

REPORT NUMBER: NCAP-MGA-2005-003

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

**Toyota Motor Corporation
2005 Toyota Corolla Matrix
NHTSA NUMBER: M55102**

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



Test Date: September 21, 2004

Report Date: October 20, 2004

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
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WASHINGTON, D.C. 20590**

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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 35.1 mph (56.5 km/h) frontal barrier impact was conducted on a 2005 Toyota Corolla Matrix at MGA Research Corporation on September 21, 2004. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.5 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 580 mm located at the vehicle left side. 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%; margin-top: 10px; border-collapse: collapse;"> <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>441</td> <td>466</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>40</td> <td>56</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-1704</td> <td>-395</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-1997</td> <td>-1576</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	441	466	Max. Thorax Accel. (3ms Clip)	G's	60	40	56	Left Femur Force	Newton	10009	-1704	-395	Right Femur Force	Newton	10009	-1997	-1576
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h 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 2005 Toyota Corolla Matrix at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on September 21, 2004. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera, seven film cameras and eight digital 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 head, chest and pelvis tri-axial accelerometers, chest displacement potentiometer, upper neck transducers, right/left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 065) and right-front passenger (position 2) ATD (Serial No. 066) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 159 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle 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 581 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable after the impact.

The driver's head, chest, and abdomen contacted the airbag. The driver's head also contacted the headrest, side header and overhead grab handle. The driver's knees contacted the bolster. 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)
Driver	440.7	39.9	-18.7	-1704	-1997
Passenger	465.8	55.8	-20.4	-395	-1576

TEST NOTES

The following channels did not collect any data:

Driver Pelvis Y

No valid data was collected for the load cell barrier.

Due to power supply failure in our video systems prior to the test, we ran eight digital and seven film cameras.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

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: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.5
Test Weight	kg	1472.0
Average Rebound	mm	862
Maximum Static Crush	mm	581
Impact Angle	degrees	0.0

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were unlocked
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
Glazing Damage	The windshield cracked.	

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	HIII 50 th / 065	HIII 50 th / 066
Head Contact	Airbag, Headrest, Side Header, Overhead Grab Handle	Airbag, Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	Airbag	Airbag
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

16mm MOVIE COVERAGE

Real Time	1
High Speed Film Cameras	7
High Speed Digital Cameras	8
Total	16

Driver ATD Sensors	52
Passenger ATD Sensors	48
Belt Assessment Sensors	6
Vehicle Structure Accelerometers	9
Total	115

DATA SHEET NO. 2**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	Corolla Matrix
Body Style	4-Door CUV
NHTSA No.	M55102
VIN	2T1KR30E15C334031
Color	White
Delivery Date	8/26/04
Odometer Reading (mile)	154
Dealer	Wilde Toyota
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	1.8
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owner's Manual Details Instructions on Disabling ADLs	NA

TEST VEHICLE OPTIONS

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Manufacturing Canada, Inc.	GVWR (kg)	1744
Date of Manufacture	05/04	GAWR Front (kg)	914
		GAWR Rear (kg)	839

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	308	308
Cold Pressure (kPa)	220	220
Recommended Tire Size	P205/55R16	P205/55R16
Tire Size on Vehicle	P205/55R16	P205/55R16
Tire Manufacturer	Continental	Continental

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				390
Cargo Wt. (RCLW) (kg)				49.9

DATA SHEET NO. 2... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	386.5	257.6		435.0	316.2	
Right	kg	365.6	263.1		401.0	319.8	
Ratio	%	59.1	40.9		56.8	43.2	
Totals	kg	752.1	520.7	1272.8	836.0	636.0	1472.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1272.8
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	49.9
Calculated Vehicle Target Weight (TVTW)	kg	1478.7

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	702	701	714	719	1066
As Tested	mm	685	688	698	693	1126
Post Test	mm	705	659	708	671	

Vehicle Wheelbase (mm): 2605

Weight of Ballast secured in cargo area (kg): 0.0

Vehicle Components Removed: Bumper, Spare Tire, Jack, Hub Cabs

Ballast weight does not include instrumentation and data acquisition system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 50.0

Usable Capacity Figure Furnished by COTR (L): 50.0

Actual Test Volume (L): 29.1

Test Fluid Type: Stoddard Solvent; Specific Gravity: 0.77

Is Vehicle Fuel Pump Electric or Mechanical? Electric

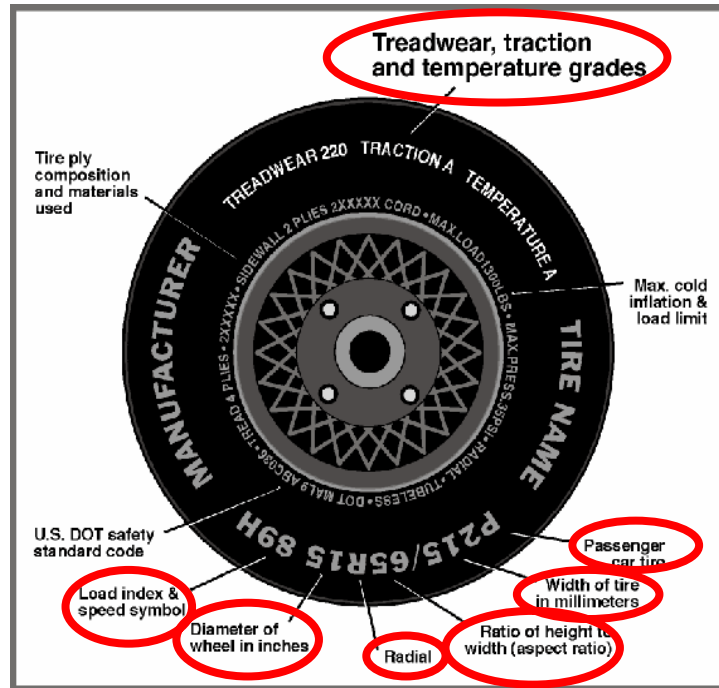
If electric, does pump operate with ignition switch "ON" & engine "OFF"? Yes

DATA SHEET NO. 3
TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

Vehicle Year	2005	Vehicle Make	Toyota
VIN	2T1KR30E15C334031	Vehicle Model	Corolla Matrix



	Front	Rear
Tire Manufacturer	Continental	Continental
Tire Name	Touring CTC	Touring CTC
Tire Type	P	P
Tire Width (mm)	205	205
Ratio of Height to Width (aspect ratio)	55	55
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	89H	89H
Treadwear	360	360
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4
POST IMPACT DATA

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.5
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	56.5
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	4350	3770	580
Center	mm	4360	3779	581
Right Side	mm	4350	3775	575

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	890
Center	mm	880
Right Side	mm	815
Average	mm	862

DATA SHEET NO. 5
TEST VEHICLE INFORMATION

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

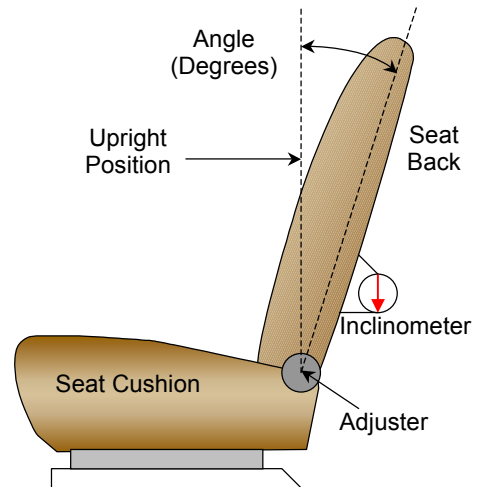
NHTSA No.: M55102
Test Date: 09/21/04

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows:

Driver seat back angle: 3rd detent with the forward most detent defined as 0

Passenger seat back angle: 4th detent with the forward most defined as 0.



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver and the passenger seat were manually operated.

Driver seat fore/aft total travel: 17 positions

Driver seat fore/aft position: 8th position with the forward most defined as 0

Passenger seat fore/aft total travel: 17 positions

Passenger seat fore/aft position: 8th position with the forward most defined as 0

DATA SHEET NO. 5... (continued)

TEST VEHICLE INFORMATION

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

FUEL TANK CAPACITY DATA

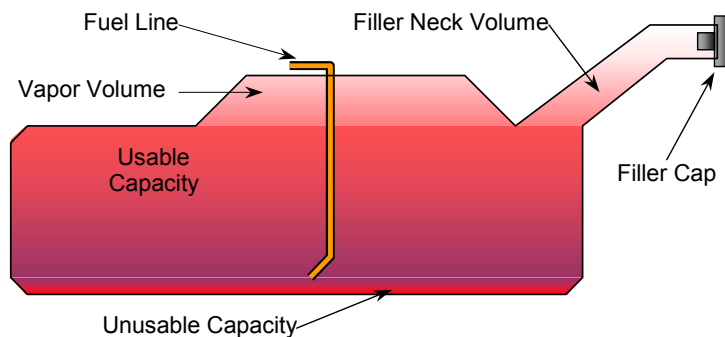
The "Usable Capacity" of the standard equipment fuel tank is: 50.0 liters

The "Usable Capacity" of any optional equipment fuel tank is: N/A liters

The "Usable Capacity" used for certification to FMVSS 301 requirements: 50.0 liters

Actual amount of Stoddard solvent added to vehicle for certification test: 29.1 liters

The fuel pump will pump fuel when the ignition is on.



VEHICLE FUEL TANK ASSEMBLY

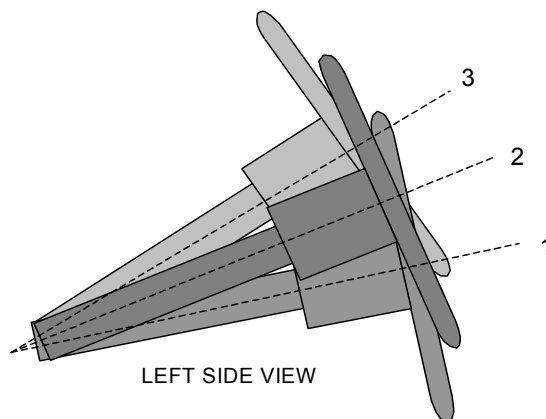
STEERING COLUMN ADJUSTMENT

Adjustable steering controls are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions.

Lowermost. Position 1: 27.8°

Geometric Center, Position 2: 29.7°

Uppermost, Position 3: 31.7°



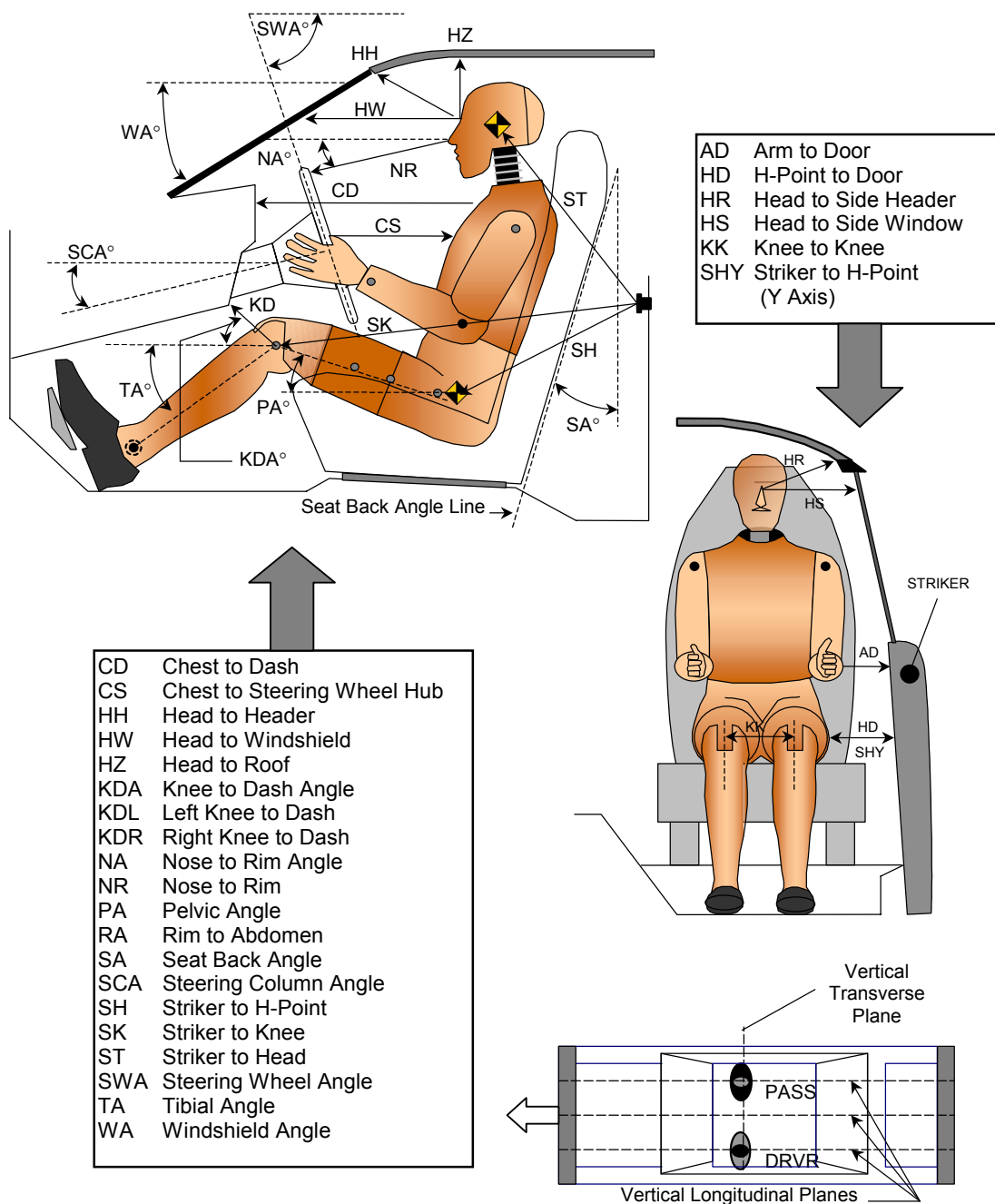
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 6 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 6... (continued)
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

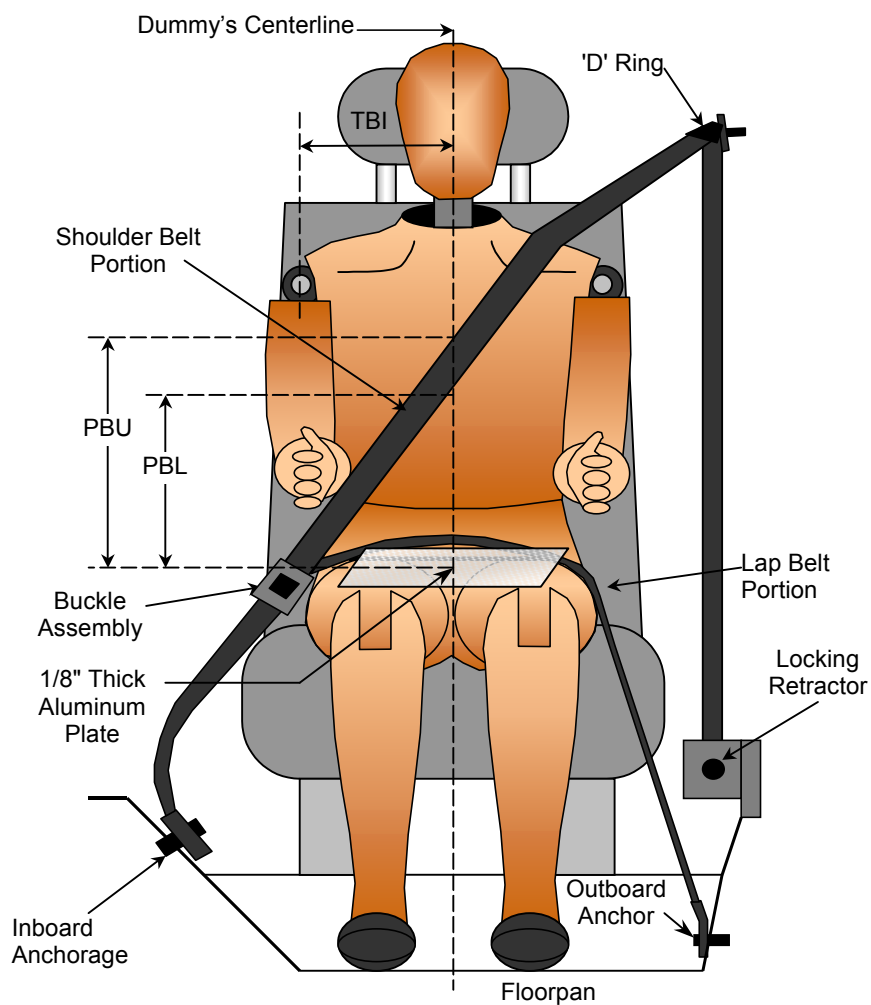
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		31.7		
SWA	Steering Wheel Angle		60.7		
SCA	Steering Column Angle		31.4		
SA	Seat Back Angle (headrest post)		1.8		0.8
HZ	Head to Roof (Z)	234	90.0	223	90.0
HH	Head to Header	375	22.4	344	23.1
HW	Head to Windshield	600	0.0	566	0.0
HR	Head to Side Header (Y)	205		201	
NR	Nose to Rim	452	15.0		
CD	Chest to Dash	571		523	
CS	Chest to Steering Hub	364	9.7		
RA	Rim to Abdomen	212	0.0		
KDL	Left Knee to Dash	165	24.2	138	
KDR	Right Knee to Dash	159		147	27.5
PA	Pelvic Angle		24.7		24.0
TA	Tibia Angle		51.8		44.7
KK	Knee to Knee (Y)	302		279	
SK	Striker to Knee	577	99.2	619	101.2
ST	Striker to Head	440	10.3	459	12.3
SH	Striker to H-Point	284	135.4	285	131.0
SHY	Striker to H-Point (Y)	240		238	
HS	Head to Side Window	286		300	
HD	H-Point to Door (Y)	141		128	
AD	Arm to Door (Y)	100		100	
AA	Ankle to Ankle	328		180	

DATA SHEET NO. 7 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04



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	341	379
PBL - To surface of reference to belt lower edge	mm	263	297

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

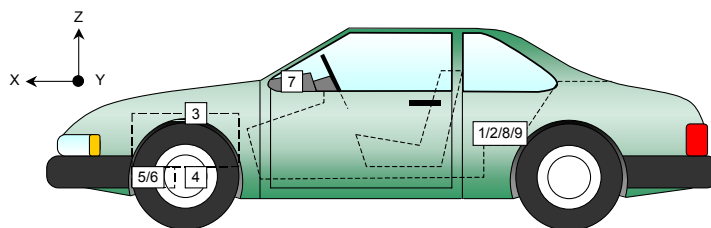
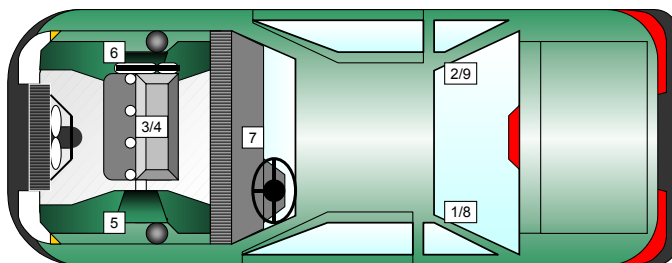
VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	1315	-440	310	G's	1.4	107	-40.7	56
2	Right Rear X-Member X	1315	440	315	G's	5.3	21	-43.1	62
3	Engine Top X	3585	-70	845	G's	104.5	46	-185.7	38
4	Engine Bottom X	3665	220	215	G's	99.5	38	-178.7	31
5	Left Brake Caliper X	3530	-617	260	G's	47.3	65	-117.5	50
6	Right Brake Caliper X	3545	617	260	G's	32.1	70	-96.3	42
7	Instrument Panel X	2980	-90	1080	G's	14.0	90	-58.2	50
8	Left Rear X-Member Z	1315	-440	310	G's	10.9	16	-10.5	81
9	Right Rear X-Member Z	1315	440	315	G's	10.9	54	-13.4	23

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

Y - Vehicle Centerline (+ to right)

Z - Ground Plane (+ up)



DATA SHEET NO. 9
HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	7.8	251	-57.6	89	13.9	240	-55.1	91
Head CG	Y	G's	3.7	105	-3.7	26	2.1	40	-13.9	84
Head CG	Z	G's	19.4	58	-17.7	92	16.5	71	-7.1	94
Head CG Resultant	N/A	G's	59.6	89			56.6	91		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.0	283	-40.6	70	3.3	190	-55.2	87
Chest CG	Y	G's	4.5	96	-4.4	59	2.5	30	-13.9	84
Chest CG	Z	G's	11.8	62	-10.9	89	7.4	57	-18.4	88
Chest CG Resultant	N/A	G's	41.6	87			58.3	87		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	1082	53	-1704	64	1034	78	-395	36
Right Femur	Z	Newtons	573	42	-1997	63	436	47	-1576	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	9084	64			9136	73		
Shoulder Belt Force	N/A	Newtons	5482	58			4698	53		

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	440.7	47.8	75.5	103.4	465.8	44.1	69.0	105.0

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	39.9	85.1	88.1	55.8	85.0	88.0

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Toyota Corolla Matrix

NHTSA No.: M55102

Test Program: 35mph Frontal Impact

Test Date: 09/21/04

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	6.6	99	-55.6	61	9.6	89	-49.7	67
Pelvis	Y	G's	*	*	*	*	4.2	49	-8.1	90
Pelvis	Z	G's	4.9	158	-36.6	67	3.0	170	-41.8	82

* No Valid Data Collected

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	219	89	-319	49	89	71	-361	96
Neck Force	Y	Newtons	114	131	-74	35	65	42	-166	82
Neck Force	Z	Newtons	1091	80	-254	261	763	69	-216	92
Neck Moment	X	N•m	9.6	127	-9.6	65	20.5	93	-4.4	207
Neck Moment	Y	N•m	26.0	136	-28.7	98	37.7	113	-60.5	92
Neck Moment	Z	N•m	4.7	67	-10.3	113	13.1	102	-5.2	149

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	12.2	109	-34.2	67	18.6	101	-53.2	42
Left Foot Aft	Z	G's	5.7	19	-50.3	72	4.4	74	-39.4	55
Left Foot Fore	Z	G's	1.8	299	-43.7	69	7.8	155	-53.8	40
Right Foot Aft	X	G's	9.0	102	-123.1	54	19.7	95	-56.5	61
Right Foot Aft	Z	G's	20.7	73	-112.5	57	5.1	78	-32.3	36
Right Foot Fore	Z	G's	34.0	71	-102.3	57	17.4	78	-51.1	62

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	29.3	64	-26.3	141	3.0	39	-28.4	67
Left Lower Moment	Y	N•m	33.3	64	-96.1	71	54.7	95	-21.2	50
Left Lower Force	Z	Newtons	200	167	-1017	75	102	205	-2271	56
Left Upper Moment	X	N•m	9.6	21	-76.2	75	15.4	40	-108.0	70
Left Upper Moment	Y	N•m	76.4	75	-16.9	46	26.0	98	-79.0	56
Left Upper Force	Z	Newtons	43	167	-990	32	105	186	-2071	65
Right Lower Moment	X	N•m	2.5	17	-28.5	100	15.8	98	-6.1	77
Right Lower Moment	Y	N•m	79.4	70	-55.9	54	82.2	94	-34.0	58
Right Lower Force	Z	Newtons	217	30	-4252	58	39	158	-3089	89
Right Upper Moment	X	N•m	27.1	89	-21.0	139	13.8	81	-56.9	95
Right Upper Moment	Y	N•m	14.7	115	-125.7	55	18.0	238	-78.3	87
Right Upper Force	Z	Newtons	178	18	-3358	60	39	165	-2705	88

DATA SHEET NO. 9... (continued)
HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest	X	mm			-18.7	70			-20.4	72

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	8.0	252	-57.6	86	13.9	240	-54.3	91
Head CG	Y	G's	4.3	66	-3.3	28	2.4	40	-16.4	84
Head CG	Z	G's	20.3	57	-17.6	92	15.4	70	-8.1	93
Head CG Resultant	N/A	G's	58.8	88			56.4	91		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.0	287	-40.6	87	3.4	189	-56.9	87
Chest CG	Y	G's	5.8	97	-3.6	36	2.5	45	-13.4	84
Chest CG	Z	G's	11.6	61	-10.5	89	7.1	58	-18.2	88
Chest CG Resultant	N/A	G's	41.9	87			59.9	87		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg.	T ¹	T ²	HIC	Avg.	T ¹	T ²
Head CG Primary Redundant	449.5	48.0	75.2	103.3	446.4	43.4	68.8	104.8

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary Redundant	40.4	80.9	83.9	57.2	85.0	88.0

DATA SHEET NO. 10**SEAT BELT PERFORMANCE ASSESSMENT TEST DATA**

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

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	341	379
PBL - Top surface of reference to belt lower edge	mm	263	297

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Retractor reel to "D" ring	mm	172	165
Shoulder belt length as measured on ATD	mm	822	835
Lap belt length as measured on ATD	mm	912	890
Remainder of belt on reel	mm	1365	1381
Total belt length for continuous webbing systems	mm	3271	3271

SHOULDER BELT SPOOL-OUT DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	Not recorded	
As determined electronically	mm	Not recorded	

DATA SHEET NO. 11
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

Windshield Mounting Details:

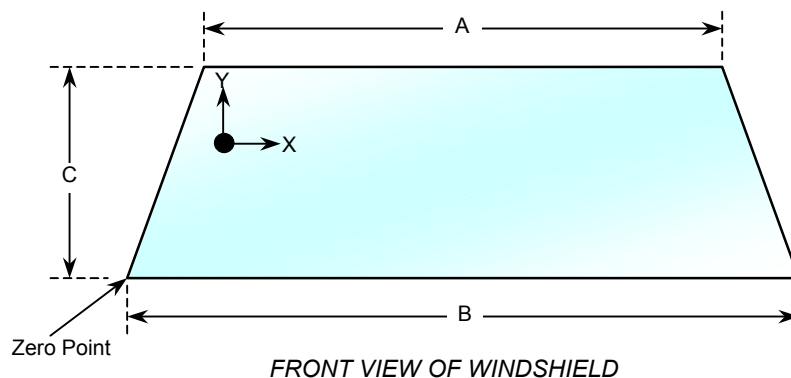
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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: 21 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	1618	1618	100
Right Side	1618	1618	100
Total	3236	3236	100



WINDSHIELD DIMENSIONS

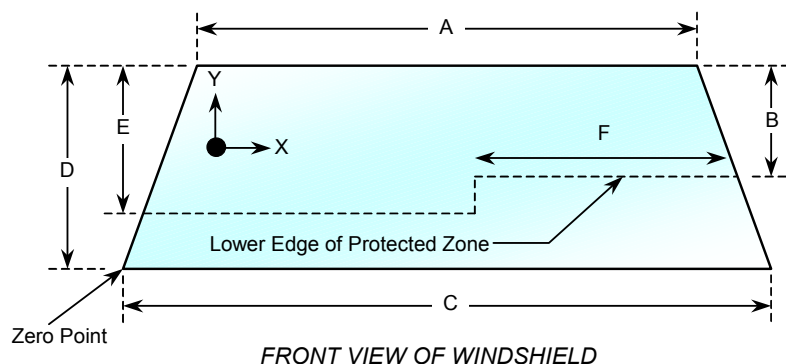
Item	Units	Segment Length	Molding Width
A	mm	1115	13
B	mm	1315	12
C	mm	805	14

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04



Item	Units	Value
A	mm	1115
B	mm	483
C	mm	1315
D	mm	805
E	mm	530
F	mm	500

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. 13

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

Temperature at Time of Impact: 21° C Test Time: 4:13 pm

Stoddard Solvent Spillage Measurements

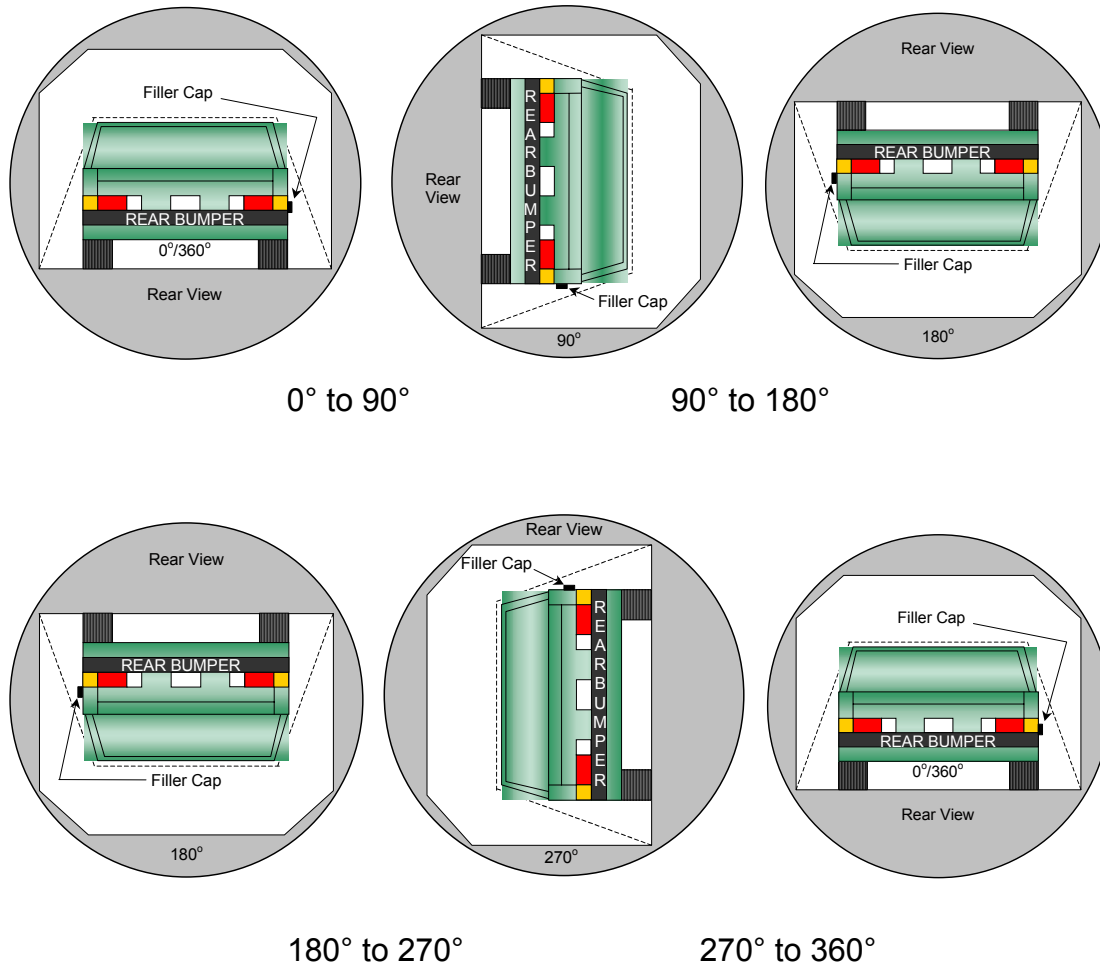
- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum Allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
 (Maximum Allowable = 1 oz. /minute)
- D. Spillage: None

DATA SHEET NO. 14
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

Test Time: 4:13 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°	164	300	0
90° to 180°	145	300	0
180° to 270°	146	300	0
270° to 360°	168	300	0

DATA SHEET NO. 15
VEHICLE MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

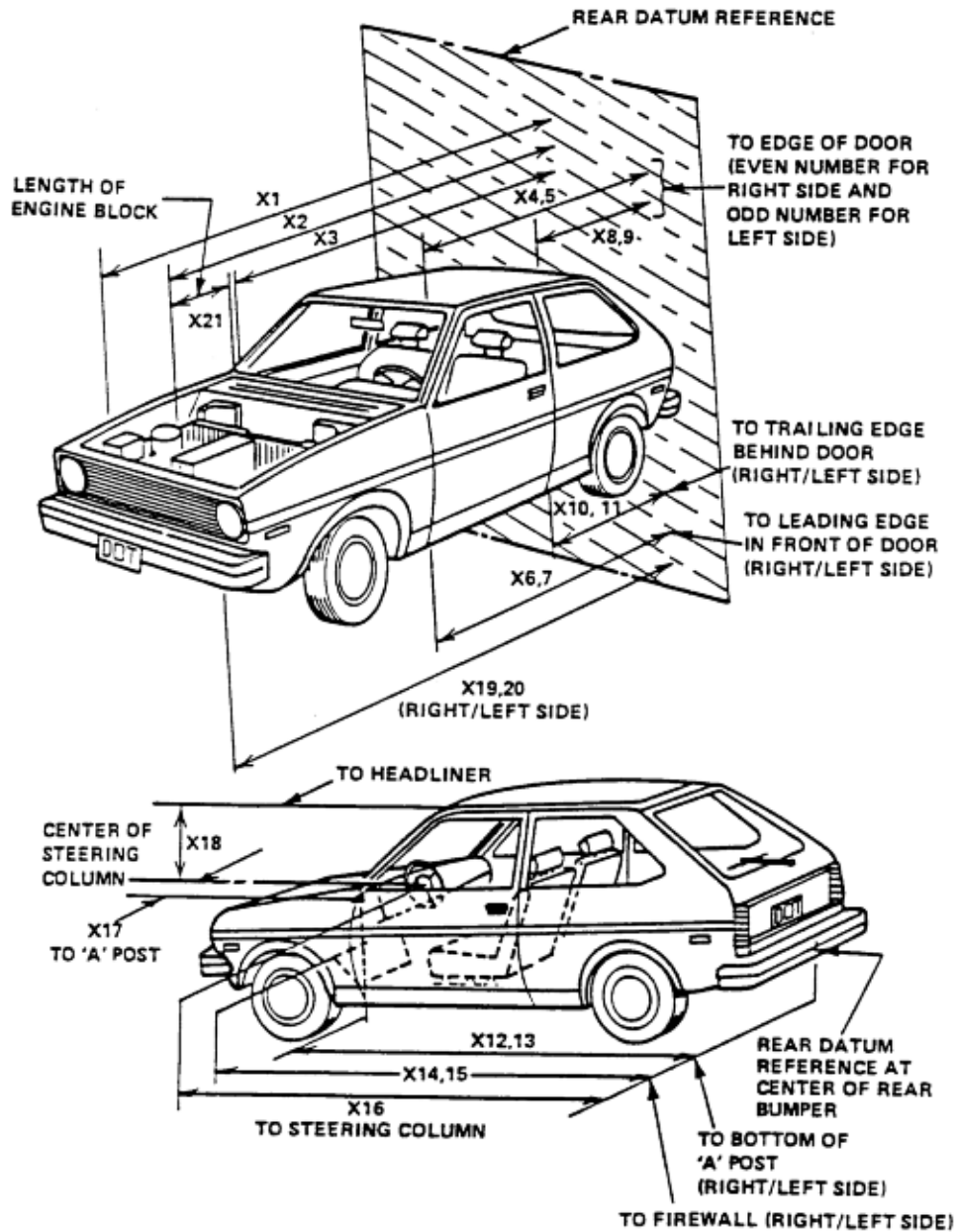
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4360	3779	581
2	RSOV to front of engine	mm	3860	3626	234
3	RSOV to firewall centerline	mm	3365	3305	60
4	RSOV to leading edge of right door	mm	2970	2967	3
5	RSOV to leading edge of left door	mm	2965	2964	1
6	RSOV to lower leading edge of right door	mm	2910	2902	8
7	RSOV to lower leading edge of left door	mm	2910	2890	20
8	RSOV to upper leading edge of right door	mm	1935	1940	-5
9	RSOV to upper leading edge of left door	mm	1925	1937	-12
10	RSOV to lower trailing edge of right door	mm	1920	1913	7
11	RSOV to lower trailing edge of left door	mm	1910	1907	3
12	RSOV to bottom of right 'A' pillar	mm	2935	2931	4
13	RSOV to bottom of left 'A' pillar	mm	2925	2911	14
14	RSOV to firewall on right side	mm	3325	3231	94
15	RSOV to firewall on left side	mm	3335	3282	53
16	RSOV to steering column	mm	2530	2532	-2
17	Center of steering column to left 'A' pillar	mm	415	381	34
18	Center of steering column to headlining	mm	450	420	30
19	RSOV to right side of front bumper	mm	4167	3816	351
20	RSOV to left side of front bumper	mm	4155	3813	342
21	Length of engine block	mm	570	570	0
RD	RSOV to right side of dash panel	mm	2815	2800	15
CD	RSOV to center of dash panel	mm	2845	2803	42
LD	RSOV to left side of dash panel	mm	2790	2800	-10

DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04



DATA SHEET NO. 15... (continued)**VEHICLE MEASUREMENTS**

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	4360
2	Total Width	1713
3	Bumper Top Height	600
4	Bumper Bottom Height	432
5	Longitudinal Member Top Height	340
6	Distance between Longitudinal Members	1025
7	Longitudinal Member Width	82
8	Engine Top Height	845
9	Engine Bottom Height	210
10	Engine and gearbox width	720
11	Front bumper-engine distance	300
12	Front shock absorber fixing height	880
13	Bonnet leading edge height	610
14	Front shock absorber fixing width	1140
15	Front bumper – front axle distance	945
16	Front axle – a pillar distance	440
17	A-pillar – B-pillar distance	1050
18	B-Pillar – rear axle distance	1095
19	B-pillar – C-pillar distance	890
20	Roof sill bottom height	1485
21	Roof sill top height	1562
22	Floor sill bottom height	255
23	Floor sill top height	313

DATA SHEET NO. 16
CAMERA LOCATIONS

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	9755	-5465	1535	24	1000
3	Steering Column Top	1915	-5725	1560	19	1000
4	Steering Column Bottom	1890	-5685	1030	25	948
5	Driver Close-up	1455	-6170	1635	50	1000
6	Driver Angle	6200	-5315	2095	50	1000
7	Right Overall	2135	6275	1420	19	1000
8	Right Passenger Half	1190	5595	1520	25	1000
9	Right Close-up	1570	5435	1500	50	1000
10	Right Angle	6060	4300	2040	50	1000
11	Windshield	290	0	2860	24	1000
12	Top Driver	165	-450	1715	13	**
13	Top Passenger	145	470	1685	13	769
14	Pit Front	1480	0	-3150	13	1000
15	Pit Rear	3360	0	-3150	13	1005
16	Left Rear Dummy Closeup	2555	-4660	1960	50	1000

*COORDINATES:

** No timing marks

+X = forward of impact plane
+Y = right of monorail centerline
+Z = above ground level

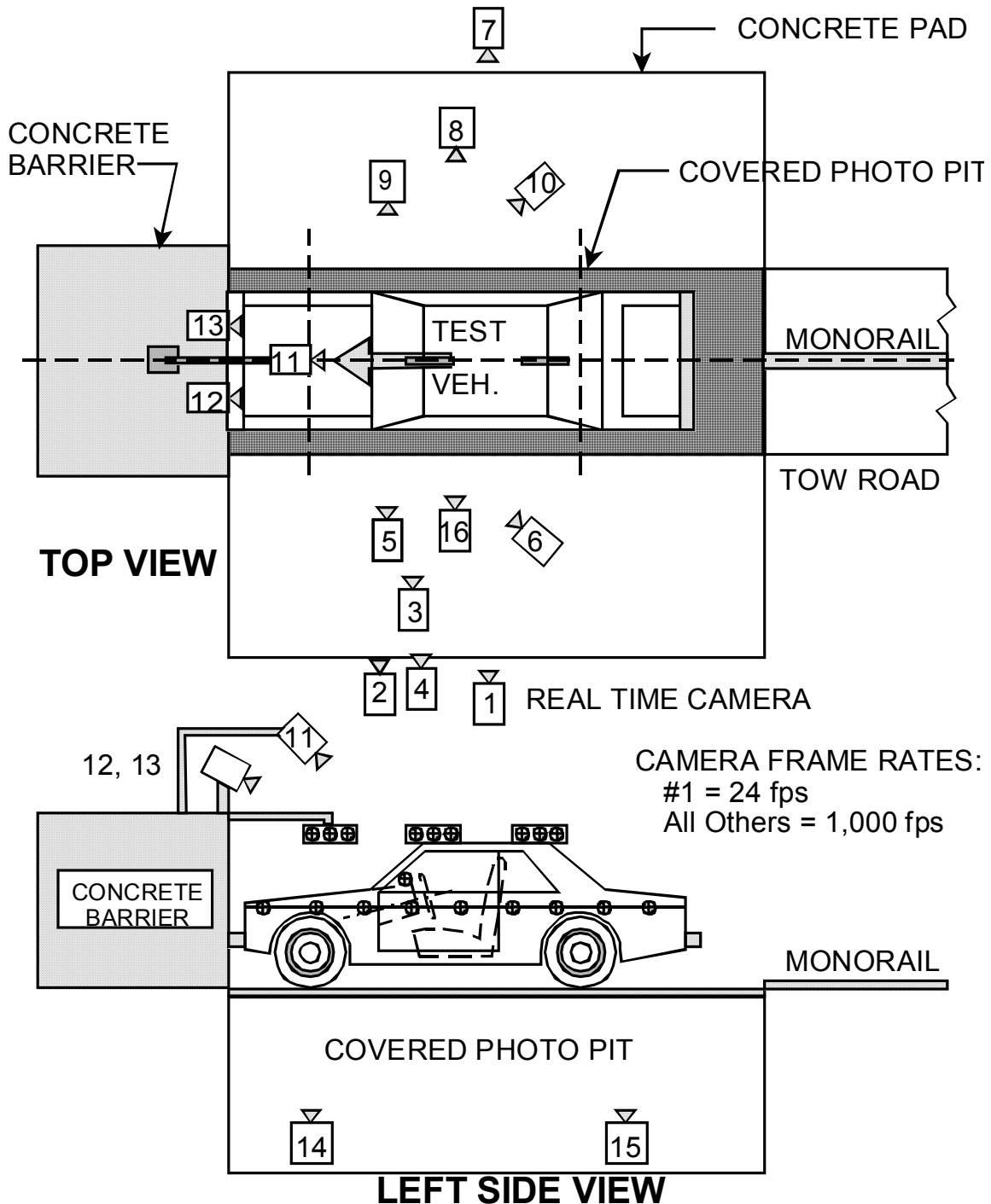
DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

Test Vehicle: 2005 Toyota Corolla
Test Program: 35mph Frontal Impact

NHTSA No.: M55108
Test Date: 09/17/04

CAMERA POSITIONS FOR FRONTAL IMPACTS



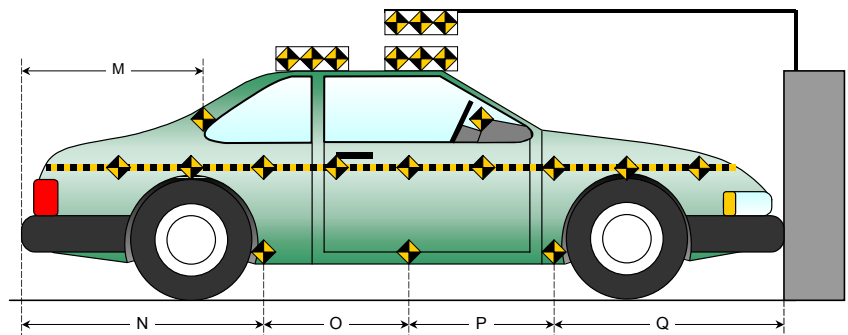
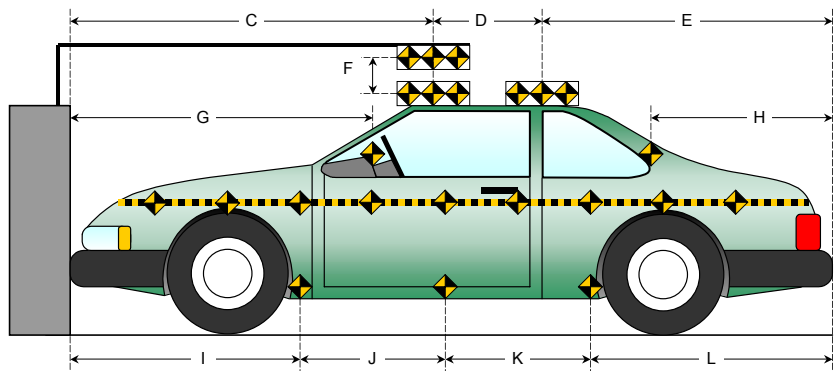
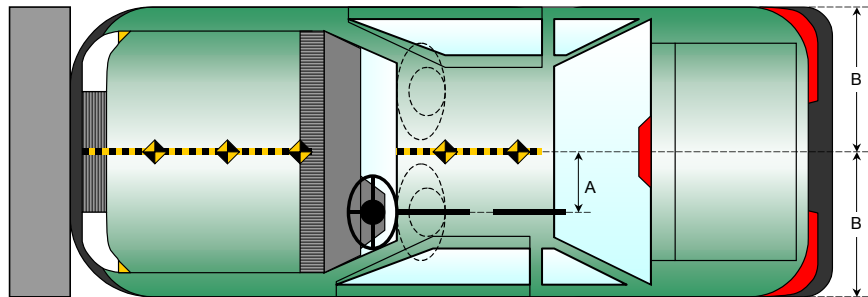
DATA SHEET NO. 17

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

Item	Value
A	366
B	856
C	2303
D	609
E	1448
F	
G	
H	1050
I	1052
J	1038
K	1035
L	1235
M	1065
N	1248
O	1025
P	1040
Q	1047



DATA SHEET NO. 18
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

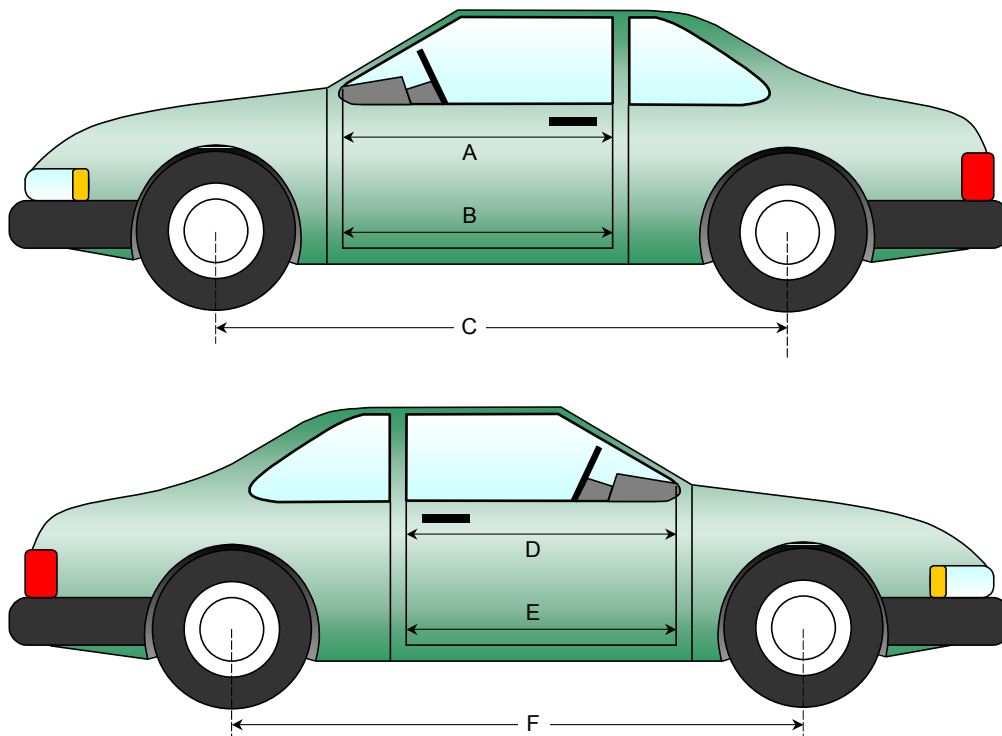
NHTSA No.: M55102
 Test Date: 09/21/04

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	959	959	0
B	Left Side Lower	mm	843	843	0
D	Right Side Upper	mm	958	955	3
E	Right Side Lower	mm	858	855	3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2605	2528	77
F	Right Side Wheelbase	mm	2605	2525	80



DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

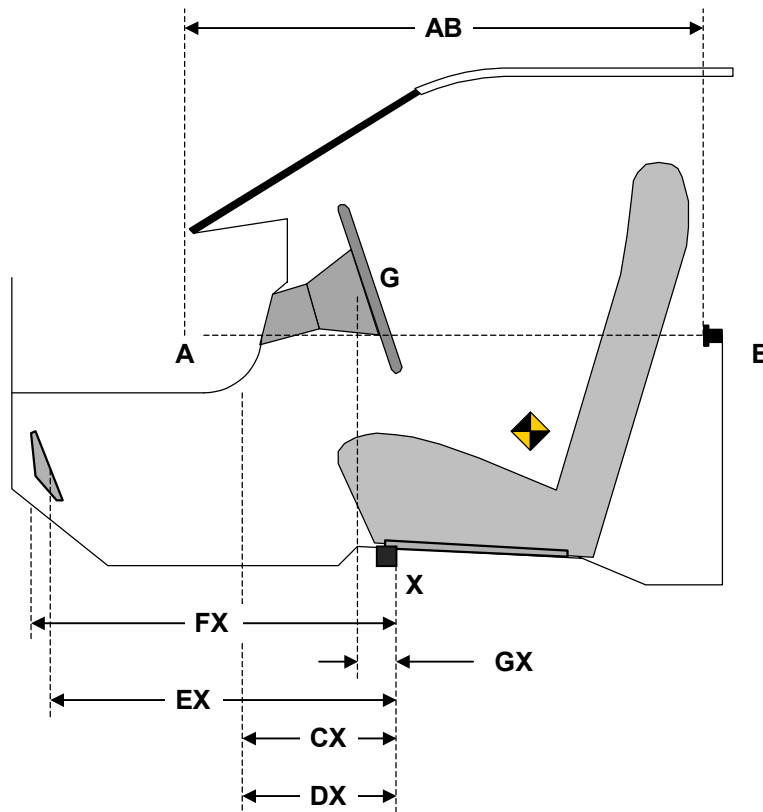
Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	959	956	3
CX	Left Knee Bolster to X	mm	330	337	-7
DX	Right Knee Bolster to X	mm	333	350	-17
EX	Brake Pedal to X	mm	558	567	-9
FX	Foot Rest to X	mm	570	543	27
GX	Center of Steering Column Wheel Hub to X	mm	112	147	-35

X = Front of Seat Track (stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

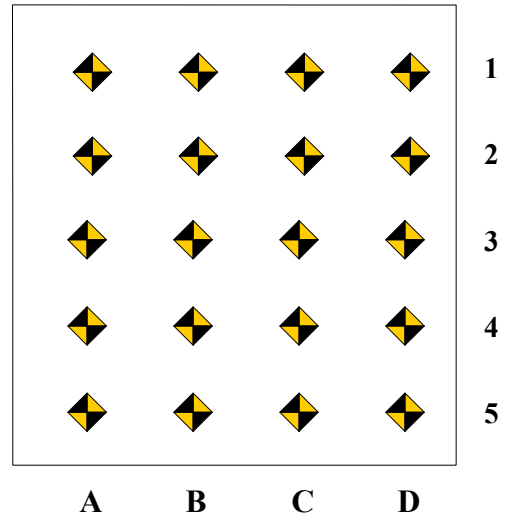
NHTSA No.: M55102
 Test Date: 09/21/04

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		650	650	647		616	597	622		34	53	25
2		590	591	595		560	547	584		30	44	11
3	545	543	542	543	530	519	511	524	15	24	31	19
4	393	385	381	408	381	386	387	388	12	-1	-6	20
5	292	250	255	274	282	238	257	272	10	12	-2	2

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-10	-20	-20		31	32	15		-41	-52	-35
2		-50	-65	-60		-23	-42	-42		-27	-23	-18
3	-90	-90	-98	-100	-85	-83	-95	-92	-5	-7	-3	-8
4	-105	-100	-103	-100	-99	-105	-99	-94	-6	5	-4	-6
5	-115	-100	-104	-65	-113	-96	-104	-68	-2	-4	0	3

DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

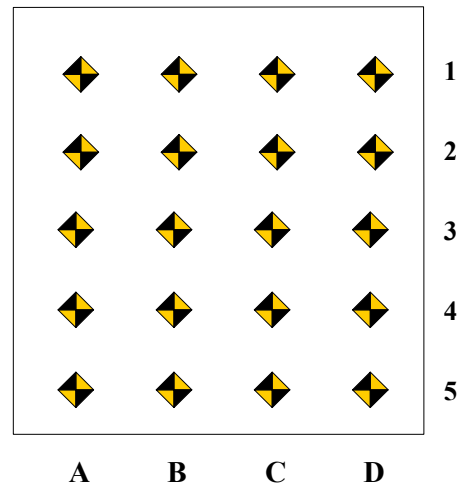
NHTSA No.: M55102
 Test Date: 09/21/04

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	670	668	670		656	645	639		14	23	31	
2	613	615	605		605	586	586		8	29	19	
3	540	540	545	555	531	523	534	532	9	17	11	23
4	412	400	395	400	403	392	390	391	9	8	5	9
5	260	253	255	265	262	256	252	256	-2	-3	3	9

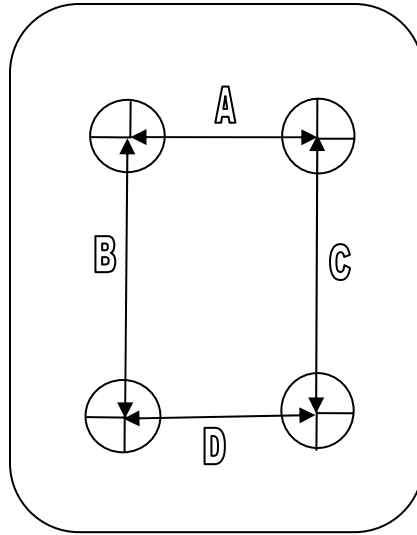
PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-3	0	-5		24	42	55		-27	-42	-60	
2	-45	-48	-44		-27	-4	-4		-18	-44	-40	
3	-96	-95	-92	-100	-87	-74	-66	-62	-9	-21	-26	-38
4	-103	-102	-105	-111	-95	-91	-90	-88	-8	-11	-15	-23
5	-68	-100	-98	-115	-63	-92	-87	-91	-5	-8	-11	-24

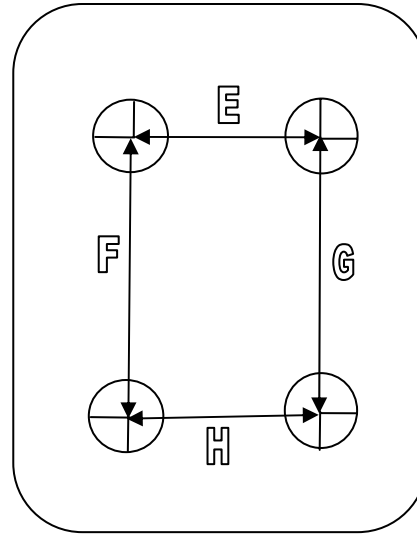
DATA SHEET NO. 18... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	320	307	13
B	370	372	-2
C	370	369	1
D	300	298	2
E	335	330	5
F	405	404	1
G	420	429	-9
H	320	328	-8

DATA SHEET NO. 19

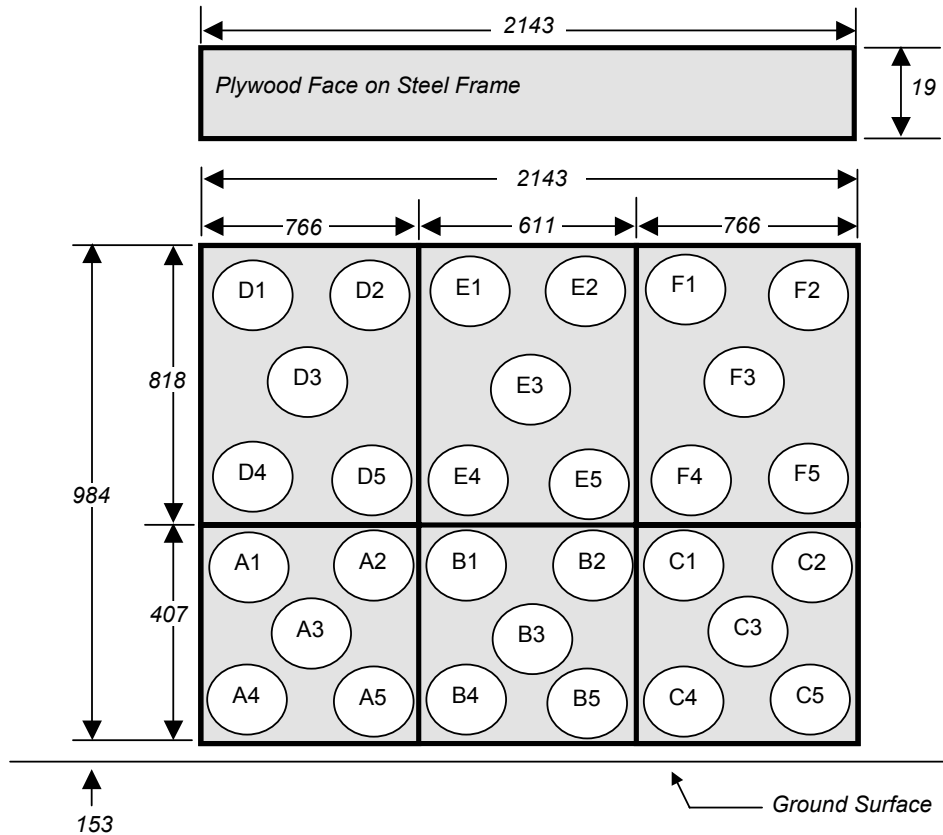
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2005 Toyota Corolla Matrix
 Test Program: 35mph Frontal Impact

NHTSA No.: M55102
 Test Date: 09/21/04

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 cross member displacement.

DATA SHEET NO. 20**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04

VEHICLE INFORMATION

VIN: 2T1KR30E15C334031 Wheelbase (mm) : 2605
Vehicle Size Category: 4-door Sedan Test Weight (kg) : 1472.0

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 14
Cal. Procedure/Interval: MGA procedure / 6 month
Integration Algorithm: Trapezoidal Linearity: > 99%
Impact Velocity (km/h): 56.5
Velocity Change (km/h): 63.1 Time of Separation (msec): 100.4

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1530 Impact Mode: Frontal

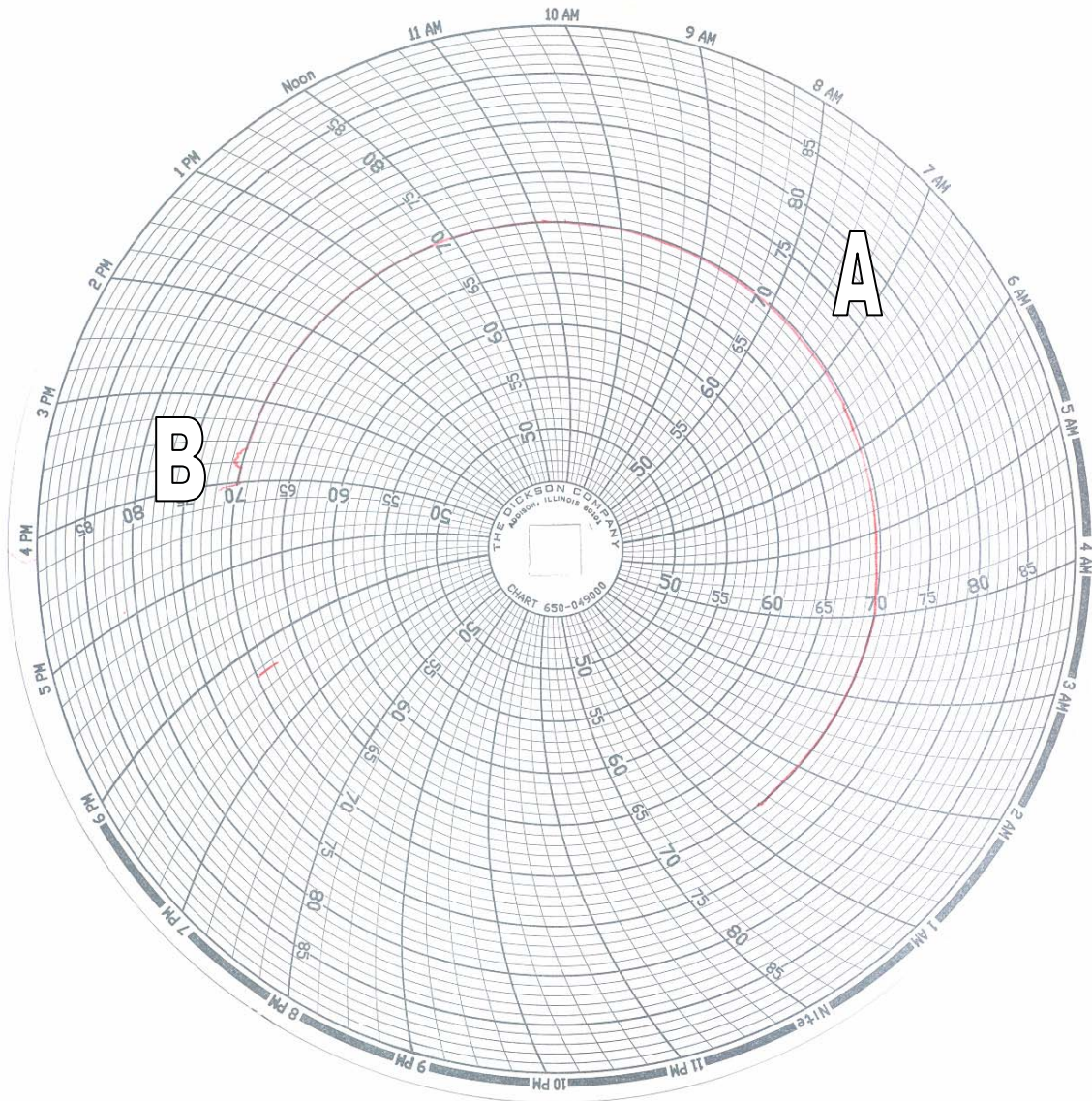
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4155	3813	342
C2	Crush zone 2 at left side	mm	4275	3745	530
C3	Crush zone 3 at left side	mm	4350	3770	580
C4	Crush zone 4 at right side	mm	4350	3775	575
C5	Crush zone 5 at right side	mm	4285	3759	526
C6	Crush zone 6 at right side	mm	4167	3816	351
L	C1 TO C6	mm	1530	1502	28

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2005 Toyota Corolla Matrix
Test Program: 35mph Frontal Impact

NHTSA No.: M55102
Test Date: 09/21/04



A = Dummies installed in vehicle at 7:00 am

B = Test conducted at 4:13 pm

APPENDIX A
PHOTOGRAPHS

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Load Cell Location

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A-2.

MFD. BY: TOYOTA MOTOR MANUFACTURING,
CANADA, INC. 05/04
GVWR 3845 LB GAWR FR 2015 LB RR 1850 LB
THIS VEHICLE CONFORMS TO ALL APPLICABLE
FEDERAL MOTOR VEHICLE SAFETY, BUMPER AND
THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE.
2T1KR30E15C334031 PASS. CAR



C/IR: 040/FB13 ZZE132L-DHPNKA
A/TM: -03A/A246E MADE IN CANADA 602 AD

Vehicle Certification Label


TIRE AND LOADING INFORMATION

SEATING CAPACITY : TOTAL 5
FRONT 2 : REAR 3

The combined weight of occupants and cargo should never exceed 390kg or 860lbs.

ORIGINAL TIRE SIZE	COLD TIRE INFLATION PRESSURE	
P205/55R16	FRONT	220kPa, 32PSI
	REAR	220kPa, 32PSI
COMPACT SPARE TIRE	COLD TIRE INFLATION PRESSURE	
T135/70R16	420kPa, 60PSI	

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

01170

INFORMATION SUR LES PNEUS ET LE CHARGEMENT

NOMBRE DE PLACES ASSISES : TOTAL 5

AVANT 2 : ARRIÈRE 3

Le poids total des occupants et du chargement ne doit jamais être supérieur à 390kg ou 860lb.

DIMENSION DES PNEUS D'ORIGINE	PRESSION DE GONFLAGE À FROID	
P205/55R16	AVANT	220kPa, 32PSI
	ARRIÈRE	220kPa, 32PSI
ROUE DE SECOURS COMPACTE	PRESSION DE GONFLAGE À FROID	
T135/70R16	420kPa, 60PSI	

**POUR DE PLUS AMPLES INFORMATIONS,
VOIR LE MANUEL DU PROPRIÉTAIRE**

N 4

MFD. BY

GVWR 3
THIS V
FEDERAL
THEFT D



C/TR:
A/TM:



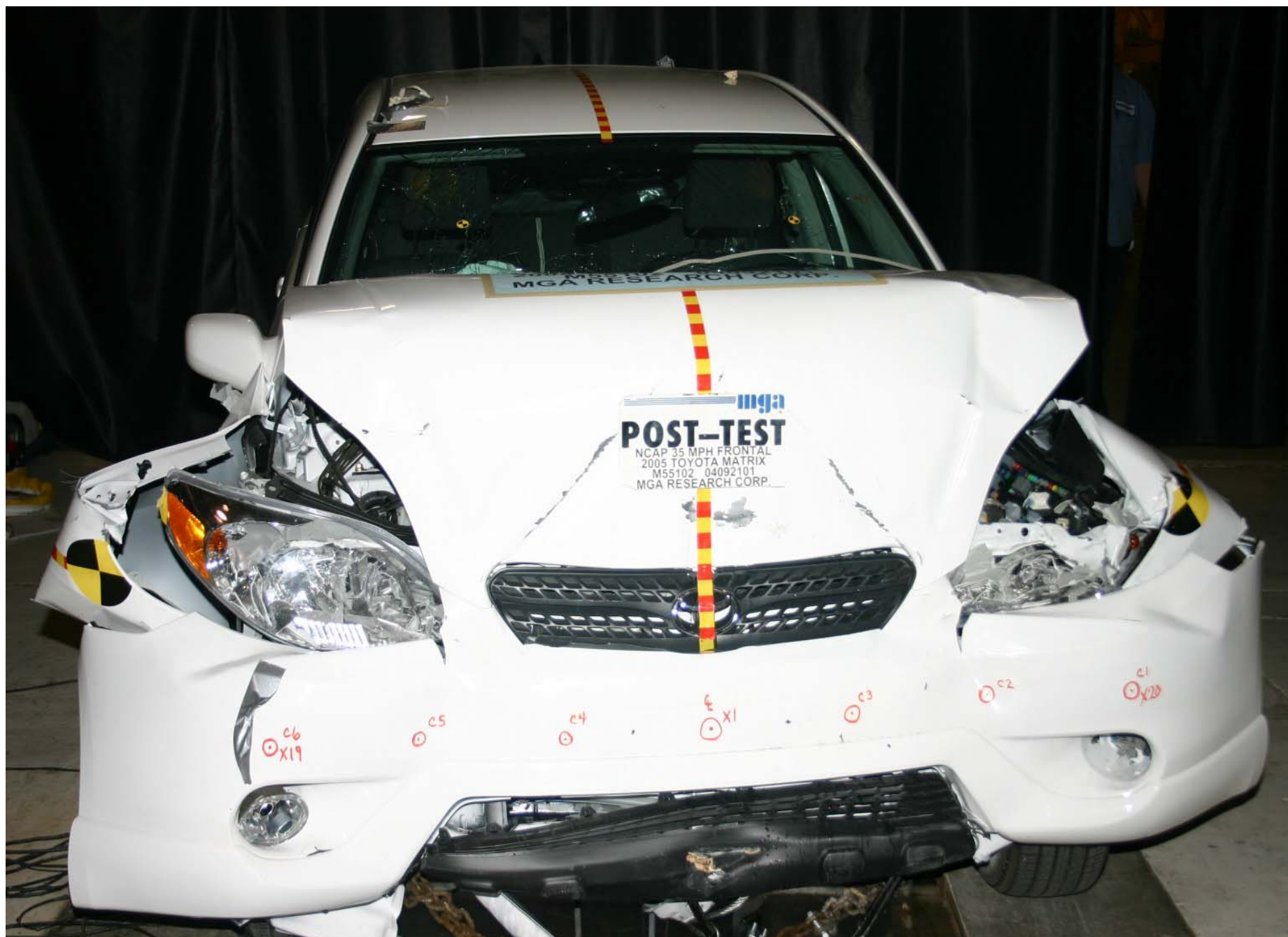
Right Front View of Test Vehicle, as received



Left Rear View of Test Vehicle, as received



Pre-Test Front View of Test Vehicle



Post-Test Front View of Test Vehicle



Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle



Pre-Test Right Side View of Test Vehicle



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



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



Post-Test Left Side Three-Quarter View of Doors After Impact



Post-Test Right Side Three-Quarter View of Doors After Impact



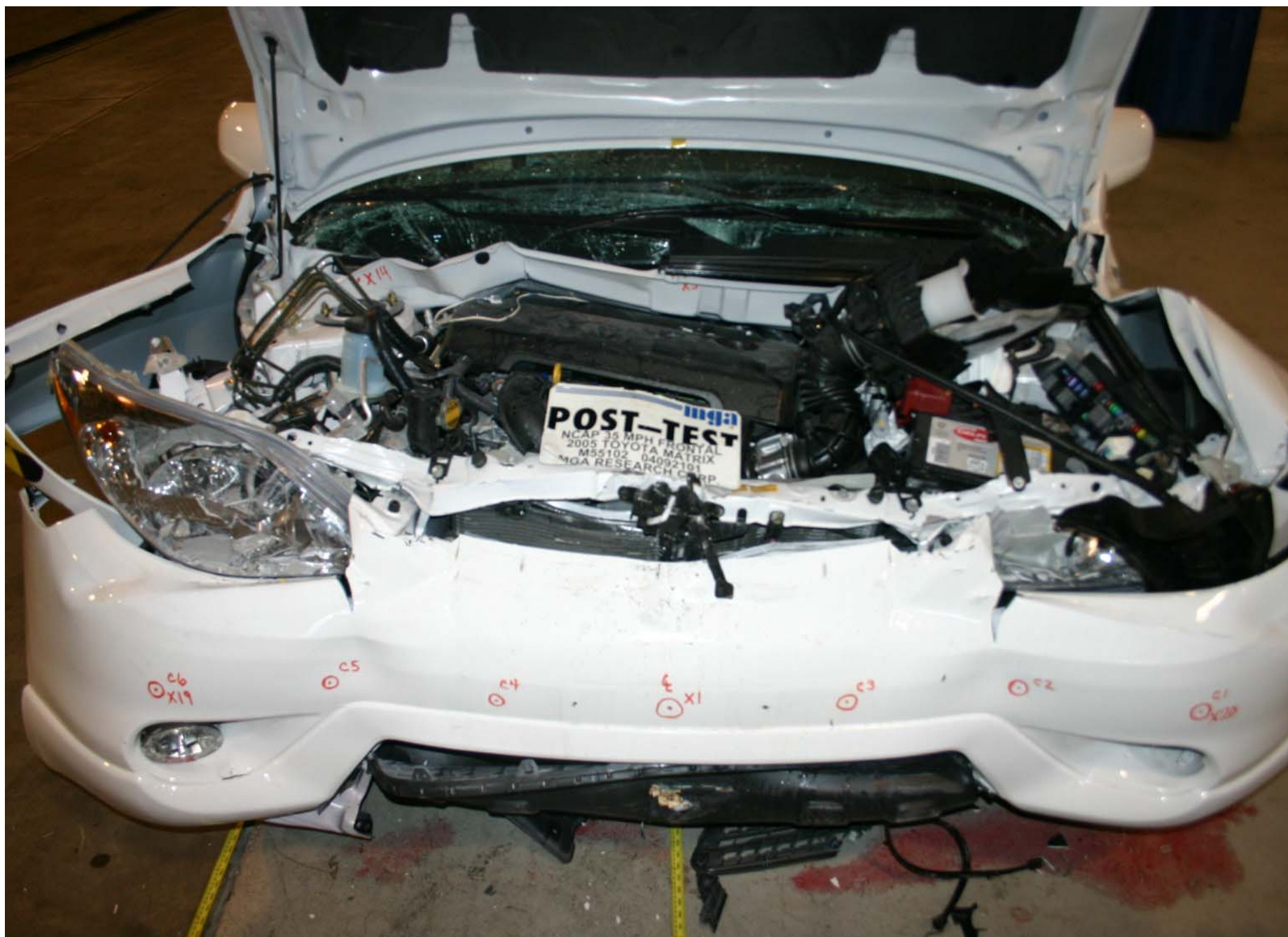
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



Post-Test Engine Compartment View

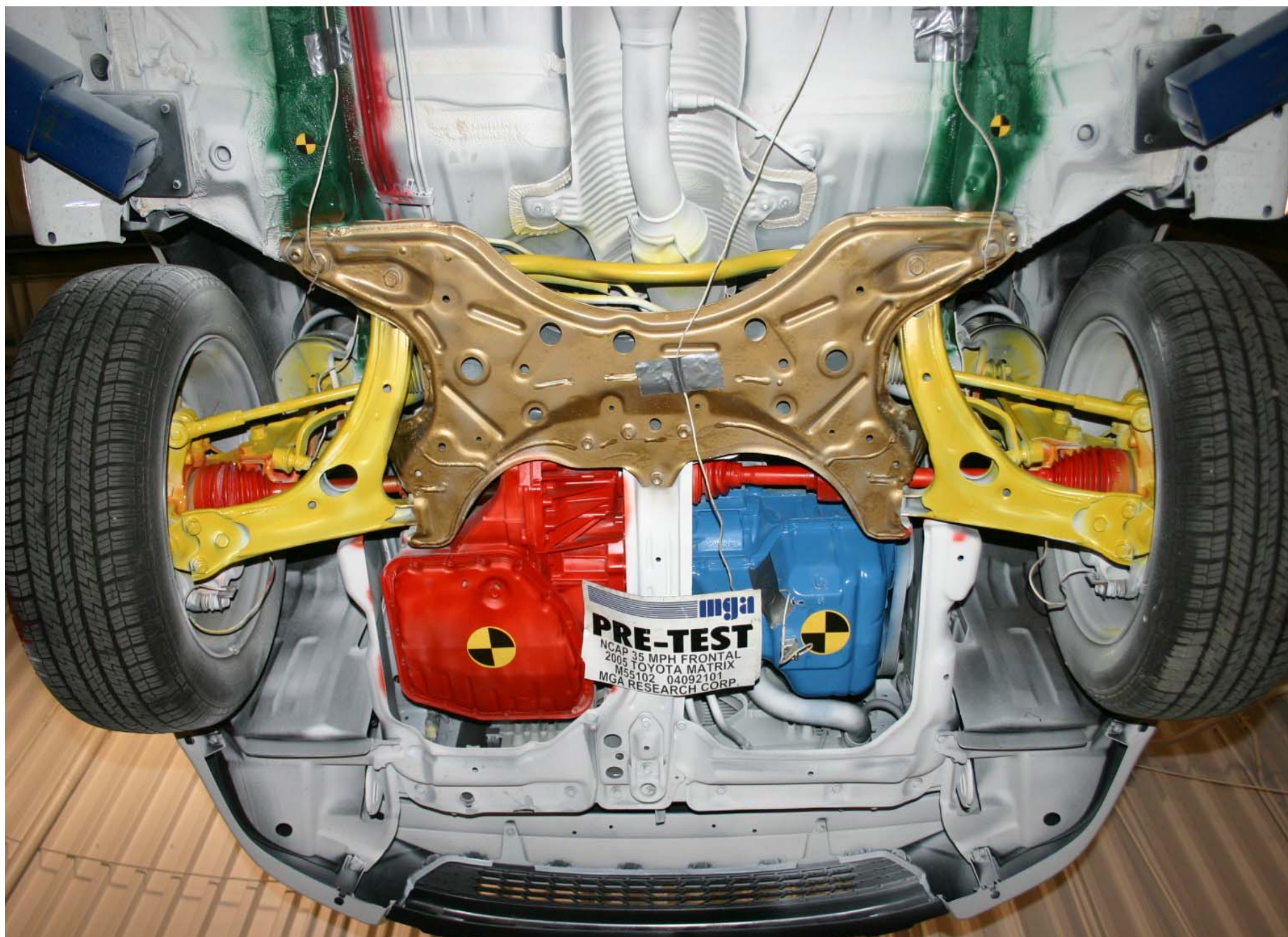


Pre-Test Fuel Filler Cap View

mga
POST-TEST
NCAP 35 MPH FRONTAL
2005 TOYOTA MATRIX
M55102 04092101
MGA RESEARCH CORP.



Post-Test Fuel Filler Cap View



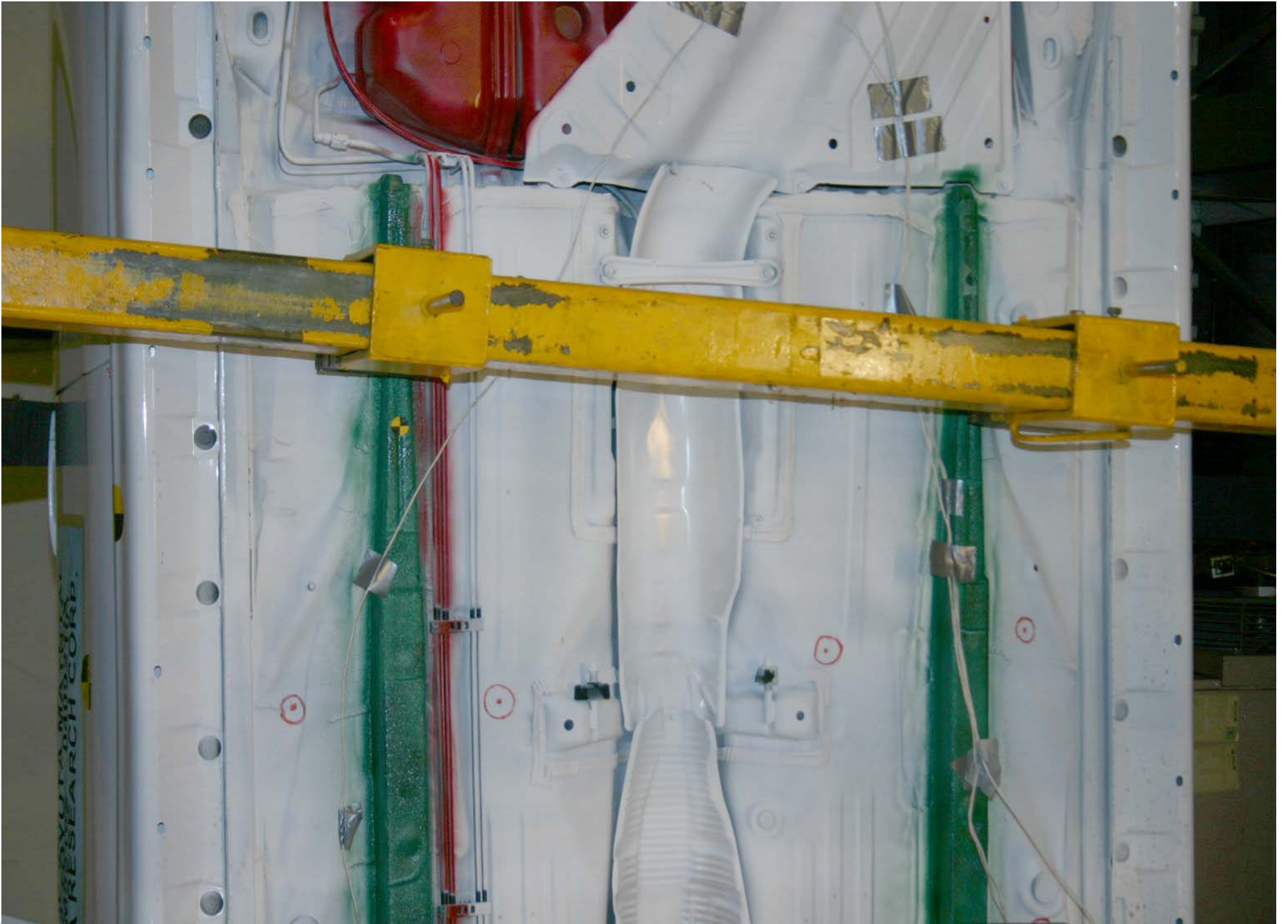
Pre-Test Front Underbody View



Post-Test Front Underbody View



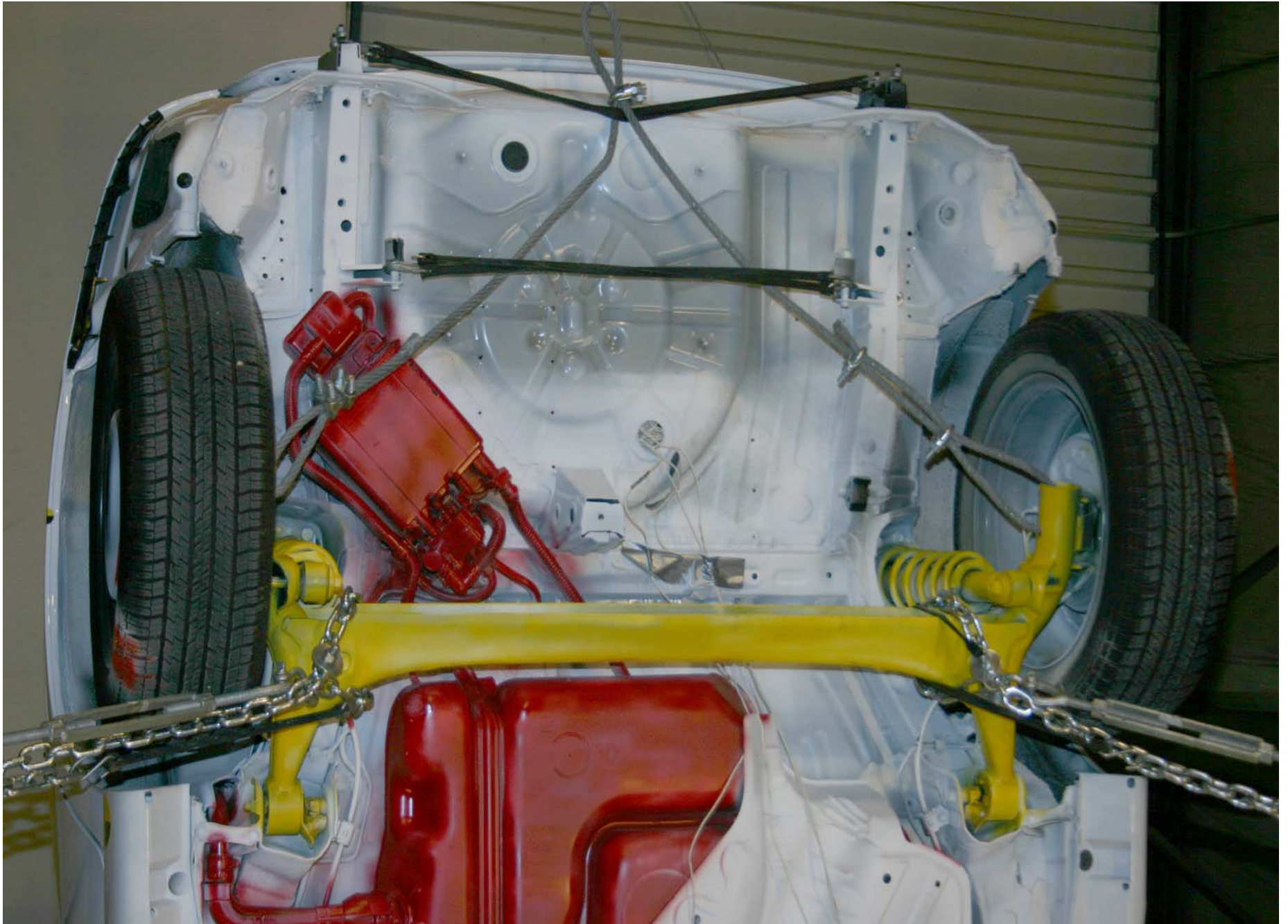
Pre-Test Mid Underbody



Post-Test Mid Underbody



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (head position)



Post-Test Driver Dummy Front View (head position)



Pre-Test Driver Dummy Position Left Side View



Post-Test Driver Dummy Position Left Side View



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



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



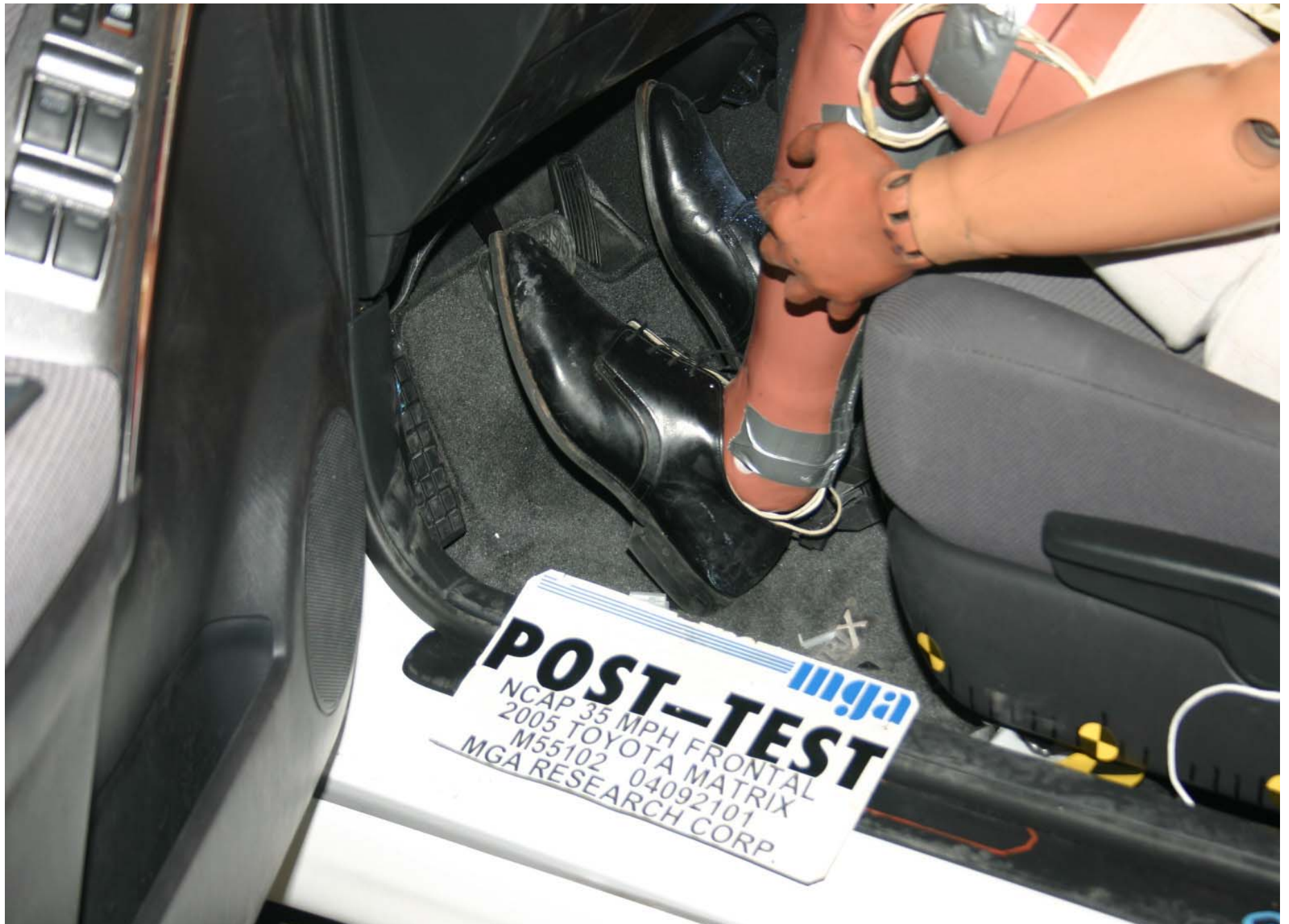
Pre-Test Driver Dummy Seat Position



Post-Test Driver Dummy Seat Position



Pre-Test Driver Dummy Feet Position



Post-Test Driver Dummy Feet Position



Pre-Test Driver Side Knee Bolster View



Post-Test Driver Side Knee Bolster View



Pre-Test Driver Side Floor Pan View



Post-Test Driver Side Floor Pan View



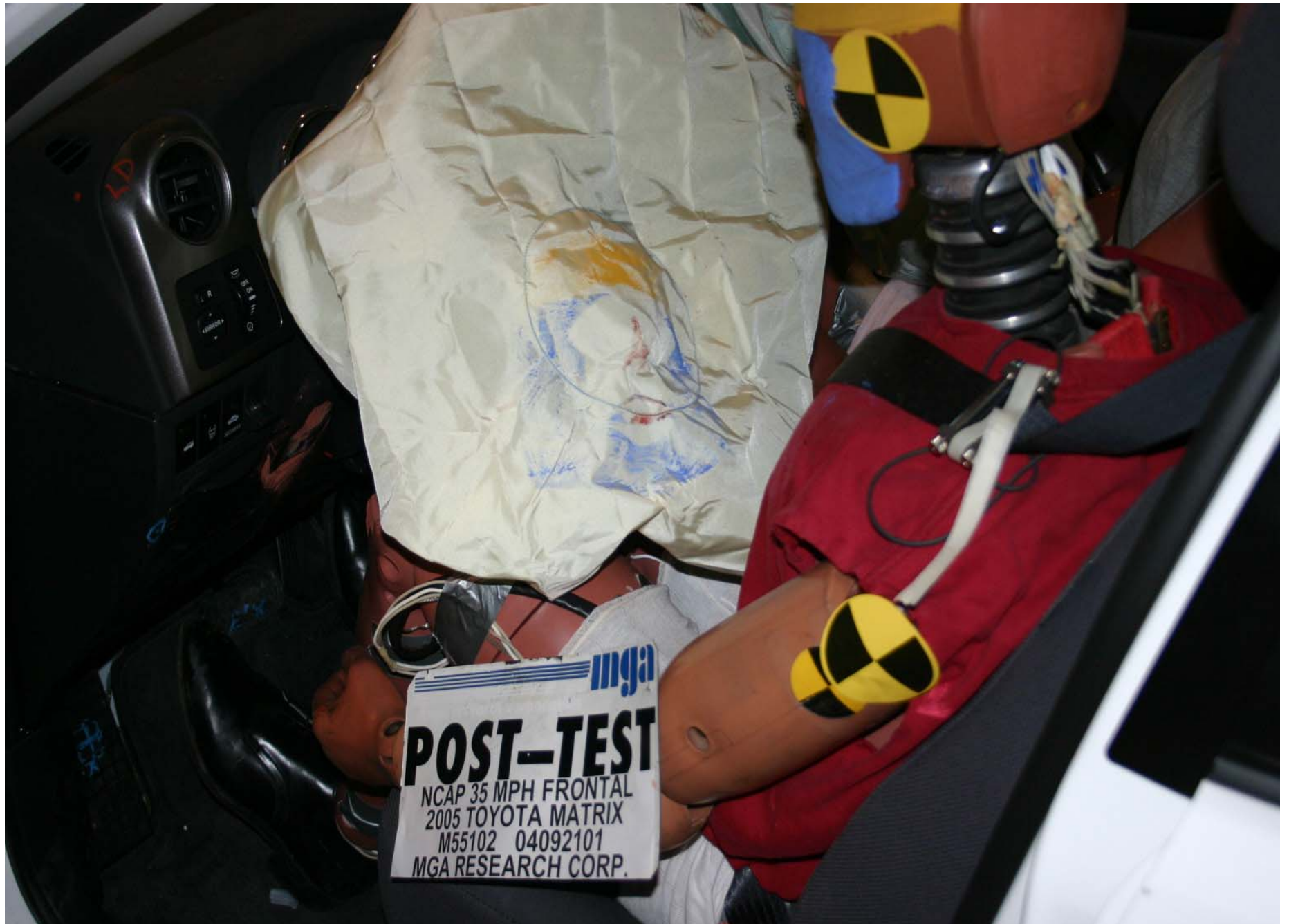
Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Head Contact (grab handle)



Post-Test Driver Dummy Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (head position)



Post-Test Passenger Dummy Front View (head position)



Pre-Test Passenger Dummy Position Right Side View



Post-Test Passenger Dummy Position Right Side View



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



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



Pre-Test Passenger Dummy Seat Position



Post-Test Passenger Dummy Seat Position



Pre-Test Passenger Dummy Feet Position



Post-Test Passenger Dummy Feet Position



Pre-Test Passenger Side Knee Bolster View



Post-Test Passenger Side Knee Bolster View



Pre-Test Passenger Side Floor Pan View



Post-Test Passenger Side Floor Pan View



Post-Test Passenger Dummy Head Contact

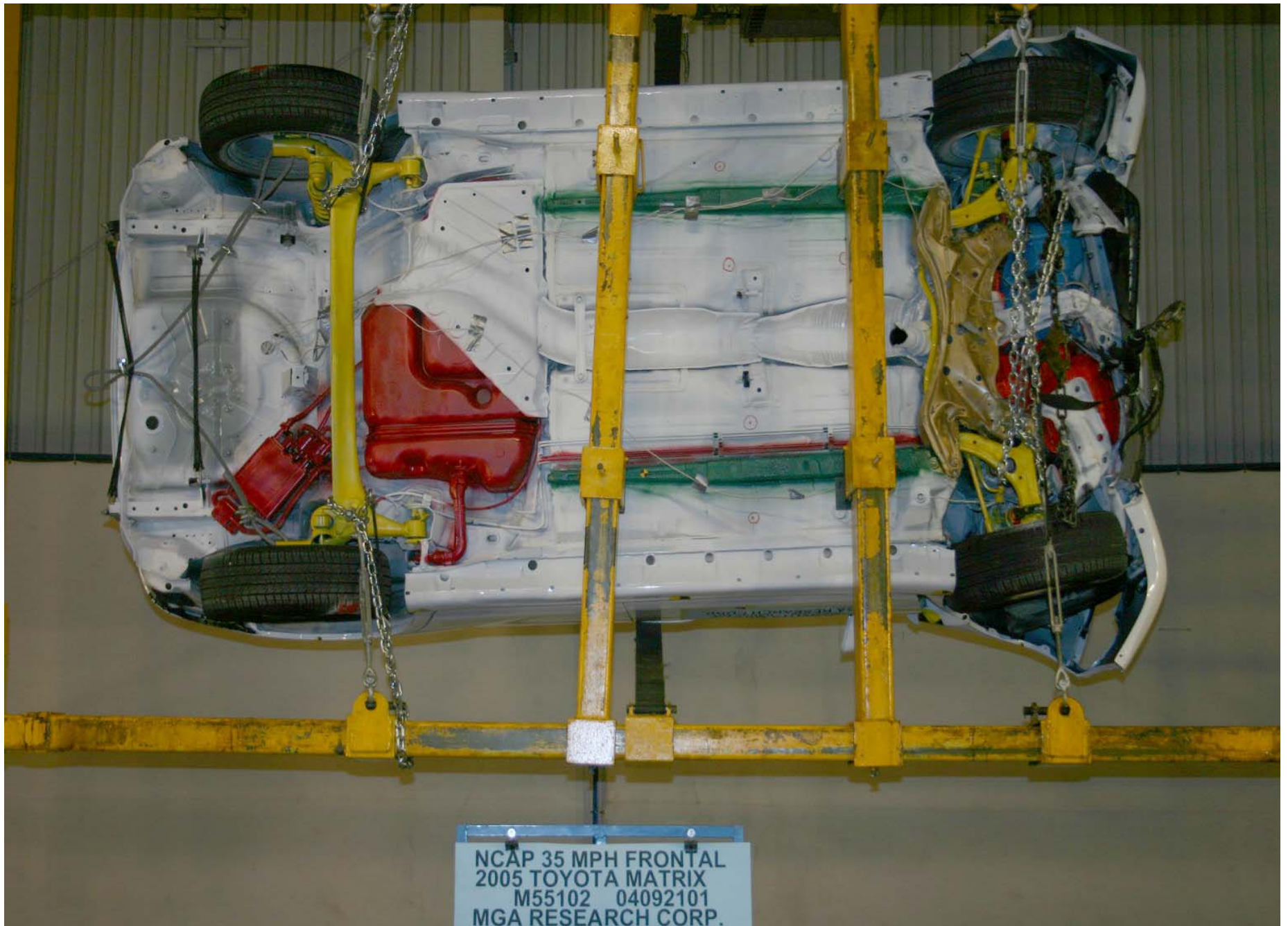


Post-Test Passenger Dummy Knee Contact

A-64.



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



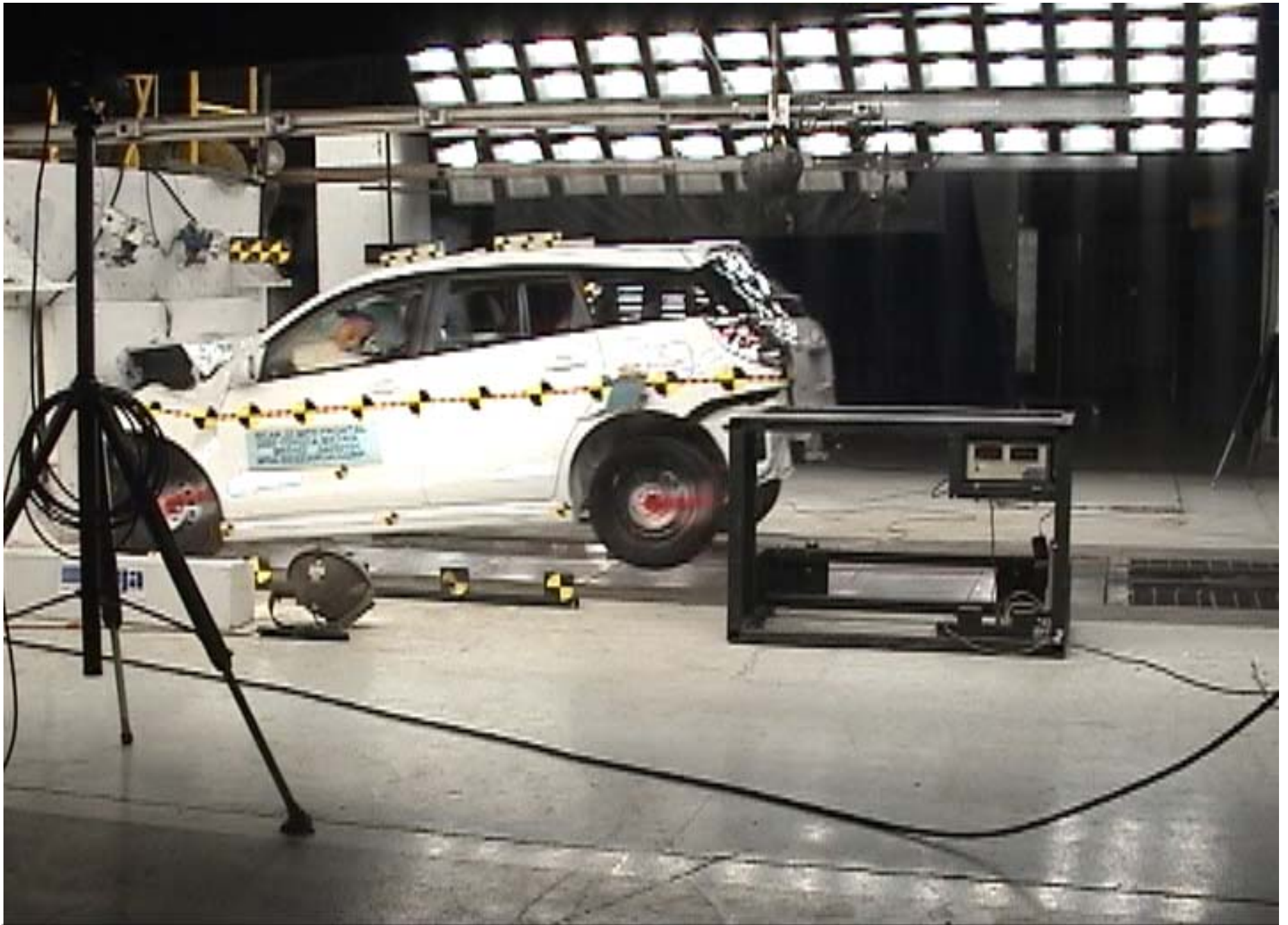
Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B

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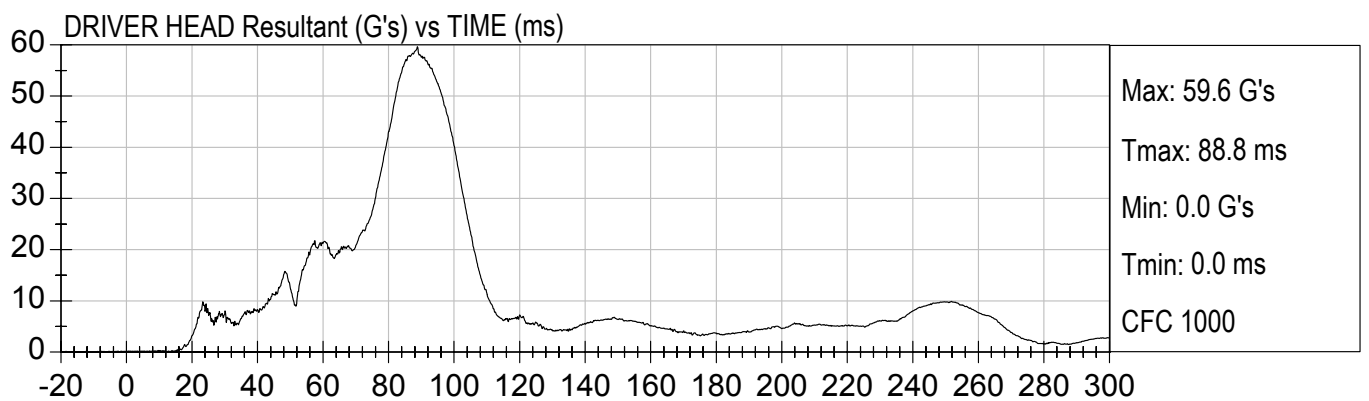
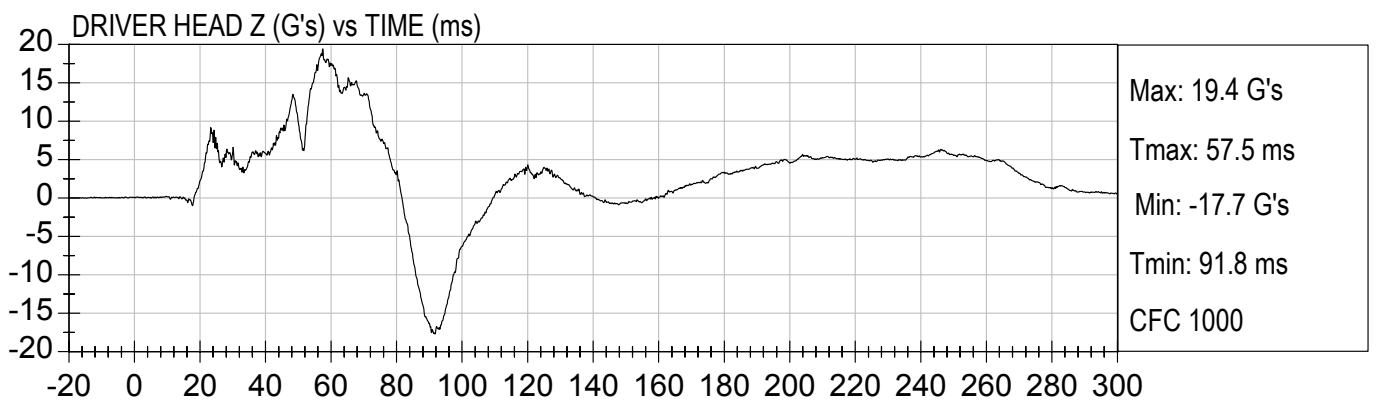
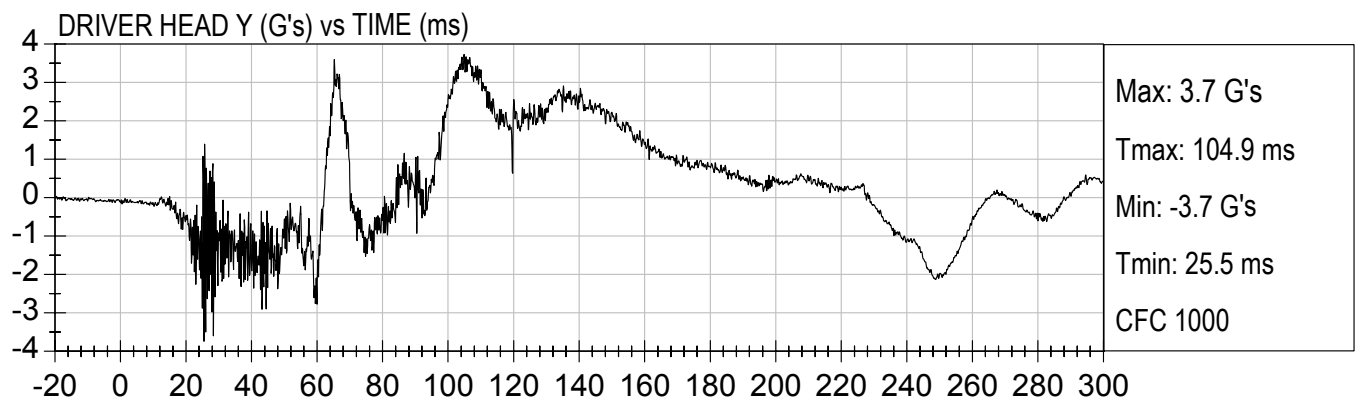
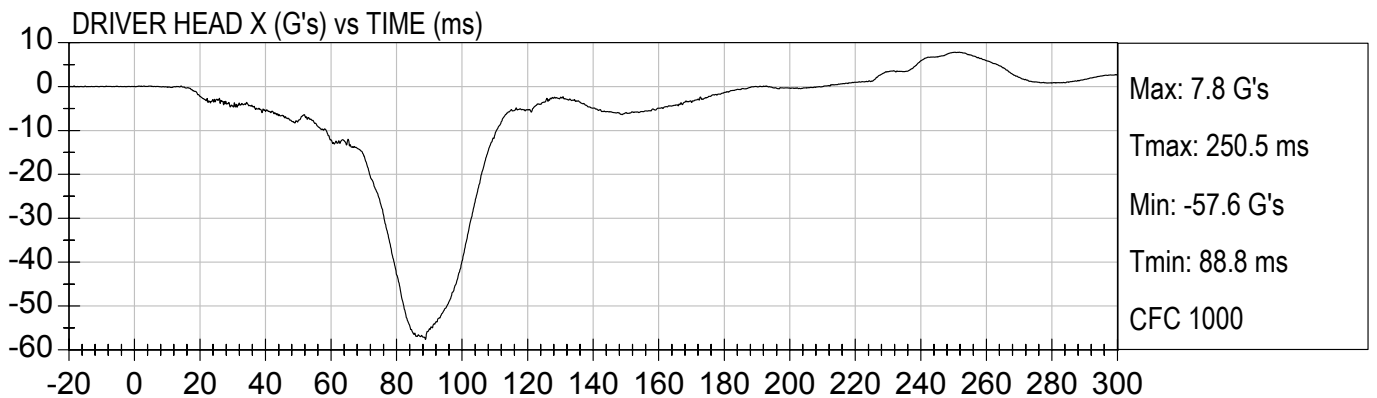
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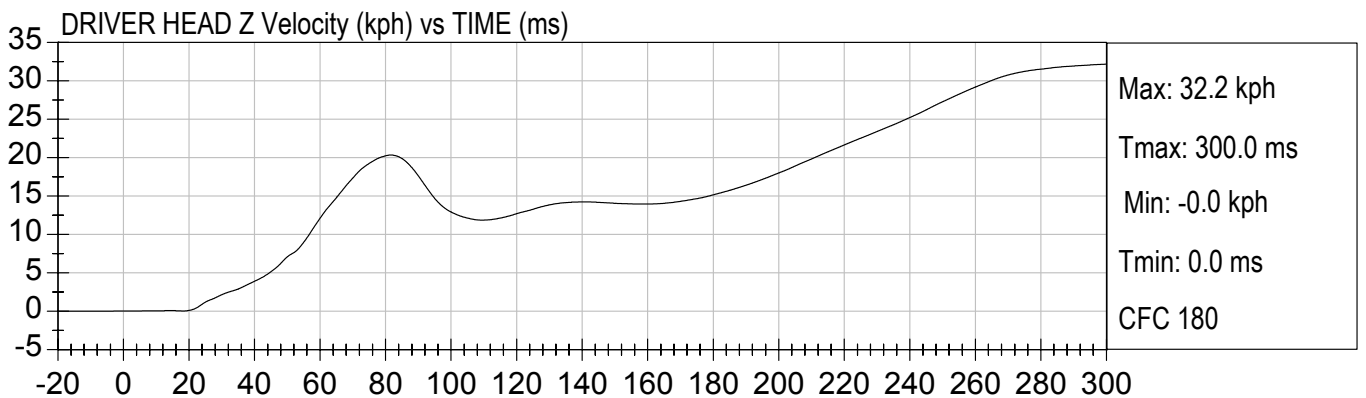
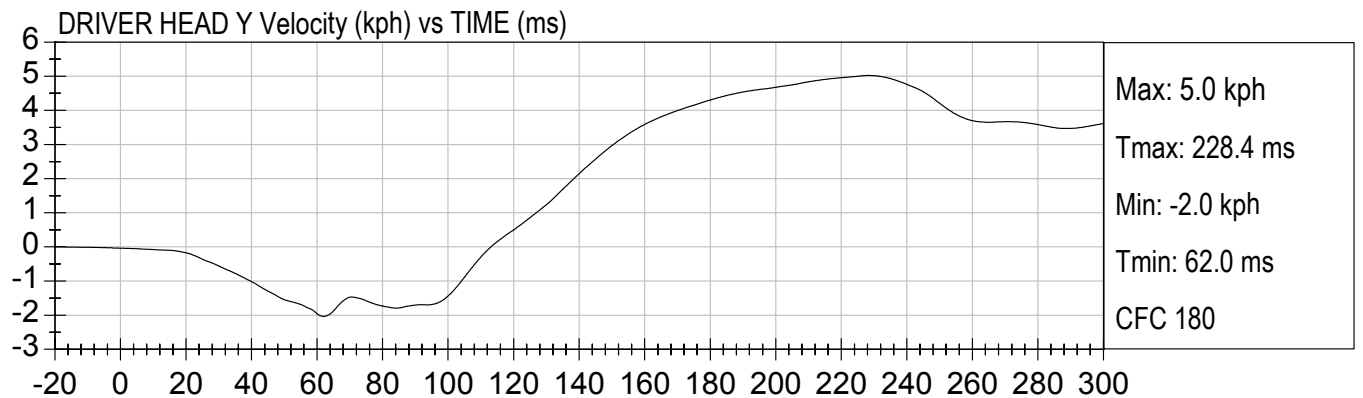
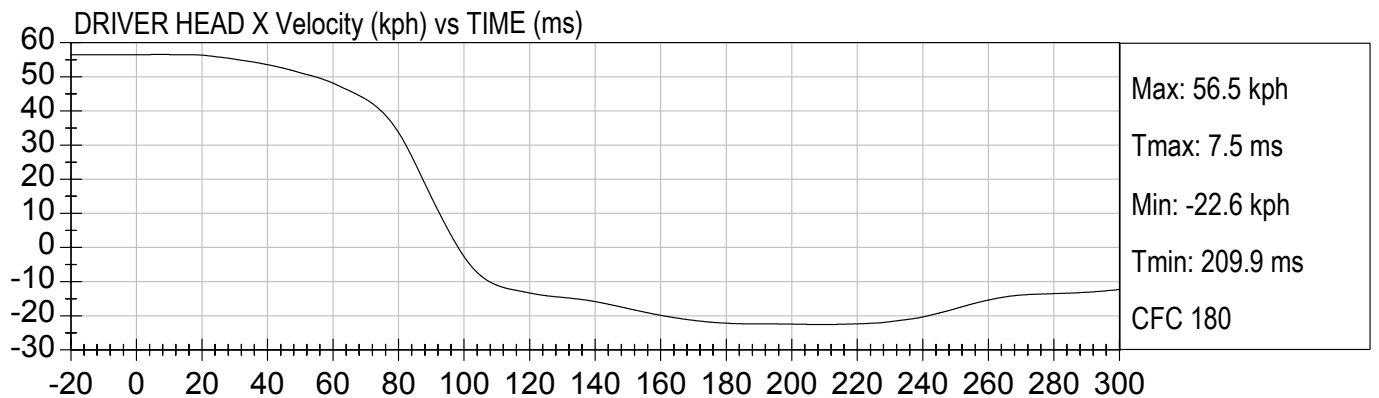
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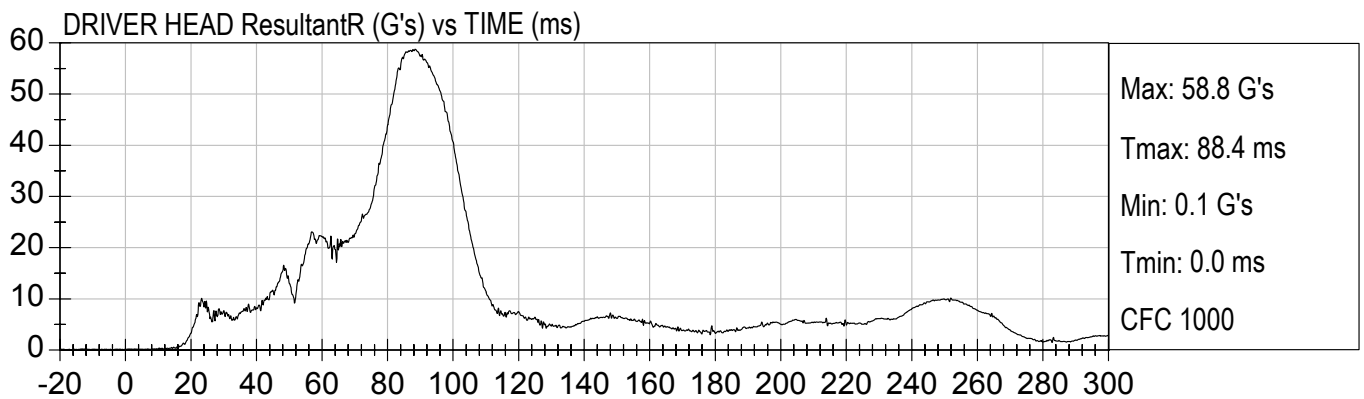
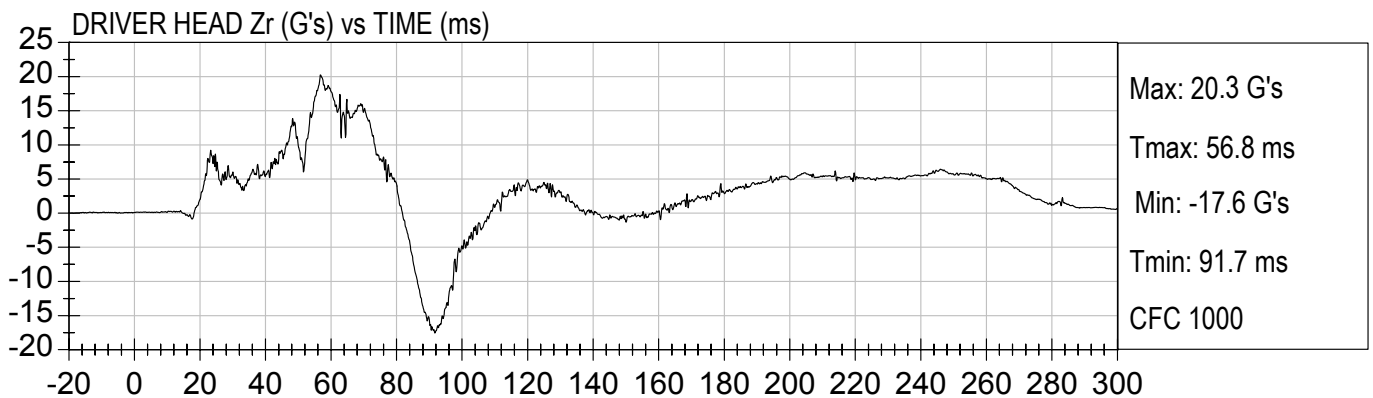
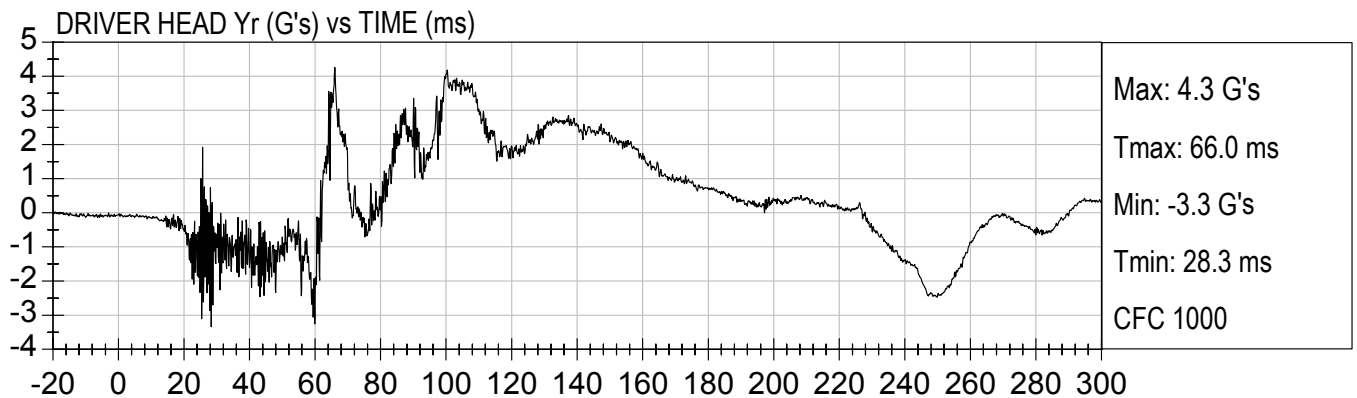
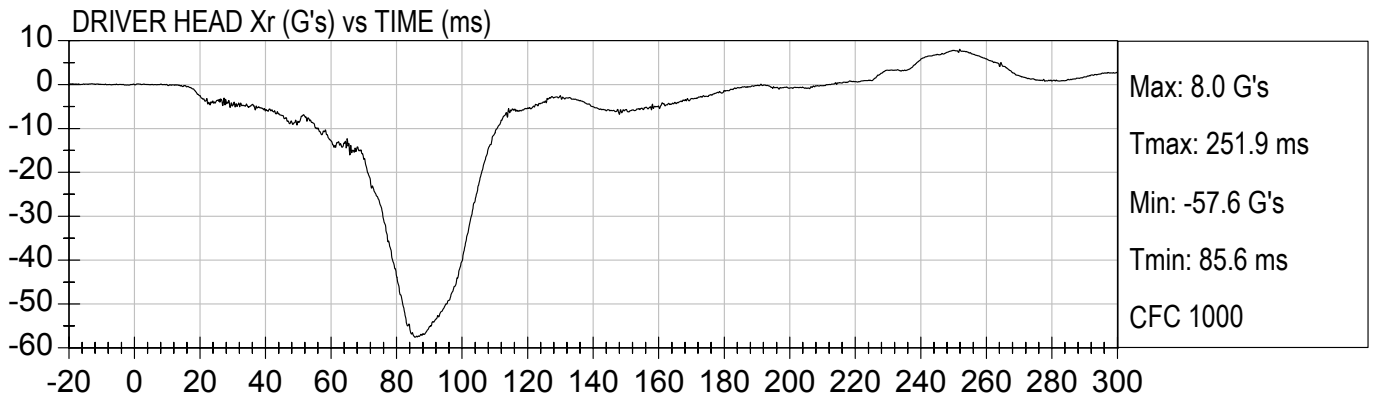
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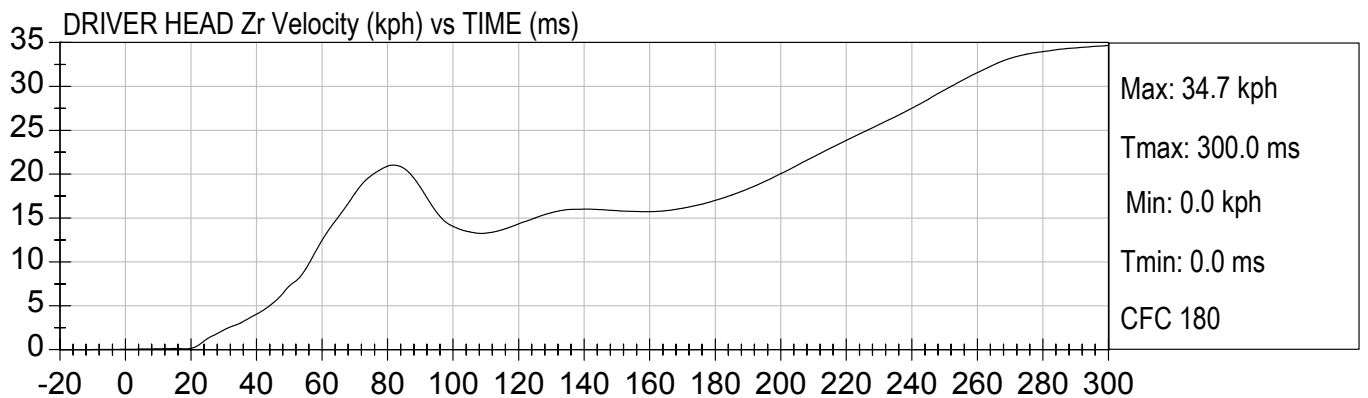
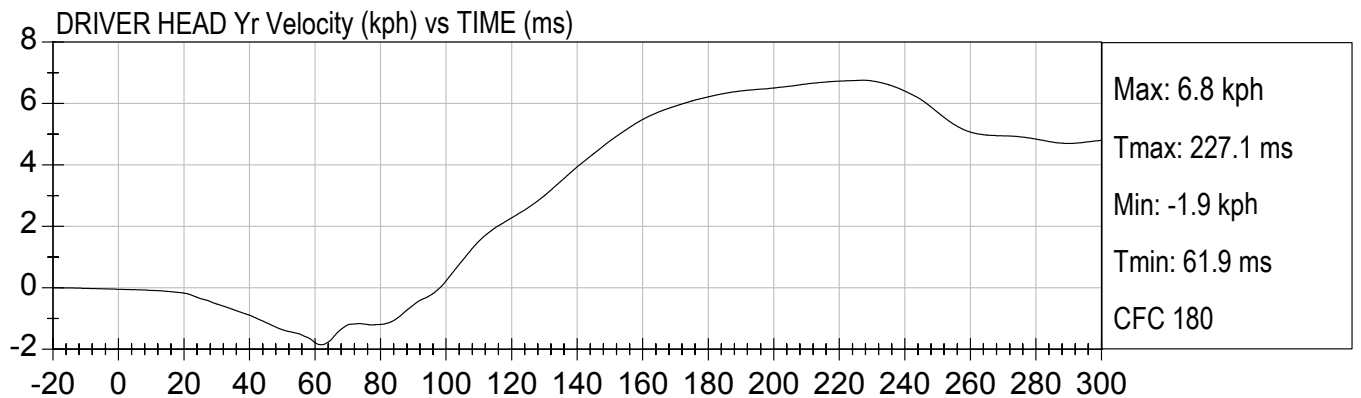
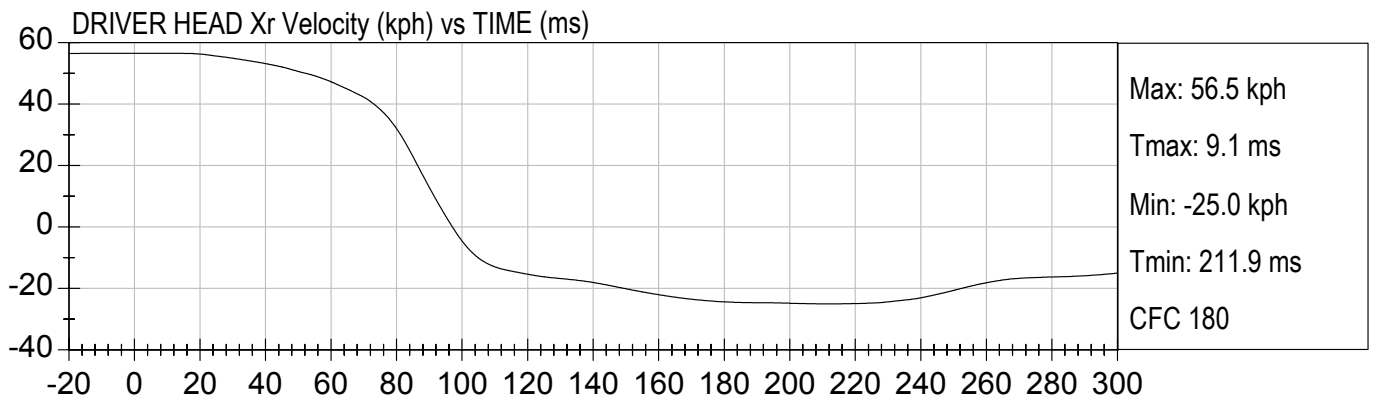
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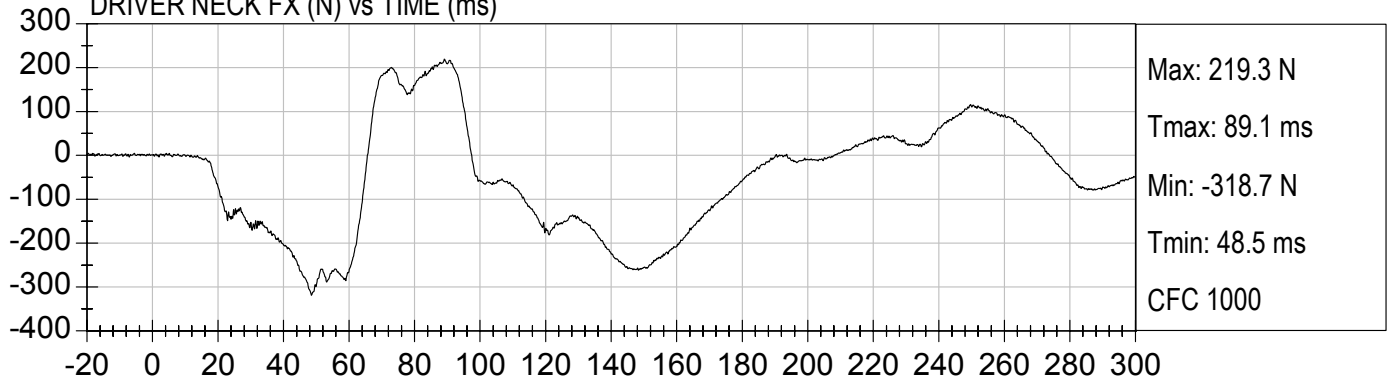




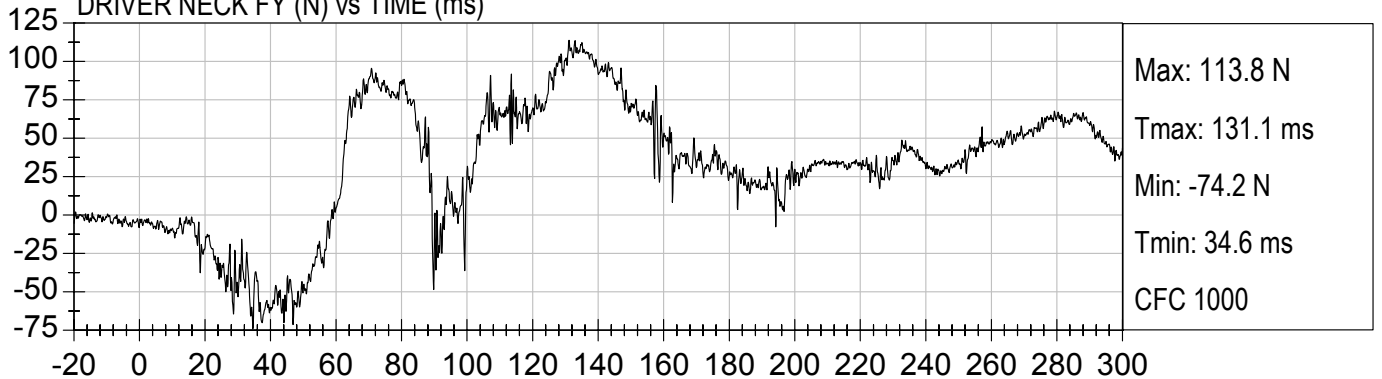




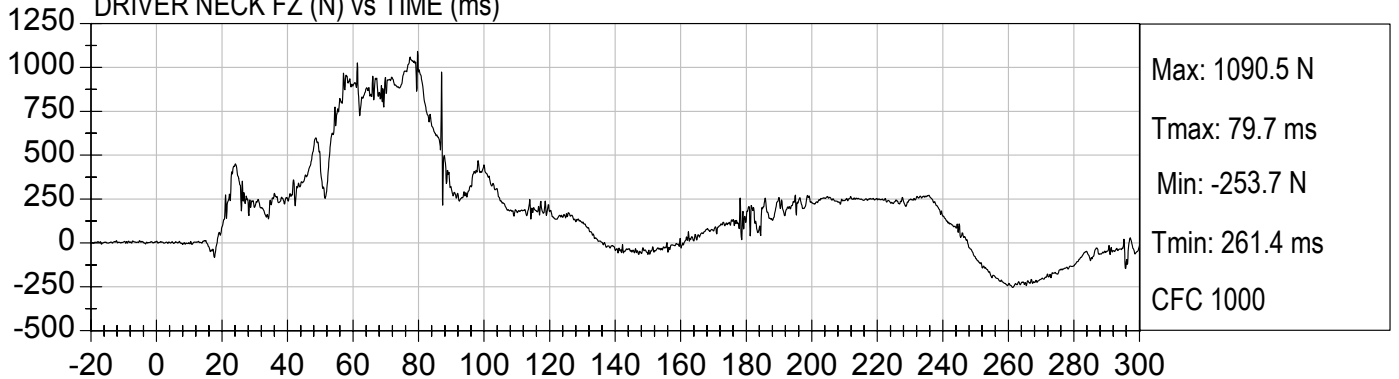
DRIVER NECK FX (N) vs TIME (ms)



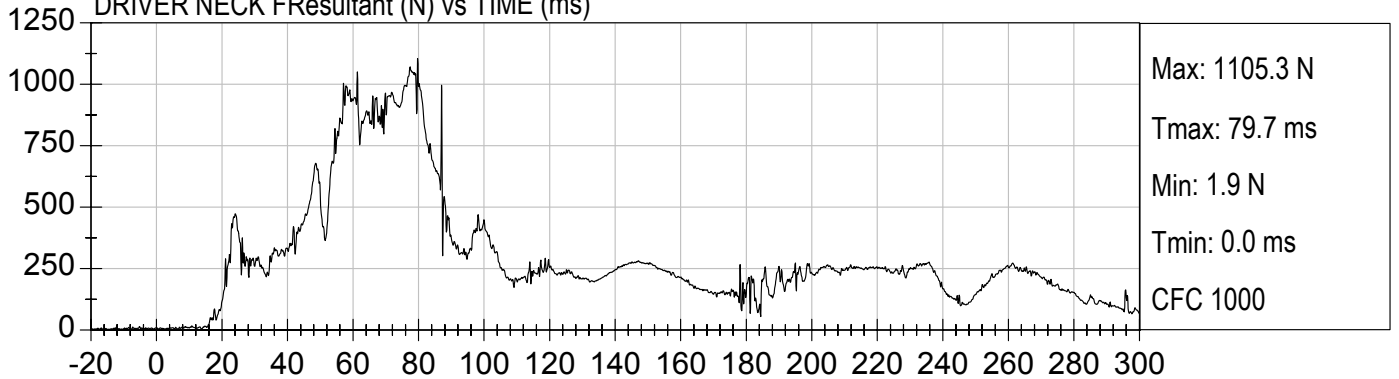
DRIVER NECK FY (N) vs TIME (ms)



DRIVER NECK FZ (N) vs TIME (ms)



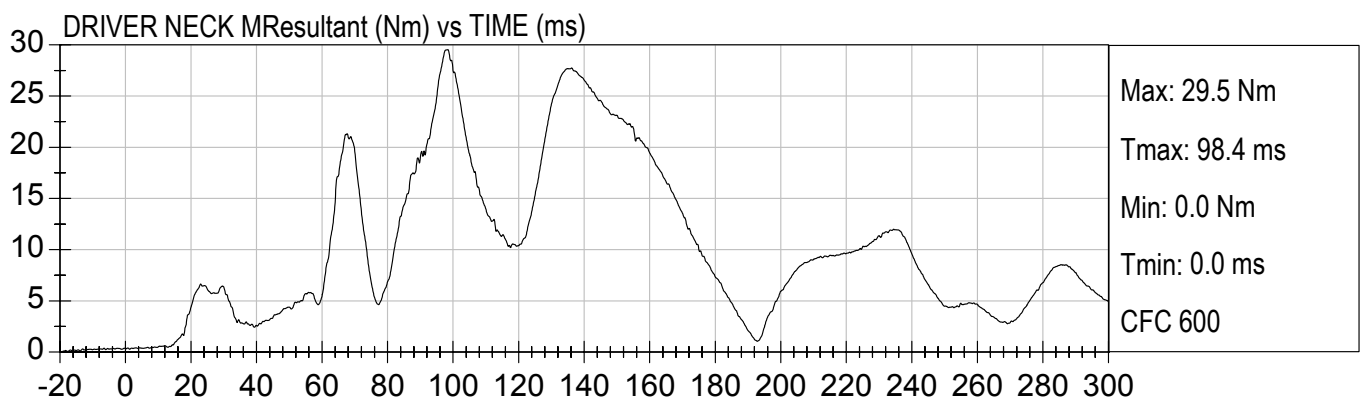
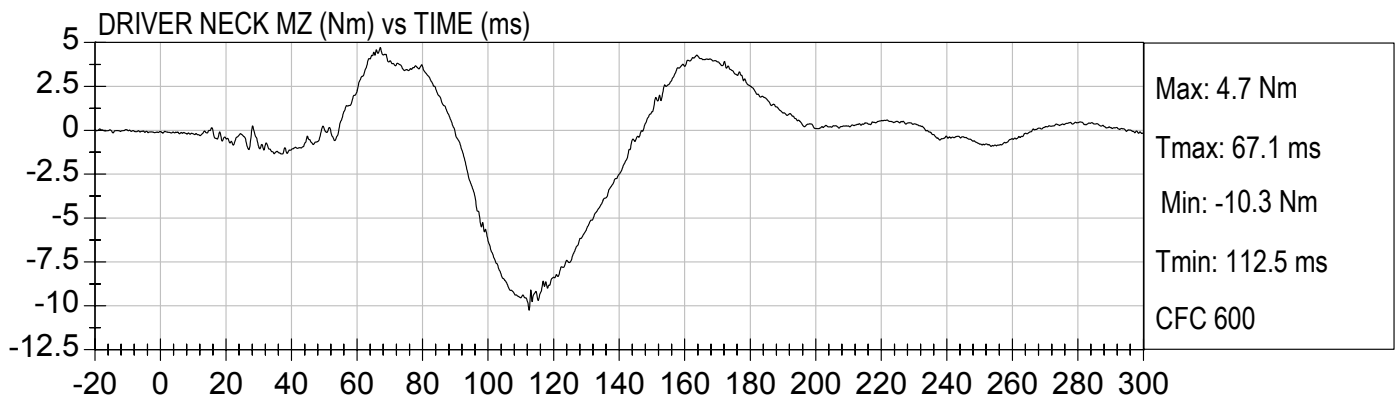
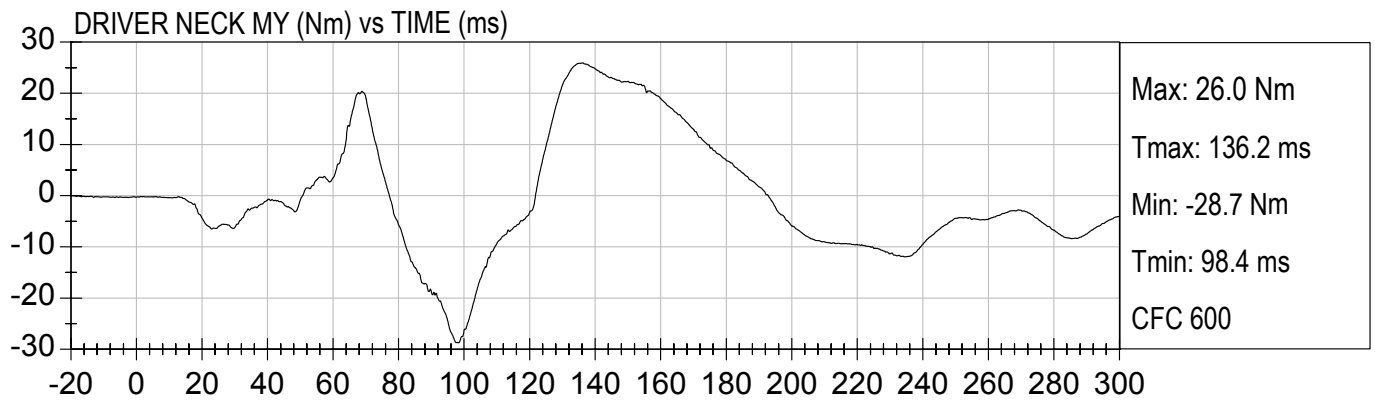
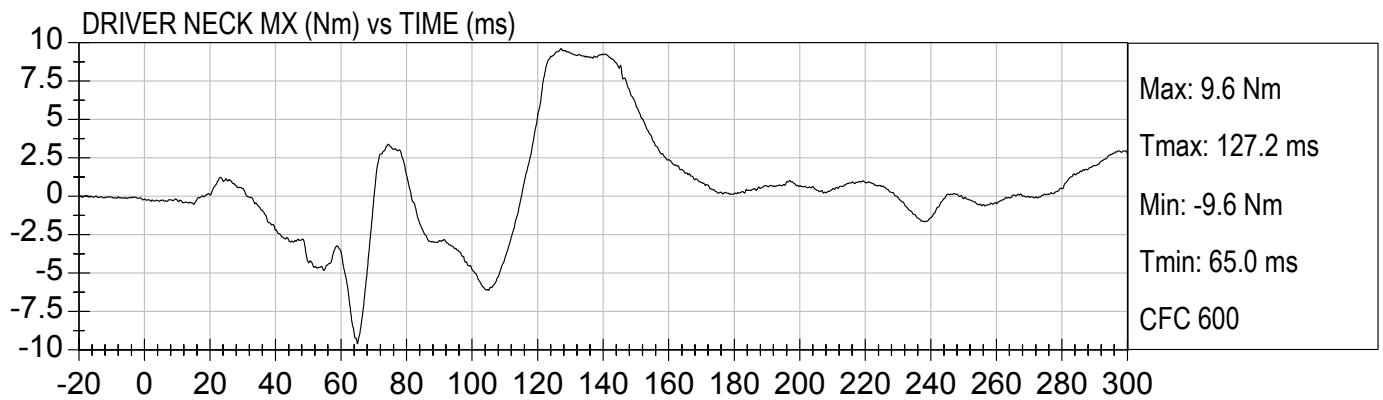
DRIVER NECK FResultant (N) vs TIME (ms)

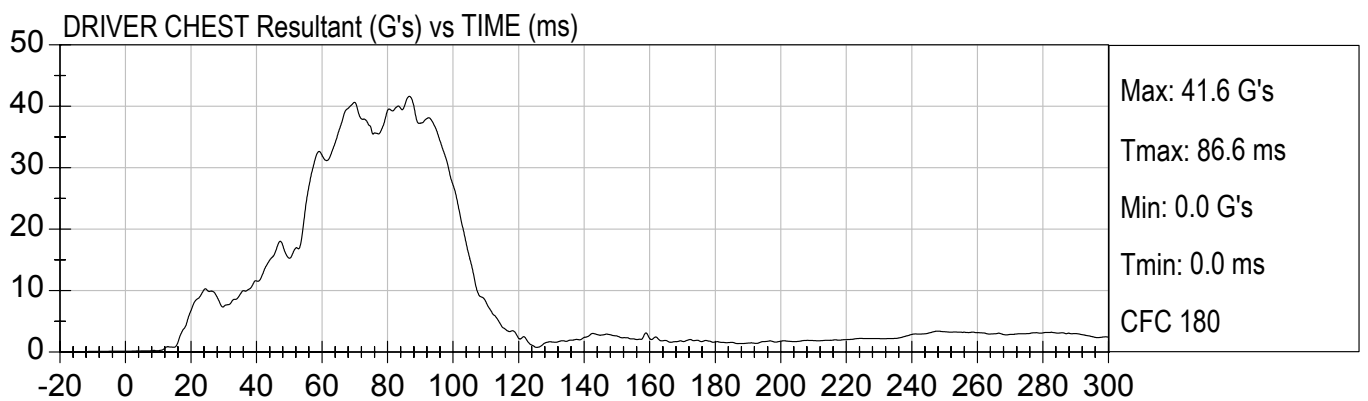
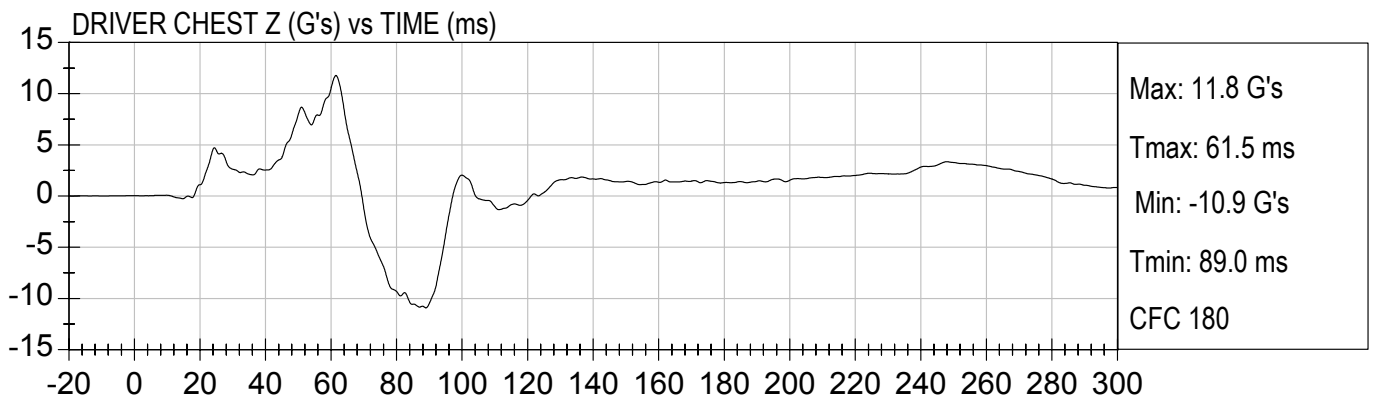
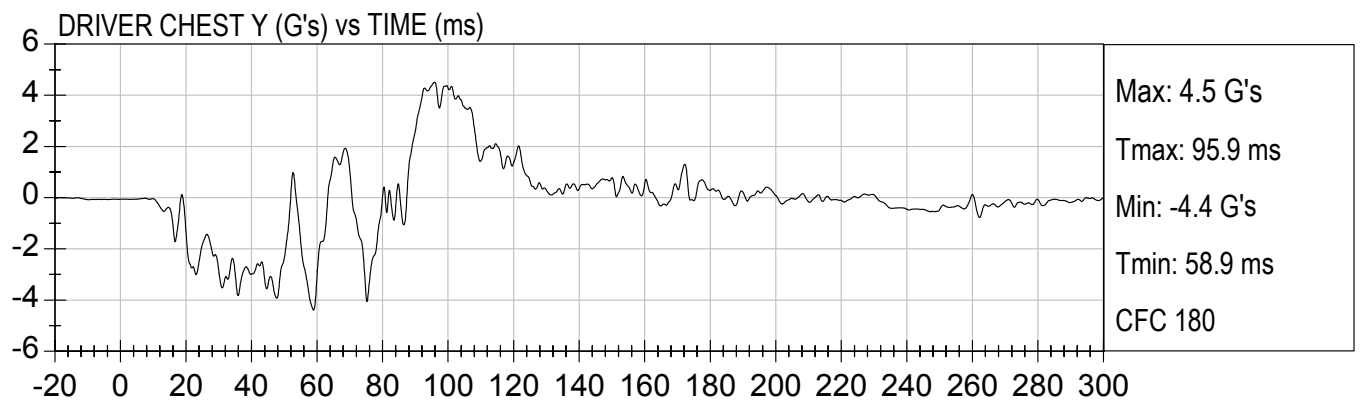
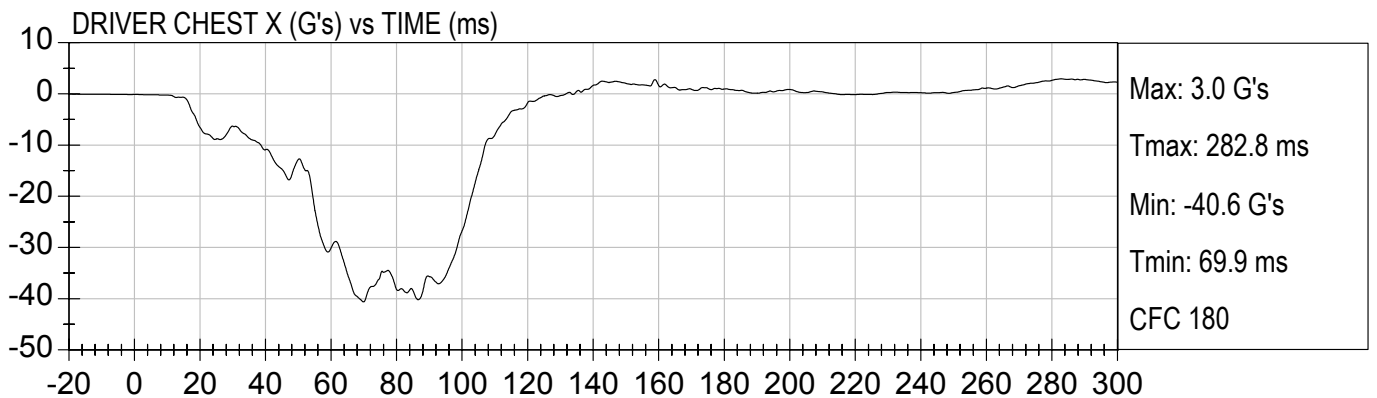




35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

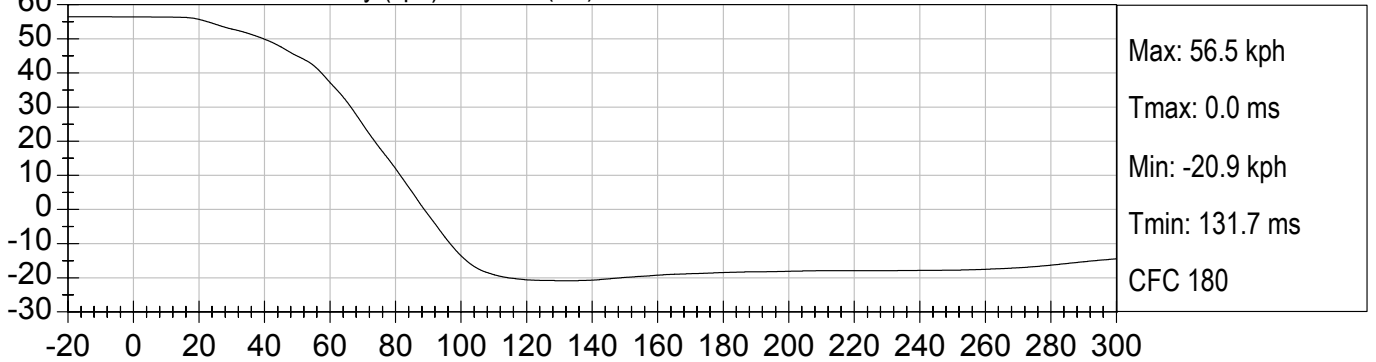
Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)



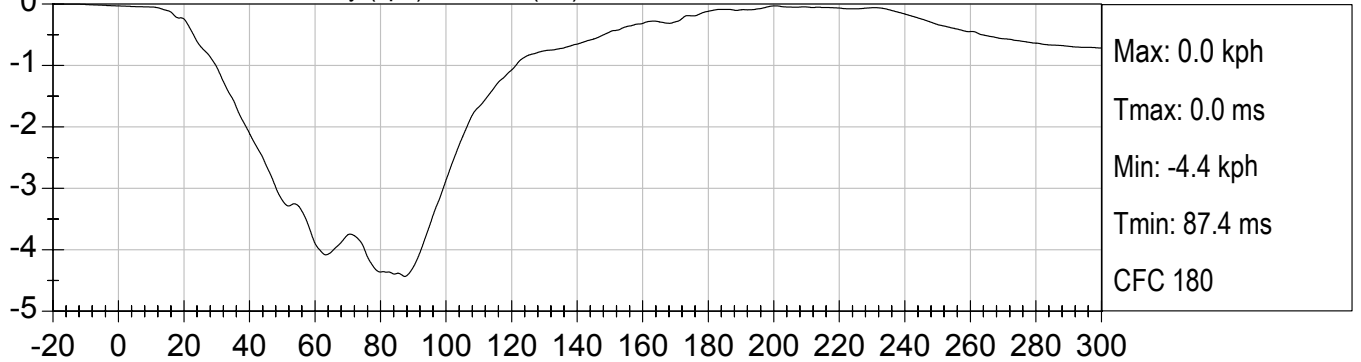




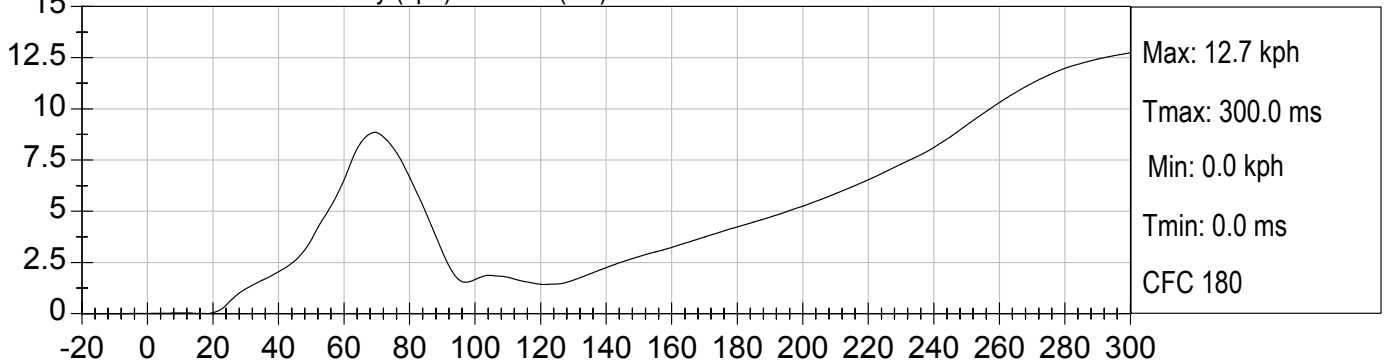
DRIVER CHEST X Velocity (kph) vs TIME (ms)



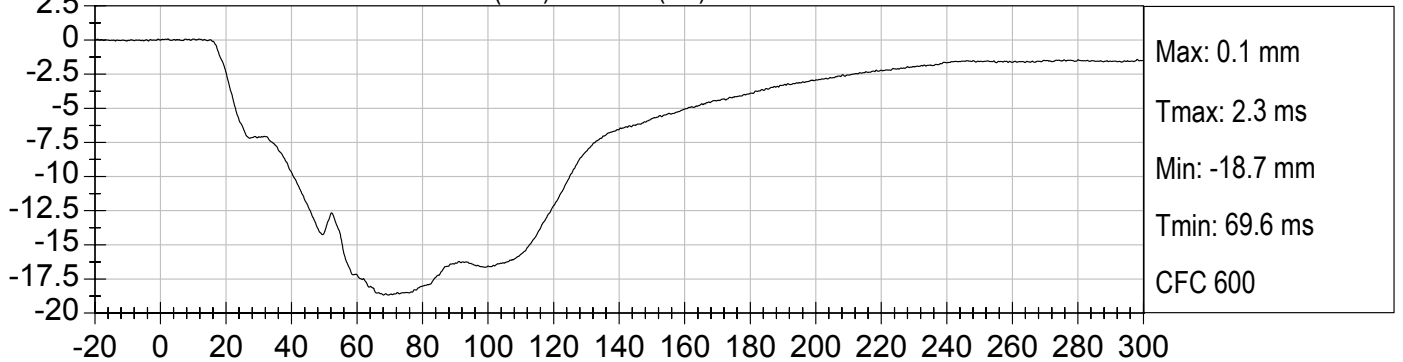
DRIVER CHEST Y Velocity (kph) vs TIME (ms)

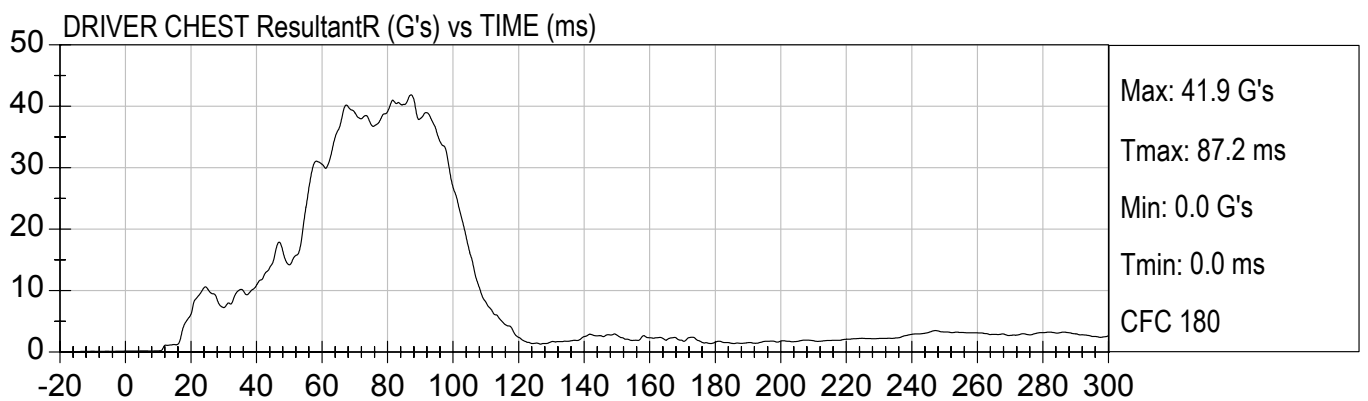
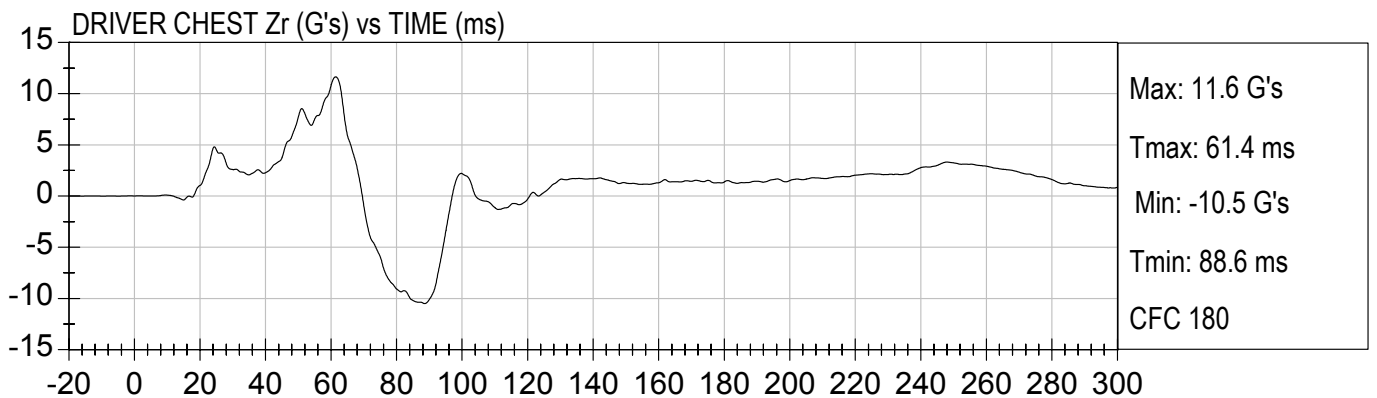
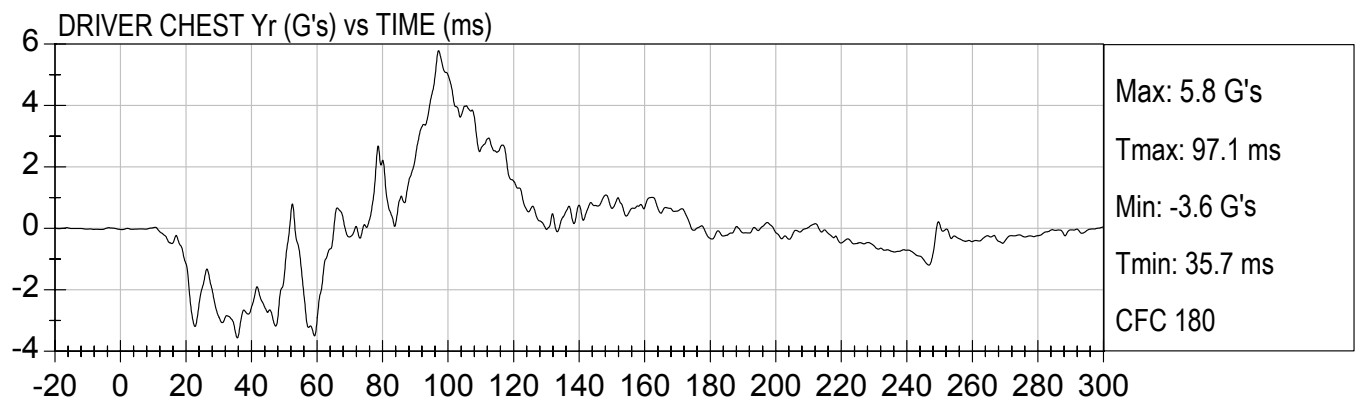
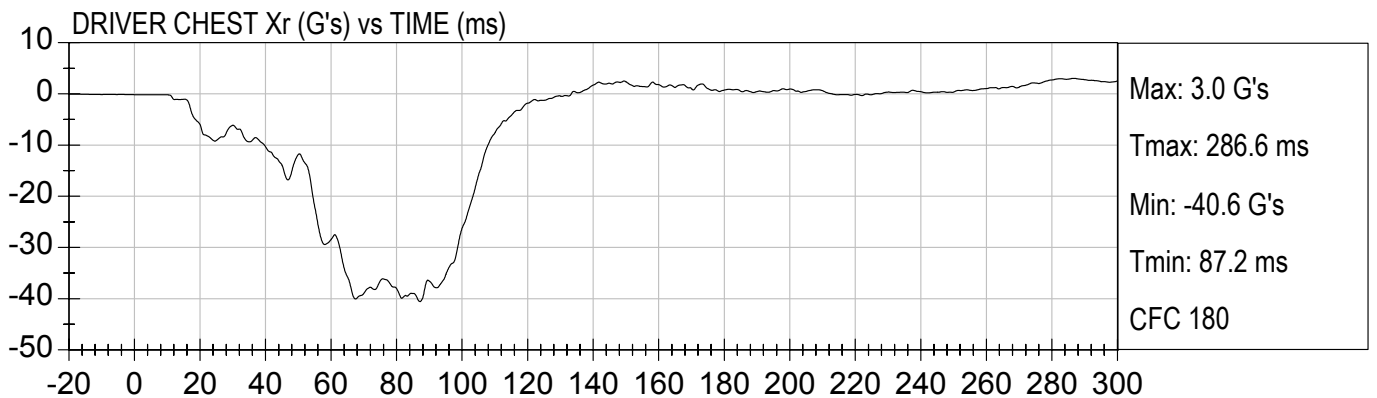


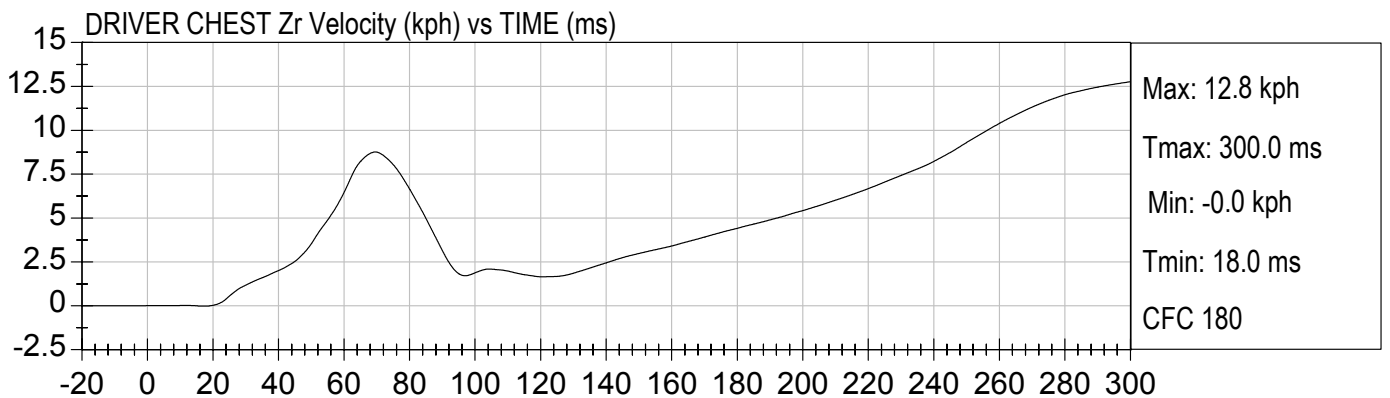
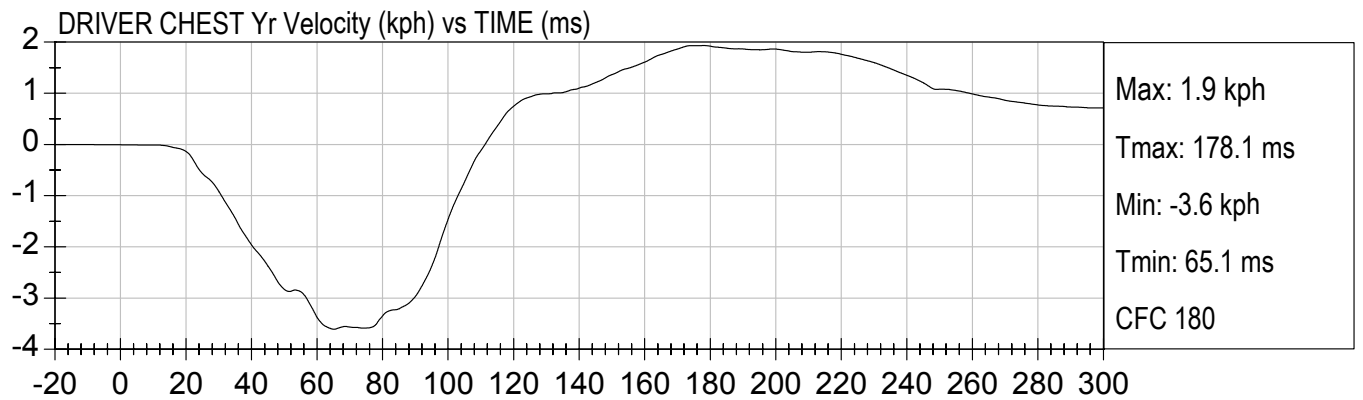
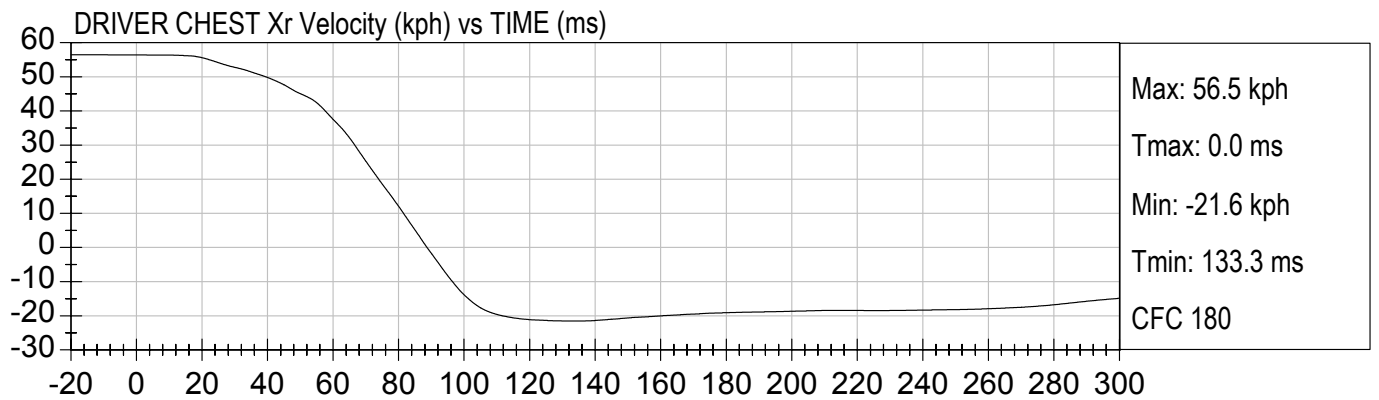
DRIVER CHEST Z Velocity (kph) vs TIME (ms)

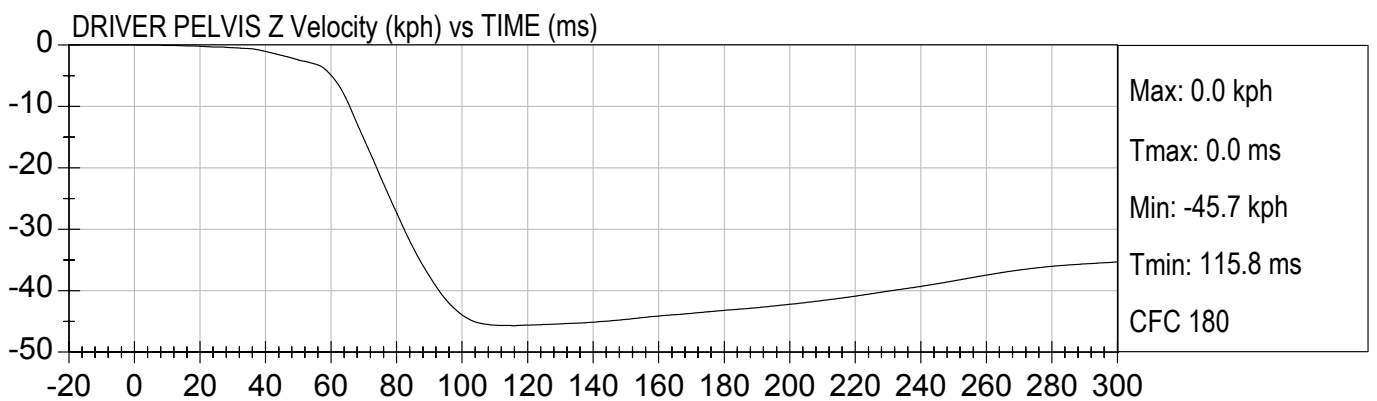
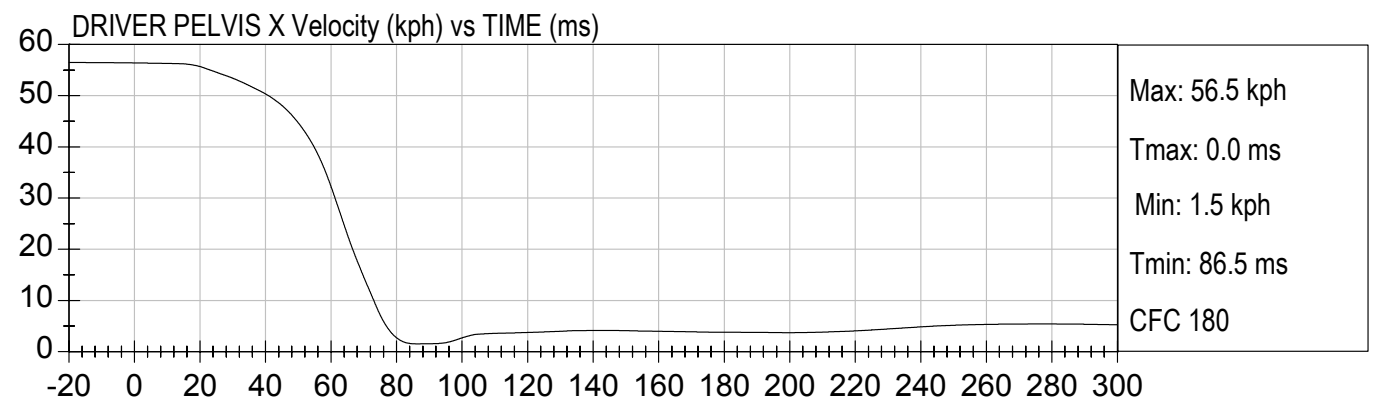
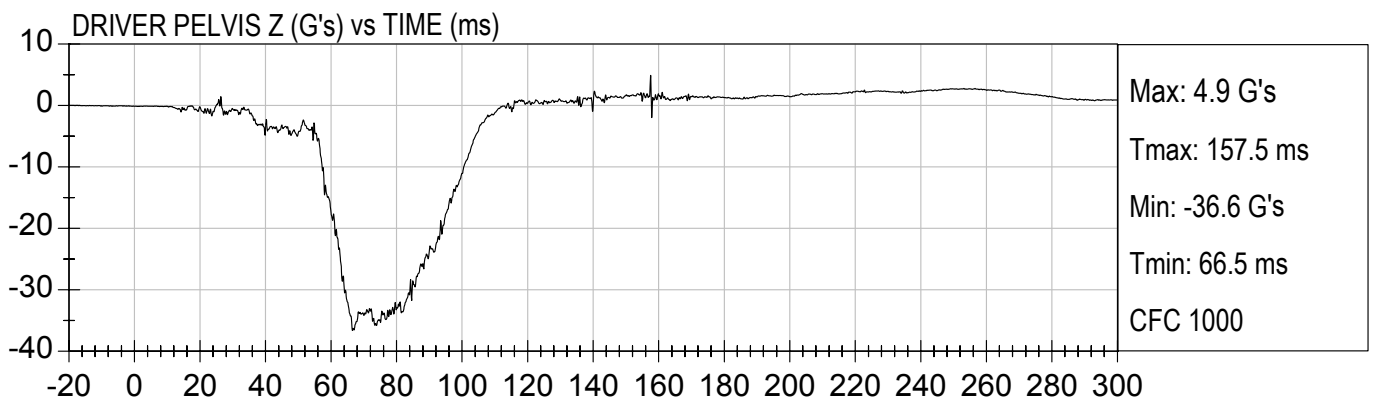
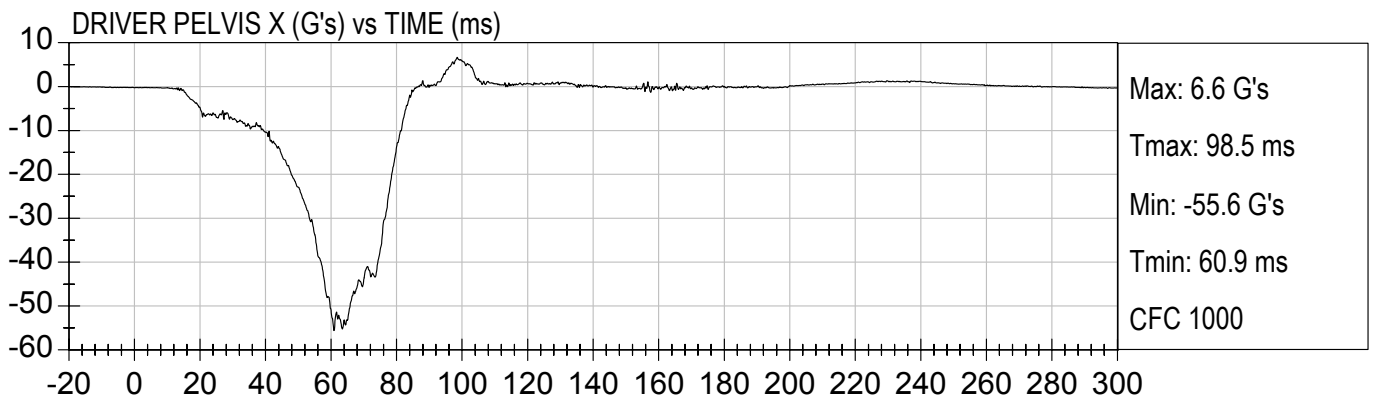


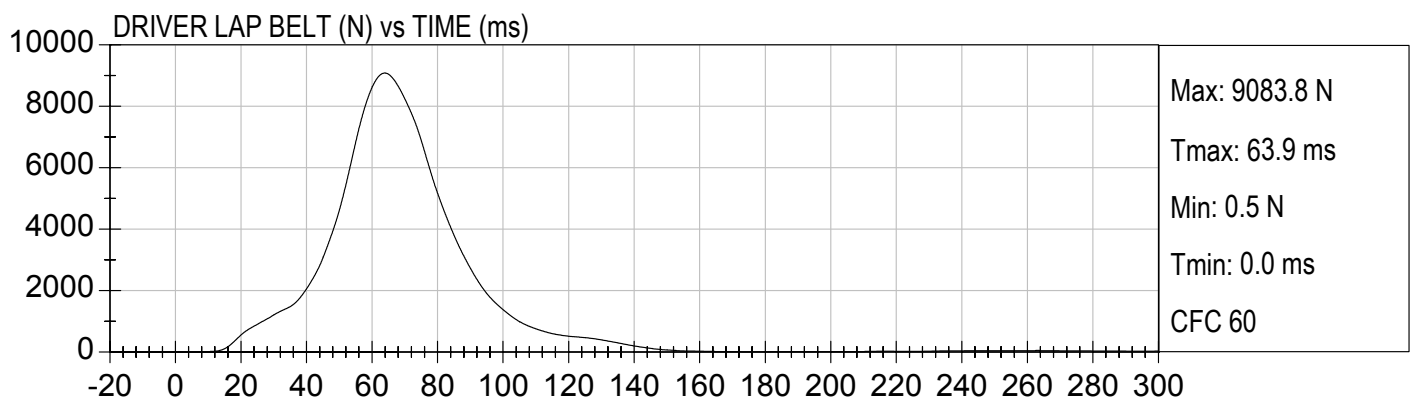
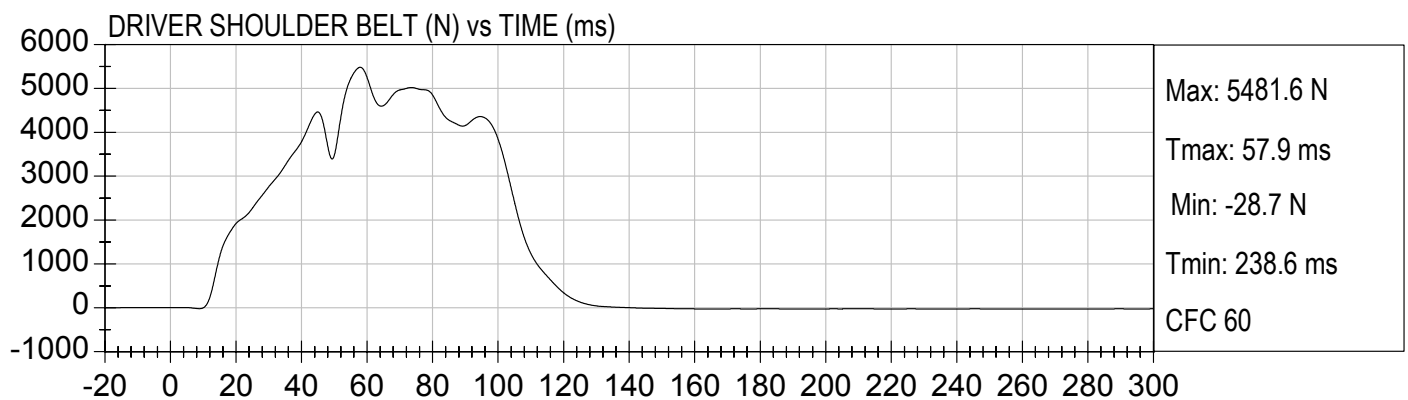
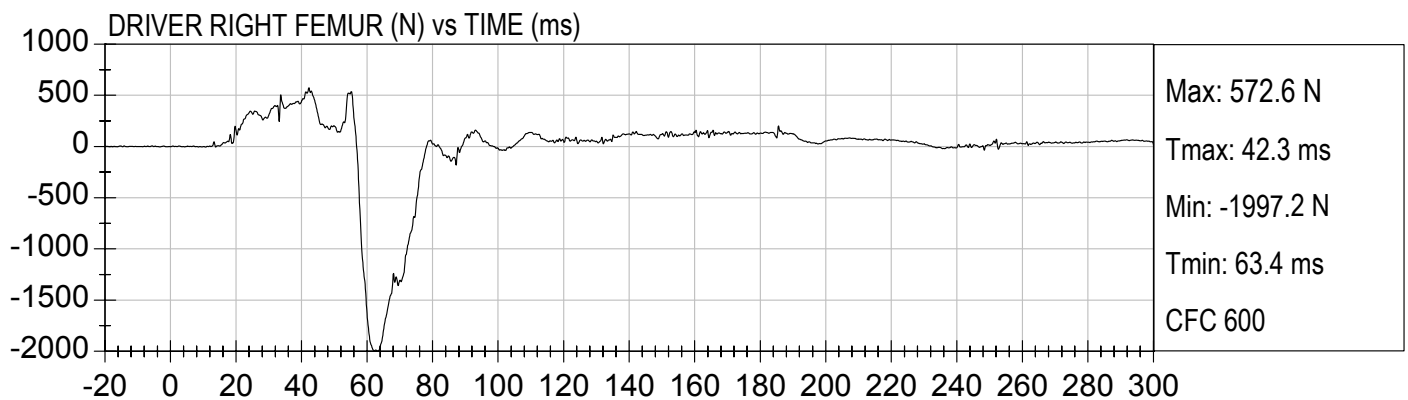
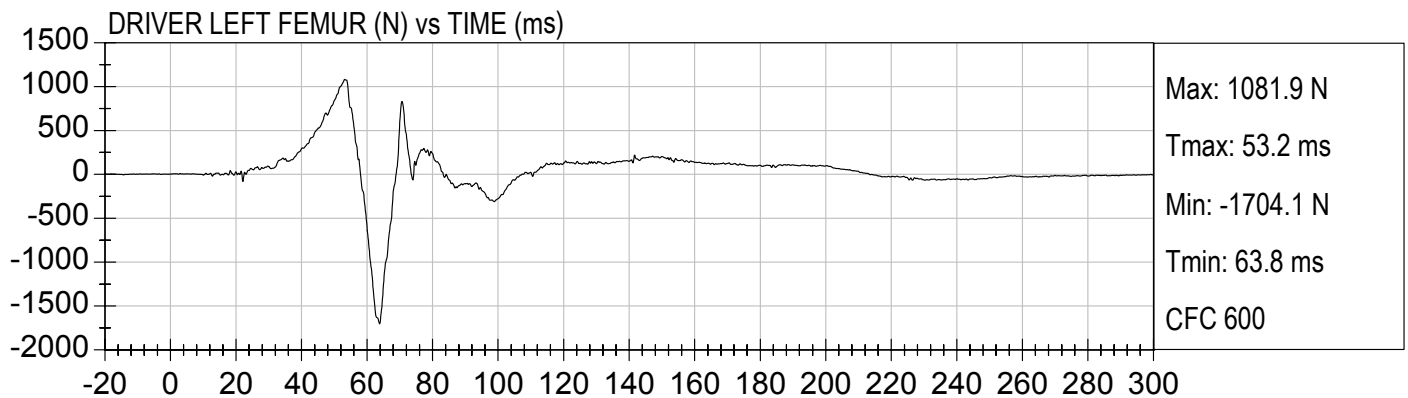
DRIVER CHEST DISPLACEMENT (mm) vs TIME (ms)





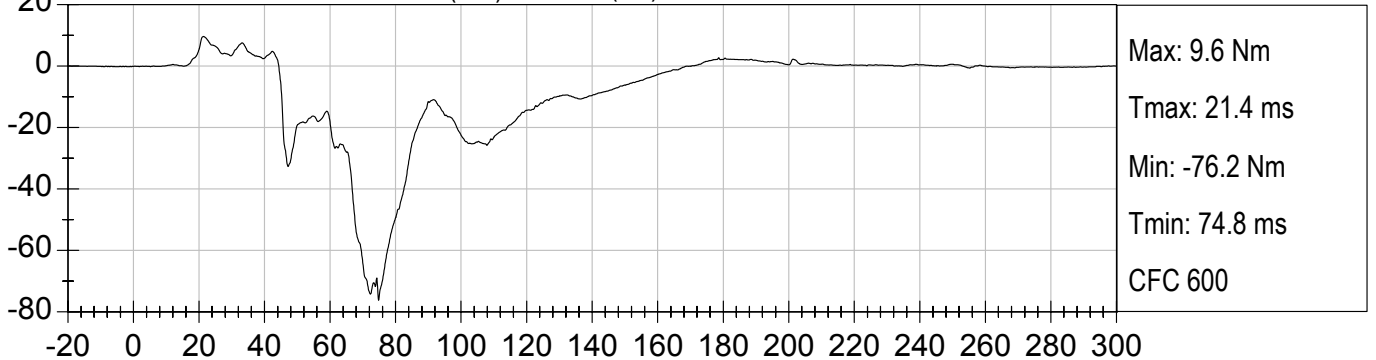




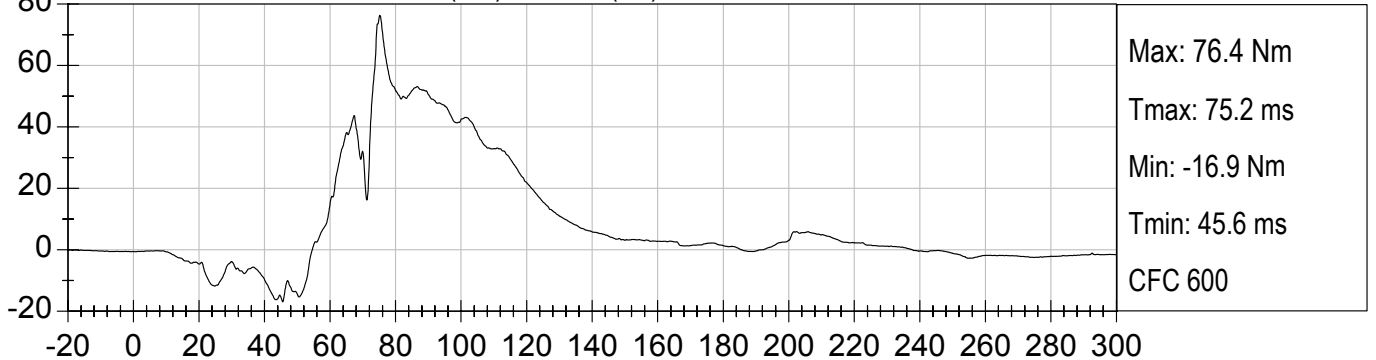




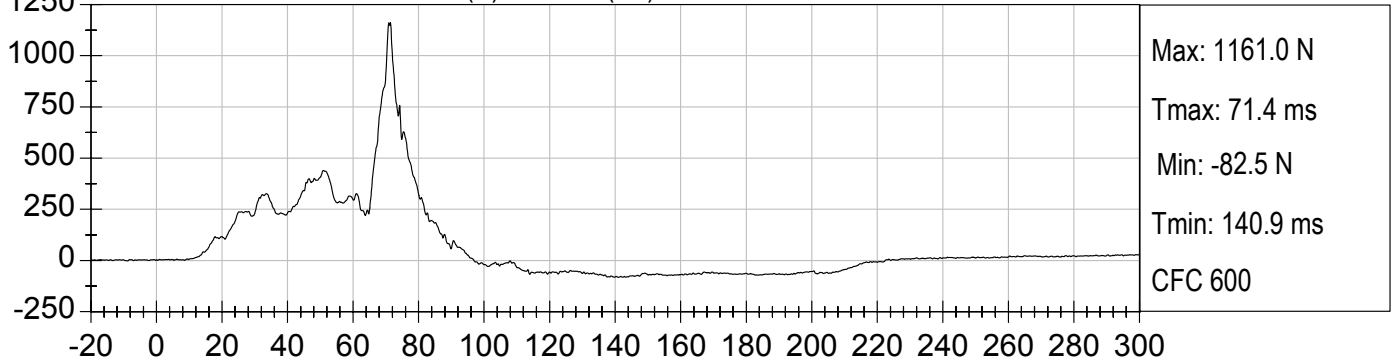
DRIVER LEFT UPPER TIBIA MX (Nm) vs TIME (ms)



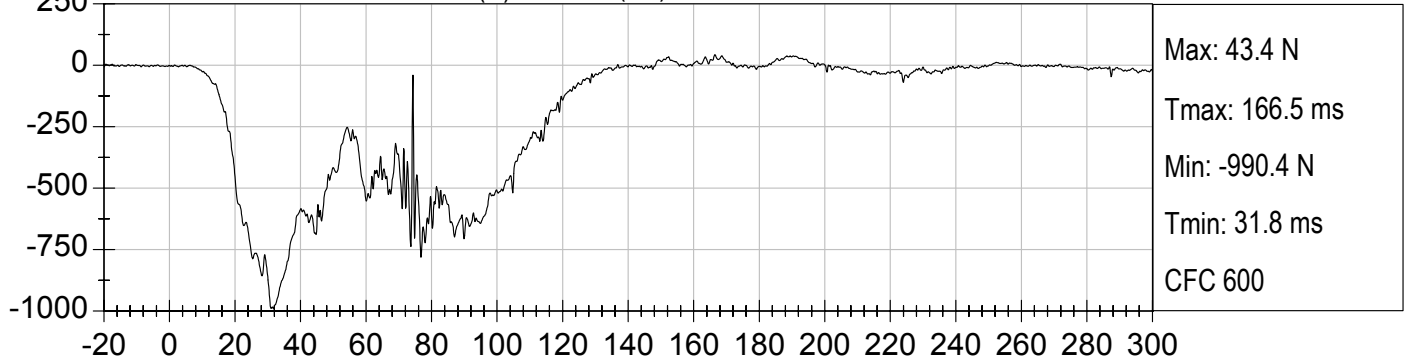
DRIVER LEFT UPPER TIBIA MY (Nm) vs TIME (ms)



DRIVER LEFT UPPER TIBIA FX (N) vs TIME (ms)

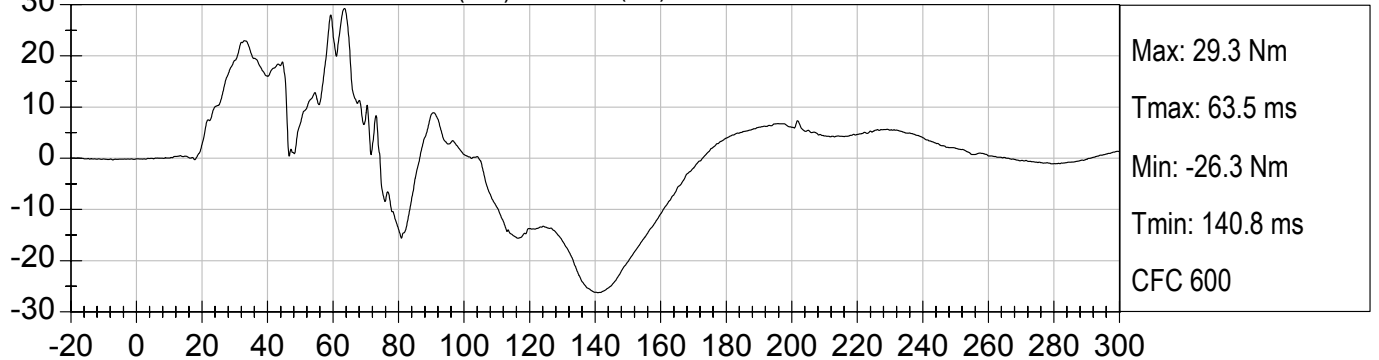


DRIVER LEFT UPPER TIBIA FZ (N) vs TIME (ms)

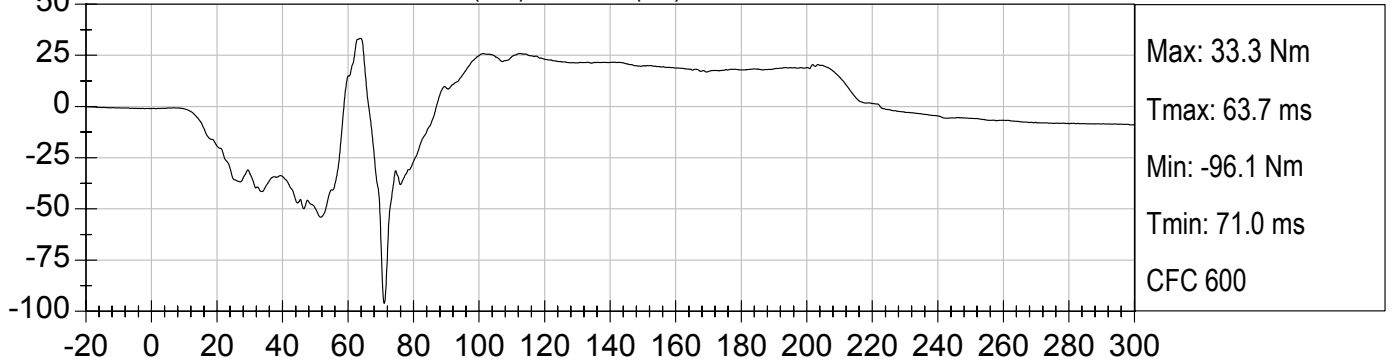




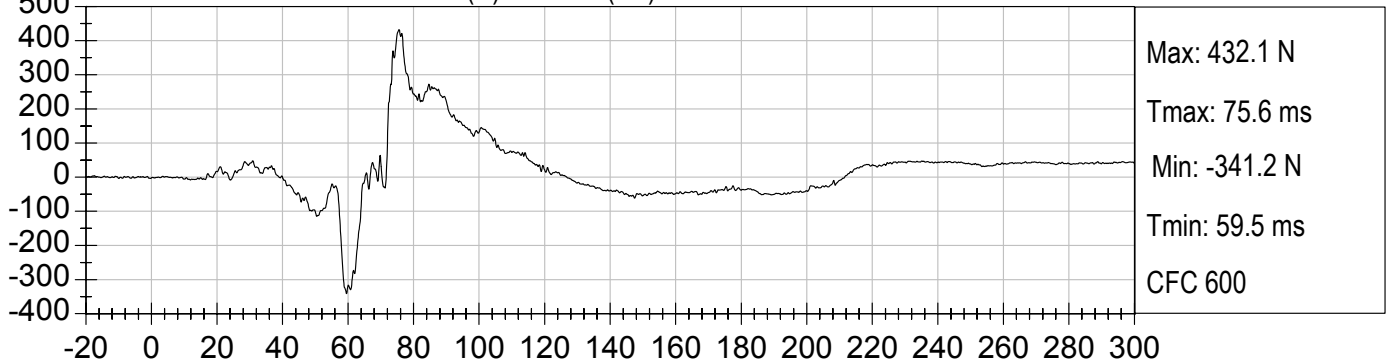
DRIVER LEFT LOWER TIBIA MX (Nm) vs TIME (ms)



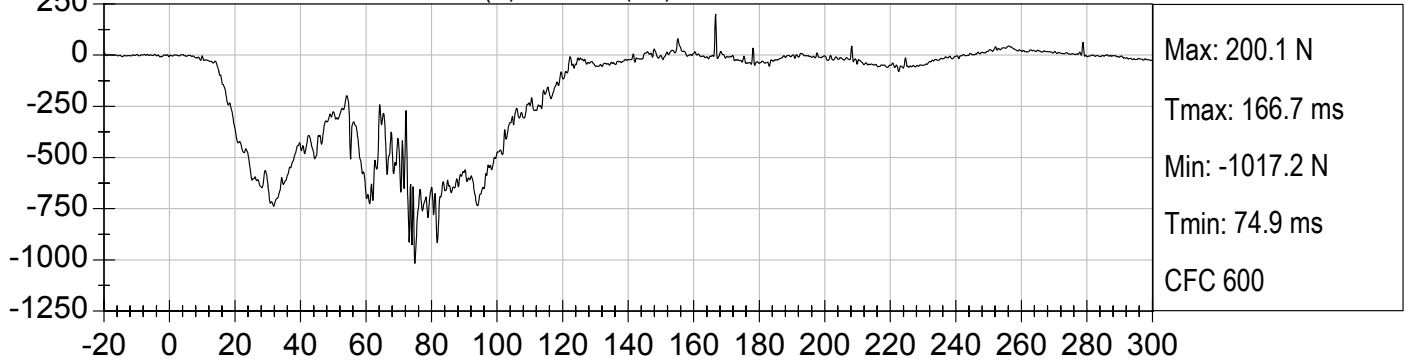
DRIVER LEFT LOWER TIBIA MY (Nm) vs TIME (ms)



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

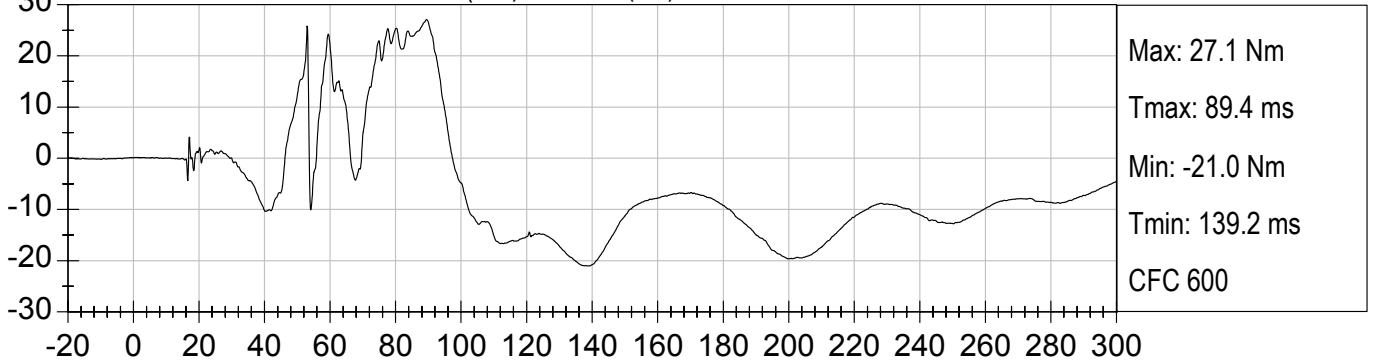


DRIVER LEFT LOWER TIBIA FZ (N) vs TIME (ms)

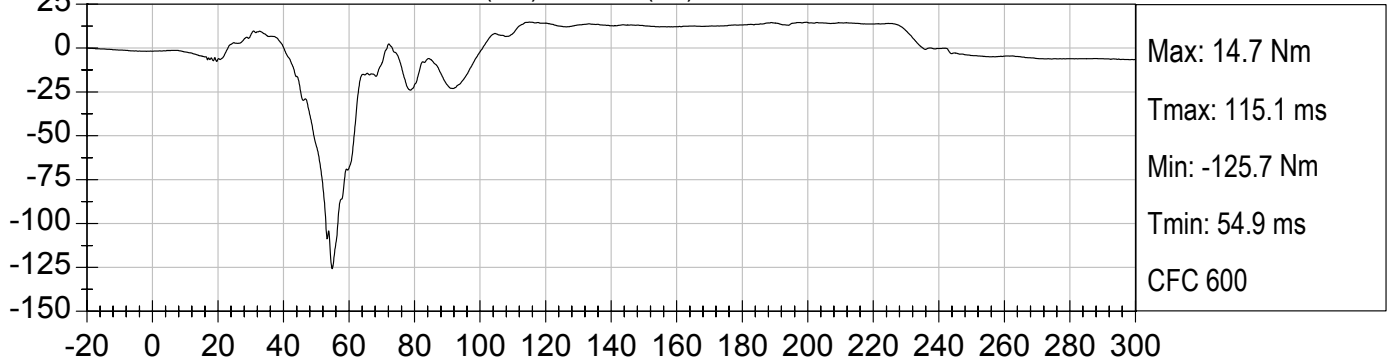




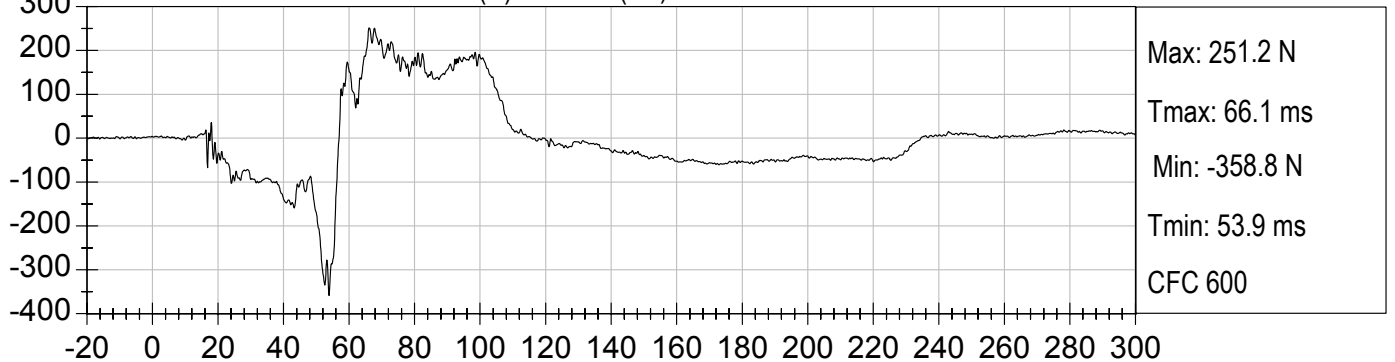
DRIVER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)



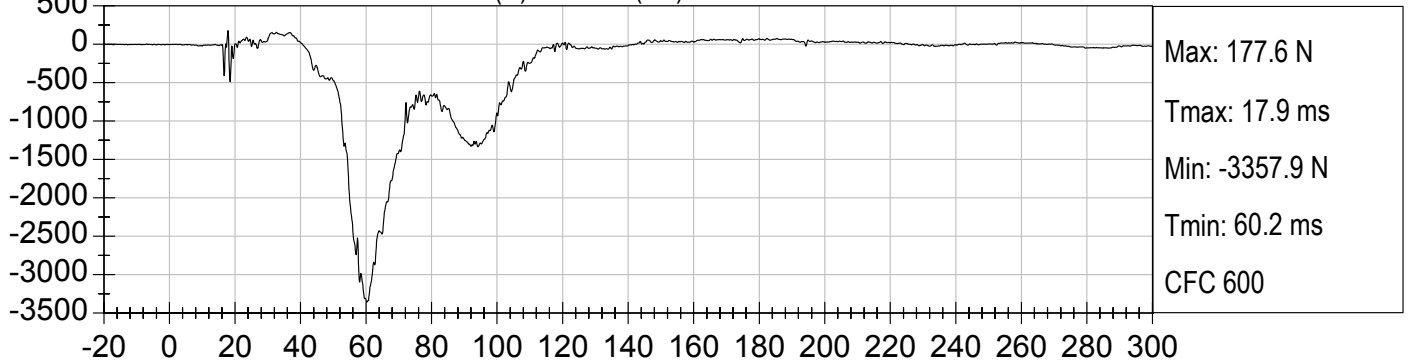
DRIVER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

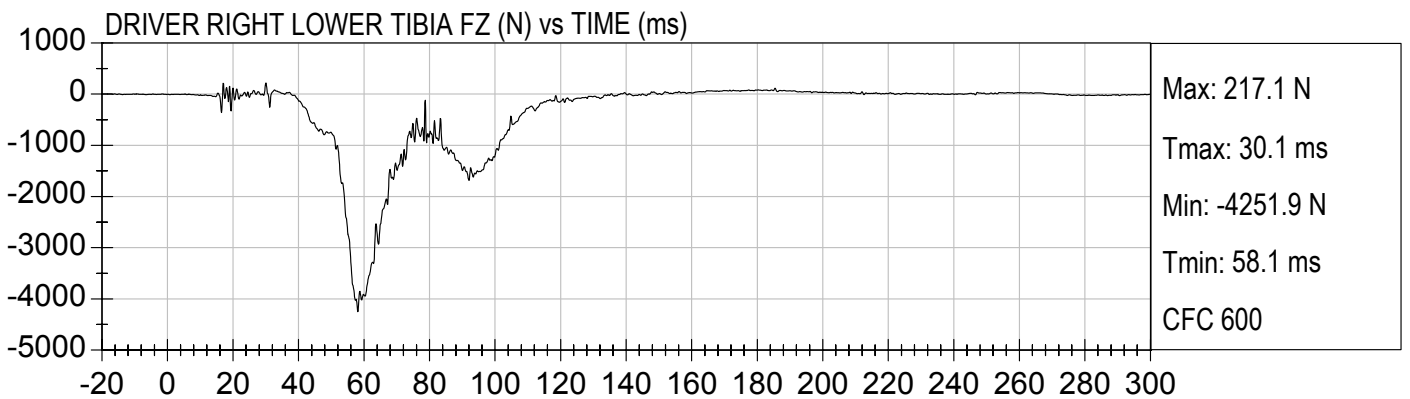
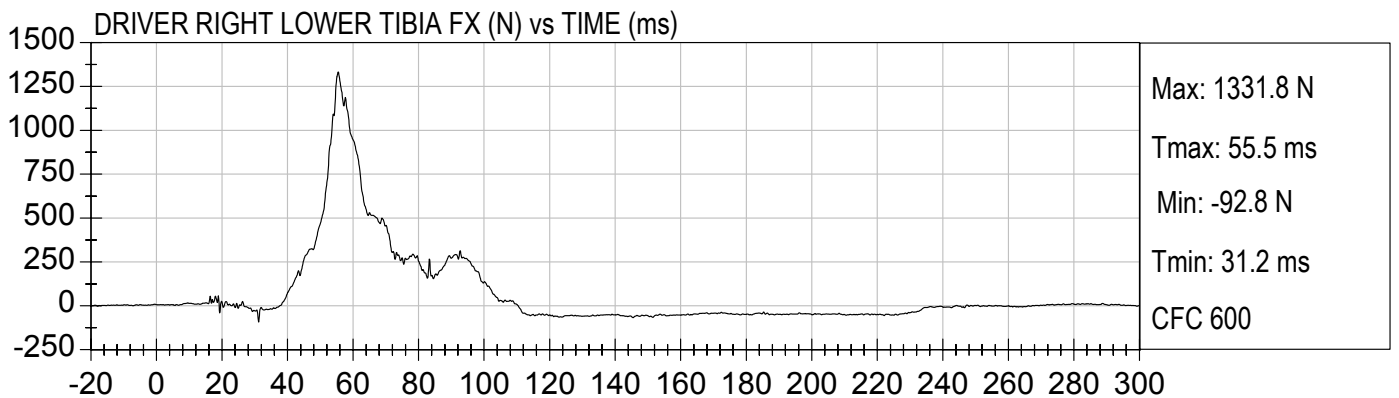
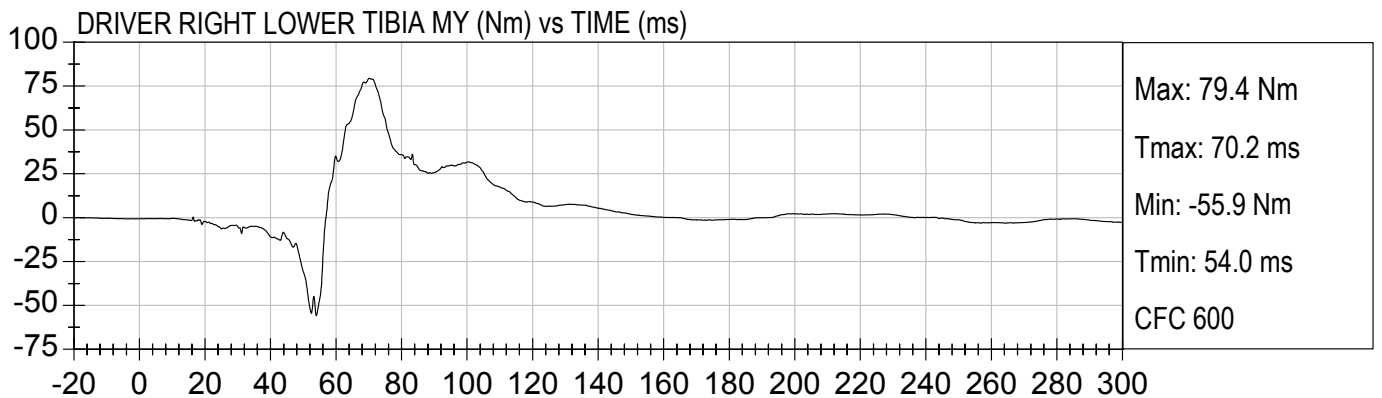
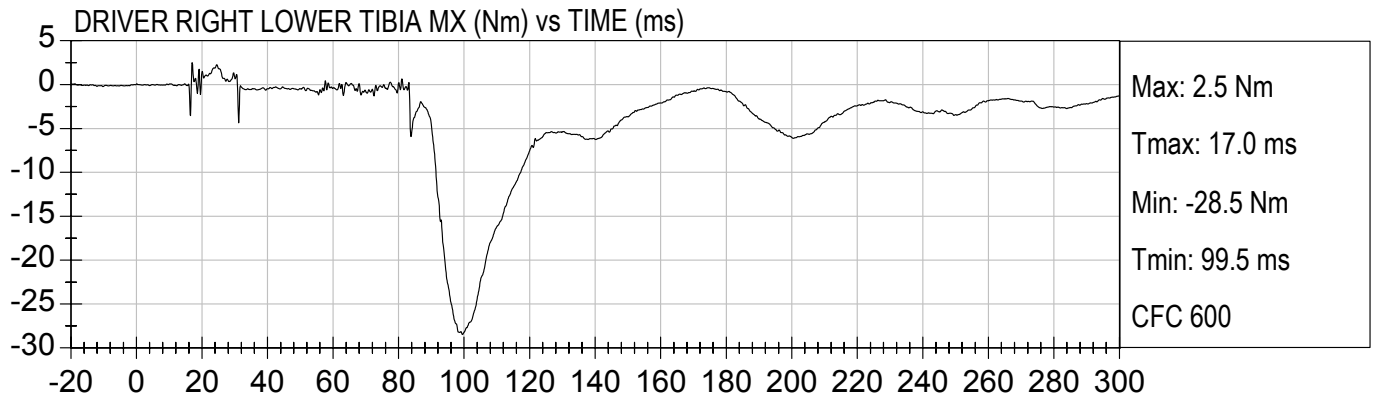


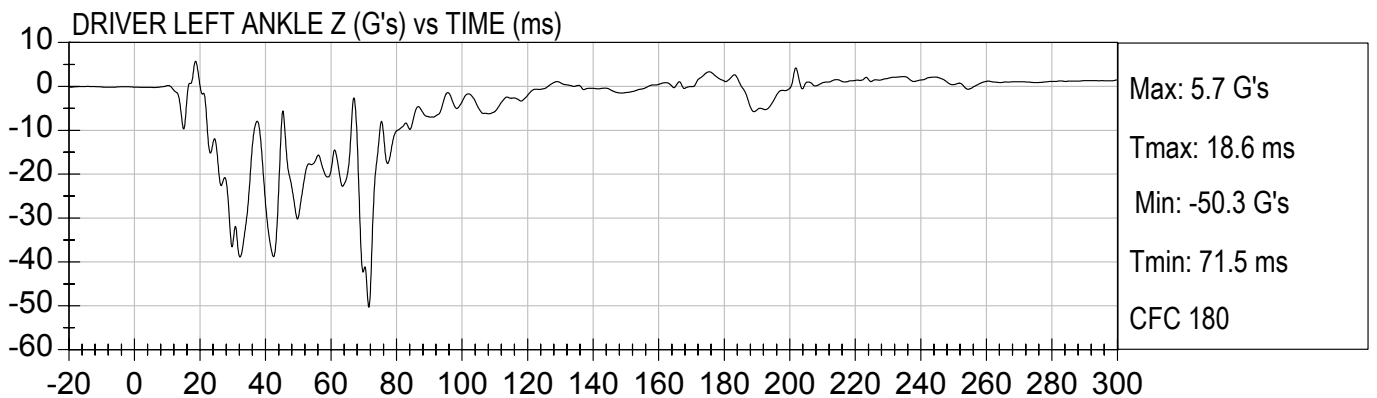
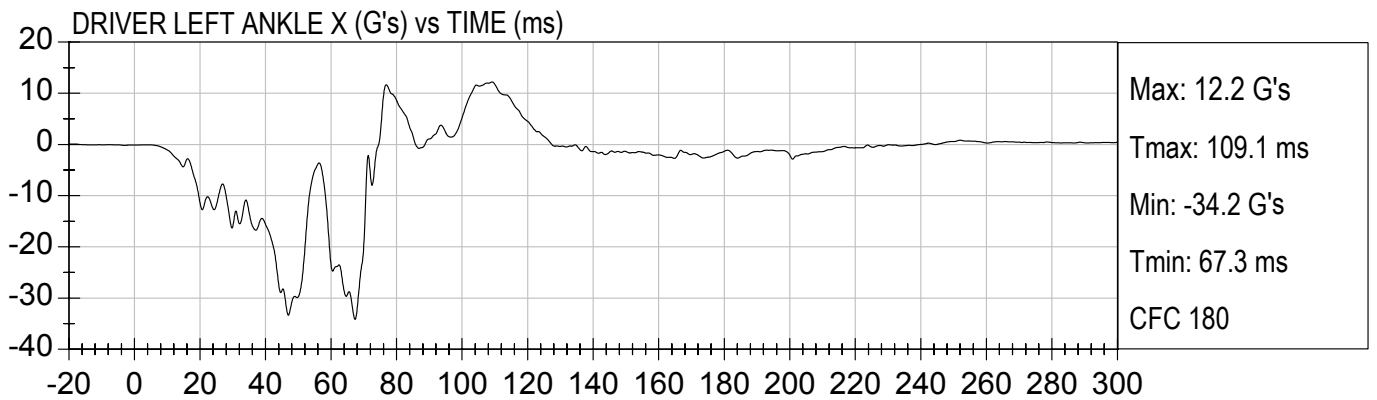
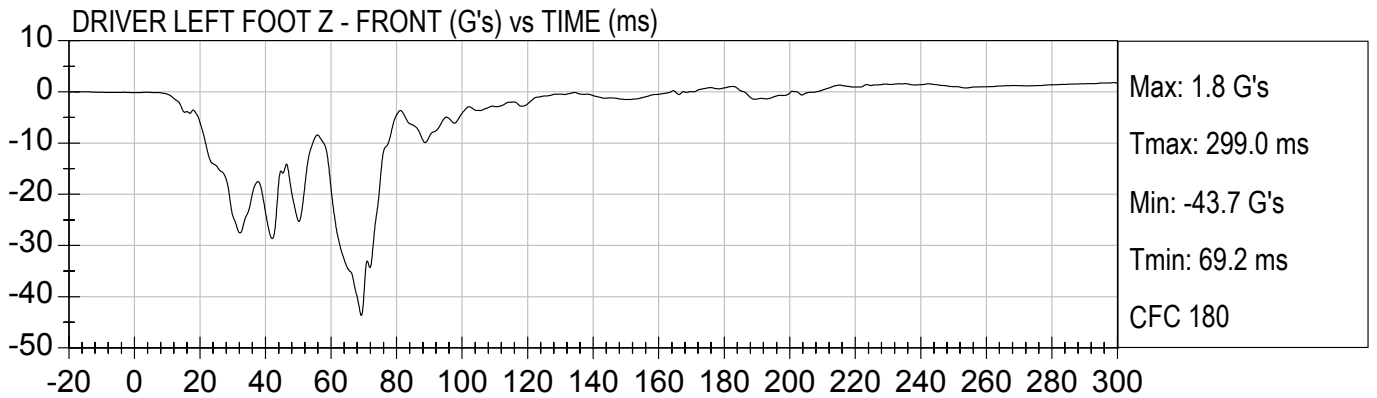
DRIVER RIGHT UPPER TIBIA FX (N) vs TIME (ms)

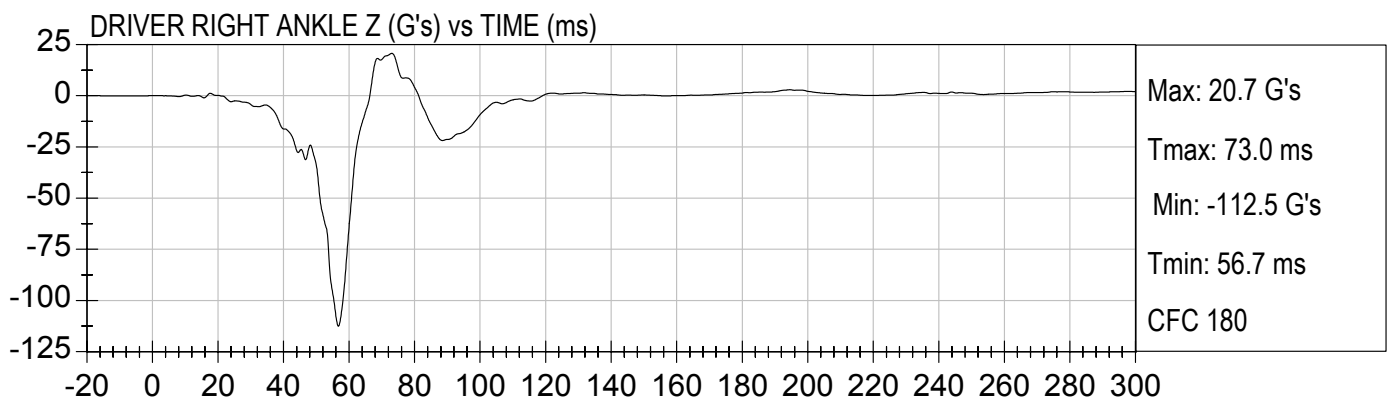
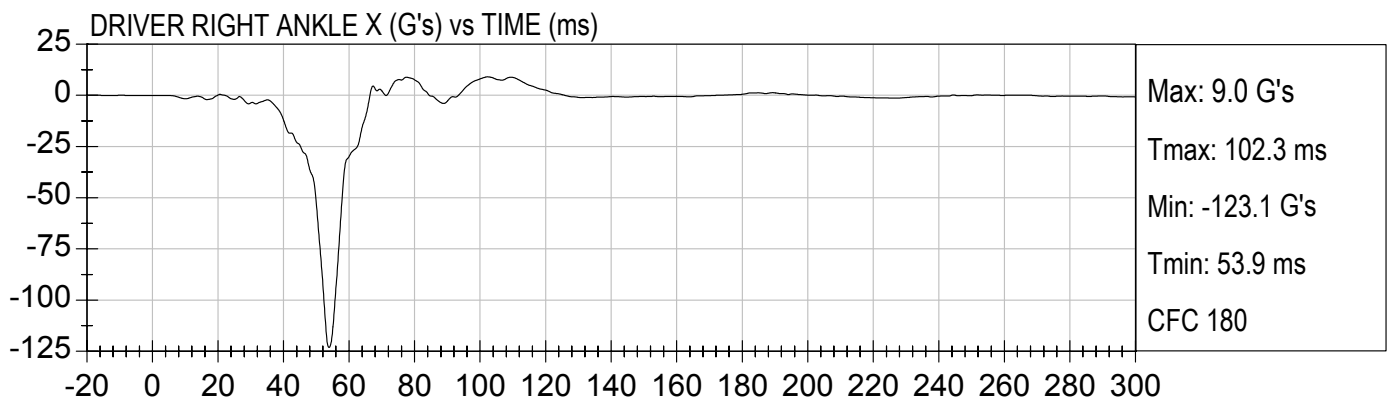
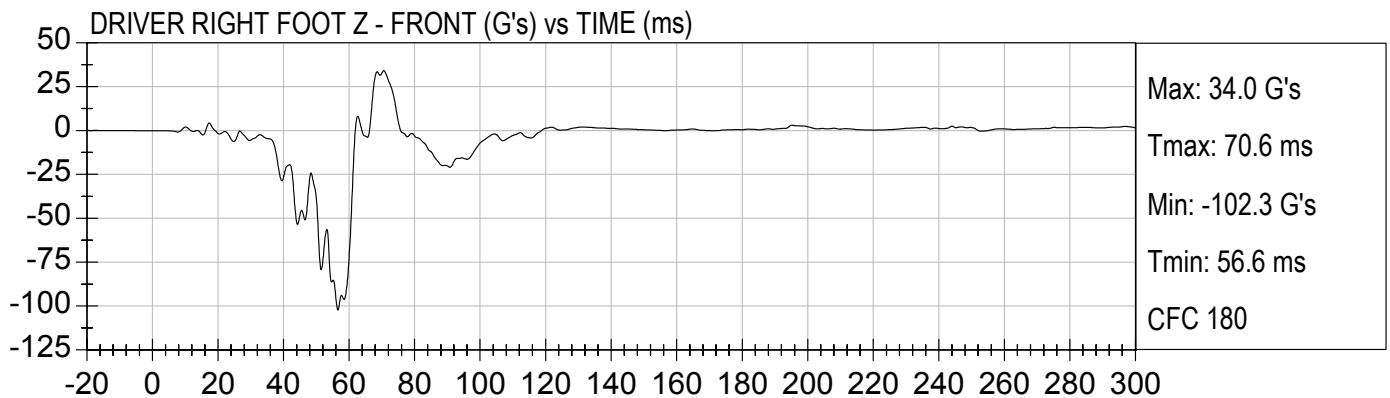


DRIVER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)



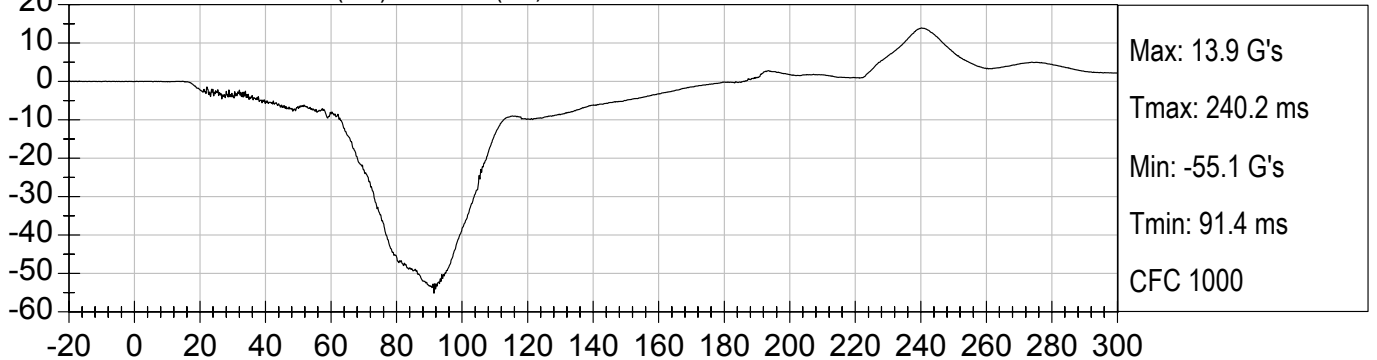




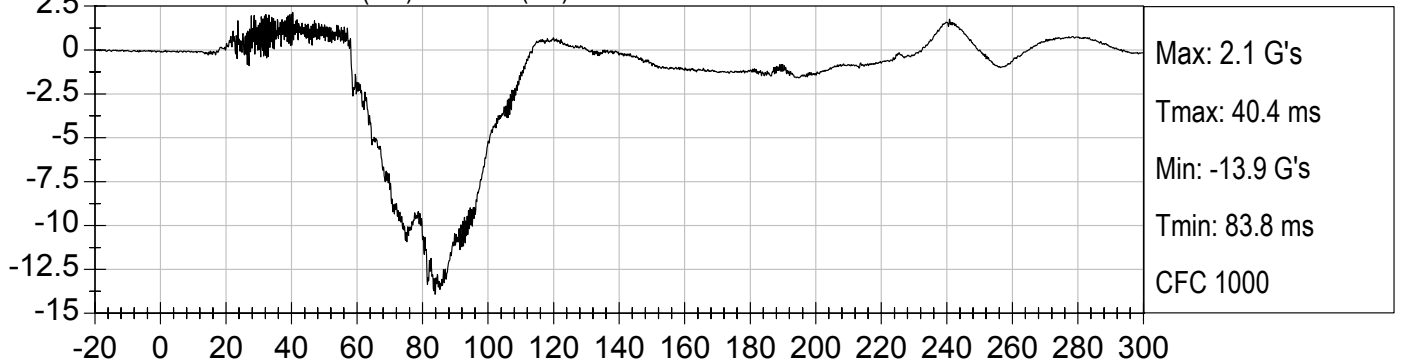




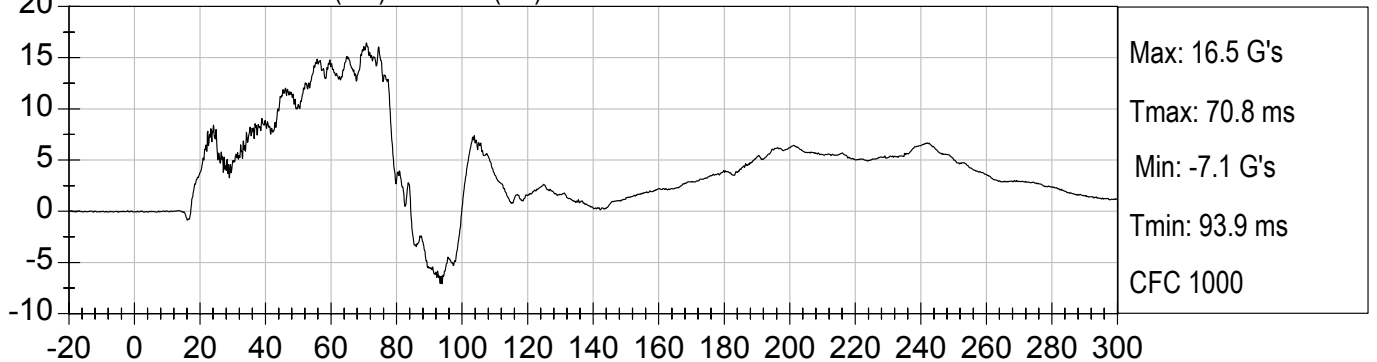
PASSENGER HEAD X (G's) vs TIME (ms)



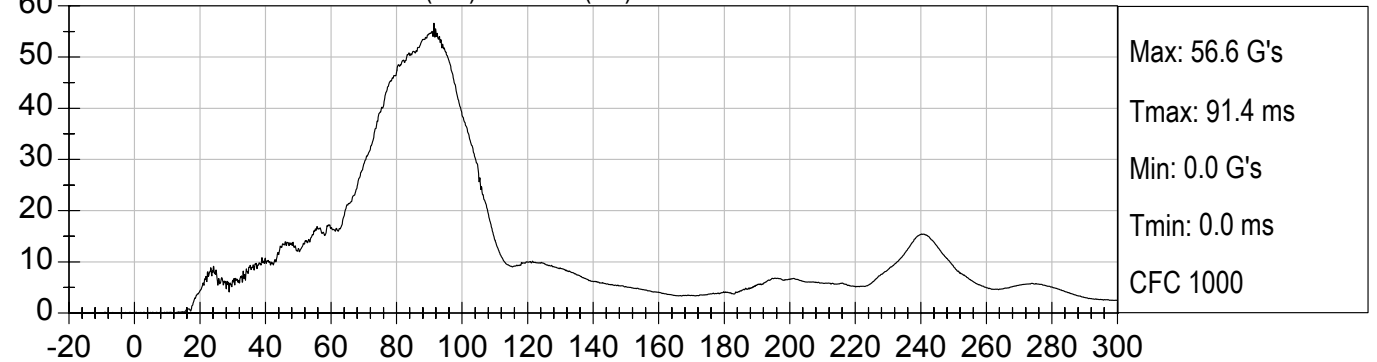
PASSENGER HEAD Y (G's) vs TIME (ms)



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

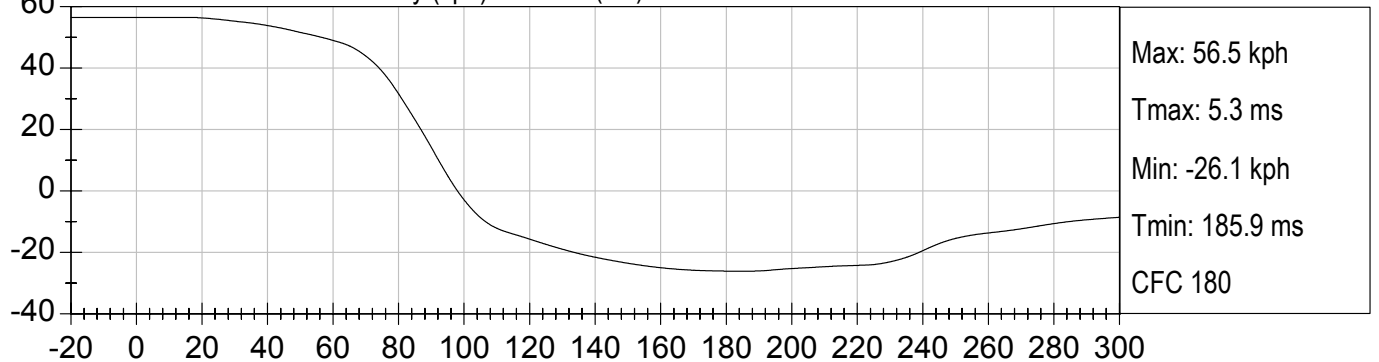


PASSENGER HEAD Resultant (G's) vs TIME (ms)

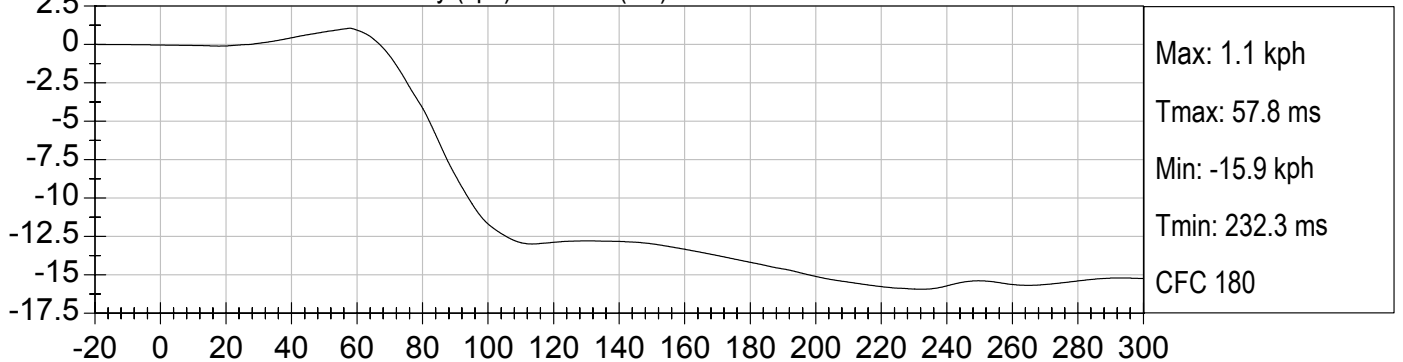




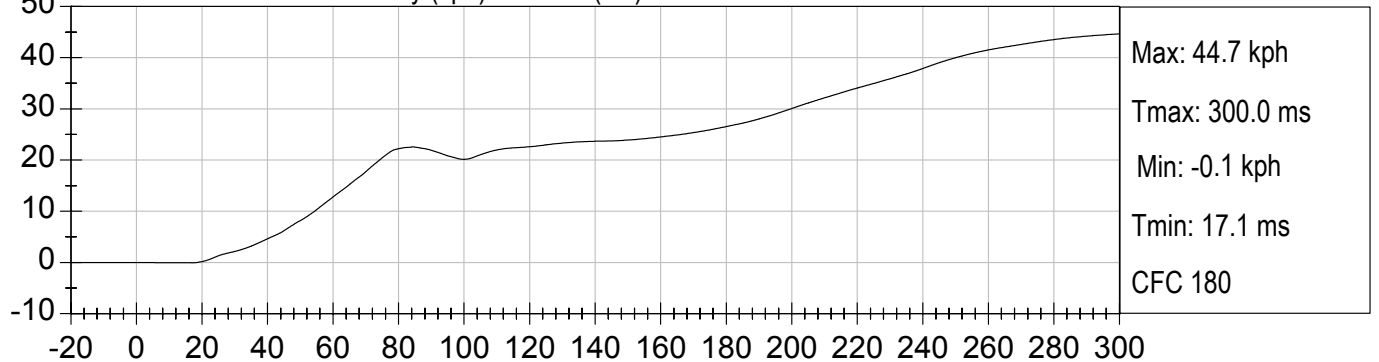
PASSENGER HEAD X Velocity (kph) vs TIME (ms)



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



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

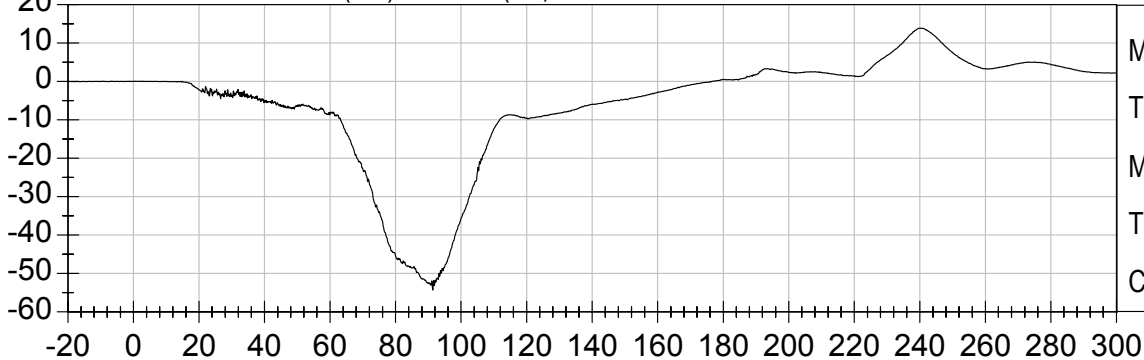




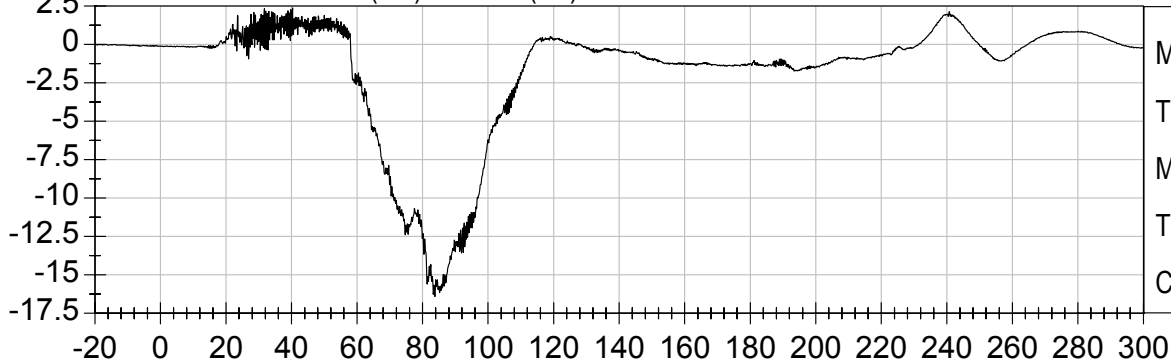
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

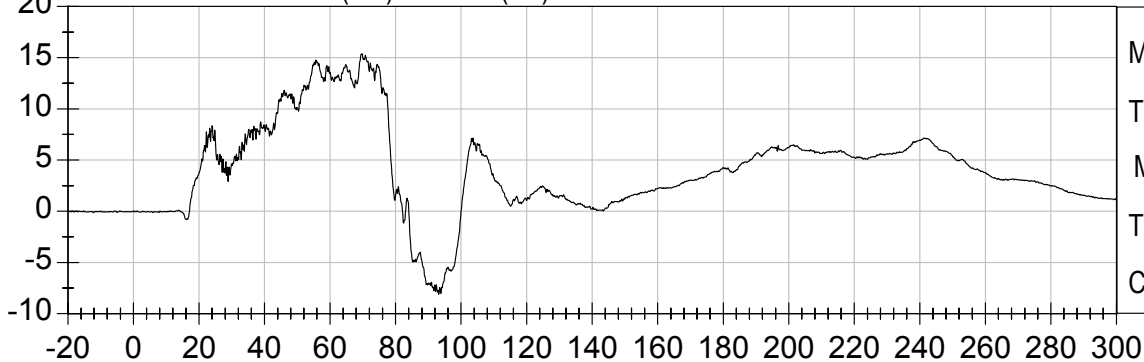
PASSENGER HEAD Xr (G's) vs TIME (ms)



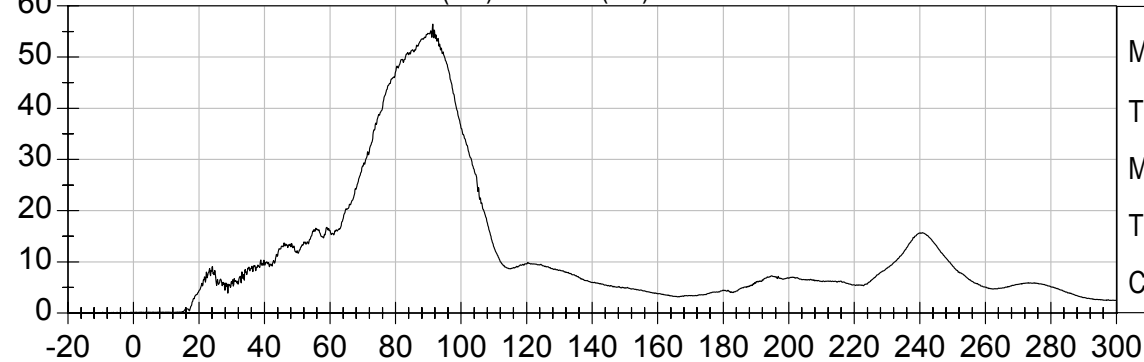
PASSENGER HEAD Yr (G's) vs TIME (ms)



PASSENGER HEAD Zr (G's) vs TIME (ms)

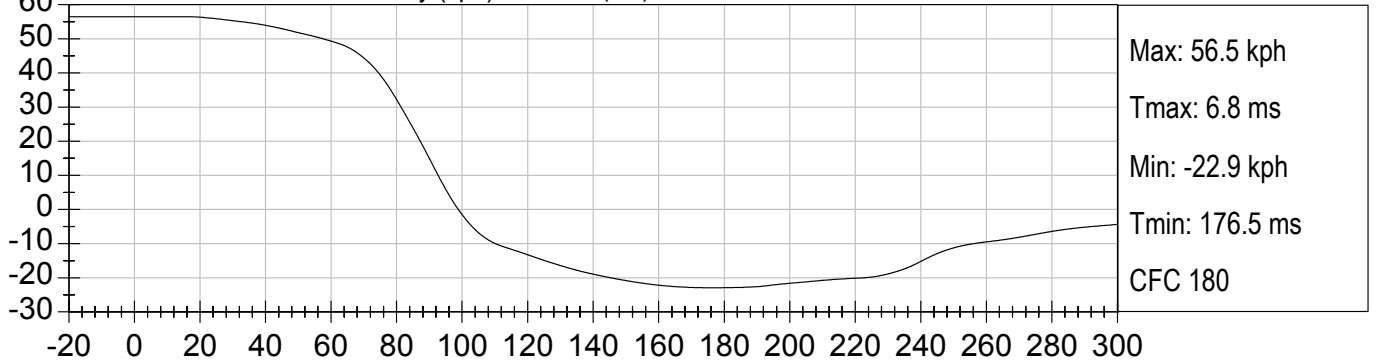


PASSENGER HEAD ResultantR (G's) vs TIME (ms)

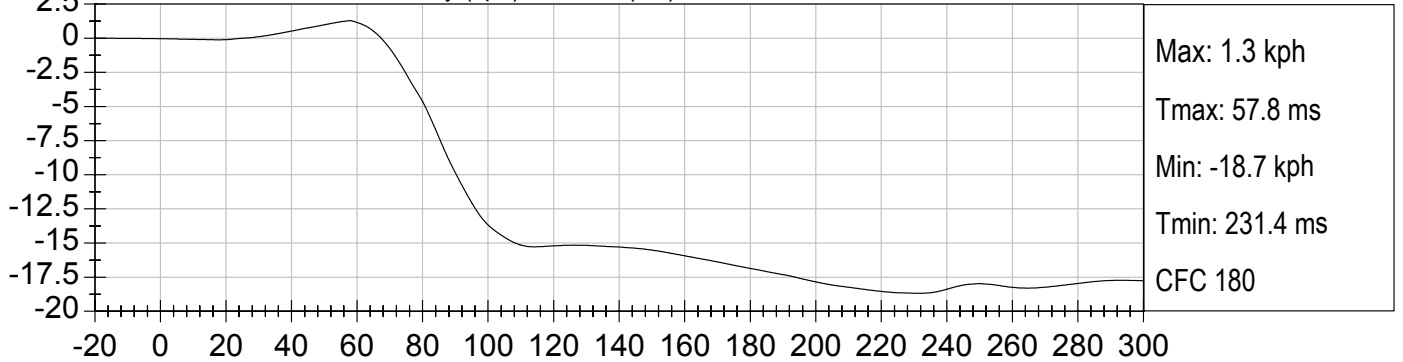




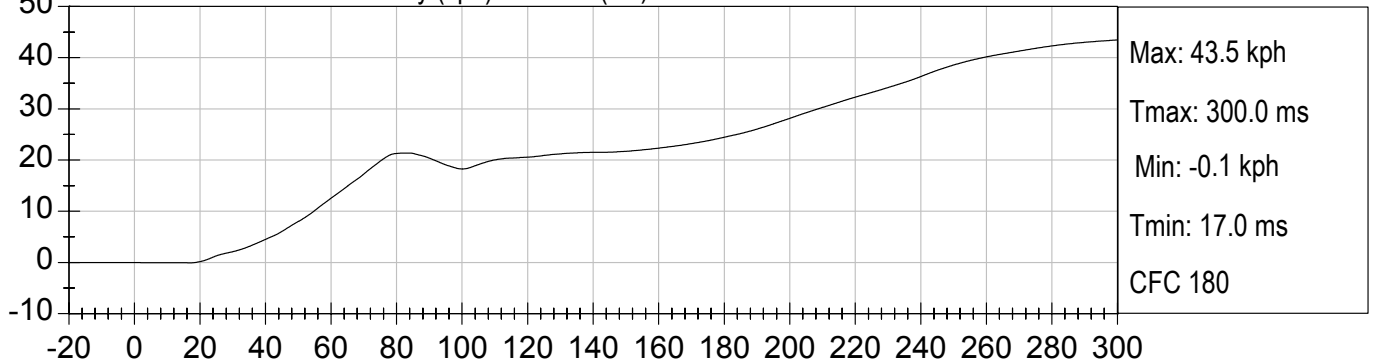
PASSENGER HEAD Xr Velocity (kph) vs TIME (ms)



PASSENGER HEAD Yr Velocity (kph) vs TIME (ms)



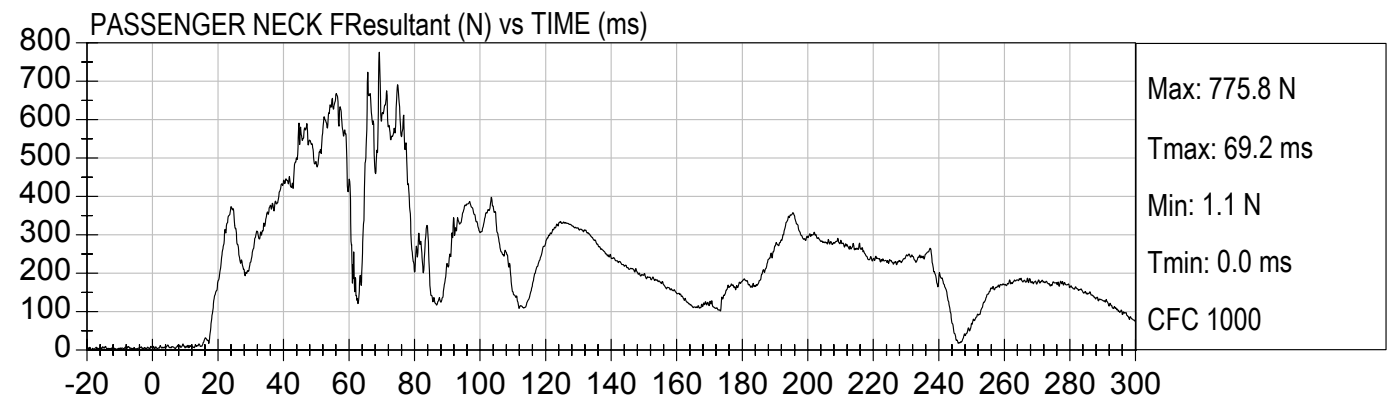
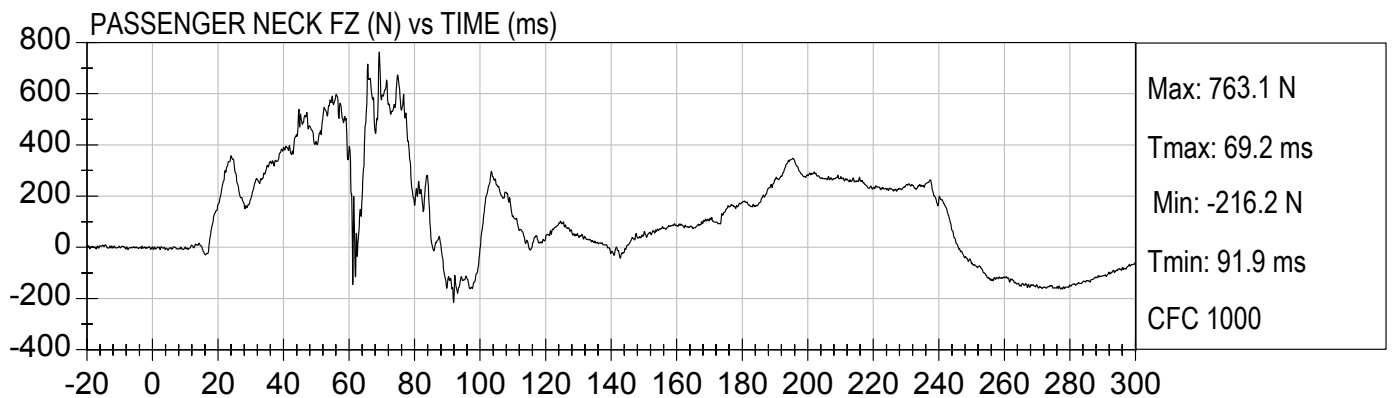
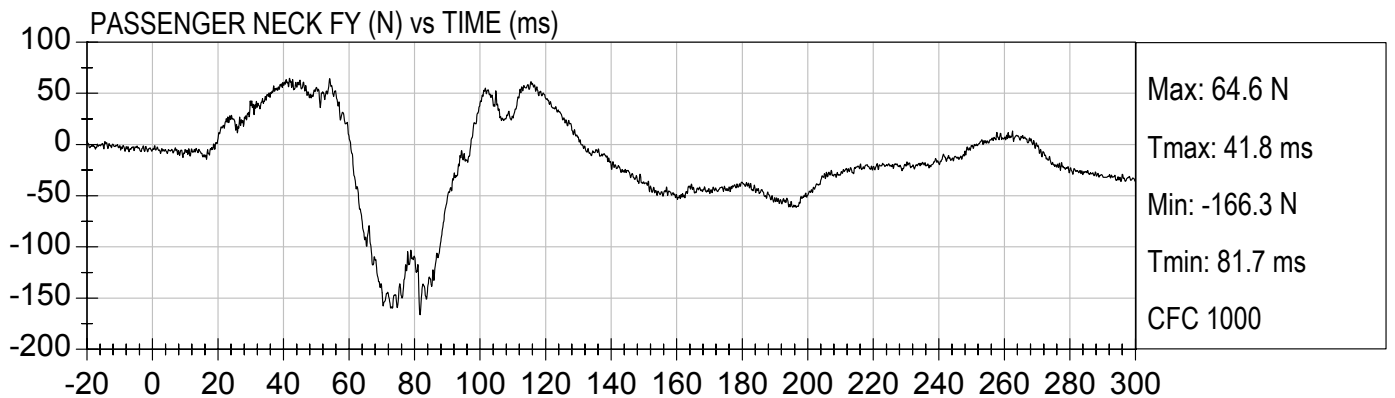
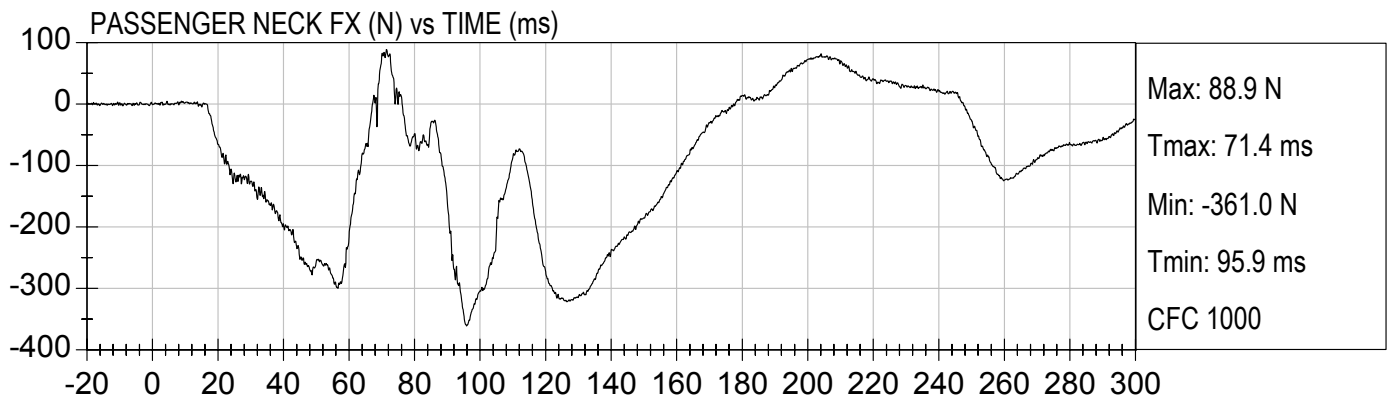
PASSENGER HEAD Zr Velocity (kph) vs TIME (ms)





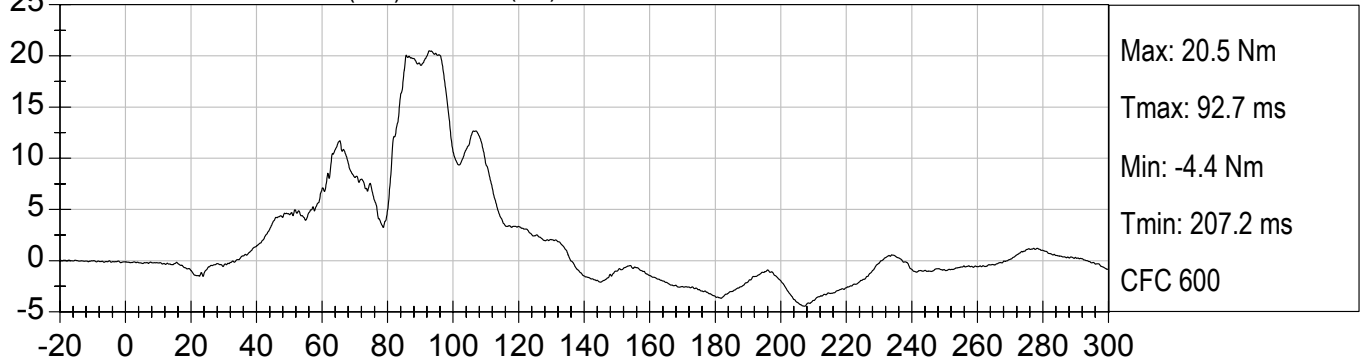
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

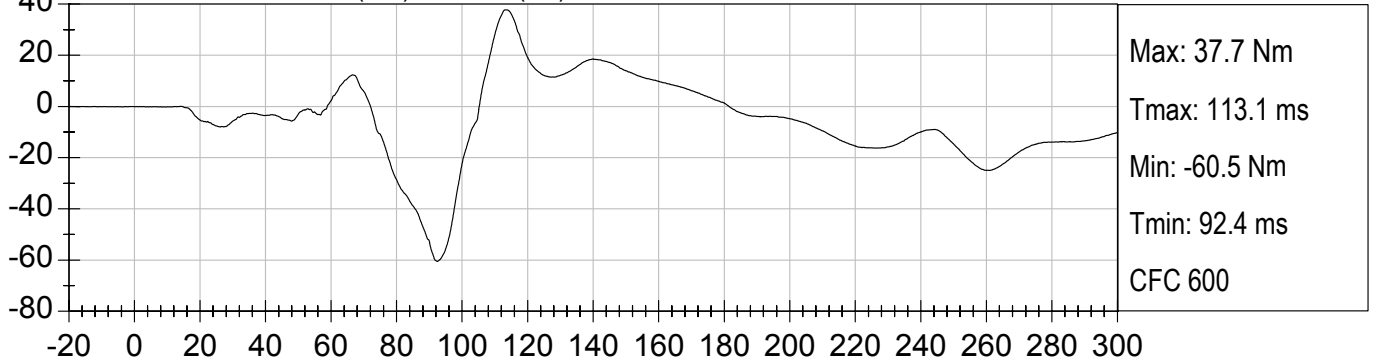




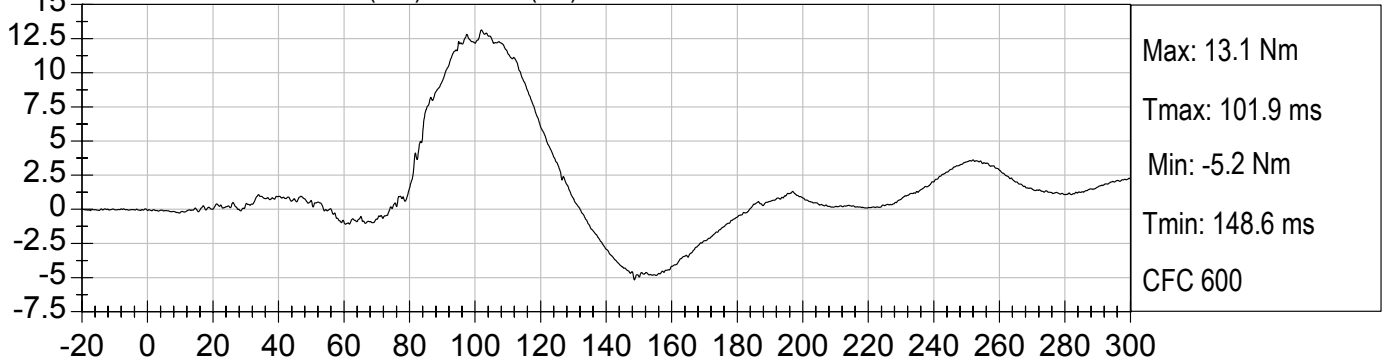
PASSENGER NECK MX (Nm) vs TIME (ms)



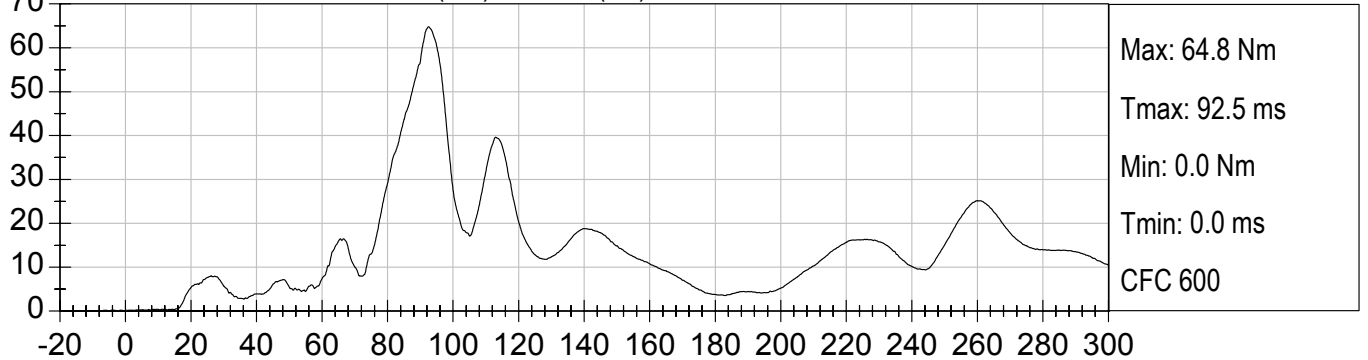
PASSENGER NECK MY (Nm) vs TIME (ms)



PASSENGER NECK MZ (Nm) vs TIME (ms)

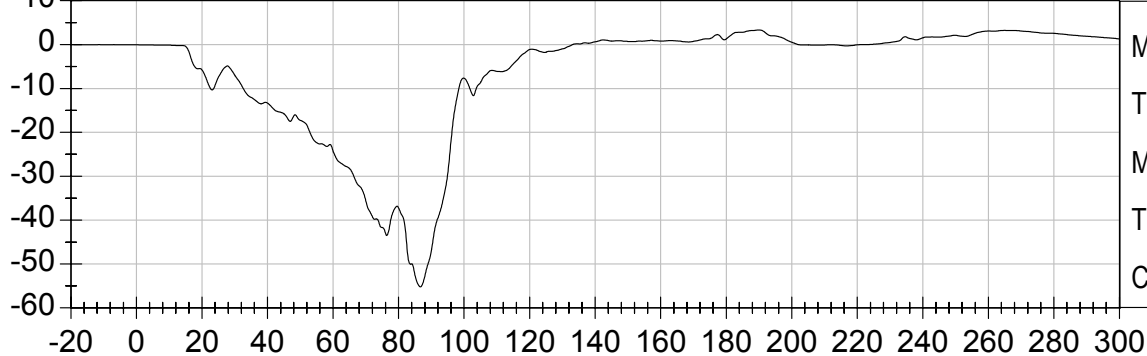


PASSENGER NECK MResultant (Nm) vs TIME (ms)

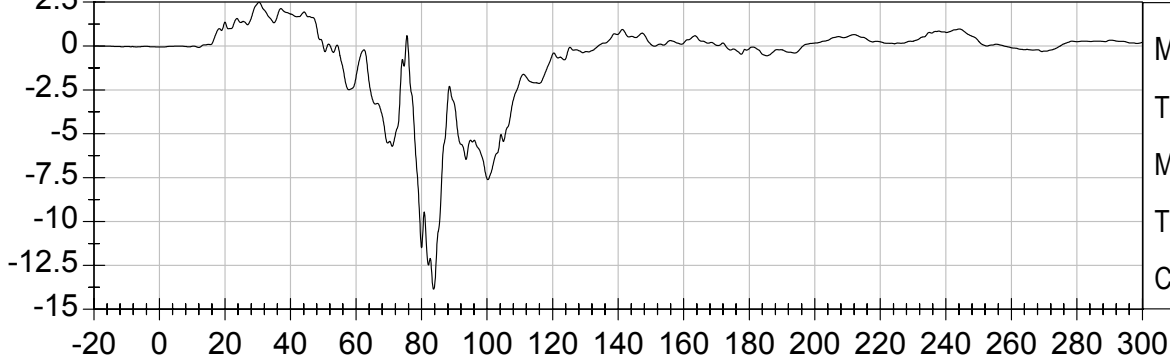




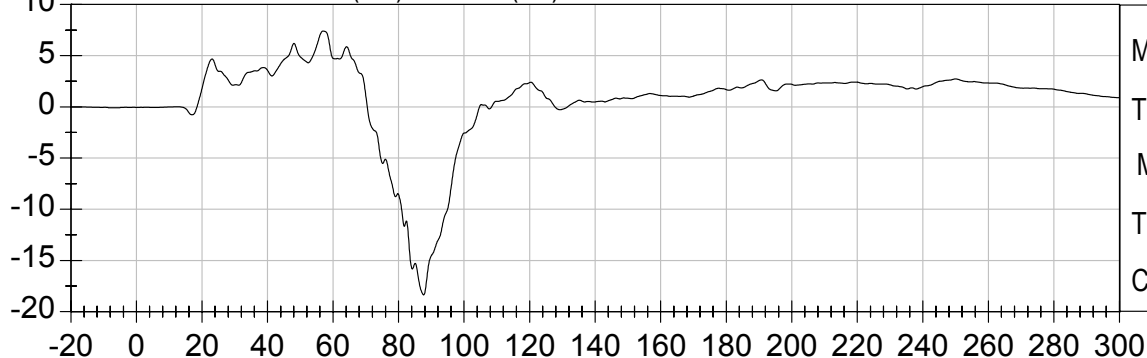
PASSENGER CHEST X (G's) vs TIME (ms)



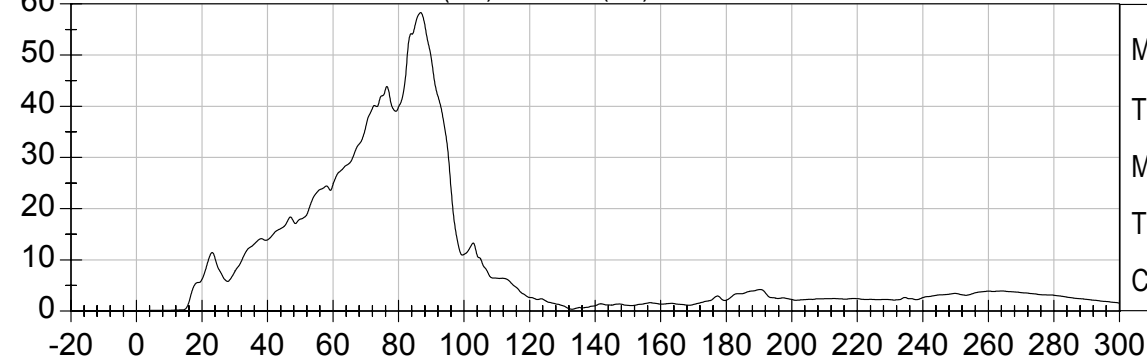
PASSENGER CHEST Y (G's) vs TIME (ms)

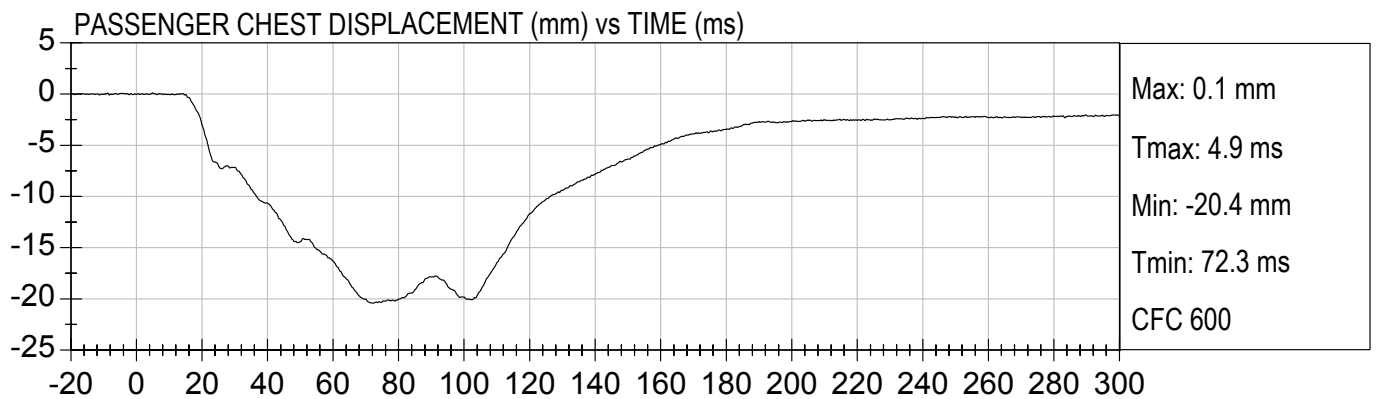
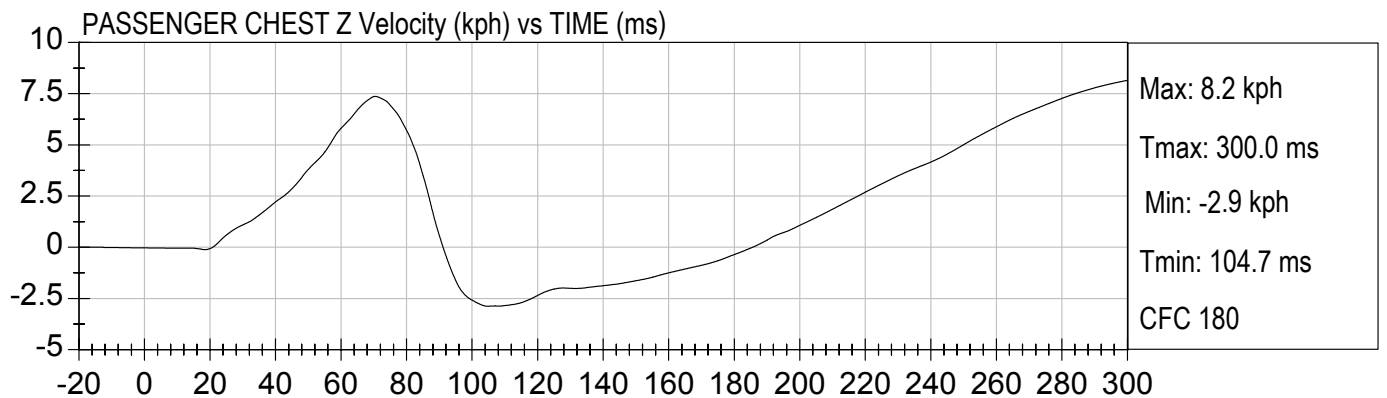
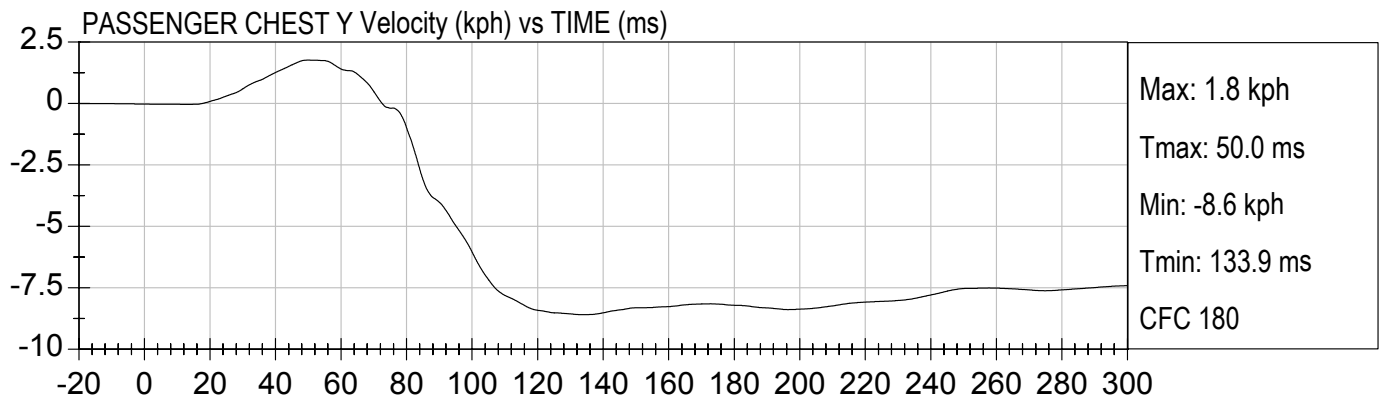
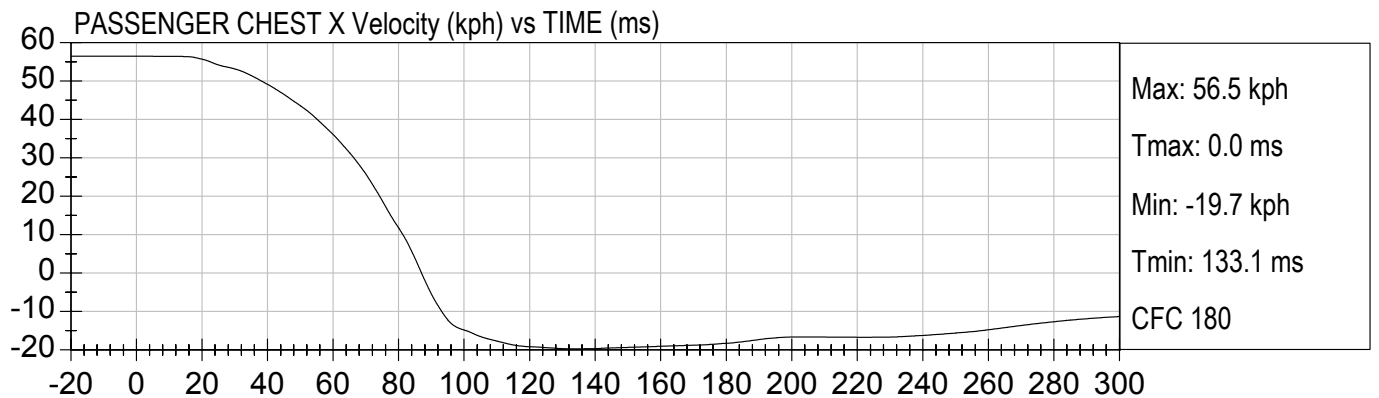


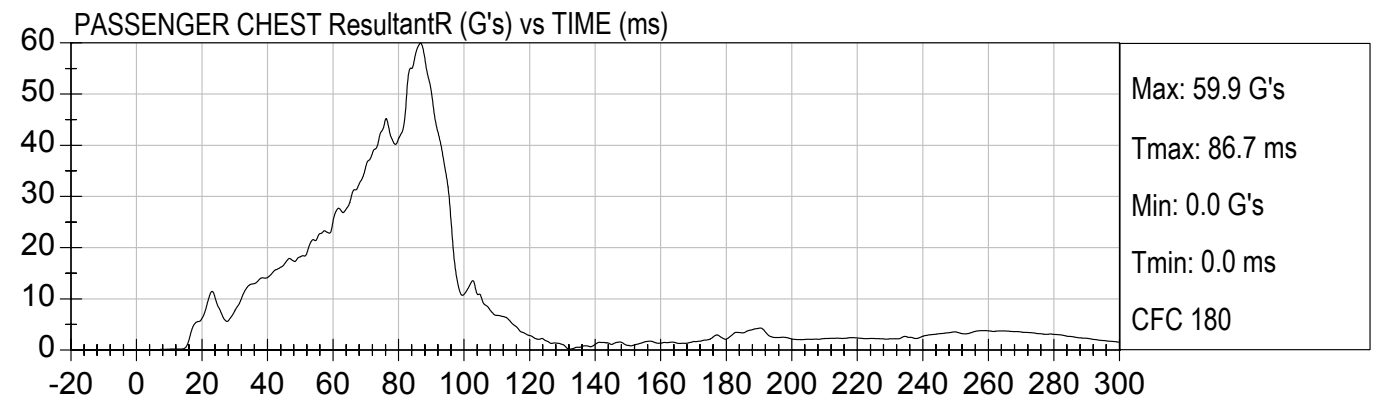
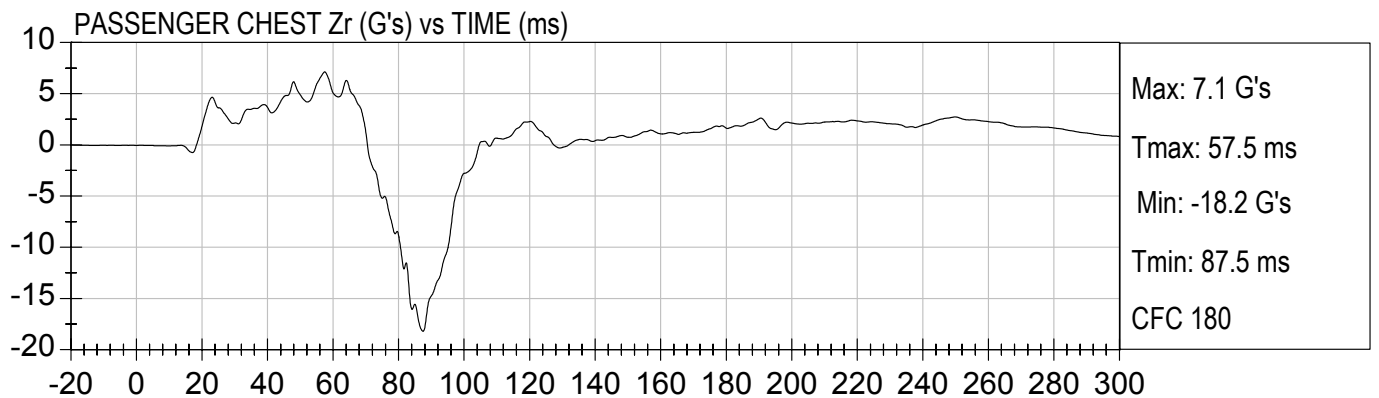
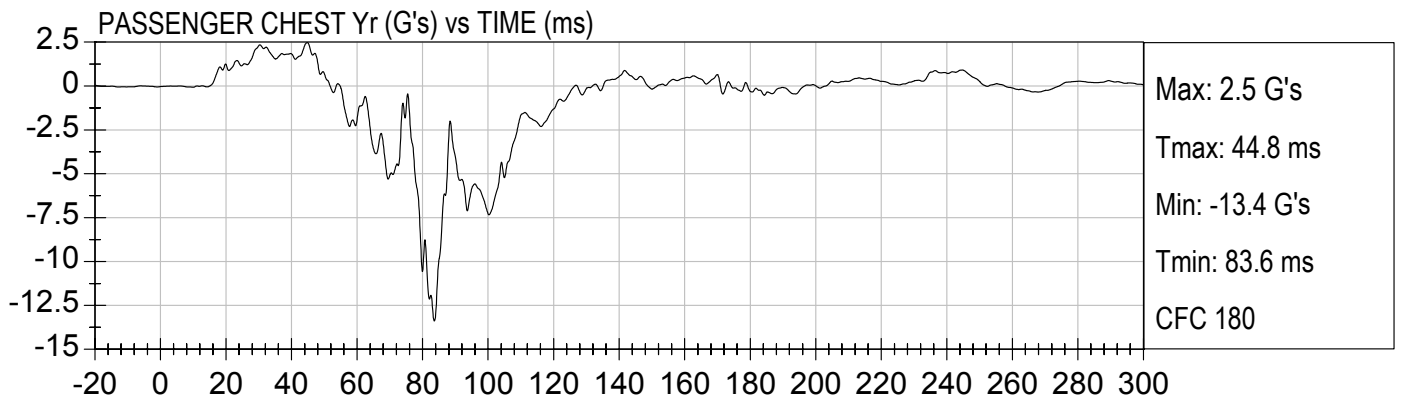
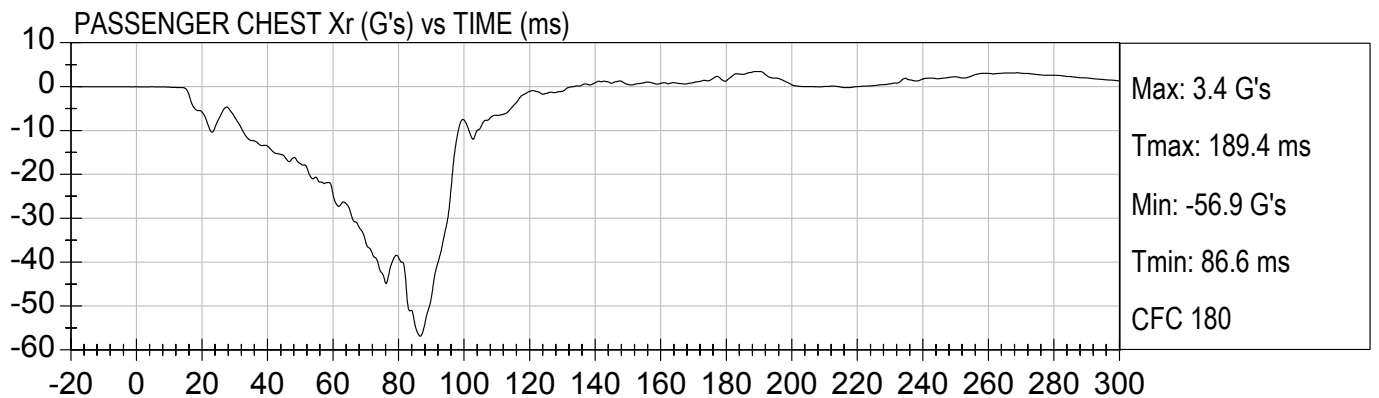
PASSENGER CHEST Z (G's) vs TIME (ms)

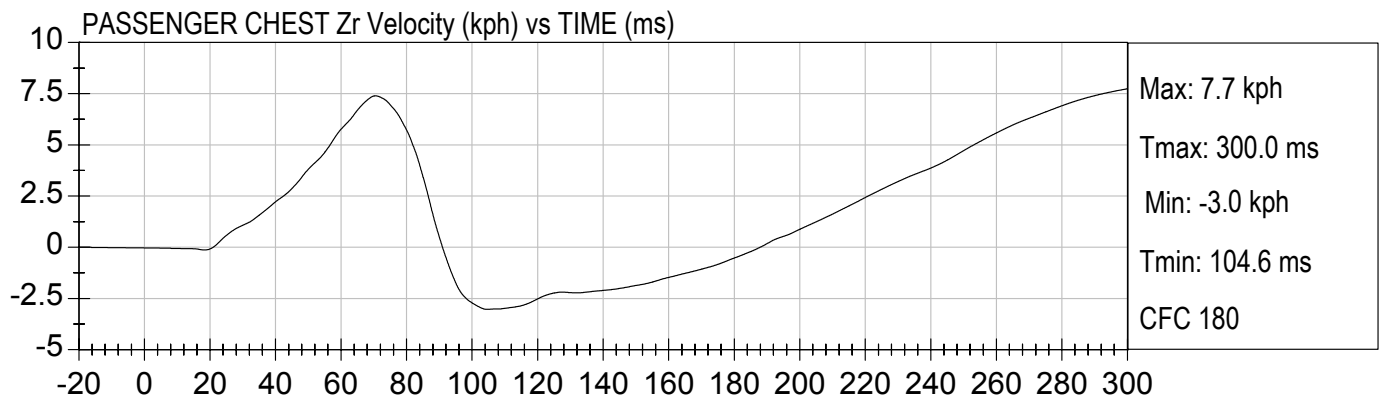
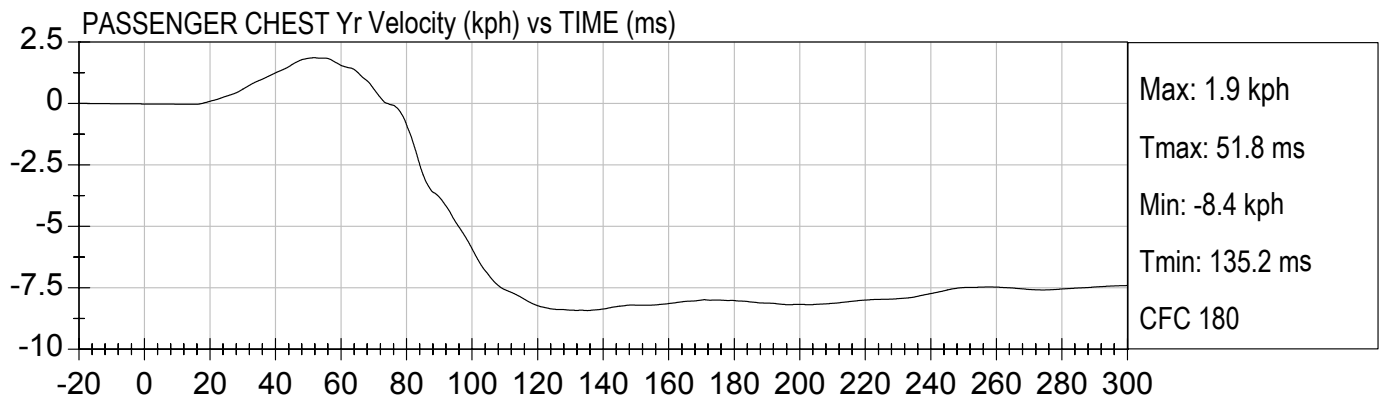
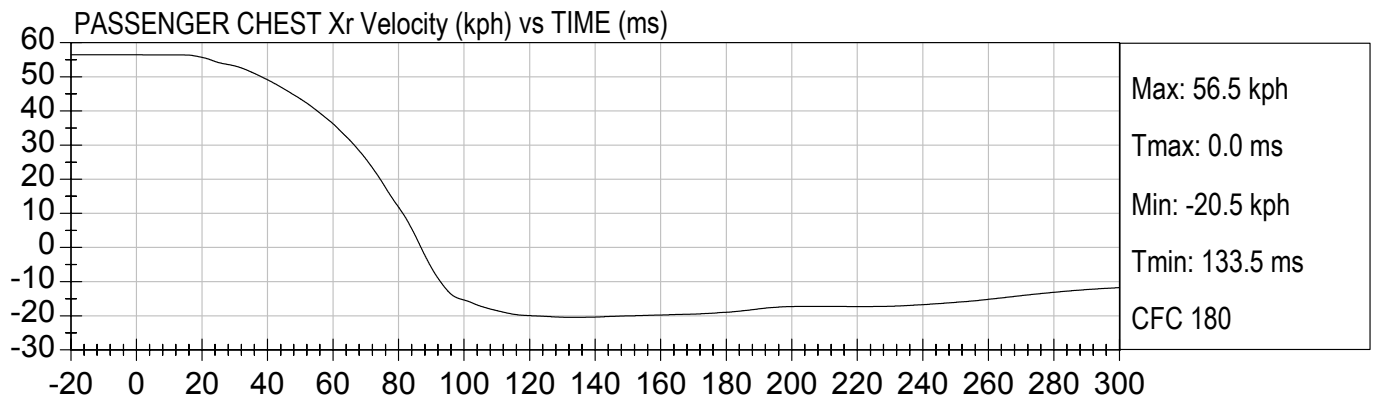


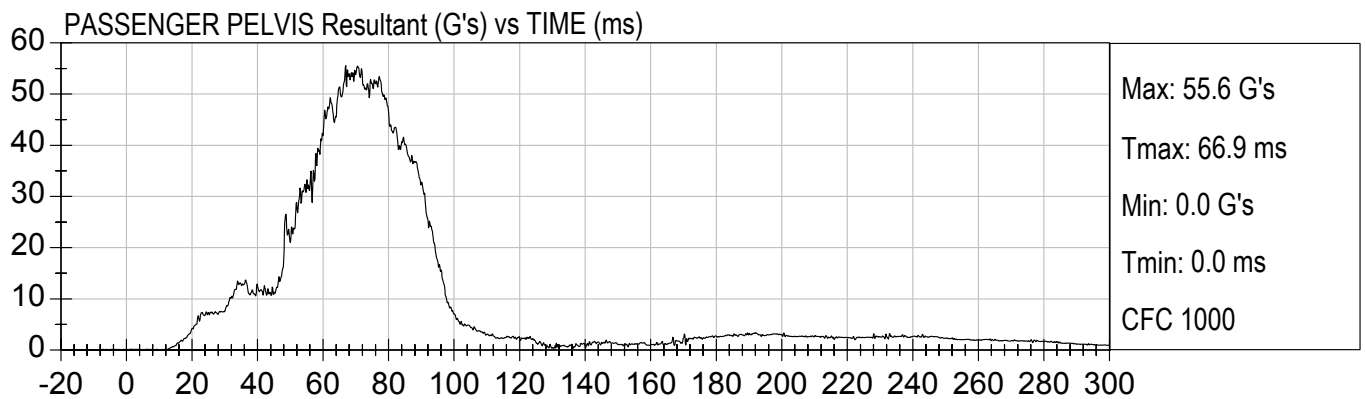
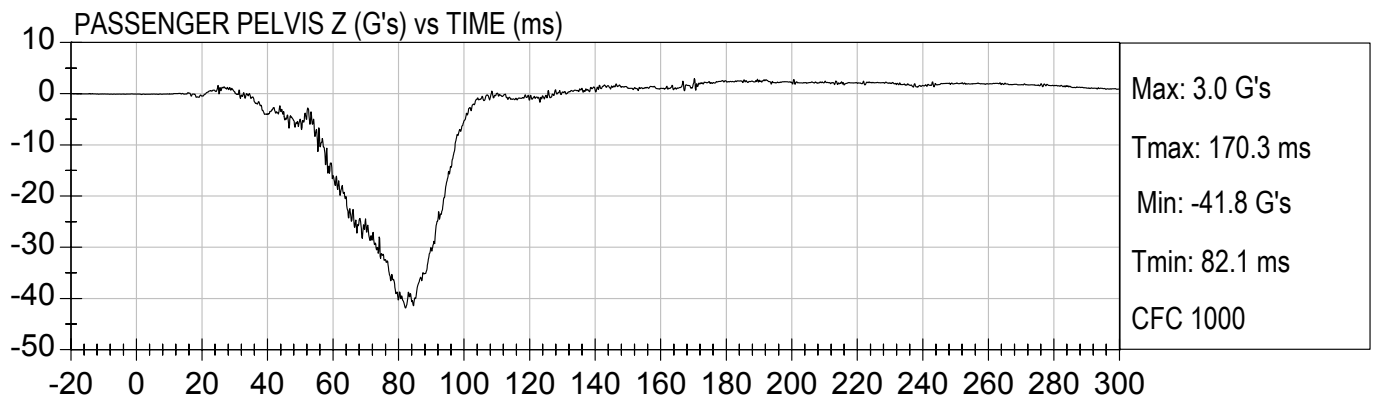
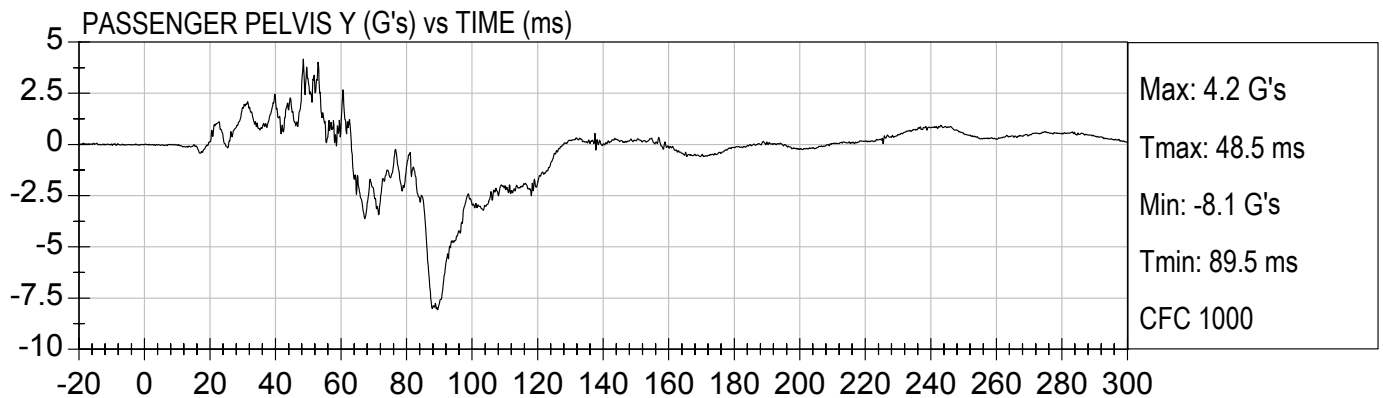
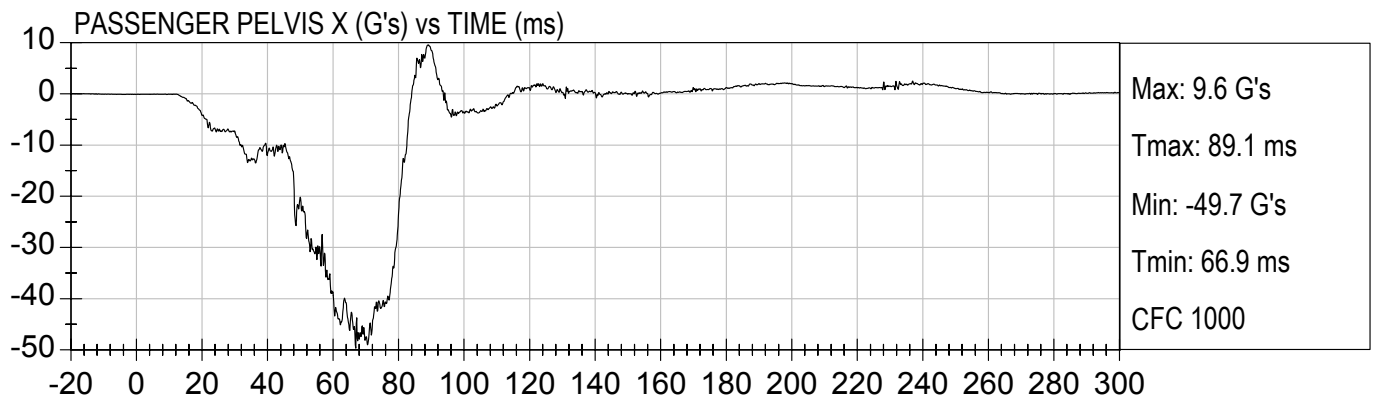
PASSENGER CHEST Resultant (G's) vs TIME (ms)

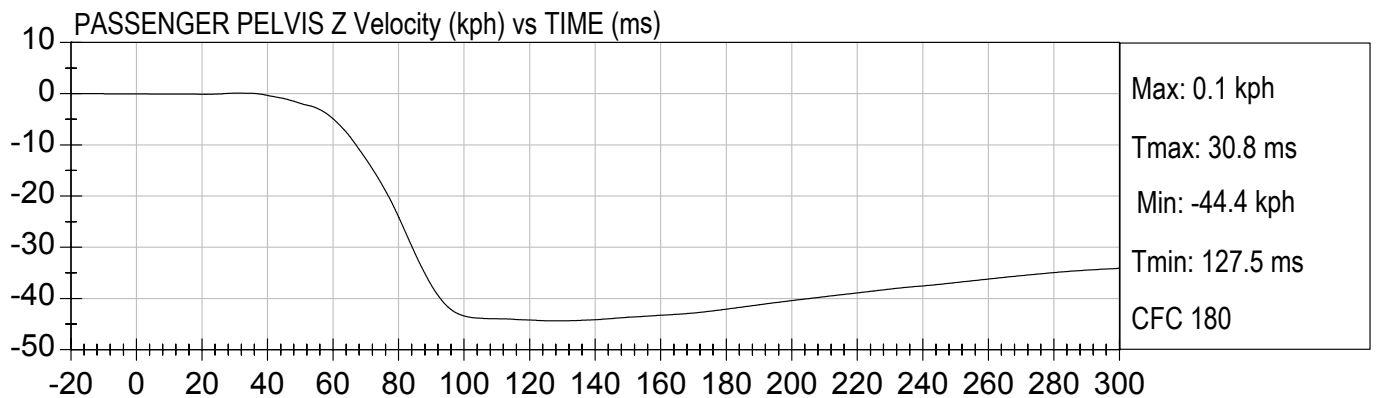
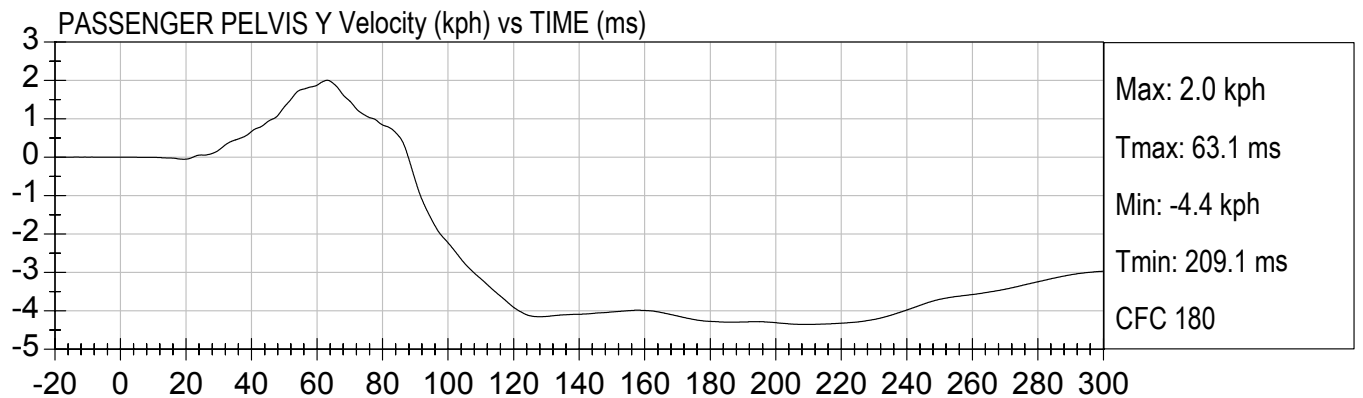
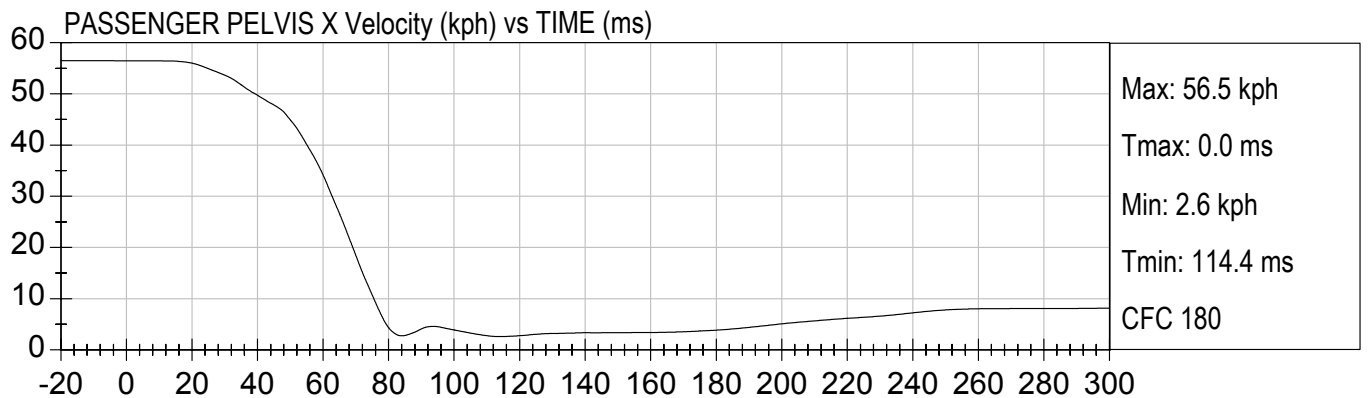






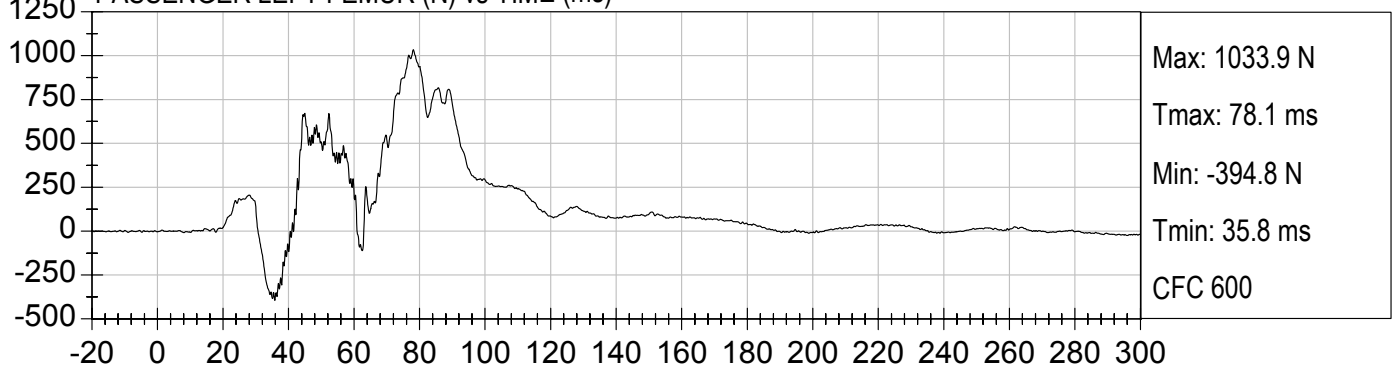




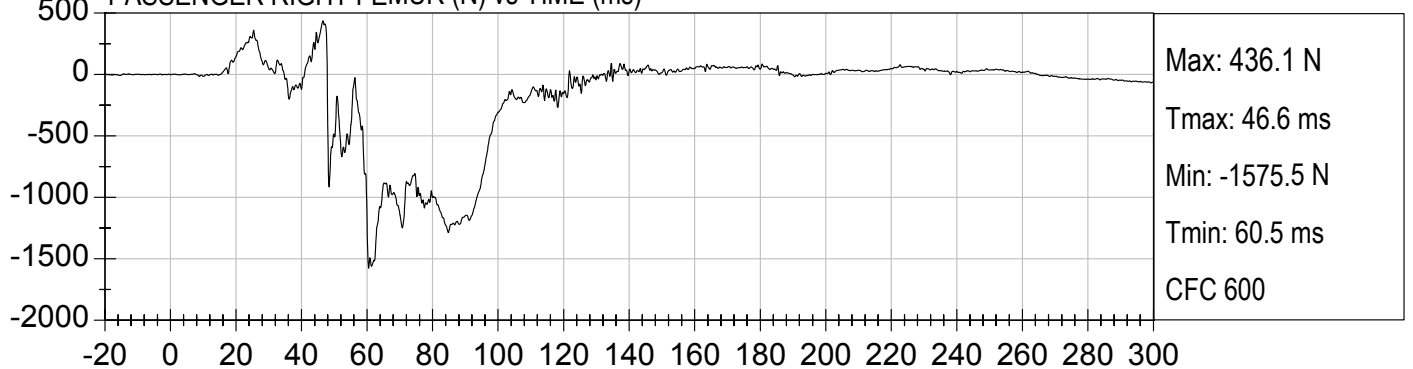




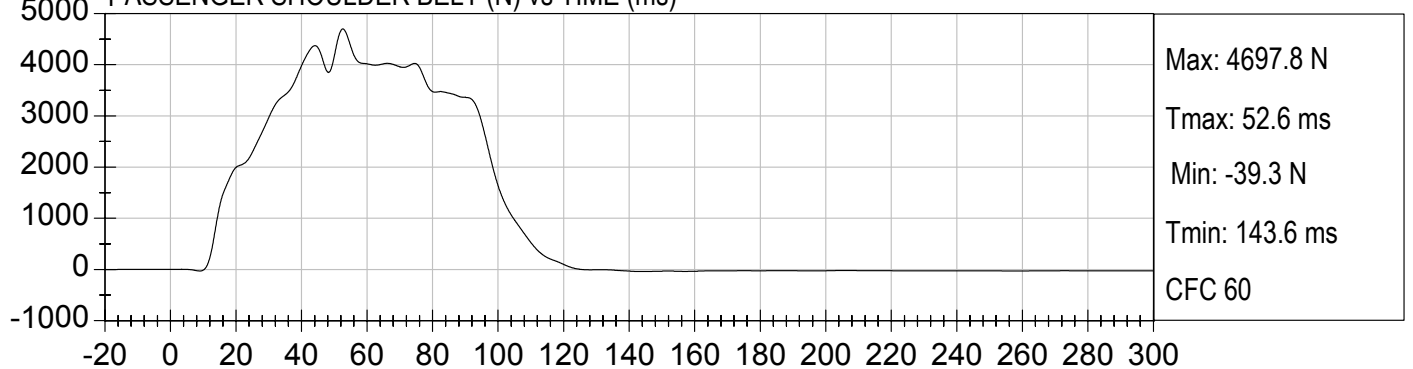
PASSENGER LEFT FEMUR (N) vs TIME (ms)



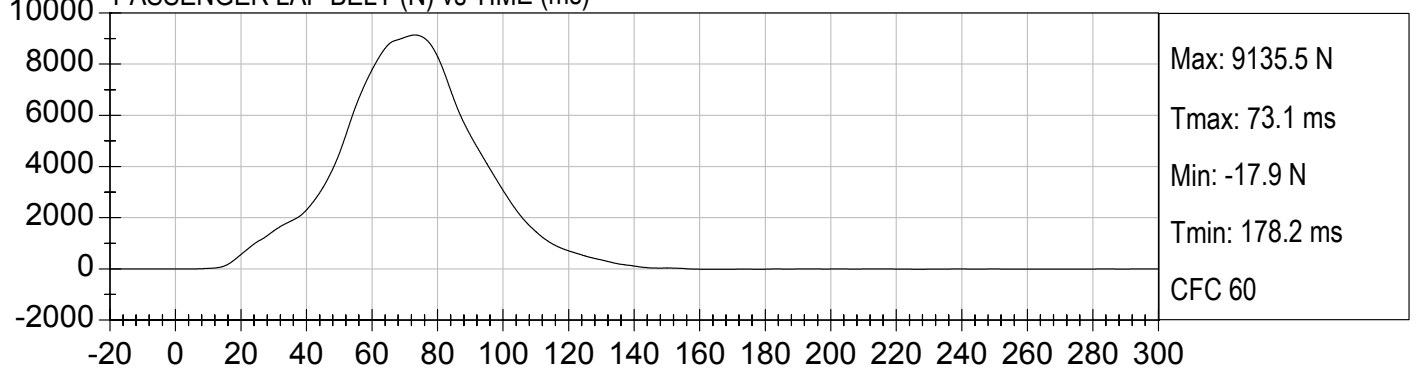
PASSENGER RIGHT FEMUR (N) vs TIME (ms)

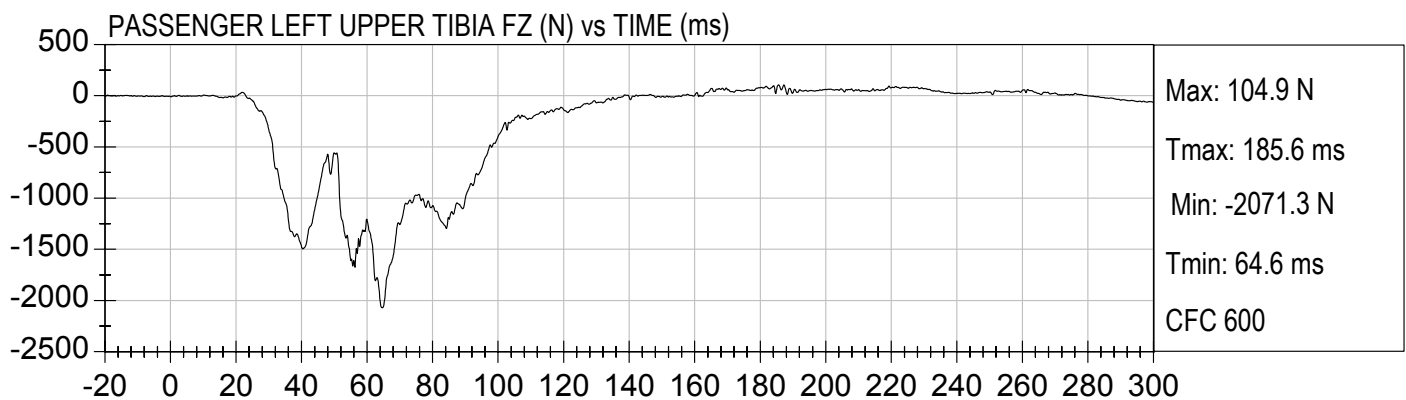
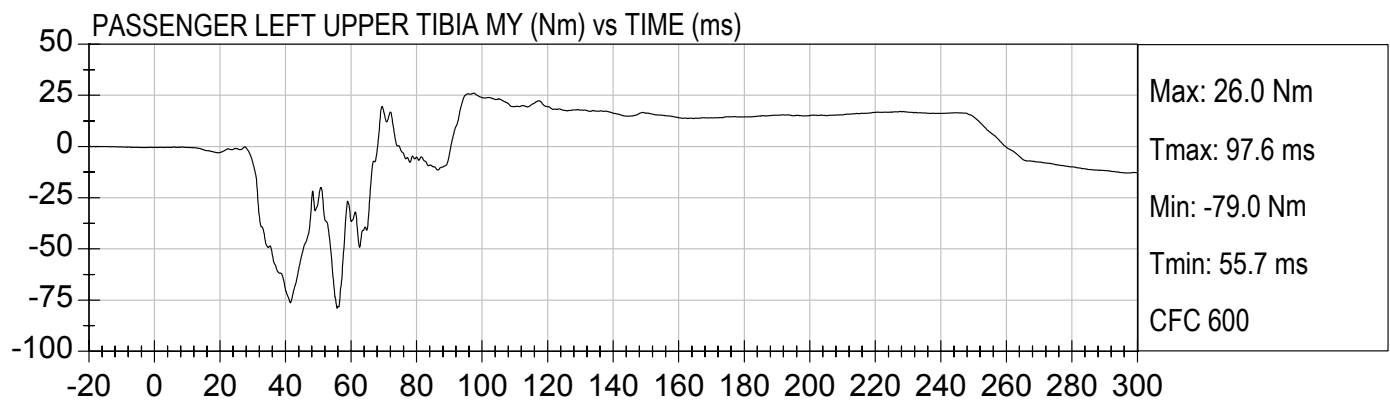
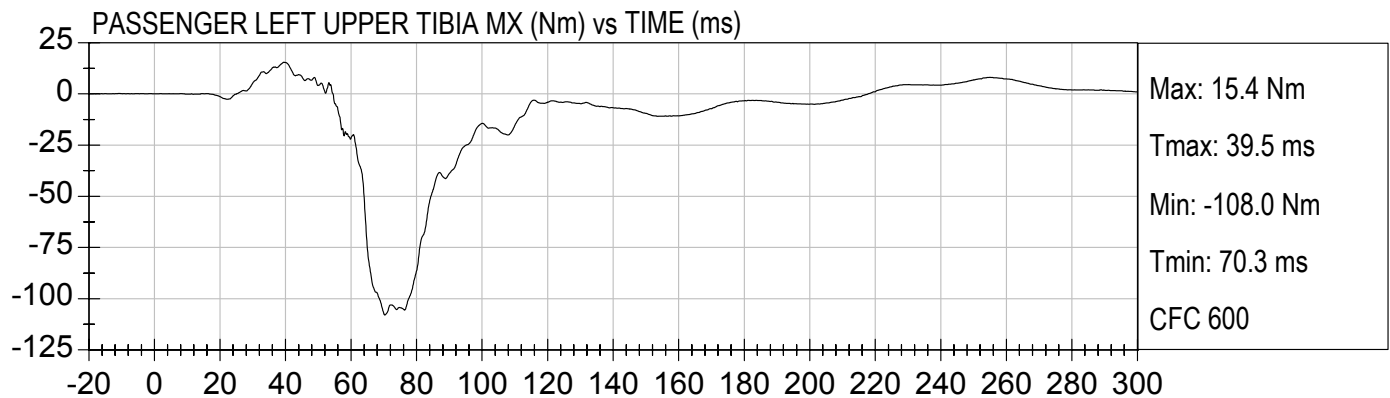


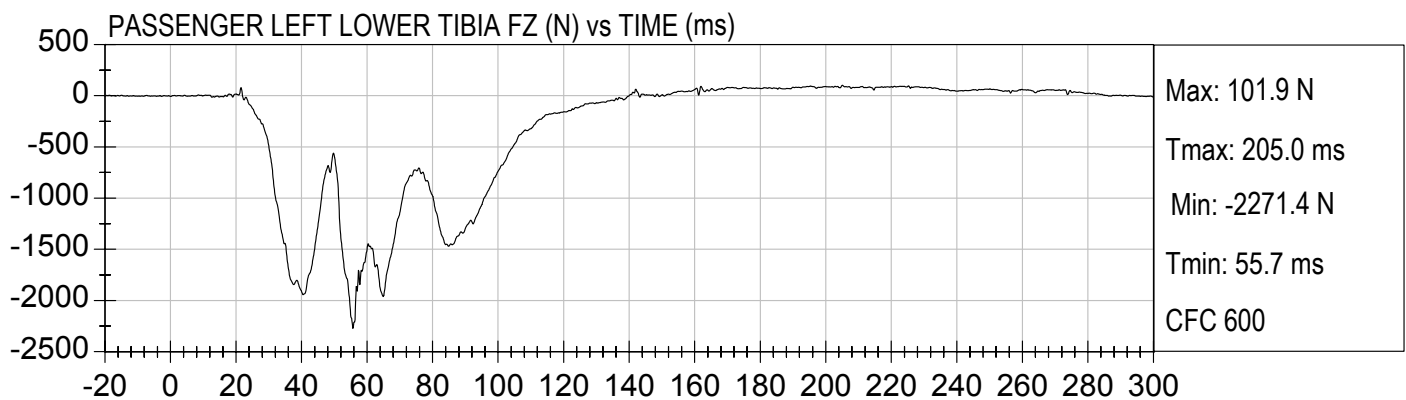
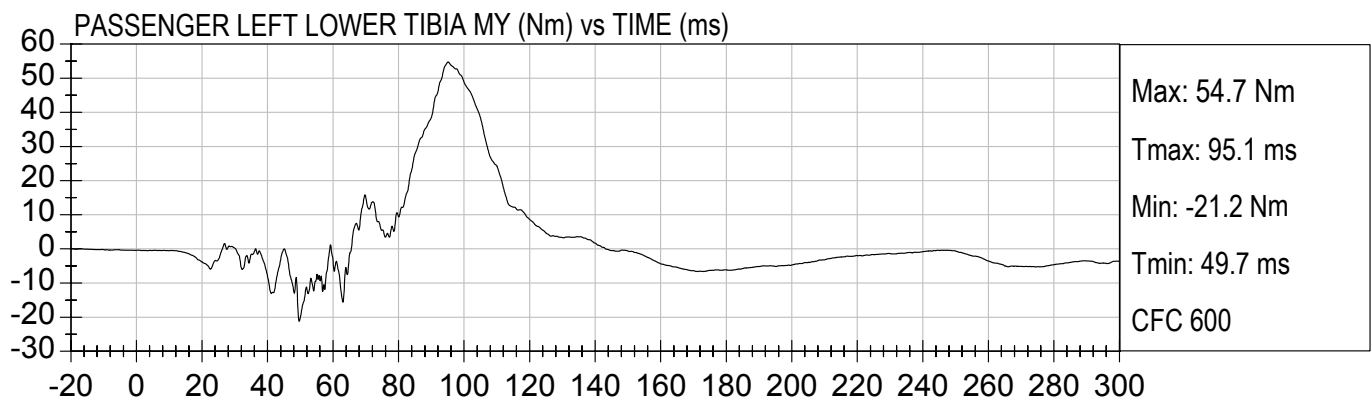
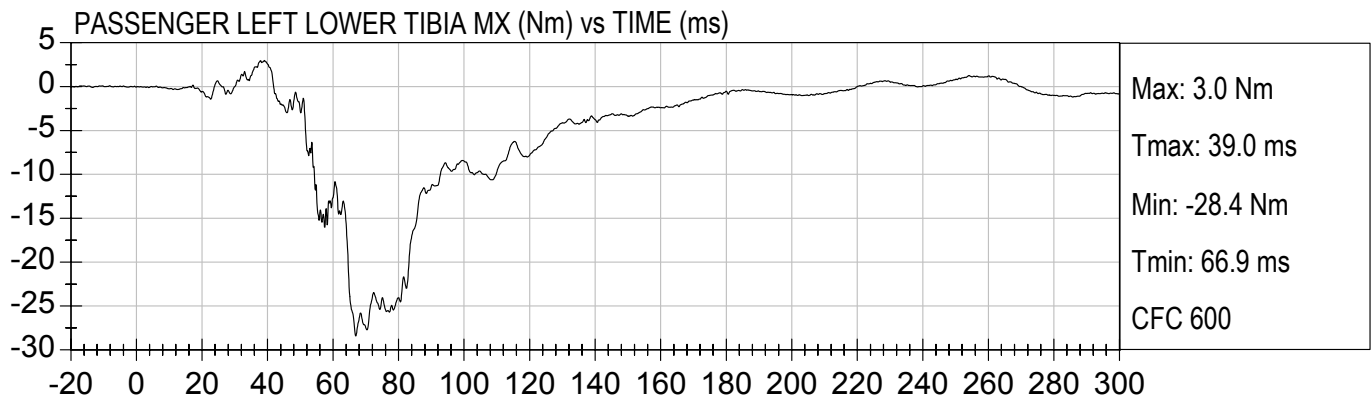
PASSENGER SHOULDER BELT (N) vs TIME (ms)



PASSENGER LAP BELT (N) vs TIME (ms)

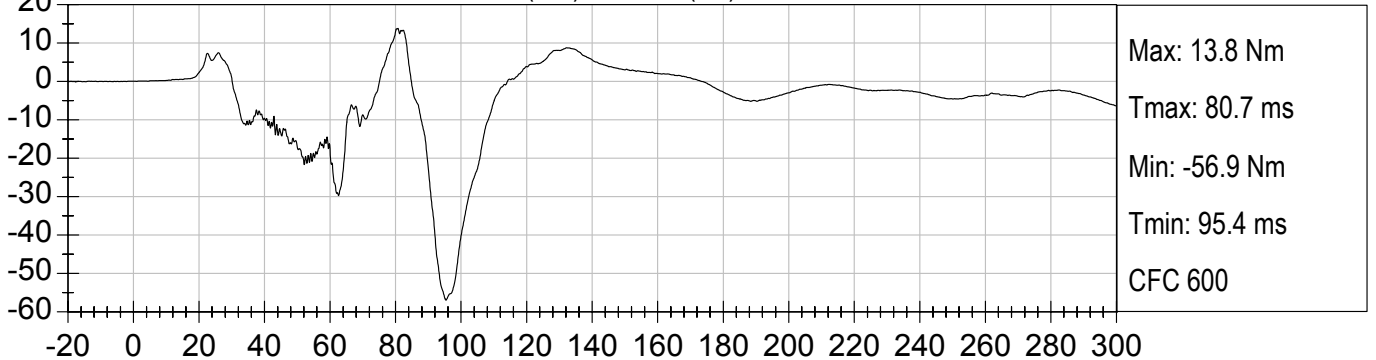




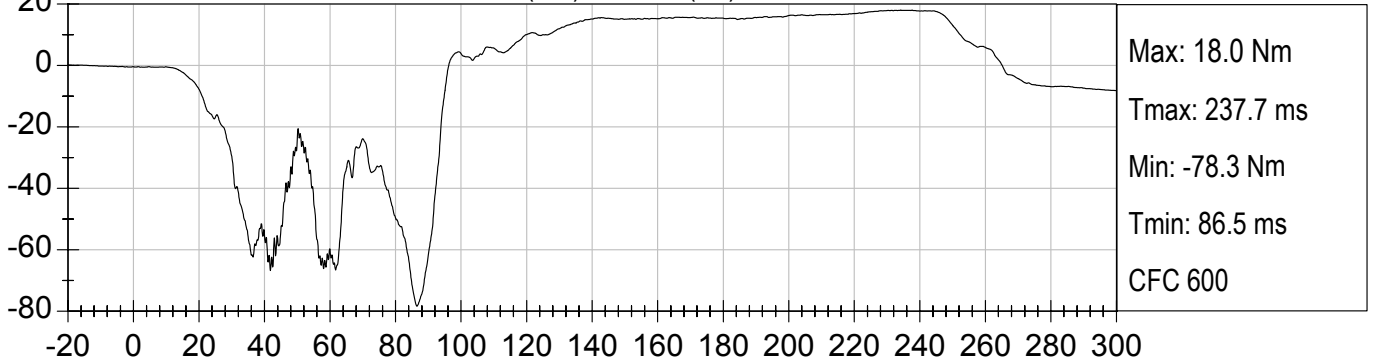




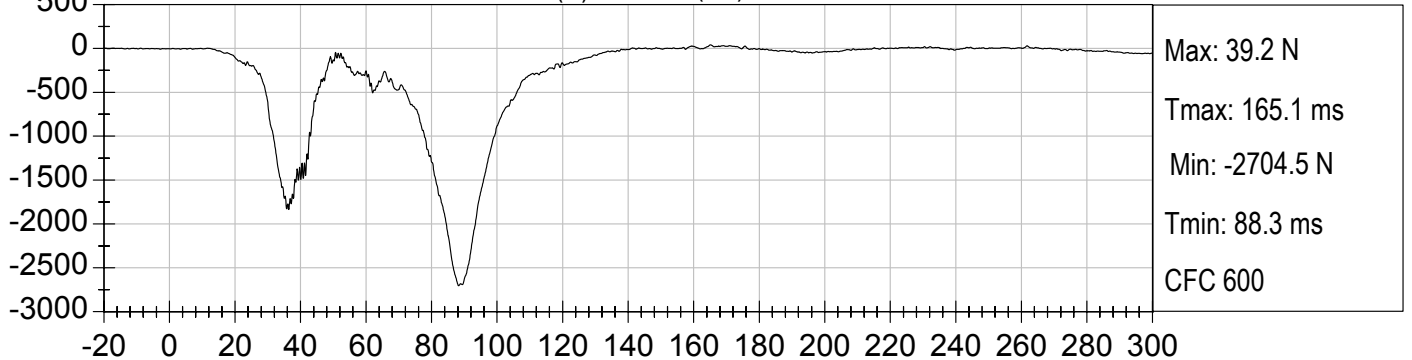
PASSENGER RIGHT UPPER TIBIA MX (Nm) vs TIME (ms)

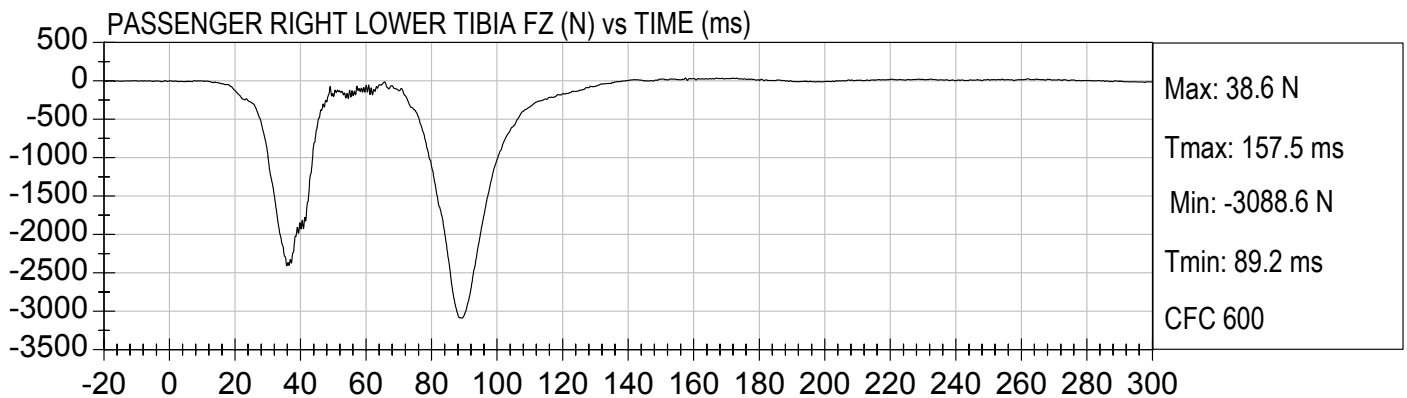
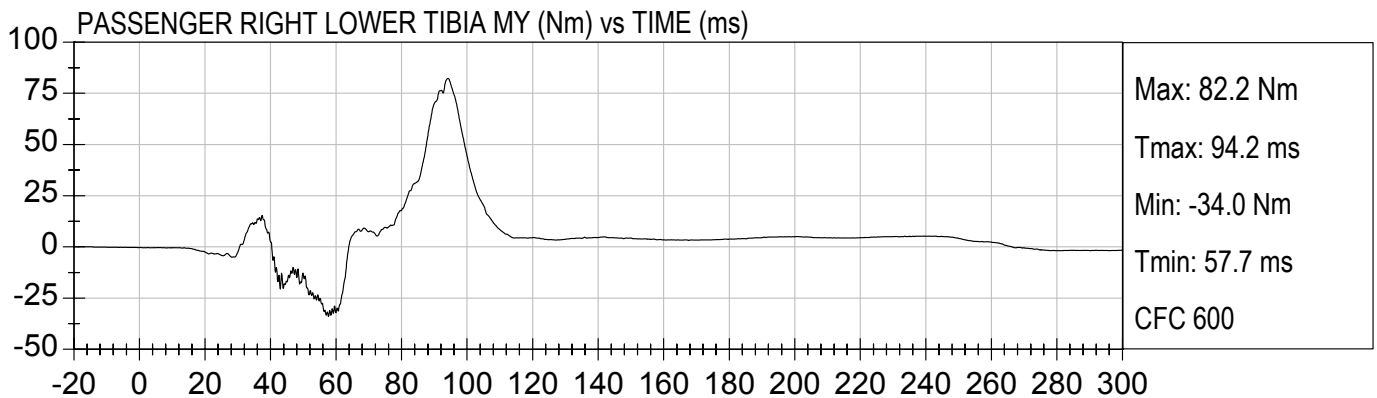
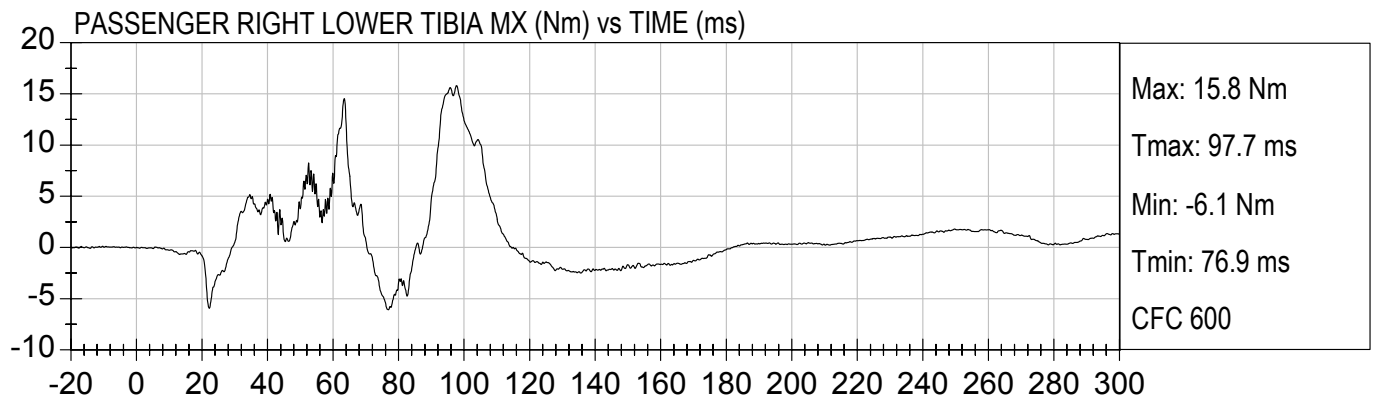


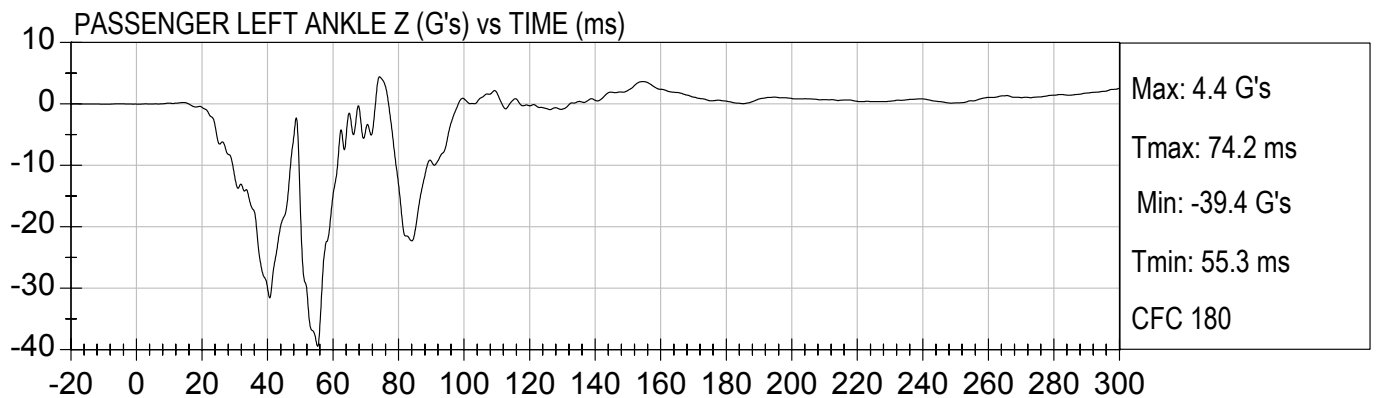
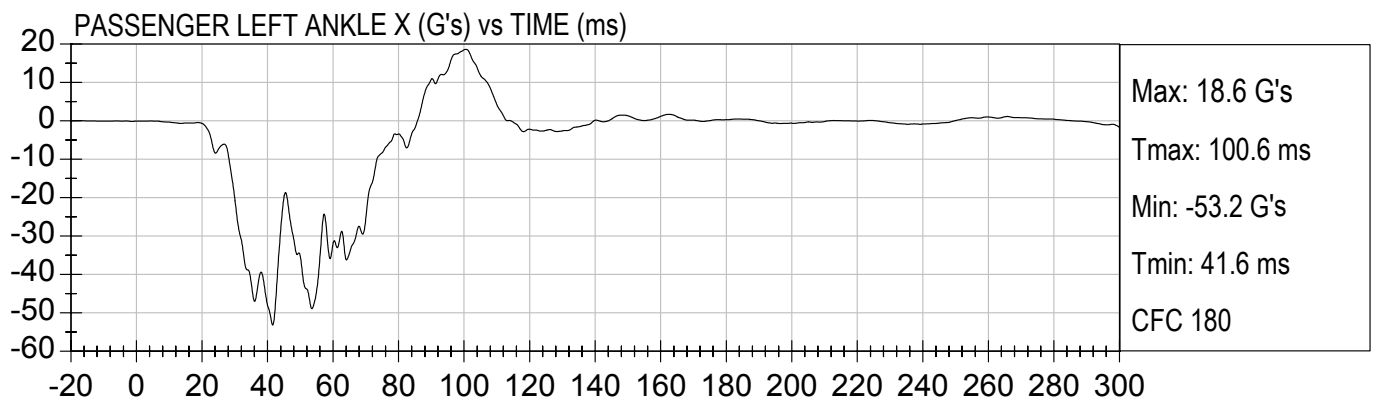
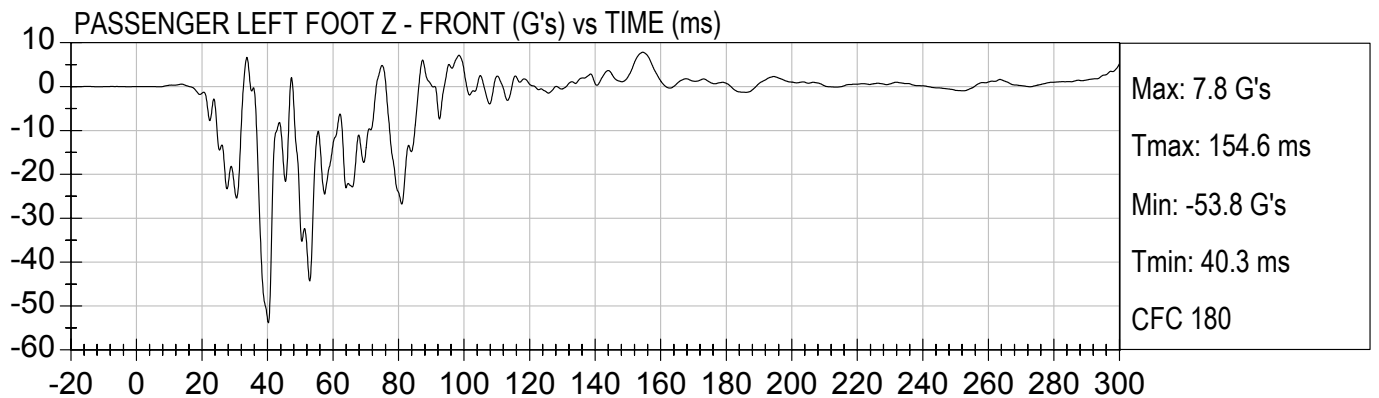
PASSENGER RIGHT UPPER TIBIA MY (Nm) vs TIME (ms)

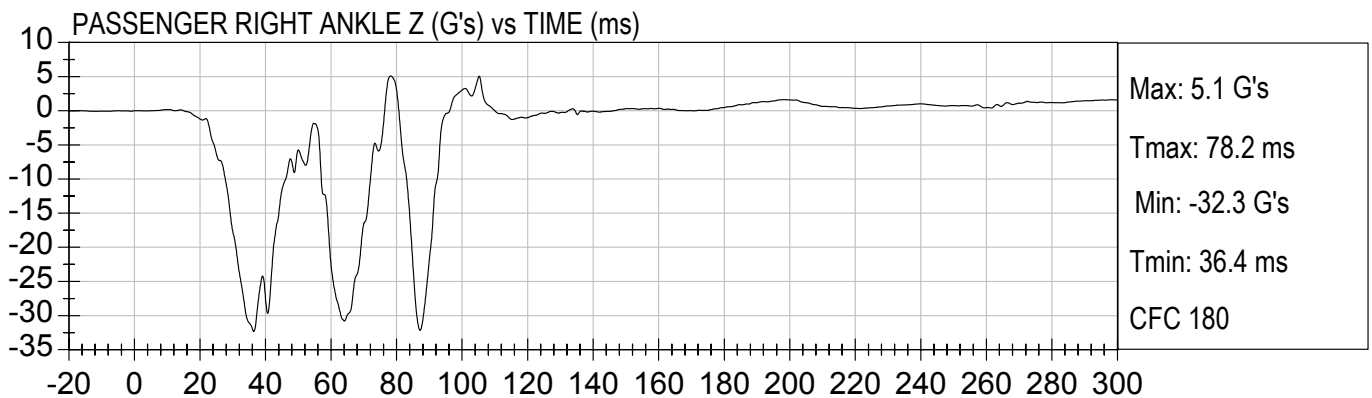
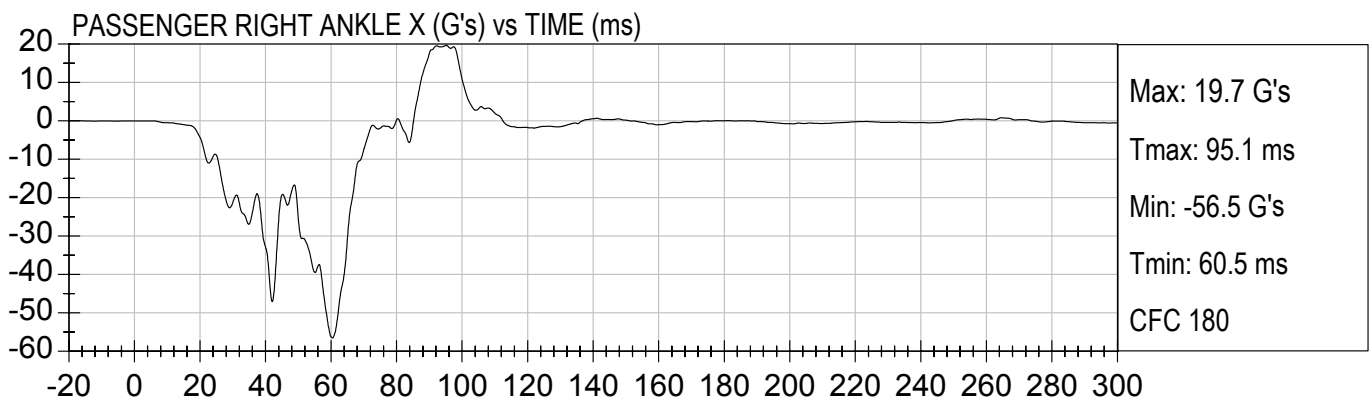
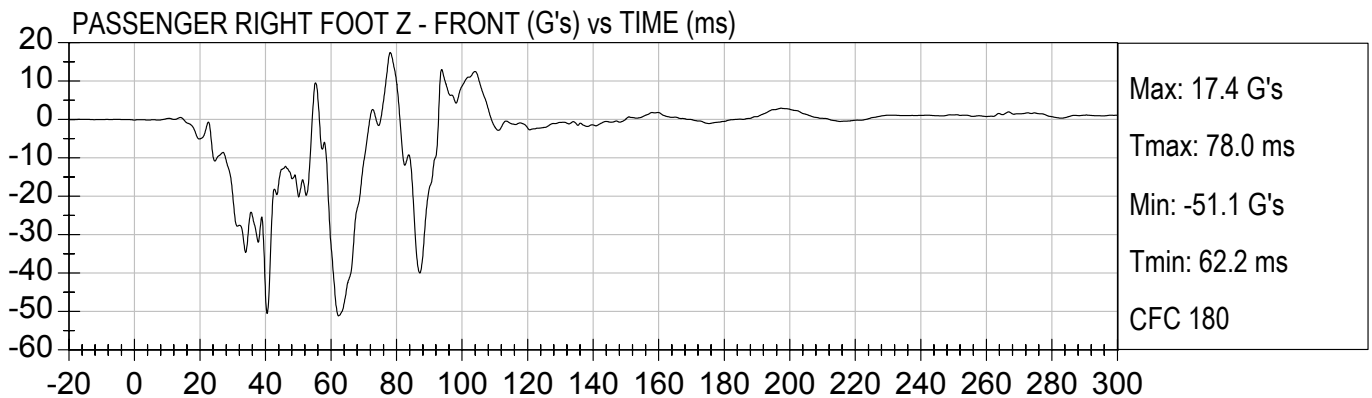


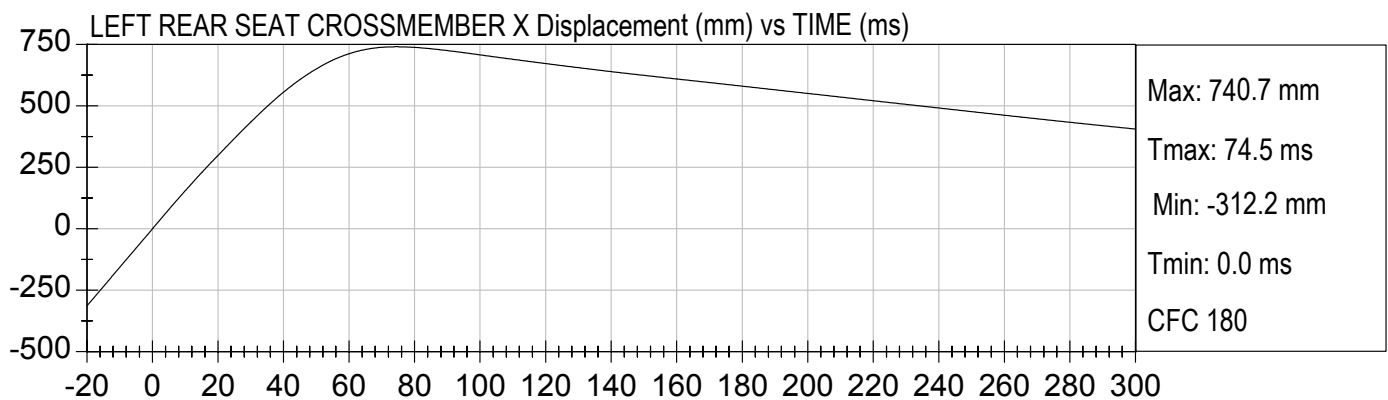
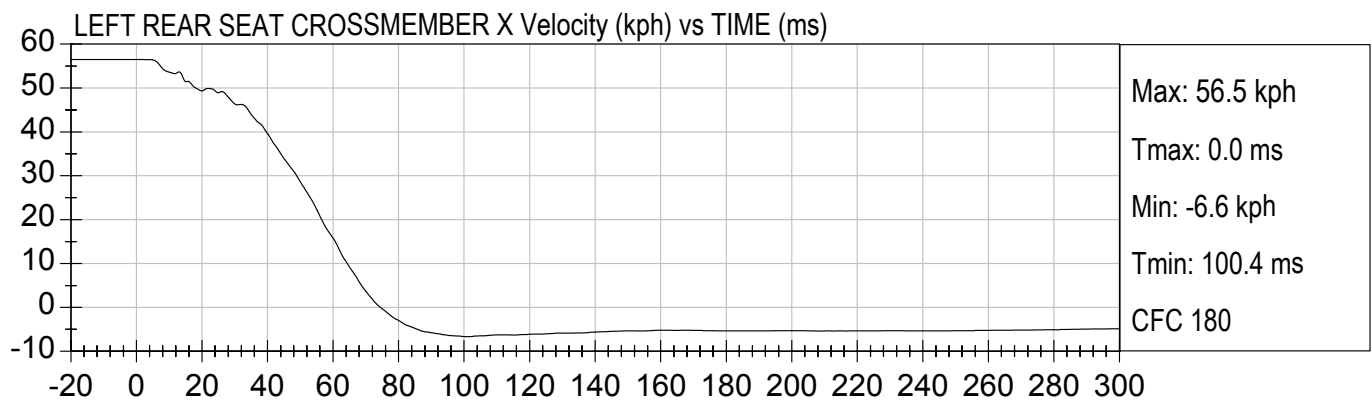
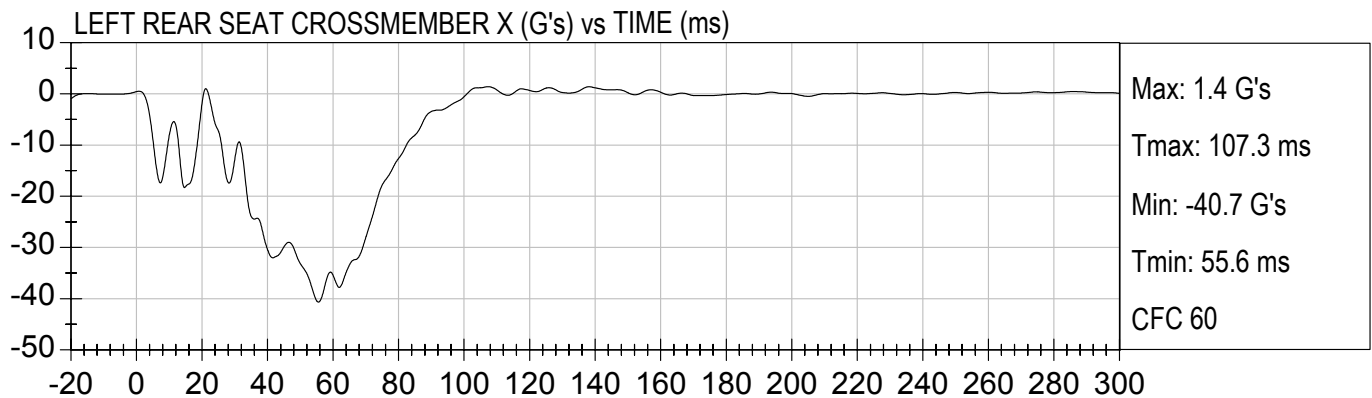
PASSENGER RIGHT UPPER TIBIA FZ (N) vs TIME (ms)

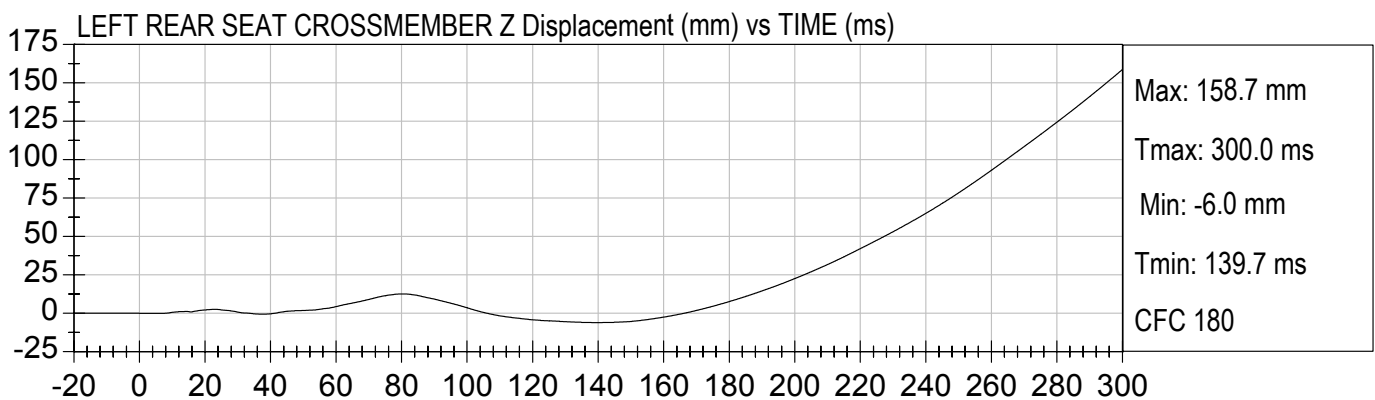
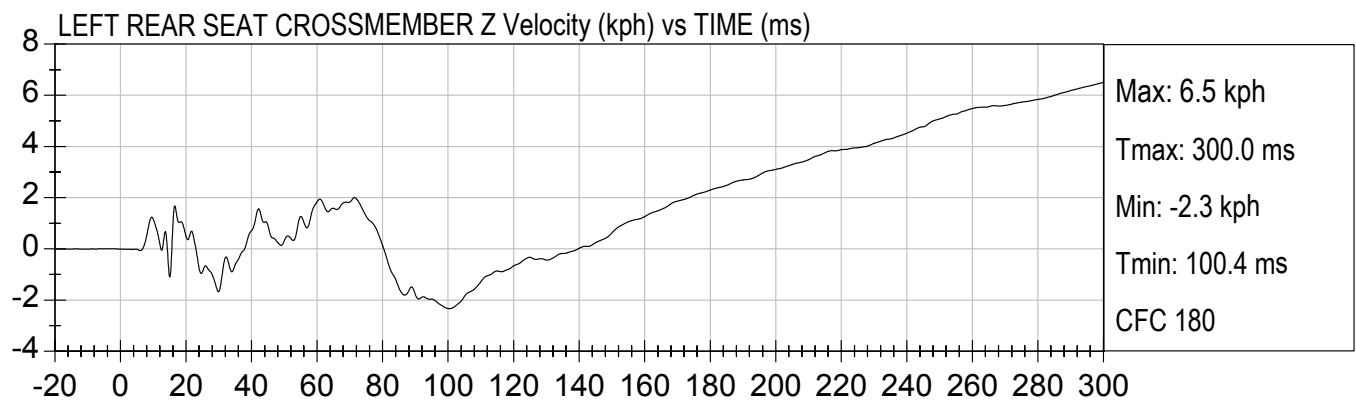
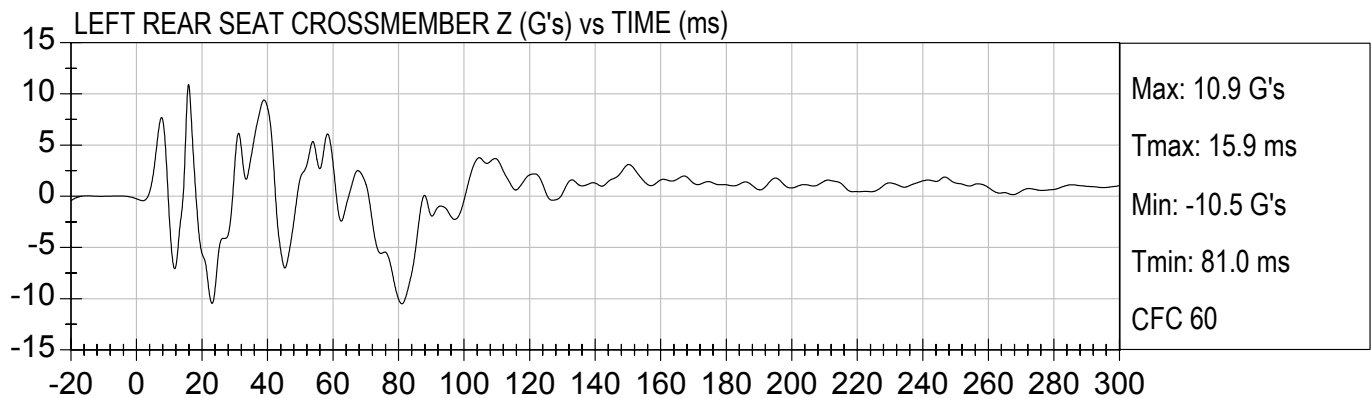


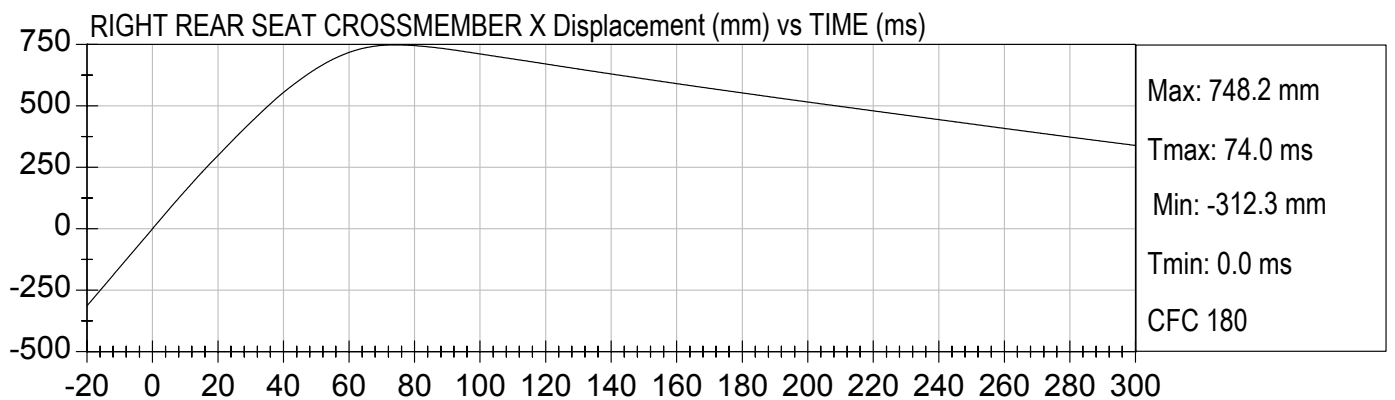
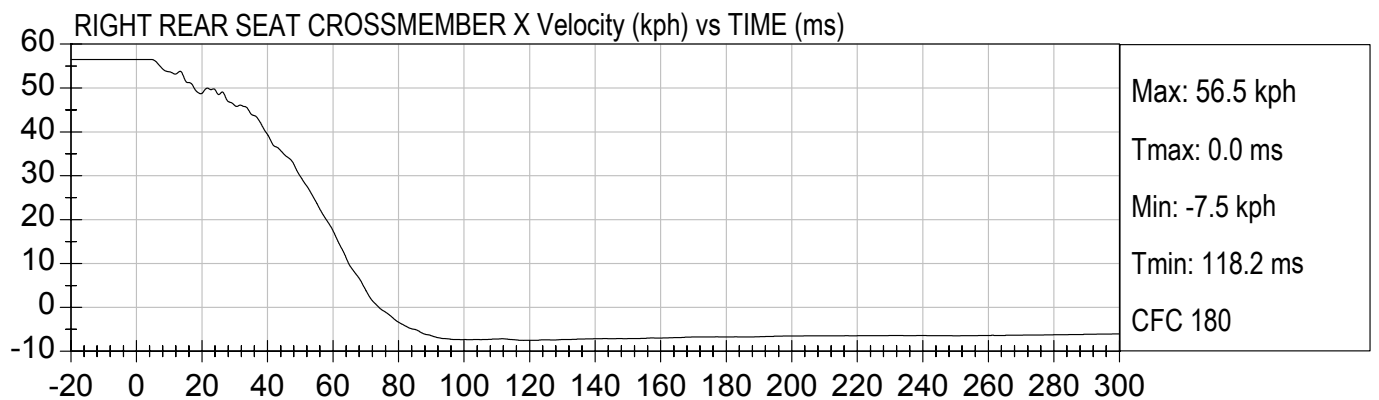
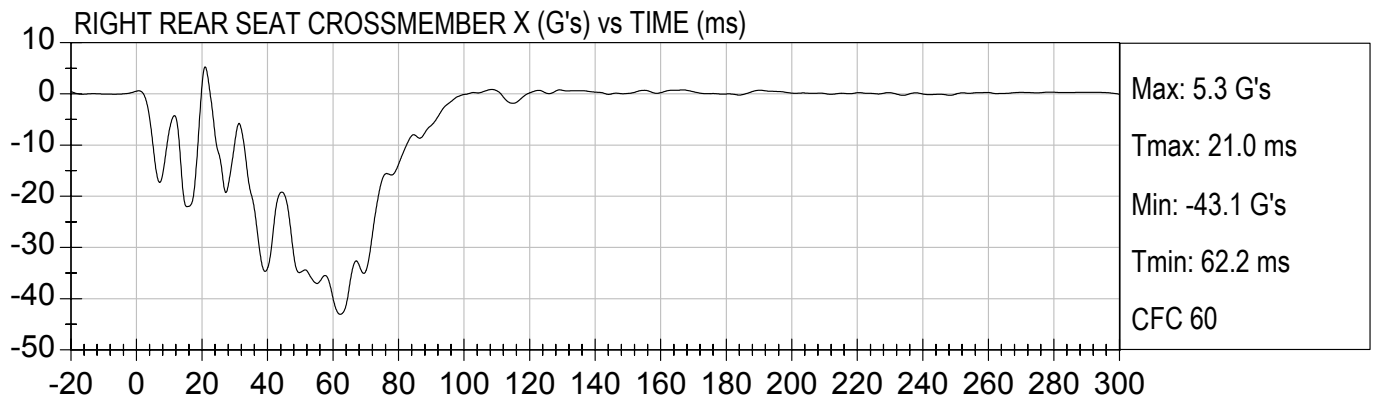


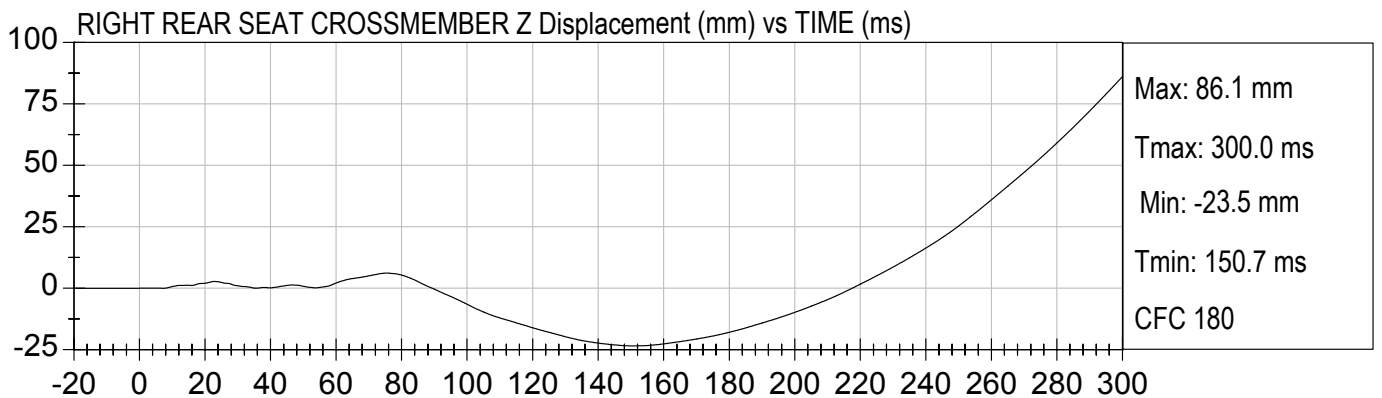
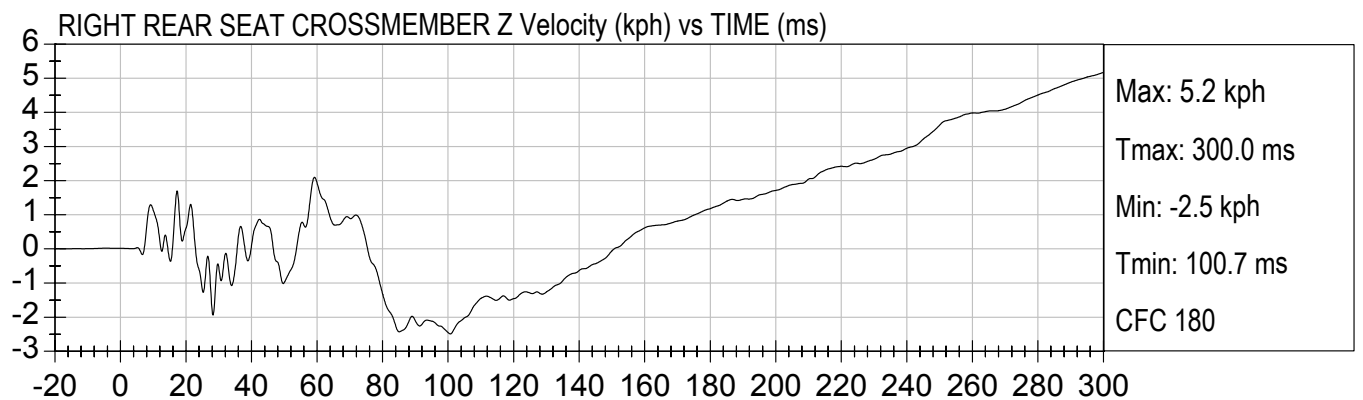
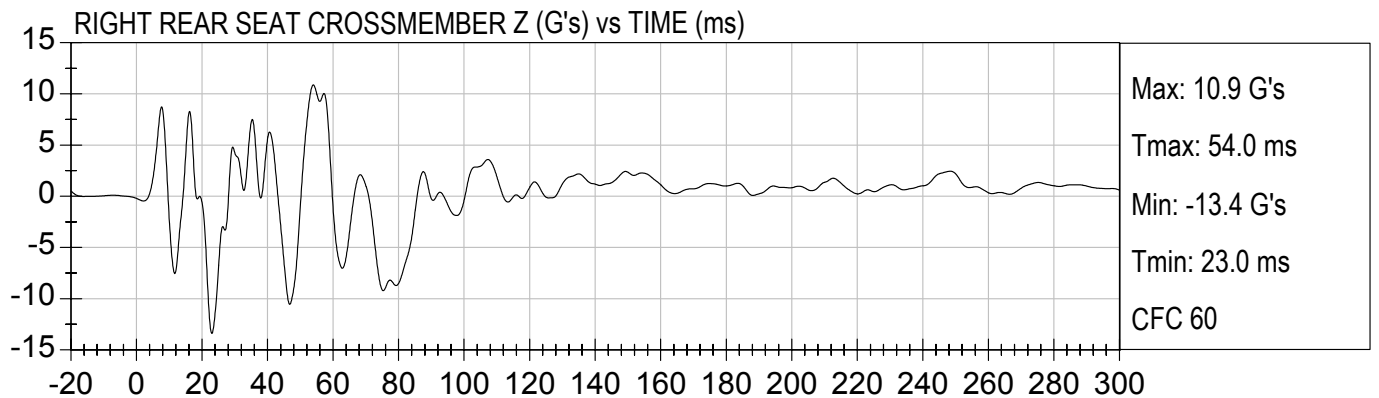


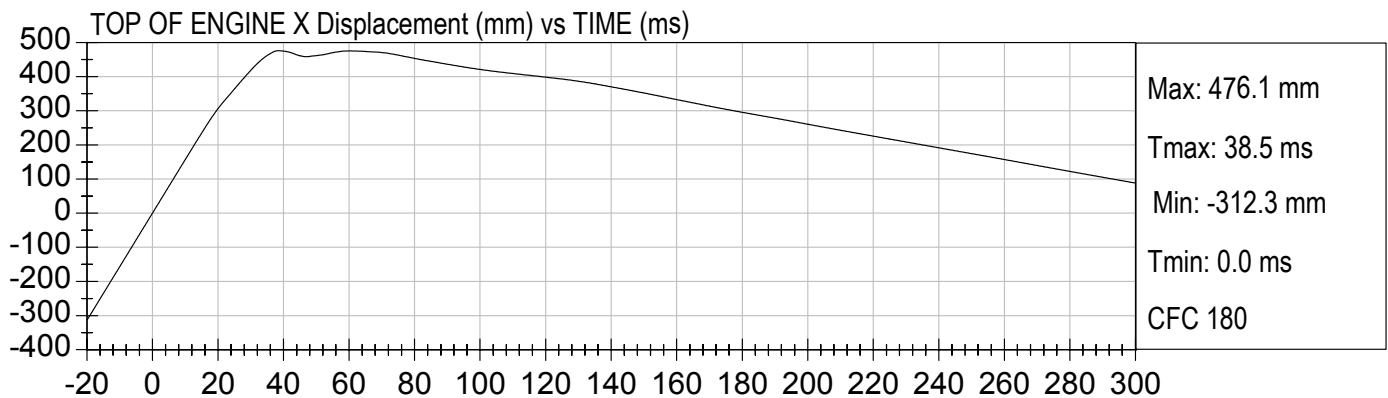
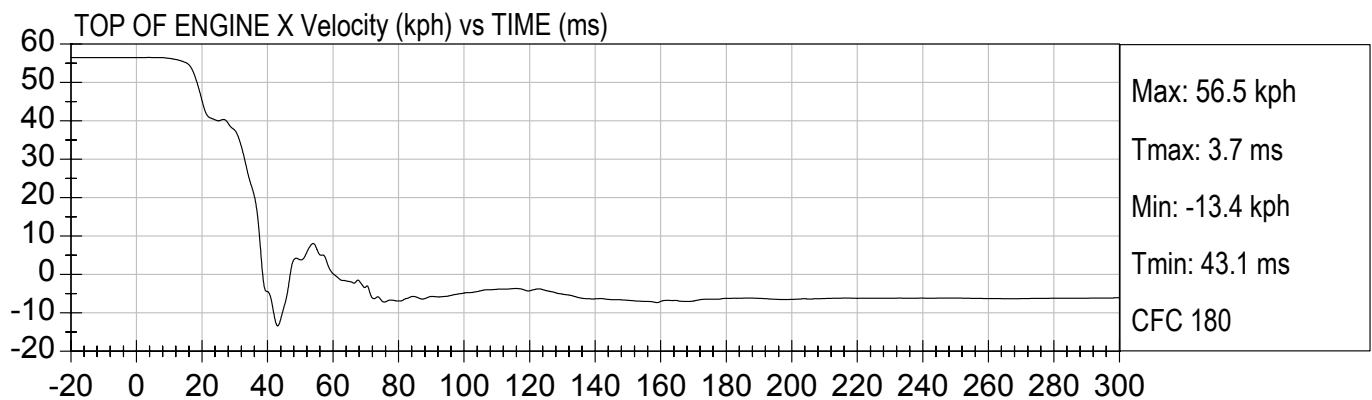
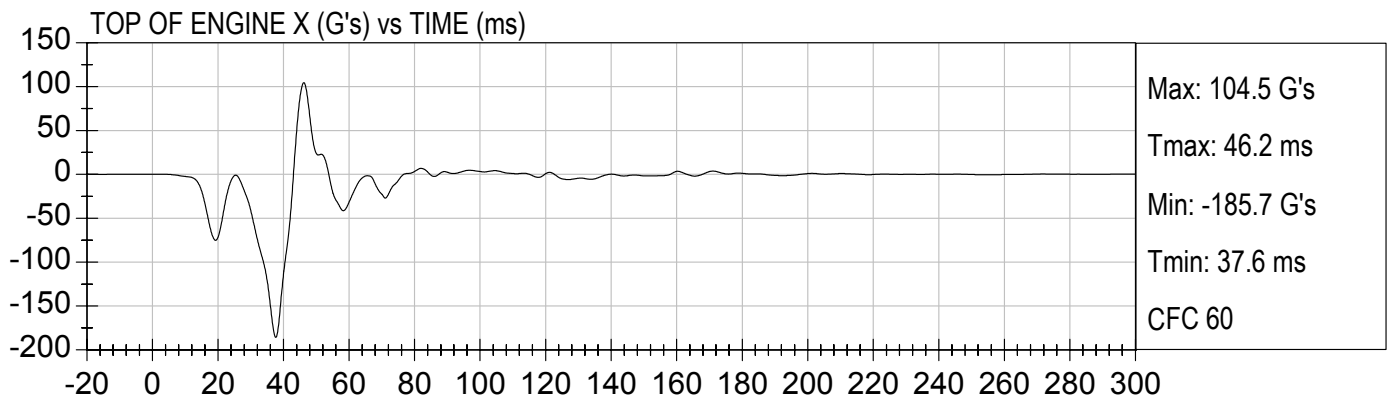


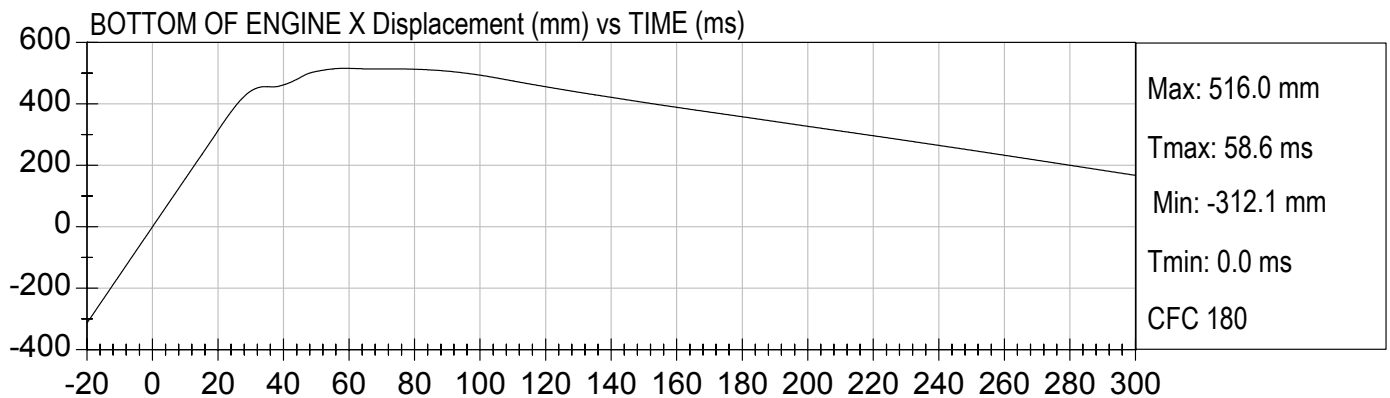
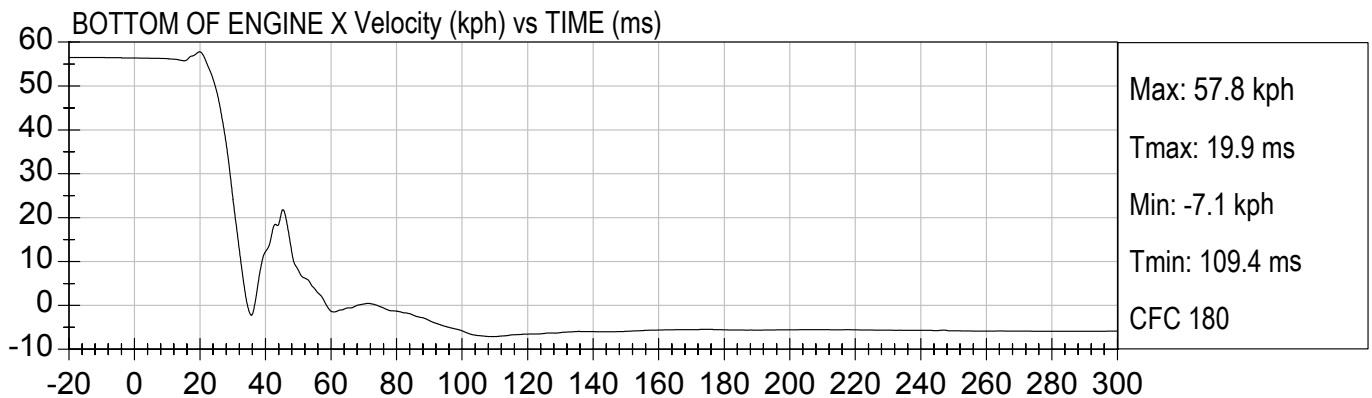
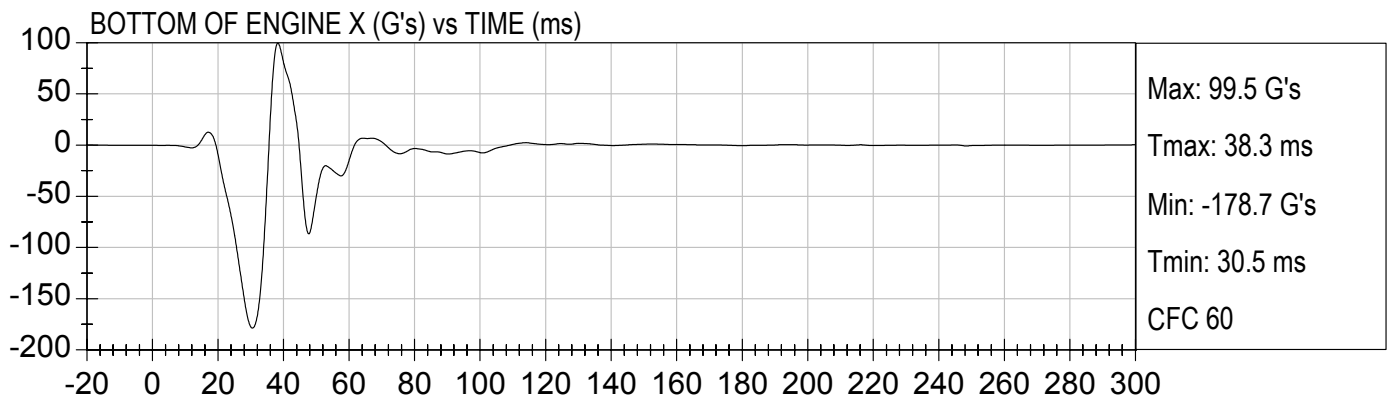


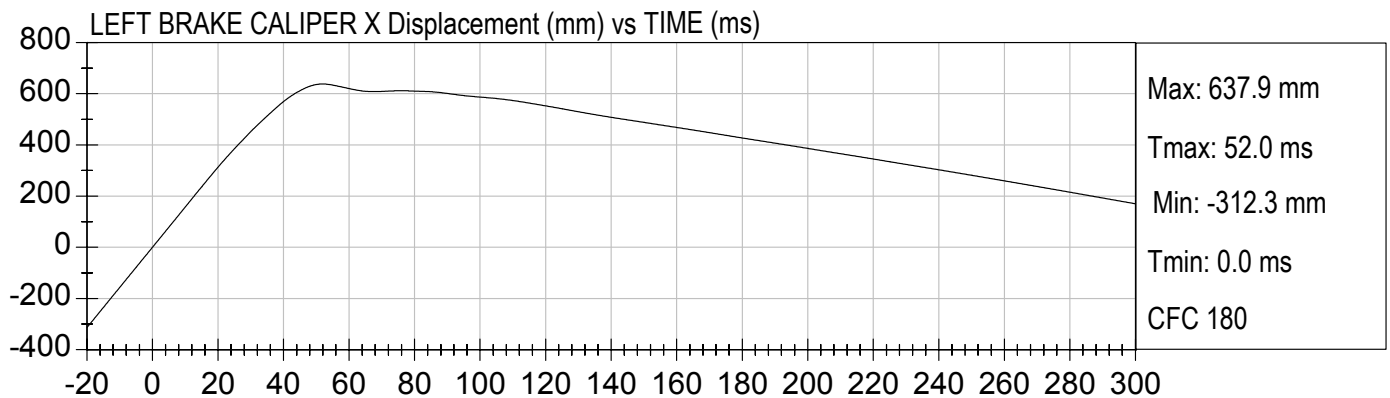
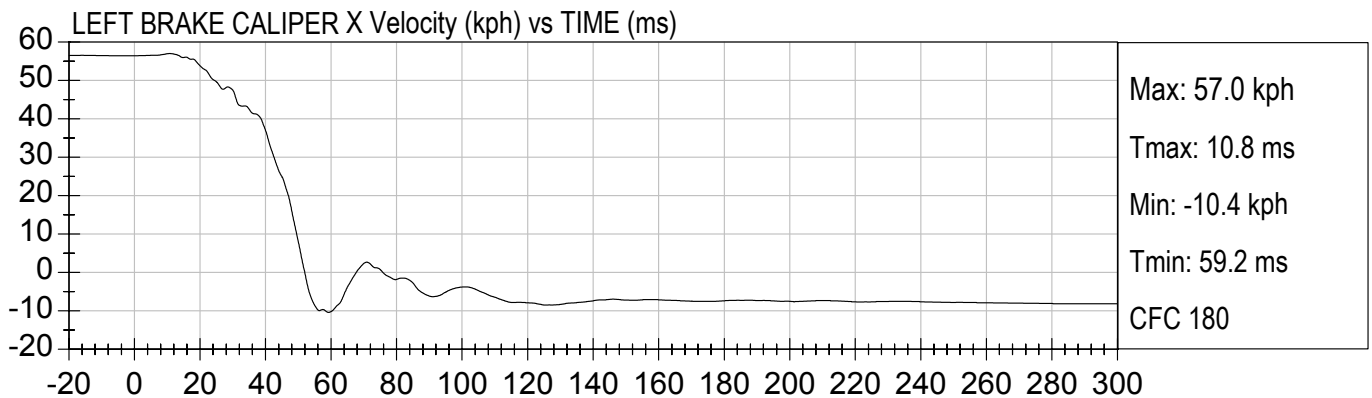
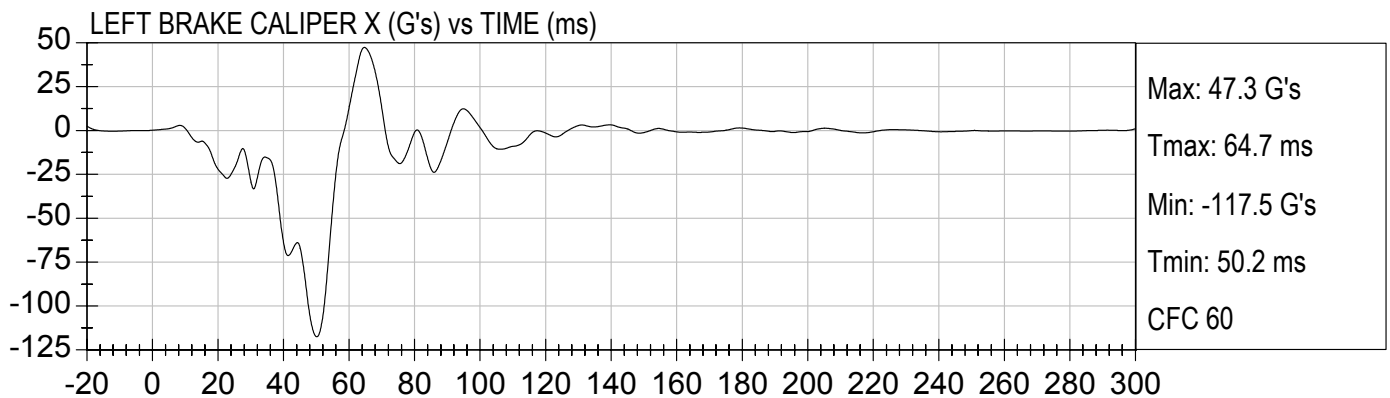


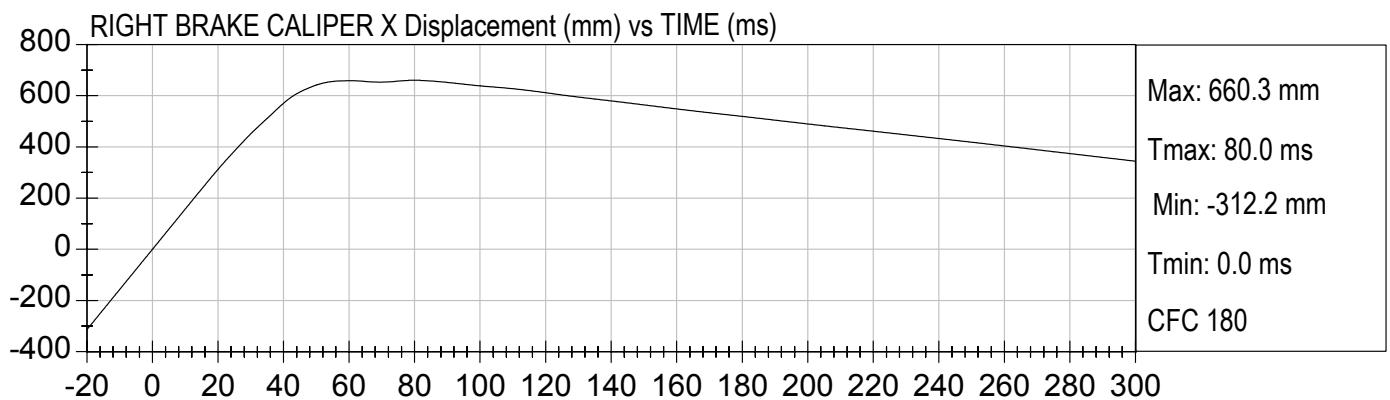
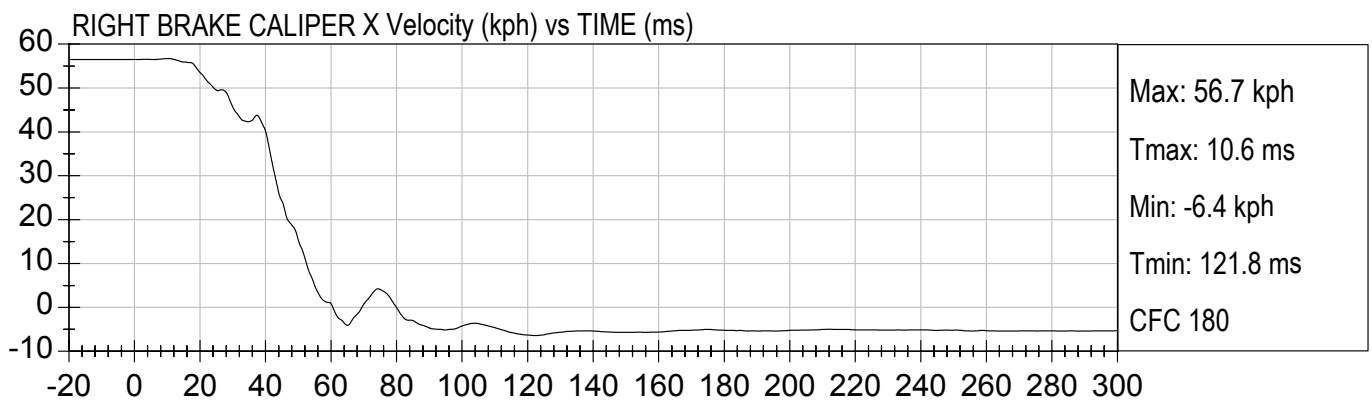
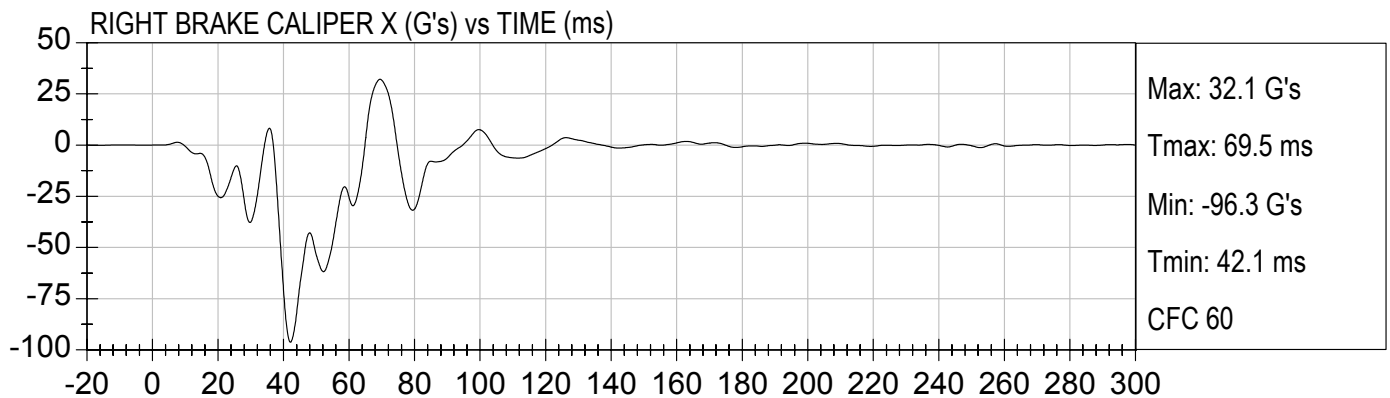


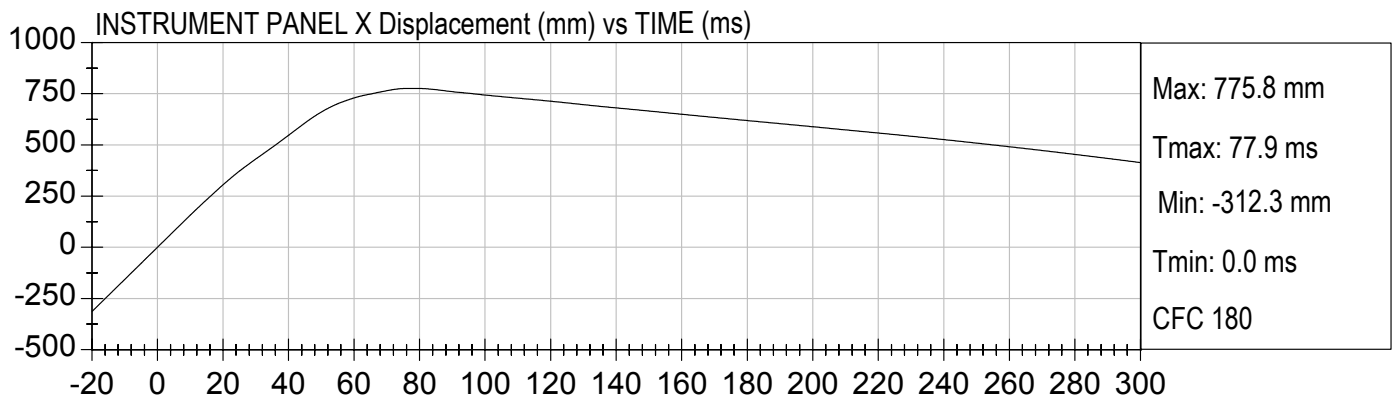
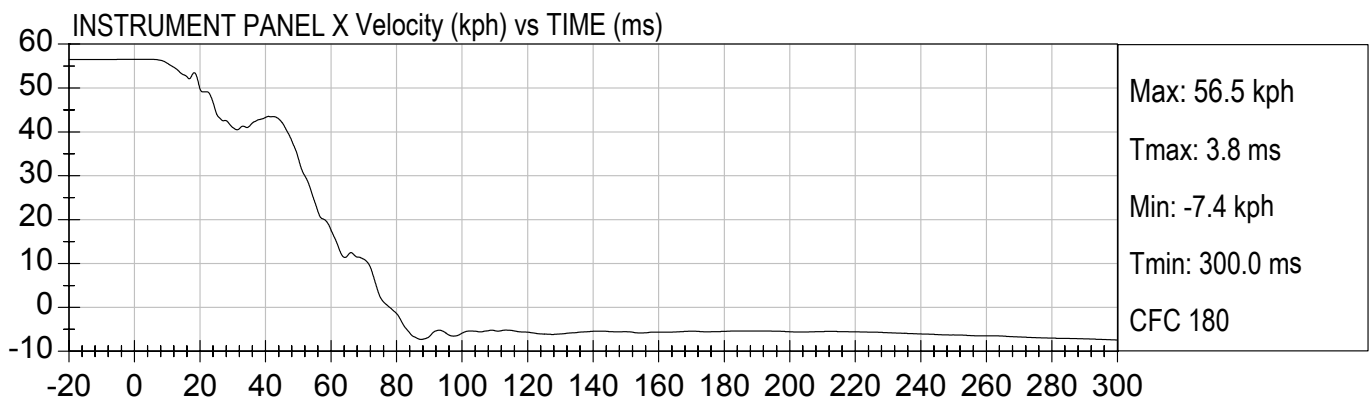
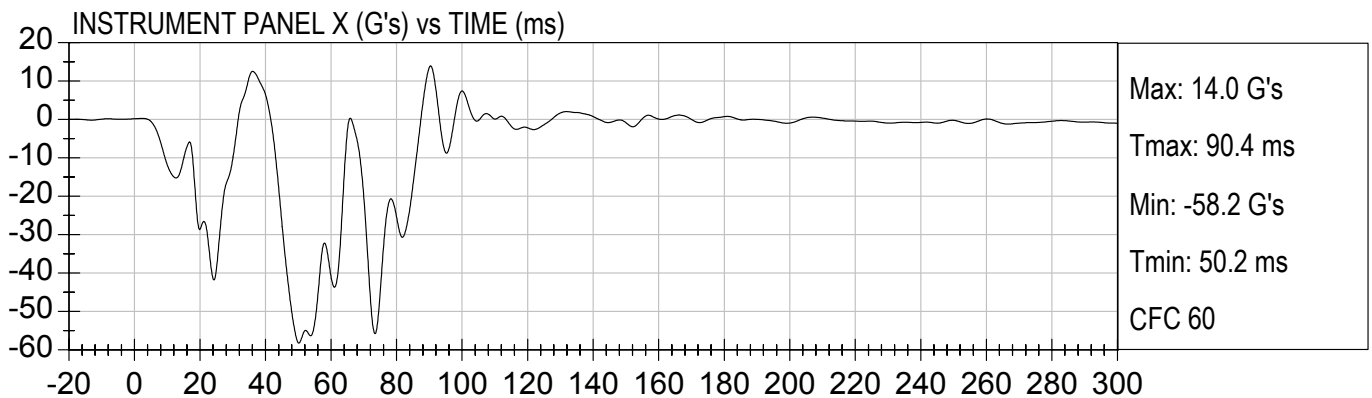












APPENDIX C
DUMMY CALIBRATION DATA TRACES AND TABLES

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test ID: D041771

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	225 - 275	248	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	6.7	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

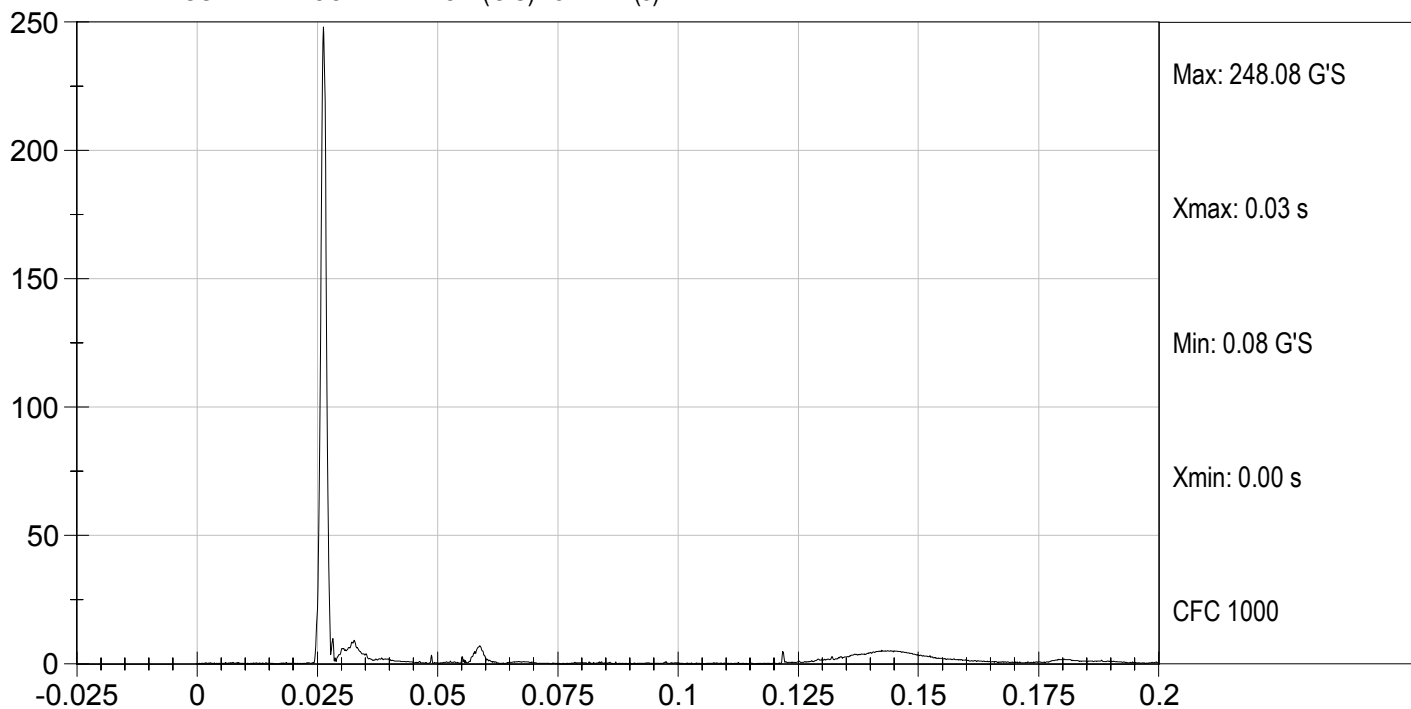
08/02/2004
Test Date



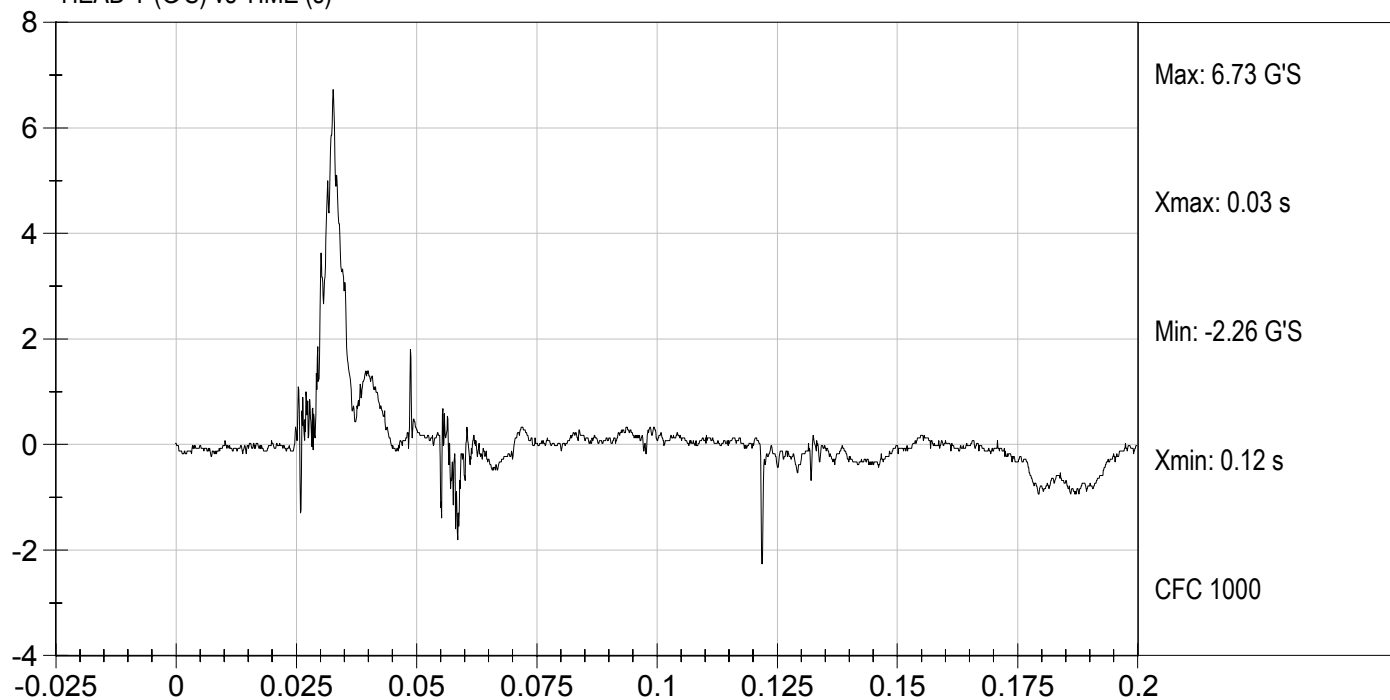
Test Desc: Head Drop
Componet ID: D041771

Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s

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



HEAD Y (G'S) vs TIME (s)



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041772

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.98	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.69	Pass
	20 msec	G's	17.60 to 22.60	19.62	Pass
	30 msec	G's	12.50 to 18.50	14.00	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.92	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.7	Pass
	Time	msec	57.0 to 64.0	59.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	119.3	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	95.5	Pass
	Time	msec	47.0 to 58.0	52.2	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	105.2	Pass
Overall Test Results					Pass


 Laboratory Technician

08/02/2004
 Test Date

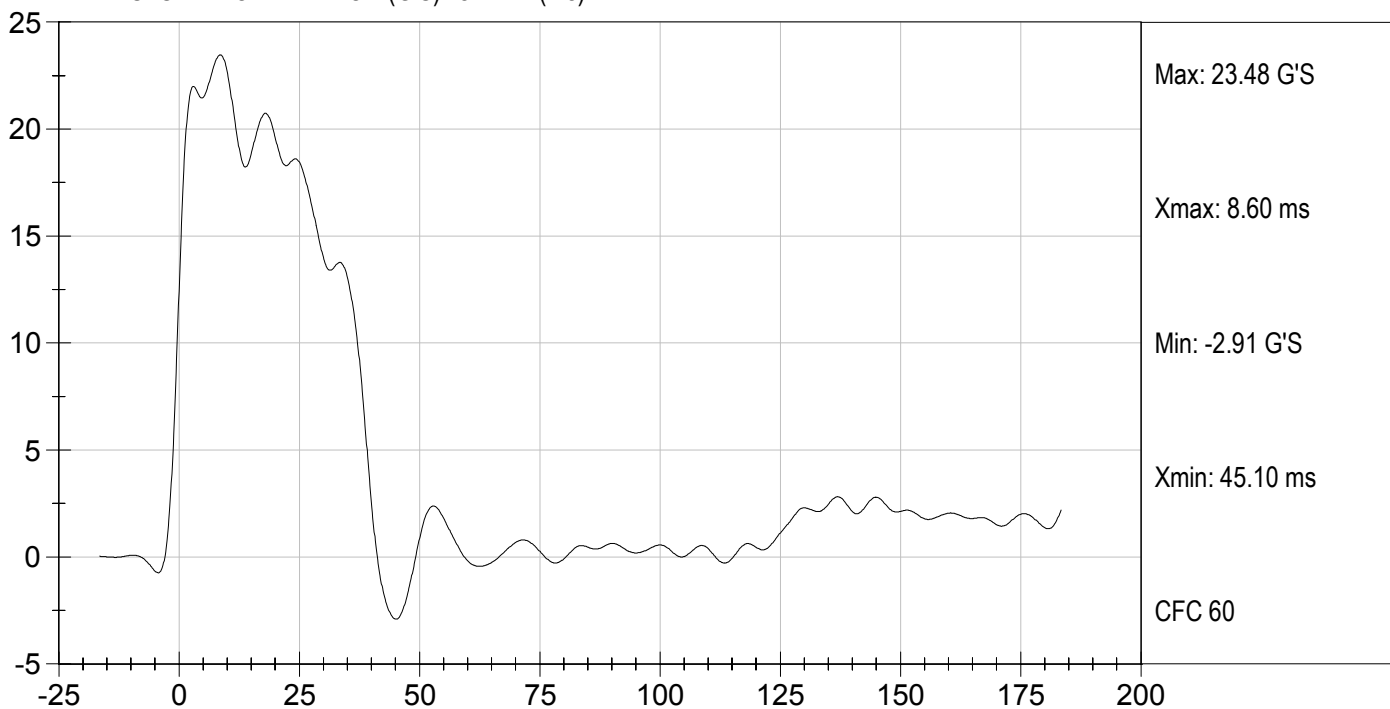

 Approved By



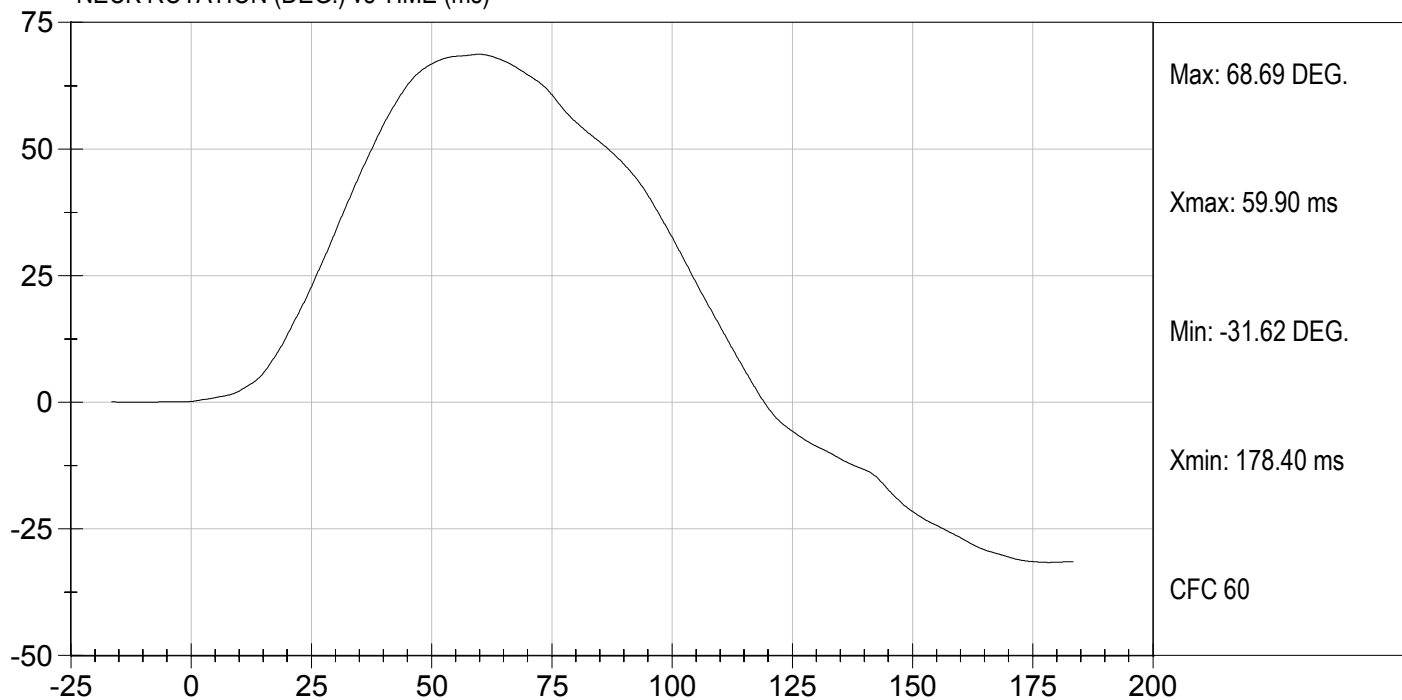
Test Desc: Neck Flexion
Componet ID: D041772

Test Date: 08/02/2004
Velocity: 22.9 ft/s, 6.98 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



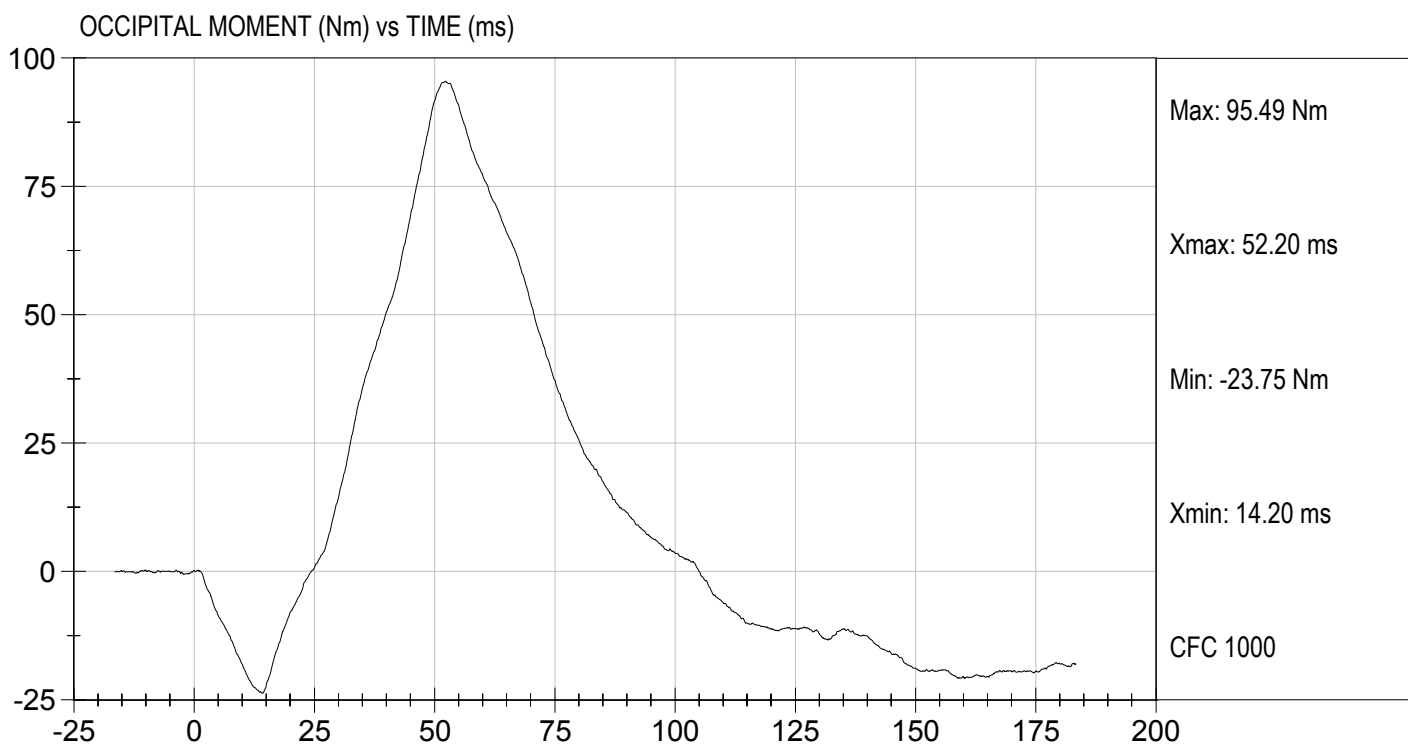
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D041772

Test Date: 08/02/2004
Velocity: 22.9 ft/s, 6.98 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041773

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.05	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.46	Pass
	20 msec	G's	14.00 to 19.00	16.54	Pass
	30 msec	G's	11.00 to 16.00	11.73	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	11.80	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.1	Pass
	Time	msec	72.0 to 82.0	80.5	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	159.0	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-65.0	Pass
	Time	msec	65.0 to 79.0	74.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	145.6	Pass
Overall Test Results					Pass


 Laboratory Technician

08/03/2004
 Test Date

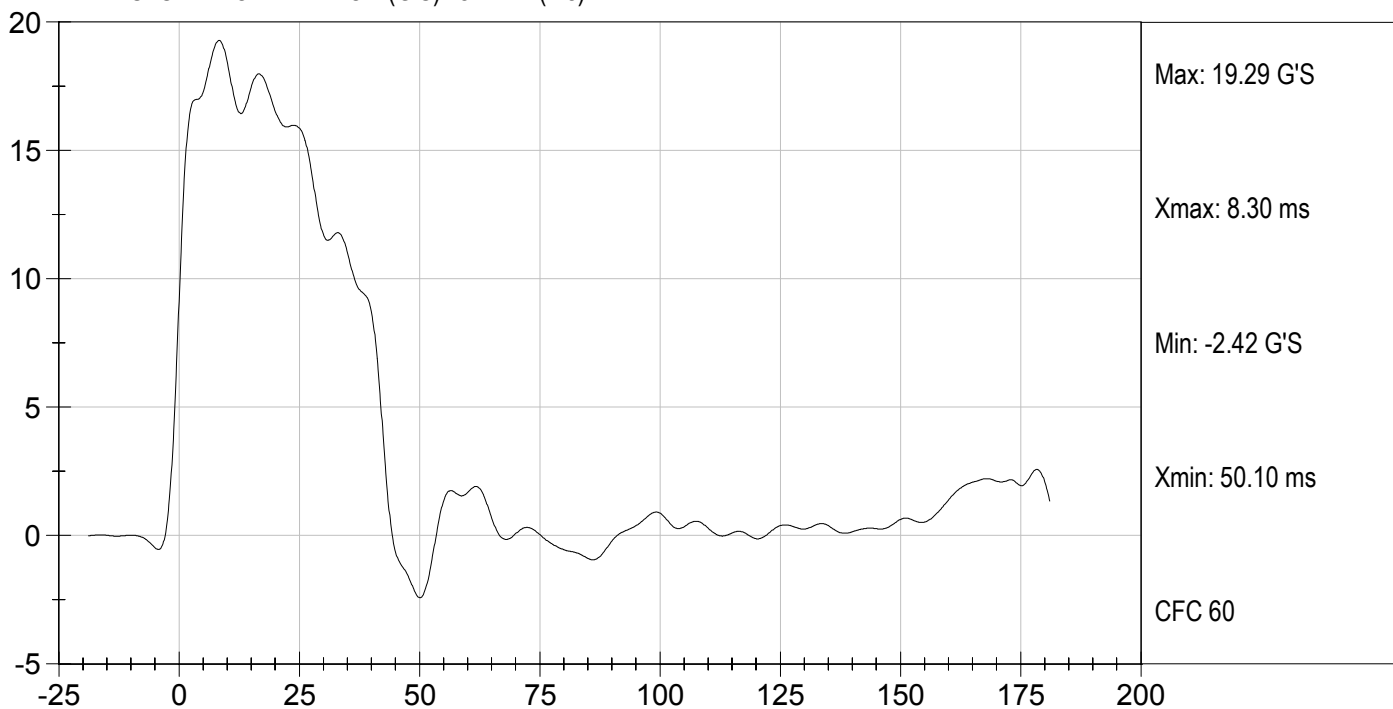

 Approved By



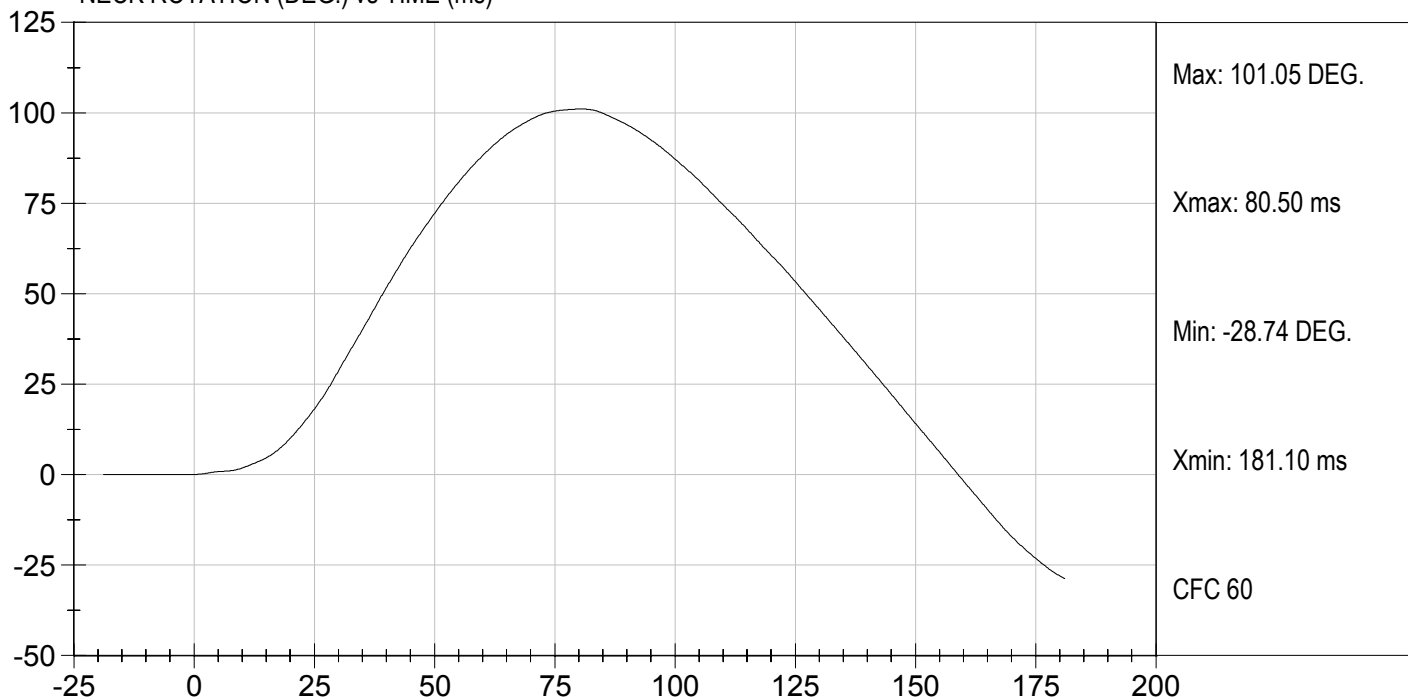
Test Desc: Neck Extension
Componet ID: D041773

Test Date: 08/03/2004
Velocity: 19.85 ft/s, 6.05 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



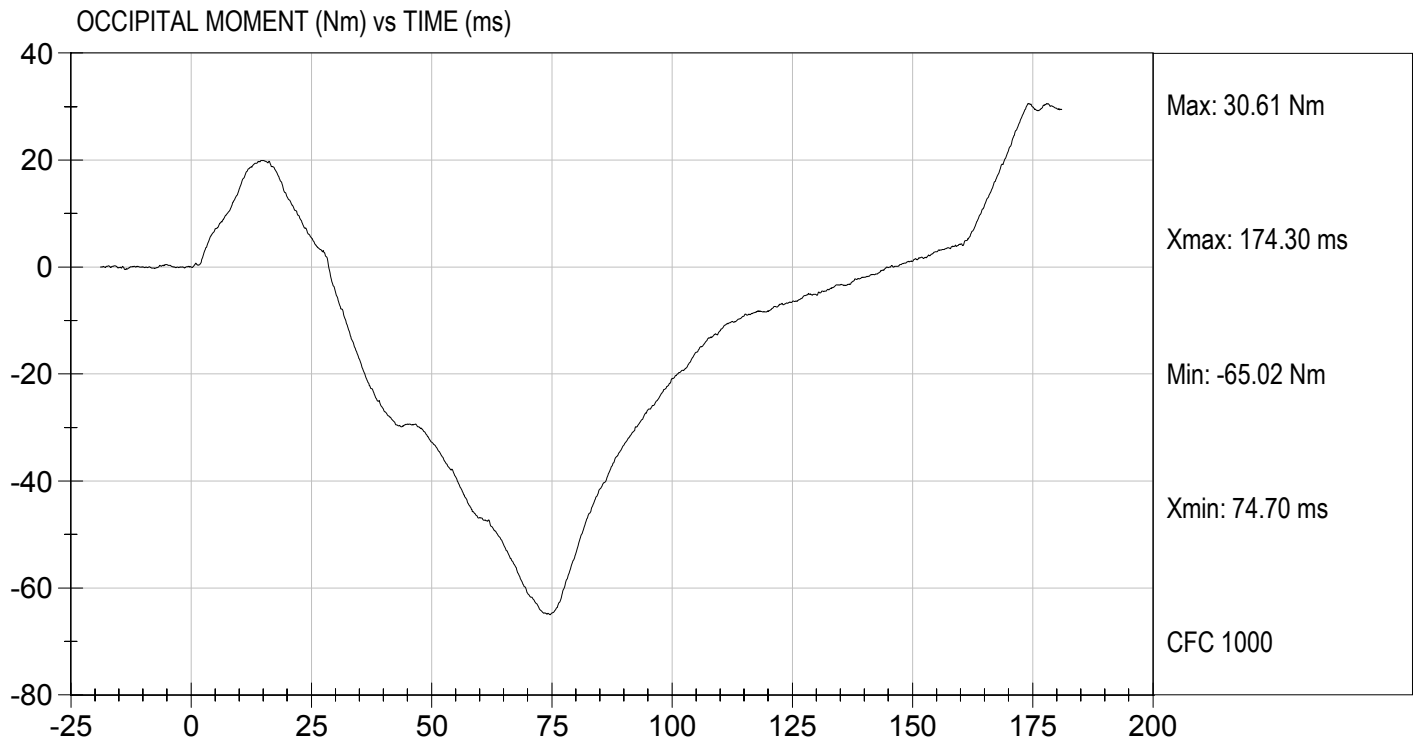
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D041773

Test Date: 08/03/2004
Velocity: 19.85 ft/s, 6.05 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041774

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	6.58 to 6.82	6.80	Pass
Peak Probe Force	N	5159 to 5893	5,648	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.68	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Overall Test Results				Pass



Laboratory Technician

08/03/2004

Test Date

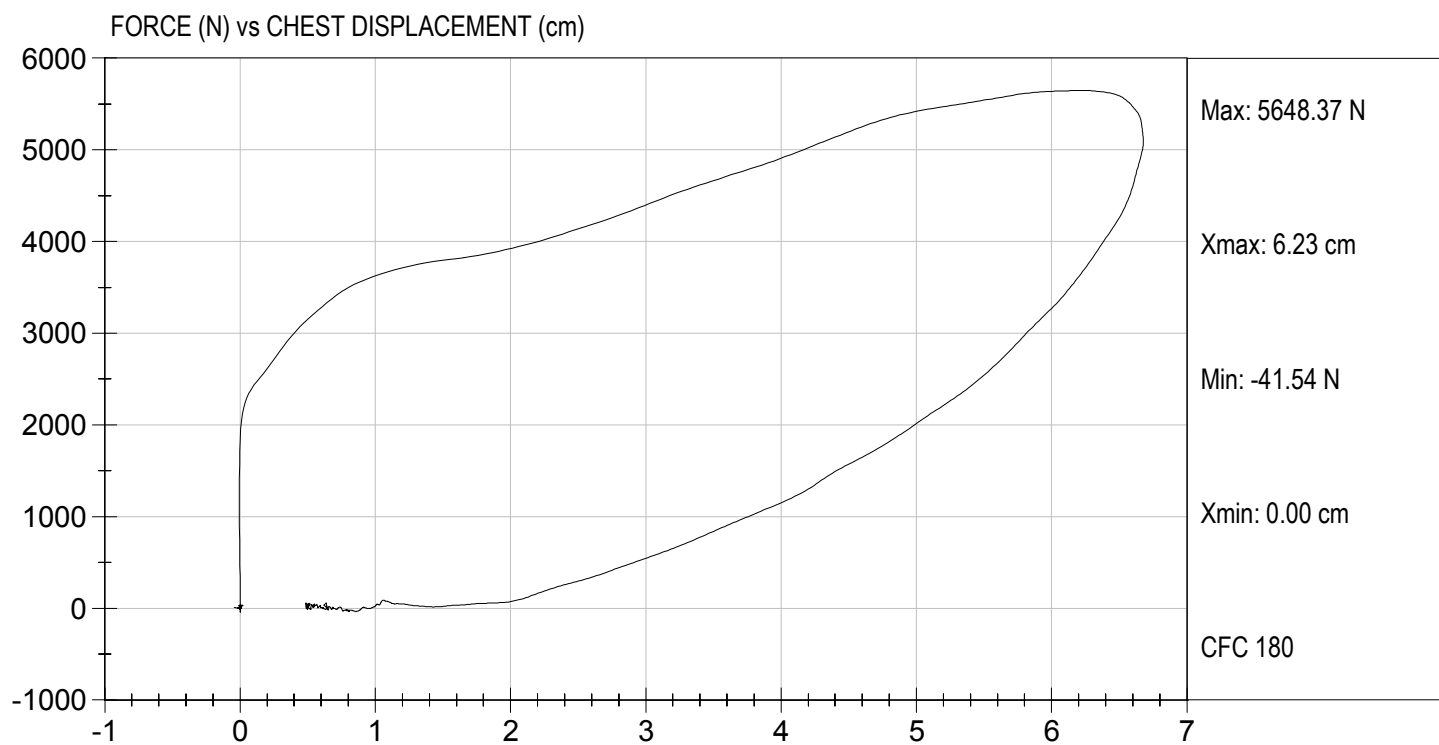


Approved By



Test Desc: Thorax Impact
Componet ID: D041774

Test Date: 08/03/2004
Velocity: 22.31 ft/s, 6.80 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041775

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,334	Pass
Overall Test Results				Pass


Laboratory Technician

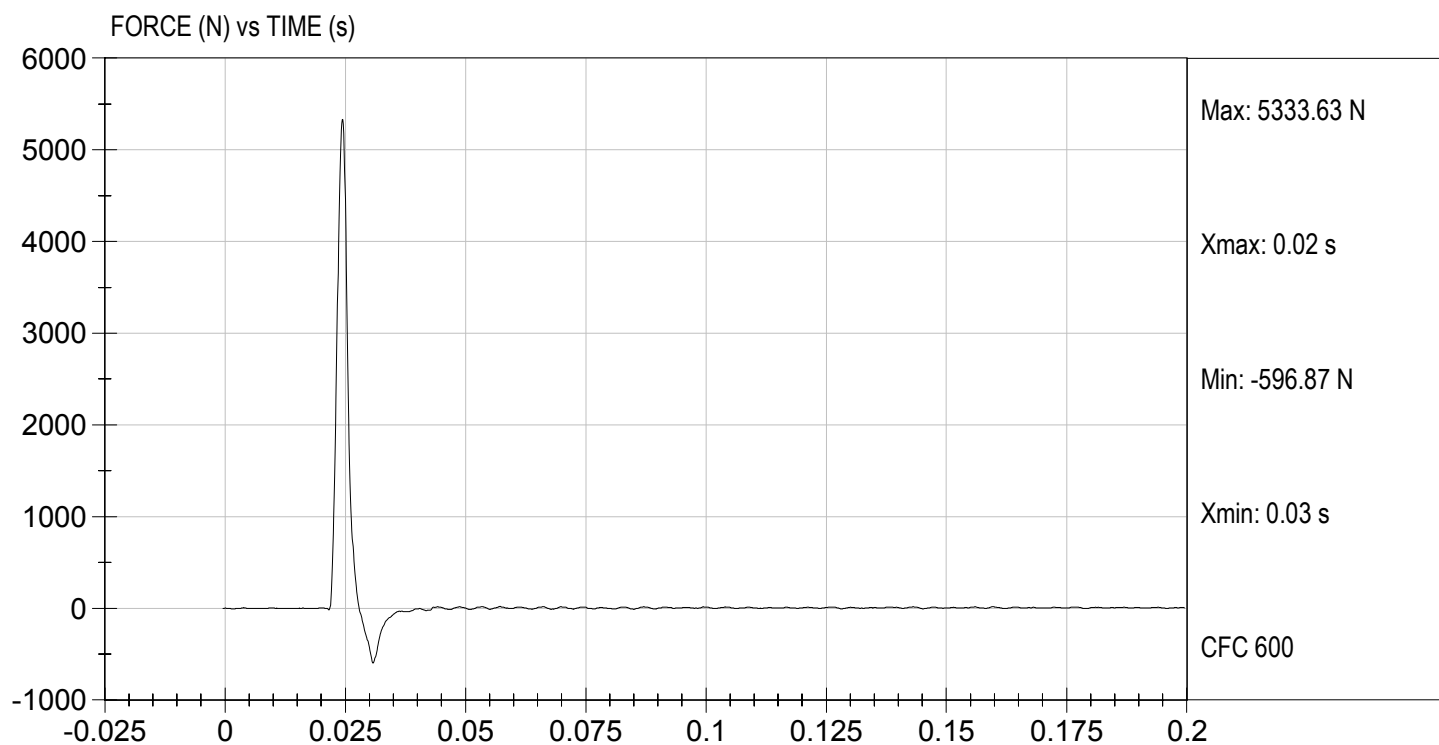

Approved By

08/03/2004
Test Date



Test Desc: Right Knee
Componet ID: D041775

Test Date: 08/03/2004
Velocity: 6.79 ft/s, 2.07 m/s



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041776

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,731	Pass
Overall Test Results				Pass


Laboratory Technician

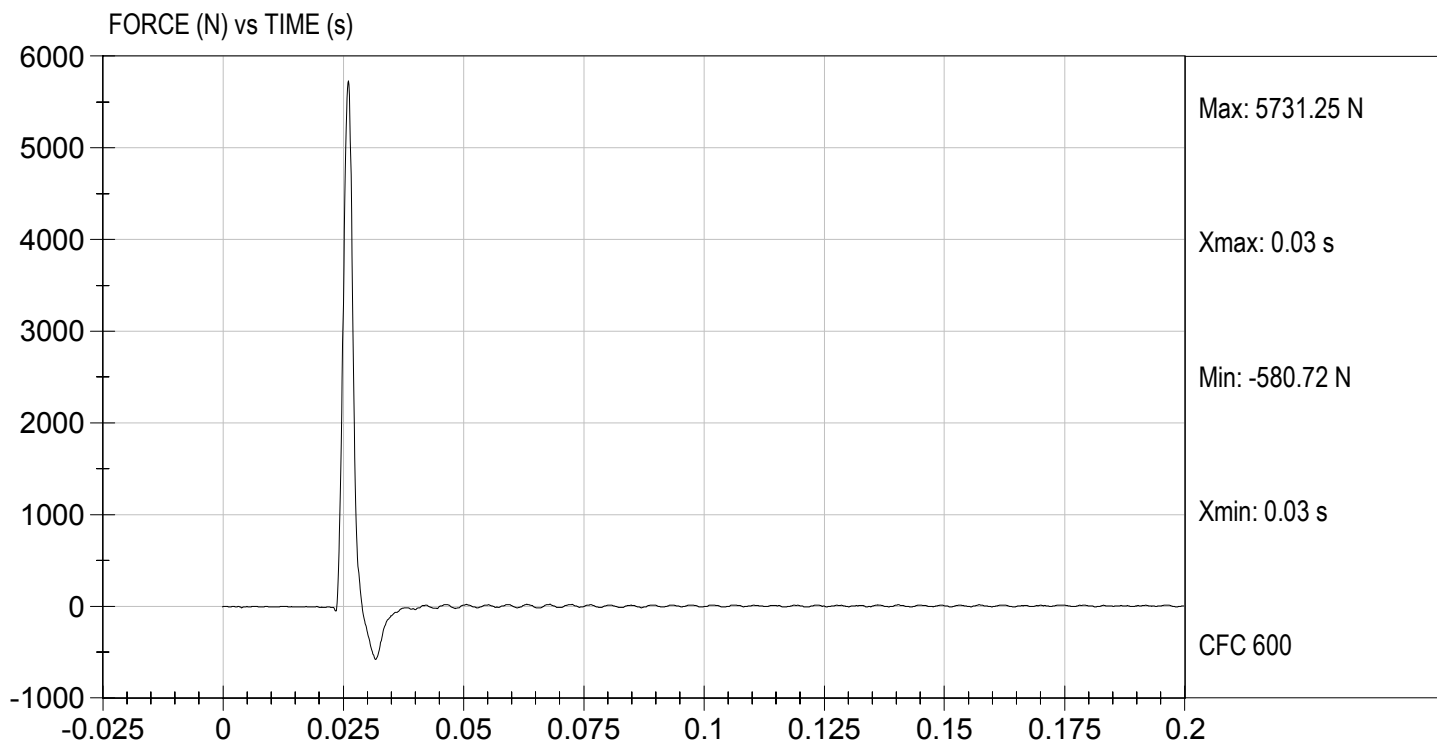
08/03/2004
Test Date


Approved By



Test Desc: Left Knee
Componet ID: D041776

Test Date: 08/03/2004
Velocity: 6.97 ft/s, 2.12 m/s



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D041770

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.0	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	48	48	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	73.3	79.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	40	Pass
Overall Test Results					Pass


Laboratory Technician

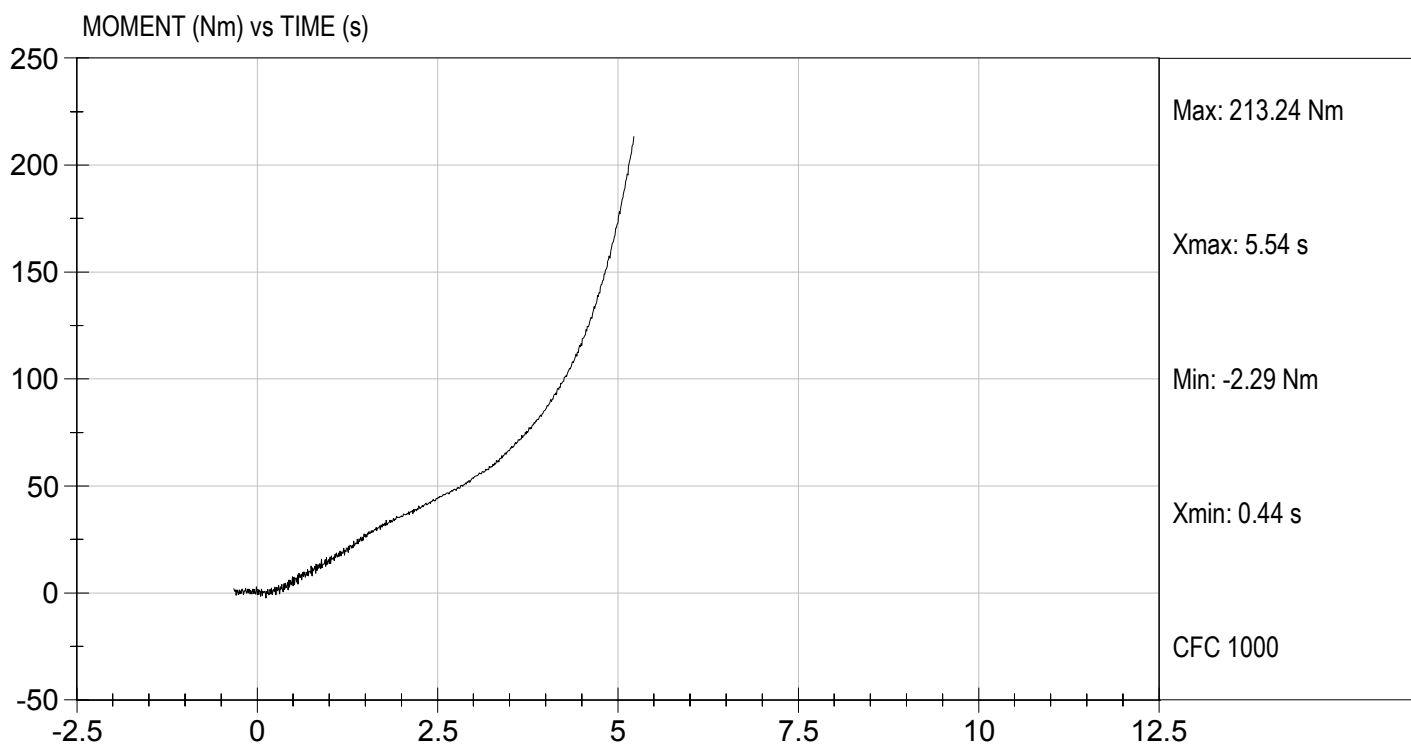
08/02/2004
Test Date


Approved By



Test Desc: Hip Femur Flexion
Componet ID: D041779

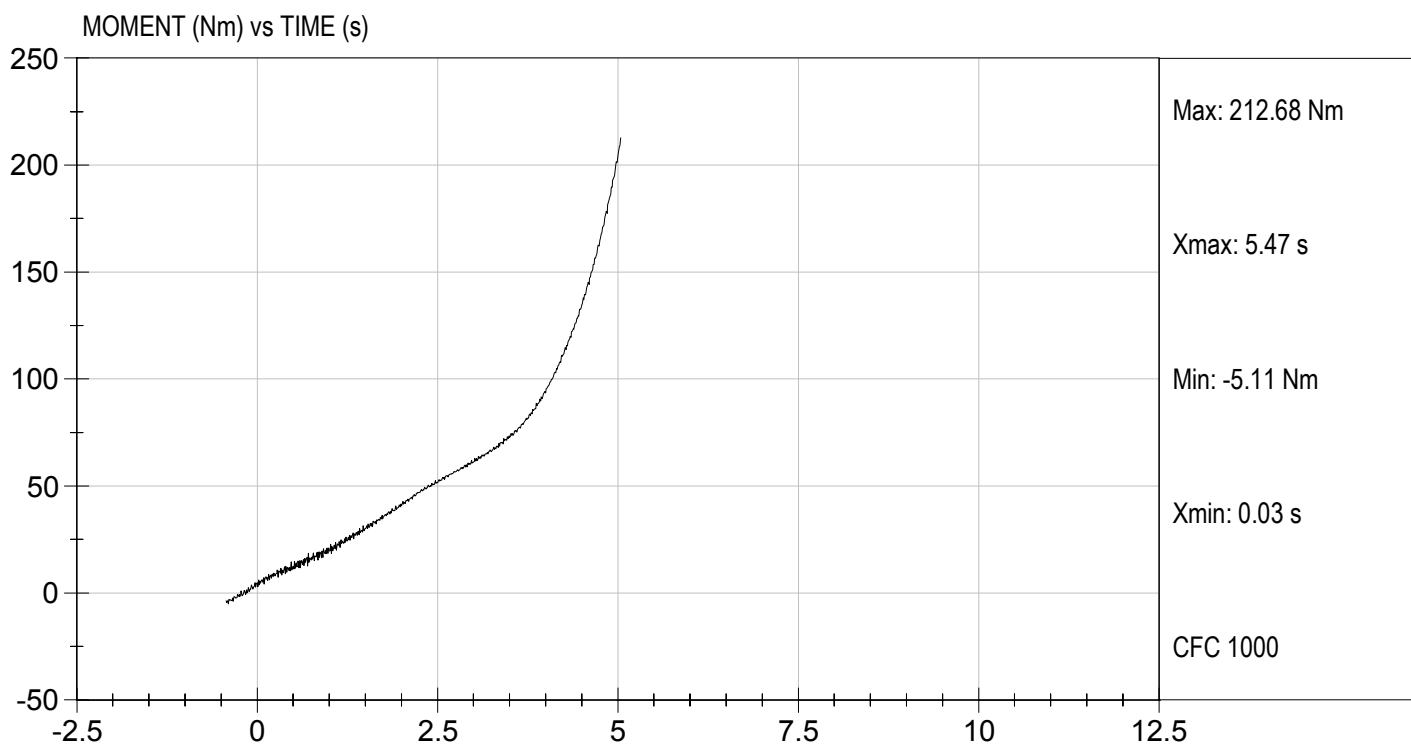
Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D041770

Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s



MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test ID: D041781

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	46	Pass
Peak Resultant Acceleration	G's	225 - 275	239	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.2	Pass
Unimodal	Yes/No	NA	Yes	Pass
Oscillations	Yes/No	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician


Approved By

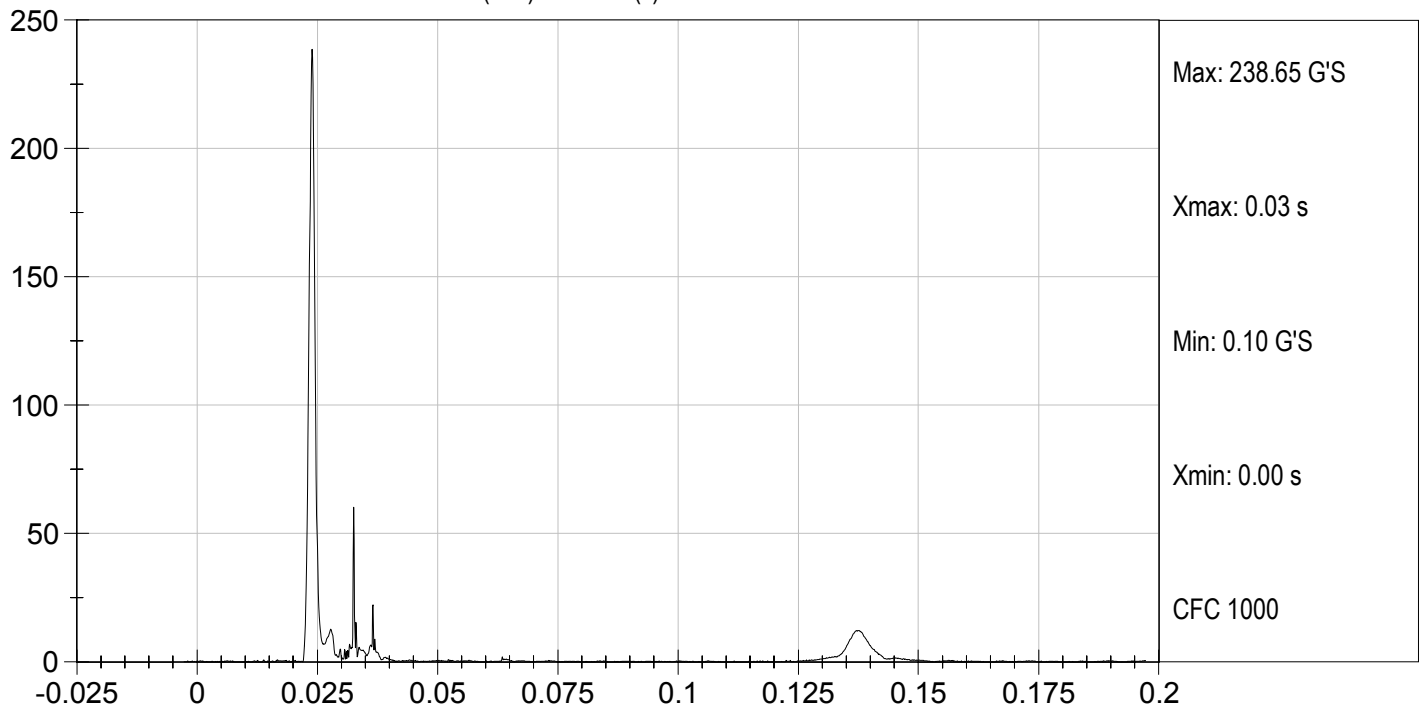
08/02/2004
Test Date



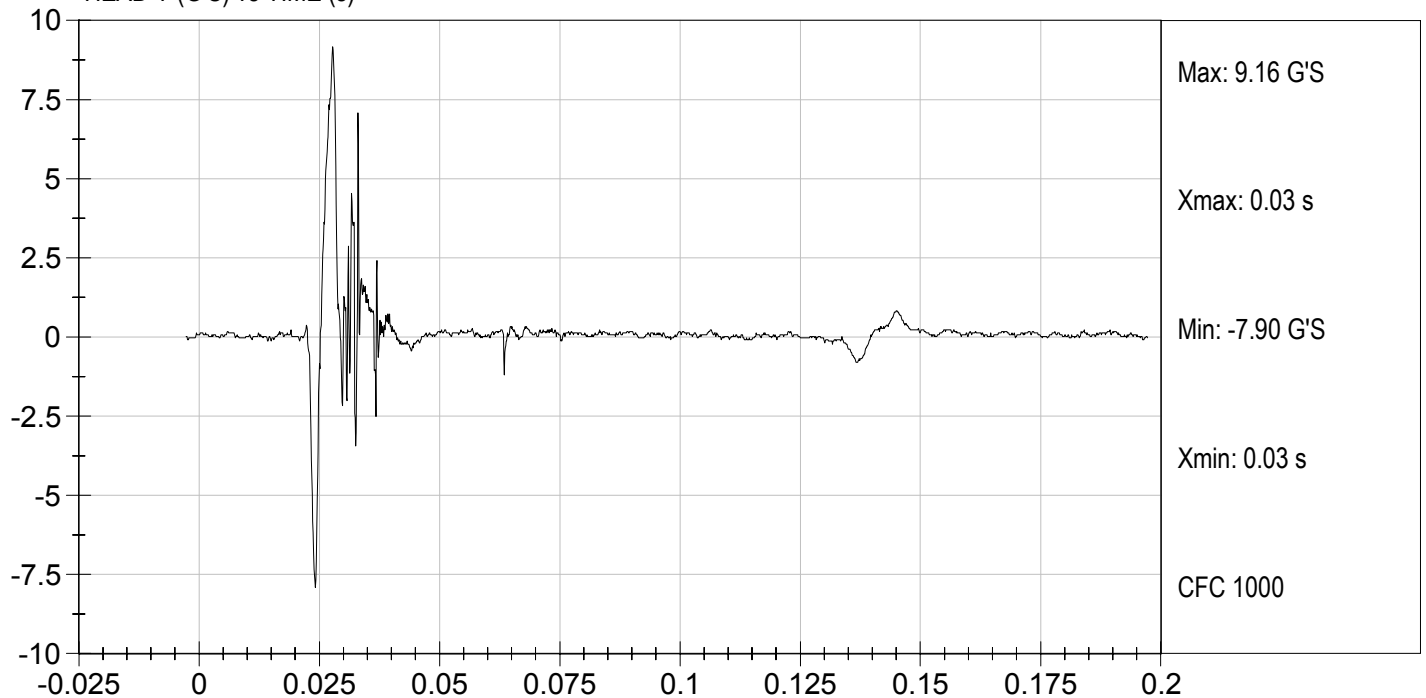
Test Desc: Head Drop
Componet ID: D041781

Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s

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



HEAD Y (G'S) vs TIME (s)



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041782

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	47	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.00	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.75	Pass
	20 msec	G's	17.60 to 22.60	19.95	Pass
	30 msec	G's	12.50 to 18.50	14.40	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.28	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.2	Pass
	Time	msec	57.0 to 64.0	58.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	93.0	Pass
	Time	msec	47.0 to 58.0	51.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	102.2	Pass
Overall Test Results					Pass


 Laboratory Technician

08/03/2004
 Test Date

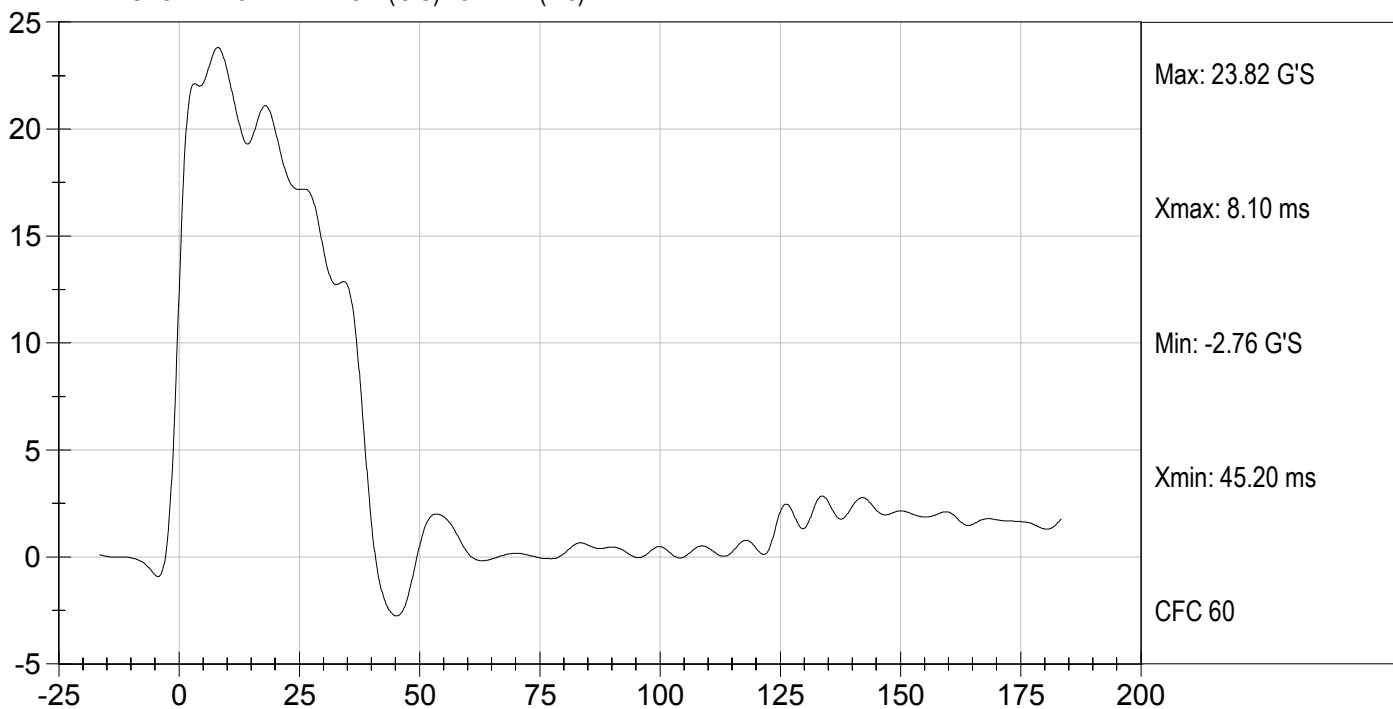

 Approved By



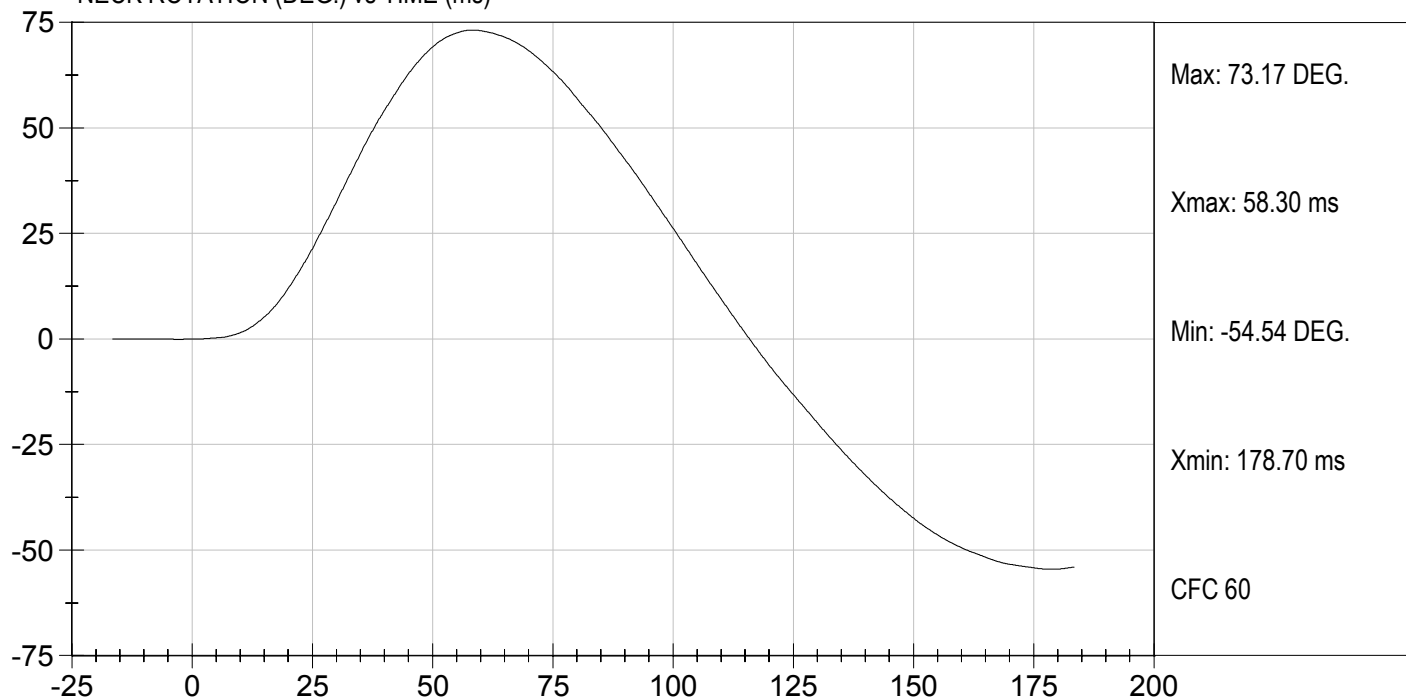
Test Desc: Neck Flexion
Componet ID: D041782

Test Date: 08/03/2004
Velocity: 22.95 ft/s, 7.00 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



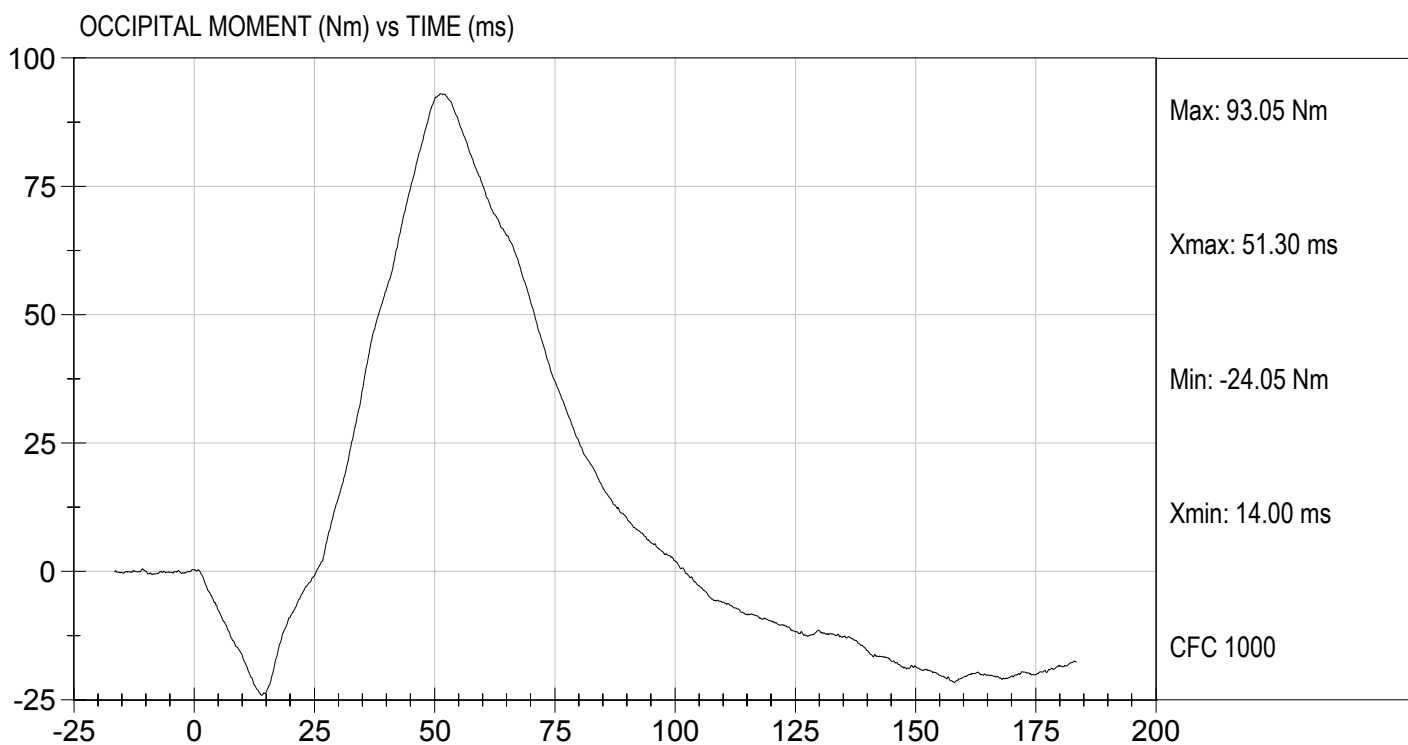
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Componet ID: D041782

Test Date: 08/03/2004
Velocity: 22.95 ft/s, 7.00 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041783

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.0	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.06	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.44	Pass
	20 msec	G's	14.00 to 19.00	16.27	Pass
	30 msec	G's	11.00 to 16.00	12.23	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	12.18	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	100.6	Pass
	Time	msec	72.0 to 82.0	78.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.4	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-65.9	Pass
	Time	msec	65.0 to 79.0	73.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	145.4	Pass
Overall Test Results					Pass


 Laboratory Technician

08/03/2004
 Test Date

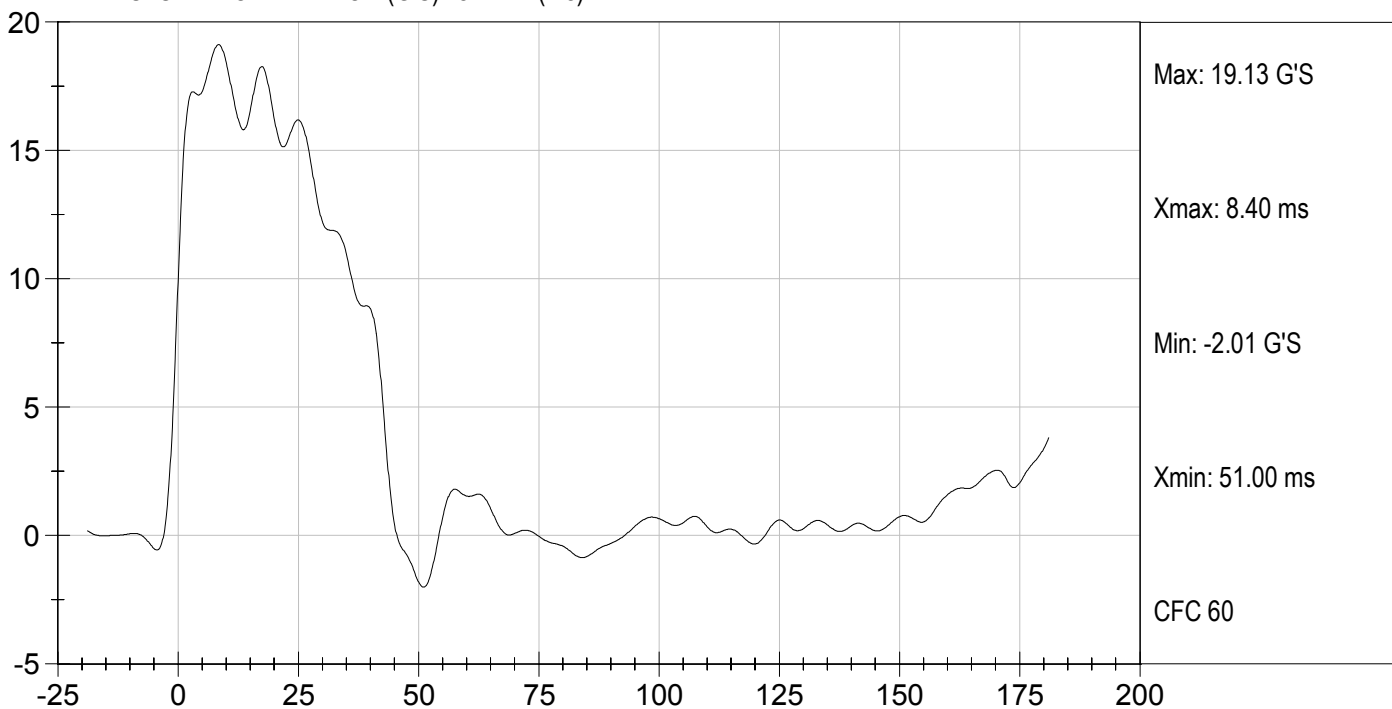

 Approved By



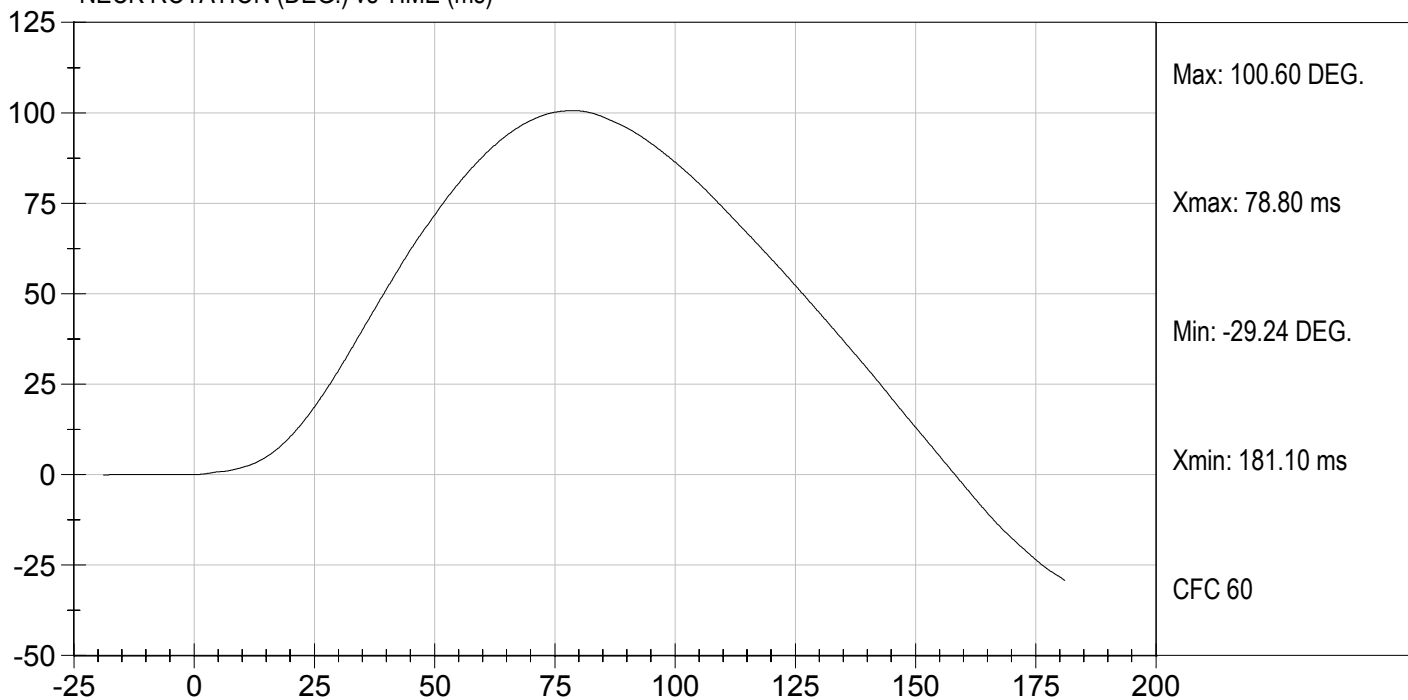
Test Desc: Neck Extension
Componet ID: D041783

Test Date: 08/03/2004
Velocity: 19.87 ft/s, 6.06 m/s

PENDULUM DECELERATION (G'S) vs TIME (ms)



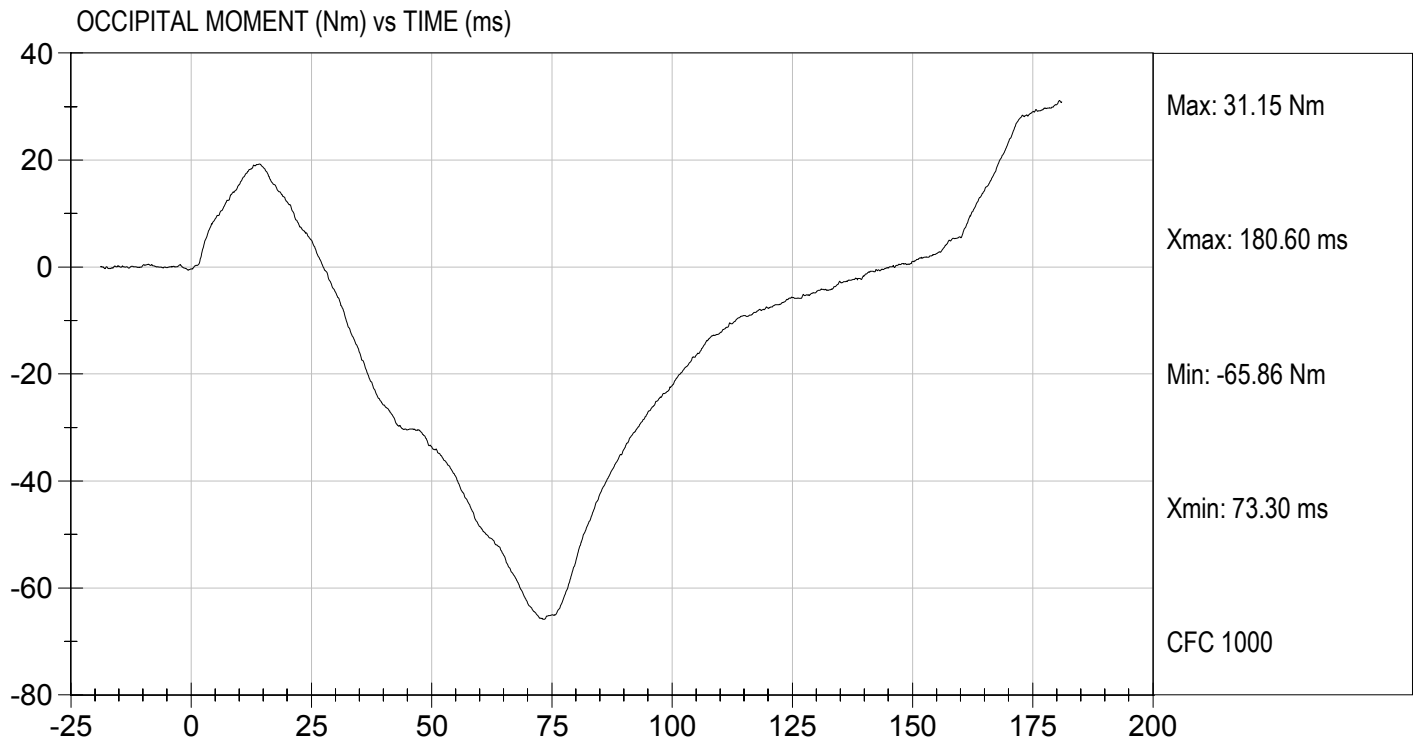
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Componet ID: D041783

Test Date: 08/03/2004
Velocity: 19.87 ft/s, 6.06 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041784

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Probe Velocity	m/s	6.58 to 6.82	6.71	Pass
Peak Probe Force	N	5159 to 5893	5,665	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.88	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results				Pass



Laboratory Technician

08/03/2004

Test Date

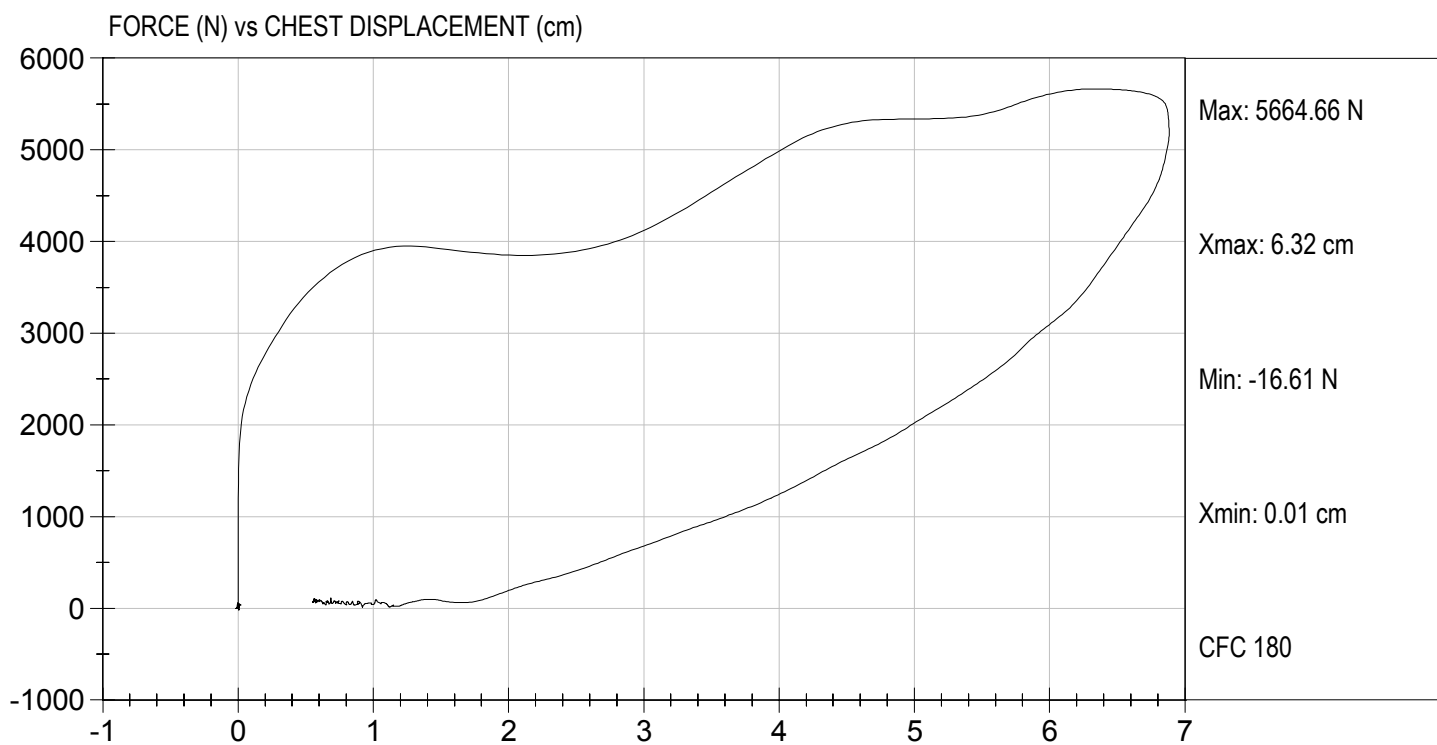


Approved By



Test Desc: Thorax Impact
Componet ID: D041784

Test Date: 08/03/2004
Velocity: 22.03 ft/s, 6.71 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041785

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	47	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	4,799	Pass
Overall Test Results				Pass


Laboratory Technician

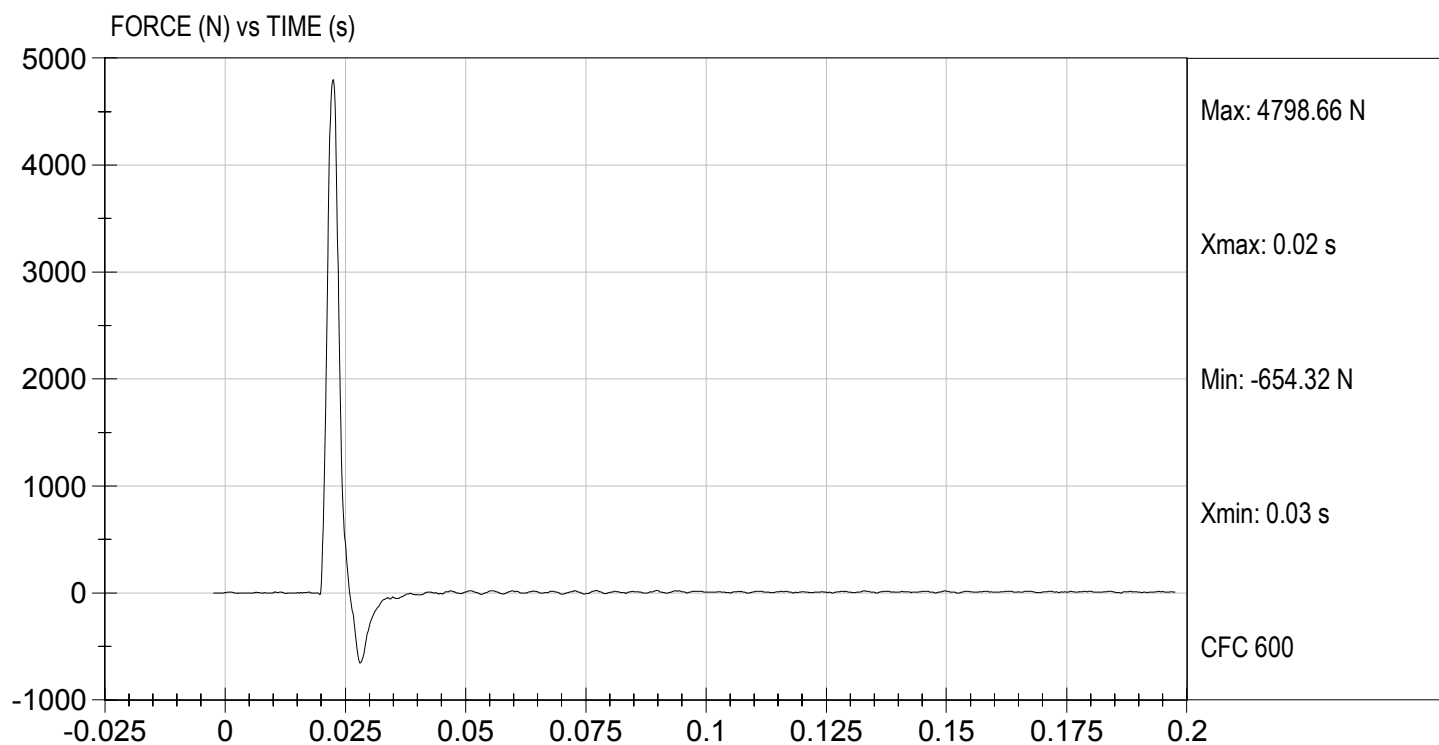
08/03/2004
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D041785

Test Date: 08/03/2004
Velocity: 7.0 ft/s, 2.13 m/s



MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041786

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	47	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,071	Pass
Overall Test Results				Pass


Laboratory Technician

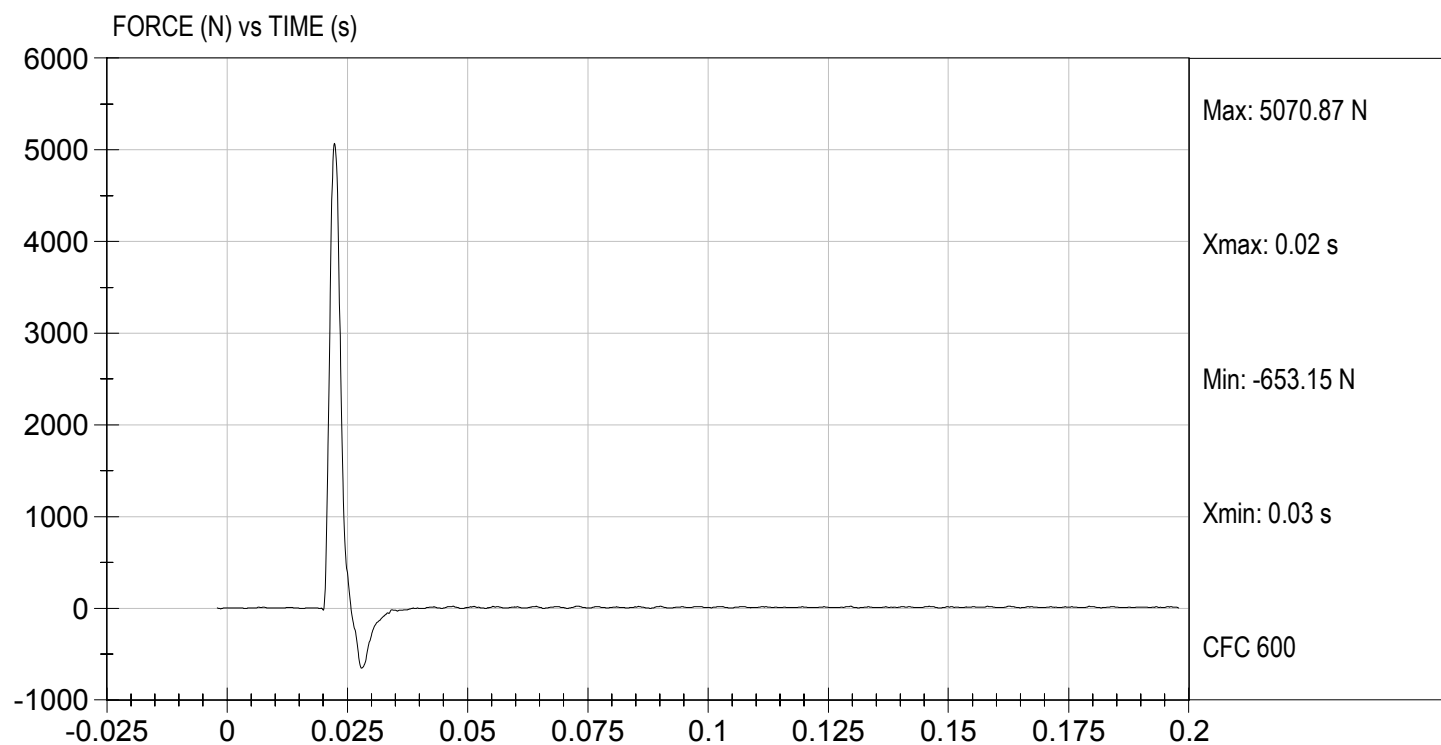
08/03/2004
Test Date


Approved By



Test Desc: Right Knee
Componet ID: D041786

Test Date: 08/03/2004
Velocity: 6.84 ft/s, 2.08 m/s



MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D041780

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	49	49	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	84.5	73.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	41	40	Pass
Overall Test Results					Pass


Laboratory Technician

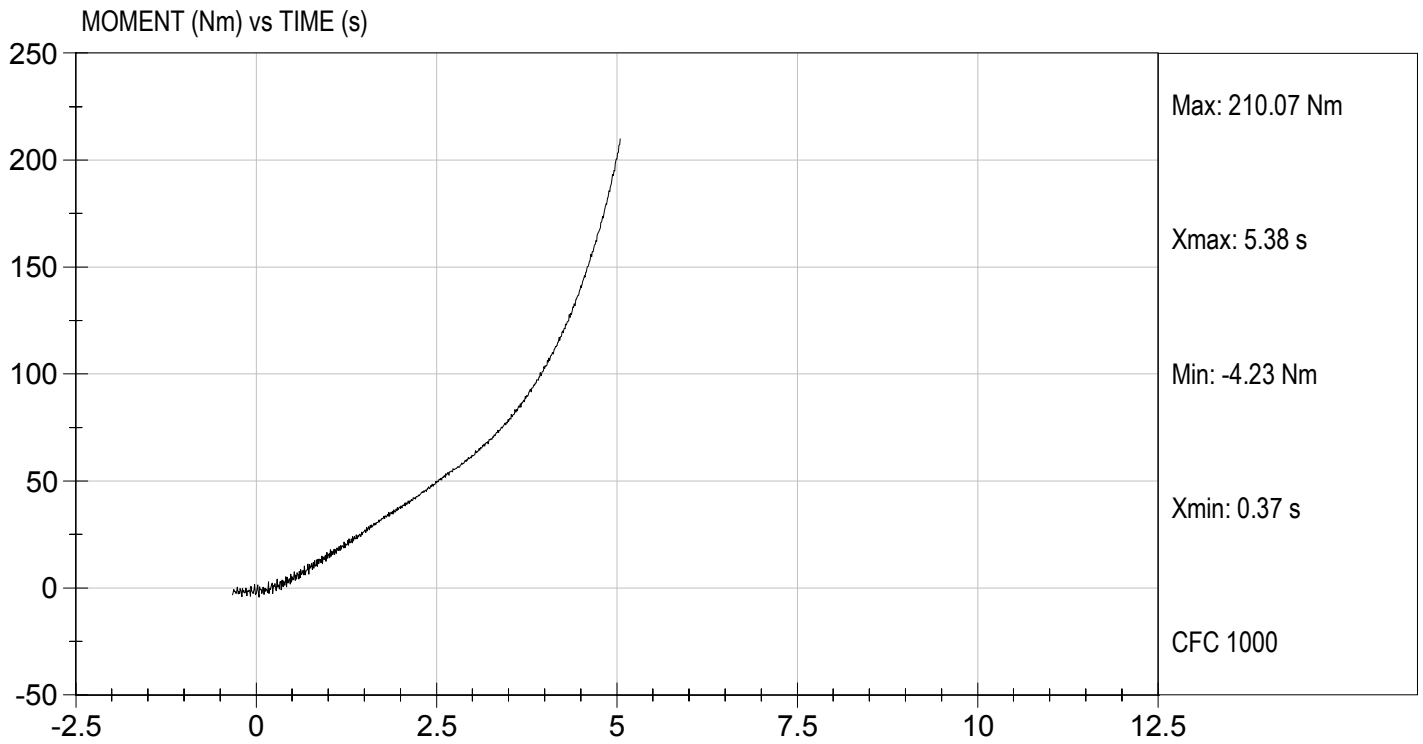
08/02/2004
Test Date


Approved By



Test Desc: Hip Femur Flexion
Componet ID: D041789

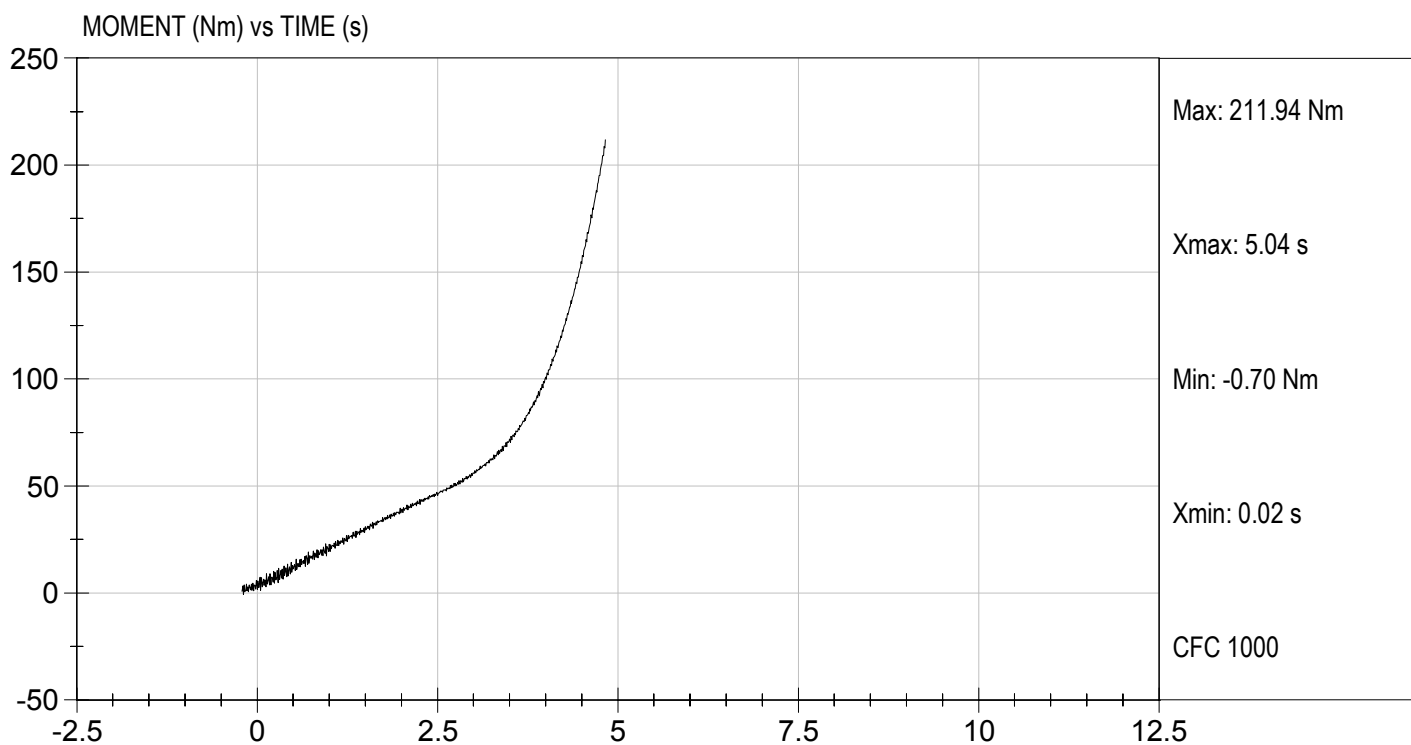
Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Componet ID: D041780

Test Date: 08/02/2004
Velocity: 0 ft/s, 0.00 m/s



APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	P27020	Endevco	8/04/04
Head Y	P27025	Endevco	8/04/04
Head Z	P22692	Endevco	8/04/04
Head X Redundant	J10431	Endevco	8/04/04
Head Y Redundant	P26986	Endevco	8/04/04
Head Z Redundant	AN9E3	Endevco	8/04/04
Head Y - Front	J19173	Endevco	8/04/04
Head Z - Front	J13656	Endevco	8/04/04
Head X - Left	J13424	Endevco	8/04/04
Head Z - Left	J14007	Endevco	8/04/04
Head X - Upper	J33415	Endevco	8/04/04
Head Y- Upper	J13630	Endevco	8/04/04
Neck Load Cell	443	Denton	7/20/04
Chest X	AMT78	Endevco	8/04/04
Chest Y	AP1Y8	Endevco	8/04/04
Chest Z	J11361	Endevco	8/04/04
Chest Deflection Gauge	065	Servo	8/03/04
Chest X Redundant	ALFP5	Endevco	8/04/04
Chest Y Redundant	AP138	Endevco	8/04/04
Chest Z Redundant	AJ9Y3	Endevco	8/04/04
Pelvis X	P26988	Endevco	5/25/04
Pelvis Y	AMP12	Endevco	5/25/04
Pelvis Z	AJ4K2	Endevco	5/25/04
Left Femur Load Cell	262	Denton	7/20/04
Right Femur Load Cell	261	Denton	7/20/04
Left Upper Tibia Load Cell	266	Denton	7/22/04
Left Lower Tibia Load Cell	179	Denton	7/22/04
Right Upper Tibia Load Cell	263	Denton	7/22/04
Right Lower Tibia Load Cell	174	Denton	7/22/04
Left Foot Z – Front	L20-A38	Entran	4/06/04
Left Ankle X	AHTB2	Endevco	4/08/04
Left Ankle Z	AJ9A7	Endevco	5/25/04

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Right Foot Z – Front	P10148	Endevco	5/25/04
Right Ankle X	P26999	Endevco	5/25/04
Right Ankle Z	J12465	Endevco	5/25/04
Shoulder Belt Load Cell	172	Denton	8/18/04
Lap Belt Load Cell	193	Denton	4/12/04

INSTRUMENTS FOR PASSENGER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	A28-H01	Entran	9/17/04
Head Y	A29-B07	Entran	9/17/04
Head Z	A28-H02	Entran	9/17/04
Head X Redundant	A27-Z12	Entran	9/17/04
Head Y Redundant	P10149	Endevco	8/23/04
Head Z Redundant	L17-Z14	Entran	9/17/04
Head Y - Front	J13938	Endevco	8/04/04
Head Z - Front	ANAT6	Endevco	8/04/04
Head X - Left	AP2A4	Endevco	8/04/04
Head Z - Left	AP2D8	Endevco	8/04/04
Head X - Upper	AP1T8	Endevco	8/04/04
Head Y- Upper	AP2D7	Endevco	8/04/04
Neck Load Cell	442	Denton	7/20/04
Chest X	P22086	Endevco	8/04/04
Chest Y	AJ9D2	Endevco	8/04/04
Chest Z	P24265	Endevco	8/04/04
Chest Deflection Gauge	066	Servo	8/03/04
Chest X Redundant	P22652	Endevco	8/04/04
Chest Y Redundant	AJ417	Endevco	8/04/04
Chest Z Redundant	P22150	Endevco	8/04/04
Pelvis X	J13851	Endevco	8/02/04
Pelvis Y	AJ808	Endevco	8/02/04
Pelvis Z	AH0F0	Endevco	8/02/04
Left Femur Load Cell	259	Denton	7/20/04
Right Femur Load Cell	256	Denton	7/20/04
Left Upper Tibia Load Cell	107	Denton	7/22/04
Left Lower Tibia Load Cell	136	Denton	7/22/04
Right Upper Tibia Load Cell	103	Denton	7/22/04
Right Lower Tibia Load Cell	133	Denton	7/22/04
Left Foot Z – Front	A05-A20	Entran	8/04/04
Left Ankle X	A05-A21	Entran	8/04/04
Left Ankle Z	A07-J01	Entran	8/04/04

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Right Foot Z – Front	ANBP7	Endevco	7/23/04
Right Ankle X	L30-Z18	Entran	8/04/04
Right Ankle Z	A12-A11	Entran	8/40/04
Shoulder Belt Load Cell	157	Denton	8/18/04
Lap Belt Load Cell	192	Denton	4/12/04

INSTRUMENTS FOR VEHICLE AND LABORATORY

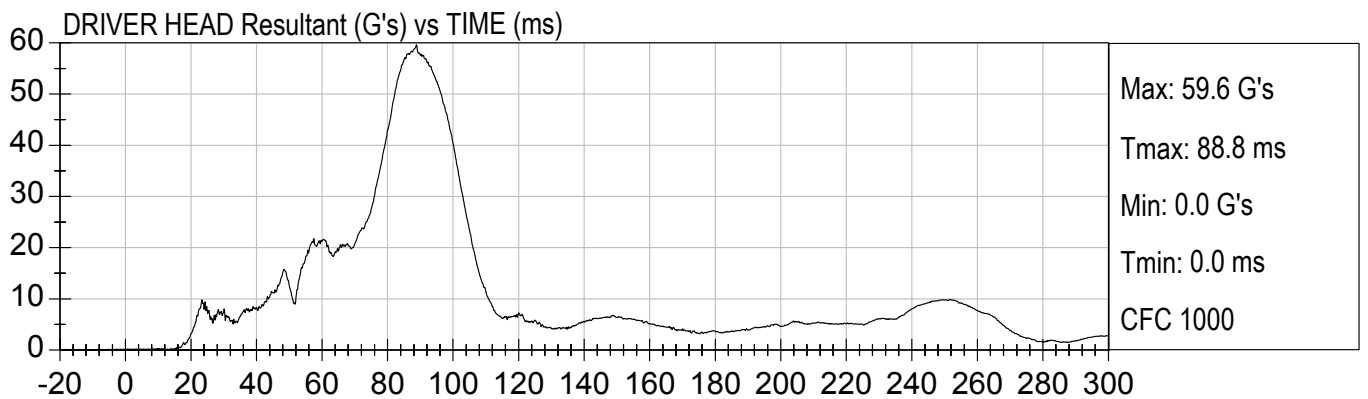
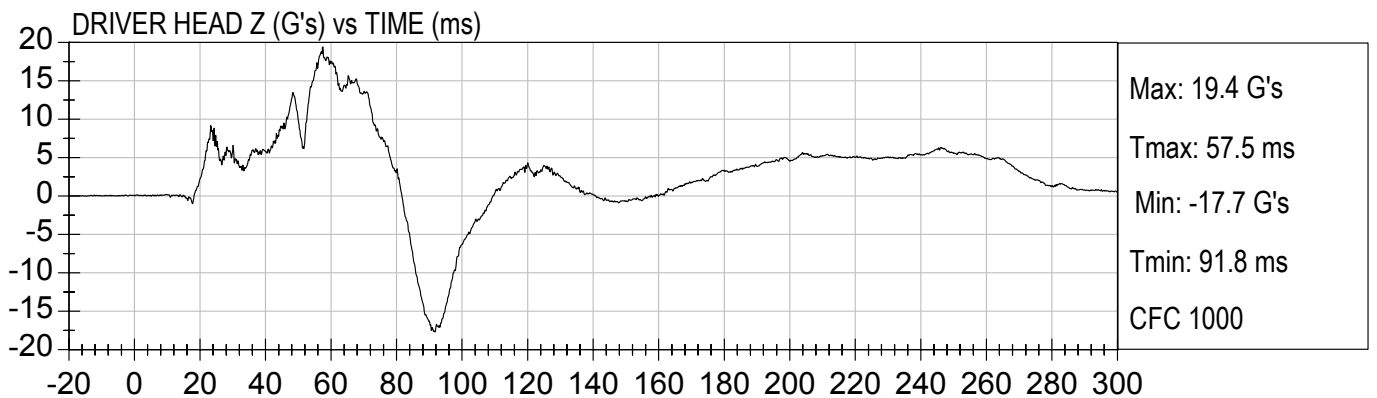
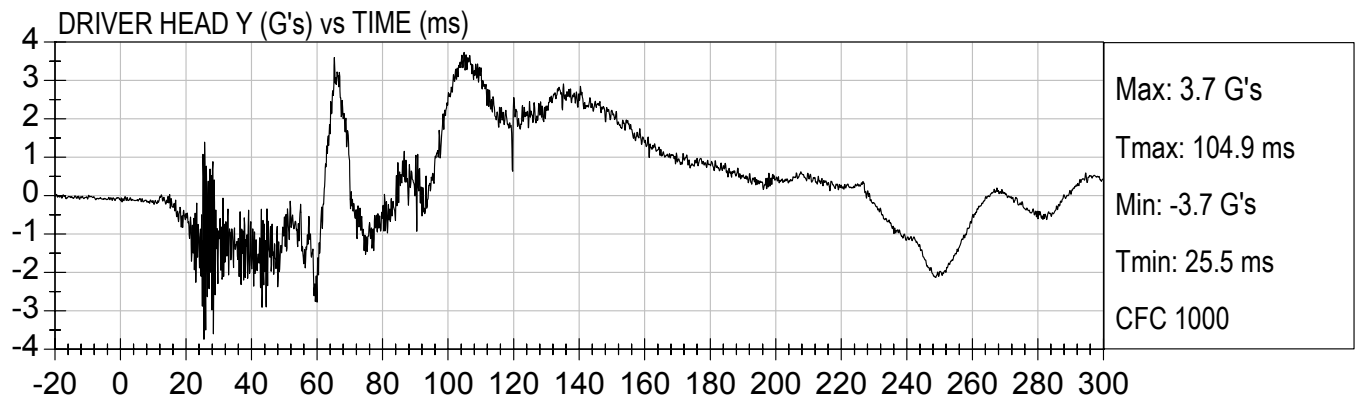
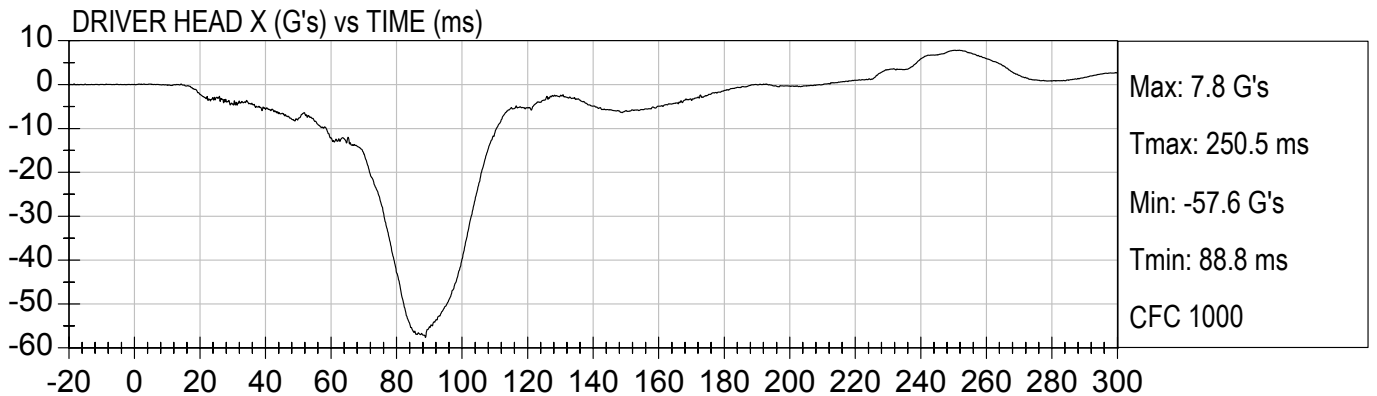
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	K07-R15	Entran	6/04/04
Left Rear Seat Crossmember Z	K20-J10	Entran	6/04/04
Right Rear Seat Crossmember X	K07-R18	Entran	8/25/04
Right Rear Seat Crossmember Z	J10-E12	Entran	8/25/04
Top of Engine X	K18-J08	Entran	8/25/04
Bottom of Engine X	K20-J09	Entran	9/13/04
Left Brake Caliper X	L20-B12	Entran	7/02/04
Right Brake Caliper X	K18-D14	Entran	6/04/04
Instrument Panel X	I16-B11	Entran	5/28/04

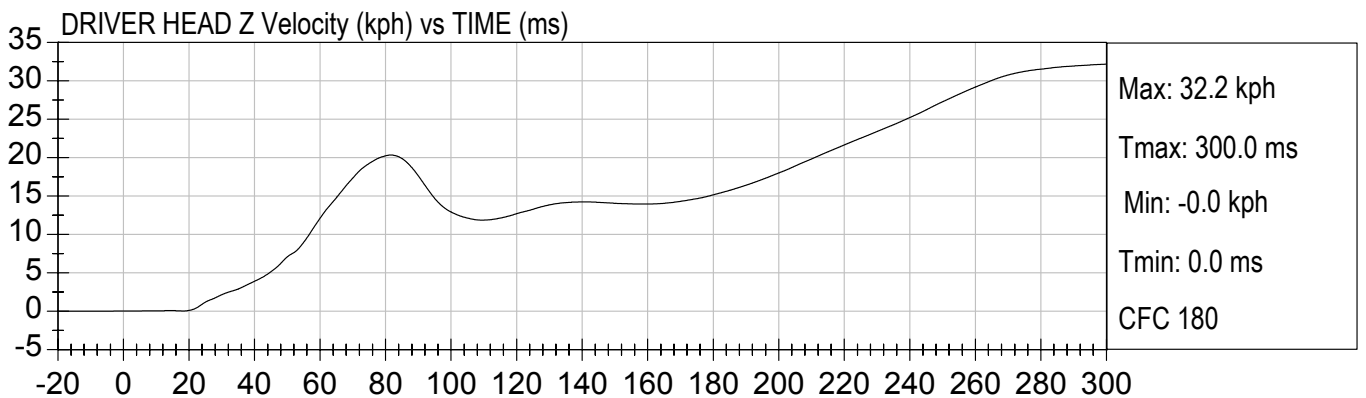
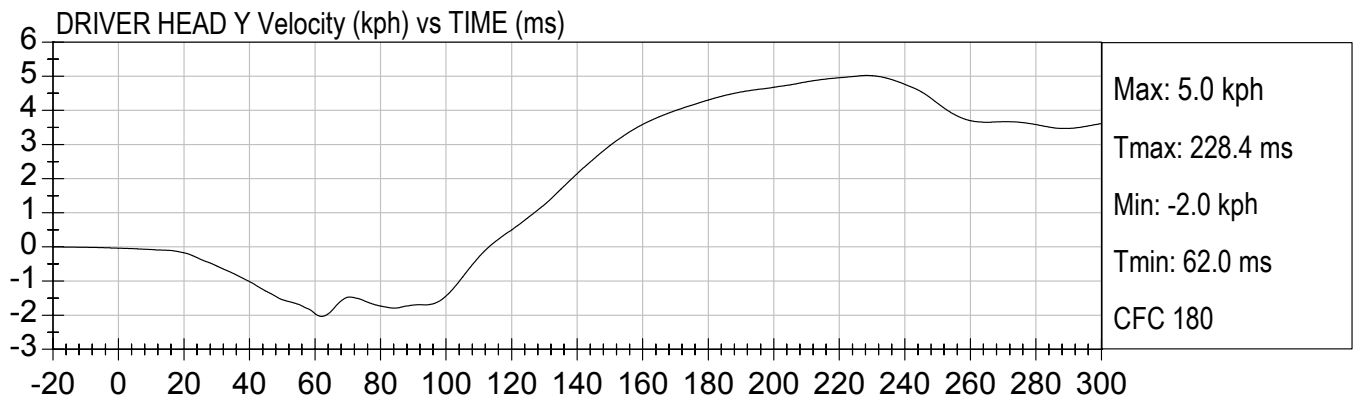
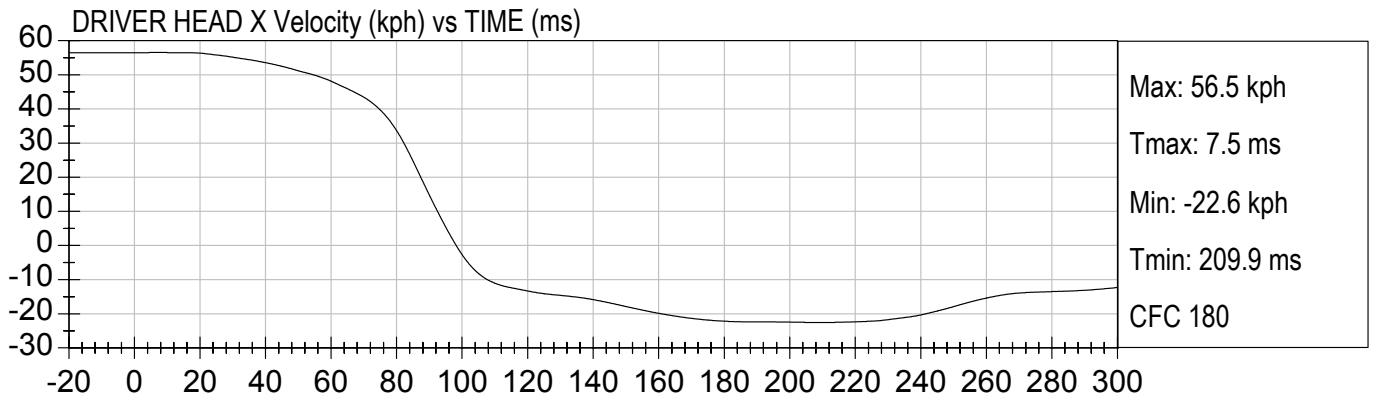
APPENDIX E
DUMMY HEAD RESPONSE DATA TRACES

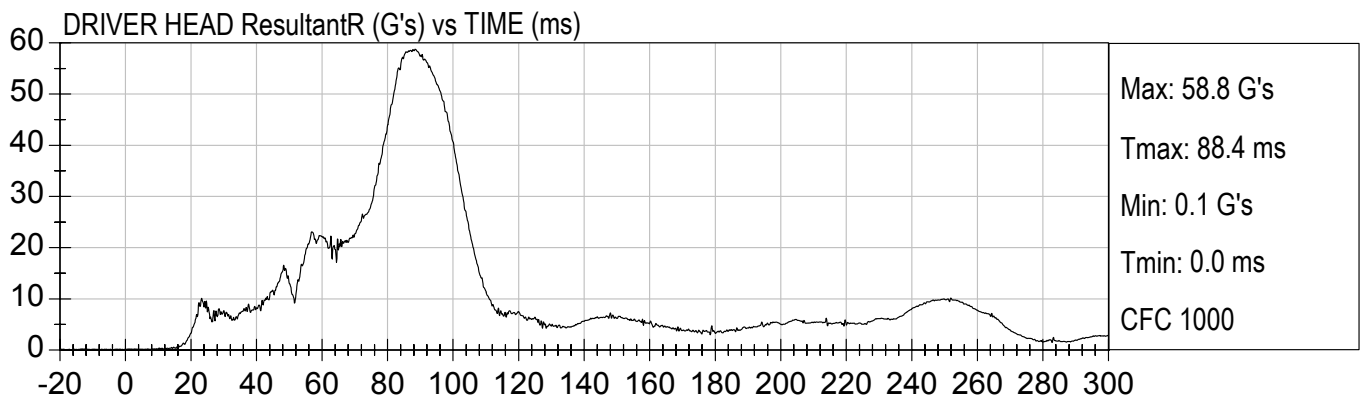
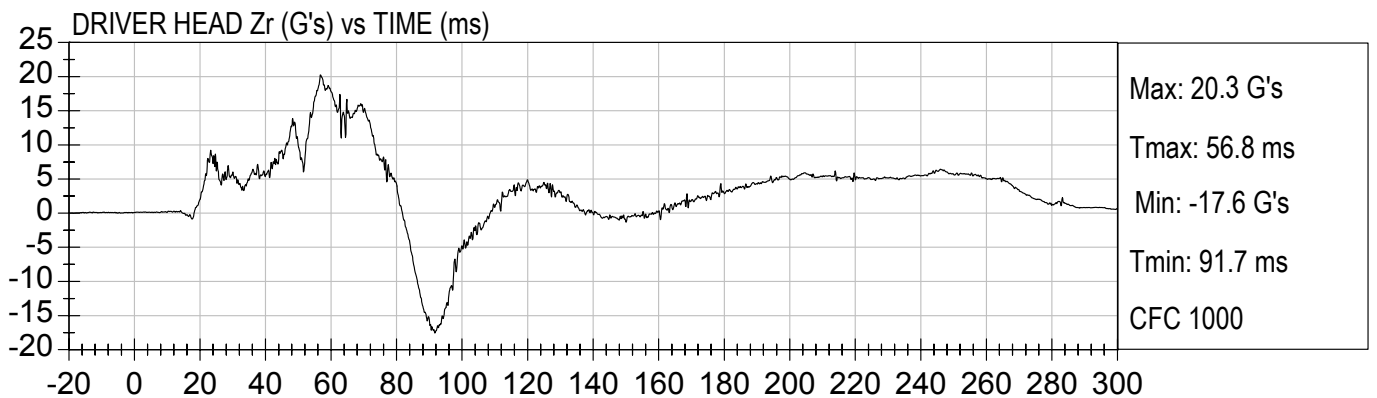
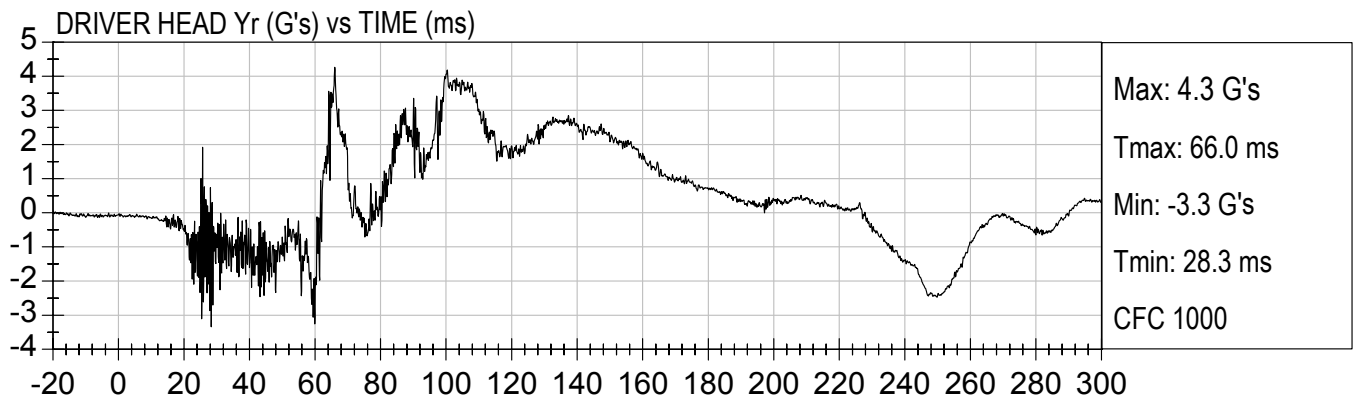
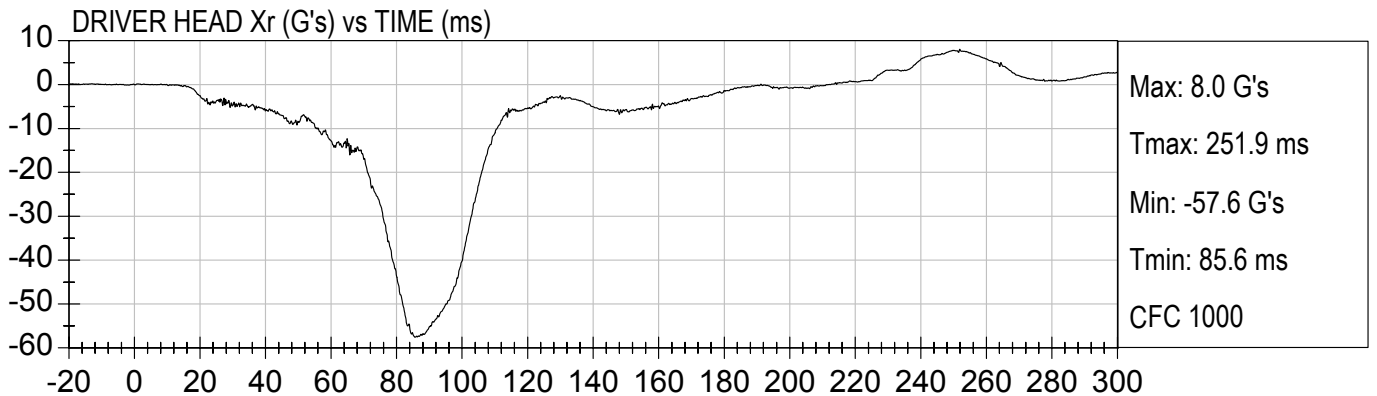
TABLE OF DATA PLOTS

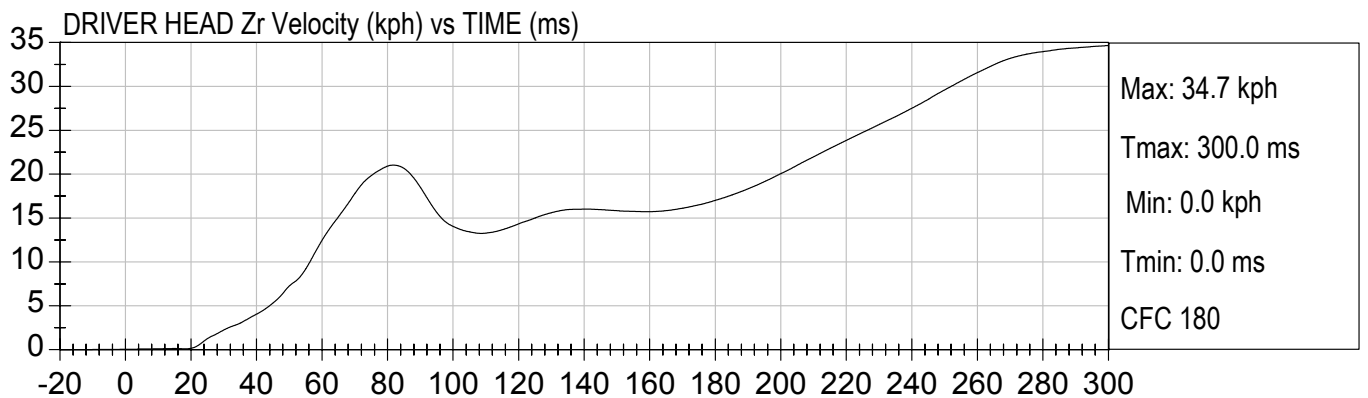
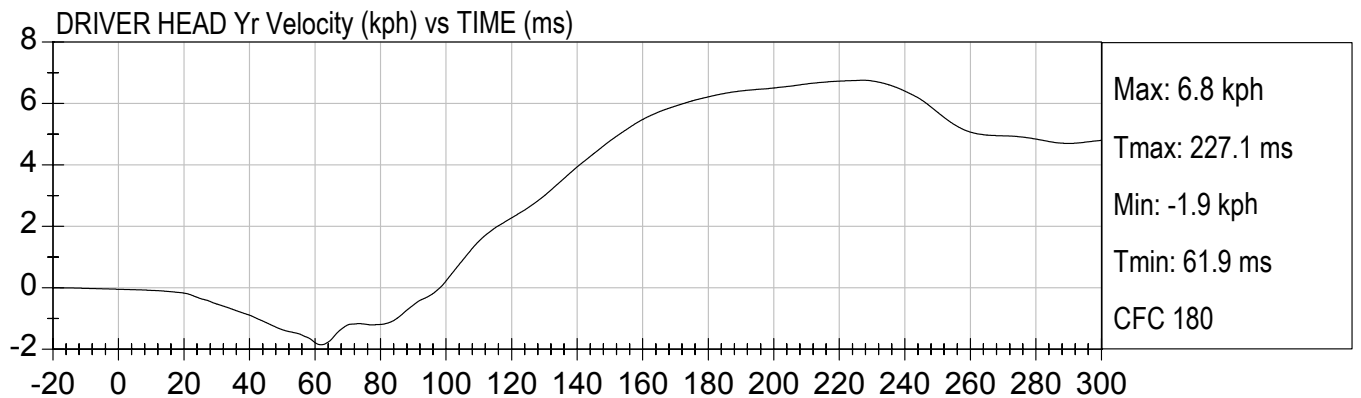
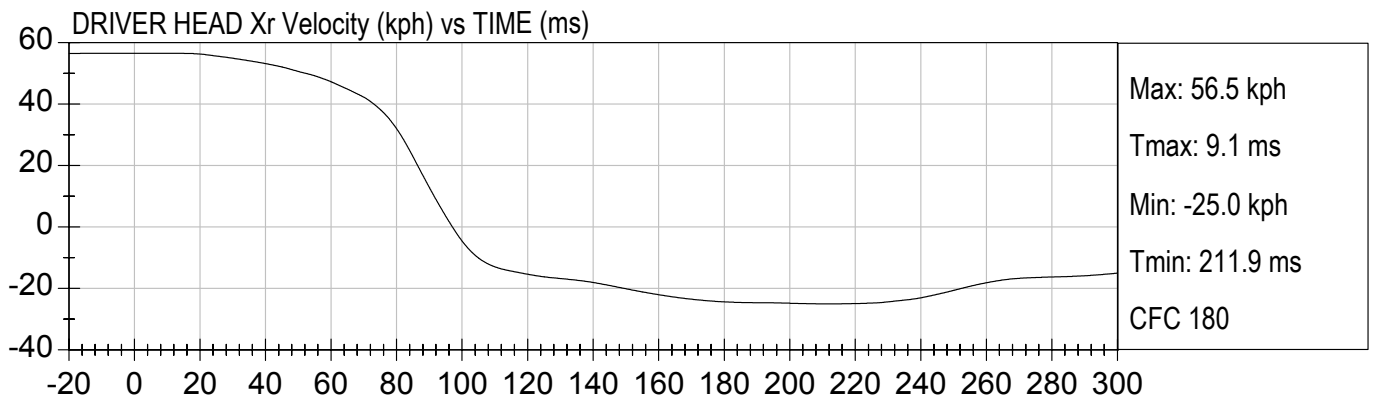
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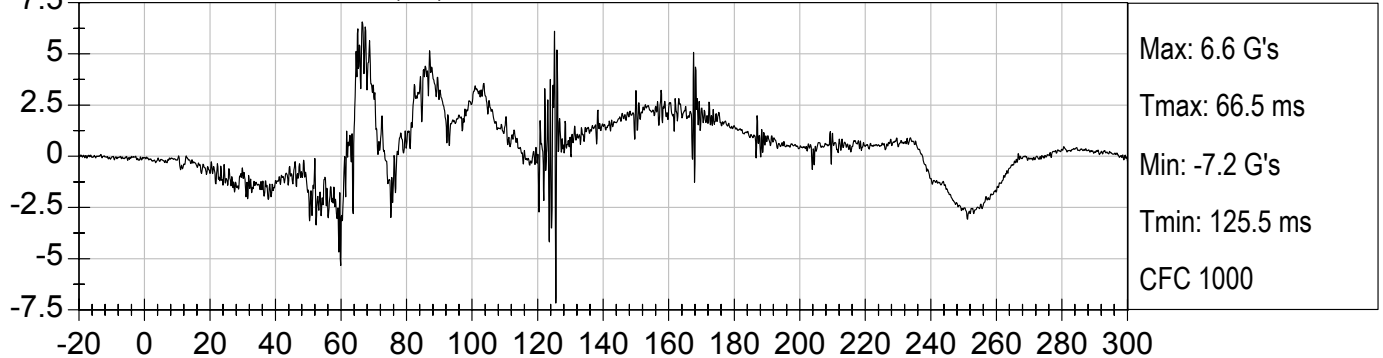




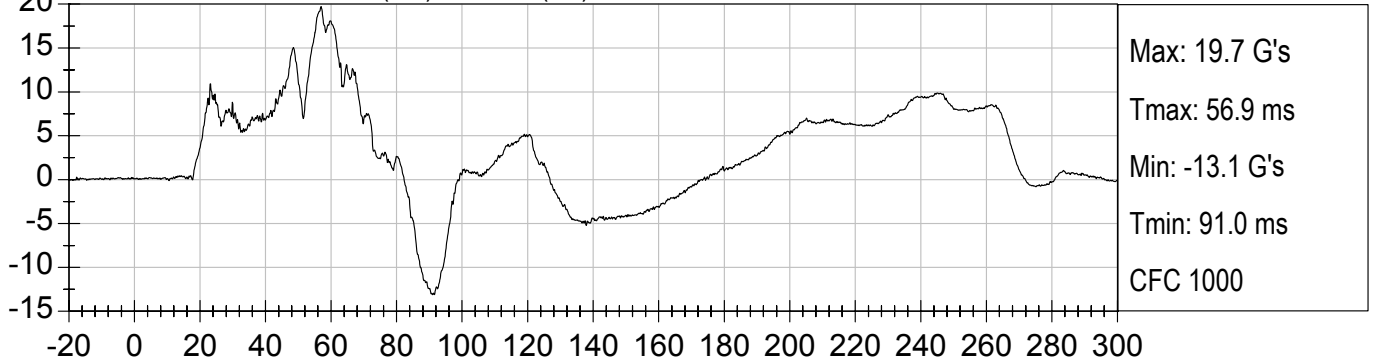




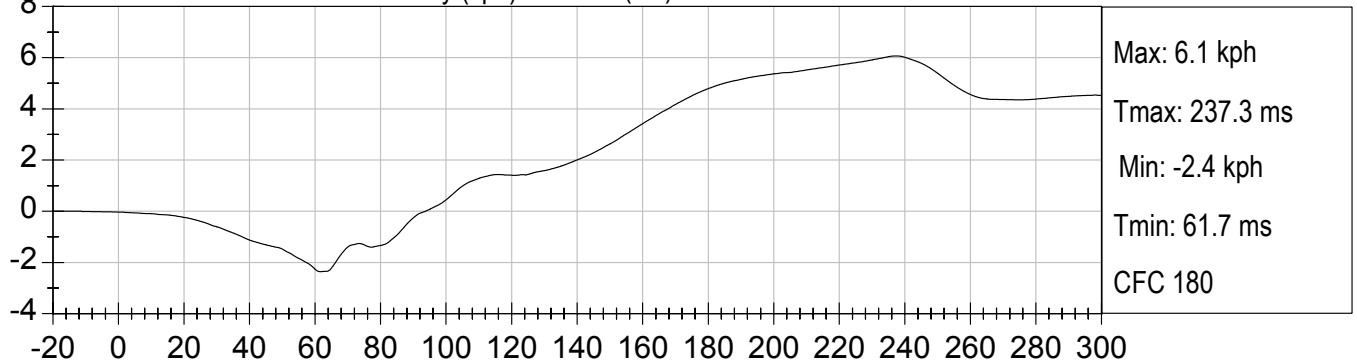
DRIVER HEAD Y - FRONT (G's) vs TIME (ms)



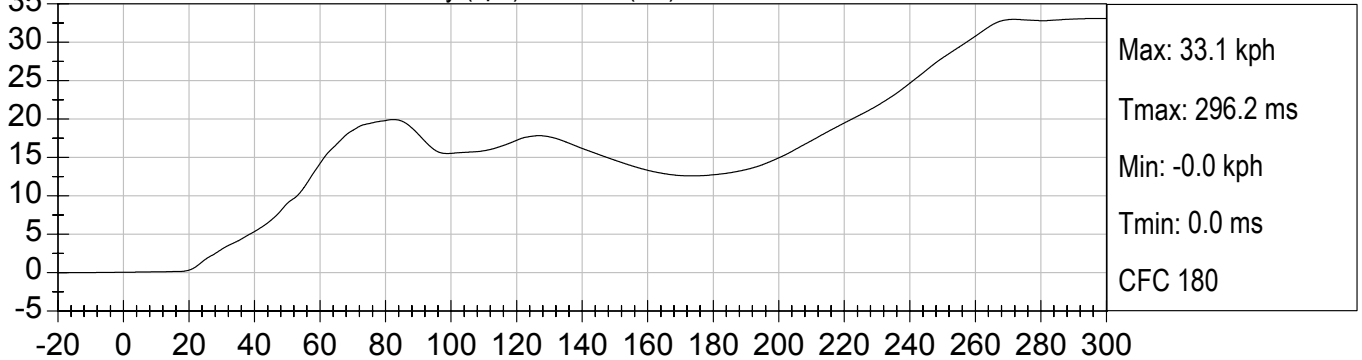
DRIVER HEAD Z - FRONT (G's) vs TIME (ms)

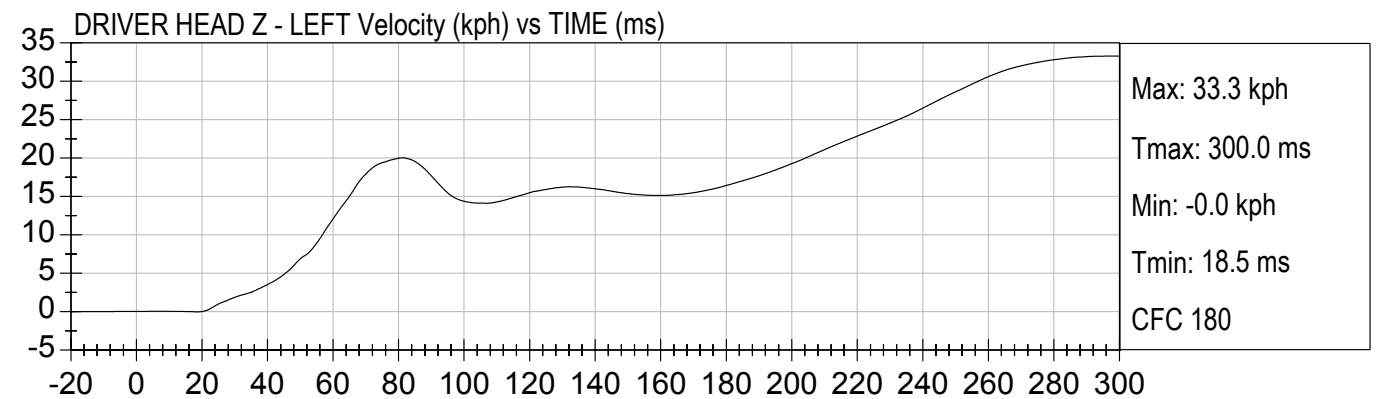
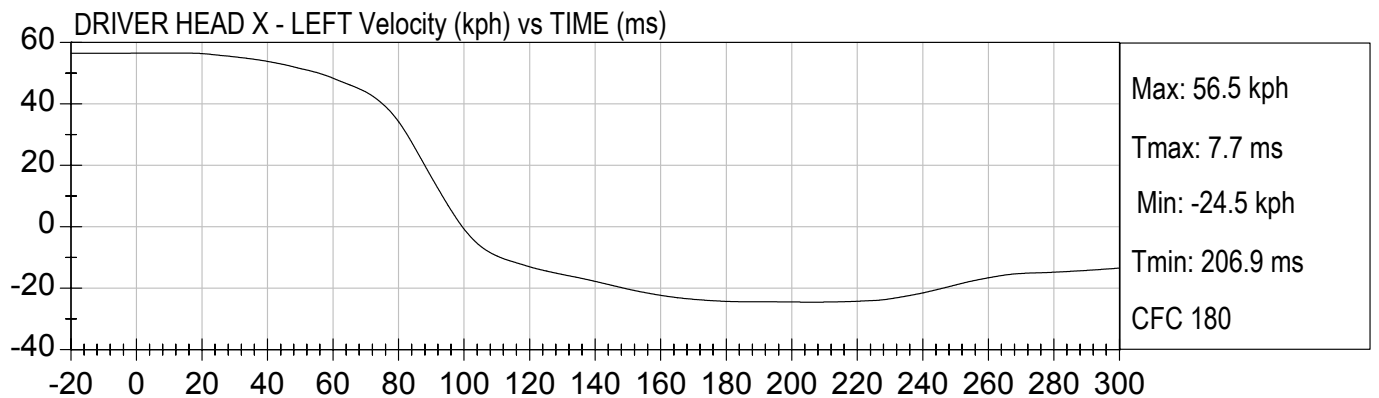
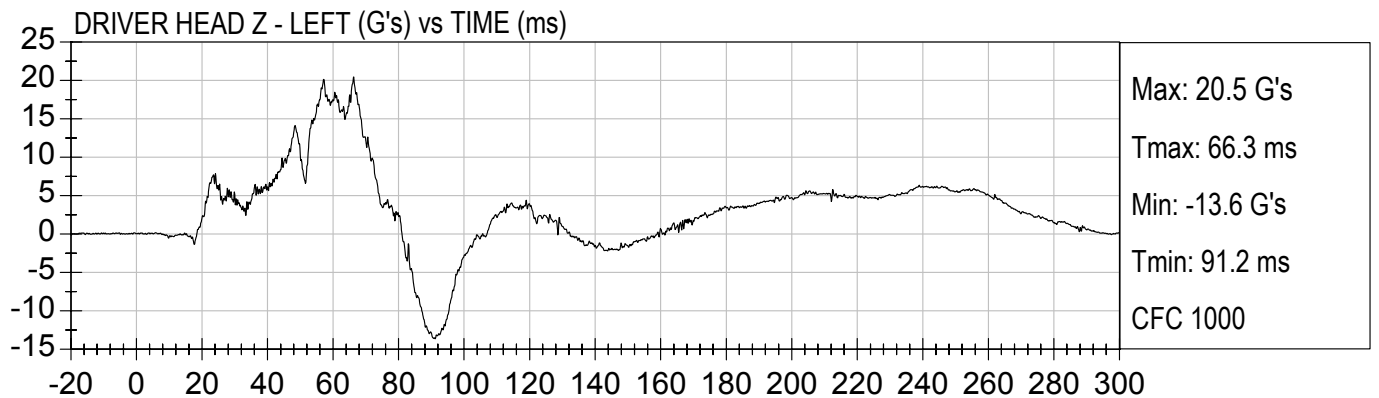
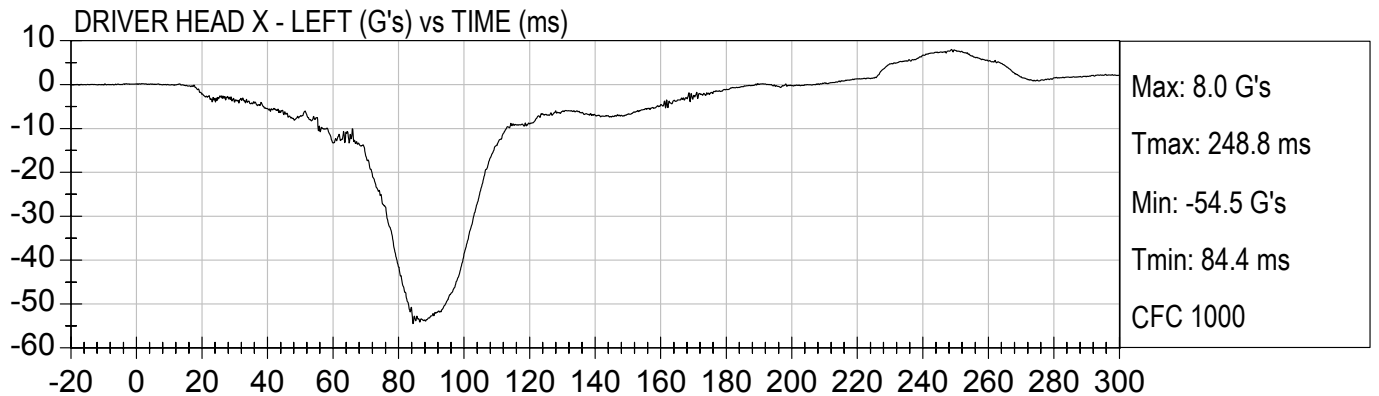


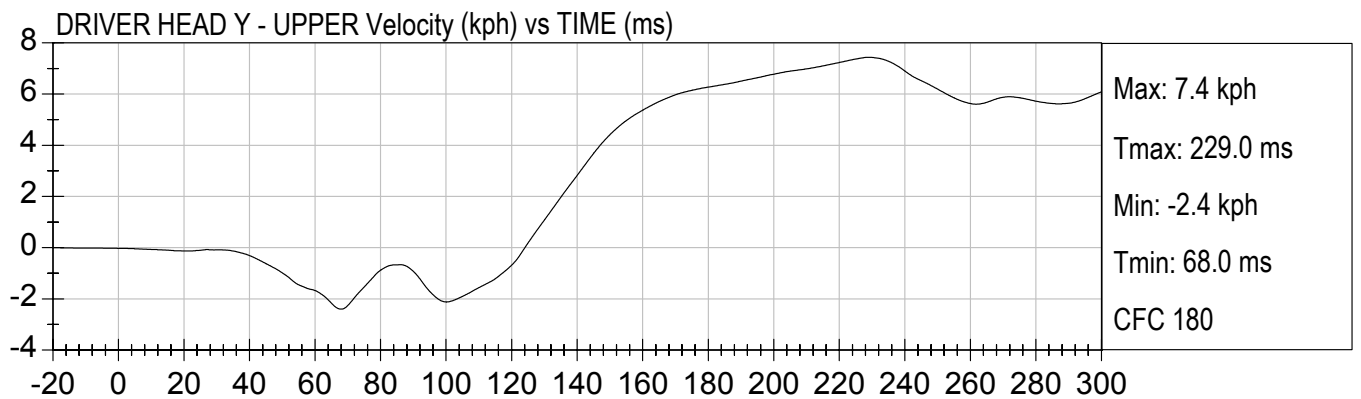
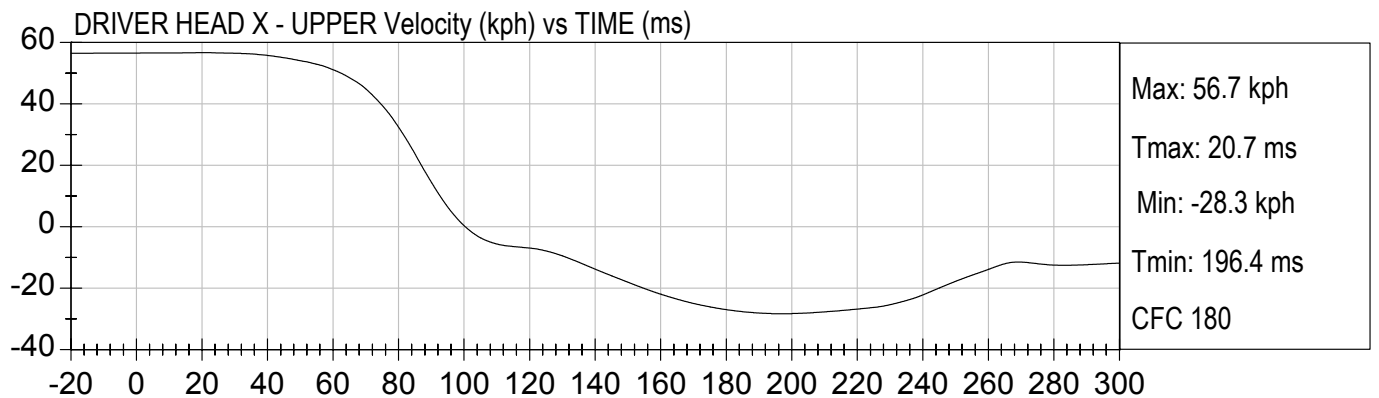
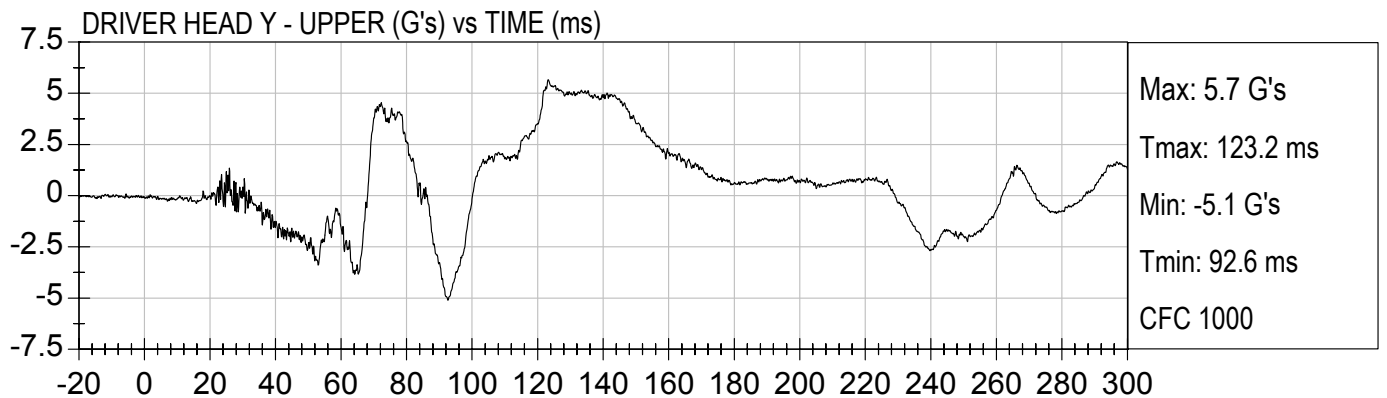
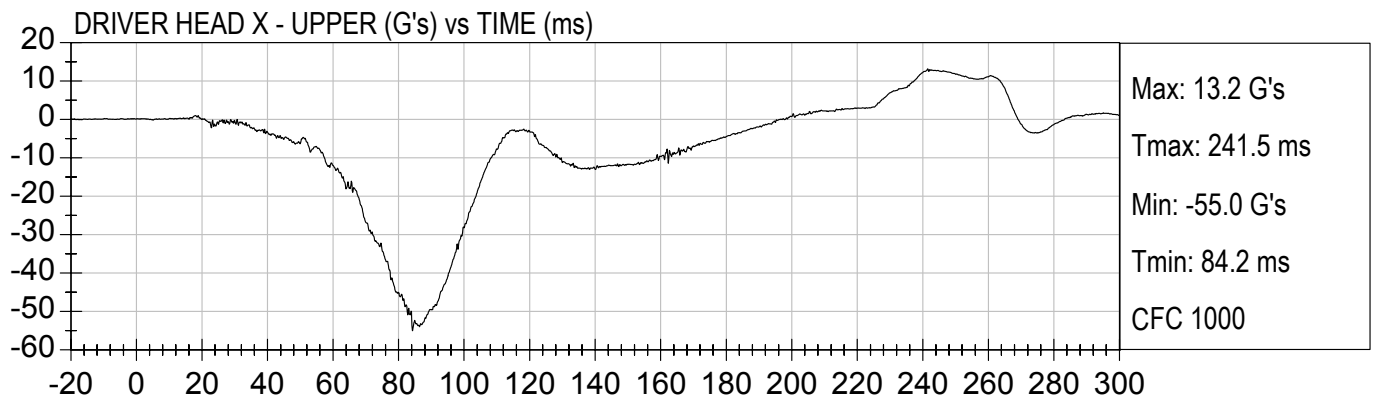
DRIVER HEAD Y - FRONT Velocity (kph) vs TIME (ms)



DRIVER HEAD Z - FRONT Velocity (kph) vs TIME (ms)





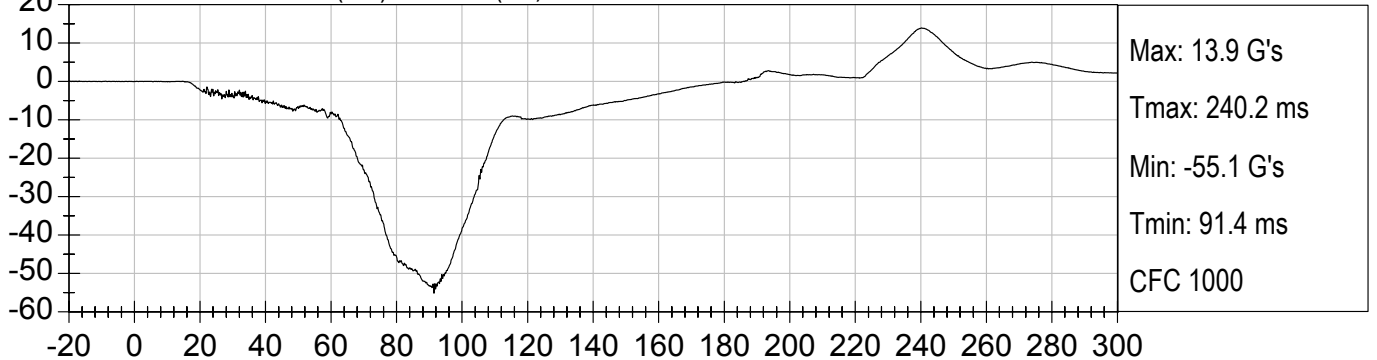




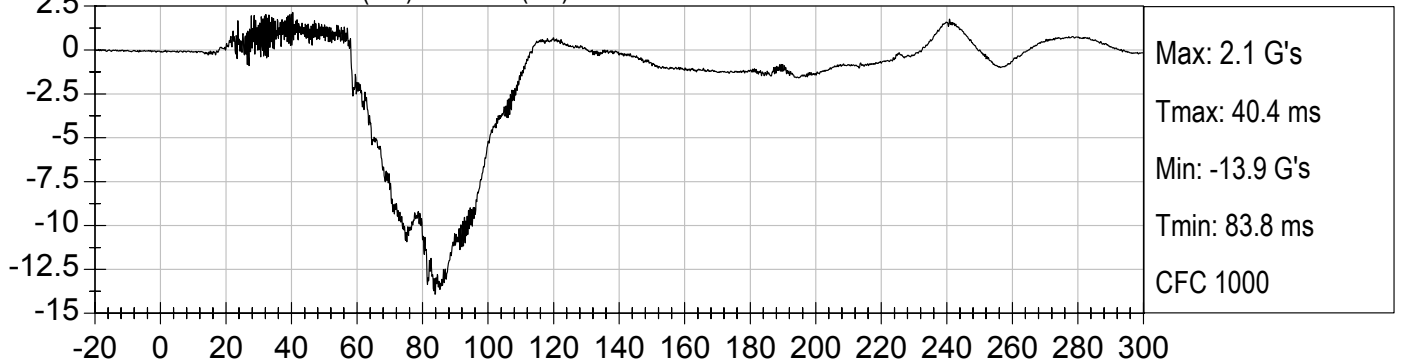
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

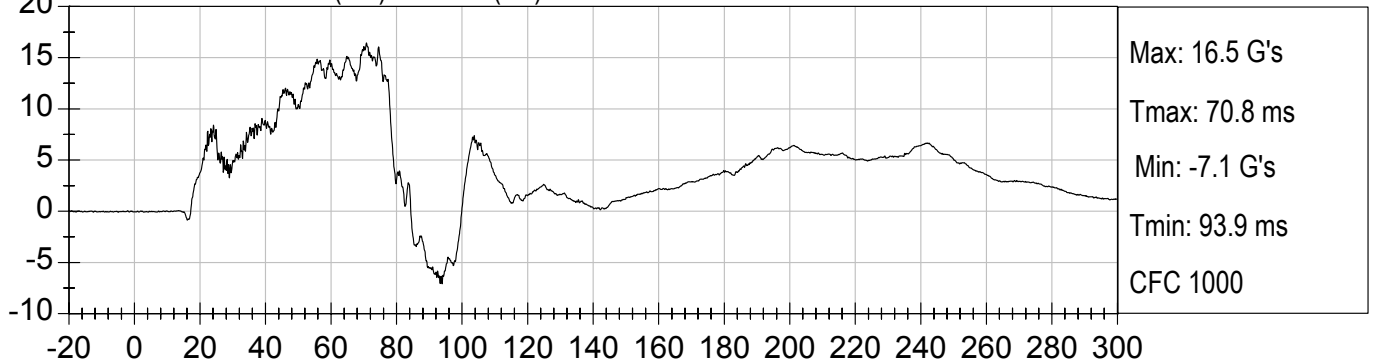
PASSENGER HEAD X (G's) vs TIME (ms)



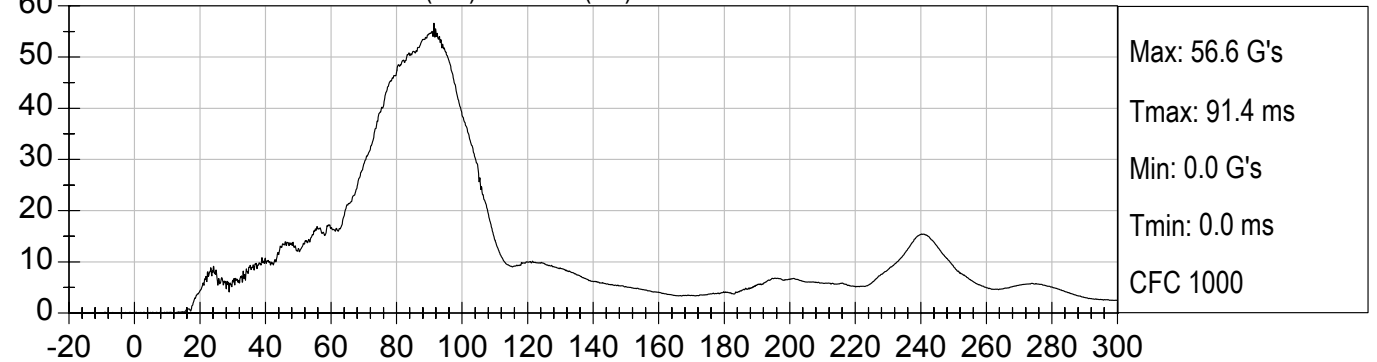
PASSENGER HEAD Y (G's) vs TIME (ms)



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

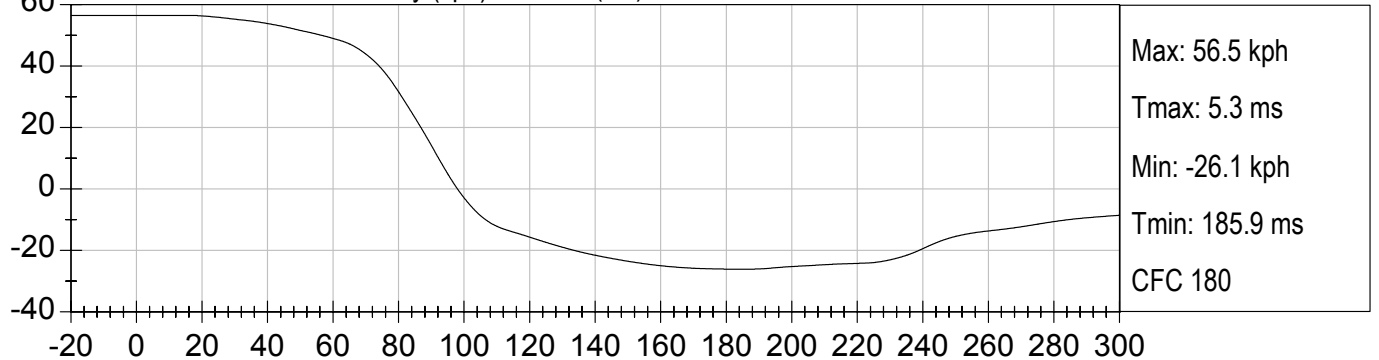


PASSENGER HEAD Resultant (G's) vs TIME (ms)

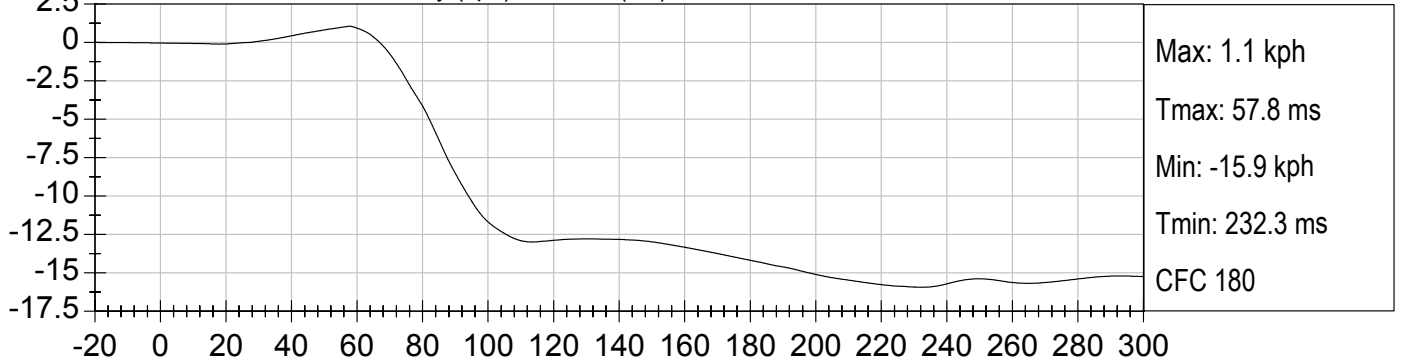




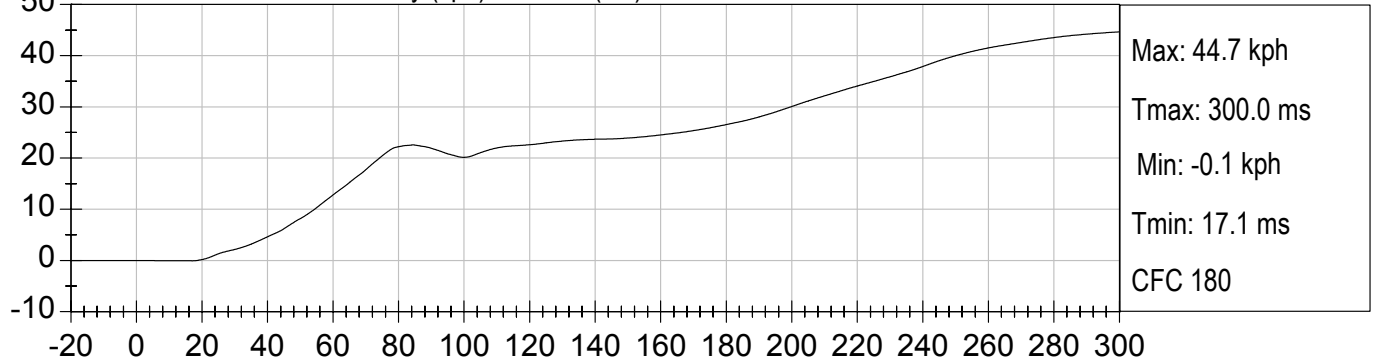
PASSENGER HEAD X Velocity (kph) vs TIME (ms)



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



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

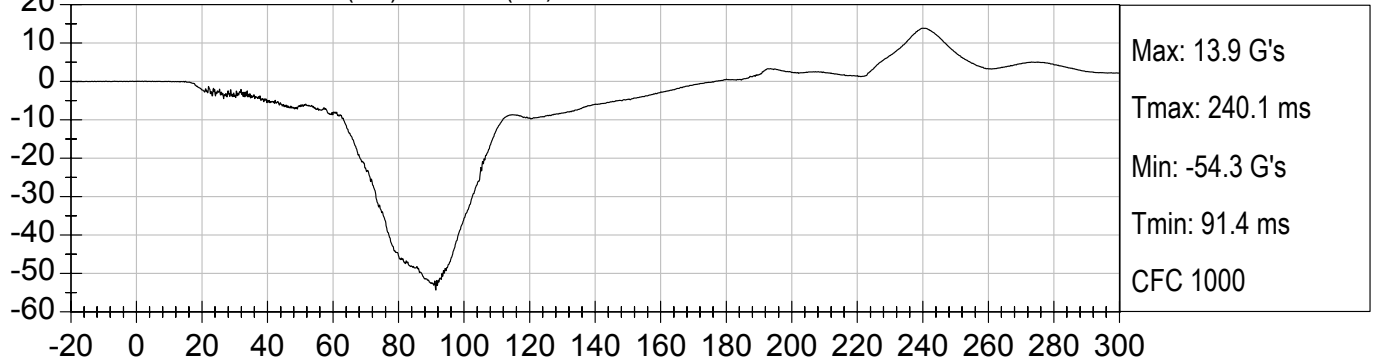




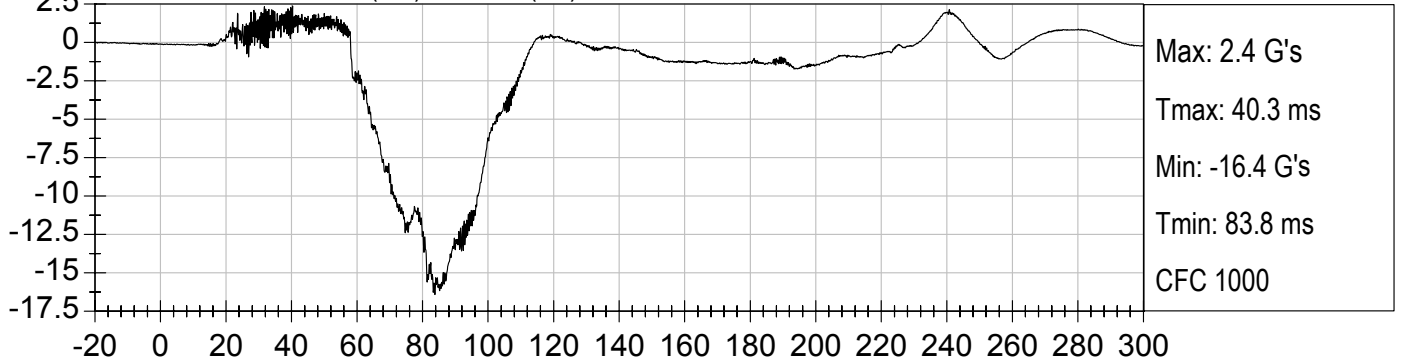
35 MPH NCAP FRONTAL
2005 TOYOTA MATRIX (M55102)

Test Date: 09/21/2004
Speed: 35.1 mph (56.5 km/h)

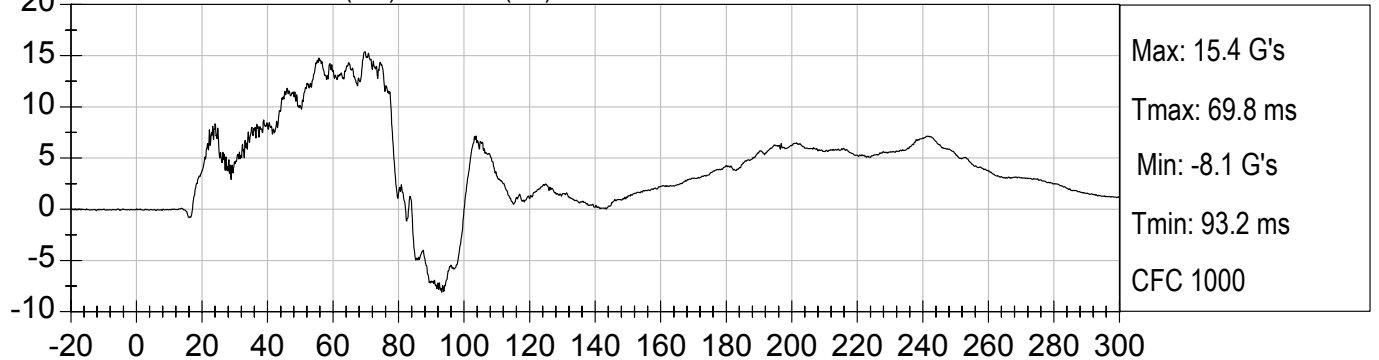
PASSENGER HEAD Xr (G's) vs TIME (ms)



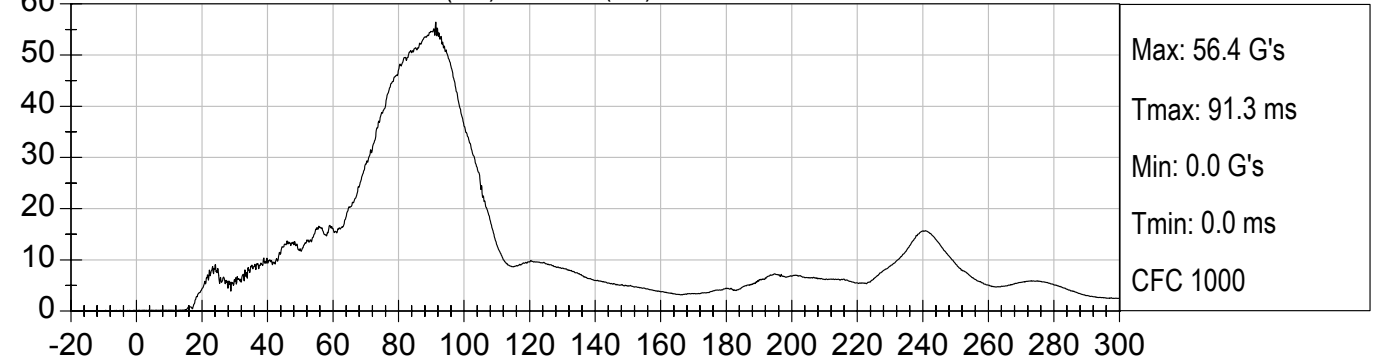
PASSENGER HEAD Yr (G's) vs TIME (ms)



PASSENGER HEAD Zr (G's) vs TIME (ms)

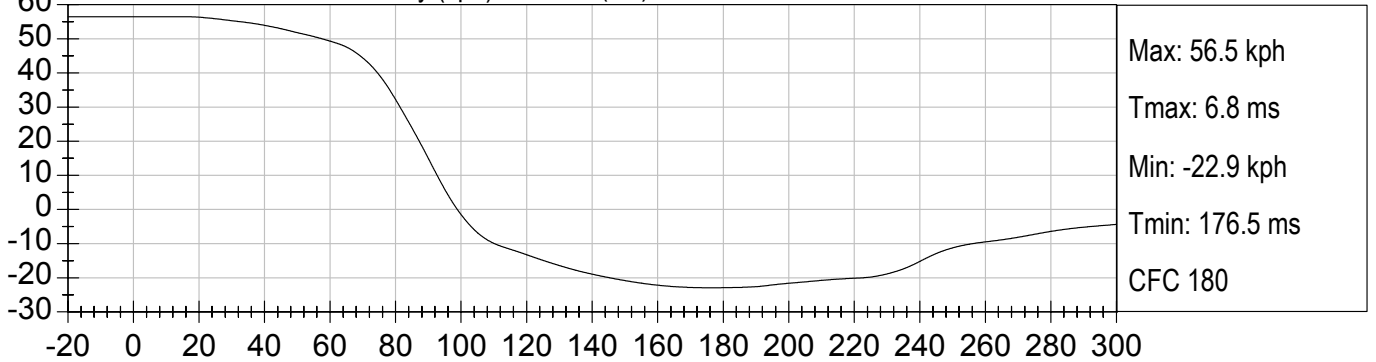


PASSENGER HEAD ResultantR (G's) vs TIME (ms)

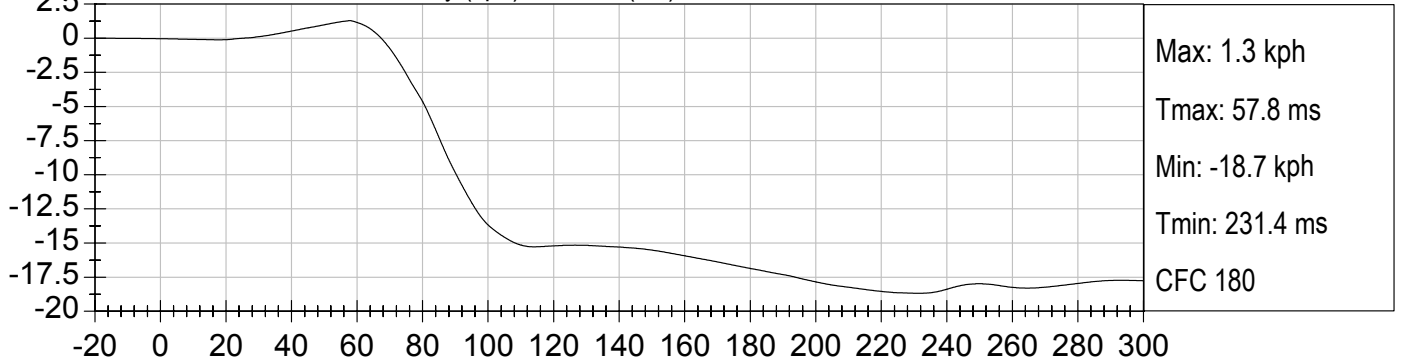




PASSENGER HEAD Xr Velocity (kph) vs TIME (ms)



PASSENGER HEAD Yr Velocity (kph) vs TIME (ms)



PASSENGER HEAD Zr Velocity (kph) vs TIME (ms)

