mga research corporation

REPORT NUMBER: TWG-MGA-2012-011A

SIDE AIRBAG OUT-OF-POSITION INJURY TECHNICAL WORKING GROUP

SUZUKI MOTOR CORPORATION
2012 SUZUKI SX4 LE
NHTSA NUMBER: MC0524TWG2

TEST DATE: FEBRUARY 9, 2012

FINAL REPORT DATE: APRIL 4, 2012

FINAL REPORT

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FINAL REPORT ACCEPTANCE BY:

_____

Date: _____

The results presented in this report relate only to the specified test items.

TABLE OF CONTENTS

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

The purpose of this test was to obtain data in a static out-of-position side air bag deployment. These data constitute part of the general consumer information collected by Alpha Technology Associate, Inc.

SUMMARY

The effects of both a curtain and torso airbag deployment in a 2012 Suzuki SX4 LE 4-Dr Sedan with an out-of-position SID-IIs Build Level D were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on February 9, 2012. Pre and post-test photographs of the vehicle and dummy can be found in Appendix A.

- Left Side Through Removed Driver Door
- Front Through Windshield
- Left Side ¾ View Through Windshield

One SID-IIs Build Level D dummy (Serial Number 304) was placed in the right front passenger seat situated in the forward-facing position per Section 3.3.5.2 according to dummy placement instructions specified in the Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as prepared by the Side Airbag Out-of-Position Injury Technical Working Group (TWG).

The dummy was instrumented with the following instrumentation:

- Head Accelerations
- Upper Neck Load Cell

The 9 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces.

The SID-IIs dummy's visible contact points were as follows:

- Curtain airbag to top and right side of head
- Torso bag to right shoulder, right torso, and right pelvis

The SID-IIs dummy was placed in the right front passenger seat sitting upright in the center of the seat facing forward with its arm along the armrest. The arm was rotated horizontally in the forward direction with respect to the dummy. The seat track was adjusted forward. The dummy was slid outboard until the dummy's side contacted the door trim panel or armrest and the CG of the head was centered in the deployment trajectory of the airbag. Masking tape was wrapped around the dummy's neck bracket to hold the dummy in place.

This orientation complies with Section 3.3.5.2 of the TWG Recommended Procedures for Evaluating Occupant Injury Risk from Deploying Side Airbags as defined by Lund, et al and the Technical Working Group First Revision dated July, 2003.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

TEST SUMMARY

	Test Data	Description
Seating Position	P2	Right Front Seating Position
Test	3.3.5.2*	Forward-facing SID-IIs dummy
Curtain Airbag	Roof-Rail Mounted	Side Airbag
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	SID-IIs Build Level D / 304	5th Percentile Adult Female

* Procedure as defined by Lund, et al and the Technical Working Group dated July, 2003

Number of Data Channels	9
Number of Airbag Channels	4
Number of High-Speed Videos	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to top and right side of head
Right Shoulder Contact	Torso bag
Right Torso Contact	Torso bag
Right Pelvis Contact	Torso bag

DATA SHEET NO. 2

TEST VEHICLE INFORMATION

Please note that this vehicle had previously been tested in an NCAP Frontal Impact on January 11, 2012.

TEST VEHICLE INFORMATION

Manufacturer	Suzuki
Model	SX4
Body Style	Sedan
NHTSA No.	MC0524TWG2
VIN	JS2YC5A30C6300337
Color	Crimson Red Metallic
Delivery Date	11/29/2011
Odometer Reading (mile)	36
Dealer	Ray Suzuki
Transmission	Manual
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	2.0
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	No
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
Rear Passenger Side Torso Airbag	Yes
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control System (TCS)	Yes
All Wheel Drive (AWD)	No
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Suzuki Motor Corporation
Date of Manufacture	06/11

GVWR (kg)	1715
GAWR Front (kg)	960
GAWR Rear (kg)	870

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				45

DATA SHEET NO. 3

DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		4 Detents From Full Forward
Seat Height Position		Non-Adjustable
Placed in Position No. 2		---
Seat Back Angle (from headrest post)	SA (°)	6.2
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	288
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	120
Head CG to Window	HD (mm)	204
Head to Seat Back Centerline	HSC (mm)	134
Chest to Dash	CD (mm)	438
Chest to Seatback	CS (mm)	285
Right Arm to Seat Back Centerline	RACL (mm)	331
Left Arm to Seat Back Centerline	LACL (mm)	N/A
Right Arm to Door Panel	RA (mm)	Contact
Left Arm to Door Panel	LA (mm)	N/A
Knee to Knee	KK (mm)	145
Toe to Toe	TT (mm)	170
Right Knee to Seat Cushion Centerline	KSCR (mm)	128
Left Knee to Seat Cushion Centerline	KSCL (mm)	11
Right Toe to Seat Cushion Centerline	TSCR (mm)	115
Left Toe to Seat Cushion Centerline	TSCL (mm)	16
Nose to Dash	ND (mm)	568
Nose to Headrest	NS (mm)	239
Top of Head to Headliner	HH (mm)	125

DATA SHEET NO. 4

DUMMY INJURY CRITERIA VALUES

NHTSA No. MC0524TWG2

		MAXIMUM VALUE			
		Position No. 2			
DESCRIPTION	UNIT	MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	5.2	10.3	-10.7	20.8
Head Y	g	7.5	7.4	-6.7	45.6
Head Z	g	26.7	6.8	-5.6	6.4
Head Resultant	g	27.6	6.8		
Upper Neck Fx	N	249.4	35.0	-48.1	169.2
Upper Neck Fy	N	107.4	178.0	-183.7	59.9
Upper Neck Fz	N	108.2	126.8	-819.9	23.0
Upper Neck F Resultant	N	832.8	23.0		
Upper Neck Mx	Nm	4.9	168.5	-18.0	33.4
Upper Neck My	Nm	15.1	34.3	-3.9	117.6
Upper Neck Mz	Nm	2.4	179.6	-8.6	35.4
Upper Neck M Resultant	Nm	24.8	33.6		

DATA SHEET NO. 4 (continued)

DUMMY INJURY CRITERIA VALUES

NHTSA No. MC0524TWG2

	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
ATD position	HIC	T^1 (msec)	T^2 (msec)	HIC	T^1 (msec)	T^2 (msec)
No. 2 Right Front	2.3	18.5	33.5	4.5	6.6	42.6

Position 2 Neck Injury Summary (SID-IIs – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.05	158.7	42.89	-38.52	5.73
Nte	0.07	117.4	81.35	-16.54	-3.90
Ncf	0.21	22.8	-816.90	146.08	2.71
Nce	0.22	23.8	-795.68	140.85	1.76
Peak Tension (CFC1000)		**108.2 N**	**Peak Compression (CFC 1000)**		**-819.9 N**

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	3880 N	Extension (mCVe)	61 N-m	Tension	2070 N
Compression (CVc)	3880 N	Flexion (mCVf)	155 N-m	Compression	2520 N
Condyle Offset	**0.01778 m**				

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Right ¾ Front View of Vehicle, As Received

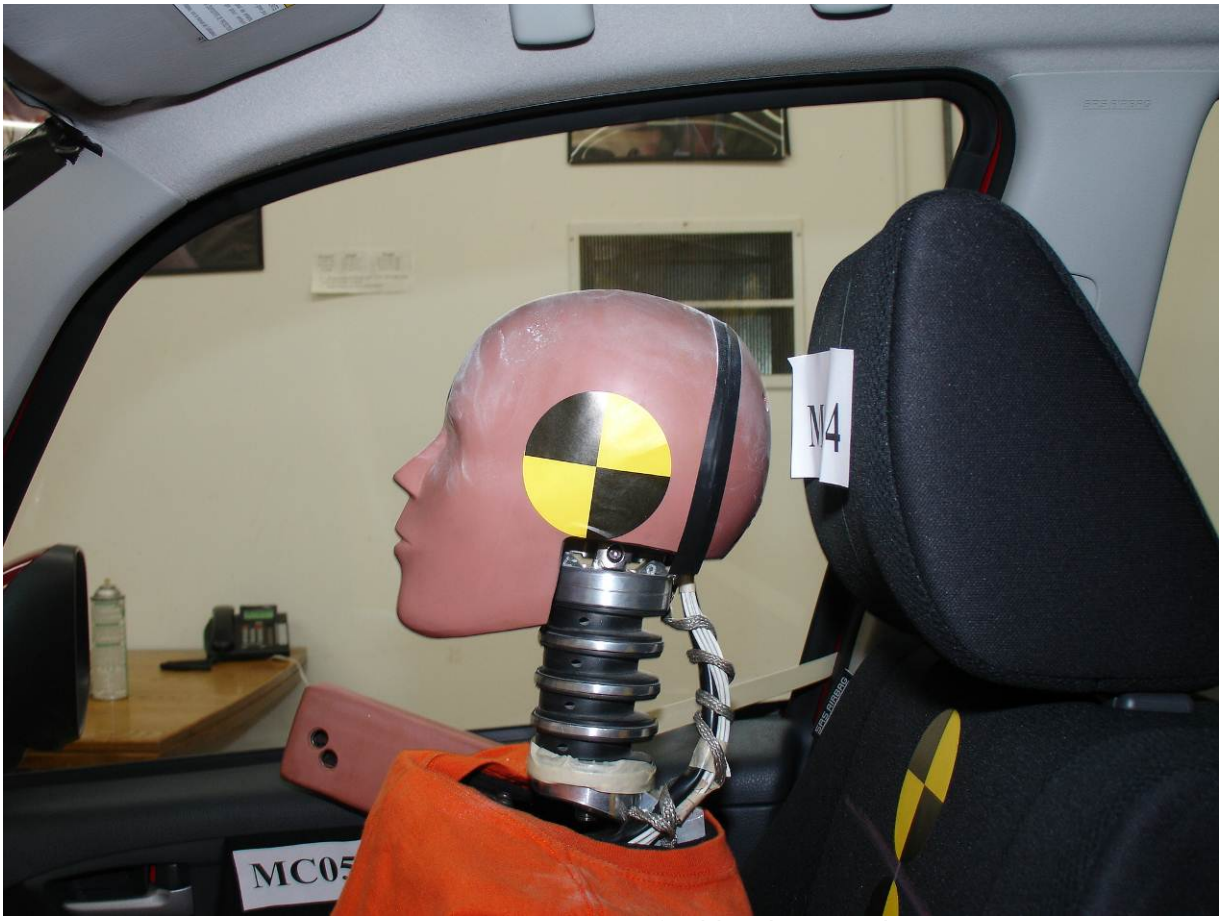
Vehicle Certification Placard

Pre-Test Vehicle Left Side View

Post-Test Vehicle Left Side View

Pre-Test SID-IIs Dummy Left Side View

Post-Test SID-IIs Dummy Left Side View

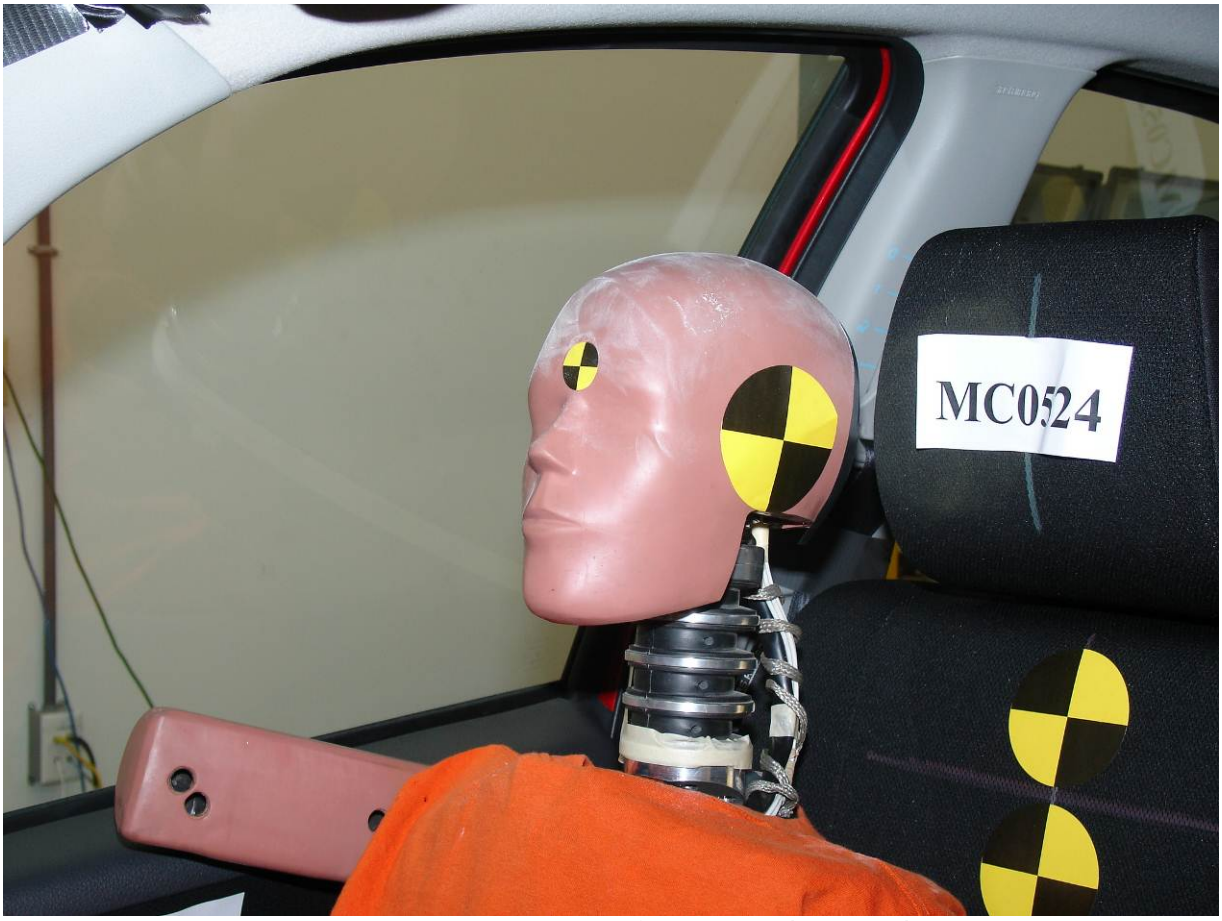


Pre-Test SID-IIs Dummy Left Side Closeup View

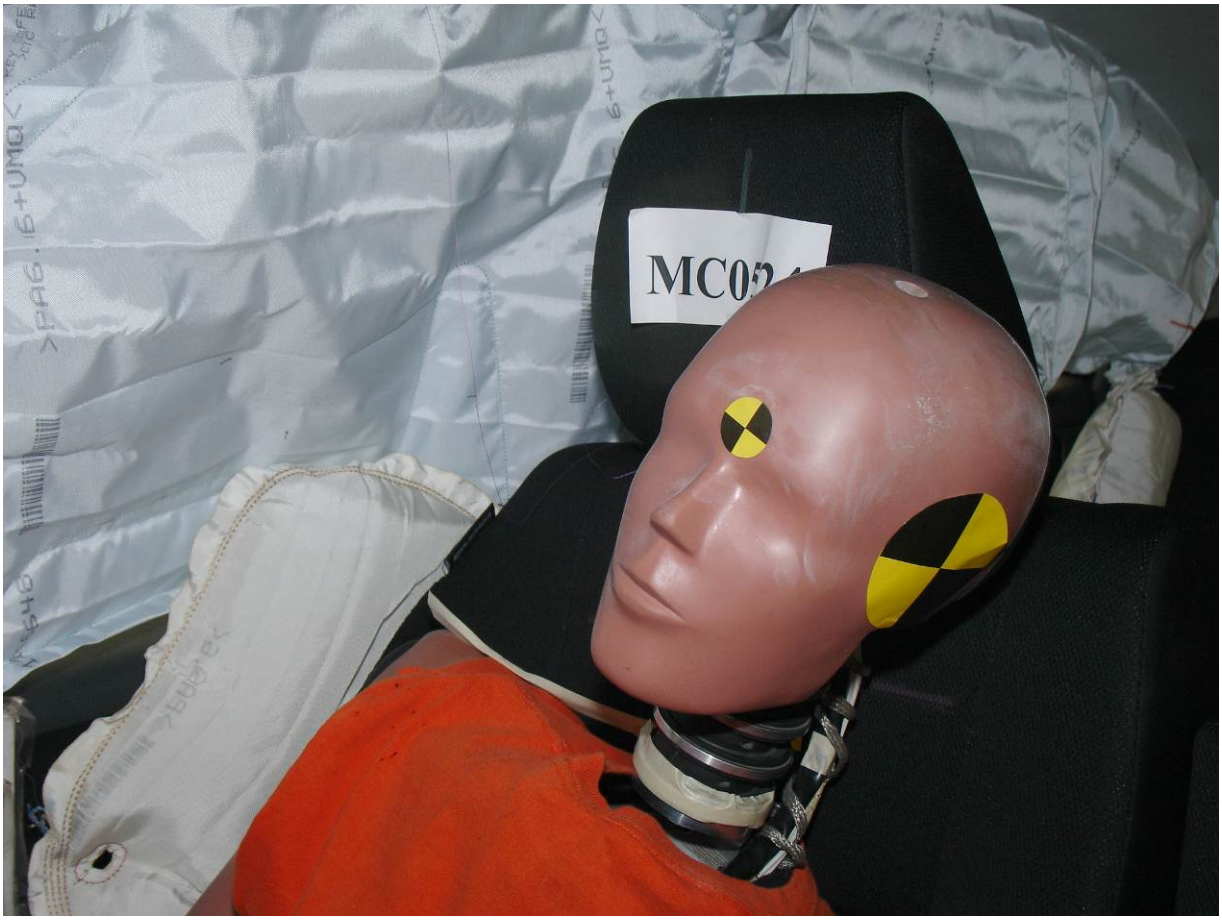
Post-Test SID-IIs Dummy Left Side Closeup View

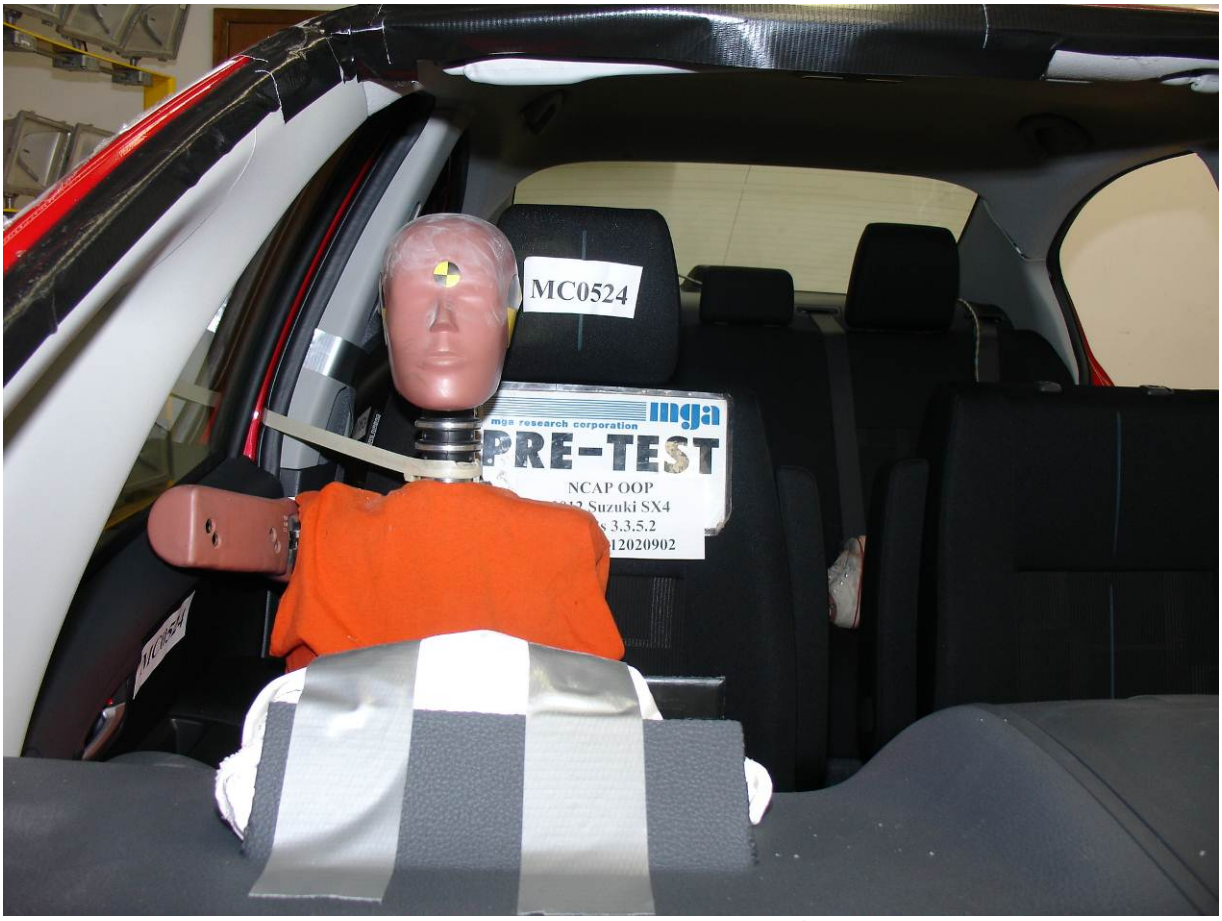
Pre-Test SID-IIs Dummy Left ¾ Front View

Post-Test SID-IIs Dummy Left ¾ Front View



Pre-Test SID-IIs Dummy Left ¾ Front Closeup View

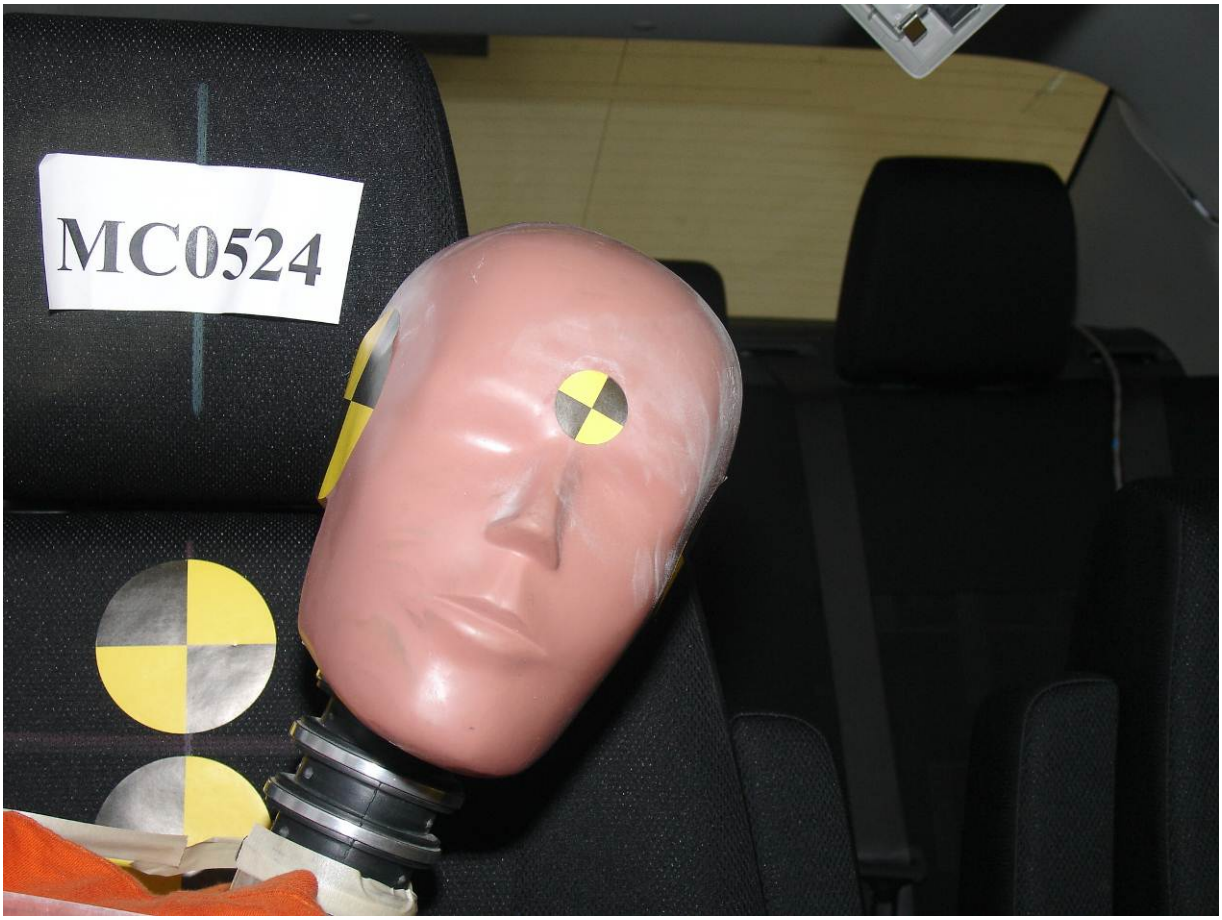

Post-Test SID-IIs Dummy Left ¾ Front Closeup View



Pre-Test SID-IIs Dummy Front View

Post-Test SID-IIs Dummy Front View

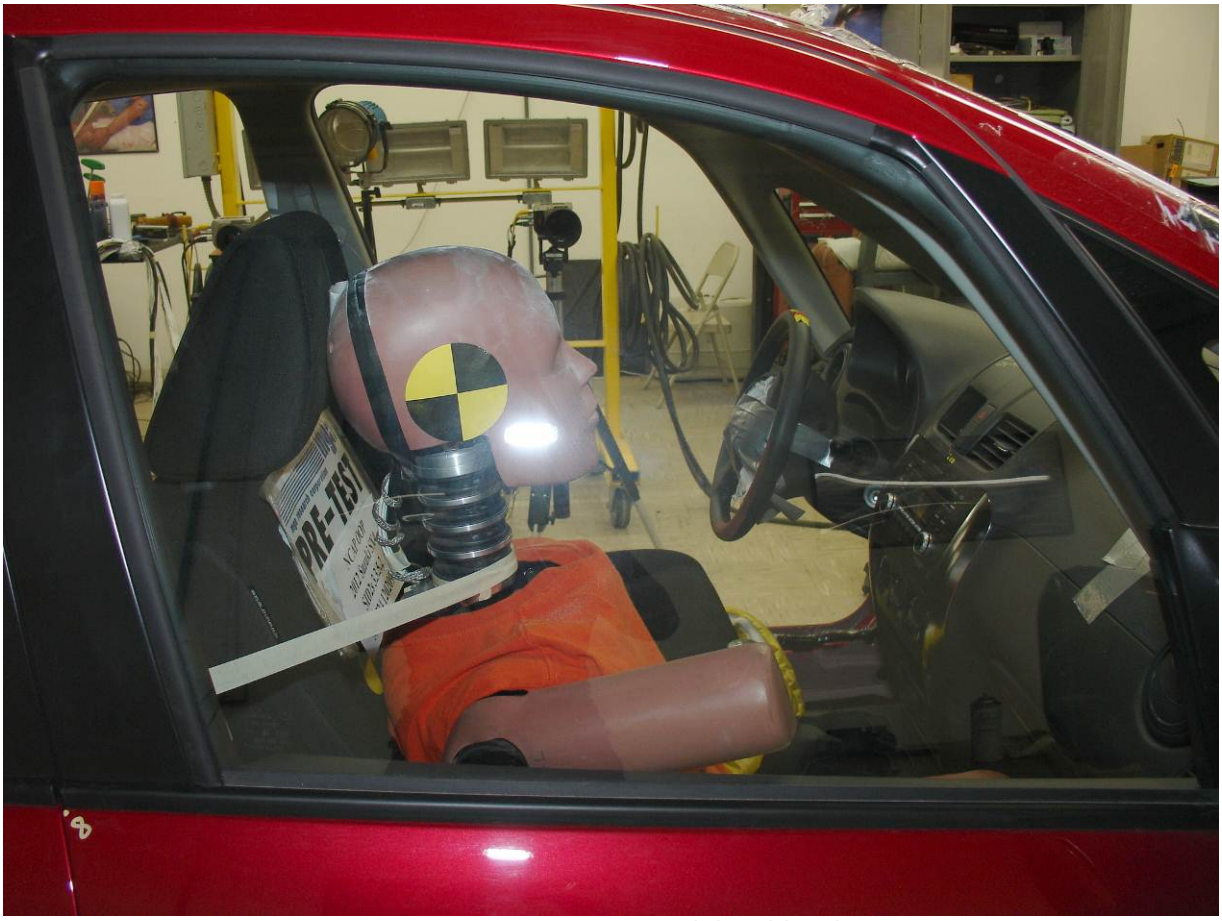
Pre-Test SID-IIs Dummy Front Closeup View



Post-Test SID-IIs Dummy Front Closeup View

Pre-Test SID-IIs Dummy Right ¾ Front View

Post-Test SID-IIs Dummy Right ¾ Front View



Pre-Test SID-IIs Dummy Right Side View

Post-Test SID-IIs Dummy Right Side View

Post-Test SID-IIs Dummy Right Side View (Door Open)

Post-Test Curtain Airbag Left View

Post-Test Curtain Airbag Front View

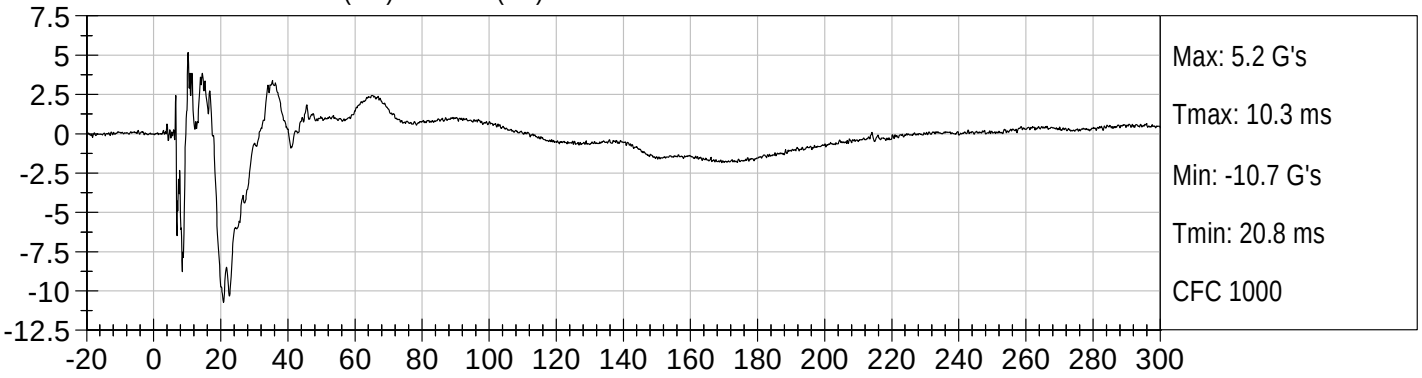

Post-Test Curtain Airbag Right View (Door Open)

APPENDIX B

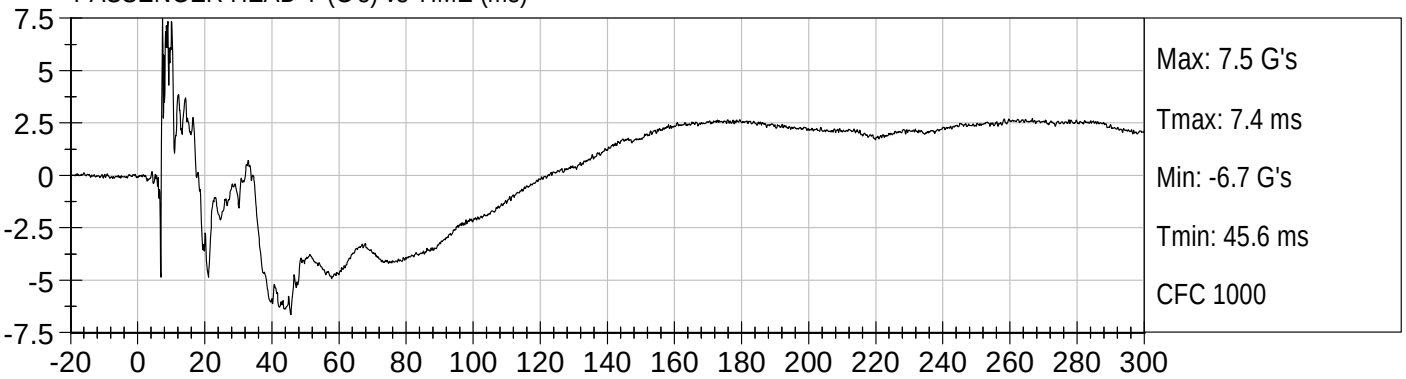
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

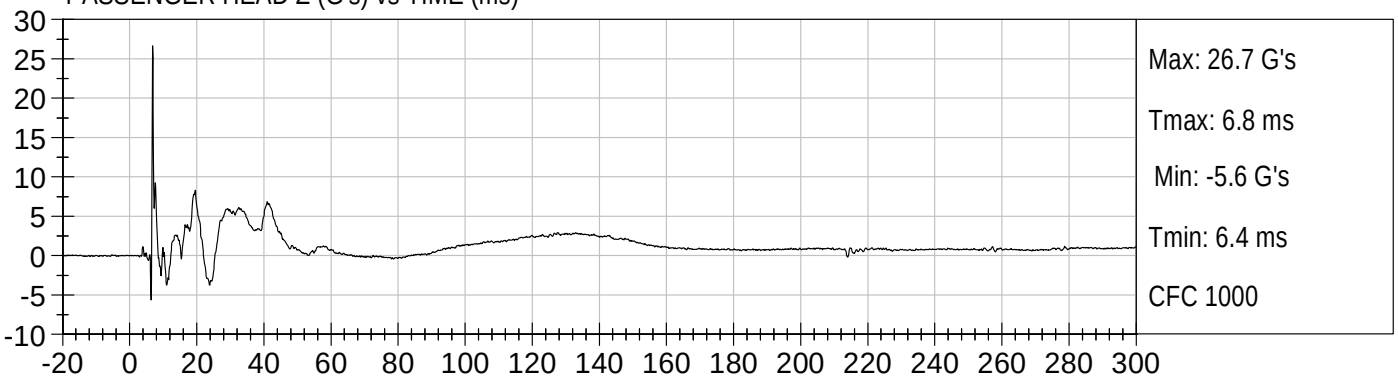
PASSENGER HEAD X (G's) vs TIME (ms)



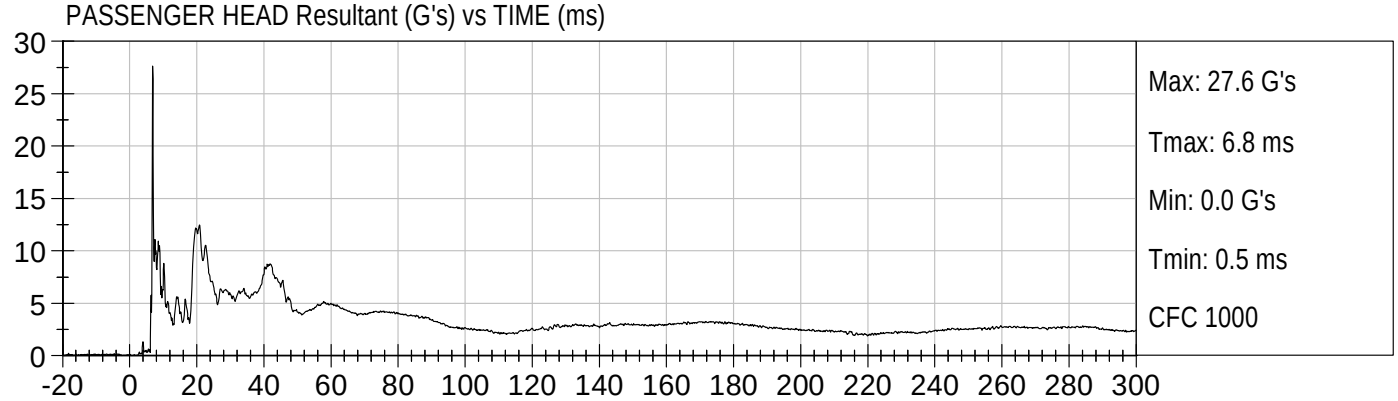
PASSENGER HEAD Y (G's) vs TIME (ms)



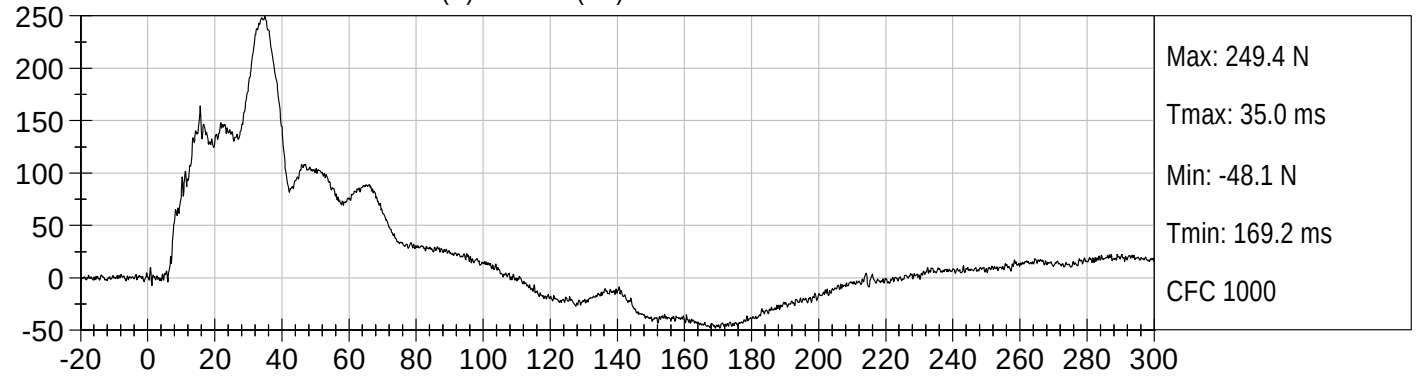
PASSENGER HEAD Z (G's) vs TIME (ms)



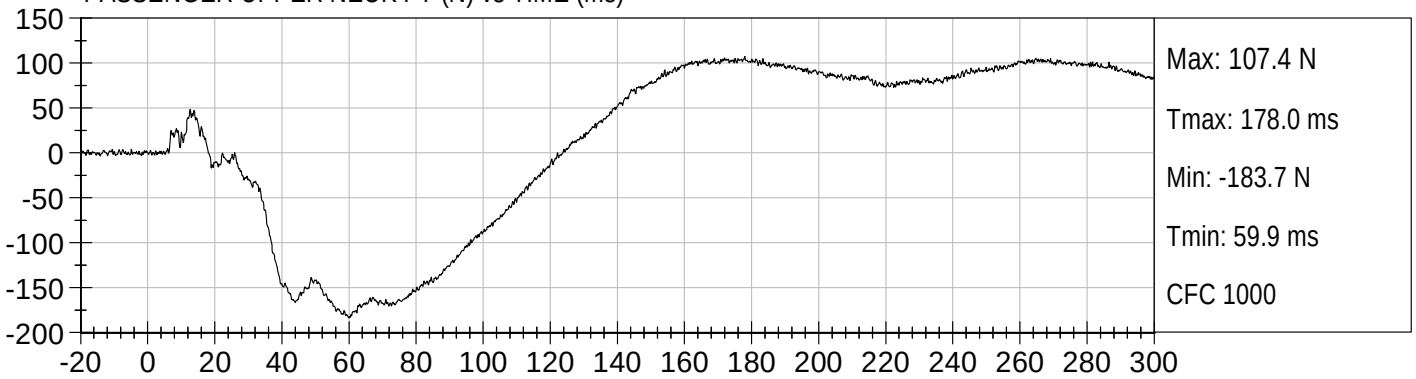
PASSENGER HEAD Resultant (G's) vs TIME (ms)



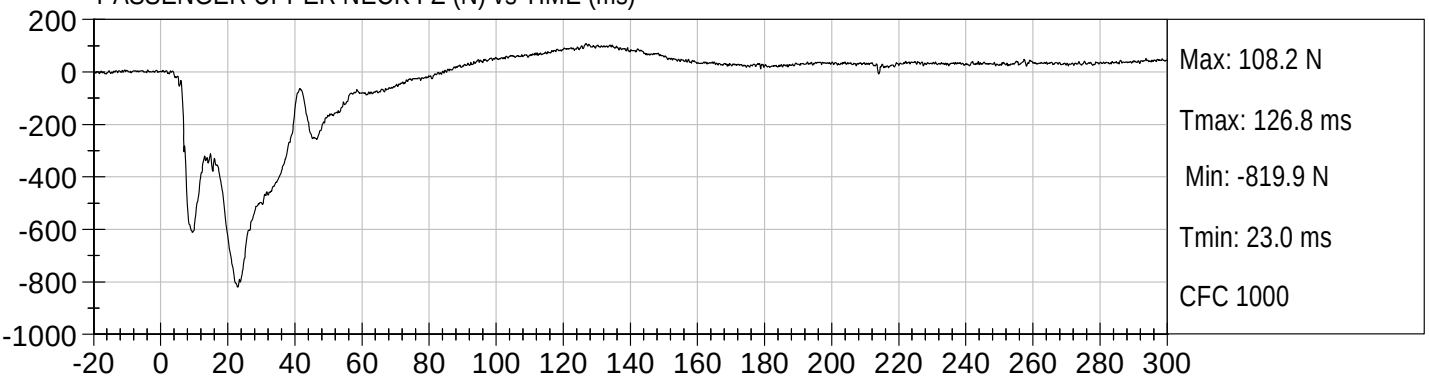
PASSENGER UPPER NECK FX (N) vs TIME (ms)



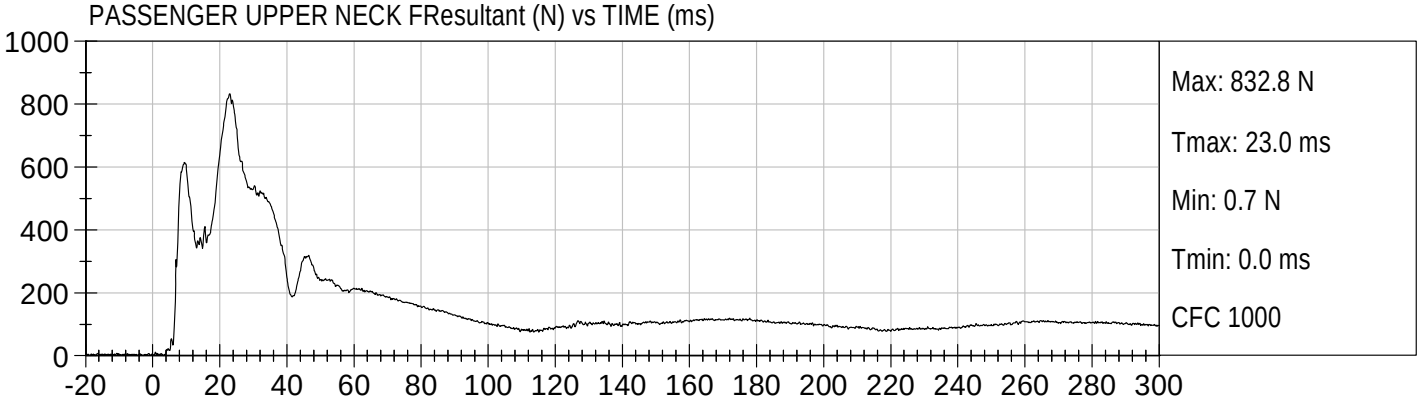
PASSENGER UPPER NECK FY (N) vs TIME (ms)



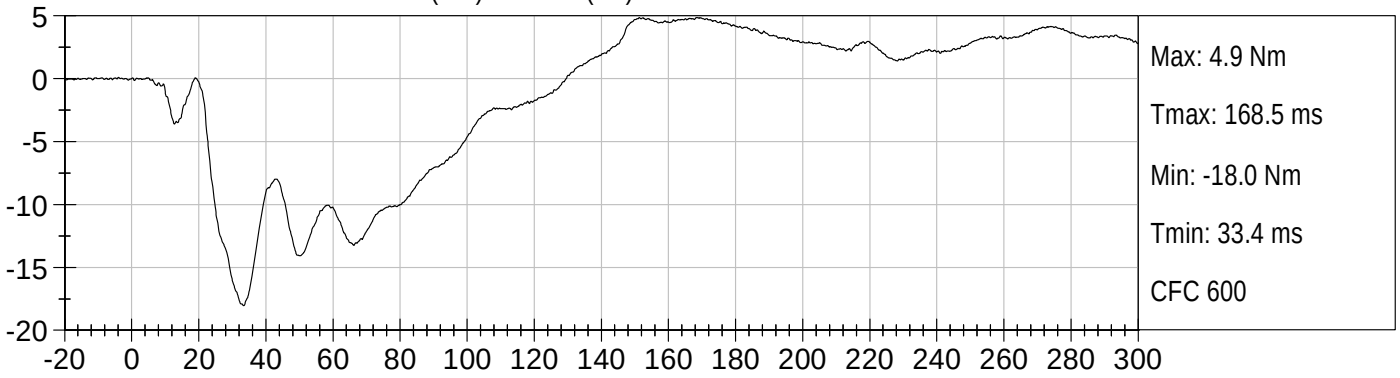
PASSENGER UPPER NECK FZ (N) vs TIME (ms)



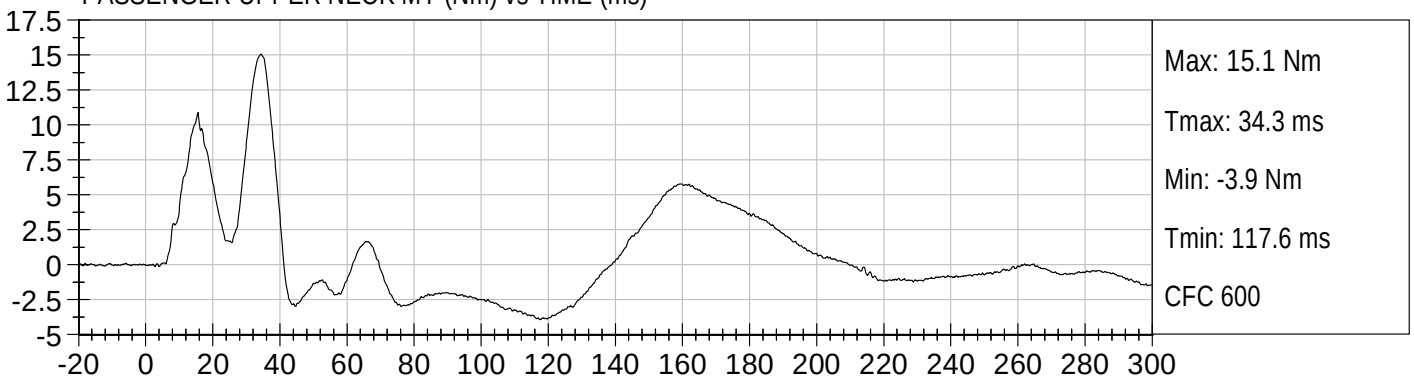
PASSENGER UPPER NECK FResultant (N) vs TIME (ms)



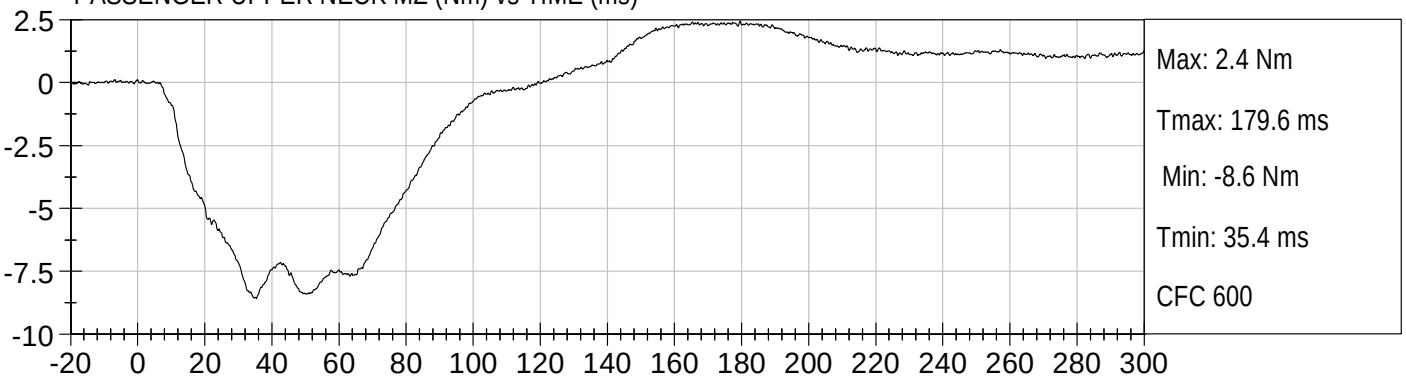
PASSENGER UPPER NECK MX (Nm) vs TIME (ms)



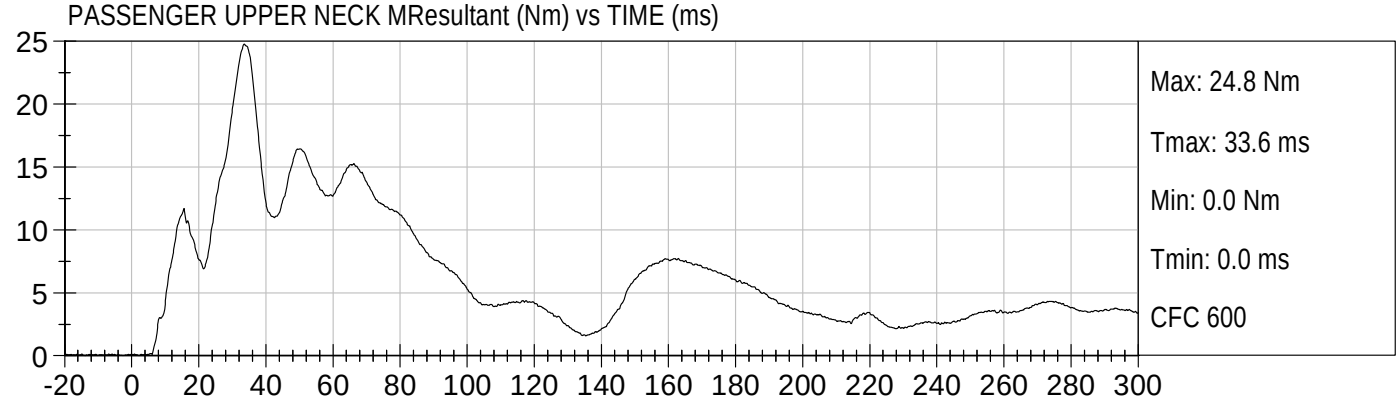
PASSENGER UPPER NECK MY (Nm) vs TIME (ms)



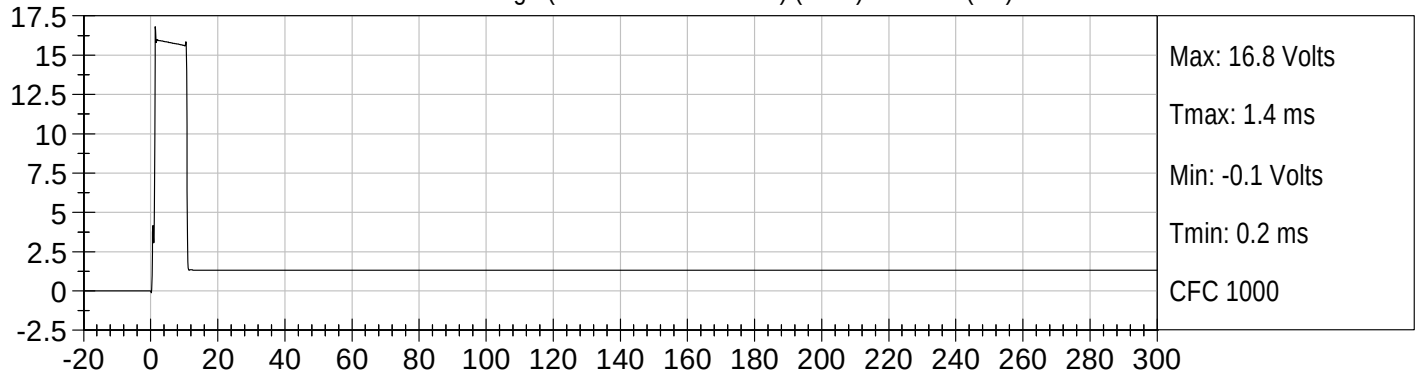
PASSENGER UPPER NECK MZ (Nm) vs TIME (ms)



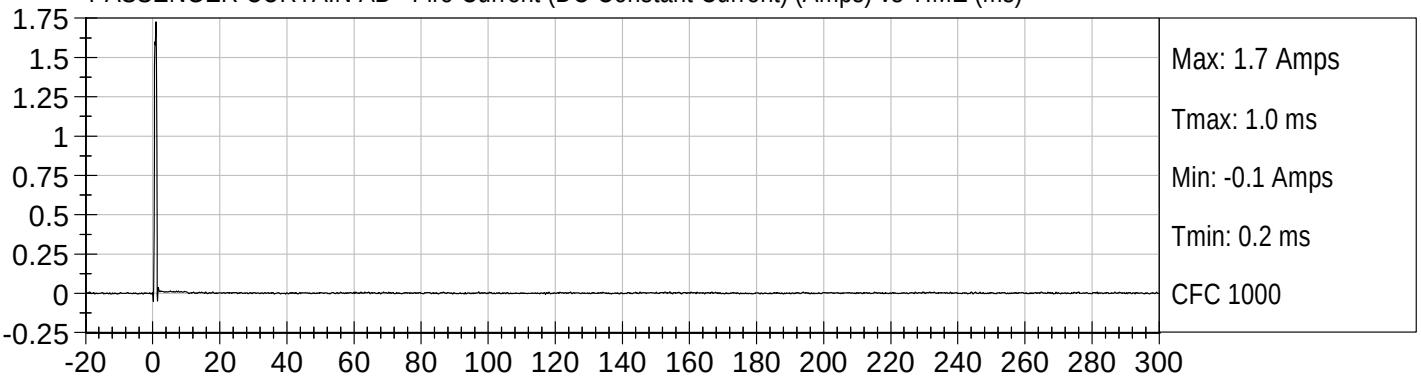
PASSENGER UPPER NECK MResultant (Nm) vs TIME (ms)



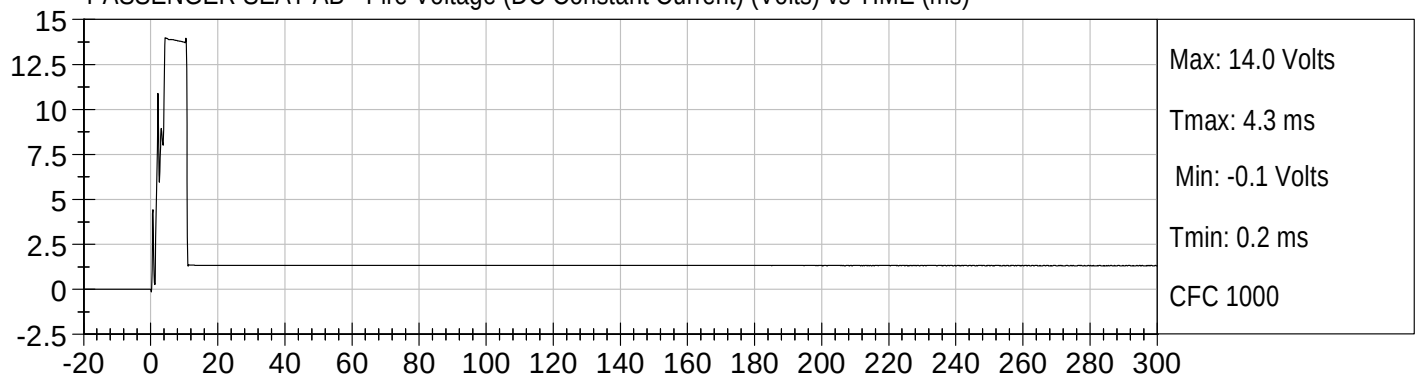
PASSENGER CURTAIN AB - Fire Voltage (DC Constant Current) (Volts) vs TIME (ms)



PASSENGER CURTAIN AB - Fire Current (DC Constant Current) (Amps) vs TIME (ms)



PASSENGER SEAT AB - Fire Voltage (DC Constant Current) (Volts) vs TIME (ms)



PASSENGER SEAT AB - Fire Current (DC Constant Current) (Amps) vs TIME (ms)