



REPORT NUMBER: TWG-MGA-2011-008

**SIDE AIRBAG OUT-OF-POSITION INJURY
TECHNICAL WORKING GROUP**

**VOLKSWAGEN DE MEXICO S.A. DE C.V.
2011 VOLKSWAGEN JETTA S
NHTSA NUMBER: MB5805TWG2**

TEST DATE: MAY 11, 2011

FINAL REPORT DATE: SEPTEMBER 16, 2011

FINAL REPORT

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FINAL REPORT ACCEPTANCE BY:

Date: _____

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

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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 2011 Volkswagen Jetta S with an out-of-position Hybrid III 3-Year-Old child dummy were evaluated. The curtain and seat airbags were fired remotely. The test was performed by MGA Research Corporation on May 11, 2011. Pre and post test photographs of the vehicle and dummy can be found in Appendix A.

Three high-speed cameras (1000 fps) were used to document the side airbag deployment event. The following camera locations were used:

- Left Side Through Removed Driver Door
- Front Through Windshield
- Left Side $\frac{3}{4}$ View Through Windshield

One Hybrid III 3-Year-Old child dummy (Serial Number 082) was placed in the right front passenger seat situated in the rear-facing position along the outboard edge of the seat per Section 3.3.3.2 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
- Lower Neck Load Cell
- Upper Spine Acceleration
- Mid Spine Acceleration
- Lower Spine Acceleration
- Upper Sternum Acceleration
- Lower Sternum Acceleration
- Lower Rib @ Spine Acceleration

The 27 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy data traces.

The Hybrid III 3-Year-Old child dummy's visible contact points were as follows:

- Curtain airbag to left side of head
- Torso/Pelvis airbag to left shoulder and torso

The Hybrid III 3-Year-Old child dummy was placed in the right front passenger seat along the outboard edge of the seat cushion, kneeling and facing rearward. The vertical centerline of the dummy's sternum was aligned as close as possible with the leading edge of the seat back bolster. The sternum contacted with seat. The dummy's head was placed in between the seat bolster and pillar/side trim to maximize contact between the sternum and seatback. The head remained in its neutral orientation. The outboard leg was positioned at the outboard edge of the seat cushion and parallel to the seat centerline and remained on the cushion. The outboard knee and lower leg was slid toward the seat back/seat cushion junction until the top edge of the upper rib was aligned horizontally with the top edge of the airbag module. The inboard leg was aligned parallel to the centerline of the seat cushion. The inboard knee and lower leg was slid toward the seat bight until a line drawn through both shoulder bolts was perpendicular to the vehicle centerline. The inboard arm was rotated towards the seat back until the thumb contacts the seat back. The outboard arm and hand was rotated to hang down as close to vertical as possible.

The dummy's skullcap seam was taped with 4mm electrical tape to prevent the airbag from getting caught in the seam. The dummy's headskin was cleaned with alcohol and dusted with baby powder to achieve acceptable frictional characteristics.

This orientation complies with Section 3.3.3.2 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	3.3.3.2*	Rear-facing child dummy
Curtain Airbag	Roof-Rail Mounted	Side Airbag
Torso Airbag	Seat Mounted	Side Airbag
ATD Type/Serial No.	Hybrid III 3 Year Old / 082	Child Dummy

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

Number of Data Channels	27
Number of Airbag Channels	4
Number of High-Speed Video	3

Visible Dummy Contact Points	
Head Contact	Curtain airbag to left side of head
Left Shoulder Contact	Torso/Pelvis bag
Left Torso Contact	Torso/Pelvis bag
Left Pelvis Contact	None

DATA SHEET NO. 2**TEST VEHICLE INFORMATION**

Please note that this vehicle had previously been tested in an
NCAP Frontal Impact on December 15, 2010.

TEST VEHICLE INFORMATION

Manufacturer	Volkswagen
Model	Jetta
Body Style	Sedan
NHTSA No.	MB5805TWG2
VIN	3VW2K7AJ5BM323928
Color	Platinum Gray Metallic
Delivery Date	11/11/2010
Odometer Reading (mile)	68
Dealer	Fox Valley Volkswagen
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.0
Engine Placement	Lateral
Automatic Door Lock (ADL)	Yes
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	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Volkswagen de Mexico S.A. de C.V.
Date of Manufacture	10.10

GVWR (kg)	1850
GAWR Front (kg)	940
GAWR Rear (kg)	960

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				495
Cargo Wt. (RCLW) (kg)				155

DATA SHEET NO. 3
DUMMY POSITIONING IN VEHICLE

Measurement		Value
Seat Position		Rearmost
Seat Height Position		Lowest
Placed in Position No. 2		---
Seat Back Angle (at headrest post)	SA (°)	18.4
Top of Curtain Airbag Module to Head/Neck Junction	AN (mm)	280
Top of Seat Airbag Module to Head/Neck Junction	AN (mm)	83
Head CG to Door Panel/Window	HD (mm)	215
Head to Seat Back Centerline	HSC (mm)	179
Back to Dash	CD (mm)	621
Chest to Seatback	CS (mm)	Contact
Right Arm to Seat Back Centerline	RACL (mm)	78
Left Arm to Seat Back Centerline	LACL (mm)	292
Right Arm to Door Panel	RA (mm)	326
Left Arm to B-Post	LA (mm)	76
Knee to Knee	KK (mm)	108
Toe to Toe	TT (mm)	112
Right Knee to Seat Cushion Centerline	KSCR (mm)	102
Left Knee to Seat Cushion Centerline	KSCL (mm)	205
Right Toe to Seat Cushion Centerline	TSCR (mm)	99
Left Toe to Seat Cushion Centerline	TSCL (mm)	203
Back of Head to Dash	ND (mm)	771
Nose to Seatback	NS (mm)	Contact
Top of Head to Headliner	HH (mm)	185

DATA SHEET NO. 4
DUMMY INJURY CRITERIA VALUES

NHTSA No. MB5805TWG2

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Position No. 2			
		MAXIMUM	TIME (ms)	MINIMUM	TIME (ms)
Head X	g	5.6	30.4	-3.0	62.4
Head Y	g	3.3	43.3	-1.8	22.3
Head Z	g	8.3	11.4	-2.2	6.1
Head Resultant	g	8.4	11.4		
Upper Neck Fx	N	109.5	10.5	-87.5	62.4
Upper Neck Fy	N	65.6	136.2	-122.8	12.0
Upper Neck Fz	N	328.7	11.2	-31.8	5.5
Upper Neck F Resultant	N	359.6	11.2		
Upper Neck Mx	Nm	5.6	181.0	-6.2	29.7
Upper Neck My	Nm	3.1	10.5	-6.1	16.2
Upper Neck Mz	Nm	4.6	130.3	-4.8	38.5
Upper Neck M Resultant	Nm	7.6	15.9		
Lower Neck Fx	N	102.0	9.7	-65.0	62.1
Lower Neck Fy	N	71.5	43.3	-189.3	11.4
Lower Neck Fz	N	349.0	11.4	-25.3	5.8
Lower Neck F Resultant	N	398.9	11.4		
Lower Neck Mx	Nm	10.2	176.5	-11.3	11.8
Lower Neck My	Nm	9.4	61.3	-6.2	11.1
Lower Neck Mz	Nm	5.8	129.0	-3.9	11.5
Lower Neck M Resultant	Nm	13.0	11.4		
Upper Spine X	G	3.1	8.5	-7.6	11.1
Upper Spine Y	G	7.0	19.6	-11.6	10.2
Upper Spine Z	G	4.2	15.3	-6.6	8.5
Upper Spine Resultant	G	13.6	10.4		
Mid Spine X	G	2.3	17.9	-12.6	9.6
Mid Spine Y	G	8.0	9.0	-2.6	36.5
Mid Spine Z	G	3.4	9.6	-2.2	41.7
Mid Spine Resultant	G	14.5	9.2		
Lower Spine X	G	4.8	17.2	-21.1	8.7
Lower Spine Y	G	18.9	9.3	-3.6	36.9
Lower Spine Z	G	10.5	9.6	-3.0	41.5
Lower Spine Resultant	G	28.9	9.2		
Upper Sternum X	G	193.7	12.6	-456.1	8.0
Lower Sternum X	G	234.0	8.3	-618.7	7.6
Lower Rib @ Spine X	G	4.9	17.6	-28.8	8.6

DATA SHEET NO. 4 (continued)
DUMMY INJURY CRITERIA VALUES

NHTSA No. MB5805TWG2

ATD position	HEAD INJURY CRITERIA (HIC)					
	HIC15			HIC36		
	HIC	T ¹ (msec)	T ² (msec)	HIC	T ¹ (msec)	T ² (msec)
No. 2 Right Front	0.4	10.3	18.4	0.74	11.0	47.0

Position 2 Neck Injury Summary (3-Year-Old – Out-Of-Position)

	Nij	Time (msec)	Z Force (N) (CFC 600)	X Force (N) (CFC 600)	Y Moment (N-m) (CFC 600)
Ntf	0.17	11.1	319.50	83.34	1.55
Nte	0.28	16.2	121.51	-17.86	-6.07
Ncf	0.03	109.0	-4.56	-18.41	1.56
Nce	0.01	3.2	-9.18	-1.03	-0.04
Peak Tension (CFC1000)	328.7 N		Peak Compression (CFC 1000)		-31.8 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	2120 N	Extension (mCVe)	27 N-m	Tension	1130 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression	1380 N

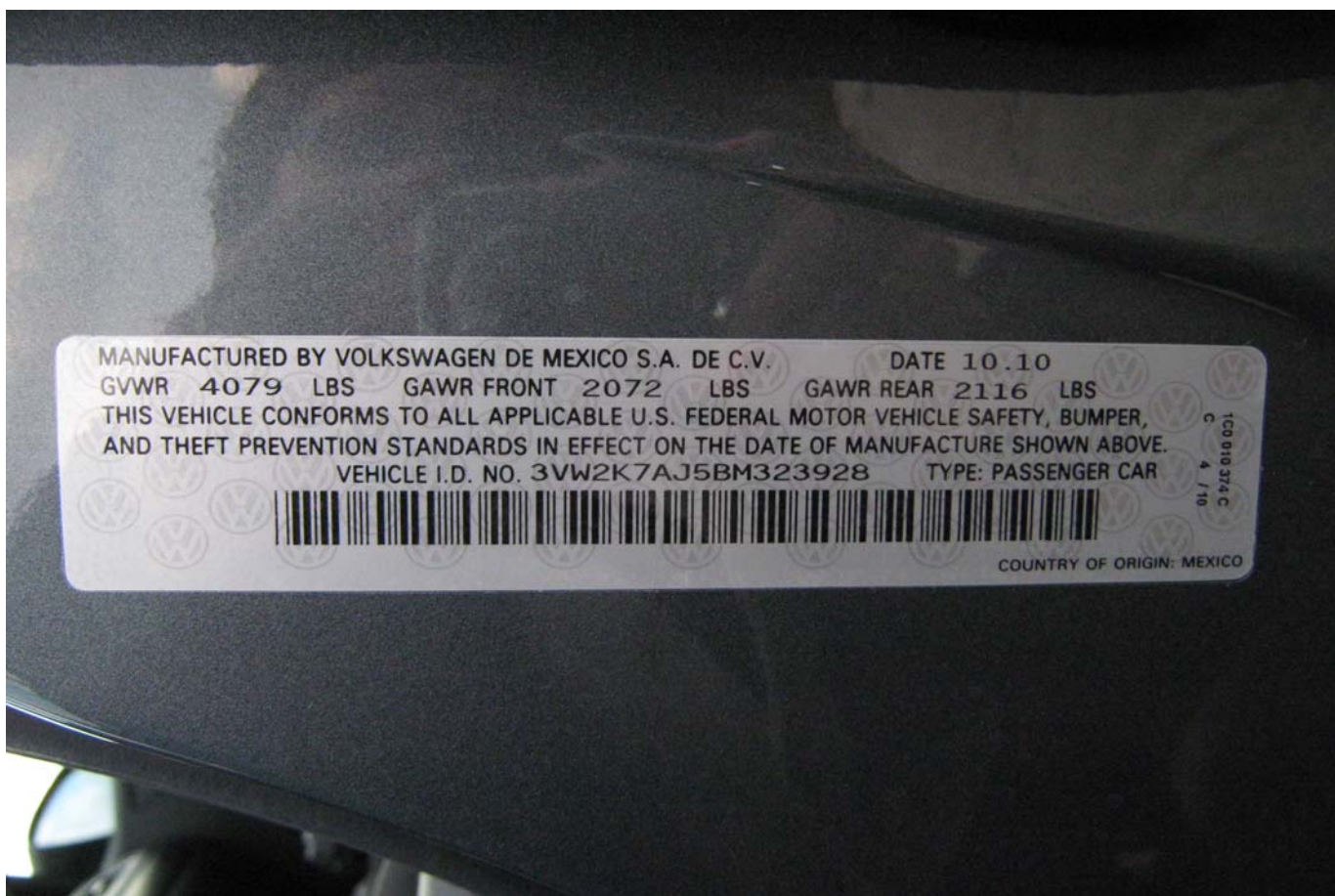
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Right ¾ Front View of Vehicle, As Received



Vehicle Certification Placard



Pre-Test Vehicle Left Side View



Post-Test Vehicle Left Side View



Pre-Test 3-Year-Old Child Dummy Left Side View



Post-Test 3-Year-Old Child Dummy Left Side View



Pre-Test 3-Year-Old Child Dummy Left Side Closeup View



Post-Test 3-Year-Old Child Dummy Left Side Closeup View



Pre-Test 3-Year-Old Child Dummy Left 3/4 Front View



Post-Test 3-Year-Old Child Dummy Left 3/4 Front View



Pre-Test 3-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Post-Test 3-Year-Old Child Dummy Left $\frac{3}{4}$ Front Closeup View



Pre-Test 3-Year-Old Child Dummy Front View



Post-Test 3-Year-Old Child Dummy Front View



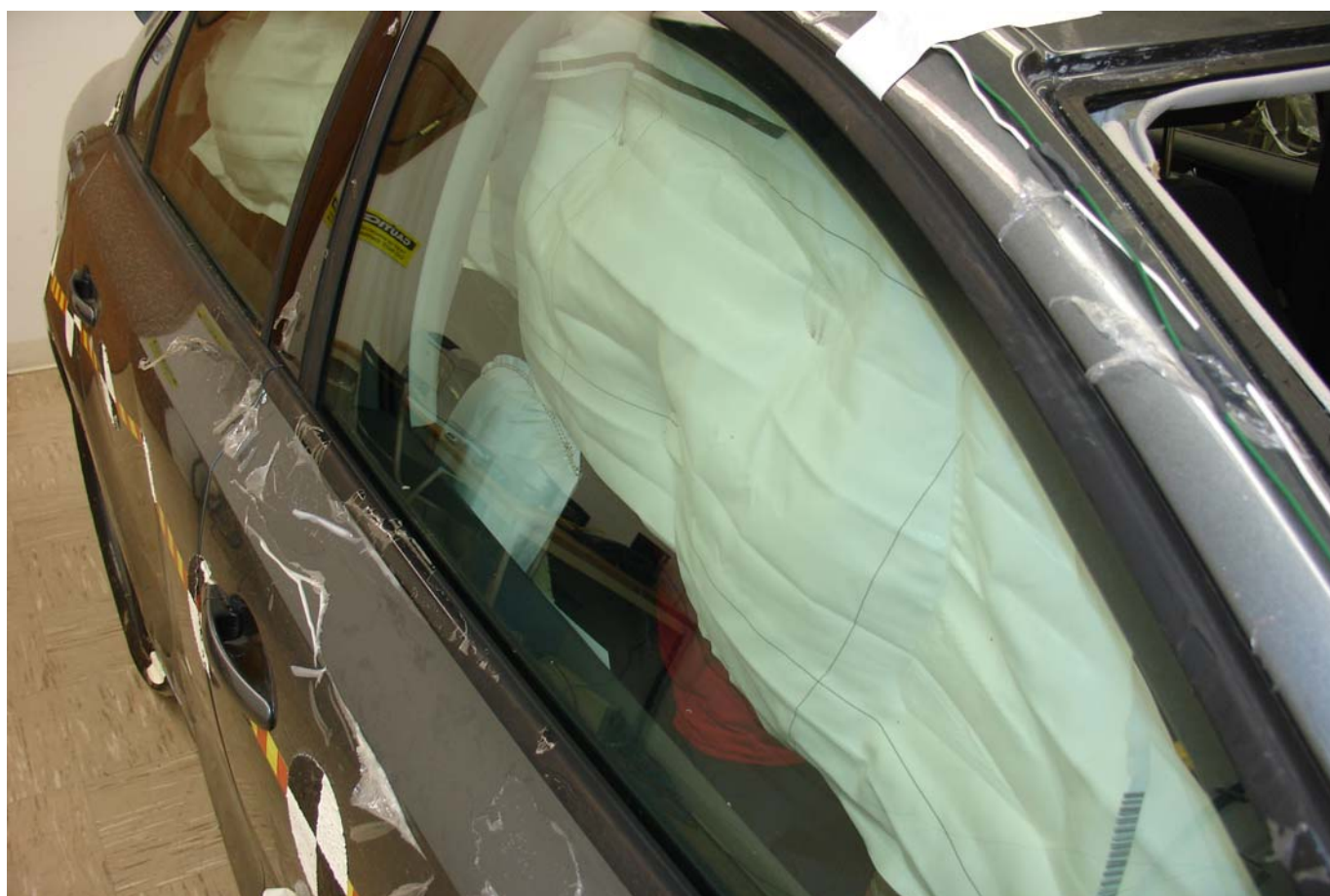
Pre-Test 3-Year-Old Child Dummy Front Closeup View



Post-Test 3-Year-Old Child Dummy Front Closeup View



Pre-Test 3-Year-Old Child Dummy Right ¾ Front View



Post-Test 3-Year-Old Child Dummy Right ¾ Front View



Pre-Test 3-Year-Old Child Dummy Right Side View



Post-Test 3-Year-Old Child Dummy Right Side View



Pre-Test 3-Year-Old Child Dummy Right $\frac{3}{4}$ Rear View



Post-Test Curtain and Torso Airbag Left Side View



Post-Test Curtain and Torso Airbag Left ¾ Front View



Post-Test Curtain and Torso Airbag Front View



Post-Test Curtain Airbag Right Side View

APPENDIX B

DUMMY RESPONSE DATA TRACES

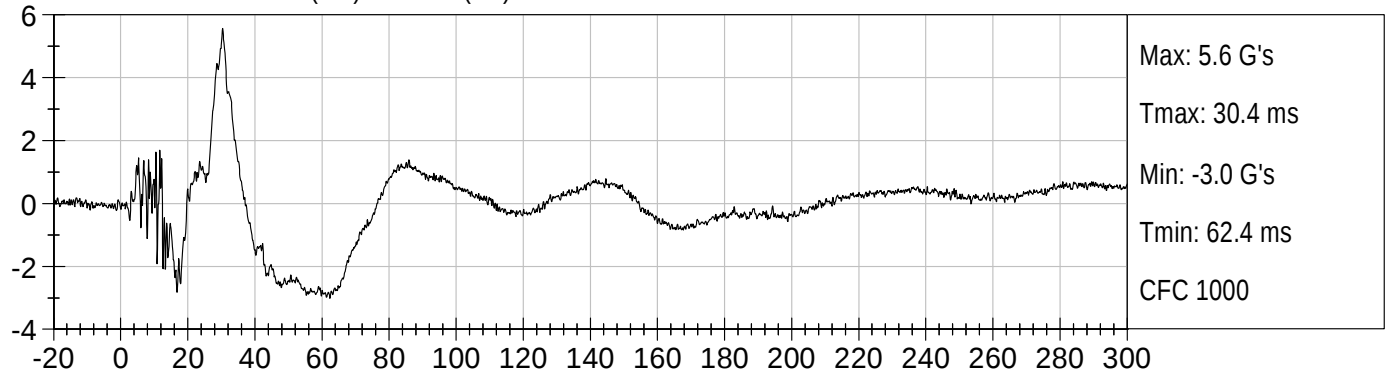
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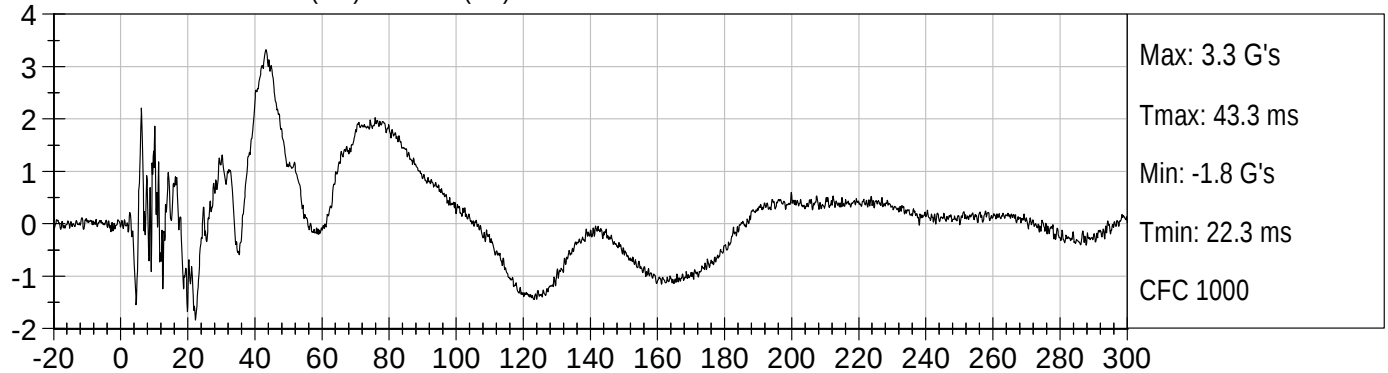
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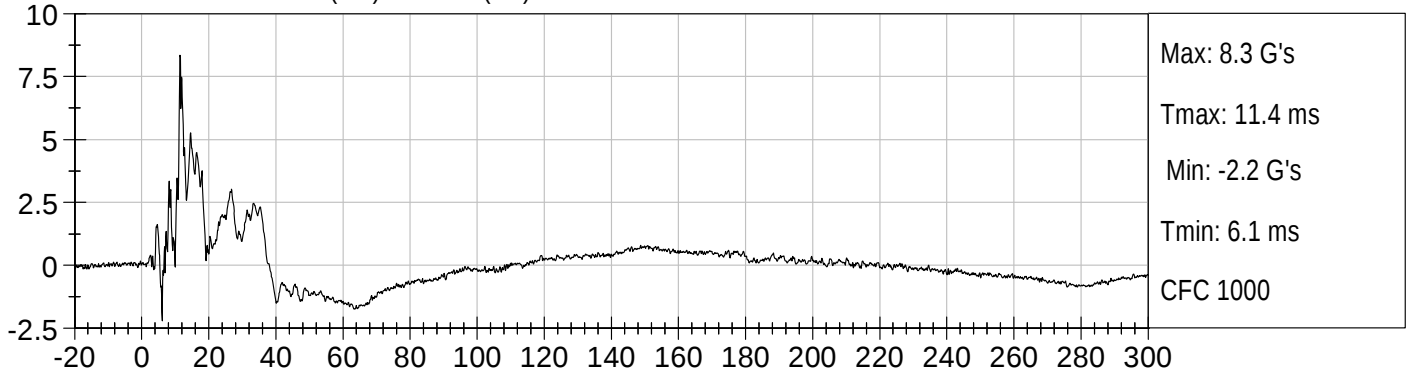
PASSENGER HEAD X (G's) vs TIME (ms)



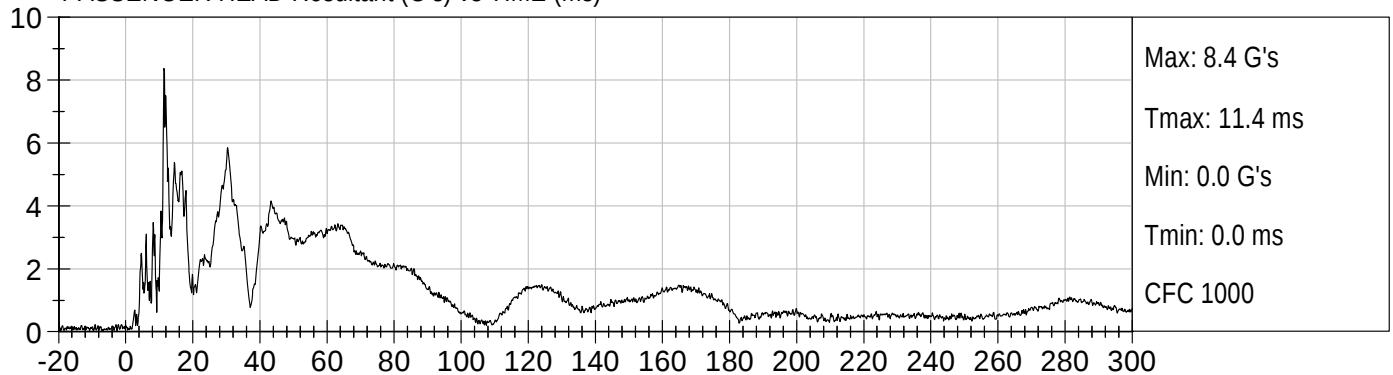
PASSENGER HEAD Y (G's) vs TIME (ms)



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

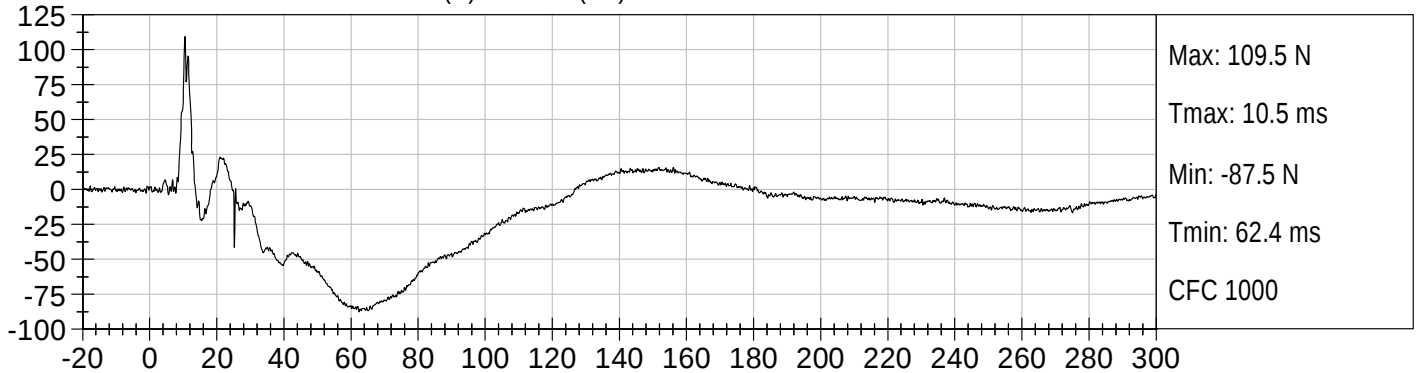


PASSENGER HEAD Resultant (G's) vs TIME (ms)

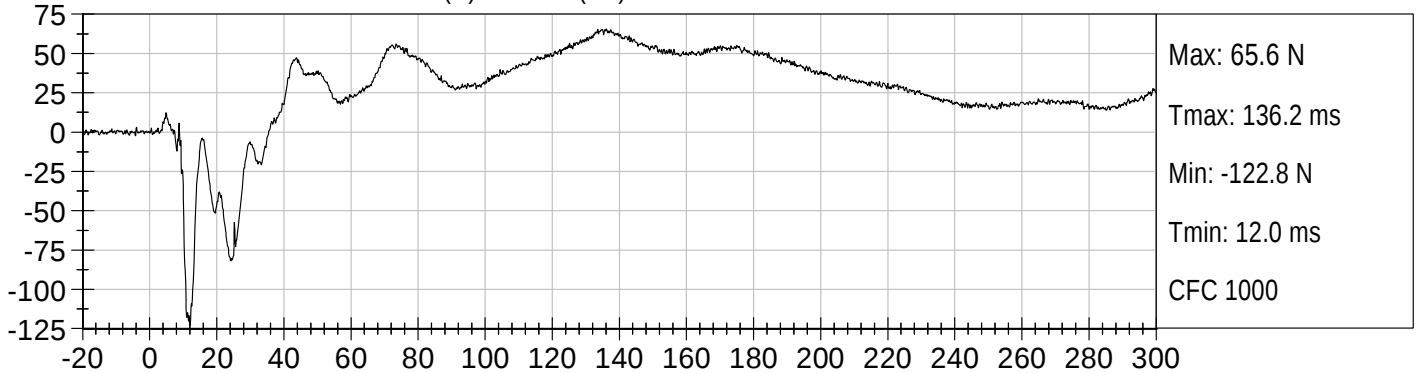




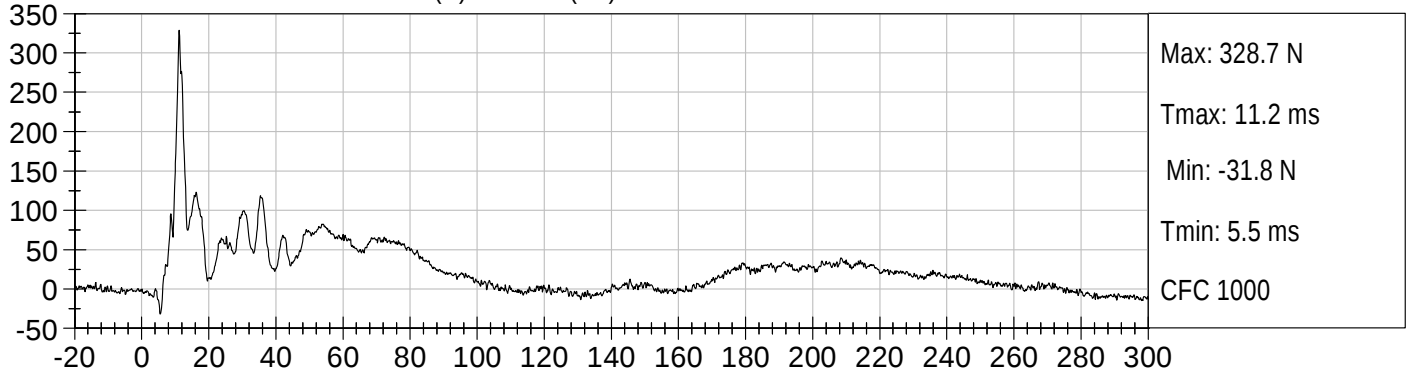
PASSENGER UPPER NECK FX (N) vs TIME (ms)



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

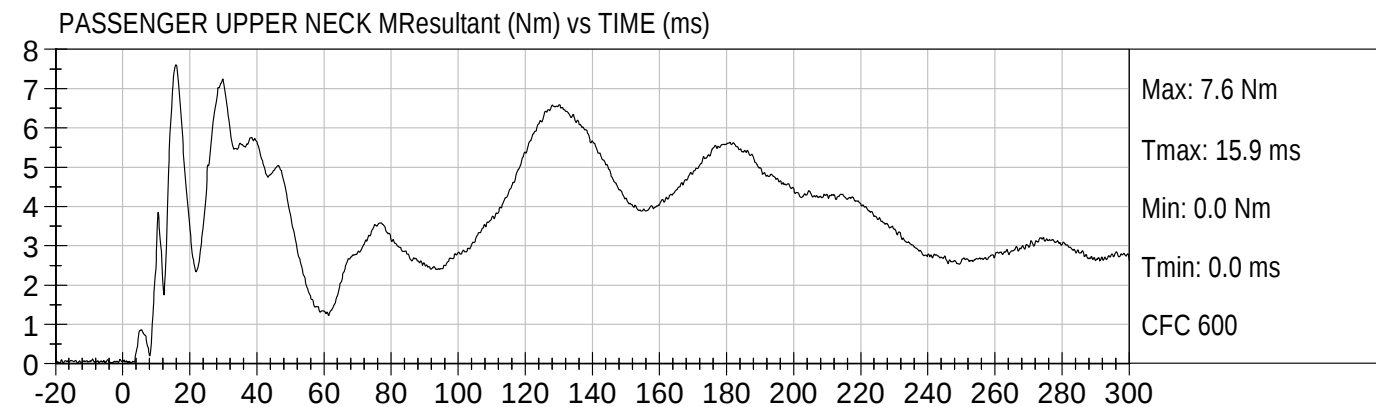
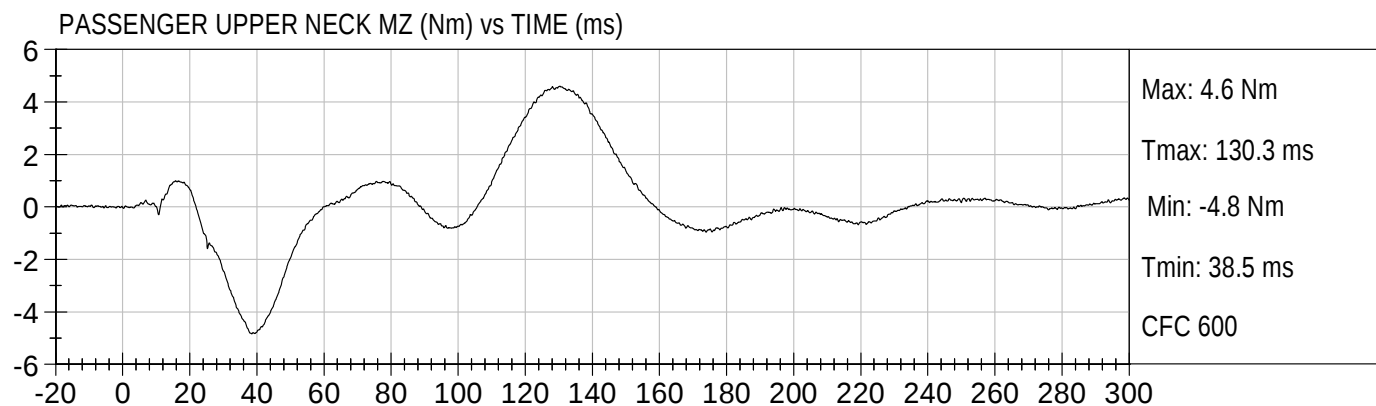
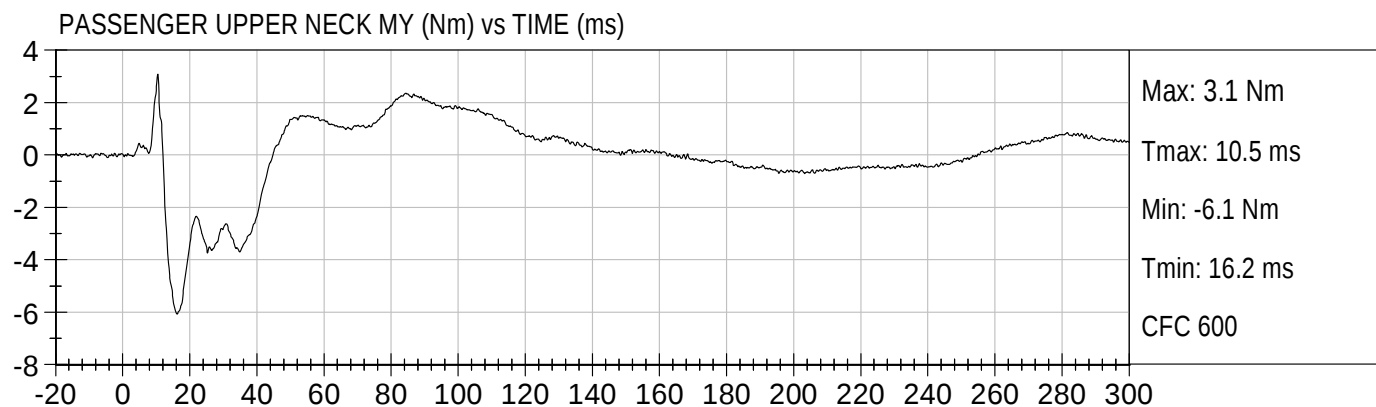
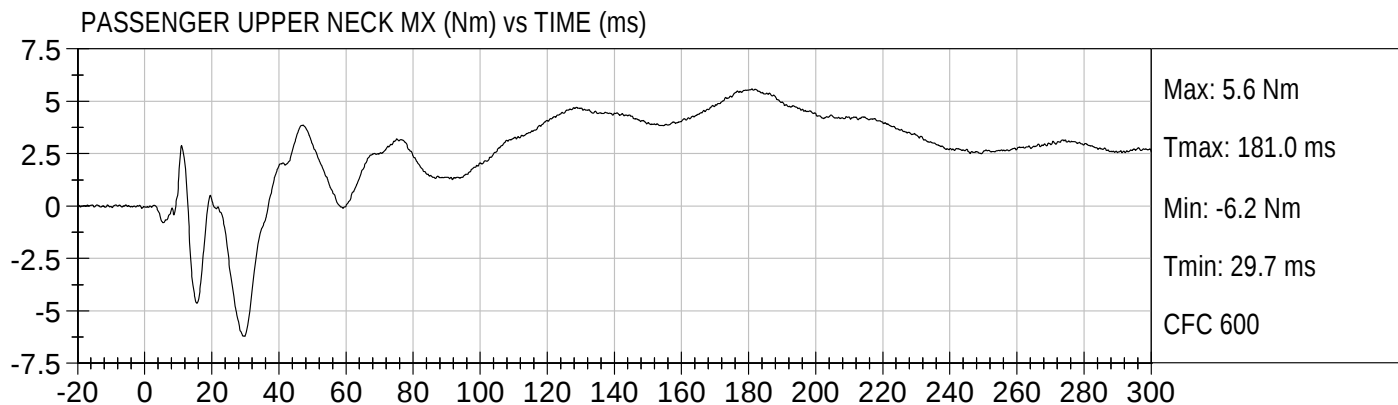


PASSENGER UPPER NECK FZ (N) vs TIME (ms)



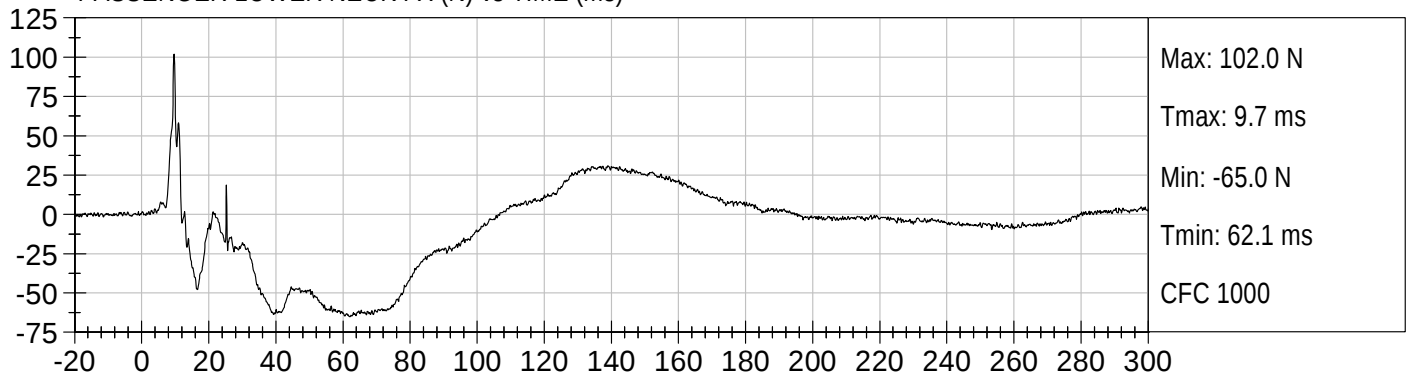
PASSENGER UPPER NECK FResultant (N) vs TIME (ms)



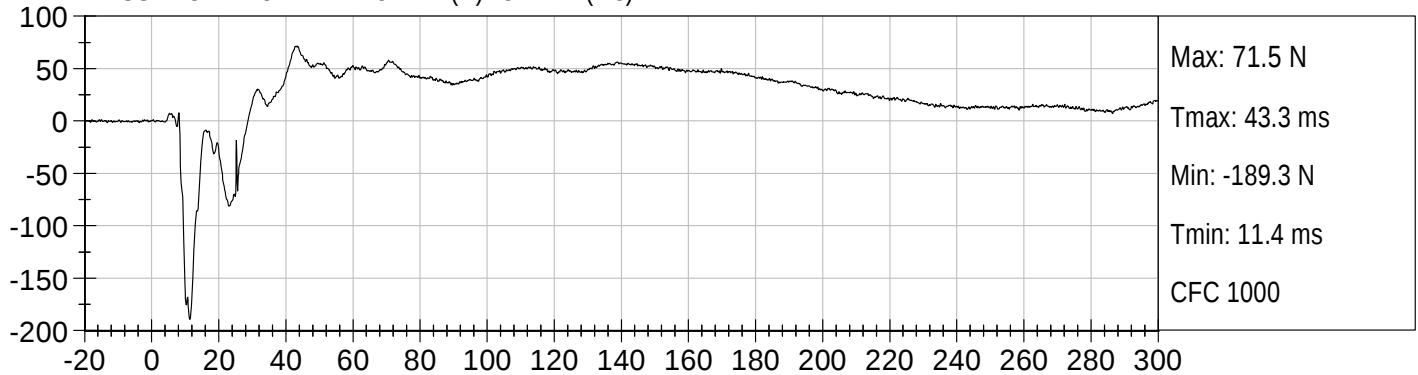




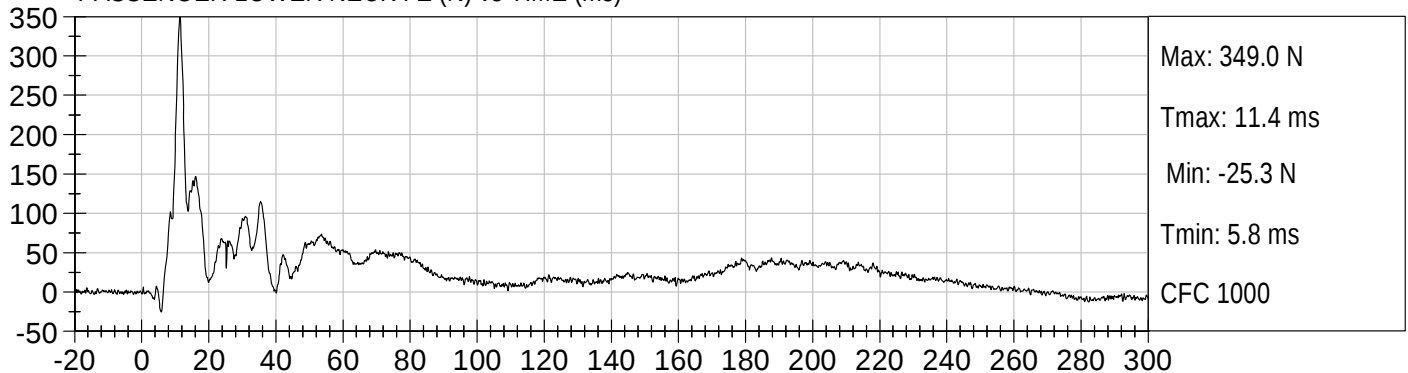
PASSENGER LOWER NECK FX (N) vs TIME (ms)



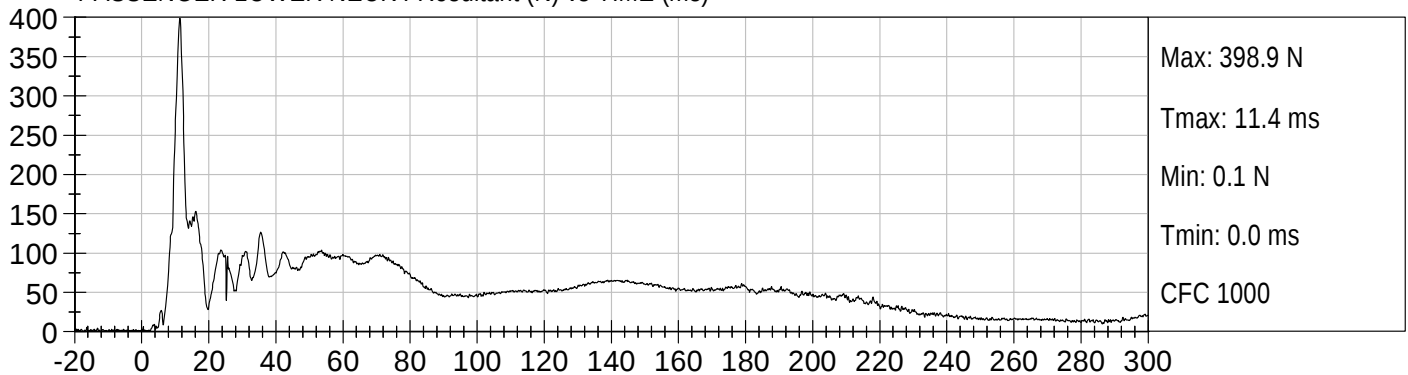
PASSENGER LOWER NECK FY (N) vs TIME (ms)

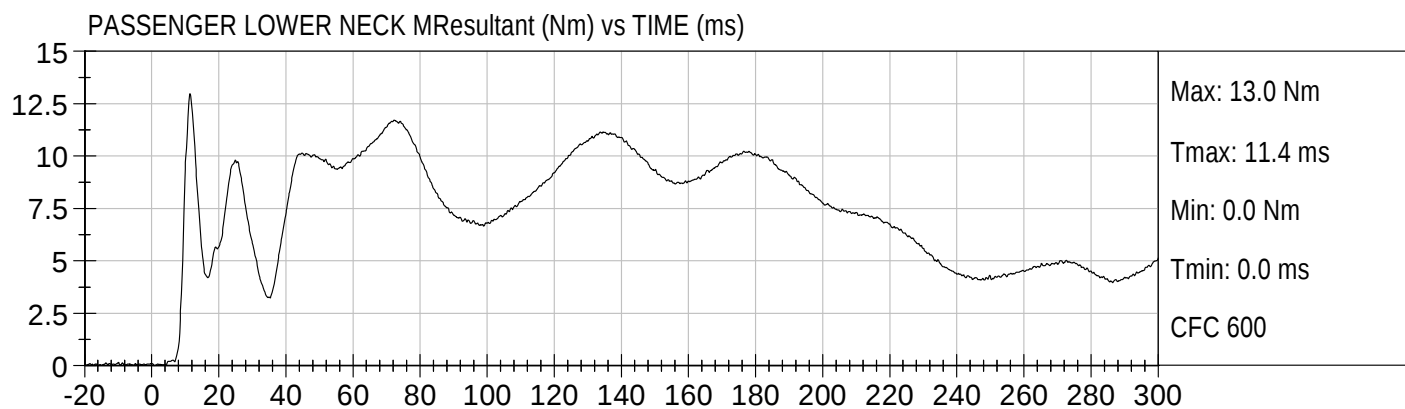
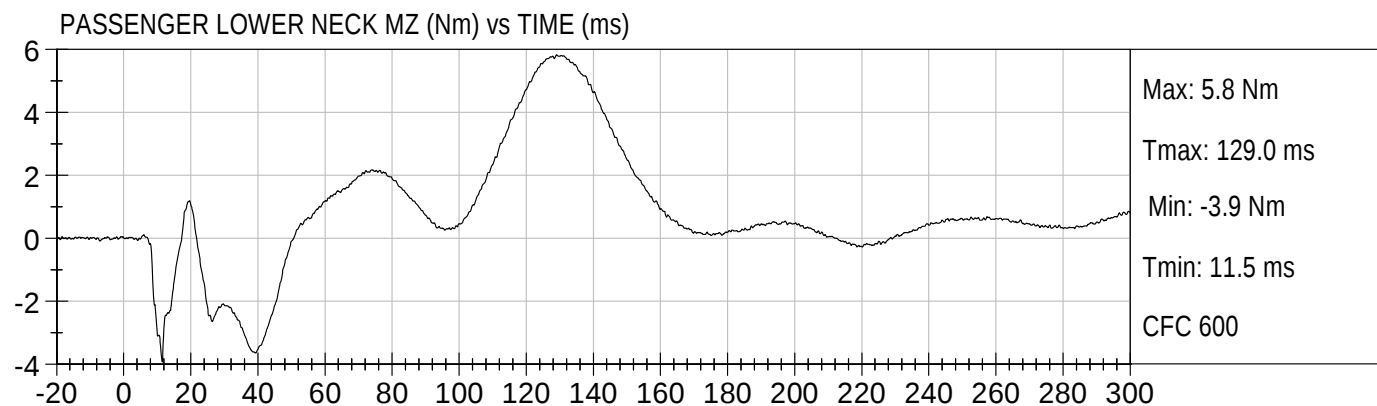
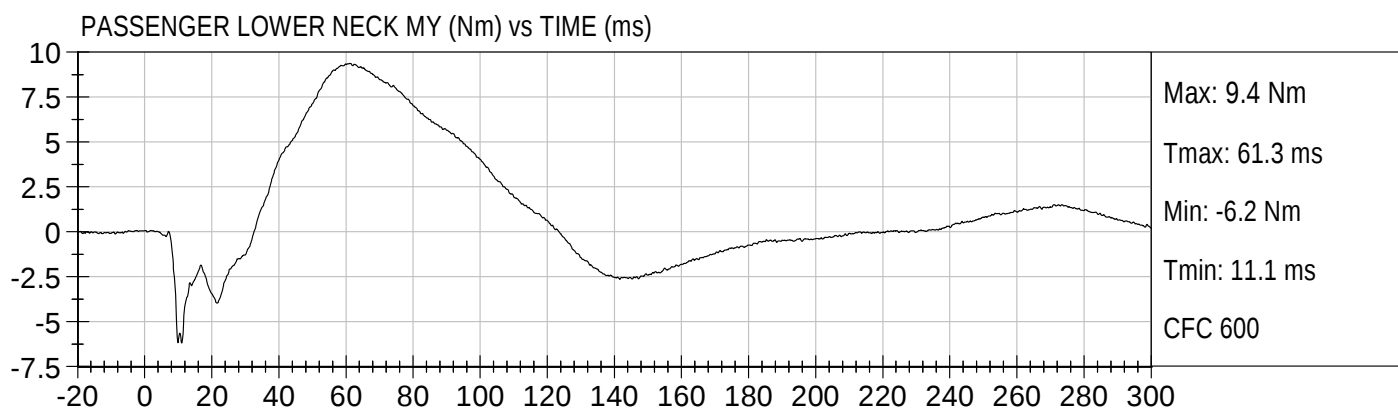
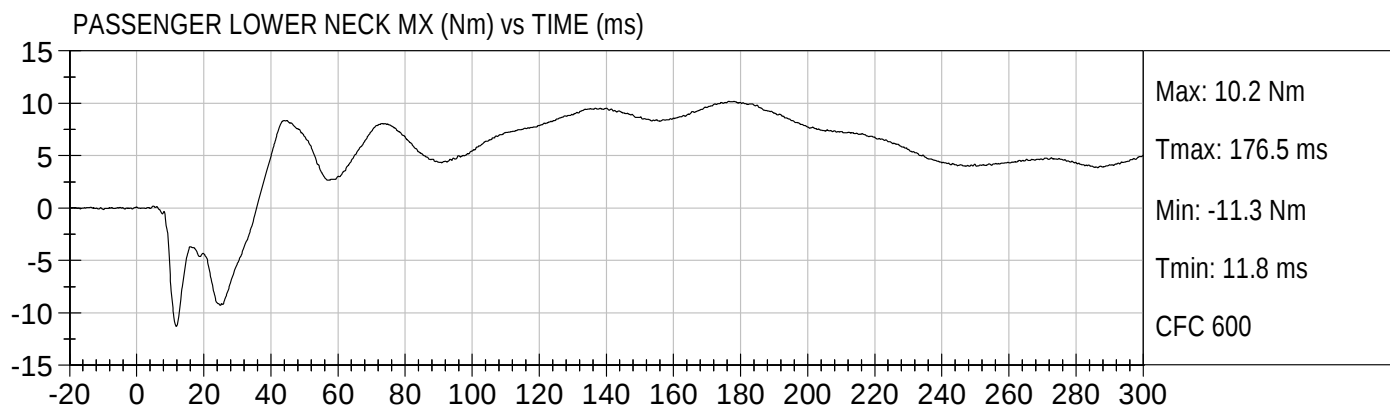


PASSENGER LOWER NECK FZ (N) vs TIME (ms)



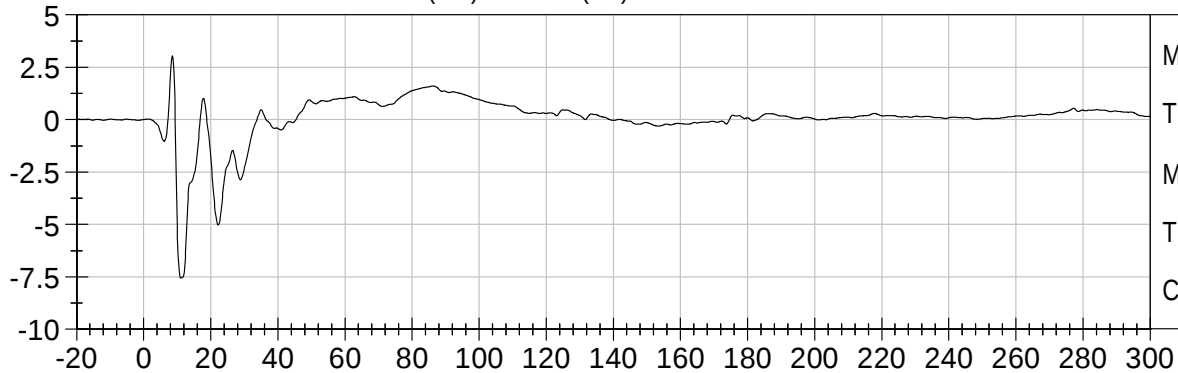
PASSENGER LOWER NECK FResultant (N) vs TIME (ms)





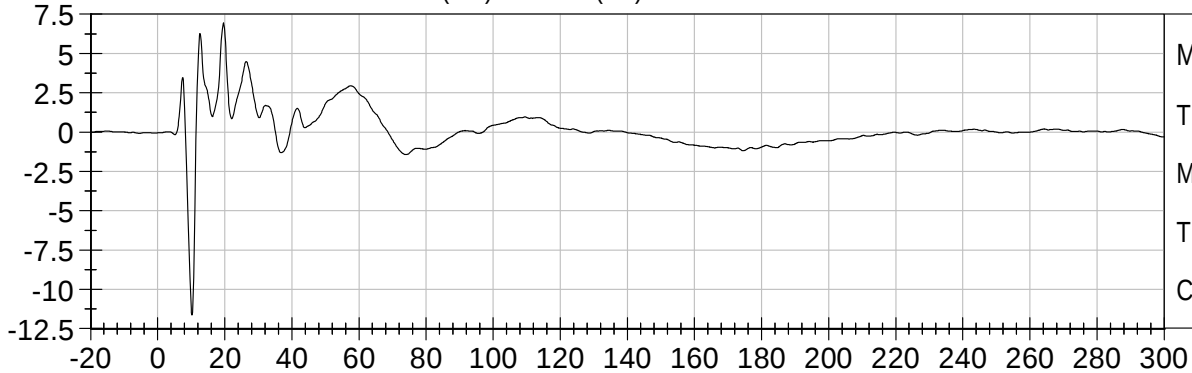


PASSENGER UPPER SPINE X (G's) vs TIME (ms)



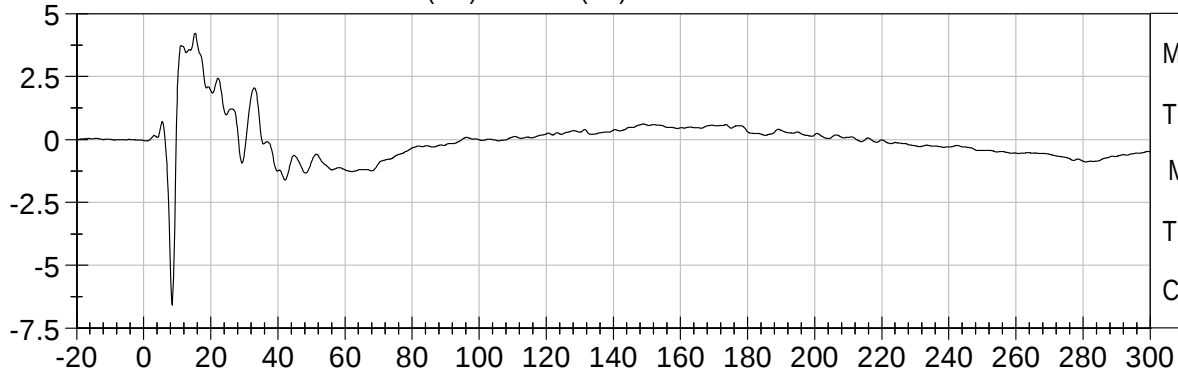
Max: 3.1 G's
Tmax: 8.5 ms
Min: -7.6 G's
Tmin: 11.1 ms
CFC 180

PASSENGER UPPER SPINE Y (G's) vs TIME (ms)



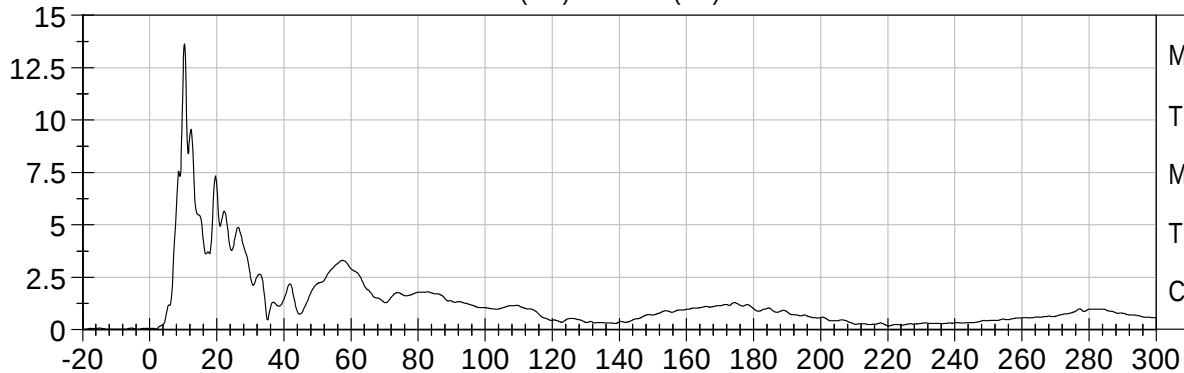
Max: 7.0 G's
Tmax: 19.6 ms
Min: -11.6 G's
Tmin: 10.2 ms
CFC 180

PASSENGER UPPER SPINE Z (G's) vs TIME (ms)



Max: 4.2 G's
Tmax: 15.3 ms
Min: -6.6 G's
Tmin: 8.5 ms
CFC 180

PASSENGER UPPER SPINE Resultant (G's) vs TIME (ms)



Max: 13.6 G's
Tmax: 10.4 ms
Min: 0.0 G's
Tmin: 0.0 ms
CFC 180

