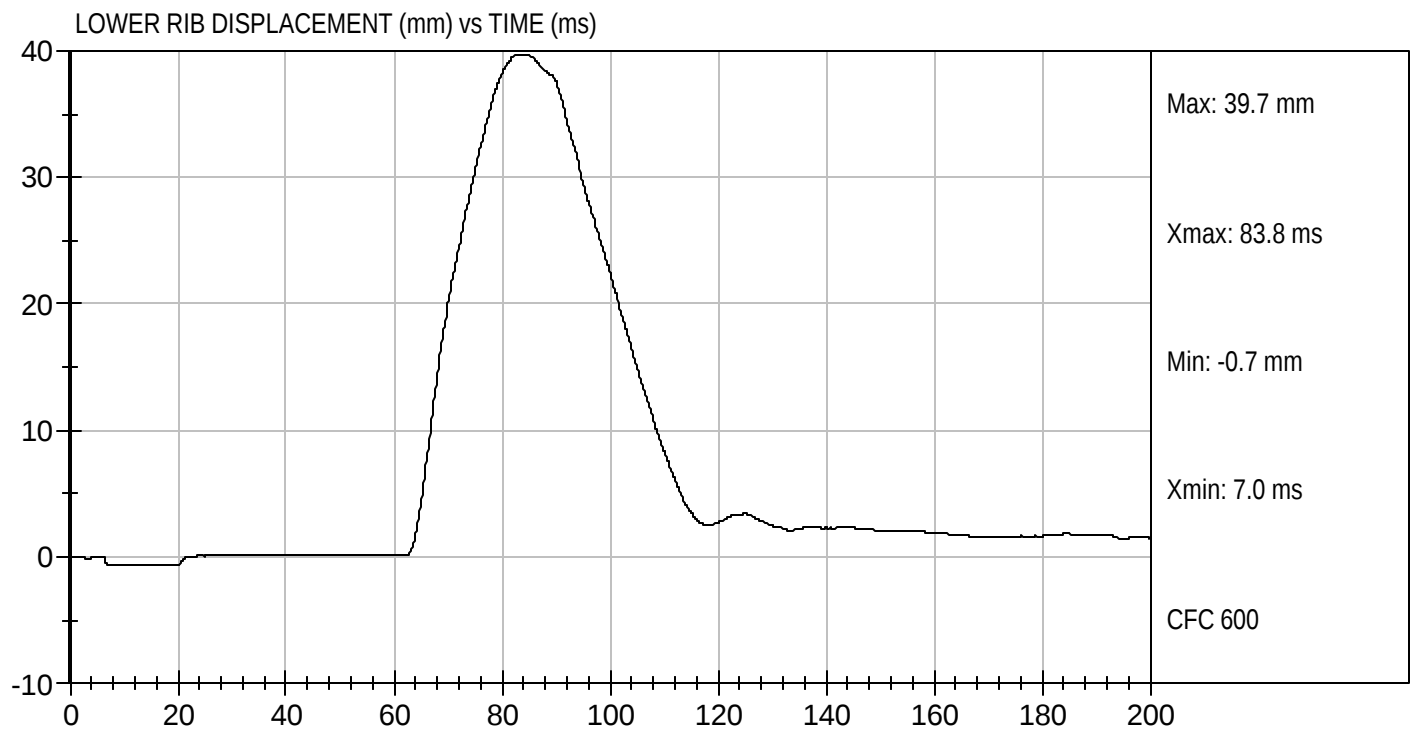
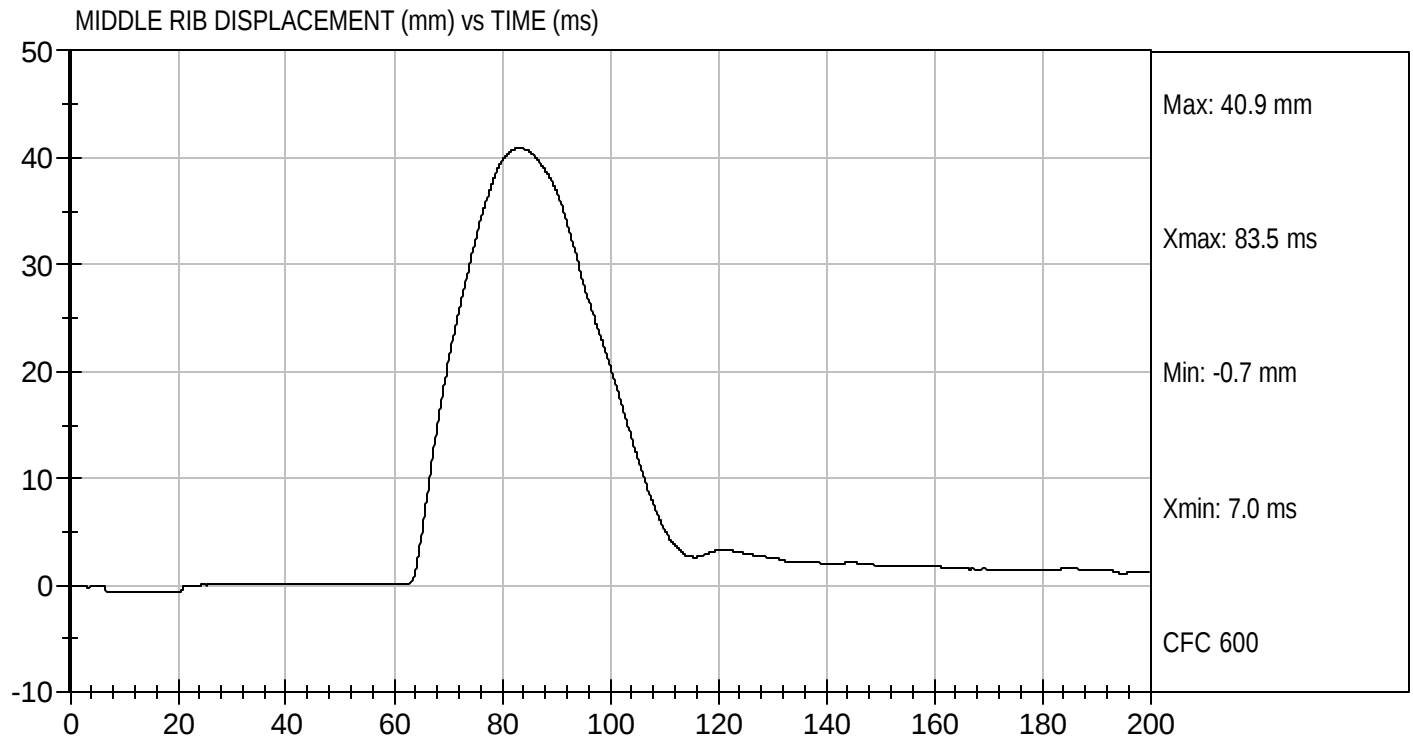
Test Date: 08/04/2005
Velocity: 14.35 ft/s, 4.37 m/s





Test Desc: Thorax Without Arm
Componet ID: D052185

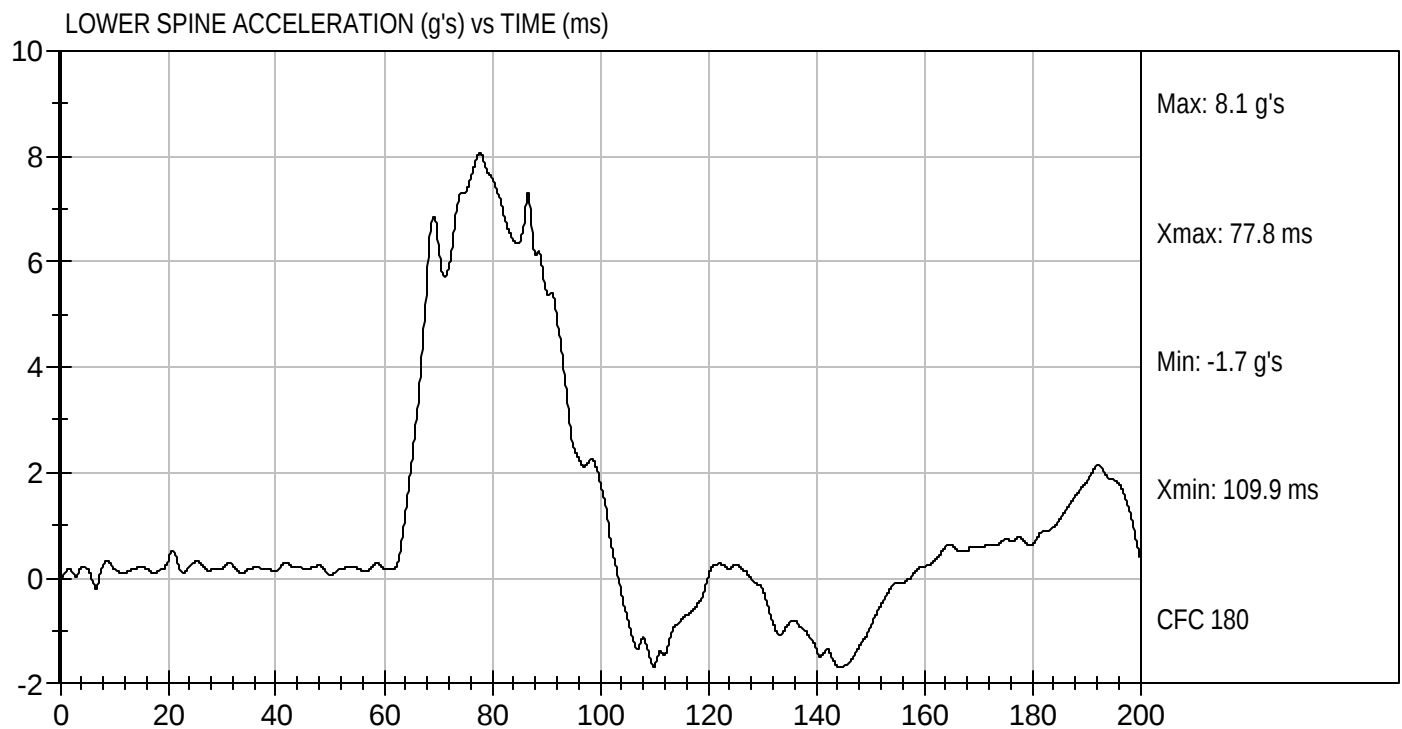
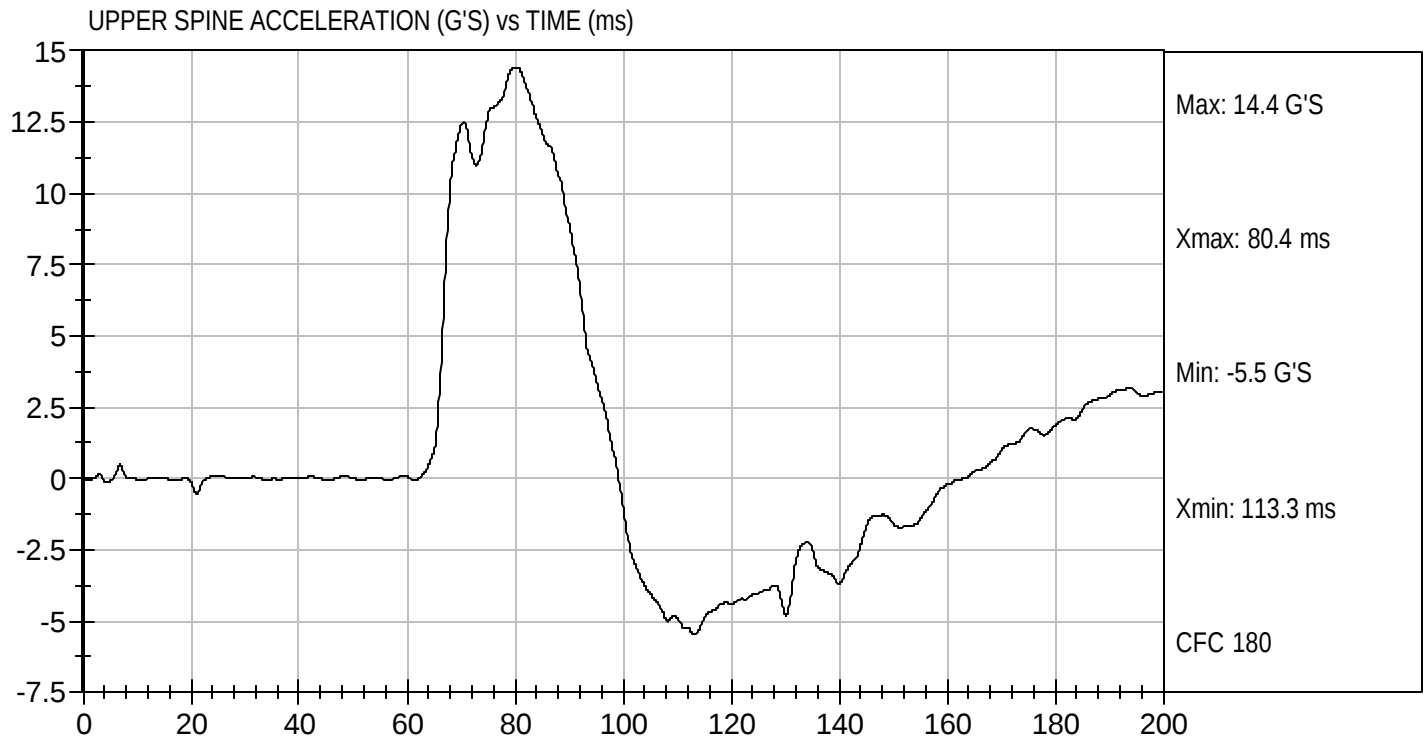
Test Date: 08/04/2005
Velocity: 14.35 ft/s, 4.37 m/s





Test Desc: Thorax Without Arm
Componet ID: D052185

Test Date: 08/04/2005
Velocity: 14.35 ft/s, 4.37 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052186

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	4.41 to 4.59	4.54	Pass
Peak Impactor Force	kN	1.3 to 1.9	1.8	Pass
Upper Rib Displacement	mm	44 to 55	44	Pass
Lower Rib Displacement	mm	44 to 56	47	Pass
Upper Spine (T1) Y Acceleration	G's	5 to 9	8	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 13	12	Pass
Overall Test Results			Pass	


Laboratory Technician

08/04/2005

Test Date

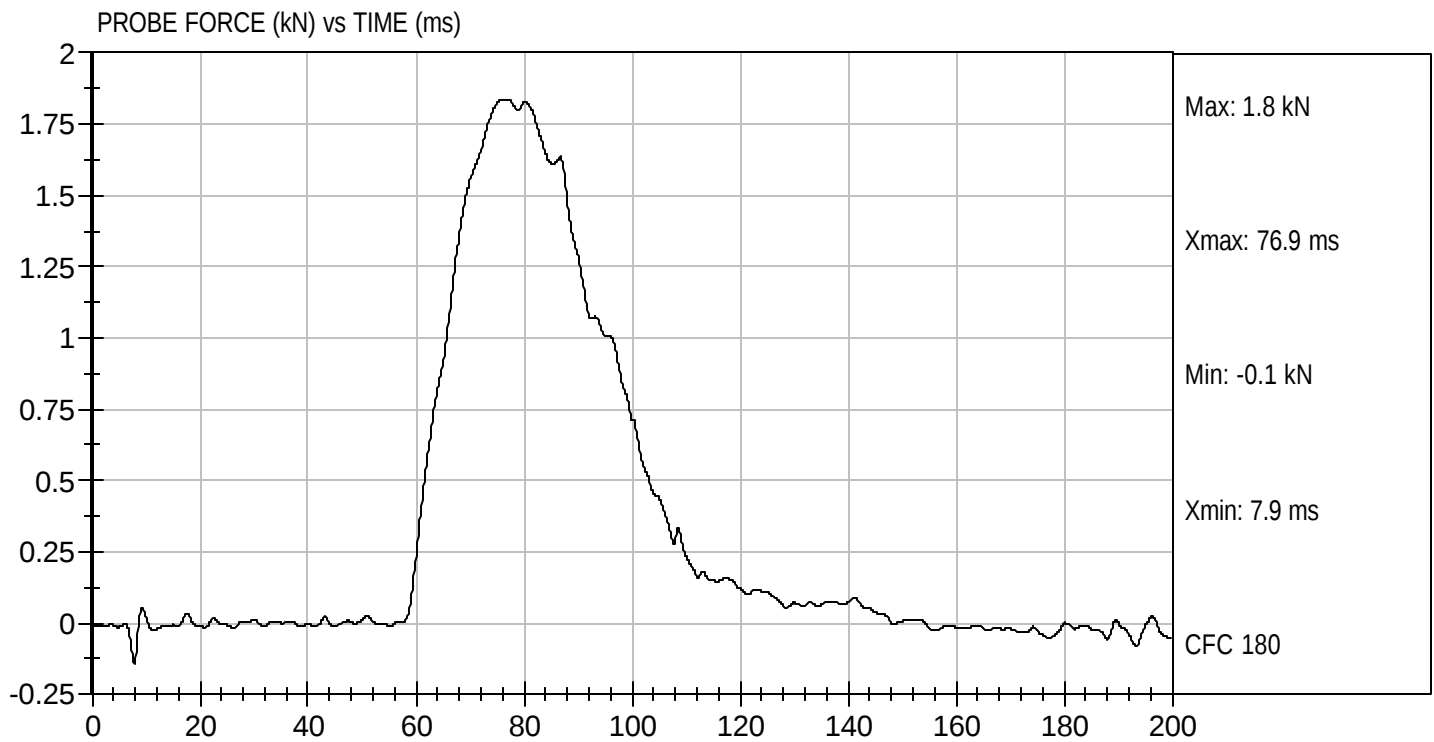


Approved By



Test Desc: Abdomen Impact
Componet ID: D052186

Test Date: 08/04/2005
Velocity: 14.89 ft/s, 4.54 m/s

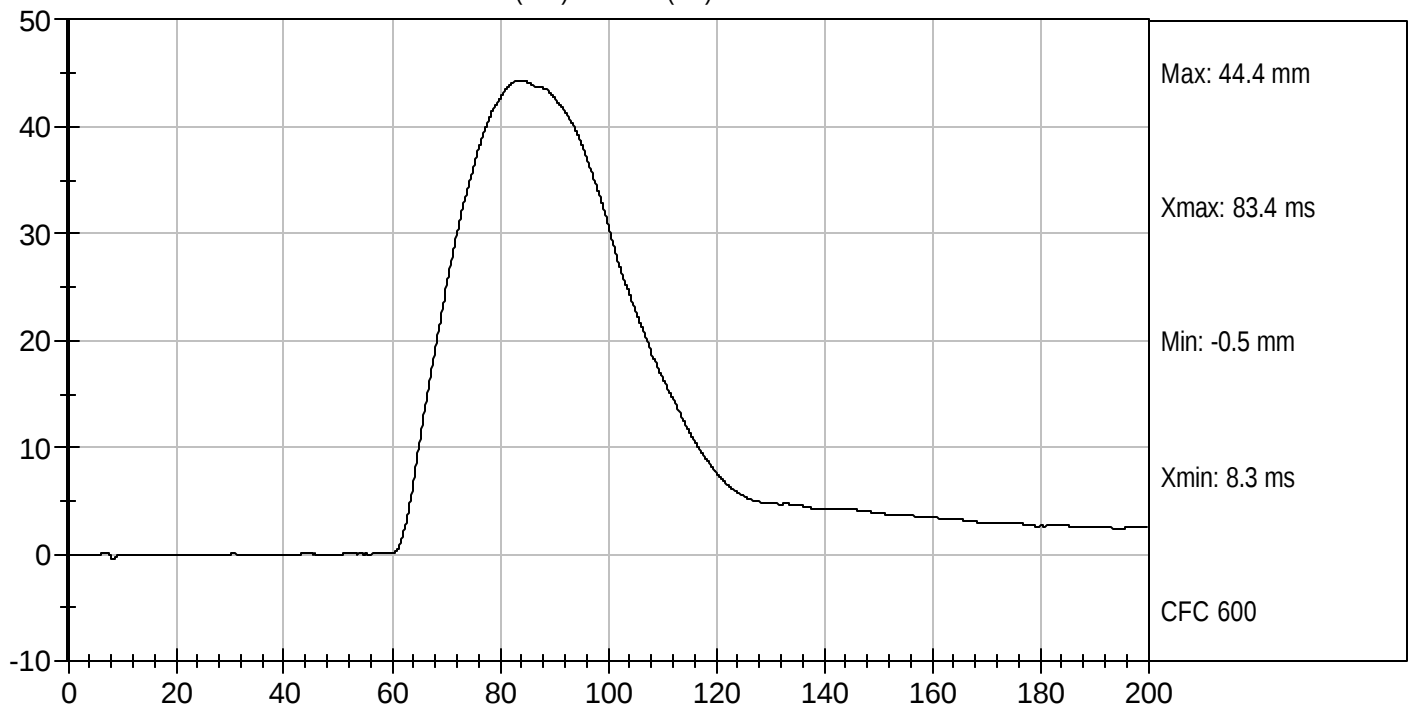




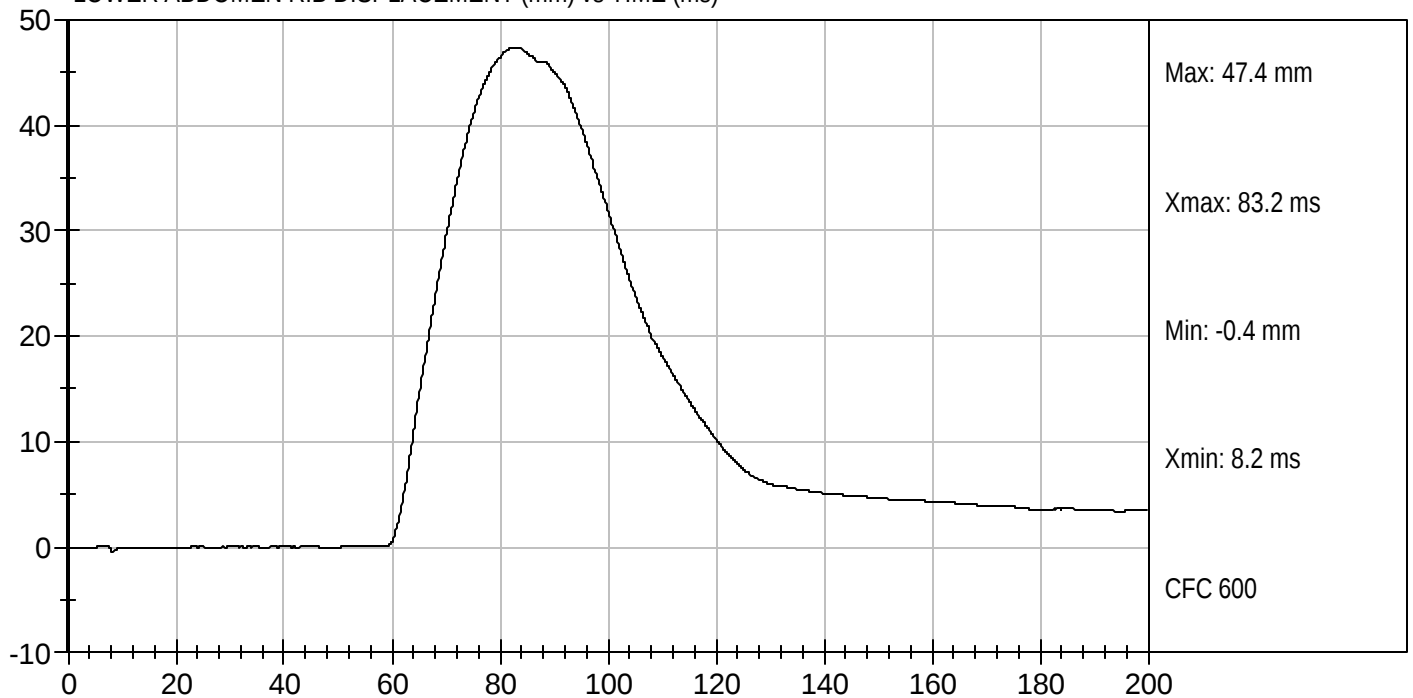
Test Desc: Abdomen Impact
Componet ID: D052186

Test Date: 08/04/2005
Velocity: 14.89 ft/s, 4.54 m/s

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



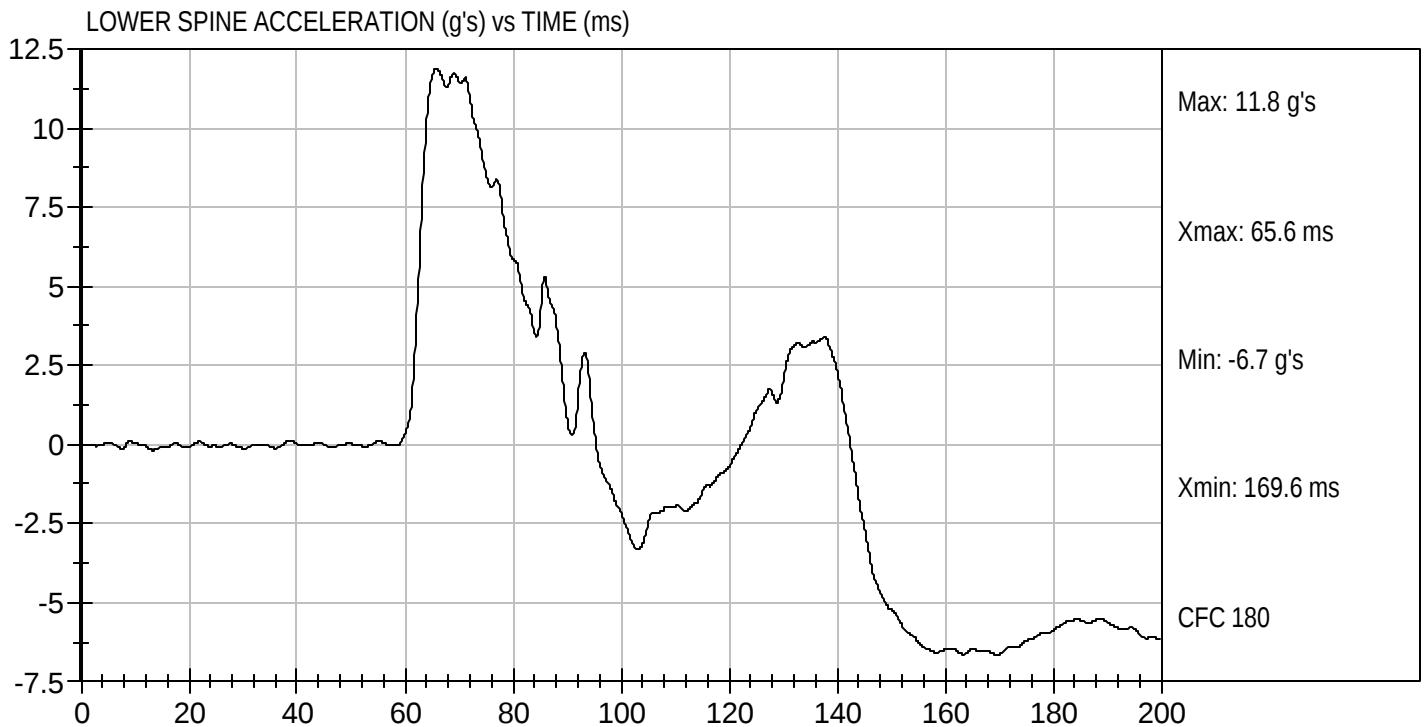
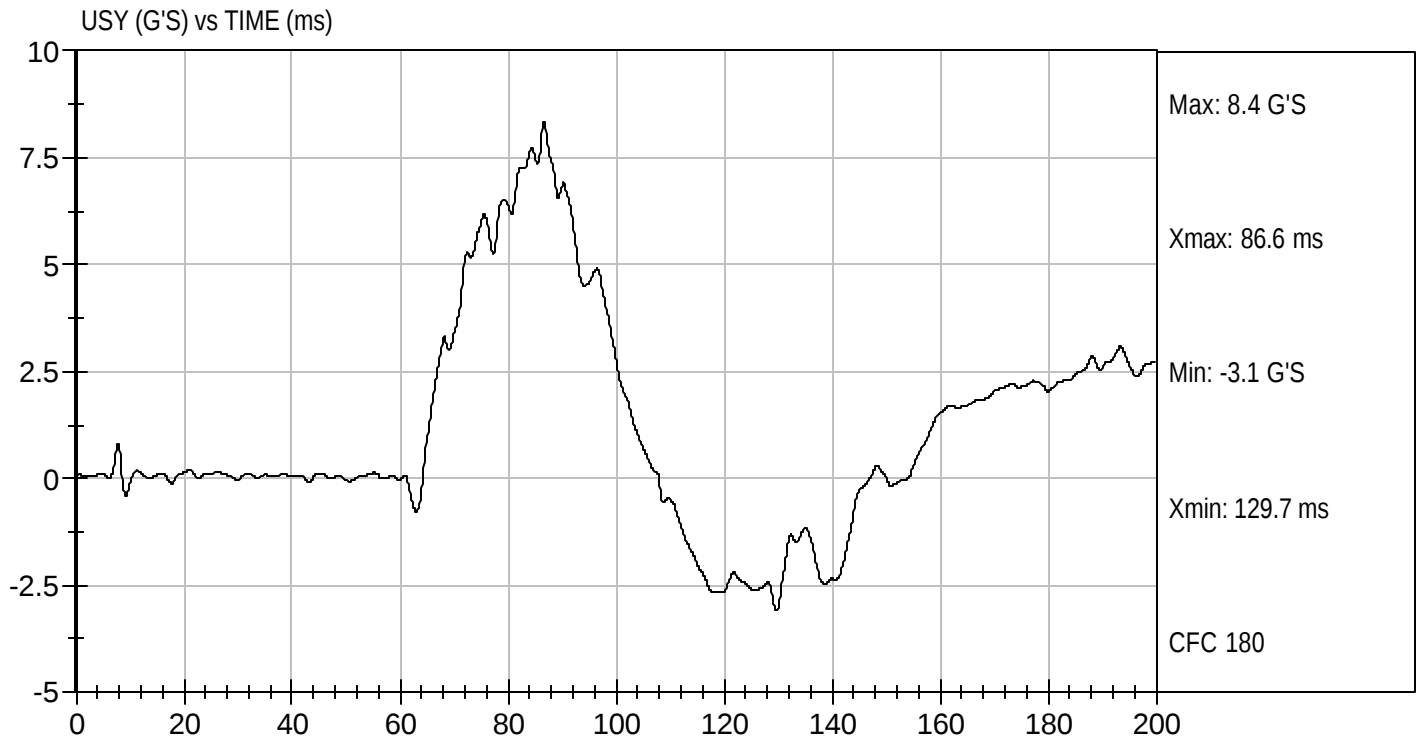
LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Abdomen Impact
Componet ID: D052186

Test Date: 08/04/2005
Velocity: 14.89 ft/s, 4.54 m/s



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052187

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	40 to 48	41	Pass
Pelvis Y Acceleration	G's	40 to 48	47	Pass
Peak Acetabulum Force	N	3803 to 4505	4036	Pass
Overall Test Results				Pass



Laboratory Technician

08/04/2005

Test Date

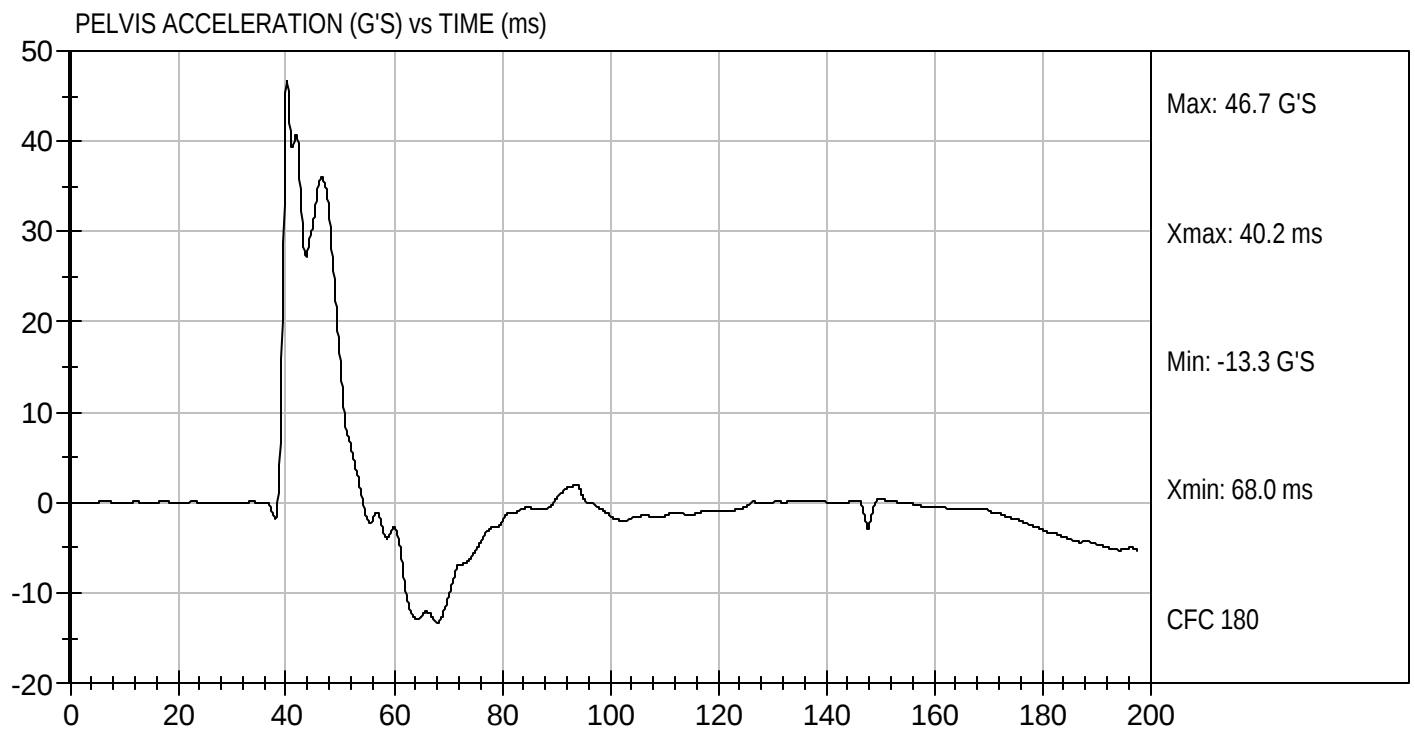
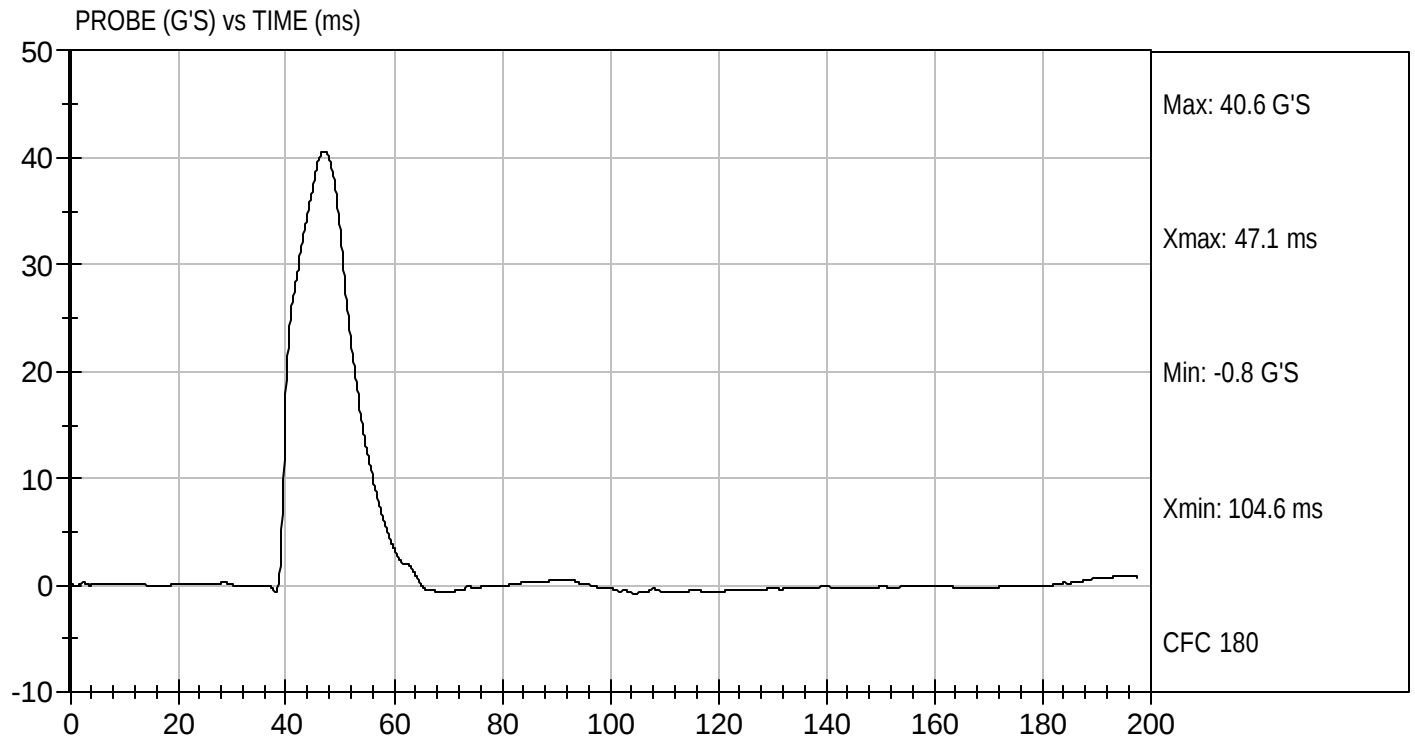


Approved By



Test Desc: Pelvis Impact
Componet ID: D052187

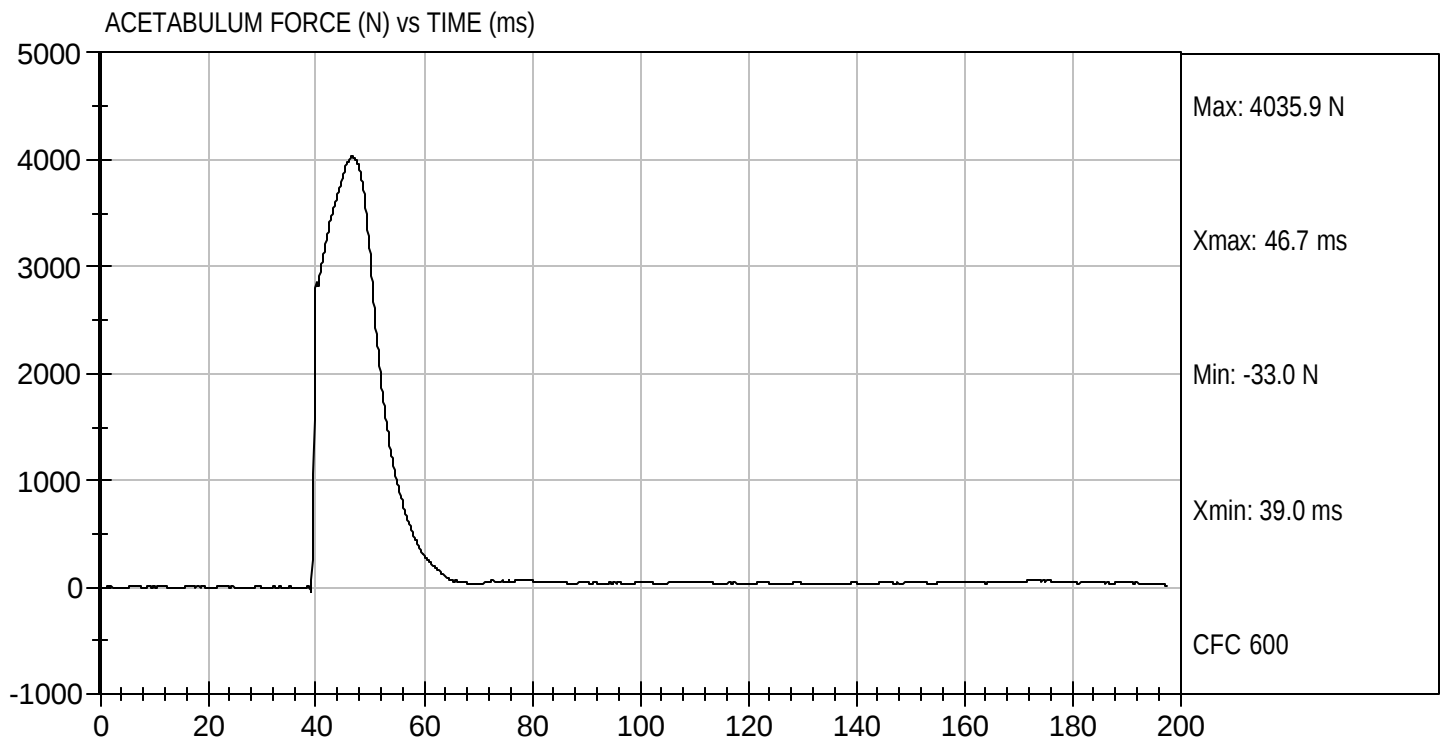
Test Date: 08/04/2005
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Componet ID: D052187

Test Date: 08/04/2005
Velocity: 21.9 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052188

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.26	Pass
Peak Impactor Acceleration	G's	41 to 47	42	Pass
Pelvis Y Acceleration	G's	32 to 40	37	Pass
Peak Pelvis Iliac Force	N	4841 to 5491	5325	Pass
Overall Test Results			Pass	



Laboratory Technician

08/05/2005

Test Date

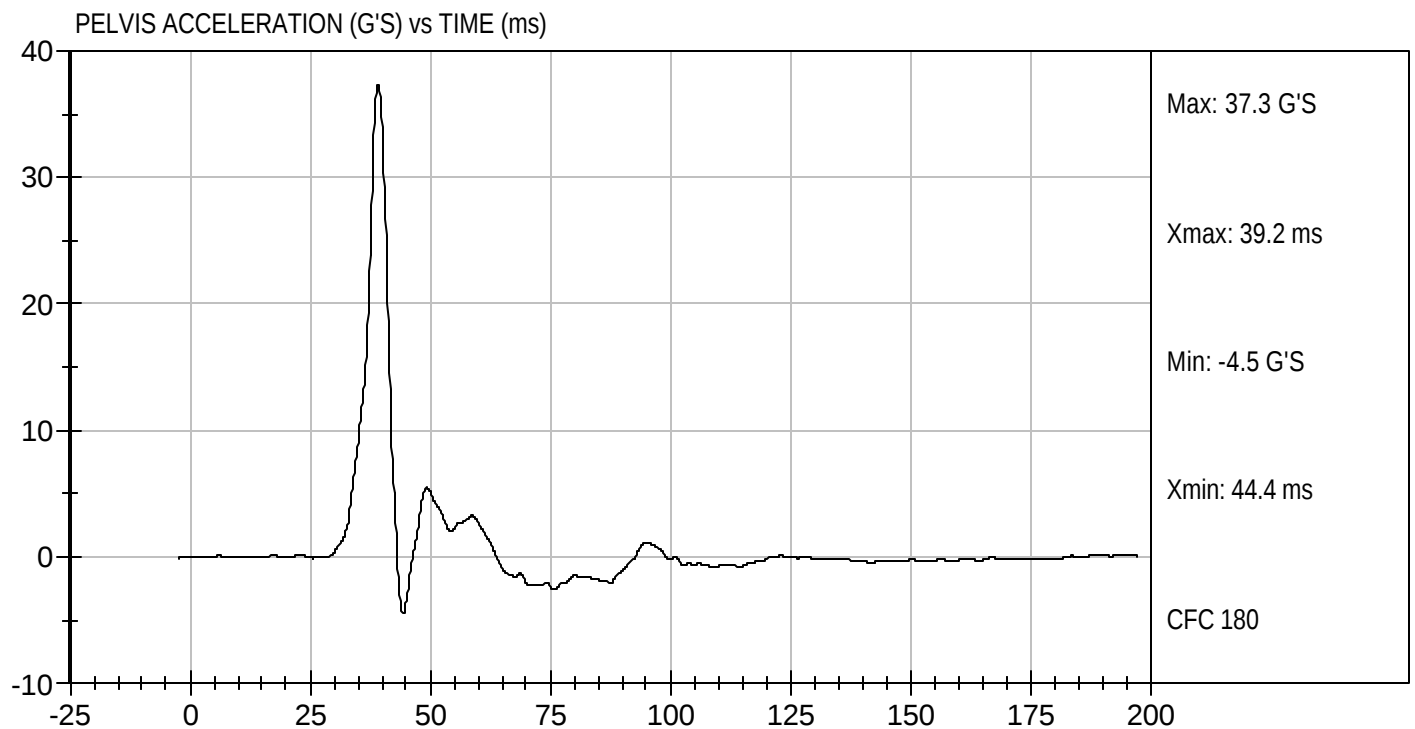
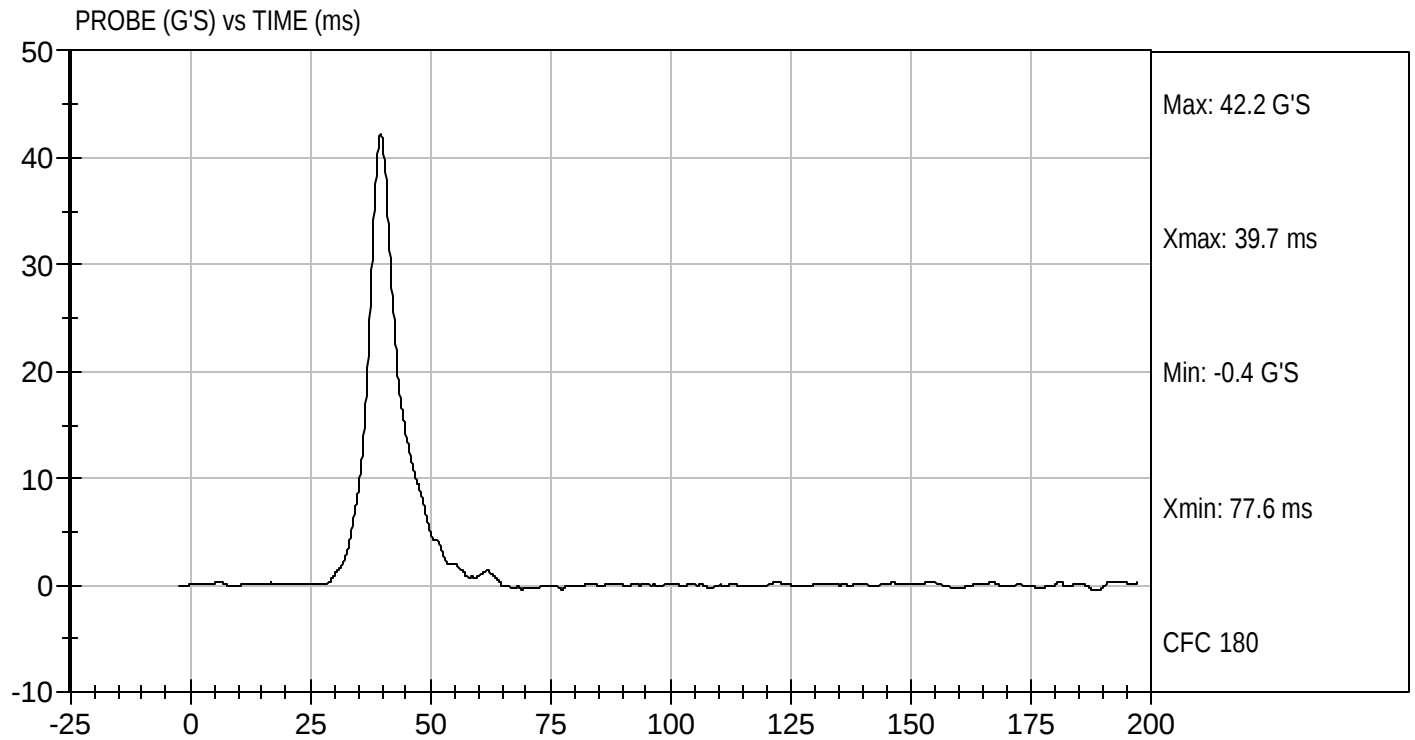


Approved By



Test Desc: Iliac Impact
Componet ID: D052188

Test Date: 08/05/2005
Velocity: 13.96 ft/s, 4.26 m/s



CERTIFICATION DATA

Dummy Serial Number: 033

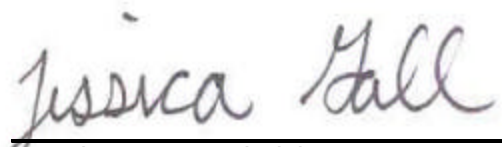
POST-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

ATD Serial No: 033

Test ID: D052241

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	43	Pass
Peak Resultant Acceleration	G's	125 to 145	125	Pass
Peak Lateral Acceleration	G's	+/- 15	8.3	Pass
Unimodal	Yes/No	<10%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

08/09/2005
Test Date

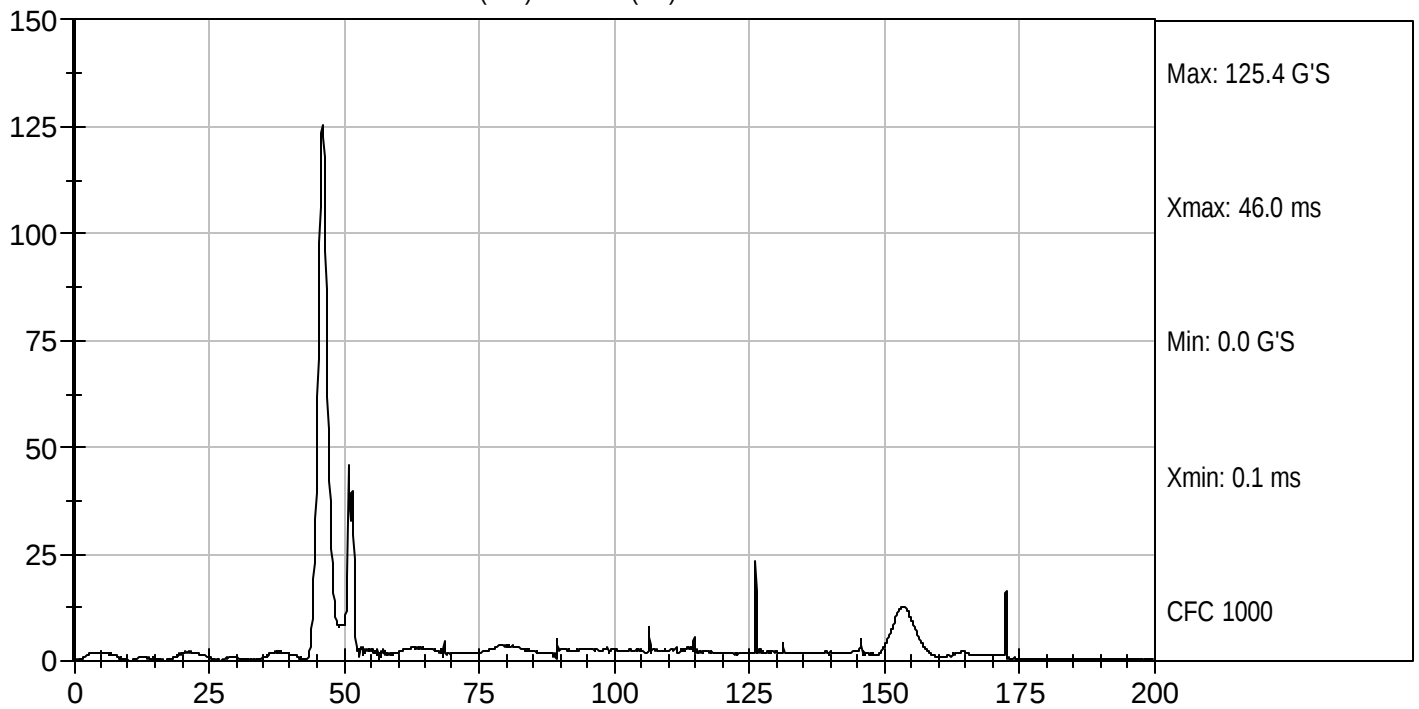

Approved By



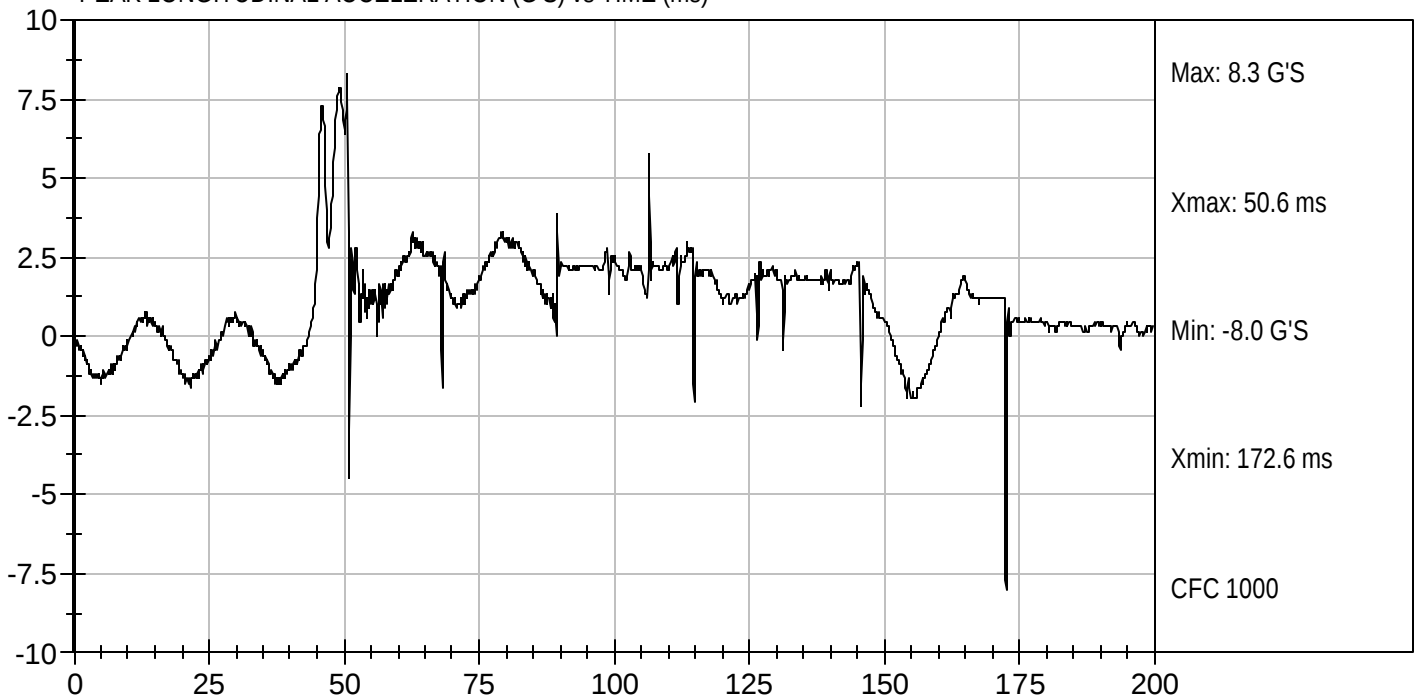
Test Desc: Head Drop
Componet ID: D052241

Test Date: 08/09/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052242

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.8	Pass
Humidity		%	10 to 70	44	Pass
Impact Velocity		m/s	5.51 to 5.63	5.62	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.49	Pass
	15 msec	m/s	3.40 to 4.10	3.54	Pass
	20 msec	m/s	4.50 to 5.40	4.76	Pass
	25 msec	m/s	5.50 to 6.10	5.67	Pass
	25-100 msec	m/s	5.20 to 6.20	5.81	Pass
Maximum D-Plane Rotation		deg	74 to 79	74	Pass
Time of Maximum D-Plane Rotation		Nm	50 to 70	63	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-45 to -40	-44	Pass
Time of Moment Decay to 0 Nm		msec	113 to 123	116	Pass
Overall Test Results				Pass	

Jessica Hall
 Laboratory Technician

David Winkelbauer

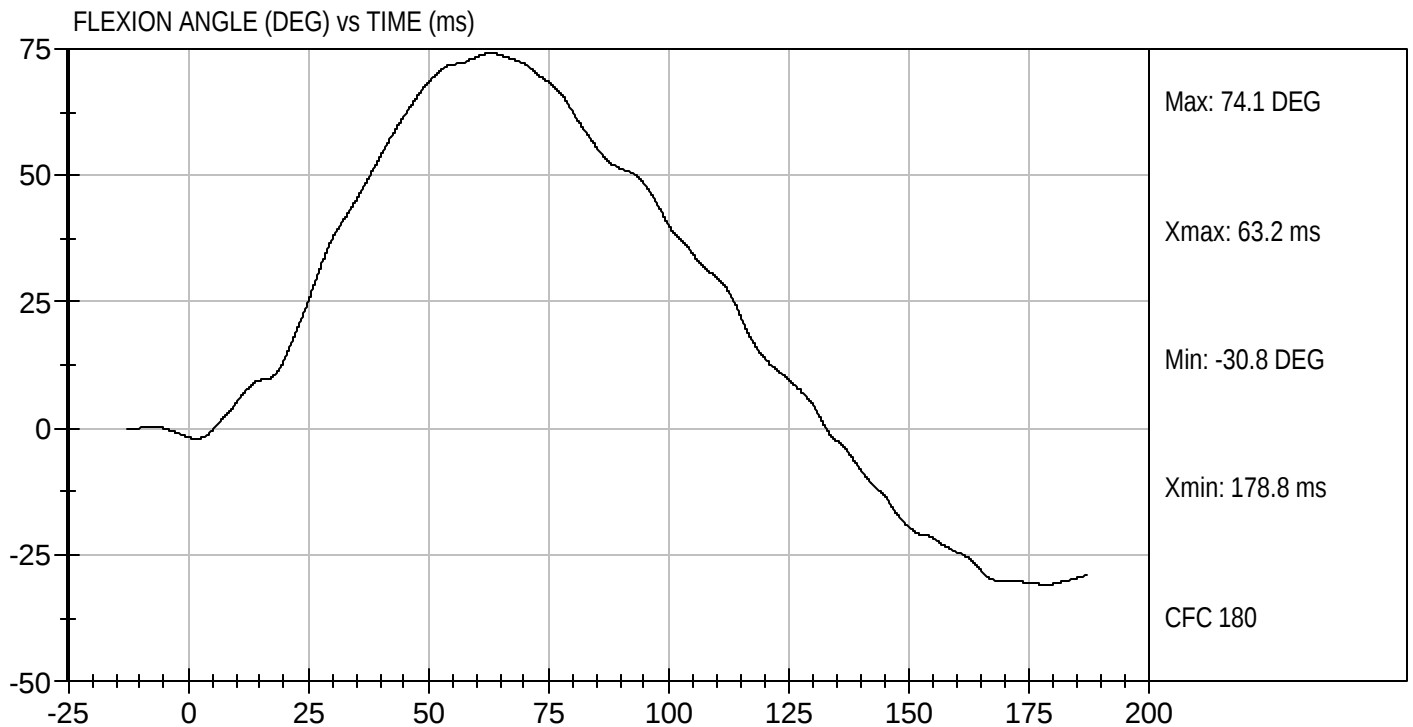
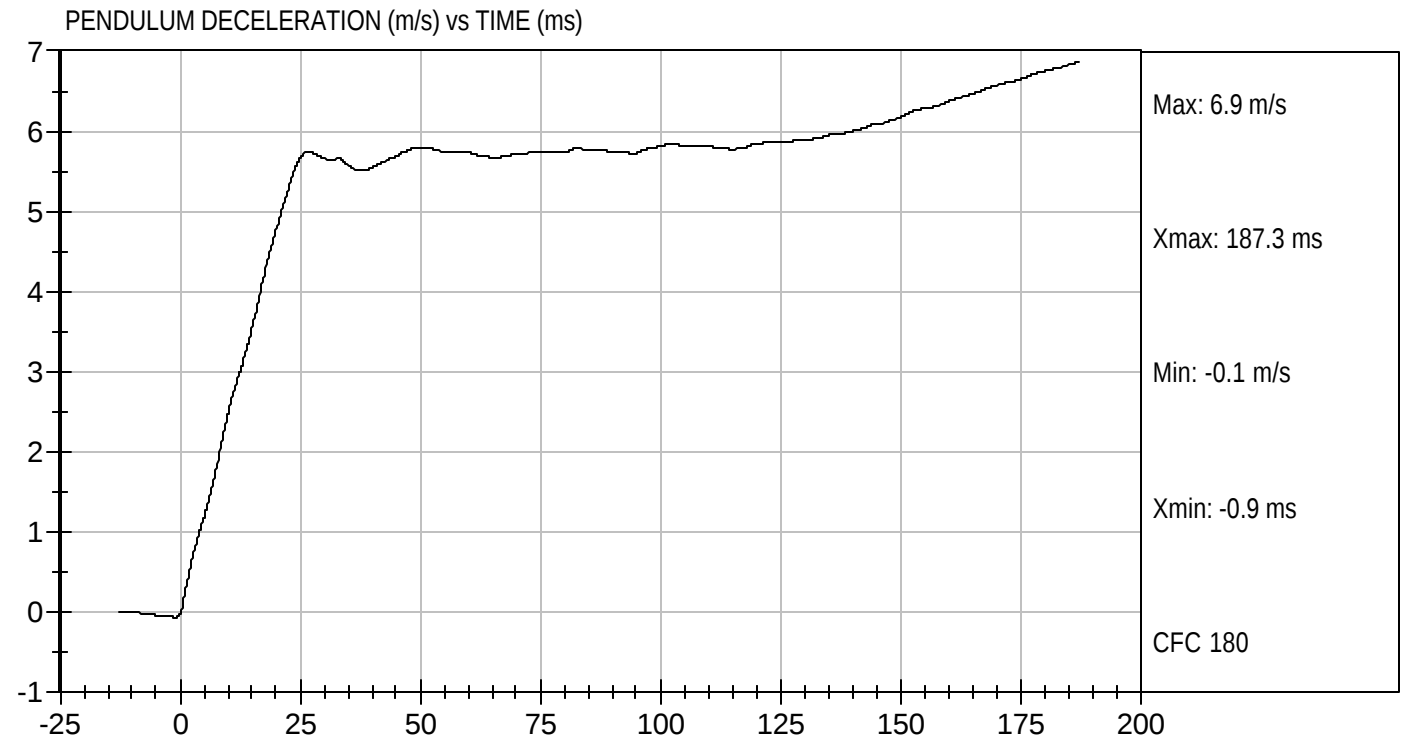
Approved By

08/10/2005
 Test Date



Test Desc: Neck Bending
Componet ID: D052242

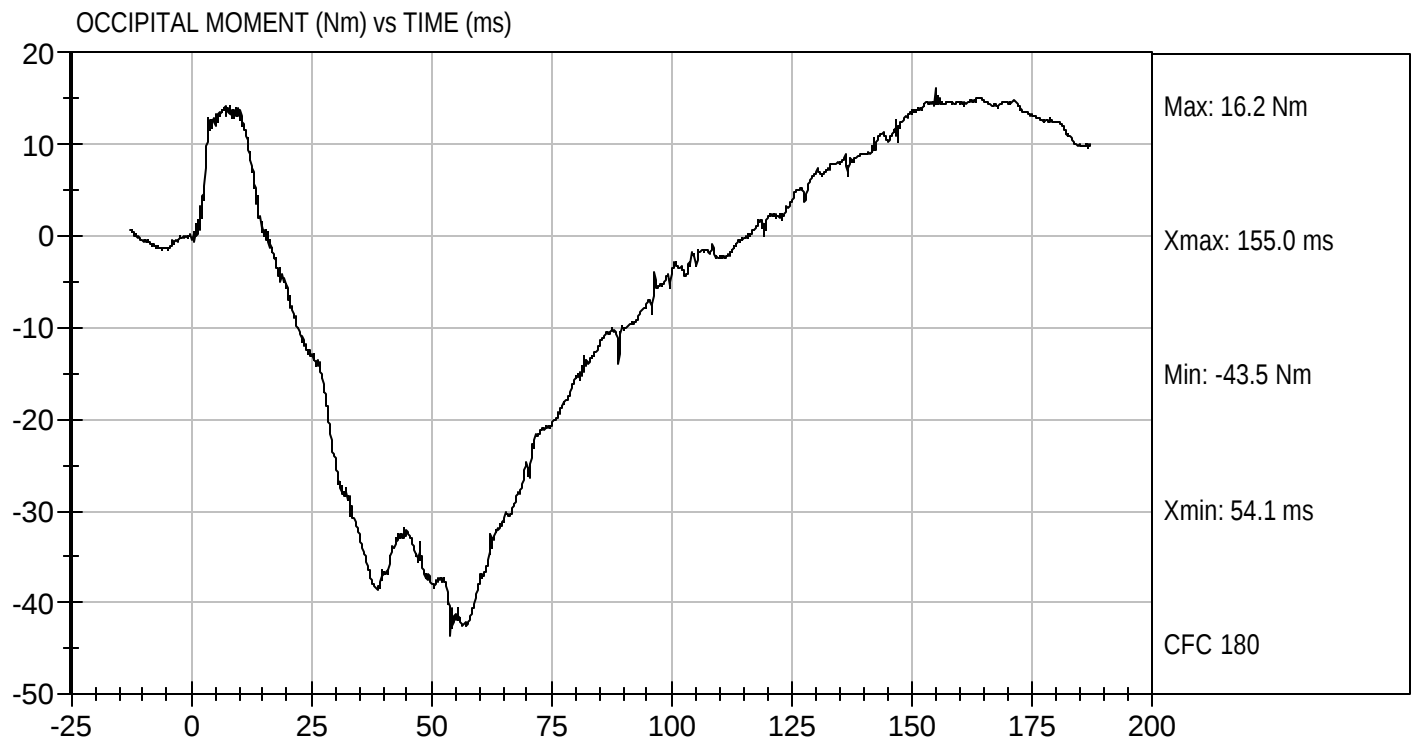
Test Date: 08/10/2005
Velocity: 18.45 ft/s, 5.62 m/s





Test Desc: Neck Bending
Componet ID: D052242

Test Date: 08/10/2005
Velocity: 18.45 ft/s, 5.62 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test ID: D052243

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	4.41 to 4.59	4.46	Pass
Maximum Probe Force	kN	1.6 to 2.4	2.3	Pass
Shoulder Displacement	mm	27 to 39	33	Pass
Overall Test Results				Pass



Laboratory Technician

08/10/2005

Test Date

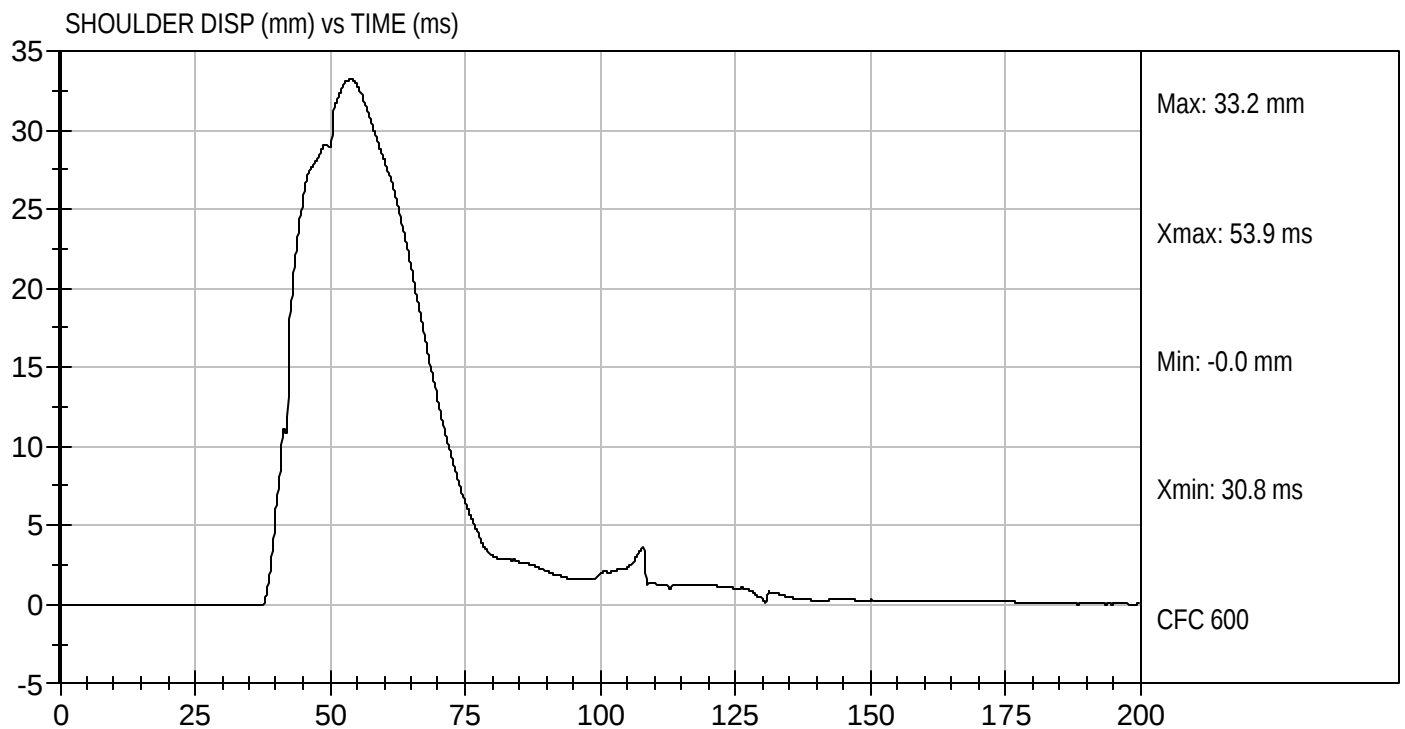
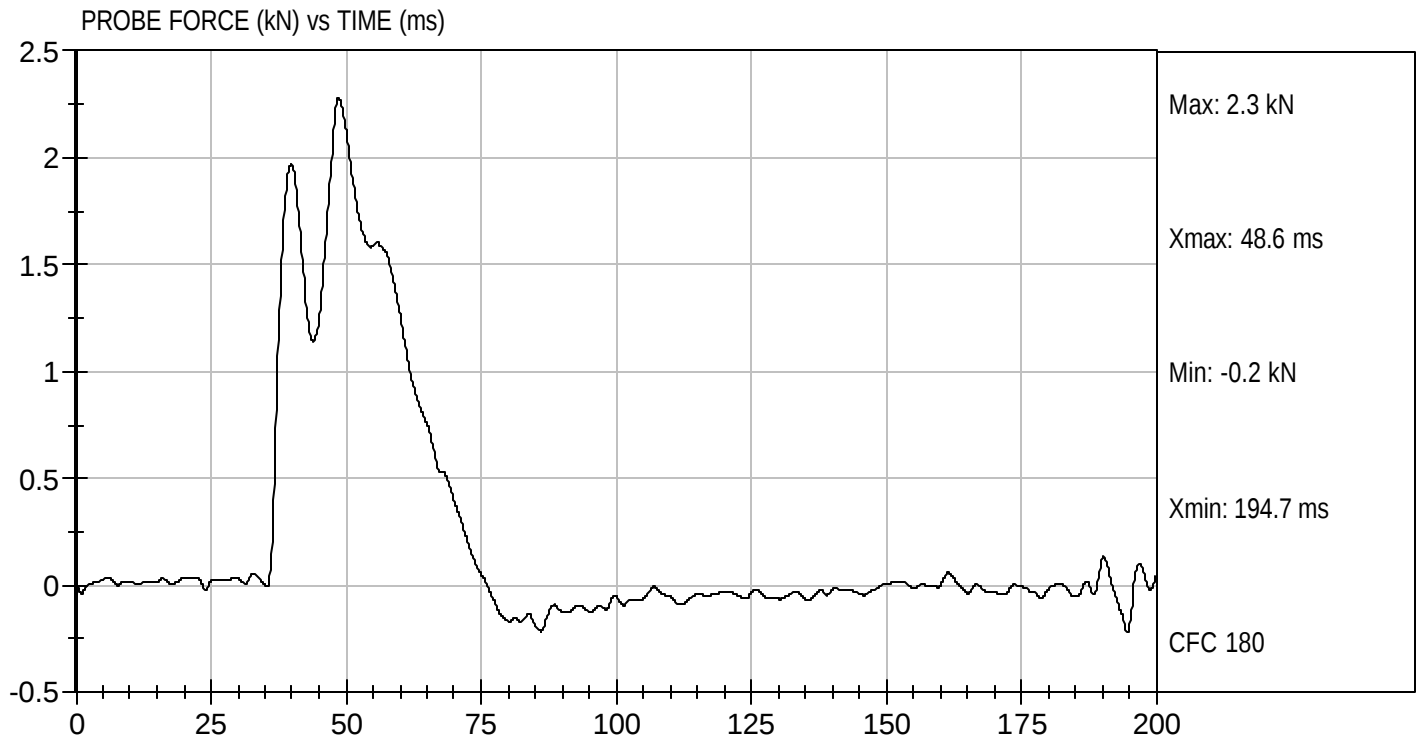


Approved By



Test Desc: Shoulder Impact
Componet ID: D052243

Test Date: 08/10/2005
Velocity: 14.64 ft/s, 4.46 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 033

Test I.D: D052244

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	6.57 to 6.84	6.80	Pass
Peak Impactor Force	kN	4.1 to 4.7	4.6	Pass
Shoulder Displacement	mm	30 to 42	38	Pass
Upper Rib Displacement	mm	23 to 35	30	Pass
Middle Rib Displacement	mm	29 to 44	33	Pass
Lower Rib Displacement	mm	33 to 40	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 48	38	Pass
Lower Spine (T12) Y Acceleration	G's	30 to 38	31	Pass
Overall Test Results				Pass


 Laboratory Technician

08/10/2005

Test Date

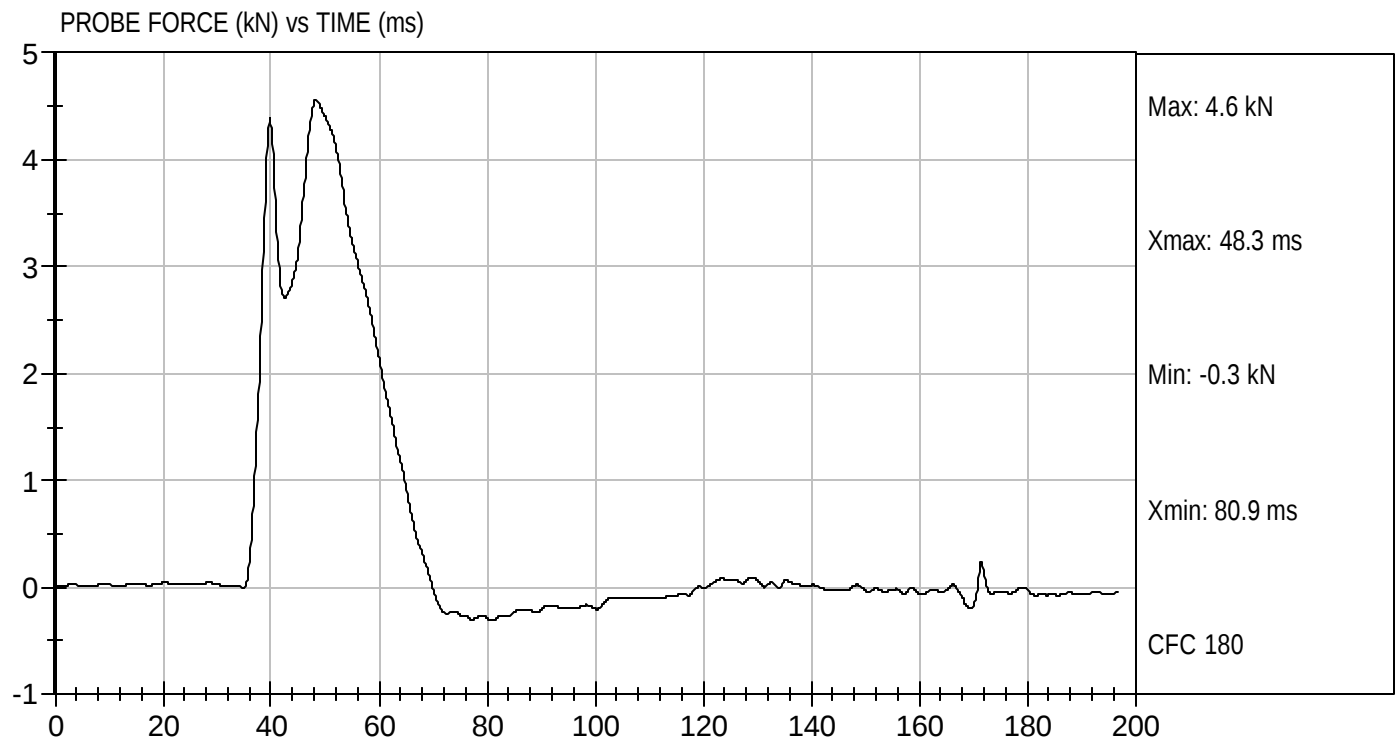


Approved By



Test Desc: Thorax With Arm
Componet ID: D052244

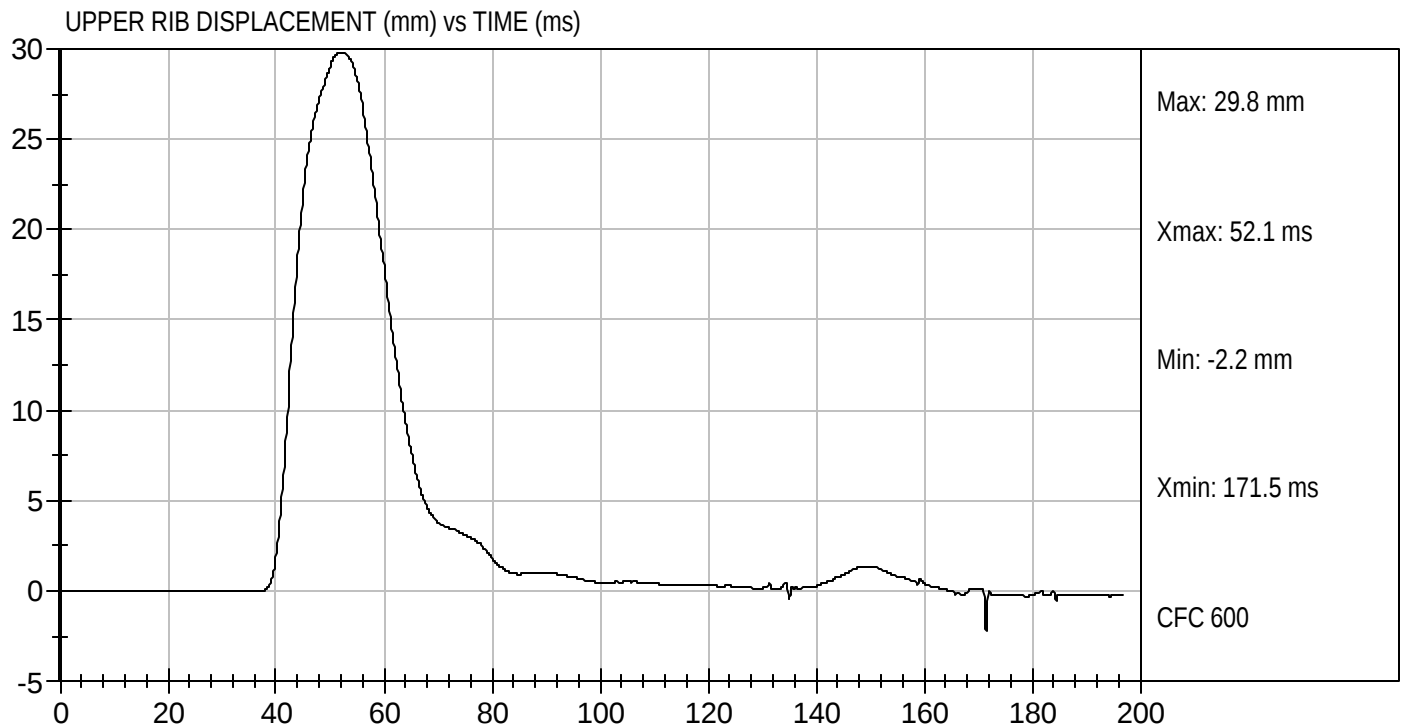
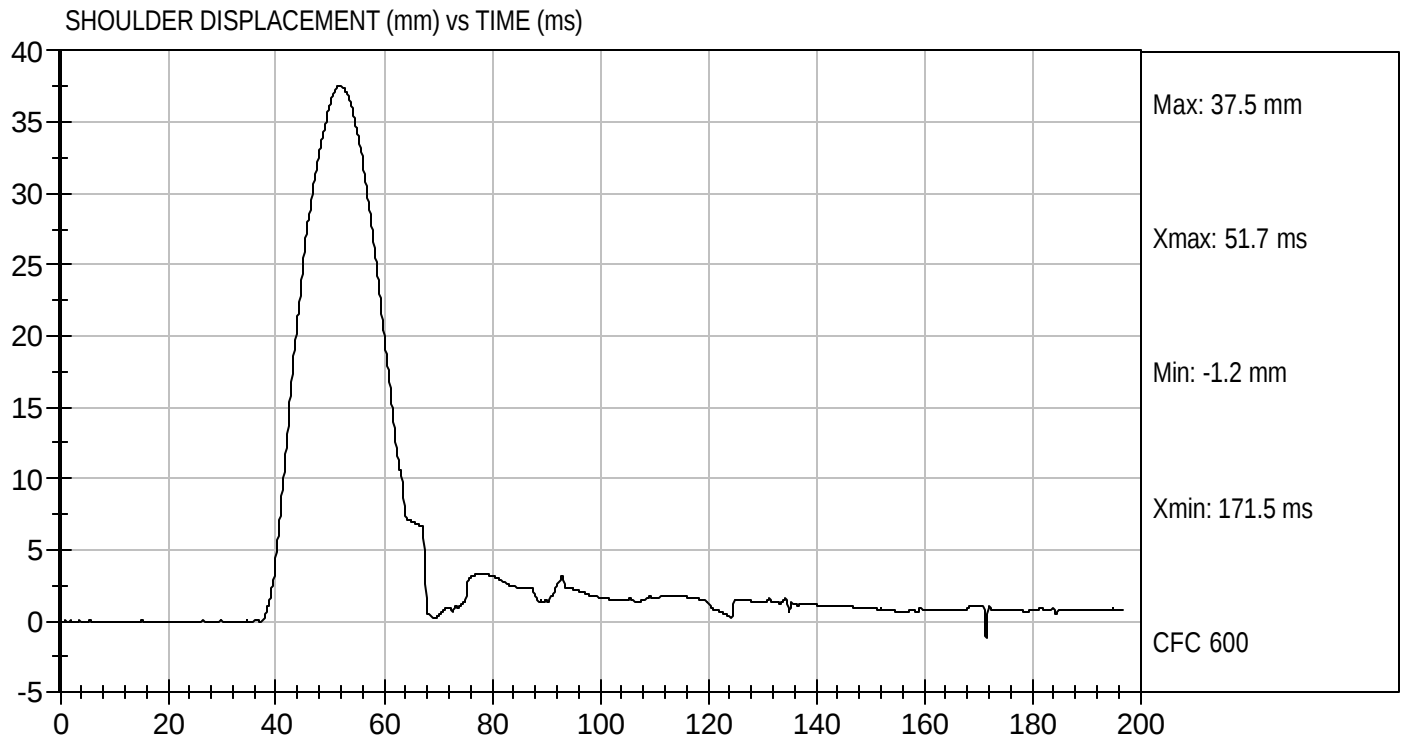
Test Date: 08/10/2005
Velocity: 22.31 ft/s, 6.80 m/s





Test Desc: Thorax With Arm
Componet ID: D052244

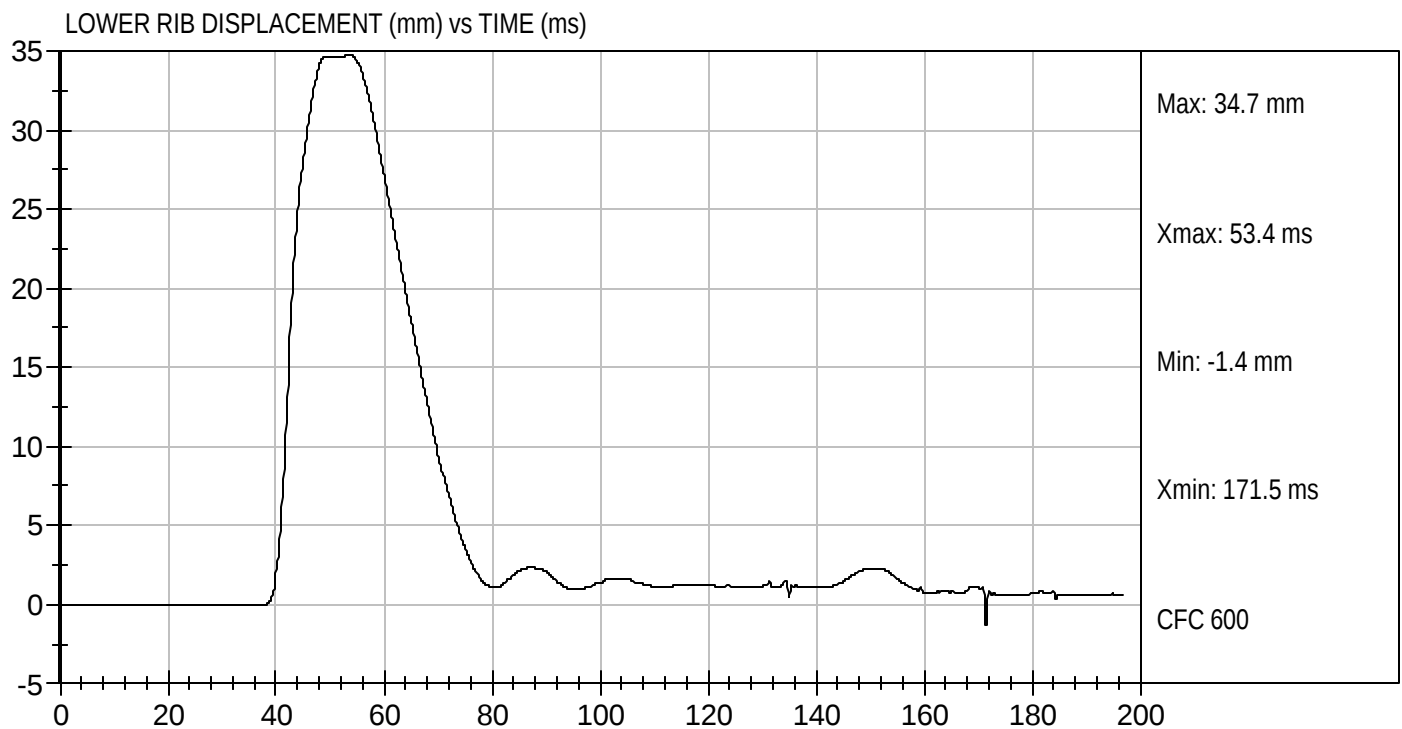
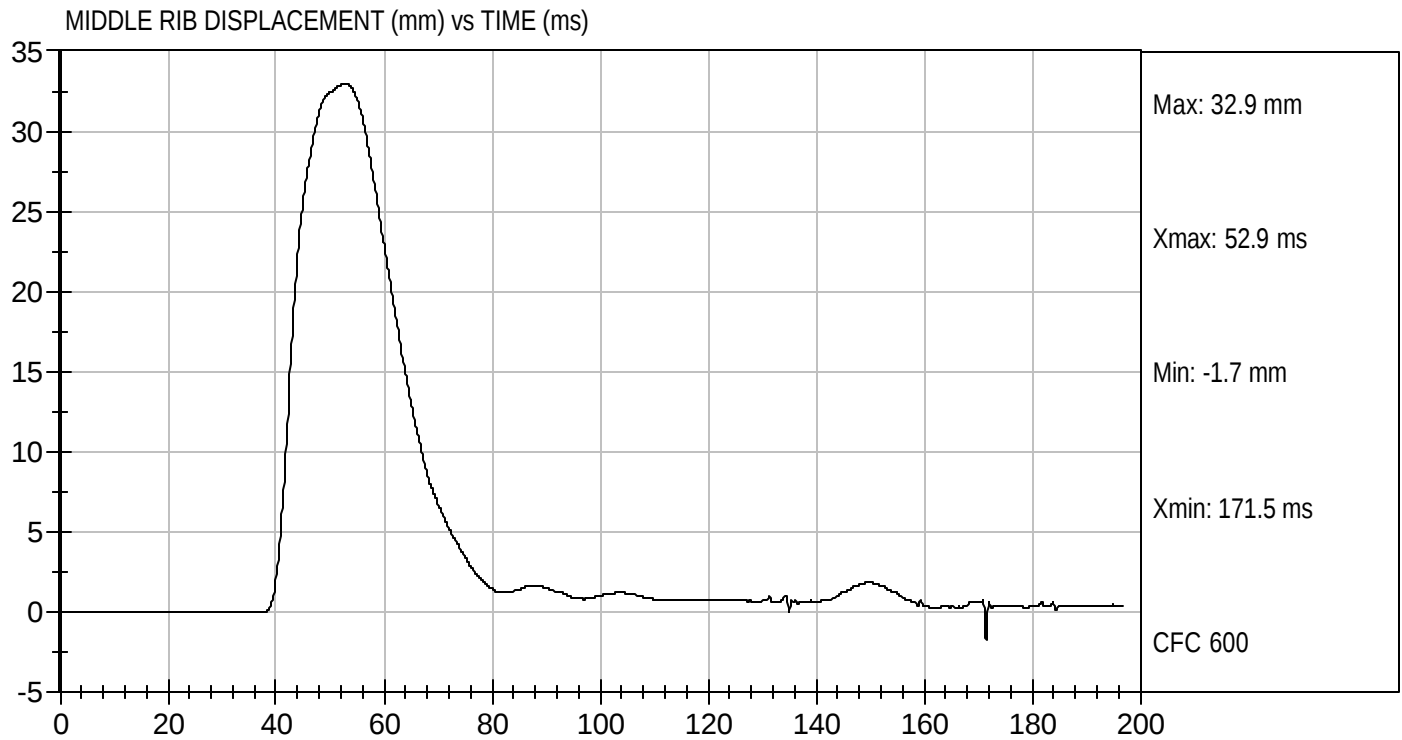
Test Date: 08/10/2005
Velocity: 22.31 ft/s, 6.80 m/s





Test Desc: Thorax With Arm
Componet ID: D052244

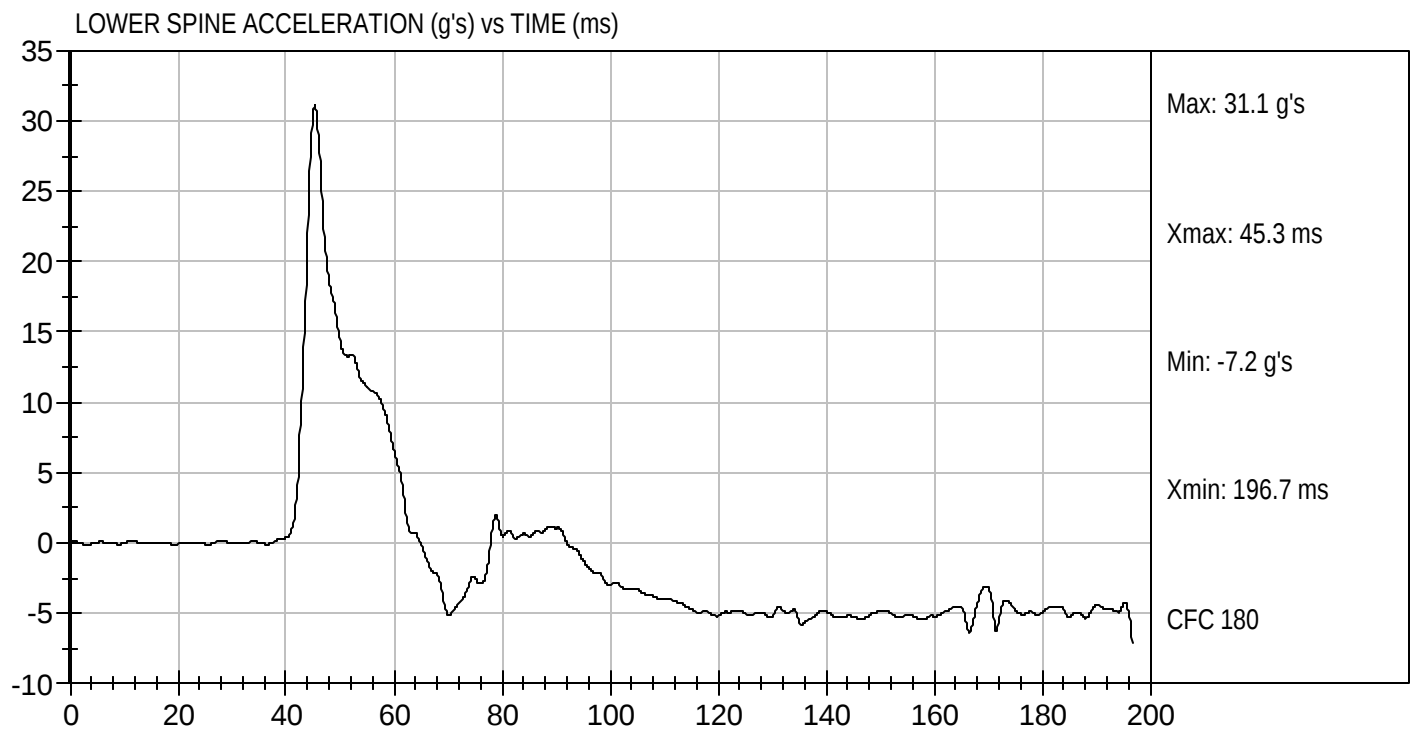
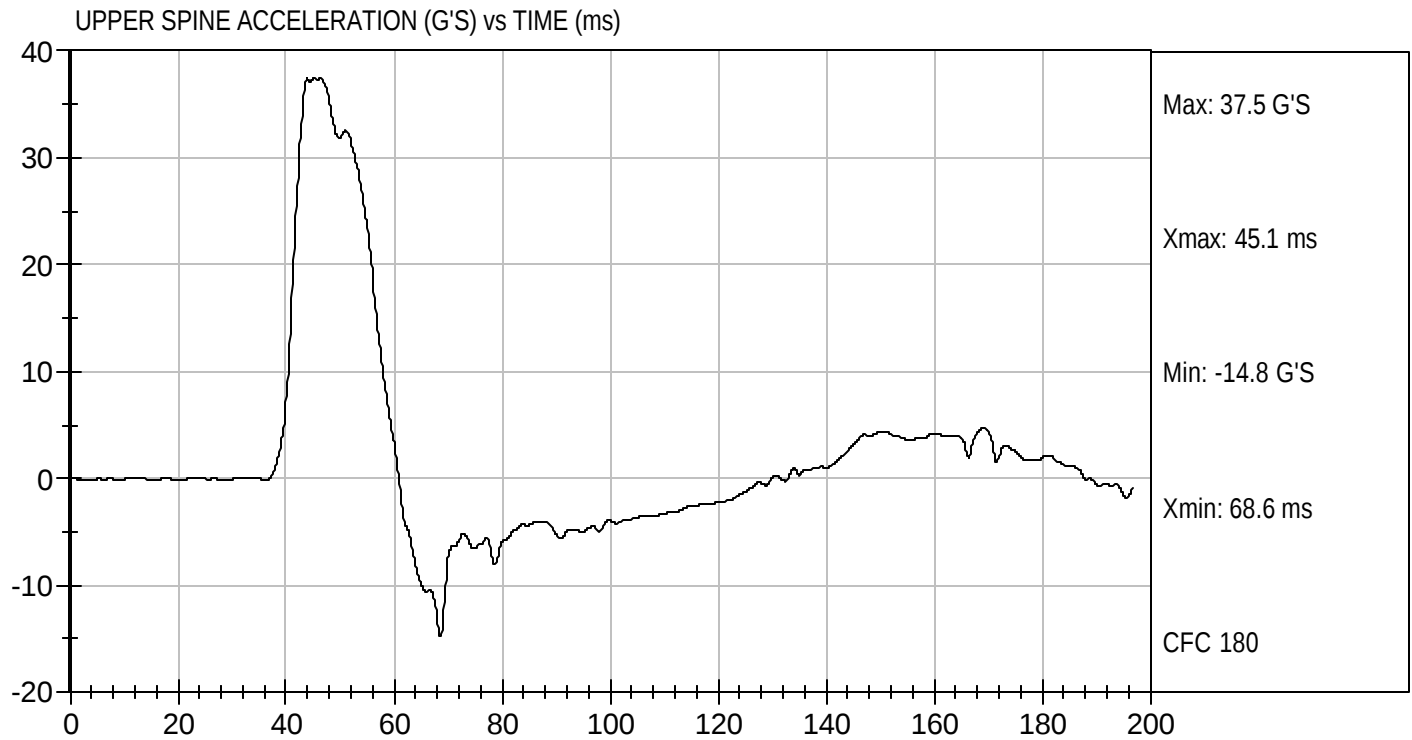
Test Date: 08/10/2005
Velocity: 22.31 ft/s, 6.80 m/s





Test Desc: Thorax With Arm
Componet ID: D052244

Test Date: 08/10/2005
Velocity: 22.31 ft/s, 6.80 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 033

Test I.D: D052245

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.9	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	4.20 to 4.40	4.31	Pass
Peak Impactor Force	kN	1.8 to 2.3	2.2	Pass
Upper Rib Displacement	mm	32 to 41	37	Pass
Middle Rib Displacement	mm	40 to 51	43	Pass
Lower Rib Displacement	mm	34 to 47	43	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 18	14	Pass
Lower Spine (T12) Y Acceleration	G's	8 to 13	10	Pass
Overall Test Results				Pass



Laboratory Technician

08/10/2005

Test Date

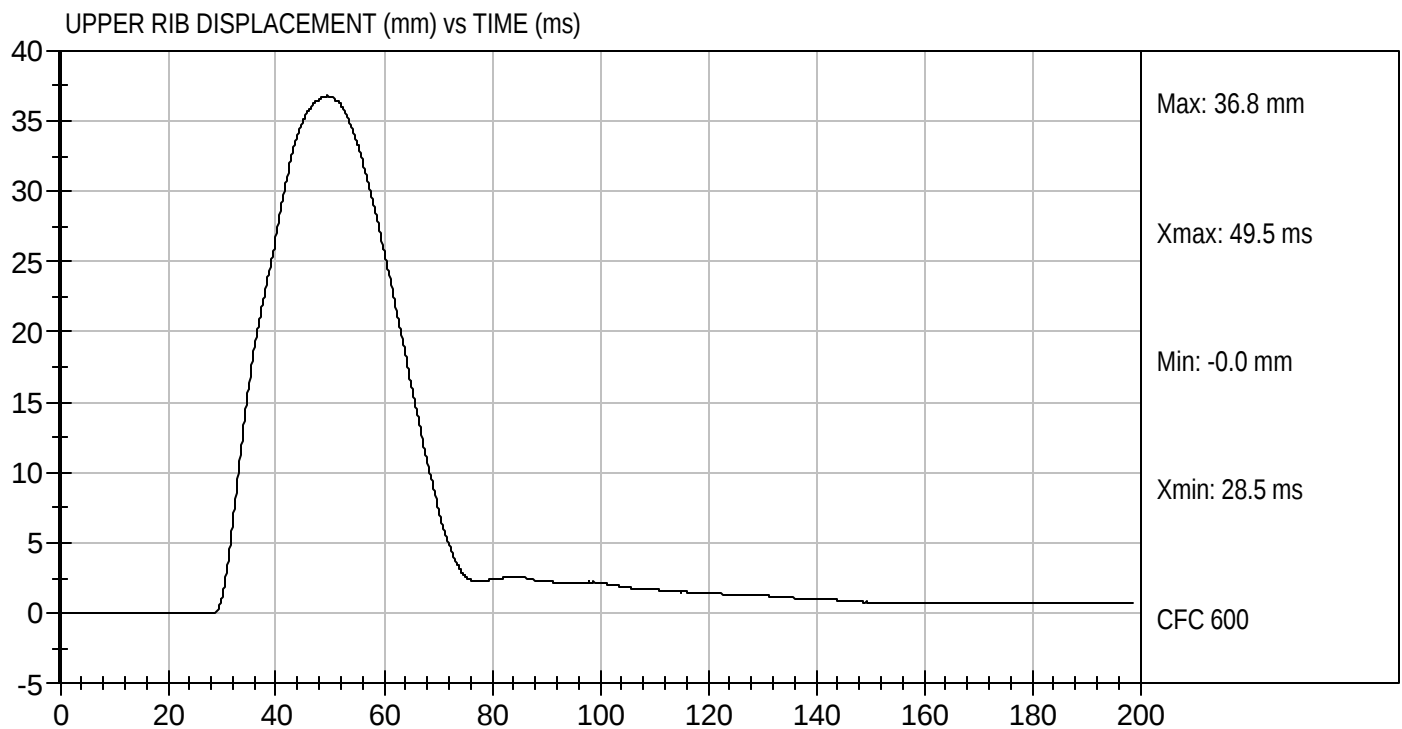
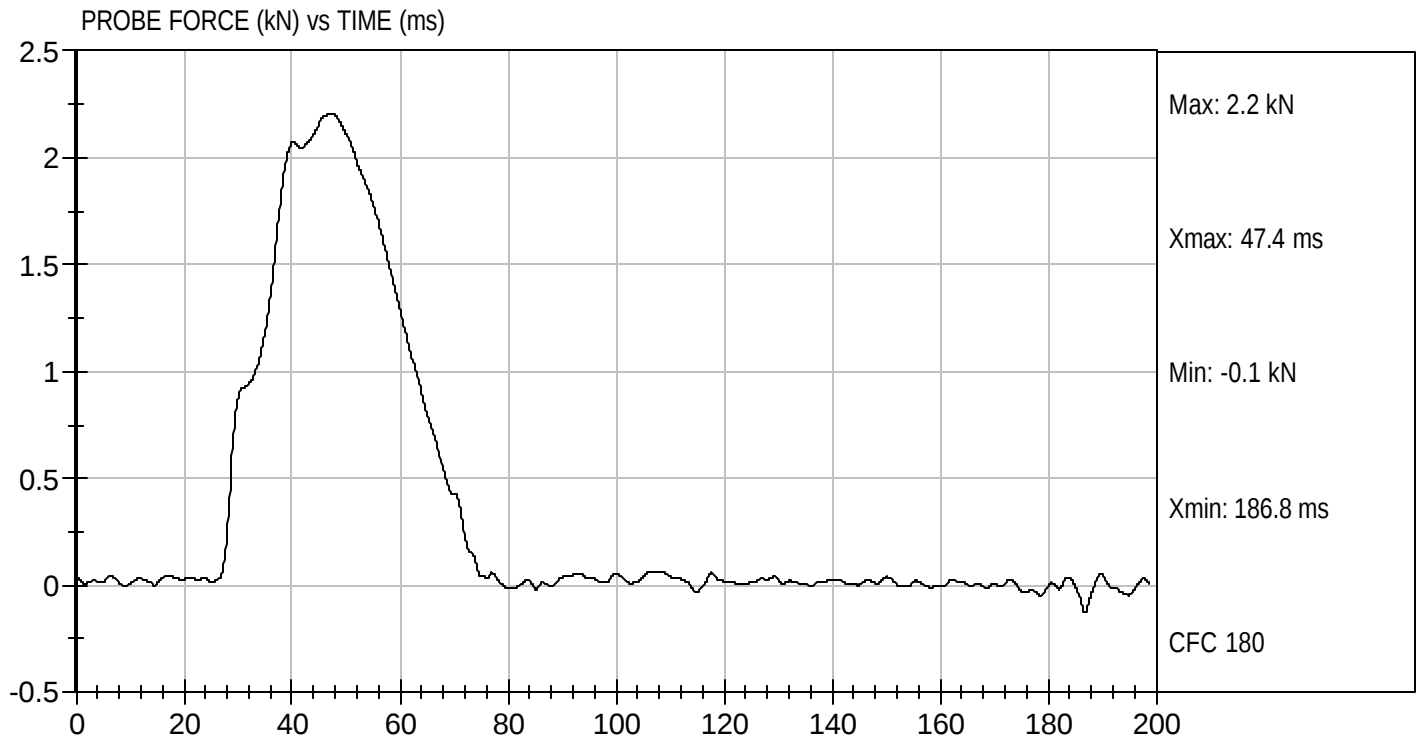


Approved By



Test Desc: Thorax Without Arm
Componet ID: D052245

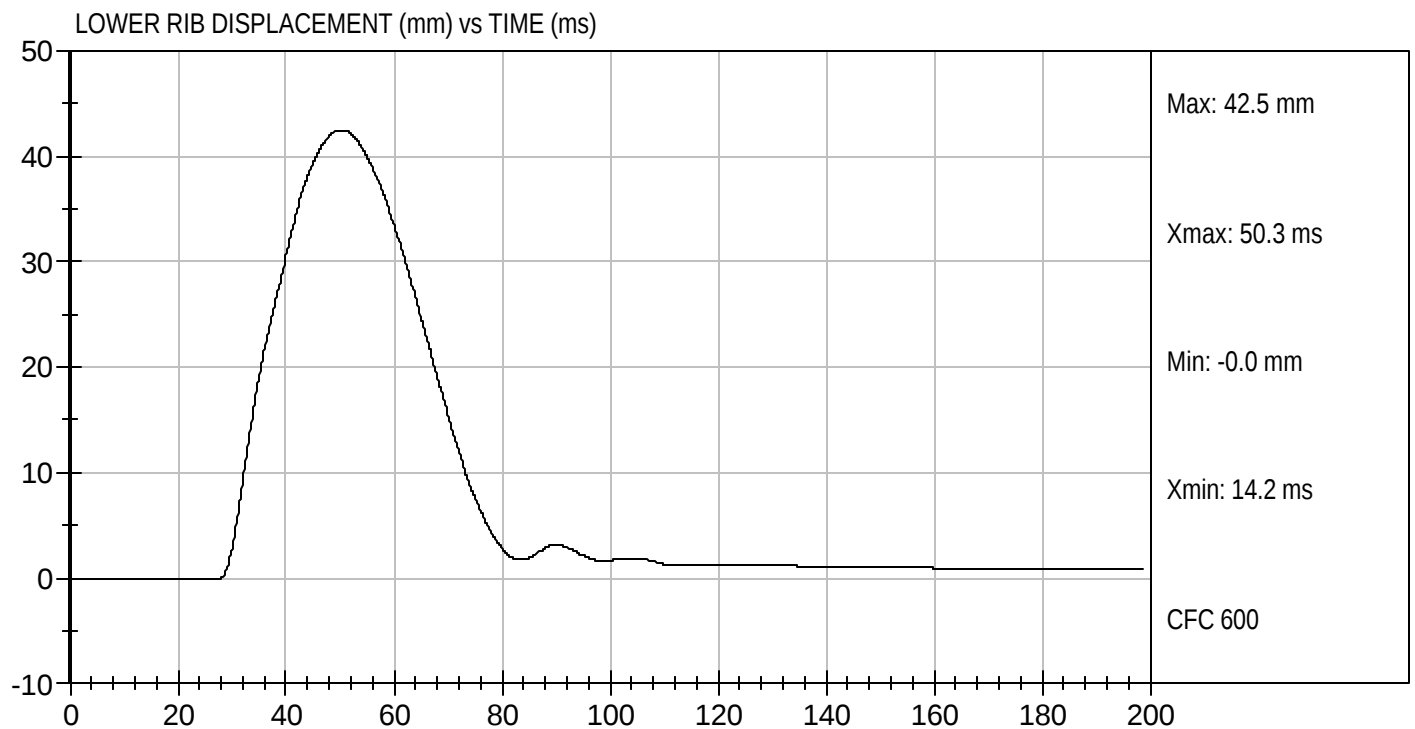
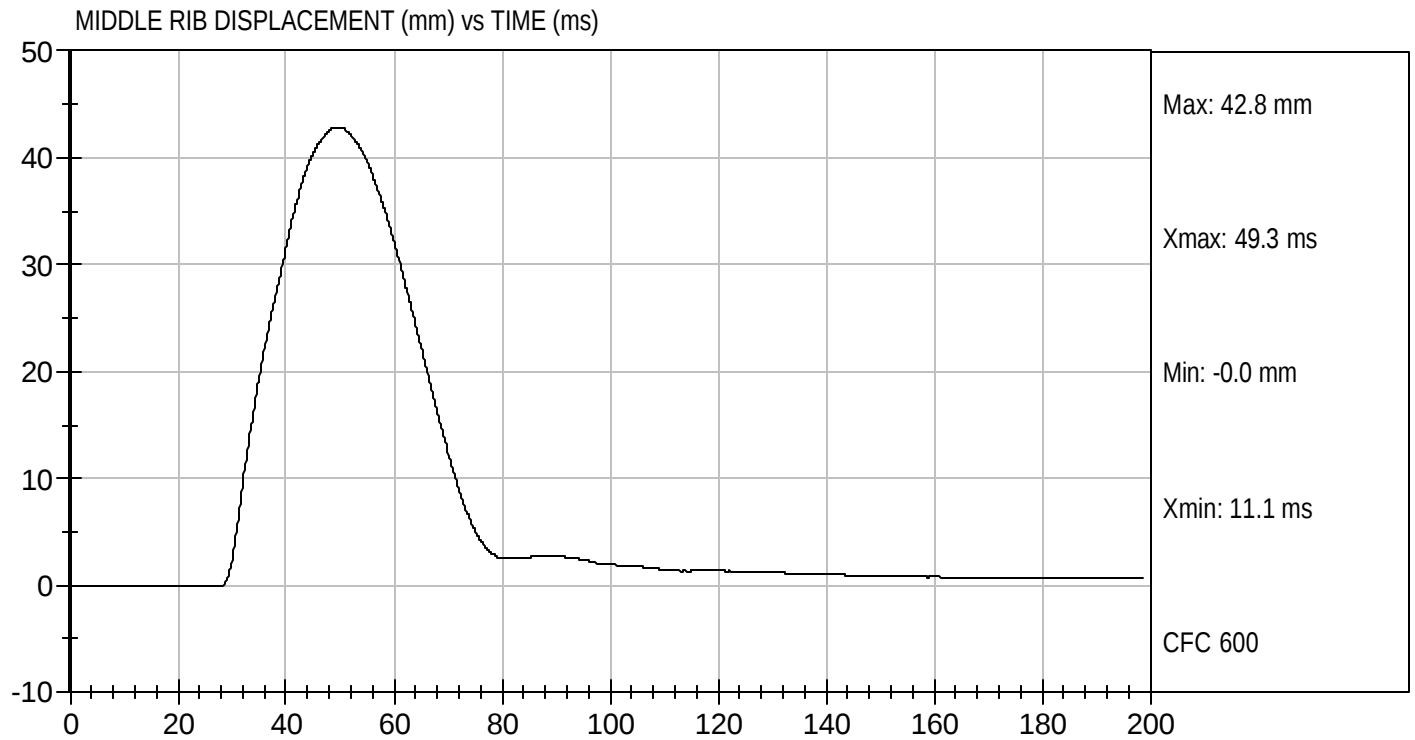
Test Date: 08/10/2005
Velocity: 14.14 ft/s, 4.31 m/s





Test Desc: Thorax Without Arm
Componet ID: D052245

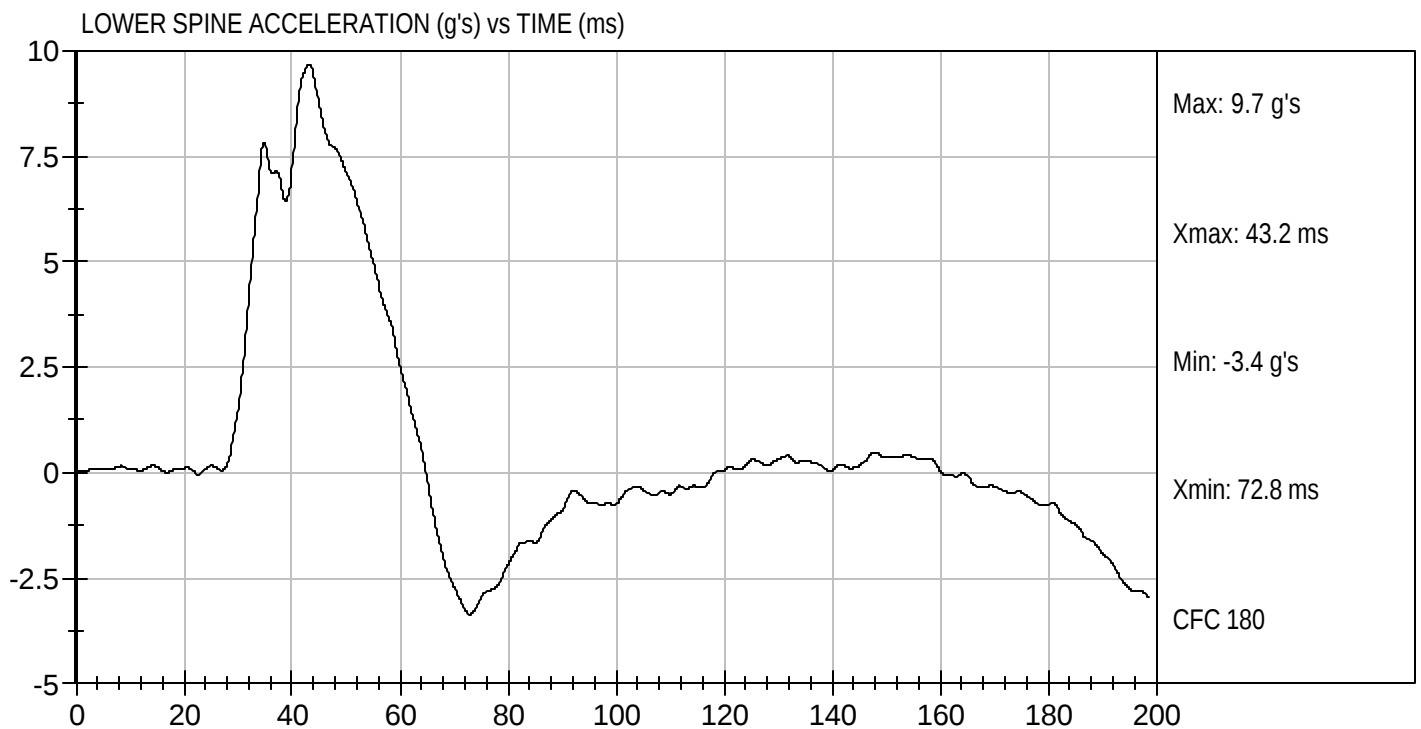
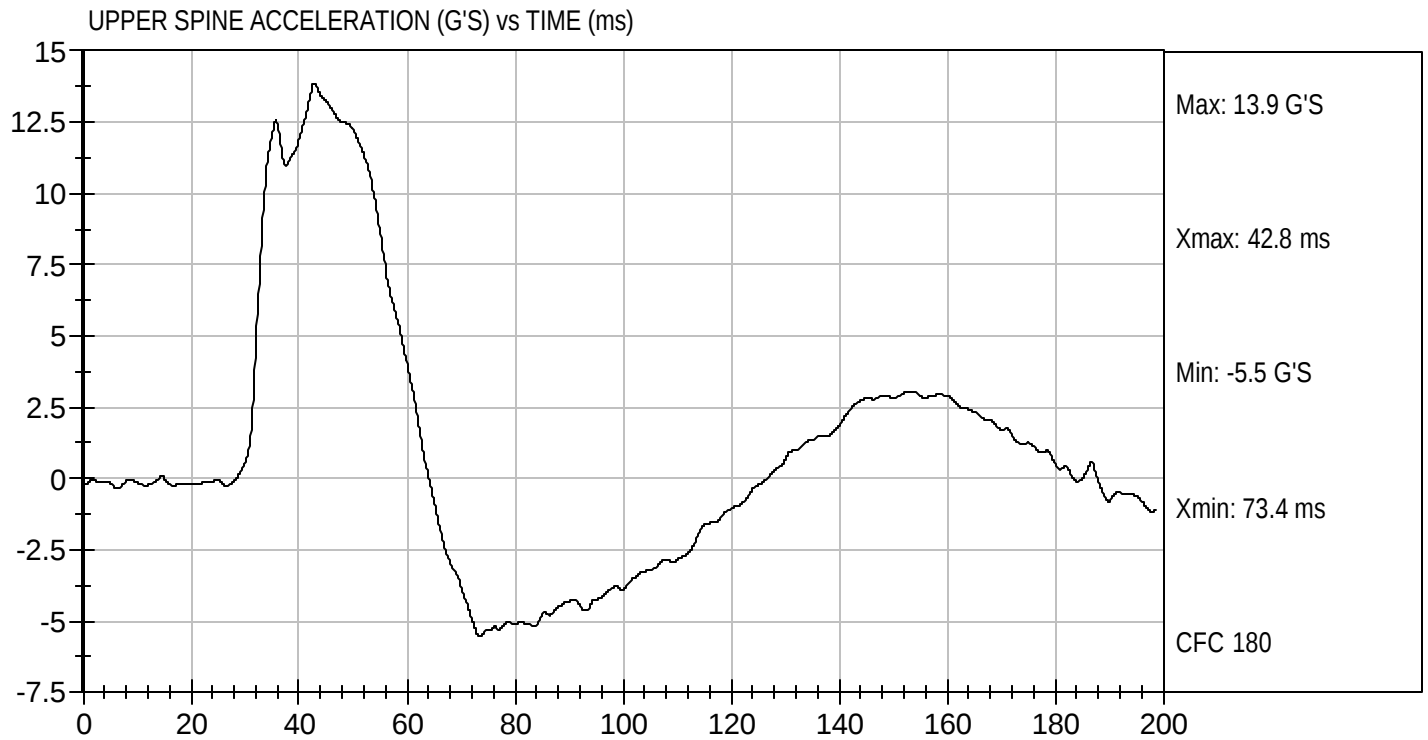
Test Date: 08/10/2005
Velocity: 14.14 ft/s, 4.31 m/s





Test Desc: Thorax Without Arm
Componet ID: D052245

Test Date: 08/10/2005
Velocity: 14.14 ft/s, 4.31 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052246

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	4.41 to 4.59	4.52	Pass
Peak Impactor Force	kN	1.3 to 1.9	1.9	Pass
Upper Rib Displacement	mm	44 to 55	45	Pass
Lower Rib Displacement	mm	44 to 56	48	Pass
Upper Spine (T1) Y Acceleration	G's	5 to 9	7	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 13	13	Pass
Overall Test Results			Pass	


Laboratory Technician

08/10/2005

Test Date

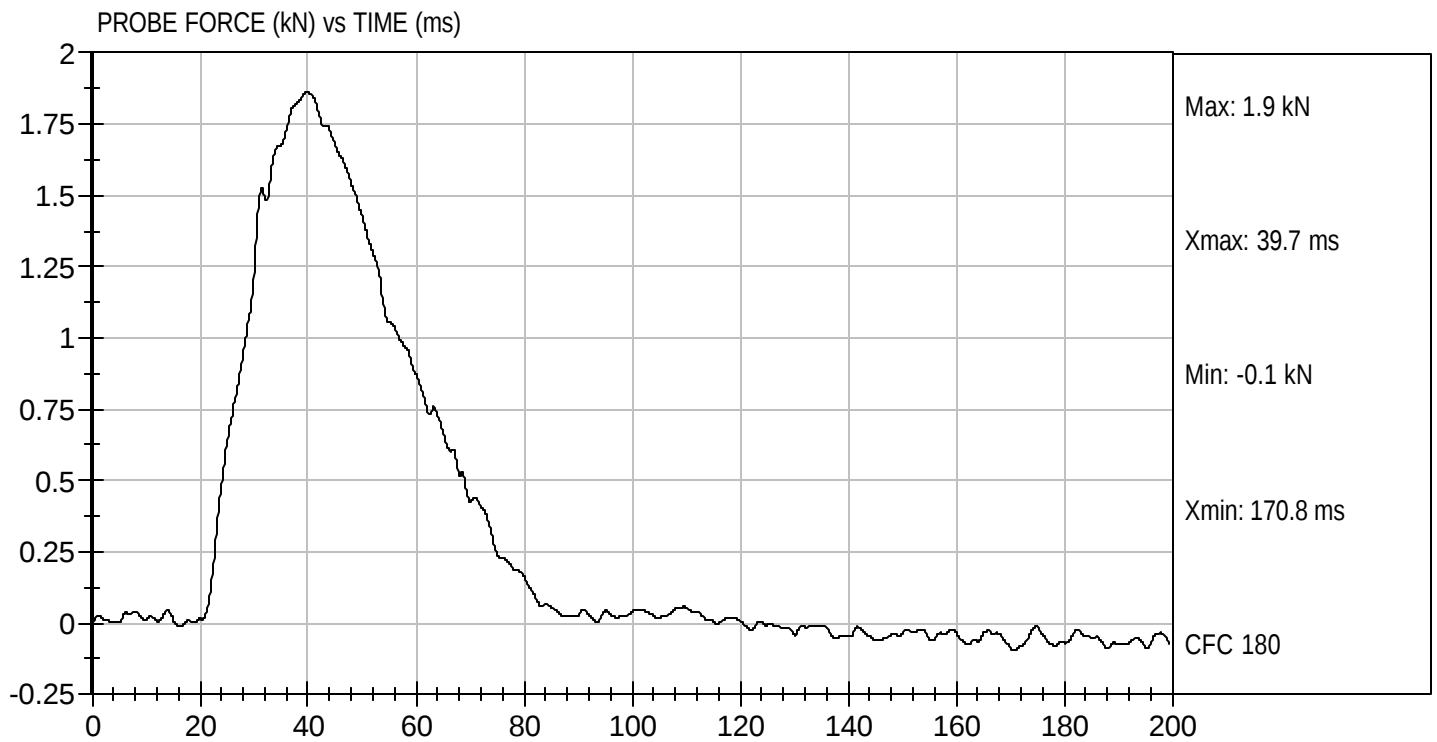


Approved By



Test Desc: Abdomen Impact
Componet ID: D052246

Test Date: 08/10/2005
Velocity: 14.83 ft/s, 4.52 m/s

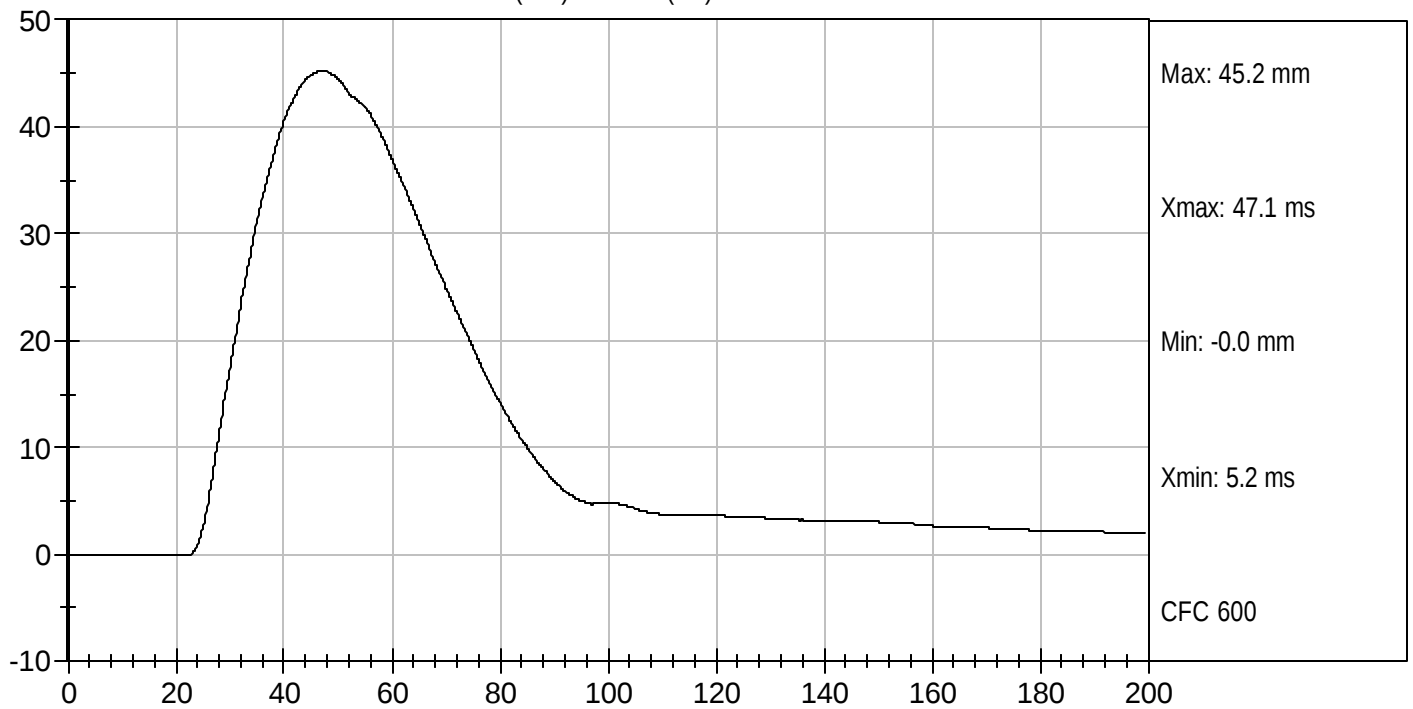




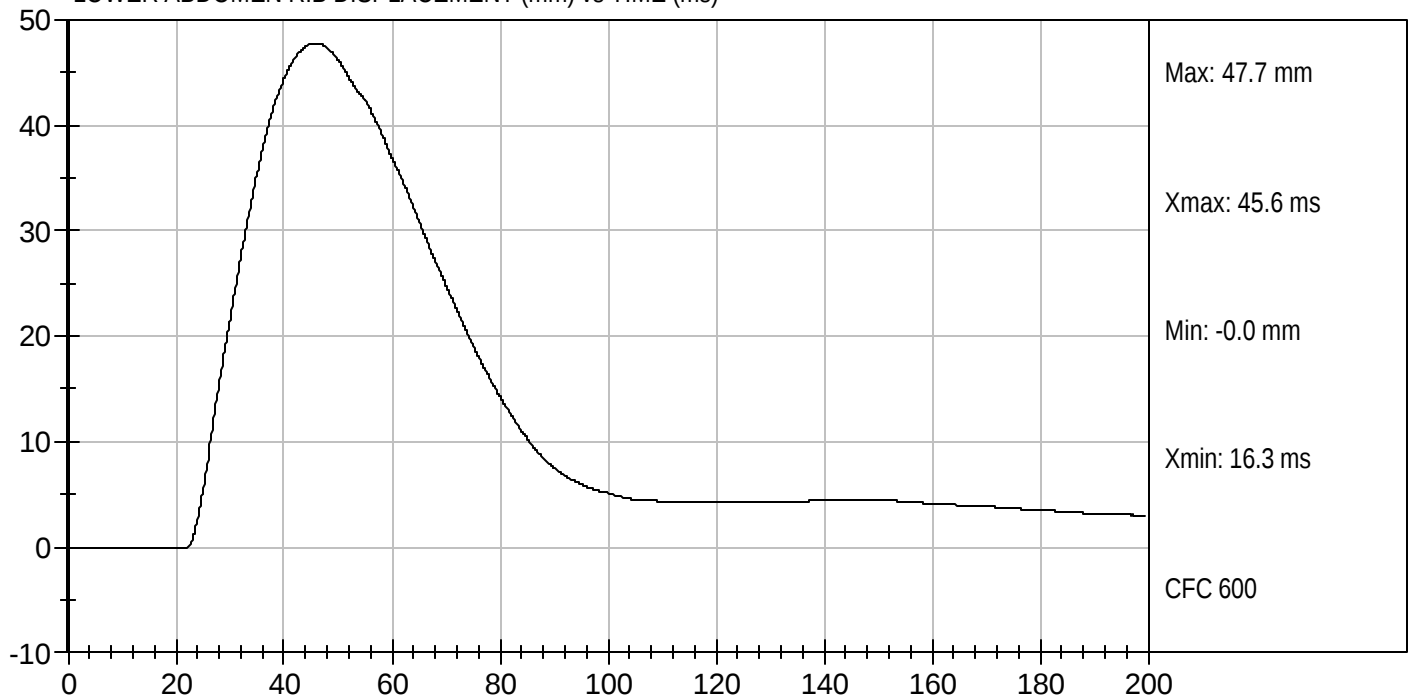
Test Desc: Abdomen Impact
Componet ID: D052246

Test Date: 08/10/2005
Velocity: 14.83 ft/s, 4.52 m/s

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



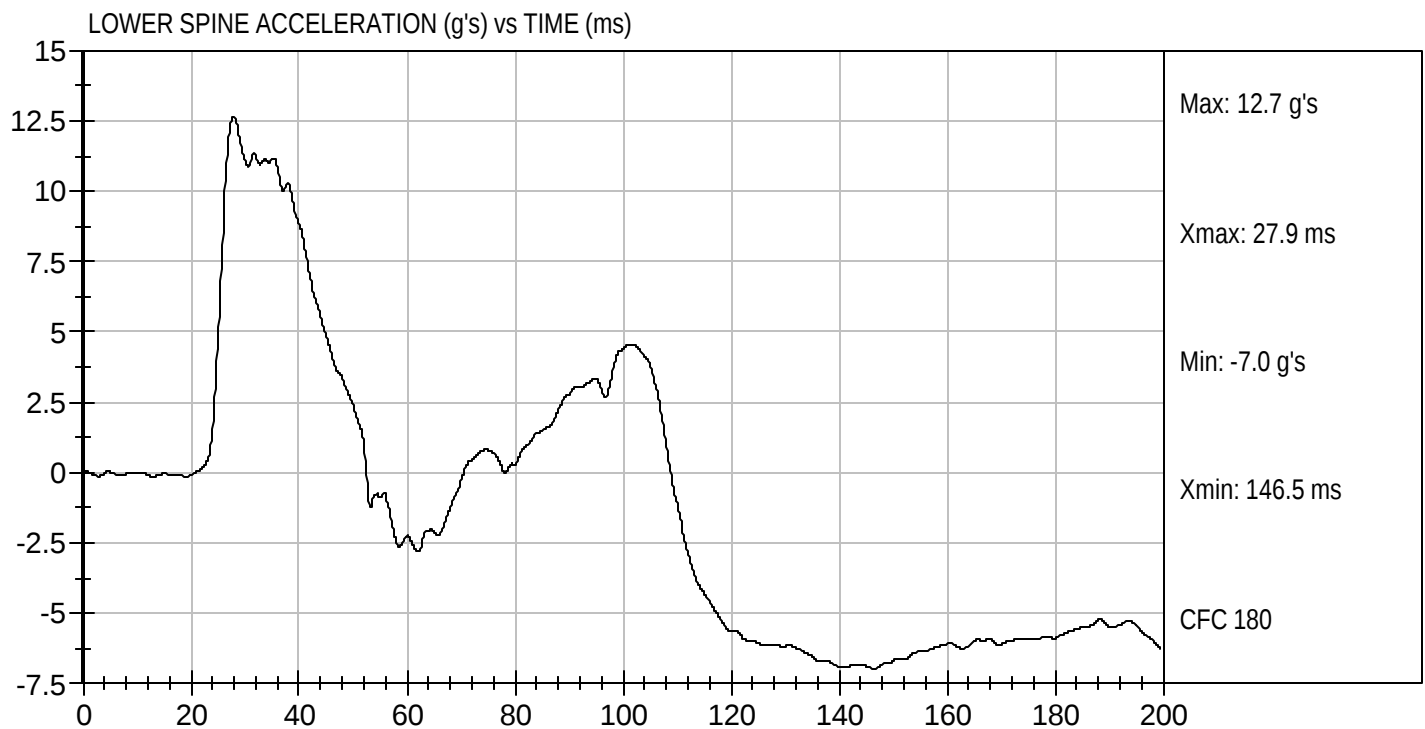
LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Abdomen Impact
Componet ID: D052246

Test Date: 08/10/2005
Velocity: 14.83 ft/s, 4.52 m/s



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052247

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	6.60 to 6.80	6.67	Pass
Peak Impactor Acceleration	G's	40 to 48	40	Pass
Pelvis Y Acceleration	G's	40 to 48	40	Pass
Peak Acetabulum Force	N	3803 to 4505	3976	Pass
Overall Test Results				Pass



Laboratory Technician

08/10/2005

Test Date

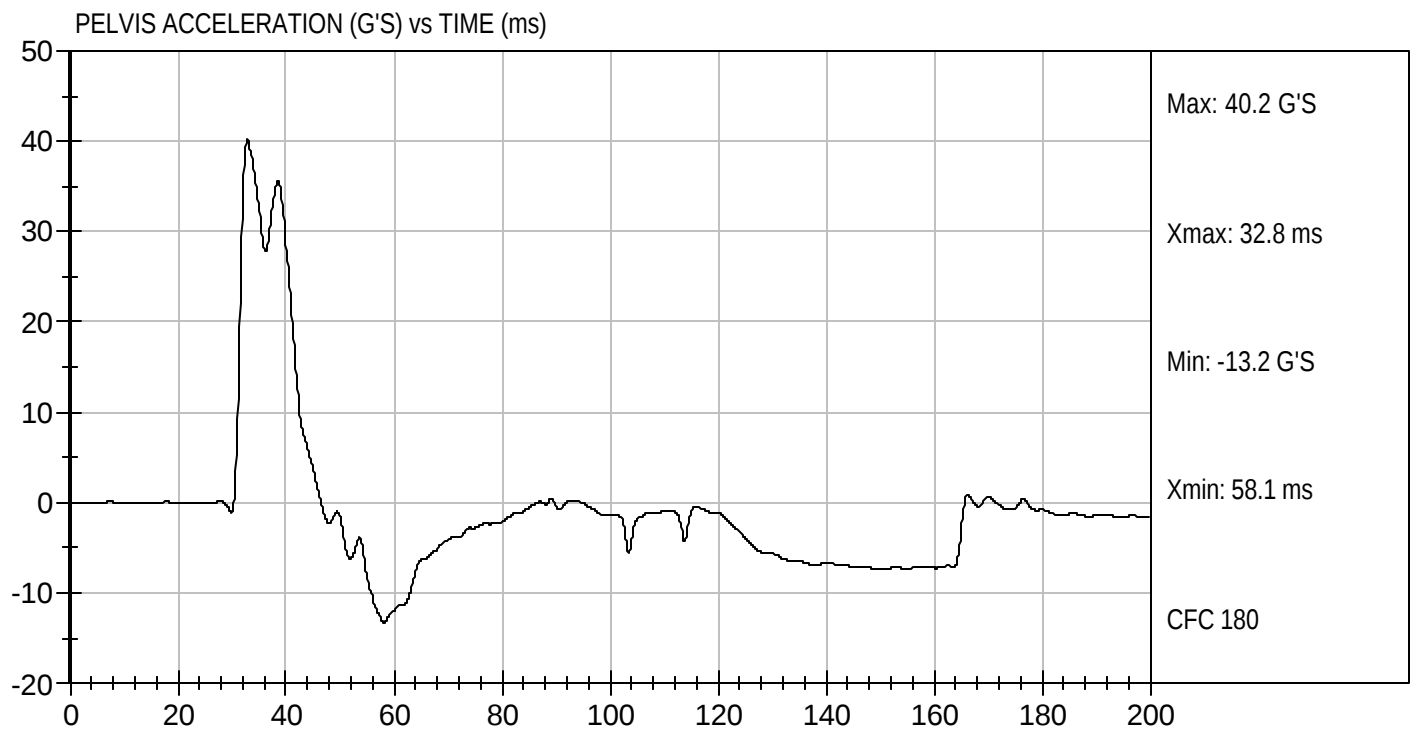
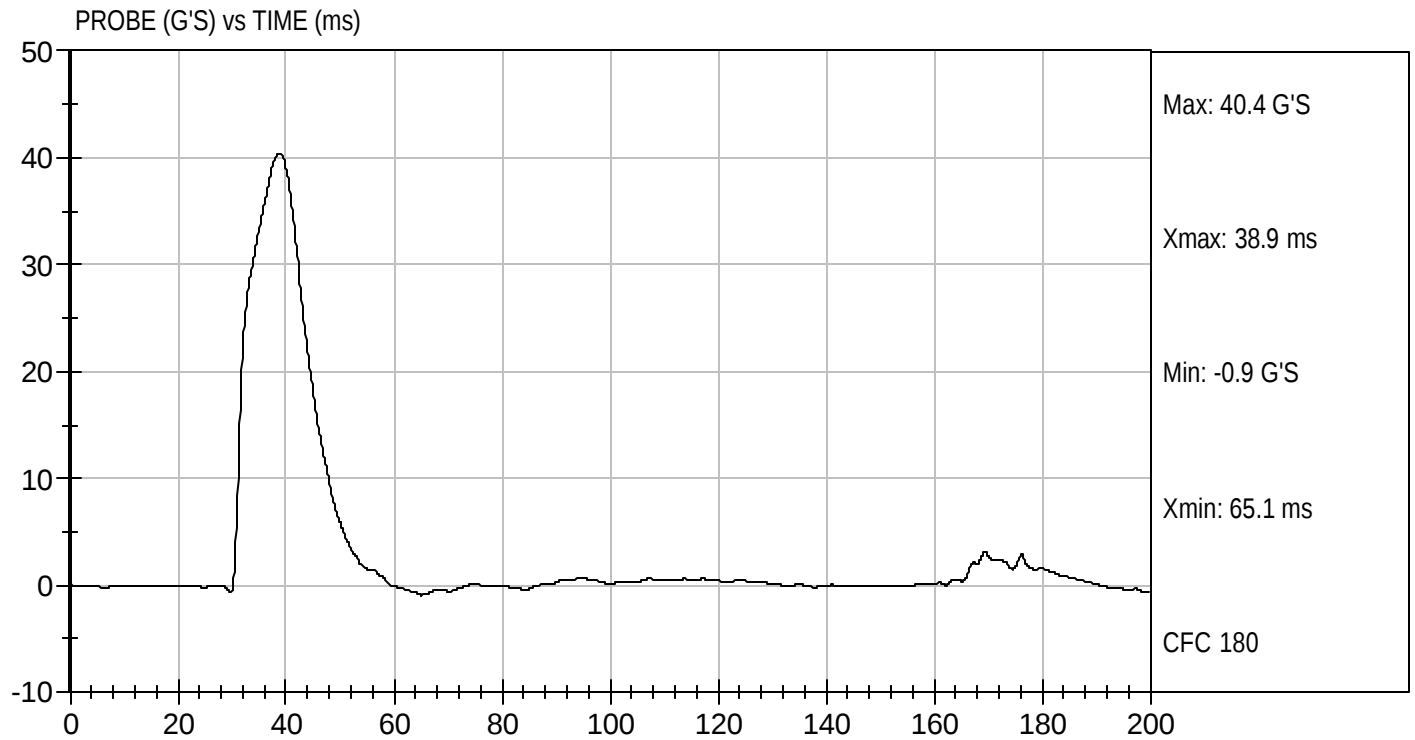


Approved By



Test Desc: Pelvis Impact
Componet ID: D052247

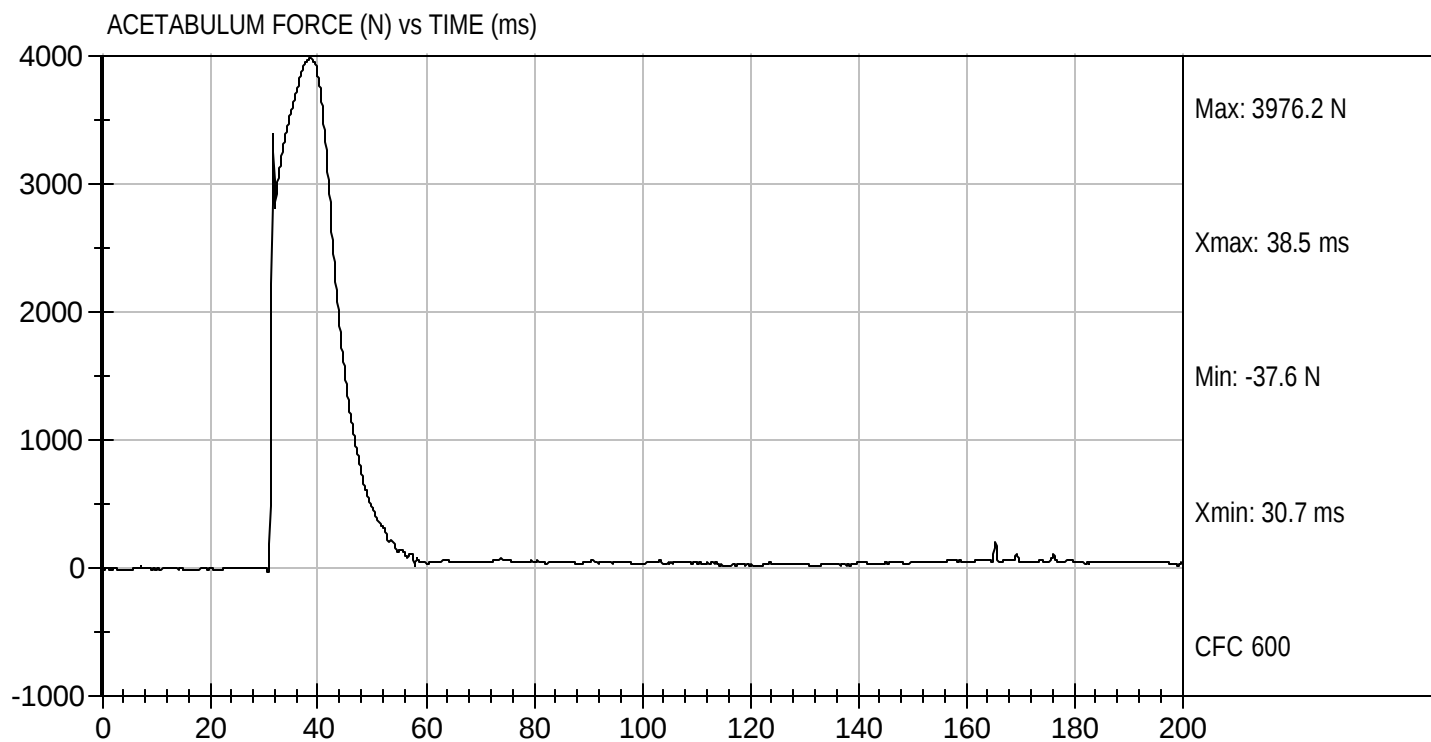
Test Date: 08/10/2005
Velocity: 21.87 ft/s, 6.67 m/s





Test Desc: Pelvis Impact
Componet ID: D052247

Test Date: 08/10/2005
Velocity: 21.87 ft/s, 6.67 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID IIs DUMMY

ATD Serial No: 033

Test I.D: D052248

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	4.20 to 4.40	4.31	Pass
Peak Impactor Acceleration	G's	41 to 47	42	Pass
Pelvis Y Acceleration	G's	32 to 40	36	Pass
Peak Pelvis Iliac Force	N	4841 to 5491	5265	Pass
Overall Test Results				Pass



Laboratory Technician

08/10/2005

Test Date

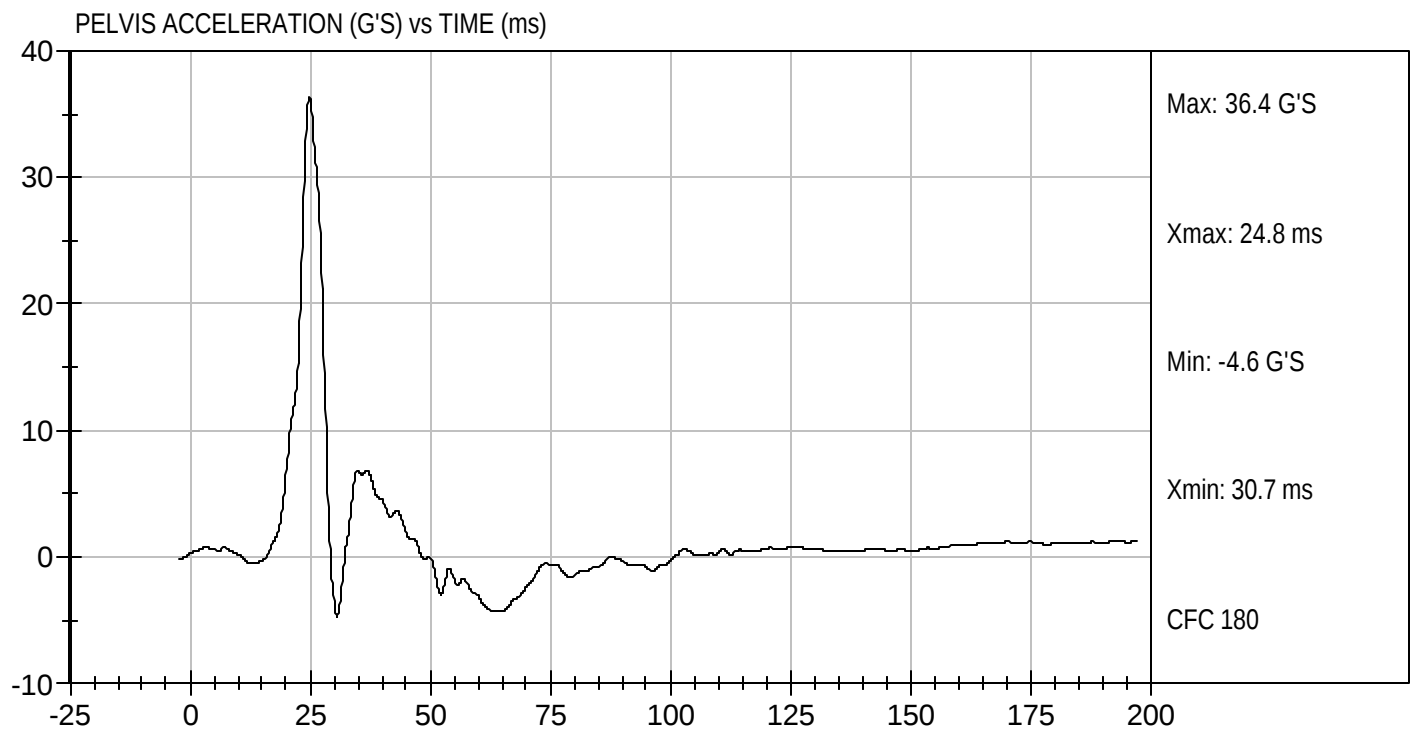
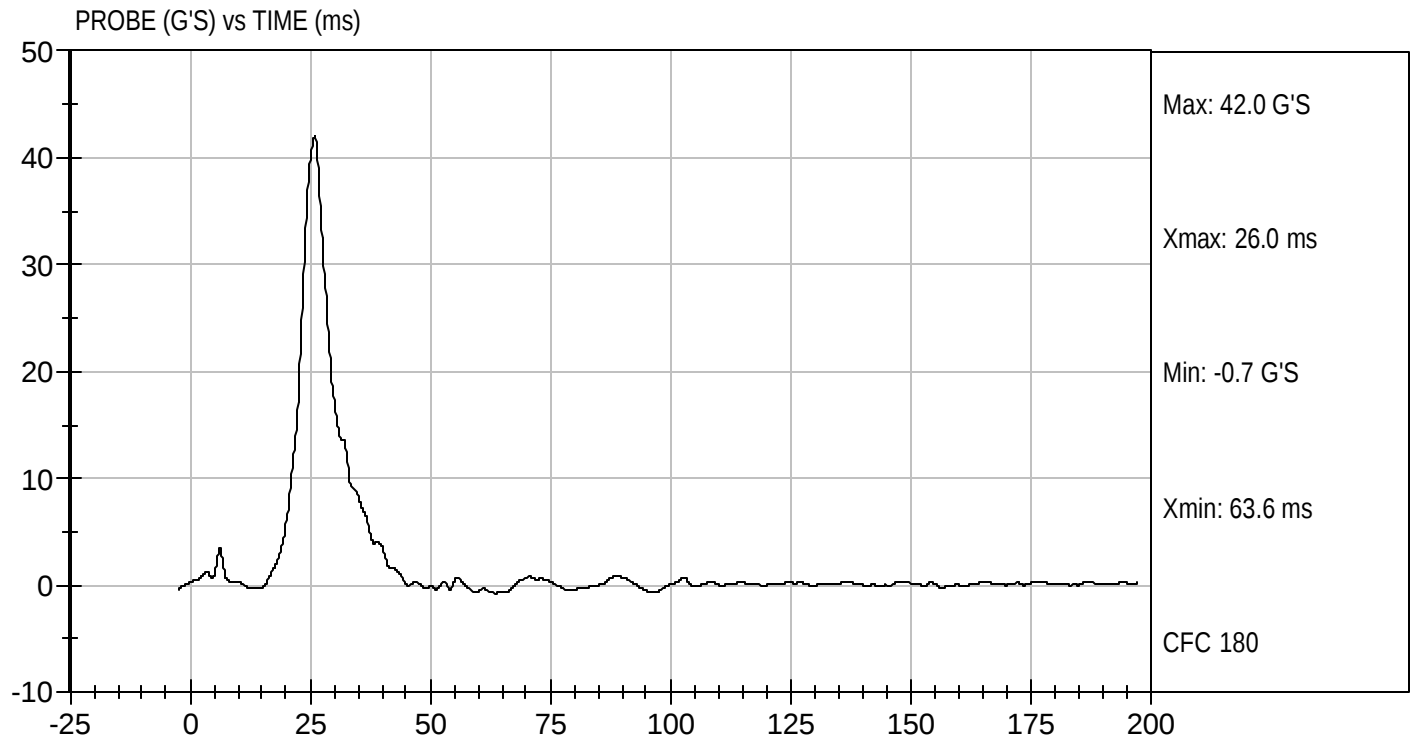


Approved By



Test Desc: Iliac Impact
Componet ID: D052248

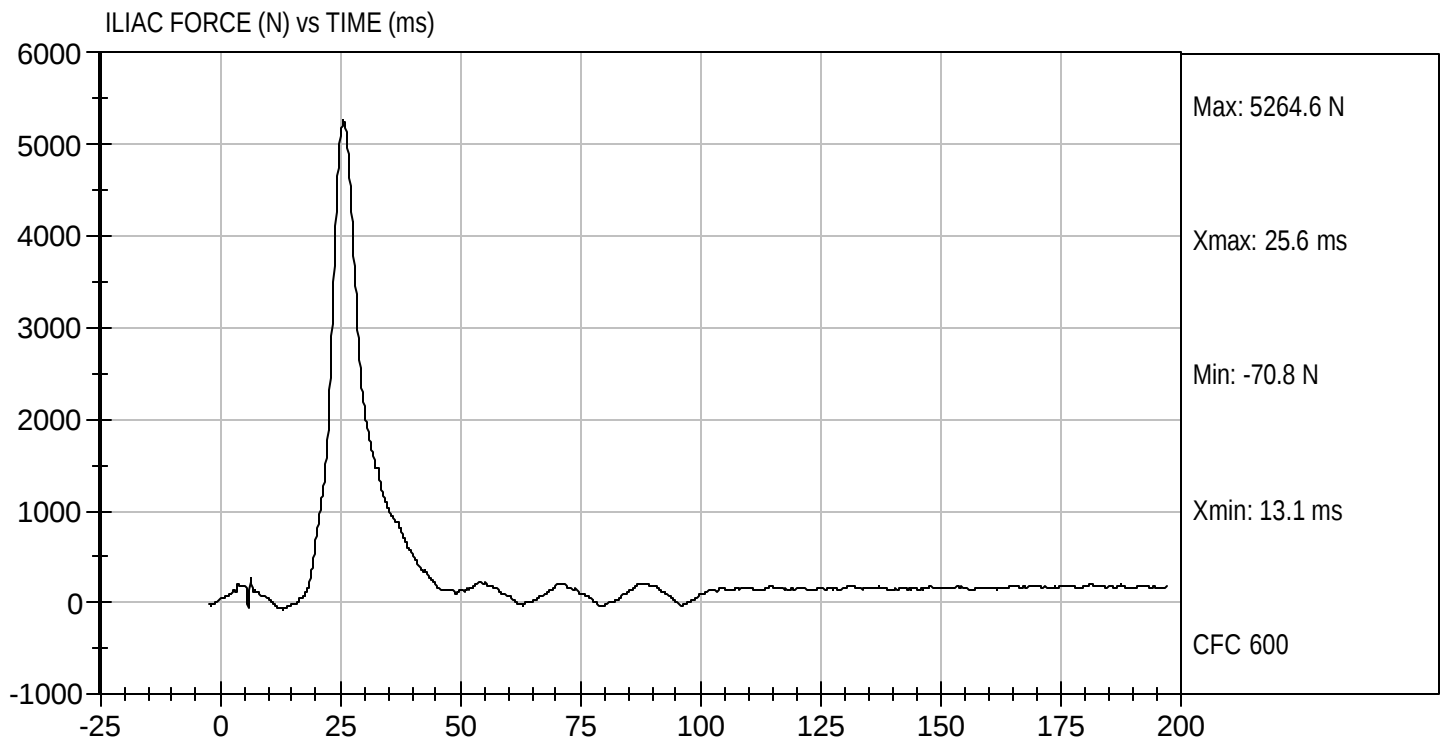
Test Date: 08/10/2005
Velocity: 14.15 ft/s, 4.31 m/s





Test Desc: Iliac Impact
Componet ID: D052248

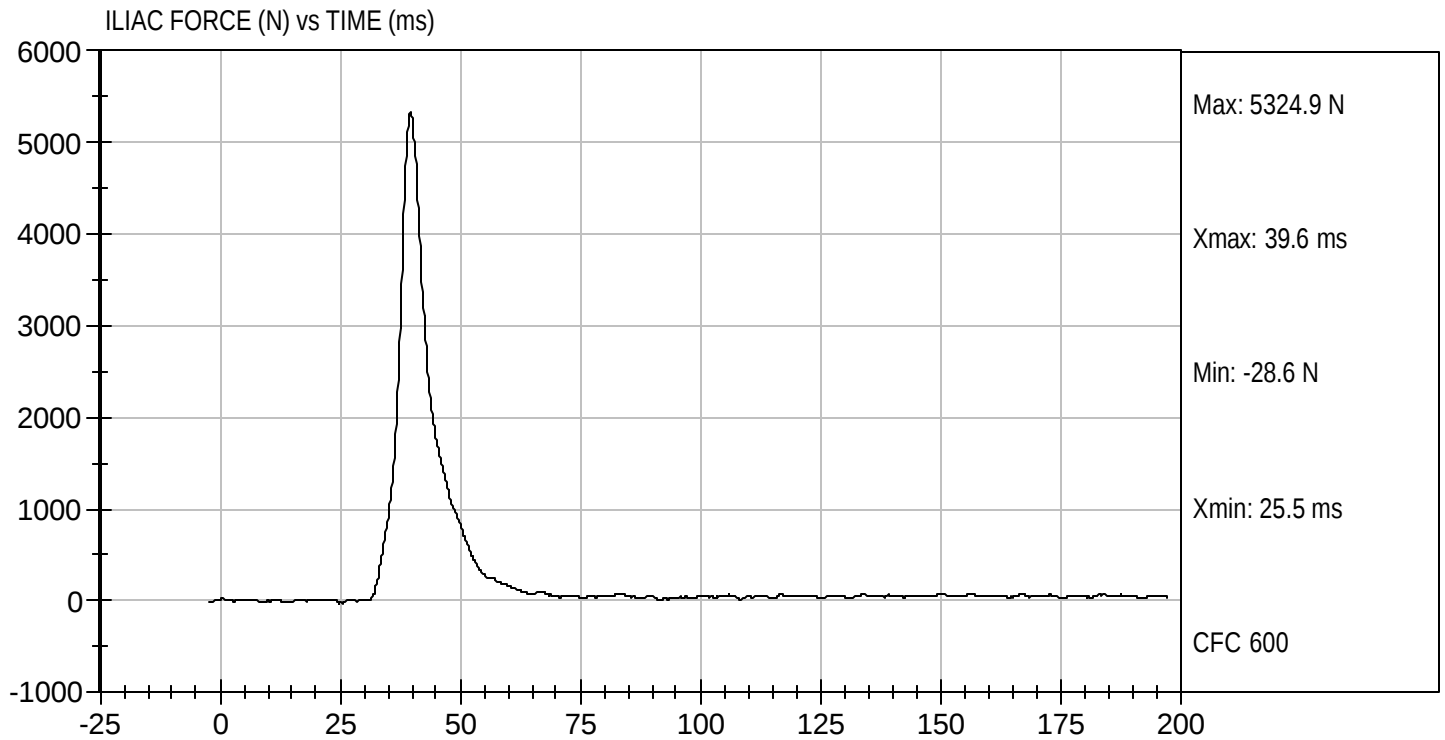
Test Date: 08/10/2005
Velocity: 14.15 ft/s, 4.31 m/s





Test Desc: Iliac Impact
Componet ID: D052188

Test Date: 08/05/2005
Velocity: 13.96 ft/s, 4.26 m/s



CERTIFICATION DATA

Dummy Serial Number: 032

PRE-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

ATD Serial No: 032

Test ID: D052191

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Peak Resultant Acceleration	G's	125 to 145	129	Pass
Peak Lateral Acceleration	G's	+/- 15	7	Pass
Unimodal	Yes/No	<10%	Yes	Pass
Overall Test Results				Pass



Laboratory Technician

08/05/2005

Test Date



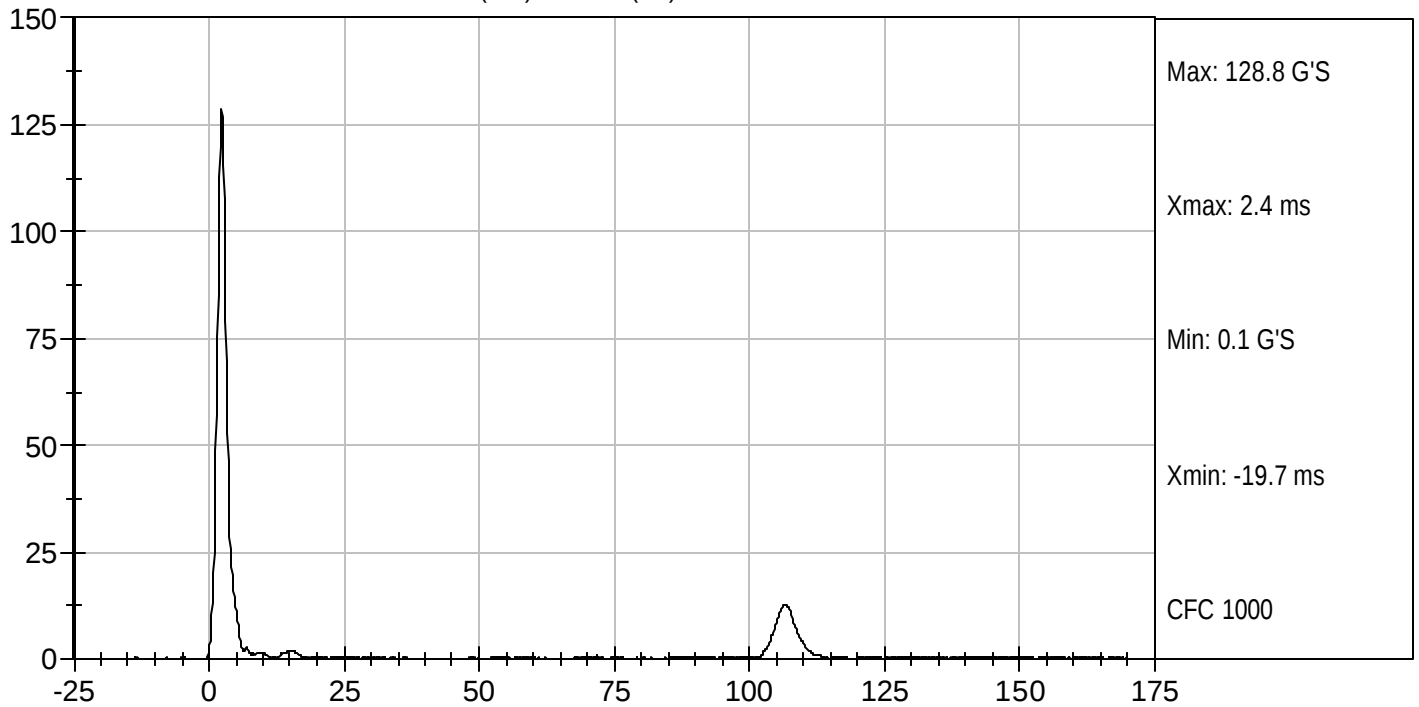
Approved By



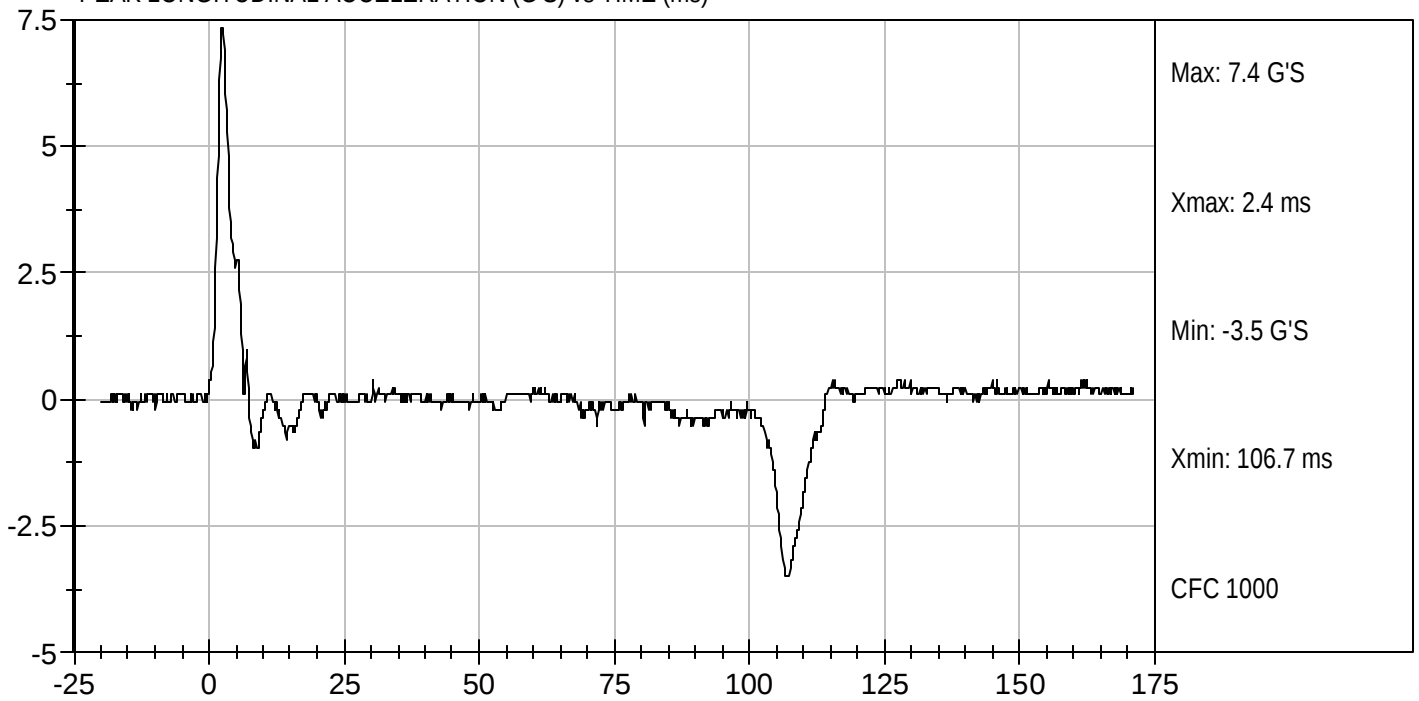
Test Desc: Head Drop
Componet ID: D052191

Test Date: 08/05/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052192

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.6	Pass
Humidity		%	10 to 70	43	Pass
Impact Velocity		m/s	5.51 to 5.63	5.62	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.69	Pass
	15 msec	m/s	3.40 to 4.10	3.88	Pass
	20 msec	m/s	4.50 to 5.40	5.12	Pass
	25 msec	m/s	5.50 to 6.10	5.84	Pass
	25-100 msec	m/s	5.20 to 6.20	5.84	Pass
Maximum D-Plane Rotation		deg	74 to 79	75	Pass
Time of Maximum D-Plane Rotation		Nm	50 to 70	64	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-45 to -40	-45	Pass
Time of Moment Decay to 0 Nm		msec	113 to 123	114	Pass
Overall Test Results				Pass	

Jessica Hall
 Laboratory Technician

David Winkelbauer

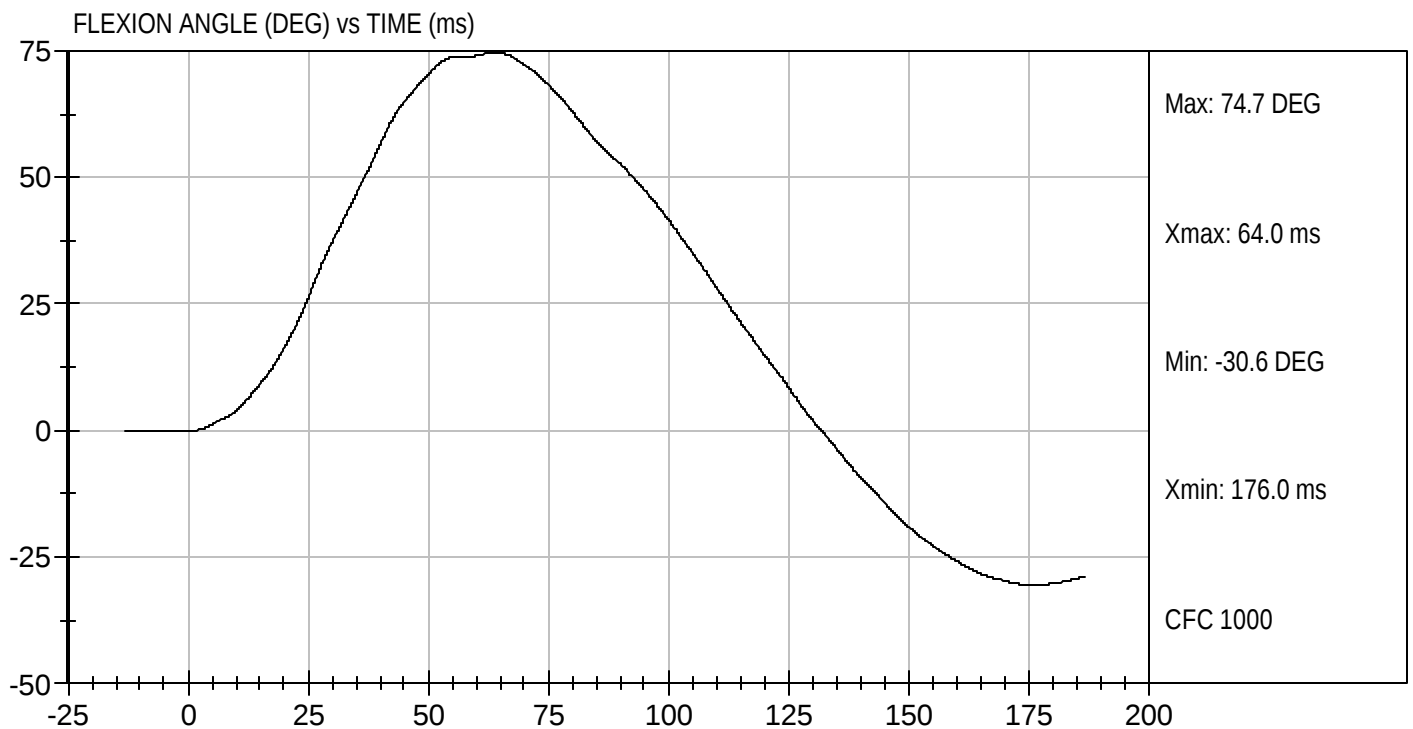
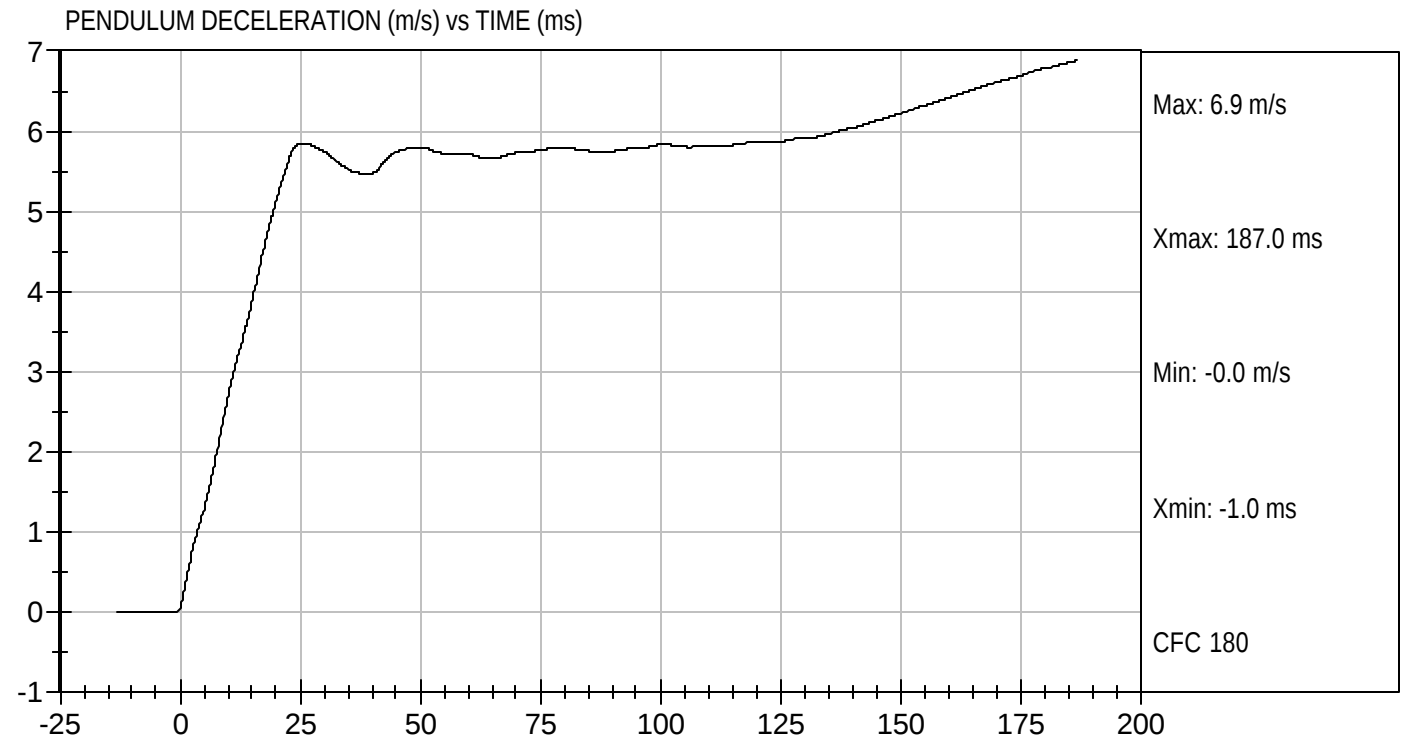
Approved By

08/05/2005
 Test Date



Test Desc: Neck Bending
Componet ID: D052192

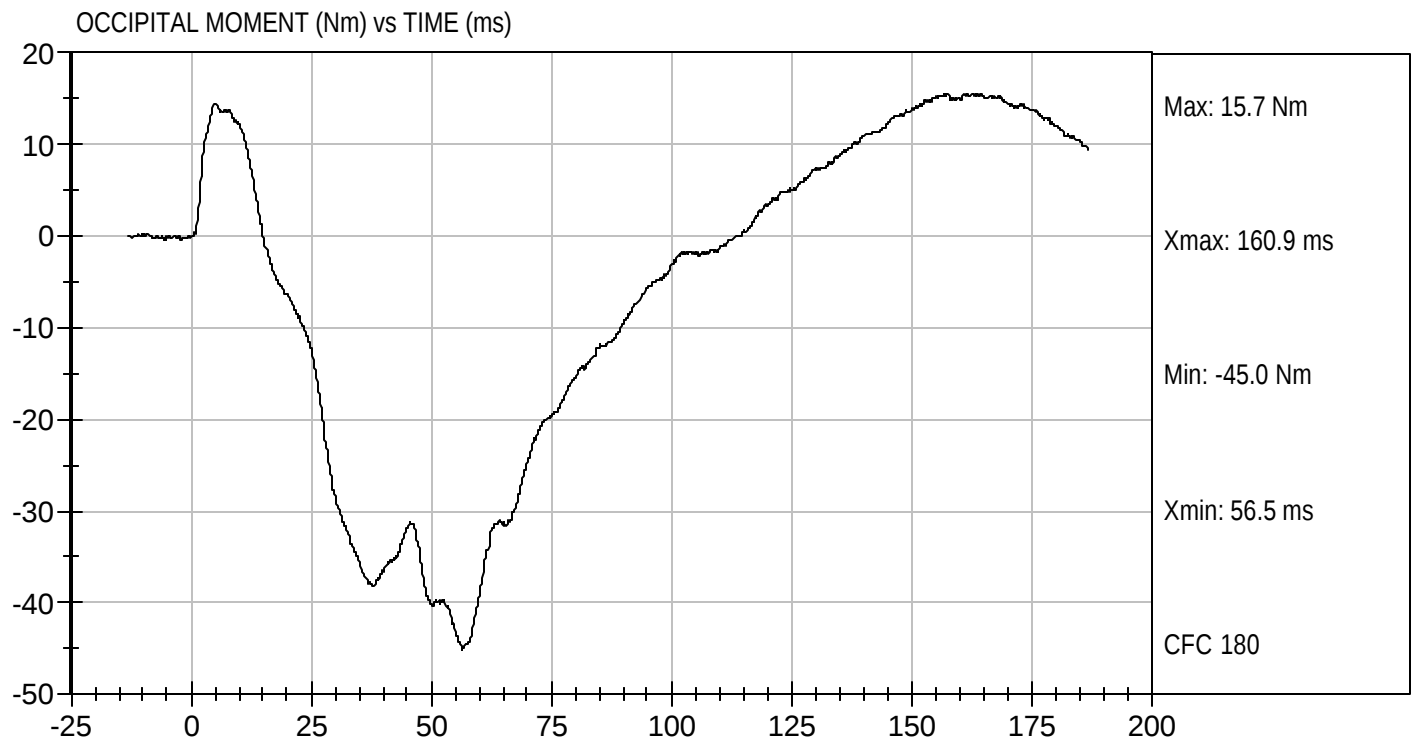
Test Date: 08/05/2005
Velocity: 18.45 ft/s, 5.62 m/s





Test Desc: Neck Bending
Componet ID: D052192

Test Date: 08/05/2005
Velocity: 18.45 ft/s, 5.62 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test ID: D052193

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	22.1	Pass
Laboratory Relative Humidity	%	10 to 70	42	Pass
Impact Velocity	m/s	4.41 to 4.59	4.48	Pass
Maximum Probe Force	kN	1.6 to 2.4	2.2	Pass
Shoulder Displacement	mm	27 to 39	32	Pass
Overall Test Results				Pass



Laboratory Technician

08/05/2005

Test Date

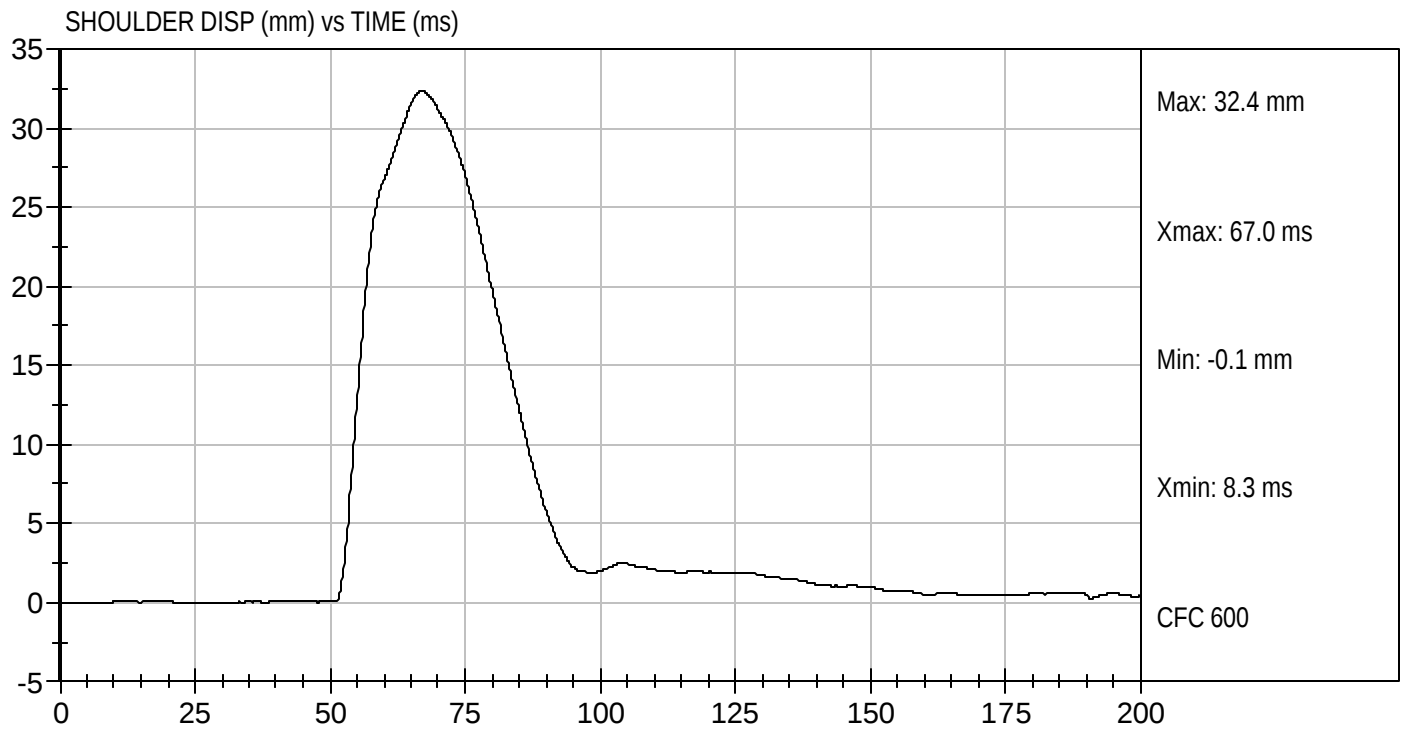
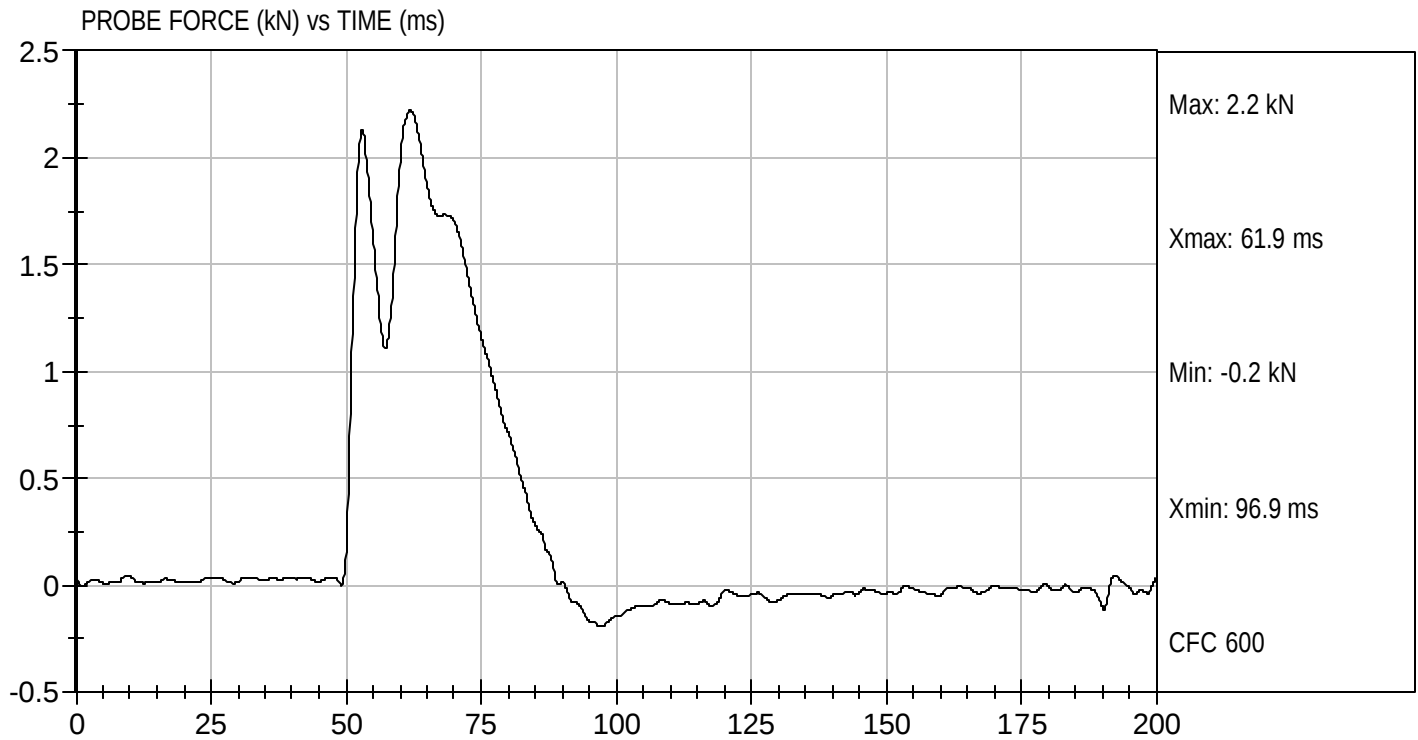


Approved By



Test Desc: Shoulder Impact
Componet ID: D052193

Test Date: 08/05/2005
Velocity: 14.70 ft/s, 4.48 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 032

Test I.D: D052194

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.7	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	6.57 to 6.84	6.74	Pass
Peak Impactor Force	kN	4.1 to 4.7	4.5	Pass
Shoulder Displacement	mm	30 to 42	37	Pass
Upper Rib Displacement	mm	23 to 35	29	Pass
Middle Rib Displacement	mm	29 to 44	33	Pass
Lower Rib Displacement	mm	33 to 40	35	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 48	38	Pass
Lower Spine (T12) Y Acceleration	G's	30 to 38	33	Pass
Overall Test Results				Pass


Laboratory Technician

08/05/2005

Test Date

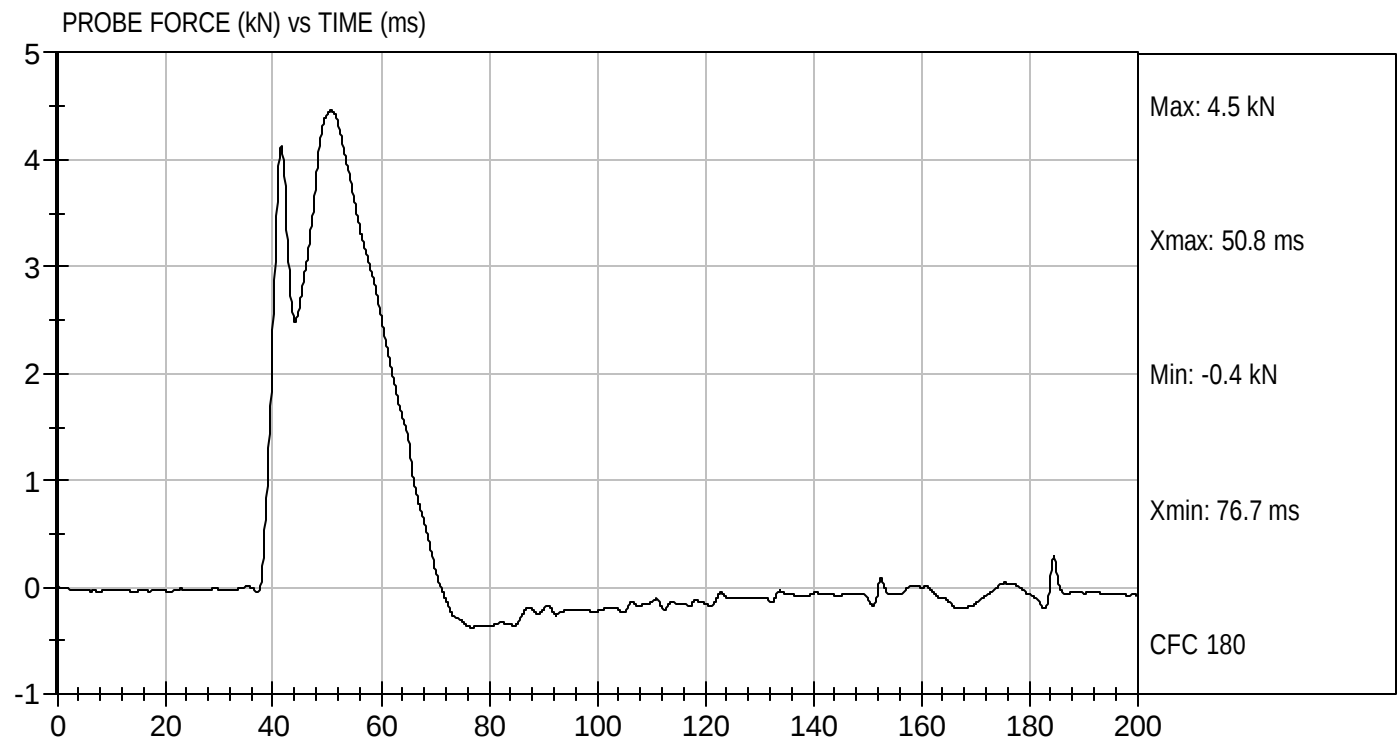


Approved By



Test Desc: Thorax With Arm
Componet ID: D052194

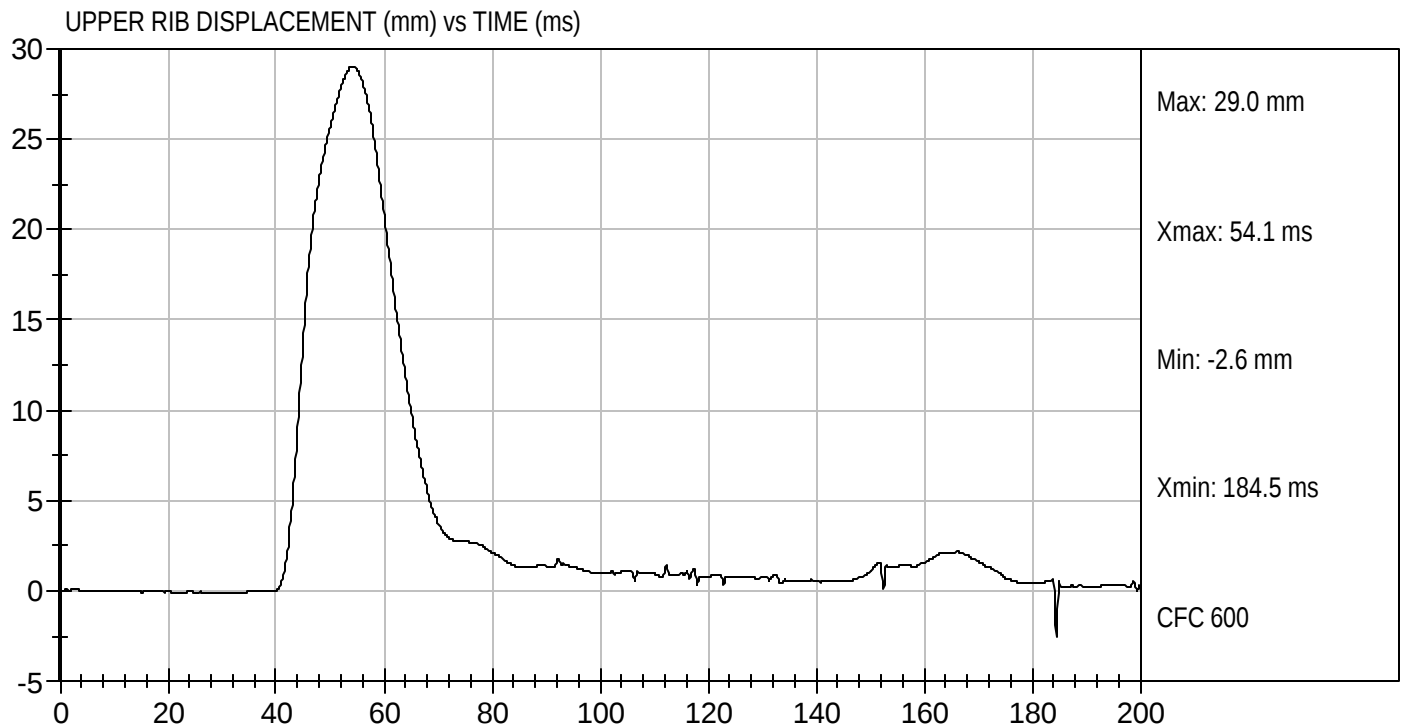
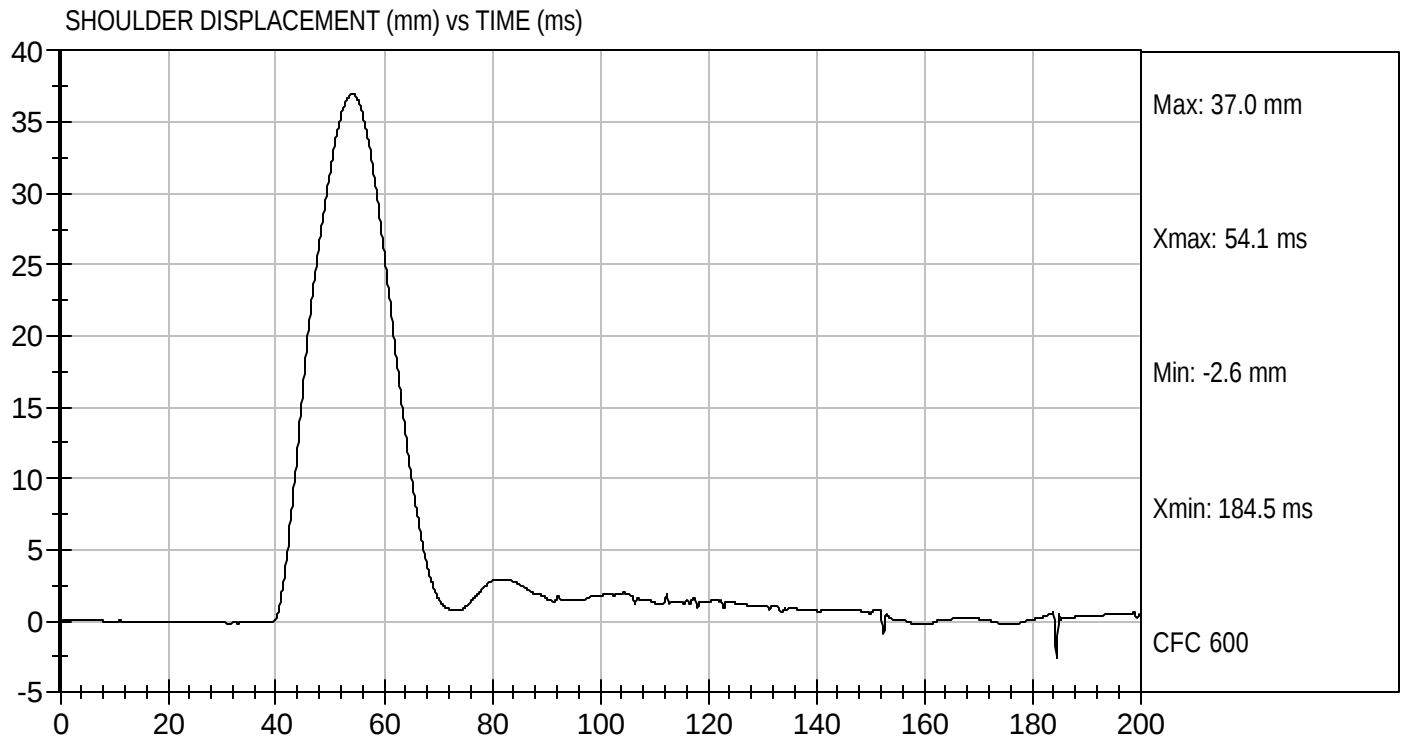
Test Date: 08/05/2005
Velocity: 22.1 ft/s, 6.74 m/s





Test Desc: Thorax With Arm
Componet ID: D052194

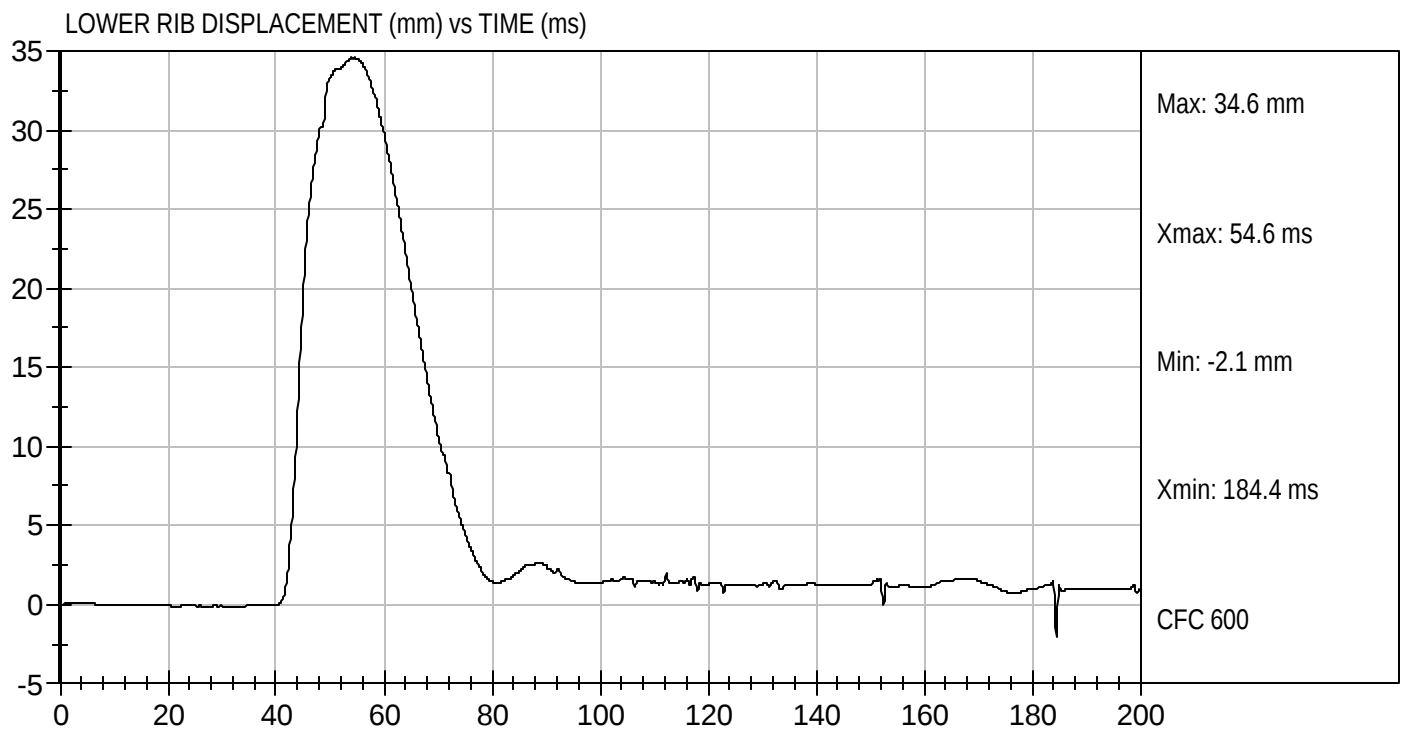
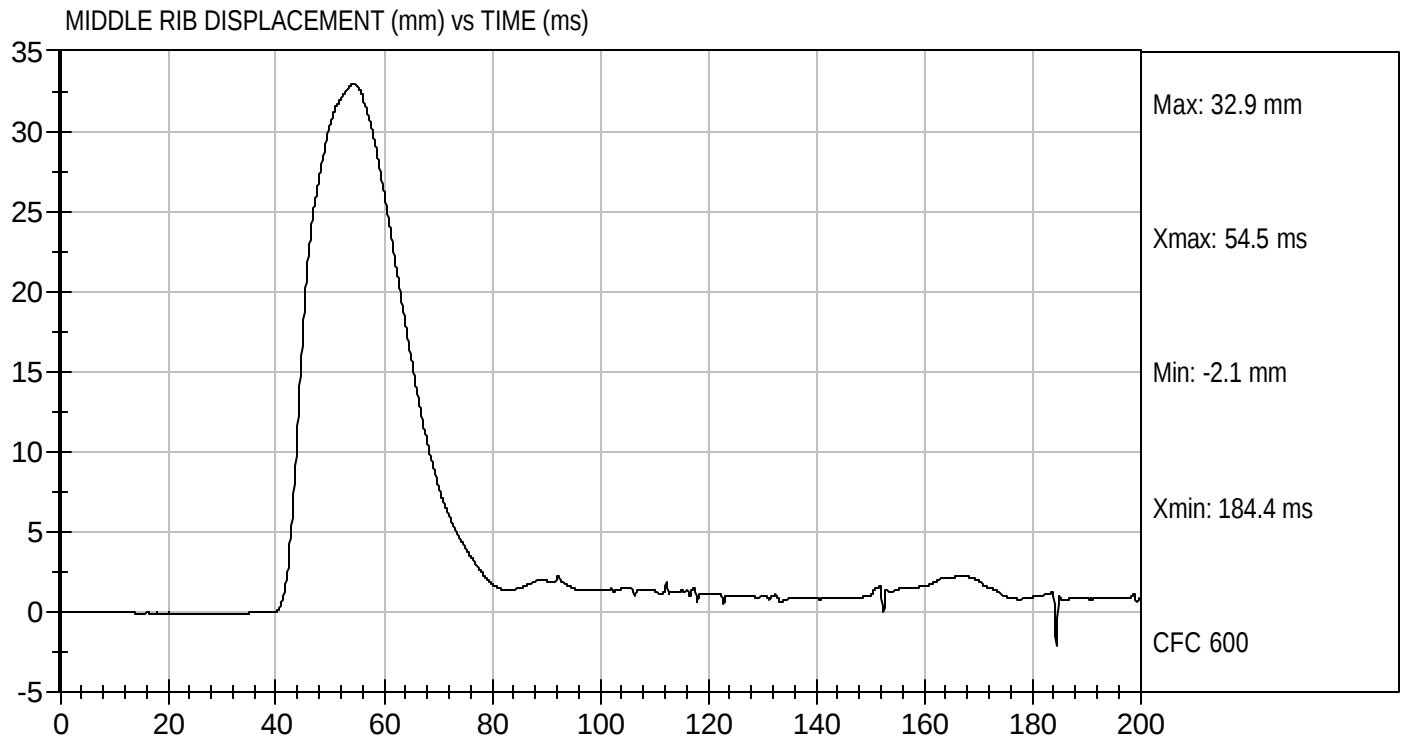
Test Date: 08/05/2005
Velocity: 22.1 ft/s, 6.74 m/s





Test Desc: Thorax With Arm
Componet ID: D052194

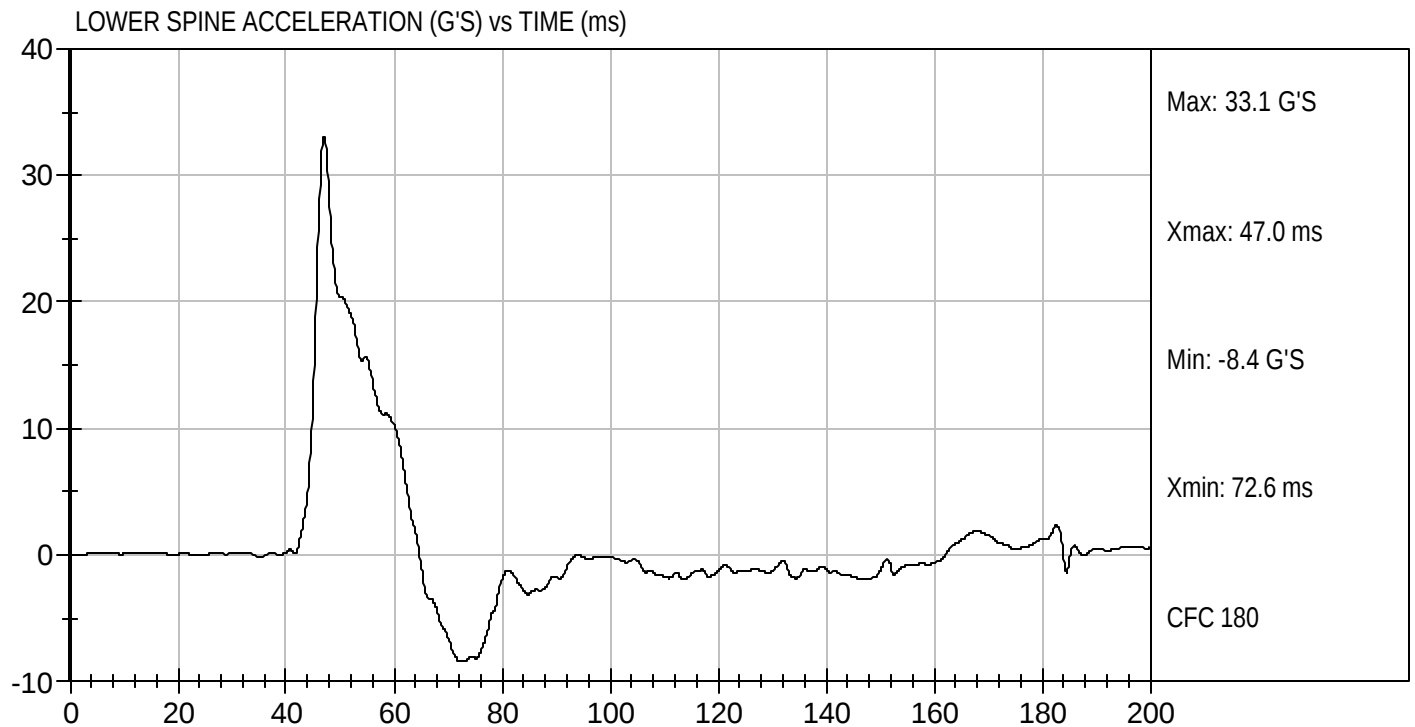
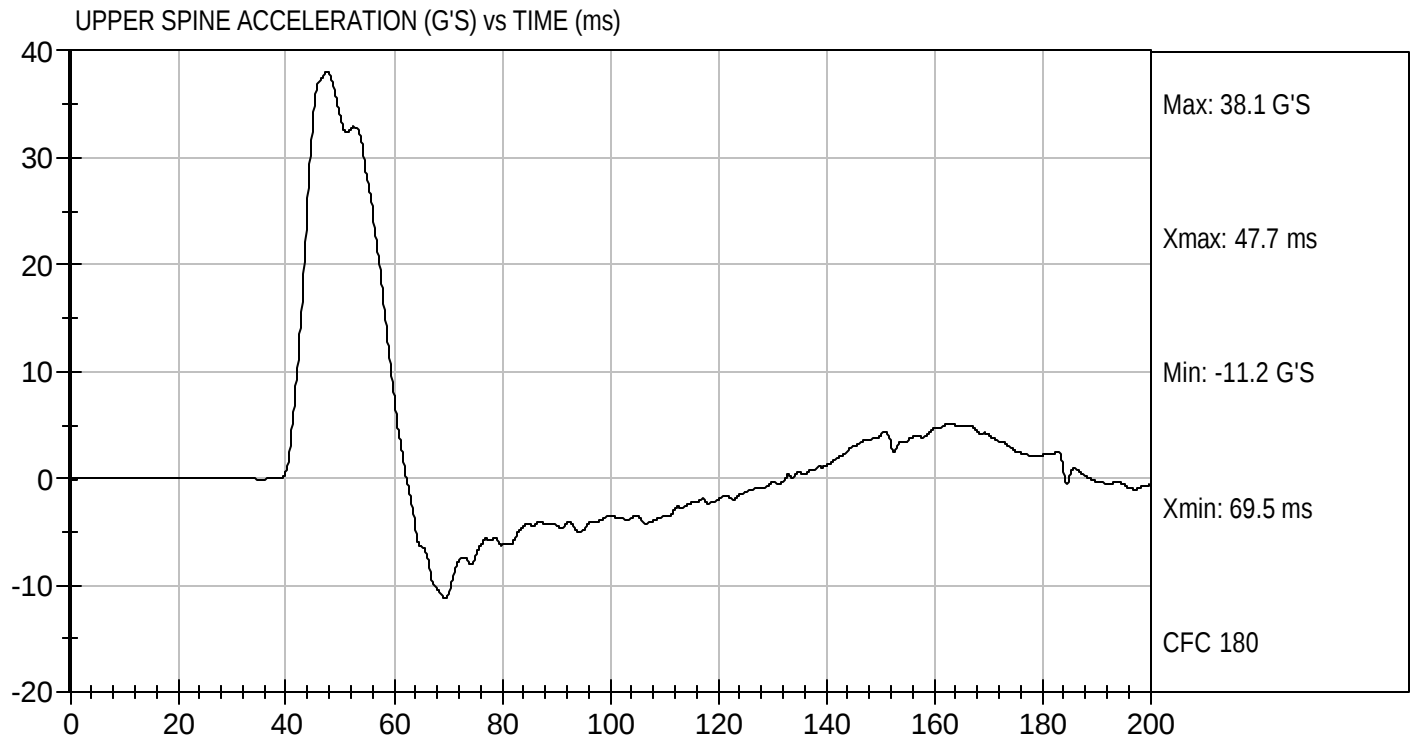
Test Date: 08/05/2005
Velocity: 22.1 ft/s, 6.74 m/s





Test Desc: Thorax With Arm
Componet ID: D052194

Test Date: 08/05/2005
Velocity: 22.1 ft/s, 6.74 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 032

Test I.D: D052195

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Force	kN	1.8 to 2.3	2.2	Pass
Upper Rib Displacement	mm	32 to 41	37	Pass
Middle Rib Displacement	mm	40 to 51	42	Pass
Lower Rib Displacement	mm	34 to 47	38	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 18	16	Pass
Lower Spine (T12) Y Acceleration	G's	8 to 13	8	Pass
Overall Test Results				Pass



Laboratory Technician

08/05/2005

Test Date

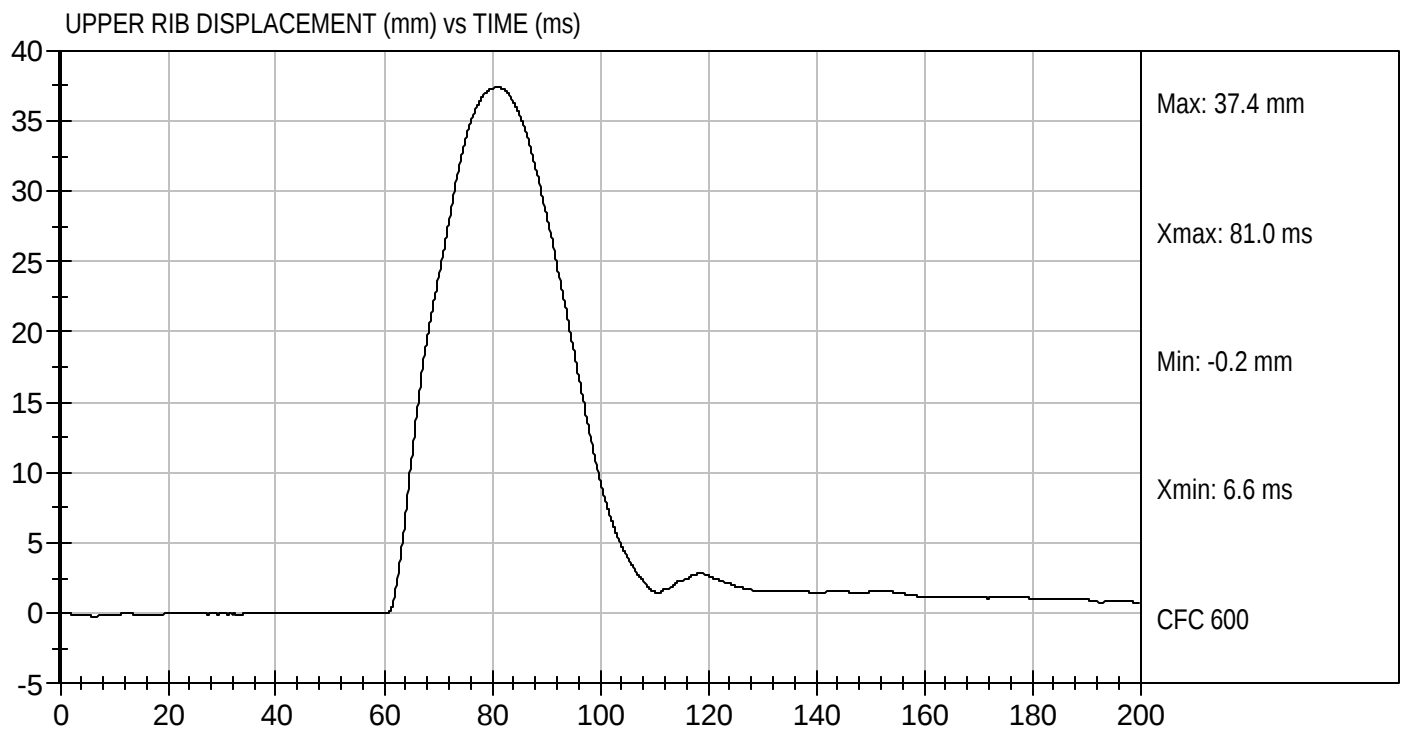
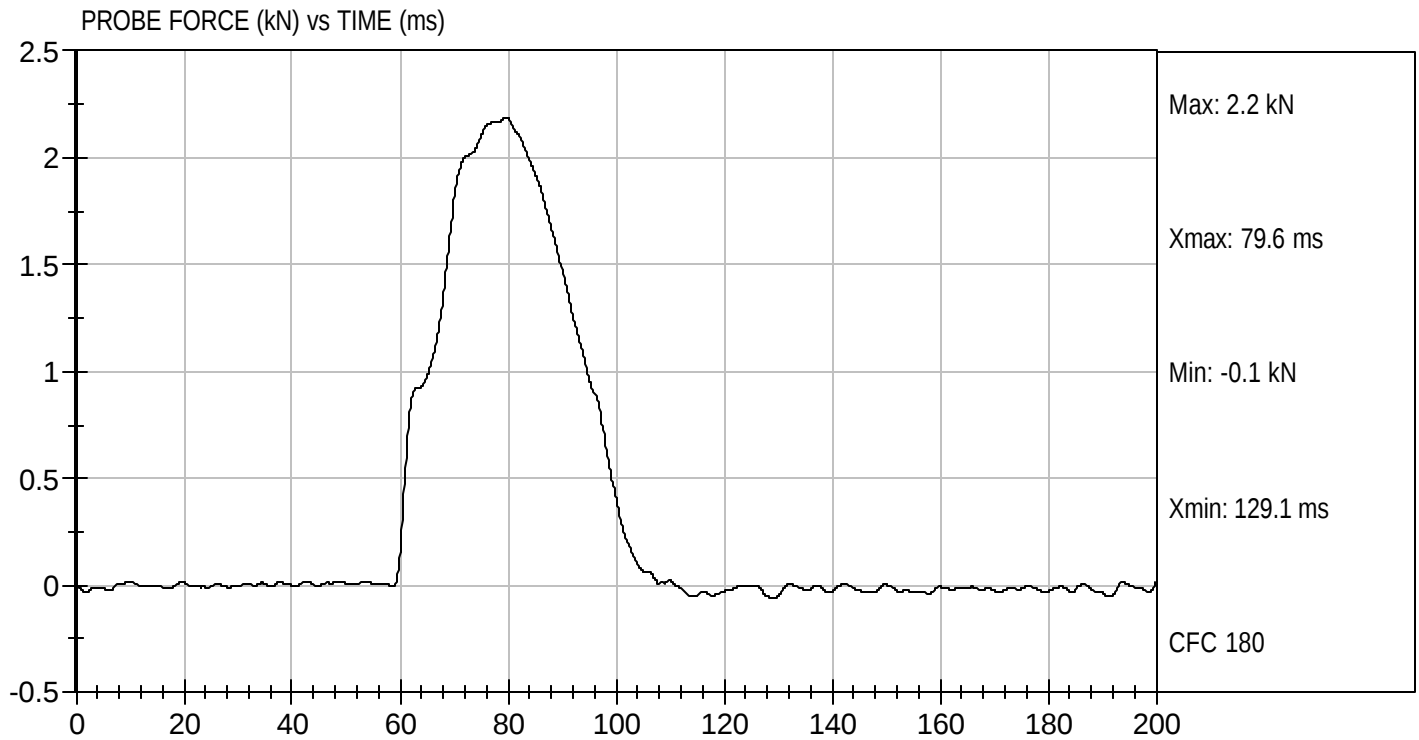


Approved By



Test Desc: Thorax Without Arm
Componet ID: D052195

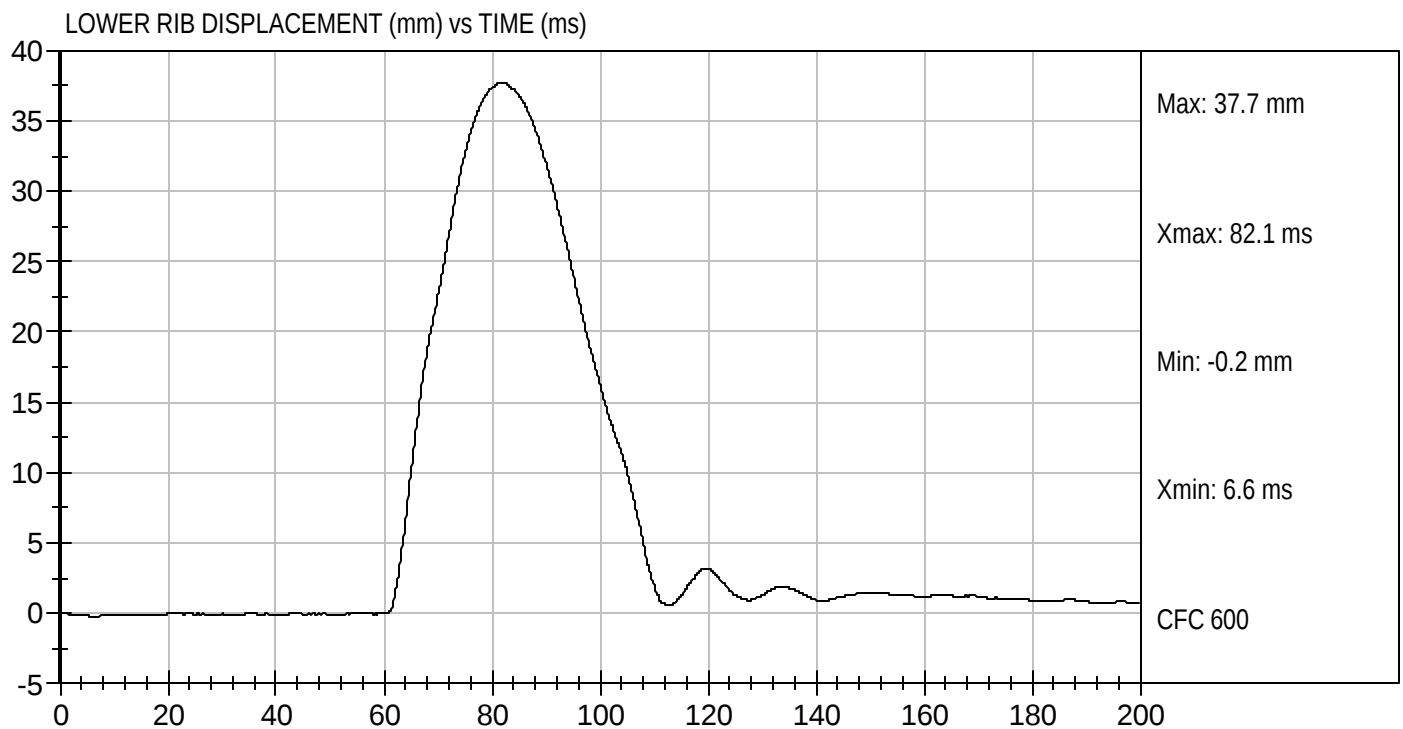
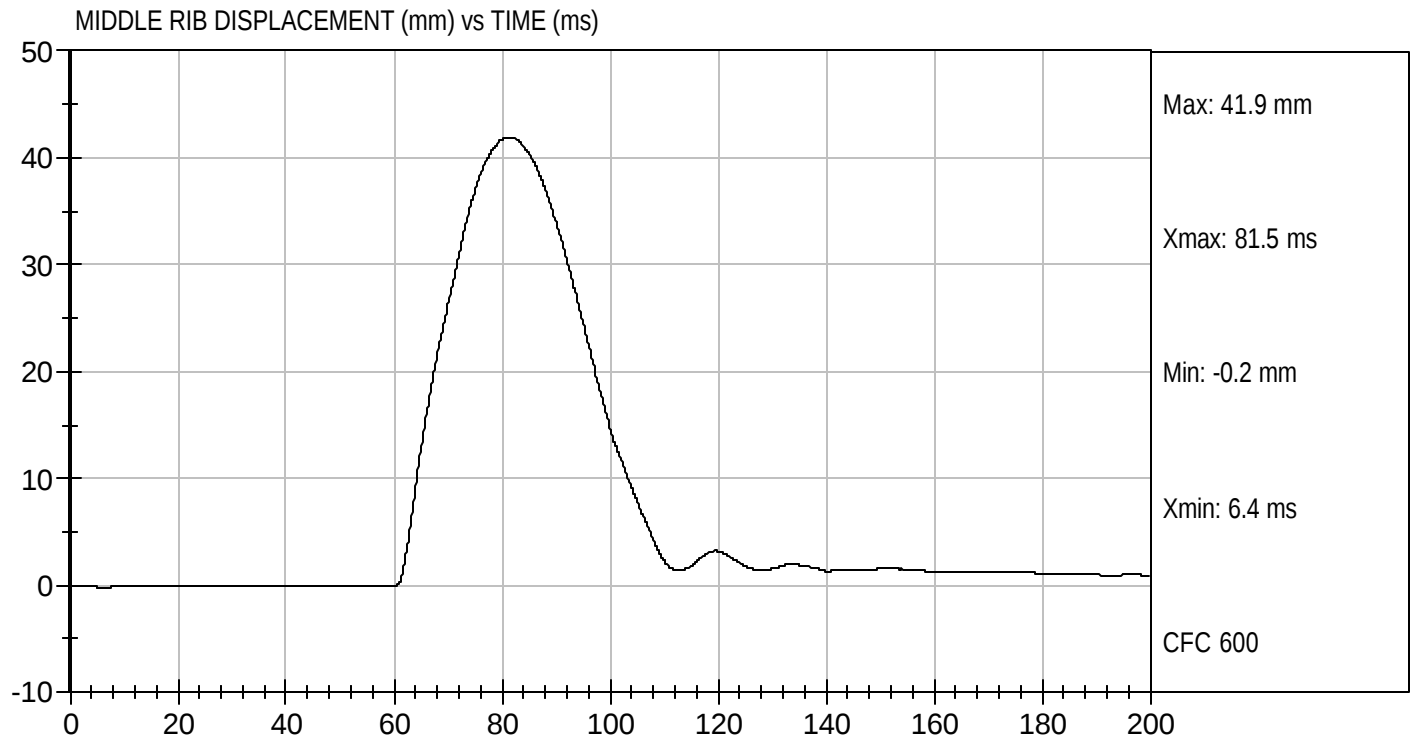
Test Date: 08/05/2005
Velocity: 14.02 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Componet ID: D052195

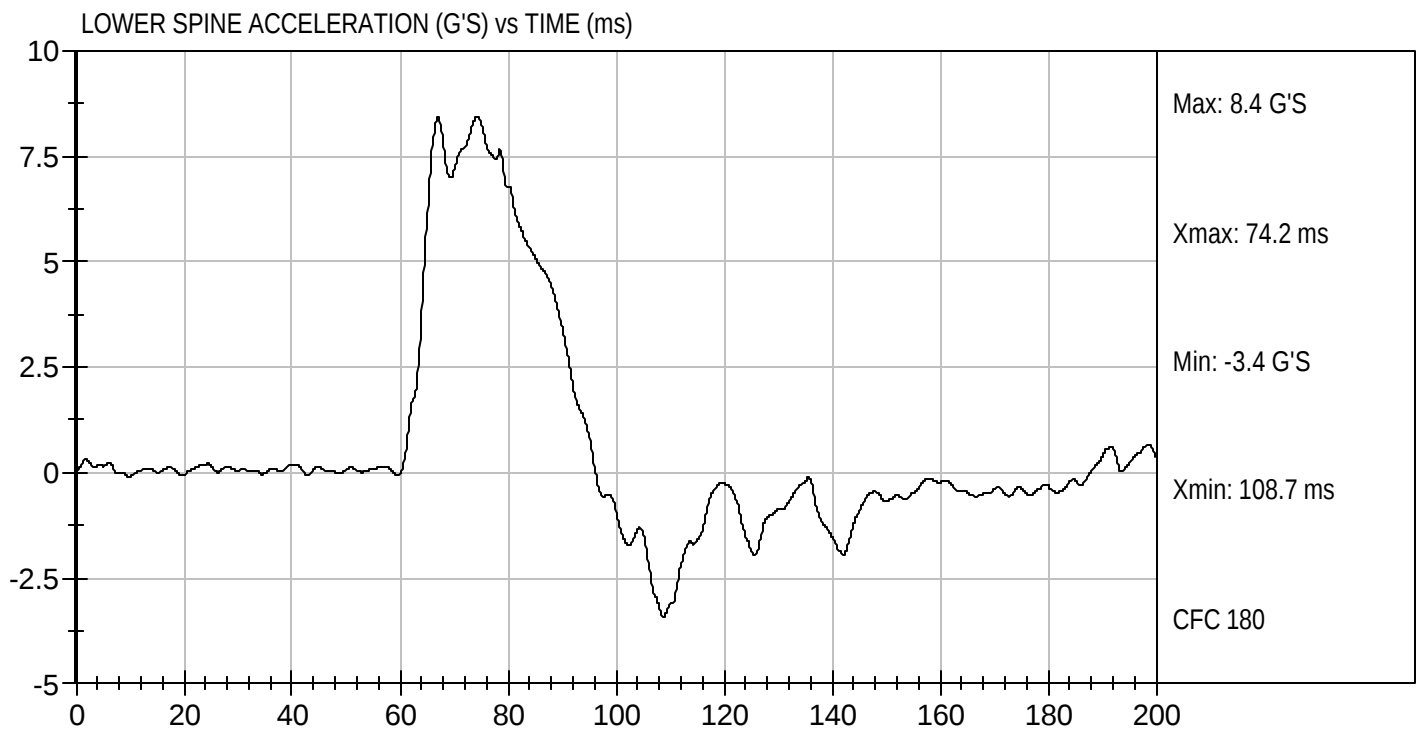
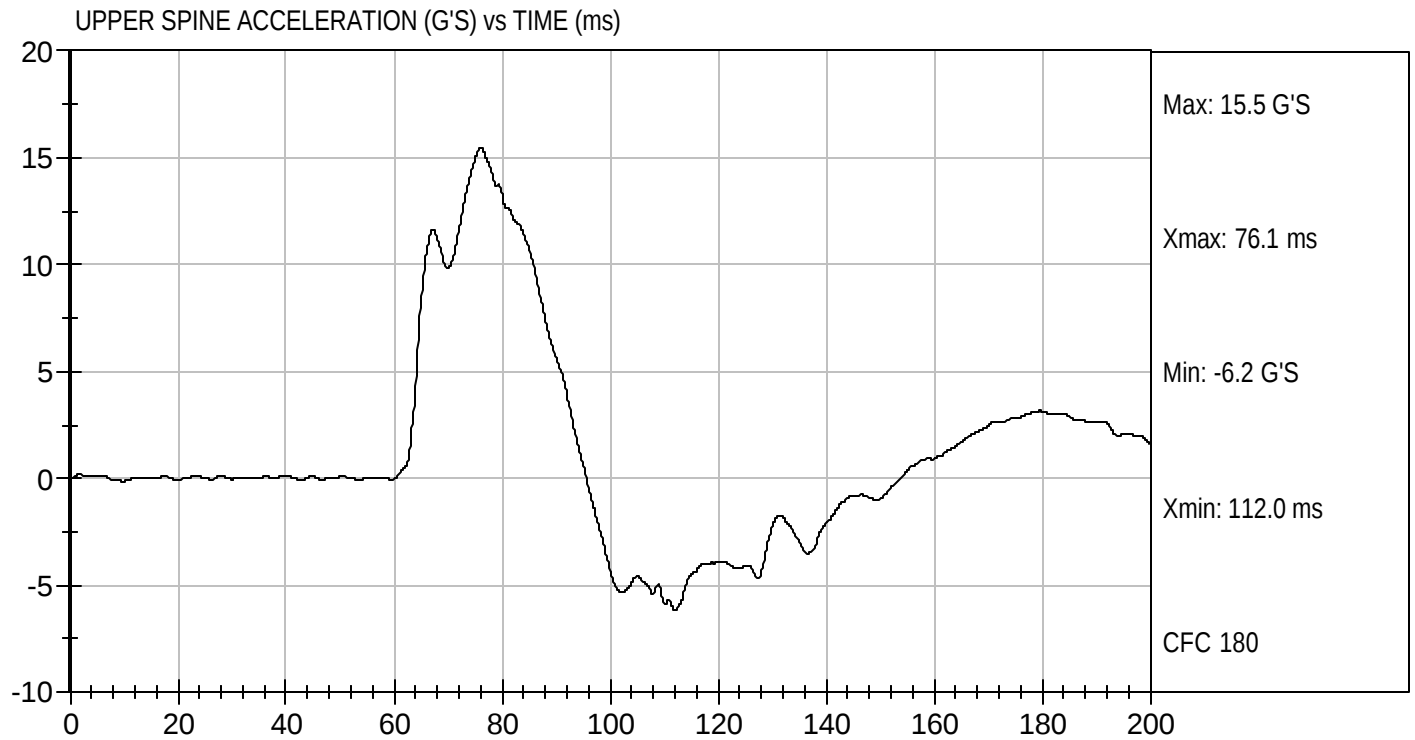
Test Date: 08/05/2005
Velocity: 14.02 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Componet ID: D052195

Test Date: 08/05/2005
Velocity: 14.02 ft/s, 4.27 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052196

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.8	Pass
Humidity	%	10 to 70	48	Pass
Impact Velocity	m/s	4.41 to 4.59	4.47	Pass
Peak Impactor Force	kN	1.3 to 1.9	1.8	Pass
Upper Rib Displacement	mm	44 to 55	46	Pass
Lower Rib Displacement	mm	44 to 56	45	Pass
Upper Spine (T1) Y Acceleration	G's	5 to 9	7	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 13	12	Pass
Overall Test Results			Pass	



Laboratory Technician

08/05/2005

Test Date

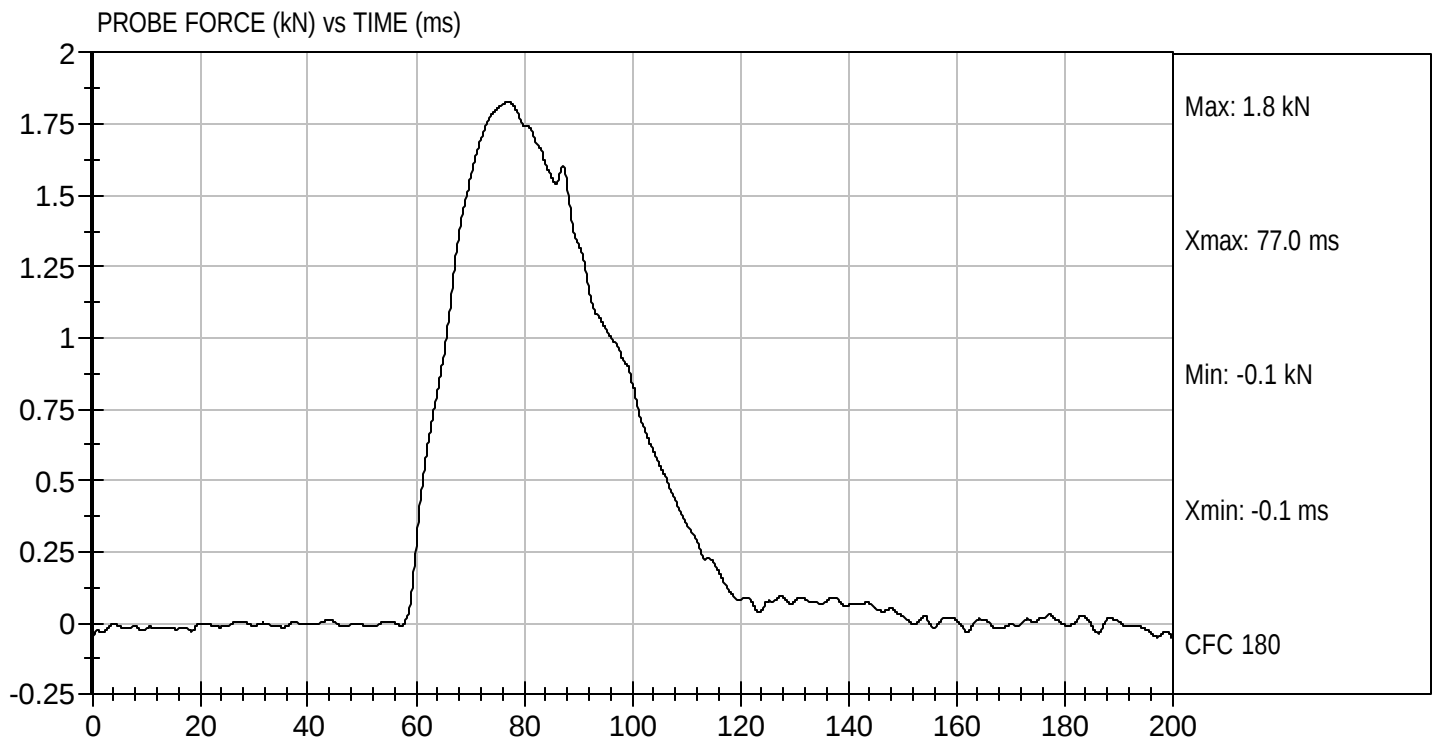


Approved By



Test Desc: Abdomen Impact
Componet ID: D052196

Test Date: 08/05/2005
Velocity: 14.67 ft/s, 4.47 m/s

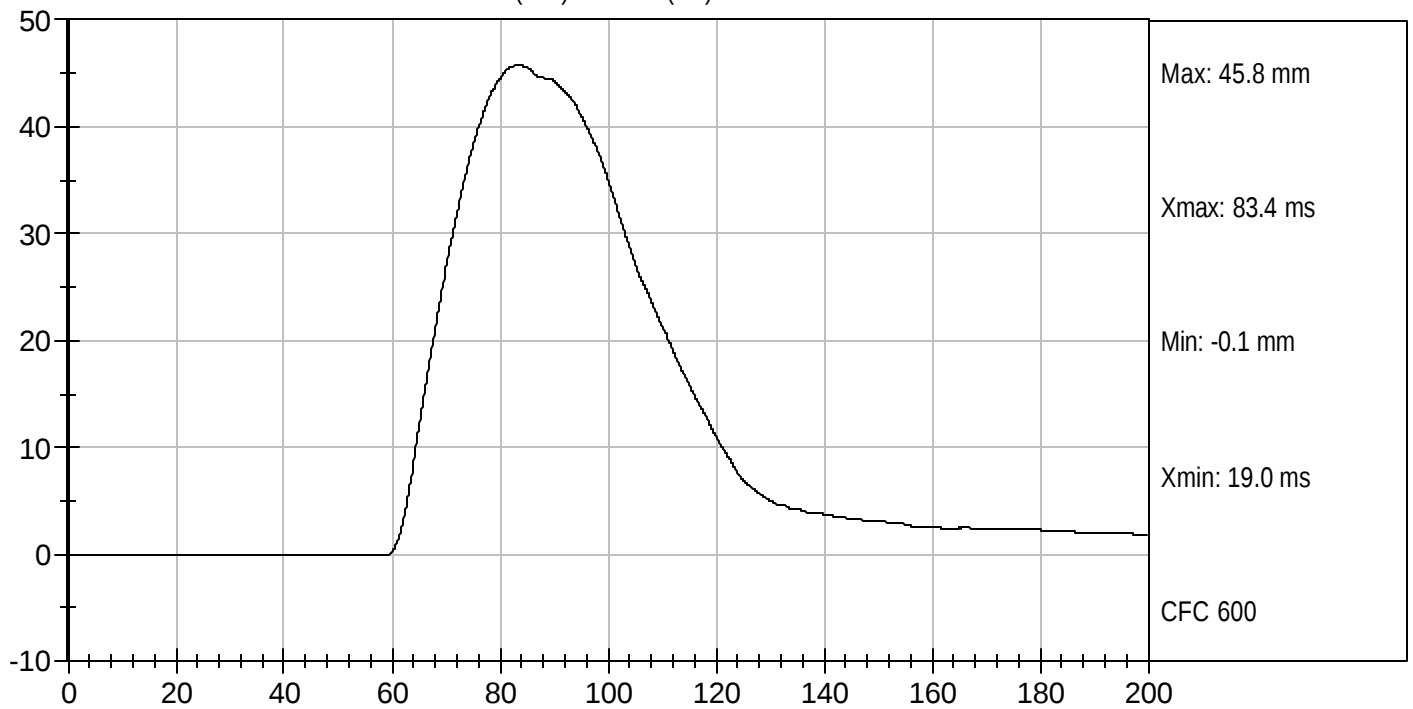




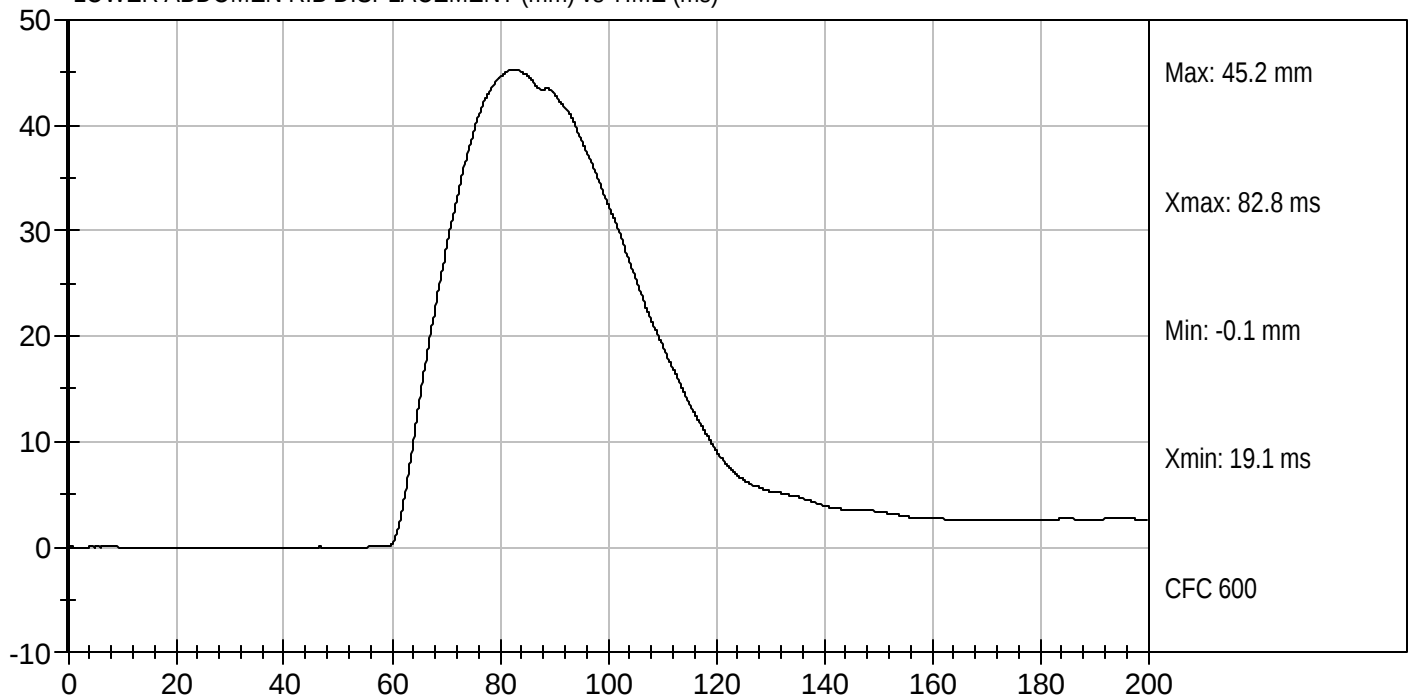
Test Desc: Abdomen Impact
Componet ID: D052196

Test Date: 08/05/2005
Velocity: 14.67 ft/s, 4.47 m/s

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



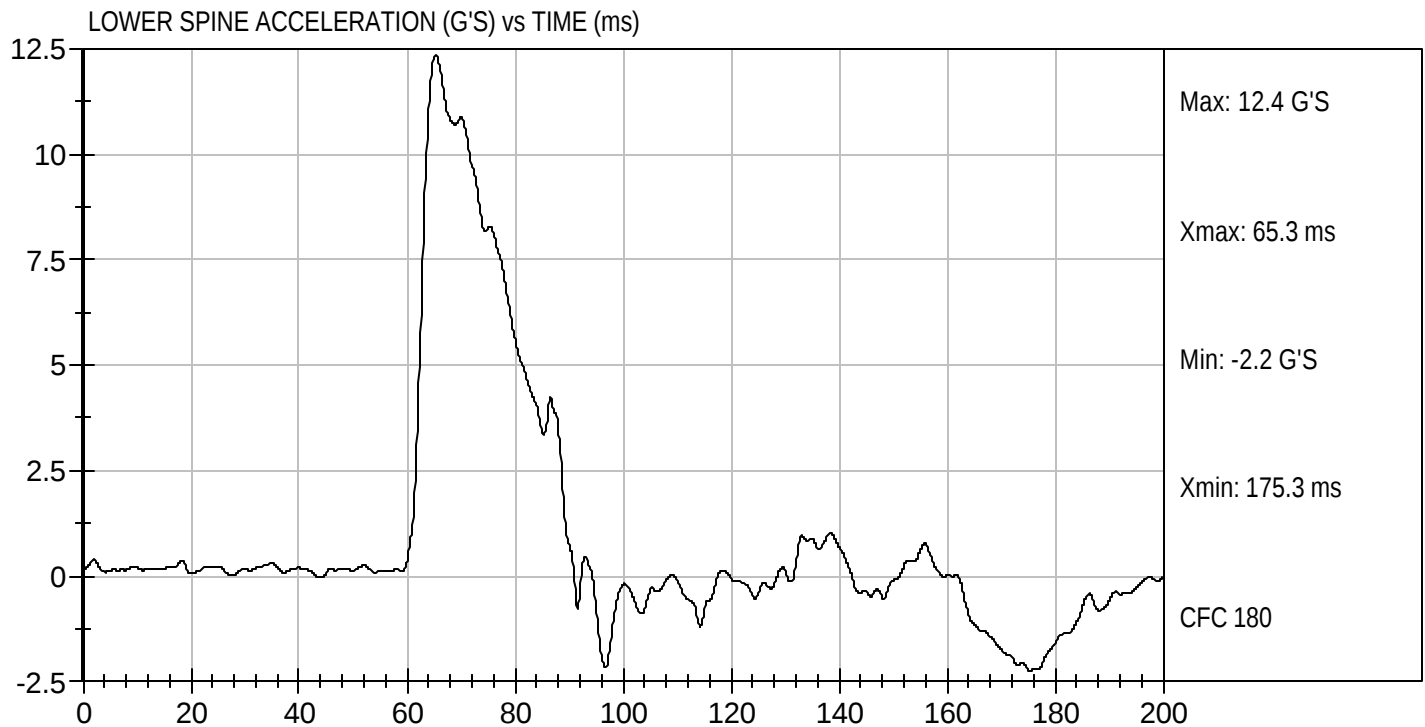
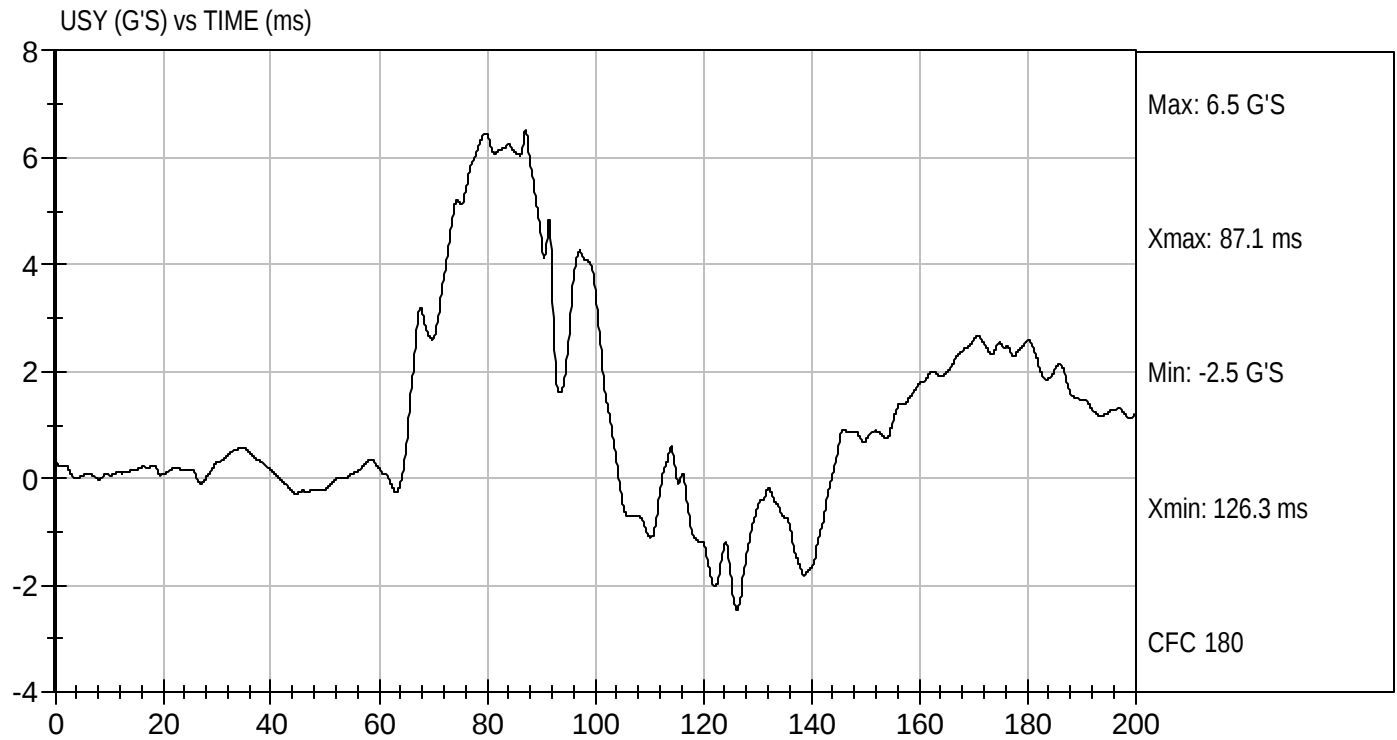
LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Abdomen Impact
Componet ID: D052196

Test Date: 08/05/2005
Velocity: 14.67 ft/s, 4.47 m/s



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052197

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	6.60 to 6.80	6.67	Pass
Peak Impactor Acceleration	G's	40 to 48	44	Pass
Pelvis Y Acceleration	G's	40 to 48	46	Pass
Peak Acetabulum Force	N	3803 to 4505	4103	Pass
Overall Test Results				Pass



Laboratory Technician

08/05/2005

Test Date

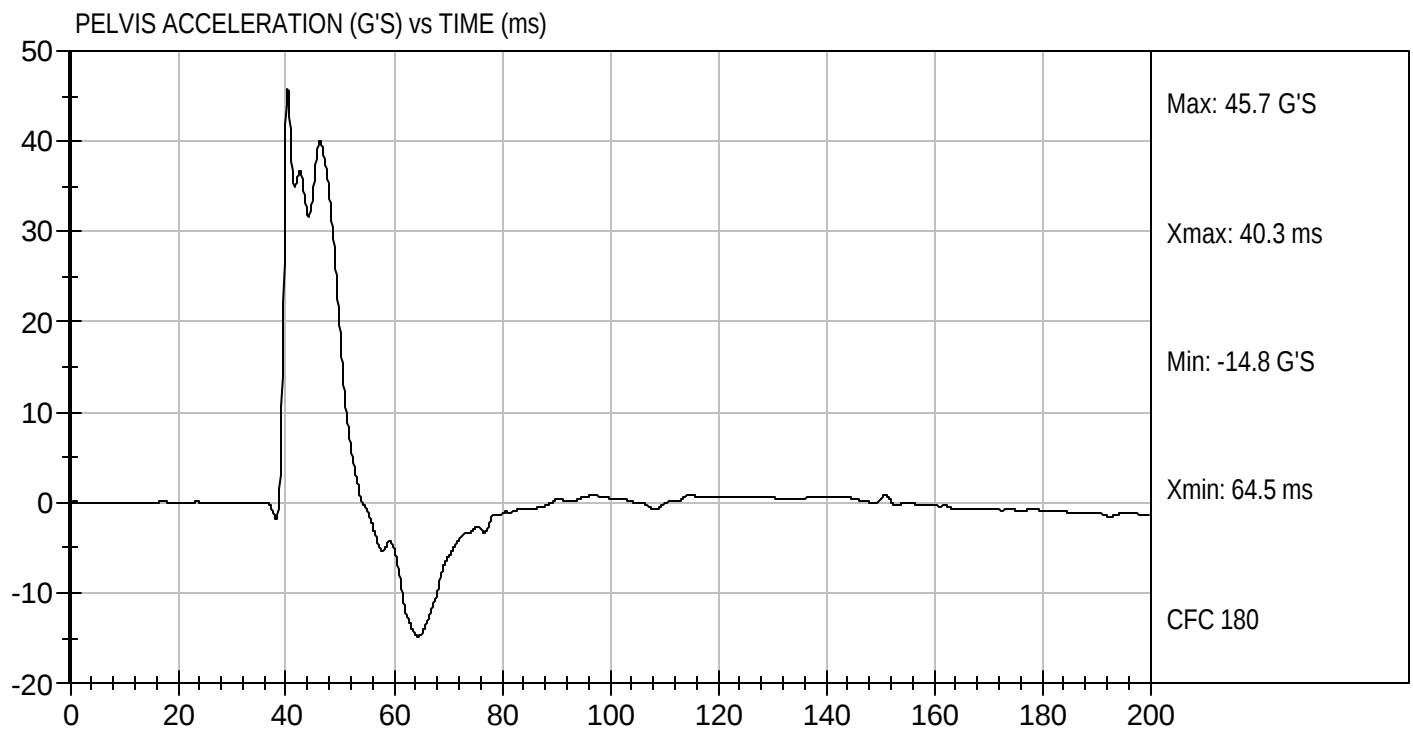
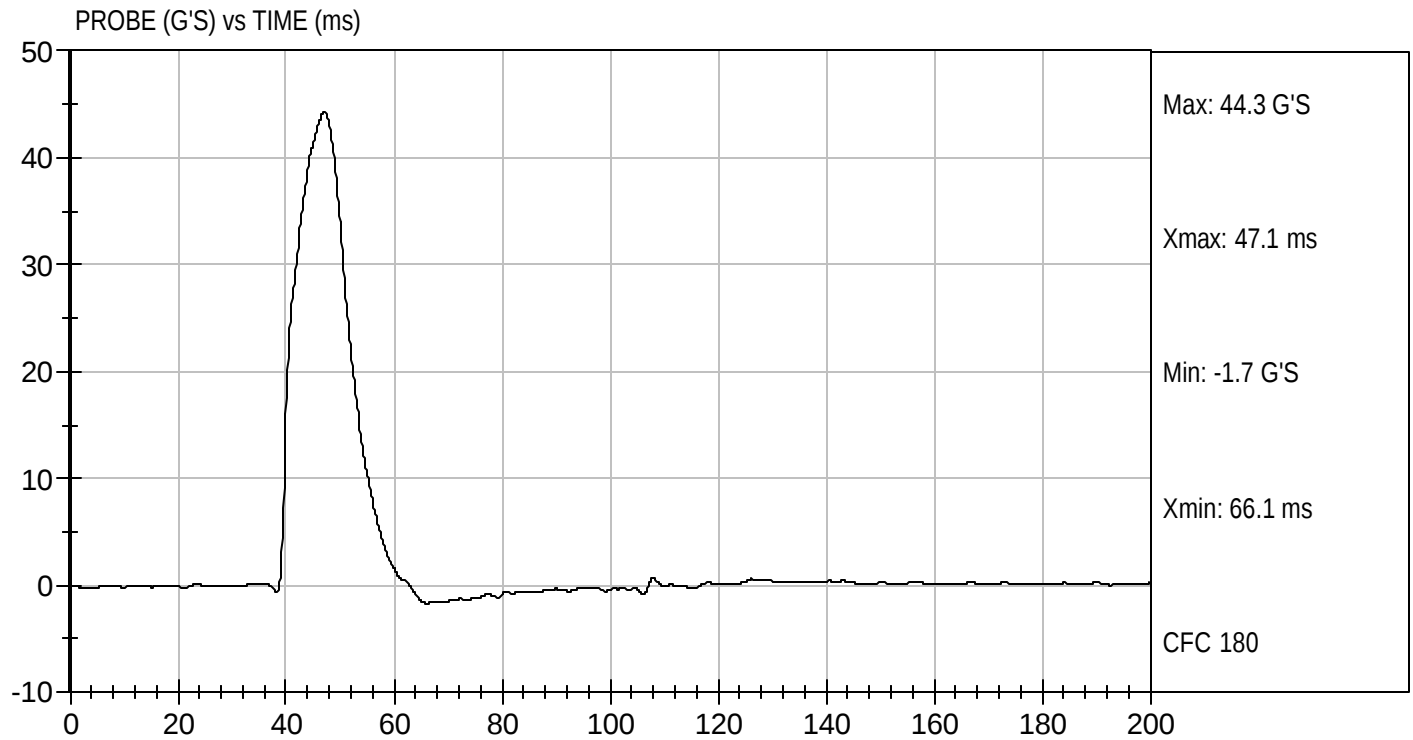


Approved By



Test Desc: Pelvis Impact
Componet ID: D052197

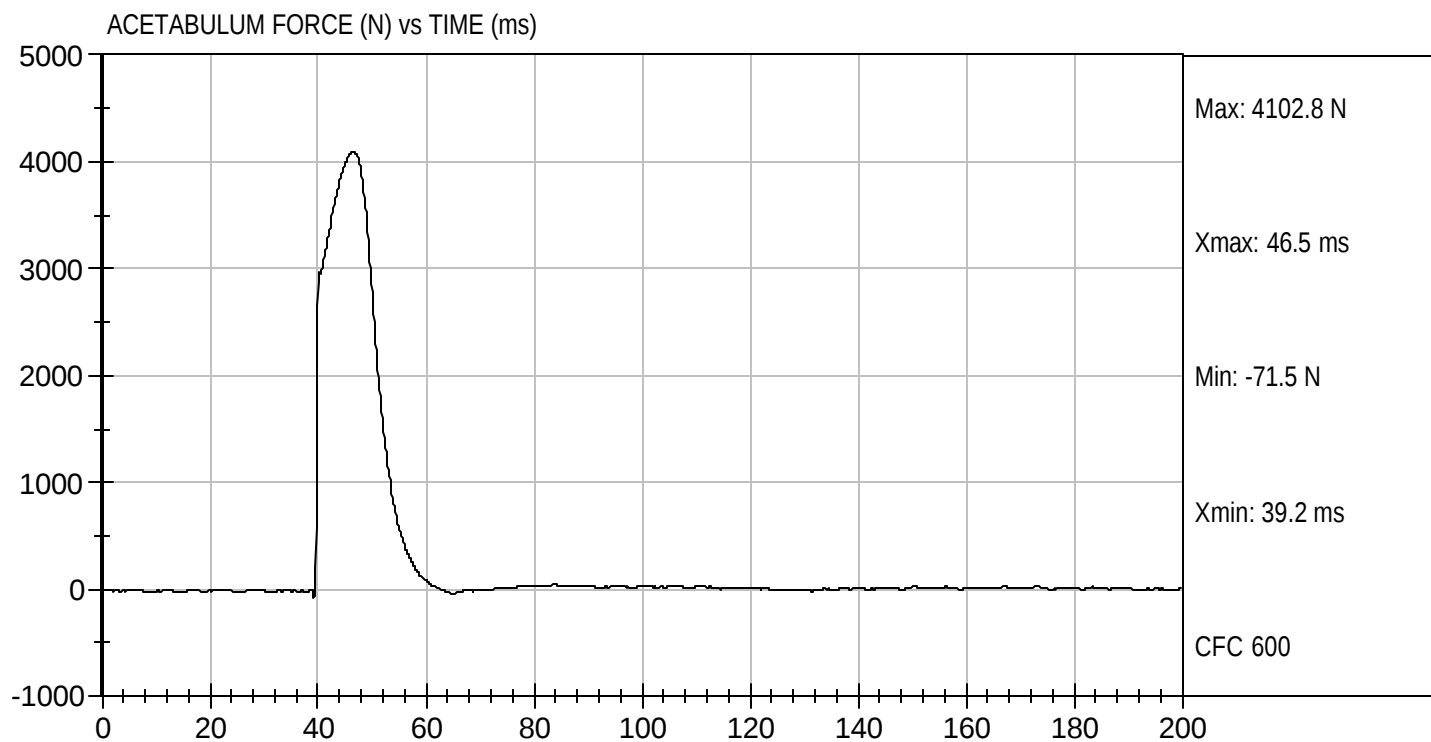
Test Date: 08/05/2005
Velocity: 21.87 ft/s, 6.67 m/s





Test Desc: Pelvis Impact
Componet ID: D052197

Test Date: 08/05/2005
Velocity: 21.87 ft/s, 6.67 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052198

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.31	Pass
Peak Impactor Acceleration	G's	41 to 47	42	Pass
Pelvis Y Acceleration	G's	32 to 40	37	Pass
Peak Pelvis Iliac Force	N	4841 to 5491	5138	Pass
Overall Test Results				Pass



Laboratory Technician

08/05/2005

Test Date

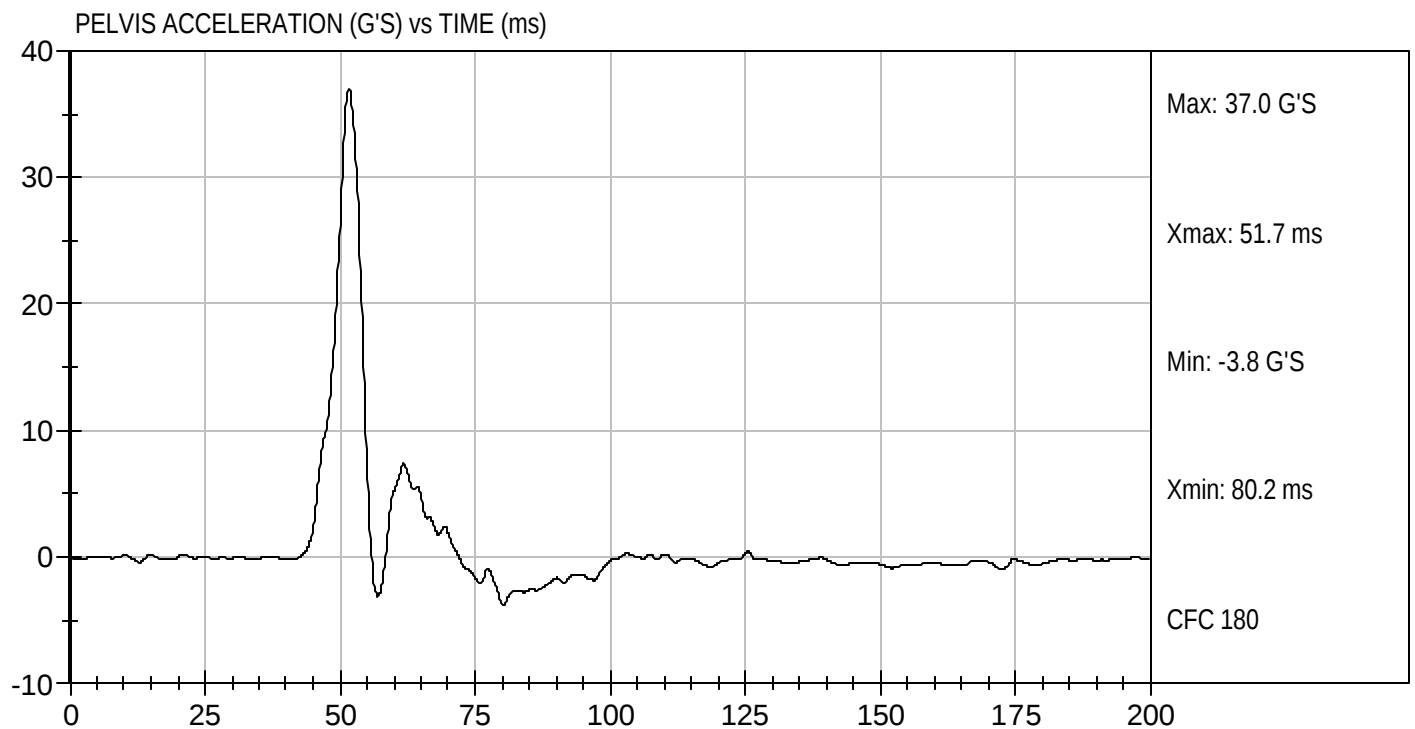
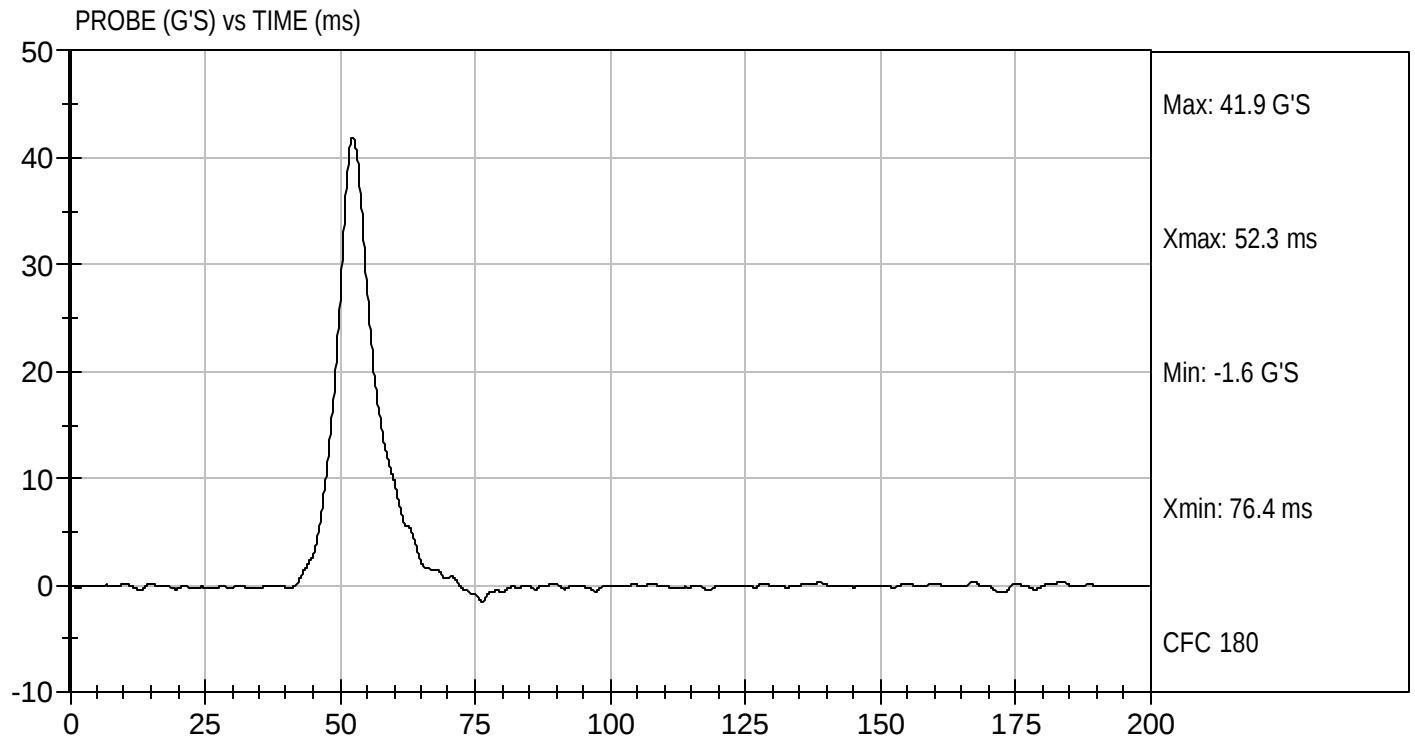


Approved By



Test Desc: Iliac Impact
Componet ID: D052198

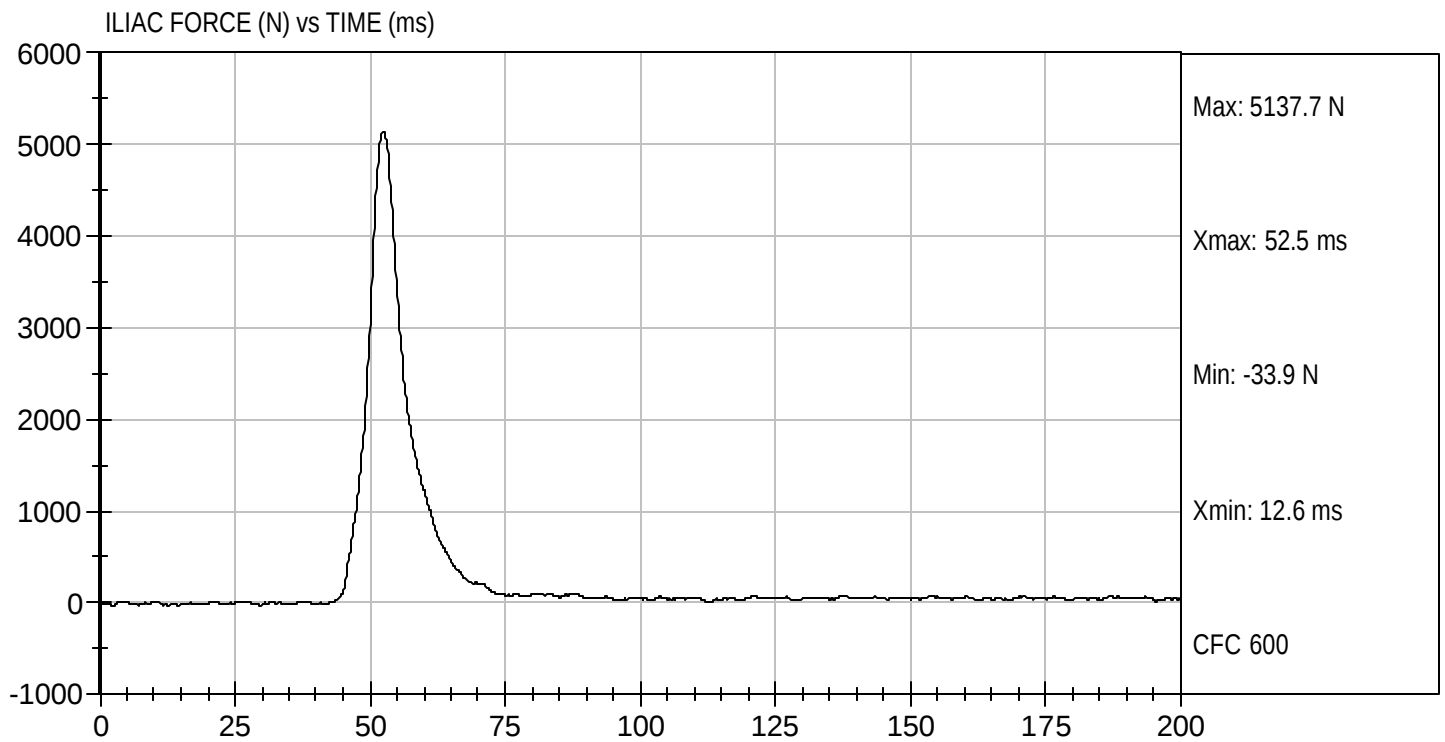
Test Date: 08/05/2005
Velocity: 14.14 ft/s, 4.31 m/s





Test Desc: Iliac Impact
Componet ID: D052198

Test Date: 08/05/2005
Velocity: 14.14 ft/s, 4.31 m/s



CERTIFICATION DATA

Dummy Serial Number: 032

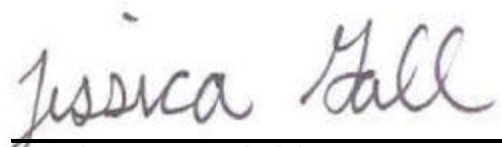
POST-TEST CALIBRATION

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID IIs DUMMY

ATD Serial No: 032

Test ID: D052231

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Peak Resultant Acceleration	G's	125 to 145	126	Pass
Peak Lateral Acceleration	G's	+/- 15	8.5	Pass
Unimodal	Yes/No	<10%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

08/10/2005
Test Date

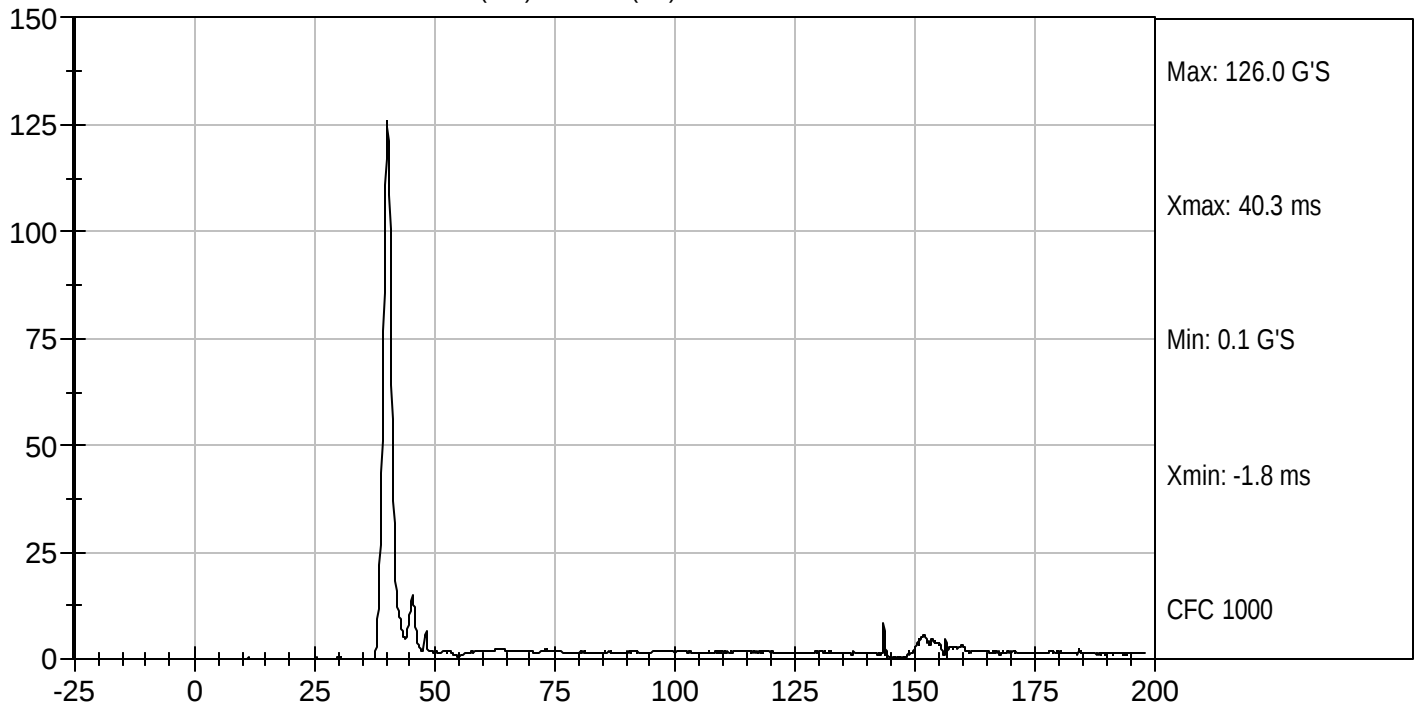

Approved By



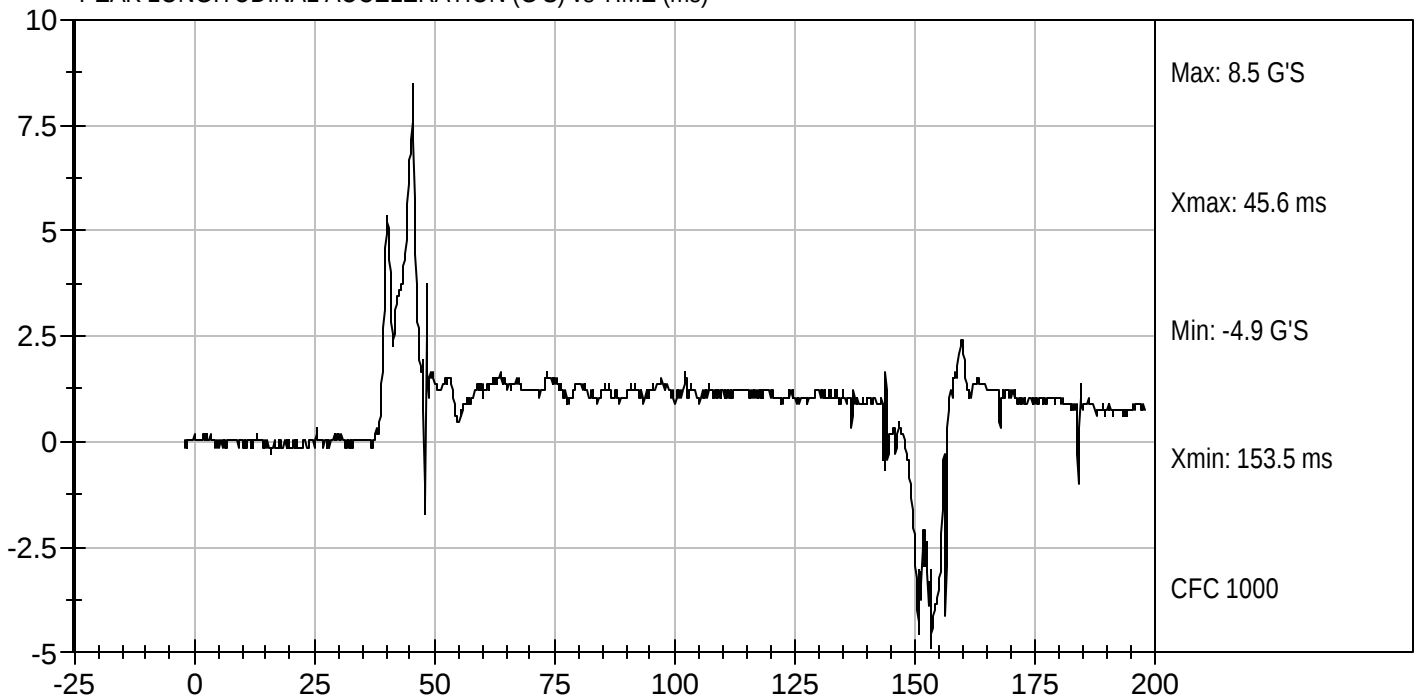
Test Desc: Head Drop
Componet ID: D052231

Test Date: 08/10/2005
Velocity: 0 ft/s, 0 m/s

PEAK RESULTANT ACCELERATION (G'S) vs TIME (ms)



PEAK LONGITUDINAL ACCELERATION (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052232

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.5	Pass
Humidity		%	10 to 70	44	Pass
Impact Velocity		m/s	5.51 to 5.63	5.62	Pass
Delta Velocity	10 msec	m/s	2.20 to 2.80	2.47	Pass
	15 msec	m/s	3.40 to 4.10	3.59	Pass
	20 msec	m/s	4.50 to 5.40	4.79	Pass
	25 msec	m/s	5.50 to 6.10	5.73	Pass
	25-100 msec	m/s	5.20 to 6.20	5.81	Pass
Maximum D-Plane Rotation		deg	74 to 79	75	Pass
Time of Maximum D-Plane Rotation		Nm	50 to 70	64	Pass
Maximum Occipital Condyle Moment during Rotation Interval		Nm	-45 to -40	-43	Pass
Time of Moment Decay to 0 Nm		msec	113 to 123	114	Pass
Overall Test Results				Pass	

Jessica Hall
 Laboratory Technician

David Winkelbauer

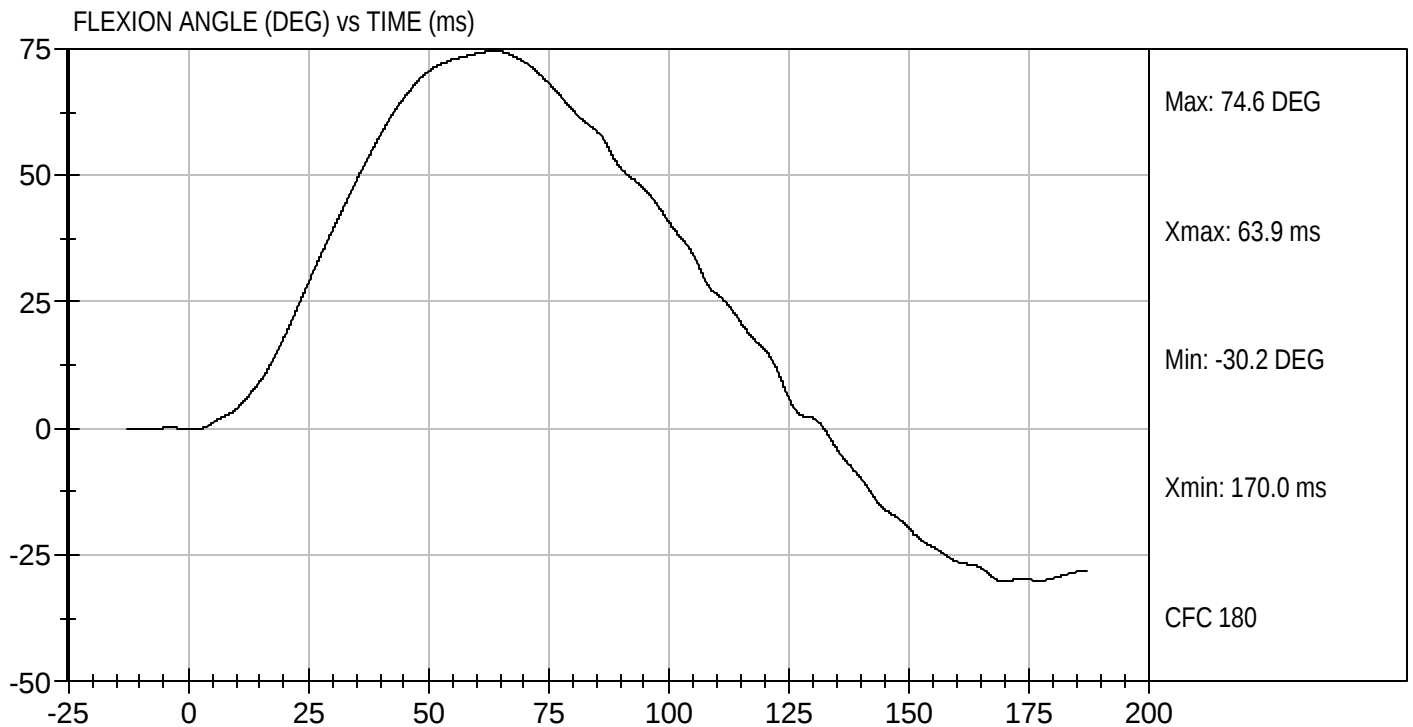
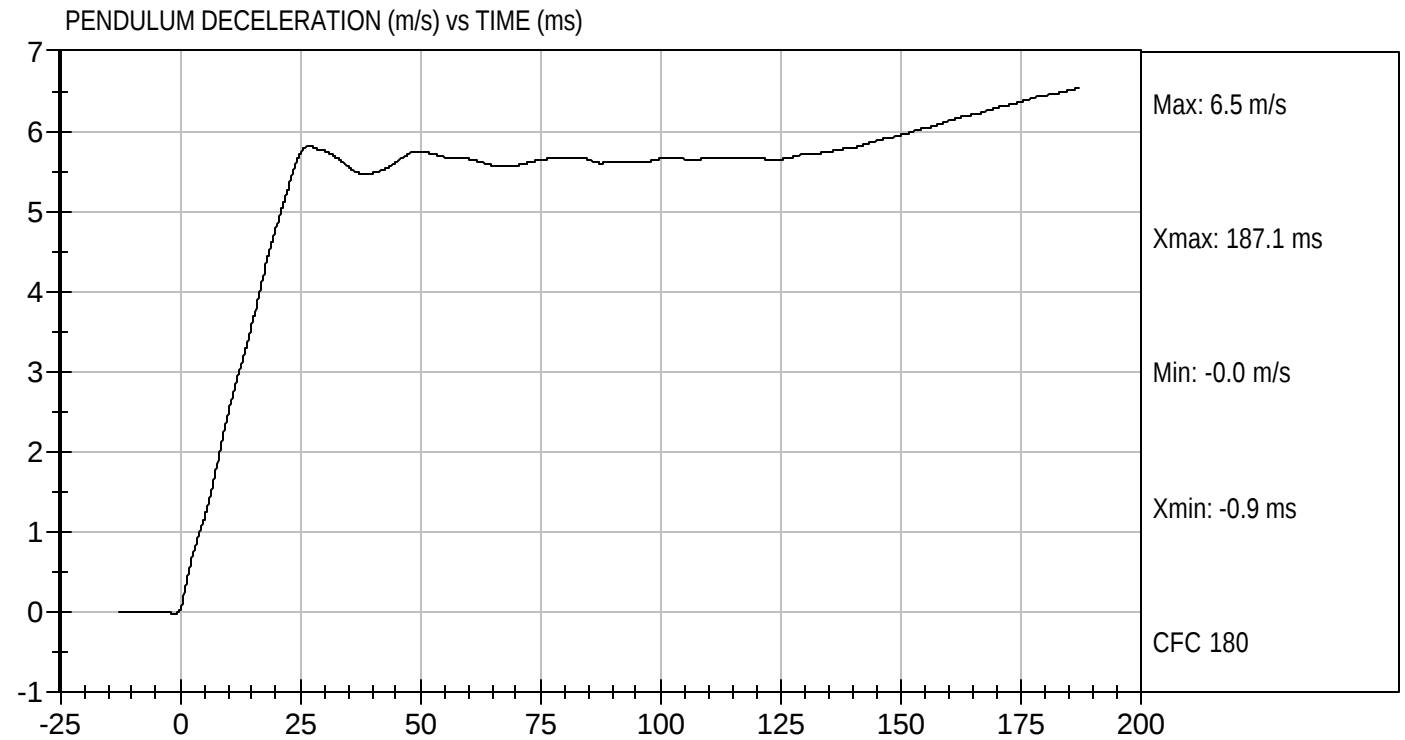
Approved By

08/10/2005
 Test Date



Test Desc: Neck Bending
Componet ID: D052232

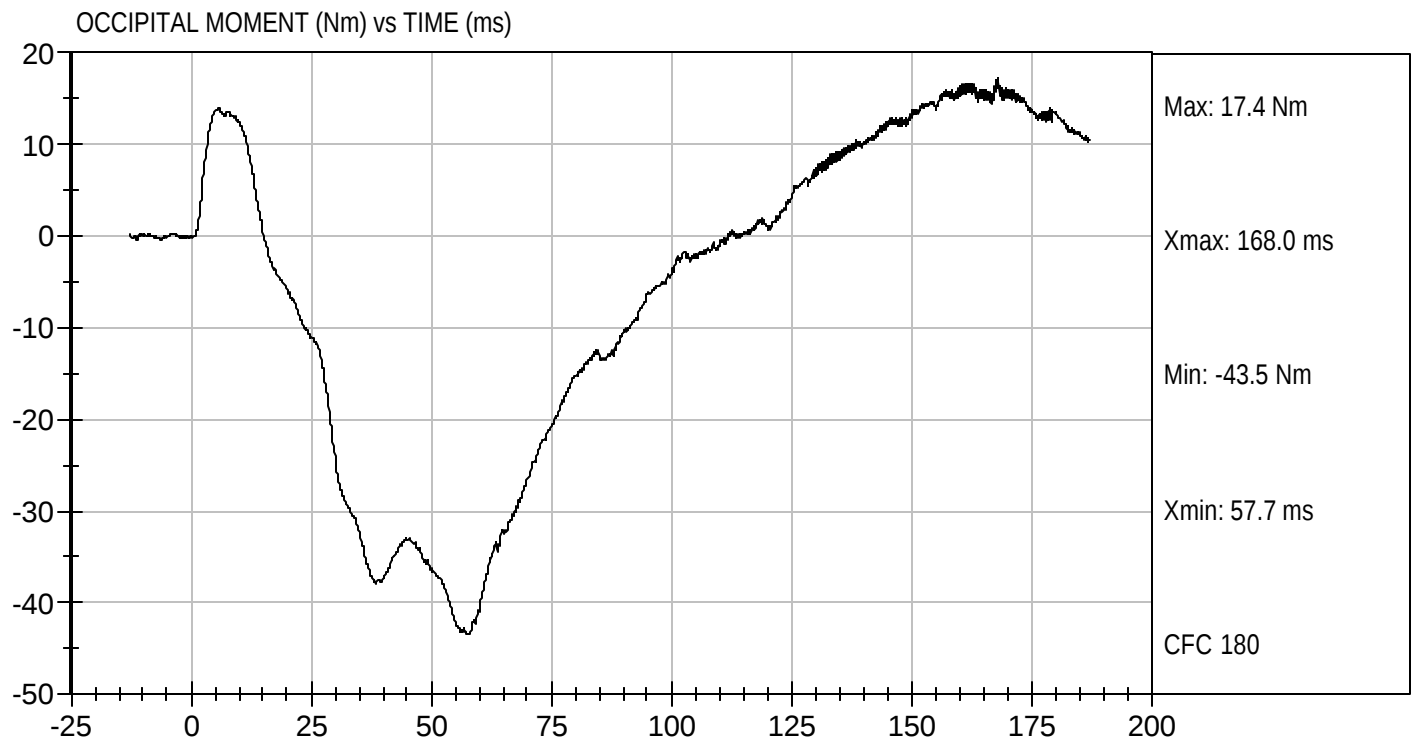
Test Date: 08/10/2005
Velocity: 18.44 ft/s, 5.62 m/s





Test Desc: Neck Bending
Componet ID: D052232

Test Date: 08/10/2005
Velocity: 18.44 ft/s, 5.62 m/s



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test ID: D052233

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	4.41 to 4.59	4.49	Pass
Maximum Probe Force	kN	1.6 to 2.4	2.2	Pass
Shoulder Displacement	mm	27 to 39	34	Pass
Overall Test Results				Pass



Laboratory Technician

08/09/2005

Test Date

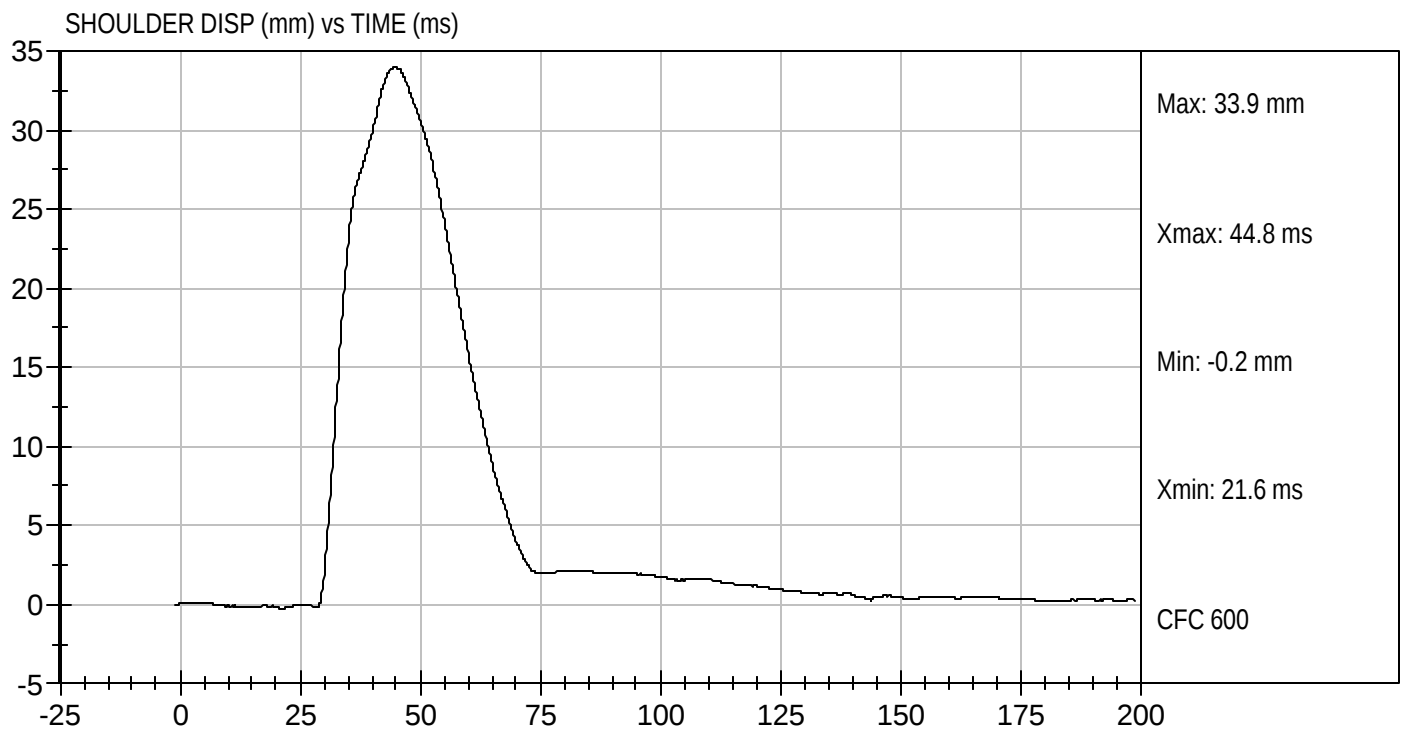
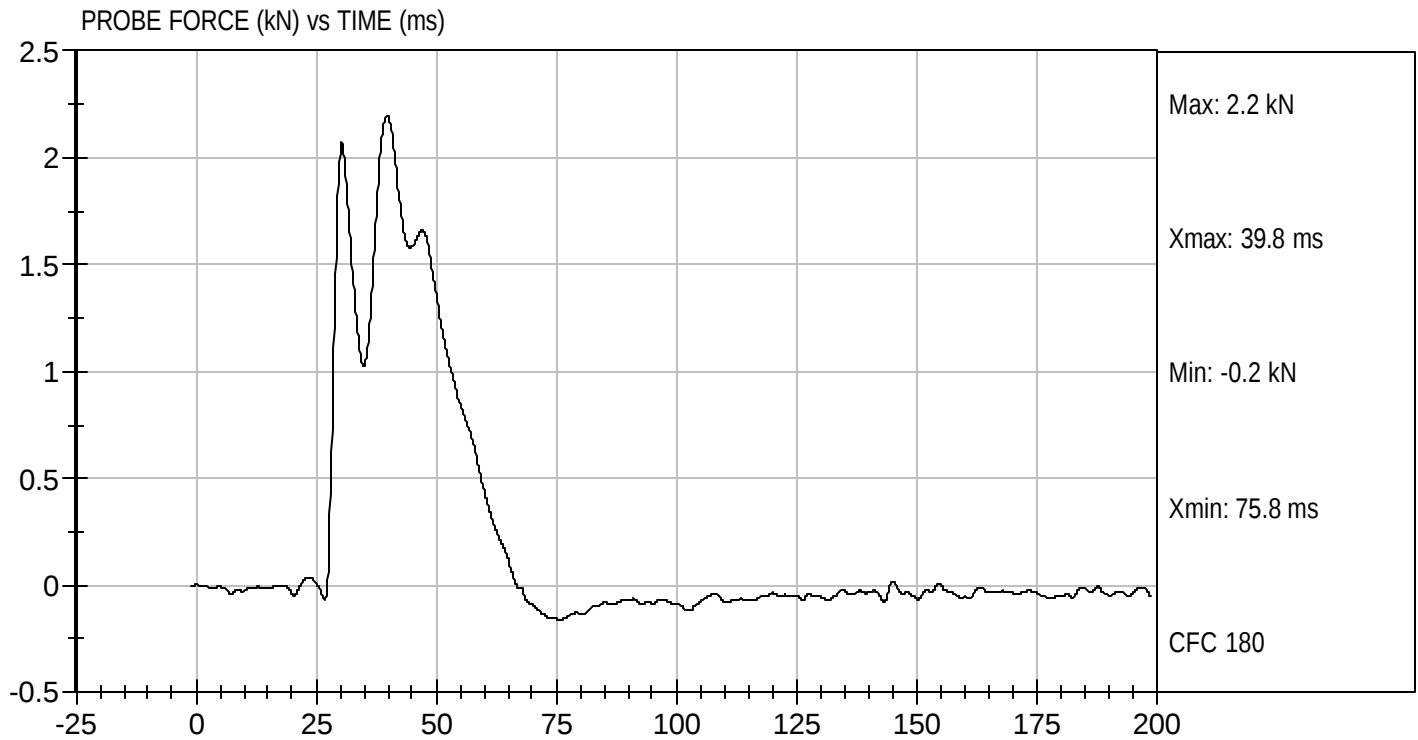


Approved By



Test Desc: Shoulder Impact
Componet ID: D052233

Test Date: 08/09/2005
Velocity: 14.73 ft/s, 4.49 m/s



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 032

Test I.D: D052234

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	6.57 to 6.84	6.68	Pass
Peak Impactor Force	kN	4.1 to 4.7	4.6	Pass
Shoulder Displacement	mm	30 to 42	37	Pass
Upper Rib Displacement	mm	23 to 35	29	Pass
Middle Rib Displacement	mm	29 to 44	32	Pass
Lower Rib Displacement	mm	33 to 40	34	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 48	39	Pass
Lower Spine (T12) Y Acceleration	G's	30 to 38	32	Pass
Overall Test Results			Pass	


Laboratory Technician

08/09/2005

Test Date

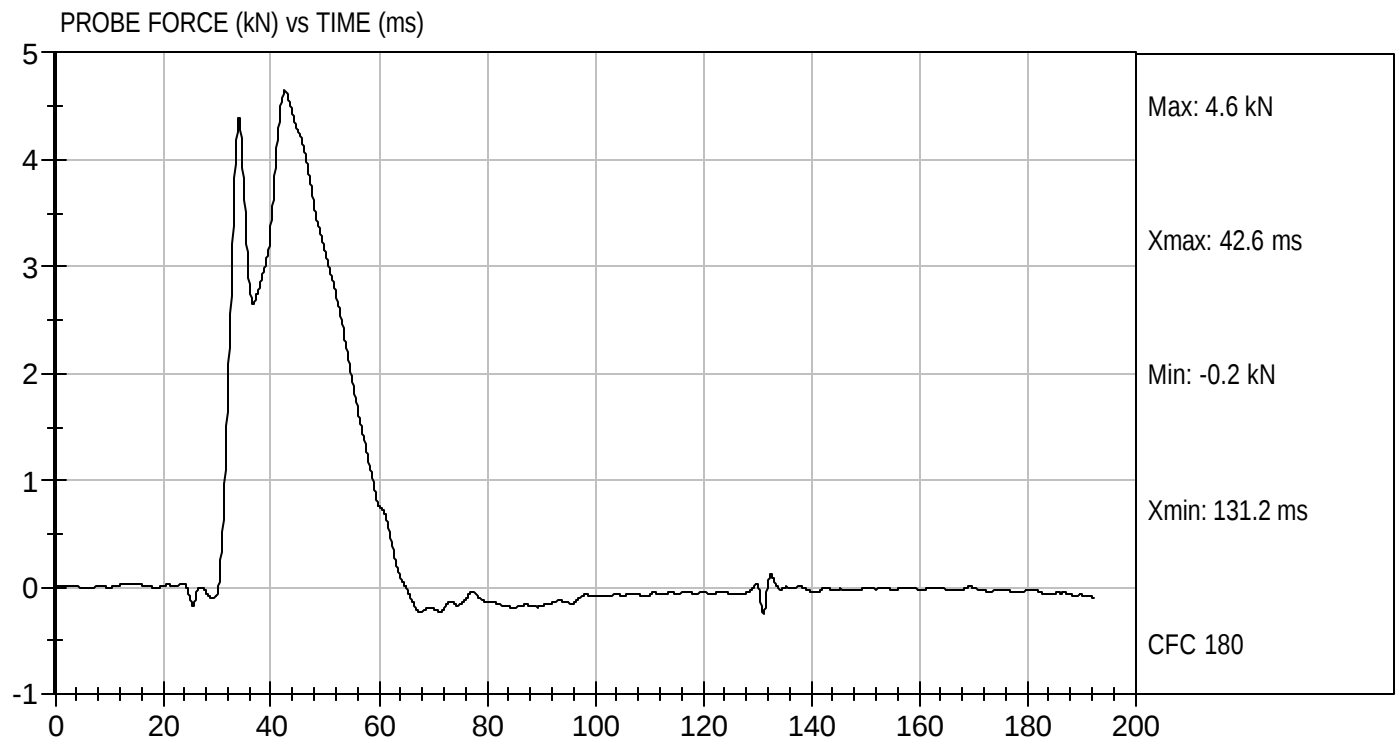


Approved By



Test Desc: Thorax With Arm
Componet ID: D052234

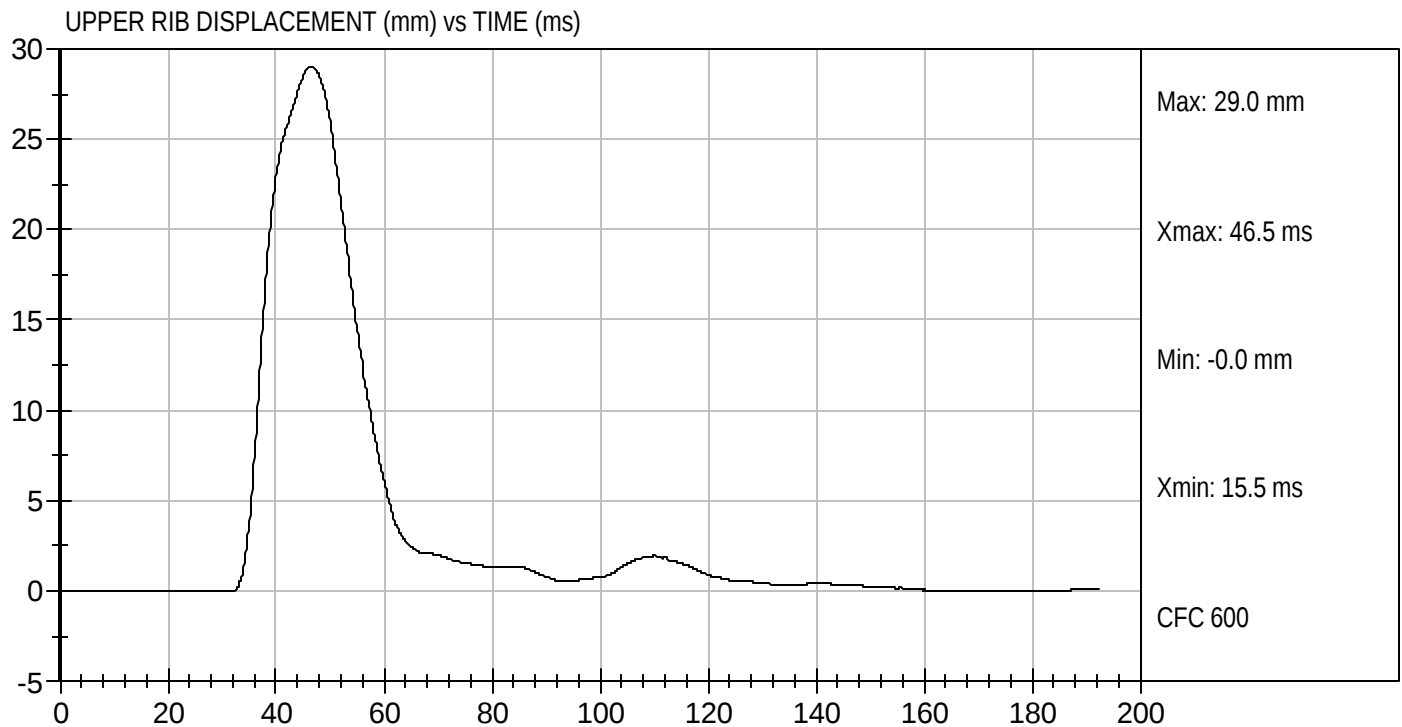
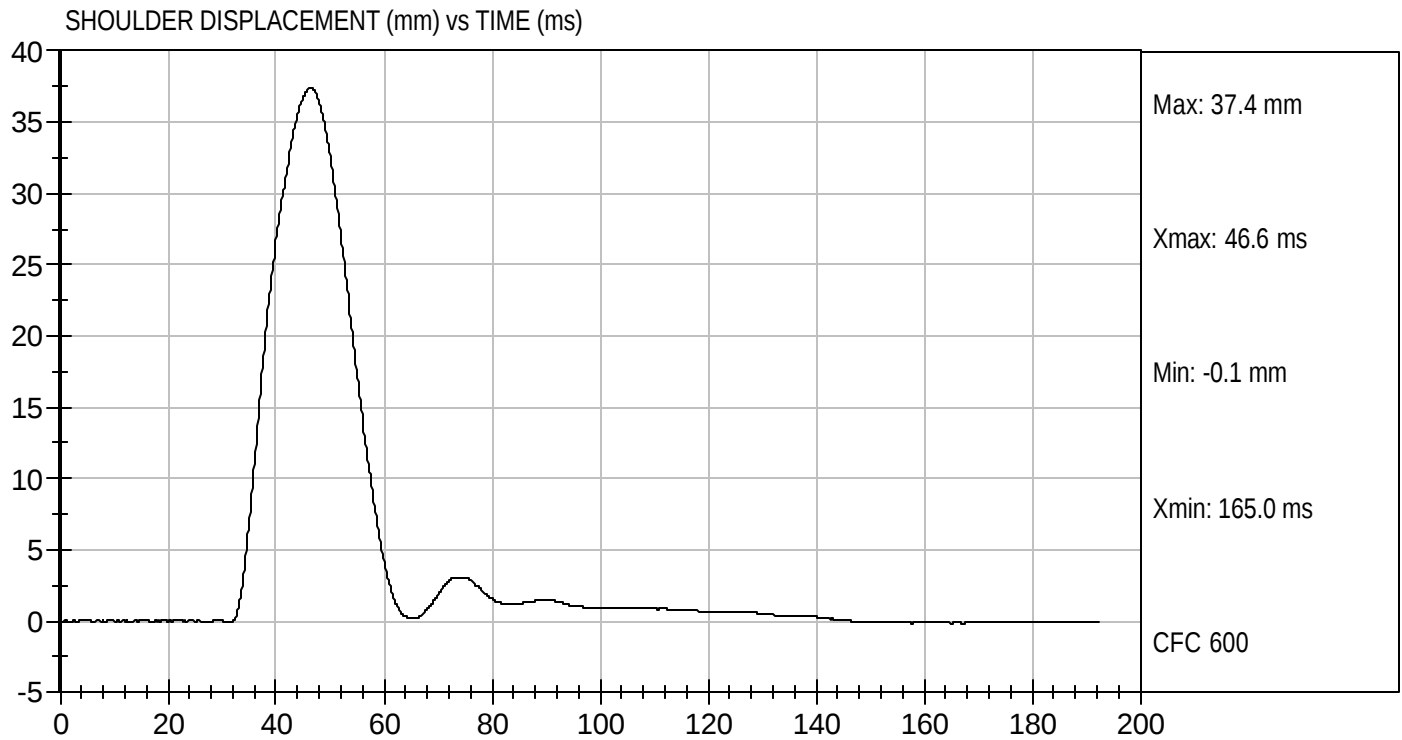
Test Date: 08/09/2005
Velocity: 21.92 ft/s, 6.68 m/s





Test Desc: Thorax With Arm
Componet ID: D052234

Test Date: 08/09/2005
Velocity: 21.92 ft/s, 6.68 m/s

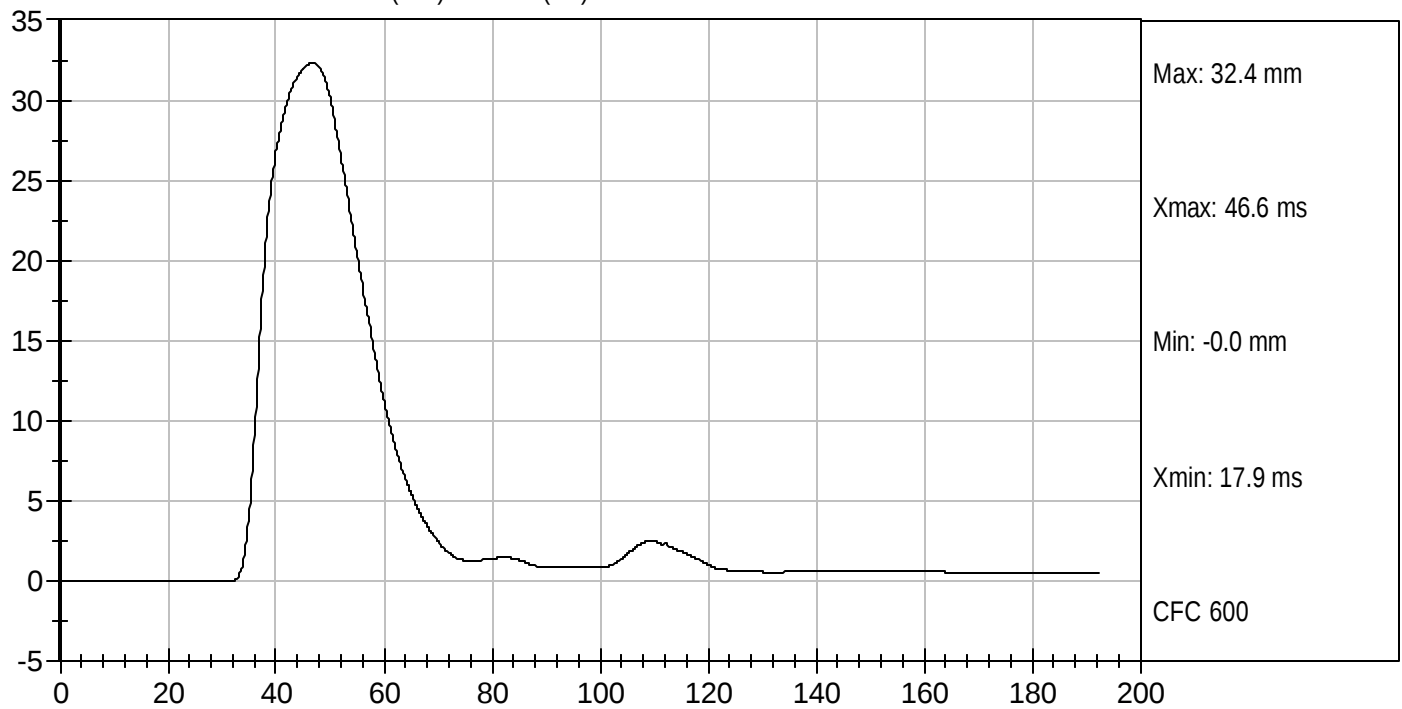




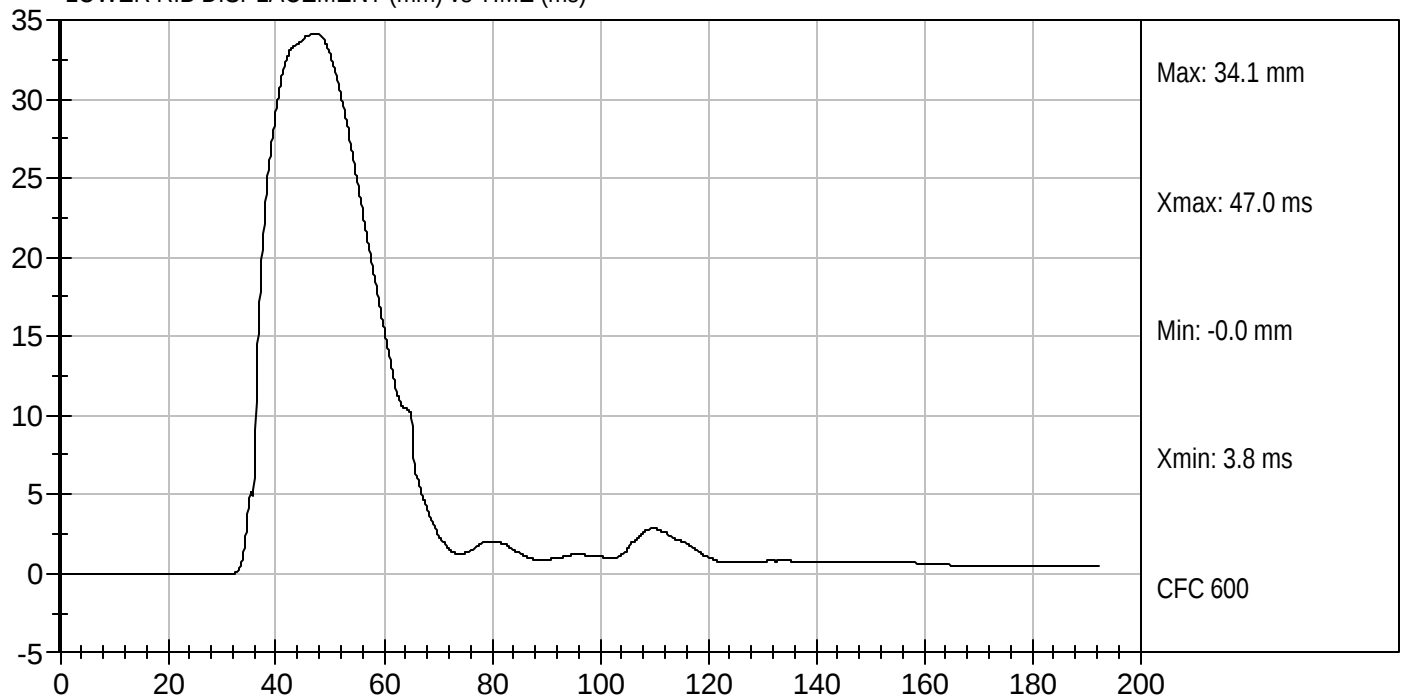
Test Desc: Thorax With Arm
Componet ID: D052234

Test Date: 08/09/2005
Velocity: 21.92 ft/s, 6.68 m/s

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



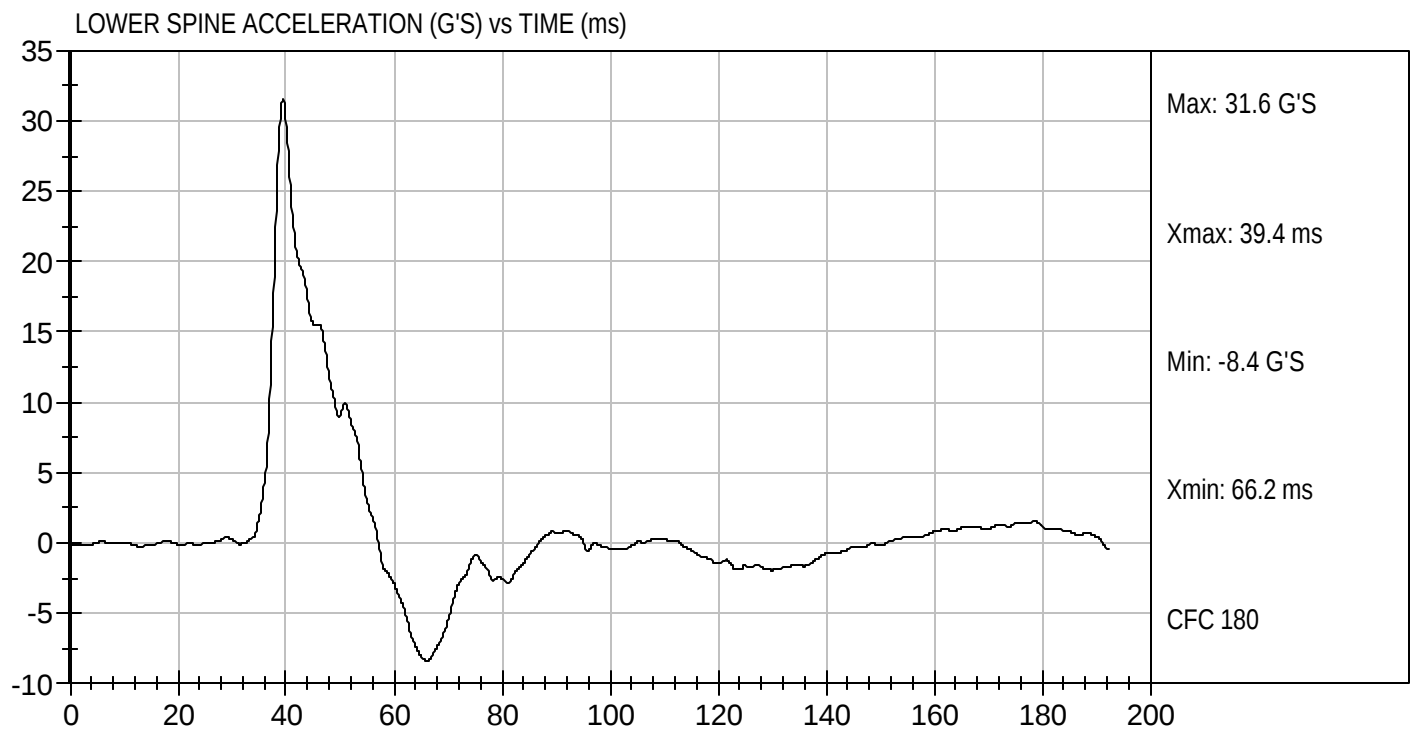
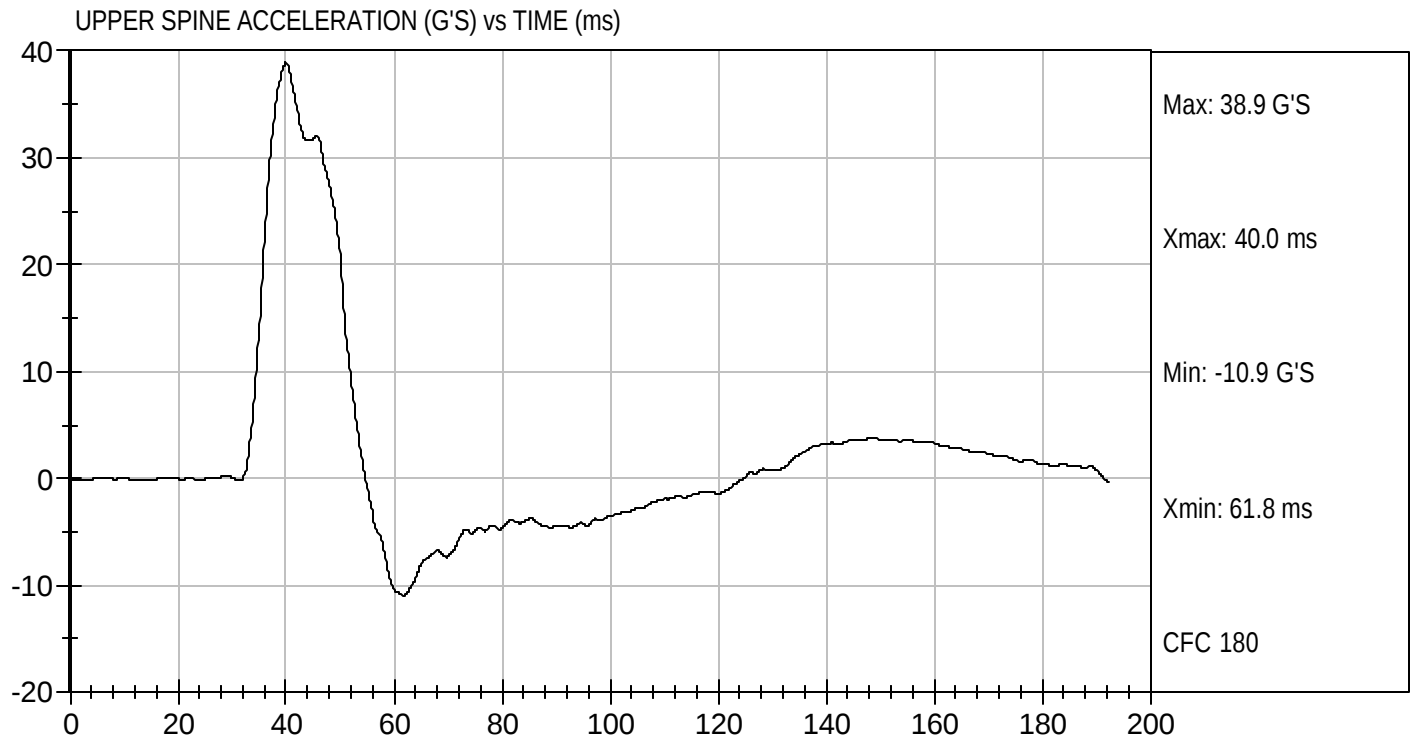
LOWER RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Thorax With Arm
Componet ID: D052234

Test Date: 08/09/2005
Velocity: 21.92 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SIDIIs DUMMY

ATD Serial No: 032

Test I.D: D052235

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	44	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Peak Impactor Force	kN	1.8 to 2.3	2.2	Pass
Upper Rib Displacement	mm	32 to 41	37	Pass
Middle Rib Displacement	mm	40 to 51	42	Pass
Lower Rib Displacement	mm	34 to 47	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 18	16	Pass
Lower Spine (T12) Y Acceleration	G's	8 to 13	9	Pass
Overall Test Results				Pass



Laboratory Technician

08/09/2005

Test Date

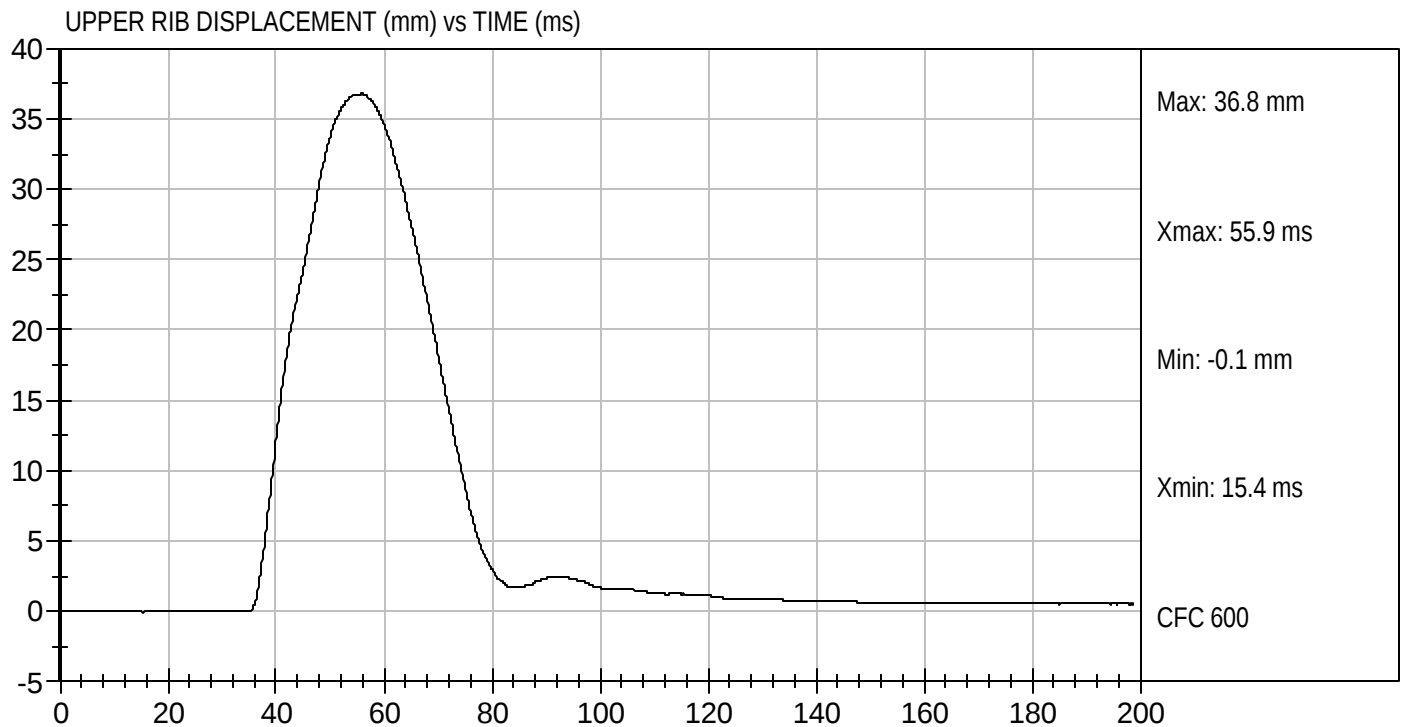
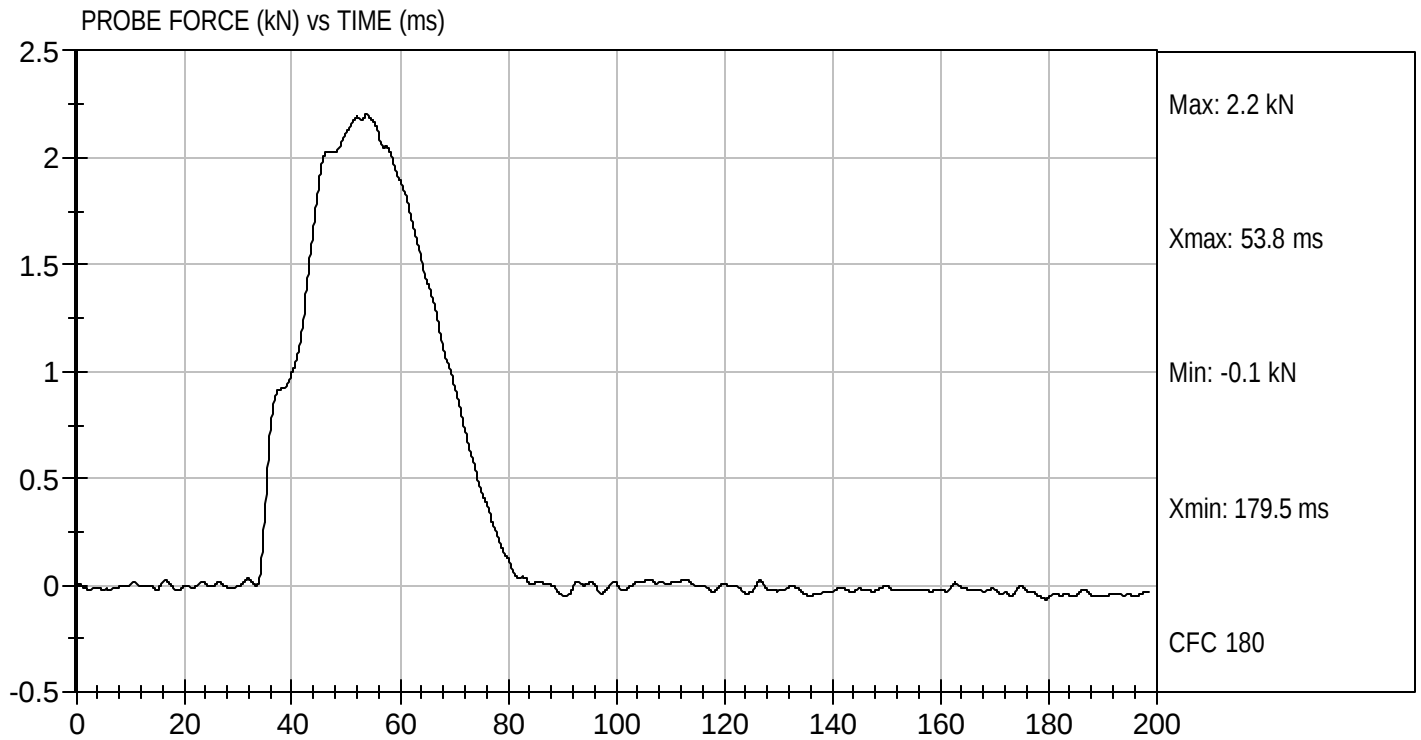


Approved By



Test Desc: Thorax Without Arm
Componet ID: D052235

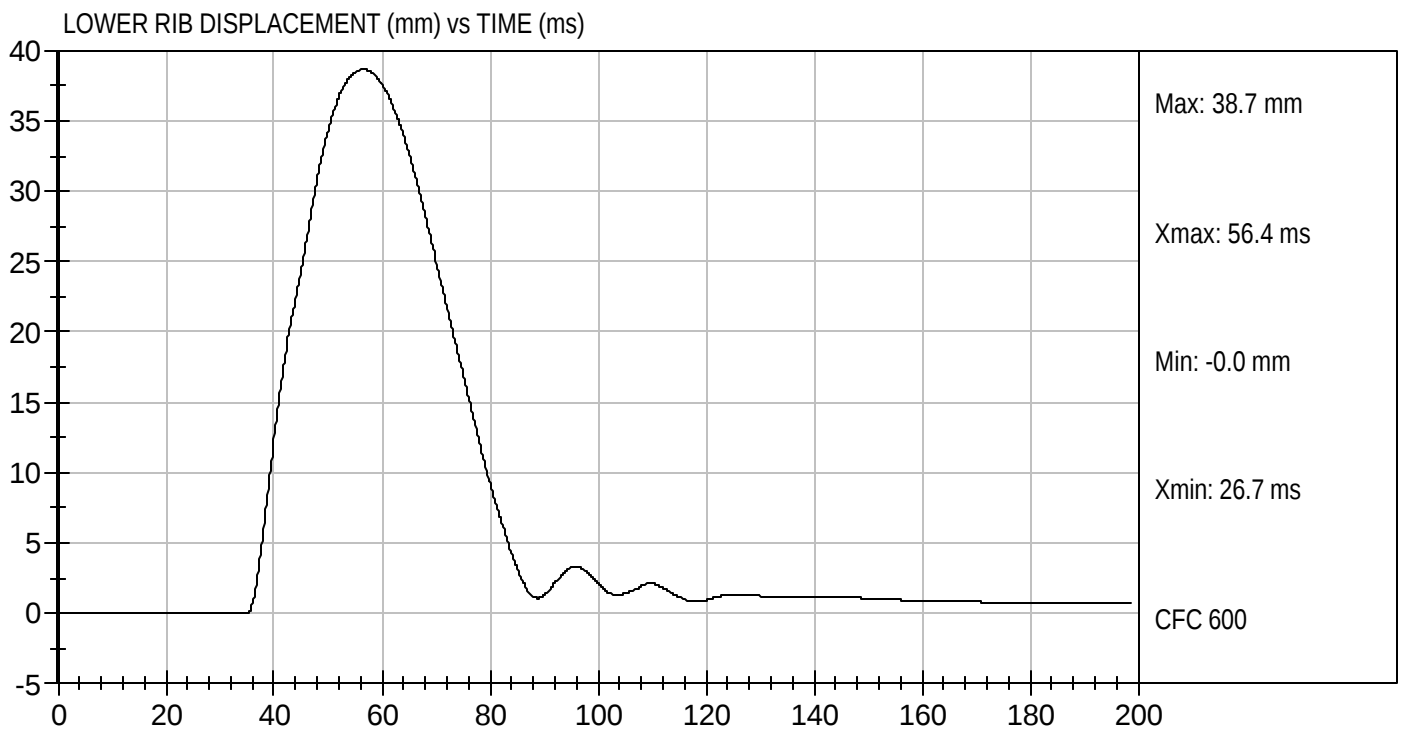
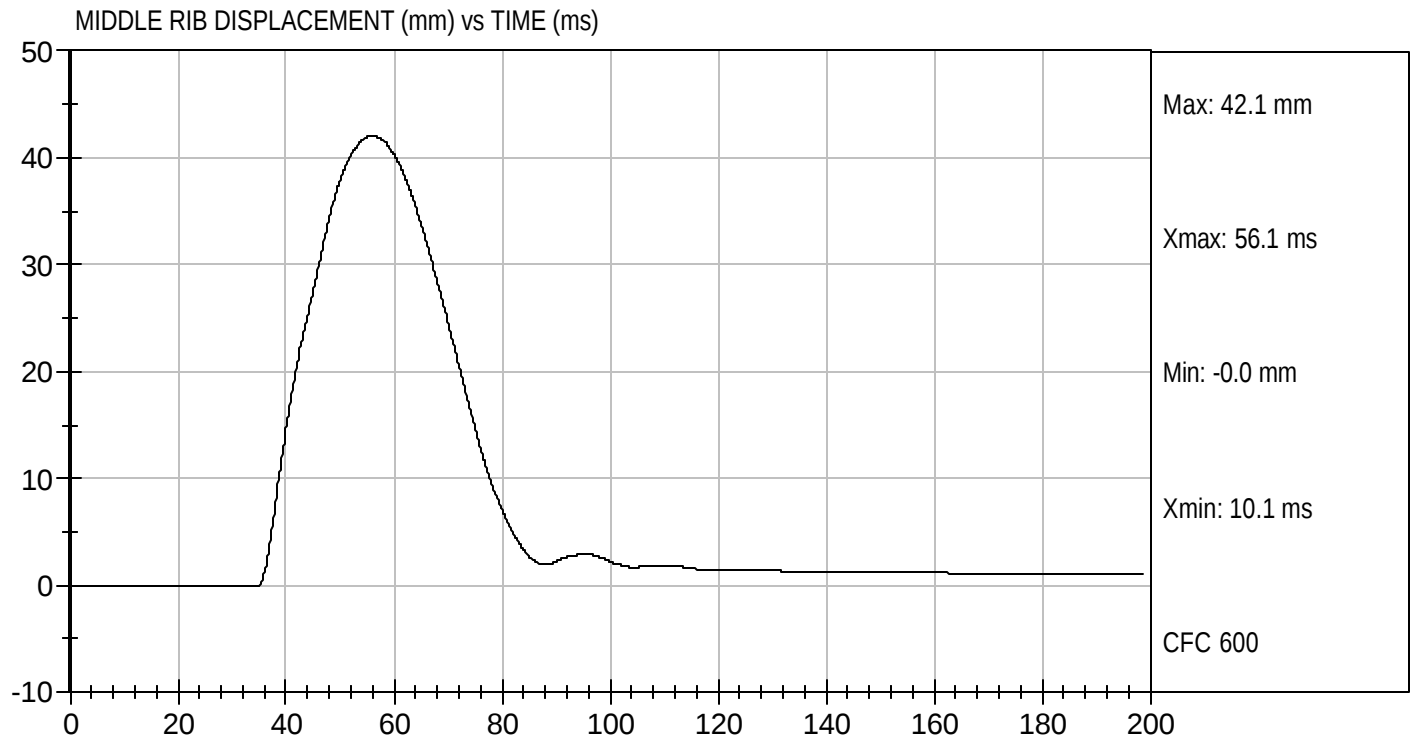
Test Date: 08/09/2005
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Componet ID: D052235

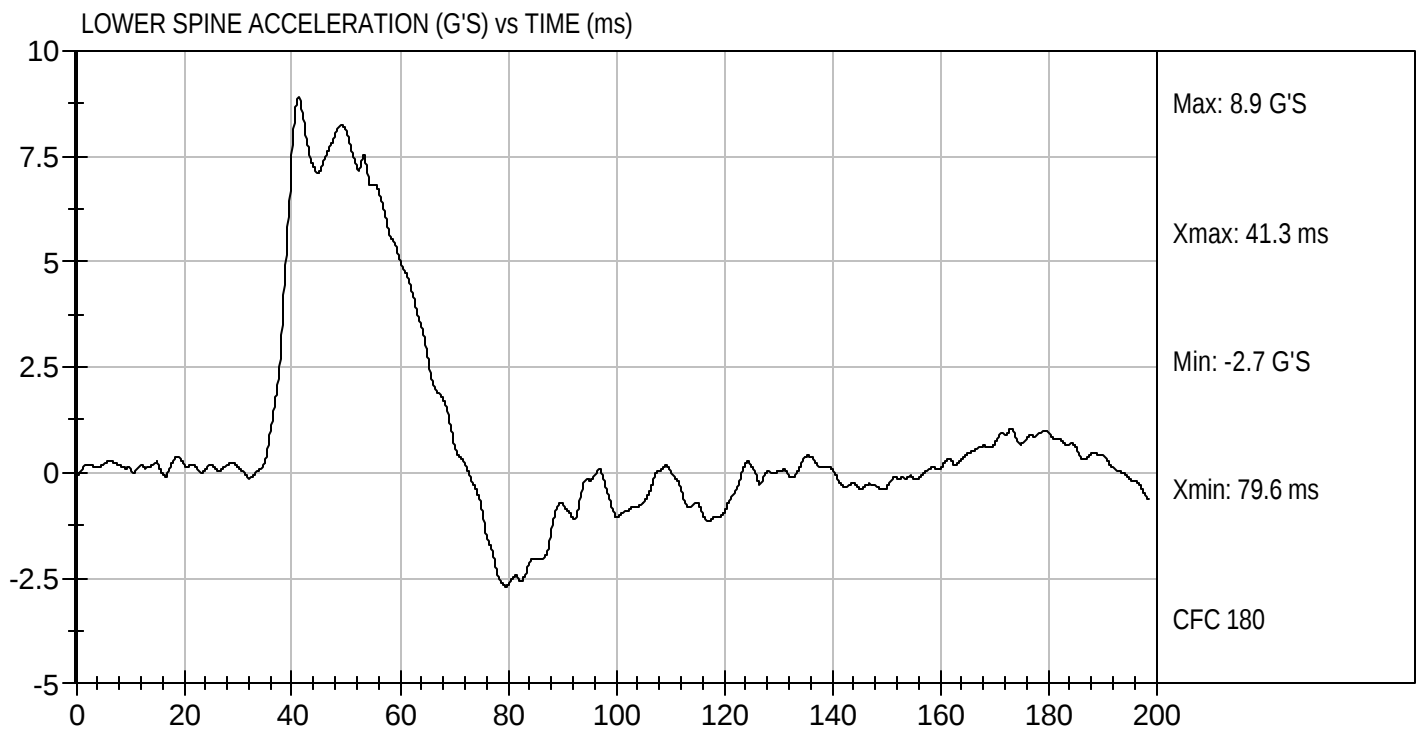
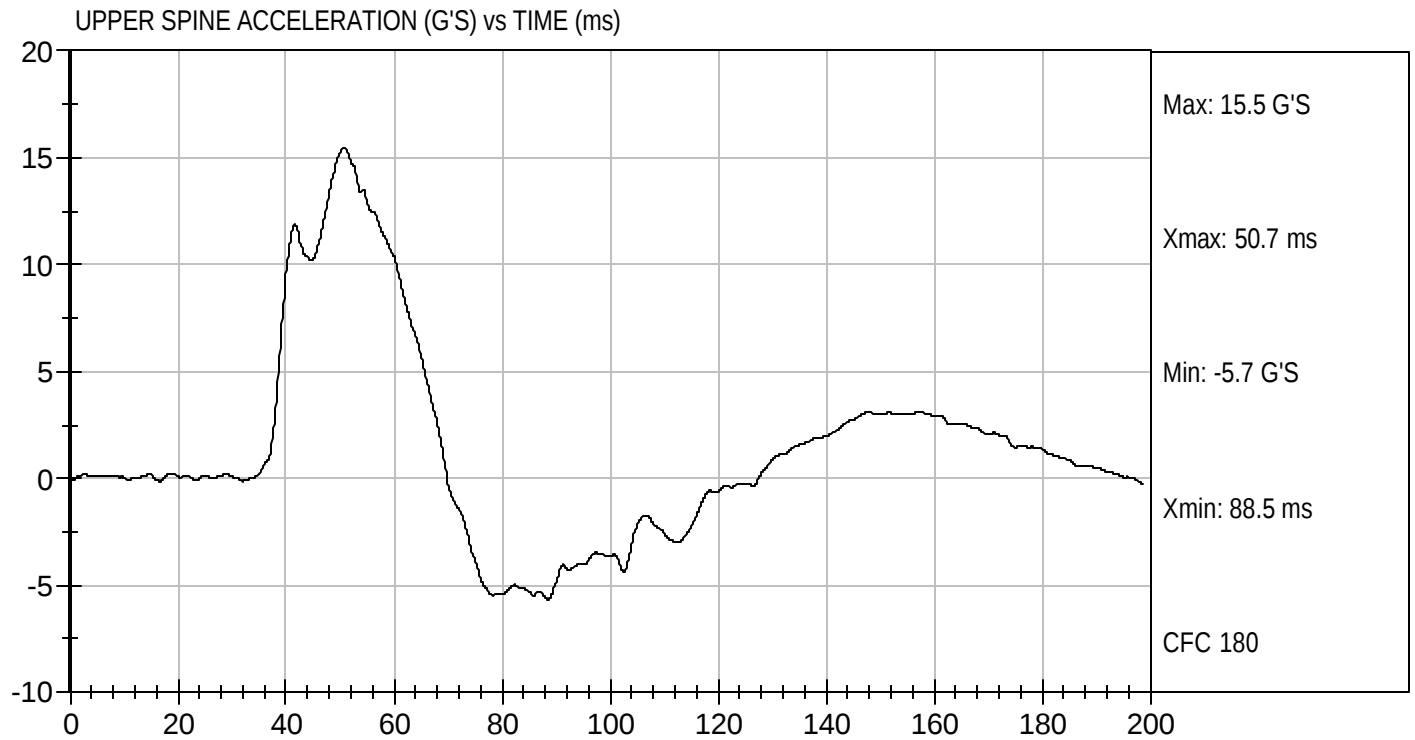
Test Date: 08/09/2005
Velocity: 14.0 ft/s, 4.27 m/s





Test Desc: Thorax Without Arm
Componet ID: D052235

Test Date: 08/09/2005
Velocity: 14.0 ft/s, 4.27 m/s



MGA RESEARCH CORPORATION
ABDOMINAL IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052236

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	4.41 to 4.59	4.48	Pass
Peak Impactor Force	kN	1.3 to 1.9	1.9	Pass
Upper Rib Displacement	mm	44 to 55	44	Pass
Lower Rib Displacement	mm	44 to 56	46	Pass
Upper Spine (T1) Y Acceleration	G's	5 to 9	6	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 13	12	Pass
Overall Test Results			Pass	


Laboratory Technician

08/09/2005

Test Date

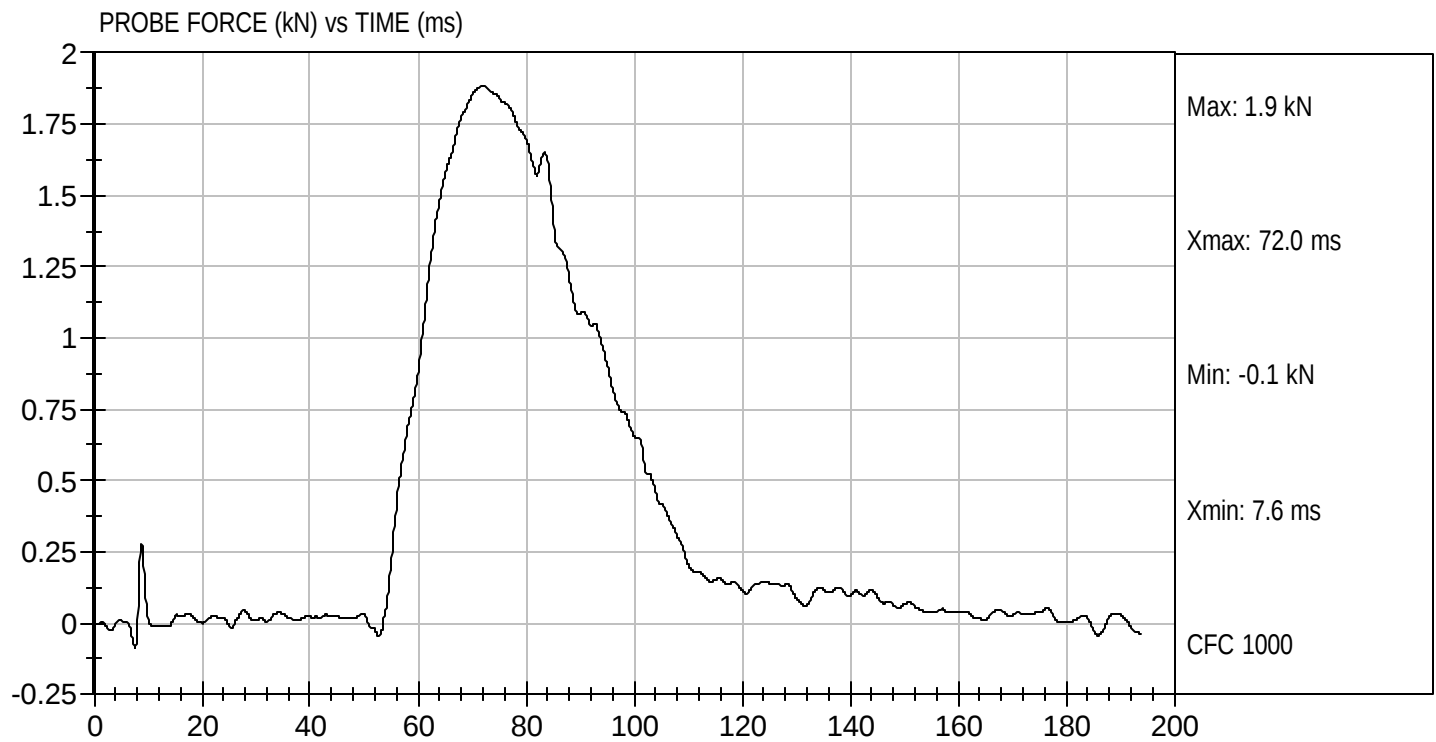


Approved By



Test Desc: Abdomen Impact
Componet ID: D052236

Test Date: 08/09/2005
Velocity: 14.69 ft/s, 4.48 m/s

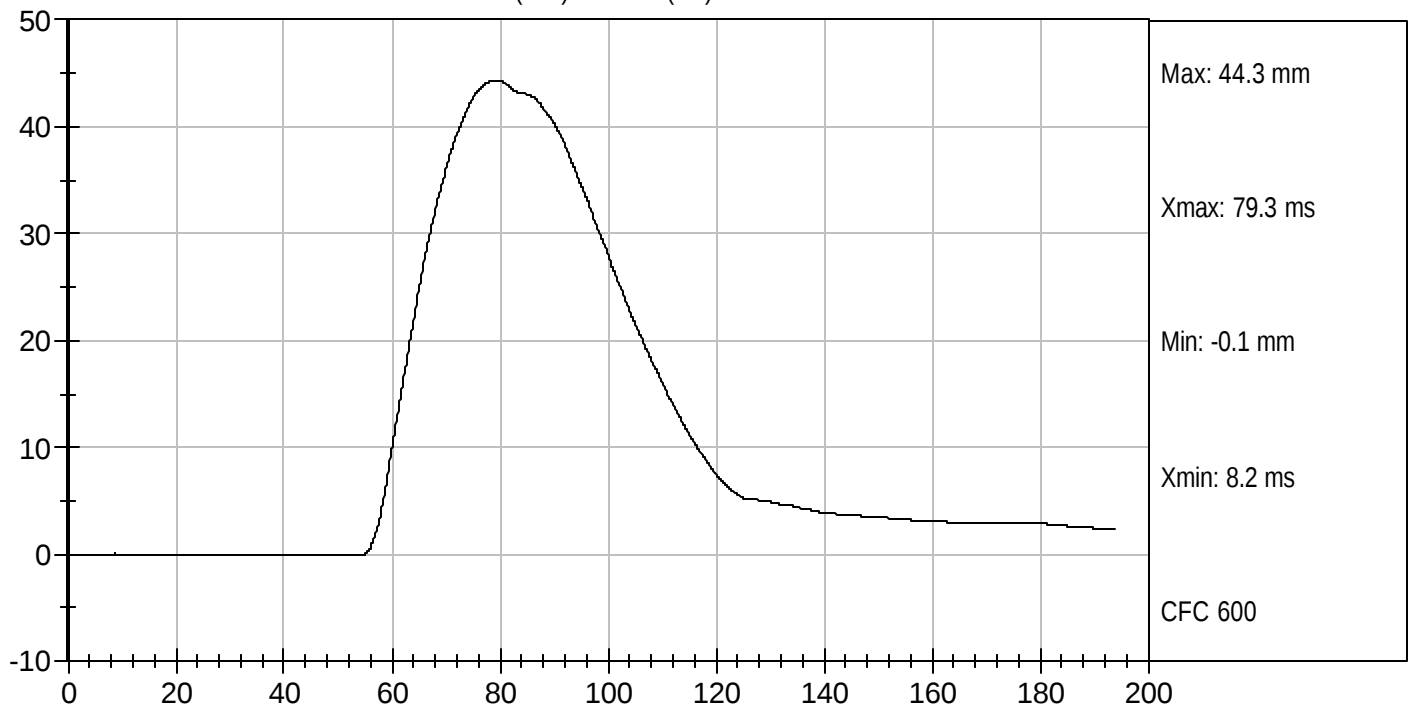




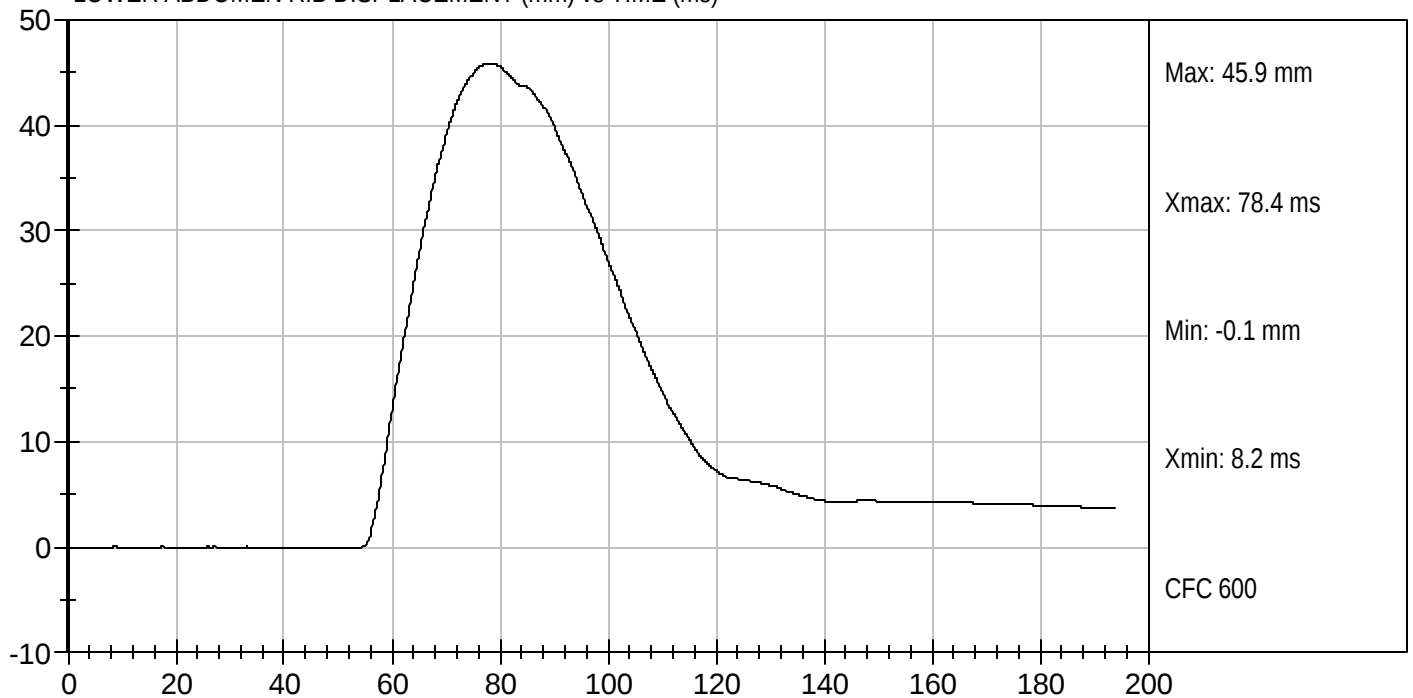
Test Desc: Abdomen Impact
Componet ID: D052236

Test Date: 08/09/2005
Velocity: 14.69 ft/s, 4.48 m/s

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



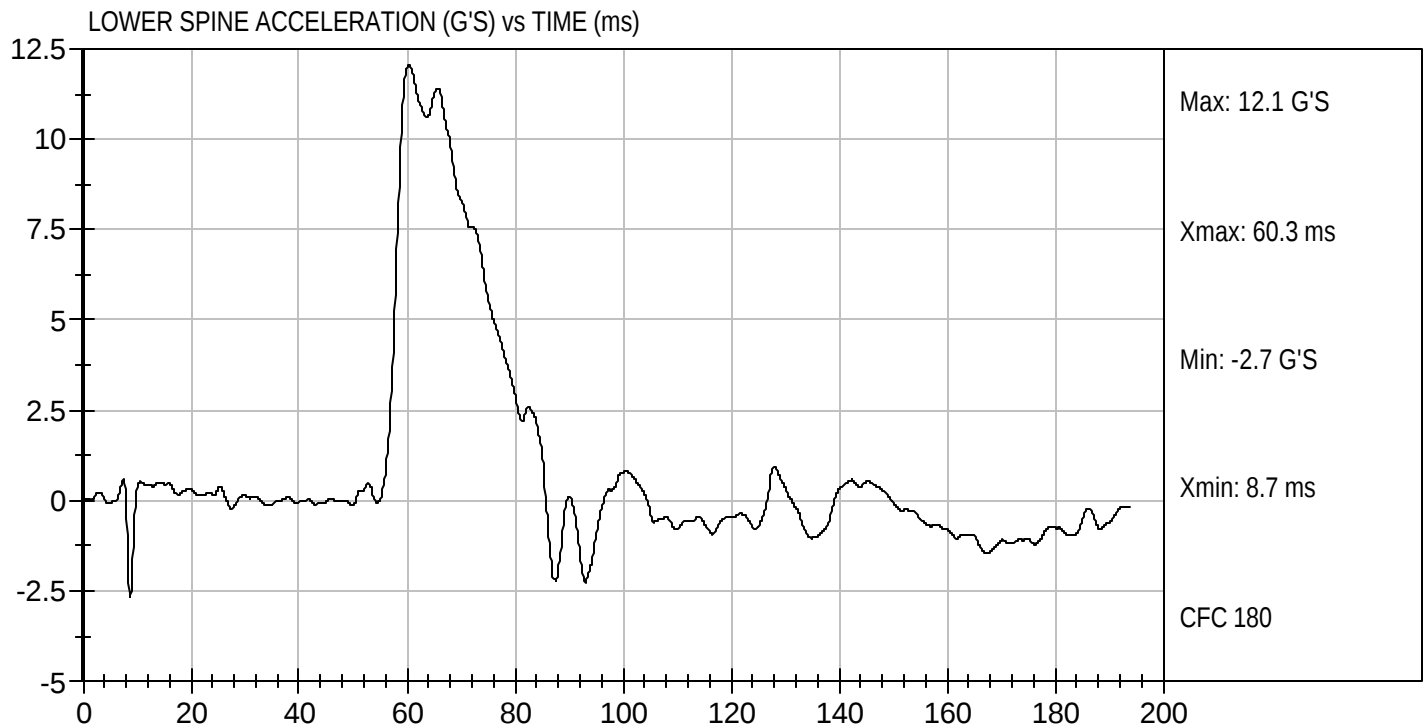
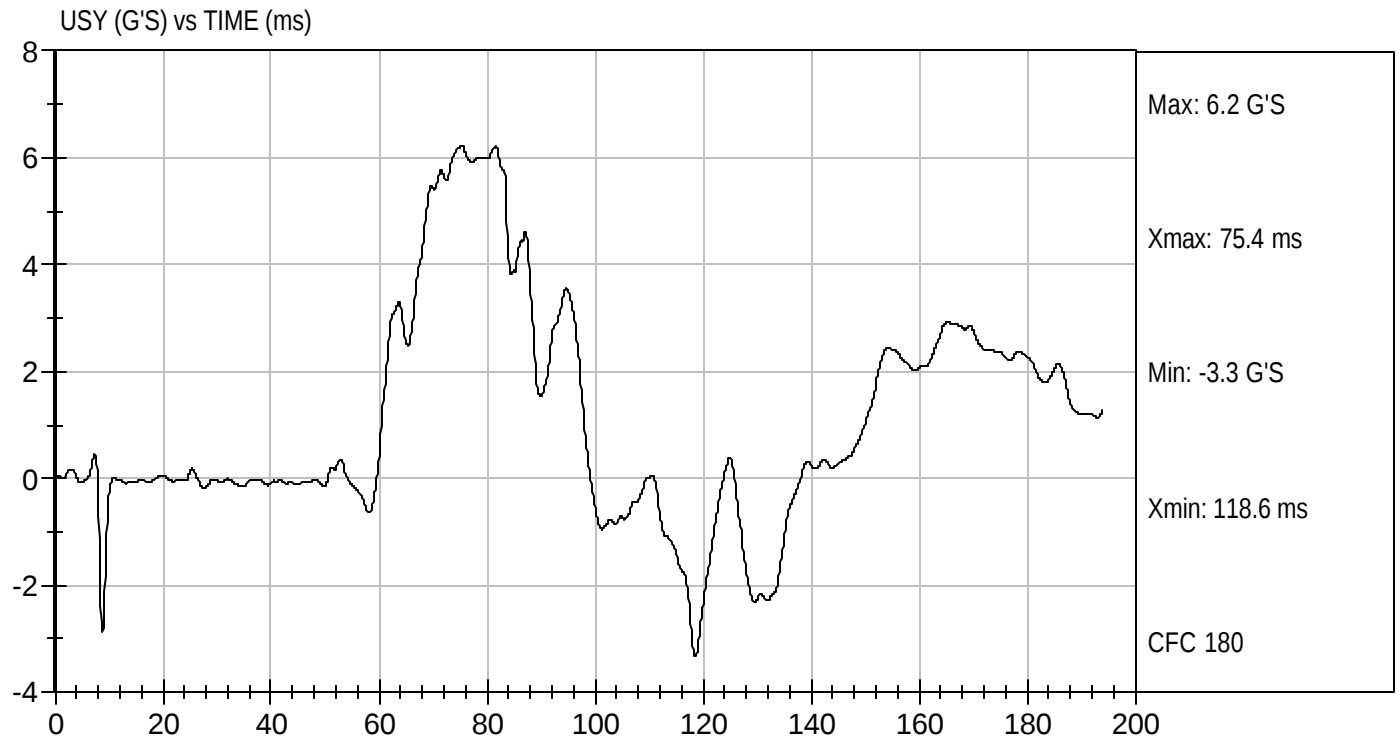
LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)





Test Desc: Abdomen Impact
Componet ID: D052236

Test Date: 08/09/2005
Velocity: 14.69 ft/s, 4.48 m/s



MGA RESEARCH CORPORATION
PELVIS IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052237

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Peak Impactor Acceleration	G's	40 to 48	42	Pass
Pelvis Y Acceleration	G's	40 to 48	46	Pass
Peak Acetabulum Force	N	3803 to 4505	3838	Pass
Overall Test Results				Pass



Laboratory Technician

08/09/2005

Test Date

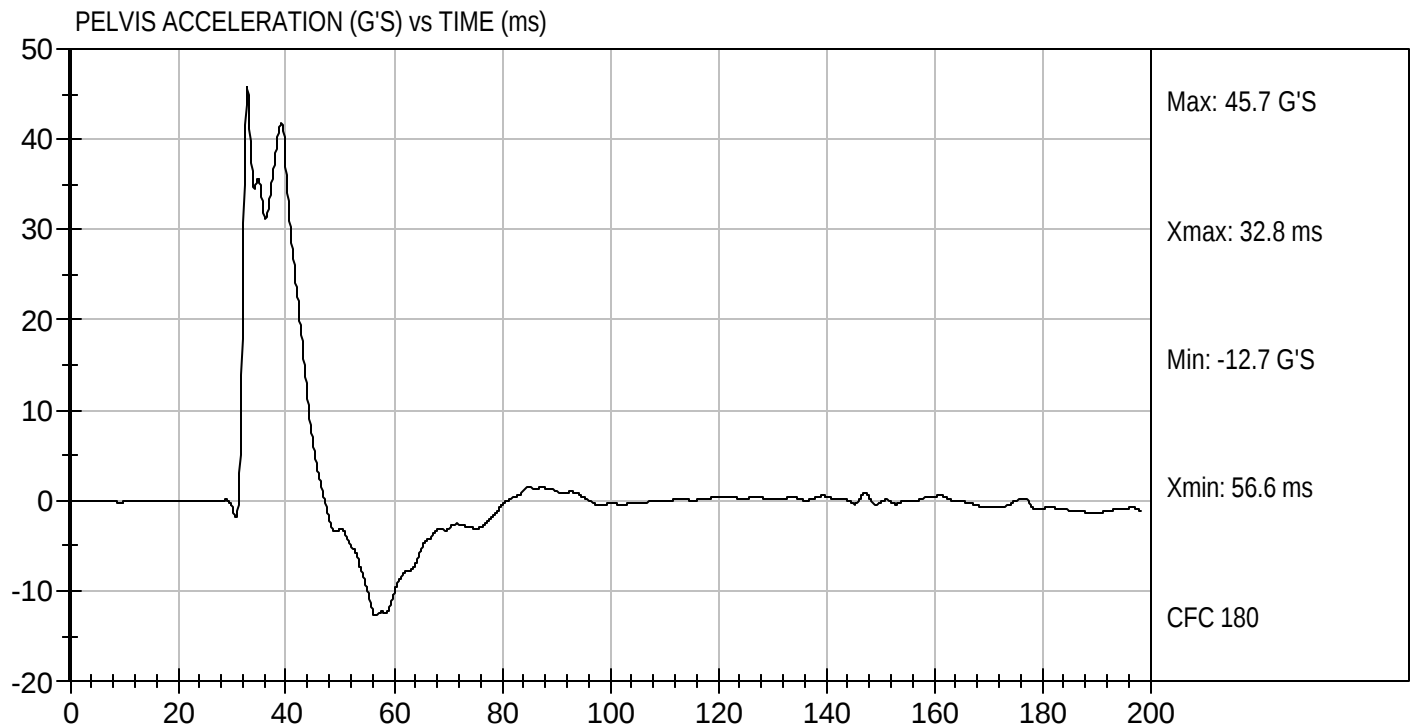
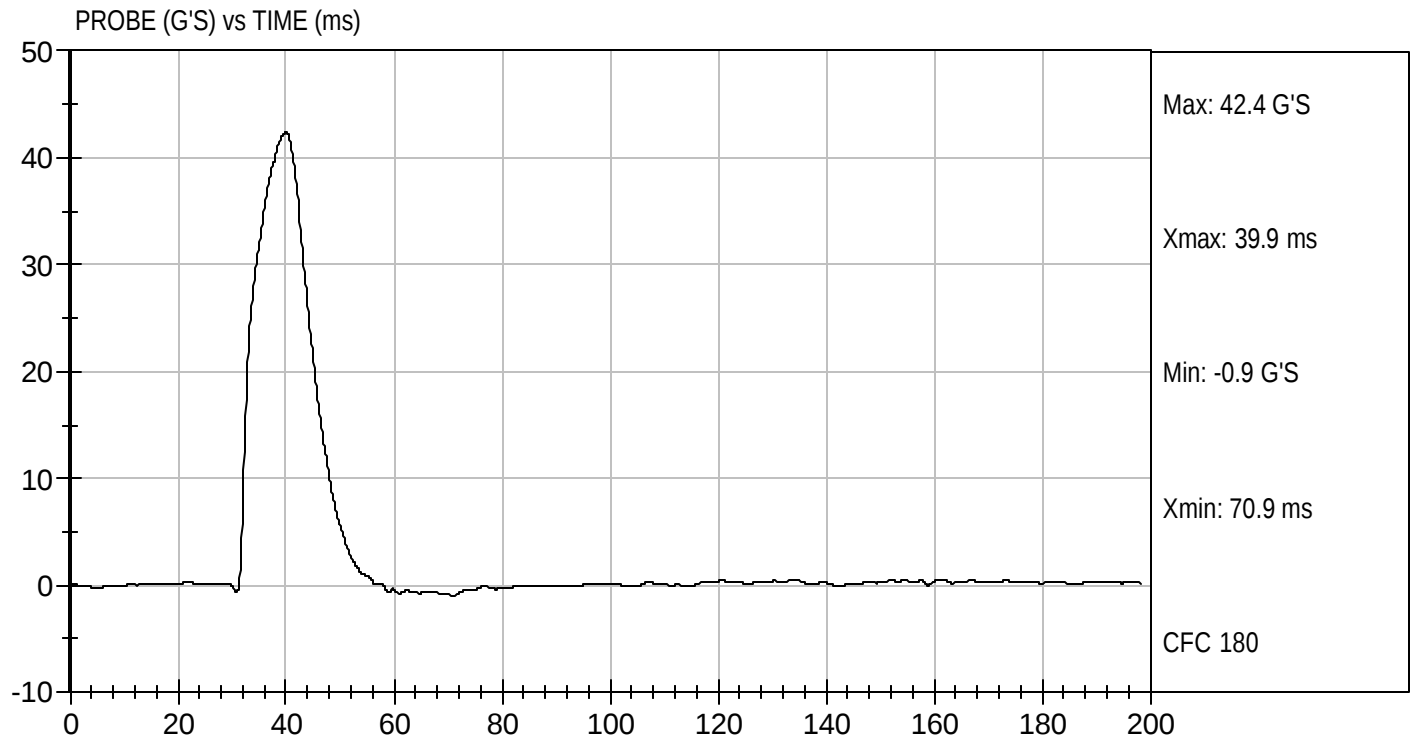


Approved By



Test Desc: Pelvis Impact
Componet ID: D052237

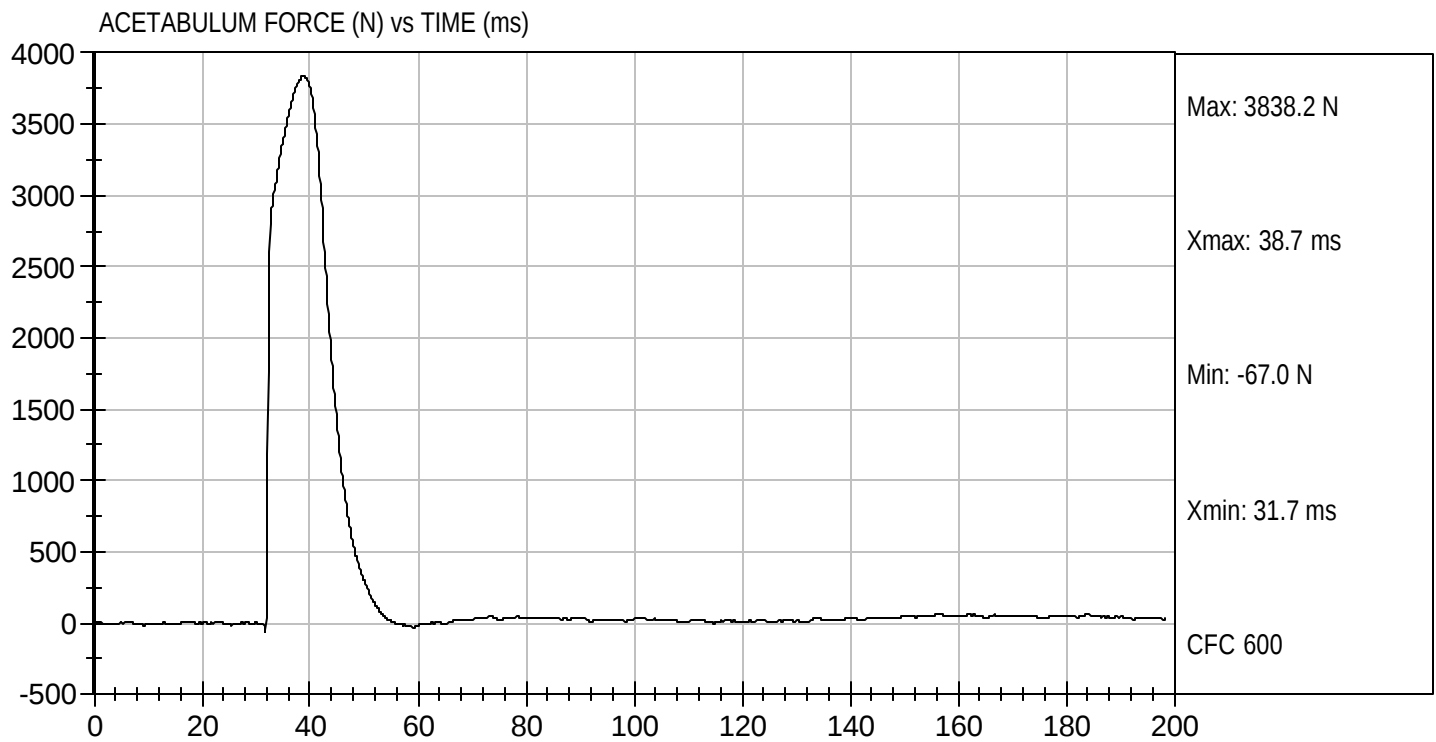
Test Date: 08/09/2005
Velocity: 21.9 ft/s, 6.68 m/s





Test Desc: Pelvis Impact
Componet ID: D052237

Test Date: 08/09/2005
Velocity: 21.9 ft/s, 6.68 m/s



MGA RESEARCH CORPORATION
ILIAC IMPACT TEST
SID IIs DUMMY

ATD Serial No: 032

Test I.D: D052238

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.5	Pass
Humidity	%	10 to 70	43	Pass
Impact Velocity	m/s	4.20 to 4.40	4.32	Pass
Peak Impactor Acceleration	G's	41 to 47	41	Pass
Pelvis Y Acceleration	G's	32 to 40	36	Pass
Peak Pelvis Iliac Force	N	4841 to 5491	5143	Pass
Overall Test Results			Pass	



Laboratory Technician

08/10/2005

Test Date

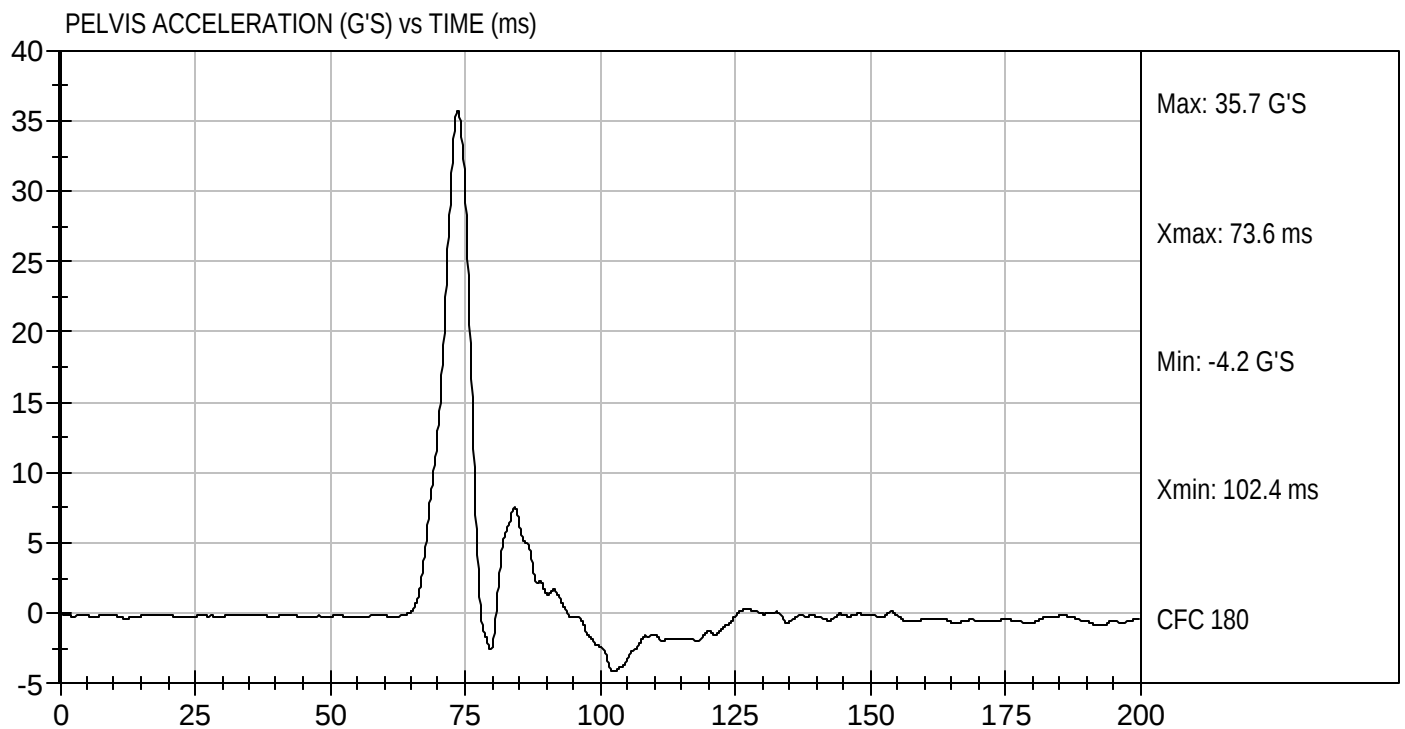
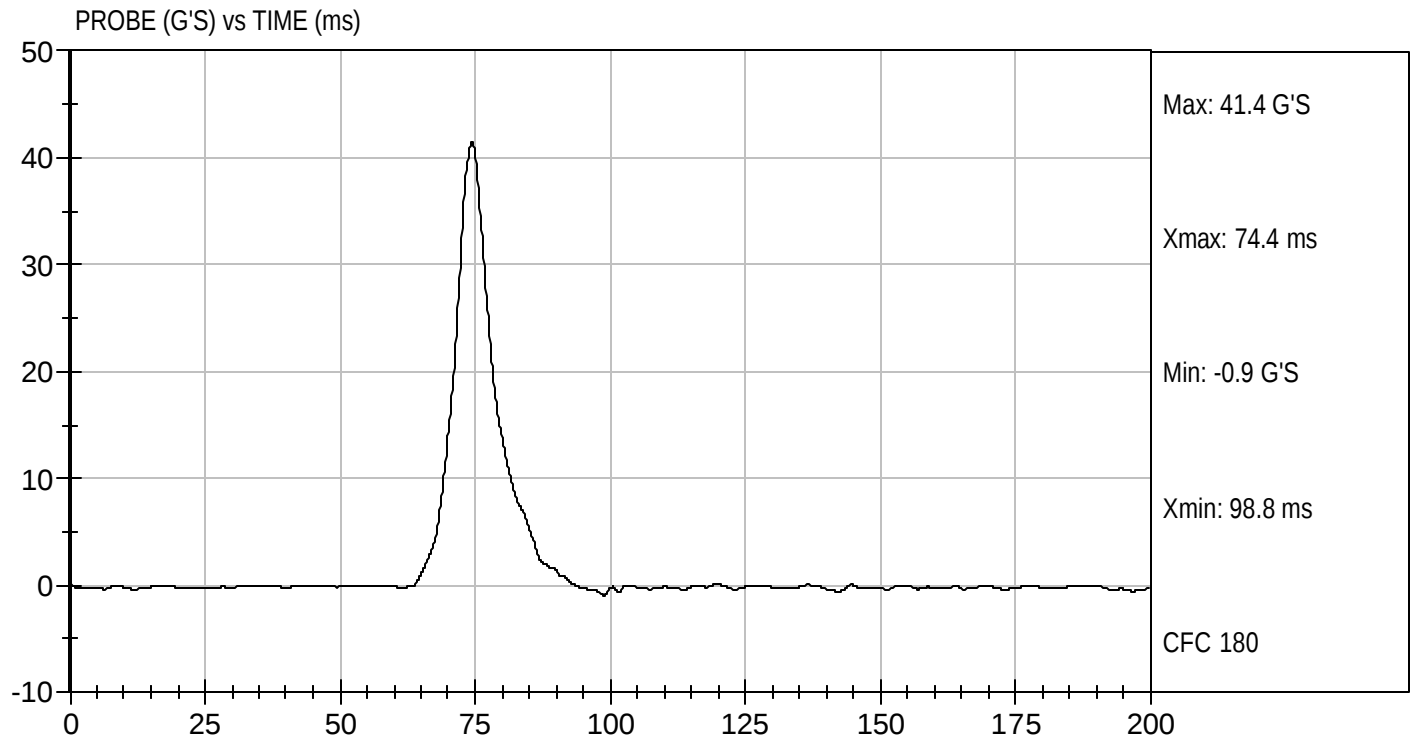


Approved By



Test Desc: Iliac Impact
Componet ID: D052238

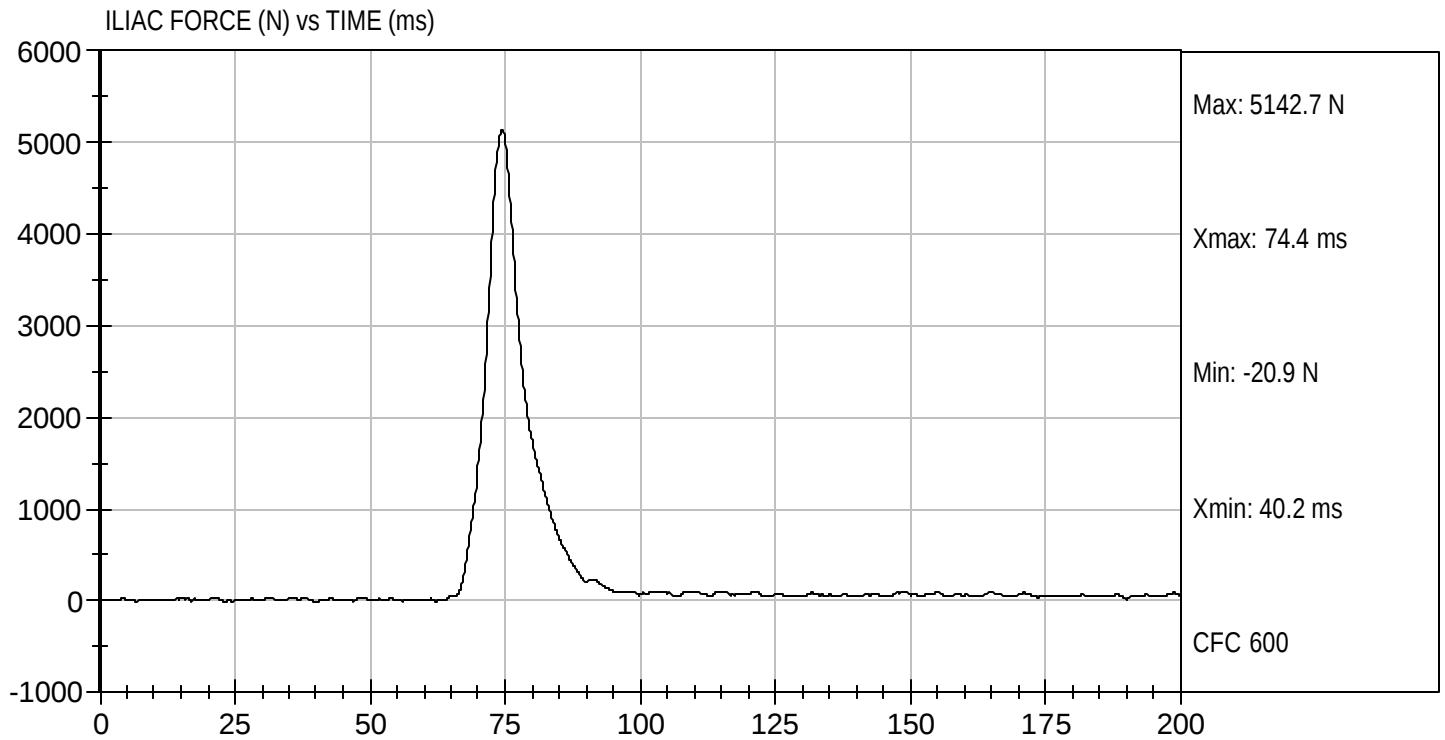
Test Date: 08/10/2005
Velocity: 14.17 ft/s, 4.32 m/s





Test Desc: Iliac Impact
Componet ID: D052238

Test Date: 08/10/2005
Velocity: 14.17 ft/s, 4.32 m/s



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY SIDIIsD: 033		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	J06-J07	Entran	7/28/05
Head Y Accelerometer	A05-A09	Entran	7/28/05
Head Z Accelerometer	A12-Z03	Entran	7/28/05
Head X Redundant	J14-J16	Entran	7/28/05
Head Y Redundant	J23-J03	Entran	7/28/05
Head Z Redundant	A05-A23	Entran	7/28/05
Upper Neck Load Cell	284	Denton	5/03/05
Upper Arm X	AHWK8	Endevco	7/07/05
Upper Arm Y	C24-A03	Entran	7/07/05
Upper Arm Z	AMTA3	Endevco	7/07/05
Shoulder Force Load Cell	107	FTSS	5/03/05
Upper Thorax Rib DY	033RIB1	Servo	6/29/05
Mid Thorax Rib DY	033RIB2	Servo	7/21/05
Lower Thorax Rib DY	033RIB3	Servo	7/12/05
Upper Abdominal Rib DY	033RIB4	Servo	6/29/05
Lower Abdominal Rib DY	033RIB5	Servo	6/29/05
Shoulder DY	033SHLD	Servo	6/29/05
Upper Spine X	L20-A38	Entran	4/12/05
Upper Spine Y	AJ9A7	Endevco	4/12/05
Upper Spine Z	AHTB2	Endevco	4/12/05
Lower Spine X	L17-Z13	Entran	7/28/05
Lower Spine Y	A12-A14	Entran	7/28/05
Lower Spine Z	L18-N01	Entran	7/28/05
Lumbar Load Cell	104	FTSS	5/03/05
Left Acetabulum FY	ACG110FY	FTSS	5/02/05
Left Ilium Crest FY	IWG115FY	FTSS	5/02/05
Pelvis X Accelerometer	A29-N20	Entran	4/29/05
Pelvis Y Accelerometer	A28-H09	Entran	4/29/05
Pelvis Z Accelerometer	A28-H06	Entran	4/29/05

	INSTRUMENTS FOR LEFT REAR DUMMY SIDII sD: 032		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	L20-B17	Entran	5/24/05
Head Y Accelerometer	AJ621	Endevco	5/24/05
Head Z Accelerometer	P22203	Endevco	5/24/05
Head X Redundant	L20-B14	Entran	5/24/05
Head Y Redundant	AJ9F3	Endevco	5/24/05
Head Z Redundant	P22695	Endevco	5/24/05
Upper Neck Load Cell	287	Denton	5/03/05
Upper Arm X	J23808	Endevco	7/07/05
Upper Arm Y	J18260	Endevco	7/07/05
Upper Arm Z	J13658	Endevco	7/07/05
Shoulder Force Load Cell	171	FTSS	5/25/05
Upper Thorax Rib DY	032RIB1	Servo	5/26/05
Mid Thorax Rib DY	032RIB2	Servo	5/26/05
Lower Thorax Rib DY	032RIB3	Servo	5/26/05
Upper Abdominal Rib DY	032RIB4	Servo	5/26/05
Lower Abdominal Rib DY	032RIB5	Servo	5/26/05
Shoulder DY	032SHLD	Servo	5/10/05
Upper Spine X	J10411	Endevco	5/24/05
Upper Spine Y	AJ9D6	Endevco	5/24/05
Upper Spine Z	J13772	Endevco	5/24/05
Lower Spine X	AJ8T5	Endevco	5/24/05
Lower Spine Y	J20965	Endevco	5/24/05
Lower Spine Z	J12439	Endevco	5/24/05
Lumbar Load Cell	135	FTSS	5/03/05
Left Acetabulum FY	ACG114FY	FTSS	5/02/05
Left Ilium Crest FY	IWG102FY	FTSS	5/02/05
Pelvis X Accelerometer	AJ4J3	Endevco	5/24/05
Pelvis Y Accelerometer	AF0M3	Endevco	5/24/05
Pelvis Z Accelerometer	AJ9D8	Endevco	5/24/05

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Mid A-Post Y	B28-Z12	Entran	3/17/05
Left Lower A-Post Y	B26-Z16	Entran	3/17/05
Left Mid B-Post Y	B19-Z14	Entran	3/03/05
Left Lower B-Post Y	E01-F13	Entran	4/28/05
RR Occupant Compartment Y	C15-L14	Entran	4/22/05
Floorpan @ Rear Axle X	C29-L17	Entran	4/25/05
Floorpan @ Rear Axle Y	C29-L32	Entran	4/25/05
Floorpan @ Rear Axle Z	C06-L14	Entran	3/24/05
Driver Seat Track Y	K11-Z01	Entran	4/28/05
Right Front Sill X	D01-Z13	Entran	4/28/05
Right Front Sill Y	C29-L33	Entran	4/28/05
Right Front Sill Z	C29-L23	Entran	4/28/05
Right Rear Sill X	C29-L37	Entran	4/28/05
Right Rear Sill Y	C21-G07	Entran	4/28/05
Right Rear Sill Z	C29-L08	Entran	4/28/05
Left Rear Sill Y	C06-L17	Entran	3/24/05
Left Front Sill Y	C21-G16	Entran	4/22/05
Vehicle CG X	B28-Z23	Entran	3/17/05
Vehicle CG Y	C11-L01	Entran	3/31/05
Vehicle CG Z	C09-Y05	Entran	3/31/05
Left Front Door @ Rib Y	H21-J08	Entran	3/09/05
Left Front Door @ Pelvis Y	E04-R21	Entran	3/09/05
Left Front Door @ Arm Y	C24-B02	Entran	3/09/05
Left Front Door @ Knee Y	C04-L15	Entran	3/24/05
Left Rear Door @ Rib Y	B26-Z06	Entran	3/17/05
Left Rear Door @ Pelvis Y	B28-Z11	Entran	3/17/05
Left Rear Door @ Knee Y	B26-Z01	Entran	3/17/05
Left Rear Door @ Arm Y	B26-Z19	Entran	3/17/05
MDB CG X	D03-Z36	Entran	6/28/05
MDB CG Y	D11-Z14	Entran	6/28/05
MDB CG Z	D08-L03	Entran	6/28/05
MDB Rear X	E05-Z36	Entran	6/28/05
MDB Rear Y	E05-Z30	Entran	6/28/05
MDB Rear Z	E05-Z44	Entran	6/28/05