REPORT NUMBER: NCAP-CAL-18-002

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

General Motors LLC
2018 Chevrolet Traverse
Four Door SUV

NHTSA No: M20180107

PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 104625

December 8, 2017

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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Prepared by: Vanessa Hansen Date: December 8, 2017
Vanessa Hansen, Senior Test Engineer

Approved by: Edward Dutton Date: December 8, 2017
Edward J. Dutton, Operations Manager
Transportation Test Operations

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 104625		***10. Work Unit No.*** ***11. Contract or Grant No.*** DTNH22-12-D-00260
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15. Supplementary Notes		

16. Abstract

A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2018 Chevrolet Traverse four door 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 November 7, 2017.

The impact velocity of the vehicle was 56.39 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 555 mm at the vehicles centerline. The test vehicle's occupant performance data is as follows:

Measurement Description	Units	Driver ATD (Serial No. 142)		Passenger ATD (Serial No. 288)	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})		700	215.714	700	333.354
Maximum Chest Compression	mm	63	-20.873	52	-23.517
Nij		1	0.156	1	0.352
Neck Tension	N	4,170	882.657	2,620	567.825
Neck Compression	N	4,000	-343.538	2,520	-227.600
Left Femur Force	N	10,008	-237.143	6,805	-1147.220
Right Femur Force	N	10,008	-180.133	6,805	-590.490

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Form DOT F1700.7 (8-69)

TABLE OF CONTENTS

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 October 2015.

SUMMARY

A ridged fixed barrier was impacted by a 2018 Chevrolet Traverse four door SUV at a velocity of 56.39 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 7, 2017. 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. 142) and the right-front passenger (position 2) ATD (Serial No. 288) 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 555 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. The right knee contacted the knee bolster.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. 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})	215.714	0.156	882.657	-343.538	39.570	-20.873	-237.143	-180.133
Passenger (5^{th})	333.354	0.352	567.825	-227.600	36.592	-23.517	-1147.220	-590.490

GENERAL COMMENTS:

1. P1 (Driver) serial number - 142
2. P2 (Passenger) serial number - 288

Data Anomalies:

- Driver Left Lower Tibia Y Moment,Questionable data throughout

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: 2018 Chevrolet Traverse four door SUV
NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 11/7/2017

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20180107
Model Year	2018
Make	Chevrolet
Model	Traverse
Body Style	SUV
VIN	1GNEVFKW0JJ113431
Body Color	Silver
Odometer Reading (km /mi)	234 mi
Engine Displacement (L)	3.6
Type / No. Cylinders	V6
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	9-Speed
Overdrive	Yes
Final Drive	All Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System (TCS)	Yes
Power Steering	Yes
Power Window Auto-Reverse	No
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other – Front Center Airbag	Yes

Does owner's manual provide instructions to turn off automatic door locks?	No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC
Date of Manufacture	08/17

GVWR (kg)	2800
GAWR Front (kg)	1450
GAWR Rear (kg)	1600

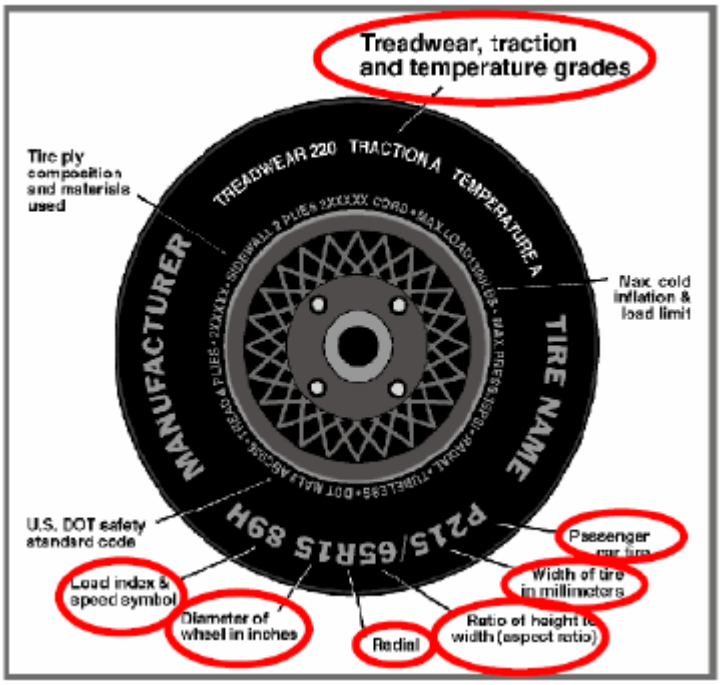
VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	3	3	8
Capacity Wt. (VCW) (kg)				738
Cargo Wt. (RCLW) (kg)				136

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

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	255/65R18	255/65R18
Tire Size on Vehicle	255/65/R18	255/65/R18
Tire Manufacturer	Bridgestone	Bridgestone
Tire Model	Dueler H/L Alenza	Dueler H/L Alenza
Treadwear	700	700
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	111T	111T
Tire Material	Rubber	Rubber
DOT Safety Code Left	7XAXDH12517	7XAXDH12517
DOT Safety Code Right	7XAXDH12517	7XAXDH12517

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

Test Vehicle: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	620	418		672	506	
Right	kg	556	450		623	512	
Ratio	%	58	42		56	44	
Totals	kg	1176	868	2044	1295	1018	2313

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2044	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	141	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2321	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	909	911	965	972	1305
As Tested	mm	895	900	945	941	1352
Post-Test	mm	967	964	957	949	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	3072
Total Vehicle Length at Left Side	mm	5048
Total Vehicle Length at Centerline	mm	5194
Total Vehicle Length at Right Side	mm	5048
Weight of Ballast in Cargo Area	kg	100
Weight of Vehicle Components Removed	kg	42
Amount of Stoddard Solvent in Fuel Tank	L	76.35

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, spare tire, jack, tail light

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

Test Vehicle: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	5194
2	Total Width	1957
3*	Bumper Top Height	556
4*	Bumper Bottom Height	442
5*	Longitudinal Member Top Height	602
6	Distance Between Longitudinal Members	1069
7	Longitudinal Member Width	85
8*	Engine Top Height	1006
9*	Engine Bottom Height	198
10	Engine and Gearbox Width	498
11	Front Bumper-Engine Distance	595
12*	Front Shock Absorber Fixing Height	1023
13*	Bonnet Leading Edge Height	927
14	Front Shock Absorber Fixing Width	1279
15	Front Bumper – Front Axle Distance	1017
16	Front Axle – A Pillar Distance	523
17	A-Pillar – B-Pillar Distance	1111
18	B-Pillar – Rear Axle Distance	1437
19	B-Pillar – C-Pillar Distance	1027
20*	Roof Sill Bottom Height	1630
21*	Roof Sill Top Height	1692
22*	Floor Sill Bottom Height	420
23*	Floor Sill Top Height	447

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

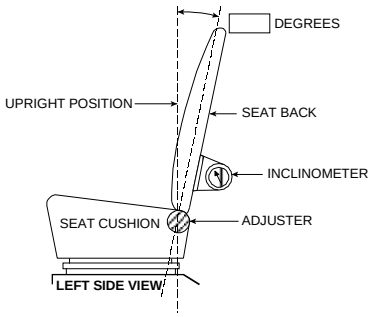
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

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	-20
Passenger Seat Back Angle	-22



FRONT SEAT ASSEMBLY

SEAT FORE / AFT POSITIONS

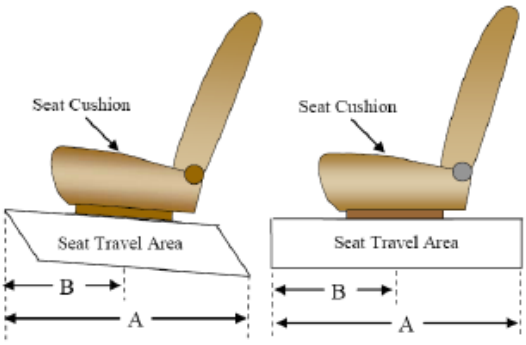
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	50 (0-49)	19
Passenger Seat	50 (0-49)	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	Fixed	Fixed
Passenger Seat	Fixed	Fixed



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

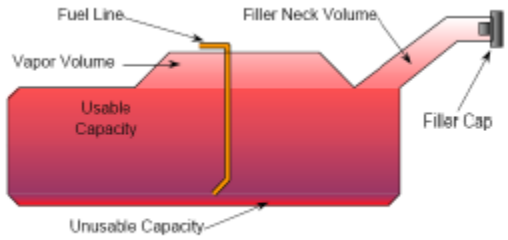
Test Vehicle: 2018 Chevrolet Traverse four door SUV
NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test
Test Date: 11/7/2017

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	82.1
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	75.53 – 77.2
Actual Amount of Solvent Used	76.35
1/3 of Usable Capacity	27.36

FUEL PUMP

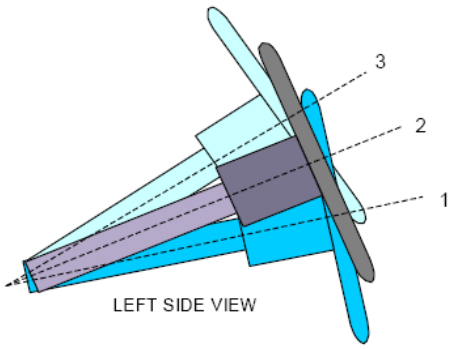
The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when 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.



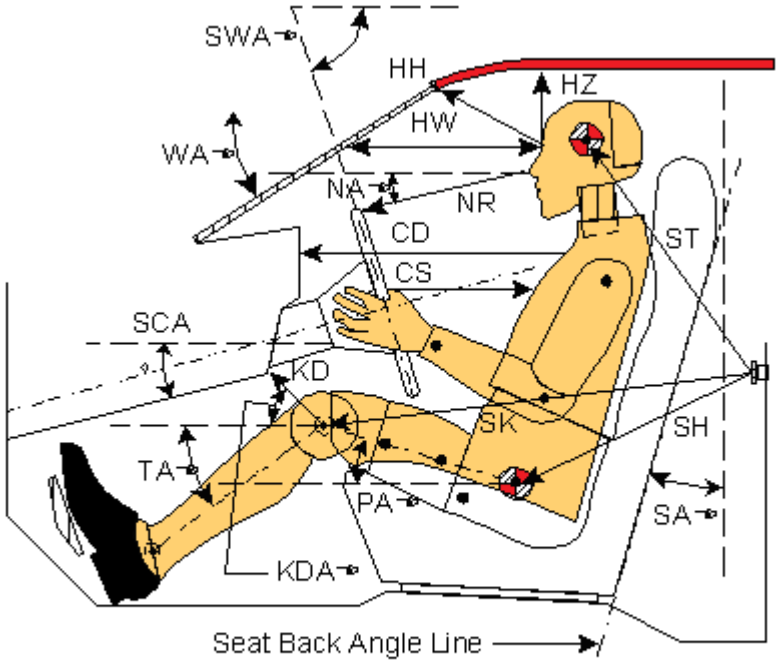
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	20.7	
Geometric center position No. 2	22.95	
Uppermost position No. 3	25.2	
Telescoping Steering Wheel Travel		64
Test Position	22.9	32

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017

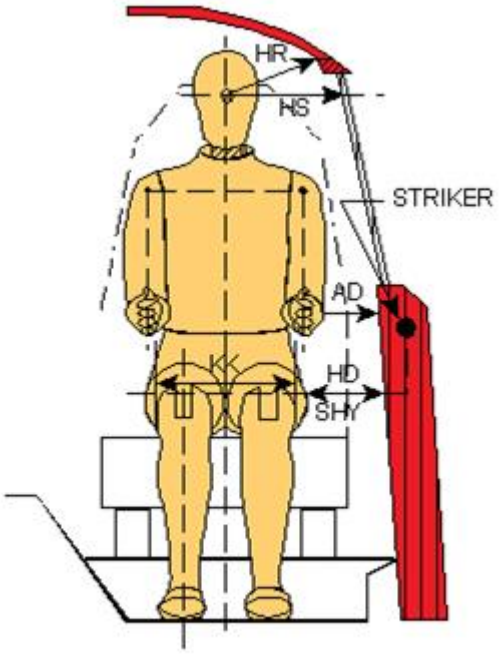


Left Side View

Code	Measurement Description	Driver (SN: 142)		Passenger (SN: 288)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		30.5		
SWA°	Steering Wheel Angle		22.7		
SCA°	Steering Column Angle		67.3		
SA°	Seat Back Angle (on headrest post)		-20		-22
HZ	Head to Roof (Z)	284	90	280	90
HH	Head to Header	494	27.2	411	41.9
HW	Head to Windshield	874	0	749	0
NR	Nose to Rim	423	6	453	24.7
CD	Chest to Dash	543		415	
CS	Chest to Steering Hub	340	3.3		
RA	Rim to Abdomen	228	0		
KDL	Left Knee to Dash	198	22	105	23.4
KDR	Right Knee to Dash	186	22.3	106	32.6
PA°	Pelvic Angle		23.2		19.1
TA°	Tibia Angle		32.5		45.6
SK	Striker to Knee	540	1.0	680	0
ST	Striker to Head	590	81.5	592	62.8
SH	Striker to H-Point	194	29.3	364	11.3

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017

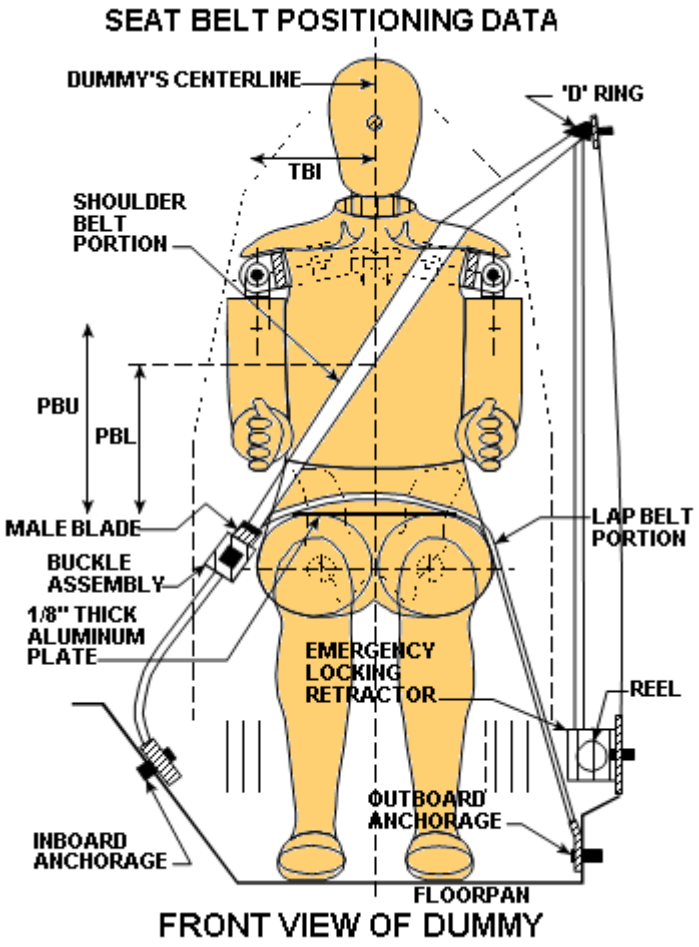


Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	140	95
HD	H-Point to Door	135	177
HR	Head to Side Header	274	316
HS	Head to Side Window	380	410
KK	Knee to Knee	370	167
SHY	Striker to H-Point (Y Direction)	250	280
AA	Ankle to Ankle	375	167

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	350	295
PBL — Top surface of reference to belt lower edge	mm	275	220

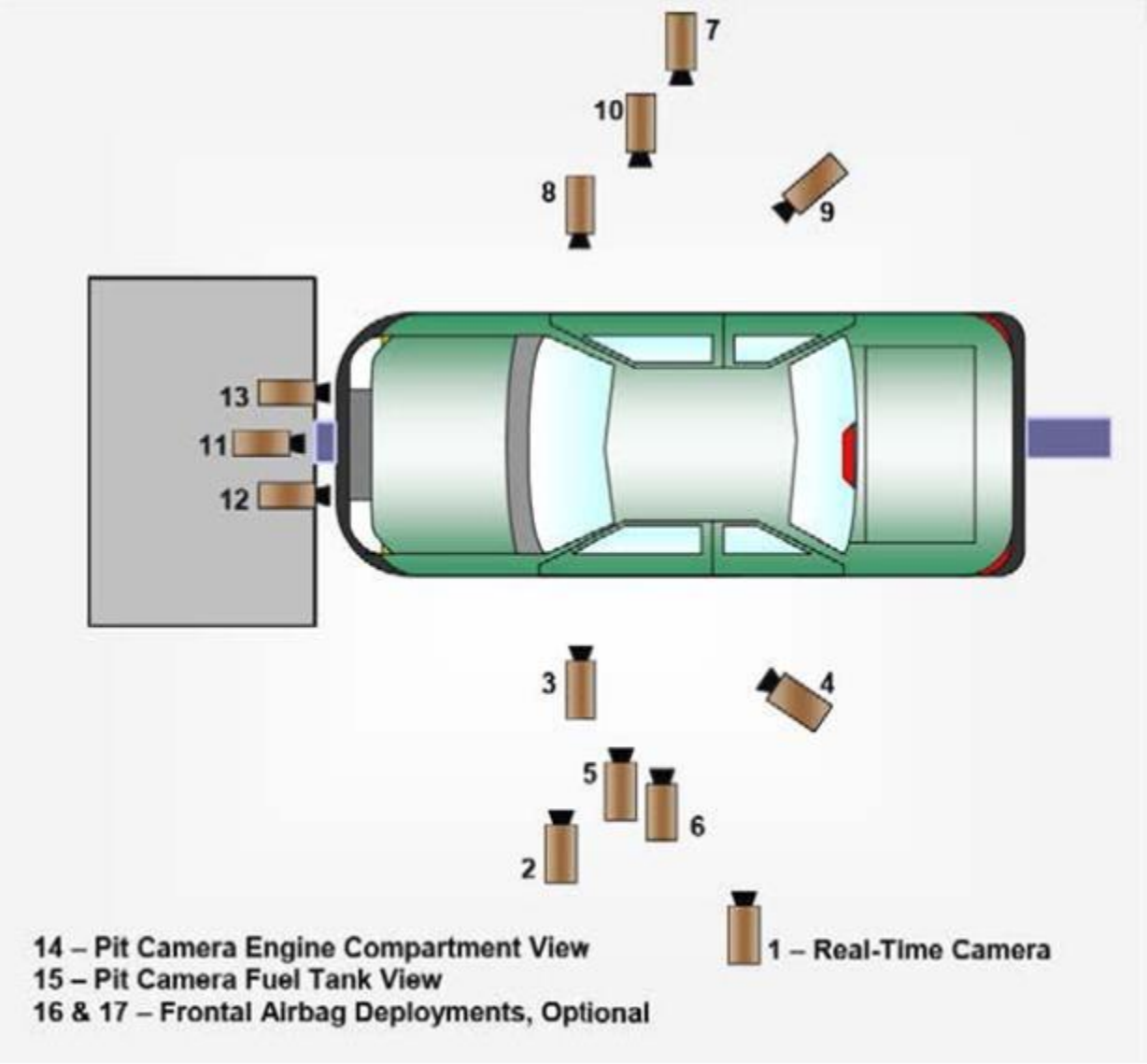
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	840	960
Lap Belt Length as measured on ATD	mm	465	530
Remainder of belt on reel	mm	945	810
Total belt length for continuous webbing systems	mm	2250	2300

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

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

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

Test Vehicle: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

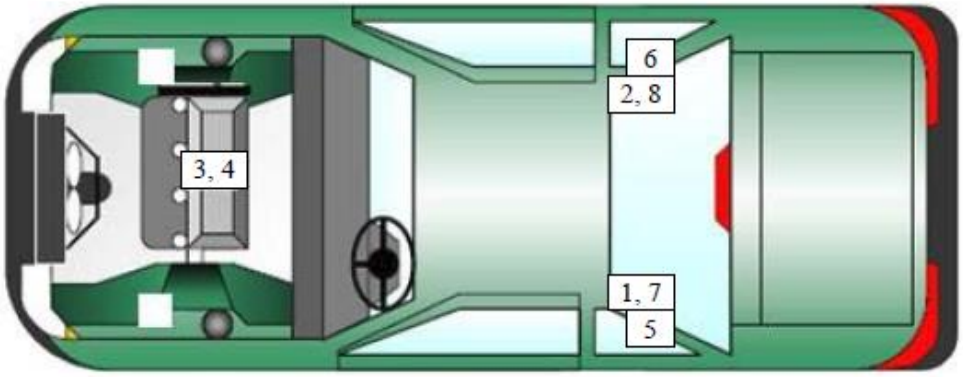
CAMERA LOCATIONS

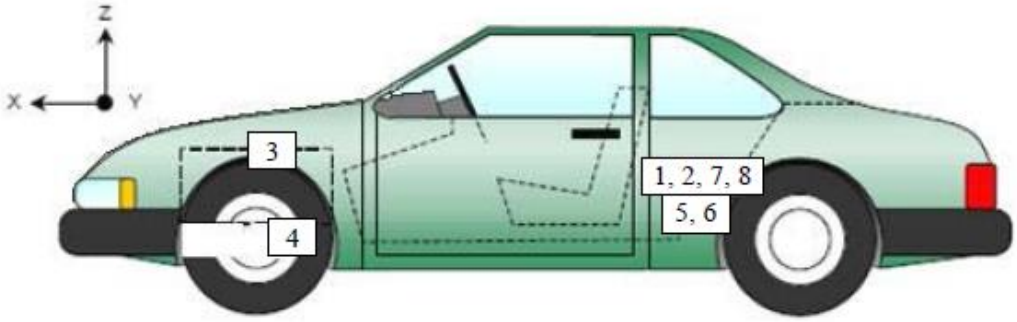
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	-1214	-8866	-1561	50	1000
3	Left Front Half	-966	-9391	-1519	28	1000
4	Left Angle	-2875	-3702	-2620	24	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2449	9694	-1446	20	1000
8	Passenger Close-Up	-2045	10048	-1449	50	1000
9	Right Front Half	-1546	8391	-1152	28	1000
10	Right Angle	-2838	3567	-2482	24	1000
11	Windshield	665	0	-3570	24	1000
12	Driver Windshield	315	-627	-1961	25	1000
13	Passenger Windshield	315	582	-1961	25	1000
14	Pit Front	-1146	0	1830	12.5	1000
15	Pit Rear	-2399	0	1830	12.5	1000
16	Onboard Driver Airbag (Optional)				8	1000
17	Onboard Passenger Airbag (Optional)				8	1000

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

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2061	-440	130
2	Right Rear Accelerometer – X Direction	2055	456	127
3	Engine Top X	4451	95	-290
4	Engine Bottom X	4539	-67	415
5	Left Rear Accelerometer – Z Direction	2061	-440	130
6	Right Rear Accelerometer – Z Direction	2055	456	127
7	Left Rear Accelerometer – X Direction Redundant	2056	-448	132
8	Right Rear Accelerometer – X Direction Redundant	2062	456	129

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

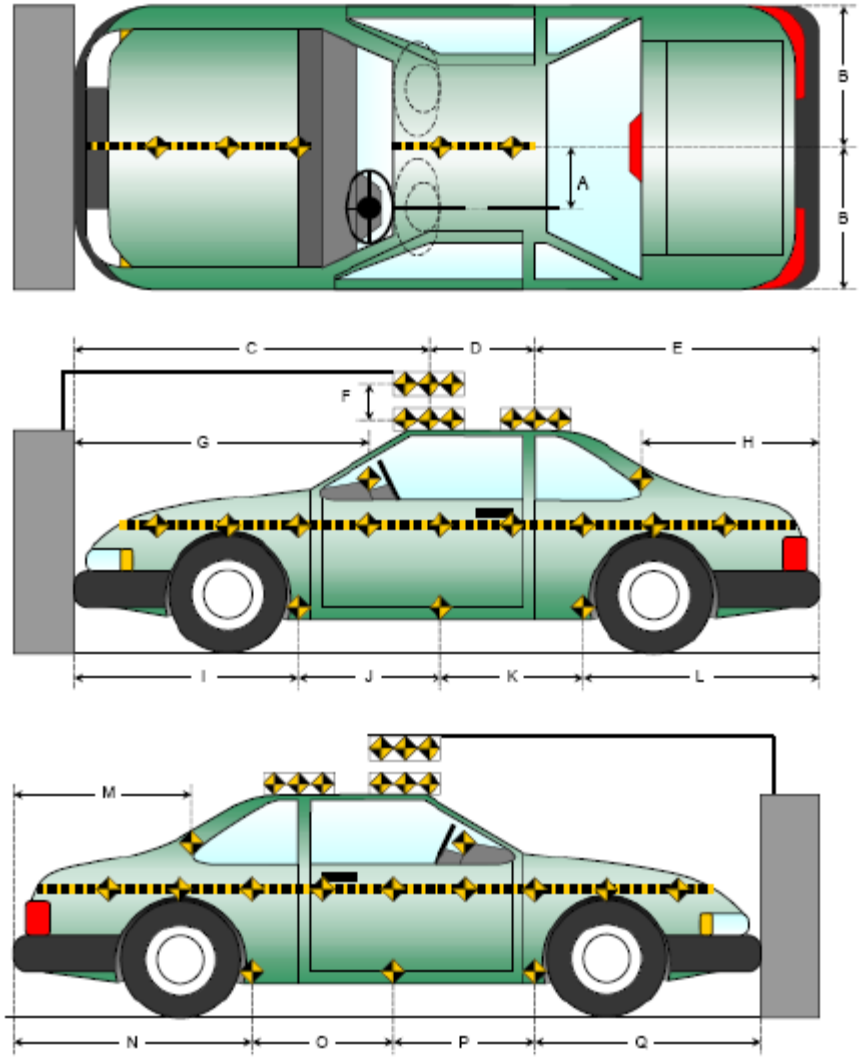
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20180107
Test Date: 11/7/2017

Item	Value
A	424
B	979
C	2689
D	611
E	1894
F	165
G	1848
H	1393
I	1537
J	1002
K	1039
L	1616
M	1394
N	1616
O	1041
P	1001
Q	1536

All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

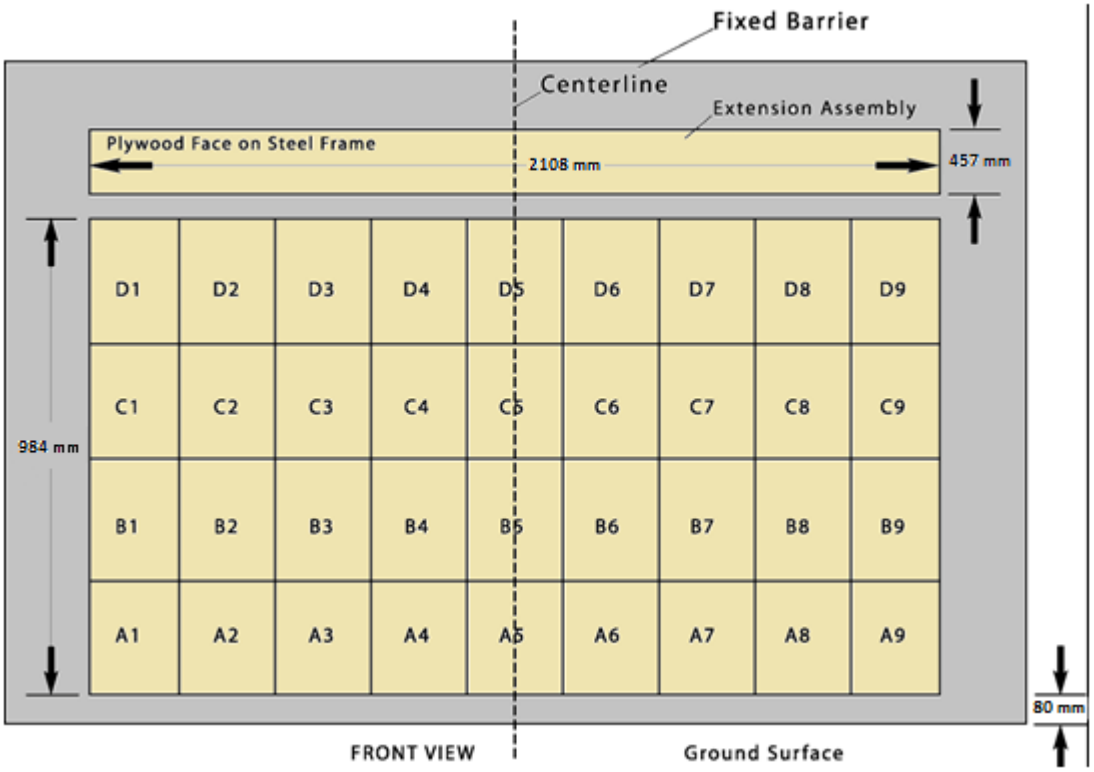


Figure 1 - Load Cell Locations on a 36-Load Cell Barrier with Plywood Height Extension*

DATA SHEET NO. 10
TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

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: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50th Male / 142	P5720 5th Female / 288
Head Contact	Front Airbag & Headrest	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	None	Glove Box
Right Knee Contact	Knee Bolster	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	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

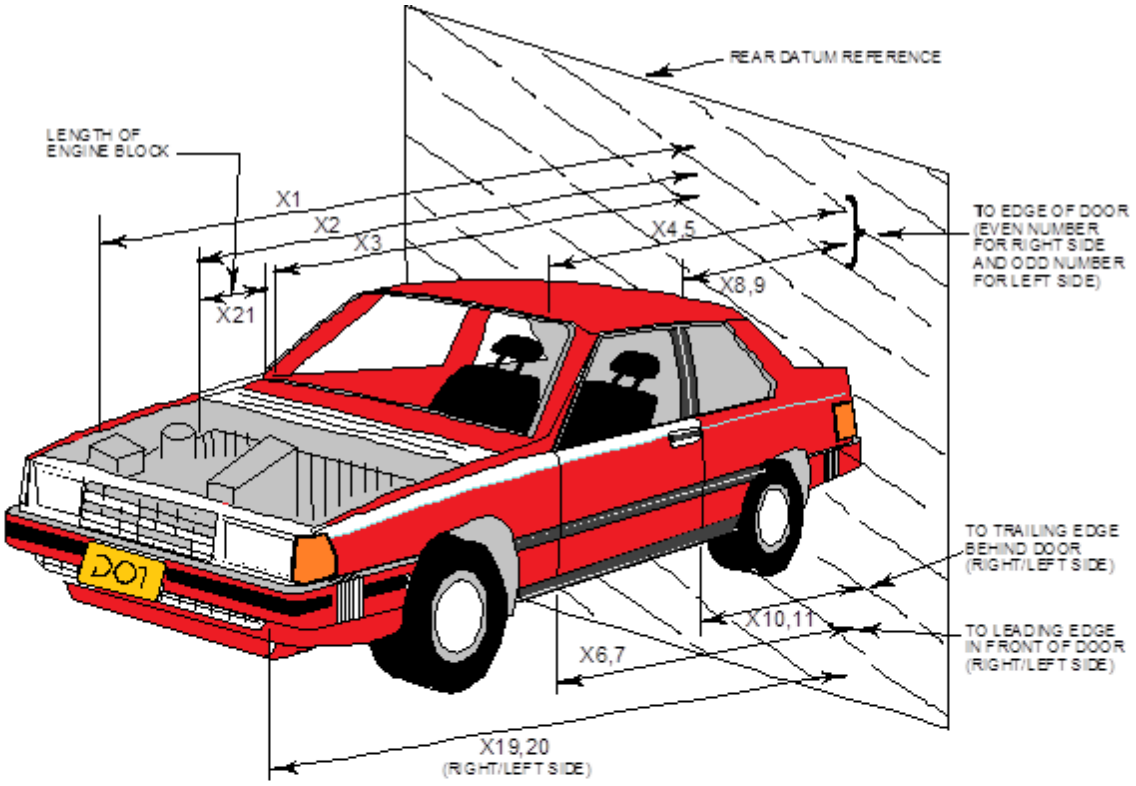
Measured Parameter	Units	Value
Left Side	mm	955
Center	mm	980
Right Side	mm	985
Average	mm	973

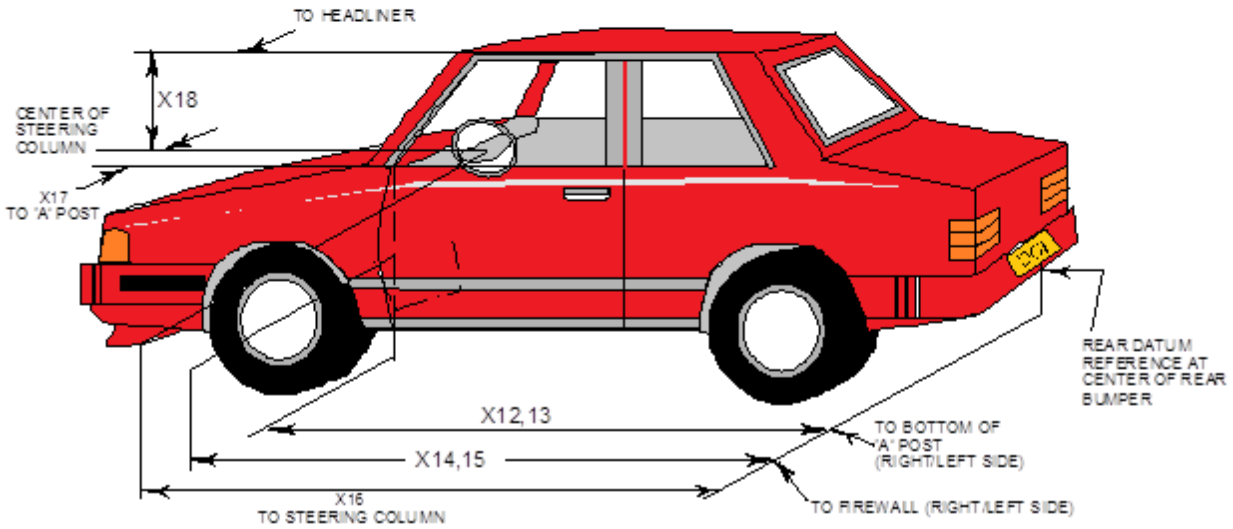
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	No	Yes	No
Knee Airbag	No	N/A	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other – Front Center Airbag	Yes	No	No	N/A

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017





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

Test Vehicle: 2018 Chevrolet Traverse four door SUV NHTSA No.: M20180107
Test Program: NCAP Frontal Barrier Impact Test Test Date: 11/7/2017

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	5194	4638	-555
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4599	4343	-256
3	RSOV to Firewall	4219	4212	-8
4	RSOV to Upper Leading Edge of Right Door	3649	3650	1
5	RSOV to Upper Leading Edge of Left Door	3651	3652	1
6	RSOV to Lower Leading Edge of Right Door	3600	3601	1
7	RSOV to Lower Leading Edge of Left Door	3603	3604	1
8	RSOV to Upper Trailing Edge of Right Door	2546	2548	2
9	RSOV to Upper Trailing Edge of Left Door	2548	2550	2
10	RSOV to Lower Trailing Edge of Right Door	2563	2565	2
11	RSOV to Lower Trailing Edge of Left Door	2563	2564	1
12	RSOV to Bottom of “A” Post of Right Side	3729	3739	10
13	RSOV to Bottom of “A” Post of Left Side	3725	3724	-1
14	RSOV to Firewall, Right Side	4212	4207	-6
15	RSOV to Firewall, Left Side	4217	4214	-3
16	RSOV to Steering Column	3188	3261	73
17	Center of Steering Column to “A” Post	293	295	2
18	Center of Steering Column to Headliner	443	460	17
19	RSOV to Right Side of Front Bumper	5101	4651	-449
20	RSOV to Left Side of Front Bumper	5100	4714	-386
21	Length of Engine Block	335	335	0
RD	RSOV to Right Side of Dash Panel	3369	3370	1
CD	RSOV to Center of Dash Panel	3320	3320	0
LD	RSOV to Left Side of Dash Panel	3370	3371	1

*UR= Unrecoverable data point
All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

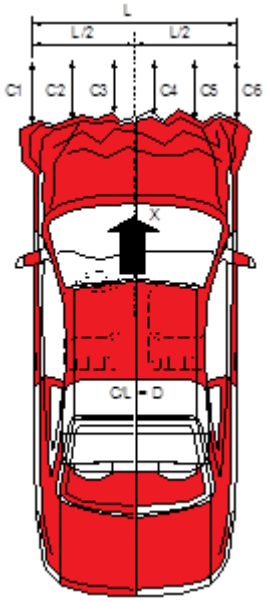
Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

VEHICLE INFORMATION

VIN:	1GNEVFKW0JJ113431	Wheelbase (mm):	3072
Vehicle Size Category:	MPV	Test Weight (kg):	2313

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):	56.39
Velocity Change (km/h):	66.56
Time of Separation (ms):	142



CRUSH PROFILE

Collision Deformation Classification:	12FDEW3
Midpoint of Damage:	C4
Damage Region Length (mm):	1482
Impact Mode:	Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4904	4612	292
C2	Crush Zone 2 at Left Side	mm	5089	4694	395
C3	Crush Zone 3 at Left Side	mm	5164	4655	509
C4	Crush Zone 4 at Right Side	mm	5163	4640	523
C5	Crush Zone 5 at Right Side	mm	5086	4654	432
C6	Crush Zone 6 at Right Side	mm	4896	4609	287
L	C1 to C6	mm	1482	1578	-96

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

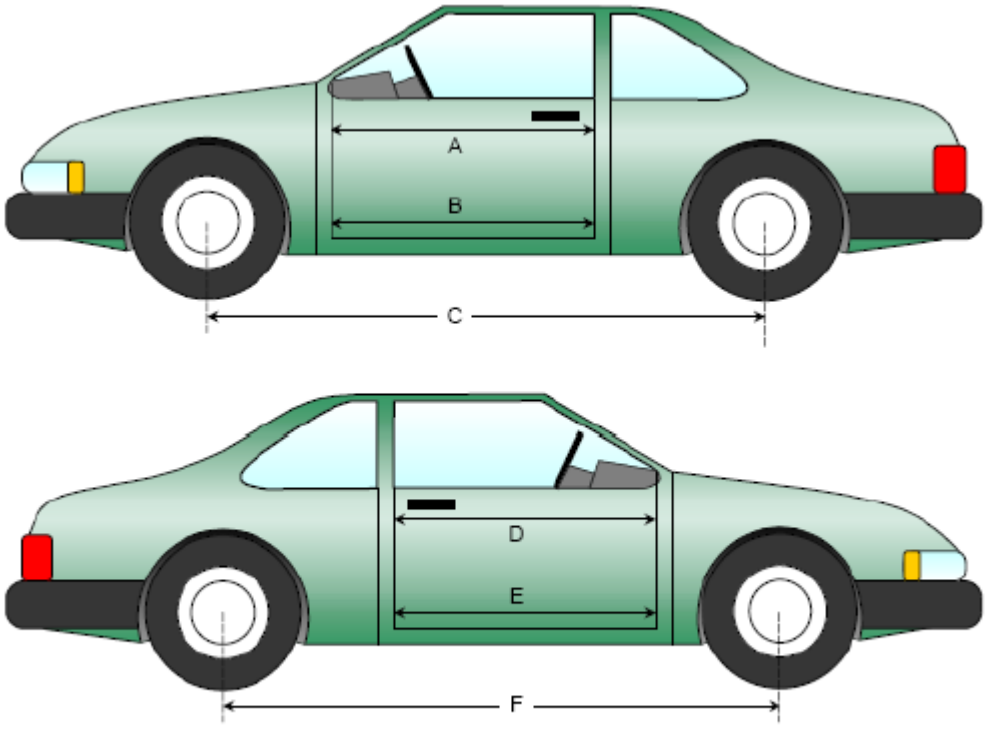
Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	968	968	0
B	Left Side Lower	mm	868	867	-1
D	Right Side Upper	mm	968	969	1
E	Right Side Lower	mm	865	865	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3072	2987	-85
F	Right Side Wheelbase	mm	3072	3003	-69



Left & Right Side Views

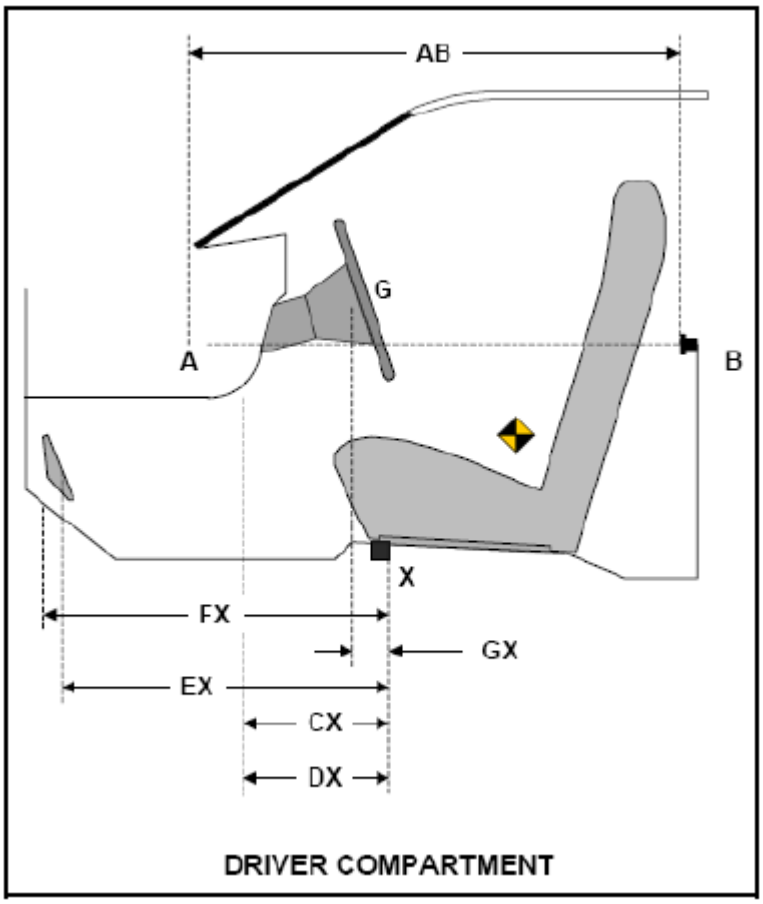
DATA SHEET NO.14 … (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	794	794	0
CX	Left Knee Bolster to X	mm	331	329	-2
DX	Right Knee Bolster to X	mm	325	322	-3
EX	Brake Pedal to X	mm	568	537	-31
FX	Foot Rest to X	mm	601	594	-7
GX	Center of Steering Column Wheel Hub to X	mm	93	165	72

X = Front of Seat Track (Stationary)



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

Test Vehicle:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

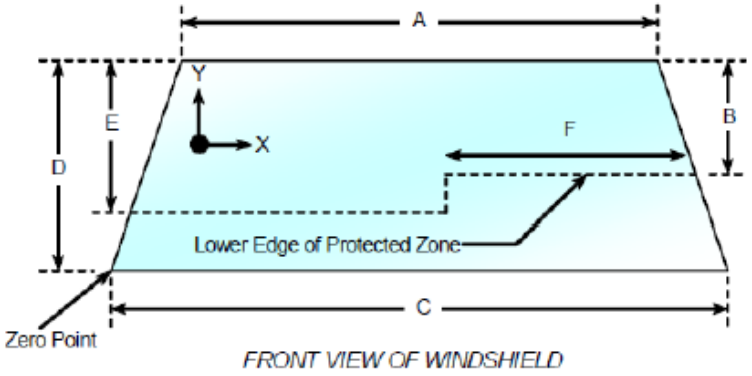
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2370	2370	100
Right Side	2370	2370	100
Total	4740	4740	100



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1368
B	mm	518
C	mm	1582
D	mm	895
E	mm	493
F	mm	528

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:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C Test Time: 9:55 AM

STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 oz.)

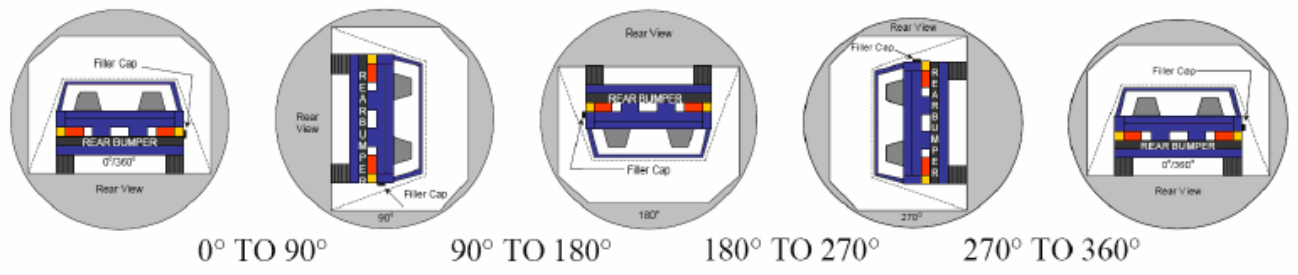
B. For the 5-minute period after motion ceases: 0 oz.
(Maximum allowable is 5 oz.)

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: 2018 Chevrolet Traverse four door SUV
Test Program: NCAP Frontal Barrier Impact Test
NHTSA No.: M20180107
Test Date: 11/7/2017



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°	68	300	368
90° to 180°	66	300	366
180° to 270°	62	300	362
270° to 360°	66	300	366

FMVSS 301 SPILLAGE TABLE

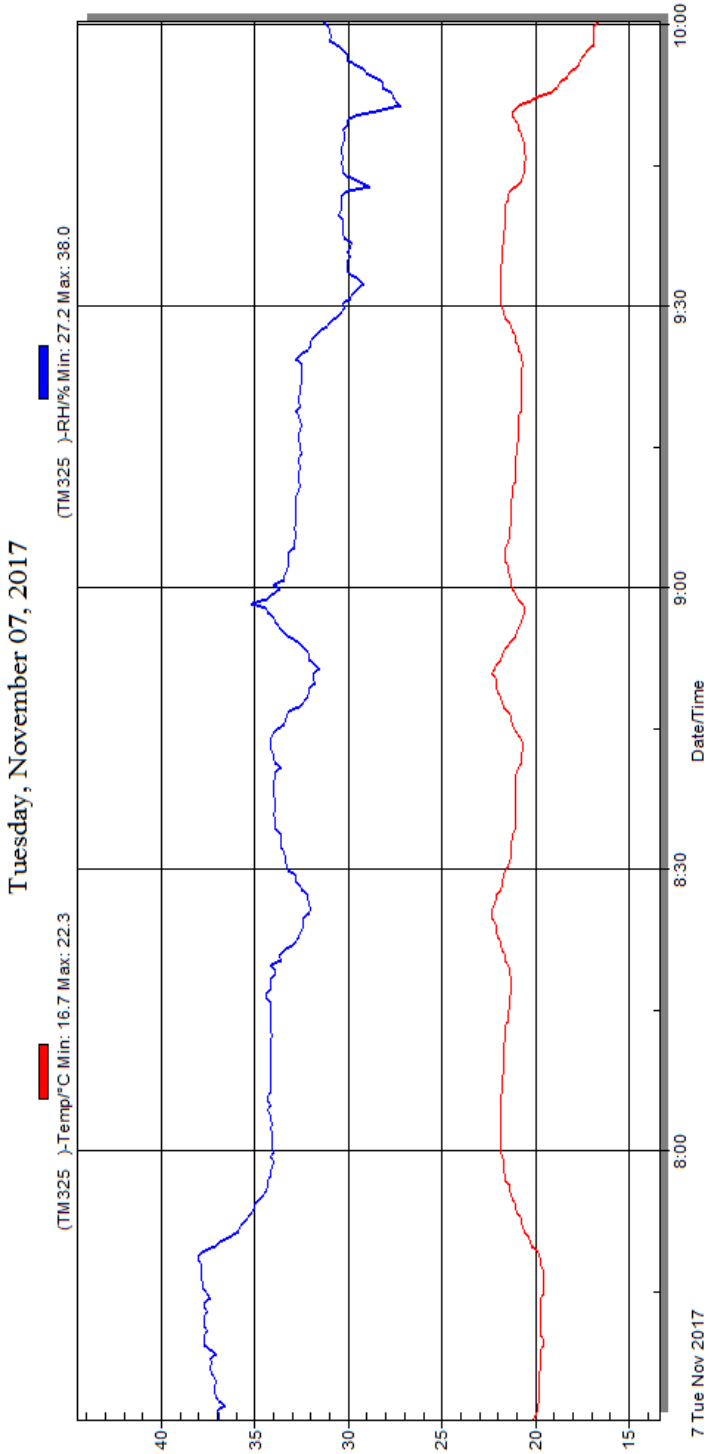
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

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:	2018 Chevrolet Traverse four door SUV	NHTSA No.:	M20180107
Test Program:	NCAP Frontal Barrier Impact Test	Test Date:	11/7/2017



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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

[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.*

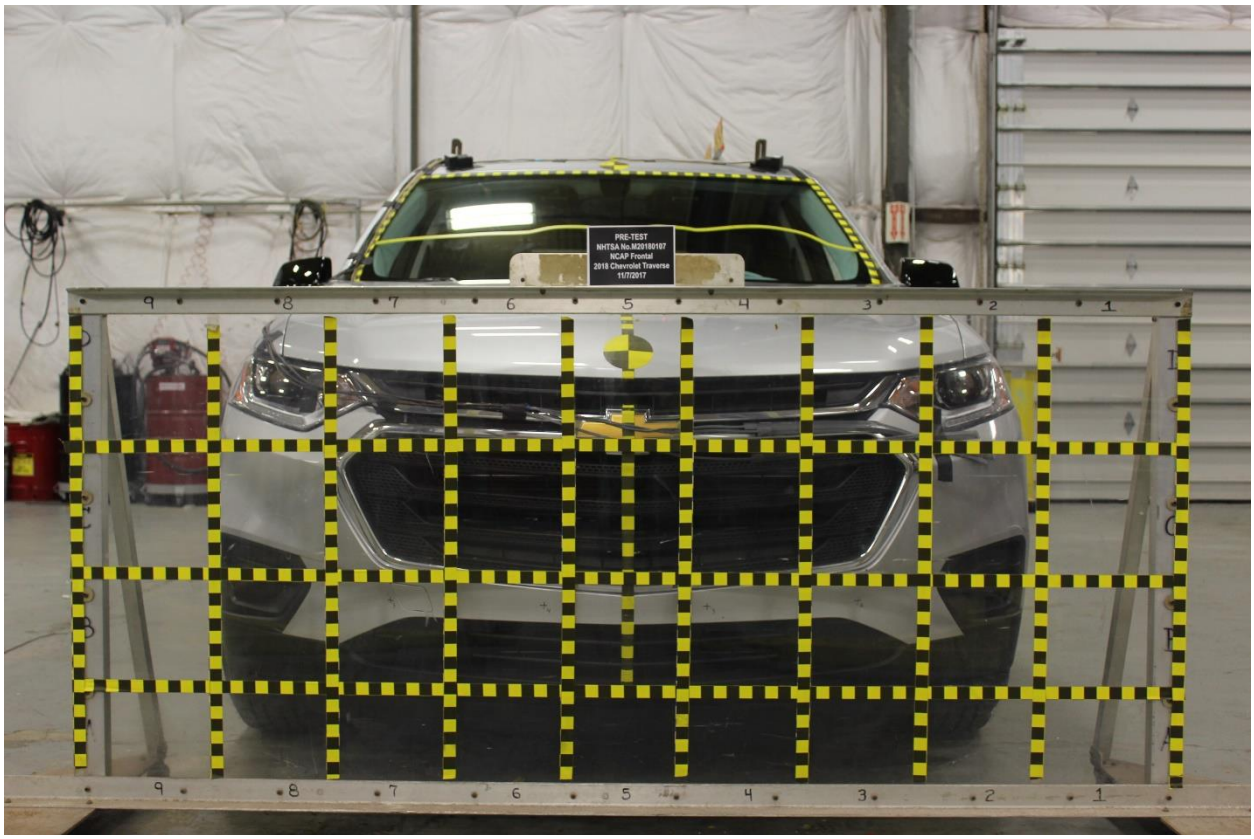


Figure A-1: Load Cell Location

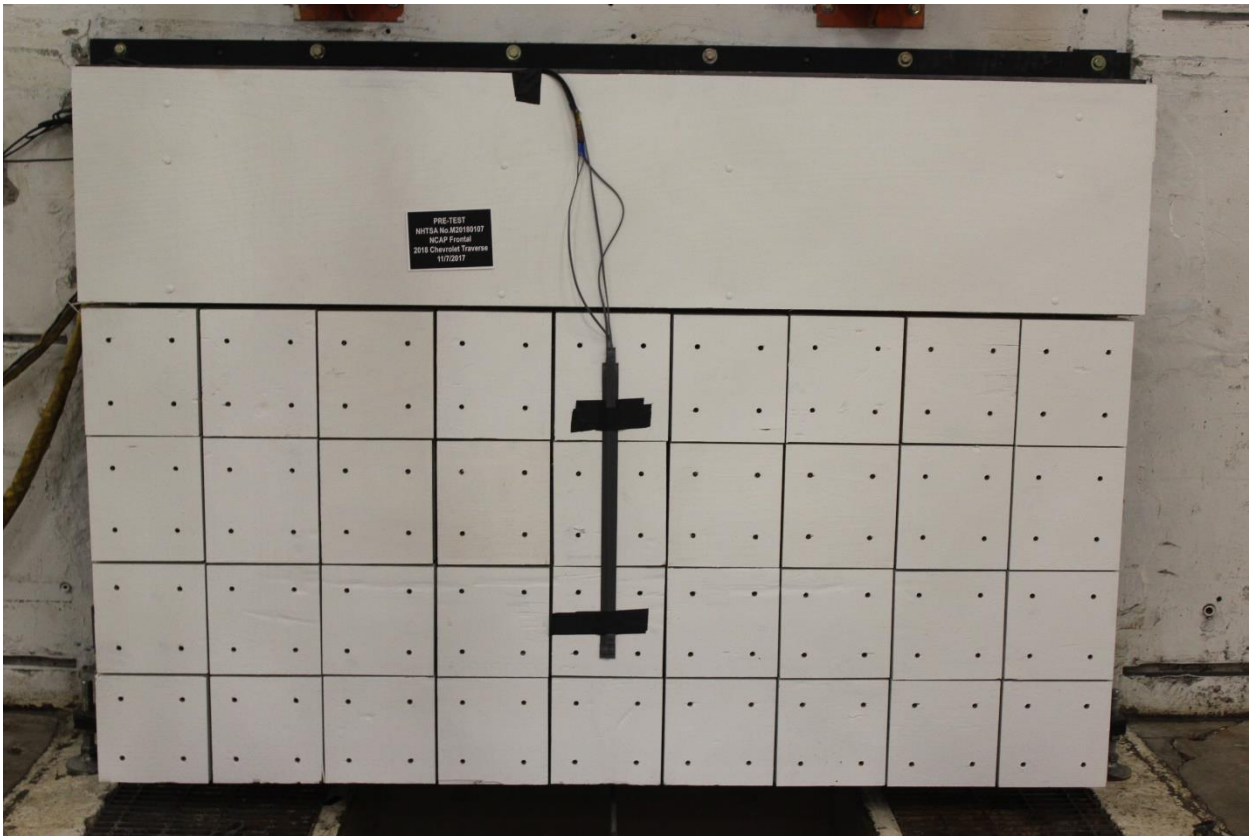


Figure A-2: Pre-Test Load Cell Wall

Figure A-3: Post-Test Load Cell Wall

Figure A-4: Manufacturer's Label

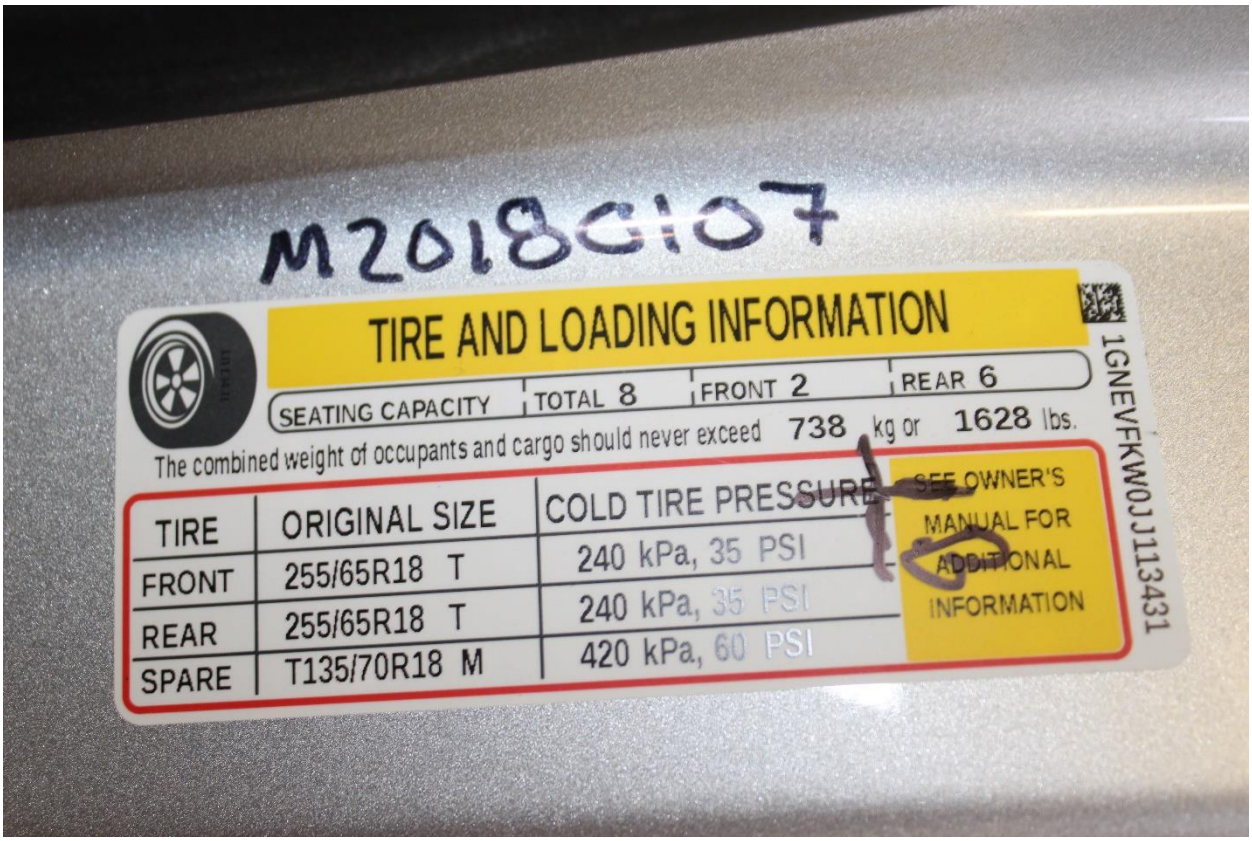


Figure A-5: Tire Placard

Figure A-6: 2018 Chevrolet Traverse Frontal As Delivered

Figure A-7: Left Rear 3-4 View, As Received

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

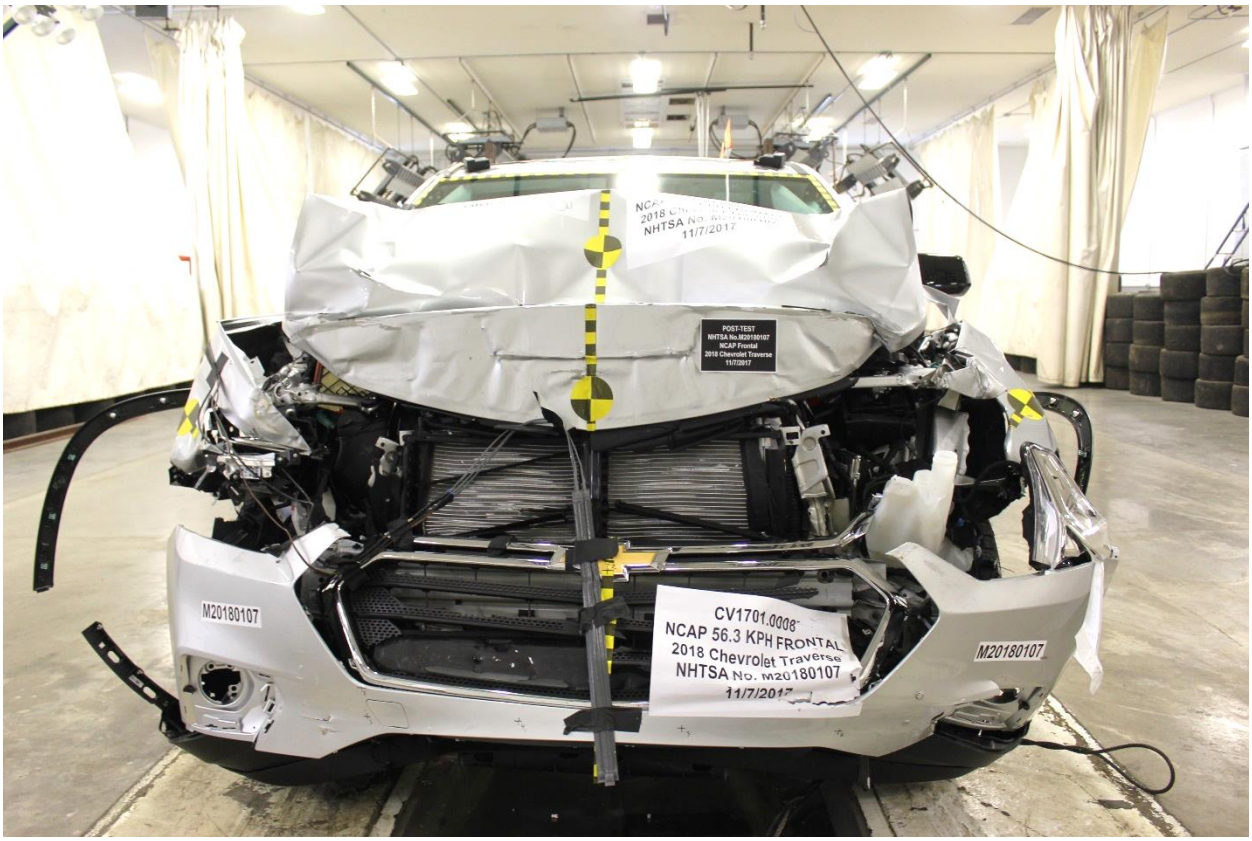


Figure A-9: Post-Test Front View of Test Vehicle

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

Figure A-11: Post-Test Left View of Test Vehicle

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

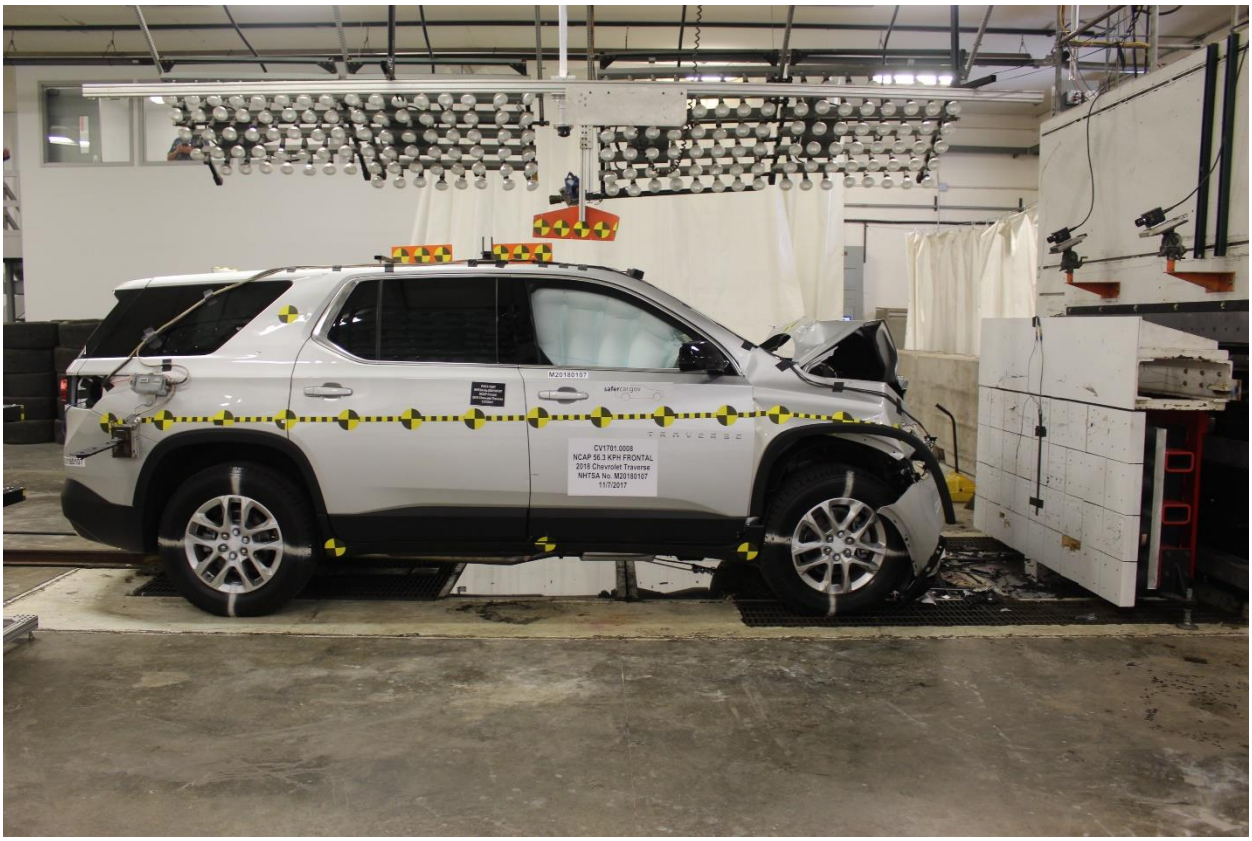


Figure A-13: Post-Test Right View of Test Vehicle

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

Figure A-15: Post-Test Right Front 3-4 View

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

Figure A-17: Post-Test Left Rear 3-4 View

Figure A-18: Pre-Test Windshield View

Figure A-19: Post-Test Windshield View

Figure A-20: Pre-Test Engine Compartment View

Figure A-21: Post-Test Engine Compartment View

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

Figure A-23: Post-Test Fuel Filler Cap View

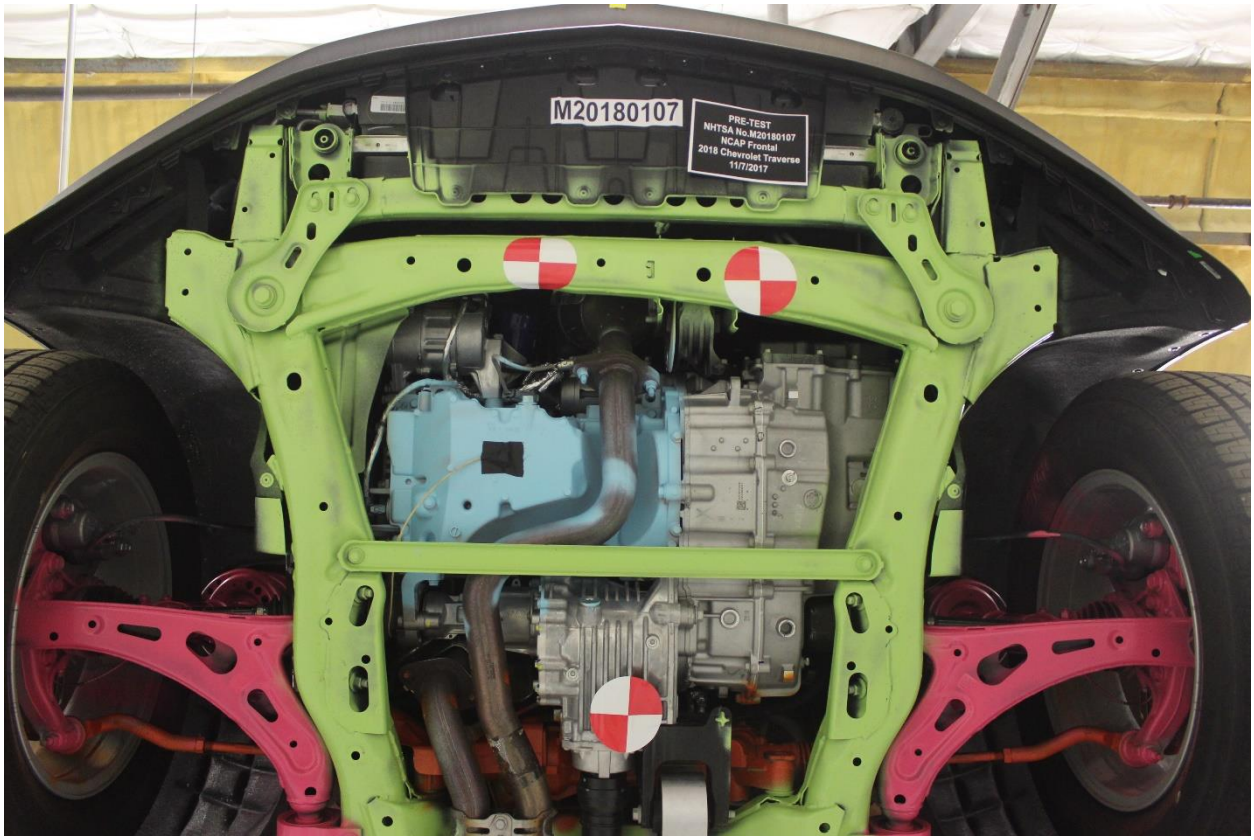


Figure A-24: Pre-Test Front Underbody View

Figure A-25: Post-Test Front Underbody View

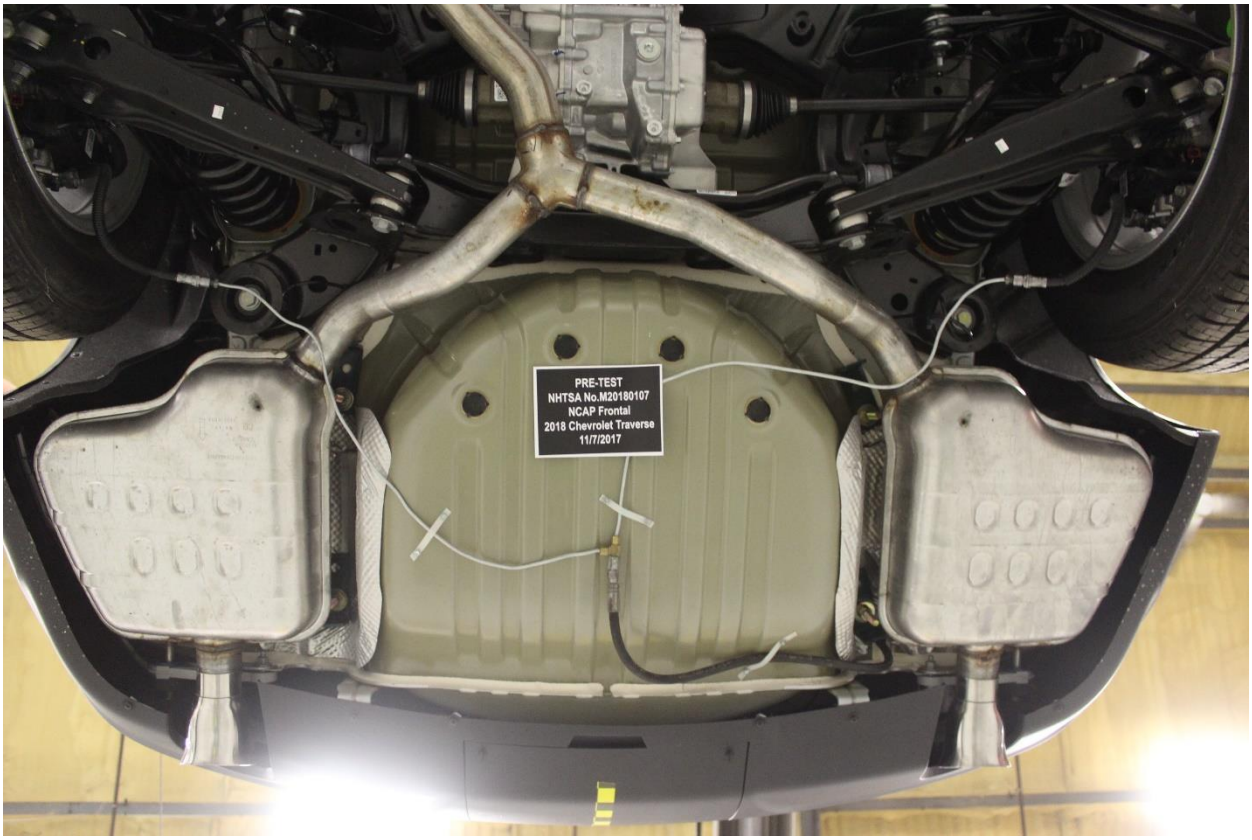


Figure A-26: Pre-Test Rear Underbody View

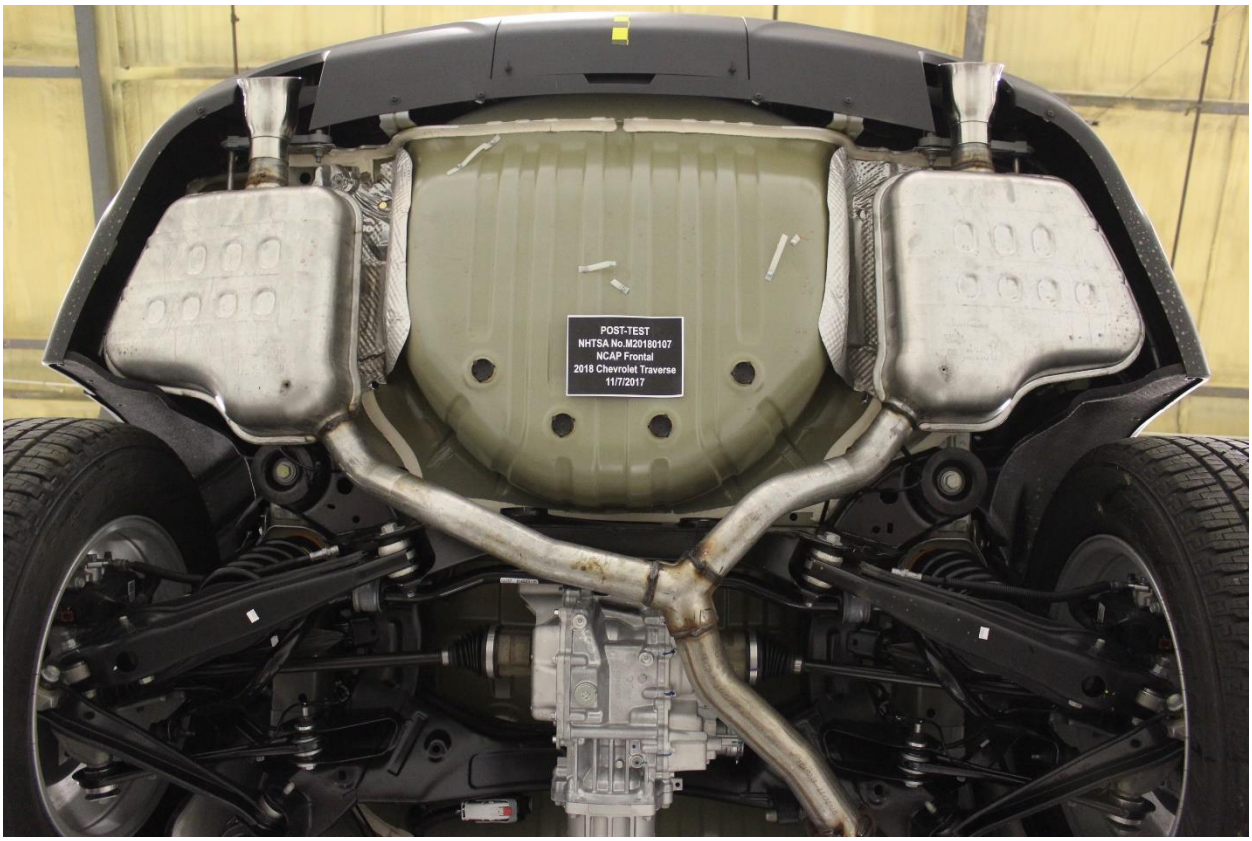


Figure A-27: Post-Test Rear Underbody View

Figure A-28: Pre-Test Dummy Cable Routing

Figure A-29: Post-Test Dummy Cable Routing

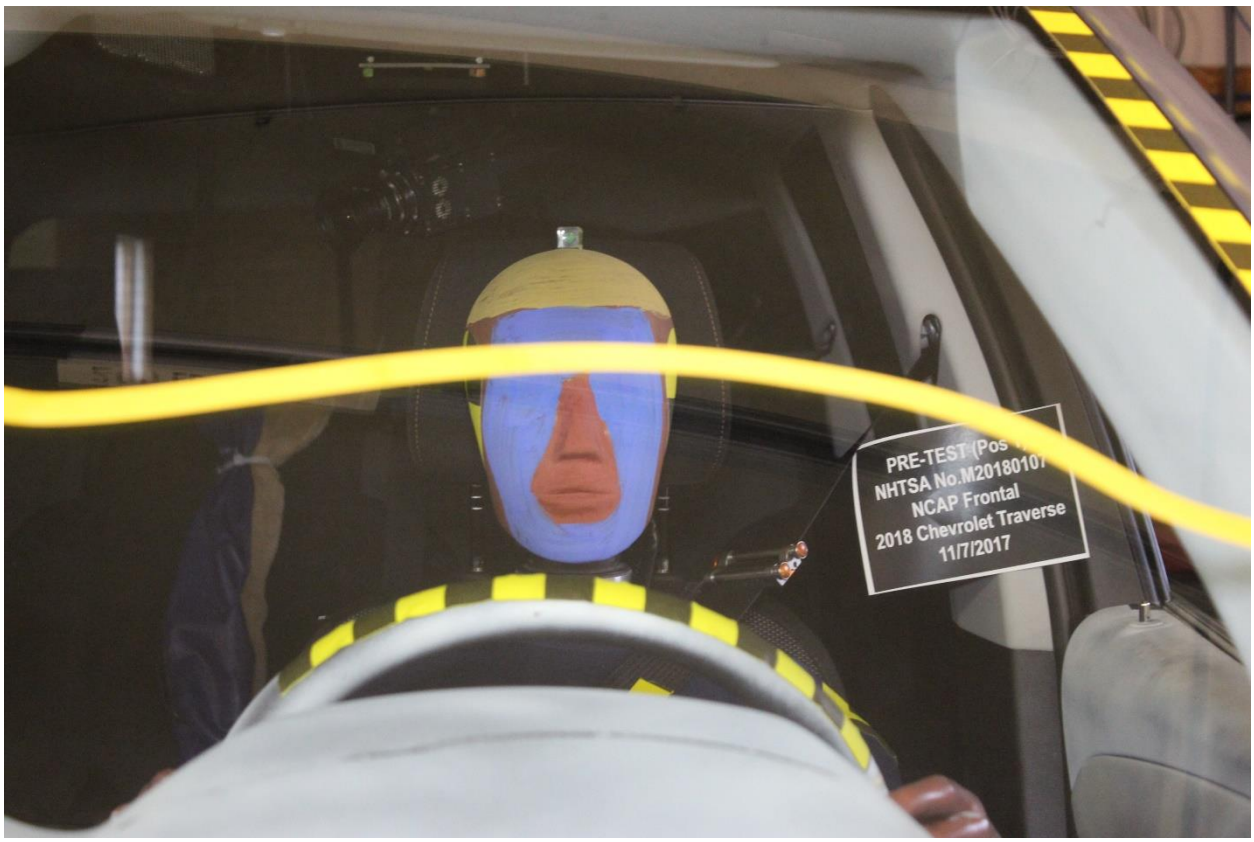


Figure A-30: Pre-Test Driver Dummy Front View

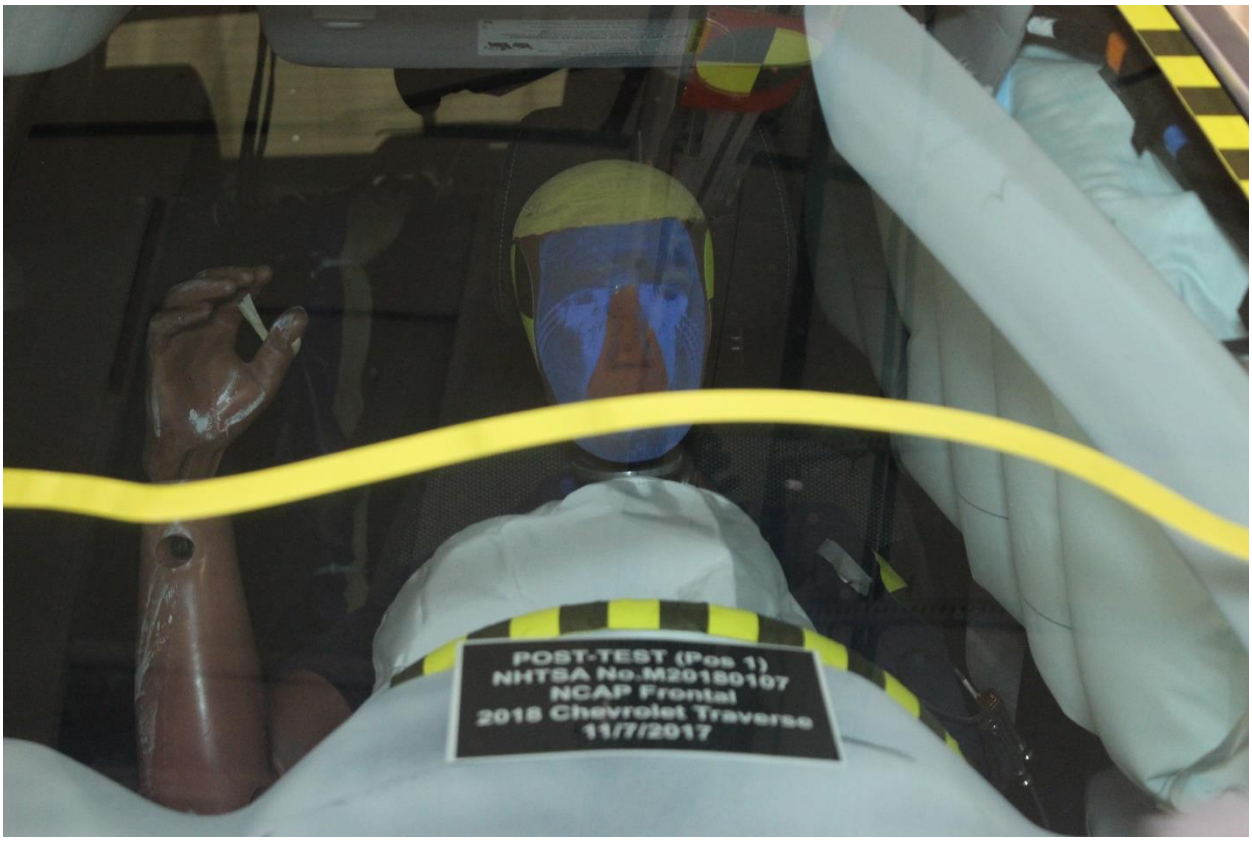


Figure A-31: Post-Test Driver Dummy Front View

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

Figure A-33: Post-Test Driver Dummy Window View

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

Figure A-35: Post-Test Driver Dummy and Vehicle Interior View

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

Figure A-37: Post-Test Driver's Seat Fore-Aft Markings

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

Figure A-39: Post-Test View of Belt Anchorage for Driver Dummy

Figure A-40: Pre-Test Driver Dummy Feet

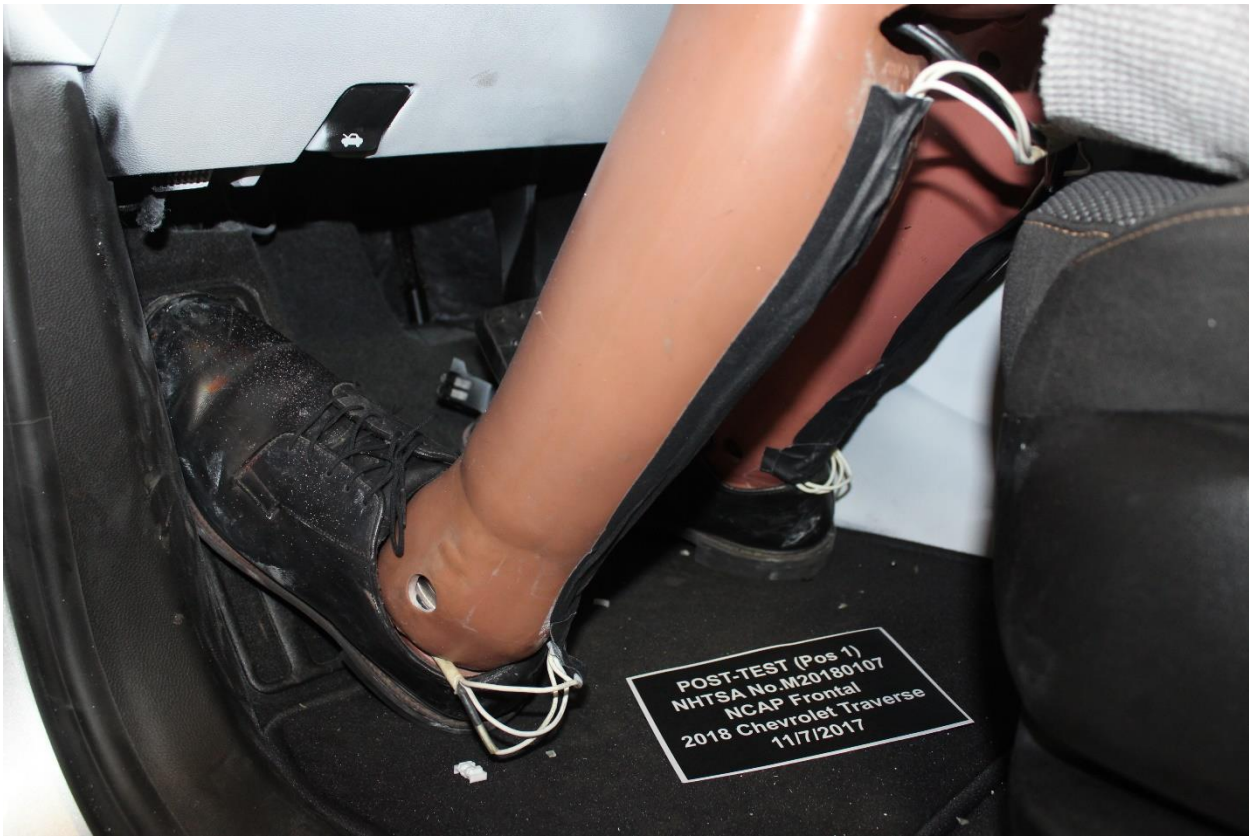


Figure A-41: Post-Test Driver Dummy Feet

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

Figure A-43: Post-Test Driver's Side Knee Bolster

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

Figure A-45: Post-Test Driver's Side Floorpan

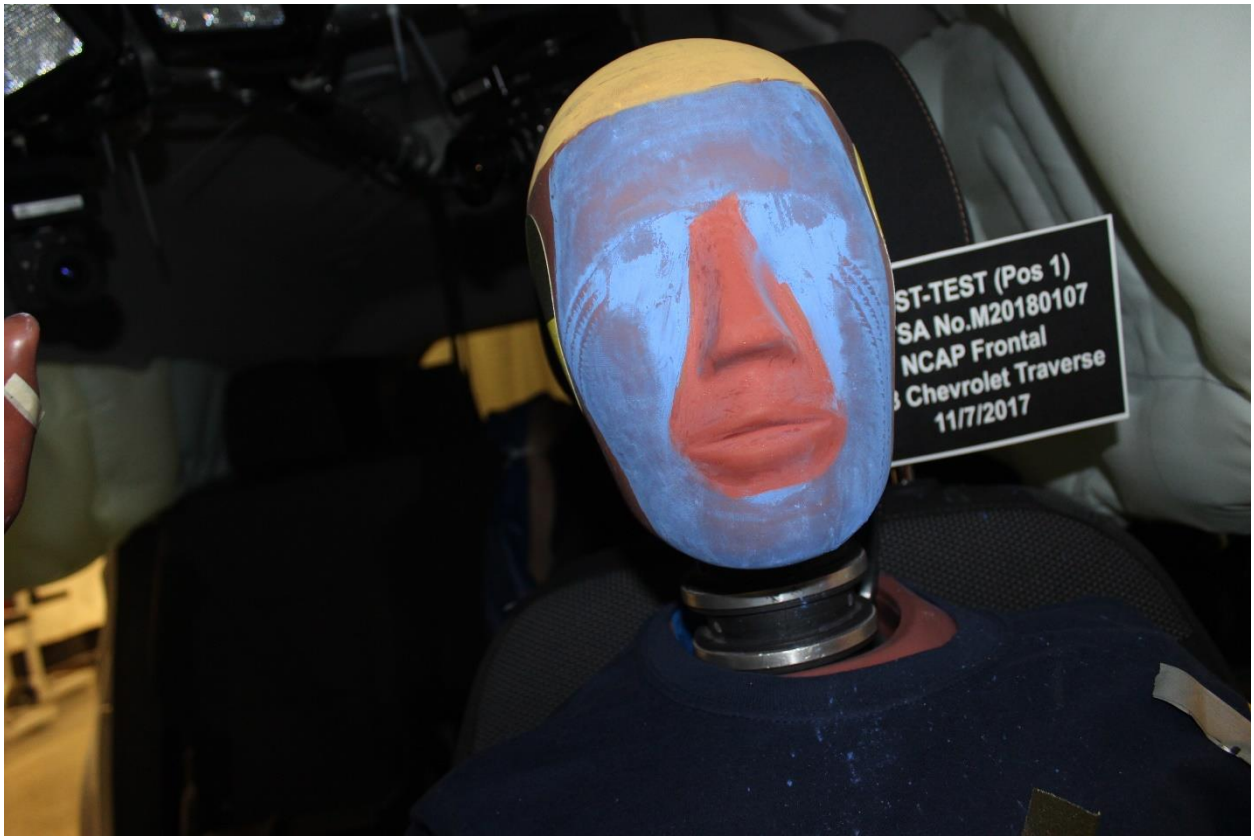


Figure A-46: Post-Test Driver Dummy Face

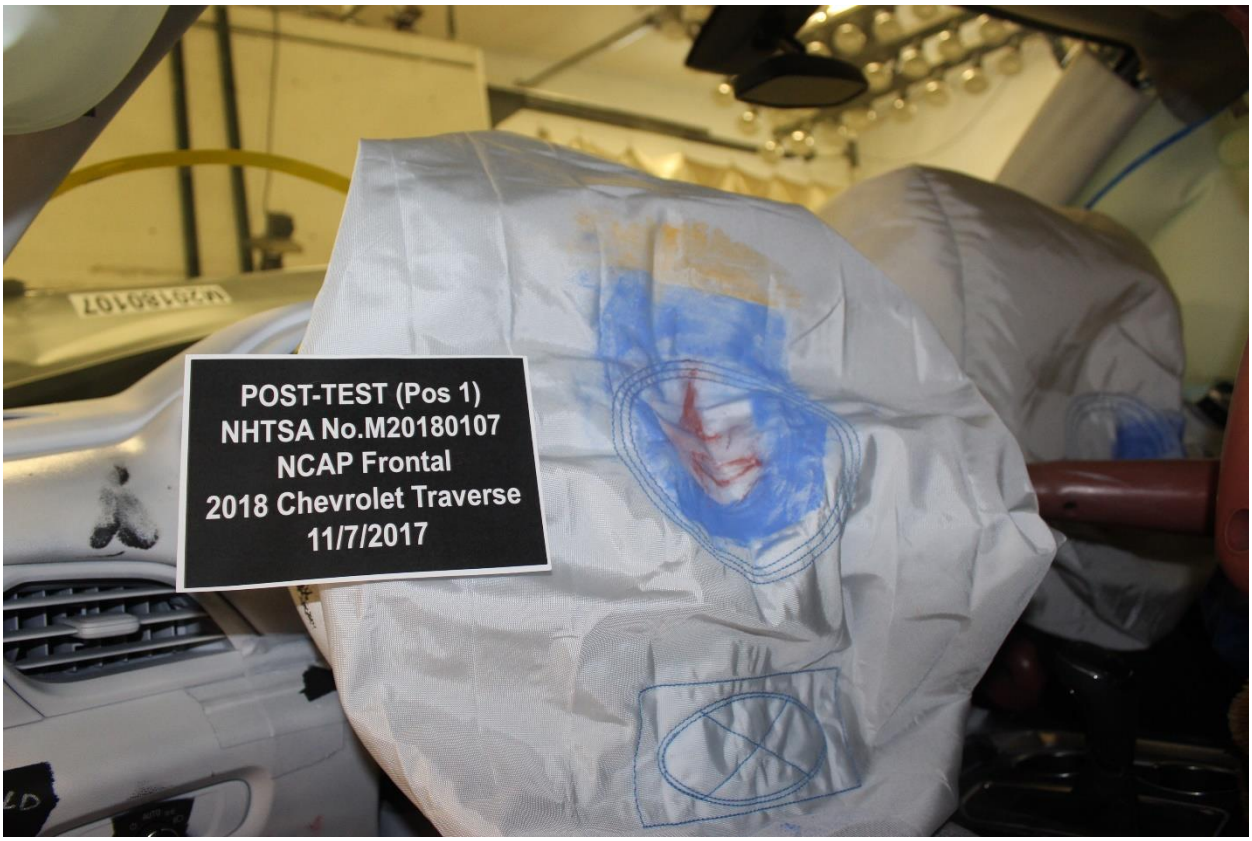


Figure A-47: Post-Test Driver Dummy Contact With Airbag

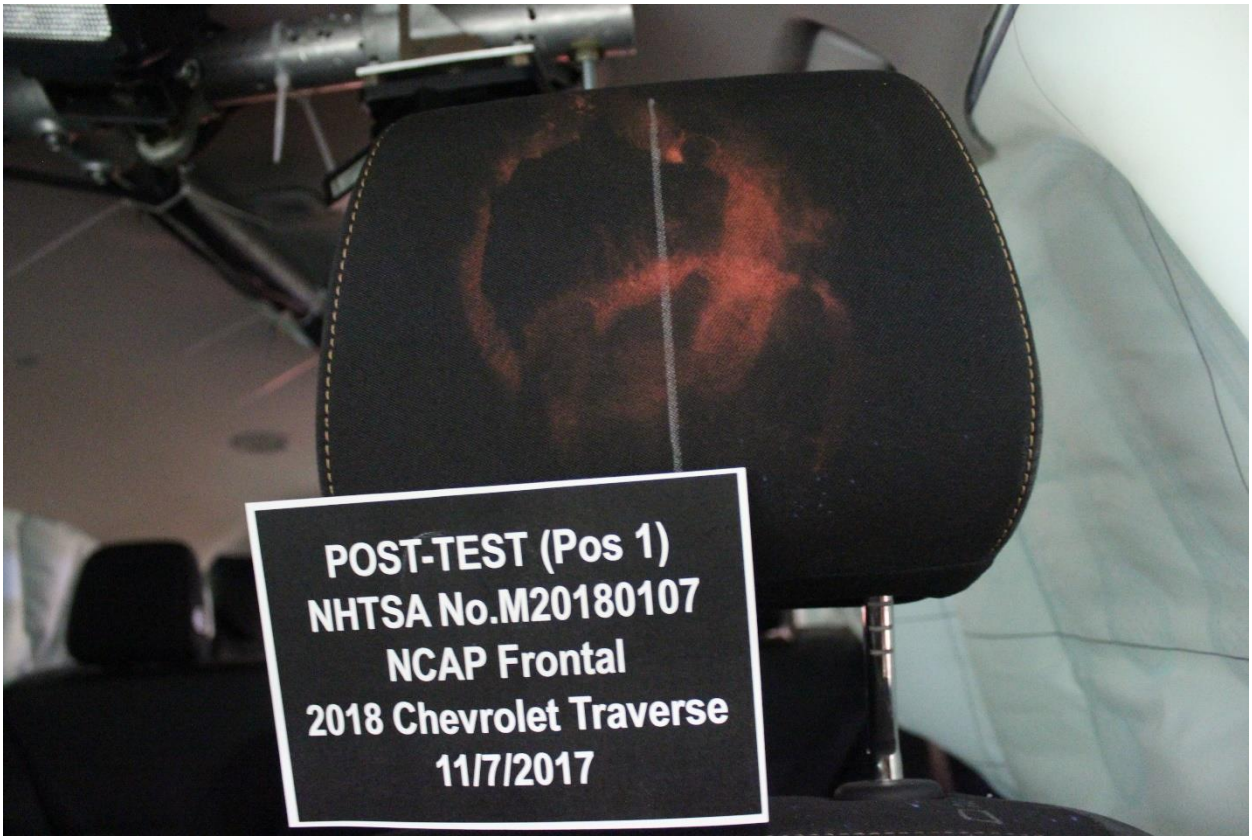


Figure A-48: Post-Test Driver Dummy Contact With Headrest

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

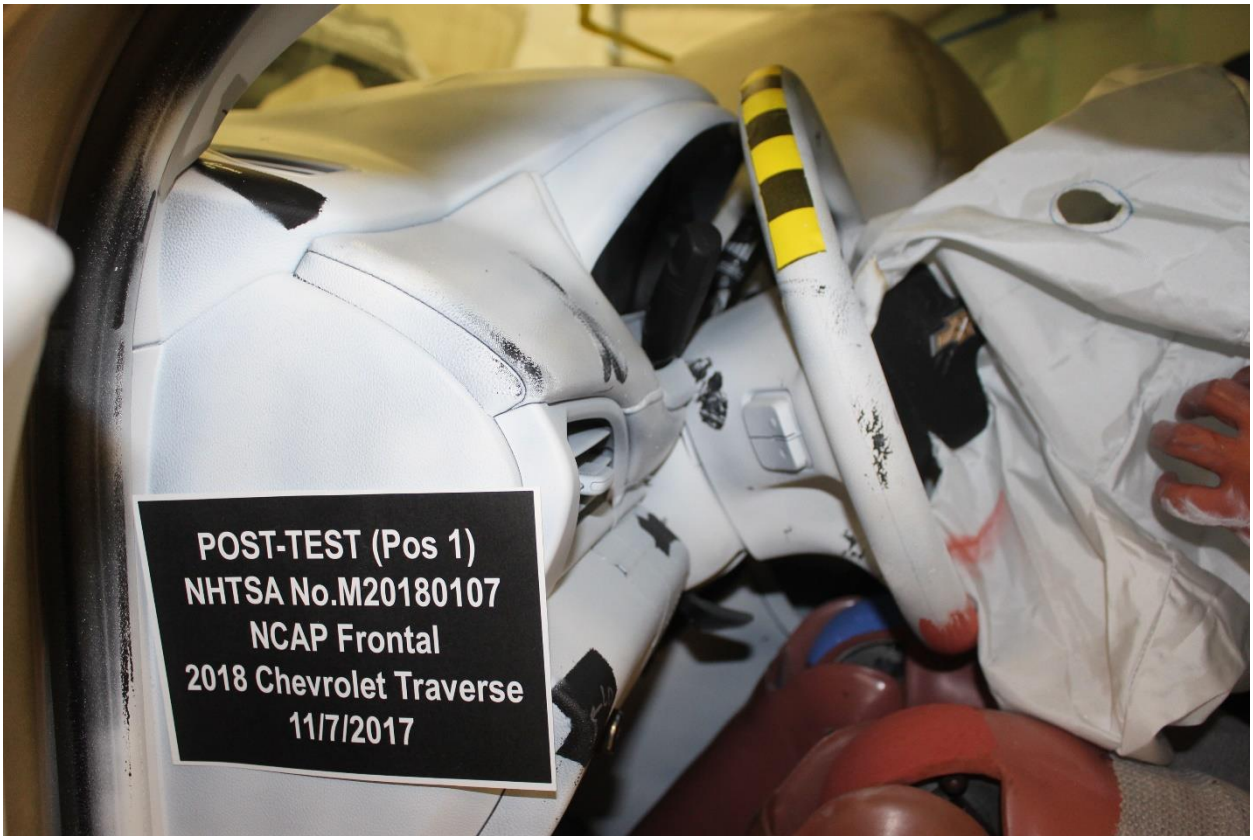


Figure A-50: Post-Test View of the Steering Wheel

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

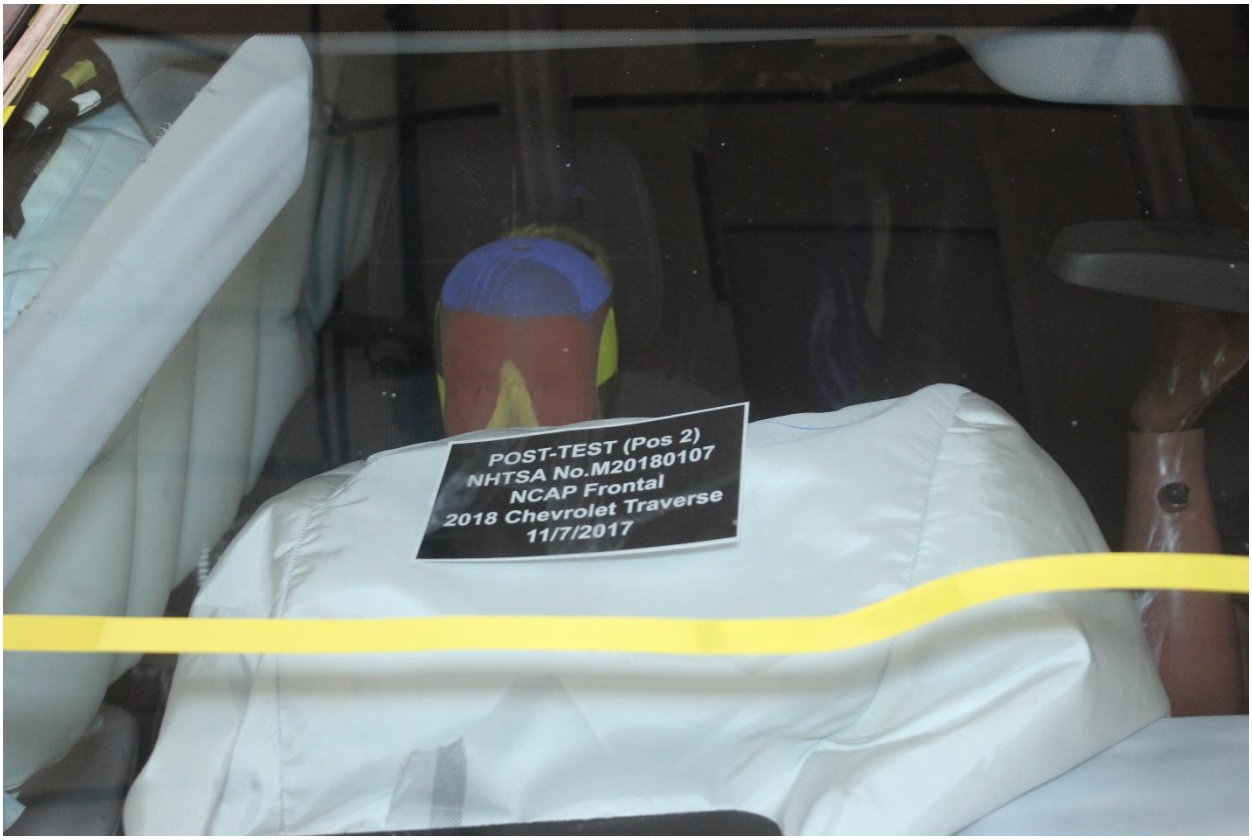


Figure A-52: Post-Test Passenger Dummy Front View

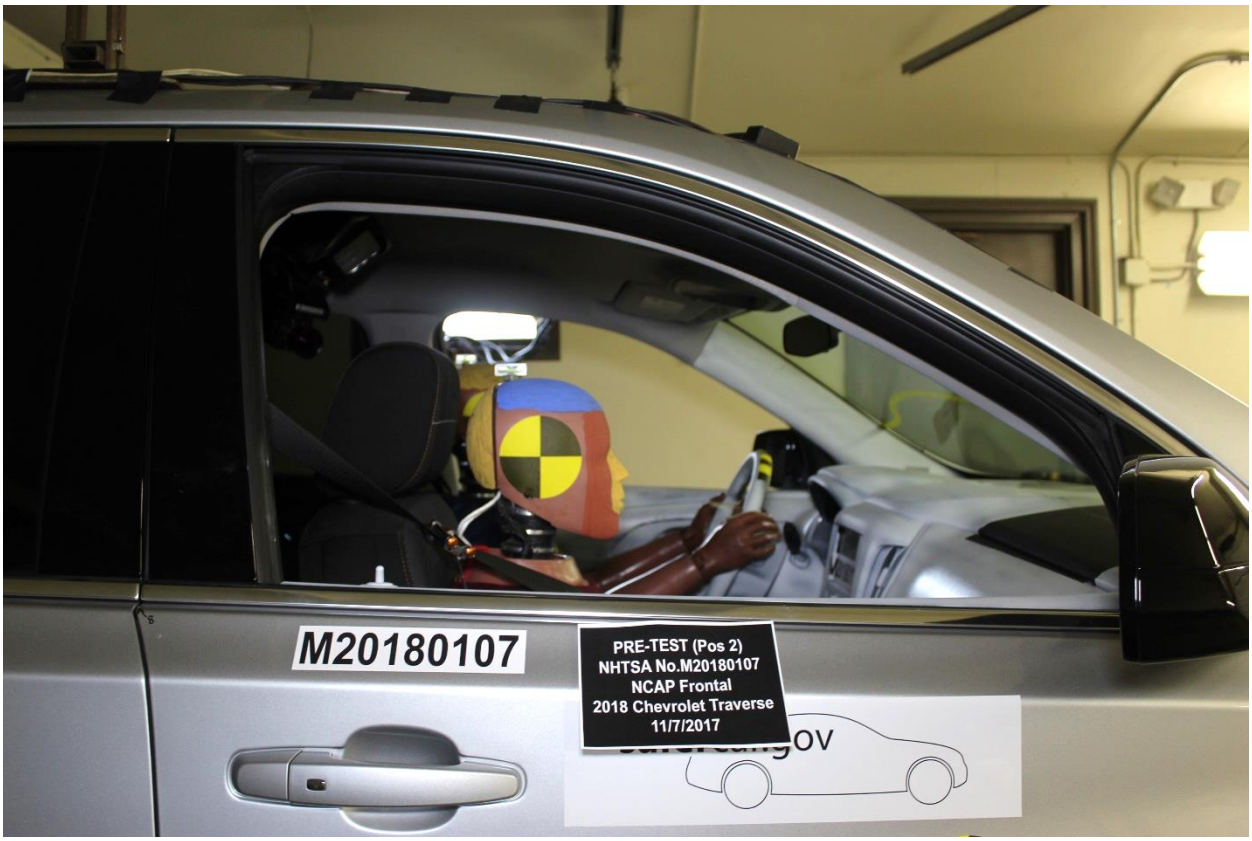


Figure A-53: Pre-Test Passenger Dummy Window View

Figure A-54: Post-Test Passenger Dummy Window View

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

Figure A-56: Post-Test Passenger Dummy and Vehicle Interior View

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

Figure A-58: Post-Test Passenger's Seat Fore-Aft Markings

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

Figure A-60: Post-Test View of Belt Anchorage for Passenger Dummy

Figure A-61: Pre-Test Passenger Dummy Feet

Figure A-62: Post-Test Passenger Dummy Feet

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

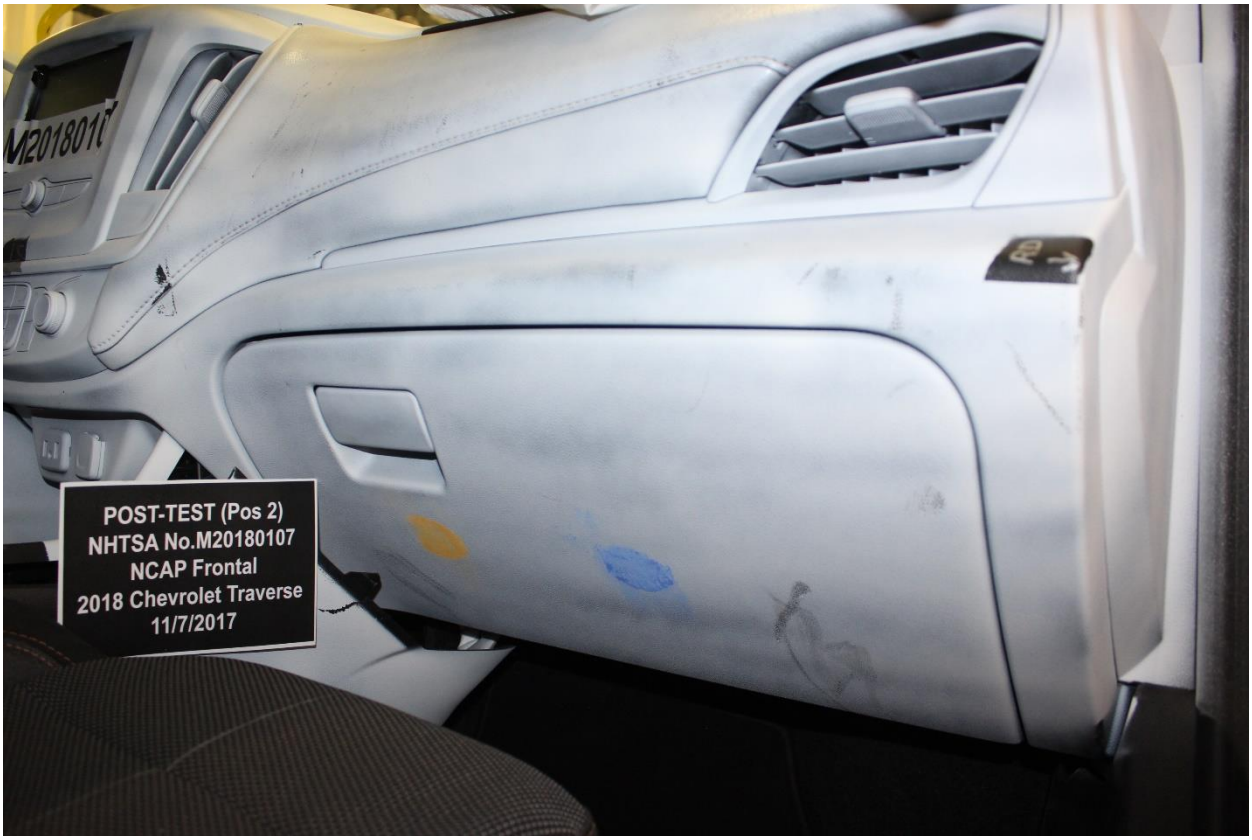


Figure A-64: Post-Test Passenger's Side Knee Bolster

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

Figure A-66: Post-Test Passenger's Side Floorpan

Figure A-67: Post-Test Passenger Dummy Face

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

Figure A-69: Post-Test Passenger Dummy Contact With Headrest

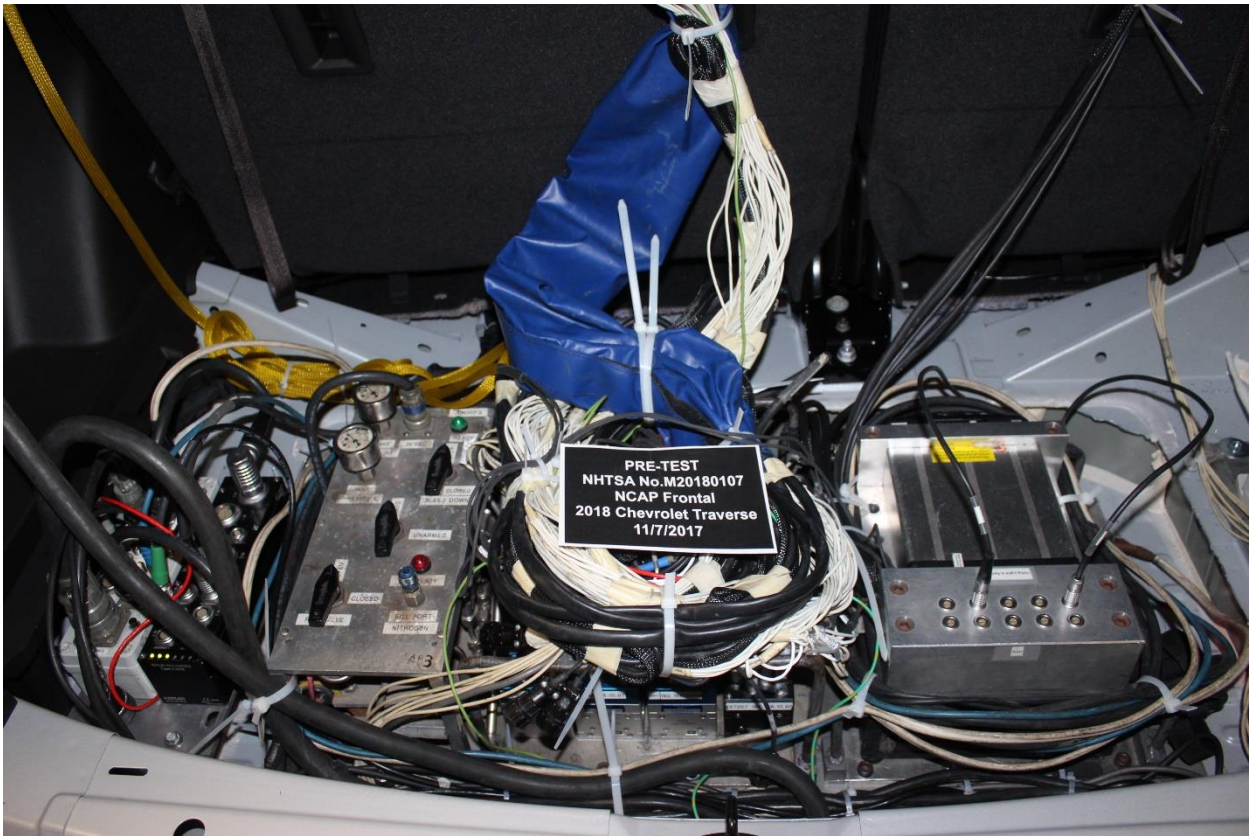


Figure A-70: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

Figure A-71: Post-Test Stoddard Solvent Spillage Location View, If Required

Figure A-72: Post-Test Speed Trap Read-Out

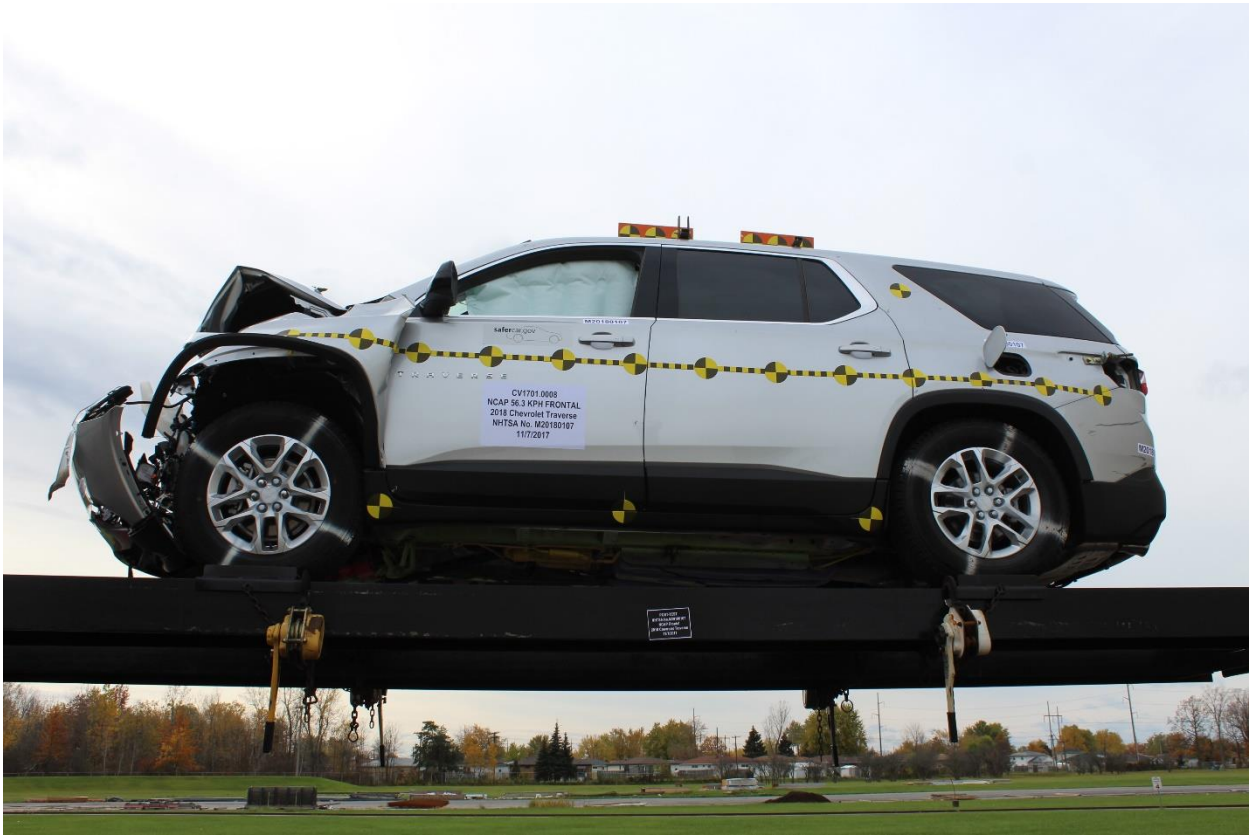


Figure A-73: Vehicle at 0º on Static Rollover Device

Figure A-74: Vehicle at 90º on Static Rollover Device

Figure A-75: Vehicle at 180º on Static Rollover Device

Figure A-76: Vehicle at 270º on Static Rollover Device

Figure A-77: Vehicle at 360º on Static Rollover Device

Figure A-78: 2018 Chevrolet Traverse Frontal Impact Event

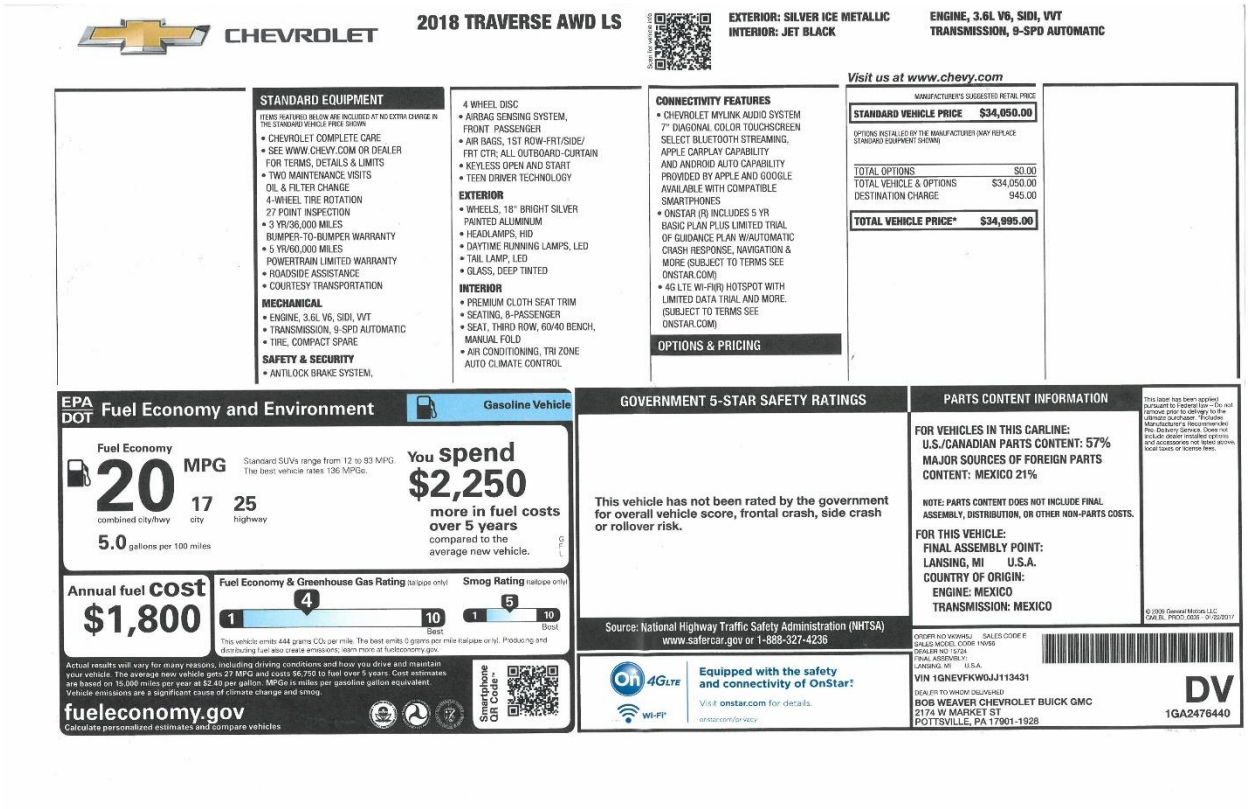
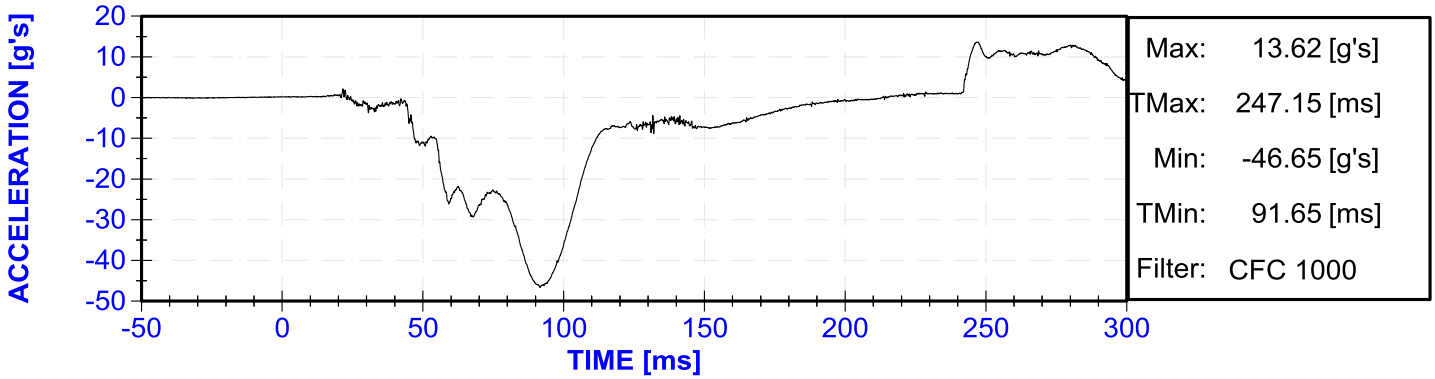


Figure A-79: Monroney Label Photograph

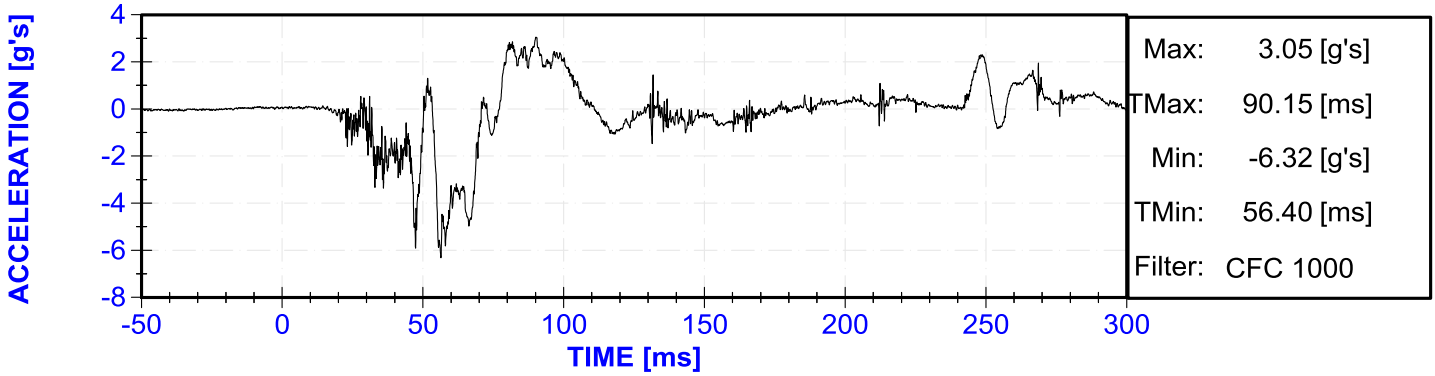
APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

Table of Data Plots

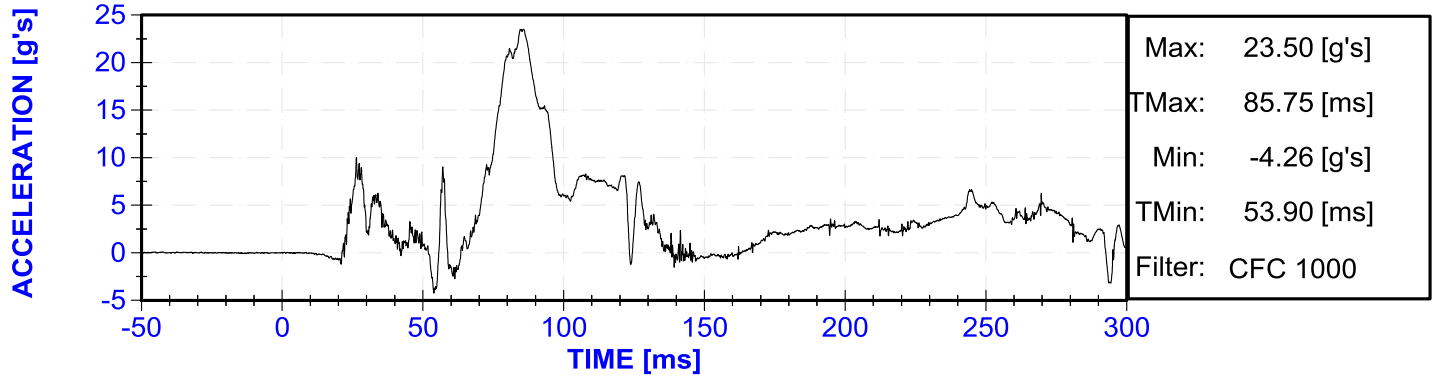
Driver Head X Acceleration vs. Time Primary



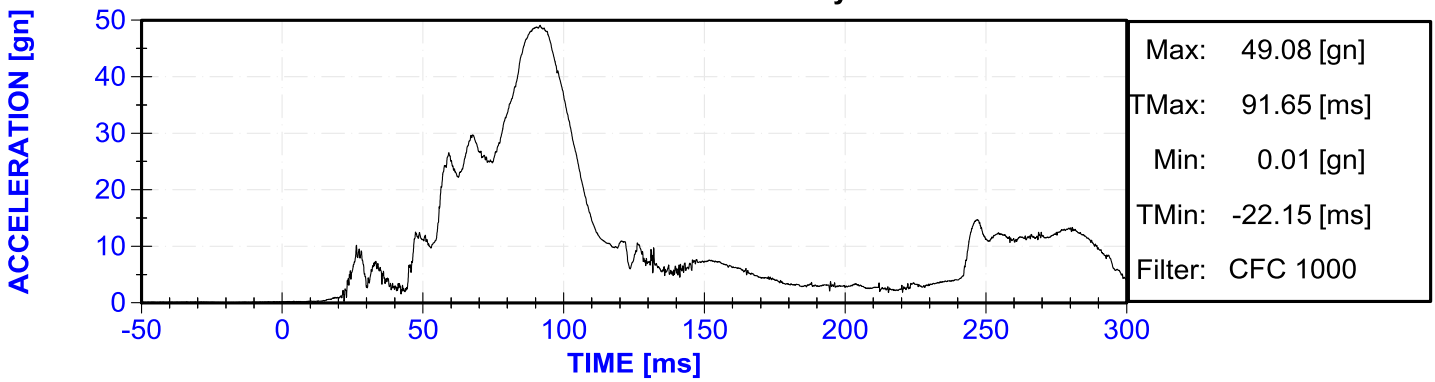
Driver Head Y Acceleration vs. Time Primary



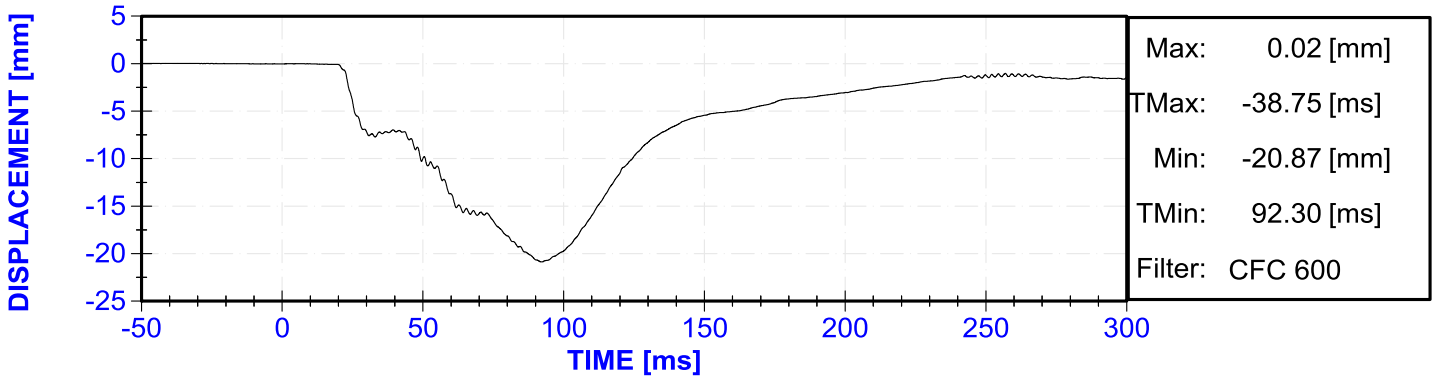
Driver Head Z Acceleration vs. Time Primary



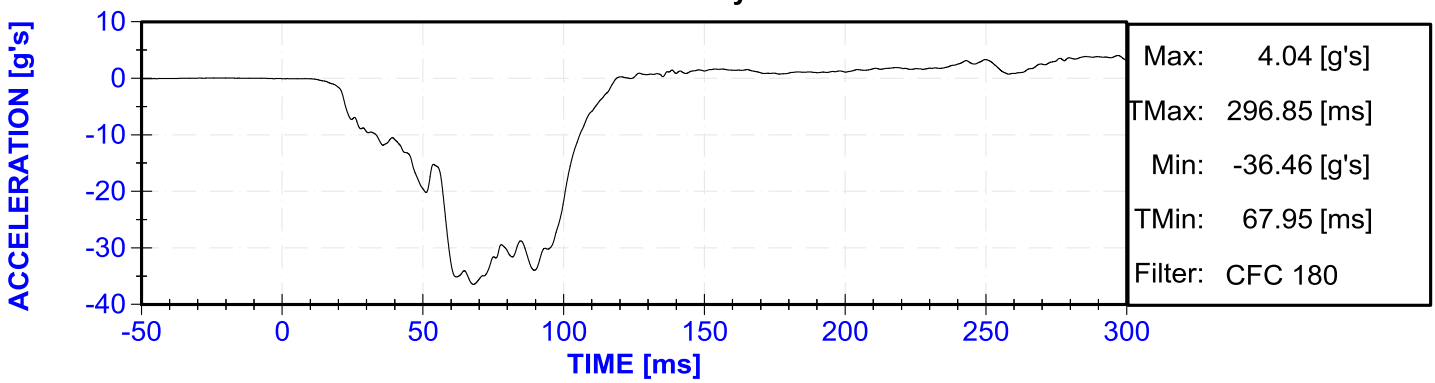
Driver Head Resultant Acceleration vs. Time Primary



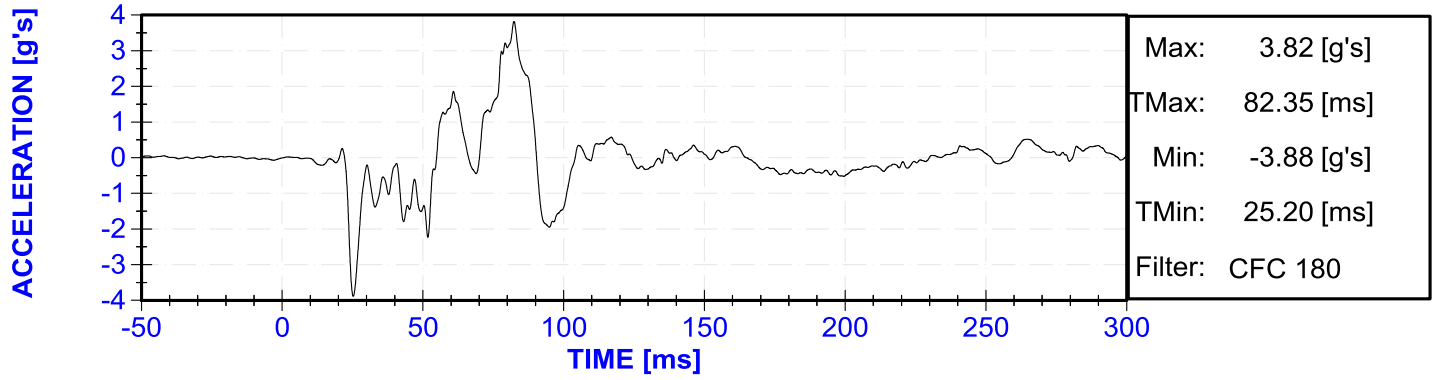
Driver Chest X Deflection vs. Time



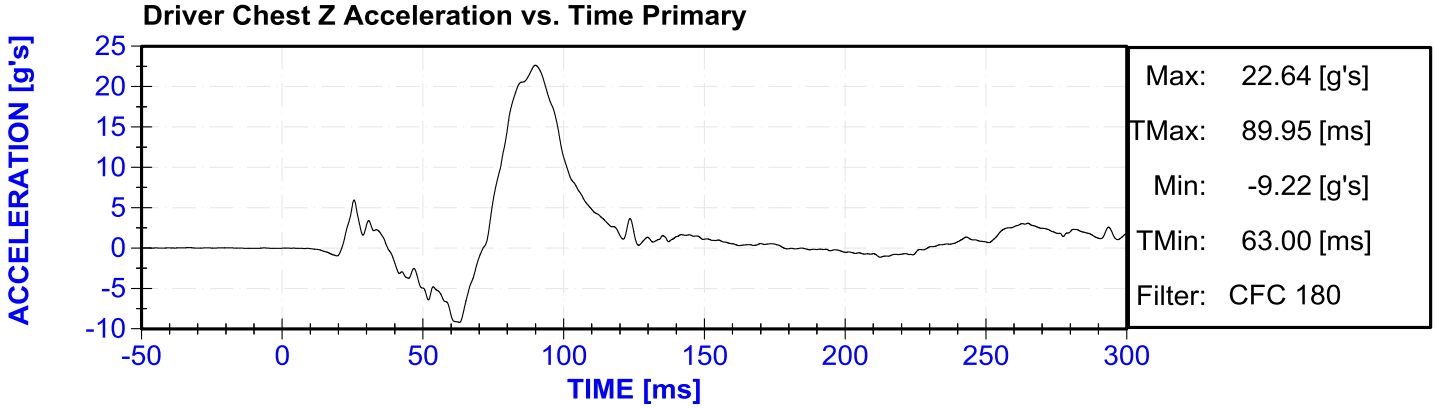
Driver Chest X Acceleration vs. Time Primary



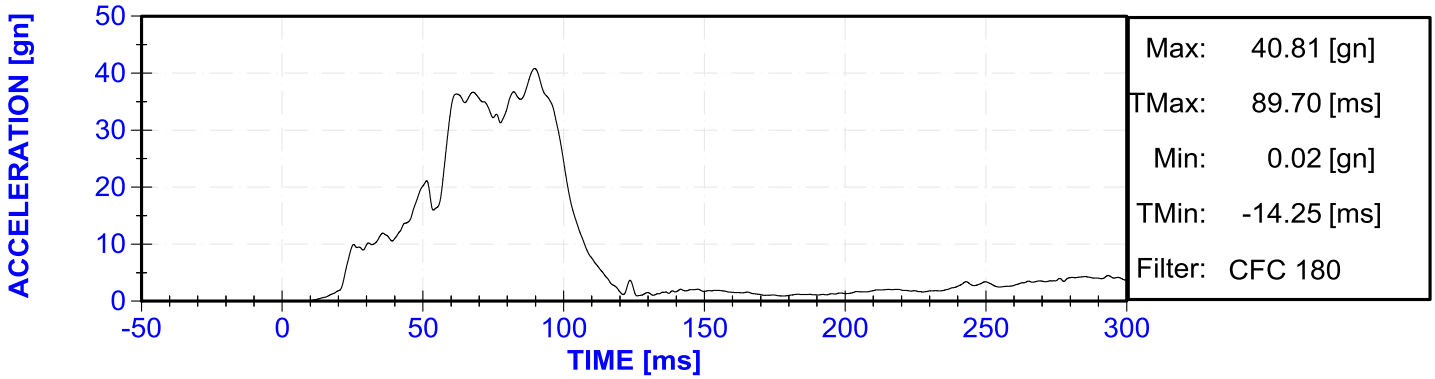
Driver Chest Y Acceleration vs. Time Primary



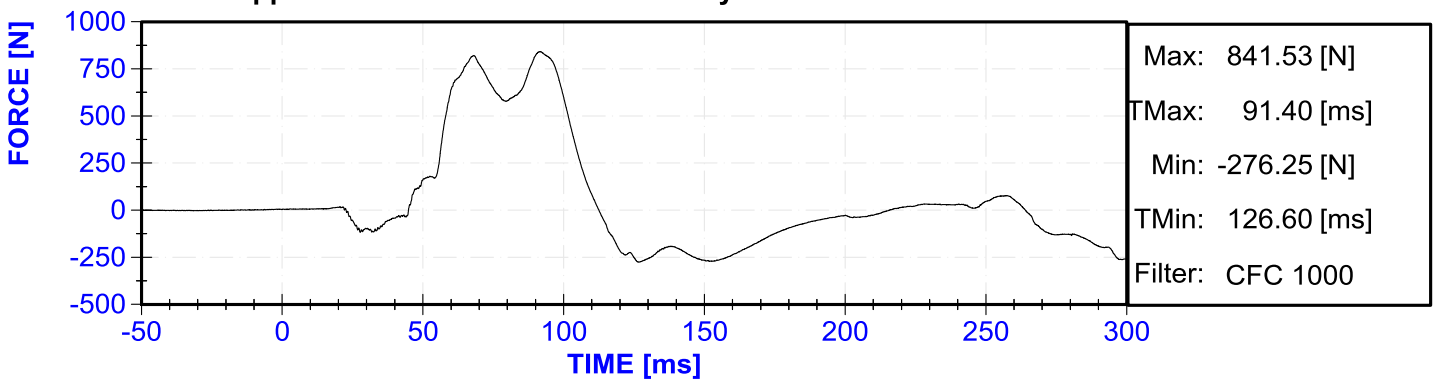
Driver Chest Z Acceleration vs. Time Primary



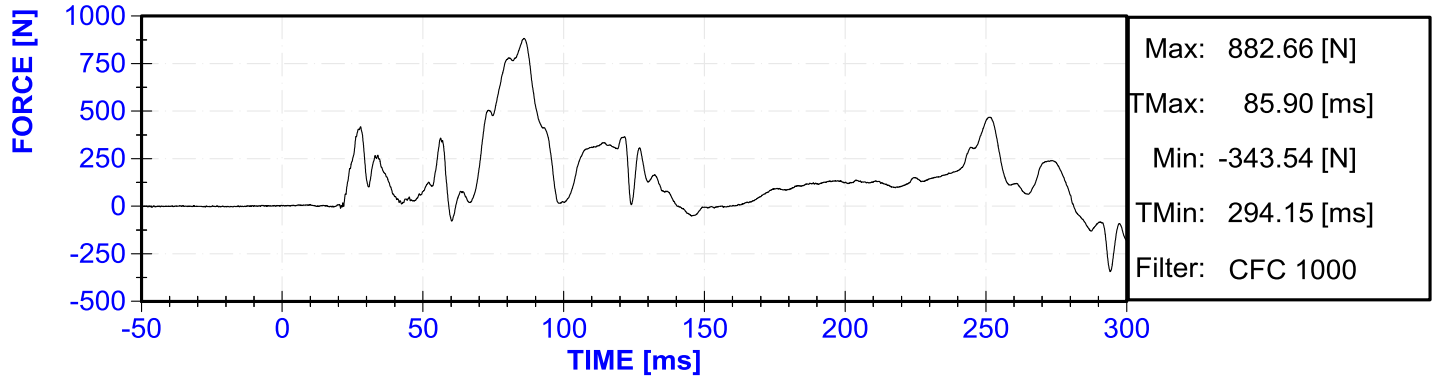
Driver Chest Resultant Acceleration vs. Time Primary



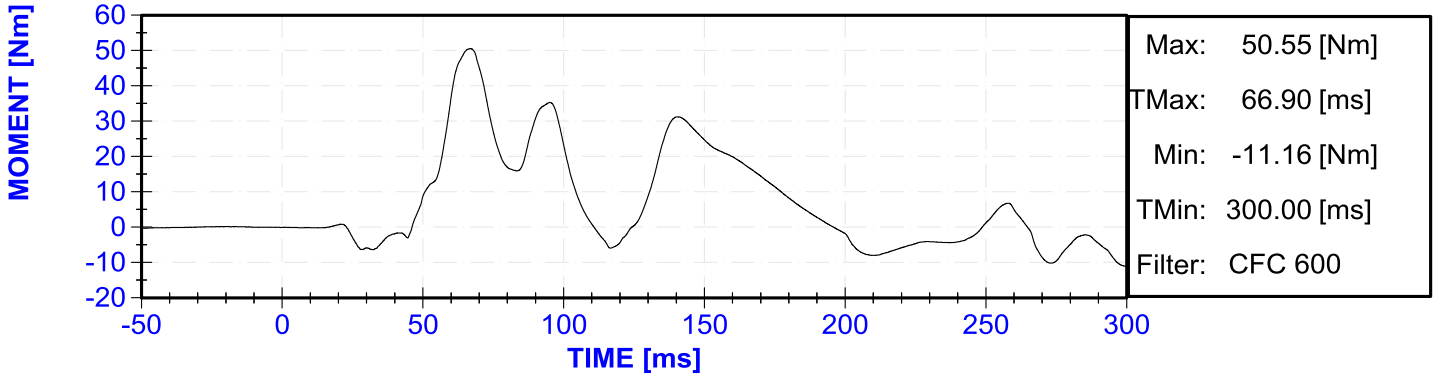
Driver Upper Neck Force X vs. Time Primary



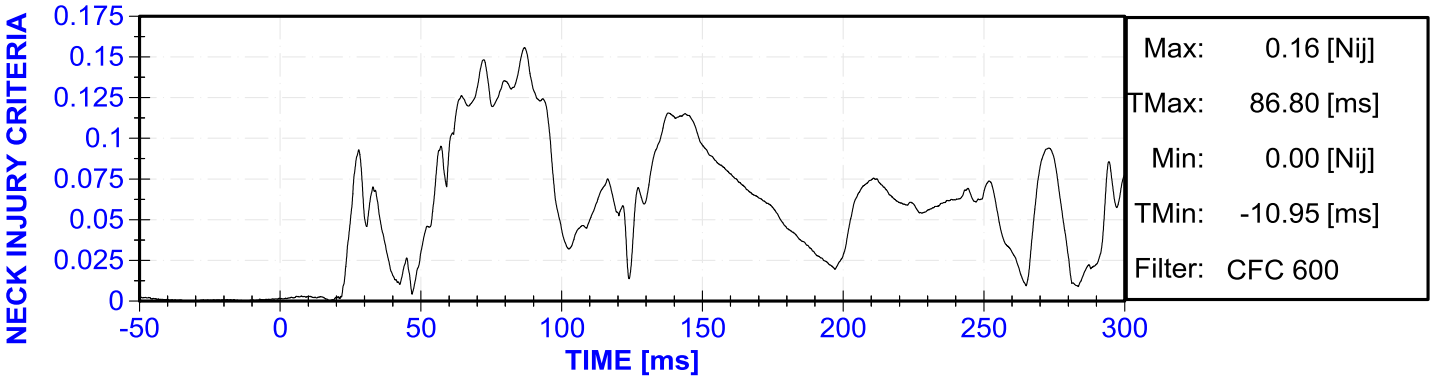
Driver Upper Neck Force Z vs. Time Primary



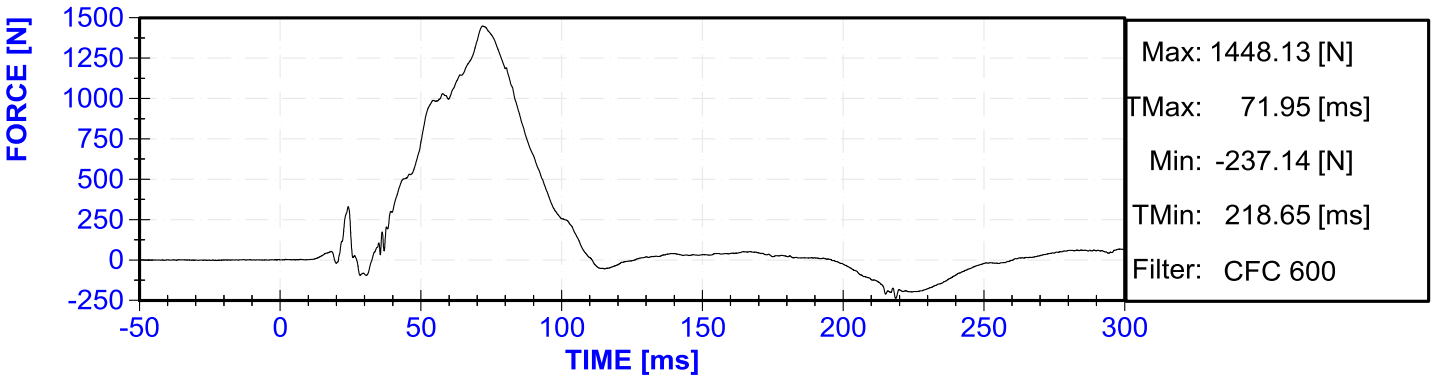
Driver Upper Neck Moment Y vs. Time Primary



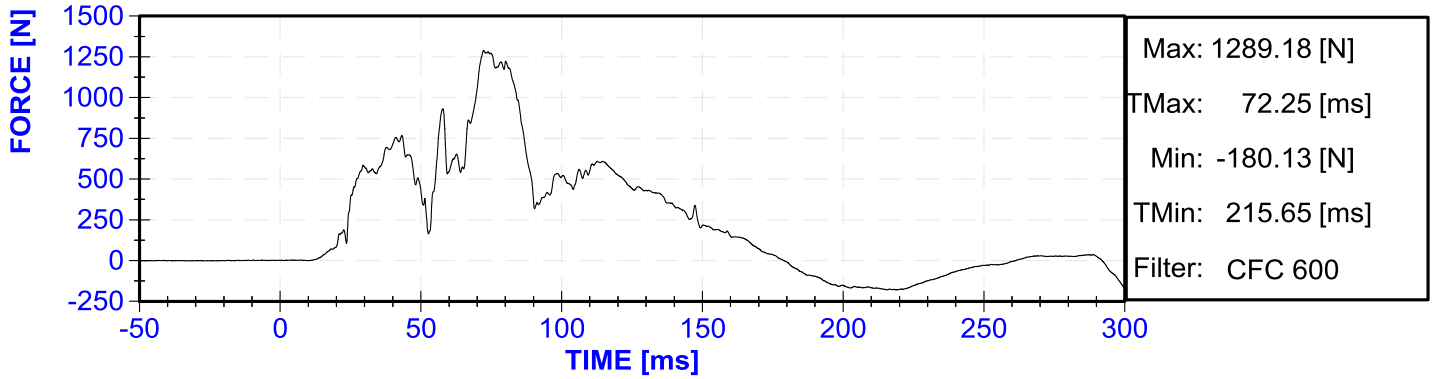
Driver Nij vs. Time Primary



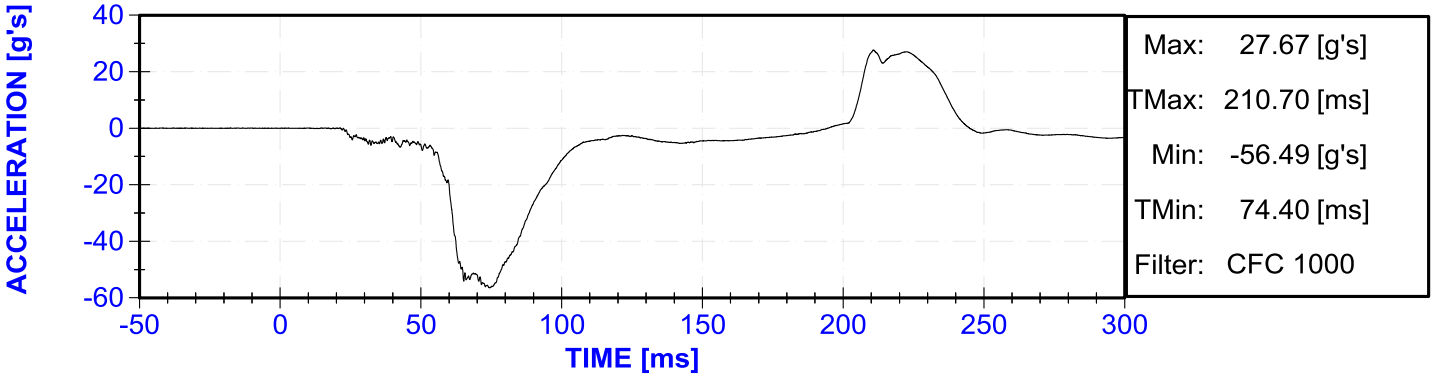
Driver Left Femur Force vs. Time



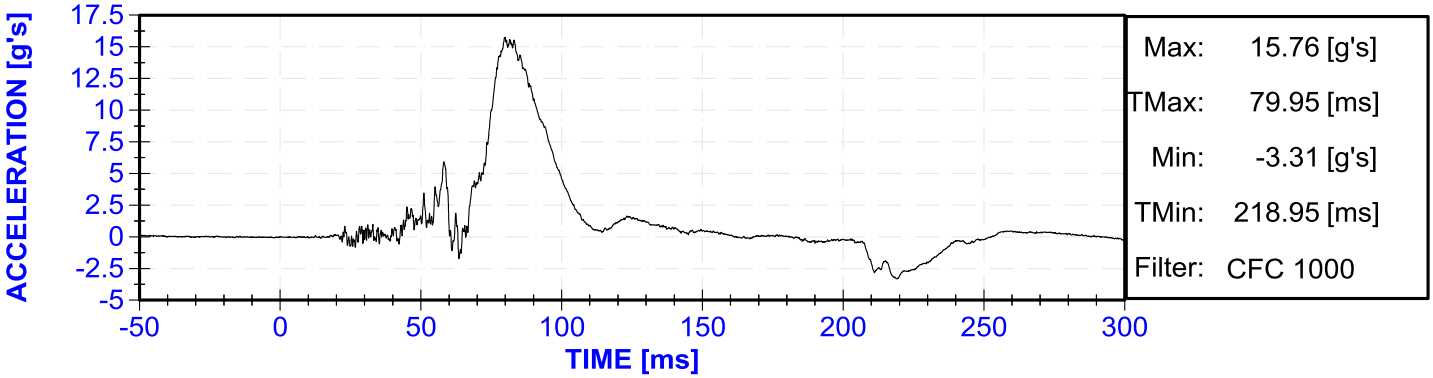
Driver Right Femur Force vs. Time



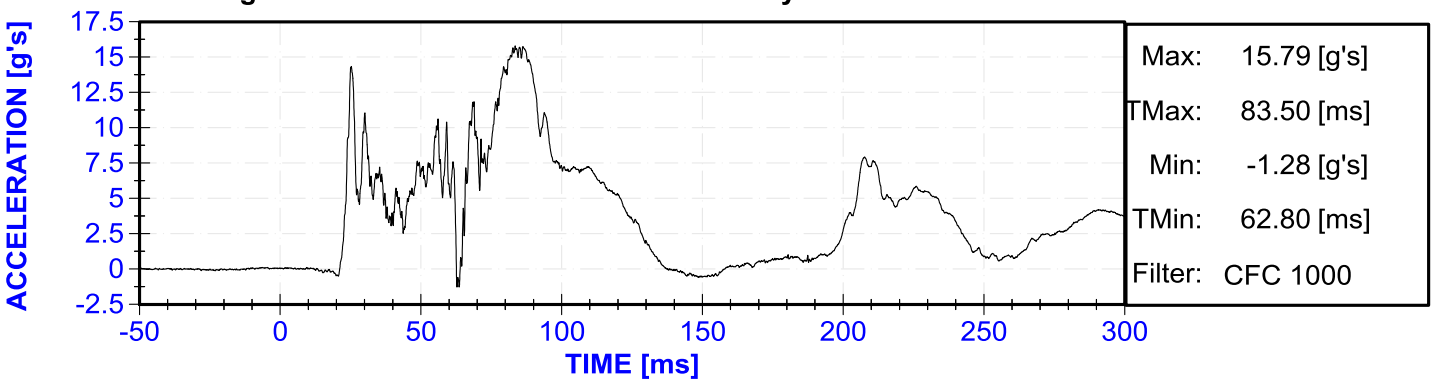
Passenger Head X Acceleration vs. Time Primary



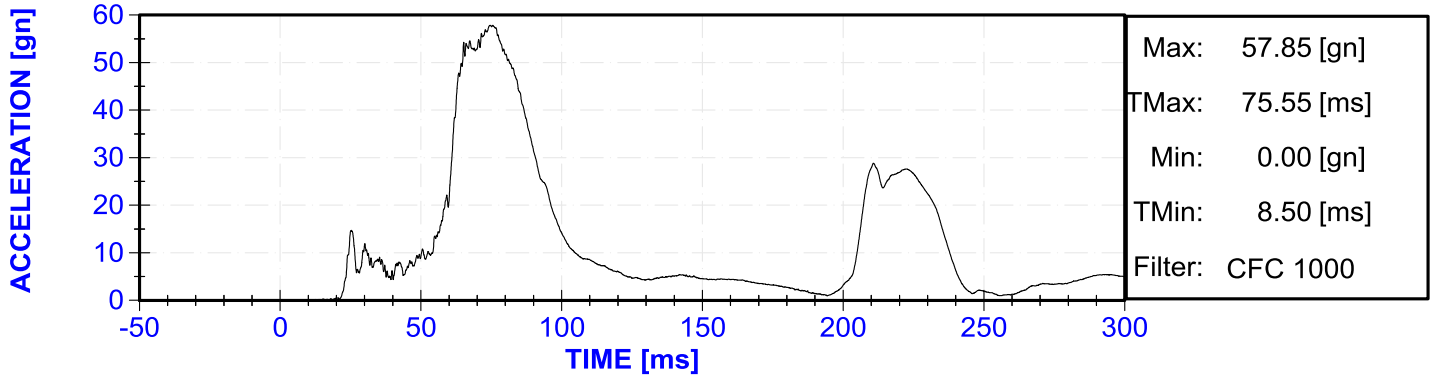
Passenger Head Y Acceleration vs. Time Primary



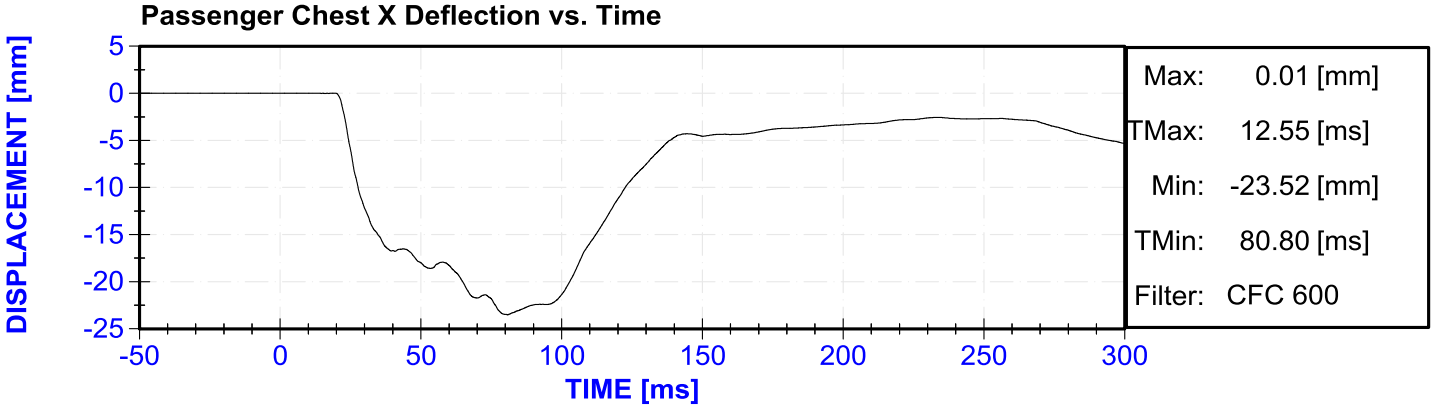
Passenger Head Z Acceleration vs. Time Primary



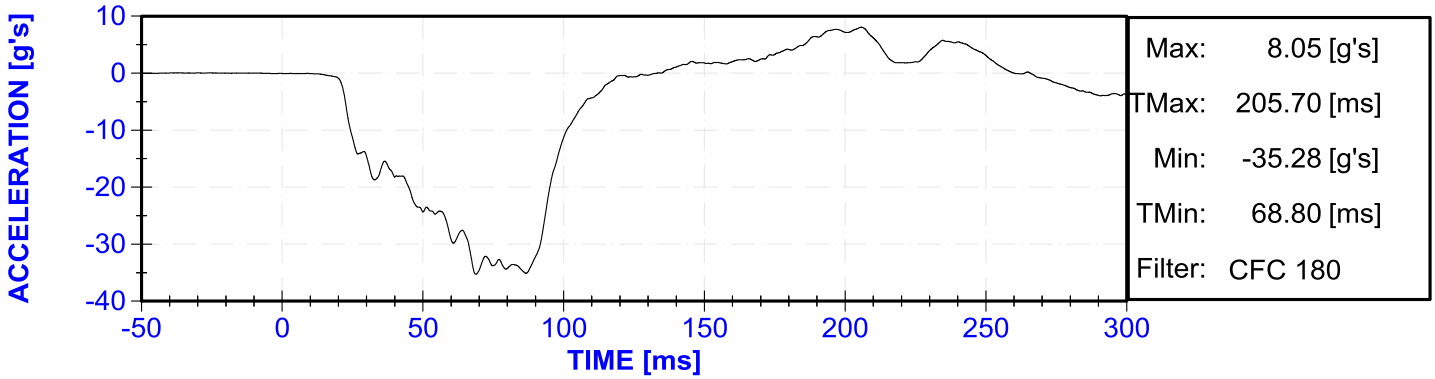
Passenger Head Resultant Acceleration vs. Time Primary



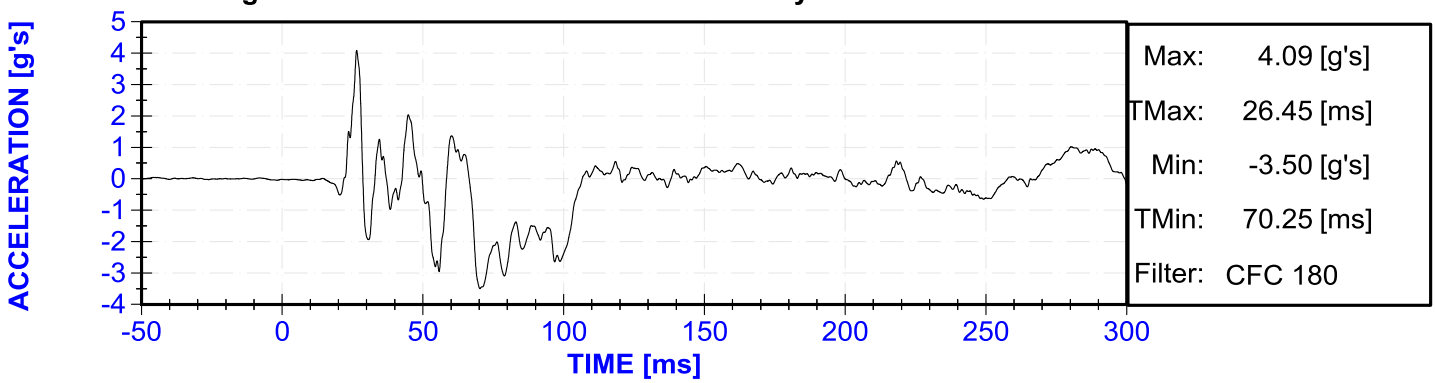
Passenger Chest X Deflection vs. Time



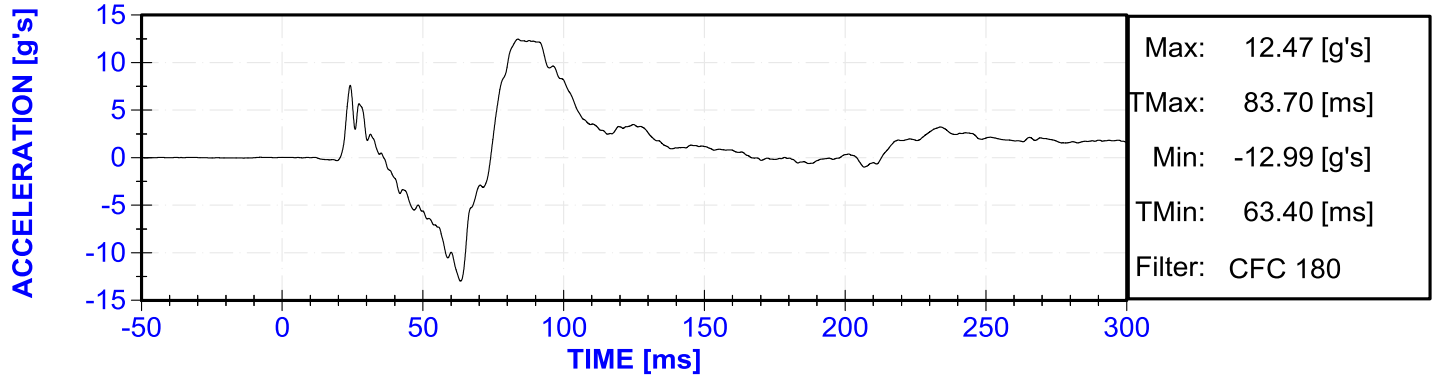
Passenger Chest X Acceleration vs. Time Primary



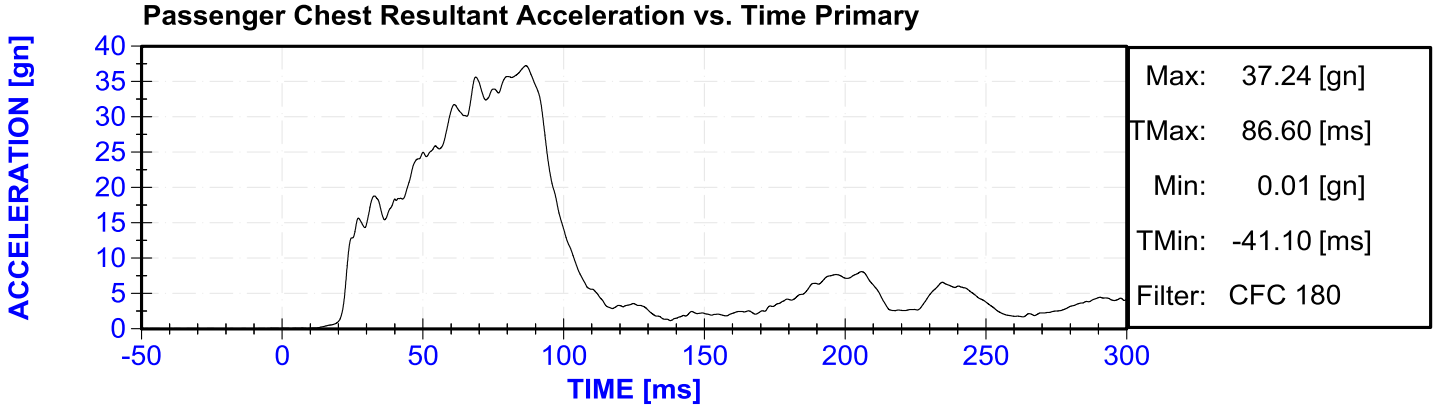
Passenger Chest Y Acceleration vs. Time Primary



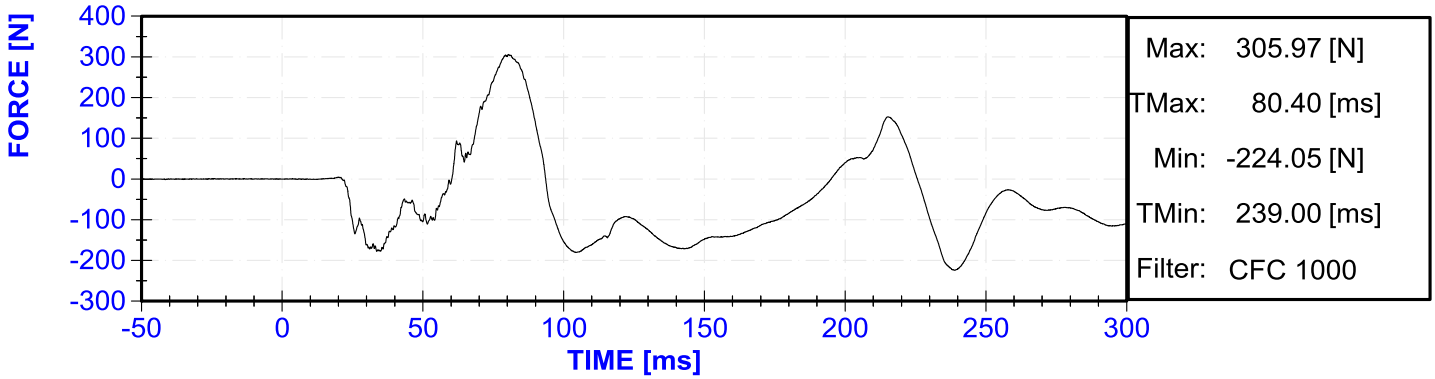
Passenger Chest Z Acceleration vs. Time Primary



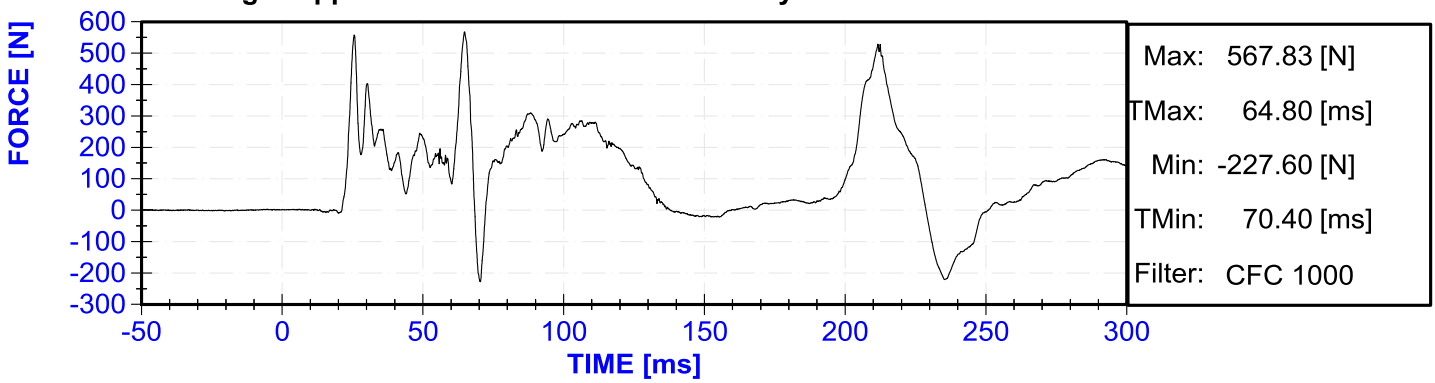
Passenger Chest Resultant Acceleration vs. Time Primary



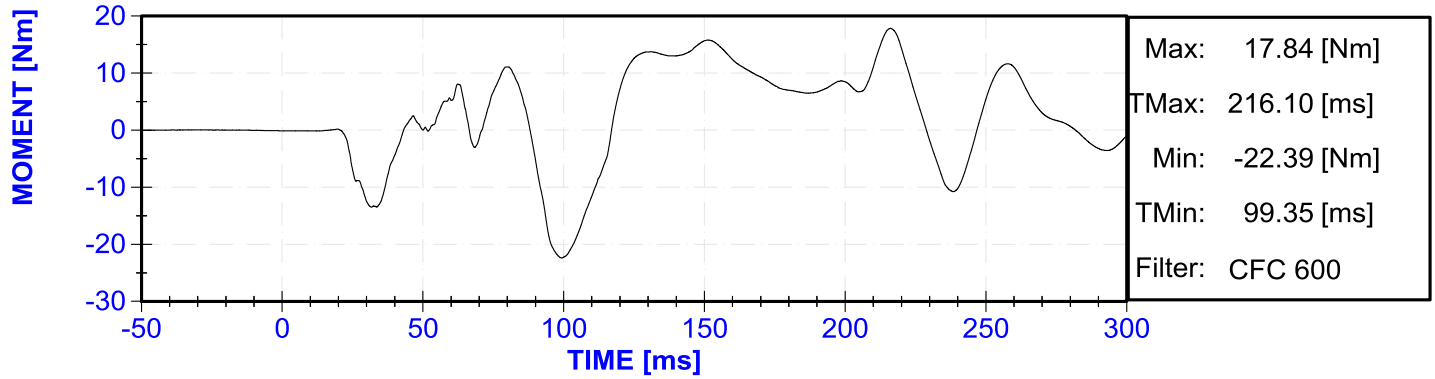
Passenger Upper Neck Force X vs. Time Primary



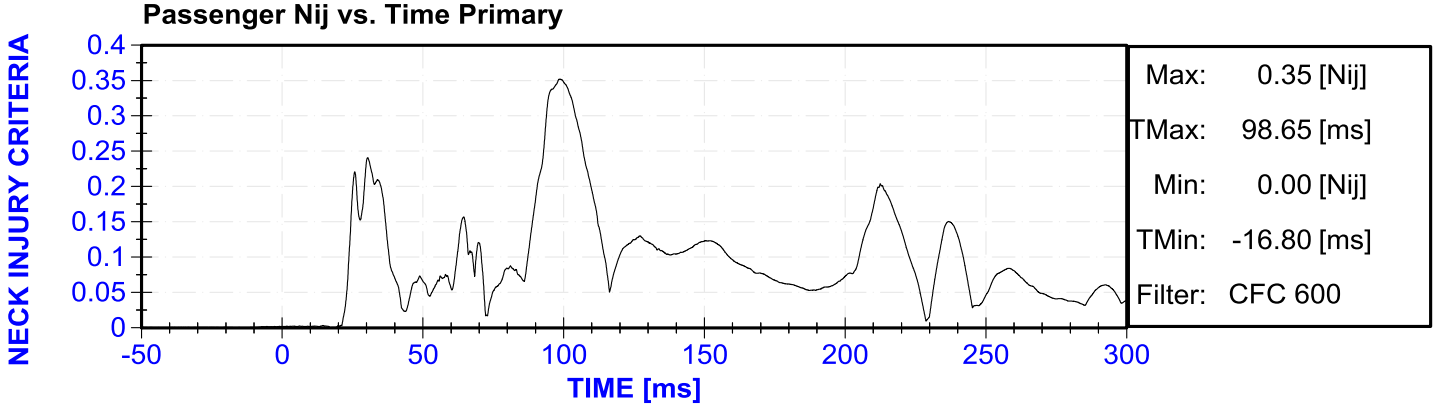
Passenger Upper Neck Force Z vs. Time Primary



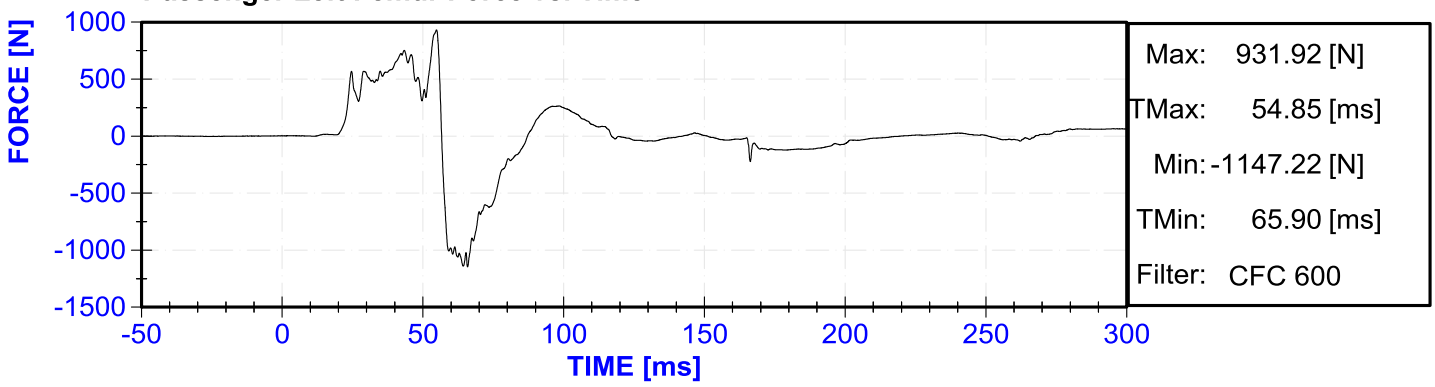
Passenger Upper Neck Moment Y vs. Time Primary



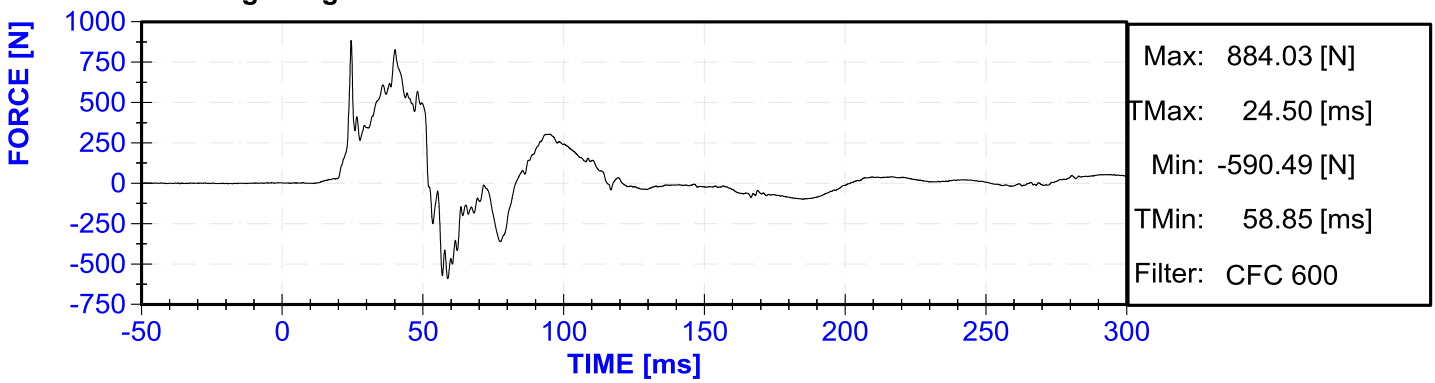
Passenger Nij vs. Time Primary



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

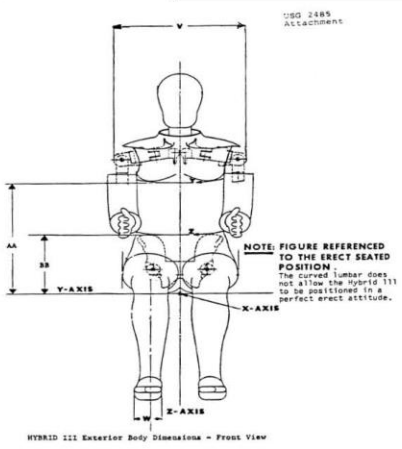
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

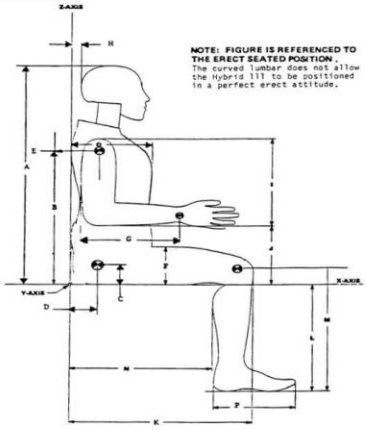
External Measurements - Hybrid 3 - 50th Male

Technician: K. Brogan Date: 11/1/2017

Dummy Serial Number: 142



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

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	3.5	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	11.5	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	8.2	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.8	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.5	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	17.0	Pass
W	Foot Breadth	3.6	4.2	4.0	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.3	Pass
Z	Waist Circumference	32.9	34.1	34.0	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

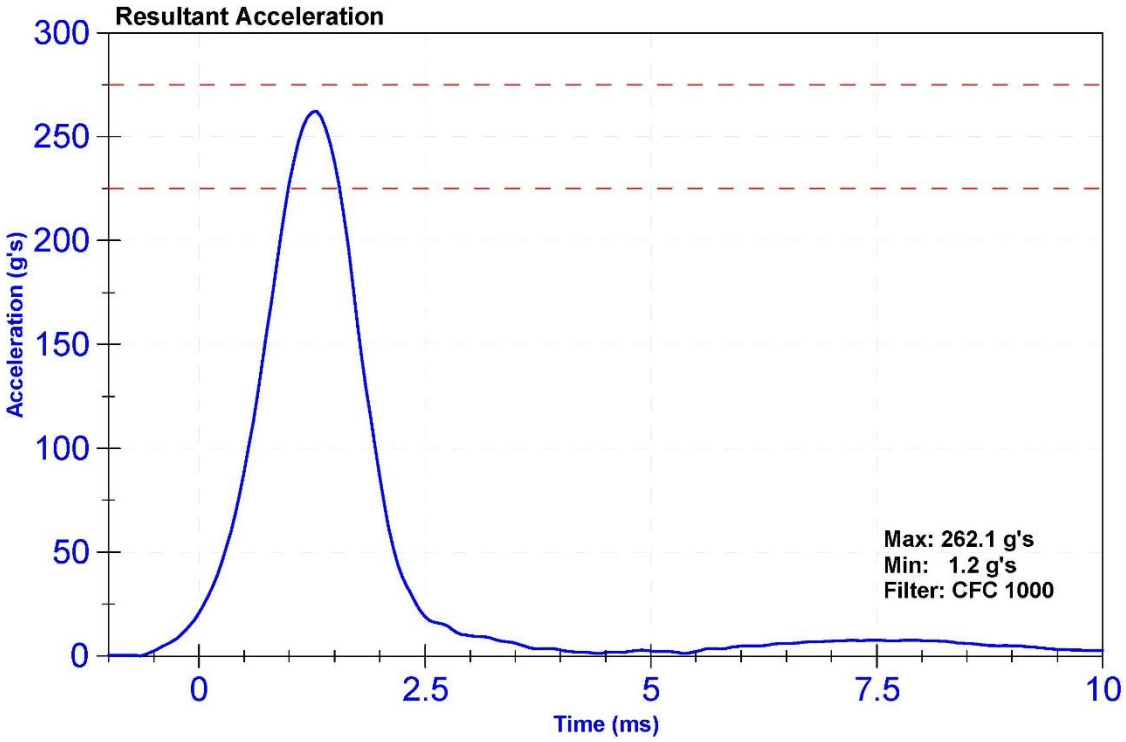
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

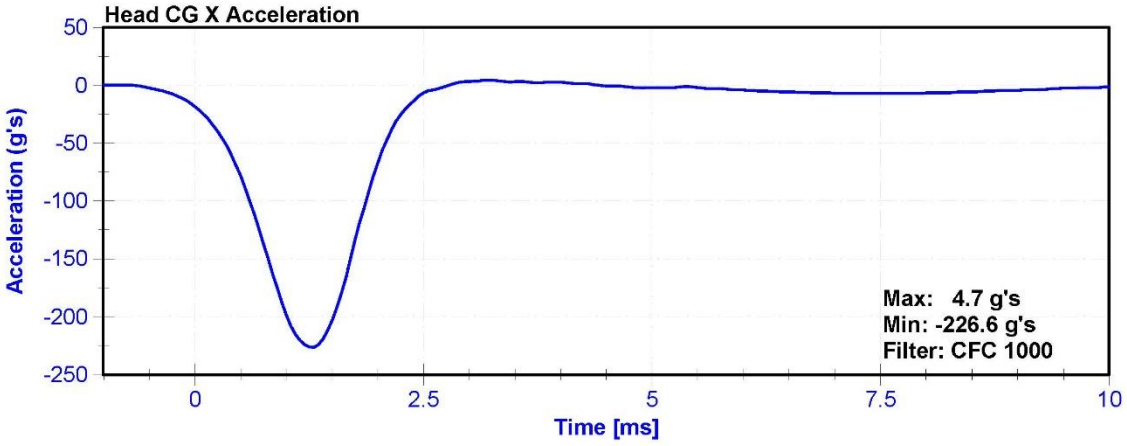
Results

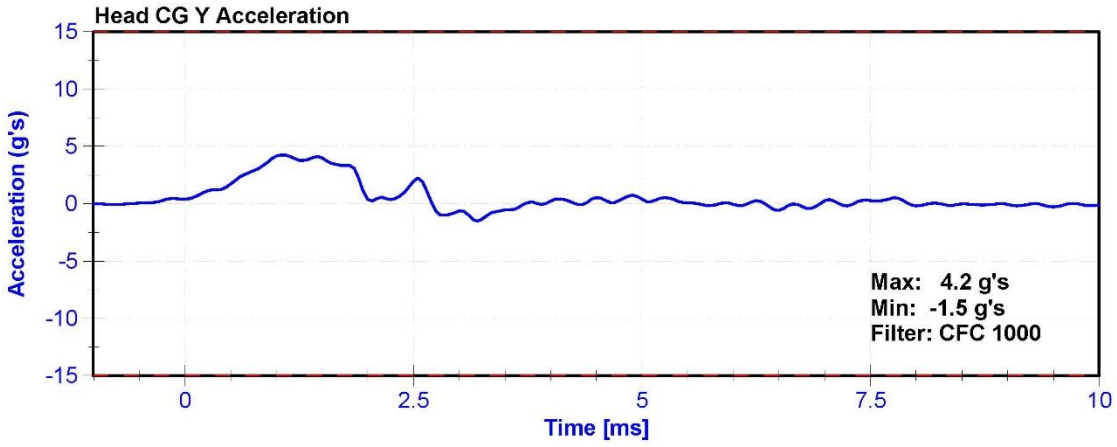
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	22.0	Pass
Humidity	10	70	%	33.6	Pass
Resultant Acceleration	225	275	g's	262.1	Pass
Oscillation	0	10	%	2.9	Pass
Lateral Acceleration	-15	15	g's	4.2	Pass

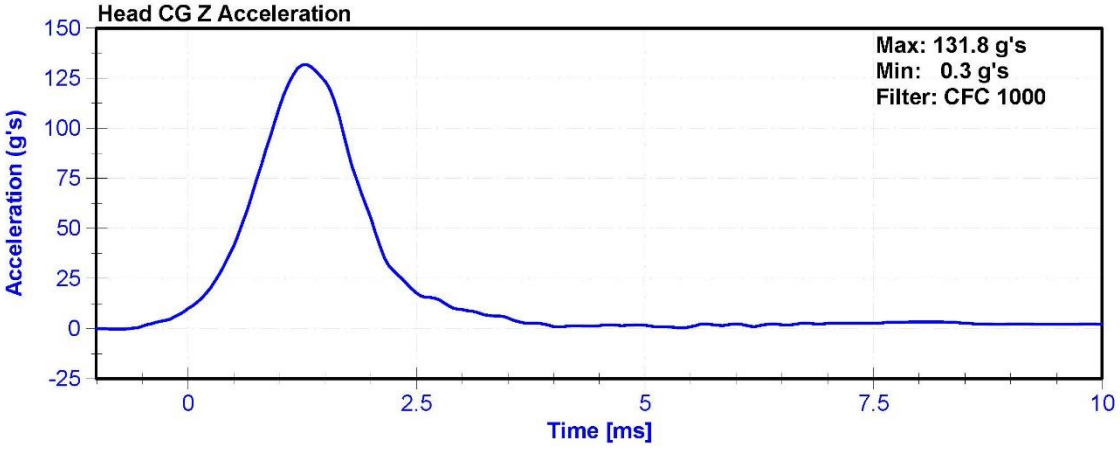
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58998	10/25/2017	4/25/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P58912	10/25/2017	4/25/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P58997	10/25/2017	4/25/2018




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 4.7 g's
Min: -226.6 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 4.2 g's
Min: -1.5 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 131.8 g's
Min: 0.3 g's
Filter: CFC 1000

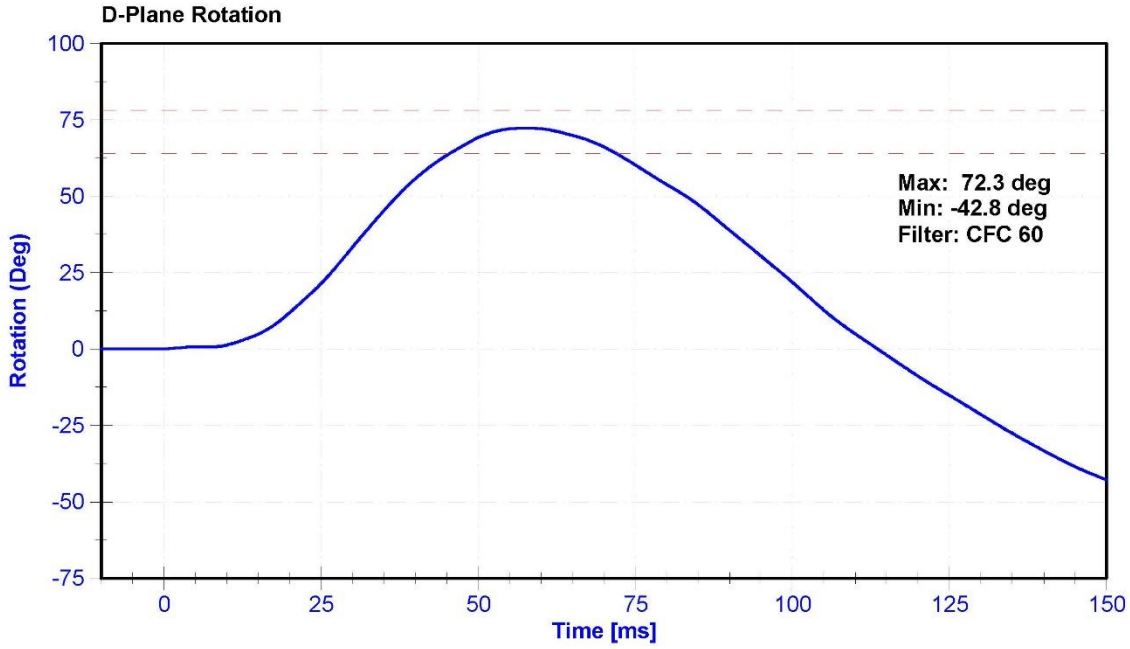
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

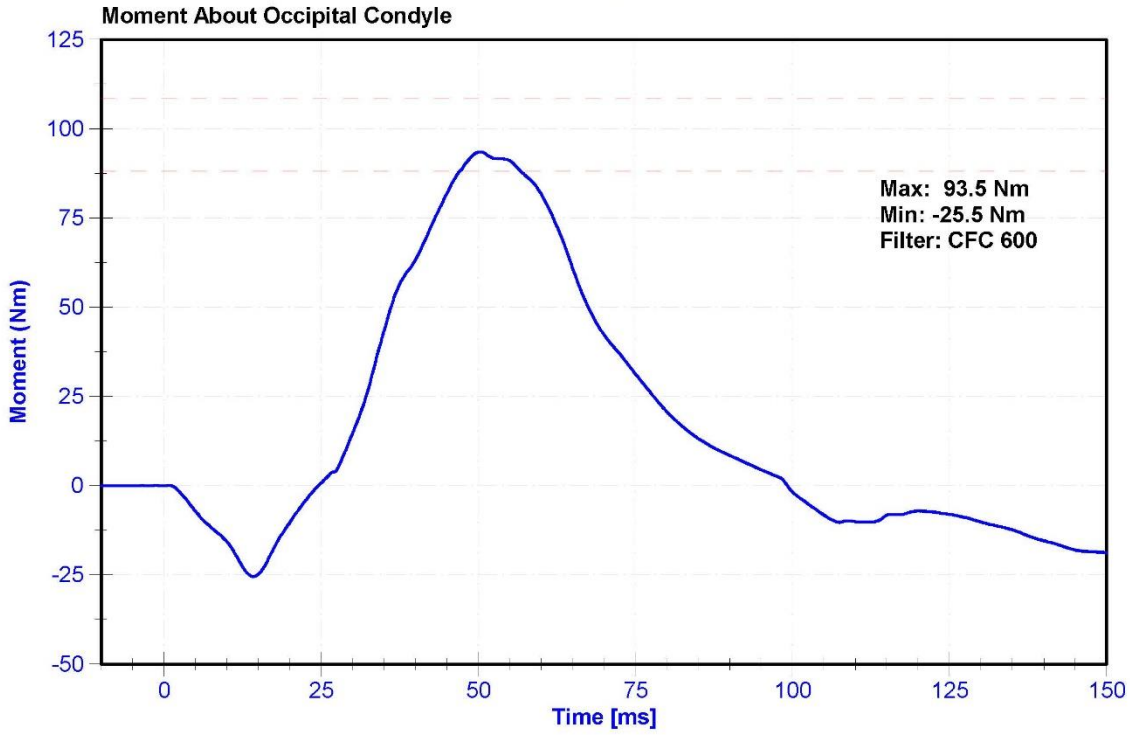
Results

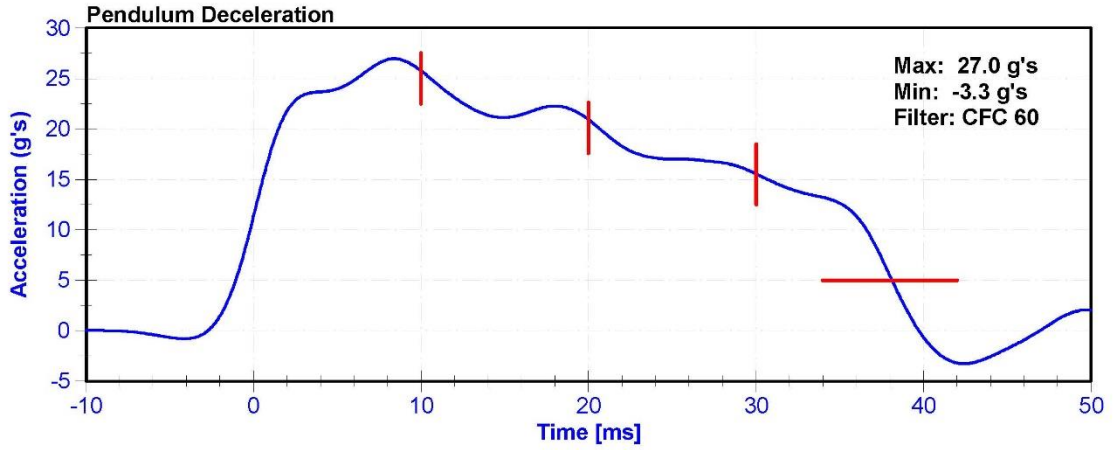
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	23.9	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.76	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	20.93	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.55	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	27.0	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	38.1	Pass
Maximum D Plane Rotation	64	78	deg	72.3	Pass
Time to Maximum Rotation	57	64	ms	57.6	Pass
Rotation Decay to Zero	113	127	ms	113.6	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	93.54	Pass
Time to Maximum Moment	47	58	ms	50.3	Pass
Moment Decay to Zero	97	107	ms	99.2	Pass

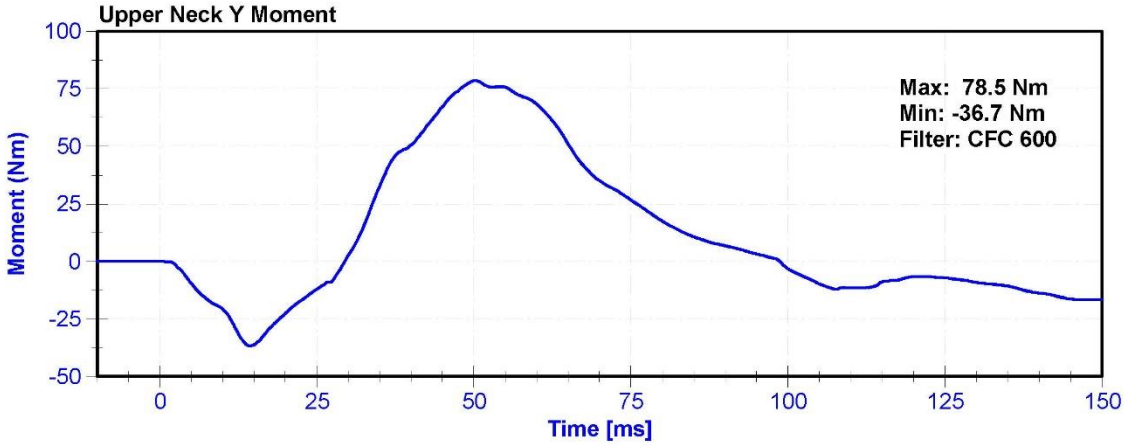
Transducer Calibrations

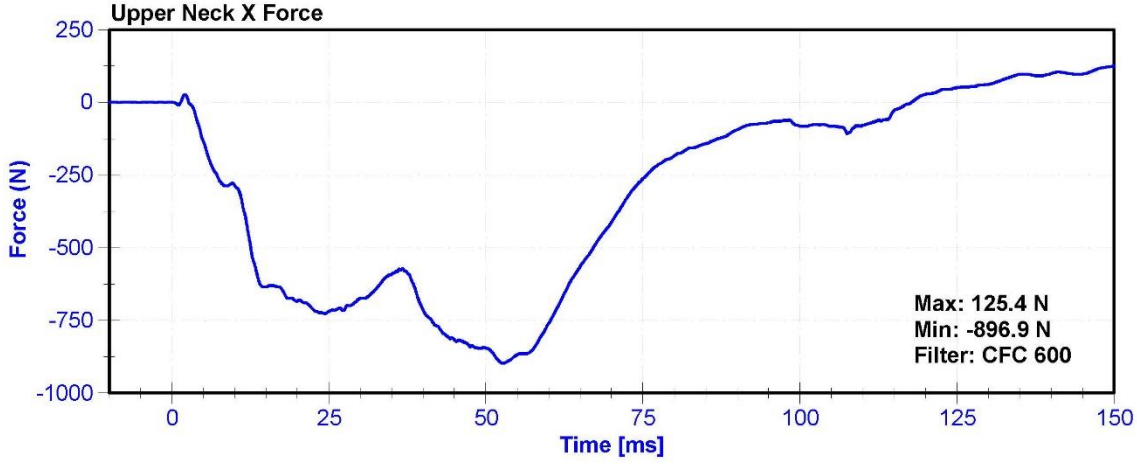
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	FTSS IF-205	LC-161Fx	7/11/2017	7/11/2018


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 72.3 deg
Min: -42.8 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.5 Nm
Min: -25.5 Nm
Filter: CFC 600


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 27.0 g's
Min: -3.3 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 78.5 Nm
Min: -36.7 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 125.4 N
Min: -896.9 N
Filter: CFC 600

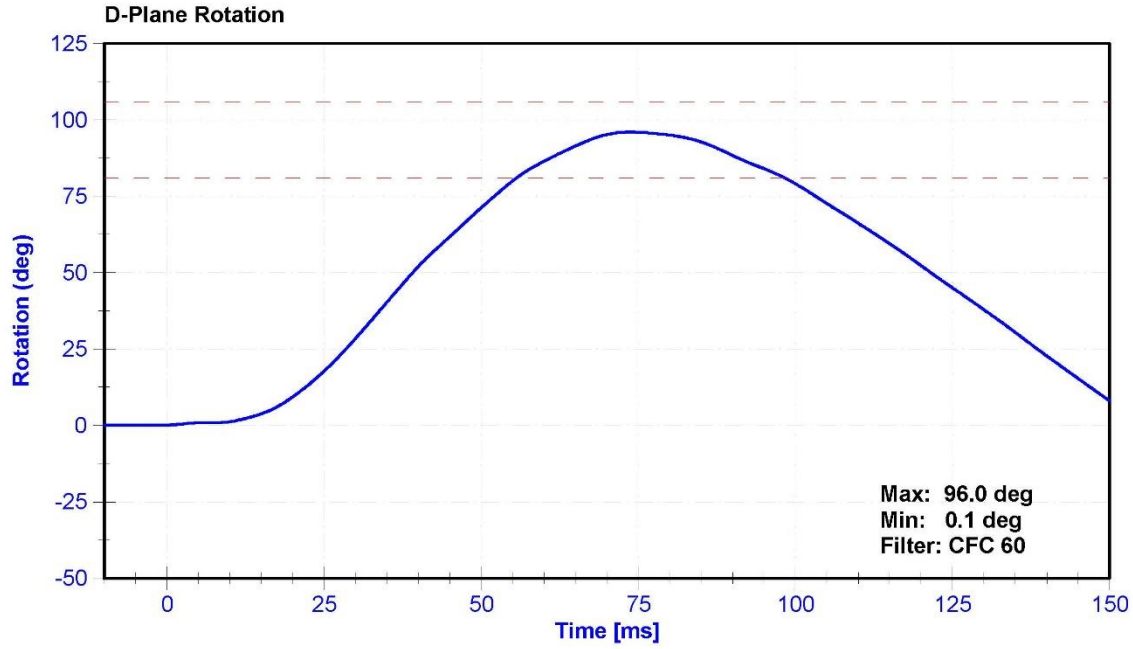
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

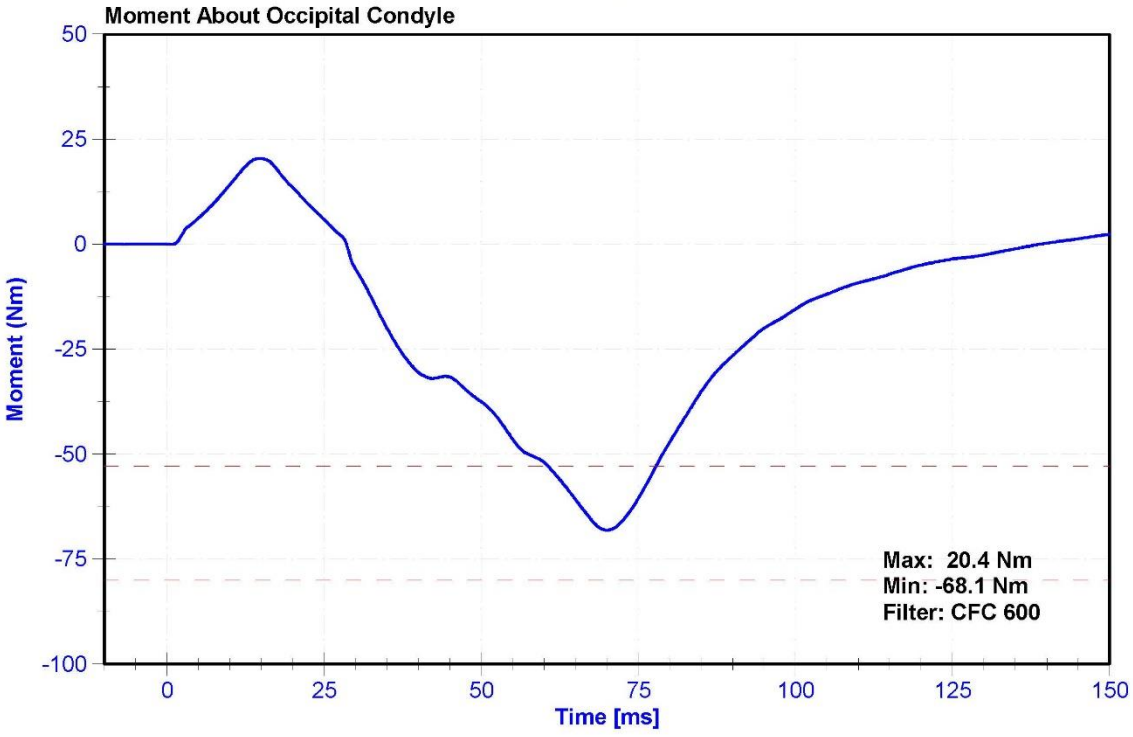
Results

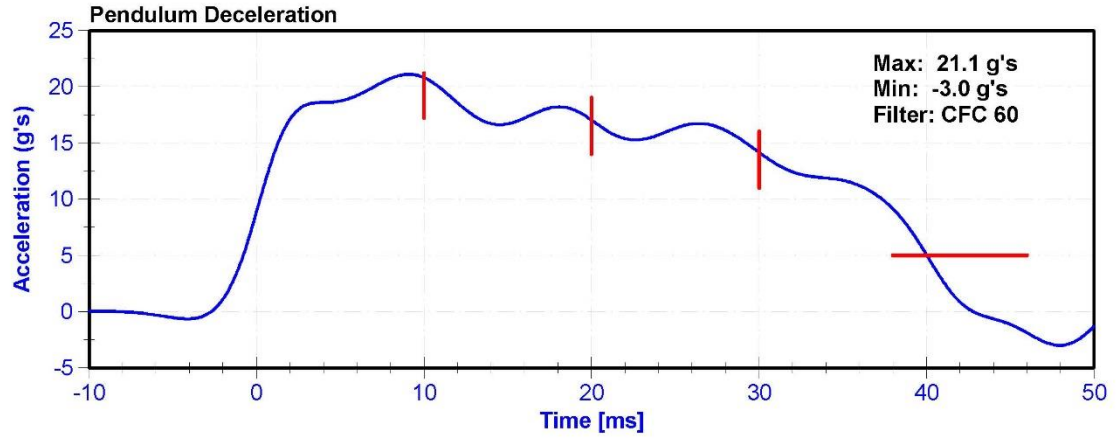
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21	Pass
Humidity	10	70	%	39.8	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.81	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.0	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.2	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	21.1	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	40.0	Pass
Maximum D Plane Rotation	81	106	deg	96.0	Pass
Time to Maximum Rotation	72	82	ms	73.7	Pass
Rotation Decay to Zero	147	174	ms	155.6	Pass
Minimum Moment About OC	-80	-52.9	Nm	-68.11	Pass
Time to Minimum Moment	65	79	ms	70.0	Pass
Moment Decay to Zero	120	148	ms	139.0	Pass

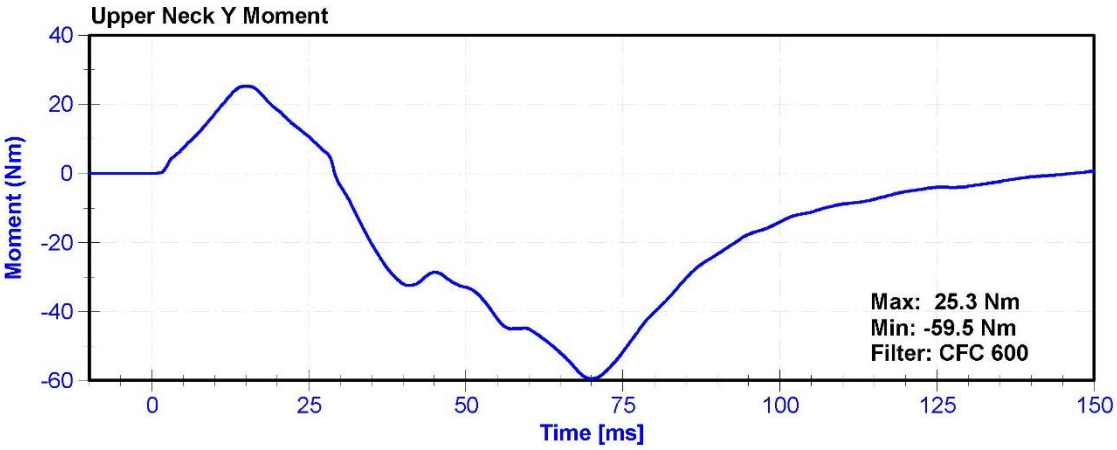
Transducer Calibrations

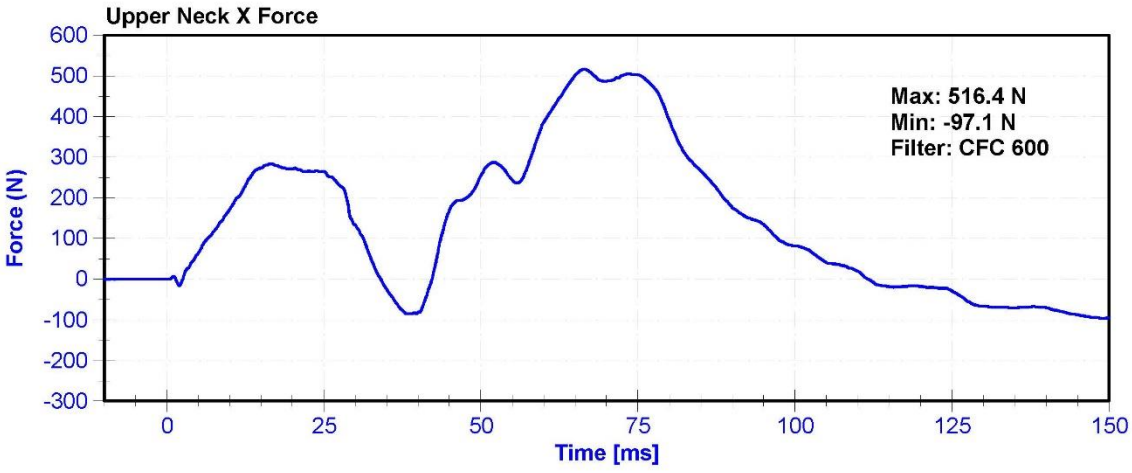
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	FTSS IF-205	LC-161Fx	7/11/2017	7/11/2018


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 96.0 deg
Min: 0.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 20.4 Nm
Min: -68.1 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 21.1 g's
Min: -3.0 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 25.3 Nm
Min: -59.5 Nm
Filter: CFC 600
Moment (Nm)
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 516.4 N
Min: -97.1 N
Filter: CFC 600
Force (N)
600
500
400
300
200
100
0
-100
-200
-300
0
25
50
75
100
125
150
Time [ms]

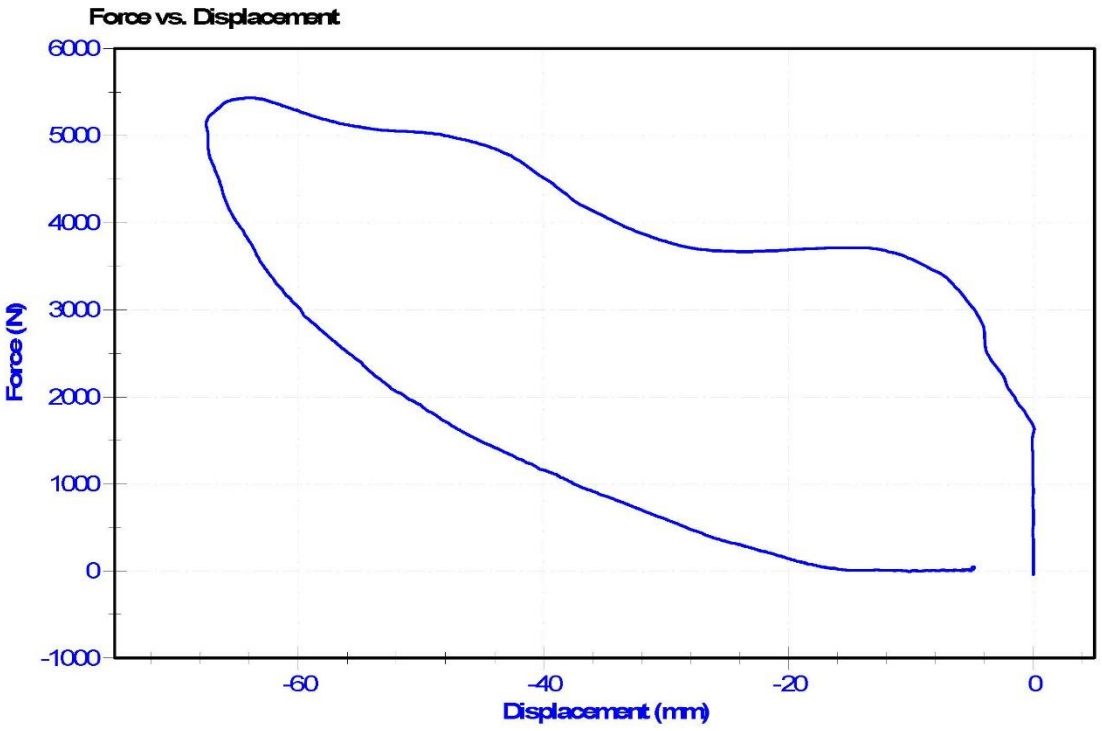
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

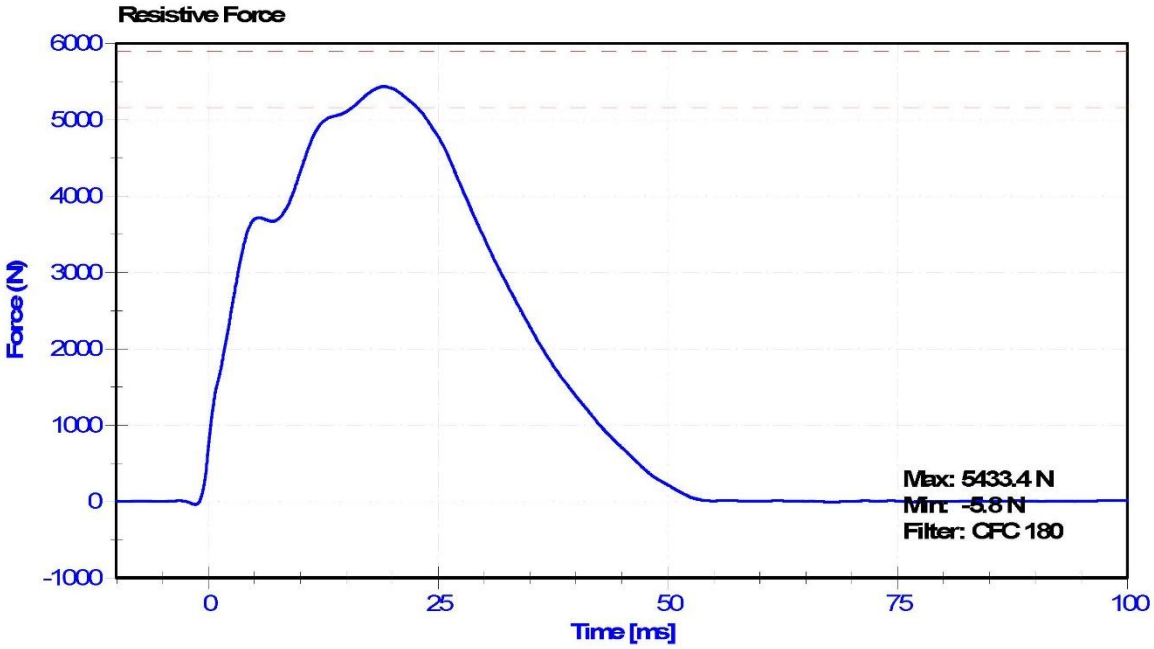
Results

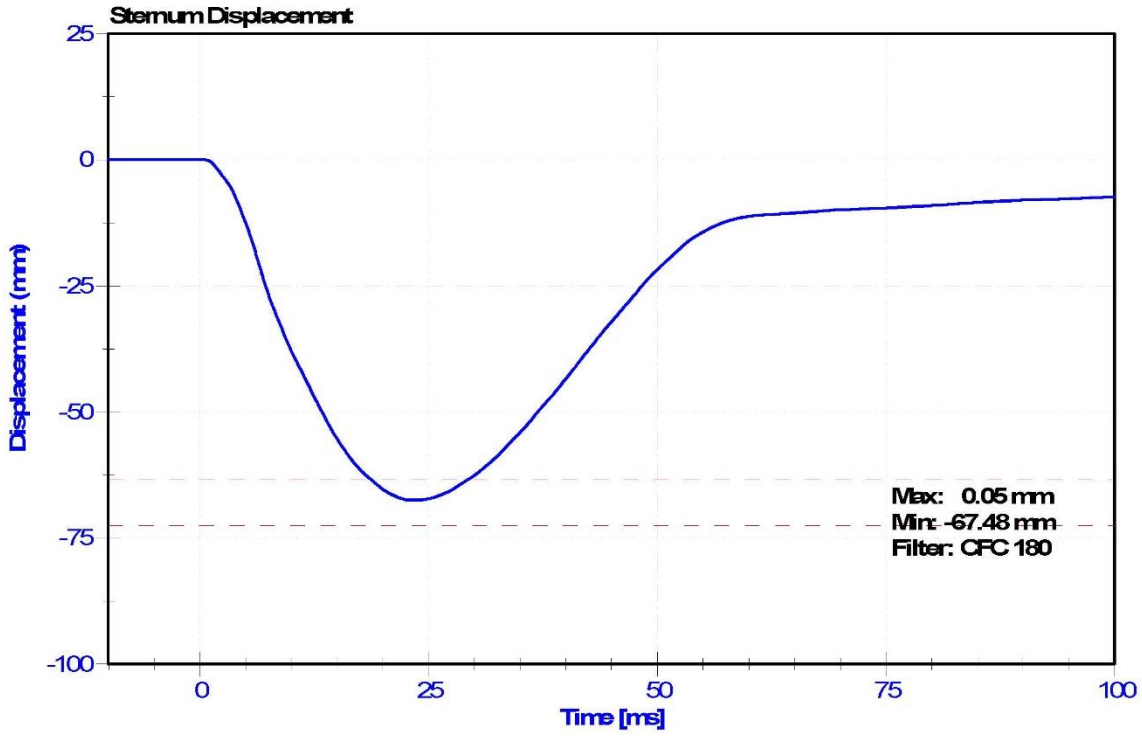
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37.1	Pass
Velocity	6.59	6.83	m/s	6.626	Pass
Chest Displacement	-72.6	-63.5	mm	-67.48	Pass
Resistive Force	5160	5894	N	5433.4	Pass
Hysteresis	65	85	%	71.7	Pass

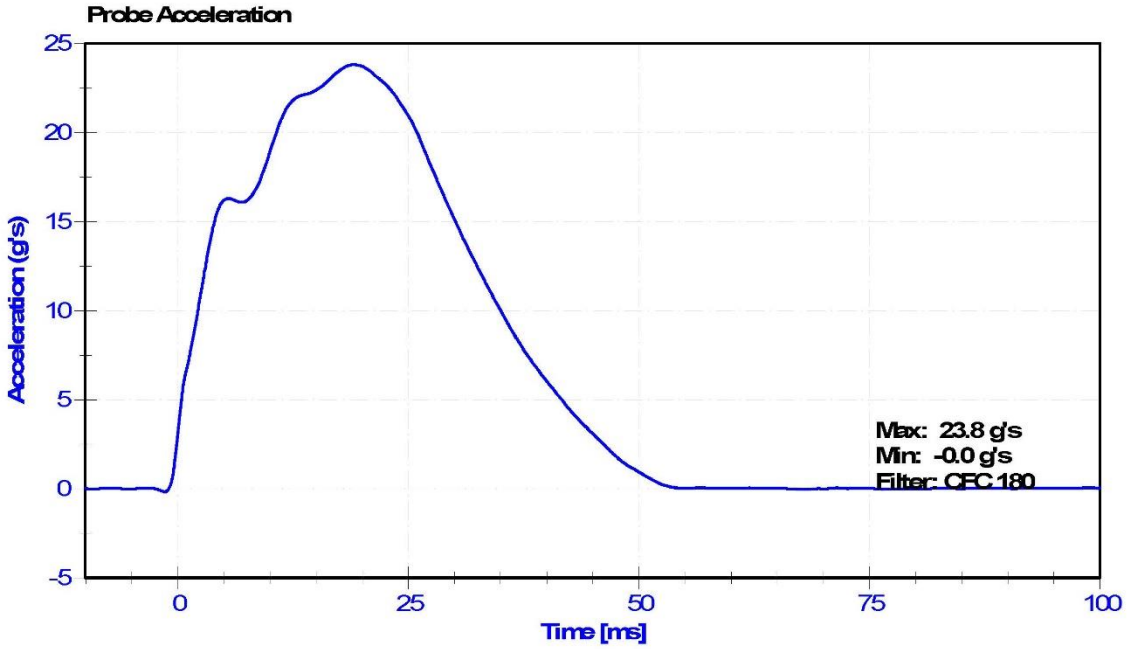
Transducer Calibrations

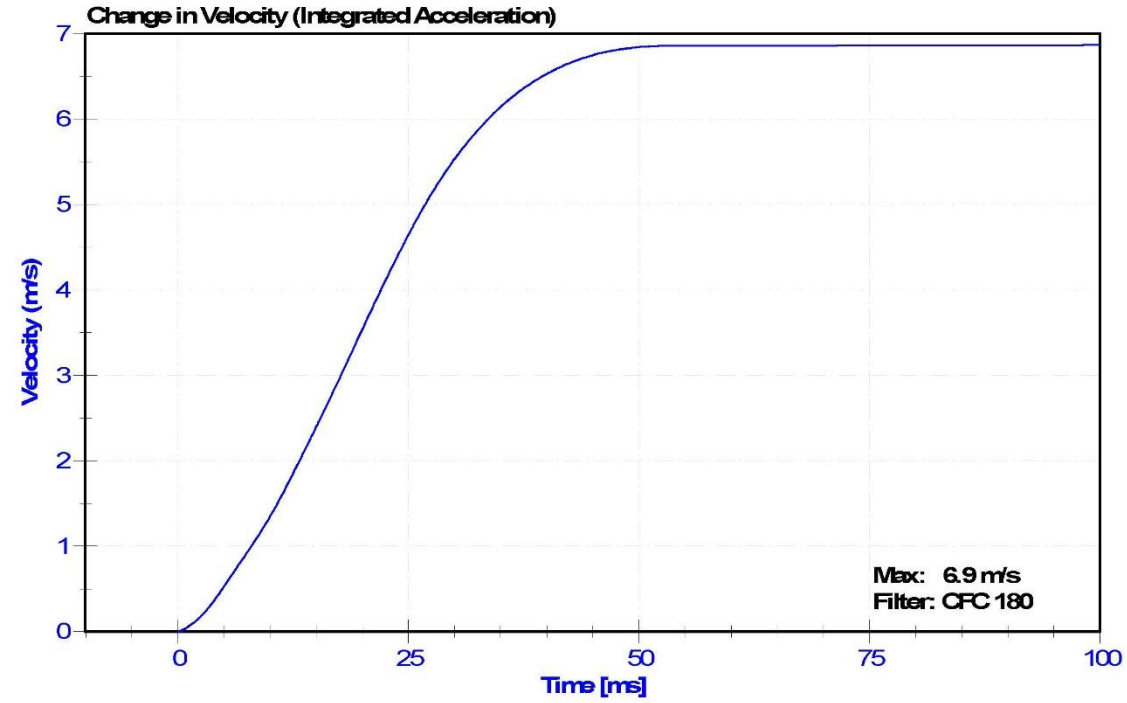
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018
Chest Potentiometer	JDK 6209-2038	DS-142	9/27/2017	9/27/2018




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5433.4 N
Min: -5.8 N
Filter: CFC 180


Sternum Displacement
Displacement (mm)
25
0
-25
-50
-75
-100
0
25
50
75
100
Time [ms]
Max: 0.05 mm
Min: -67.48 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 23.8 g's
Min: -0.0 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 6.9 m/s
Filter: CFC 180

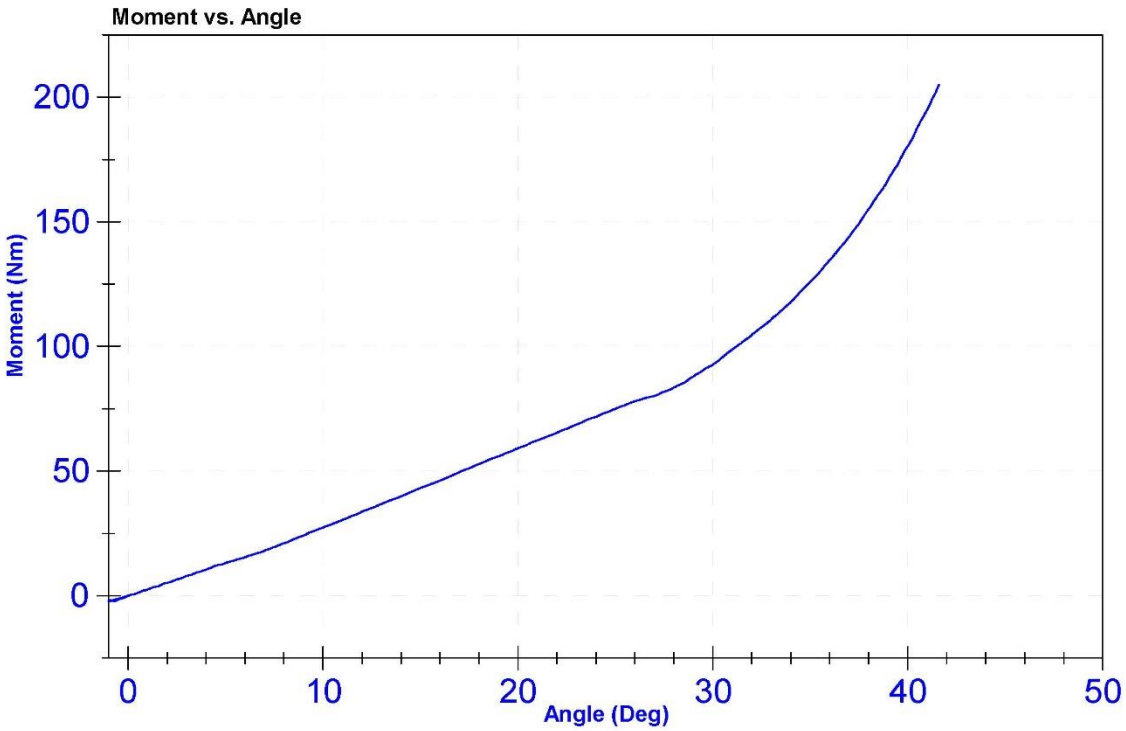
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	36.2	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	41.5	Pass
Moment at 30 degrees	0	94.9	Nm	92.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	6/8/2017	6/8/2018
Load Cell	Key Trans 2301-02	LC-115 My	6/8/2017	6/8/2018



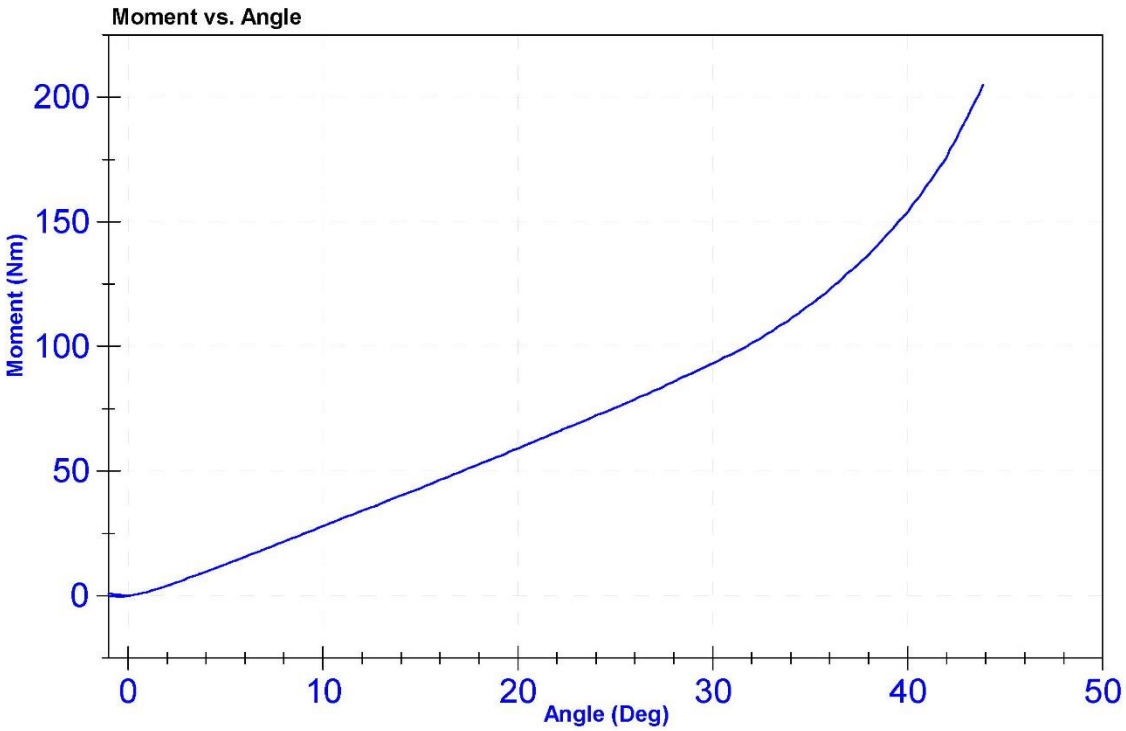
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

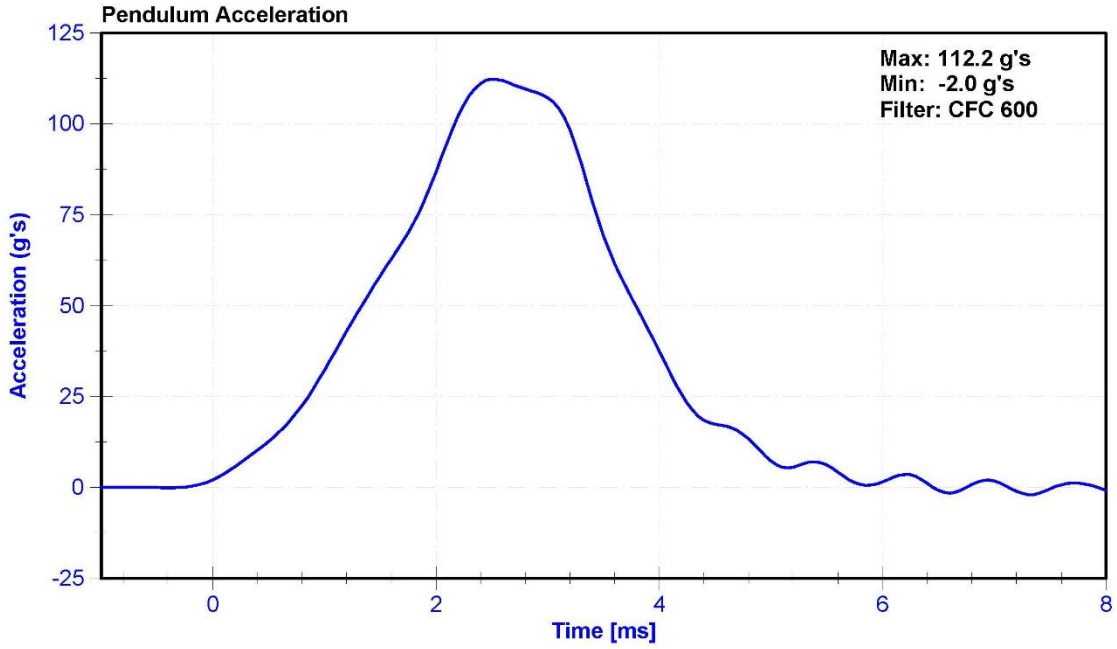
Results

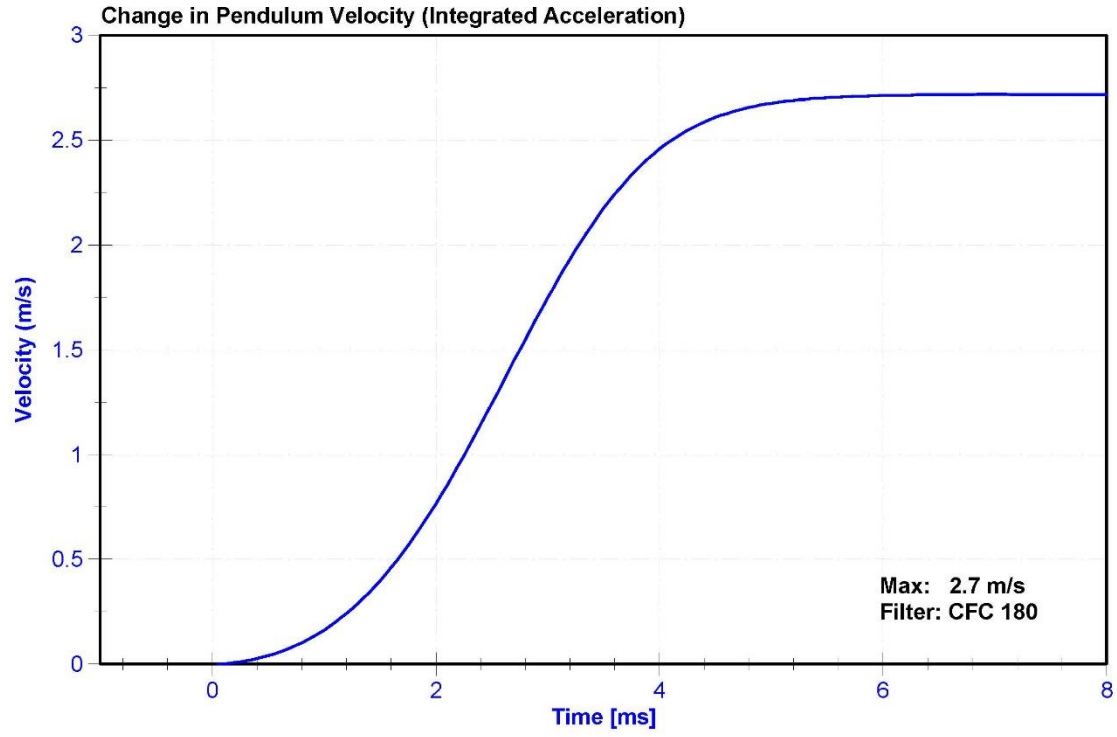
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	34.6	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	43.8	Pass
Moment at 30 degrees	0	94.9	Nm	93.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	6/8/2017	6/8/2018
Load Cell	Key Trans 2301-02	LC-115 My	6/8/2017	6/8/2018




Pendulum Acceleration
Max: 112.2 g's
Min: -2.0 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.7 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

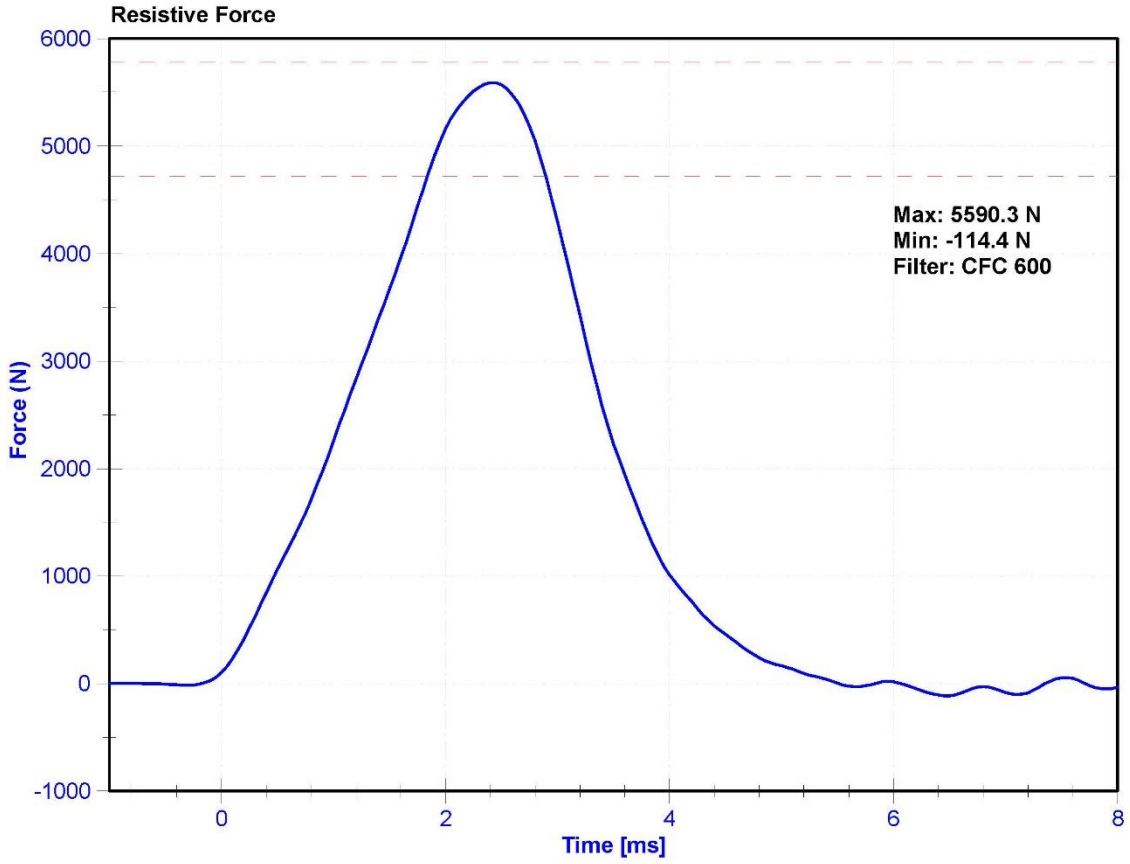
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

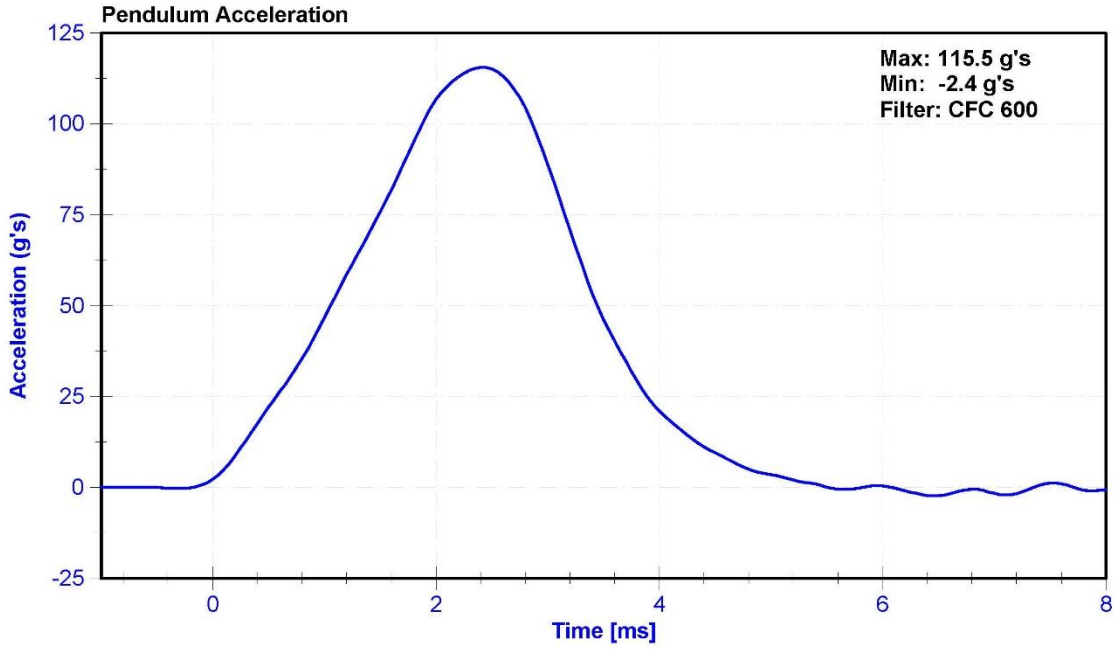
Results

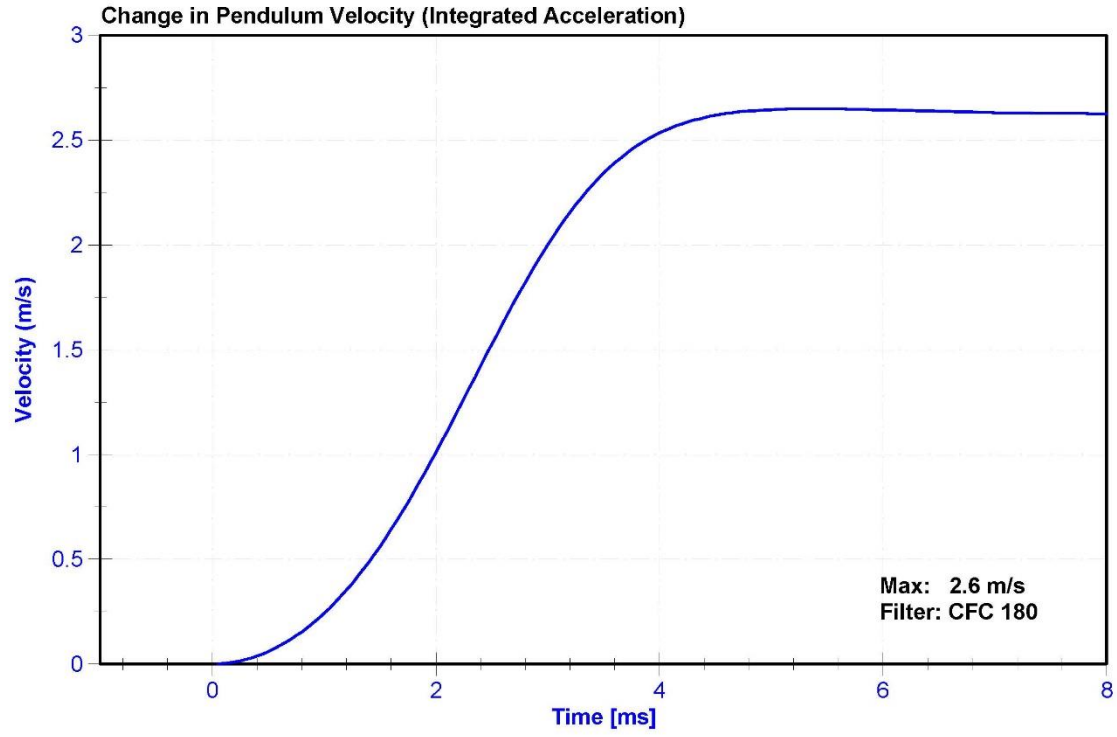
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21	Pass
Humidity	10	70	%	37.6	Pass
Velocity	2.07	2.13	m/s	2.078	Pass
Maximum Resistive Force	4720	5780	N	5590.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Max: 115.5 g's
Min: -2.4 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Max: 2.6 m/s
Filter: CFC 180
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]

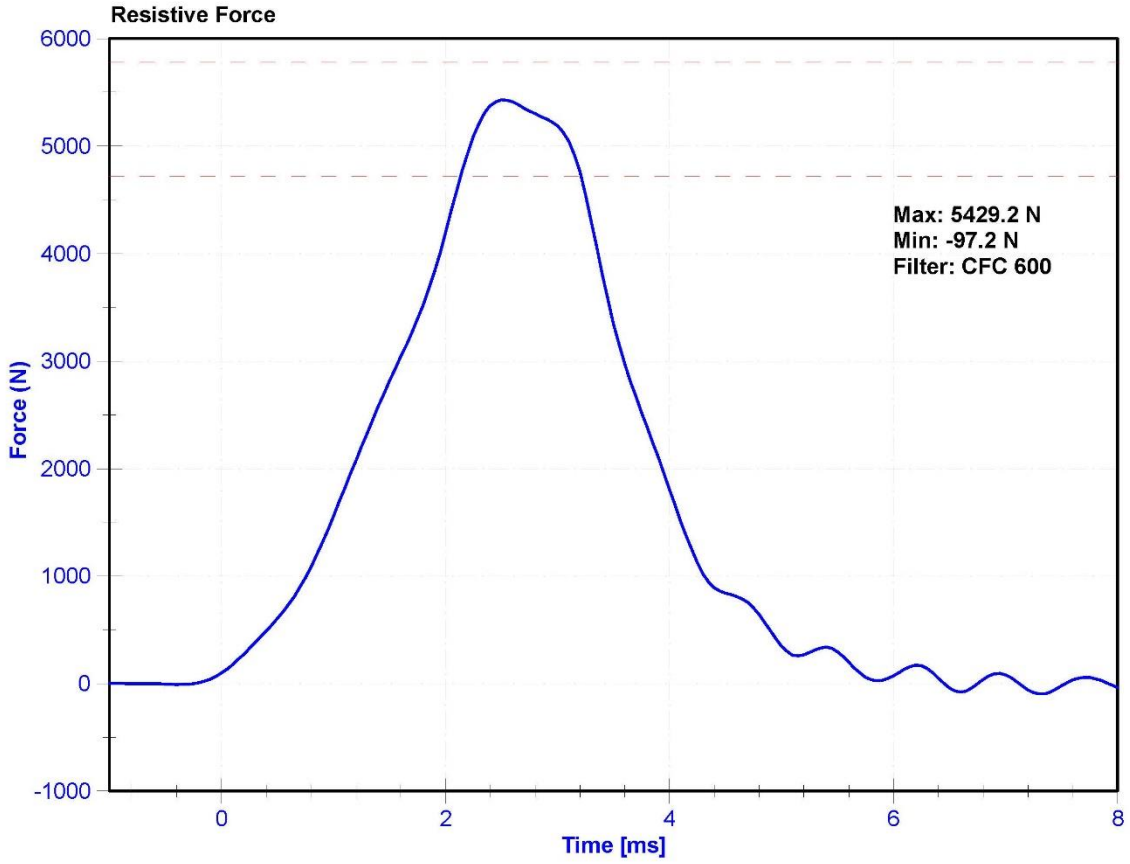
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	37.7	Pass
Velocity	2.07	2.13	m/s	2.075	Pass
Maximum Resistive Force	4720	5780	N	5429.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018



CALIBRATION TEST RESULTS

PRE-TEST

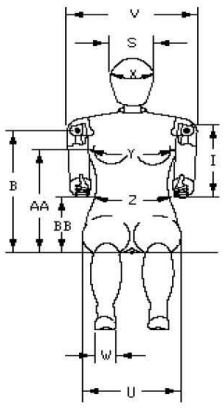
HYBRID III 5TH PERCENTILE - PASSENGER ATD

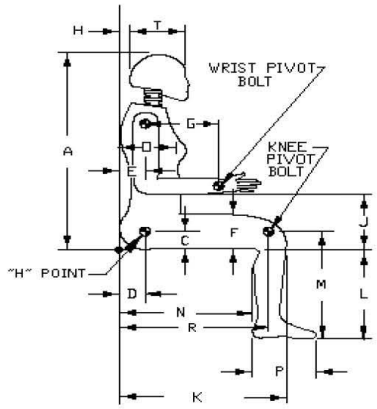
SERIAL NO: 288

External Measurements - Hybrid 3 - 5th Female

Technician: Steve Keller Date: 11/3/2017

Dummy Serial Number: 288





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	782	Pass
B	Shoulder Pivot Height	432	457	440	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	75	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	285	Pass
J	Elbow Rest Height	183	203	188	Pass
K	Buttock to Knee Length	521	546	541	Pass
L	Popliteal Height	356	376	366	Pass
M	Knee Pivot Height	394	419	401	Pass
N	Buttock Popliteal Length	414	439	430	Pass
O	Chest Depth without Jacket	175	191	180	Pass
P	Foot Length (right)	219	234	220	Pass
R	Buttock To Knee Pivot Length	457	483	462	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	307	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	855	Pass
Z	Waist Circumference	460	790	776	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

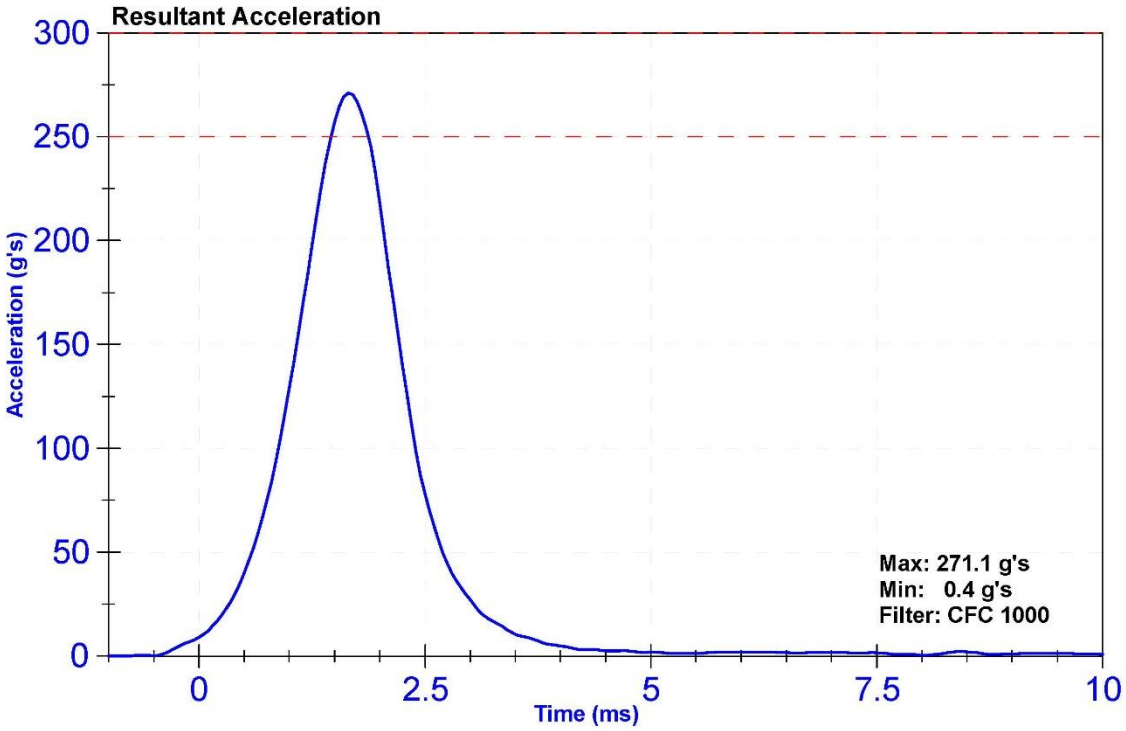
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

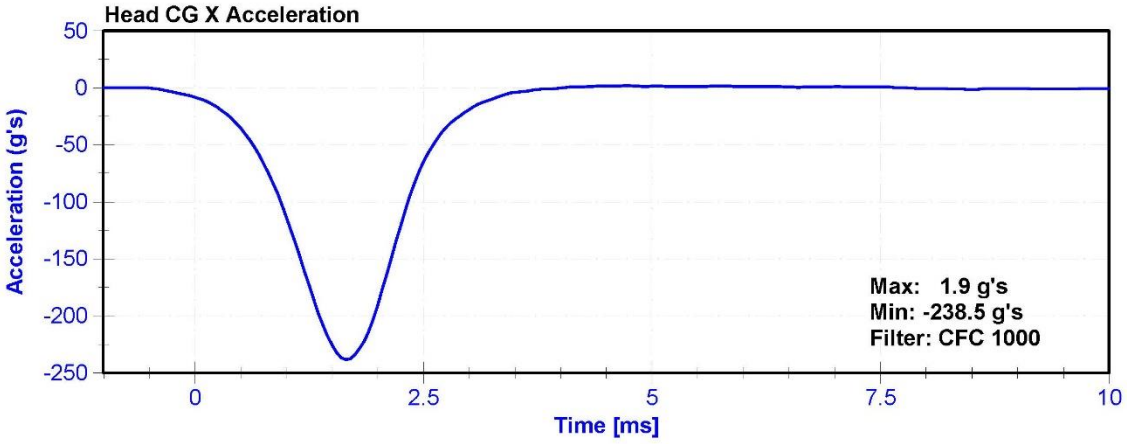
Results

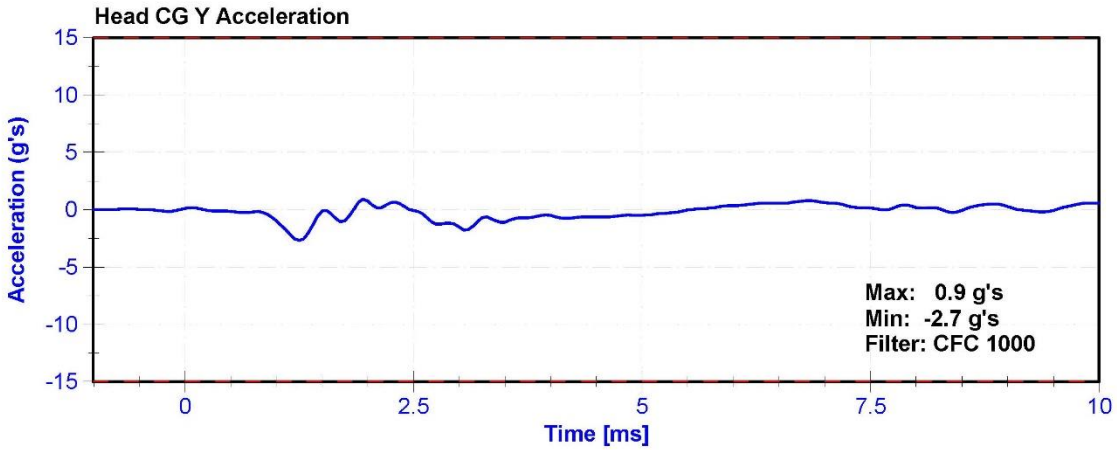
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	49	Pass
Resultant Acceleration	250	300	g's	271.1	Pass
Oscillation	0	10	%	1.1	Pass
Lateral Acceleration	-15	15	g's	-2.7	Pass

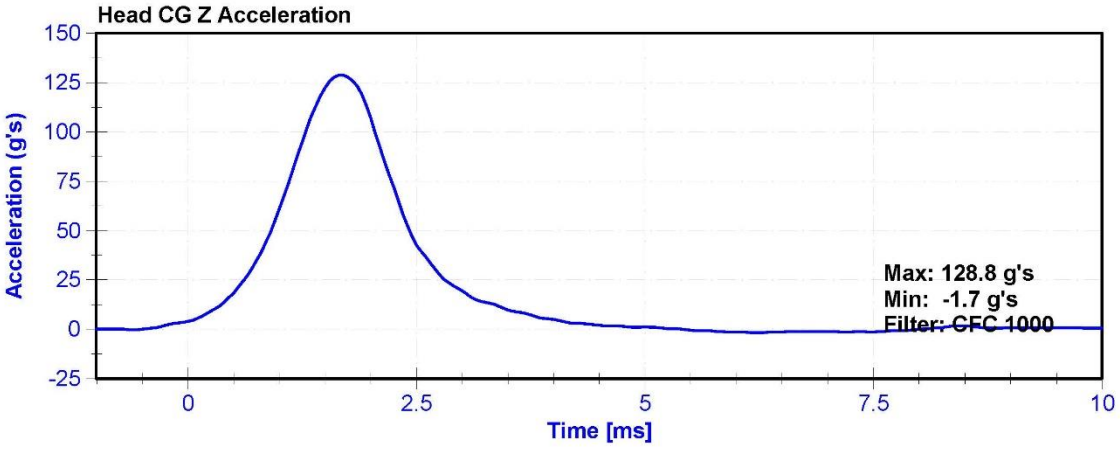
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	10/10/2017	4/10/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	10/10/2017	4/10/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/10/2017	4/10/2018




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 1.9 g's
Min: -238.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 0.9 g's
Min: -2.7 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 128.8 g's
Min: -1.7 g's
Filter: CFC 1000

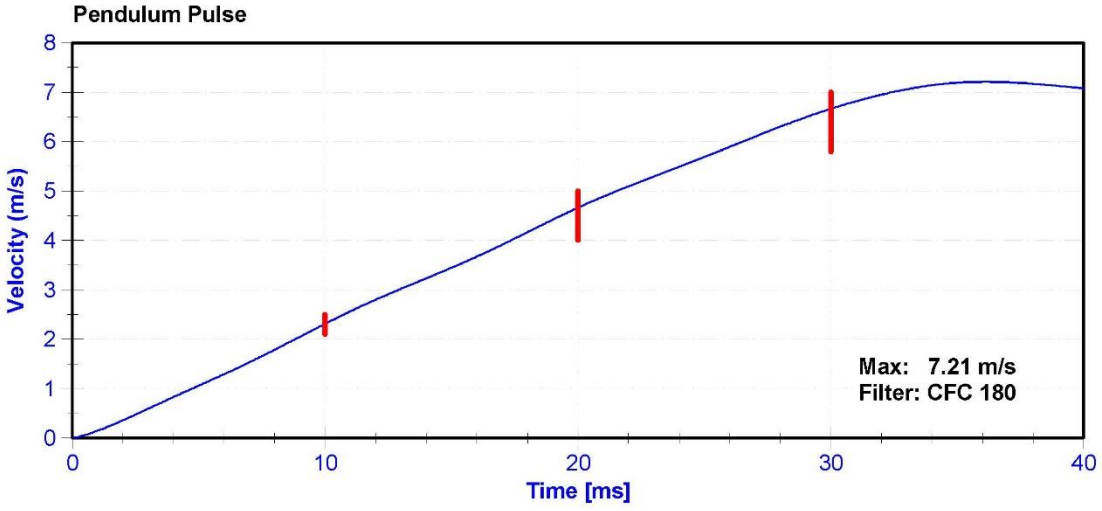
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

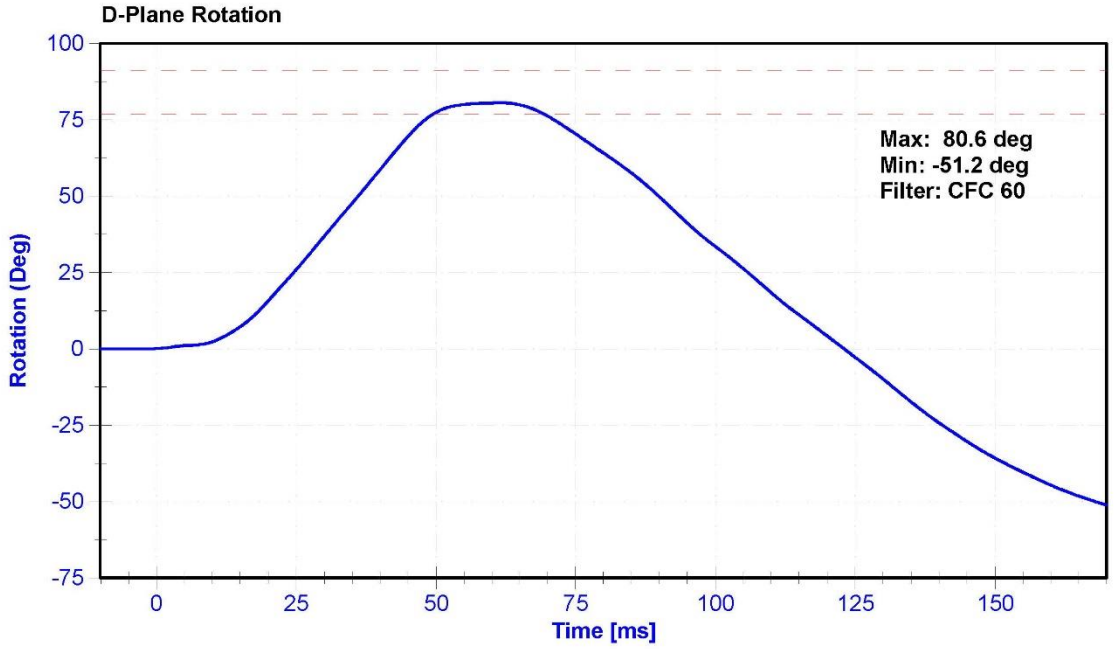
Results

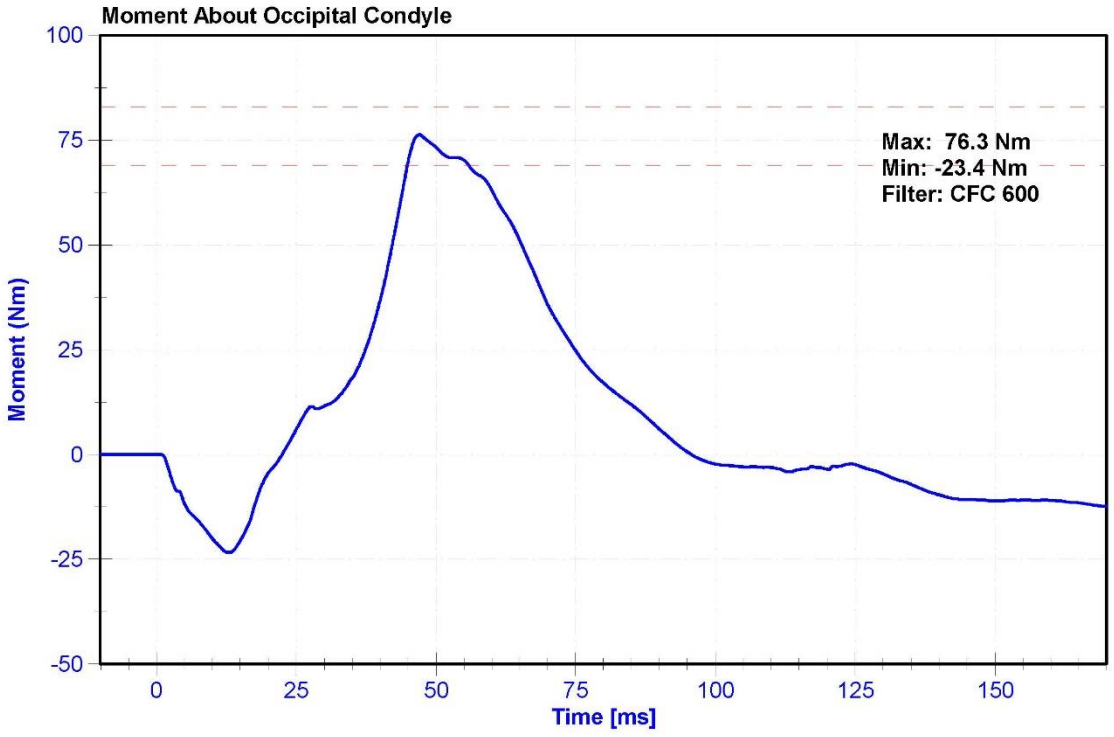
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	51.6	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.31	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.66	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.66	Pass
Max D Plane Rotation	77	91	deg	80.6	Pass
Max Moment During Rotation Interval	69	83	Nm	76.3	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.8	Pass

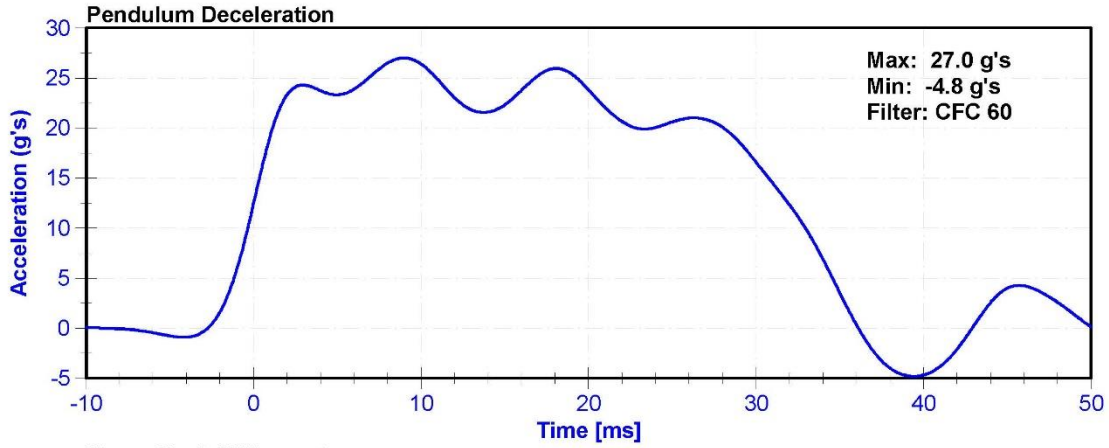
Transducer Calibrations

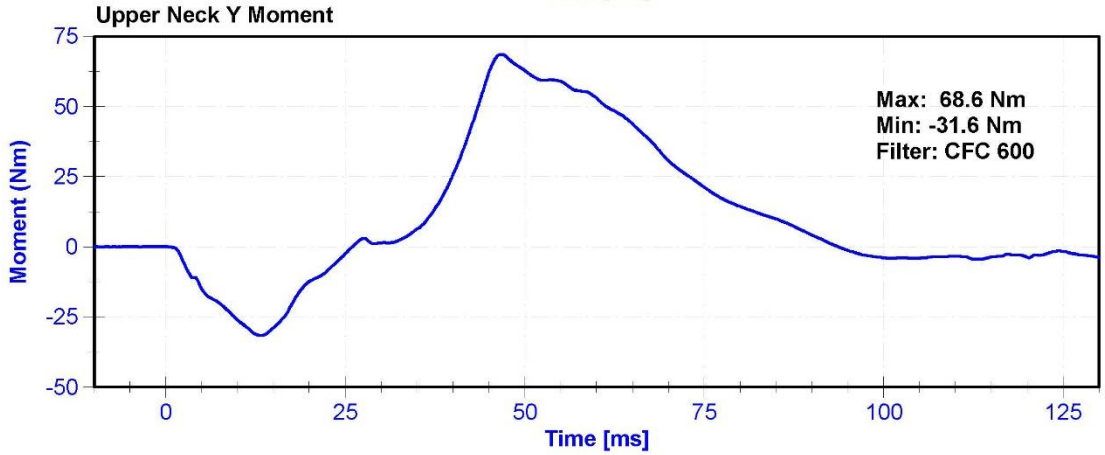
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	7/12/2017	7/12/2018

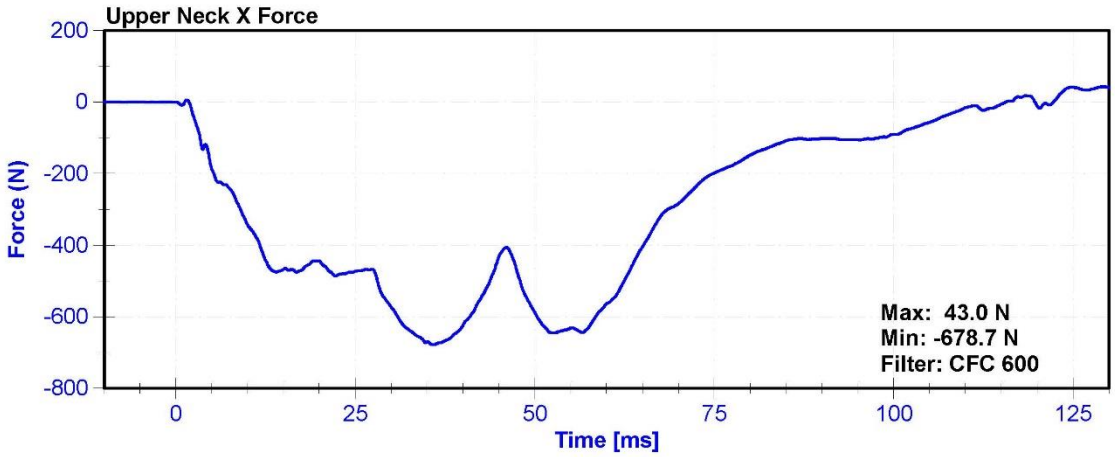



D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 80.6 deg
Min: -51.2 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 76.3 Nm
Min: -23.4 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 27.0 g's
Min: -4.8 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 68.6 Nm
Min: -31.6 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 43.0 N
Min: -678.7 N
Filter: CFC 600
Force (N)
Time [ms]

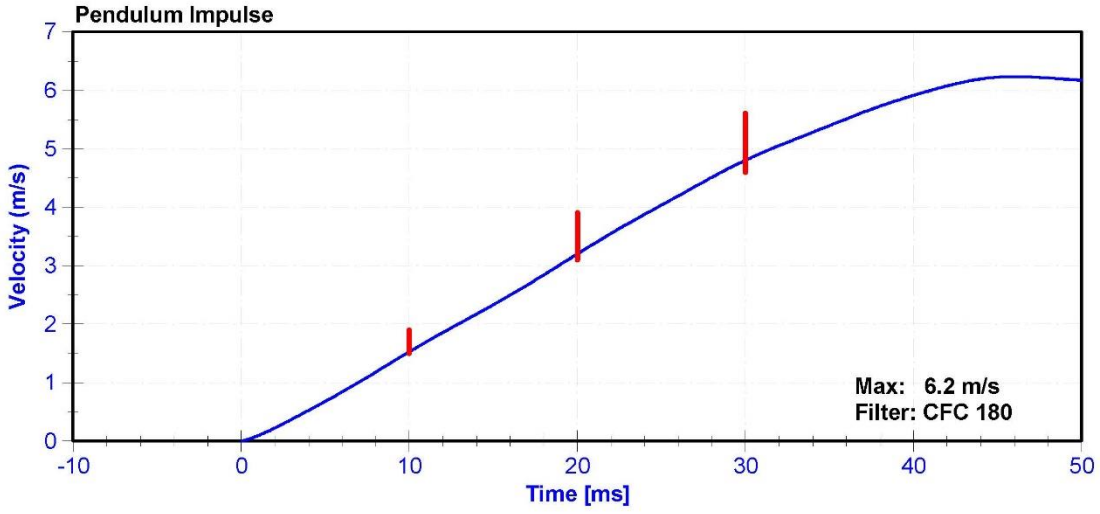
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

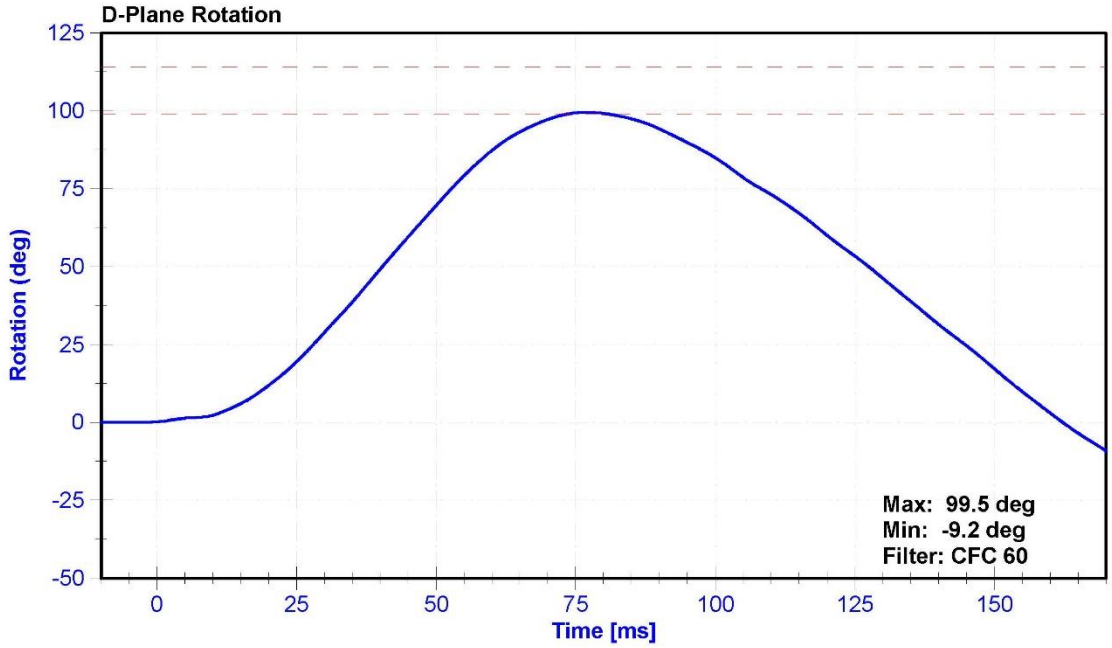
Results

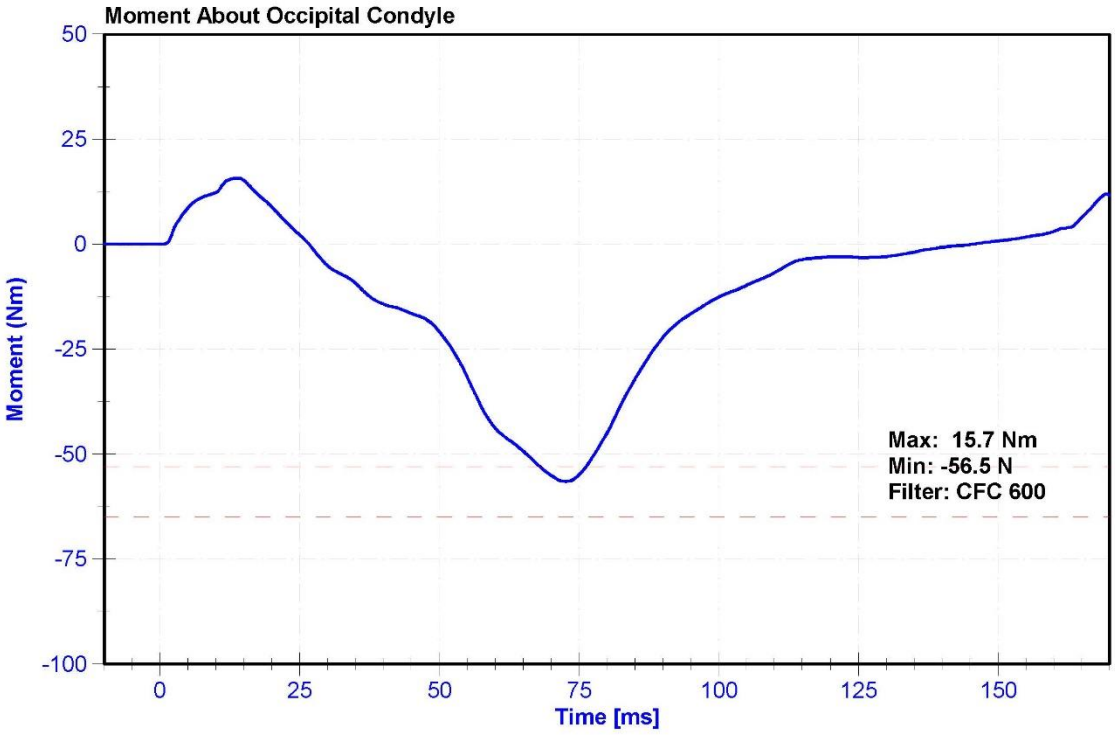
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	51.6	Pass
Velocity	5.95	6.19	m/s	6.068	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.53	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.20	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	4.80	Pass
D Plane Rotation	99	114	deg	99.5	Pass
Moment During Rotation Interval	-65	-53	Nm	-56.5	Pass
Moment Decay to -10Nm	94	114	ms	104.7	Pass

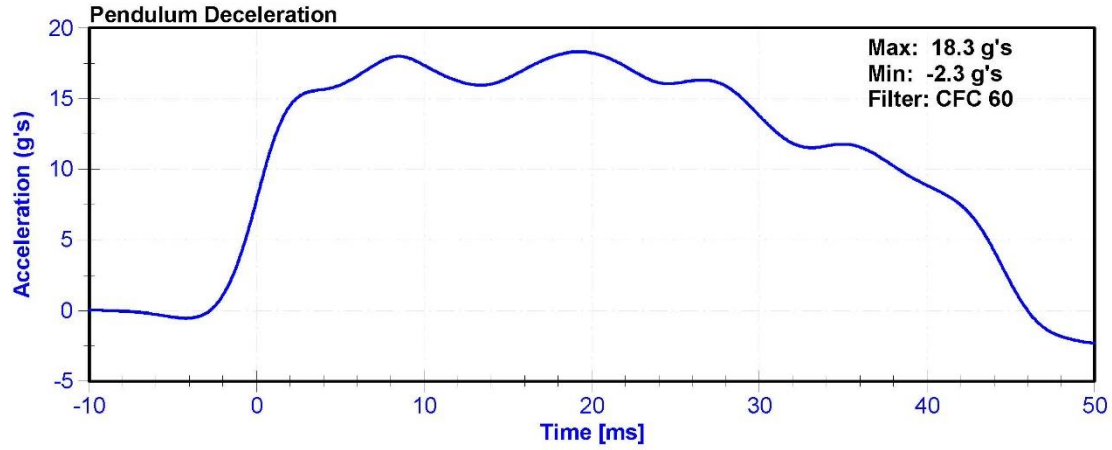
Transducer Calibrations

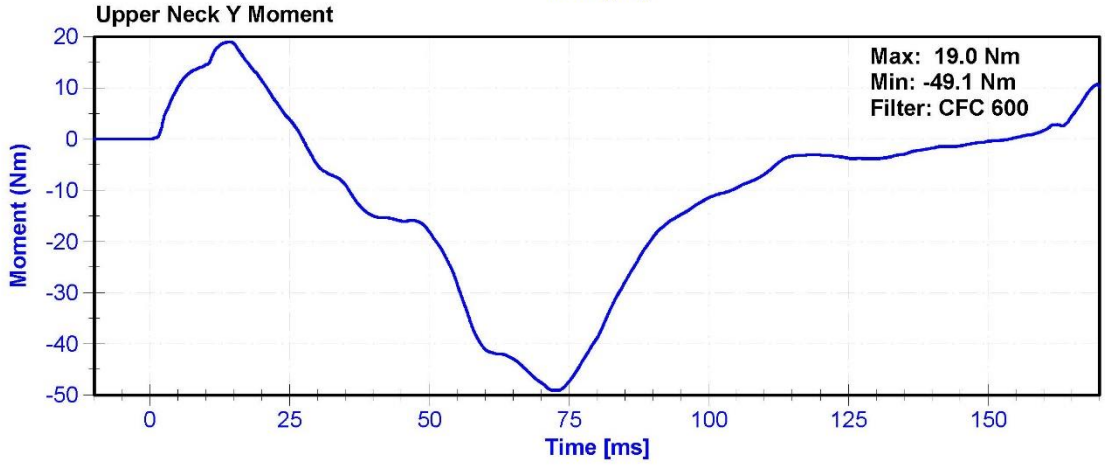
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	7/12/2017	7/12/2018

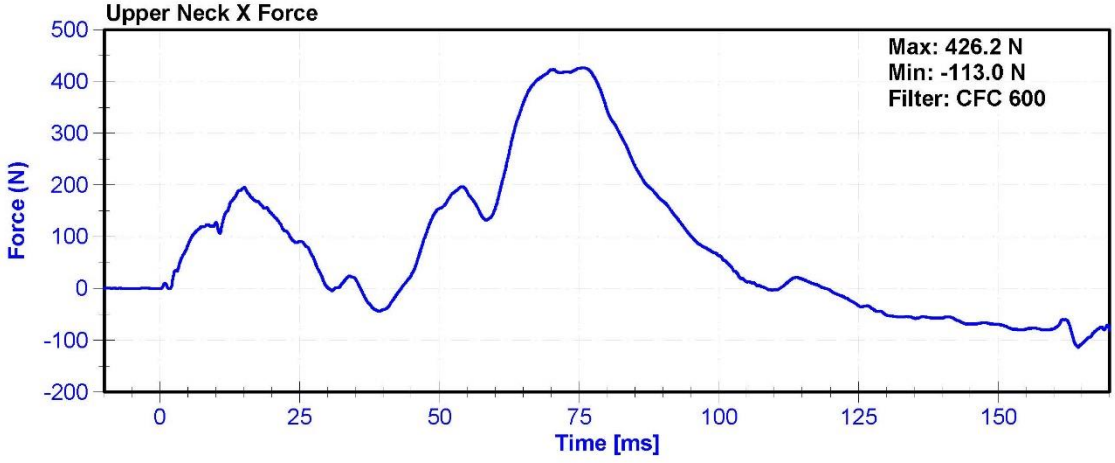



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 99.5 deg
Min: -9.2 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 15.7 Nm
Min: -56.5 N
Filter: CFC 600


Pendulum Deceleration
Max: 18.3 g's
Min: -2.3 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 19.0 Nm
Min: -49.1 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 426.2 N
Min: -113.0 N
Filter: CFC 600
Force (N)
Time [ms]

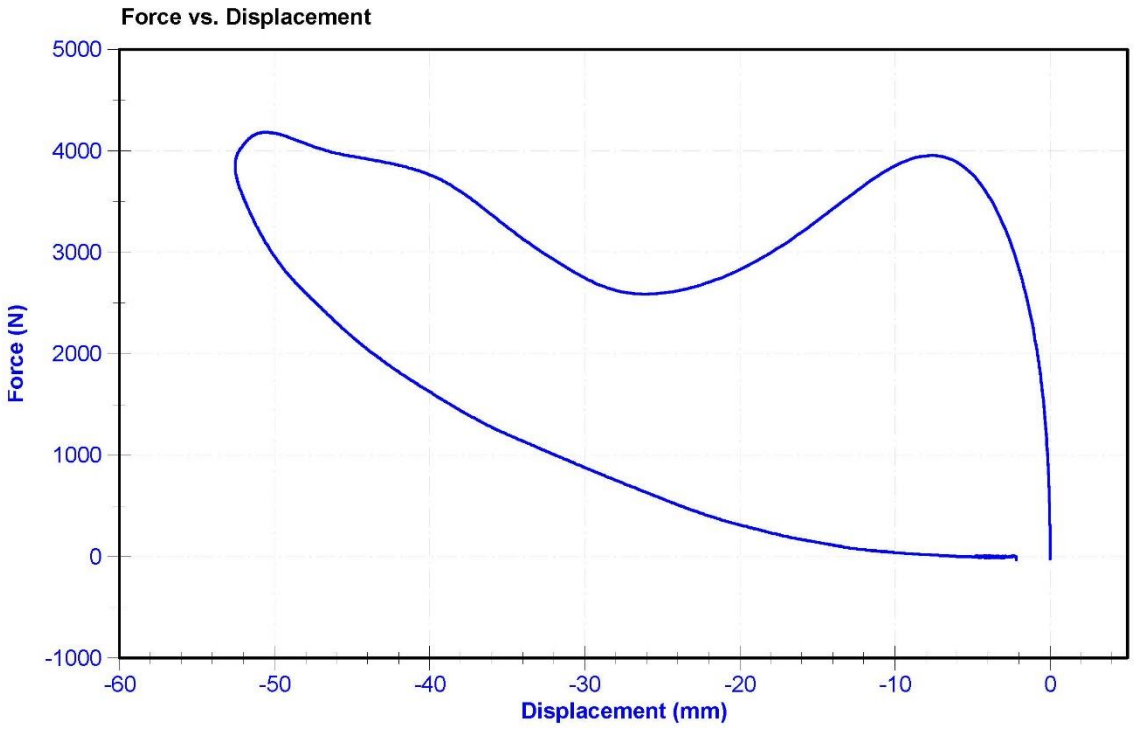
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

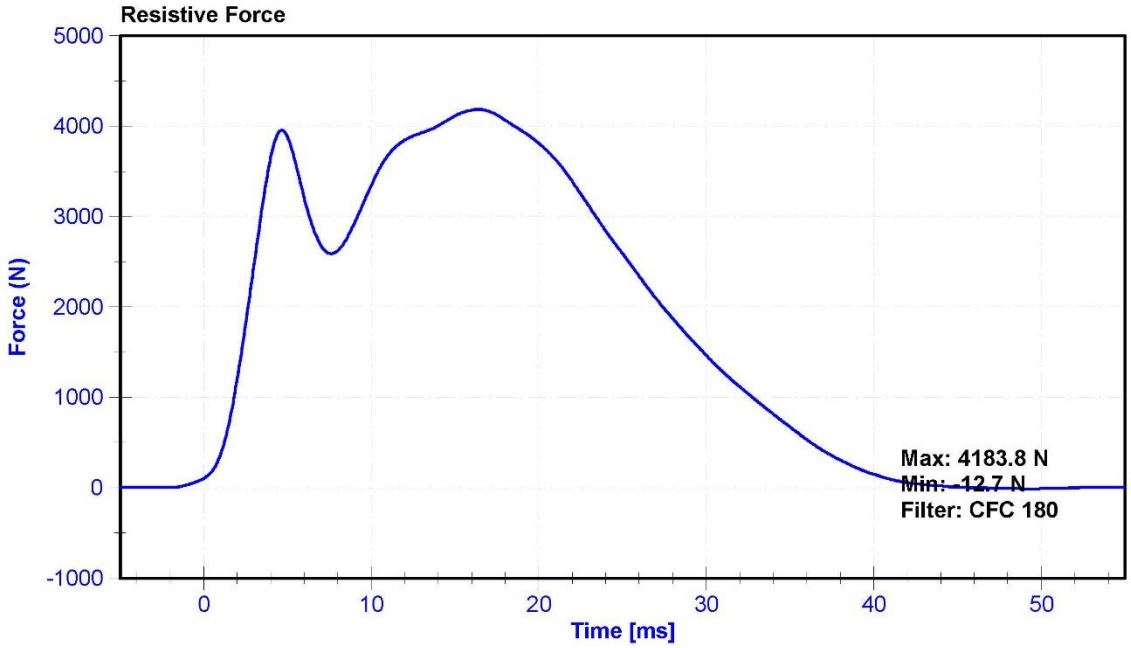
Results

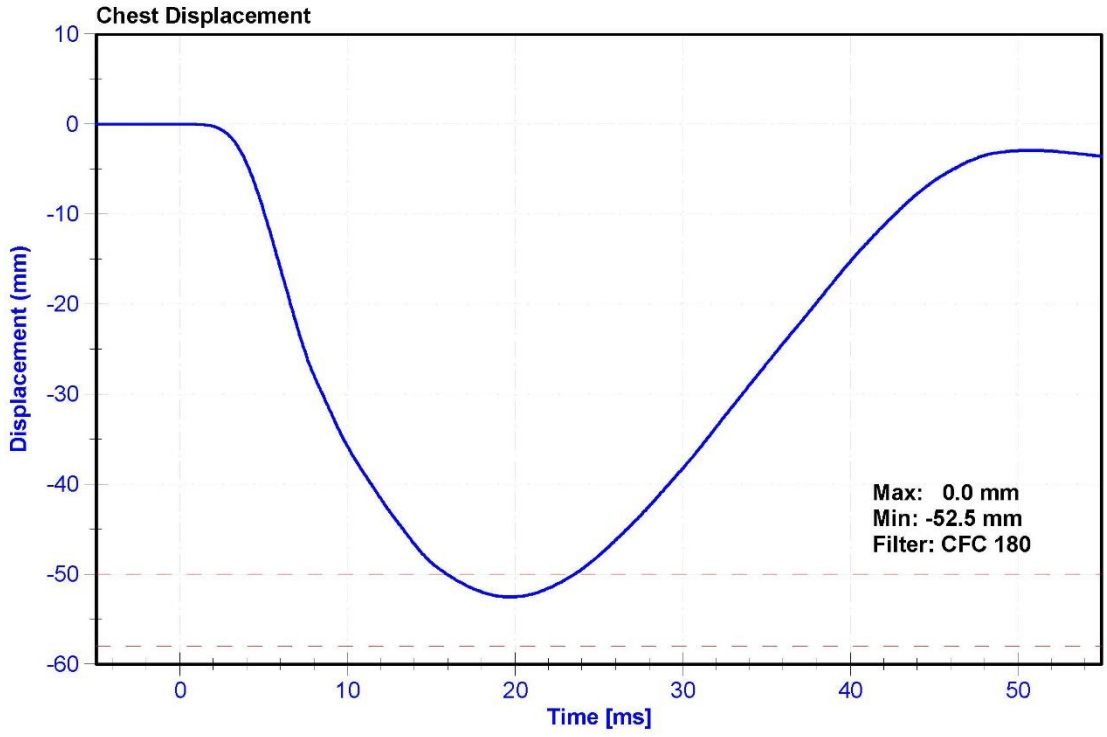
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	40.2	Pass
Velocity	6.59	6.83	m/s	6.684	Pass
Chest Deflection	-58	-50	mm	-52.5	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4183.8	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4174.9	Pass
Hysteresis	69	85	%	71.6	Pass

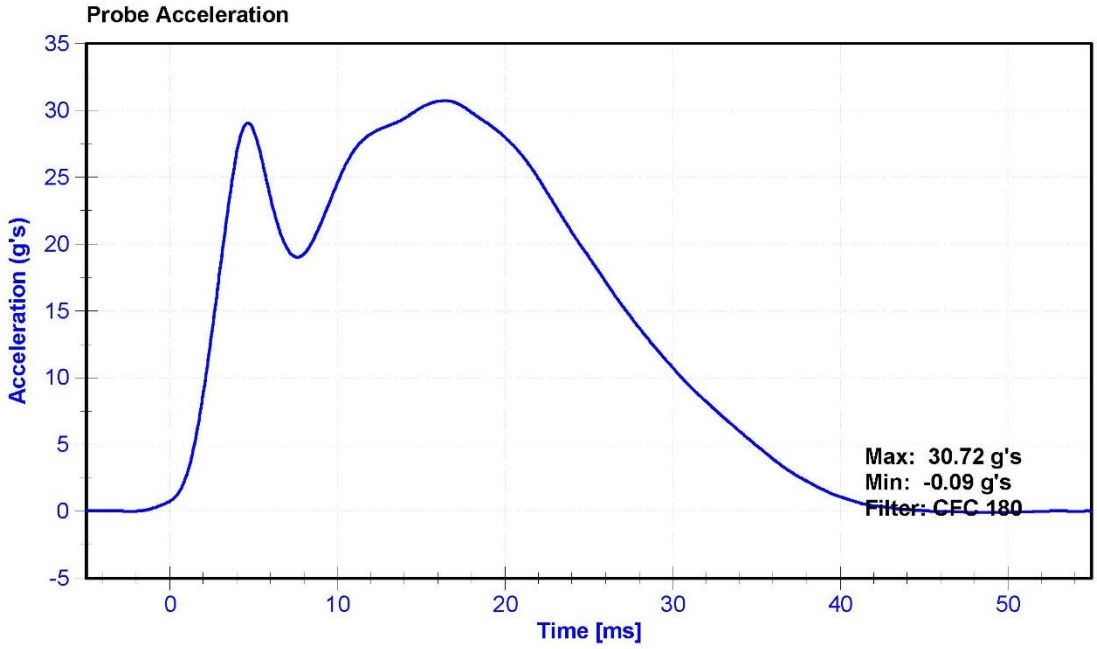
Transducer Calibrations

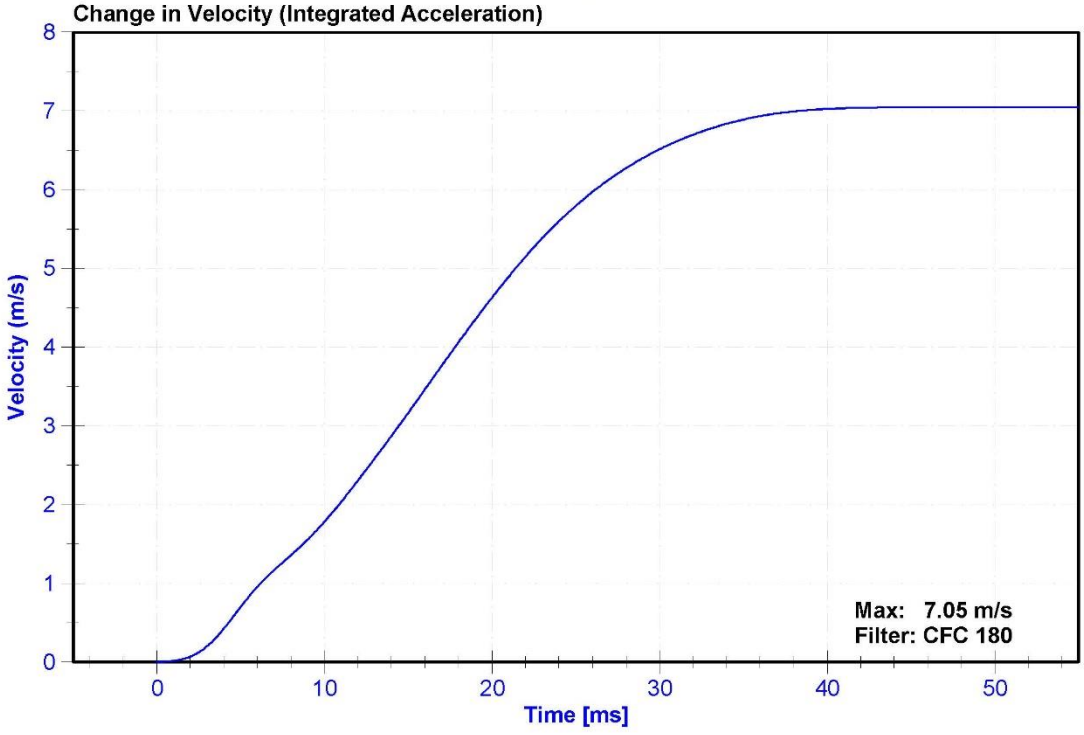
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018
Chest Potentiometer	SERVO 14CB1-2897	DS-288	10/25/2017	10/25/2018




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4183.8 N
Min: -12.7 N
Filter: CFC 180


Chest Displacement
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]
Max: 0.0 mm
Min: -52.5 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 30.72 g's
Min: -0.09 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.05 m/s
Filter: CFC 180

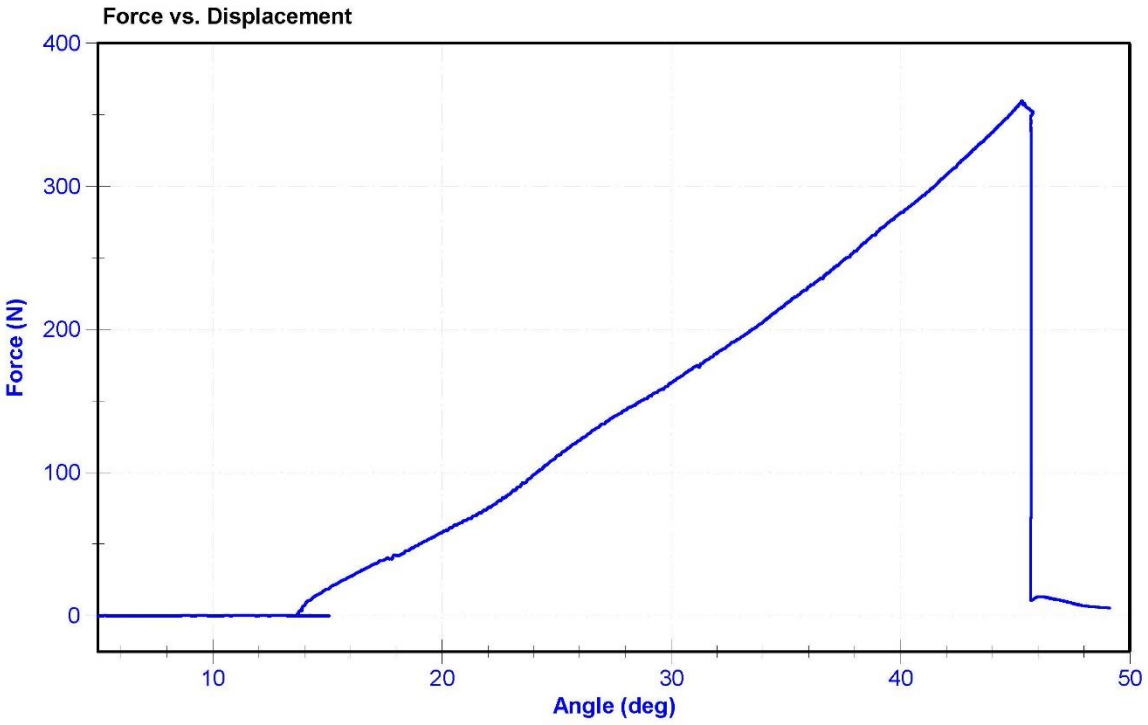
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.2	Pass
Humidity	10	70	%	49.6	Pass
Initial Angle	0	20	deg	13.6	Pass
Force at 45 Degrees	320	390	N	359.5	Pass
Return Angle Relative to Initial	0	8	deg	6.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	10/6/2017	10/6/2018
Load Cell	Interface SML-200	LC-493319	10/7/2017	10/7/2018



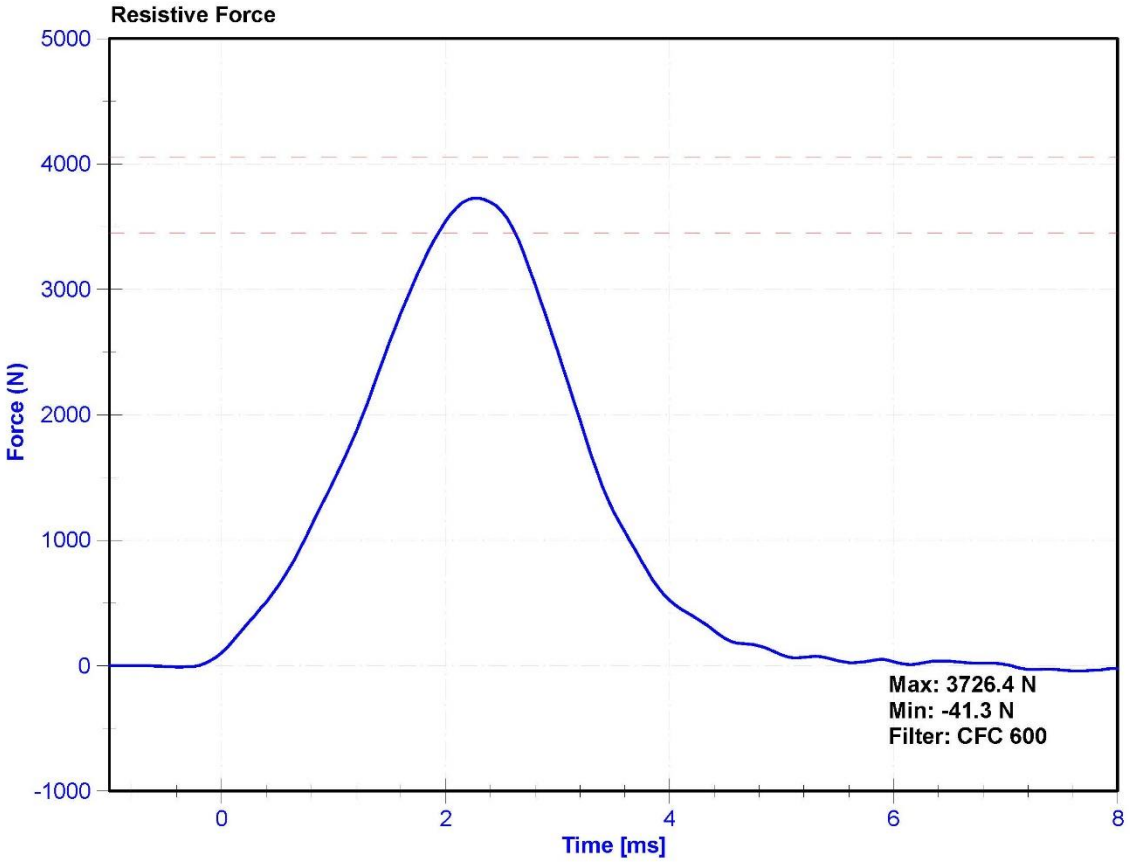
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

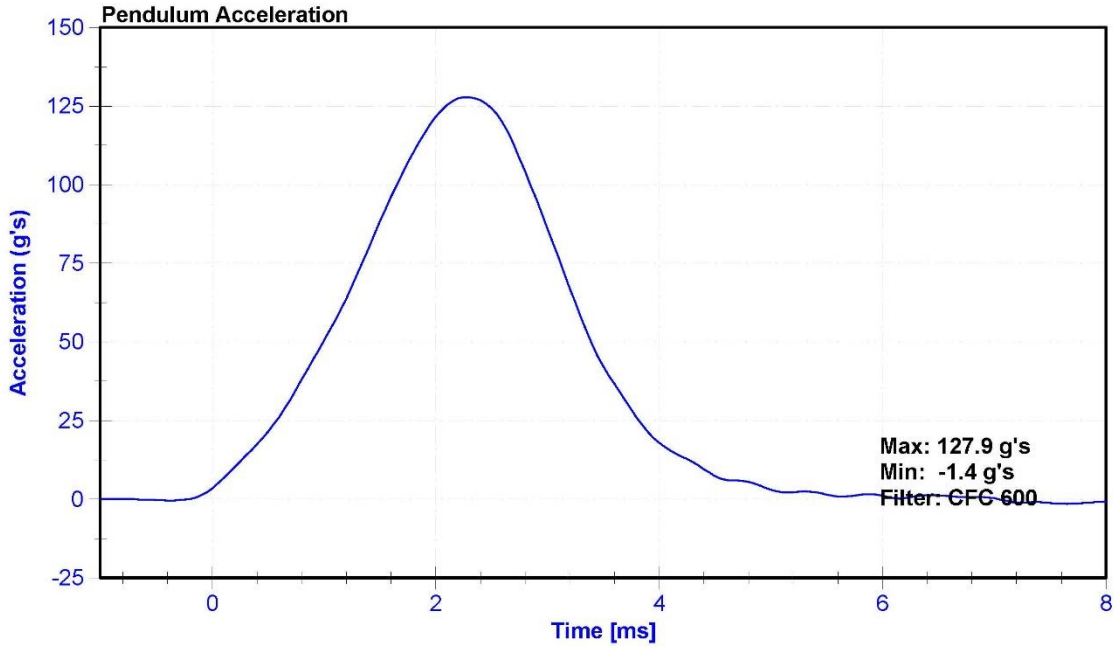
Results

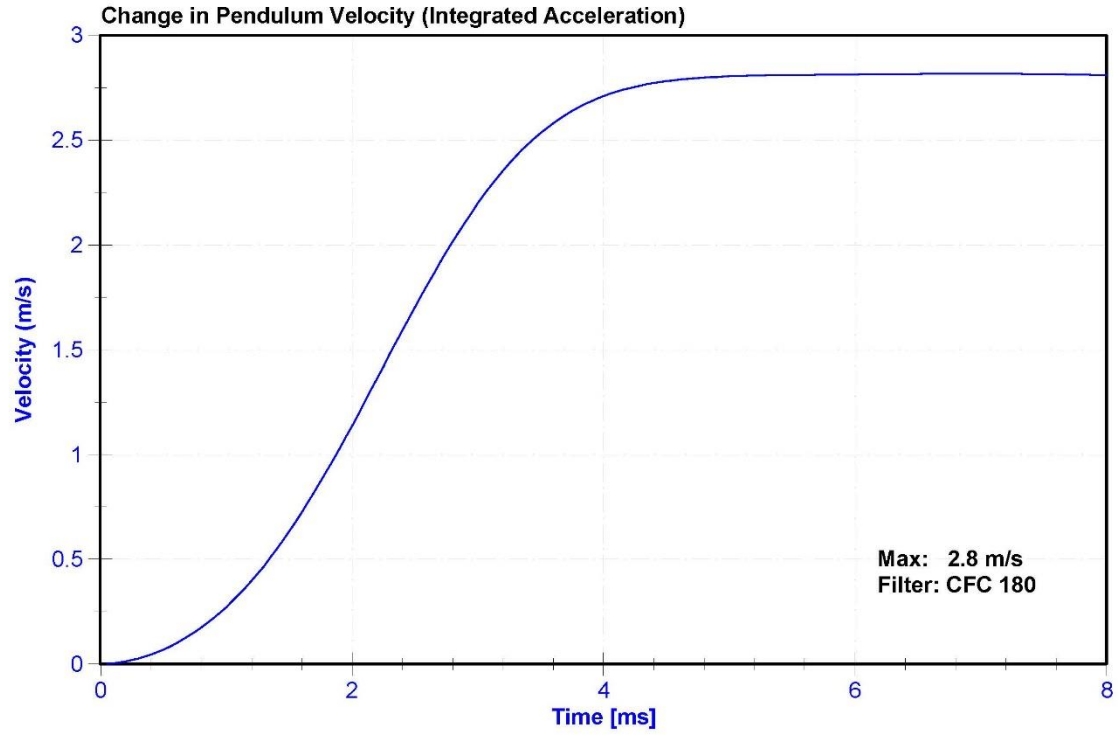
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.7	Pass
Humidity	10	70	%	34.4	Pass
Velocity	2.07	2.13	m/s	2.104	Pass
Resistive Force	3450	4060	N	3726.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 127.9 g's
Min: -1.4 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

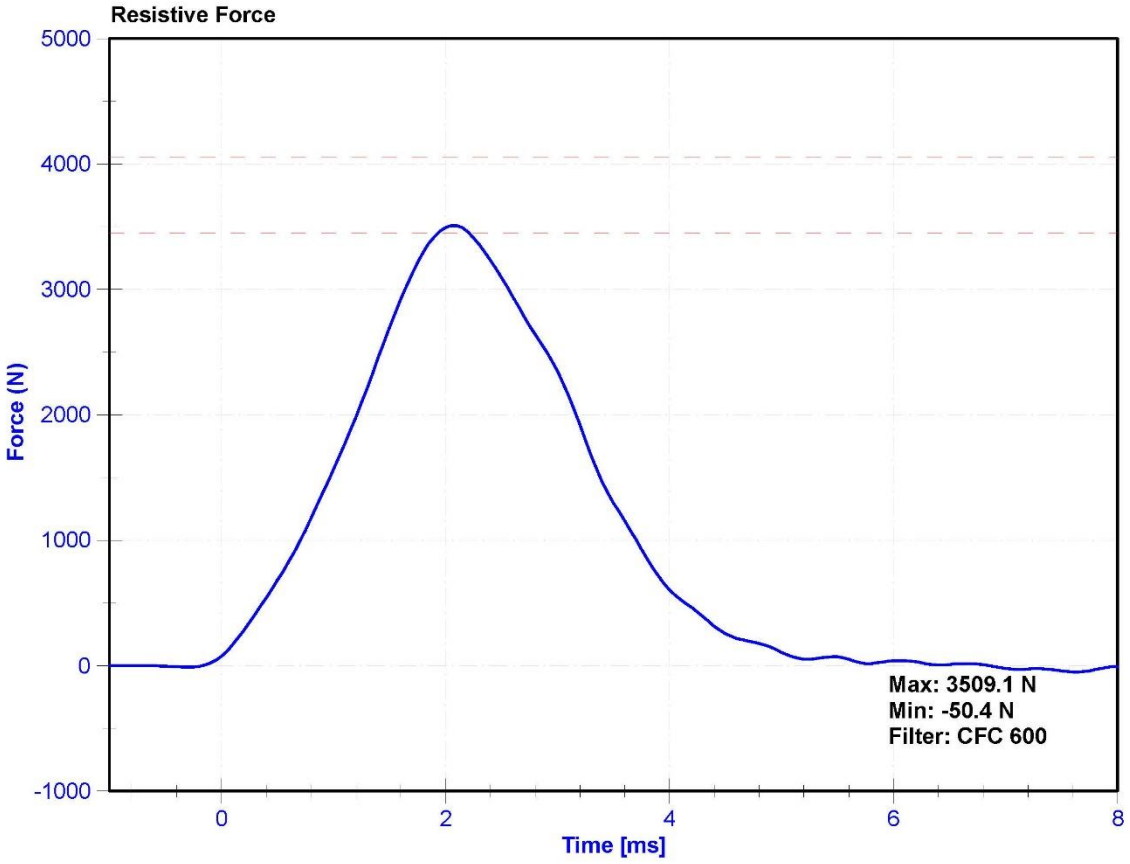
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

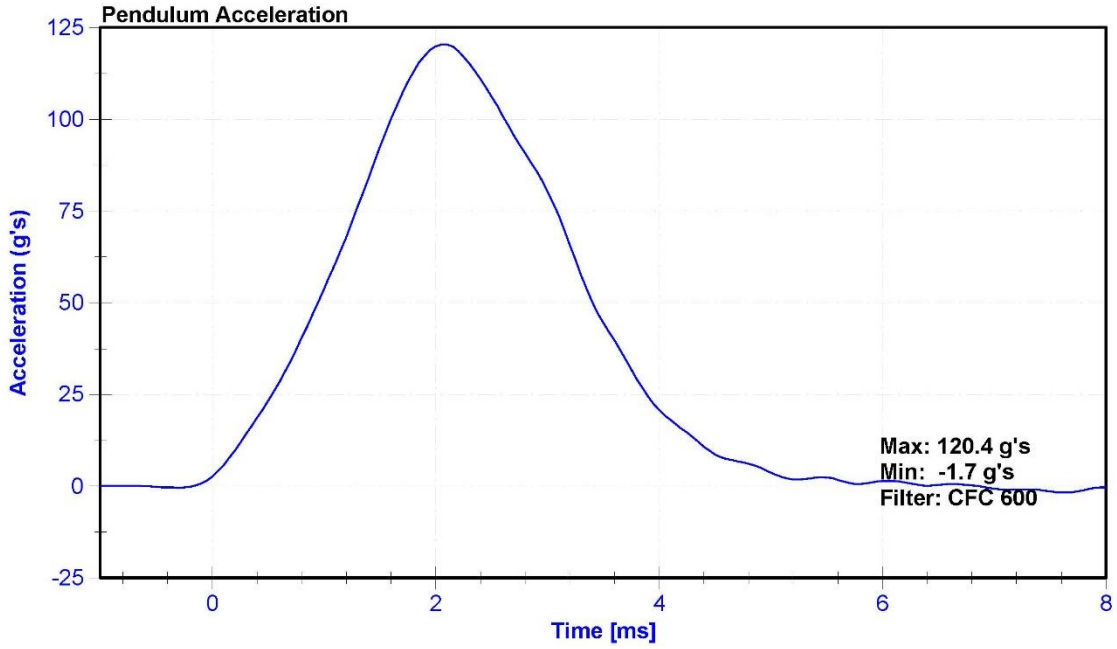
Results

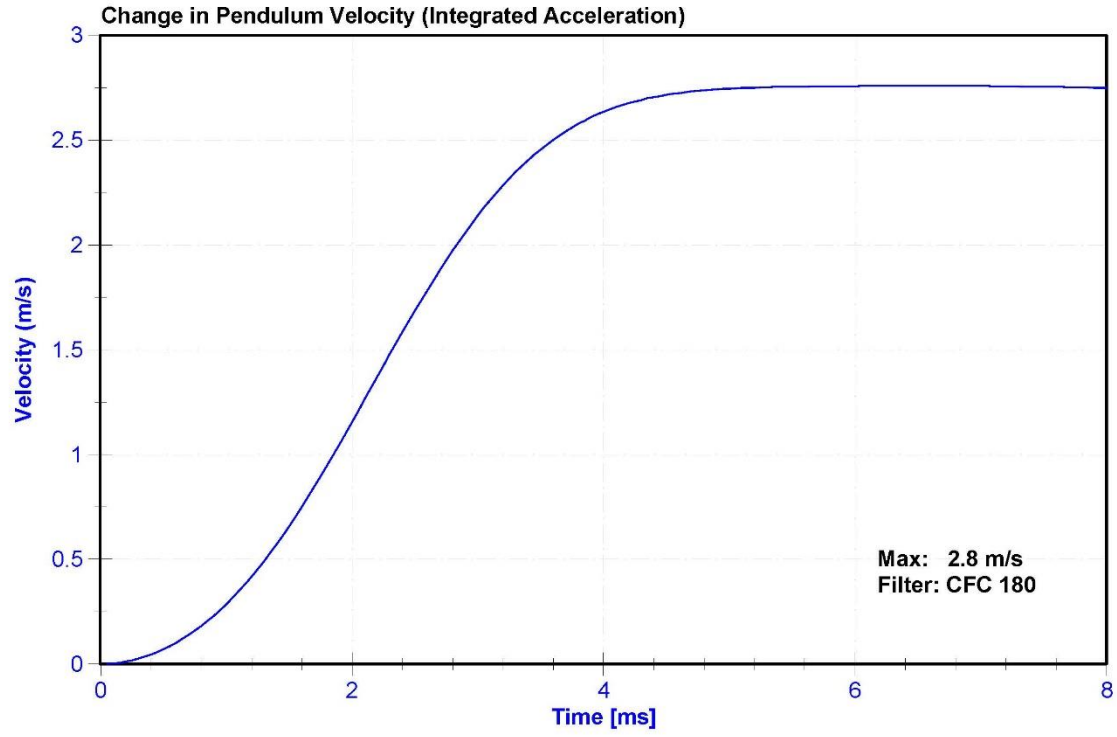
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.7	Pass
Humidity	10	70	%	34.4	Pass
Velocity	2.07	2.13	m/s	2.102	Pass
Resistive Force	3450	4060	N	3509.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 120.4 g's
Min: -1.7 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

CALIBRATION TEST RESULTS

POST-TEST

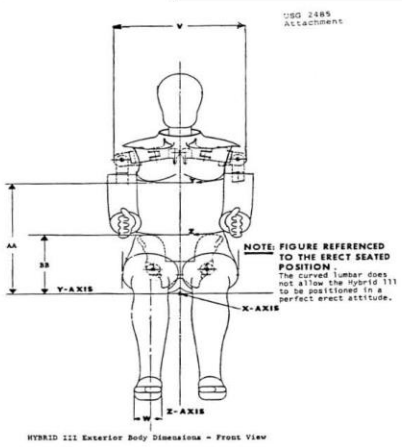
HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 142

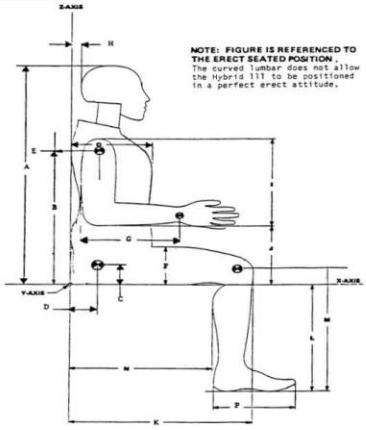
External Measurements - Hybrid 3 - 50th Male

Technician: K. Brogan Date: 11/9/2017

Dummy Serial Number: 142



HYBRID III Exterior Body Dimensions - Front View



HYBRID III Exterior Body Dimensions - Side View

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	3.5	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	11.5	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	8.2	Pass
K	Buttock to Knee Length	22.8	23.8	23.1	Pass
L	Popliteal Height	16.9	17.9	17.8	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.5	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	17.0	Pass
W	Foot Breadth	3.6	4.2	4.0	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.3	Pass
Z	Waist Circumference	32.9	34.1	34.0	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

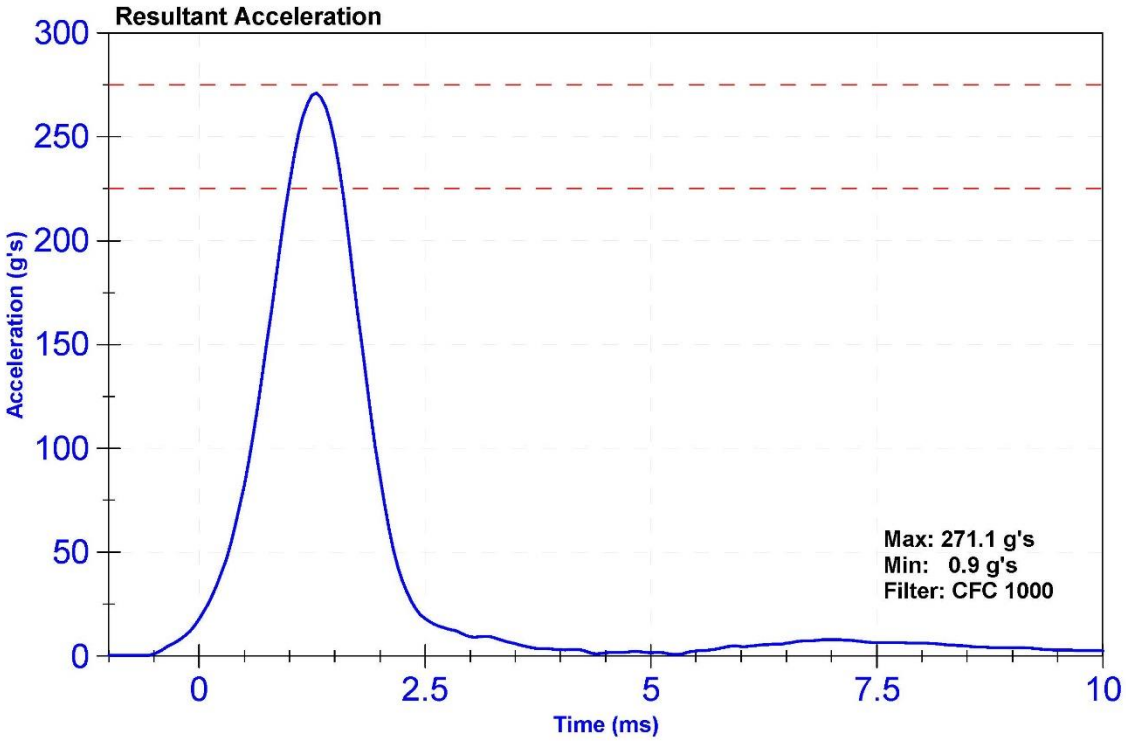
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

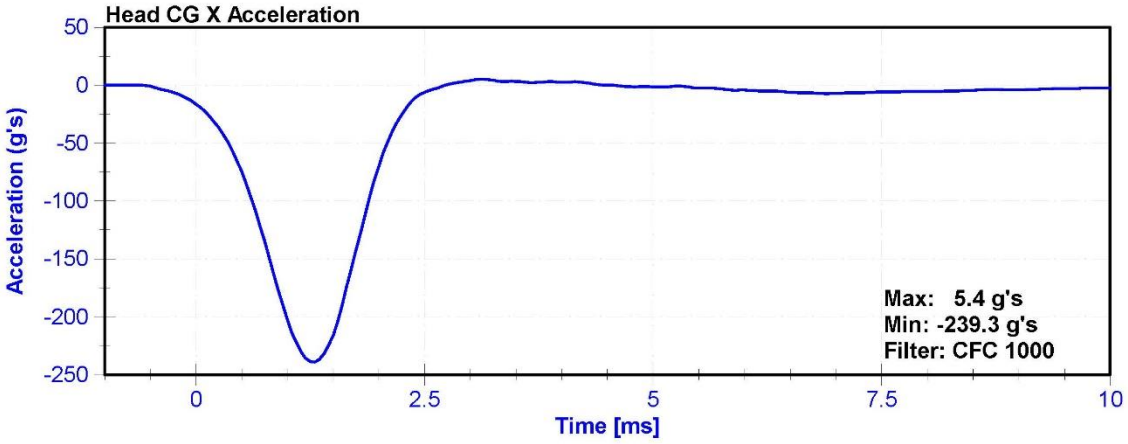
Results

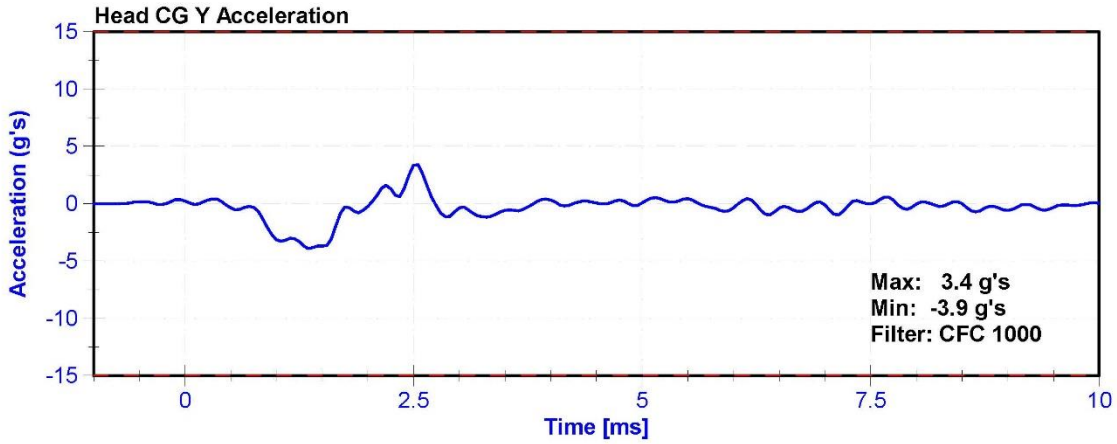
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	34.5	Pass
Resultant Acceleration	225	275	g's	271.1	Pass
Oscillation	0	10	%	3.5	Pass
Lateral Acceleration	-15	15	g's	-3.9	Pass

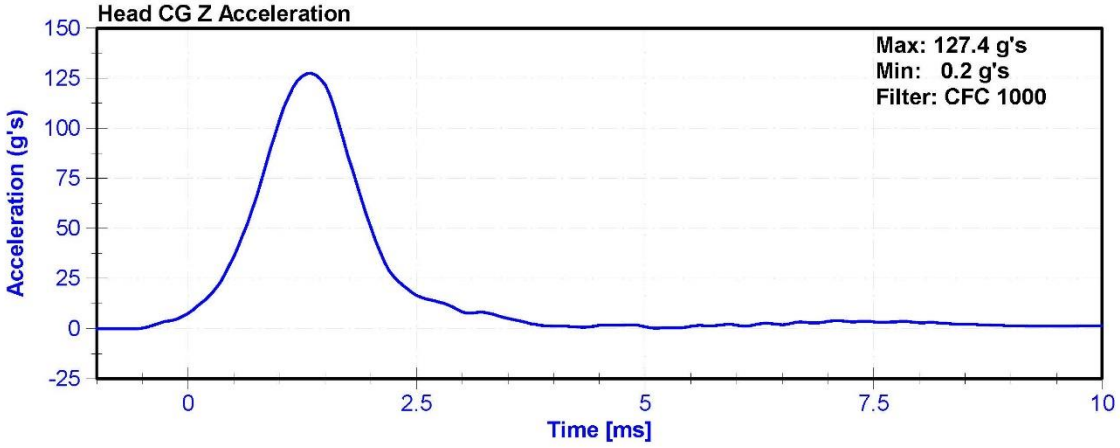
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58998	10/25/2017	4/25/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P58912	10/25/2017	4/25/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P58997	10/25/2017	4/25/2018




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 5.4 g's
Min: -239.3 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 3.4 g's
Min: -3.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 127.4 g's
Min: 0.2 g's
Filter: CFC 1000

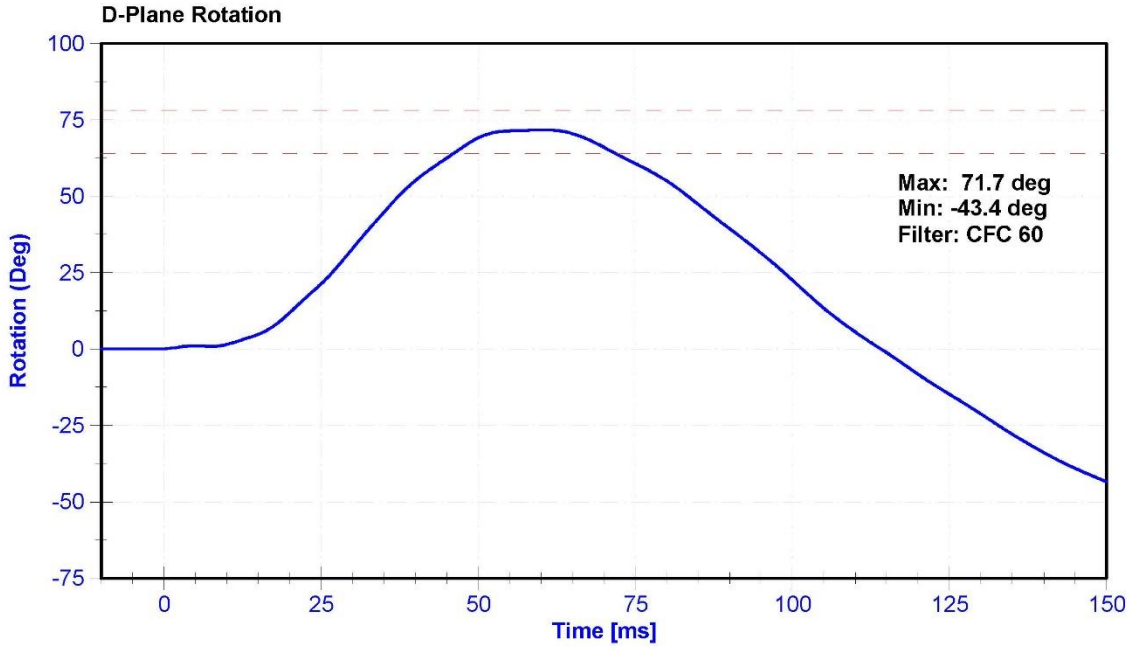
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

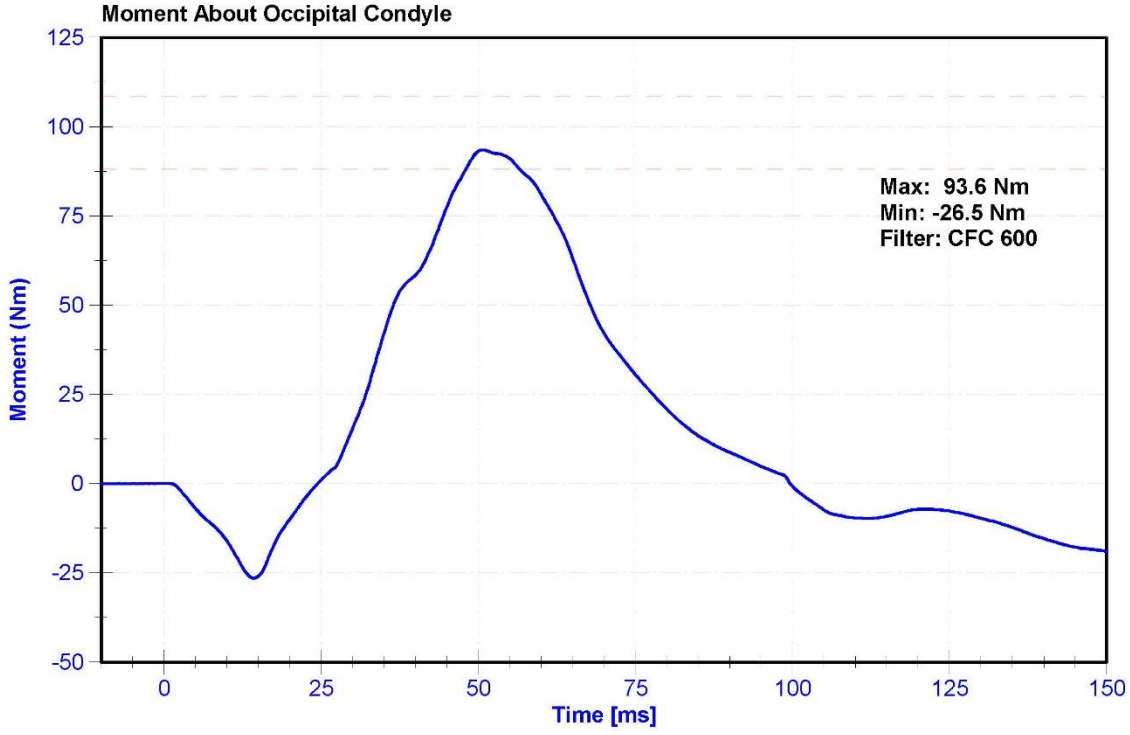
Results

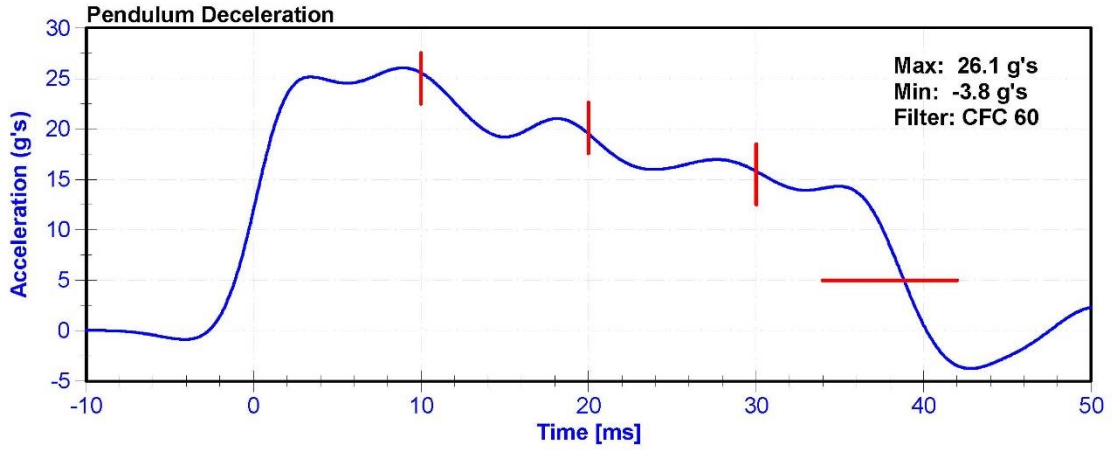
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	30.3	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.58	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	19.52	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.82	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	26.1	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	38.8	Pass
Maximum D Plane Rotation	64	78	deg	71.7	Pass
Time to Maximum Rotation	57	64	ms	60.5	Pass
Rotation Decay to Zero	113	127	ms	114.1	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	93.56	Pass
Time to Maximum Moment	47	58	ms	50.7	Pass
Moment Decay to Zero	97	107	ms	99.7	Pass

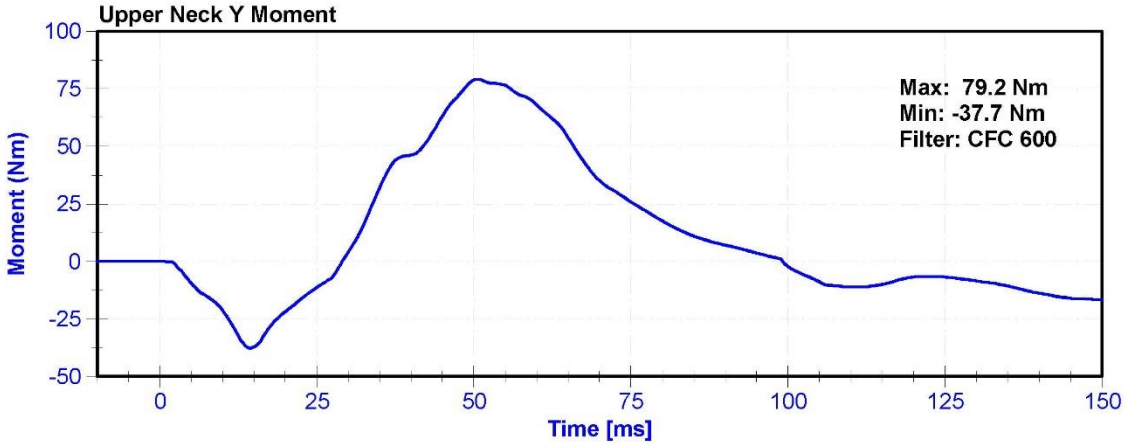
Transducer Calibrations

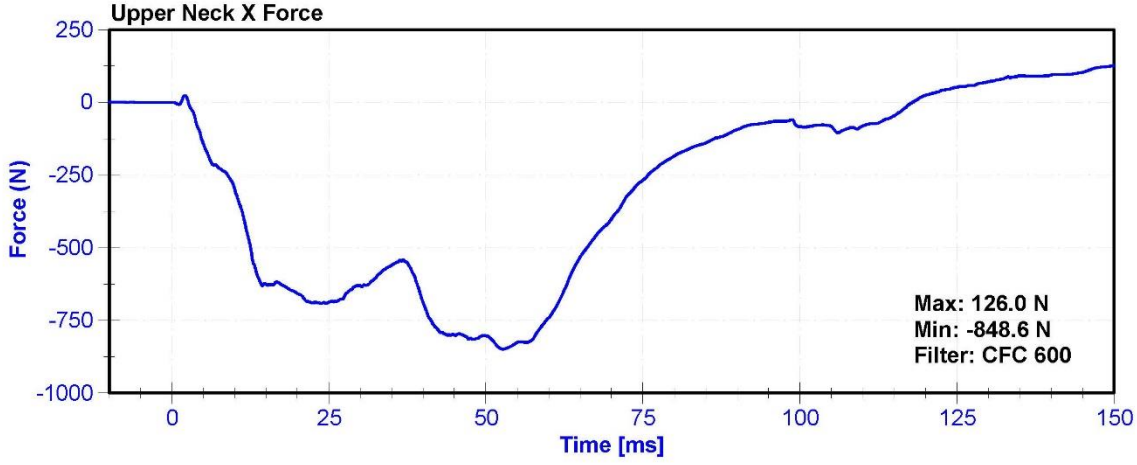
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	FTSS IF-205	LC-161Fx	7/11/2017	7/11/2018


D-Plane Rotation
Rotation (Deg)
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150
Time [ms]
Max: 71.7 deg
Min: -43.4 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 93.6 Nm
Min: -26.5 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 26.1 g's
Min: -3.8 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 79.2 Nm
Min: -37.7 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 126.0 N
Min: -848.6 N
Filter: CFC 600
Force (N)
Time [ms]

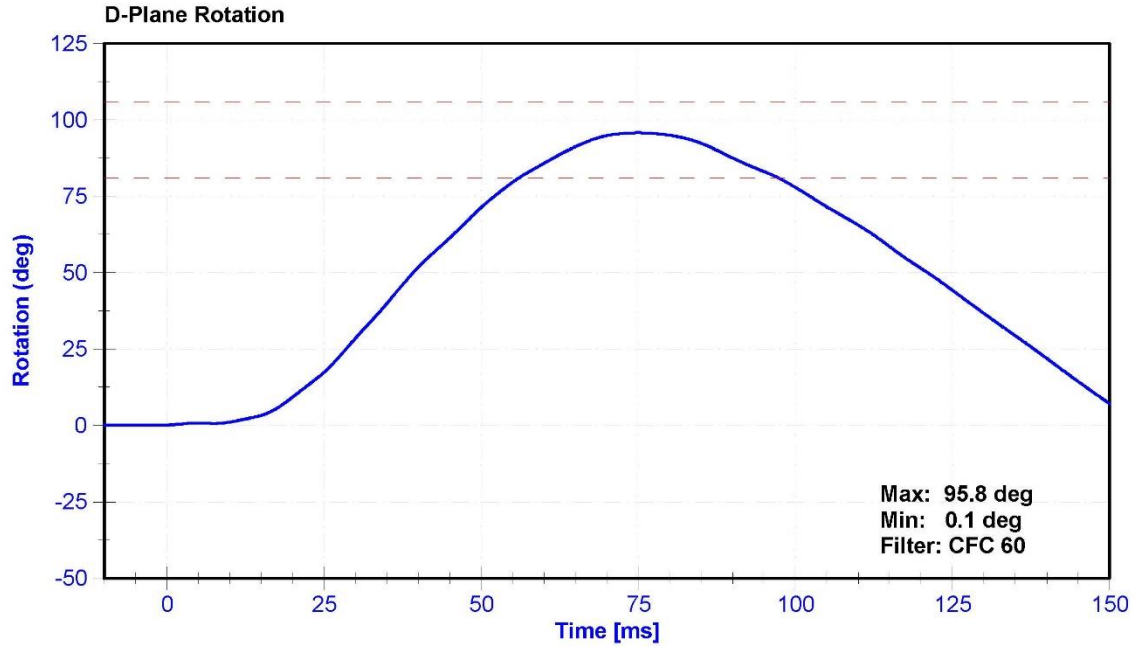
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

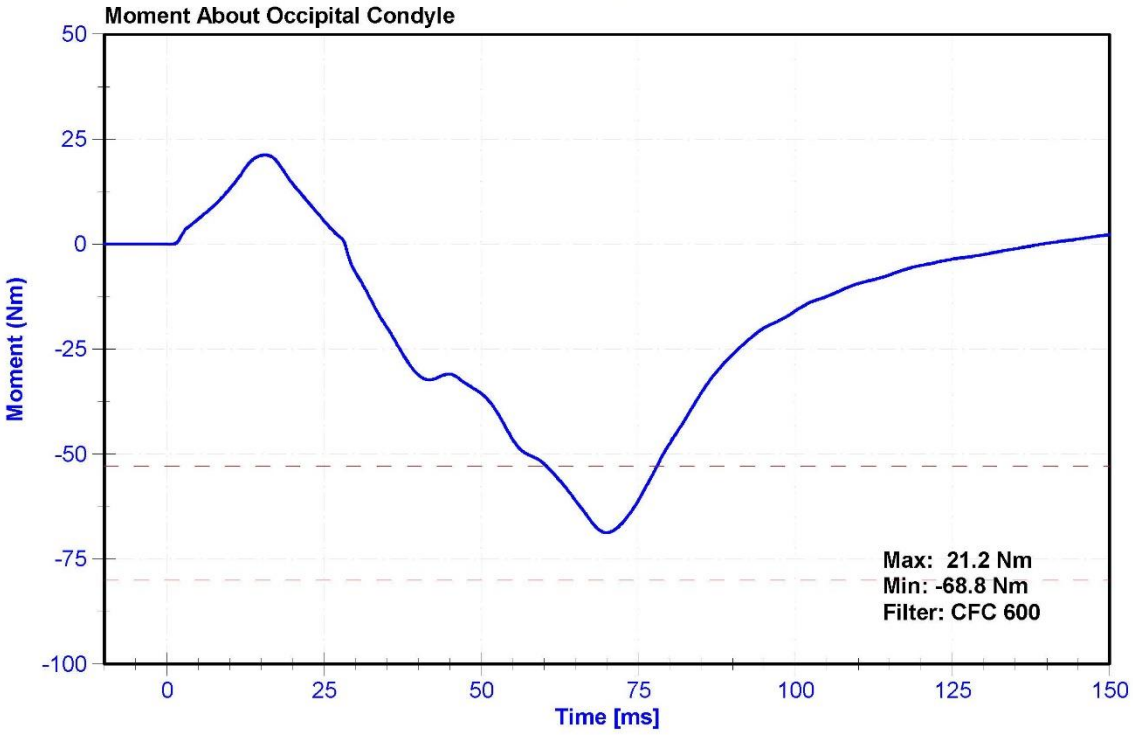
Results

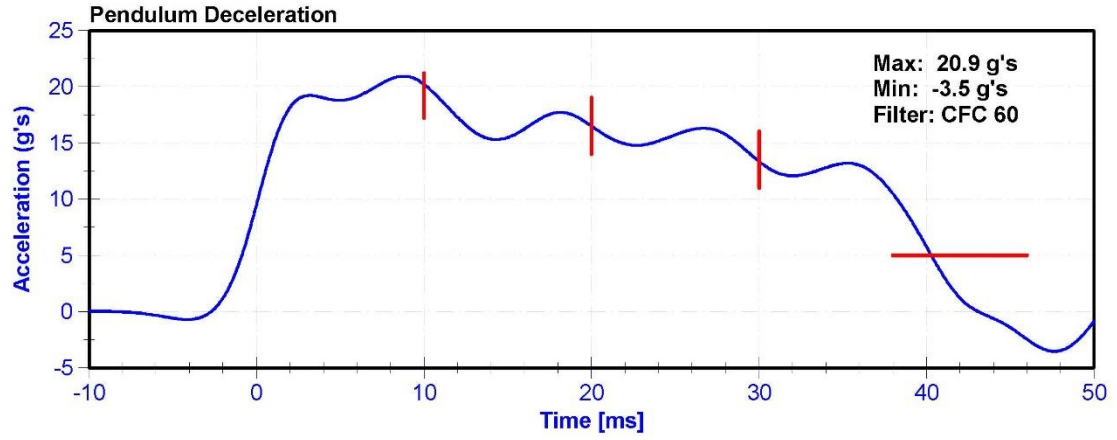
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	29.2	Pass
Velocity	5.94	6.19	m/s	6.025	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.21	Pass
Pendulum Deceleration at 20ms	14	19	g's	16.5	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.4	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.9	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	40.3	Pass
Maximum D Plane Rotation	81	106	deg	95.8	Pass
Time to Maximum Rotation	72	82	ms	75.0	Pass
Rotation Decay to Zero	147	174	ms	154.9	Pass
Minimum Moment About OC	-80	-52.9	Nm	-68.75	Pass
Time to Minimum Moment	65	79	ms	70.0	Pass
Moment Decay to Zero	120	148	ms	139.2	Pass

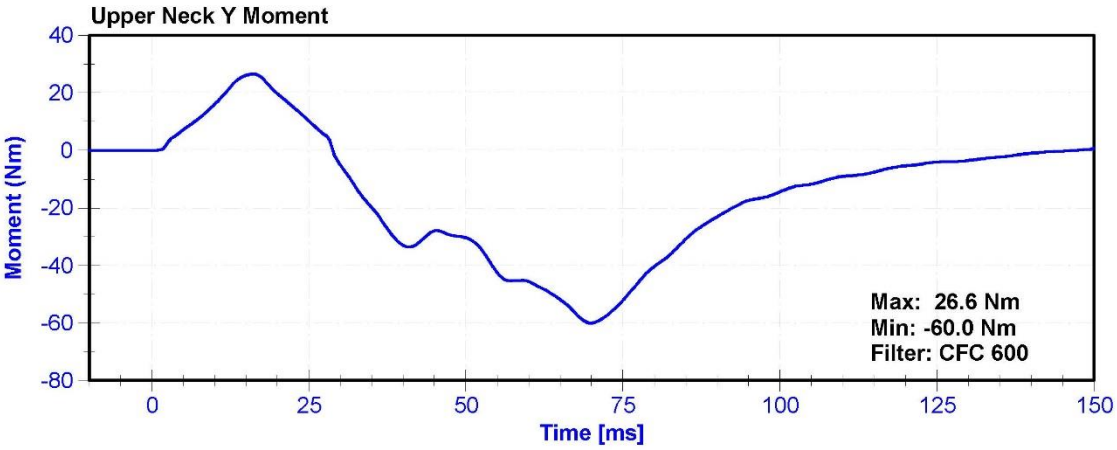
Transducer Calibrations

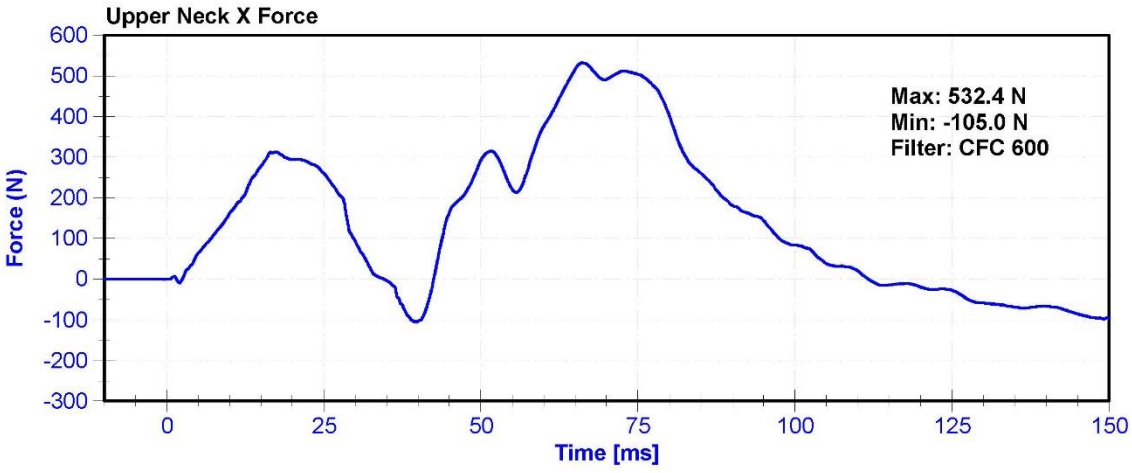
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	FTSS IF-205	LC-161Fx	7/11/2017	7/11/2018


D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 95.8 deg
Min: 0.1 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 21.2 Nm
Min: -68.8 Nm
Filter: CFC 600


Pendulum Deceleration
Max: 20.9 g's
Min: -3.5 g's
Filter: CFC 60
Acceleration (g's)
Time [ms]


Upper Neck Y Moment
Max: 26.6 Nm
Min: -60.0 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]


Upper Neck X Force
Max: 532.4 N
Min: -105.0 N
Filter: CFC 600
Force (N)
Time [ms]

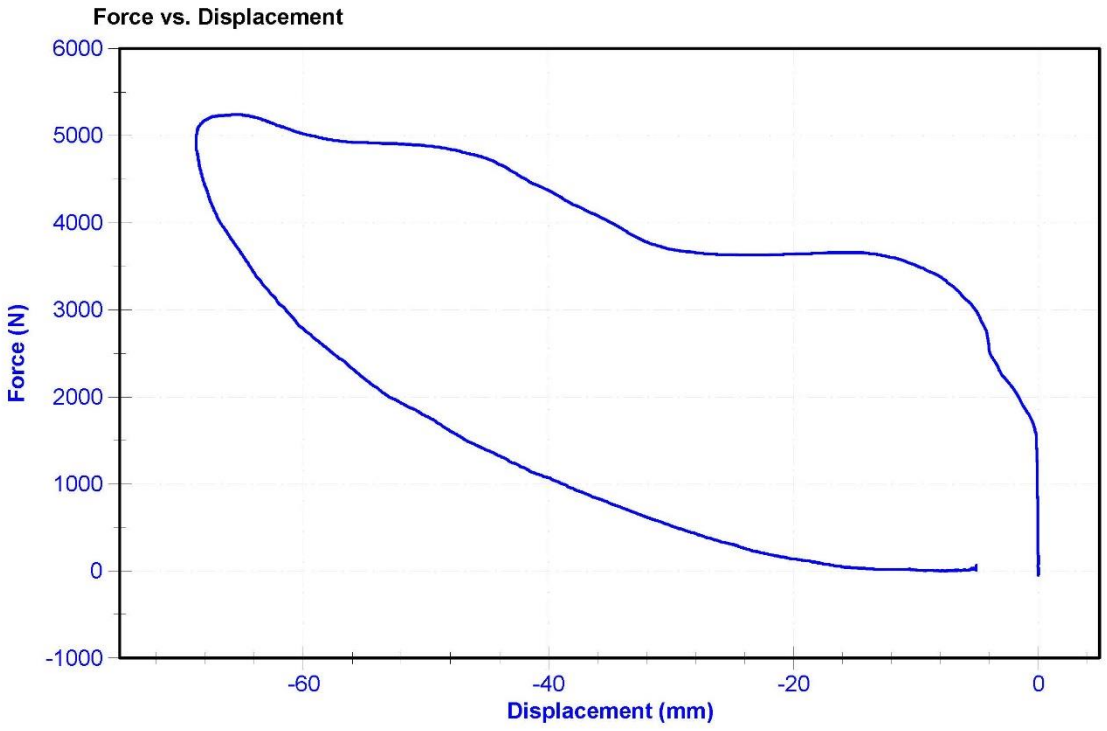
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

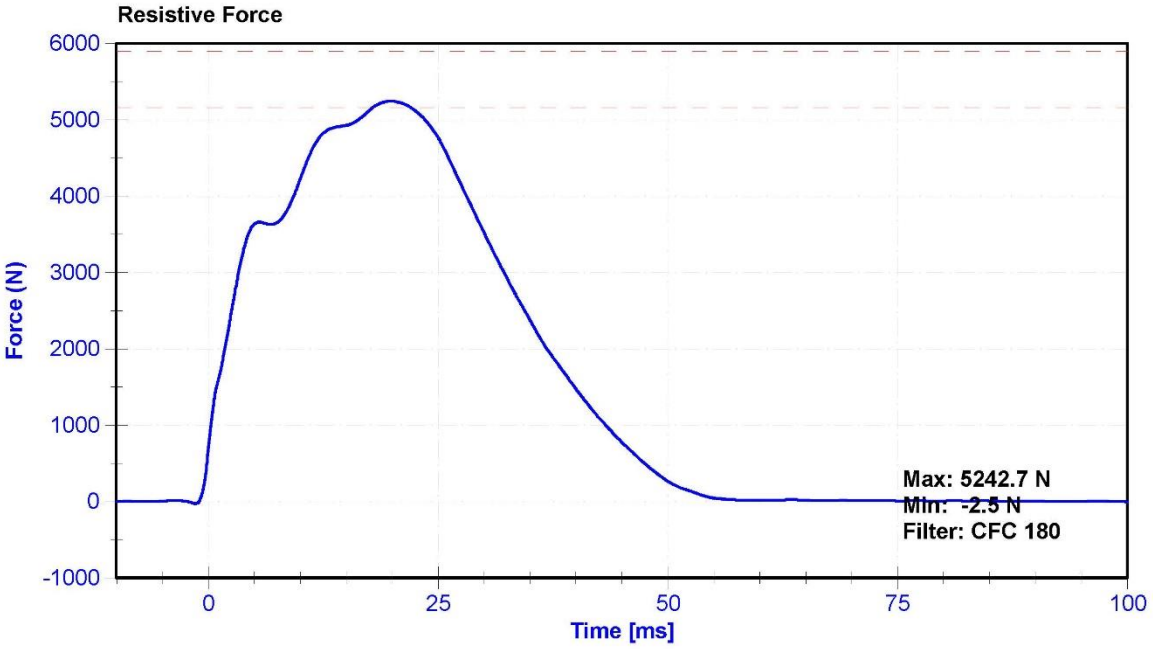
Results

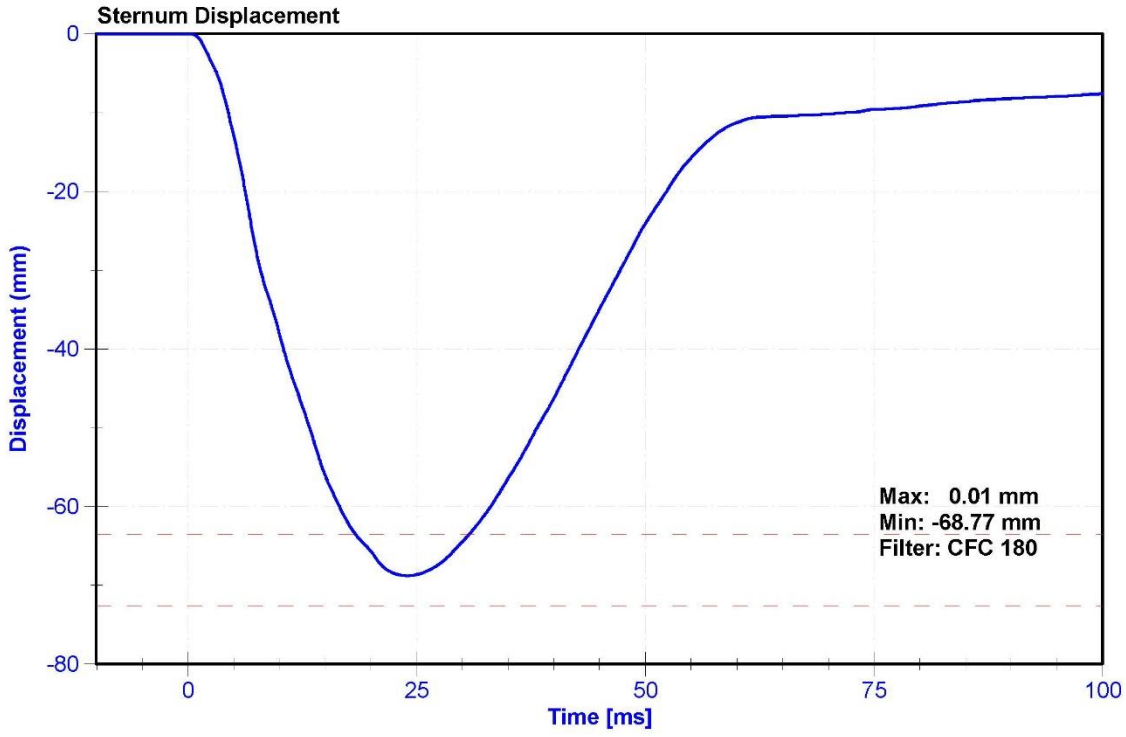
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	34.7	Pass
Velocity	6.59	6.83	m/s	6.612	Pass
Chest Displacement	-72.6	-63.5	mm	-68.77	Pass
Resistive Force	5160	5894	N	5242.7	Pass
Hysteresis	65	85	%	71.9	Pass

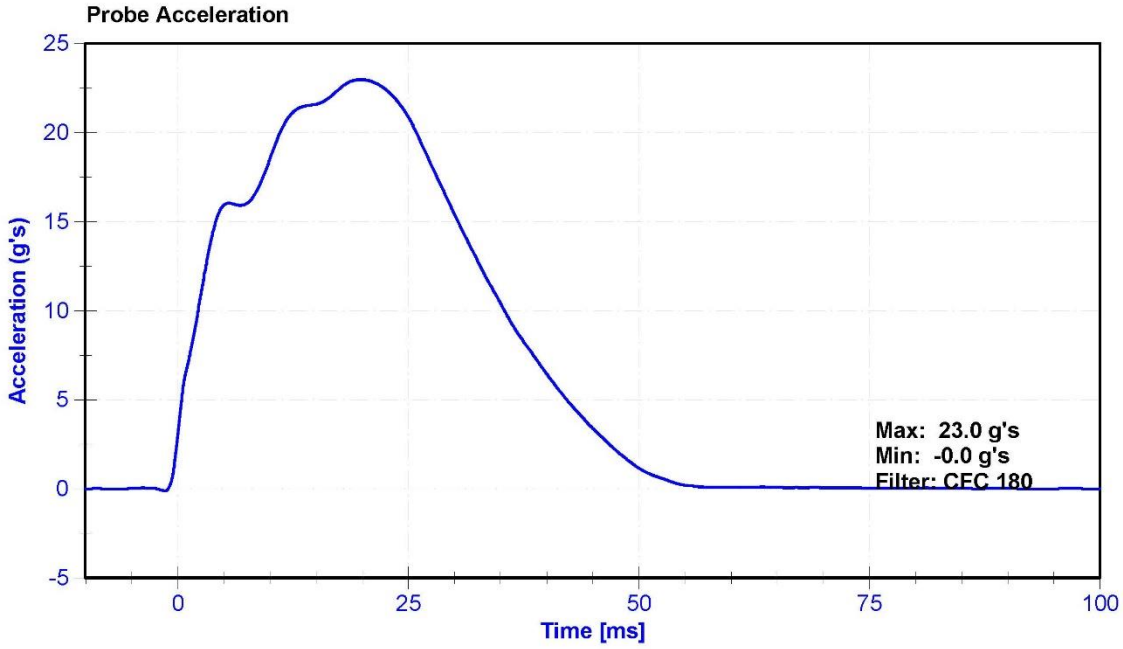
Transducer Calibrations

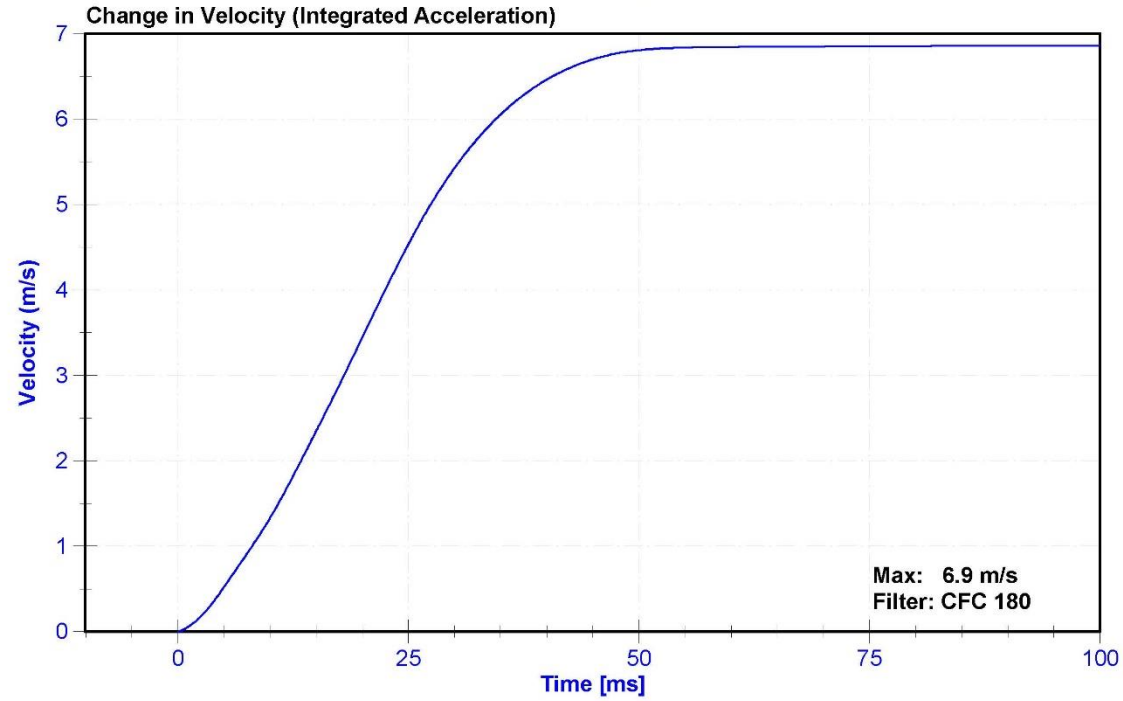
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018
Chest Potentiometer	JDK 6209-2038	DS-142	9/27/2017	9/27/2018




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
25
50
75
100
Time [ms]
Max: 5242.7 N
Min: -2.5 N
Filter: CFC 180


Sternum Displacement
Displacement (mm)
0
-20
-40
-60
-80
0
25
50
75
100
Time [ms]
Max: 0.01 mm
Min: -68.77 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
25
20
15
10
5
0
-5
0
25
50
75
100
Time [ms]
Max: 23.0 g's
Min: -0.0 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
7
6
5
4
3
2
1
0
0
25
50
75
100
Time [ms]
Max: 6.9 m/s
Filter: CFC 180

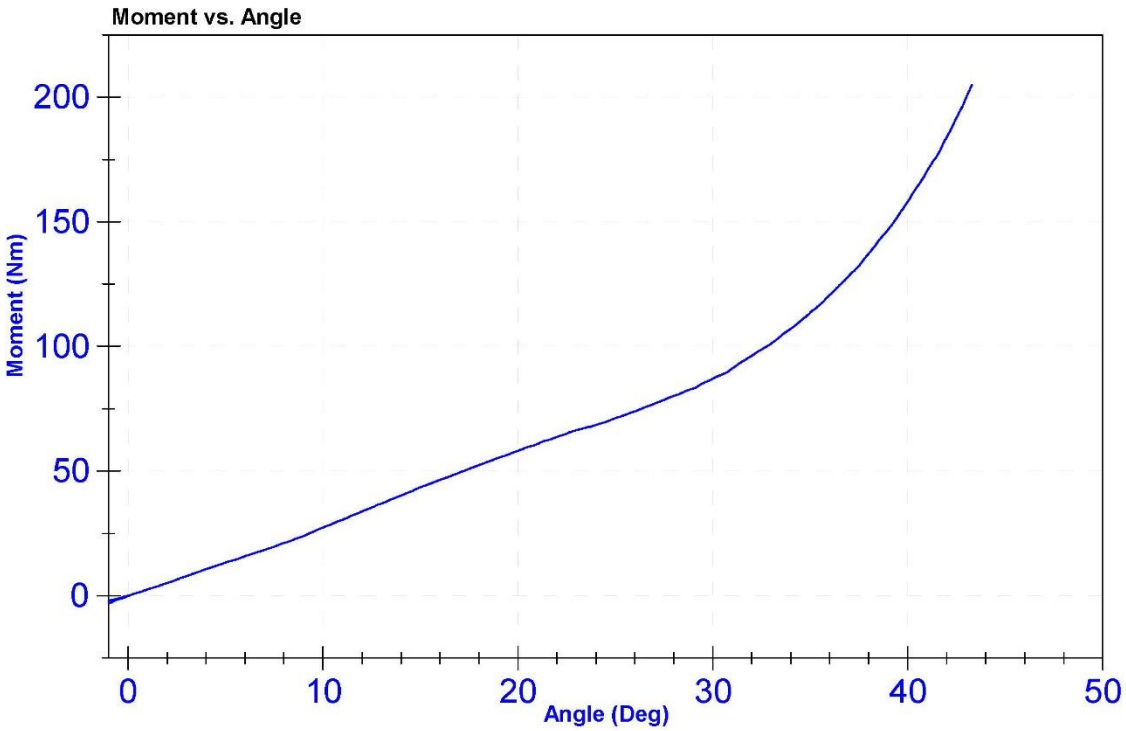
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	35.1	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	43.2	Pass
Moment at 30 degrees	0	94.9	Nm	87.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	6/8/2017	6/8/2018
Load Cell	Key Trans 2301-02	LC-115 My	6/8/2017	6/8/2018



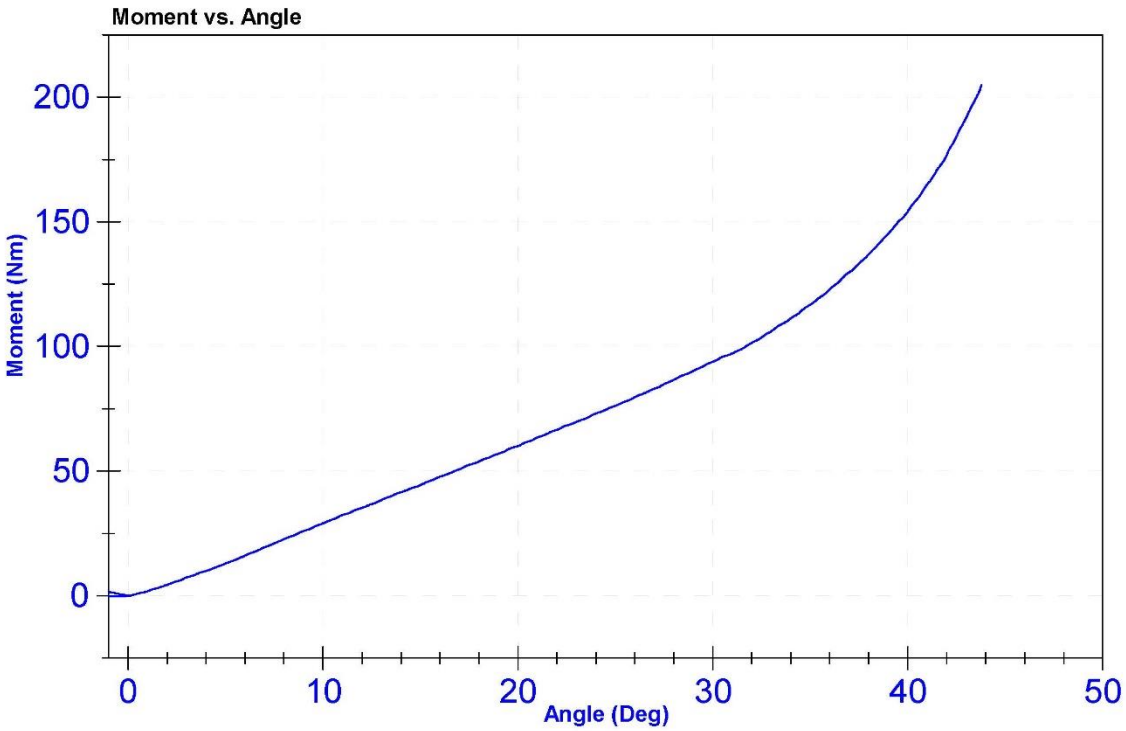
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	35.1	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	43.7	Pass
Moment at 30 degrees	0	94.9	Nm	93.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	6/8/2017	6/8/2018
Load Cell	Key Trans 2301-02	LC-115 My	6/8/2017	6/8/2018



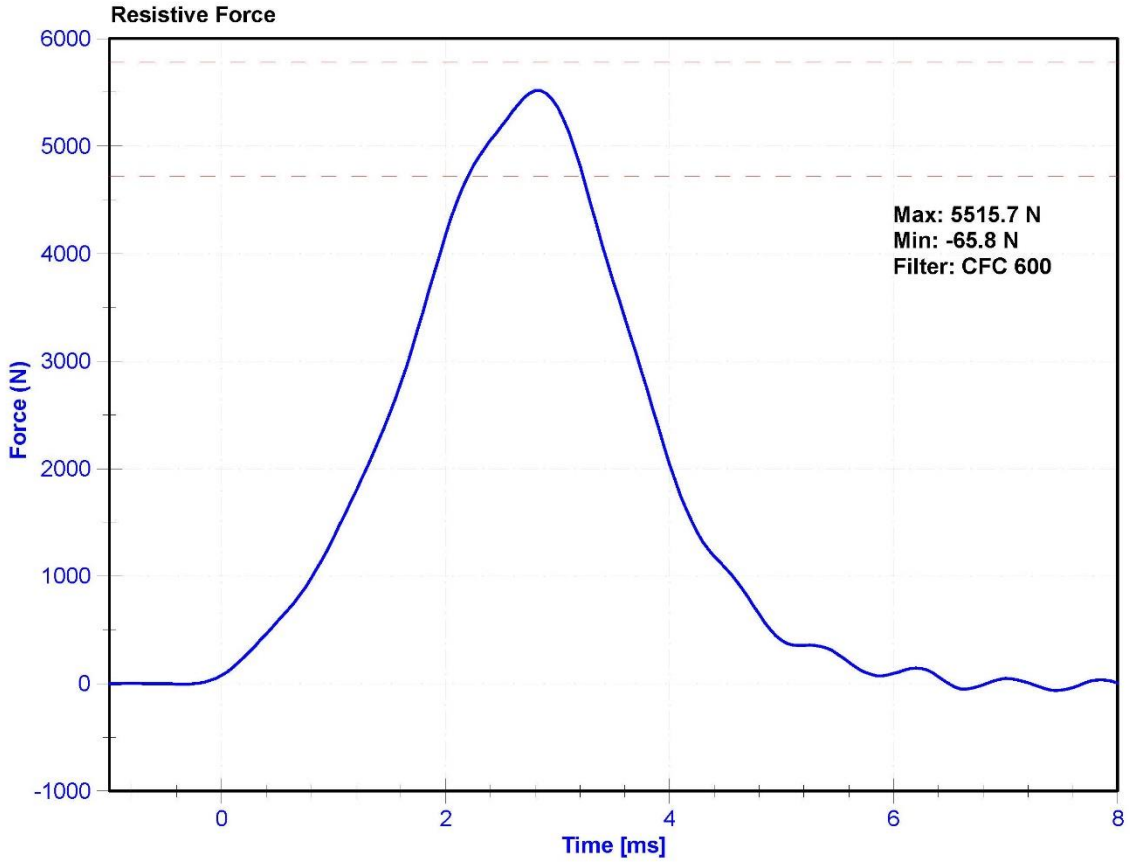
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

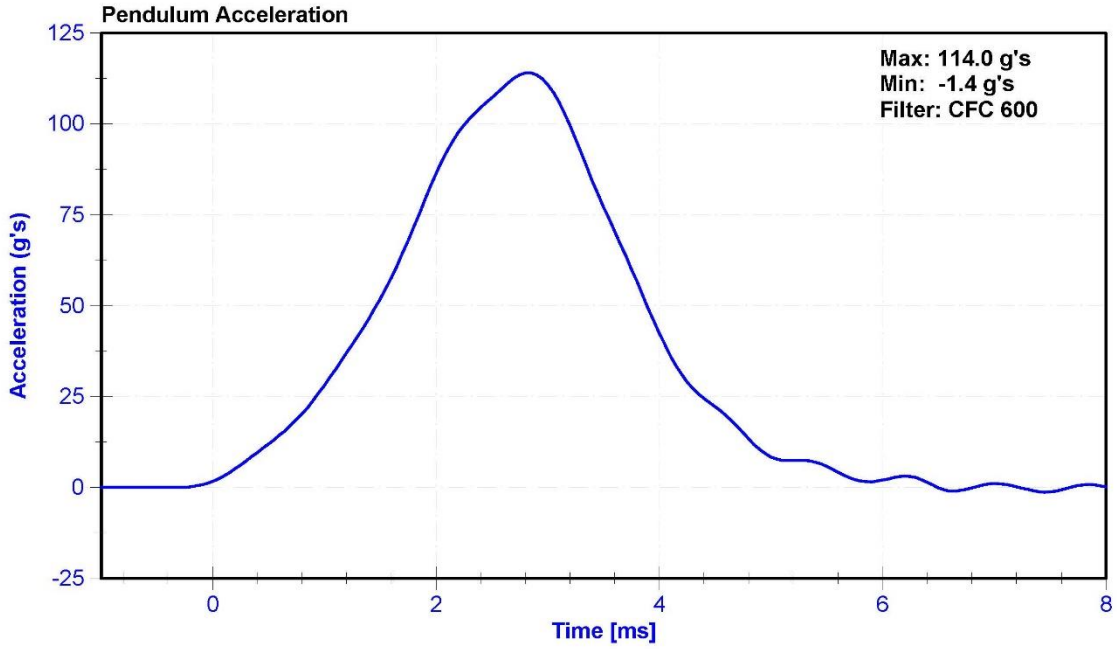
Results

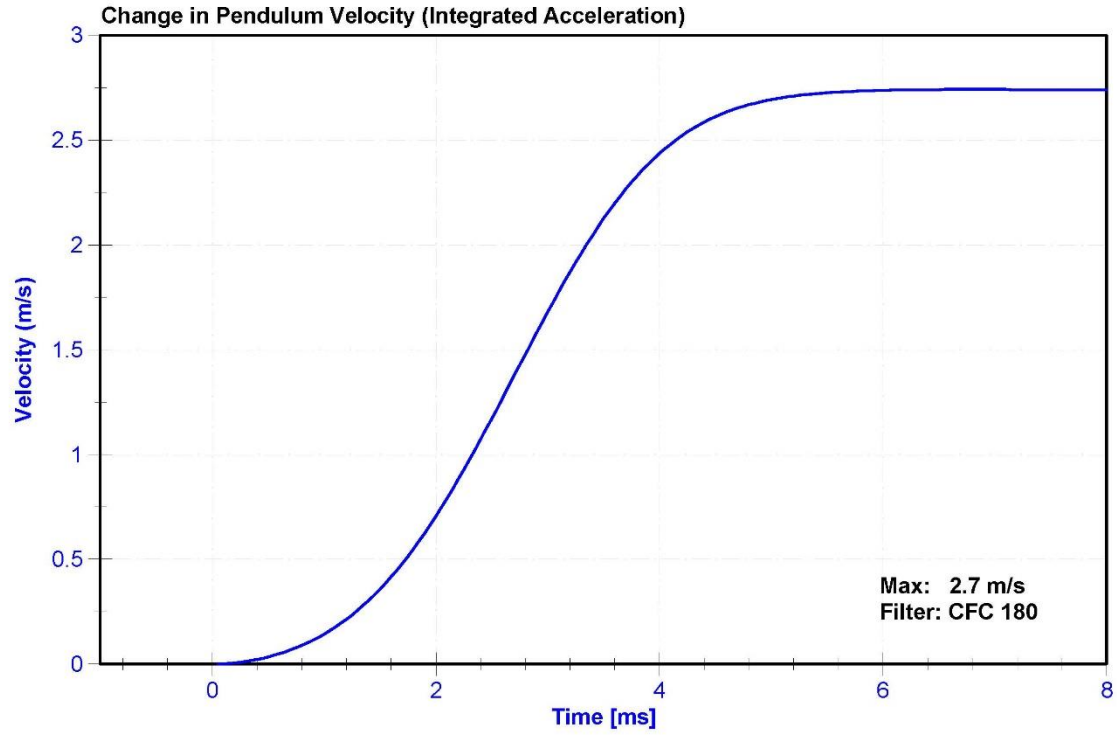
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	31.8	Pass
Velocity	2.07	2.13	m/s	2.082	Pass
Maximum Resistive Force	4720	5780	N	5515.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Max: 114.0 g's
Min: -1.4 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.7 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

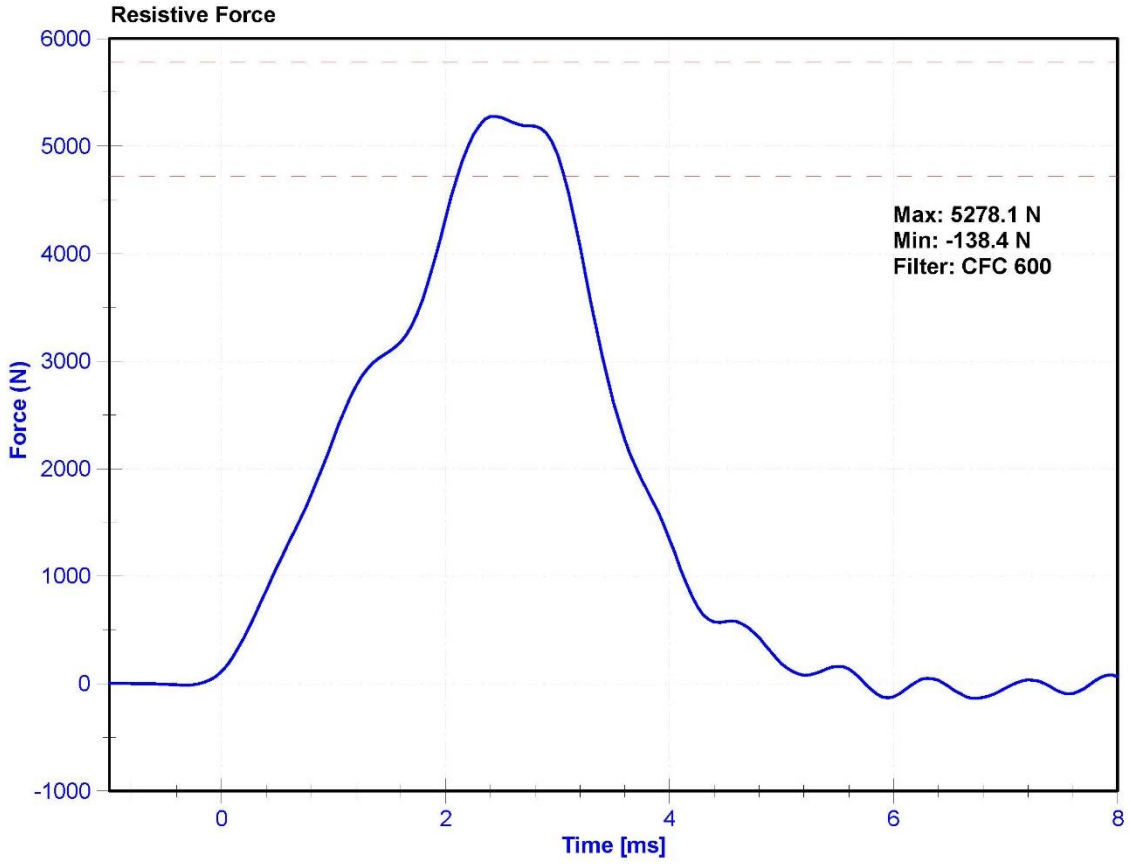
ATD Manufacturer	Humanetics	Test Technician	K. Brogan
ATD Serial Number	142	Laboratory Supervisor	M. Goehle

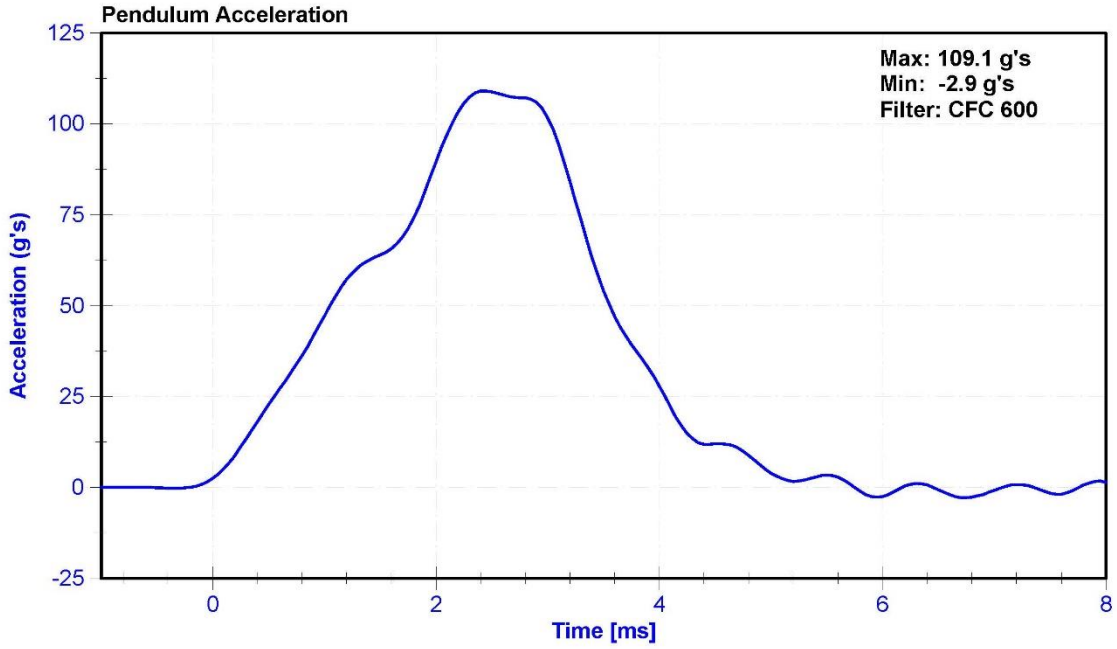
Results

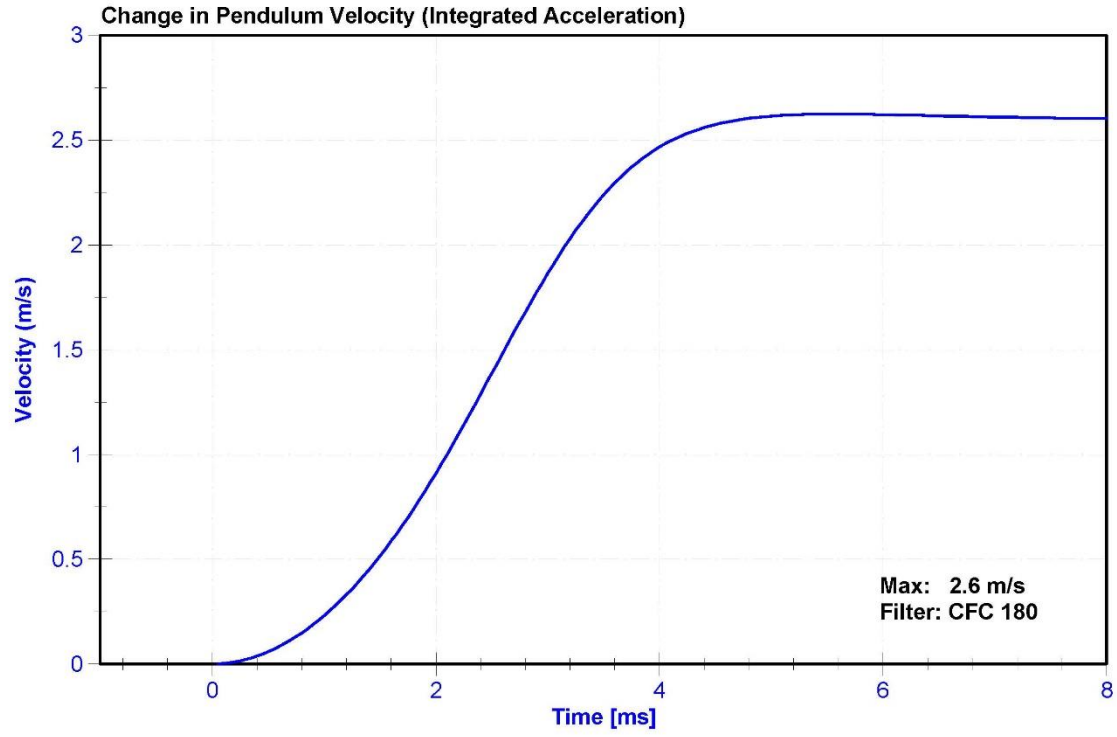
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	31.6	Pass
Velocity	2.07	2.13	m/s	2.079	Pass
Maximum Resistive Force	4720	5780	N	5278.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Max: 109.1 g's
Min: -2.9 g's
Filter: CFC 600
Acceleration (g's)
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
Max: 2.6 m/s
Filter: CFC 180
0
2
4
6
8
Time [ms]

CALIBRATION TEST RESULTS

POST-TEST

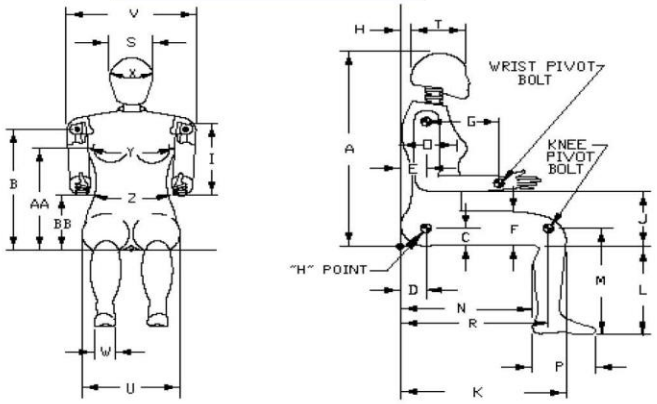
HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 288

External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan Date: 11/9/2017

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	782	Pass
B	Shoulder Pivot Height	432	457	440	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	74	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	285	Pass
J	Elbow Rest Height	183	203	188	Pass
K	Buttock to Knee Length	521	546	541	Pass
L	Popliteal Height	356	376	366	Pass
M	Knee Pivot Height	394	419	401	Pass
N	Buttock Popliteal Length	414	439	430	Pass
O	Chest Depth without Jacket	175	191	180	Pass
P	Foot Length (right)	219	234	220	Pass
R	Buttock To Knee Pivot Length	457	483	462	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	307	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	85	Pass
X	Head Circumference	528	549	537	Pass
Y	Chest Circumference with Jacket	851	881	855	Pass
Z	Waist Circumference	460	790	776	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

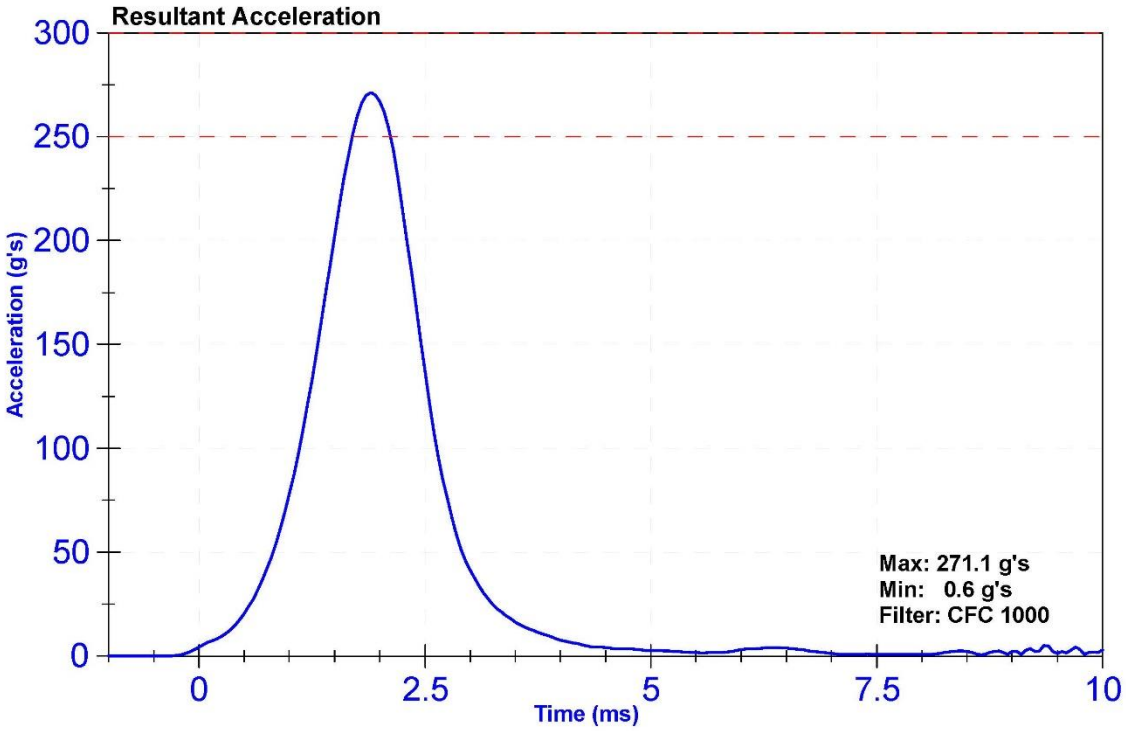
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

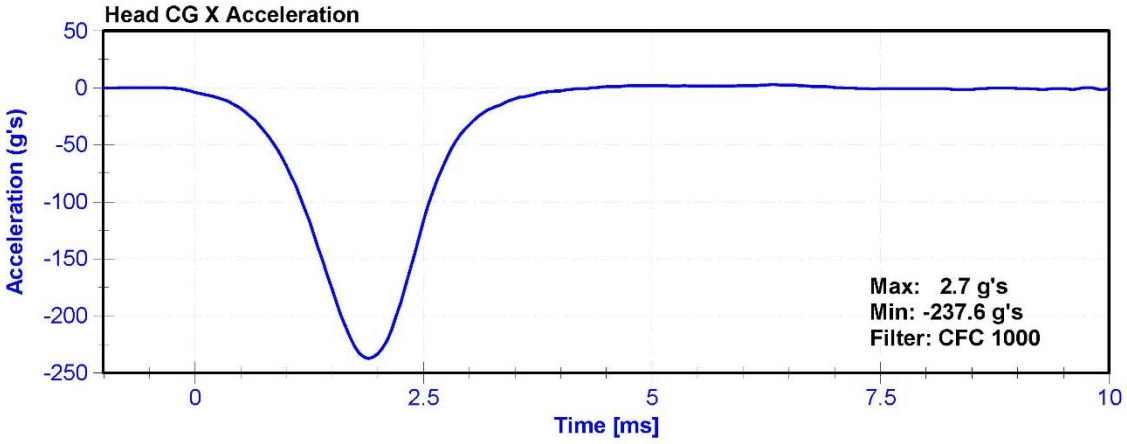
Results

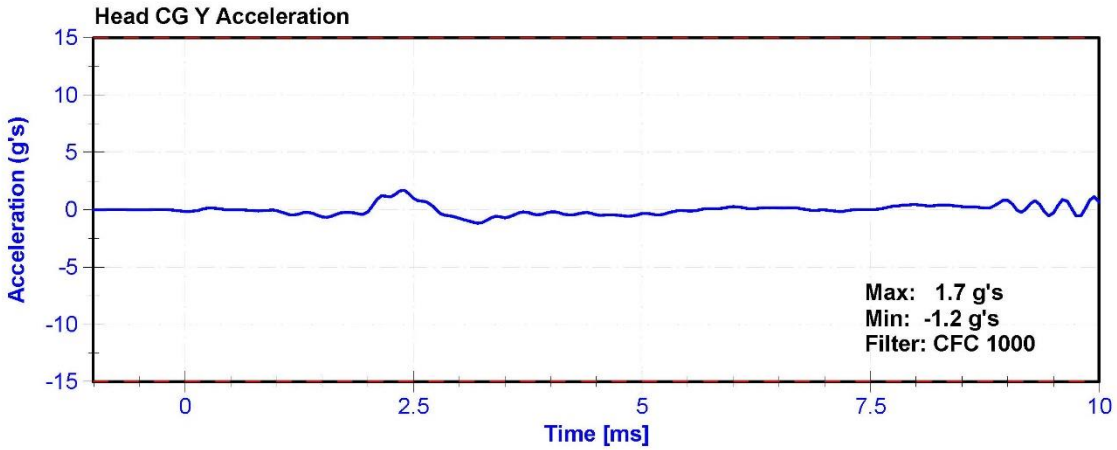
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	30.3	Pass
Resultant Acceleration	250	300	g's	271.1	Pass
Oscillation	0	10	%	1.8	Pass
Lateral Acceleration	-15	15	g's	3.1	Pass

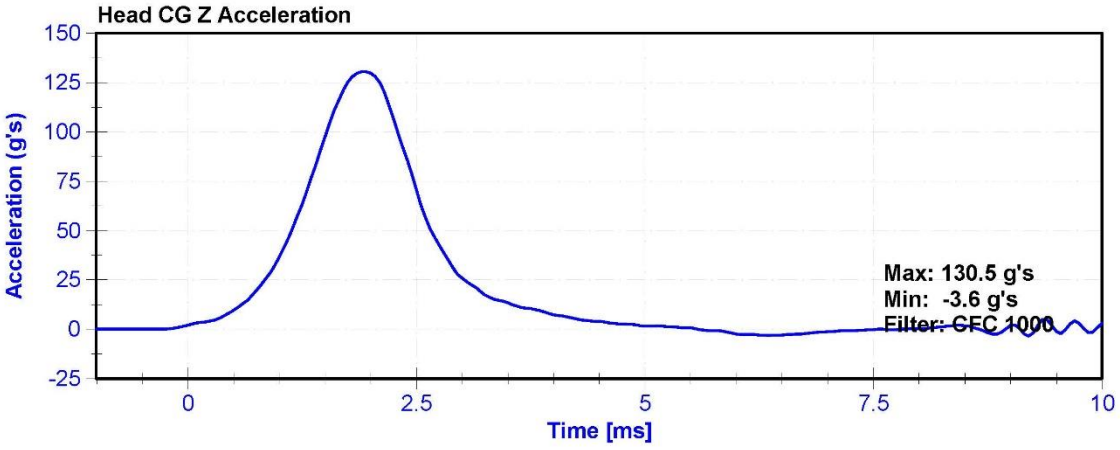
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	10/10/2017	4/10/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	10/10/2017	4/10/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/10/2017	4/10/2018




Head CG X Acceleration
Acceleration (g's)
50
0
-50
-100
-150
-200
-250
0
2.5
5
7.5
10
Time [ms]
Max: 2.7 g's
Min: -237.6 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 1.7 g's
Min: -1.2 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 130.5 g's
Min: -3.6 g's
Filter: CFC 1000

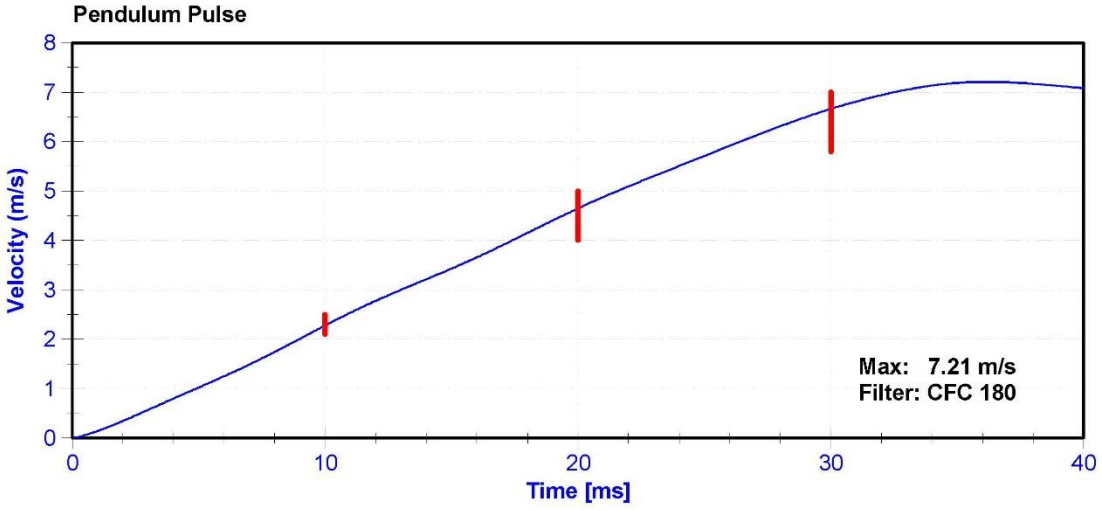
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

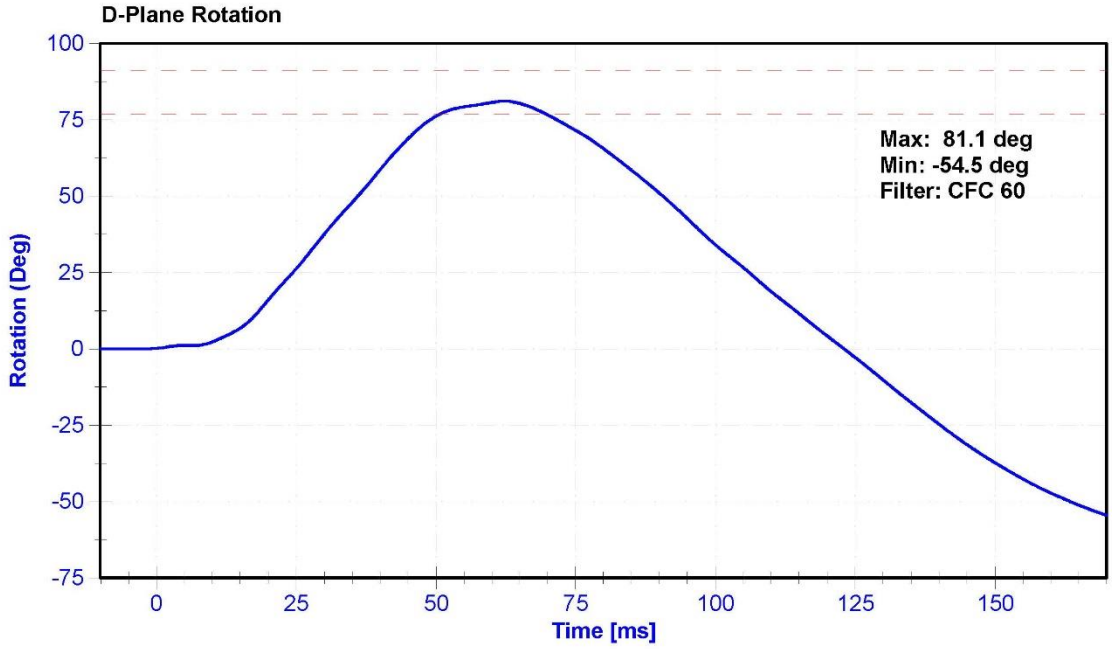
Results

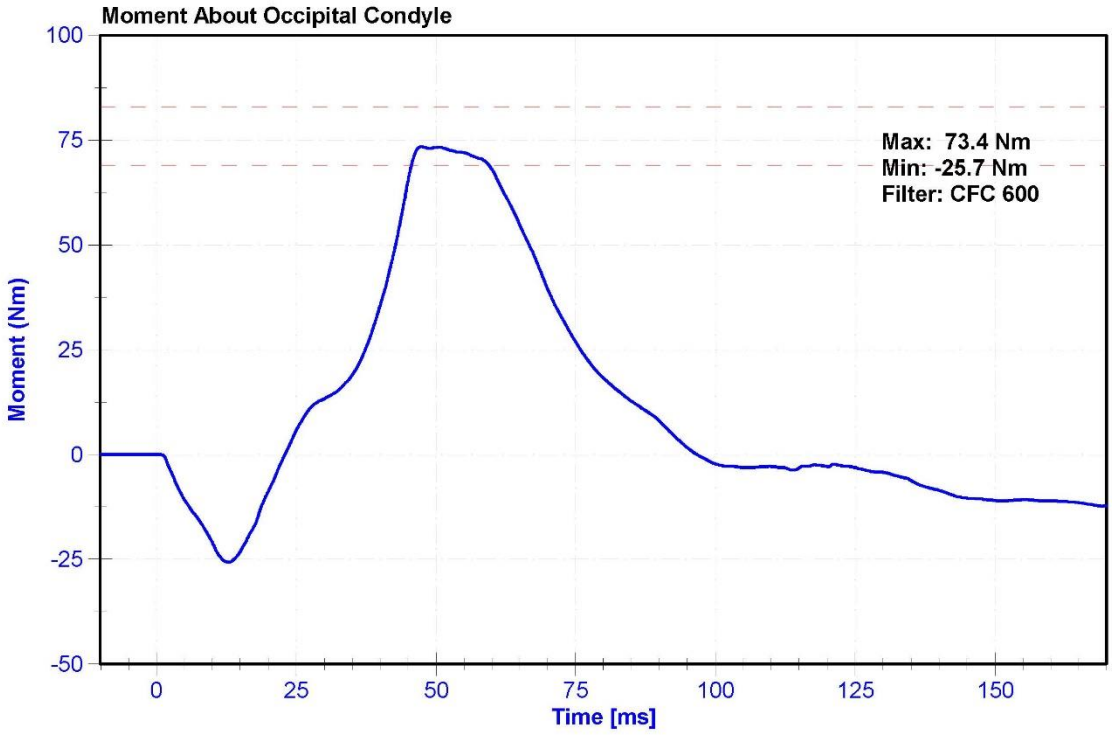
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	35.1	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.28	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.65	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.66	Pass
Max D Plane Rotation	77	91	deg	81.1	Pass
Max Moment During Rotation Interval	69	83	Nm	73.4	Pass
Moment Decay to 10.0 Nm	80	100	ms	88.0	Pass

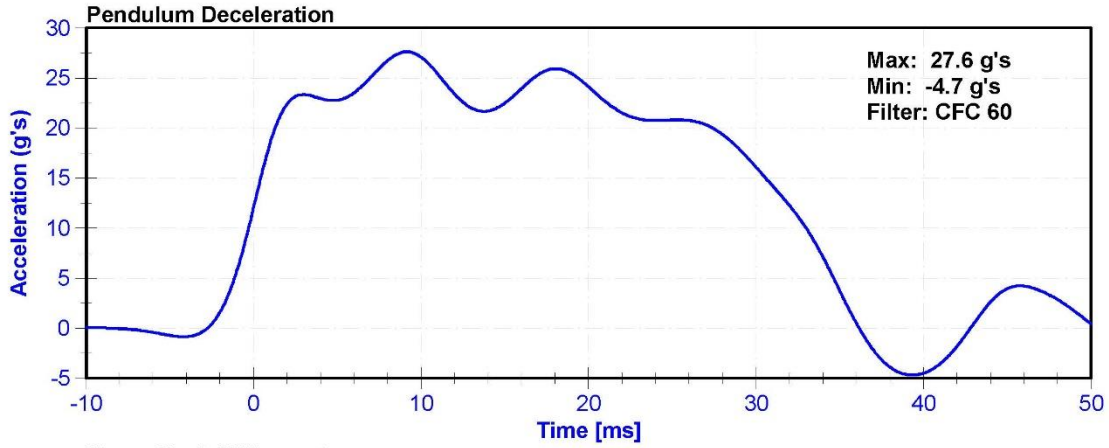
Transducer Calibrations

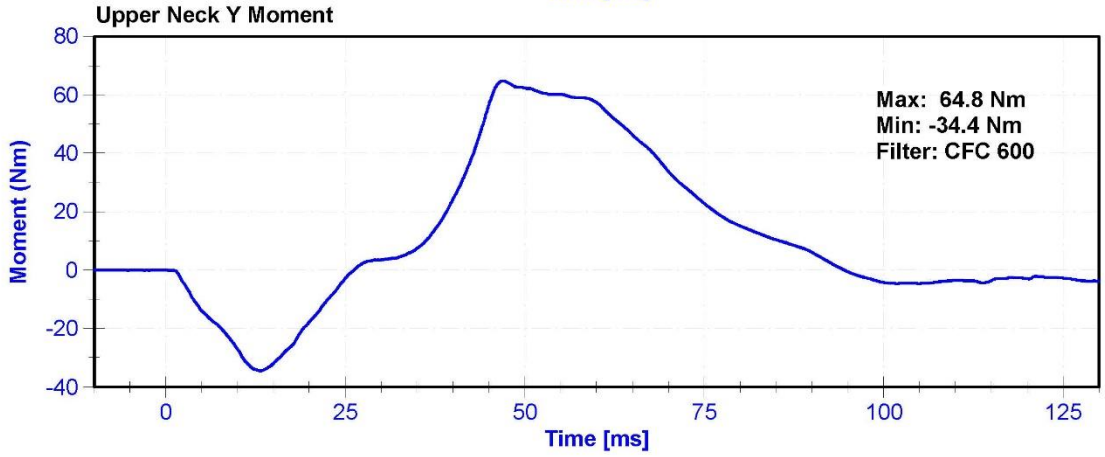
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	7/12/2017	7/12/2018

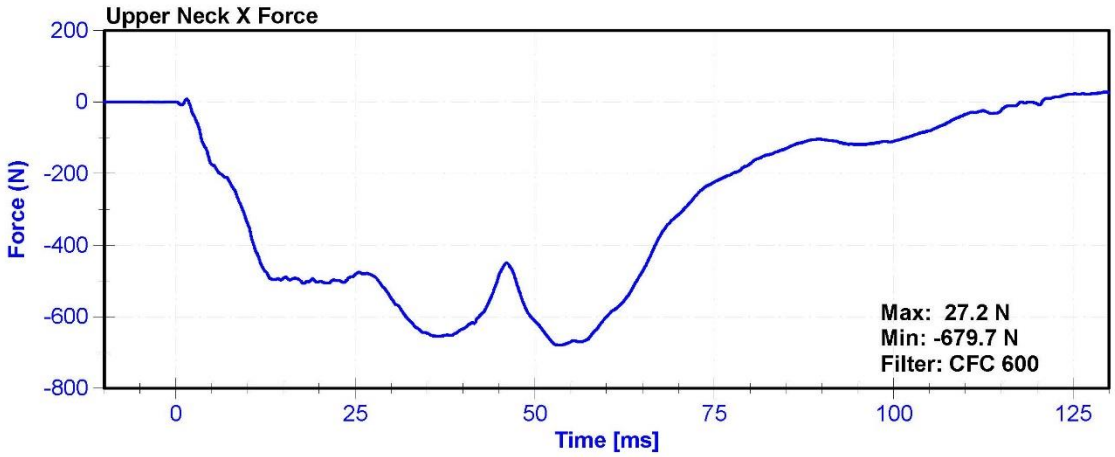



D-Plane Rotation
Max: 81.1 deg
Min: -54.5 deg
Filter: CFC 60
Rotation (Deg)
Time [ms]
100
75
50
25
0
-25
-50
-75
0
25
50
75
100
125
150


Moment About Occipital Condyle
Max: 73.4 Nm
Min: -25.7 Nm
Filter: CFC 600
Moment (Nm)
Time [ms]
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150


Pendulum Deceleration
Acceleration (g's)
Time [ms]
Max: 27.6 g's
Min: -4.7 g's
Filter: CFC 60


Upper Neck Y Moment
Moment (Nm)
Time [ms]
Max: 64.8 Nm
Min: -34.4 Nm
Filter: CFC 600


Upper Neck X Force
Force (N)
Time [ms]
Max: 27.2 N
Min: -679.7 N
Filter: CFC 600

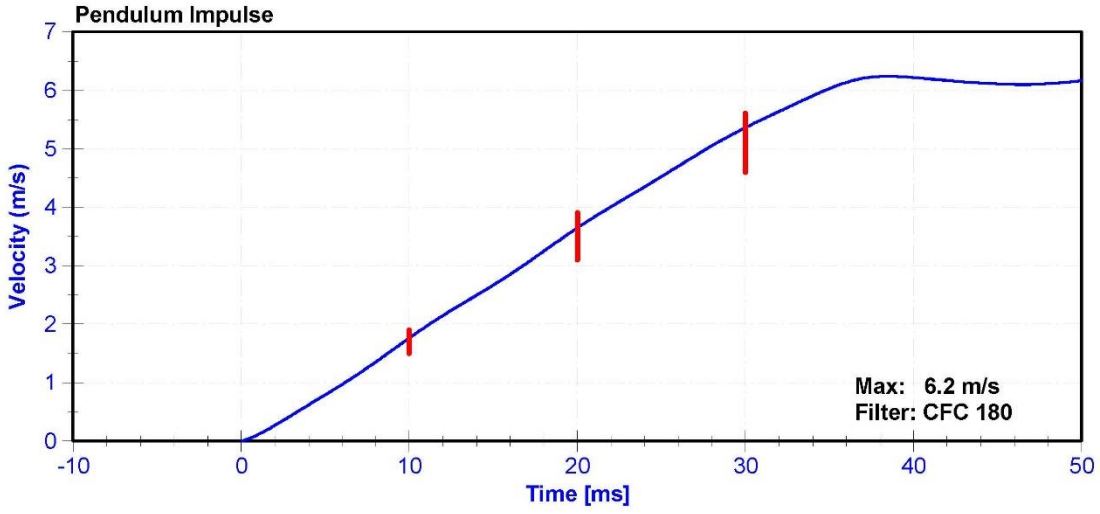
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

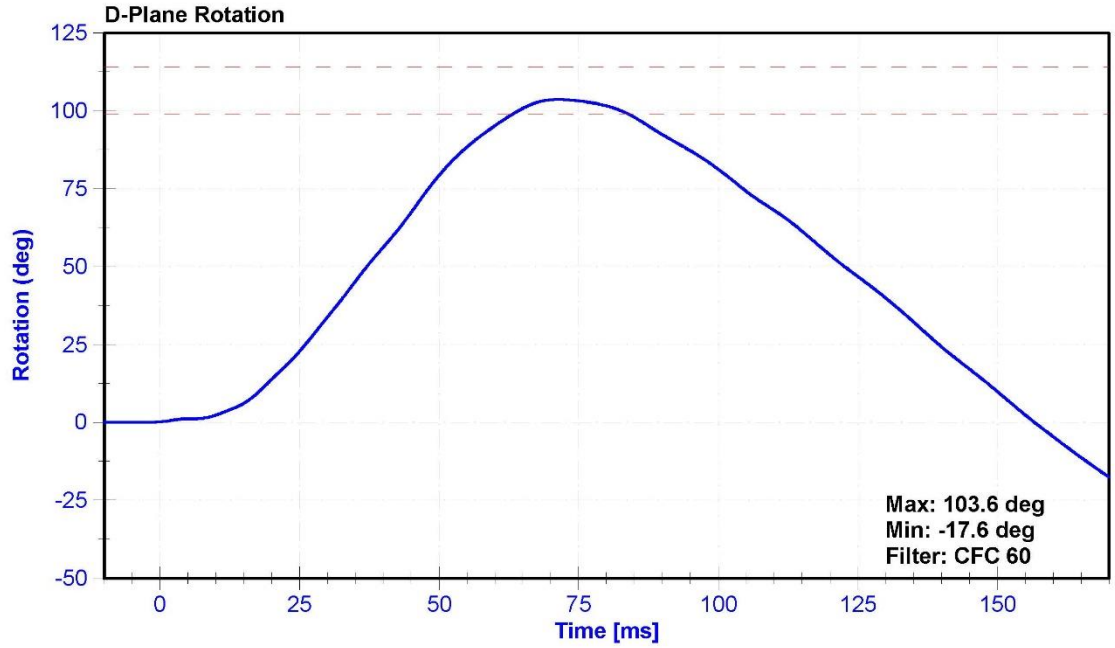
Results

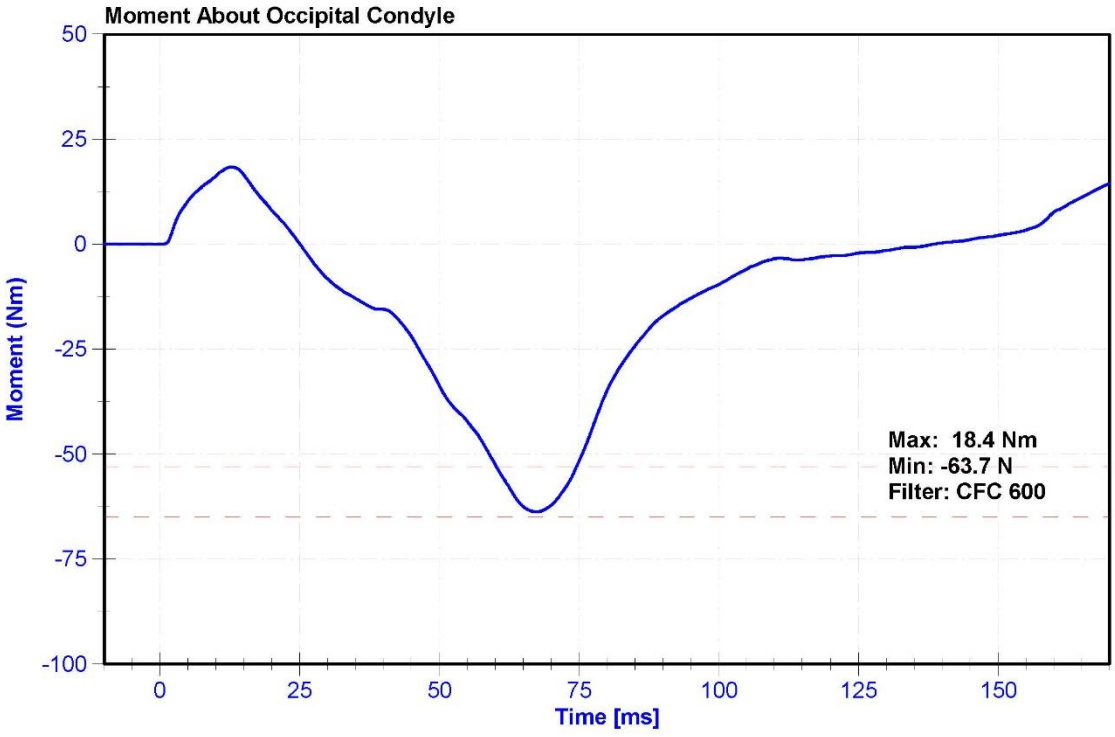
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	34.0	Pass
Velocity	5.95	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.76	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.65	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.36	Pass
D Plane Rotation	99	114	deg	103.6	Pass
Moment During Rotation Interval	-65	-53	Nm	-63.7	Pass
Moment Decay to -10Nm	94	114	ms	99.4	Pass

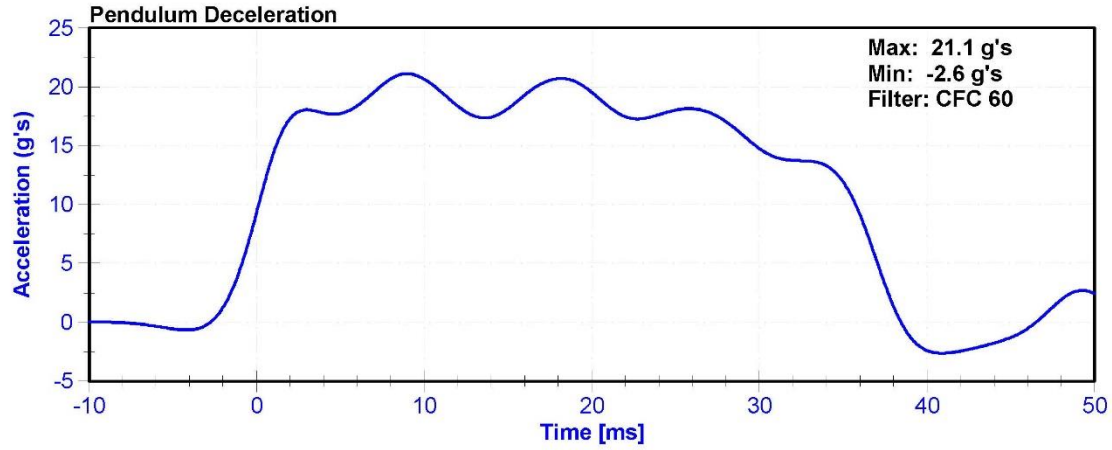
Transducer Calibrations

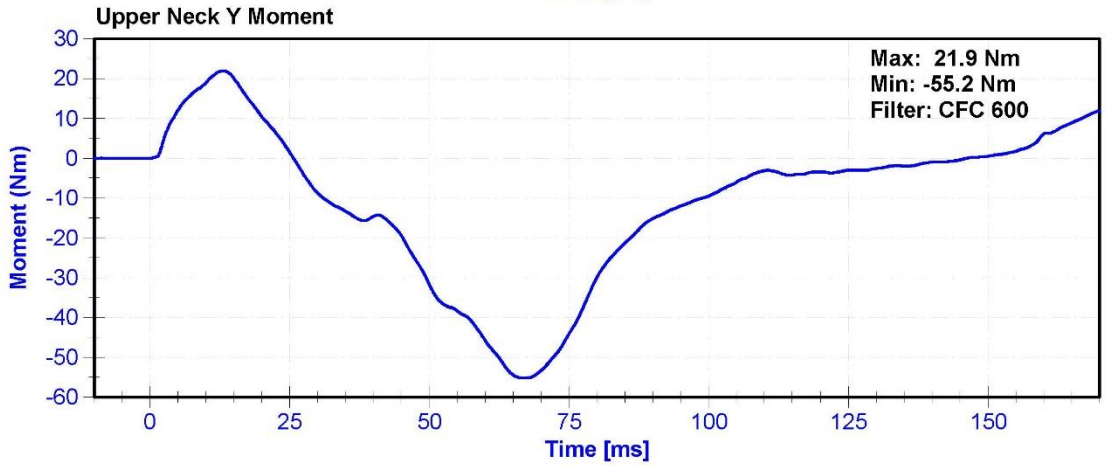
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2017	5/11/2018
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/10/2017	10/10/2018
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/10/2017	10/10/2018
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	7/12/2017	7/12/2018

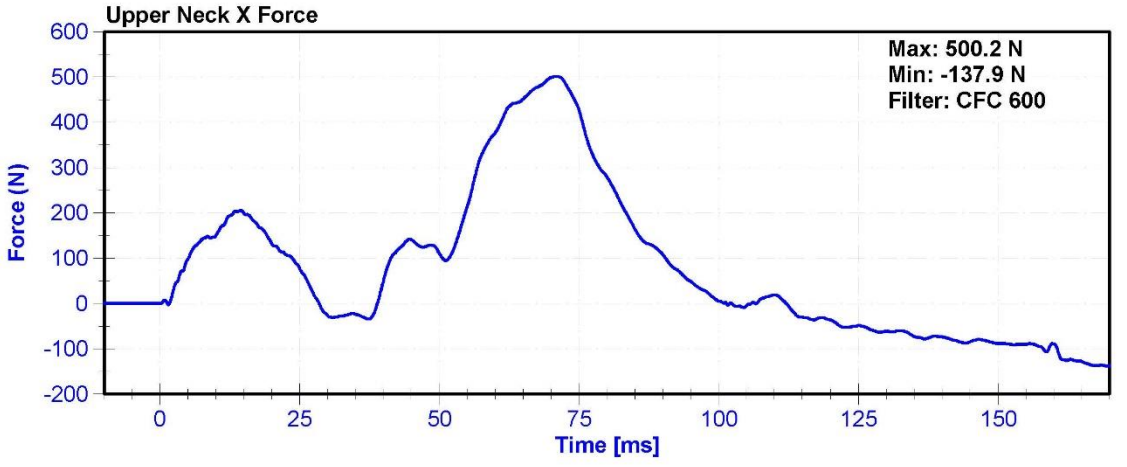



D-Plane Rotation
Rotation (deg)
125
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]
Max: 103.6 deg
Min: -17.6 deg
Filter: CFC 60


Moment About Occipital Condyle
Moment (Nm)
50
25
0
-25
-50
-75
-100
0
25
50
75
100
125
150
Time [ms]
Max: 18.4 Nm
Min: -63.7 N
Filter: CFC 600


Pendulum Deceleration
Max: 21.1 g's
Min: -2.6 g's
Filter: CFC 60
Acceleration (g's)
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]


Upper Neck Y Moment
Max: 21.9 Nm
Min: -55.2 Nm
Filter: CFC 600
Moment (Nm)
30
20
10
0
-10
-20
-30
-40
-50
-60
0
25
50
75
100
125
150
Time [ms]


Upper Neck X Force
Max: 500.2 N
Min: -137.9 N
Filter: CFC 600
Force (N)
600
500
400
300
200
100
0
-100
-200
0
25
50
75
100
125
150
Time [ms]

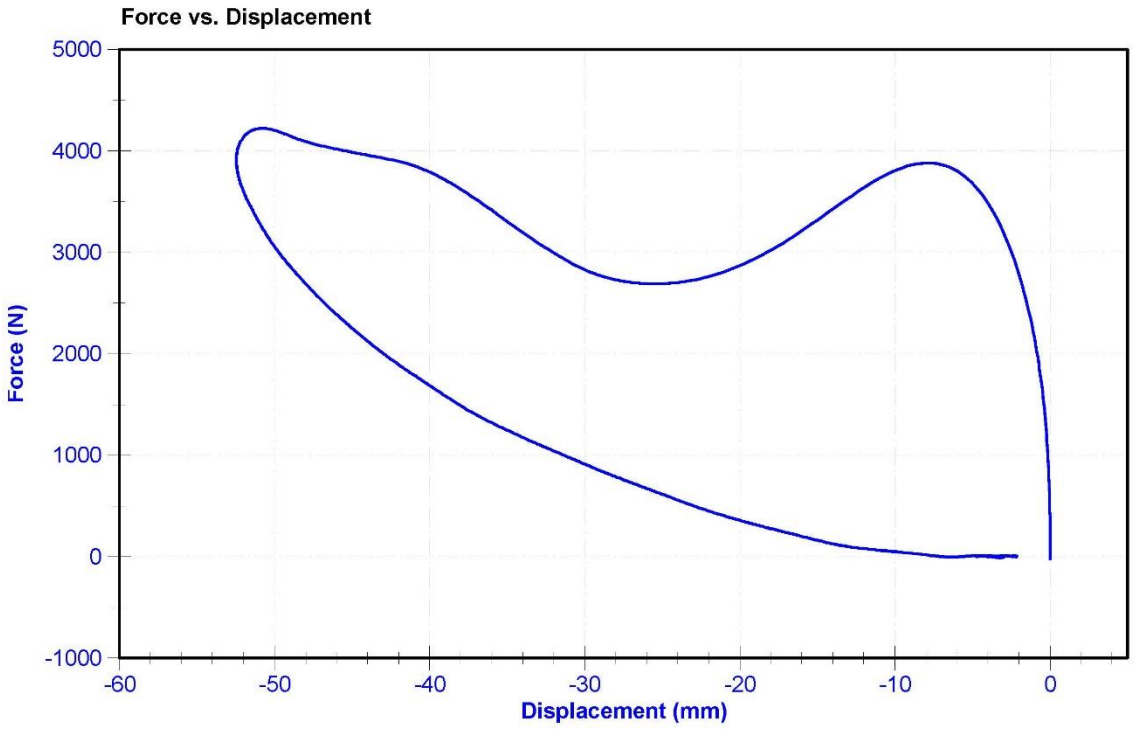
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

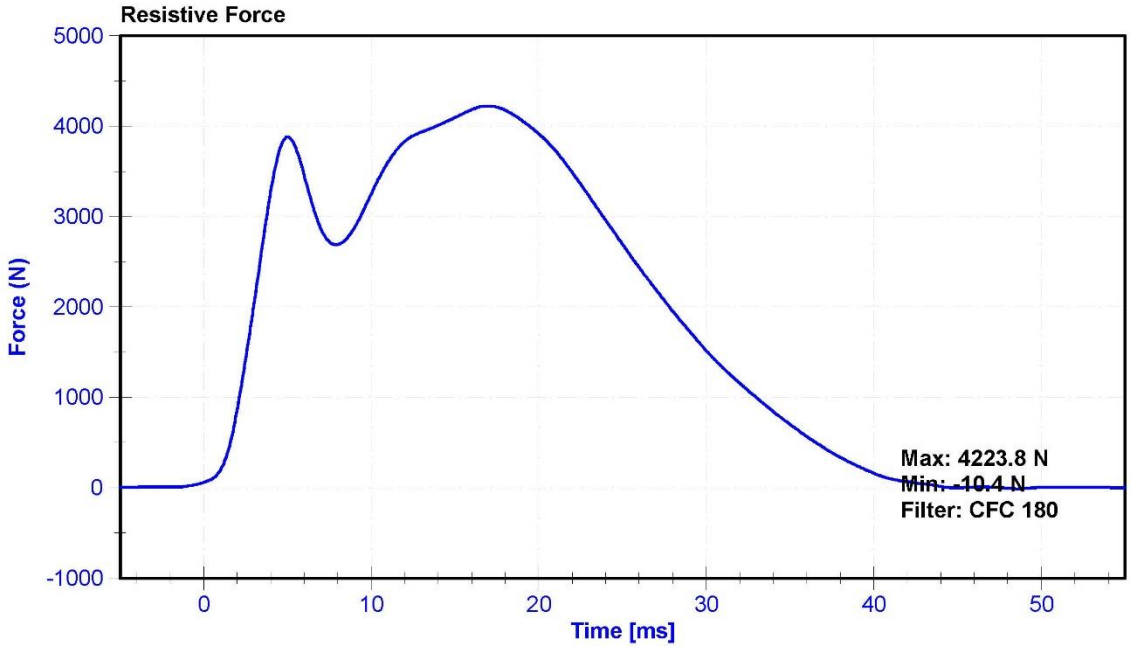
Results

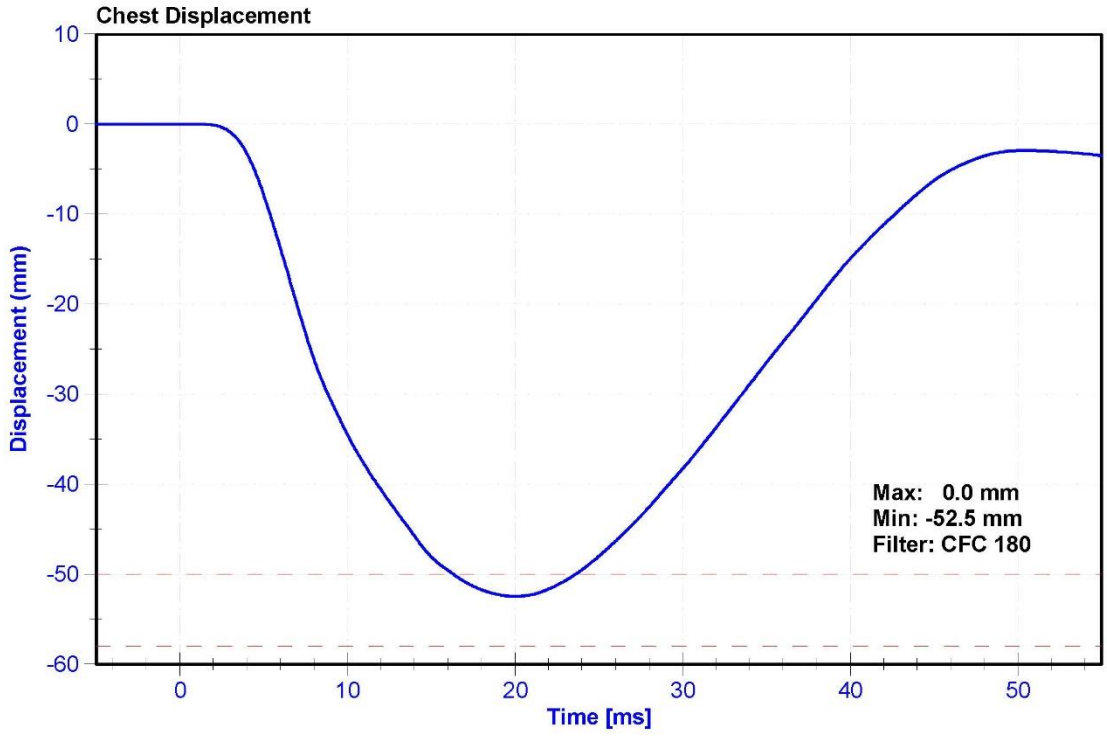
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	35.5	Pass
Velocity	6.59	6.83	m/s	6.684	Pass
Chest Deflection	-58	-50	mm	-52.5	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4223.8	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4204.1	Pass
Hysteresis	69	85	%	70.7	Pass

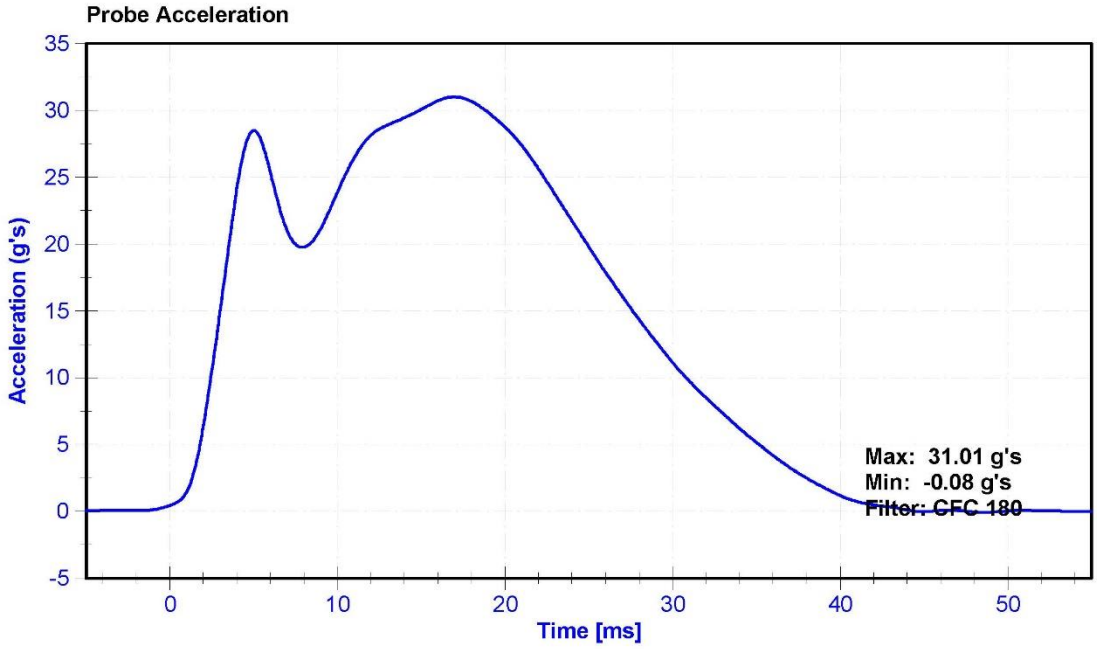
Transducer Calibrations

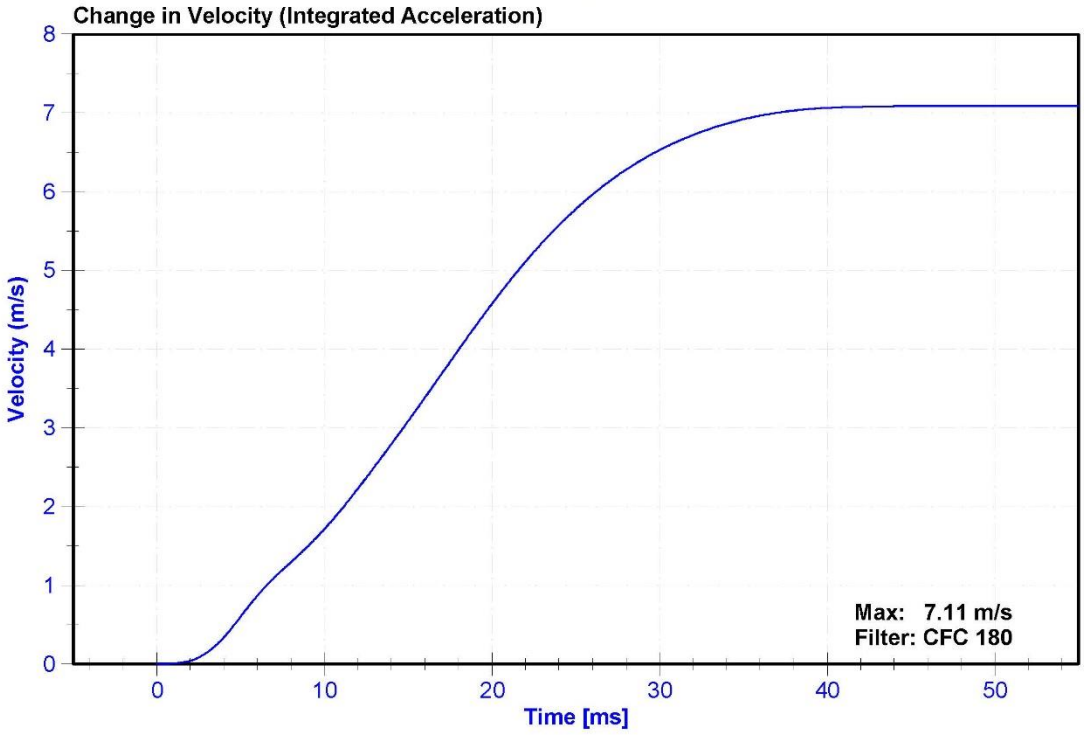
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018
Chest Potentiometer	SERVO 14CB1-2897	DS-288	10/25/2017	10/25/2018




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4223.8 N
Min: -10.4 N
Filter: CFC 180


Chest Displacement
Displacement (mm)
10
0
-10
-20
-30
-40
-50
-60
0
10
20
30
40
50
Time [ms]
Max: 0.0 mm
Min: -52.5 mm
Filter: CFC 180


Probe Acceleration
Acceleration (g's)
35
30
25
20
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 31.01 g's
Min: -0.08 g's
Filter: CFC 180


Change in Velocity (Integrated Acceleration)
Velocity (m/s)
8
7
6
5
4
3
2
1
0
0
10
20
30
40
50
Time [ms]
Max: 7.11 m/s
Filter: CFC 180

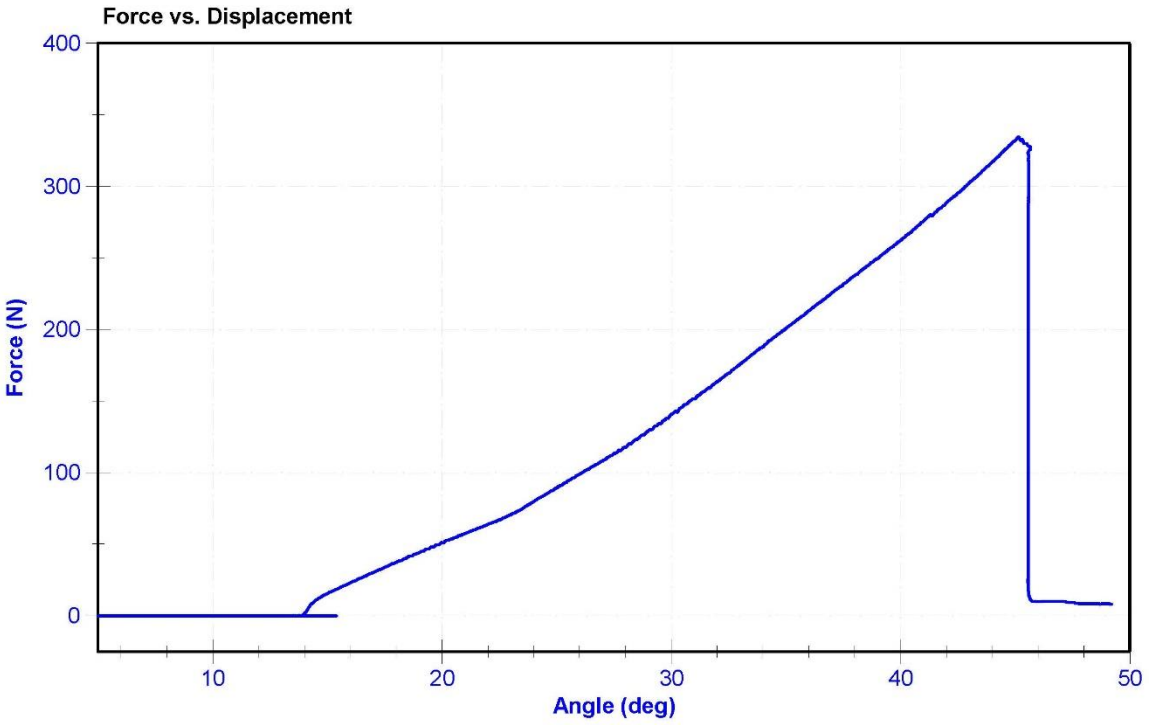
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.6	Pass
Humidity	10	70	%	30.4	Pass
Initial Angle	0	20	deg	13.9	Pass
Force at 45 Degrees	320	390	N	334.6	Pass
Return Angle Relative to Initial	0	8	deg	7.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	10/6/2017	10/6/2018
Load Cell	Interface SML-200	LC-493319	10/7/2017	10/7/2018



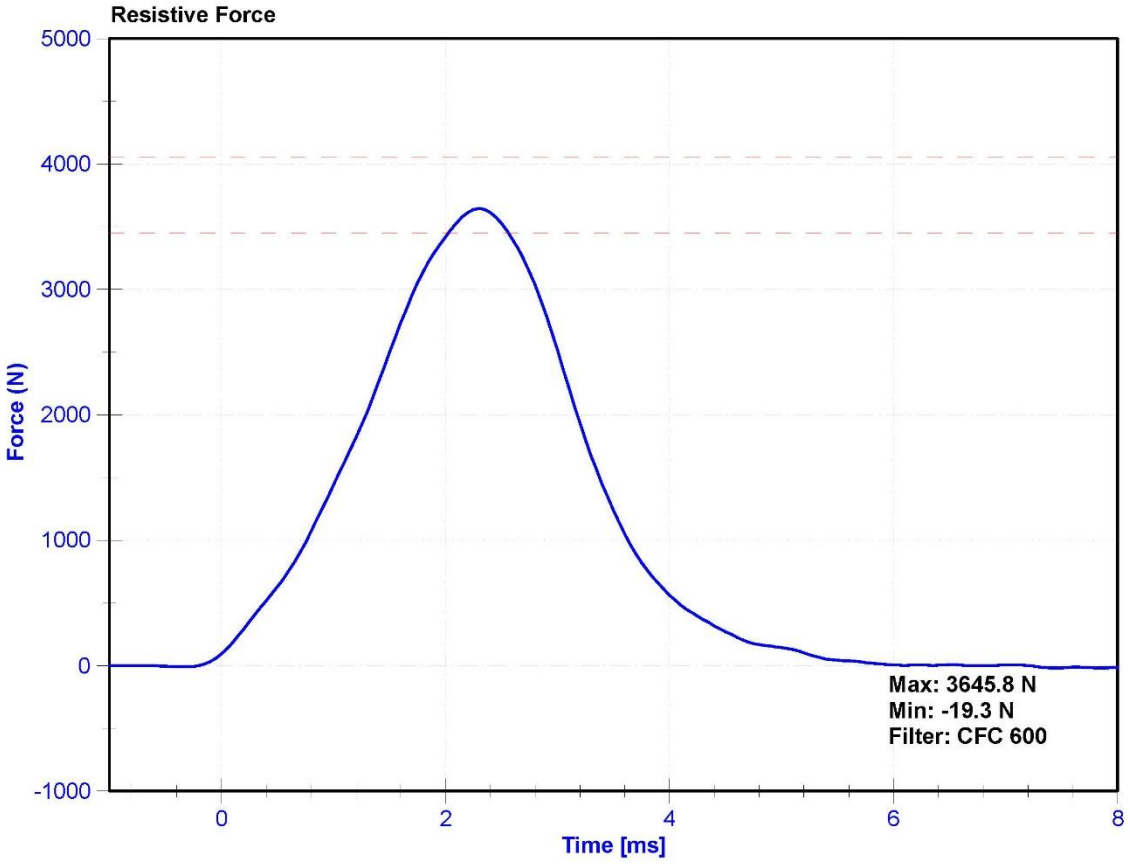
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

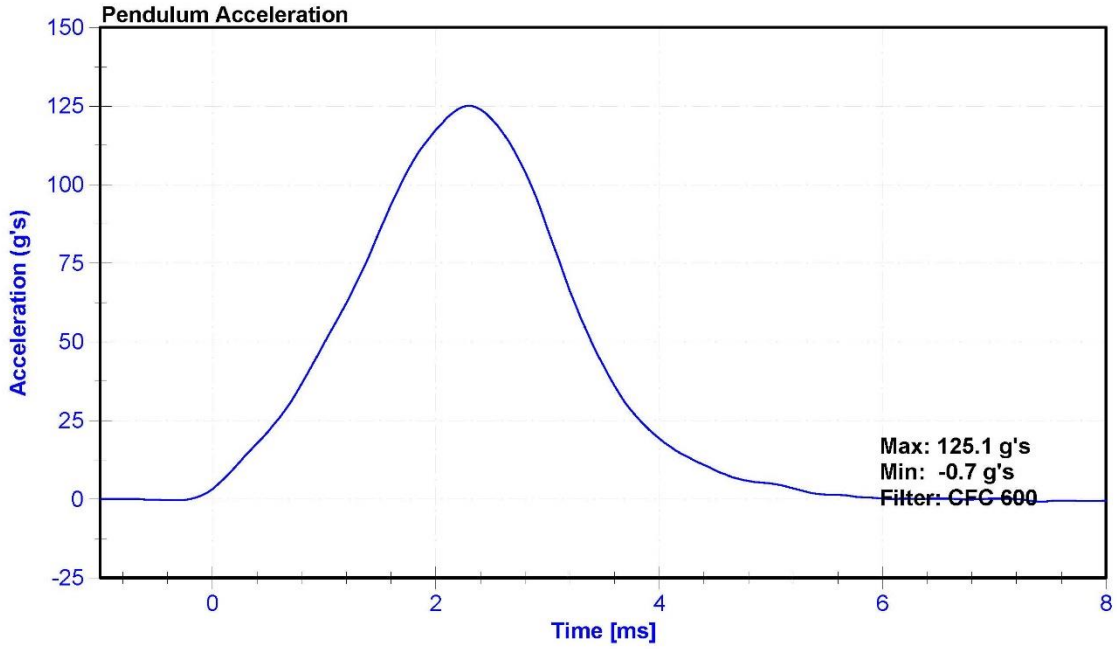
Results

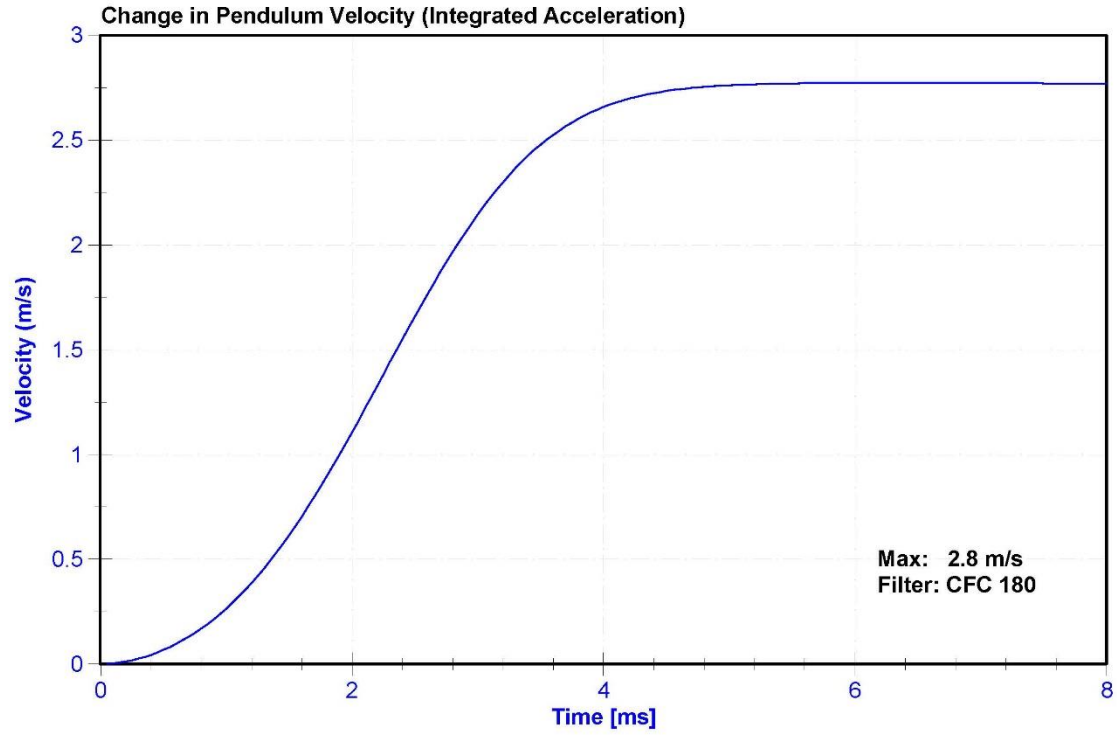
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.7	Pass
Humidity	10	70	%	34.2	Pass
Velocity	2.07	2.13	m/s	2.086	Pass
Resistive Force	3450	4060	N	3645.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 125.1 g's
Min: -0.7 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180

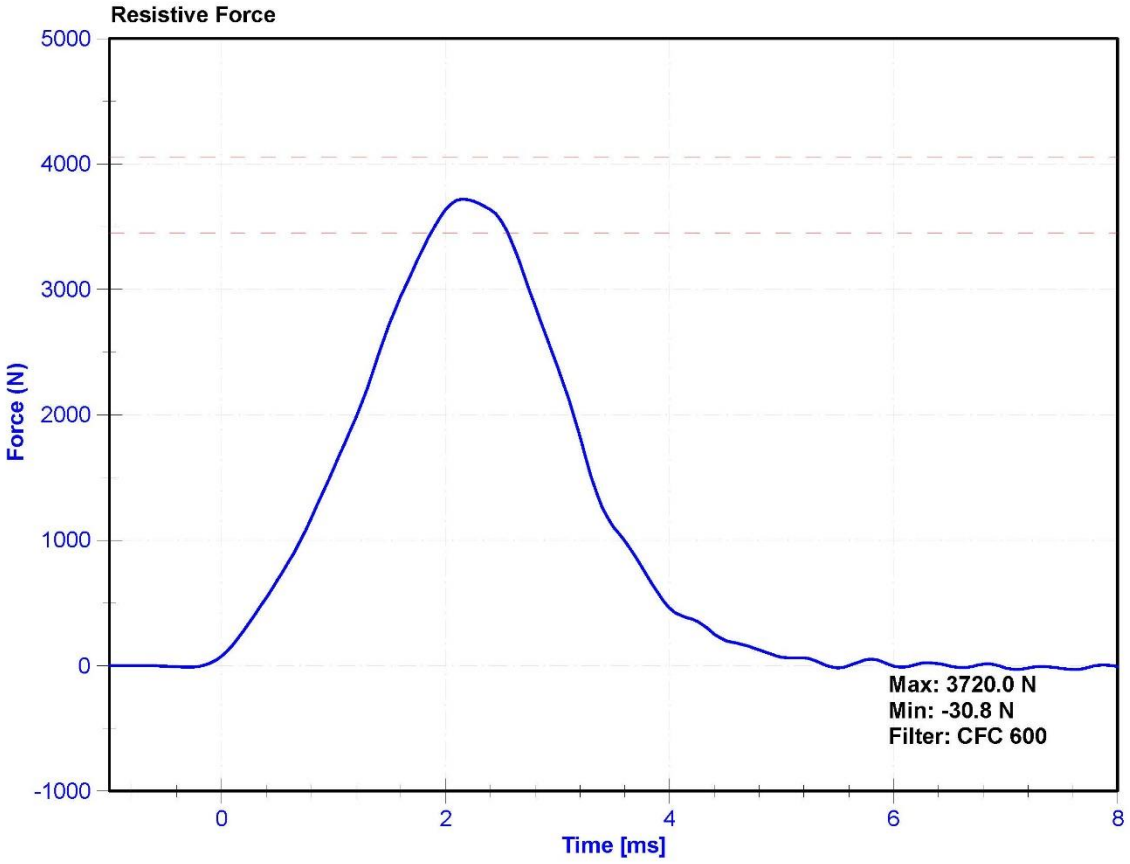
ATD Manufacturer	FTSS	Test Technician	K. Brogan
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

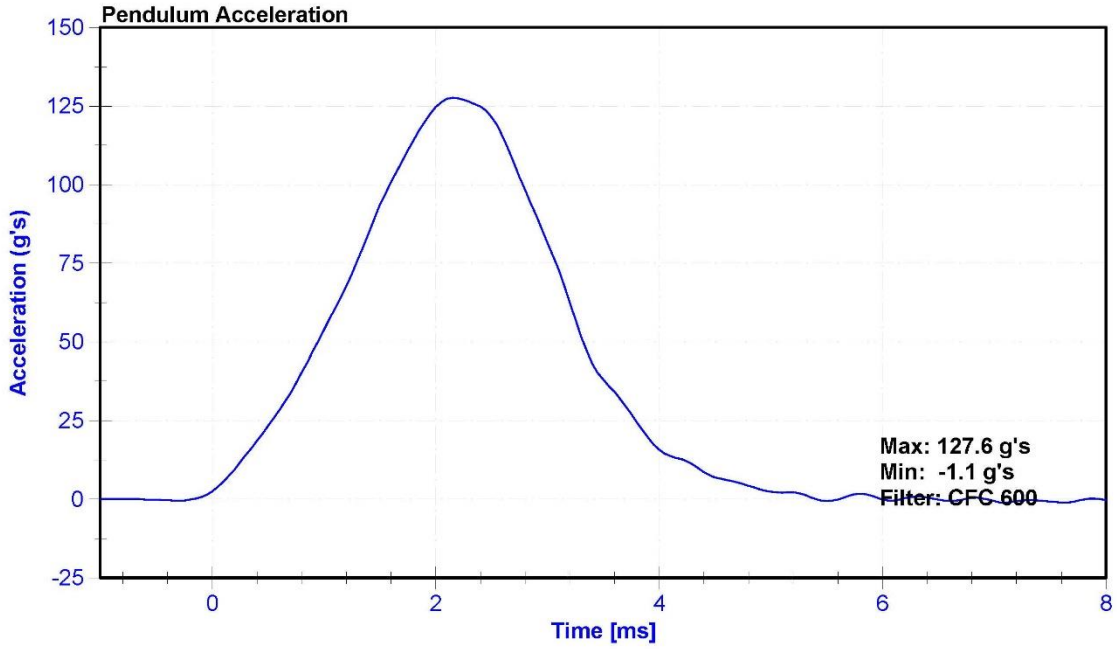
Results

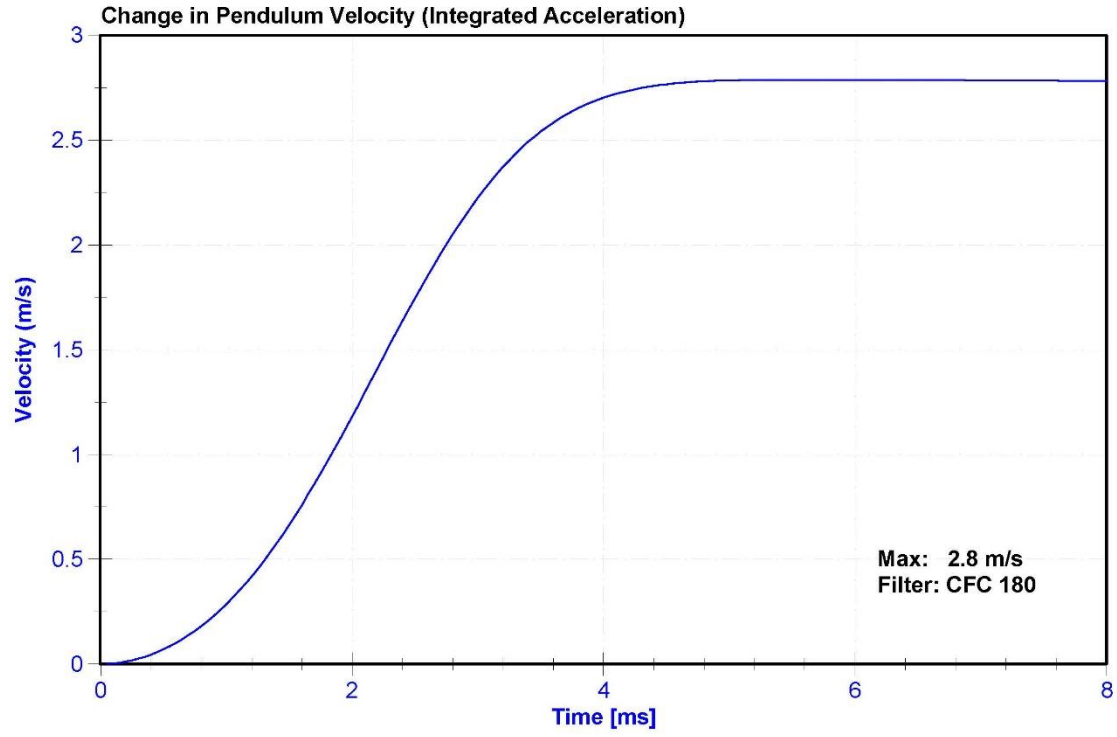
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.7	Pass
Humidity	10	70	%	34.2	Pass
Velocity	2.07	2.13	m/s	2.096	Pass
Resistive Force	3450	4060	N	3720.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	4/17/2018




Pendulum Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
-25
0
2
4
6
8
Time [ms]
Max: 127.6 g's
Min: -1.1 g's
Filter: CFC 600


Change in Pendulum Velocity (Integrated Acceleration)
Velocity (m/s)
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
Time [ms]
Max: 2.8 m/s
Filter: CFC 180