

REPORT NUMBER: NCAP-MGA-2002-006

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**SATURN CORPORATION
2002 SATURN VUE 4 DOOR
NHTSA NUMBER: M20108**

**PREPARED BY:
MGA RESEARCH CORPORATION
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BURLINGTON, WI 53105**



Test Date: March 19, 2002

Report Date: March 26, 2002

FINAL REPORT

**PREPARED FOR:
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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-12005.

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Date of Acceptance

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Date of Acceptance

Technical Report Documentation Page

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16. Abstract A 35 mph (56.3 km/h) frontal barrier impact was conducted on a 2002 Saturn Vue 4 door at MGA Research Corporation on March 19, 2002. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.3 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 632 mm located to the right of the vehicle centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td>N/A</td> <td>1000</td> <td>363</td> <td>771</td> </tr> <tr> <td>Max. Thorax Accel. (3msec Clip)</td> <td>G's</td> <td>60</td> <td>43</td> <td>42</td> </tr> <tr> <td>Left Femur force</td> <td>Newtons</td> <td>10009</td> <td>4355</td> <td>4233</td> </tr> <tr> <td>Right Femur force</td> <td>Newtons</td> <td>10009</td> <td>2069</td> <td>3576</td> </tr> </tbody> </table>				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC)	N/A	1000	363	771	Max. Thorax Accel. (3msec Clip)	G's	60	43	42	Left Femur force	Newtons	10009	4355	4233	Right Femur force	Newtons	10009	2069	3576
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-01-D-12005. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier consisting of 30 load cells was impacted by a 2002 Saturn Vue 4 door at a velocity of 56.3 kph. The test was performed at MGA Research Corporation on March 19, 2002. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and sixteen high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with nine accelerometer array head, chest and pelvis triaxial accelerometers, chest displacement potentiometer, upper neck transducers, right/left femur load cells, lower leg instrumentation, and foot accelerometers. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 066) and right-front passenger (position 2) ATD (Serial No. 065) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 115 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 632 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's head, chest, and abdomen contacted the airbag. The driver's head contacted the headrest. The driver's knees contacted the knee bolster and steering column. The passenger's head, chest, and abdomen contacted the airbag. The passenger's head contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	Clip(g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spoolout (mm)
Driver	363	43	26	4355	2069	229
Passenger	771	42	23	4233	3576	305

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	English Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressure	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

*Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.3
Test Weight	kg	1802.5
Average Rebound	mm	918
Maximum Static Crush	mm	632
Impact Angle	degrees	90.1

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	HIII / 066	HIII / 065
Head Contact	Airbag, headrest	Airbag, headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	Airbag	Airbag
Left Knee Contact	Knee bolster, steering column	Glovebox
Right Knee Contact	Knee bolster, steering column	Glovebox

16mm MOVIE COVERAGE

High Speed	16
Real Time	1
Total	17

Driver ATD Sensors	48
Passenger ATD Sensors	48
Belt Assessment Sensors	4
Vehicle Structure Accelerometers	9
Rigid Barrier Load Plates	6
Total	115

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

TEST VEHICLE INFORMATION

Manufacturer	Saturn
Model	Vue
Body Style	4 door SUV
NHTSA No.	M20108
VIN	5GZCZ63B52S808465
Color	Silver
Delivery Date	2/19/02
Odometer Reading (mile)	82
Dealer	Saturn of Gurnee
Transmission	Automatic
Final Drive	AWD
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Driver Airbag	Yes
Passenger Airbag	Yes
Force Limiter	Yes
Pretensioner	No
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	No
Anti-lock Brakes	No
AM/FM/CD	Yes
Anti-theft System	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Saturn Corporation	GVWR (kg)	1991
Date of Manufacture	02/02	GAWR Front (kg)	1048
		GAWR Rear (kg)	949

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	210	210
Cold Pressure (kPa)	210	210
Recommended Tire Size	P235/65R16	P235/65R16
Tire Size on Vehicle	P235/65R16	P235/65R16
Tire Manufacturer	Bridgestone	Bridgestone

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Cargo Wt. (RCLW) (kg)				31.8

DATA SHEET NO. 2...(continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	480.4	342.5		533.4	393.7	
Right	kg	459.5	337.0		495.3	380.1	
Ratio	%	58.0	42.0		57.1	42.9	
Totals	kg	939.9	679.5	1619.4	1028.7	773.8	1802.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1619.4
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	31.8
Calculated Vehicle Target Weight (TVTW)	kg	1807.2

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	837	840	846	854	1138
As Tested	mm	820	828	833	840	1164
Post Test	mm	803	819	825	836	

Vehicle Wheelbase (mm): 2712

Weight of Ballast secured in cargo area (kg): 0

Vehicle Components Removed: Rear Seat

Ballast weight does not include cameras, instrumentation, and brake abort system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 59.1

Usable Capacity Figure Furnished by COTR (L): 59.1

Actual Test Volume (L): 54.4

Test Fluid Type: Stoddard Solvent ; Specific Gravity: 0.77

Is Vehicle Fuel Pump Electric or Mechanical? electric

If electric, does pump operate with ignition switch "ON" & engine "OFF"? yes

The fuel pump will only operate with the ignition on and the engine running or cranking. With the ignition on, the pump relay is only energized for 2-3 seconds and will be disabled if the PCM does not see reference pulses from the EI module. To re-initialize the pump, the ignition must be off for at least 10 seconds.

DATA SHEET NO. 3
POST IMPACT DATA

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.3
Trap No. 1 Entry Distance	mm	<1524	1300
Trap No. 1 Exit Distance	mm	<1524	300
Trap No. 2 Velocity (Redundant)	km/h	55.5 – 57.1	56.3
Trap No. 2 Entry Distance	mm	<1524	1425
Trap No. 2 Exit Distance	mm	<1524	425

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4416	3881	535
Center	mm	4560	3980	580
Right Side	mm	4417	3785	632

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	997
Center	mm	849
Right Side	mm	909
Average	mm	918

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

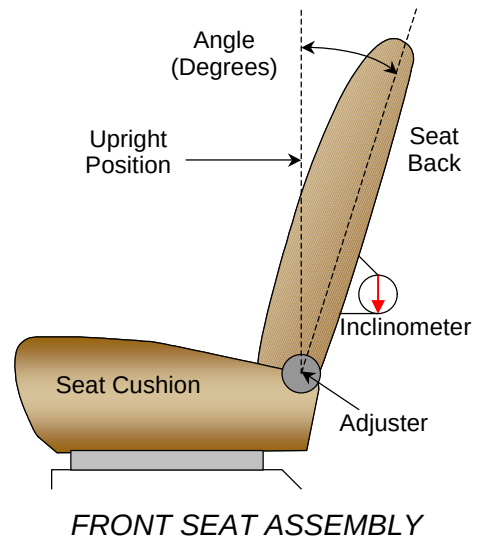
NHTSA No.: M20108
Test Date: 3/19/02

NORMAL DESIGN RIDING POSITION

The driver and passenger seat backs are positioned to the manufacturer's designated angle. The procedure is as follows: The seat back angle is set to 18 degrees. This is accomplished by measuring 4.5 degrees when the inclinometer is positioned across the headrest support posts. The dummy is not in the seat during this measurement.

Driver seat back angle: 4.7 degrees

Passenger seat back angle: 4.4 degrees



SEAT FORE/AFT POSITIONS

The driver seat and the passenger seat are manually operated. The fore/aft position is set at the middle position for both driver and passenger.

Driver seat fore/aft total travel: 25 seat positions

Passenger seat fore/aft total travel: 25 seat positions

Driver seat fore/aft position: 13th position, 1st as one

Passenger seat fore/aft position: 13th position, 1st as one

SEAT BELT UPPER ANCHORAGE

The seat belt anchorage has 5 adjustment positions. It was placed in the 3rd position, with the top as 1.

DATA SHEET NO. 4...(continued)

TEST VEHICLE INFORMATION

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

FUEL TANK CAPACITY DATA

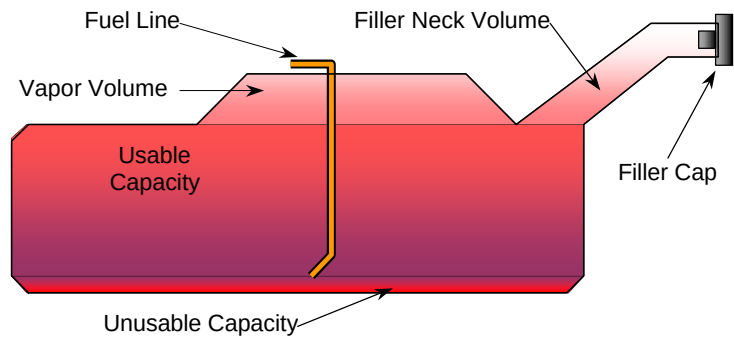
The "Usable Capacity" of the standard equipment fuel tank is: 59.1 liters

The "Usable Capacity" of any optional equipment fuel tank is: n/a liters

The "Usable Capacity" used for certification to FMVSS 301 requirements: 59.1 liters

Actual amount of Stoddard solvent added to vehicle for certification test: 54.4 liters

The test vehicle is equipped with an electric fuel pump. The fuel filler door is located on the right rear fender.

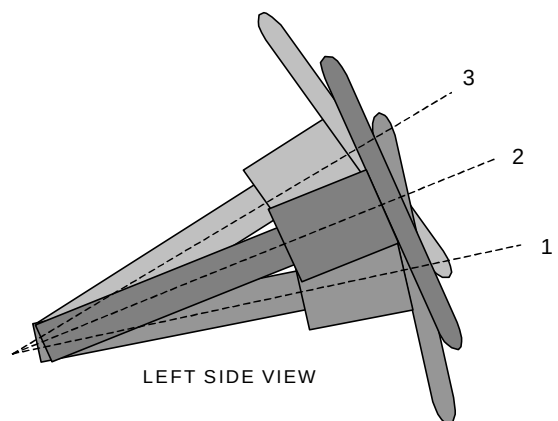


VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Measure the steering wheel angle at the highest and lowest point of the column travel and bisect the difference. Midspan should measure 24 degrees.

Lowermost, position 1: 22.2 deg
Geometric center, position 2: 24.2 deg
Uppermost, position 3: 26.1 deg



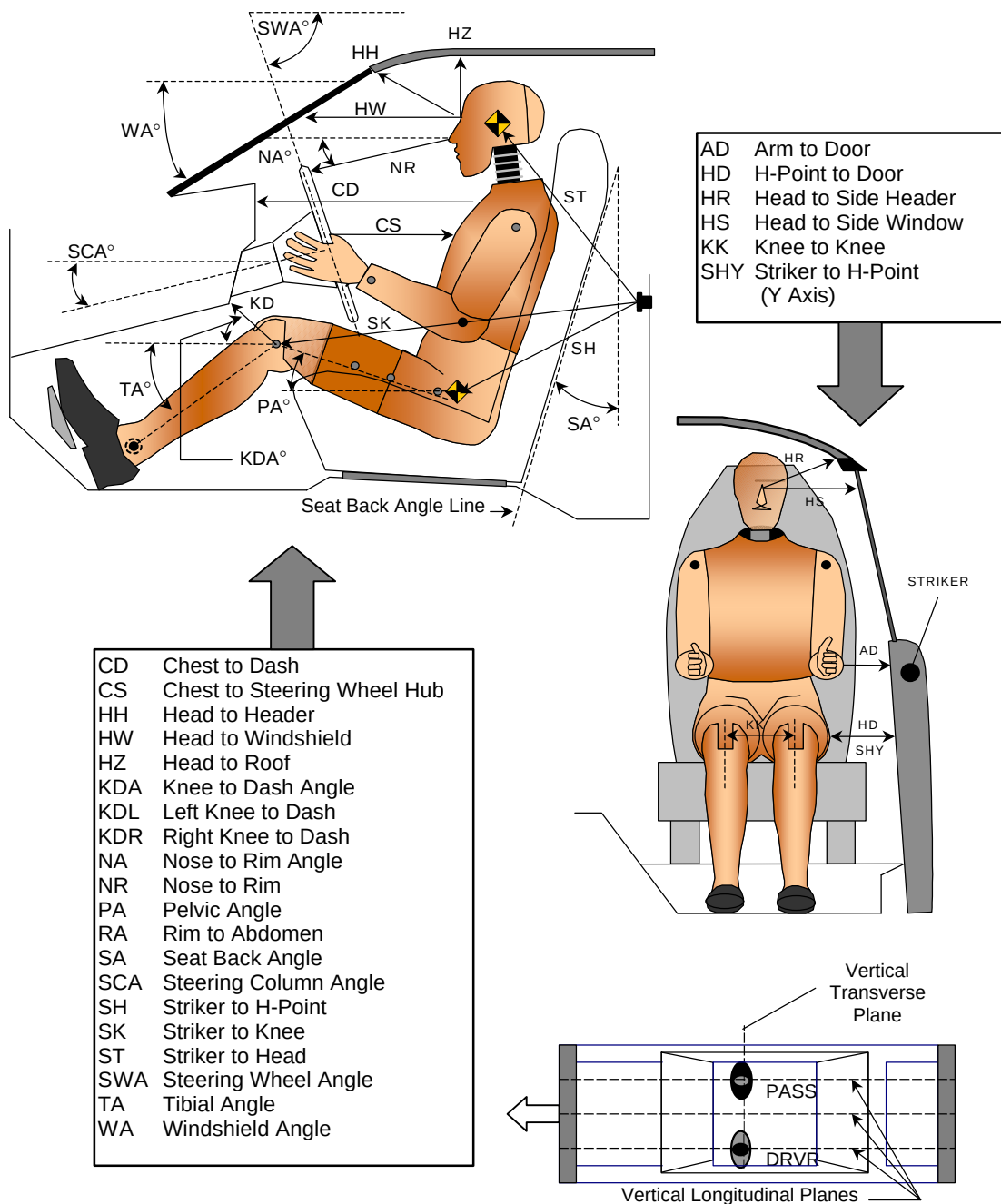
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 5 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5...(continued)
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

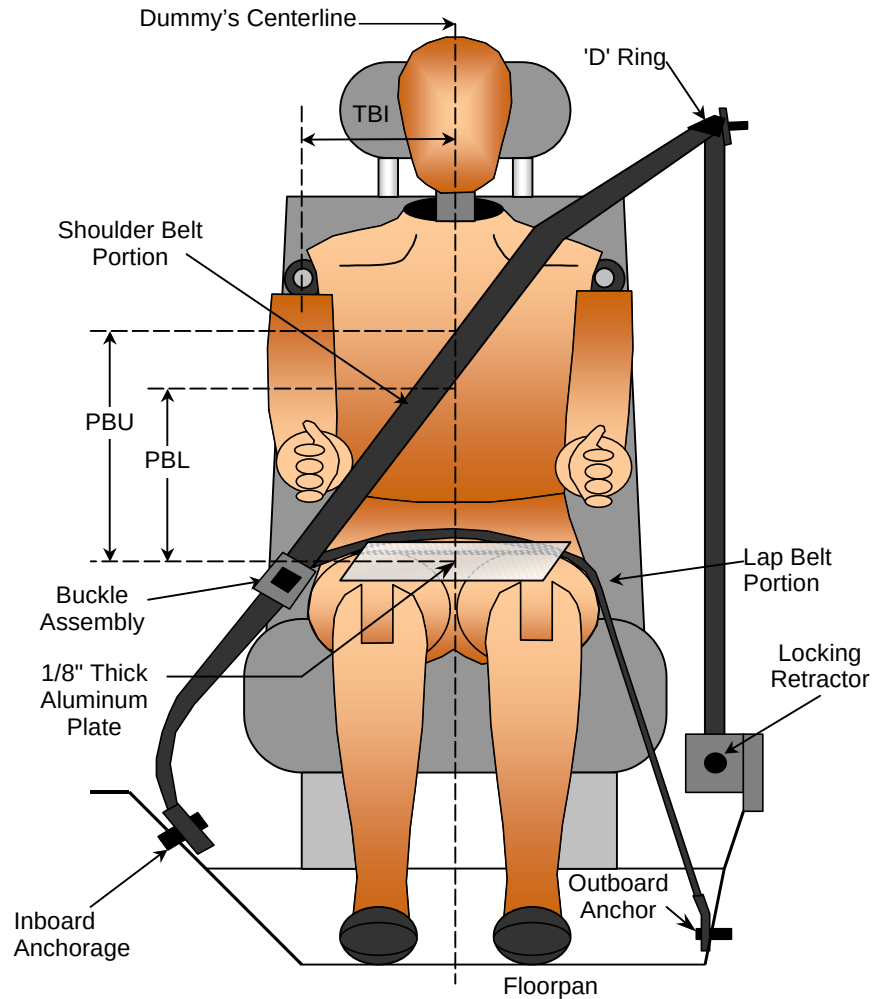
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		34		
SWA	Steering Wheel Angle		67		
SCA	Steering Column Angle		16		
SA	Seat Back Angle		4.4		4.7
HZ	Head to Roof (Z)	212	90	195	90
HH	Head to Header	402	22	414	16
HW	Head to Windshield	649	0	670	0
HR	Head to Side Header (Y)	220		198	
NR	Nose to Rim	405	12		
CD	Chest to Dash	541		558	
CS	Chest to Steering Hub	332	10		
RA	Rim to Abdomen	206	0		
KDL	Left Knee to Dash	205	0	181	
KDR	Right Knee to Dash	161		192	0
PA	Pelvic Angle		24		24
TA	Tibia Angle		61		46
KK	Knee to Knee (Y)	295		251	
SK	Striker to Knee	581	91	605	92
ST	Striker to Head	581	5	597	5
SH	Striker to H-Point	185	112	184	112
SHY	Striker to H-Point (Y)	244		238	
HS	Head to Side Window	329		327	
HD	H-Point to Door (Y)	139		125	
AD	Arm to Door (Y)	104		91	
AA	Ankle to Ankle	269		200	

DATA SHEET NO. 6 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy centerline to shoulder bolt	mm	170	170
PBU - Top surface of reference to belt upper edge	mm	339	360
PBL - To surface of reference to belt lower edge	mm	265	265

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

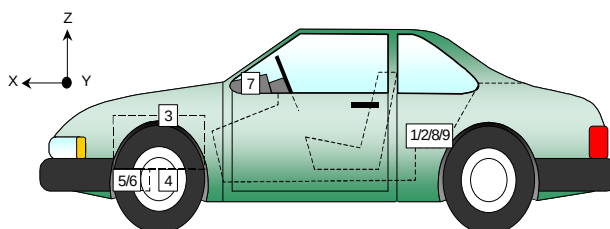
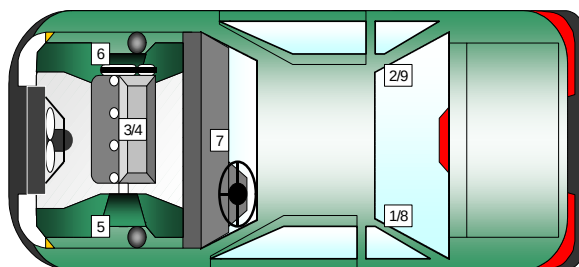
No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	1610	-560	477	G's	1.4	139	35.5	42
2	Right Rear X-Member X	1610	560	477	G's	1.6	141	42.8	43
3	Engine Top X	3889	-44	855	G's	**	**	**	**
4	Engine Bottom X	3679	43	259	G's	19.2	53	112.0	34
5	Left Brake Caliper X	3753	-678	275	G's	9.1	60	78.1	47
6	Right Brake Caliper X	3755	678	275	G's	17.5	78	84.1	54
7	Instrument Panel X	2872	0	1020	G's	11.5	101	45.5	49
8	Left Rear X-Member Z	1610	-560	477	G's	5.3	95	4.6	62
9	Right Rear X-Member Z	1610	560	477	G's	5.7	57	6.9	79

Reference Points: X - Rear Surface of Vehicle (+ forward)

Y - Vehicle Centerline (+ to right)

Z - Ground Plane (+ up)

** No valid data after 25 msec



DATA SHEET NO. 8

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	2.7	33	46.3	81	2.8	47	66.3	90
Head CG	Y	G's	5.1	33	14.8	91	5.9	76	13.7	96
Head CG	Z	G's	22.6	76	2.3	23	33.1	81	1.6	25
Head CG Resultant	N/A	G's	50.0	81			72.2	90		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.7	154	43.6	89	1.5	164	41.0	85
Chest CG	Y	G's	2.5	112	11.0	87	4.5	89	2.8	84
Chest CG	Z	G's	9.3	67	5.2	108	13.2	91	4.7	58
Chest CG Resultant	N/A	G's	44.8	89			42.3	81		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	235	181	4355	64	224	174	4233	63
Right Femur	Z	Newtons	273	36	2069	71	166	112	3576	61

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	6199	66			4819	63		
Shoulder Belt	N/A	Newtons	3893	87			3683	97		

HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg G's	T ¹	T ²
Head CG Primary	363	39.9	63.5	99.5	771	54.7	73.6	108.4

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	43.4	87.2	90.2	41.5	82.1	85.1

DATA SHEET NO. 8...(continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	1.3	138	62.4	64	3.1	119	61.3	63
Pelvis	Y	G's	5.4	96	13.5	73	9.7	105	15.1	81
Pelvis	Z	G's	2.0	155	25.5	78	14.9	104	28.2	74

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	854	85	380	136	493	95	206	138
Neck Force	Y	Newtons	61	60	215	117	94	73	130	95
Neck Force	Z	Newtons	1196	64	90	138	2116	84	51	155
Neck Moment	X	N•m	6.0	94	15.0	127	18.9	97	7.0	73
Neck Moment	Y	N•m	60.5	68	11.9	200	24.8	96	16.0	61
Neck Moment	Z	N•m	15.7	106	9.6	158	14.3	111	6.1	169

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	7.9	78	55.7	66	6.3	93	81.9	58
Left Foot Aft	Z	G's	3.6	77	42.6	68	3.0	53	53.7	47
Left Foot Fore	Z	G's	18.3	59	78.8	67	18.7	69	80.5	48
Right Foot Aft	X	G's	9.6	98	74.8	57	14.3	83	69.2	66
Right Foot Aft	Z	G's	8.8	80	78.2	55	11.4	54	45.2	45
Right Foot Fore	Z	G's	35.4	65	94.1	56	11.7	78	63.7	61

* Driver Right Foot Front Z – Data spike at 112 msec.

UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Lower Moment	X	N•m	108.8	69	17.9	32	12.8	96	5.5	163
Left Lower Moment	Y	N•m	32.0	75	26.7	66	30.4	49	21.7	59
Left Lower Force	Z	Newtons	92	184	2916	70	91	156	3577	46
Left Upper Moment	X	N•m	81.8	68	53.4	35	36.3	96	24.1	59
Left Upper Moment	Y	N•m	31.0	157	167.2	69	46.7	54	112.9	73
Left Upper Force	Z	Newtons	150	157	2506	69	76	132	3076	46
Right Lower Moment	X	N•m	6.1	53	51.6	59	51.2	61	5.4	40
Right Lower Moment	Y	N•m	125.9	73	45.9	56	41.3	79	30.4	68
Right Lower Force	Z	Newtons	92	130	2975	50	49	140	3642	79
Right Upper Moment	X	N•m	22.1	57	50.9	94	9.9	186	49.2	59
Right Upper Moment	Y	N•m	30.0	147	159.3	58	68.6	53	125.2	68
Right Upper Force	Z	Newtons	61	147	2452	61	49	164	3605	79

DATA SHEET NO. 8...(continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	mm			26.1	94			22.8	90

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	2.3	29	46.8	81	2.1	34	65.2	92
Head CG	Y	G's	6.4	41	14.9	90	5.6	55	12.4	110
Head CG	Z	G's	23.8	76	2.5	137	34.3	75	2.0	25
Head CG	N/A	G's	51.3	77			69.5	90		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.6	154	42.7	88	1.4	177	40.9	83
Chest CG	Y	G's	2.2	108	9.7	88	4.3	75	3.8	71
Chest CG	Z	G's	9.2	67	5.1	108	12.7	91	4.4	57
Chest CG	N/A	G's	43.7	88			42.0	83		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg G's	T ¹	T ²
Head CG Redundant	354	39.9	64.2	100.2	754	53.8	73.6	109.1

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Redundant	42.7	87.1	90.1	41.8	81.9	84.9

DATA SHEET NO. 9
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

SEAT BELT PLACEMENT MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy centerline to shoulder bolt	mm	170	170
PBU - Top surface of reference to belt upper edge	mm	339	360
PBL - Top surface of reference to belt lower edge	mm	265	265

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Retractor reel to "D" ring	mm	134	134
Shoulder belt length as measured on ATD	mm	790	820
Lap belt length as measured on ATD	mm	594	605
Remainder of belt on reel	mm	1751	1639
Total belt length for continuous webbing systems	mm	3269	3198

SHOULDER BELT SPOOL-OUT DATA

Measurement Description	Units	Driver	Passenger
As determined by film analysis	mm	229	305

DATA SHEET NO. 10
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

Windshield Mounting Details:

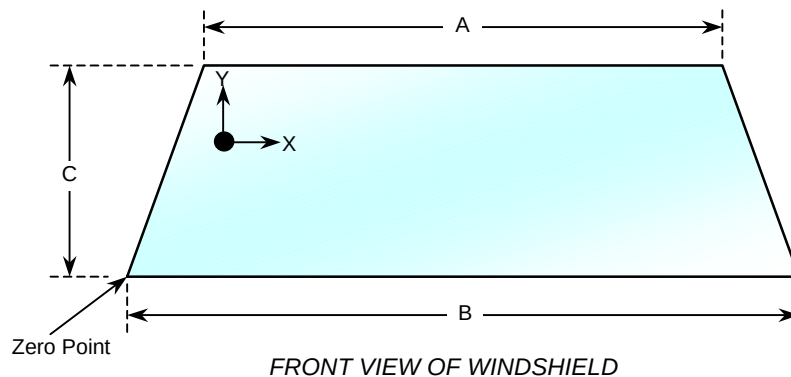
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

The standard requires that the post-test retention measurement be a minimum of 75 percent of the pretest total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles, which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 22 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2216	2216	100
Right Side	2216	2216	100
Total	4432	4432	100



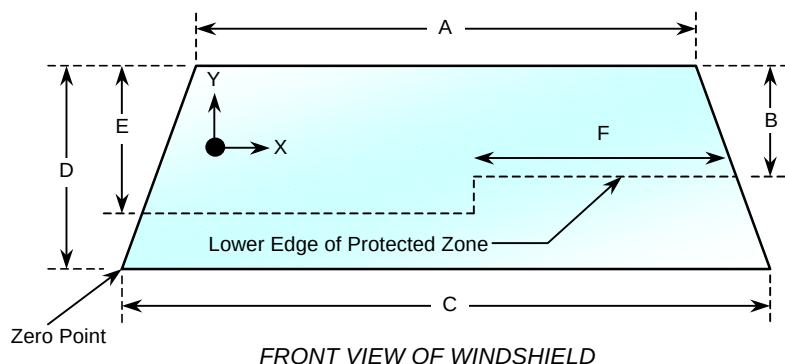
WINDSHIELD DIMENSIONS

Item	Units	Segment Length	Molding Width
A	mm	1206	19
B	mm	1484	N/A
C	mm	871	11

DATA SHEET NO. 11
WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02



Item	Units	Value
A	mm	1206
B	mm	620
C	mm	1484
D	mm	871
E	mm	624
F	mm	442

AREA OF PROTECTED ZONE FAILURES - NONE

- A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield. **None**

X	Y

- B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component. **None**

X	Y

DATA SHEET NO. 12

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

Temperature at Time of Impact: 21° C Test Time: 12:52 PM

Stoddard Solvent Spillage Measurements

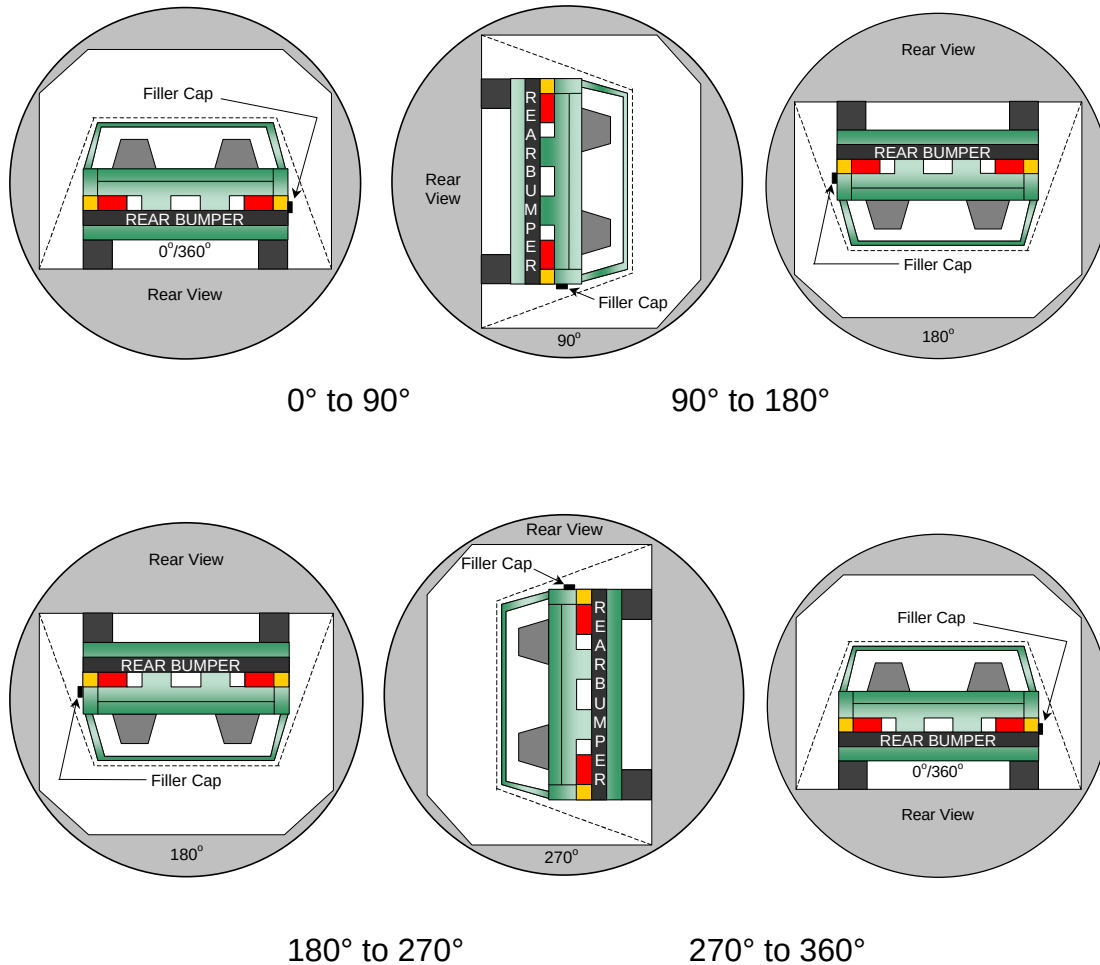
- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum Allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
 (Maximum Allowable = 1 oz./minute)
- D. Spillage : None

DATA SHEET NO. 13
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

Test Time: 12:52 PM



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage locations: None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	170	300	0
90° to 180°	151	300	0
180° to 270°	138	300	0
270° to 360°	157	300	0

DATA SHEET NO. 14
VEHICLE MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

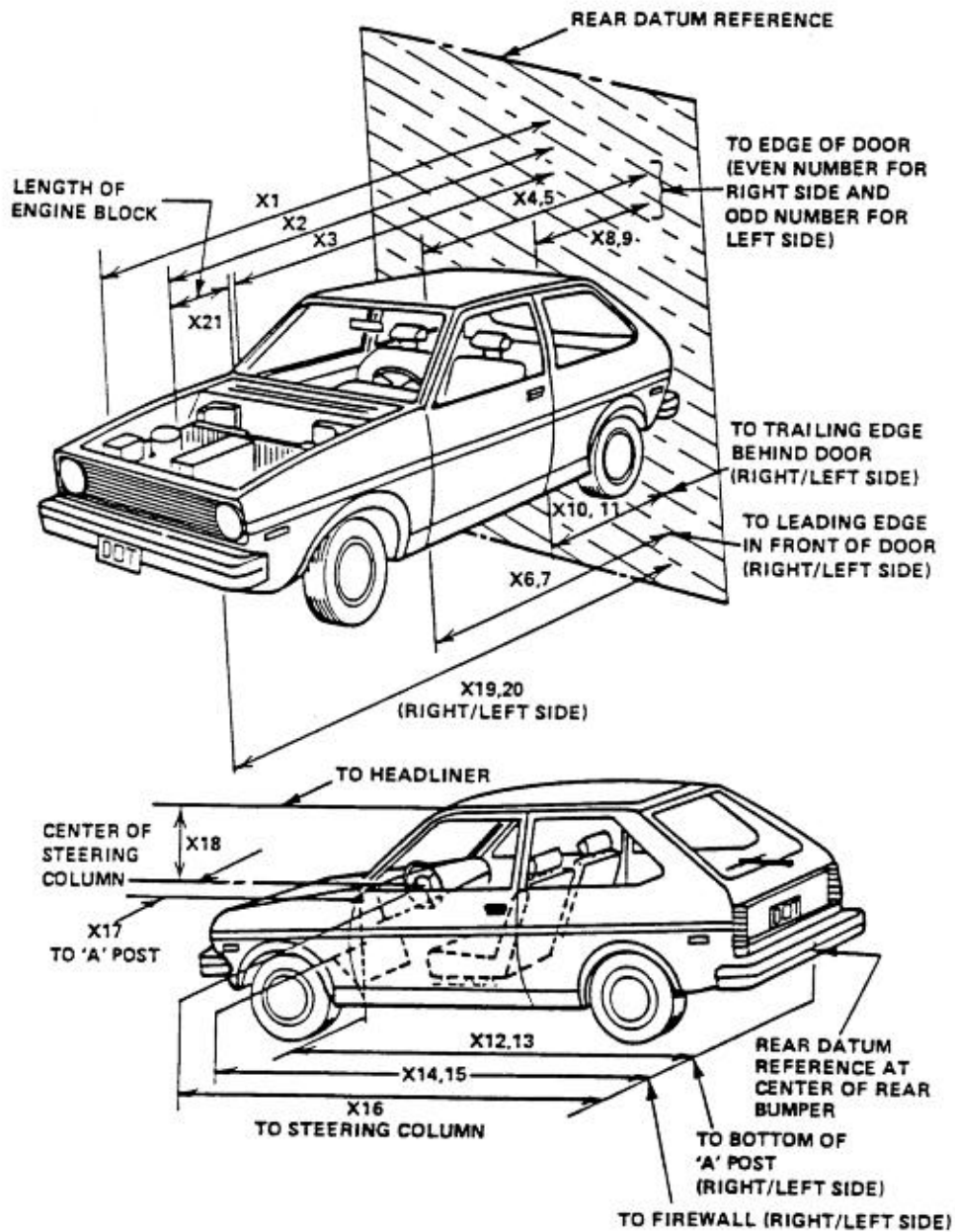
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4560	3980	580
2	RSOV to front of engine	mm	3984	3745	239
3	RSOV to firewall centerline	mm	3560	3520	40
4	RSOV to leading edge of right door	mm	3026	3035	-9
5	RSOV to leading edge of left door	mm	3026	3032	-6
6	RSOV to lower leading edge of right door	mm	3010	3009	1
7	RSOV to lower leading edge of left door	mm	3012	3010	2
8	RSOV to upper leading edge of right door	mm	1989	2000	-11
9	RSOV to upper leading edge of left door	mm	1997	1999	-2
10	RSOV to lower trailing edge of right door	mm	2021	2018	3
11	RSOV to lower trailing edge of left door	mm	2021	2018	3
12	RSOV to bottom of right 'A' pillar	mm	3008	3013	-5
13	RSOV to bottom of left 'A' pillar	mm	3009	3007	2
14	RSOV to firewall on right side	mm	3498	3482	16
15	RSOV to firewall on left side	mm	3493	3468	25
16	RSOV to steering column	mm	2648	2658	-10
17	Center of steering column to left 'A' pillar	mm	358	374	-16
18	Center of steering column to headlining	mm	408	410	-2
19	RSOV to right side of front bumper	mm	4417	3785	632
20	RSOV to left side of front bumper	mm	4416	3881	535
21	Length of engine block	mm	375	375	0
RD	RSOV to right side of dash panel	mm	2791	2809	-18
CD	RSOV to center of dash panel	mm	2802	2820	-18
LD	RSOV to left side of dash panel	mm	2795	2792	3

DATA SHEET NO. 14...(continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02



DATA SHEET NO. 15
CAMERA LOCATIONS

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				18	32
2	Left Front View	1000	-8000	1430	25	1010
3	Steering Column Top	2000	-8170	1560	25	1010
4	Steering Column Bottom	2000	-8170	1030	25	1010
5	Driver Close-up	1500	-8580	1320	50	**
6	Driver Angle	4680	-5070	2030	50	1000
7	Onboard Driver				13	1015
8	Onboard Passenger				13	1005
9	Right Overall	1966	6748	1375	13	909
10	Right Passenger Half	1101	7431	1338	25	957
11	Right Close-up	1419	10186	1333	25	1042
12	Right Angle	4869	5552	2120	50	1000
13	Windshield	-700	0	2650	13	1005
14	Top Driver	90	-430	1745	13	1064
15	Top Passenger	90	460	1745	13	1010
16	Pit Front	1000	0	-3220	13	1005
17	Pit Rear	2730	0	-3220	13	1015

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

+Z = film plane above ground level

** No timing marks

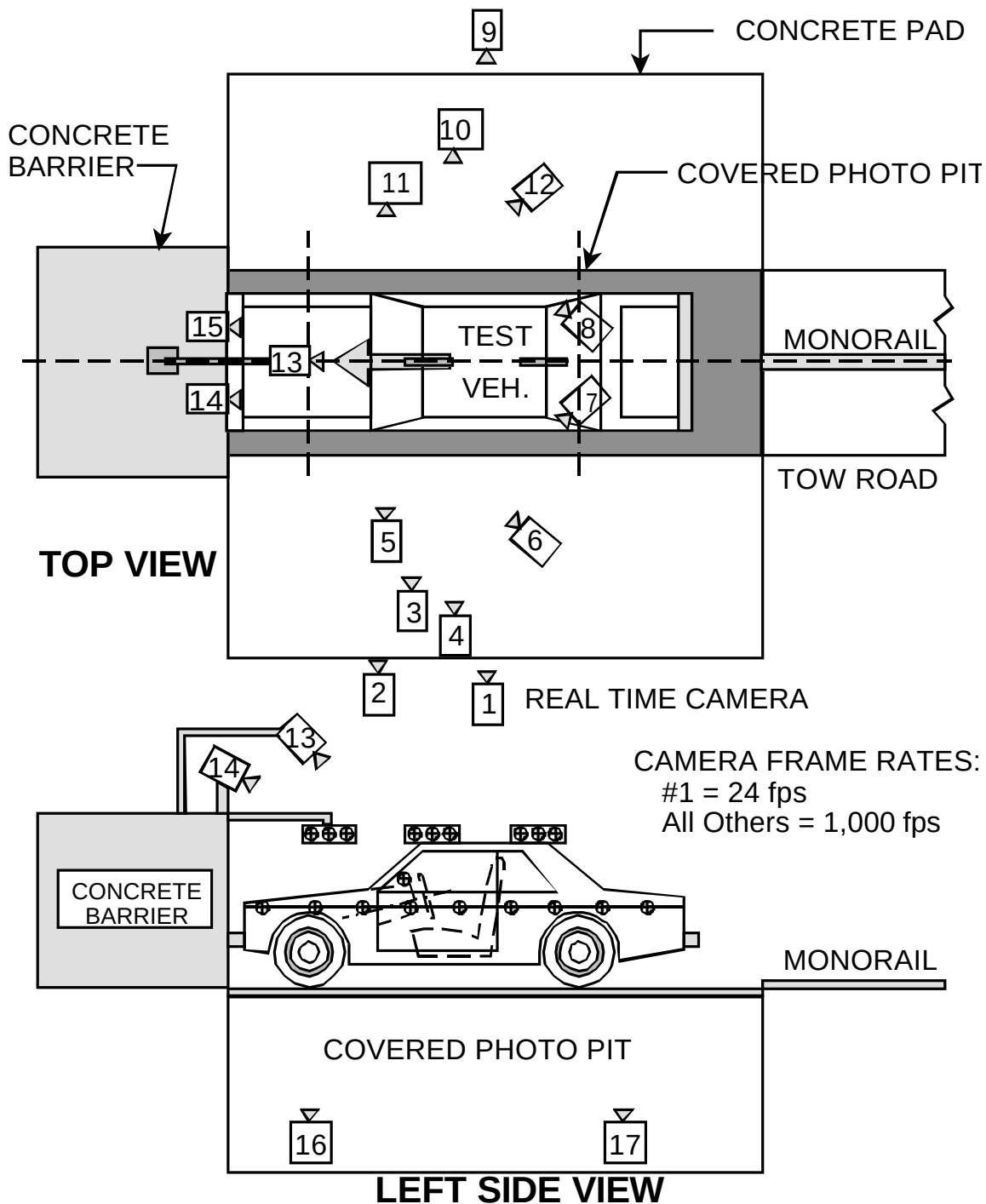
DATA SHEET NO. 15...(continued)

CAMERA LOCATIONS

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

CAMERA POSITIONS FOR FRONTAL IMPACTS

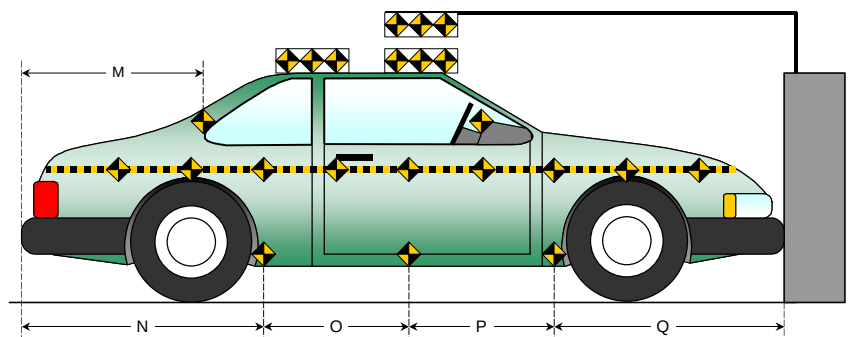
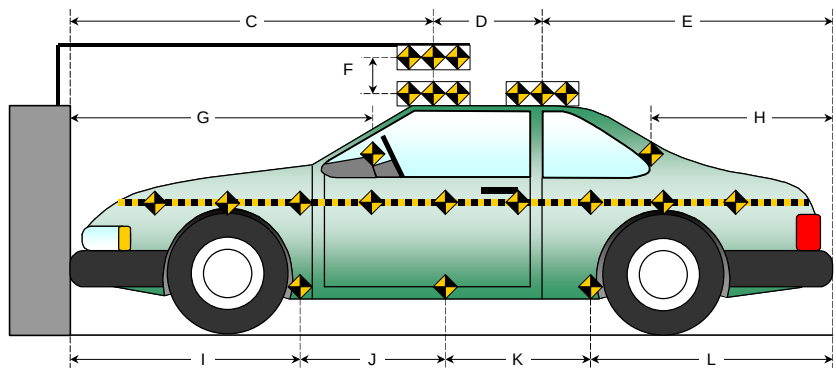
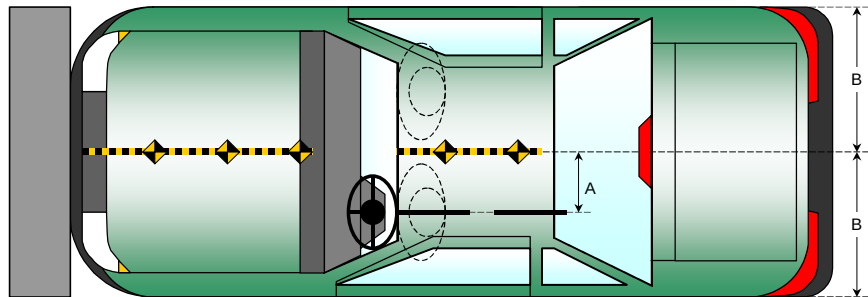


DATA SHEET NO. 16
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

Item	Value
A	370
B	882
C	2375
D	610
E	1575
F	139
G	1782
H	905
I	1435
J	876
K	881
L	1368
M	905
N	1377
O	880
P	877
Q	1426



DATA SHEET NO. 17
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

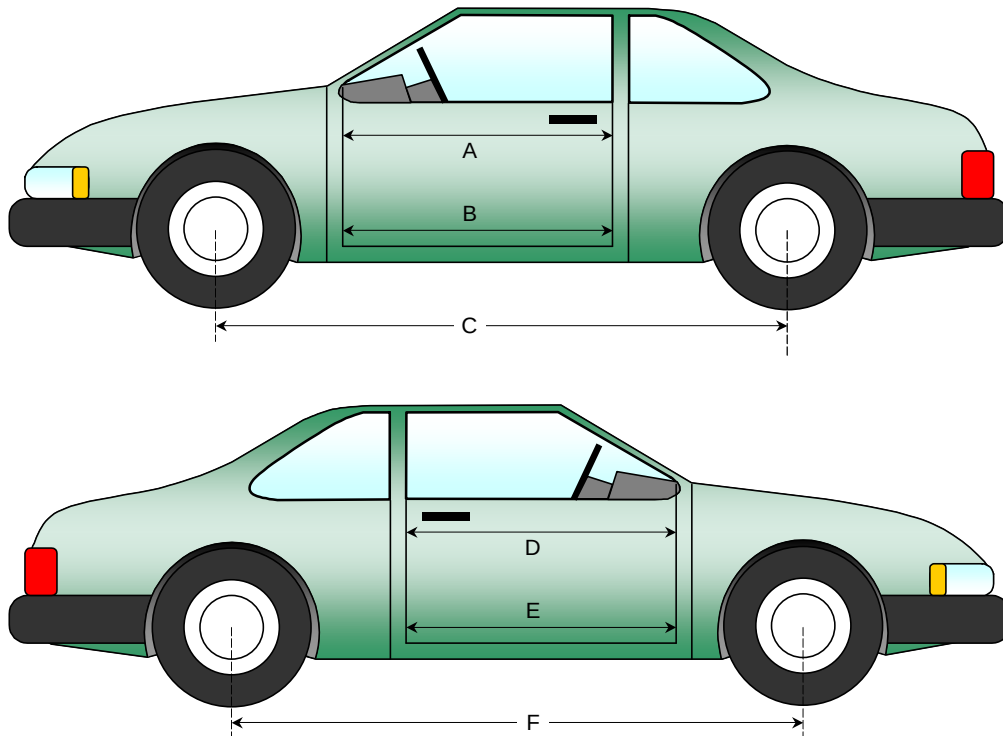
NHTSA No.: M20108
 Test Date: 3/19/02

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	938	938	0
B	Left Side Lower	mm	860	858	2
D	Right Side Upper	mm	940	940	0
E	Right Side Lower	mm	858	858	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2712	2636	76
F	Right Side Wheelbase	mm	2712	2603	109



DATA SHEET NO. 17...(continued)
VEHICLE INTRUSION MEASUREMENTS

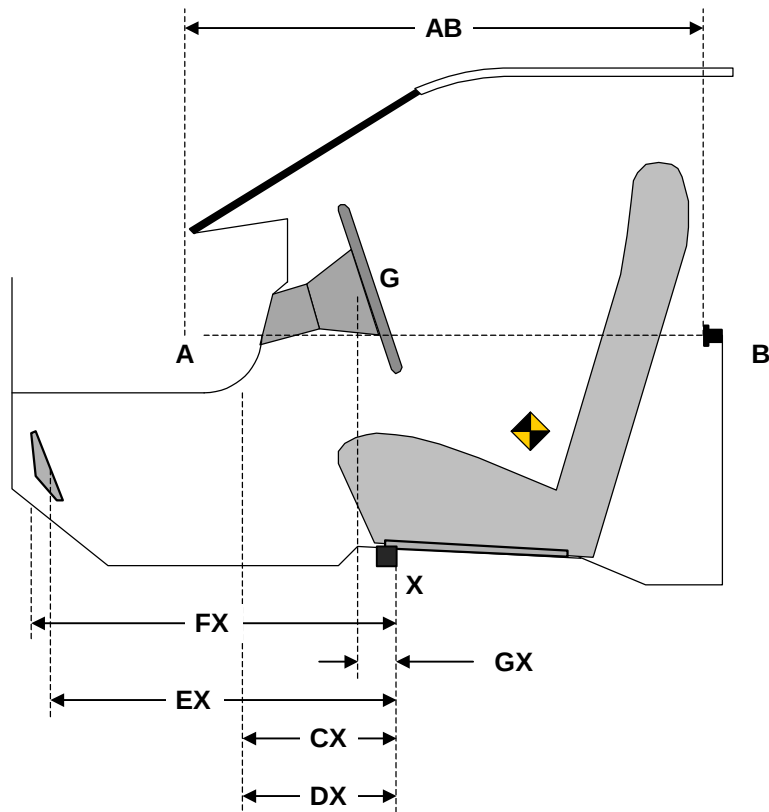
Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	912	912	0
CX	Left Knee Bolster to X	mm	311	282	29
DX	Right Knee Bolster to X	mm	315	296	19
EX	Brake Pedal to X	mm	595	517	78
FX	Foot Rest to X	mm			
GX	Center of Steering Column Wheel Hub to X	mm	155	174	-19

X = Left Front Seat Front Outboard Anchor Bolt Head



DRIVER COMPARTMENT

DATA SHEET NO. 17...(continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

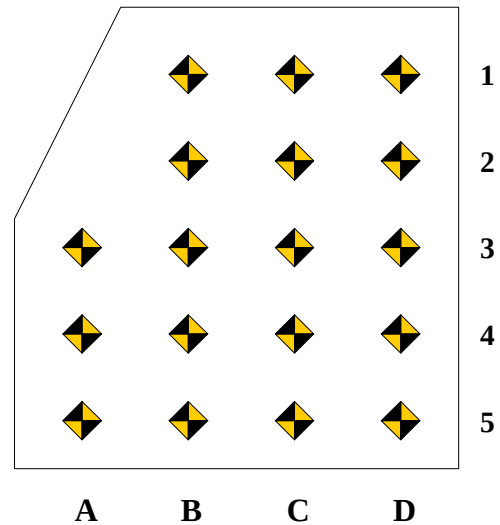
NHTSA No.: M20108
 Test Date: 3/19/02

Measurement reference point for X and Z axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4, and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



DRIVER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		665	675	678		646	655	637		19	20	41
2		575	587	590		565	578	575		10	9	15
3	475	476	475	475	475	475	474	472	0	1	1	3
4	385	385	385	380	383	383	381	380	2	2	4	0
5	277	280	275	272	277	278	276	275	0	2	-1	-3

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-25	-52	-50		-10	-42	-31		-15	-10	-19
2		-100	-122	-120		-89	-117	-124		-11	-5	4
3	-136	-133	-136	-136	-136	-142	-150	-139	0	6	14	3
4	-131	-131	-131	-133	-122	-128	-130	-124	-9	-3	-1	-9
5	-127	-132	-131	-132	-116	-126	-130	-127	-11	-6	-1	-5

DATA SHEET NO. 17...(continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

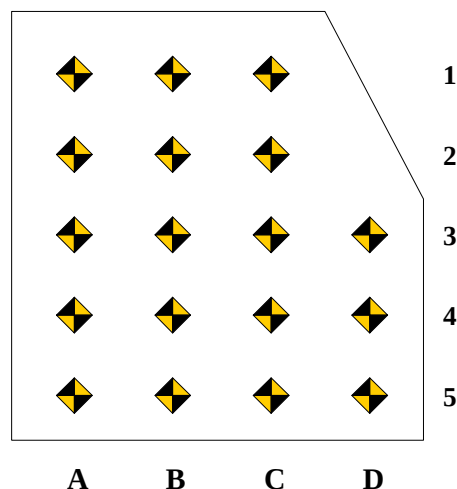
NHTSA No.: M20108
 Test Date: 3/19/02

Measurement reference point for X and Z axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3, 4, and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



PASSENGER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	665	671	669		635	652	653		30	19	16	
2	582	587	590		569	575	580		13	12	10	
3	489	482	485	481	489	480	482	480	0	2	3	1
4	381	378	380	377	380	378	377	377	1	0	3	0
5	282	282	280	275	278	280	276	274	4	2	4	1

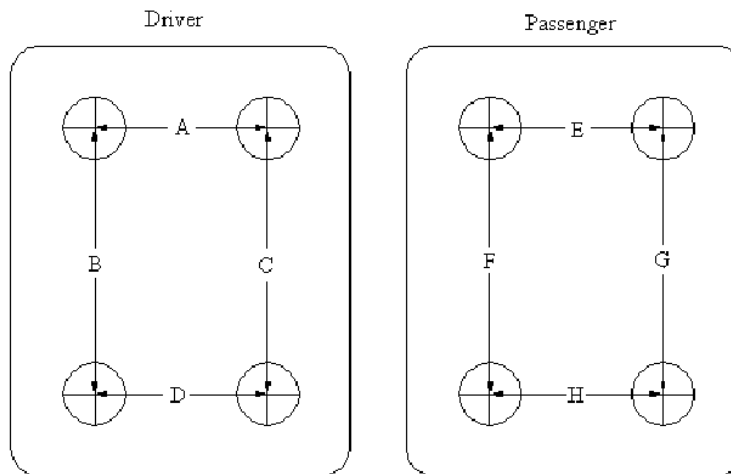
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-42	-42	-42		-23	-26	-22		-19	-16	-20	
2	-104	-105	-98		-100	-97	-86		-4	-8	-12	
3	-144	-144	-144	-139	-162	-150	-144	-132	18	6	0	-7
4	-140	-138	-135	-131	-150	-136	-129	-118	10	-2	-6	-13
5	-143	-139	-133	-128	-149	-138	-127	-114	6	-1	-6	-14

DATA SHEET NO. 17...(continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02



UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	268	256	12
B	354	346	8
C	333	331	2
D	258	257	1
E	272	269	3
F	277	276	1
G	296	295	1
H	254	246	8

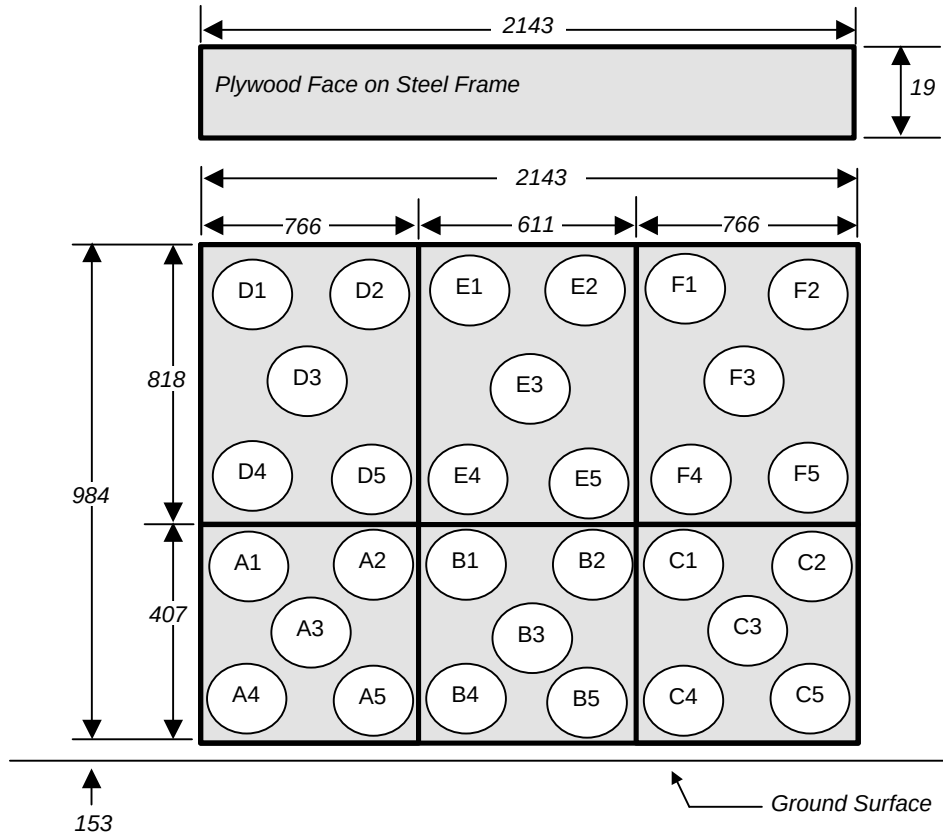
DATA SHEET NO. 18

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2002/Saturn/Vue/4 door
 Test Program: NCAP

NHTSA No.: M20108
 Test Date: 3/19/02

30 Load Cell Rigid Barrier Load Cell Locations on Fixed Barrier



Group 4 D1-D5	Group 5 E1-E5	Group 6 F1-F5
Group 1 A1-A5	Group 2 B1-B5	Group 3 C1-C5

6 Groups of 5 Load Cells Each

The Data is presented in Appendix B with the following requirements:

1. Sum data from 6 groupings shown above (5 cells/group)
2. Sum of left 2 groupings, center 2 groupings and right 2 groupings.
3. Total or sum of all 30 individual load cells.
4. Total versus average rear seat crossmember displacement.

DATA SHEET NO. 19**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02

VEHICLE INFORMATION

VIN: 5GZCZ63B52S808465 Wheelbase (mm) : 2712
Vehicle Size Category: SUV Test Weight (kg) : 1802.5

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 13
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.3
Velocity Change (km/h): 68.3 Time of Separation (msec): 129

CRUSH PROFILE

Collision Deformation Classification: frontal Midpoint of Damage: centerline
Damage Region Length (mm): 1313 Impact Mode: frontal

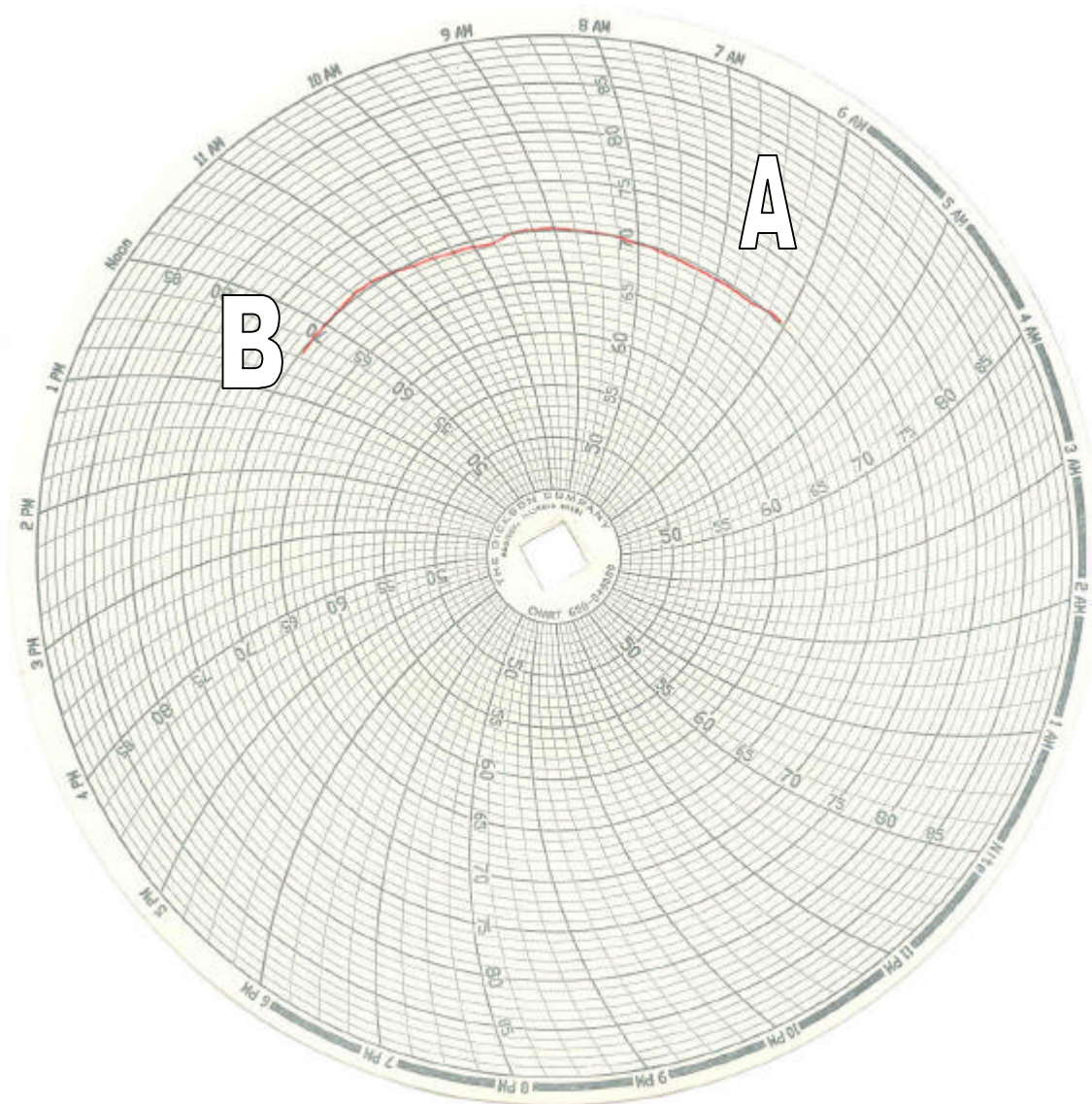
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4416	3881	535
C2	Crush zone 2 at left side	mm	4528	3961	567
C3	Crush zone 3 at left side	mm	4559	3978	581
C4	Crush zone 4 at right side	mm	4560	3974	586
C5	Crush zone 5 at right side	mm	4528	3947	581
C6	Crush zone 6 at right side	mm	4417	3785	632

DATA SHEET NO. 20

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2002/Saturn/Vue/4 door
Test Program: NCAP

NHTSA No.: M20108
Test Date: 3/19/02



A = Dummies installed in vehicle at 7:00 a.m.

B = Test conducted at 12:52 p.m.

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle

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Pre-Test Rear View of Test Vehicle



Post-Test Rear View of Test Vehicle



Pre-Test Left Side View of Test Vehicle

A-6.



Post-Test Left Side View of Test Vehicle



Pre-Test Left Rear Three-Quarter View of Test Vehicle



Post-Test Left Rear Three-Quarter View of Test Vehicle



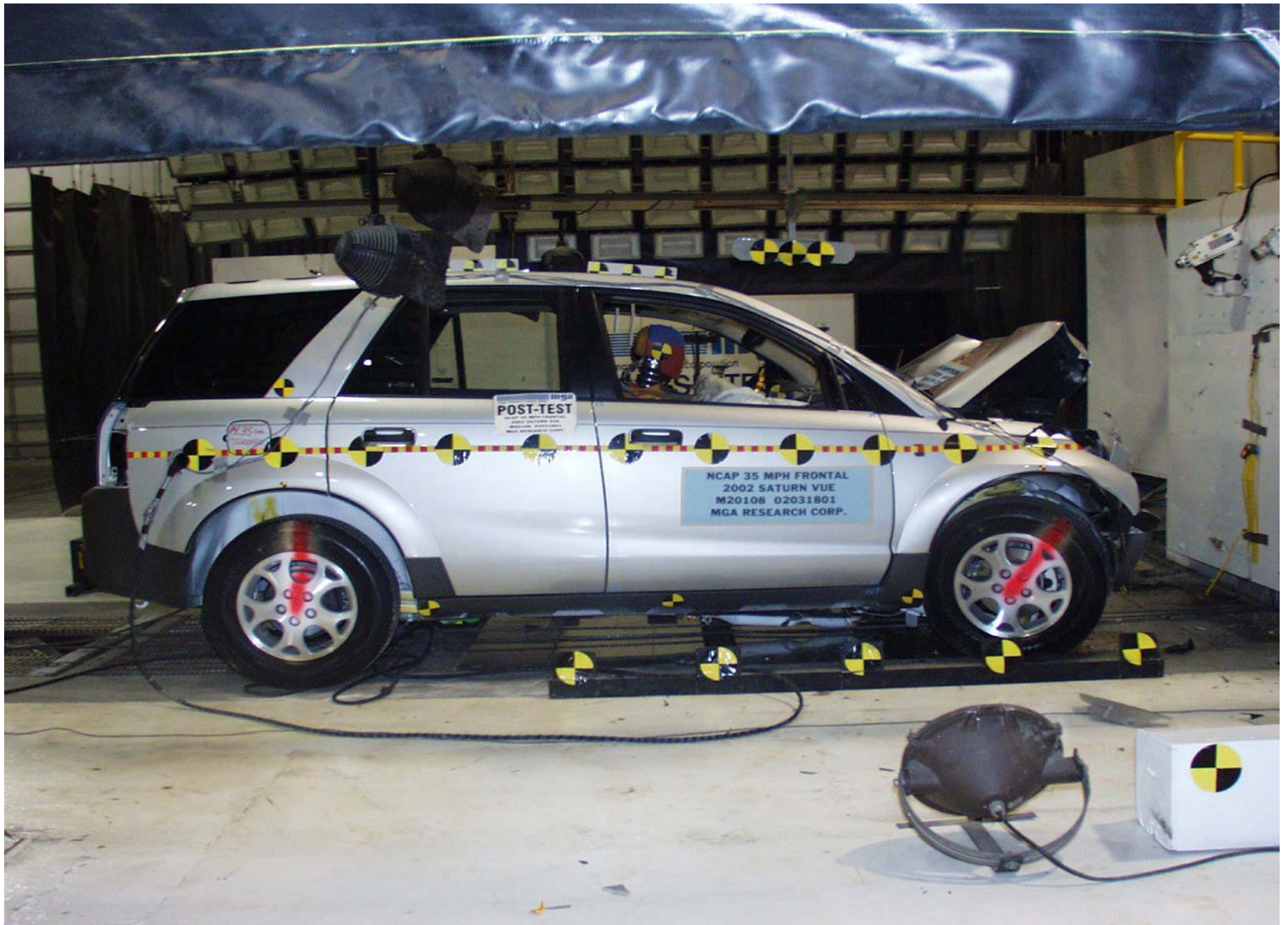
Pre-Test Right Front Three-Quarter View of Test Vehicle



Post-Test Right Front Three-Quarter View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



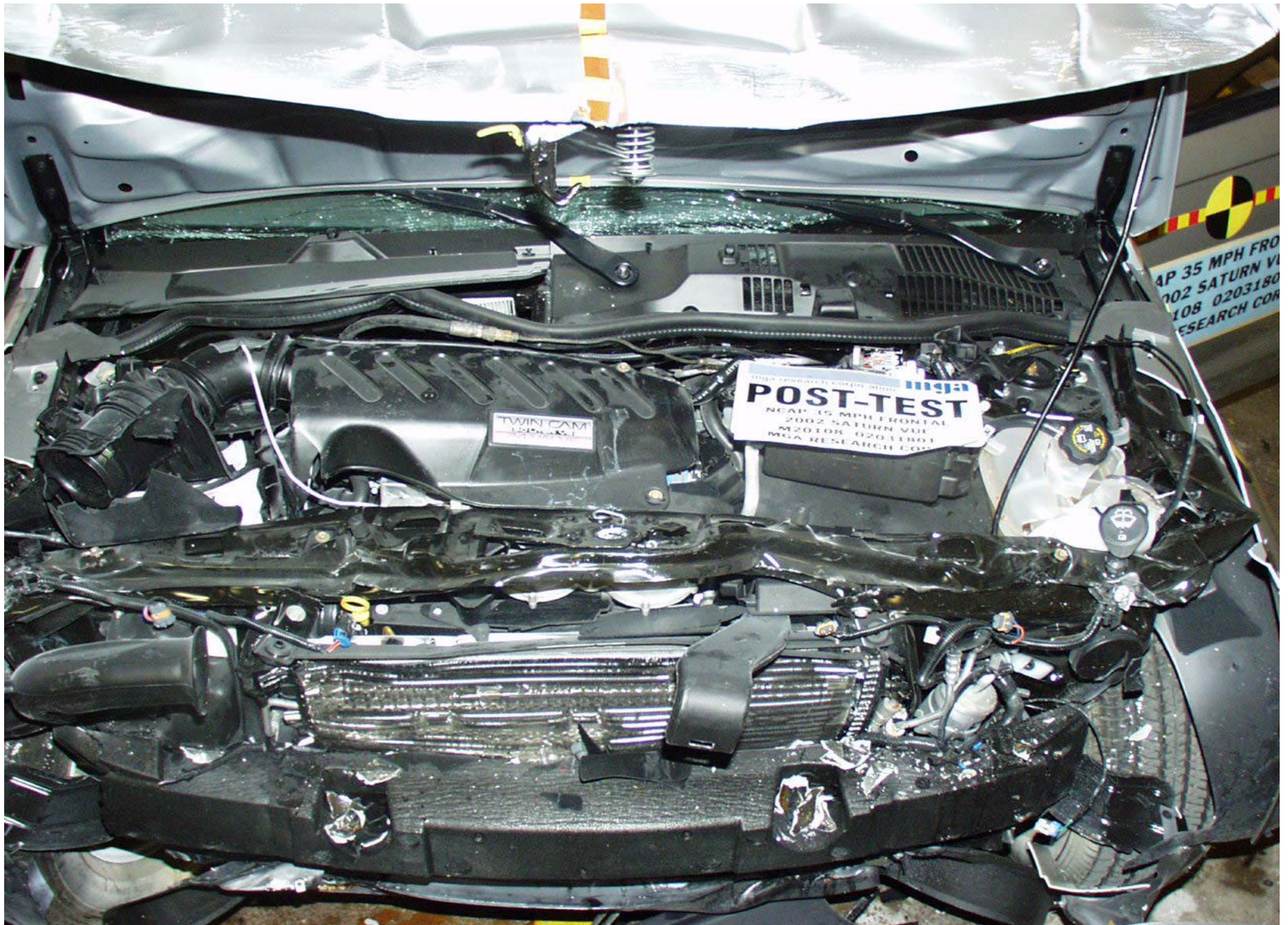
Post-Test Right Side View of Test Vehicle



Pre-Test Fuel Filler Cap View



Pre-Test Engine Compartment View



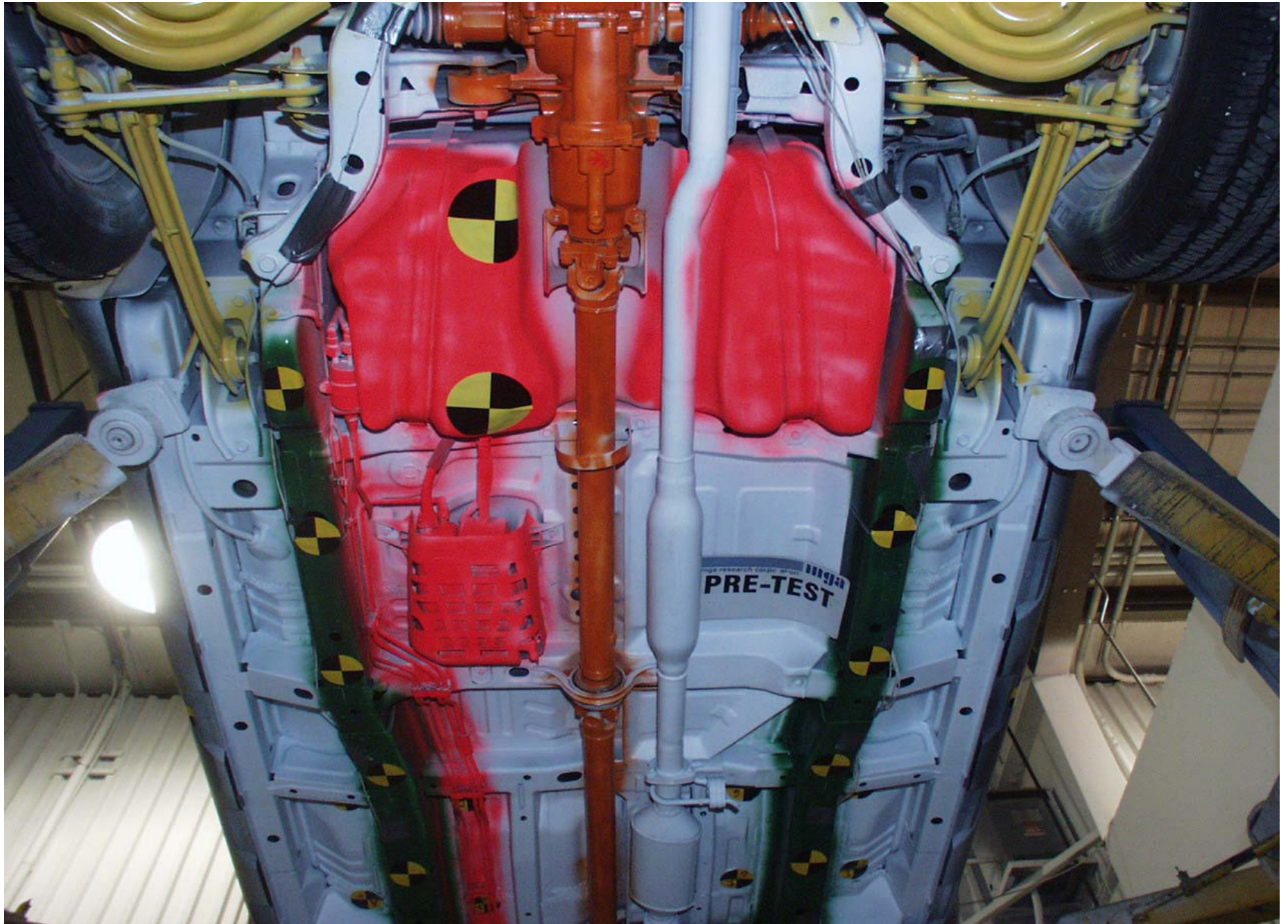
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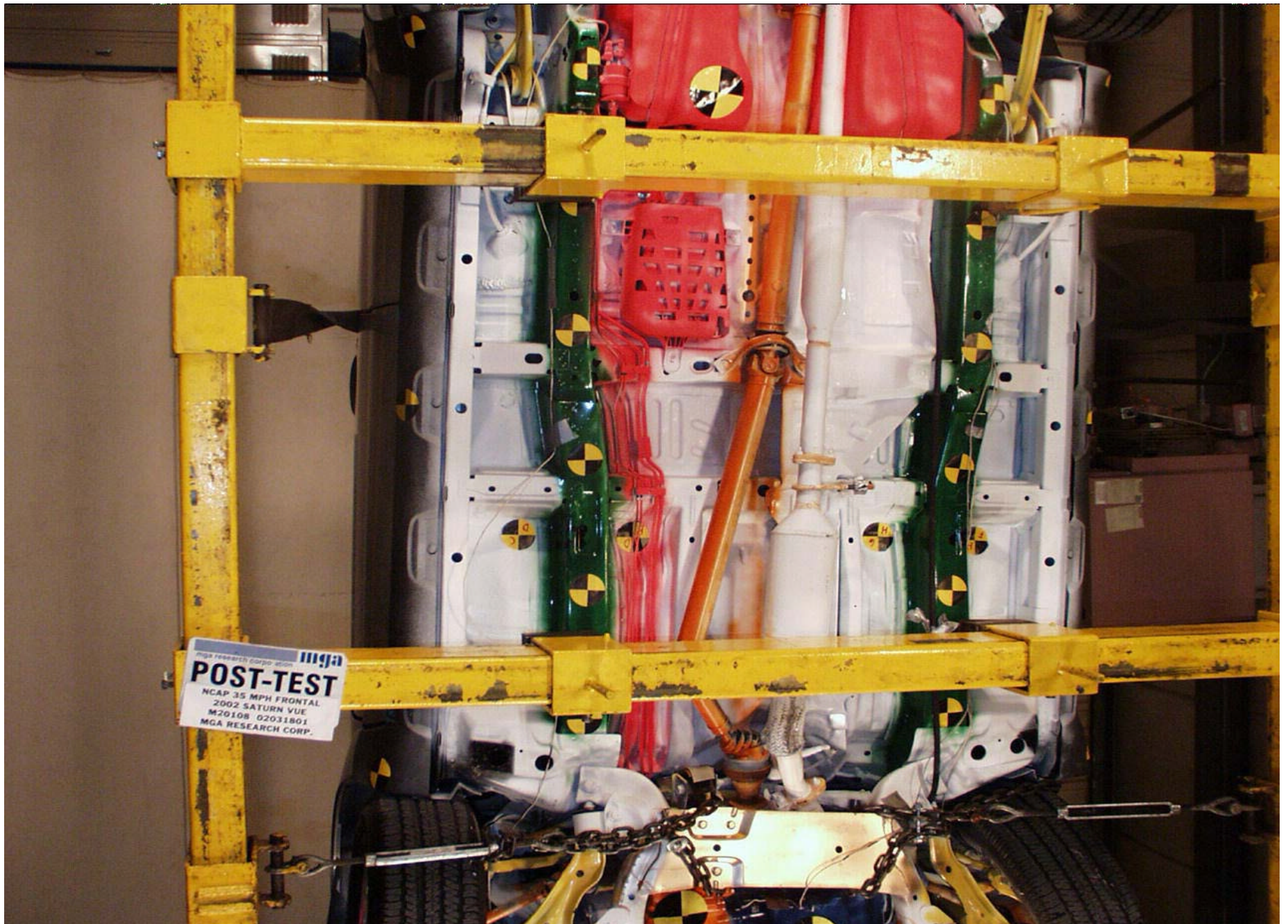
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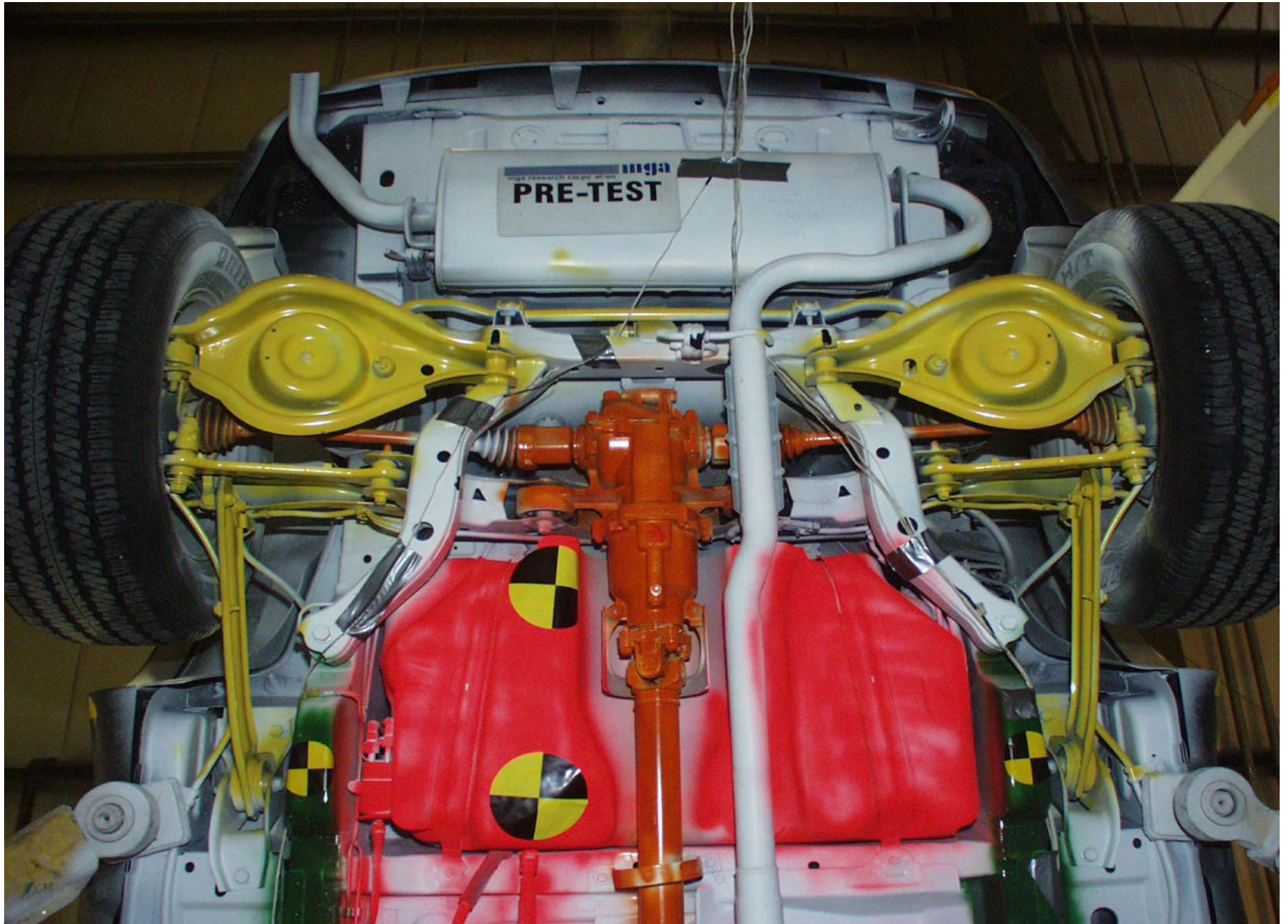
Post-Test Front Underbody View



Pre-Test Mid Underbody View



Post-Test Mid Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Driver Position Left Side View



Post-Test Driver Position Left Side View



Pre-Test Driver Position Left Side View (Door Open)



Post-Test Driver Position Left Side View (Door Open)



Pre-Test Driver Seat Position View



Post-Test Driver Seat Position View

Pre-Test Driver Knee Position View



Post-Test Driver Knee Position View



Post-Test Driver Airbag Contact



Post-Test Driver Head Contact (headrest)



Post-Test Driver Knee Contact

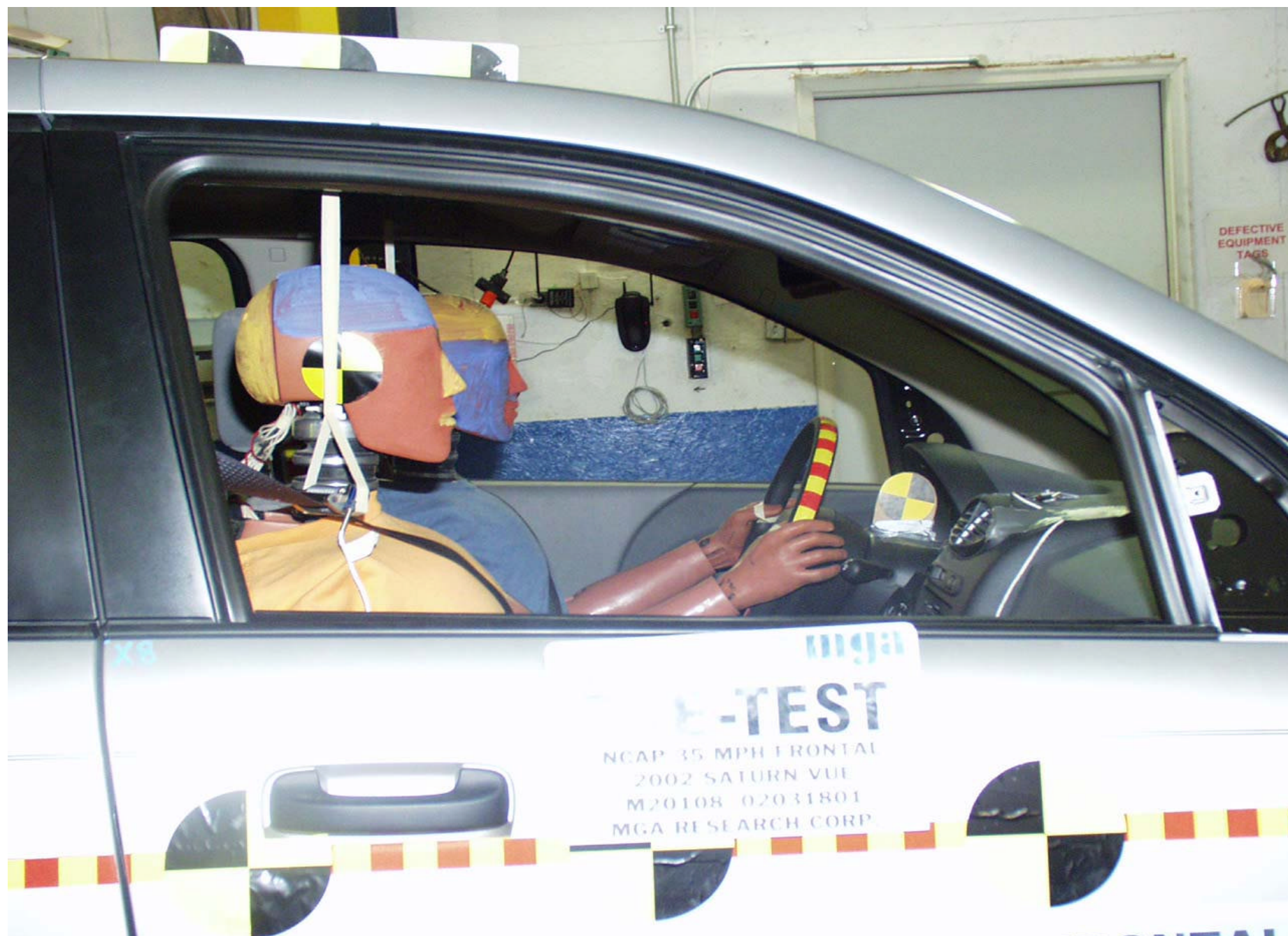


Pre-Test Driver Windshield View



Post-Test Driver Windshield View

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Pre-Test Passenger Position Right Side View



Post-Test Passenger Position Right Side View



Pre-Test Passenger Position Right Side View (Door Open)



Post-Test Passenger Position Right Side View (Door Open)



Pre-Test Passenger Seat Position View



Post-Test Passenger Seat Position View



Pre-Test Passenger Knee Position View



Post-Test Passenger Knee Position View



Post-Test Passenger Airbag Contact



Post-Test Passenger Head Contact (headrest)



Post-Test Passenger Knee Contact



Pre-Test Passenger Windshield View



Post-Test Passenger Windshield View


MFD BY SATURN CORPORATION
02/02

GVWR	GAWR FRT	GAWR RR
1991KG(4390LB)	1048KG(2311LB)	0943KG(2079LB)

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

5GZCZ63B52S808465
TYPE: M.P.V.
MODEL: ZLE26

LPRD	TIRE SIZE	SPEED RTG	RIM	COLD TIRE PRESSURE
FRT	P235/65R16	S	16X6.5J	210KPA(30PSI)
RR	P235/65R16	S	16X6.5J	210KPA(30PSI)
SPA	T155/90D16	M	16X4T	420KPA(60PSI)

SEE OWNER'S MANUAL FOR MORE INFORMATION.



Vehicle Impact

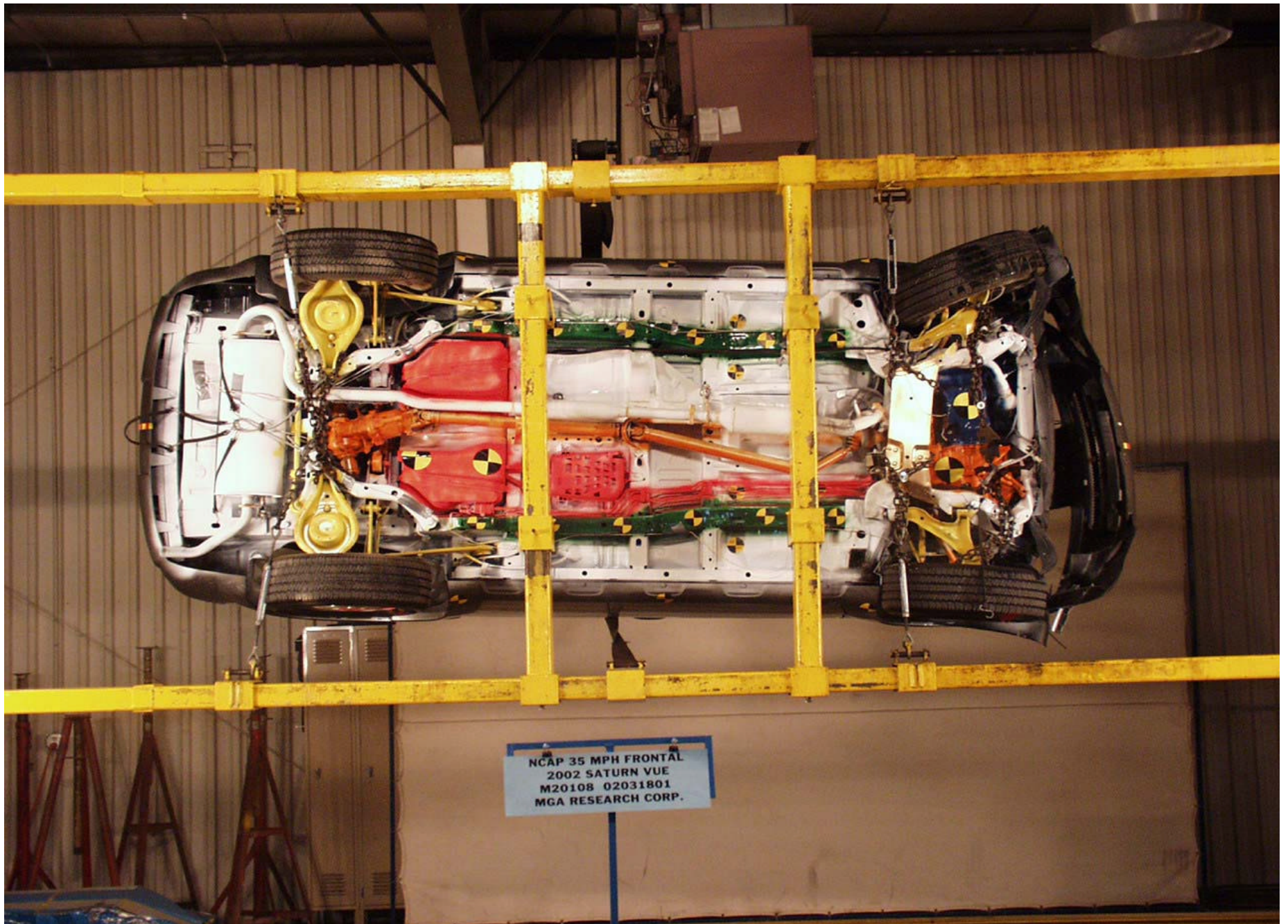


Rollover 90 Degrees



Rollover 180 Degrees

A-54.



Rollover 270 Degrees



Rollover 360 Degrees

APPENDIX B

DUMMY AND VEHICLE RESPONSE DATA TRACES

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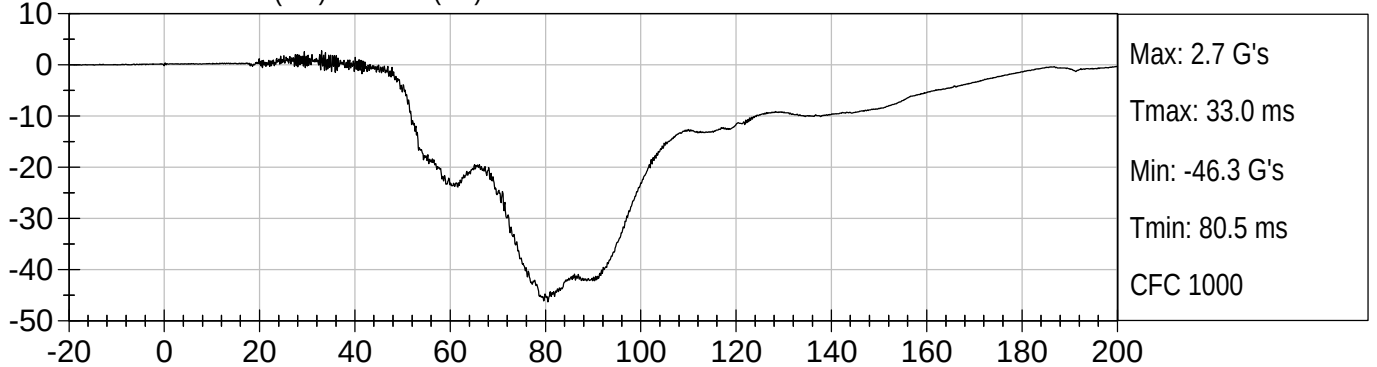
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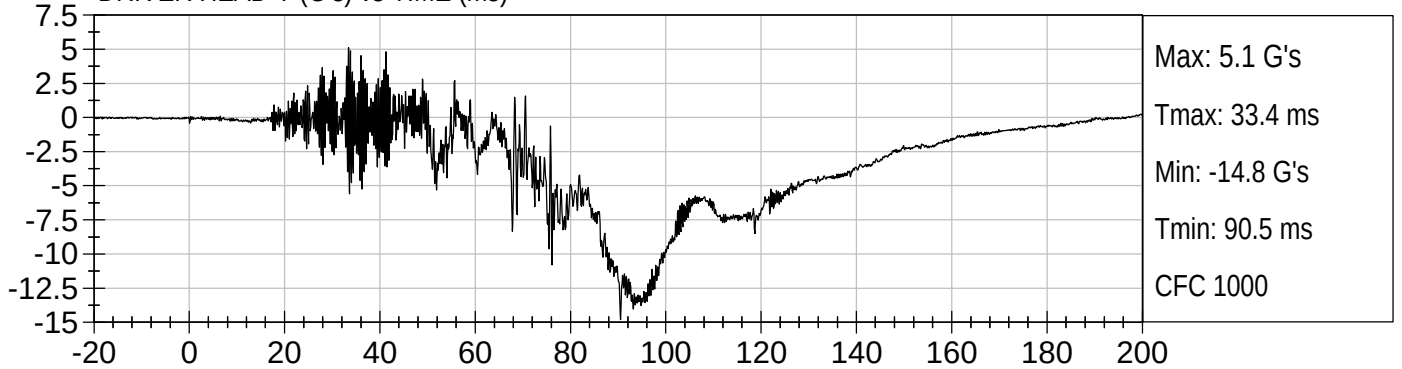
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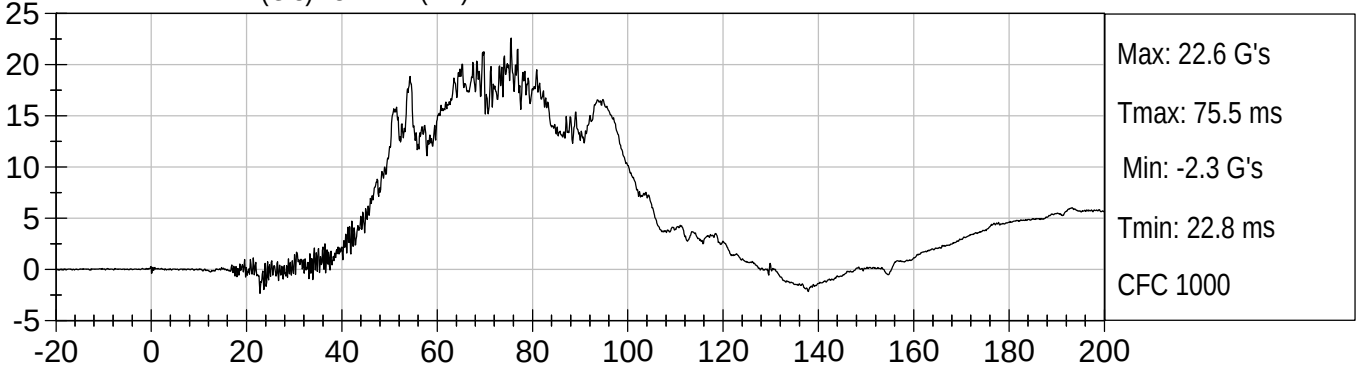
DRIVER HEAD X (G's) vs TIME (ms)



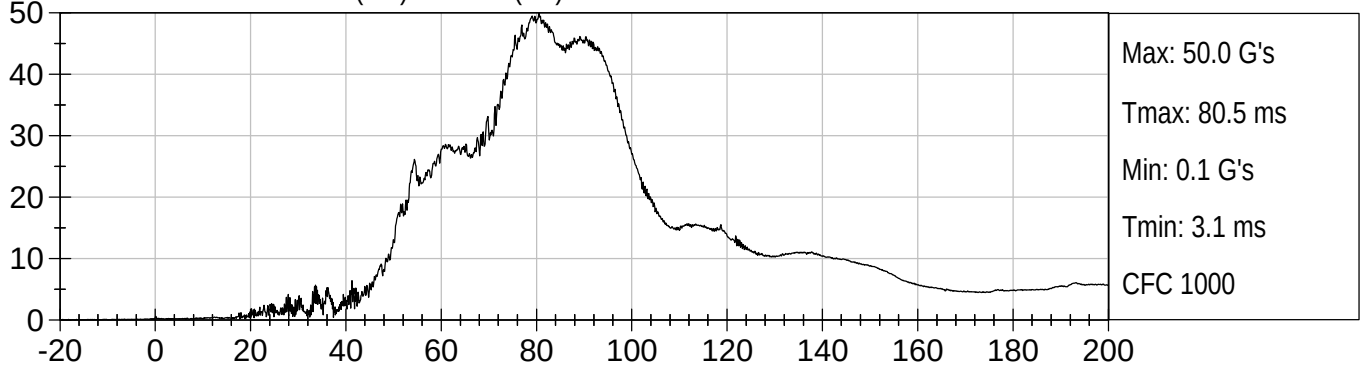
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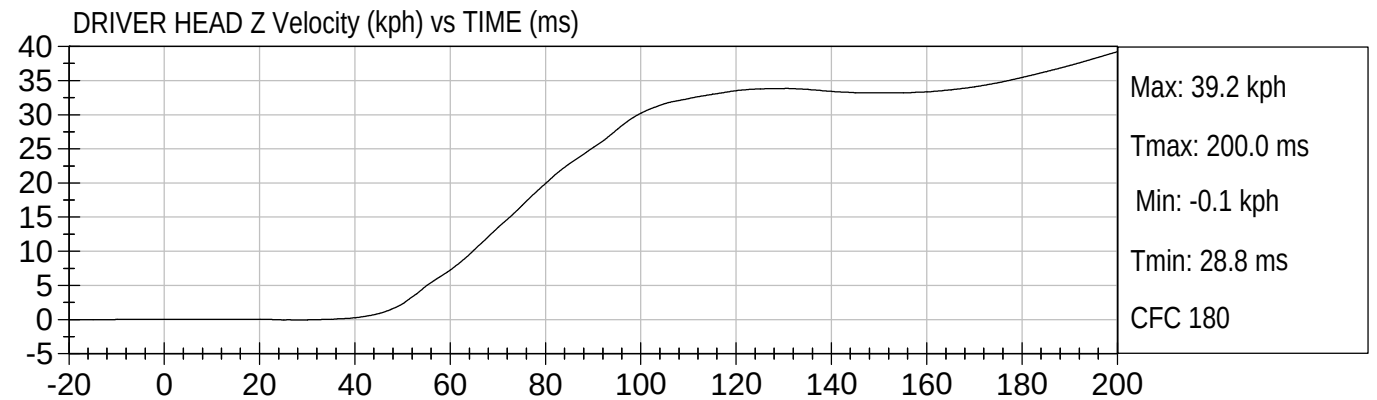
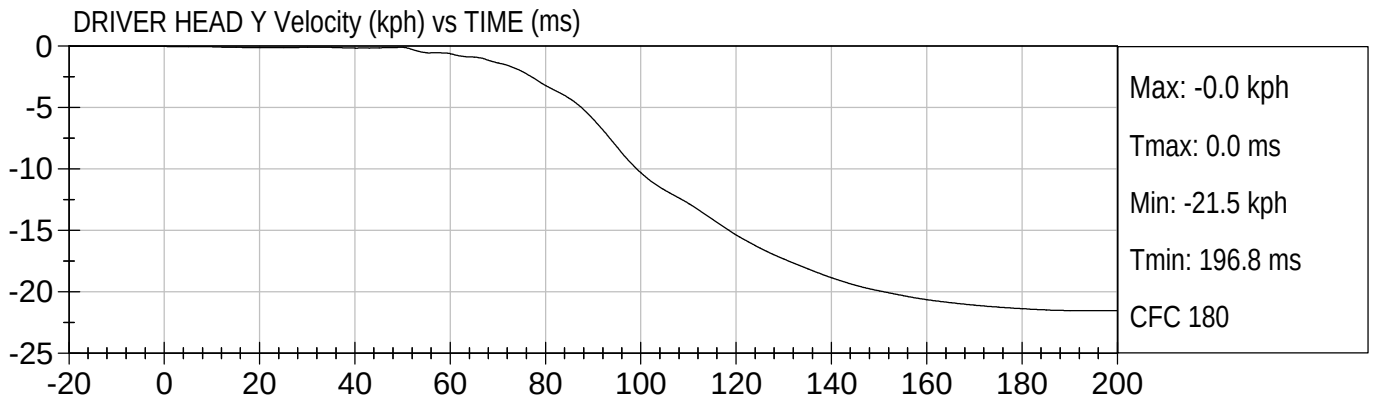
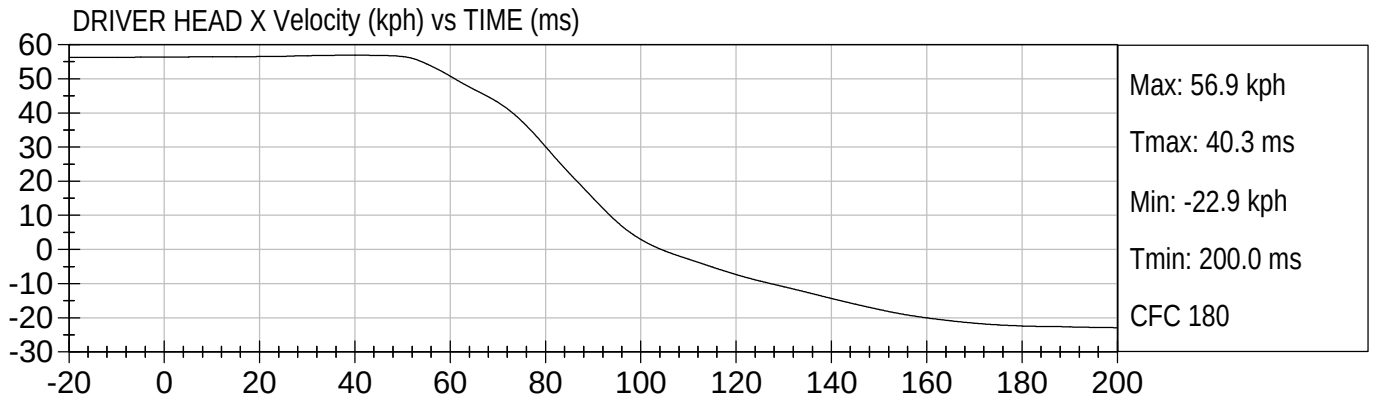


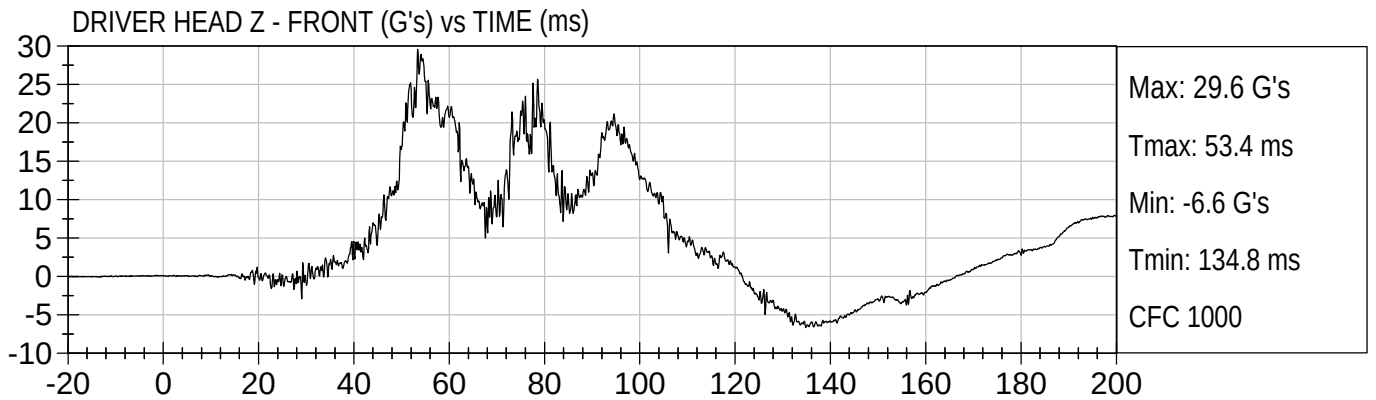
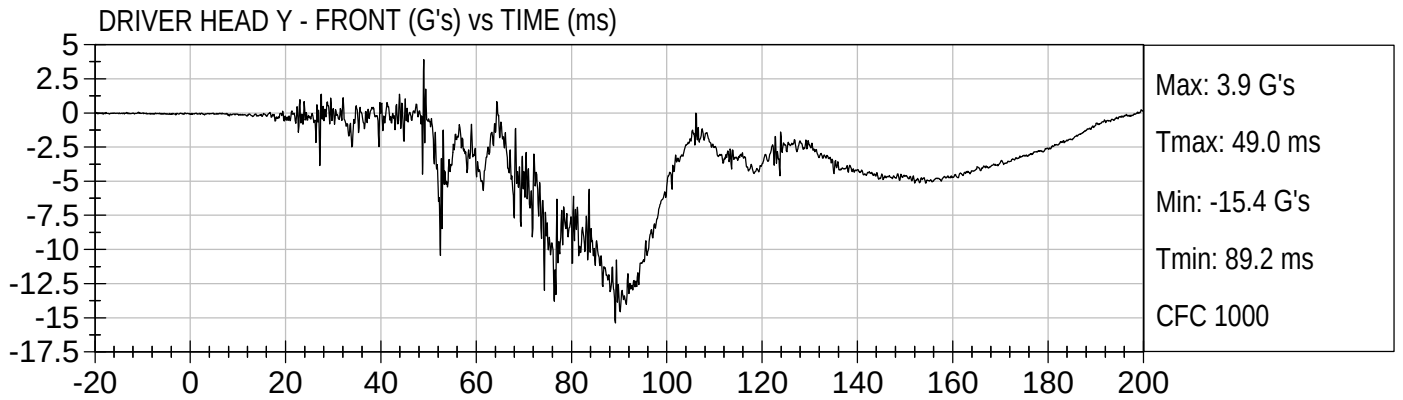
DRIVER HEAD Z (G's) vs TIME (ms)

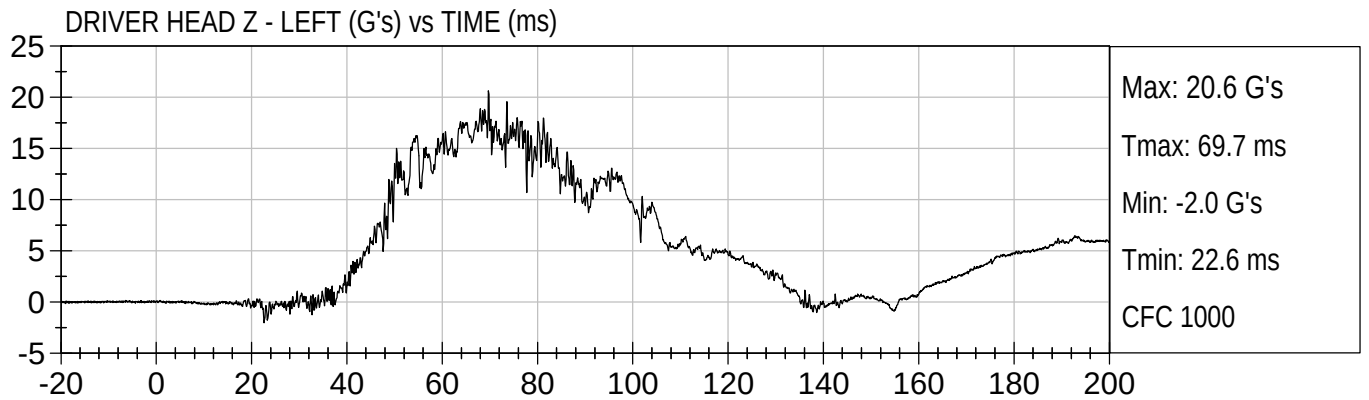
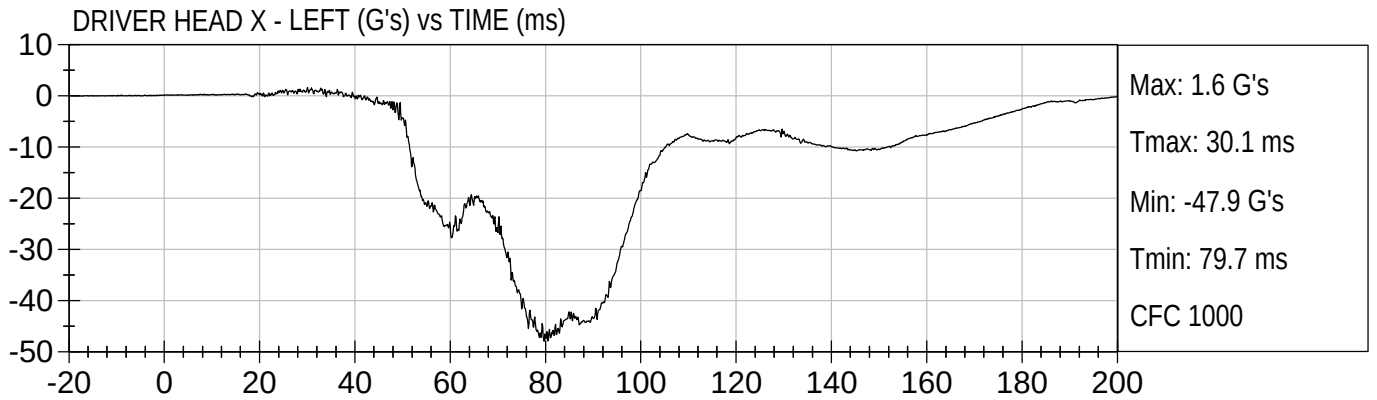


DRIVER HEAD Resultant (G's) vs TIME (ms)



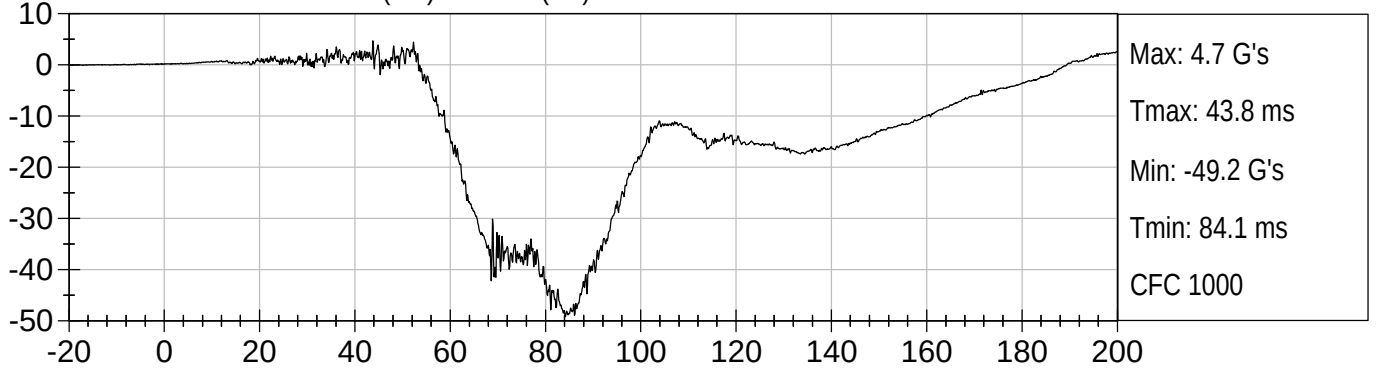




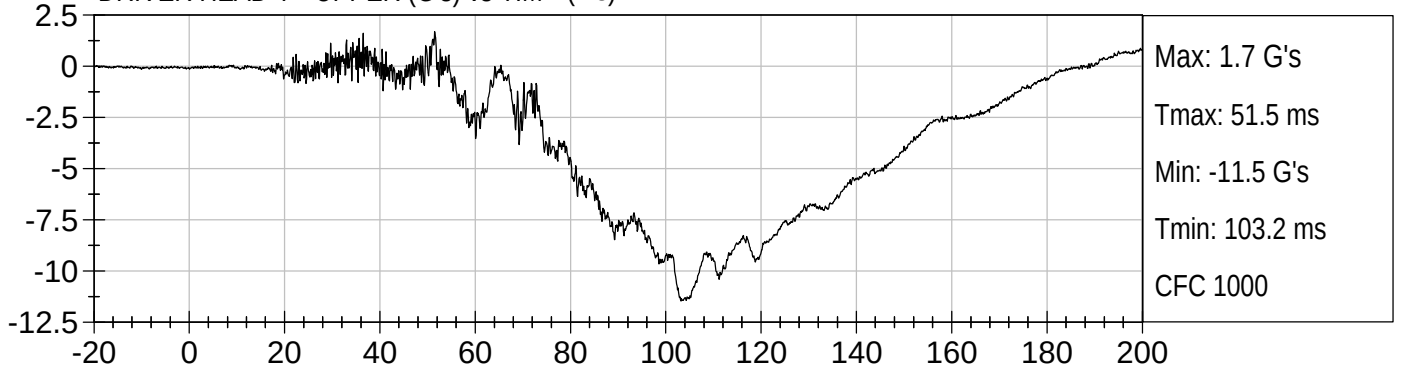


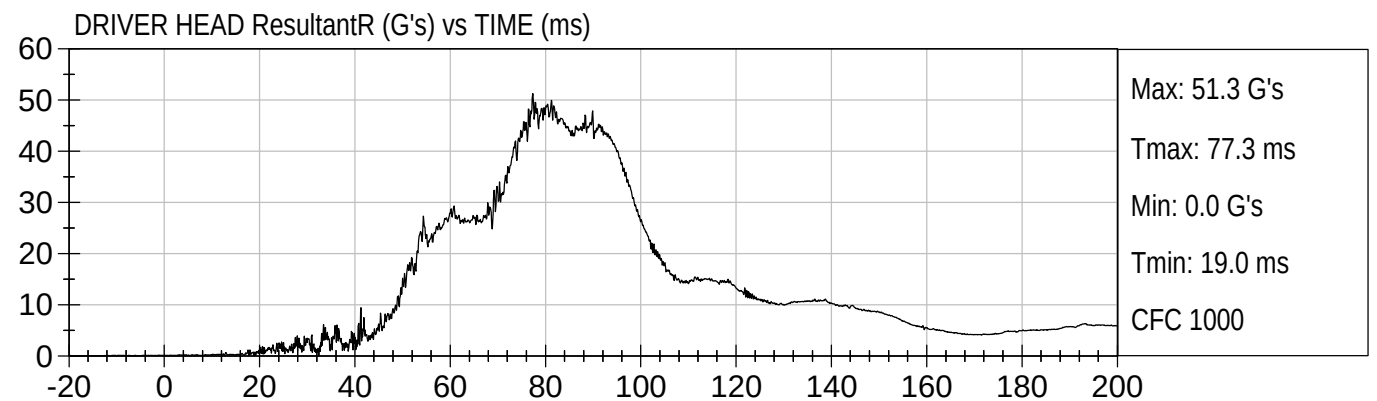
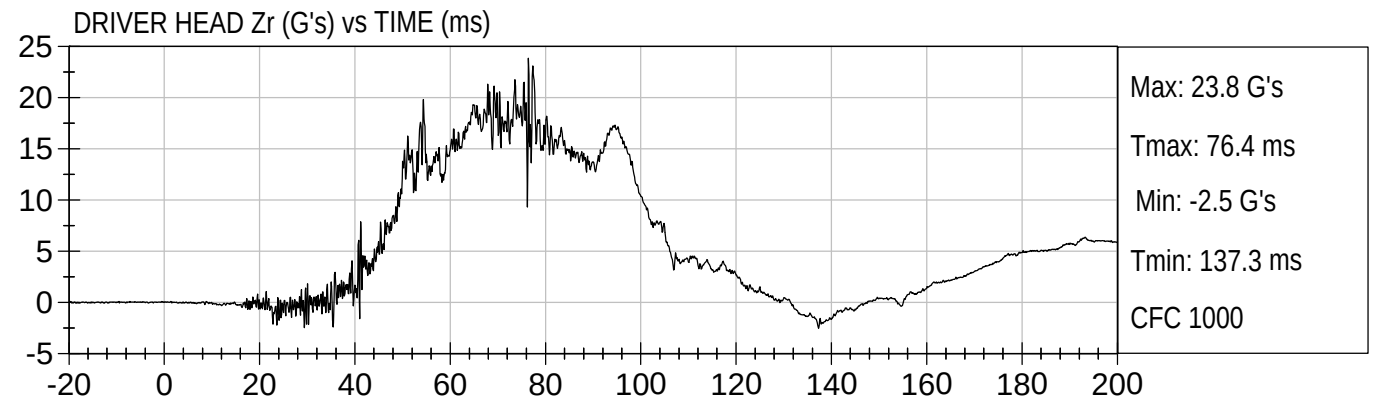
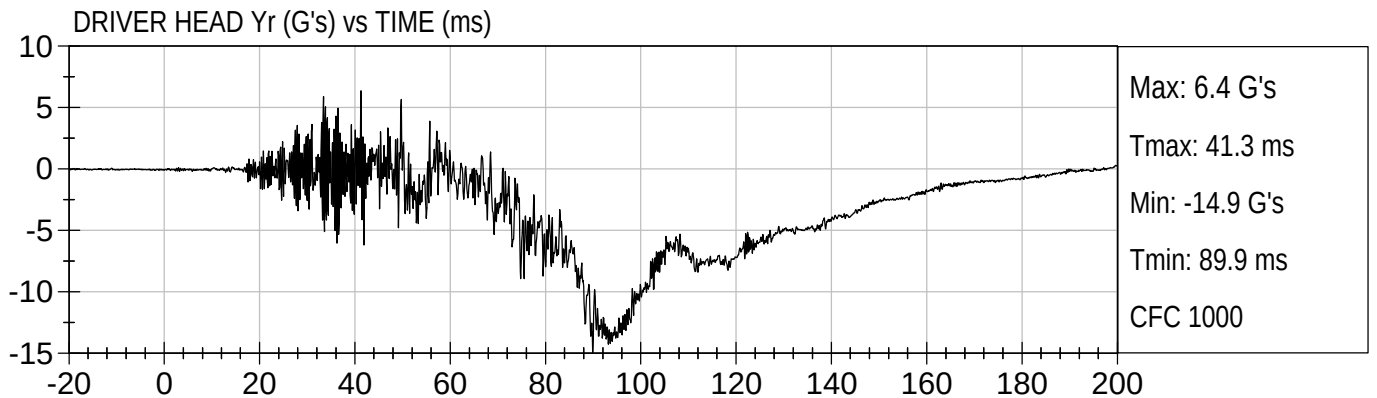
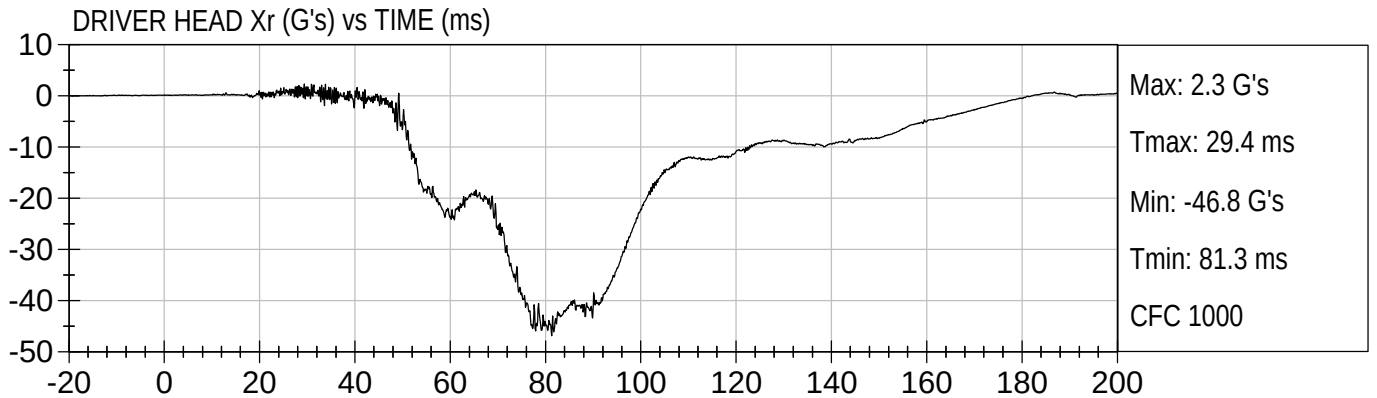


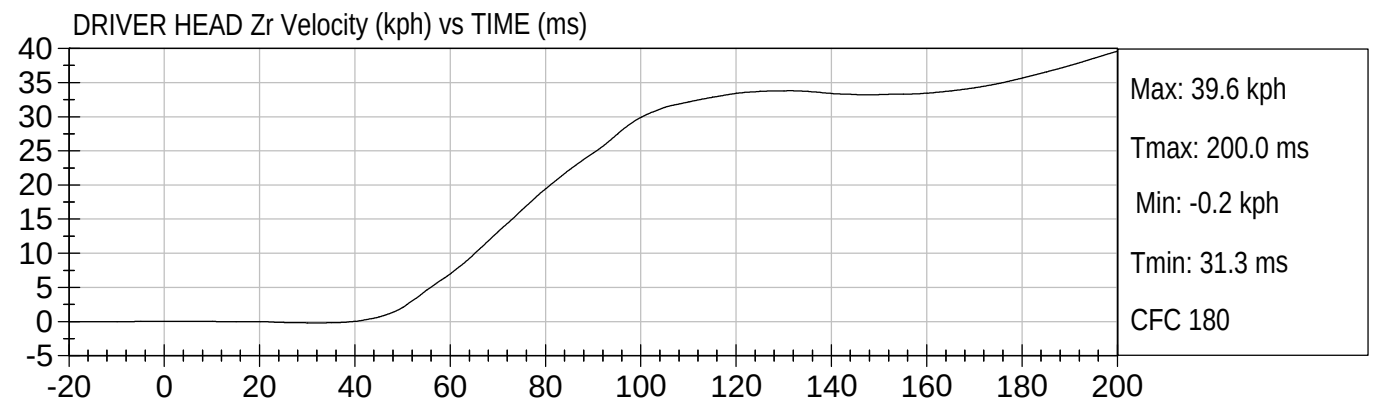
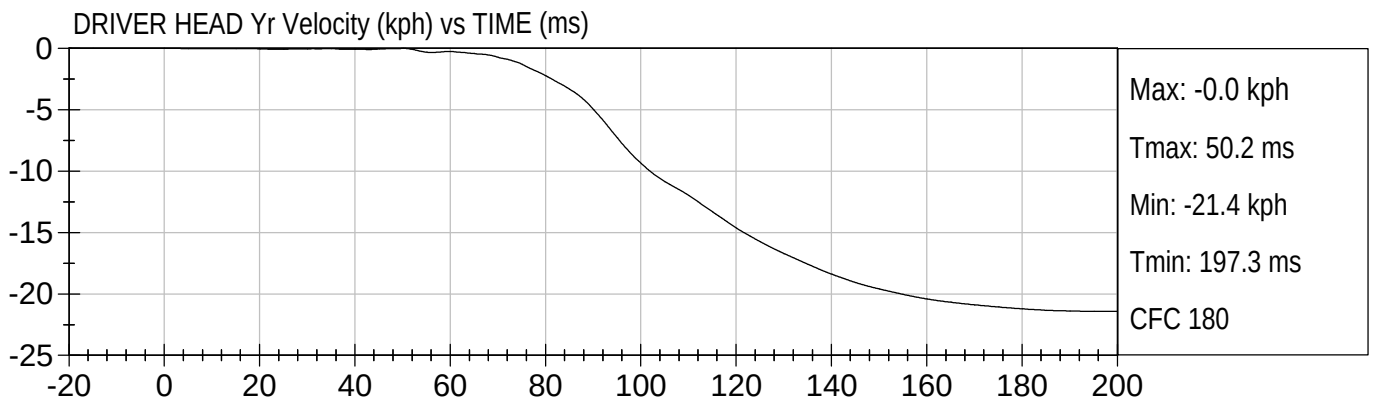
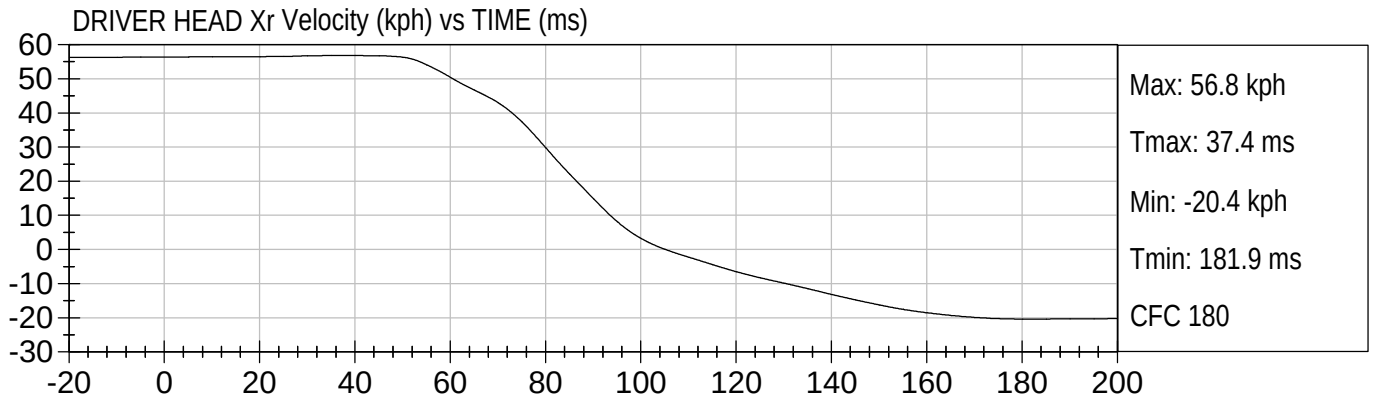
DRIVER HEAD X - UPPER (G's) vs TIME (ms)



DRIVER HEAD Y - UPPER (G's) vs TIME (ms)

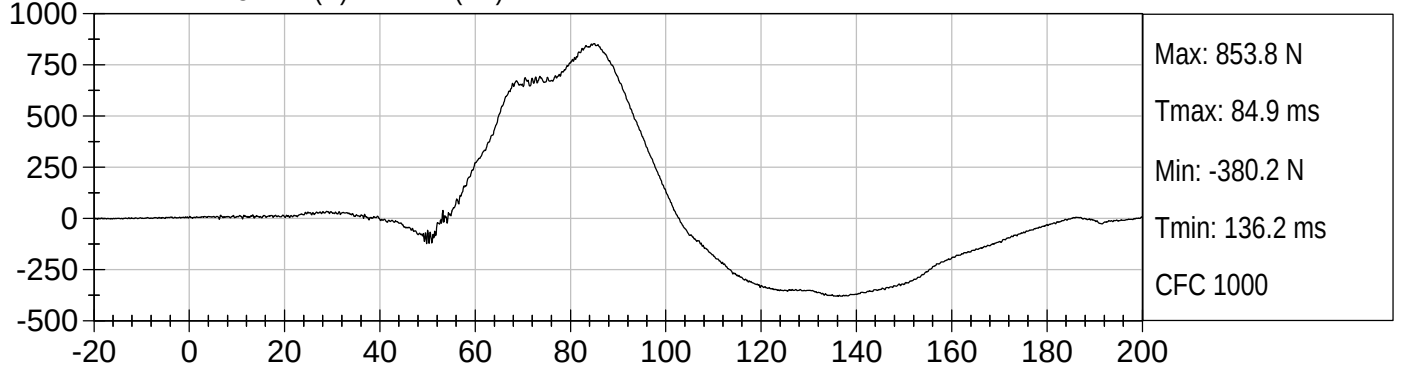




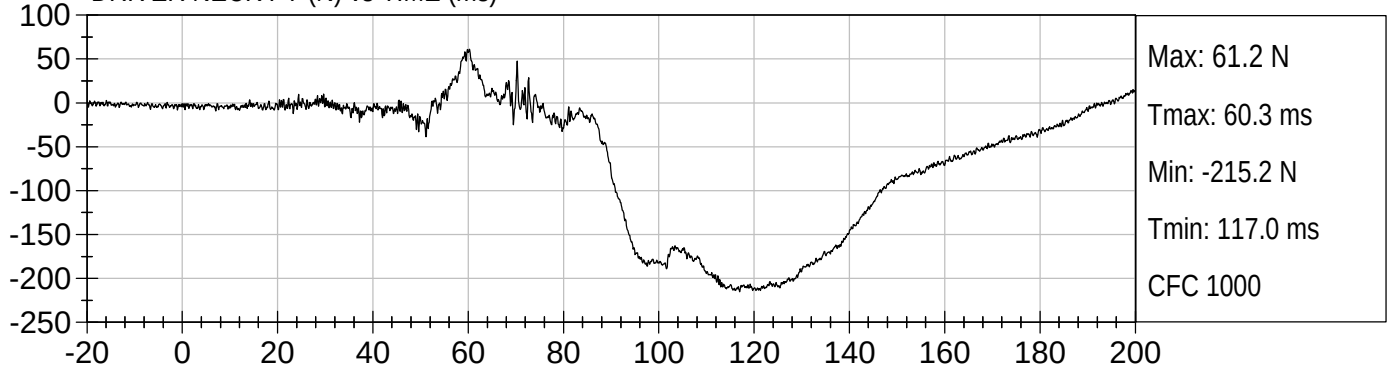




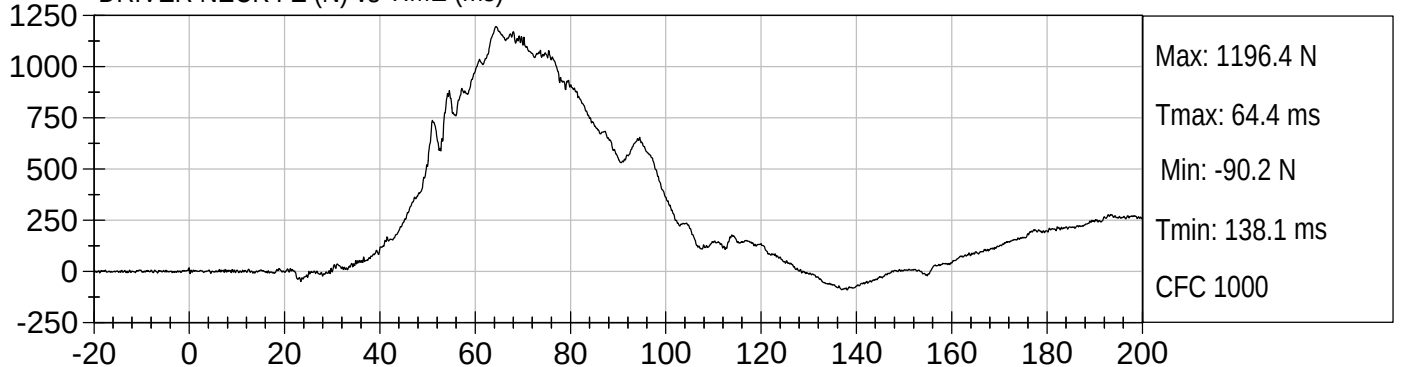
DRIVER NECK FX (N) vs TIME (ms)



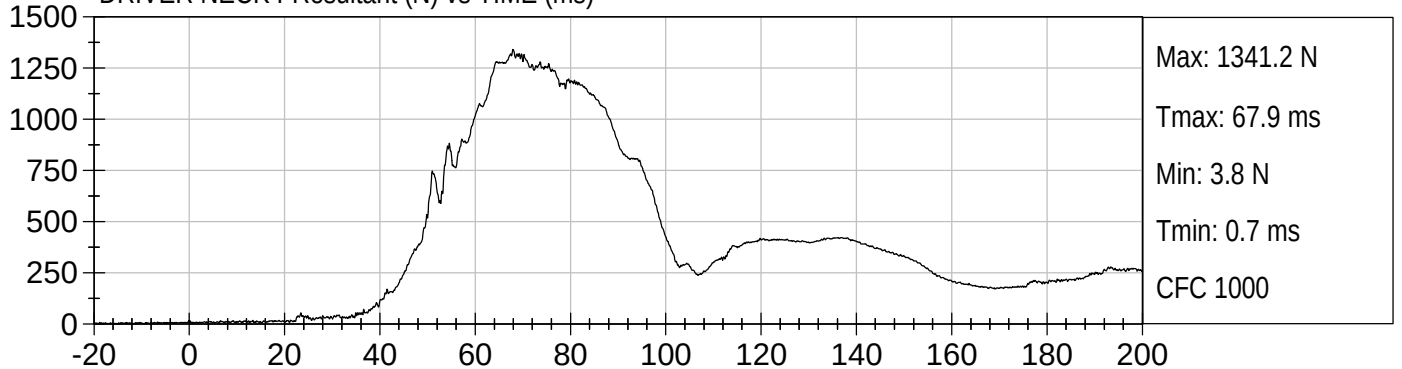
DRIVER NECK FY (N) vs TIME (ms)

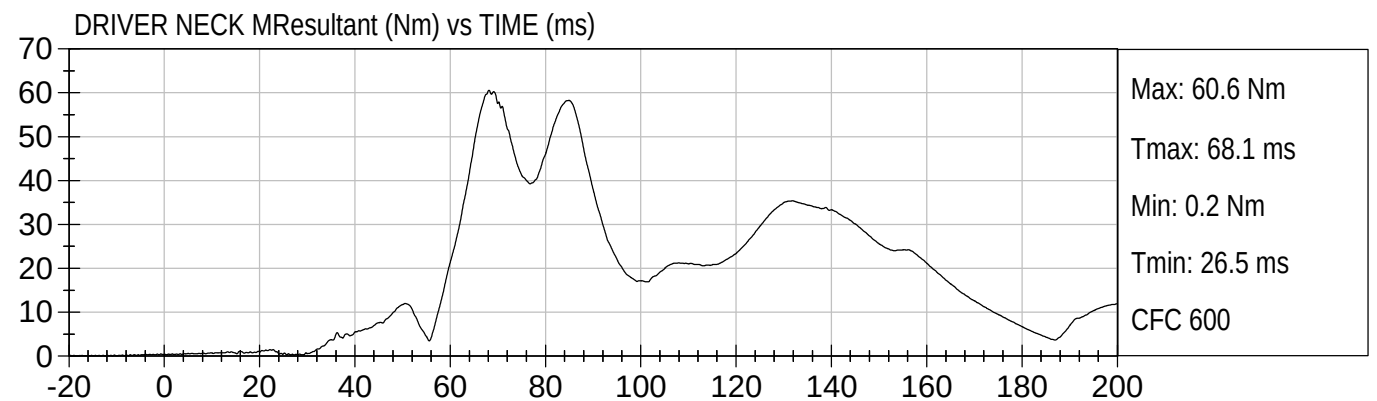
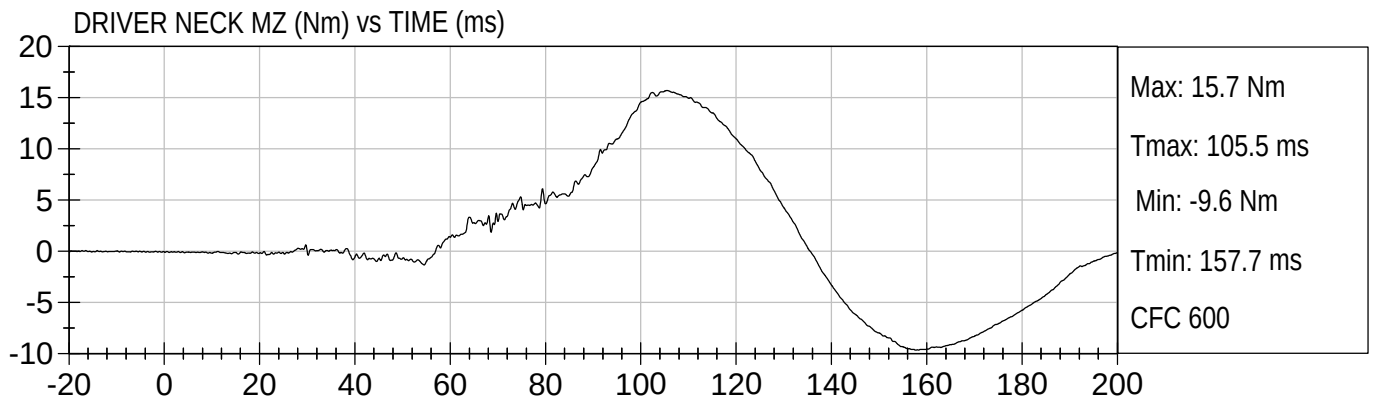
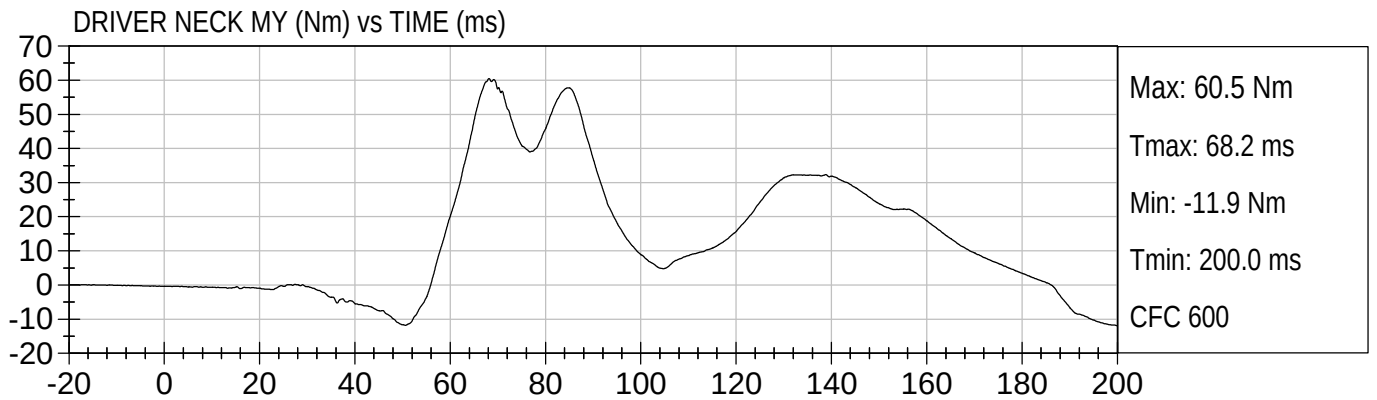
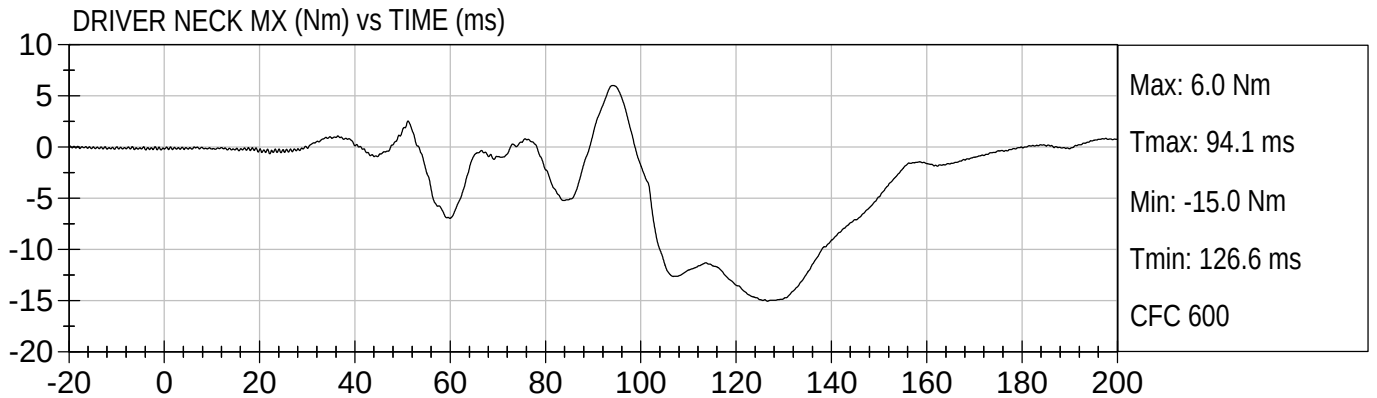


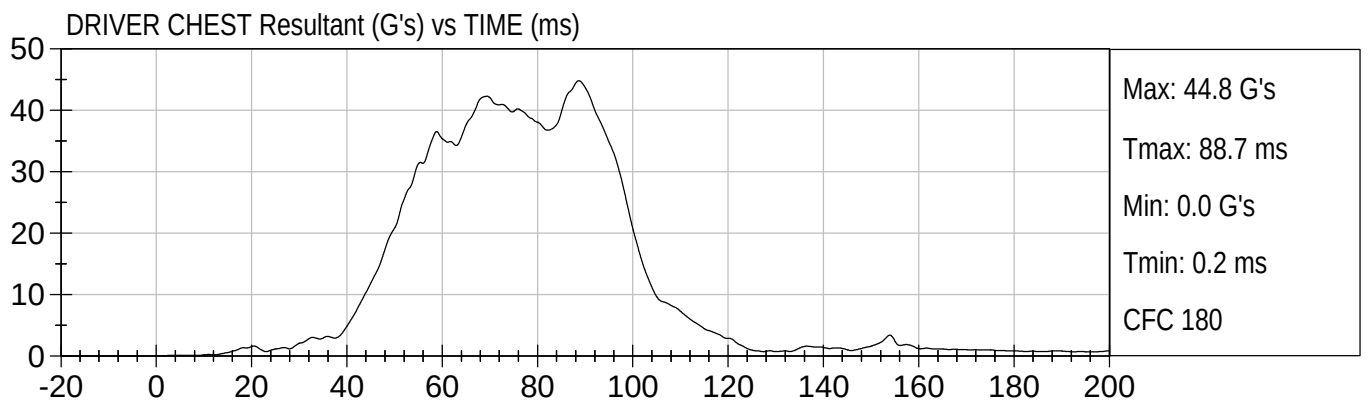
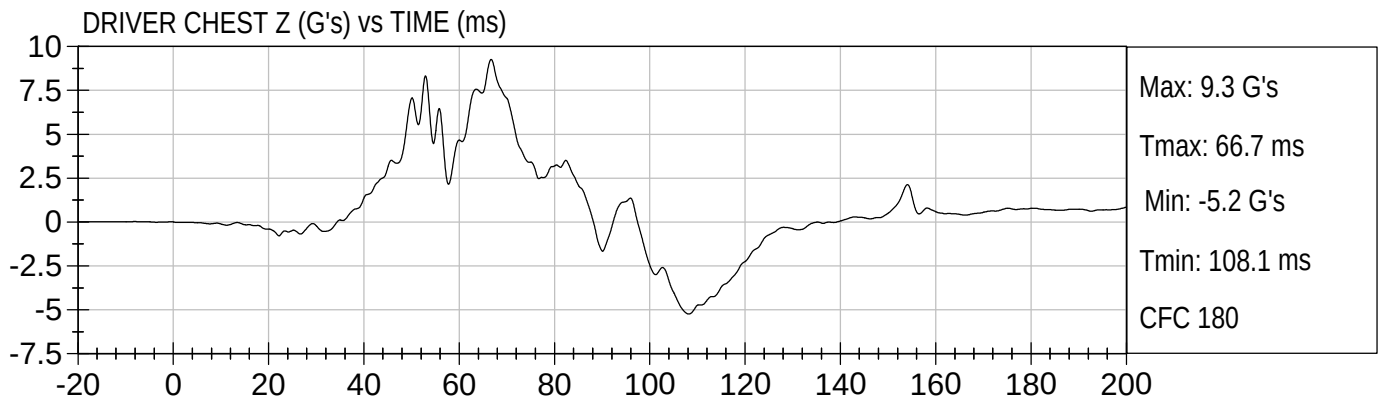
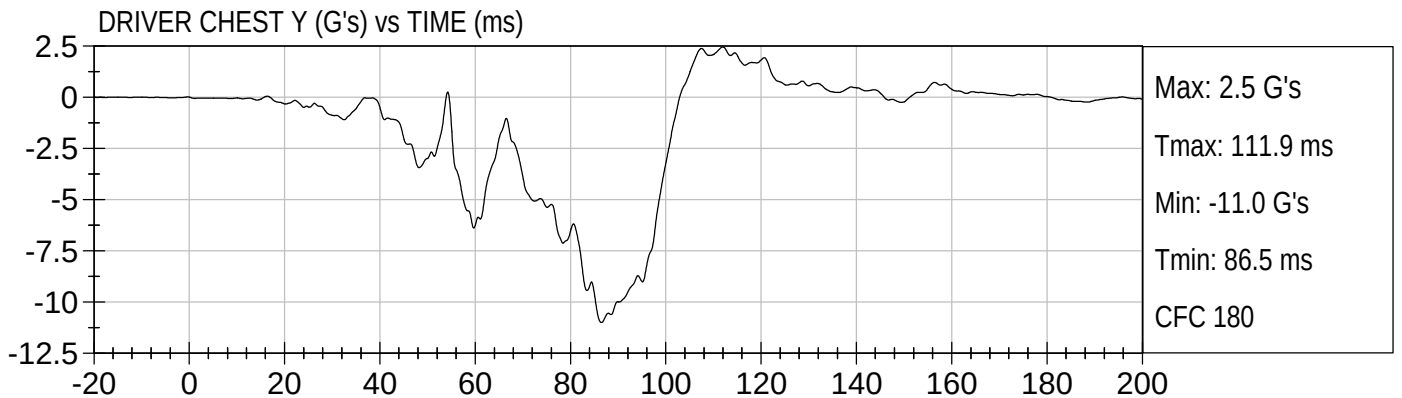
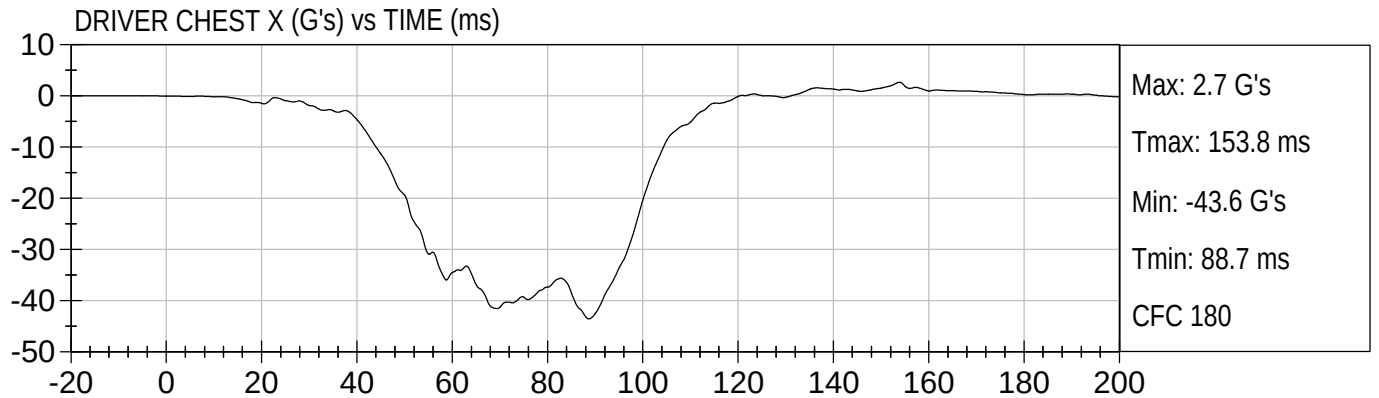
DRIVER NECK FZ (N) vs TIME (ms)



DRIVER NECK FResultant (N) vs TIME (ms)

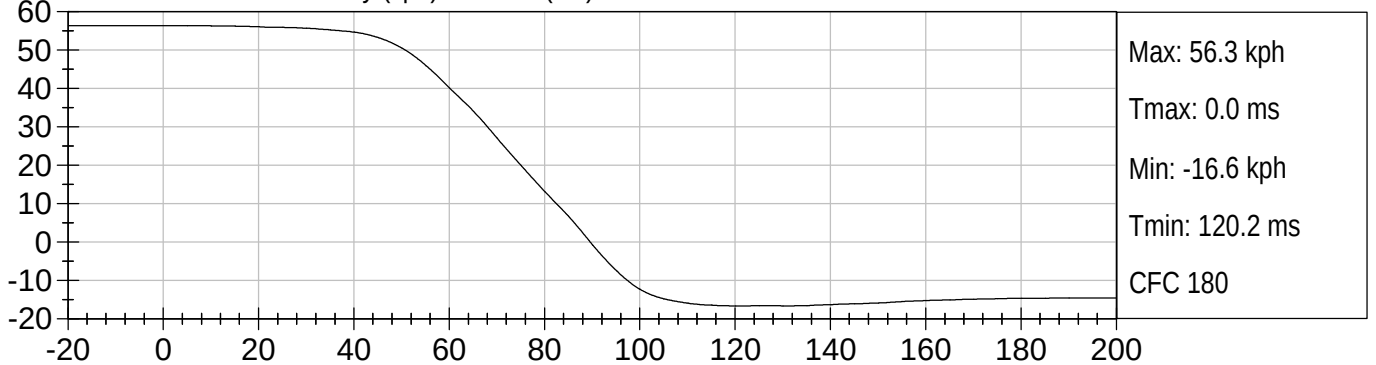




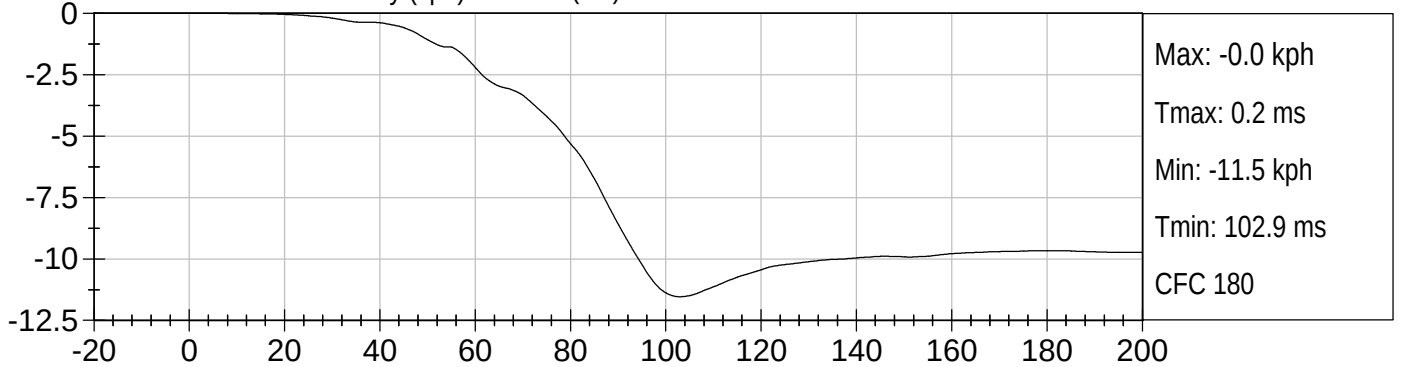




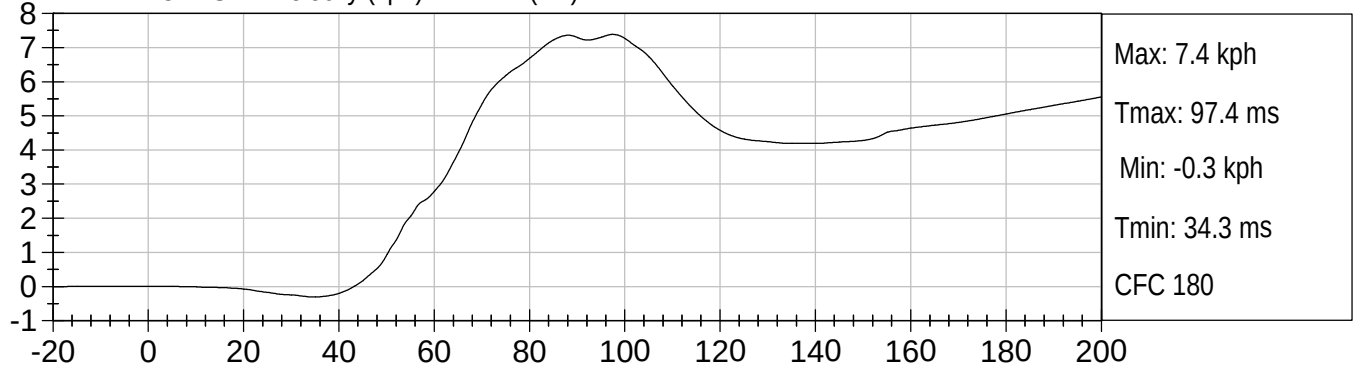
DRIVER CHEST X Velocity (kph) vs TIME (ms)



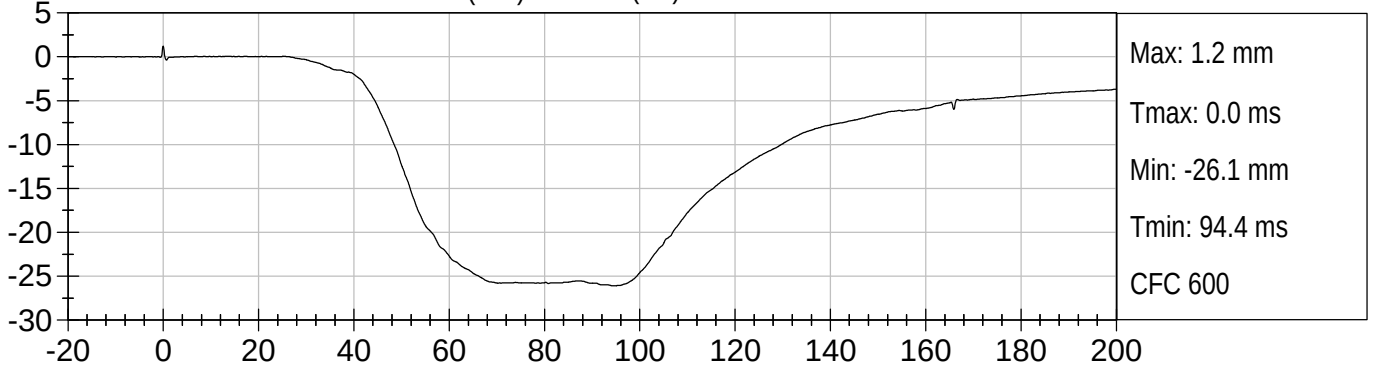
DRIVER CHEST Y Velocity (kph) vs TIME (ms)

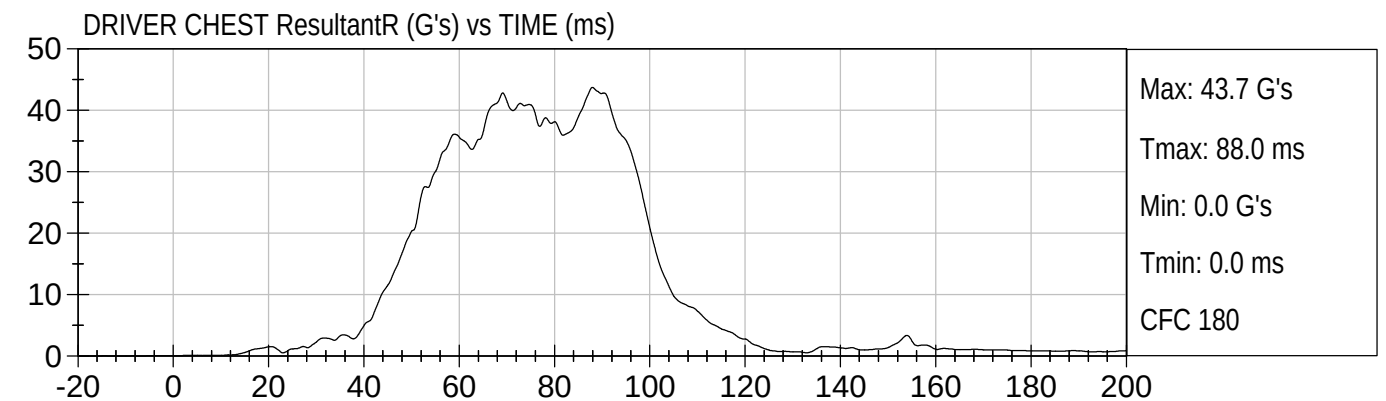
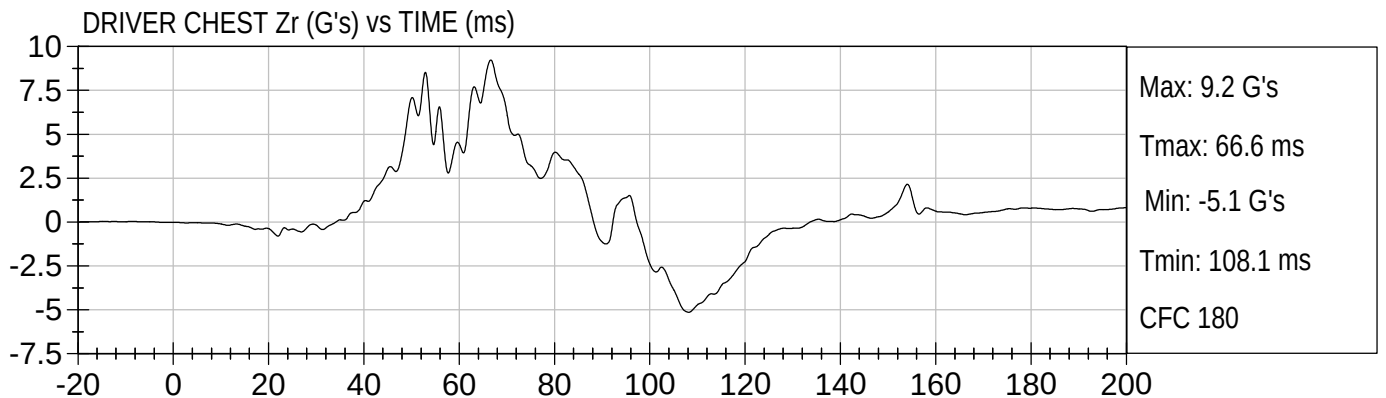
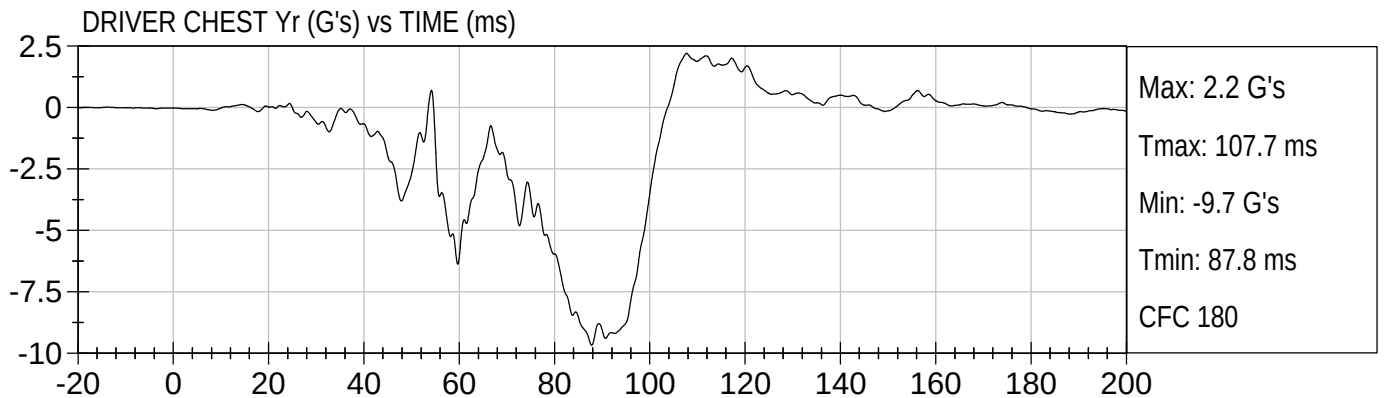
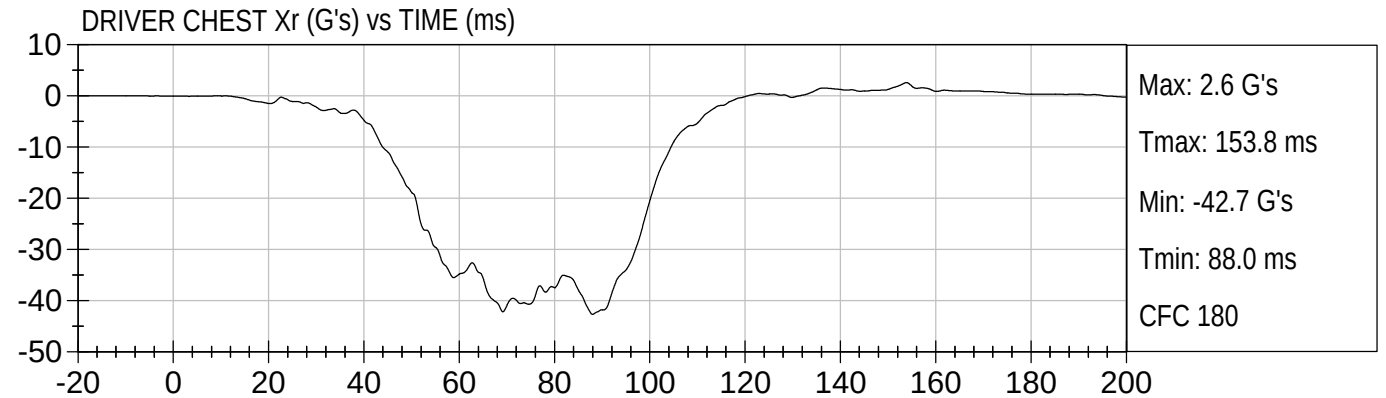


DRIVER CHEST Z Velocity (kph) vs TIME (ms)



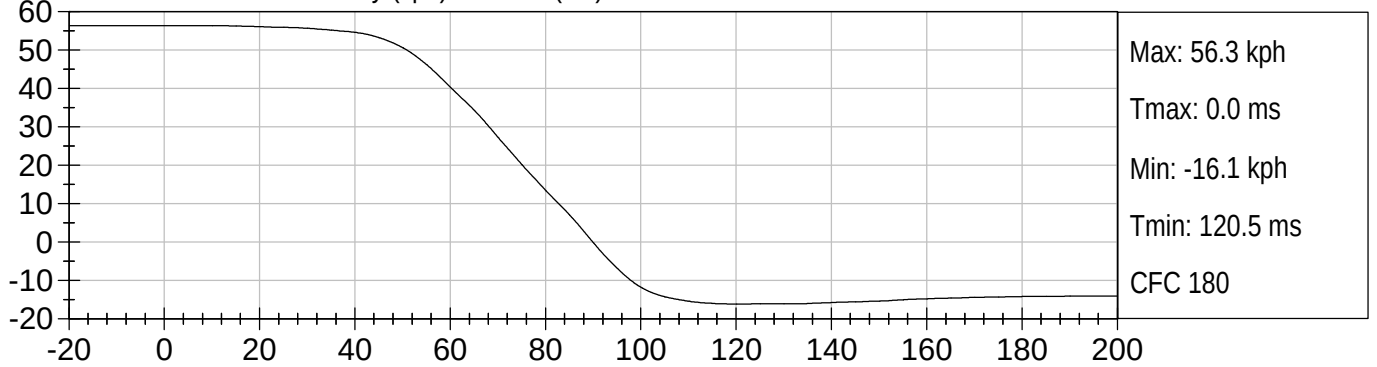
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)



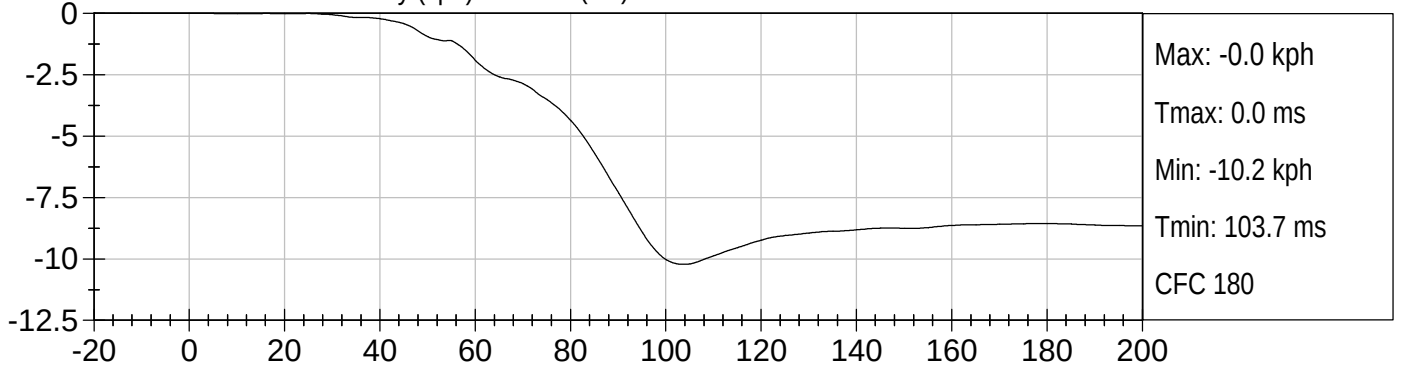




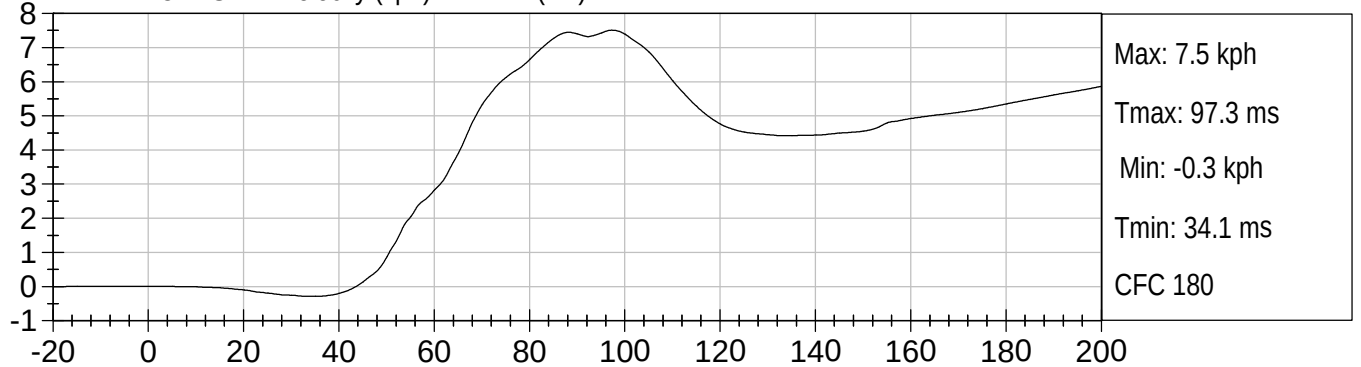
DRIVER CHEST Xr Velocity (kph) vs TIME (ms)

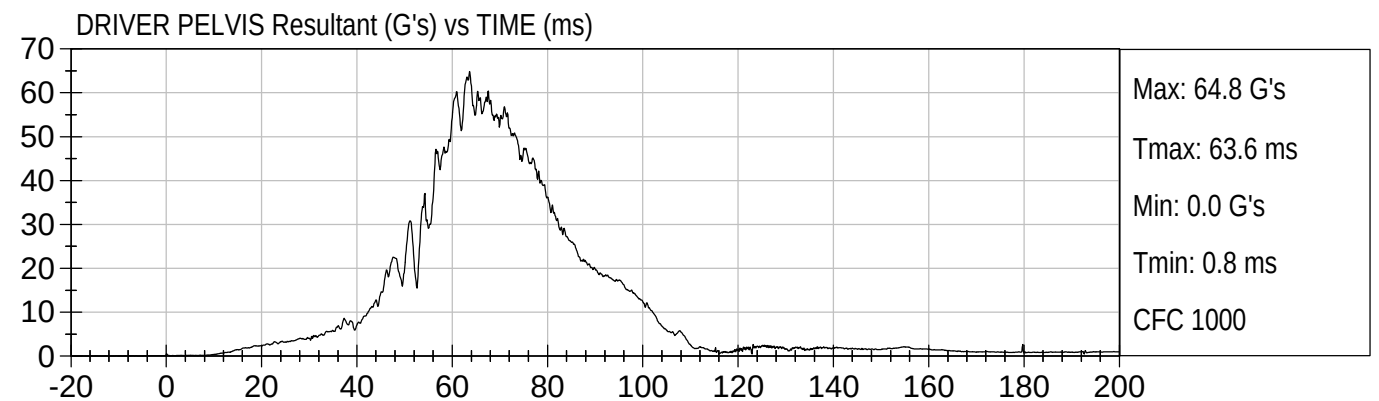
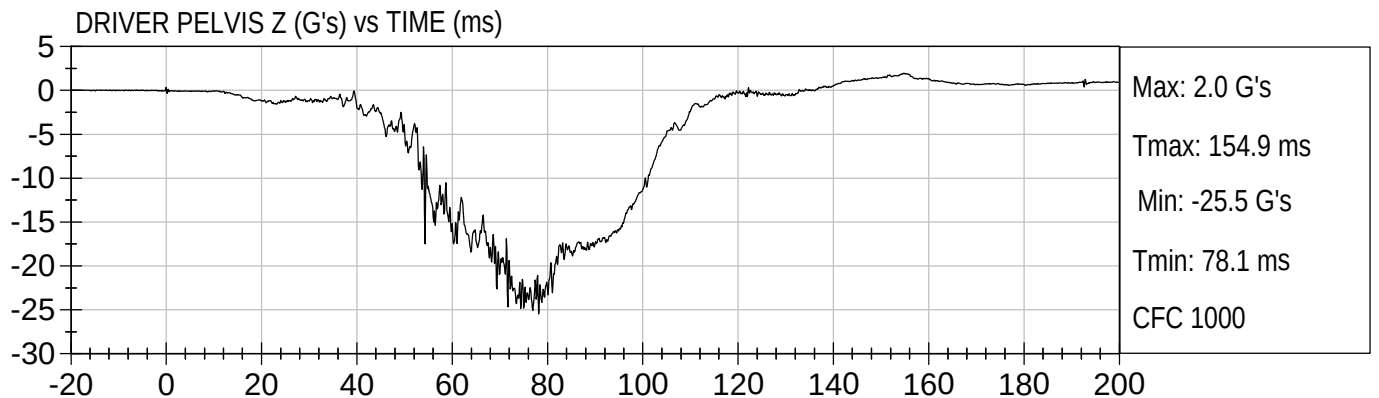
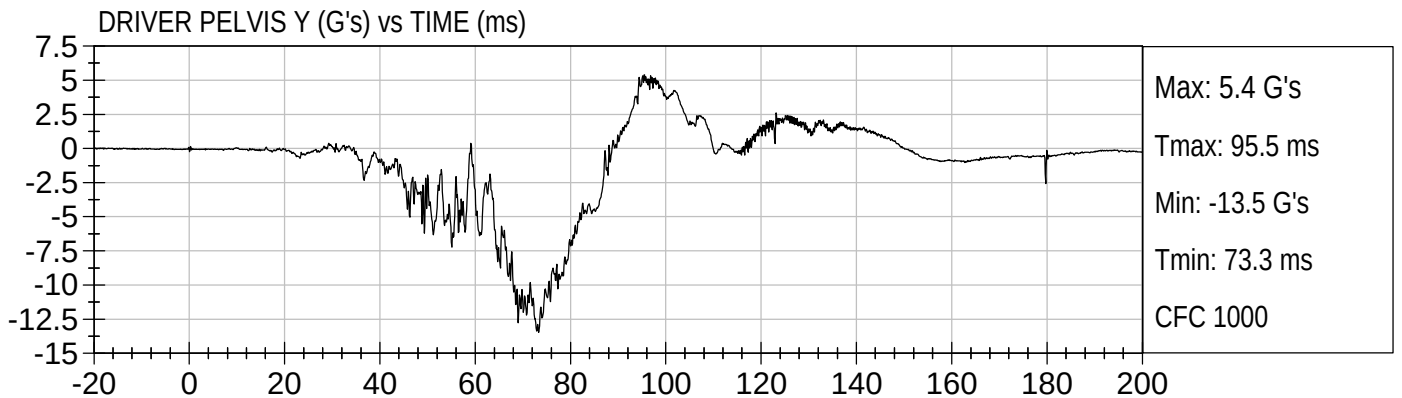
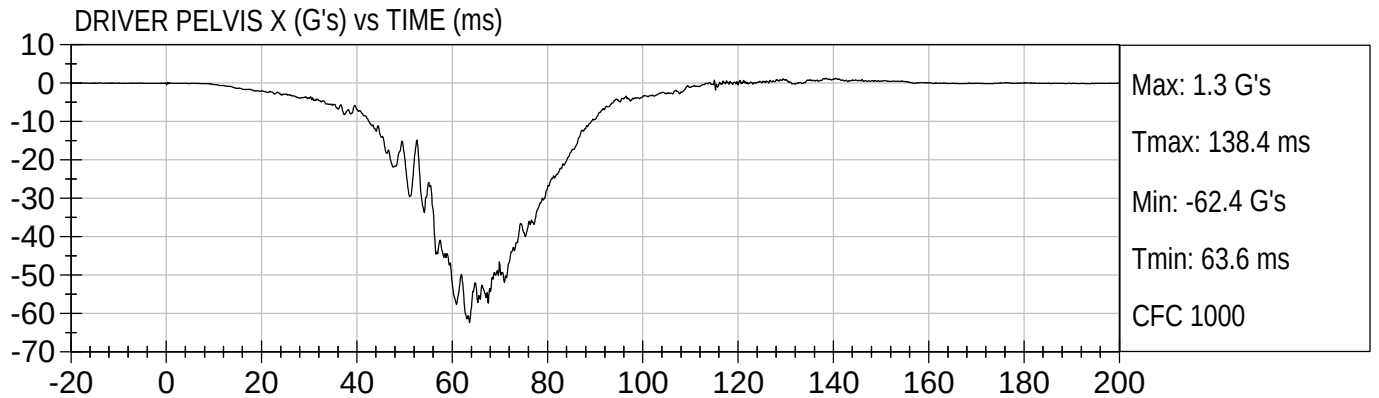


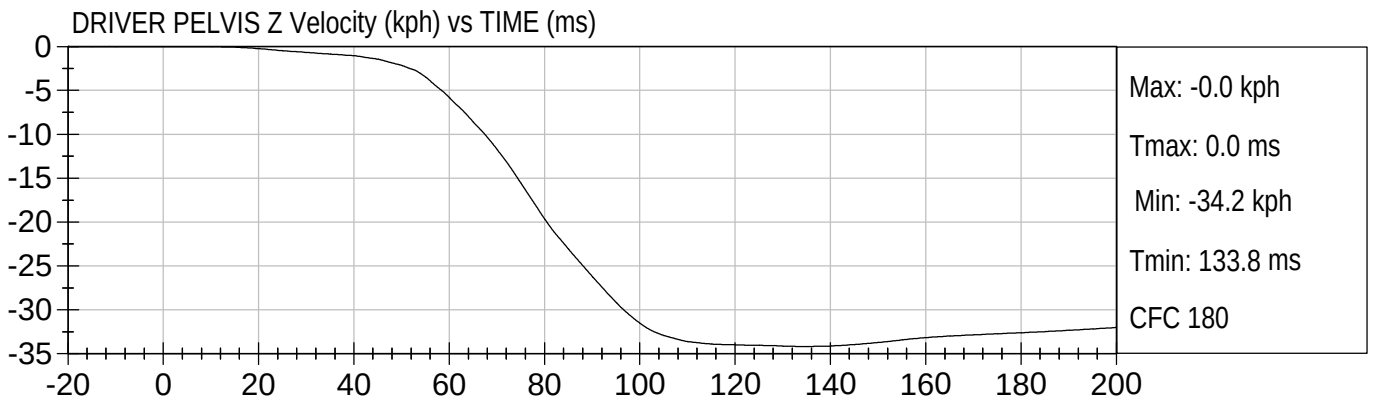
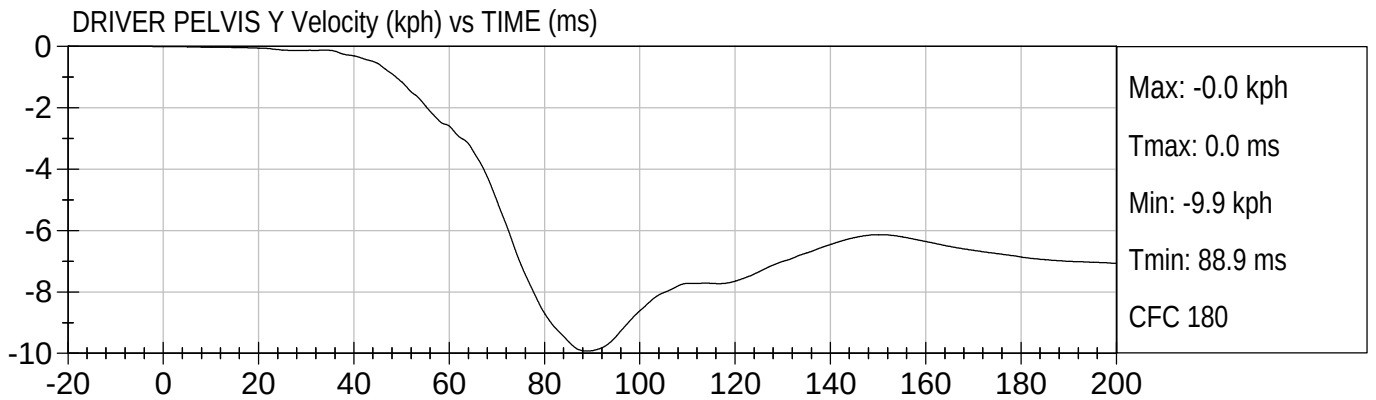
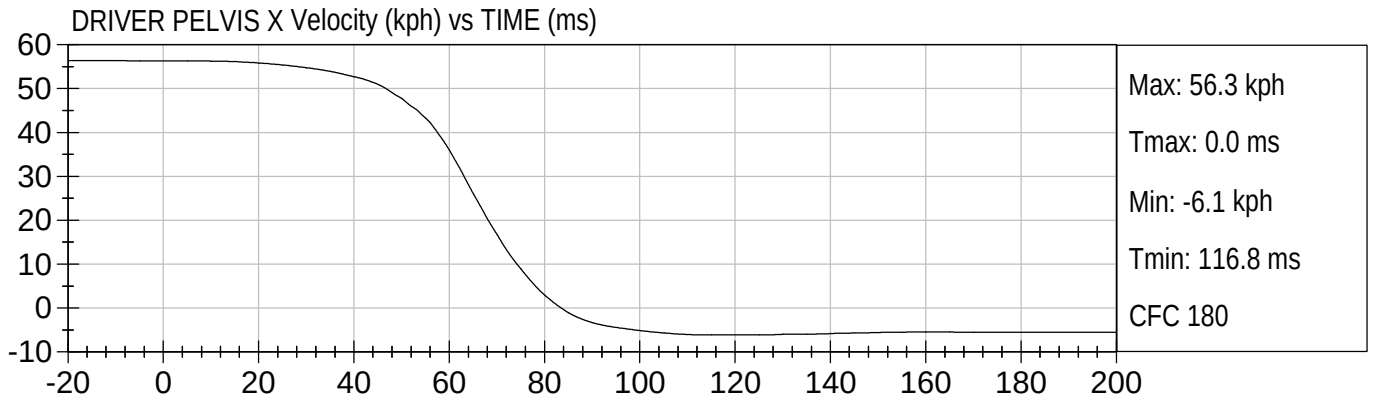
DRIVER CHEST Yr Velocity (kph) vs TIME (ms)

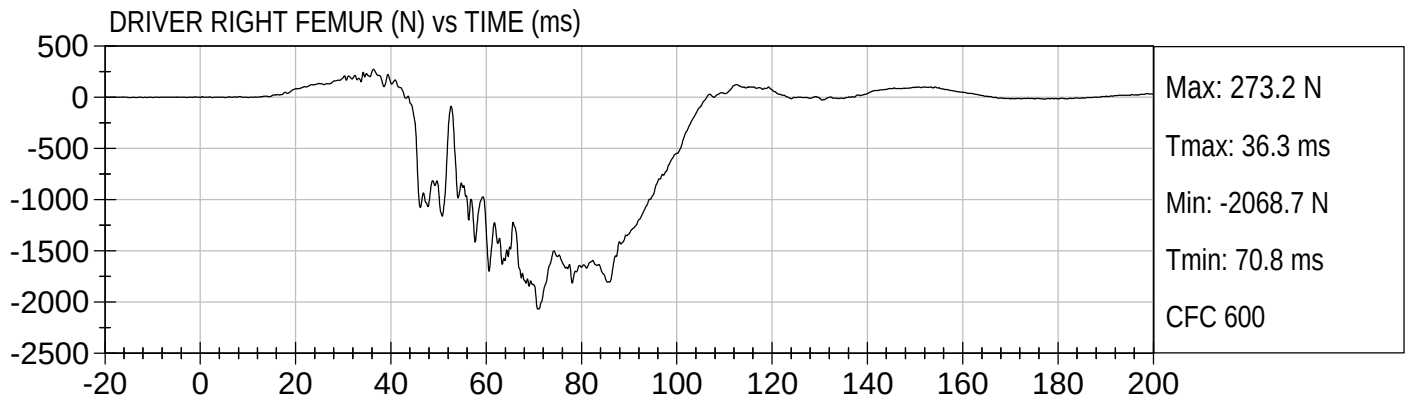
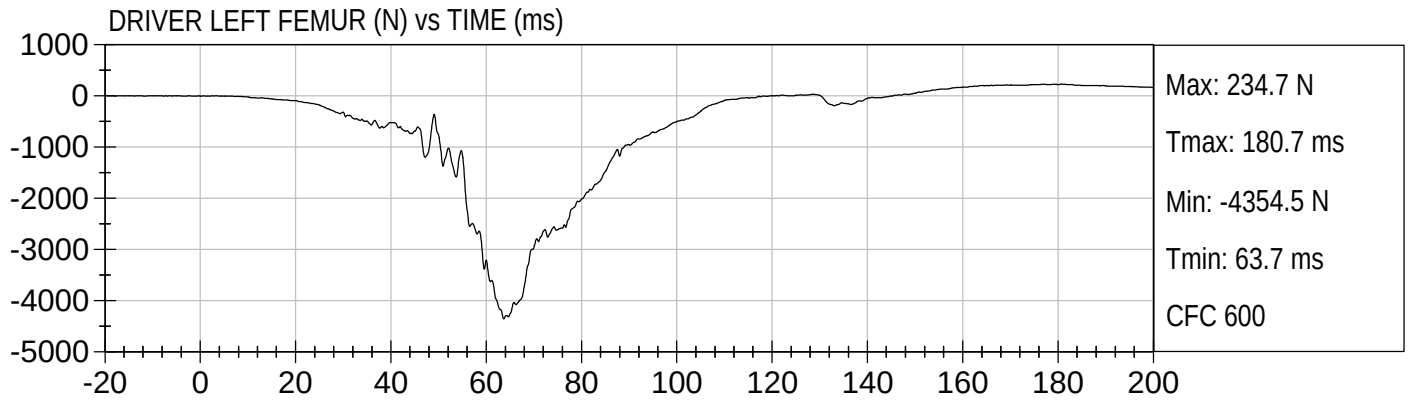


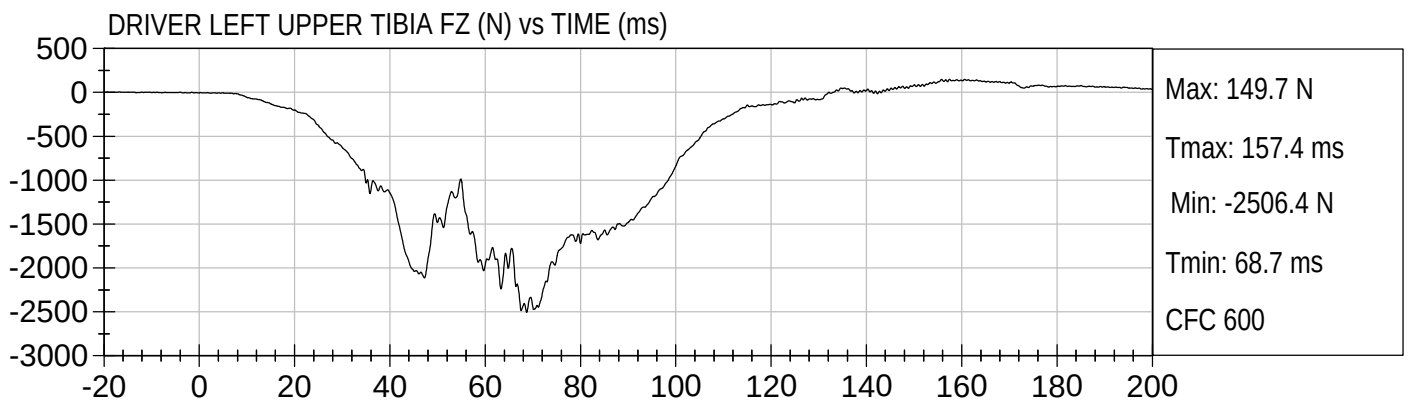
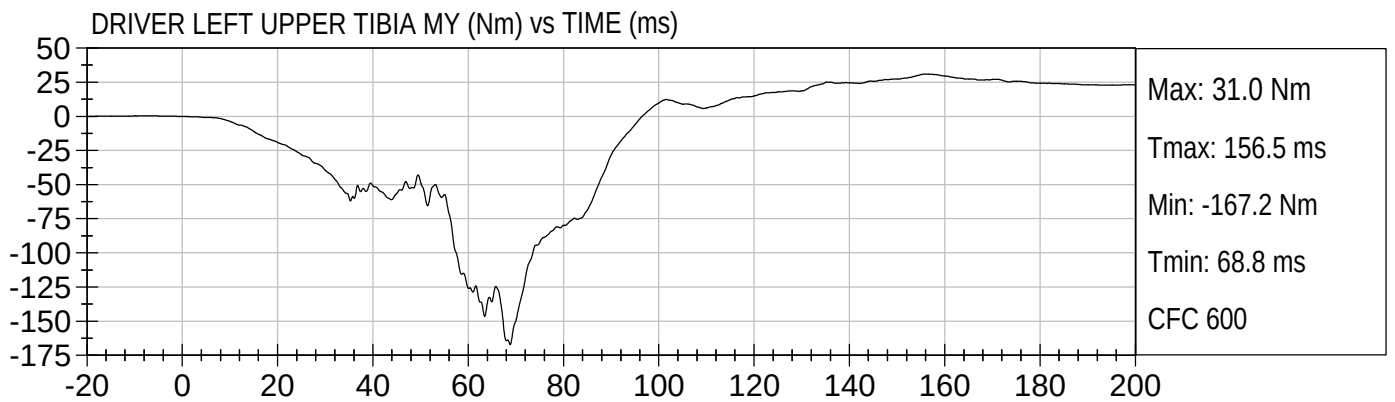
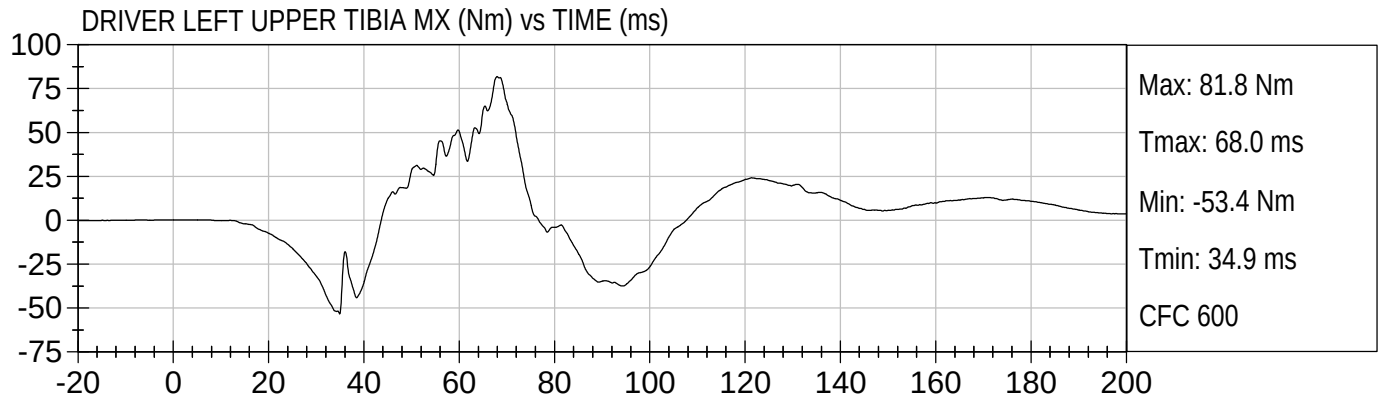
DRIVER CHEST Zr Velocity (kph) vs TIME (ms)





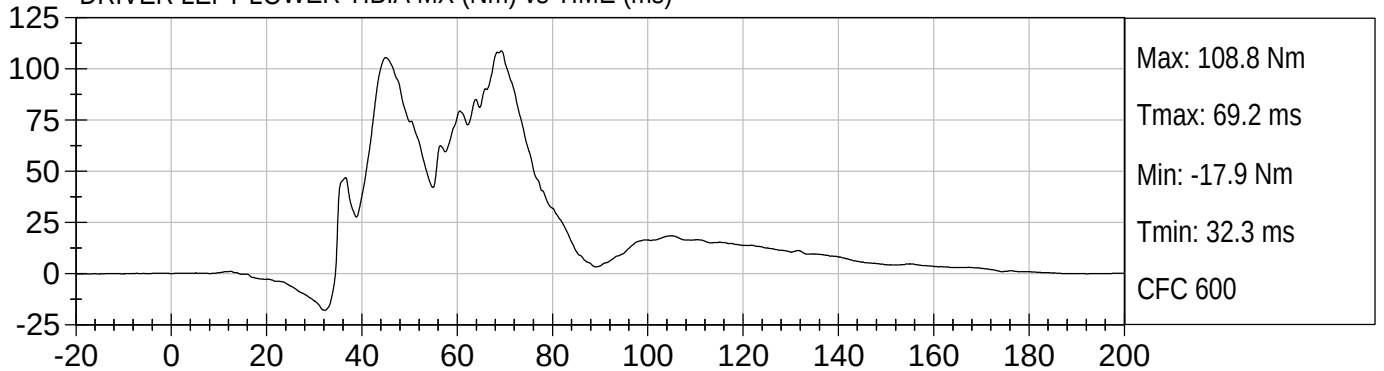




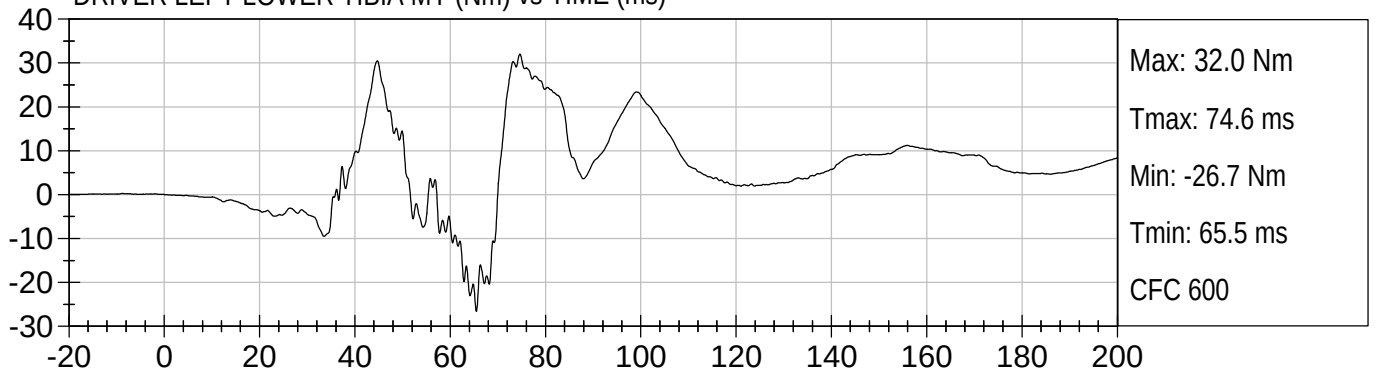




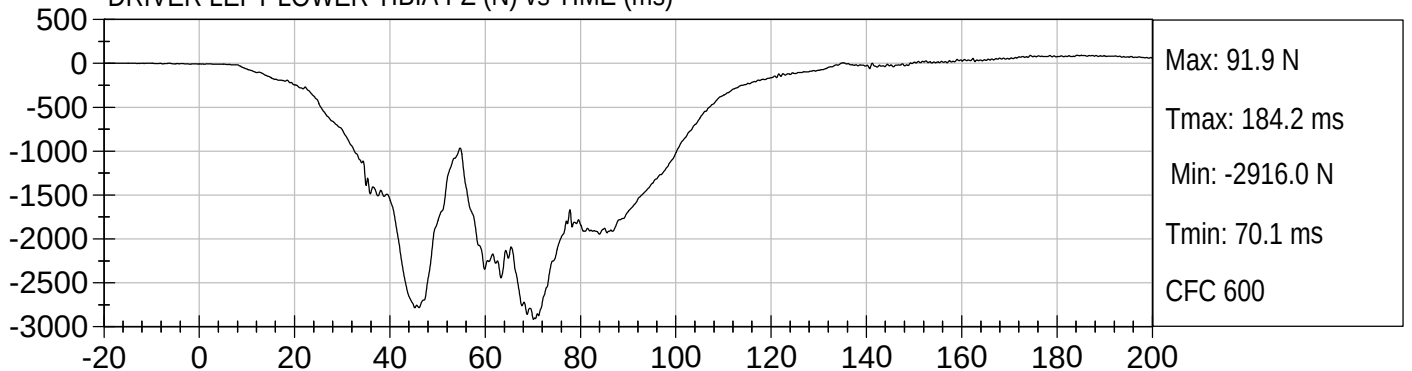
DRIVER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



DRIVER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)

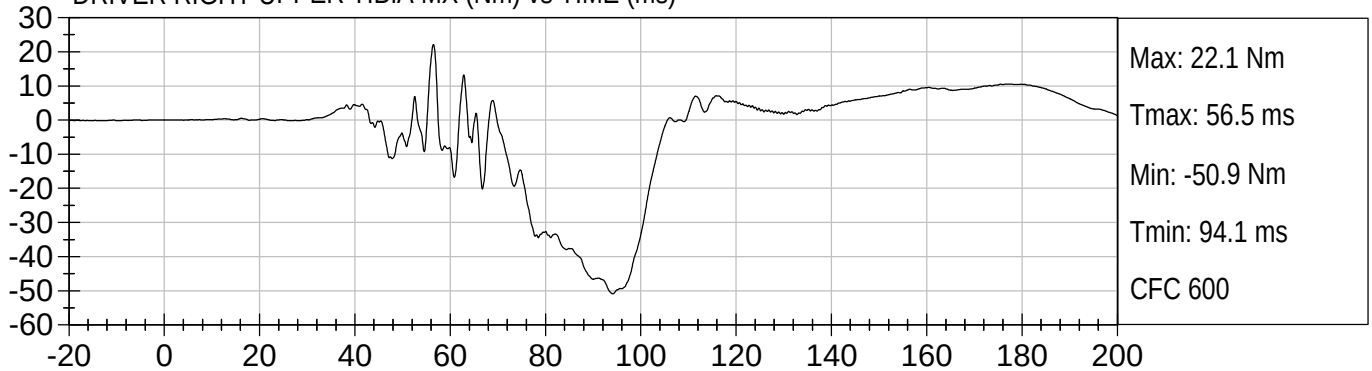


DRIVER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

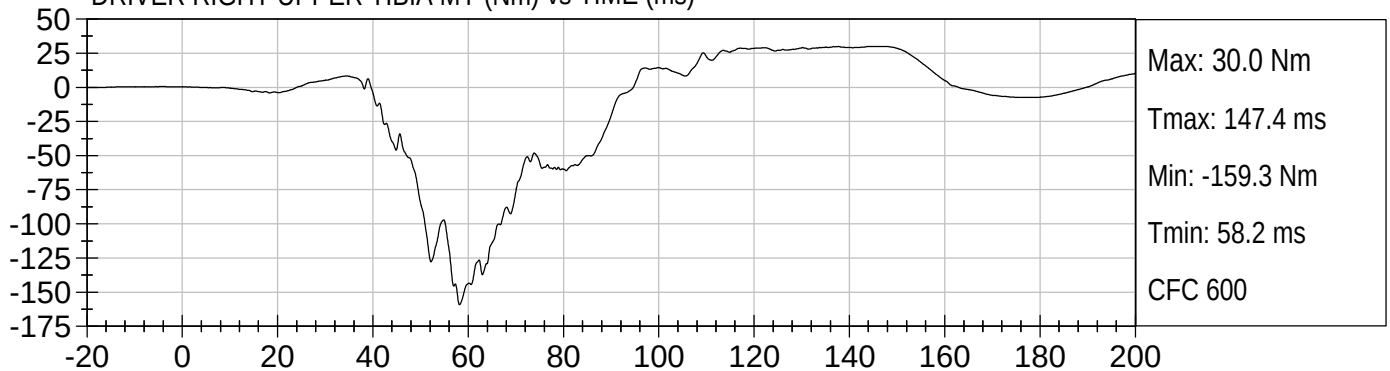




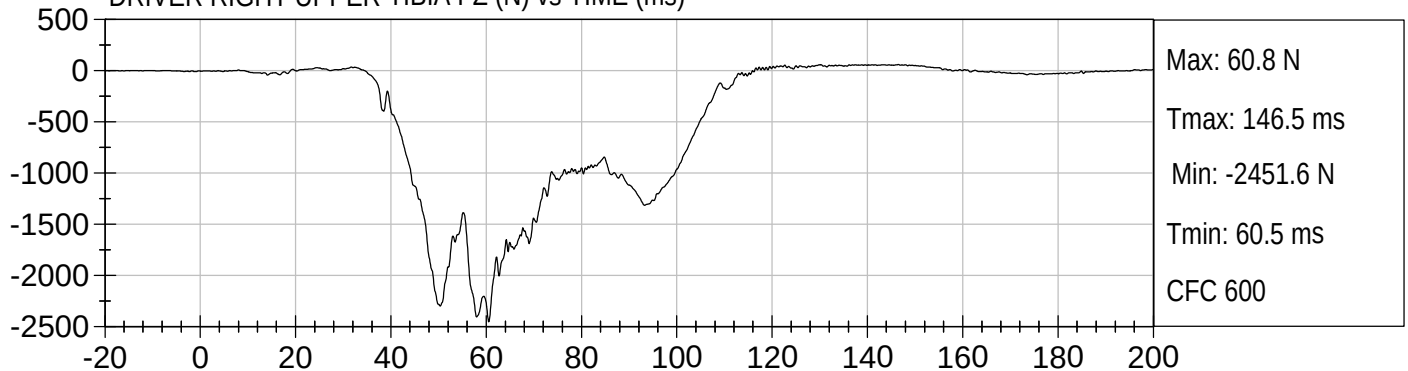
DRIVER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



DRIVER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

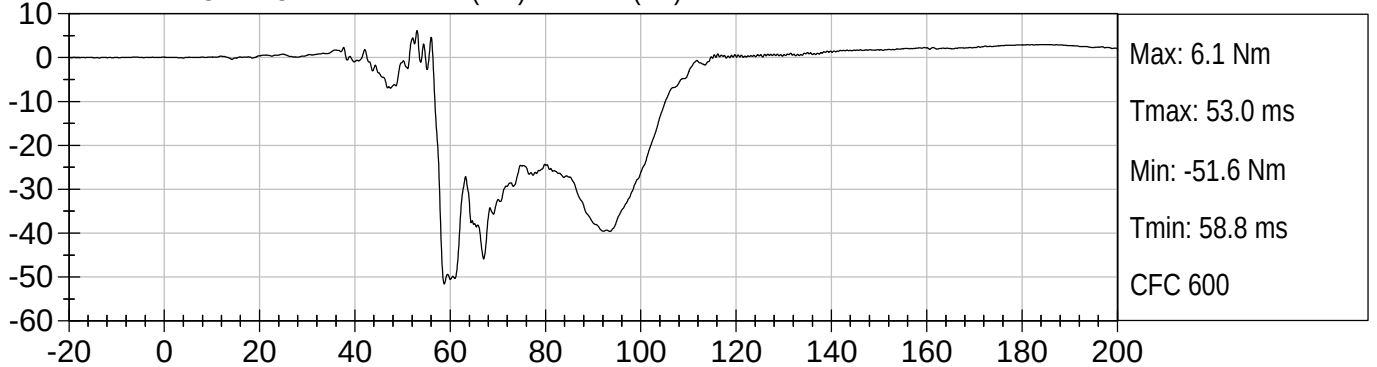


DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

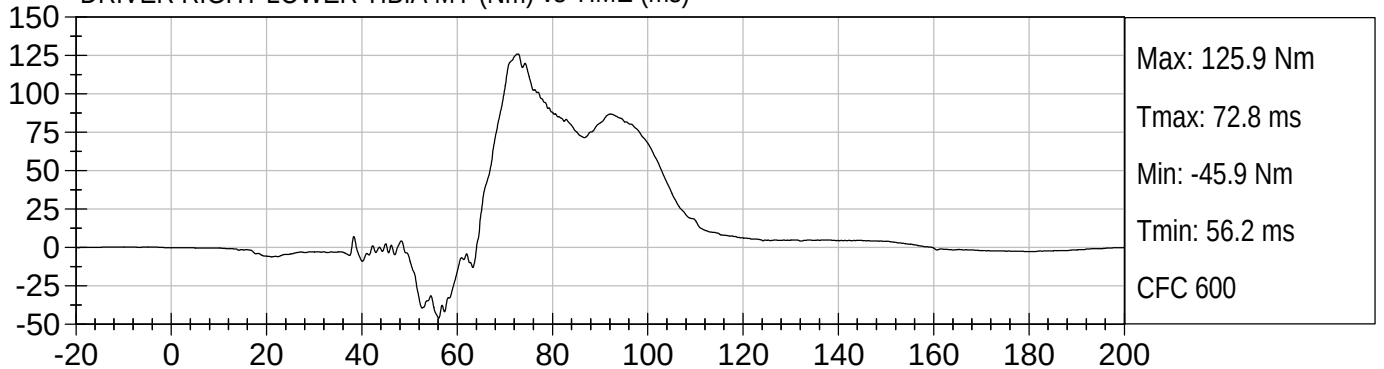




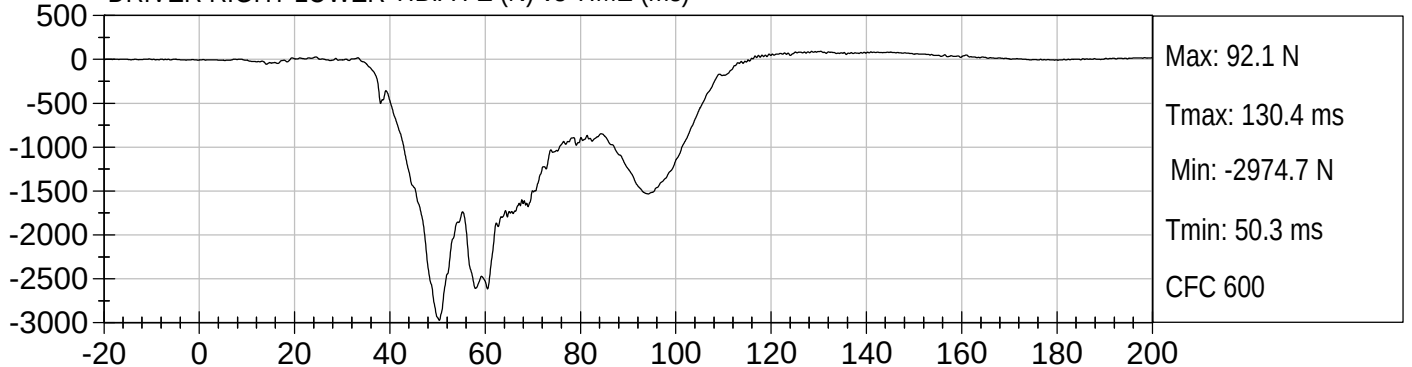
DRIVER RIGHT LOWER TIBIA MX (Nm) vs TIME (ms)

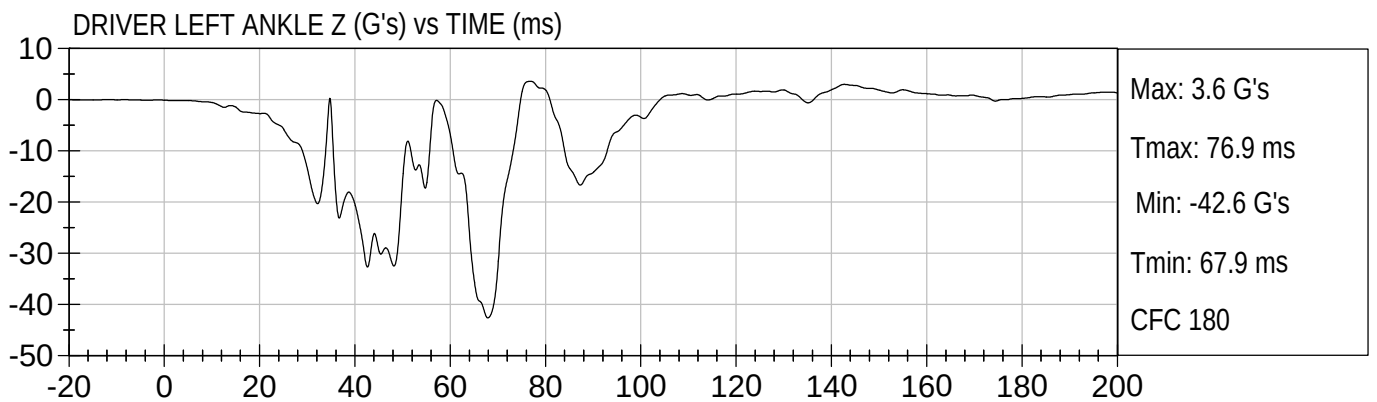
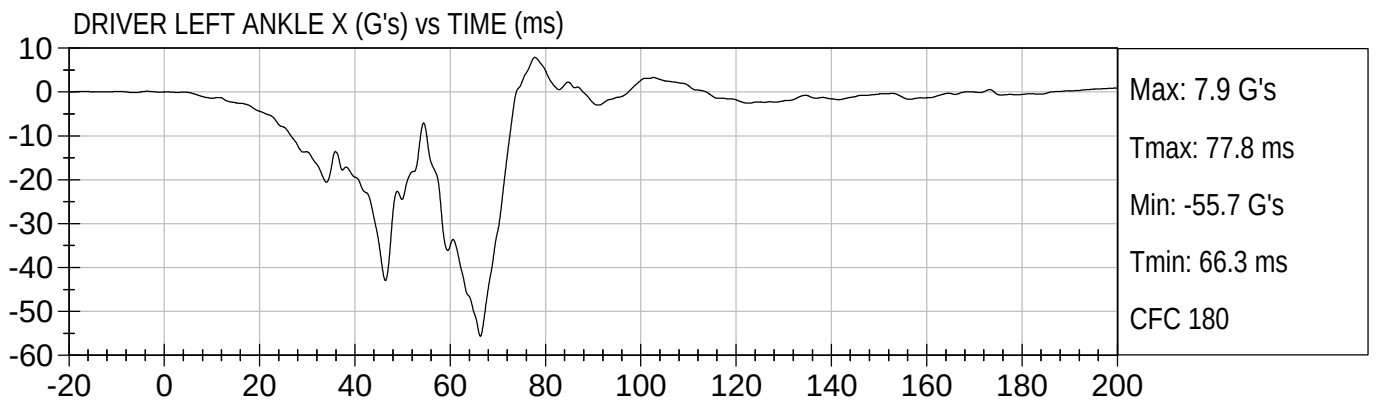
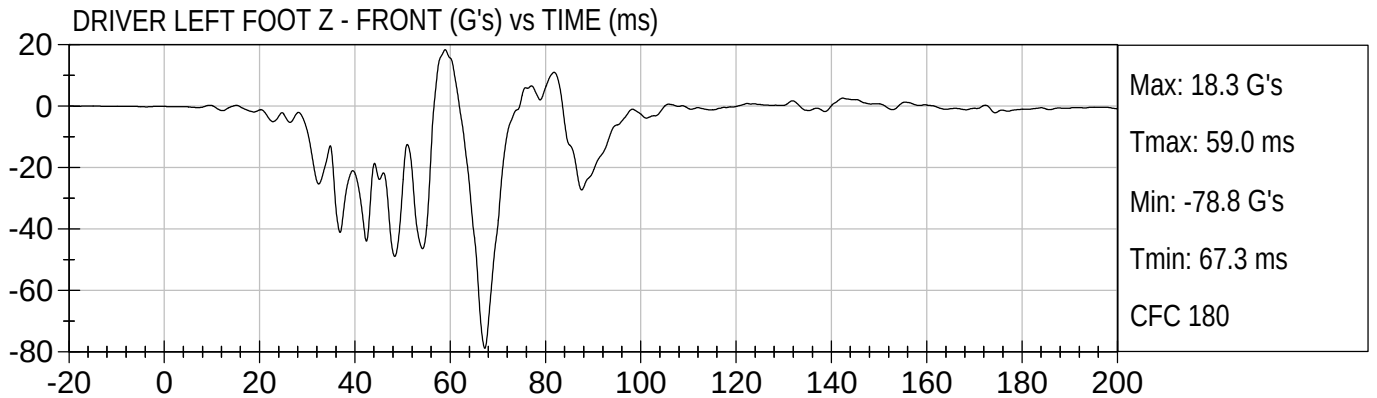


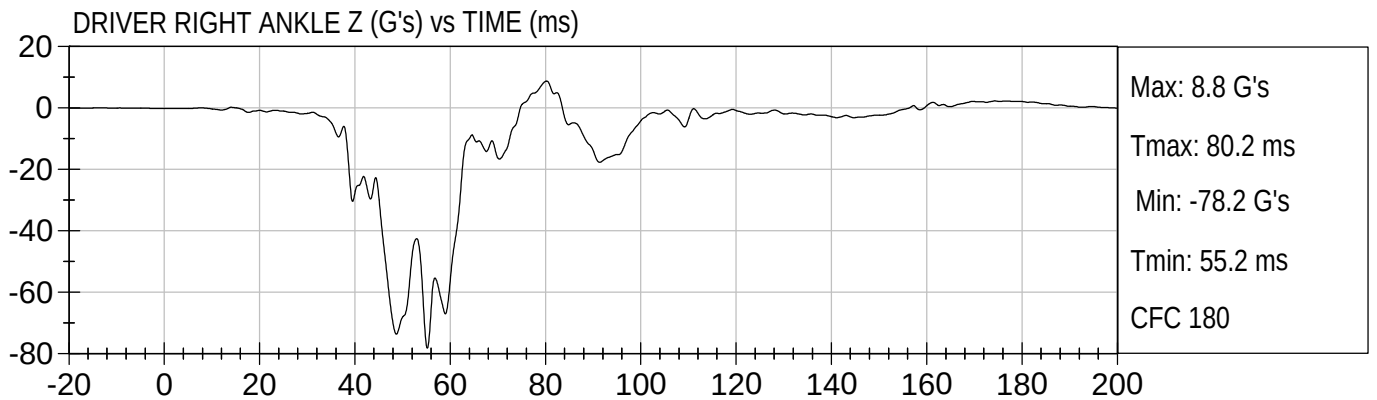
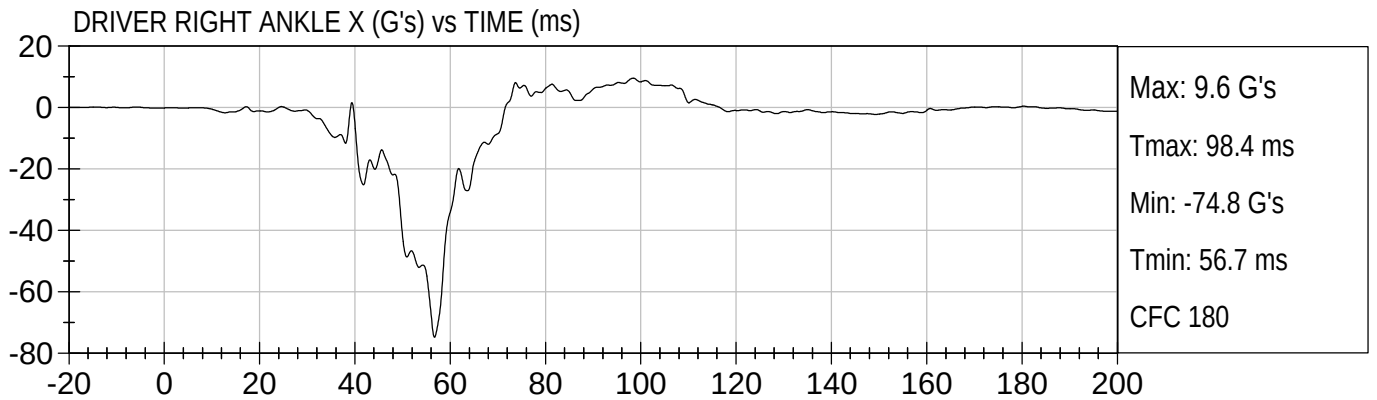
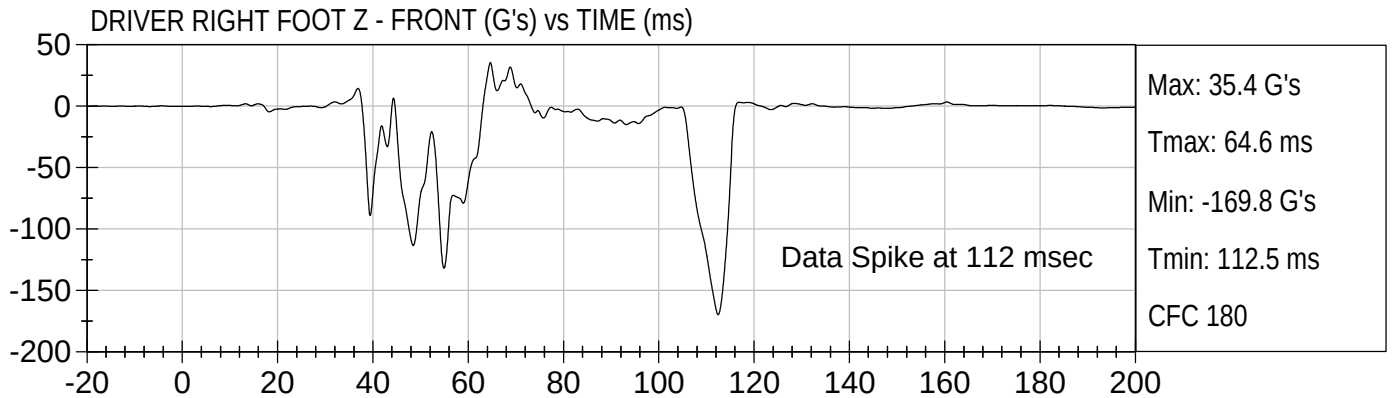
DRIVER RIGHT LOWER TIBIA MY (Nm) vs TIME (ms)

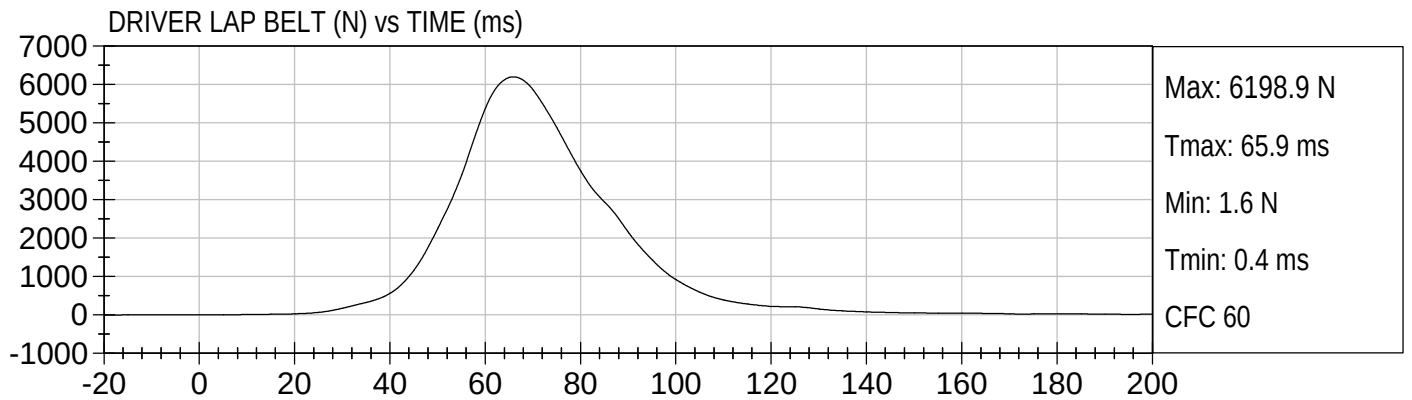
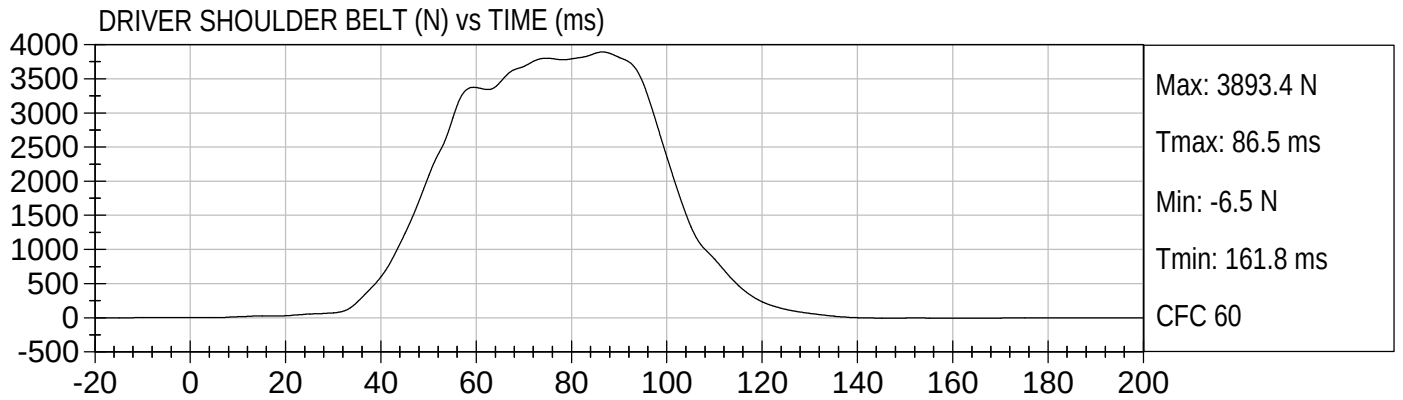


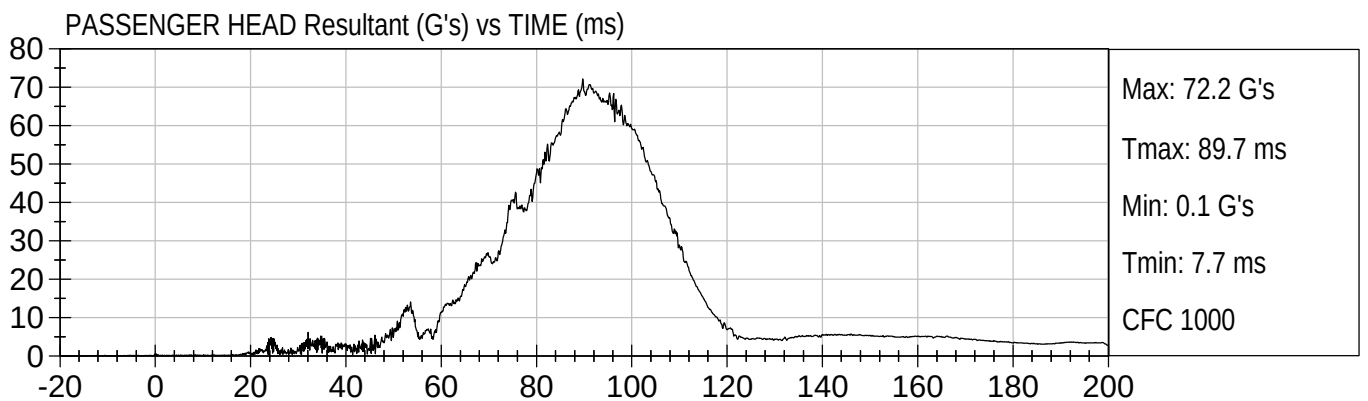
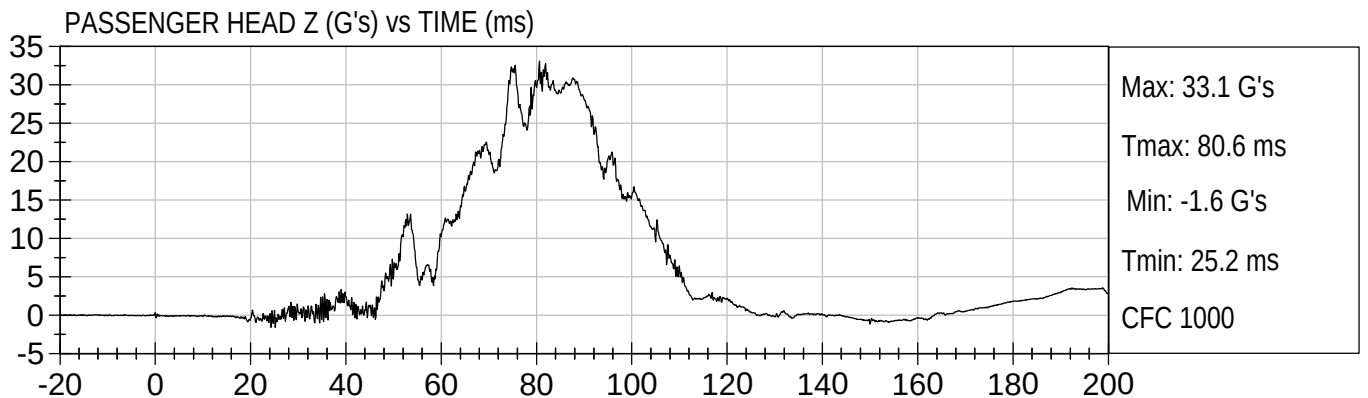
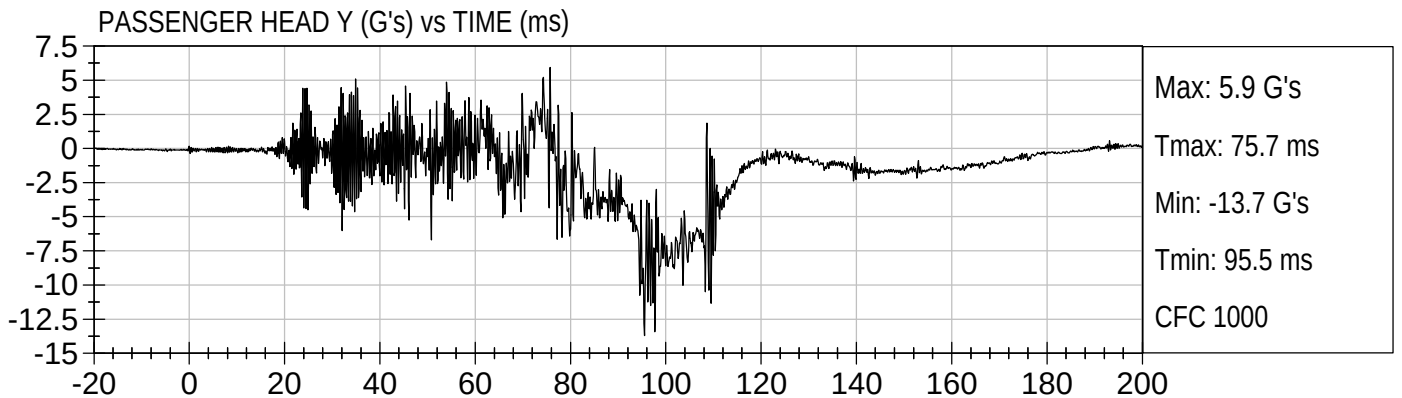
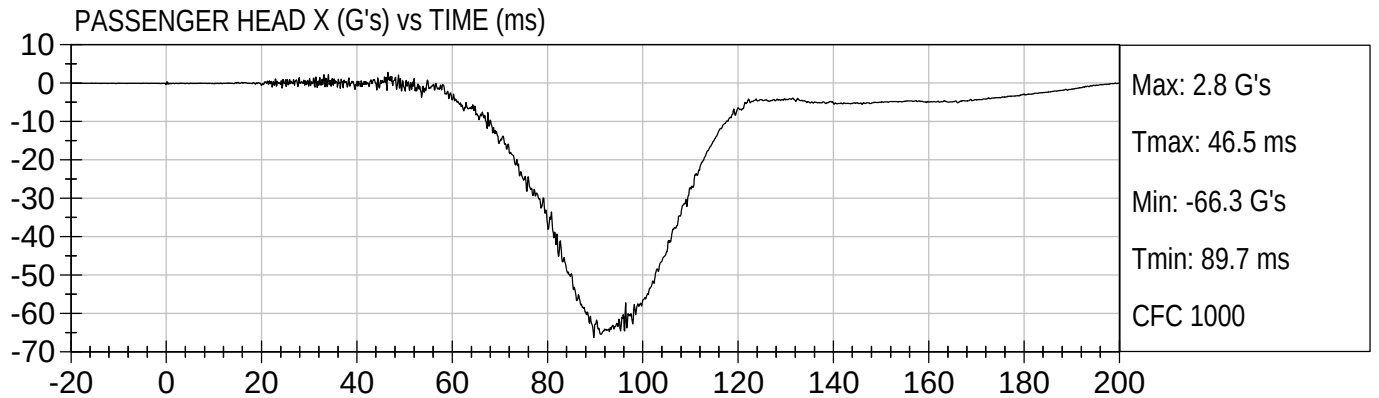
DRIVER RIGHT LOWER TIBIA FZ (N) vs TIME (ms)

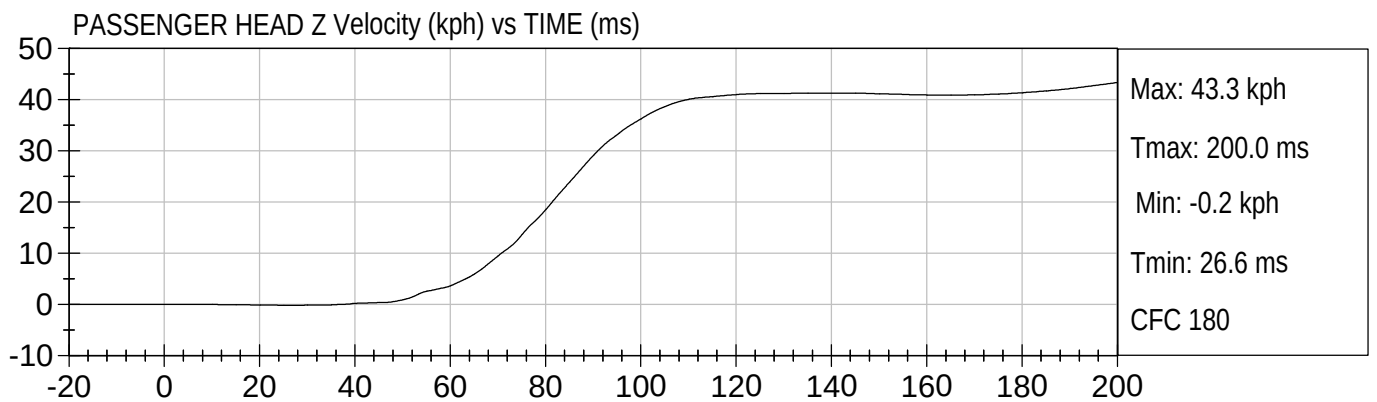
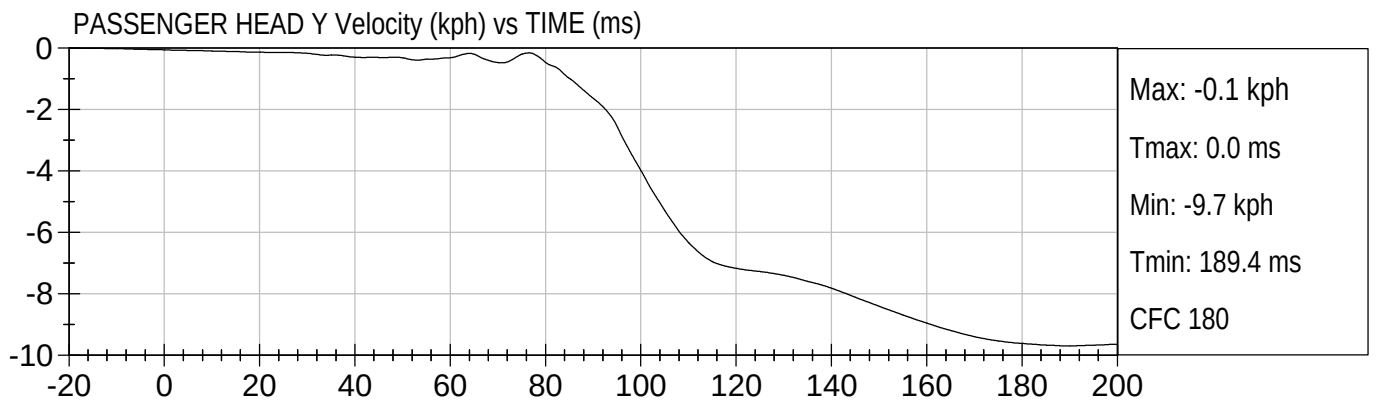
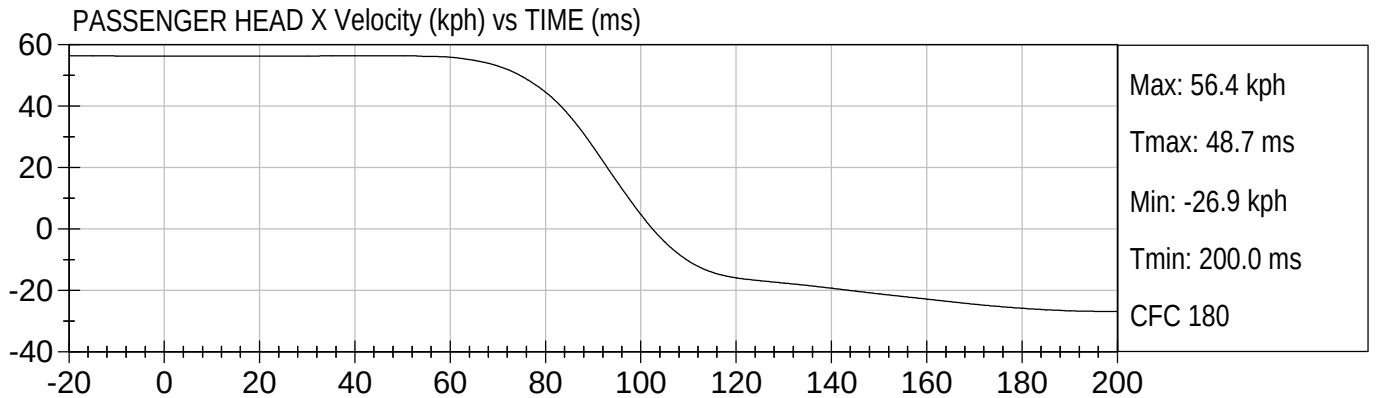


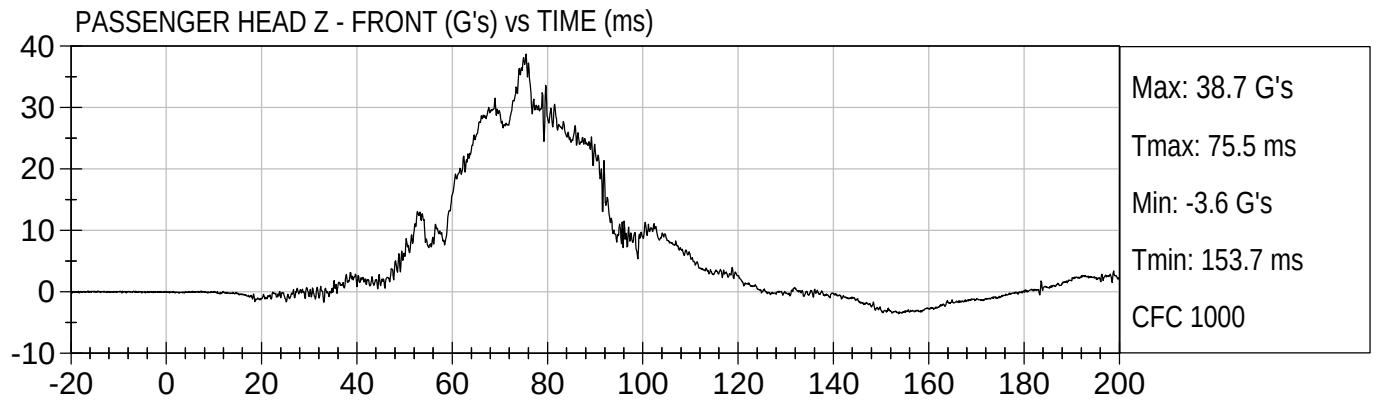
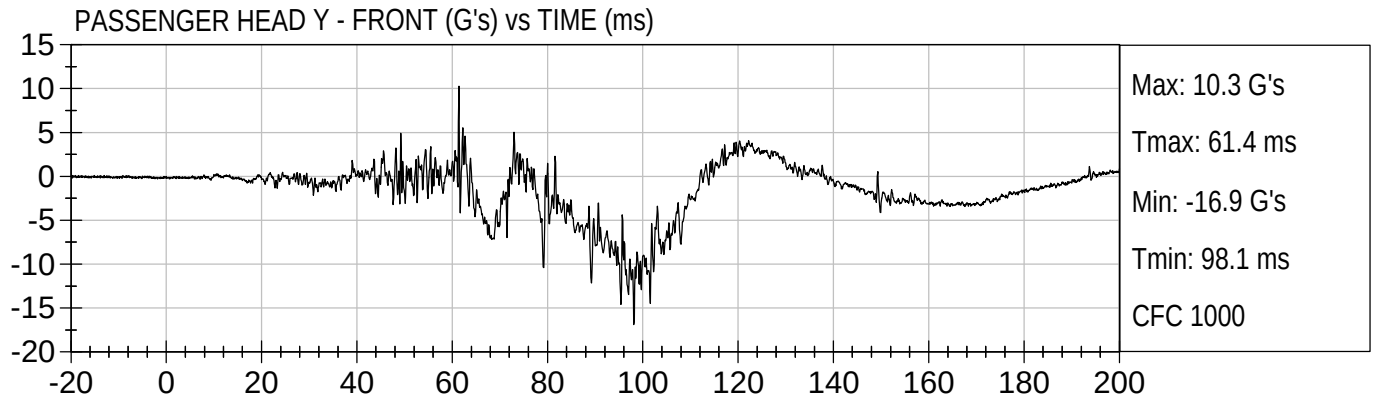


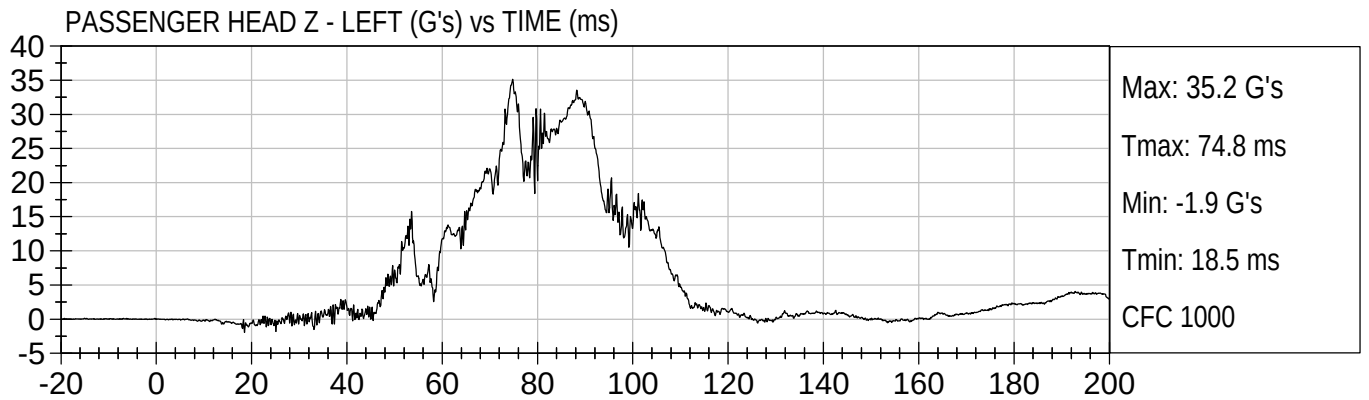
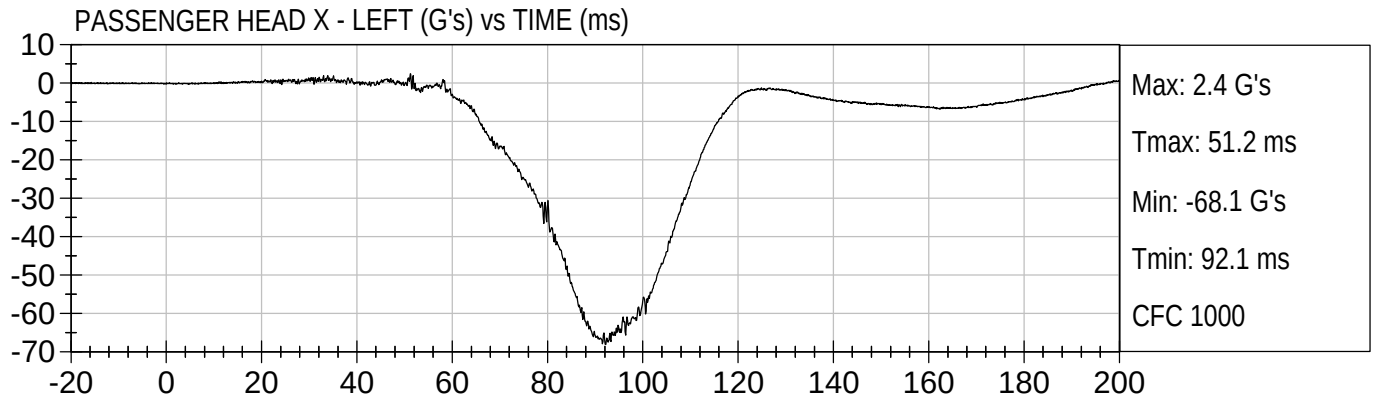






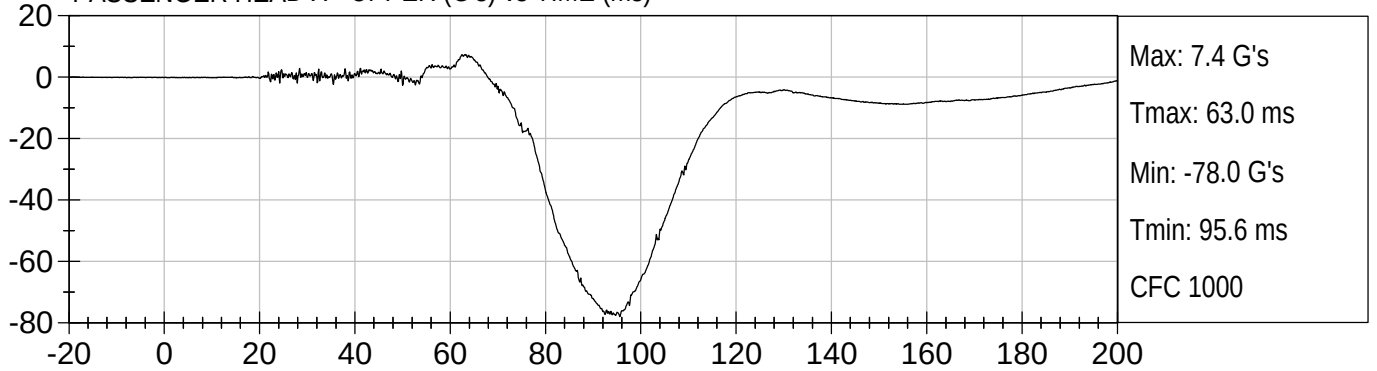




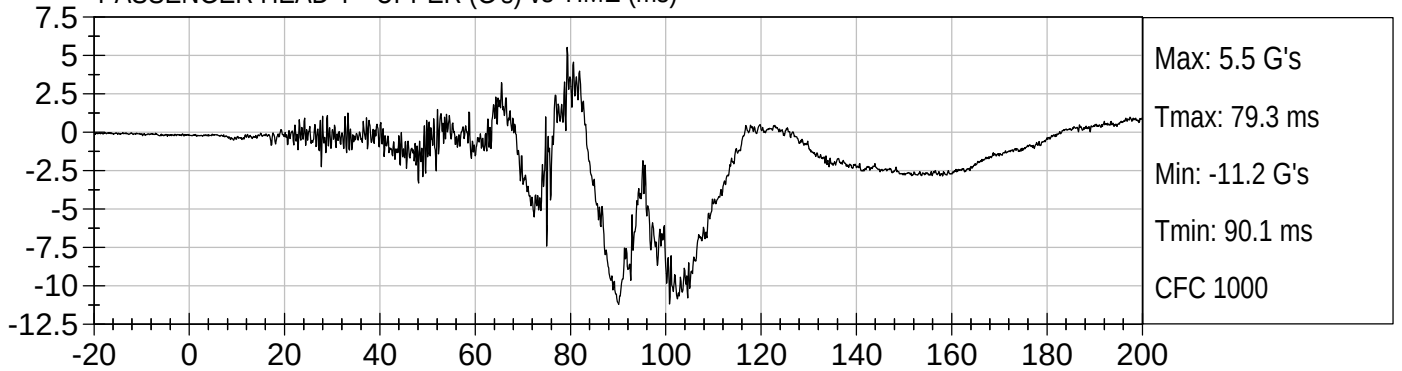


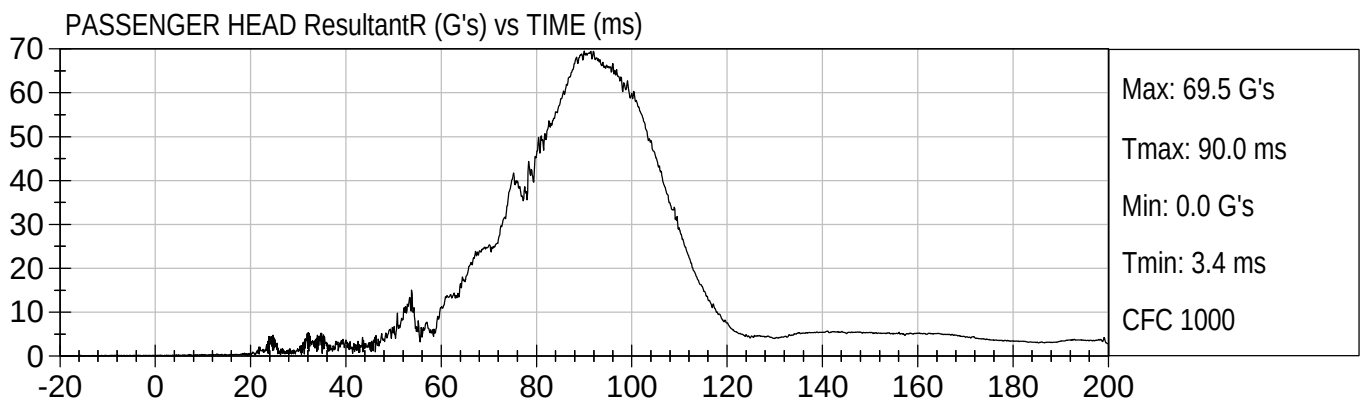
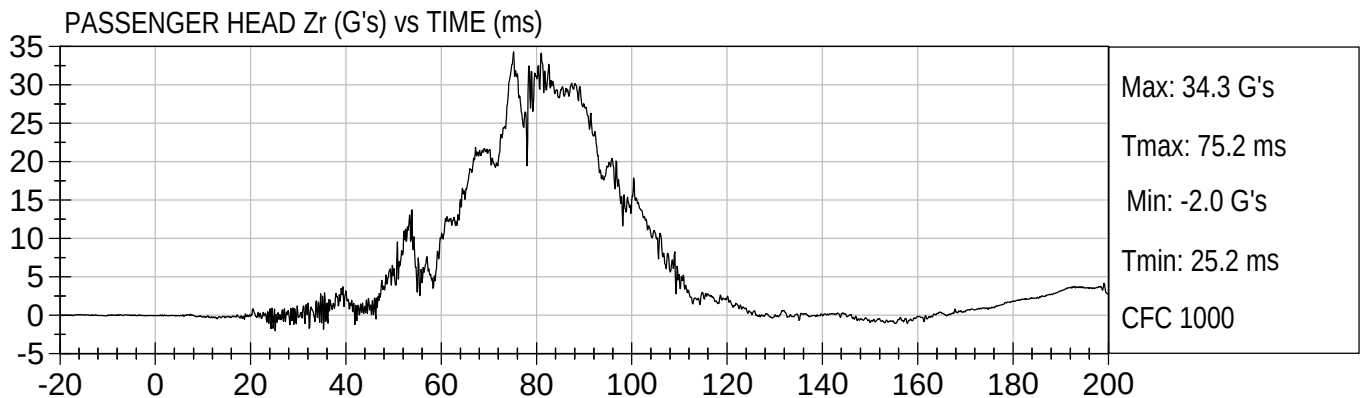
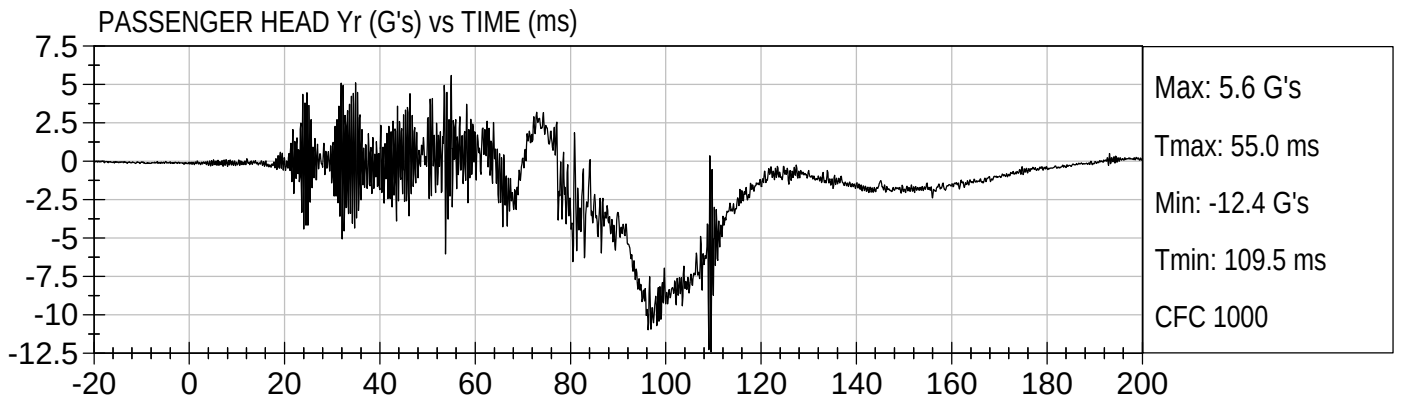
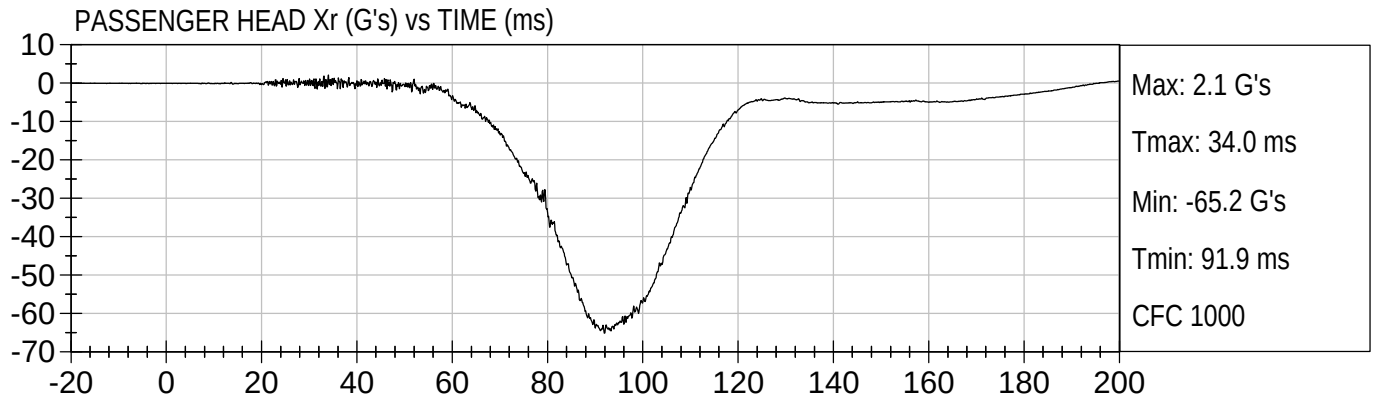


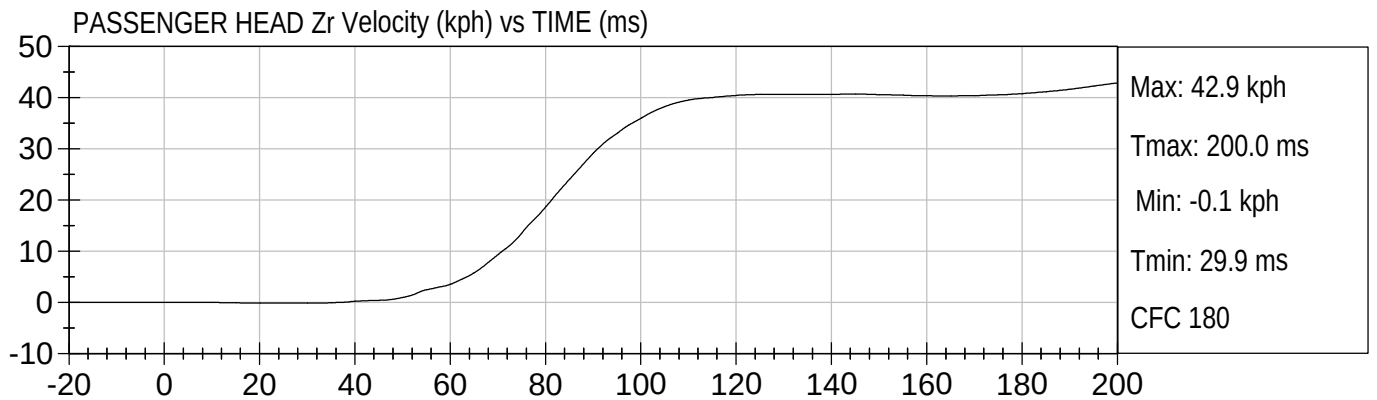
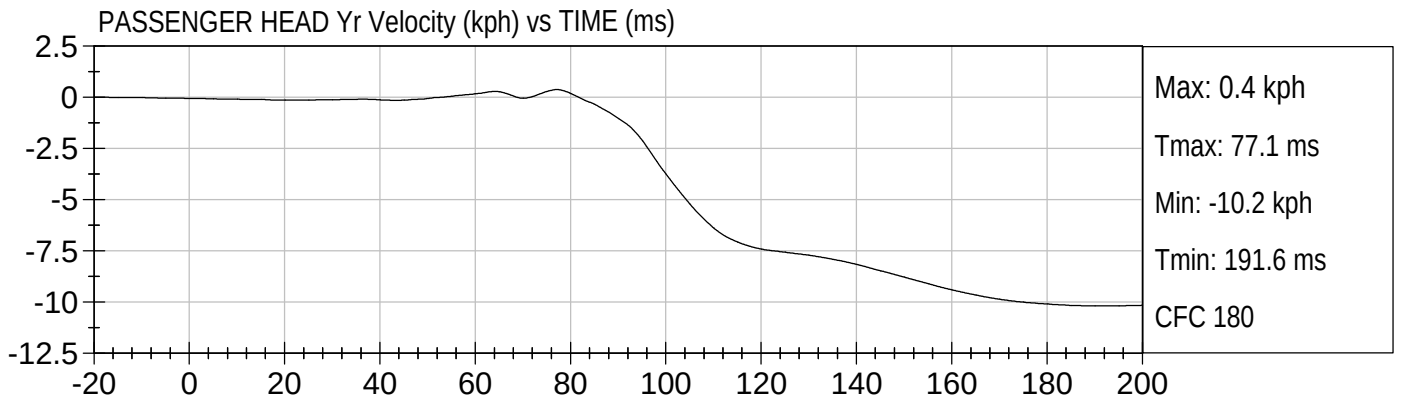
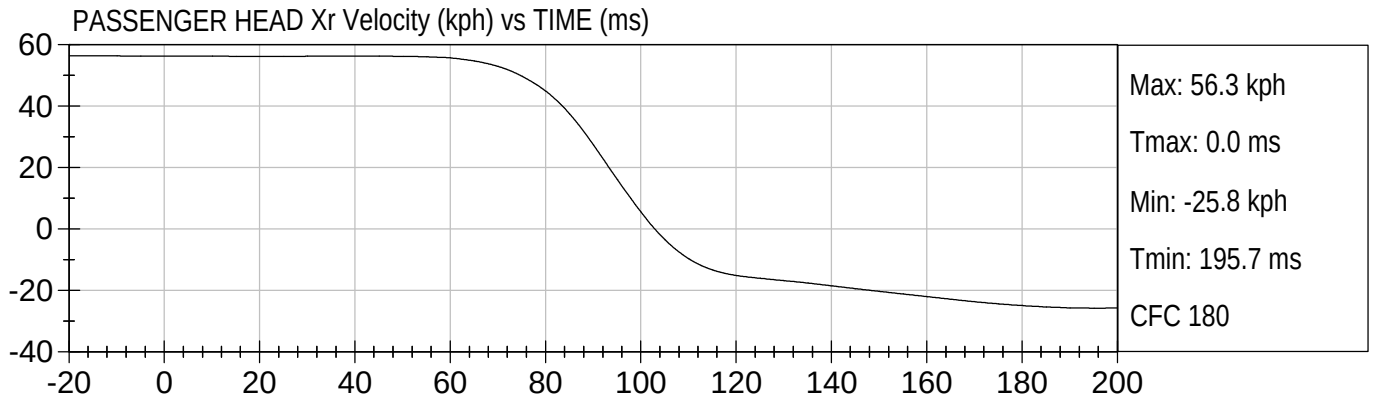
PASSENGER HEAD X - UPPER (G's) vs TIME (ms)

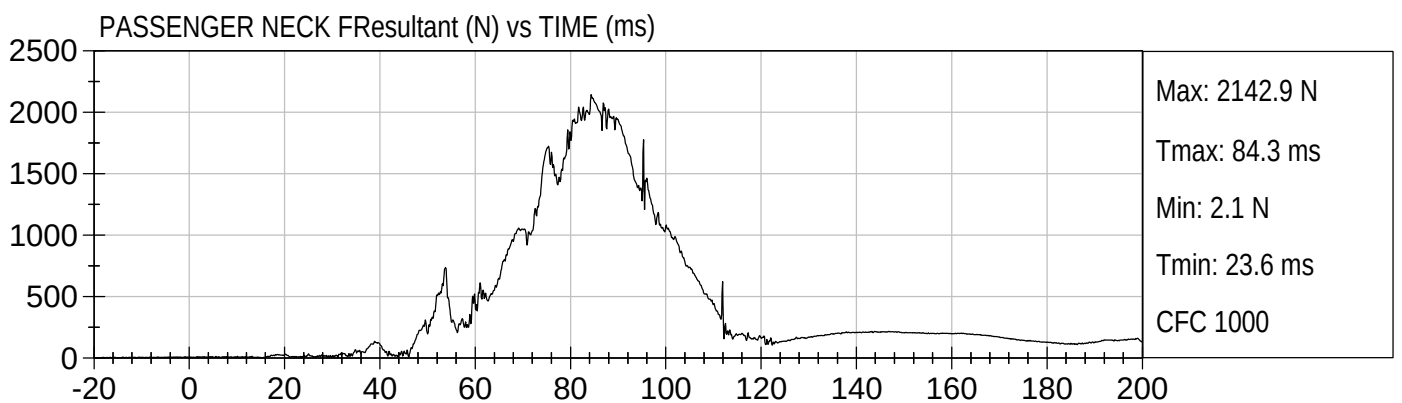
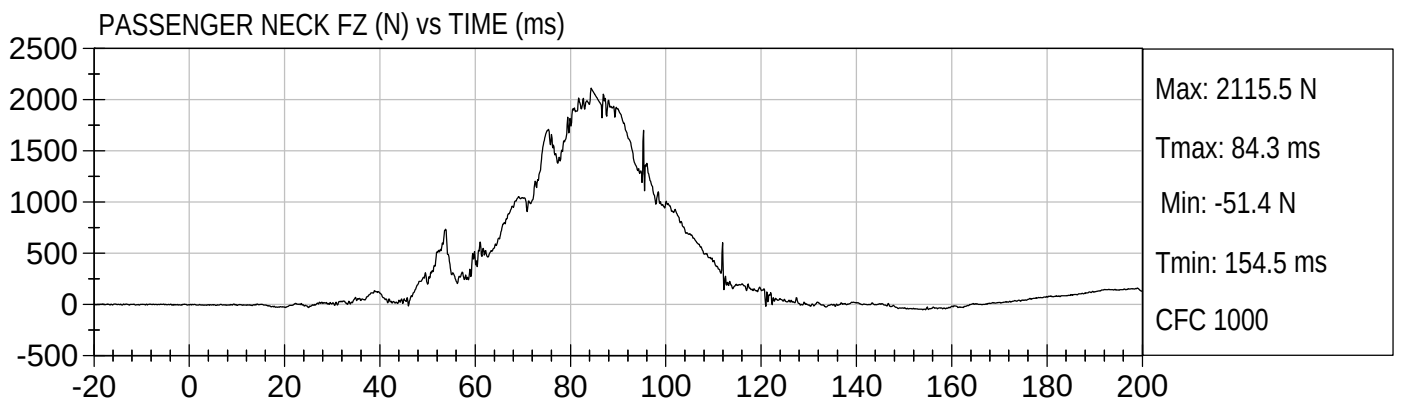
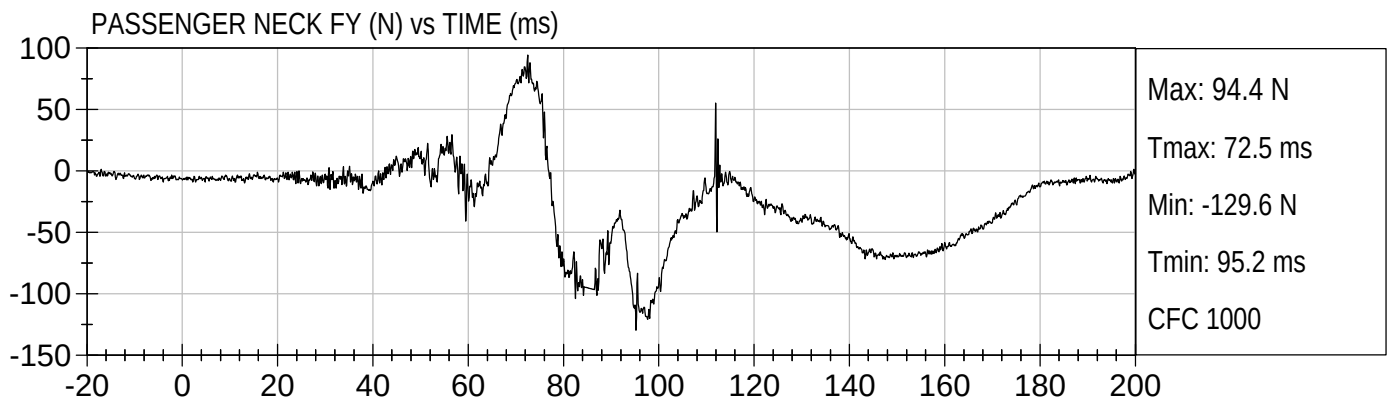
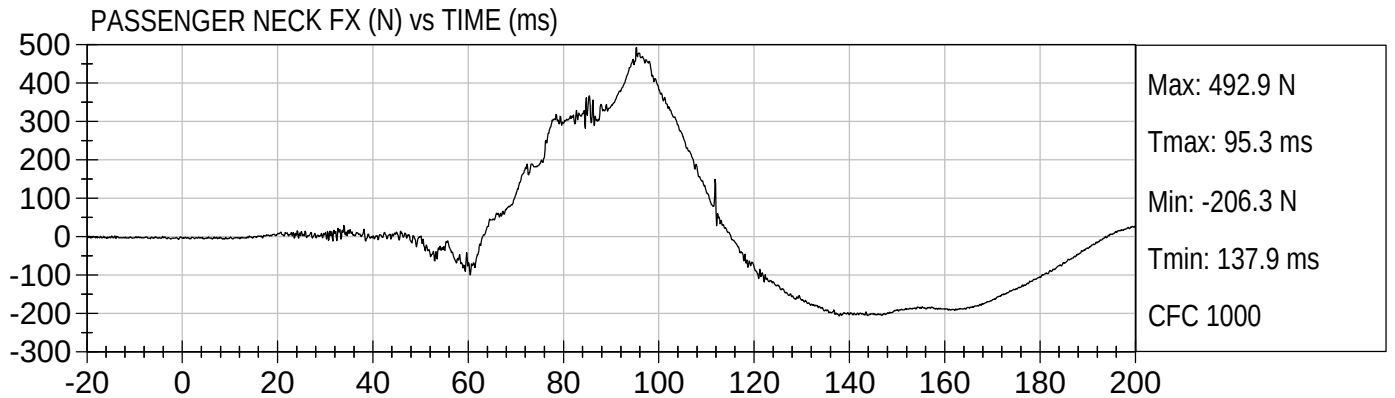


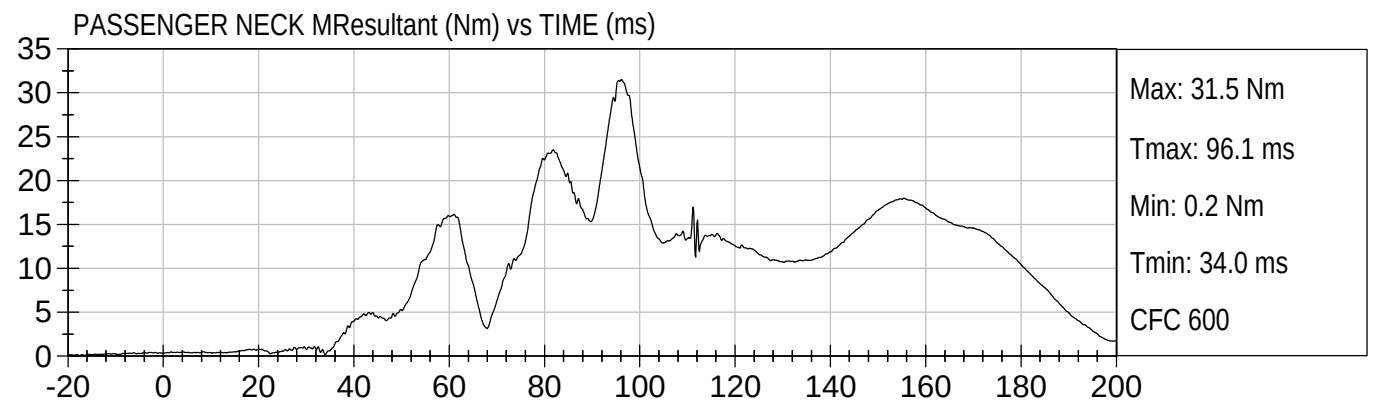
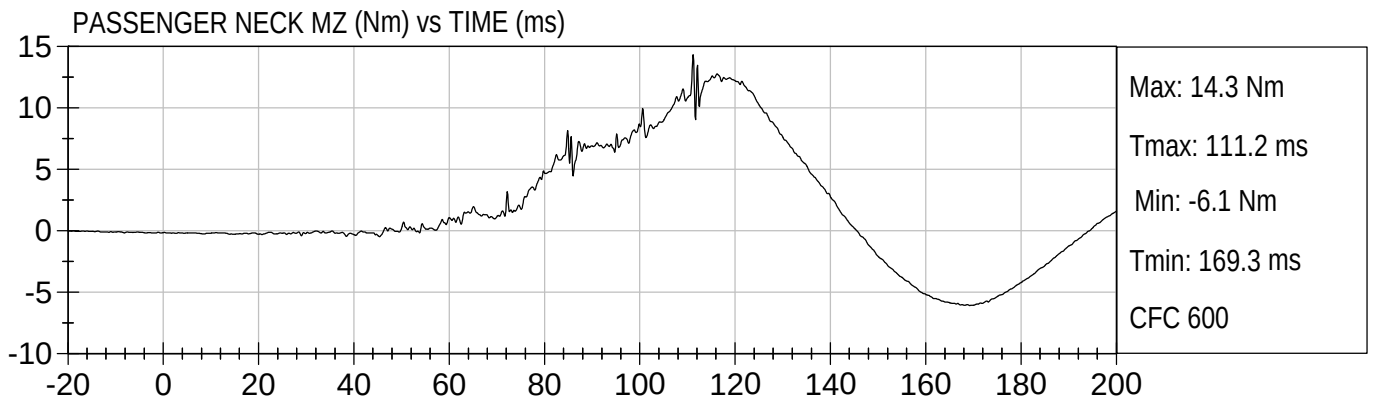
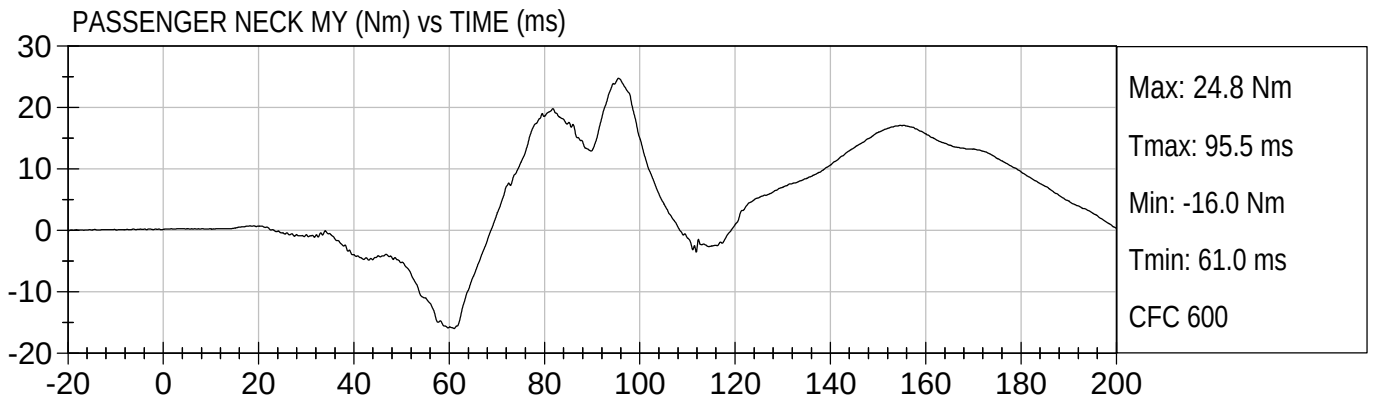
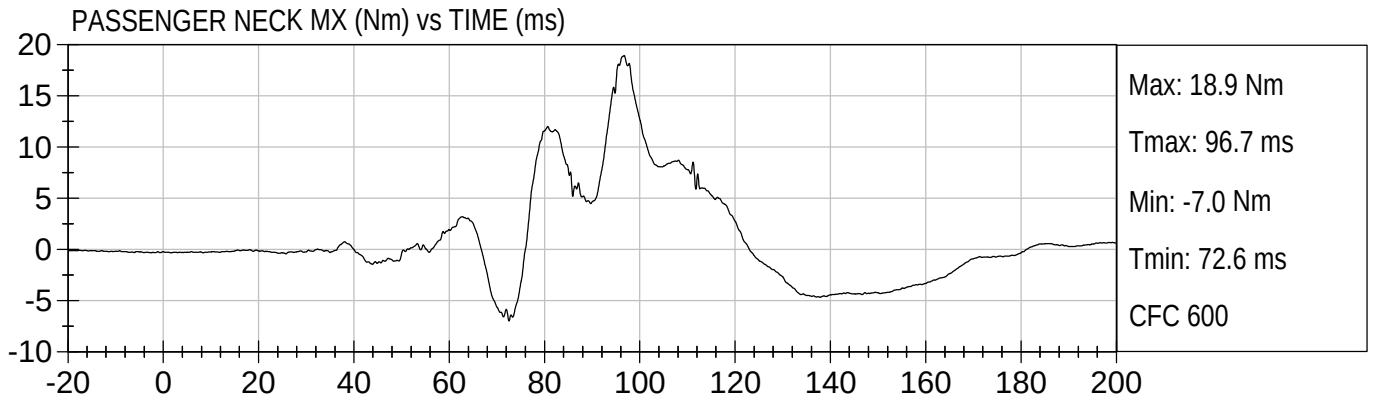
PASSENGER HEAD Y - UPPER (G's) vs TIME (ms)

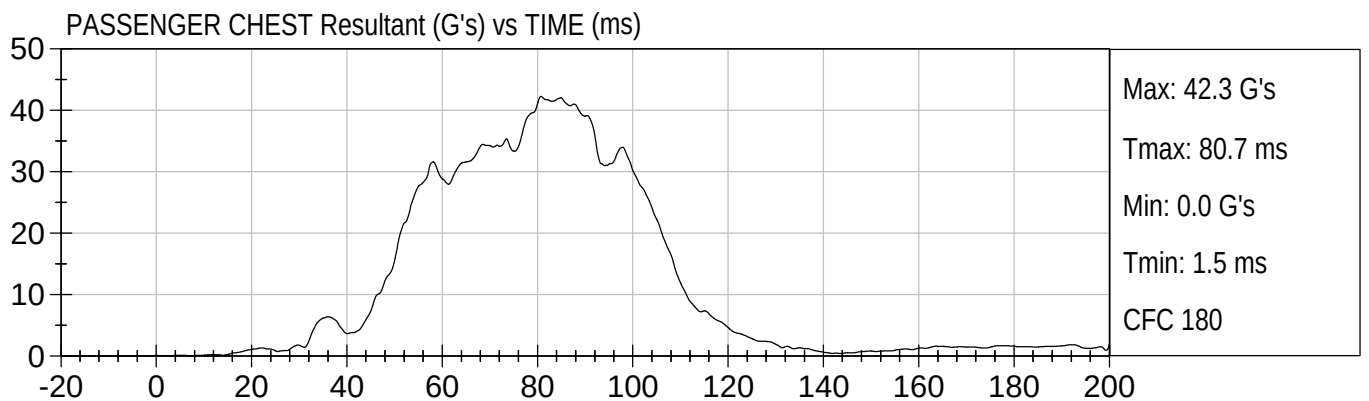
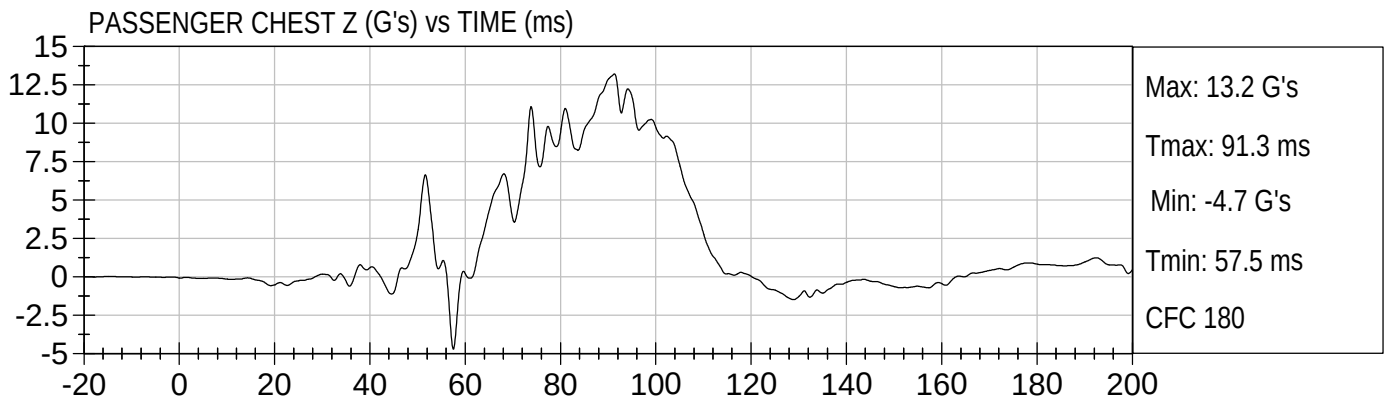
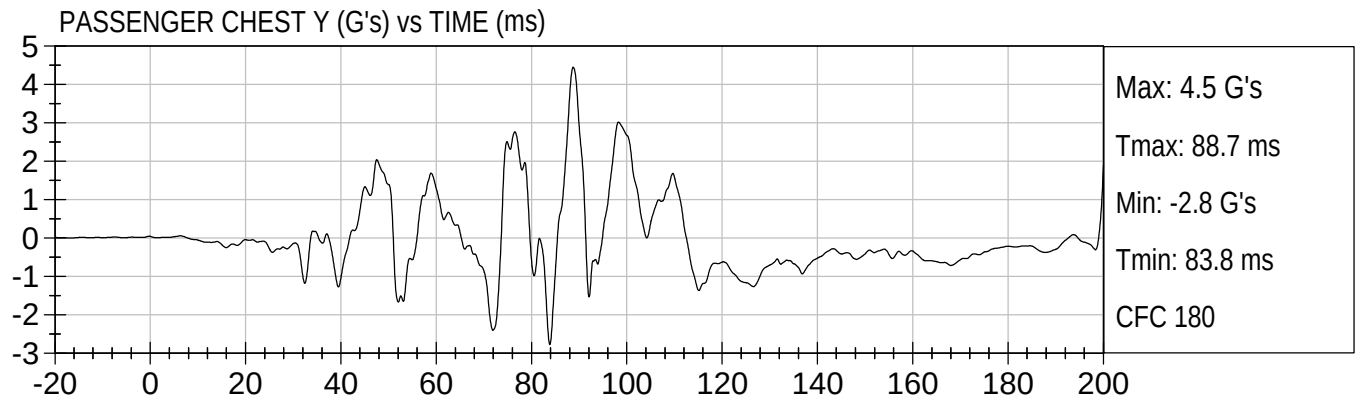
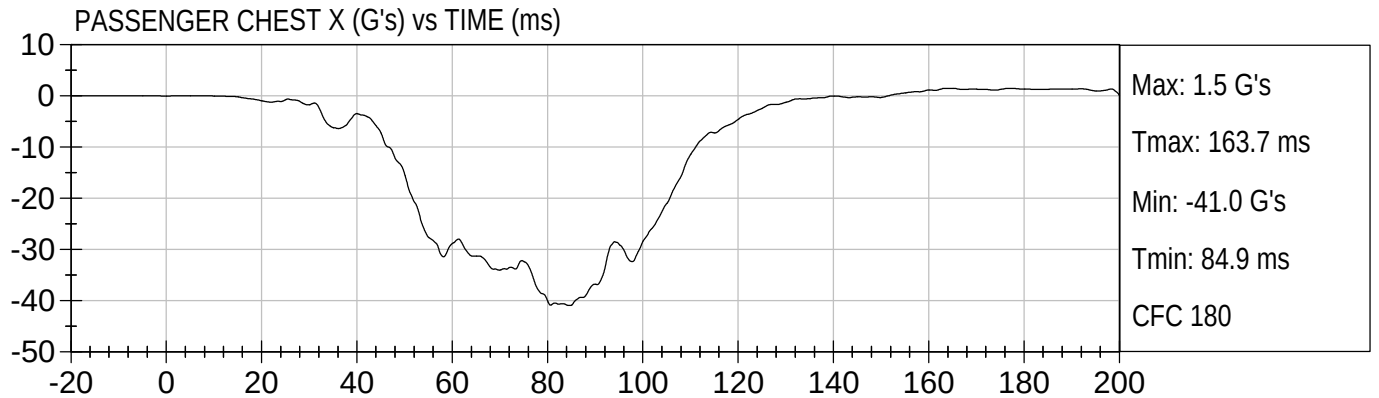






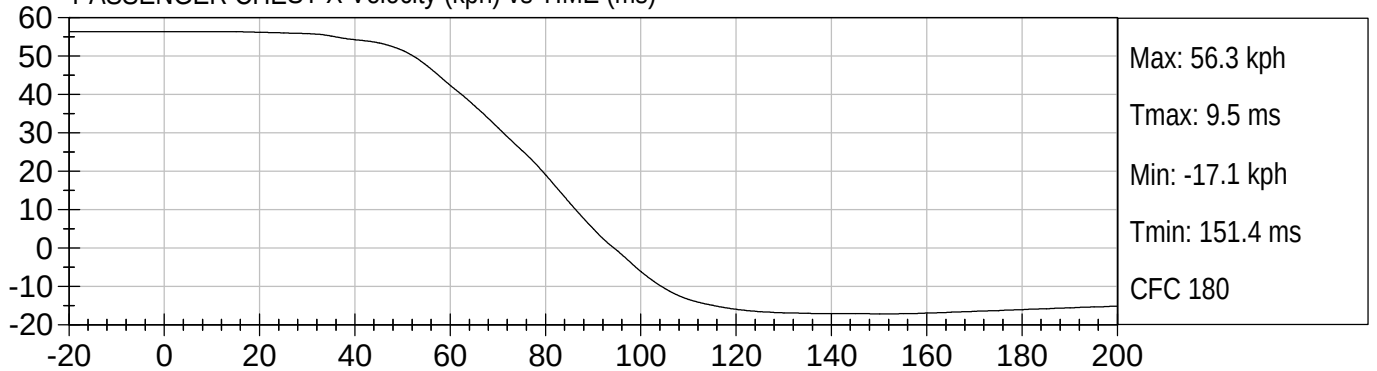




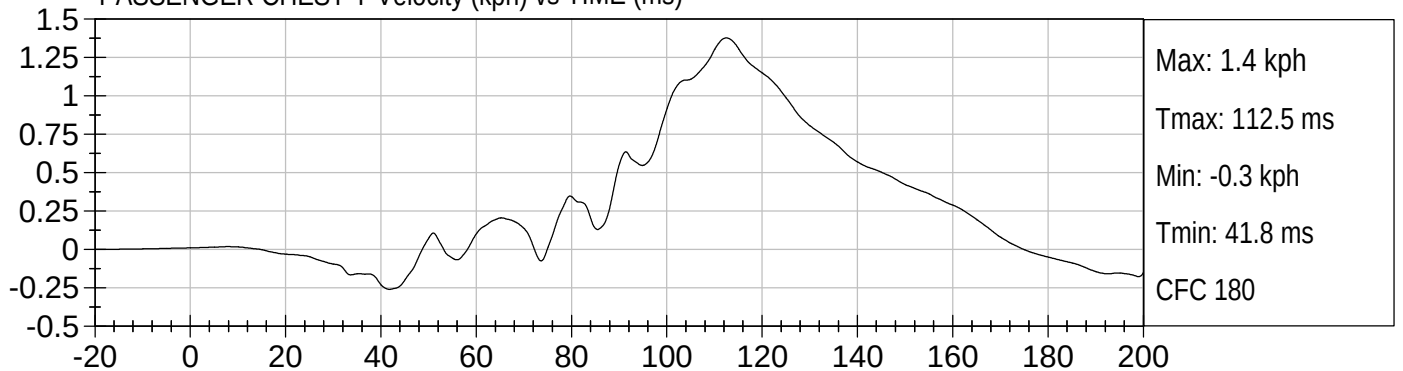




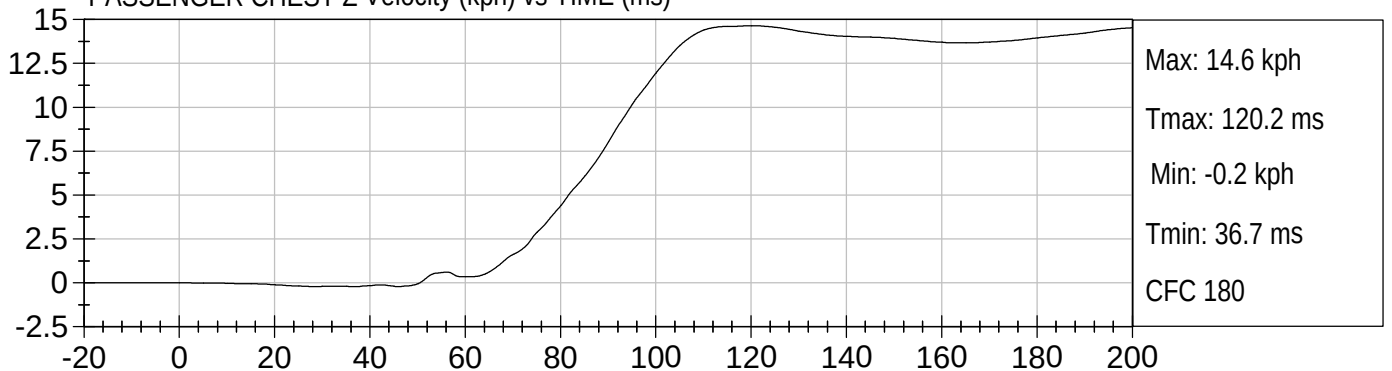
PASSENGER CHEST X Velocity (kph) vs TIME (ms)



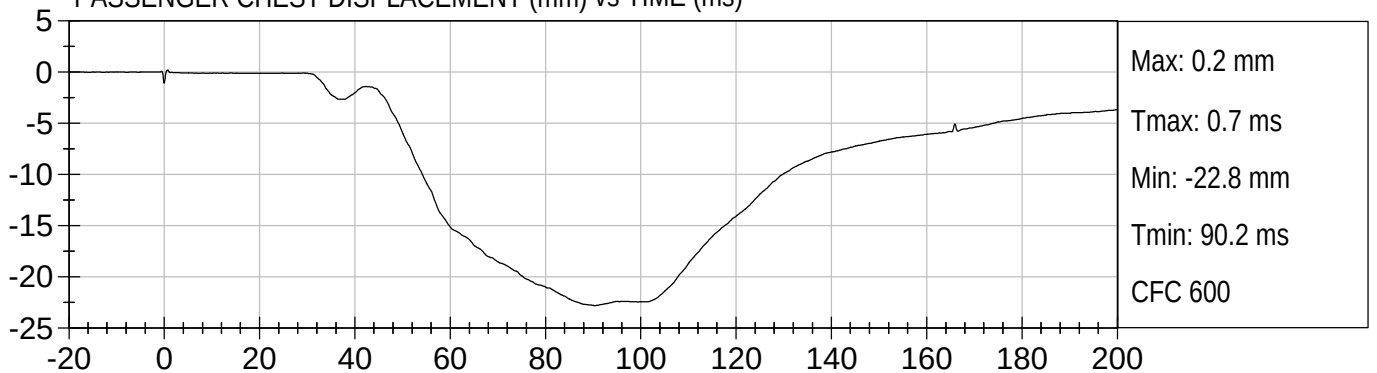
PASSENGER CHEST Y Velocity (kph) vs TIME (ms)

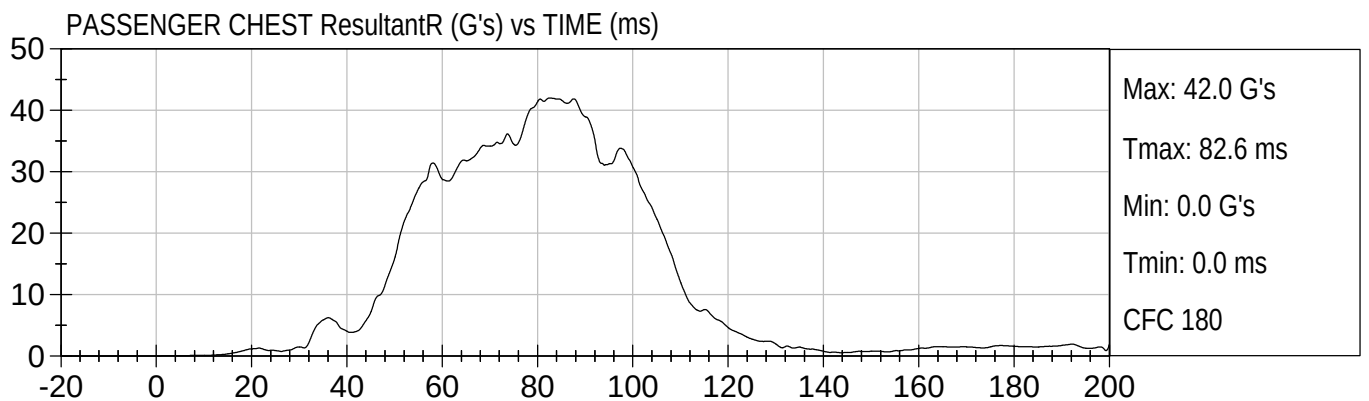
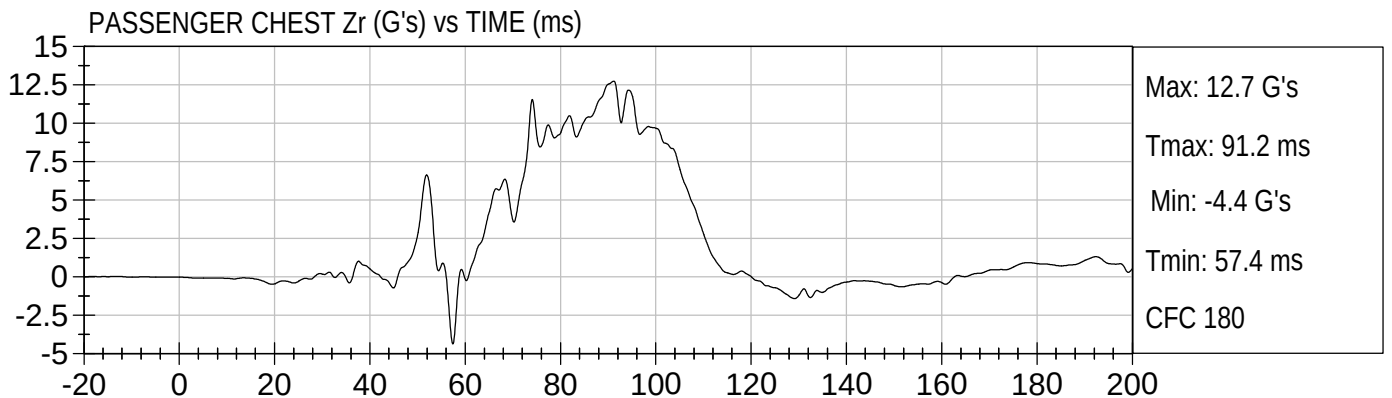
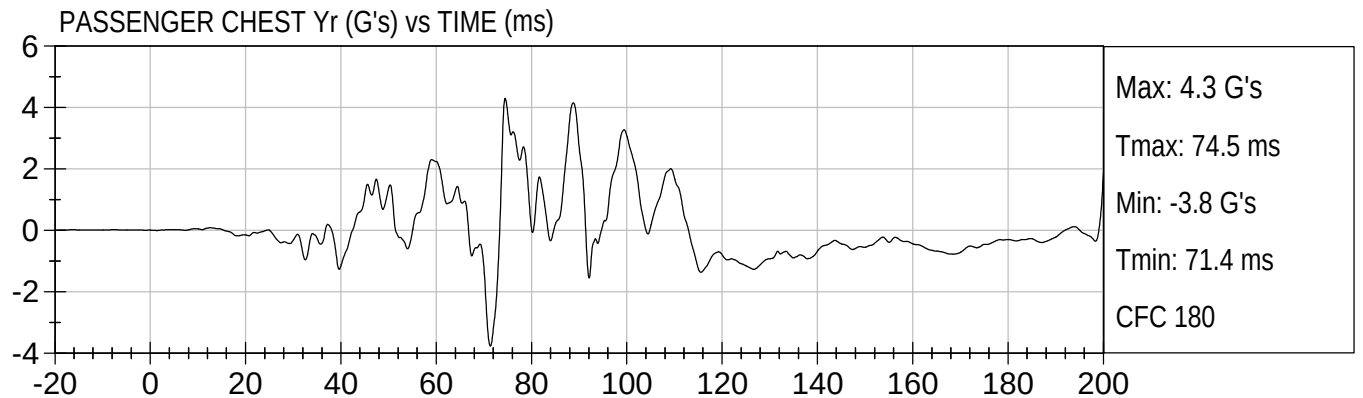
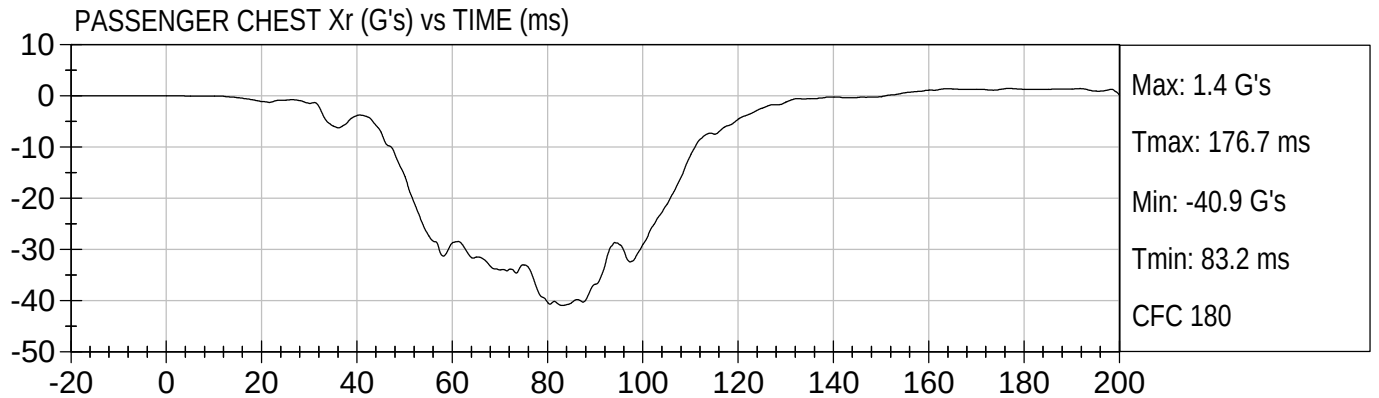


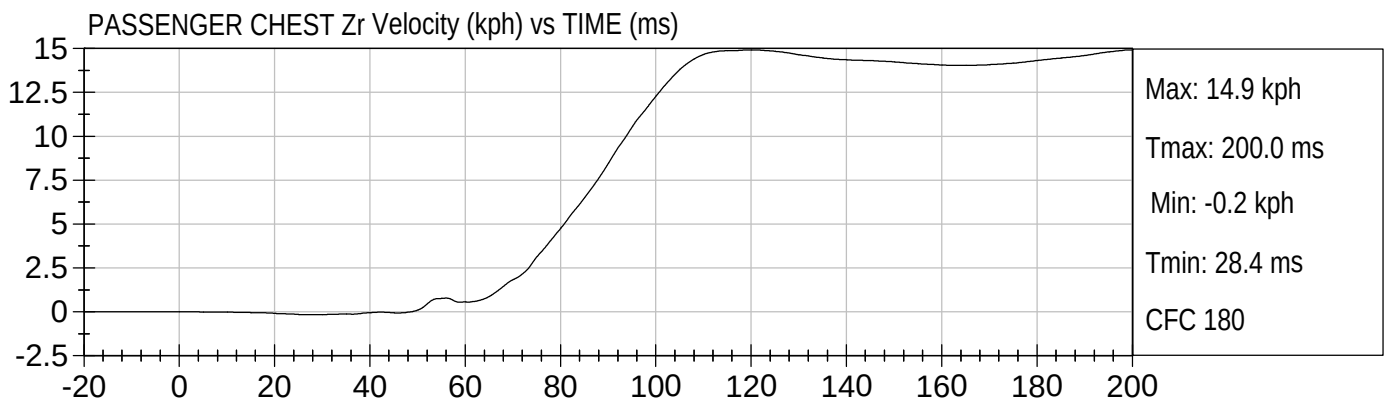
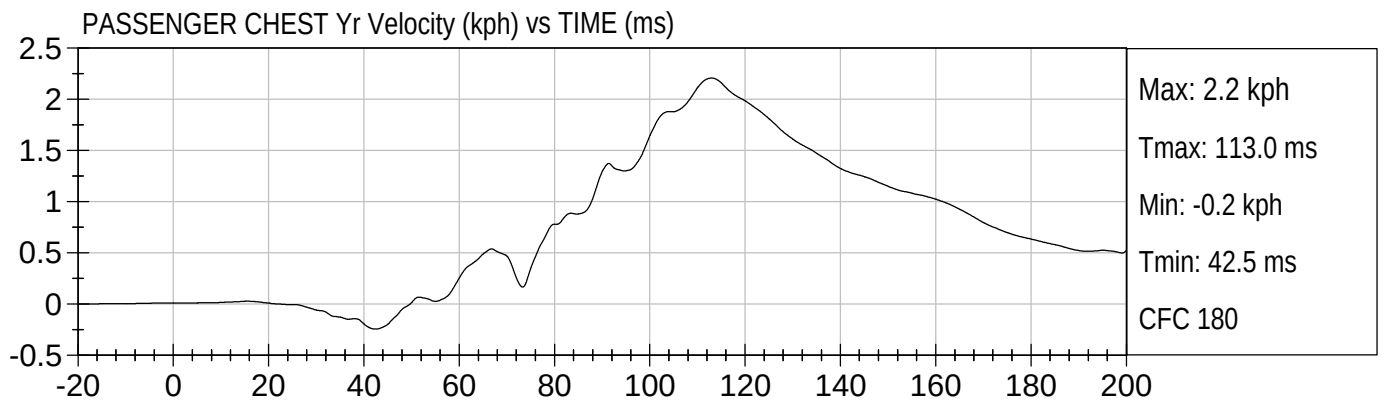
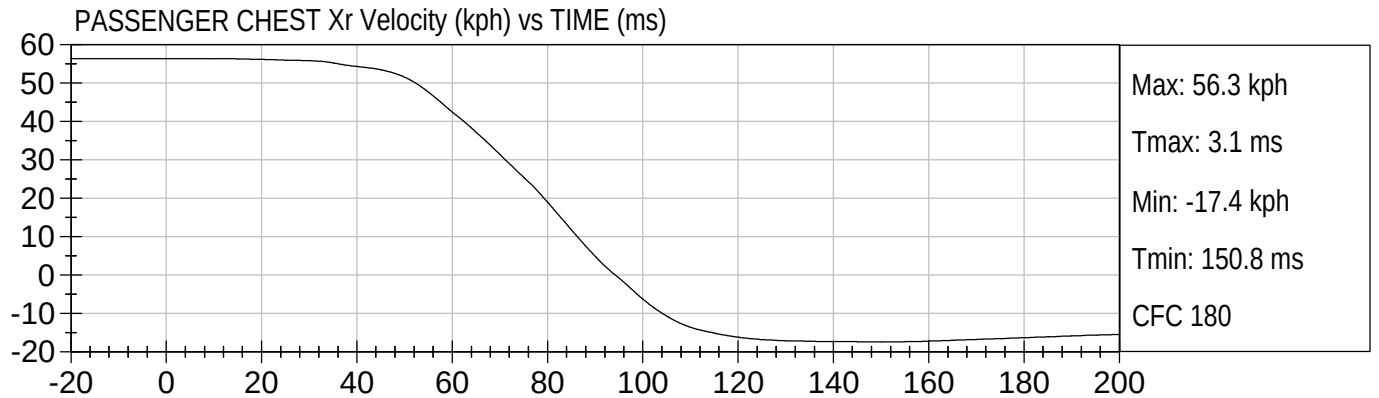
PASSENGER CHEST Z Velocity (kph) vs TIME (ms)

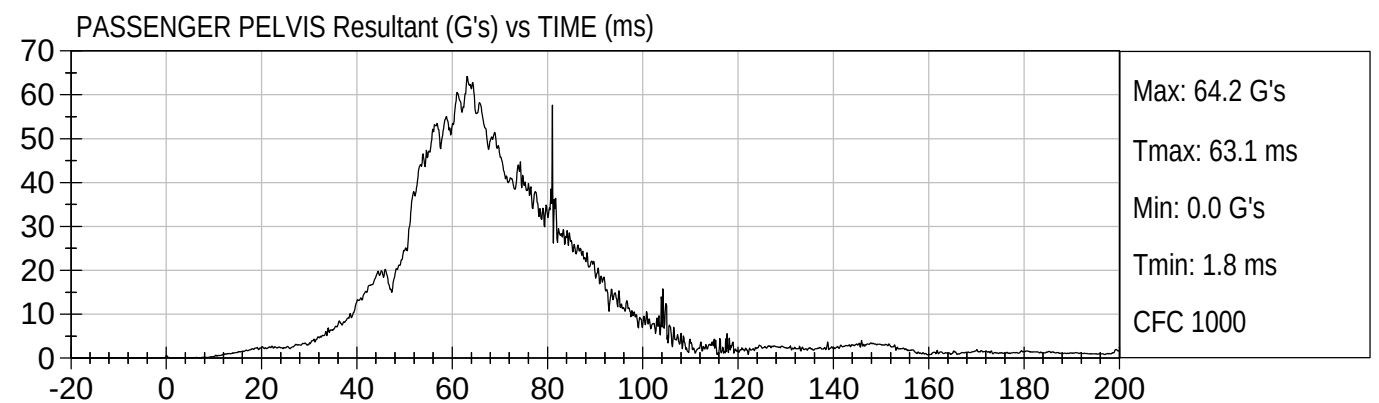
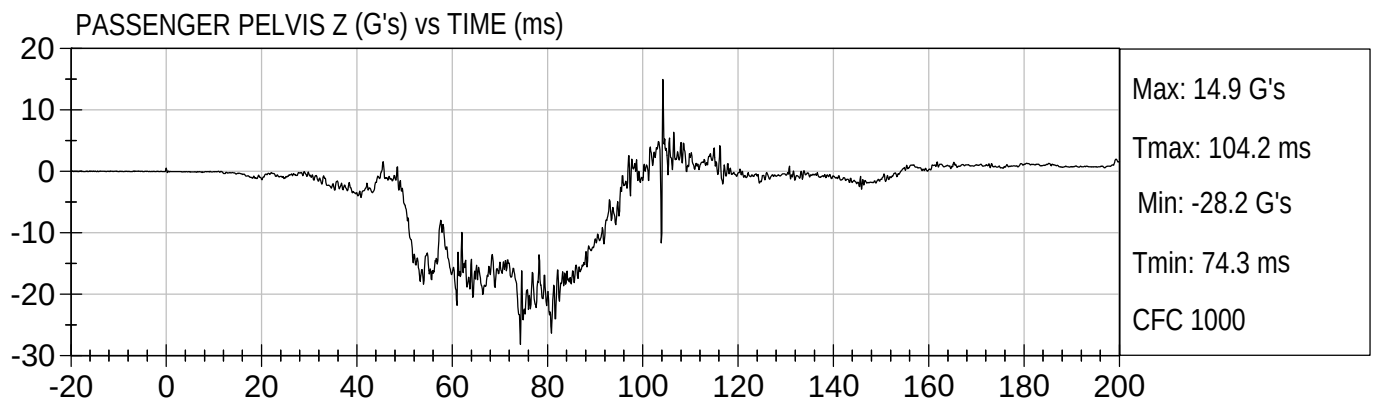
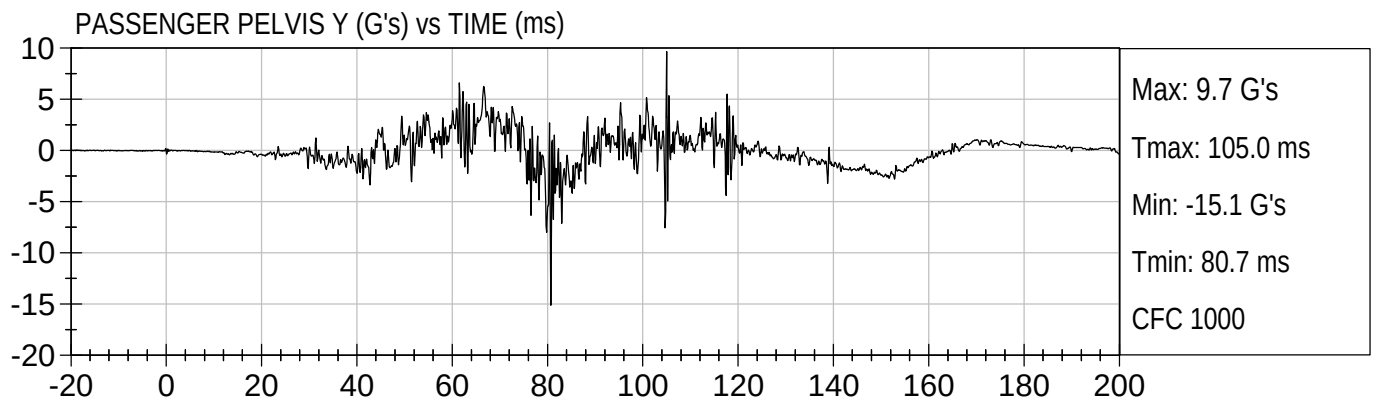
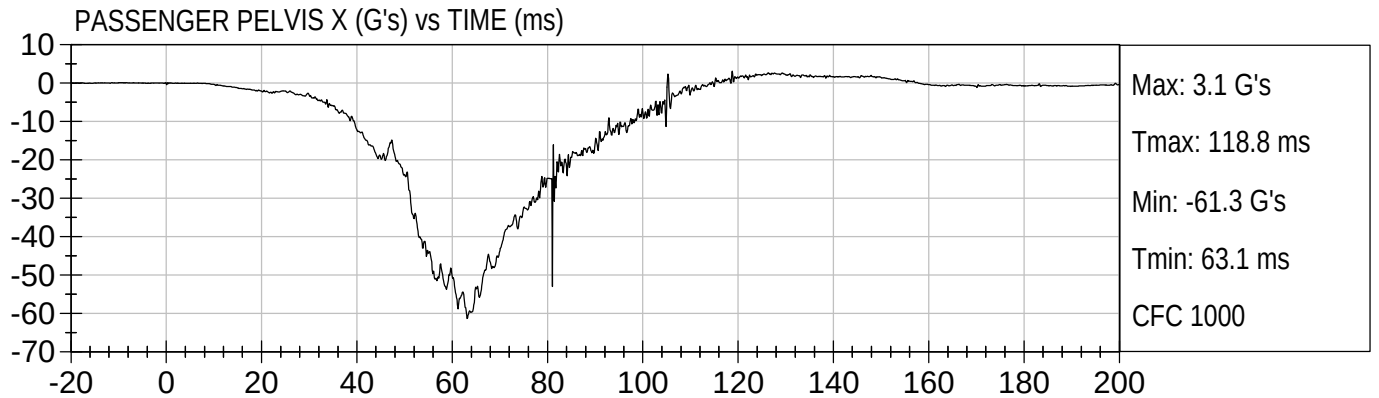


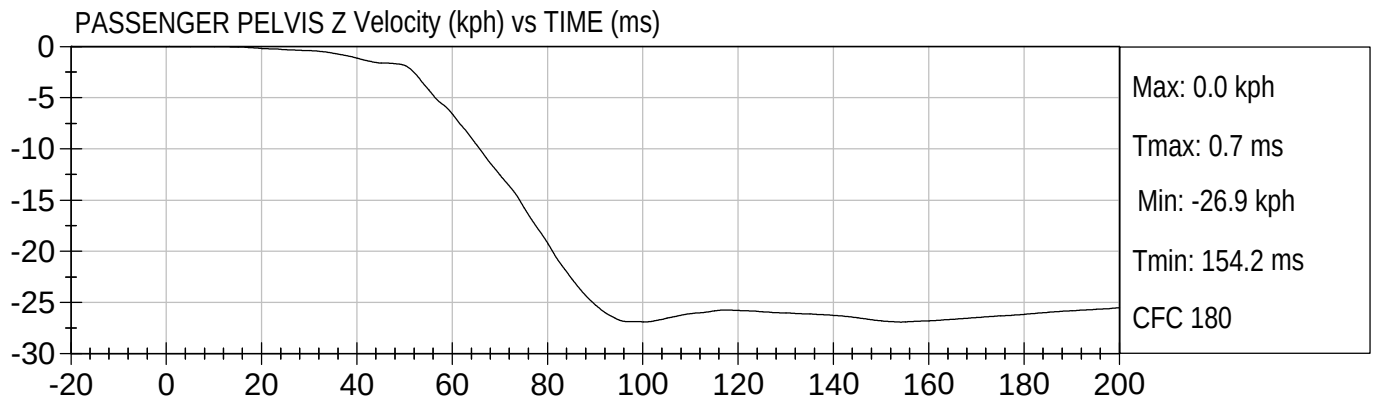
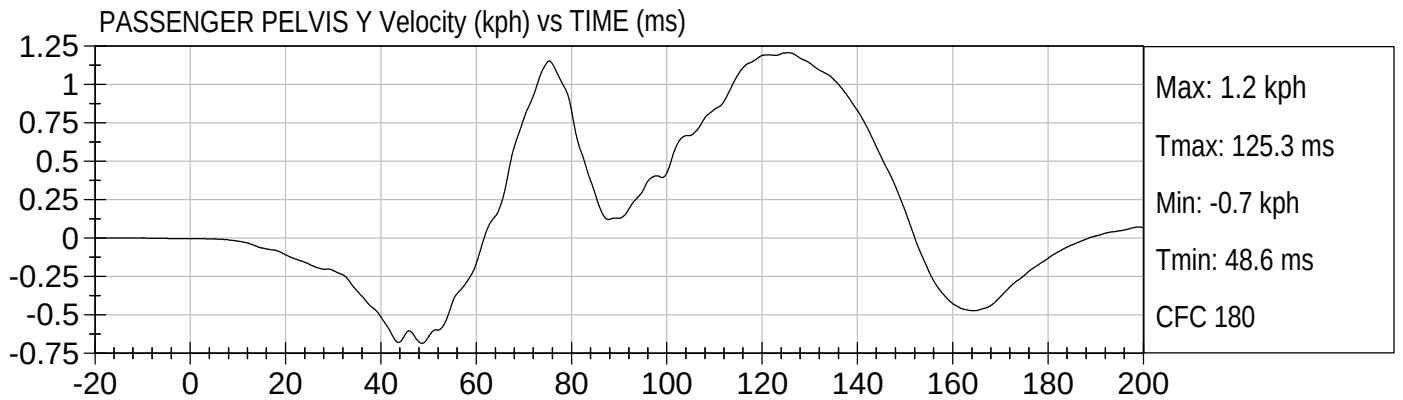
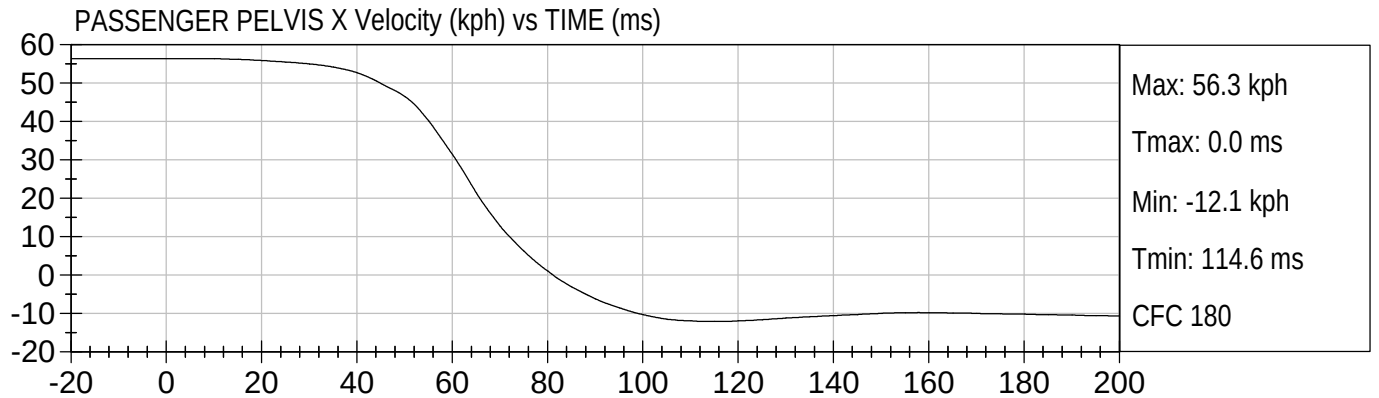
PASSENGER CHEST DISPLACEMENT (mm) vs TIME (ms)

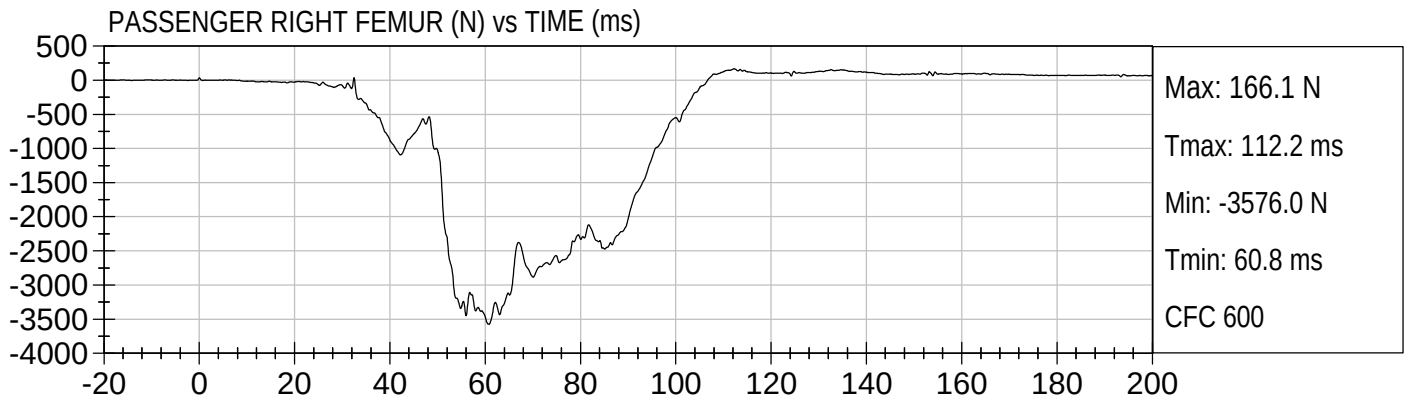
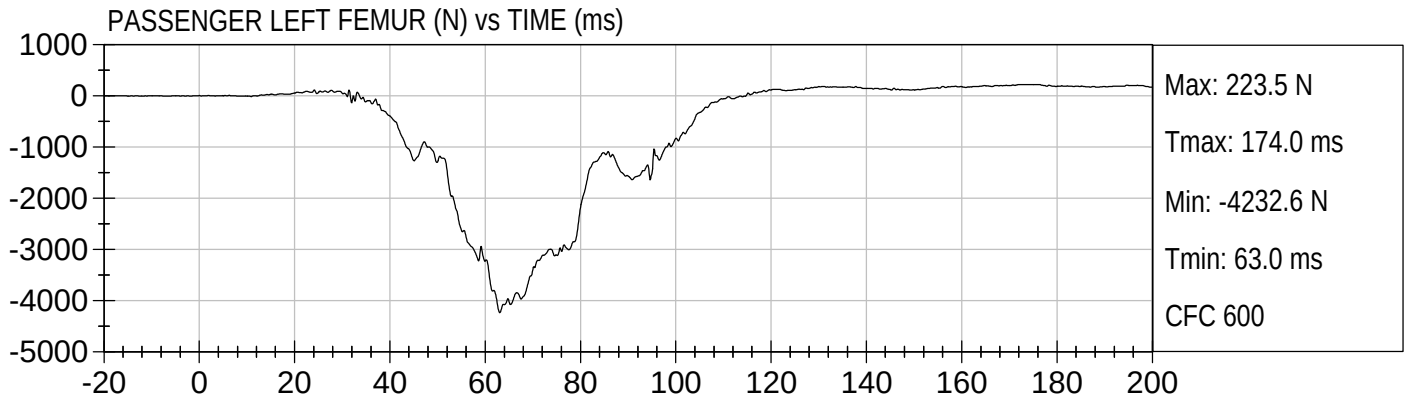






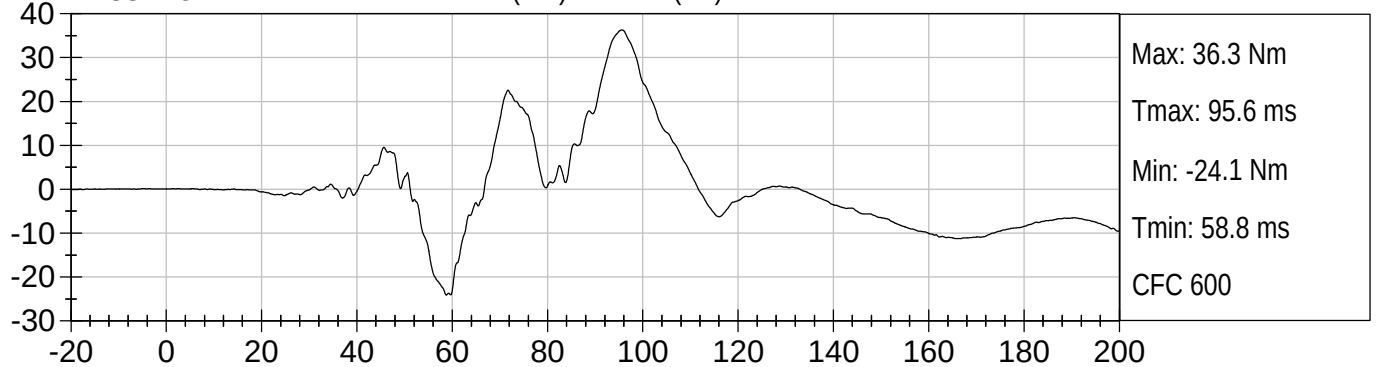




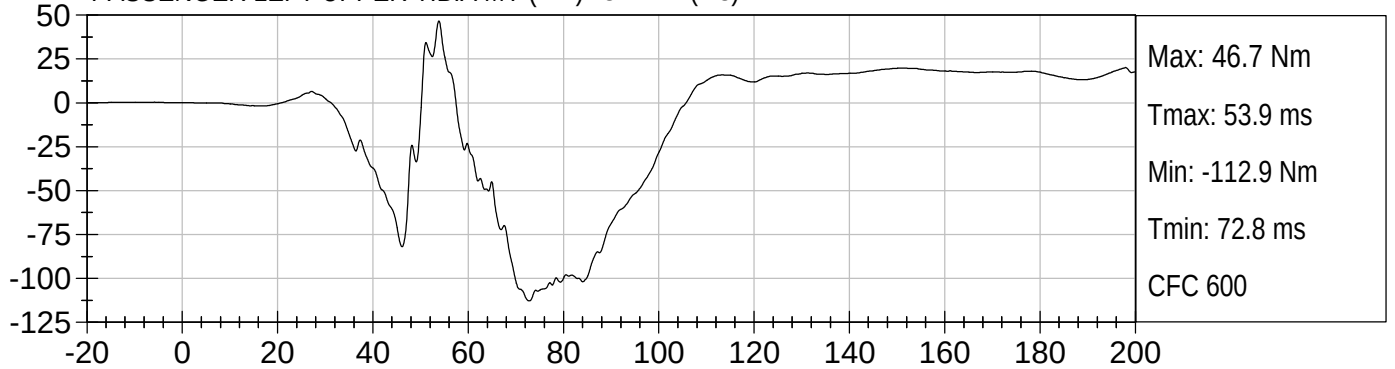




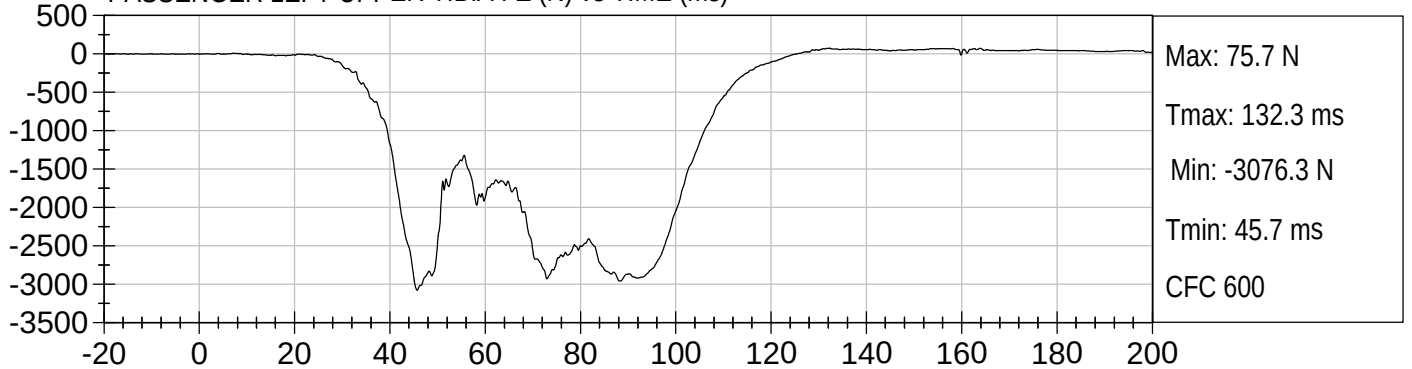
PASSENGER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



PASSENGER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)

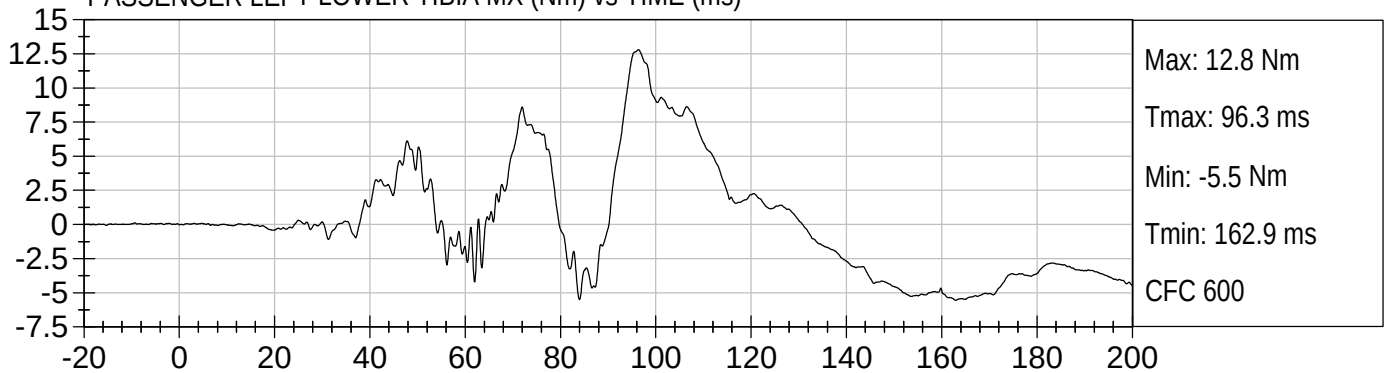


PASSENGER LEFT UPPER TIBIA FZ (N) vs TIME (ms)

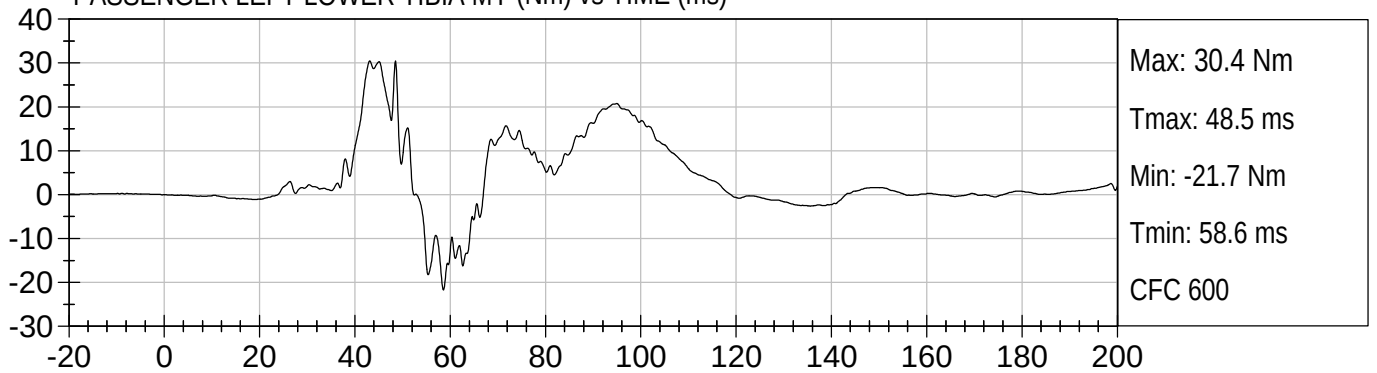




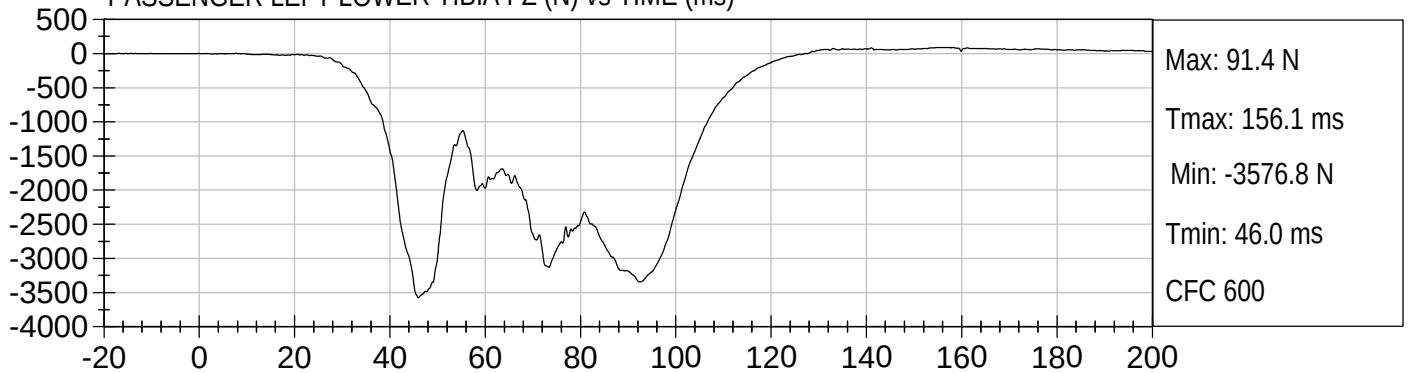
PASSENGER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



PASSENGER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)

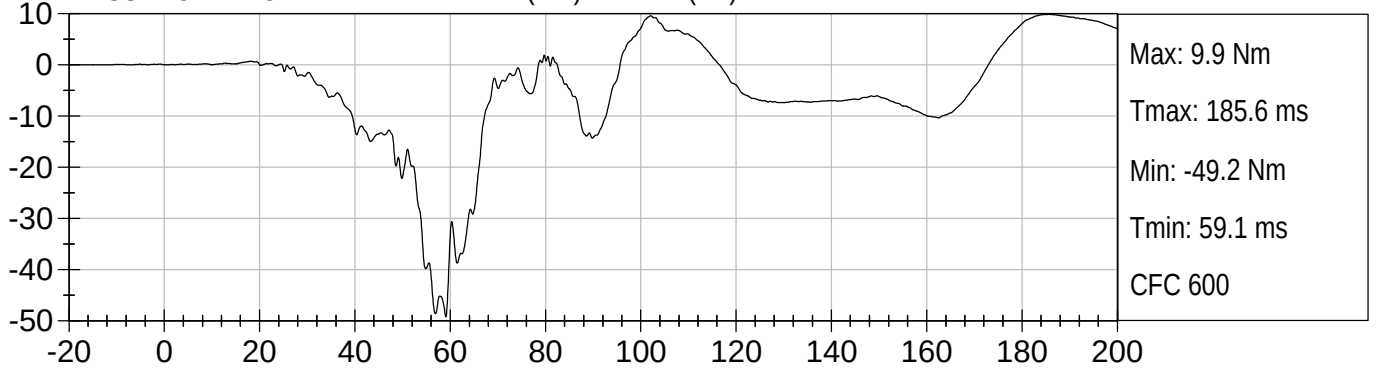


PASSENGER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

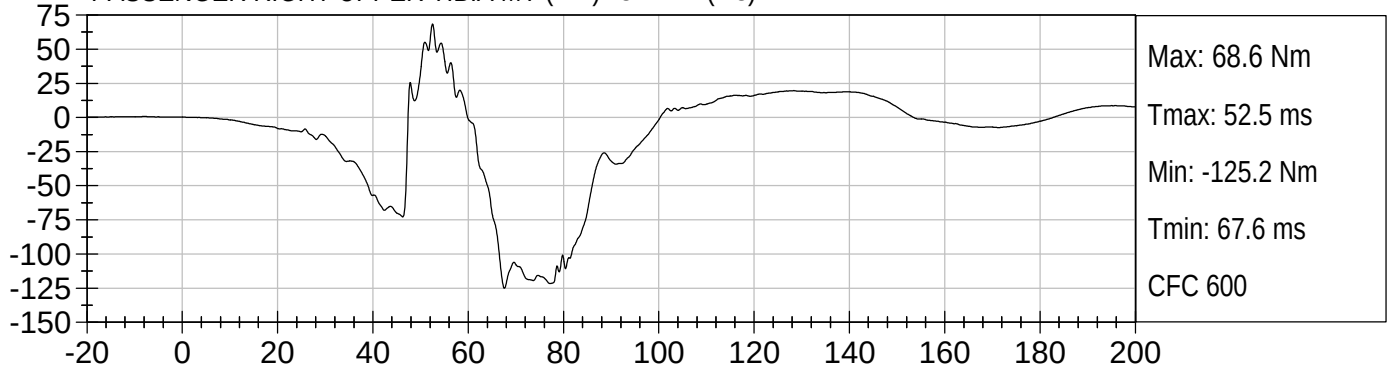




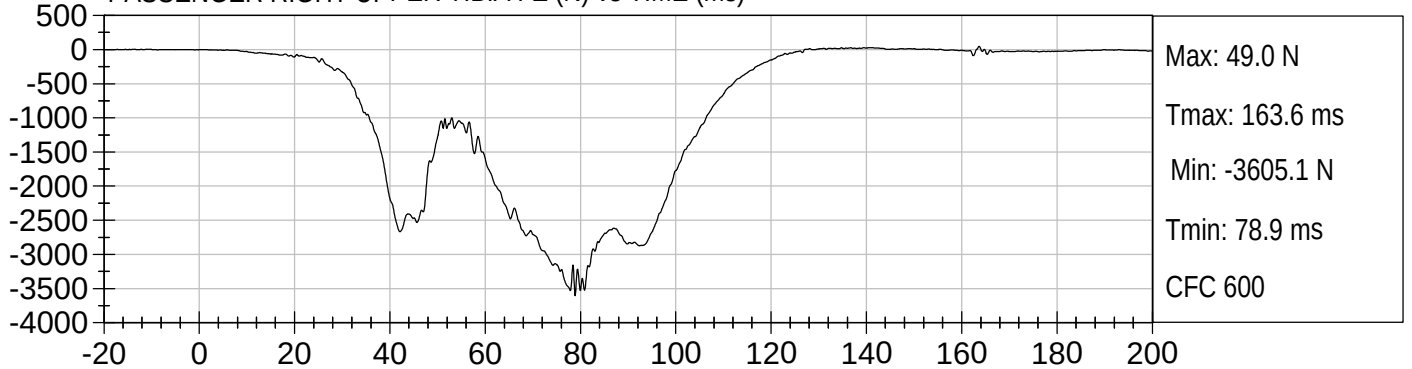
PASSENGER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)

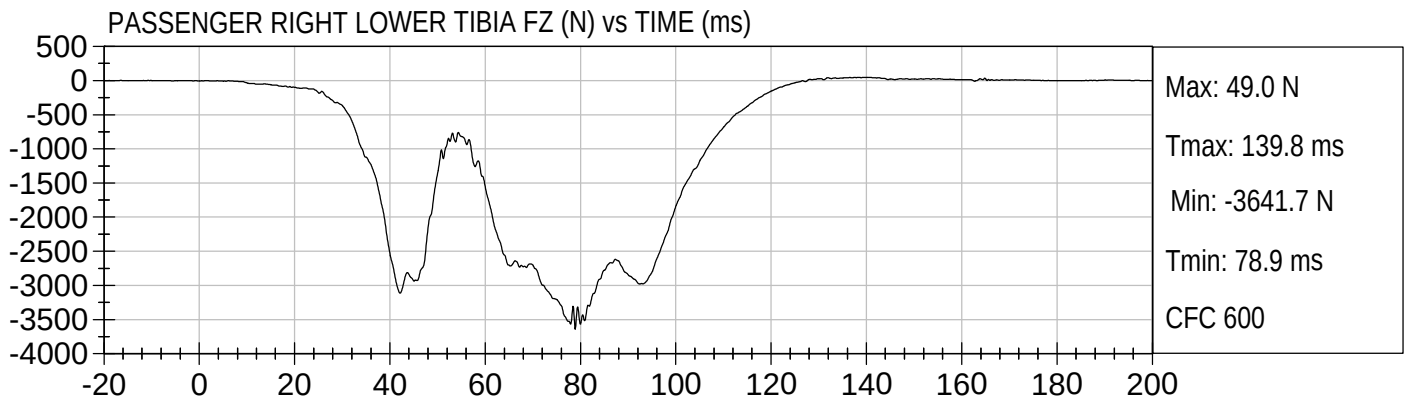
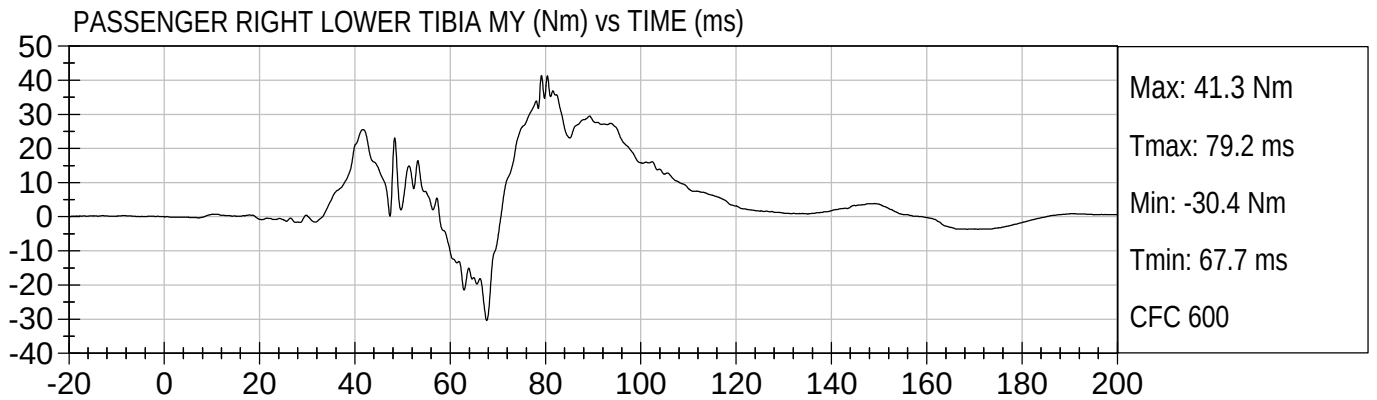
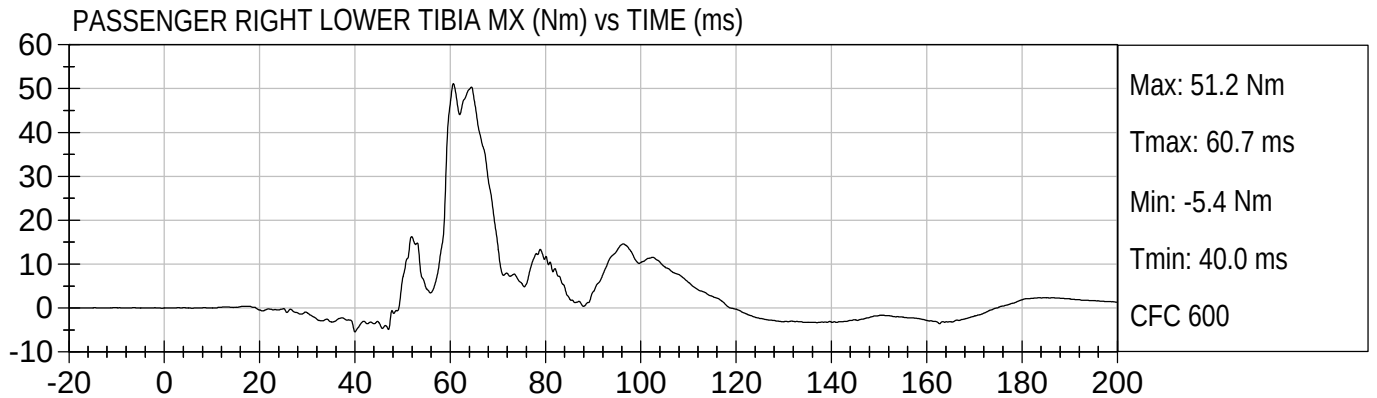


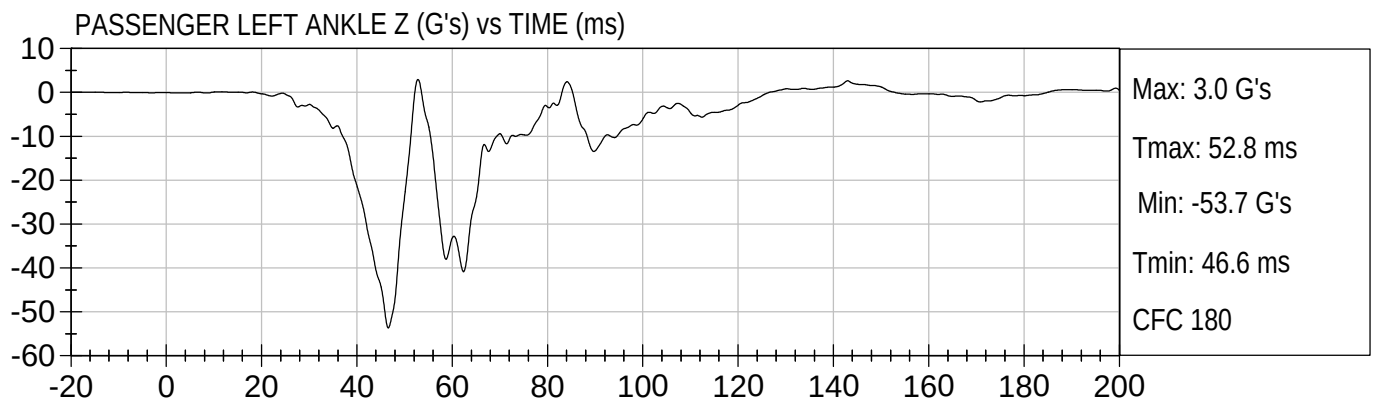
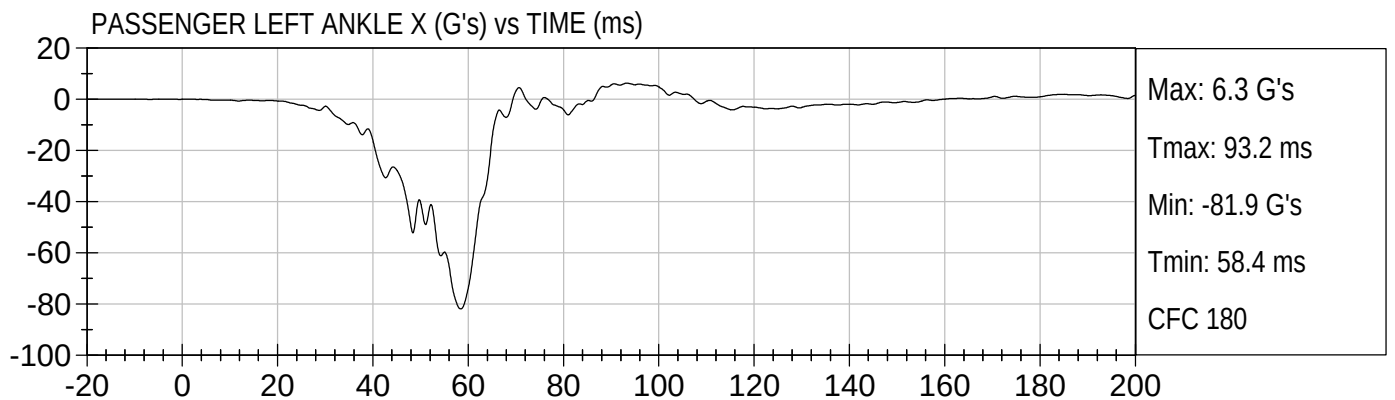
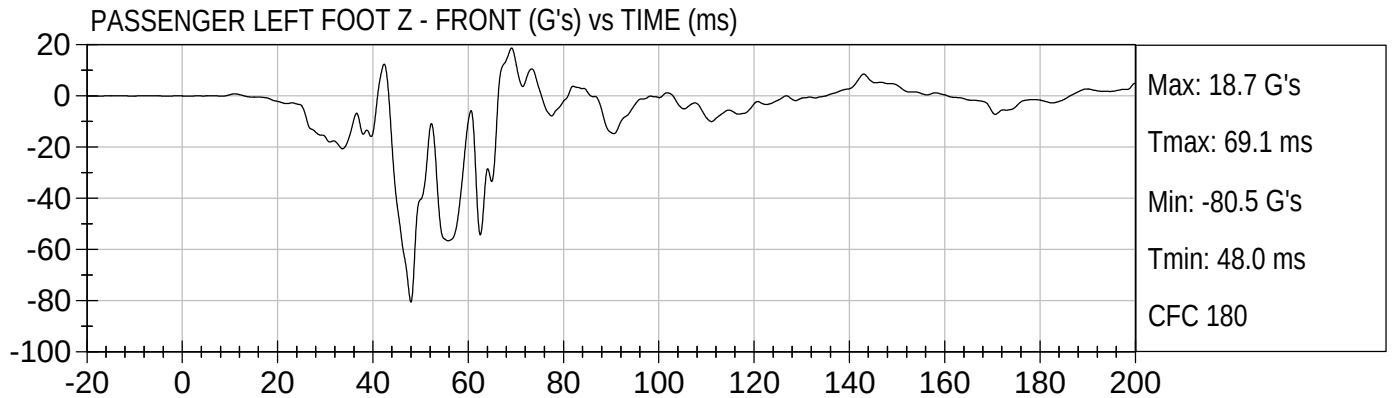
PASSENGER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

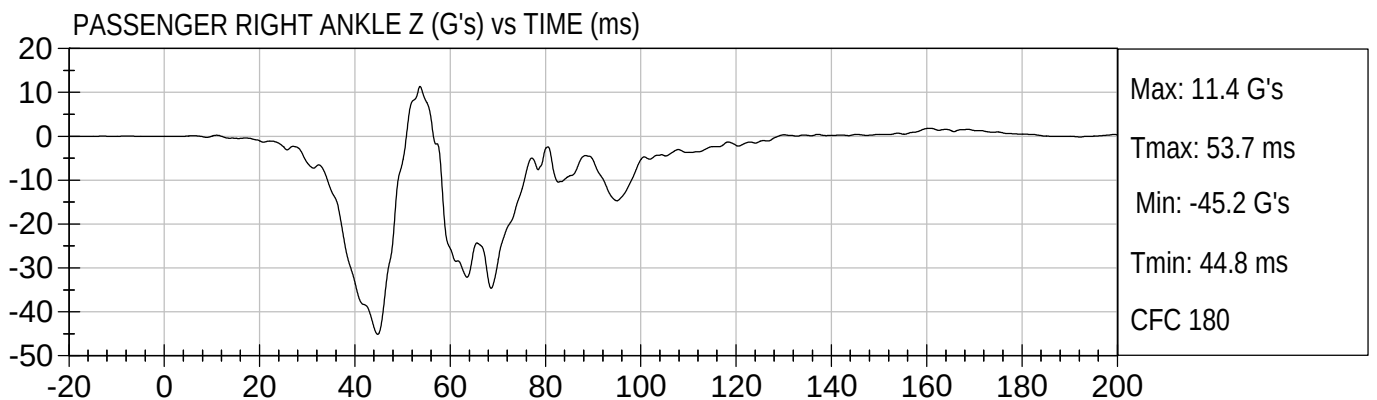
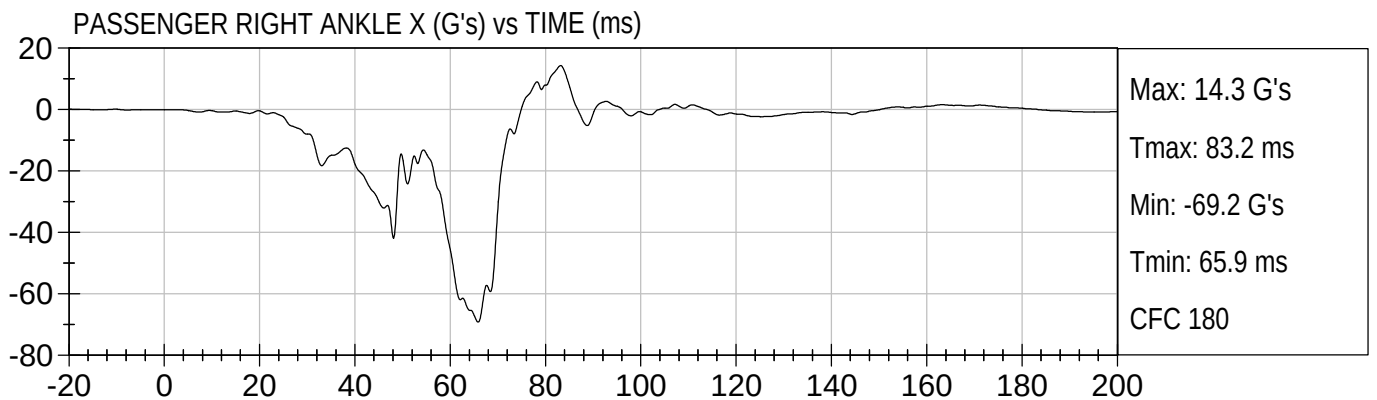
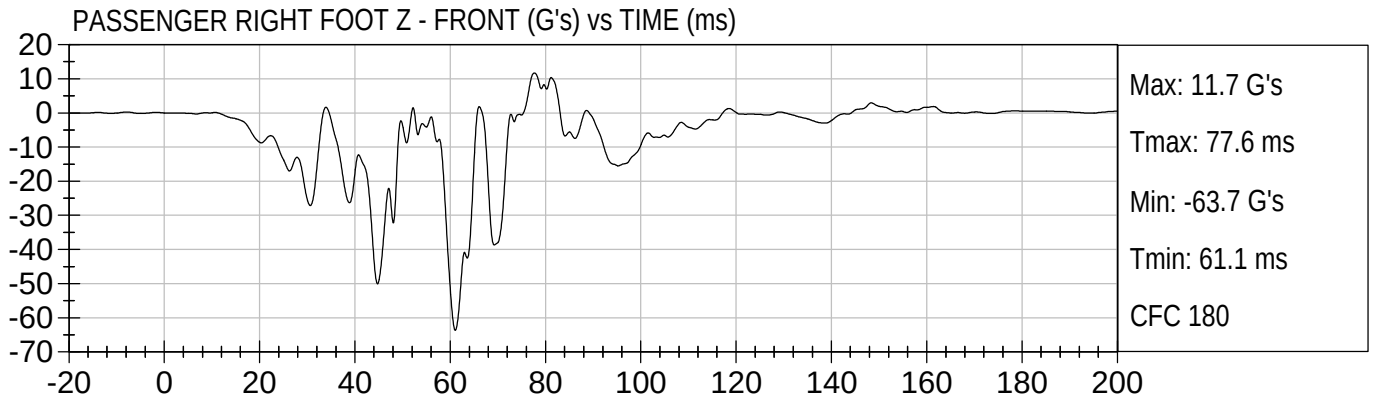


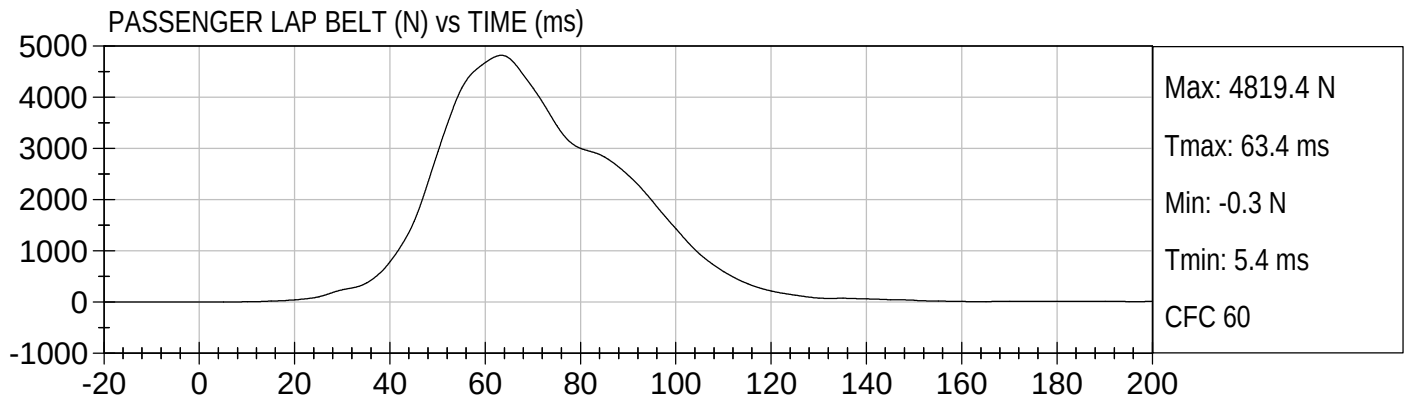
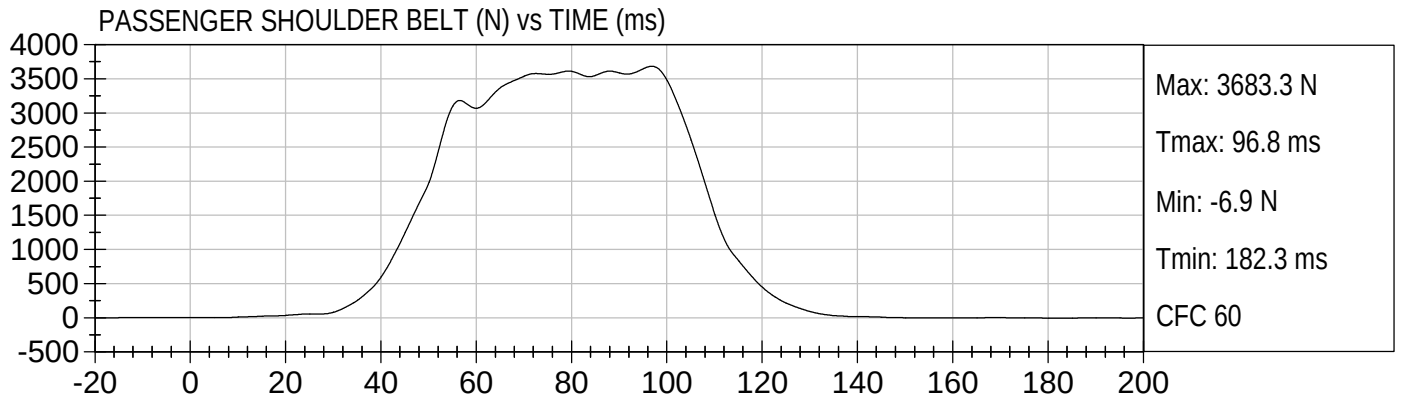
PASSENGER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)





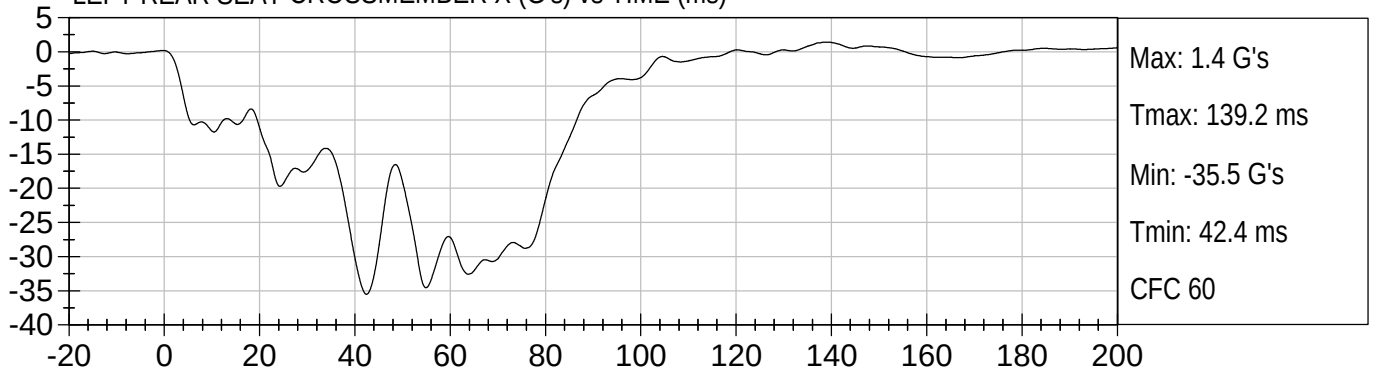




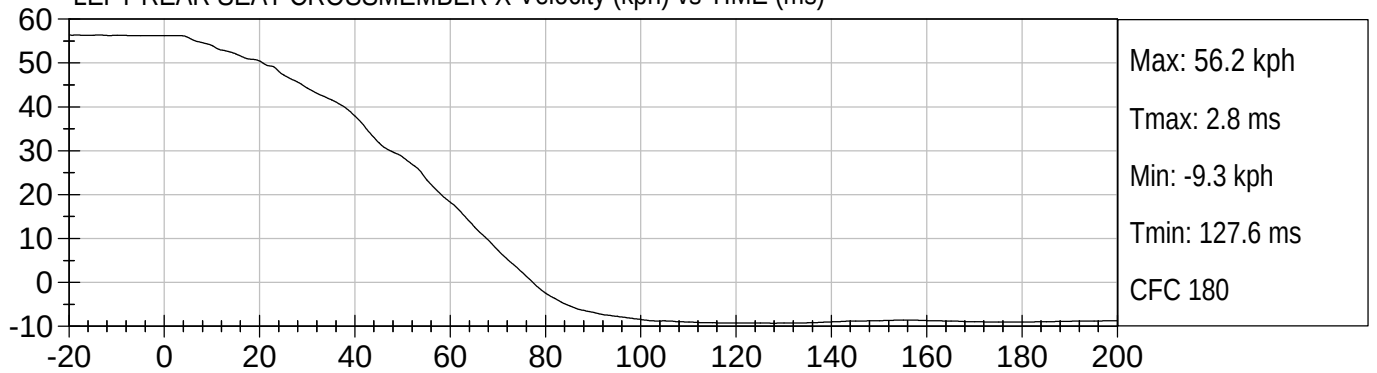




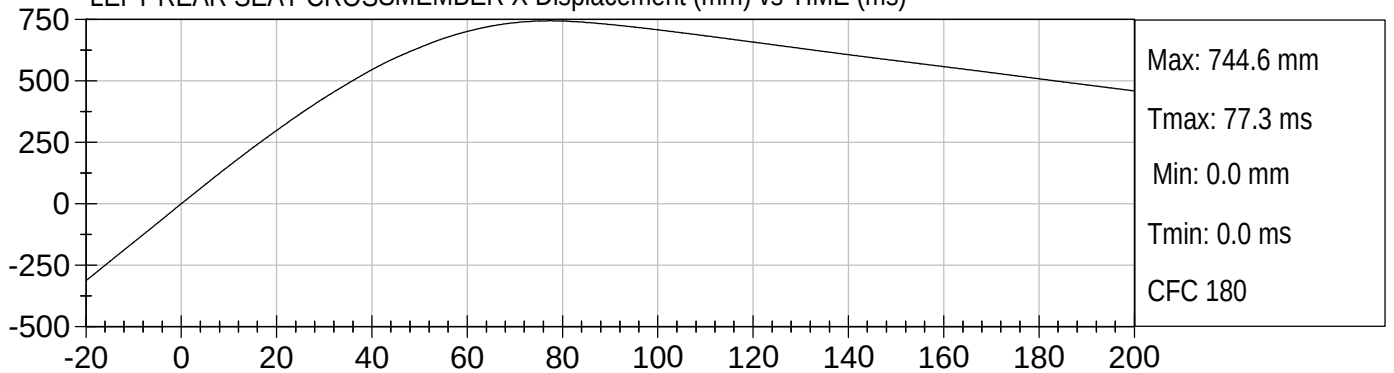
LEFT REAR SEAT CROSSMEMBER X (G's) vs TIME (ms)



LEFT REAR SEAT CROSSMEMBER X Velocity (kph) vs TIME (ms)

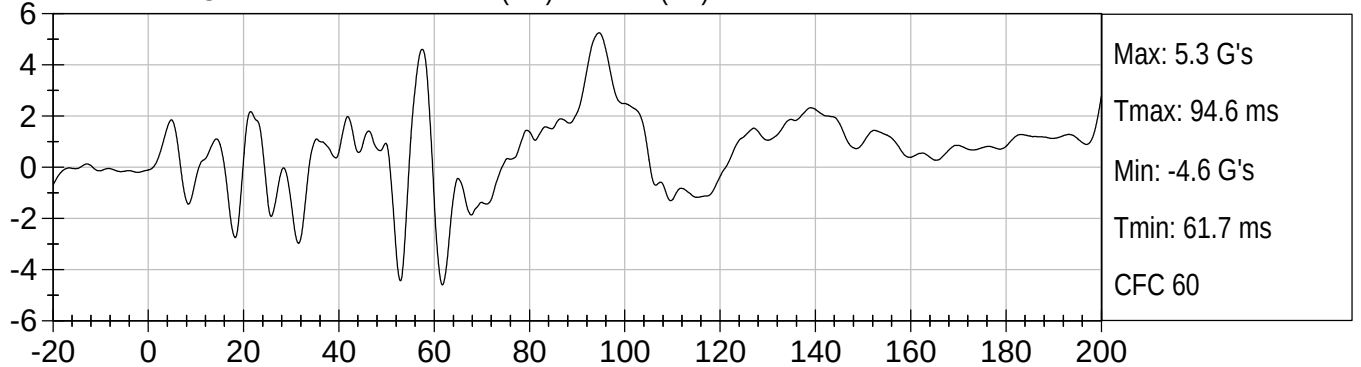


LEFT REAR SEAT CROSSMEMBER X Displacement (mm) vs TIME (ms)

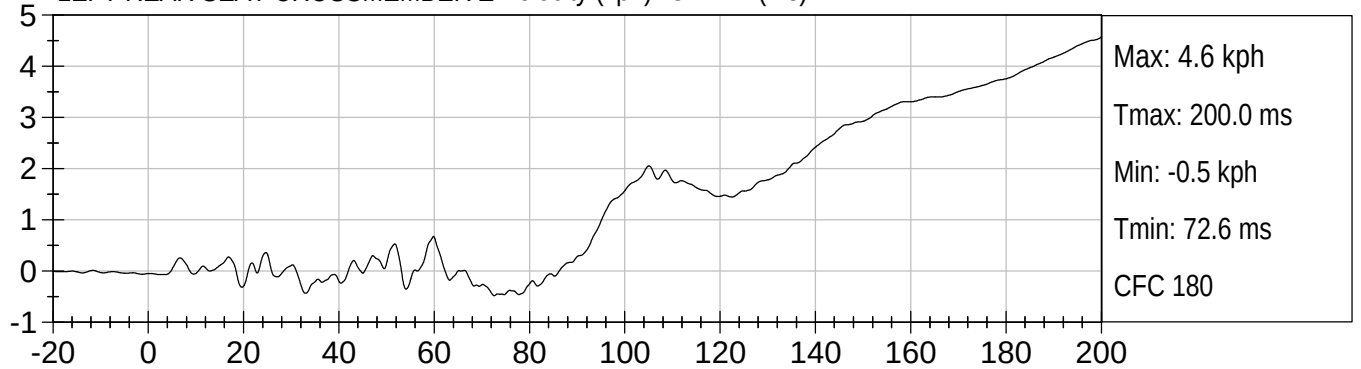




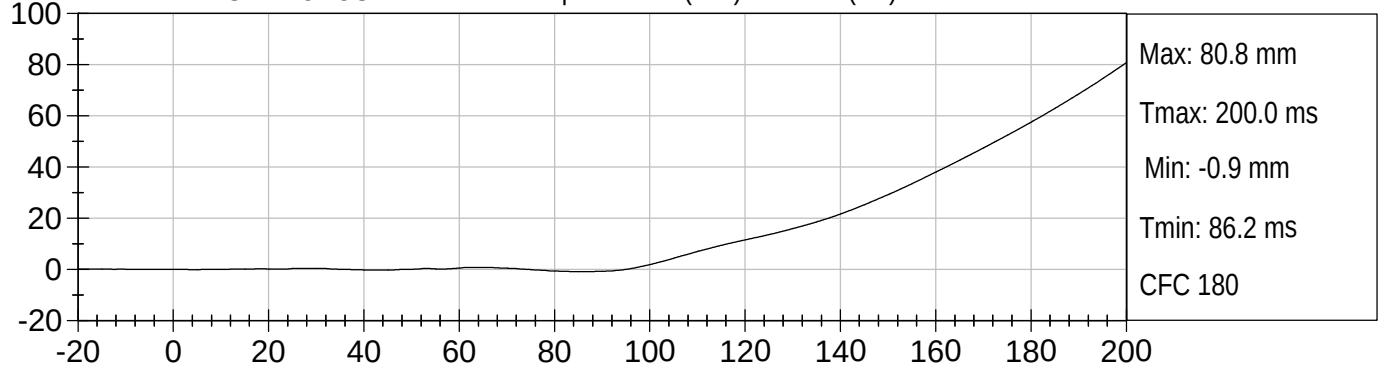
LEFT REAR SEAT CROSSMEMBER Z (G's) vs TIME (ms)

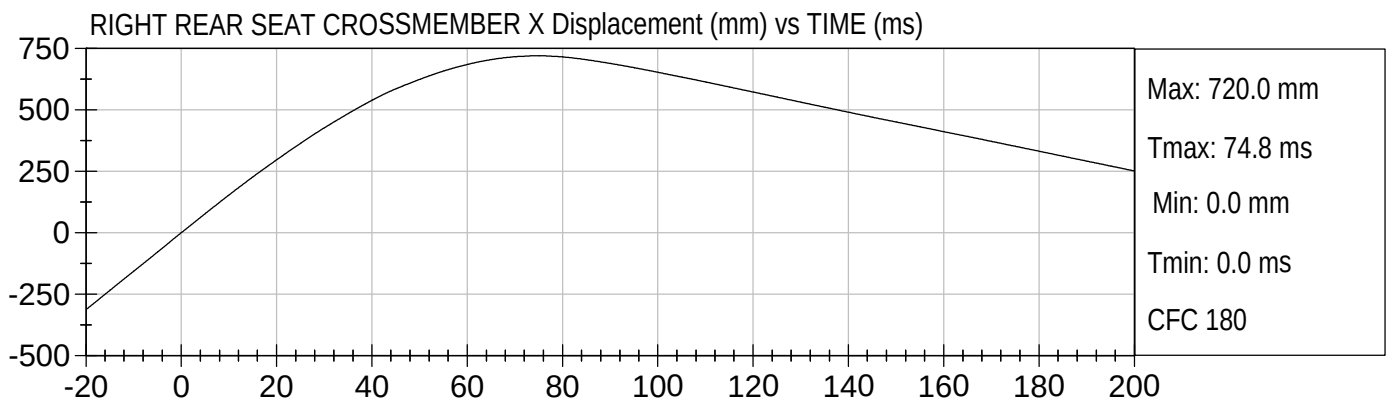
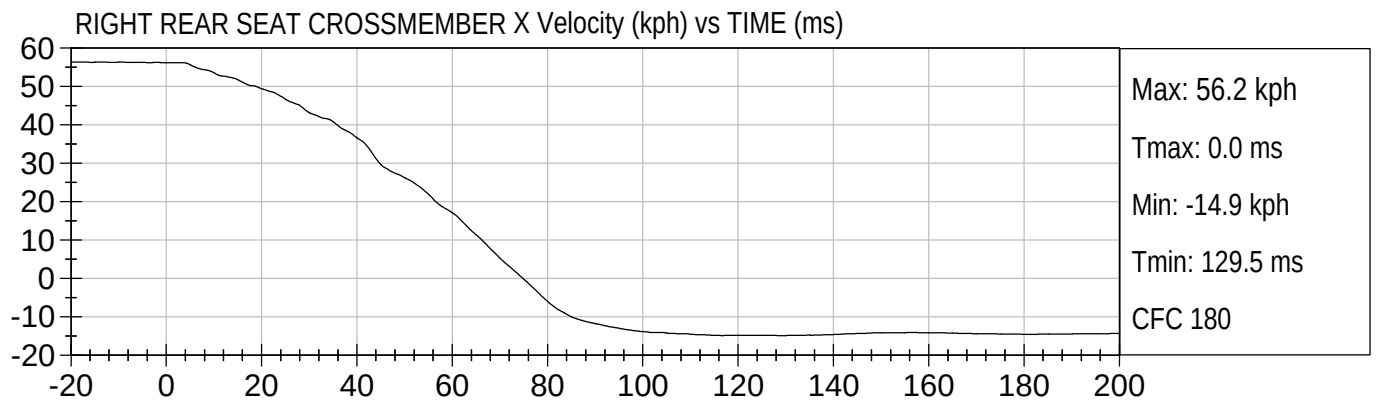
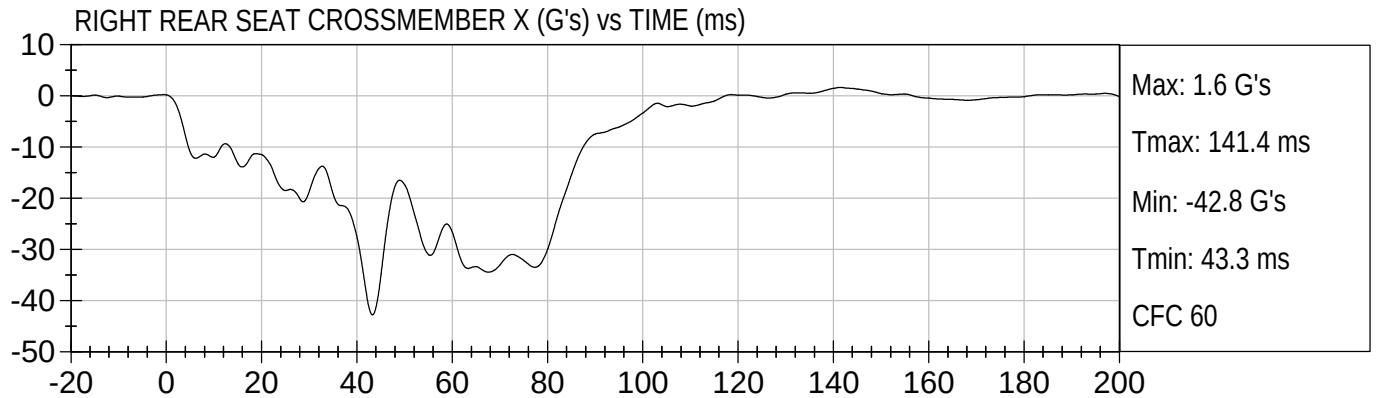


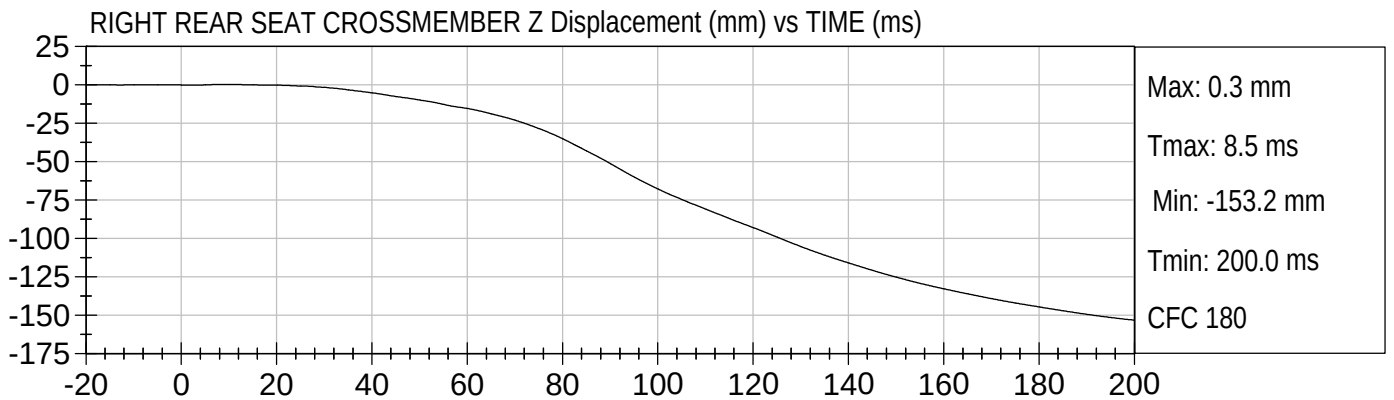
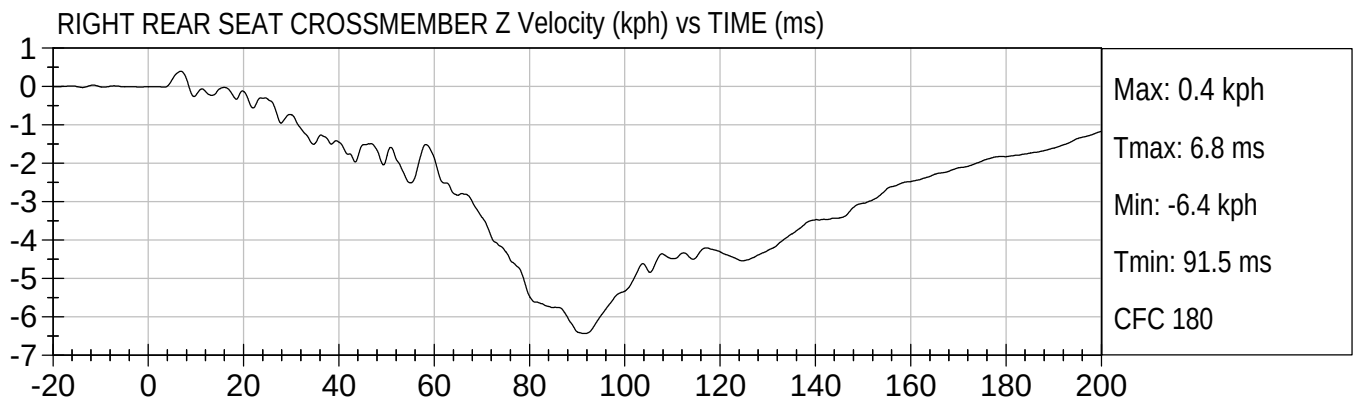
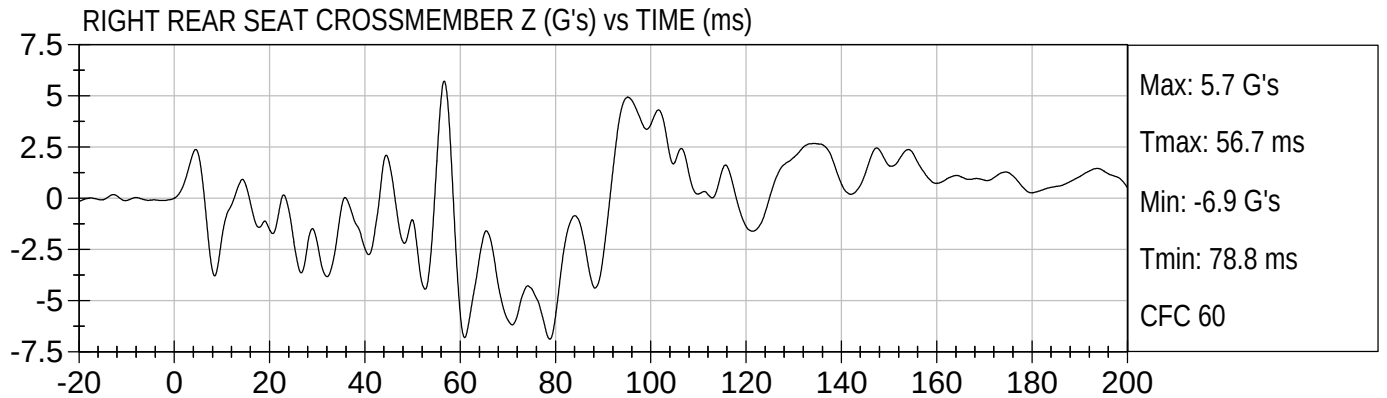
LEFT REAR SEAT CROSSMEMBER Z Velocity (kph) vs TIME (ms)

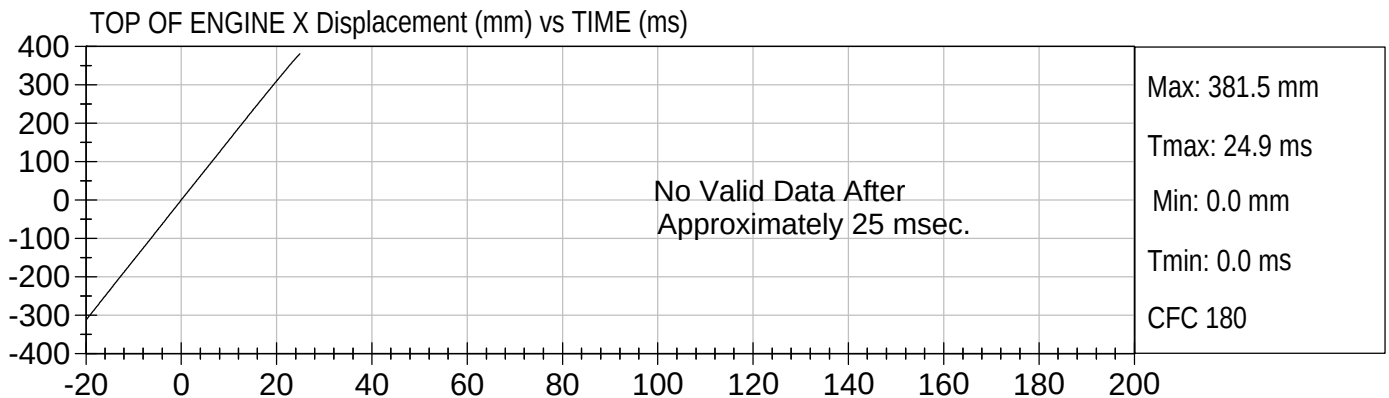
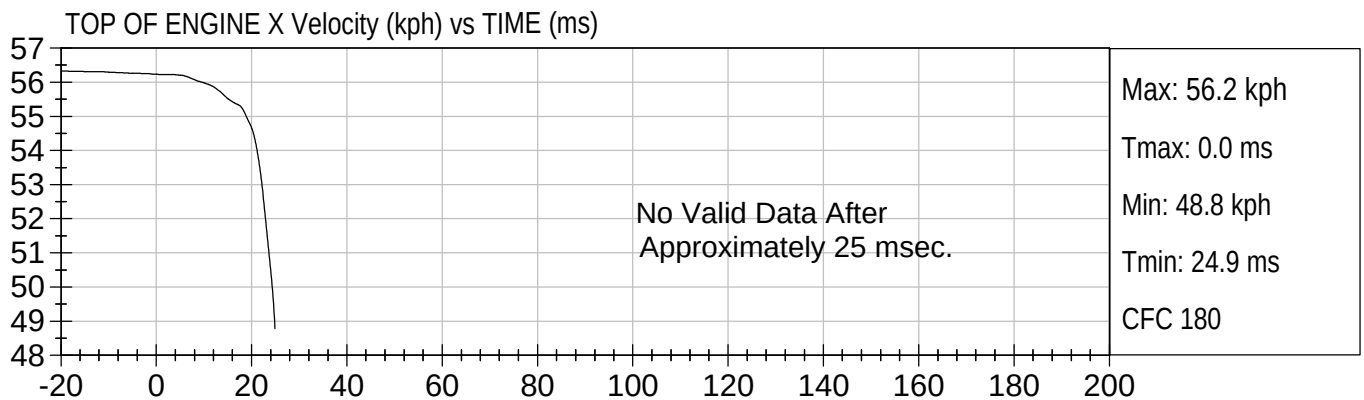
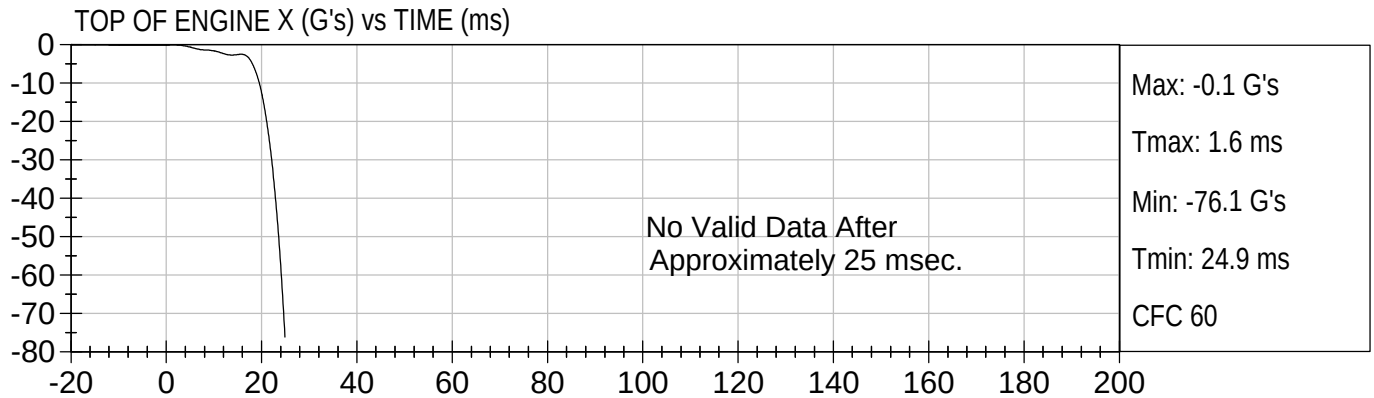


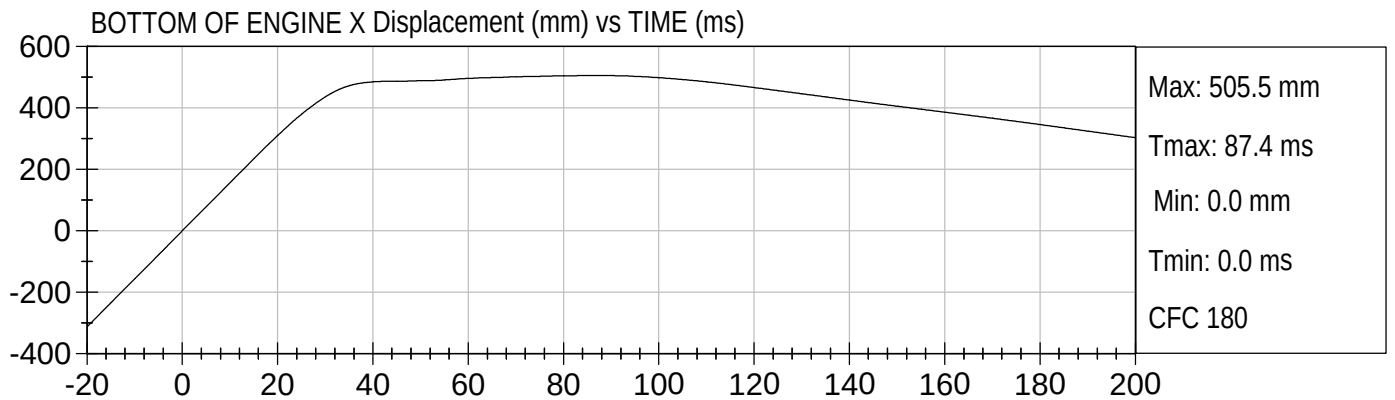
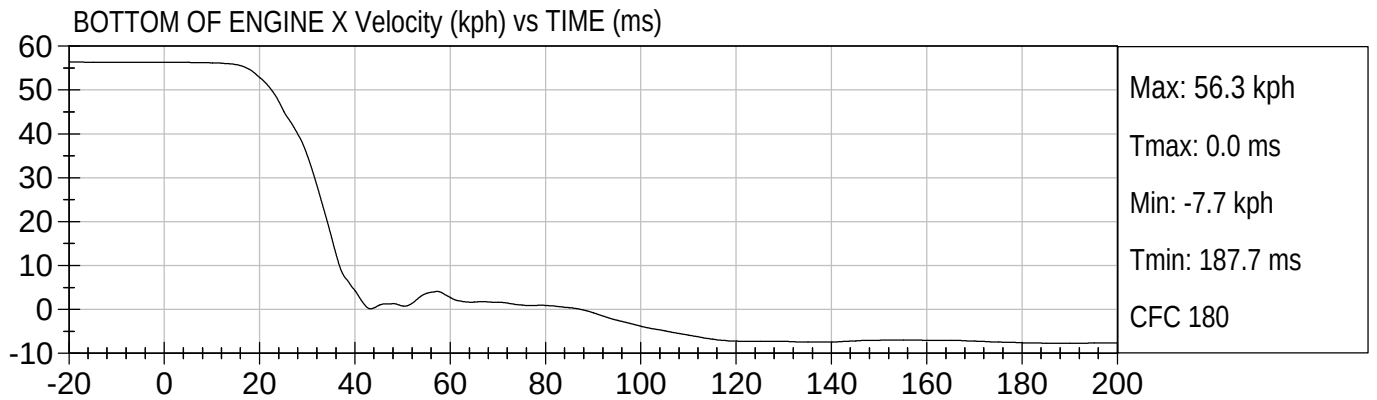
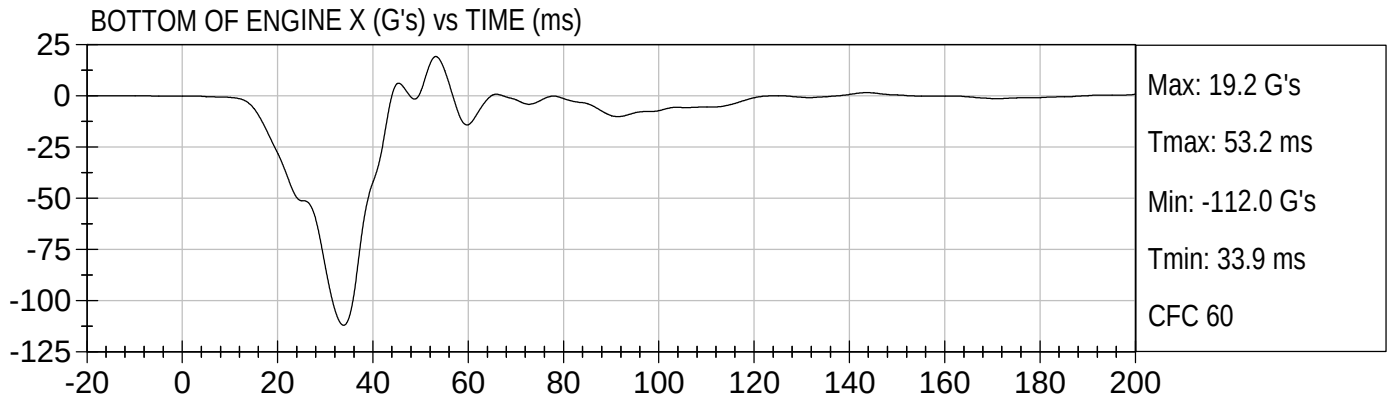
LEFT REAR SEAT CROSSMEMBER Z Displacement (mm) vs TIME (ms)

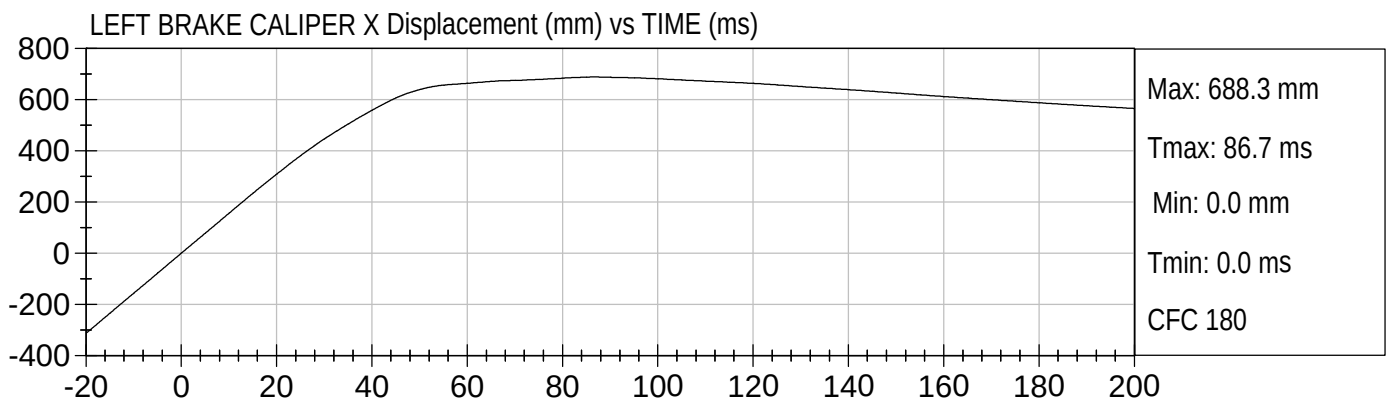
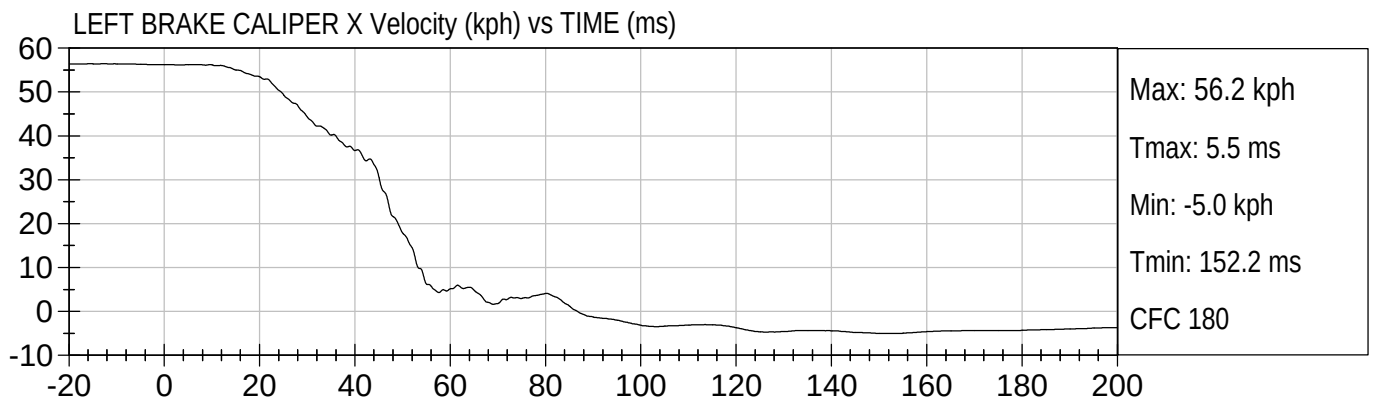
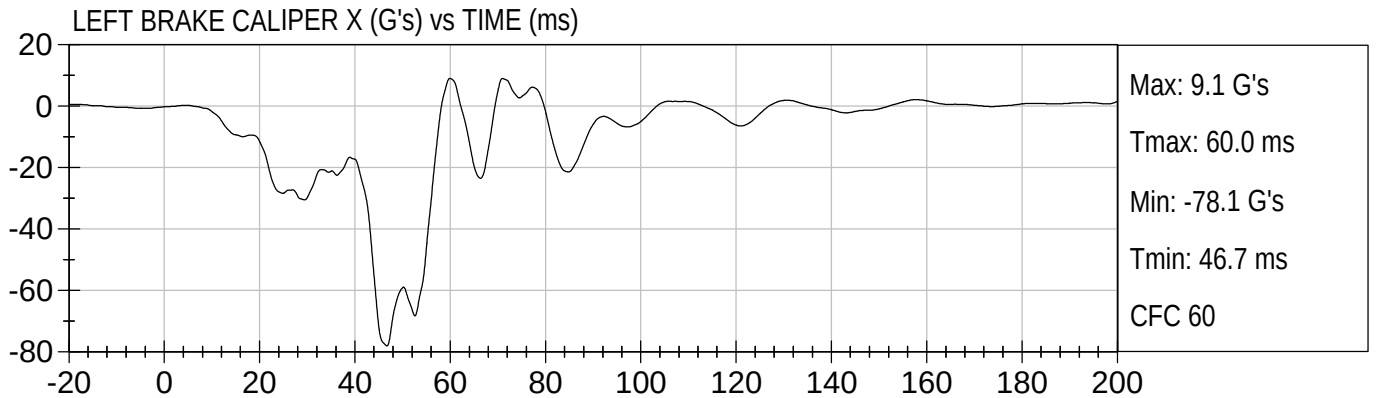


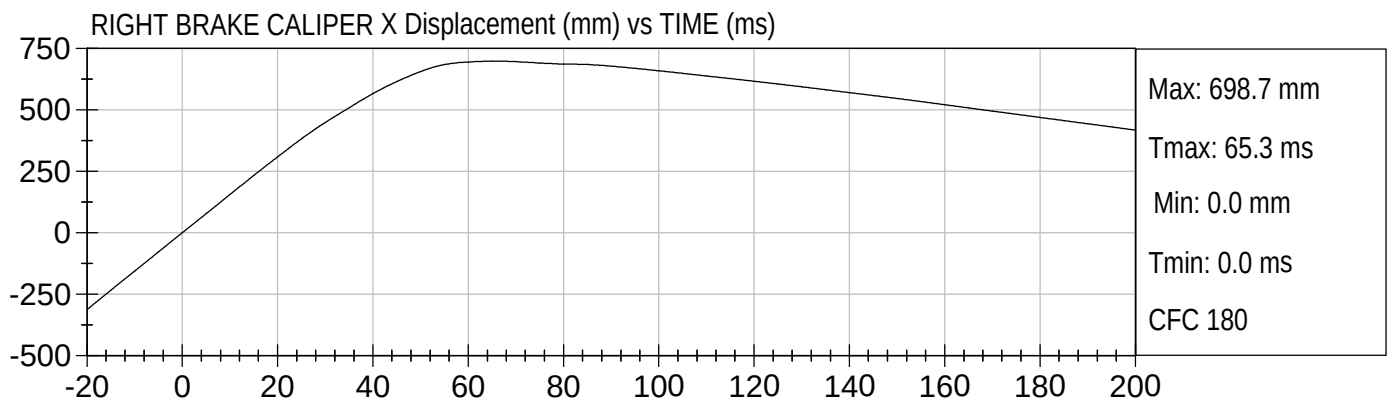
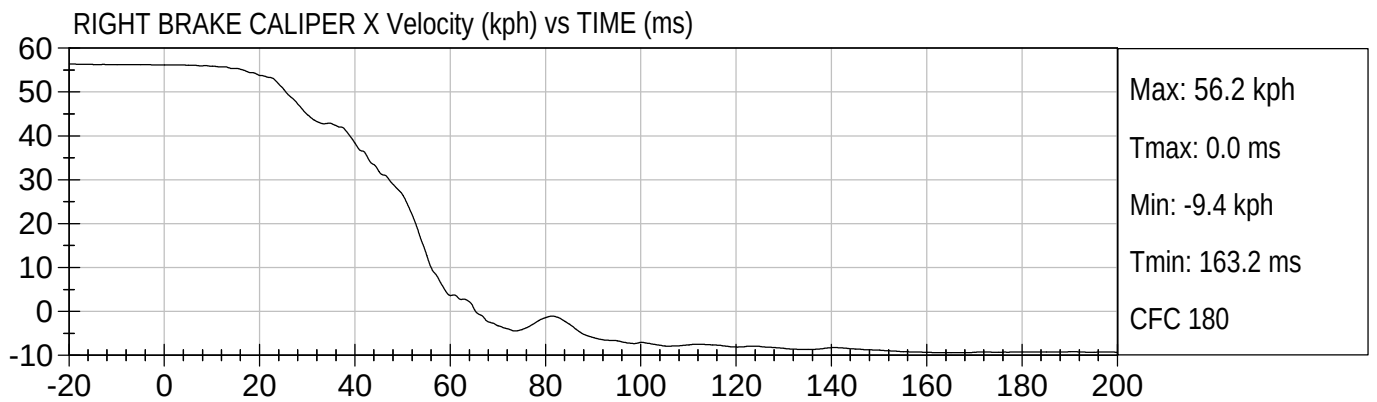
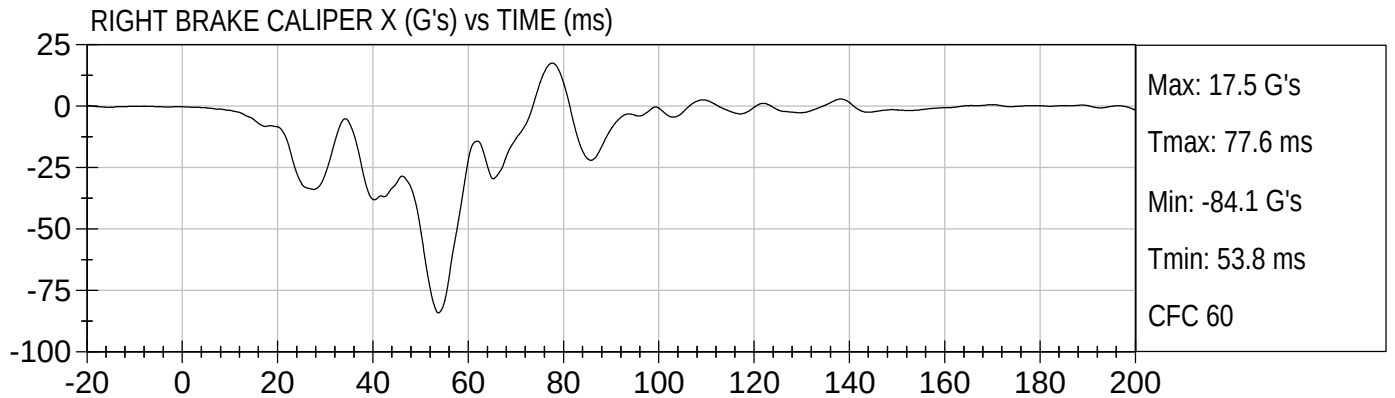


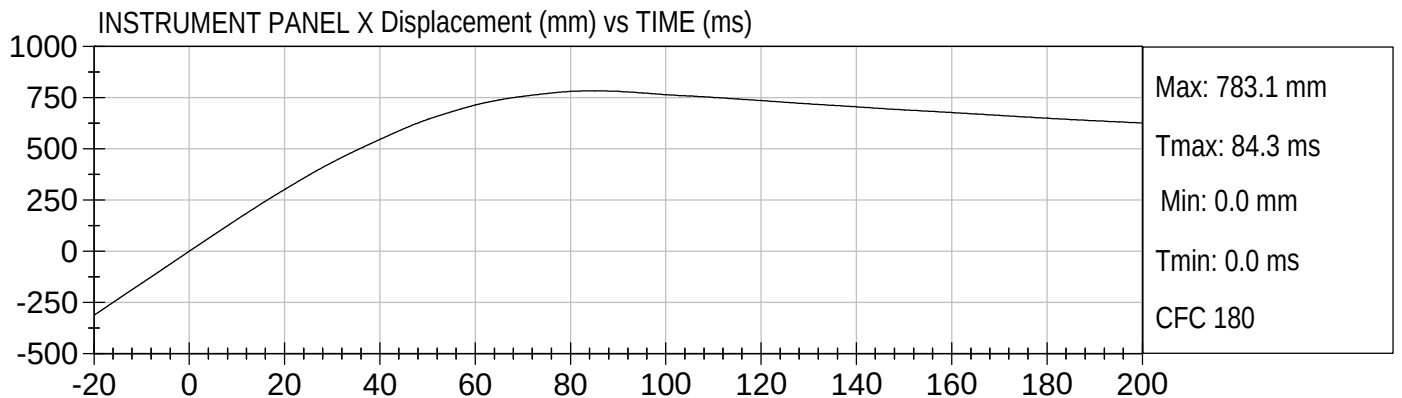
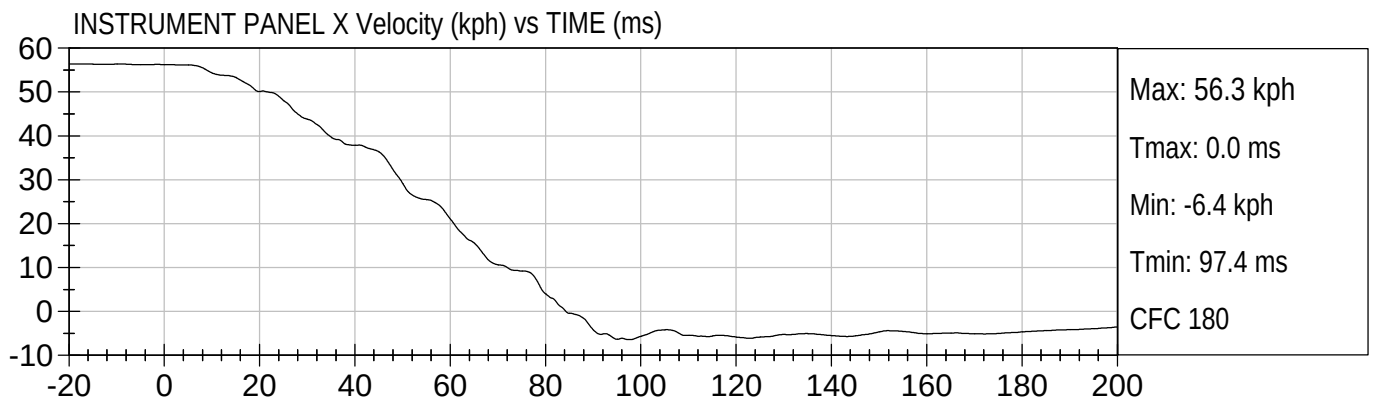
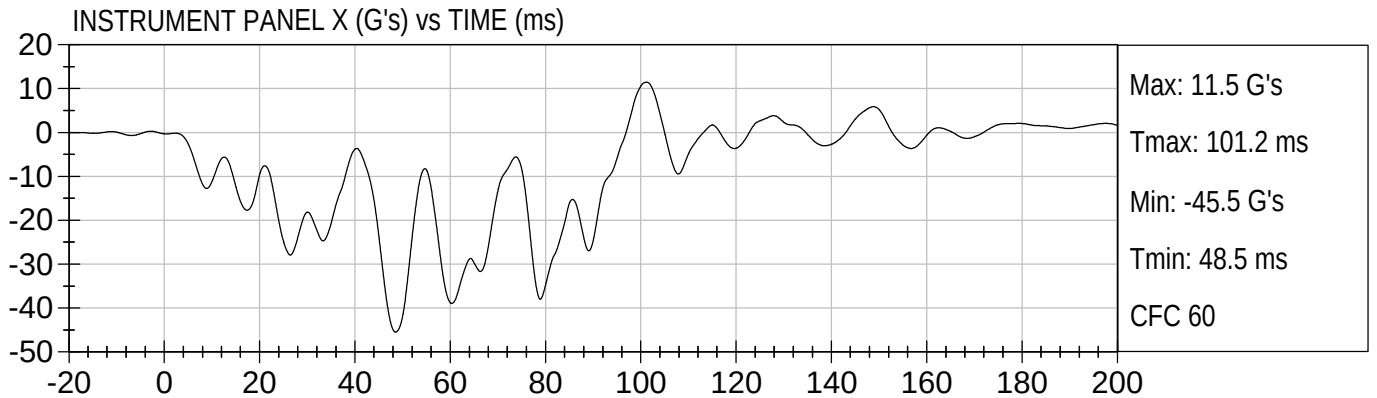


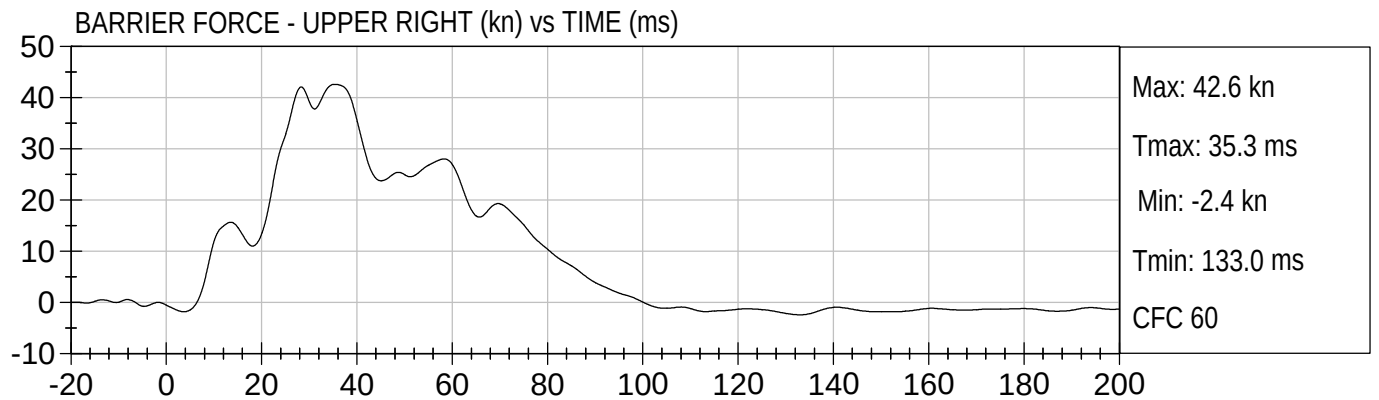
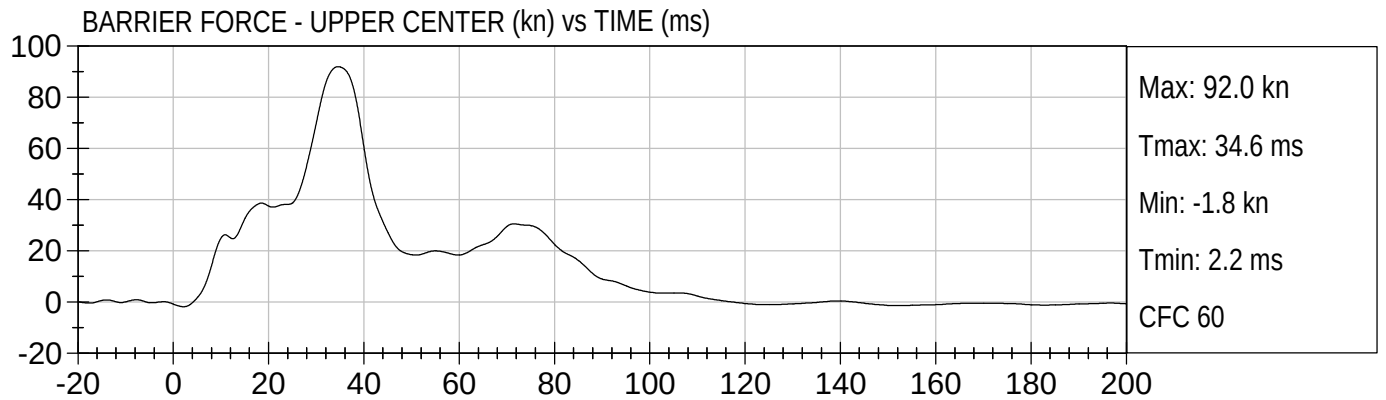
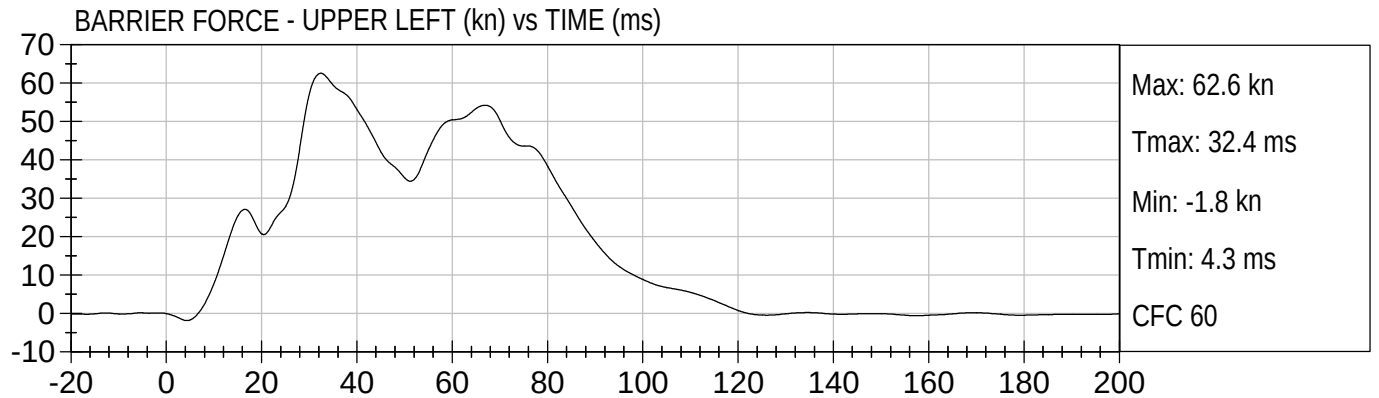


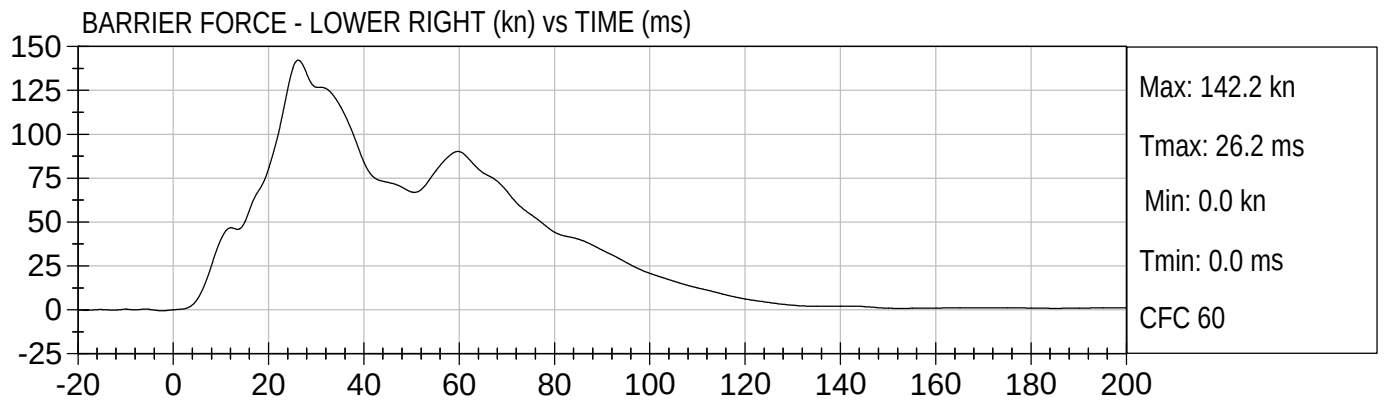
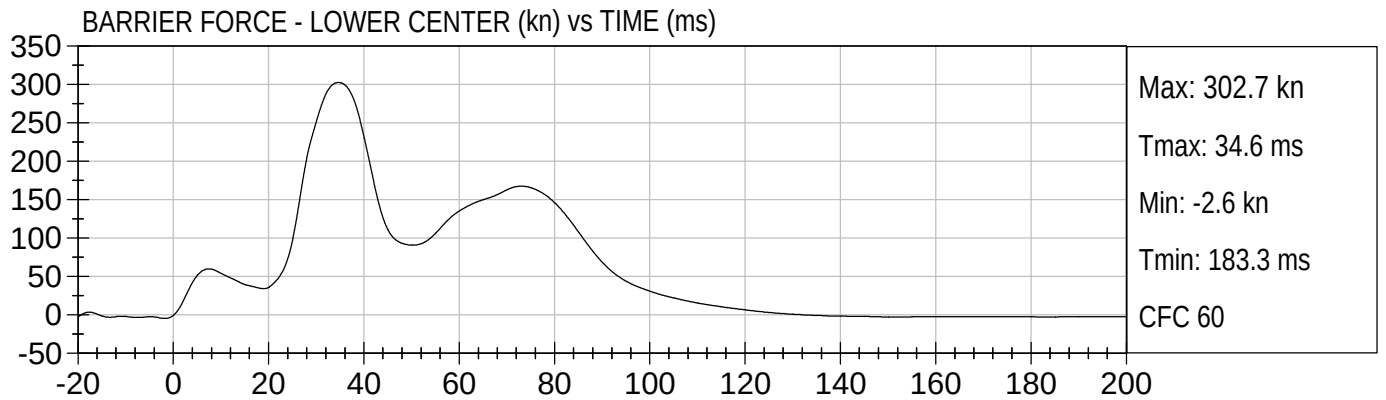
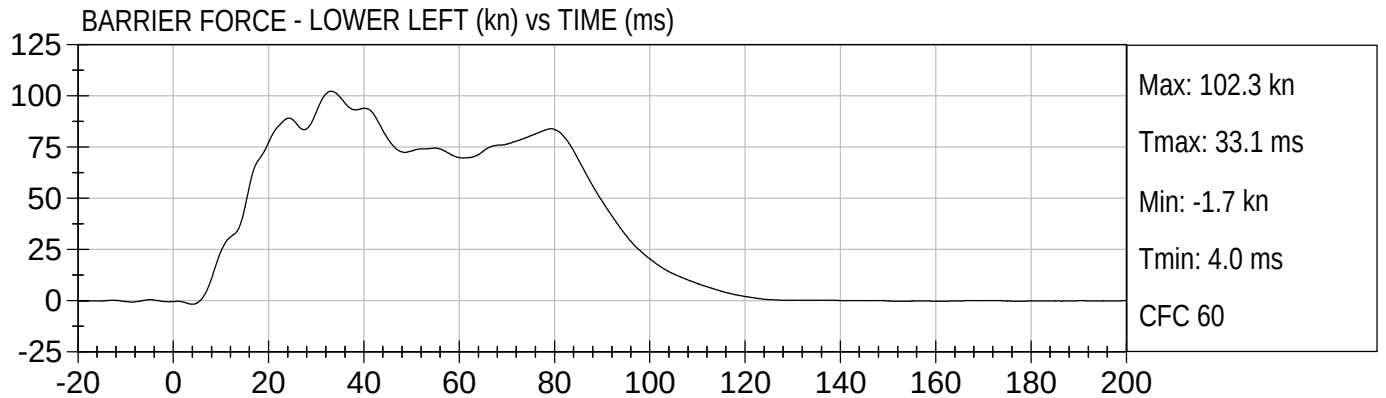


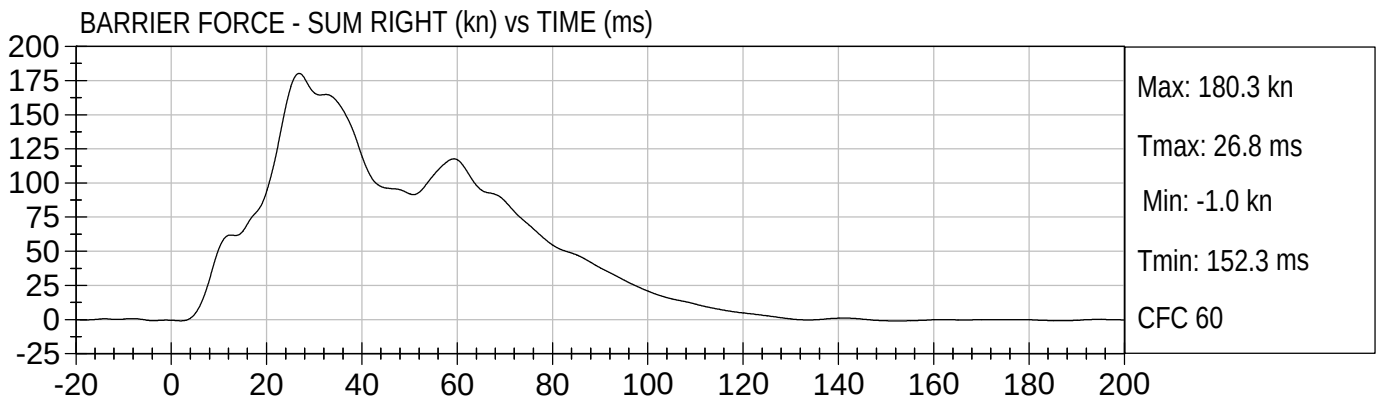
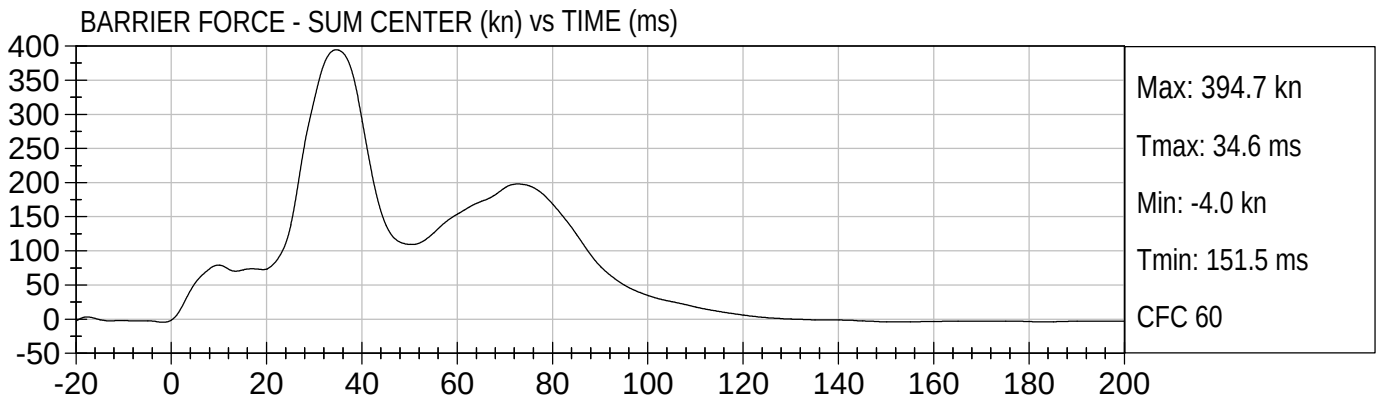
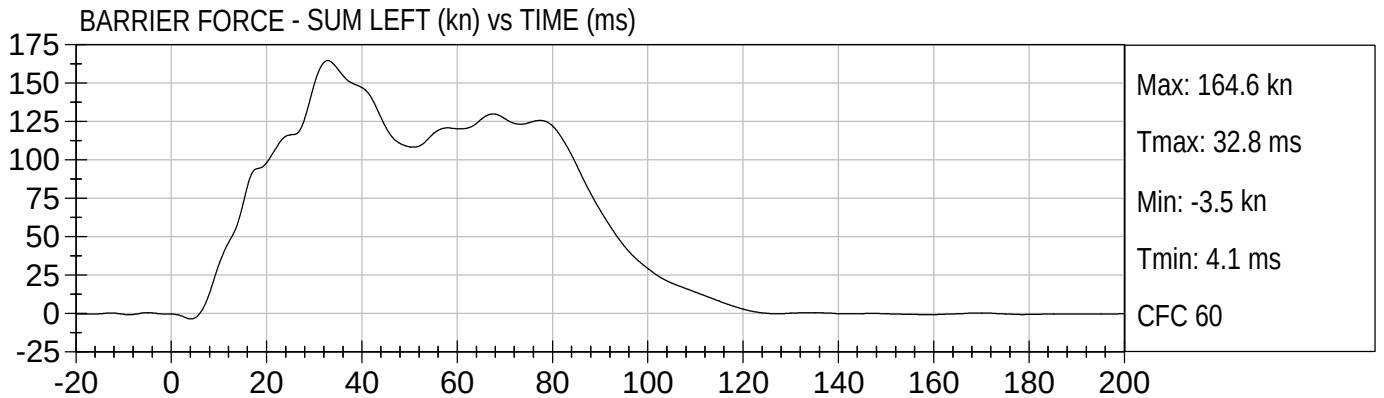


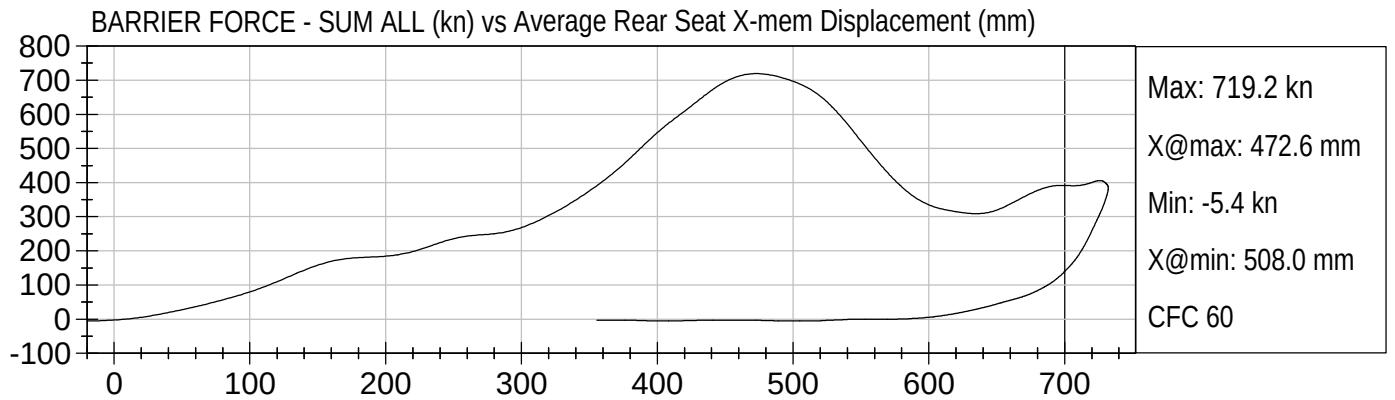
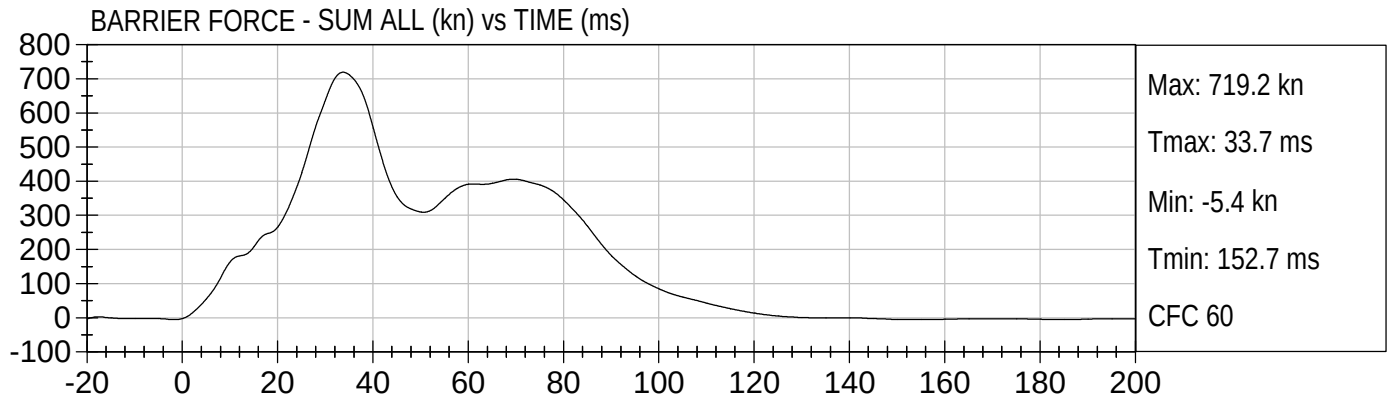












APPENDIX C

DUMMY CALIBRATION DATA TRACES AND TABLES

Hybrid III Calibration Data Sheet
50th Percentile Male
Head Drop Calibration

ATD Serial No: 066

Test I.D: D02191

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	262.1	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.7	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
			Overall Test Results	Pass

Laboratory Technician

2/7/02
Test Date

Approved By



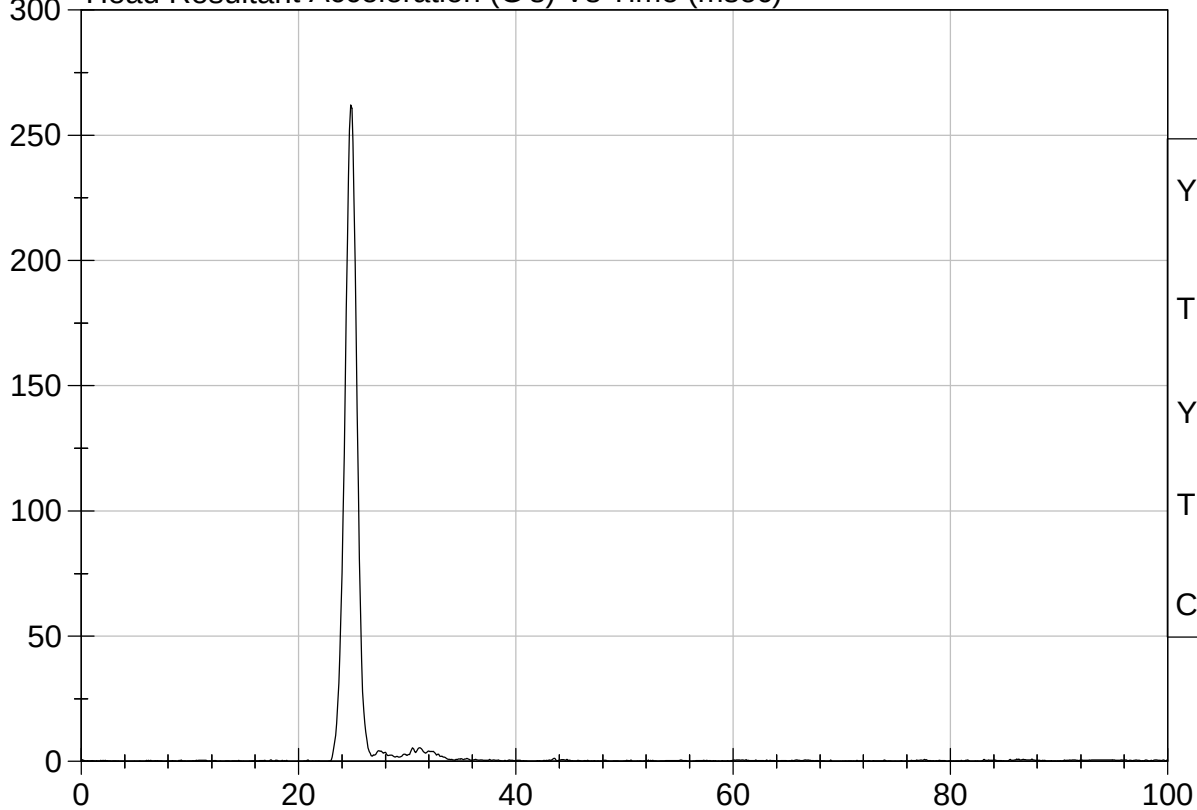
Test Description: Head Drop

Test Date: 2/7/02

Component: D02191

Speed: 0 ft/s, 0.00 m/s

Head Resultant Acceleration (G's) Vs Time (msec)



YMax: 262.1 G

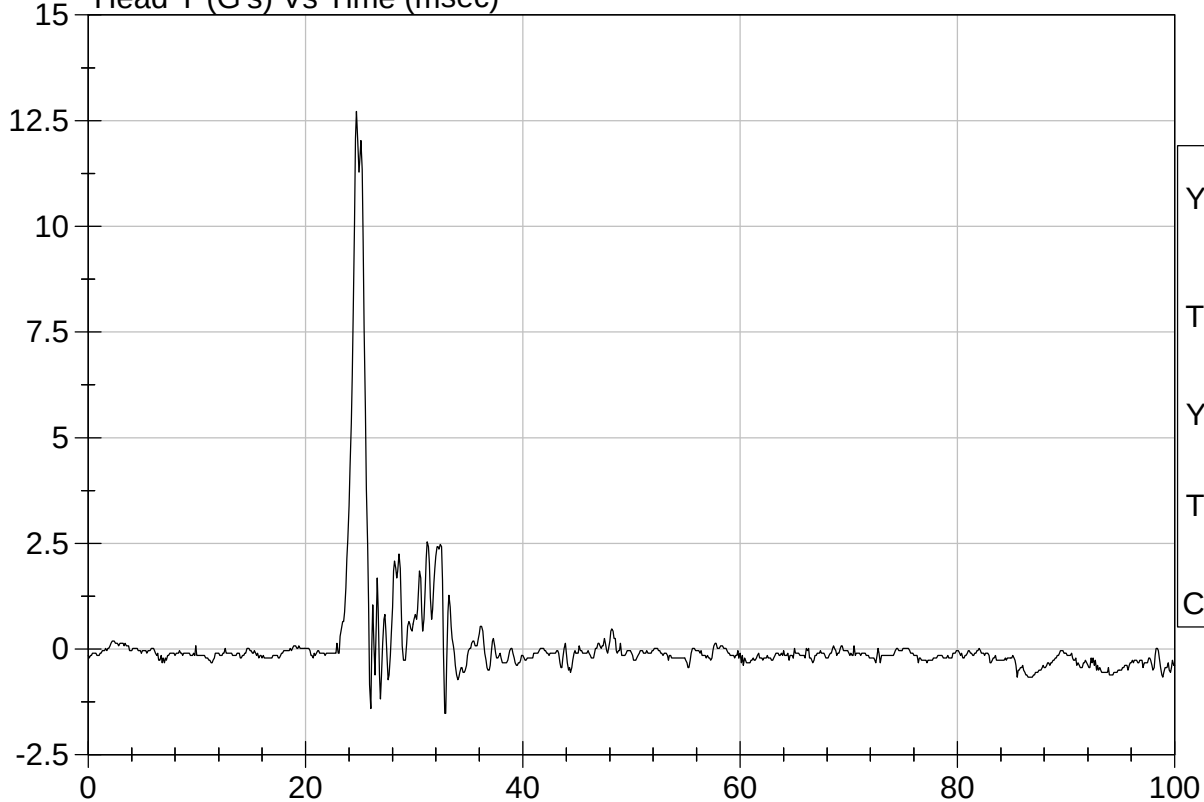
Tmax: 24.8 ms

YMin: 0.1 G

Tmin: 4.1 ms

CFC 1000

Head Y (G's) Vs Time (msec)



YMax: 12.7 G

Tmax: 24.7 ms

YMin: -1.5 G

Tmin: 32.8 ms

CFC 1000

Hybrid III Calibration Data Sheet
50th Percentile Male
Neck Flexion Test

ATD Serial No: 066

Test I.D: D02192

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	22	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.90	Pass
	20 msec	G's	17.60 to 22.60	18.78	Pass
	30 msec	G's	12.50 to 18.50	14.67	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.7	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.1	Pass
	Time	msec	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.9	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	95.0	Pass
	Time	msec	47.0 to 58.0	50.5	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	97.8	Pass
Overall Test Results					Pass

Laboratory Technician

2/7/02

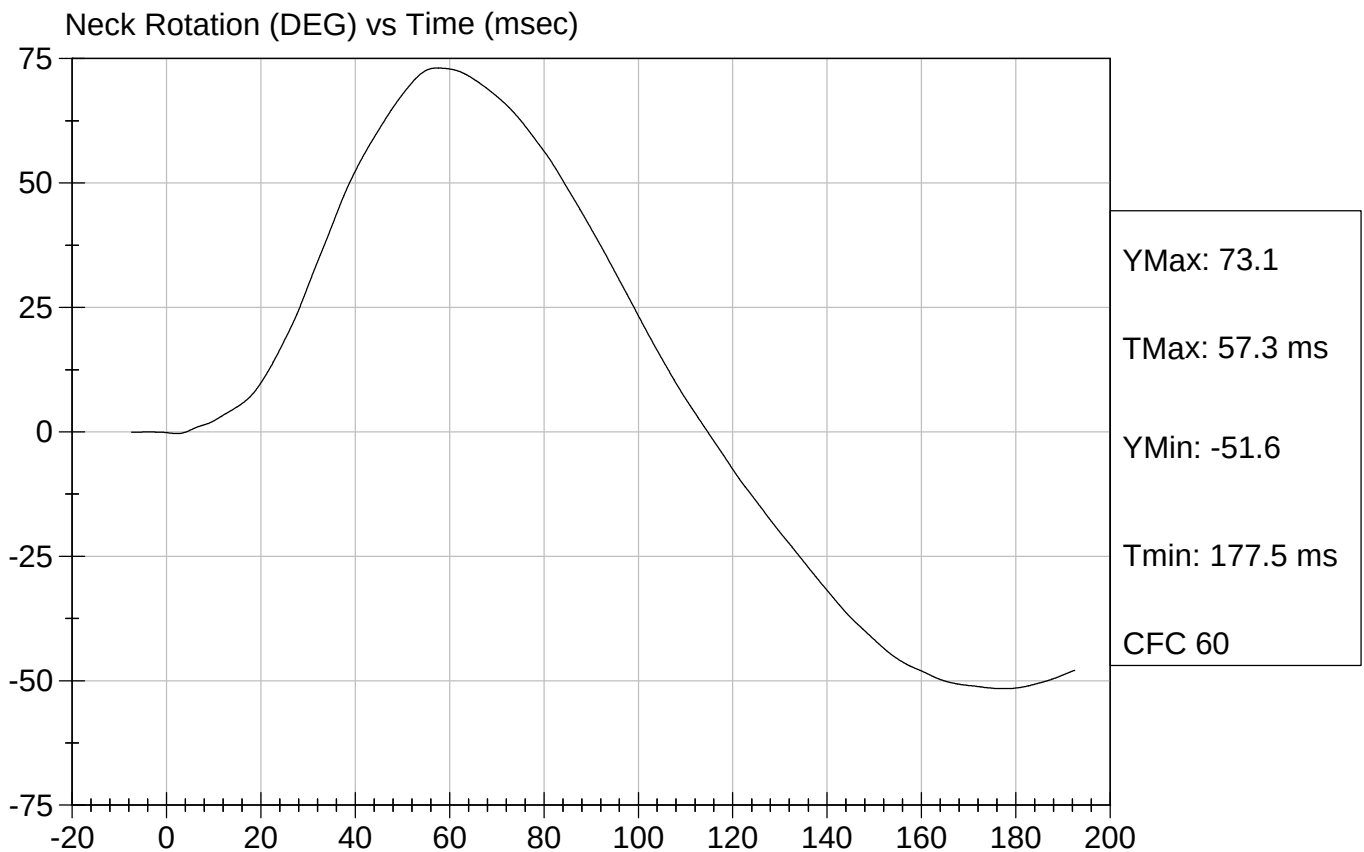
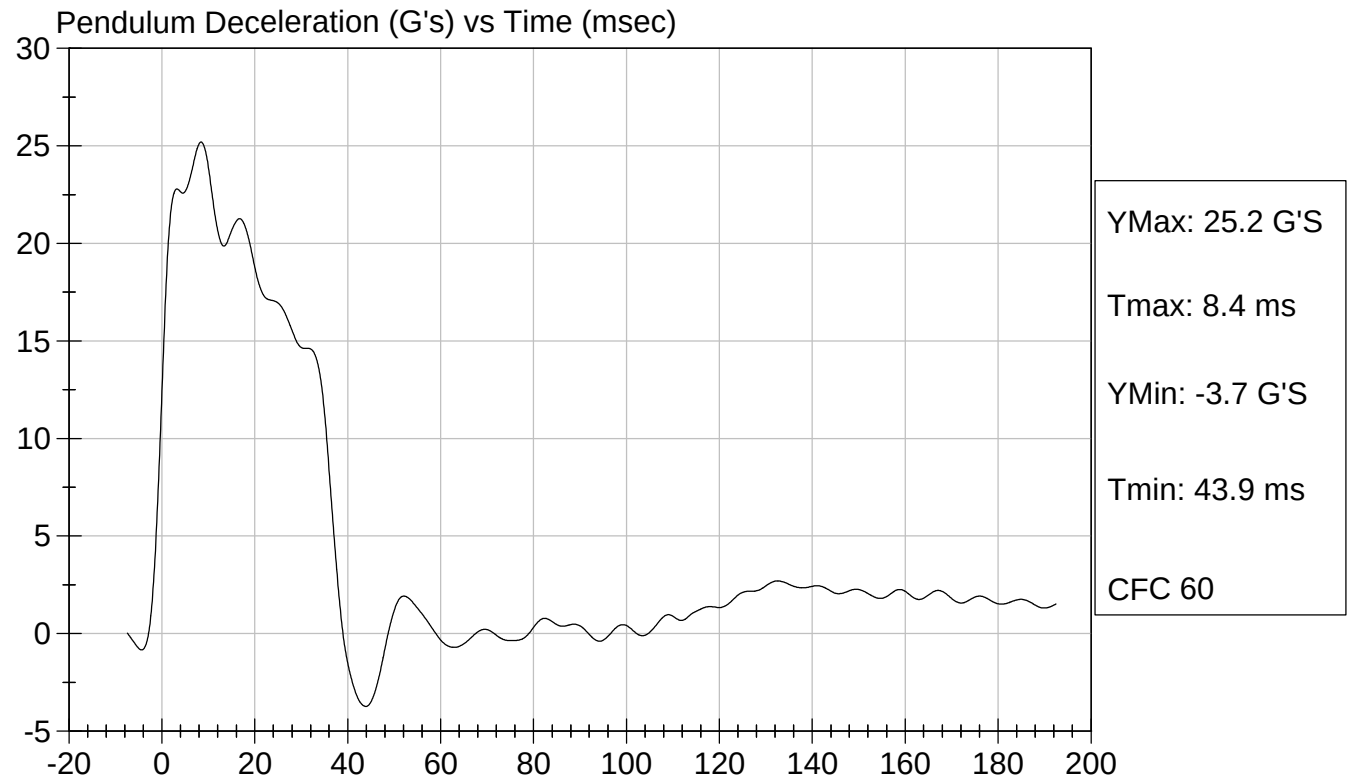
Test Date

Approved By



Test Desc: Neck Flexion
Component ID: D02192

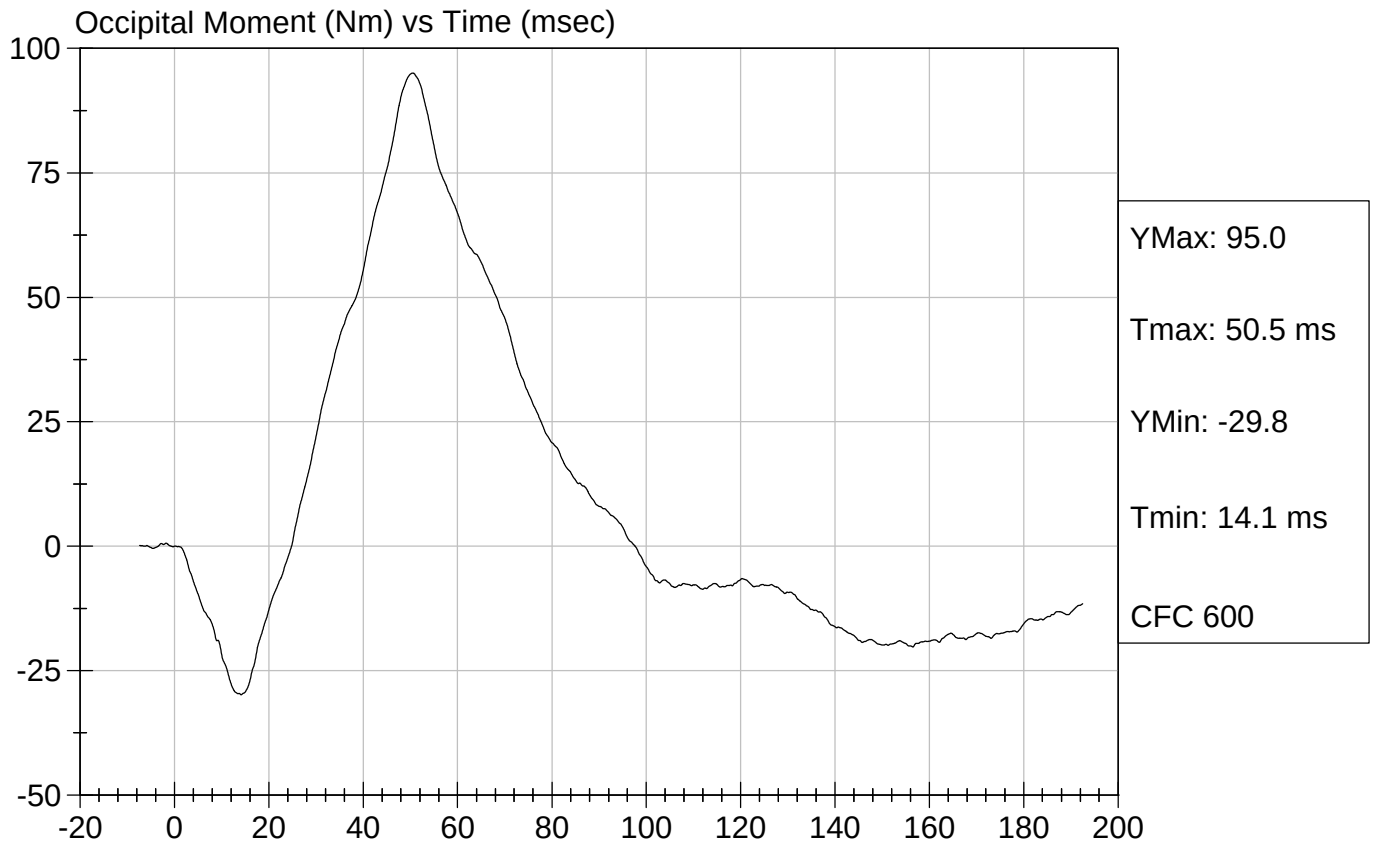
Test Date: 2/7/02
Speed: 22.80 ft/sec, 6.95 m/sec





Test Desc: Neck Flexion
Component ID: D02192

Test Date: 2/7/02
Speed: 22.80 ft/sec, 6.95 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Neck Extension Test

ATD Serial No: 066

Test I.D: D02193

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	22	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.06	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.17	Pass
	20 msec	G's	14.00 to 19.00	16.17	Pass
	30 msec	G's	11.00 to 16.00	13.82	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.8	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.6	Pass
	Time	msec	72.0 to 82.0	75.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	153.5	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-62.5	Pass
	Time	msec	65.0 to 79.0	69.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	138.8	Pass
Overall Test Results					Pass

Laboratory Technician

2/7/02

Test Date

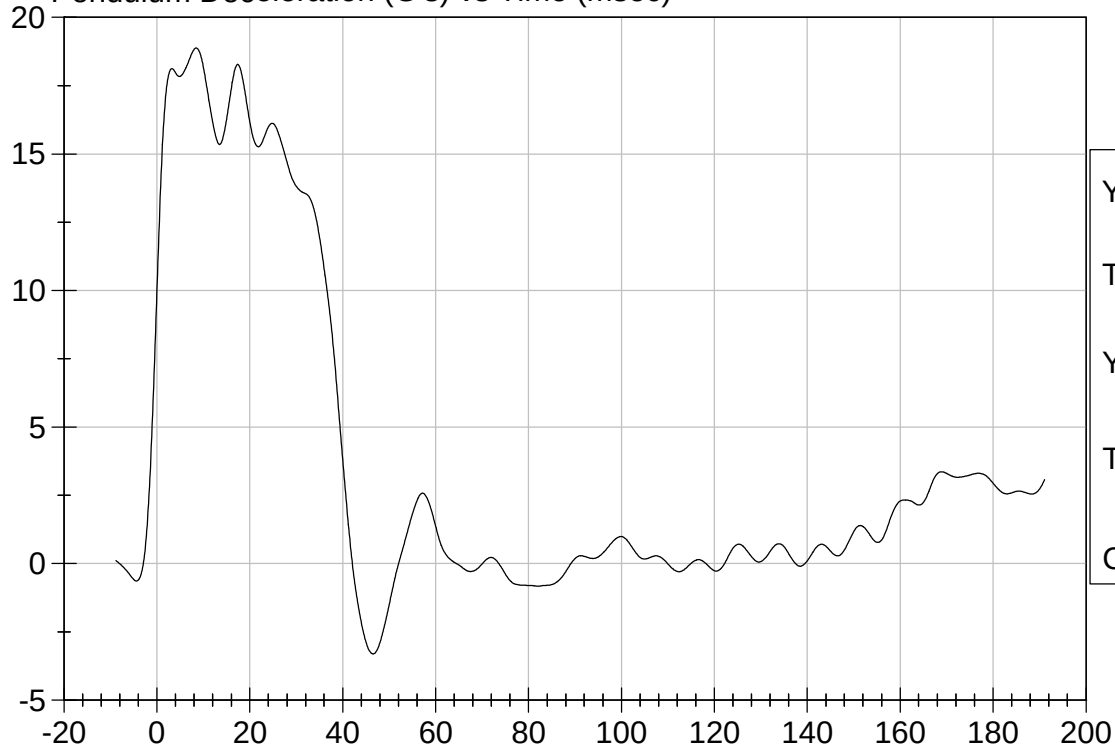
Approved By



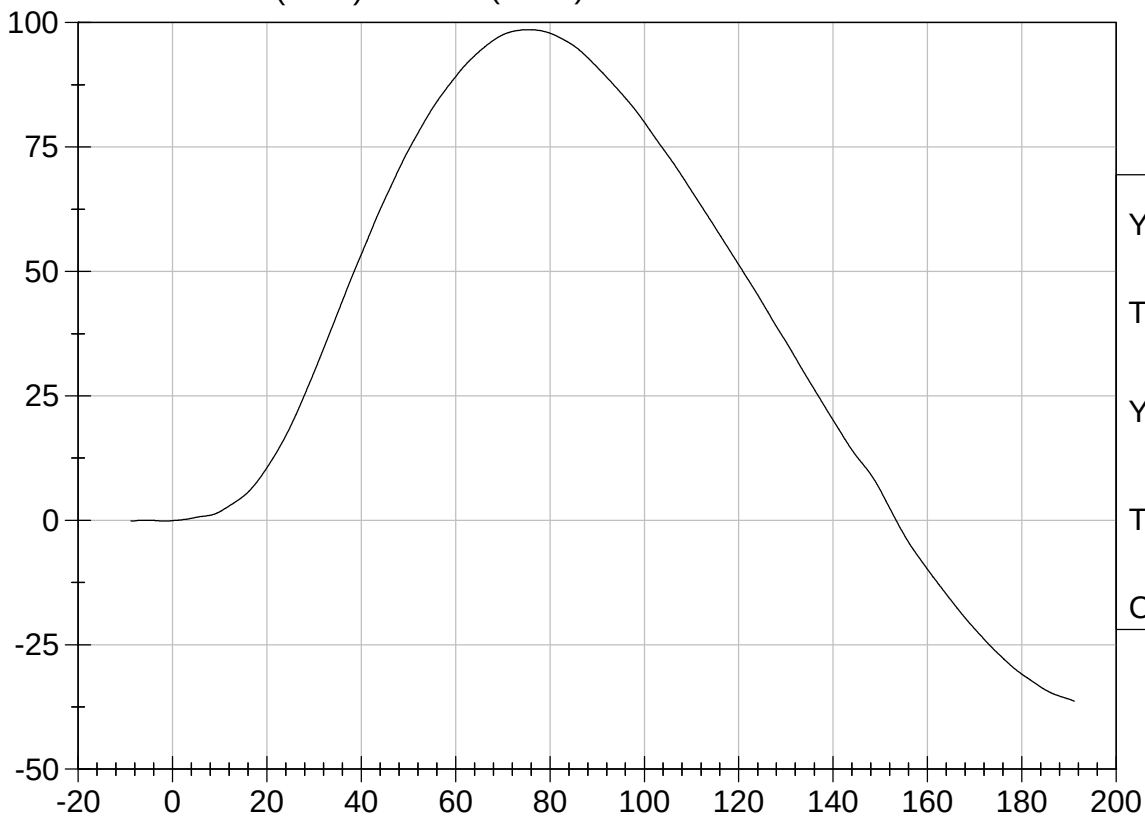
Test Desc: Neck Extension
Component ID: D02193

Test Date: 2/7/02
Speed: 19.88 ft/sec, 6.06 m/sec

Pendulum Deceleration (G's) vs Time (msec)



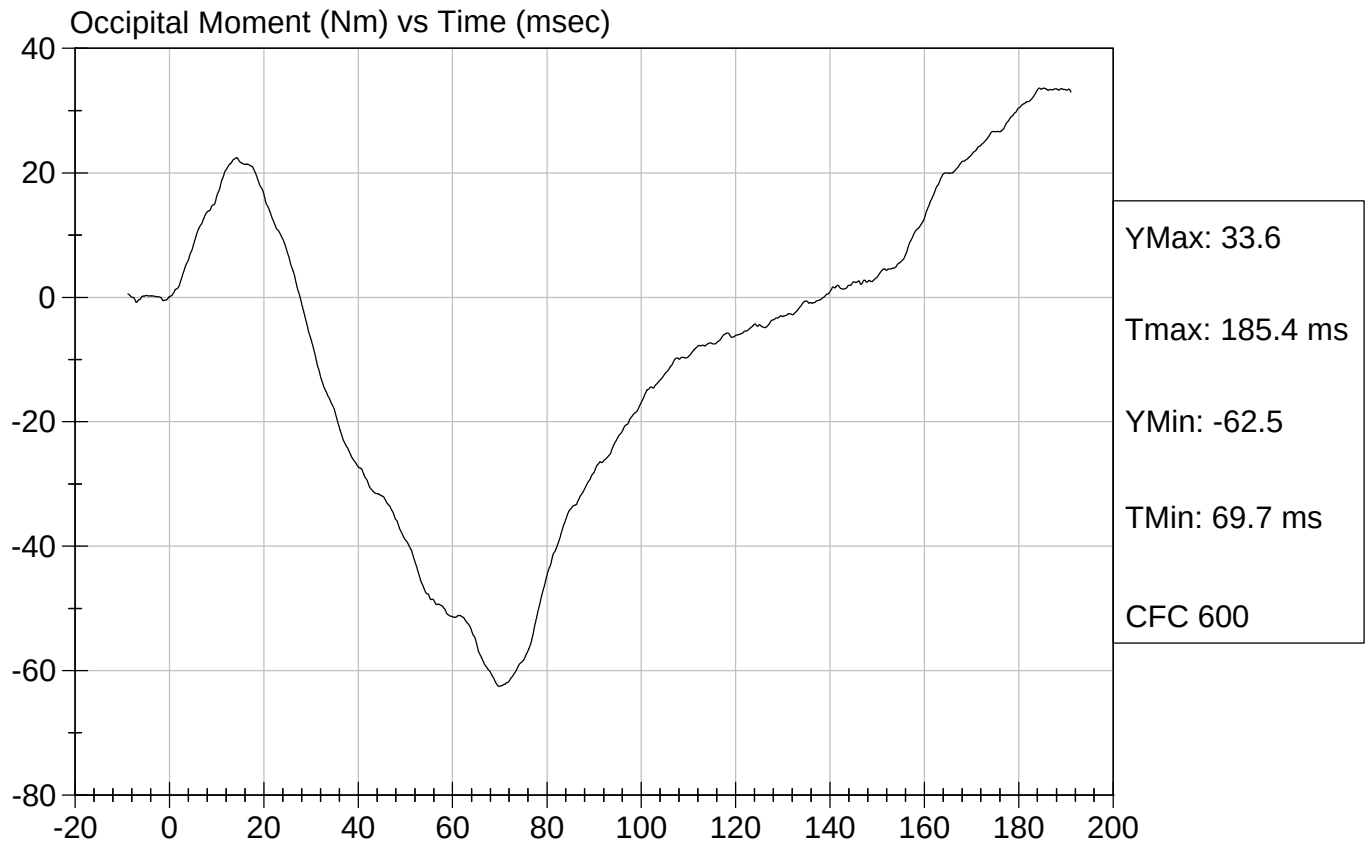
Neck Rotation (DEG) vs Time (msec)





Test Desc: Neck Extension
Component ID: D02193

Test Date: 2/7/02
Speed: 19.88 ft/sec, 6.06 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Thorax Impact Test

ATD Serial No: 066

Test I.D: D02194

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	19	Pass
Probe Velocity	m/s	6.58 to 6.82	6.69	Pass
Peak Probe Force	Newtons	5159 to 5893	5,787	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.68	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results				Pass

Laboratory Technician

2/11/02
Test Date

Approved By

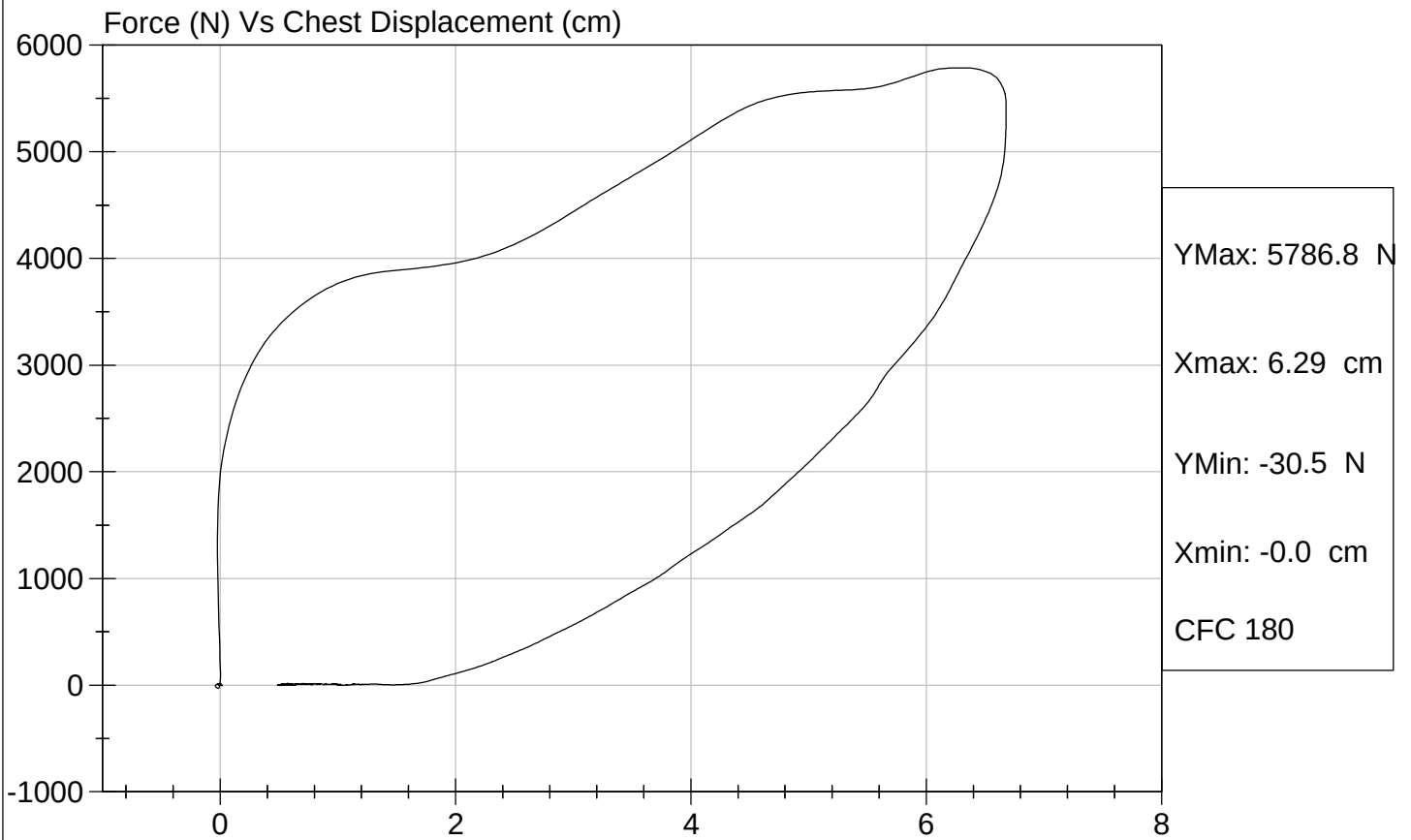


Test Description: Thorax Impact

Test Date: 2/11/02

Component: D02194

Speed: 21.95 ft/sec, 6.69 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Right Knee Impact Test

ATD Serial No: 066

Test I.D: D02195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	4,966	Pass
Overall Test Results				Pass

Laboratory Technician

2/7/02
Test Date

Approved By

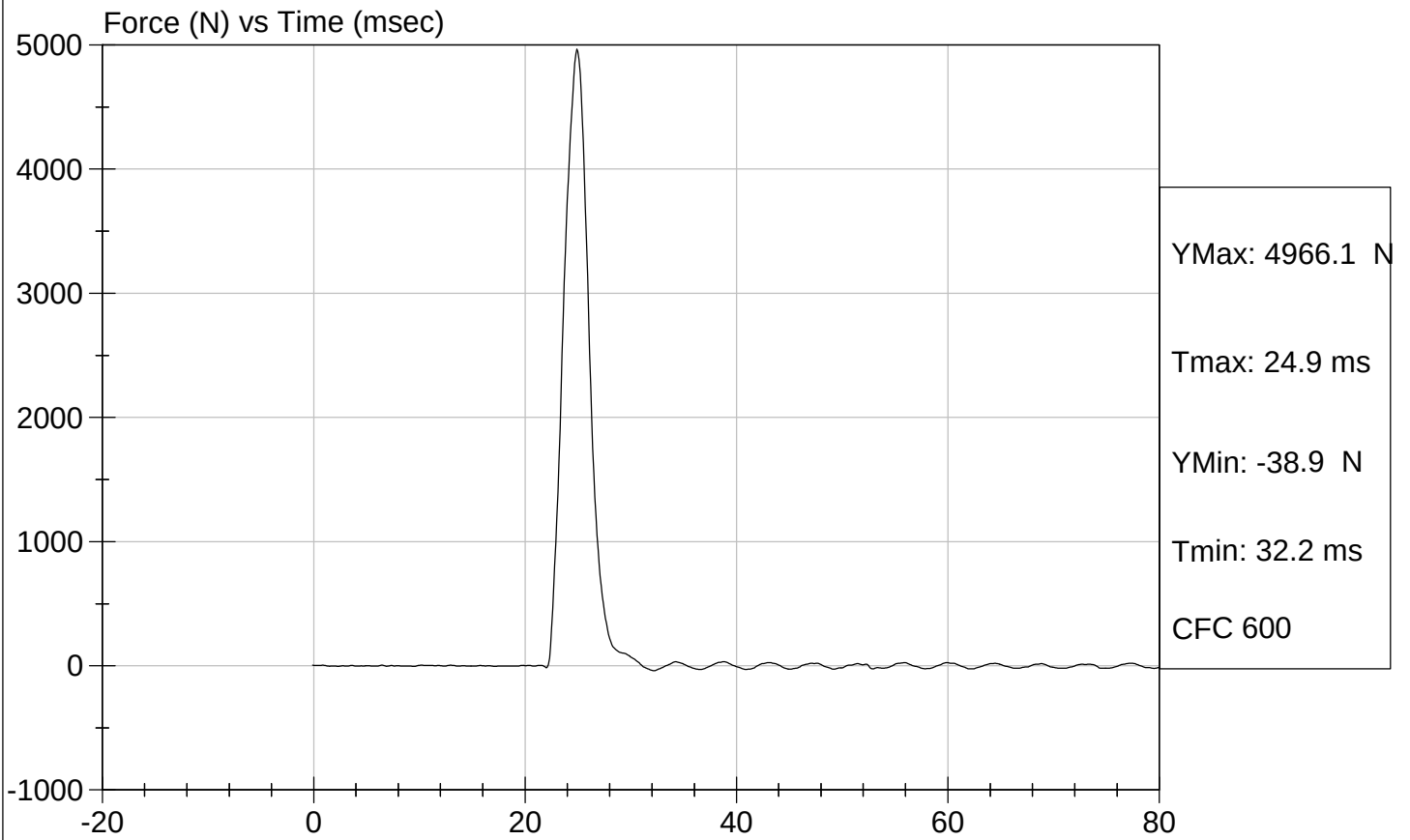


Test Description: Right Knee

Test Date: 2/7/02

Component: D02195

Speed: 6.92 ft/sec, 2.11 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Left Knee Impact Test

ATD Serial No: 066

Test I.D: D02196

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,146	Pass
Overall Test Results				Pass

Laboratory Technician

2/7/02
Test Date

Approved By

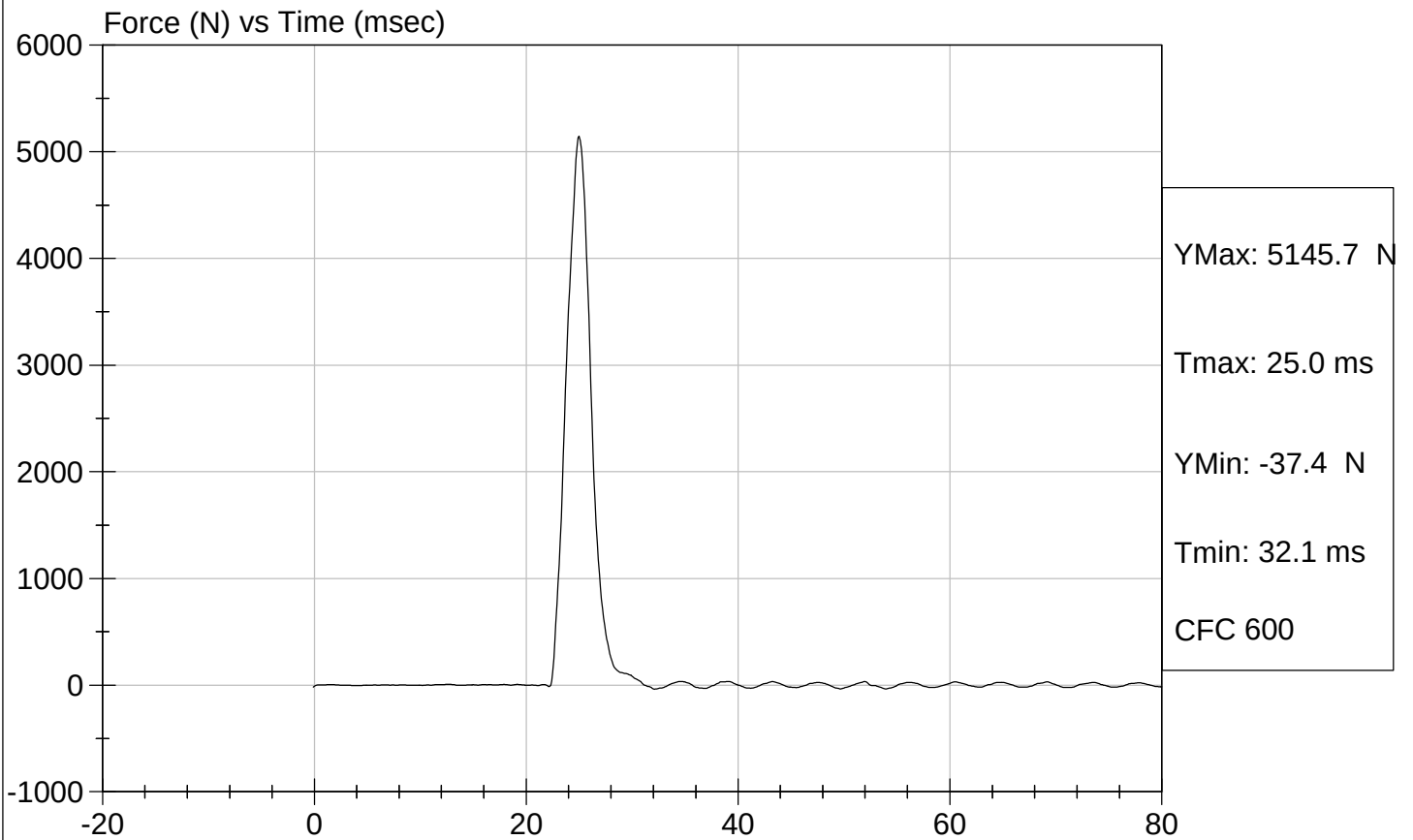


Test Description: Left Knee

Test Date: 2/7/02

Component: D02196

Speed: 6.92 ft/sec, 2.11 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Hip-Femur Flexion Test

ATD Serial No: 066

Test I.D: D02199/0

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.4	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	22	22	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	72.2	69.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	45	44	Pass
Overall Test Results					Pass

Laboratory Technician

2/8/02
Test Date

Approved By

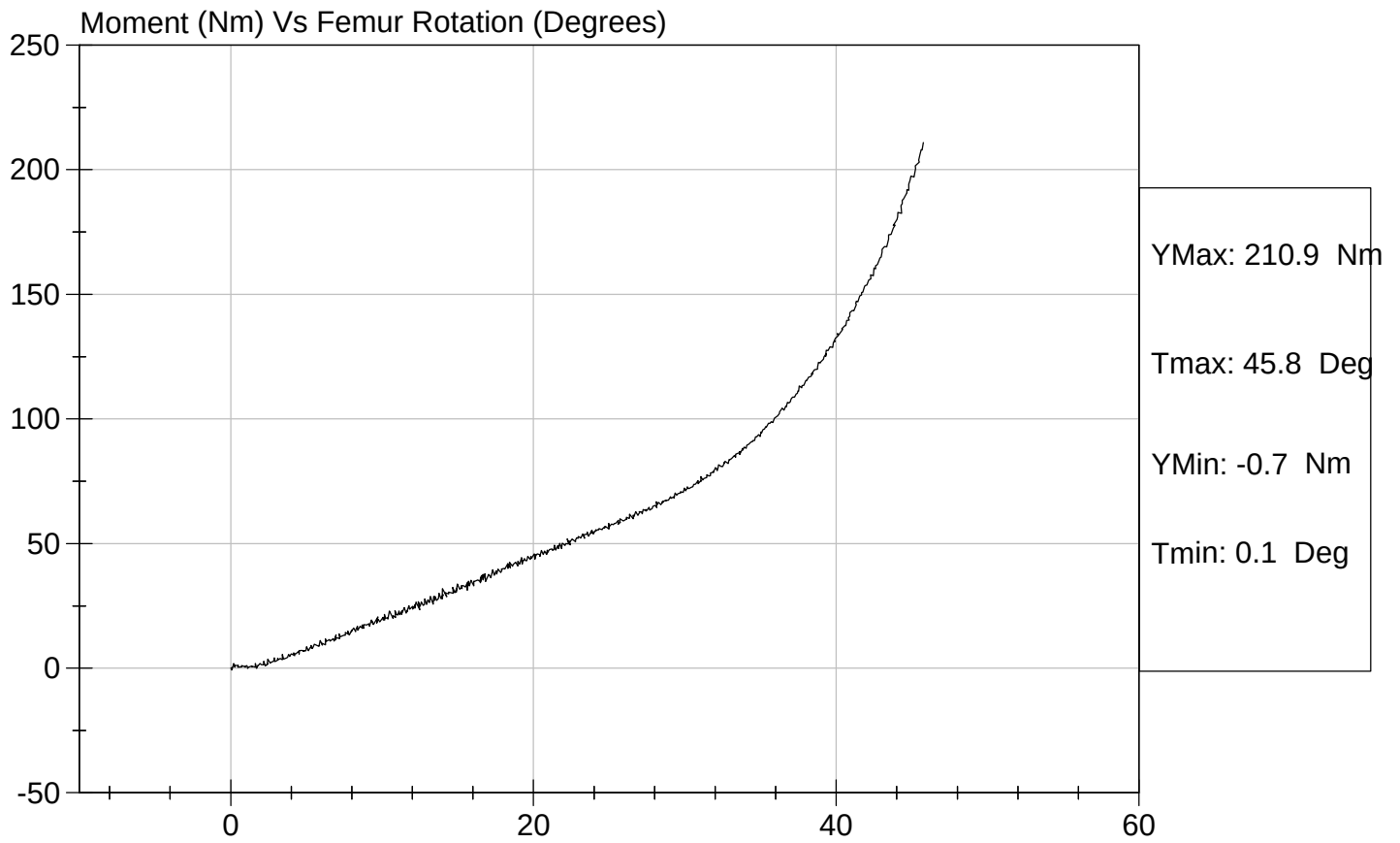


Test Description: Hip Femur Flexion

Test Date: 2/8/02

Component: D02199

Speed: 0 ft/sec, 0.00 m/sec



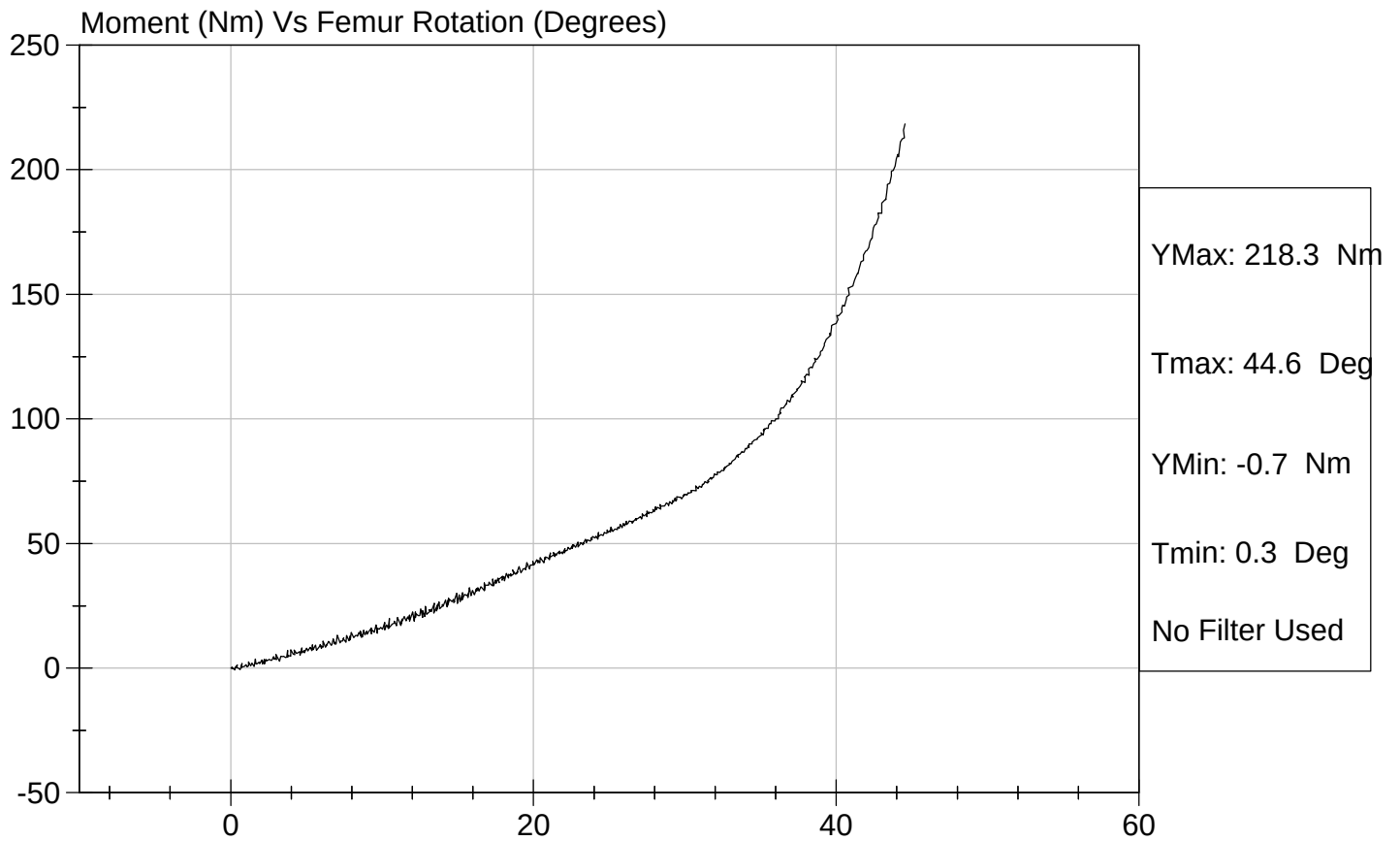


Test Description: Hip Femur Flexion

Test Date: 2/8/02

Component: D02190

Speed: 0 ft/sec, 0.00 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Head Drop Calibration

ATD Serial No: 065

Test I.D: D02181

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	21	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	243.3	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	8.2	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
			Overall Test Results	Pass

Laboratory Technician

2/7/02
Test Date

Approved By



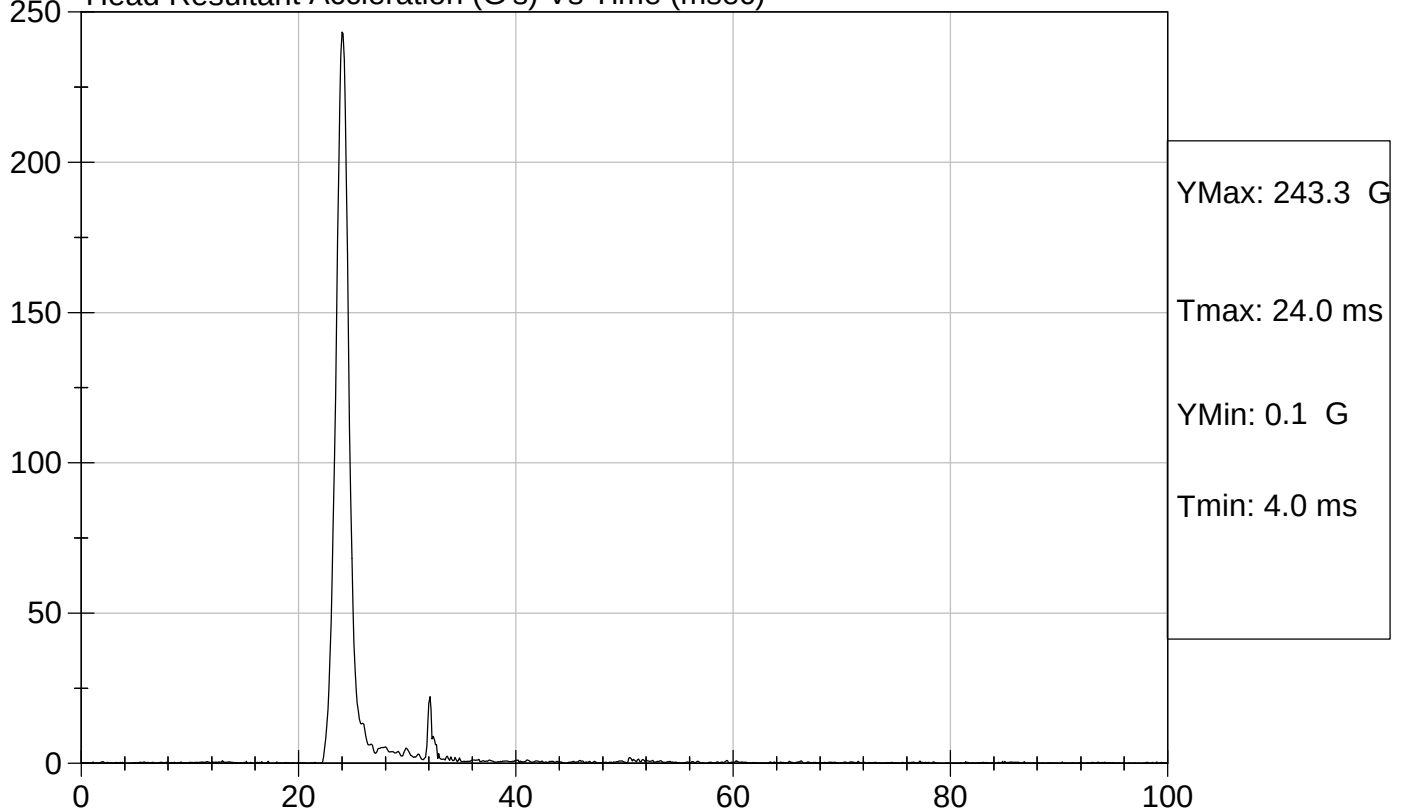
Test Description: Head Drop

Test Date: 2/7/02

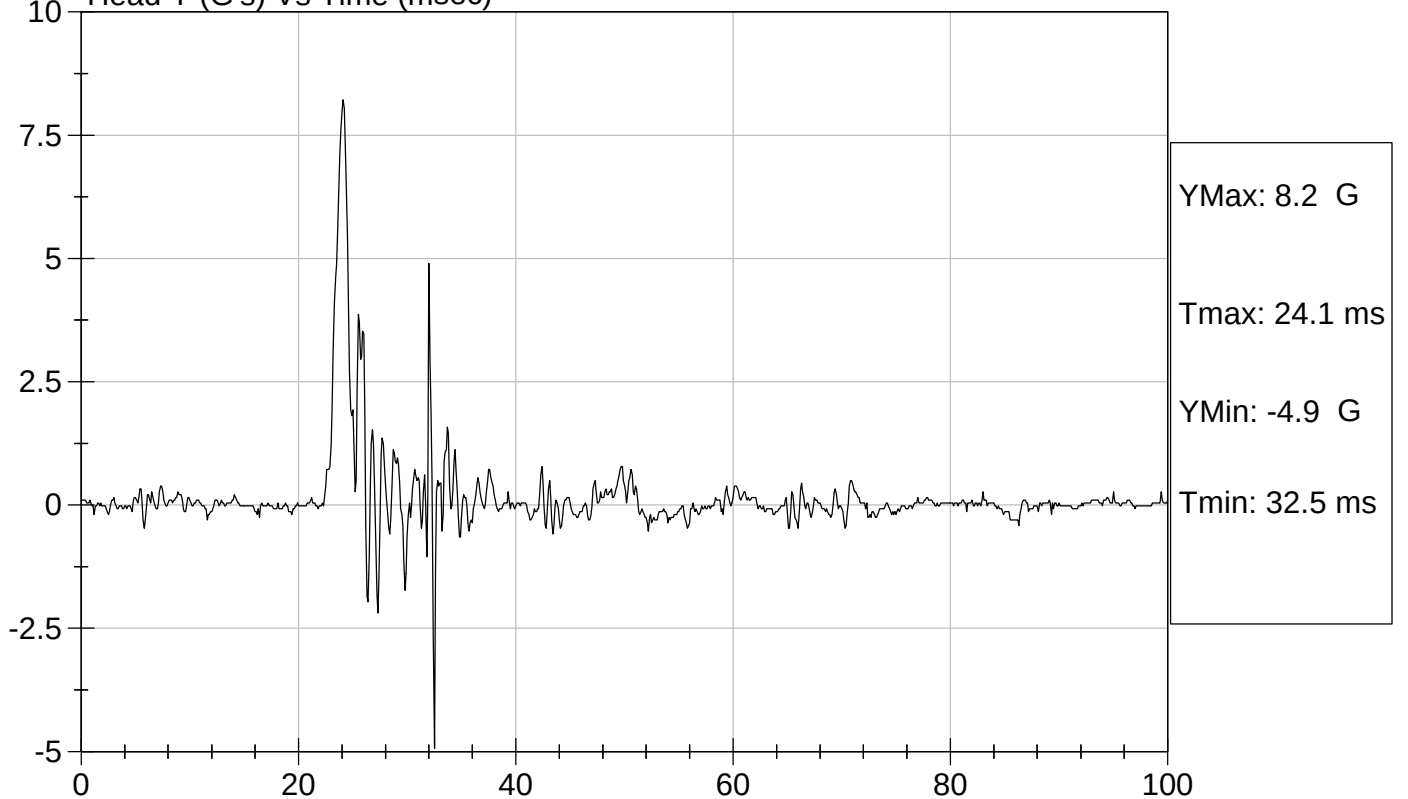
Component: D02181

Speed: 0 ft/s, 0.00 m/s

Head Resultant Acceleration (G's) Vs Time (msec)



Head Y (G's) Vs Time (msec)



Hybrid III Calibration Data Sheet
50th Percentile Male
Neck Flexion Test

ATD Serial No: 065

Test I.D: D02182

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	19	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.43	Pass
	20 msec	G's	17.60 to 22.60	19.29	Pass
	30 msec	G's	12.50 to 18.50	15.18	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.2	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	38.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	74.6	Pass
	Time	msec	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.7	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	92.3	Pass
	Time	msec	47.0 to 58.0	51.8	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	102.1	Pass
Overall Test Results					Pass

Laboratory Technician

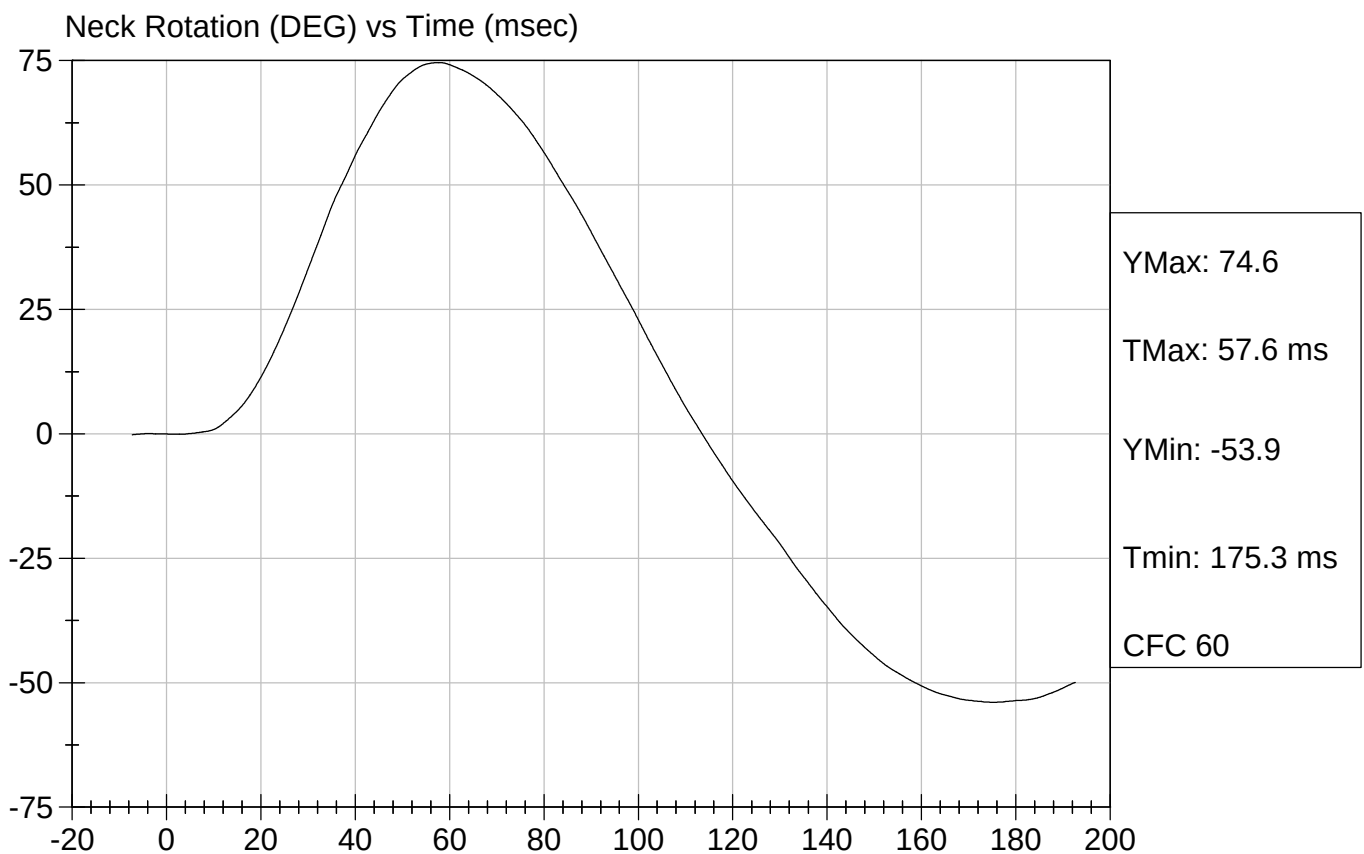
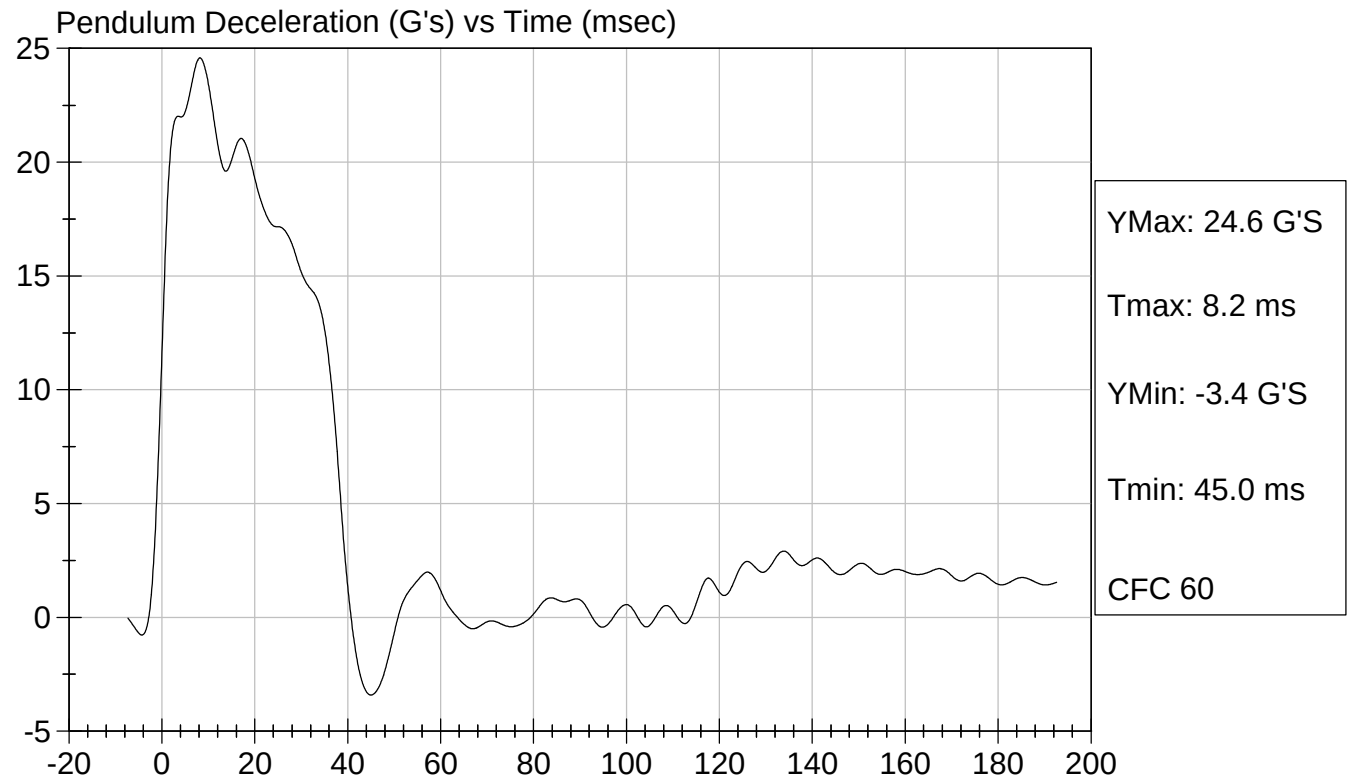
2/11/02
Test Date

Approved By



Test Desc: Neck Flexion
Component ID: D02182

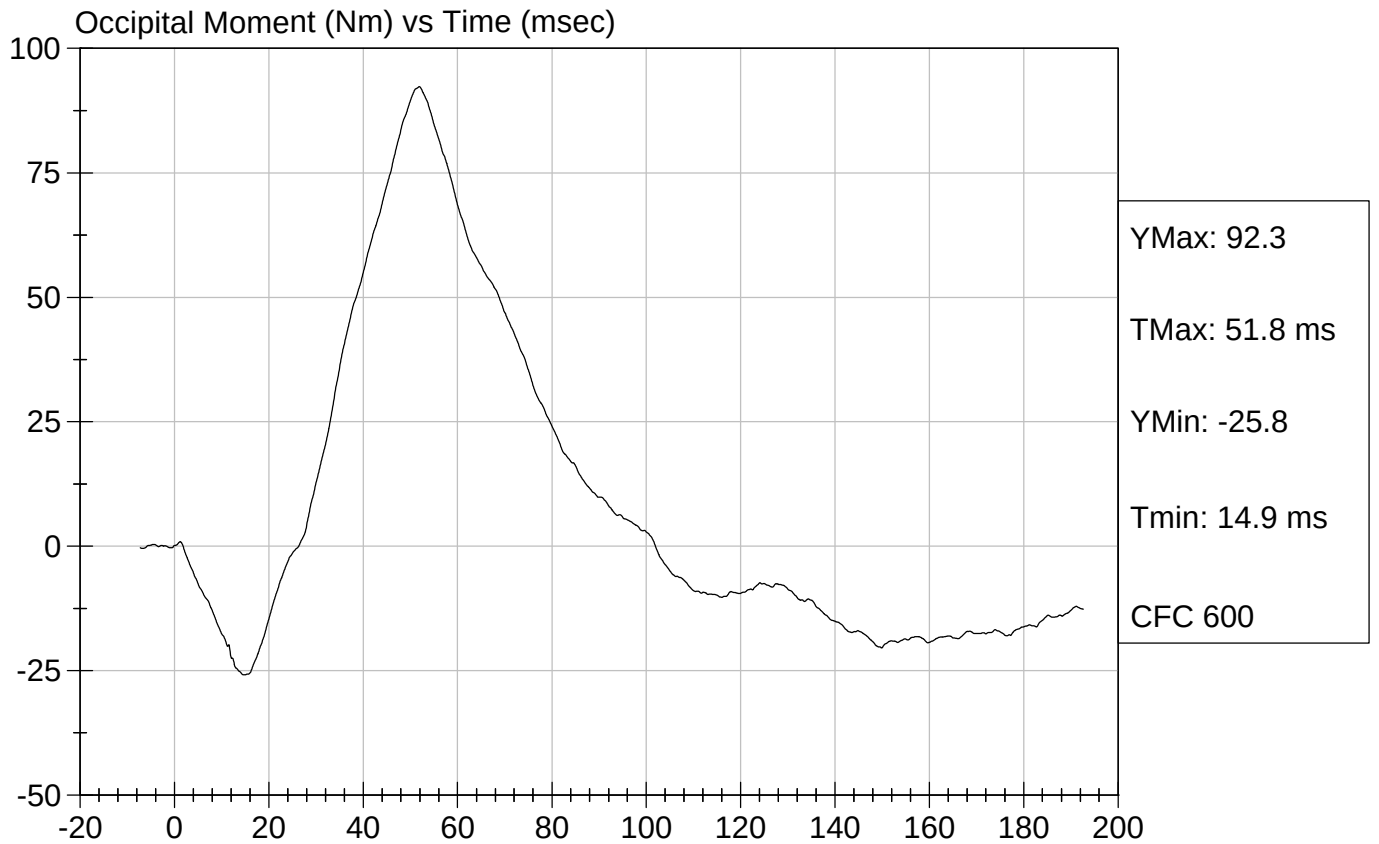
Test Date: 2/11/02
Speed: 22.90 ft/sec, 6.98 m/sec





Test Desc: Neck Flexion
Component ID: D02182

Test Date: 2/11/02
Speed: 22.90 ft/sec, 6.98 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Neck Extension Test

ATD Serial No: 065

Test I.D: D02183

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	19	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.02	Pass
	20 msec	G's	14.00 to 19.00	16.92	Pass
	30 msec	G's	11.00 to 16.00	13.36	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.9	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.7	Pass
	Time	msec	72.0 to 82.0	75.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	155.2	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-62.6	Pass
	Time	msec	65.0 to 79.0	72.4	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.2	Pass
Overall Test Results					Pass

Laboratory Technician

2/11/02

Test Date

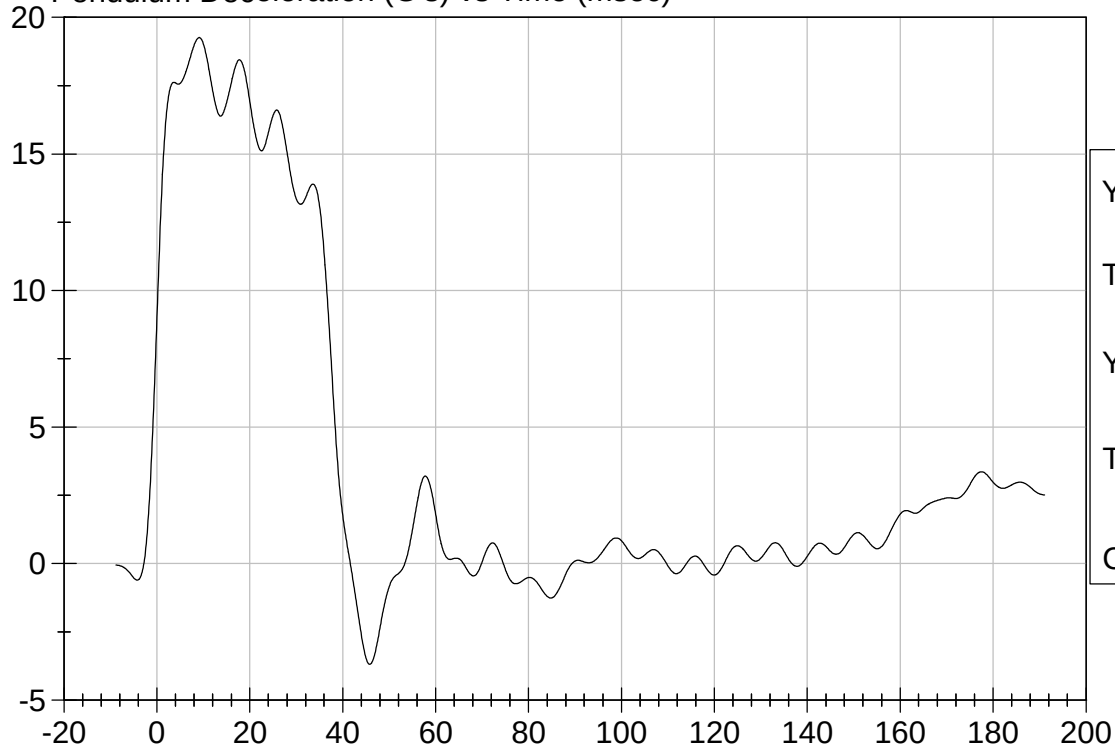
Approved By



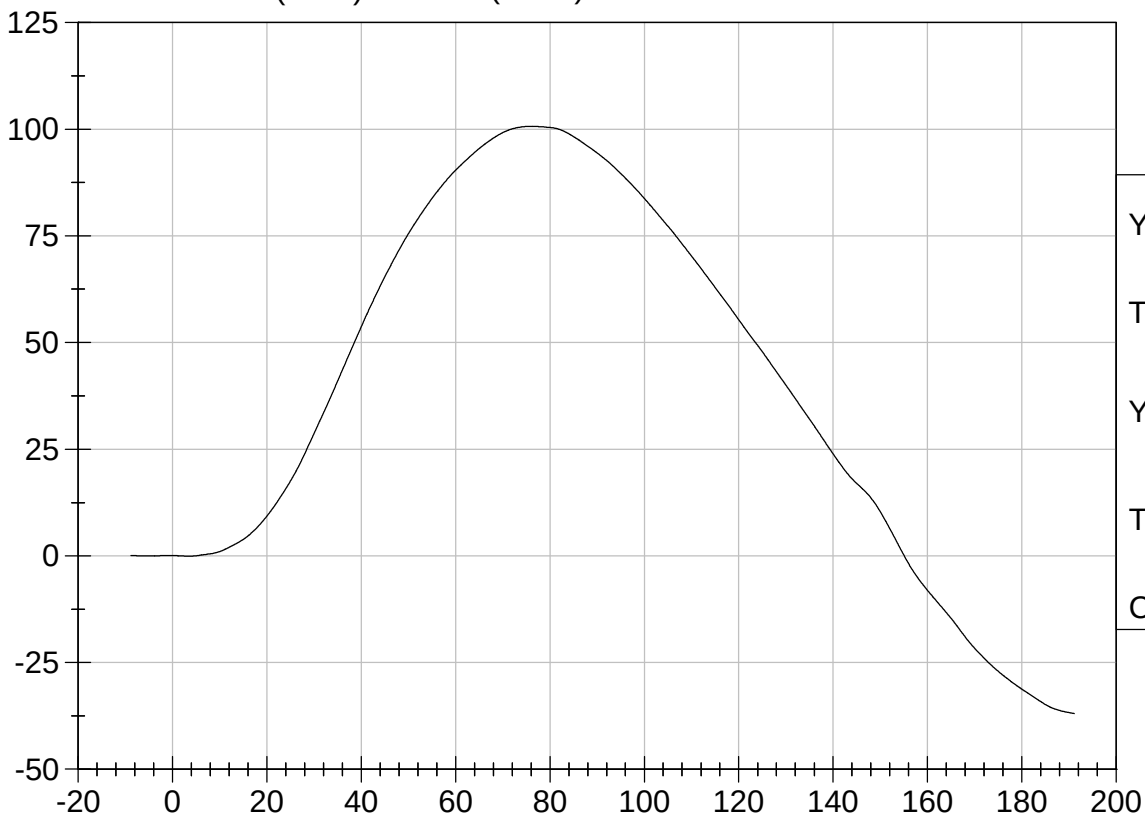
Test Desc: Neck Extension
Component ID: D02183

Test Date: 2/11/02
Speed: 19.95 ft/sec, 6.08 m/sec

Pendulum Deceleration (G's) vs Time (msec)



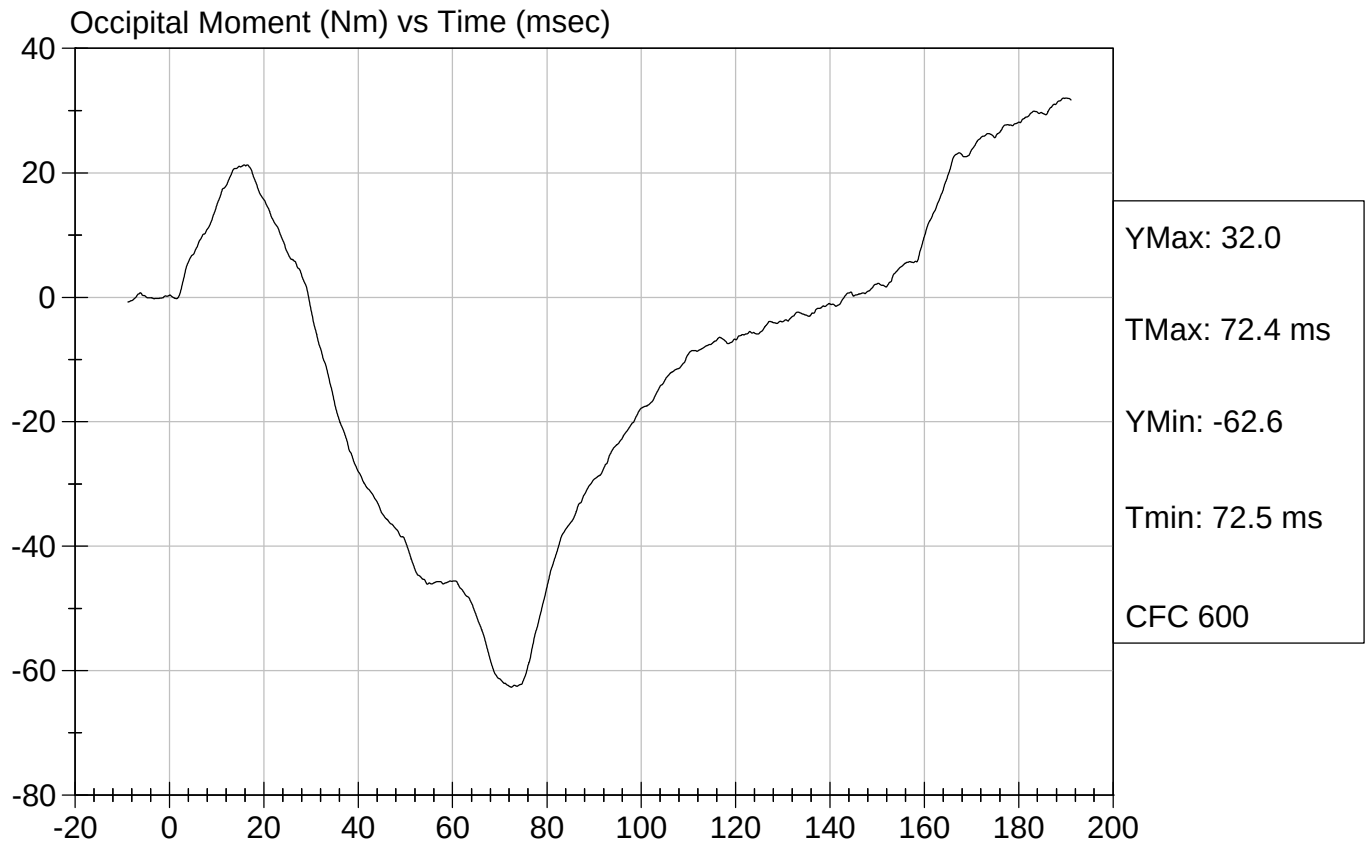
Neck Rotation (DEG) vs Time (msec)





Test Desc: Neck Extension
Component ID: D02183

Test Date: 2/11/02
Speed: 19.95 ft/sec, 6.08 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Thorax Impact Test

ATD Serial No: 065

Test I.D: D02184

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	19	Pass
Probe Velocity	m/s	6.58 to 6.82	6.73	Pass
Peak Probe Force	Newtons	5159 to 5893	5,808	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.82	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Overall Test Results				Pass

Laboratory Technician

2/11/02
Test Date

Approved By

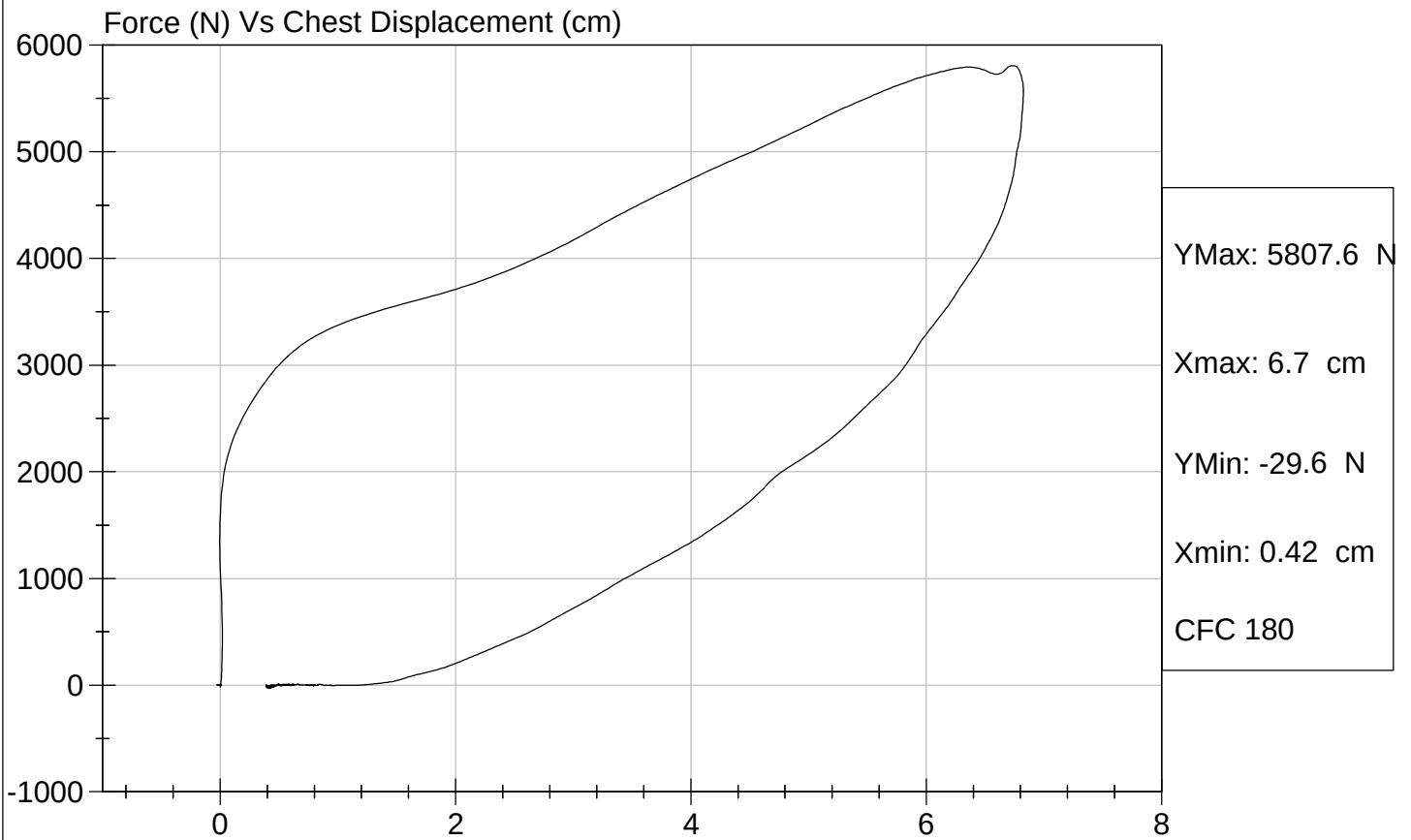


Test Description: Thorax Impact

Test Date: 2/11/02

Component: D02184

Speed: 22.08 ft/sec, 6.73 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Right Knee Impact Test

ATD Serial No: 065

Test I.D: D02185

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,663	Pass
Overall Test Results				Pass

Laboratory Technician

2/7/02
Test Date

Approved By

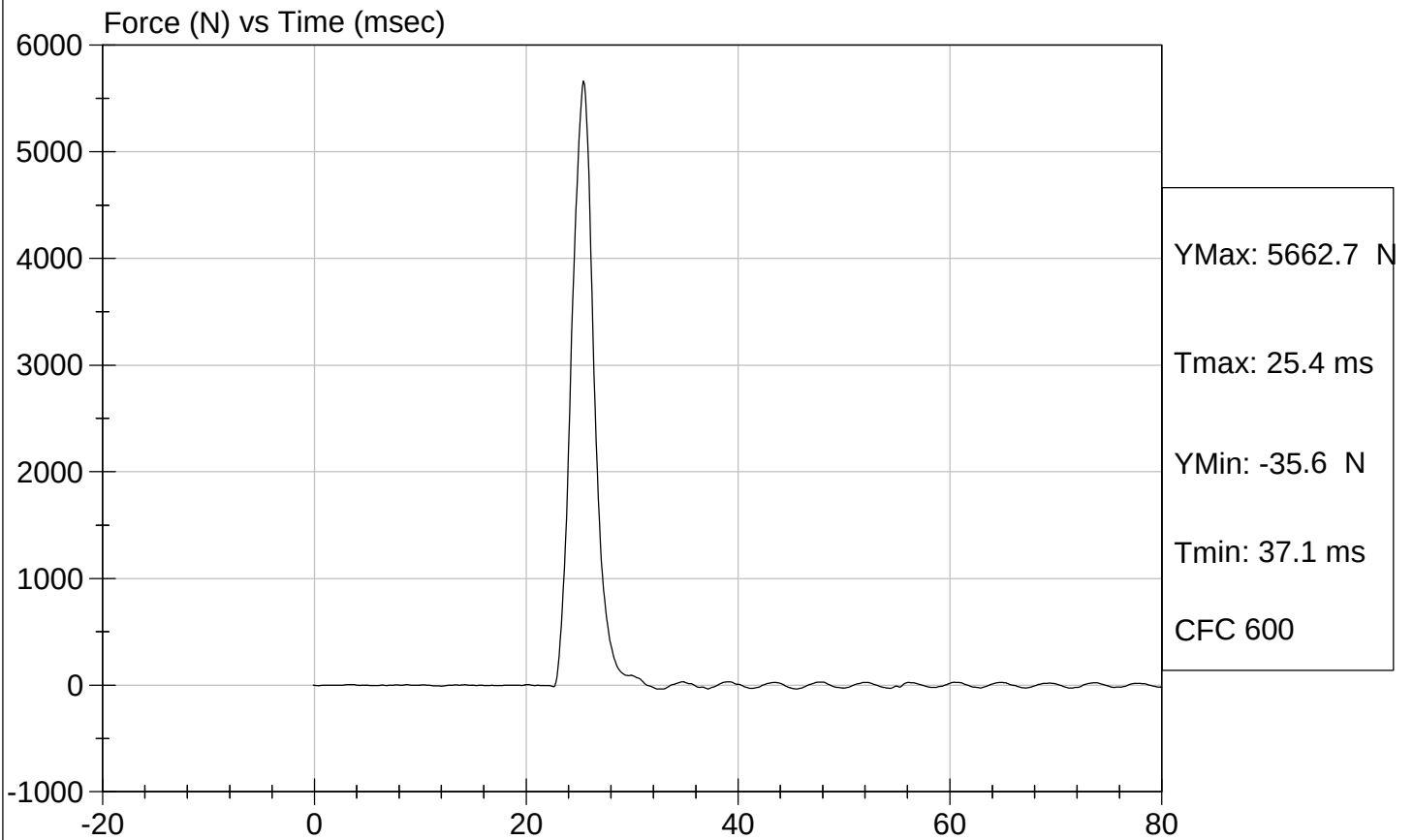


Test Description: Right Knee Impact

Test Date: 2/7/02

Component: D02185

Speed: 6.89 ft/sec, 2.10 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Left Knee Impact Test

ATD Serial No: 065

Test I.D: D02186

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5,500	Pass
Overall Test Results				Pass

Laboratory Technician

2/7/02
Test Date

Approved By

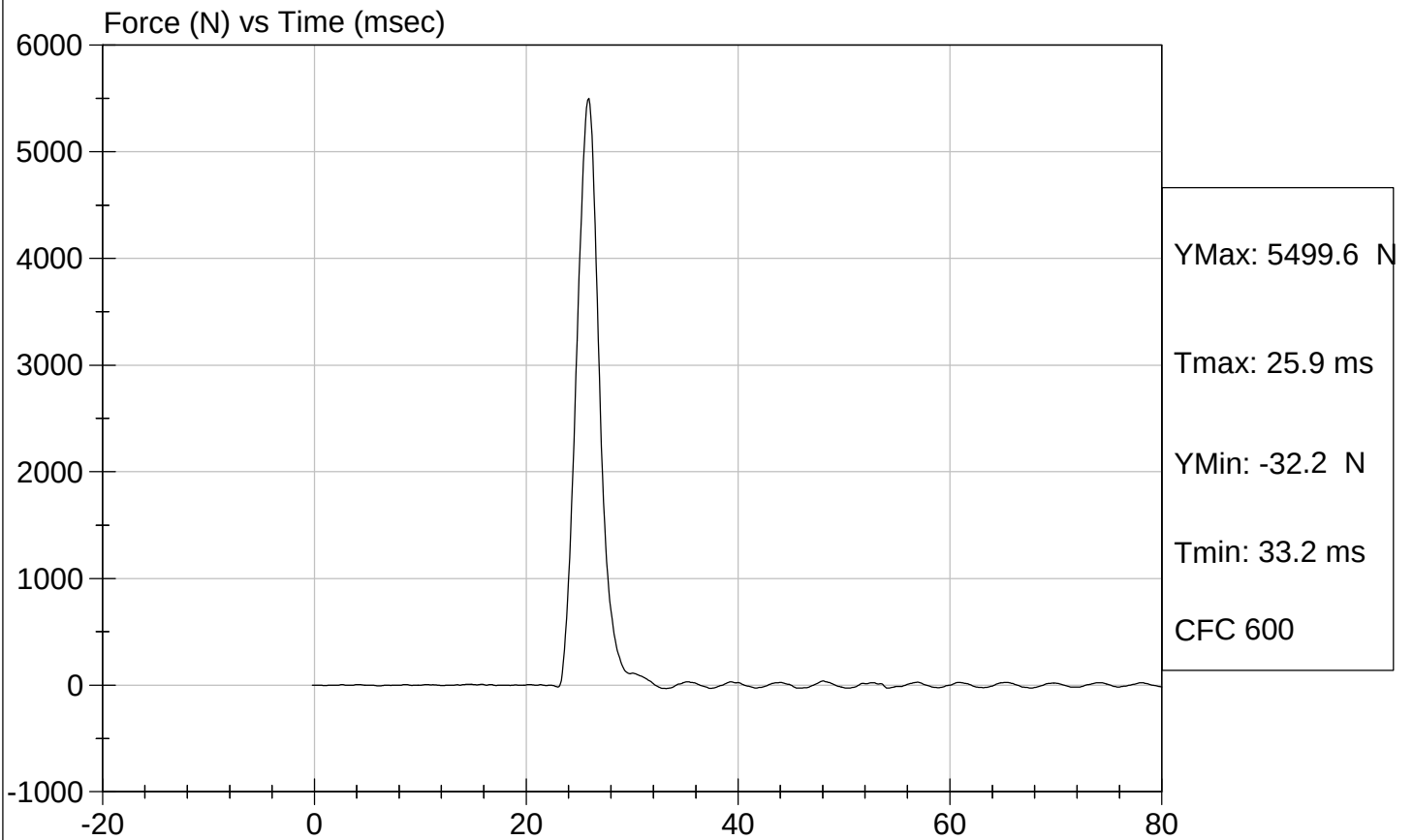


Test Description: Left Knee Impact

Test Date: 2/7/02

Component: D02186

Speed: 6.89 ft/sec, 2.10 m/sec



Hybrid III Calibration Data Sheet
50th Percentile Male
Hip-Femur Flexion Test

ATD Serial No: 065

Test I.D: D02189/0

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	20.4	20.4	Pass
Laboratory Relative Humidity	%	10 to 70	22	22	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	58.6	66.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	45	Pass
Overall Test Results					Pass

Laboratory Technician

2/8/02
Test Date

Approved By

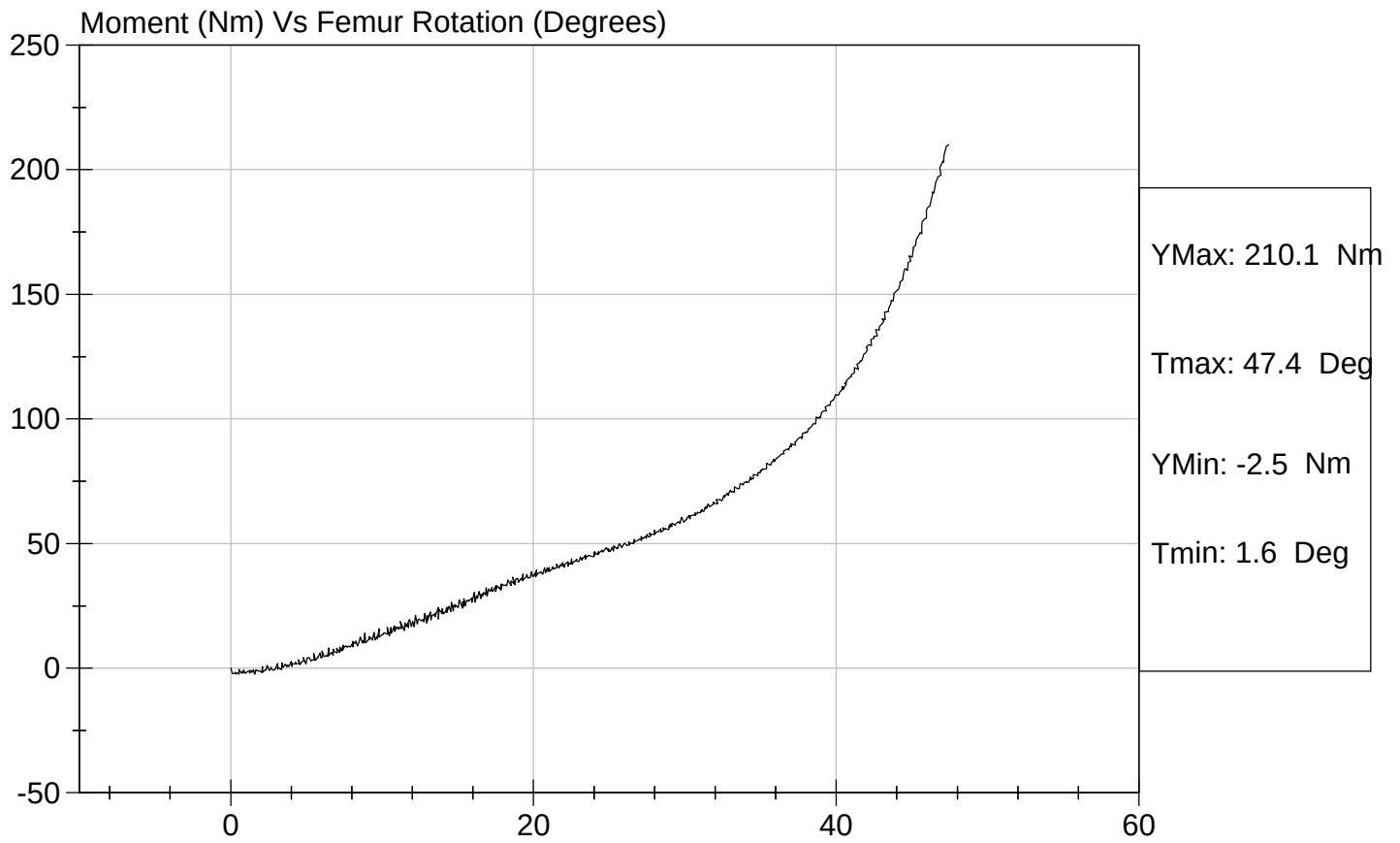


Test Description: Right Femur

Test Date: 2/8/02

Component: D02189

Speed: 0 ft/sec, 0.00 m/sec



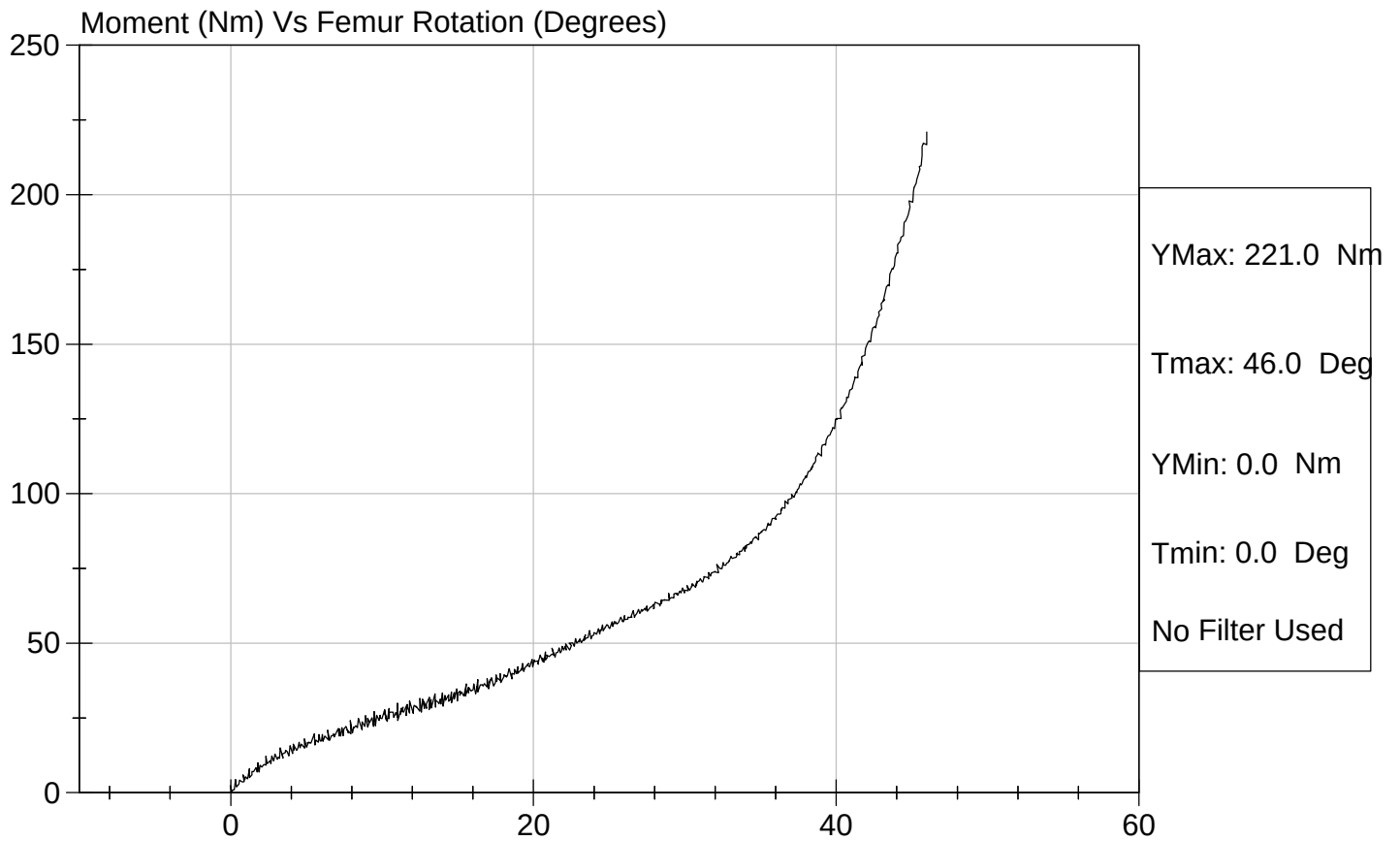


Test Description: Left Femur

Test Date: 2/8/02

Component: D02180

Speed: 0 ft/sec, 0.00 m/sec



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	11/14/01
Head Y	ACC61	Endevco	11/14/01
Head Z	ACCW9	Endevco	11/14/01
Head Y – Front	APYY3	Endevco	10/2/01
Head Z – Front	J23774	Endevco	11/15/01
Head X – Left	J20382	Endevco	11/15/01
Head Z – Left	J28988	Endevco	11/15/01
Head X – Upper	J22036	Endevco	11/15/01
Head Y - Upper	J20569	Endevco	11/15/01
Head X Redundant	J19884	Endevco	11/15/01
Head Y Redundant	J21988	Endevco	11/15/01
Head Z Redundant	J28986	Endevco	11/15/01
Neck Load Cell	443	Denton	1/24/02
Chest X	ACCY1	Endevco	11/14/01
Chest Y	ACCC8	Endevco	11/14/01
Chest Z	ACCT7	Endevco	11/14/01
Chest Deflection Gauge	066	Servo	11/28/01
Chest X Redundant	J13541	Endevco	11/15/01
Chest Y Redundant	J20093	Endevco	11/15/01
Chest Z Redundant	J19440	Endevco	11/15/01
Pelvis X	J13530	Endevco	2/11/02
Pelvis Y	J13535	Endevco	2/11/02
Pelvis Z	AP2E1	Endevco	2/12/02
Left Femur Load Cell	946	Denton	1/17/02
Right Femur Load Cell	945	Denton	1/17/02
Left Upper Tibia Load Cell	109	Denton	11/19/01
Left Lower Tibia Load Cell	138	Denton	11/16/01
Right Upper Tibia Load Cell	106	Denton	11/19/01

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Right Lower Tibia Load Cell	135	Denton	11/16/01
Left Foot Z – Front	AHWK8	Endevco	11/16/01
Left Ankle X	AH0D1	Endevco	11/16/01
Left Ankle Z	AH0M0	Endevco	11/16/01
Right Foot Z – Front	J21612	Endevco	11/16/01
Right Ankle X	J22034	Endevco	11/16/01
Right Ankle Z	J21724	Endevco	11/16/01
Shoulder Belt Load Cell	197	Denton	11/7/01
Lap Belt Load Cell	198	Denton	11/19/01

INSTRUMENTS FOR PASSENGER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	11/14/01
Head Y	J13941	Endevco	10/2/01
Head Z	AAMW5	Endevco	11/14/01
Head Y – Front	J20165	Endevco	11/15/01
Head Z – Front	J28708	Endevco	11/15/01
Head X – Left	J27513	Endevco	11/15/01
Head Z – Left	J23946	Endevco	11/15/01
Head X – Upper	J20580	Endevco	11/15/01
Head Y - Upper	J23914	Endevco	11/15/01
Head X Redundant	J18724	Endevco	11/15/01
Head Y Redundant	J14235	Endevco	11/15/01
Head Z Redundant	AJ5R0	Endevco	11/15/01
Neck Load Cell	252	Denton	10/12/01
Chest X	ACC78	Endevco	11/14/01
Chest Y	ACCE6	Endevco	11/14/01
Chest Z	ACCY3	Endevco	11/14/01
Chest Deflection Gauge	065	Servo	11/28/01
Chest X Redundant	J19927	Endevco	11/15/01
Chest Y Redundant	J14674	Endevco	11/15/01
Chest Z Redundant	J18736	Endevco	11/15/01
Pelvis X	J33416	Endevco	2/12/02
Pelvis Y	J13927	Endevco	10/2/01
Pelvis Z	AHTB2	Endevco	2/12/02
Left Femur Load Cell	946	Denton	1/17/02
Right Femur Load Cell	945	Denton	1/17/02
Left Upper Tibia Load Cell	105	Denton	11/19/01
Left Lower Tibia Load Cell	133	Denton	11/16/01
Right Upper Tibia Load Cell	103	Denton	11/19/01

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Right Lower Tibia Load Cell	134	Denton	11/16/01
Left Foot Z – Front	J13630	Endevco	2/12/02
Left Ankle X	J13938	Endevco	2/12/02
Left Ankle Z	ANAT6	Endevco	2/12/02
Right Foot Z – Front	AJ9J7	Endevco	11/16/01
Right Ankle X	AJ819	Endevco	11/16/01
Right Ankle Z	AJ7A2	Endevco	11/16/01
Shoulder Belt Load Cell	192	Denton	11/7/01
Lap Belt Load Cell	191	Denton	11/7/01

INSTRUMENTS FOR VEHICLE AND LABORATORY

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	I25-F08	Entran	1/16/02
Left Rear Seat Crossmember Z	I25-F07	Entran	1/14/02
Right Rear Seat Crossmember X	D11-F14	Entran	1/16/02
Right Rear Seat Crossmember Z	E03-H06	Entran	1/16/02
Top of Engine X	K21-N23	Entran	1/17/02
Bottom of Engine X	F18-G13	Entran	1/16/02
Left Brake Caliper X	I25-F09	Entran	1/16/02
Right Brake Caliper X	I12-F05	Entran	10/10/01
Instrument Panel X	H07-A11	Entran	3/6/02

Note: All Endevco accelerometers are Model No. 7264-2000
All Entran accelerometers are Model No. EGE-72

APPENDIX E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT INSTRUCTIONS



Seats and Restraint Systems

Here you'll find information about the seats in your Saturn and how to use your safety belts properly. You can also learn about some things you should *not* do with air bags and safety belts.

SEATS AND SEAT CONTROLS

This section tells you about the seats — how to adjust them, and also about reclining front and rear seatbacks and head restraints.

Manual Seat



CAUTION

You can lose control of the vehicle if you try to adjust a manual driver's seat while the vehicle is moving. The sudden movement could startle and confuse you, or make you push a pedal when you don't want to. Adjust the driver's seat only when the vehicle is not moving.

Manual Front Passenger Seats



Lift the bar under the front of the seat to unlock it. Slide the seat forward or rearward to where you want it and release the bar. Then try to move the seat with your body to make sure the seat is locked in place.

Driver's Seat Height Adjuster



The driver's seat height adjuster is located on the left side of the seat cushion.

To raise the seat, ratchet the lever upward until the seat is at the desired height. To lower the seat, ratchet the lever downward until the seat is at the desired height.

Reclining Front Seatbacks



To adjust the seatback on a manual seat, lift the lever located on the rear left side of the seat cushion and move the seatback to where you want it. Then release the lever to lock the seatback in place.

But don't have the seatback reclined if your vehicle is moving.



⚠ CAUTION

Sitting in a reclined position when your vehicle is in motion can be dangerous. Even if you buckle up, your safety belts can't do their job when you're reclined like this.



⚠ CAUTION (Continued)

The shoulder belt can't do its job because it won't be against your body. Instead, it will be in front of you. In a crash you could go into it, receiving neck or other injuries.

The lap belt can't do its job either. In a crash the belt could go up over your abdomen. The belt forces would be there, not at your pelvic bones. This could cause serious internal injuries.

For proper protection when the vehicle is in motion, have the seatback upright. Then sit well back in the seat and wear your safety belt properly.

Fold-Flat Front Passenger SeatBack

Your Saturn is equipped with a fold-flat front passenger seat back.

To fold the seatback down flat, lift the bar under the front seat to unlock it. Slide the seat to the rear-most position, then release the bar.

Lift the recliner lever, located on the outside of the seat, and fold the seat forward until the seatback disengages. Continue to fold the seat forward until it locks in the folded position.



Head Restraints



Your Saturn vehicle has adjustable head restraints on the front seats. To slide the head restraint up or down, depress the head restraint button located between the bottom of the head restraint and the top of the seat.



Slide an adjustable head restraint up or down so that the top of the restraint is closest to the top of your head. This position reduces the chance of a neck injury in a crash.

The rear seat head restraints in your vehicle are adjustable. They work the same as the front seat head restraints.

Reclining or Folding the Rear Seatbacks

The seatbacks on each section of the split bench seat can be reclined or folded forward.

You can recline either the left or right side of the seatback separately, or have both seatbacks recline together.

To recline the rear seatbacks, lift the lever on the back corner of the seatbacks.

Your Saturn is also equipped with split fold-down rear seatbacks. This feature is designed to increase the cargo area of your Saturn.

You can fold either the left or right side of the seatback. Just make sure the front seat is not reclined. If it is, the rear seatback won't fold down all the way. In addition, ensure the rear center shoulder belt is unlatched from the lap belt before folding the left (driver's side) seatback.

You will not be able to raise the seatback to the upright position unless you unlatch the rear center seat shoulder belt from the lap belt before you lower the left (driver's side) seatback.



To fold either the left or right side of the seatback, lift the lever on the back corner of the seatback. Next, move the seatback to the folded position.



CAUTION

If the seatback isn't locked, it could move forward in a sudden stop or crash. That could cause injury to the person sitting there. Always press rearward on the seatback to be sure it is locked.

The rear seatback will lock in the lowered position. To raise the seatback, lift the recliner lever while pulling up on the seatback. Push and pull on the seatback to check that it is locked in the upright position.

SAFETY BELTS: THEY'RE FOR EVERYONE

This section of the handbook tells you how to use safety belts properly. It also tells you some things you should not do with safety belts. And it explains the air bag system.



CAUTION

Don't let anyone ride where he or she can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be much worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.



CAUTION

It is extremely dangerous to ride in a cargo area, inside or outside of a vehicle. In a collision, people riding in these areas are more likely to be seriously injured or killed. Do not allow people to ride in any area of your vehicle that is not equipped with seats and safety belts. Be sure everyone in your vehicle is in a seat and using a safety belt properly.



Your vehicle has a light that comes on as a reminder to buckle up. (See "Safety Belt Reminder Light" in the Index.)

In most states and Canadian provinces, the law says to wear safety belts. Here's why: *They work.*

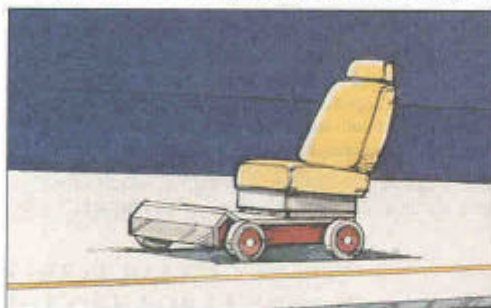
You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are mild, and some crashes can be so serious that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts, they could have been badly hurt or killed.

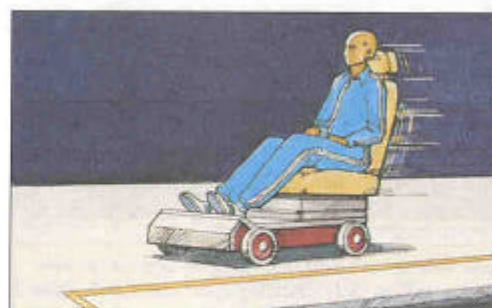
After more than 30 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter . . . a lot!

Why Safety Belts Work

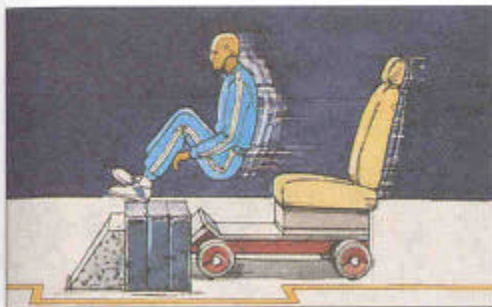
When you ride in or on anything, you go as fast as it goes.



Take the simplest vehicle. Suppose it's just a seat on wheels.



Put someone on it.



Get it up to speed. Then stop the vehicle. The rider doesn't stop.



The person keeps going until stopped by something. In a real vehicle, it could be the windshield . . .



or the instrument panel . . .



or the safety belts!

With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

Here Are Questions Many People Ask About Safety Belts — and the Answers

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You *could* be — whether you're wearing a safety belt or not. But you can unbuckle a safety belt, even if you're upside down. And your chance of being conscious during and after an accident, so you *can* unbuckle and get out, is *much* greater if you are belted.

Q: If my vehicle has air bags, why should I have to wear safety belts?

A: Air bags are in many vehicles today and will be in most of them in the future. But they are supplemental systems only; so they work *with* safety belts — not instead of them. Every air bag system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has air bags, you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident — even one that isn't your fault — you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

HOW TO WEAR SAFETY BELTS PROPERLY

Adults

This section is only for people of adult size.

Be aware that there are special things to know about safety belts and children. And there are different rules for smaller children and babies. If a child will be riding in your Saturn, see the section of this handbook called "Children." Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your vehicle has. We'll start with the driver position.

DRIVER POSITION

This section describes the driver's restraint system.

Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see "Seats" in the Index) so you can sit up straight.

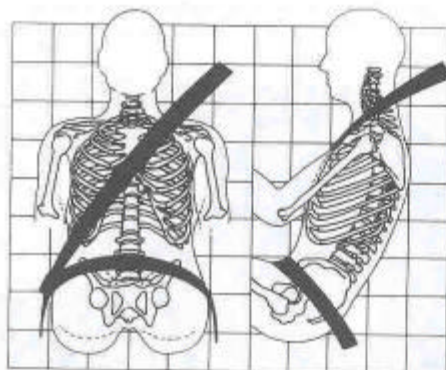


3. Pick up the latch plate and pull the belt across you. Don't let it get twisted. The shoulder belt may lock if you pull the belt across you very quickly. If this happens, let the belt go back slightly to unlock it. Then pull the belt across you more slowly.
4. Push the latch plate into the buckle until it clicks. Pull up on the latch plate to make sure it is secure.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.



The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries.

The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or crash, or if you pull the belt very quickly out of the retractor.

Shoulder Belt Height Adjuster

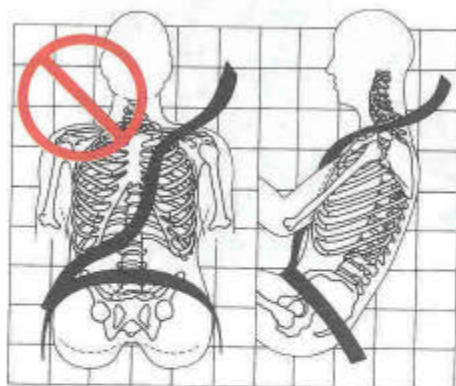
Before you begin to drive, move the shoulder belt height adjuster to the height that is right for you.

To move it up or down, grasp the adjuster knob and move the height adjuster to the desired position. After you move the height adjuster to where you want it, try to move it down without touching the knob to make sure it has locked into position.

Adjust the height so that the shoulder portion of the belt is centered on your shoulder. The belt should be away from your face and neck, but not falling off your shoulder.



Q: What's wrong with this?

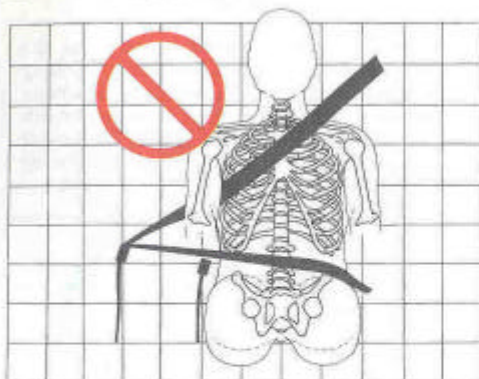


A: The shoulder belt is too loose. It won't give nearly as much protection this way.

CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

Q: What's wrong with this?



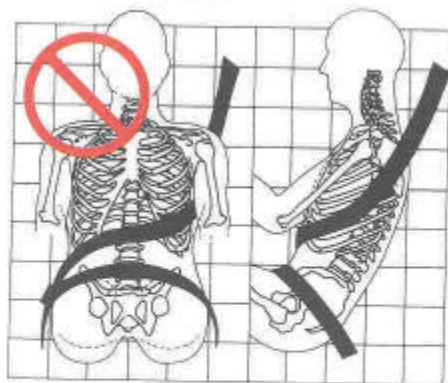
A: The belt is buckled in the wrong place.



CAUTION

You can be seriously injured if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

Q: What's wrong with this?



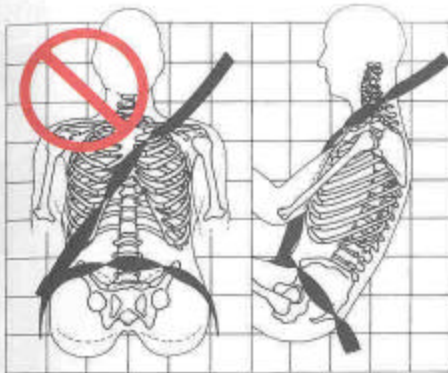
A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.



CAUTION

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

Q: What's wrong with this?



A: The belt is twisted across the body.

CAUTION

You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly, or ask your Saturn retailer to fix it.



To unlatch the safety belt, just push the button on the buckle. The belt should go back out of the way.

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.

SAFETY BELT USE DURING PREGNANCY



Safety belts work for everyone, including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts.

A pregnant woman should wear a lap-shoulder belt, and the lap portion should be worn as low as possible, below the rounding, throughout the pregnancy.

The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.

RIGHT FRONT PASSENGER POSITION

To learn how to wear the right front passenger's safety belt properly, see "Driver Position" earlier in this section. The right front passenger's safety belt works the same way as the driver's safety belt — except for one thing.

If you ever pull the shoulder portion of the belt out all the way, you will engage the child restraint locking feature. If this happens, just let the belt go back all the way and start again.

AIR BAG SYSTEMS

This section explains the frontal and side impact air bag systems.

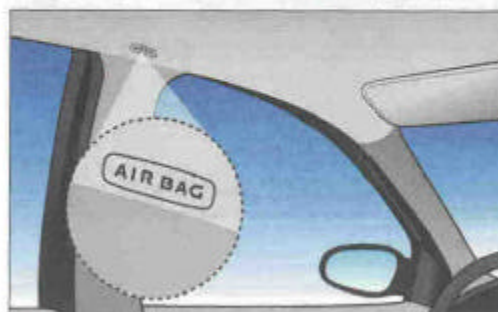
Your vehicle has air bags — a frontal air bag for the driver and another frontal air bag for the right front passenger.

Side Impact Air Bags (Option)

Your vehicle may also have side impact air bags — a side impact air bag for the driver and passenger directly behind the driver, and another side impact air bag for the right front

passenger and the person seated directly behind that passenger. This type of side impact air bag is sometimes called a "roof rail" or "head curtain" air bag.

If your vehicle has side impact air bags, it will say "AIR BAG" on the air bag covering on the ceiling near the driver's and right front passenger's window. In addition to providing side impact protection for the driver and the right front passenger, the side impact air bags are also designed to help protect occupants in the rear seat outboard positions.



Frontal air bags are designed to help reduce the risk of injury from the force of an inflating frontal air bag. But these air bags must inflate very quickly to do their job and comply with federal regulations.

Here are the most important things to know about the air bag systems:

 CAUTION

You can be severely injured or killed in a crash if you aren't wearing your safety belt — even if you have air bags. Wearing your safety belt during a crash helps reduce your chance of hitting things inside the vehicle or being ejected from it. Air bags are “supplemental restraints” to the safety belts. All air bags are designed to work with safety belts, but don't replace them.

Frontal air bags for the driver and right front passenger are designed to work only in moderate to severe crashes where the front of your vehicle hits something.

 CAUTION (Continued)

They are not designed to inflate at all in rollover, rear, side or low-speed frontal crashes. And, for unrestrained occupants, air bags may provide less protection in frontal crashes than more forceful air bags have provided in the past.

Side impact air bags are designed to inflate only in moderate to severe crashes where something hits the side of your vehicle. They are not designed to inflate in frontal, in rollover or in rear crashes. Everyone in your vehicle should wear a safety belt properly — whether or not there's an air bag for that person.

 CAUTION

Both frontal and side impact air bags inflate with great force, faster than the blink of an eye. If you're too close to an inflating air bag, as you would be if you were leaning forward, it could seriously injure you. Safety belts help keep you in position before and during a crash. Always wear your safety belt, even with air bags. The driver should sit as far back as possible while still maintaining control of the vehicle. Occupants should not lean on or sleep against the door.

 CAUTION

Anyone who is up against, or very close to, any air bag when it inflates can be seriously injured or killed. Air bags plus lap-shoulder belts offer the best protection for adults, but not for young children and infants. Neither the vehicle's safety belt system nor its air bag system is designed for them. Young children and infants need the protection that a child restraint system can provide. Always secure children properly in your vehicle. To read how, see the part of this handbook called “Children.”

Air Bag Readiness Light



There is an air bag readiness light on the instrument panel, which shows "AIR BAG" and the air bag symbol.

The system checks the air bag electrical system for malfunctions. The light tells you if there is an electrical problem. See "Air Bag Readiness Light" in the Index for more information.

How the Air Bag System Works



Q: Where are the air bags?

A: The driver's frontal air bag is in the middle of the steering wheel.



The right front passenger's frontal air bag is in the instrument panel on the passenger's side.



The side impact air bag for the driver and the person seated directly behind the driver is in the ceiling above the side windows.

The side impact air bag for the right front passenger and the person seated directly behind that passenger is in the ceiling above the side windows.

**CAUTION**

If something is between an occupant and an air bag, the bag might not inflate properly or it might force the object into that person. The path of an inflating air bag must be kept clear. Don't put anything between an occupant and an air bag, and don't attach or put anything on the steering wheel hub or on or near any other air bag covering.

If your vehicle has side impact air bags, never secure anything to the roof of your vehicle by routing a rope or tiedown through any door or window opening. If you do, the path of an inflating side impact air bag will be blocked. The path of an inflating air bag must be kept clear.

Q: When should an air bag inflate?

A: The driver's and right front passenger's frontal air bags are designed to inflate in moderate to severe frontal or near-frontal crashes. But they are designed to inflate only if the impact speed is above the system's designed "threshold level." If your vehicle goes straight into a wall that doesn't move or deform, the threshold level is about 9 to 15 mph (14 to 24 km/h).

The threshold level can vary, however, with specific vehicle design, so that it can be somewhat above or below this range. If your vehicle strikes something that will move or deform, such as a parked car, the threshold level will be higher.

The driver's and right front passenger's frontal air bags are not designed to inflate in rollovers, side impacts, or rear impacts, because inflation would not help the occupant.

The side impact air bags are designed to inflate in moderate to severe side crashes. A side impact air bag will inflate if the crash severity is above the system's designed "threshold level." The threshold level can vary with specific vehicle design. Side impact air bags are not designed to inflate in frontal or near-frontal impacts, rollovers or rear impacts, because inflation would not help the occupant. A side impact air bag will only deploy on the side of the vehicle that is struck.

In any particular crash, no one can say whether an air bag should have inflated simply because of the damage to a vehicle or because of what the repair costs were. For frontal air bags, inflation is determined by the angle of the impact and how quickly the vehicle slows down in frontal and near-frontal impacts. For side impact air bags, inflation is determined by the location and severity of the impact.

The air bag system is designed to work properly under a wide range of conditions, including off-road usage. Observe safe driving speeds, especially on rough terrain. As always, wear your safety belt. See "Off-Road Driving" in the Index for more tips on off-road driving.

Q: What makes an air bag inflate?

A: In an impact of sufficient severity, the air bag sensing system detects that the vehicle is in a crash. For both frontal and side impact air bags, the sensing system triggers a release of gas from the inflator, which inflates the air bag. The inflator, air bag and related hardware are all part of the air bag modules inside the steering wheel, instrument panel and the ceiling of the vehicle, near the side windows.

Q: How does an air bag restrain?

A: In moderate to severe frontal or near-frontal collisions, even belted occupants can contact the steering wheel or instrument panel. In moderate to severe side collisions, even belted occupants can contact the inside of the vehicle. The air bag supplements the protection provided by safety belts.

Air bags distribute the force of the impact more evenly over the occupant's upper body, stopping the occupant more gradually. But the frontal air bags would not help you in many types of collisions, including rollovers, rear impacts, and side impacts, primarily because an occupant's motion is not toward those air bags.

Side air bags would not help you in many types of collisions, including frontal or near frontal collisions, rollovers, and rear impacts, primarily because an occupant's motion is not toward those air bags.

Air bags should never be regarded as anything more than a supplement to safety belts, and then only in moderate to severe frontal or near-frontal collisions for the driver's and right front passenger's frontal air bags, and only in moderate to severe side collisions for the side impact air bags.

Q: What will you see after an air bag inflates?

A: After the air bag inflates, it quickly deflates — so quickly that some people may not even realize the air bag inflated. Some components of the air bag module — the steering wheel hub for the driver's air bag, the instrument panel for the right front passenger's bag, the area along the ceiling of your vehicle near the side windows — will be hot for a short time. The parts of the bag that come into contact with you may be warm, but not too hot to touch. There will be some smoke and dust coming from vents in the deflated air bags. Air bag inflation doesn't prevent the driver from seeing or from being able to steer the vehicle, nor does it stop people from leaving the vehicle.

 CAUTION

When an air bag inflates, there is dust in the air. This dust could cause breathing problems for people with a history of asthma or other breathing trouble. To avoid this, everyone in the vehicle should get out as soon as it is safe to do so. If you have breathing problems but can't get out of the vehicle after an air bag inflates, then get fresh air by opening a window or a door.

In many crashes severe enough to inflate an air bag, windshields are broken by vehicle deformation. Additional windshield breakage may also occur from the right front passenger air bag.

- Air bags are designed to inflate only once. After they inflate, you'll need some new parts for your air bag system. If you don't get them replaced, the air bag system won't be there to help protect you in another crash. A new system will include air bag modules and possibly other parts. The service manual for your vehicle covers the need to replace other parts.
- Your vehicle is equipped with a crash sensing and diagnostic module, which records information about the air bag system. The module records information about the readiness of the system, when the system commands air bag inflation and driver's safety belt usage at deployment or in a near-deployment crash. The module also records speed, engine rpm, brake and throttle data.
- Let only qualified technicians work on your air bag system. Improper service can mean that your air bag system won't work properly. See your Saturn retailer for service.

NOTICE

If you damage the covering for the driver's or the right front passenger's air bag, or the side impact air bag covering on the ceiling near the side windows, the air bag may not work properly. You may have to replace the air bag module in the steering wheel, both the air bag module and the instrument panel for the right front passenger's air bag, or side impact air bag module and side impact air bag covering. Do not open or break the air bag coverings.

Servicing Your Air Bag-Equipped Saturn

Air bags affect how your Saturn should be serviced. There are parts of the air bag system in several places around your vehicle. You don't want the air bag system to inflate while someone is working on your car. Your Saturn retailer and the Saturn Service Manual have information about servicing your vehicle and the air bag systems. To purchase a service manual set, see "Publications" in the Index.

 CAUTION

For up to one minute after the ignition key is turned off and the battery is disconnected, an air bag can still inflate during improper service. You can be injured if you are close to an air bag when it inflates. Avoid wires wrapped with yellow tape, yellow coverings, or yellow connectors. They are probably part of the air bag systems. Be sure to follow proper service procedures, and make sure the person performing work for you is qualified to do so.

The air bag systems do not need regular maintenance.

Adding Equipment to Your Air Bag-Equipped Vehicle

Q: If I add a luggage carrier or sunroof to the roof of my vehicle, will it keep the side impact air bags from working properly?

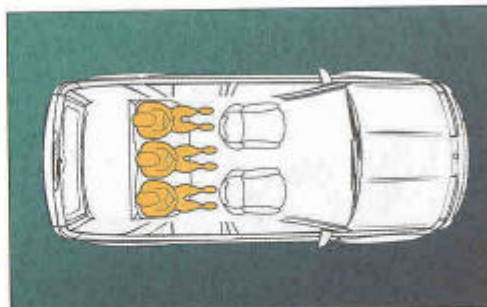
A: As long as the luggage carrier or sunroof is properly installed so that the vehicle's basic structure is not changed, it is not likely to keep the side impact air bags from working properly in a crash.

REAR SEAT PASSENGERS

It's very important for rear seat passengers to buckle up! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.

Rear Seat Passenger Positions



Lap-Shoulder Belt

All three rear seating positions have lap-shoulder belts. Here's how to wear one properly.



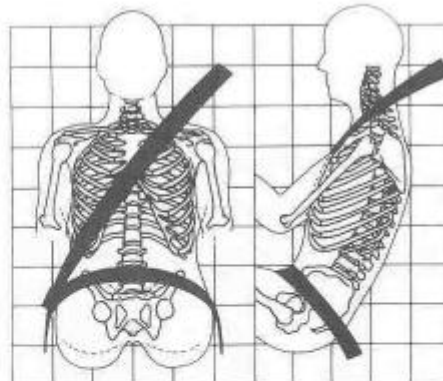
1. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

The shoulder belt may lock if you pull the belt across you very quickly. If this happens, let the belt go back slightly to unlock it. Then pull the belt across you more slowly.

2. Push the latch plate into the buckle until it clicks. Pull up on the latch plate to make sure it is secure.
When the shoulder belt is pulled out all the way, it will lock. If it does, let it go back all the way and start again.
Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



3. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder part.



The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen.

This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces. The safety belt locks if there's a sudden stop or crash, or if you pull the belt very quickly out of the retractor.

CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, which could increase injury. The shoulder belt should fit against your body.



4. To unlatch the belt, just push the button on the buckle.