REPORT NUMBER: NCAP-MGA-2004-004

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

Toyota Motor Corporation
2004 Toyota Sienna
NHTSA NUMBER: M45100

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

Test Date: November 25, 2003

Report Date: December 8, 2003

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
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This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-12005.

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Technical Report Documentation Page

1. Report No. NCAP-MGA-2004-004	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final Report of New Car Assessment Program Testing of a 2004 Toyota Sienna NHTSA No.: M45100		*5. Report Date* December 8, 2003 *6. Performing Organization Code* MGA
7. Author(s) Shefalika Agarwal, Project Engineer		*8. Performing Organization Report No.* NCAP-MGA-2004-004
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-01-D-12005
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 400 Seventh Street, SW, Room 5311 Washington, D.C. 20590		*13. Type of Report and Period Covered* 11/25/03 to 12/08/03 *14. Sponsoring Agency Code* NVS-111
15. Supplementary Notes		

16. Abstract

A 35.2 mph (56.6 km/h) frontal barrier impact was conducted on a 2004 Toyota Sienna at MGA Research Corporation on November 25, 2003. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.6 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 526 mm located at the vehicle centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Pass. ATD
Head Injury Criteria (HIC)	N/A	1000	370	678
Max. Thorax Accel. (3msec Clip)	G's	60	39	33
Left Femur force	Newton	10009	-2824	-4833
Right Femur force	Newton	10009	-3959	-2767

17. Key Words 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2004 Toyota Sienna NHTSA No: M45100		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	*20. Security Classif. (of this page)* Unclassified	*21. No. of Pages* 213	22. Price

Form DOT F1700.7 (8-72)

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.6 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 2004 Toyota Sienna at a velocity of 56.6 kph. The test was performed at MGA Research Corporation on November 25, 2003. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with 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. 066) and right-front passenger (position 2) ATD (Serial No. 065) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 150 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

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

The maximum static crush of the vehicle was 526 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 and chest contacted the airbag. The driver’s head also contacted the headrest. The driver’s knees contacted the bolster. The driver’s abdomen contacted the airbag. The passenger’s head, chest and abdomen contacted the airbag. The passenger's head contacted the headrest. The passenger’s knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)
Driver	370	39	-23	-2824	-3959	*
Passenger	678	33	-19	-4833	-2767	*

* Not recorded

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

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: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact
NHTSA No.: M45100
Test Date: 11/25/03

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/hr	56.6
Test Weight	kg	2102.9
Average Rebound	mm	1723
Maximum Static Crush	mm	526
Impact Angle	degrees	0

DOOR OPENING AND SEAT TRACK INFORMATION

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

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type / Serial No.	H III 50th/ 066	H III 50th/ 065
Head Contact	Airbag, Head Rest	Airbag, Head Rest
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

High Speed	16
Real Time	1
Total	17

Driver ATD Sensors	42
Passenger ATD Sensors	42
Belt Assessment Sensors	4
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	6
Total	103

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

TEST VEHICLE INFORMATION

Manufacturer	Toyota
Model	Sienna
Body Style	Van
NHTSA No.	M45100
VIN	5TDZA23C14S057073
Color	Silver
Delivery Date	11/18/03
Odometer Reading (mile)	125
Dealer	Classic Toyota
Transmission	Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.3
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Driver Airbag	Yes
Passenger Airbag	Yes
Force Limiter	Yes
Pretensioner	Yes
Power Windows	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	Yes
AM/FM/Cassette	Yes
Anti-theft System	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota
Date of Manufacture	08/03

GVWR (kg)	2580
GAWR Front (kg)	1290
GAWR Rear (kg)	1290

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	240	240
Cold Pressure (kPa)	240	240
Recommended Tire Size	P215/65R16	P215/65R16
Tire Size on Vehicle	P215/65R16	P215/65R16
Tire Manufacturer	Dunlop	Dunlop

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Bench	
Number Of Occupants	2	2	3	7
Capacity Wt. (VCW) (kg)				526
Cargo Wt. (RCLW) (kg)				49.9

DATA SHEET NO. 2... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	552.9	409.6		600.1	468.6	
Right	kg	545.7	396.0		587.9	446.3	
Ratio	%	57.7	42.3		56.5	43.5	
Totals	kg	1098.6	805.6	1904.2	1188.0	914.9	2102.9

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1904.2
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	49.9
Calculated Vehicle Target Weight (TVTW)	kg	2110.1

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG(aft of front axle)
As Delivered	mm	770	762	751	774	1280
As Tested	mm	750	760	743	751	1317
Post Test	mm	720	749	745	734	

Vehicle Wheelbase (mm): 3026

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

Vehicle Components Removed: Spare tire, third row seat, jack, rear floor mats

Ballast weight does not include cameras, instrumentation, and data acquisition system.

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 79.5

Usable Capacity Figure Furnished by COTR (L): N/A

Actual Test Volume (L): 37.9

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

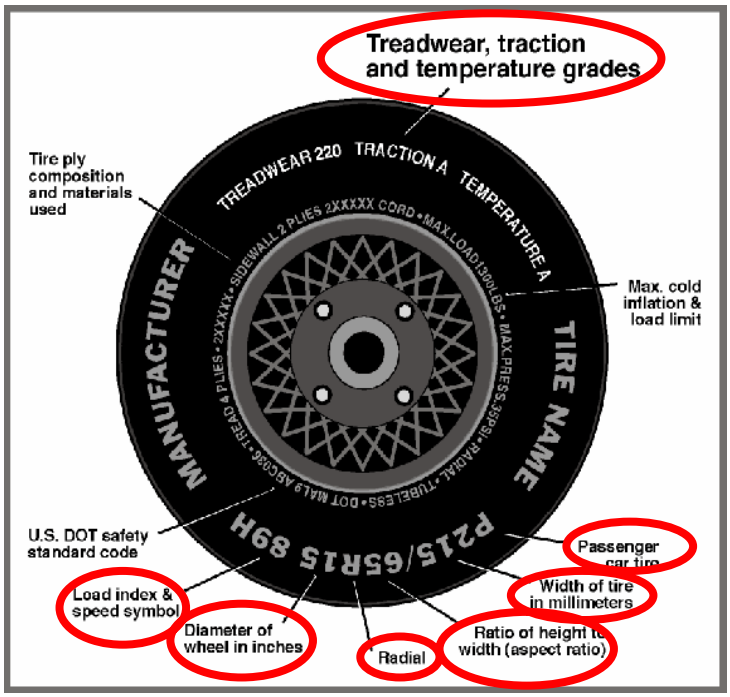
DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

Vehicle Year	2004	Vehicle Make	Toyota
VIN	5TDZA23C14S057073	Vehicle Model	Sienna Van



	Front	Rear
Tire Manufacturer	Dunlop	Dunlop
Tire Name	SP4000	SP4000
Tire Type	Passenger	Passenger
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	65	65
Radial	Radial	Radial
Wheel Diameter	16	16
Load Index & Speed Symbol	96T	96T
Treadwear	340	340
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4

POST IMPACT DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.5 – 57.1	56.6
Trap No. 1 Entry Distance	mm	<1524	1300
Trap No. 1 Exit Distance	mm	<1524	300
Trap No. 2 Velocity (Redundant)	km/h	55.5 – 57.1	56.3
Trap No. 2 Entry Distance	mm	<1524	1425
Trap No. 2 Exit Distance	mm	<1524	425

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4913	4562	351
Center	mm	5080	4554	526
Right Side	mm	4913	4496	417

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1695
Center	mm	1700
Right Side	mm	1774
Average	mm	1723

DATA SHEET NO. 5

TEST VEHICLE INFORMATION

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

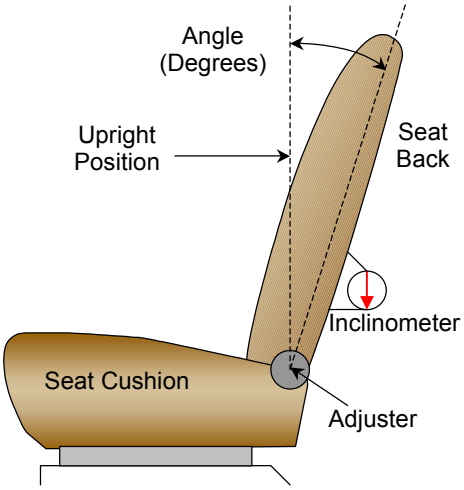
NHTSA No.: M45100
Test Date: 11/25/03

NORMAL DESIGN RIDING POSITION

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

For Driver: (manual seat): Recline to the fifth notch rearward from the most upright position. Seat back angle is 8 degrees.

For Passenger: Recline to the sixth notch rearward from the most upright position. Seat back angle is 10 degrees.



FRONT SEAT ASSEMBLY

Driver seat back angle: 8.0°

Passenger seat back angle: 10.0°

SEAT FORE/AFT POSITIONS

For Front seats (for driver and passenger) – Move the seat to the ninth notch from the foremost position.

Driver seat fore/aft total travel: 17 notches

Passenger seat fore/aft total travel: 17 notches

Driver seat fore/aft position: 9 of 17

Passenger seat fore/aft position: 9 of 17

SEAT BELT UPPER ANCHORAGE

The front outboard D-rings were adjusted to the mid track position.

DATA SHEET NO. 5... (continued)

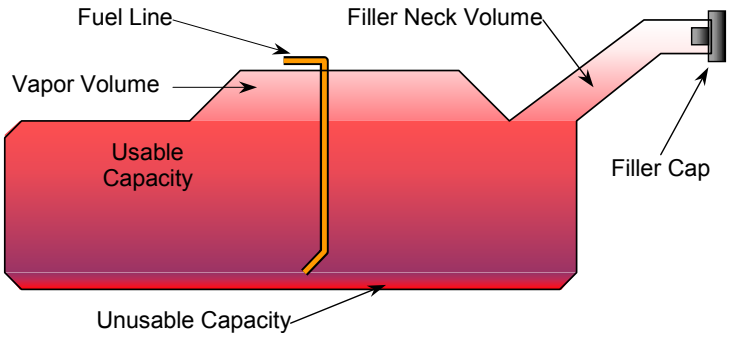
TEST VEHICLE INFORMATION

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is:	79.5 liters
The "Usable Capacity" of any optional equipment fuel tank is:	N/A liters
The "Usable Capacity" used for certification to FMVSS 301 requirements:	79.5 liters
Actual amount of Stoddard solvent added to vehicle for certification test:	37.9 liters

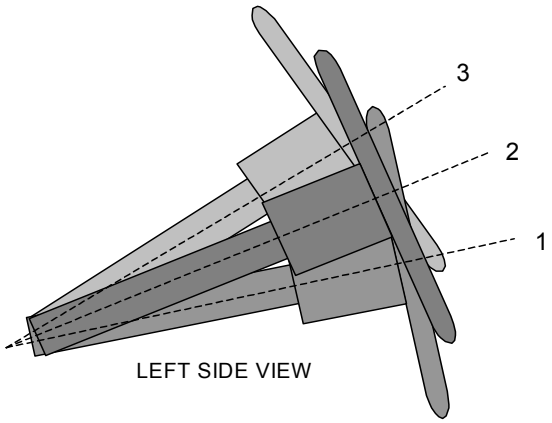
The fuel tank is mounted on the LH side of the vehicle, forward of the rear axle and inboard of the frame rails.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments 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. Telescope: 20mm rearward from the foremost position.



STEERING COLUMN ASSEMBLY

Lowermost, position 1: 26.8 °

Geometric center, position 2: 28.6 °

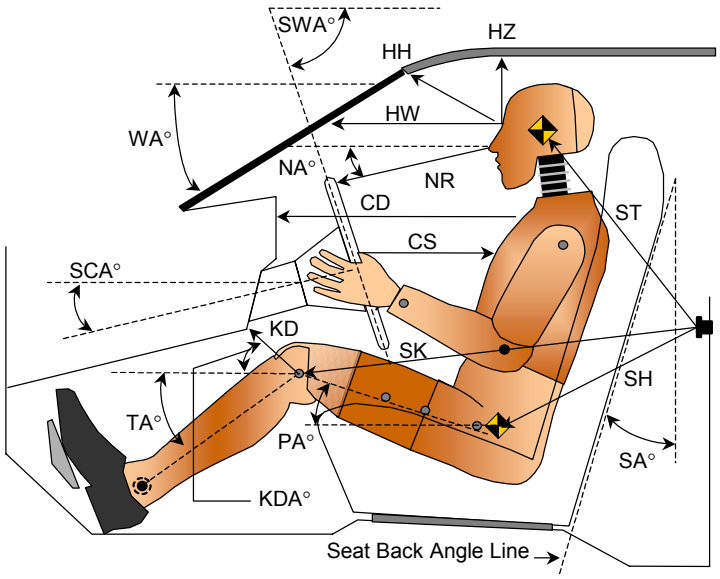
Uppermost. Position 3: 30.5°

DATA SHEET NO. 6

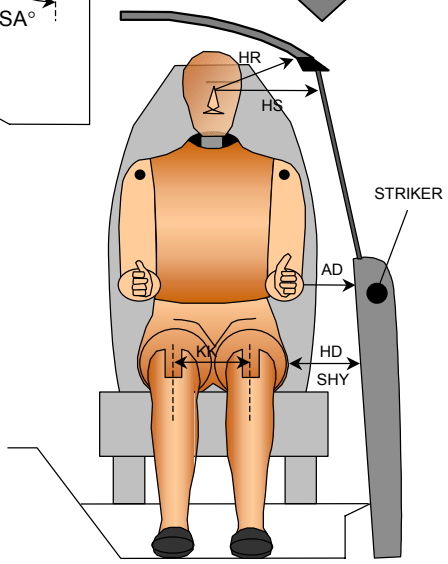
DUMMY POSITIONING IN VEHICLE

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03

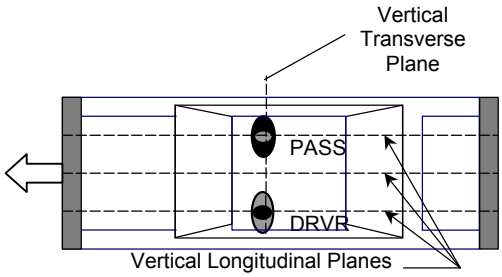
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



AD	Arm to Door
HD	H-Point to Door
HR	Head to Side Header
HS	Head to Side Window
KK	Knee to Knee
SHY	Striker to H-Point (Y Axis)



CD	Chest to Dash
CS	Chest to Steering Wheel Hub
HH	Head to Header
HW	Head to Windshield
HZ	Head to Roof
KDA	Knee to Dash Angle
KDL	Left Knee to Dash
KDR	Right Knee to Dash
NA	Nose to Rim Angle
NR	Nose to Rim
PA	Pelvic Angle
RA	Rim to Abdomen
SA	Seat Back Angle
SCA	Steering Column Angle
SH	Striker to H-Point
SK	Striker to Knee
ST	Striker to Head
SWA	Steering Wheel Angle
TA	Tibial Angle
WA	Windshield Angle



DATA SHEET NO. 6... (continued)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

TEST DUMMY POSITION MEASUREMENTS

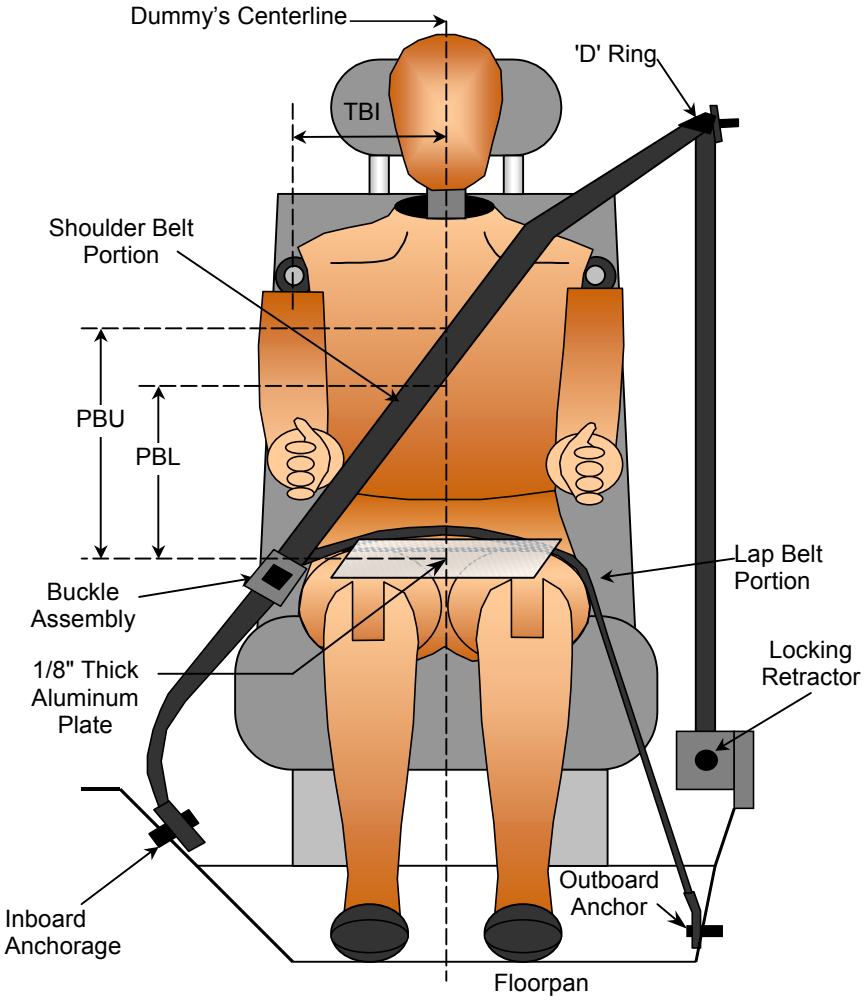
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		29.3		
SWA	Steering Wheel Angle		61.4		
SCA	Steering Column Angle		28.8		
SA	Seat Back Angle		8.0		10.0
HZ	Head to Roof (Z)	237	90	176	0
HH	Head to Header	434	22.2	351	21.4
HW	Head to Windshield	723	0	589	0
HR	Head to Side Header (Y)	265		223	
NR	Nose to Rim	438	11.4		
CD	Chest to Dash	559		545	
CS	Chest to Steering Hub	355	6.5		
RA	Rim to Abdomen	212	0		
KDL	Left Knee to Dash	140	22.8	106	
KDR	Right Knee to Dash	134		93	17.3
PA	Pelvic Angle		24.5		24.9
TA	Tibia Angle		53.7		58.3
KK	Knee to Knee (Y)	324		273	
SK	Striker to Knee	642	95.8	661	95.7
ST	Striker to Head	478	9.1	515	21.9
SH	Striker to H-Point	305	125.9	305	120.1
SHY	Striker to H-Point (Y)	293		288	
HS	Head to Side Window	359		335	
HD	H-Point to Door (Y)	159		121	
AD	Arm to Door (Y)	144		134	
AA	Ankle to Ankle	308		216	

DATA SHEET NO. 7

SEAT BELT POSITIONING DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03



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	334	338
PBL - To surface of reference to belt lower edge	mm	257	252

DATA SHEET NO. 8

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

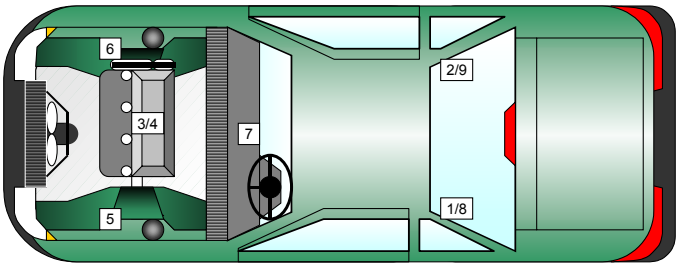
VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

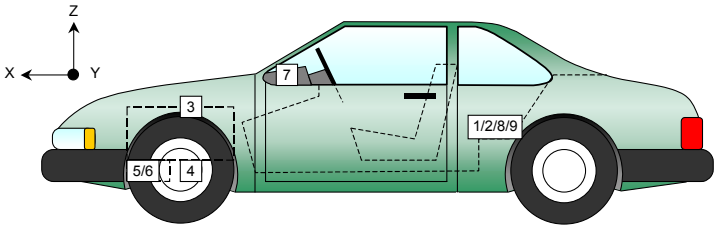
No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member X	2212	-490	475	G's	1.9	115	-37.3	67
2	Right Rear X-Member X	2196	490	475	G's	0.5	0	-35.7	45
3	Engine Top X	4454	111	880	G's	*	*	*	*
4	Engine Bottom X	4275	0	290	G's	51.6	45	-139.3	34
5	Left Brake Caliper X	4212	-740	265	G's	**	**	**	**
6	Right Brake Caliper X	4213	740	263	G's	48.0	38	-67.8	33
7	Instrument Panel X	3660	0	1220	G's	14.1	88	-67.8	46
8	Left Rear X-Member Z	2212	-490	475	G's	11.9	28	-14.2	26
9	Right Rear X-Member Z	2196	490	475	G's	6.6	59	-12.5	40

* - No Valid Data Collected after approximately 52 msec

** - No Valid Data collected after approximately 60 msec

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: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact
NHTSA No.: M45100
Test Date: 11/25/03

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	1.9	200	-49.5	83	13.3	133	-63.4	91
Head CG	Y	G's	3.7	109	-6.3	90	7.7	129	-12.5	99
Head CG	Z	G's	14.3	65	-13.7	101	19.4	78	-18.9	112
Head CG Resultant	N/A	G's	50.2	83			64.2	87		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.5	178	-40.1	90	1.1	193	-31.8	85
Chest CG	Y	G's	8.3	102	-6.5	55	4.3	49	-8.8	100
Chest CG	Z	G's	5.0	37	-10.5	103	12.2	87	-5.7	119
Chest CG Resultant	N/A	G's	40.8	90			34.1	86		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	522	43	-2824	56	329	32	-4833	60
Right Femur	Z	Newtons	946	46	-3959	55	296	28	-2767	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	6097	58			5097	60		
Shoulder Belt Force	N/A	Newtons	6379	63			4996	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	370	40.2	62.4	98.4	678	51.9	72.4	107.3

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary	39.3	88.8	91.8	33.4	84.2	87.2

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact
NHTSA No.: M45100
Test Date: 11/25/03

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	*	*	*	*	3.4	135	-61.3	58
Pelvis	Y	G's	*	*	*	*	8.8	67	-9.0	72
Pelvis	Z	G's	*	*	*	*	1.3	31	-21.9	71

* Questionable Data, Loose Accelerometer Pack

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	406	68	-325	143	485	129	-441	78
Neck Force	Y	Newtons	252	100	-71	54	373	129	-52	86
Neck Force	Z	Newtons	1623	80	-111	107	1053	78	-286	116
Neck Moment	X	N•m	8.5	155	-5.6	105	17.7	85	-3.1	73
Neck Moment	Y	N•m	40.9	132	-29.8	95	9.7	200	-51.9	110
Neck Moment	Z	N•m	8.7	90	-3.2	143	25.1	125	-6.5	194

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	18.3	95	-70.8	67	13.1	80	-124.9	46
Left Foot Aft	Z	G's	17.6	51	-62.6	66	20.3	69	-45.4	54
Left Foot Fore	Z	G's	15.1	55	-123.1	66	98.4	44	-150.2	53
Right Foot Aft	X	G's	35.3	52	-135.8	44	21.9	95	-48.9	49
Right Foot Aft	Z	G's	27.2	58	-64.0	49	3.5	180	-62.0	37
Right Foot Fore	Z	G's	158.7	58	-149.5	41	45.8	46	-126.0	35

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	9.8	79	-11.9	63	63.2	79	-14.2	54
Left Lower Moment	Y	N•m	36.2	67	-21.3	105	97.9	83	-67.3	48
Left Lower Force	Z	Newtons	82	164	-1879	30	171	135	-2947	84
Left Upper Moment	X	N•m	15.5	126	-51.6	65	87.2	77	-31.6	53
Left Upper Moment	Y	N•m	49.3	55	-80.7	36	20.3	154	-108	57
Left Upper Force	Z	Newtons	121	48	-1312	35	140	194	-3005	82
Right Lower Moment	X	N•m	15.5	48	-92.9	65	46.1	66	-29.7	103
Right Lower Moment	Y	N•m	74.4	45	-155.8	68	234.6	76	-36.8	37
Right Lower Force	Z	Newtons	221	130	-3248	66	95	122	-1295	74
Right Upper Moment	X	N•m	42.8	57	-13.0	97	75.8	63	-35.6	97
Right Upper Moment	Y	N•m	13.6	104	-132.3	56	46.2	98	-40.7	49
Right Upper Force	Z	Newtons	242	37	-3081	68	112	117	-1726	63

DATA SHEET NO. 9... (continued)

HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact
NHTSA No.: M45100
Test Date: 11/25/03

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	mm			-23.3	82			-19.0	85

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	2.2	200	-50.0	84	13.3	131	-63.2	89
Head CG	Y	G's	6.1	108	-6.4	79	8.0	69	-11.3	100
Head CG	Z	G's	13.8	65	-14.4	102	21.4	78	-19.3	111
Head CG Resultant	N/A	G's	50.4	84			64.0	89		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.2	178	-39.7	90	1.5	193	-32.1	85
Chest CG	Y	G's	7.6	91	-5.9	54	4.4	48	-8.4	100
Chest CG	Z	G's	4.7	37	-9.8	102	12.0	79	-5.9	122
Chest CG Resultant	N/A	G's	40.5	90			33.5	85		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg.	T^1	T^2	HIC	Avg.	T^1	T^2
Head CG Primary Redundant	365	40.0	61.8	97.8	653	51.4	72.4	106.8

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T^1	T^2	CLIP	T^1	T^2
Chest CG Primary Redundant	39.3	88.6	91.6	32.8	84.1	87.1

DATA SHEET NO. 10

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

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	334	338
PBL - Top surface of reference to belt lower edge	mm	257	252

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Retractor reel to "D" ring	mm	0	0
Shoulder belt length as measured on ATD	mm	903	1015
Lap belt length as measured on ATD	mm	819	942
Remainder of belt on reel	mm	1670	1446
Total belt length for continuous webbing systems	mm	3392	3403

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: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

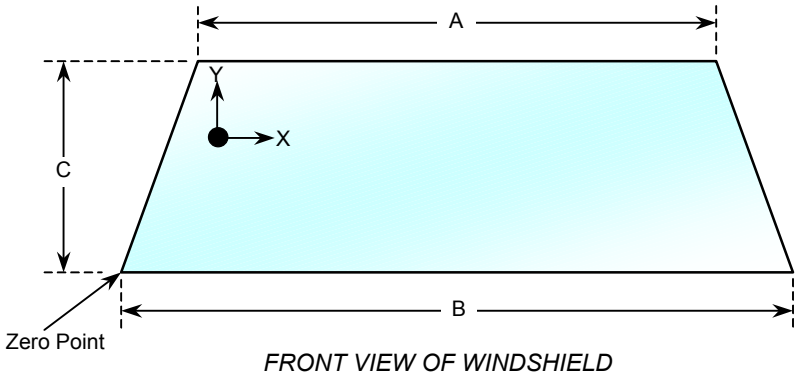
Windshield Mounting Details:
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2405	2405	100
Right Side	2405	2405	100
Total	4810	4810	100



FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

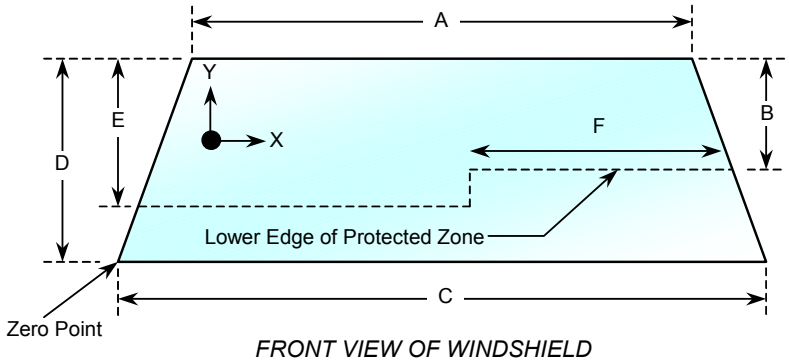
Item	Units	Segment Length	Molding Width
A	mm	1360	10
B	mm	1730	10
C	mm	860	10

DATA SHEET NO. 12

WINDSHIELD ZONE INTRUSION FMVSS 219 (Partial) DATA

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1360
B	mm	590
C	mm	1730
D	mm	860
E	mm	595
F	mm	525

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: 2004 Toyota Sienna NHTSA No.: M45100
Test Program: 35mph Frontal Impact Test Date: 11/25/03

Temperature at Time of Impact: 21° C Test Time: 12:38 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)

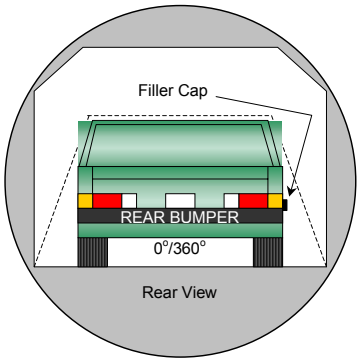
D. Spillage: None

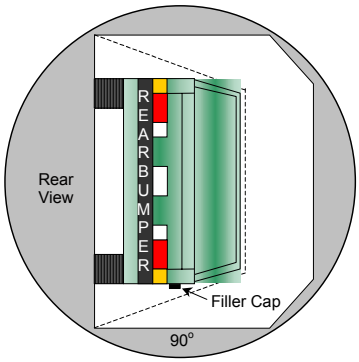
DATA SHEET NO. 14

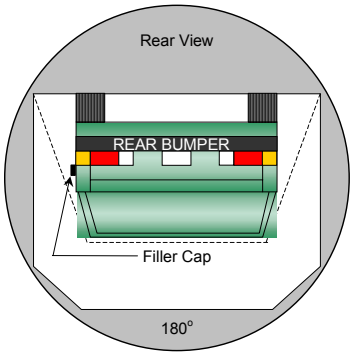
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2004 Toyota Sienna NHTSA No.: M45100
Test Program: 35mph Frontal Impact Test Date: 11/25/03

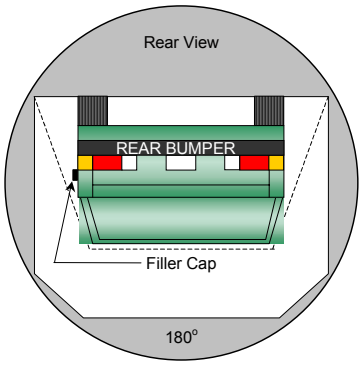
Test Time: 12:38 pm

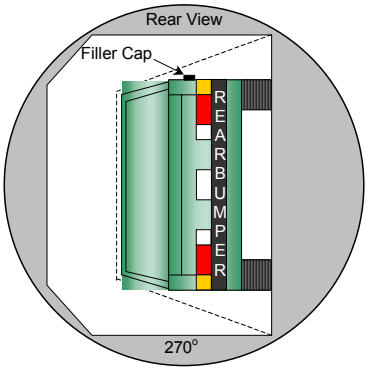


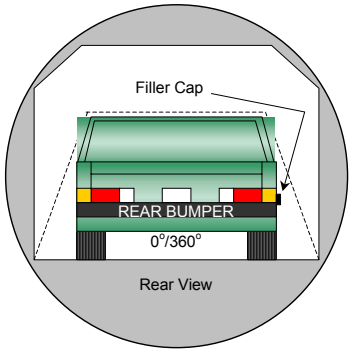




0° TO 90° 90° TO 180°







180° TO 270° 270° TO 360°

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°	163	300	0
90° TO 180°	148	300	0
180° TO 270°	156	300	0
270° TO 360°	167	300	0

DATA SHEET NO. 15

VEHICLE MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

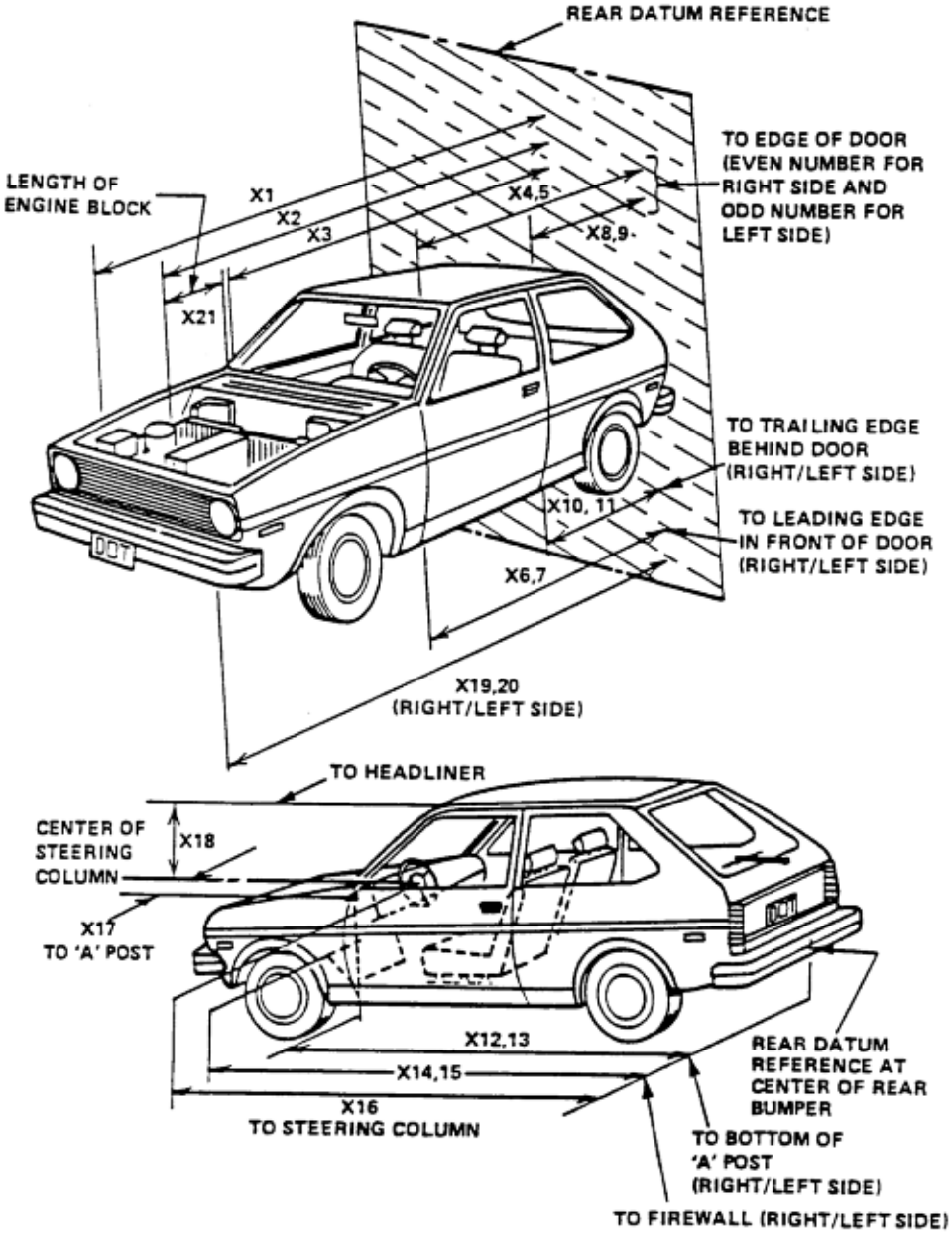
NHTSA No.: M45100
Test Date: 11/25/03

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	5080	4554	526
2	RSOV to front of engine	mm	4520	4273	247
3	RSOV to firewall centerline	mm	4260	4245	15
4	RSOV to leading edge of right door	mm	3651	3645	6
5	RSOV to leading edge of left door	mm	3646	3668	-22
6	RSOV to lower leading edge of right door	mm	3560	3555	5
7	RSOV to lower leading edge of left door	mm	3562	3553	9
8	RSOV to upper leading edge of right door	mm	2575	2575	0
9	RSOV to upper leading edge of left door	mm	2579	2585	-6
10	RSOV to lower trailing edge of right door	mm	2554	2549	5
11	RSOV to lower trailing edge of left door	mm	2560	2549	11
12	RSOV to bottom of right 'A' pillar	mm	3571	3551	20
13	RSOV to bottom of left 'A' pillar	mm	3575	3555	20
14	RSOV to firewall on right side	mm	4149	4101	48
15	RSOV to firewall on left side	mm	4162	4116	46
16	RSOV to steering column	mm	3238	3170	68
17	Center of steering column to left 'A' pillar	mm	433	265	168
18	Center of steering column to headlining	mm	452	472	-20
19	RSOV to right side of front bumper	mm	4913	4496	417
20	RSOV to left side of front bumper	mm	4913	4562	351
21	Length of engine block	mm	565	567	-2
RD	RSOV to right side of dash panel	mm	3414	3414	0
CD	RSOV to center of dash panel	mm	3405	3428	-23
LD	RSOV to left side of dash panel	mm	3447	3436	11

DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03



DATA SHEET NO. 15... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna NHTSA No.: M45100
Test Program: 35mph Frontal Impact Test Date: 11/25/03

Target Vehicle Structural Measurement

	Elements	Pre-Test (mm)
1	Total Length	5080
2	Total Width	1839
3	Bumper Top Height	750
4	Bumper Bottom Height	420
5	Longitudinal Member Top Height	240
6	Distance between Longitudinal Members	810
7	Longitudinal Member Width	125
8	Engine Top Height	900
9	Engine Bottom Height	295
10	Engine and gearbox width	830
11	Front bumper-engine distance	480
12	Front shock absorber fixing height	960
13	Bonnet leading edge height	820
14	Front shock absorber fixing width	1270
15	Front bumper – front axle distance	955
16	Front axle – a pillar distance	485
17	A-pillar – B-pillar distance	1070
18	B-Pillar – rear axle distance	1470
19	B-pillar – C-pillar distance	1045
20	Roof sill bottom height	1670
21	Roof sill top height	1720
22	Floor sill bottom height	200
23	Floor sill top height	320

DATA SHEET NO. 16

CAMERA LOCATIONS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1000	-8000	1570	25	1015
3	Steering Column Top	2000	-8000	1570	25	1036
4	Steering Column Bottom	2000	-8000	1030	25	1000
5	Driver Close-up	1500	-9950	1520	75	1111
6	Driver Angle	4800	-5100	2020	50	1176
7	Left Rear				13	513
8	Right Rear				13	526
9	Right Overall	2250	7420	1540	13	1010
10	Right Passenger Half	940	8160	1520	25	1020
11	Right Close-up	1590	10100	1470	75	1136
12	Right Angle	4800	5500	2100	50	*
13	Windshield	320	0	2920	13	**
14	Top Driver	-120	-485	2300	13	1031
15	Top Passenger	-120	510	2300	13	1010
16	Pit Front	1130	0	-3150	13	1015
17	Pit Rear	2610	0	-3150	13	1005

*COORDINATES:

+X = film plane rearward of barrier

+Y = film plane to right of monorail centerline

+Z = film plane above ground level

* no timing marks

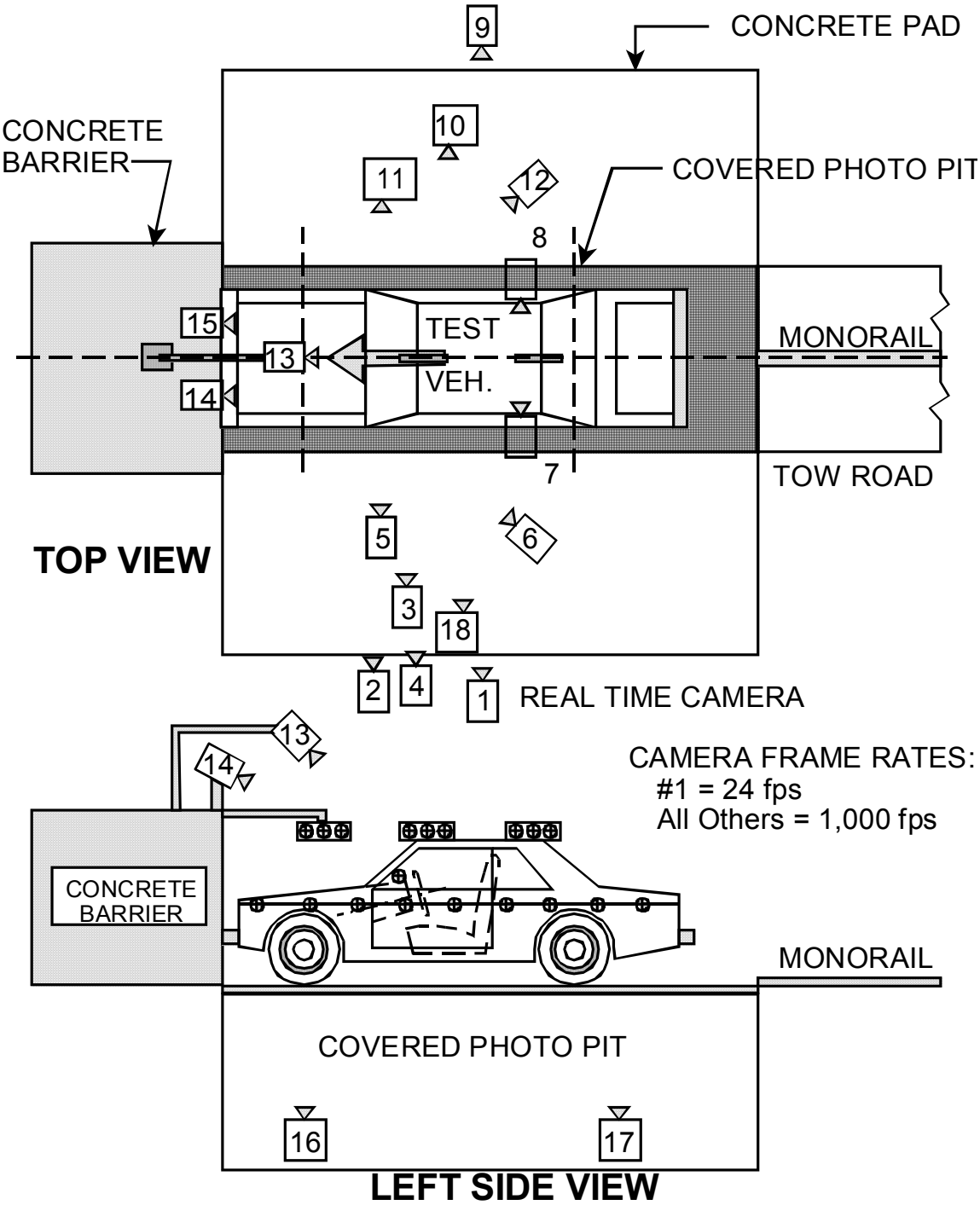
** camera did not run

DATA SHEET NO. 16... (continued)

CAMERA LOCATIONS

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03

CAMERA POSITIONS FOR FRONTAL IMPACTS



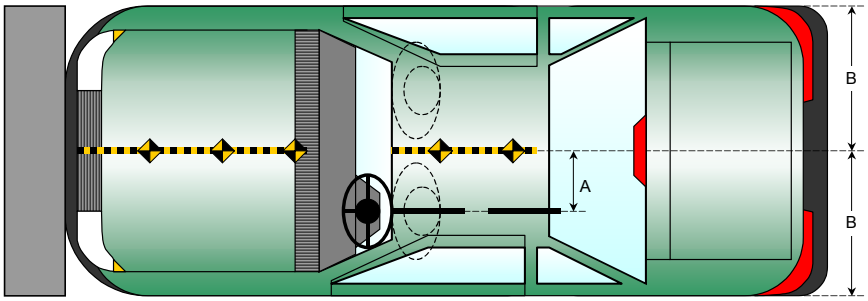
DATA SHEET NO. 17

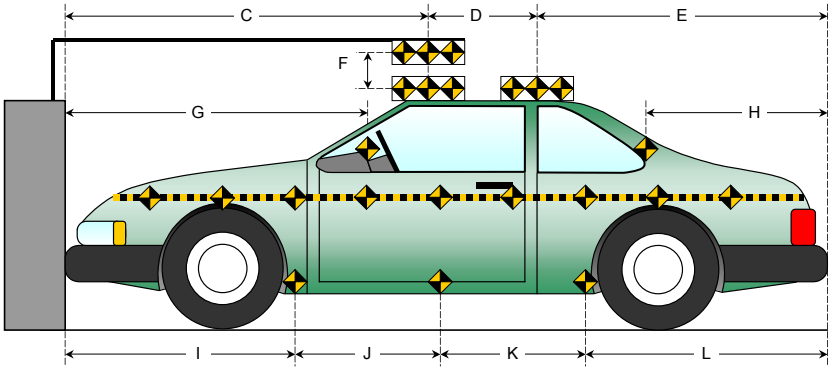
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

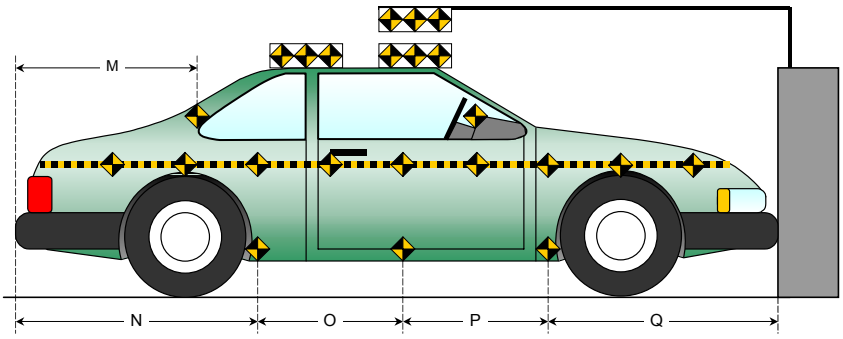
Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03

Item	Value
A	455
B	919
C	2384
D	610
E	2086
F	
G	NA
H	1396
I	1474
J	1034
K	1040
L	1532
M	1419
N	1536
O	1030
P	1028
Q	1486







DATA SHEET NO. 18

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

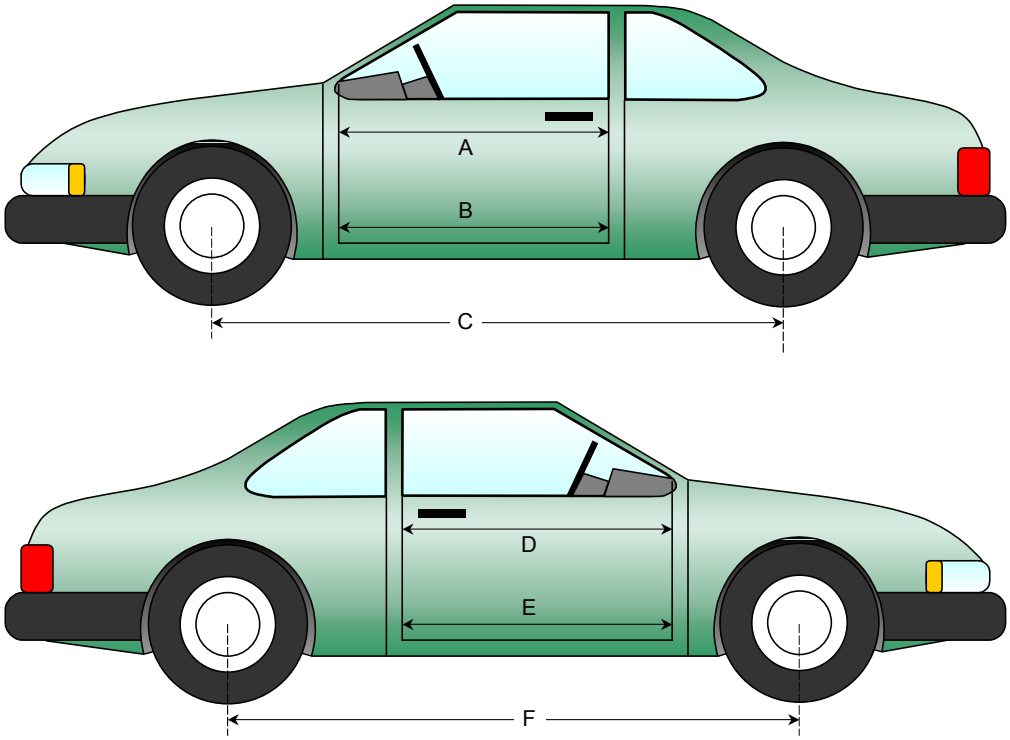
NHTSA No.: M45100
Test Date: 11/25/03

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1005	1002	3
B	Left Side Lower	mm	968	966	2
D	Right Side Upper	mm	1004	1004	0
E	Right Side Lower	mm	950	950	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3026	2955	71
F	Right Side Wheelbase	mm	3026	2971	55



DATA SHEET NO. 18... (continued)

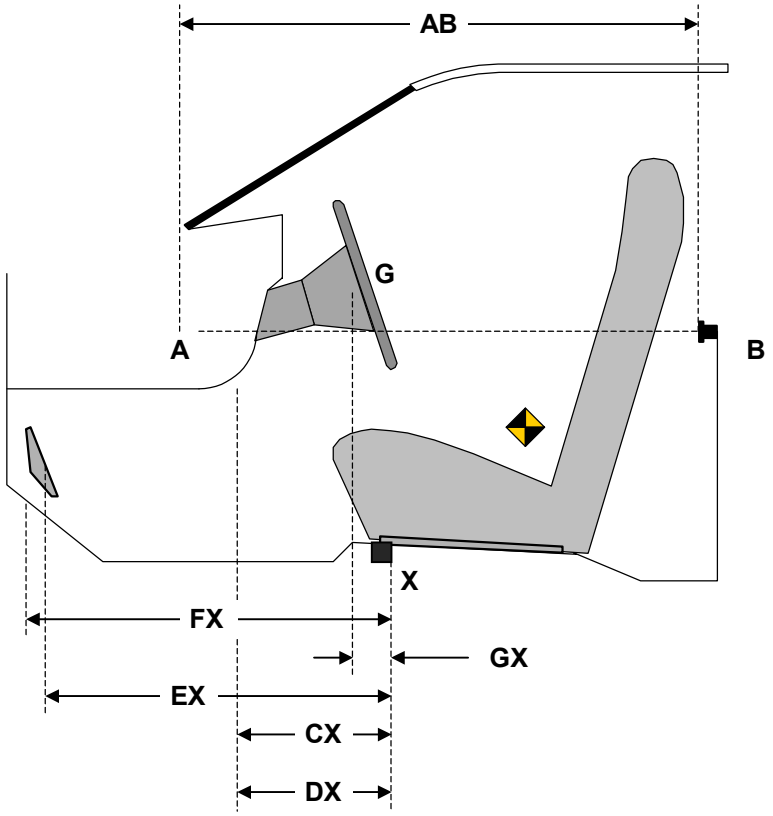
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna NHTSA No.: M45100
Test Program: 35mph Frontal Impact Test Date: 11/25/03

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	992	989	3
CX	Left Knee Bolster to X	mm	255	244	11
DX	Right Knee Bolster to X	mm	281	238	43
EX	Brake Pedal to X	mm	535	553	-18
FX	Foot Rest to X	mm	523	512	11
GX	Center of Steering Column Wheel Hub to X	mm	48	46	2

X = Left Front Seat Front Outboard Anchor Bolt Head



DRIVER COMPARTMENT

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

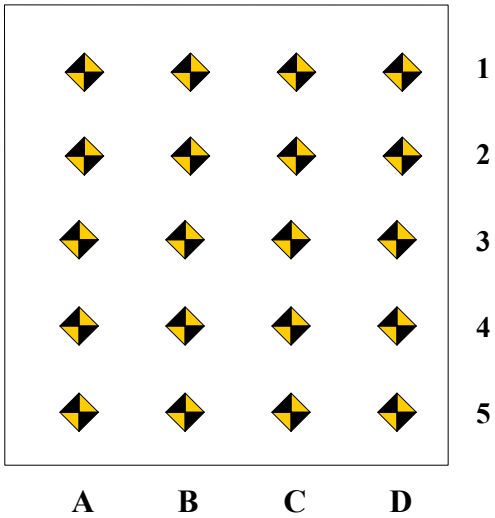
NHTSA No.: M45100
Test Date: 11/25/03

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		737	776	768		690	712	655		47	64	113
2		670	706	703		641	673	645		29	33	58
3	550	532	528	535	526	523	511	485	24	9	17	50
4	330	332	327	333	325	325	311	314	5	7	16	19
5	137	128	126	129	125	123	99	96	12	5	27	33

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		15	-4	-5		67	65	62		-52	-69	-67
2		-75	-177	-175		-48	-75	-61		-27	-102	-114
3	-179	-166	-165	-159	-170	-168	-168	-165	-9	2	3	6
4	-161	-156	-157	-160	-170	-159	-160	-191	9	3	3	31
5	-145	-140	-115	-123	-144	-140	-107	-123	-1	0	-8	0

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

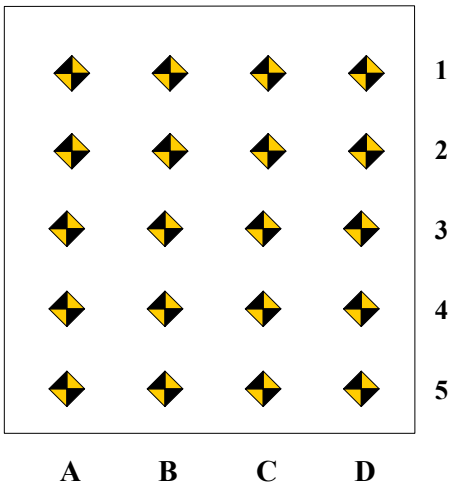
NHTSA No.: M45100
Test Date: 11/25/03

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		715	703			601	642			114	61	
2	645	640	620		591	620	615		54	20	5	
3	510	512	525	531	485	511	525	527	25	1	0	4
4	319	327	328	338	304	314	325	330	15	13	3	8
5	127	130	126	129	105	108	120	127	22	22	6	2

PASSENGER FLOOR PAN Z-AXIS

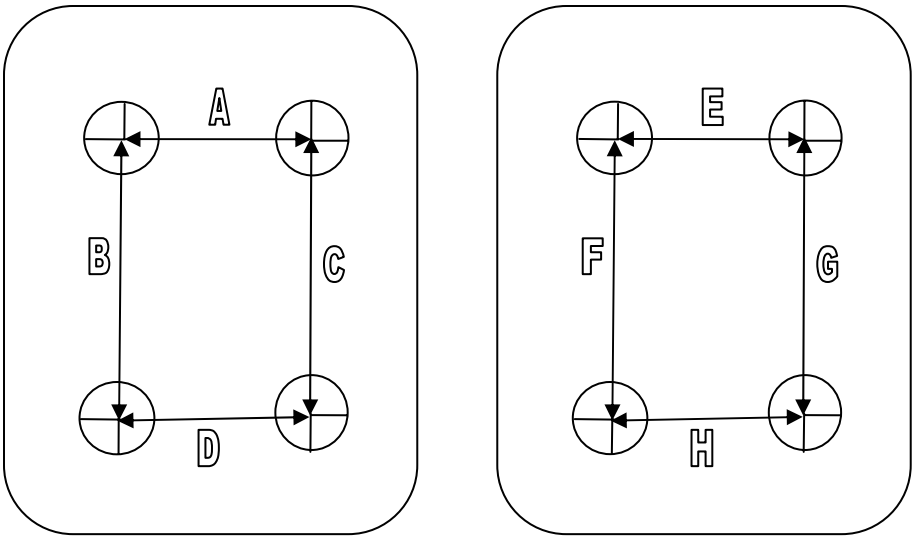
	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-80	-68			-32	-35			-48	-33	
2	-131	-134	-136		-118	-138	-140		-13	4	4	
3	-165	-160	-162	-171	-169	-182	-178	-176	4	22	16	5
4	-159	-155	-155	-161	-185	-167	-160	-161	26	12	5	0
5	-160	-119	-141	-145	-180	-118	-139	-145	20	-1	-2	0

DATA SHEET NO. 18... (continued)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2004 Toyota Sienna
Test Program: 35mph Frontal Impact

NHTSA No.: M45100
Test Date: 11/25/03



Driver Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	505	502	3
B	357	360	-3
C	336	323	13
D	555	545	10
E	380	375	5
F	398	388	10
G	432	430	2
H	390	380	10

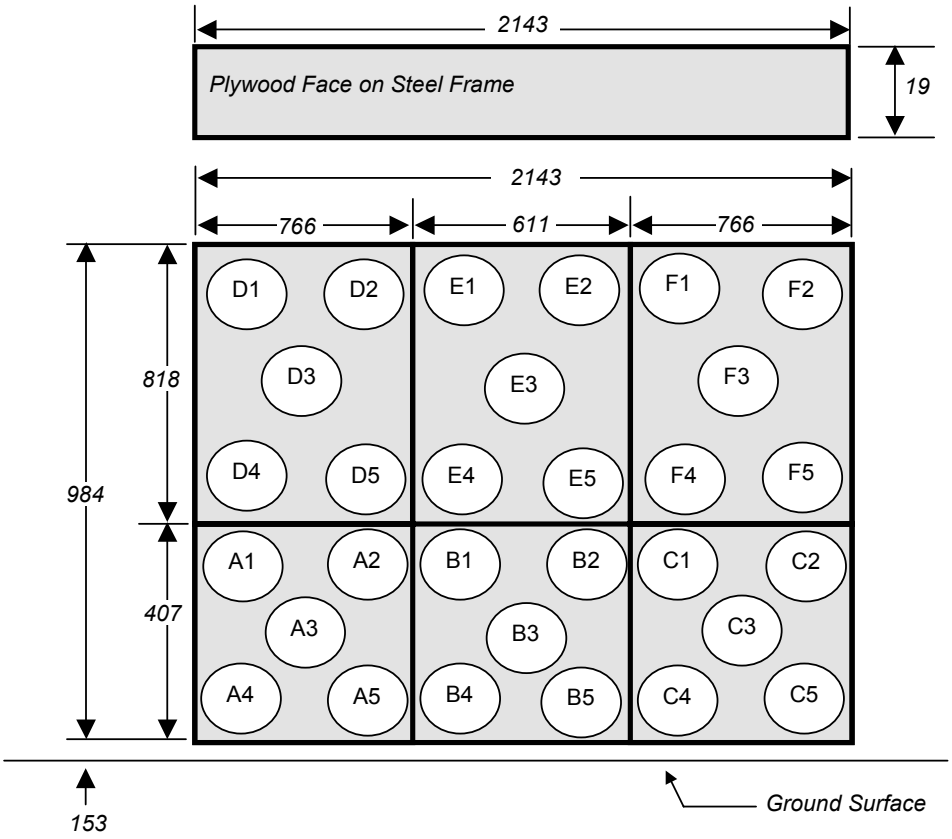
DATA SHEET NO. 19

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03

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: 2004 Toyota Sienna NHTSA No.: M45100
Test Program: 35mph Frontal Impact Test Date: 11/25/03

VEHICLE INFORMATION

VIN: 5TDZA23C14S057073 Wheelbase (mm) : 3026
Vehicle Size Category: Minivan Test Weight (kg) : 2102.9

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 13

Cal. Procedure/Interval: MGA procedure / 6 month

Integration Algorithm: Trapezoidal Linearity: > 99%

Impact Velocity (km/h): 56.6

Velocity Change (km/h): 73.1 Time of Separation (msec): 155

CRUSH PROFILE

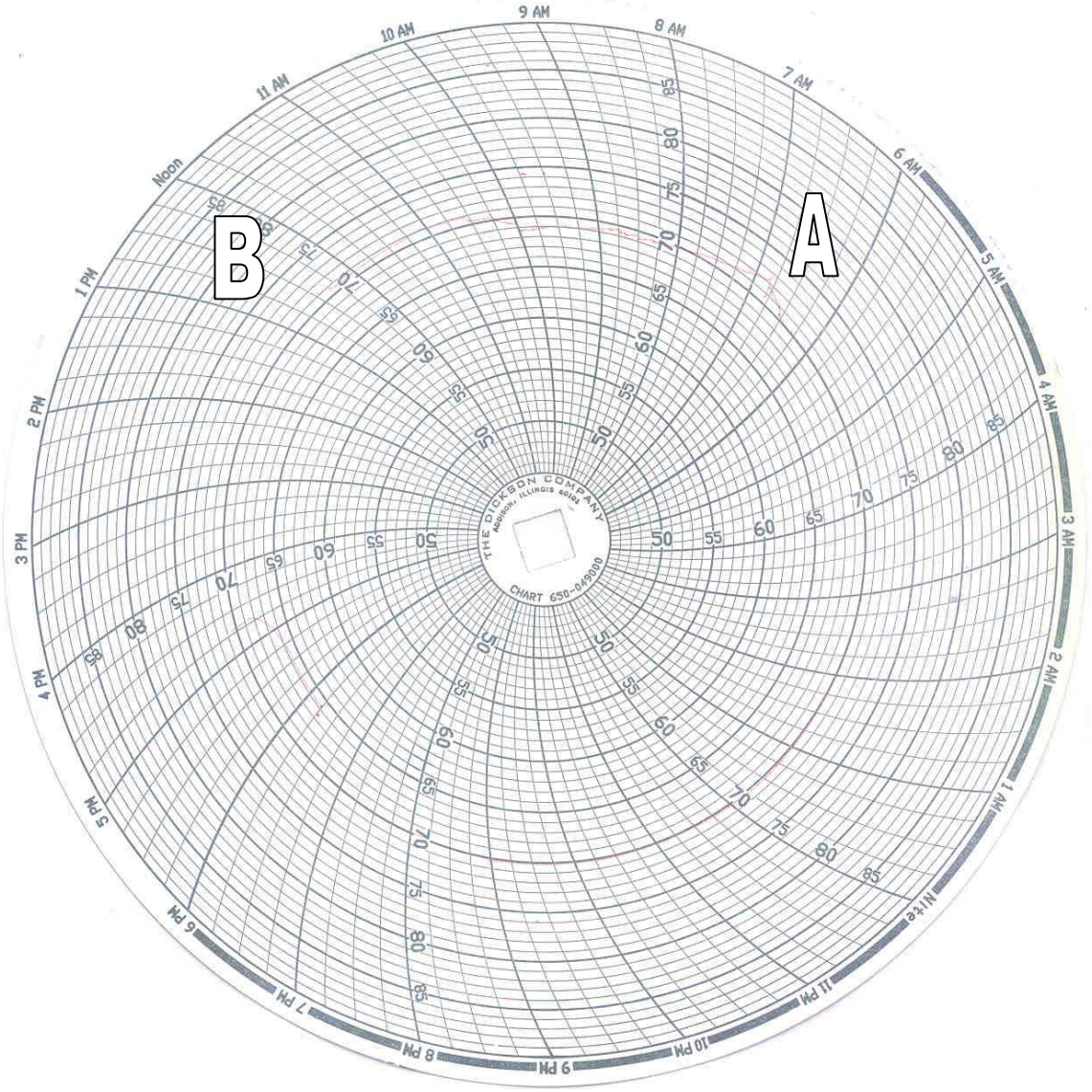
Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
Damage Region Length (mm): 1524 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4913	4562	351
C2	Crush zone 2 at left side	mm	4994	4551	443
C3	Crush zone 3 at left side	mm	5056	4584	472
C4	Crush zone 4 at right side	mm	5056	4543	513
C5	Crush zone 5 at right side	mm	4994	4491	503
C6	Crush zone 6 at right side	mm	4913	4496	417
L	C1 TO C6	mm	1524	1521	3

DATA SHEET NO. 21

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle:	2004 Toyota Sienna	NHTSA No.:	M45100
Test Program:	35mph Frontal Impact	Test Date:	11/25/03



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

B = Test conducted at 12:38 p.m.

APPENDIX A

PHOTOGRAPHS

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Load Cell Location

Vehicle Certification Label

• CHARGE MAXIMALE DU VEHICULE : 526 kg (1160LIVRES)
• PERSONNES :
7 PERSONNE MÒDELE : AVANT 2 CENTRE 2 ARRIERE 3
• DIMENSION DES PNEUS ET PRESSION DE PNEUS (kPa(LB/PO²))
AU POIDS MAXIMAL DU VEHICULE CHARGE

DIMENSION	AVANT	ARRIERE
P215 / 65R16 96T	240 (35)	240 (35)
P225 / 60R17 98T	240 (35)	240 (35)
T155 / 80R17 101M (Ròue de secours)	420 (60)	

POUR DE PLUS AMPLES DETALIS,
VOIR LE MANUEL DU PROPRIETAIRE

• VEHICLE CAPACITY WEIGHT : 526 kg (1160lbs)
• OCCUPANTS :
7 PERSON MODEL : FRT. 2 CENTER 2 RR. 3
• RECOMMENDED TIRE SIZE & COLD TIRE PRESSURES (kPa(PSI))
UP TO VEHICLE CAPACITY WEIGHT

TIRE SIZE	FRONT	REAR
P215 / 65R16 96T	240 (35)	240 (35)
P225 / 60R17 98T	240 (35)	240 (35)
T155 / 80R17 101M (Spare Tire)	420 (60)	

SEE OWNER'S MANUAL FOR
ADDITIONAL INFORMATION

A E 0 1 0

R G

Tire Placard

Right Front View of Test Vehicle, as received

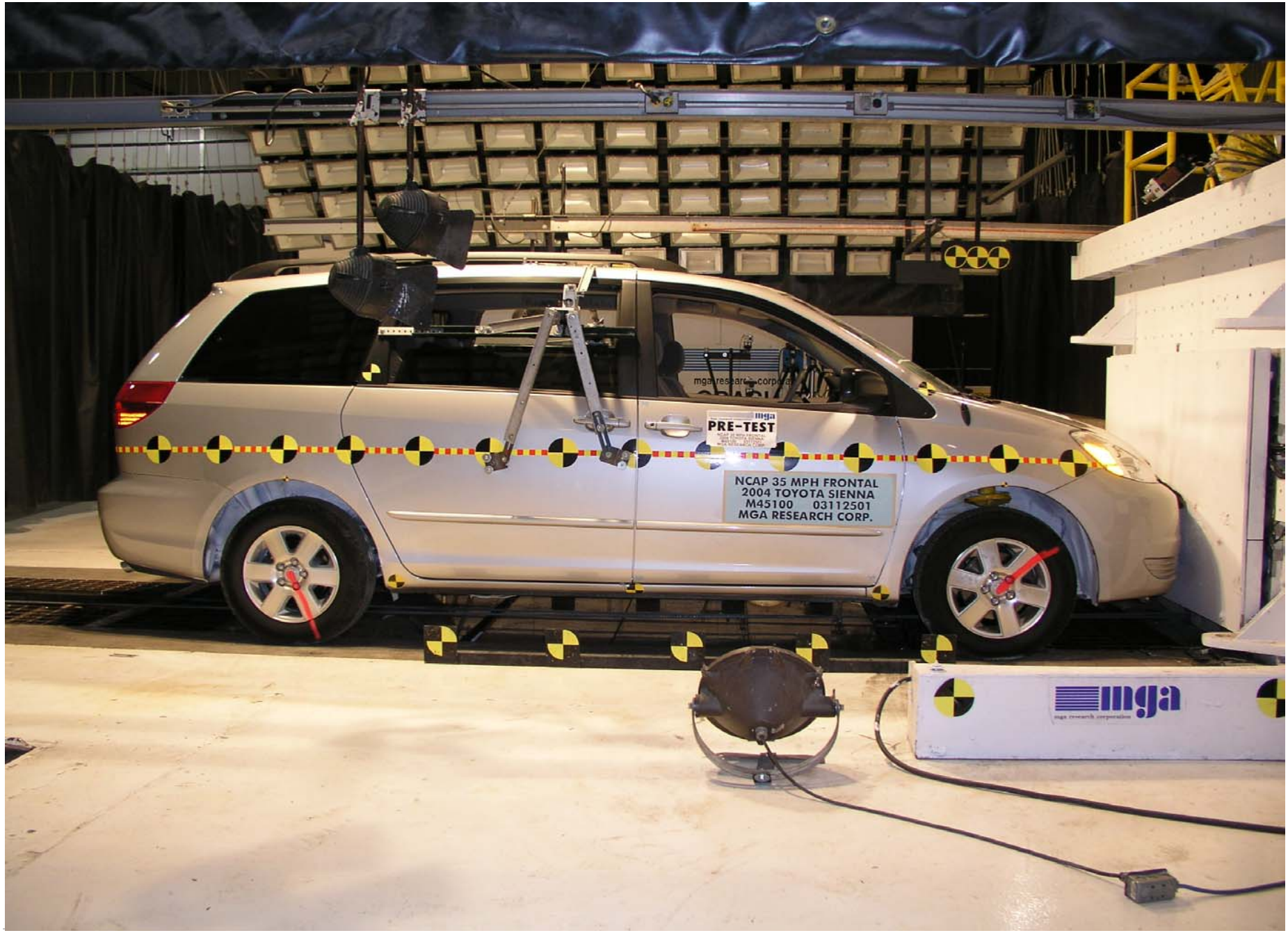
Left Rear View of Test Vehicle, as received

Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Left Side View of Test Vehicle

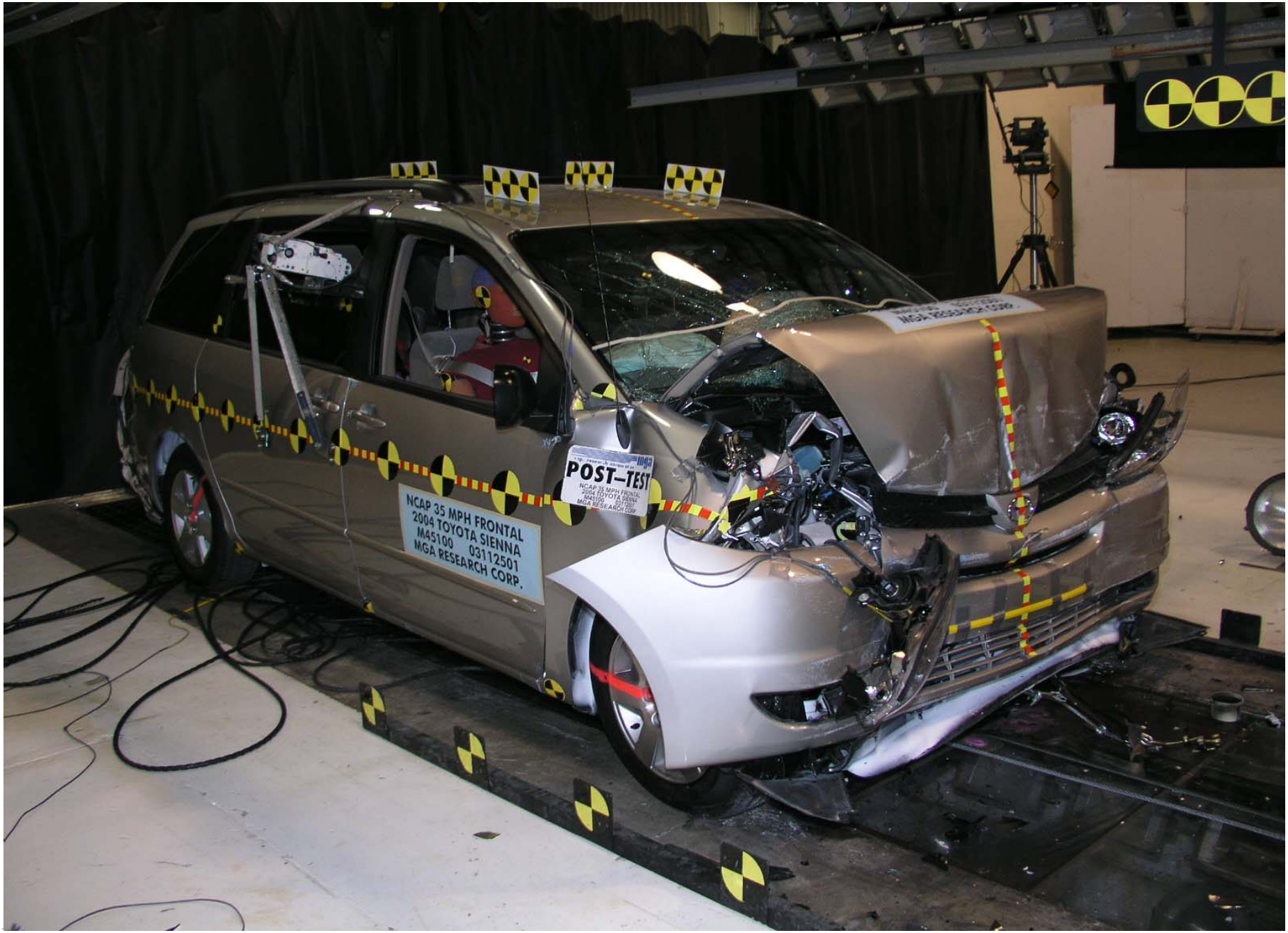
Post-Test Left Side View of Test Vehicle



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 Rear Three-Quarter View of Door After Impact

Post-Test Right Rear Three-Quarter View of Door After Impact

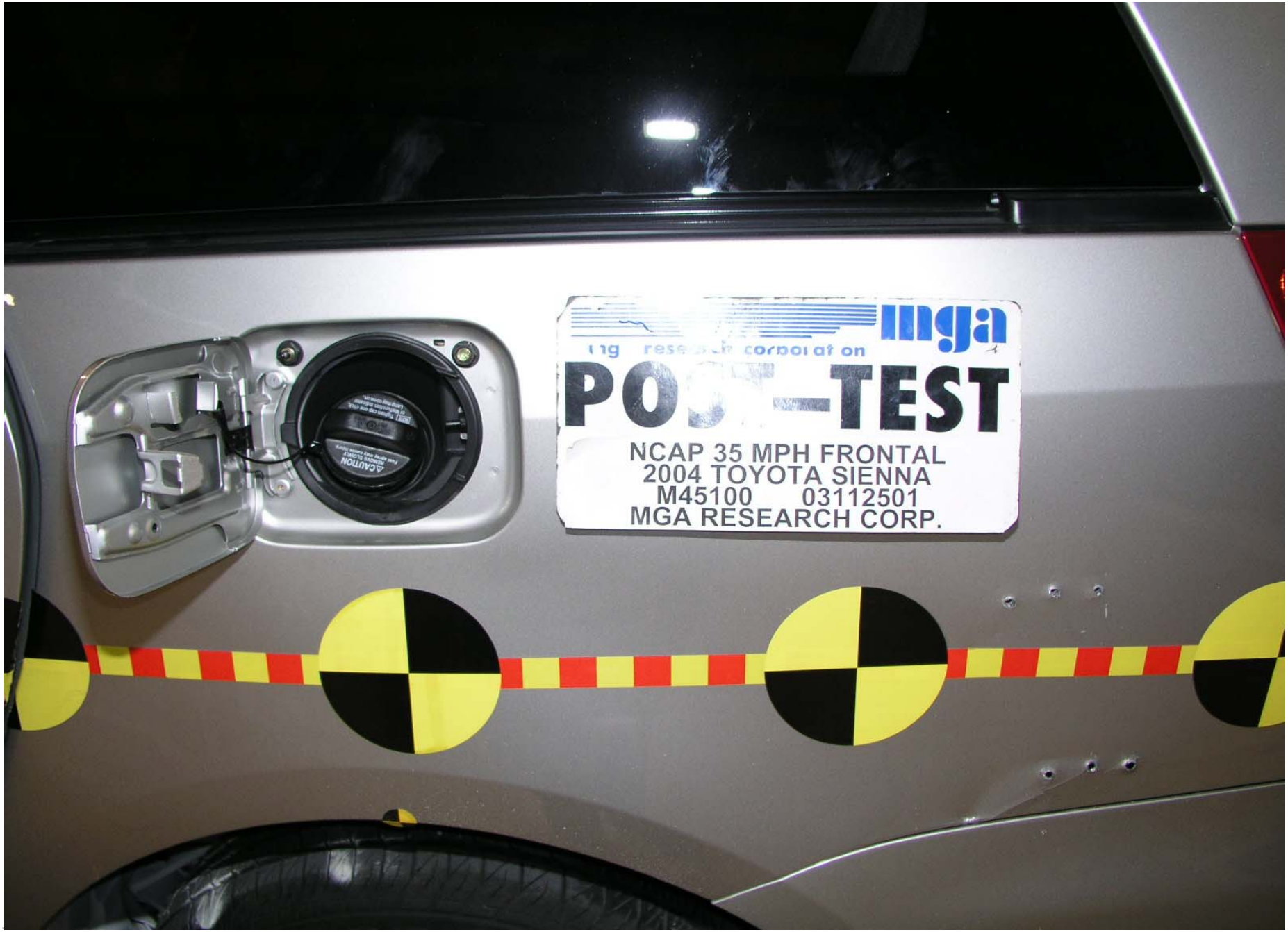
Pre-Test Windshield View

Post-Test Windshield View

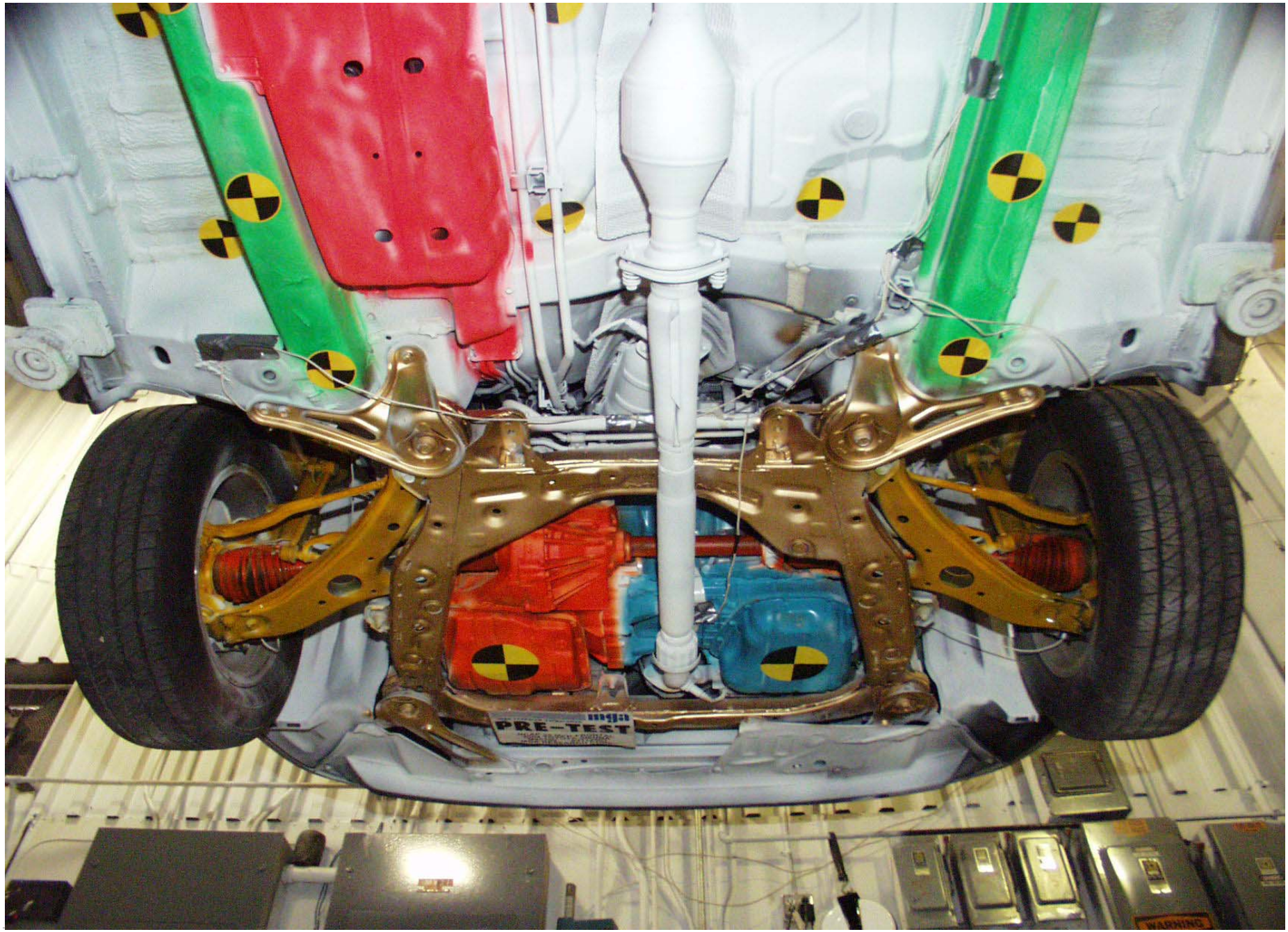
Pre-Test Engine Compartment View

Post-Test Engine Compartment View

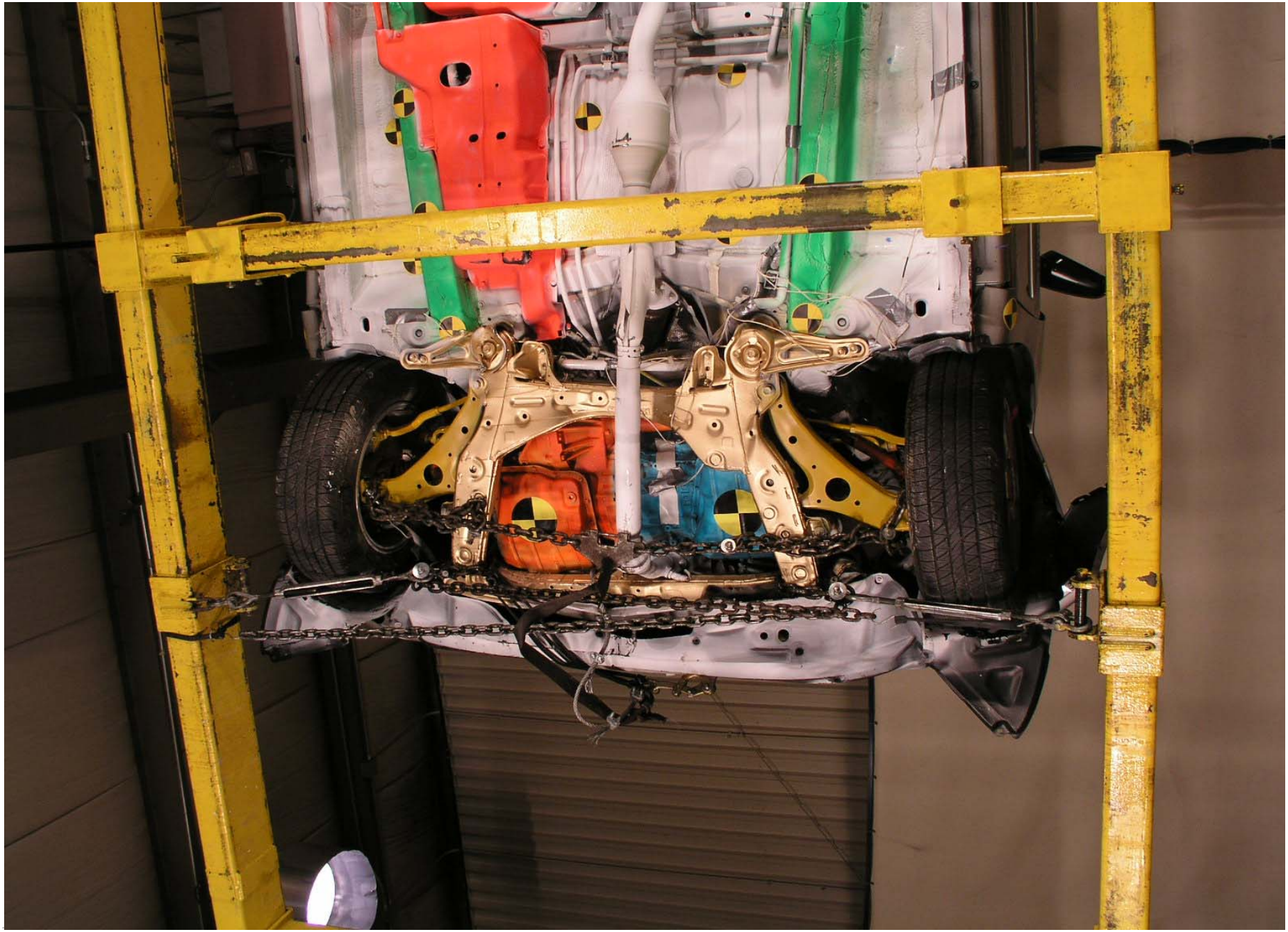
Pre-Test Fuel Filler Cap View



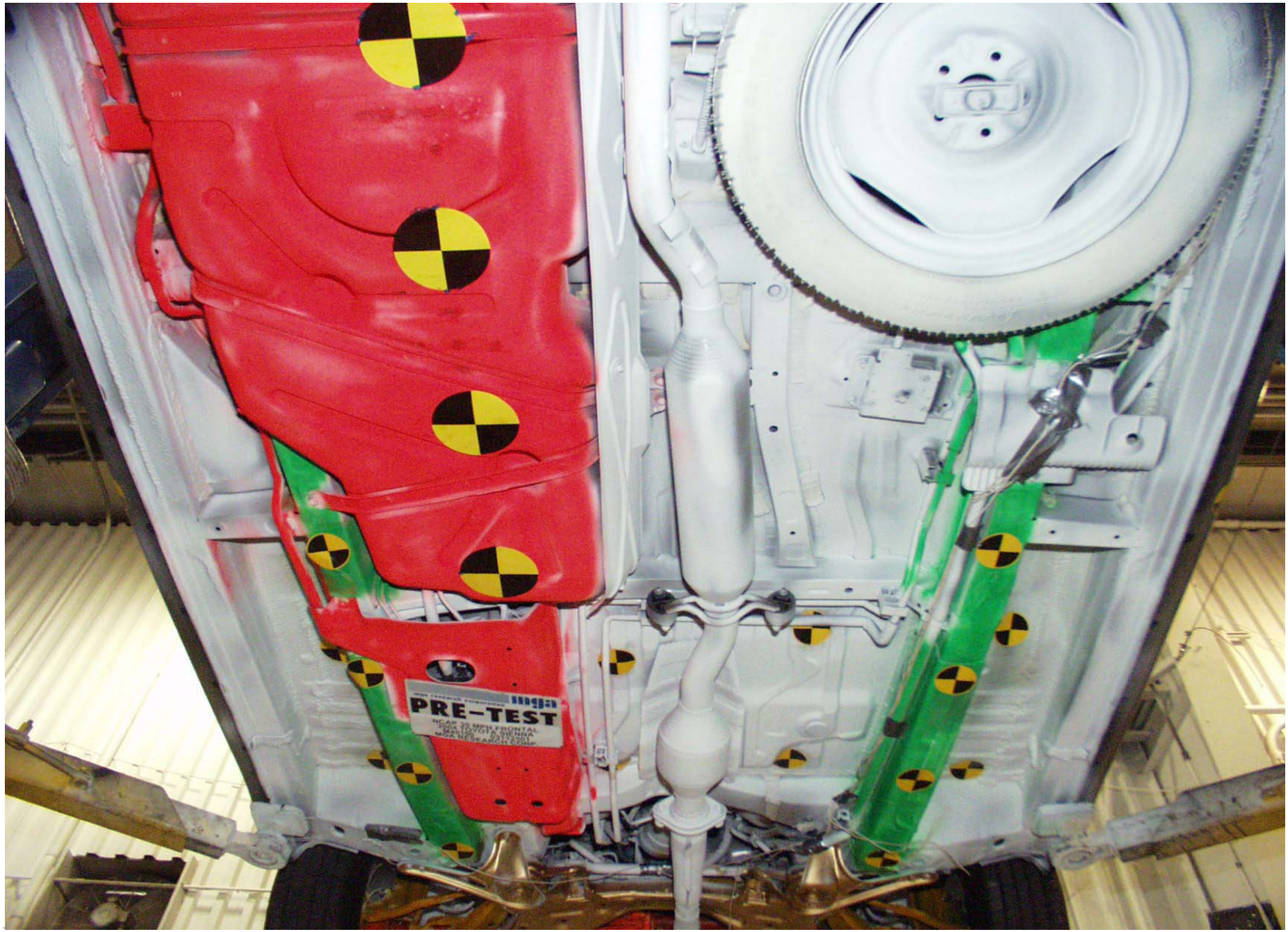
Post-Test Fuel Filler Cap View



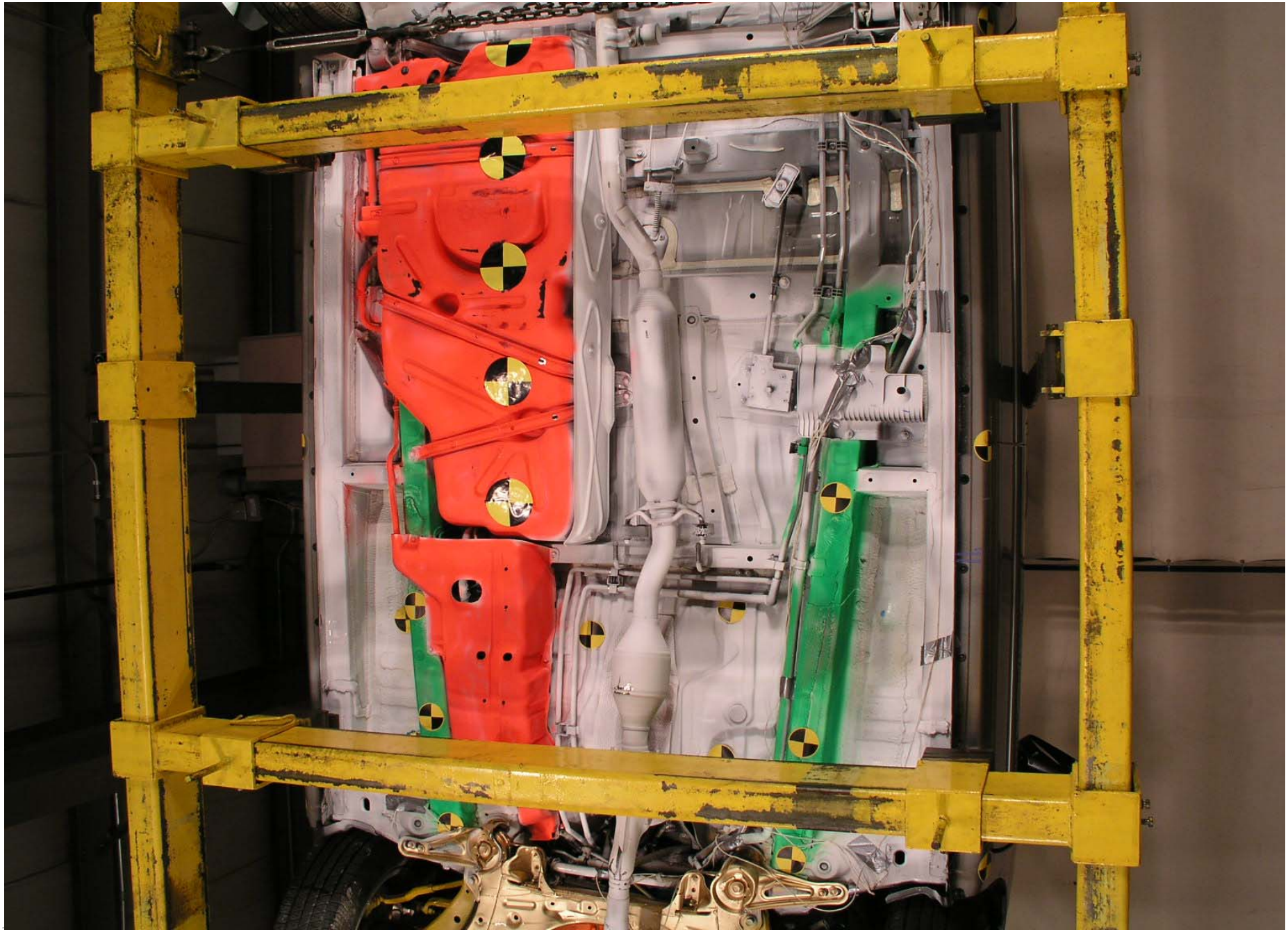
Pre-Test Front Underbody View



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 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 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 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

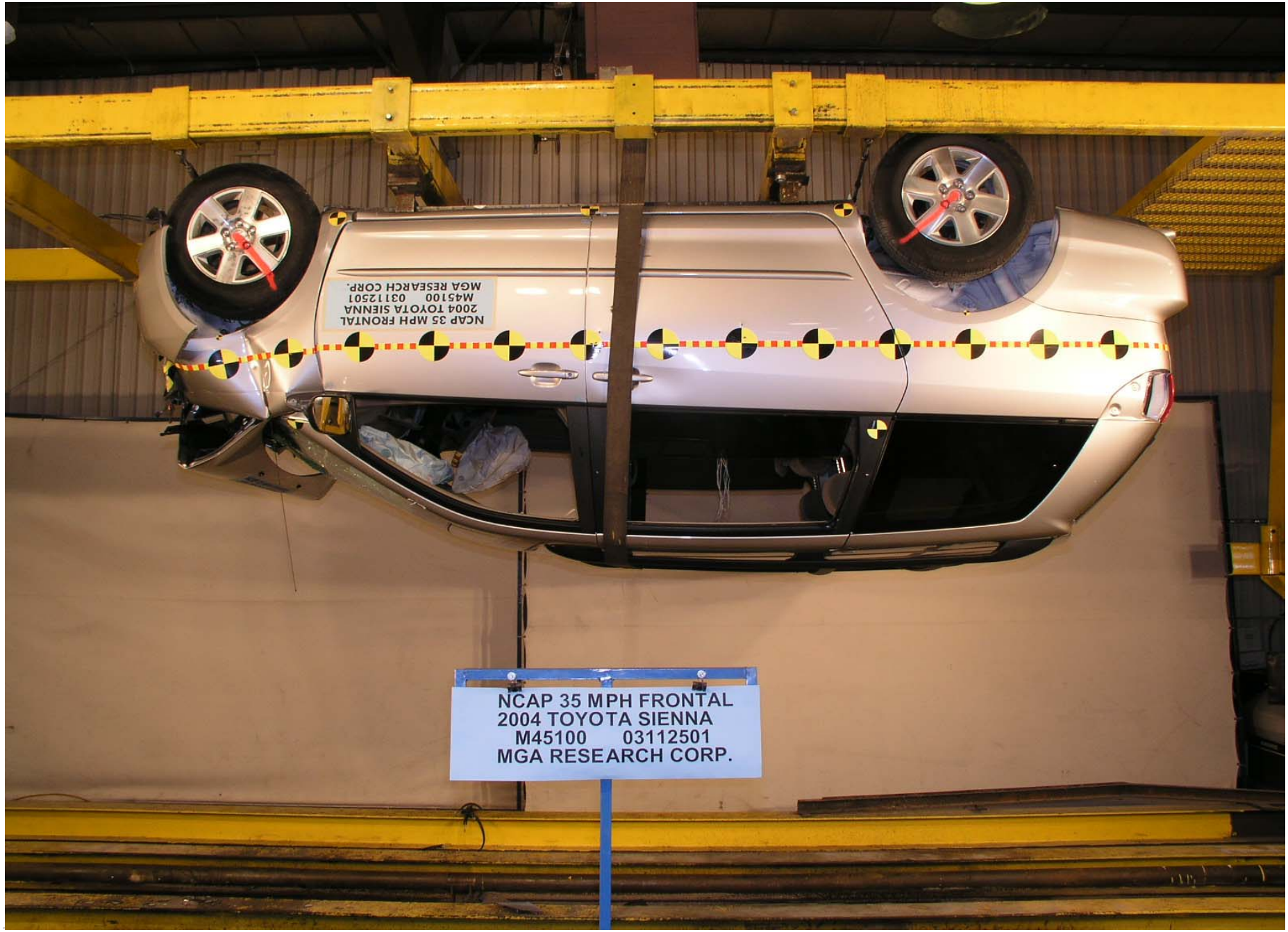
Post-Test Passenger Side Floor Pan View

Post-Test Passenger Dummy Head Contact

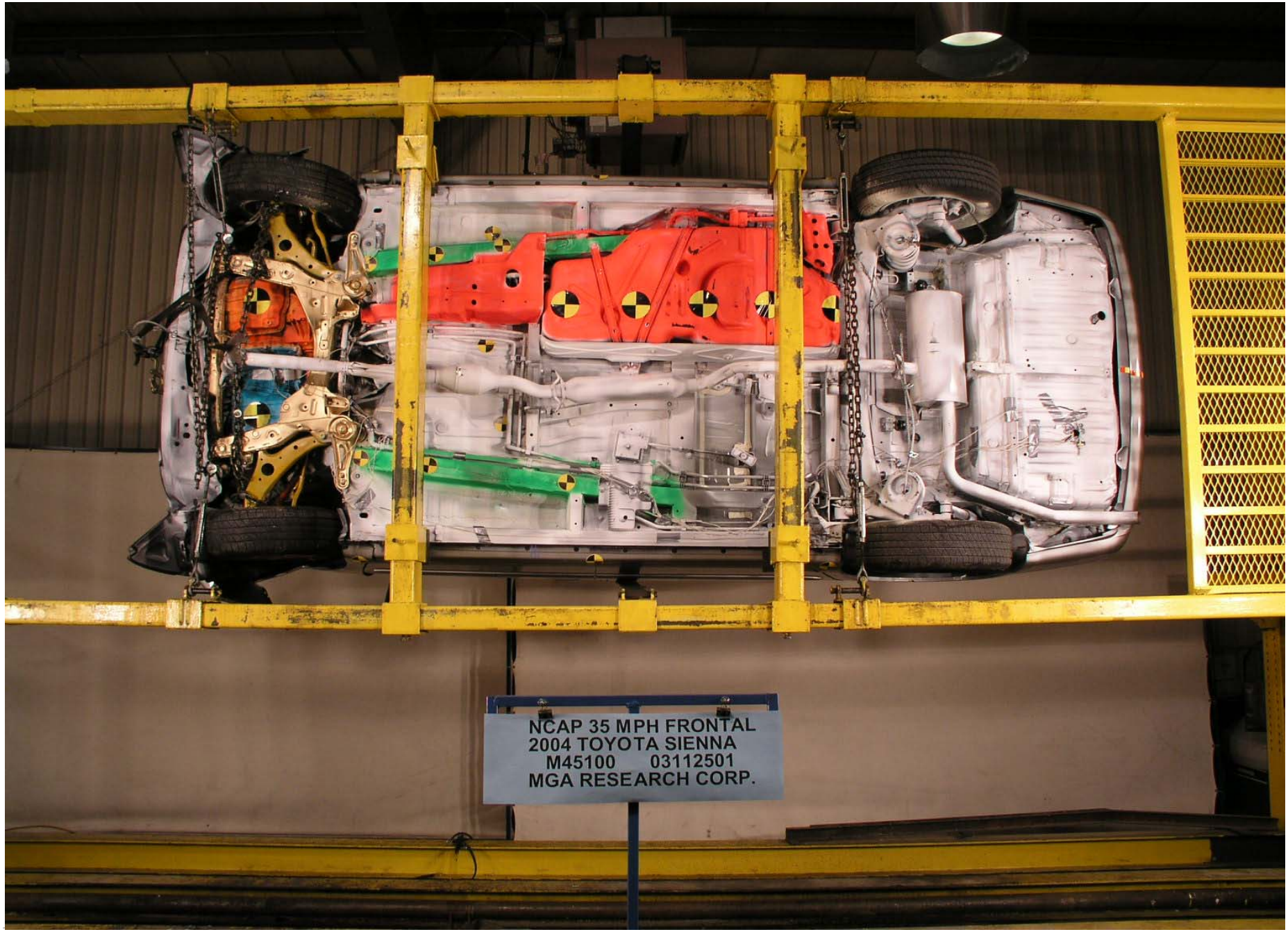
Post-Test Passenger Dummy Knee Contact

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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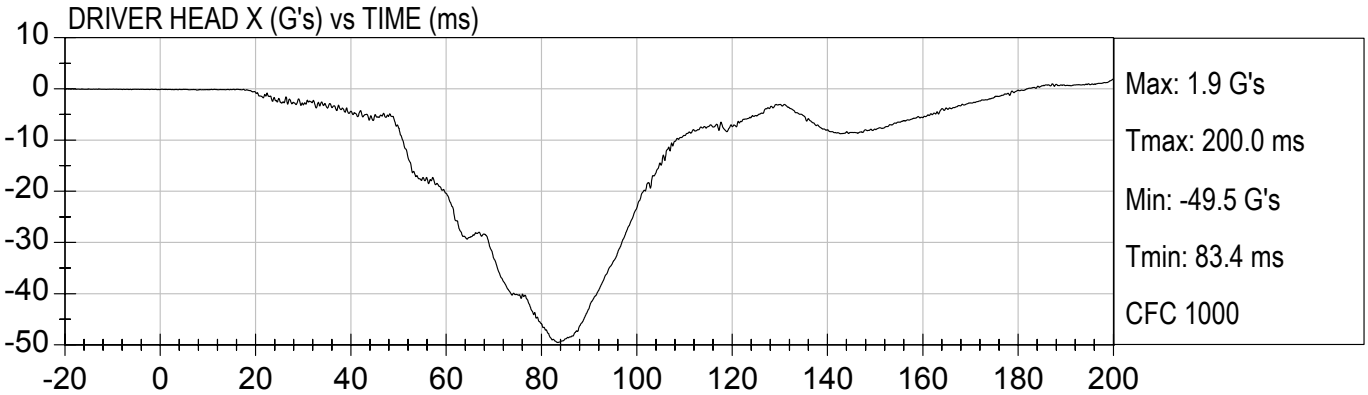
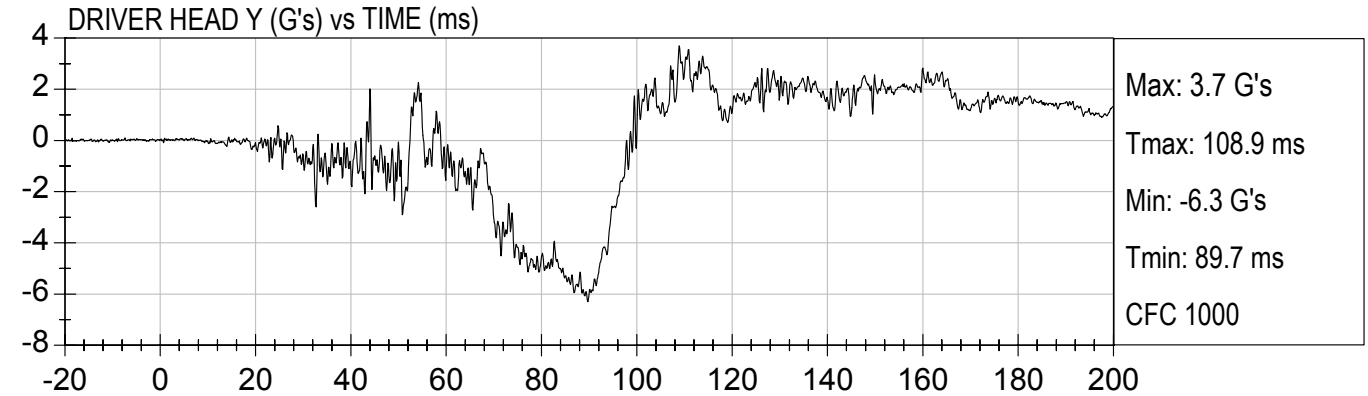
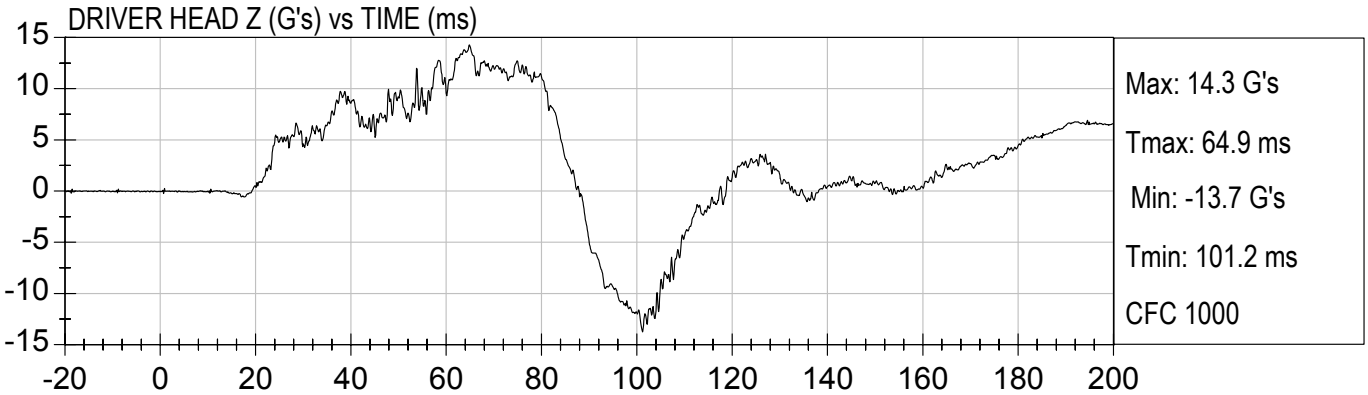
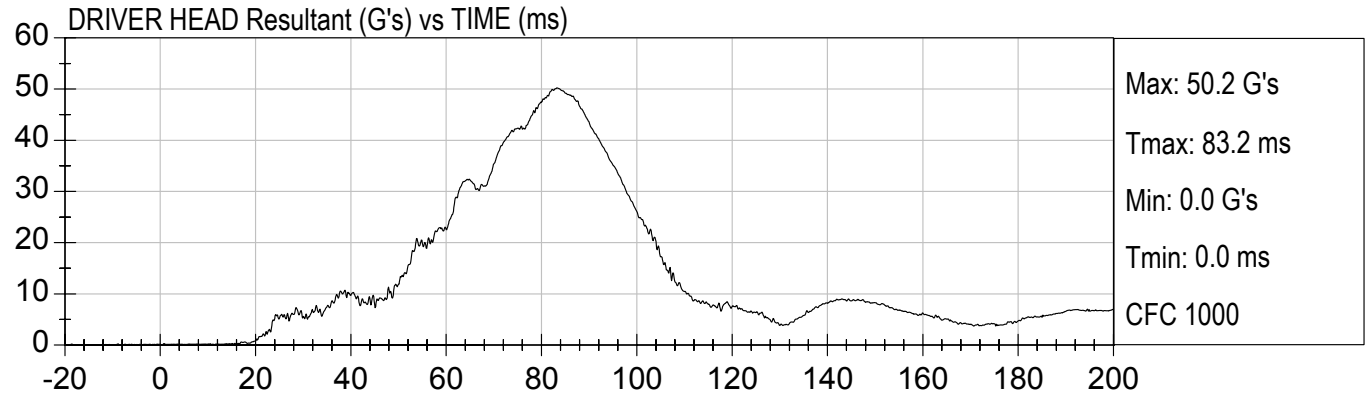
35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)









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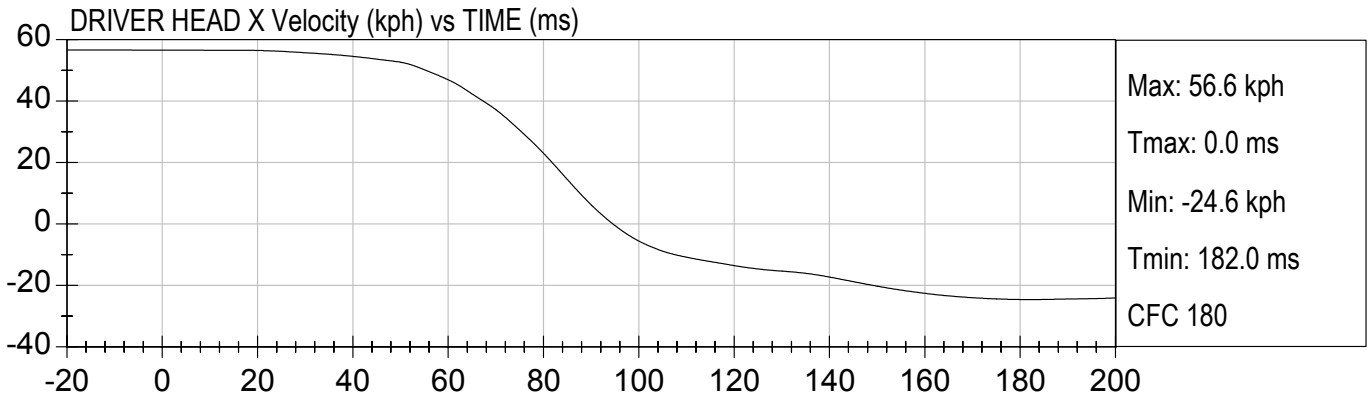

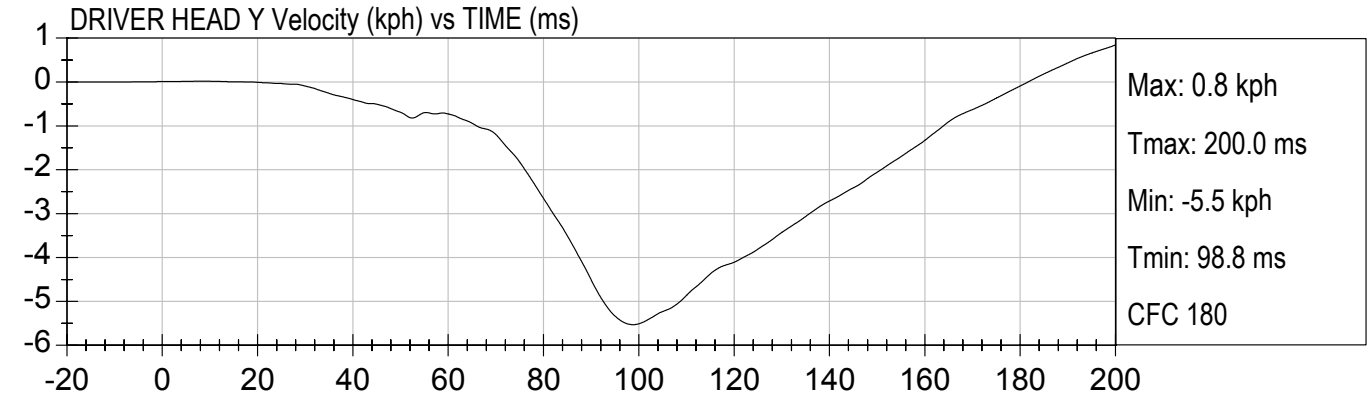

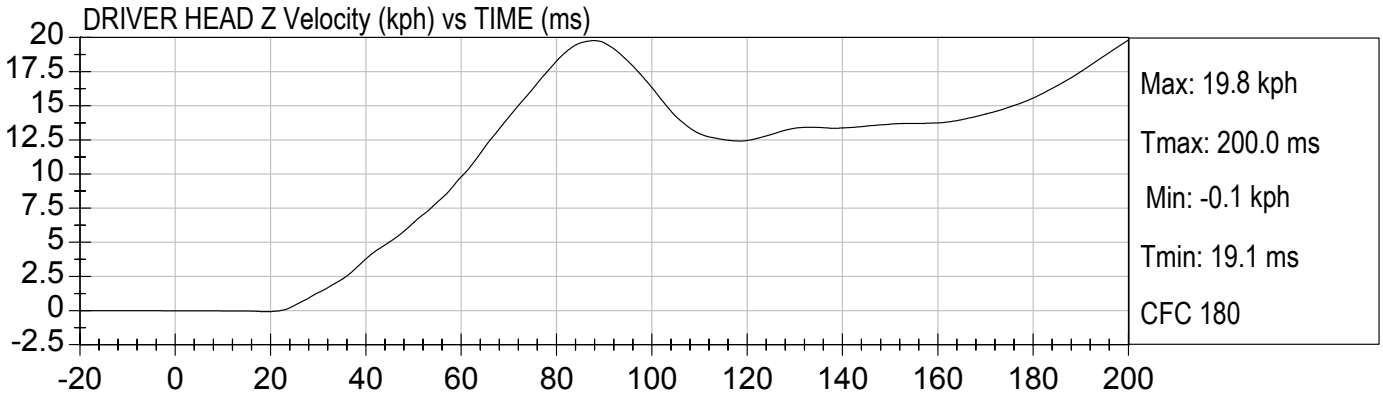

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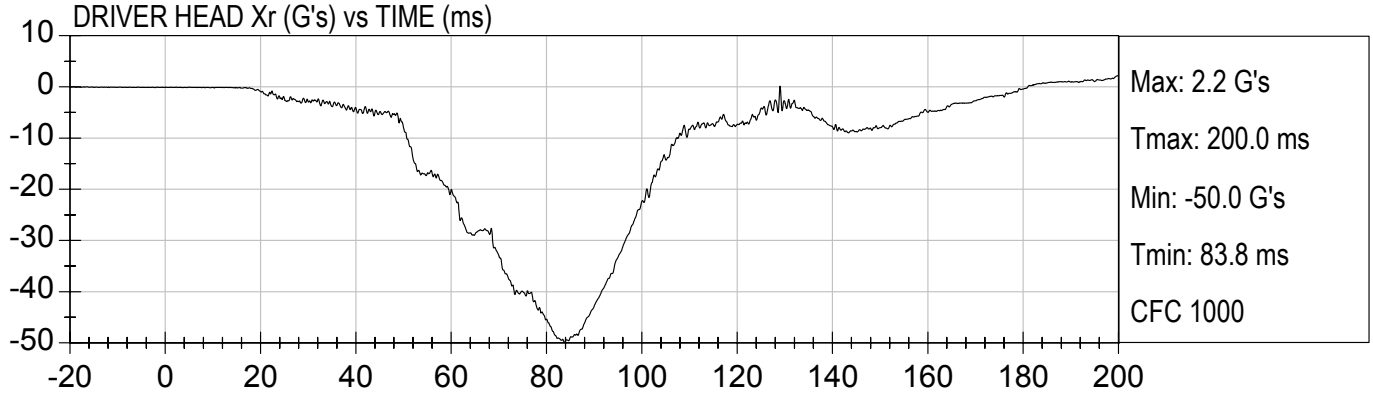

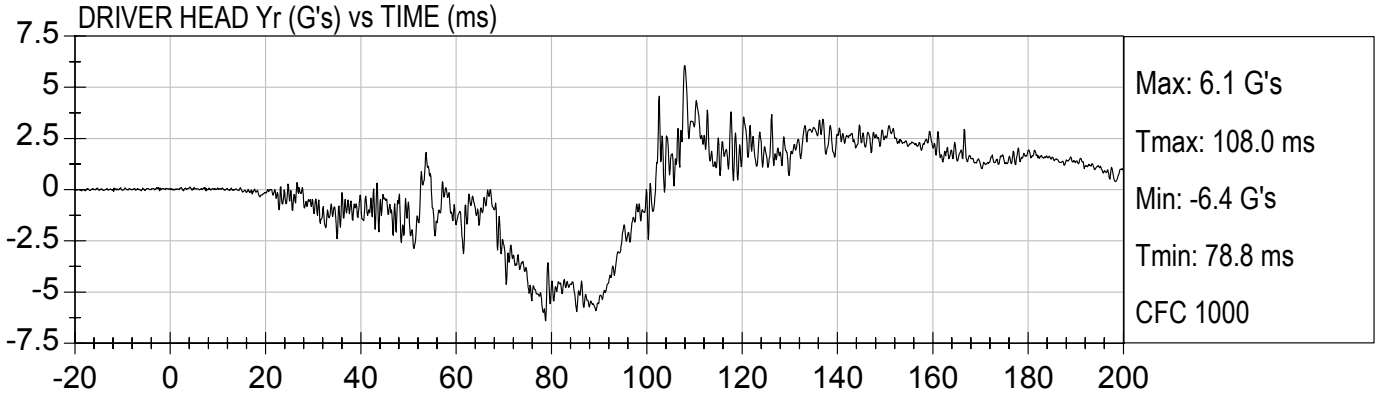

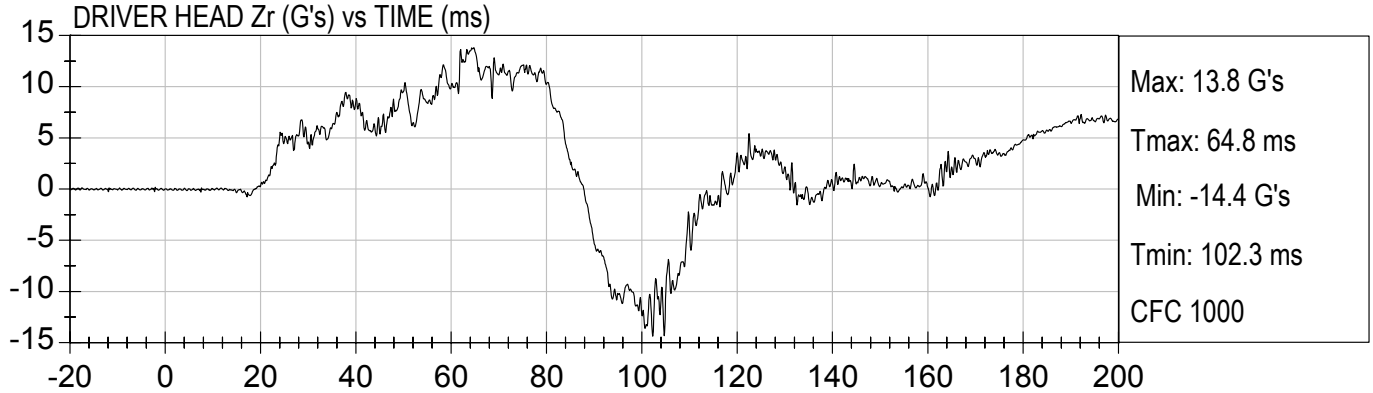

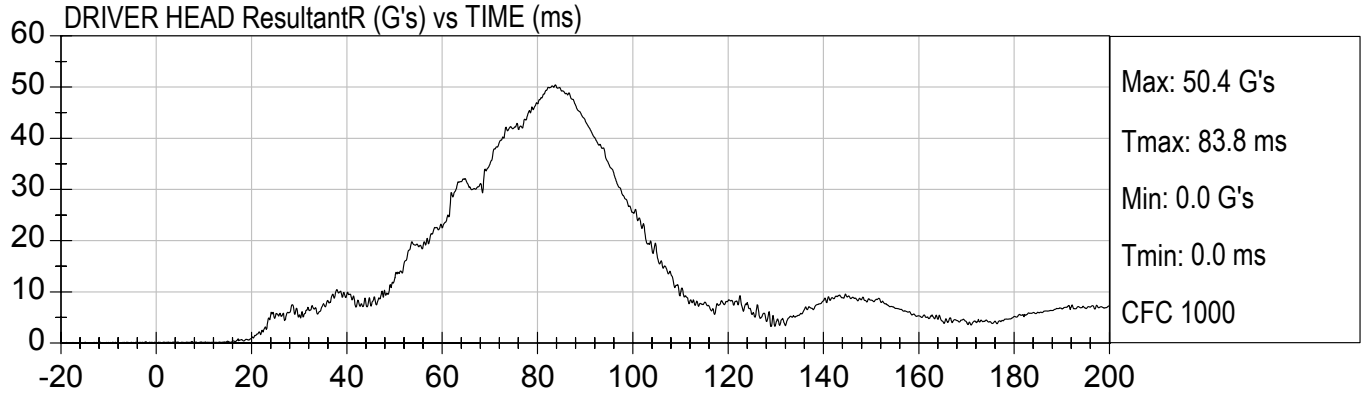

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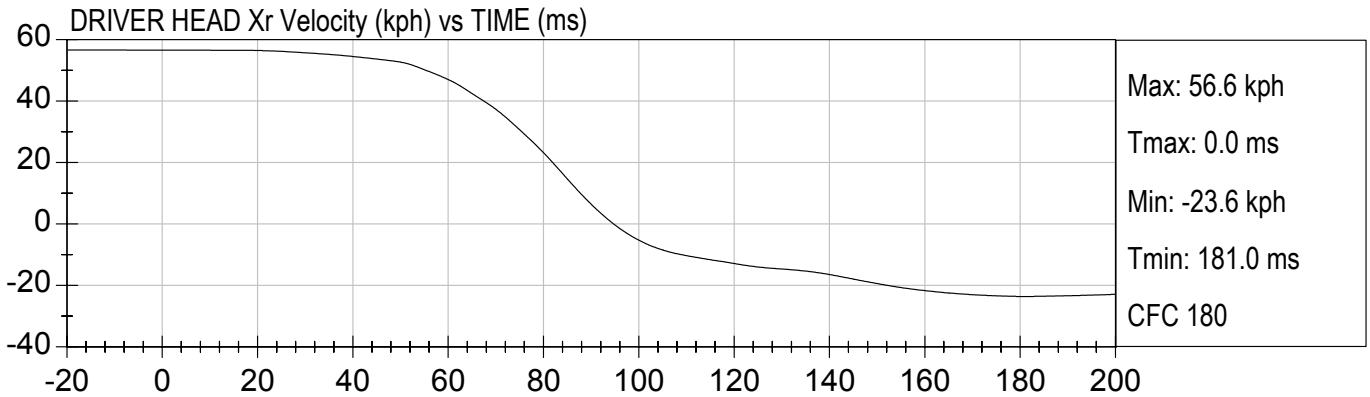

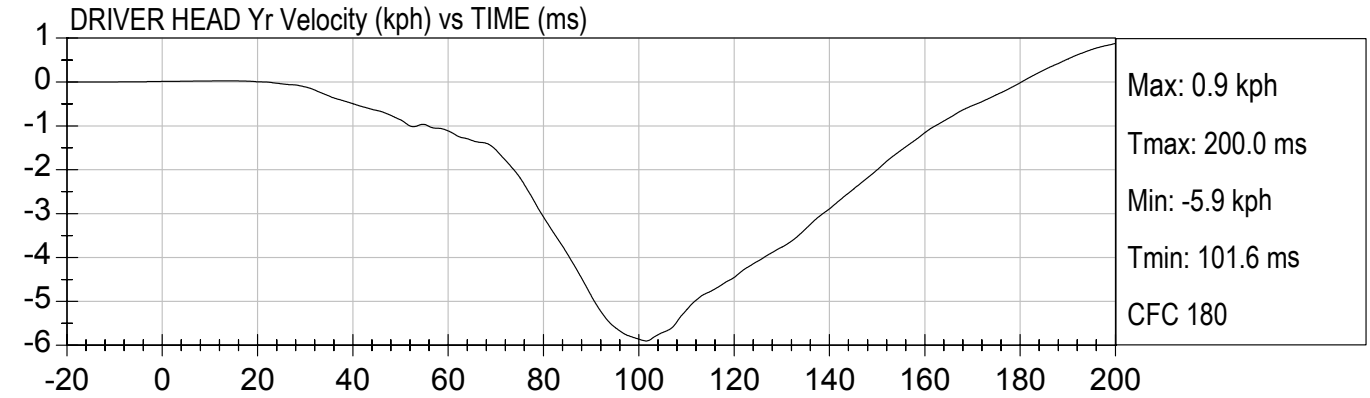

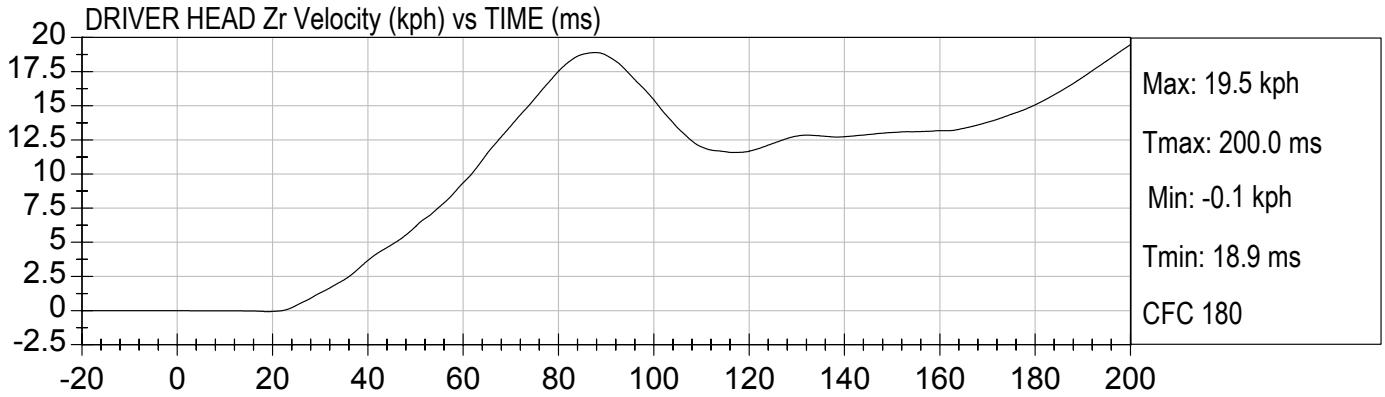

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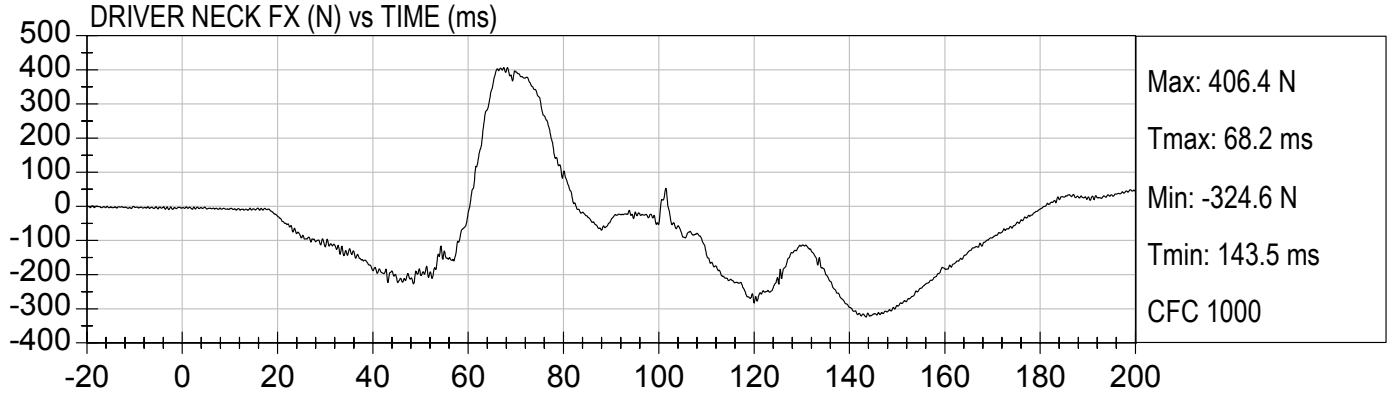

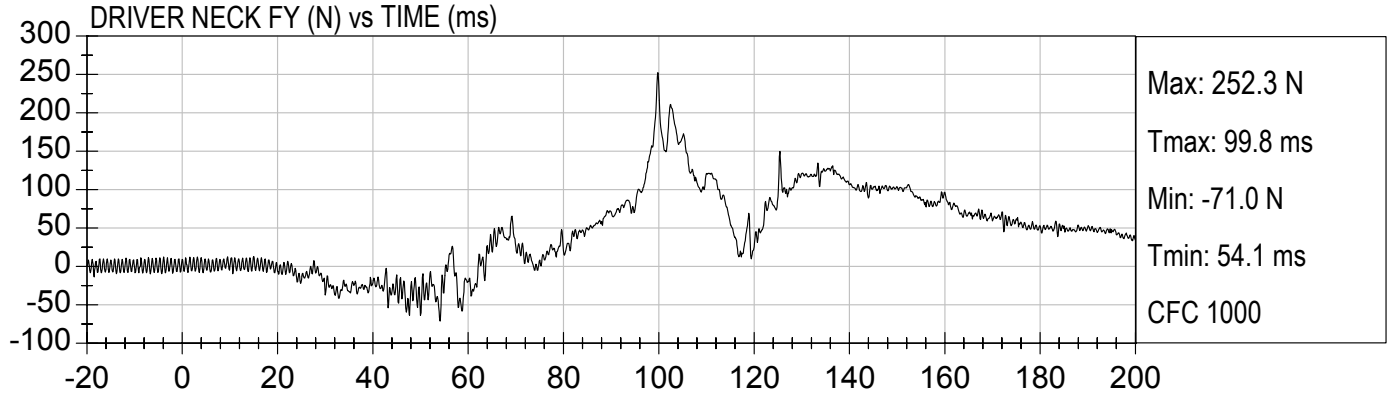

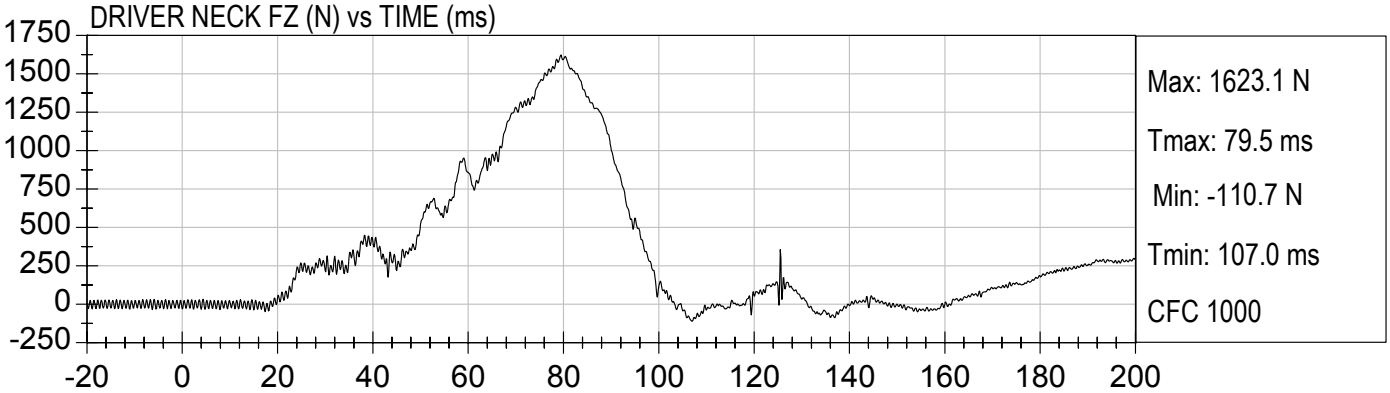

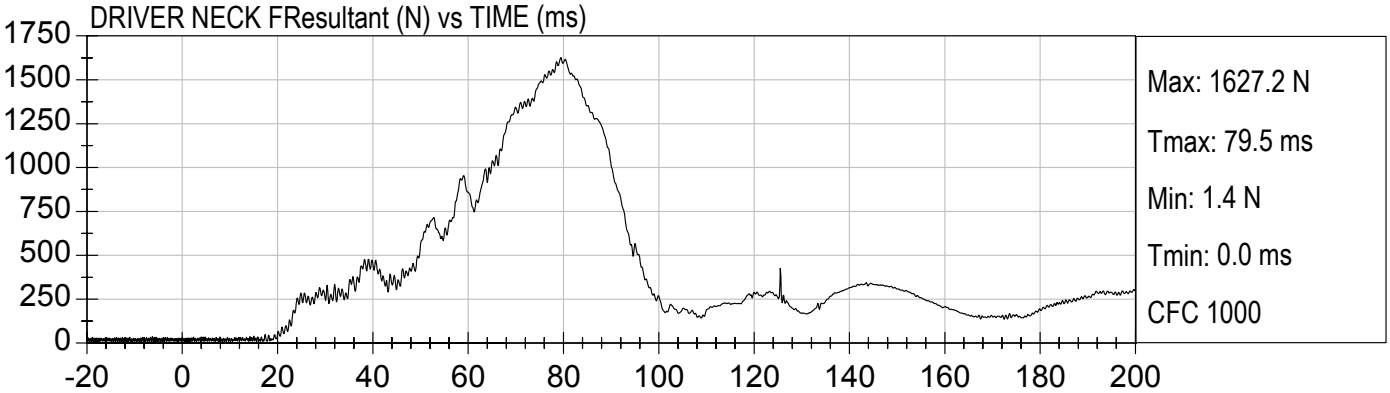

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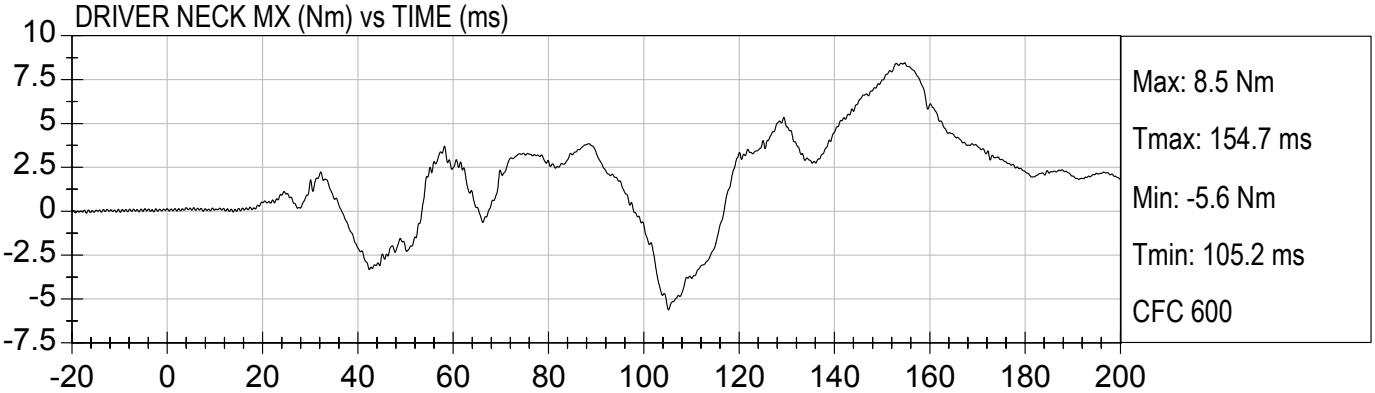

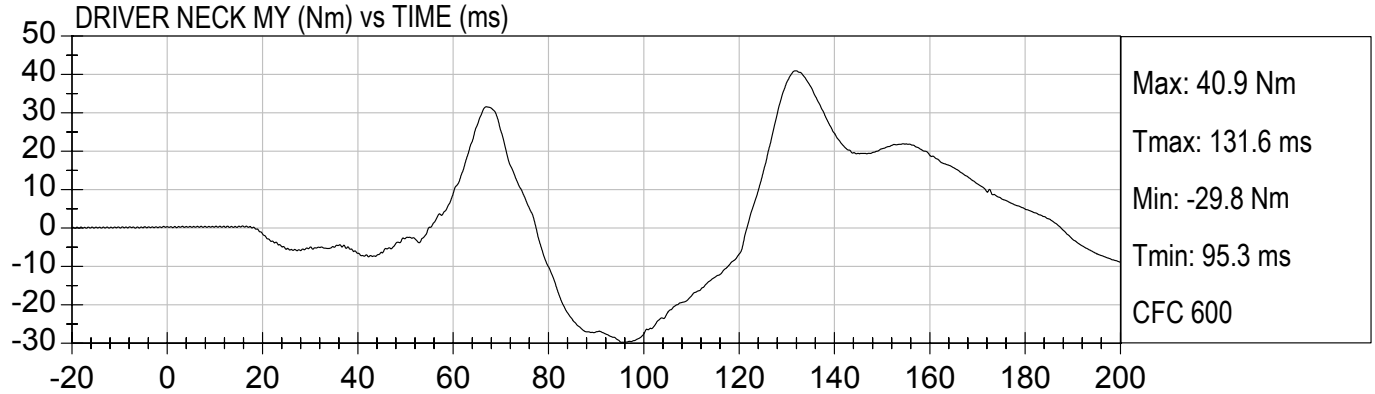

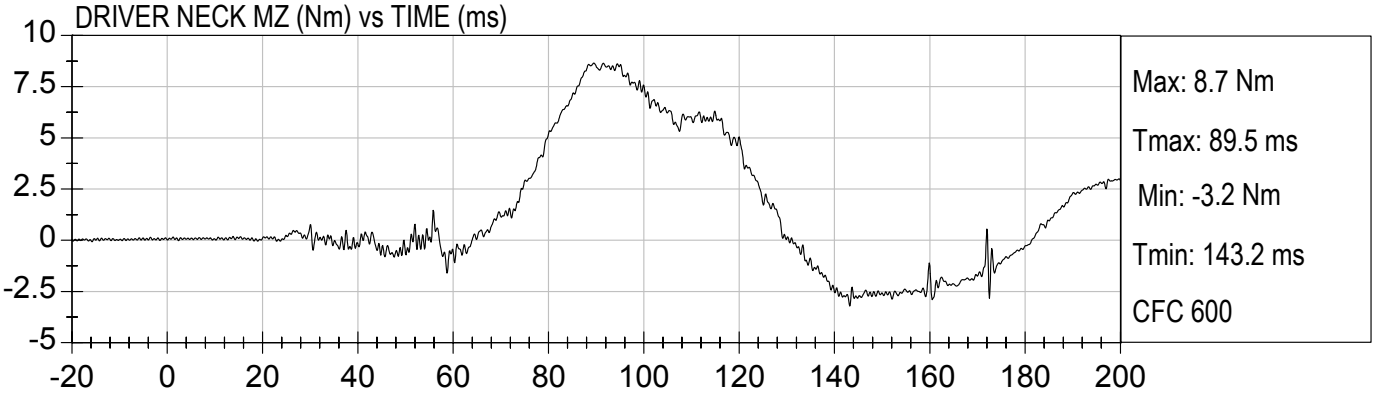

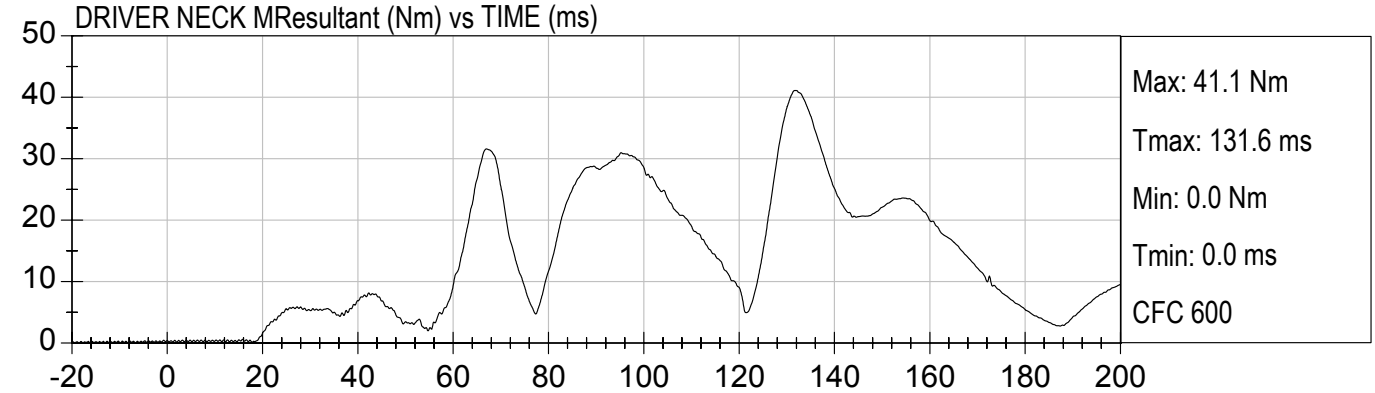

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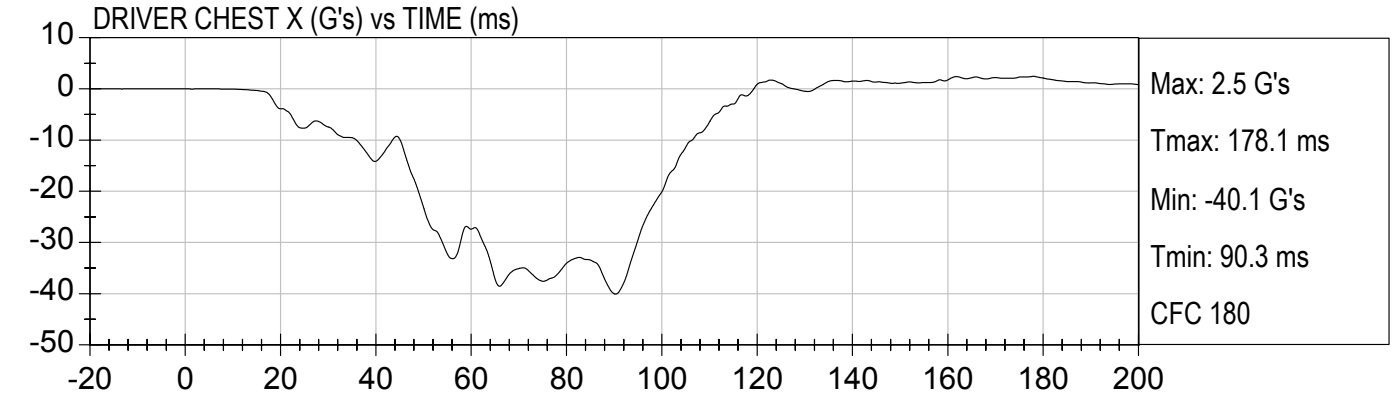

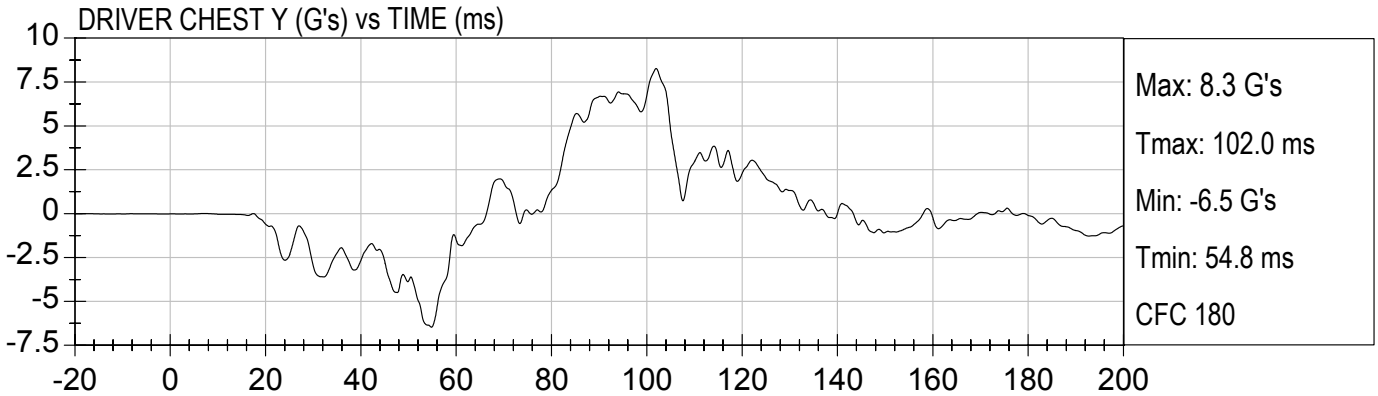

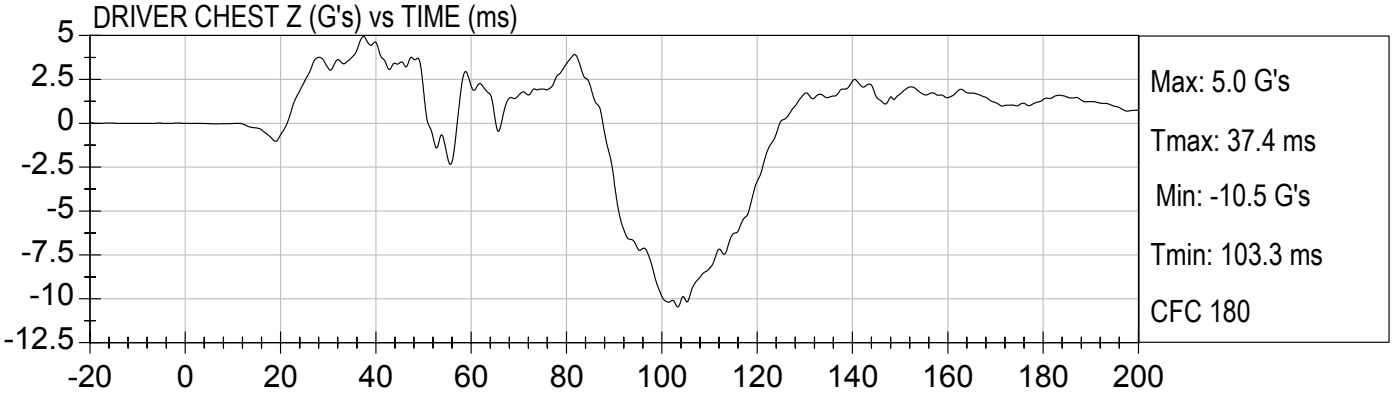

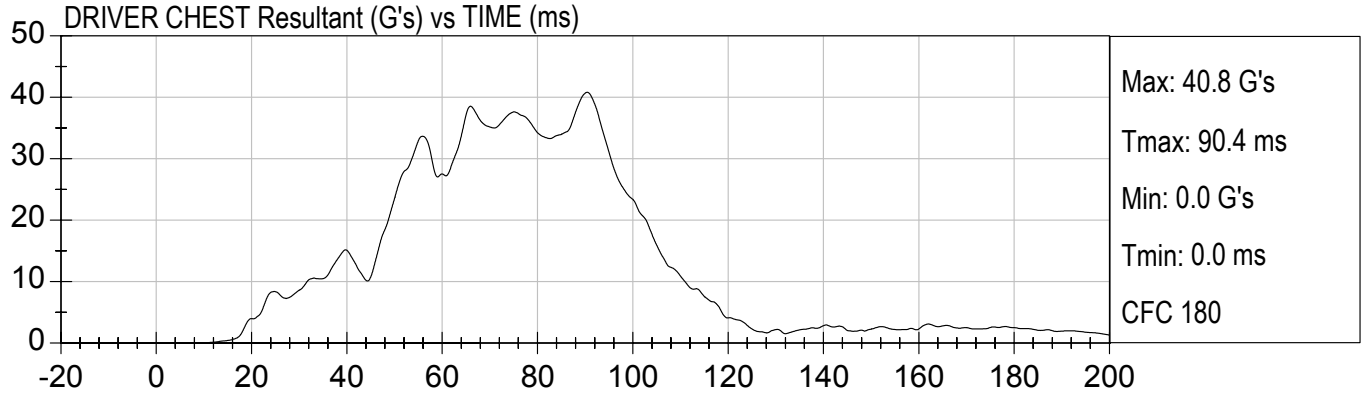

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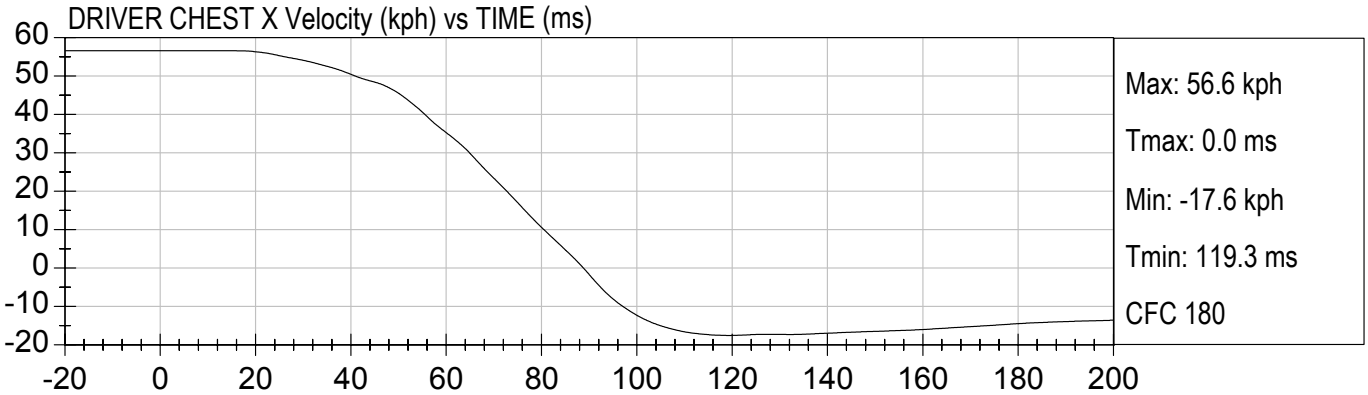

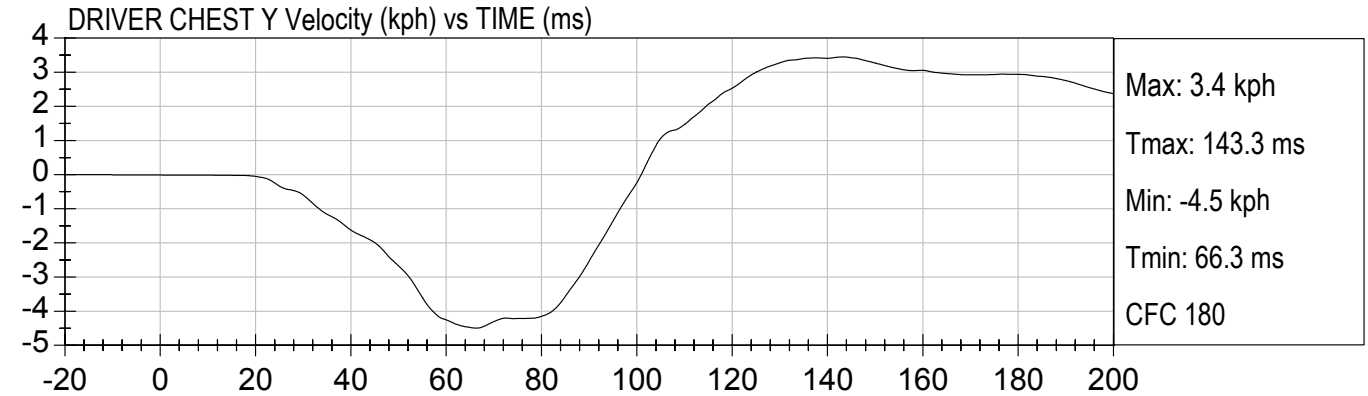

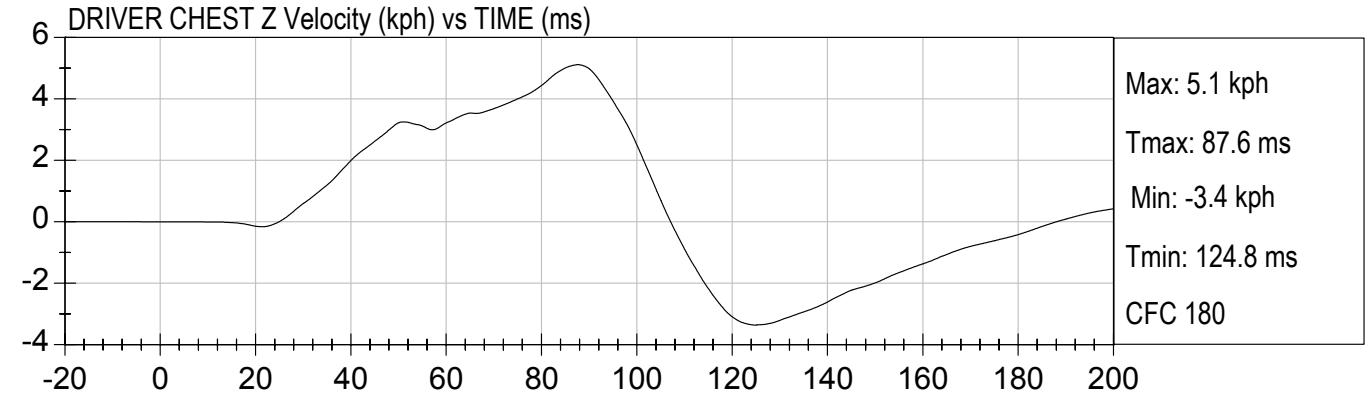

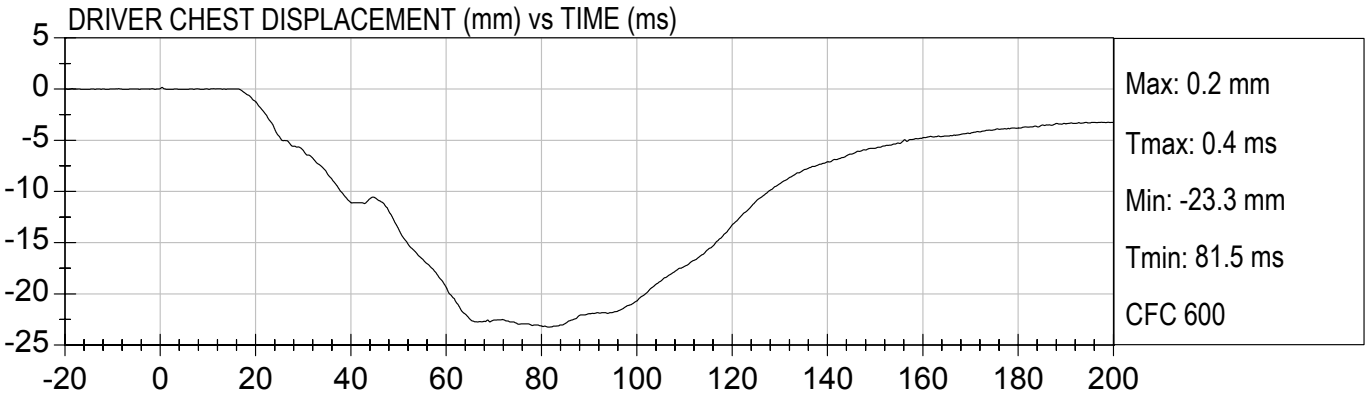

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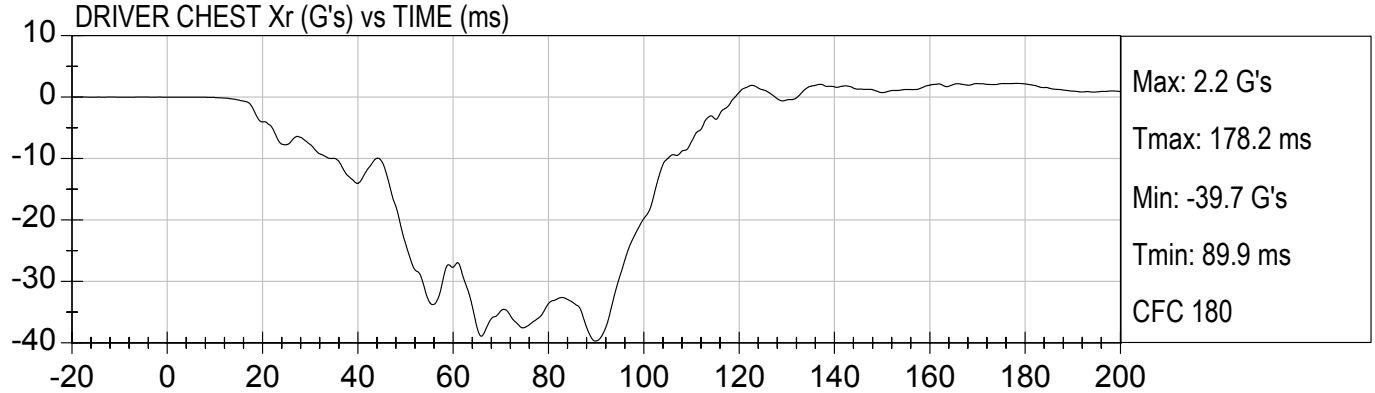

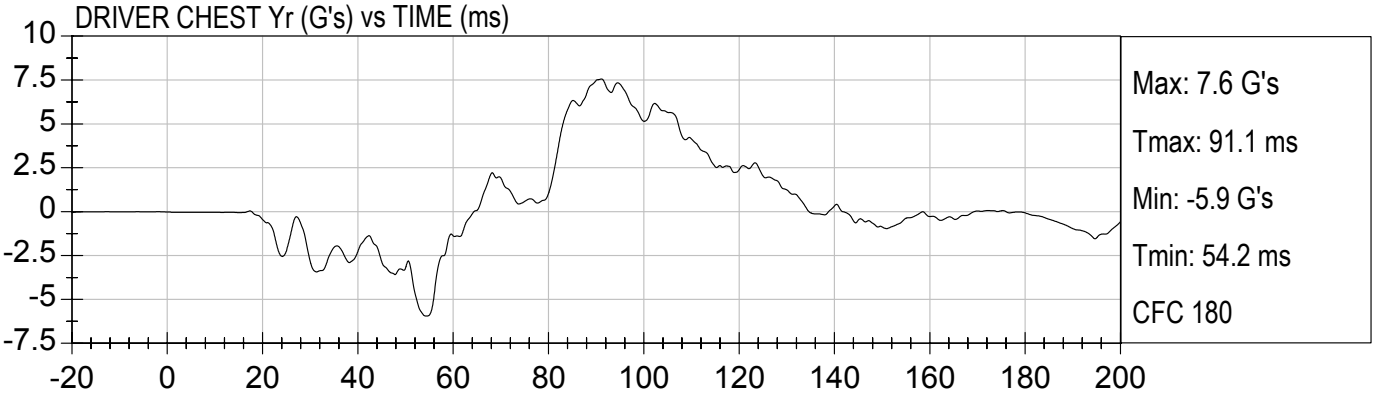

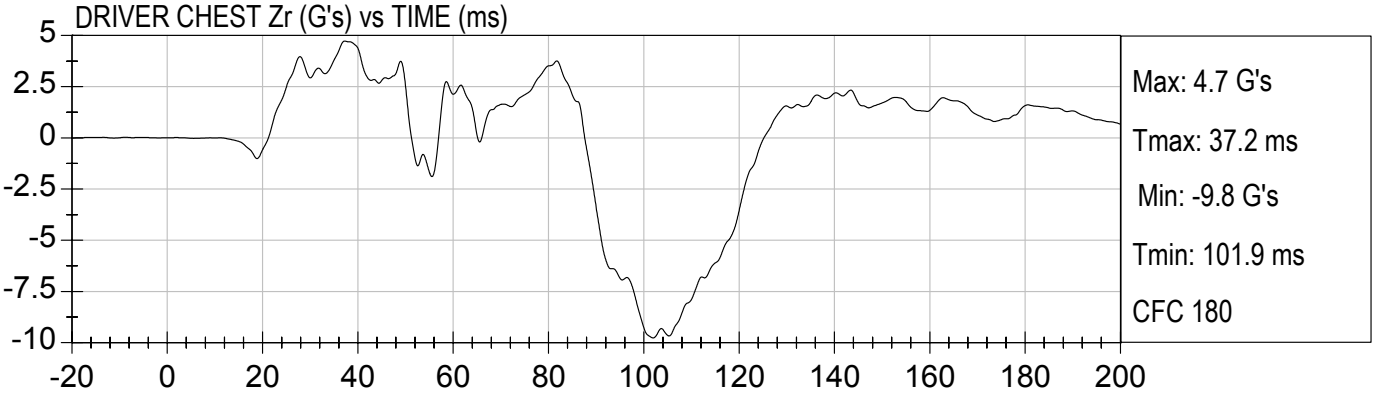

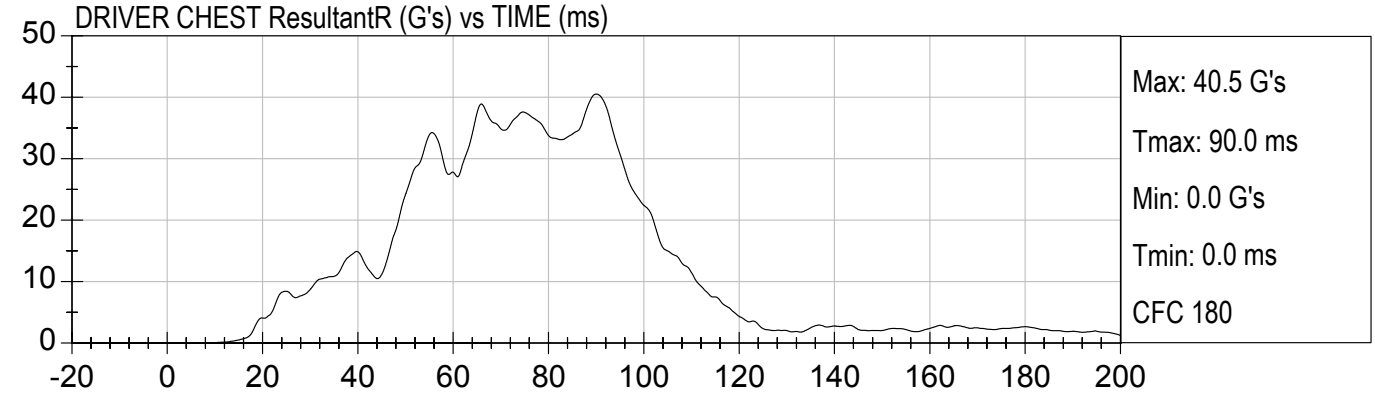

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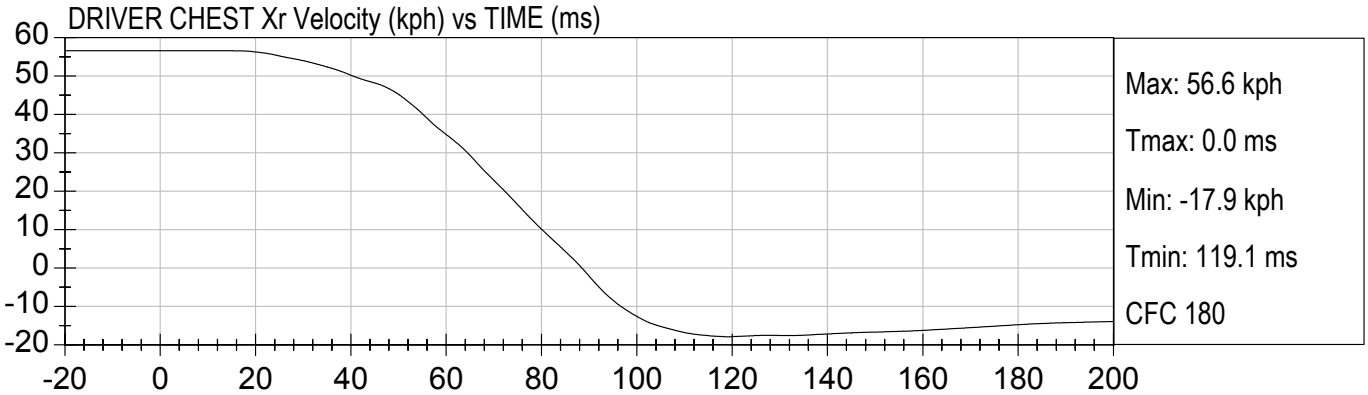

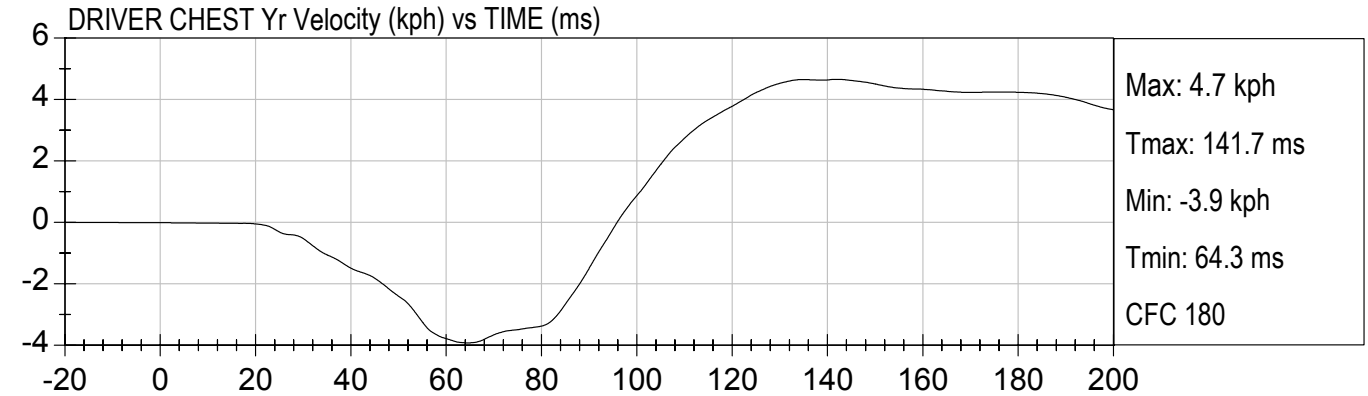

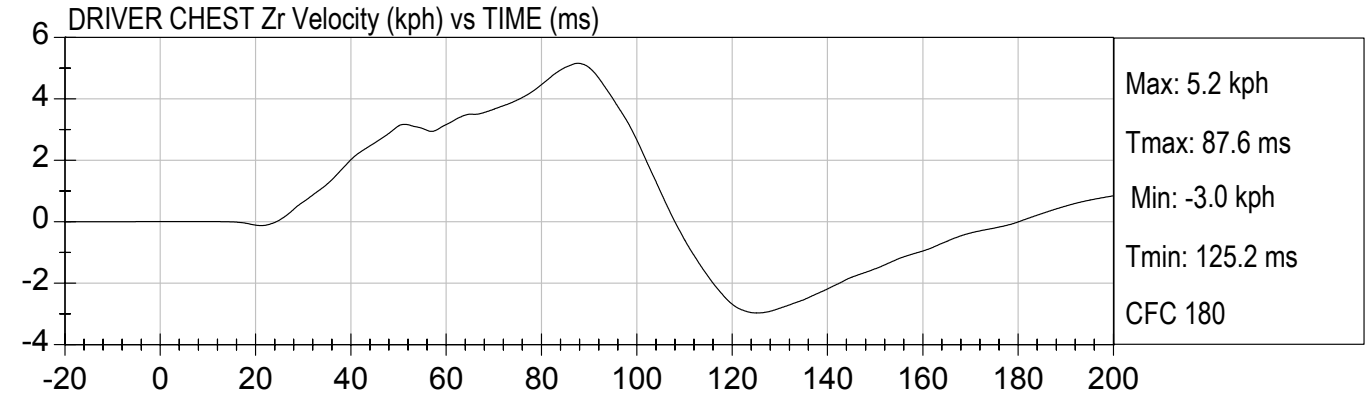

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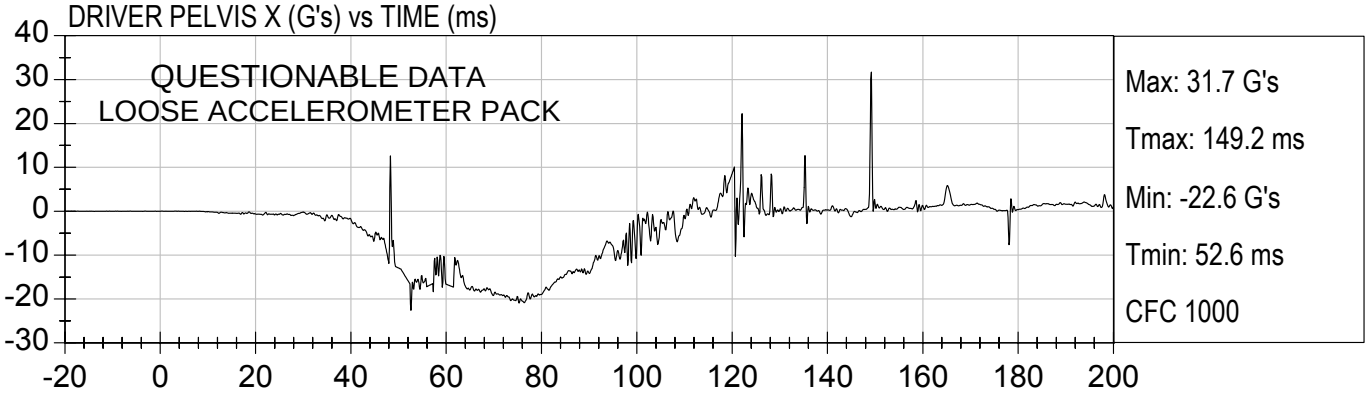

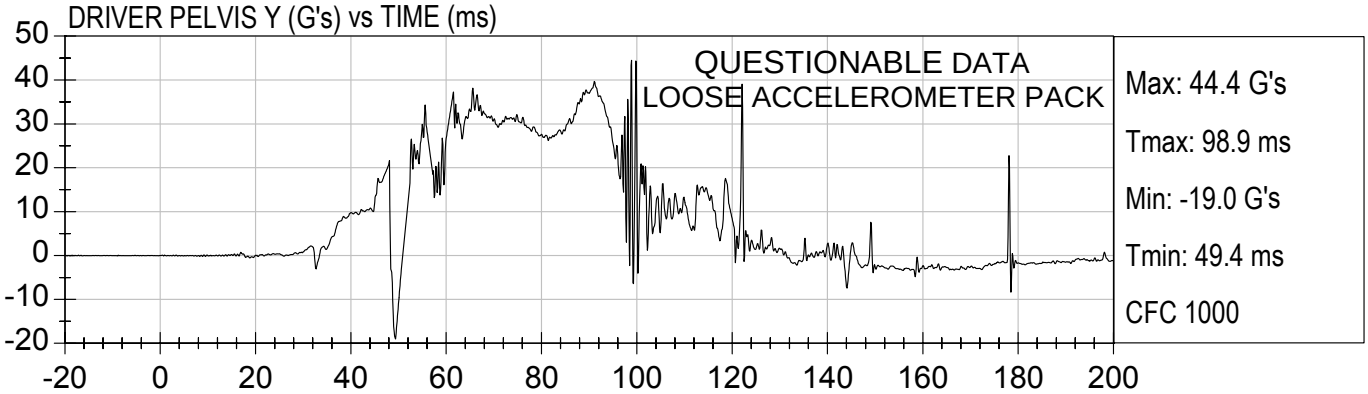

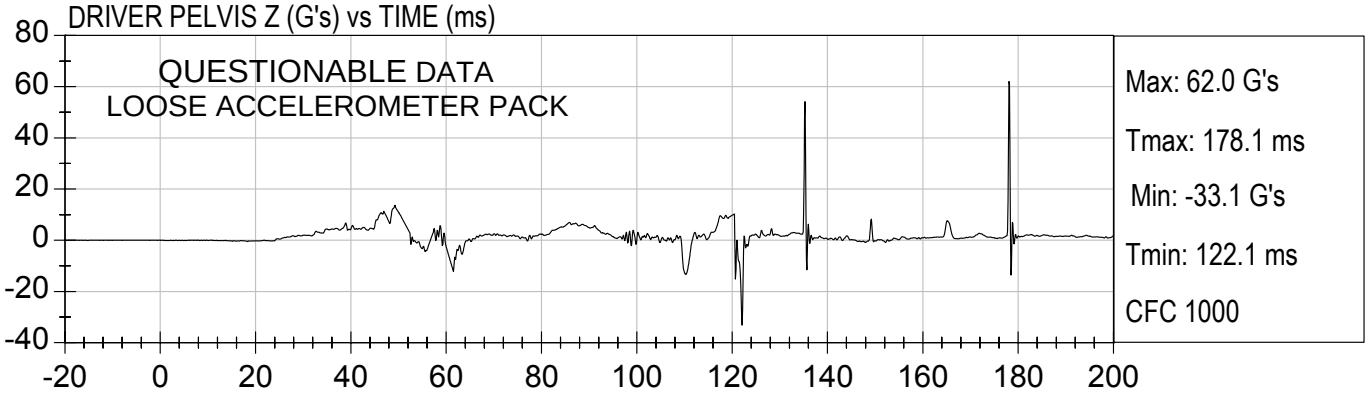

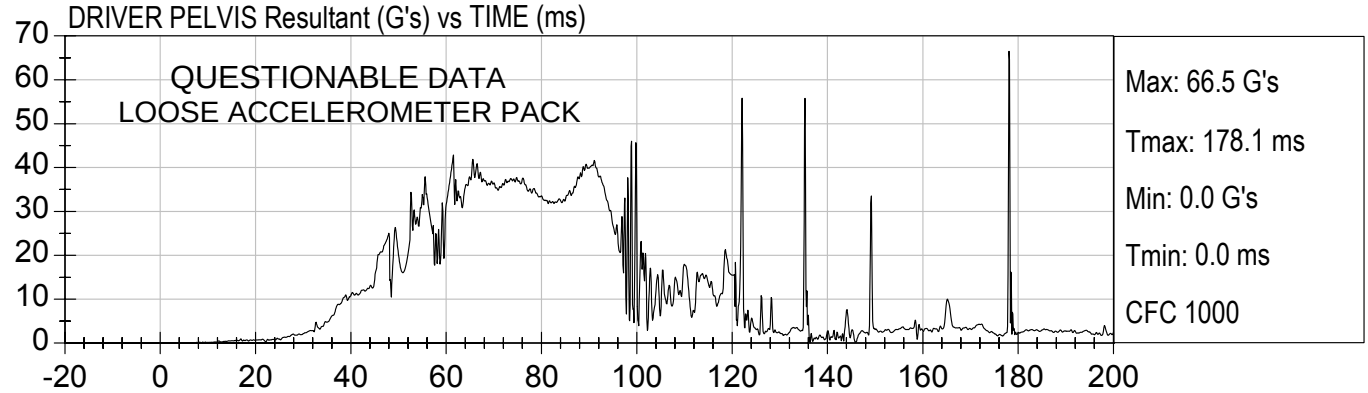

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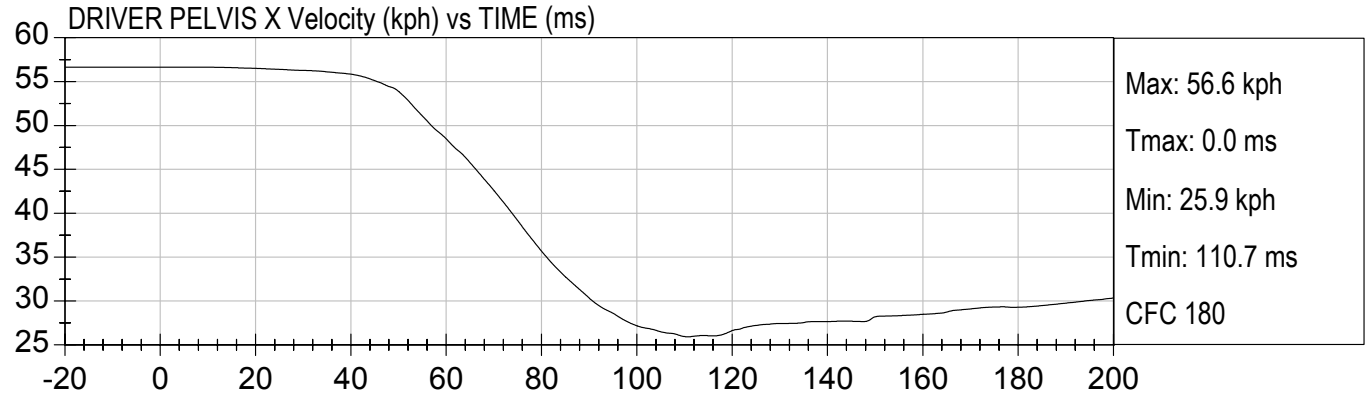

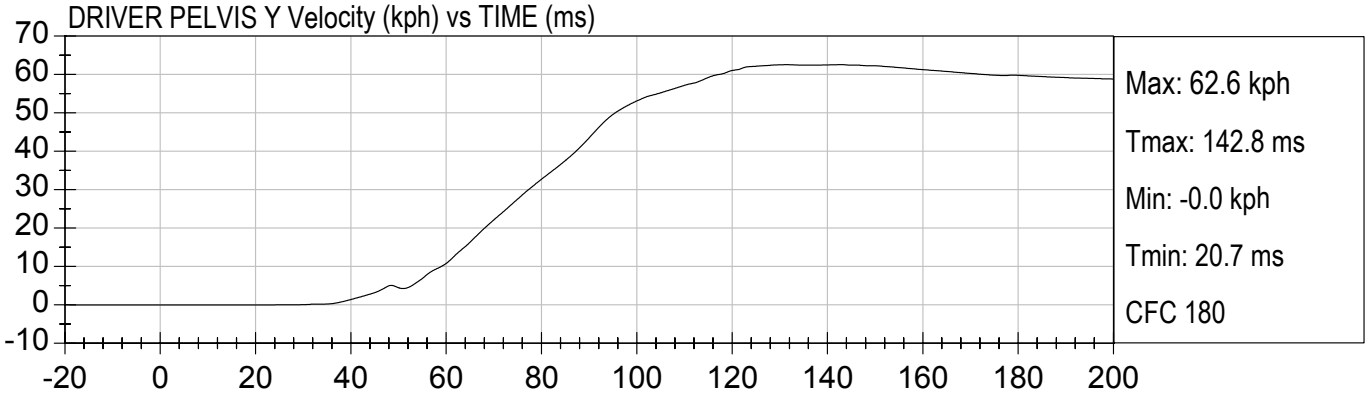

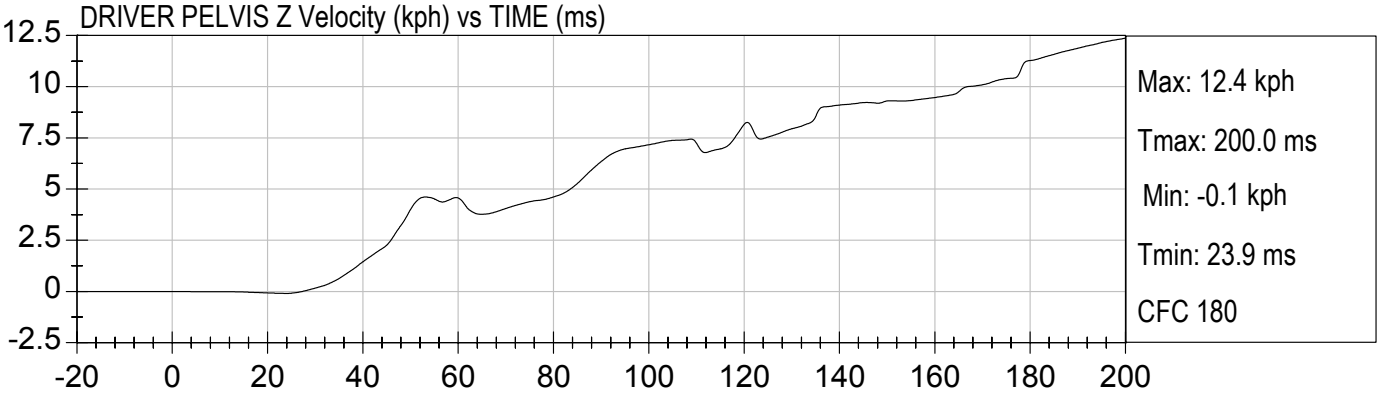

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Test Date: 11/25/03
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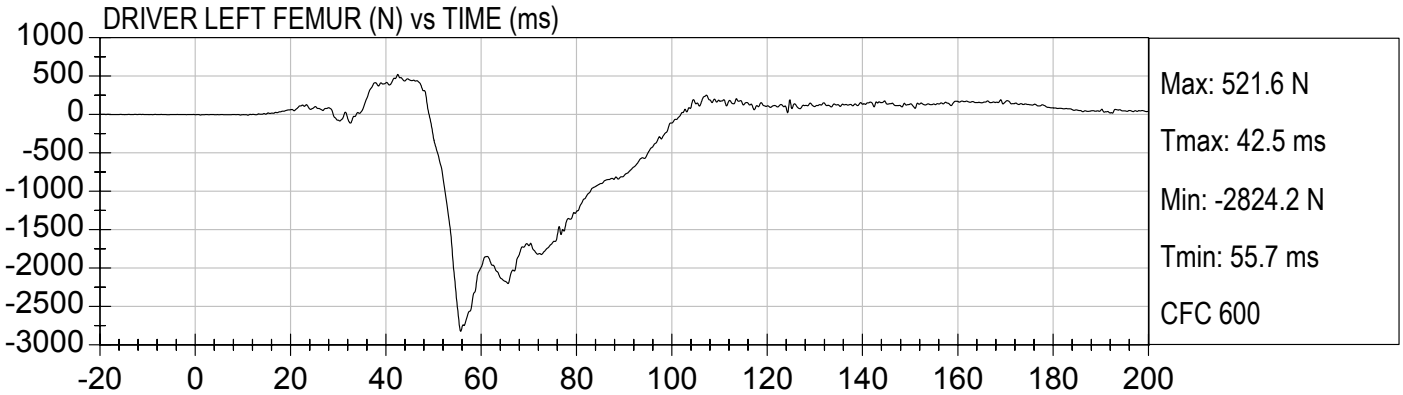
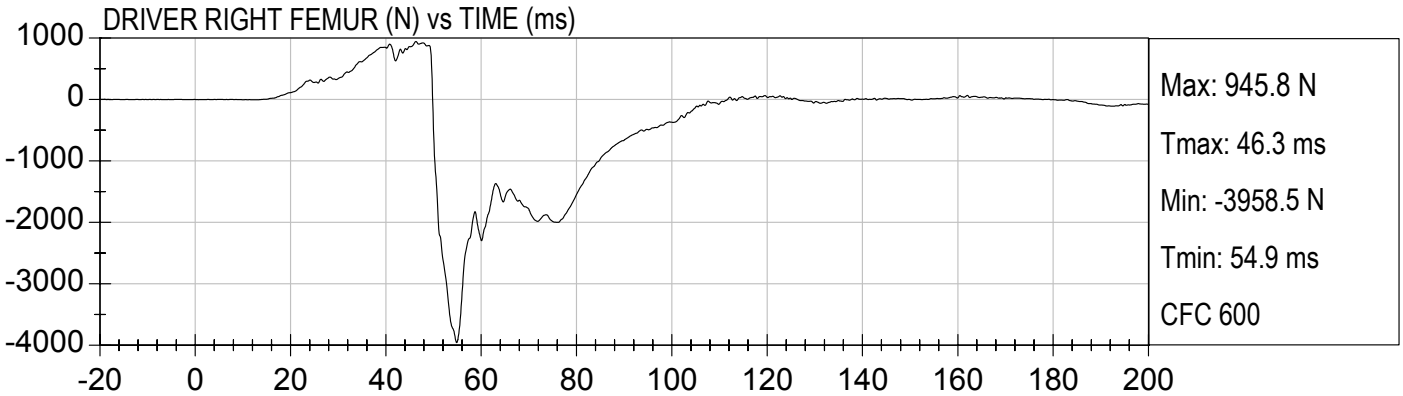
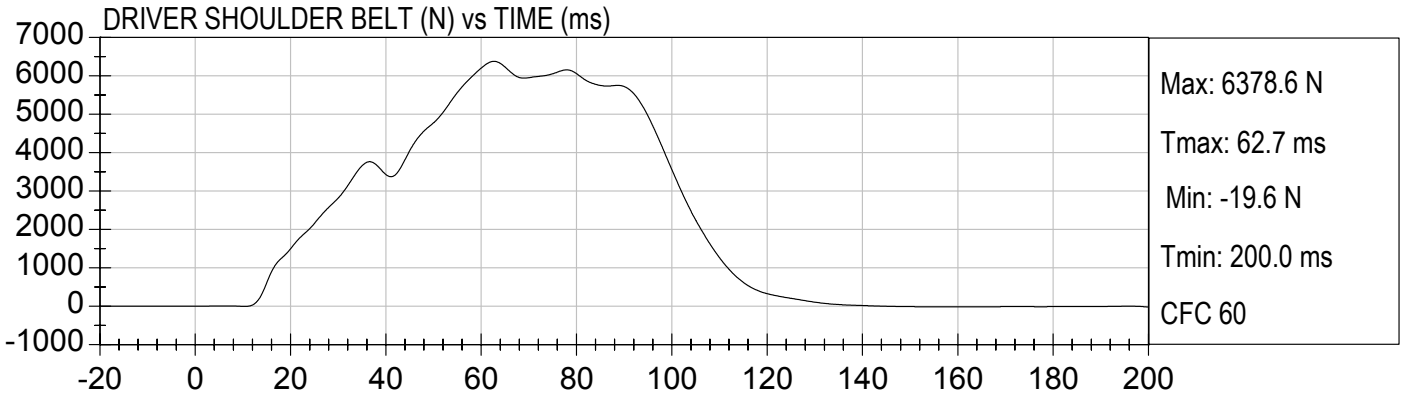
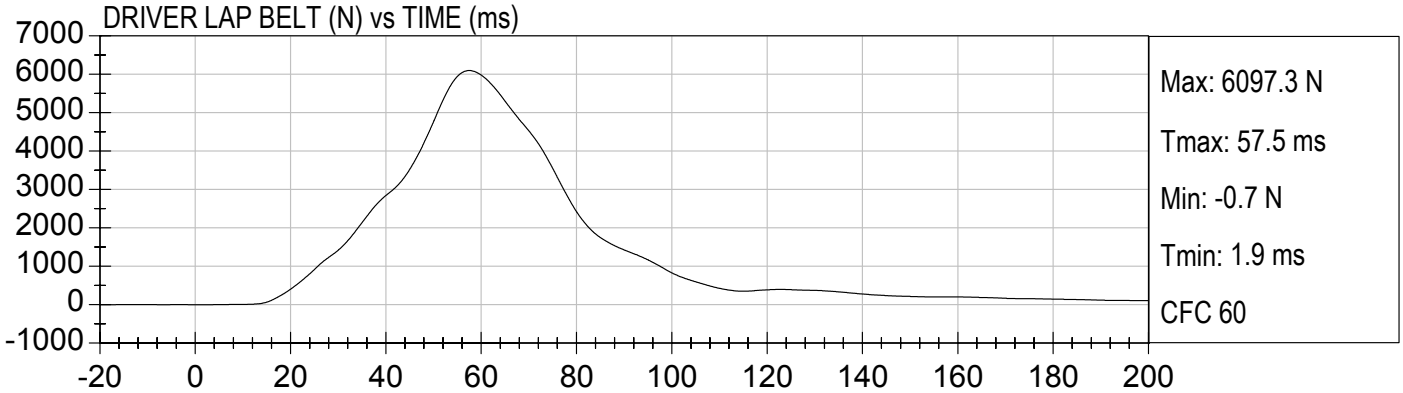


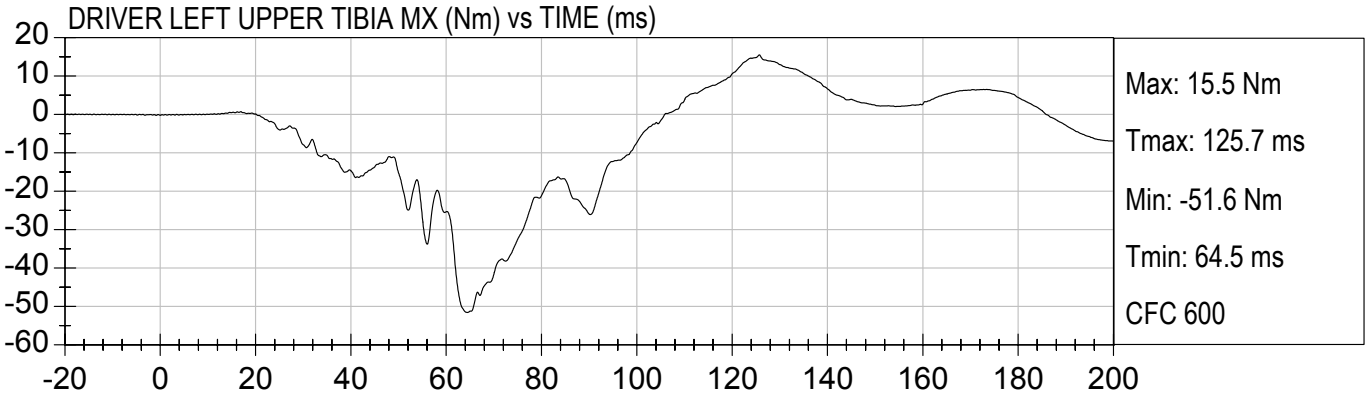


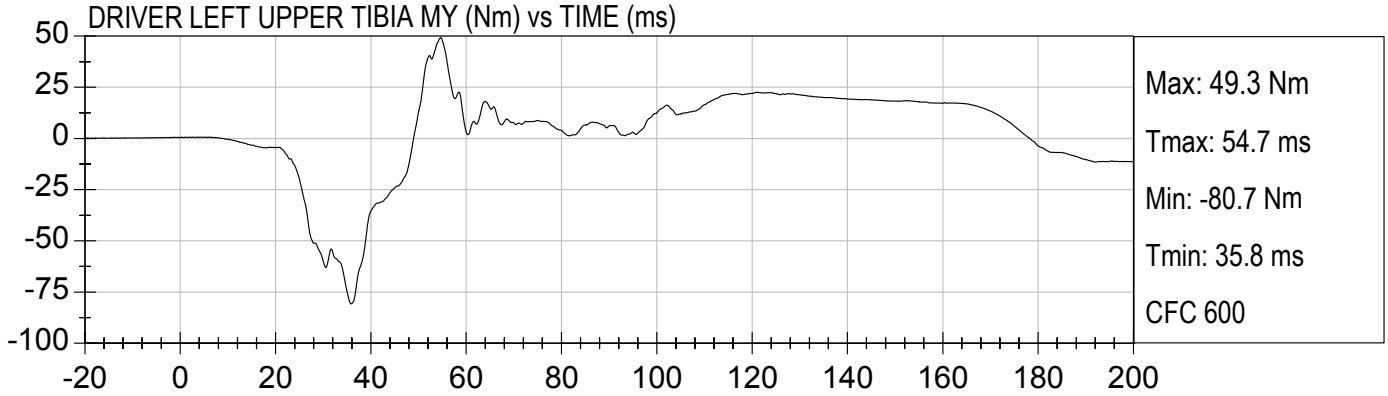


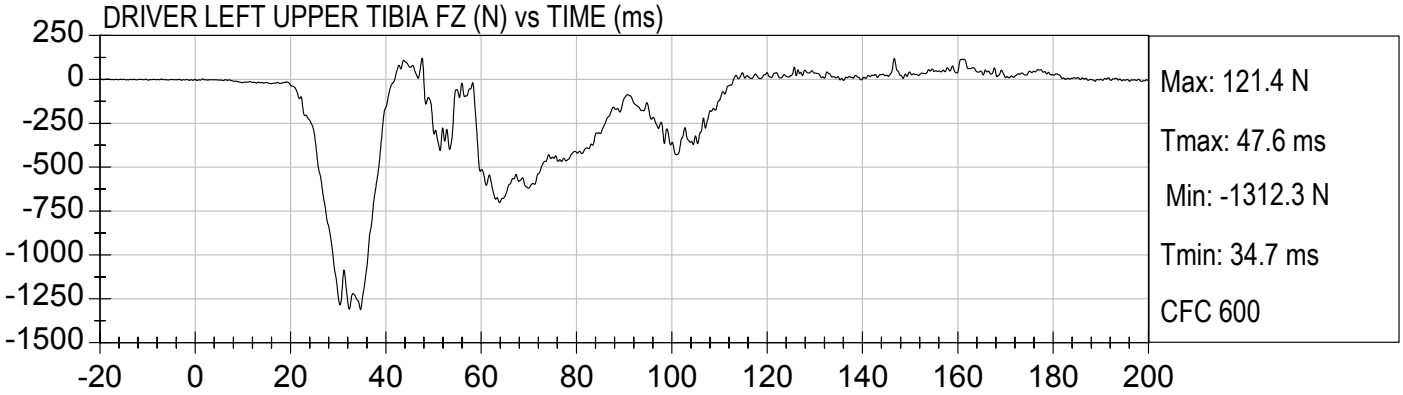


35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)

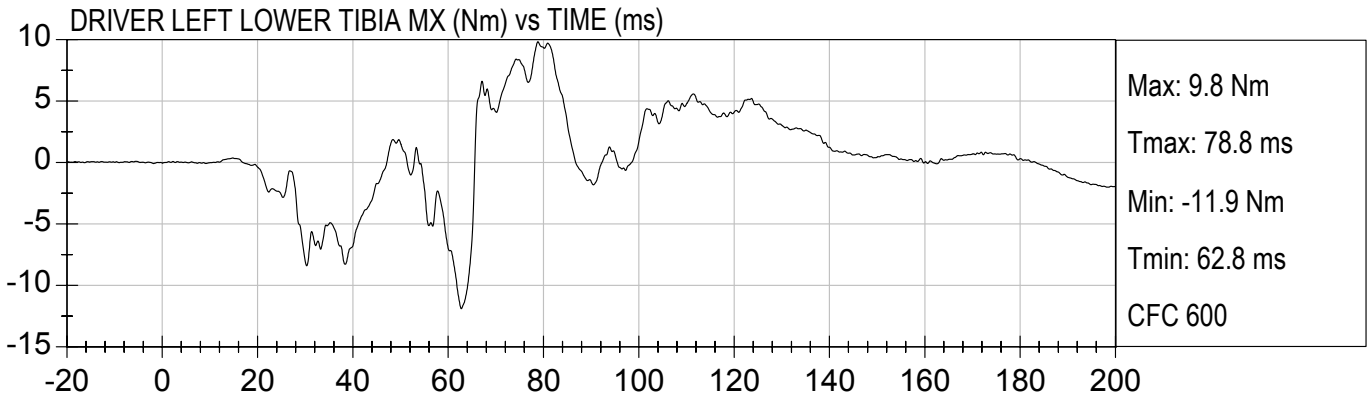


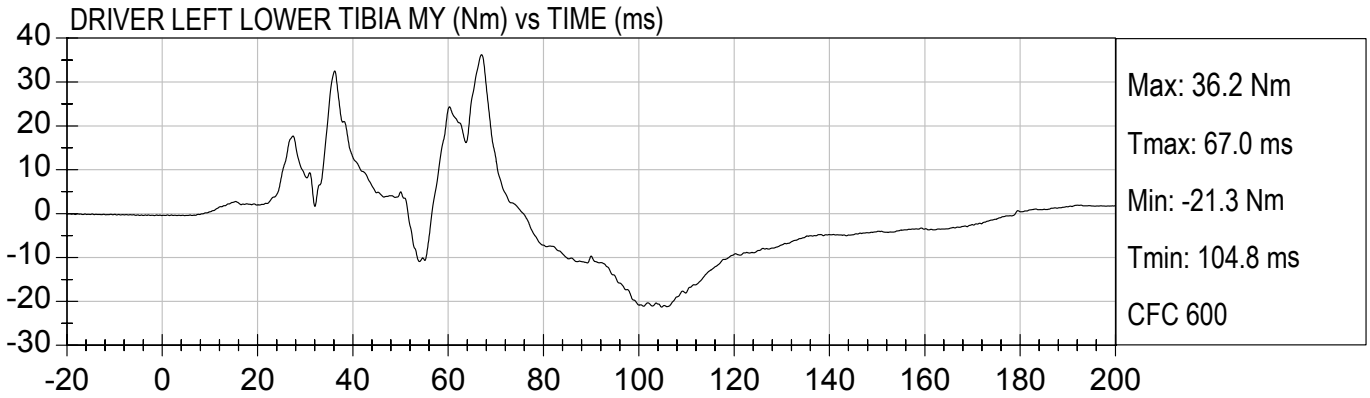


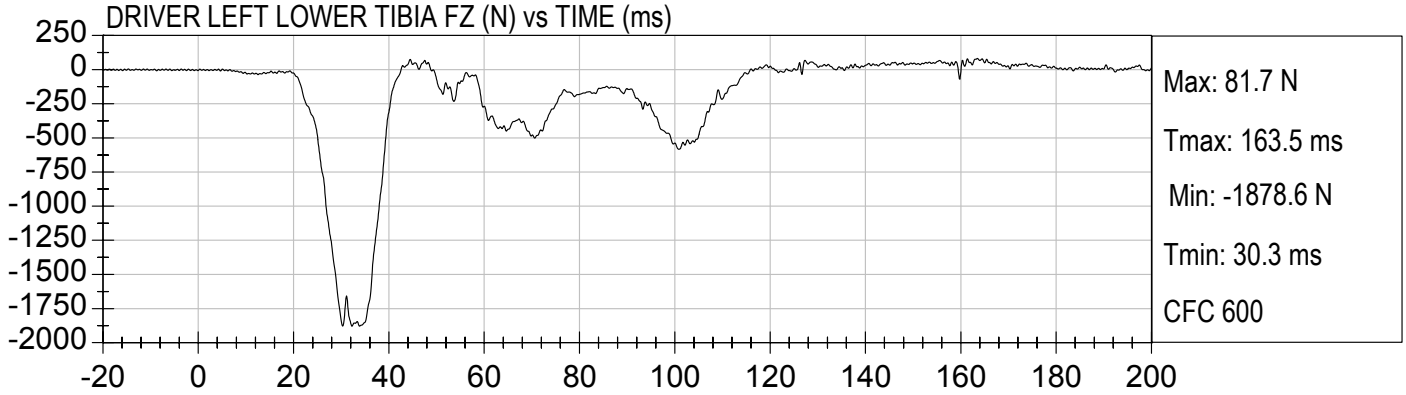


35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)







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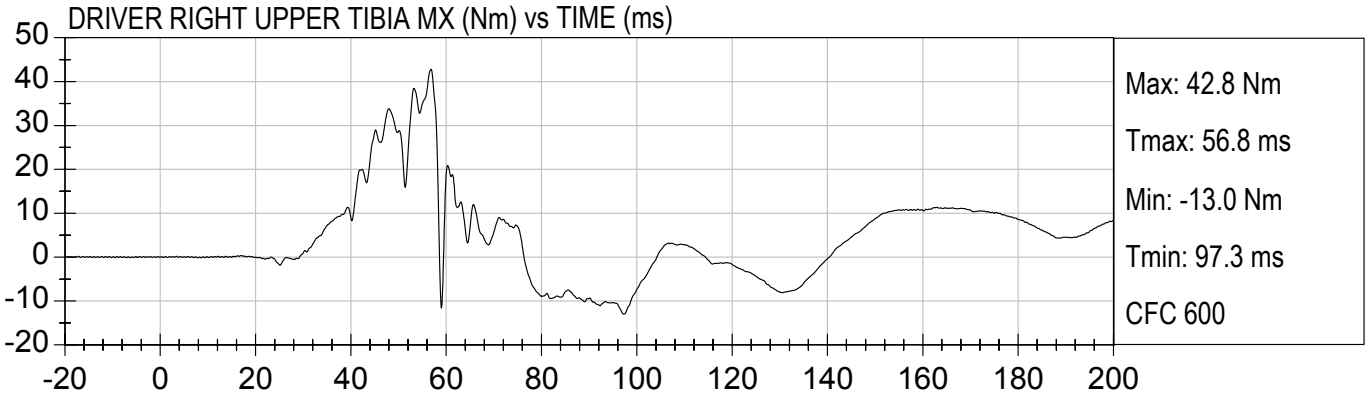

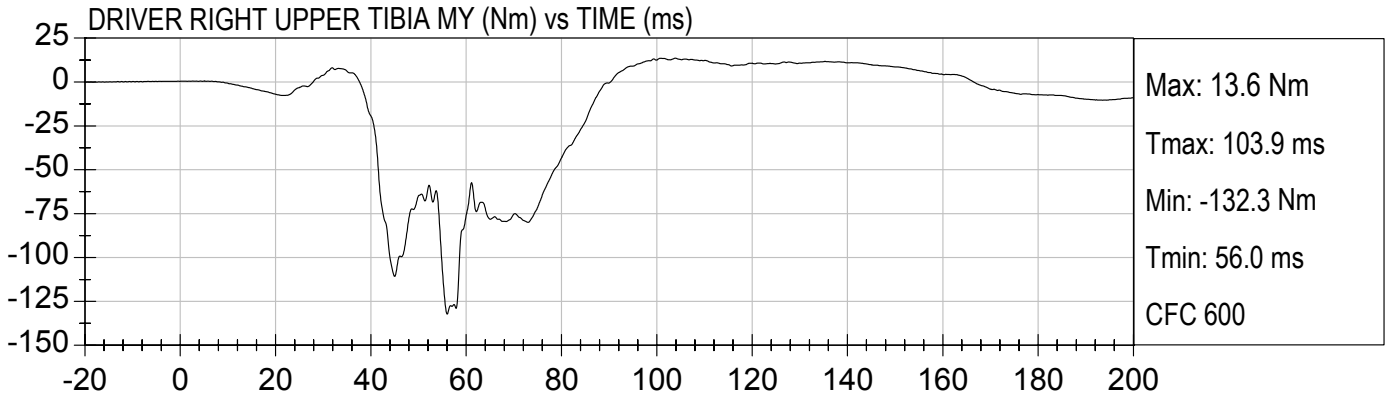

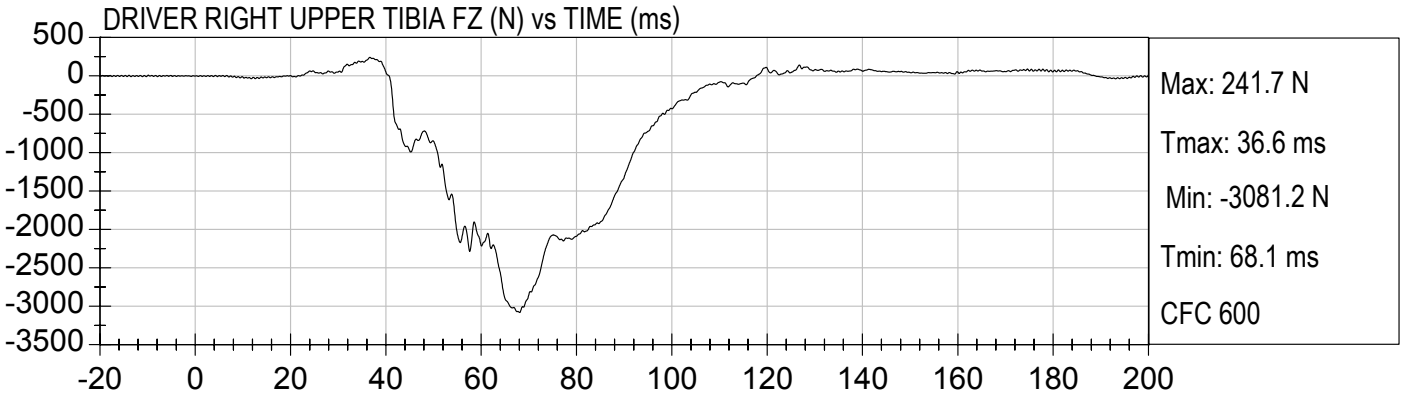

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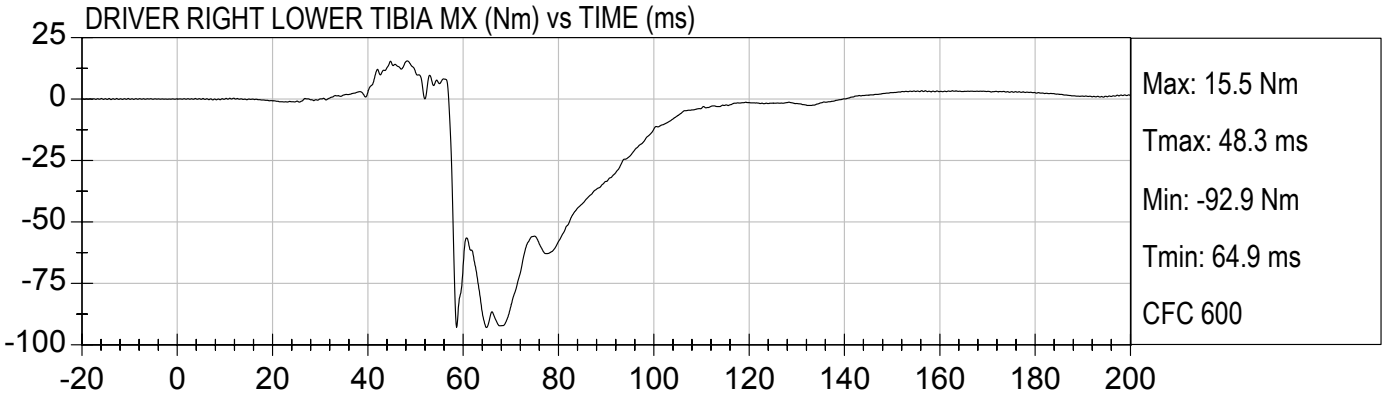

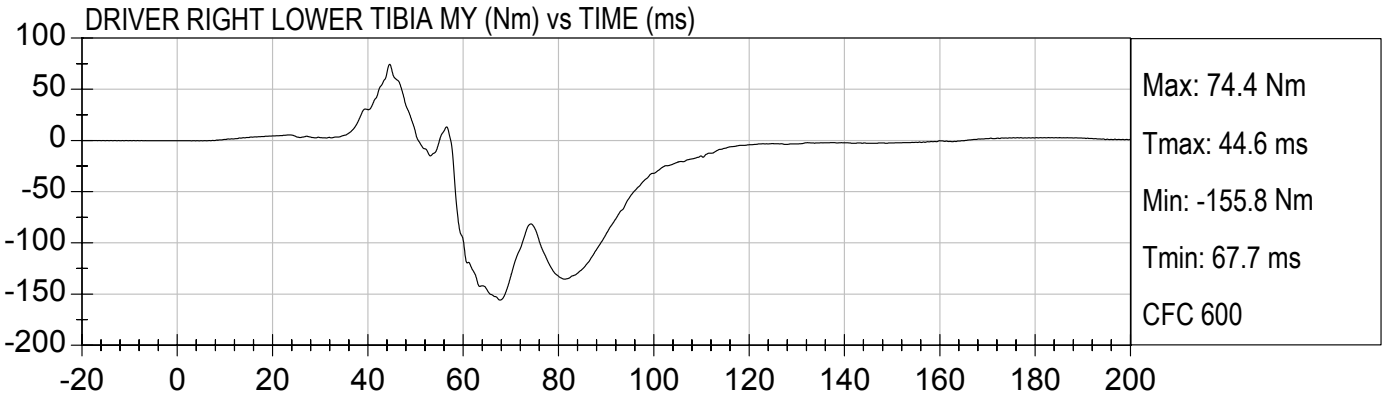

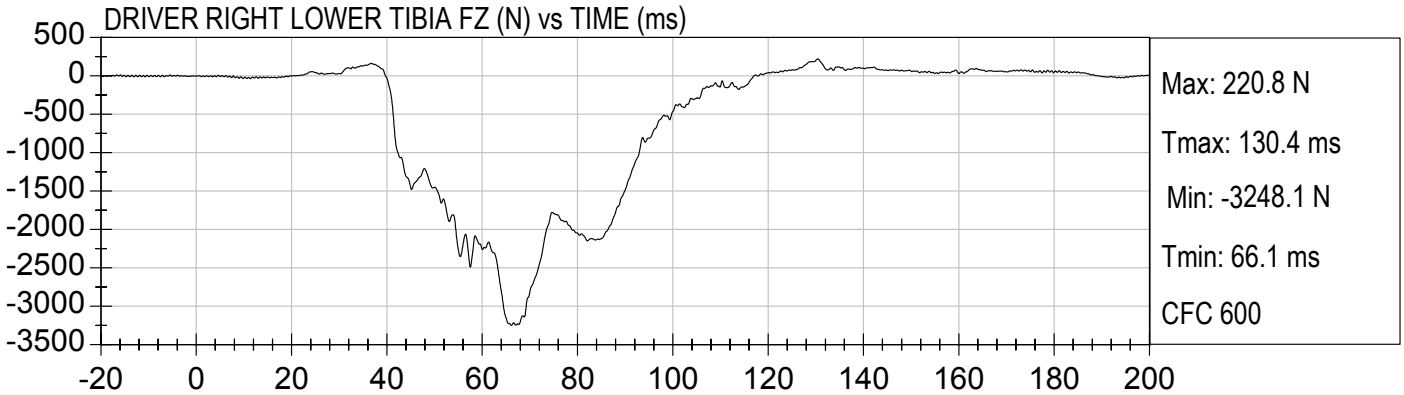

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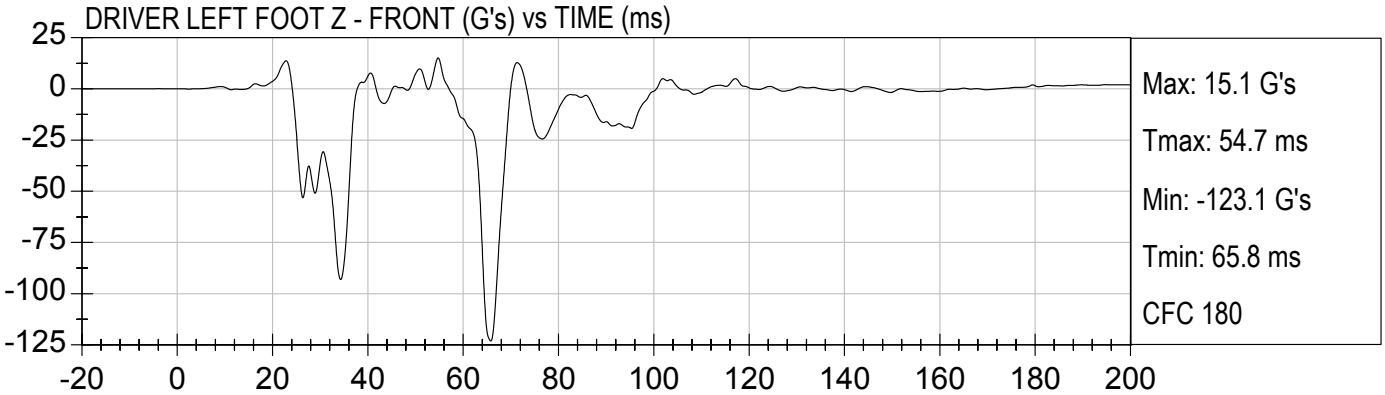

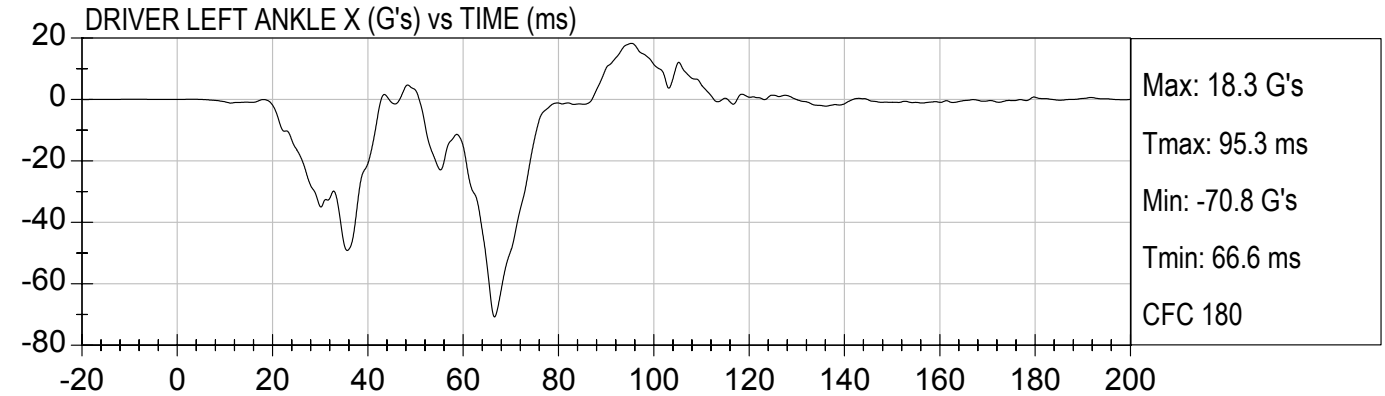

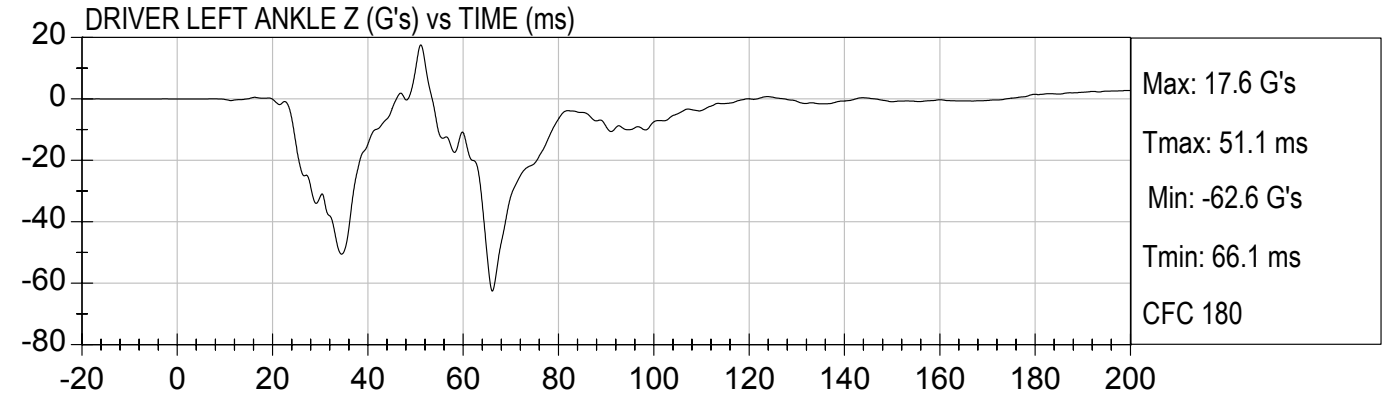

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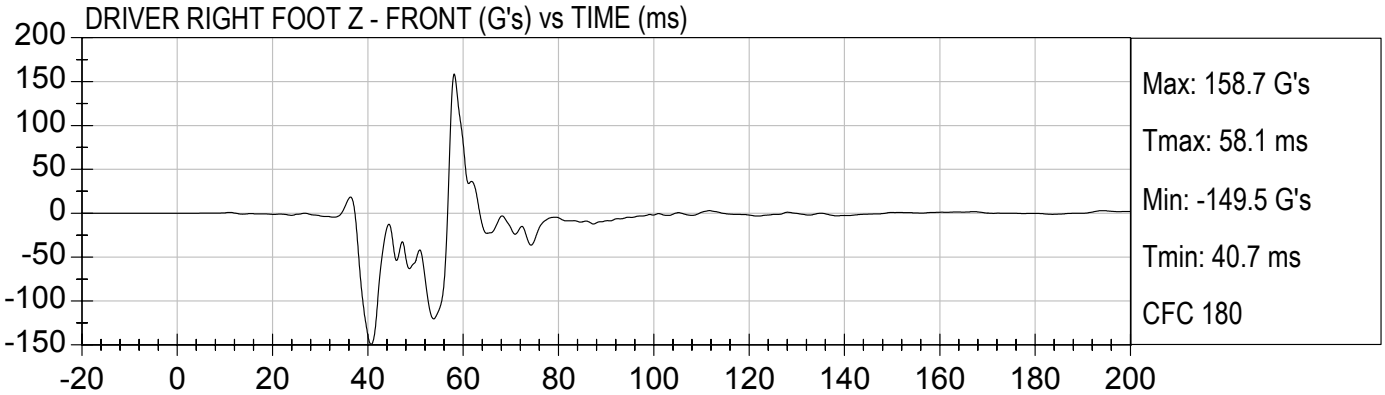

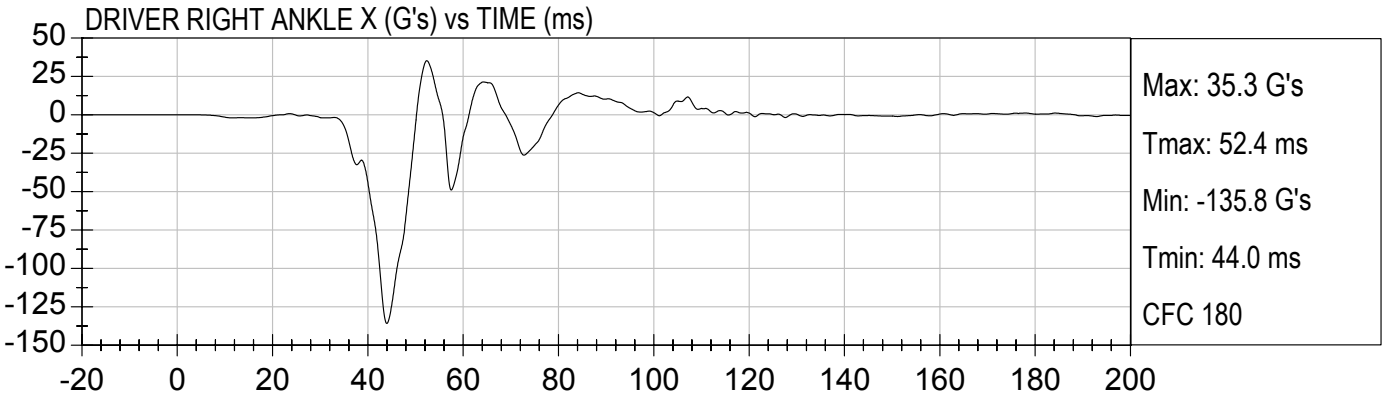

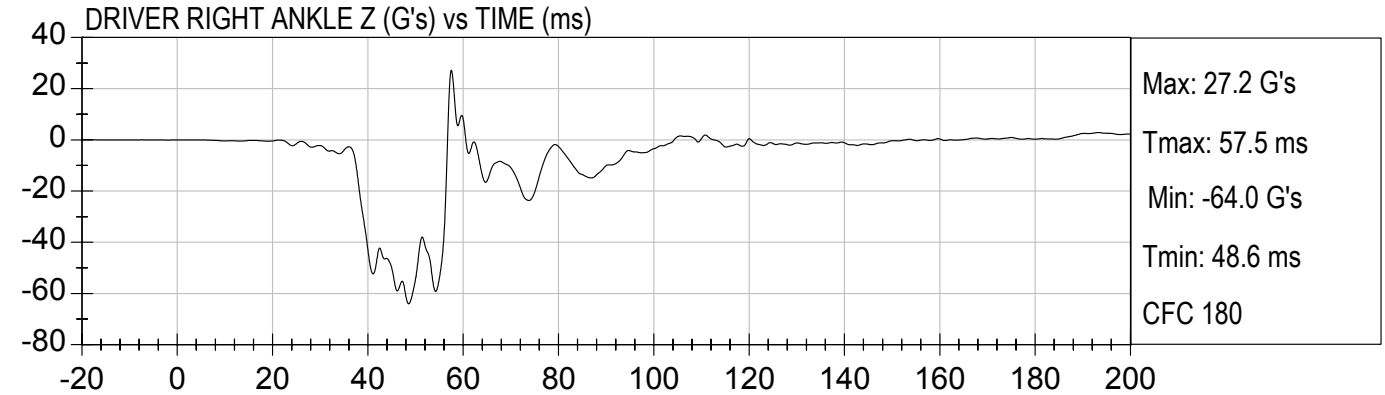

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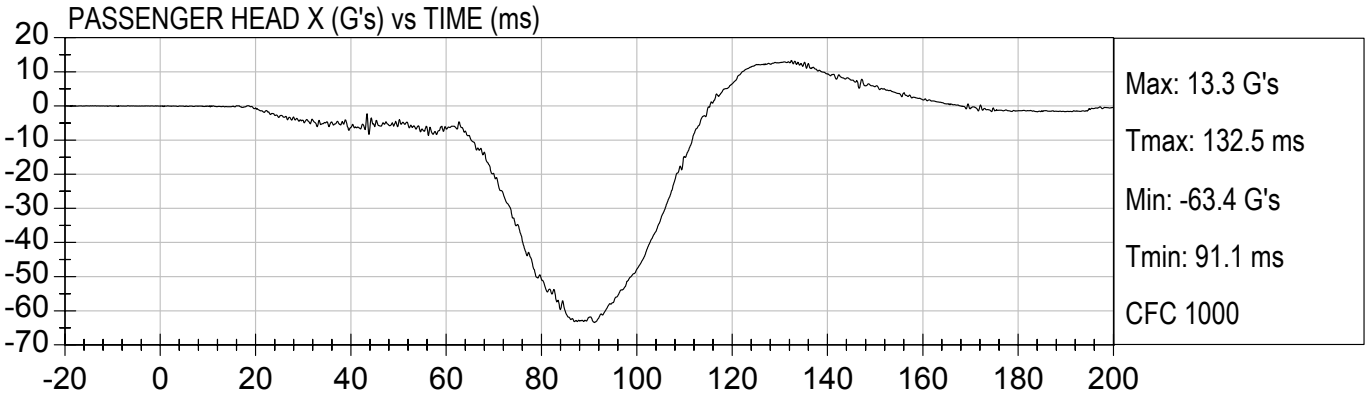

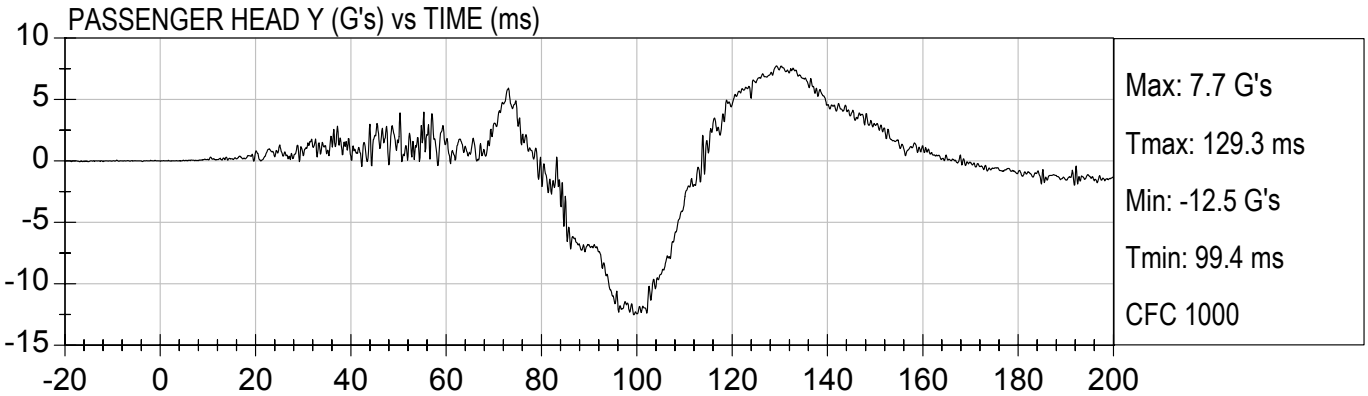

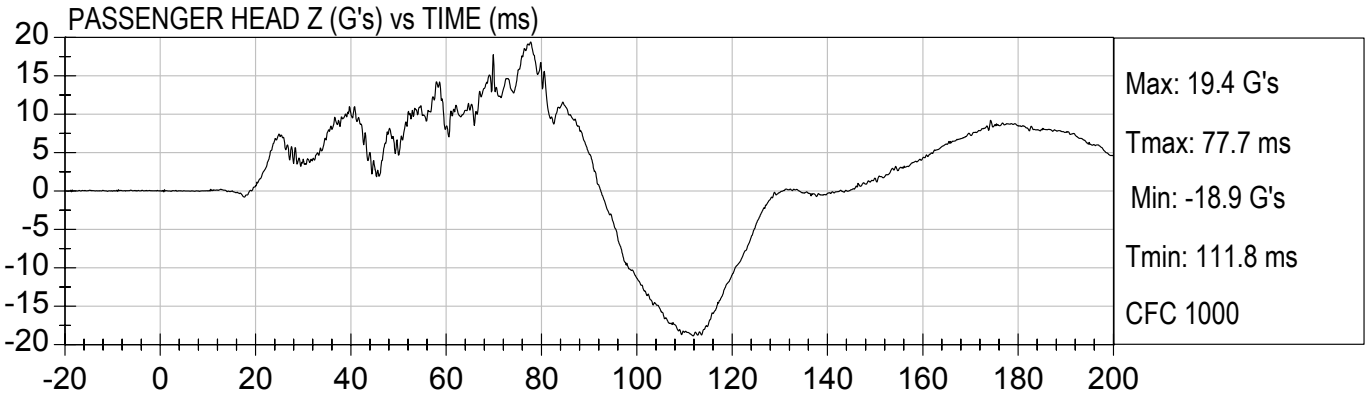

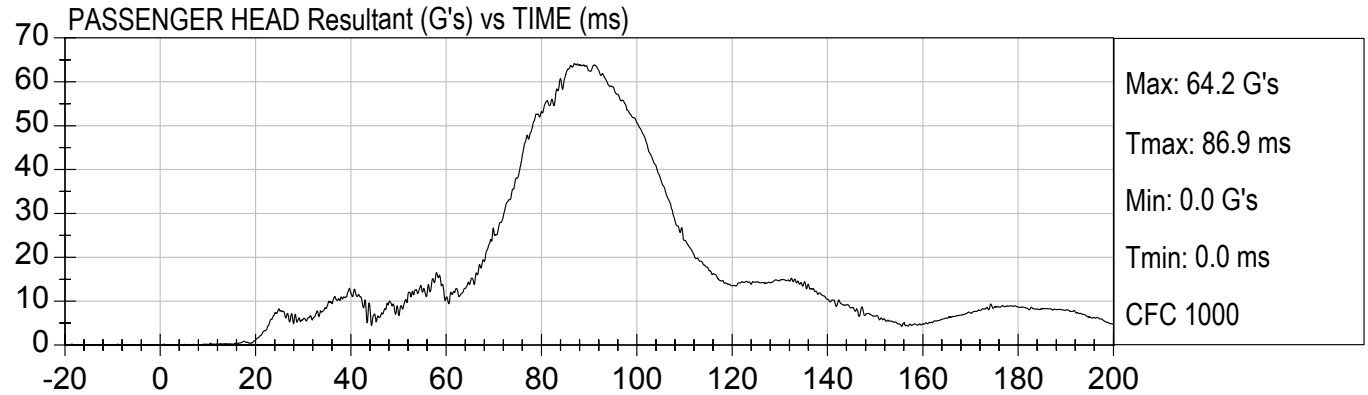

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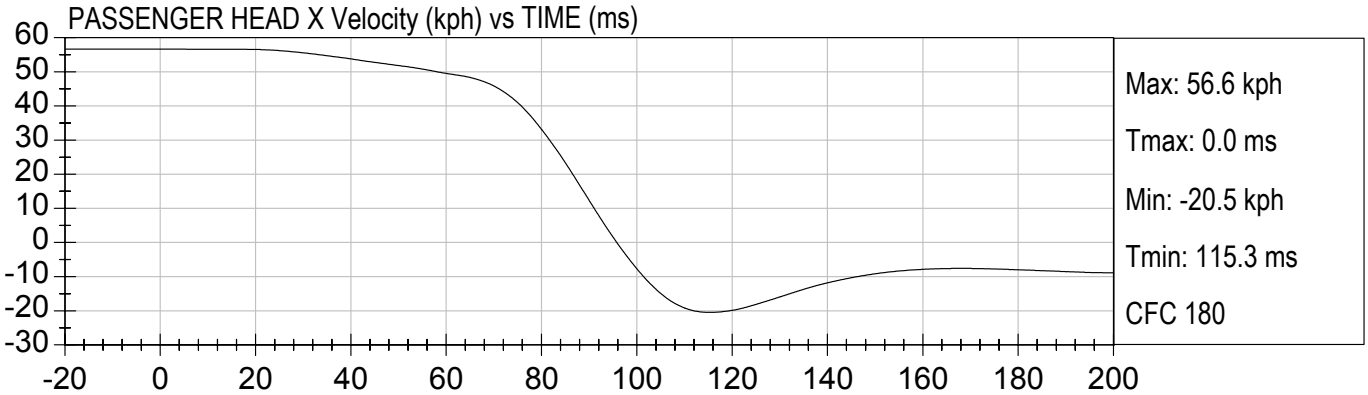

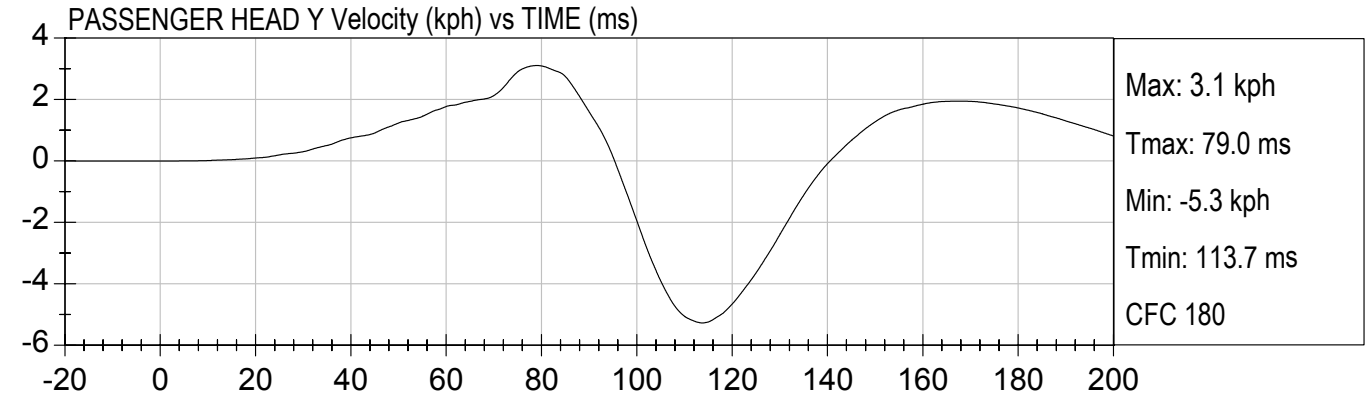

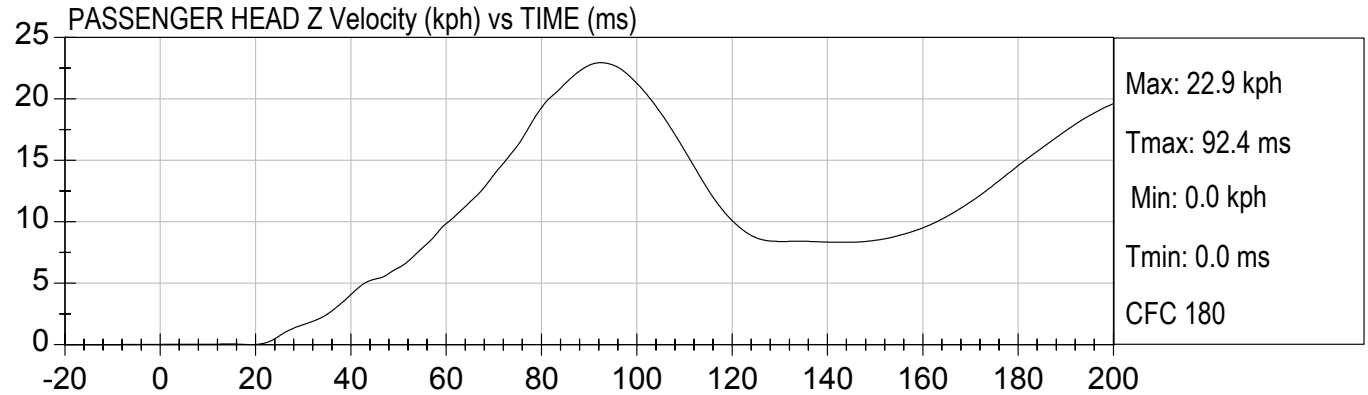

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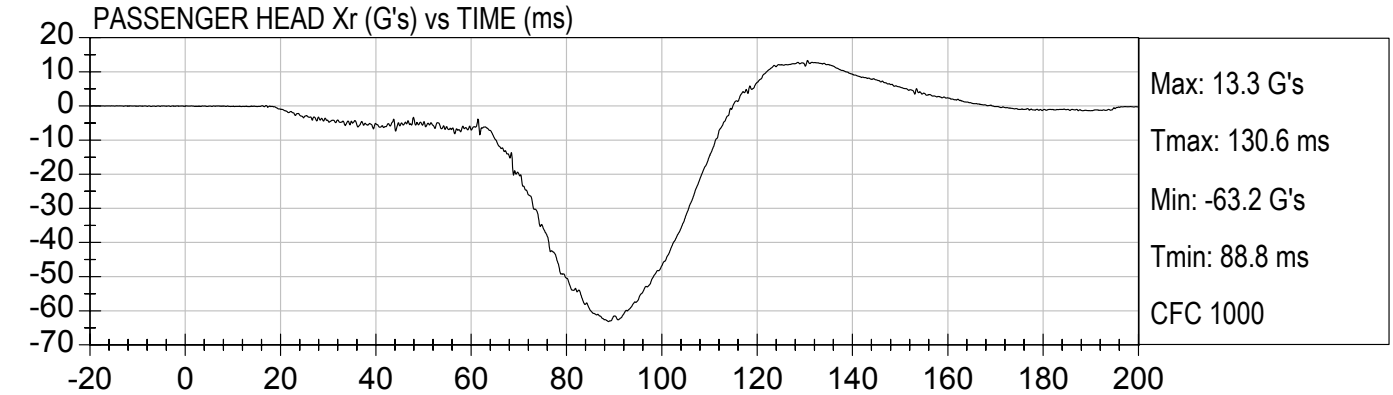

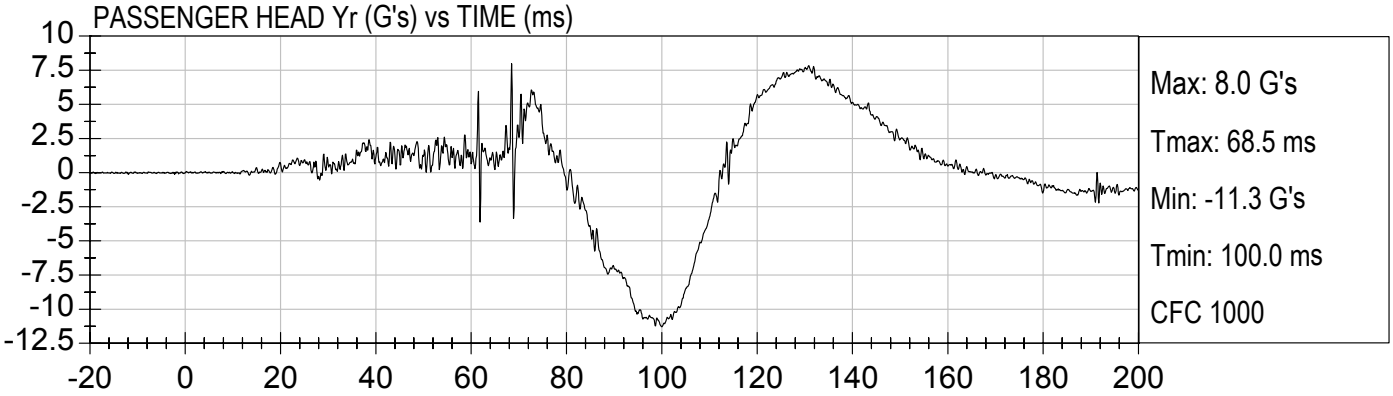

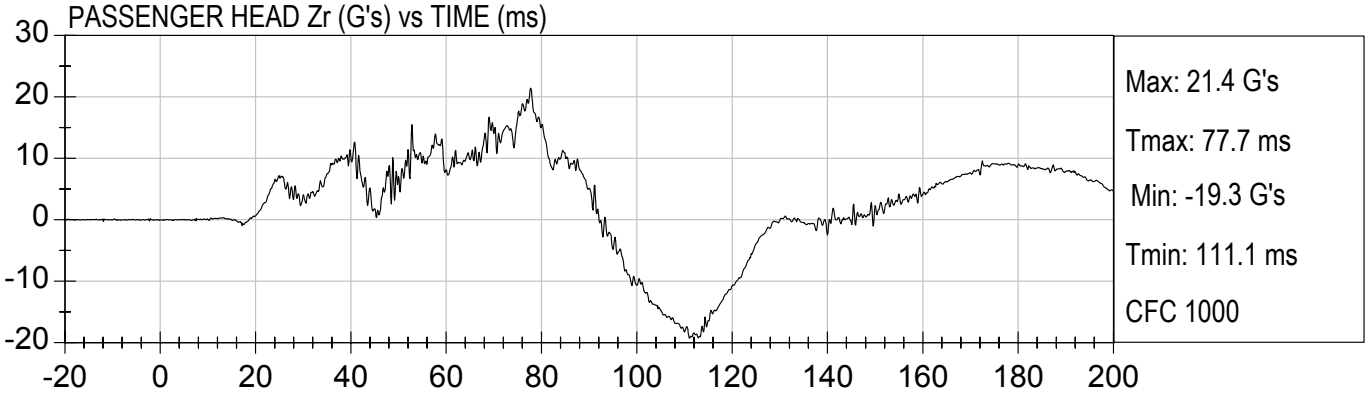

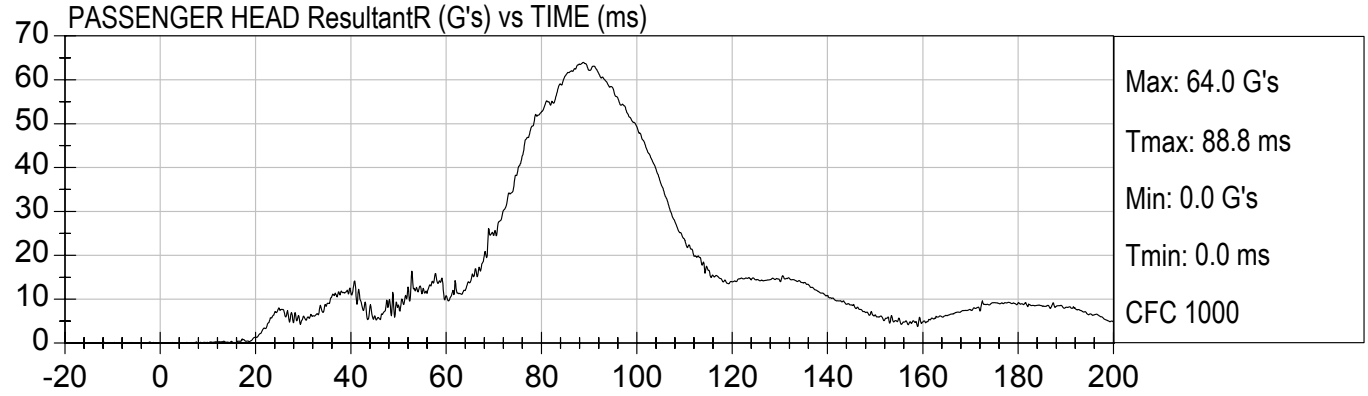

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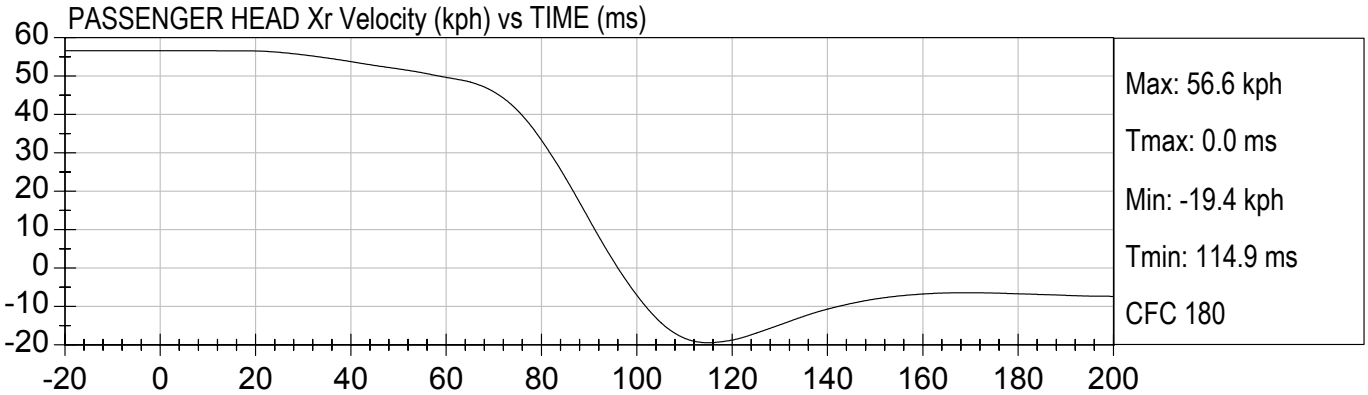

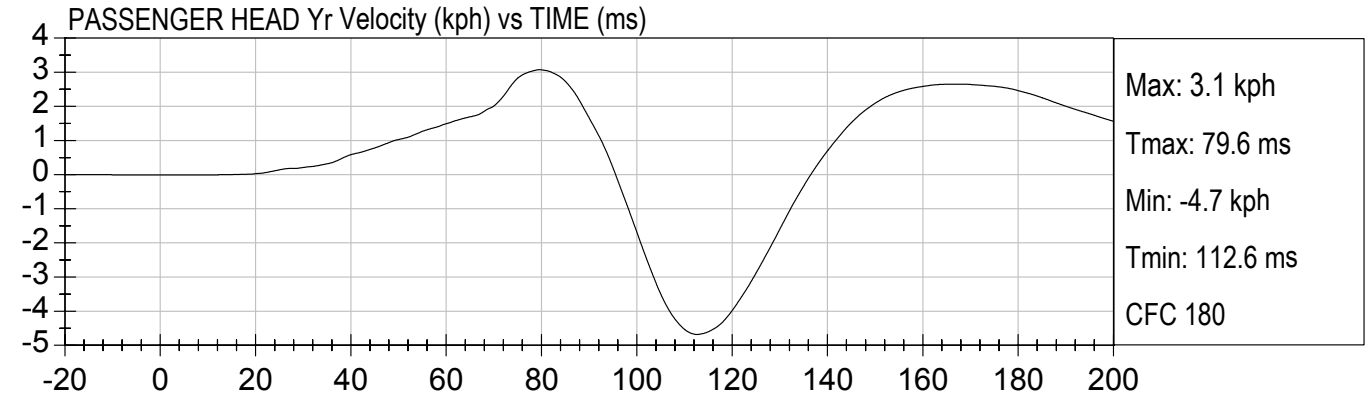

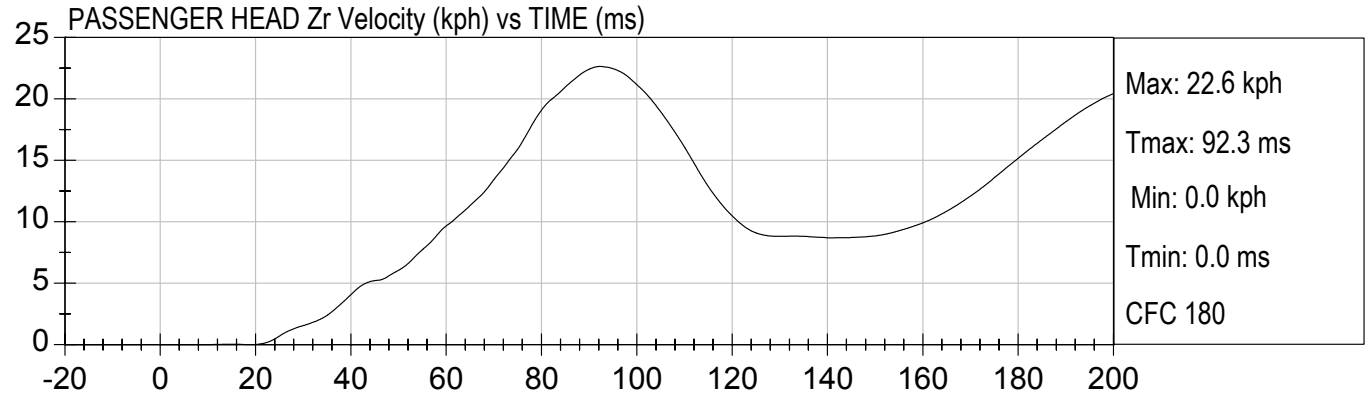

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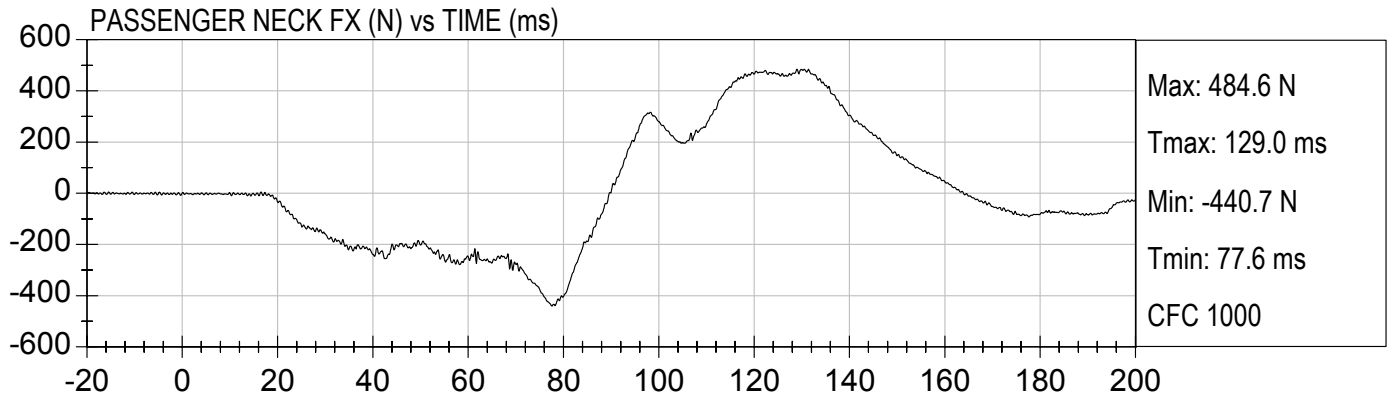

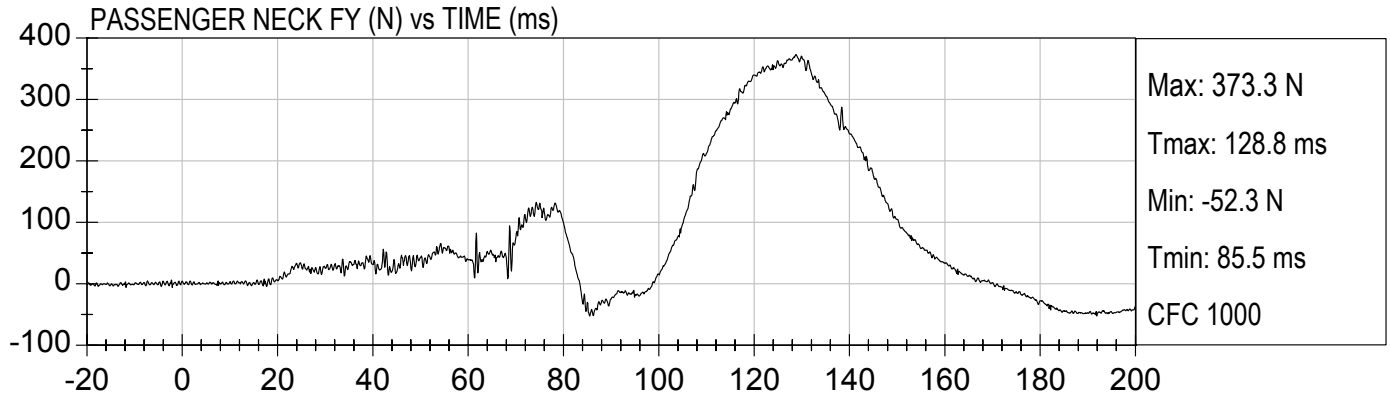

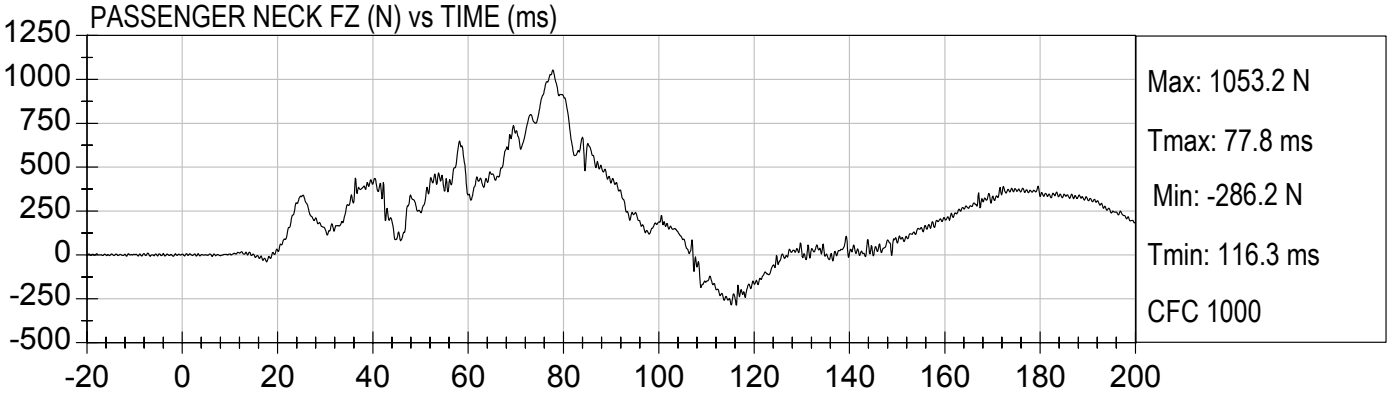

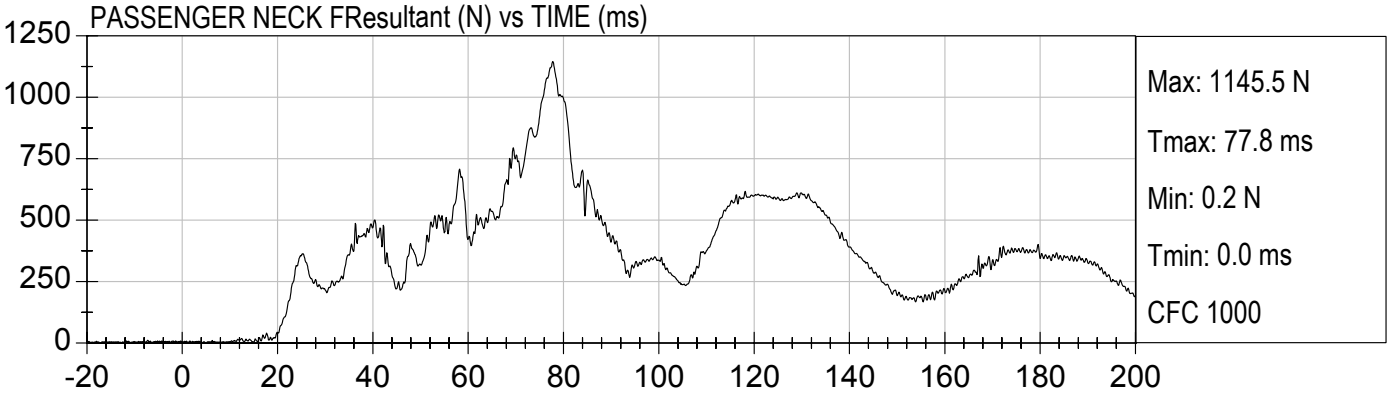

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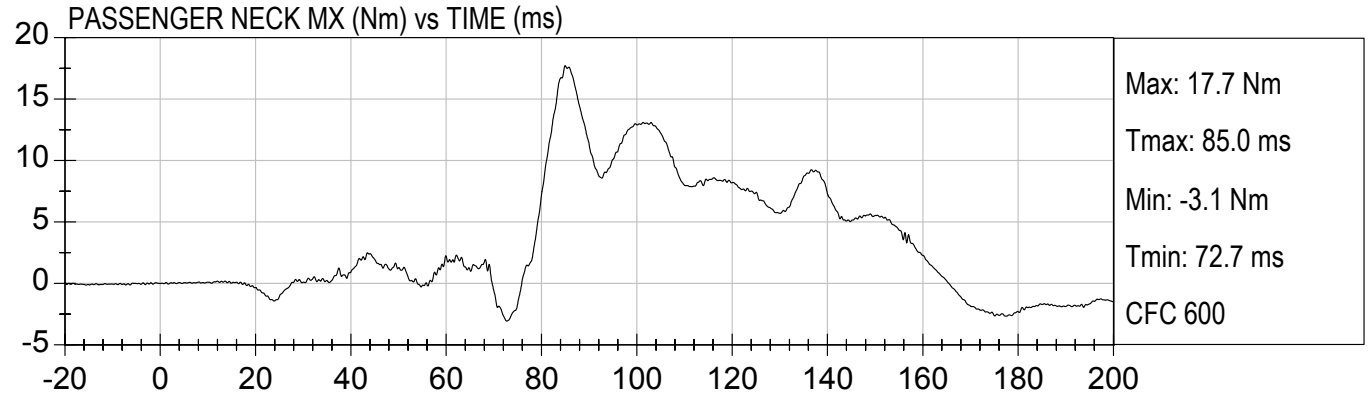

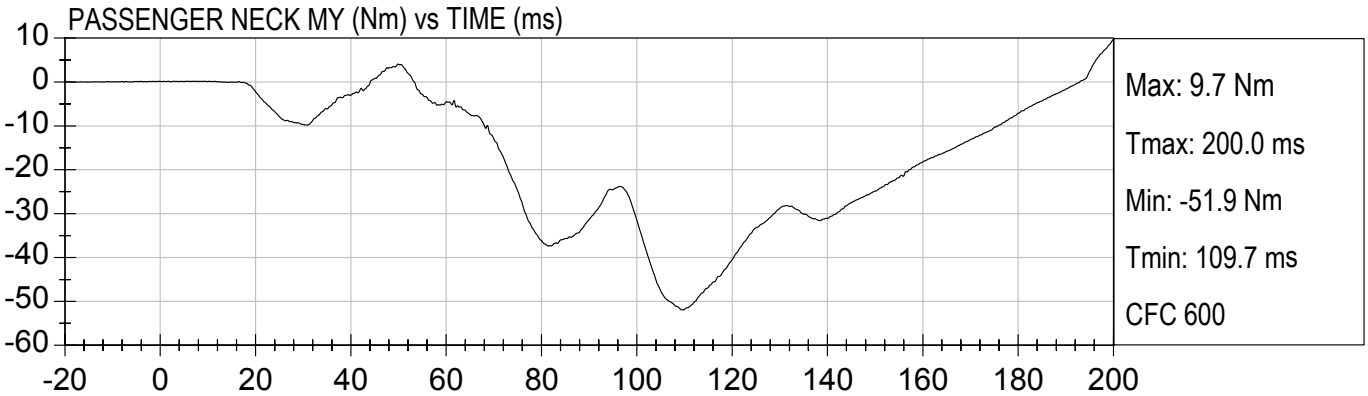

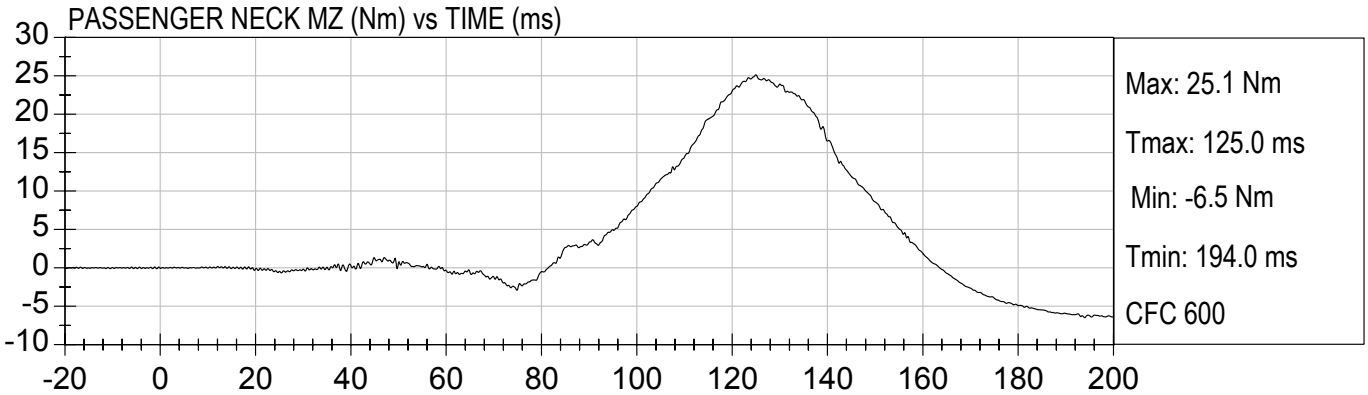

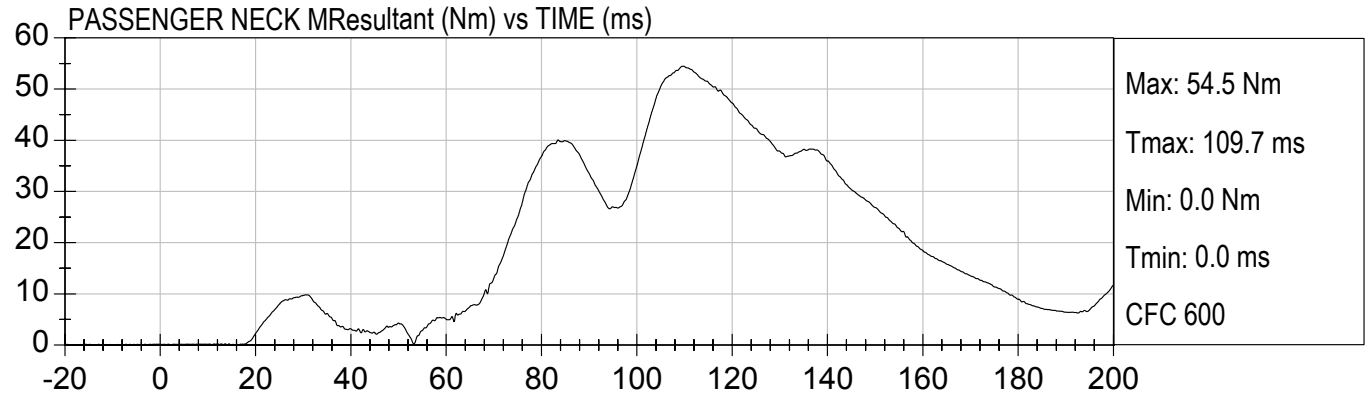

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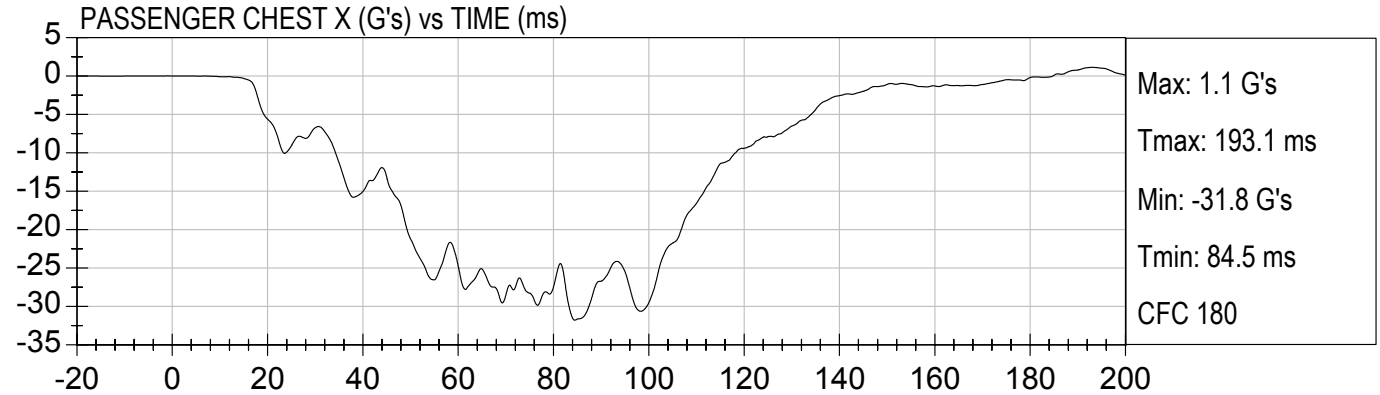

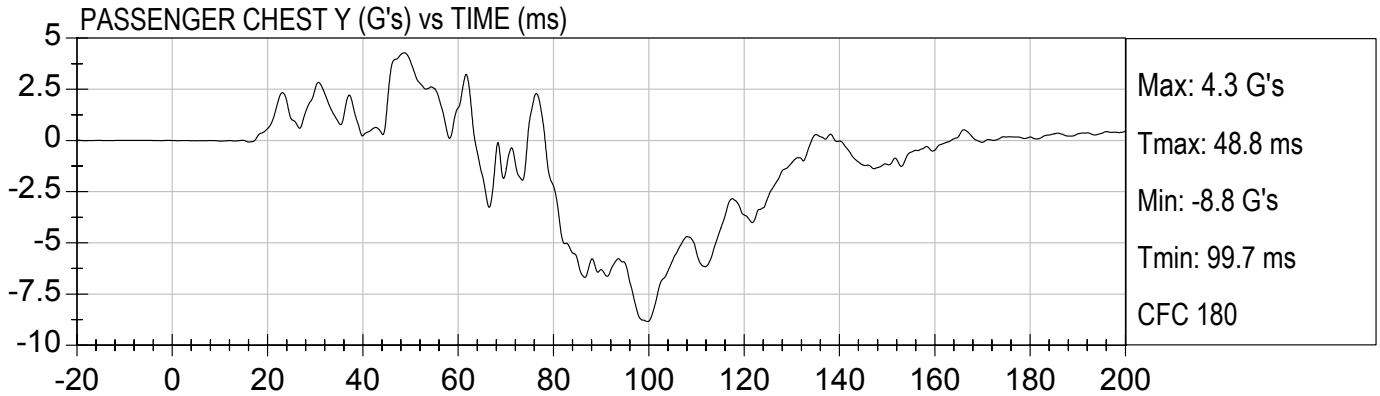

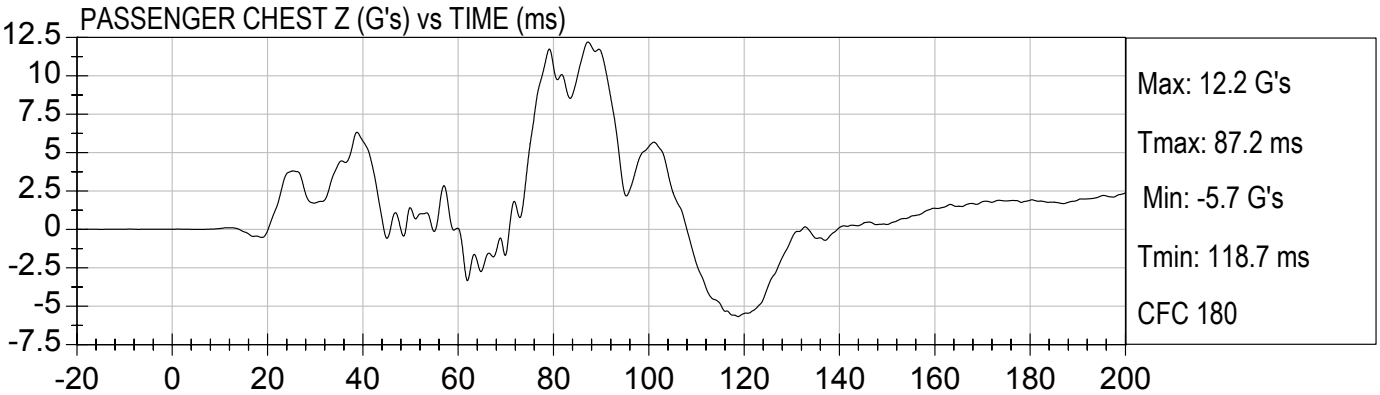

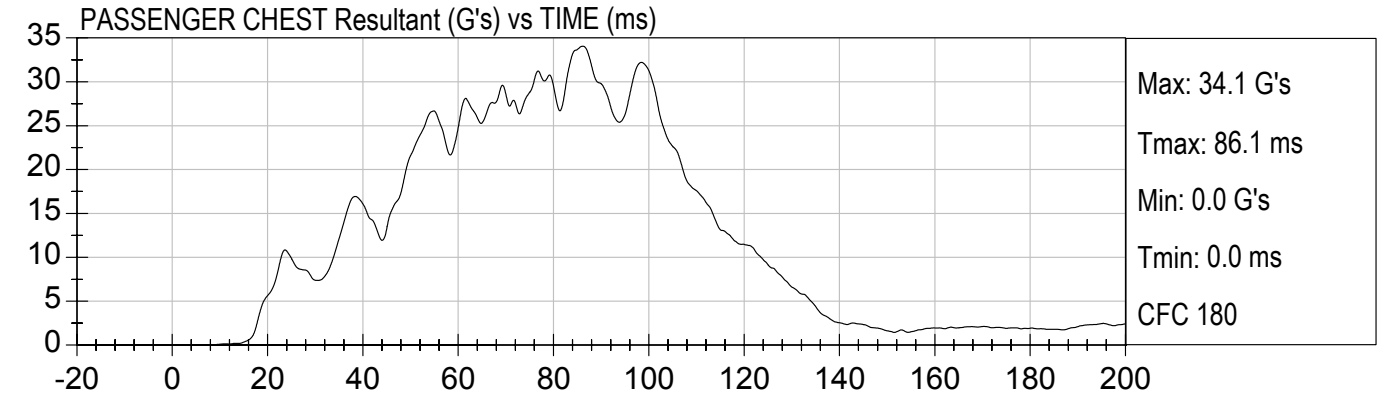

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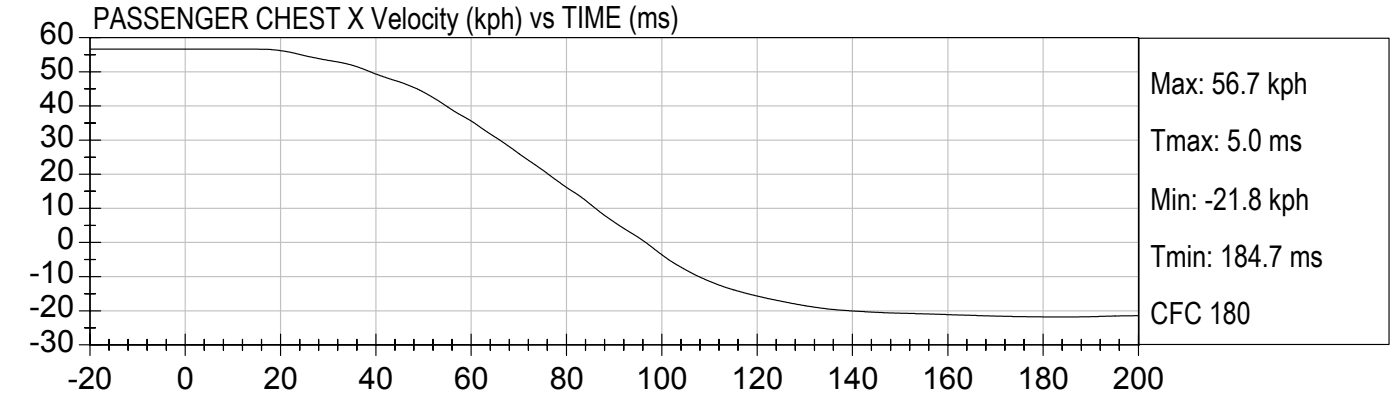

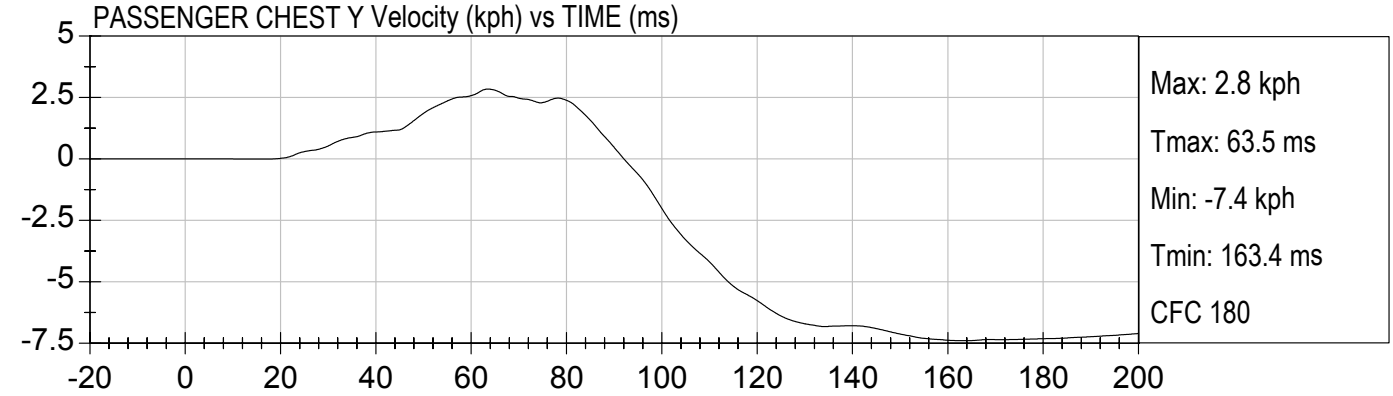

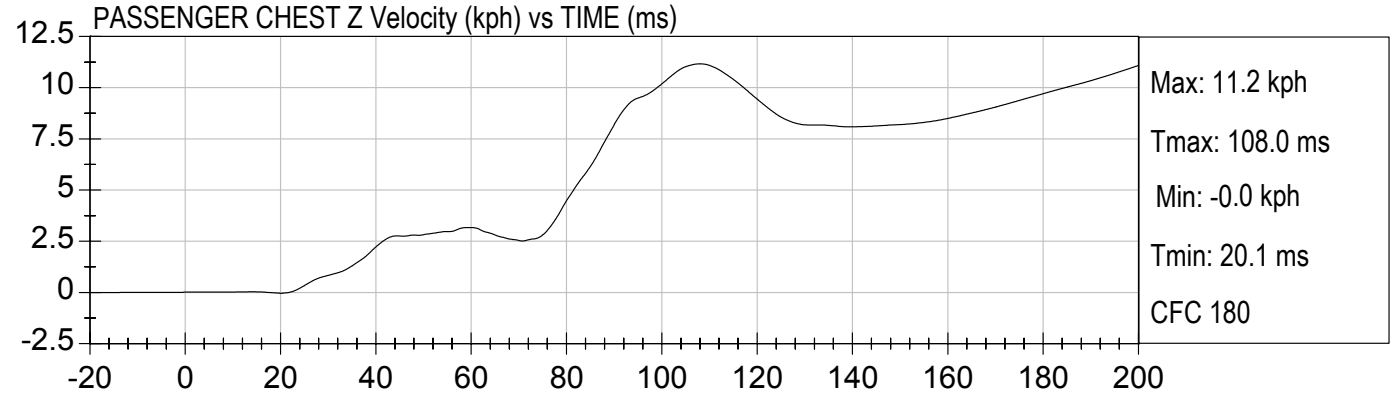

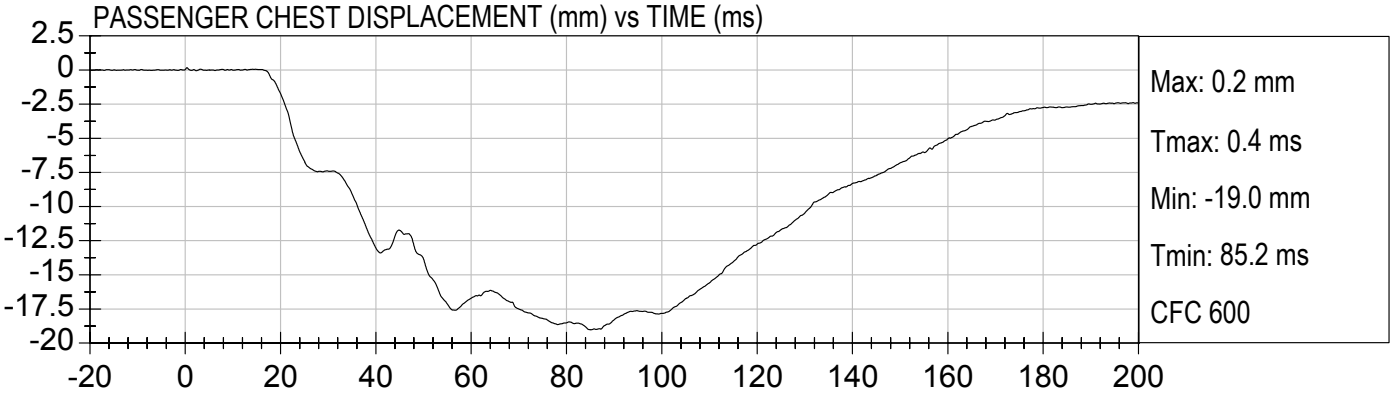

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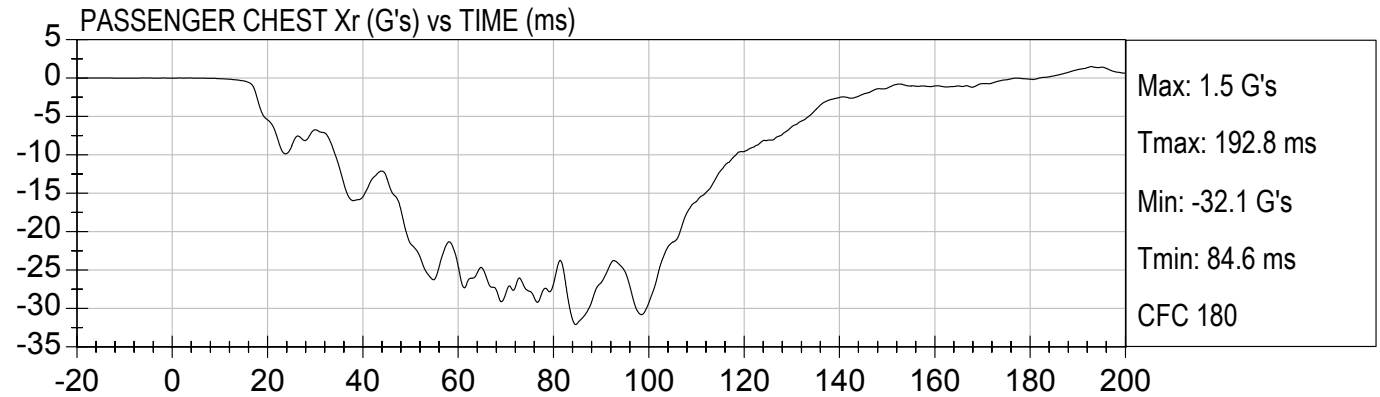

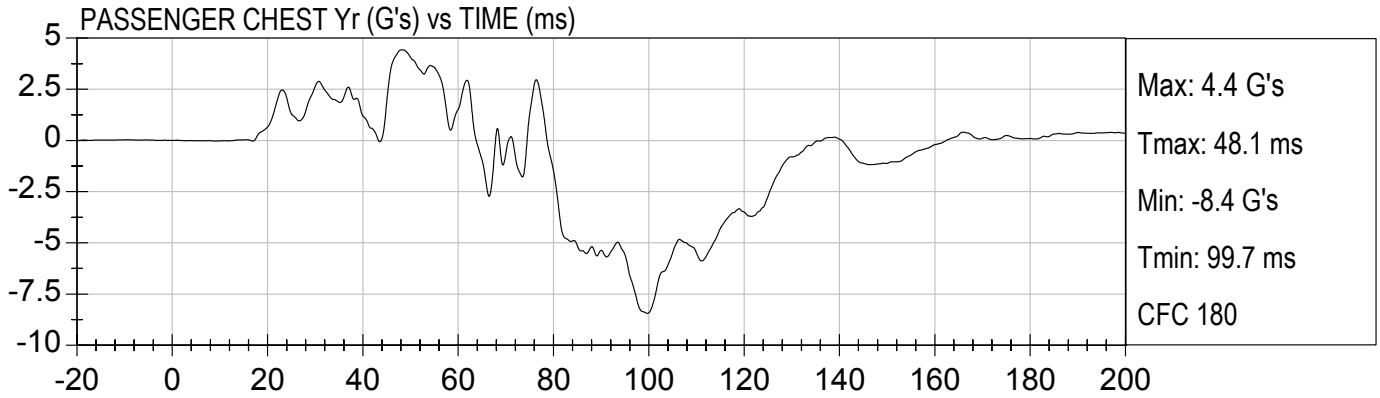

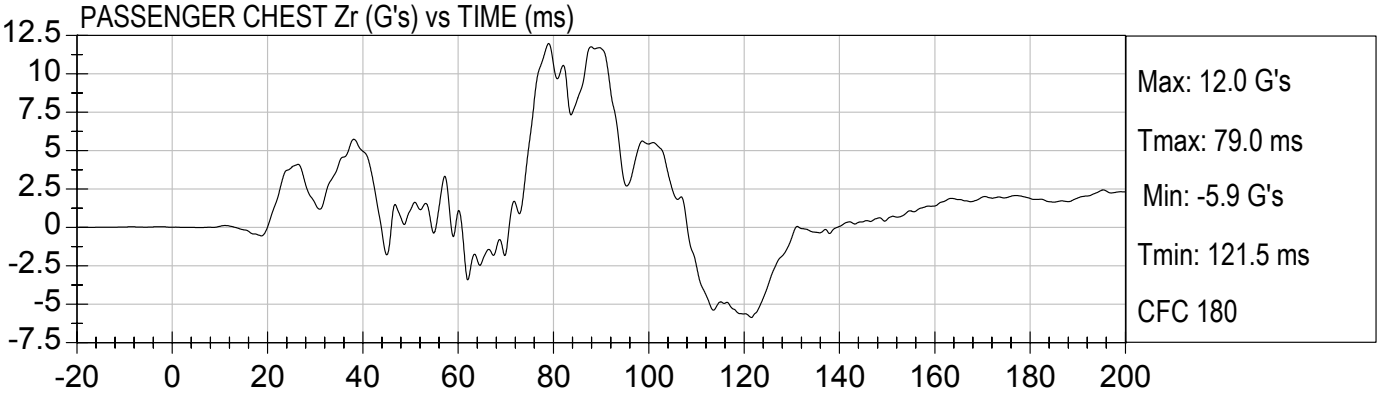

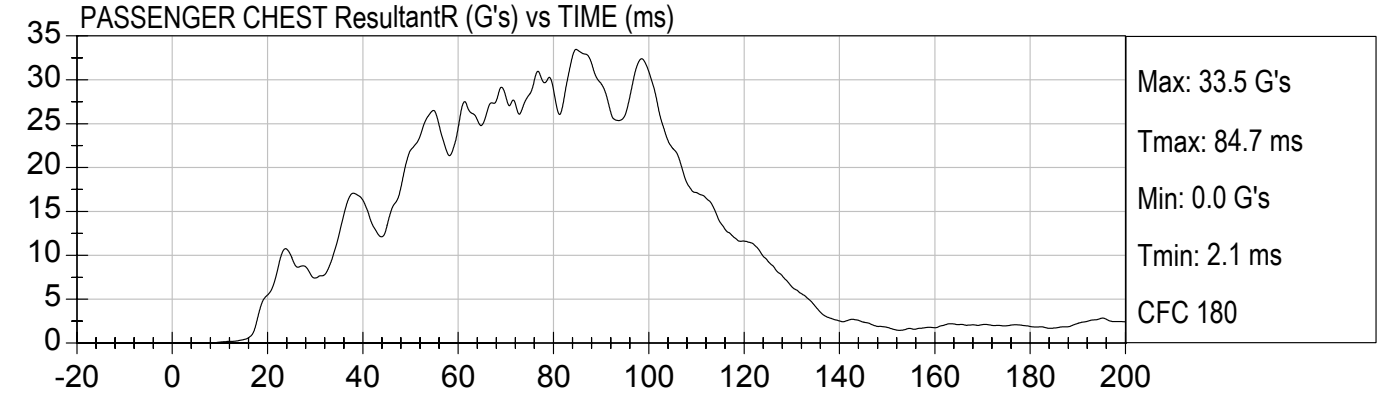

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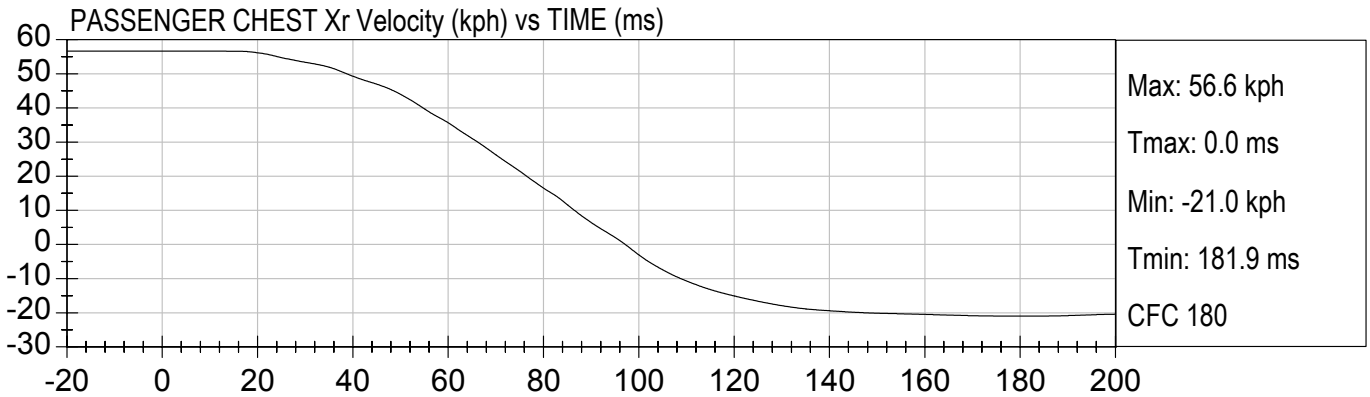
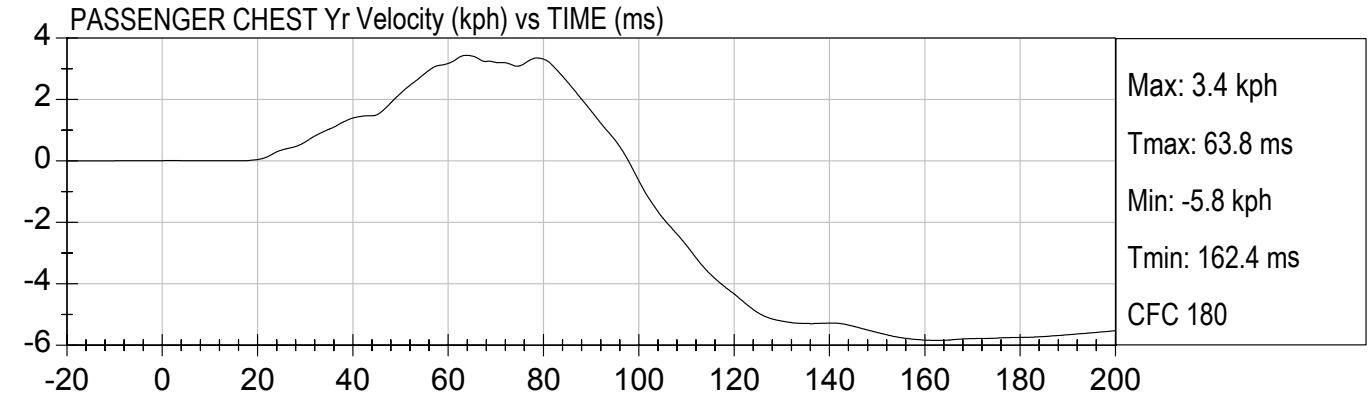
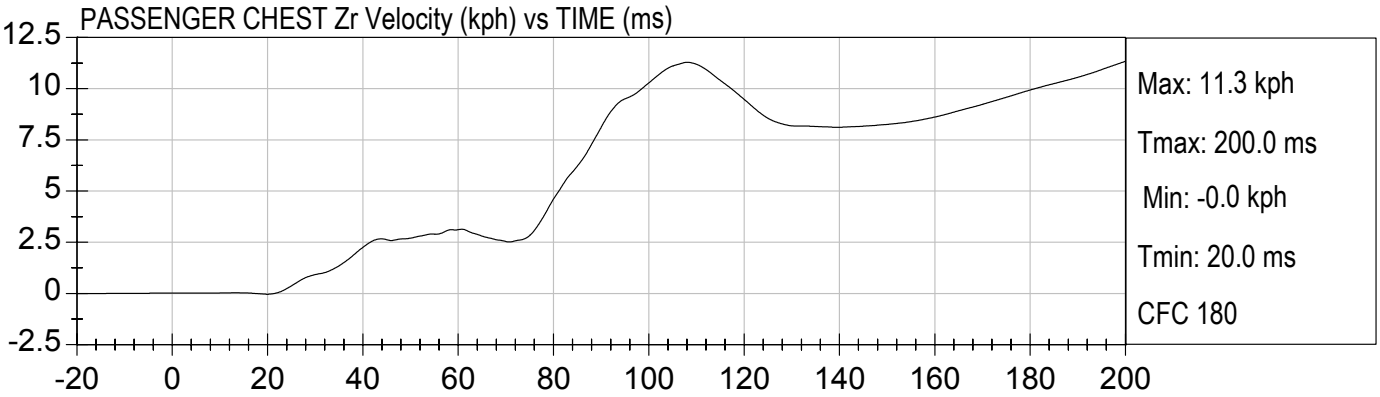
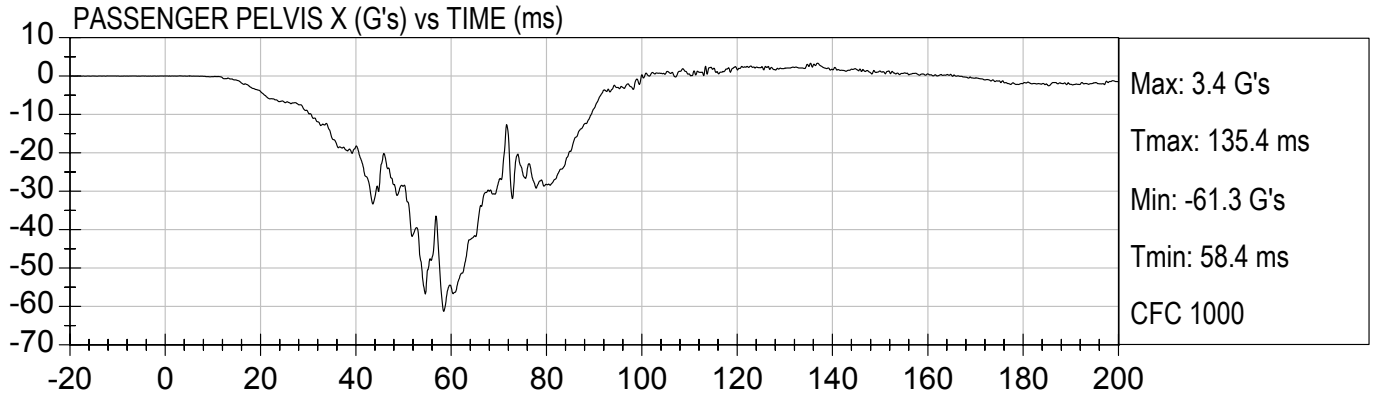


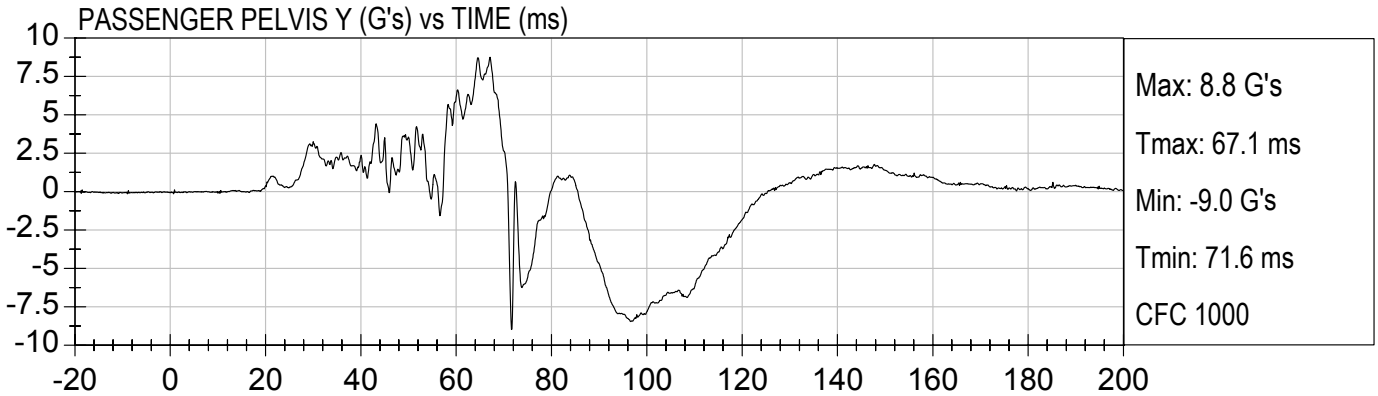


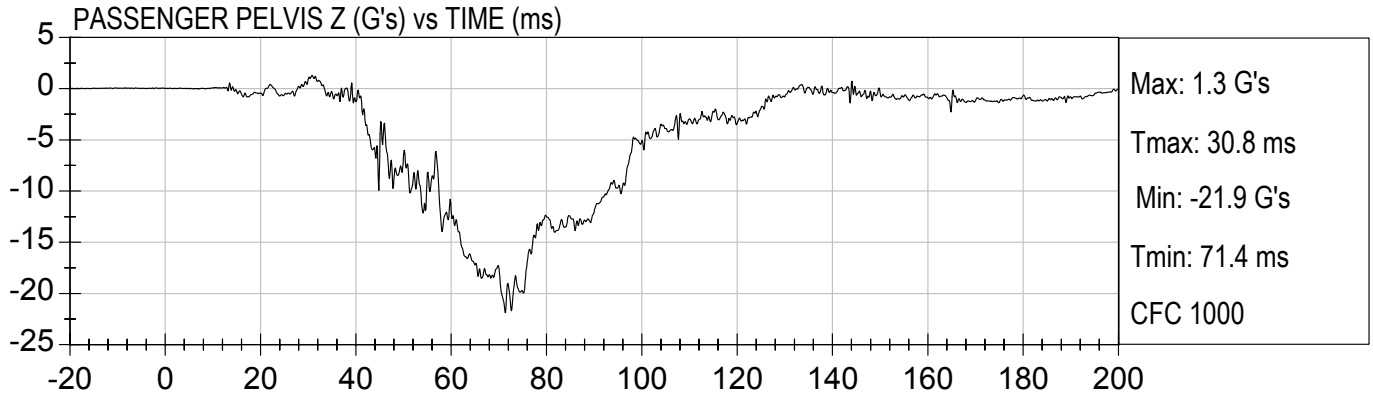


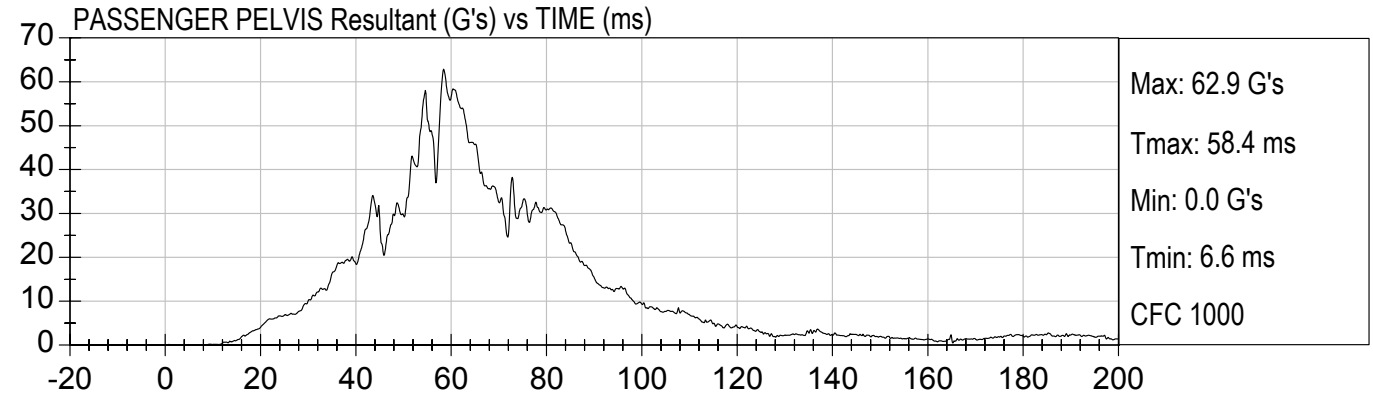
35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)









35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
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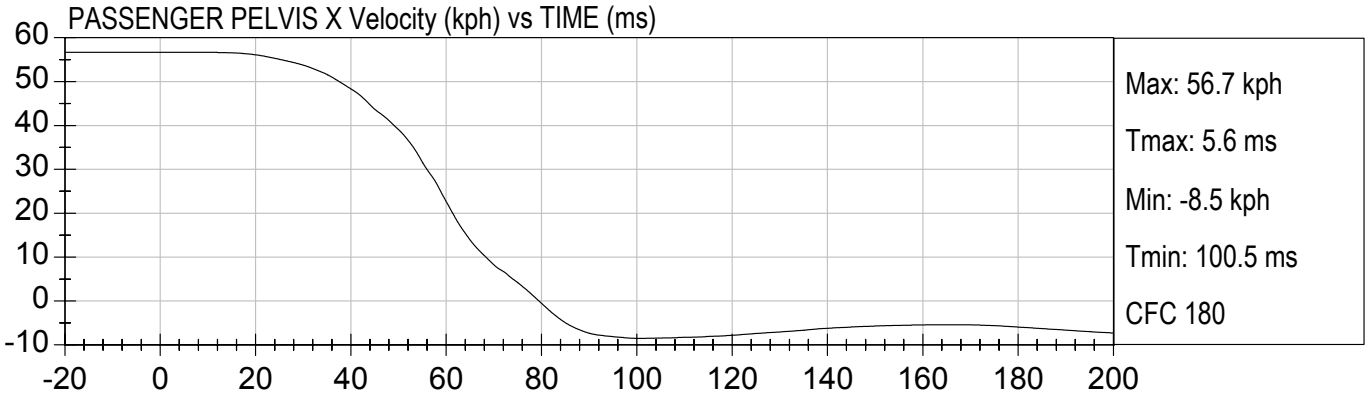

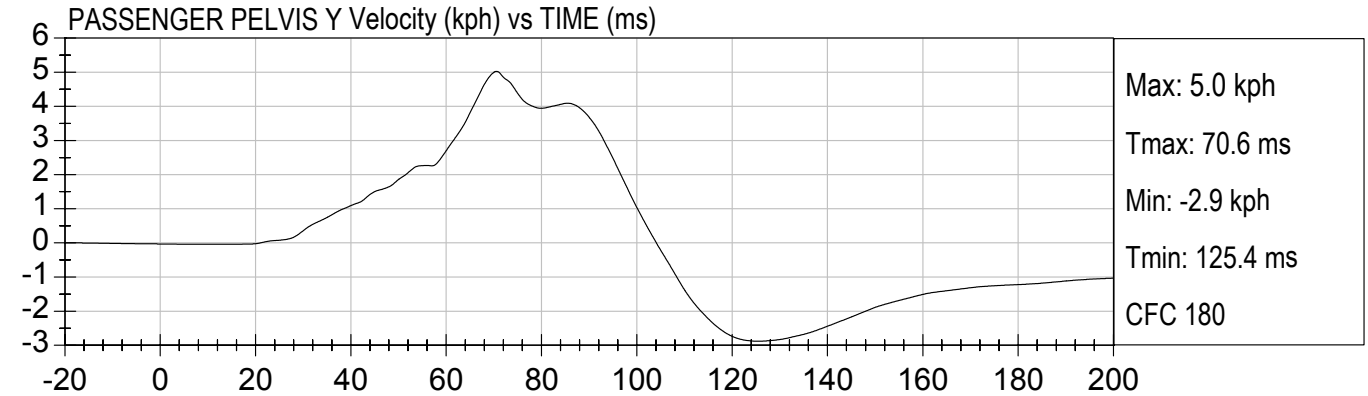

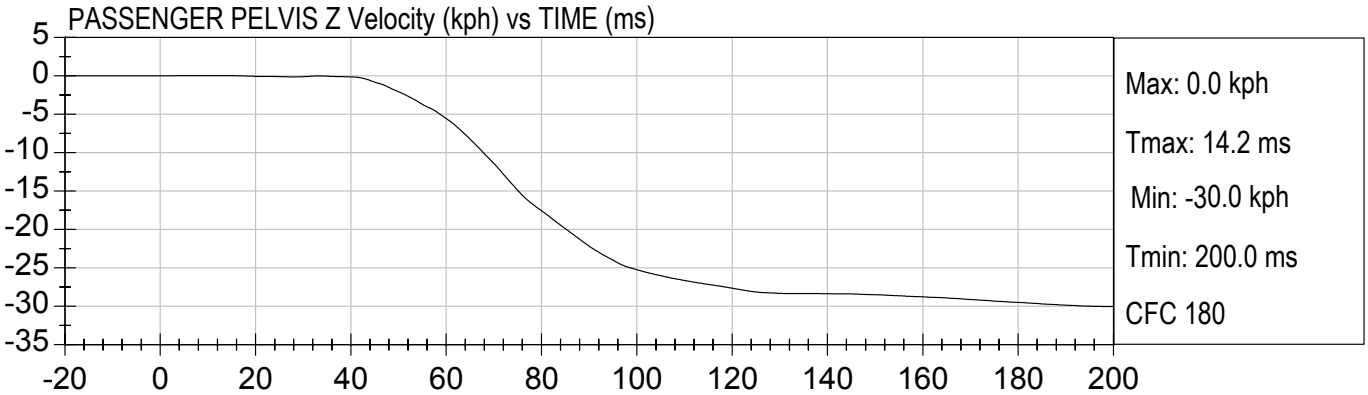

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2004 TOYOTA SIENNA

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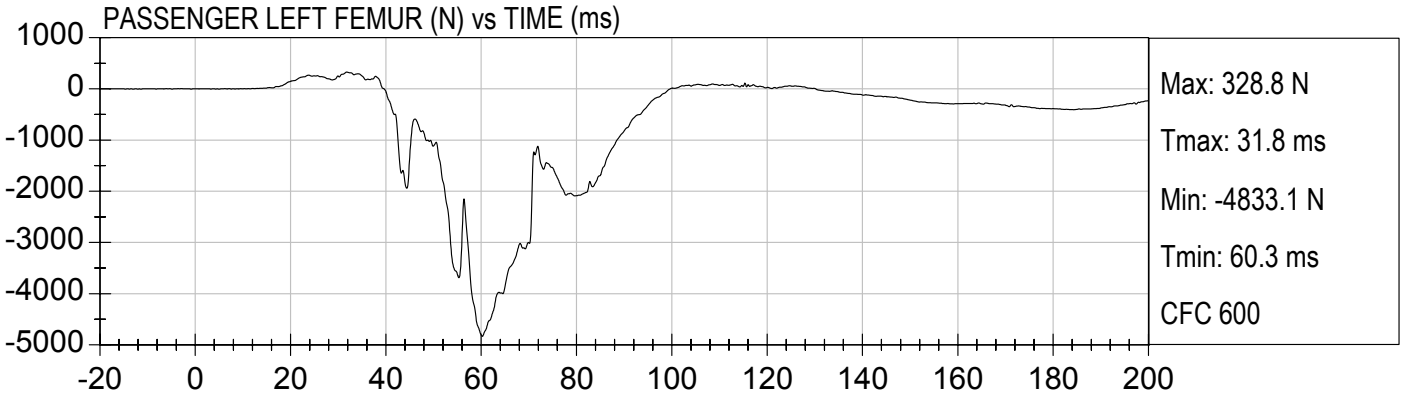

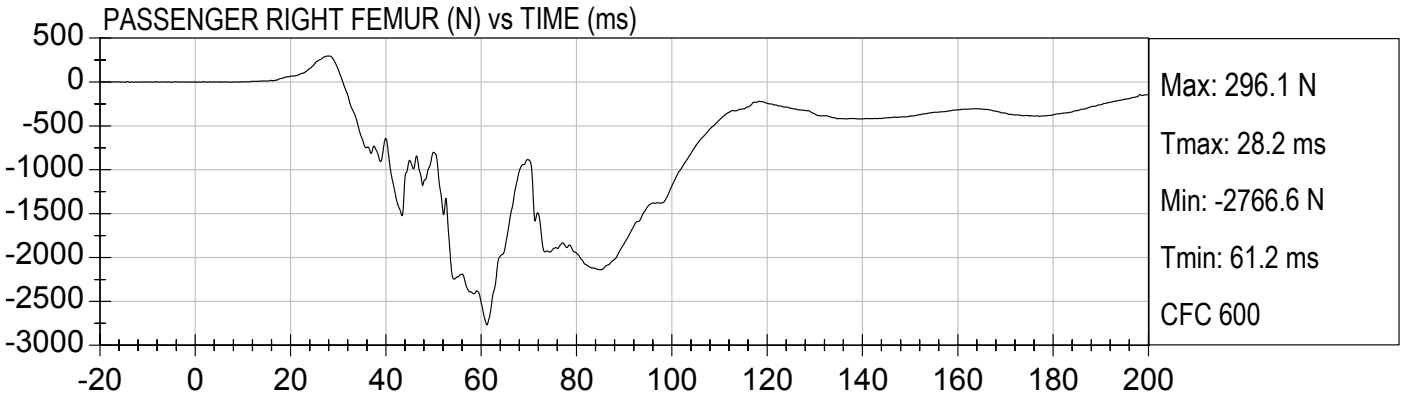

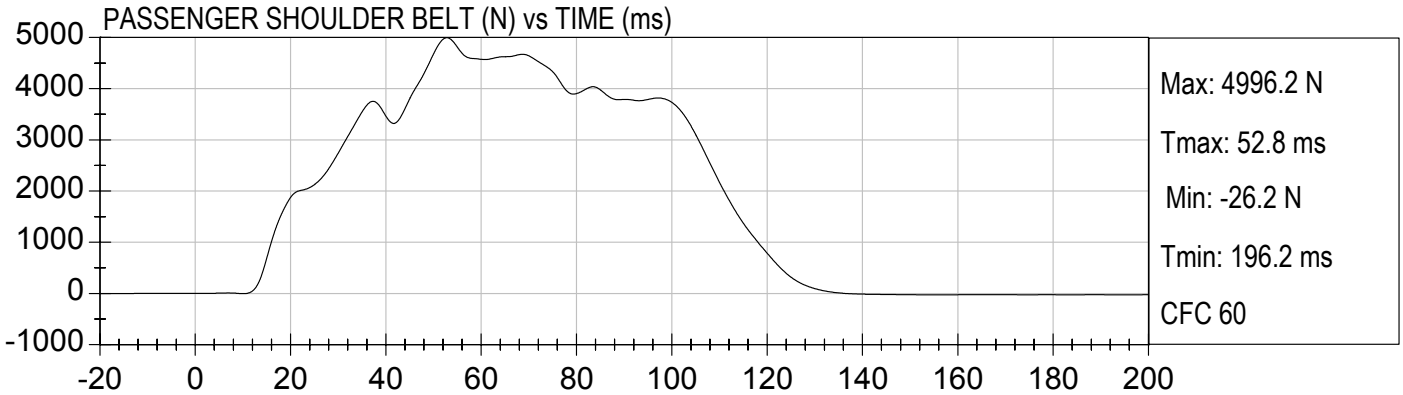

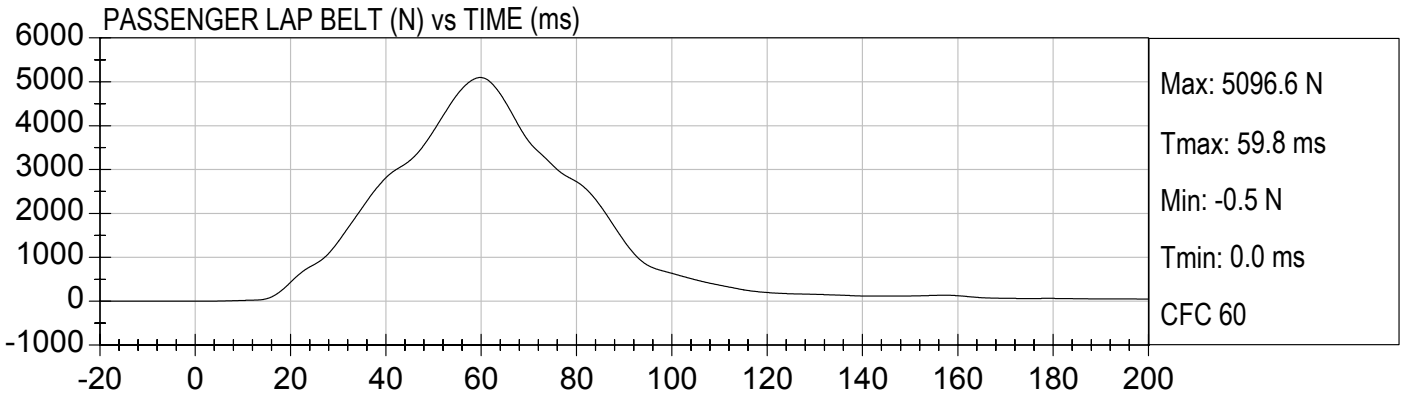

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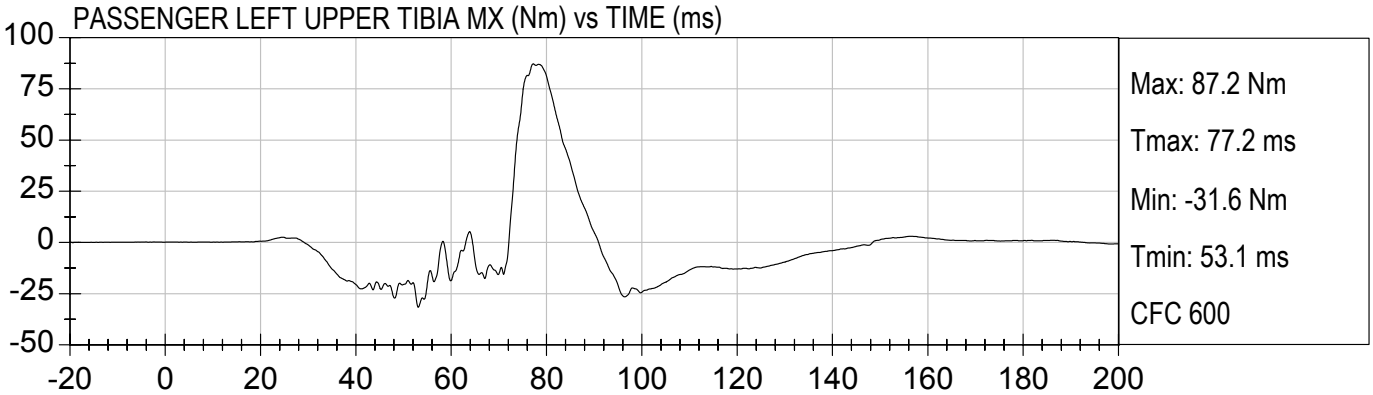

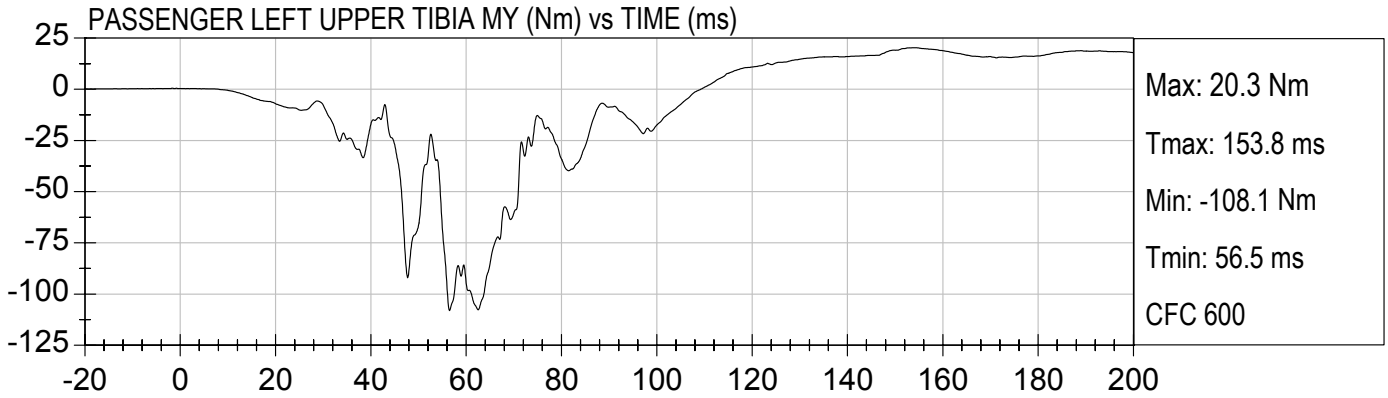

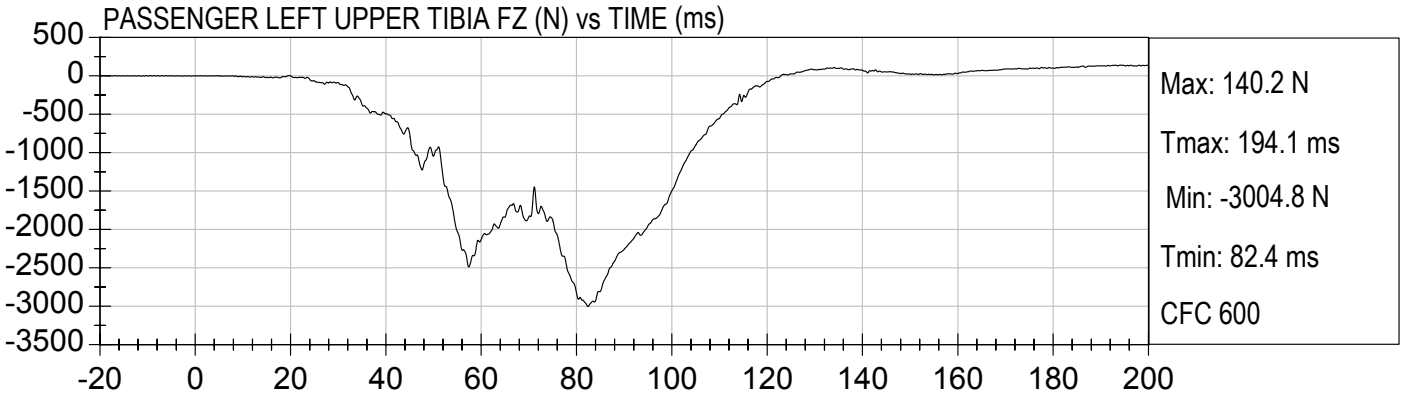

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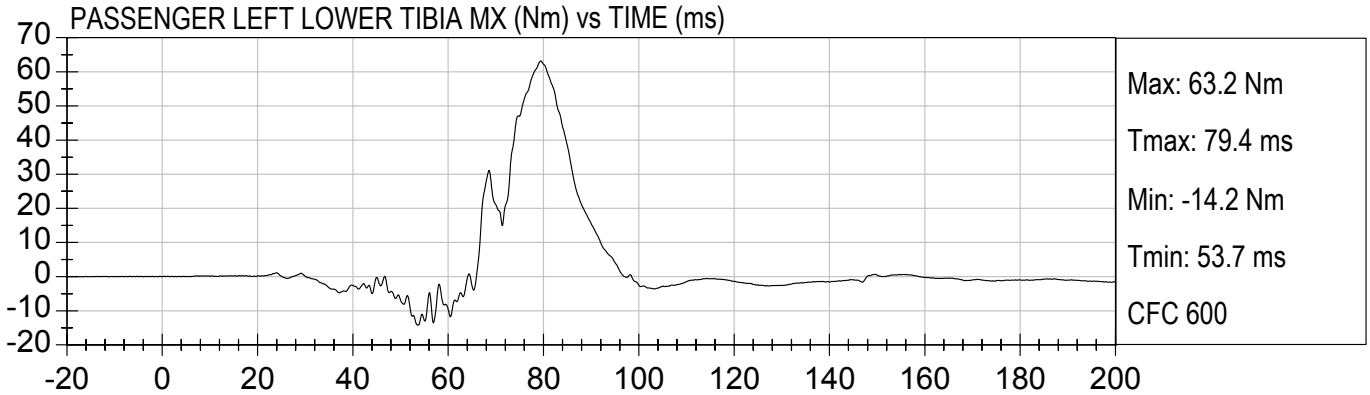

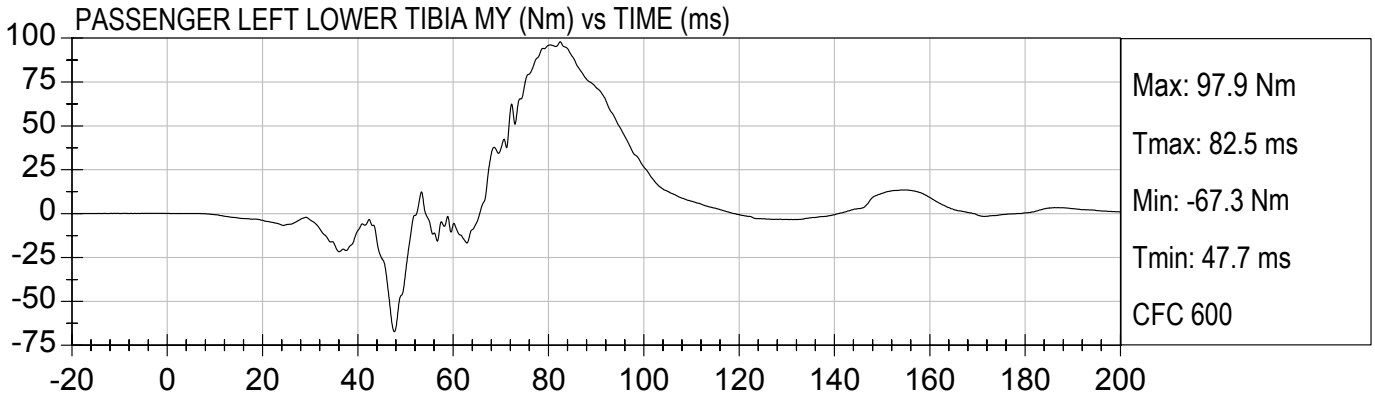

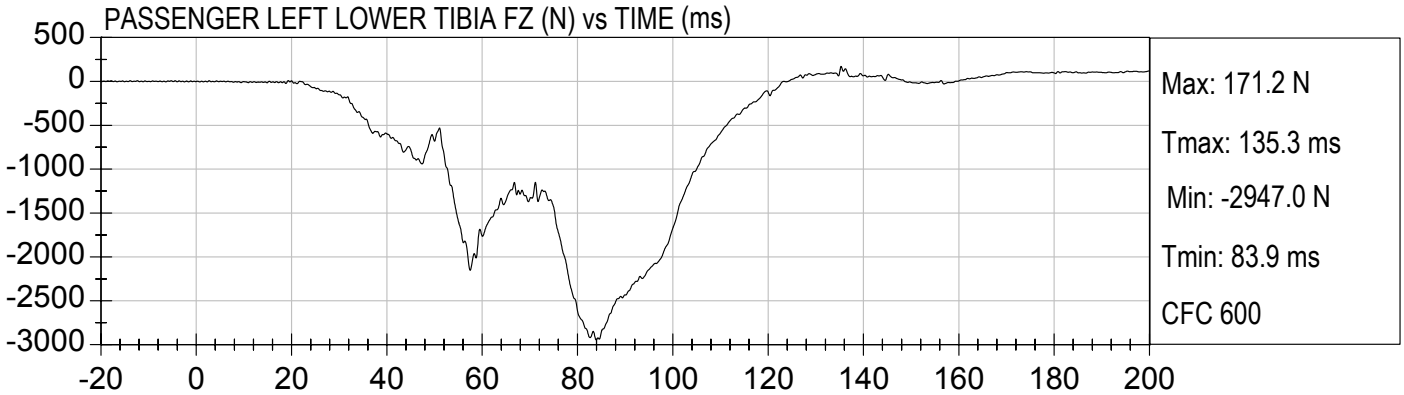

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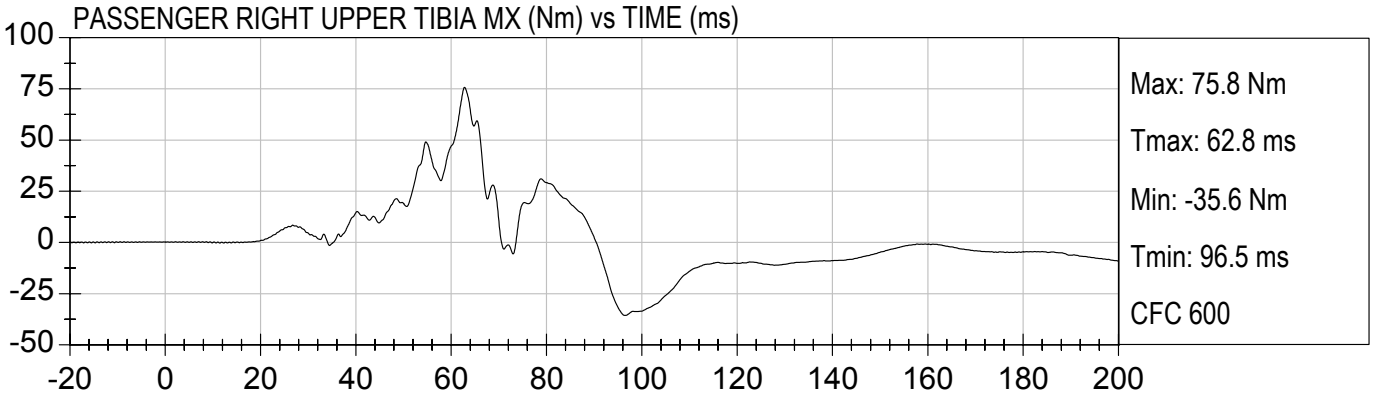

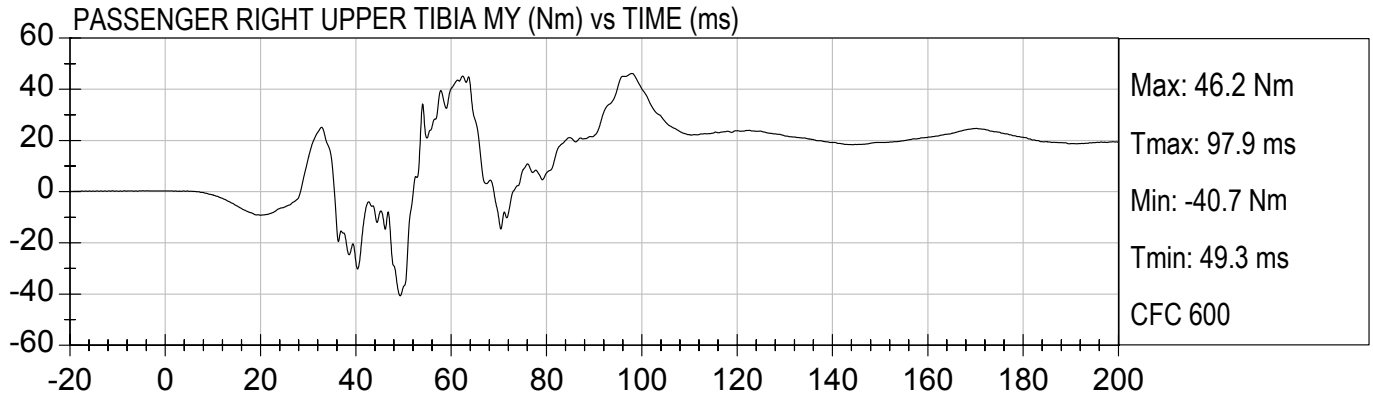

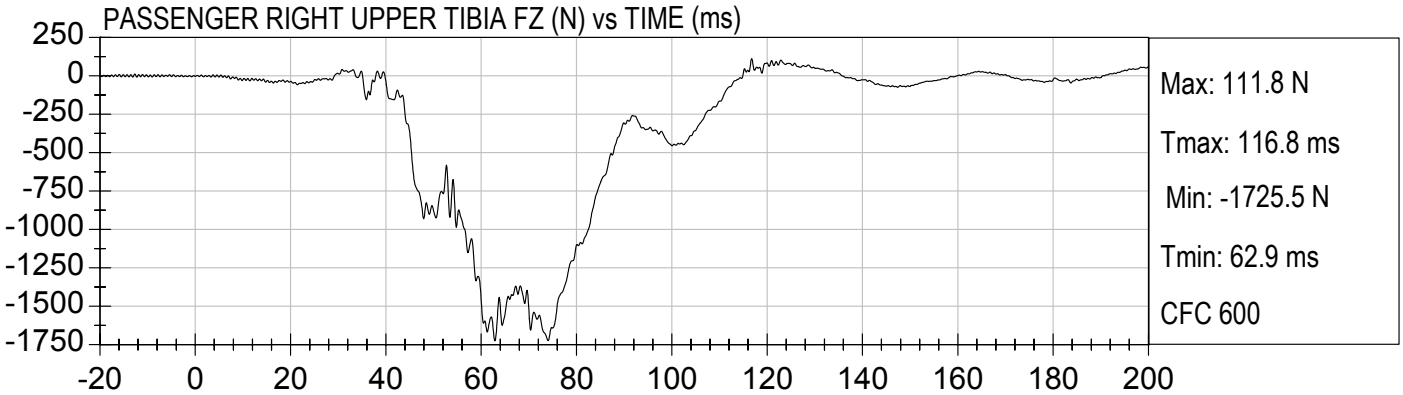

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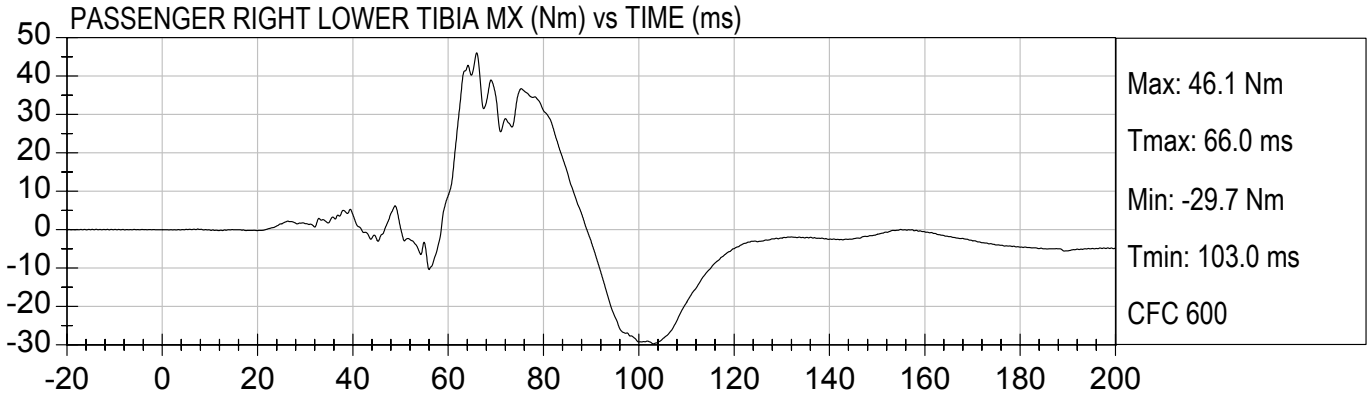

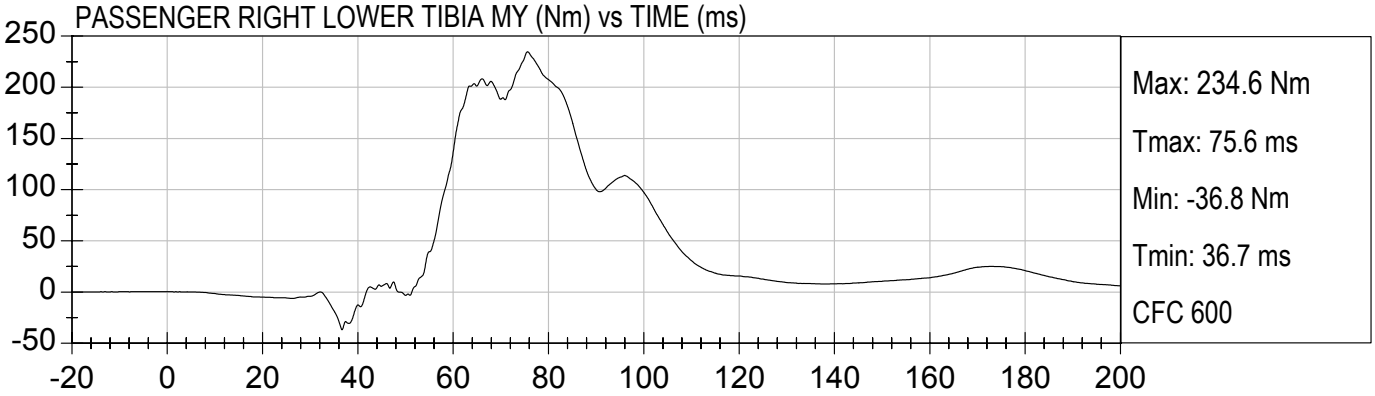

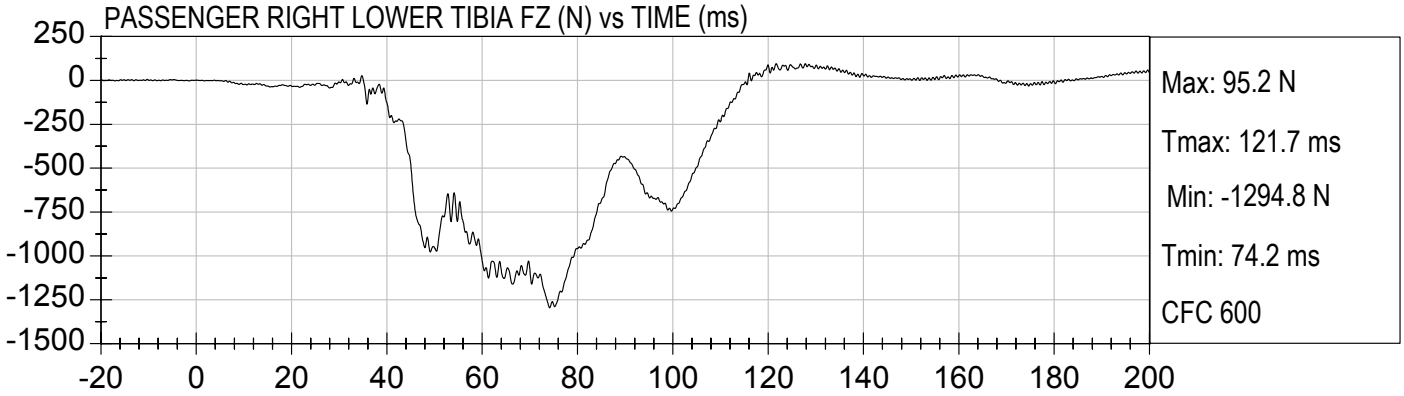

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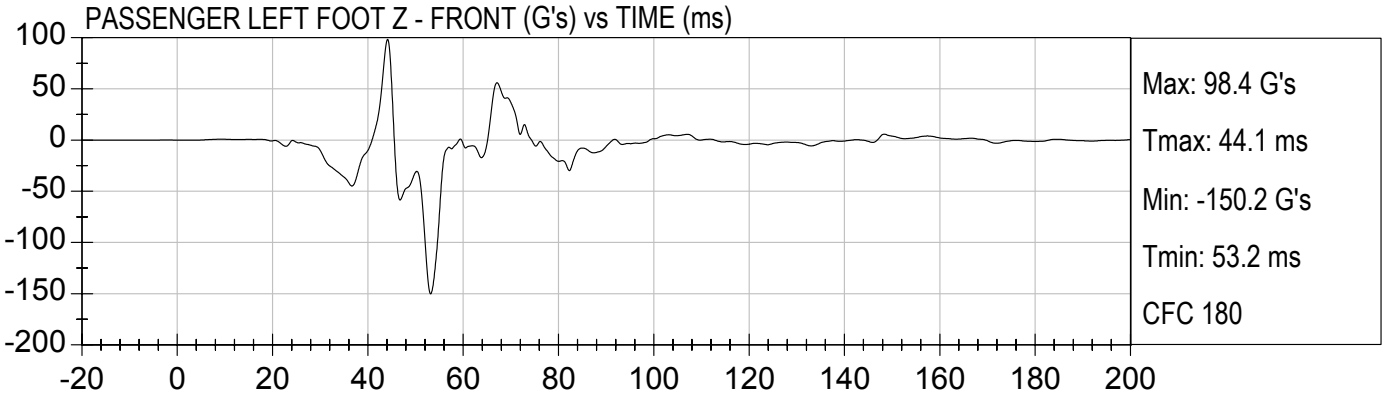

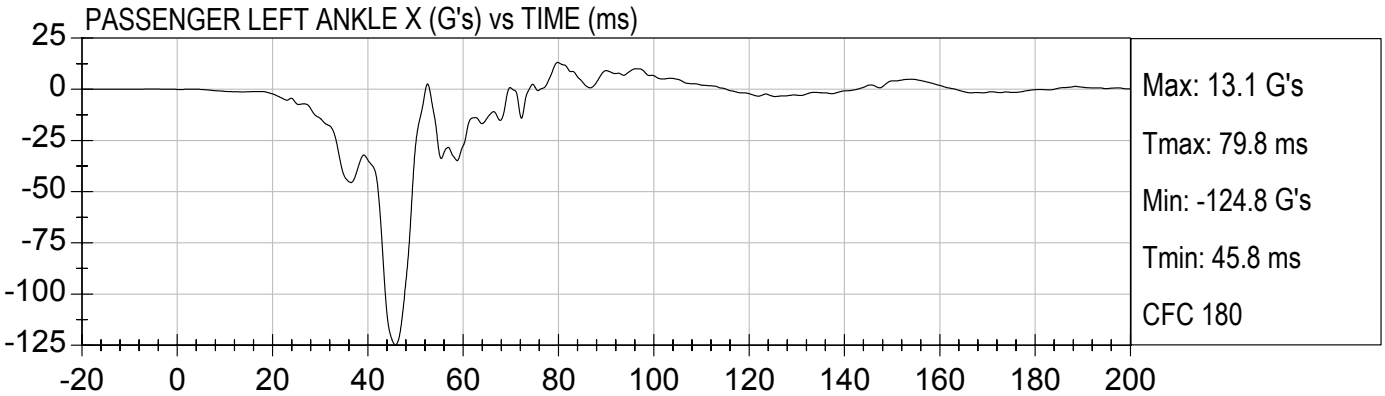

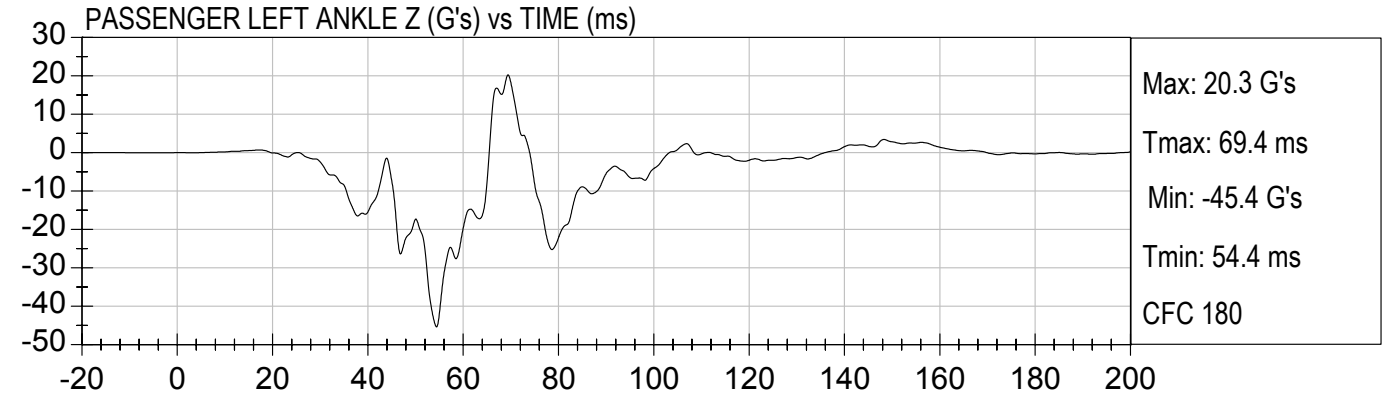

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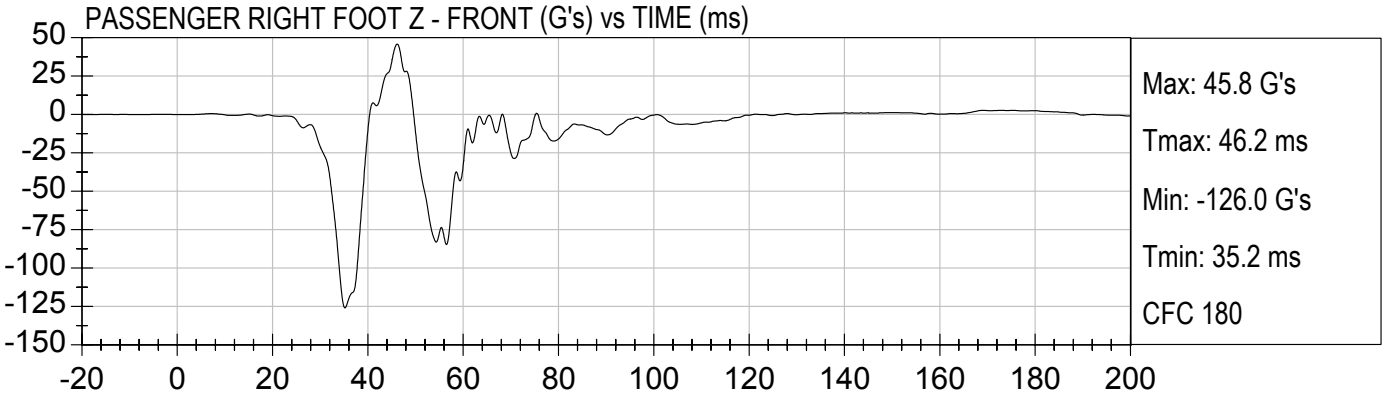

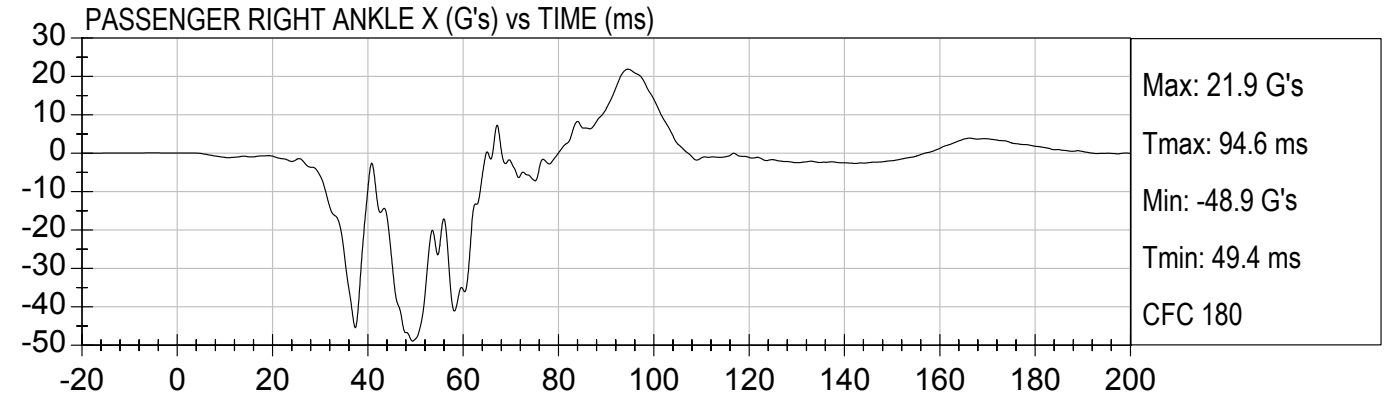

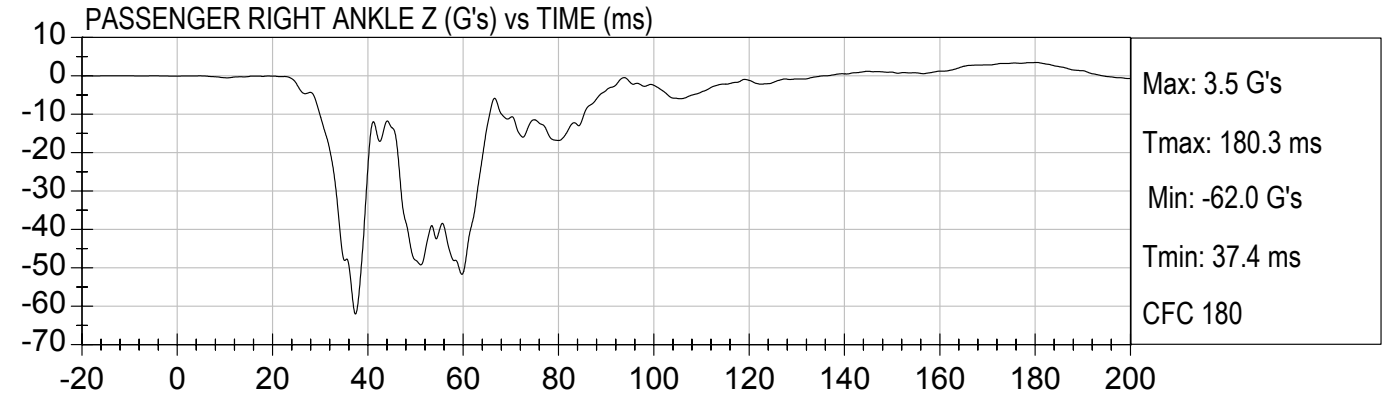

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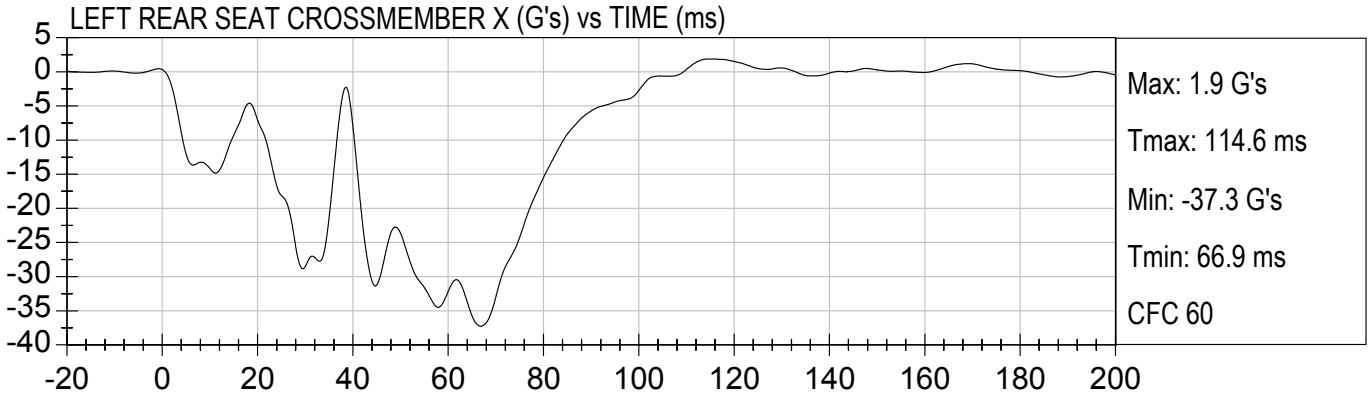

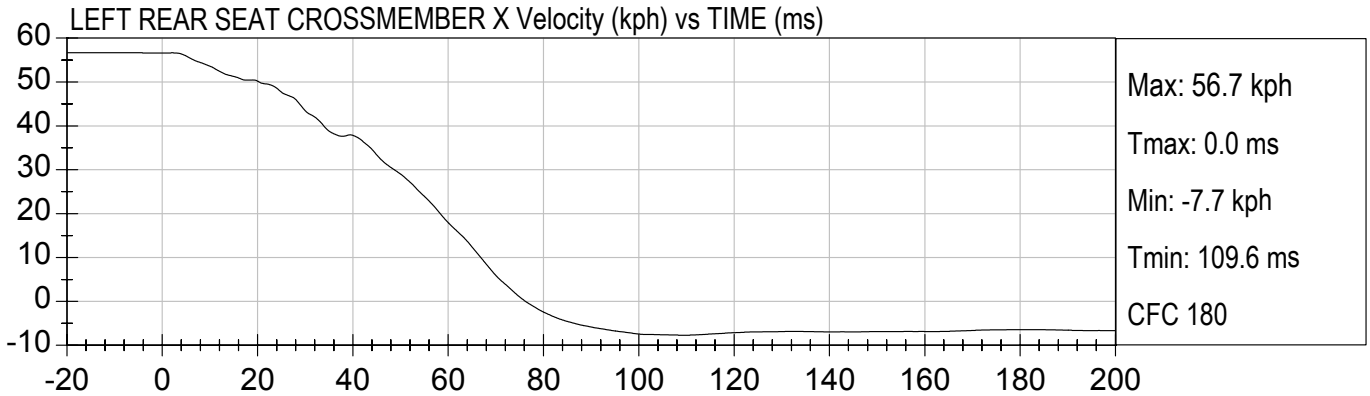

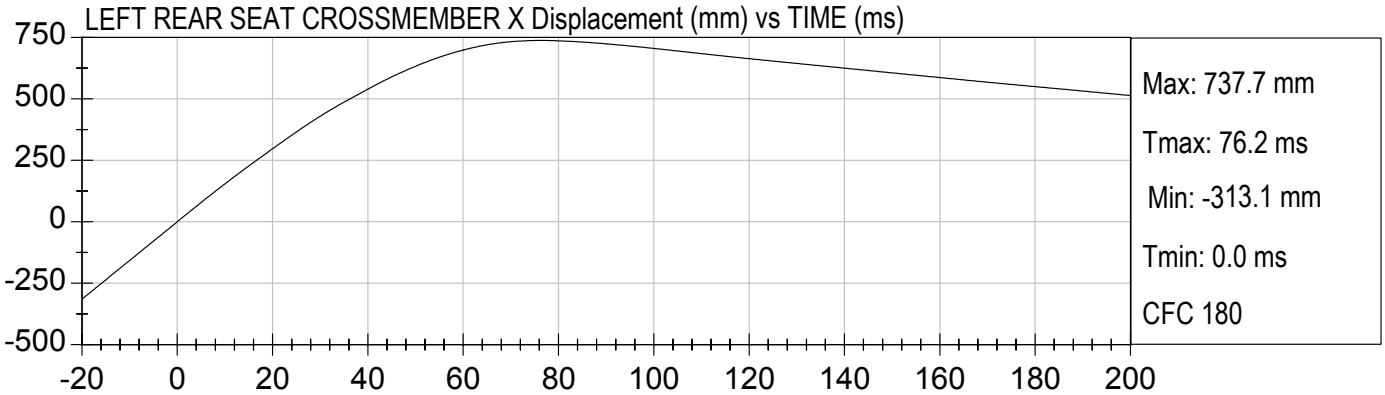

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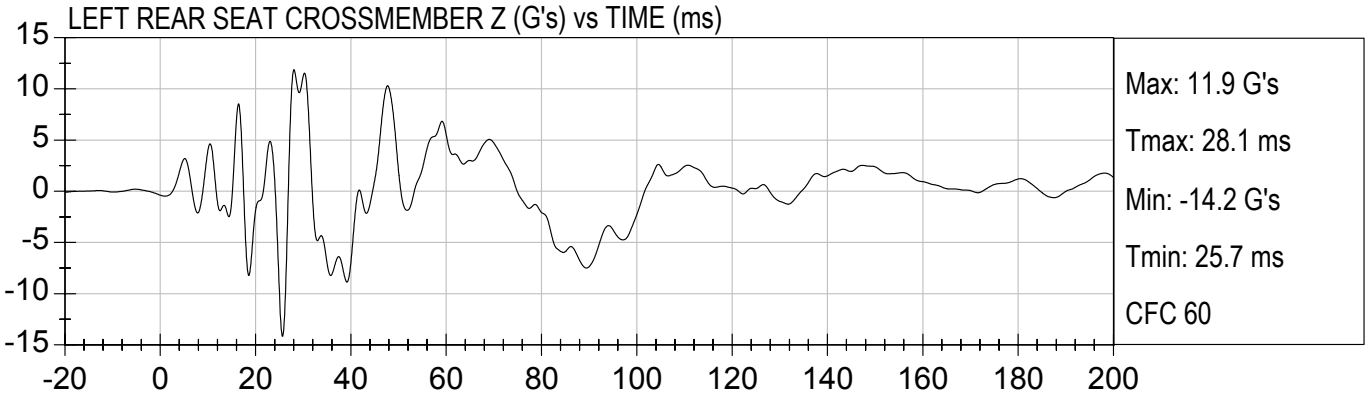

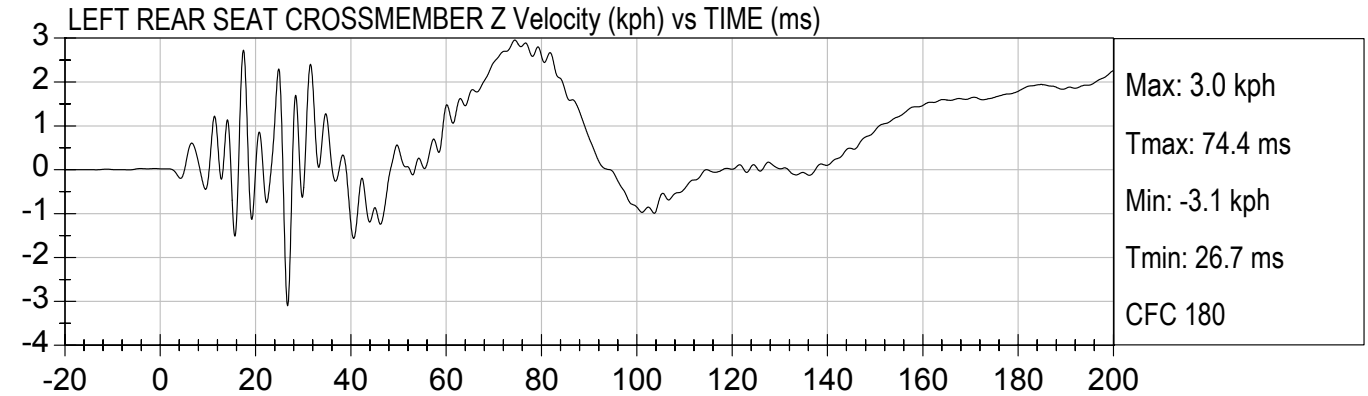

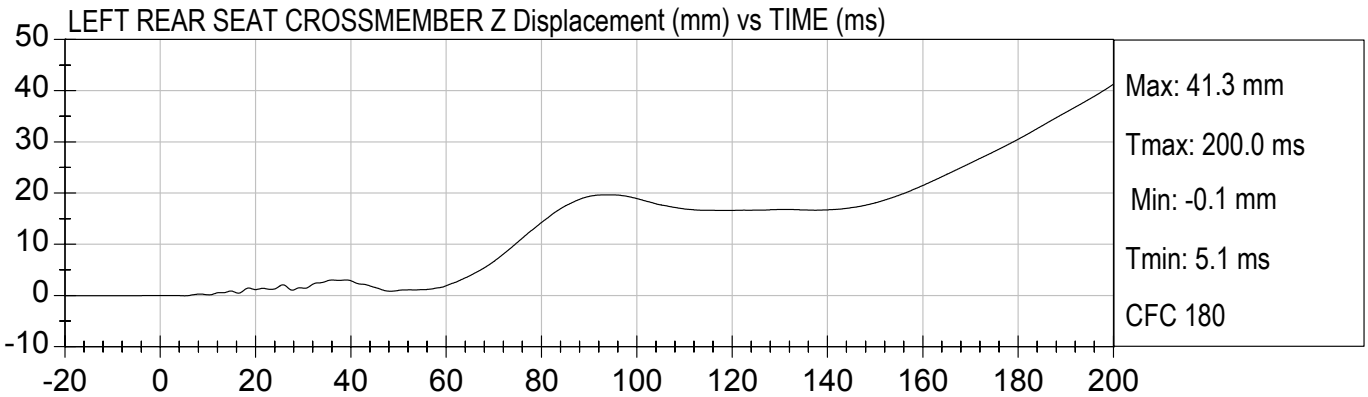

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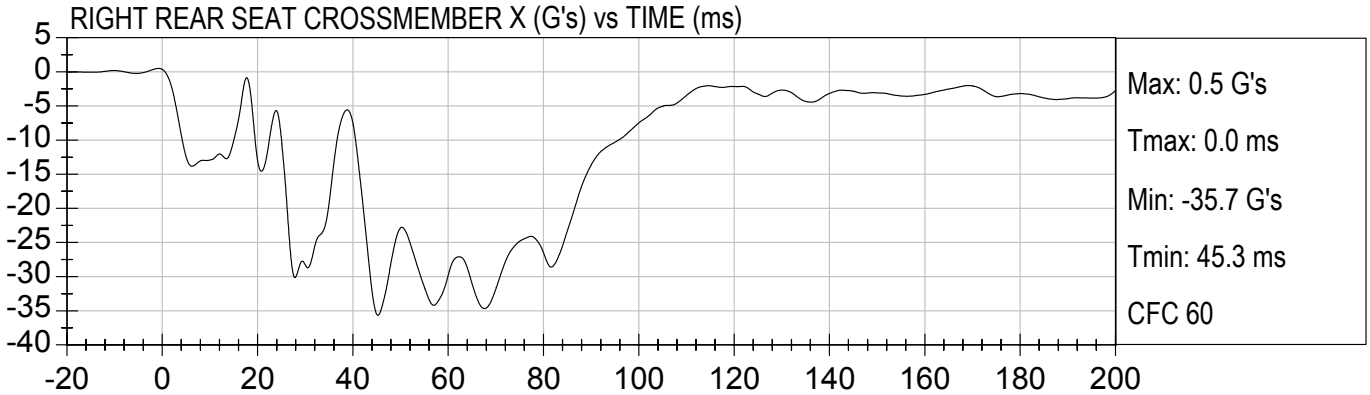

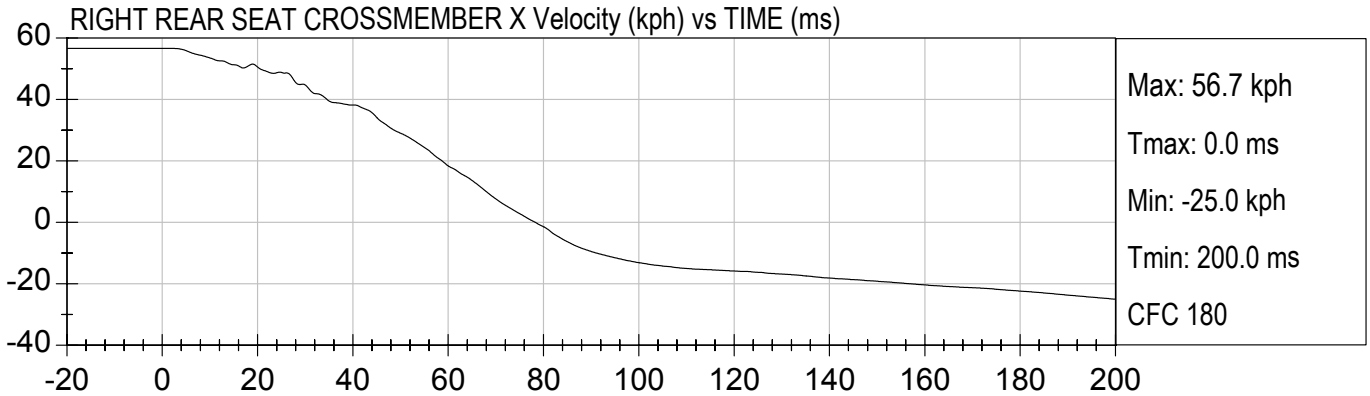

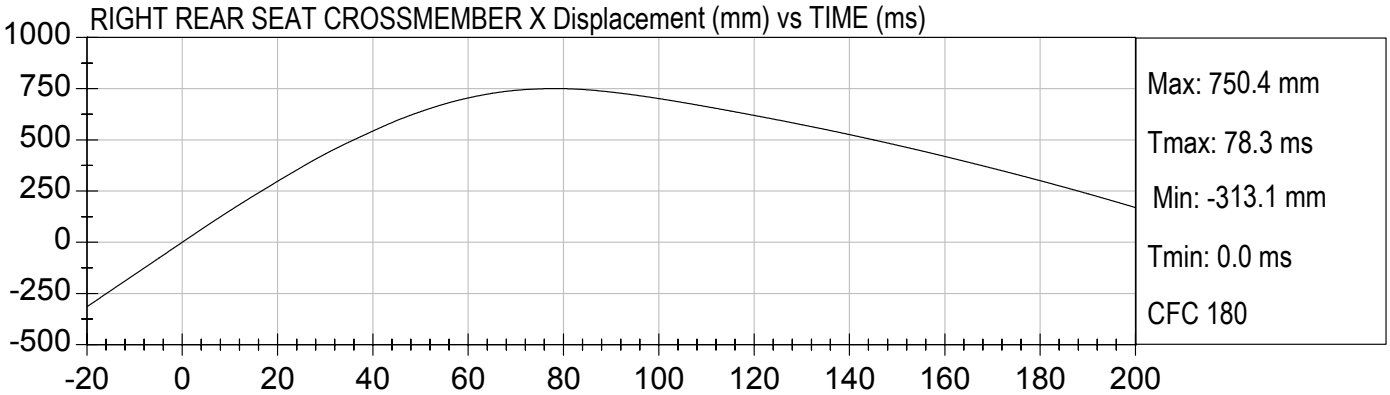

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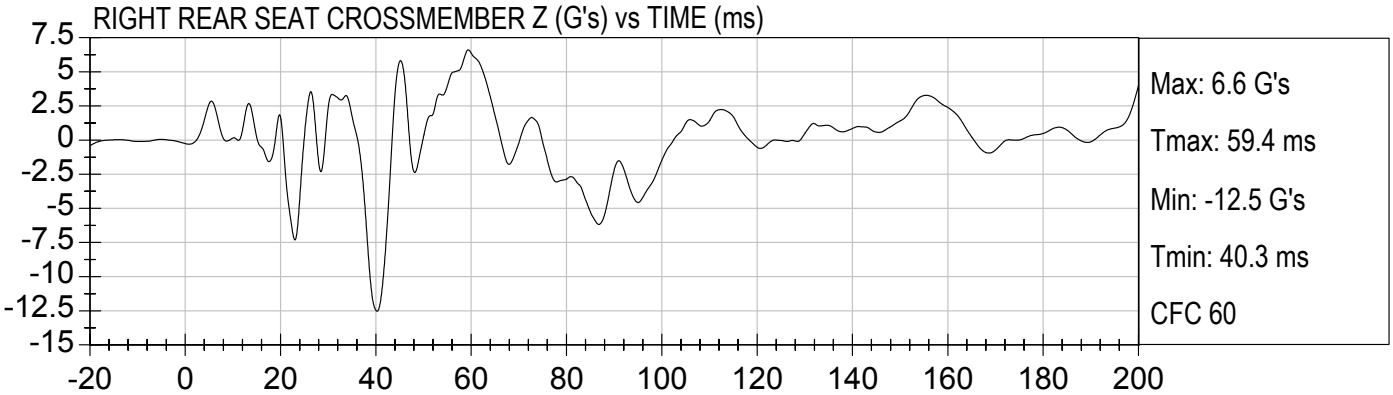

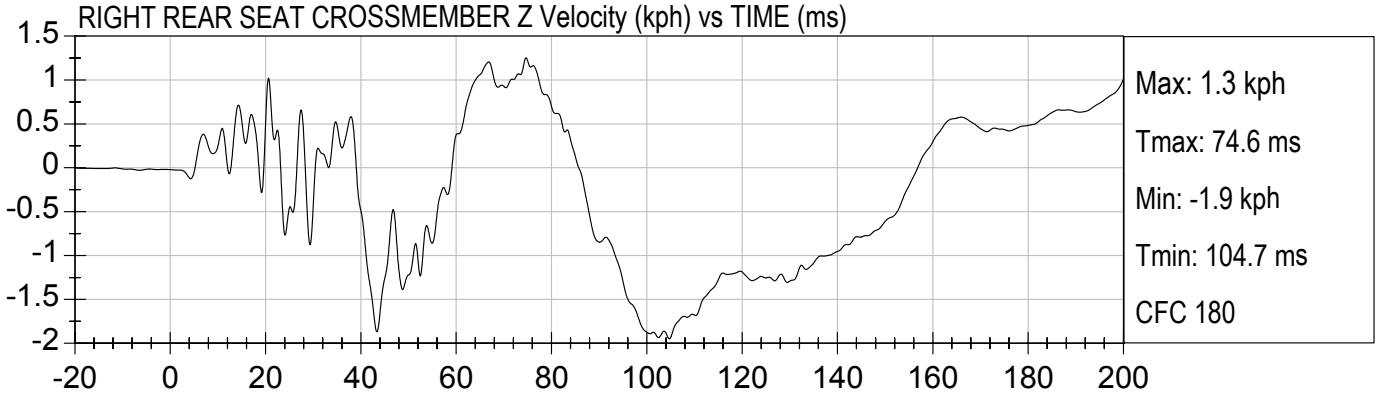

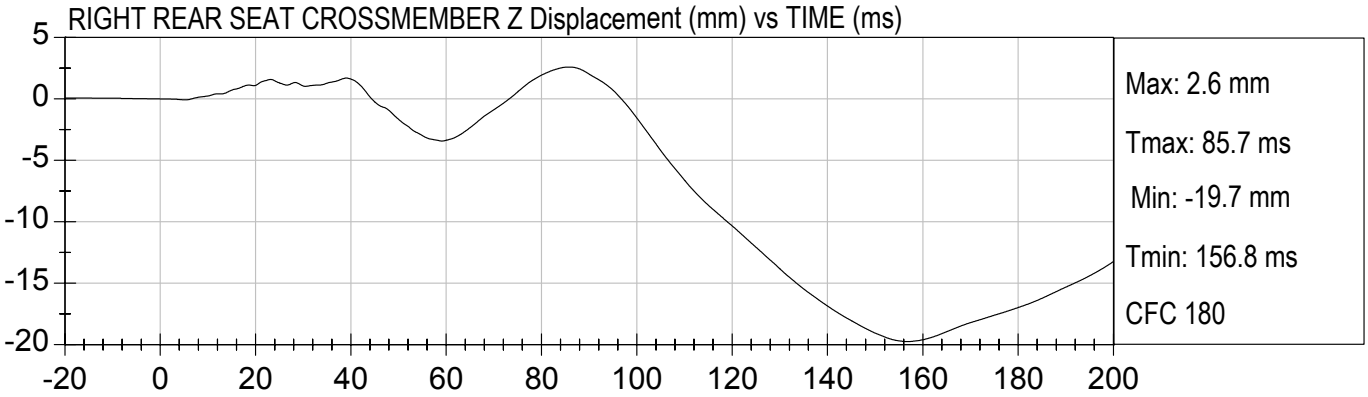

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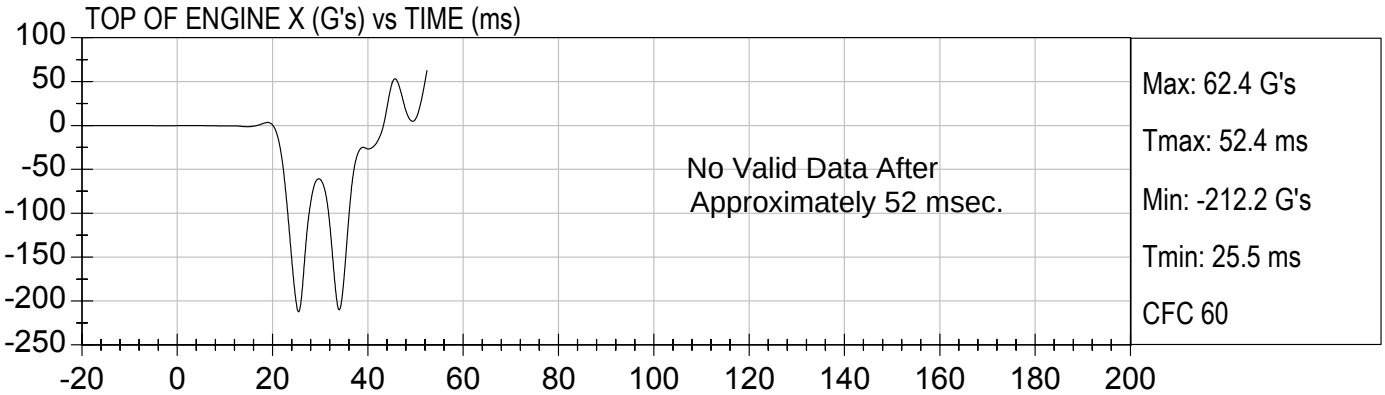

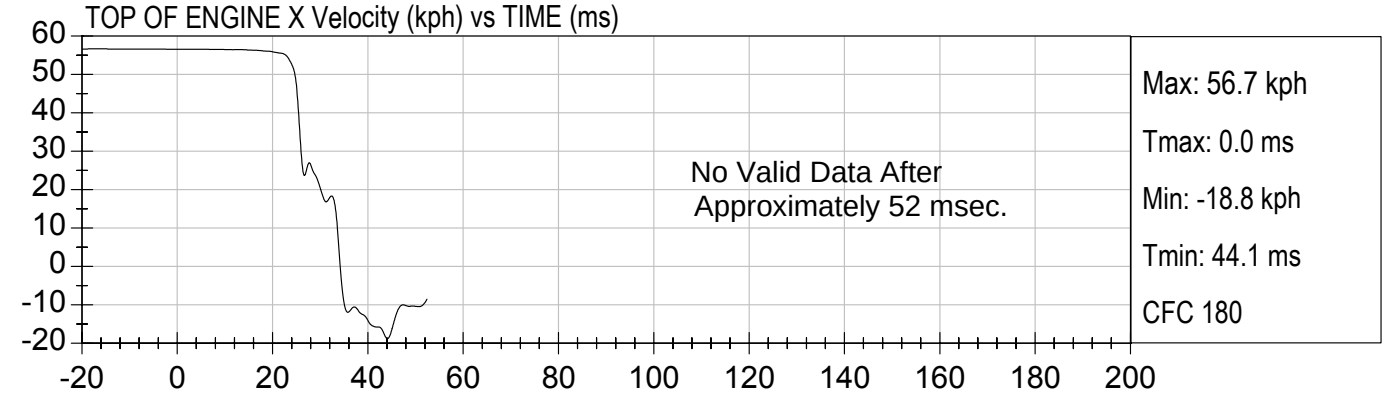

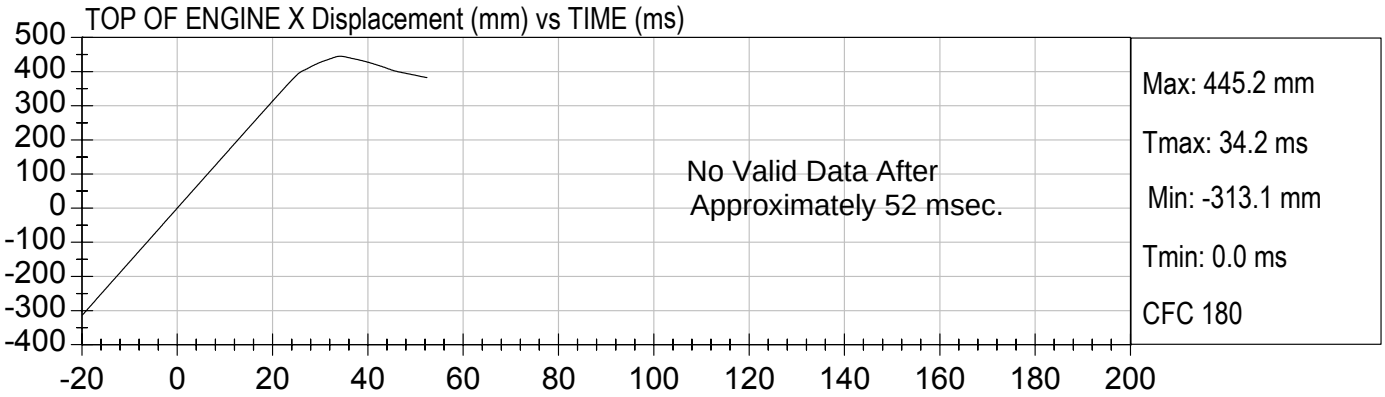

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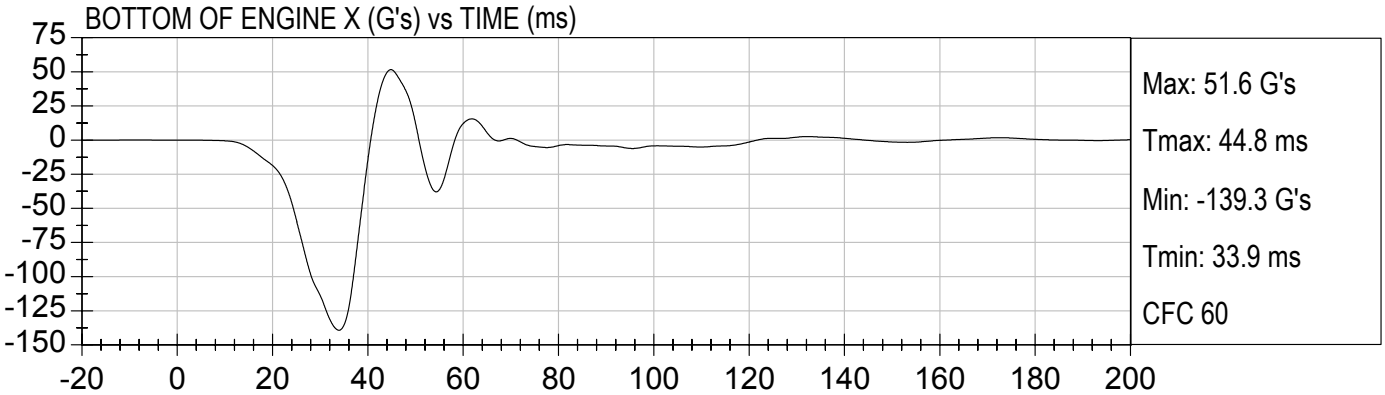

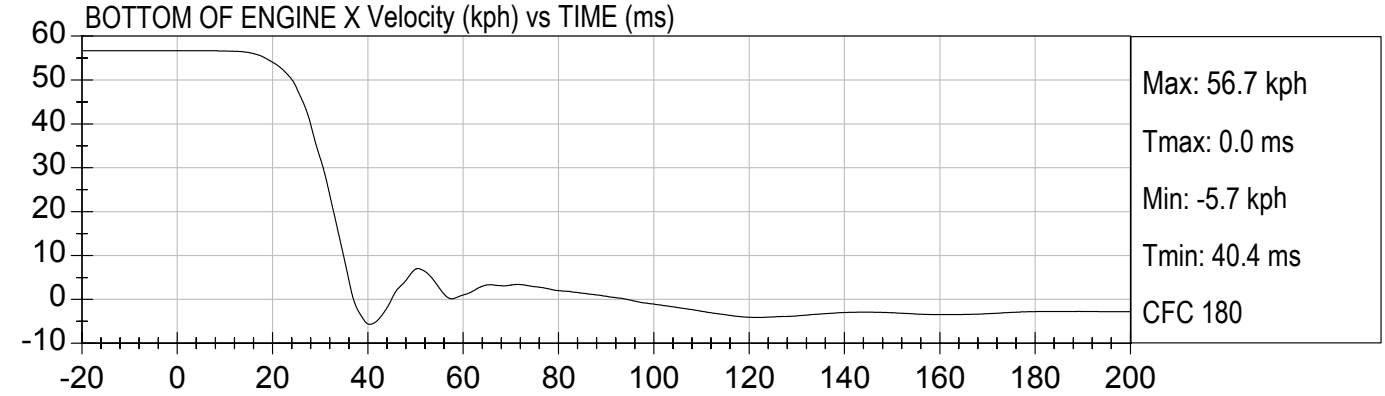

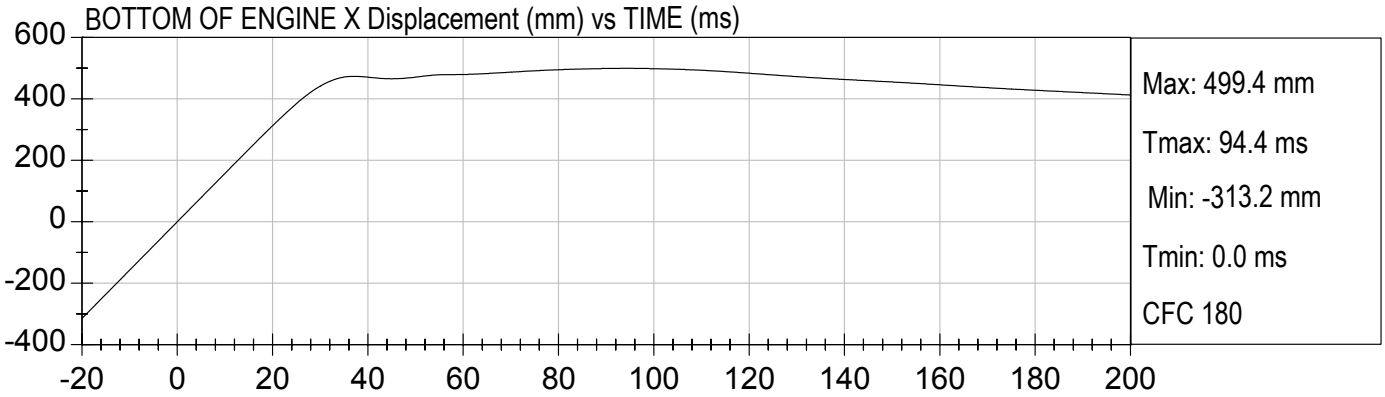

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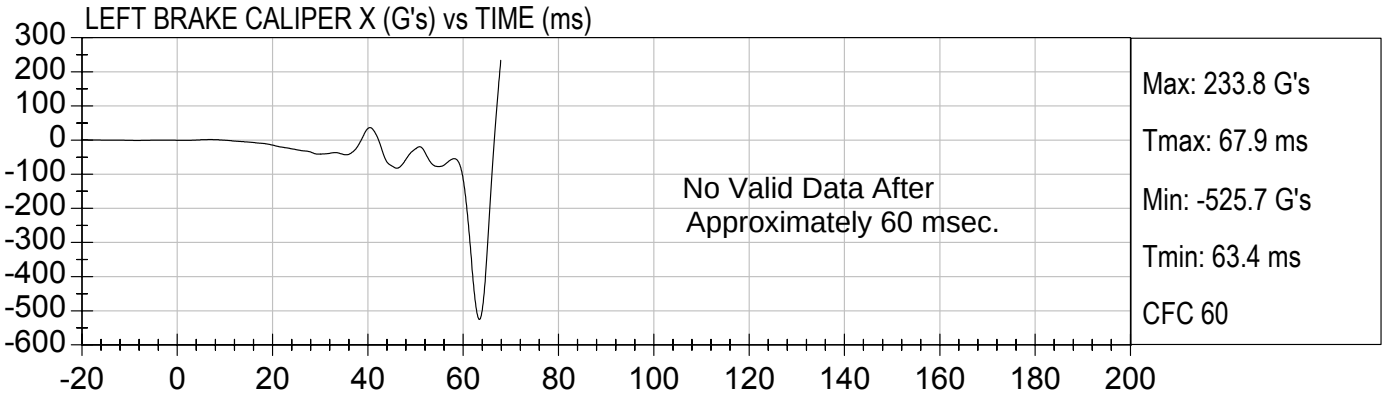

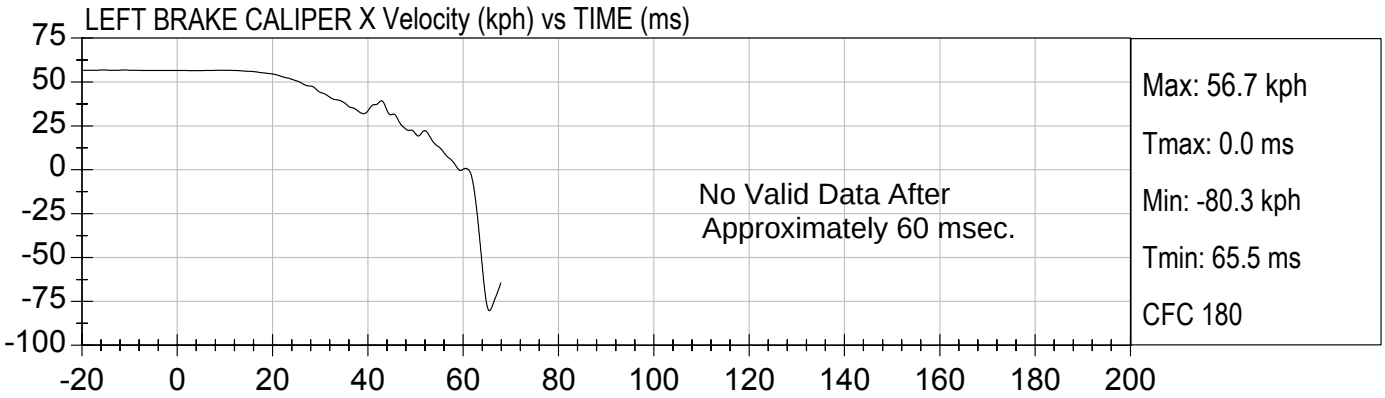

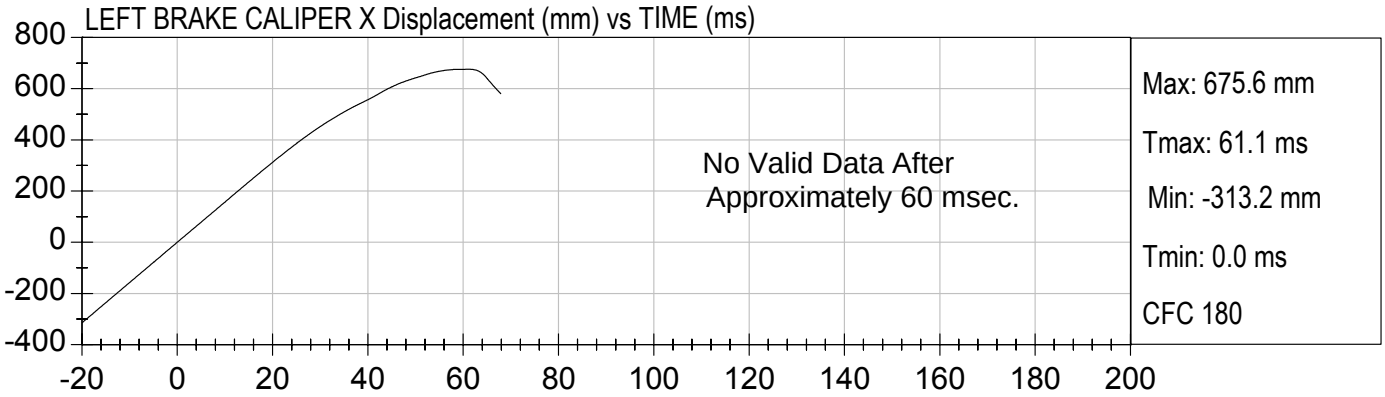

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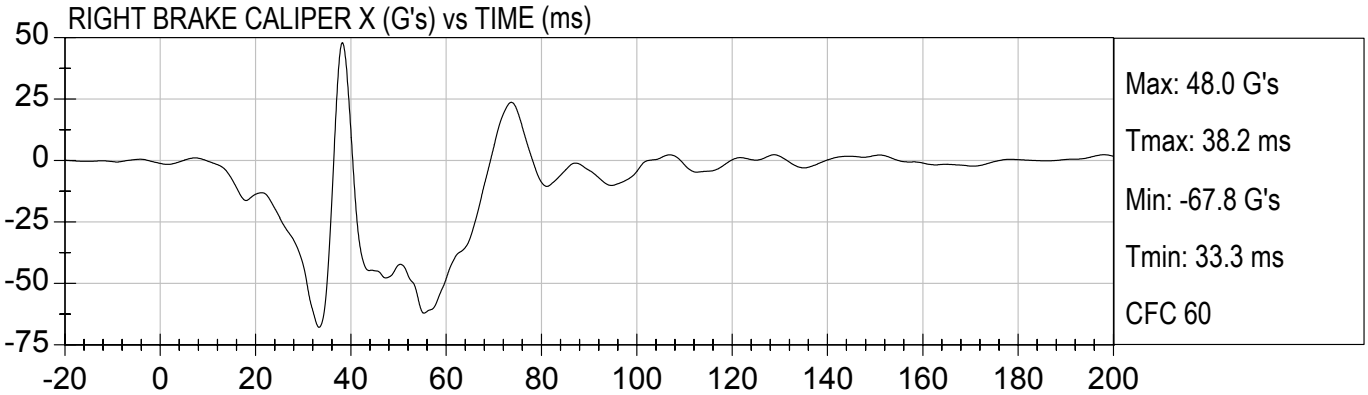

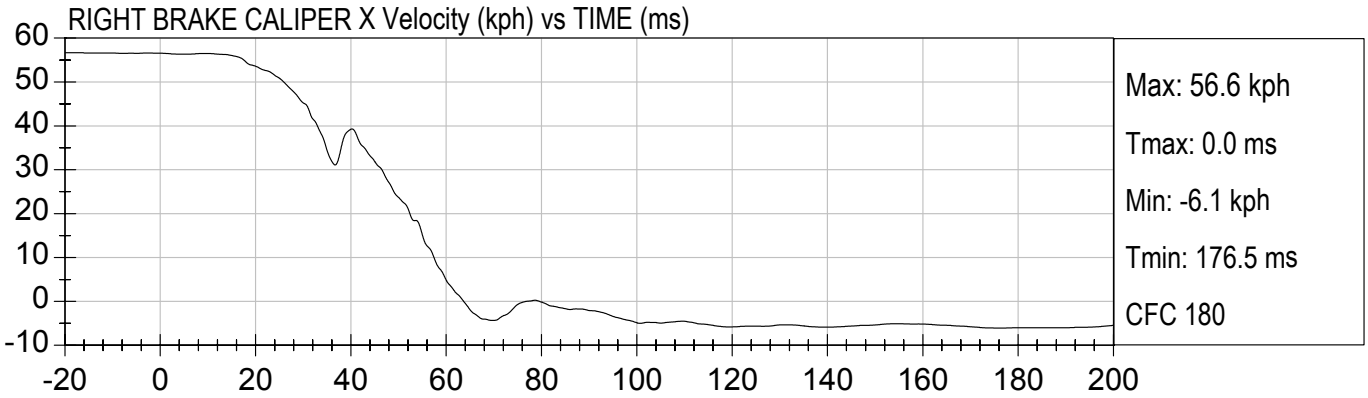

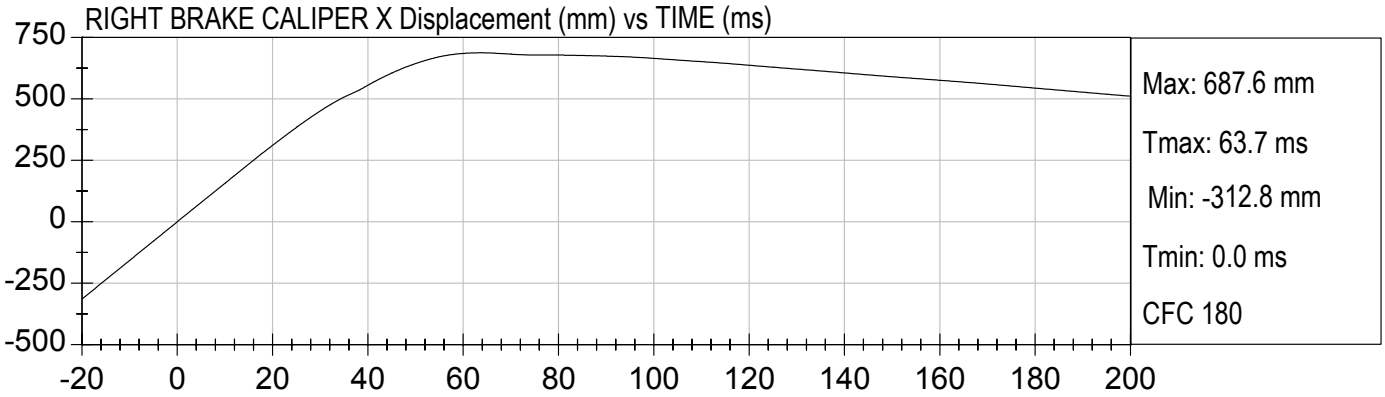

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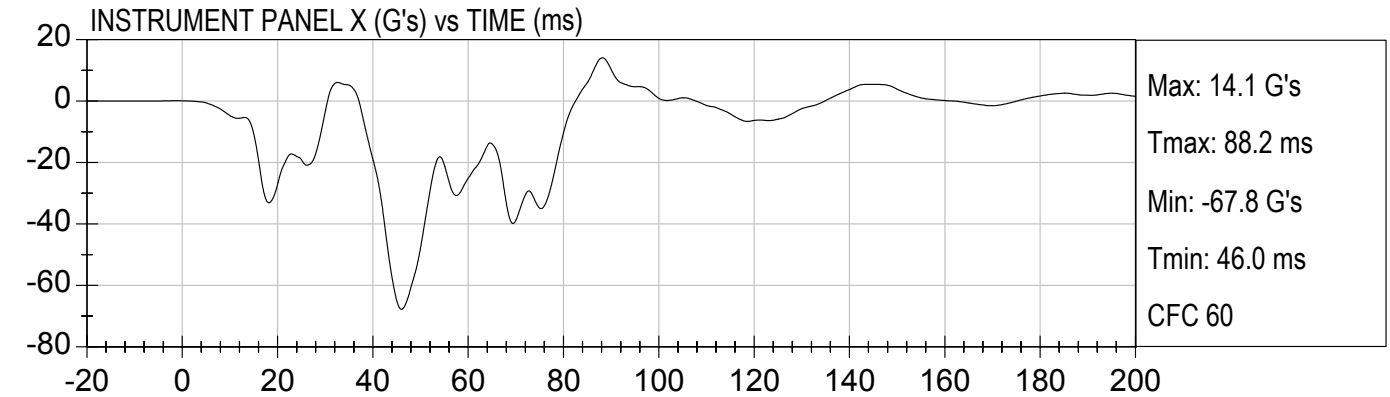
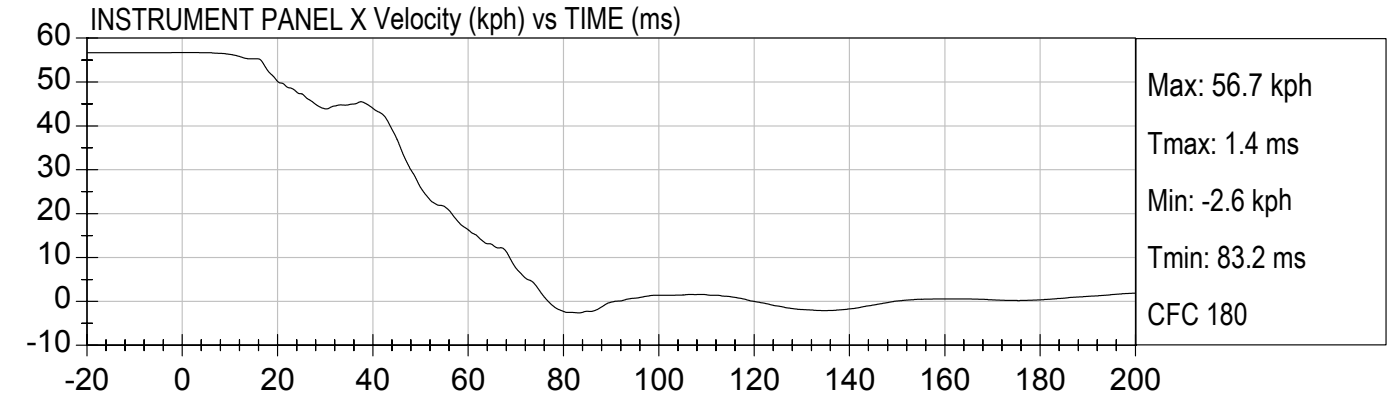
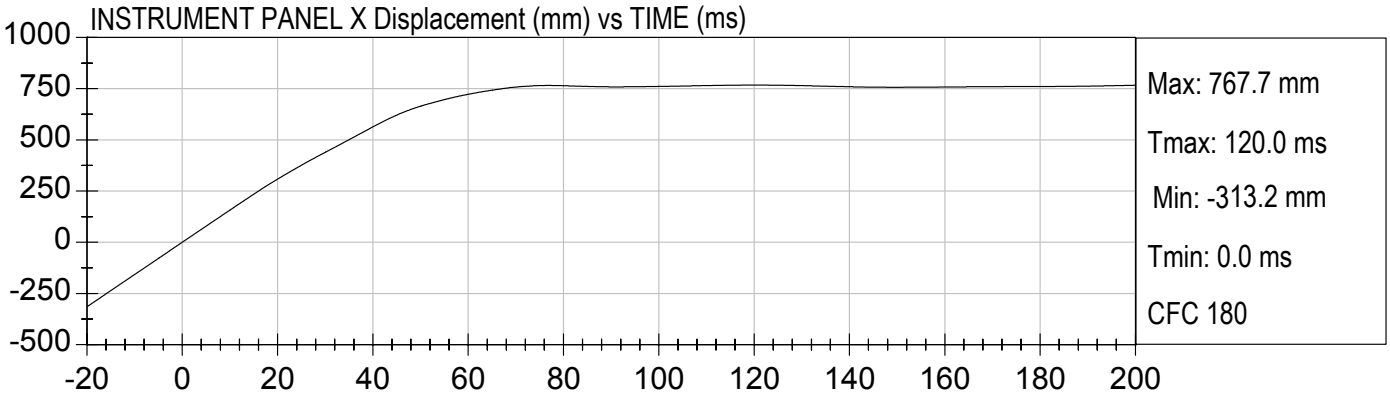
Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)

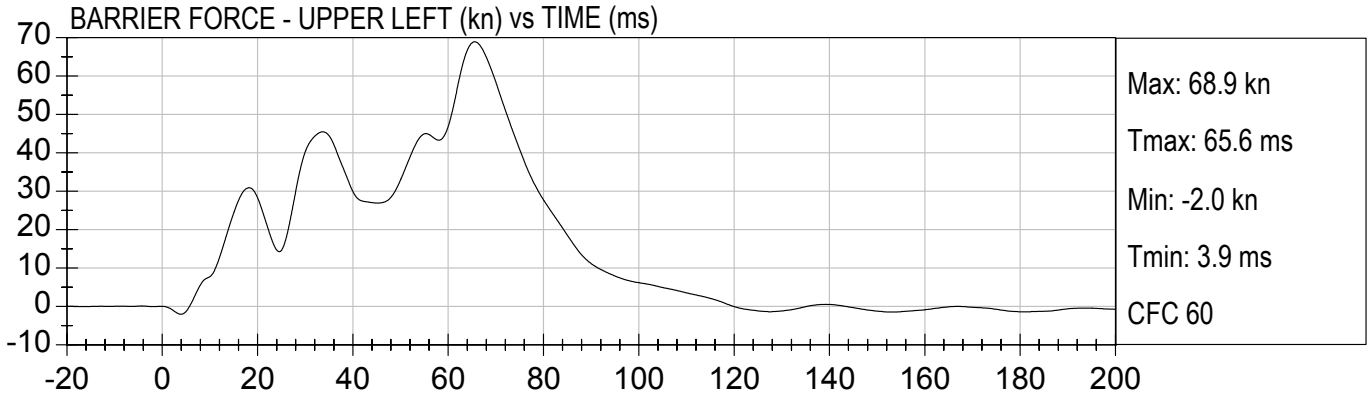


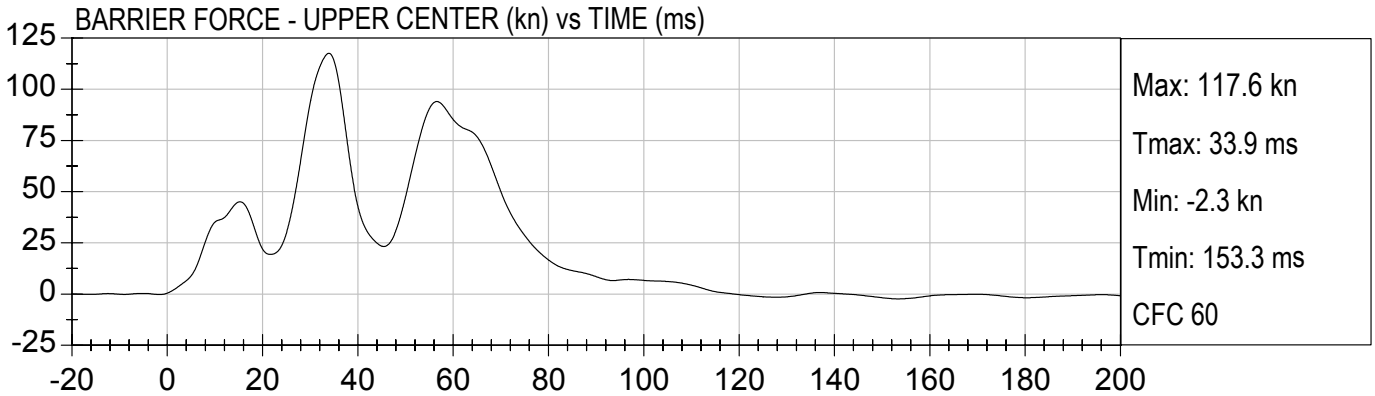


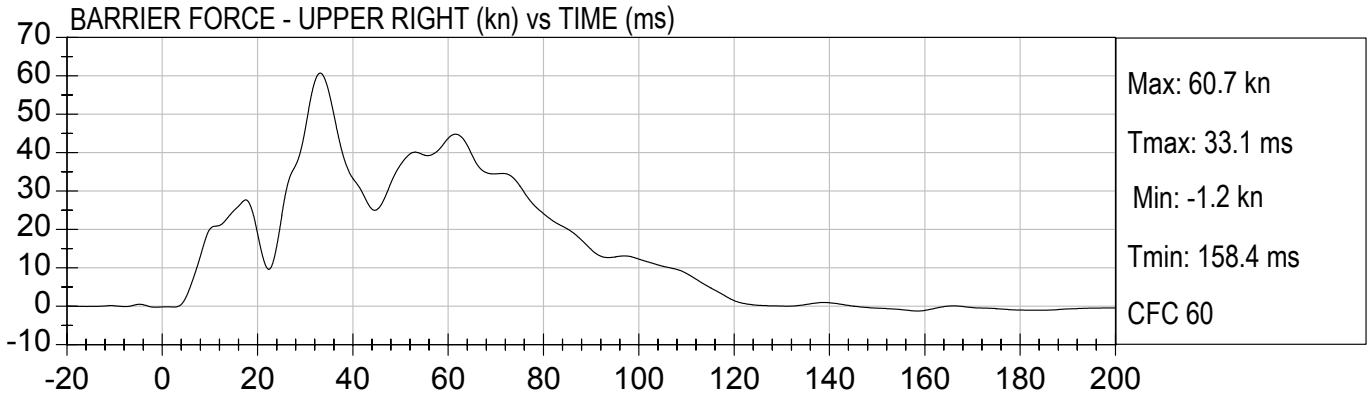


35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)

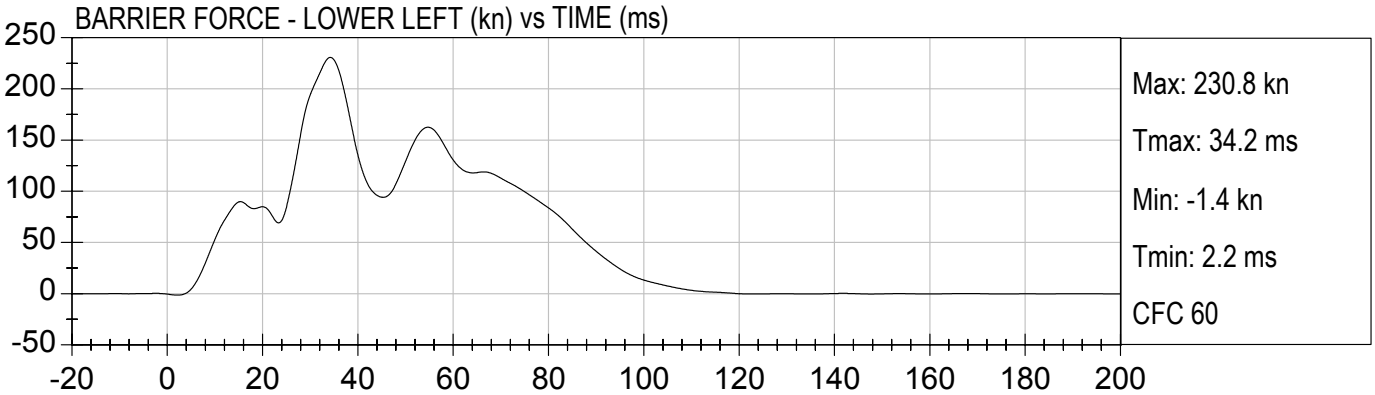


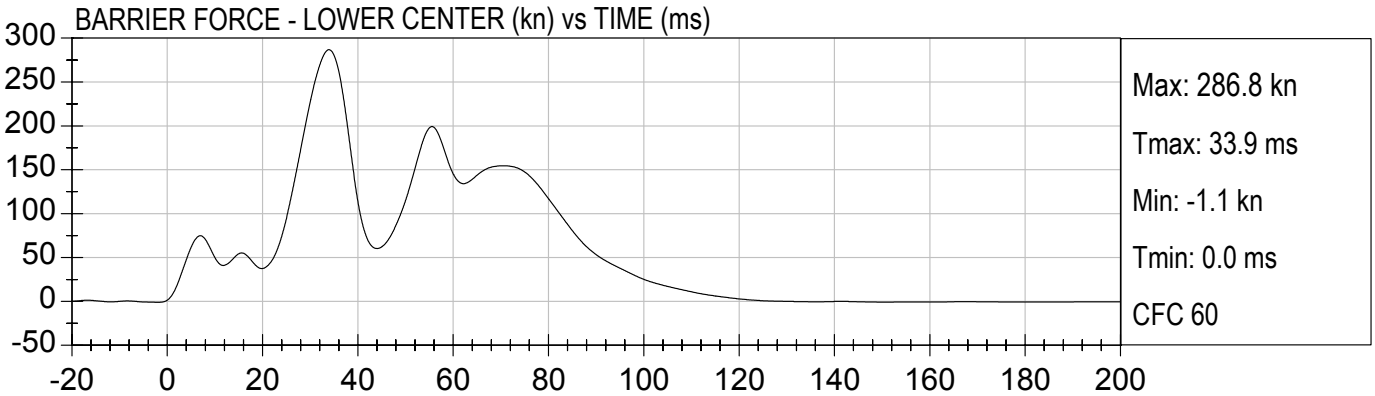


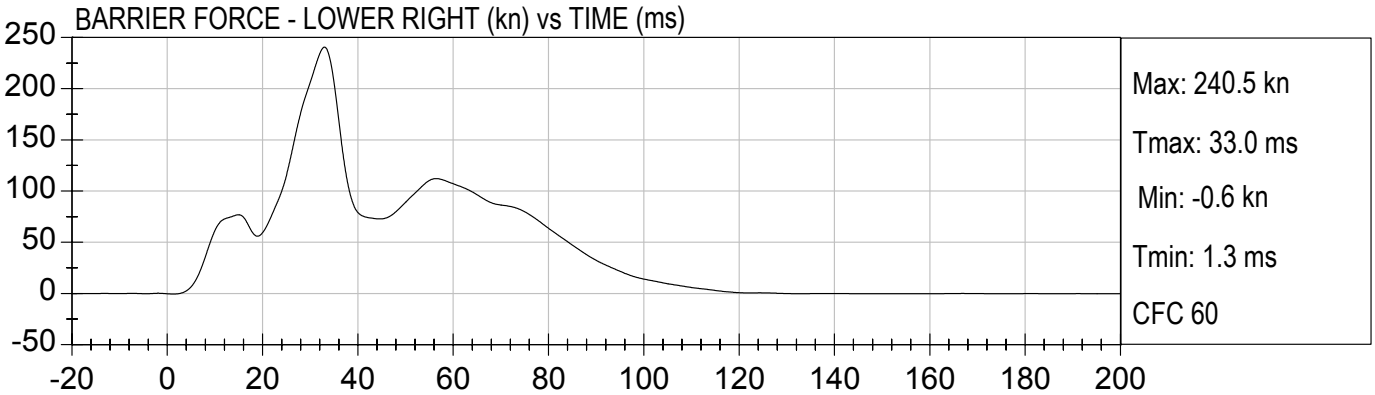


35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)

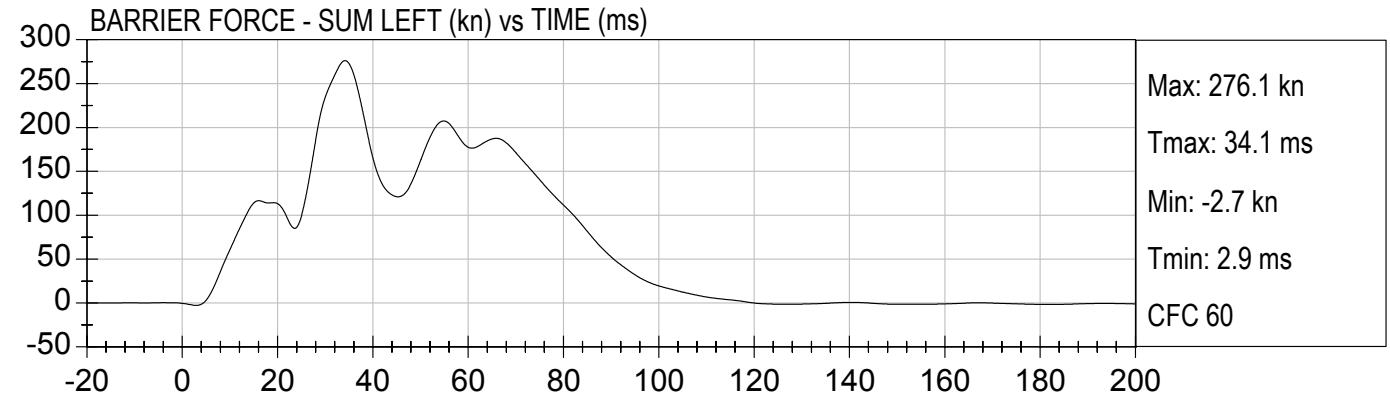


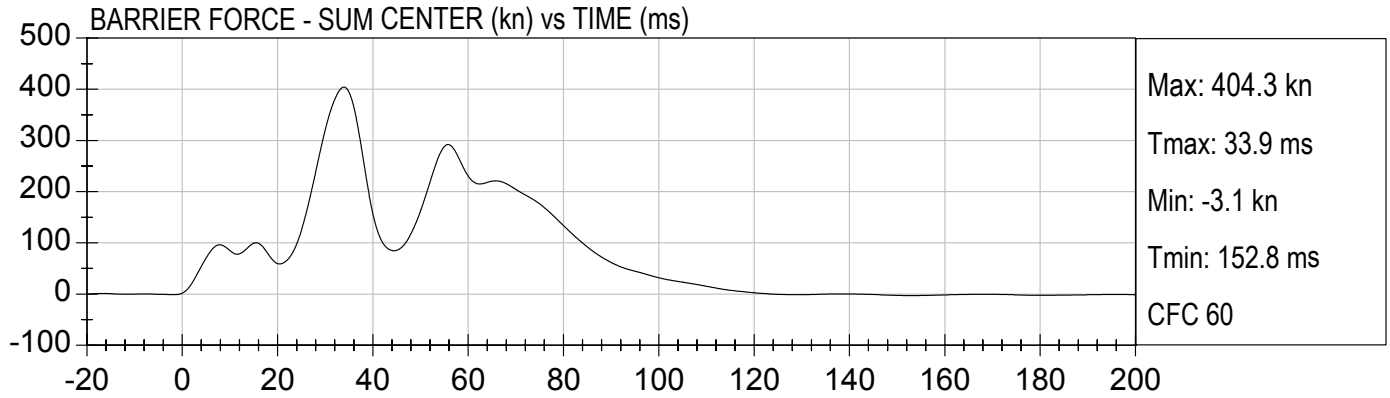


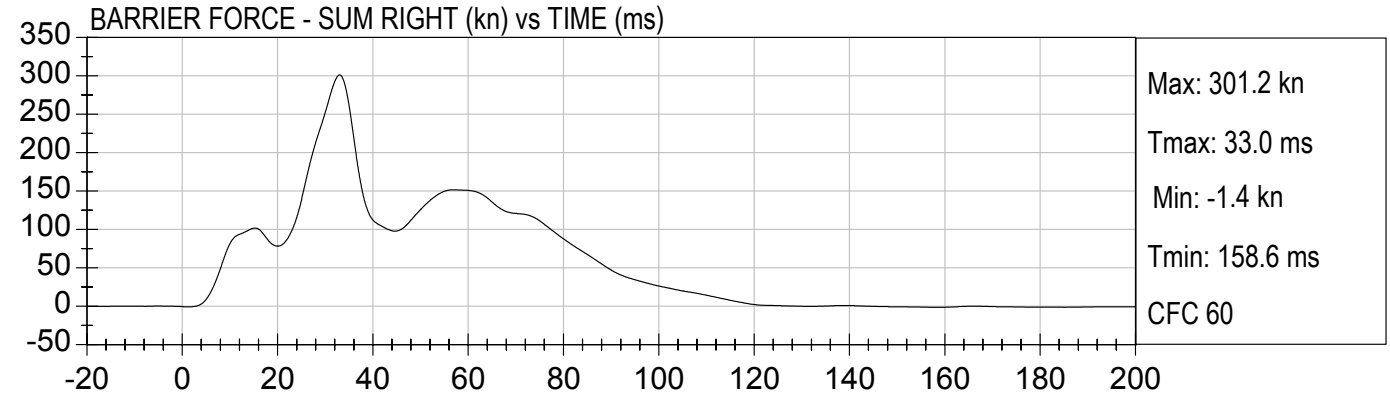


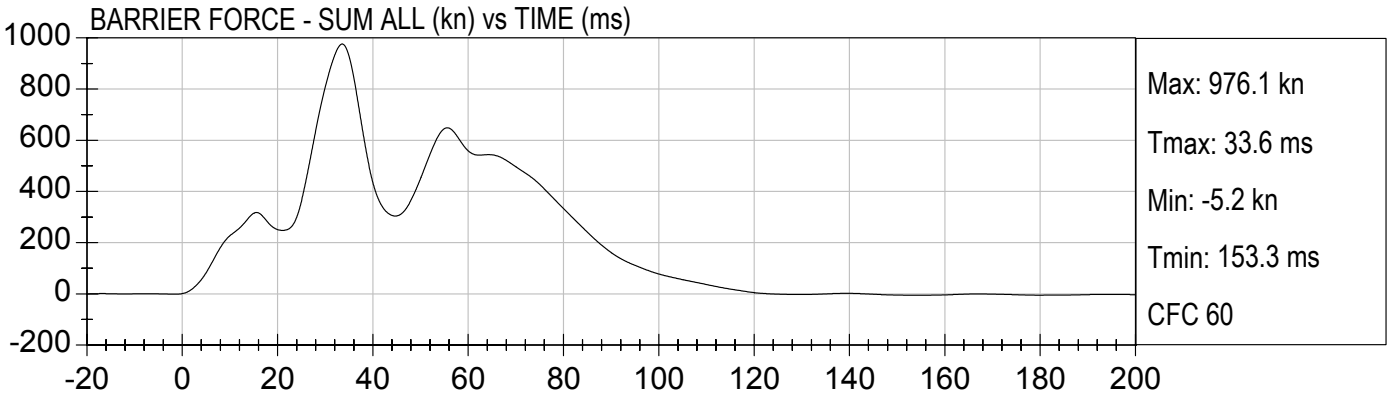
35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)



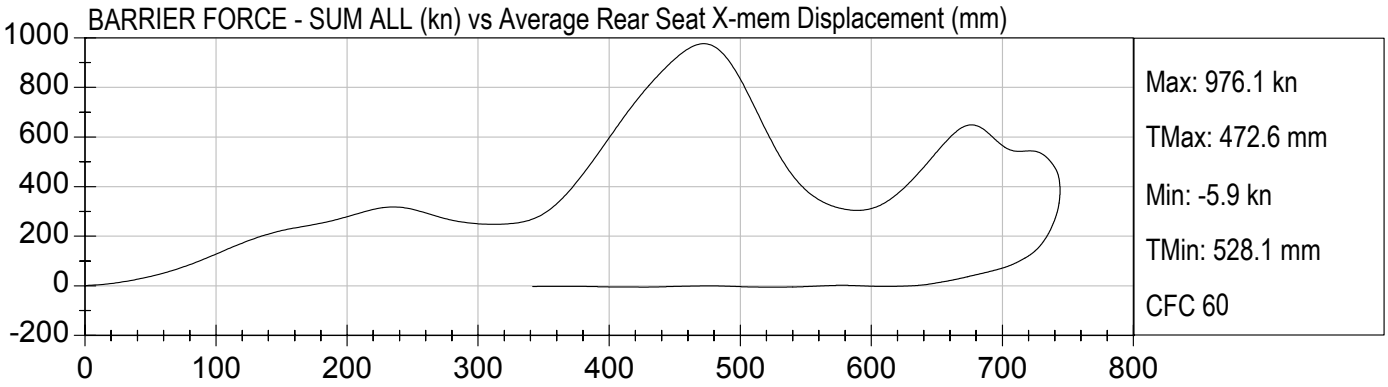






35MPH NCAP FRONTAL IMPACT
2004 TOYOTA SIENNA

Test Date: 11/25/03
Speed: 35.2 mph (56.6 km/h)



APPENDIX C

DUMMY CALIBRATION DATA TRACES AND TABLES

CERTIFICATION DATA

Dummy Serial Number: 066

Calibration Test Results Summary

Dummy Serial Number: 066

Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Flexion Test:	The neck passed all flexion test requirements.
Neck Extension Test:	The neck passed all extension test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Knee Impact Tests:	Both knees passed all impact test requirements.
Hip-Femur Flexion Tests:	Both femurs passed all flexion test requirements.

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Dummy Serial Number: 066

Date of Verification: 9/29/03

Test Number: D03190

DESCRIPTION	SPECIFICATION	TEST RESULTS
Temperature (°F)	20.6 – 22.2	21.7
Relative Humidity	10 – 70 %	29
AA - Location for Chest Circumference	429.3 – 434.3 mm	431.8
BB - Location for Waist Circumference	226.1 – 231.1 mm	228.6
A - Total Sitting Height	878.8 – 889.0 mm	879.5
B – Shoulder Pivot Height	505.5 – 520.7 mm	514.4
C – H Point Height	82.9 – 88.9 mm	88.9
D – H Point from Seat Back	134.7 – 139.7 mm	136.5
E – Shoulder Pivot From Backline	84.8 – 94.0 mm	94.0
F – Thigh Clearance	139.7 – 154.9 mm	146.1
G – Back of Elbow to Wrist Pivot	289.6 – 304.8 mm	292.1
H – Skull Cap Skin to Backline	40.7 – 45.7 mm	44.5
I – Shoulder Elbow Length	330.2 – 345.4 mm	330.2
J – Elbow Rest Height	190.5 – 210.9 mm	205.7
K – Buttock Knee Length	579.1 – 604.5 mm	596.9
L – Popliteal Height	429.3 – 454.7 mm	438.2
M – Knee Pivot Height	485.2 – 500.4 mm	495.3
N – Buttock Popliteal Length	452.1 – 477.5 mm	463.6
O – Chest Depth at 3rd Rib	213.4 – 228.6 mm	215.9
P – Foot Length	251.5 – 266.7 mm	260.4
V – Shoulder Breadth	421.7 – 436.9 mm	436.9
W – Foot Breadth	91.5 – 106.7 mm	101.6
Y – Chest Circumference	970.3 – 1000.7 mm	984.3
Z – Waist Circumference	835.7 – 866.1 mm	866.1

Technician: Jessica Hall

Approved By: Shefalika Jyawal

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

ATD Serial No: 066 **Test I.D:** D031901

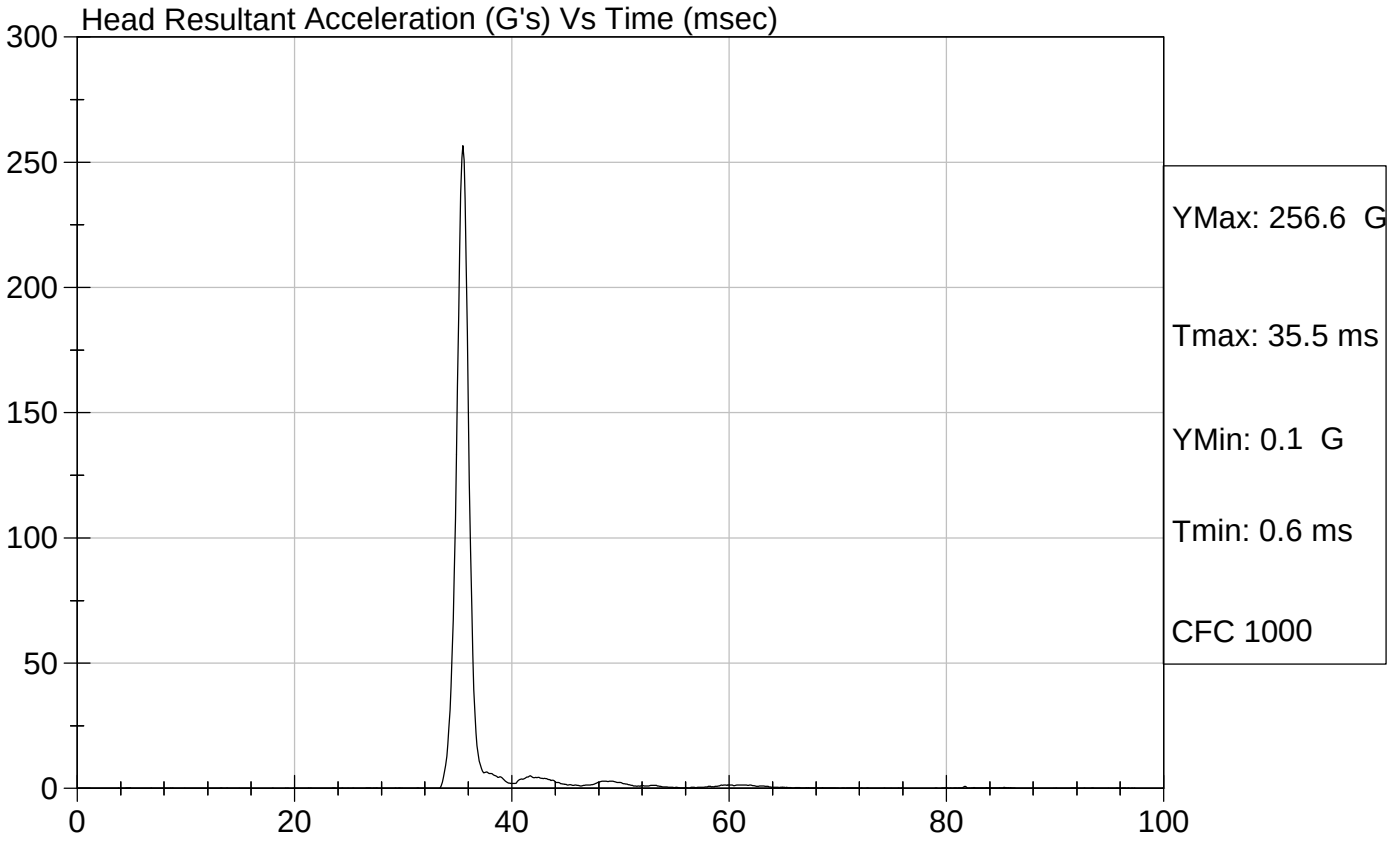
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	256.6	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	1.1	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
		Overall Test Results		Pass

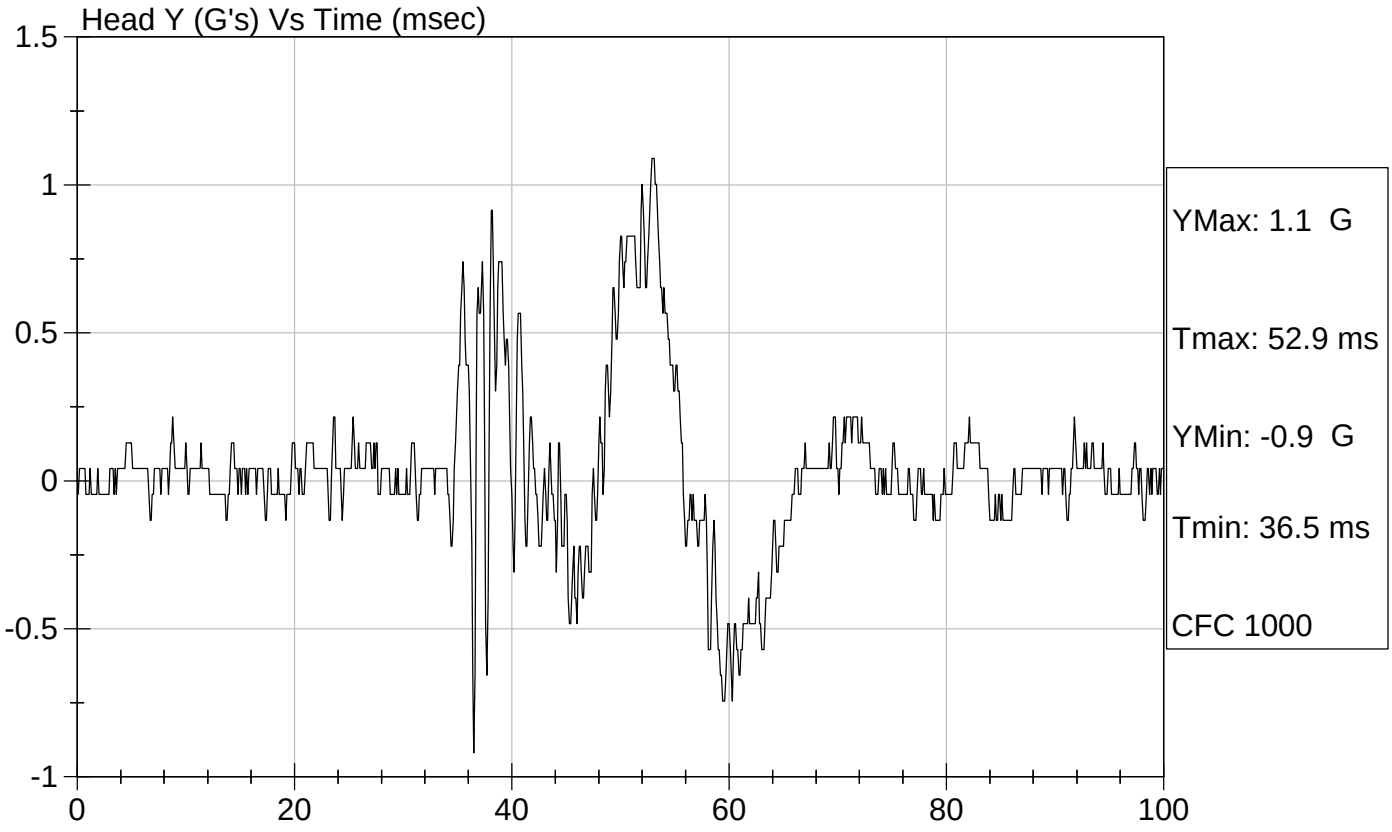
Jessica Gall
Laboratory Technician

11/19/2003
Test Date

Shefalika Jgarwal
Approved By

	Test Description: Head Drop	Test Date: 11/19/2003
	Component: D031901	Speed: 0 ft/s, 0.00 m/s





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

ATD Serial No: 066 **Test I.D:** D031902

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.12	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	23.05	Pass
	20 msec	G's	17.60 to 22.60	19.52	Pass
	30 msec	G's	12.50 to 18.50	15.93	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.93	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	39.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	73.3	Pass
	Time	msec	57.0 to 64.0	57.9	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.0	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	94.5	Pass
	Time	msec	47.0 to 58.0	52.5	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	101.0	Pass
			Overall Test Results		Pass

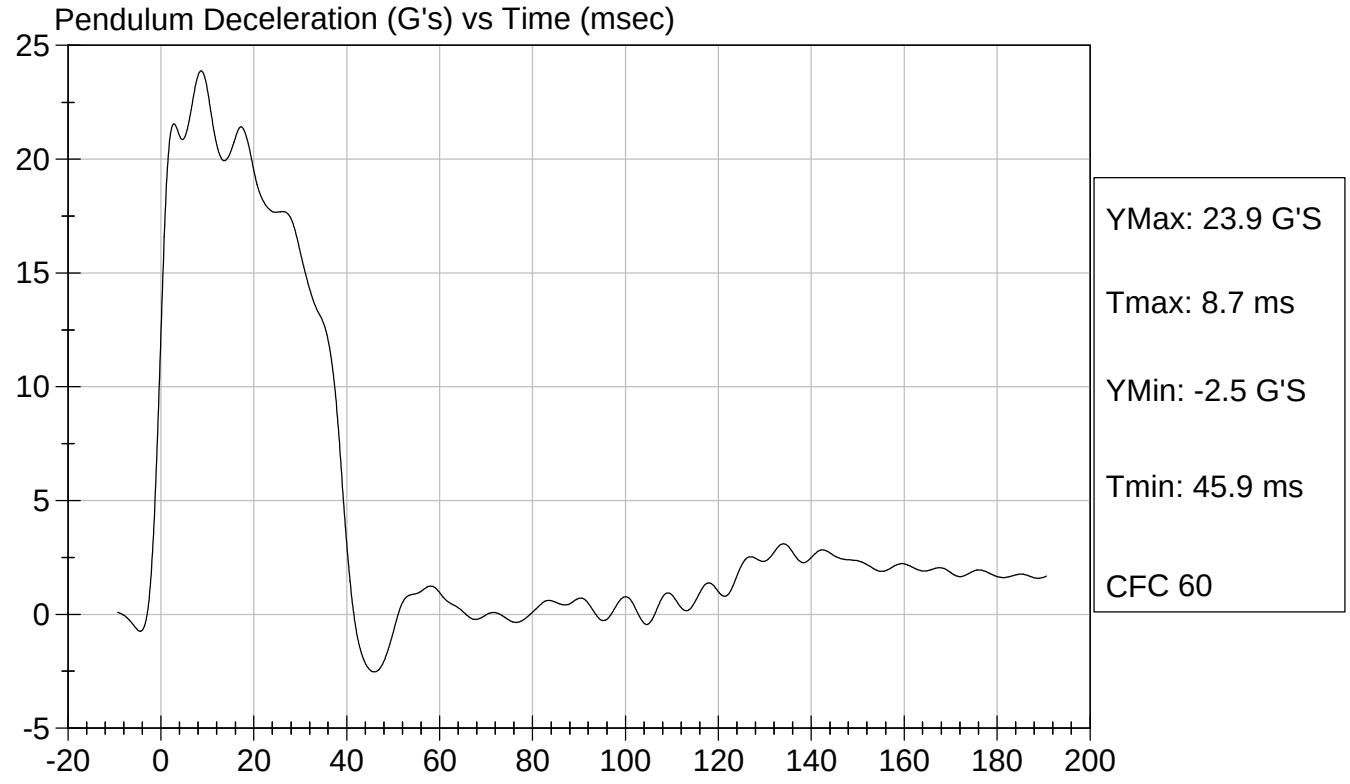
Jessica Gall
Laboratory Technician

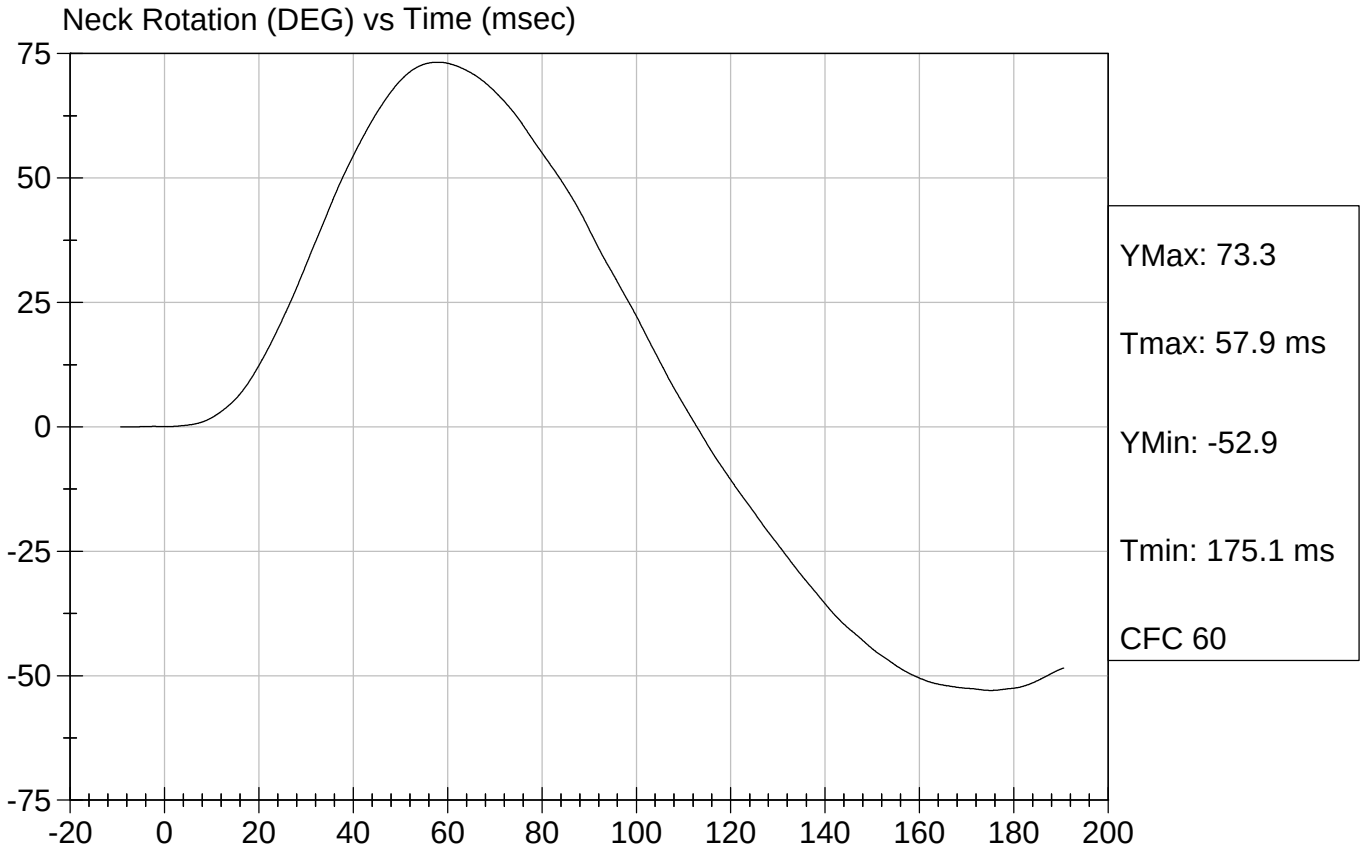
11/22/2003
Test Date

Shefalika Jgarwal
Approved By

Test Desc: Neck Flexion
Component ID: D031902

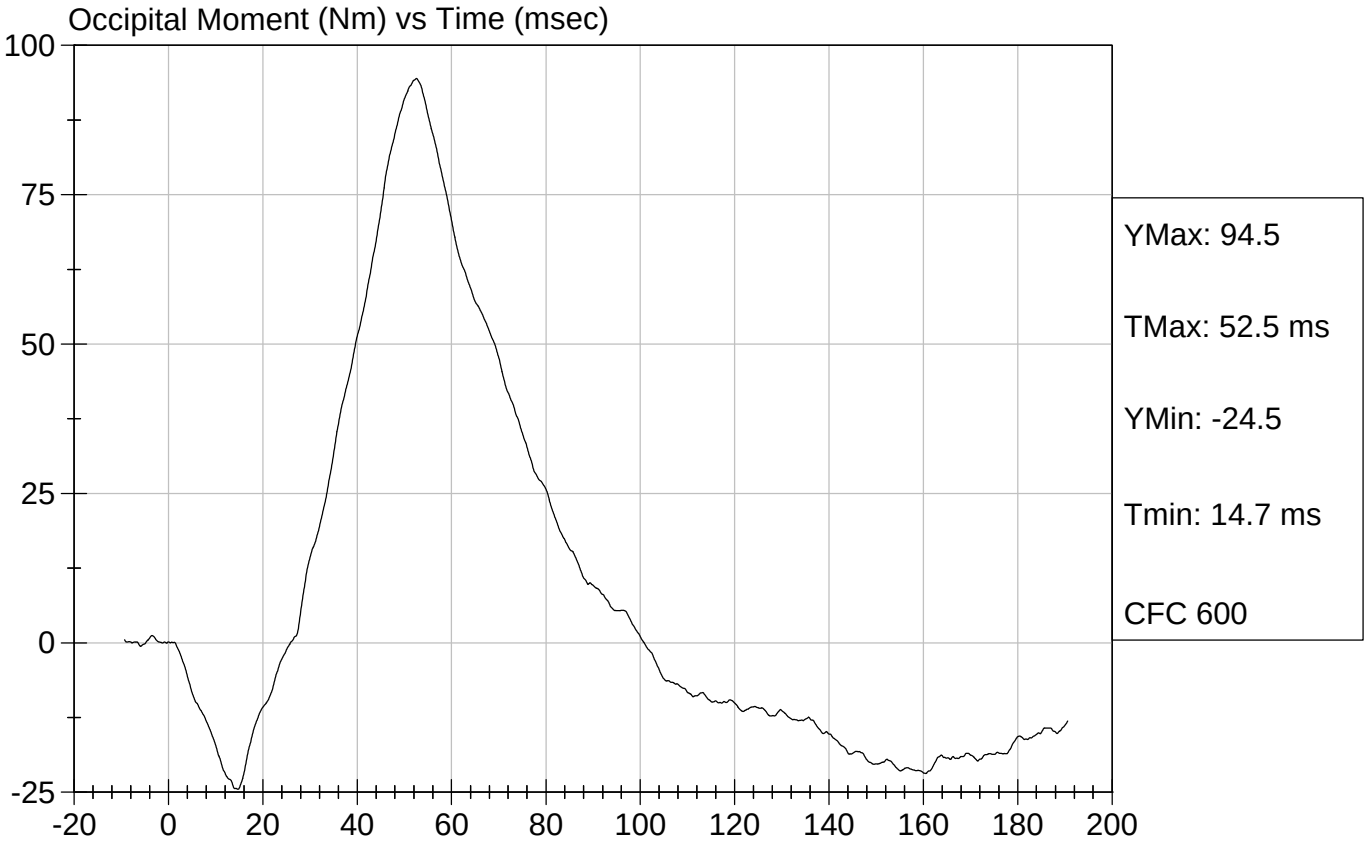
Test Date: 11/22/2003
Speed: 23.36 ft/sec, 7.12 m/sec





Test Desc: Neck Flexion
Component ID: D031902

Test Date: 11/22/2003
Speed: 23.36 ft/sec, 7.12 m/sec



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

ATD Serial No: 066 **Test I.D:** D031903

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.18	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.81	Pass
	20 msec	G's	14.00 to 19.00	15.74	Pass
	30 msec	G's	11.00 to 16.00	13.25	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.3	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	42.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.4	Pass
	Time	msec	72.0 to 82.0	76.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	151.5	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-68.7	Pass
	Time	msec	65.0 to 79.0	71.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	140.8	Pass
			Overall Test Results		Pass

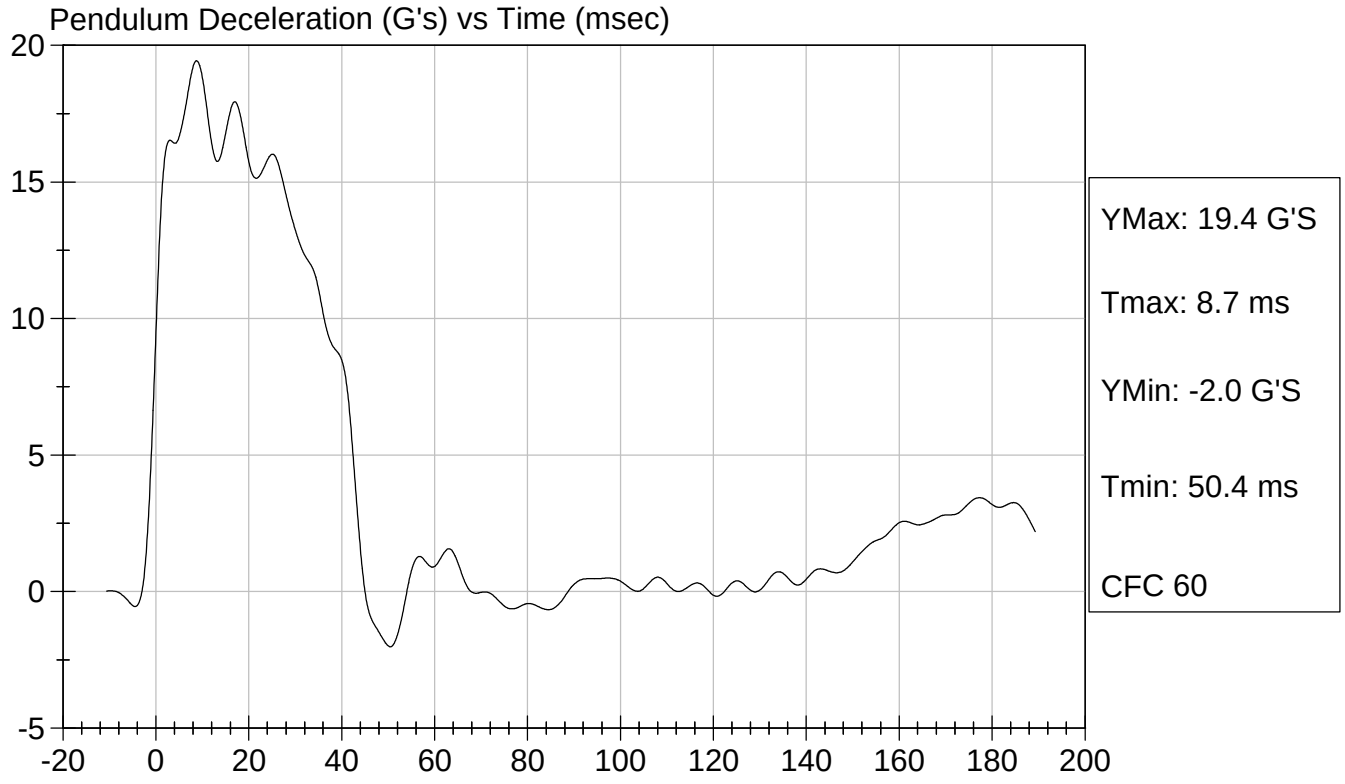
Jessica Gall
Laboratory Technician

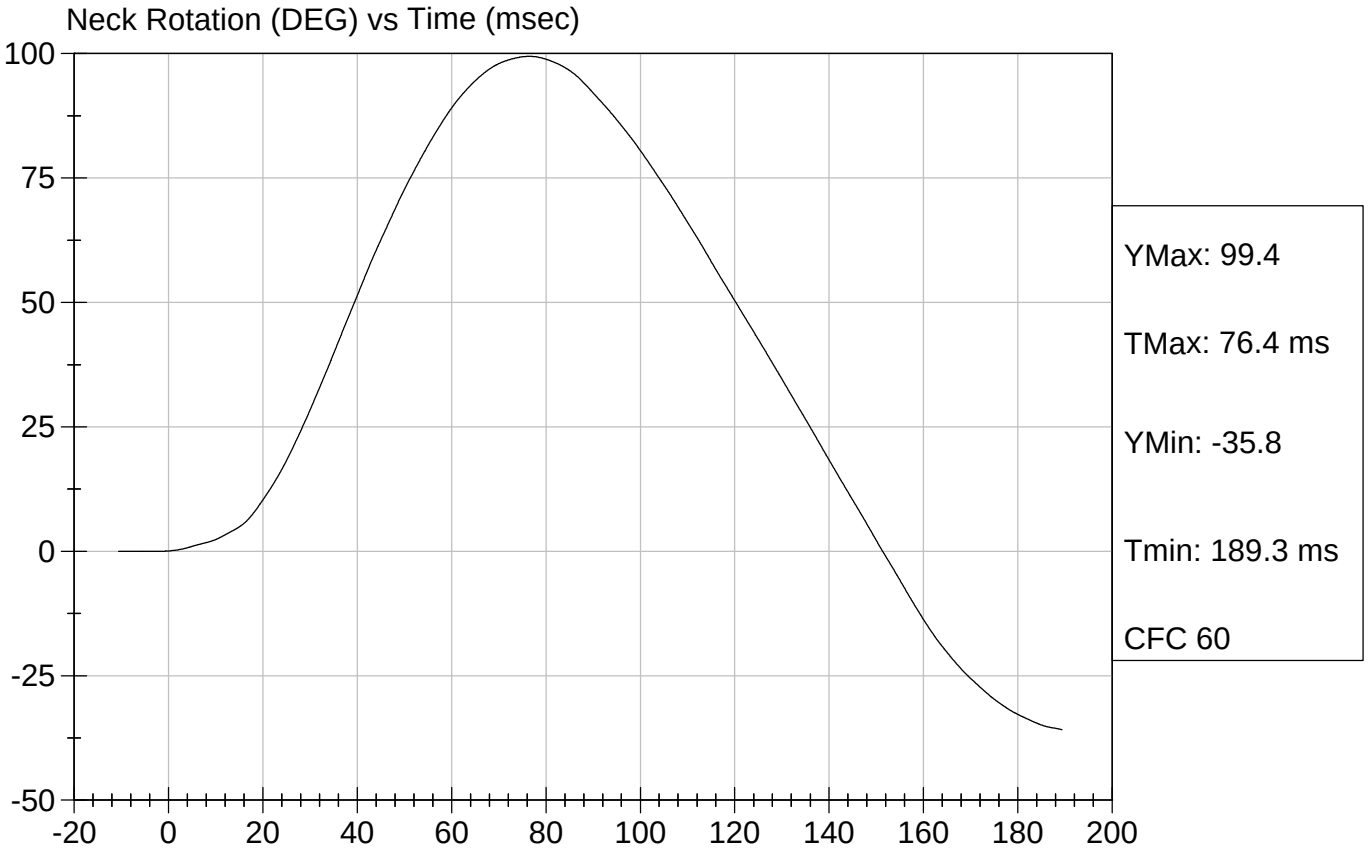
11/22/2003
Test Date

Shefalika Jgarwal
Approved By

Test Desc: Neck Extension
Component ID: D031903

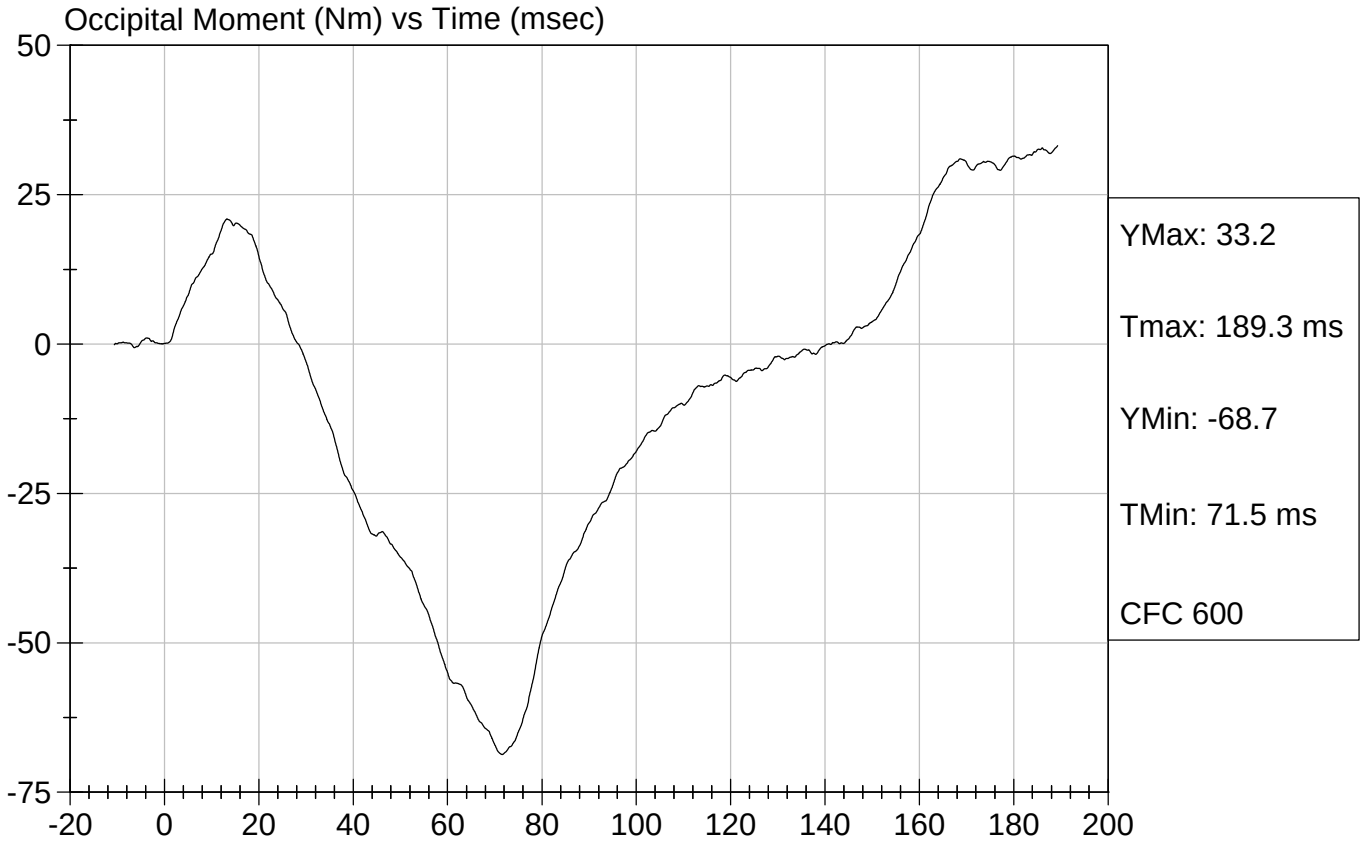
Test Date: 11/22/2003
Speed: 20.28 ft/sec, 6.18 m/sec





Test Desc: Neck Extension
Component ID: D031903

Test Date: 11/22/2003
Speed: 20.28 ft/sec, 6.18 m/sec



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

ATD Serial No: 066 **Test I.D:** D031904

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	17	Pass
Probe Velocity	m/s	6.58 to 6.82	6.82	Pass
Peak Probe Force	Newtons	5159 to 5893	5,595	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.57	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/24/2003
Test Date

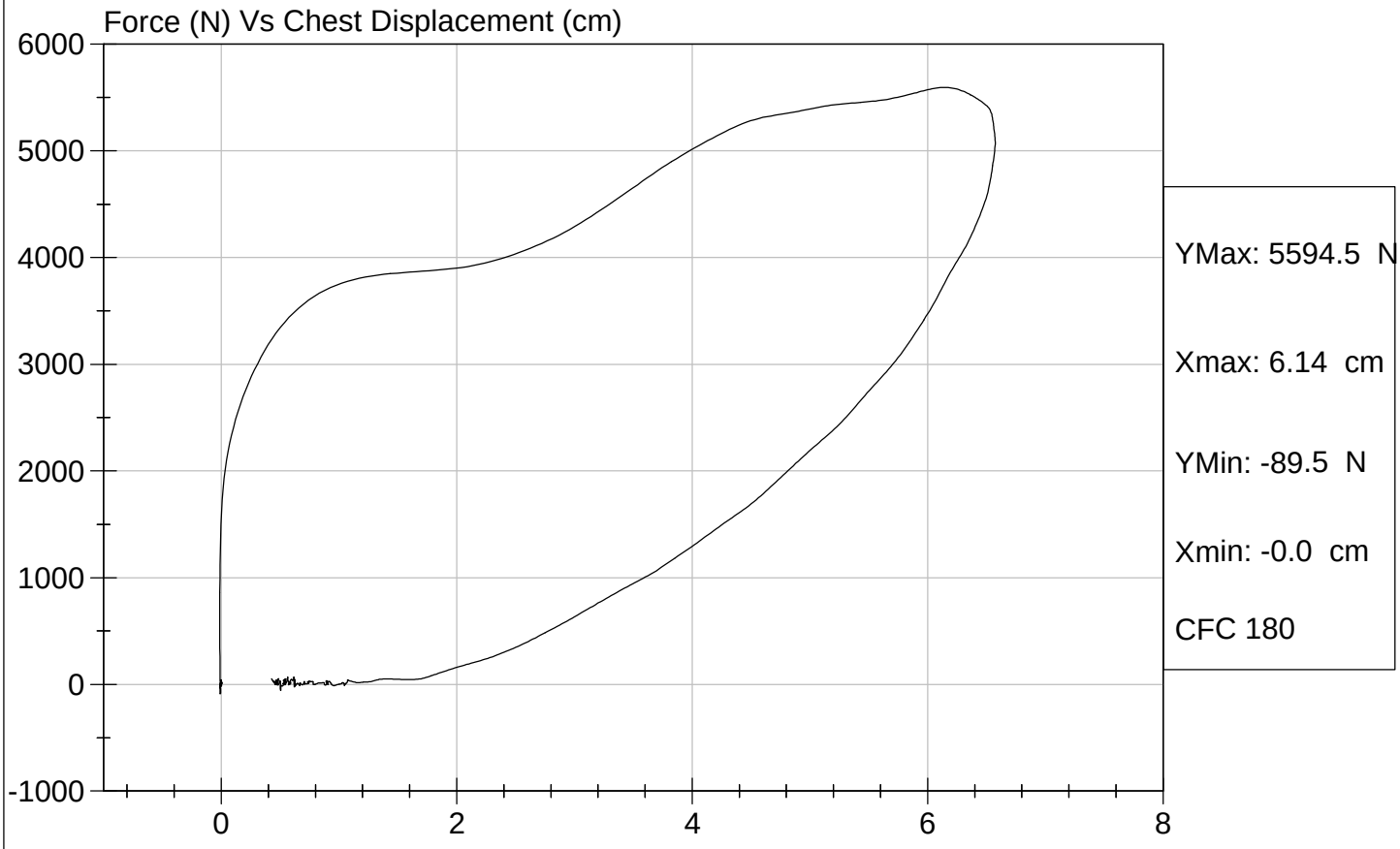
Shefalika Jgarwal
Approved By

Test Description: Thorax Impact

Test Date: 11/24/2003

Component: D031904

Speed: 22.37 ft/sec, 6.82 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 066 **Test I.D:** D031905

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,277	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/22/2003
Test Date

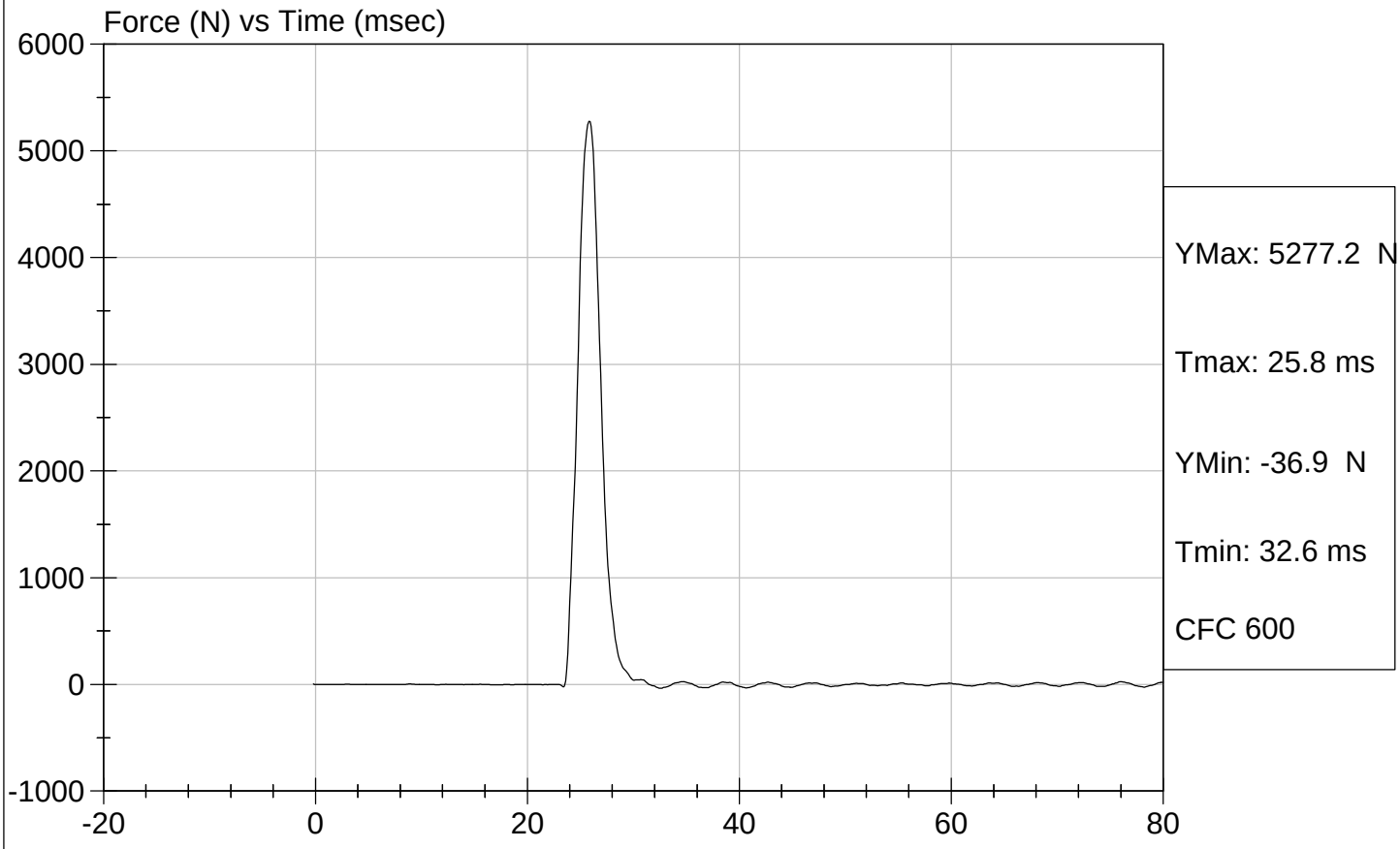
Shefalika Jgarwal
Approved By

Test Description: Right Knee

Test Date: 11/22/2003

Component: D031905

Speed: 6.8 ft/sec, 2.073 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Left Knee Impact Test

ATD Serial No: 066 **Test I.D:** D031906

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,105	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/22/2003
Test Date

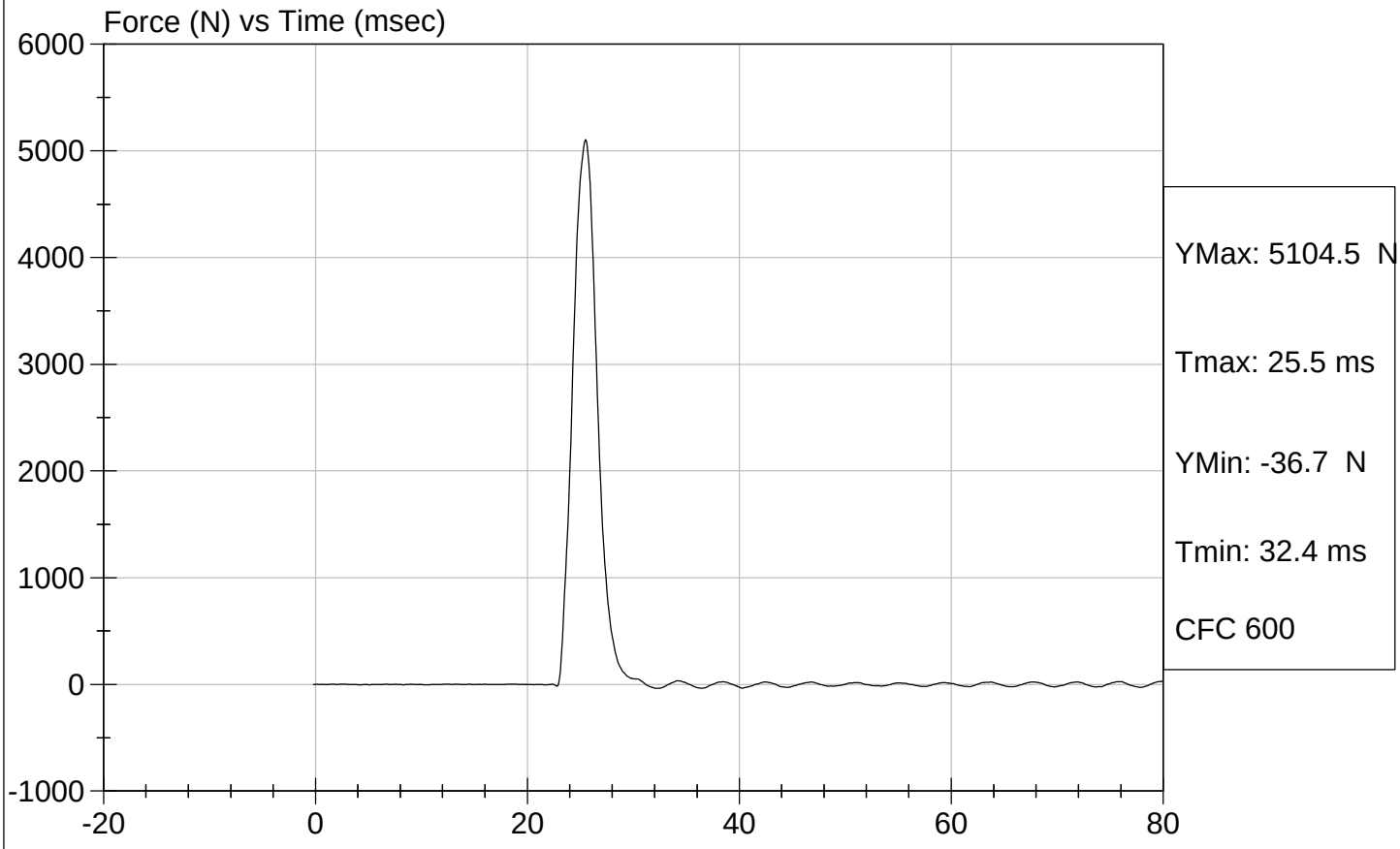
Shefalika Jgarwal
Approved By

Test Description: Left Knee

Test Date: 11/22/2003

Component: D031906

Speed: 6.84 ft/sec, 2.085 m/sec



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

ATD Serial No: 066 **Test I.D:** D031900

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.1	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	30	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	78.1	81.2	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	40	Pass
		Overall Test Results			Pass

Jessica Gall
Laboratory Technician

11/21/2003
Test Date

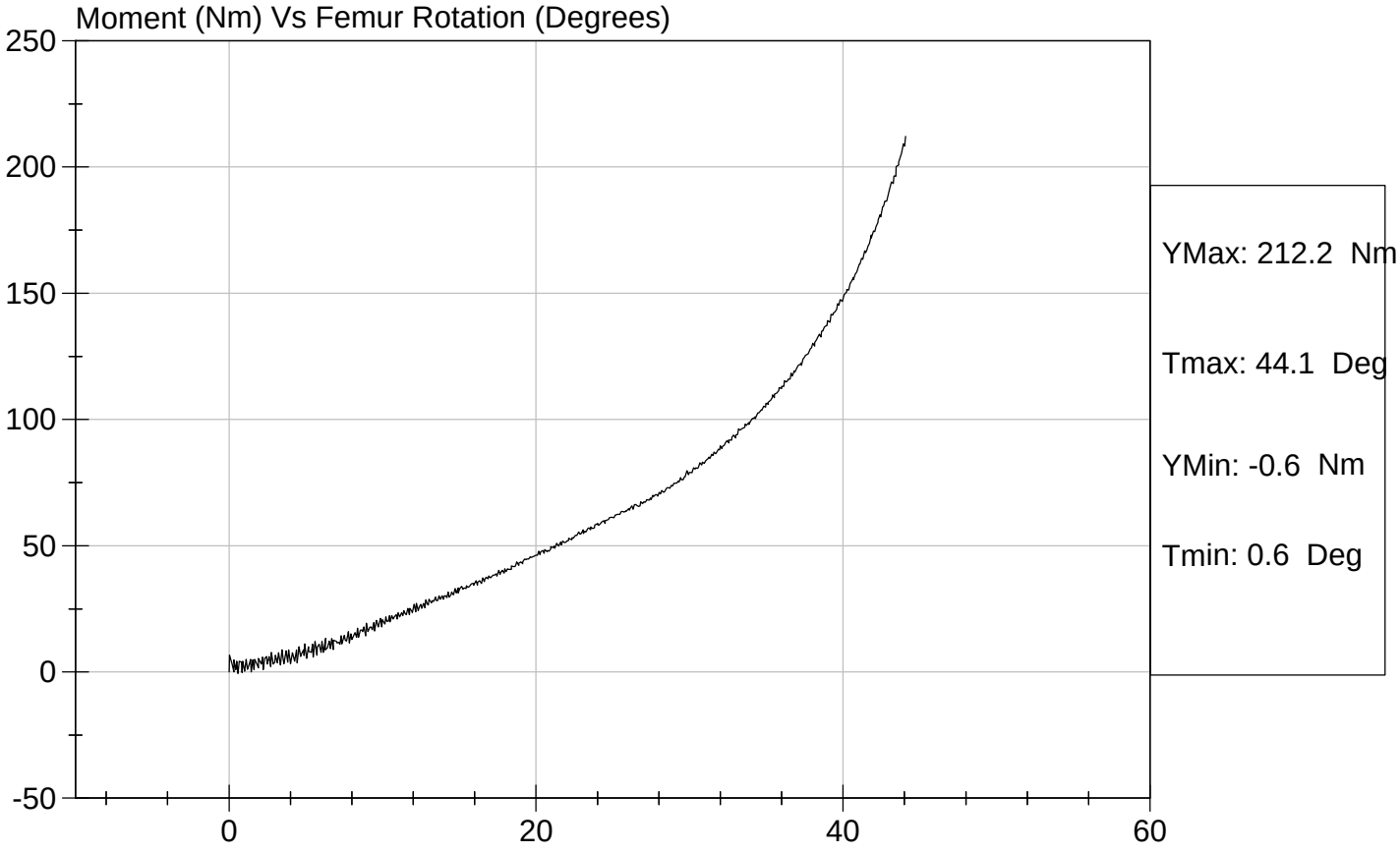
Shefalika Jgarwal
Approved By

Test Description: Hip Femur Flexion

Test Date: 11/21/2003

Component: D031909

Speed: 0 ft/sec, 0.00 m/sec

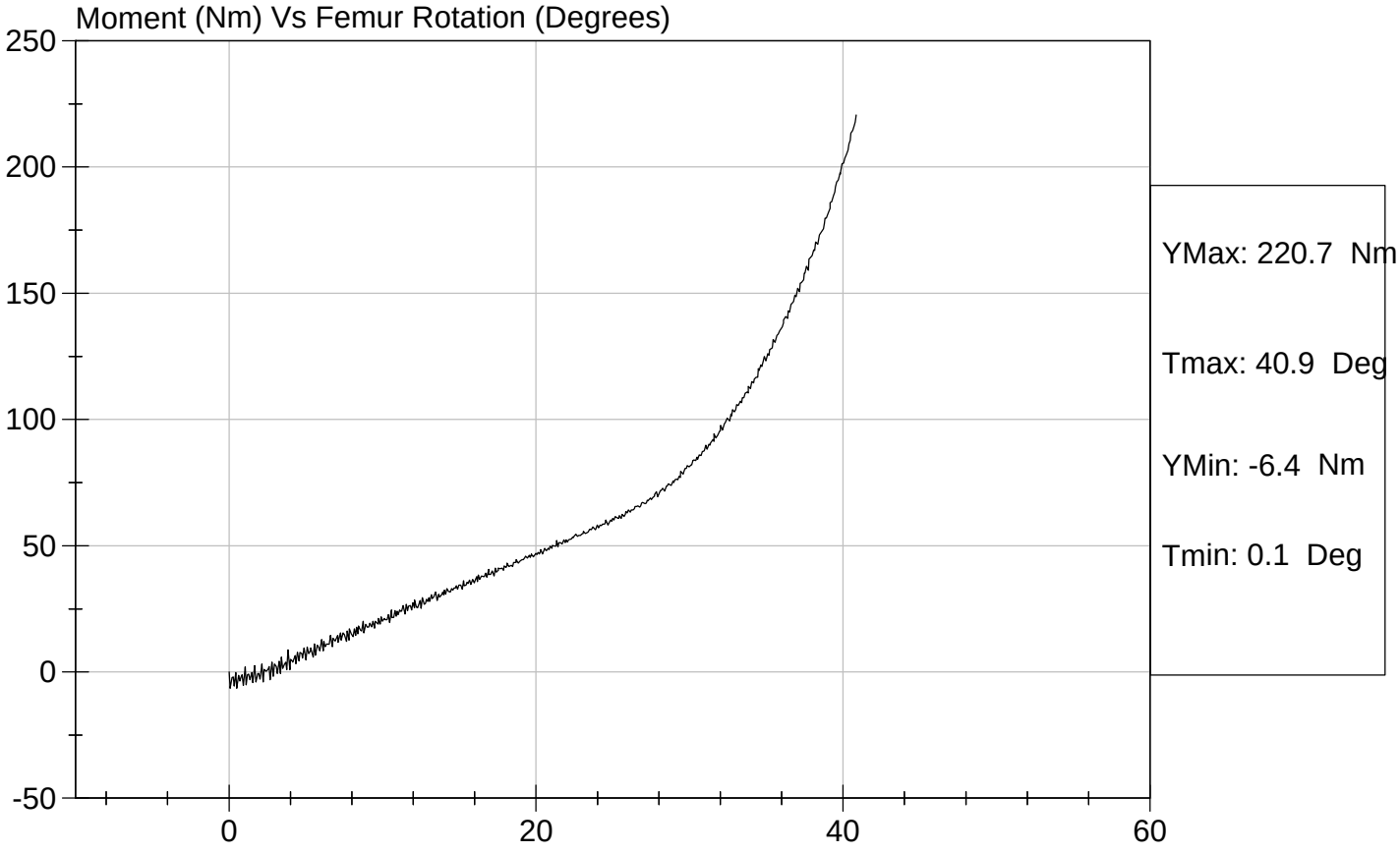


Test Description: Hip Femur Flexion

Test Date: 11/21/2003

Component: D031900

Speed: 0 ft/sec, 0.00 m/sec



DUMMY INSPECTION CHECKLIST

Type: Hybrid III

Dummy Serial Number: 066

Inspected By: Jessica Gall

Date: 11/24/03

Part	Items Checked	Comments
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque, nodding blocks	OK
Clavicles	visual, bumpers, range of motion	OK
Arms/Hands	visual, bumpers, range of motion	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual, bumpers	OK
Lumbar spine	visual, cable torque	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual, load cell bolts	OK
Knees	visual, stops, inserts, sliders	OK
Lower legs	visual, range of motion	OK
Ankles	visual, range of motion	OK
Feet	visual, range of motion	OK
Joints	1 to 2 g range	OK
Other		

Notes (include component/problem/action/reason):

CERTIFICATION DATA

Dummy Serial Number: 065

Calibration Test Results Summary

Dummy Serial Number: 065

Calibration

External Dimensions:	The dummy passed all external dimension requirements.
Head Drop Test:	The head passed all drop test requirements.
Neck Flexion Test:	The neck passed all flexion test requirements.
Neck Extension Test:	The neck passed all extension test requirements.
Thorax Impact Test:	The thorax passed all impact test requirements.
Knee Impact Tests:	Both knees passed all impact test requirements.
Hip-Femur Flexion Tests:	Both femurs passed all flexion test requirements.

HYBRID III DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Dummy Serial Number: 065

Date of Verification: 9/29/03

Test Number: D03189

DESCRIPTION	SPECIFICATION	TEST RESULTS
Temperature (°F)	20.6 – 22.2	21.1
Relative Humidity	10 – 70 %	30
AA - Location for Chest Circumference	429.3 – 434.3 mm	431.8
BB - Location for Waist Circumference	226.1 – 231.1 mm	228.6
A - Total Sitting Height	878.8 – 889.0 mm	882.7
B – Shoulder Pivot Height	505.5 – 520.7 mm	508.0
C – H Point Height	82.9 – 88.9 mm	88.9
D – H Point from Seat Back	134.7 – 139.7 mm	139.7
E – Shoulder Pivot From Backline	84.8 – 94.0 mm	94.0
F – Thigh Clearance	139.7 – 154.9 mm	146.1
G – Back of Elbow to Wrist Pivot	289.6 – 304.8 mm	292.1
H – Skull Cap Skin to Backline	40.7 – 45.7 mm	44.5
I – Shoulder Elbow Length	330.2 – 345.4 mm	330.2
J – Elbow Rest Height	190.5 – 210.9 mm	196.9
K – Buttock Knee Length	579.1 – 604.5 mm	603.3
L – Popliteal Height	429.3 – 454.7 mm	444.5
M – Knee Pivot Height	485.2 – 500.4 mm	488.2
N – Buttock Popliteal Length	452.1 – 477.5 mm	469.9
O – Chest Depth at 3rd Rib	213.4 – 228.6 mm	215.9
P – Foot Length	251.5 – 266.7 mm	254.0
V – Shoulder Breadth	421.7 – 436.9 mm	434.3
W – Foot Breadth	91.5 – 106.7 mm	98.4
Y – Chest Circumference	970.3 – 1000.7 mm	977.9
Z – Waist Circumference	835.7 – 866.1 mm	844.6

Technician: Jessica Gall

Approved By: Shefalika Jyawal

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

ATD Serial No: 065 **Test I.D:** D031891

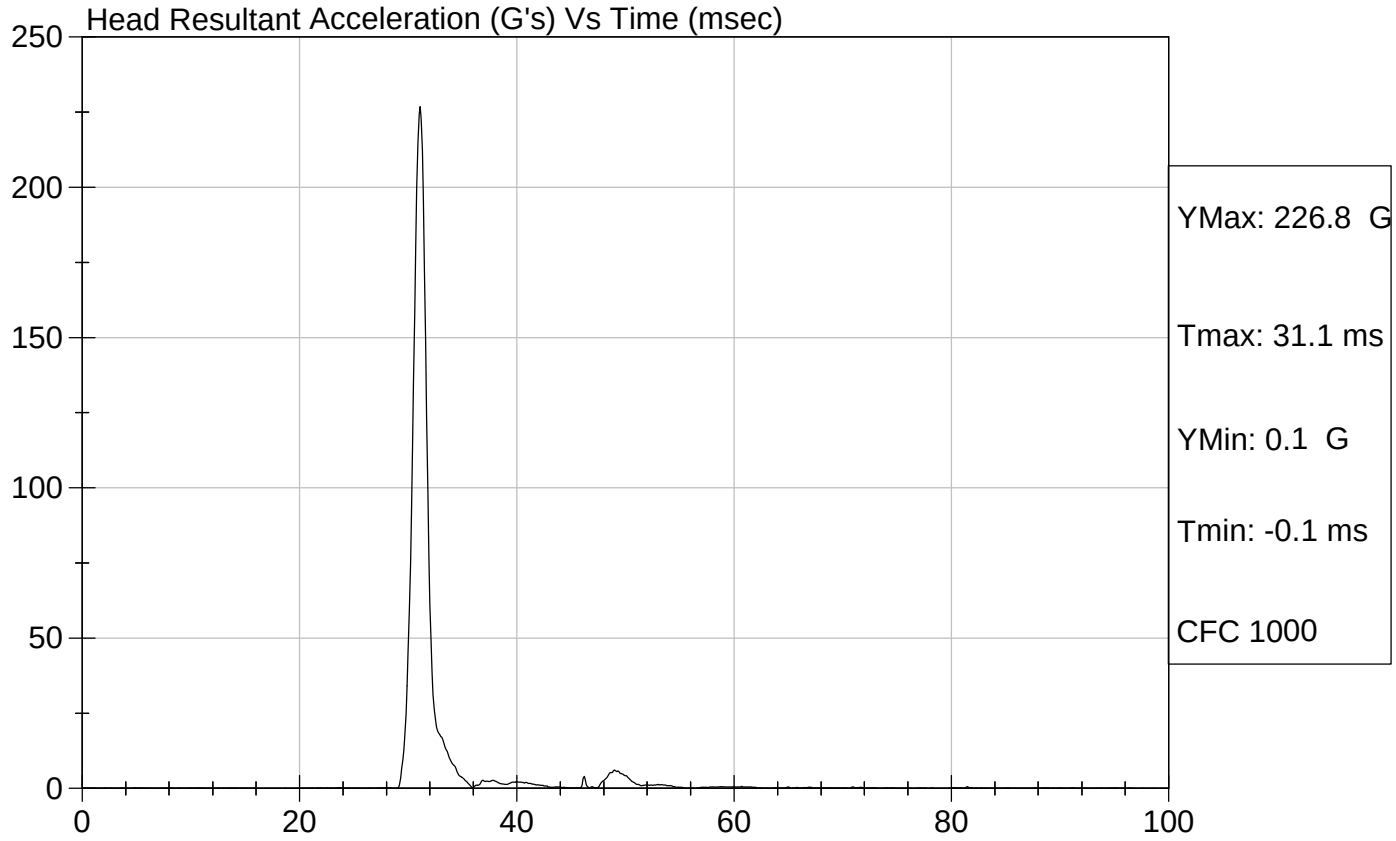
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	29	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	226.8	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	12.3	Pass
Is Acceleration Unimodal?	Yes/No	< 10% Peak	Yes	Pass
		Overall Test Results		Pass

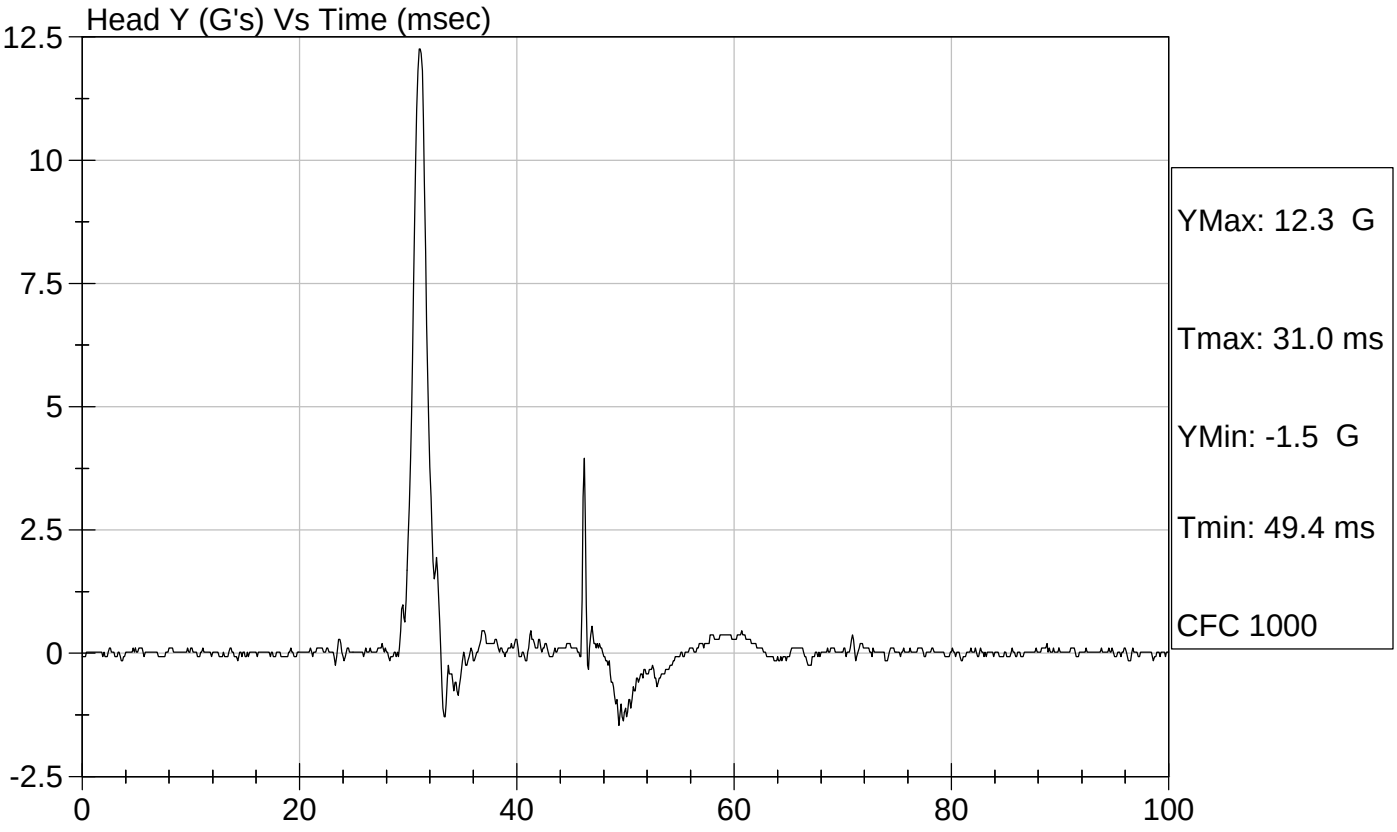
Jessica Gall
Laboratory Technician

11/19/2003
Test Date

Shefalika Jgarwal
Approved By

	Test Description: Head Drop	Test Date: 11/19/2003
	Component: D031891	Speed: 0 ft/s, 0.00 m/s





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

ATD Serial No: 065 **Test I.D:** D031892

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.89	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.58	Pass
	20 msec	G's	17.60 to 22.60	19.05	Pass
	30 msec	G's	12.50 to 18.50	14.62	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.62	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	65.9	Pass
	Time	msec	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	114.3	Pass
Moment About Occipital Condyle	Maximum	N m	84.1 to 108.5	85.5	Pass
	Time	msec	47.0 to 58.0	50.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	104.3	Pass
			Overall Test Results		Pass

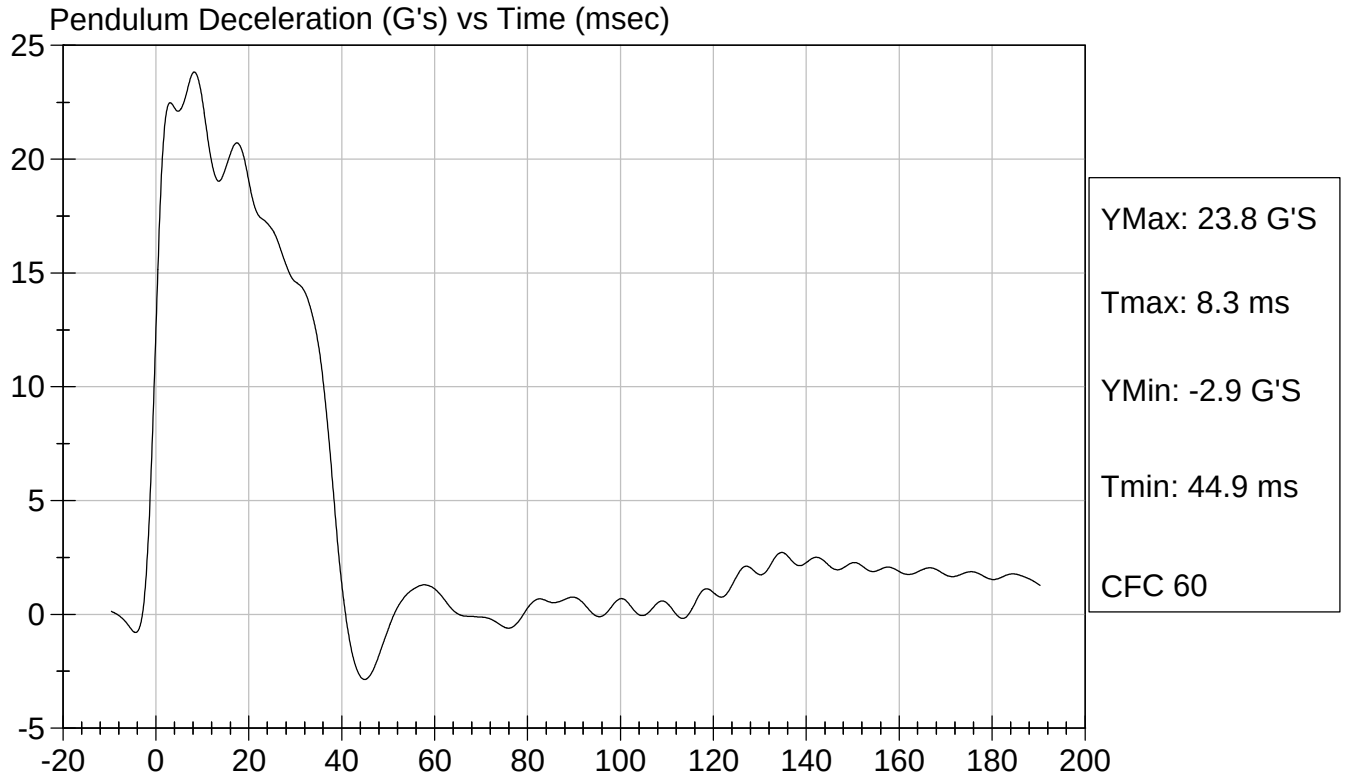
Jessica Gall
Laboratory Technician

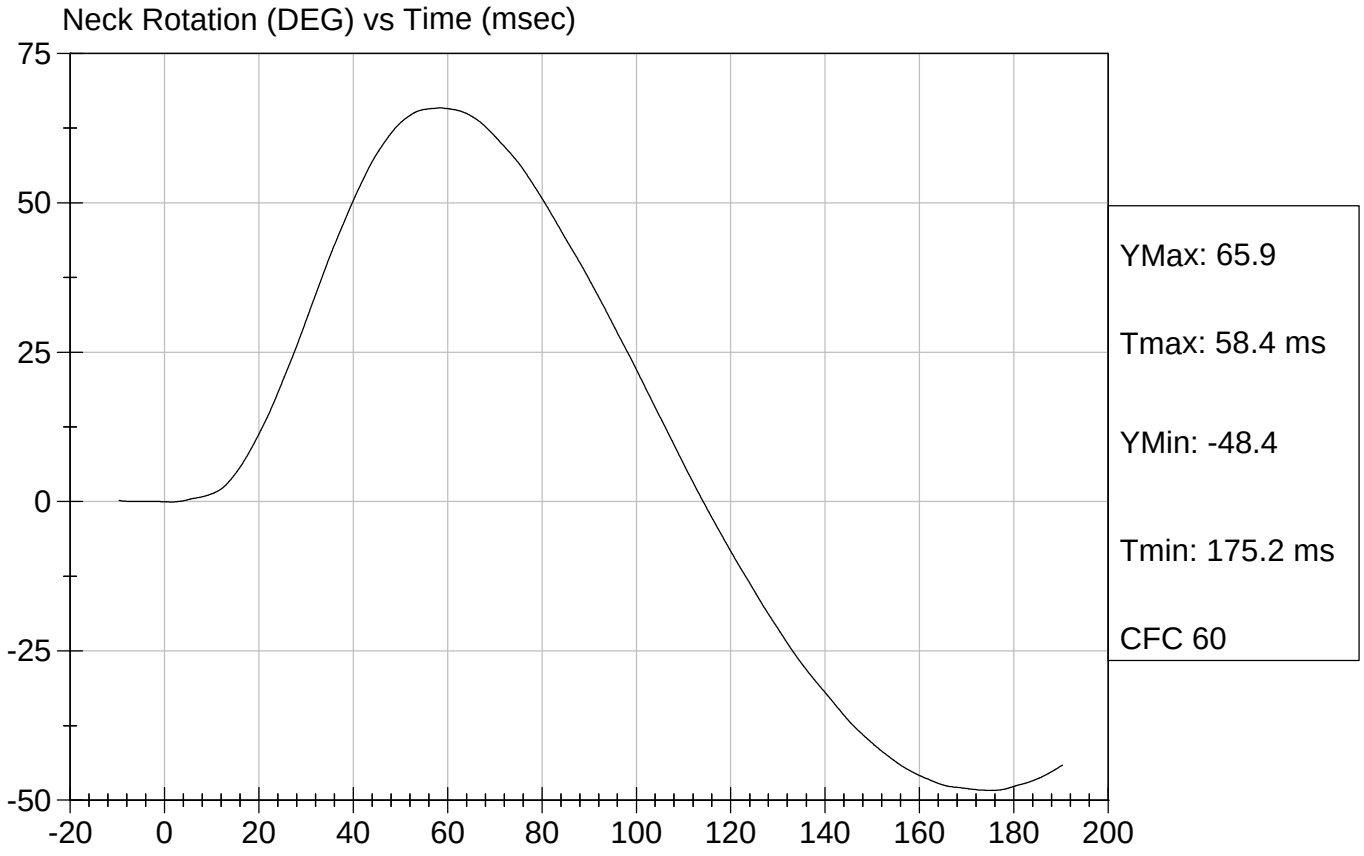
11/19/2003
Test Date

Shefalika Jgarwal
Approved By

Test Desc: Neck Flexion
Component ID: D031892

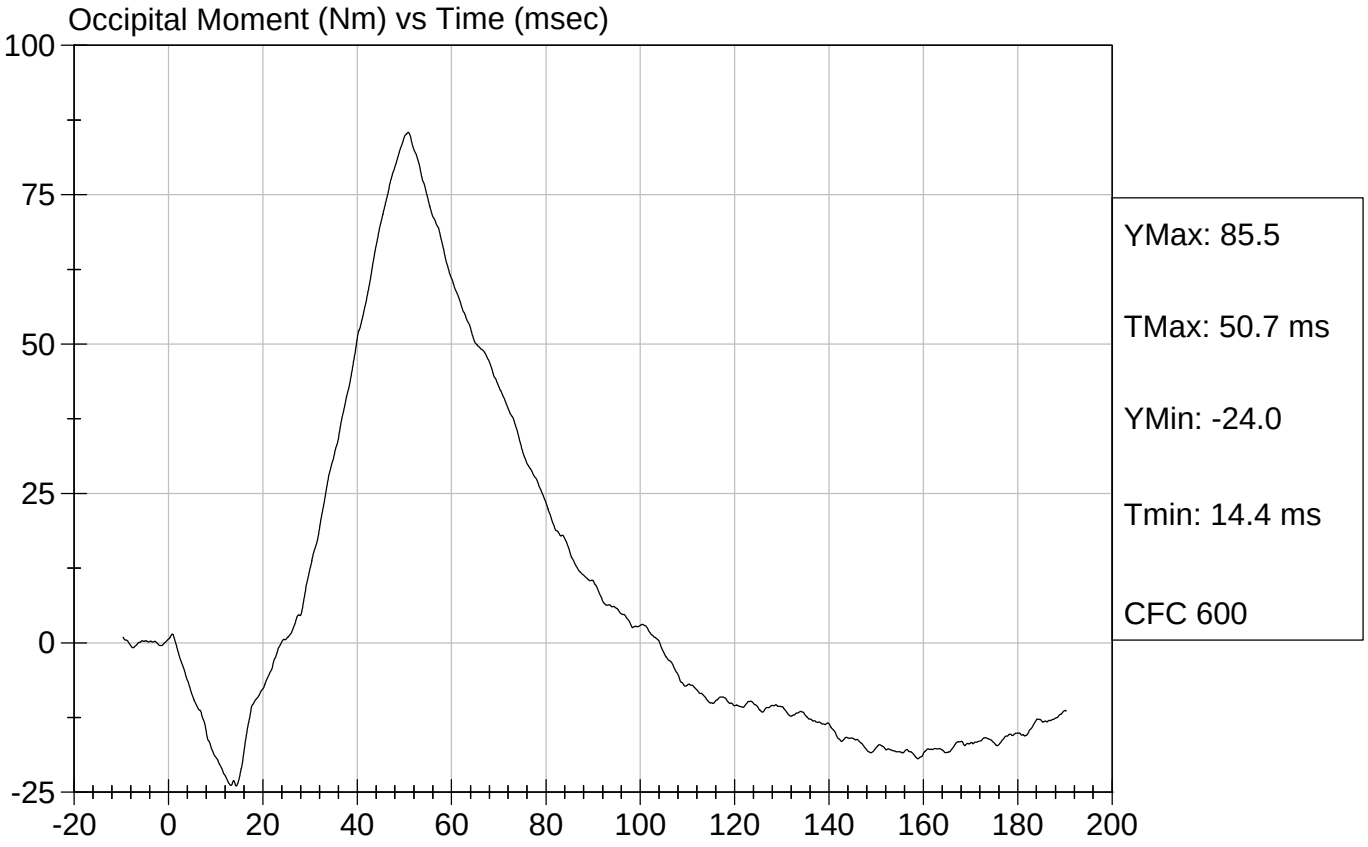
Test Date: 11/19/2003
Speed: 22.61 ft/sec, 6.89 m/sec





Test Desc: Neck Flexion
Component ID: D031892

Test Date: 11/19/2003
Speed: 22.61 ft/sec, 6.89 m/sec



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

ATD Serial No: 065 **Test I.D:** D031893

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	28	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.12	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.43	Pass
	20 msec	G's	14.00 to 19.00	16.84	Pass
	30 msec	G's	11.00 to 16.00	13.41	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.7	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.8	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	101.4	Pass
	Time	msec	72.0 to 82.0	75.0	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	153.9	Pass
Moment About Occipital Condyle	Minimum	N m	-52.9 to -79.9	-71.2	Pass
	Time	msec	65.0 to 79.0	70.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	139.3	Pass
			Overall Test Results		Pass

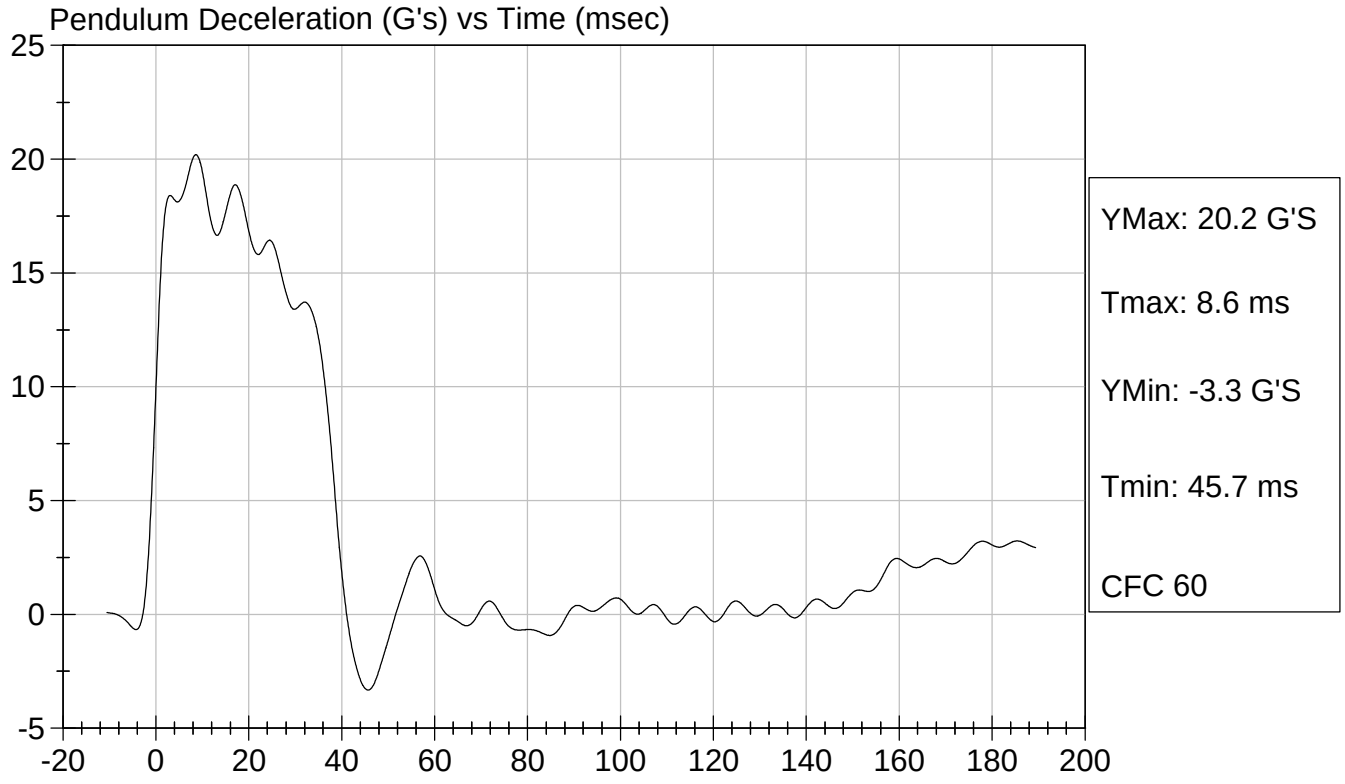
Jessica Gall
Laboratory Technician

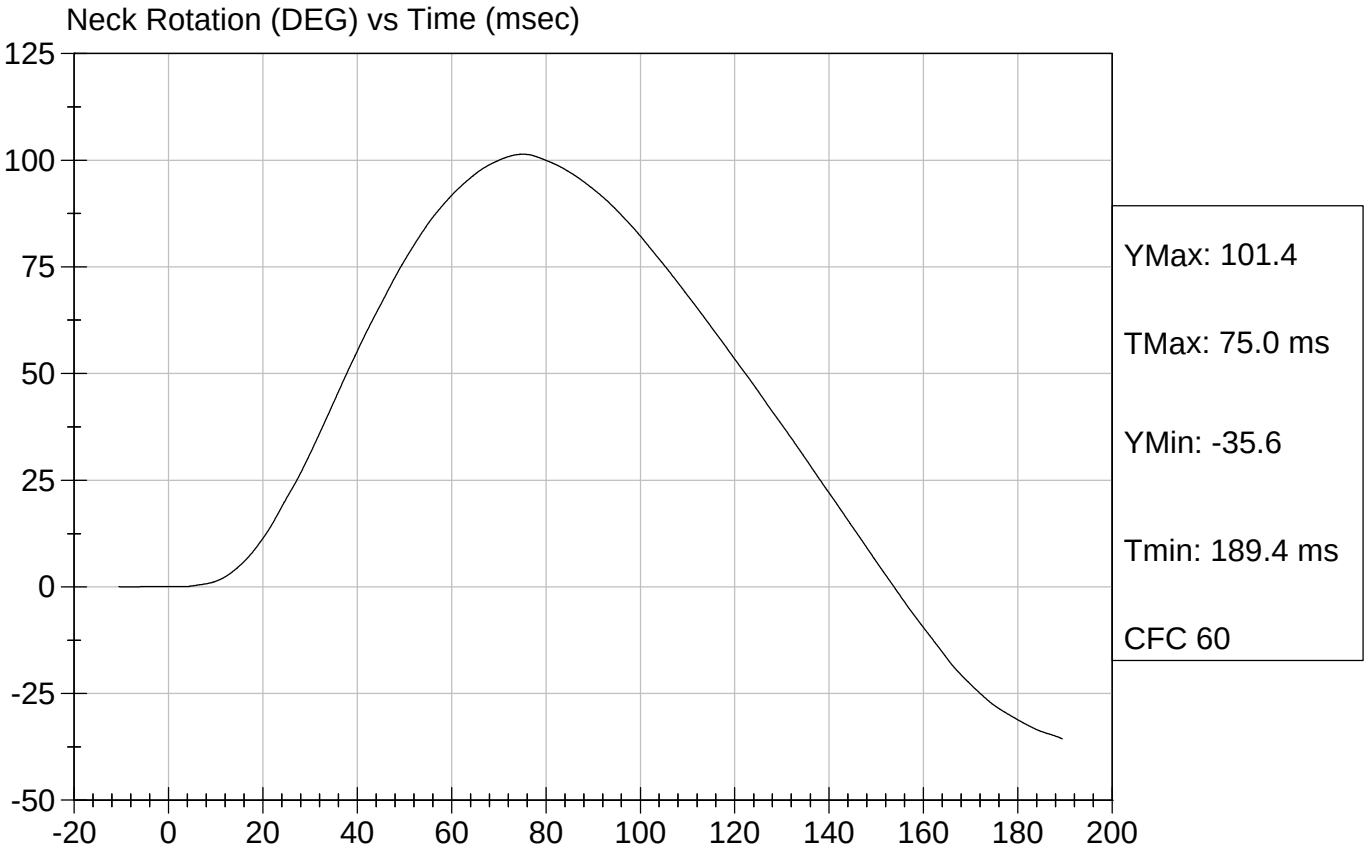
11/19/2003
Test Date

Shefalika Jgarwal
Approved By

Test Desc: Neck Extension
Component ID: D031893

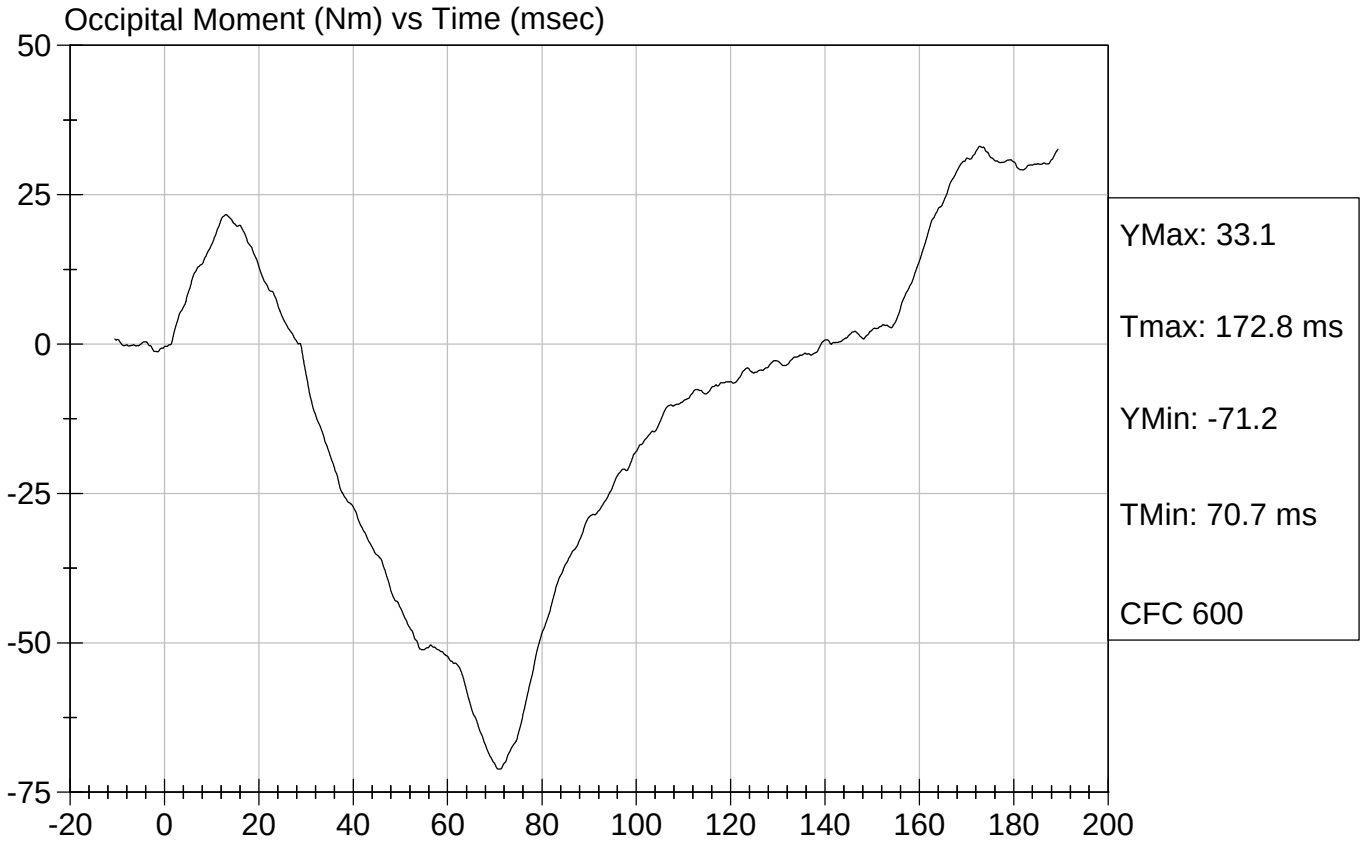
Test Date: 11/19/2003
Speed: 20.07 ft/sec, 6.12 m/sec





Test Desc: Neck Extension
Component ID: D031893

Test Date: 11/19/2003
Speed: 20.07 ft/sec, 6.12 m/sec



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

ATD Serial No: 065 **Test I.D:** D031894

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	16	Pass
Probe Velocity	m/s	6.58 to 6.82	6.72	Pass
Peak Probe Force	Newtons	5159 to 5893	5,515	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.55	Pass
Internal Hysteresis	%	69 to 85	72	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/24/2003
Test Date

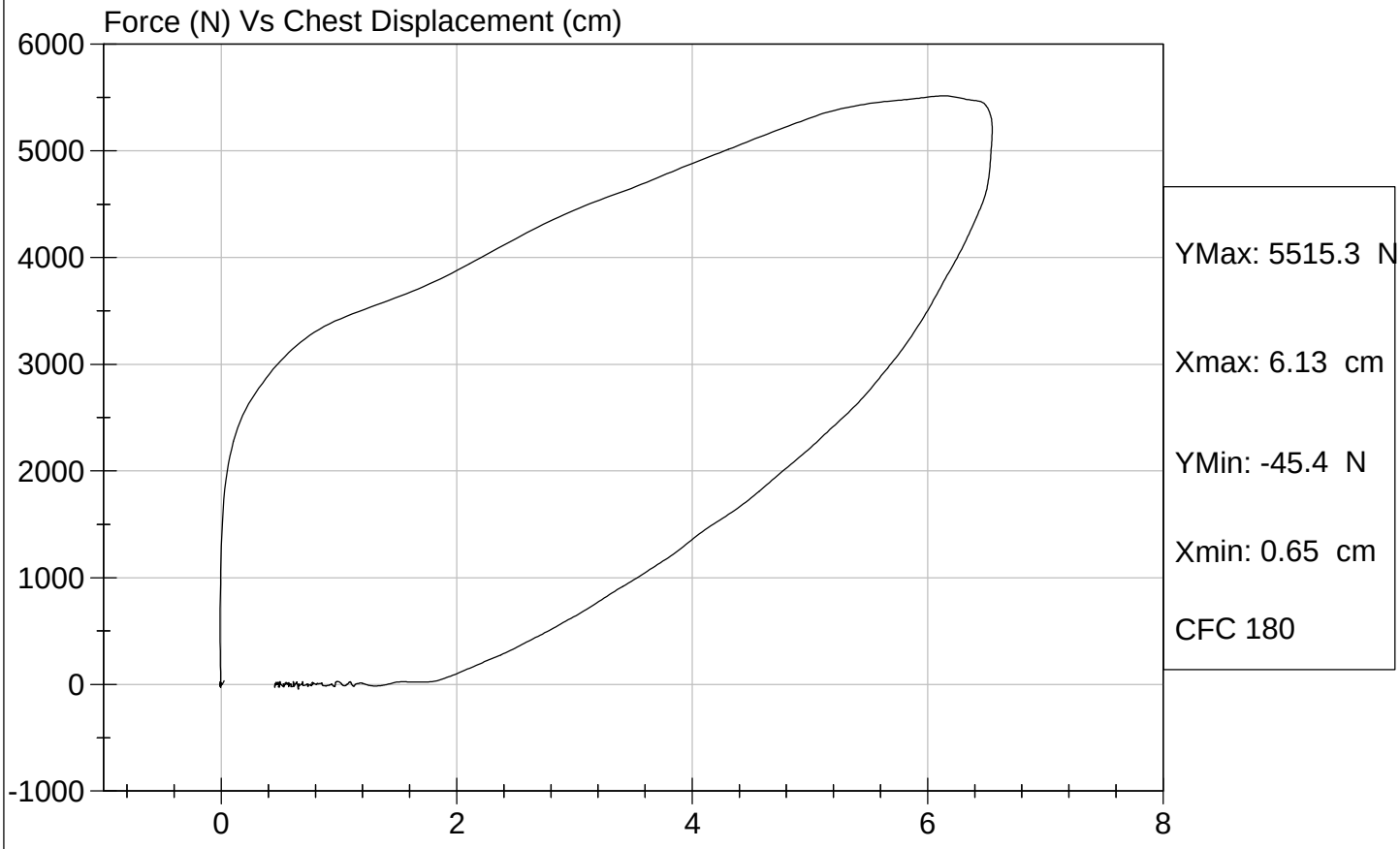
Shefalika Jgarwal
Approved By

Test Description: Thorax Impact

Test Date: 11/24/2003

Component: D031894

Speed: 22.06 ft/sec, 6.72 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Right Knee Impact Test

ATD Serial No: 065 **Test I.D:** D031895

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,371	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/22/2003
Test Date

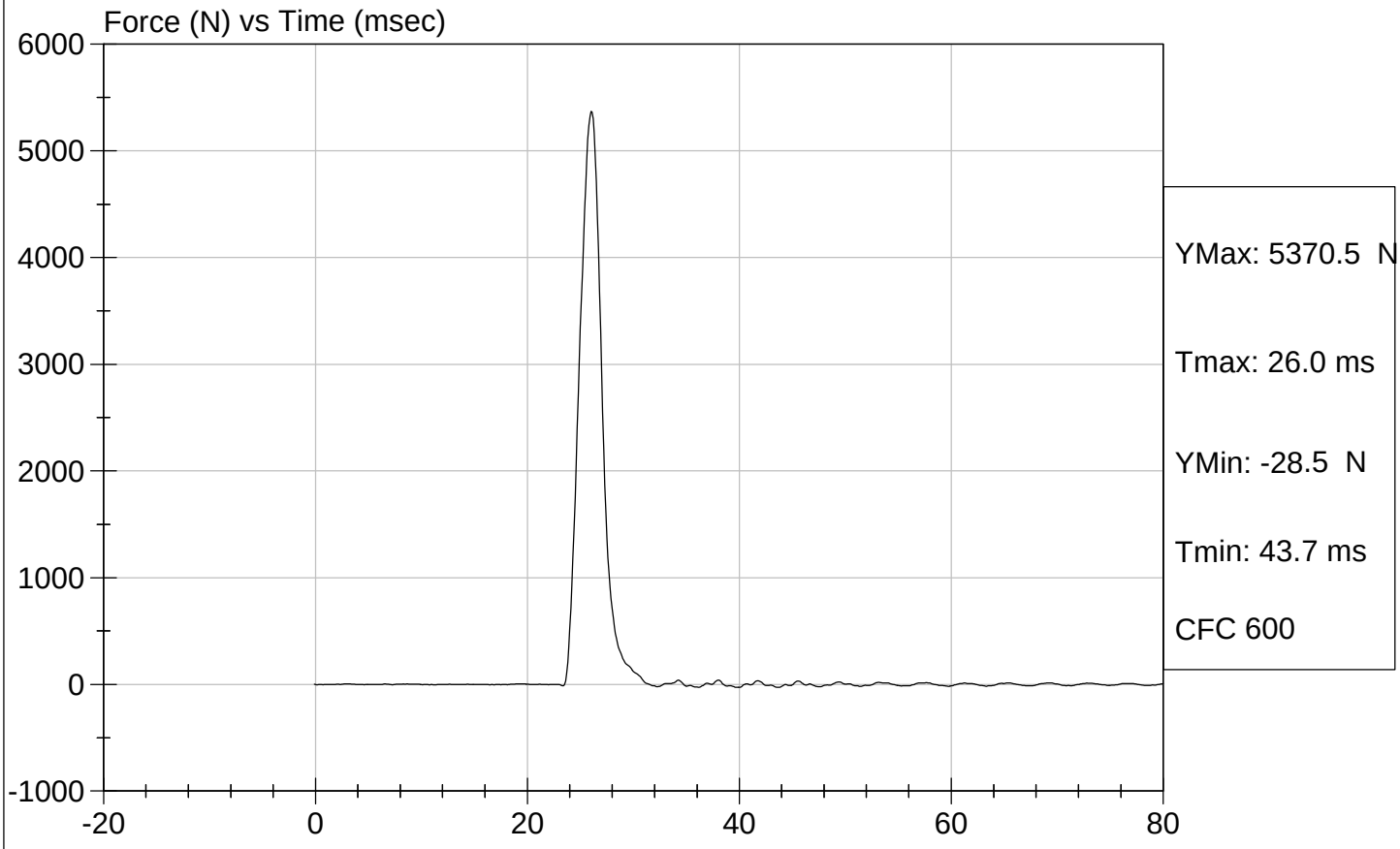
Shefalika Jgarwal
Approved By

Test Description: Right Knee

Test Date: 11/22/2003

Component: D031895

Speed: 6.81 ft/sec, 2.076 m/sec



Hybrid III Calibration Data Sheet

50th Percentile Male

Left Knee Impact Test

ATD Serial No: 065 **Test I.D:** D031896

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/s	2.07 to 2.13	2.08	Pass
Peak Probe Force	Newtons	4715 to 5782	5,216	Pass
		Overall Test Results		Pass

Jessica Gall
Laboratory Technician

11/22/2003
Test Date

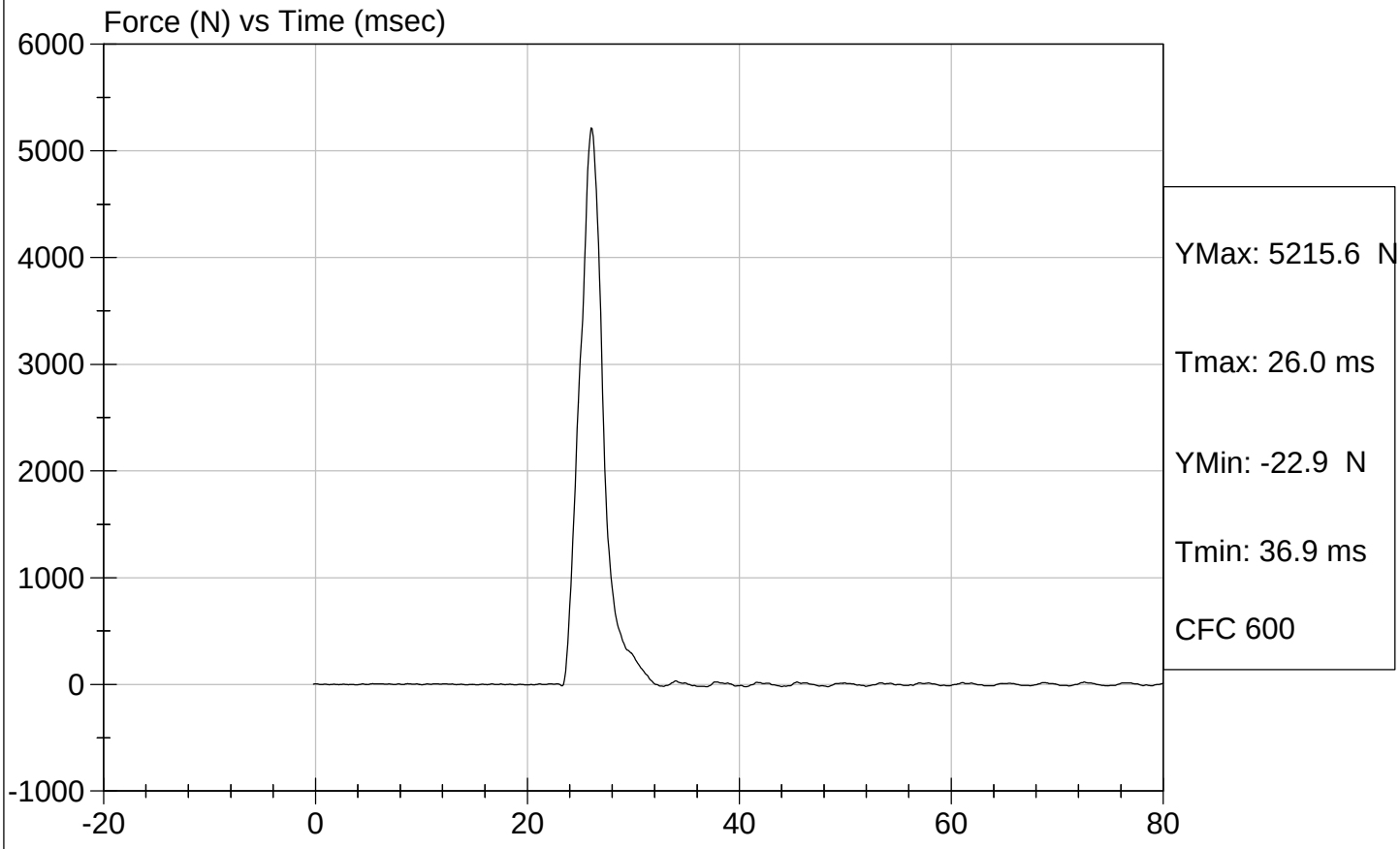
Shefalika Jgarwal
Approved By

Test Description: Left Knee

Test Date: 11/22/2003

Component: D031896

Speed: 6.81 ft/sec, 2.076 m/sec



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

ATD Serial No: 065 **Test I.D:** D031890

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.1	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	30	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	61.3	63.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	47	44	Pass
		Overall Test Results			Pass

Jessica Gall
Laboratory Technician

11/21/2003
Test Date

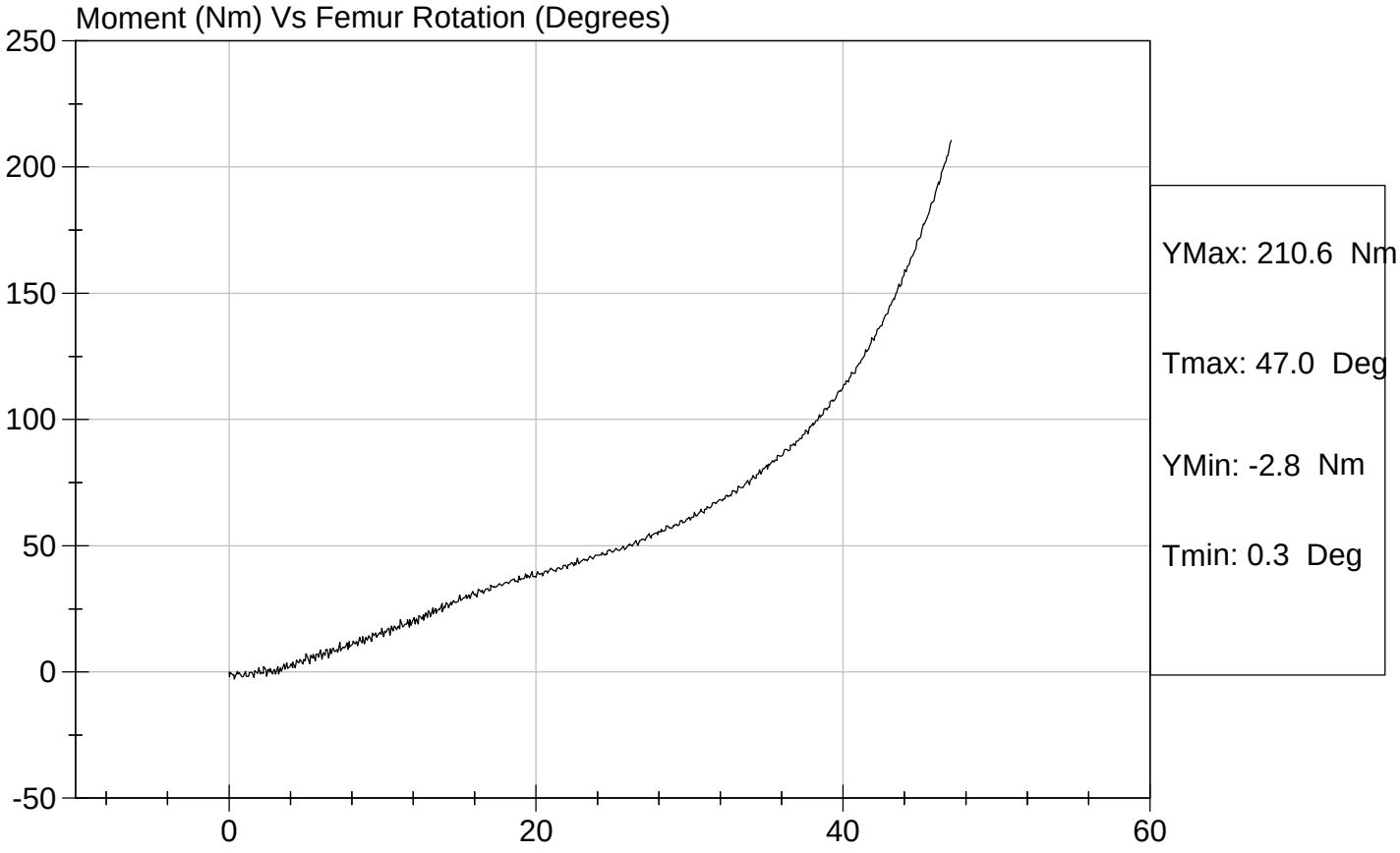
Shefalika Jgarwal
Approved By

Test Description: Hip Femur Flexion

Test Date: 11/20/2003

Component: D031899

Speed: 0 ft/sec, 0.00 m/sec

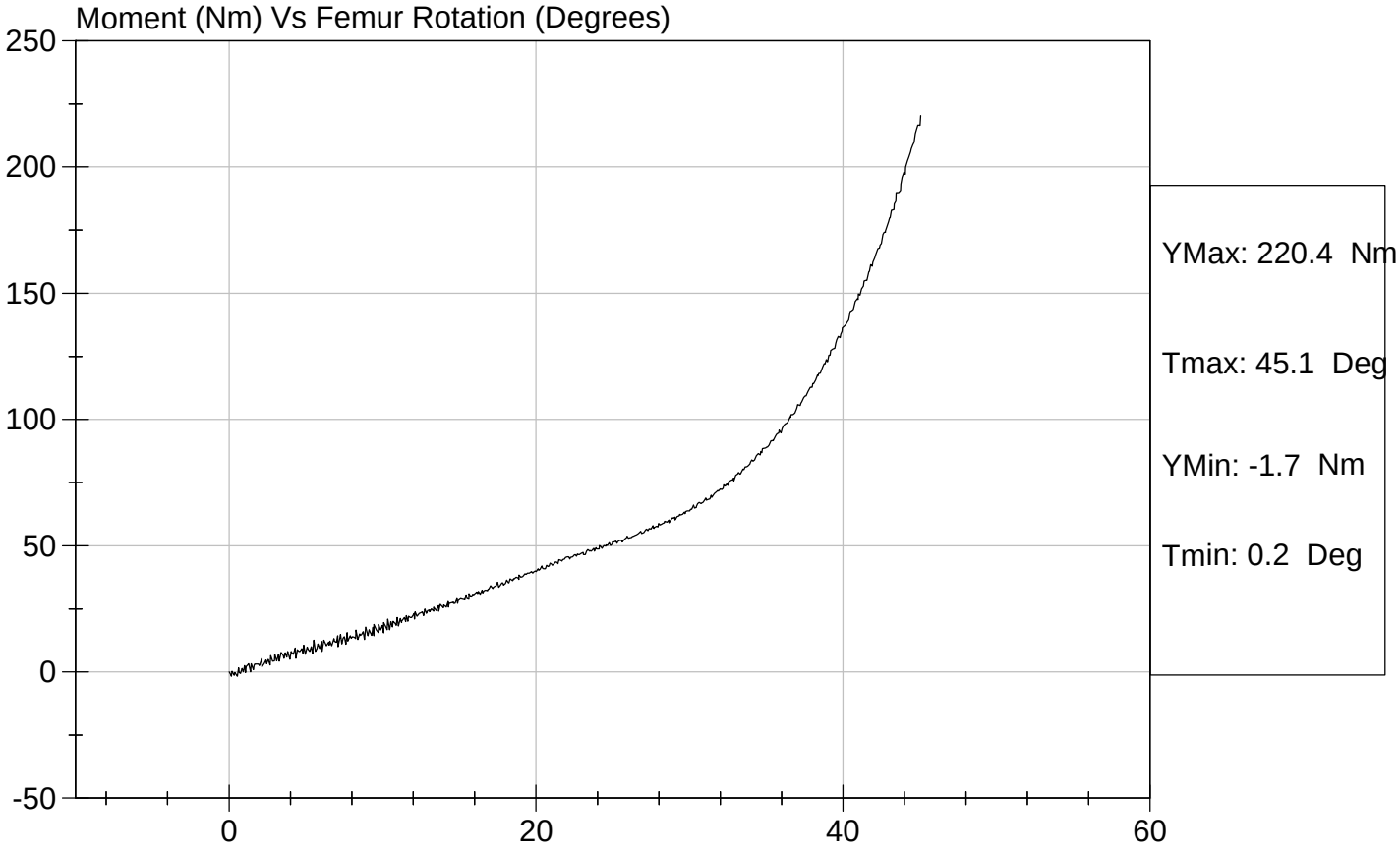


Test Description: Hip Femur Flexion

Test Date: 11/21/2003

Component: D031890

Speed: 0 ft/sec, 0.00 m/sec



DUMMY INSPECTION CHECKLIST

Type: Hybrid III

Dummy Serial Number: 065

Inspected By: Jessica Gall

Date: 11/24/03

Part	Items Checked	Comments
Skin	visual inspection	OK
Head	visual, ballast, accelerometer mount	OK
Neck	visual, cable torque, nodding blocks	OK
Clavicles	visual, bumpers, range of motion	OK
Arms/Hands	visual, bumpers, range of motion	OK
Spine box	visual, ballast, weldment, accelerometer mount	OK
Rib cage	visual, measure, stiffeners	OK
Sternum	visual, bumpers	OK
Lumbar spine	visual, cable torque	OK
Abdomen	visual	OK
Pelvis	visual, palpate, accelerometer mount	OK
Upper legs	visual, load cell bolts	OK
Knees	visual, stops, inserts, sliders	OK
Lower legs	visual, range of motion	OK
Ankles	visual, range of motion	OK
Feet	visual, range of motion	OK
Joints	1 to 2 g range	OK
Other		

Notes (include component/problem/action/reason):

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

INSTRUMENTS FOR DRIVER DUMMY NO. 066

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	AAMN8	Endevco	10/3/03
Head Y	ACC61	Endevco	10/3/03
Head Z	ACCW9	Endevco	10/3/03
Head X Redundant	J19884	Endevco	10/3/03
Head Y Redundant	J21988	Endevco	10/3/03
Head Z Redundant	J28986	Endevco	10/3/03
Neck Load Cell	443	Denton	8/20/03
Chest X	ACCY1	Endevco	10/6/03
Chest Y	ACCC8	Endevco	10/6/03
Chest Z	ACCT7	Endevco	10/6/03
Chest Displacement	066	Servo	9/30/03
Chest X Redundant	J13541	Endevco	10/6/03
Chest Y Redundant	J20093	Endevco	10/6/03
Chest Z Redundant	J19440	Endevco	10/6/03
Pelvis X	J22033	Endevco	10/3/03
Pelvis Y	J21691	Endevco	10/3/03
Pelvis Z	J21970	Endevco	10/3/03
Left Femur Load Cell	262	Denton	8/20/03
Right Femur Load Cell	261	Denton	8/20/03
Left Upper Tibia Load Cell	109	Denton	8/19/03
Left Lower Tibia Load Cell	138	Denton	8/19/03
Right Upper Tibia Load Cell	106	Denton	8/20/03
Right Lower Tibia Load Cell	135	Denton	8/20/03
Left Foot Z – Front	J28988	Endevco	10/3/03
Left Ankle X	J22036	Endevco	10/3/03
Left Ankle Z	J20569	Endevco	10/3/03
Right Foot Z – Front	J20382	Endevco	8/7/03
Right Ankle X	J20165	Endevco	8/7/03
Right Ankle Z	J28708	Endevco	8/7/03
Shoulder Belt Load Cell	172	Denton	10/11/03
Lap Belt Load Cell	194	Denton	6/9/03

INSTRUMENTS FOR PASSENGER DUMMY NO. 065

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X	ACCY6	Endevco	10/3/03
Head Y	J13941	Endevco	10/6/03
Head Z	AAMW5	Endevco	10/3/03
Head X Redundant	J18724	Endevco	10/6/03
Head Y Redundant	J14235	Endevco	10/8/03
Head Z Redundant	AJ5R0	Endevco	10/3/03
Neck Load Cell	442	Denton	8.20/03
Chest X	ACC78	Endevco	10/3/03
Chest Y	ACCE6	Endevco	10/3/03
Chest Z	ACCY3	Endevco	10/3/03
Chest Deflection Gauge	065	Servo	9/30/03
Chest X Redundant	J19927	Endevco	10/3/03
Chest Y Redundant	J20580	Endevco	10/3/03
Chest Z Redundant	J23914	Endevco	10/3/03
Pelvis X	AHTN3	Endevco	10/3/03
Pelvis Y	AH0C3	Endevco	10/3/03
Pelvis Z	AHT12	Endevco	10/3/03
Left Femur Load Cell	259	Denton	8/20/03
Right Femur Load Cell	256	Denton	8/20/03
Left Upper Tibia Load Cell	105	Denton	8/20/03
Left Lower Tibia Load Cell	133	Denton	8/19/03
Right Upper Tibia Load Cell	103	Denton	8/19/03
Right Lower Tibia Load Cell	134	Denton	8/20/03
Left Foot Z – Front	J14120	Endevco	10/8/03
Left Ankle X	J23774	Endevco	10/6/03
Left Ankle Z	APYY3	Endevco	10/8/03
Right Foot Z – Front	J18736	Endevco	10/6/03
Right Ankle X	J23946	Endevco	10/6/03
Right Ankle Z	J27513	Endevco	10/6/03
Shoulder Belt Load Cell	157	Denton	8/21/03
Lap Belt Load Cell	190	Denton	7/8/03

INSTRUMENTS FOR VEHICLE AND LABORATORY

	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Rear Seat Crossmember X	E01-F09	Entran	11/11/03
Left Rear Seat Crossmember Z	E01-F15	Entran	11/11/03
Right Rear Seat Crossmember X	A08-A13	Entran	9/11/03
Right Rear Seat Crossmember Z	E01-F04	Entran	11/11/03
Top of Engine X	K16-X06	Entran	8/15/03
Bottom of Engine X	K11-J07	Entran	9/11/03
Left Brake Caliper X	A27-R04	Entran	11/7/03
Right Brake Caliper X	A27-R03	Entran	11/7/03
Instrument Panel X	I15-Z01	Entran	11/11/03

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