

REPORT NUMBER: TWG-TRC-18-03

NEW CAR ASSESSMENT PROGRAM (NCAP)
Side Airbag Out-of-Position Test

VOLSKWAGEN DE MEXICO S.A. DE C.V. MEXICO
2018 Volkswagen Tiguan

NHTSA NUMBER: M20185805TWG2
TRC TEST NUMBER: 180718-1

PREPARED BY:
TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
P.O. BOX B-67
East Liberty, OH 43319



Test Date: July 18, 2018

FINAL REPORT

Alpha Technology Associate, Inc.
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This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-13-D-00311L, Alpha Technology PO 14GT150. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

Prepared By: ILO Projects Operations Group

Approved By: 
John Shultz
Project Manager

Approval Date: November 6, 2018

FINAL REPORT ACCEPTANCE BY:

Accepted By: _____

Acceptance Date: _____

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16. <u>ABSTRACT</u> A side air bag out of position test was conducted on the subject 2018 Volkswagen Tiguan in accordance with the specifications of the Office of Crashworthiness Standards SAB OOP NCAP Laboratory Test Procedure for the generation of consumer information on vehicle side air bag protection. The test was conducted at the Transportation Research Center Inc. in East Liberty, Ohio, on July 18, 2018. The curtain and torso side air bags were deployed and responses were measured on a 3-Year-Old. One real-time camera and three high speed cameras recorded the event. The ambient temperature at the time of air bag deployment was 20.8°C.			
Section 3.3.3.1 – 3-Year-Old – Position 2			
Measurement Description	Units	IARV	Result
Head Injury Criteria (HIC15)	N/A	570	10
Nij	N/A	1	0.74
Upper Neck Tension	Newton	1130	864.8
Upper Neck Compression	Newton	1380	-503.0
Maximum Chest Compression	mm	36	
Maximum Chest Compression rate	m/sec	8.0	
17. <u>KEY WORDS</u> New Car Assessment Program Side Air Bag Out-of-position (OOP) Technical Working Group (TWG)		18. <u>DISTRIBUTION STATEMENT</u> Copies of this report are available from the following: Alpha Technology Associate, Inc. 2810 Old Lee Hwy, Suite 120 Fairfax, VA 22031 Phone: (703) 876-0010 FAX: (703) 876-0120 Attn: Steven Kim	
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SECTION 1 – TEST PURPOSE AND PROCEDURE

This side air bag out-of-position test is part of the MY18 New Car Assessment Program (NCAP), sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-13-D-00311L. The purpose of this test is to obtain data on the performance of side air bags with an out-of-position occupant in a 2018 Volkswagen Tiguan. The air bag test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure, dated April 2018.

SECTION 2 – SUMMARY OF TEST RESULTS

The effects of both a seat-mounted side air bag and a curtain air bag deployment in a 2018 Volkswagen Tiguan on an out-of-position 3-Year-Old were evaluated. The test was performed by TRC on July 18, 2018. Pre and post-test photographs of the vehicle and ATD can be found in Appendix A.

The vehicle had previously undergone crash testing as part of the NCAP. After conducting the crash test and before conducting the air bag deployment test, the vehicle was inspected for damage. The vehicle was found to be in good condition to undergo the air bag deployment test.

One real-time camera and three high-speed cameras were used to record the air bag deployment event. High speed images were recorded at rates of 1,000 frames per second. Cameras were placed relative to the position 2 and were positioned to capture the deployment event from the side, the front, and the oblique views.

The 3-Year-Old was placed in the right front (passenger) seat situated forward facing. This placement followed the ATD placement instructions in the NCAP Laboratory Test Procedure as well as 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 specific test section was section 3.3.3.1.

The 3-Year-Old was instrumented with head X, Y, and Z accelerometers, a six-axis upper neck load cell, and a six-axis lower neck load cell. During the air bag deployment, a total of twenty-two channels of data were recorded using an on-board data acquisition system. Appendix B contains the ATD response data traces and Appendix C contains the instrumentation list and calibration information. Appendix D contains the dummy's pre-test qualification performance verification data.

No Injury Reference Values were exceeded during the test. The occupant data is summarized below:

Measurement Description	Units	Passenger ATD 3-Year-Old	
		IARV	Result
Head Injury Criteria (HIC15)	N/A	570	10
Nij	N/A	1	0.74
Upper Neck Tension	N	1130	864.8
Upper Neck Compression	N	1380	-503.0
Thorax Compression	mm	36	
Thorax Compression rate	m/sec	8.0	

SECTION 3 DATA SHEET

DATA SHEET NO. 1 TEST SUMMARY

Test Vehicle:	2018 Volkswagen Tiguan	NHTSA No.:	M20185805TWG2
Test Program:	Side Air Bag Out-of-Position Test	Test Date:	7/18/2018

TEST SUMMARY

TEST CONFIGURATION INFORMATION

Seating Position:	P2	Right Front Seating Position
Test Section:	3.3.3.1	Seat-Mounted, Forward Facing
Airbag 1:	Seat	Seat mounted – outside seam
Airbag 2:	Side Rail	Side curtain airbag
Booster Block:	Foam	300 mm deep by 450 mm wide by 75
ATD Type/Serial No.:	3-Year-Old	040
Vehicle	Volkswagen	Tiguan
Previous Crash Test	MDB	12/14/2017 and M20185805

EQUIPMENT INFORMATION

Number of Data Channels	22
Number of High Speed Video Cameras	3
Number of Real Time Video Cameras	1

VISIBLE DUMMY CONTACT POINTS

Head	None Visible
Upper Torso	None Visible
Lower Torso	None Visible
Knee	None Visible

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2018 Volkswagen Tiguan
 Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
 Test Date: 7/18/2018

TEST CONFIGURATION INFORMATION

NHTSA No.	M20185805
Model Year	2018
Make	Volkswagen
Model	Tiguan
Body Style	MPV
VIN	3VV1B7AX2JM018714
Body Color	Silk Blue Metallic
Odometer Reading (km/mi)	103 mi
Engine Displacement (L)	2.0
Type/No. Cylinders	Straight/4
Engine Placement	Front/Transverse
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	No
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Passenger Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Passenger Load Limiter	Yes
Other Safety Restraint	No

DATA FROM CERTIFICATION LABEL

Manufactured By	VOLSKWAGEN DE MEXICO S.A. DE C.V. MEXICO
Date of Manufacture	07/17
Vehicle Type	MPV

GVWR (kg)	2380
GAWR Front (kg)	2537
GAWR Rear (kg)	1270

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	2	7	
Capacity Weight (VCW) (kg)				550	(A)
DSC x 68.04 (kg)				476.3	(B)
Cargo Weight (RCLW) (kg)				73.7	(A-B)

VEHICLE SEAT TYPE

Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	Yes	N/A	N/A		N/A	Yes	N/A
Rear or Second Row Seat	N/A	N/A	Yes	Yes	N/A	Yes	N/A
Third Row Seat	N/A	N/A	Yes	N/A	N/A	N/A	N/A

DATA SHEET NO. 3
SEAT ADJUSTMENT DATA

Test Vehicle: 2018 Volkswagen Tiguan
Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
Test Date: 7/18/2018

VEHICLE SEAT FORE/AFT POSITION

Seat Location	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	# Detents	mm	# Detents
Front Right	254	39	126	31
Rear Right	180	19	180	19

Seat Fore/Aft Position Per TWG Guidelines	Full rear
Reason for Deviation from TWG Guidelines	To align upper spine with airbag deployment trajectory

VEHICLE SEAT BACK ANGLE ADJUSTMENT

Seat Location	Total Seat Back Angle Range		Test Position from Most Upright (Vertical)	
	Degrees	# Detents	Degrees	# Detents
Front Right	63.8	36	18.1	9
Rear Right	Fixed	N/A	N/A	N/A

OEM Back Angle Design Position	18.0
Method of Measuring Back Angle Position	Inclinometer on headrest post, zeroed on sill
Seat Back Angle Position Per TWG Guidelines	Manufacturers design position
Reason for Deviation from TWG Guidelines	None

VEHICLE SEAT HEIGHT ADJUSTMENT

Seat Location	Total Height Adjustment Range		Test Position from Lowest Position	
	mm	# Detents	mm	# Detents
Front Right	40	N/A	0	N/A
Rear Right	Fixed	N/A	N/A	N/A

Seat Height Adjustment Per TWG Guidelines	Full down
Reason for Deviation from TWG Guidelines	None

DATA SHEET NO. 4
DUMMY SETUP AND POSITIONING DATA

Test Vehicle: 2018 Volkswagen Tiguan
 Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
 Test Date: 7/18/2018

DUMMY INFORMATION

ATD Type	H-III 3-Year-Old
Serial Number	040
Qualification Date	7/13/18
Qualification Type	Partial
Clothing	Shirt, pants, shoes
Other ATD Prep	Baby powder, electrical tape

DUMMY POSITIONING INFORMATION

TWG Setup Instructions	Seat positioned to specifications in 3.3.1; ATD positioned to 3.3.3.1.1
Actual Setup	As specified in the 3.3.3.1 Test Procedure; We began with the vehicle seat in the full rear position with the seat back angle set 18.0 degrees, according to the design position called out in Form 1. The dummy's skull cap is powdered and the seam is taped. The dummy is seated forward facing on the outboard edge of the booster foam block. The dummy's upper spine is positioned as close as possible to the seat back side bolster's leading edge. (In order to achieve this, the seat track was moved forward to 31st detent from the forward-most position) The dummy's head is neutral between the B-pillar and the seat back in order to maximize the contact between the seat and the neck. The lower edge of the head skin is aligned vertically with the top edge of the airbag module. The shoulder belt has been removed. The heels are placed on the previously marked placement points on the seat cushion. With the vehicle door closed, the pelvis and upper torso were slid outboard as much as possible. In order to keep the head and upper spine aligned with the top edge of the airbag module contact between the vehicle door and the outboard arm and pelvis/upper torso could not be achieved. The inboard arm is in the position specified in the procedure.

DATA SHEET NO. 5
DUMMY INJURY CRITERIA DATA

Test Vehicle: 2018 Volkswagen Tiguan
Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
Test Date: 7/18/2018

RECORDED DATA - MINIMUMS AND MAXIMUMS

Channel	Unit	CFC	Maximum	Time (ms)	Minimum	Time (ms)
Head X	G	1000	19.06	52.40	-9.97	37.92
Head Y	G	1000	10.09	14.24	-16.73	15.68
Head Z	G	1000	20.70	14.88	-22.16	15.12
Head Resultant	G	1000	28.53	15.12	0.04	-19.44
Head Red X	G	1000	19.02	52.48	-10.88	37.84
Head Red Y	G	1000	10.28	14.24	-16.93	15.68
Head Red Z	G	1000	20.77	14.88	-21.97	15.12
Head Red Resultant	G	1000	28.32	15.12	0.02	-18.56
Upper Neck X	N	1000	289.91	18.72	-24.66	173.84
Upper Neck Y	N	1000	71.47	8.88	-107.77	15.12
Upper Neck Z	N	1000	864.83	53.20	-502.97	16.80
Upper Neck X	Nm	600	5.13	13.84	-9.32	25.12
Upper Neck Y	Nm	600	14.30	9.28	-9.02	53.44
Upper Neck Z	Nm	600	1.92	110.24	-8.72	51.92
Lower Neck X	N	1000	138.67	43.04	-362.68	7.52
Lower Neck Y	N	1000	183.19	16.48	-83.48	6.16
Lower Neck Z	N	1000	149.50	54.00	-494.88	16.40
Lower Neck X	Nm	600	5.04	7.12	-12.89	20.80
Lower Neck Y	Nm	600	5.16	172.56	-42.75	52.72
Lower Neck Z	Nm	600	2.73	52.00	-1.85	18.08

HEAD INJURY SUMMARY

HIC15	T1 (ms)	T2 (ms)	HIC36	T1 (ms)	T2 (ms)
10	23.36	38.40	16	21.36	57.36

DATA SHEET NO. 5
DUMMY INJURY CRITERIA DATA (CONTINUED)

Test Vehicle: 2018 Volkswagen Tiguan
 Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
 Test Date: 7/18/2018

NECK INJURY SUMMARY

Injury Criteria	Value	Time (ms)
Upper Neck NTF	0.17	23.60
Upper Neck NTE	0.74	53.36
Upper Neck NCF	0.40	16.80
Upper Neck NCE	0.08	303.44
Peak Tension	864.8	53.20
Peak Compression	-503.0	16.80

CHEST INJURY SUMMARY

Injury Criteria	Value	Time (ms)
Chest Deflection		
Deflection Rate ¹		

¹ Deflection Rate was assessed by measuring compression from a rotary potentiometer

RESEARCH INJURY SUMMARY

Research Injury Criteria ¹	Value	Time (ms)
Upper Neck Lateral Moment		
Upper Neck Twist Moment		
Lower Neck Flexion Moment		
Lower Neck Extension Moment		
Lower Neck Lateral Moment		
Lower Neck Twist Moment		
Lower Neck Tension		
Lower Neck Compression		
Spine Acceleration		

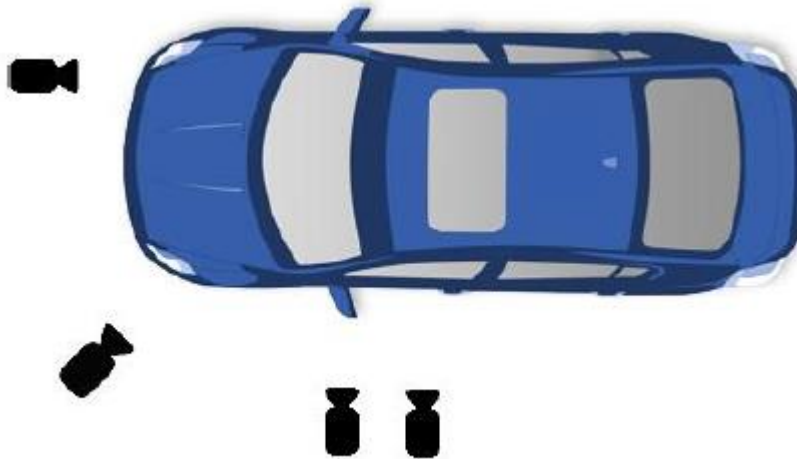
¹These injury criteria are only monitored and not considered pass/fail

DATA SHEET NO. 6
CAMERA SETUP AND DESCRIPTION

Test Vehicle: 2018 Volkswagen Tiguan
 Test Program: Side Air Bag Out-of-Position Test

NHTSA No.: M20185805TWG2
 Test Date: 7/18/2018

CAMERA SETUP DIAGRAM FOR SAB OOP TESTS



No.	Camera View	Location (mm) ¹			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Left View	278	-2512	-1091	50	1000
2	Oblique View	1353	-1164	-1617	50	1000
3	Front View	2442	289	-1599	50	1000
4	Real Time (optional)	0	-2628	-1104	Zoom	30

¹ +X forward of vehicle, +Y right of vehicle, +Z into ground

APPENDIX A
PHOTOGRAPHS

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Figure A-1 Right Front ¾ View of Test Vehicle as Delivered

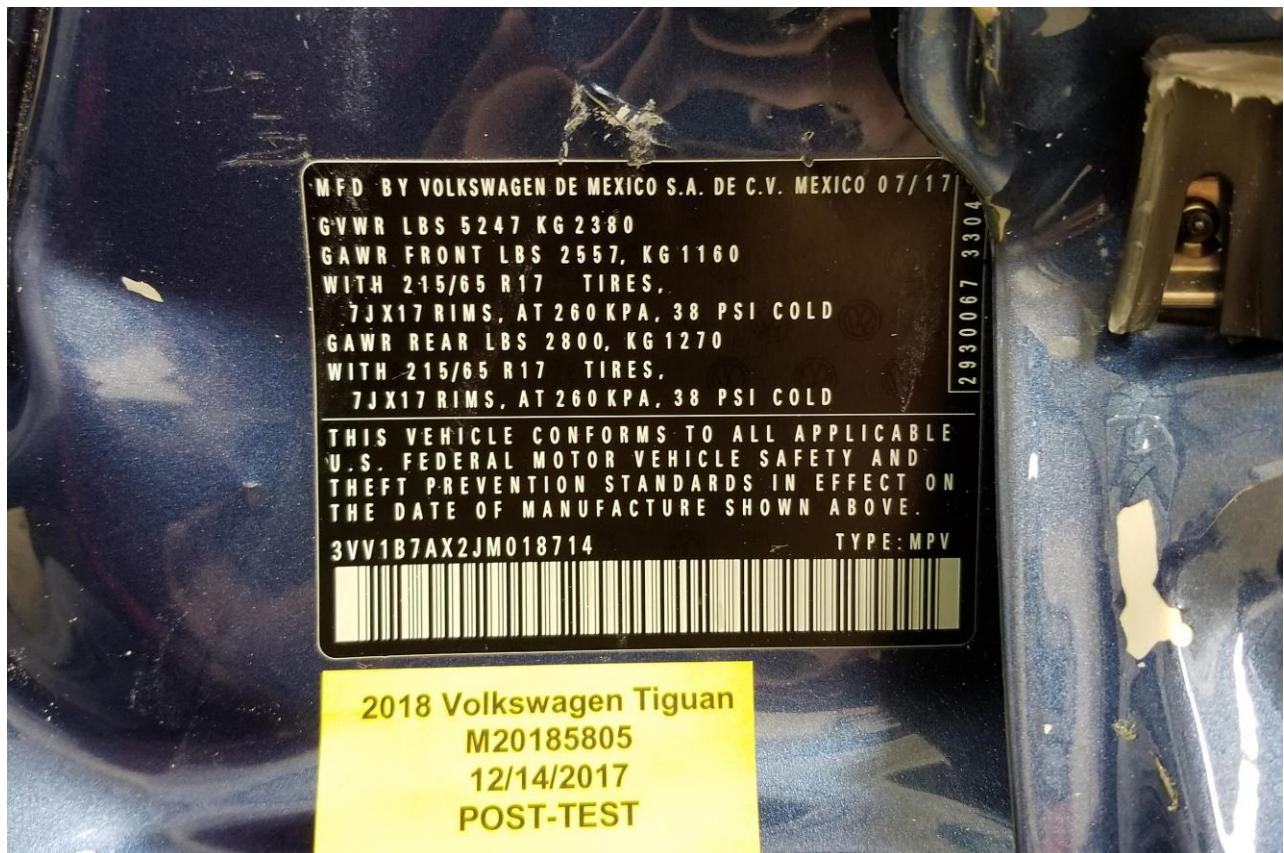


Figure A-2 Vehicle Certification Label



Figure A-3 Pre-Test Vehicle Left Side View



Figure A-4 Post-Test Vehicle Left Side View

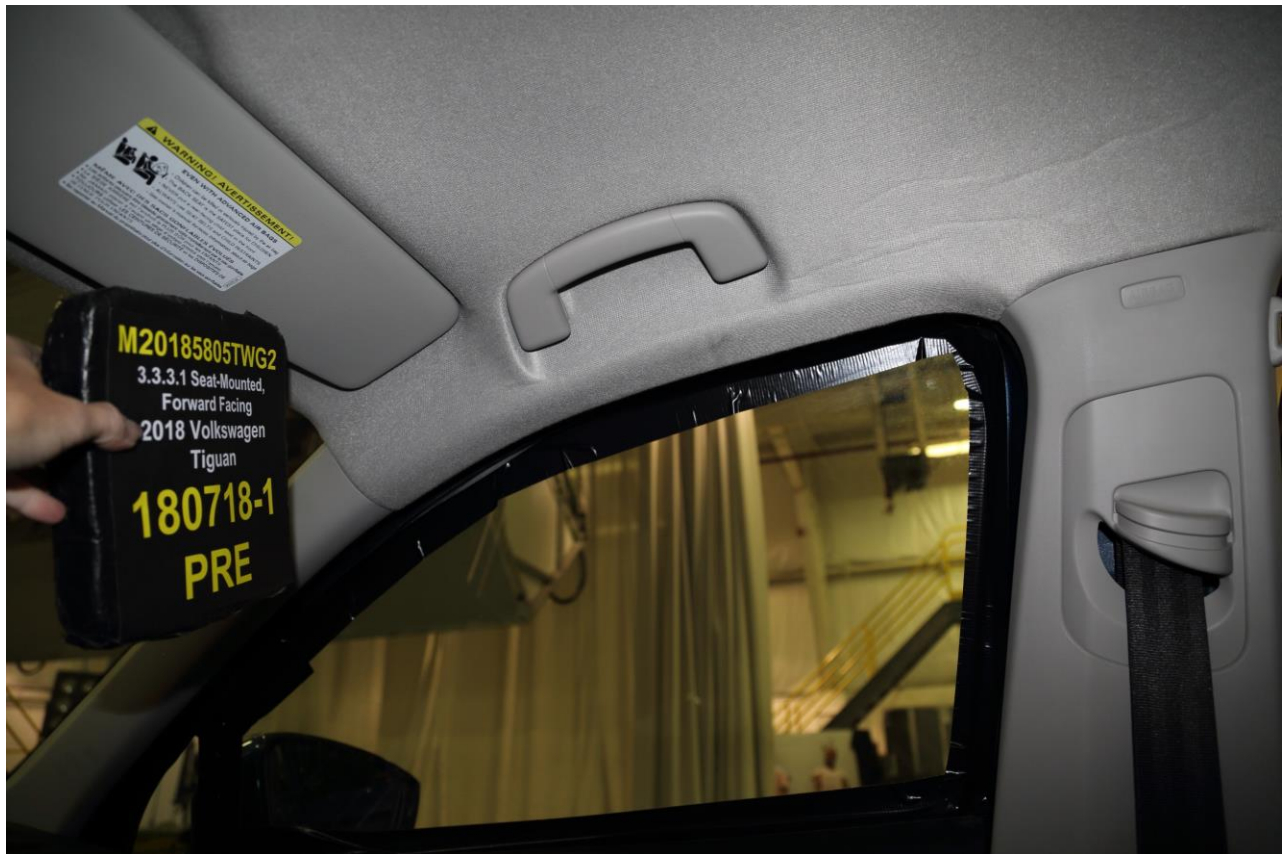


Figure A-5 Pre-Test Vehicle Location of Air Bag 1



Figure A-6 Pre-Test Vehicle Location of Air Bag 2



Figure A-7 Pre-Test Vehicle Location of Air Bag 3



Figure A-8 Pre-Test Vehicle Seat Back Angle



Figure A-9 Pre-Test Dummy Left Side View



Figure A-10 Post-Test Dummy Left Side View



Figure A-11 Pre-Test Dummy Left Side Close-up View



Figure A-12 Post-Test Dummy Left Side Close-up View



Figure A-13 Pre-Test Dummy Left $\frac{3}{4}$ Front View



Figure A-14 Post-Test Dummy Left $\frac{3}{4}$ Front View



Figure A-15 Pre-Test Dummy Left $\frac{3}{4}$ Front Close-up View



Figure A-16 Post-Test Dummy Left $\frac{3}{4}$ Front Close-up View



Figure A-17 Pre-Test Dummy Front View



Figure A-18 Post-Test Dummy Front View



Figure A-19 Pre-Test Dummy Front Close-up View



Figure A-20 Post-Test Dummy Front Close-up View

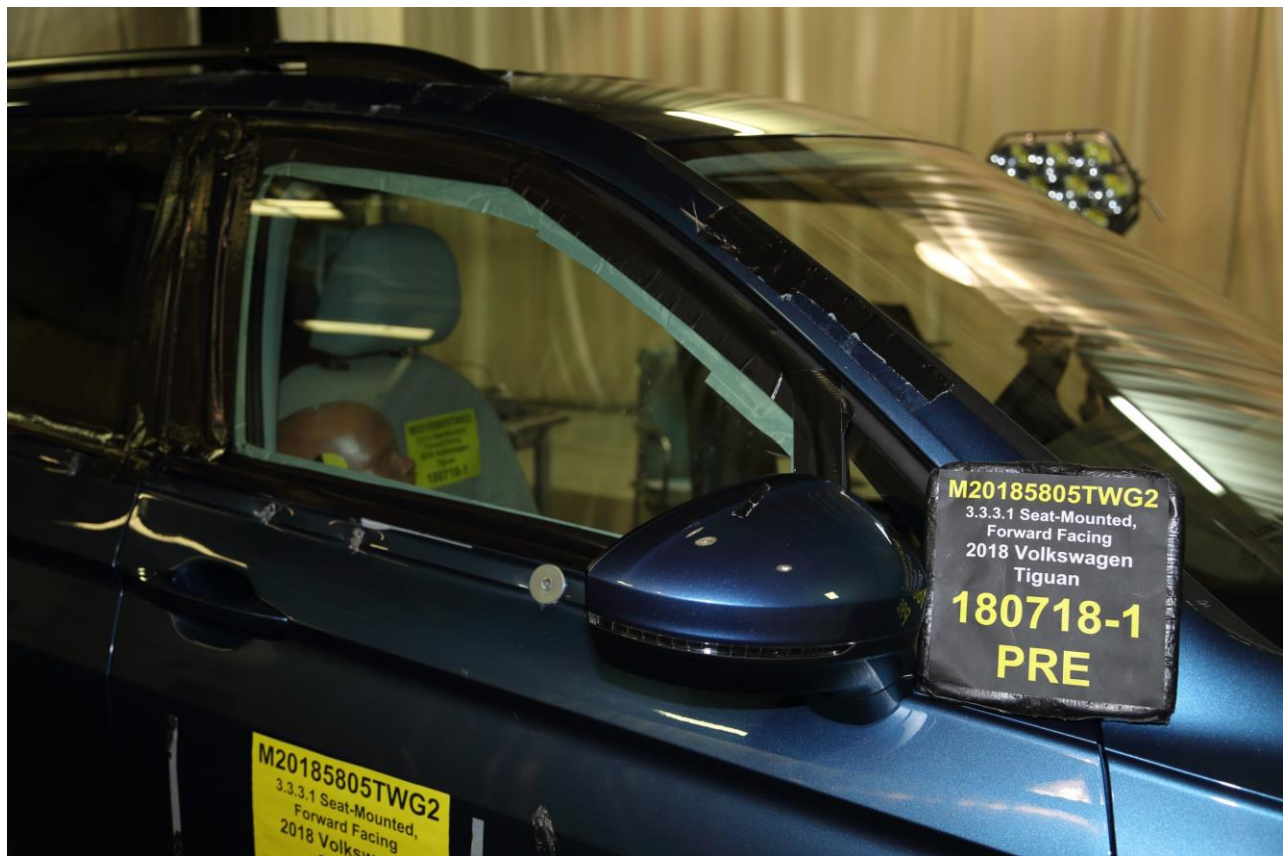


Figure A-21 Pre-Test Dummy Right $\frac{3}{4}$ Front View



Figure A-22 Post-Test Dummy Right $\frac{3}{4}$ Front View



Figure A-23 Pre-Test Dummy Right Side Front View



Figure A-24 Post-Test Dummy Right Side Front View



Figure A-25 Post-Test Dummy Right Side Front View

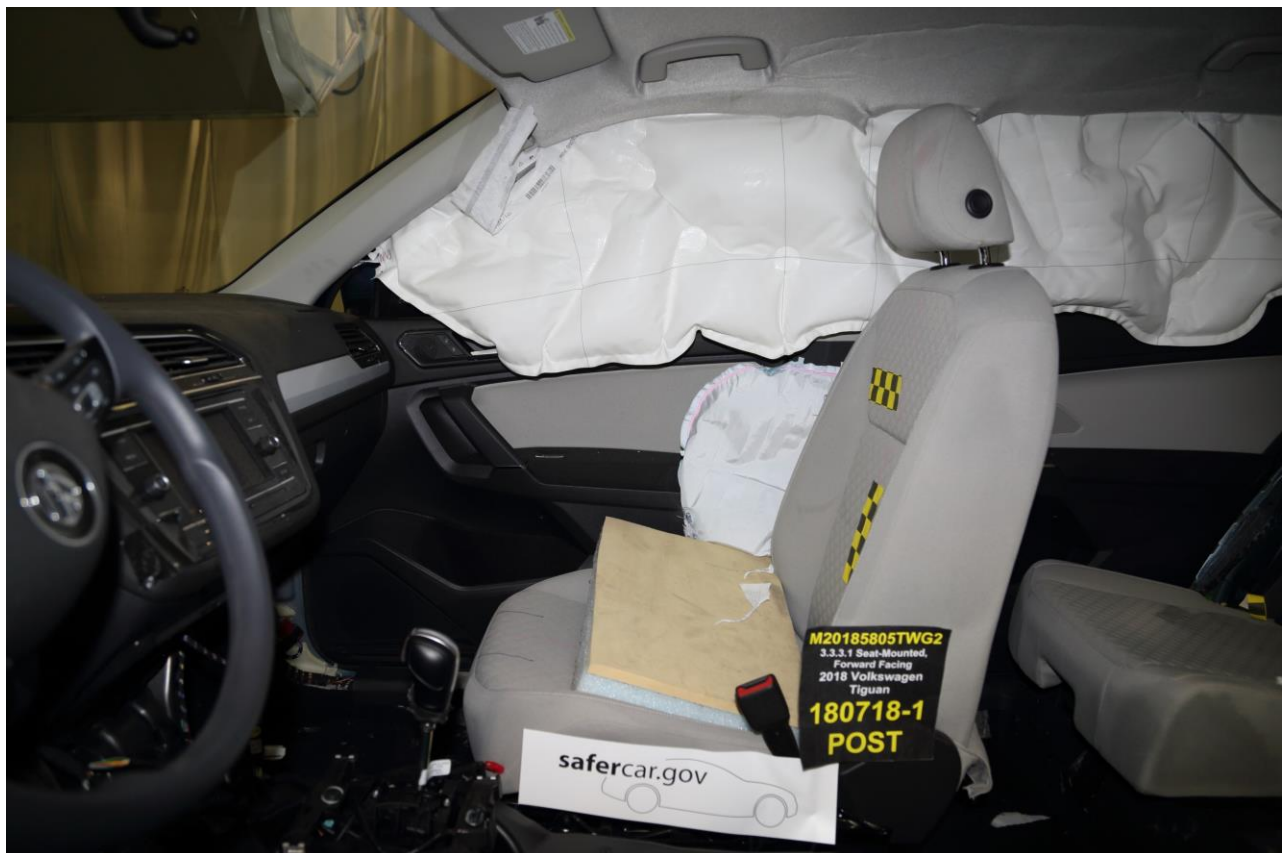


Figure A-26 Post-Test Curtain Air Bag Left Side View



Figure A-27 Post-Test Curtain Air Bag Left ¾ Front View



Figure A-28 Post-Test Curtain Air Bag Front View



Figure A-29 Post-Test Curtain Air Bag Right Side View

APPENDIX B

DUMMY RESPONSE DATA PLOTS

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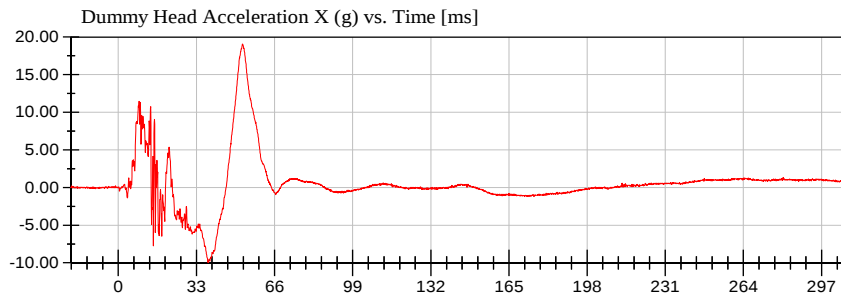
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



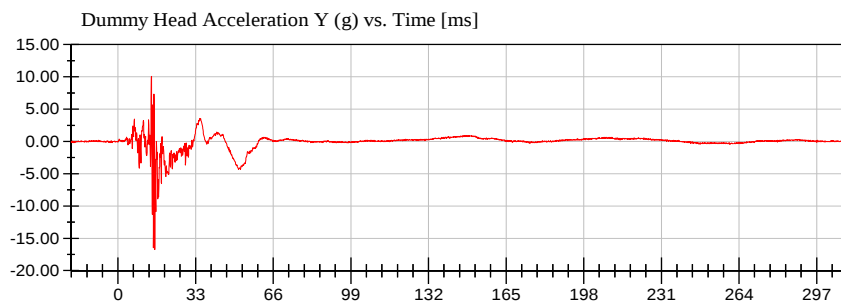
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19.06 g at 52.40 ms

<Min>

-9.97 g at 37.92 ms

CFC_1000



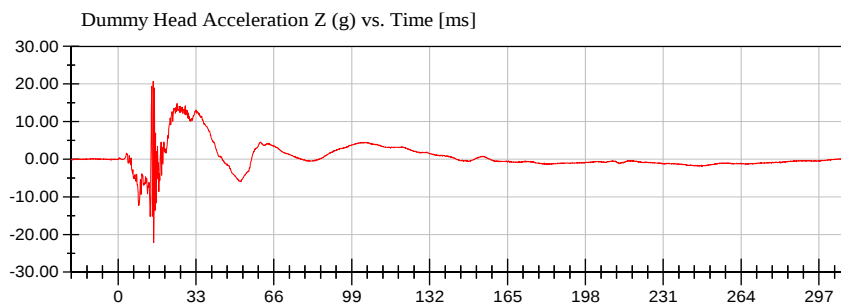
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10.09 g at 14.24 ms

<Min>

-16.73 g at 15.68 ms

CFC_1000



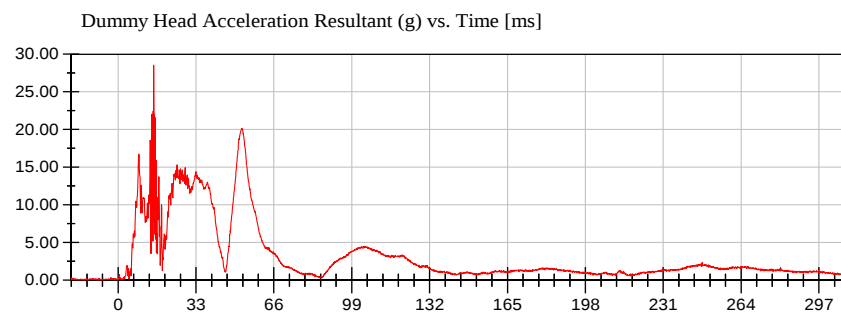
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20.70 g at 14.88 ms

<Min>

-22.16 g at 15.12 ms

CFC_1000



<Max>

28.53 g at 15.12 ms

<Min>

0.04 g at -19.44 ms

CFC_1000



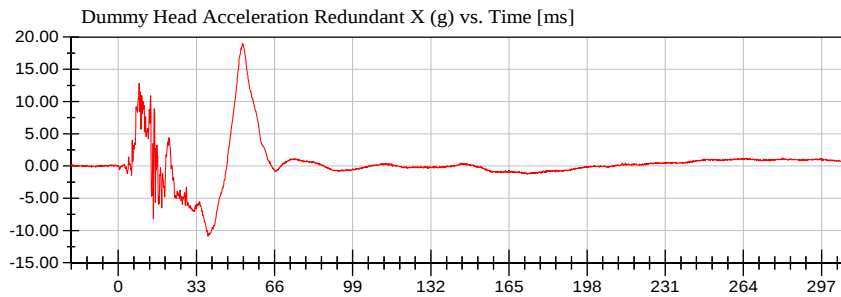
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Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



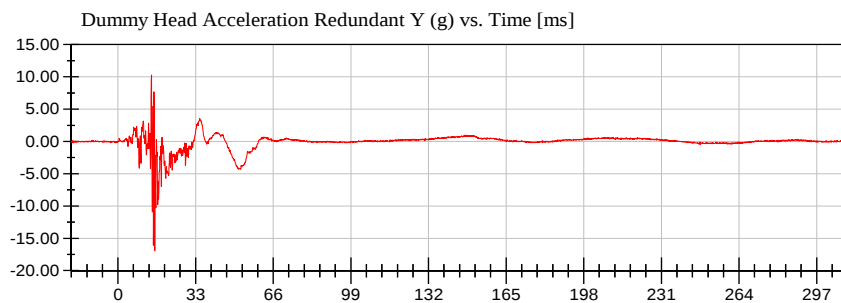
<Max>

19.02 g at 52.48 ms

<Min>

-10.88 g at 37.84 ms

CFC_1000



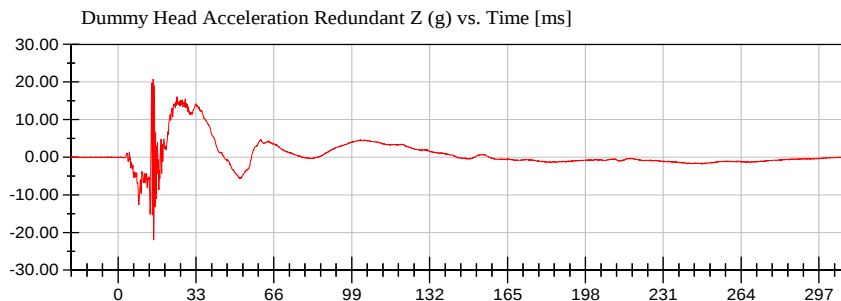
<Max>

10.28 g at 14.24 ms

<Min>

-16.93 g at 15.68 ms

CFC_1000



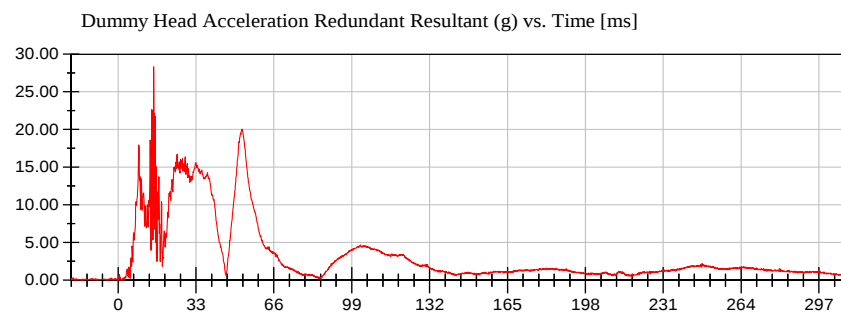
<Max>

20.77 g at 14.88 ms

<Min>

-21.97 g at 15.12 ms

CFC_1000



<Max>

28.32 g at 15.12 ms

<Min>

0.02 g at -18.56 ms

CFC_1000



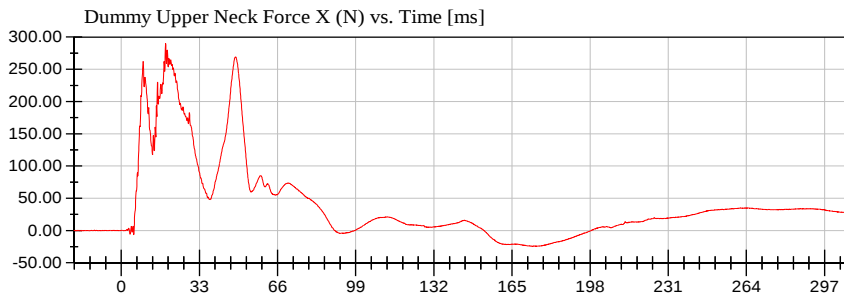
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



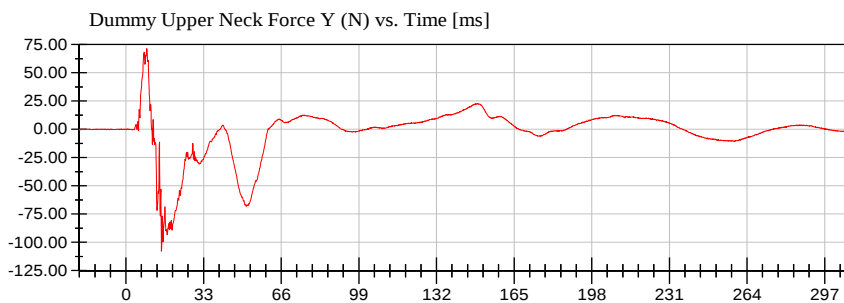
<Max>

289.91 N at 18.72 ms

<Min>

-24.65 N at 173.84 ms

CFC_1000



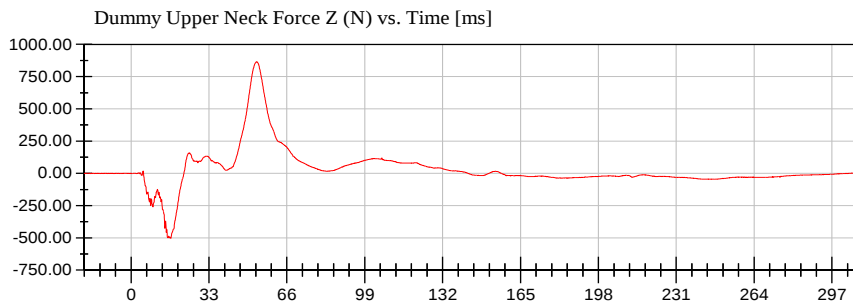
<Max>

71.47 N at 8.88 ms

<Min>

-107.77 N at 15.12 ms

CFC_1000



<Max>

864.83 N at 53.20 ms

<Min>

-502.97 N at 16.80 ms

CFC_1000



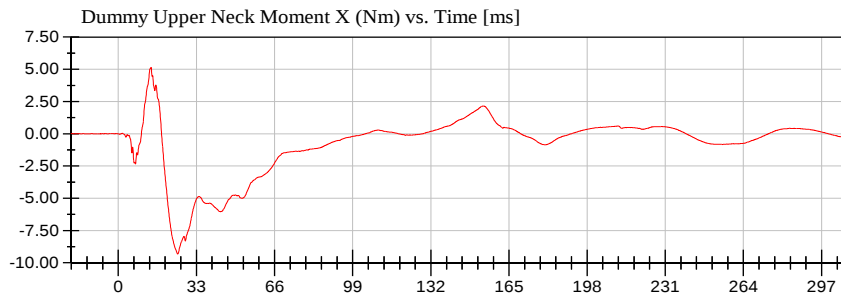
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



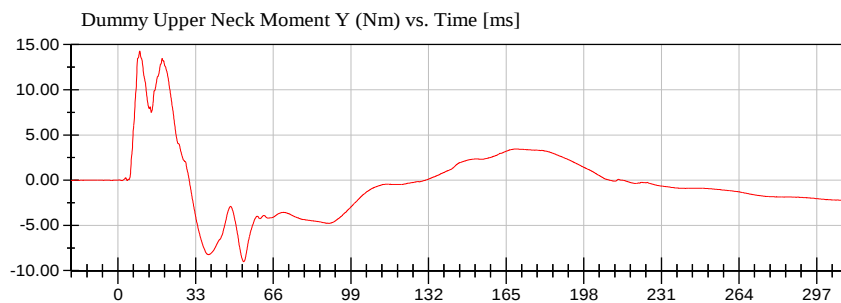
<Max>

5.13 Nm at 13.84 ms

<Min>

-9.32 Nm at 25.12 ms

CFC_600



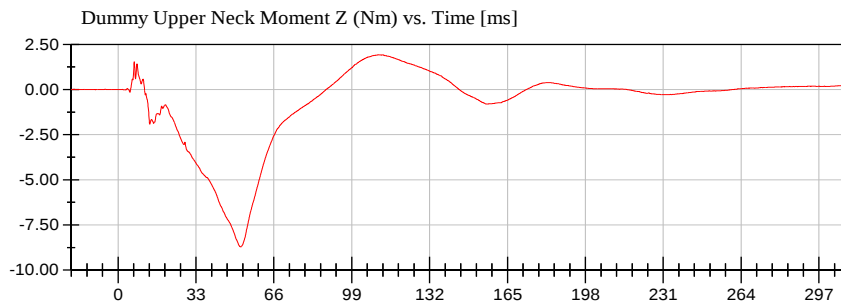
<Max>

14.30 Nm at 9.28 ms

<Min>

-9.02 Nm at 53.44 ms

CFC_600



<Max>

1.92 Nm at 110.24 ms

<Min>

-8.72 Nm at 51.92 ms

CFC_600



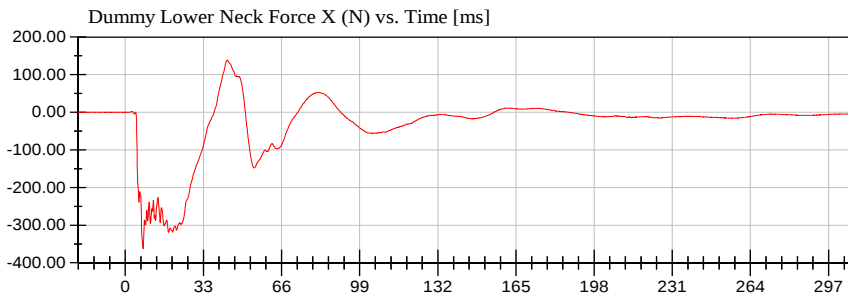
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



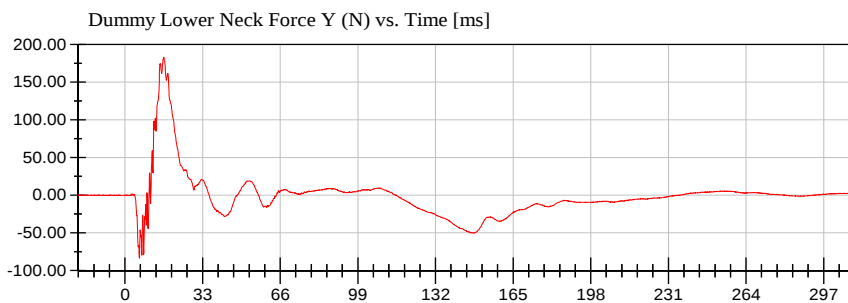
<Max>

138.67 N at 43.04 ms

<Min>

-362.68 N at 7.52 ms

CFC_1000



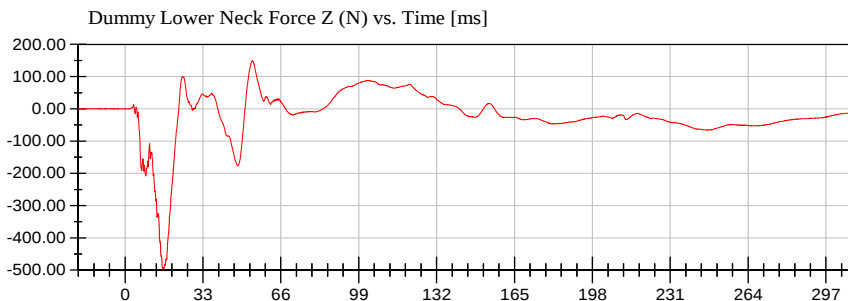
<Max>

183.19 N at 16.48 ms

<Min>

-83.48 N at 6.16 ms

CFC_1000



<Max>

149.50 N at 54.00 ms

<Min>

-494.88 N at 16.40 ms

CFC_1000



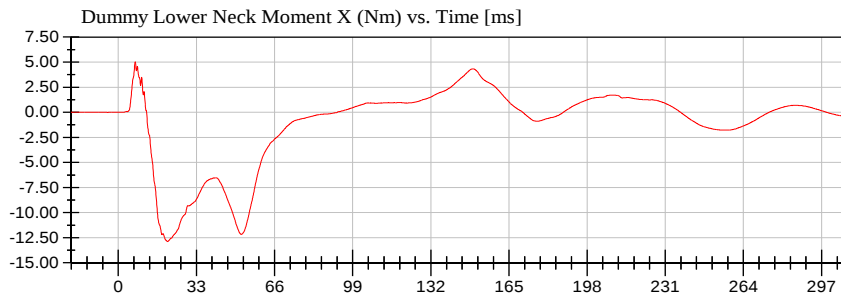
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Test Date: 07/18/2018

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)



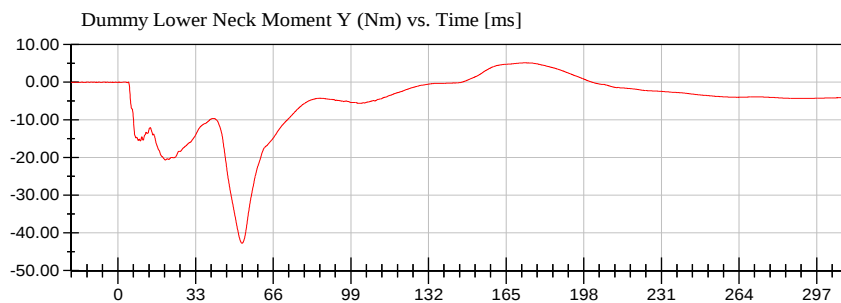
<Max>

5.04 Nm at 7.12 ms

<Min>

-12.89 Nm at 20.80 ms

CFC_600



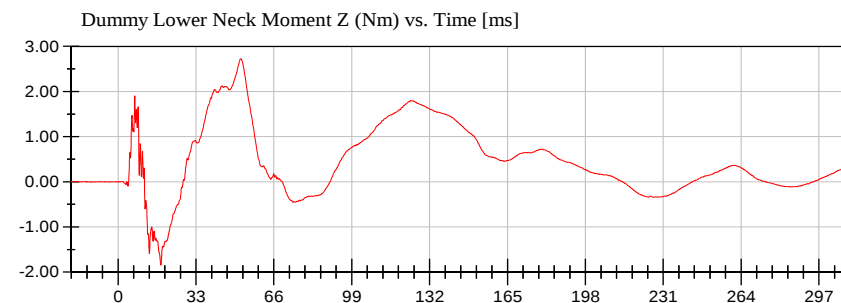
<Max>

5.16 Nm at 172.56 ms

<Min>

-42.75 Nm at 52.72 ms

CFC_600



<Max>

2.73 Nm at 52.00 ms

<Min>

-1.85 Nm at 18.08 ms

CFC_600





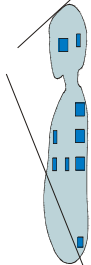
2018 Volkswagen Tiguan TWG OOP Test 3.3.3.1 Neck Injury Predictor (NIJ)

Date: 07/18/2018
Time: 11:01

Customer: Alpha Technology

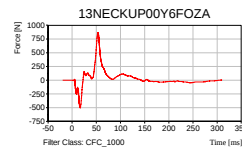
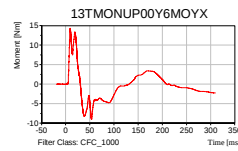
Test Number: M20185805TWG2

Test Orientation = Side
Fzc(Tension) = 2120
Fzc(Compression) = 2120
Myc(Extension) = 27
Myc(Flexion) = 68



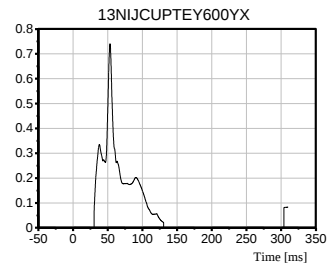
Dummy: HIII 3 Year Old
Seating Position:
Right Front Passenger

NIJ Source Code: (Fz/Fzc)+(Myc/Myc)

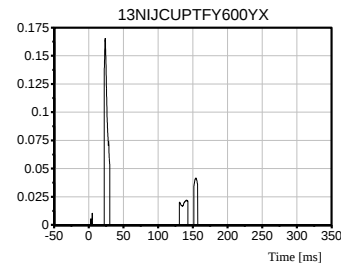


TRC Inc. Test Lab: CTF

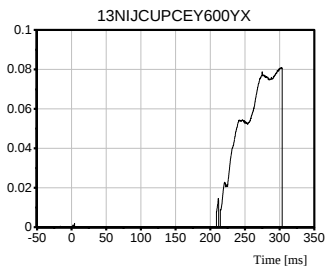
Test Number: 180718-1



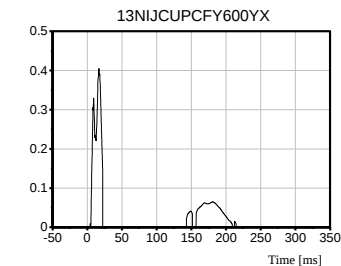
Max [NTE] 0.7413 at 53.36 ms



Max [NTF] 0.1654 at 23.60 ms



Max [NCE] 0.0809 at 303.44 ms



Max [NCF] 0.4044 at 16.80 ms

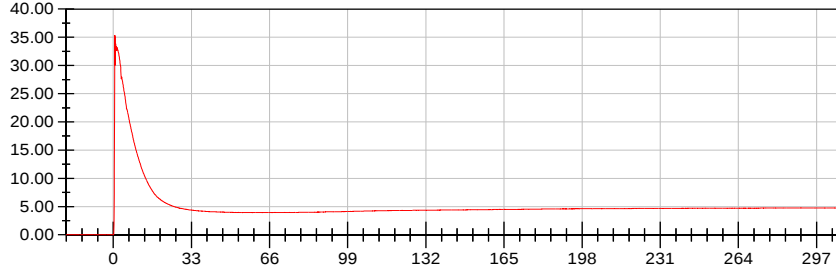
Alpha Technology

Test Lab: CTF

Test Number: 180718-1 (M20185805TWG2)

Position #2 Hybrid III 3 year old Dummy (Part 572 P) (040)
Test Date: 07/18/2018

Airbag Event Right Side Passenger Seat (V) vs. Time [ms]



<Max>

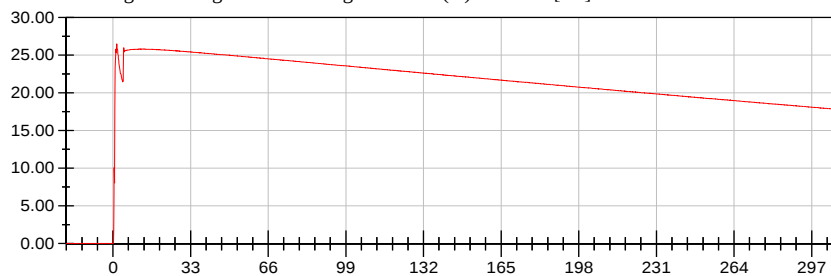
35.33 V at 0.64 ms

<Min>

0.00 V at -20.00 ms

Unfiltered

Airbag Event Right Side Passenger Curtain (V) vs. Time [ms]



<Max>

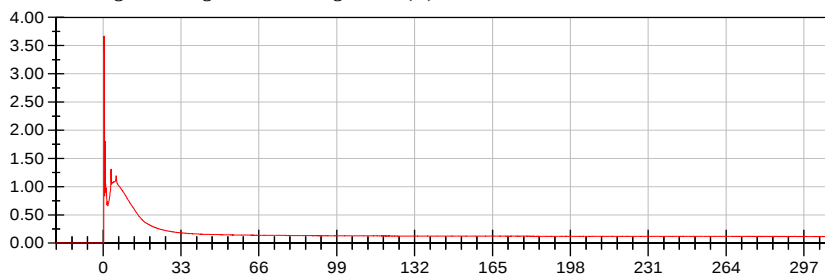
26.51 V at 1.60 ms

<Min>

0.00 V at -20.00 ms

Unfiltered

Airbag Event Right Side Passenger Seat (A) vs. Time [ms]



<Max>

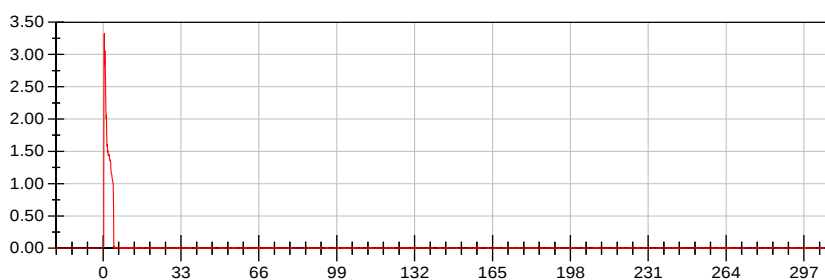
3.67 A at 0.40 ms

<Min>

0.00 A at -20.00 ms

Unfiltered

Airbag Event Right Side Passenger Curtain (A) vs. Time [ms]



<Max>

3.33 A at 0.48 ms

<Min>

0.00 A at -20.00 ms

Unfiltered



APPENDIX C
DUMMY QUALIFICATION DATA

Pre-Test Calibration Sheets
Passenger S/N 040

Transportation Research Center Inc.

Front Head Drop

HIII 3YO Serial No. 040 Certification No. 8-1

Test Date: 7/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Peak Head Resultant Acceleration	250 - 280 g	258.3 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-8.5 g	Yes
Is Acceleration Curve Unimodal?	Yes	Yes	Yes

Test meets specifications.

Condition: Used

Comments:

Head Skin S/N: N/A

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

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07.12.2018 08:21:36 581

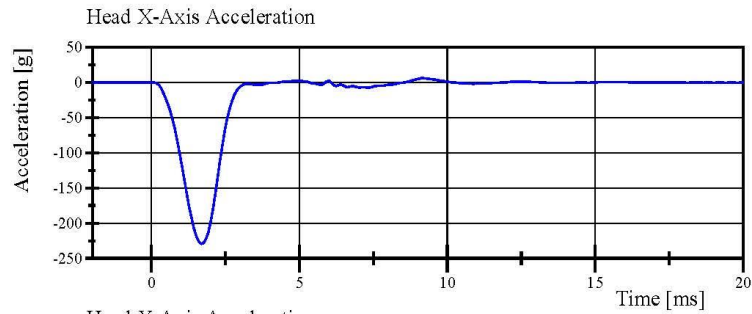


Transportation Research Center Inc.

Front Head Drop

HIII 3YO Serial No. 040 Certification No. 8-1

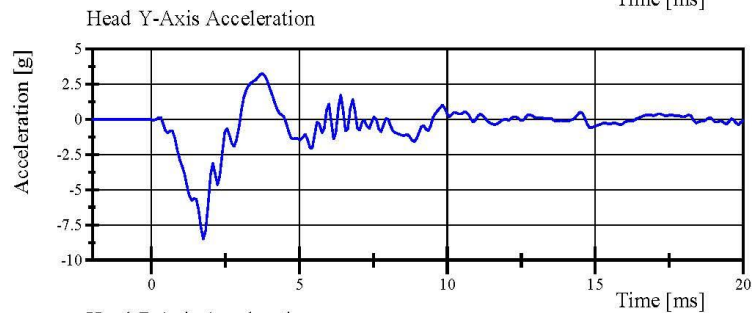
Test Date: 7/12/2018



Filter Class: CFC_1000

Max: 5.9 g at 9.1 ms

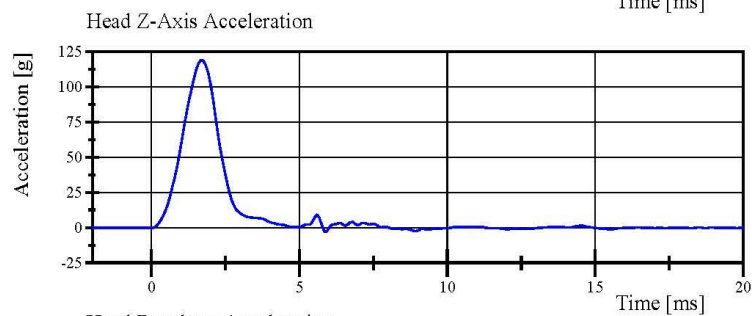
Min: -229.1 g at 1.7 ms



Filter Class: CFC_1000

Max: 3.3 g at 3.8 ms

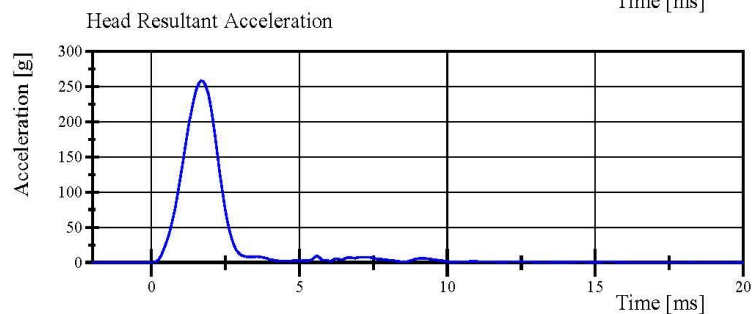
Min: -8.5 g at 1.8 ms



Filter Class: CFC_1000

Max: 119.0 g at 1.7 ms

Min: -2.8 g at 5.9 ms



Filter Class: CFC_1000

Max: 258.3 g at 1.7 ms

Min: 0.0 g at -2.0 ms

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 08:24:41 581



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Transportation Research Center Inc.

Neck Flexion

HIII 3YO Serial No. 040 Certification No. 8-2

Test Date: 7/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Impact Velocity	5.40 - 5.60 m/s	5.446 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	(-2.0) - (-2.7) m/s	-2.44 m/s	Yes
Pendulum Integrated Velocity Change at 15 ms	(-3.0) - (-4.0) m/s	-3.64 m/s	Yes
Pendulum Integrated Velocity Change at 20 ms	(-4.0) - (-5.1) m/s	-4.91 m/s	Yes
Total Headform D-Plane Rotation	(-70) - (-82) °	-77.4 °	Yes
Peak Neck Occipital Condyles Moment	42 - 53 Nm	50.4 Nm	Yes
Neck Occipital Condyles Moment Decay to 10 Nm	60 - 80 ms	66.6 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: DG6492

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

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07.12.2018 09:15:43 733

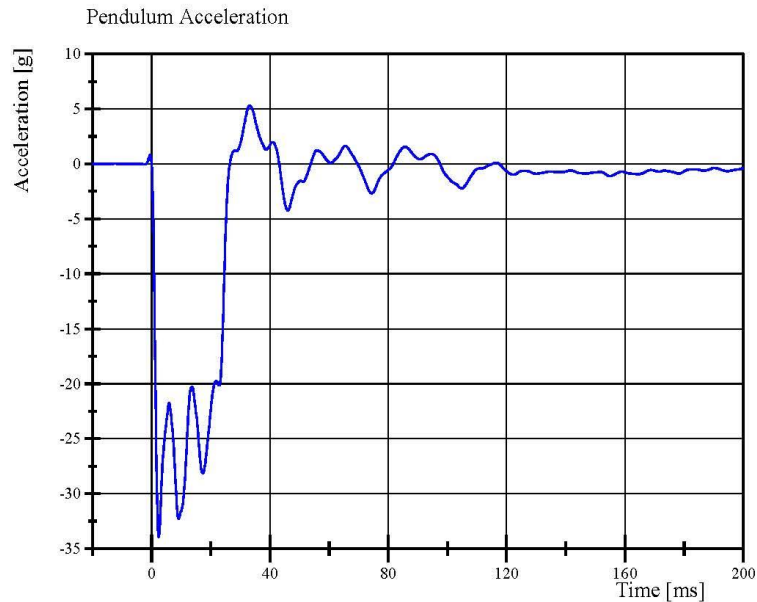


Transportation Research Center Inc.

Neck Flexion

HIII 3YO Serial No. 040 Certification No. 8-2

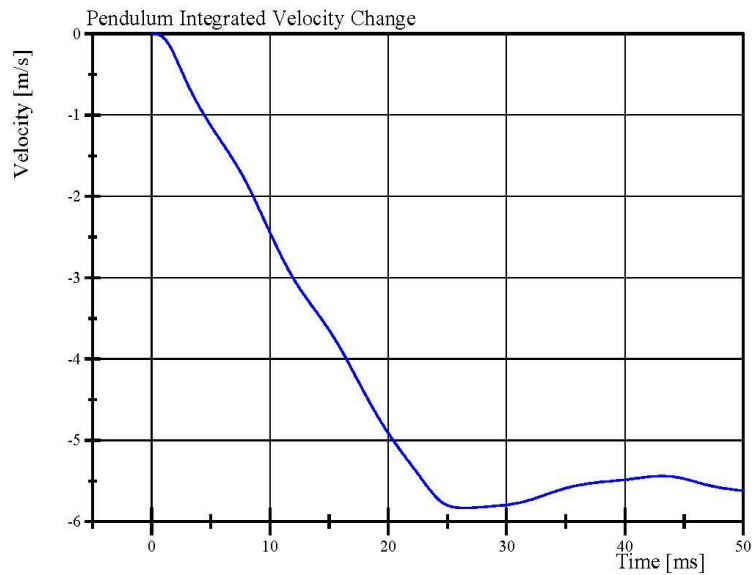
Test Date: 7/12/2018



Filter Class: CFC_180

Max: 5.3 g at 33.2 ms

Min: -33.9 g at 2.4 ms



Filter Class: CFC_180

Max: 0.0 m/s at 0.0 ms

Min: -5.8 m/s at 26.4 ms

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 09:16:22 733



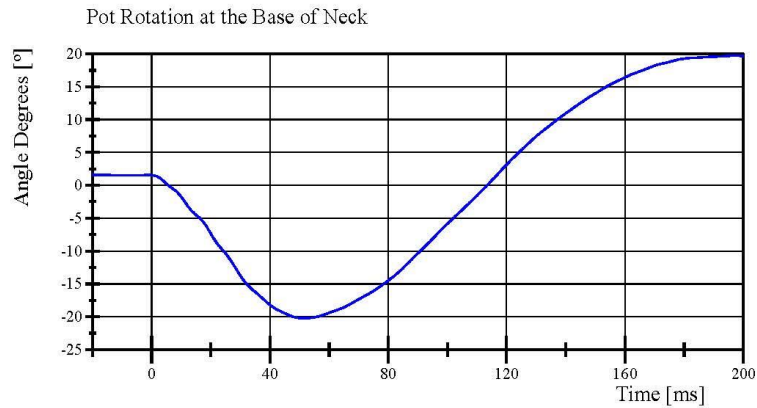
Page 12 of 22

Transportation Research Center Inc.

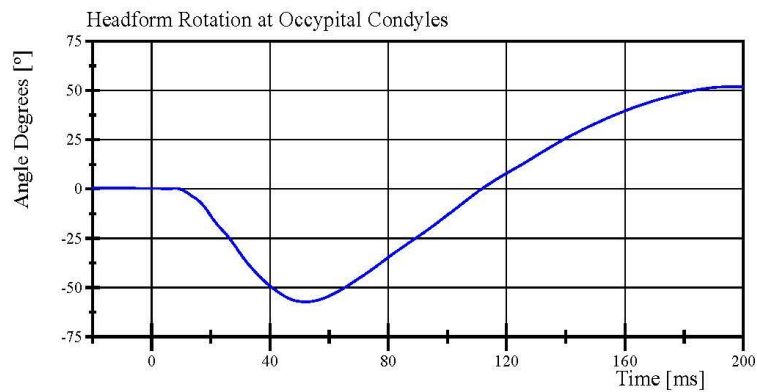
Neck Flexion

HIII 3YO Serial No. 040 Certification No. 8-2

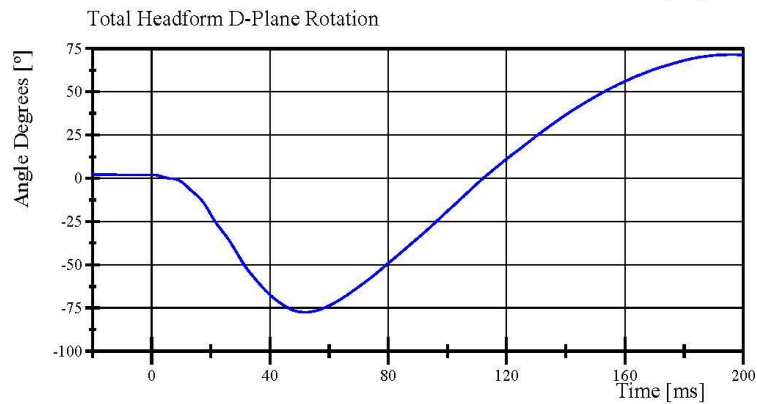
Test Date: 7/12/2018



Filter Class: CFC_60
Max: 19.7 ° at 196.8 ms
Min: -20.2 ° at 51.3 ms



Filter Class: CFC_60
Max: 51.9 ° at 195.9 ms
Min: -57.2 ° at 52.0 ms



Filter Class: CFC_60
Max: 71.6 ° at 196.1 ms
Min: -77.4 ° at 51.9 ms

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 09:16:22 733

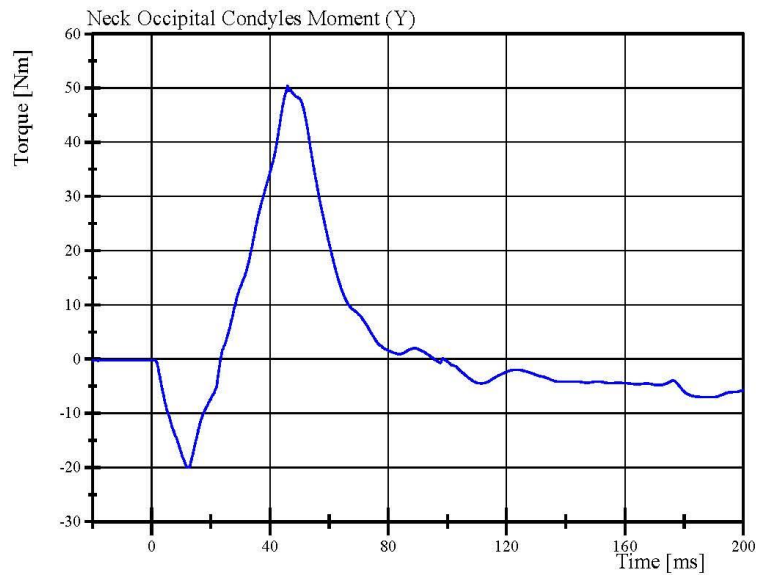
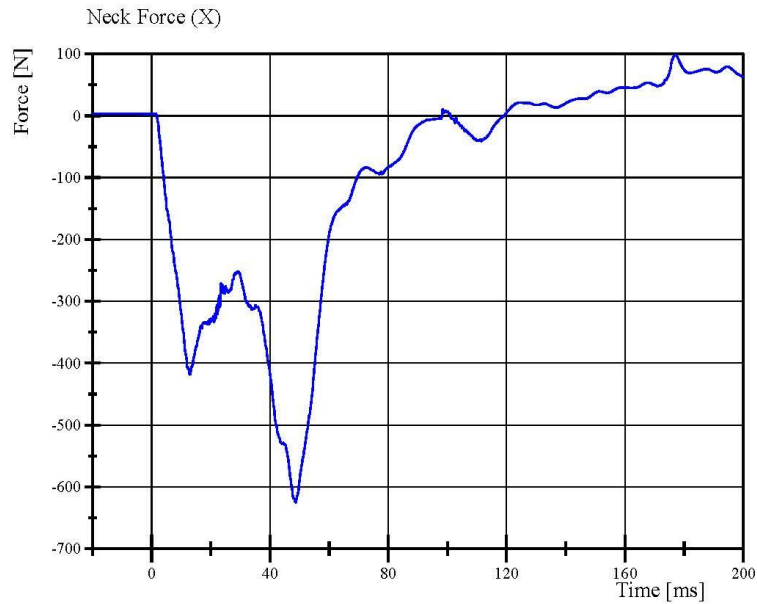


Transportation Research Center Inc.

Neck Flexion

HIII 3YO Serial No. 040 Certification No. 8-2

Test Date: 7/12/2018



Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 09:16:23 733



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Transportation Research Center Inc.

Neck Extension

HIII 3YO Serial No. 040 Certification No. 8-1

Test Date: 7/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Impact Velocity	(-3.55) - (-3.75) m/s	-3.556 m/s	Yes
Pendulum Integrated Velocity Change at 6 ms	1.0 - 1.4 m/s	1.29 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	1.9 - 2.5 m/s	2.34 m/s	Yes
Pendulum Integrated Velocity Change at 14 ms	2.8 - 3.5 m/s	3.27 m/s	Yes
Total Headform D-Plane Rotation	83 - 93 °	85.8 °	Yes
Peak Neck Occipital Condyles Moment Neck Occipital Condyles Moment	(-43.7) - (-53.3) Nm	-47.49 Nm	Yes
Decay to 10 Nm	60 - 80 ms	71.8 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: DG6492

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

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07.12.2018 10:03:40 1133

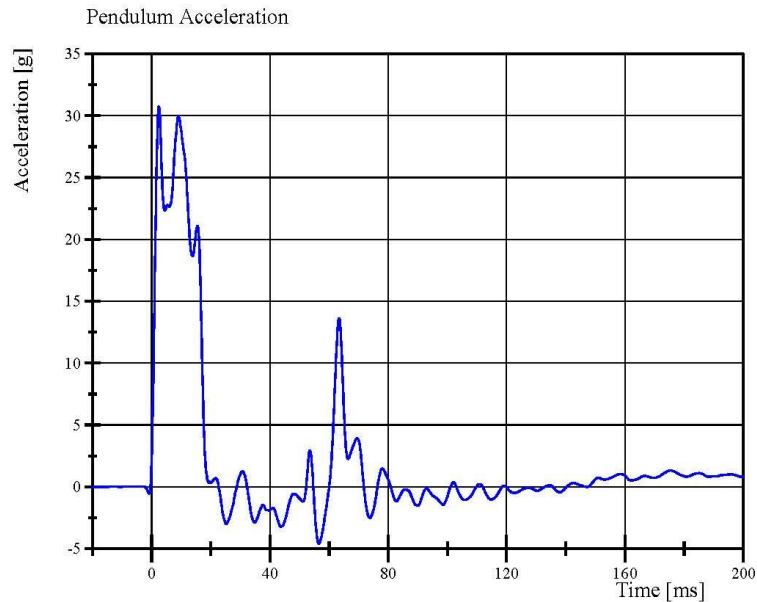


Transportation Research Center Inc.

Neck Extension

HIII 3YO Serial No. 040 Certification No. 8-1

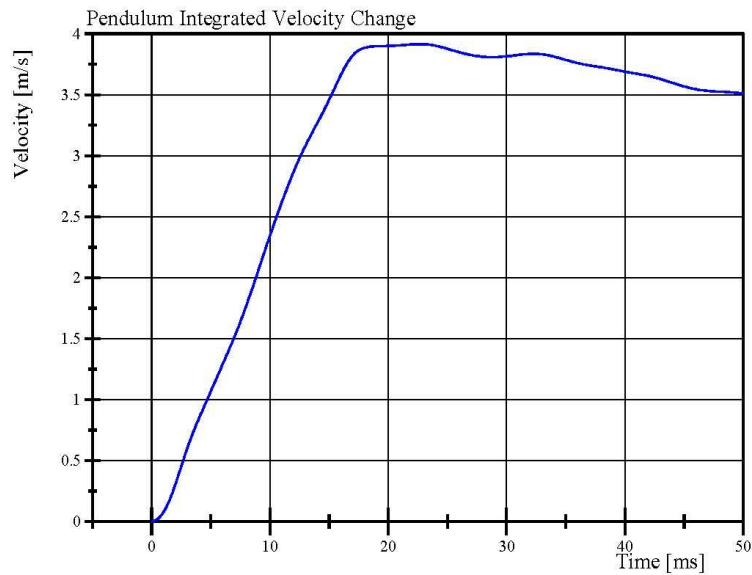
Test Date: 7/12/2018



Filter Class: CFC_180

Max: 30.8 g at 2.5 ms

Min: -4.6 g at 56.6 ms



Filter Class: CFC_180

Max: 3.9 m/s at 22.6 ms

Min: 0.0 m/s at 0.0 ms

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 10:08:31 1133



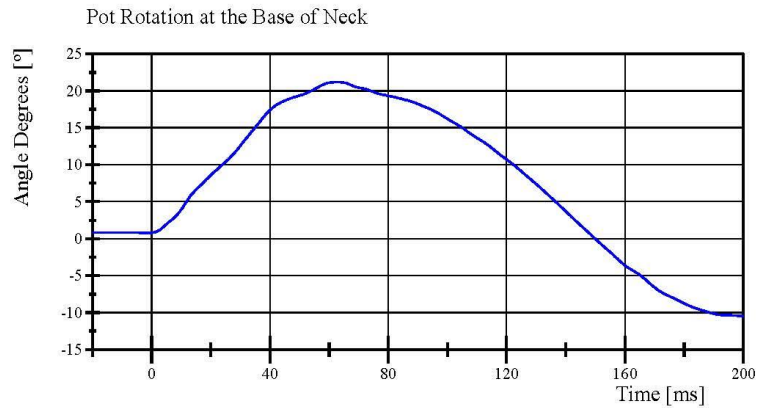
Page 16 of 22

Transportation Research Center Inc.

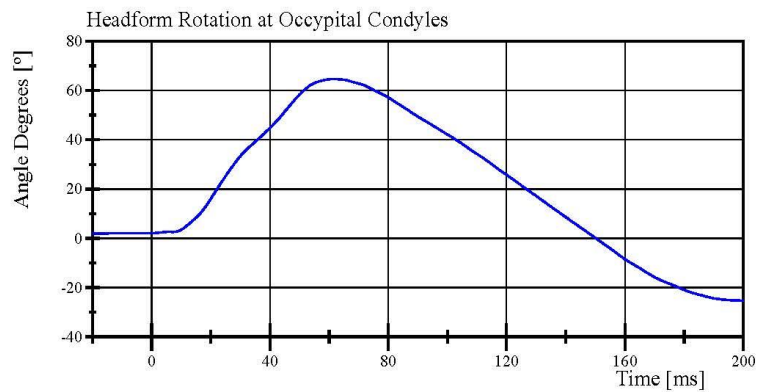
Neck Extension

HIII 3YO Serial No. 040 Certification No. 8-1

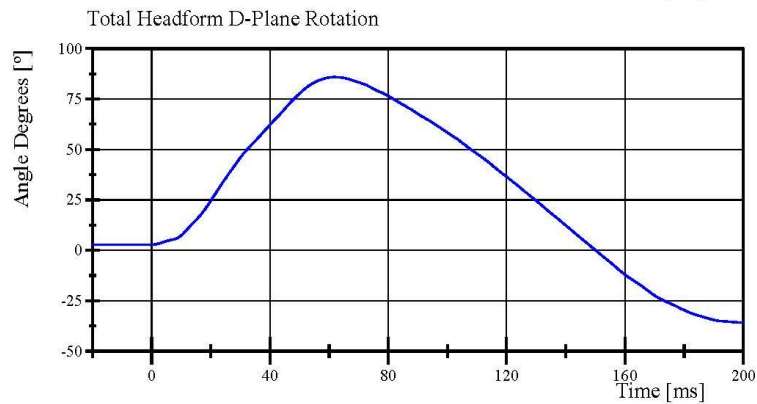
Test Date: 7/12/2018



Filter Class: CFC_60
Max: 21.2 ° at 63.0 ms
Min: -10.5 ° at 200.0 ms



Filter Class: CFC_60
Max: 64.6 ° at 61.4 ms
Min: -25.4 ° at 200.0 ms



Filter Class: CFC_60
Max: 85.8 ° at 61.8 ms
Min: -35.8 ° at 200.0 ms

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 10:08:32 1133

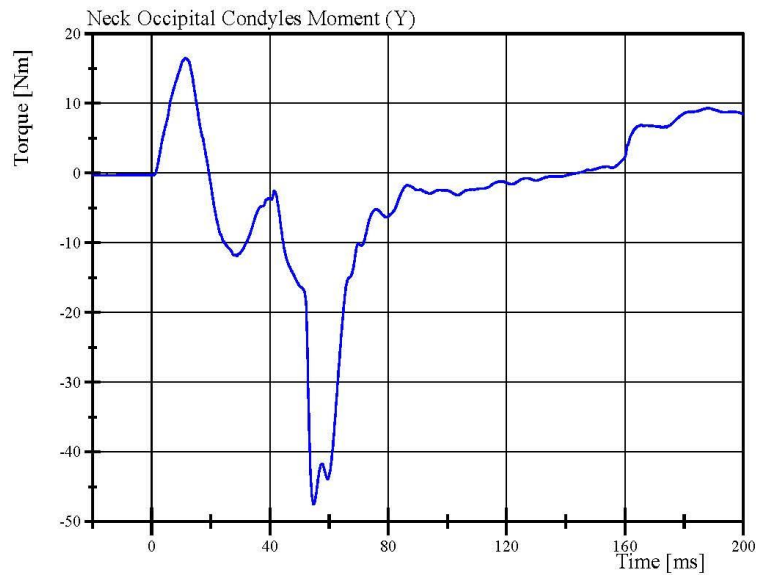
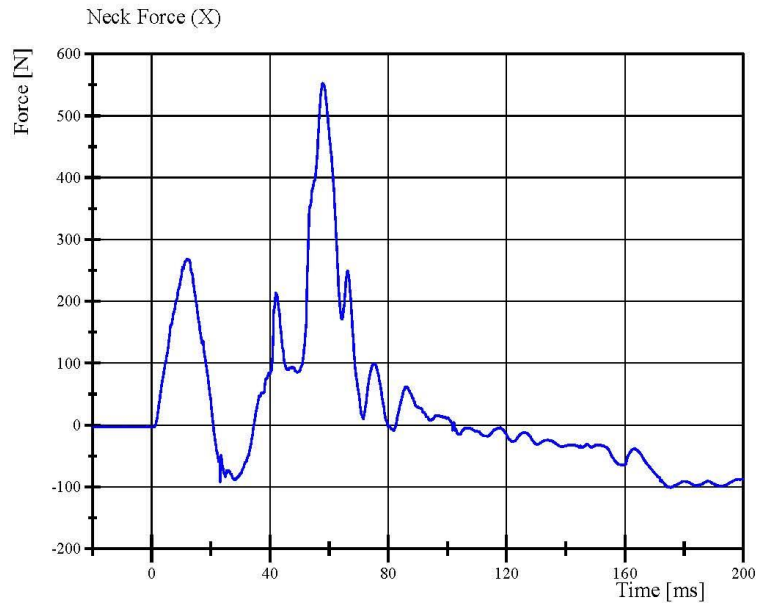


Transportation Research Center Inc.

Neck Extension

HIII 3YO Serial No. 040 Certification No. 8-1

Test Date: 7/12/2018



Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

07.12.2018 10:08:32 1133



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Transportation Research Center Inc.

Front Thorax

HIII 3YO Serial No. 040 Certification No. 8-1

Test Date: 7/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Probe Velocity	5.9 - 6.1 m/s	5.97 m/s	Yes
Probe Force Peak Between 32.0 mm and 38.0 mm Chest Deflection	(-680) - (-810) N	-738.0 N	Yes
Probe Force Peak Between 12.5 mm and 32.0 mm Chest Deflection	>= (-910) N	-674.2 N	Yes
Maximum Chest Compression	(-32) - (-38) mm	-37.2 mm	Yes
Internal Hysteresis	65 - 85 %	67.4 %	Yes

Test meets specifications.

Condition: Used

Comments:

Torso Flesh S/N: 16533

Rib Set S/N: 16030071

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

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07.12.2018 13:34:19 413

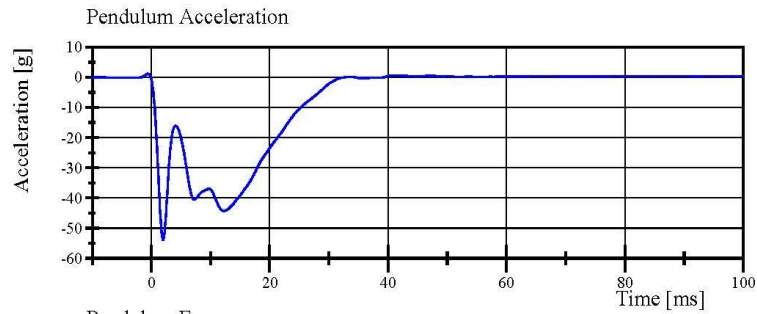


Transportation Research Center Inc.

Front Thorax

HIII 3YO Serial No. 040 Certification No. 8-1

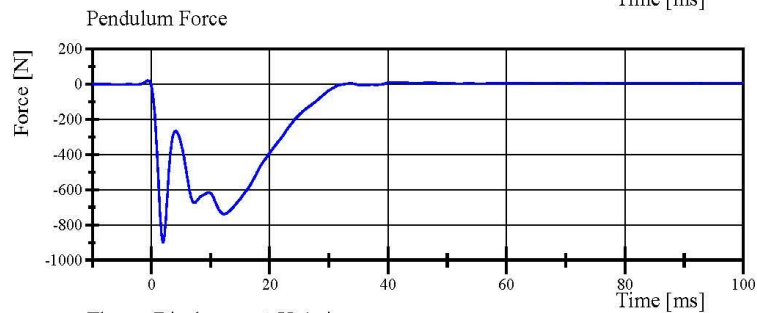
Test Date: 7/12/2018



Filter Class: CFC_180

Max: 1.2 g at -0.6 ms

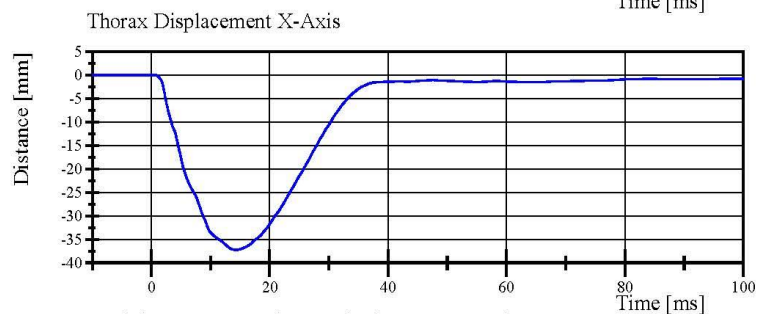
Min: -53.9 g at 2.0 ms



Filter Class: CFC_180

Max: 20.2 N at -0.6 ms

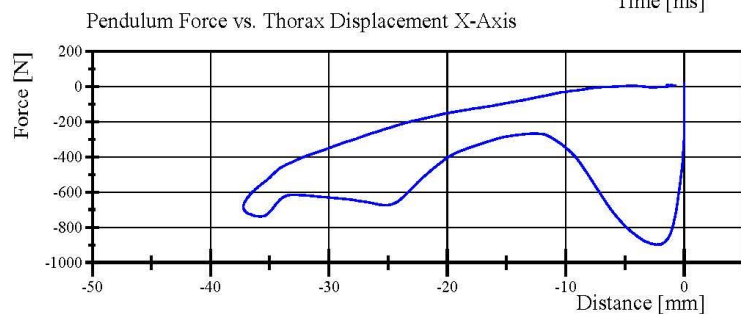
Min: -898.1 N at 2.0 ms



Filter Class: CFC_600

Max: 0.0 mm at 0.6 ms

Min: -37.2 mm at 14.2 ms



Filter Class: CFC_180

Max: 20.2 N at -0.0 mm

Min: -898.1 N at -2.4 mm

Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

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APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

			Serial Number	Manufacturer and Model #	Calibration Date	Date Due
ATD		N/A	040	FTSS	13-Jul-2018	
Head Accelerometers	Primary	X	P97685	Endevco	11-Jul-2018	10-Jan-2019
		Y	P97528	Endevco	11-Jul-2018	10-Jan-2019
		Z	P97862	Endevco	11-Jul-2018	10-Jan-2019
	Redundant	X	P97696	Endevco	11-Jul-2018	11-Jan-2019
		Y	P97533	Endevco	11-Jul-2018	10-Jan-2019
		Z	P97531	Endevco	05-Jul-2018	04-Jan-2019
Upper Neck Load Cell		Fx, Fy, Fz, Mx, My, Mz	214	Denton	11-Jul-2018	11-Jul-2019
Lower Neck Load Cell		Fx, Fy, Fz, Mx, My, Mz	210	Denton	11-Jul-2018	11-Jul-2019
Chest Potentiometer		Dx				
Sternum Accelerometer		X				
Spine Accelerometer		X				
Data System		N/A	223	Kayser-Threde	18-Jul-2018	
		N/A	DP-2	Mitutoyo Pro 360	11/20/2017	11/20/2018