

REPORT NUMBER: NCAP-CAL-17-005

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

**General Motors LLC
2017 Chevrolet Volt
Five Door Hatchback**

NHTSA No: M20170116

**PREPARED BY:
CALSPAN CORPORATION
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February 10, 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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Date: February 10, 2017

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: _____

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15. Supplementary Notes																																																									
16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2017 Chevrolet Volt five door hatchback 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 December 16, 2016. The impact velocity of the vehicle was 56.82 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 471 mm at the vehicles centerline. The test vehicle's occupant performance data is as follows:																																																									
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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 2017 Chevrolet Volt five door hatchback at a velocity of 56.82 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on December 16, 2016. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 14 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Frontal NCAP Laboratory Test Procedure. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right / left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 1046) and the right-front passenger (position 2) ATD (Serial No. 288) were calibrated previous to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 100 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. The fuel system integrity could not be assessed due to the fuel tank

being damaged by the laboratory's tow system guide rail during post-test vehicle rebound. The maximum static crush of the test vehicle was 471 mm at the vehicles centerline. During and after the impact event, the driver's and passenger's side doors were closed and operational.

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

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

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)	320.429	0.172	682.315	-90.809	43.863	-22.039	-344.716	-809.411
Passenger (5 th)	382.529	0.274	1069.243	-123.986	41.796	-19.047	-1937.971	-1922.529

GENERAL COMMENTS:

1. P1 (Driver) serial number - 1046
2. P2 (Passenger) serial number - 288

Data Anomalies:

- Passenger Upper Neck X Force, Questionable spike 80.6ms, ***Nij Questionable***
- Passenger Upper Neck Y Force, Questionable spike 80.6ms
- Barrier Load Cell B7 Fx, Questionable data after 18.1ms

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: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20170116	Traction Control System (TCS)	Yes
Model Year	2017	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	No
Model	Volt	Driver Frontal Airbag	Yes
Body Style	Five Door Hatchback	Driver Curtain Airbag	Yes
VIN	1G1RC6S51HU149332	Driver Head/Torso Airbag	No
Body Color	Gray	Driver Torso Airbag	No
Odometer Reading (km /mi)	16 km / 10 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	1.5	Driver Pelvis Airbag	No
Type / No. Cylinders	I4	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	Direct Drive	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	Front Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other	-

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	2013
Date of Manufacture	10/16	GAWR Front (kg)	1080
		GAWR Rear (kg)	933

VEHICLE SEATING AND WEIGHT CAPACITY DATA

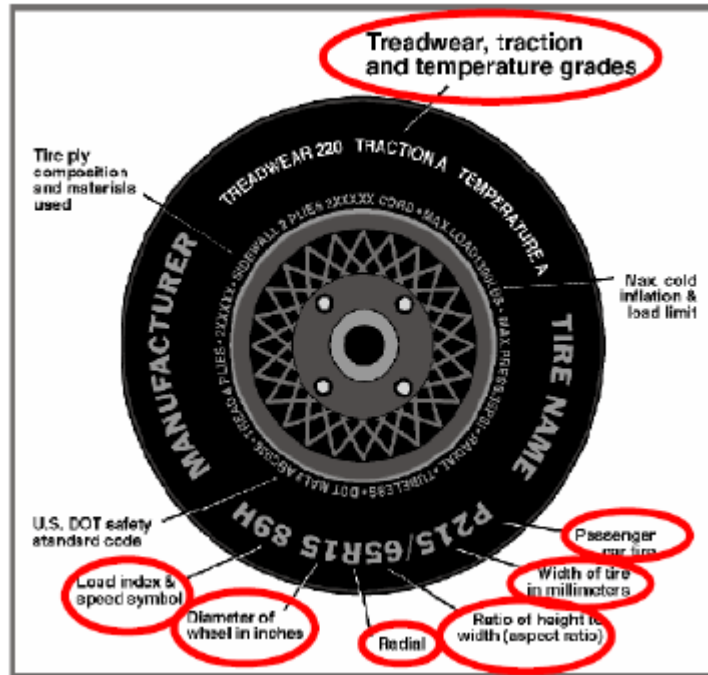
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	-	
Number of Occupants	2	3	-	5
Capacity Wt. (VCW) (kg)				388
Cargo Wt. (RCLW) (kg)				47.8

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

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)	250	250
Recommended Tire Size	P215/50R17	P215/50R17
Tire Size on Vehicle	P215/50R17	P215/50R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Energy Saver	Energy Saver
Treadwear	480	480
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 1 Polyamide, 2 Steel	1 Polyester, 1 Polyamide, 2 Steel
Load Index / Speed Symbol	91H	91H
Tire Material	Rubber	Rubber
DOT Safety Code Left	M338001X3216	M338001X3216
DOT Safety Code Right	M338001X3216	M338001X3216

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	500	311		523	392	
Right	kg	470	331		521	365	
Ratio	%	60	40		58	42	
Totals	kg	970	642	1612	1044	757	1801

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1612	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	147	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	47.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1806.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	697	702	710	709	1073
As Tested	mm	693	695	684	683	1132
Post-Test	mm	747	726	702	679	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2694
Total Vehicle Length at Left Side	mm	4399
Total Vehicle Length at Centerline	mm	4587
Total Vehicle Length at Right Side	mm	4399
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	22
Amount of Stoddard Solvent in Fuel Tank	L	31.3

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk carpeting, pump kit, tow hook, rear speaker, tail light

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	4587
2	Total Width	1788
3*	Bumper Top Height	521
4*	Bumper Bottom Height	399
5*	Longitudinal Member Top Height	518
6	Distance Between Longitudinal Members	1086
7	Longitudinal Member Width	80
8*	Engine Top Height	783
9*	Engine Bottom Height	199
10	Engine and Gearbox Width	450
11	Front Bumper-Engine Distance	657
12*	Front Shock Absorber Fixing Height	865
13*	Bonnet Leading Edge Height	654
14	Front Shock Absorber Fixing Width	1159
15	Front Bumper – Front Axle Distance	1016
16	Front Axle – A Pillar Distance	449
17	A-Pillar – B-Pillar Distance	1094
18	B-Pillar – Rear Axle Distance	1149
19	B-Pillar – C-Pillar Distance	952
20*	Roof Sill Bottom Height	1330
21*	Roof Sill Top Height	1375
22*	Floor Sill Bottom Height	259
23*	Floor Sill Top Height	369

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

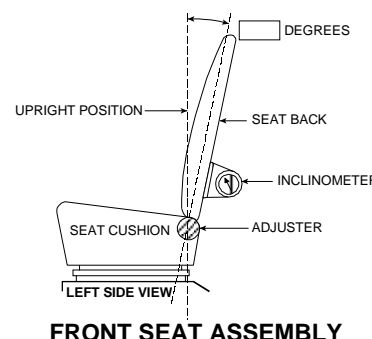
**DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

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	14.5
Passenger Seat Back Angle	18

SEAT FORE / AFT POSITIONS

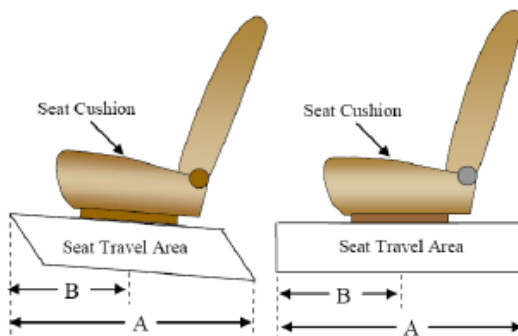
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	25 (0-24)	10
Passenger Seat	25 (0-24)	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: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

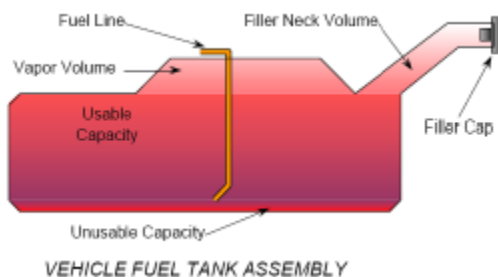
NHTSA No.: M20170116
 Test Date: 12/16/2016

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	33.7
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	31 – 31.7
Actual Amount of Solvent Used	31.3
1/3 of Usable Capacity	11.2

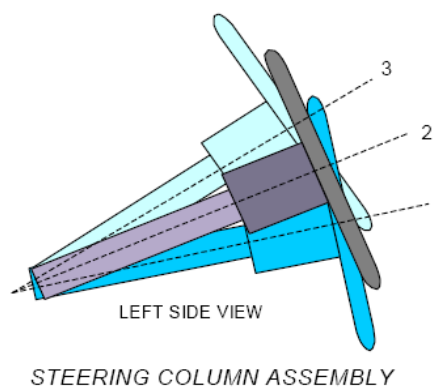
FUEL PUMP

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



STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



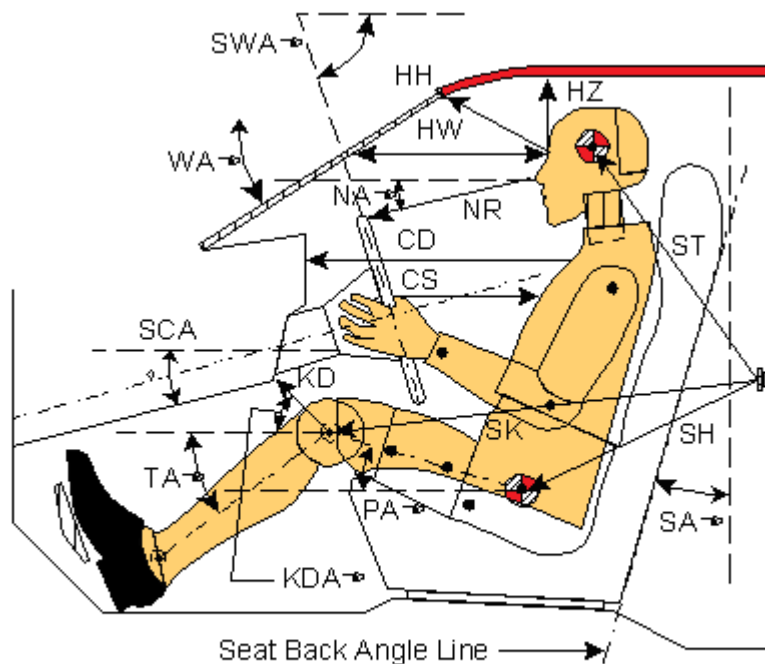
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	19.4	
Geometric center position No. 2	21.4	
Uppermost position No. 3	23.4	
Telescoping Steering Wheel Travel		60
Test Position	21.4	30

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
Test Date: 12/16/2016



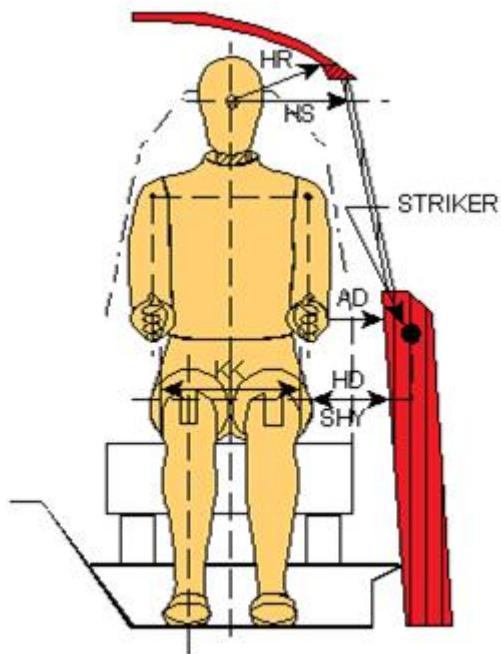
Left Side View

Code	Measurement Description	Driver (SN: 1046)		Passenger (SN: 288)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		24		
SWA°	Steering Wheel Angle		21.7		
SCA°	Steering Column Angle		68.3		
SA°	Seat Back Angle (on headrest post)		14.8		18
HZ	Head to Roof (Z)	215	90	240	90
HH	Head to Header	440	21.1	363	33.9
HW	Head to Windshield	835	0	772	0
NR	Nose to Rim	442	5.6	526	22.6
CD	Chest to Dash	595		484	
CS	Chest to Steering Hub	355	1.7		
RA	Rim to Abdomen	246	0		
KDL	Left Knee to Dash	237	25.9	175	30.3
KDR	Right Knee to Dash	268	2.4	177	28.5
PA°	Pelvic Angle		24.3		21.5
TA°	Tibia Angle		28.4		36.6
SK	Striker to Knee	493	6.5	592	8.5
ST	Striker to Head	469	96.2	450	76.1
SH	Striker to H-Point	212	50.5	287	28.7

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



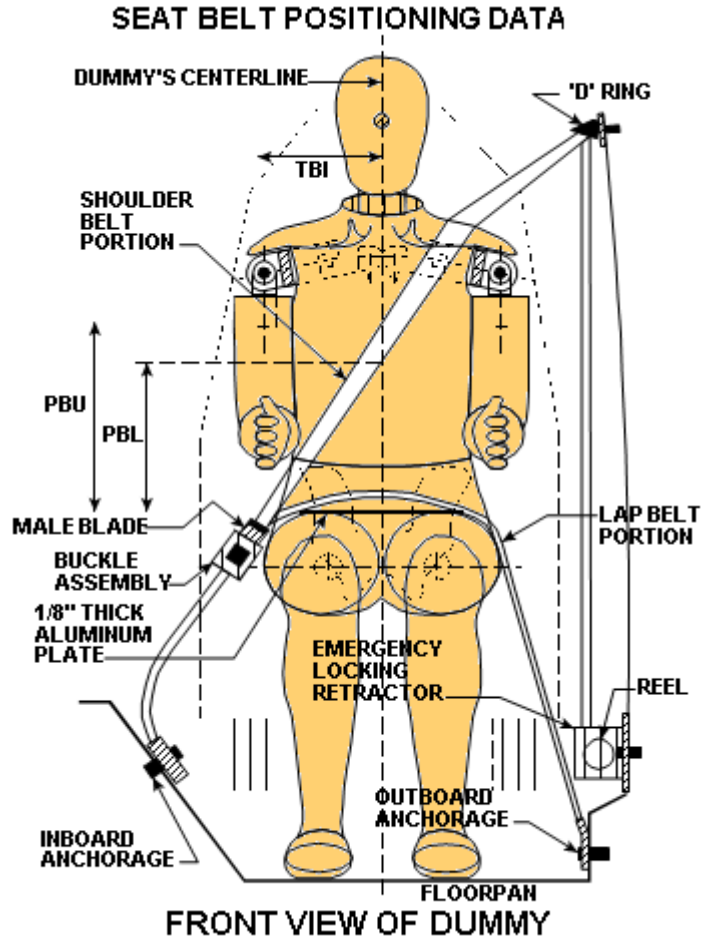
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	128	66
HD	H-Point to Door	146	166
HR	Head to Side Header	214	236
HS	Head to Side Window	342	365
KK	Knee to Knee	335	166
SHY	Striker to H-Point (Y Direction)	230	250
AA	Ankle to Ankle	360	163

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	335	285
PBL — Top surface of reference to belt lower edge	mm	260	210

BELT LENGTH DATA

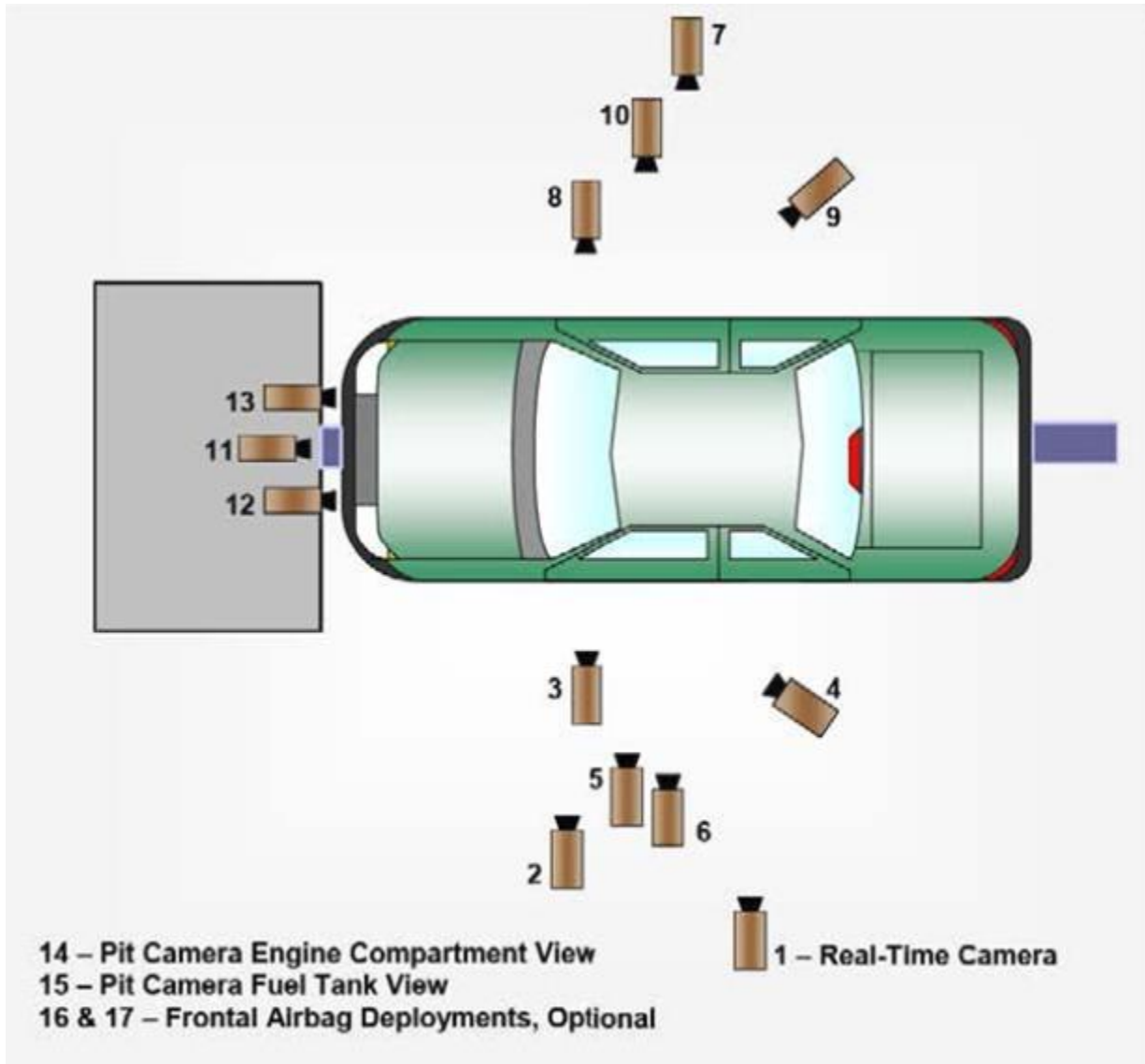
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	760	820
Lap Belt Length as measured on ATD	mm	480	480
Remainder of belt on reel	mm	1060	1000
Total belt length for continuous webbing systems	mm	2300	2300

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
Test Date: 12/16/2016

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

CAMERA LOCATIONS

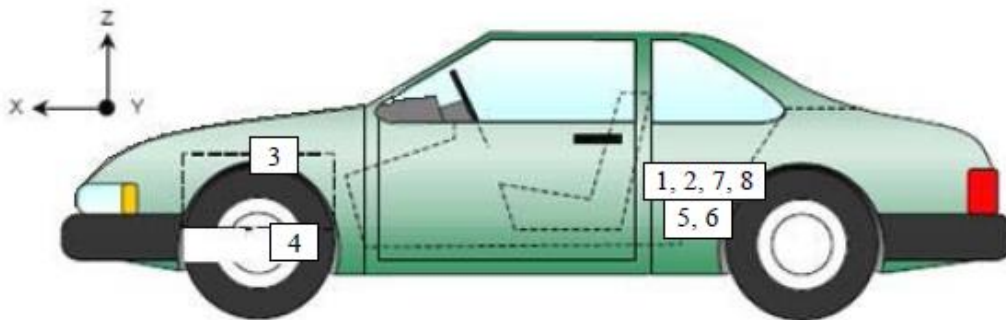
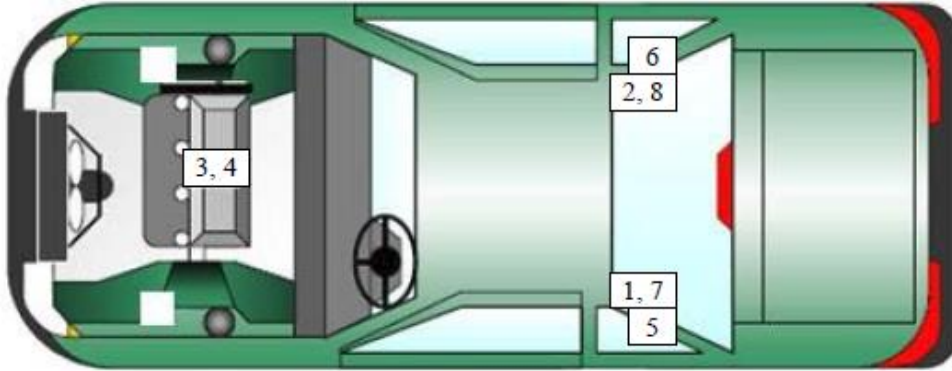
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	-1864	-8772	-1607	50	1000
3	Left Front Half	-1096	-9150	-1624	28	1000
4	Left Angle	-2856	-2900	-2114	24	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2008	7724	-900	24	1000
8	Passenger Close-Up	-1538	7018	-1197	50	1000
9	Right Front Half	-950	6351	-1151	28	1000
10	Right Angle	-2859	3010	-2141	24	1000
11	Windshield	940	0	-3505	20	1000
12	Driver Windshield	275	-600	-2051	25	1000
13	Passenger Windshield	275	600	-2051	25	1000
14	Pit Front	-900	0	1830	12.5	1000
15	Pit Rear	-2338	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: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1794	-391	130
2	Right Rear Accelerometer – X Direction	1794	463	141
3	Engine Top X	3907	-91	-223
4	Engine Bottom X	4186	66	291
5	Left Rear Accelerometer – Z Direction	1794	-391	130
6	Right Rear Accelerometer – Z Direction	1794	463	141
7	Left Rear Accelerometer – X Direction Redundant	1797	-403	139
8	Right Rear Accelerometer – X Direction Redundant	1790	465	129

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

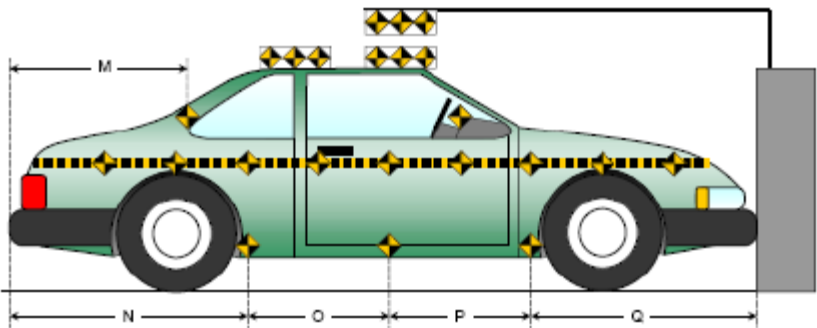
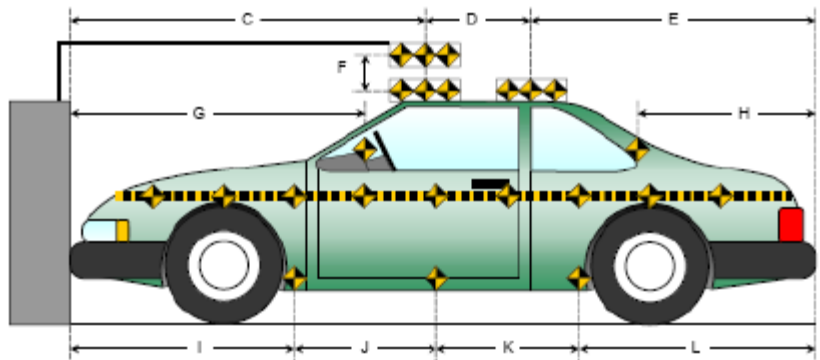
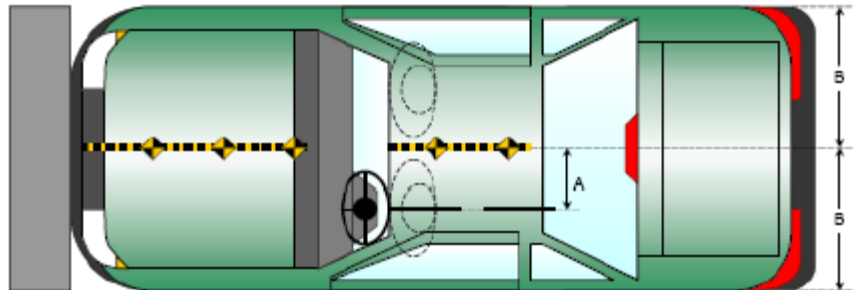
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

Item	Value
A	307
B	894
C	2367
D	611
E	1608
F	203
G	1810
H	881
I	1455
J	908
K	906
L	1317
M	878
N	1319
O	905
P	910
Q	1452

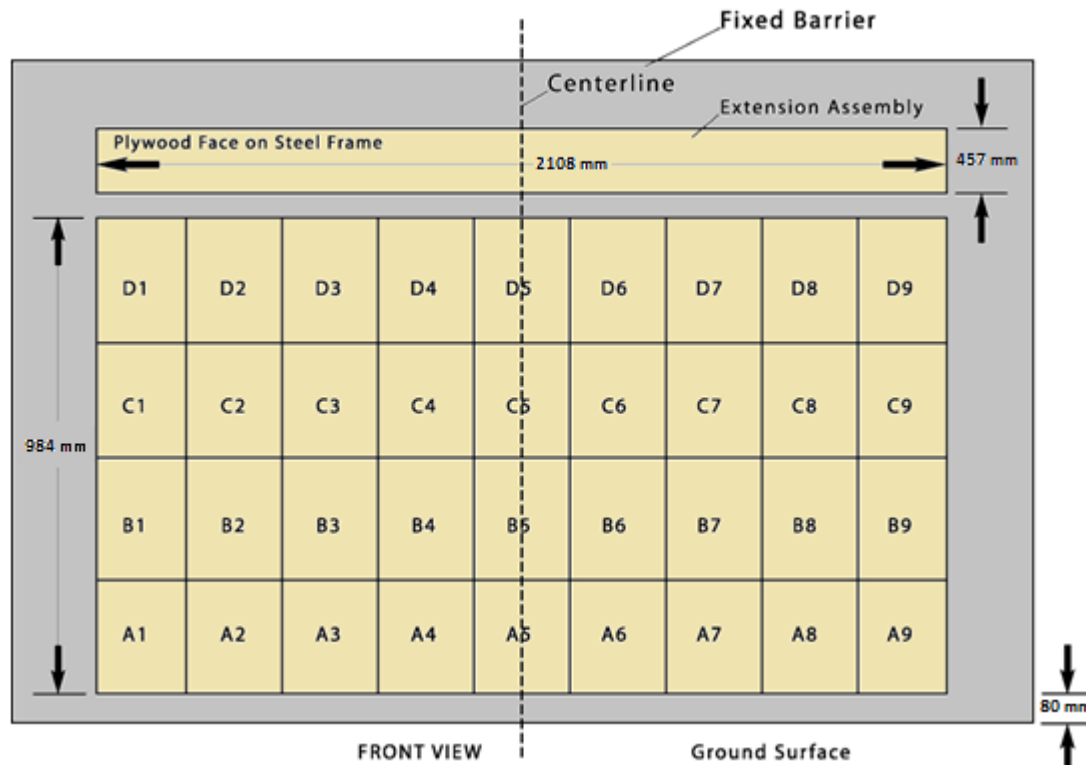
All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



*** Load cell Barrier was not used**

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: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	46
Passenger Dummy Accelerometers	46
Vehicle Structure Accelerometers	8
Load Cell Barrier	0
Total	100

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: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 th Male / 1046	P5720 5 th Female / 288
Head Contact	Front Airbag & Headrest	Front & Curtain Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Minor Cracks
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1153
Center	mm	1088
Right Side	mm	1005
Average	mm	1082

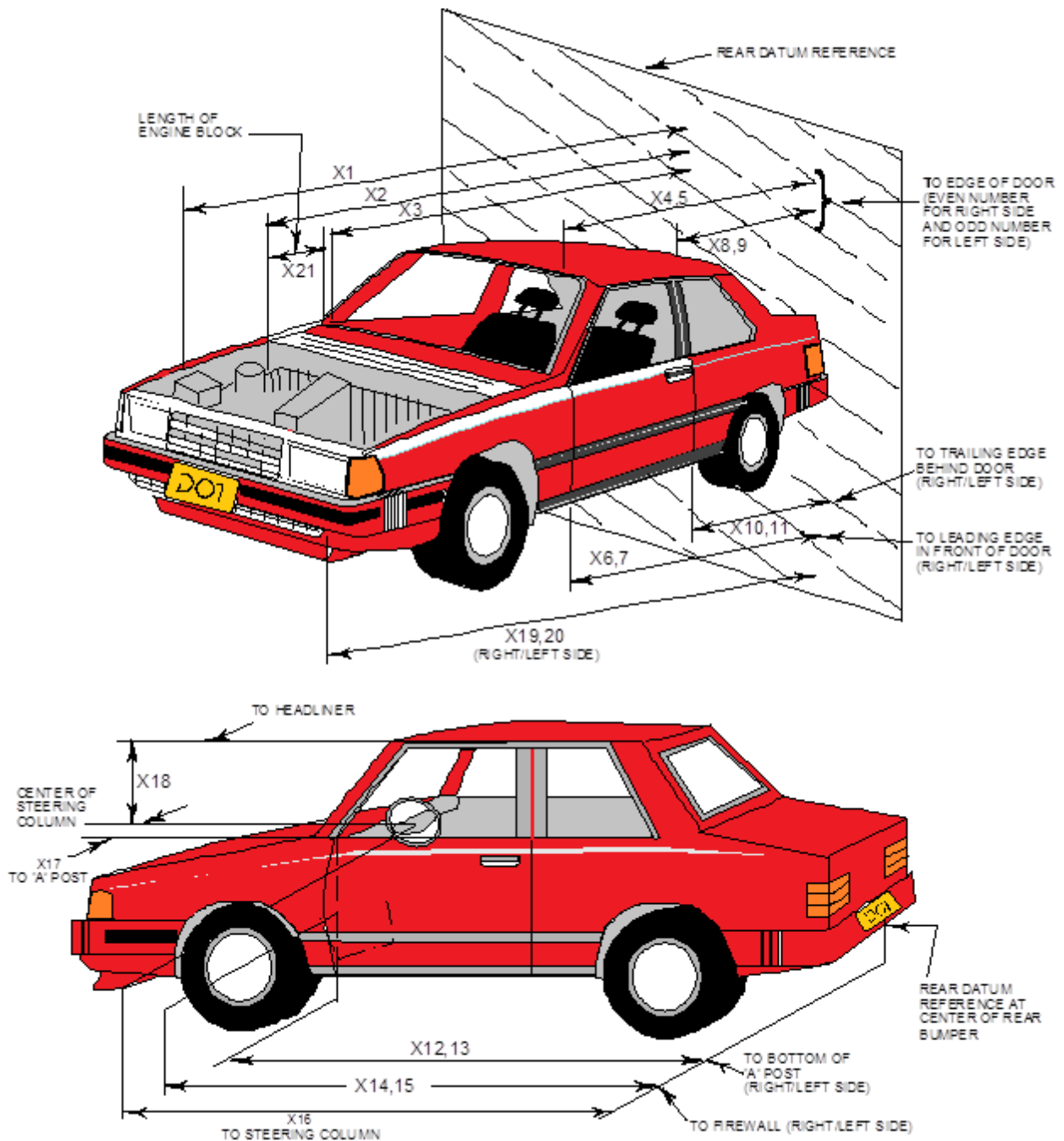
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4587	4116	-471
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3929	3734	-196
3	RSOV to Firewall	3551	3515	-36
4	RSOV to Upper Leading Edge of Right Door	3118	3116	-2
5	RSOV to Upper Leading Edge of Left Door	3118	3118	0
6	RSOV to Lower Leading Edge of Right Door	3074	3070	-5
7	RSOV to Lower Leading Edge of Left Door	3074	3073	-1
8	RSOV to Upper Trailing Edge of Right Door	2032	2031	-1
9	RSOV to Upper Trailing Edge of Left Door	2032	2031	-1
10	RSOV to Lower Trailing Edge of Right Door	2058	2055	-4
11	RSOV to Lower Trailing Edge of Left Door	2056	2057	1
12	RSOV to Bottom of "A" Post of Right Side	3299	3297	-2
13	RSOV to Bottom of "A" Post of Left Side	3299	3299	0
14	RSOV to Firewall, Right Side	3626	3605	-21
15	RSOV to Firewall, Left Side	3625	3603	-22
16	RSOV to Steering Column	2618	2678	60
17	Center of Steering Column to "A" Post	291	264	-27
18	Center of Steering Column to Headliner	391	385	-6
19	RSOV to Right Side of Front Bumper	4465	4124	-341
20	RSOV to Left Side of Front Bumper	4464	4059	-405
21	Length of Engine Block	219	219	0
RD	RSOV to Right Side of Dash Panel	2846	2844	-2
CD	RSOV to Center of Dash Panel	2761	2754	-7
LD	RSOV to Left Side of Dash Panel	2842	2841	-1

*UR= Unrecoverable data point
 All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2017 Chevrolet Volt five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
Test Date: 12/16/2016

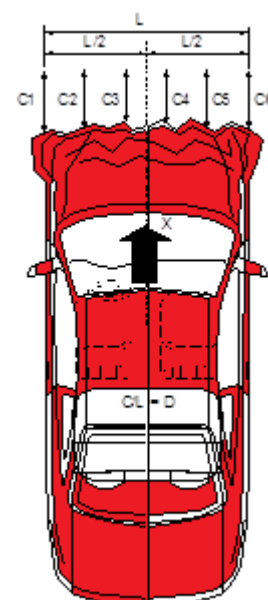
VEHICLE INFORMATION

VIN: 1G1RC6S51HU149332
Vehicle Size Category: Passenger

Wheelbase (mm): 2694
Test Weight (kg): 1801

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): 56.82
Velocity Change (km/h): 56.82
Time of Separation (ms): 100



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1284
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4344	4042	302
C2	Crush Zone 2 at Left Side	mm	4477	4055	422
C3	Crush Zone 3 at Left Side	mm	4563	4104	459
C4	Crush Zone 4 at Right Side	mm	4561	4120	441
C5	Crush Zone 5 at Right Side	mm	4476	4127	349
C6	Crush Zone 6 at Right Side	mm	4343	4139	204
L	C1 to C6	mm	1284	1419	-135

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

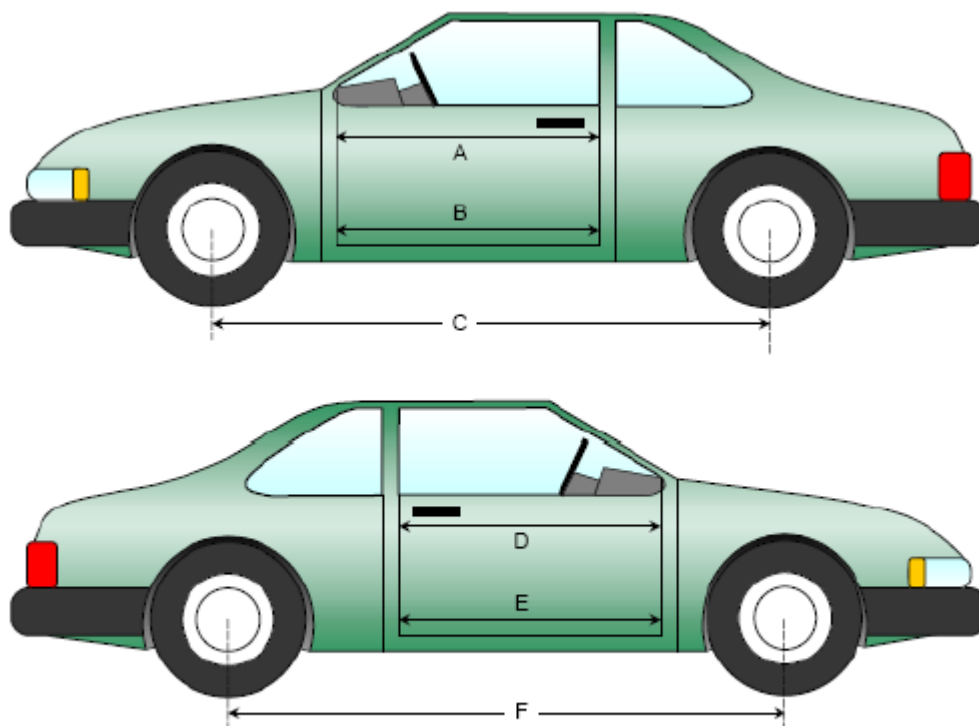
NHTSA No.: M20170116
 Test Date: 12/16/2016

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	953	953	0
B	Left Side Lower	mm	848	848	0
D	Right Side Upper	mm	953	954	1
E	Right Side Lower	mm	815	815	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2694	2631	-63
F	Right Side Wheelbase	mm	2694	2621	-73



Left & Right Side Views

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

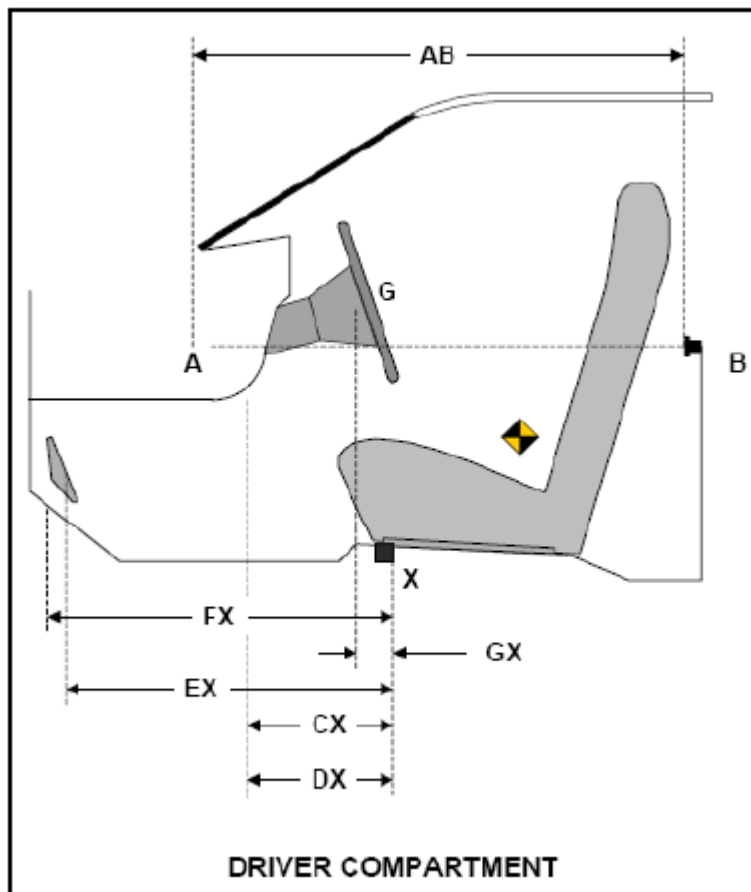
Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	786	787	1
CX	Left Knee Bolster to X	mm	312	304	-8
DX	Right Knee Bolster to X	mm	287	272	-15
EX	Brake Pedal to X	mm	561	506	-55
FX	Foot Rest to X	mm	588	535	-53
GX	Center of Steering Column Wheel Hub to X	mm	74	132	58

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016

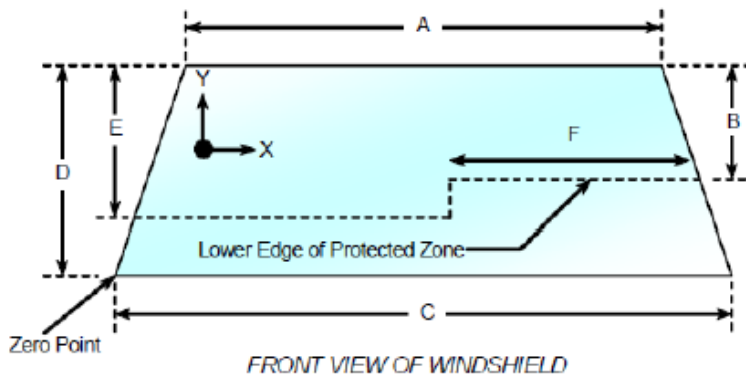
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2165	2165	100
Right Side	2165	2165	100
Total	4330	4330	100



Item	Units	Value
A	mm	1220
B	mm	559
C	mm	1526
D	mm	792
E	mm	565
F	mm	440

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: 2017 Chevrolet Volt five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
Test Date: 12/16/2016

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 11:45 AM

STODDARD SOLVENT SPILLAGE MEASUREMENTS

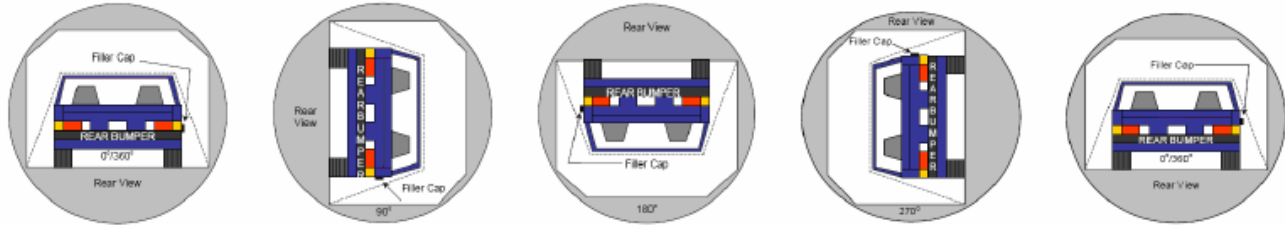
- | | | |
|---|--|-----|
| A. From impact until vehicle motion ceases:
(Maximum allowable is 1 oz.) | N/A* | oz. |
| B. For the 5-minute period after motion ceases:
(Maximum allowable is 5 oz.) | N/A* | oz. |
| C. For the following 25 minutes:
(Maximum allowable is 1 oz./minute) | N/A* | oz. |
| D. Spillage: | Fuel System Could Not be Assessed* | |

***Note:** *Fuel system integrity could not be assessed due to the fuel tank being damaged by the laboratory's tow system guide rail during post-test vehicle rebound.*

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2017 Chevrolet Volt five door hatchback
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
 Test Date: 12/16/2016



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

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: Fuel System Could Not be Assessed

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	N/A	300	N/A*
90° to 180°	N/A	300	N/A*
180° to 270°	N/A	300	N/A*
270° to 360°	N/A	300	N/A*

***Note:** Fuel system integrity could not be assessed due to the fuel tank being damaged by the laboratory's tow system guide rail during post-test vehicle rebound.

FMVSS 301 SPILLAGE TABLE

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

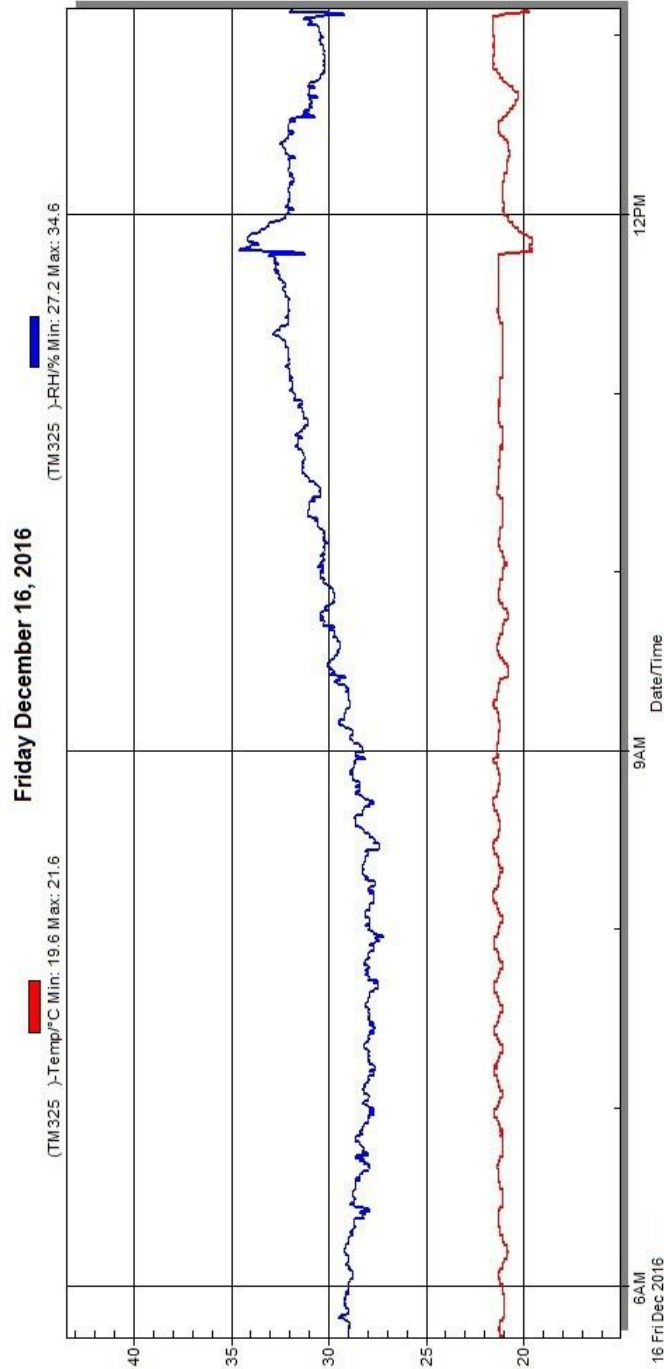
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	N/A
90° to 180°	N/A
180° to 270°	N/A
270° to 360°	N/A

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2017 Chevrolet Volt five door hatchback
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20170116
Test Date: 12/16/2016



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

APPENDIX A
PHOTOGRAPHS

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Fig.	Description	Page
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Fig.	Description	Page
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¹NOTE: *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.*

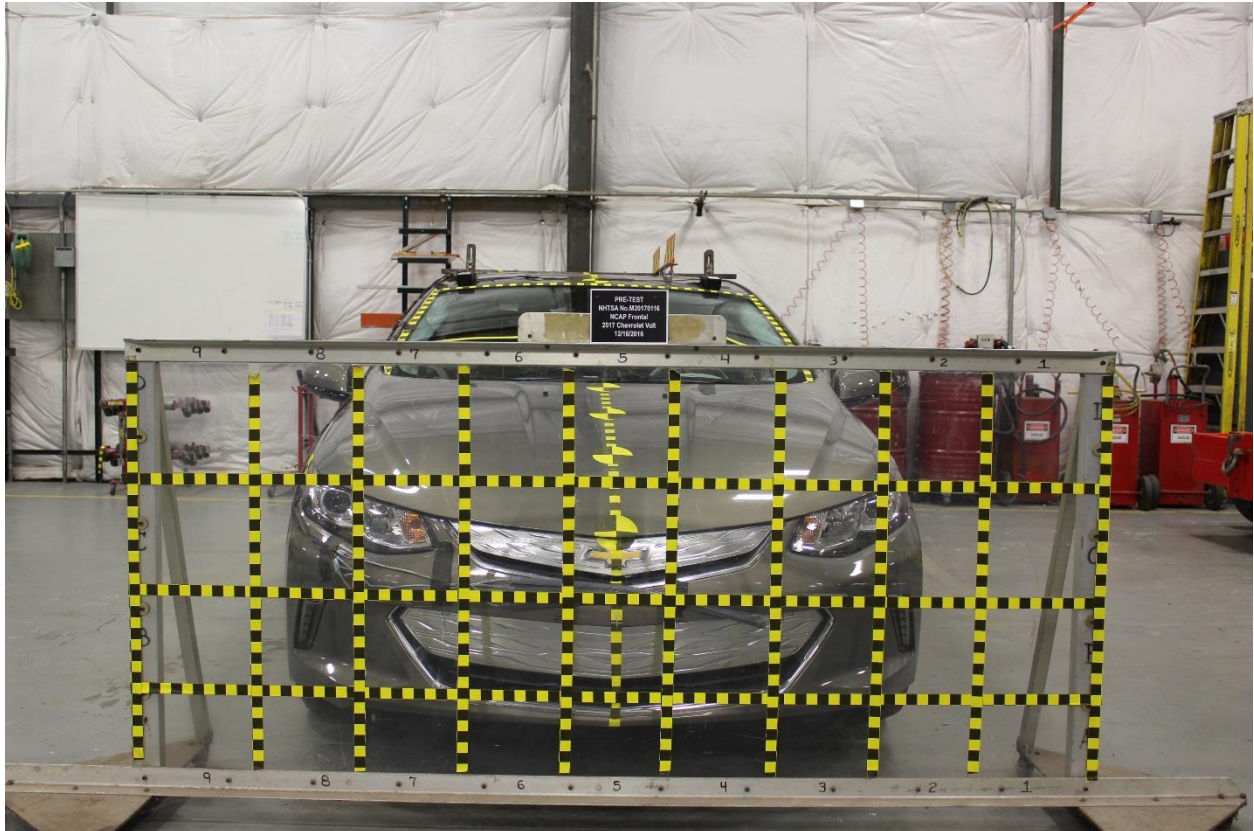


Figure A-1: Load Cell Location

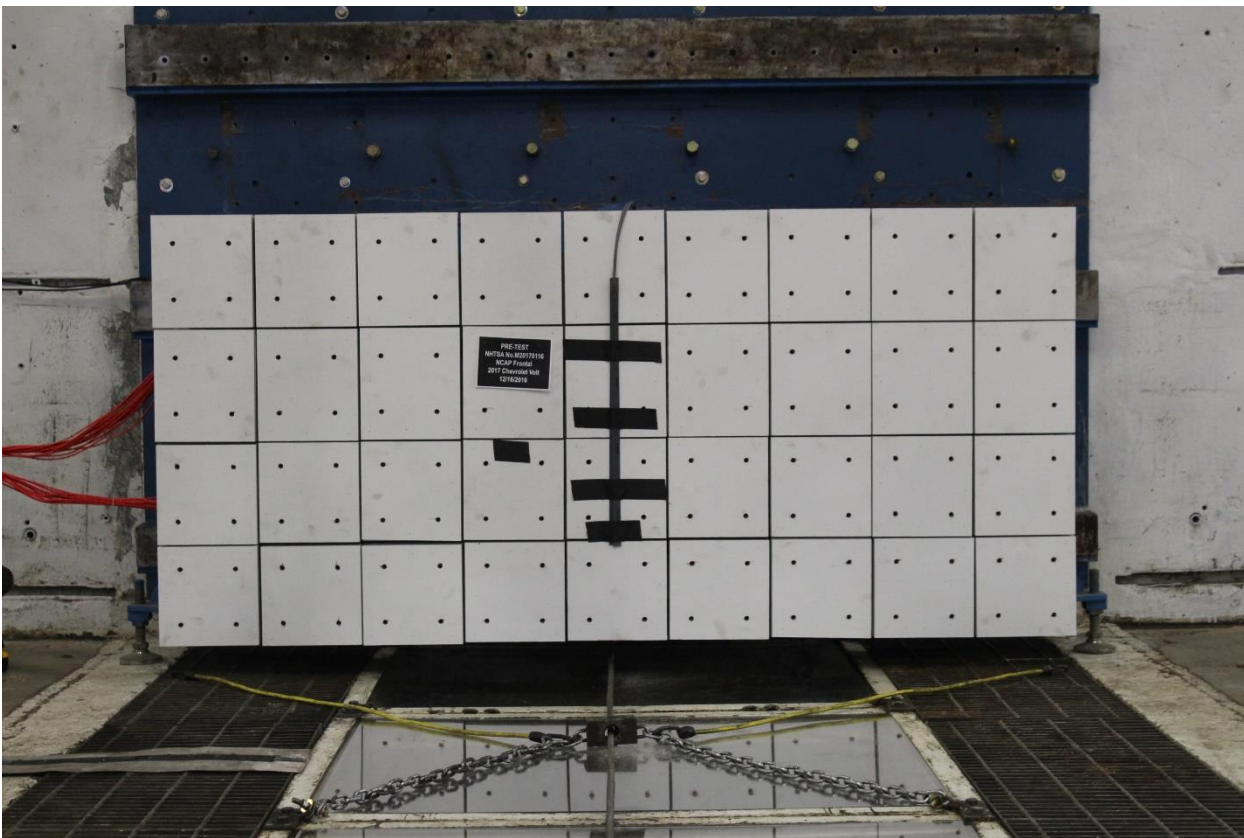


Figure A-2: Pre-Test Load Cell Wall



Figure A-3: Post-Test Load Cell Wall

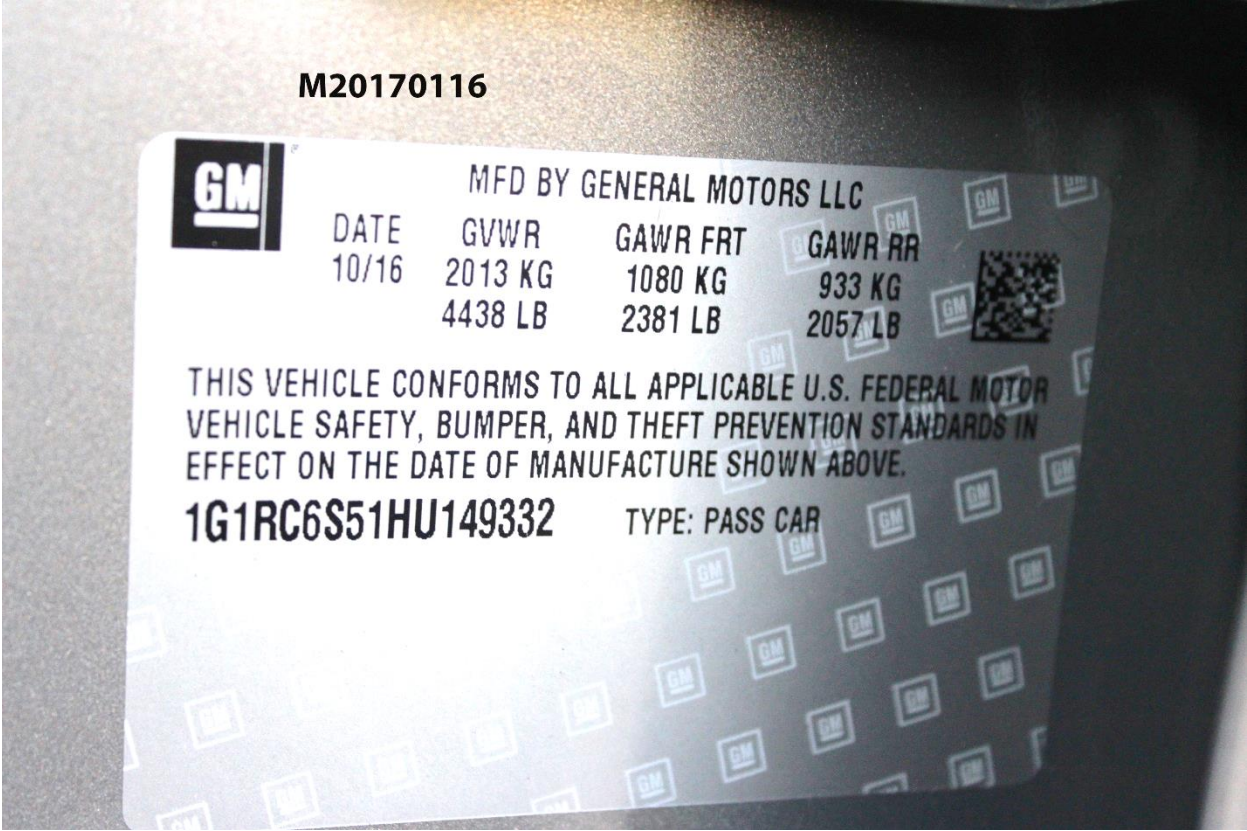


Figure A-4: Manufacturer's Label



Figure A-5: Tire Placard



Figure A-6: 2017 Chevrolet Volt 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

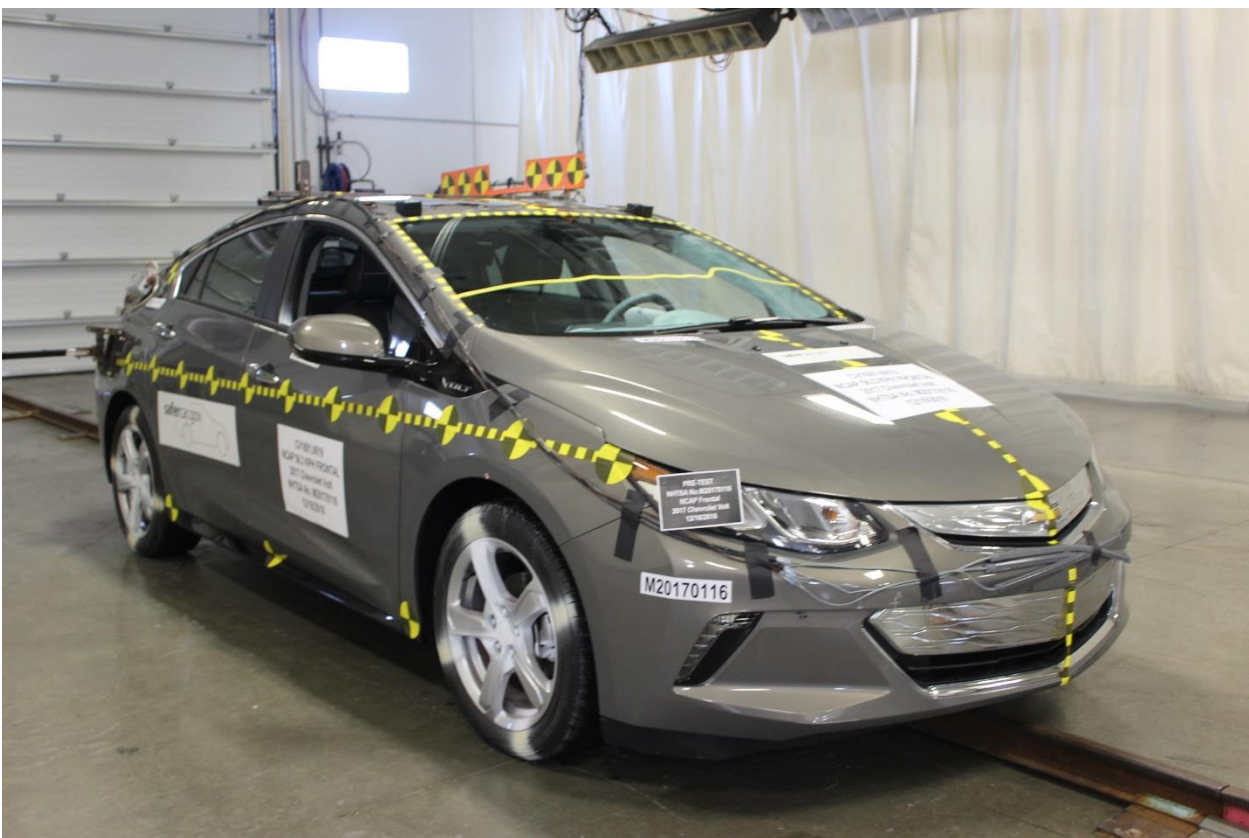


Figure A-14: Pre-Test Right Front 3-4 View



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

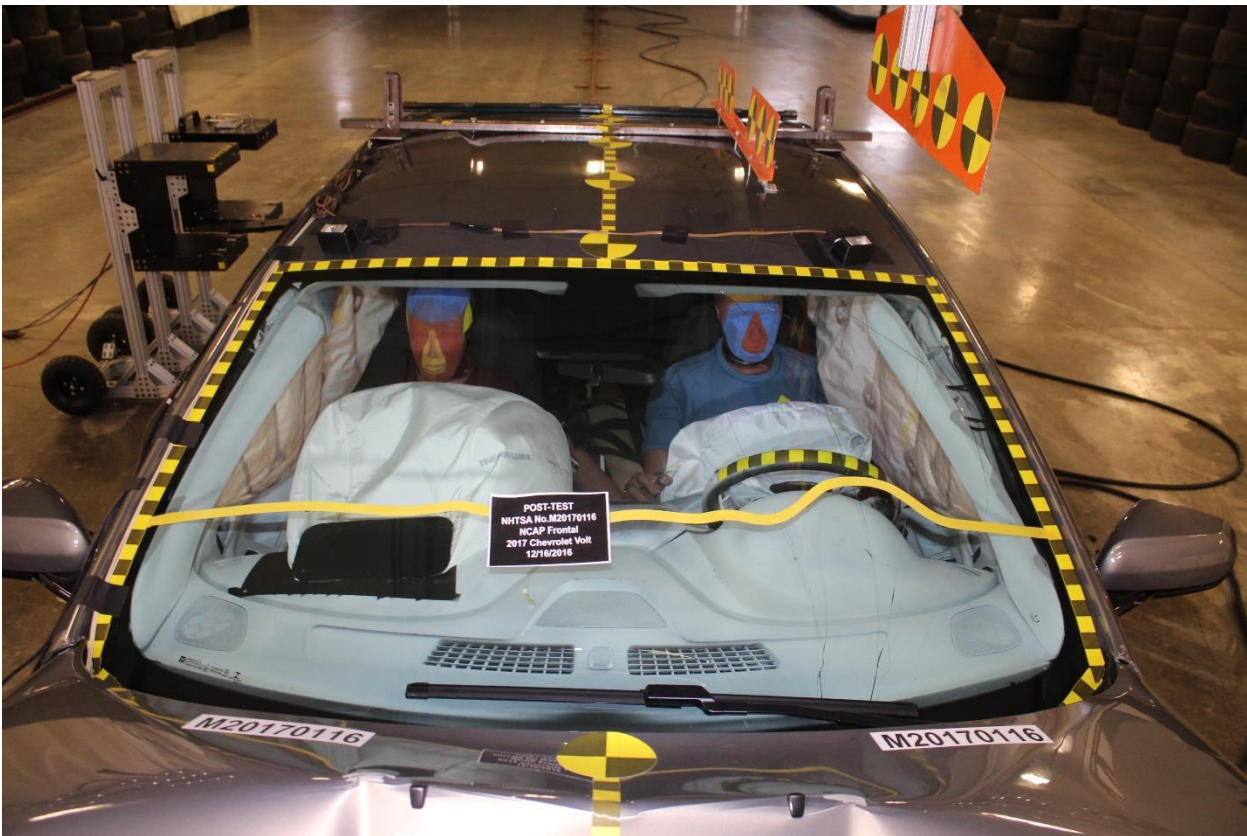


Figure A-19: Post-Test Windshield View



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

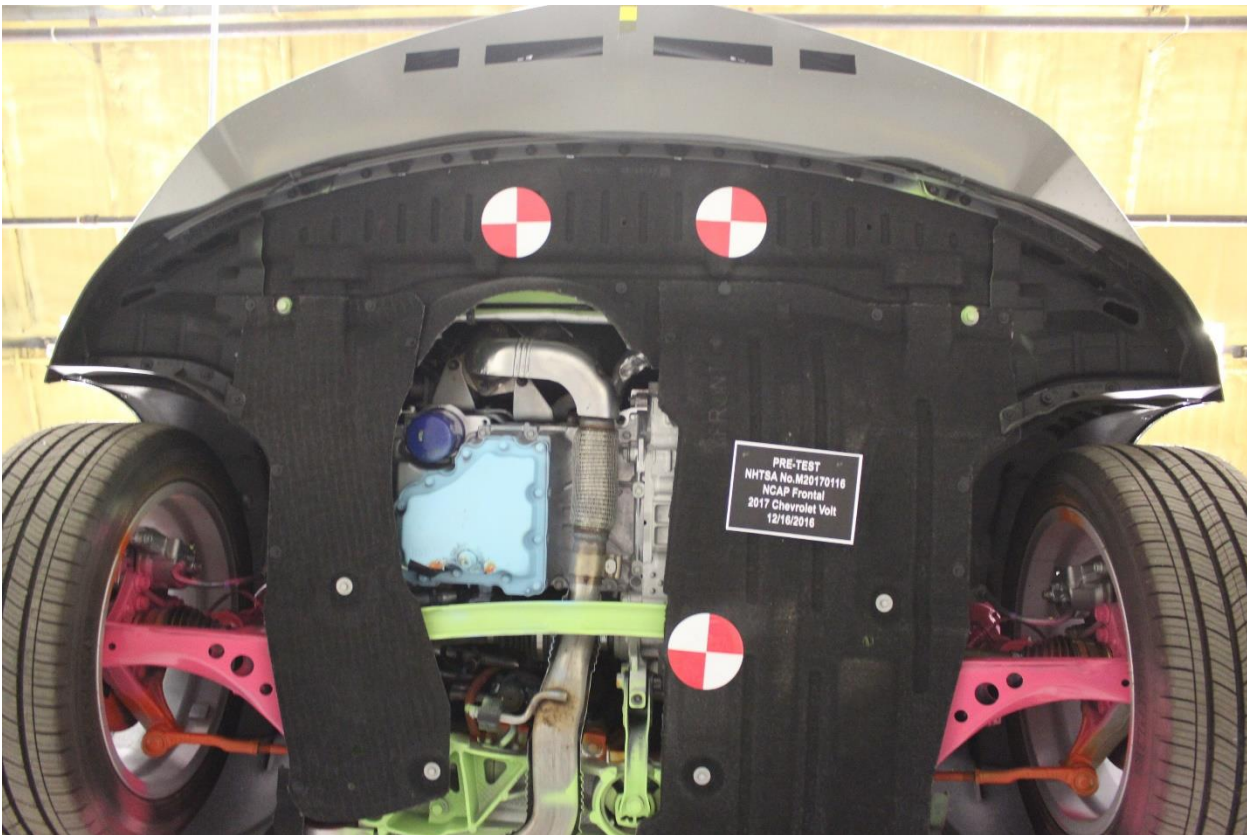


Figure A-24: Pre-Test Front Underbody View



Figure A-25: Post-Test Front Underbody View

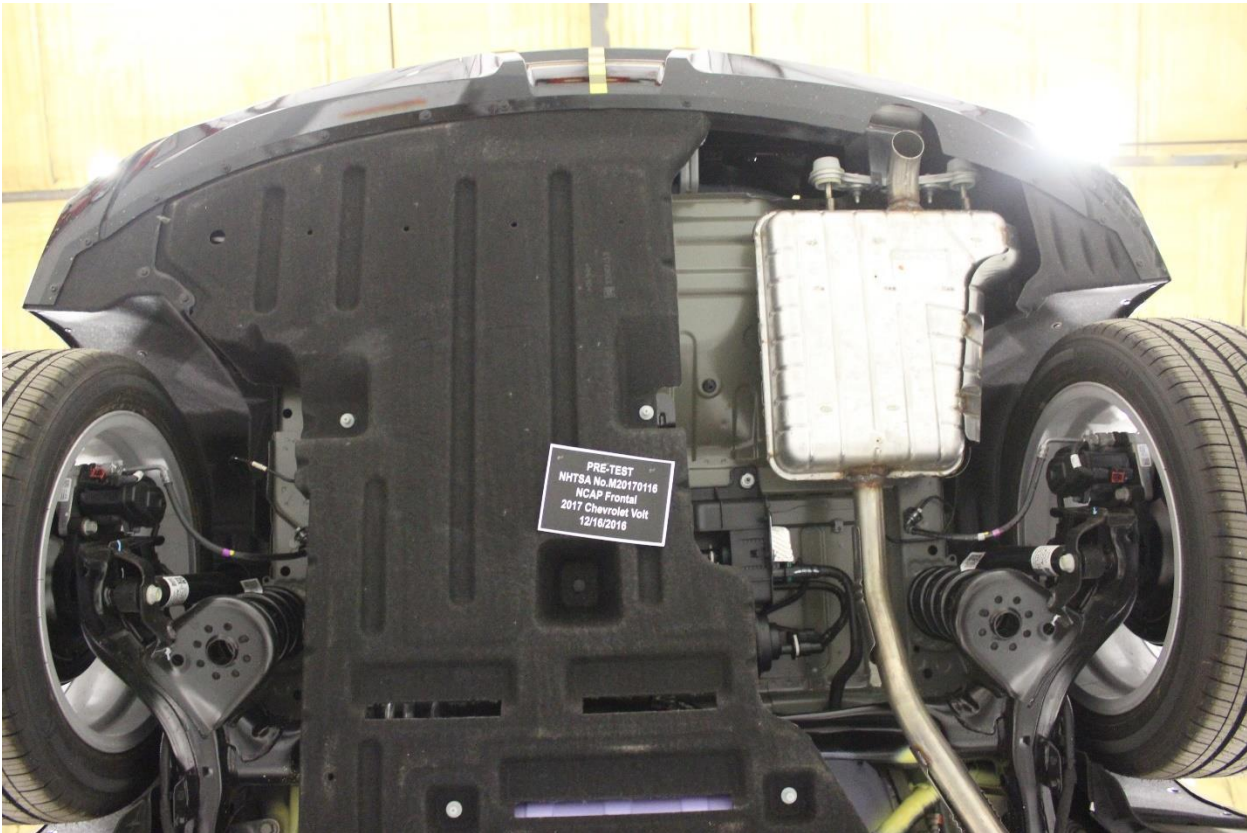


Figure A-26: Pre-Test Rear Underbody View

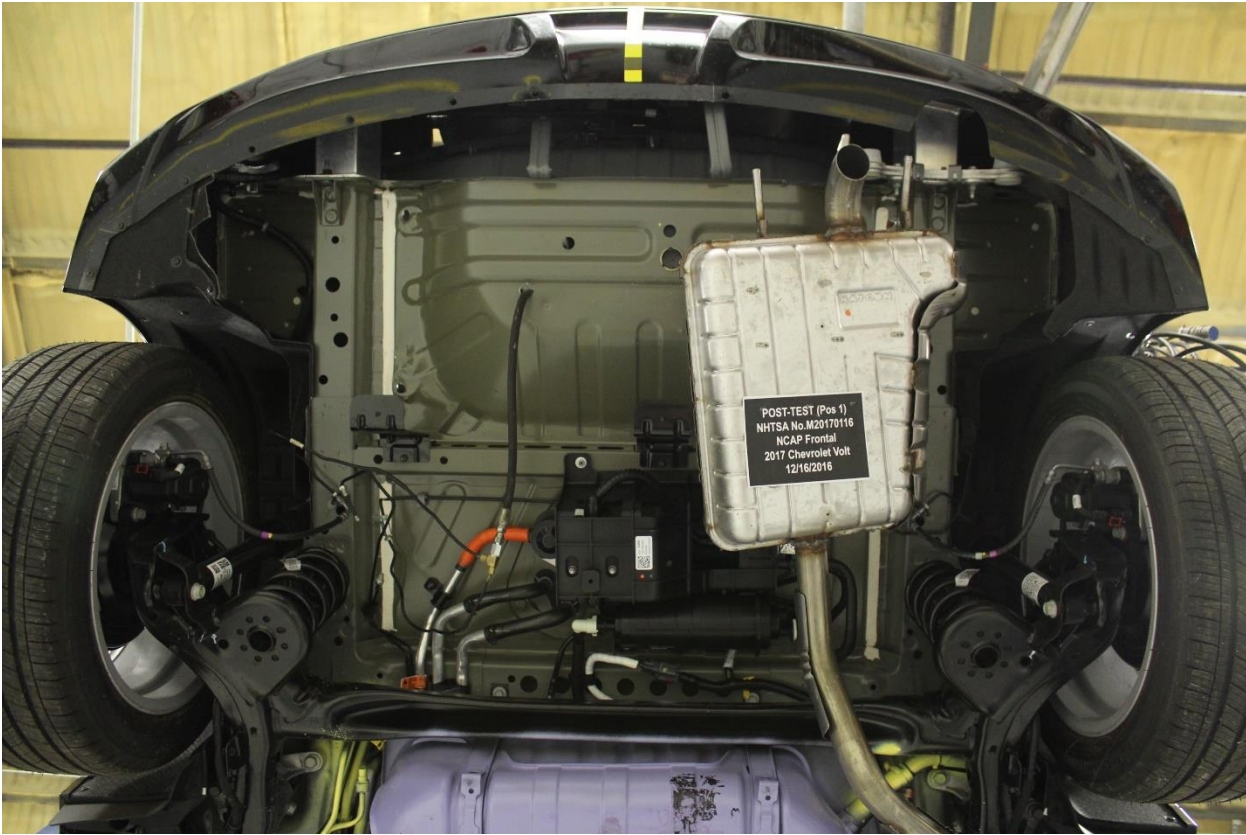


Figure A-27: Post-Test Rear Underbody View



Figure A-28: Pre-Test Dummy Cable Routing



POST-TEST
NHTSA No. M20170116
NCAP Frontal
2017 Chevrolet Volt
12/16/2016

Figure A-29: Post-Test Dummy Cable Routing



PRE-TEST (Pos 1)
NHTSA No. M20170116
NCAP Frontal
2017 Chevrolet Volt
12/16/2016

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

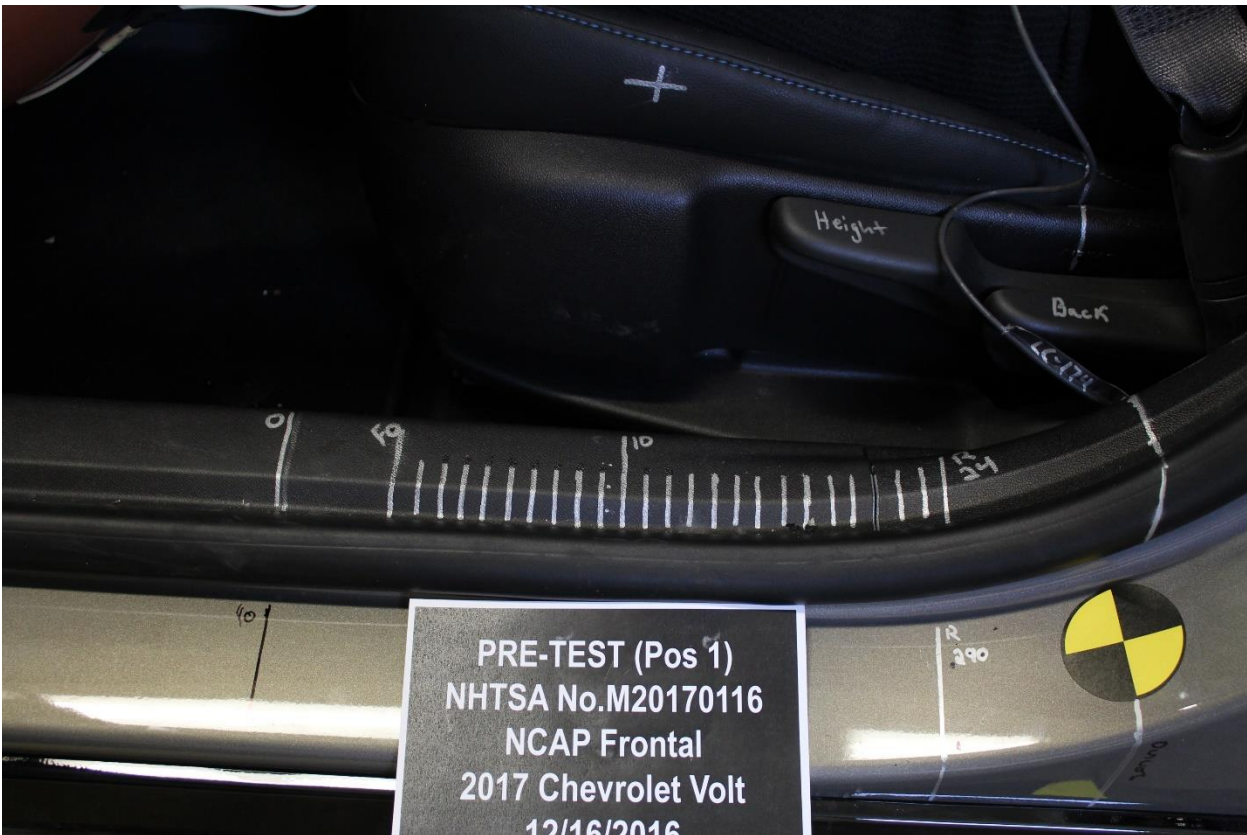


Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings



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

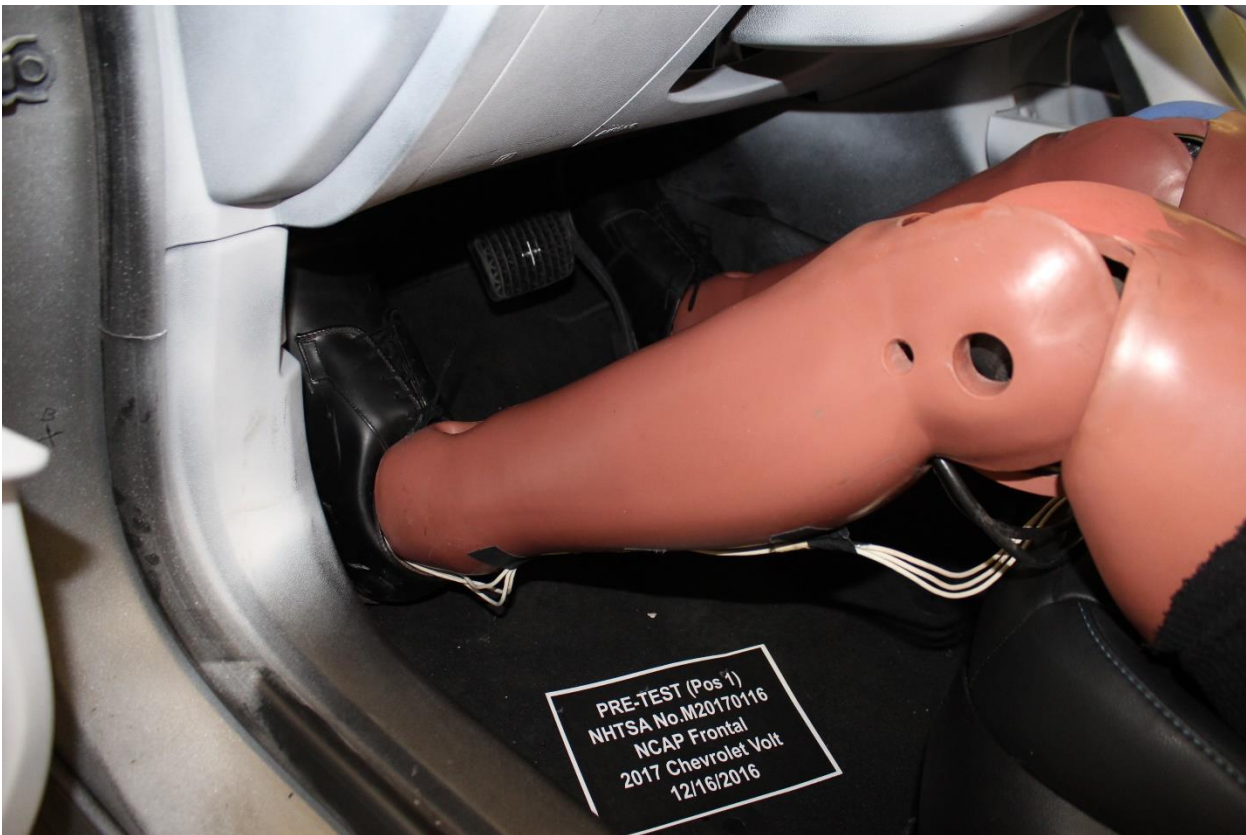


Figure A-40: Pre-Test Driver Dummy Feet



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

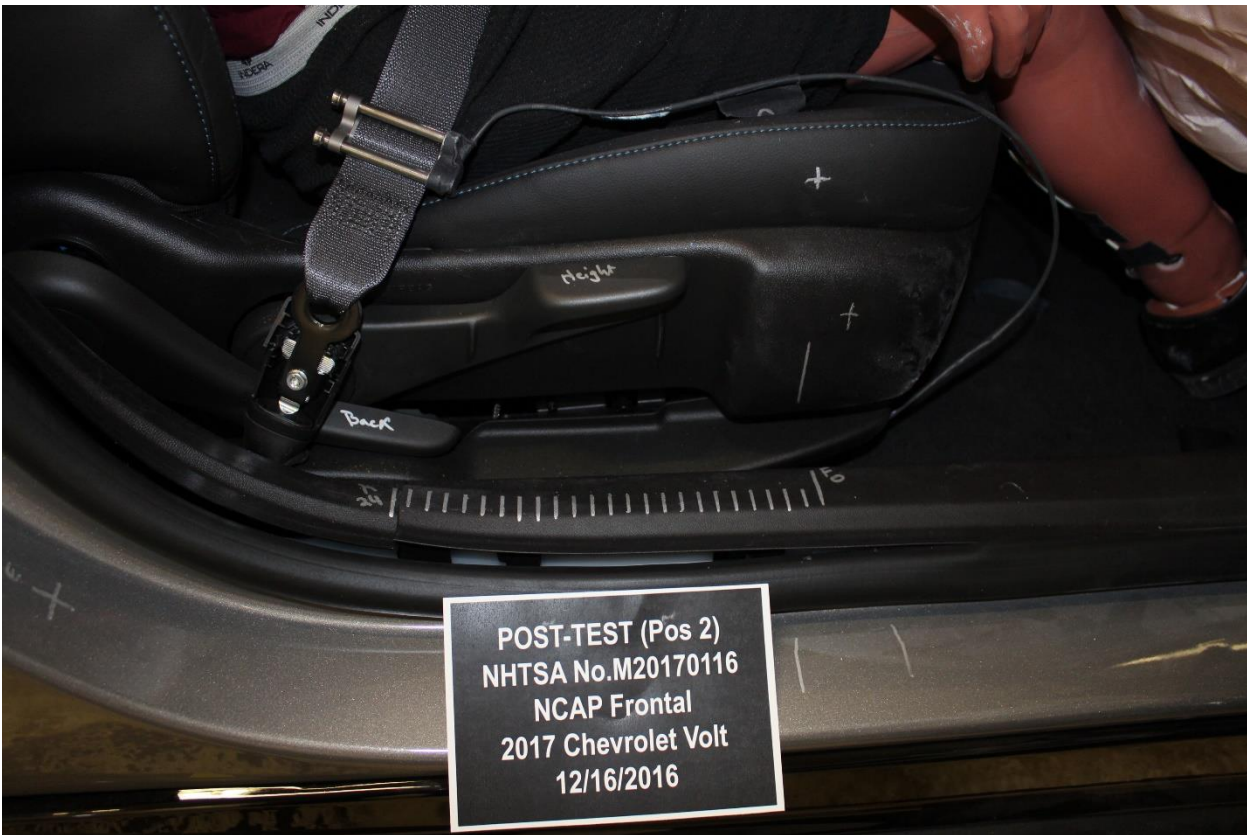


Figure A-58: Post-Test Passenger's Seat Fore-Aft Markings



PRE-TEST (Pos 2)
NHTSA No.M20170116
NCAP Frontal
2017 Chevrolet Volt
12/16/2016

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



POST-TEST (Pos 2)
NHTSA No.M20170116
NCAP Frontal
2017 Chevrolet Volt
12/16/2016

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

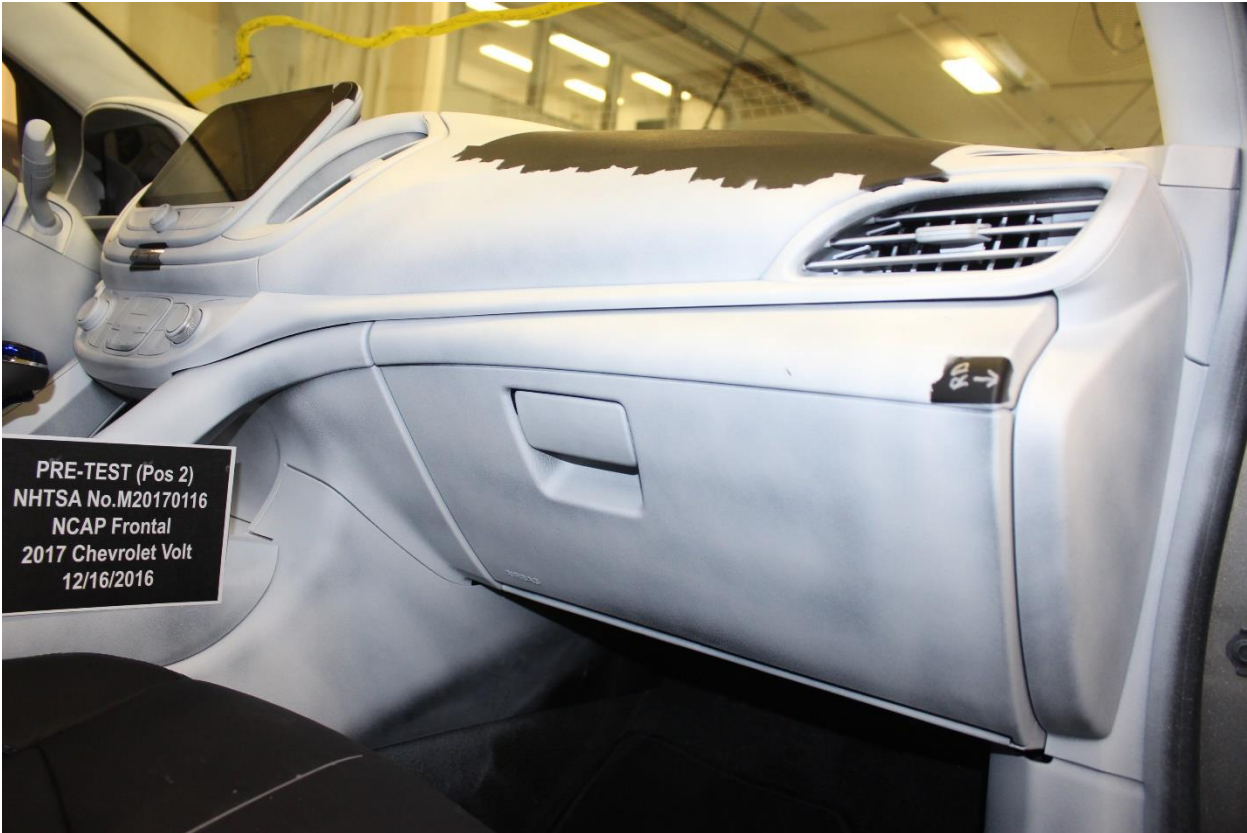


Figure A-63: Pre-Test Passenger's Side Knee Bolster



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

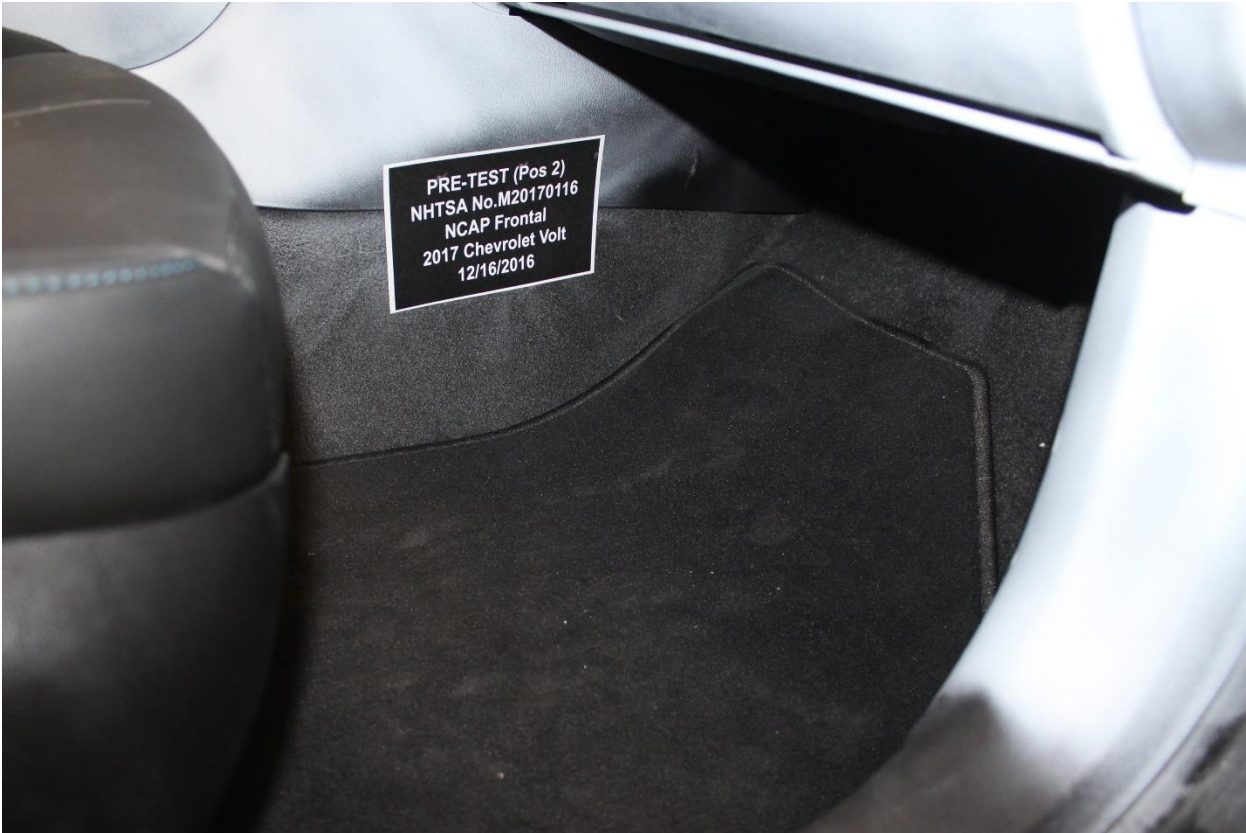


Figure A-65: Pre-Test Passenger's Side Floorpan



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

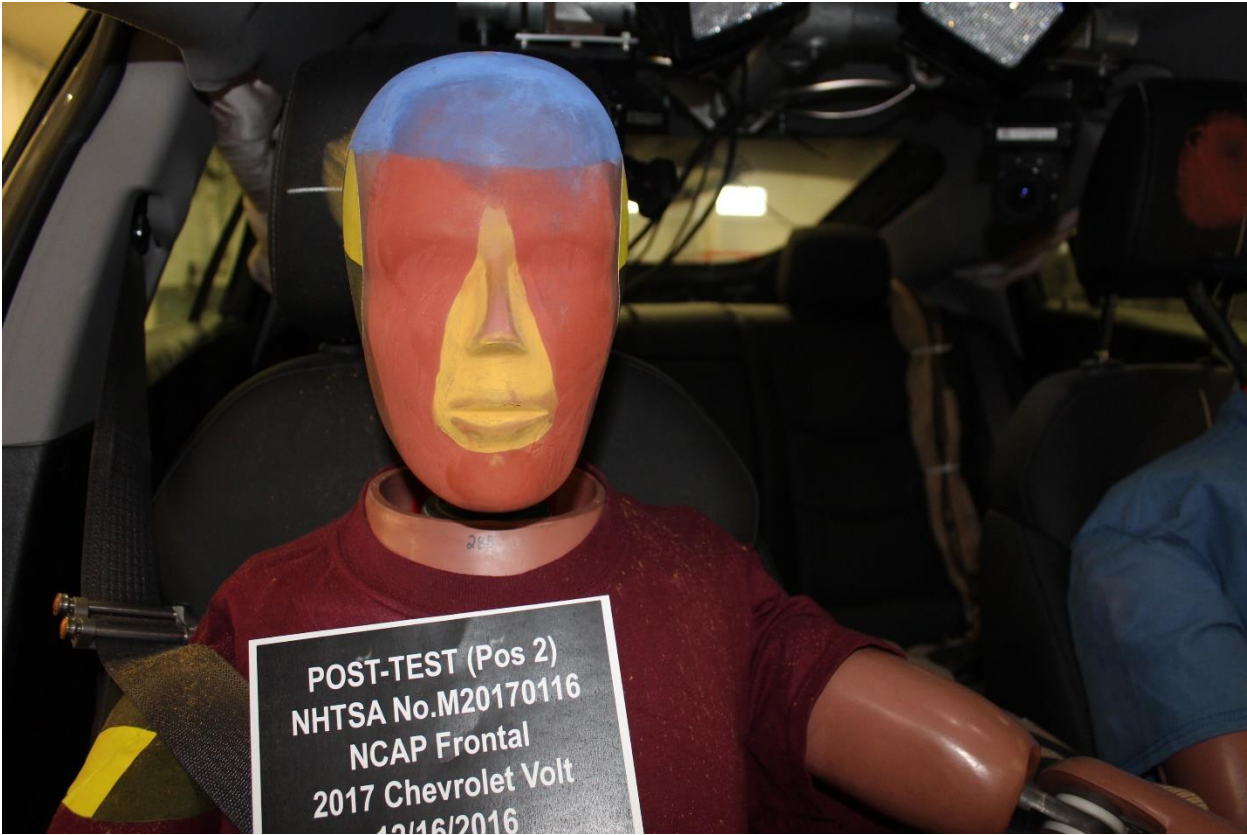


Figure A-67: Post-Test Passenger Dummy Face



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



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

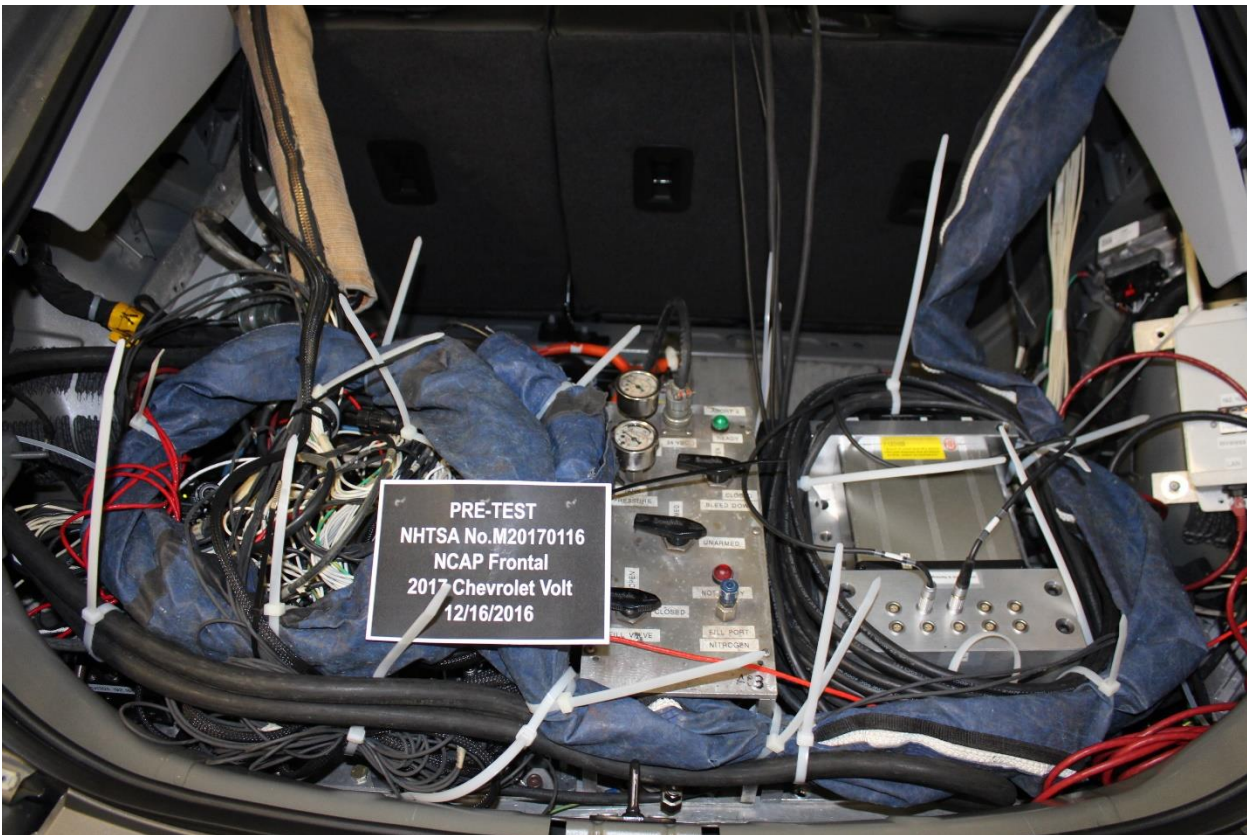


Figure A-70: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

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

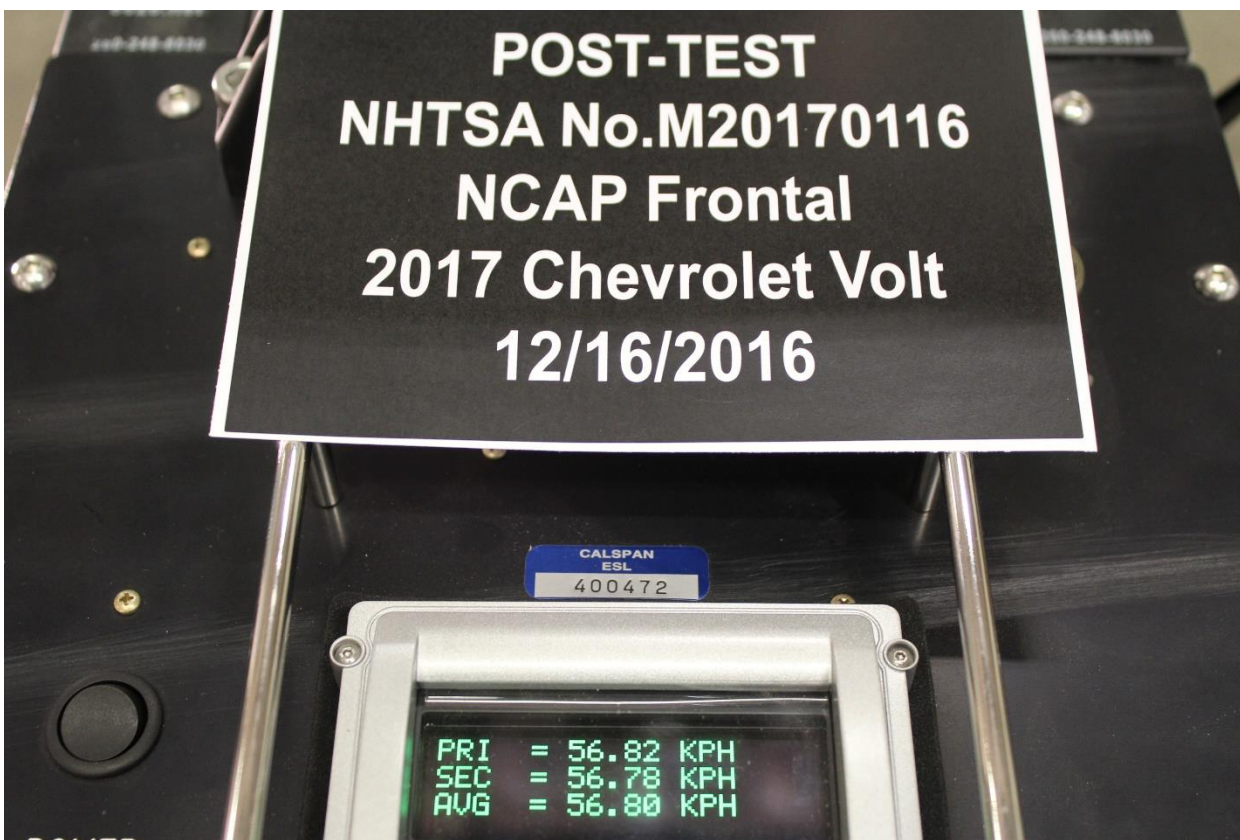


Figure A-72: Post-Test Speed Trap Read-Out



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



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

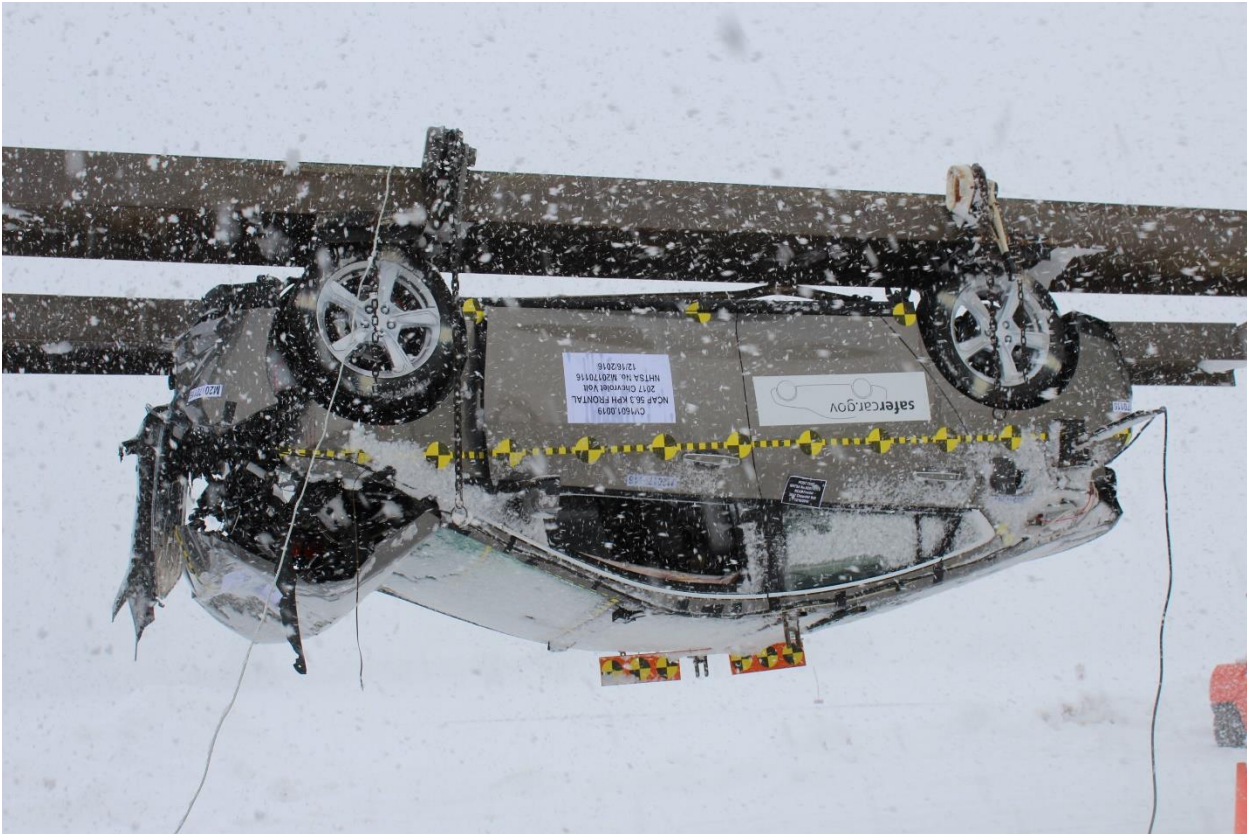


Figure A-75: Vehicle at 180° on Static Rollover Device



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



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

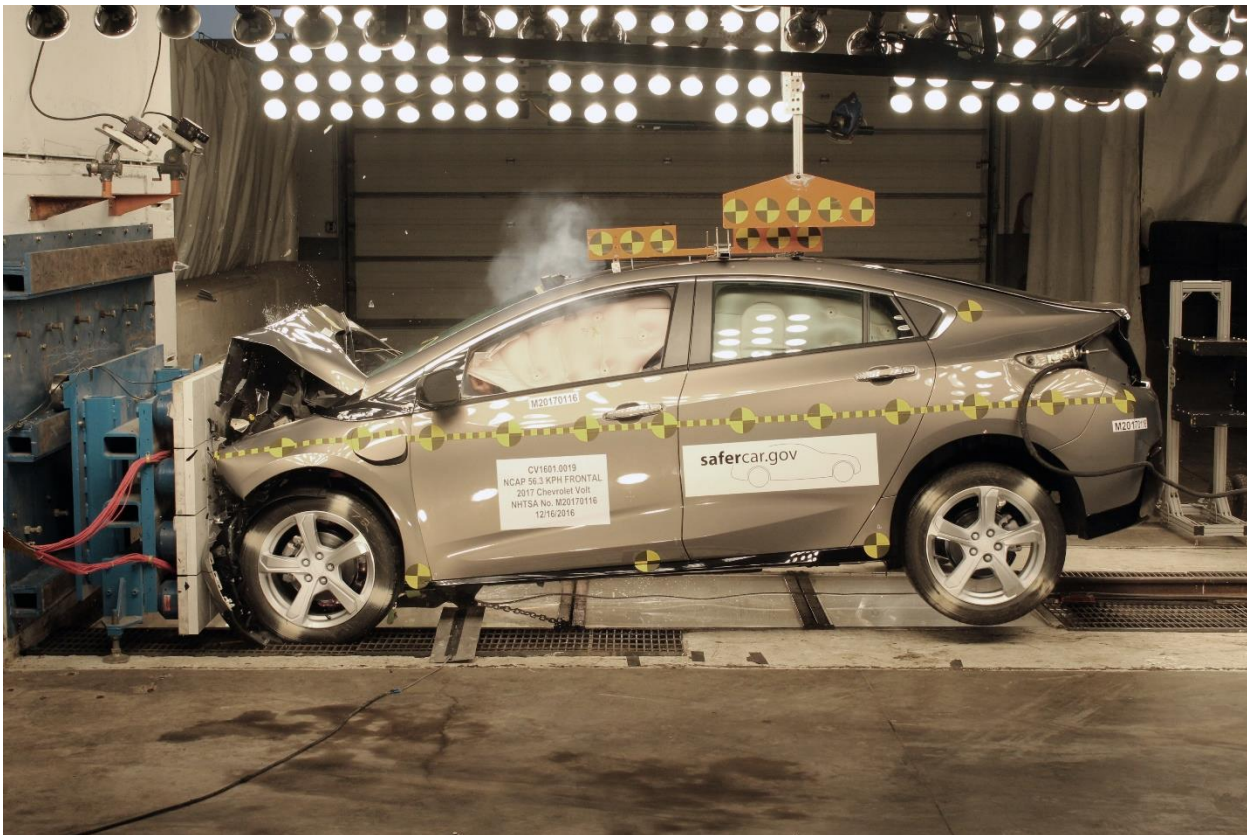


Figure A-78: 2017 Chevrolet Volt Frontal Impact Event



2017 VOLT LT HATCHBACK



**EXTERIOR: PEPPERDUST METALLIC
INTERIOR: JET BLACK W/ JET BLACK
ACCENT**

**ENGINE, RANGE EXTENDER, 1.5L
ELECTRIC DRIVE UNIT, VOLTEC**

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STANDARD EQUIPMENT

- ITEMS FEATURED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD MODEL PRICE (\$30,400)
- 8 YEAR / 100,000 MILE BATTERY AND VOLTEC LIMITED WARRANTY
 - 5 YR / 60,000 MILES POWERTRAIN LIMITED WARRANTY
 - ROADSIDE ASSISTANCE
 - COURTESY TRANSPORTATION
 - CHEVROLET COMPLETE CARE
 - SEE CHEVY.COM OR DEALER FOR TERMS, DETAILS, & LIMITS
 - TWO MAINTENANCE VISITS OIL & FILTER CHANGE
 - 4-WHEEL TIRE ROTATION
 - 27 POINT INSPECTION
- MECHANICAL**
- BATTERY, PROPULSION, LIONON
 - ELECTRIC DRIVE UNIT, VOLTEC
 - ENGINE, RANGE EXTENDER, 1.5L
 - REGEN ON DEMAND
 - LOCATION BASED CHARGING
 - TIRE SEALANT & INFLATOR KIT

IN PLACE OF SPARE TIRE

- CHARGE CORD, 120V PORTABLE
- SAFETY & SECURITY**
- AIR BAGS, DUAL STAGE FRONTAL, & KNEE FOR DRIVER AND FRONT PASSENGER
 - AIR BAGS, HEAD CURTAIN AND SEAT-MOUNTED, SIDE IMPACT FRT AND REAR OUTBOARD SEAT POSITIONS
 - ANTILOCK BRAKE SYSTEM
 - REAR CHILD SEAT LATCH ANCHORS
 - THEFT DETERRENT SYSTEM
 - STABILITRAK STABILITY CONTROL INCLUDES TRACTION CONTROL
 - REMOTE KEYSLESS ENTRY WITH REMOTE START
 - POWER DOOR LOCKS WITH LOCKOUT PROTECTION
 - PEDESTRIAN SAFETY SIGNAL
 - HEADLAMPS, AUTO ON/OFF

REAR VISION CAMERA

- TIRE PRESSURE MONITOR
 - KEYSLESS OPEN AND START
- EXTERIOR**
- WHEELS, 17" 5-SPOKE ALUMINUM
 - MIRRORS, OUTSIDE POWER ADJUSTABLE, MANUAL FOLDING
 - REAR WINDOW DEFROSTER
 - WINDSHIELD WIPERS VARIABLE & INTERMITTENT
 - WINDSHIELD, SOLAR ABSORBING
- INTERIOR**
- AIR CONDITIONING, AUTOMATIC
 - MIRROR, MANUAL INSIDE RR VIEW
 - FLOOR MATS, CARPET FRONT/REAR
 - STEERING COLUMN, TILT & TELESCOPING
 - LEATHER WRAP STEERING WHEEL
 - STEERING WHEEL RADIO CONTROLS
 - VISORS, WITH VANITY MIRRORS
 - EFFICIENCY DISPLAY SCREENS

CRUISE CONTROL

- FRONT BUCKET SEATS
 - REAR SEAT, 60/40 SPLIT FOLD
 - POWER WINDOWS EXPRESS DOWN, DRIVER EXPRESS UP
 - CARGO COVER
- CONNECTIVITY FEATURES**
- CHEVROLET MYLINK RADIO
 - 8" SCREEN W/ APPLE CARPLAY CAPABILITY AND ANDROID AUTO CAPABILITY PROVIDED BY APPLE AND GOOGLE AVAILABLE WITH COMPATIBLE SMARTPHONES
 - XM RADIO + SERVICE SUBSCRIPTION SOLD SEPARATELY BY SIRIUSXM AFTER 3 MTHS
 - AUDIO SYSTEM, 6 SPEAKER (ONSTAR) INCLUDES 5 YR BASIC PLAN PLUS 6 MTH SERVICE W/ AUTOMATIC CRASH RESPONSE, NAVIGATION & MORE (SUBJECT TO TERMS SEE ONSTAR.COM)

4G LTE WI-FI-HOTSPOT WITH LIMITED DATA TRIAL AND MORE.

- USB PORTS (2), AUX INPUT PORT
- OPTIONS & PRICING**
- MANUFACTURER'S SUGGESTED RETAIL PRICE
- | | |
|---|--------------------|
| STANDARD VEHICLE PRICE | \$33,220.00 |
| OPTION INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN) | |
| LOW EMISSIONS PACKAGE | INC. |
| SEATS, LEATHER-APPOINTED | 900.00 |
| BOSE PREMIUM 8 SPEAKER AUDIO COMFORT PACKAGE | 560.00 |
| DRIVER & FRONT PASSENGER HEATED SEATS | 460.00 |
| HEATED STEERING WHEEL | |
| MIRRORS OUTSIDE HEATED, POWER | |

ADJUSTABLE, MANUAL FOLDING ILLUMINATED CHARGE PORT (DEALER INSTALLED)

ILLUMINATED CHARGE PORT (DEALER INSTALLED)	225.00
FLOOR MATS, ALL WEATHER FRONT AND REAR (DEALER INSTALLED)	140.00
ALL-WEATHER CARGO MAT (DEALER INSTALLED)	110.00
CARGO NET (DEALER INSTALLED)	60.00
TOTAL OPTIONS	\$2,455.00
TOTAL VEHICLE & OPTIONS	\$35,675.00
DESTINATION CHARGE	875.00
TOTAL VEHICLE PRICE*	\$36,550.00

EPA DOT Fuel Economy and Environment

Compact cars range from 14 to 116 MPGe. The best vehicle uses 119 MPGe.

Fuel Economy	Electricity	Gasoline Only
Change Time: 4.5 hours (24V)	106 MPGe 31 kWh per 100 miles	42 MPG 2.4 gallons per 100 miles

You save \$3,750 in fuel costs over 5 years compared to the average new vehicle.

Driving Range: All electric range 53 miles, Gasoline only 400 miles, Combined city/highway 475 miles.

Annual fuel cost \$650

Fuel Economy & Greenhouse Gas Rating (tailpipe only) **10** Best

Smog Rating (tailpipe only) **8** Best

Source: National Highway Traffic Safety Administration (NHTSA) www.safercar.gov or 1-888-327-4236

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 26 MPG and costs \$7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.45 per gallon and \$0.13 per kWh. This is a fuelled automobile. MPGe is miles per gasoline-gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT: 50%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 19%
KOREA 18%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: DETROIT, MI U.S.A.
COUNTRY OF ORIGIN: ENGINE: MEXICO
TRANSMISSION (ELECTRIC DRIVE UNIT): UNITED STATES

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VIN 1G1RC6S51HU149332
DEALER TO WHOM DELIVERED
WIN KELLY CHEVROLET BUICK GMC
12421 AUTO DR
CLARKSVILLE, MD 21026-1266

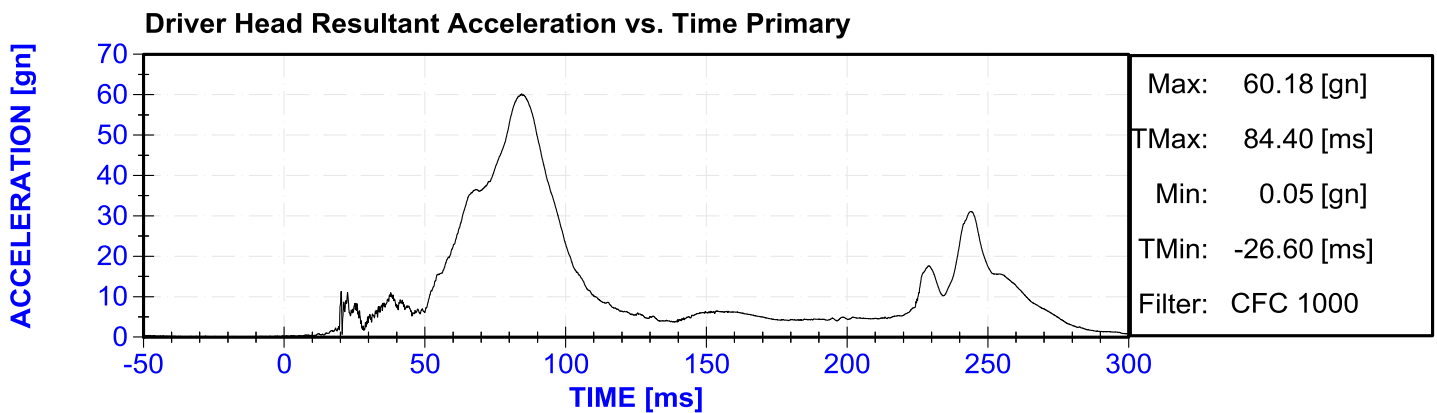
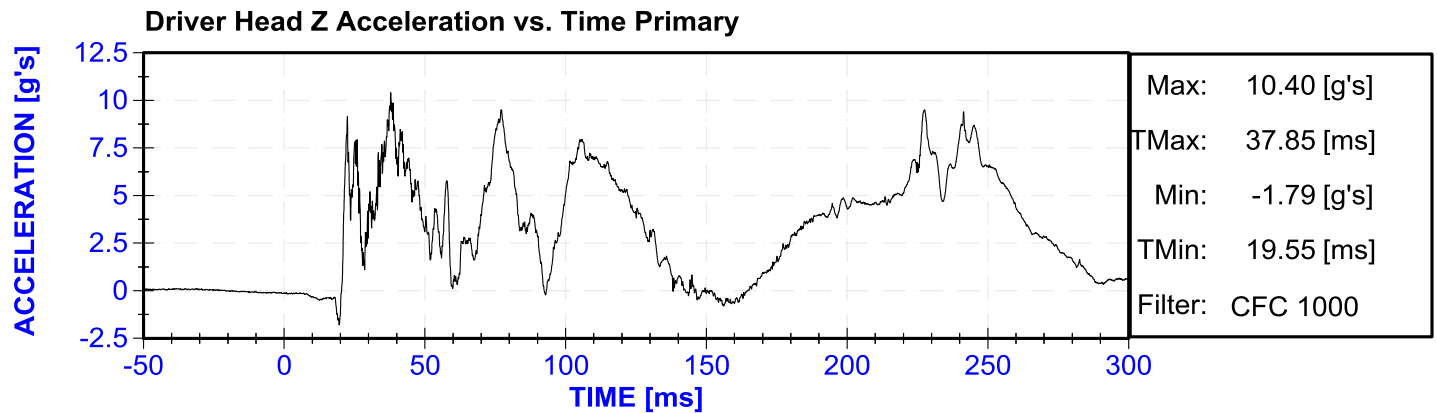
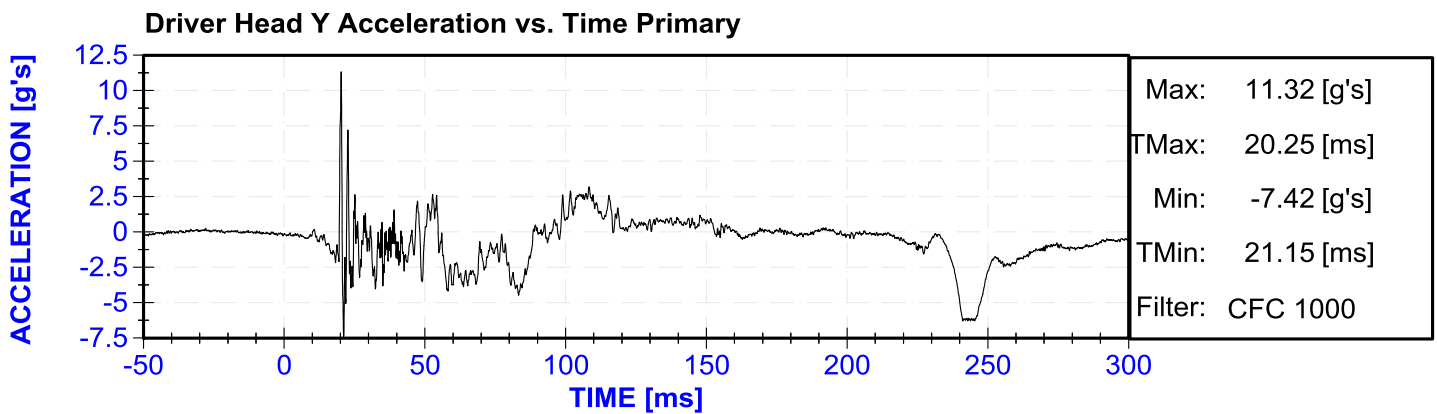
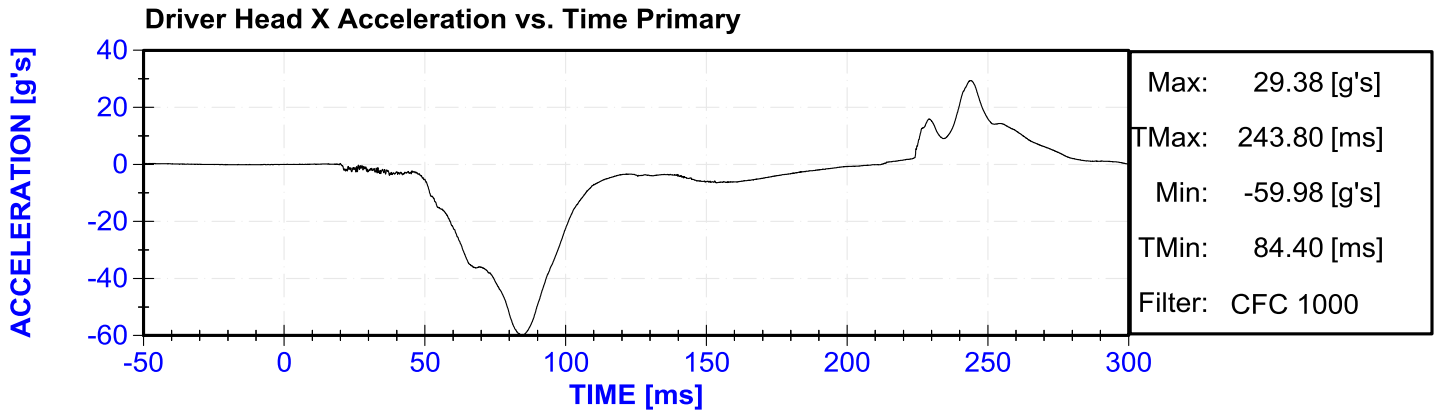
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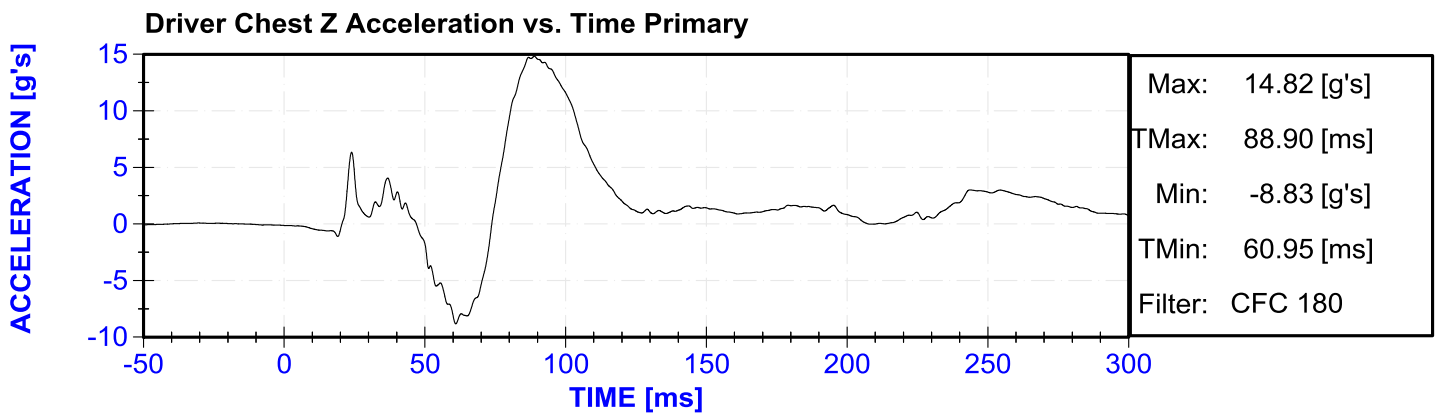
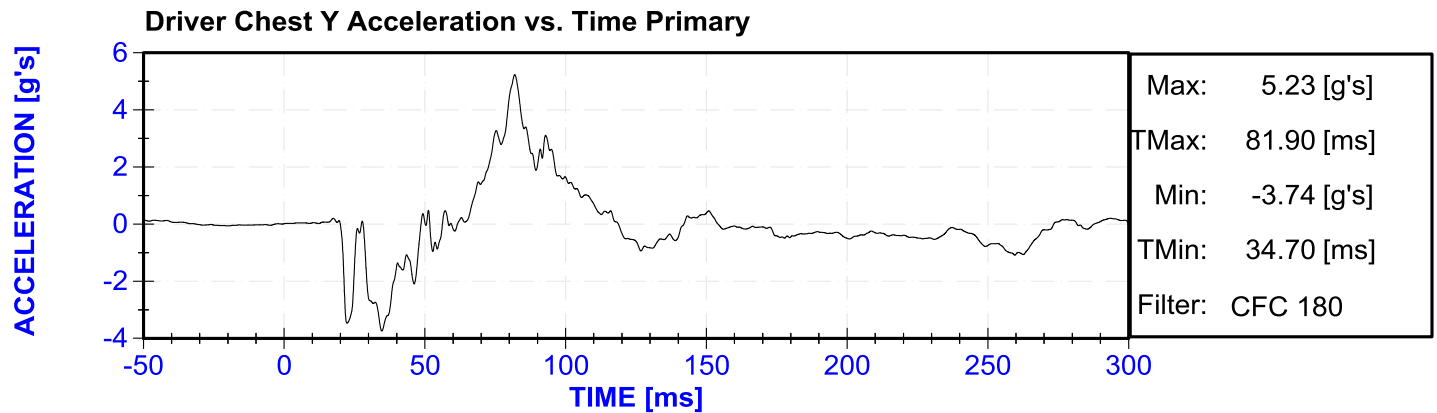
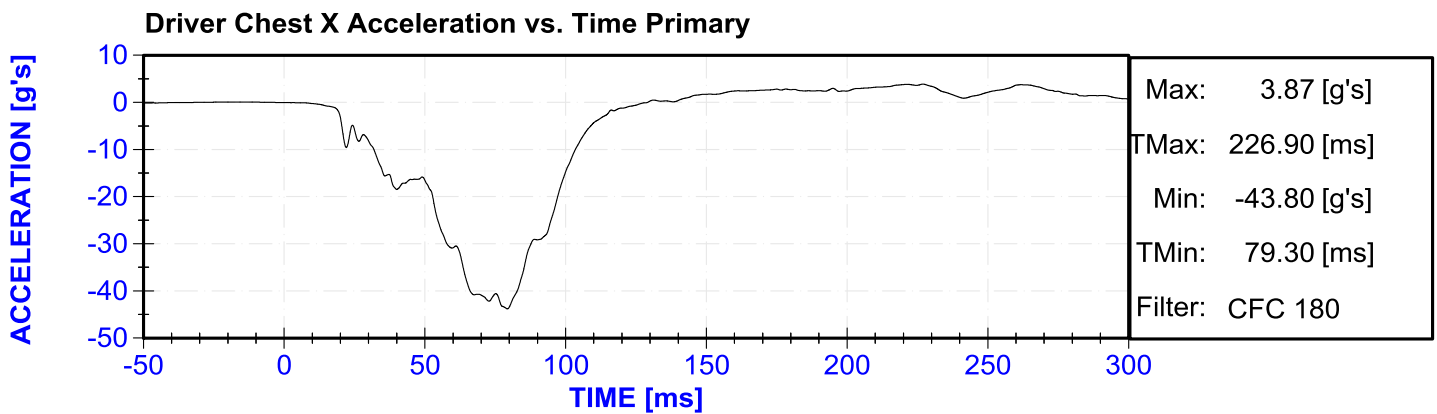
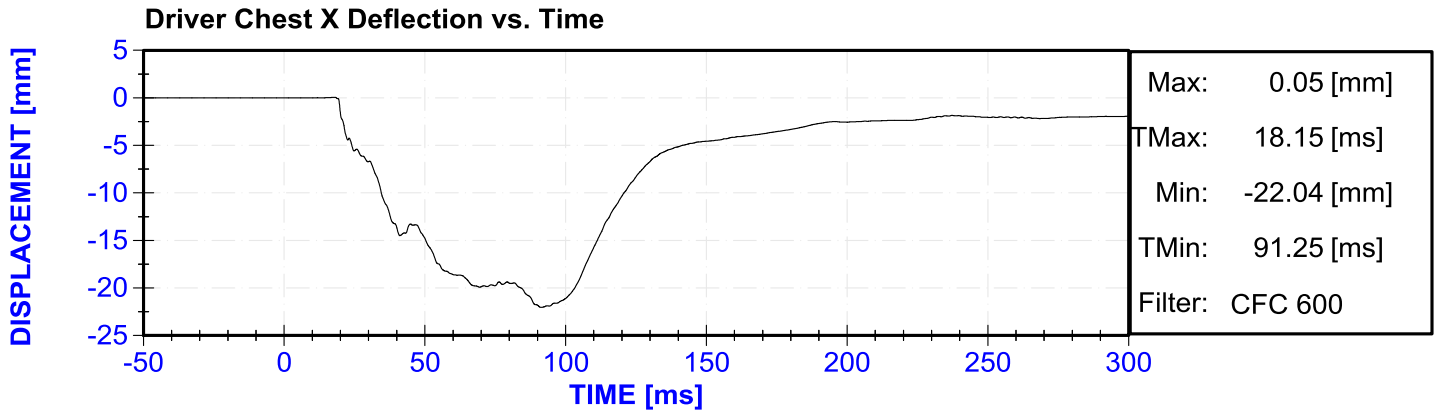
Figure A-79: Monroney Label Photograph

APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

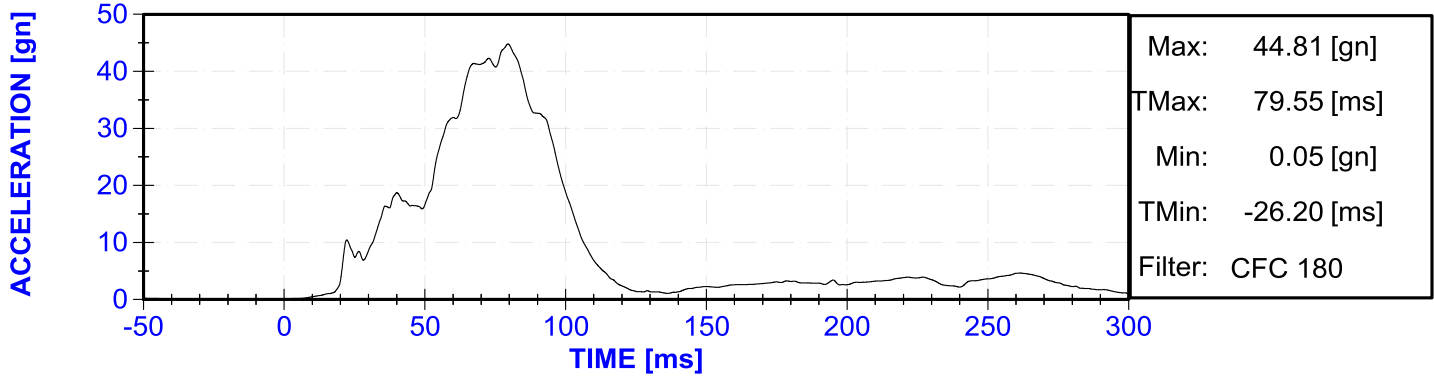
Table of Data Plots

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

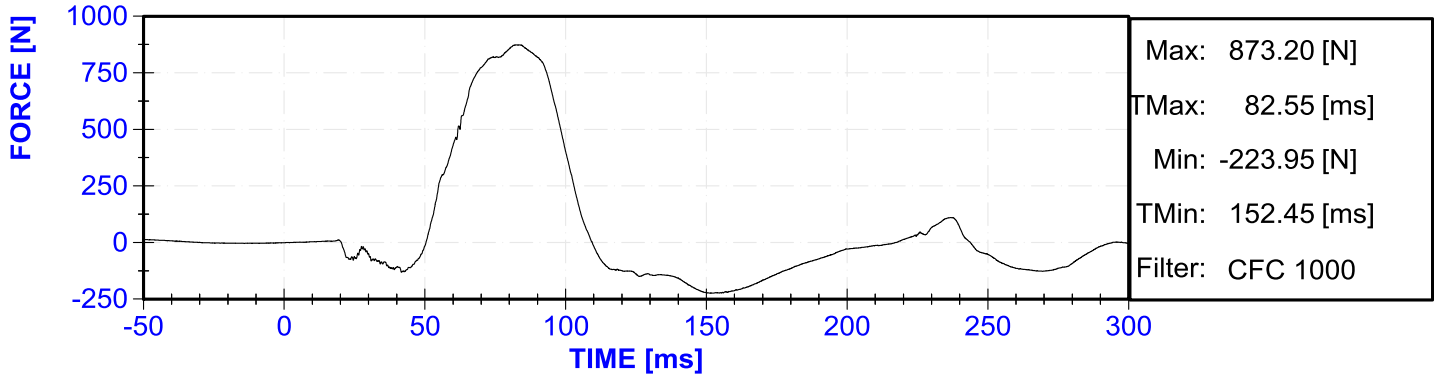




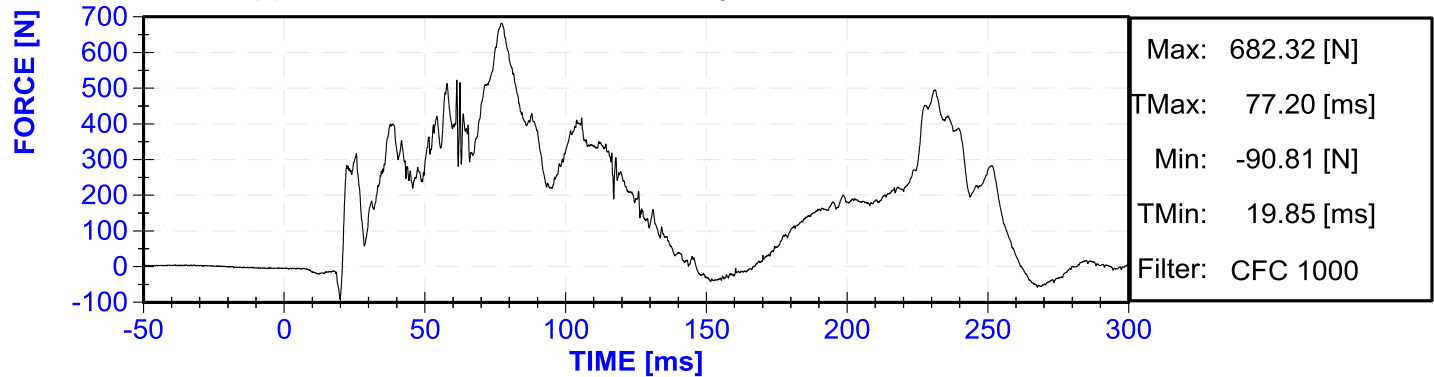
Driver Chest Resultant Acceleration vs. Time Primary



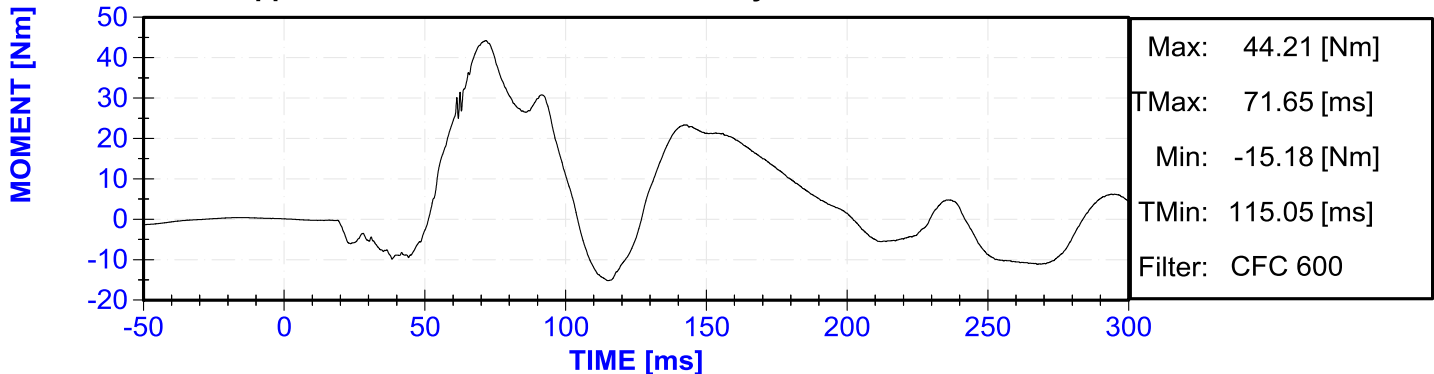
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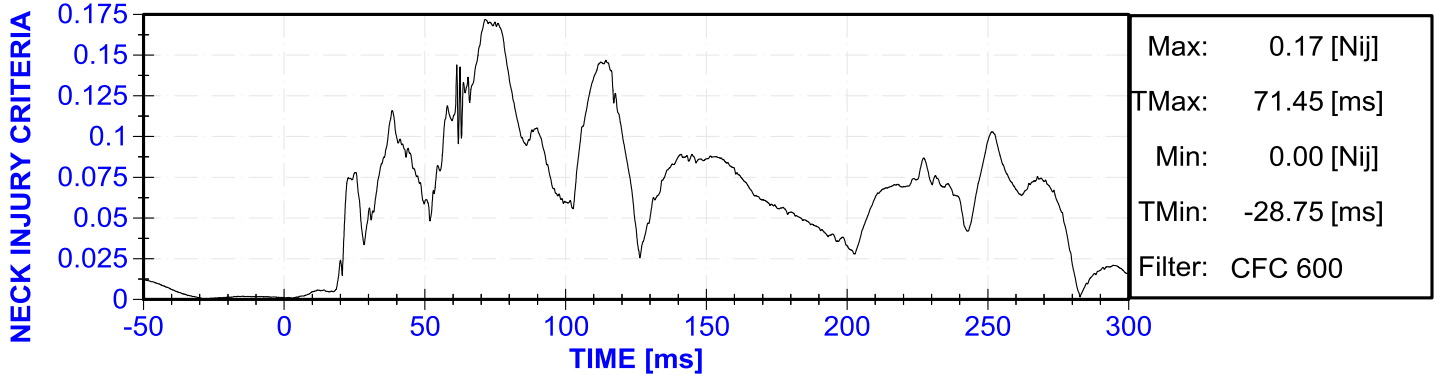
Driver Upper Neck Force Z vs. Time Primary



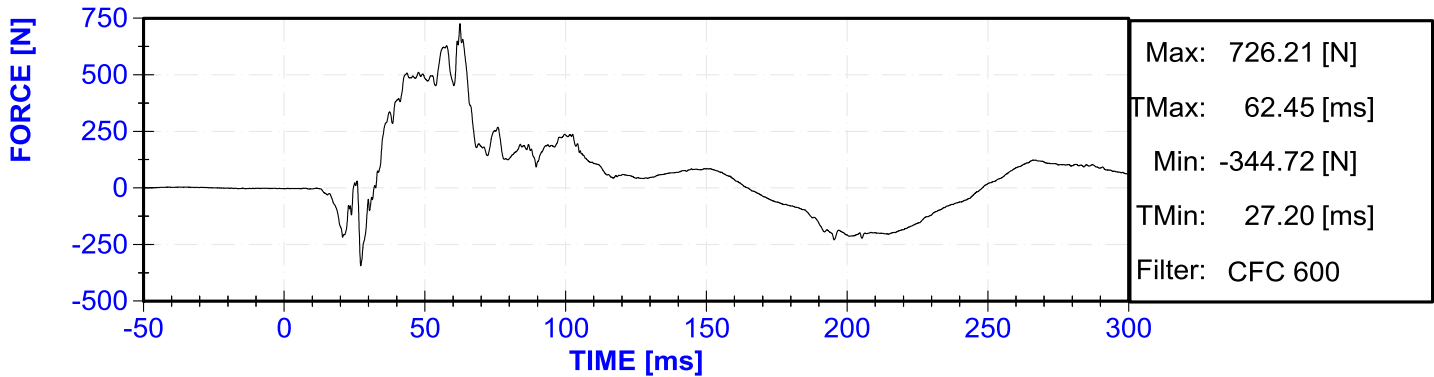
Driver Upper Neck Moment Y vs. Time Primary



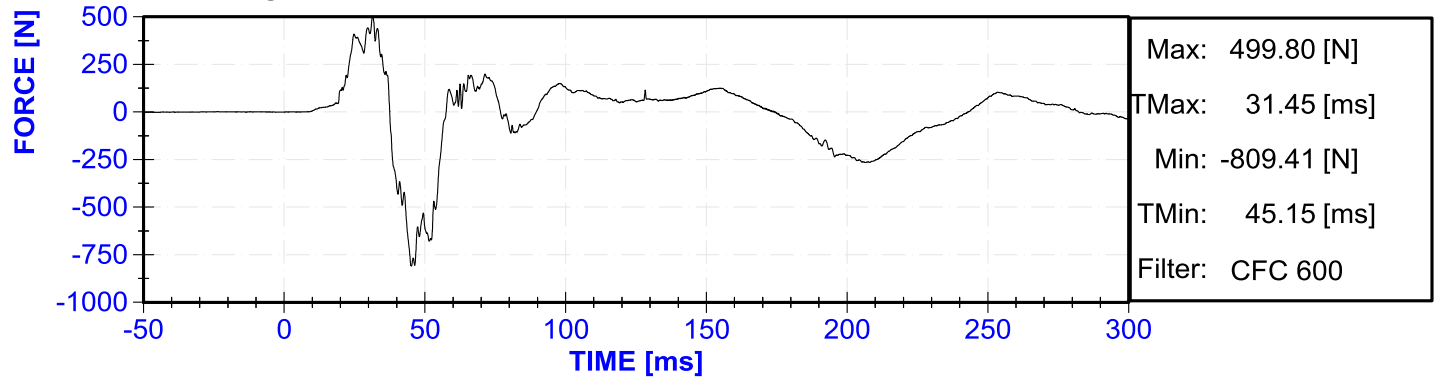
Driver Nij vs. Time Primary



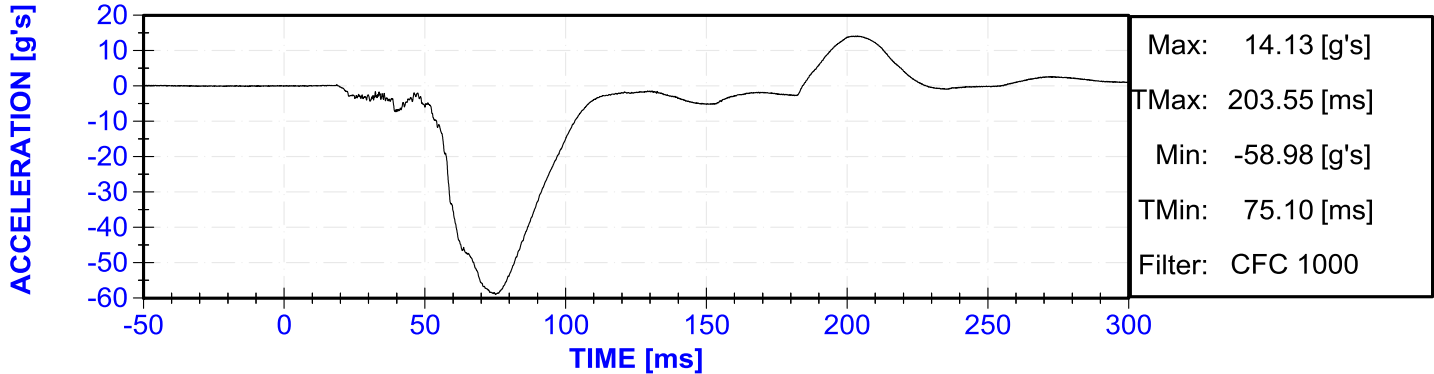
Driver Left Femur Force vs. Time

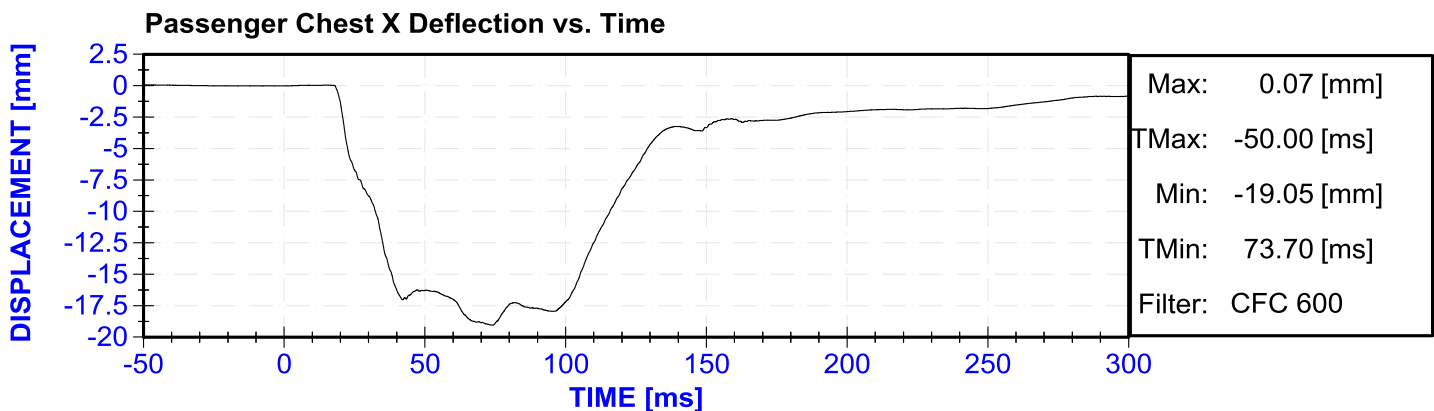
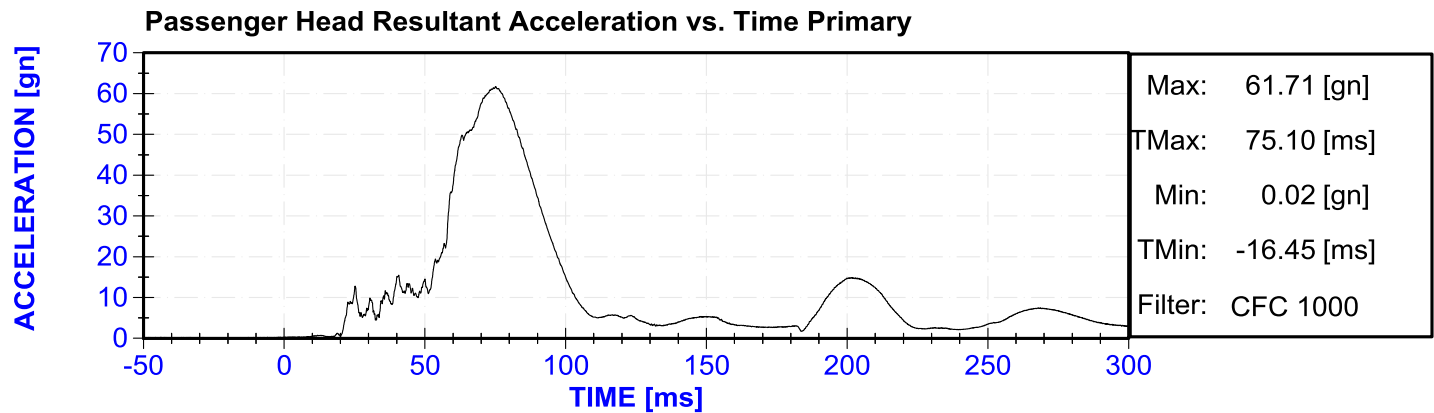
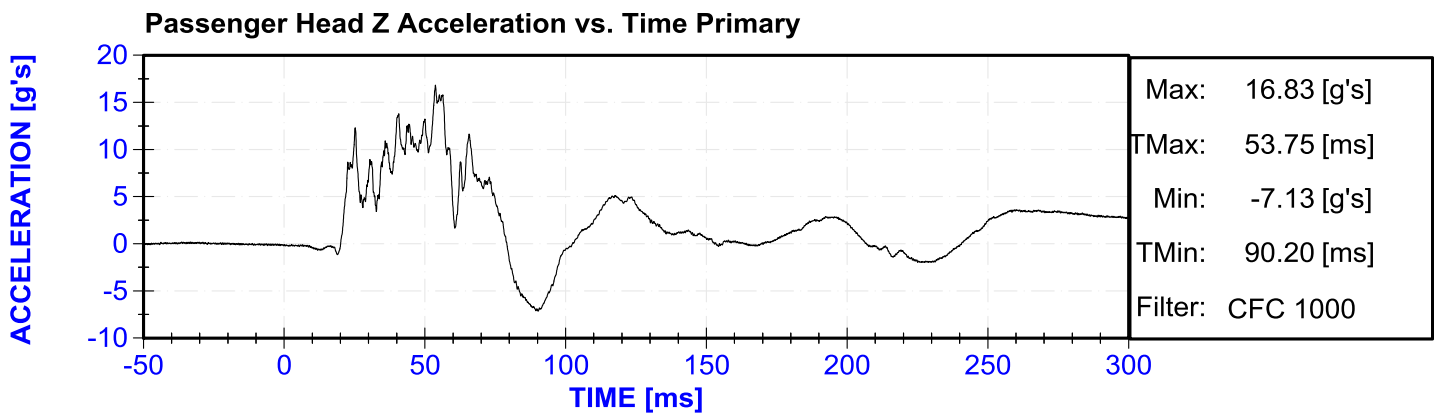
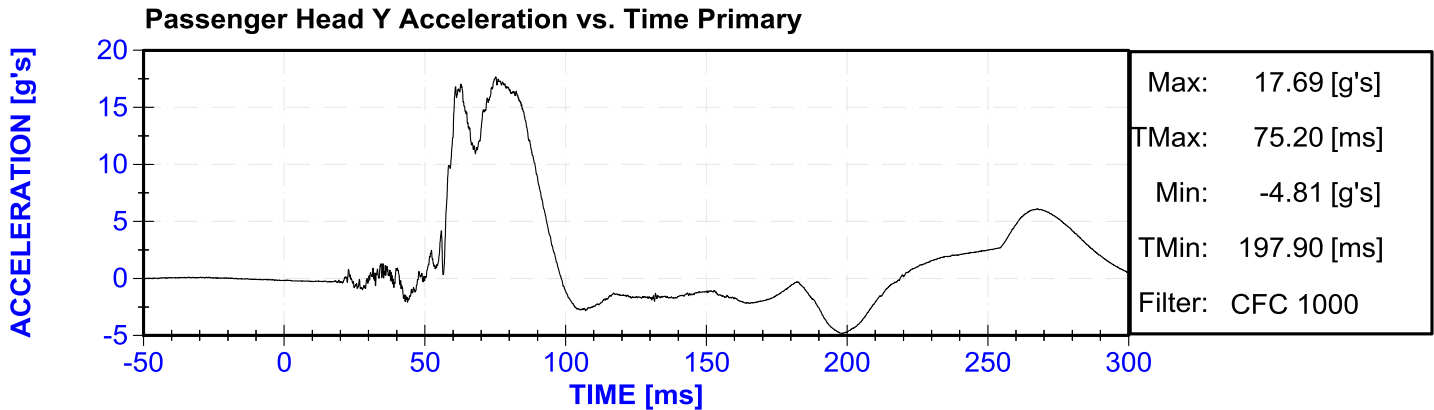


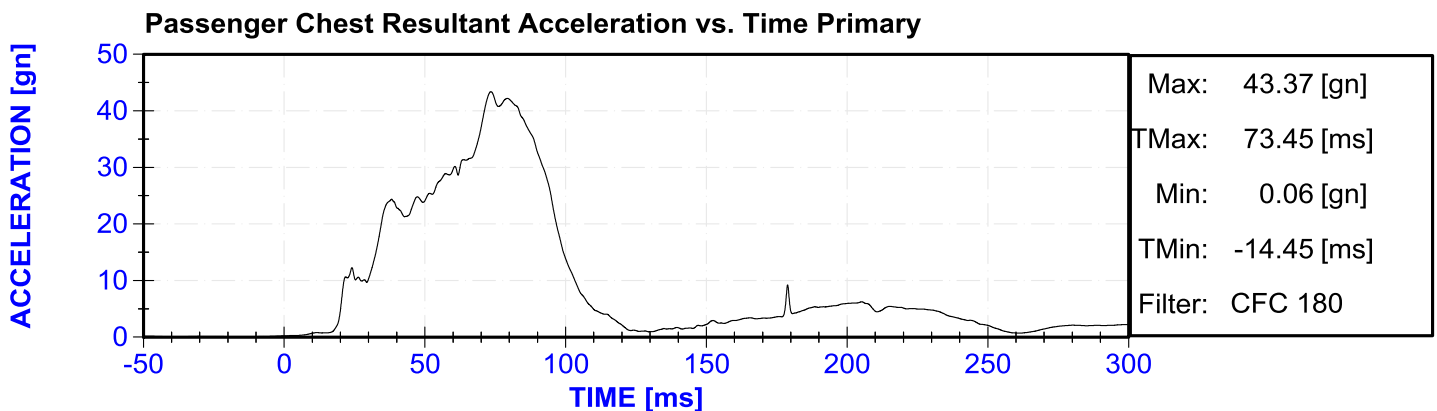
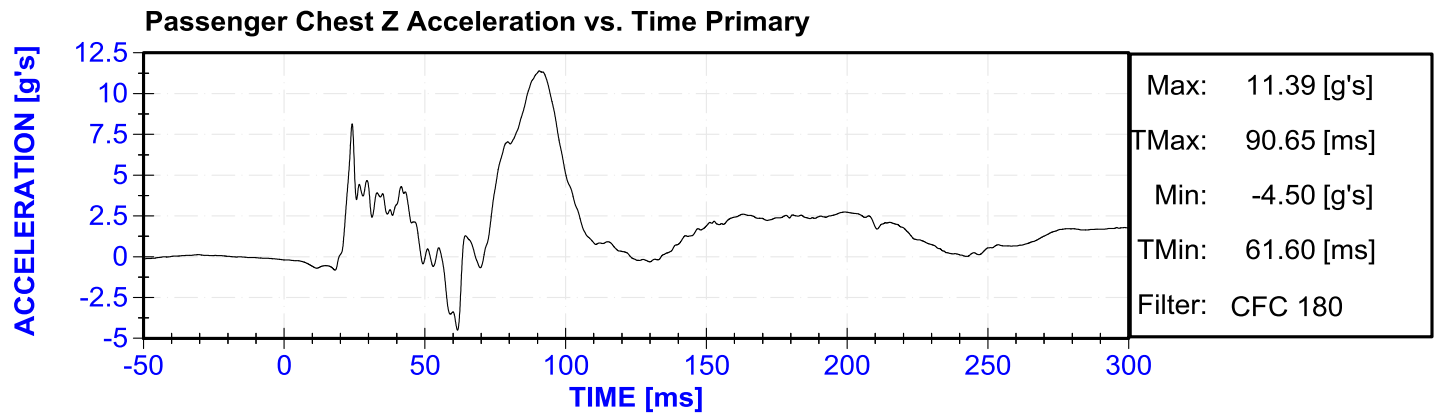
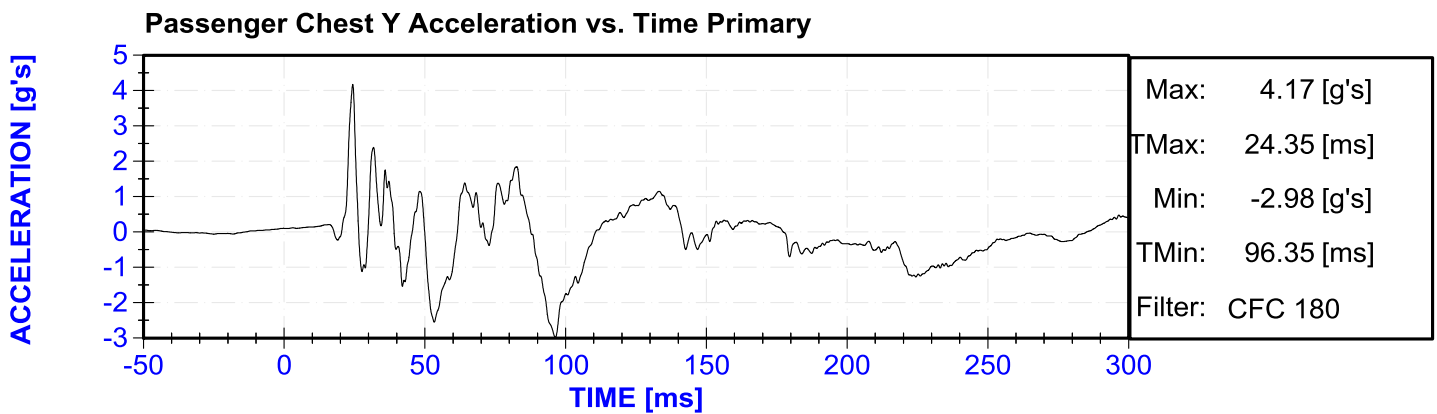
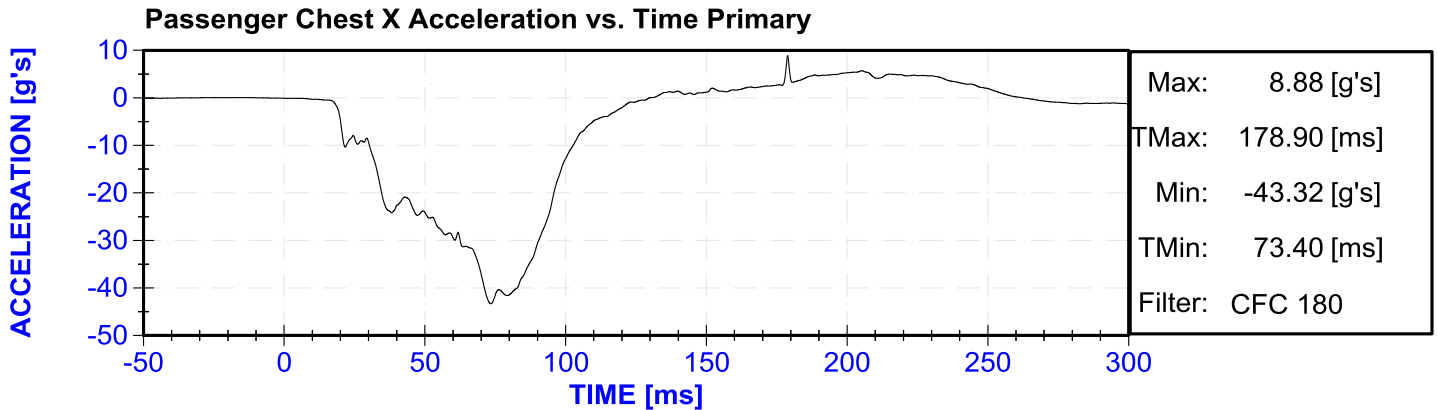
Driver Right Femur Force vs. Time

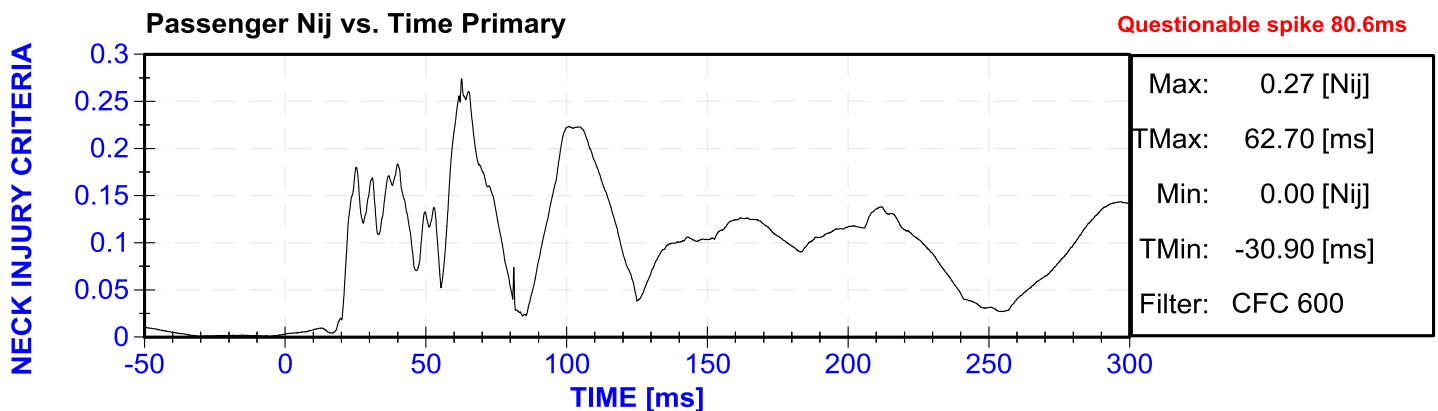
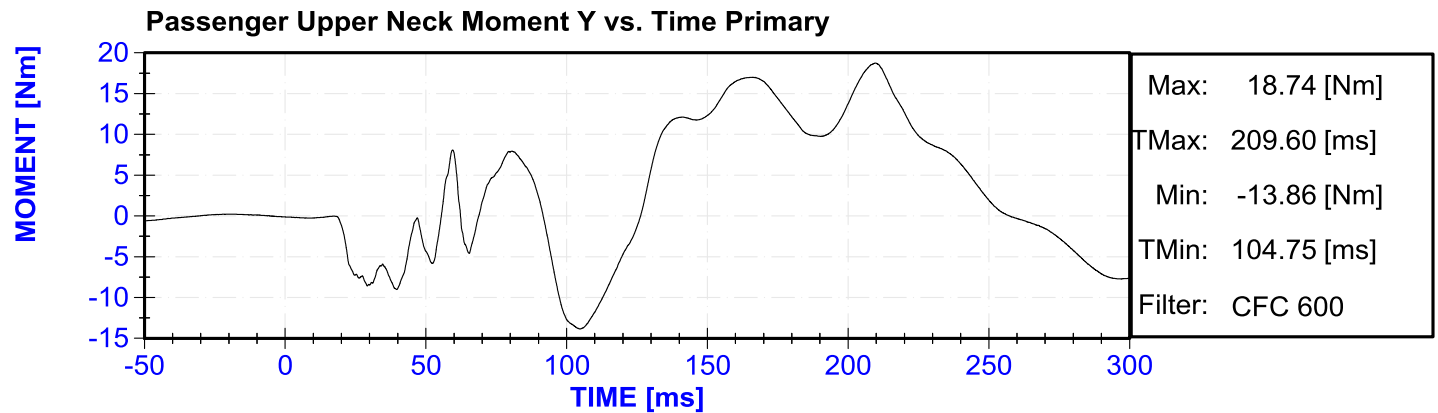
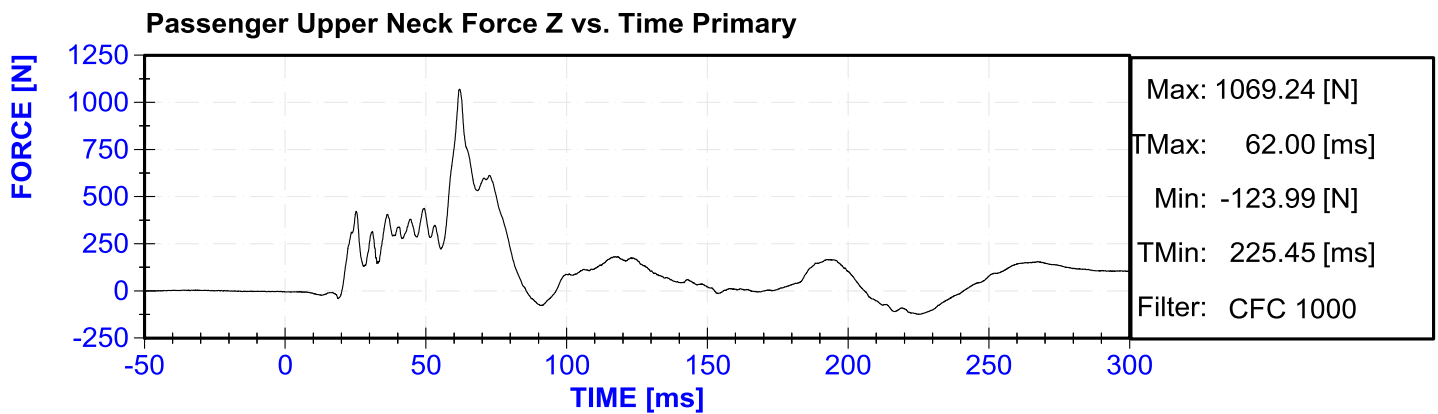
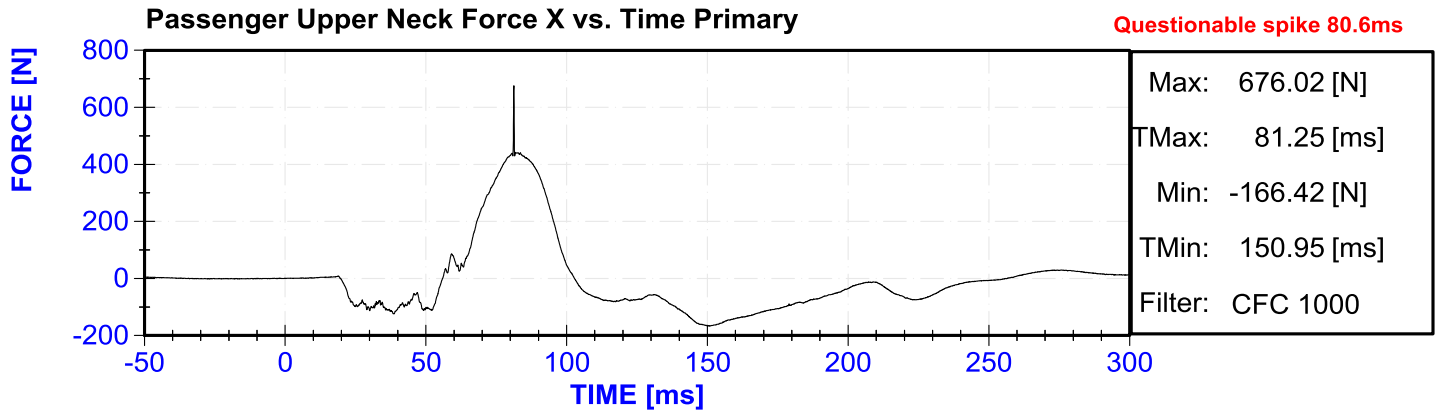


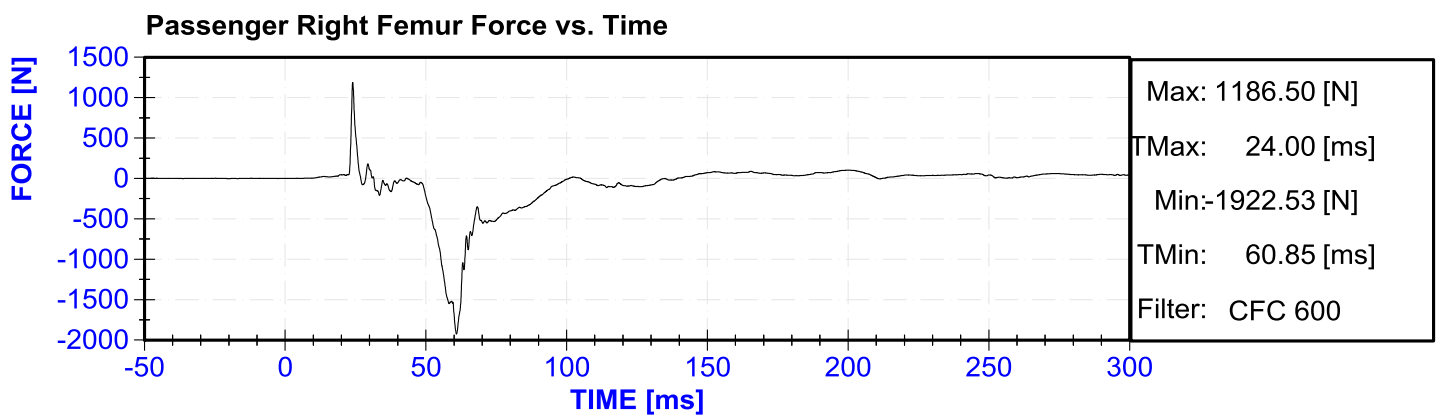
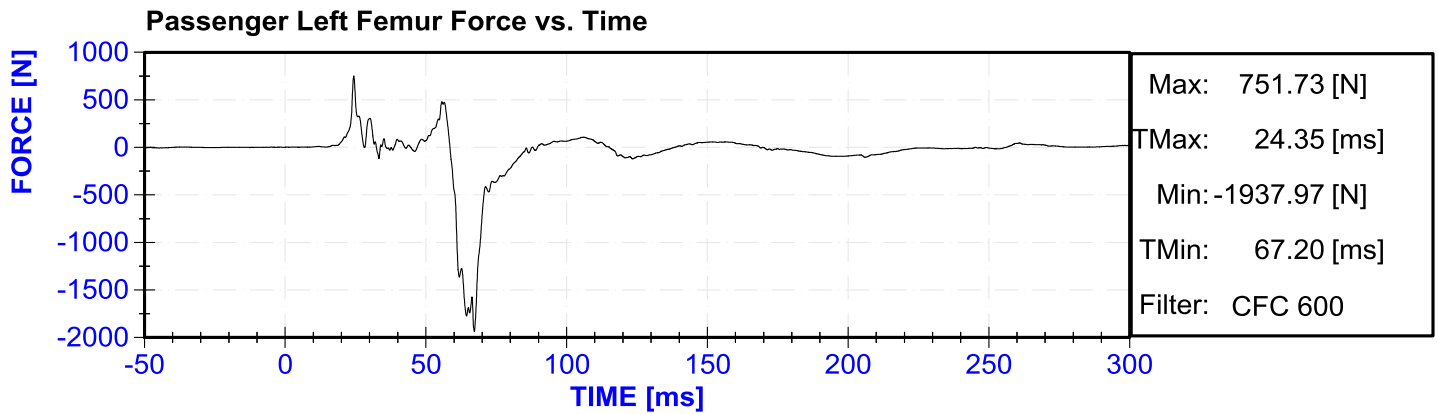
Passenger Head X Acceleration vs. Time Primary











APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

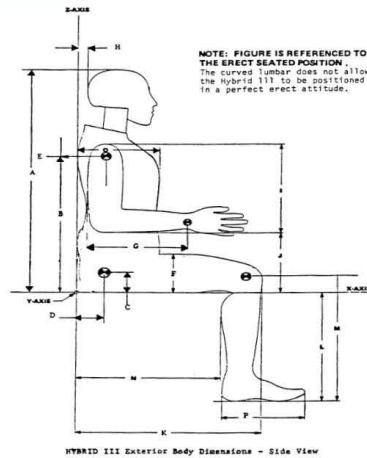
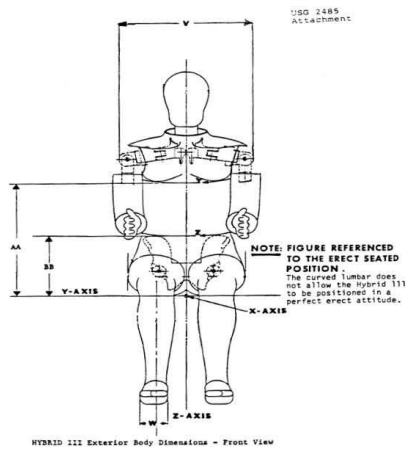


External Measurements - Hybrid 3 - 50th Male

Technician: M.Hartung

Date: 11/28/2016

Dummy Serial Number: 1046



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.7	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.5	Pass
D	H-Point from Backline	5.3	5.5	5.5	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	Pass
F	Thigh Clearance	5.5	6.1	5.8	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.8	Pass
H	Head Back to Backline	1.6	1.8	1.8	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.3	Pass
J	Elbow Rest Height	7.5	8.3	7.9	Pass
K	Buttock to Knee Length	22.8	23.8	23.3	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.4	Pass
N	Buttock Popliteal Length	17.8	18.8	18.2	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.2	Pass
V	Shoulder Breadth	16.3	17.2	16.6	Pass
W	Foot Breadth	3.6	4.2	3.9	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.1	Pass
Z	Waist Circumference	32.9	34.1	33.2	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

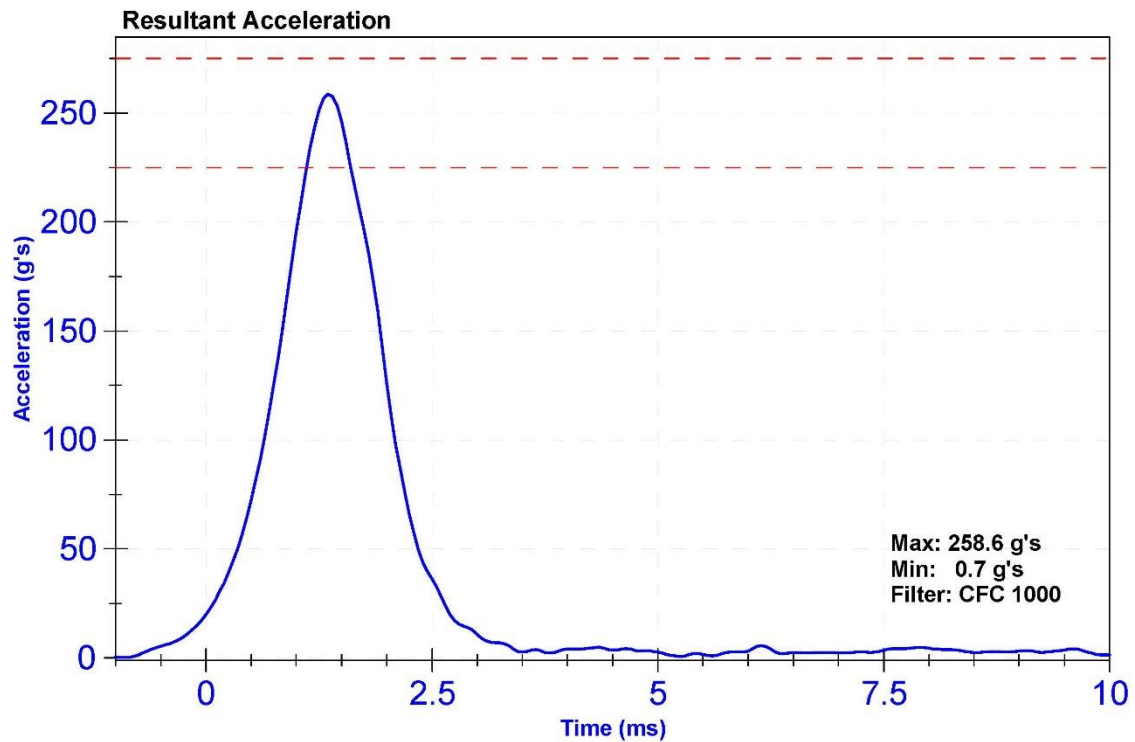
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

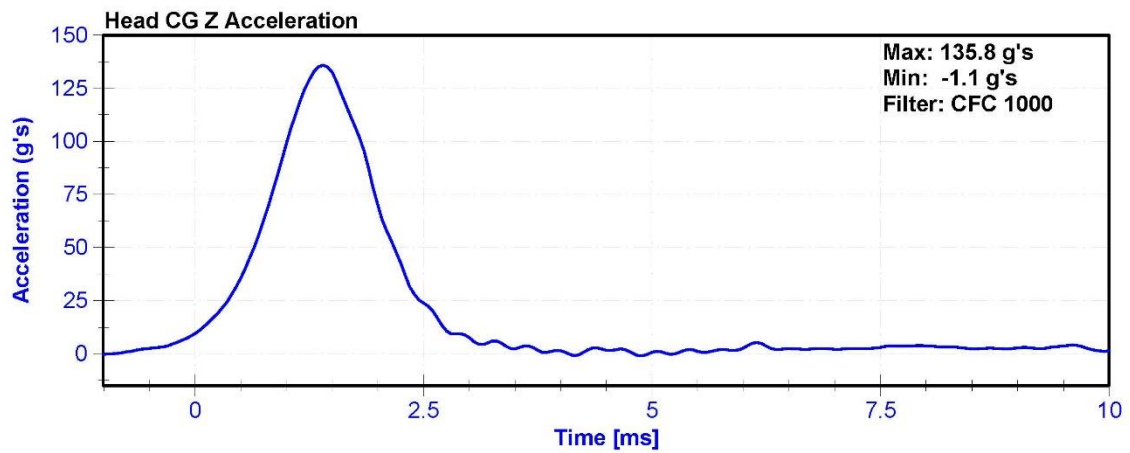
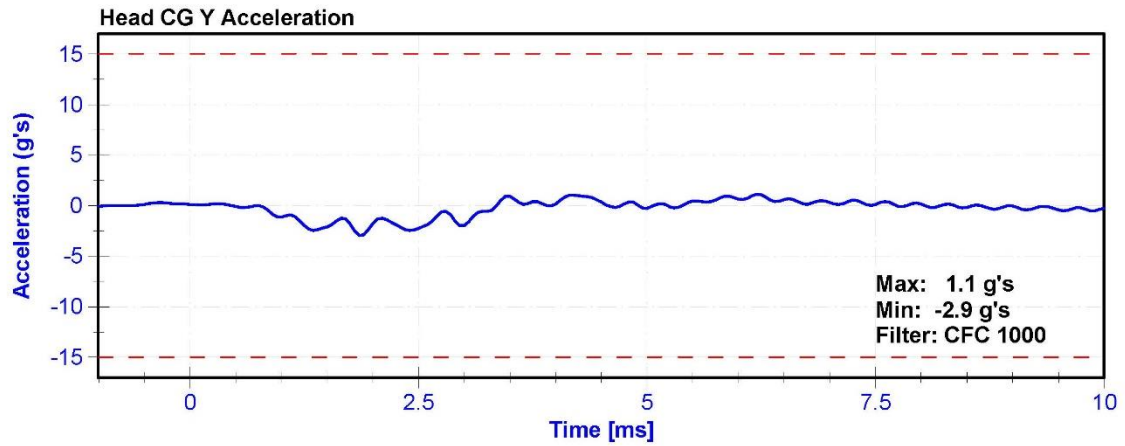
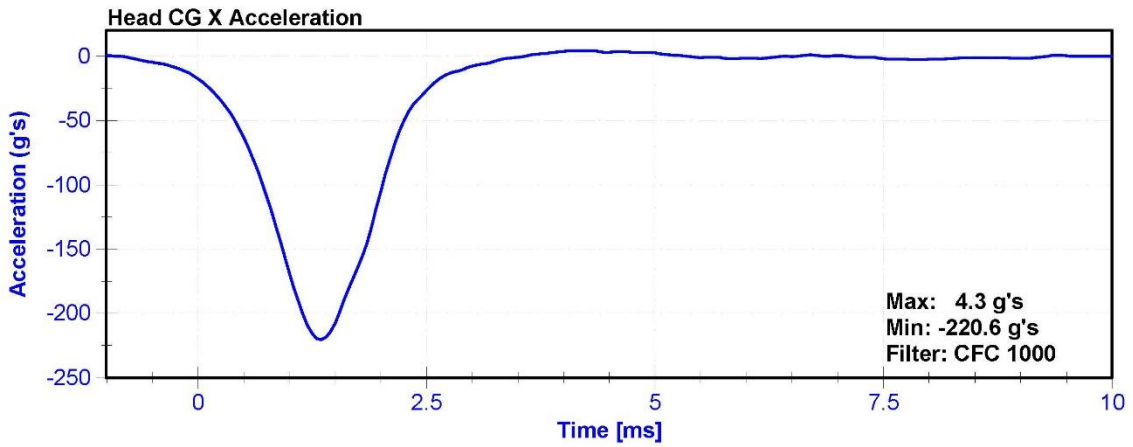
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	26.4	Pass
Resultant Acceleration	225	275	g's	258.6	Pass
Oscillation	0	10	%	2.2	Pass
Lateral Acceleration	-15	15	g's	-2.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	9/19/2016	3/20/2017
Y Accelerometer	ENDEVCO 7264	AC-P12359	9/19/2016	3/20/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	9/19/2016	3/20/2017





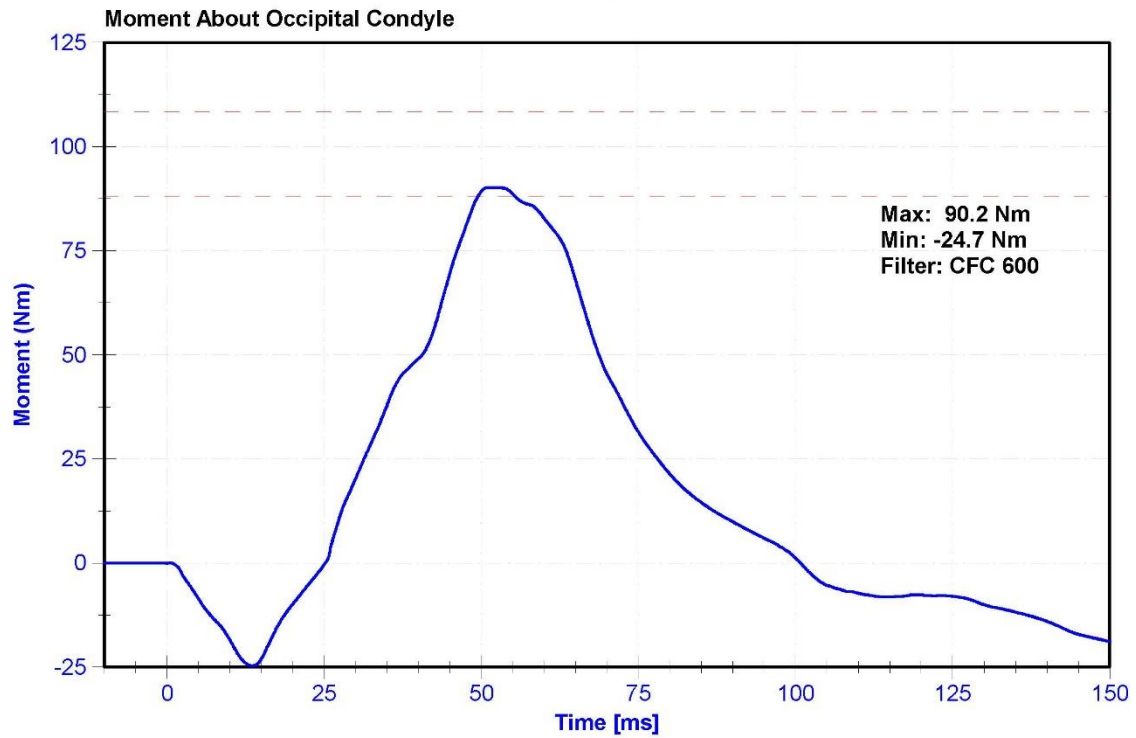
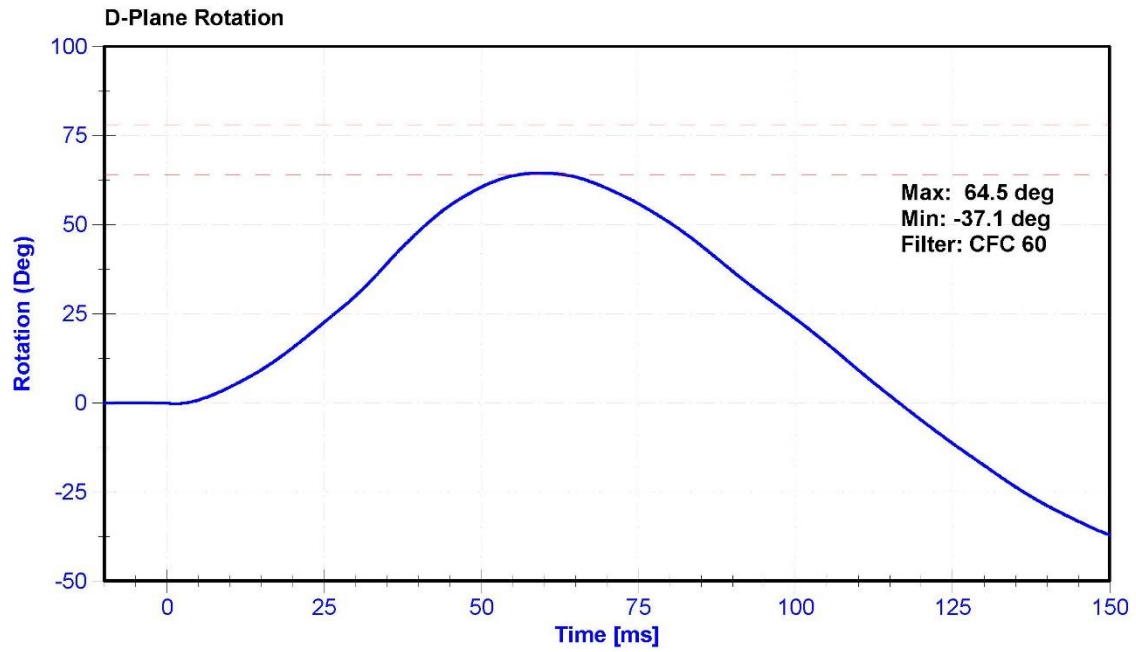
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

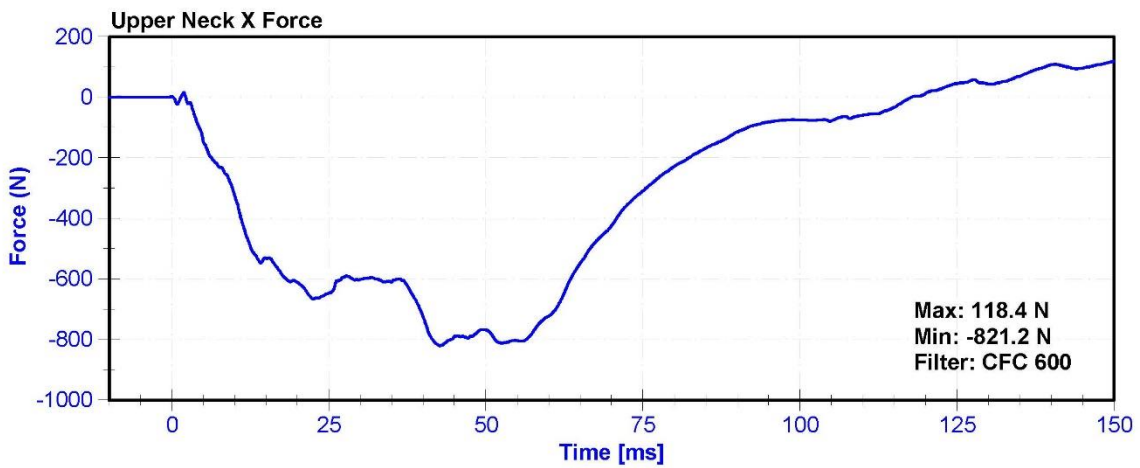
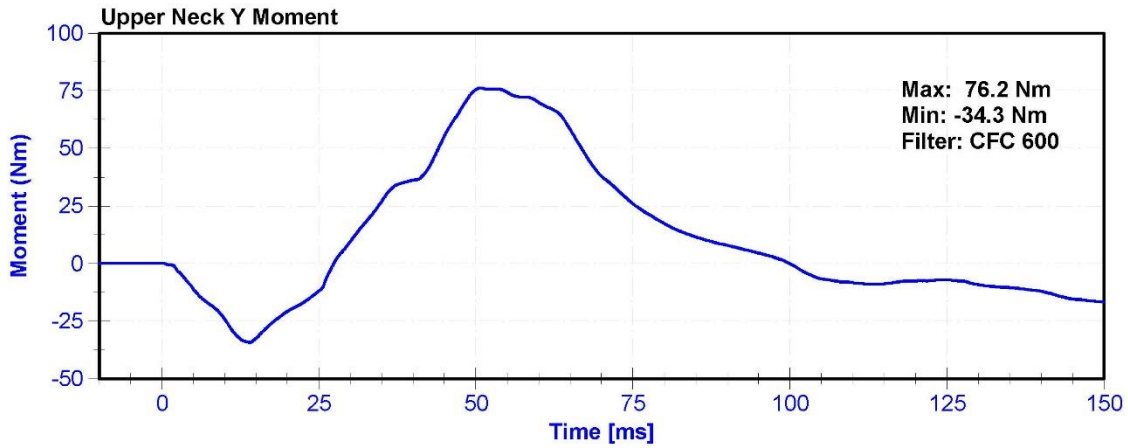
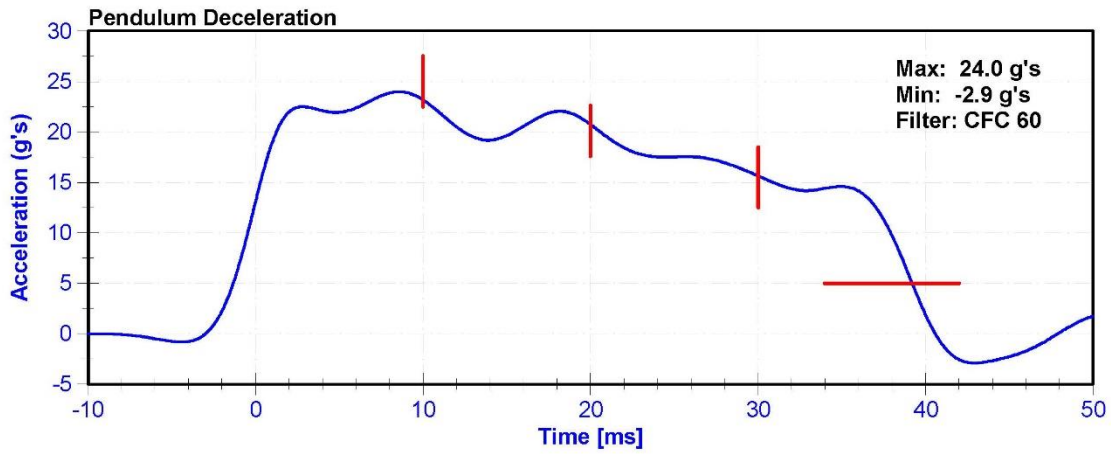
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31.8	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	23.17	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	20.74	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.64	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.0	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	39.2	Pass
Maximum D Plane Rotation	64	78	deg	64.5	Pass
Time to Maximum Rotation	57	64	ms	59.7	Pass
Rotation Decay to Zero	113	127	ms	116.6	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	90.15	Pass
Time to Maximum Moment	47	58	ms	51.1	Pass
Moment Decay to Zero	97	107	ms	100.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017





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

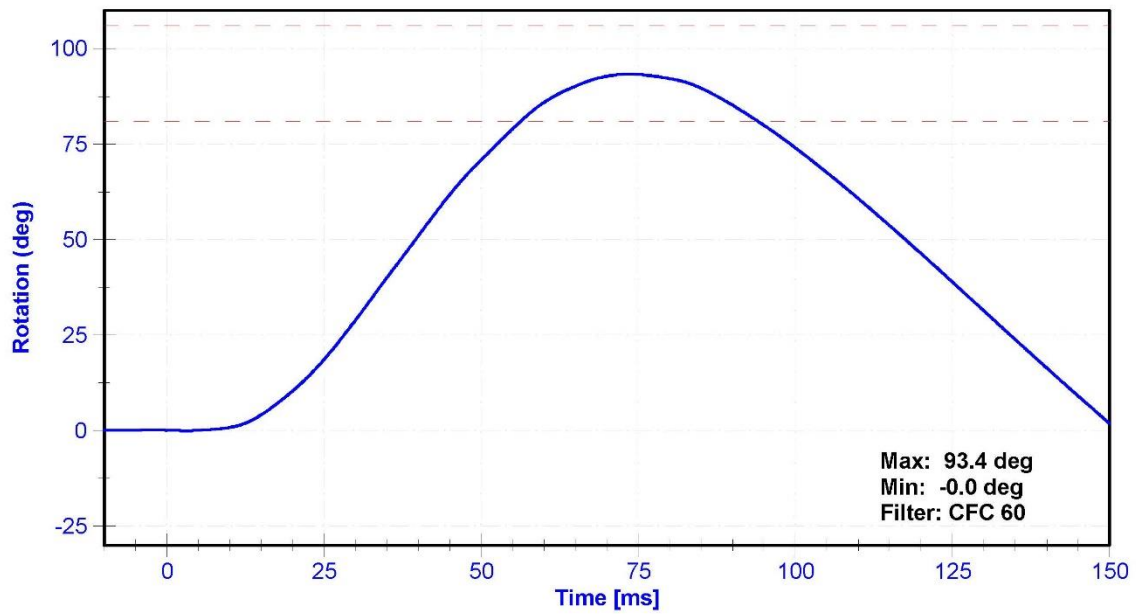
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	31	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.91	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.0	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.5	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	21.6	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	39.2	Pass
Maximum D Plane Rotation	81	106	deg	93.4	Pass
Time to Maximum Rotation	72	82	ms	73.5	Pass
Rotation Decay to Zero	147	174	ms	151.2	Pass
Minimum Moment About OC	-80	-52.9	Nm	-71.23	Pass
Time to Minimum Moment	65	79	ms	68.5	Pass
Moment Decay to Zero	120	148	ms	134.9	Pass

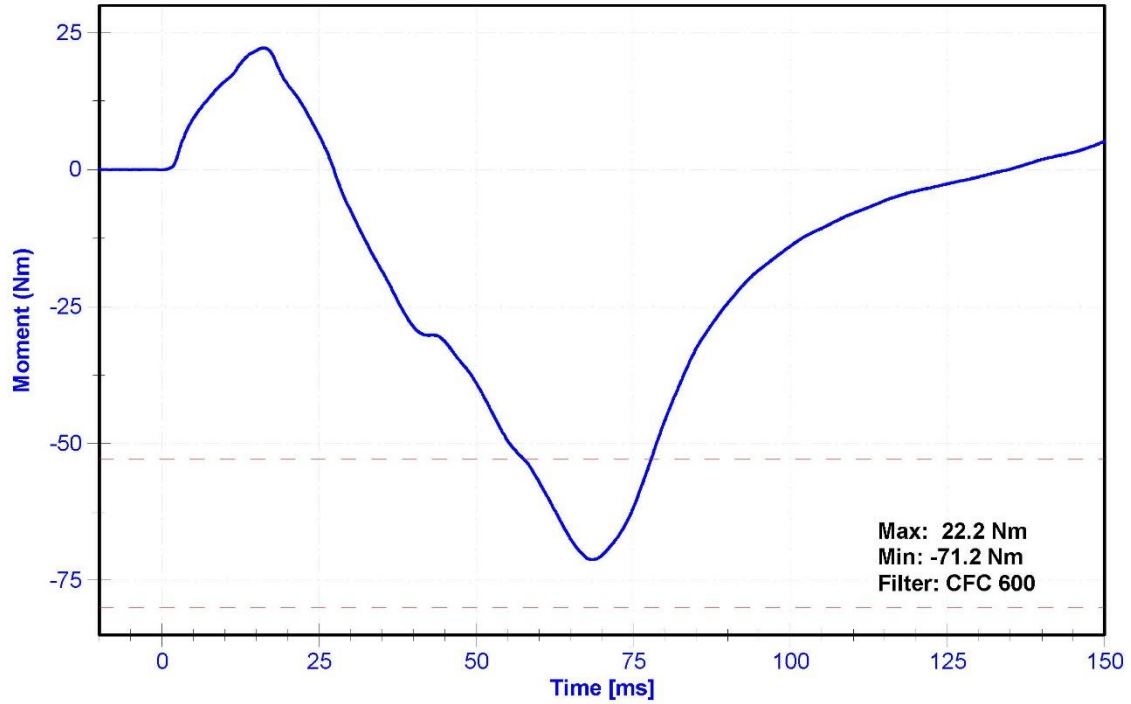
Transducer Calibrations

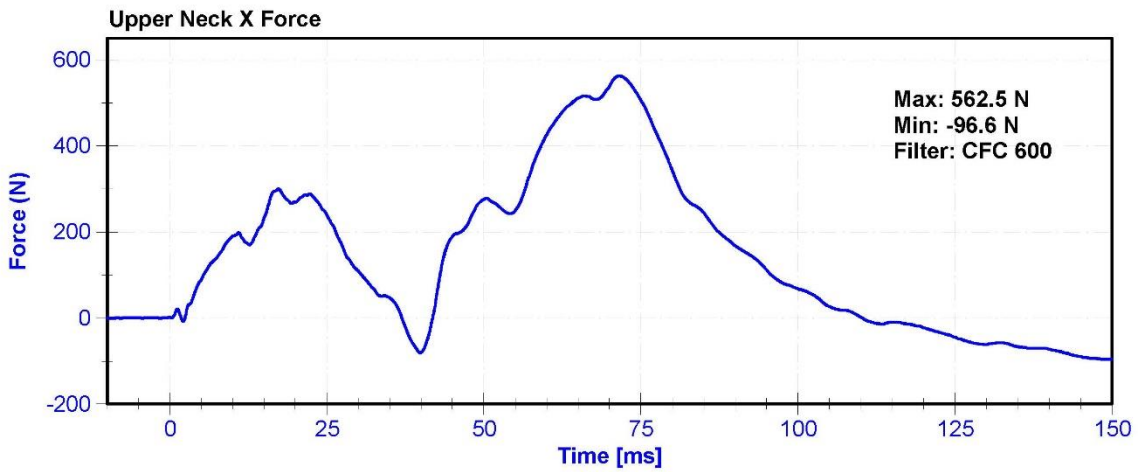
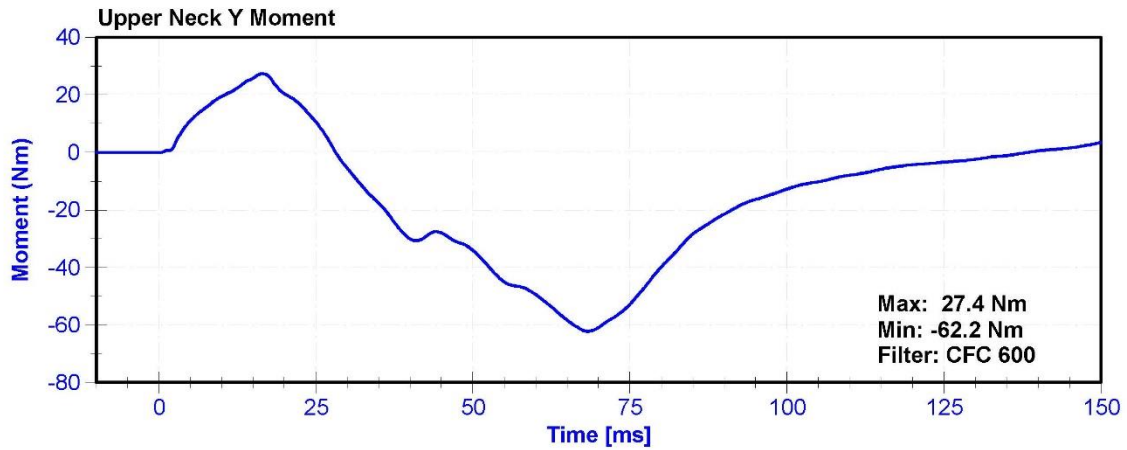
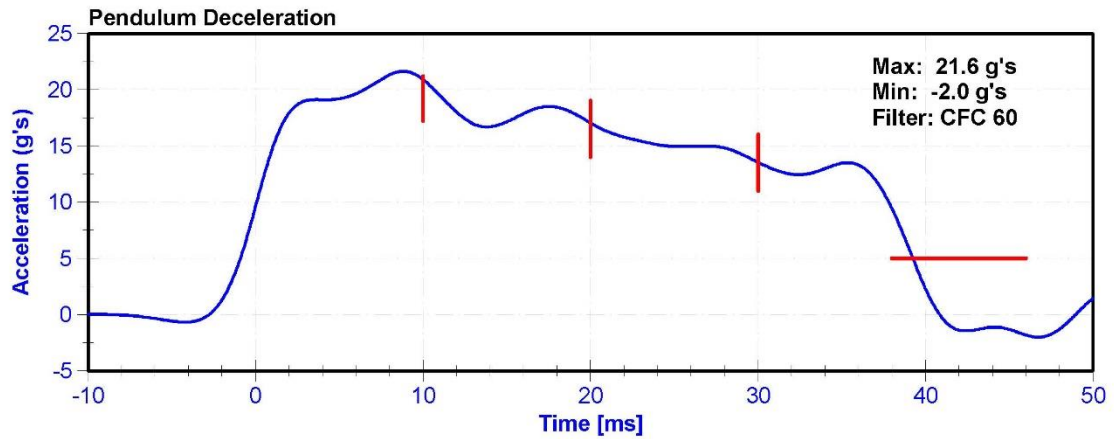
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017

D-Plane Rotation



Moment About Occipital Condyle





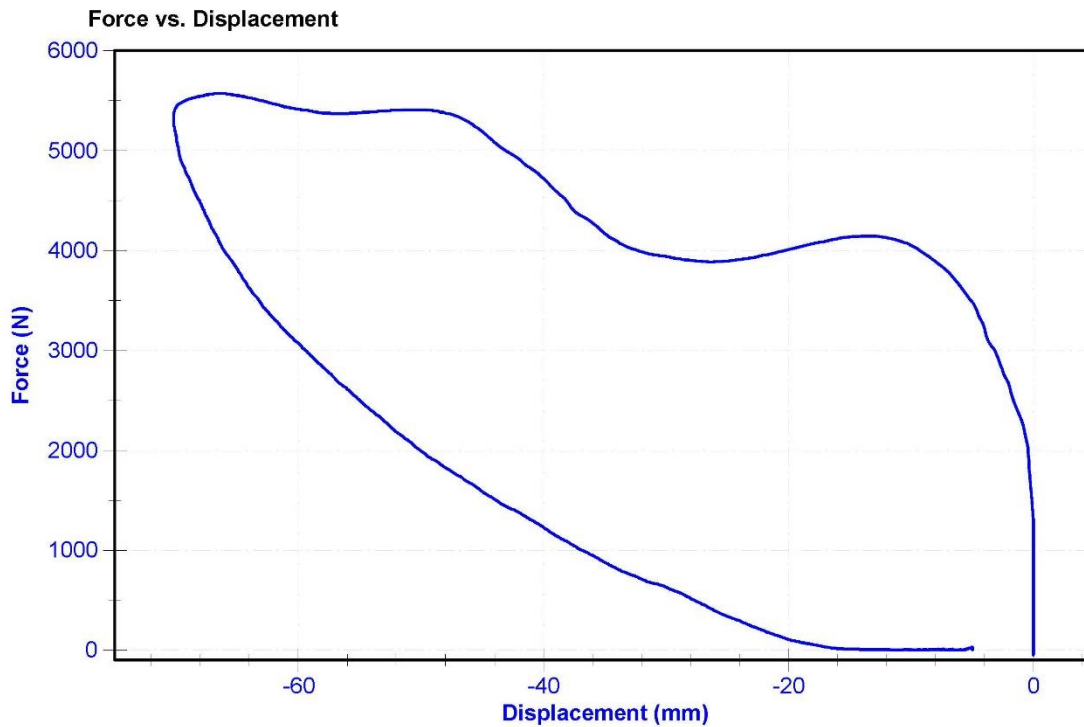
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

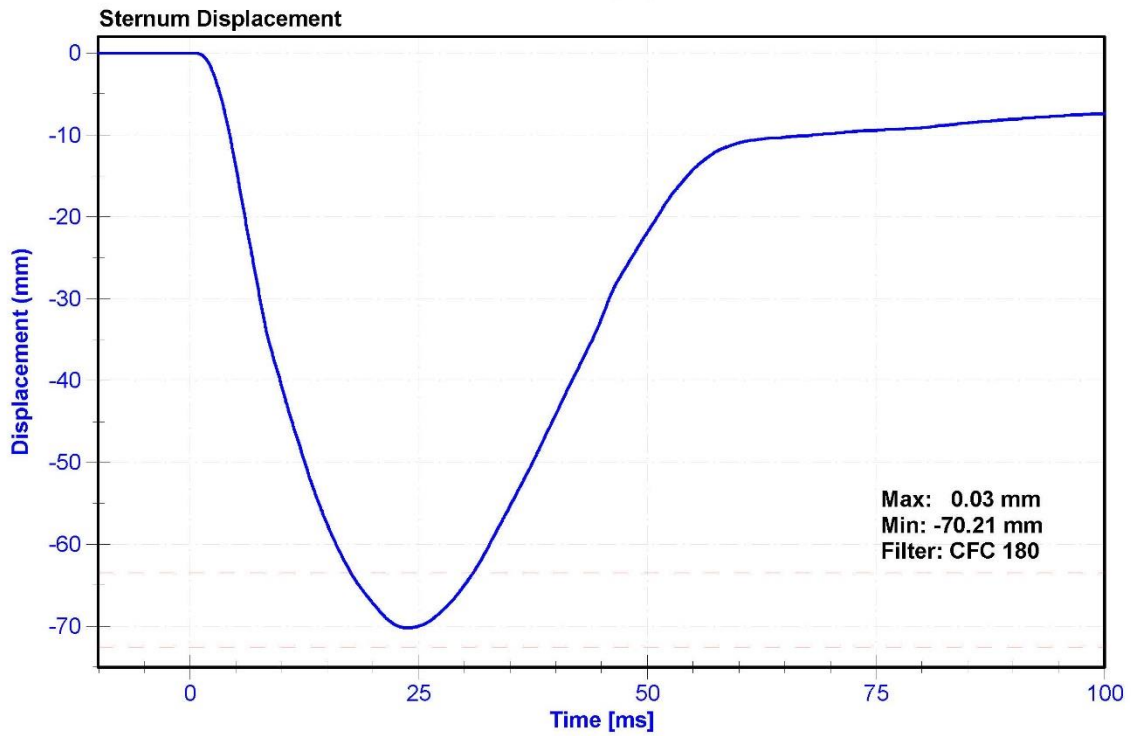
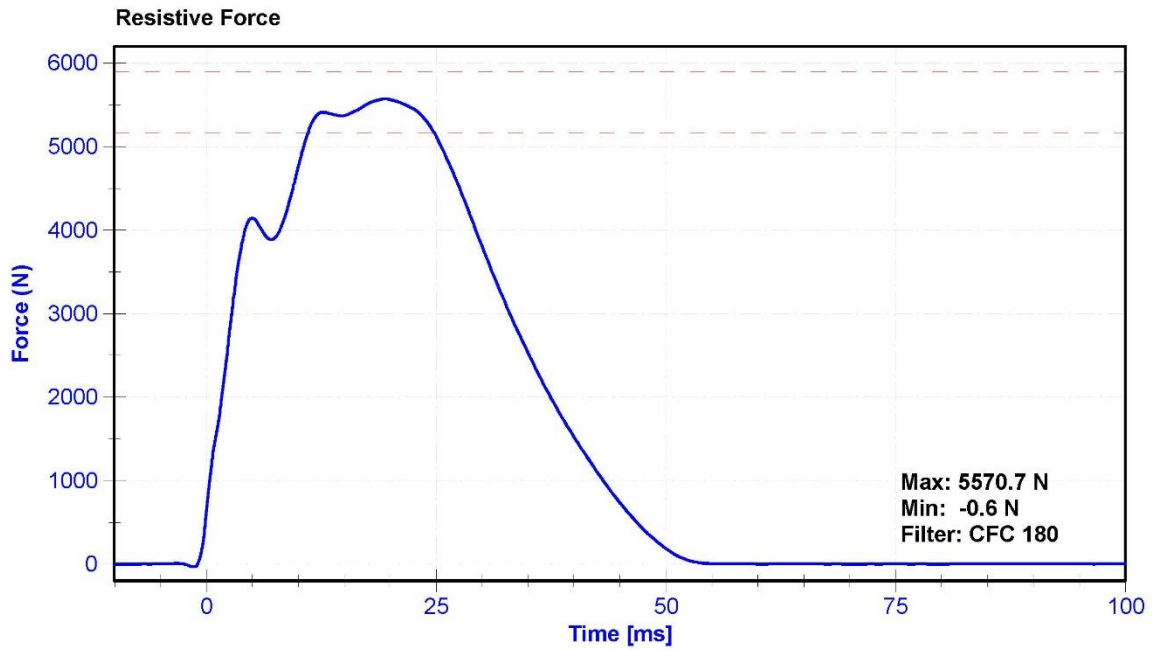
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	27.7	Pass
Velocity	6.59	6.83	m/s	6.670	Pass
Chest Displacement	-72.6	-63.5	mm	-70.21	Pass
Resistive Force	5160	5894	N	5570.7	Pass
Hysteresis	65	85	%	70.4	Pass

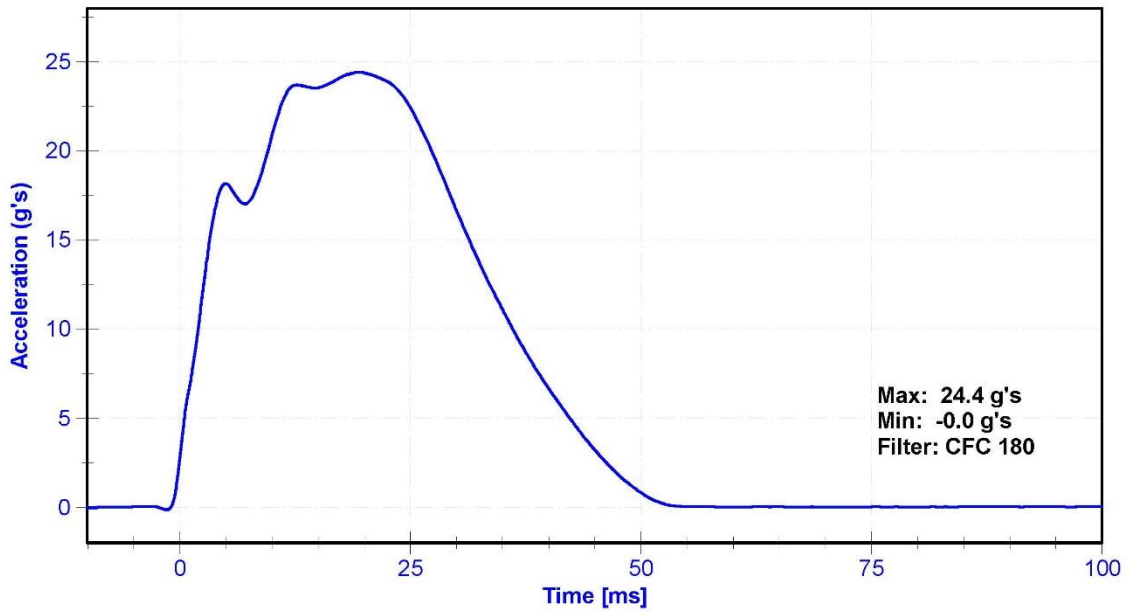
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	Servo 14CB1-2897	DS-1046	9/19/2016	9/19/2017

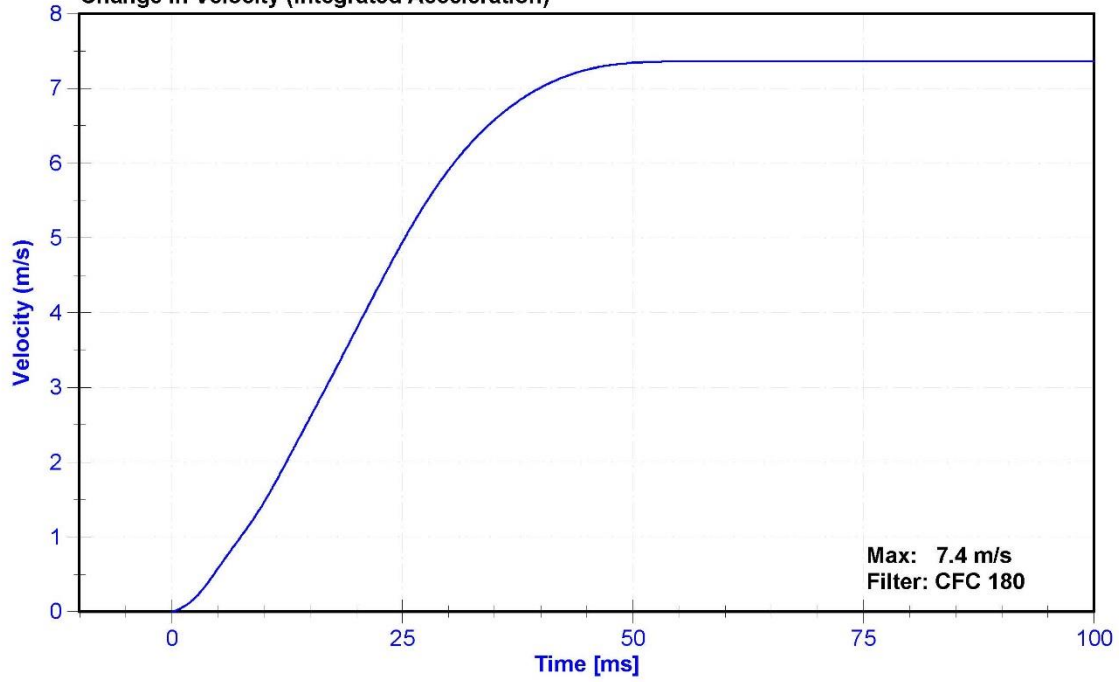




Probe Acceleration



Change in Velocity (Integrated Acceleration)



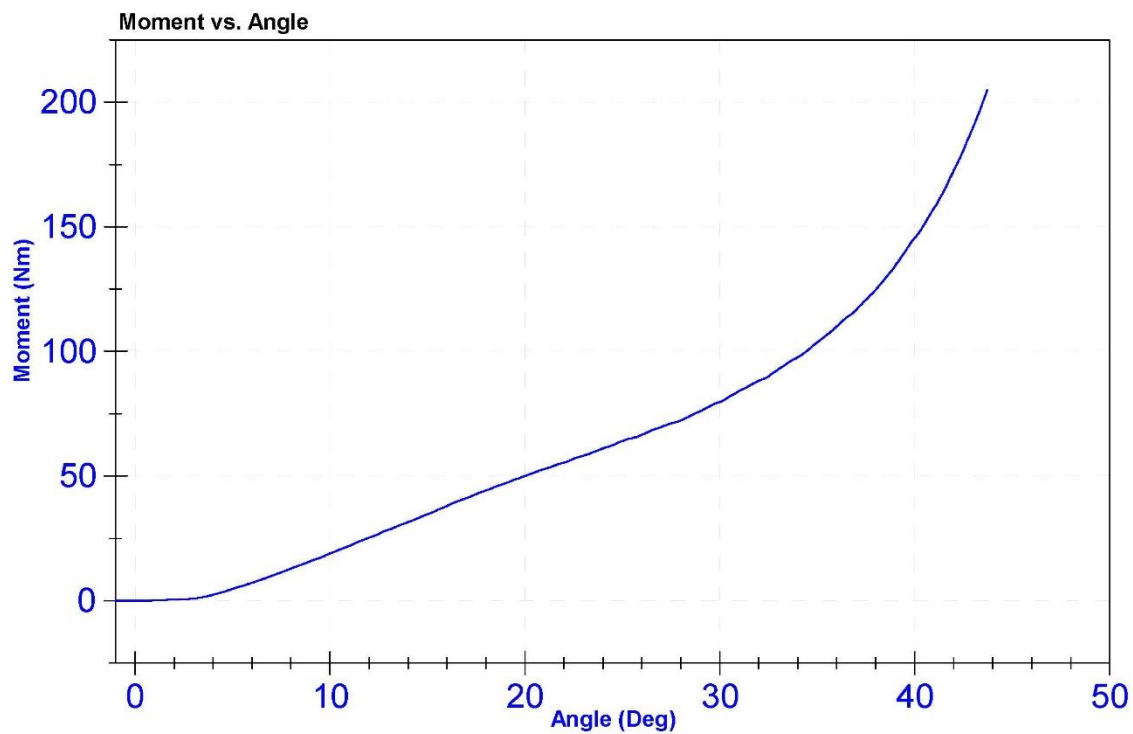
ATD Manufacturer	FTSS	Test Technician	S Keller
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.9	Pass
Humidity	10	70	%	26.5	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.6	Pass
Moment at 30 degrees	0	94.9	Nm	79.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



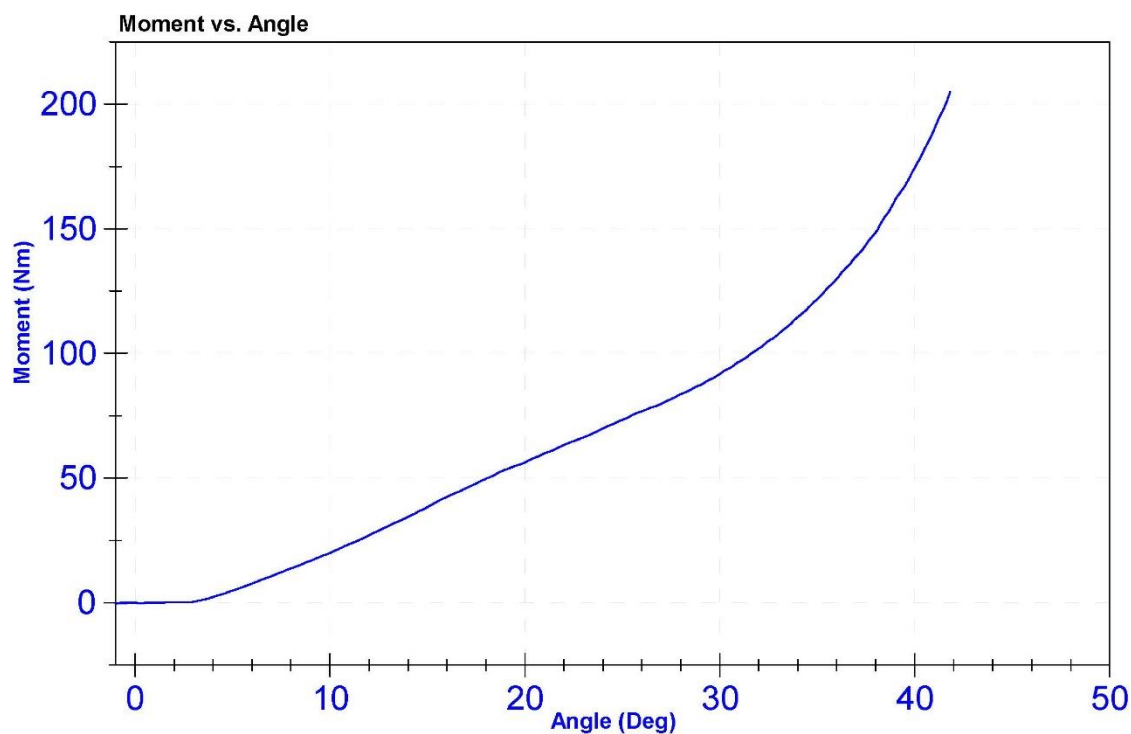
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	26.4	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	41.7	Pass
Moment at 30 degrees	0	94.9	Nm	91.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



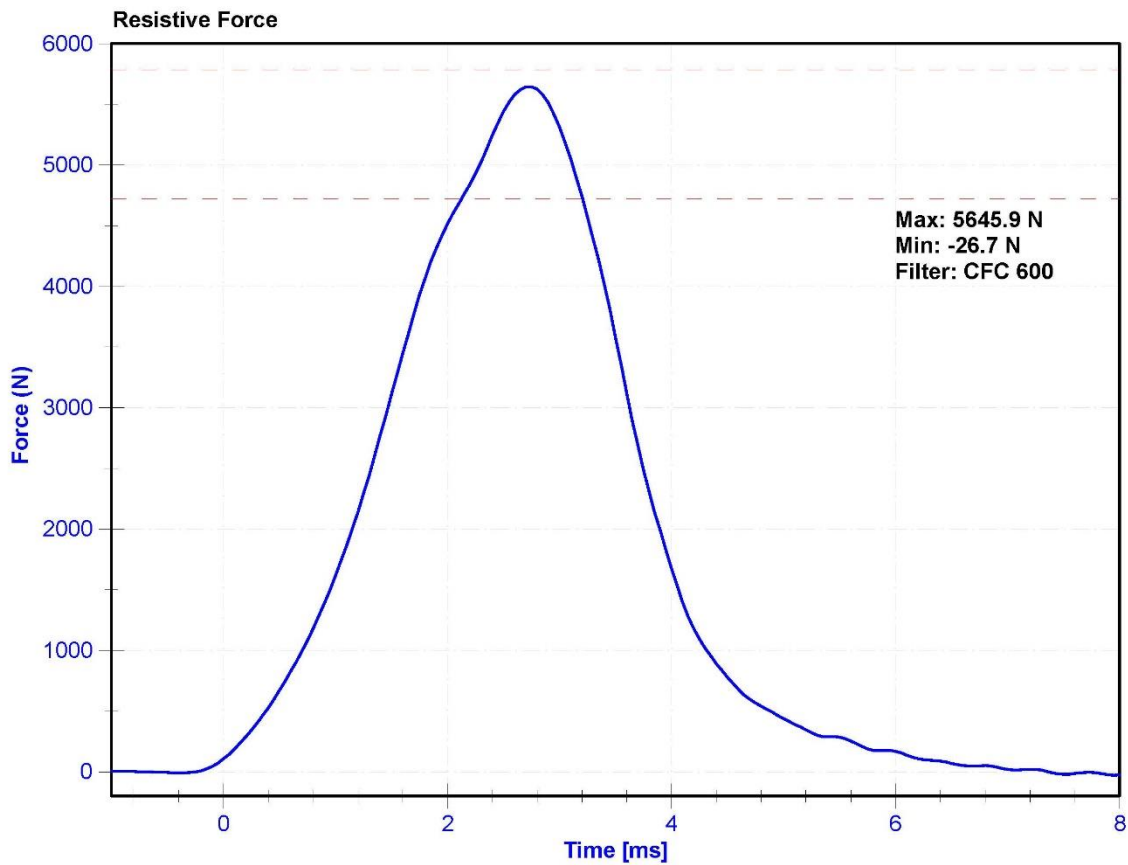
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

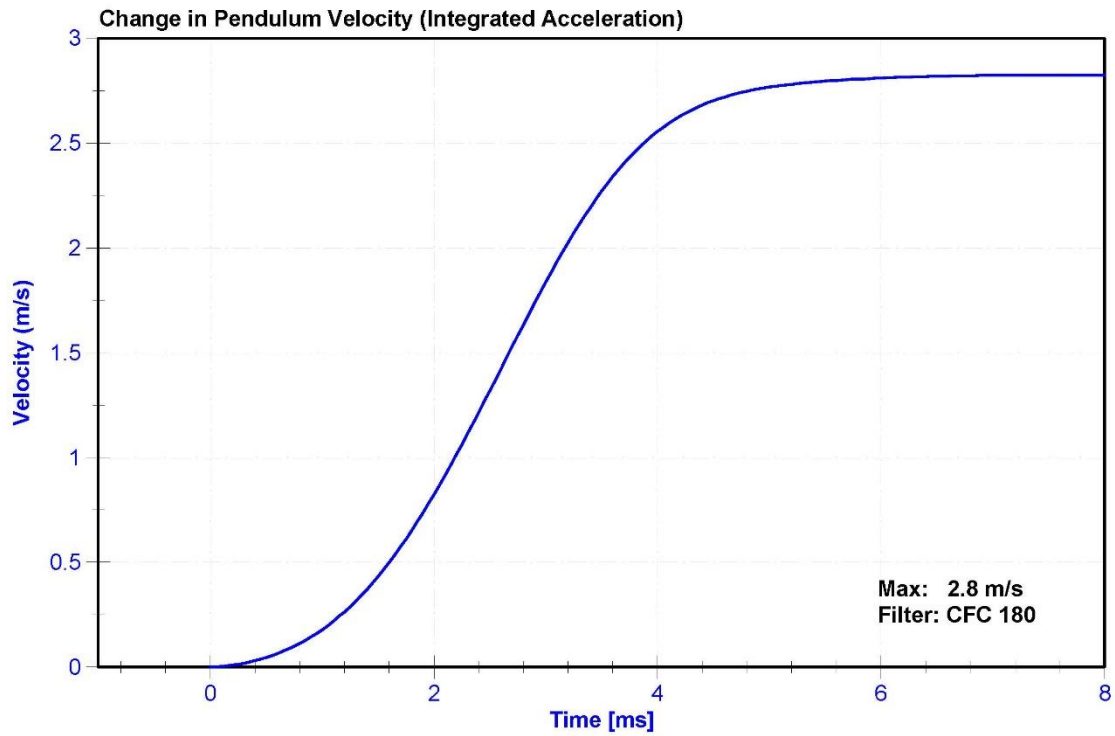
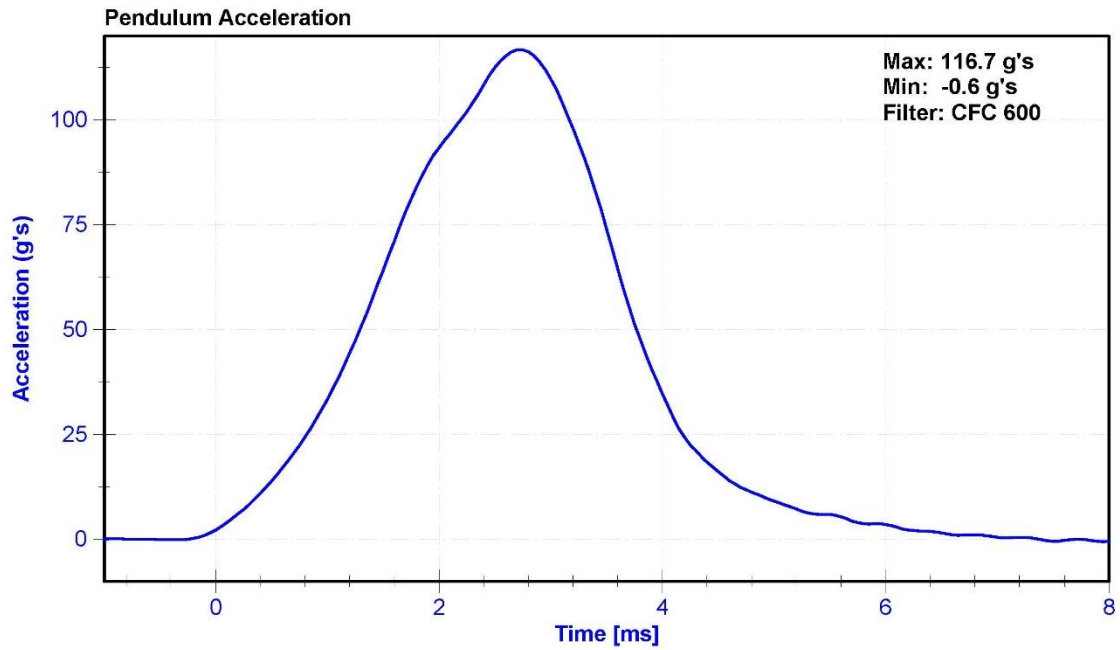
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	22.5	Pass
Velocity	2.07	2.13	m/s	2.098	Pass
Maximum Resistive Force	4720	5780	N	5645.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





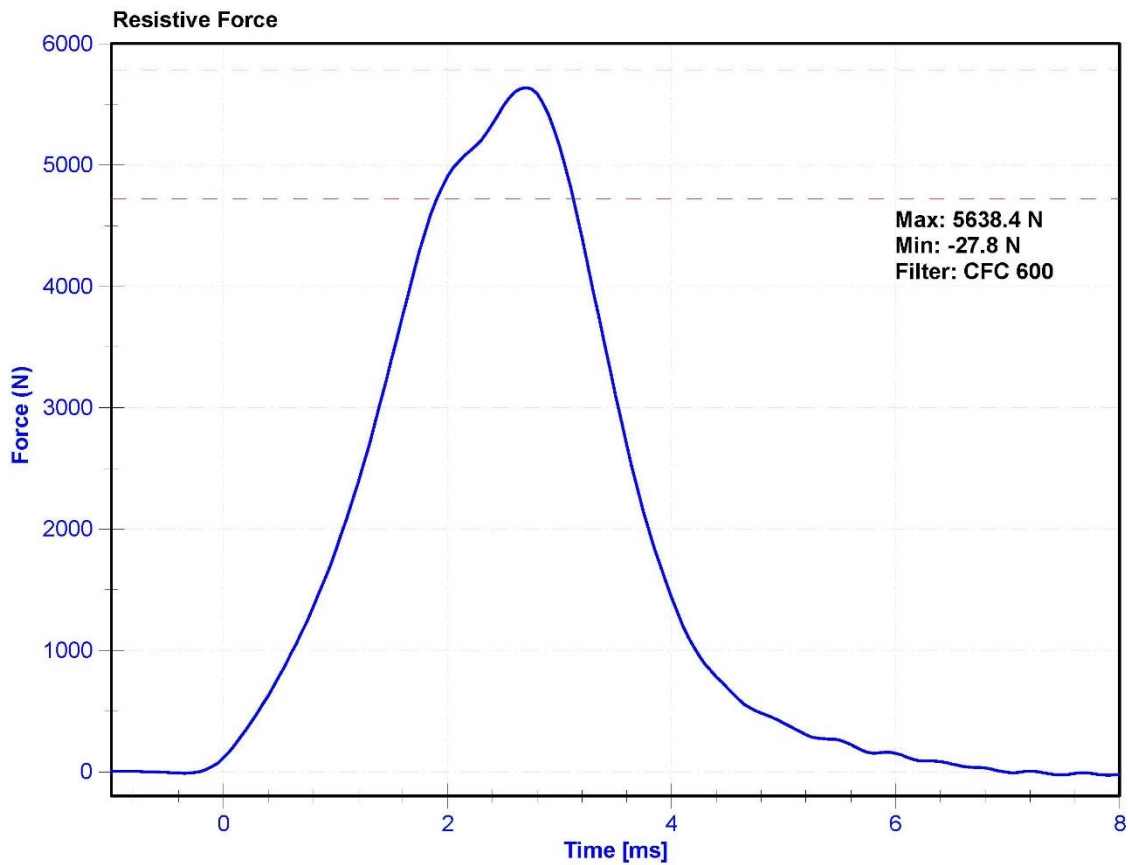
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

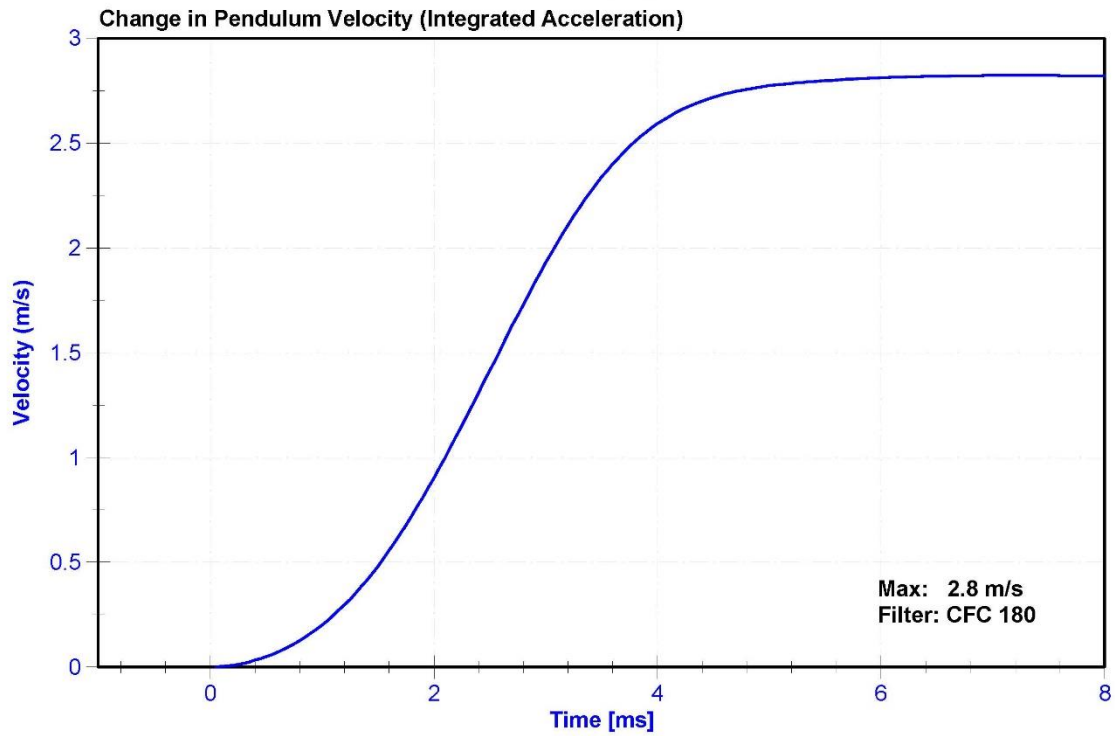
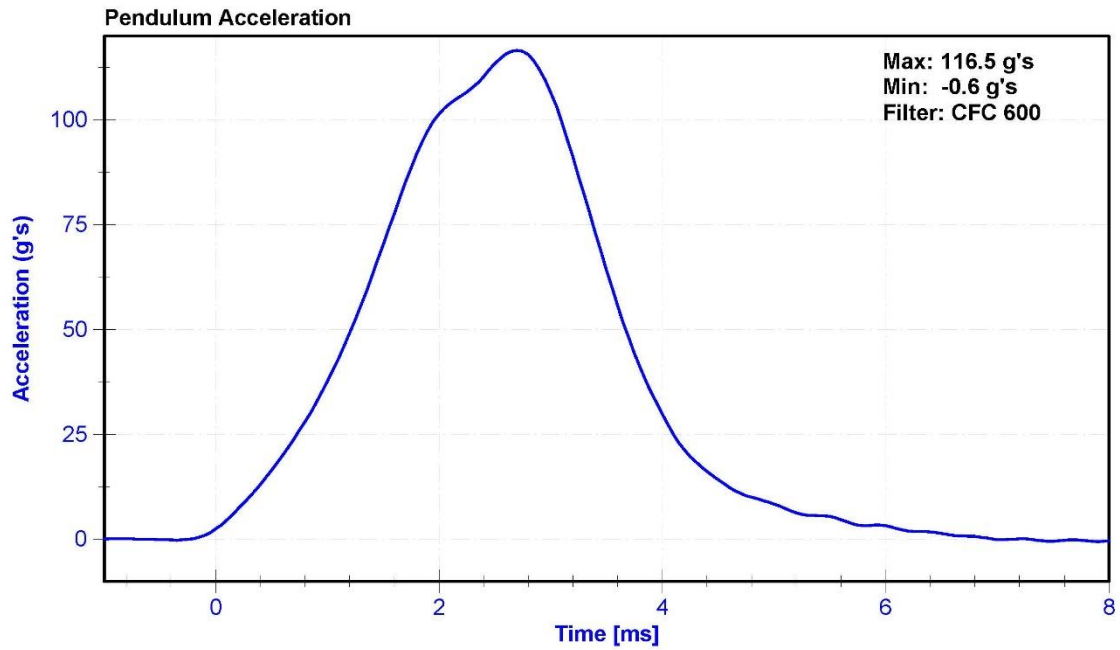
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	23.1	Pass
Velocity	2.07	2.13	m/s	2.099	Pass
Maximum Resistive Force	4720	5780	N	5638.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE - PASSENGER ATD

SERIAL NO: 288

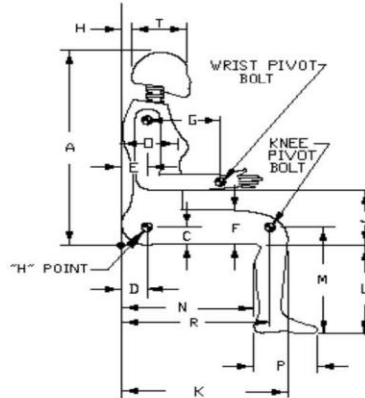
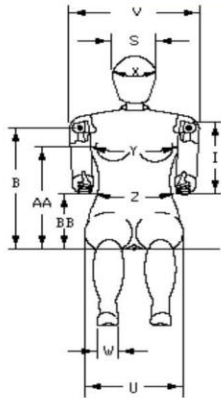


External Measurements - Hybrid 3 - 5th Female

Technician: M. Goehle

Date: 11/29/2016

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	780	Pass
B	Shoulder Pivot Height	432	457	440	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	147	Pass
E	Shoulder Pivot from Backline	69	84	76	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	250	Pass
H	Head Back to Backline	43	48	46	Pass
I	Shoulder to Elbow Length	277	297	283	Pass
J	Elbow Rest Height	183	203	188	Pass
K	Buttock to Knee Length	521	546	538	Pass
L	Popliteal Height	356	376	363	Pass
M	Knee Pivot Height	394	419	398	Pass
N	Buttock Popliteal Length	414	439	429	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	180	Pass
U	Hip Breadth	300	315	304	Pass
V	Shoulder Breadth	351	366	362	Pass
W	Foot Breadth	79	94	84	Pass
X	Head Circumference	528	549	536	Pass
Y	Chest Circumference with Jacket	851	881	853	Pass
Z	Waist Circumference	460	790	782	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

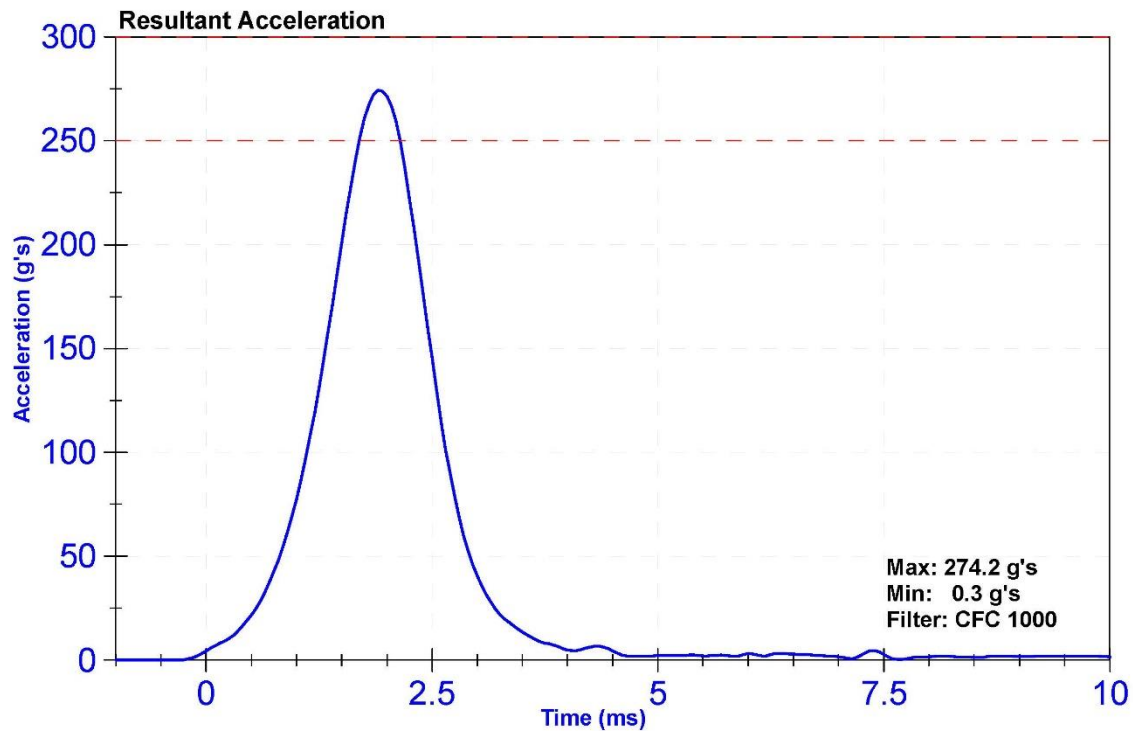
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

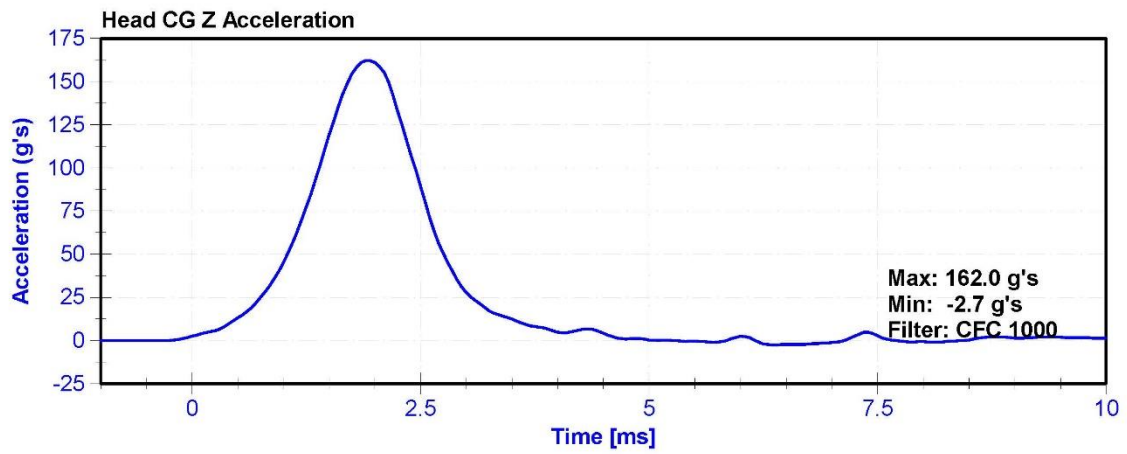
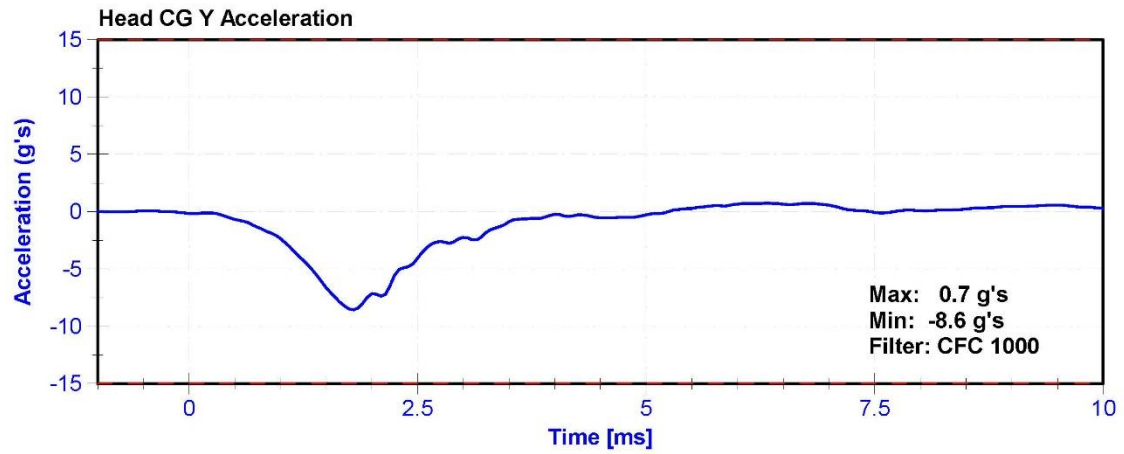
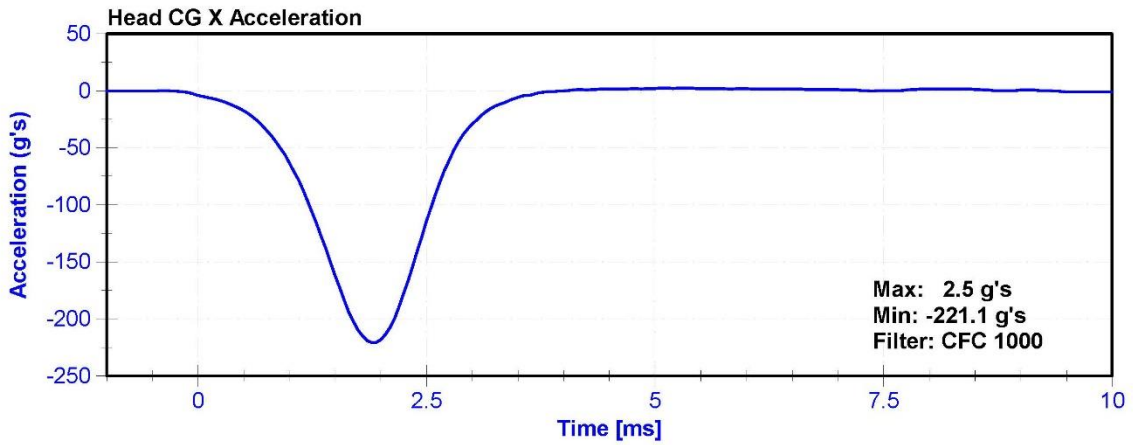
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	26.7	Pass
Resultant Acceleration	250	300	g's	274.2	Pass
Oscillation	0	10	%	2.4	Pass
Lateral Acceleration	-15	15	g's	-8.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	10/3/2016	4/3/2017
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	10/3/2016	4/3/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/3/2016	4/3/2017





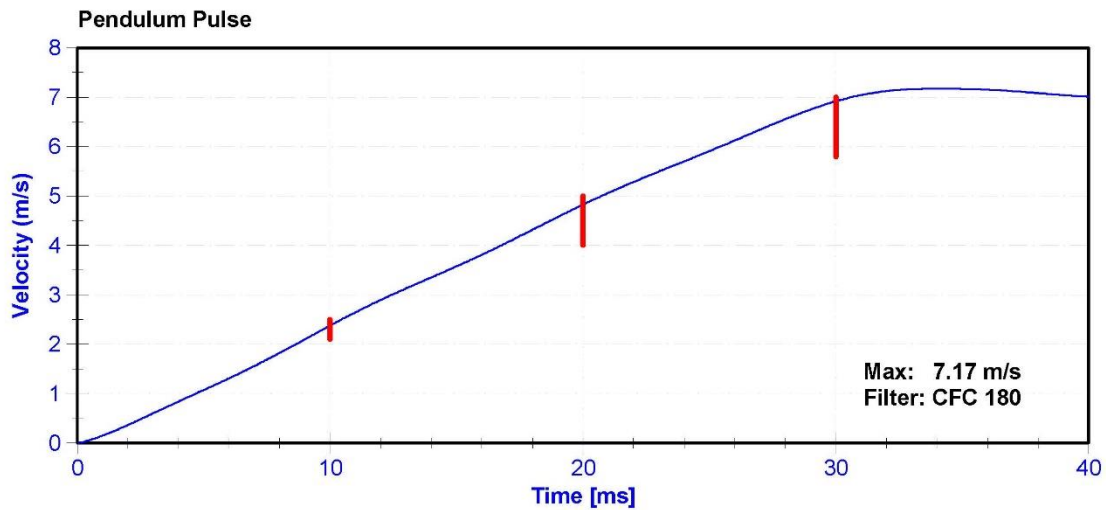
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

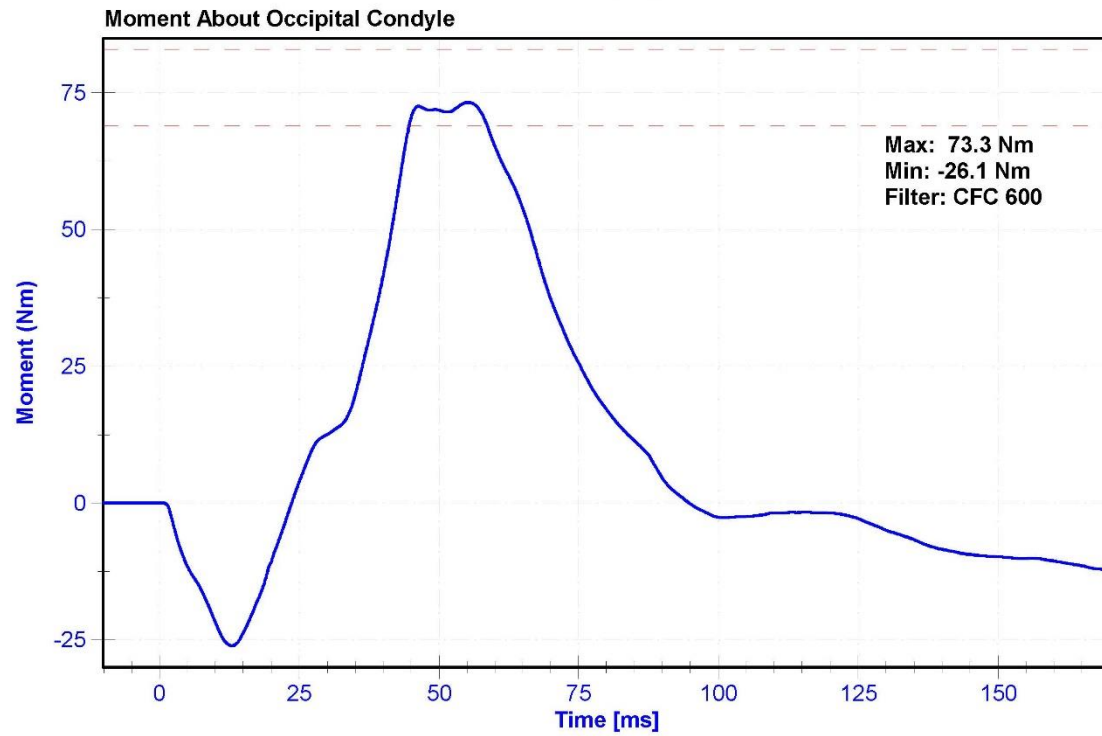
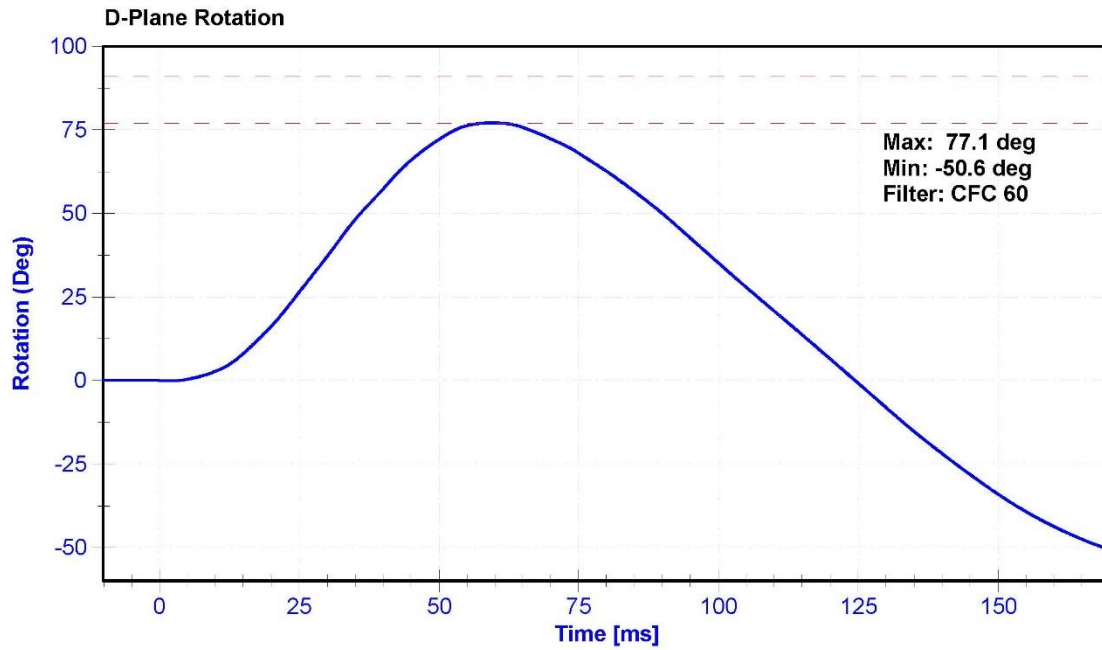
Results

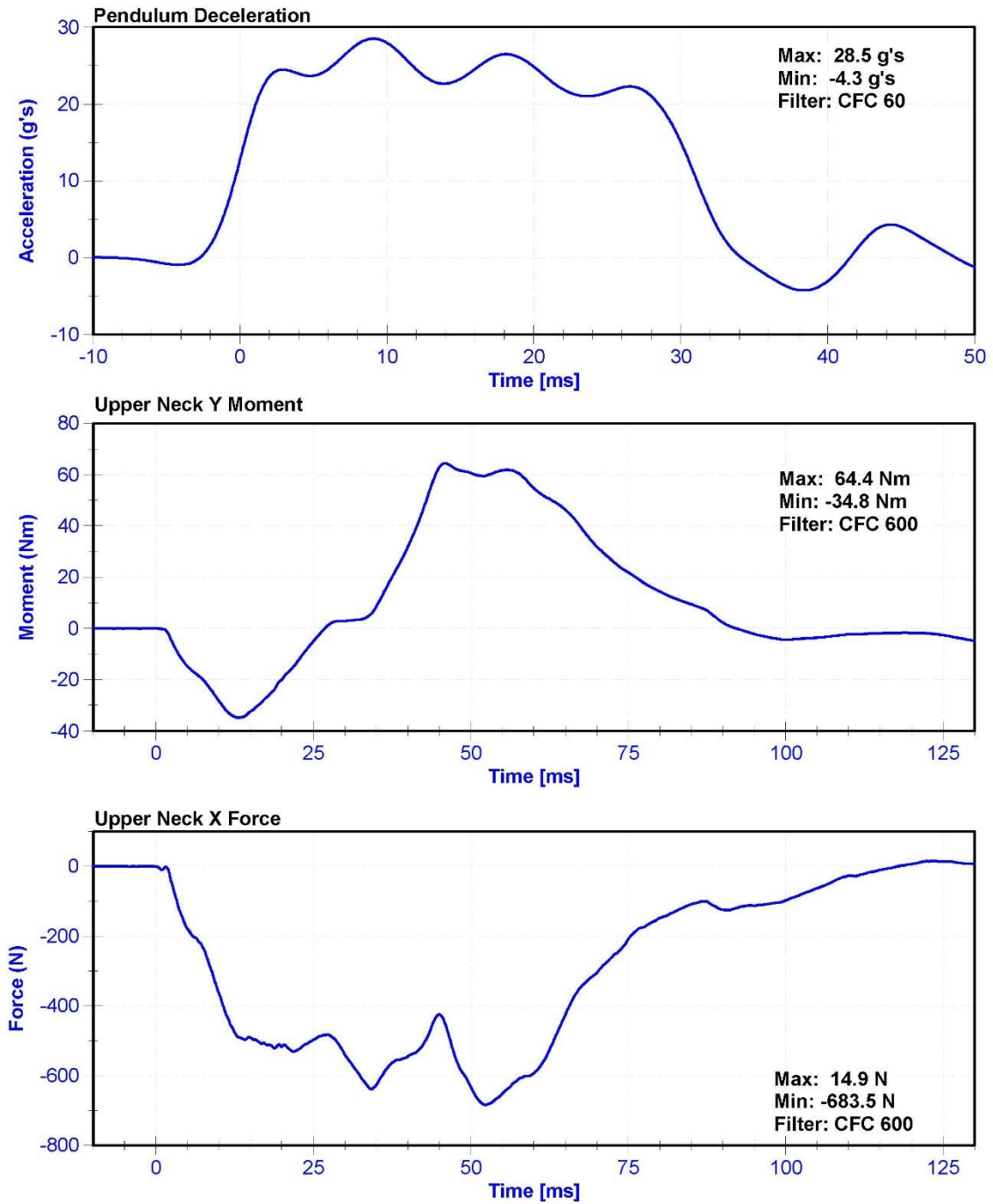
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	28.6	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.38	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.83	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.92	Pass
Max D Plane Rotation	77	91	deg	77.1	Pass
Max Moment During Rotation Interval	69	83	Nm	73.3	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017







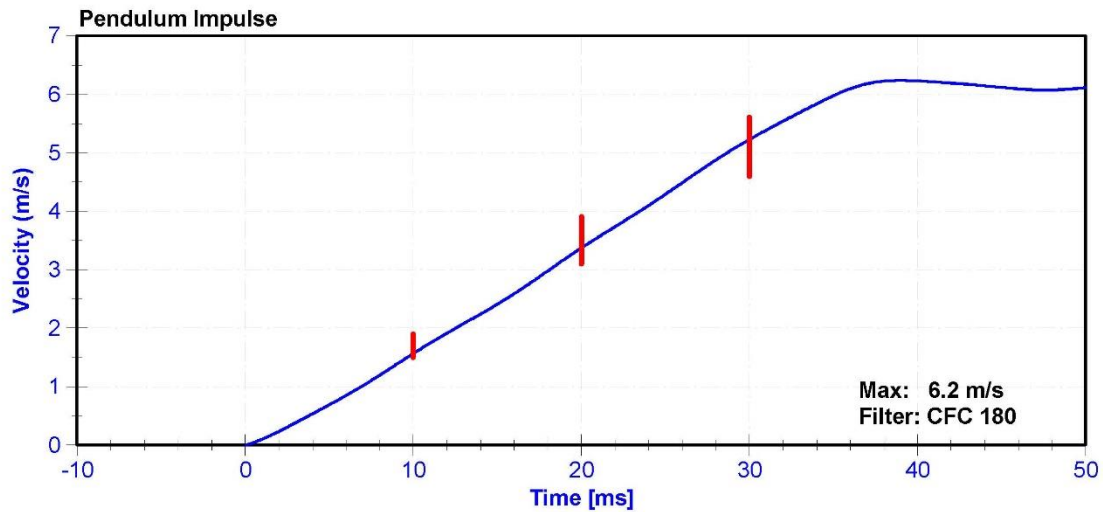
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

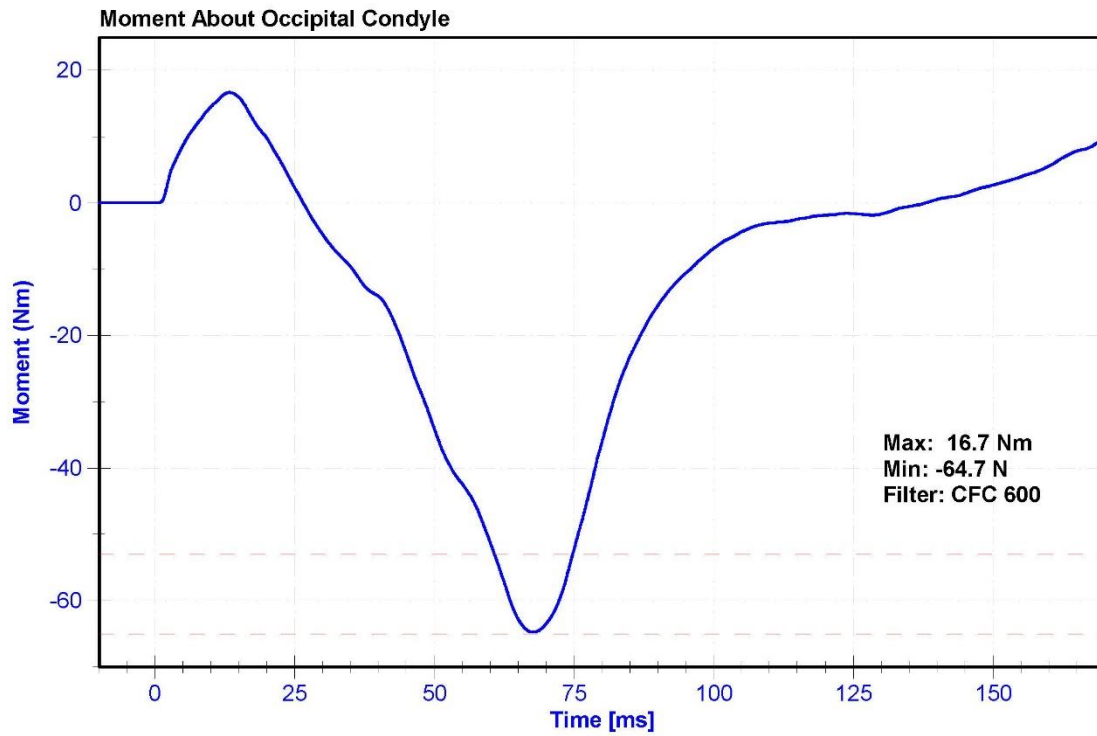
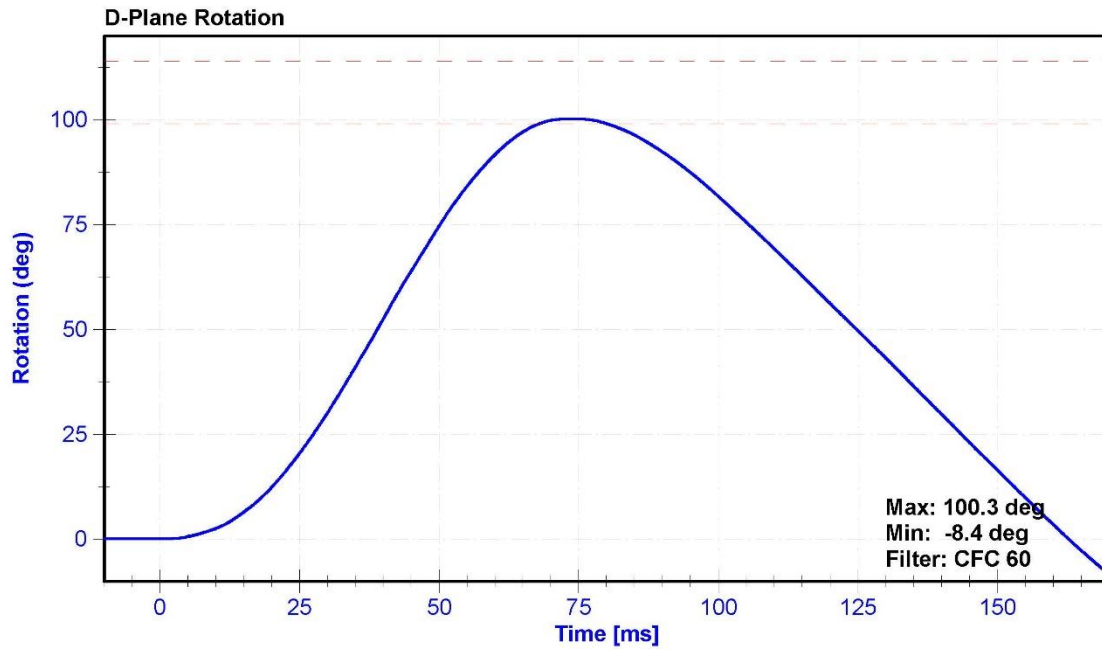
Results

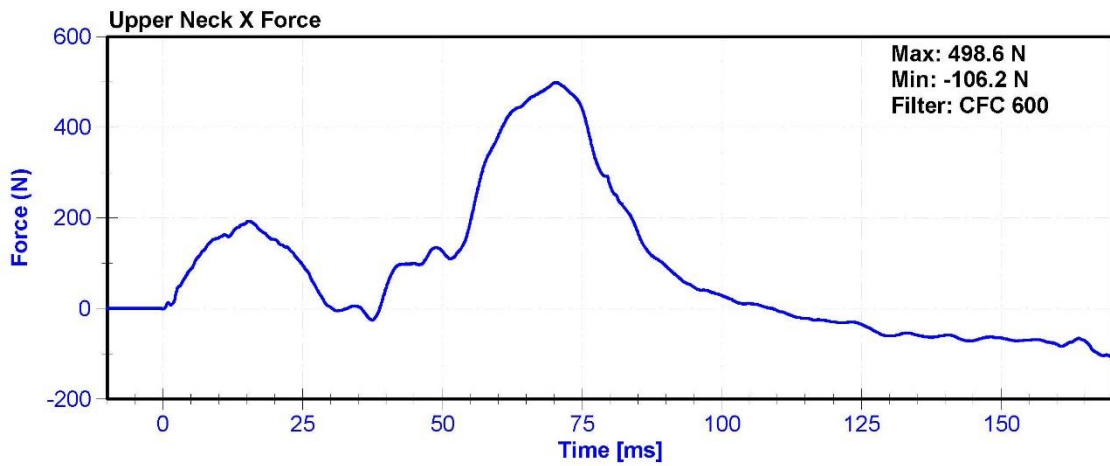
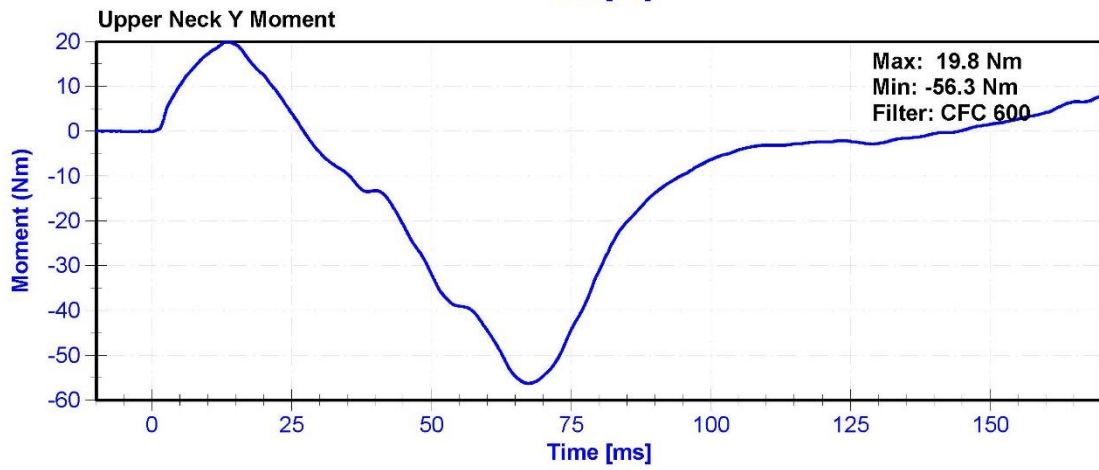
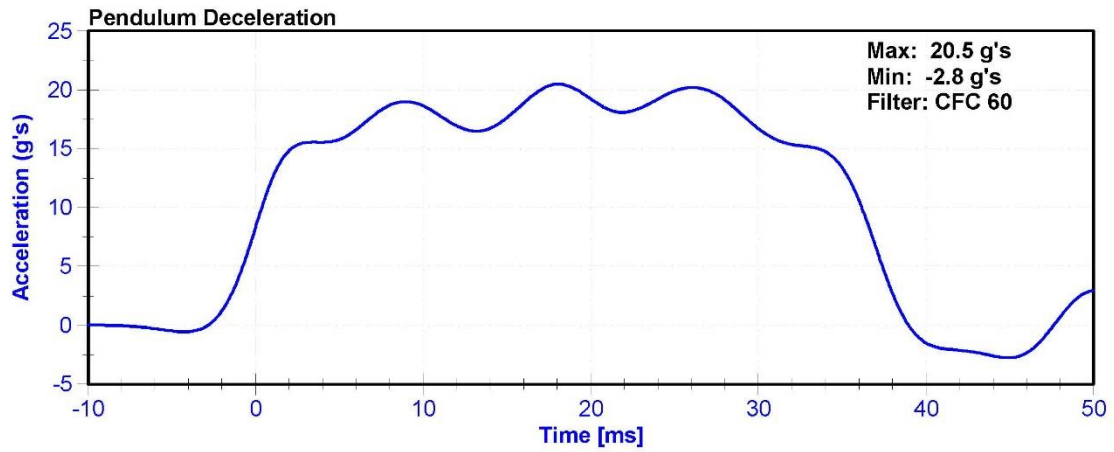
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28.4	Pass
Velocity	5.95	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.57	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.37	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.23	Pass
D Plane Rotation	99	114	deg	100.3	Pass
Moment During Rotation Interval	-65	-53	Nm	-64.7	Pass
Moment Decay to -10Nm	94	114	ms	95.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017







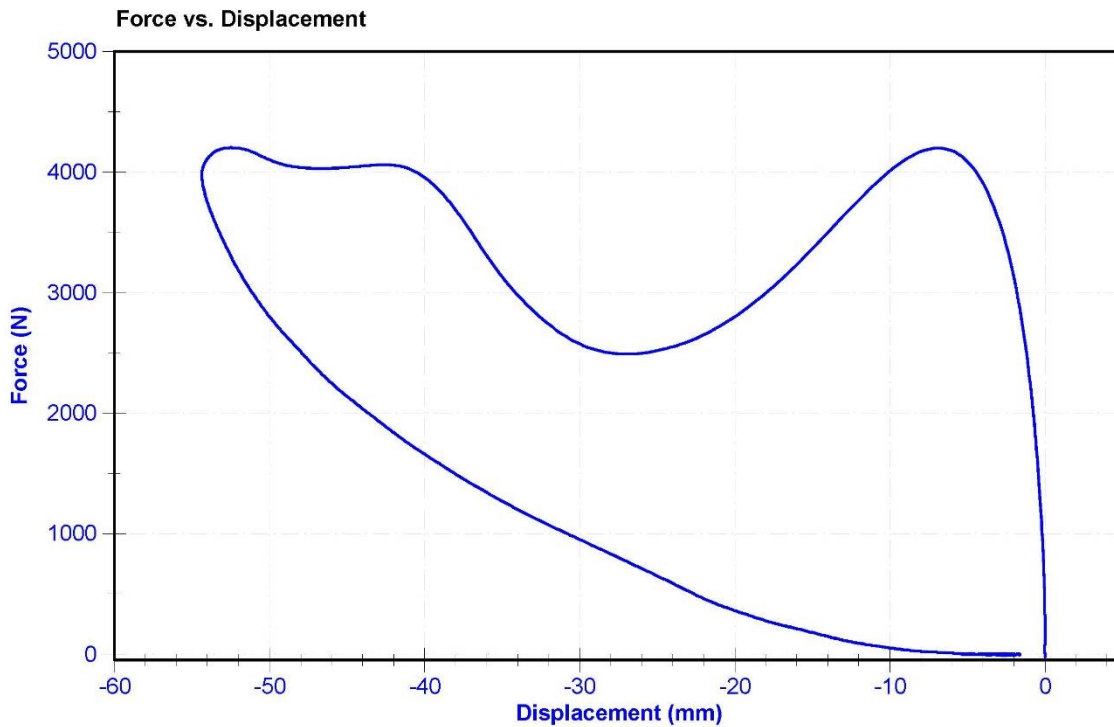
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

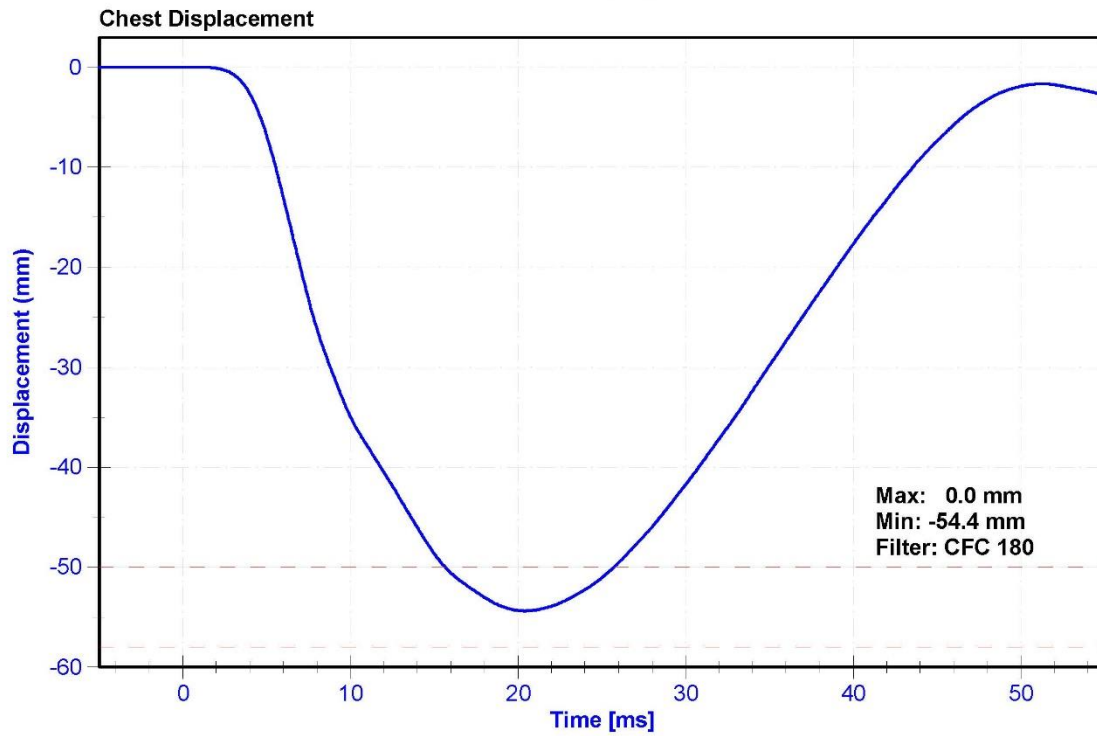
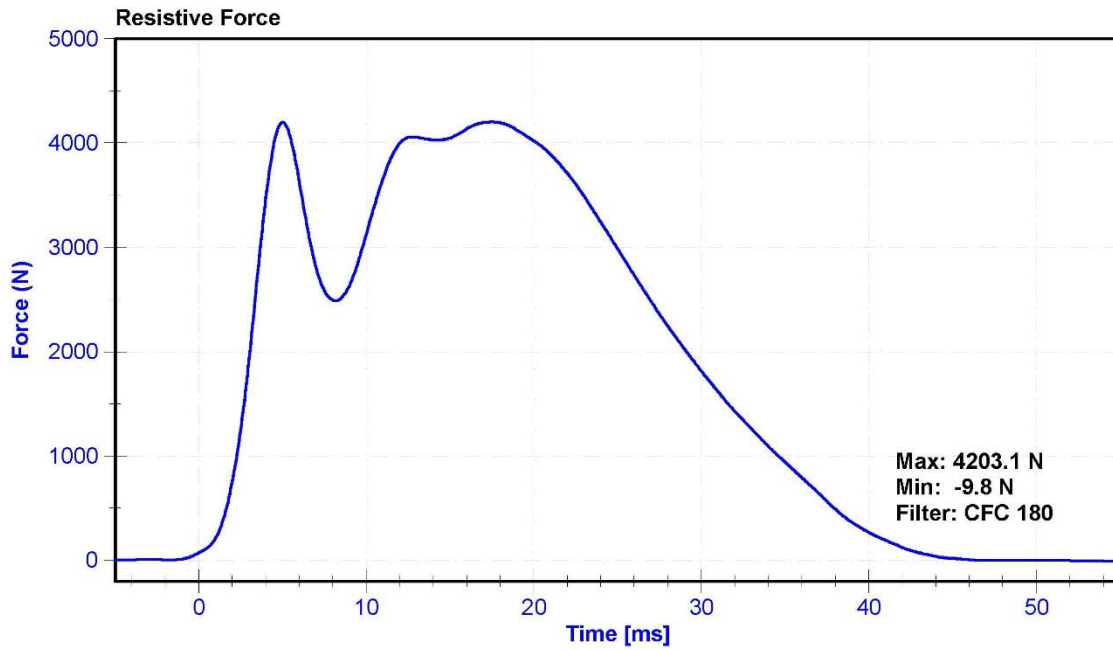
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	22.4	Pass
Velocity	6.59	6.83	m/s	6.655	Pass
Chest Deflection	-58	-50	mm	-54.4	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4203.1	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4097.4	Pass
Hysteresis	69	85	%	69.3	Pass

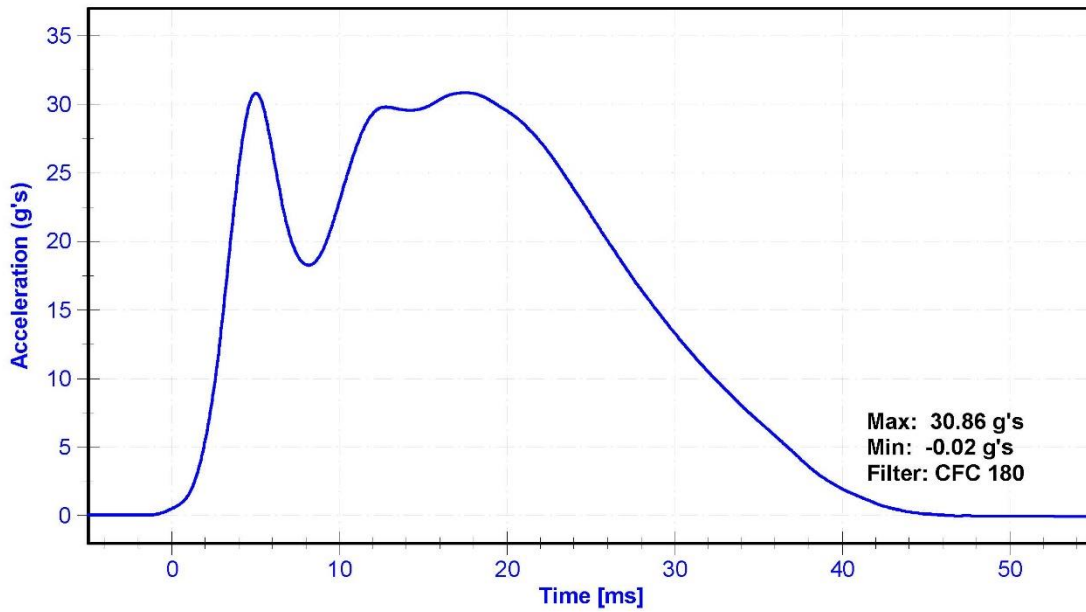
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/30/2016	9/30/2017

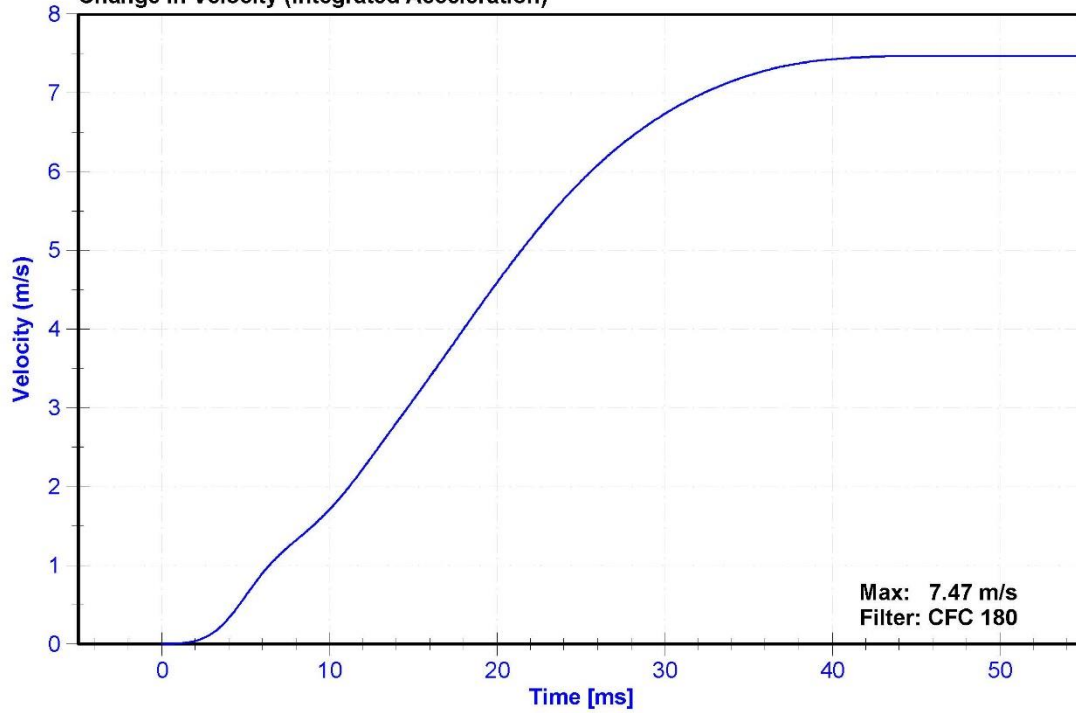




Probe Acceleration



Change in Velocity (Integrated Acceleration)



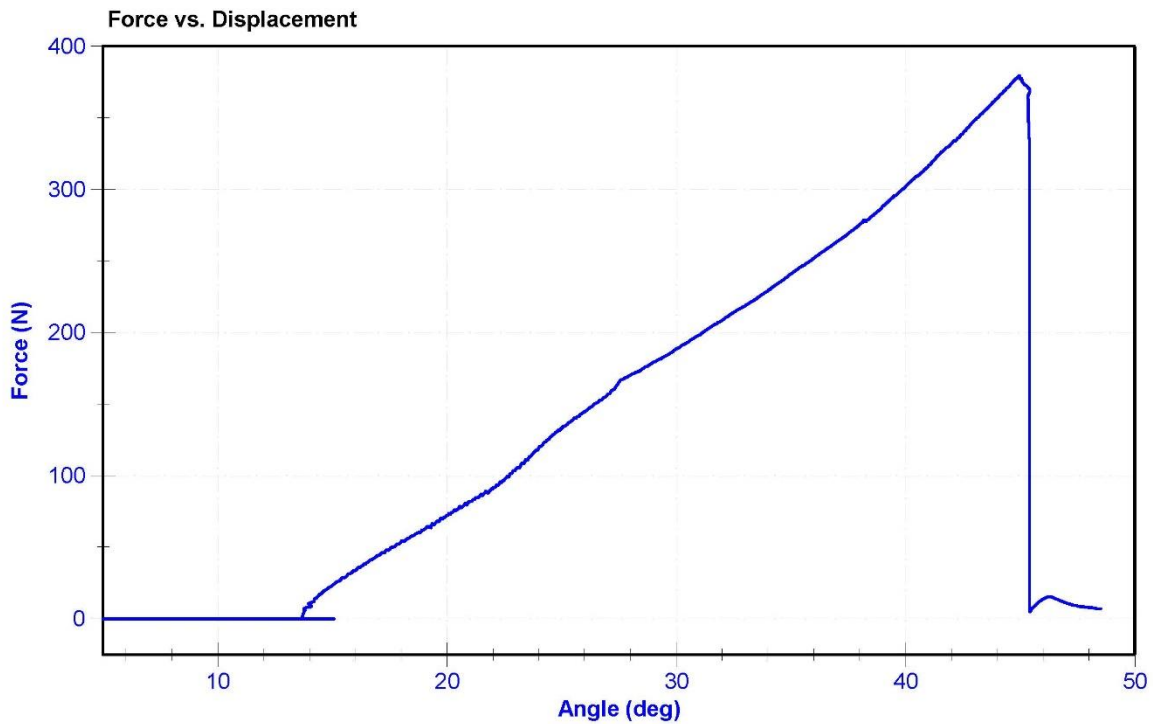
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.4	Pass
Humidity	10	70	%	28	Pass
Initial Angle	0	20	deg	13.6	Pass
Force at 45 Degrees	320	390	N	379.3	Pass
Return Angle Relative to Initial	0	8	deg	5.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	9/7/2016	9/7/2017
Load Cell	Interface SML-200	LC-493319	9/7/2016	9/7/2017



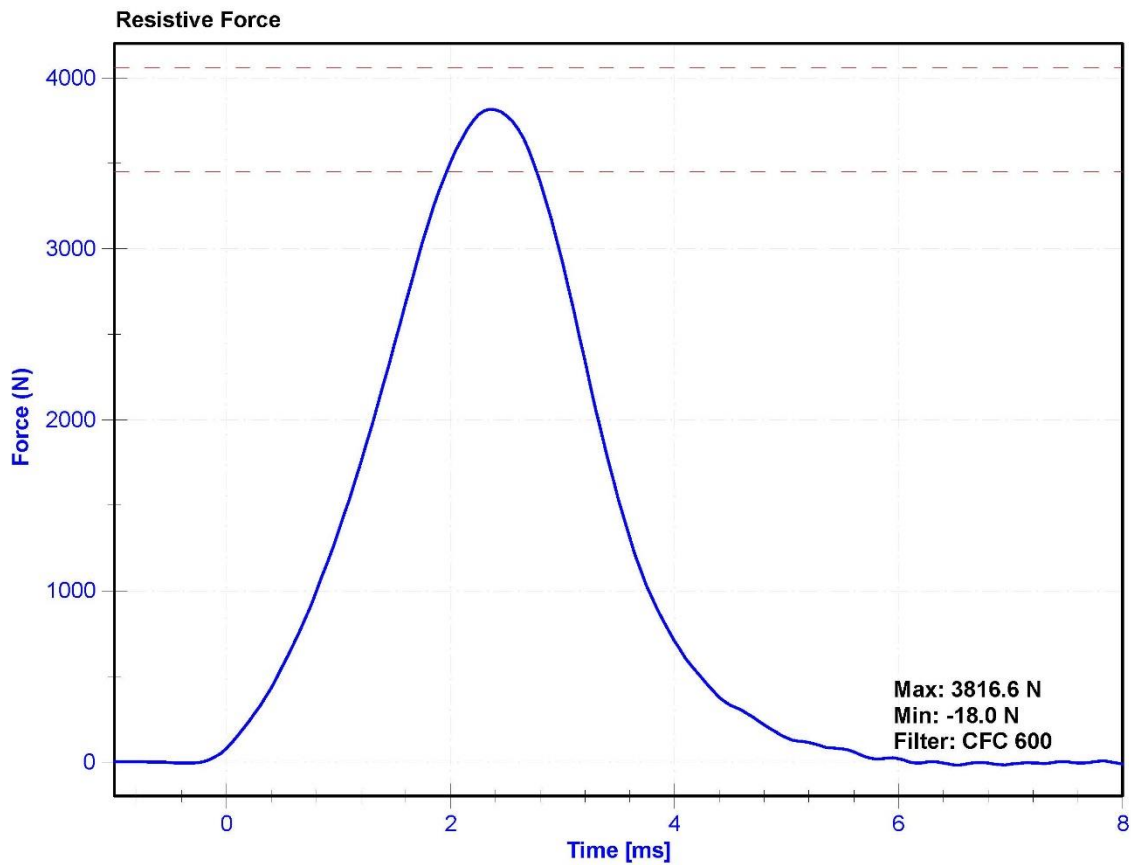
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

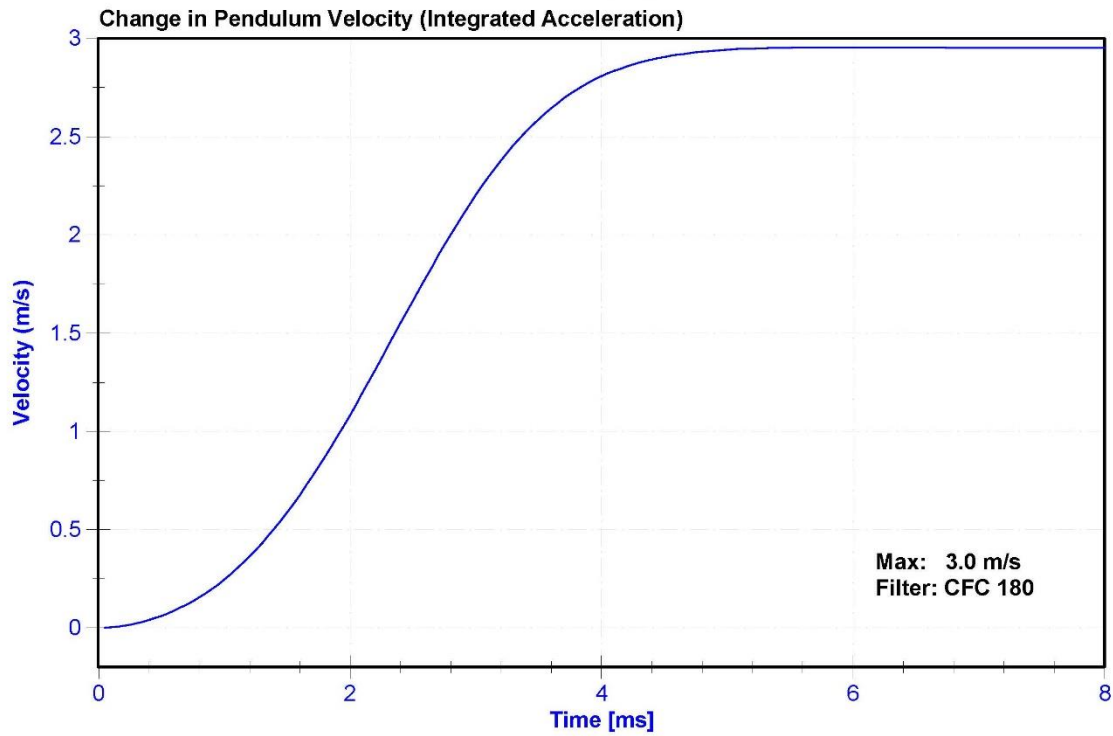
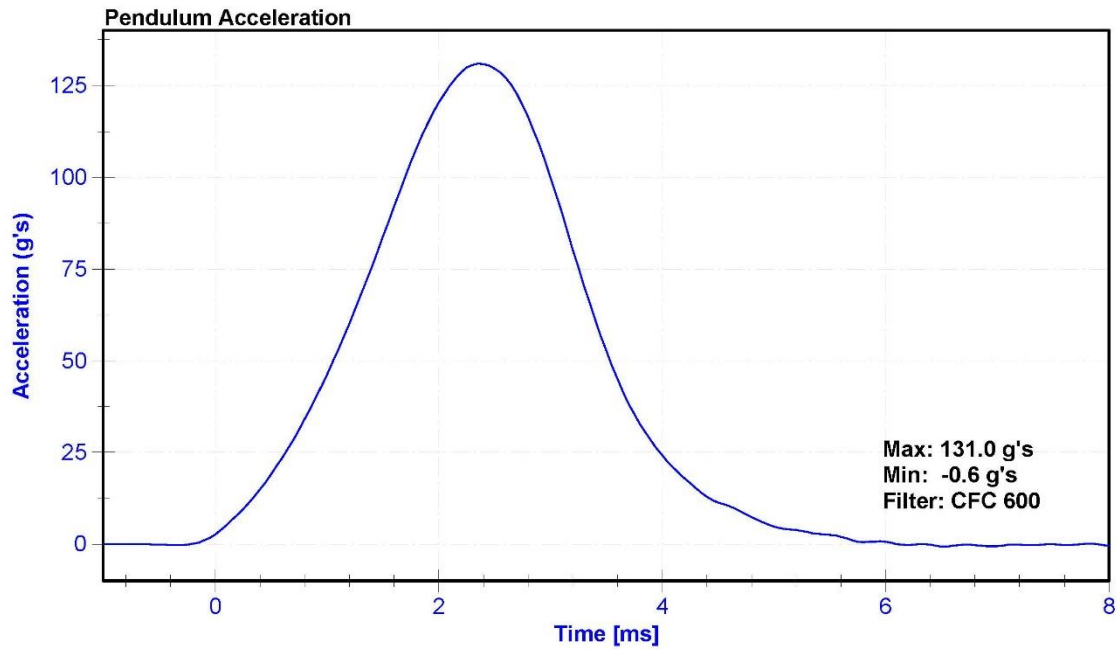
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	21.9	Pass
Velocity	2.07	2.13	m/s	2.104	Pass
Resistive Force	3450	4060	N	3816.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





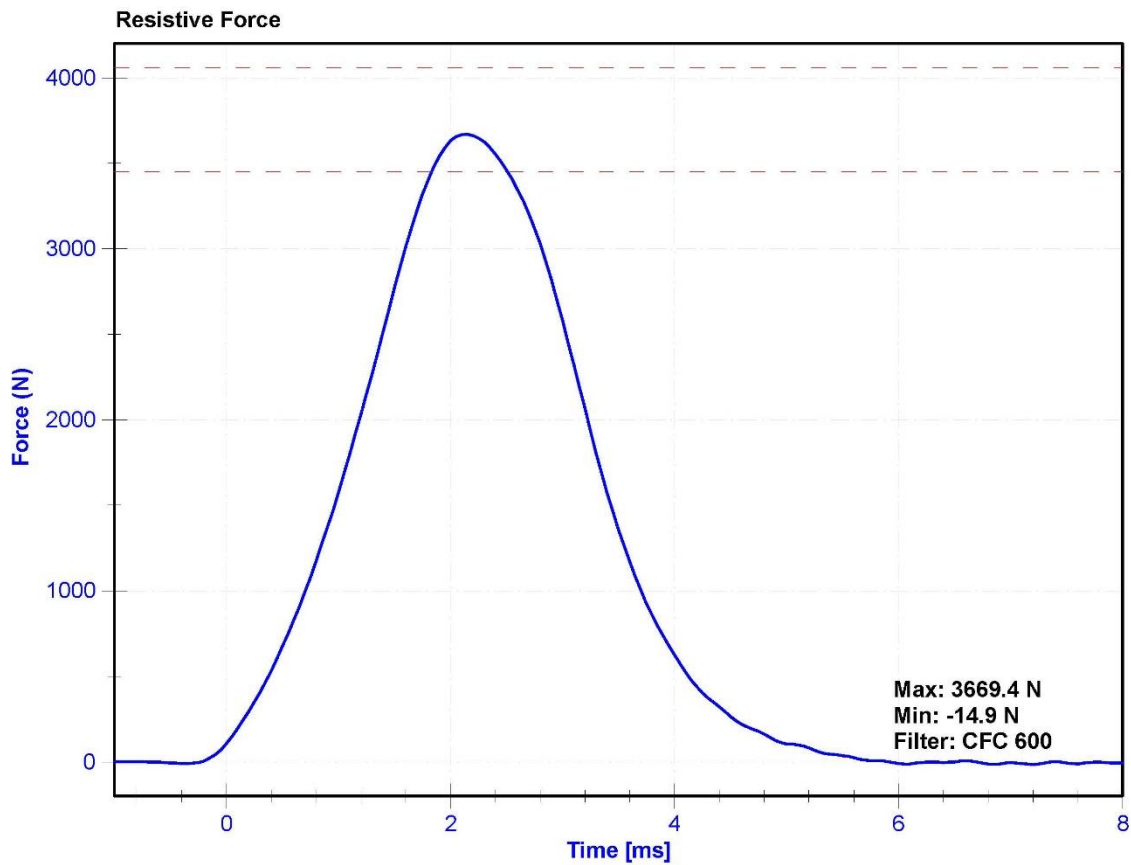
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

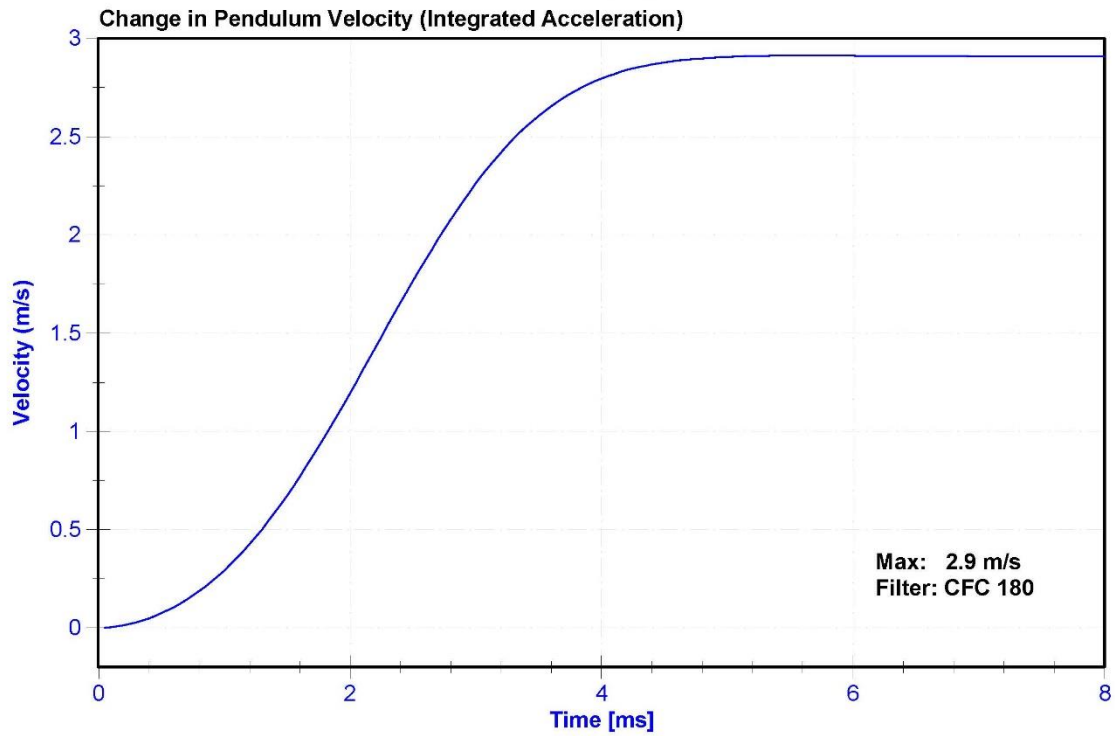
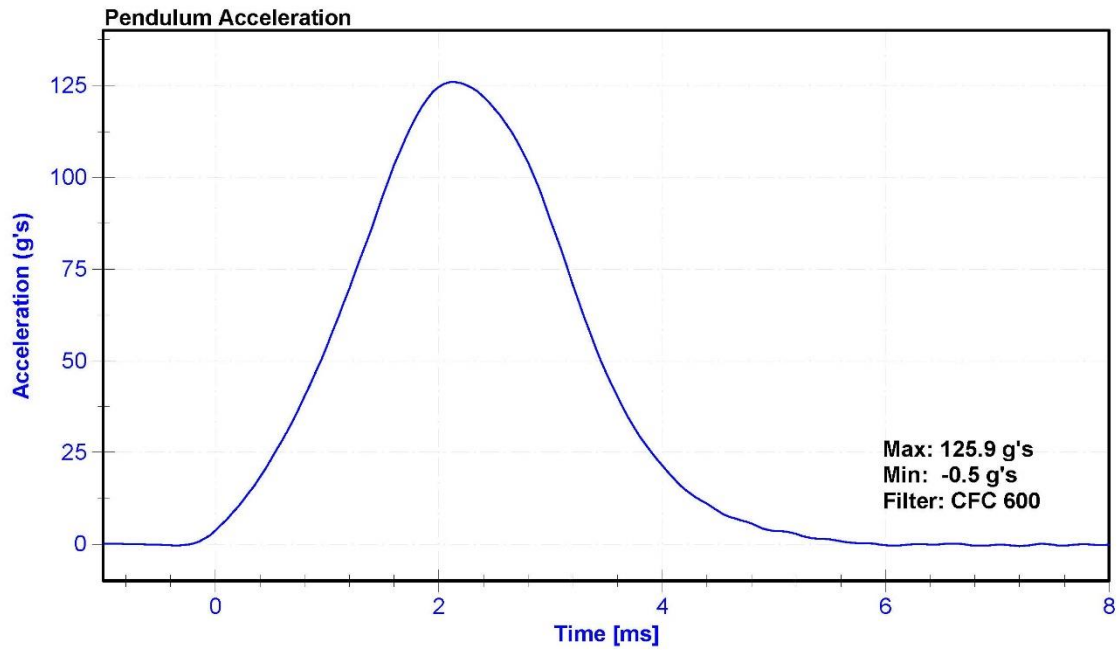
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	21.9	Pass
Velocity	2.07	2.13	m/s	2.102	Pass
Resistive Force	3450	4060	N	3669.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

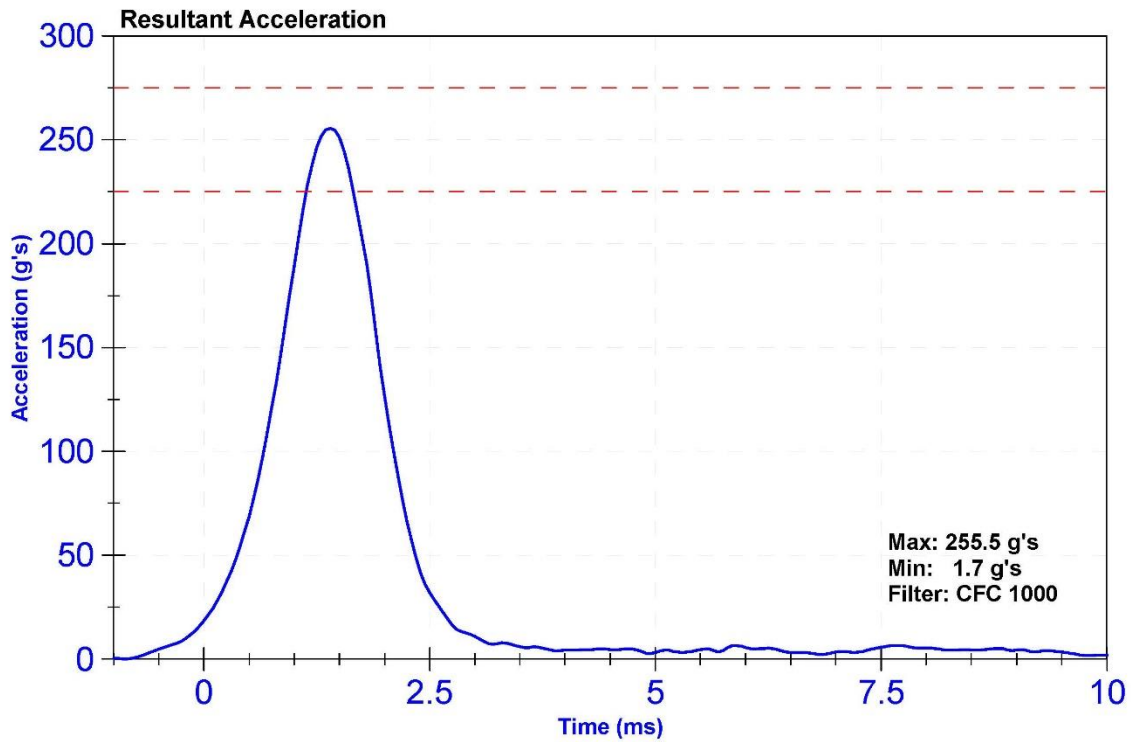
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

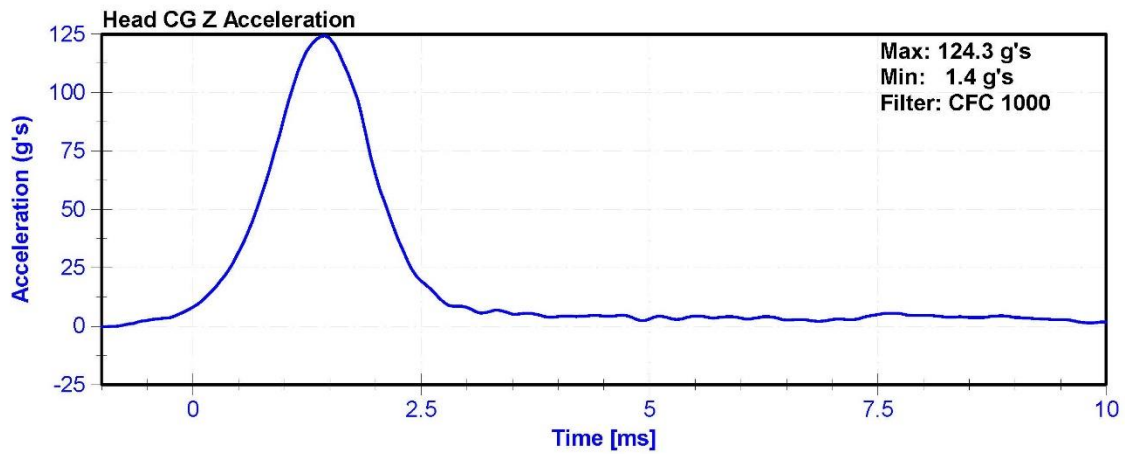
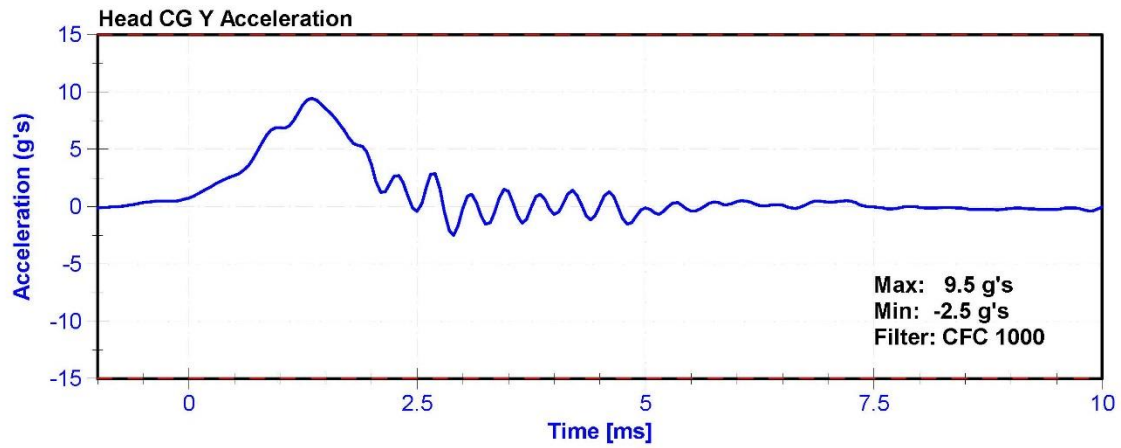
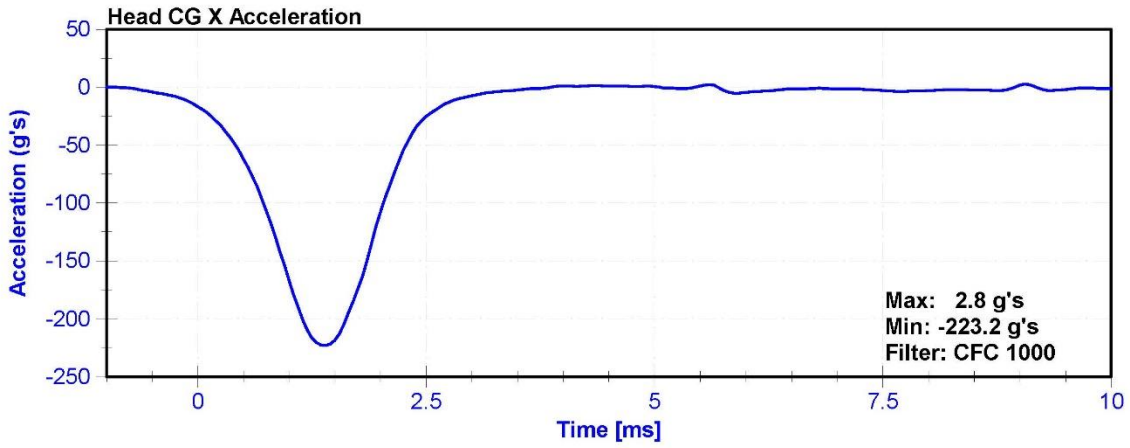
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.6	Pass
Humidity	10	70	%	28.9	Pass
Resultant Acceleration	225	275	g's	255.5	Pass
Oscillation	0	10	%	3.0	Pass
Lateral Acceleration	-15	15	g's	9.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	9/19/2016	3/20/2017
Y Accelerometer	ENDEVCO 7264	AC-P12359	9/19/2016	3/20/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	9/19/2016	3/20/2017





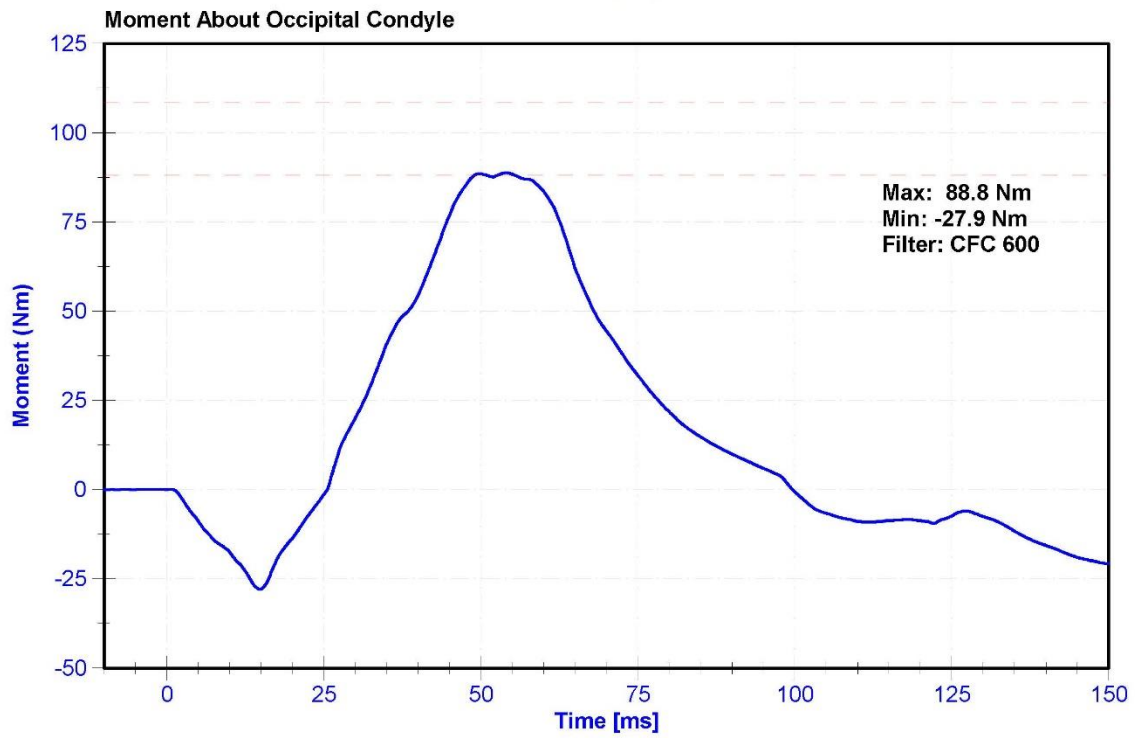
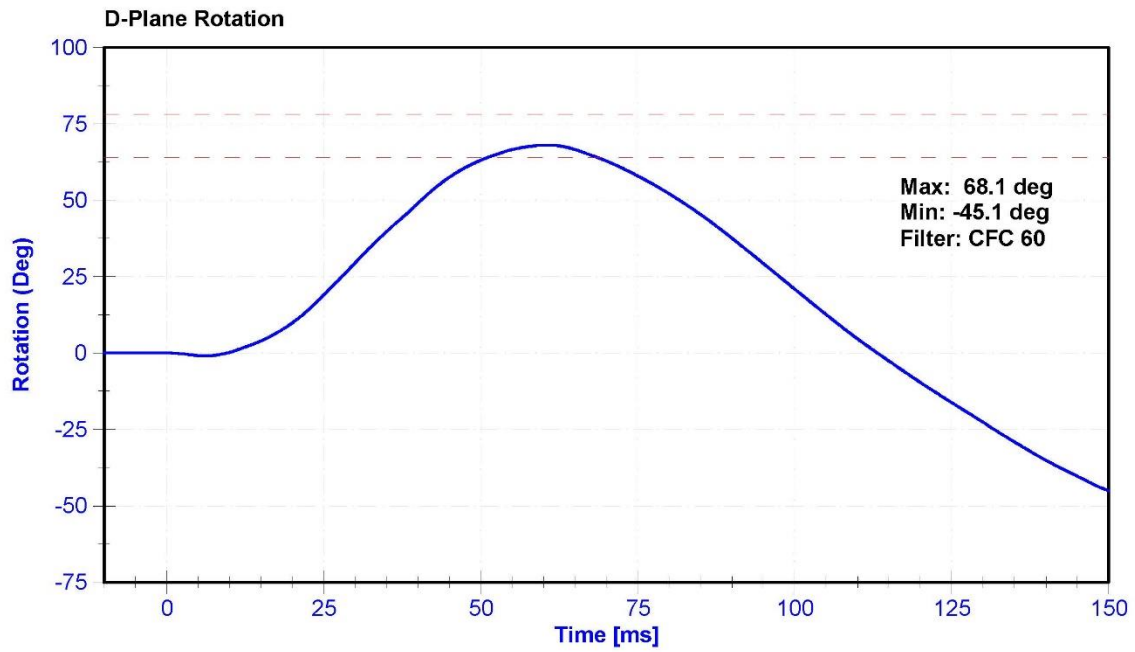
ATD Manufacturer	FTSS	Test Technician	M.Hatrung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

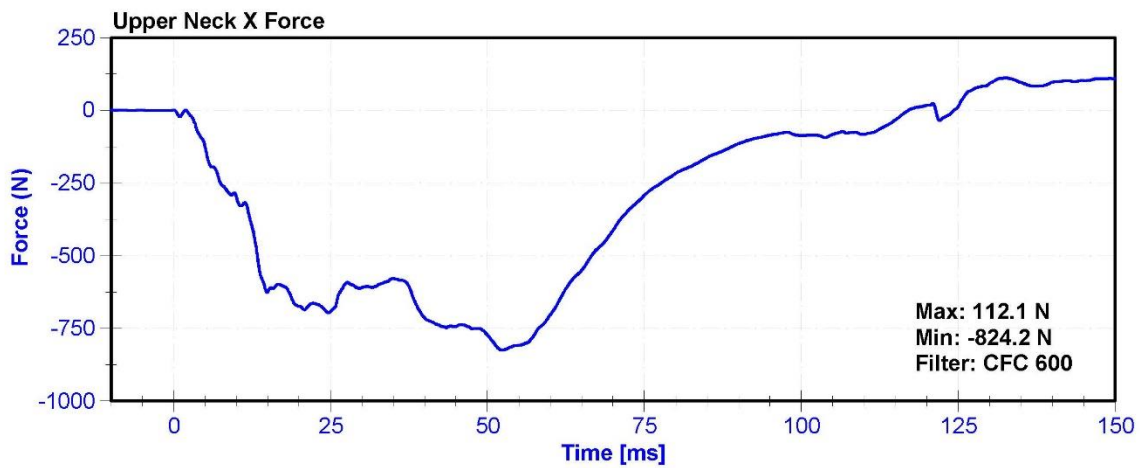
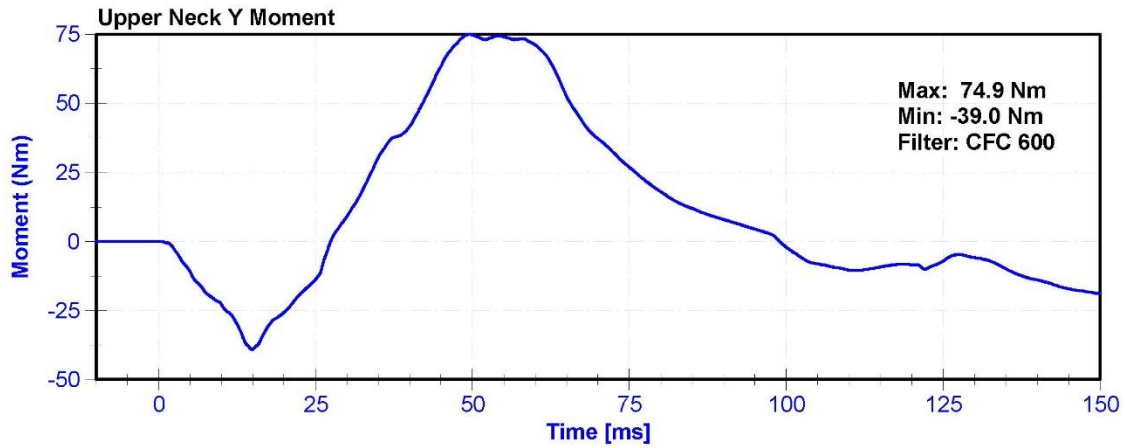
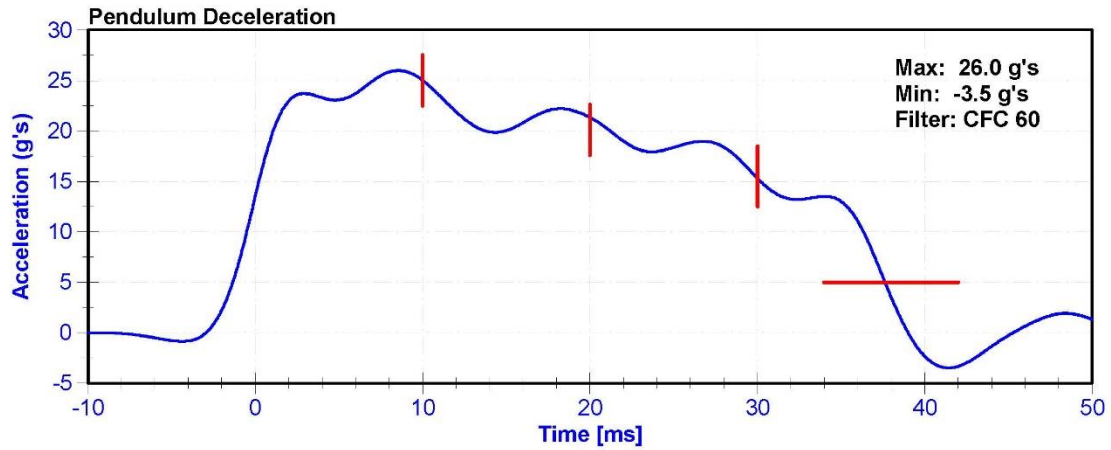
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	28.6	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.02	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.35	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.30	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	26.0	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	37.6	Pass
Maximum D Plane Rotation	64	78	deg	68.1	Pass
Time to Maximum Rotation	57	64	ms	60.6	Pass
Rotation Decay to Zero	113	127	ms	113.2	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	88.82	Pass
Time to Maximum Moment	47	58	ms	54.1	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	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017





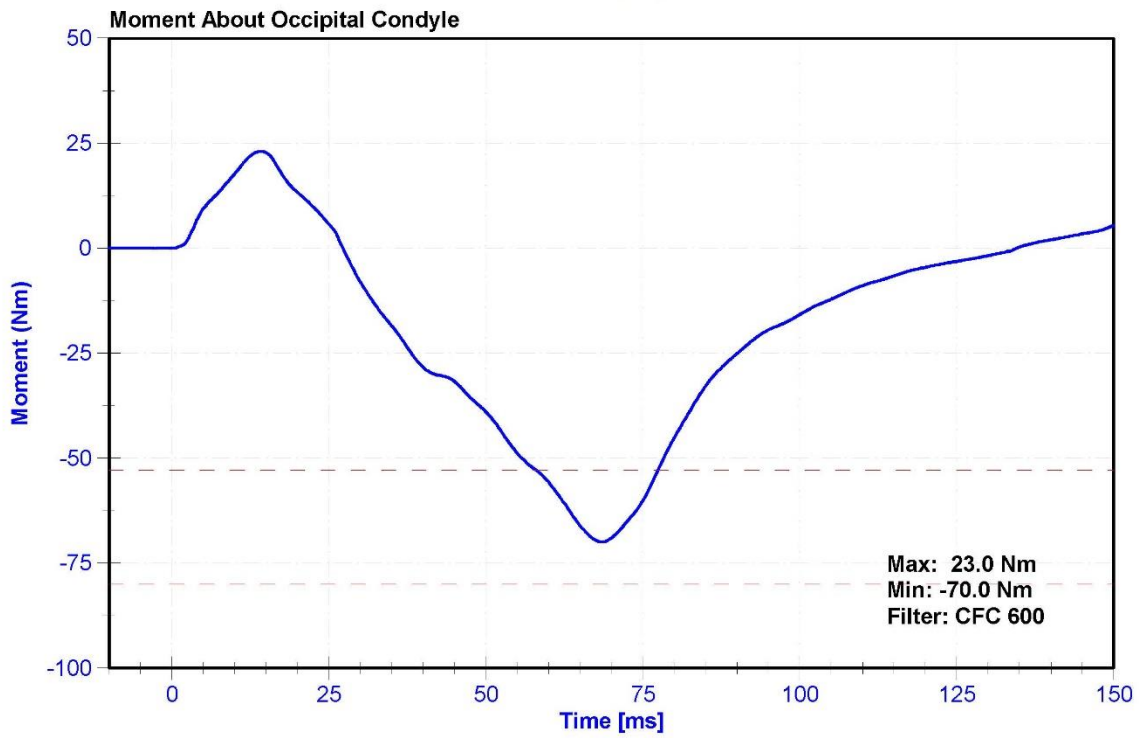
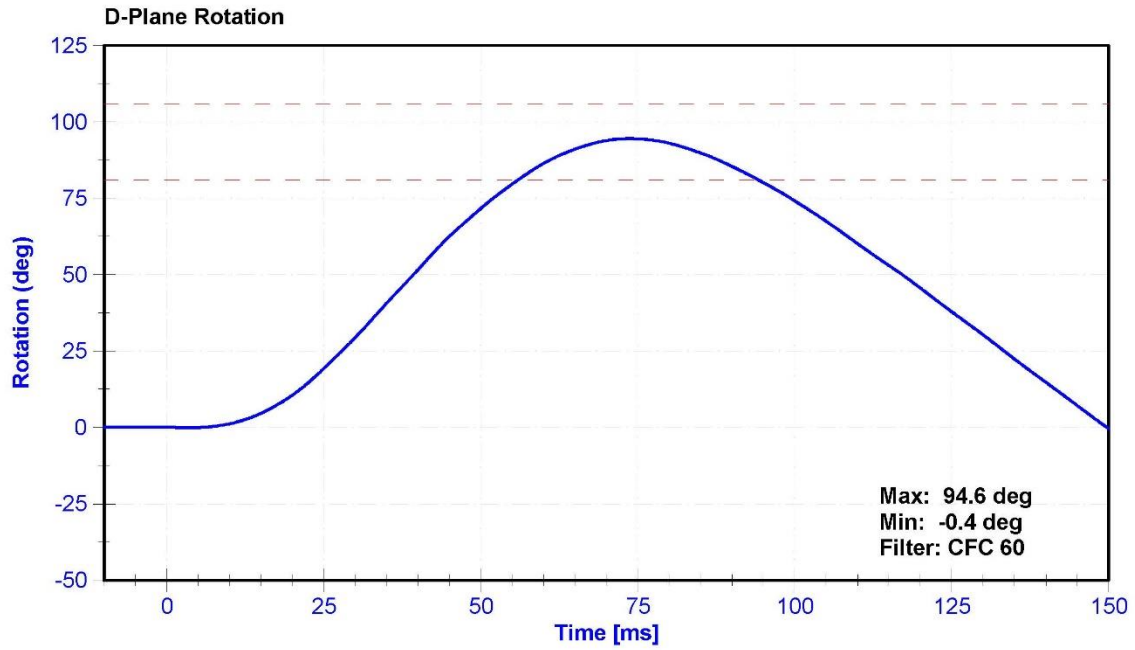
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

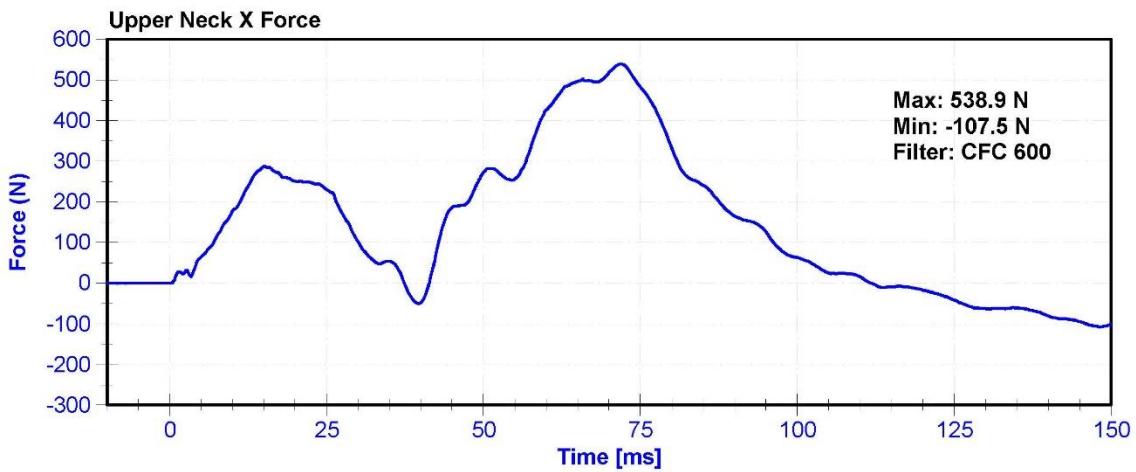
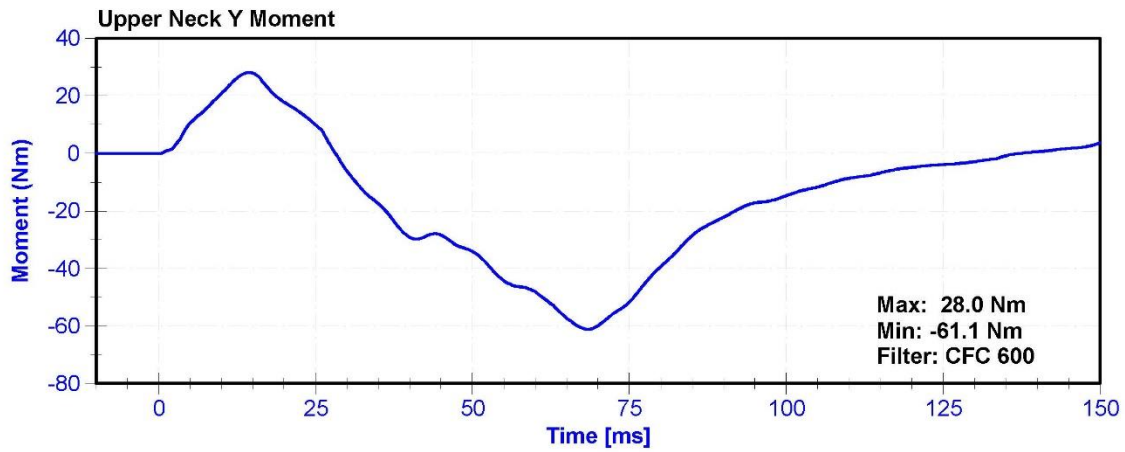
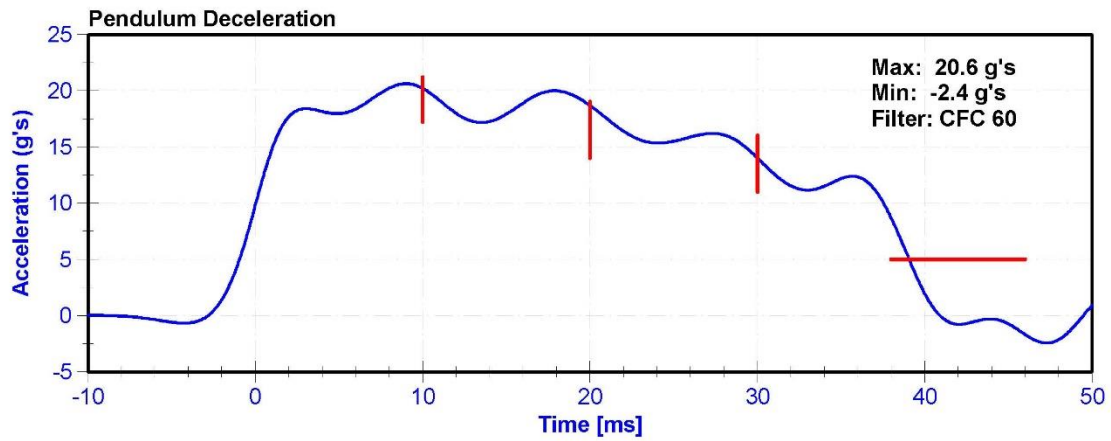
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	28.1	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.21	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.7	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.0	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.6	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	39.1	Pass
Maximum D Plane Rotation	81	106	deg	94.6	Pass
Time to Maximum Rotation	72	82	ms	73.8	Pass
Rotation Decay to Zero	147	174	ms	149.7	Pass
Minimum Moment About OC	-80	-52.9	Nm	-69.97	Pass
Time to Minimum Moment	65	79	ms	68.5	Pass
Moment Decay to Zero	120	148	ms	134.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/24/2016	5/24/2017





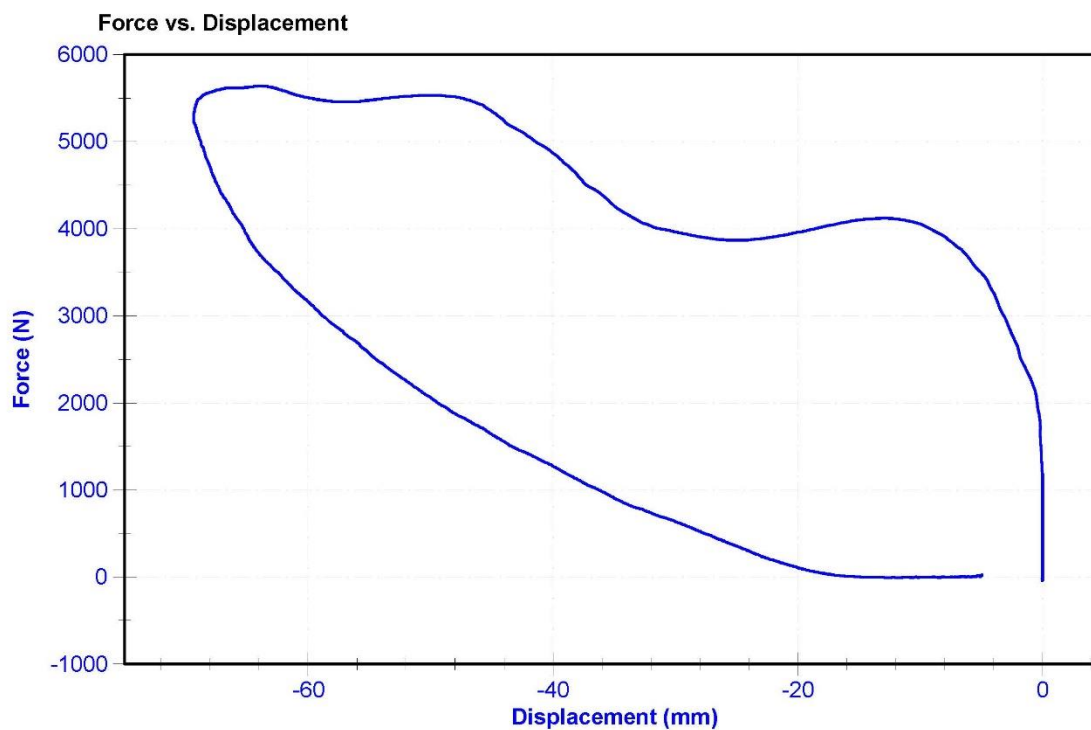
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

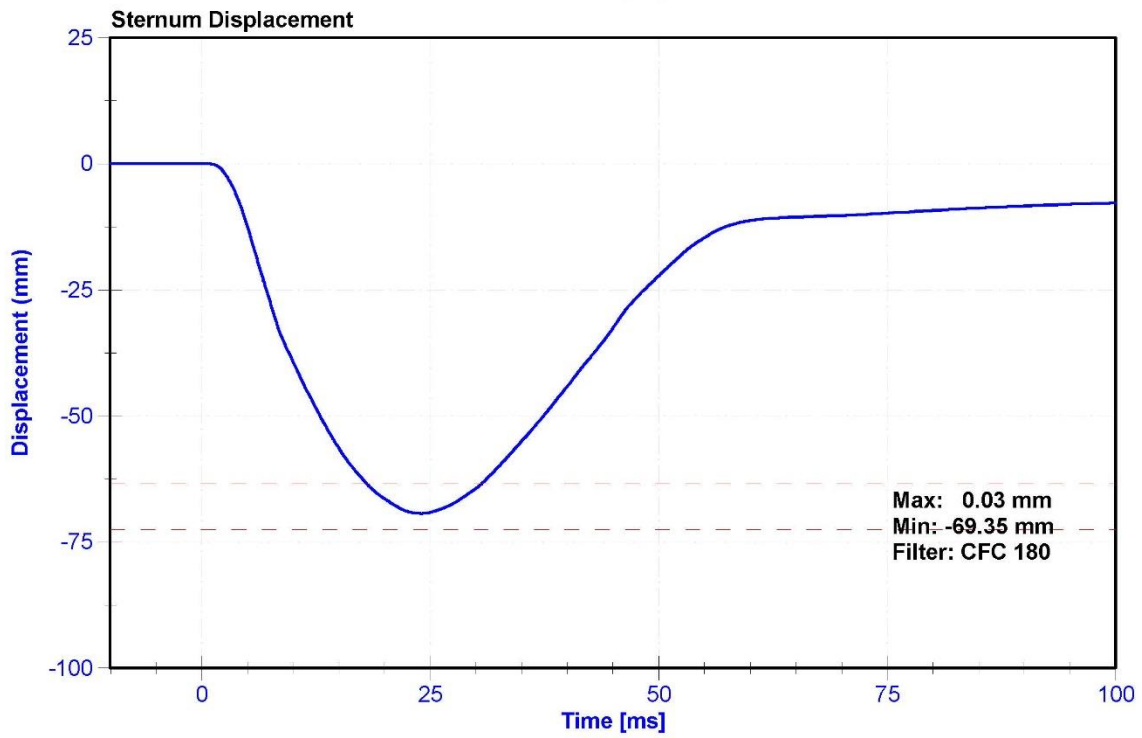
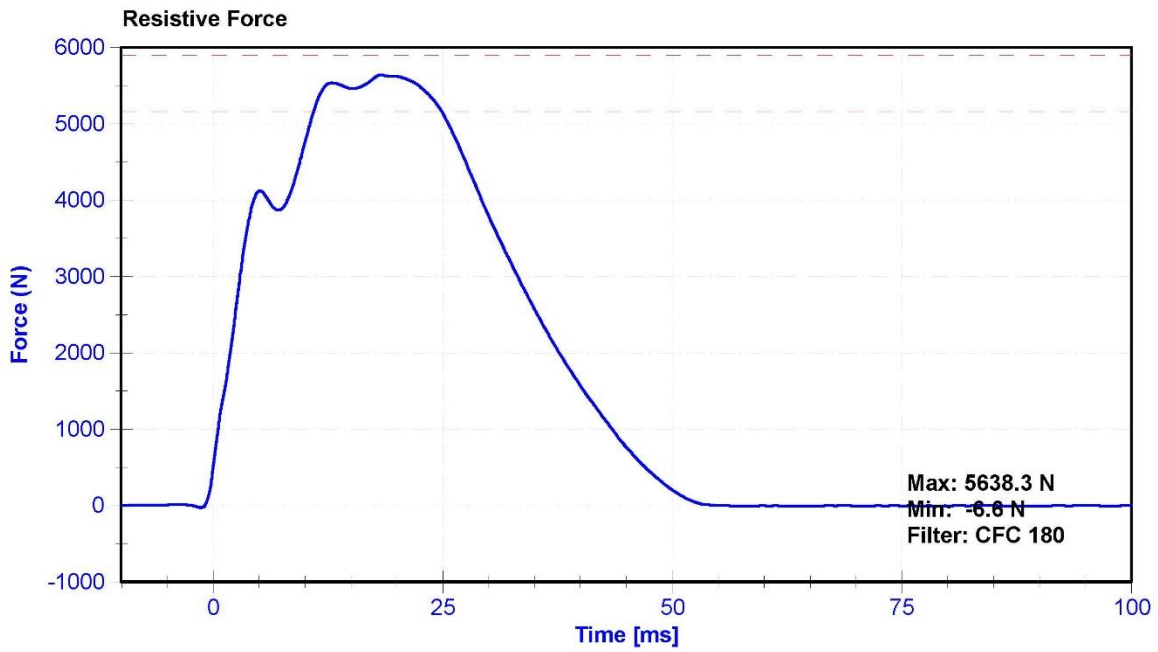
Results

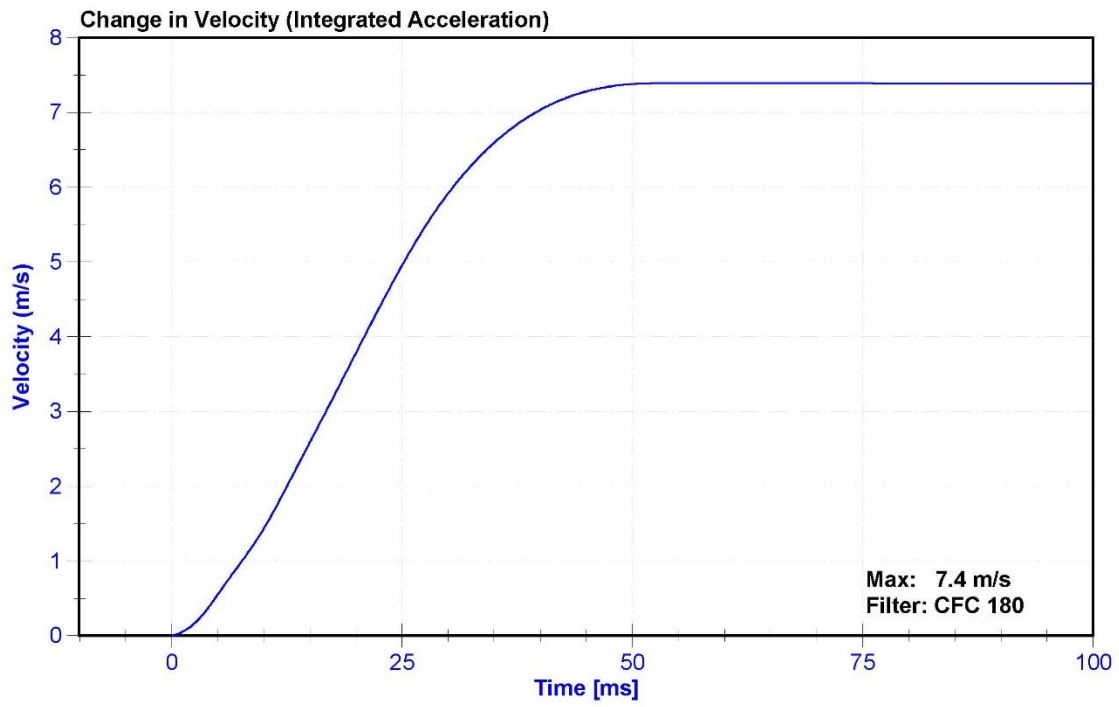
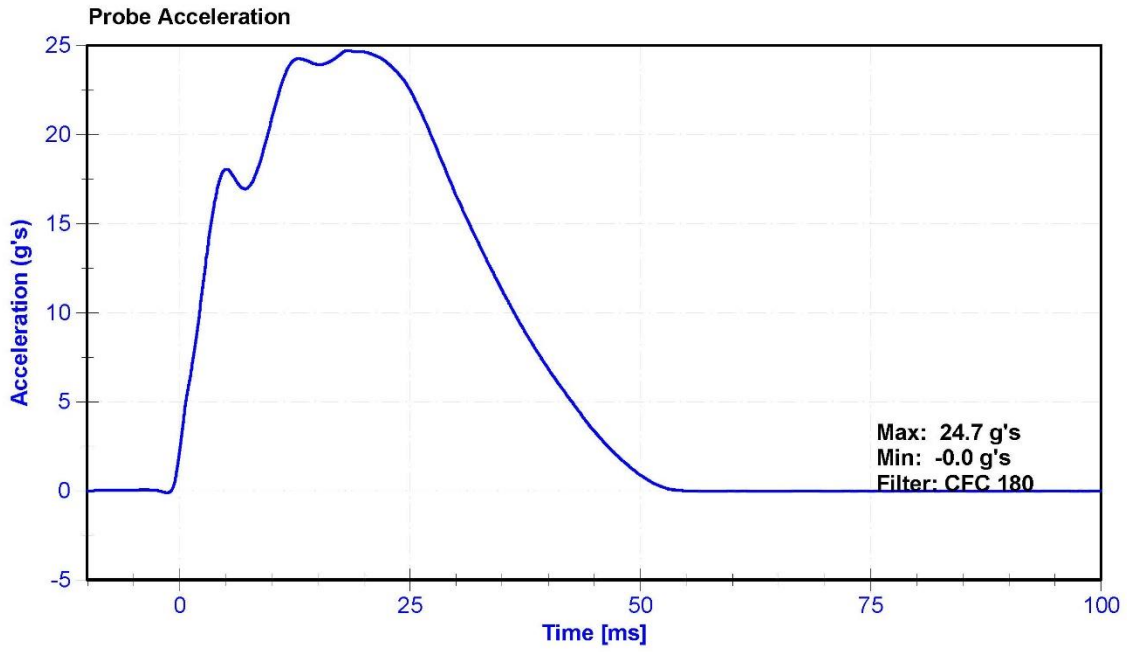
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	22.5	Pass
Velocity	6.59	6.83	m/s	6.670	Pass
Chest Displacement	-72.6	-63.5	mm	-69.35	Pass
Resistive Force	5160	5894	N	5638.3	Pass
Hysteresis	65	85	%	70.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	Servo 14CB1-2897	DS-1046	9/19/2016	9/19/2017







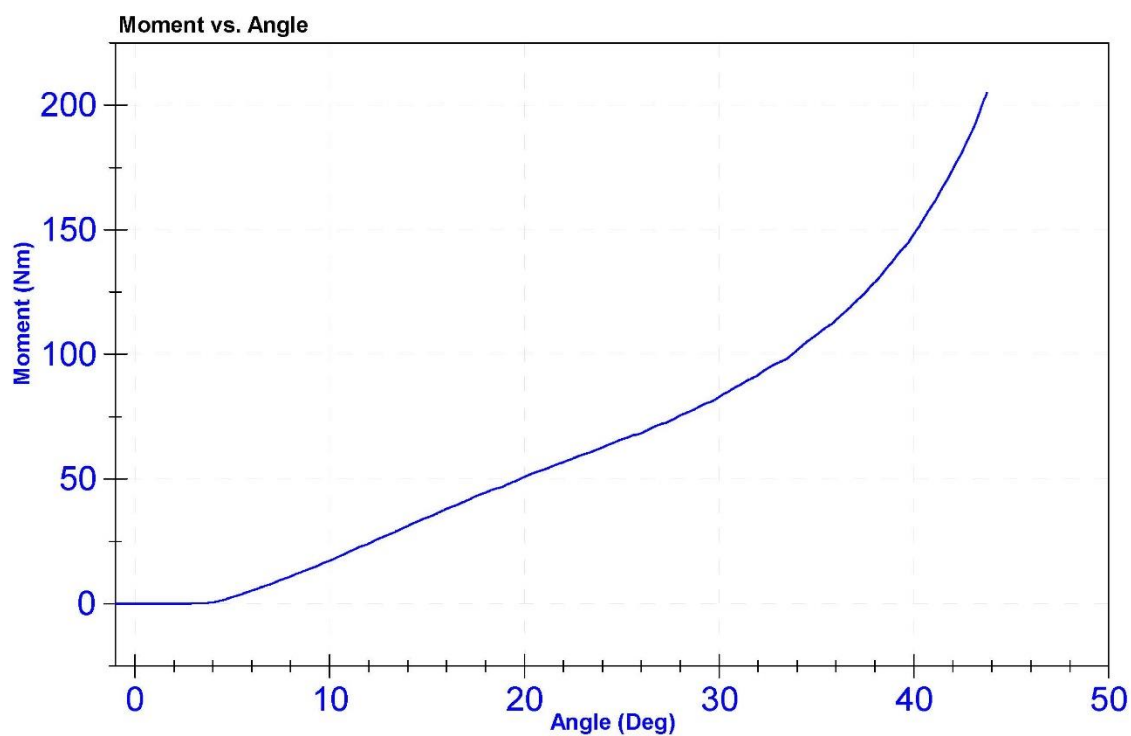
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	25.4	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.6	Pass
Moment at 30 degrees	0	94.9	Nm	83.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



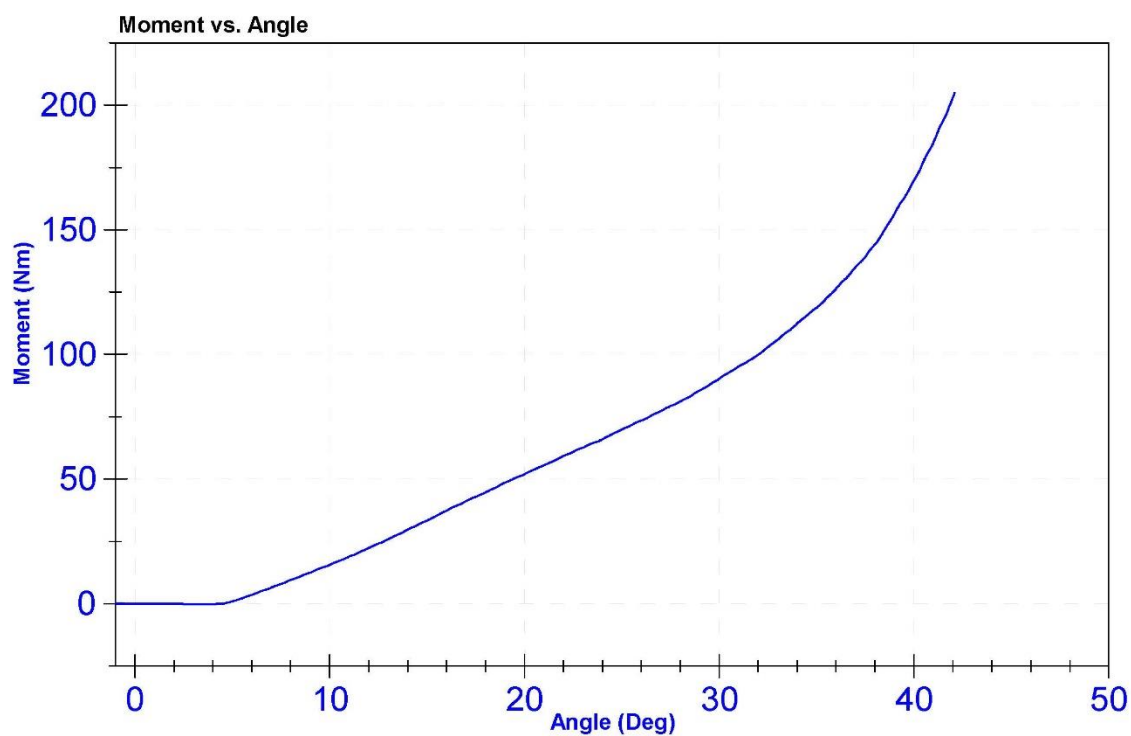
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.8	Pass
Humidity	10	70	%	25.4	Pass
Average Velocity	5	10	deg/s	7.2	Pass
Angle at 203Nm	40	50	deg	42.0	Pass
Moment at 30 degrees	0	94.9	Nm	90.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	4/4/2016	4/4/2017
Load Cell	Key Trans 2301-02	LC-115 My	4/21/2016	4/21/2017



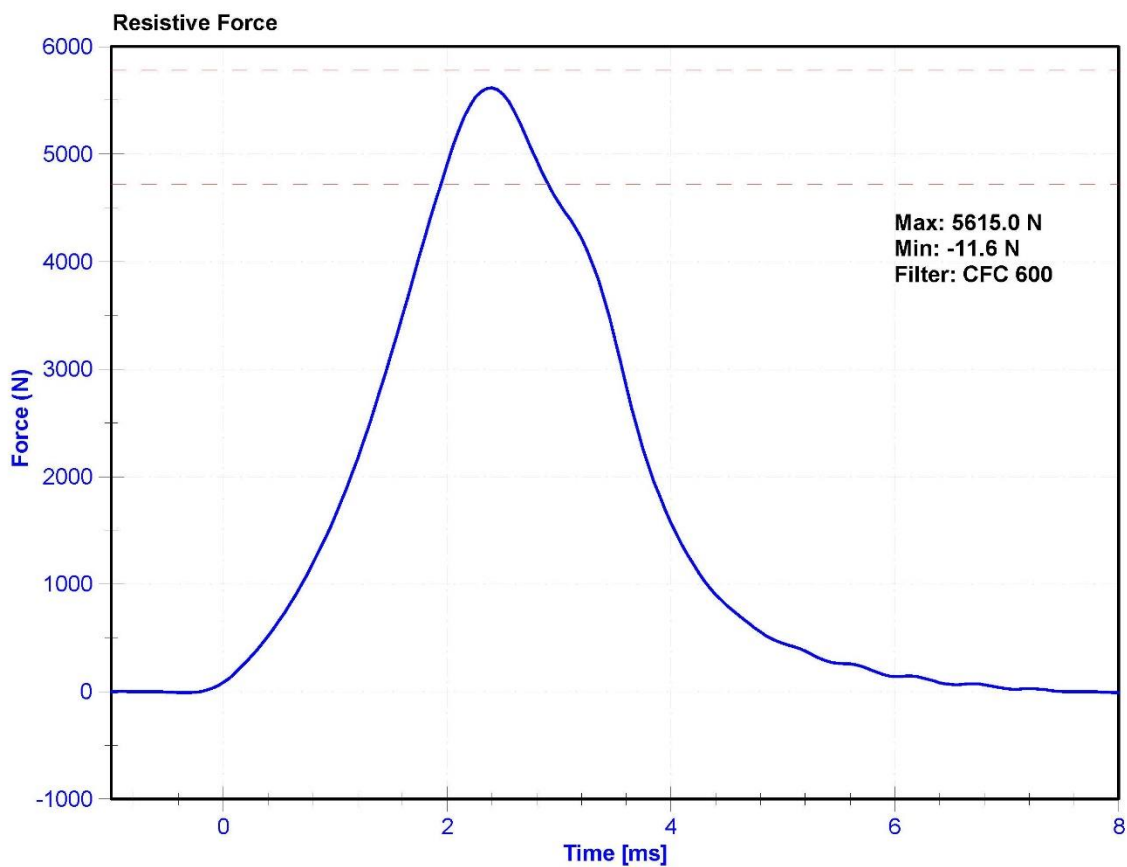
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

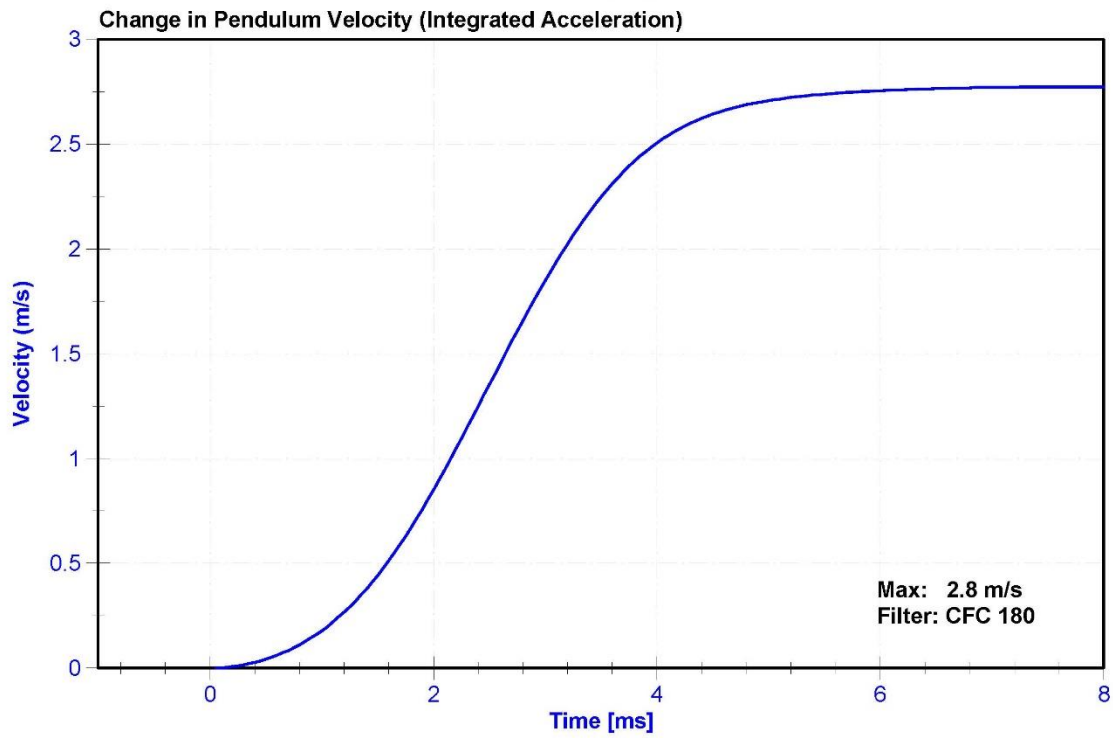
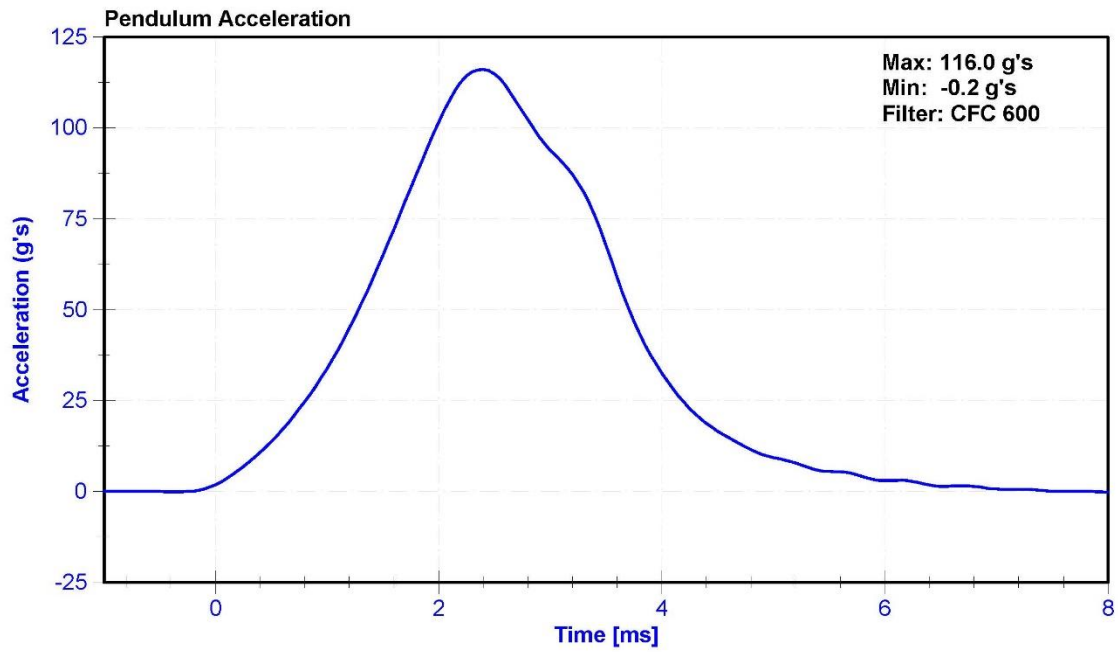
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.9	Pass
Humidity	10	70	%	23.5	Pass
Velocity	2.07	2.13	m/s	2.076	Pass
Maximum Resistive Force	4720	5780	N	5615.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





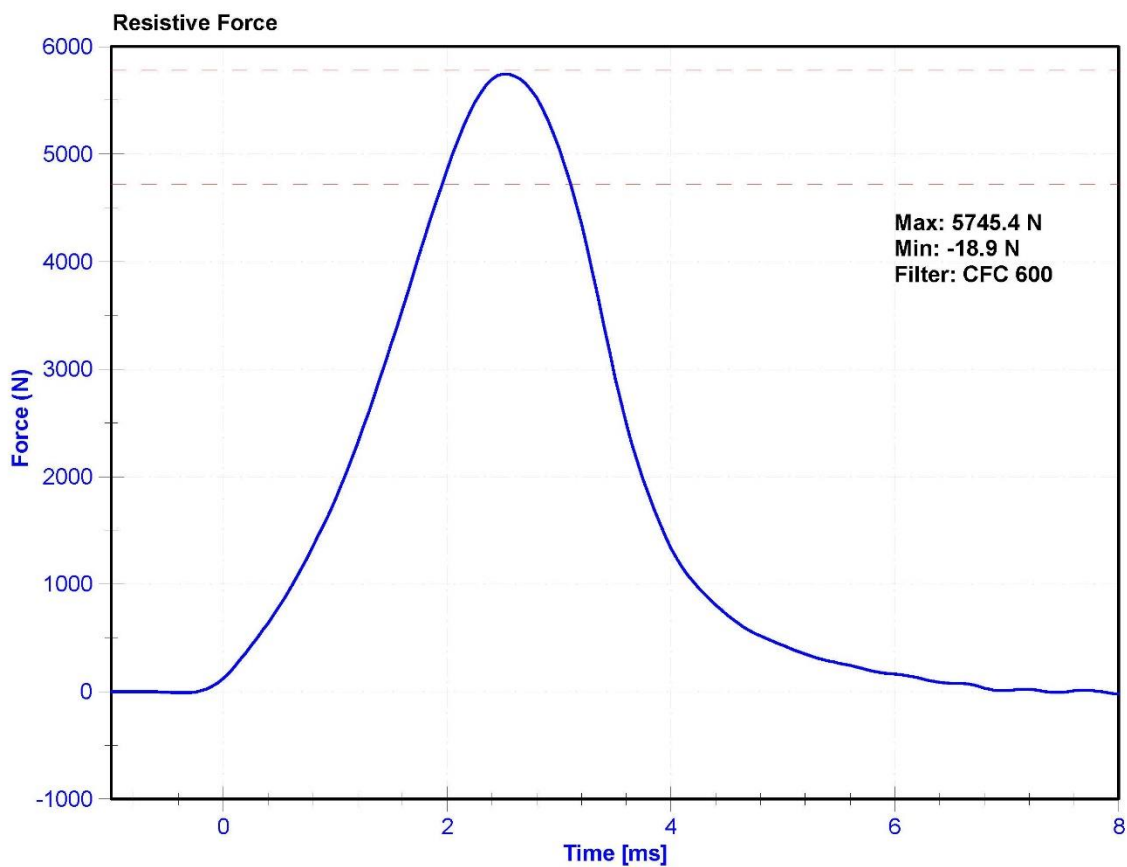
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

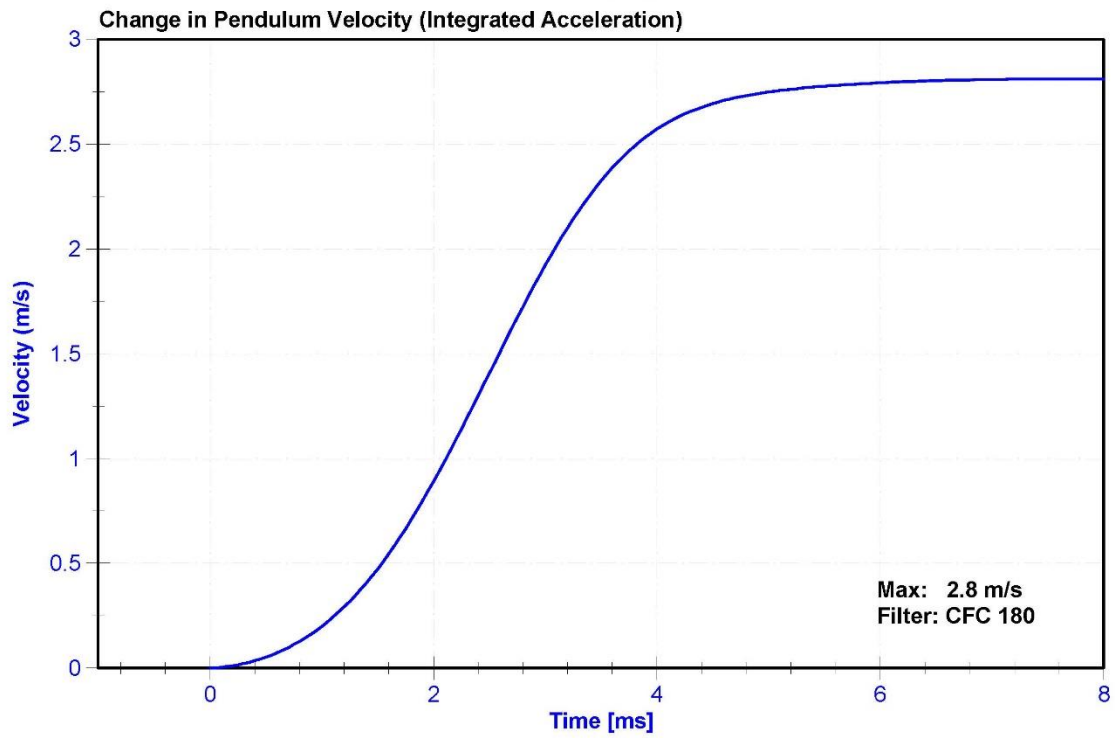
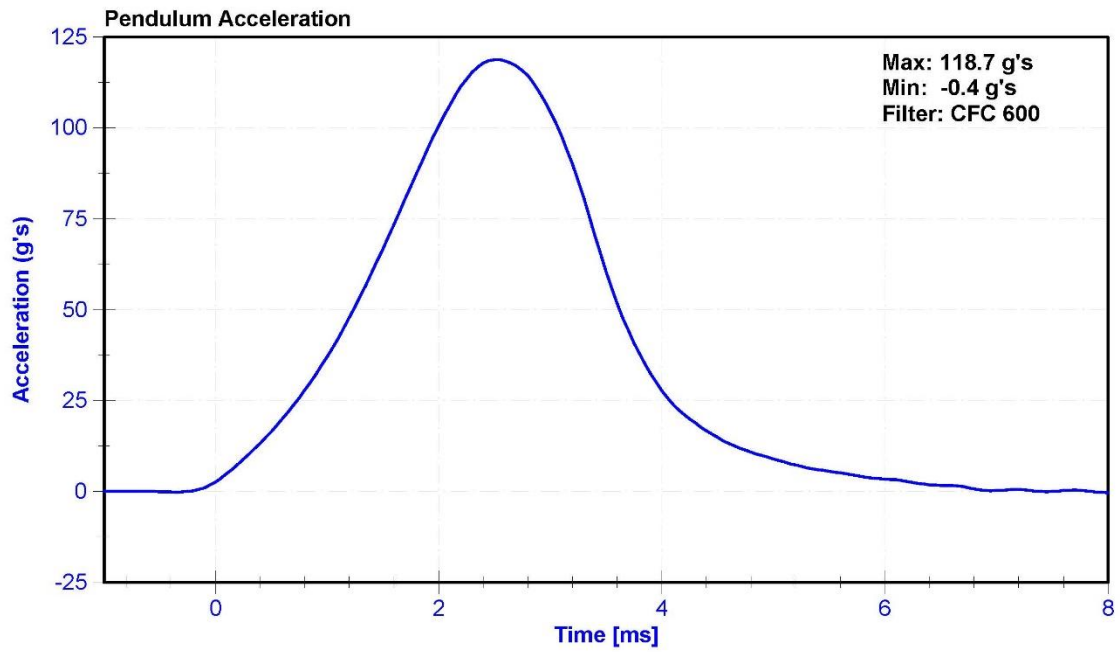
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.9	Pass
Humidity	10	70	%	23.5	Pass
Velocity	2.07	2.13	m/s	2.076	Pass
Maximum Resistive Force	4720	5780	N	5745.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 288

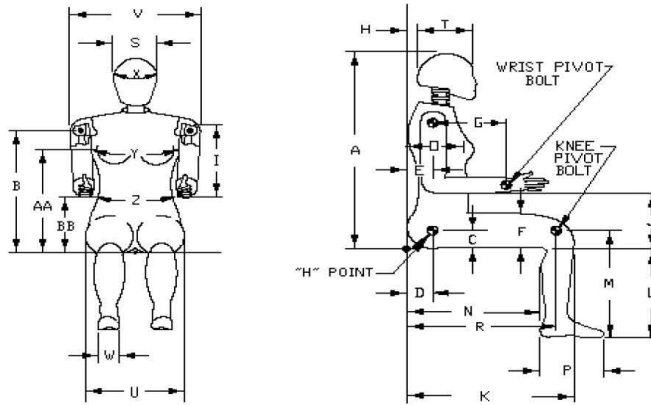


External Measurements - Hybrid 3 - 5th Female

Technician: Steve Keller

Date: 12/20/2016

Dummy Serial Number: 288



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	781	Pass
B	Shoulder Pivot Height	432	457	440	Pass
C	H-Point Height	81	86	84	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	76	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	251	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	282	Pass
J	Elbow Rest Height	183	203	187	Pass
K	Buttock to Knee Length	521	546	538	Pass
L	Popliteal Height	356	376	362	Pass
M	Knee Pivot Height	394	419	399	Pass
N	Buttock Popliteal Length	414	439	424	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	141	Pass
T	Head Depth	178	188	181	Pass
U	Hip Breadth	300	315	303	Pass
V	Shoulder Breadth	351	366	362	Pass
W	Foot Breadth	79	94	84	Pass
X	Head Circumference	528	549	535	Pass
Y	Chest Circumference with Jacket	851	881	854	Pass
Z	Waist Circumference	460	790	782	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

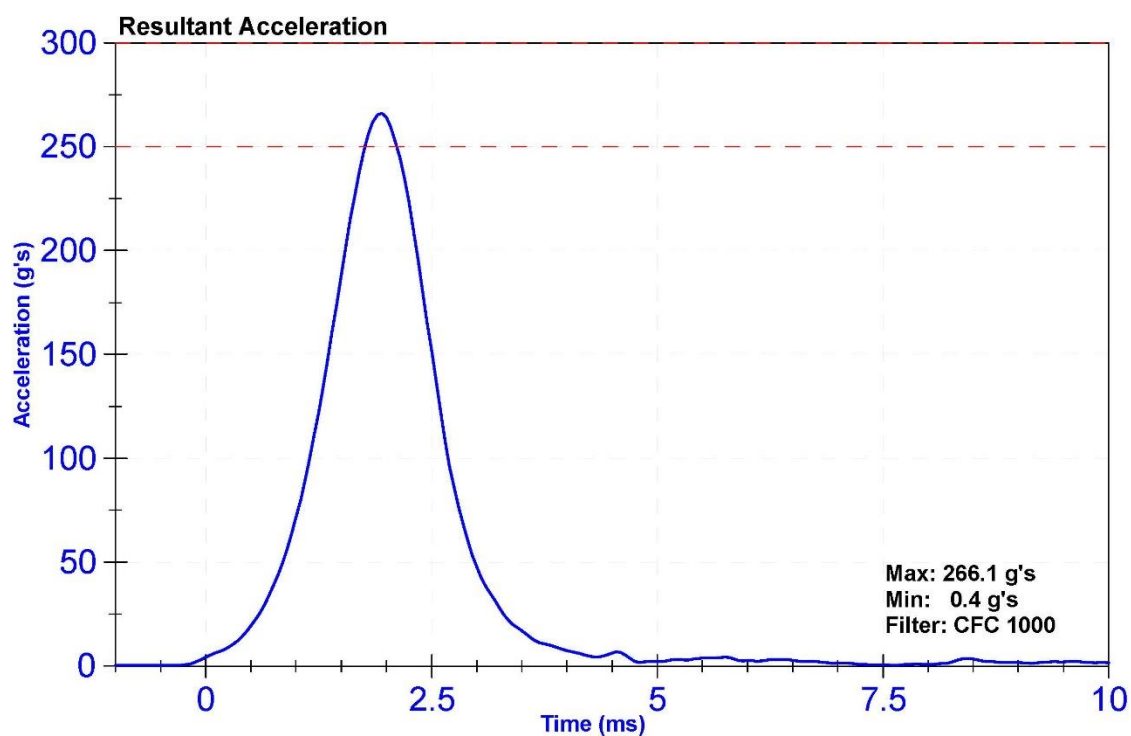
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

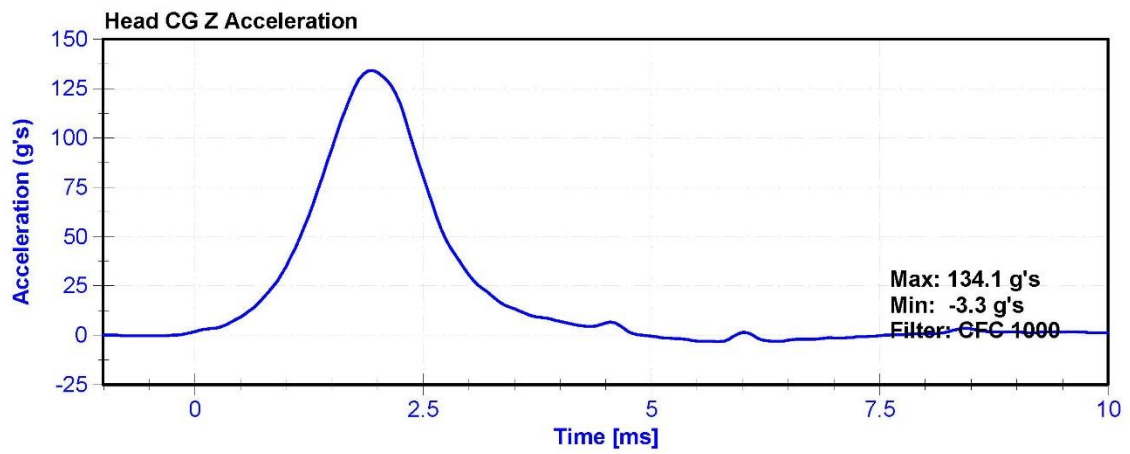
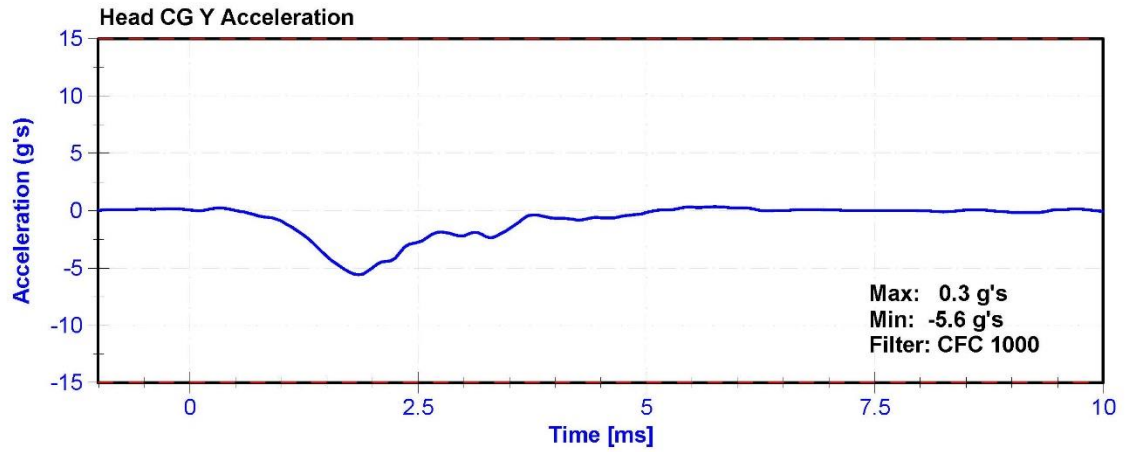
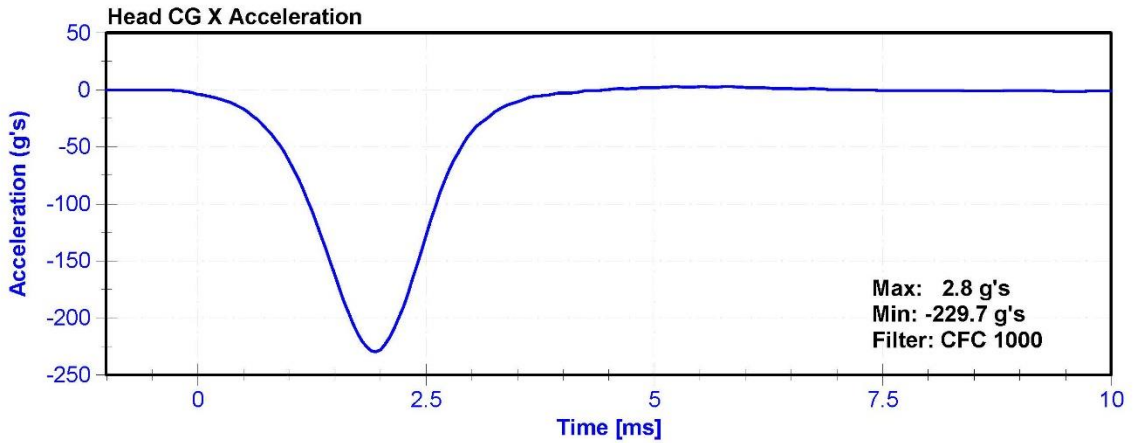
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.9	Pass
Humidity	10	70	%	19.4	Pass
Resultant Acceleration	250	300	g's	266.1	Pass
Oscillation	0	10	%	2.5	Pass
Lateral Acceleration	-15	15	g's	-5.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	10/3/2016	4/3/2017
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	10/3/2016	4/3/2017
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	10/3/2016	4/3/2017





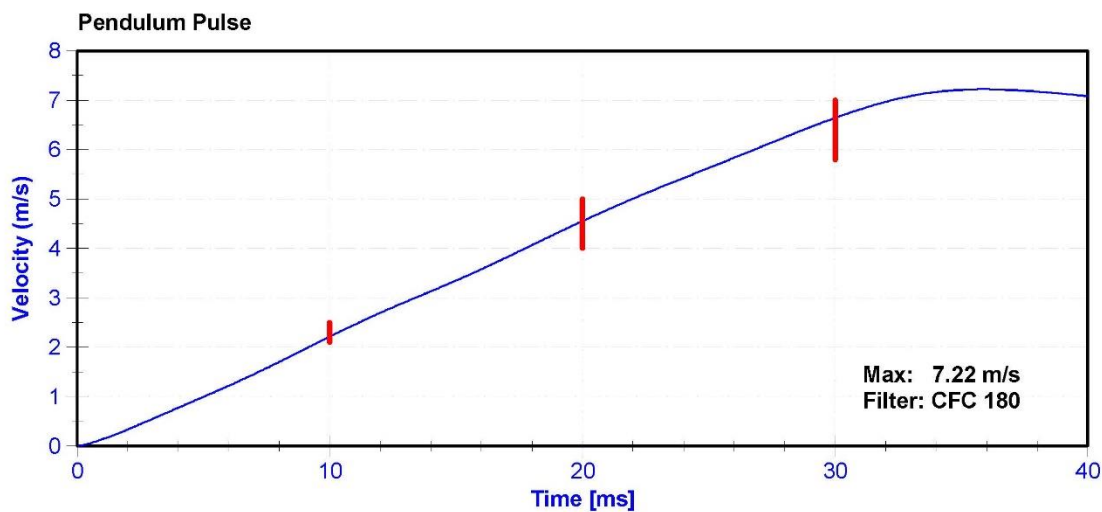
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

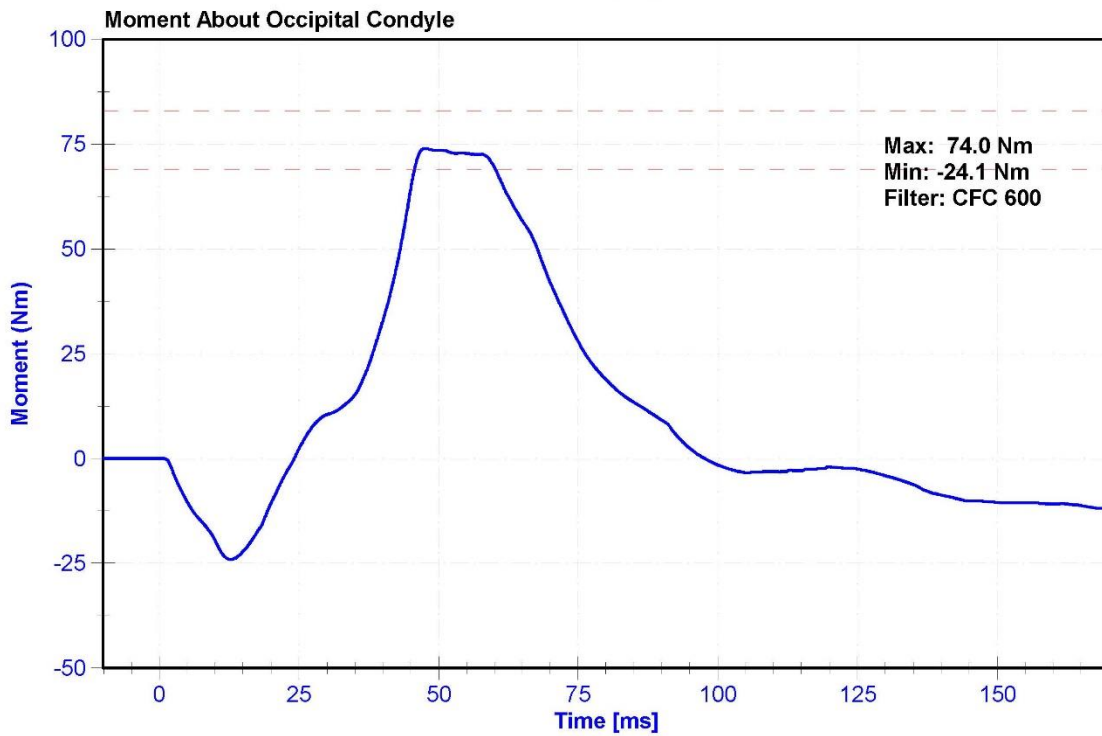
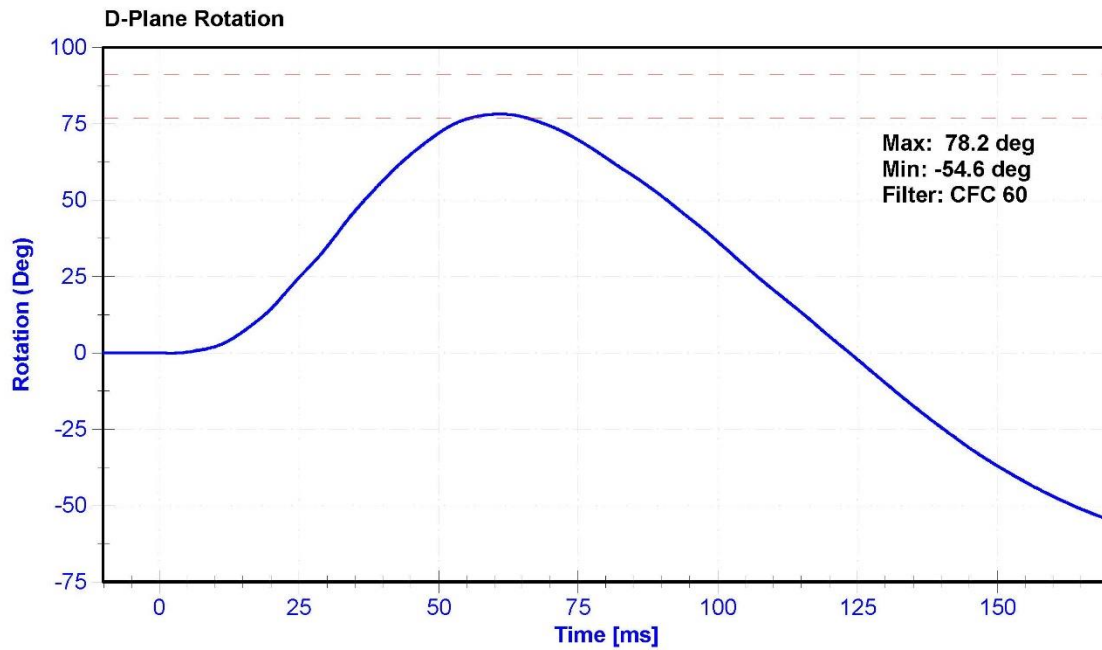
Results

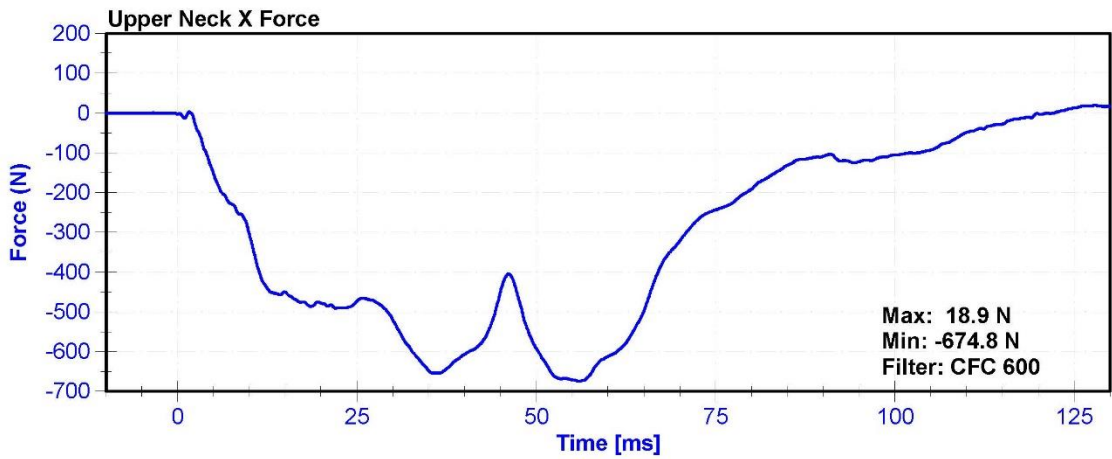
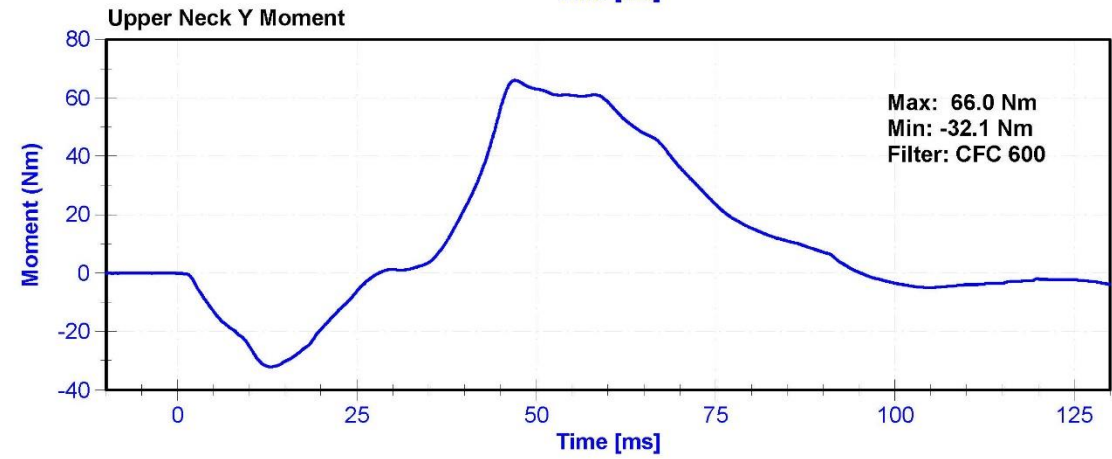
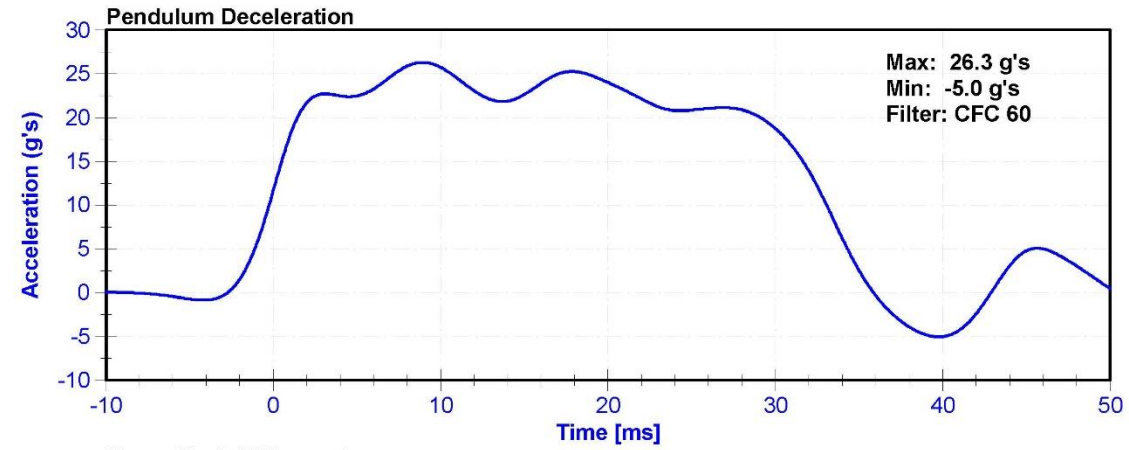
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	25.1	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.22	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.55	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.64	Pass
Max D Plane Rotation	77	91	deg	78.2	Pass
Max Moment During Rotation Interval	69	83	Nm	74.0	Pass
Moment Decay to 10.0 Nm	80	100	ms	89.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017







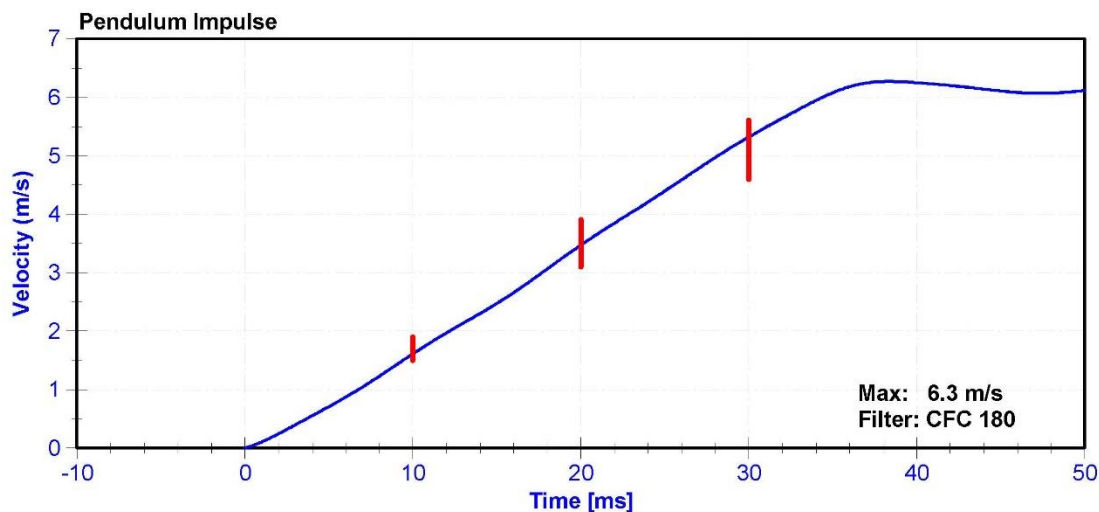
ATD Manufacturer	FTSS	Test Technician	S. Keller
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

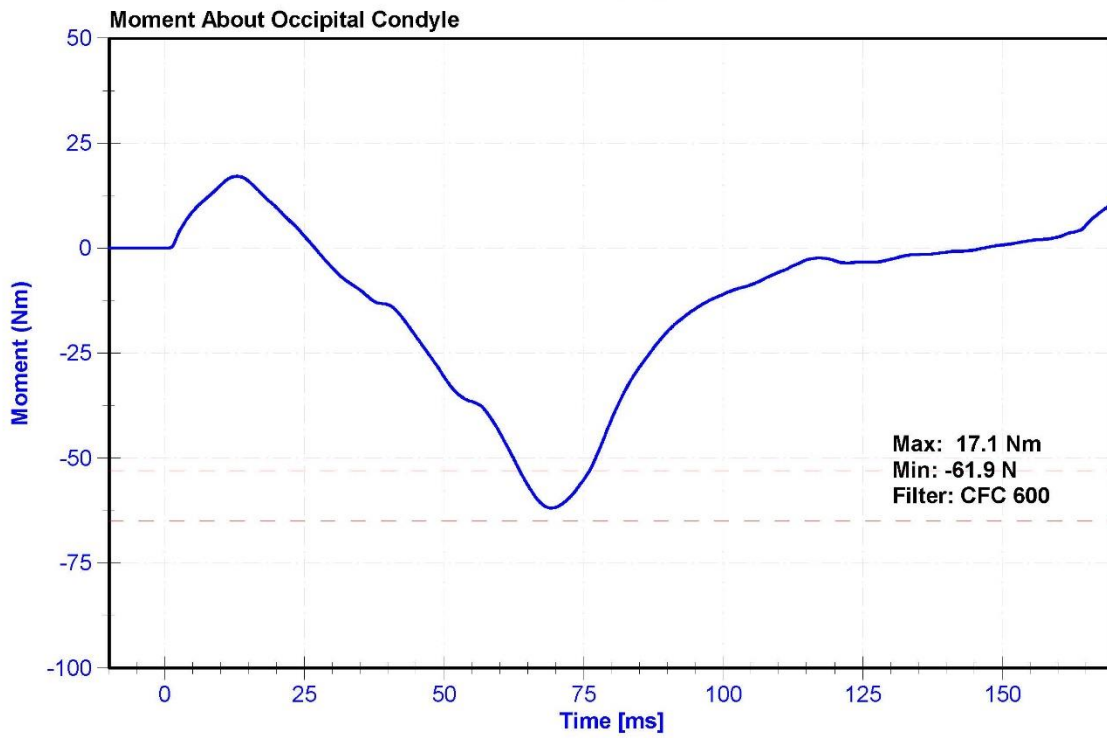
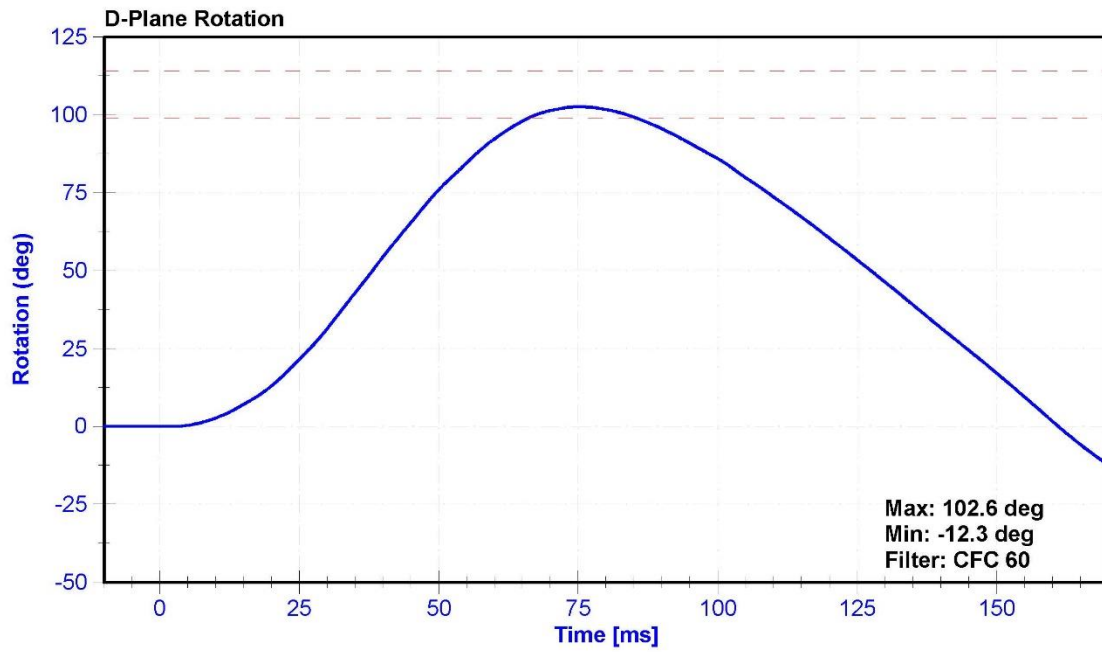
Results

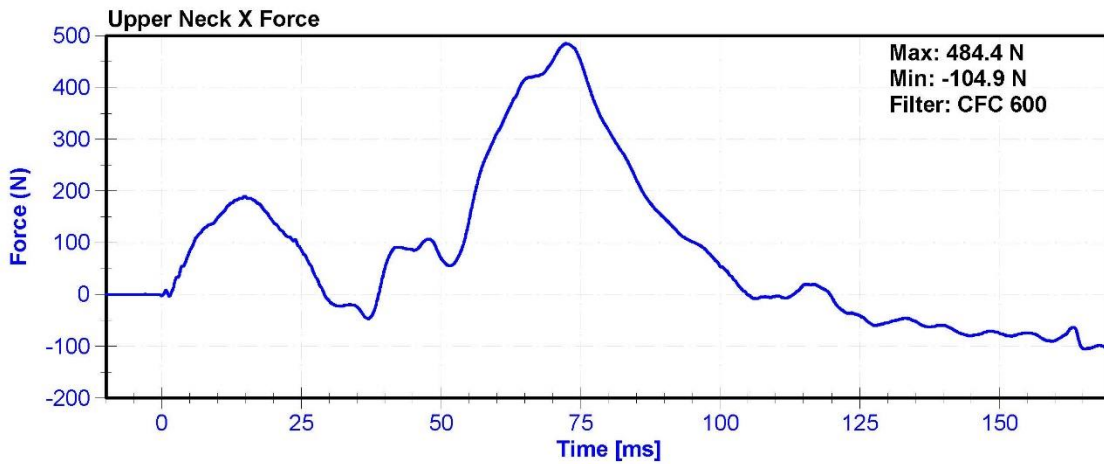
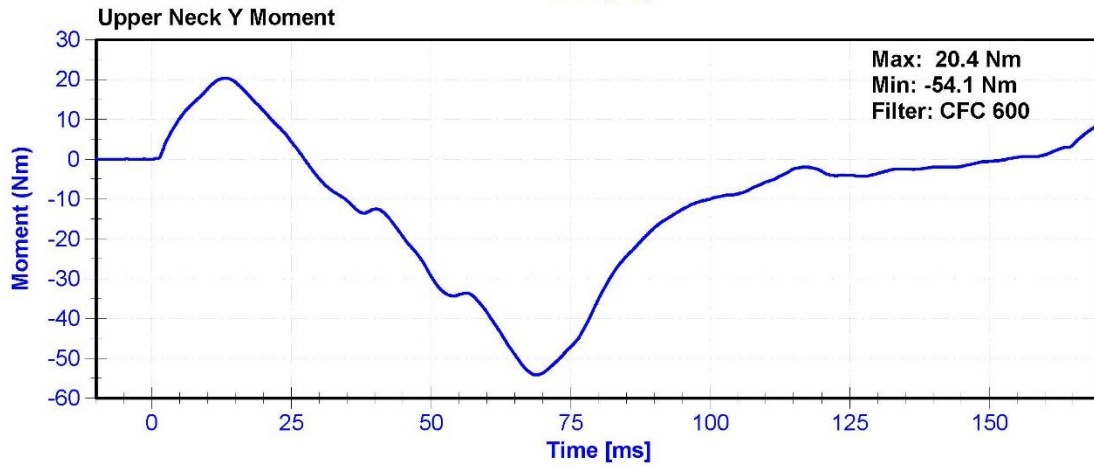
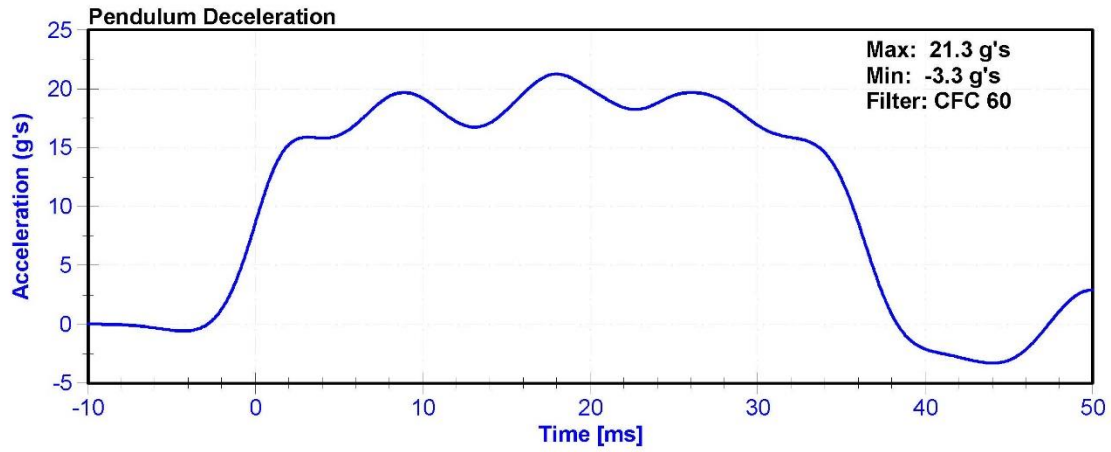
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	25.2	Pass
Velocity	5.95	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.61	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.47	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.32	Pass
D Plane Rotation	99	114	deg	102.6	Pass
Moment During Rotation Interval	-65	-53	Nm	-61.9	Pass
Moment Decay to -10Nm	94	114	ms	101.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/10/2016	5/10/2017
Pendulum Potentiometer	ETI SP22G	DS-PendPot	10/3/2016	10/3/2017
Condyle Potentiometer	ETI SP22G	DS-CondPot	10/3/2016	10/3/2017
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/24/2016	5/24/2017







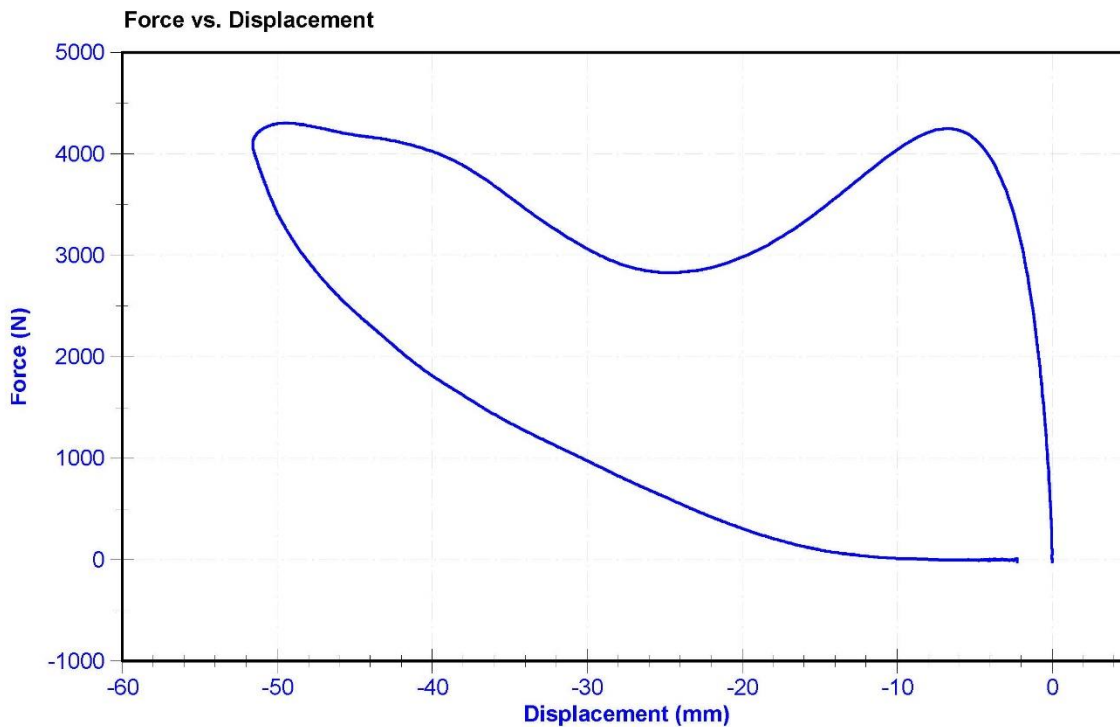
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

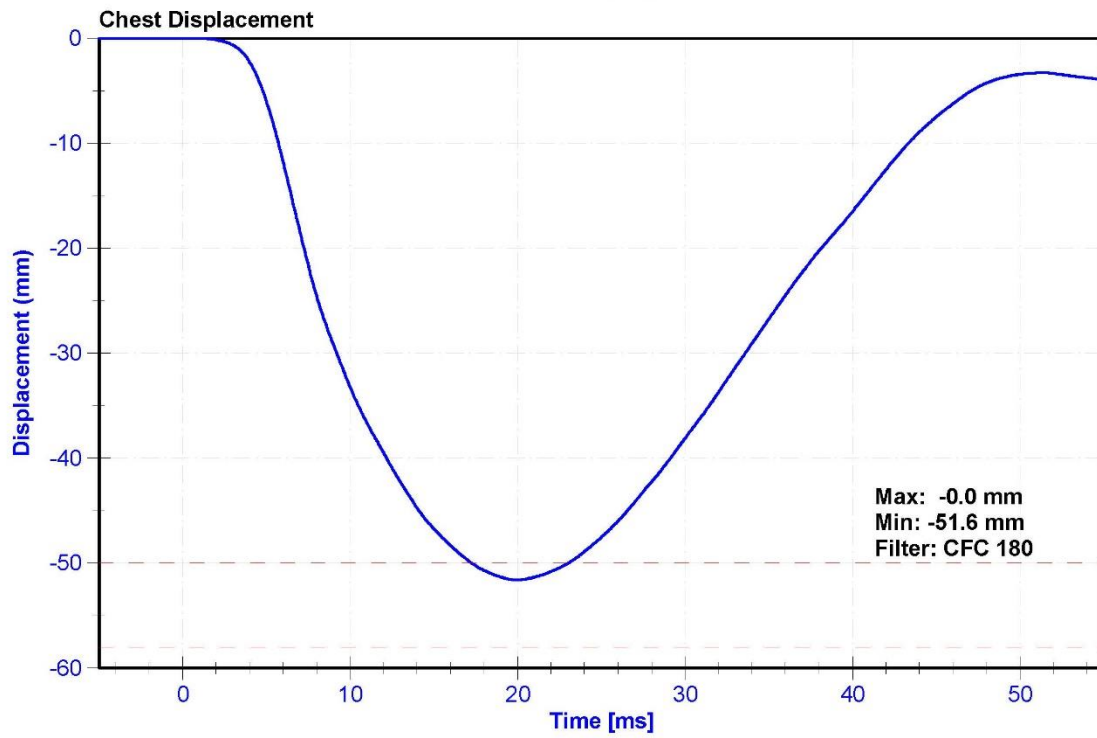
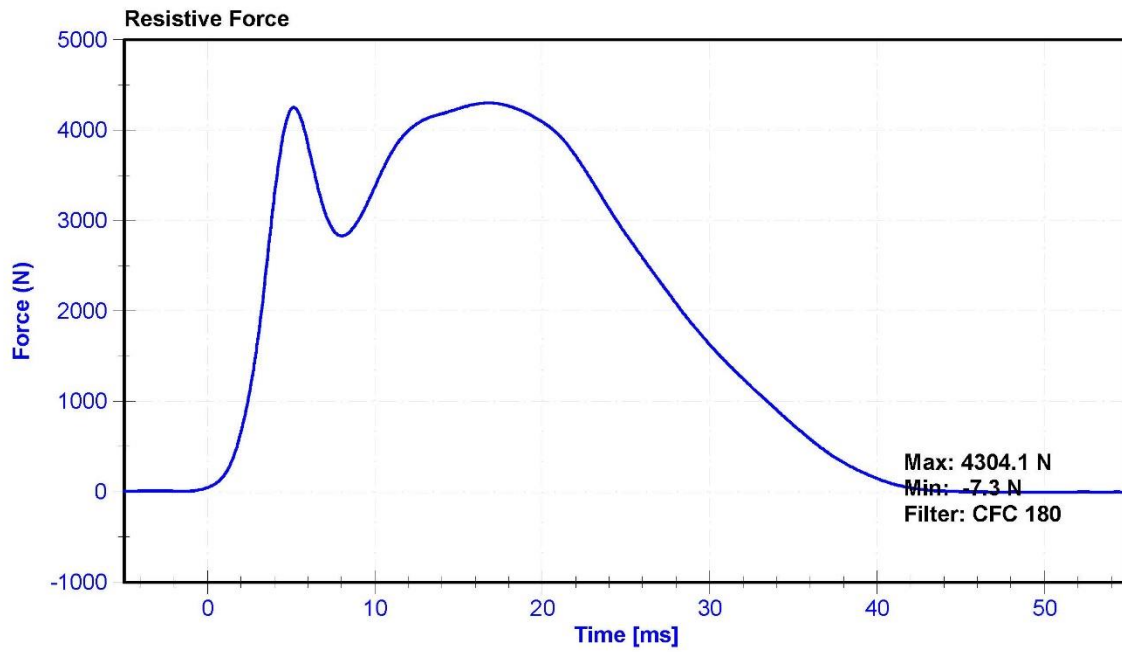
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	26	Pass
Velocity	6.59	6.83	m/s	6.641	Pass
Chest Deflection	-58	-50	mm	-51.6	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4298.5	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4304.1	Pass
Hysteresis	69	85	%	71.8	Pass

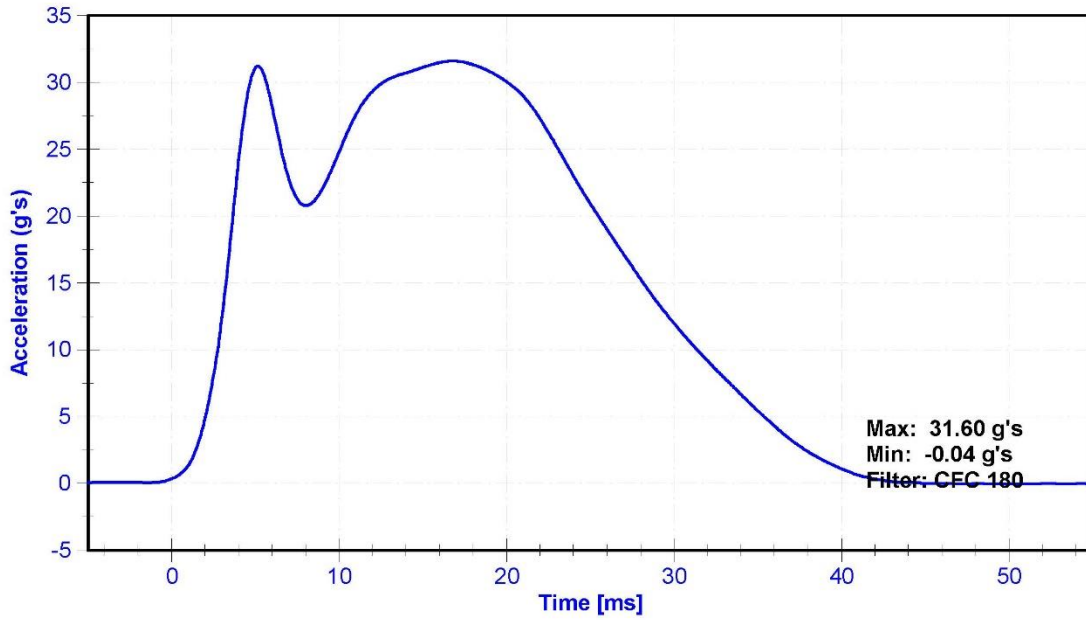
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/30/2016	9/30/2017

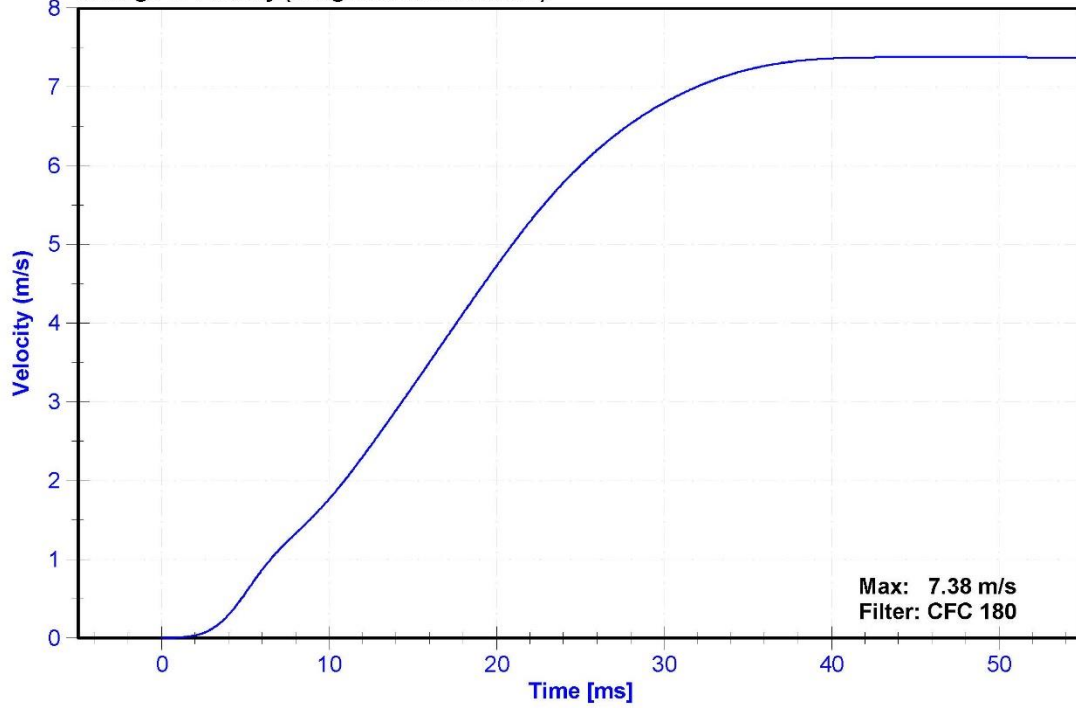




Probe Acceleration



Change in Velocity (Integrated Acceleration)



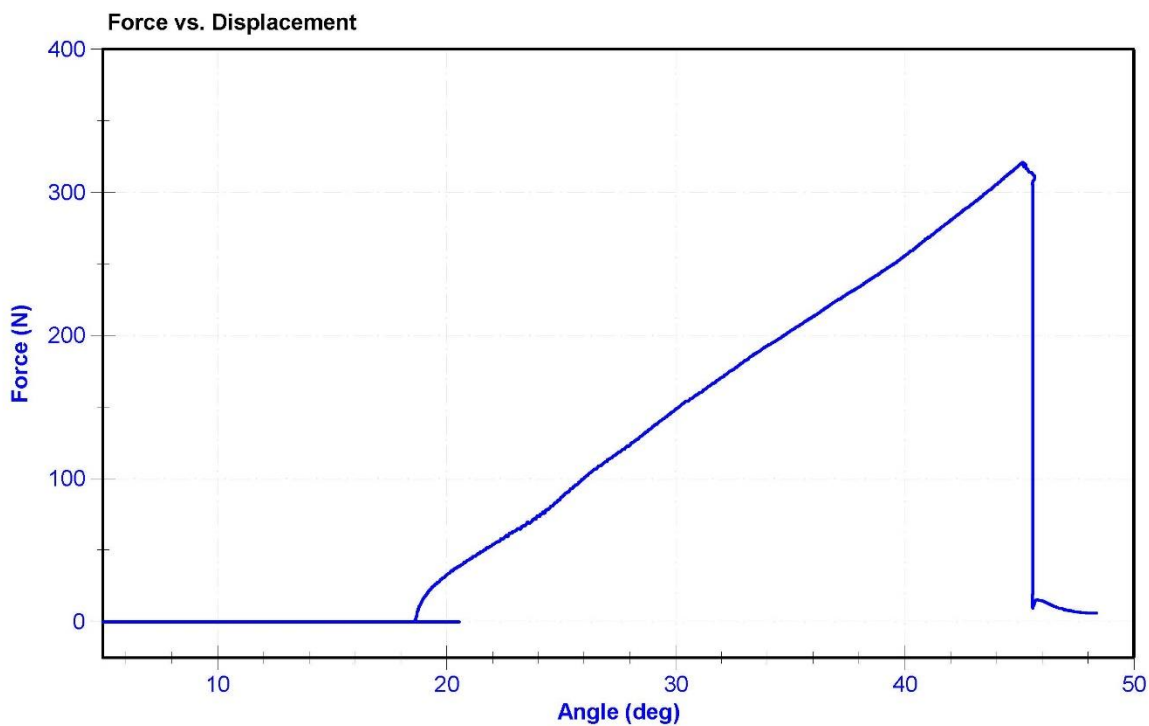
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.9	Pass
Humidity	10	70	%	28.3	Pass
Initial Angle	0	20	deg	18.6	Pass
Force at 45 Degrees	320	390	N	320.9	Pass
Return Angle Relative to Initial	0	8	deg	3.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	9/7/2016	9/7/2017
Load Cell	Interface SML-200	LC-493319	9/7/2016	9/7/2017



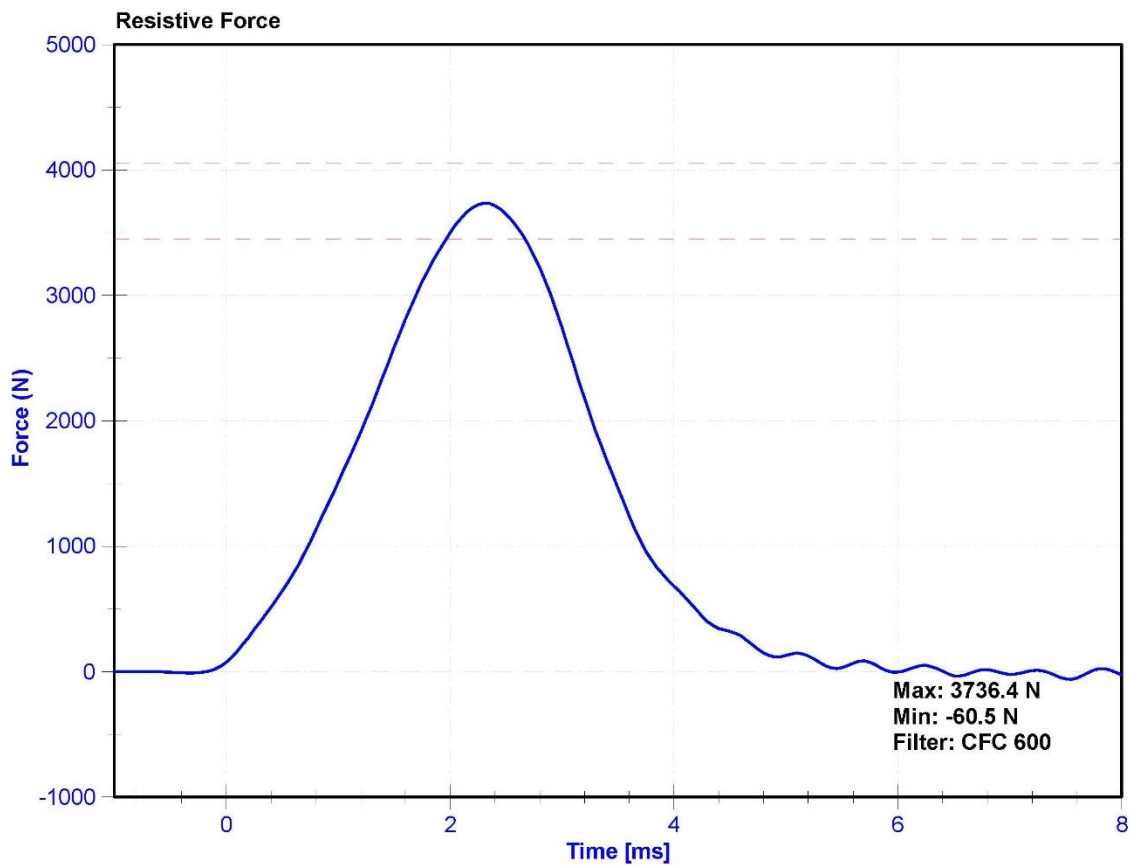
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

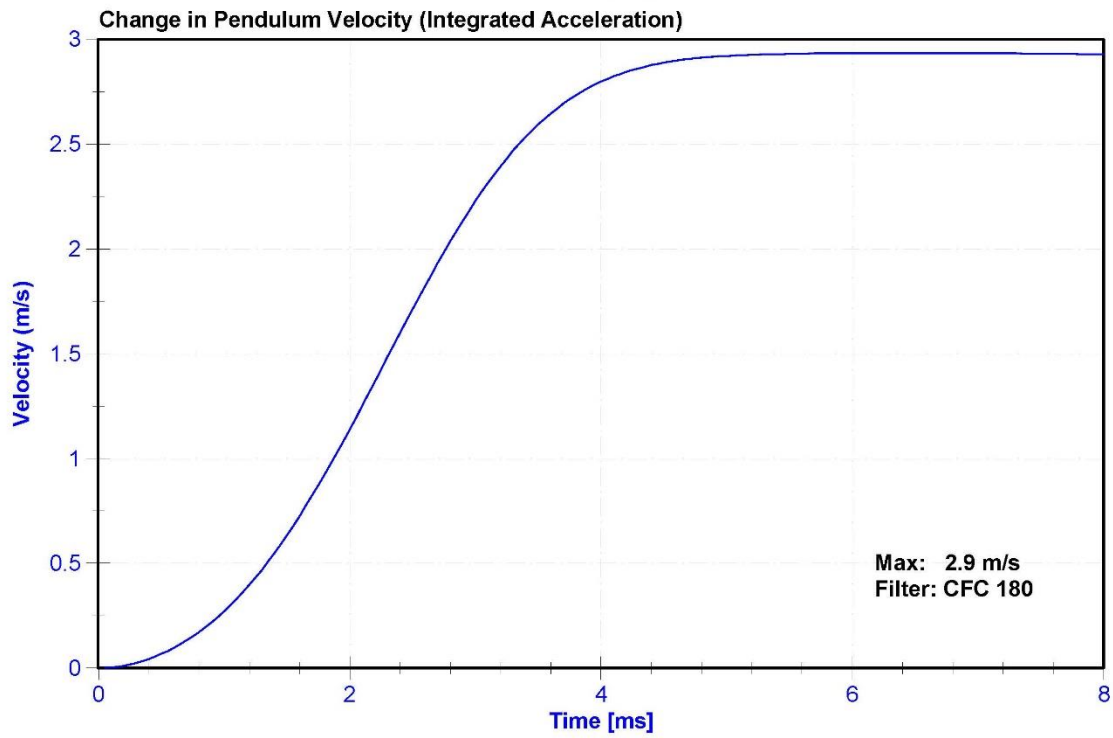
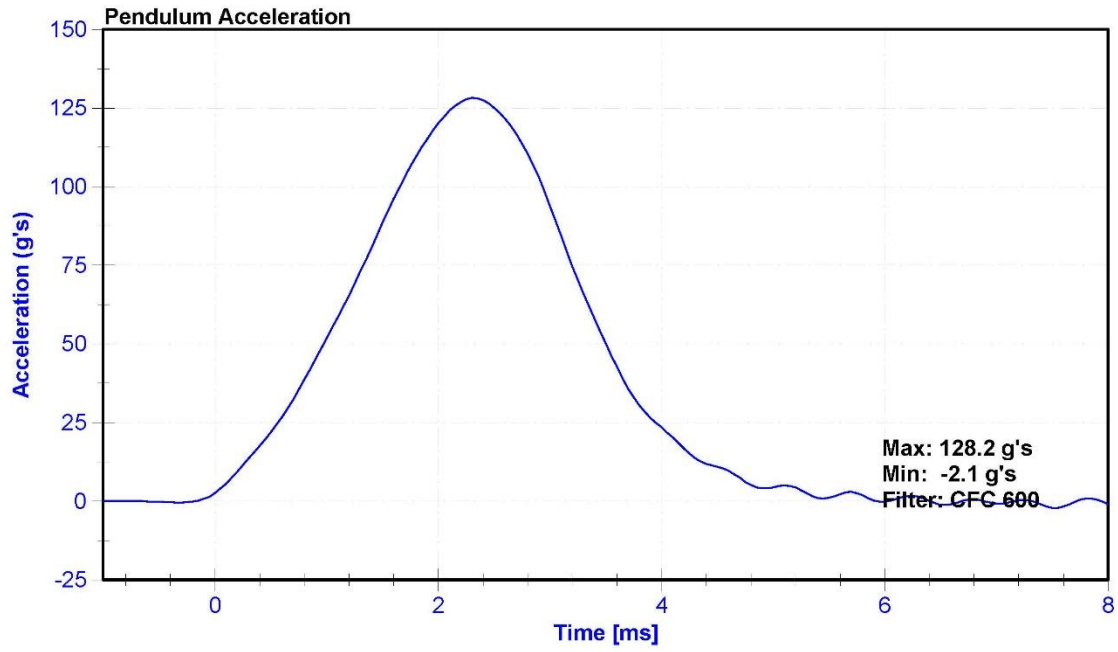
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.4	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.085	Pass
Resistive Force	3450	4060	N	3736.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017





ATD Manufacturer	FTSS	Test Technician	M.Hartung
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	21.4	Pass
Humidity	10	70	%	25.6	Pass
Velocity	2.07	2.13	m/s	2.083	Pass
Resistive Force	3450	4060	N	3642.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P21393	5/27/2016	5/27/2017

