

REPORT NUMBER: NCAP-CAL-15-003

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**Toyota Motor Corporation
2015 Toyota RAV-4
SUV**

NHTSA No: M20155309

**PREPARED BY:
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April 2, 2015

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
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Date: _____

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16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2015 Toyota RAV-4 SUV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on January 29, 2015. The impact velocity of the vehicle was 56.58 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 439 mm at the vehicles centerline. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 1046)</th> <th colspan="2">Passenger ATD (Serial No. 139)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>279.152</td> <td>700</td> <td>388.000</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-21.871</td> <td>52</td> <td>-8.102</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.358</td> <td>1</td> <td>0.372</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>2245.865</td> <td>2,620</td> <td>1047.908</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-111.034</td> <td>2,520</td> <td>-216.585</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-2233.153</td> <td>6,805</td> <td>-1763.680</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-2400.439</td> <td>6,805</td> <td>-972.883</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 1046)		Passenger ATD (Serial No. 139)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	279.152	700	388.000	Maximum Chest Compression	mm	63	-21.871	52	-8.102	Nij		1	0.358	1	0.372	Neck Tension	N	4,170	2245.865	2,620	1047.908	Neck Compression	N	4,000	-111.034	2,520	-216.585	Left Femur Force	N	10,008	-2233.153	6,805	-1763.680	Right Femur Force	N	10,008	-2400.439	6,805	-972.883
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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Purpose and Summary of the Test	1-1
2	Occupant and Vehicle Information / Data Sheets	2-1
<u>Data Sheet</u>		<u>Page</u>
1	General Test and Vehicle Parameter Data	2-2
2	Seat Adjustment, Fuel System, and Steering Wheel Data	2-6
3	Dummy Longitudinal Clearance Dimensions	2-8
4	Dummy Lateral Clearance Dimensions	2-9
5	Seat Belt Positioning Data	2-10
6	High-Speed Camera Locations and Data	2-11
7	Vehicle Accelerometer Locations	2-13
8	Photographic Reference Target Locations	2-14
9	Load Cell Locations on Fixed Barrier	2-15
10	Test Vehicle Summary of Results	2-16
11	Post-Test Observations	2-17
12	Vehicle Profile Measurements	2-18
13	Accident Investigation Division Data	2-20
14	Vehicle Intrusion Measurements	2-21
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	2-23
16	FMVSS 301 Static Rollover Results	2-25
17	Dummy/Vehicle Temperature Stabilization Chart	2-26
<u>Appendix</u>		<u>Page</u>
A	Photographs	A-1
B	Dummy Response Data Traces	B-1
C	Dummy Calibration and Performance Verification Data	C-1

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00260. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test procedure, dated August 2013.

SUMMARY

A ridged fixed barrier was impacted by a 2015 Toyota RAV-4 SUV at a velocity of 56.58 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on January 29, 2015. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right / left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 1046) and the right-front passenger (position 2) ATD (Serial No. 139) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the 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 a total of 0.0 grams of stoddard solvent leakage after

the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 439 mm at the vehicles centerline. During and after the impact event, the driver's and passenger's side doors were closed and operational.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint and seat back. The upper torso contacted the frontal airbag. Both knees contacted the glove box.

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	279.152	0.358	2245.865	-111.034	46.806	-21.871	-2233.153	-2400.439
Passenger (5 th)	388.000	0.372	1047.908	-216.585	51.071	-8.102	-1763.680	-972.883

GENERAL COMMENTS:

1. P1 (Driver) serial number - 1046
2. P2 (Passenger) serial number - 139

Data Anomalies:

- Pelvic Z Acceleration - Questionable Data after 200ms

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of FMVSS 212, 219 (Partial), and 301 Data

Data Sheet No. 16 – FMVSS 301 Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20155309	Traction Control System (TCS)	Yes
Model Year	2015	Power Steering	Yes
Make	Toyota	Power Window Auto-Reverse	No
Model	RAV-4	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	JTMBFREV3FD111868	Driver Head/Torso Airbag	No
Body Color	Brown	Driver Torso Airbag	No
Odometer Reading (km /mi)	11.3 km / 7 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.5	Driver Pelvis Airbag	No
Type / No. Cylinders	I4	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	All Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Front Pass. Seat Pan Airbag	Yes

Does owner's manual provide instructions to turn off automatic door locks?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	2105
Date of Manufacture	11/14	GAWR Front (kg)	1150
		GAWR Rear (kg)	1150

VEHICLE SEATING AND WEIGHT CAPACITY DATA

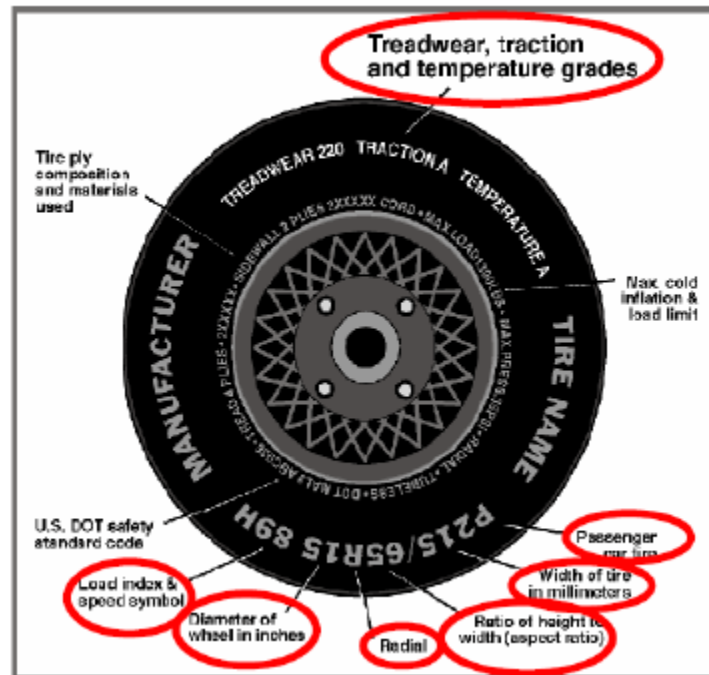
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	3	-	5
Capacity Wt. (VCW) (kg)				405
Cargo Wt. (RCLW) (kg)				64.8

DATA SHEET NO. 1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

Collect items circled in red, tire manufacturer, and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander G91	Geolander G91
Treadwear	280	280
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Nylon	1 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	102H	102H
Tire Material	Rubber	Rubber
DOT Safety Code Left	FDFSPEK4614	FDFSPEK4614
DOT Safety Code Right	FDFSPEK4614	FDFSPEK4614

DATA SHEET NO. 1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	500	342		520	437	
Right	kg	459	334		489	394	
Ratio	%	59%	41%		55%	45%	
Totals	kg	959	676	1635	1009	831	1840

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1635	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	147	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	64.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1846.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	810	820	831	843	1099
As Tested	mm	800	810	801	811	1200
Post-Test	mm	745	783	822	824	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2657
Total Vehicle Length at Left Side	mm	4469
Total Vehicle Length at Centerline	mm	4565
Total Vehicle Length at Right Side	mm	4467
Weight of Ballast in Cargo Area	kg	30
Weight of Vehicle Components Removed	kg	32
Amount of Stoddard Solvent in Fuel Tank	L	55.97

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, tail light, and trim panels.

DATA SHEET NO.1 ... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4565
2	Total Width	1826
3*	Bumper Top Height	583
4*	Bumper Bottom Height	498
5*	Longitudinal Member Top Height	579
6	Distance Between Longitudinal Members	1047
7	Longitudinal Member Width	67
8*	Engine Top Height	923
9*	Engine Bottom Height	223
10	Engine and Gearbox Width	554
11	Front Bumper-Engine Distance	659
12*	Front Shock Absorber Fixing Height	942
13*	Bonnet Leading Edge Height	905
14	Front Shock Absorber Fixing Width	1196
15	Front Bumper – Front Axle Distance	909
16	Front Axle – A Pillar Distance	480
17	A-Pillar – B-Pillar Distance	1071
18	B-Pillar – Rear Axle Distance	1107
19	B-Pillar – C-Pillar Distance	1013
20*	Roof Sill Bottom Height	1535
21*	Roof Sill Top Height	1583
22*	Floor Sill Bottom Height	405
23*	Floor Sill Top Height	453

*Height Measurements are taken from the ground
 Note: All measurements are in millimeters

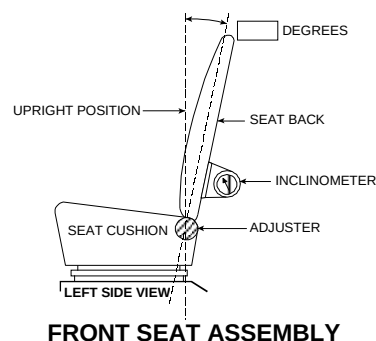
DATA SHEET NO. 2 SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

NOMINAL DESIGN RIDING POSITION

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



Seating Position	Degrees
Driver Seat Back Angle	+4.1
Passenger Seat Back Angle	+4.8

SEAT FORE / AFT POSITIONS

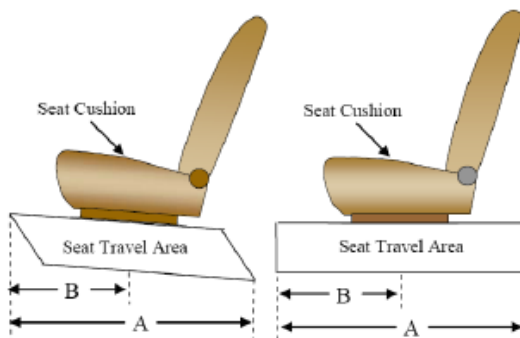
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	25 detents	10
Passenger Seat	27 detents	0

SEAT BELT UPPER ANCHORAGE

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50th percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5th percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	4	0 – Uppermost
Passenger Seat	4	0 – Uppermost



DATA SHEET NO. 2 ... (CONTINUED)
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

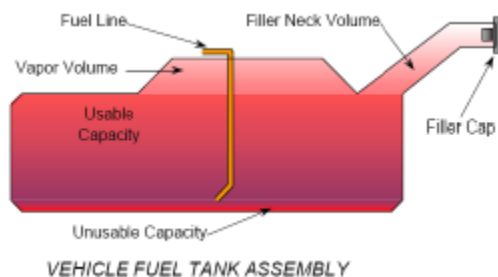
NHTSA No.: M20155309
 Test Date: 1/29/2015

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	60.18
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	55.34 – 56.57
Actual Amount of Solvent Used	55.97
1/3 of Usable Capacity	18.05

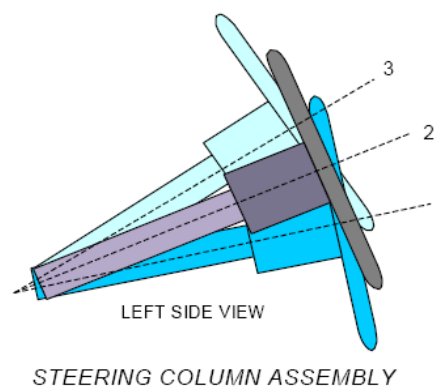
FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



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 moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



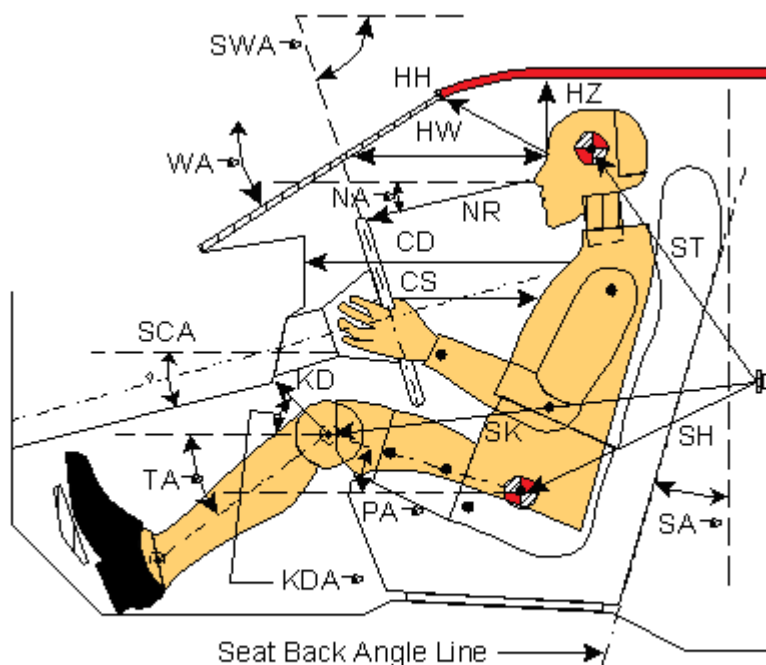
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	22.7	
Geometric center position No. 2	24.7	
Uppermost position No. 3	26.7	
Telescoping Steering Wheel Travel		38
Test Position	24.7	19

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



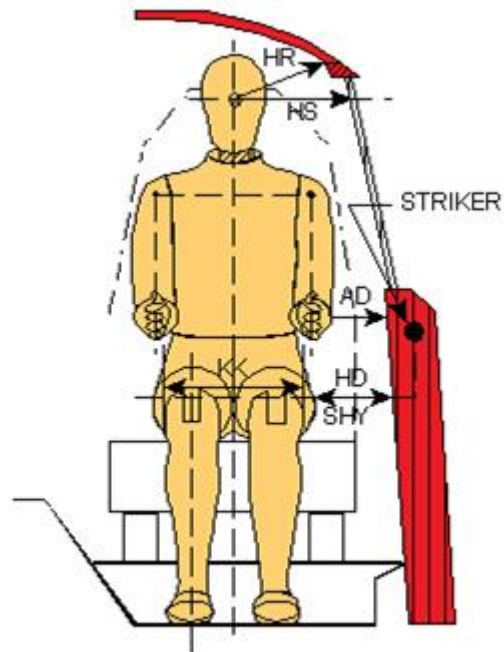
Left Side View

Code	Measurement Description	Driver (SN: 1046)		Passenger (SN: 139)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		-28.5		
SWA°	Steering Wheel Angle		25.3		
SCA°	Steering Column Angle		64.7		
SA°	Seat Back Angle (on headrest post)		4.1		4.8
HZ	Head to Roof (Z)	231	90	233	90
HH	Head to Header	380	28.5	308	51
HW	Head to Windshield	692	0	623	0
NR	Nose to Rim	417	-12.7	435	-41
CD	Chest to Dash	531		365	
CS	Chest to Steering Hub	326	-5.0		
RA	Rim to Abdomen	205	2.0		
KDL	Left Knee to Dash	163	26.8	70	30.8
KDR	Right Knee to Dash	158	28.2	78	31.4
PA°	Pelvic Angle		23.7		19.2
TA°	Tibia Angle		-35.6		42.7
SK	Striker to Knee	585	-12.1	700	-9.5
ST	Striker to Head	436	83.9	447	53.8
SH	Striker to H-Point	320	-50.1	424	-27.4

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



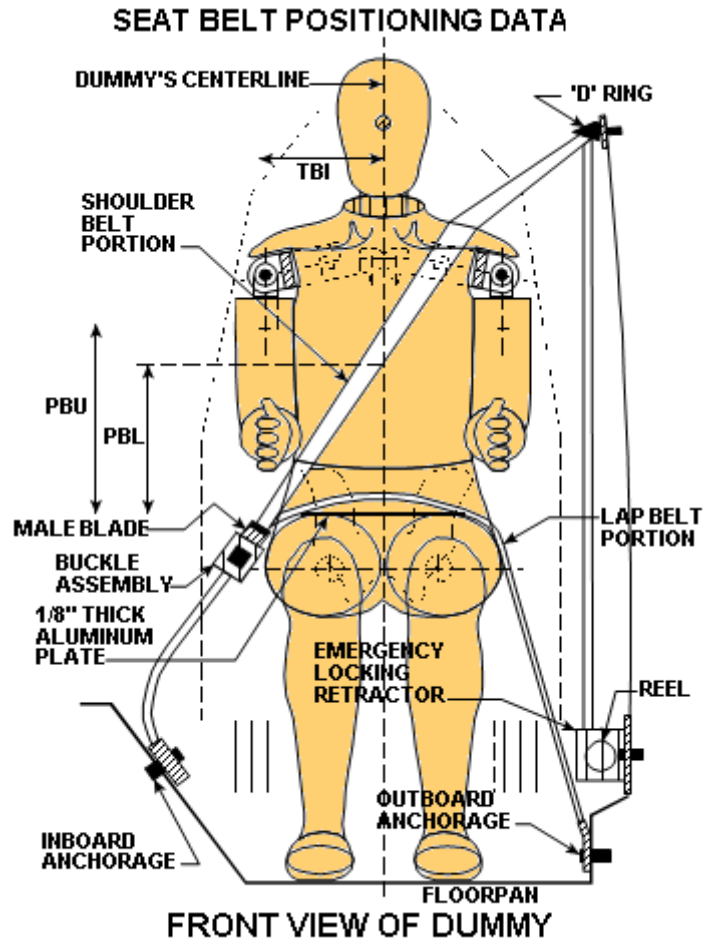
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	145	75
HD	H-Point to Door	155	165
HR	Head to Side Header	252	272
HS	Head to Side Window	353	375
KK	Knee to Knee	340	166
SHY	Striker to H-Point (Y Direction)	250	255
AA	Ankle to Ankle	345	166

DATA SHEET NO. 5 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	360	345
PBL — Top surface of reference to belt lower edge	mm	290	270

BELT LENGTH DATA

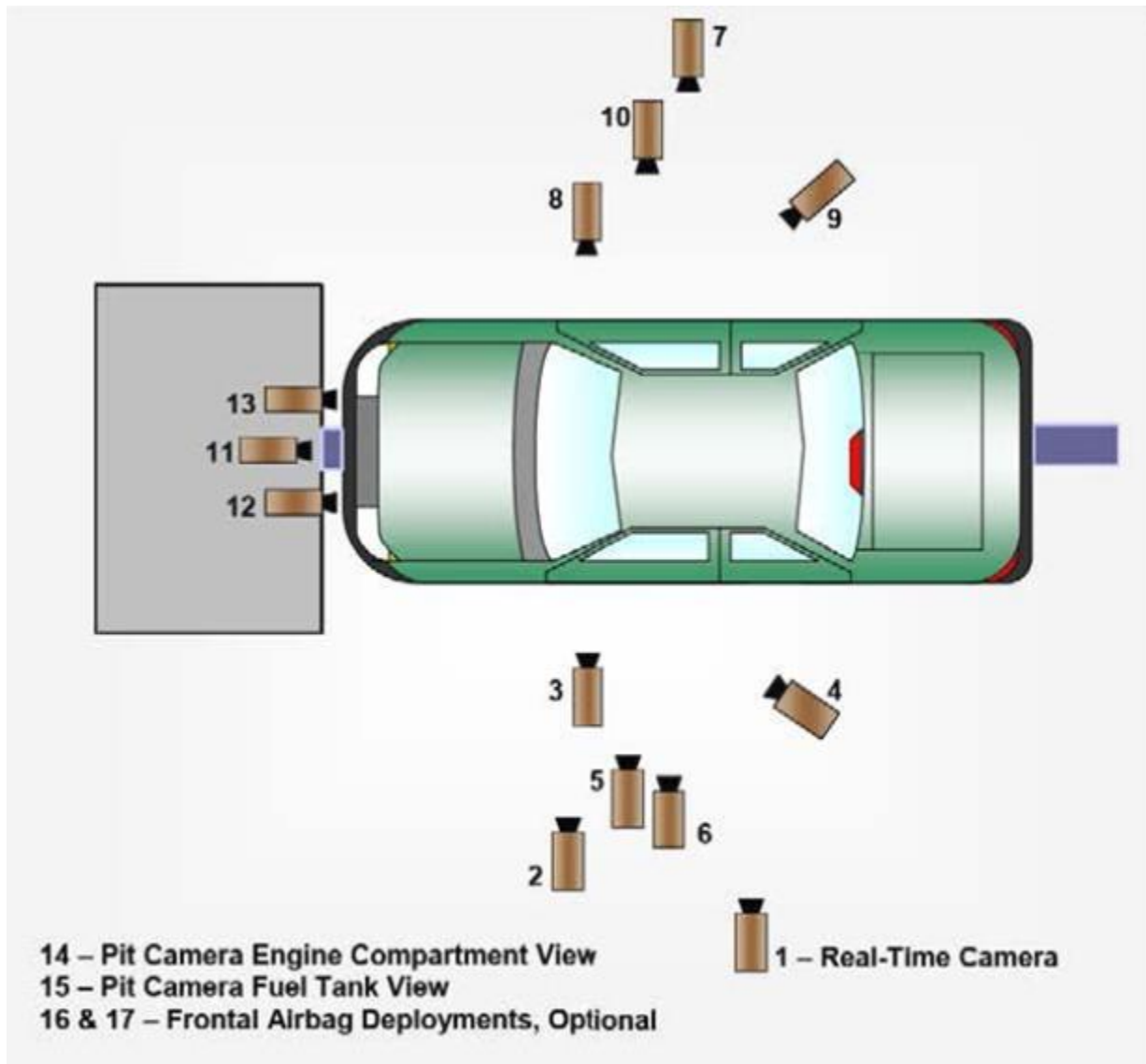
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	880	965
Lap Belt Length as measured on ATD	mm	770	870
Remainder of belt on reel	mm	850	665
Total belt length for continuous webbing systems	mm	2500	2500

DATA SHEET NO. 6
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

DATA SHEET NO. 6 ... (CONTINUED)
HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

CAMERA LOCATIONS

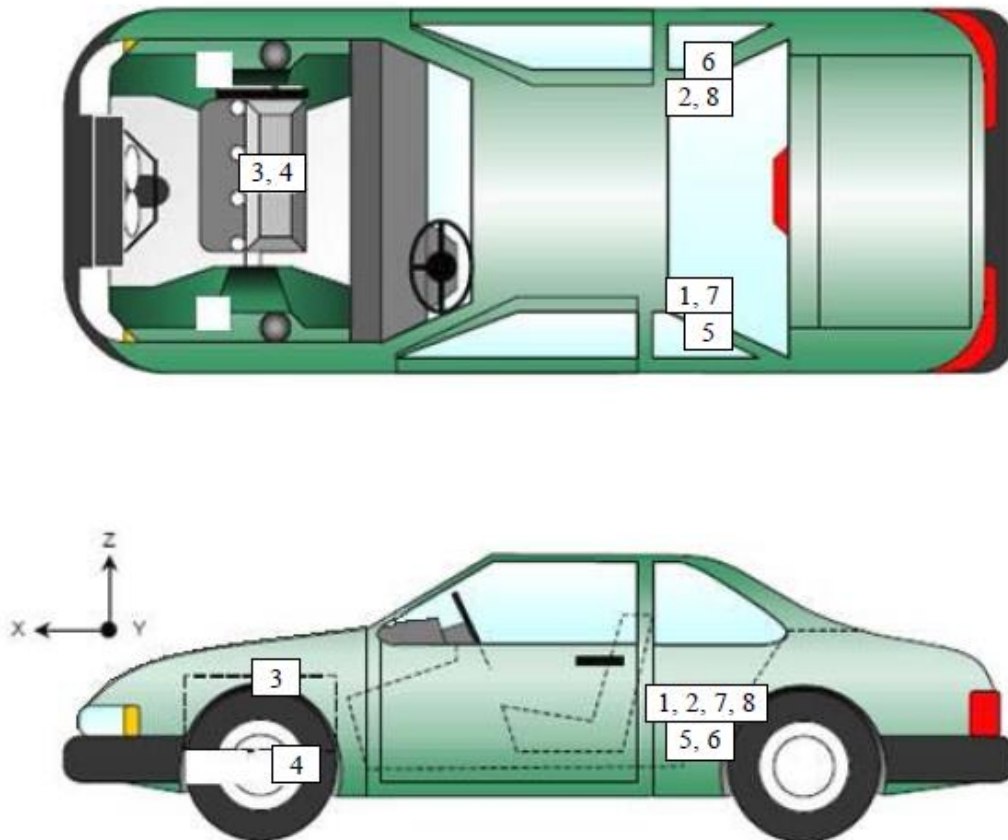
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-	Zoom	60
2	Driver Close-Up	-1976	-8295	-1574	50	1000
3	Left Front Half	-982	-9542	-1603	50	1000
4	Left Angle	-2834	-3107	-2278	24	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-1927	8720	-1188	24	1000
8	Passenger Close-Up	-1463	7535	-1363	50	1000
9	Right Front Half	-1077	7212	-1136	28	1000
10	Right Angle	-2809	3126	-2290	24	1000
11	Windshield	954	0	-3505	20	1000
12	Driver Windshield	395	-600	-2051	25	1000
13	Passenger Windshield	395	600	-2051	25	1000
14	Pit Front	-967	0	2041	12.5	1000
15	Pit Rear	-2047	0	2050	12.5	1000
16	Onboard Driver Airbag (Optional)				12.5	1000
17	Onboard Passenger Airbag (Optional)				12.5	1000

* COORDINATES: +X = forward of impact plane
 +Y = right of monorail center
 +Z = into ground

DATA SHEET NO. 7 **VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1535	-588	84
2	Right Rear Accelerometer – X Direction	1540	579	77
3	Engine Top X	3856	-91	-339
4	Engine Bottom X	3861	209	315
5	Left Rear Accelerometer – Z Direction	1535	-581	77
6	Right Rear Accelerometer – Z Direction	1525	587	84
7	Left Rear Accelerometer – X Direction Redundant	1535	-588	84
8	Right Rear Accelerometer – X Direction Redundant	1540	579	77

Reference Points: *X – Rear Surface of Vehicle (+ forward)*
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

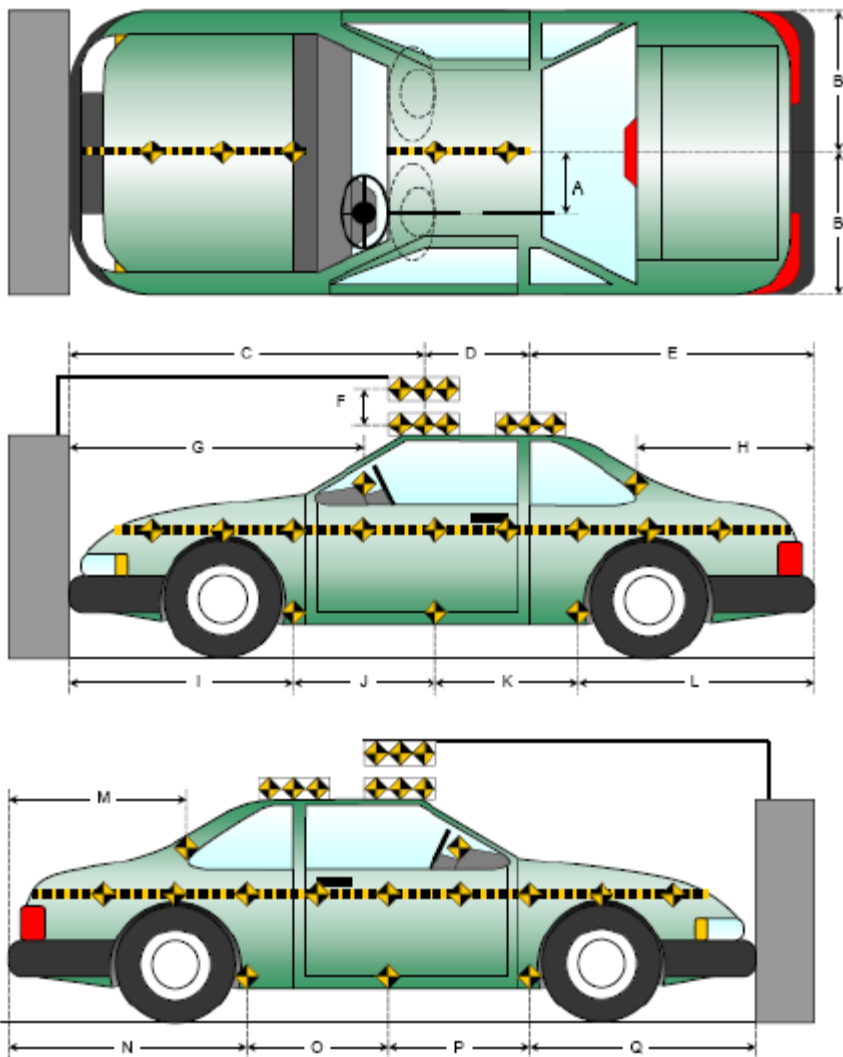
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

Item	Value
A	376
B	913
C	2057
D	610
E	1899
F	170
G	1693
H	1092
I	1385
J	850
K	848
L	1482
M	1096
N	1480
O	842
P	854
Q	1389

All units in millimeters



DATA SHEET NO. 9 **LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

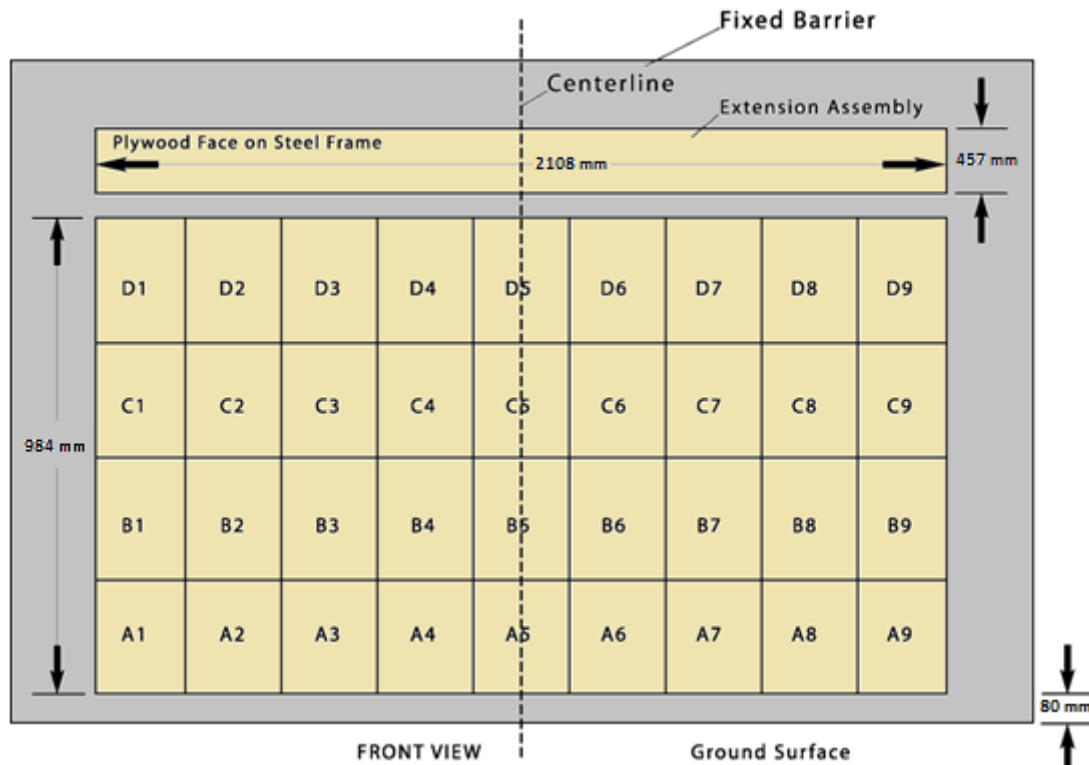


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension*

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	36
Total	136

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	12
Real-Time Panning	1
Total	15

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 1046	P5720 5 th Female / 139
Head Contact	Front & Curtain Airbag & Headrest	Front & Curtain Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove Box
Right Knee Contact	Knee Airbag	Glove Box

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	No	No
Glazing Damage	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Minor cracks along bottom driver's side
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	782
Center	mm	787
Right Side	mm	822
Average	mm	797

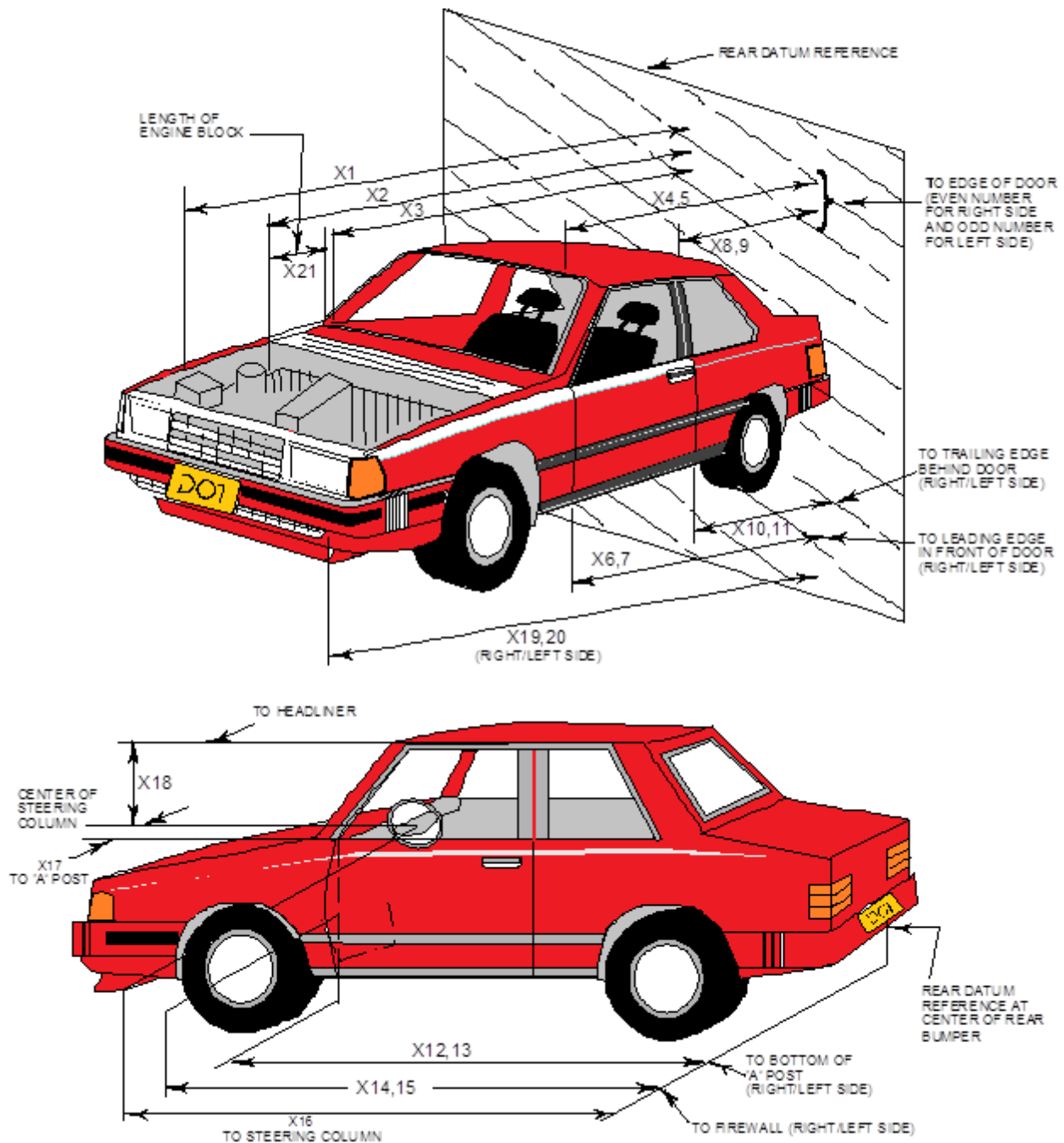
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	Yes	Yes	Yes
Knee Airbag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Seat Pan Airbag	No	N/A	Yes	Yes

DATA SHEET NO. 12 **VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



DATA SHEET NO. 12 ... (CONTINUED)
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4565	4126	-439
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3906	3699	-207
3	RSOV to Firewall	3545	3512	-33
4	RSOV to Upper Leading Edge of Right Door	3168	3172	4
5	RSOV to Upper Leading Edge of Left Door	3169	3168	-1
6	RSOV to Lower Leading Edge of Right Door	3133	3139	6
7	RSOV to Lower Leading Edge of Left Door	3135	3141	6
8	RSOV to Upper Trailing Edge of Right Door	2104	2108	4
9	RSOV to Upper Trailing Edge of Left Door	2106	2105	-1
10	RSOV to Lower Trailing Edge of Right Door	2111	2117	6
11	RSOV to Lower Trailing Edge of Left Door	2113	2119	7
12	RSOV to Bottom of "A" Post of Right Side	3209	3211	2
13	RSOV to Bottom of "A" Post of Left Side	3208	3208	0
14	RSOV to Firewall, Right Side	3526	3486	-40
15	RSOV to Firewall, Left Side	3543	3528	-15
16	RSOV to Steering Column	2725	2791	66
17	Center of Steering Column to "A" Post	306	297	-9
18	Center of Steering Column to Headliner	450	459	9
19	RSOV to Right Side of Front Bumper	4525	4106	-419
20	RSOV to Left Side of Front Bumper	4525	4105	-420
21	Length of Engine Block	240	240	0
RD	RSOV to Right Side of Dash Panel	2909	2908	-1
CD	RSOV to Center of Dash Panel	2807	2815	8
LD	RSOV to Left Side of Dash Panel	2911	2912	1

*UR= Unrecoverable data point
 All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

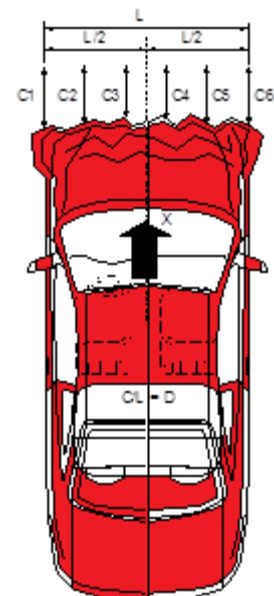
VEHICLE INFORMATION

VIN: JTMBFREV3FD111868
Vehicle Size Category: Passenger

Wheelbase (mm): 2,657
Test Weight (kg): 1,840

ACCELEROMETER DATA

Accelerometer Locations: Please See Data Sheet No. 7
Cal. Procedure / Interval: Calspan Procedure / 6 month
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.58
Velocity Change (km/h): 56.58
Time of Separation (ms): 124



CRUSH PROFILE

Collision Deformation Classification: 12FDEW02
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1390
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4345	3991	354
C2	Crush Zone 2 at Left Side	mm	4534	4112	422
C3	Crush Zone 3 at Left Side	mm	4563	4129	434
C4	Crush Zone 4 at Right Side	mm	4563	4124	439
C5	Crush Zone 5 at Right Side	mm	4532	4106	426
C6	Crush Zone 6 at Right Side	mm	4340	4043	297
L	C1 to C6	mm	1390	1530	-140

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

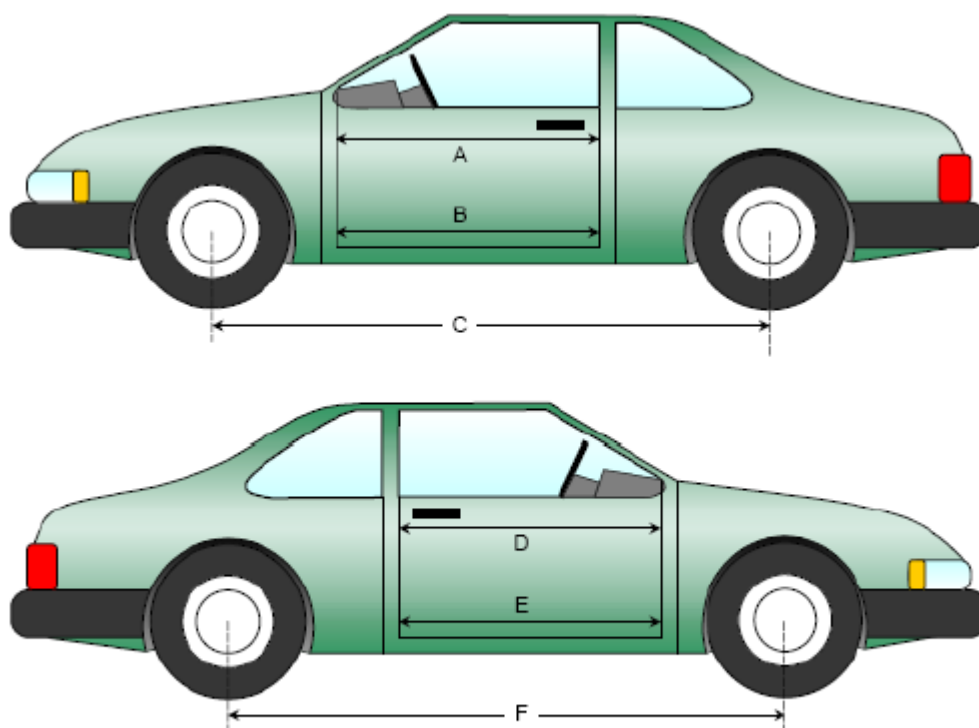
NHTSA No.: M20155309
Test Date: 1/29/2015

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	968	968	0
B	Left Side Lower	mm	854	854	0
D	Right Side Upper	mm	972	972	0
E	Right Side Lower	mm	843	844	1

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2657	2604	-53
F	Right Side Wheelbase	mm	2657	2633	-24



Left & Right Side Views

DATA SHEET NO.14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

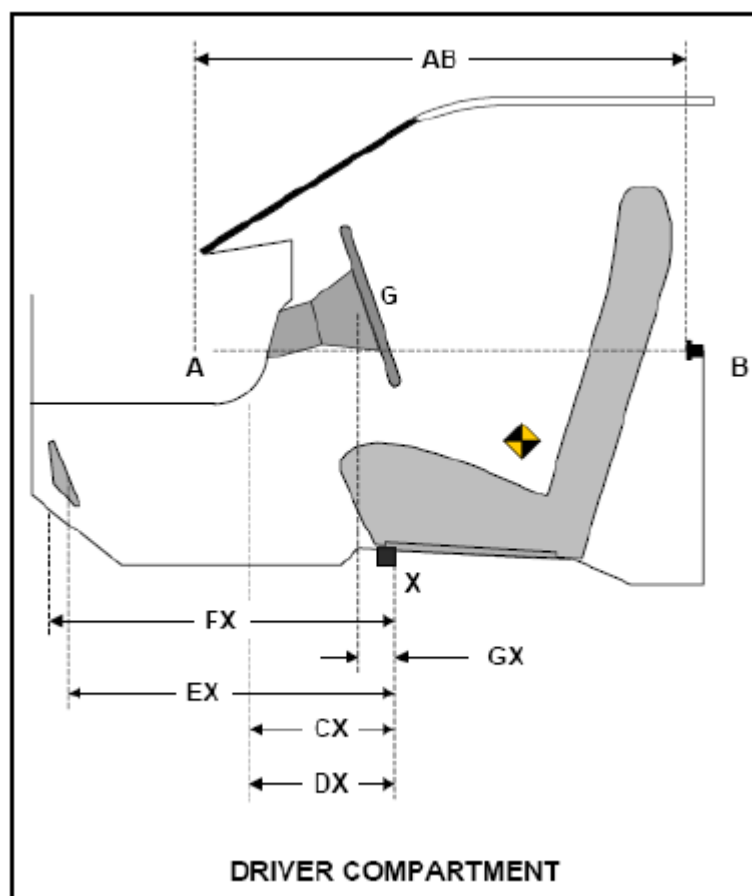
Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	818	816	-2
CX	Left Knee Bolster to X	mm	319	323	4
DX	Right Knee Bolster to X	mm	311	318	7
EX	Brake Pedal to X	mm	578	562	-16
FX	Foot Rest to X	mm	651	643	-8
GX	Center of Steering Column Wheel Hub to X	mm	99	166	67

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015

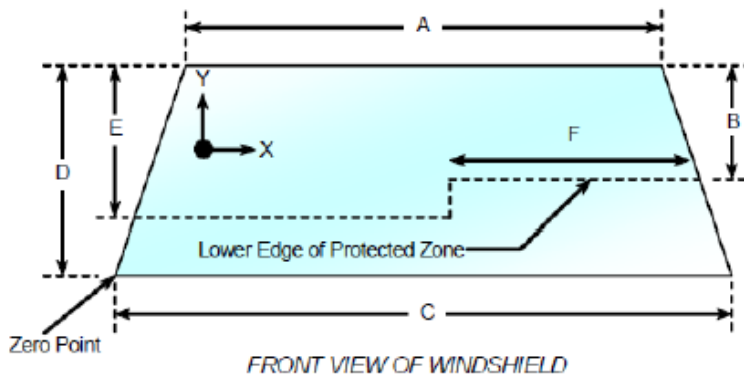
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% 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)	% Retention
Left Side	2095	2095	100%
Right Side	2095	2095	100%
Total	4190	4190	100%



Item	Units	Value
A	mm	1210
B	mm	485
C	mm	1360
D	mm	810
E	mm	470
F	mm	520

AREAS OF PROTECTED ZONE FAILURES

A. *Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.*

- No Penetration

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.*

- No Penetration

X	Y

DATA SHEET NO. 15 ... (CONTINUED)
SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2015 Toyota RAV-4 SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
Test Date: 1/29/2015

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 2:35 PM

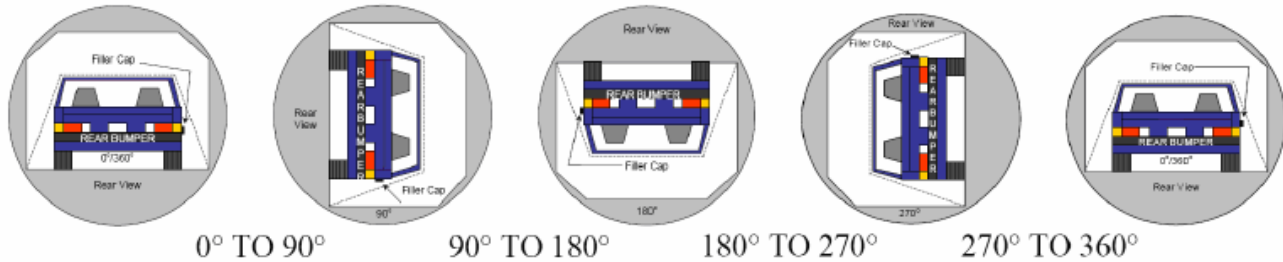
STODDARD SOLVENT SPILLAGE MEASUREMENTS

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 oz./minute)
- D. Spillage: No Spillage Occurred

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



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: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	71	300	371
90° to 180°	62	300	362
180° to 270°	61	300	361
270° to 360°	70	300	370

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

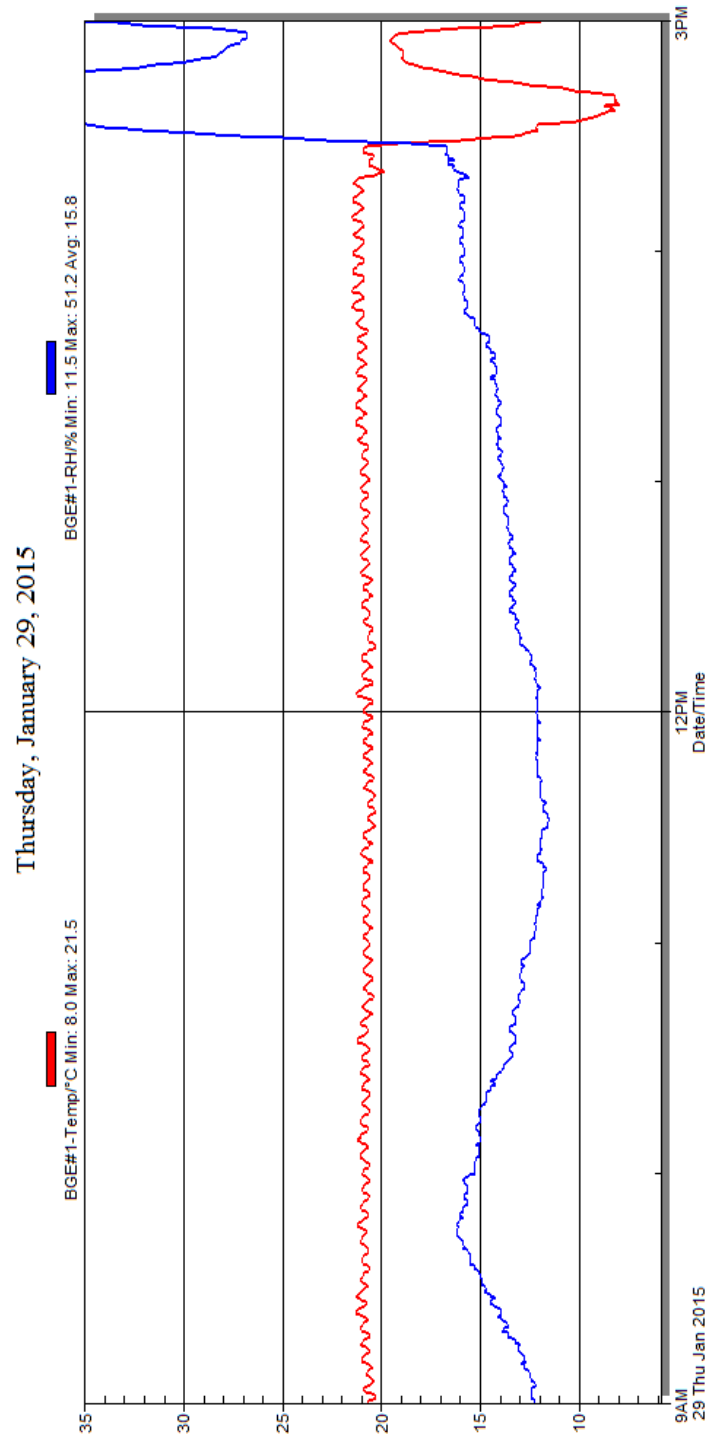
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2015 Toyota RAV-4 SUV
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20155309
 Test Date: 1/29/2015



Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Fig.	Description	Page
1	Load Cell Location	A-5
2	Load Cell Wall	A-5
3	Manufacturer's Label	A-6
4	Tire Placard	A-6
5	2015 Toyota RAV-4 Frontal As Delivered	A-7
6	Left Rear 3-4 View, as Received	A-7
7	Pre-Test Front View of Test Vehicle	A-8
8	Post-Test Front View of Test Vehicle	A-8
9	Pre-Test Left View of Test Vehicle	A-9
10	Post-Test Left View of Test Vehicle	A-9
11	Pre-Test Right View of Test Vehicle	A-10
12	Post-Test Right View of Test Vehicle	A-10
13	Pre-Test Right Front 3-4 View	A-11
14	Post-Test Right Front 3-4 View	A-11
15	Pre-Test Left Rear 3-4 View	A-12
16	Post-Test Left Rear 3-4 View	A-12
17	Pre-Test Windshield View	A-13
18	Post-Test Windshield View	A-13
19	Pre-Test Engine Compartment View	A-14
20	Post-Test Engine Compartment View	A-14
21	Pre-Test Fuel Filler Cap View	A-15
22	Post-Test Fuel Filler Cap View	A-15
23	Pre-Test Front Underbody View ¹	A-16
24	Post-Test Front Underbody View ¹	A-16
25	Pre-Test Rear Underbody View ¹	A-17
26	Post-Test Rear Underbody View ¹	A-17
27	Pre-Test Dummy Cable Routing	A-18
28	Post-Test Dummy Cable Routing	A-18
29	Pre-Test Driver Dummy Front View	A-19
30	Post-Test Driver Dummy Front View	A-19
31	Pre-Test Driver Dummy Window View	A-20
32	Post-Test Driver Dummy Window View	A-20
33	Pre-Test Driver Dummy and Vehicle Interior View	A-21
34	Post-Test Driver Dummy and Vehicle Interior View	A-21

Fig.	Description	Page
35	Pre-Test Driver's Seat Fore-Aft Markings	A-22
36	Post-Test Driver's Seat Fore-Aft Markings	A-22
37	Pre-Test View of Belt Anchorage for Driver Dummy	A-23
38	Post-Test View of Belt Anchorage for Driver Dummy	A-23
39	Pre-Test Driver Dummy Feet	A-24
40	Post-Test Driver Dummy Feet	A-24
41	Pre-Test Driver's Side Knee Bolster	A-25
42	Post-Test Driver's Side Knee Bolster	A-25
43	Pre-Test Driver's Side Floorpan	A-26
44	Post-Test Driver's Side Floorpan	A-26
45	Post-Test Driver Dummy Face	A-27
46	Post-Test Driver Dummy Contact With Airbag	A-27
47	Post-Test Driver Dummy Contact With Headrest	A-28
48	Pre-Test View of the Steering Wheel	A-28
49	Post-Test View of the Steering Wheel	A-29
50	Pre-Test Passenger Dummy Front View	A-29
51	Post-Test Passenger Dummy Front View	A-30
52	Pre-Test Passenger Dummy Window View	A-30
53	Post-Test Passenger Dummy Window View	A-31
54	Pre-Test Passenger Dummy and Vehicle Interior View	A-31
55	Post-Test Passenger Dummy and Vehicle Interior View	A-32
56	Pre-Test Passenger's Seat Fore-Aft Markings	A-32
57	Post-Test Passenger's Seat Fore-Aft Markings	A-33
58	Pre-Test View of Belt Anchorage for Passenger Dummy	A-33
59	Post-Test View of Belt Anchorage for Passenger Dummy	A-34
60	Pre-Test Passenger Dummy Feet	A-34
61	Post-Test Passenger Dummy Feet	A-35
62	Pre-Test Passenger's Side Knee Bolster	A-35
63	Post-Test Passenger's Side Knee Bolster	A-36
64	Pre-Test Passenger's Side Floorpan	A-36
65	Post-Test Passenger's Side Floorpan	A-37
66	Post-Test Passenger Dummy Face	A-37
67	Post-Test Passenger Dummy Contact With Airbag	A-38
68	Post-Test Passenger Dummy Contact With Headrest	A-38

Fig.	Description	Page
69	Photograph of Ballast Installed in Vehicle	A-39
70	Post-Test Stoddard Solvent Spillage Location View, if Required	A-39
71	Post-Test Speed Trap Read-Out	A-40
72	Vehicle at 0° on Static Rollover Device	A-40
73	Vehicle at 90° on Static Rollover Device	A-41
74	Vehicle at 180° on Static Rollover Device	A-41
75	Vehicle at 270° on Static Rollover Device	A-42
76	Vehicle at 360° on Static Rollover Device	A-42
77	2015 Toyota RAV-4 Frontal Impact Event	A-43
78	Monroney Label Photograph	A-43

¹**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*



Figure A-1: Load Cell Location

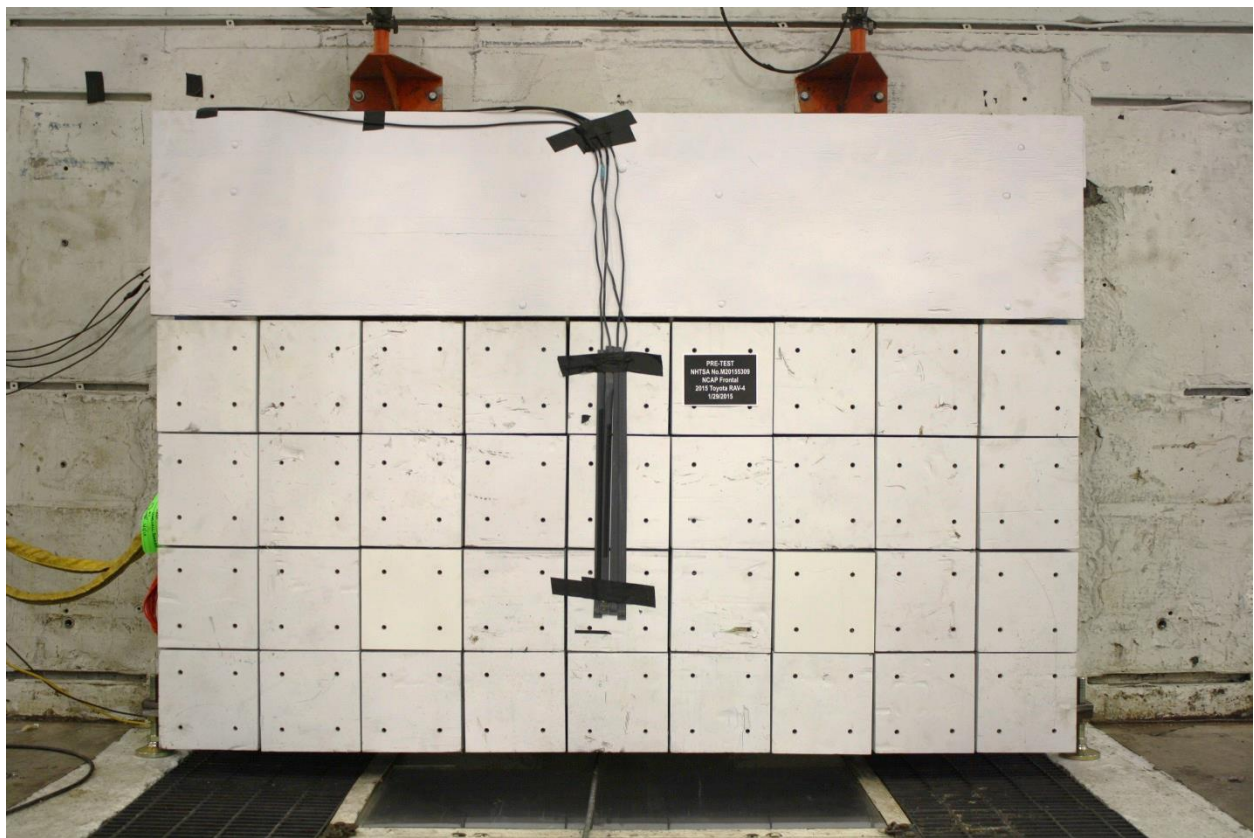


Figure A-2: Load Cell Wall



Figure A-3: Manufacturer's Label



Figure A-4: Tire Placard



Figure A-5: 2015 Toyota RAV-4 Frontal As Delivered



Figure A-6: Left Rear 3-4 View, As Received

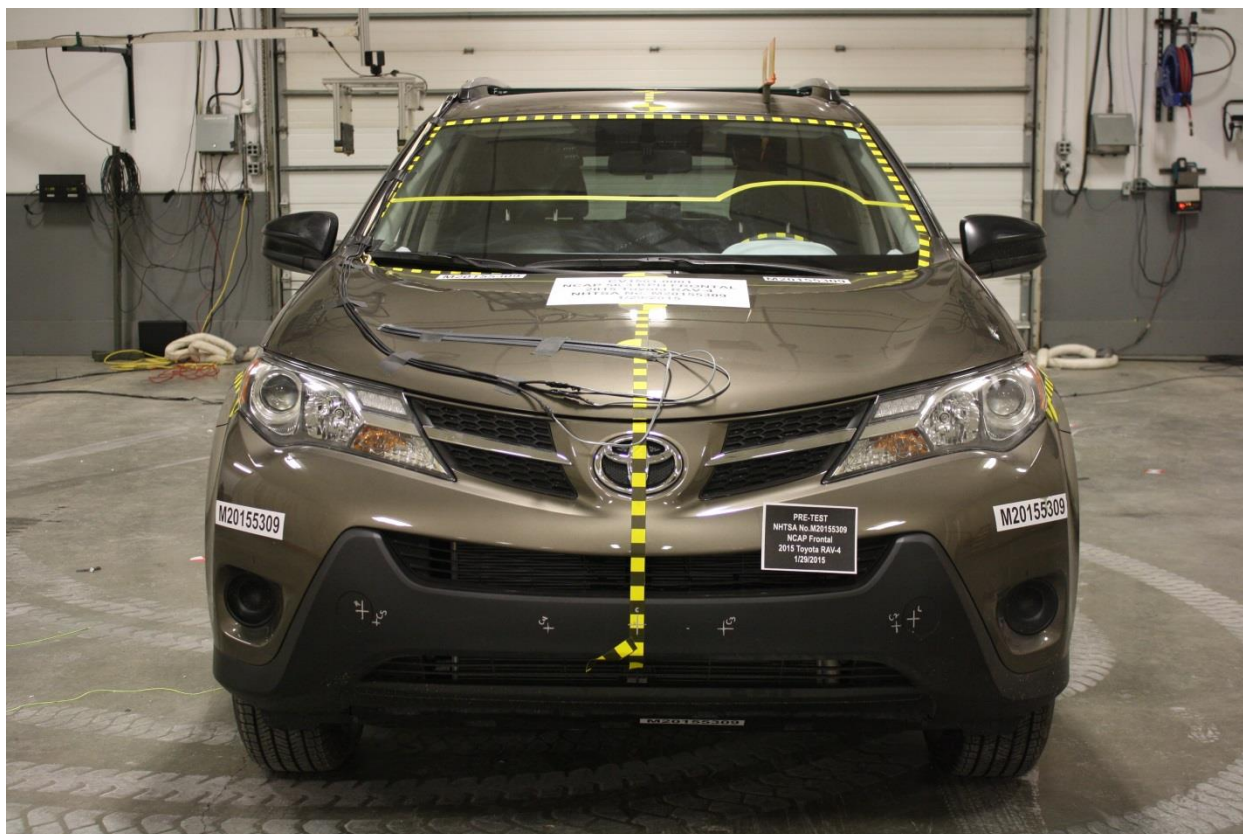


Figure A-7: Pre-Test Front View of Test Vehicle



Figure A-8: Post-Test Front View of Test Vehicle



Figure A-9: Pre-Test Left View of Test Vehicle



Figure A-10: Post-Test Left View of Test Vehicle



Figure A-11: Pre-Test Right View of Test Vehicle



Figure A-12: Post-Test Right View of Test Vehicle

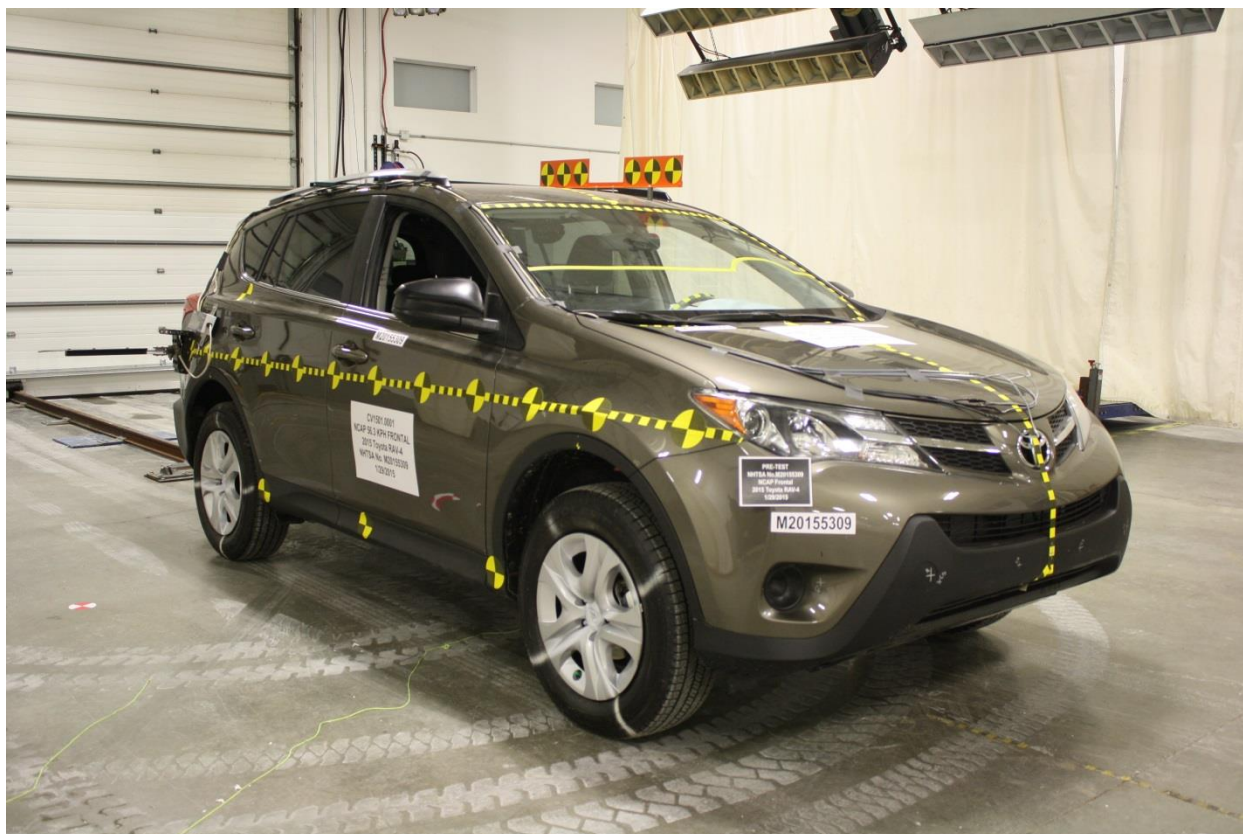


Figure A-13: Pre-Test Right Front 3-4 View

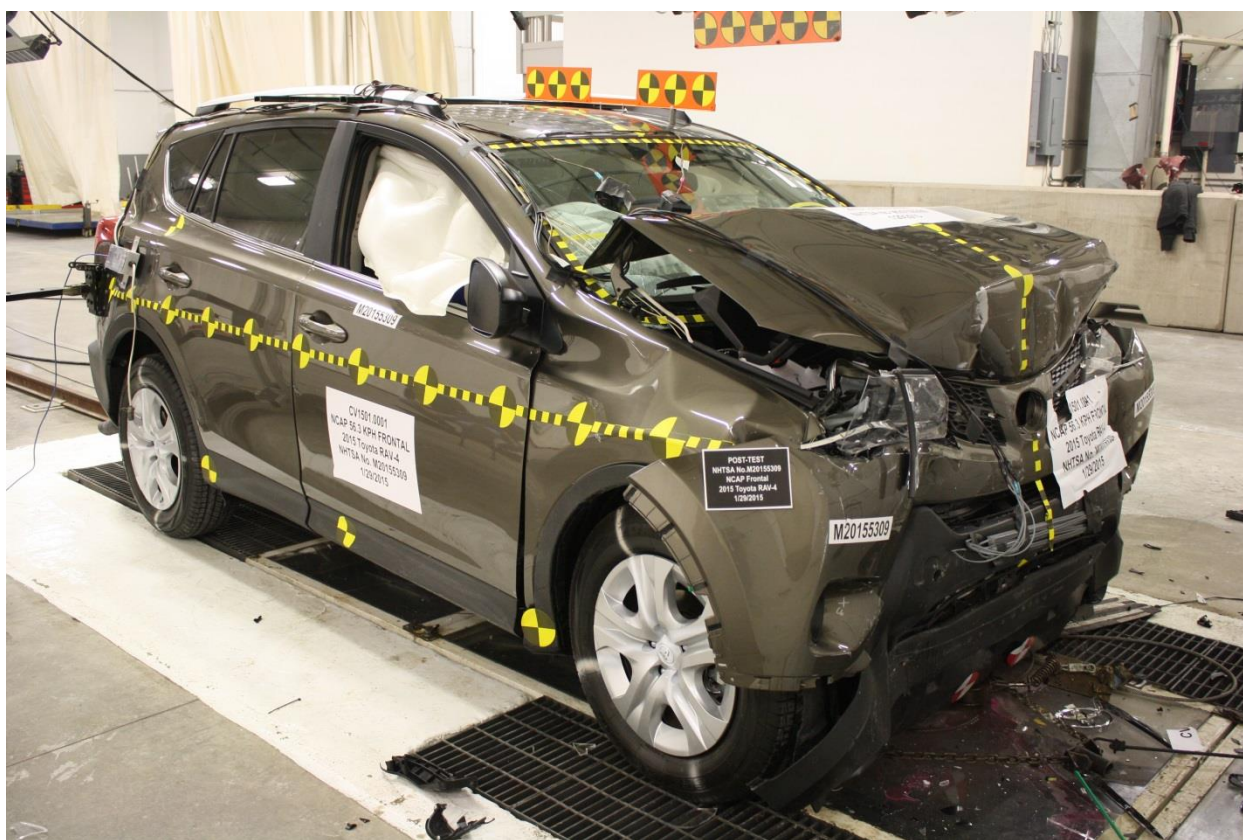


Figure A-14: Post-Test Right Front 3-4 View



Figure A-15: Pre-Test Left Rear 3-4 View



Figure A-16: Post-Test Left Rear 3-4 View



Figure A-17: Pre-Test Windshield View



Figure A-18: Post-Test Windshield View



Figure A-19: Pre-Test Engine Compartment View



Figure A-20: Post-Test Engine Compartment View



Figure A-21: Pre-Test Fuel Filler Cap View



Figure A-22: Post-Test Fuel Filler Cap View



Figure A-23: Pre-Test Front Underbody View



Figure A-24: Post-Test Front Underbody View

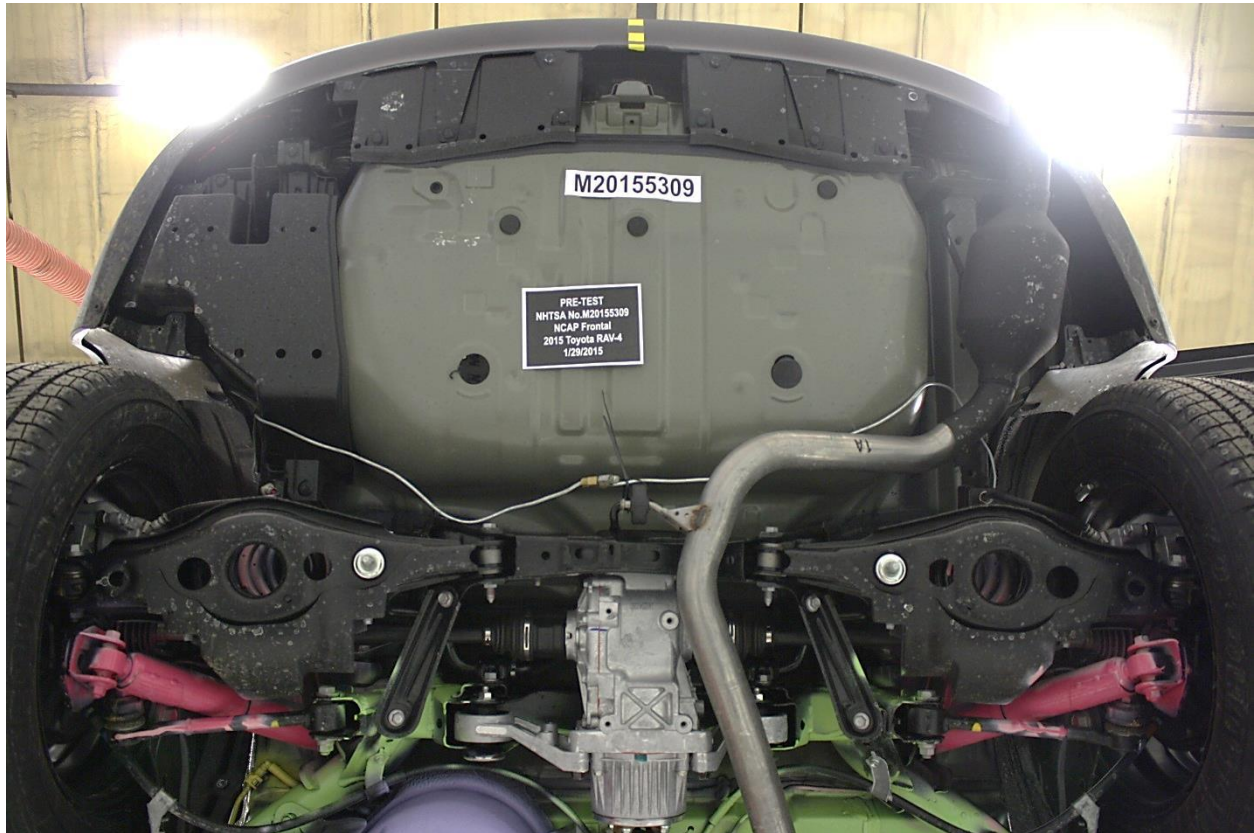


Figure A-25: Pre-Test Rear Underbody View

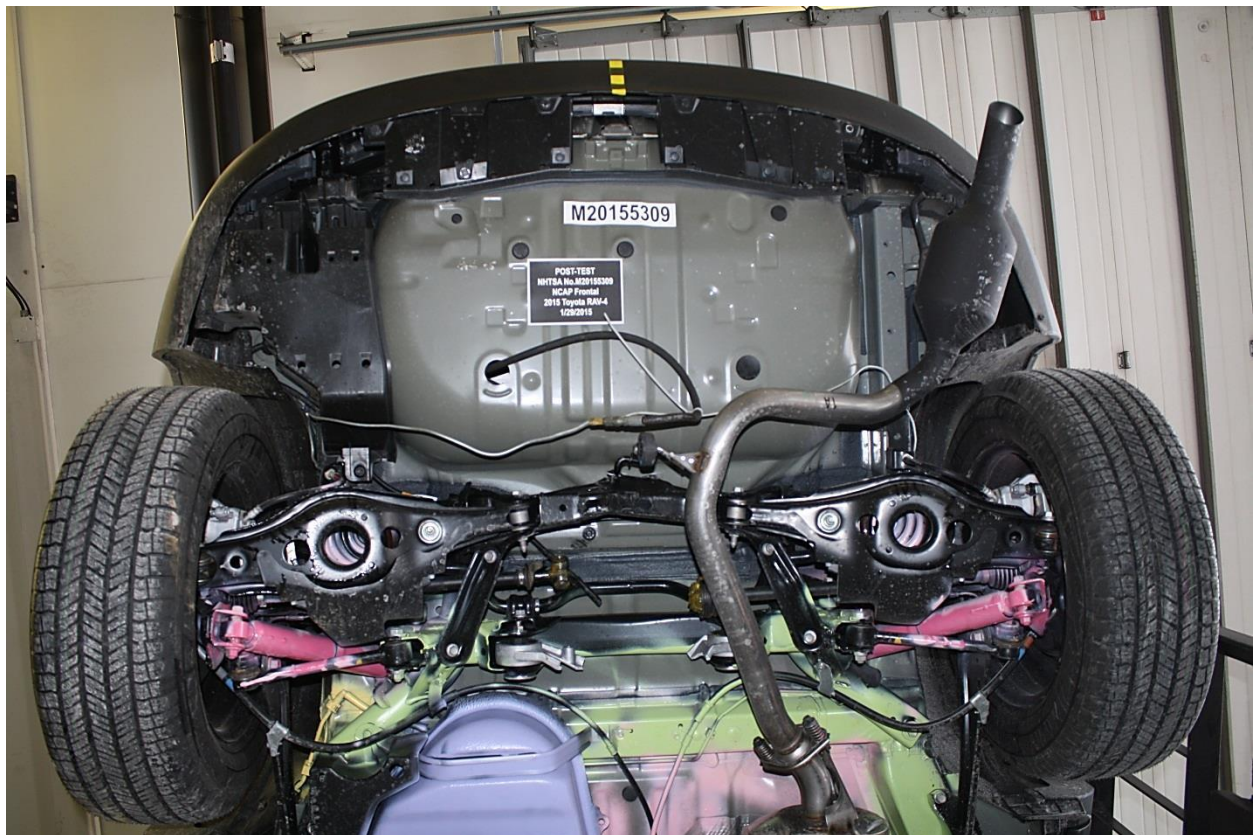


Figure A-26: Post-Test Rear Underbody View



Figure A-27: Pre-Test Dummy Cable Routing



Figure A-28: Post-Test Dummy Cable Routing



Figure A-29: Pre-Test Driver Dummy Front View



Figure A-30: Post-Test Driver Dummy Front View



Figure A-31: Pre-Test Driver Dummy Window View



Figure A-32: Post-Test Driver Dummy Window View



Figure A-33: Pre-Test Driver Dummy and Vehicle Interior View



Figure A-34: Post-Test Driver Dummy and Vehicle Interior View



Figure A-35: Pre-Test Driver's Seat Fore-Aft Markings



Figure A-36: Post-Test Driver's Seat Fore-Aft Markings



Figure A-37: Pre-Test View of Belt Anchorage for Driver Dummy



Figure A-38: Post-Test View of Belt Anchorage for Driver Dummy

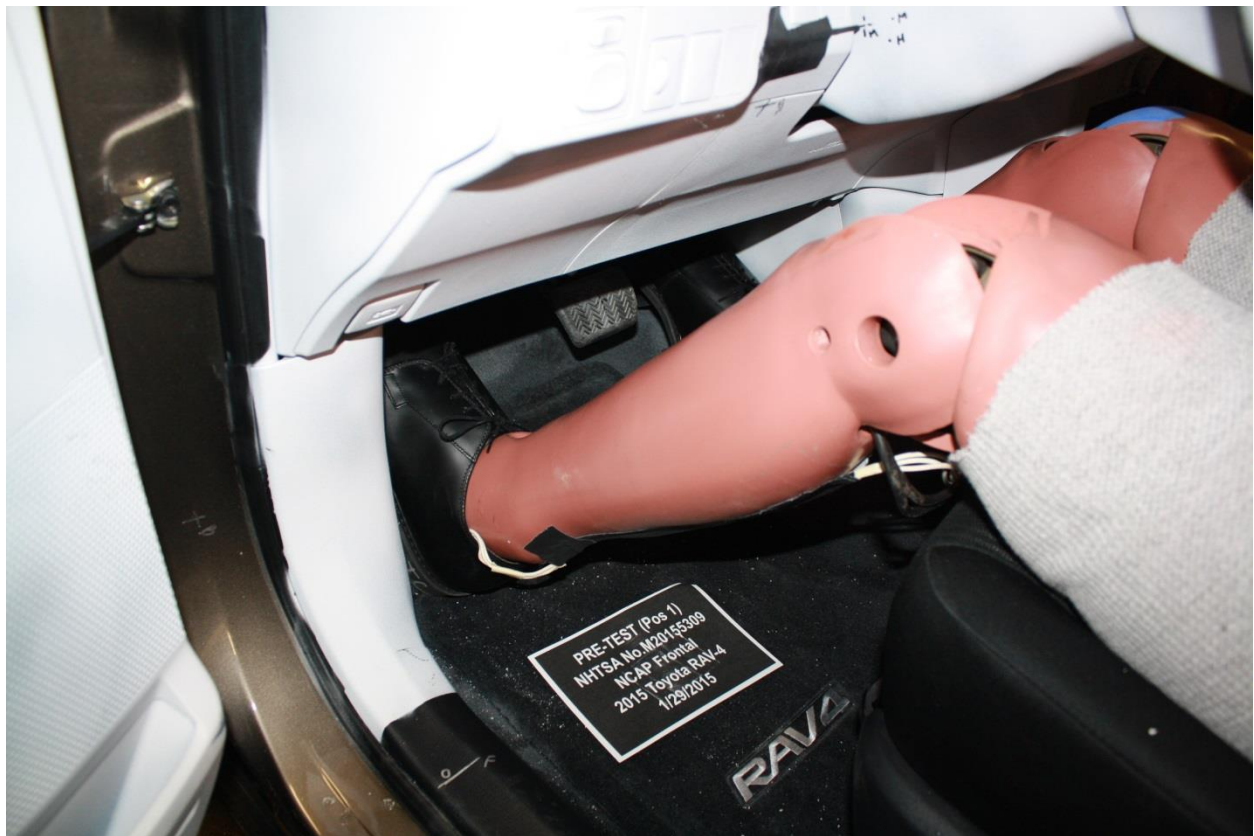


Figure A-39: Pre-Test Driver Dummy Feet



Figure A-40: Post-Test Driver Dummy Feet



Figure A-41: Pre-Test Driver's Side Knee Bolster



Figure A-42: Post-Test Driver's Side Knee Bolster



Figure A-43: Pre-Test Driver's Side Floorpan



Figure A-44: Post-Test Driver's Side Floorpan

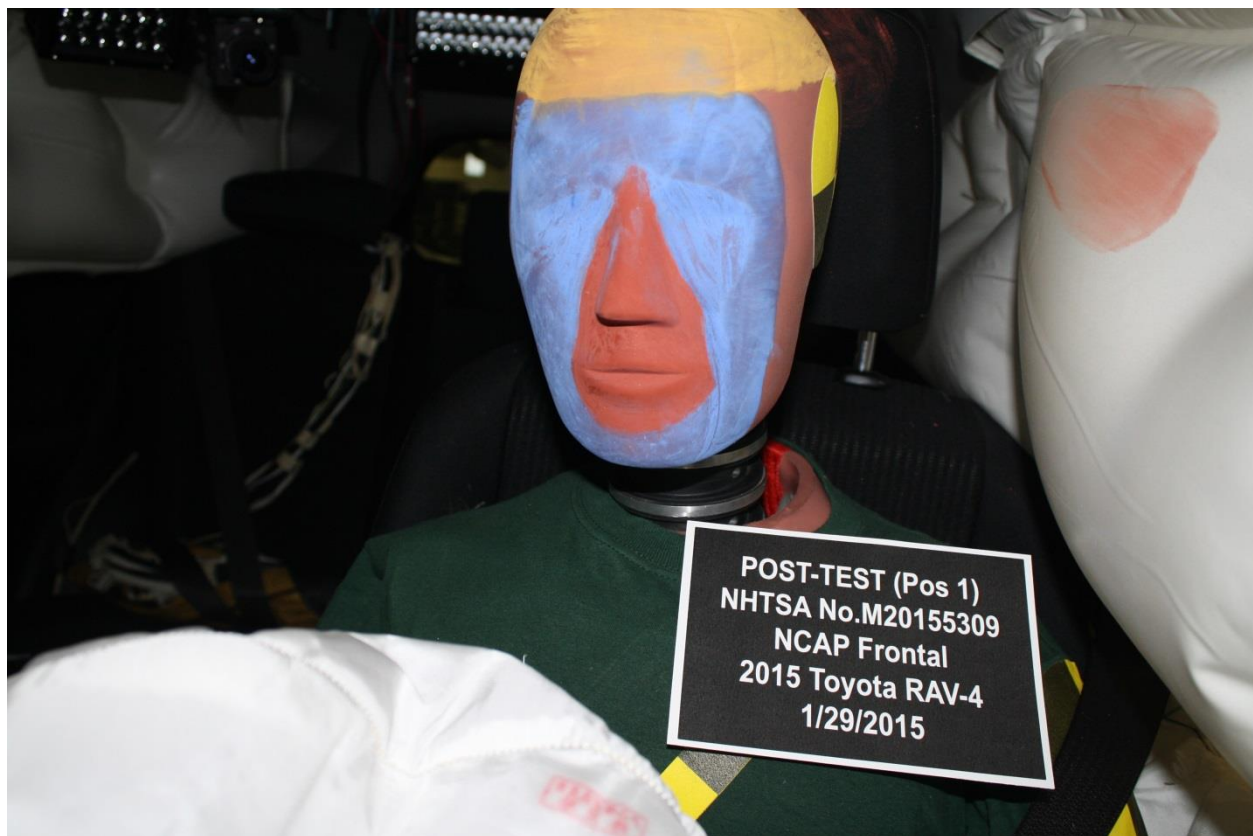


Figure A-45: Post-Test Driver Dummy Face



Figure A-46: Post-Test Driver Dummy Contact With Airbag

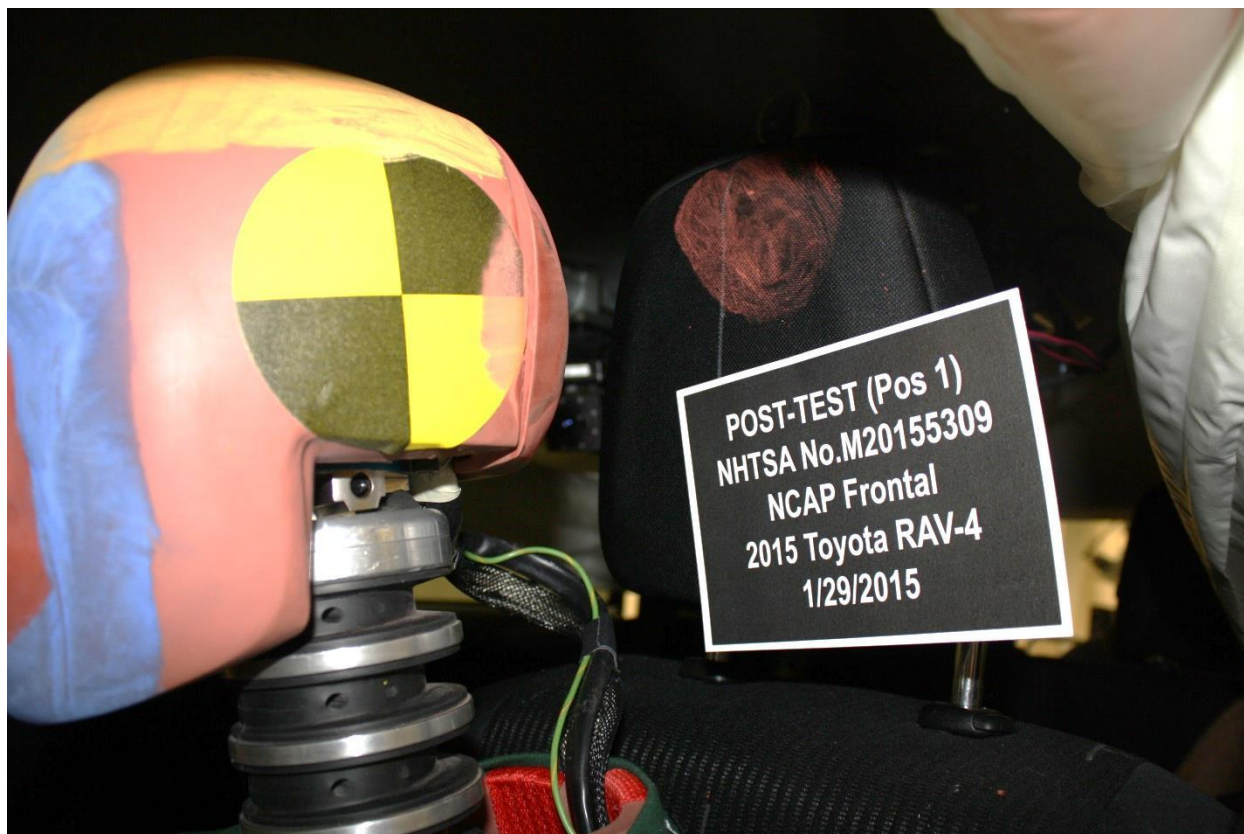


Figure A-47: Post-Test Driver Dummy Contact With Headrest



Figure A-48: Pre-Test View of the Steering Wheel

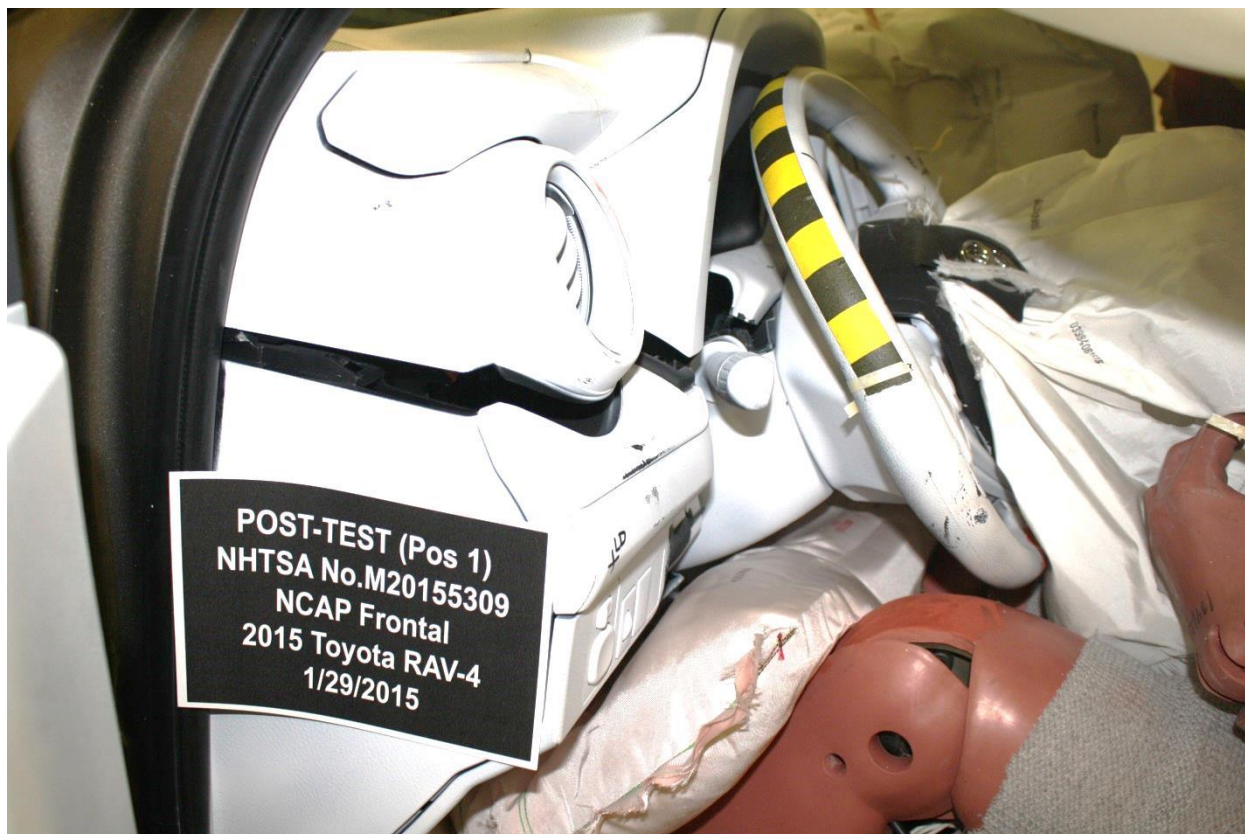


Figure A-49: Post-Test View of the Steering Wheel



Figure A-50: Pre-Test Passenger Dummy Front View

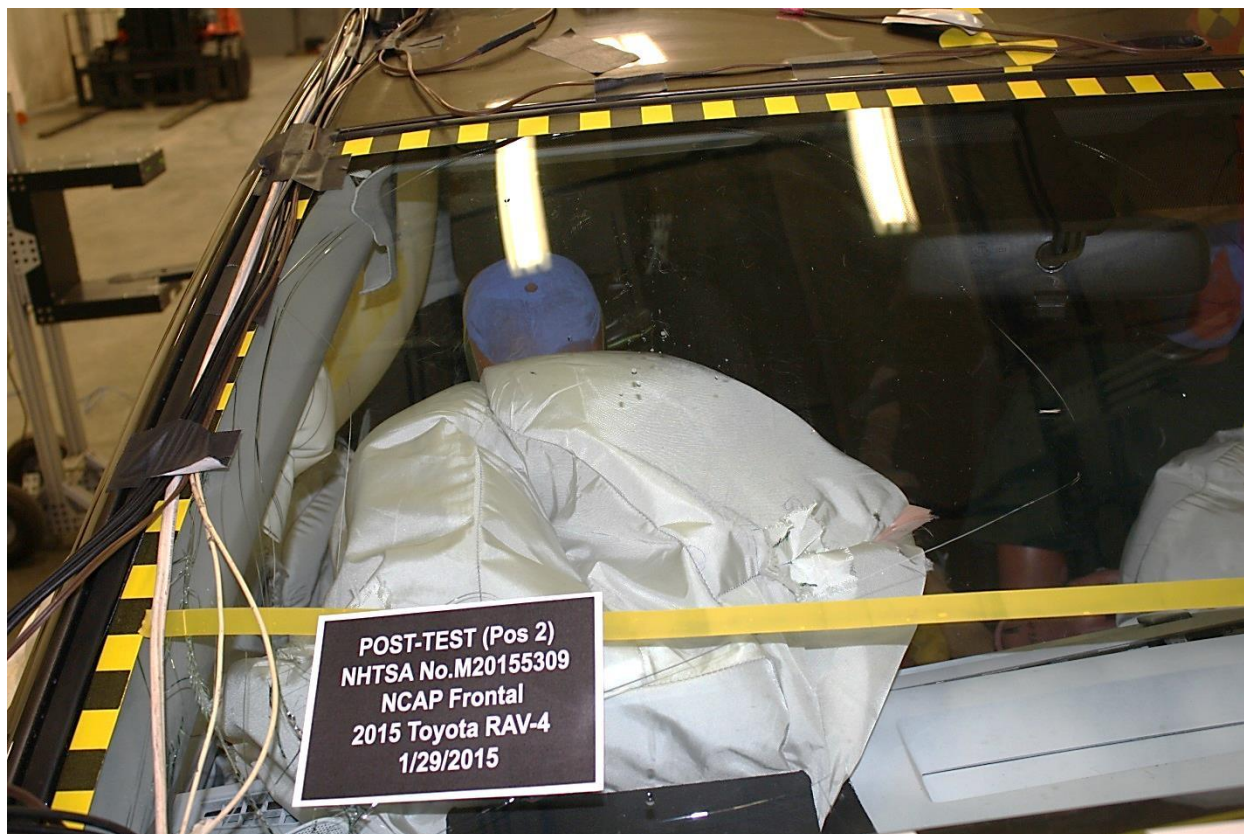


Figure A-51: Post-Test Passenger Dummy Front View

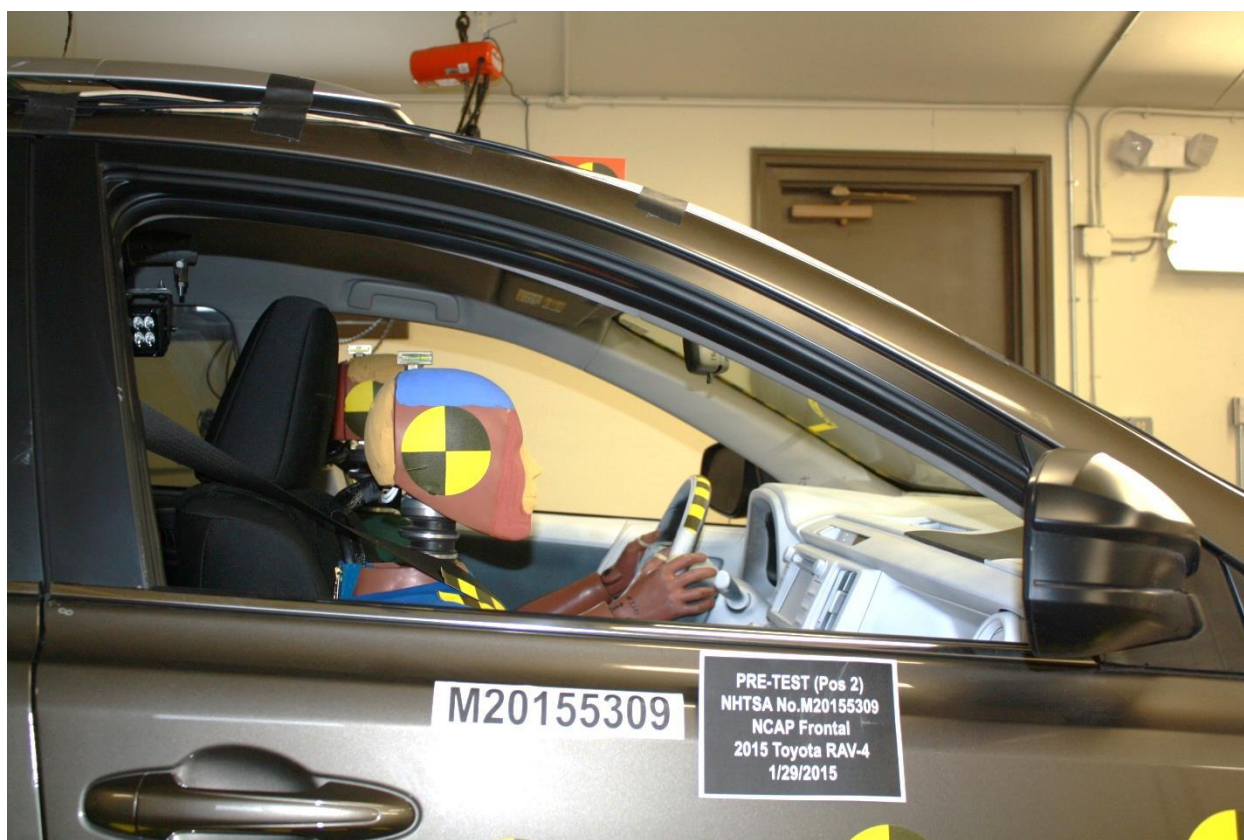


Figure A-52: Pre-Test Passenger Dummy Window View



Figure A-53: Post-Test Passenger Dummy Window View



Figure A-54: Pre-Test Passenger Dummy and Vehicle Interior View



Figure A-55: Post-Test Passenger Dummy and Vehicle Interior View



Figure A-56: Pre-Test Passenger's Seat Fore-Aft Markings



Figure A-57: Post-Test Passenger's Seat Fore-Aft Markings

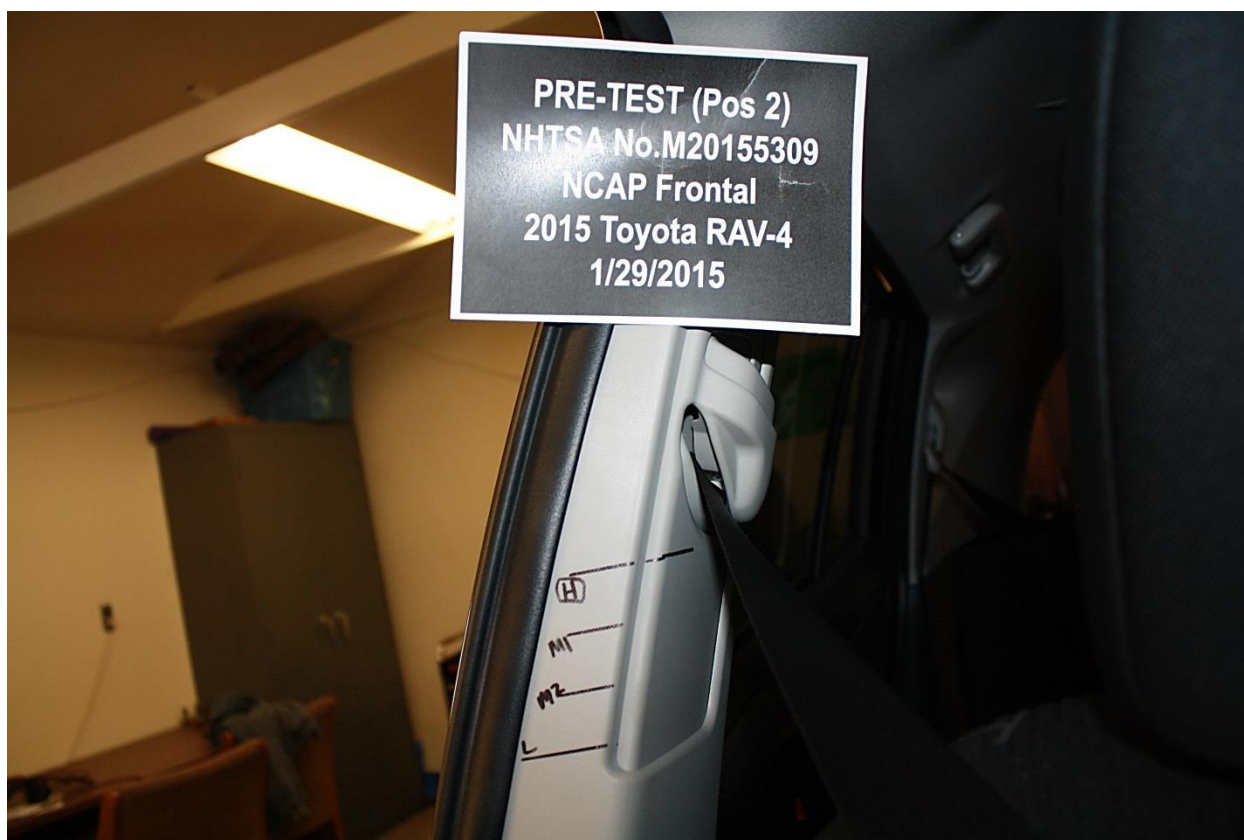


Figure A-58: Pre-Test View of Belt Anchorage for Passenger Dummy

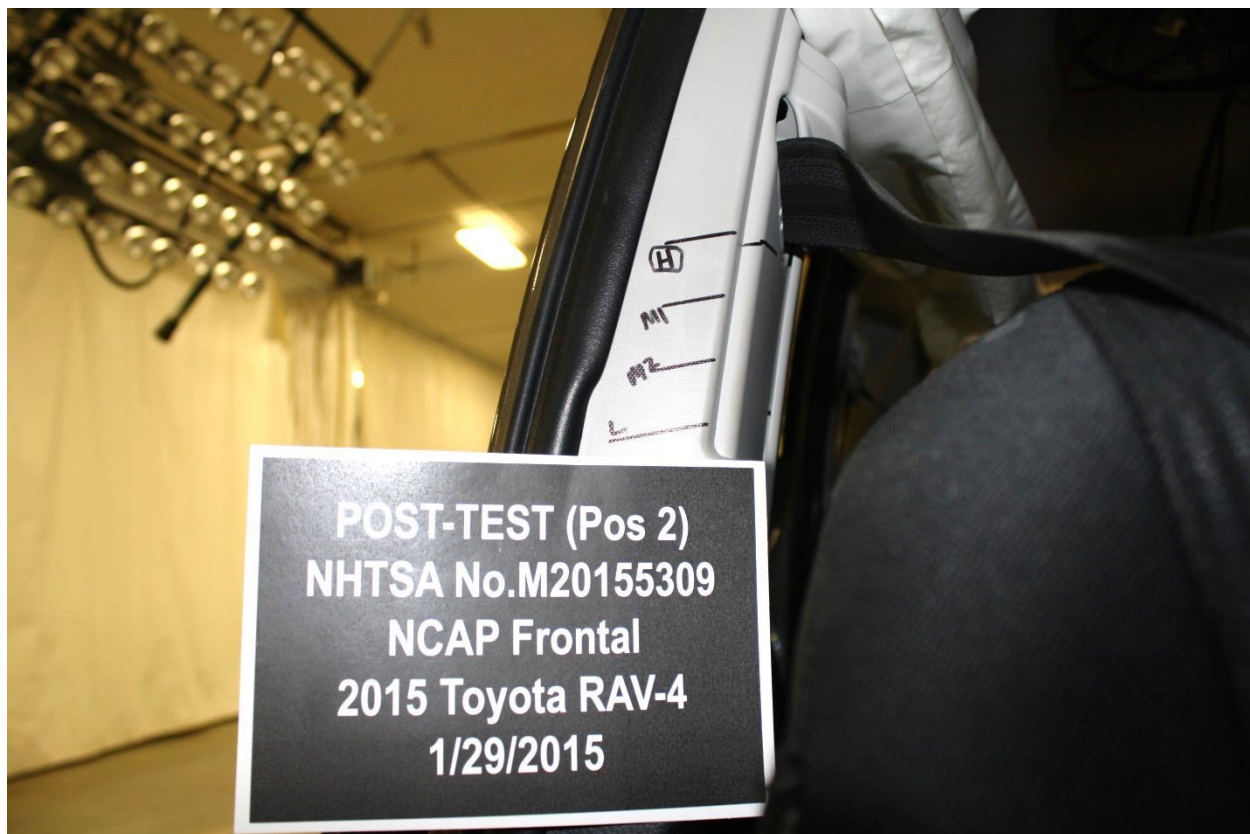


Figure A-59: Post-Test View of Belt Anchorage for Passenger Dummy



Figure A-60: Pre-Test Passenger Dummy Feet



Figure A-61: Post-Test Passenger Dummy Feet



Figure A-62: Pre-Test Passenger's Side Knee Bolster



Figure A-63: Post-Test Passenger's Side Knee Bolster



Figure A-64: Pre-Test Passenger's Side Floorpan



Figure A-65: Post-Test Passenger's Side Floorpan

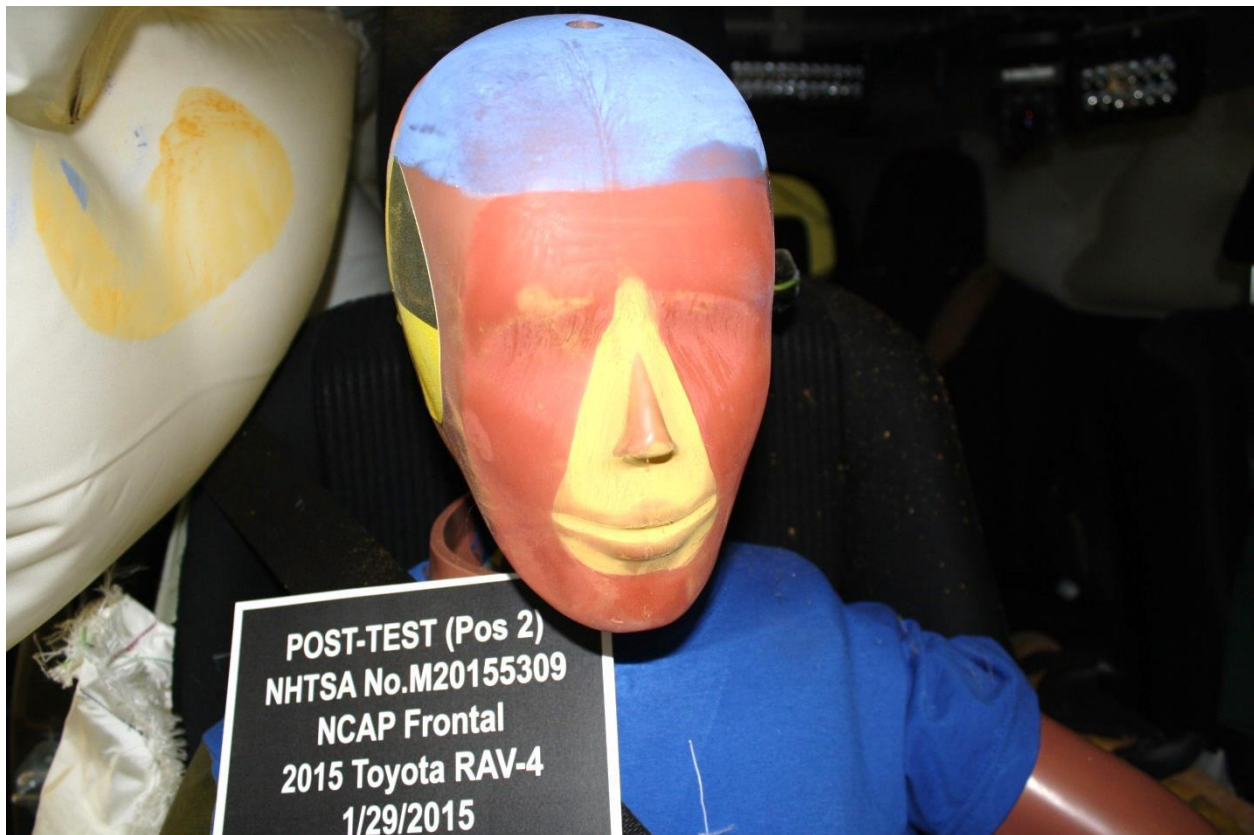


Figure A-66: Post-Test Passenger Dummy Face



Figure A-67: Post-Test Passenger Dummy Contact With Airbag



Figure A-68: Post-Test Passenger Dummy Contact With Headrest

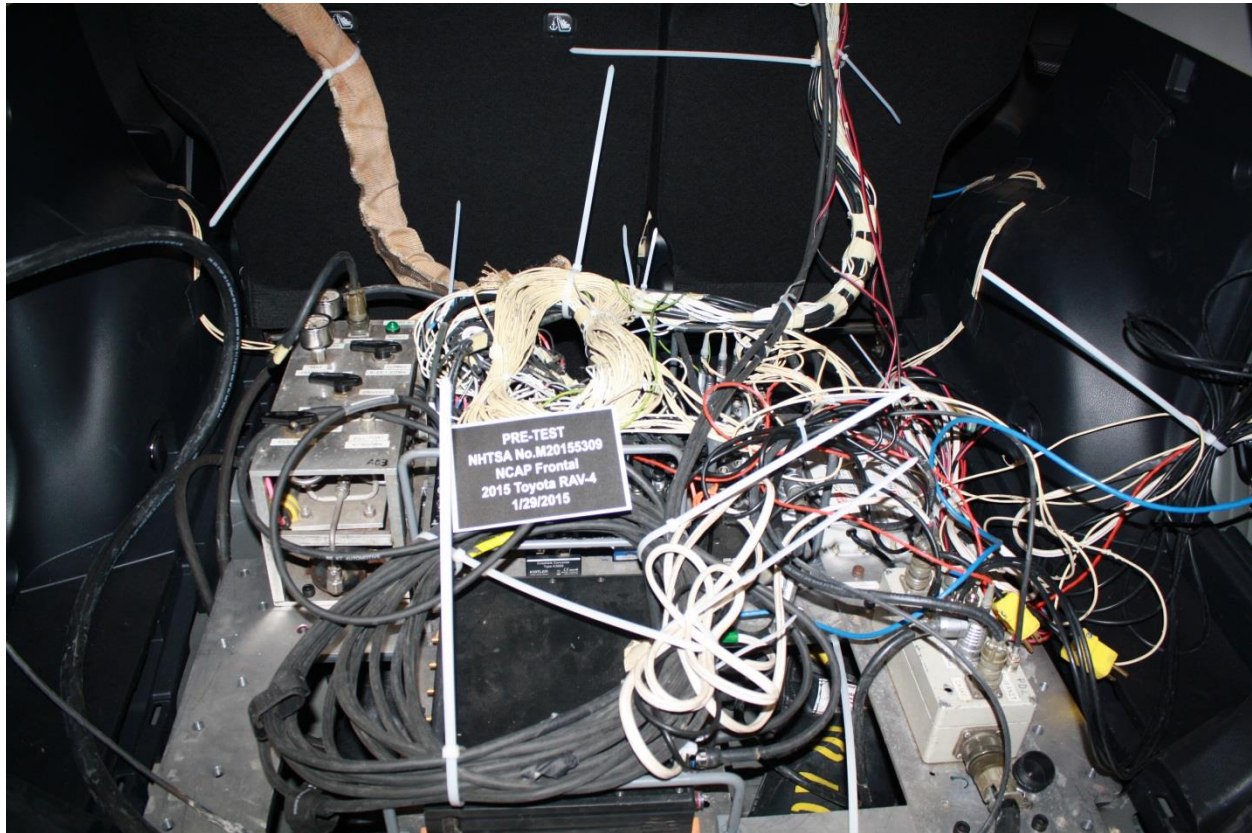


Figure A-69: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-70: Post-Test Stoddard Solvent Spillage Location View, If Required



Figure A-71: Post-Test Speed Trap Read-Out



Figure A-72: Vehicle at 0° on Static Rollover Device



Figure A-73: Vehicle at 90° on Static Rollover Device



Figure A-74: Vehicle at 180° on Static Rollover Device



Figure A-75: Vehicle at 270° on Static Rollover Device



Figure A-76: Vehicle at 360° on Static Rollover Device



Figure A-77: 2015 Toyota RAV-4 Frontal Impact Event

TOYOTA
Let's Go Places

DESC.: **RAV4** LE AWD SUV
VIN: **JTMBFREV3FD111868**
YR/MDL: 2015/4432C
CLR: PYRITE MICA/FB20 (D4T3/20)
PORT/PLANT: Portland, OR RAILHEAD:

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated		
Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.		
Frontal Crash	Driver Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat Rear seat	Not Rated
Based on the risk of injury in a side impact.		
Rollover		Not Rated
Based on the risk of rollover in a single-vehicle crash.		

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

STANDARD EQUIPMENT

MECHANICAL & PERFORMANCE

- 2.5L DOHC 4-Cylinder Engine w/Dual VVT-i
- 176 hp @ 6000 rpm / 172 lb-ft @ 4100 rpm
- 6-Speed Automatic Transmission
- Dynamic Torque Ctrl All Wheel Drive(AWD)
- Eco and Sport Modes

SAFETY & CONVENIENCE

- Star Safety System: Enhanced Vehicle Stability Control, Traction Control, Anti-Lock Brakes, Electronic Brake Force Distribution, Brake Assist and Smart Stop Technology
- LATCH-Lower Anchor & Tether for Children

EXTERIOR

- 17" Steel Wheels with Wide Vent Covers
- Power Outside Mirrors
- Rear Spoiler
- Privacy Glass- Rear Side, Qtr & Liftgate

INTERIOR

- Entune Audio, 6.1" Touch-screen Display
- Steering Wheel Audio/Bluetooth Controls
- Backup Camera
- Reclining & Fold-Flat 2nd Row Seats
- Remote Keyless Entry System
- 12V Power Outlets (2), USB Port (1)

Full Tank of Gas

MANUFACTURER'S SUGGESTED RETAIL PRICE \$25,080.00

OPTIONAL EQUIPMENT

FE	56 State Emissions	150.00
RR	Roof Rails	90.00
TC	Tonneau Cover	90.00
CF	Carpet Floor Mats/Cargo Mat	225.00

EPA DOT Fuel Economy and Environment

Gasoline Vehicle

Fuel Economy

25 MPG combined city/hwy
22 city 29 highway
4.0 gallons per 100 miles

You save \$500 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$2,100

Fuel Economy & Greenhouse Gas Rating (subject only)

Smog Rating (subject only)

Actual results may vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 24 MPG and costs \$11,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.50 per gallon. MPGe is miles per gallon (petroleum) equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles.

Search by QR Code

DELIVERY PROCESSING AND HANDLING FEE 885.00

TOTAL \$26,430.00

Dealer Name / Address: 48012
JACK SAFFO TOYOTA
20445 WEST CAPITOL DRIVE
BROCKFIELD WIS5045

Ship to:

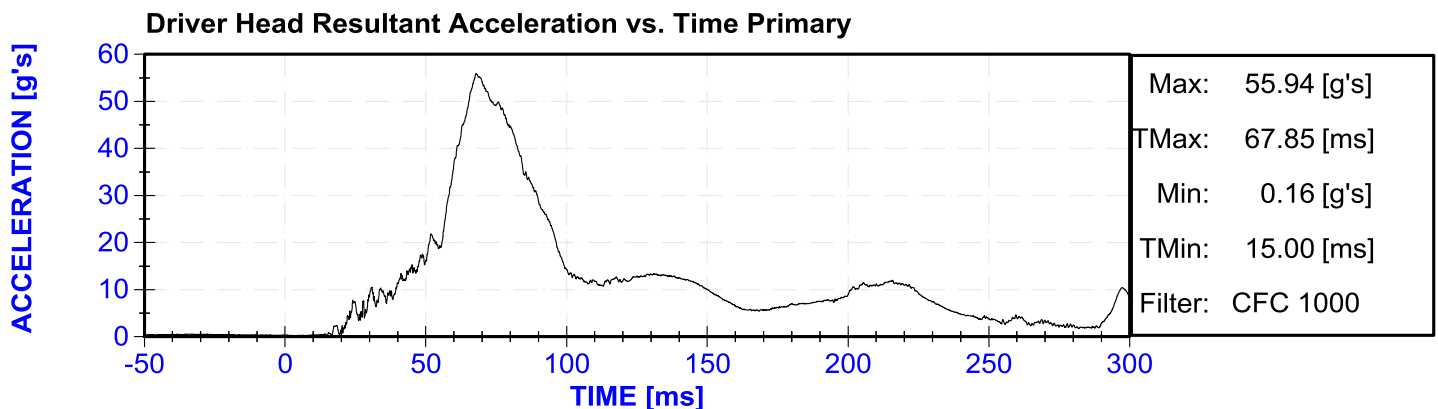
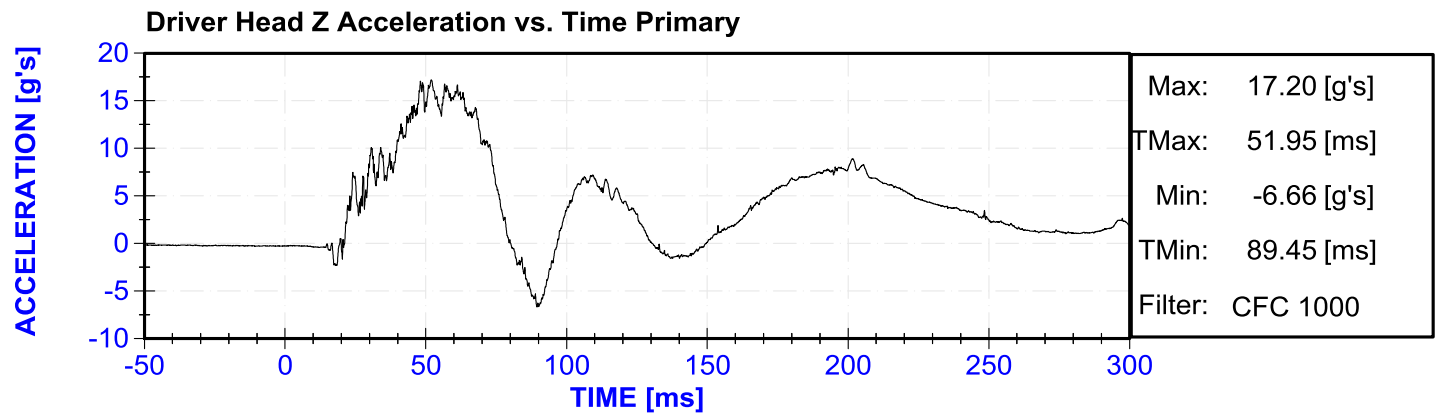
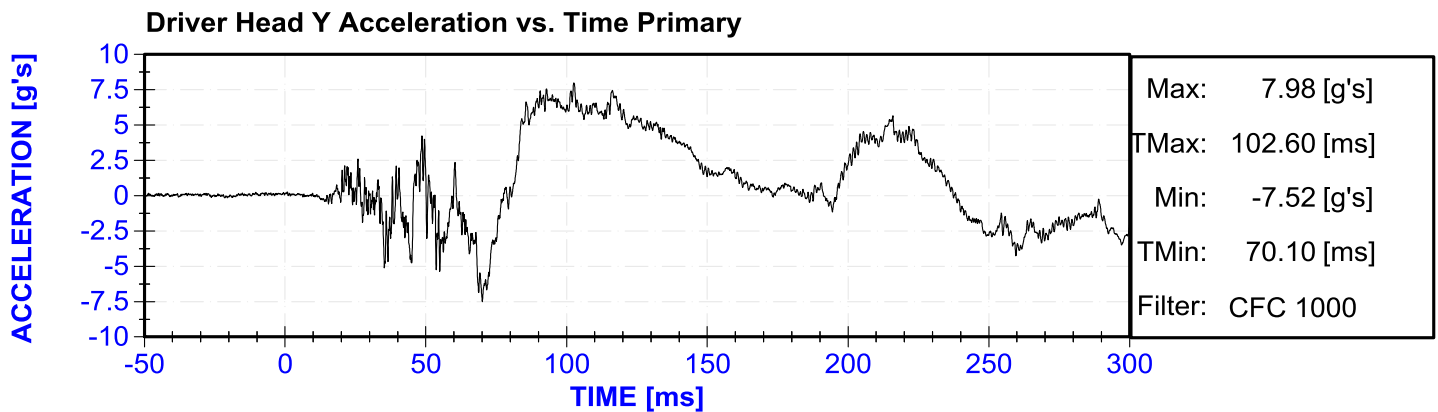
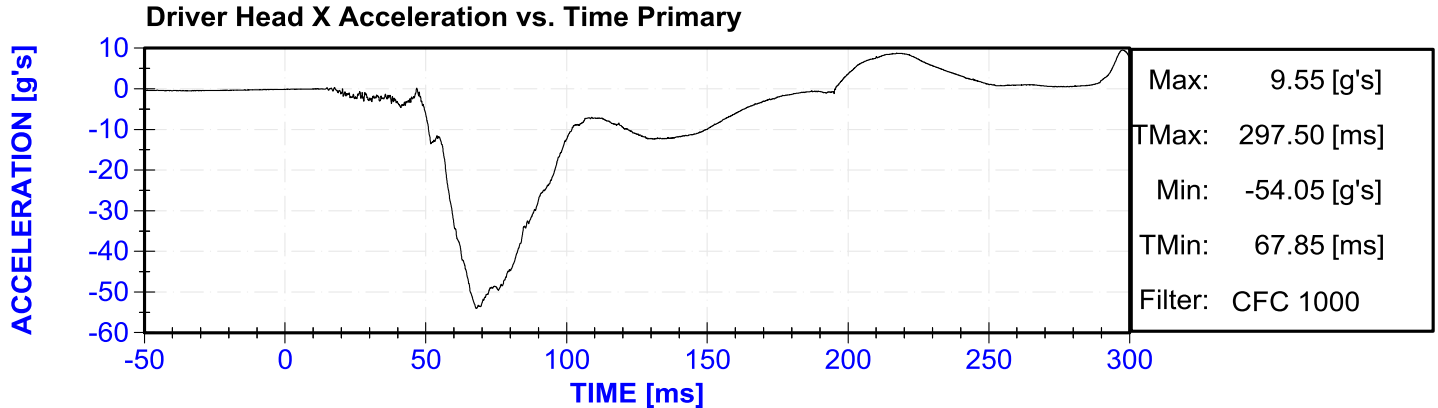
ToyotaCare, which covers normal factory scheduled maintenance for two years or 25,000 miles, whichever occurs first, is included as part of the sales price of the vehicle for qualifying buyers. See participation dealer for #NHTSA25K coverage details.

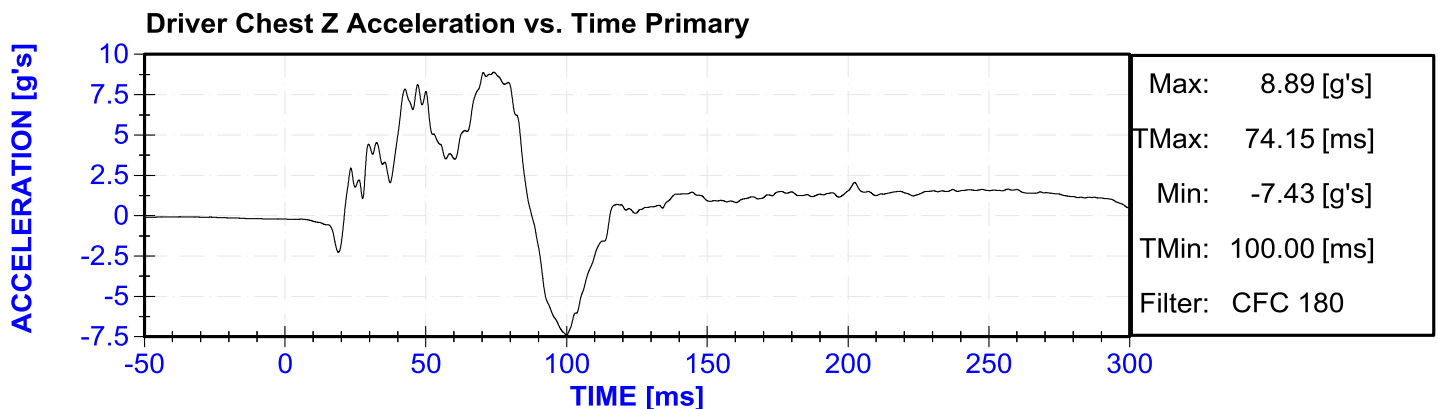
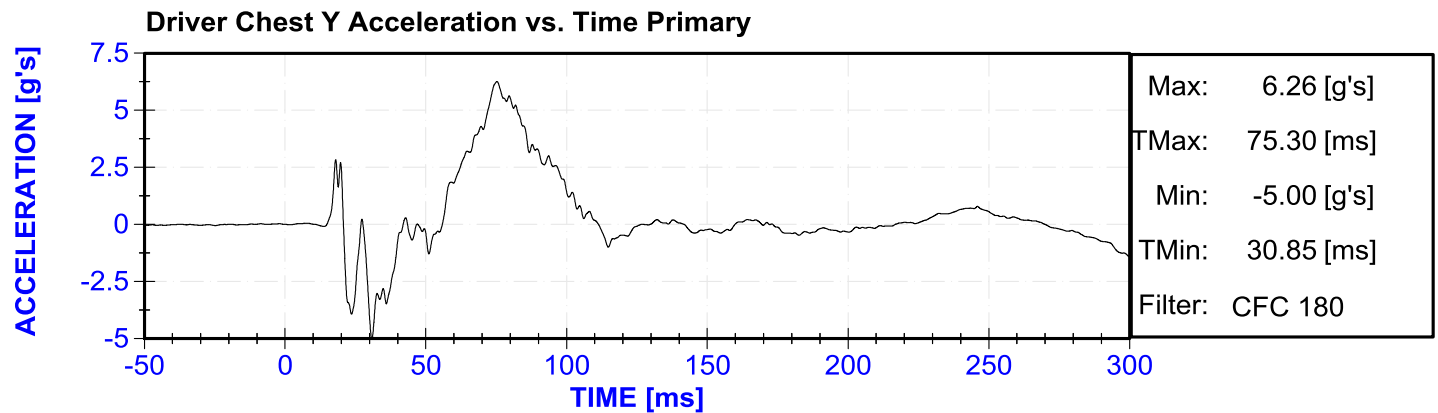
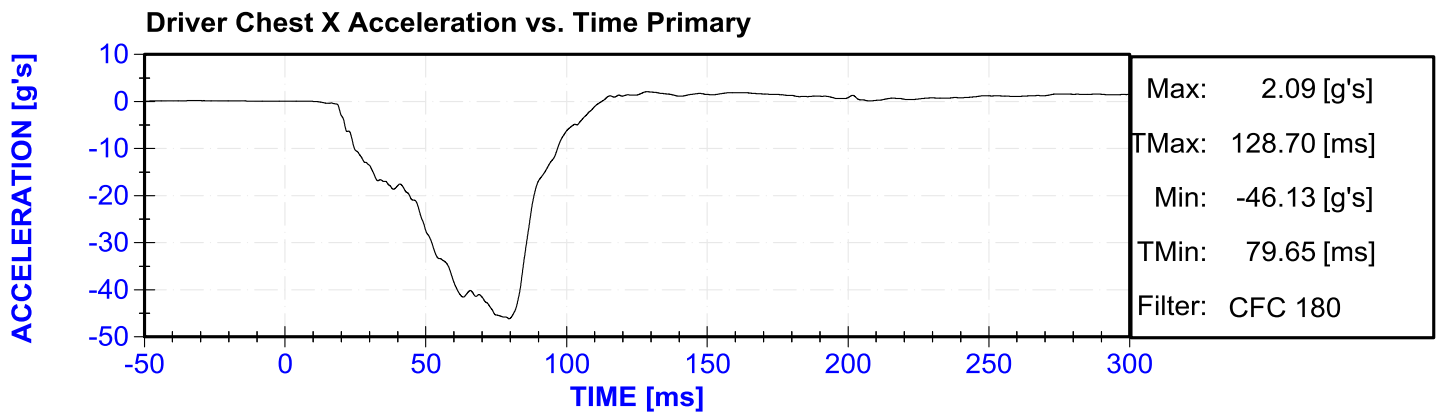
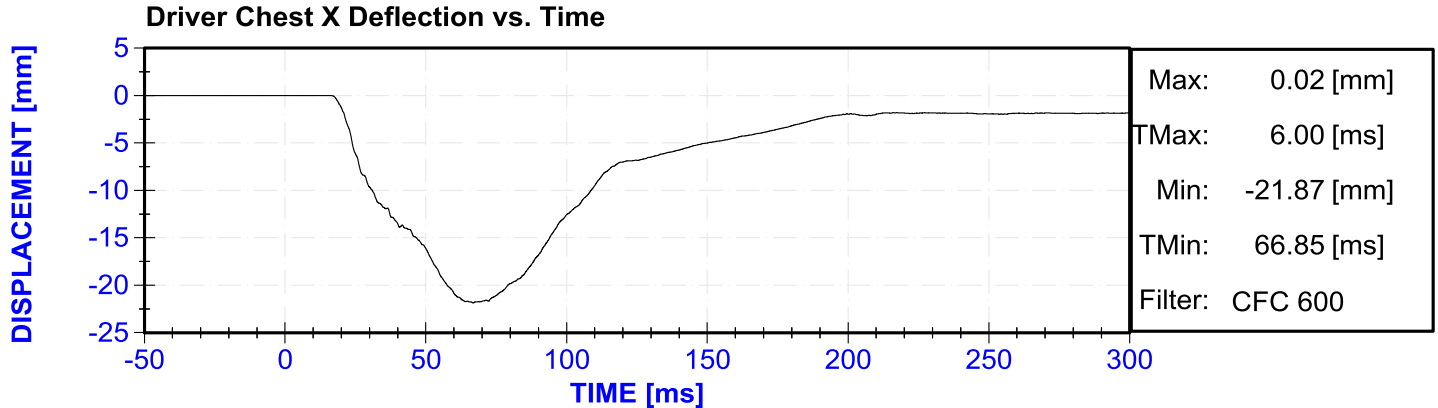
Figure A-78: Monroney Label Photograph

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

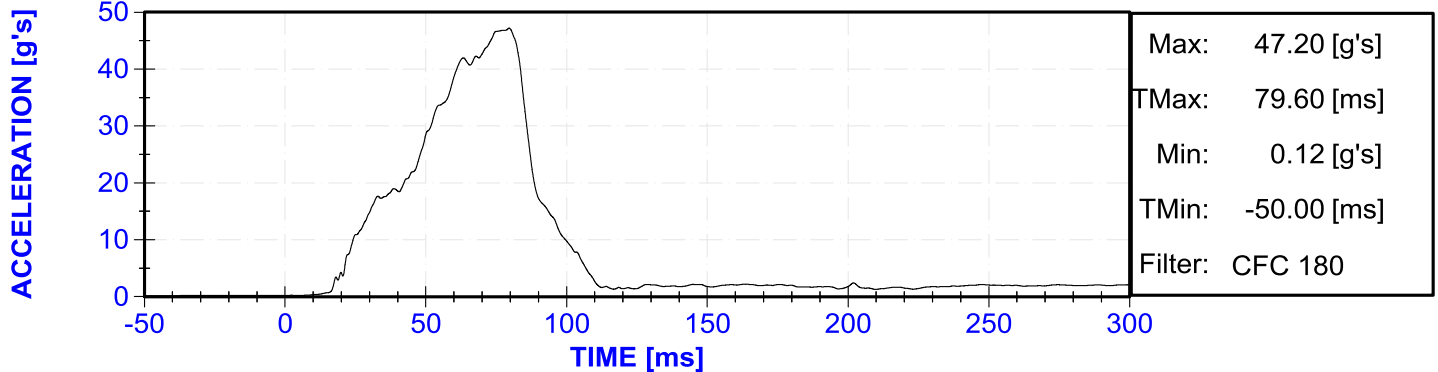
Table of Data Plots

No.	Description	Page
Plot 1	Driver Head X Acceleration vs. Time Primary	B-3
Plot 2	Driver Head Y Acceleration vs. Time Primary	B-3
Plot 3	Driver Head Z Acceleration vs. Time Primary	B-3
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-3
Plot 5	Driver Chest X Deflection vs. Time	B-4
Plot 6	Driver Chest X Acceleration vs. Time Primary	B-4
Plot 7	Driver Chest Y Acceleration vs. Time Primary	B-4
Plot 8	Driver Chest Z Acceleration vs. Time Primary	B-4
Plot 9	Driver Chest Resultant Acceleration vs. Time Primary	B-5
Plot 10	Driver Upper Neck Force X vs. Time Primary	B-5
Plot 11	Driver Upper Neck Force Z vs. Time Primary	B-5
Plot 12	Driver Upper Neck Moment Y vs. Time Primary	B-5
Plot 13	Driver Nij vs. Time Primary	B-6
Plot 14	Driver Left Femur Force vs. Time	B-6
Plot 15	Driver Right Femur Force vs. Time	B-6
Plot 16	Passenger Head X Acceleration vs. Time Primary	B-6
Plot 17	Passenger Head Y Acceleration vs. Time Primary	B-7
Plot 18	Passenger Head Z Acceleration vs. Time Primary	B-7
Plot 19	Passenger Head Resultant Acceleration vs. Time Primary	B-7
Plot 20	Passenger Chest X Deflection vs. Time	B-7
Plot 21	Passenger Chest X Acceleration vs. Time Primary	B-8
Plot 22	Passenger Chest Y Acceleration vs. Time Primary	B-8
Plot 23	Passenger Chest Z Acceleration vs. Time Primary	B-8
Plot 24	Passenger Chest Resultant Acceleration vs. Time Primary	B-8
Plot 25	Passenger Upper Neck Force X vs. Time Primary	B-9
Plot 26	Passenger Upper Neck Force Z vs. Time Primary	B-9
Plot 27	Passenger Upper Neck Moment Y vs. Time Primary	B-9
Plot 28	Passenger Nij vs. Time Primary	B-9
Plot 29	Passenger Left Femur Force vs. Time	B-10
Plot 30	Passenger Right Femur Force vs. Time	B-10

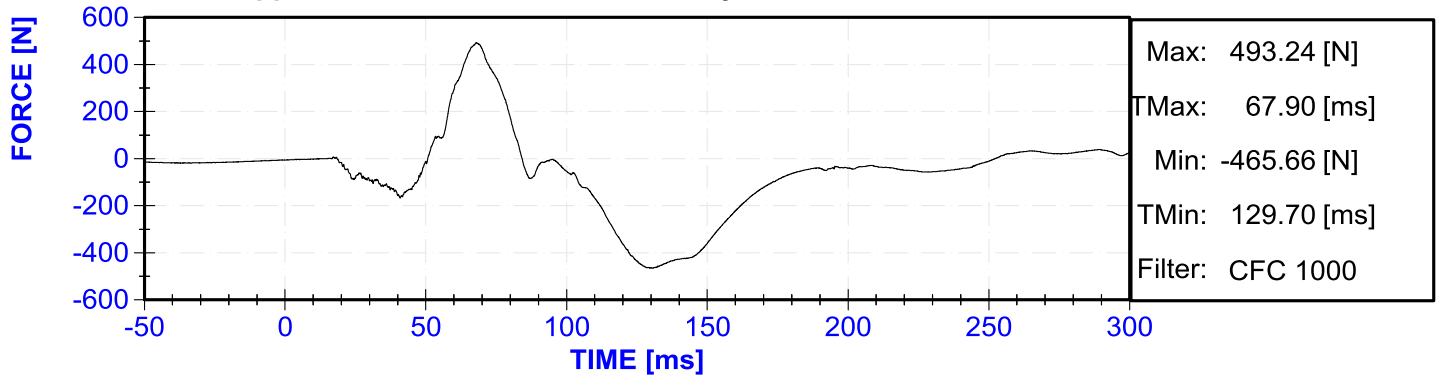




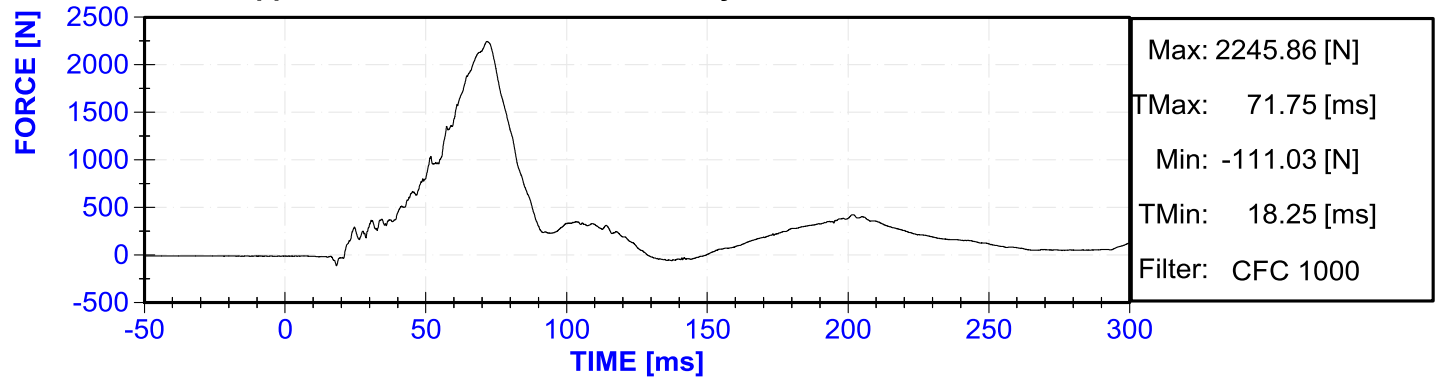
Driver Chest Resultant Acceleration vs. Time Primary



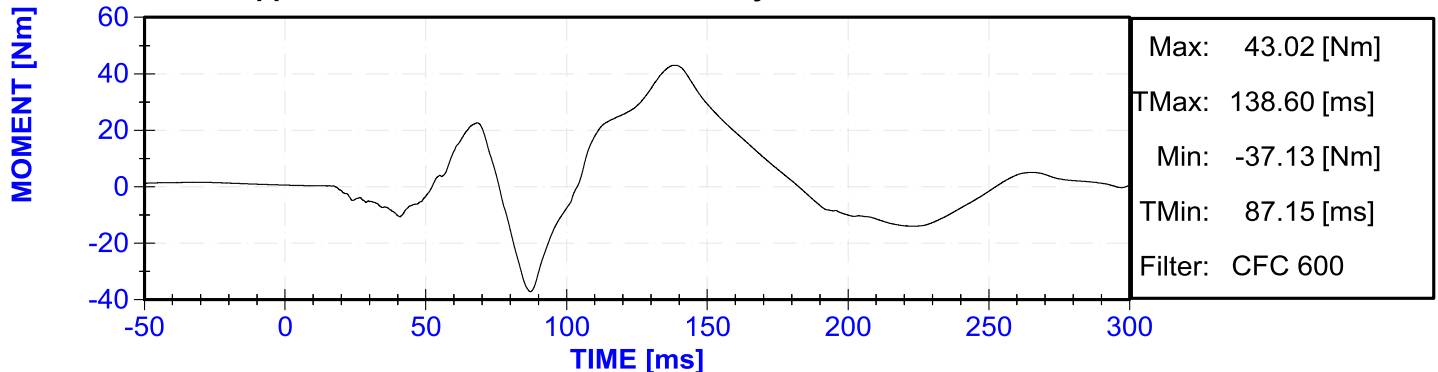
Driver Upper Neck Force X vs. Time Primary

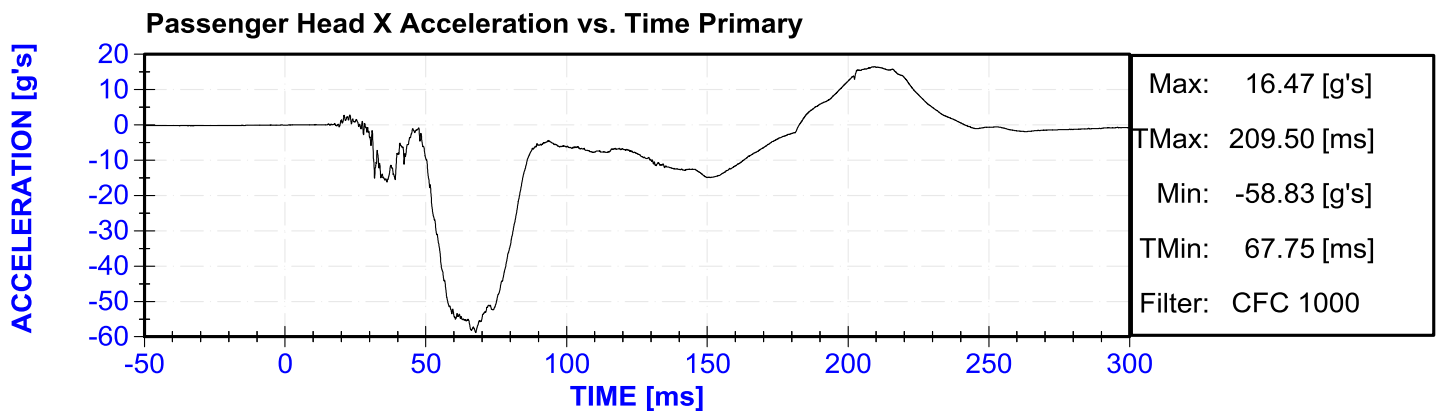
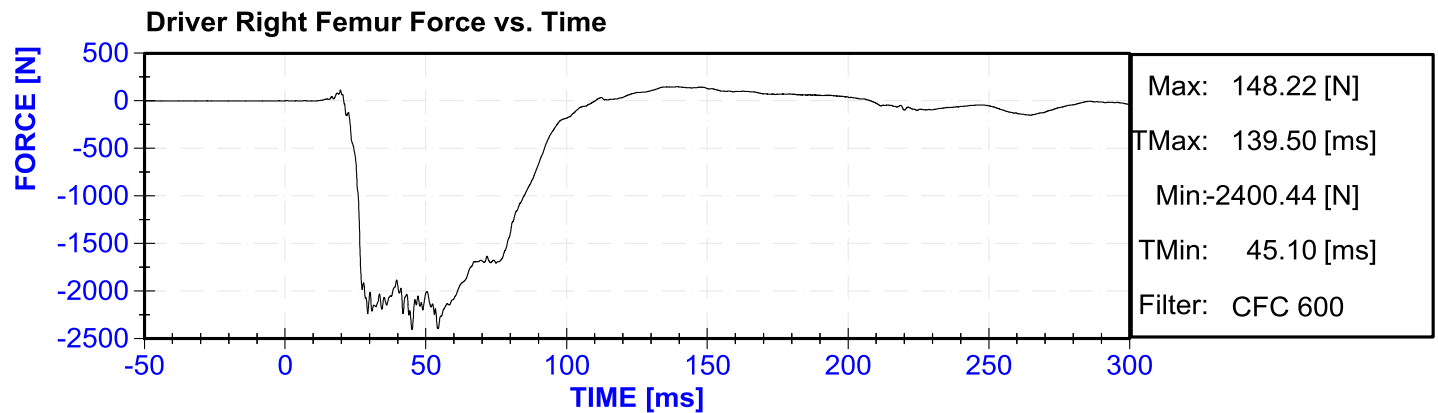
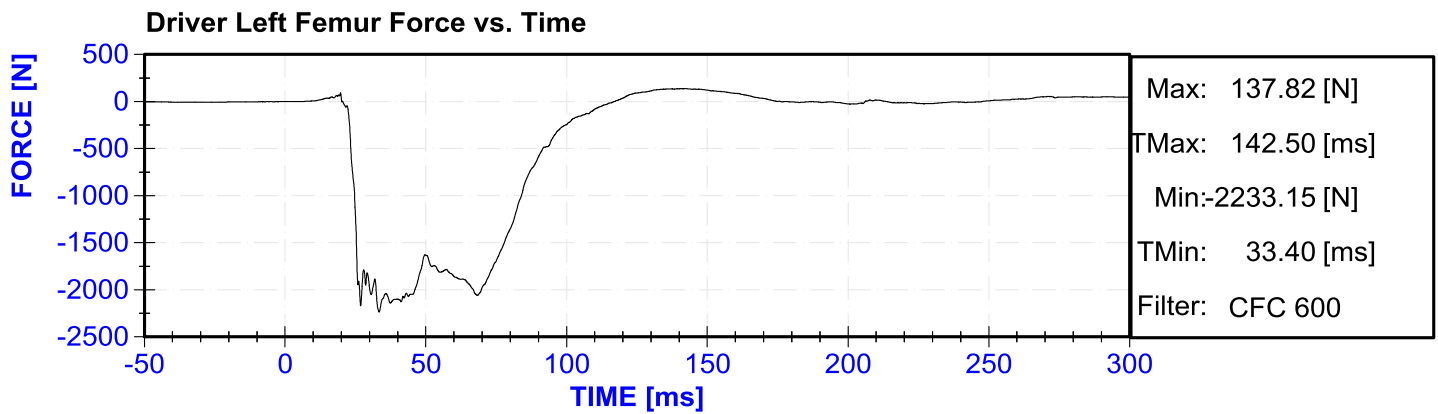
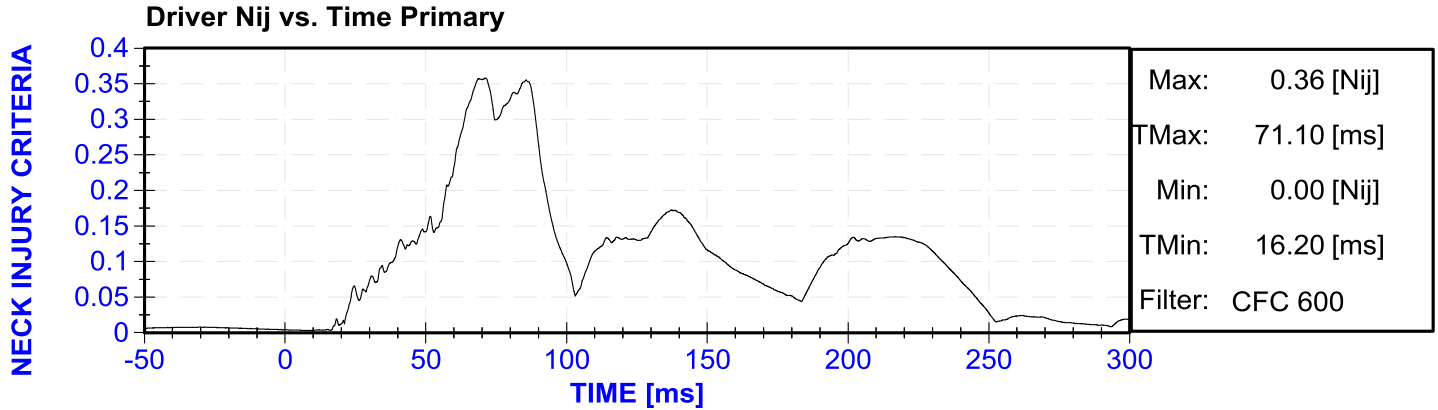


Driver Upper Neck Force Z vs. Time Primary

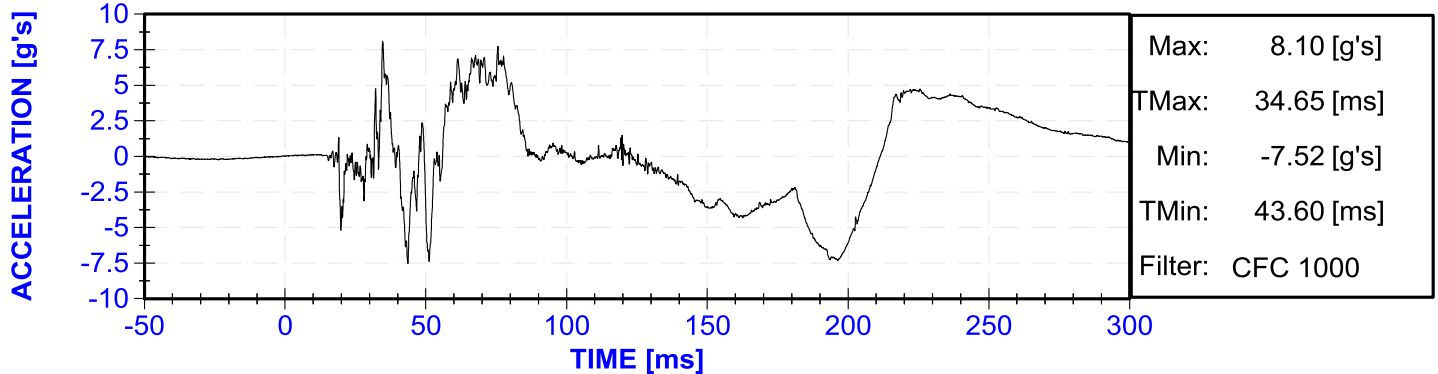


Driver Upper Neck Moment Y vs. Time Primary

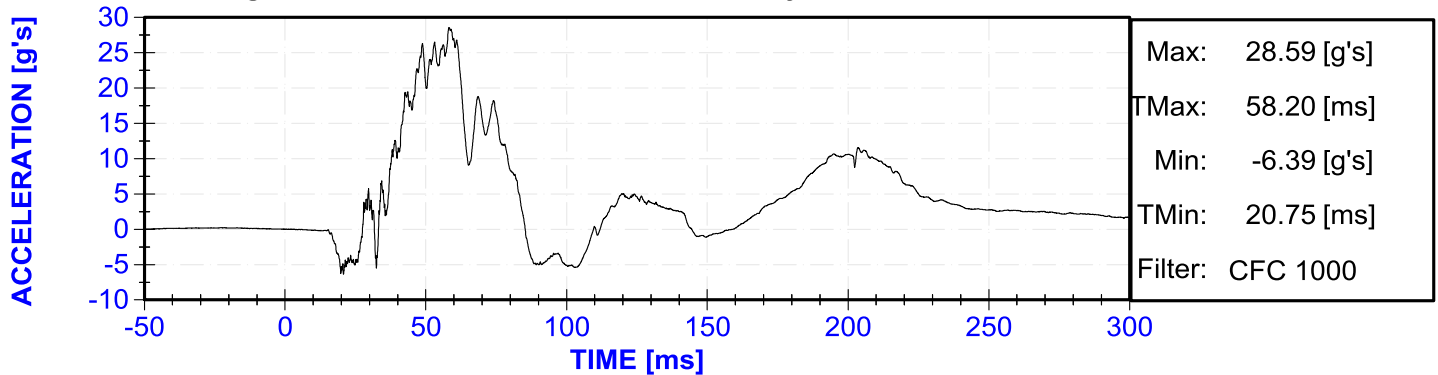




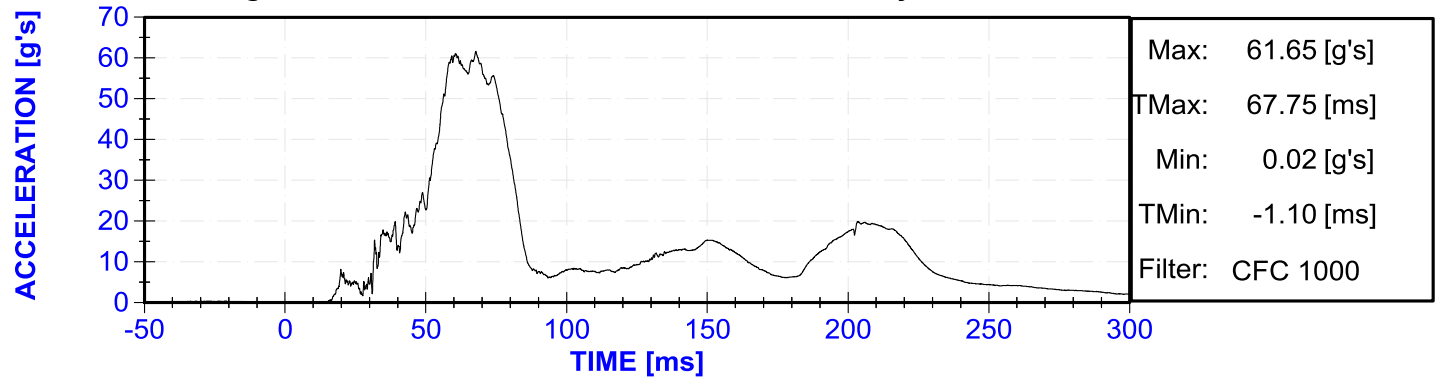
Passenger Head Y Acceleration vs. Time Primary



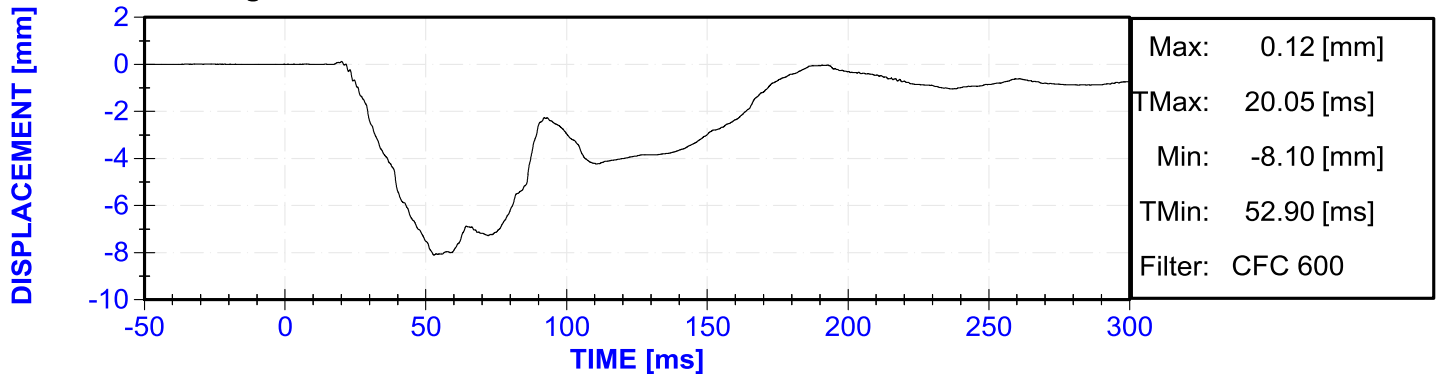
Passenger Head Z Acceleration vs. Time Primary

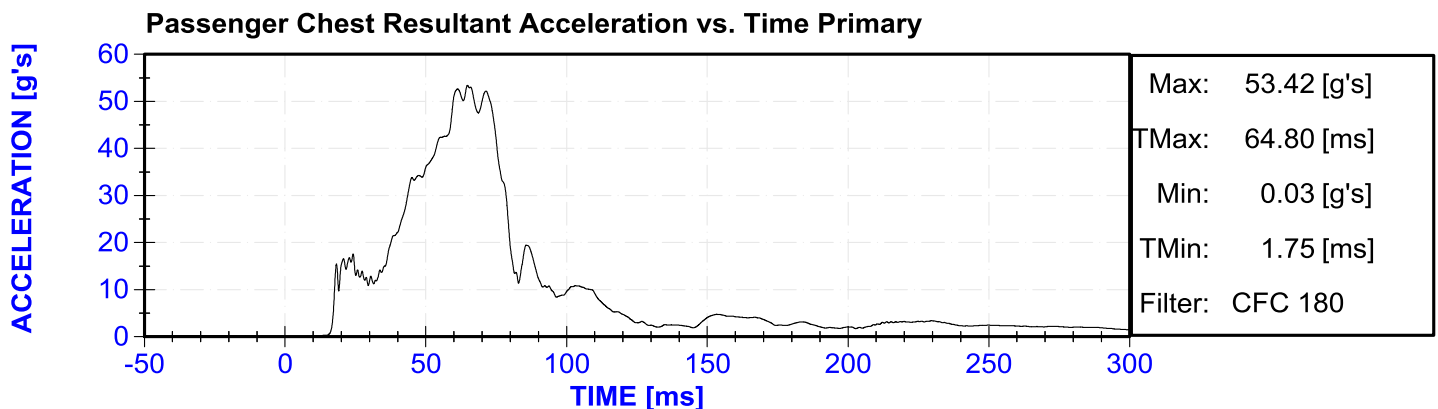
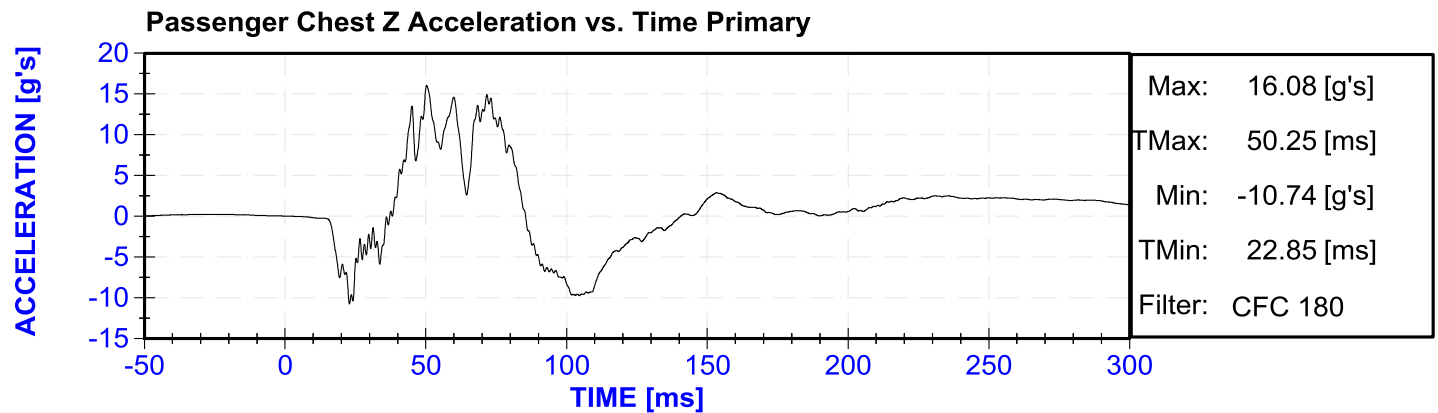
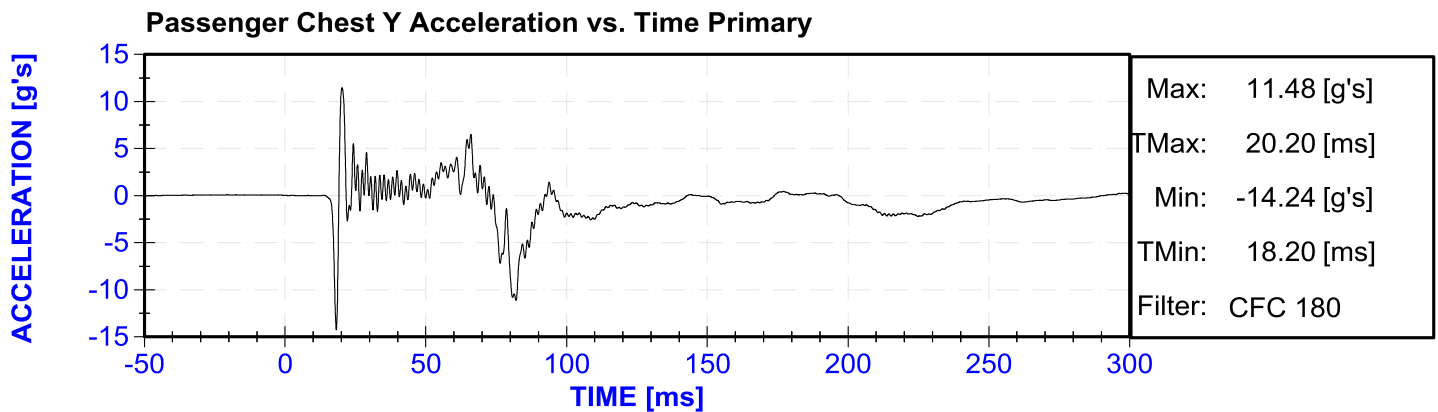
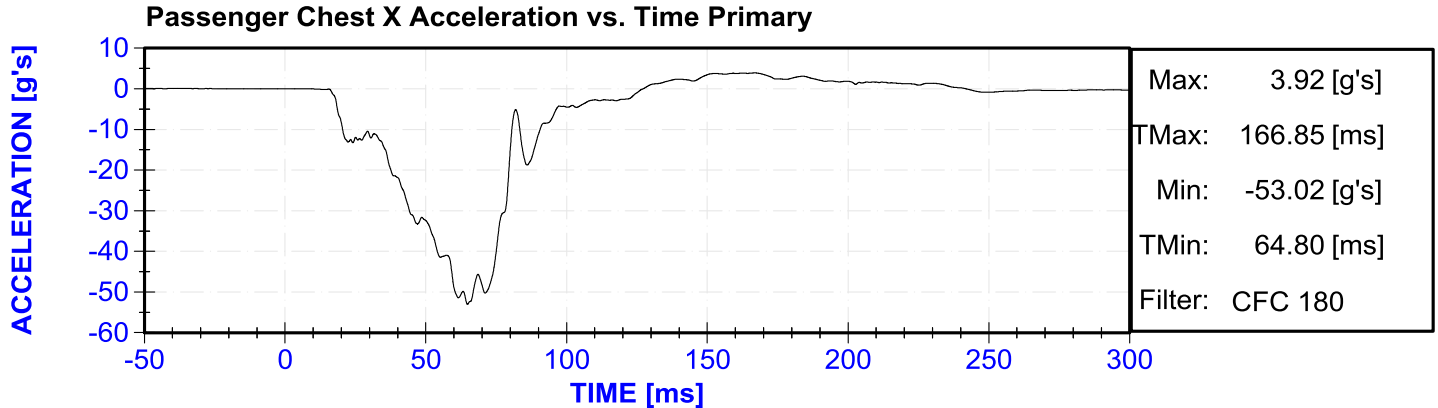


Passenger Head Resultant Acceleration vs. Time Primary

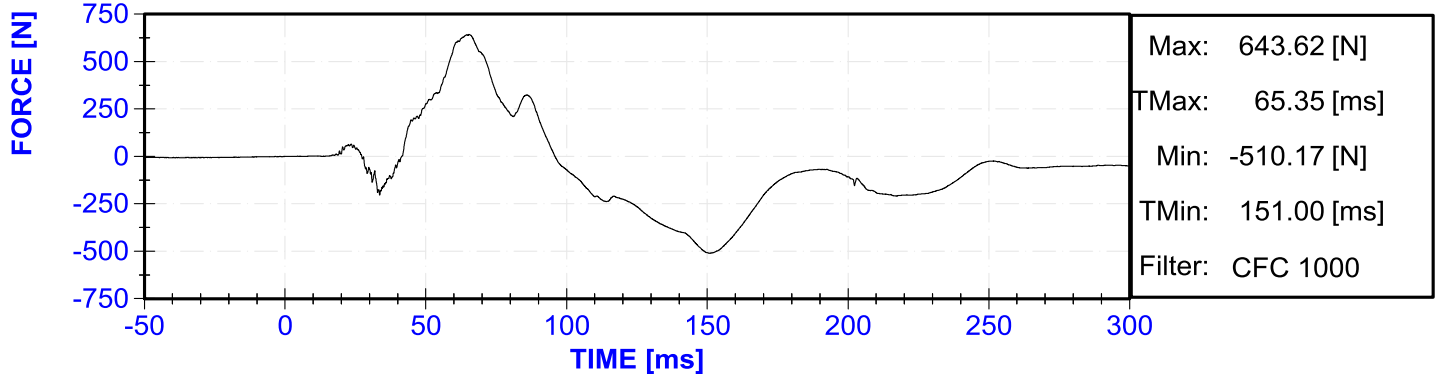


Passenger Chest X Deflection vs. Time

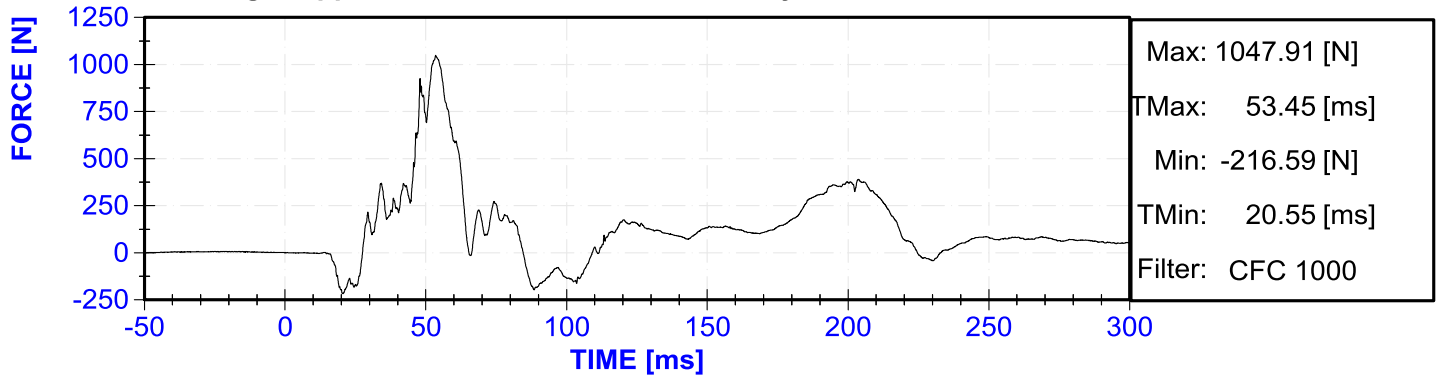




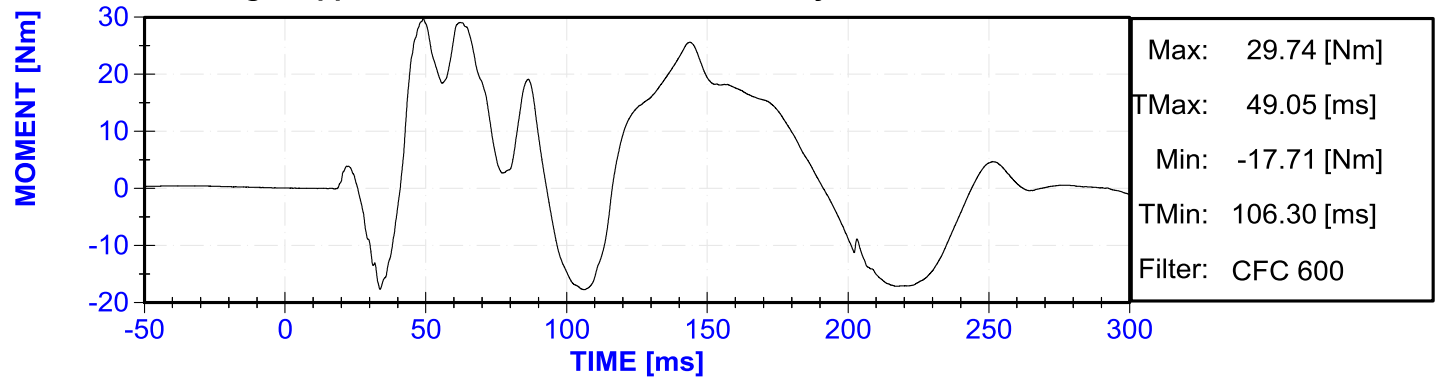
Passenger Upper Neck Force X vs. Time Primary



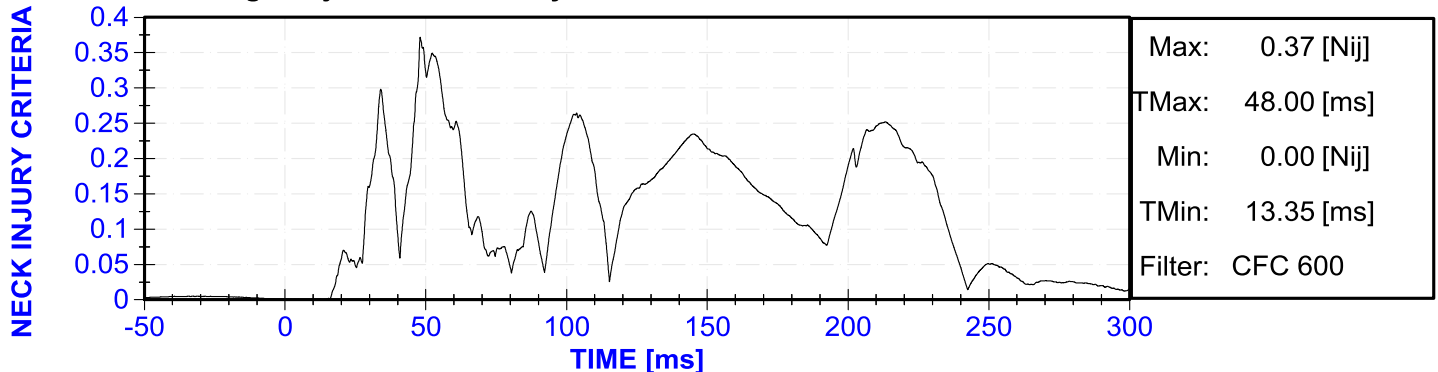
Passenger Upper Neck Force Z vs. Time Primary



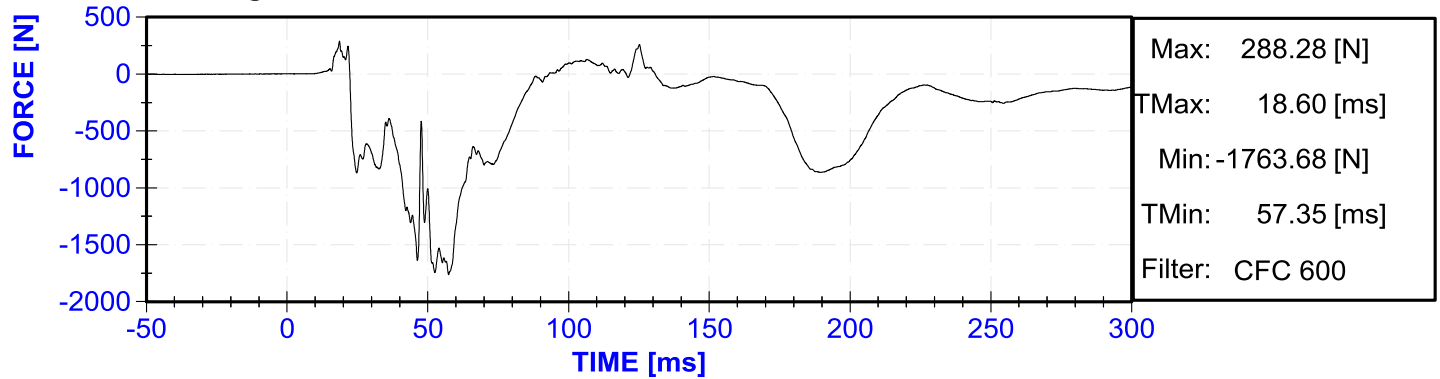
Passenger Upper Neck Moment Y vs. Time Primary



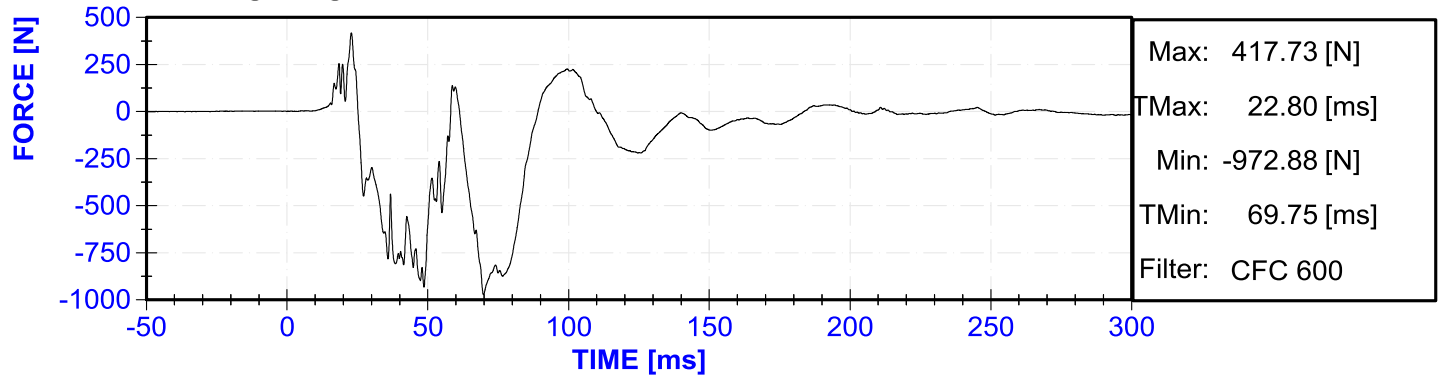
Passenger Nij vs. Time Primary



Passenger Left Femur Force vs. Time



Passenger Right Femur Force vs. Time



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

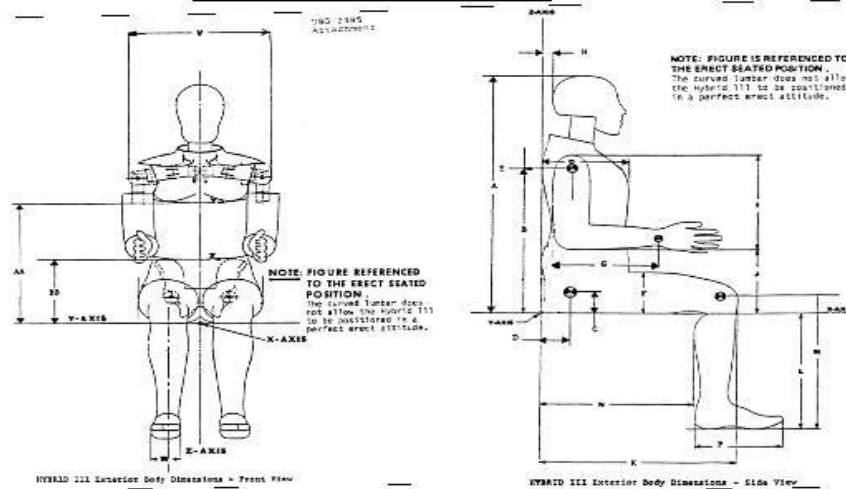


External Measurements - Hybrid 3 - 50th Male

Technician: R. Weil

Date: 12/11/2014

Dummy Serial Number: 1046



Dim. No.	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.9	Pass
B	Shoulder Pivot Height	19.9	20.5	20.0	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	6.0	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.0	Pass
J	Elbow Rest Height	7.5	8.3	7.8	Pass
K	Buttock to Knee Length	22.8	23.8	23.2	Pass
L	Popliteal Height	16.9	17.9	17.3	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.2	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.7	Pass
W	Foot Breadth	3.6	4.2	3.7	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.9	Pass
Z	Waist Circumference	32.9	34.1	33.8	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Head Drop	Test Date:	12/10/2014
		Test Time:	4:23:45 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.80 deg C P
Humidity	10 -- 70	21.40 %RH P
Resultant Acceleration	225 -- 275	257.8 G's P
Oscillation	0 -- 10	2.7 % P
Lateral Acceleration	-15 -- 15	4.7 G's P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **M. Goehle**



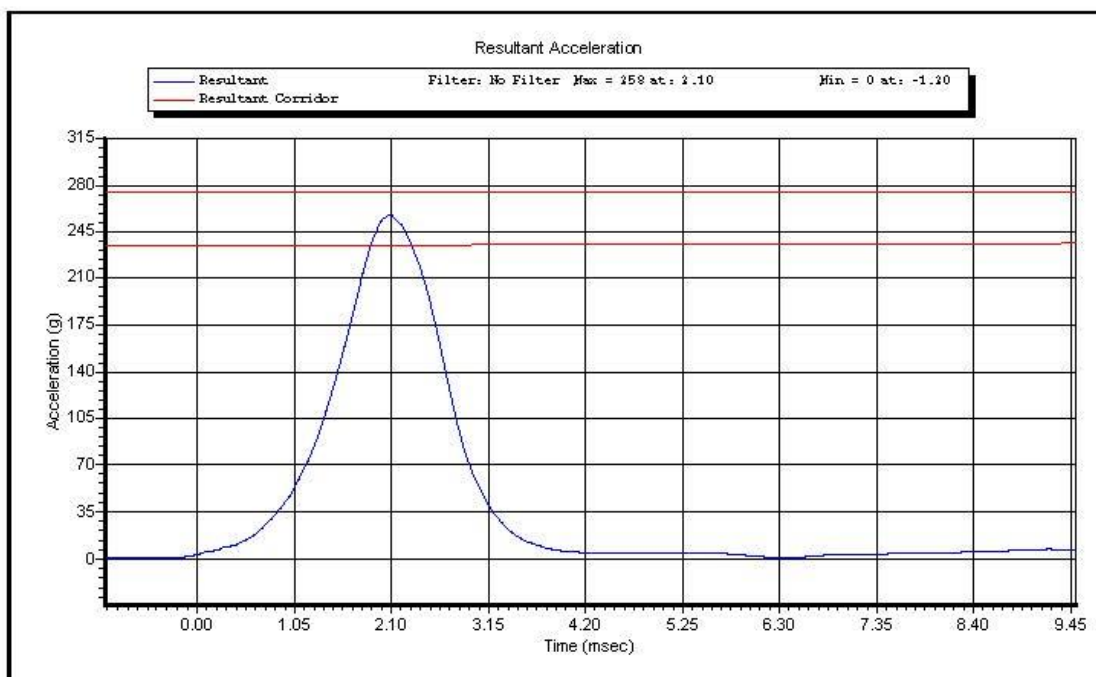
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P58871	6/27/2014
Endevco	7264-2000	P12359	6/27/2014
Endevco	7264-2000	P52133	6/27/2014



Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046

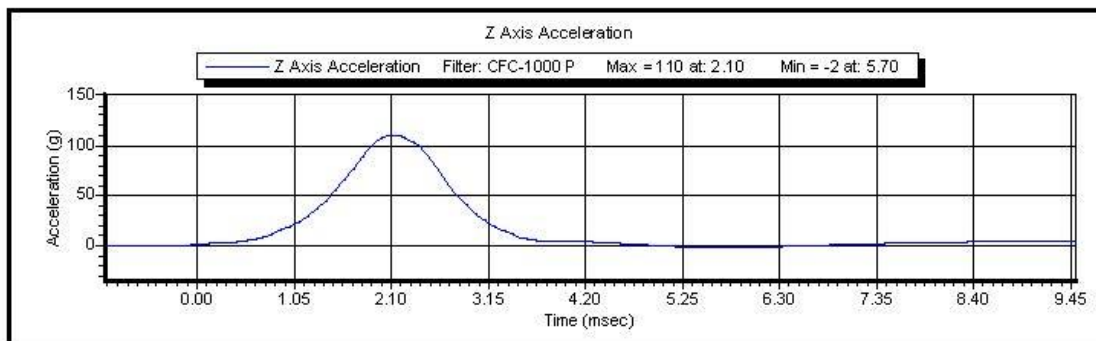
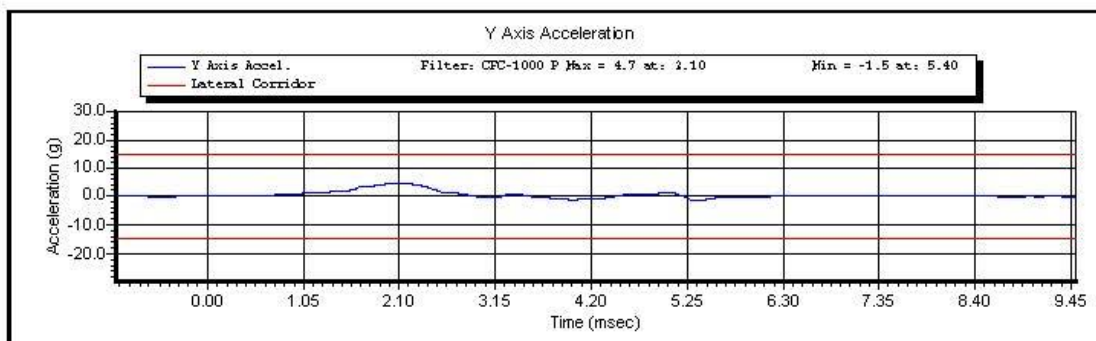
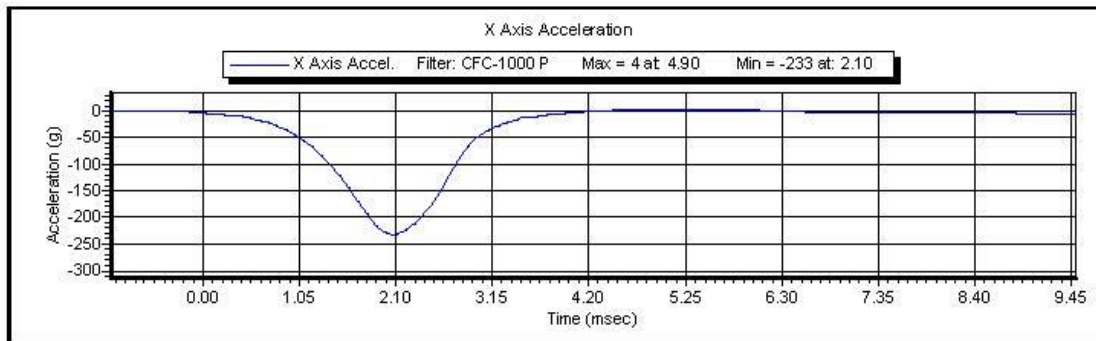


Test ID: **Head Drop**

Test Time: **4:23:45 PM**

Test Date: **12/10/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Head Drop**

Test Time: **4:23:45 PM**

Test Date: **12/10/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Neck Extension	Test Date:	12/11/2014
		Test Time:	10:51:44 AM

Test Parameters		Test Specifications		Test Results	
Temperature		20.6	-- 22.2	22.00 deg C	P
Humidity		10	-- 70	20.30 %RH	P
Velocity		5.94	-- 6.19	6.023 m/s	P
Pendulum Deceleration at	10 ms	17.2	-- 21.2	19.45 G's	P
Pendulum Deceleration at	20 ms	14.0	-- 19.0	17.63 G's	P
Pendulum Deceleration at	30 ms	11.0	-- 16.0	15.03 G's	P
Max Pendulum Deceleration after	30 ms	0.0	-- 22.0	15.18 G's	P
Deceleration Time to	5 G's	38	-- 46	38.2 ms	P
D Plane Rotation		81	-- 106	96.7 degrees	P
Time at Max Rotation		72	-- 82	75.9 ms	P
Rotation Decay to Zero		147	-- 174	155.4 ms	P
Moment About Occipital Condyle		-80.0	-- -52.9	-67.46 Nm	P
Time at Maximum Moment		65	-- 79	71.6 ms	P
Moment Decay to Zero		120	-- 148	140.0 ms	P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **M. Goehle**



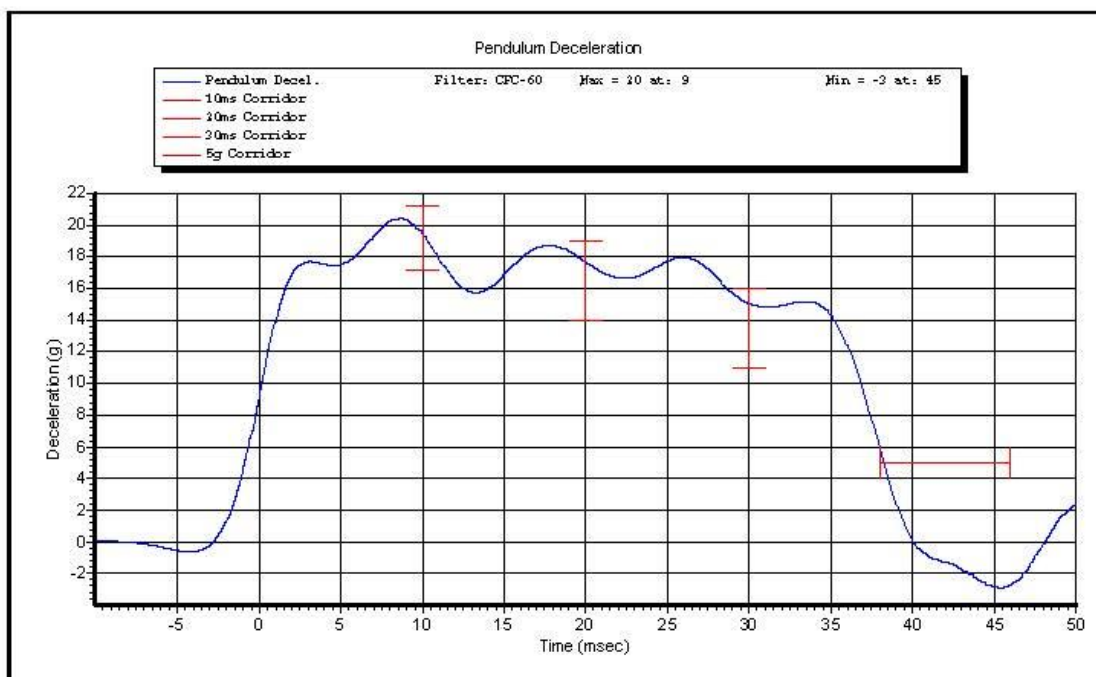
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	11/6/2014
ETI	SP22G	Pendulum Pot	9/16/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2186 My	8/7/2014
Denton	1716A	LC-2186 Fx	8/7/2014



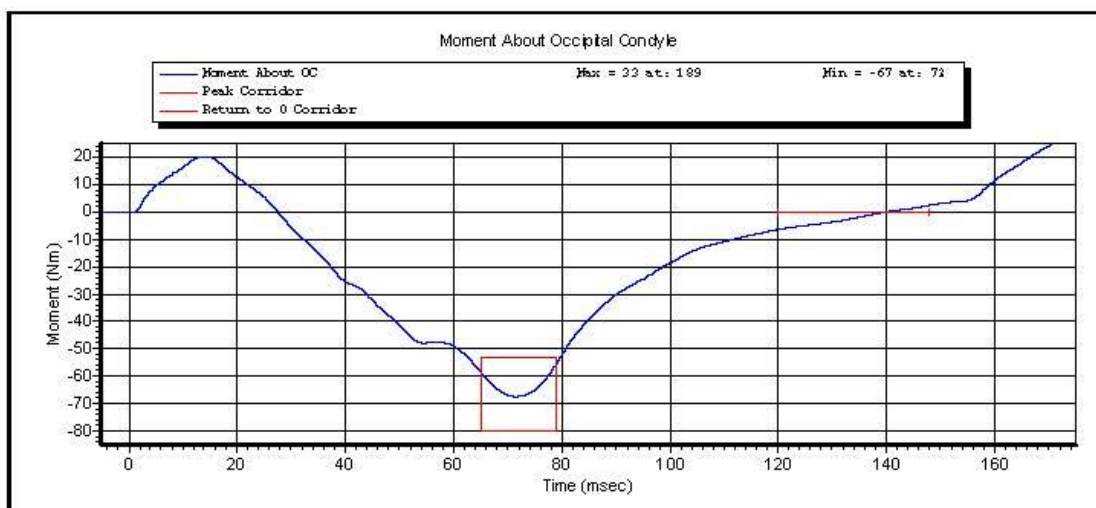
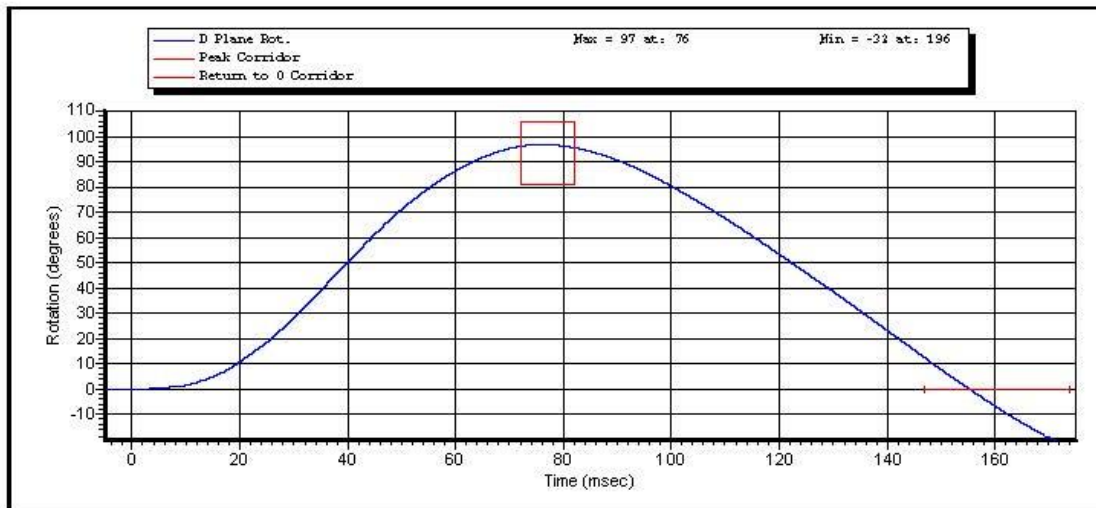
Name of Test:	Neck Extension
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



ID of Test: **Neck Extension** Time of Test: **10:51:44 AM**

Date of Test: **12/11/2014**

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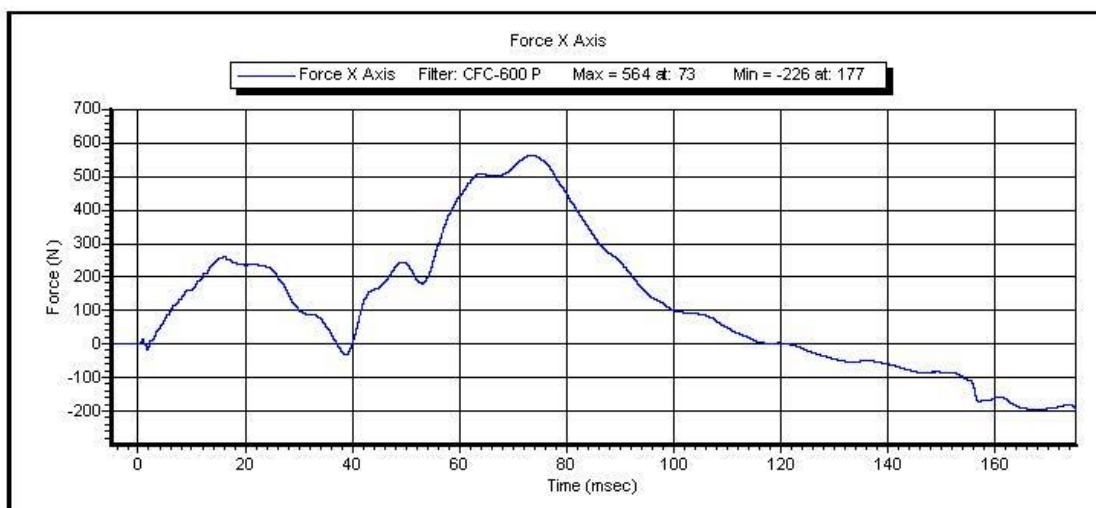
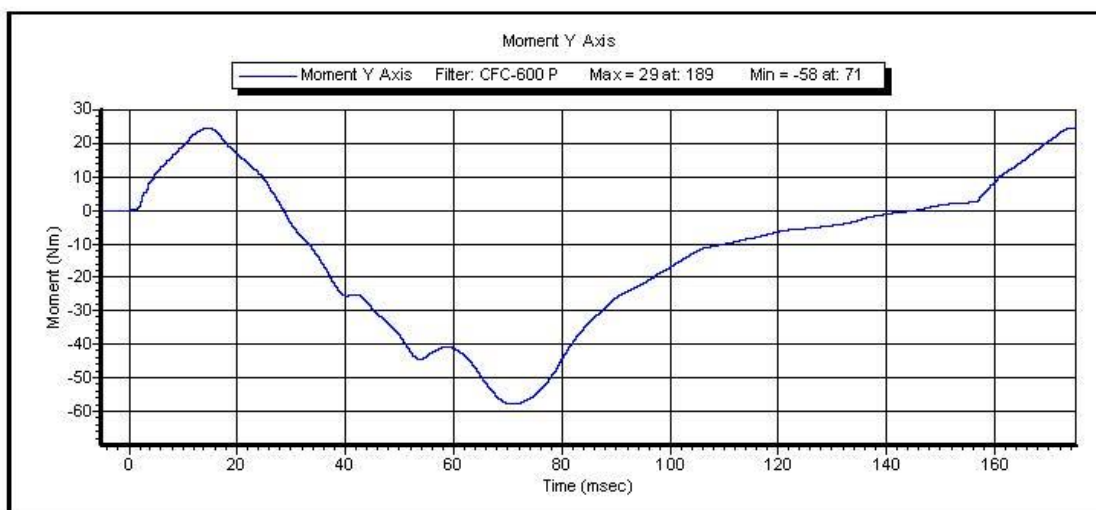


ID of Test: **Neck Extension**

Time of Test: **10:51:44 AM**

Date of Test: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



ID of Test: **Neck Extension**

Time of Test: **10:51:44 AM**

Date of Test: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Neck Flexion	Test Date:	12/11/2014
		Test Time:	10:15:13 AM

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.10 deg C P
Humidity	10 -- 70	20.80 %RH P
Velocity	6.89 -- 7.13	6.939 m/s P
Pendulum Deceleration at 10 ms	22.5 -- 27.5	22.77 G's P
Pendulum Deceleration at 20 ms	17.6 -- 22.6	21.57 G's P
Pendulum Deceleration at 30 ms	12.5 -- 18.5	17.36 G's P
Maximum Pendulum Deceleration After 30 ms	0 -- 29	17.4 G's P
Deceleration Time to 5 G's	34 -- 42	37.7 ms P
D Plane Rotation	-78 -- -64	-70.3 degrees P
Time at Maximum Rotation	57 -- 64	60.0 ms P
Rotation Decay to Zero	113 -- 128	113.9 ms P
Moment About Occipital Condyle	88.1 -- 108.4	95.37 Nm P
Time at Maximum Moment	47 -- 58	49.9 ms P
Moment Decay to Zero	97.0 -- 107.0	98.8 ms P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **M. Goehle**



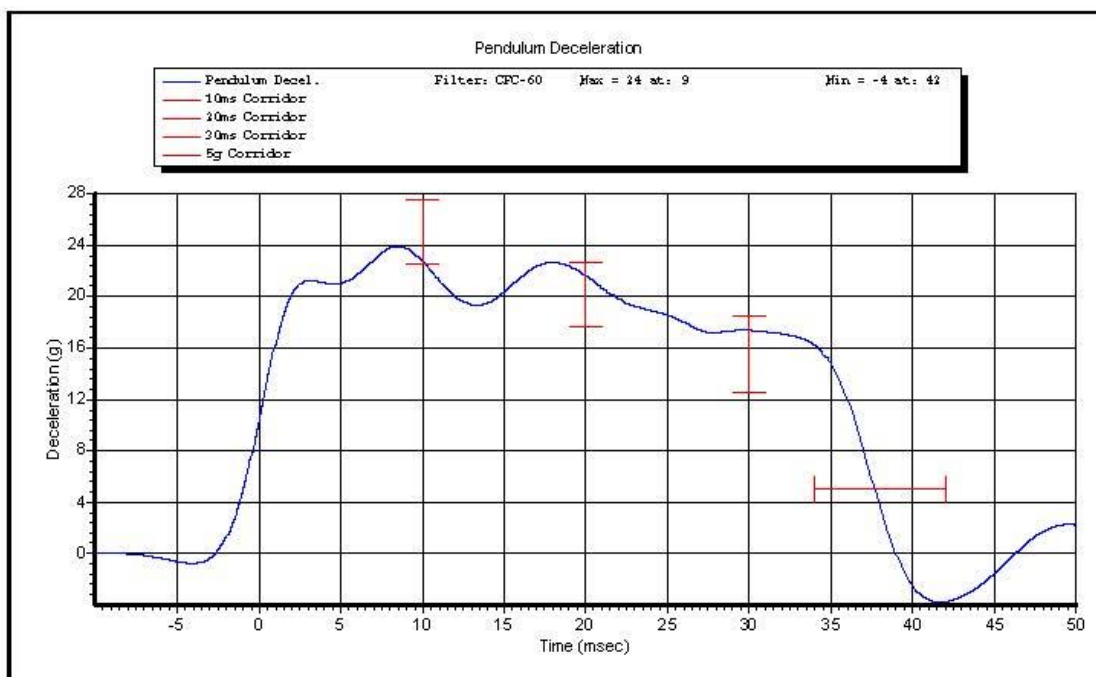
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	11/6/2014
ETI	SP22G	Pendulum Pot	9/16/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2186 My	8/7/2014
Denton	1716A	LC-2186 Fx	8/7/2014



Name of Test:	Neck Flexion
Name of Sub Test:	
Type of ATD:	Hybrid 3 - 50th Male
ATD Serial Number:	1046

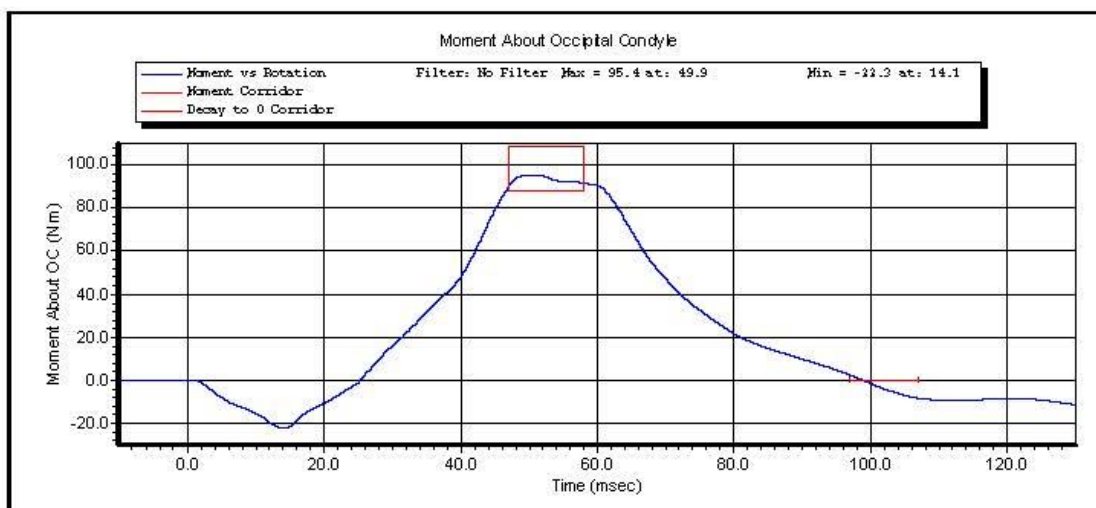
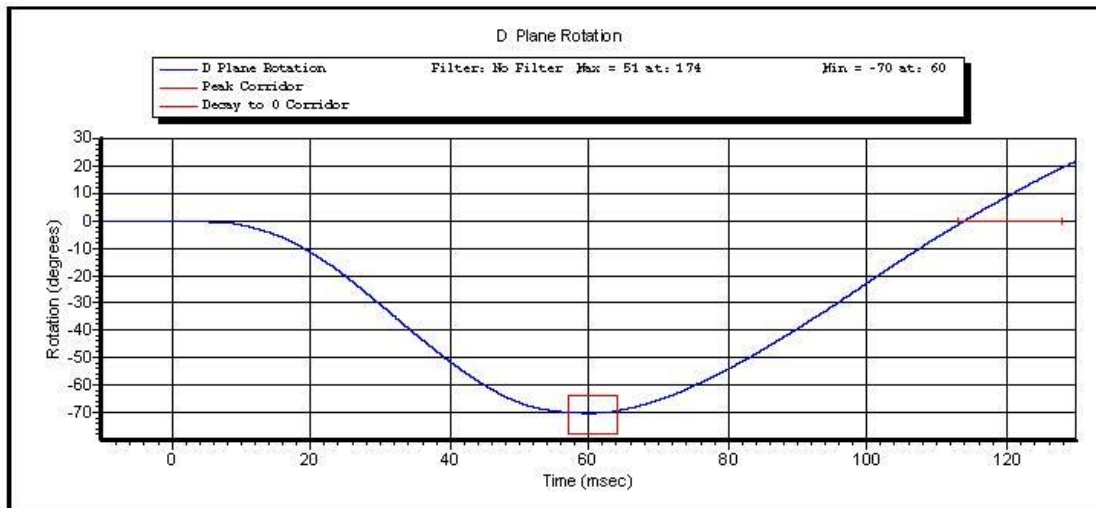


ID of Test: **Neck Flexion**

Time of Test: **10:15:13 AM**

Date of Test: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

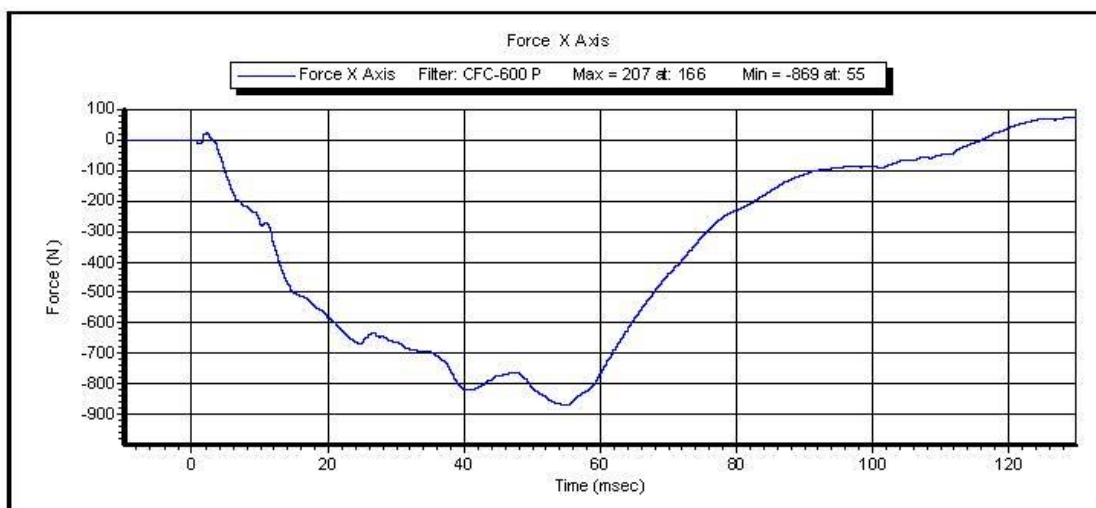
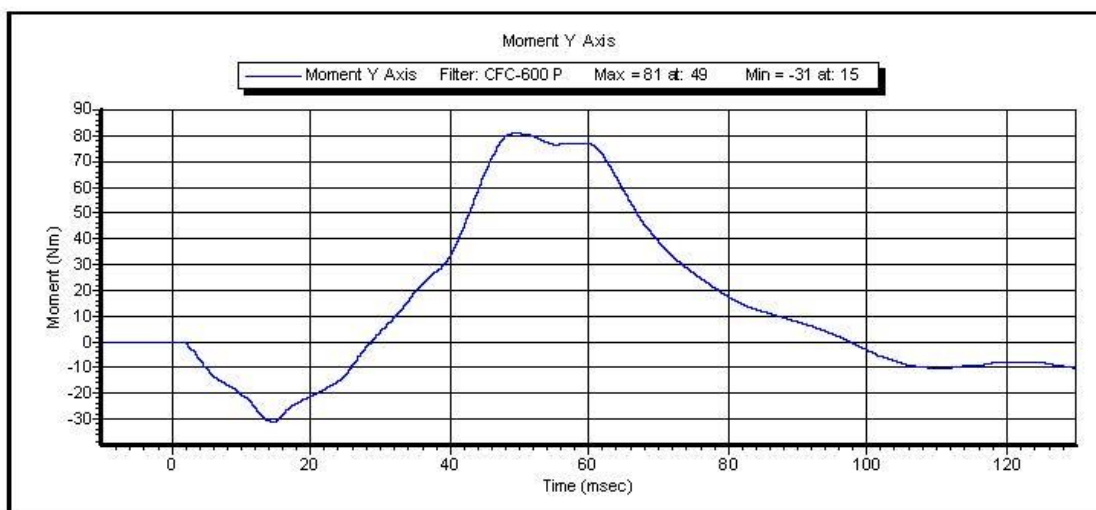


ID of Test: **Neck Flexion**

Time of Test: **10:15:13 AM**

Date of Test: **12/11/2014**

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ID of Test: **Neck Flexion**

Time of Test: **10:15:13 AM**

Date of Test: **12/11/2014**

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VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Thorax Impact	Test Date:	12/12/2014
		Test Time:	11:07:23 AM

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	20.90 deg C P
Humidity	10 -- 70	23.00 %RH P
Velocity	6.59 -- 6.83	6.752 m/s P
Chest Deflection	-72.6 -- -63.5	-67.39 mm P
Resistive Force	-5.894 -- -5.160	-5.5225 kN P
Hysteresis	69 -- 85	72.0 % P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



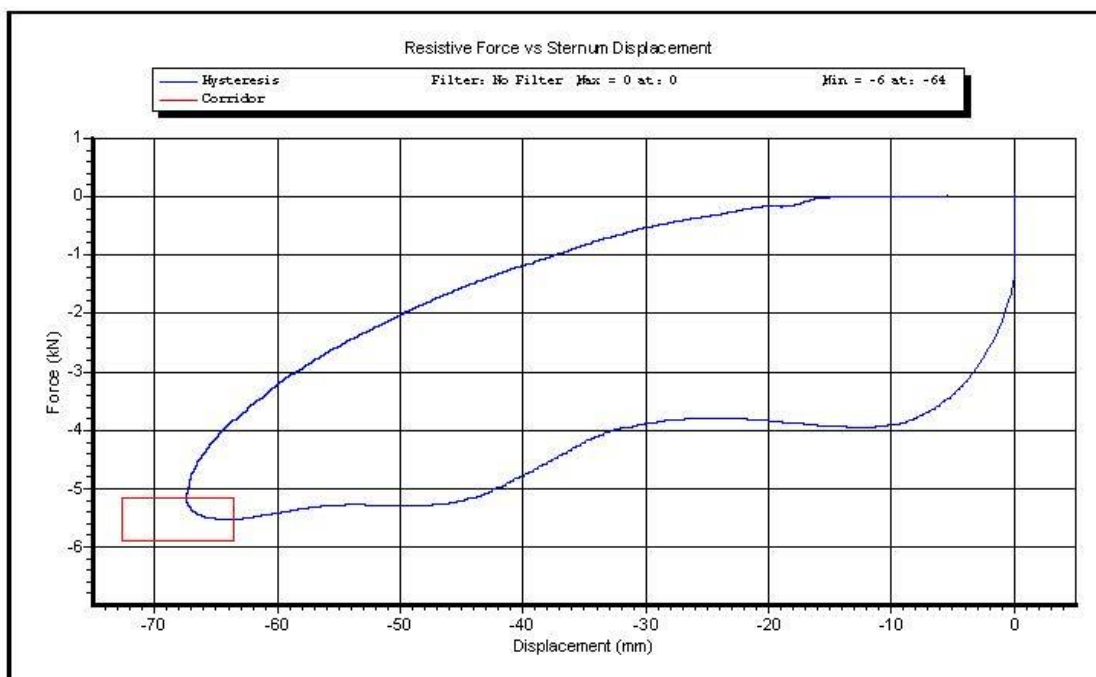
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	7/30/2014
Servo	14 CBI-2897	DS-1046	7/31/2014



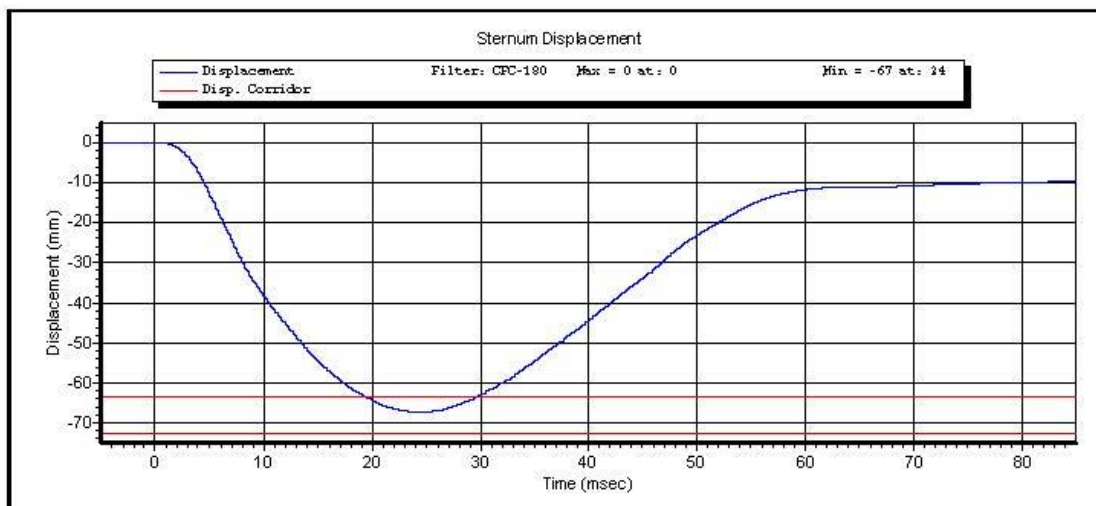
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Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



Test ID: Thorax Impact Test Time: 11:07:23 AM

Test Date: 12/12/2014

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

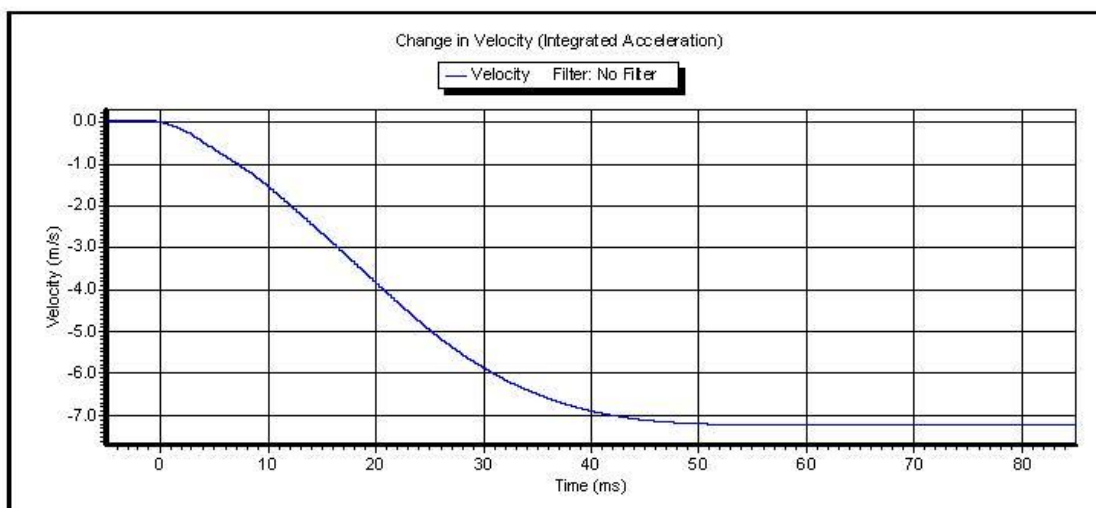
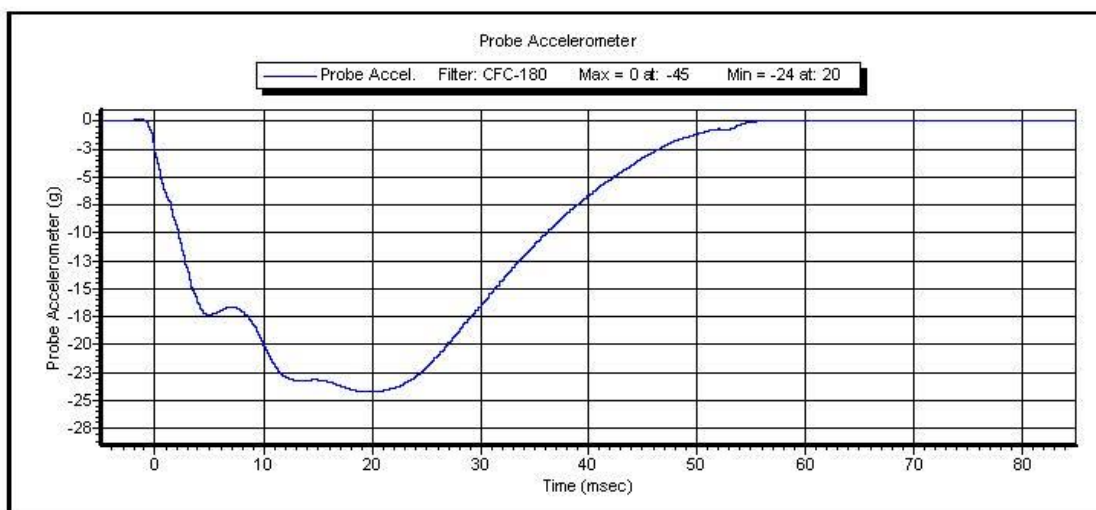


Test ID: **Thorax Impact**

Test Time: **11:07:23 AM**

Test Date: **12/12/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Thorax Impact**

Test Time: **11:07:23 AM**

Test Date: **12/12/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Hip ROM Left	Test Date:	12/10/2014
		Test Time:	2:55:52 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.70 deg C P
Humidity	10 -- 70	21.10 %RH P
Average Velocity	5 -- 10	6.3 deg/s P
Angle at 203 Nm	40 -- 50	41.5 degrees P
Moment at 30 degrees	0.0 -- 94.9	89.46 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **M. Goehle**



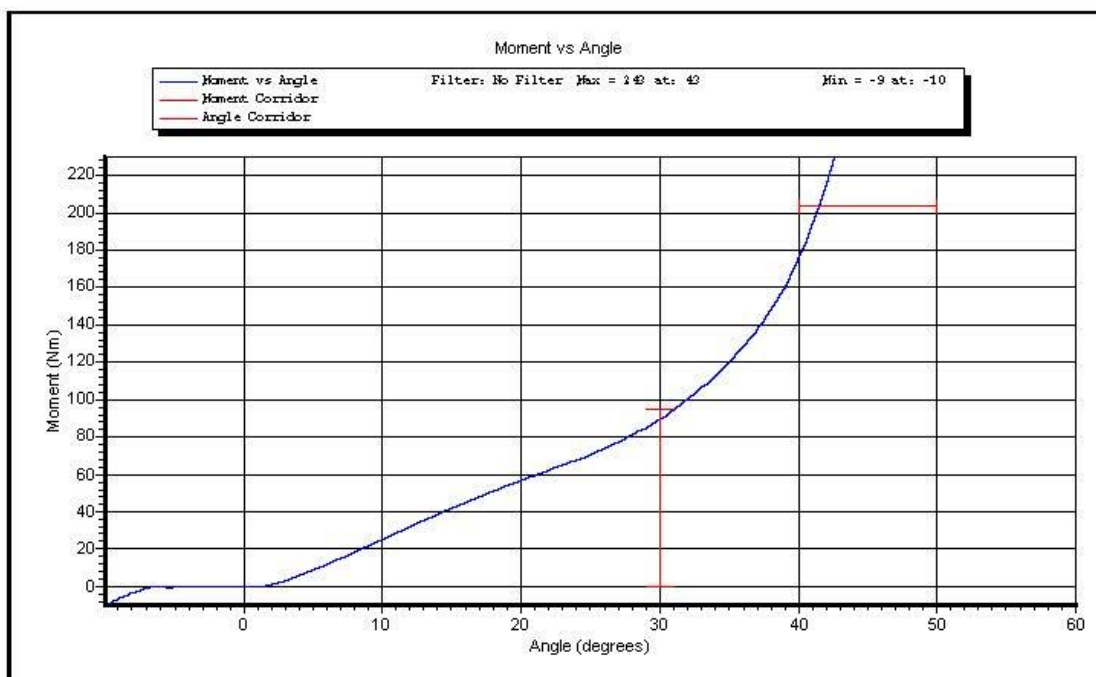
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/25/2014
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014



Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



Test ID: **Hip ROM Left** Test Time: **2:55:52 PM** Test Date: **12/10/2014**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Hip ROM	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Hip ROM Right	Test Date:	12/10/2014
		Test Time:	3:16:50 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.70 deg C P
Humidity	10 -- 70	21.00 %RH P
Average Velocity	5 -- 10	6.1 deg/s P
Angle at 203 Nm	40 -- 50	40.3 degrees P
Moment at 30 degrees	0.0 -- 94.9	92.54 Nm P

All test parameters are within specifications

Technician: **R. Weil**

Supervisor: **M. Goehle**



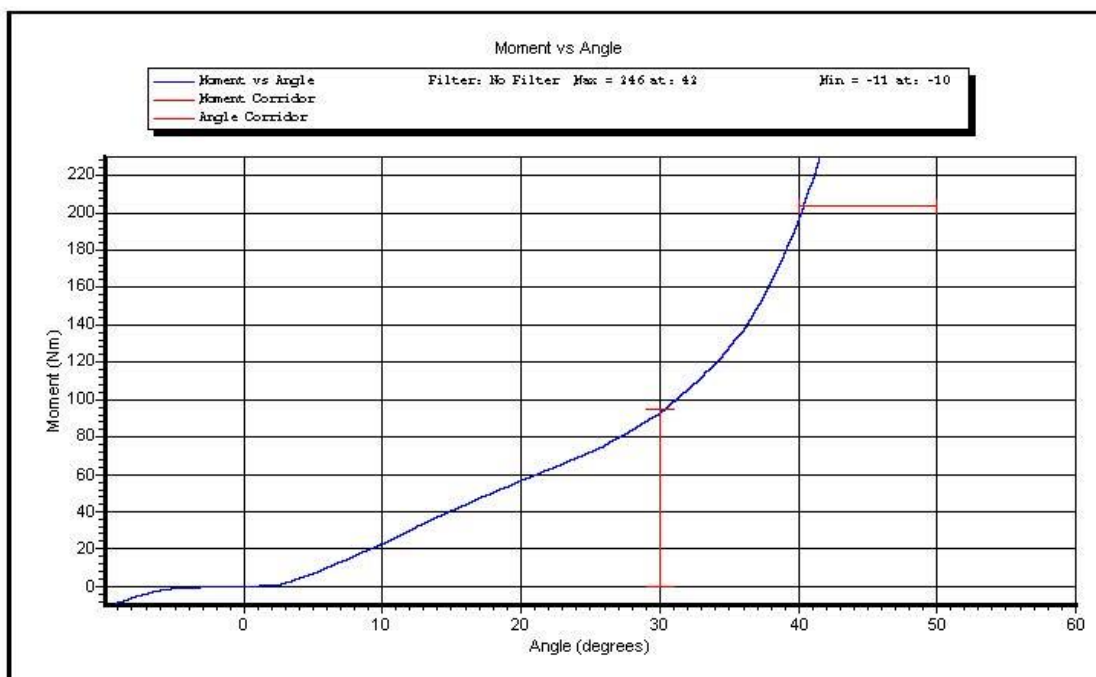
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Key Trans/PCB	2301-02	115	3/25/2014
DentonATD	14 CB1-3615	0008	2/20/2014
DentonATD	A0 Output	1	1/11/2014



Test Name:	Hip ROM
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



Test ID: **Hip ROM Right** Test Time: **3:16:50 PM**

Test Date: **12/10/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Knee Impact Left	Test Date:	12/12/2014
		Test Time:	3:22:03 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.60 deg C P
Humidity	10 -- 70	24.30 %RH P
Velocity	2.07 -- 2.13	2.091 m/s P
Resistive Force	-5.780 -- -4.720	-5.371 kN P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



VERIFICATION REPORT

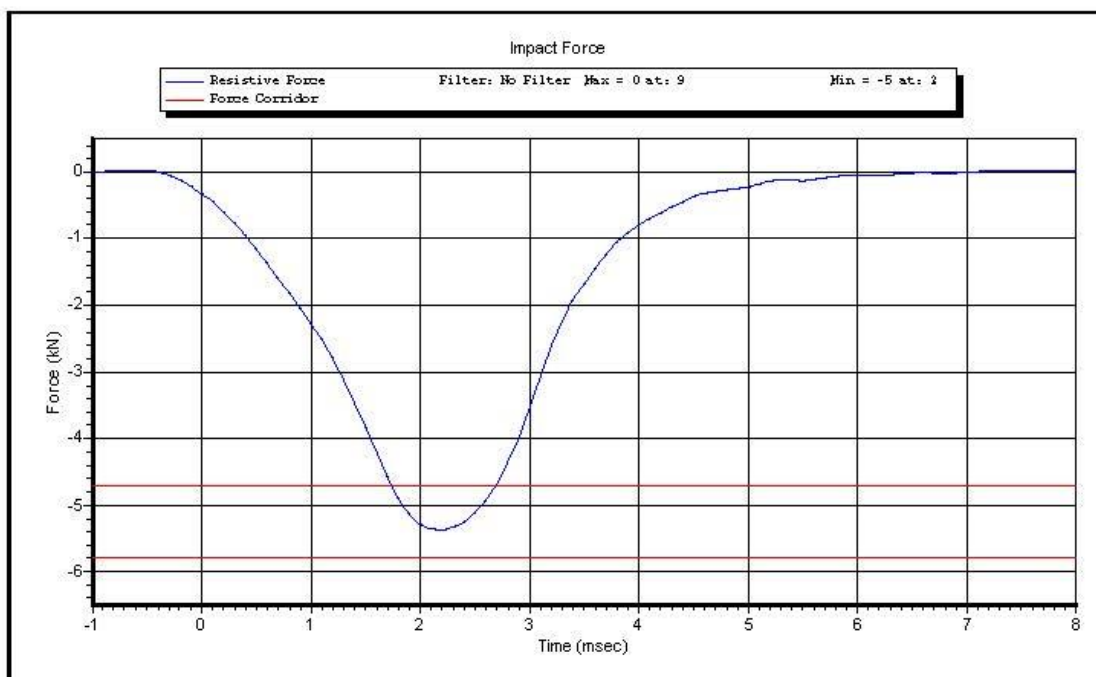
REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 7/30/2014

Copyright 2006 Denton ATD, Inc. LabPac II Version: 1.8.5.0

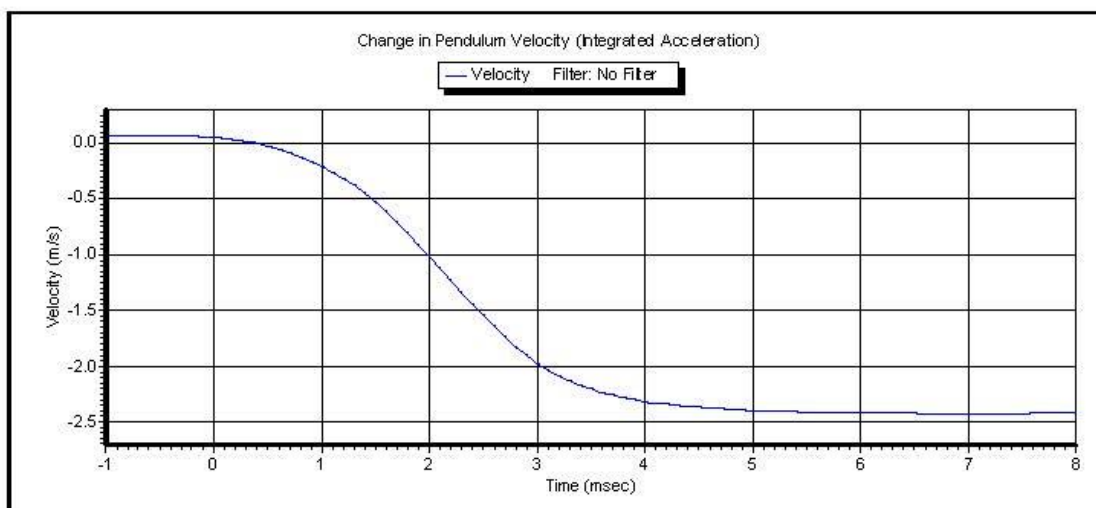
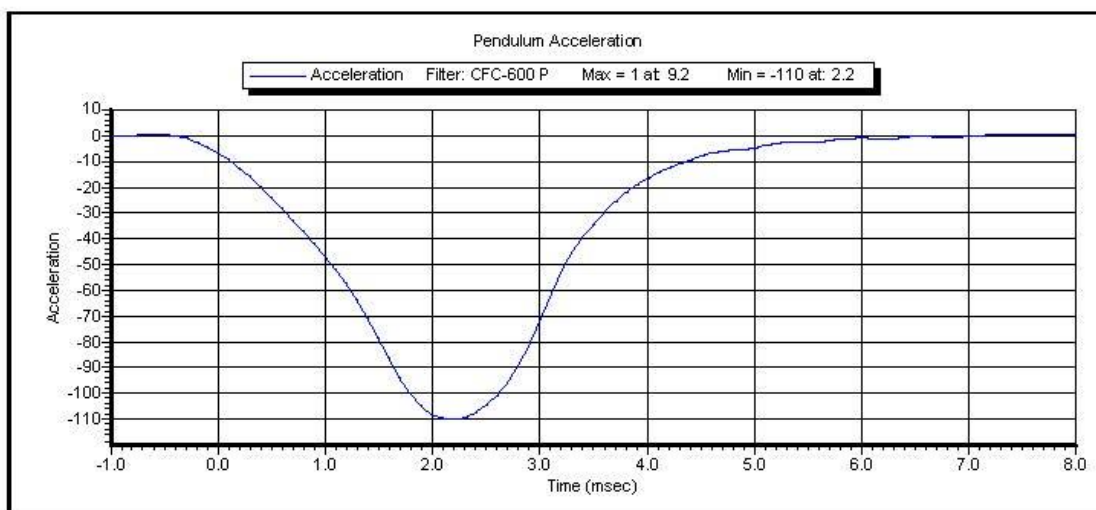


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



Test ID: **Knee Impact Left** Test Time: **3:22:03 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **12/12/2014**



Test ID: **Knee Impact Left** Test Time: **3:22:03 PM**

Test Date: **12/12/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	10/1/2001
Sub Test Name:			
ATD Type:	Hybrid 3 - 50th Male		
ATD Serial Number:	1046		
Test ID:	Knee Impact Right	Test Date:	12/12/2014
		Test Time:	2:39:23 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.60 deg C P
Humidity	10 -- 70	23.90 %RH P
Velocity	2.07 -- 2.13	2.097 m/s P
Resistive Force	-5.780 -- -4.720	-5.612 kN P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 7/30/2014



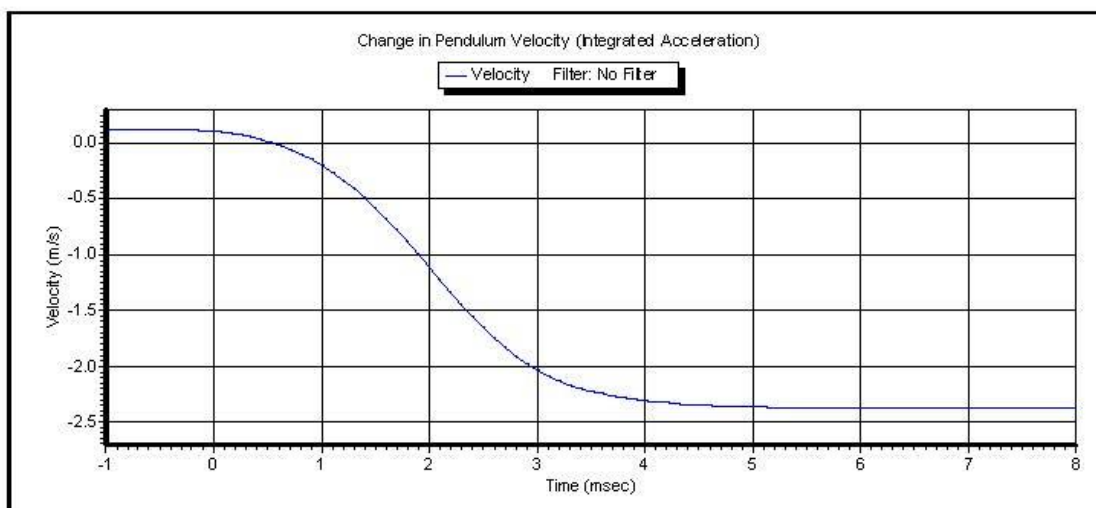
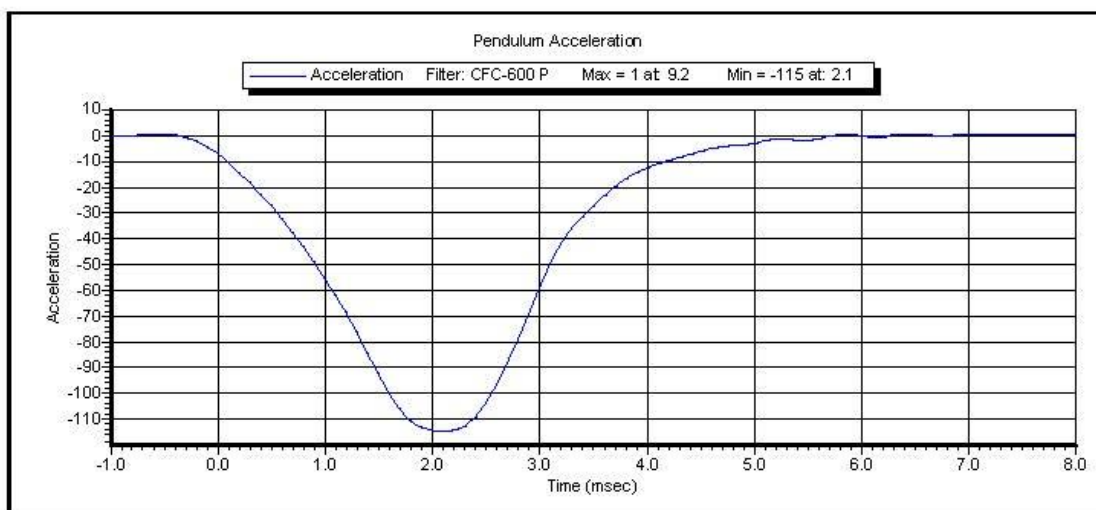
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Sub Test Name:	
ATD Type:	Hybrid 3 - 50th Male
ATD Serial Number:	1046



Test ID: **Knee Impact Right** Test Time: **2:39:23 PM**

Test Date: **12/12/2014**

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Test ID: **Knee Impact Right** Test Time: **2:39:23 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **12/12/2014**

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139

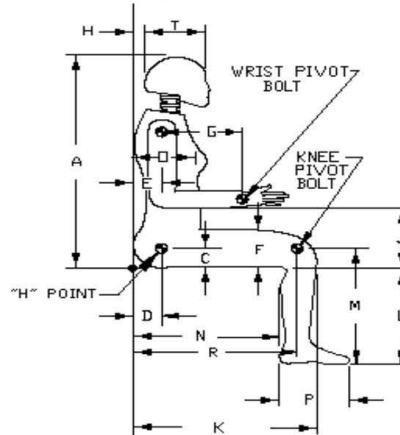
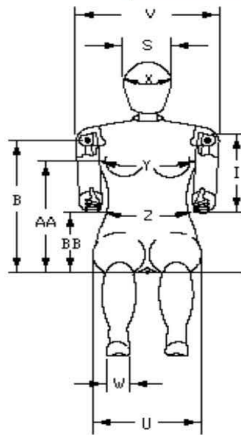


External Measurements - Hybrid 3 - 5th Female

Technician: M. Geesey

Date: 12/11/2014

Dummy Serial Number: 139



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	788	Pass
B	Shoulder Pivot Height	432	457	447	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	76	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	248	Pass
H	Head Back to Backline	43	48	44	Pass
I	Shoulder to Elbow Length	277	297	293	Pass
J	Elbow Rest Height	183	203	186	Pass
K	Buttock to Knee Length	521	546	542	Pass
L	Popliteal Height	356	376	361	Pass
M	Knee Pivot Height	394	419	398	Pass
N	Buttock Popliteal Length	414	439	422	Pass
O	Chest Depth without Jacket	175	191	183	Pass
P	Foot Length (right)	219	234	220	Pass
R	Buttock To Knee Pivot Length	457	483	471	Pass
S	Head Breadth	137	437	140	Pass
T	Head Depth	178	188	181	Pass
U	Hip Breadth	300	315	302	Pass
V	Shoulder Breadth	351	366	362	Pass
W	Foot Breadth	79	94	82	Pass
X	Head Circumference	528	549	536	Pass
Y	Chest Circumference with Jacket	851	881	851	Pass
Z	Waist Circumference	460	790	771	Pass
AA	Reference Location (Chest Circumference)	333	358	357	Pass
BB	Reference Location (Waist Circumference)	160	170	170	Pass



VERIFICATION REPORT

Test Name:	Head Drop	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Head Drop	Test Date:	12/12/2014
		Test Time:	5:31:51 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	21.40 deg C P
Humidity	10 -- 70	23.70 %RH P
Resultant Acceleration	250 -- 300	264.5 G's P
Oscillation	0 -- 10	0.0 % P
Lateral Acceleration	-15 -- 15	-6.2 G's P

All test parameters are within specifications

Technician: M. Geesey

Supervisor: M. Goehle



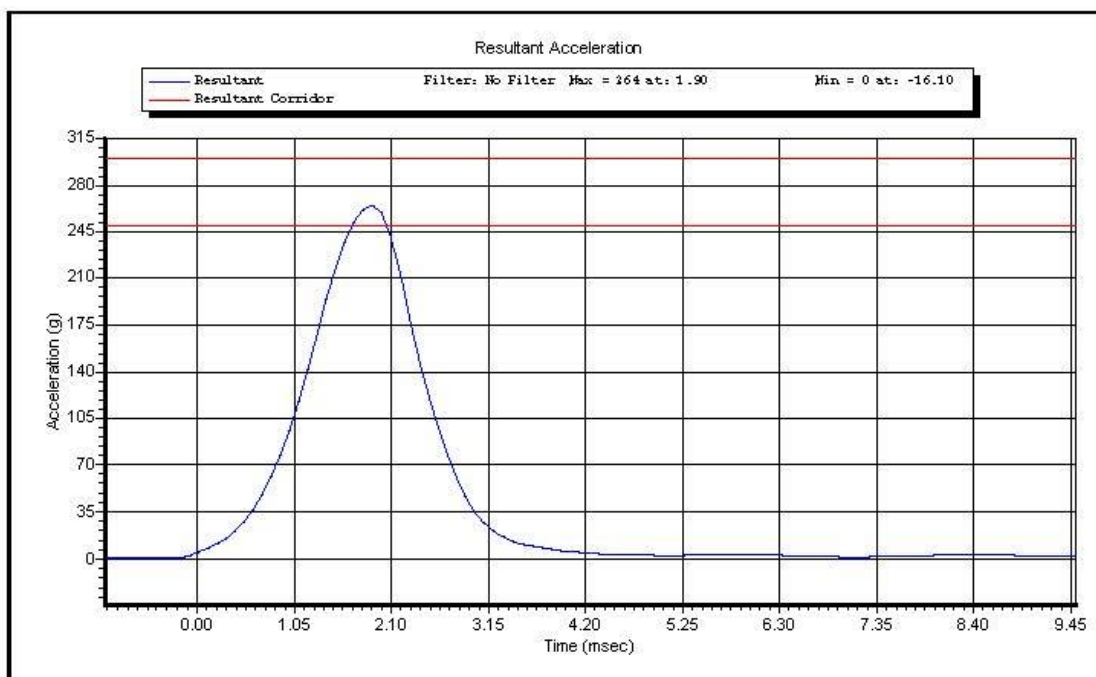
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P52054	8/26/2014
Endevco	7264-2000	P52007	8/26/2014
Endevco	7264-2000	P51298	8/26/2014



Test Name:	Head Drop
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139

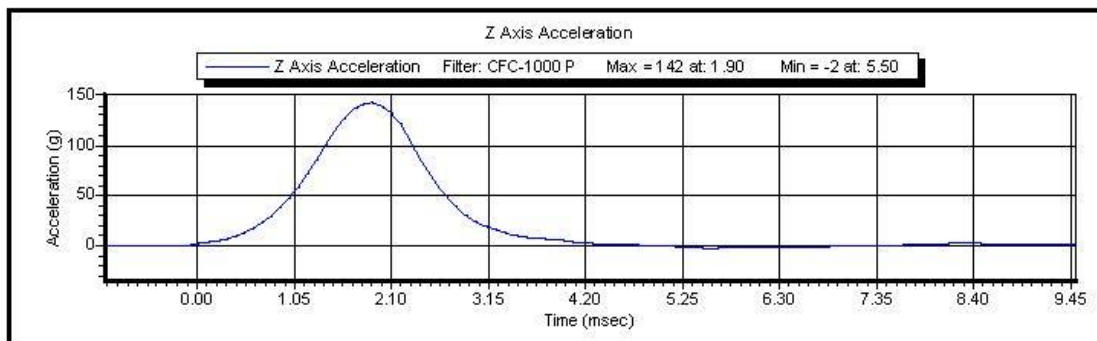
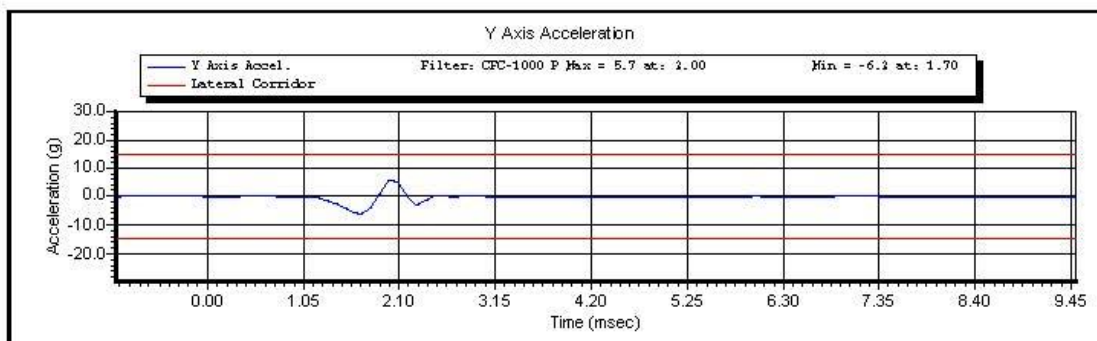
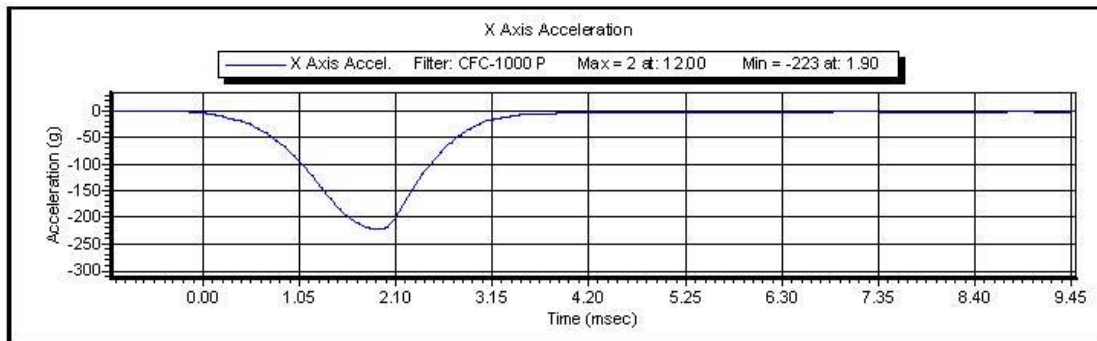


Test ID: **Head Drop**

Test Time: **5:31:51 PM**

Test Date: **12/12/2014**

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Test ID: **Head Drop**

Test Time: **5:31:51 PM**

Test Date: **12/12/2014**

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VERIFICATION REPORT

Test Name:	Neck Extension	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Extension	Test Date:	12/11/2014
		Test Time:	3:36:44 PM

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.70 deg C P
Humidity	10 -- 70	20.60 %RH P
Velocity	5.95 -- 6.19	5.997 m/s P
Pendulum Impulse at 10 ms	1.5 -- 1.9	1.76 m/s P
Pendulum Impulse at 20 ms	3.1 -- 3.9	3.55 m/s P
Pendulum Impulse at 30 ms	4.6 -- 5.6	5.38 m/s P
D Plane Rotation	99 -- 114	109.9 degrees P
Moment During Rotation Interval	-65 -- -53	-60.1 Nm P
Moment Decay to -10.0 Nm	94 -- 114	104.4 ms P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



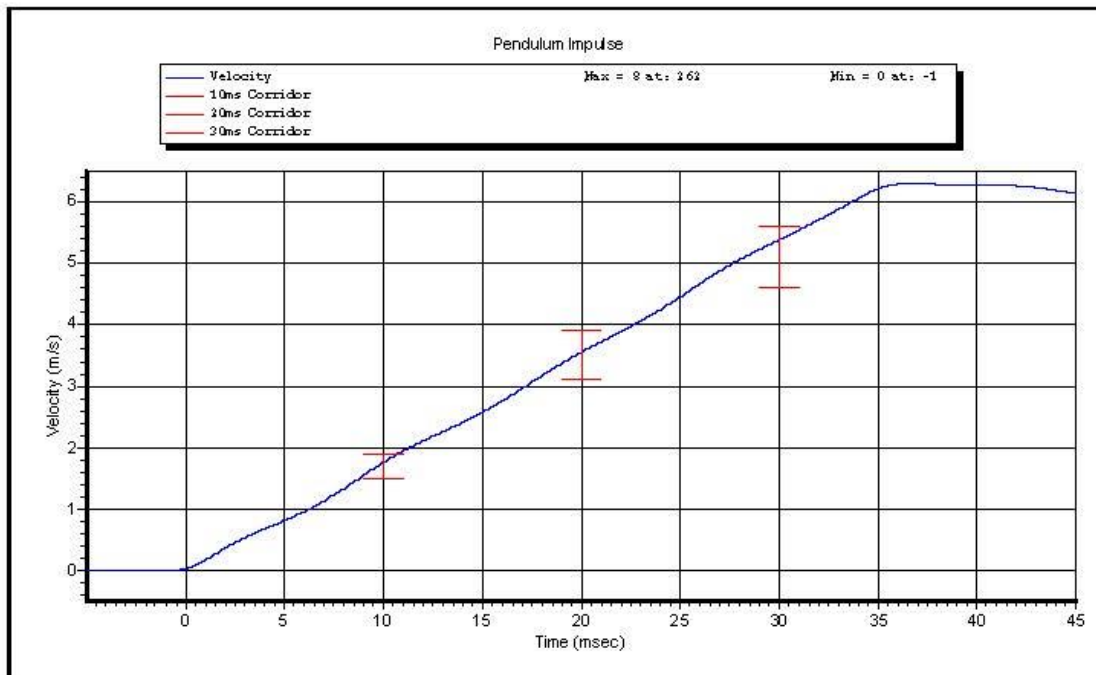
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	11/6/2014
ETI	SP22G	Pendulum Pot	9/16/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2018My	5/1/2014
Denton	1716A	LC-2018Fx	5/1/2014



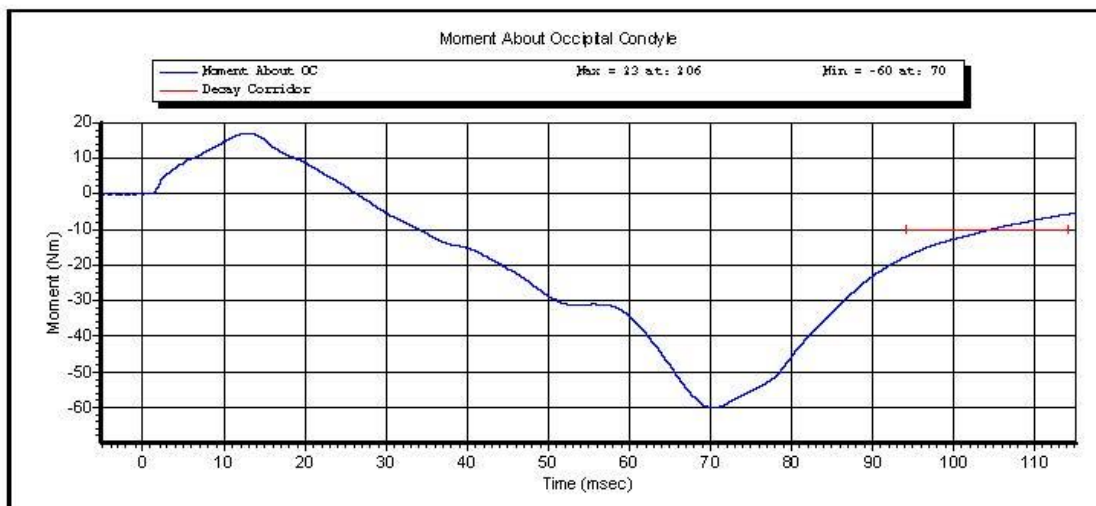
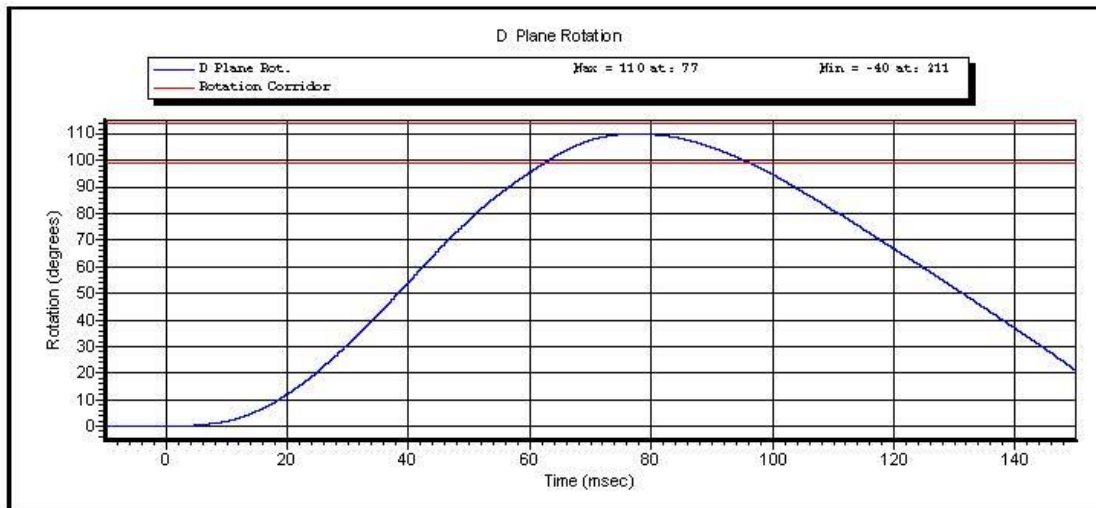
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Neck Extension Test Time: 3:36:44 PM

Test Date: 12/11/2014

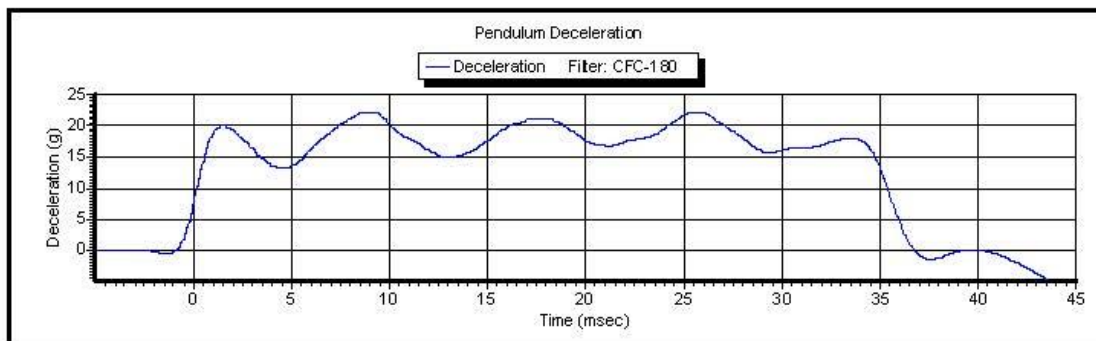
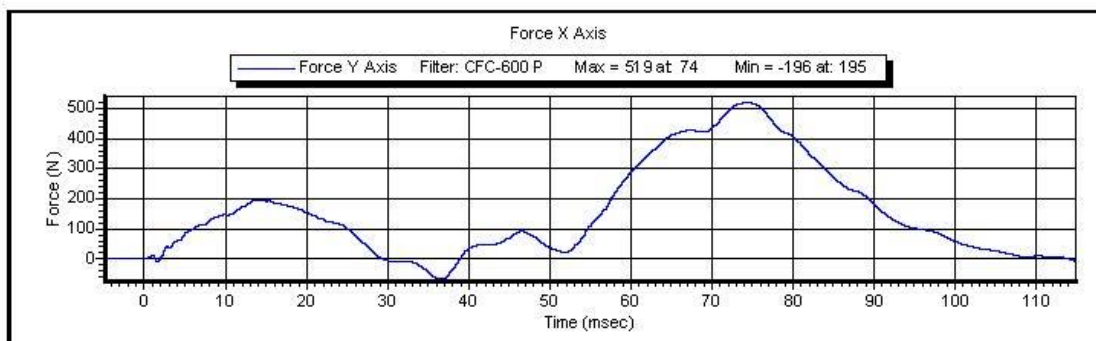
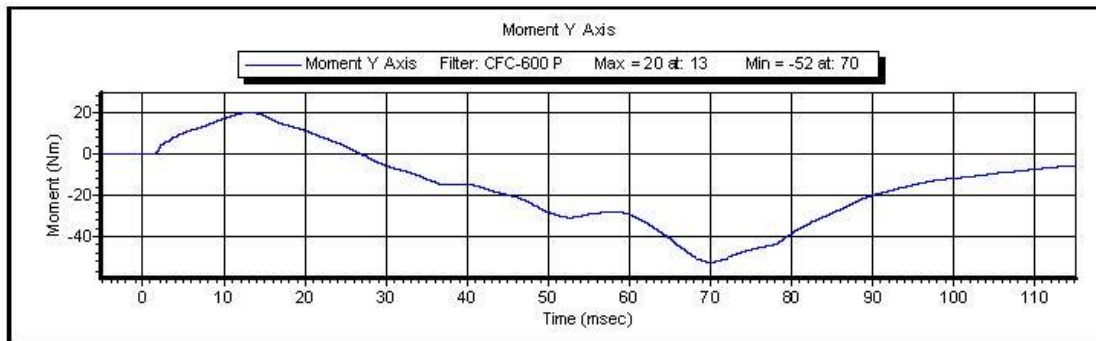
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Neck Extension** Test Time: **3:36:44 PM**

Test Date: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Neck Extension** Test Time: **3:36:44 PM**

Test Date: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Neck Flexion	Test Date:	12/11/2014
		Test Time:	3:04:41 PM

Test Parameters	Test Specifications	Test Results
Temperature	21 -- 22	21.70 deg C P
Humidity	10 -- 70	20.40 %RH P
Velocity	6.89 -- 7.13	6.974 m/s P
Pendulum Impulse at 10 ms	2.1 -- 2.5	2.29 m/s P
Pendulum Impulse at 20 ms	4 -- 5	4.6 m/s P
Pendulum Impulse at 30 ms	5.8 -- 7.0	6.83 m/s P
D Plane Rotation	-91 -- -77	-80.2 degrees P
Moment During Rotation Interval	69 -- 83	69.8 Nm P
Moment Decay to 10.0 Nm	80 -- 100	86.7 ms P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



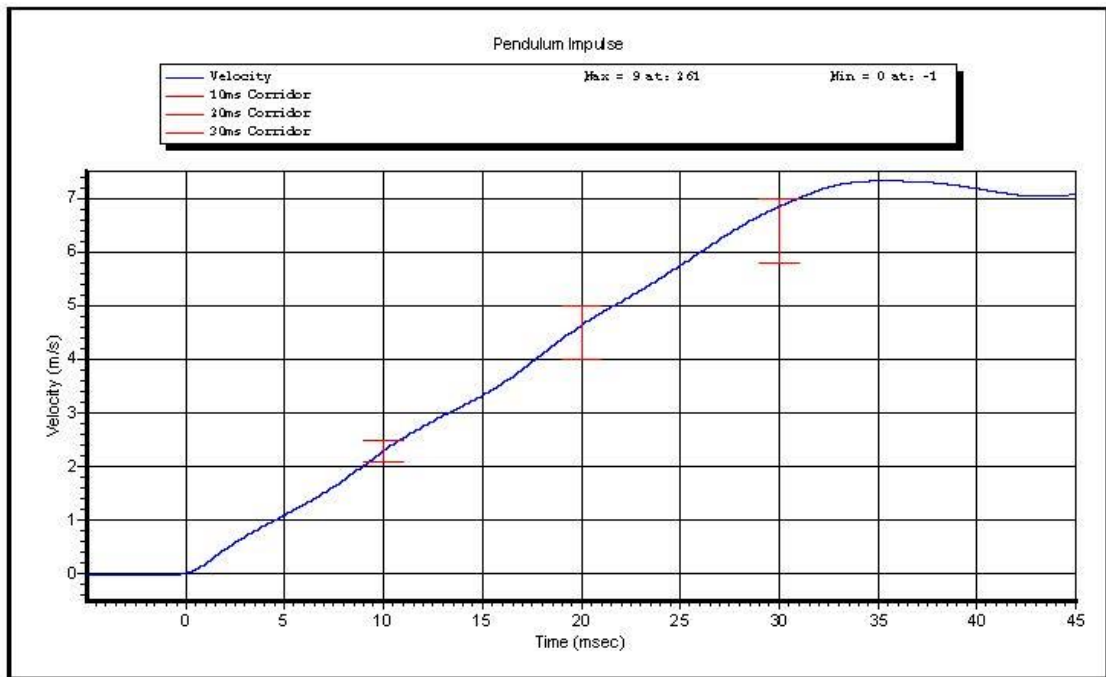
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	AH5F3	11/6/2014
ETI	SP22G	Pendulum Pot	9/16/2014
ETI	SP22D	SP22 CONDYLE	2/21/2014
Denton	1716A	LC-2018My	5/1/2014
Denton	1716A	LC-2018Fx	5/1/2014



Test Name:	Neck Flexion
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139

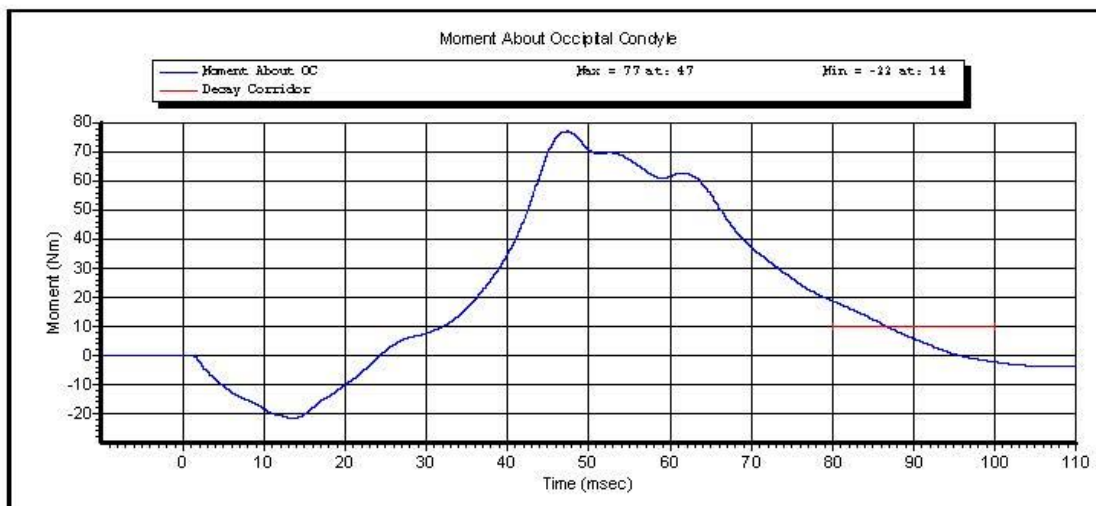
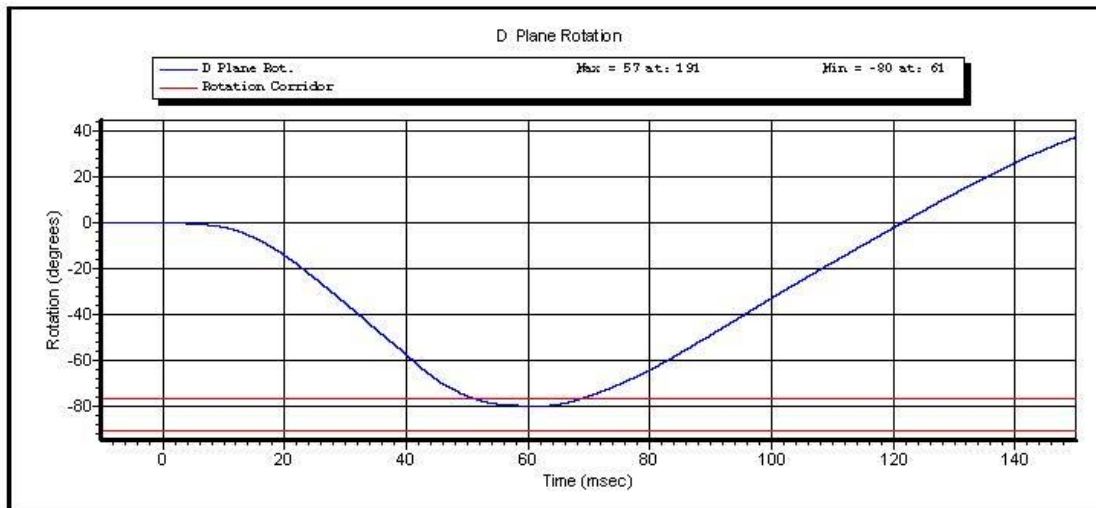


Test ID: Neck Flexion

Test Time: 3:04:41 PM

Test Date: 12/11/2014

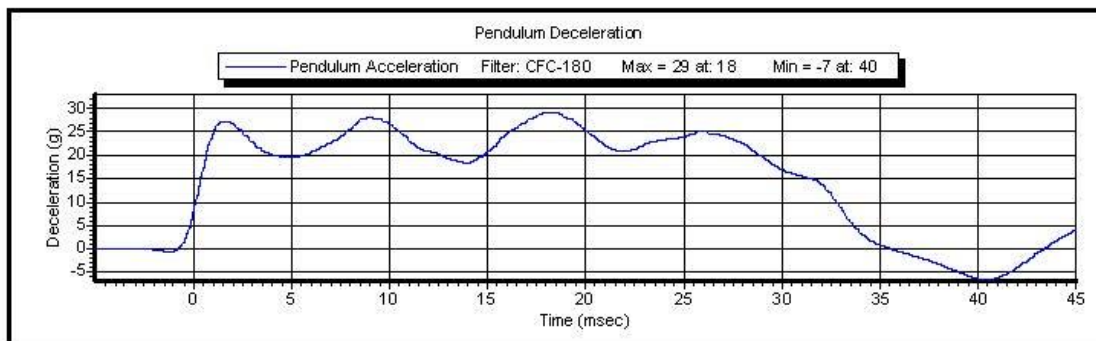
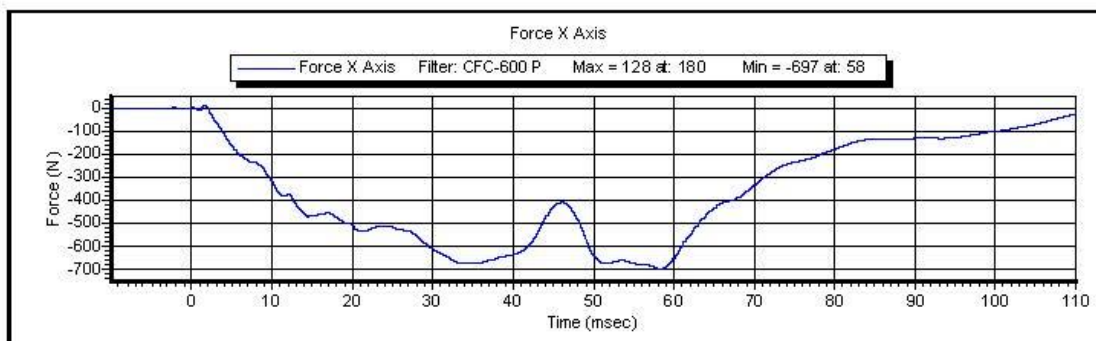
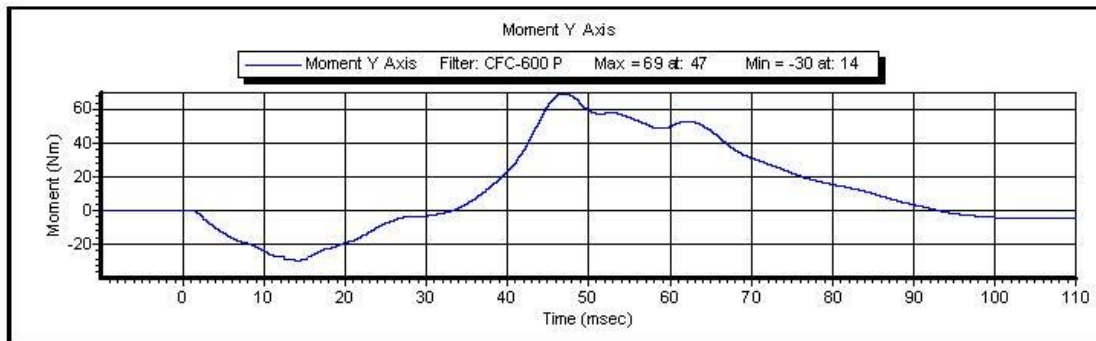
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Test ID: Neck Flexion Test Time: 3:04:41 PM

Test Date: 12/11/2014

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Test ID: **Neck Flexion** Test Time: **3:04:41 PM**

Test Date: **12/11/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Thorax Impact	Test Date:	12/12/2014
		Test Time:	10:01:55 AM

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.00 deg C P
Humidity	10 -- 70	22.20 %RH P
Velocity	6.59 -- 6.83	6.765 m/s P
Sternum Displacement	-58 -- -50	-56.4 mm P
Force During Displacement Interval	-4400 -- -3900	-4187.2 N P
Force During -18mm to -50mm Displacement	-4600 -- 0	-4007.8 N P
Hysteresis	69 -- 85	71.1 % P

All test parameters are within specifications

Technician: **M. Geesey**
Supervisor: **M. Goehle**



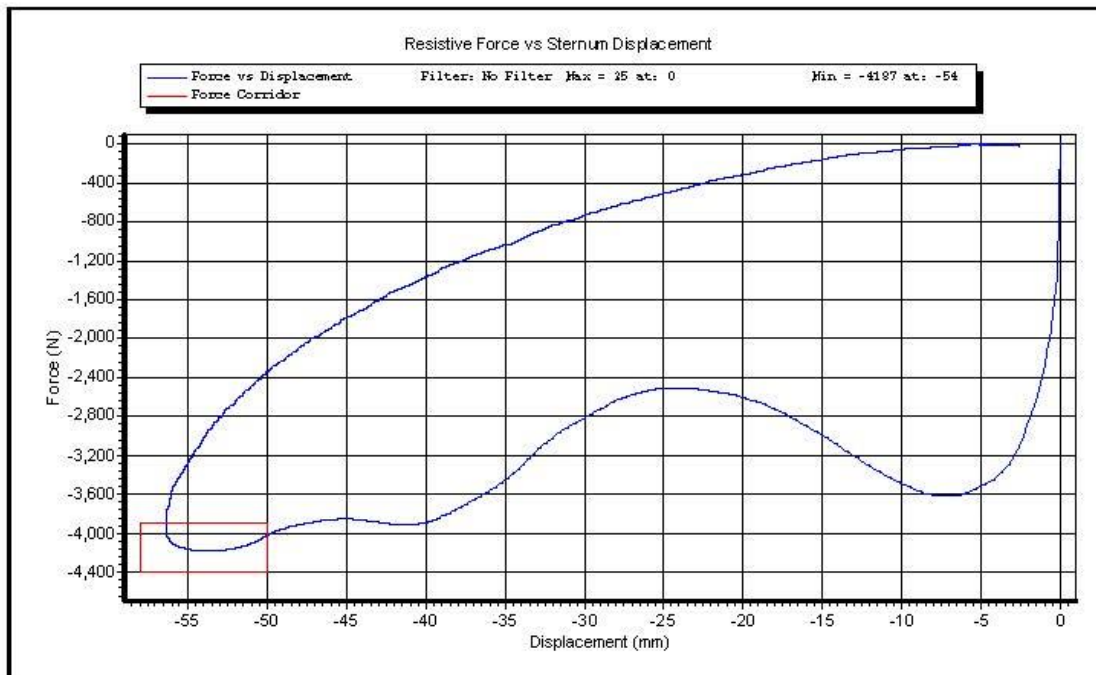
VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD	Velocity Trap	1	1/11/2014
Endevco	7231CT	C14953	7/30/2014
Servo	14 CB1-3615	DS-139	7/31/2014



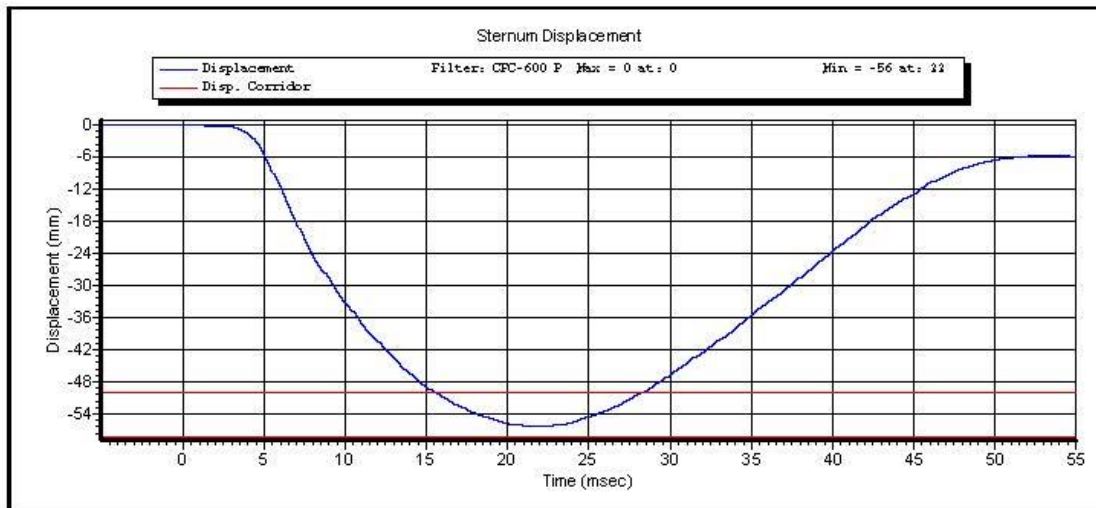
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Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: Thorax Impact Test Time: 10:01:55 AM

Test Date: 12/12/2014

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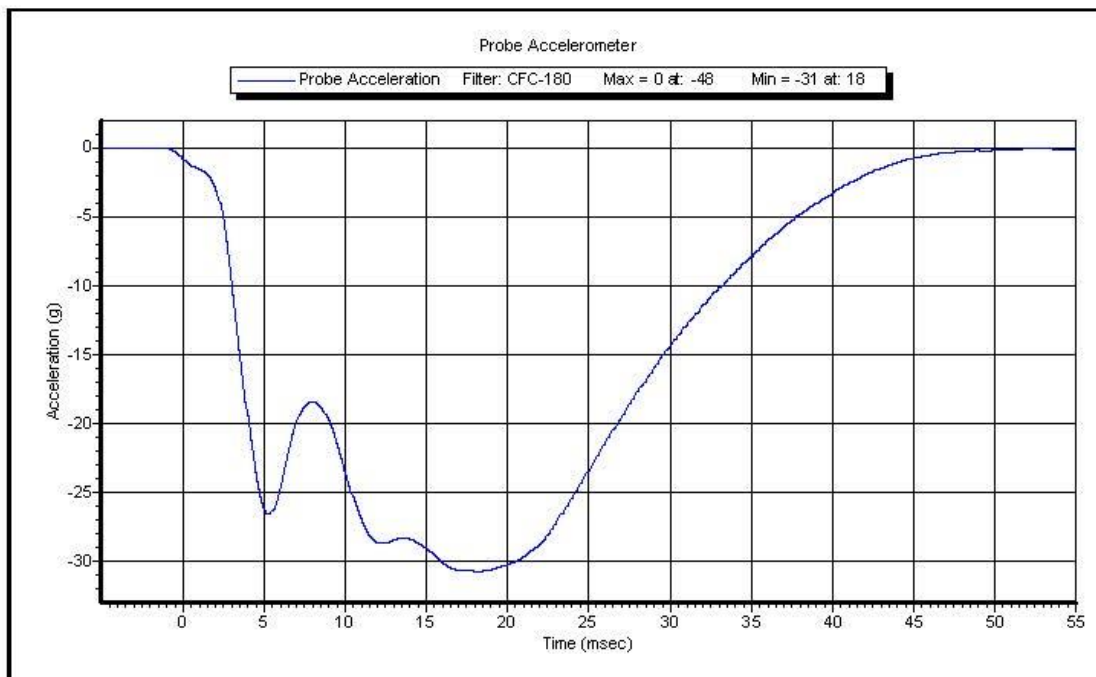


Test ID: **Thorax Impact**

Test Time: **10:01:55 AM**

Test Date: **12/12/2014**

Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0



Test ID: **Thorax Impact**

Test Time: **10:01:55 AM**

Test Date: **12/12/2014**

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Torso Flexion

Part 572O HIII 5% Female

ATD Serial No: 139

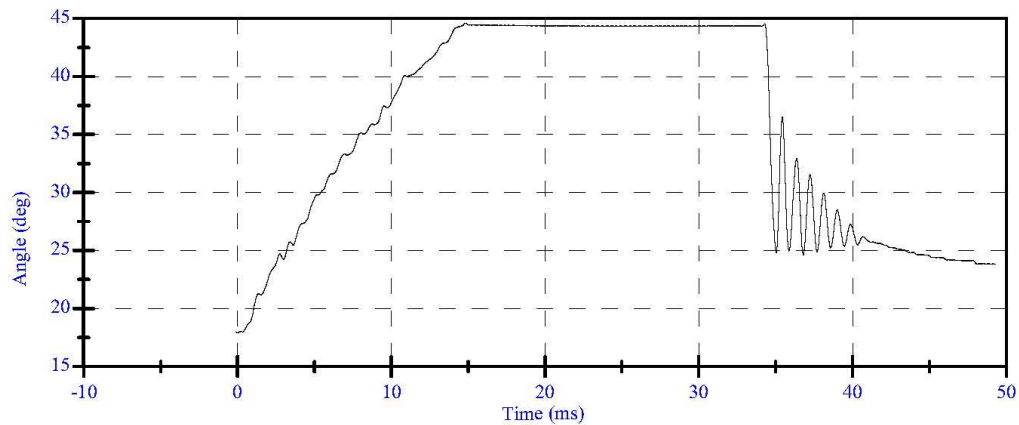
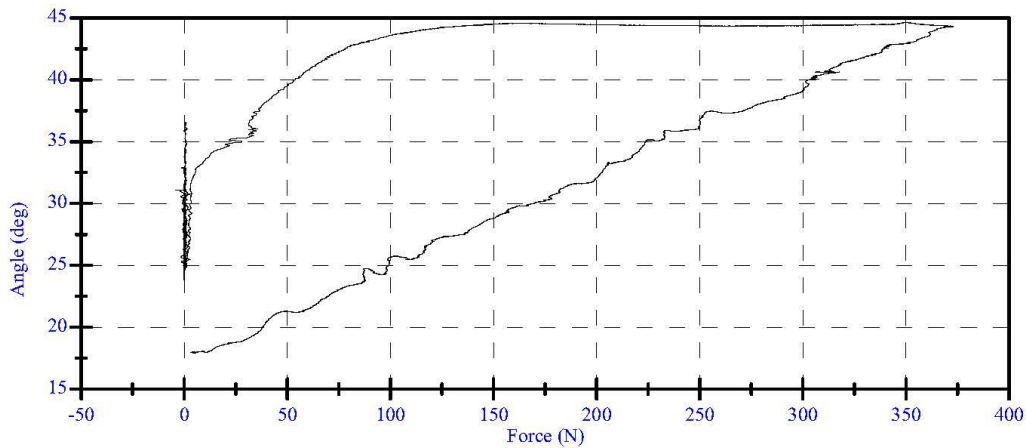
Laboratory Supervisor: M. Goehle

Date: 12/15/2014

Laboratory Technician: M. Geesey

TEST PARAMETER	SPECIFICATION	TEST RESULTS	STATUS
Lab Temperature:	18.9-25.6 C	22.1 Deg C	Passed
Lab Humidity:	10-70 %	27.9 %	Passed
Initial Angle:	0.00-20.00 Deg	16.9 Deg	Passed
Force at 45 Deg	320.00-390.00 N	373.138N	Passed
Return Angle	8 Deg Max from Initial	19.5 Deg	Passed

TORSO FLEXION TEST





VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Left	Test Date:	12/12/2014
		Test Time:	4:32:46 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.60 deg C P
Humidity	10 -- 70	24.70 %RH P
Velocity	2.07 -- 2.13	2.117 m/s P
Resistive Force	-4060 -- -3450	-3786.0 N P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 7/30/2014

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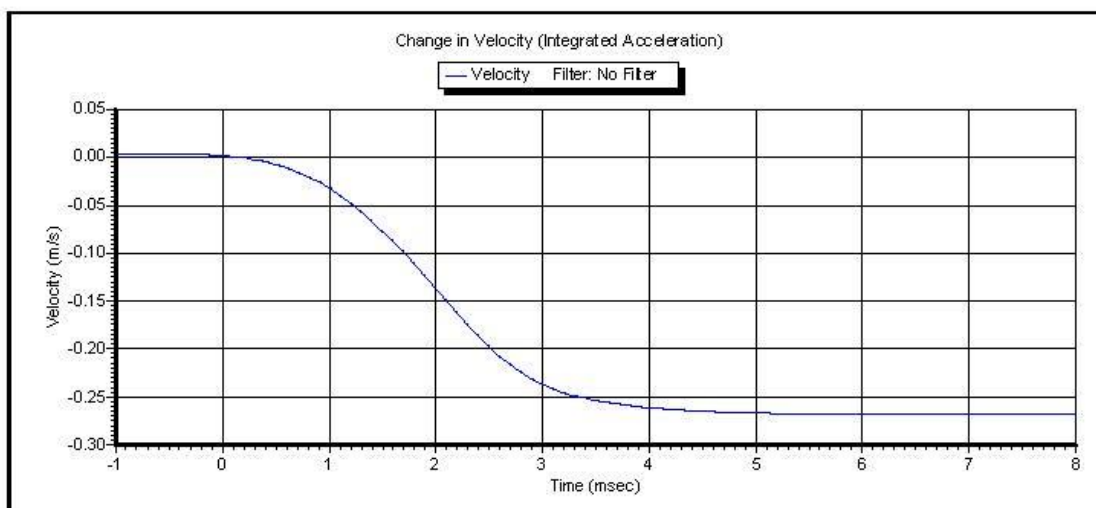
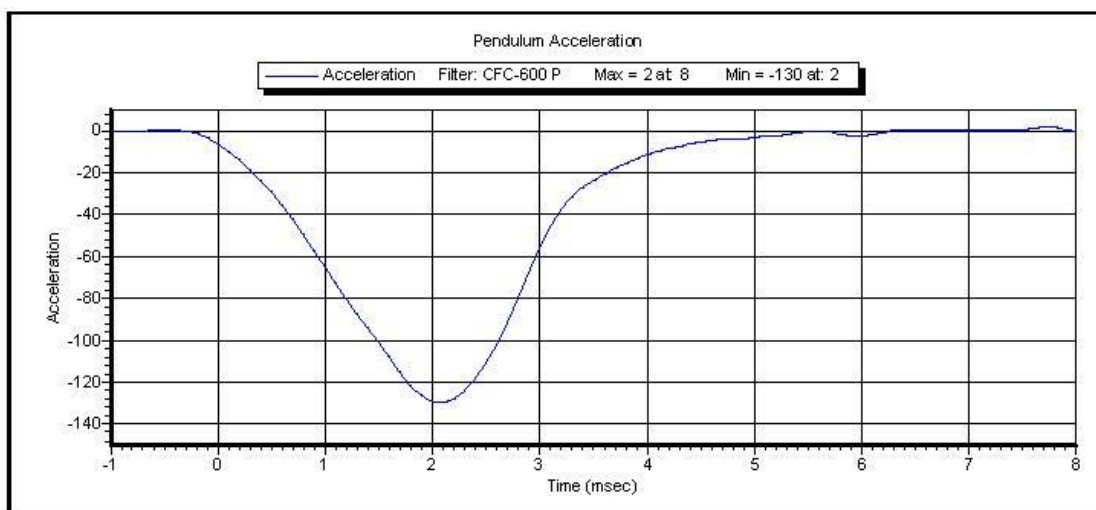


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Left** Test Time: **4:32:46 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **12/12/2014**



Test ID: **Knee Impact Left** Test Time: **4:32:46 PM**

Test Date: **12/12/2014**

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VERIFICATION REPORT

Test Name:	Knee Impact	Revision:	7/15/2002
Sub Test Name:			
ATD Type:	Hybrid 3 - 5th Female		
ATD Serial Number:	139		
Test ID:	Knee Impact Right	Test Date:	12/12/2014
		Test Time:	4:25:43 PM

Test Parameters	Test Specifications	Test Results
Temperature	18.9 -- 25.6	20.60 deg C P
Humidity	10 -- 70	24.70 %RH P
Velocity	2.07 -- 2.13	2.122 m/s P
Resistive Force	-4060 -- -3450	-3939.9 N P

All test parameters are within specifications

Technician: **M. Geesey**

Supervisor: **M. Goehle**



VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
DentonATD Endevco	Velocity Trap 7231CT	1 C14953	1/11/2014 7/30/2014

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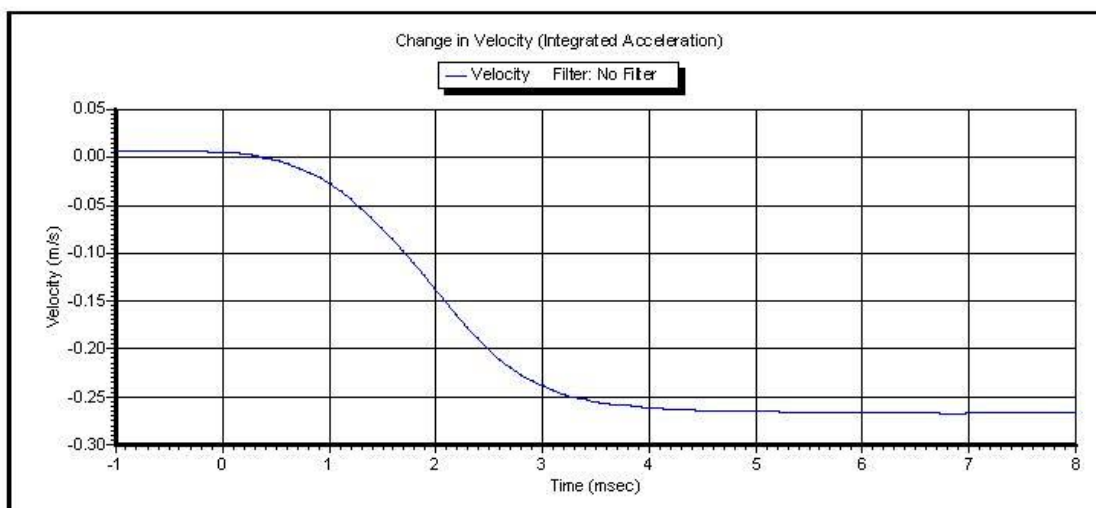
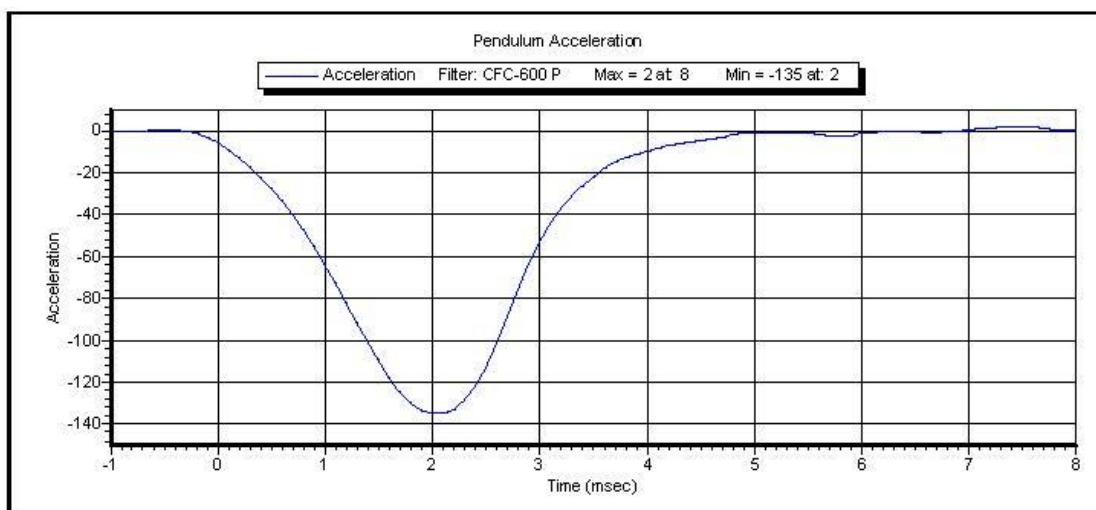


Test Name:	Knee Impact
Sub Test Name:	
ATD Type:	Hybrid 3 - 5th Female
ATD Serial Number:	139



Test ID: **Knee Impact Right** Test Time: **4:25:43 PM**
Copyright 2003 Denton ATD, Inc. LabPaqII Version: 1.8.5.0

Test Date: **12/12/2014**



Test ID: **Knee Impact Right** Test Time: **4:25:43 PM**

Test Date: **12/12/2014**

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CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

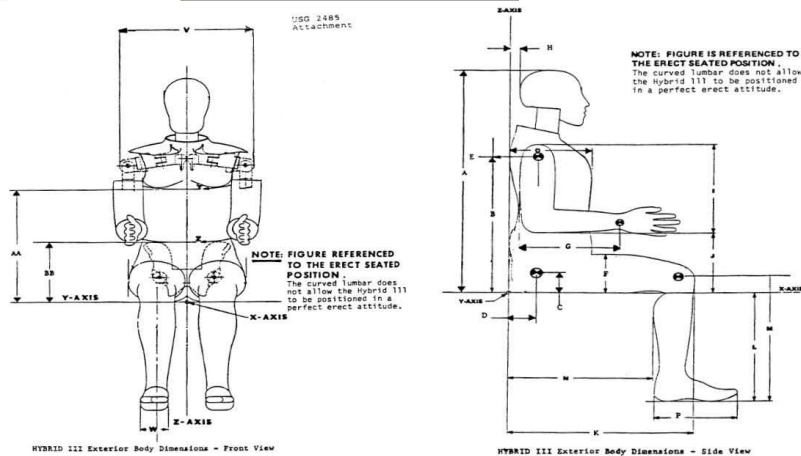


External Measurements - Hybrid 3 - 50th Male

Technician: **M. Hartung**

Date: **1/30/2015**

Dummy Serial Number: **1046**



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.0	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.7	Pass
H	Head Back to Backline	1.6	1.8	1.8	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.1	Pass
J	Elbow Rest Height	7.5	8.3	7.8	Pass
K	Buttock to Knee Length	22.8	23.8	23.3	Pass
L	Popliteal Height	16.9	17.9	17.3	Pass
M	Knee Pivot Height	19.1	19.7	19.5	Pass
N	Buttock Popliteal Length	17.8	18.8	18.2	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.7	Pass
W	Foot Breadth	3.6	4.2	3.7	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.9	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.1	Pass

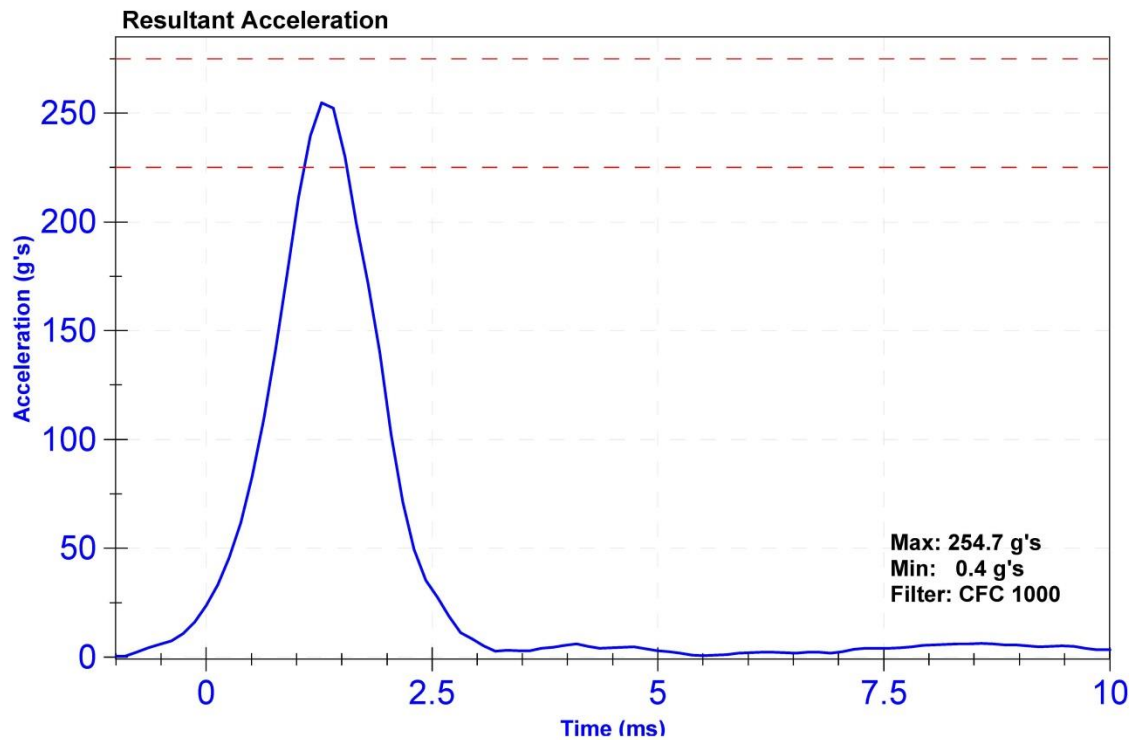
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

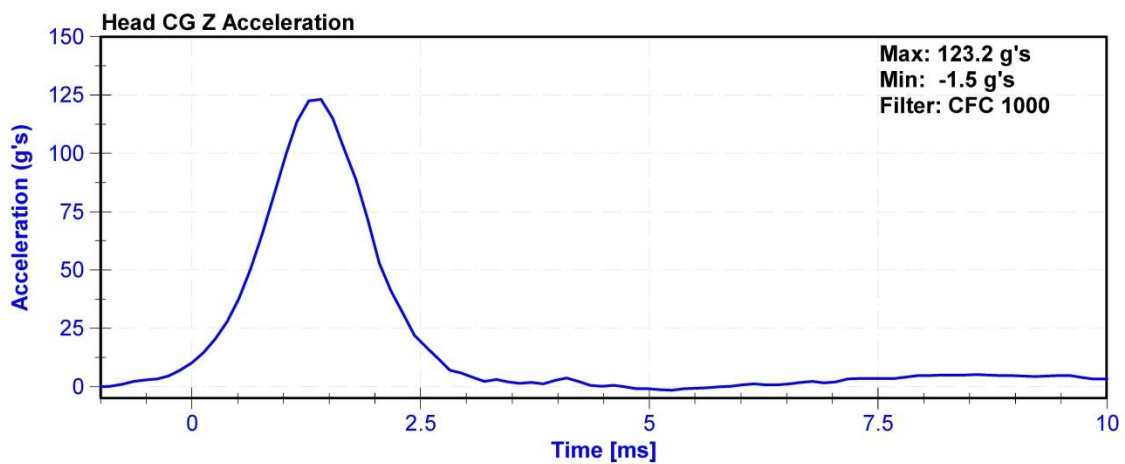
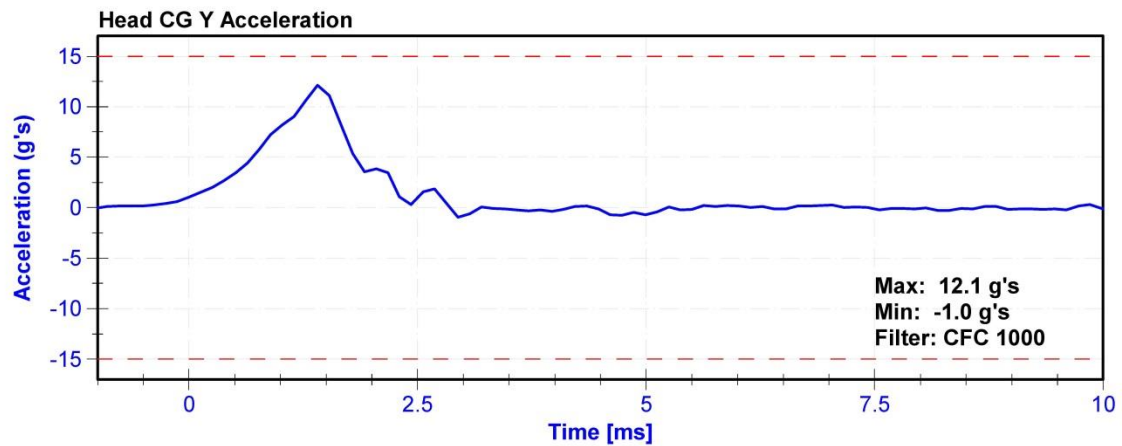
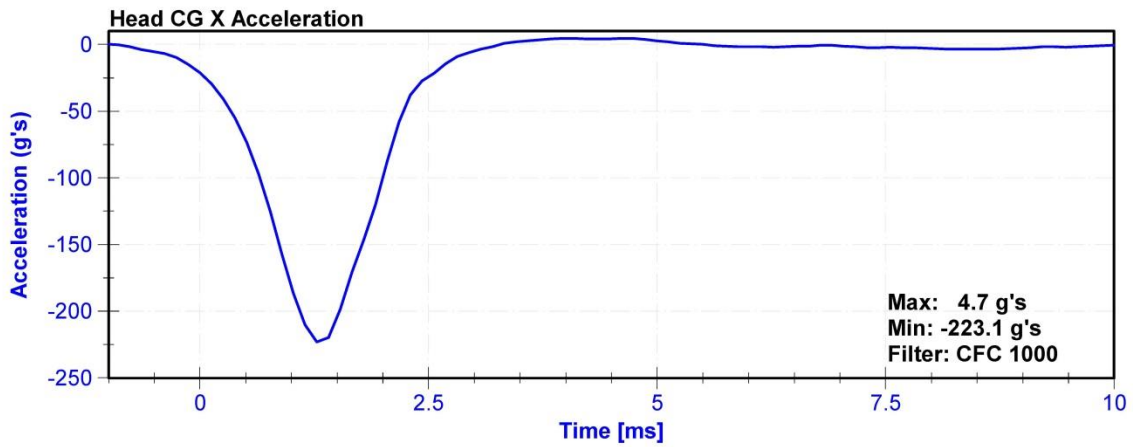
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	21.4	Pass
Resultant Acceleration	225	275	g's	254.7	Pass
Oscillation	0	10	%	2.4	Pass
Lateral Acceleration	-15	15	g's	12.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	12/19/2014	6/19/2015
Y Accelerometer	ENDEVCO 7264	AC-P12359	12/19/2014	6/19/2015
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	12/19/2014	6/19/2015





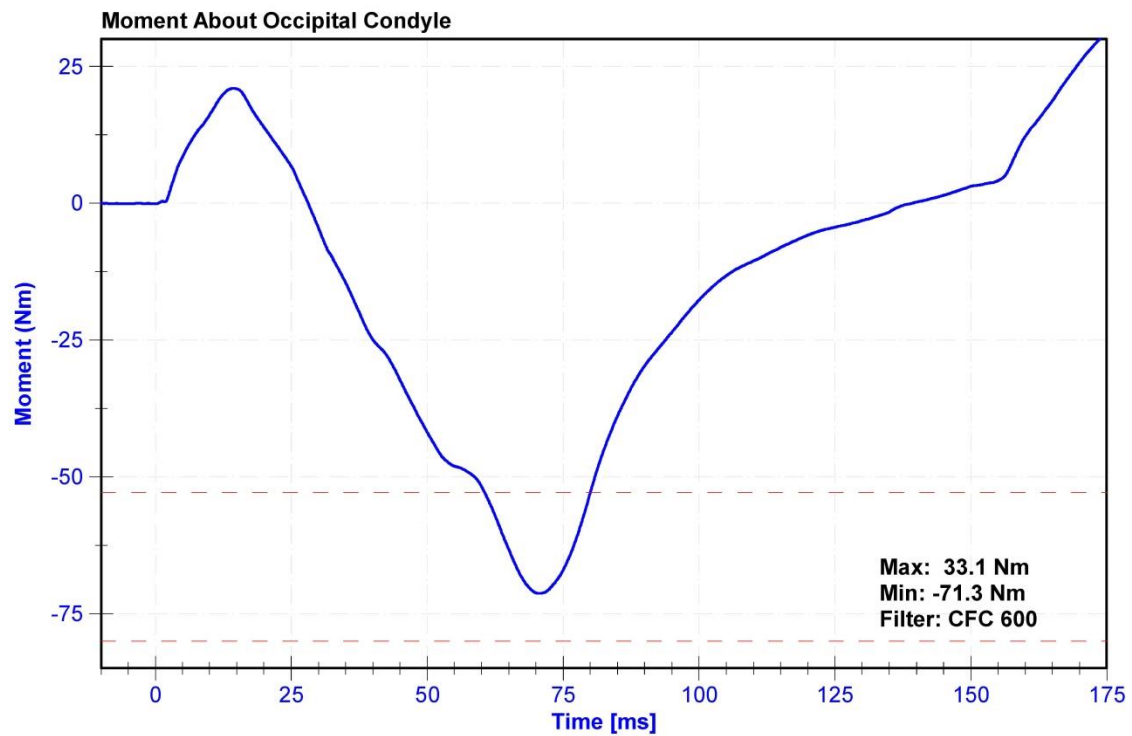
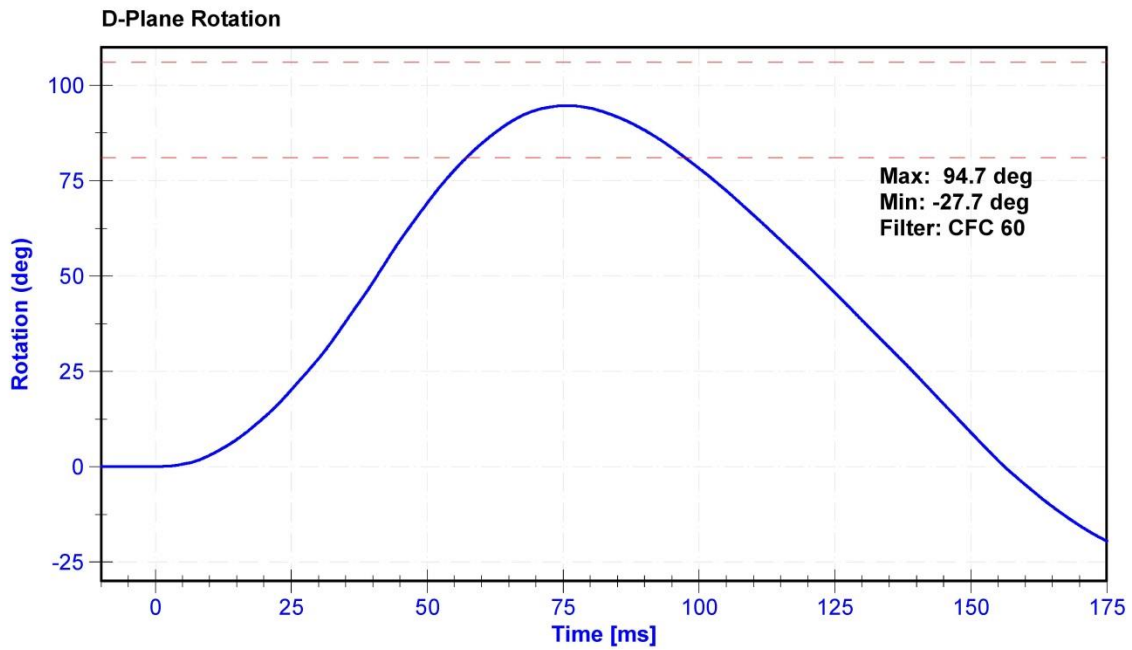
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

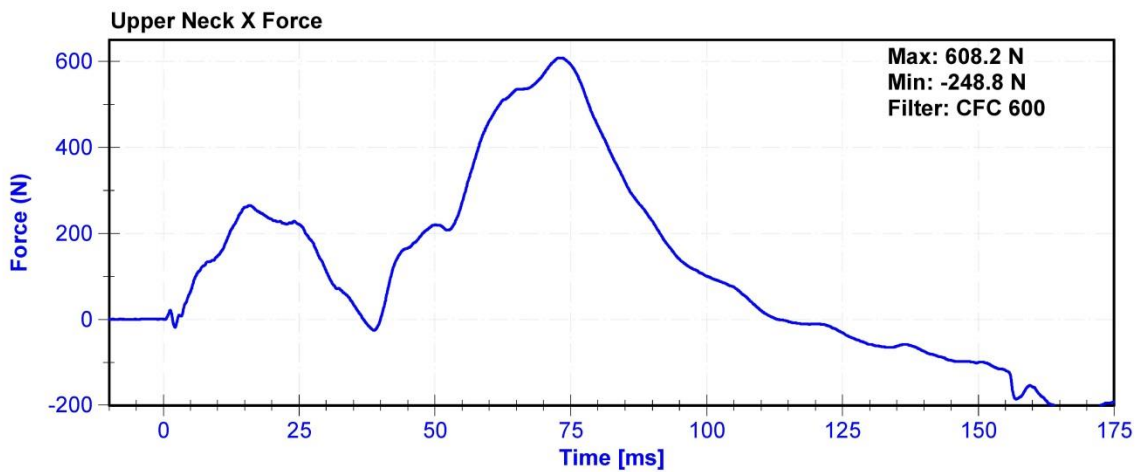
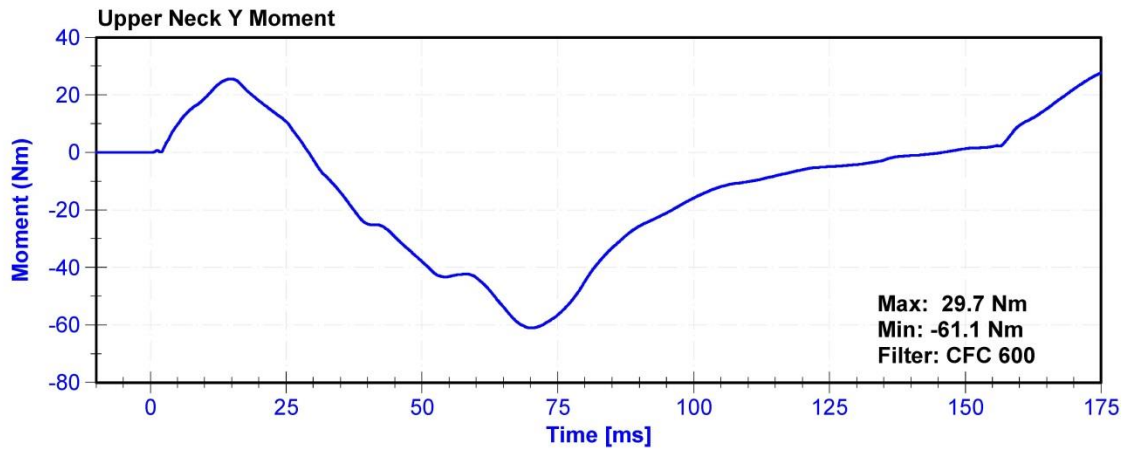
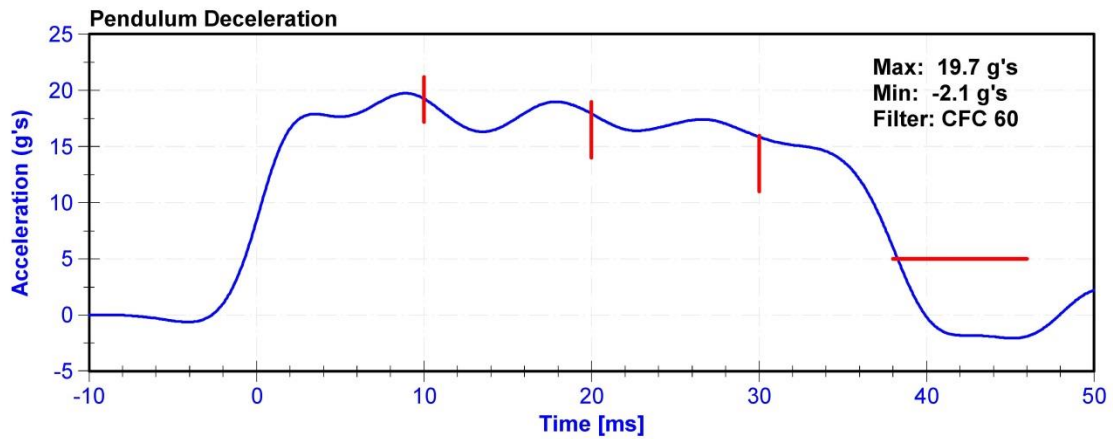
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	14.8	Pass
Velocity	5.94	6.19	m/s	6.025	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.26	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.9	Pass
Pendulum Deceleration at 30ms	11	16	g's	15.9	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.7	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	38.3	Pass
D Plane Rotation	81	106	deg	94.7	Pass
Time at Maximum Rotation	72	82	ms	75.8	Pass
Rotation Decay to Zero	147	174	ms	156.3	Pass
Moment About Occipital Condyle	-80	-52.9	Nm	-71.33	Pass
Time at Minimum Moment	65	79	ms	70.7	Pass
Moment Decay to Zero	120	148	ms	139.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	11/6/2014	11/6/2015
Pendulum Potentiometer	SP22G	DS-PendPot	9/16/2014	9/16/2015
Condyle Potentiometer	SP22G	DS-CondPot	2/21/2014	2/21/2015
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	8/7/2014	8/7/2015





ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

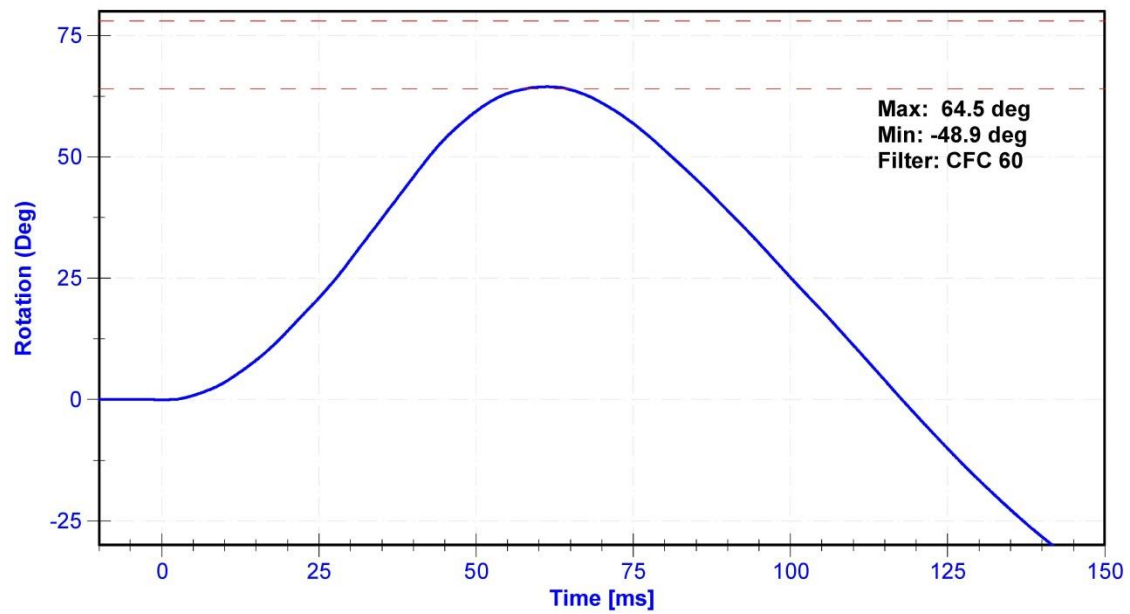
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	13.6	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	22.68	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	19.44	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	17.82	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	23.5	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	39.0	Pass
D Plane Rotation	64	78	deg	64.5	Pass
Time at Maximum Rotation	57	64	ms	61.3	Pass
Rotation Decay to Zero	113	127	ms	117.7	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	94.60	Pass
Time at Maximum Moment	47	58	ms	52.3	Pass
Moment Decay to Zero	97	107	ms	100.5	Pass

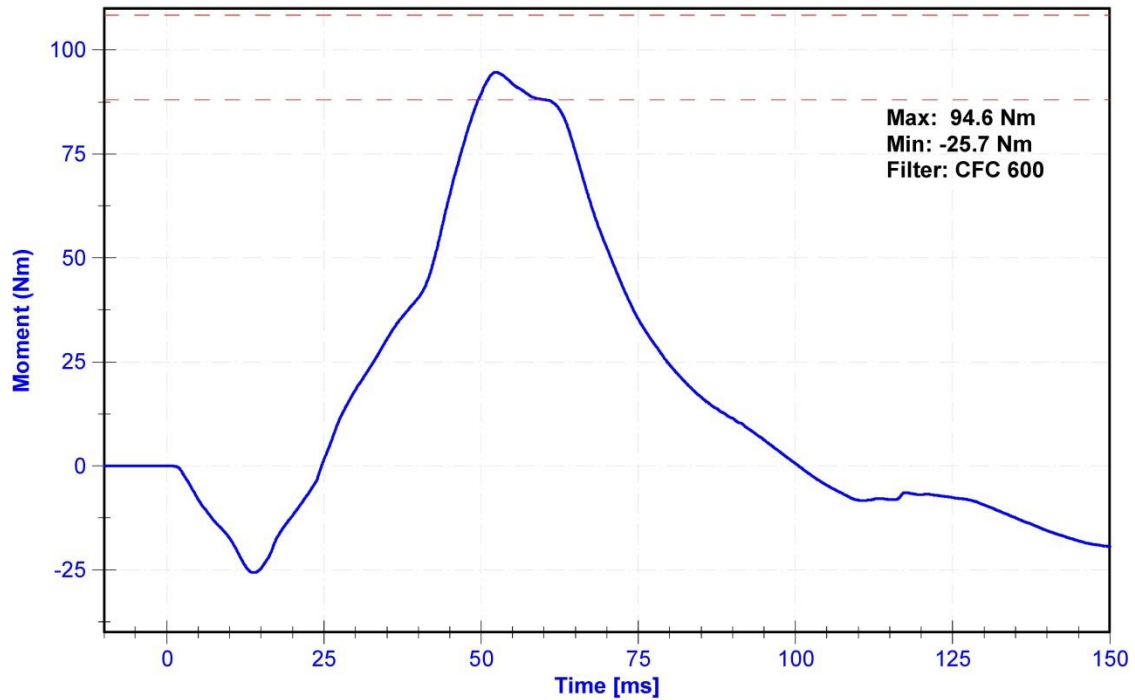
Transducer Calibrations

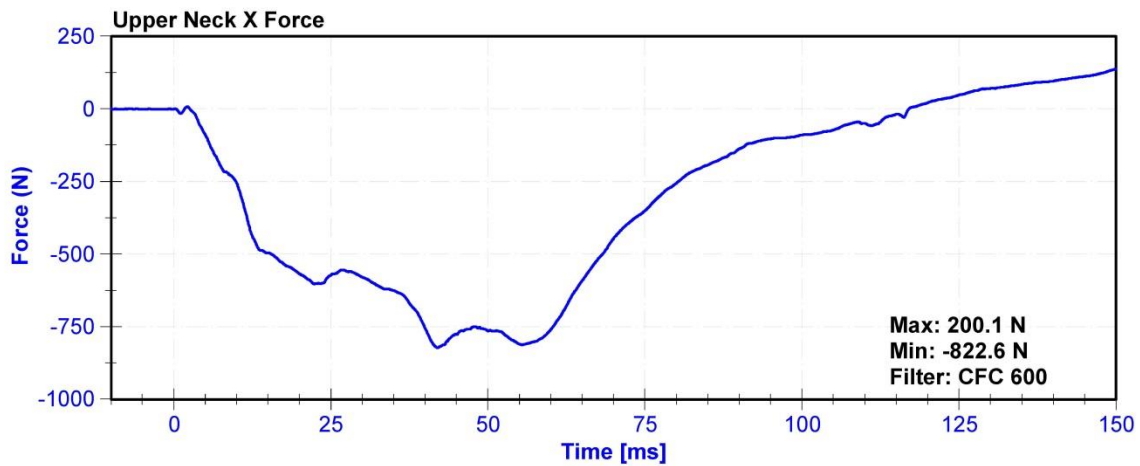
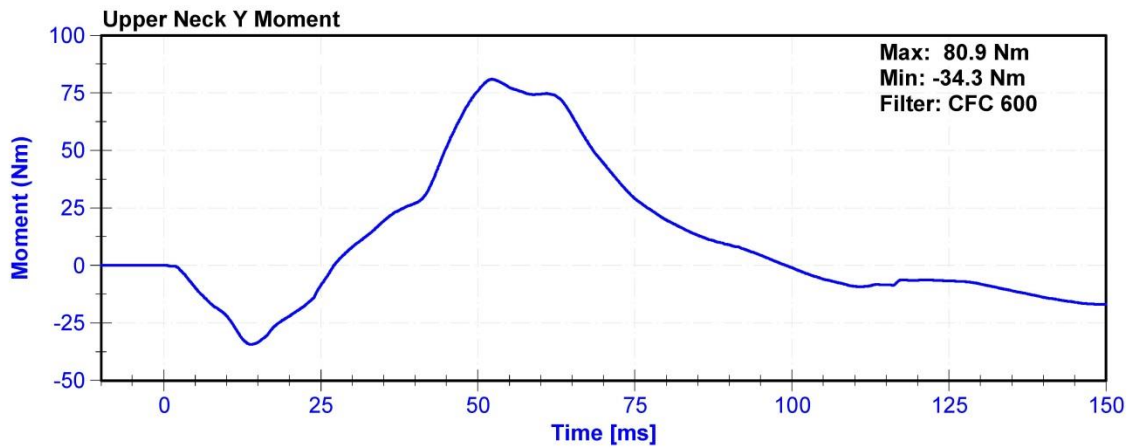
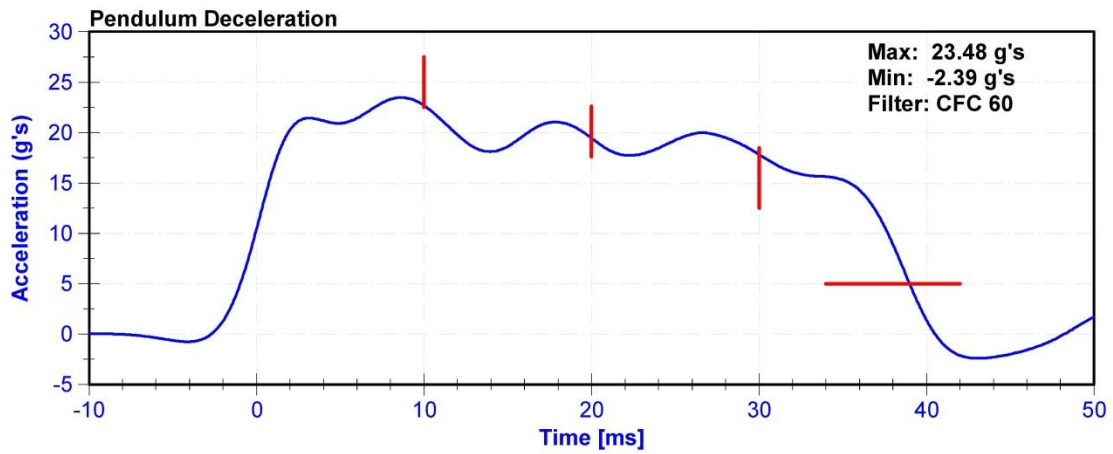
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	11/6/2014	11/6/2015
Pendulum Potentiometer	SP22G	DS-PendPot	9/16/2014	9/16/2015
Condyle Potentiometer	SP22G	DS-CondPot	2/21/2014	2/21/2015
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	8/7/2014	8/7/2015

D-Plane Rotation



Moment About Occipital Condyle





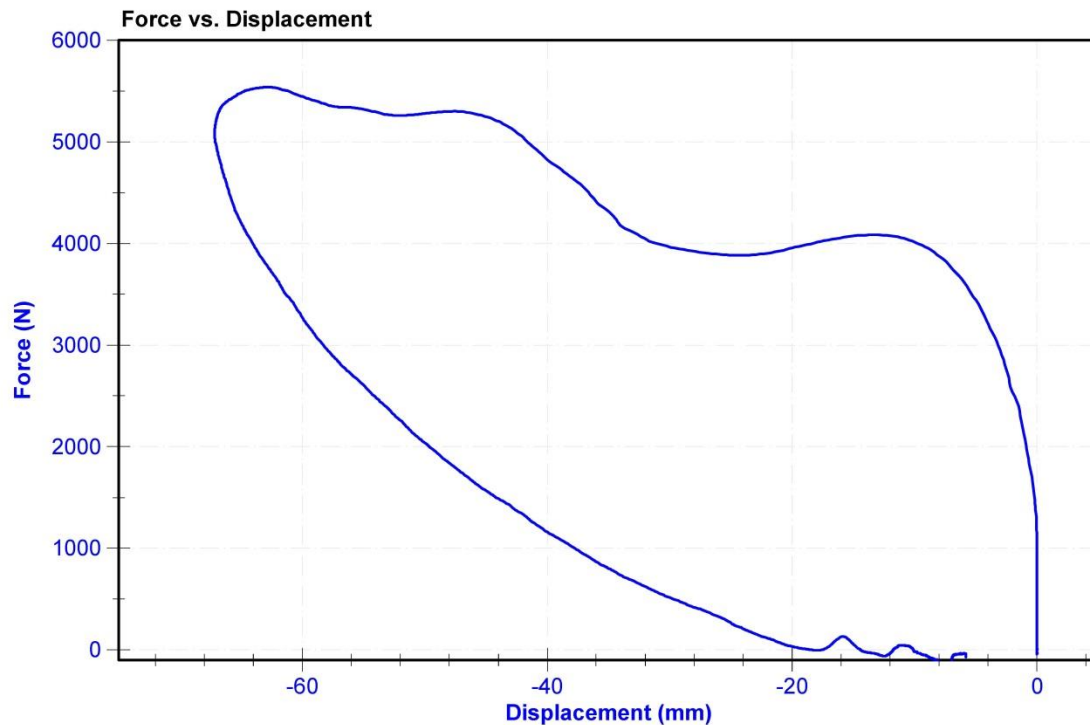
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

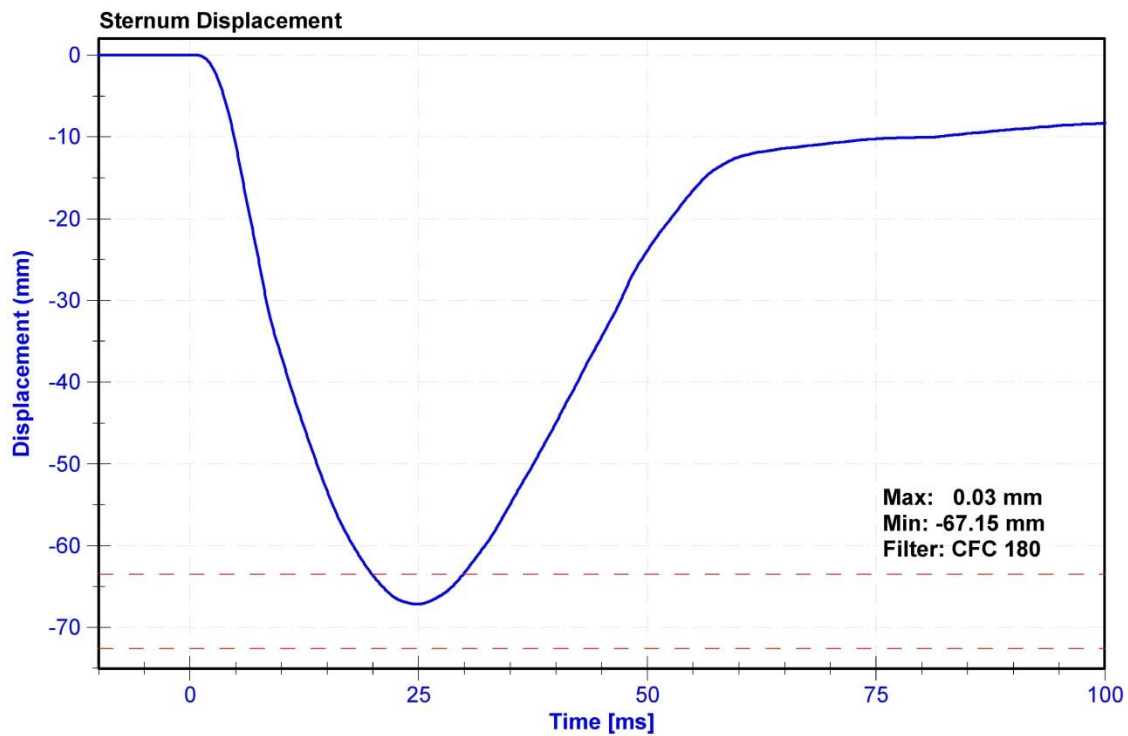
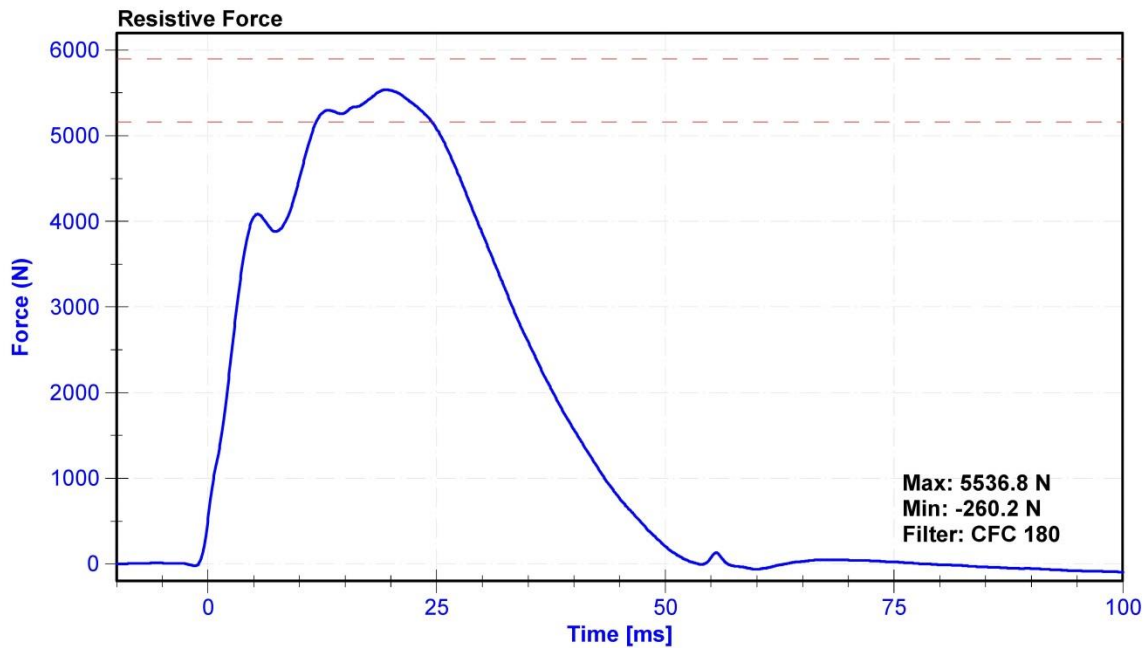
Results

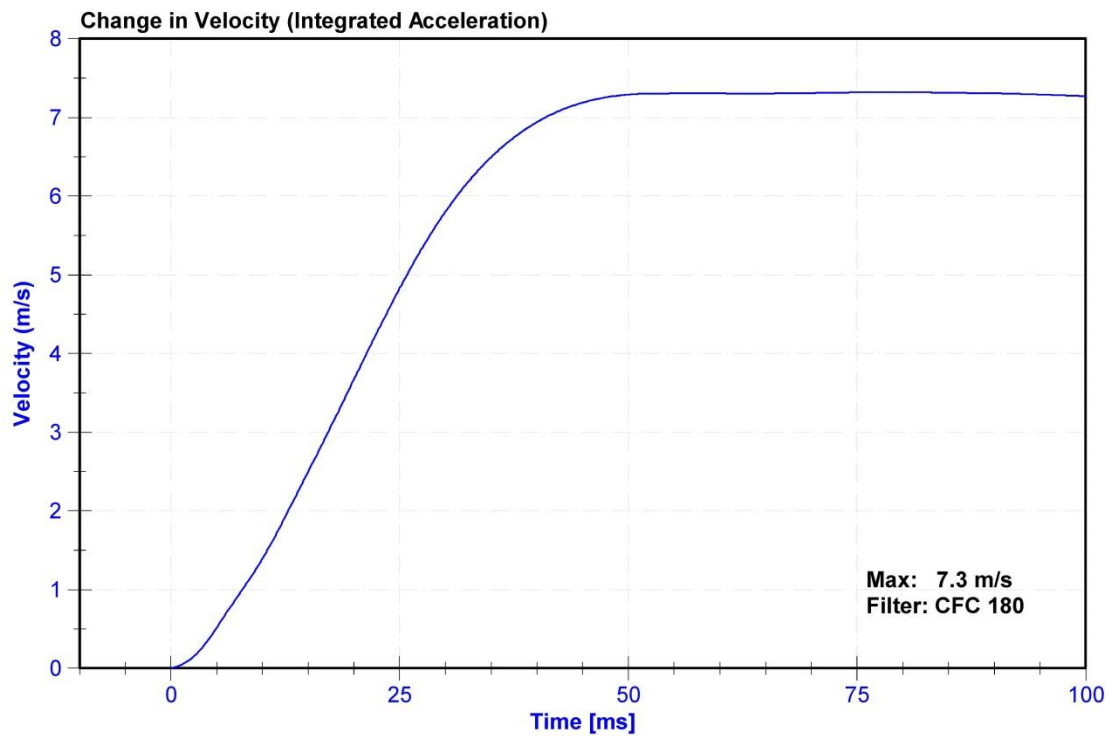
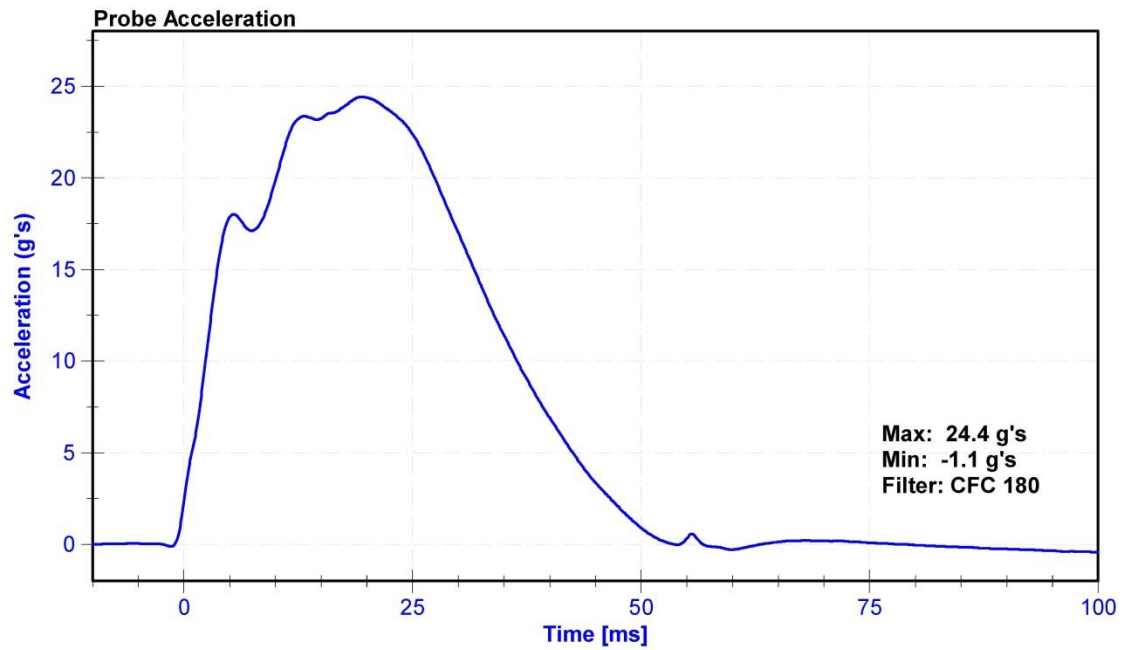
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	16.6	Pass
Velocity	6.59	6.83	m/s	6.773	Pass
Chest Displacement	-72.6	-63.5	mm	-67.15	Pass
Resistive Force	5,160	5,894	N	5536.8	Pass
Hysteresis	69	85	%	72.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015
Chest Potentiometer	Servo 14CB1-2897	DS-1046	7/31/2014	7/31/2015







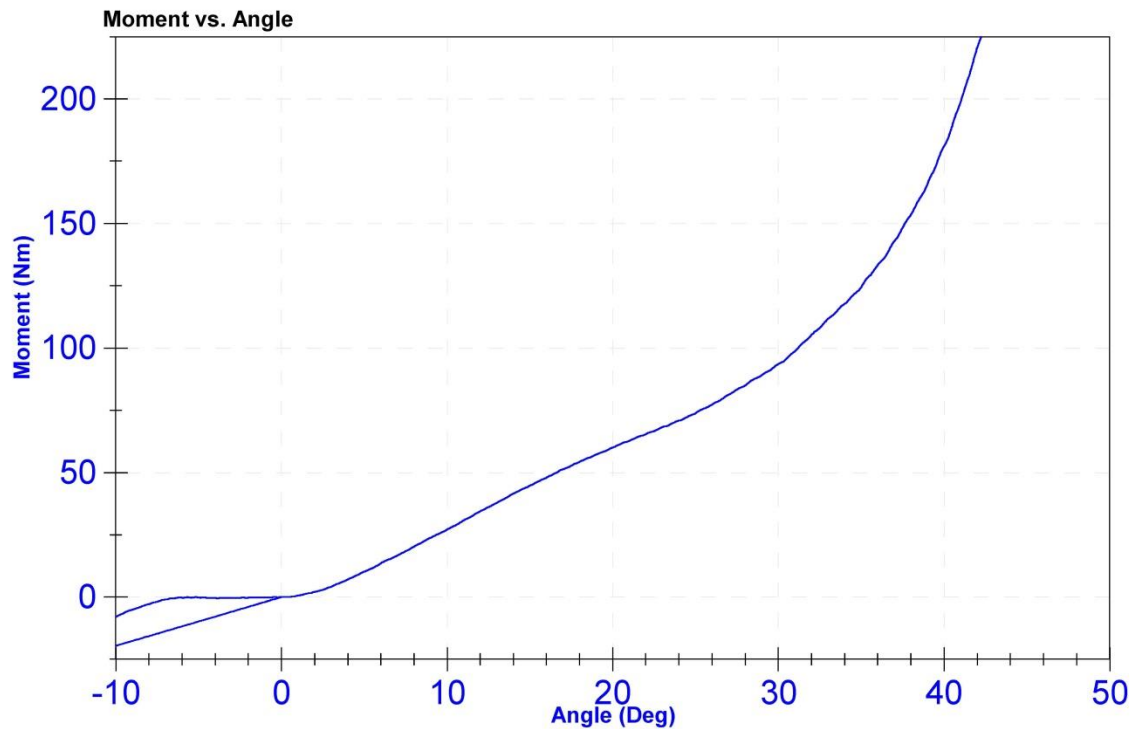
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	22.0	Pass
Humidity	10	70	%	13.5	Pass
Average Velocity	5	10	deg/s	5.1	Pass
Angle at 203Nm	40	50	deg	41.2	Pass
Moment at 30 degrees	0	94.9	Nm	93.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	DS-0008	2/20/2014	2/20/2015
Load Cell	Key Trans 2301-02	LC-115 My	3/25/2014	3/25/2015



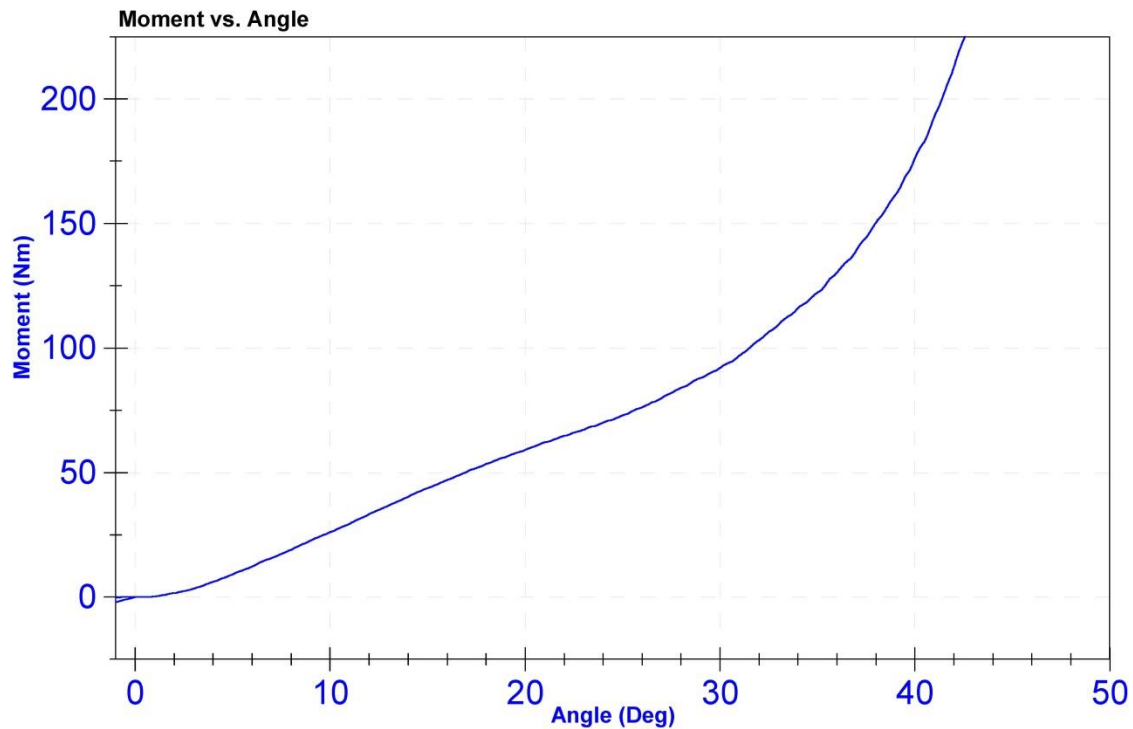
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	22.0	Pass
Humidity	10	70	%	13.5	Pass
Average Velocity	5	10	deg/s	5.4	Pass
Angle at 203Nm	40	50	deg	41.5	Pass
Moment at 30 degrees	0	94.9	Nm	92.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	DS-0008	2/20/2014	2/20/2015
Load Cell	Key Trans 2301-02	LC-115 My	3/25/2014	3/25/2015



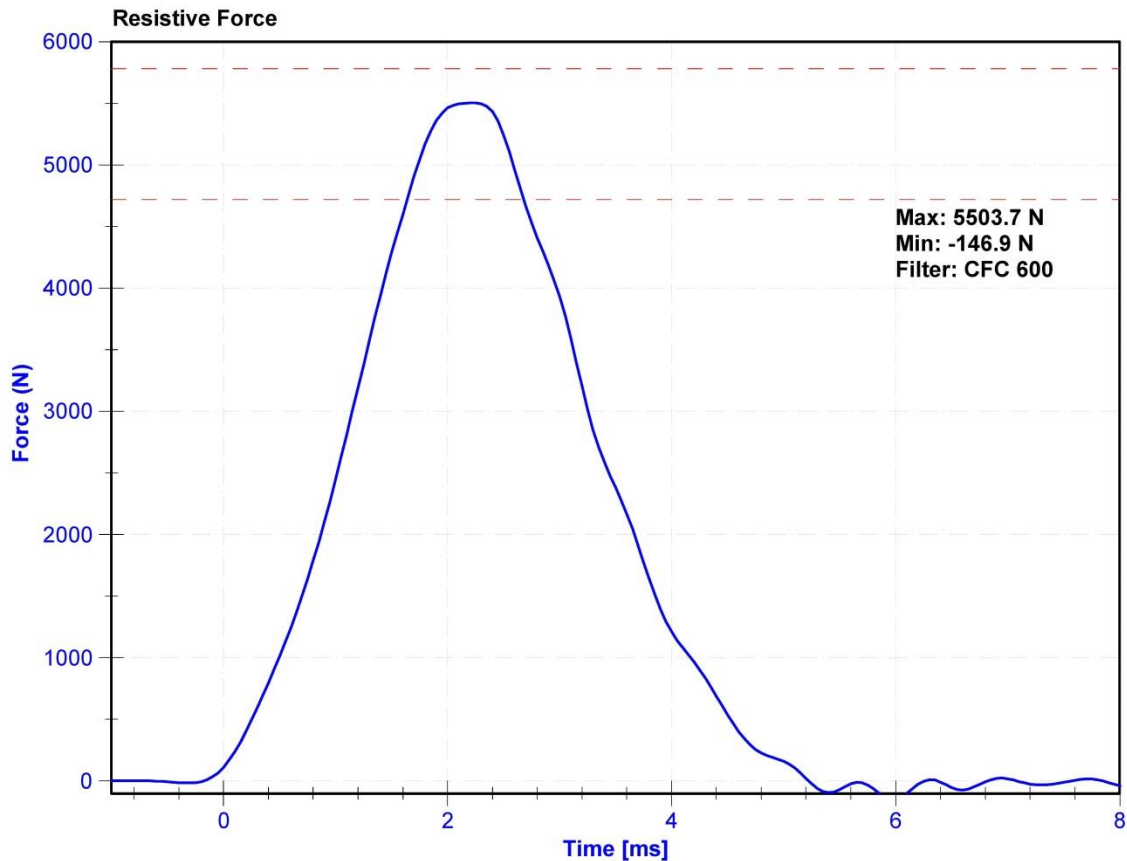
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ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

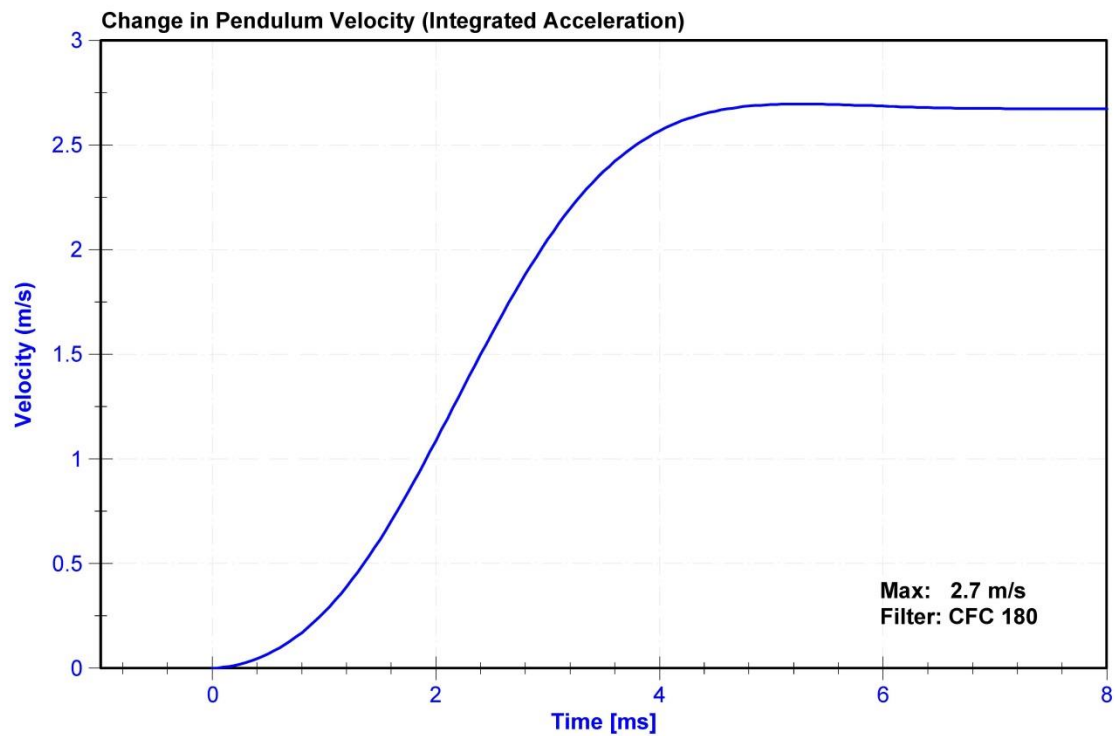
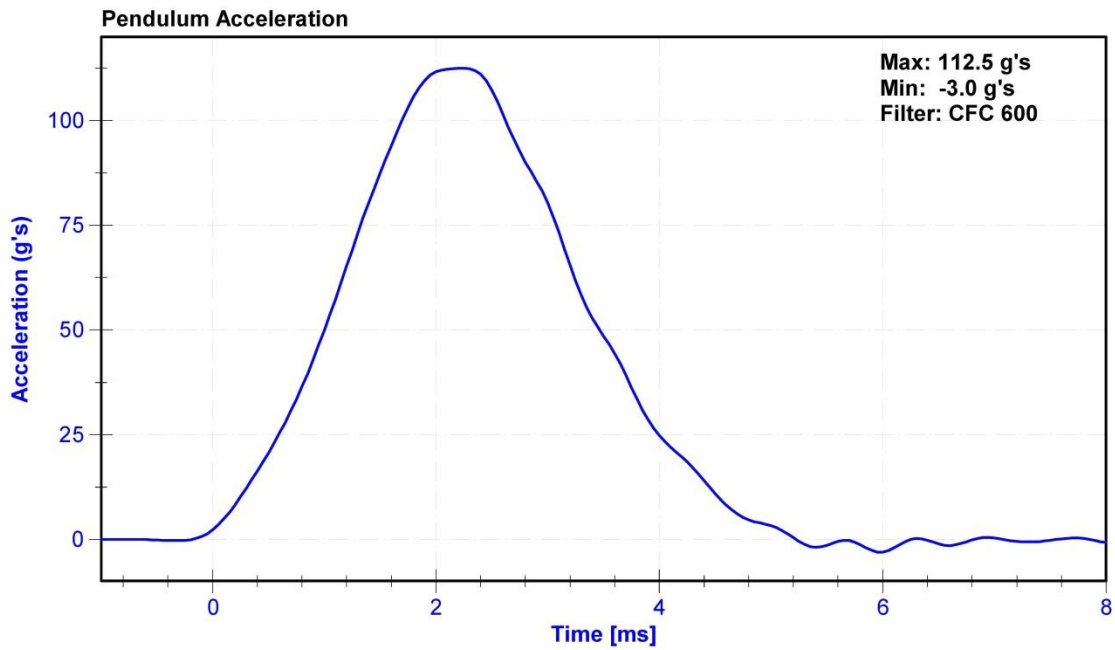
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	16.7	Pass
Velocity	2.07	2.13	m/s	2.128	Pass
Resistive Force	4,720	5,780	N	5503.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015





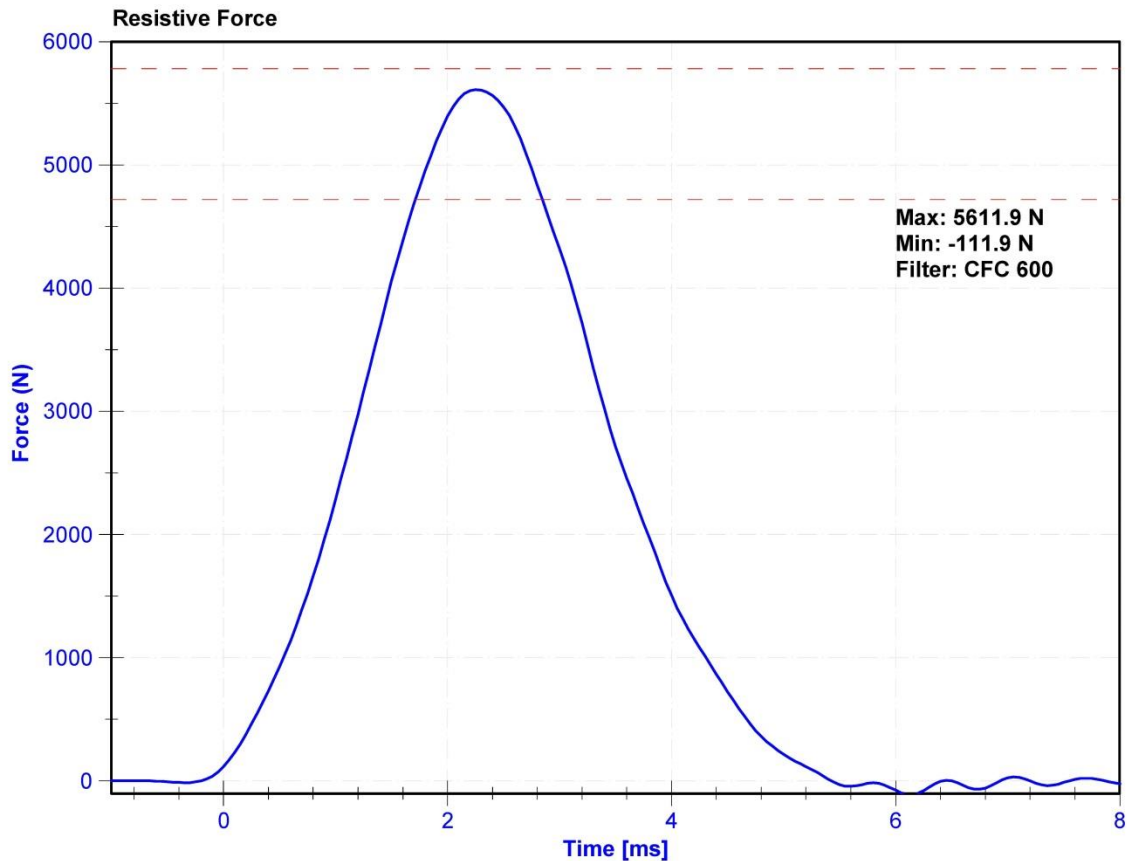
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

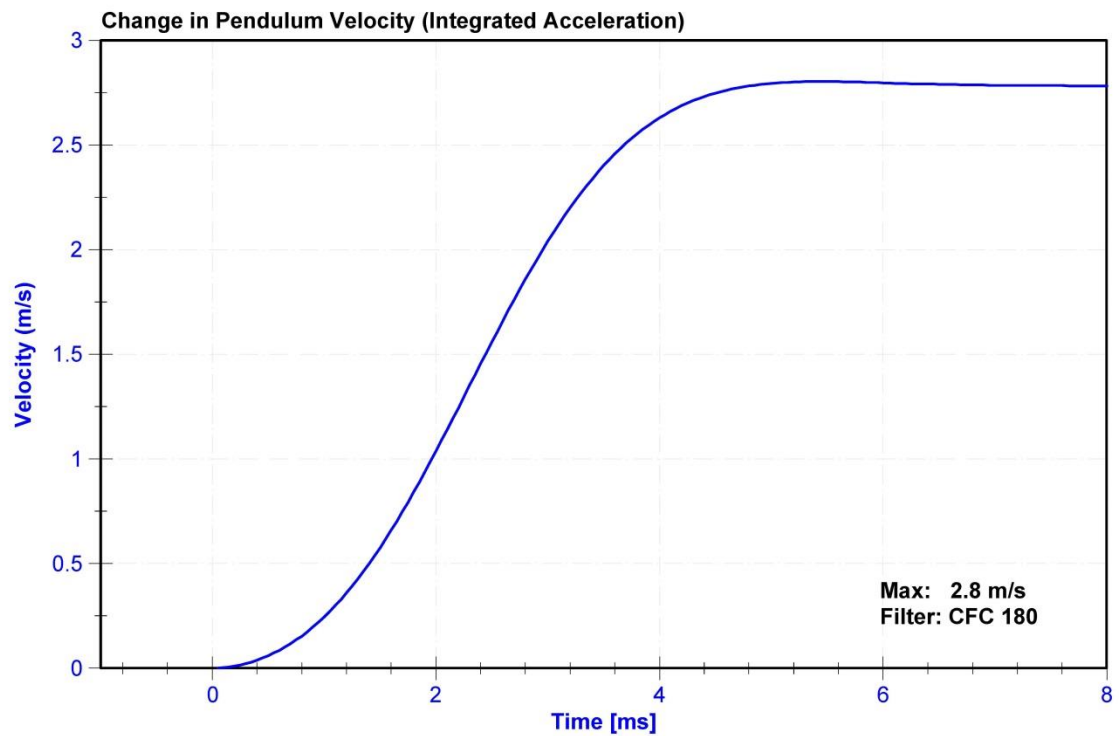
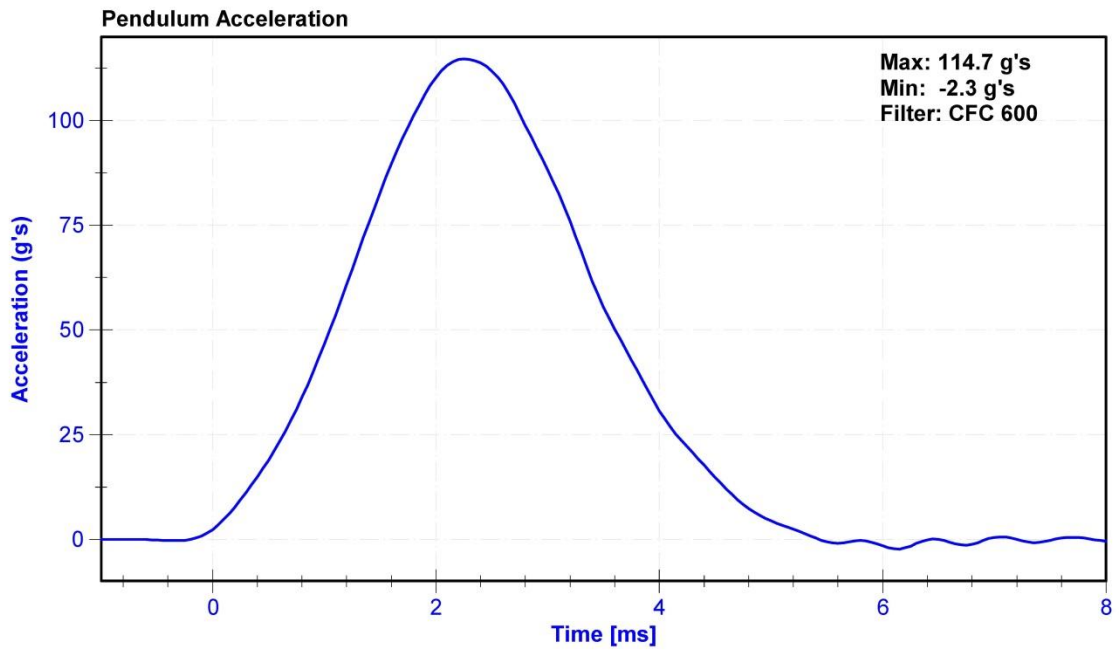
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	16.7	Pass
Velocity	2.07	2.13	m/s	2.096	Pass
Resistive Force	4,720	5,780	N	5611.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 139

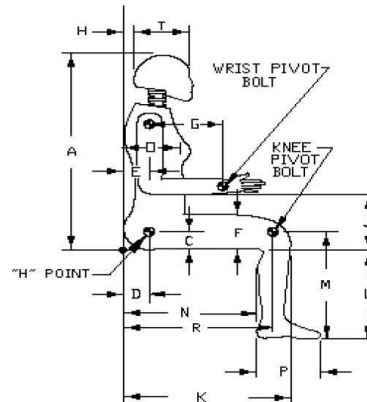
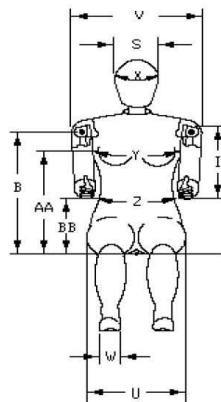


External Measurements - Hybrid 3 - 5th Female

Technician: M. Geesey

Date: 1/30/2015

Dummy Serial Number: 139



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	790	Pass
B	Shoulder Pivot Height	432	457	447	Pass
C	H-Point Height	81	86	85	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	74	Pass
F	Thigh Clearance	119	135	125	Pass
G	Back of Elbow to Wrist Pivot	244	259	248	Pass
H	Head Back to Backline	43	48	44	Pass
I	Shoulder to Elbow Length	277	297	291	Pass
J	Elbow Rest Height	183	203	186	Pass
K	Buttock to Knee Length	521	546	542	Pass
L	Popliteal Height	356	376	360	Pass
M	Knee Pivot Height	394	419	397	Pass
N	Buttock Popliteal Length	414	439	422	Pass
O	Chest Depth without Jacket	175	191	183	Pass
P	Foot Length (right)	219	234	219	Pass
R	Buttock To Knee Pivot Length	457	483	471	Pass
S	Head Breadth	137	437	140	Pass
T	Head Depth	178	188	181	Pass
U	Hip Breadth	300	315	301	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	82	Pass
X	Head Circumference	528	549	536	Pass
Y	Chest Circumference with Jacket	851	881	851	Pass
Z	Waist Circumference	460	790	771	Pass
AA	Reference Location (Chest Circumference)	333	358	356	Pass
BB	Reference Location (Waist Circumference)	160	170	170	Pass

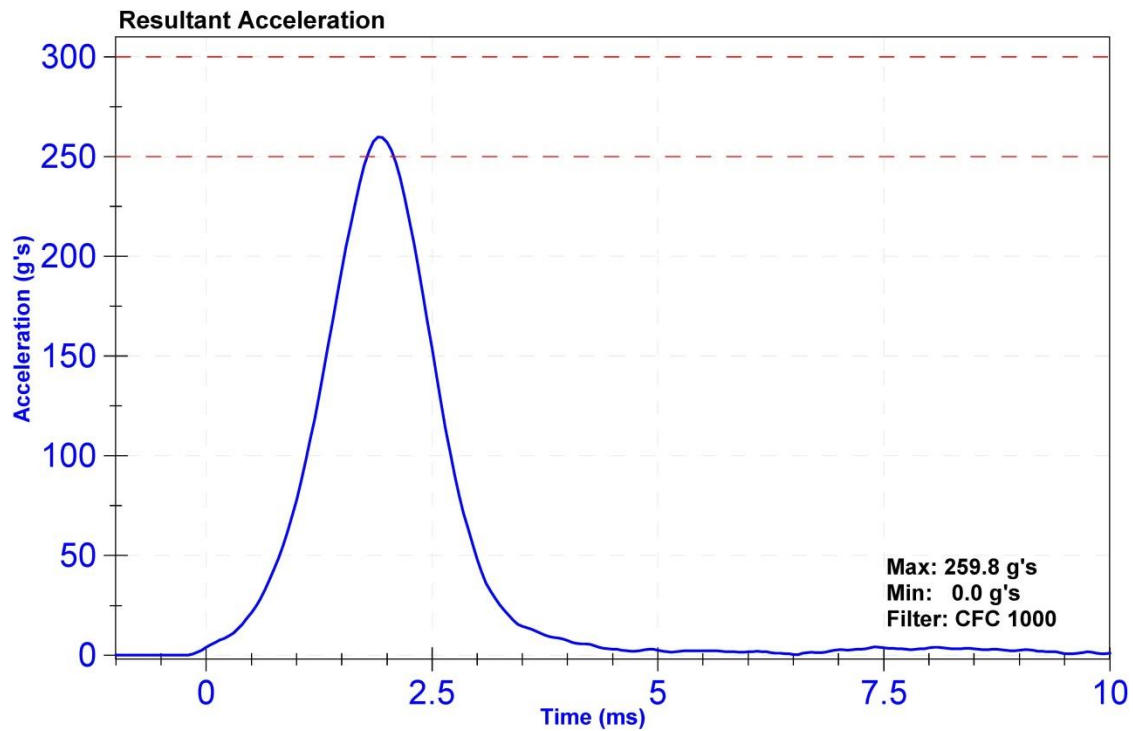
ATD Manufacturer	Denton	Test Technician	M. Goehle
ATD Serial Number	139	Laboratory Supervisor	M. Goehle

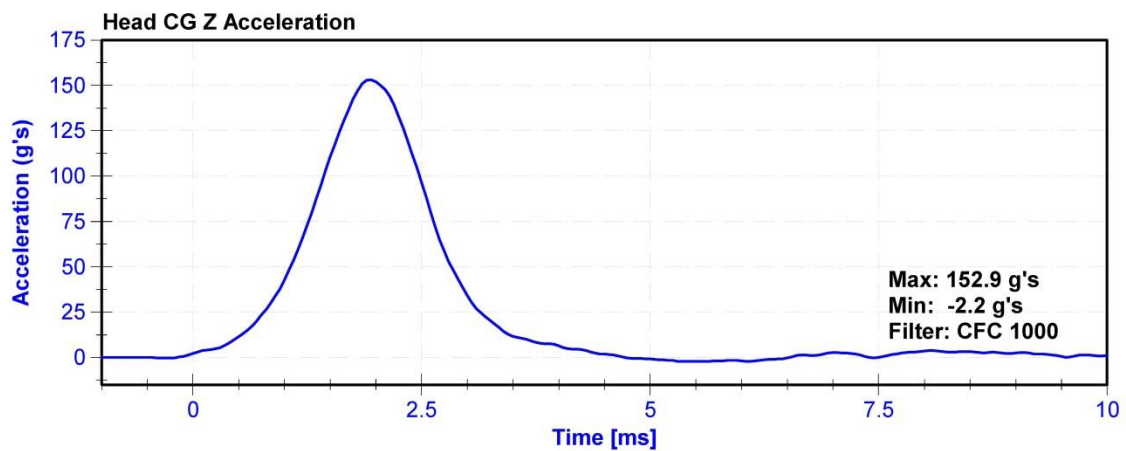
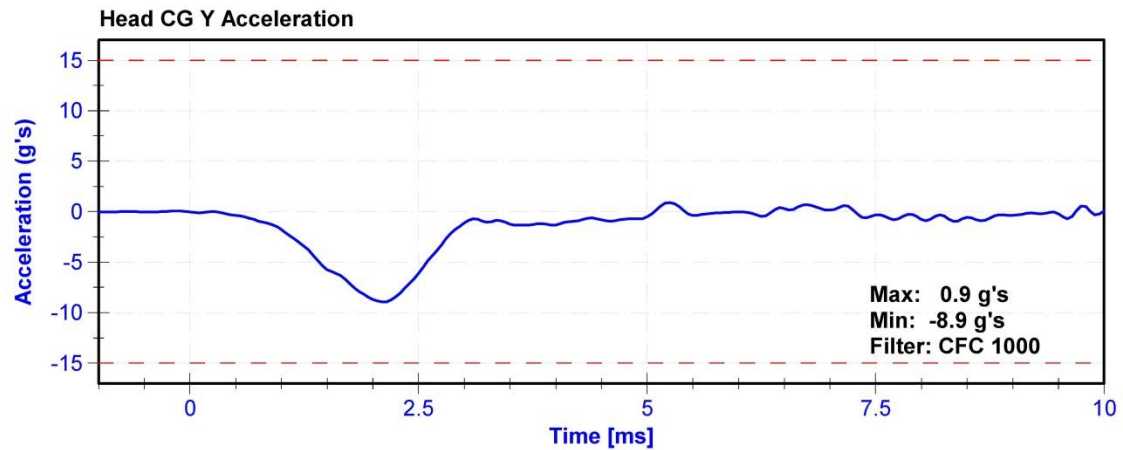
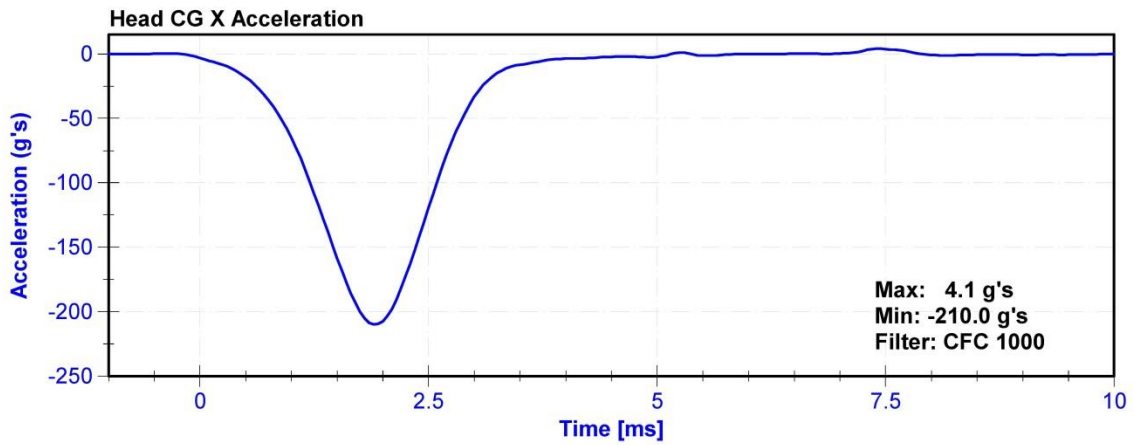
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.9	Pass
Humidity	10	70	%	16.8	Pass
Resultant Acceleration	250	300	g's	259.8	Pass
Oscillation	0	10	%	1.5	Pass
Lateral Acceleration	-15	15	g's	-8.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P52054	8/26/2014	2/24/2015
Y Accelerometer	ENDEVCO 7264	AC-P52007	8/26/2014	2/24/2015
Z Accelerometer	ENDEVCO 7264	AC-P51298	8/26/2014	2/24/2015





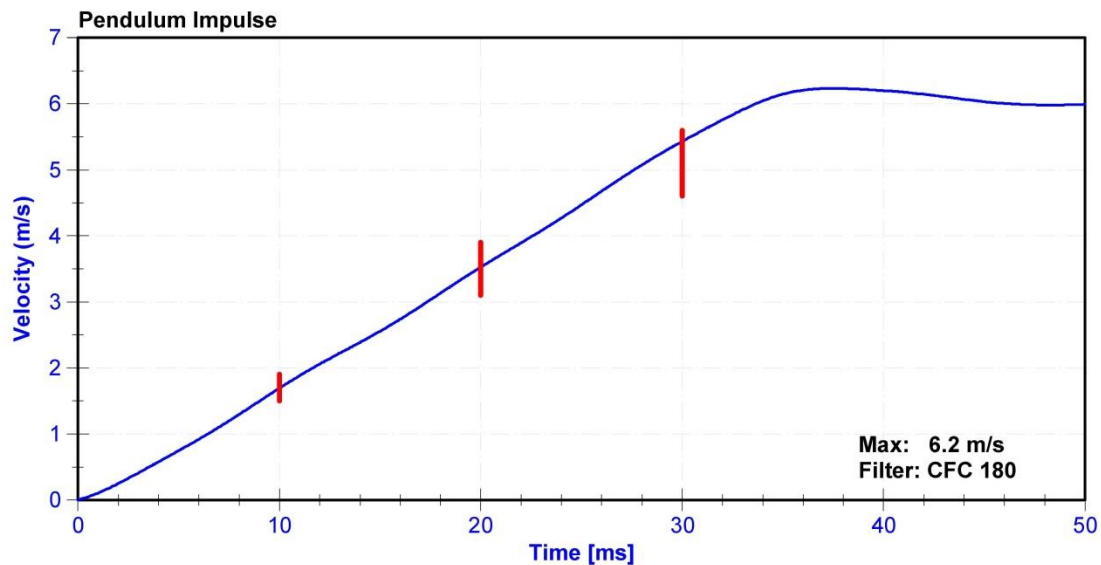
ATD Manufacturer	Denton	Test Technician	M. Geesey
ATD Serial Number	139	Laboratory Supervisor	M. Goehle

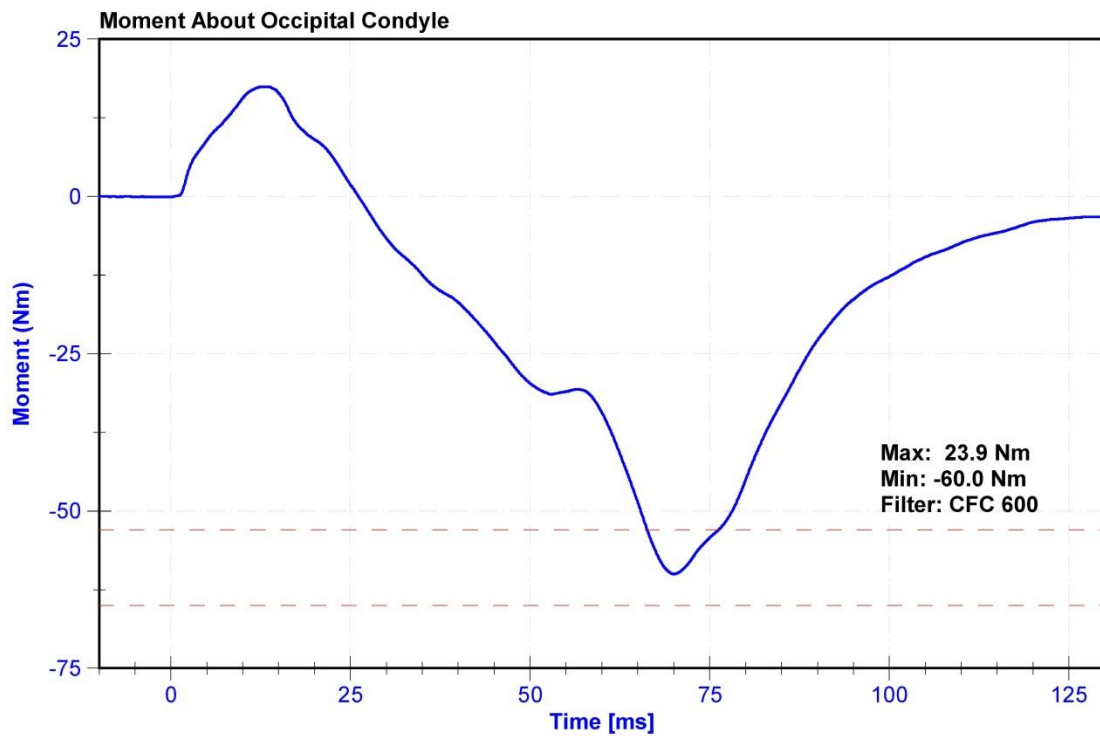
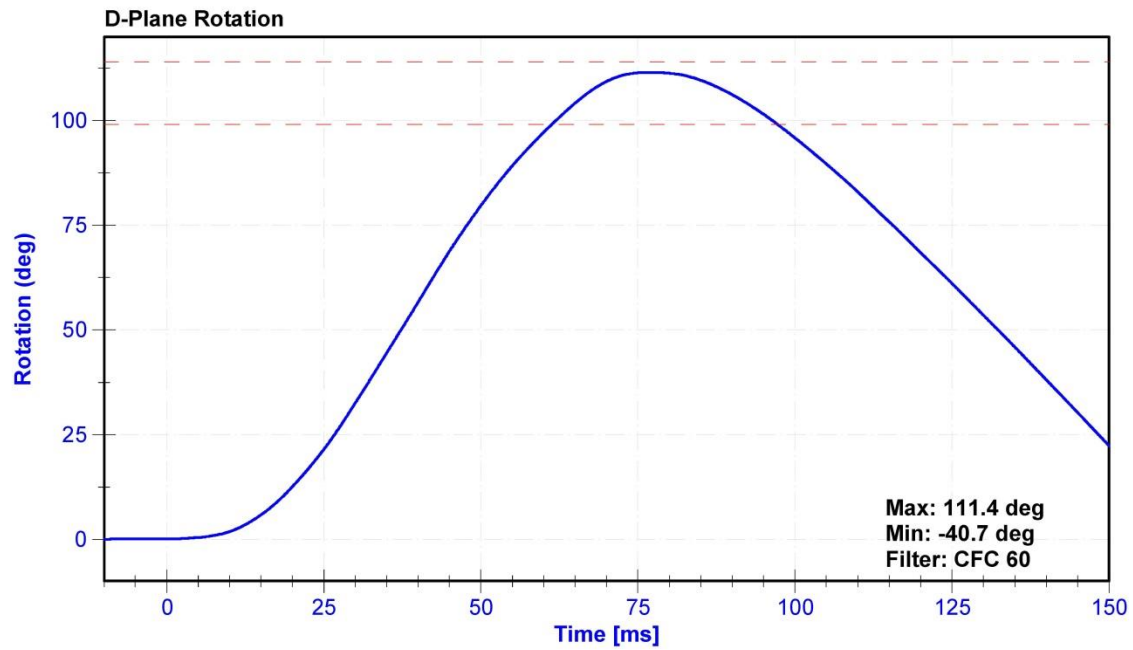
Results

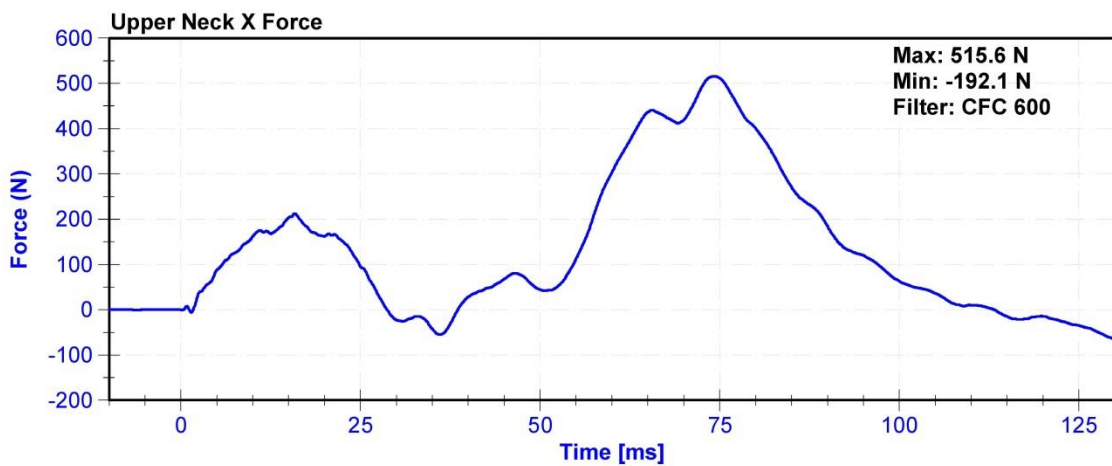
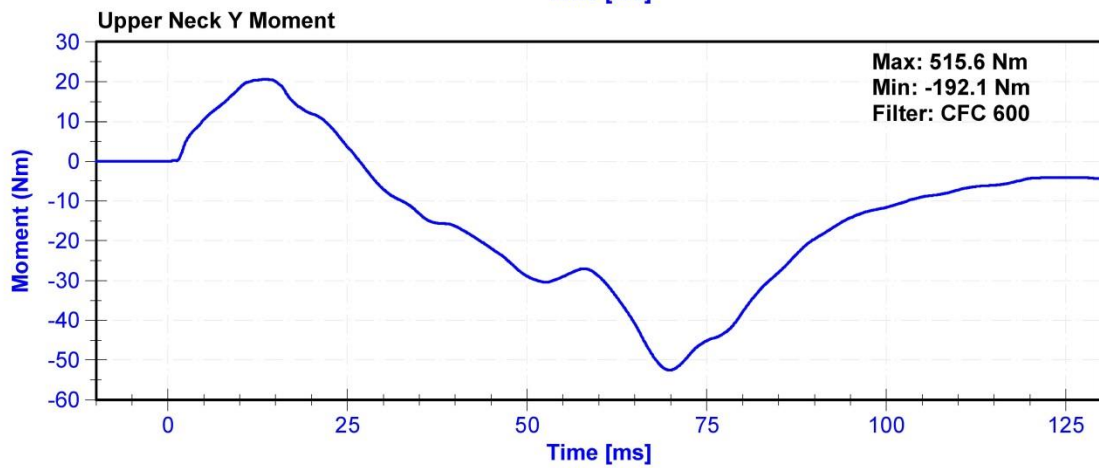
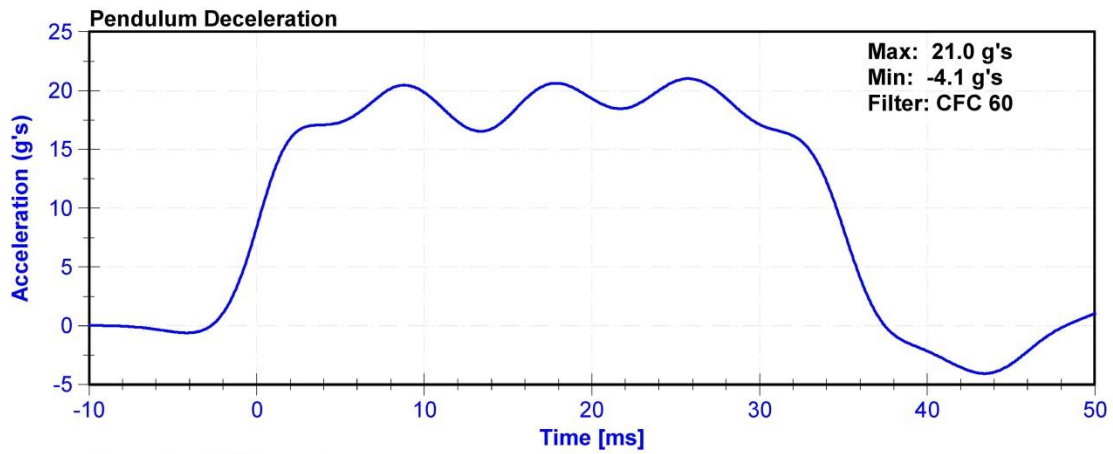
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	13.1	Pass
Velocity	5.96	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.69	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.53	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.43	Pass
D Plane Rotation	99	114	deg	111.4	Pass
Moment During Rotation Interval	-65	-53	Nm	-60.0	Pass
Moment Decay to -10Nm	94	114	ms	104.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	11/6/2014	11/6/2015
Pendulum Potentiometer	SP22G	DS-PendPot	9/16/2014	9/16/2015
Condyle Potentiometer	SP22G	DS-CondPot	2/21/2014	2/21/2015
Upper Neck Load Cell	Denton 1716A	LC-2019Fx	5/19/2014	5/19/2015







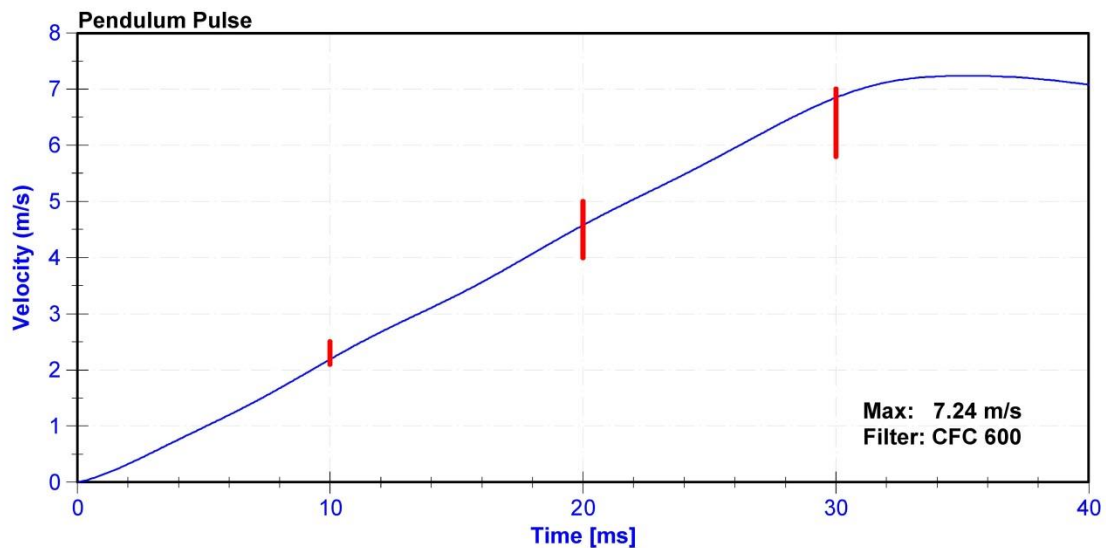
ATD Manufacturer	Denton	Test Technician	M. Geesey
ATD Serial Number	139	Laboratory Supervisor	M. Goehle

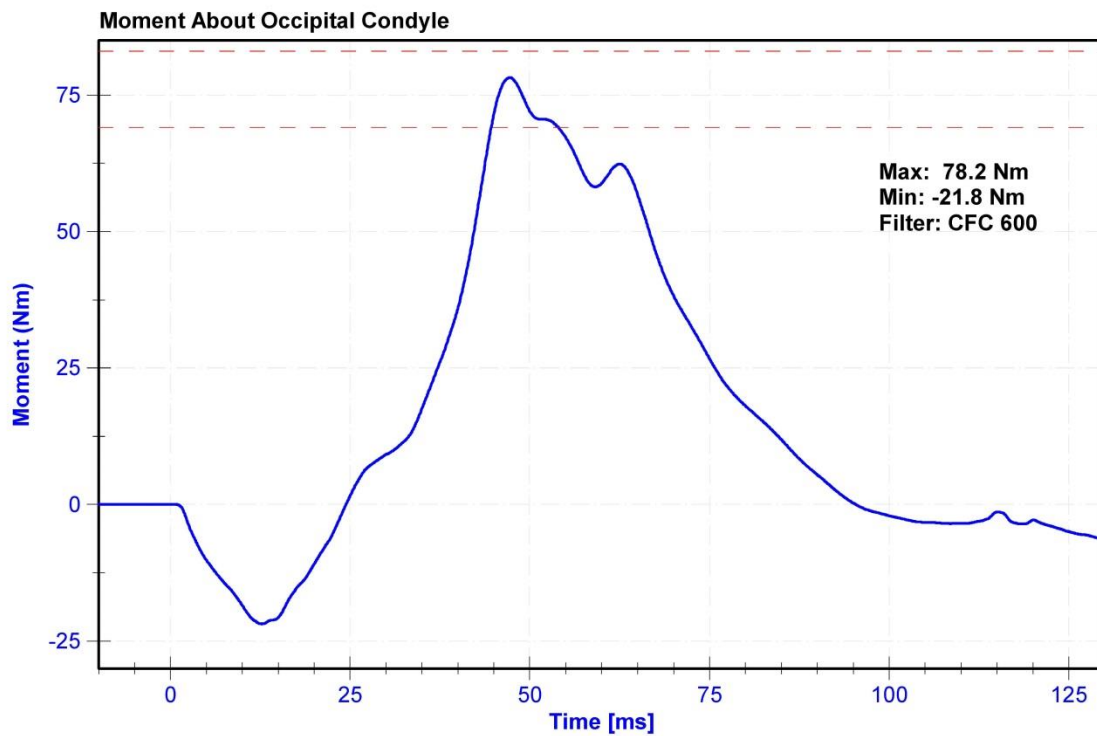
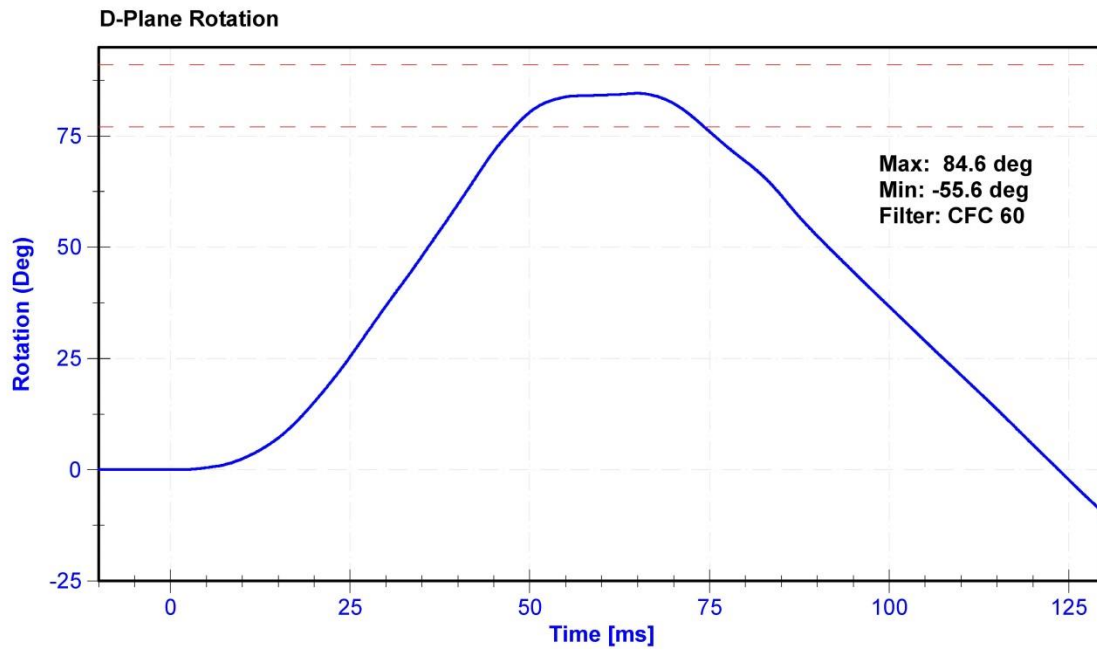
Results

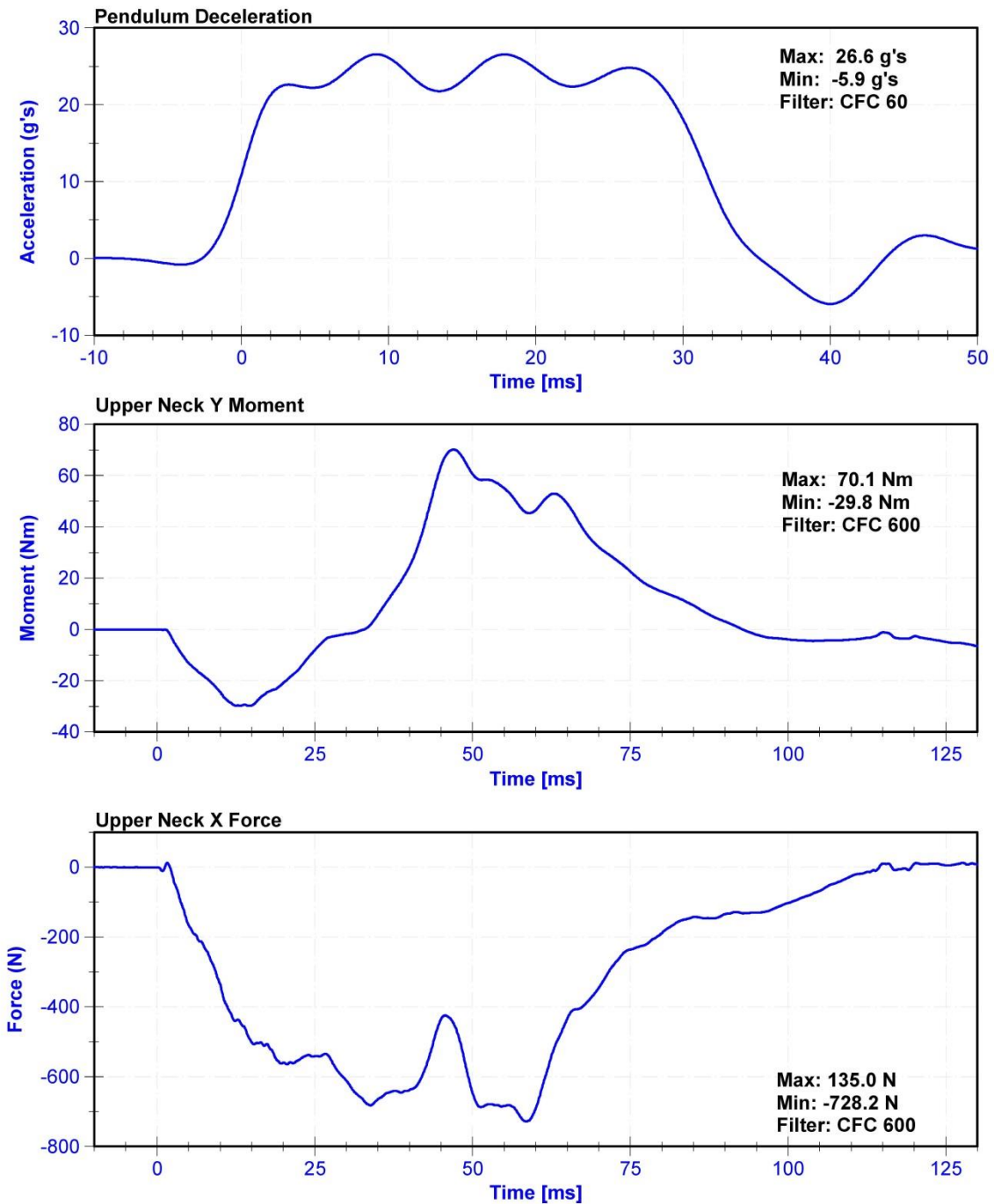
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	14.0	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.19	Pass
Pendulum Impulse at 20ms	4	5	m/s	4.58	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.85	Pass
D Plane Rotation	77	91	deg	84.6	Pass
Moment During Rotation Interval	69	83	Nm	78.2	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	11/6/2014	11/6/2015
Pendulum Potentiometer	SP22G	DS-PendPot	9/16/2014	9/16/2015
Condyle Potentiometer	SP22G	DS-CondPot	2/21/2014	2/21/2015
Upper Neck Load Cell	Denton 1716A	LC-2018Fx	5/1/2014	5/1/2015







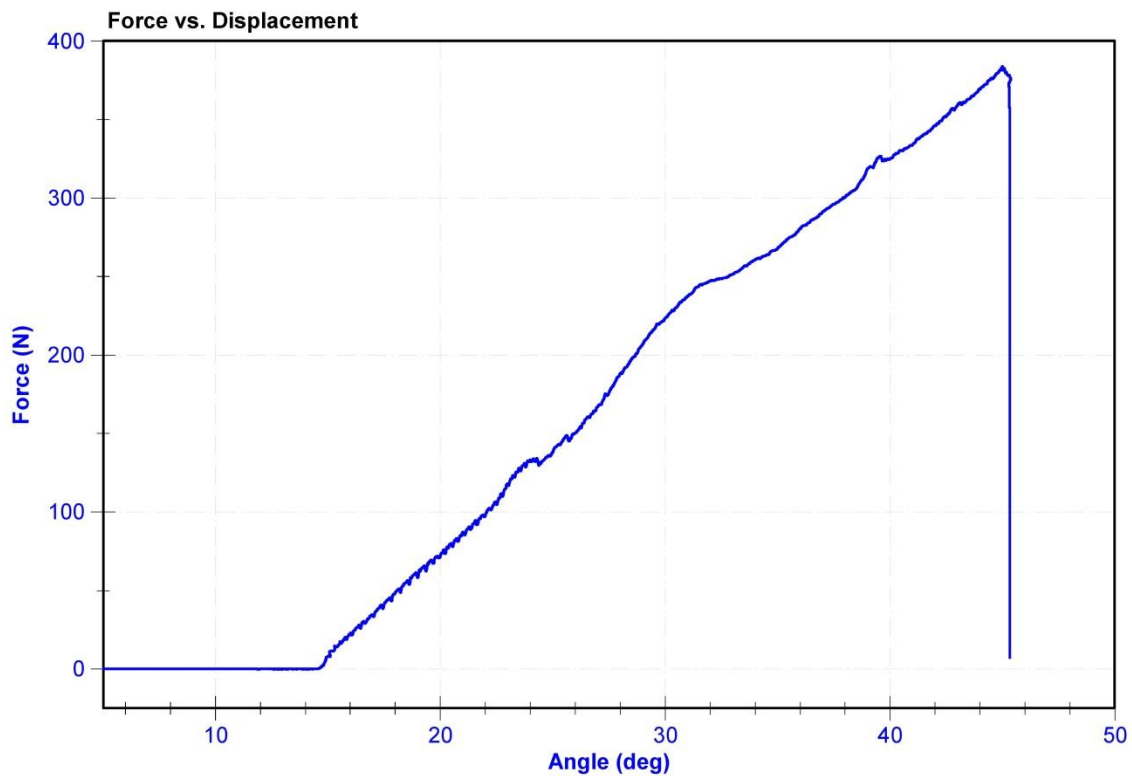
ATD Manufacturer	Denton	Test Technician	M. Goehle
ATD Serial Number	139	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.9	Pass
Humidity	10	70	%	16.0	Pass
Initial Angle	0	20	deg	13.4	Pass
Force at 45 Degrees	320	390	N	381.4	Pass
Return Angle	0	8	deg	7.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	8/1/2014	8/1/2015
Load Cell	Interface SML-200	LC-493319	8/13/2014	8/13/2015



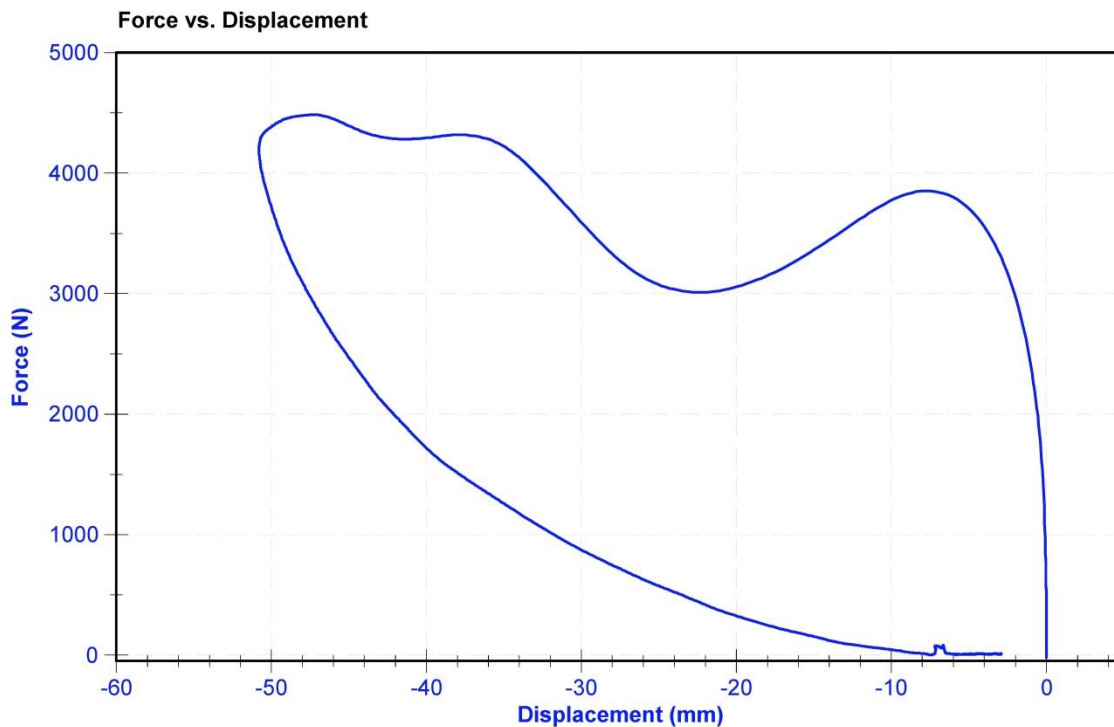
ATD Manufacturer	Denton	Test Technician	M. Geesey
ATD Serial Number	139	Laboratory Supervisor	M. Goehle

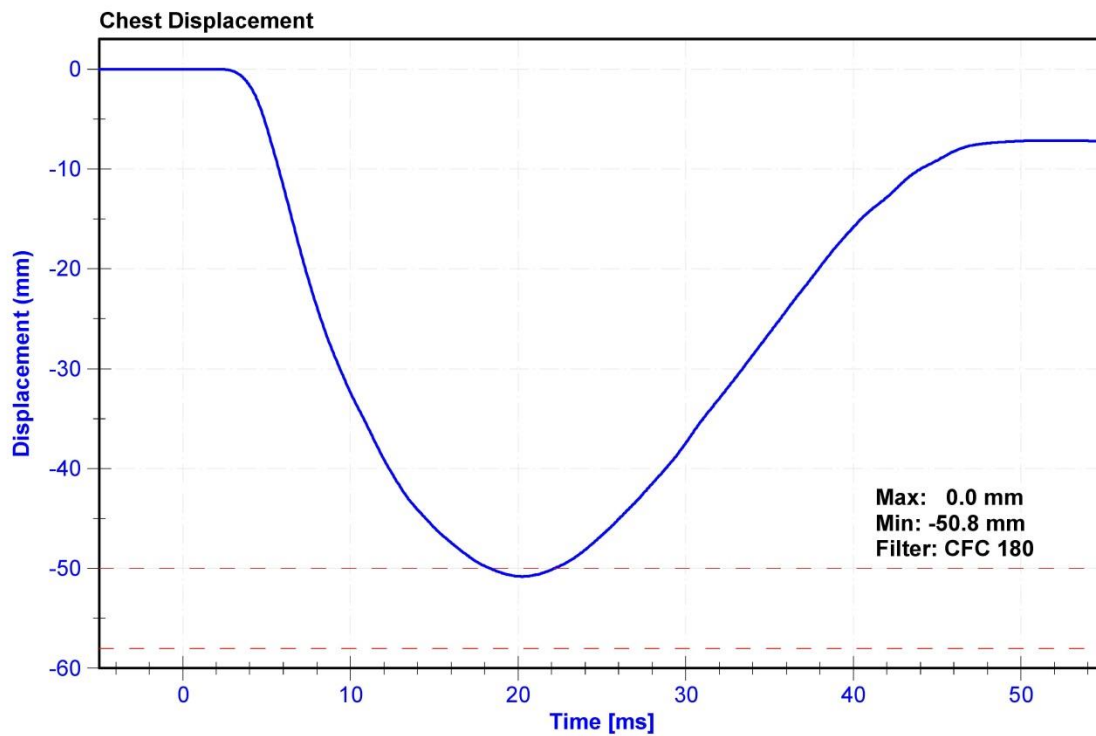
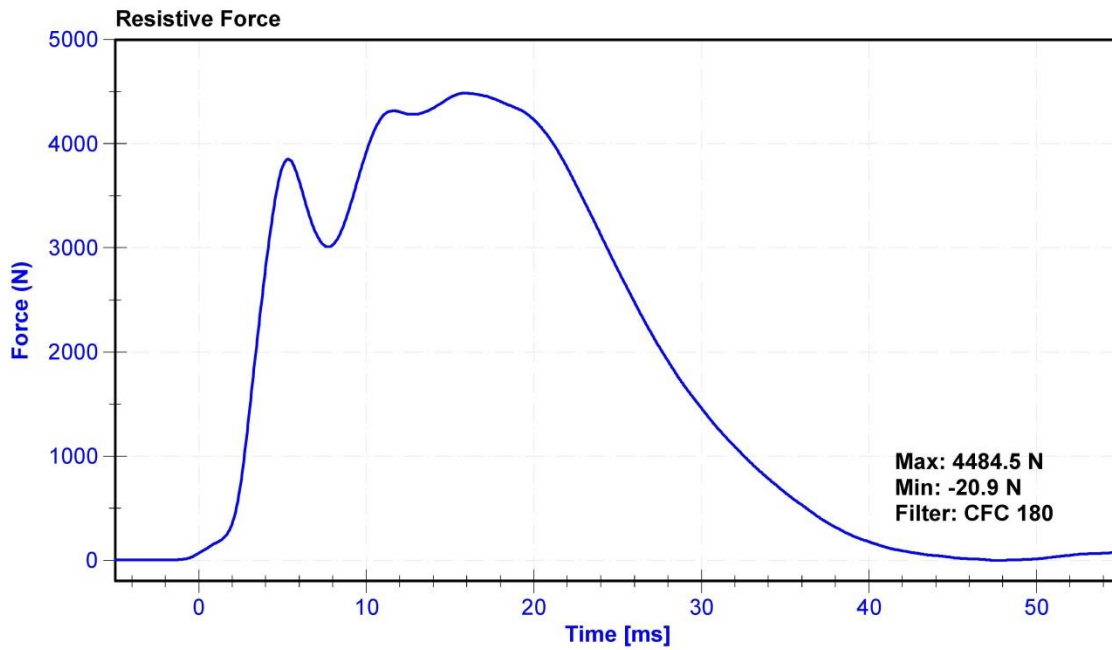
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	15.4	Pass
Velocity	6.59	6.83	m/s	6.76	Pass
Chest Displacement	-58	-50	mm	-50.8	Pass
Force During Displacement Interval	3,900	4,400	N	4374.9	Pass
Force During -18 to 50mm Displacement	0	4,600	N	4484.5	Pass
Hysteresis	69	85	%	74.0	Pass

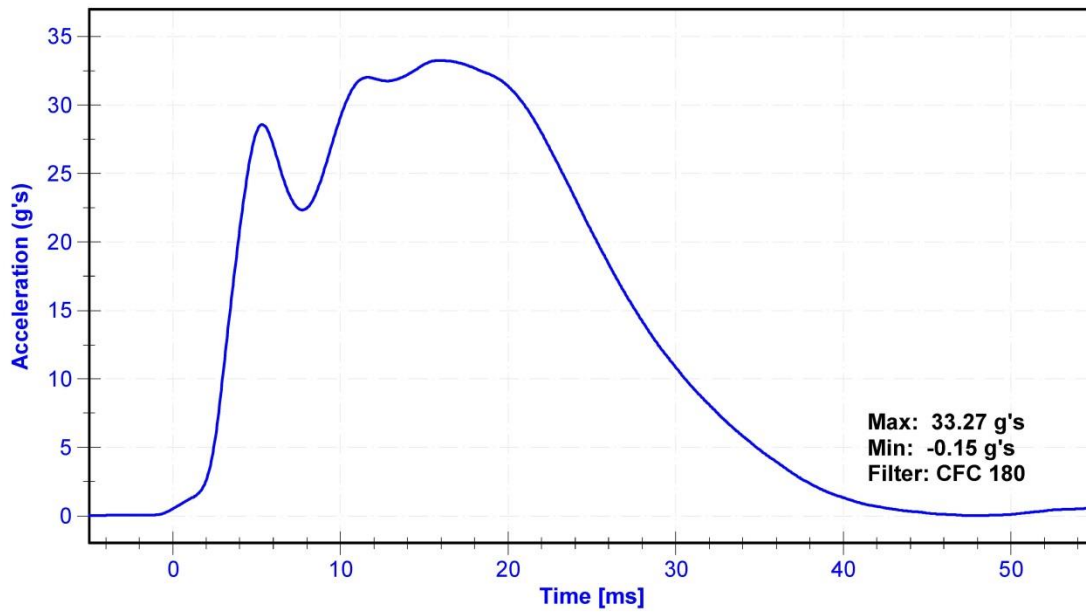
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015
Chest Potentiometer	Servo 14CBI-3615	DS-139	7/31/2014	7/31/2015

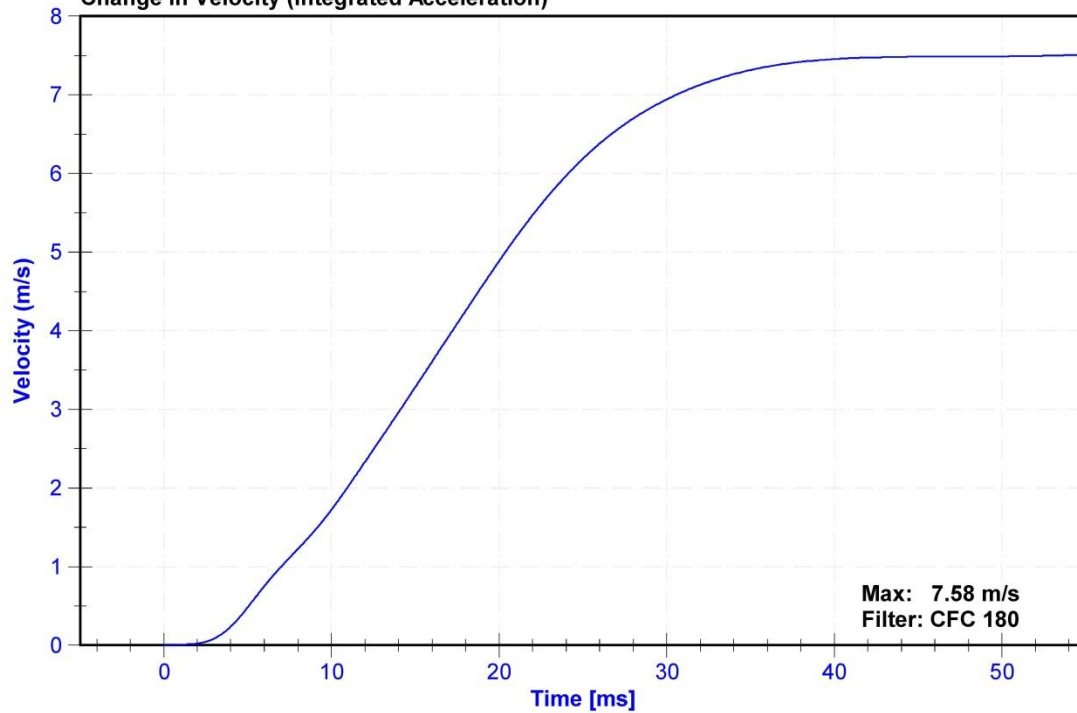




Probe Acceleration



Change in Velocity (Integrated Acceleration)



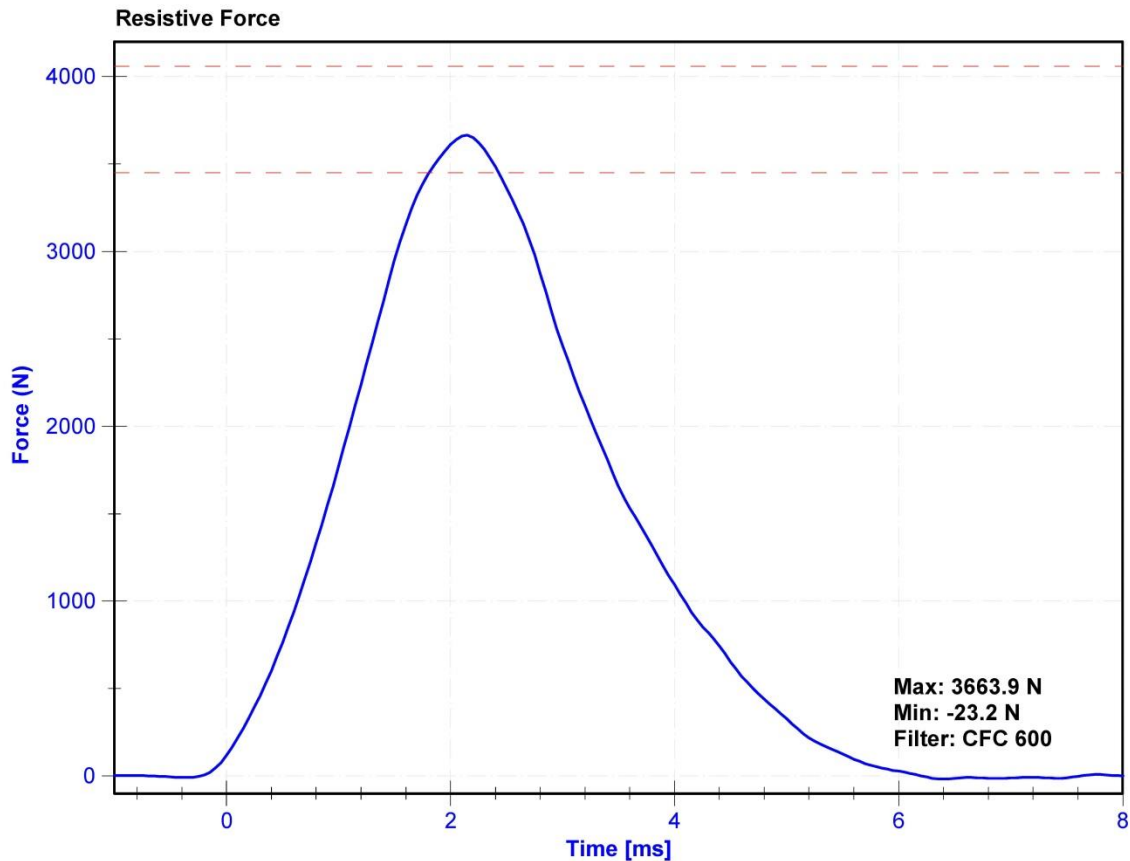
ATD Manufacturer	Denton	Test Technician	M.Hartung
ATD Serial Number	139	Laboratory Supervisor	M.Goehle

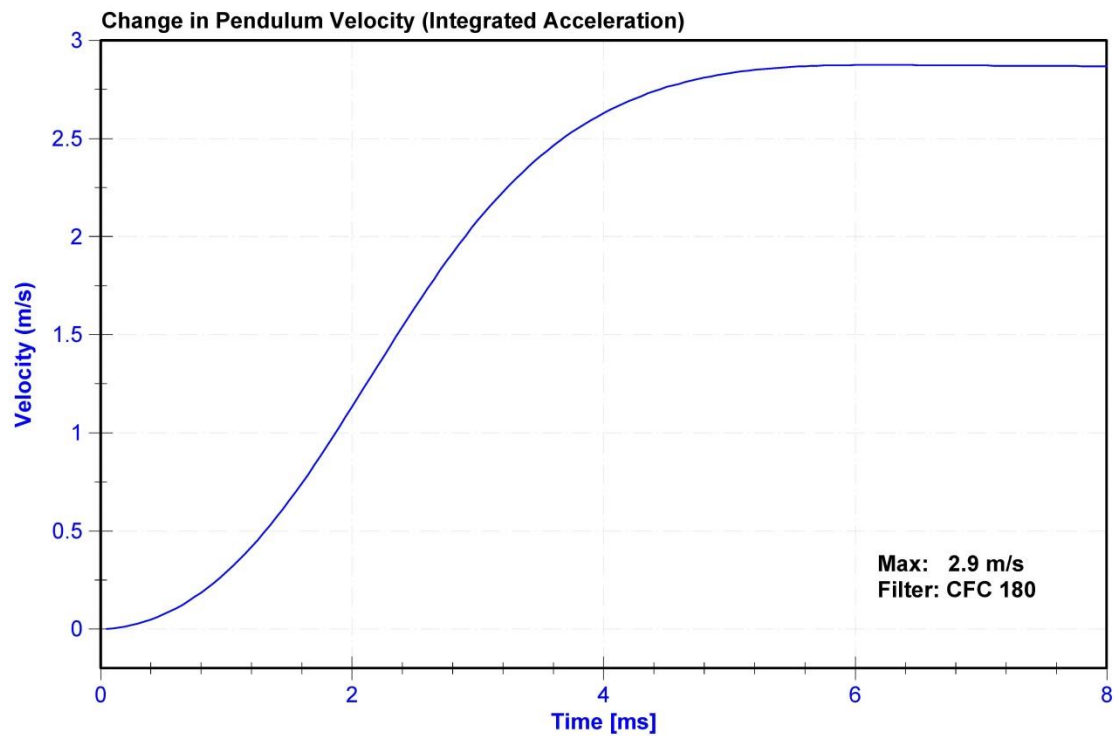
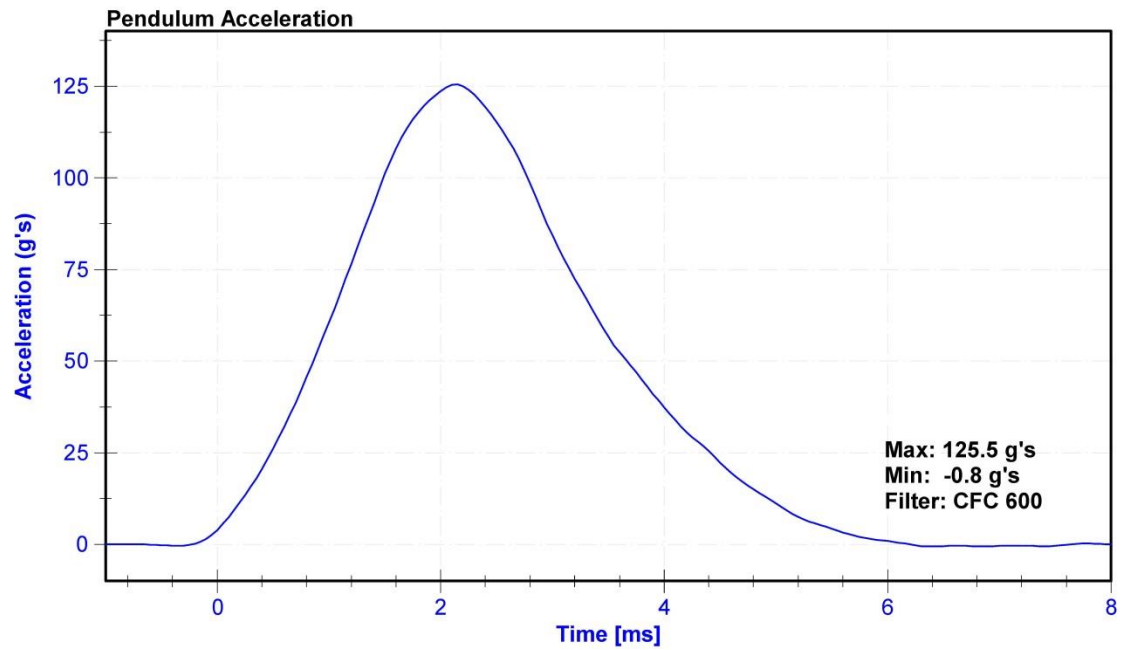
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.0	Pass
Humidity	10	70	%	15.5	Pass
Velocity	2.07	2.13	m/s	2.085	Pass
Resistive Force	3,450	4,060	N	3663.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015





ATD Manufacturer	Denton	Test Technician	M.Hartung
ATD Serial Number	139	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	14.8	Pass
Velocity	2.07	2.13	m/s	2.086	Pass
Resistive Force	3,450	4,060	N	3642.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14953	1/29/2015	7/30/2015

