

REPORT NUMBER: NCAP-CAL-16-004

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

**General Motors LLC
2016 Chevrolet Silverado
Double Cab Pickup Truck**

NHTSA No: O20160103

**PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 14225**



May 23, 2016

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**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Administration, in response to Contract Number DTNH22-12-D-00260.

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Date: May 23, 2016

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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16. Abstract A 56.30 km/h (35 mph), NCAP Frontal Impact Test was conducted on a 2016 Chevrolet Silverado Double Cab Pickup Truck 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 April 4, 2016. The impact velocity of the vehicle was 56.57 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 658 mm at vehicle centerline. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 1046)</th> <th colspan="2">Passenger ATD (Serial No. 288)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td>700</td> <td>431.636</td> <td>700</td> <td>227.262</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-23.930</td> <td>52</td> <td>-15.772</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.207</td> <td>1</td> <td>0.443</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>1196.680</td> <td>2,620</td> <td>1148.391</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-499.533</td> <td>2,520</td> <td>-368.248</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-1496.300</td> <td>6,805</td> <td>-251.883</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-1644.172</td> <td>6,805</td> <td>-1536.199</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 1046)		Passenger ATD (Serial No. 288)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)		700	431.636	700	227.262	Maximum Chest Compression	mm	63	-23.930	52	-15.772	Nij		1	0.207	1	0.443	Neck Tension	N	4,170	1196.680	2,620	1148.391	Neck Compression	N	4,000	-499.533	2,520	-368.248	Left Femur Force	N	10,008	-1496.300	6,805	-251.883	Right Femur Force	N	10,008	-1644.172	6,805	-1536.199
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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 2016 Chevrolet Silverado Double Cab Pickup Truck at a velocity of 56.57 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 4, 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 136 channels of data were recorded on an on-board data acquisition system. Please refer to Appendix B for the dummy response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was a total of 0.0 grams of stoddard solvent leakage after

the event and including all phases of the static rollover. The maximum static crush of the test vehicle was 658 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 bolster.

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

The occupant data is summarized below.

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 th)	431.636	0.207	1196.680	-499.533	42.057	-23.930	-1496.300	-1644.172
Passenger (5 th)	227.262	0.443	1148.391	-368.248	41.779	-15.772	-251.883	-1536.199

GENERAL COMMENTS:

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

Data Anomalies:

- Passenger Lap Force, Questionable data 40.5ms to 106ms

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: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20160103	Traction Control System (TCS)	Yes
Model Year	2016	Power Steering	Yes
Make	Chevrolet	Power Window Auto-Reverse	No
Model	Silverado 2500	Driver Frontal Airbag	Yes
Body Style	Double Cab Pickup Truck	Driver Curtain Airbag	Yes
VIN	1GC2KUEGXGZ166502	Driver Head/Torso Airbag	No
Body Color	Red	Driver Torso Airbag	No
Odometer Reading (km /mi)	299.3 km / 186 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	6.0	Driver Pelvis Airbag	No
Type / No. Cylinders	V8	Driver Knee Airbag	No
Engine Placement	Inline	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	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)	4309
Date of Manufacture	12/15	GAWR Front (kg)	2177
		GAWR Rear (kg)	2812

VEHICLE SEATING AND WEIGHT CAPACITY DATA

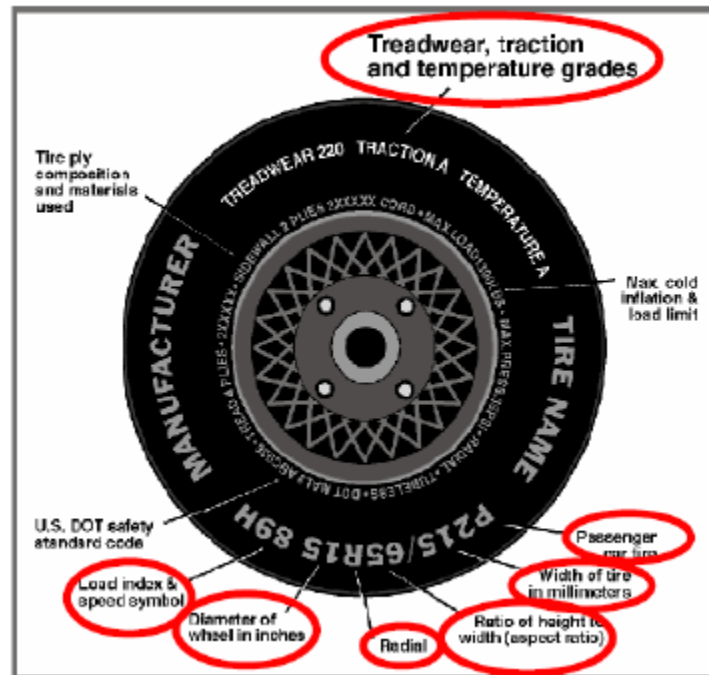
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Split Bench	Bench	-	
Number of Occupants	3	3	-	6
Capacity Wt. (VCW) (kg)				1268
Cargo Wt. (RCLW) (kg)				136

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

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



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	550	550
Cold Pressure (kPa)	420	550
Recommended Tire Size	LT 245/75R17 E	LT 245/75R17 E
Tire Size on Vehicle	LT 245/75R17 E	LT 245/75R17 E
Tire Manufacturer	Firestone	Firestone
Tire Model	Transforce HT	Transforce HT
Treadwear	N/A	N/A
Traction	N/A	N/A
Temperature Grades	N/A	N/A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index / Speed Symbol	121/118R	121/118R
Tire Material	Rubber	Rubber
DOT Safety Code Left	8X43TH24715	8X43TH24715
DOT Safety Code Right	8X43TH24715	8X43TH24715

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	876	645		932	730	
Right	kg	836	629		893	708	
Ratio	%	57	43		56	44	
Totals	kg	1712	1274	2986	1825	1438	3263

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2986	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	147	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	3269	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	1020	1023	1088	1090	1717
As Tested	mm	1014	1016	1078	1074	1773
Post-Test	mm	1033	1033	1081	1093	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	4024
Total Vehicle Length at Left Side	mm	6270
Total Vehicle Length at Centerline	mm	6364
Total Vehicle Length at Right Side	mm	6270
Weight of Ballast in Cargo Area	kg	63
Weight of Vehicle Components Removed	kg	34
Amount of Stoddard Solvent in Fuel Tank	L	126

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Jack, Rear Seats

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

TARGET VEHICLE STRUCTURAL MEASUREMENT

No.	Description	Pre-Test
1	Total Length	6364
2	Total Width	2006
3*	Bumper Top Height	760
4*	Bumper Bottom Height	522
5*	Longitudinal Member Top Height	672
6	Distance Between Longitudinal Members	913
7	Longitudinal Member Width	81
8*	Engine Top Height	1225
9*	Engine Bottom Height	383
10	Engine and Gearbox Width	536
11	Front Bumper-Engine Distance	901
12*	Front Shock Absorber Fixing Height	784
13*	Bonnet Leading Edge Height	1261
14	Front Shock Absorber Fixing Width	995
15	Front Bumper – Front Axle Distance	990
16	Front Axle – A Pillar Distance	580
17	A-Pillar – B-Pillar Distance	1143
18	B-Pillar – Rear Axle Distance	2300
19	B-Pillar – C-Pillar Distance	766
20*	Roof Sill Bottom Height	1863
21*	Roof Sill Top Height	1894
22*	Floor Sill Bottom Height	633
23*	Floor Sill Top Height	646

*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

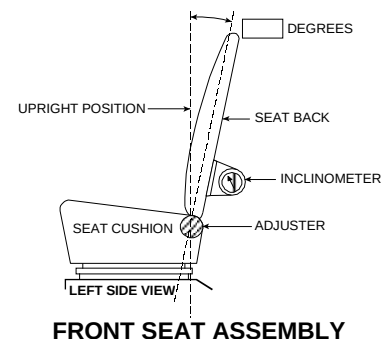
Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
Test Date: 4/4/2016

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	2.0
Passenger Seat Back Angle	0.4



SEAT FORE / AFT POSITIONS

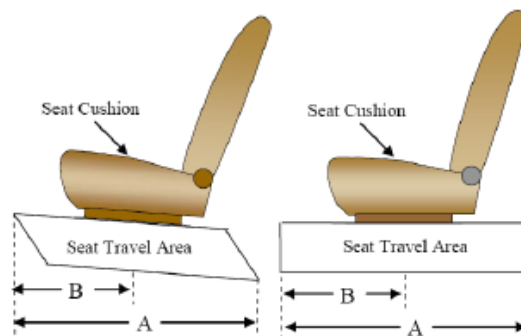
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	53 (0-52)	26
Passenger Seat	43 (0-42)	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	5	0 – Uppermost
Passenger Seat	5	0 – Uppermost



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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

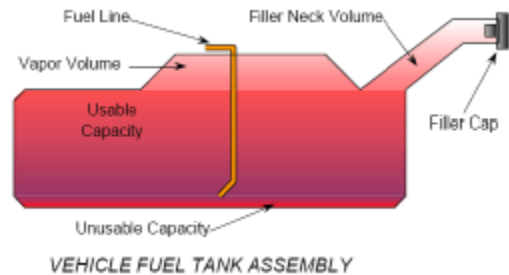
NHTSA No.: O20160103
 Test Date: 4/4/2016

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	135.1
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	124.3 – 127
Actual Amount of Solvent Used	125.6
1/3 of Usable Capacity	45

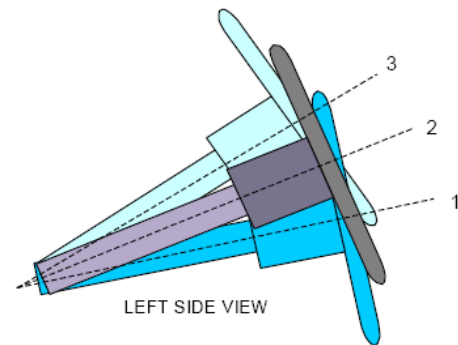
FUEL PUMP

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



STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

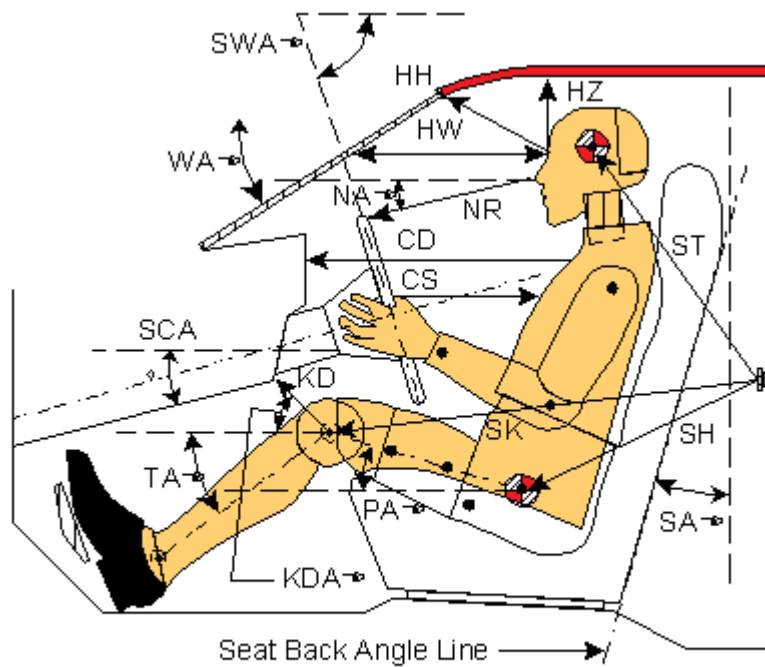
STEERING COLUMN POSITIONS

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	11.0	
Geometric center position No. 2	22.2	
Uppermost position No. 3	33.5	
Telescoping Steering Wheel Travel		N/A
Test Position	23.7	N/A

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



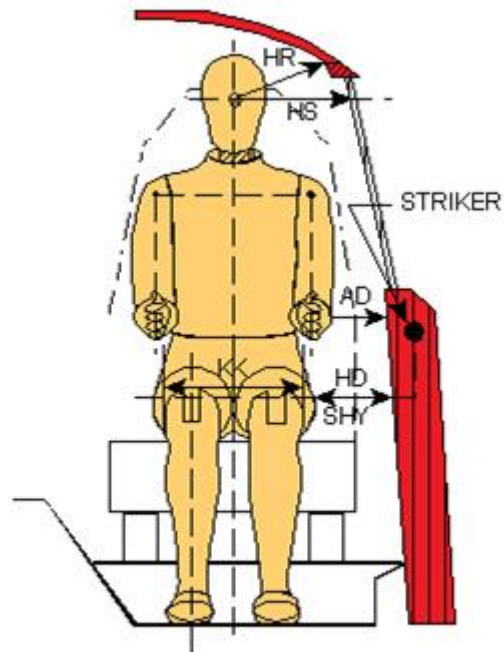
Left Side View

Code	Measurement Description	Driver (SN: 1046)		Passenger (SN: 288)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		33.3		
SWA°	Steering Wheel Angle		20.8		
SCA°	Steering Column Angle		69.2		
SA°	Seat Back Angle (on headrest post)		2.5		0.4
HZ	Head to Roof (Z)	280	90	330	90
HH	Head to Header	483	18.9	450	32
HW	Head to Windshield	766	0	747	0
NR	Nose to Rim	416	6.8	499	18.3
CD	Chest to Dash	557		452	
CS	Chest to Steering Hub	335	28		
RA	Rim to Abdomen	225	0		
KDL	Left Knee to Dash	175	24.8	150	28.2
KDR	Right Knee to Dash	170	18.4	148	29.8
PA°	Pelvic Angle		24.4		19.2
TA°	Tibia Angle		35.4		45.5
SK	Striker to Knee	598	5.6	642	2.4
ST	Striker to Head	651	81.2	583	76.6
SH	Striker to H-Point	244	12.3	324	2.2

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



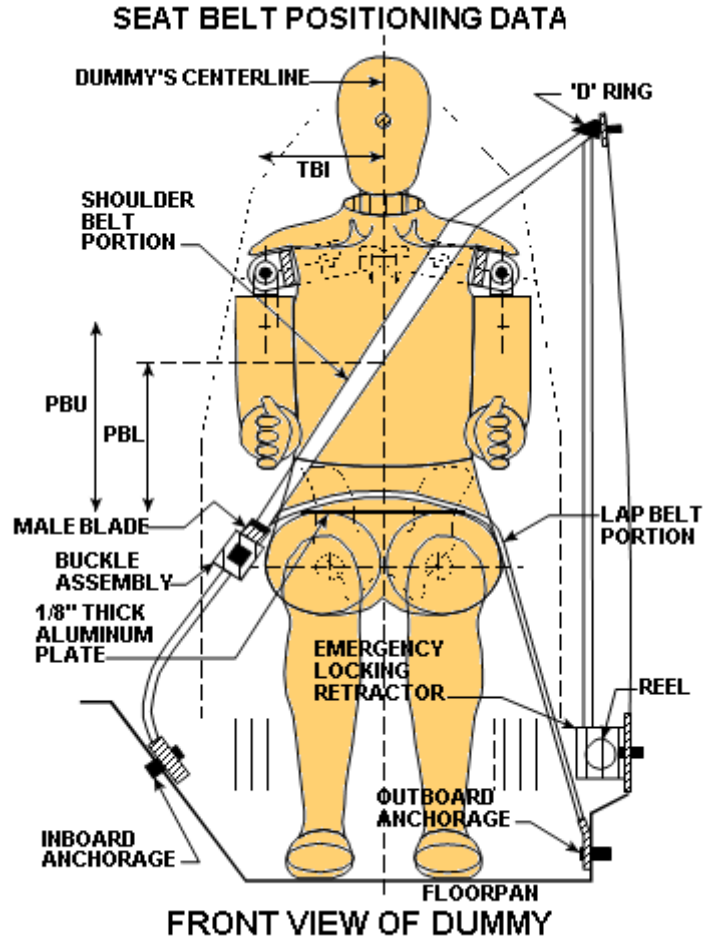
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	160	80
HD	H-Point to Door	152	172
HR	Head to Side Header	251	299
HS	Head to Side Window	352	370
KK	Knee to Knee	337	164
SHY	Striker to H-Point (Y Direction)	270	270
AA	Ankle to Ankle	352	157

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU — Top surface of reference to belt upper edge	mm	340	305
PBL — Top surface of reference to belt lower edge	mm	265	230

BELT LENGTH DATA

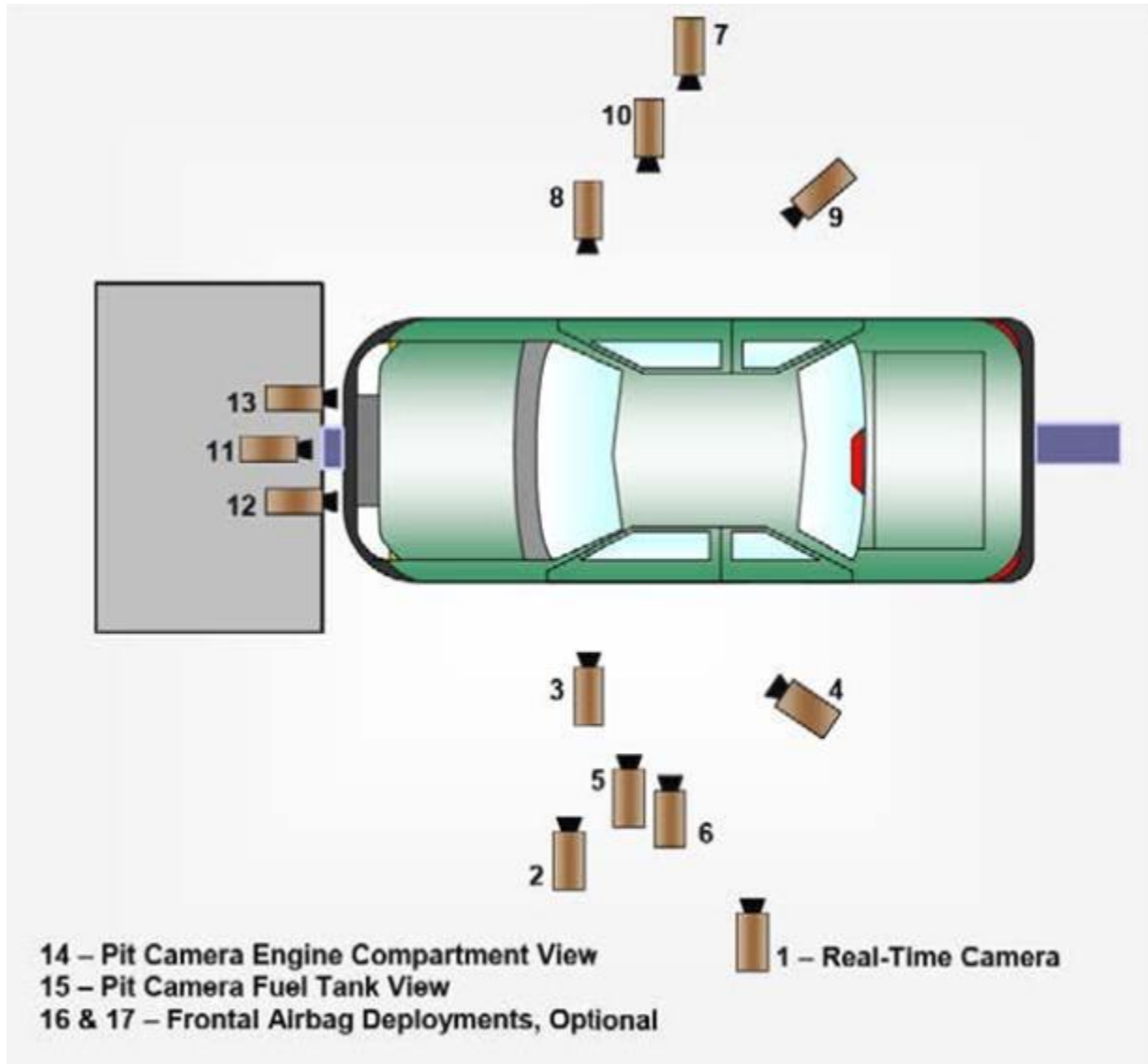
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	850	880
Lap Belt Length as measured on ATD	mm	535	485
Remainder of belt on reel	mm	915	935
Total belt length for continuous webbing systems	mm	2300	2300

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
Test Date: 4/4/2016

CAMERA POSITIONS FOR FRONTAL IMPACTS



Top View

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

CAMERA LOCATIONS

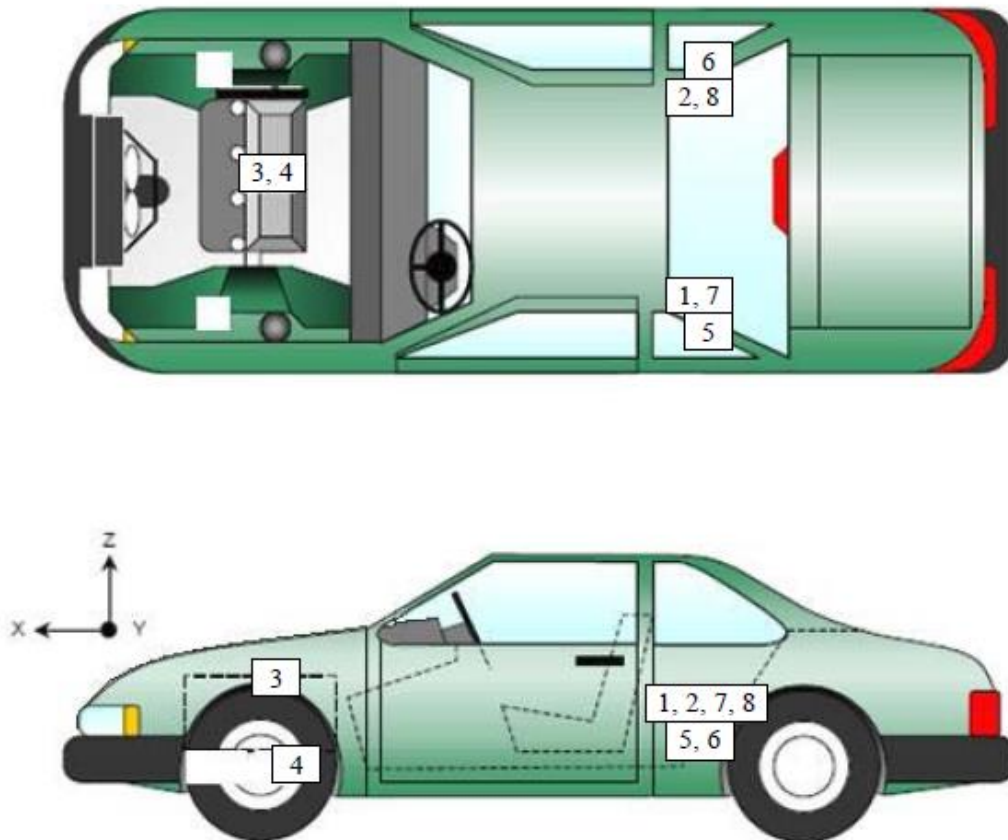
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Driver Close-Up	-1849	-8668	-1617	50	1000
3	Left Front Half	-1594	-8304	-1558	50	1000
4	Left Angle	-2503	-3062	-2309	24	1000
5	Steering Column - Top					
6	Steering Column - Bottom					
7	Right Overall	-2631	9964	-1402	24	1000
8	Passenger Close-Up	-1773	7747	-1589	50	1000
9	Right Front Half	-957	7020	-1341	28	1000
10	Right Angle	-2562	2975	-2185	24	1000
11	Windshield	125	0	-3505	20	1000
12	Driver Windshield	-341	-600	-2051	12.5	1000
13	Passenger Windshield	-341	600	-2051	12.5	1000
14	Pit Front	-799	0	2110	12.5	1000
15	Pit Rear	-3120	0	2110	12.5	1000
16	Onboard Driver Airbag (Optional)				12.5	1000
17	Onboard Passenger Airbag (Optional)				12.5	1000

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

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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	3014	-661	-168
2	Right Rear Accelerometer – X Direction	3018	647	-168
3	Engine Top X	5203	39	-612
4	Engine Bottom X	4586	-399	136
5	Left Rear Accelerometer – Z Direction	3014	-661	-168
6	Right Rear Accelerometer – Z Direction	3018	647	-168
7	Left Rear Accelerometer – X Direction Redundant	3013	-638	-171
8	Right Rear Accelerometer – X Direction Redundant	3018	632	-170

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

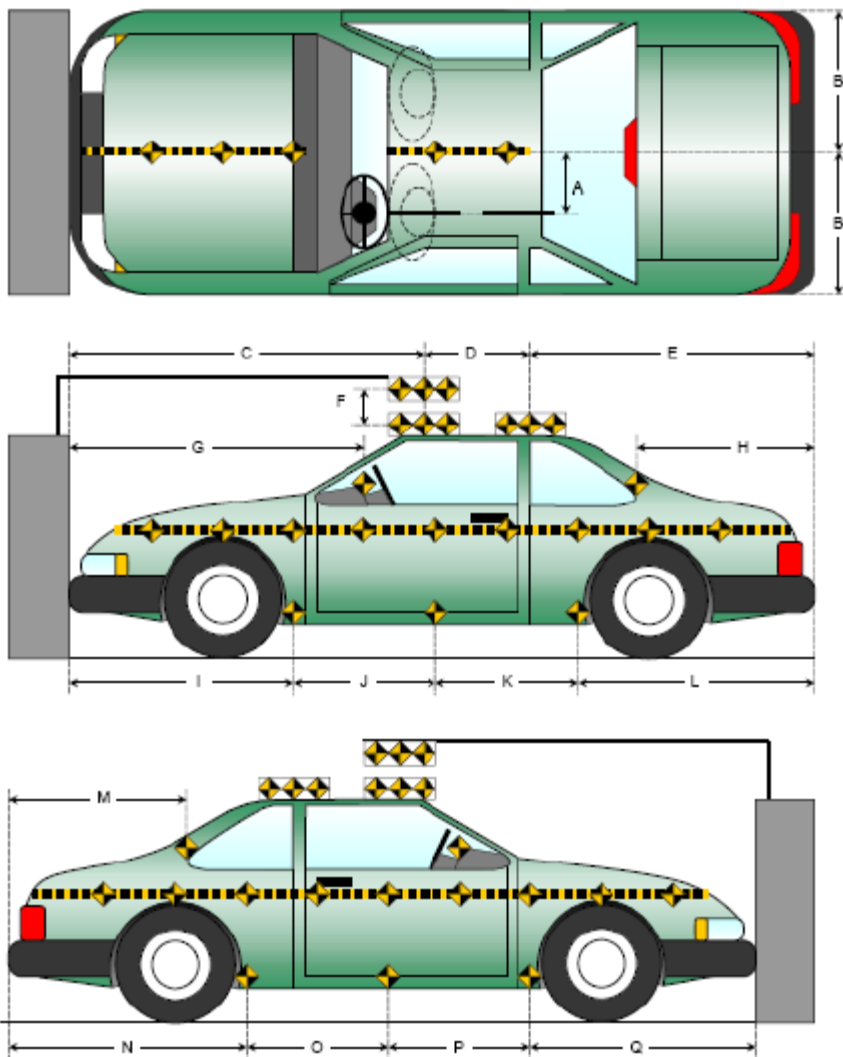
DATA SHEET NO. 8
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

Item	Value
A	454
B	1003
C	2735
D	611
E	3018
F	188
G	1895
H	2838
I	1535
J	1462
K	1476
L	1890
M	2840
N	1896
O	1467
P	1467
Q	1534

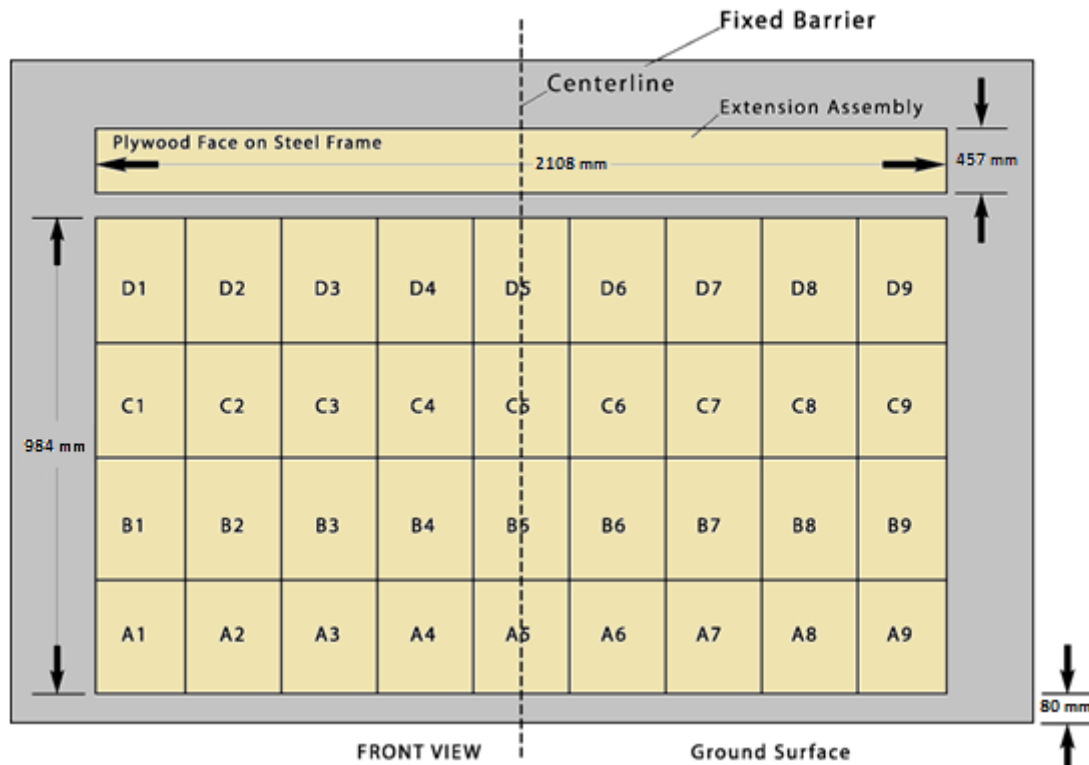
All units in millimeters



DATA SHEET NO. 9
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



***Load Cell wall was not used for test.**

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: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
Test Date: 4/4/2016

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 Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Knee Bolster
Right Knee Contact	Knee Bolster	Knee Bolster

DOOR OPENING AND SEAT TRACK INFORMATION

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	Spare Tire Detached during impact

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	309
Center	mm	334
Right Side	mm	305
Average	mm	316

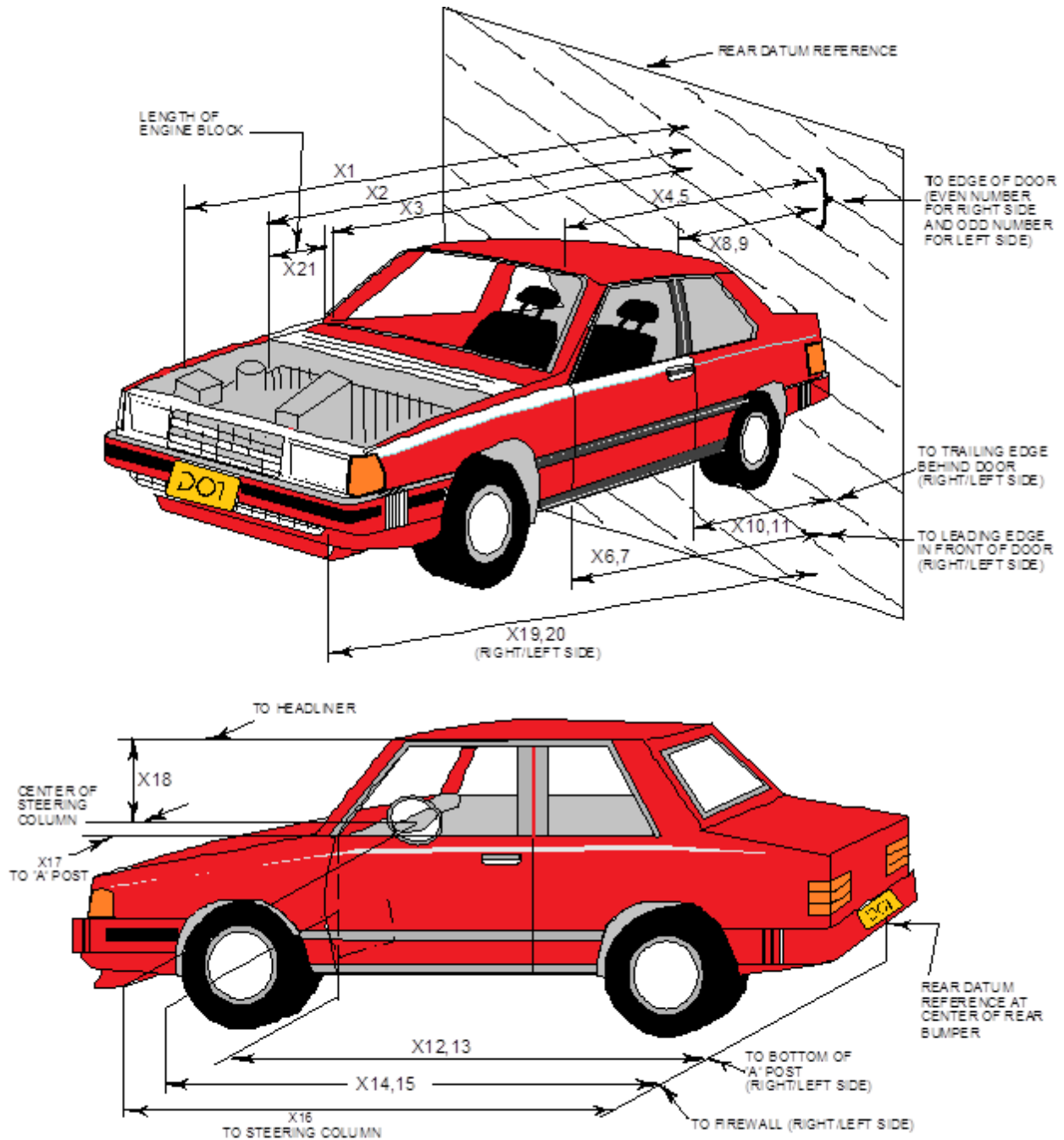
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	6364	5706	-658
2	Rear Surface of Vehicle (RSOV) to Front of Engine	5462	5342	-120
3	RSOV to Firewall	5170	5122	-48
4	RSOV to Upper Leading Edge of Right Door	4795	4768	-26
5	RSOV to Upper Leading Edge of Left Door	4790	4764	-26
6	RSOV to Lower Leading Edge of Right Door	4739	4731	-7
7	RSOV to Lower Leading Edge of Left Door	4733	4709	-24
8	RSOV to Upper Trailing Edge of Right Door	3656	3632	-24
9	RSOV to Upper Trailing Edge of Left Door	3652	3628	-24
10	RSOV to Lower Trailing Edge of Right Door	3628	3623	-4
11	RSOV to Lower Trailing Edge of Left Door	3625	3622	-2
12	RSOV to Bottom of "A" Post of Right Side	4893	4867	-27
13	RSOV to Bottom of "A" Post of Left Side	4891	4867	-24
14	RSOV to Firewall, Right Side	5120	5086	-34
15	RSOV to Firewall, Left Side	5115	5083	-32
16	RSOV to Steering Column	4296	4282	-14
17	Center of Steering Column to "A" Post	303	289	-14
18	Center of Steering Column to Headliner	422	438	15
19	RSOV to Right Side of Front Bumper	6317	5751	-566
20	RSOV to Left Side of Front Bumper	6317	5745	-572
21	Length of Engine Block	411	411	0
RD	RSOV to Right Side of Dash Panel	4447	4424	-23
CD	RSOV to Center of Dash Panel	4470	4433	-37
LD	RSOV to Left Side of Dash Panel	4443	4423	-20

*UR= Unrecoverable data point
 All Dimensions in mm

DATA SHEET NO. 13
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
Test Date: 4/4/2016

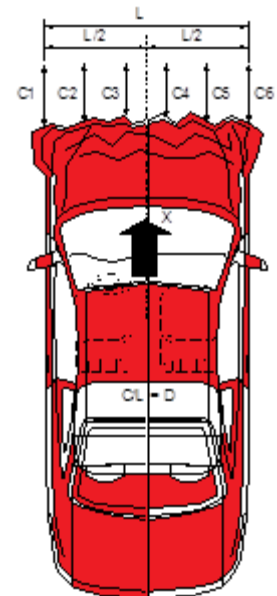
VEHICLE INFORMATION

VIN: 1GC2KUEGXGZ166502
Vehicle Size Category: Truck

Wheelbase (mm): 4,024
Test Weight (kg): 3,263

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): 56.57
Velocity Change (km/h): 56.57
Time of Separation (ms): 190



CRUSH PROFILE

Collision Deformation Classification: 12FDEW3
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1750
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	6173	5682	491
C2	Crush Zone 2 at Left Side	mm	6312	5744	568
C3	Crush Zone 3 at Left Side	mm	6355	5730	625
C4	Crush Zone 4 at Right Side	mm	6355	5732	623
C5	Crush Zone 5 at Right Side	mm	6313	5751	562
C6	Crush Zone 6 at Right Side	mm	6176	5689	487
L	C1 to C6	mm	1750	1786	-36

DATA SHEET NO. 14
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

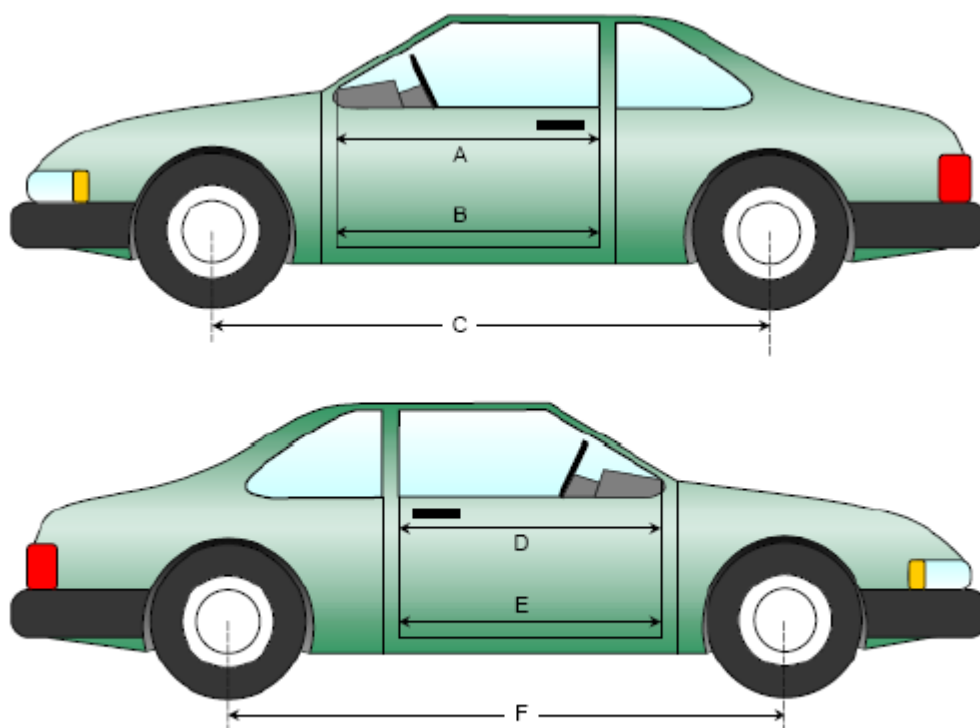
NHTSA No.: O20160103
Test Date: 4/4/2016

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1037	1037	0
B	Left Side Lower	mm	956	955	-1
D	Right Side Upper	mm	1037	1036	-1
E	Right Side Lower	mm	960	960	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	4024	3871	-153
F	Right Side Wheelbase	mm	4024	3892	-132



Left & Right Side Views

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

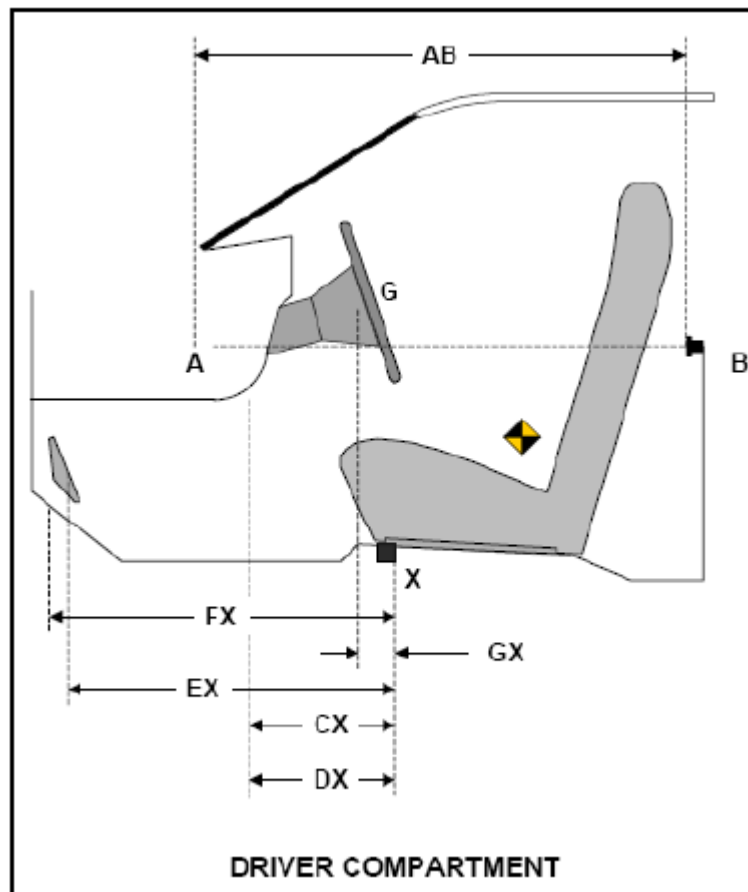
Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	738	740	2
CX	Left Knee Bolster to X	mm	325	309	-16
DX	Right Knee Bolster to X	mm	325	297	-28
EX	Brake Pedal to X	mm	547	522	-25
FX	Foot Rest to X	mm	734	722	-12
GX	Center of Steering Column Wheel Hub to X	mm	106	102	-4

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016

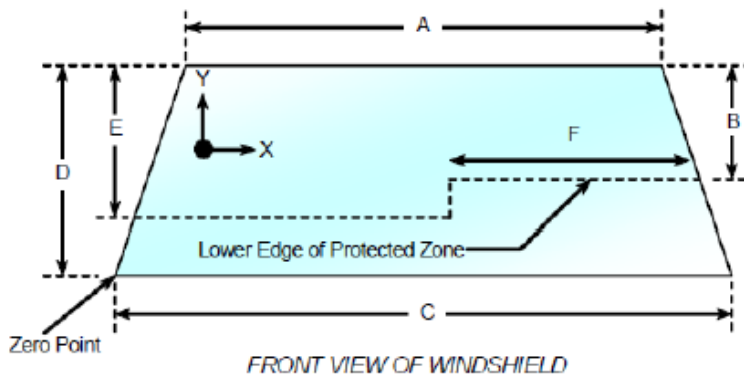
Windshield Mounting Details: A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

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	2304	2304	100
Right Side	2304	2304	100
Total	4608	4608	100



Item	Units	Value
A	mm	1380
B	mm	415
C	mm	1640
D	mm	794
E	mm	417
F	mm	620

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: 2016 Chevrolet Silverado Double Cab Pickup Truck
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
Test Date: 4/4/2016

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21 ° C

Test Time: 11:47 AM

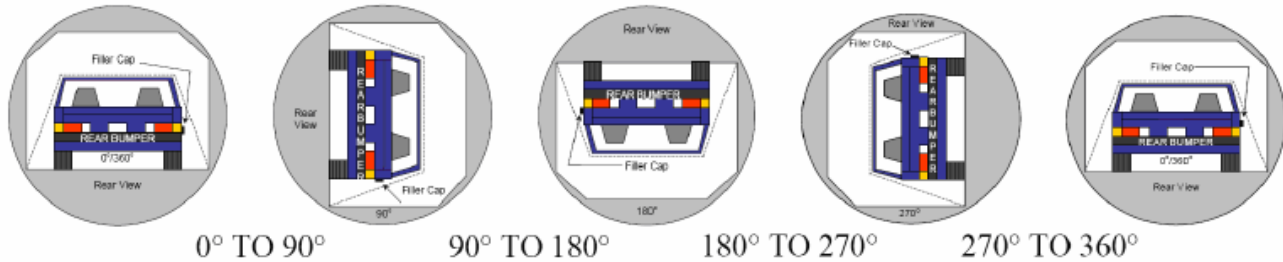
STODDARD SOLVENT SPILLAGE MEASUREMENTS

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

DATA SHEET NO. 16
FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	63	300	363
90° to 180°	67	300	367
180° to 270°	68	300	368
270° to 360°	67	300	367

FMVSS 301 SPILLAGE TABLE

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

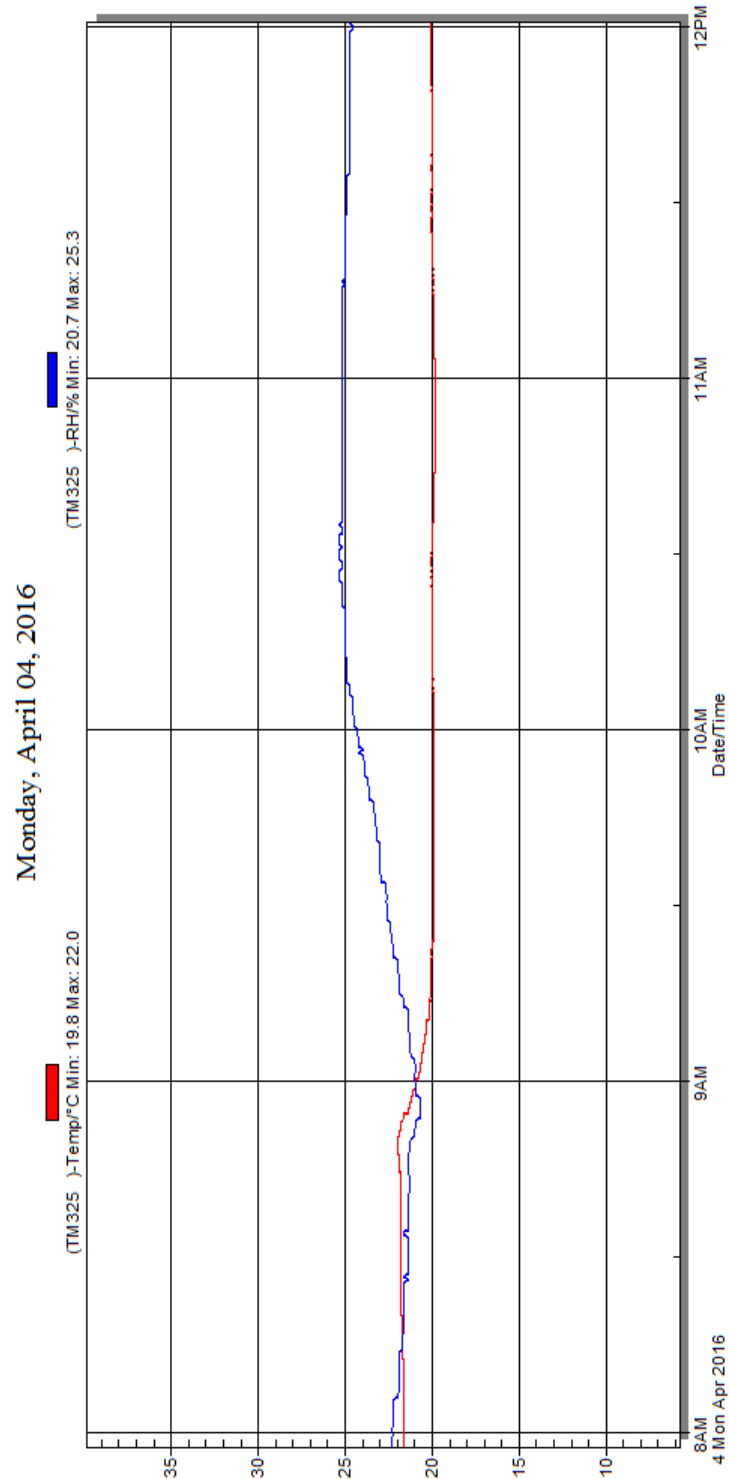
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17
DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2016 Chevrolet Silverado Double Cab Pickup Truck
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: O20160103
 Test Date: 4/4/2016



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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77	Vehicle at 360° on Static Rollover Device	A-43
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¹**NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*

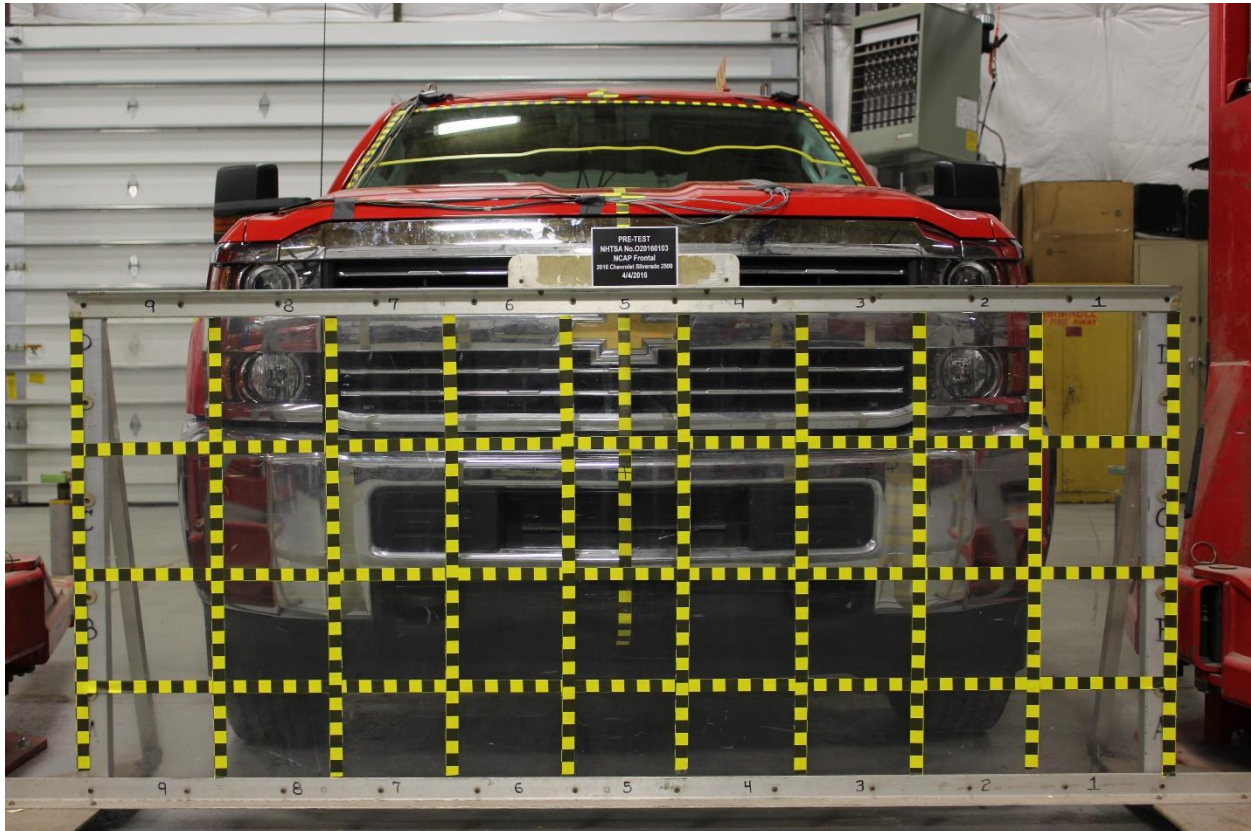


Figure A-1: Load Cell Location

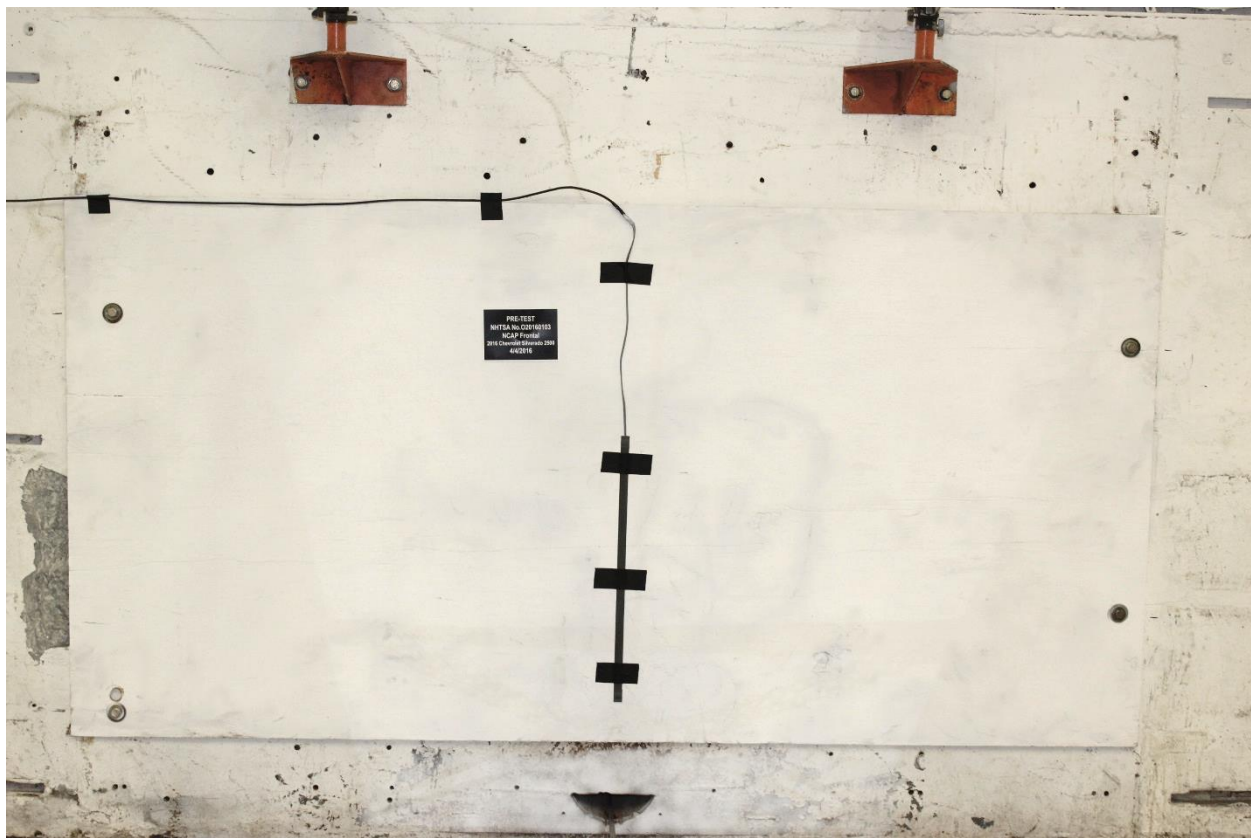


Figure A-2: Pre-Test Load Cell Wall



Figure A-3: Post-Test Load Cell Wall



Figure A-4: Manufacturer's Label



Figure A-5: Tire Placard



Figure A-6: 2016 Chevrolet Silverado Frontal As Delivered



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



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



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



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



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



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



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



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



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



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



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



Figure A-18: Pre-Test Windshield View



Figure A-19: Post-Test Windshield View



Figure A-20: Pre-Test Engine Compartment View



Figure A-21: Post-Test Engine Compartment View



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



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



Figure A-24: Pre-Test Front Underbody View



Figure A-25: Post-Test Front Underbody View



Figure A-26: Pre-Test Rear Underbody View

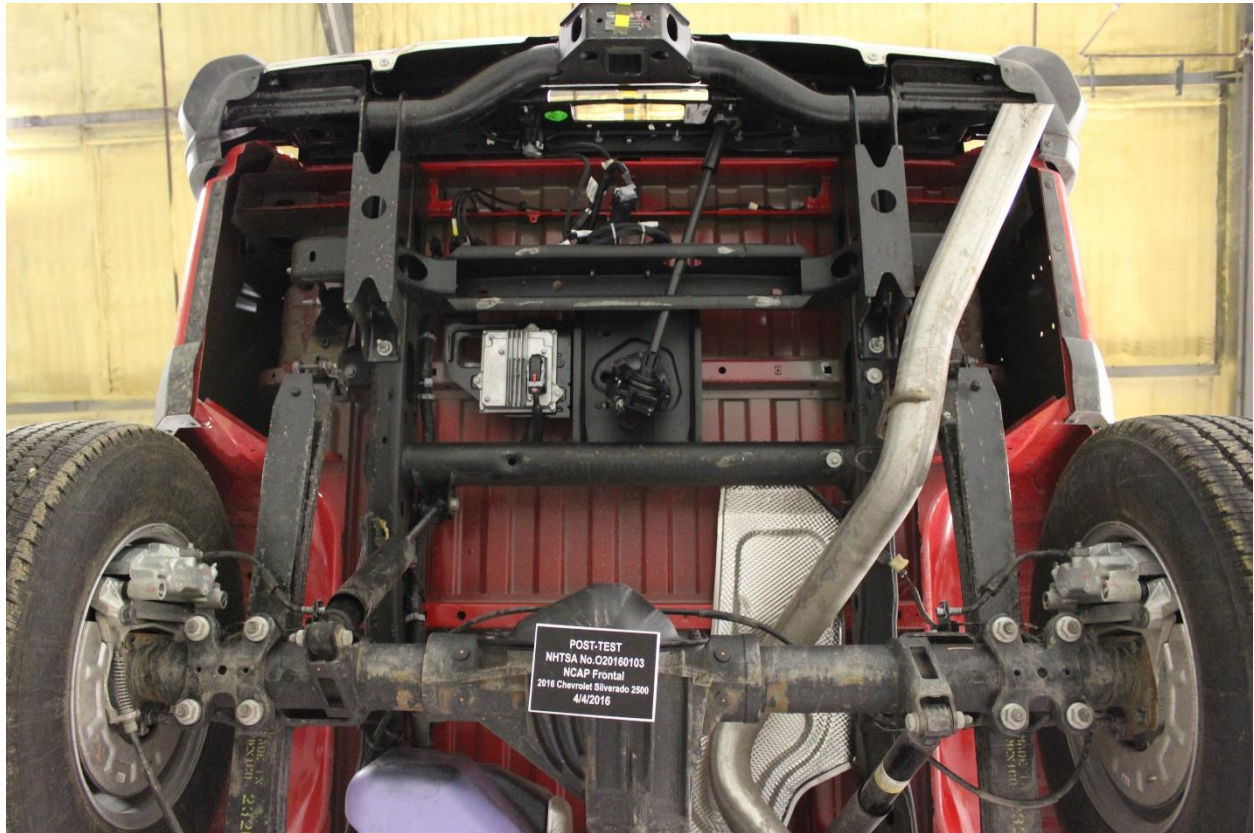


Figure A-27: Post-Test Rear Underbody View



Figure A-28: Pre-Test Dummy Cable Routing

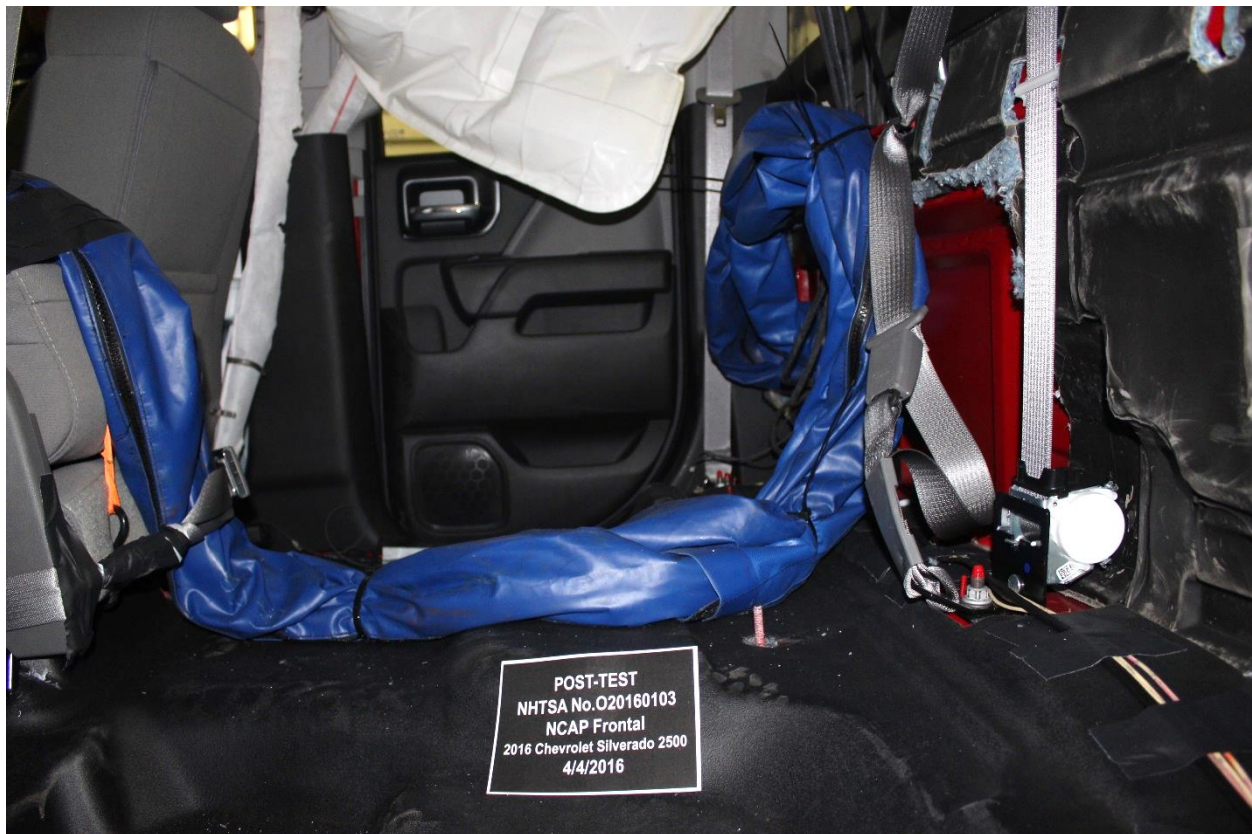


Figure A-29: Post-Test Dummy Cable Routing



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



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



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



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



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



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

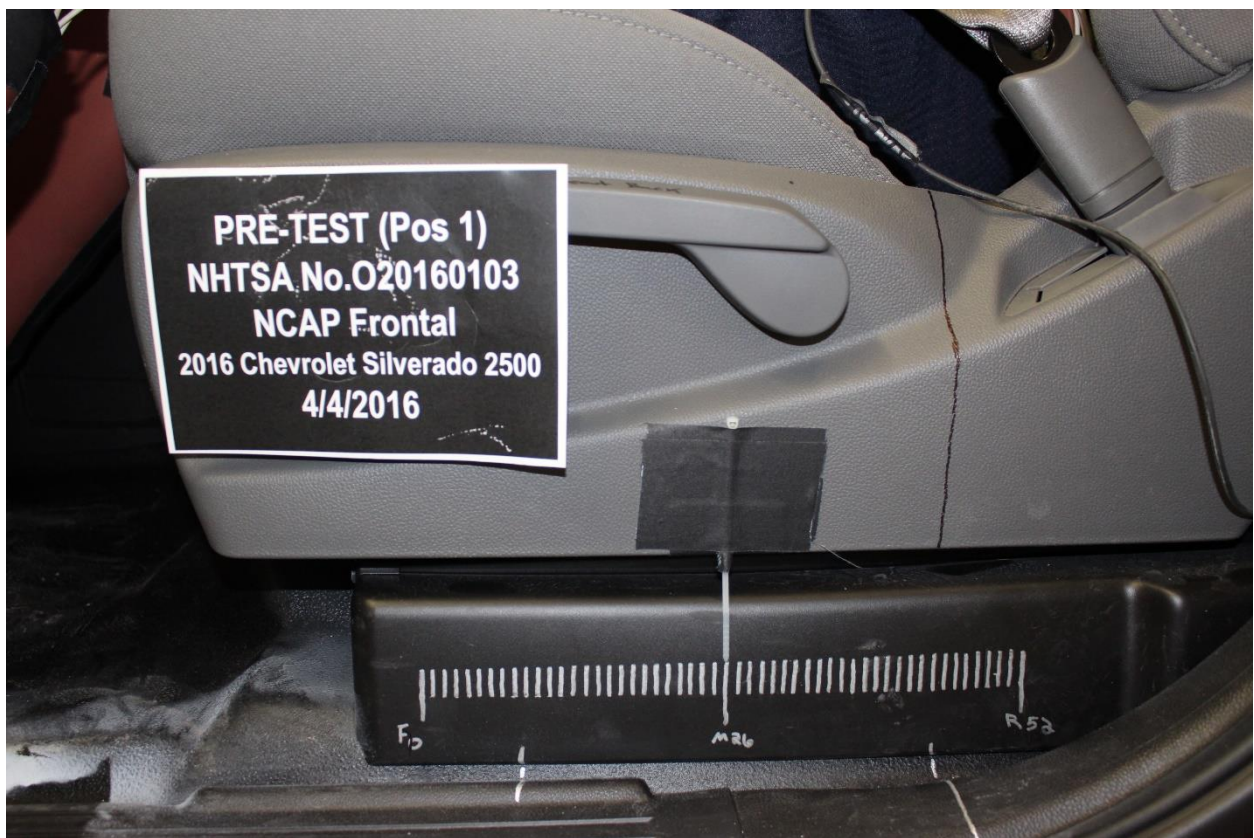


Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings



**Figure A-37: Post-Test Driver's Seat Fore-Aft Markings
(Plastic moved not seat track)**



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

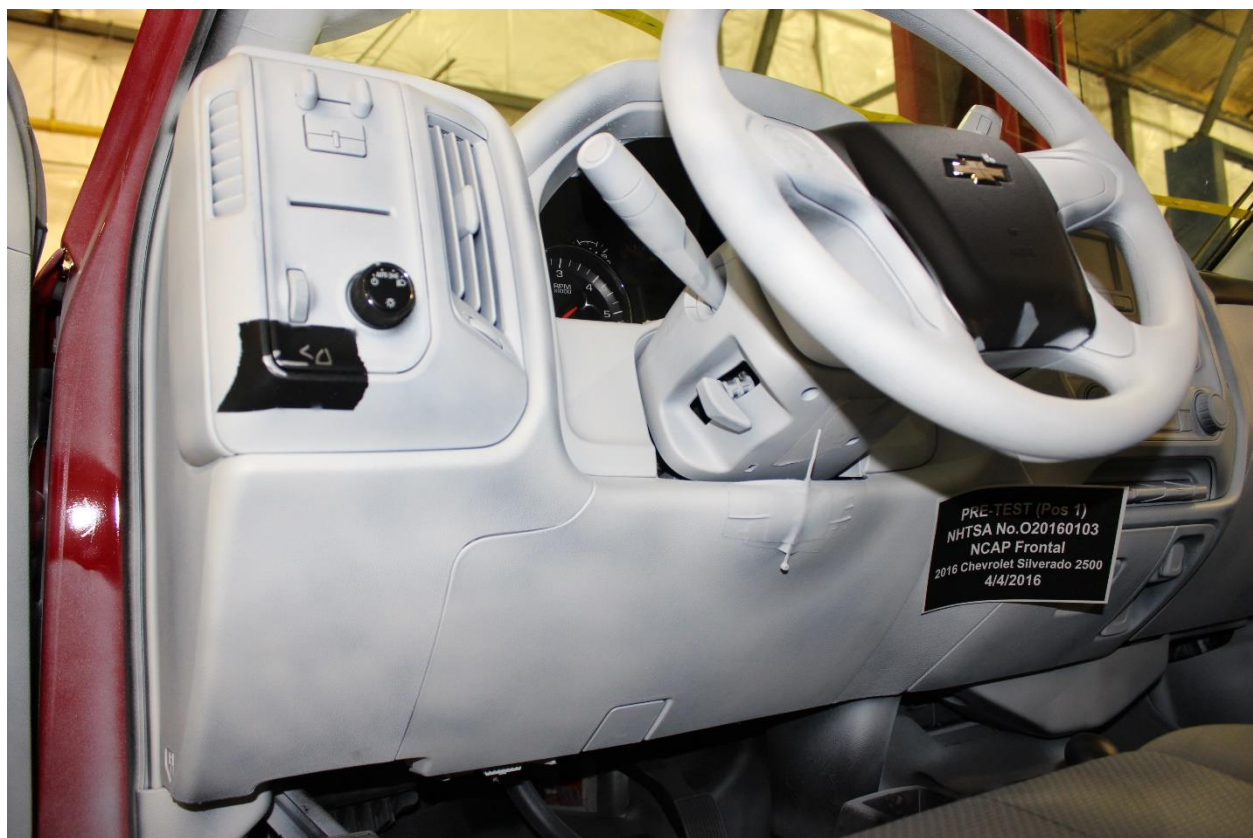


Figure A-42: Pre-Test Driver's Side Knee Bolster



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
(Plastic Moved not Seat track)



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

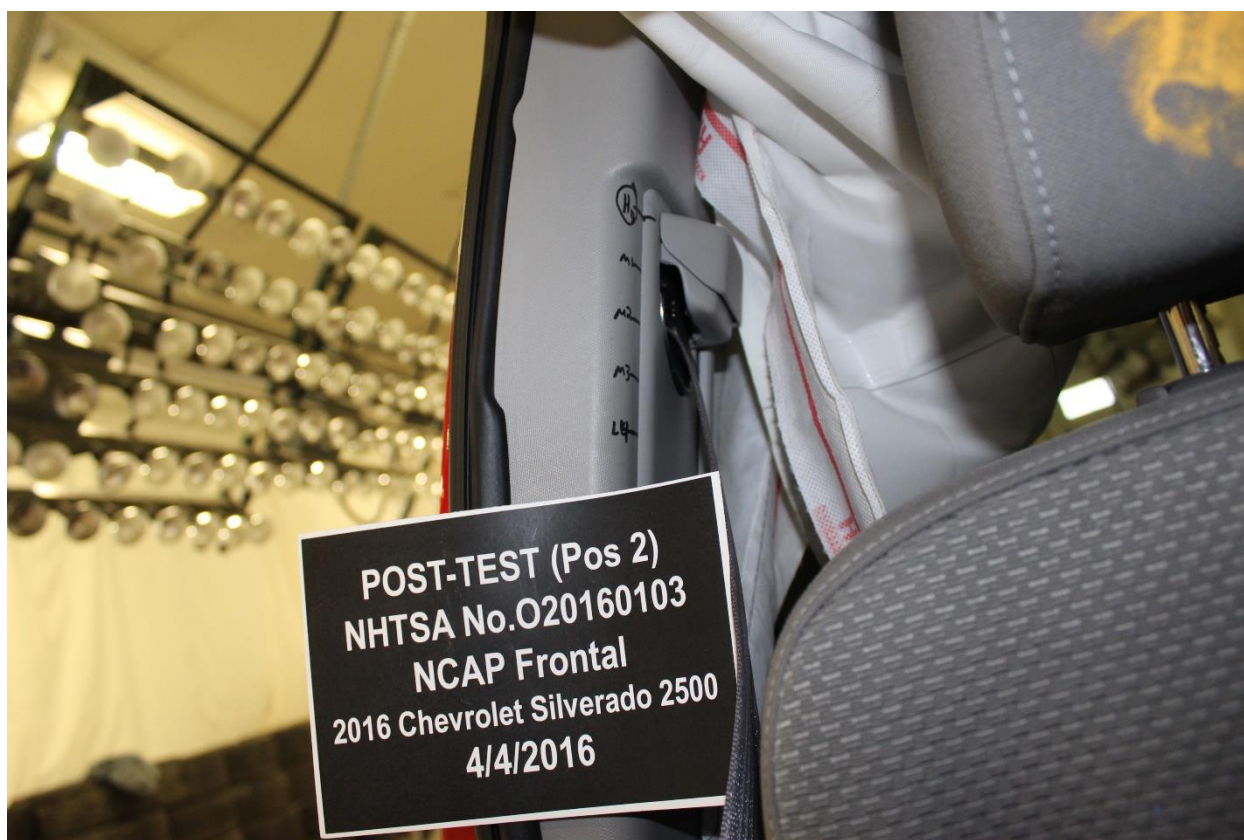


Figure A-60: Post-Test View of Belt Anchorage for Passenger Dummy



Figure A-61: Pre-Test Passenger Dummy Feet



Figure A-62: Post-Test Passenger Dummy Feet



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



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



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



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



Figure A-67: Post-Test Passenger Dummy Face



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



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

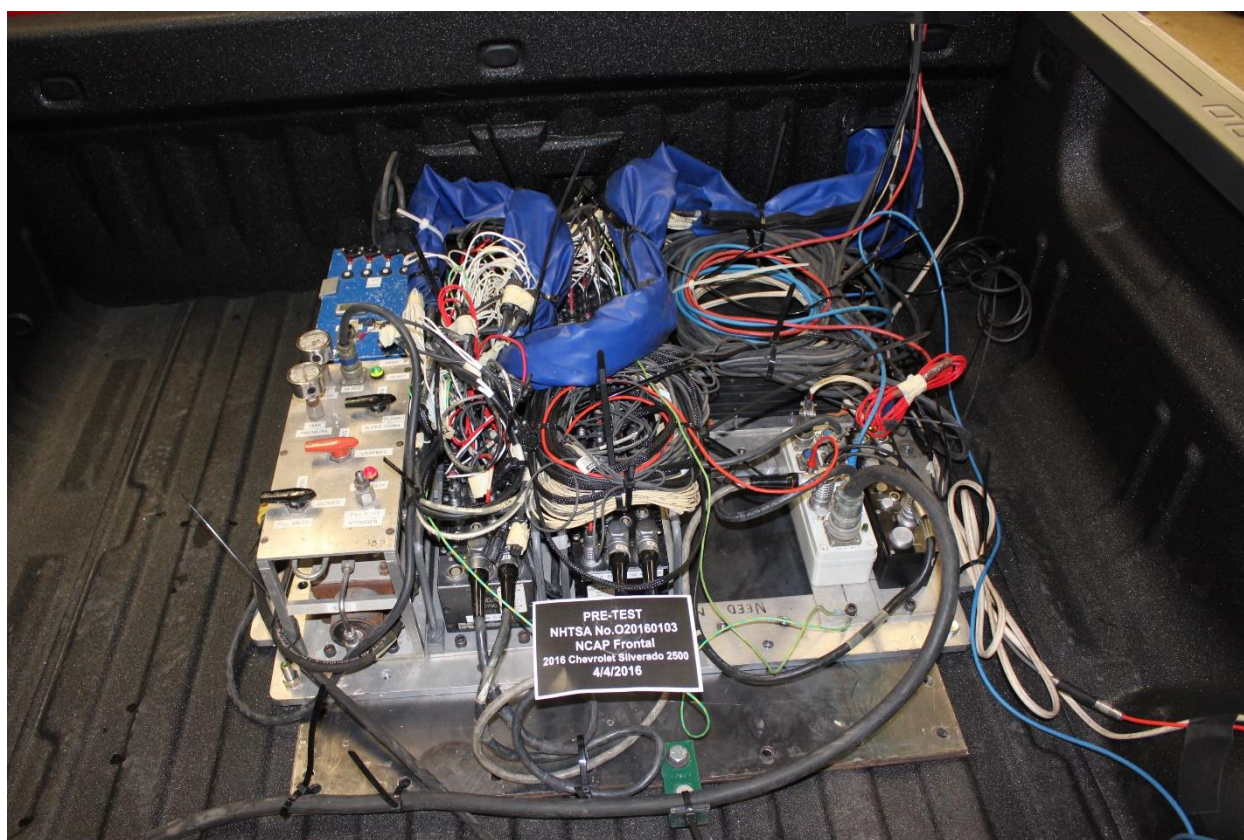


Figure A-70: Photograph of Ballast Installed in Vehicle

Photo Not Applicable

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



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



Figure A-73: Vehicle at 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

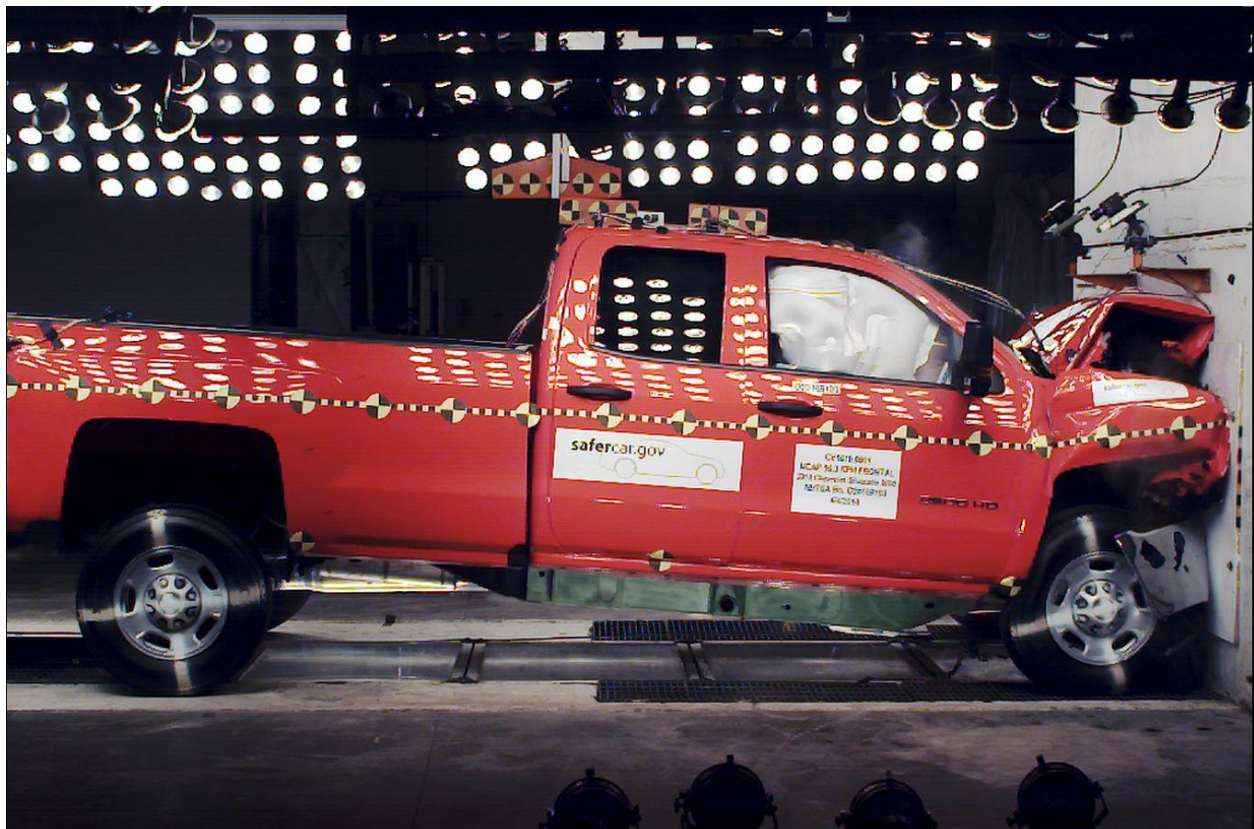


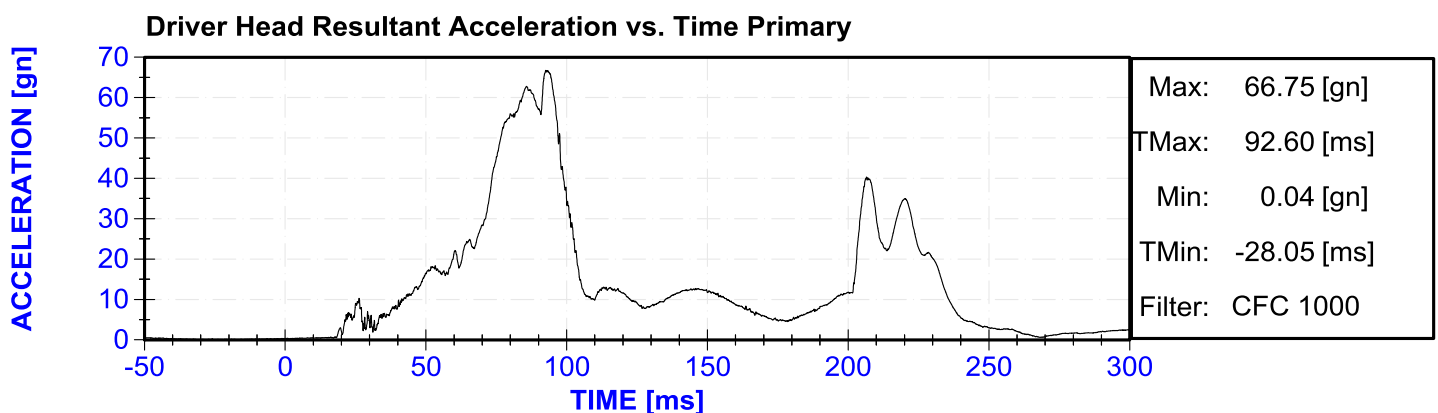
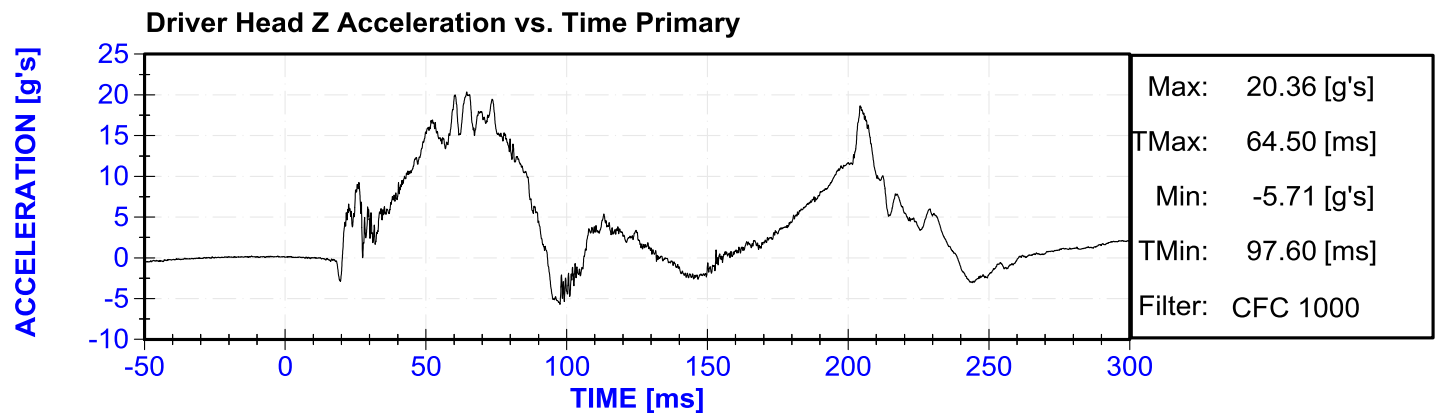
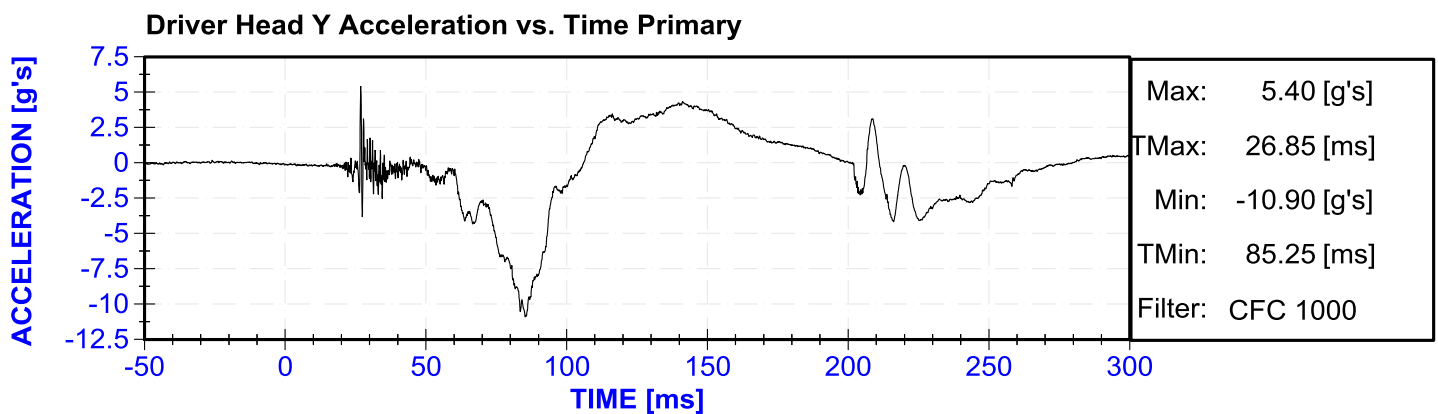
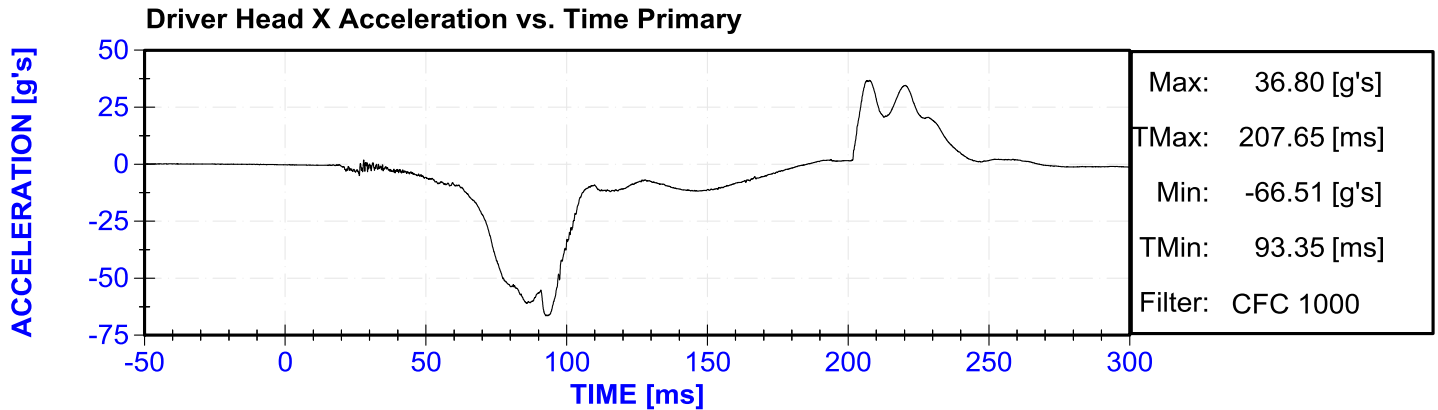
Figure A-78: 2016 Chevrolet Silverado Frontal Impact Event

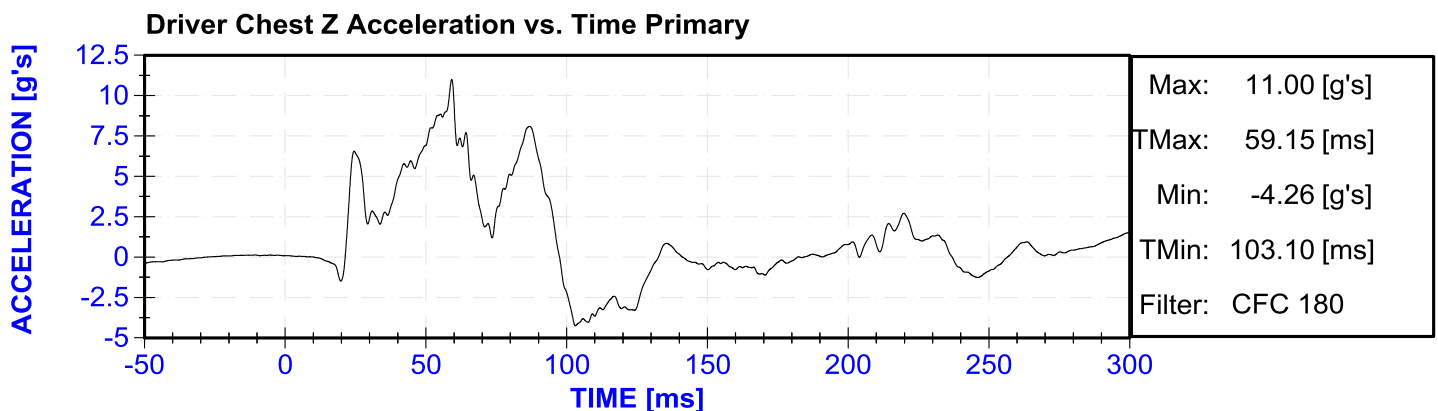
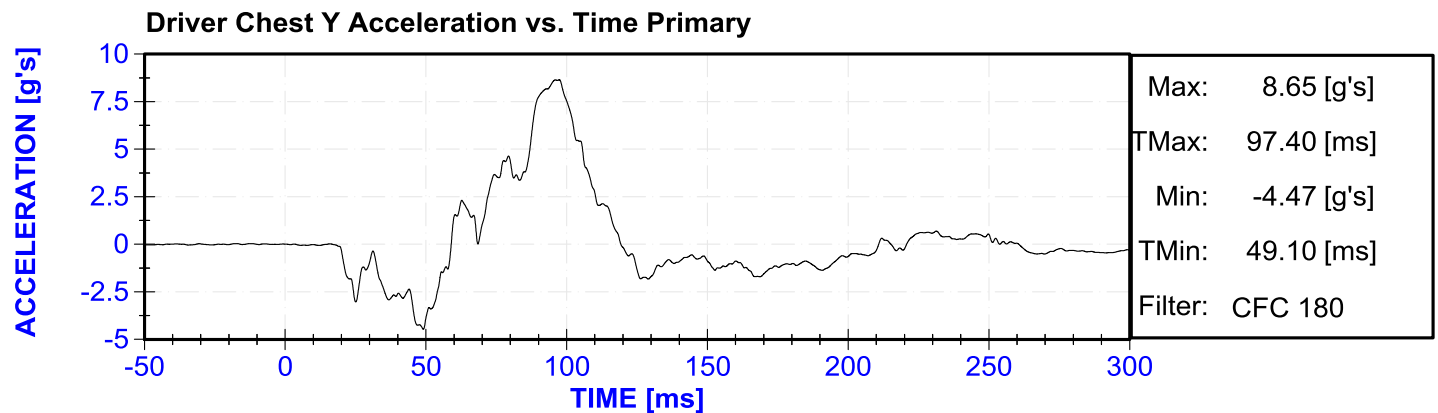
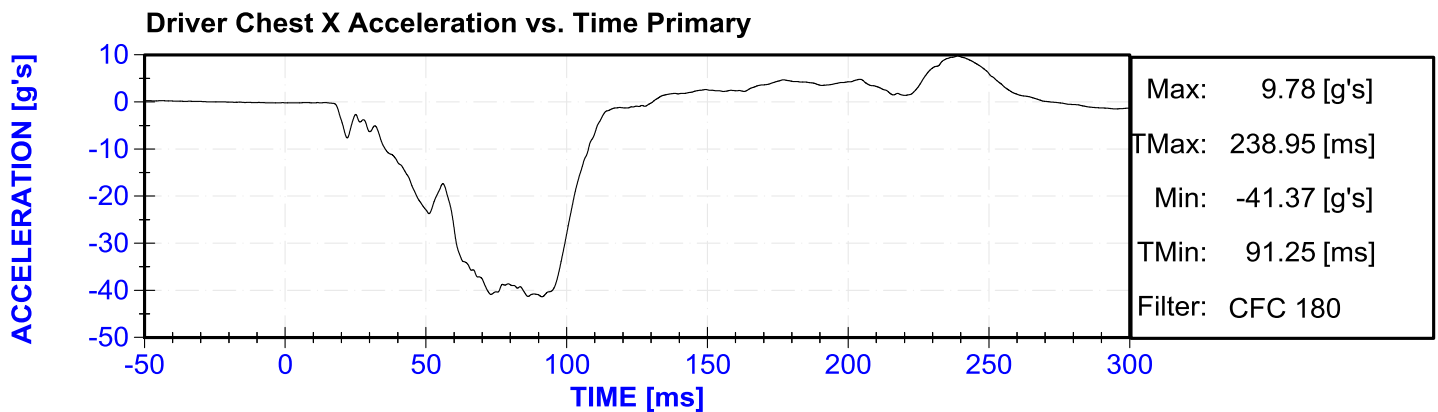
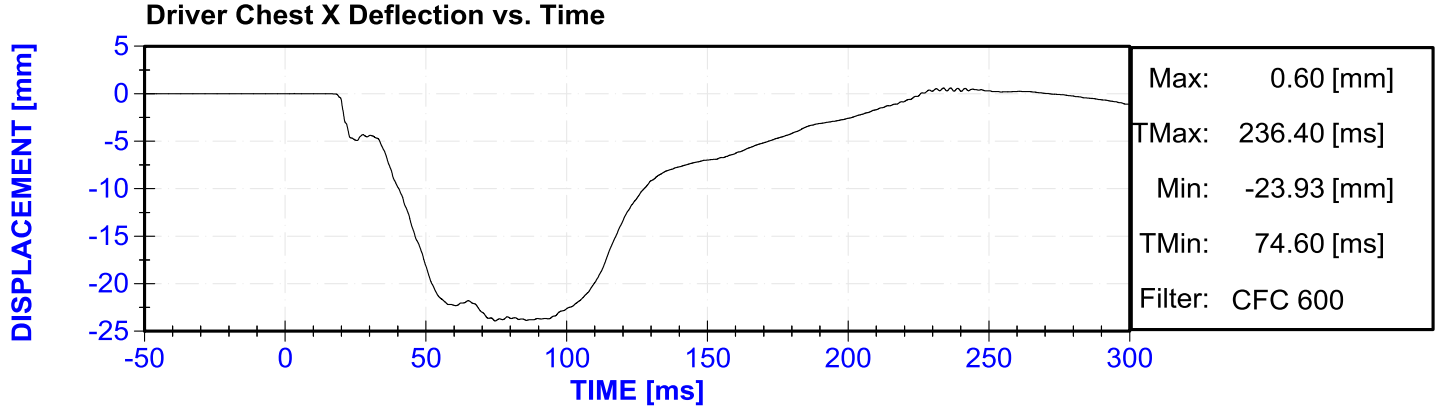


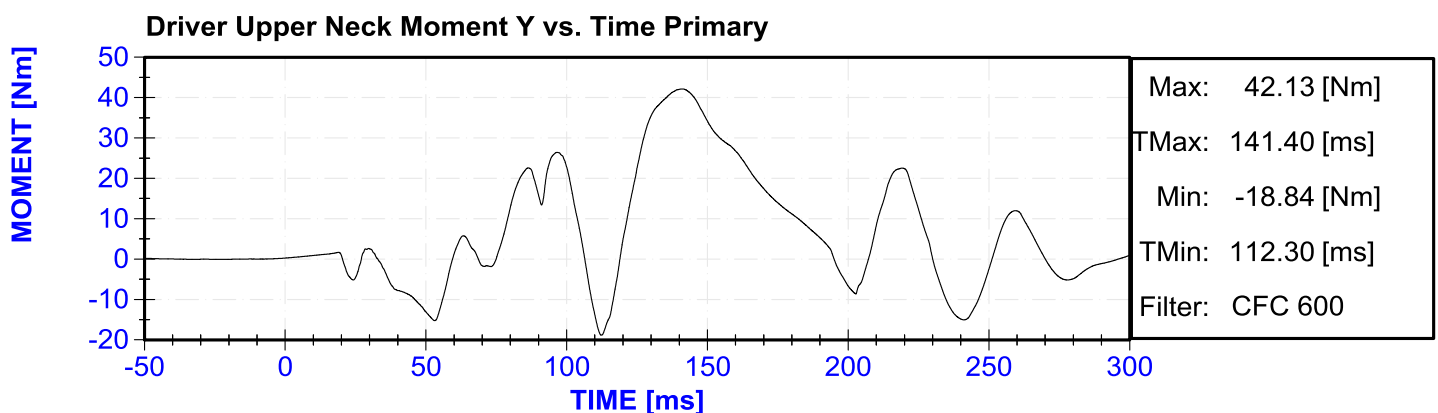
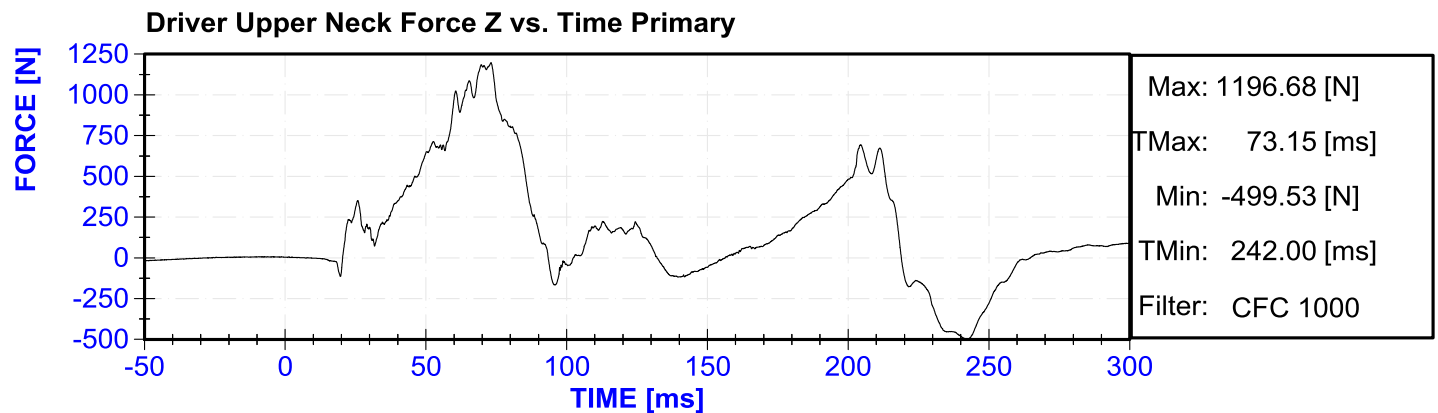
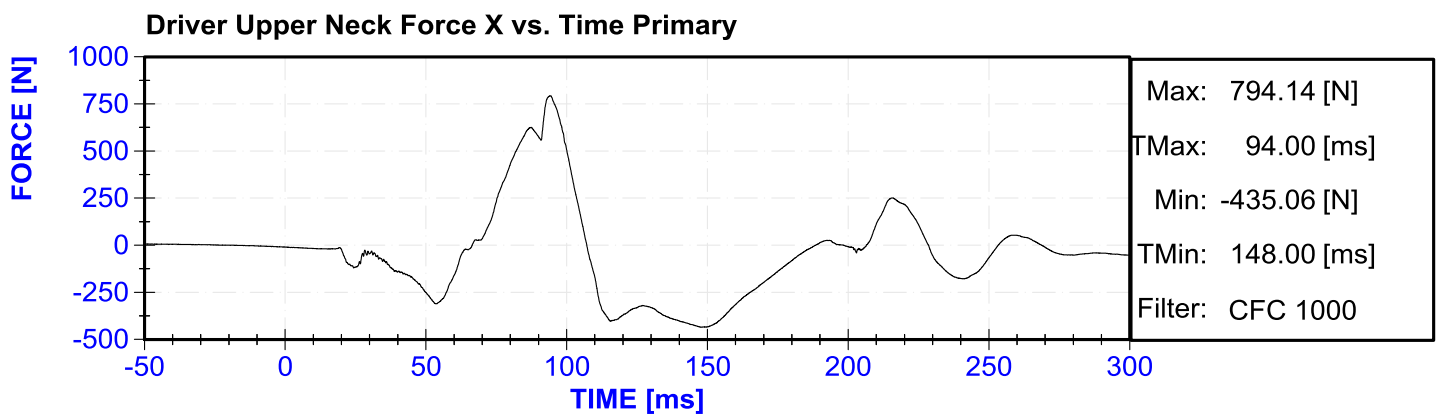
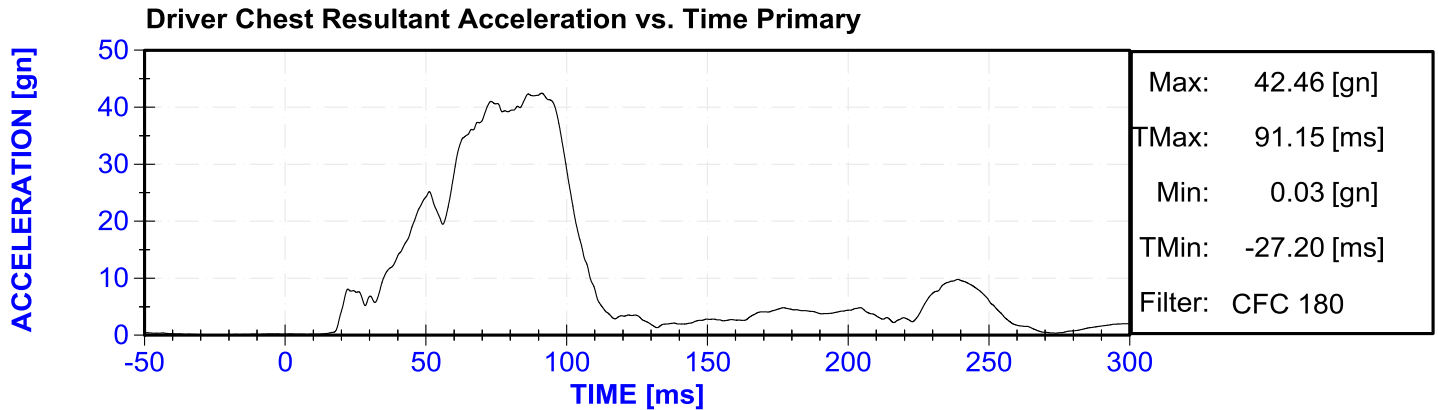
APPENDIX B
VEHICLE & DUMMY RESPONSE DATA TRACES

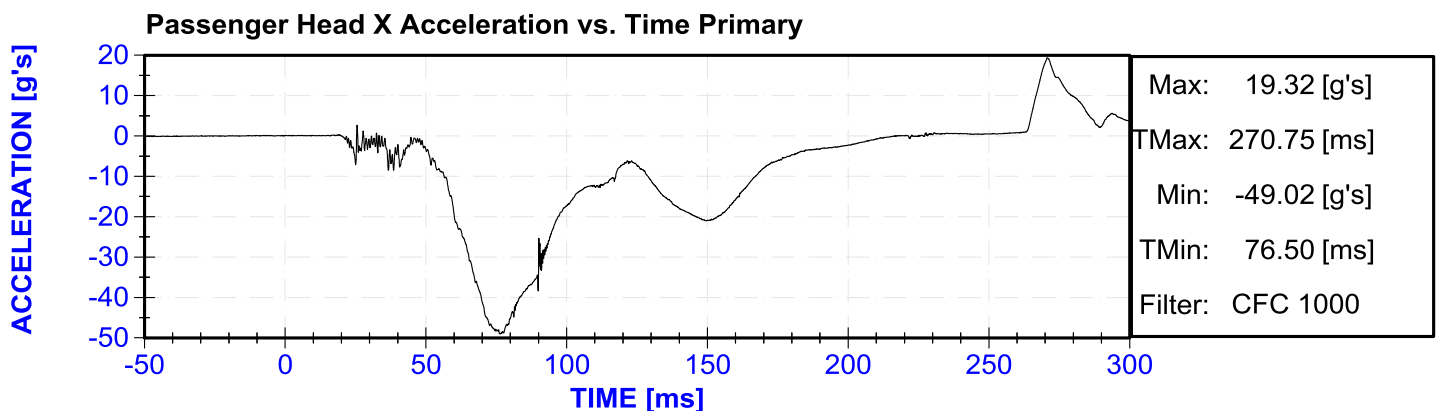
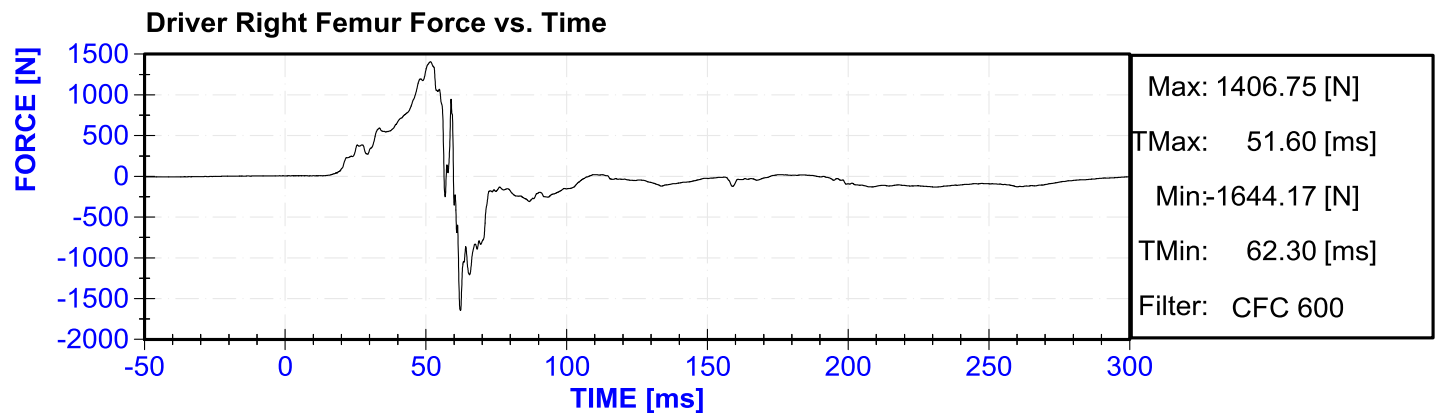
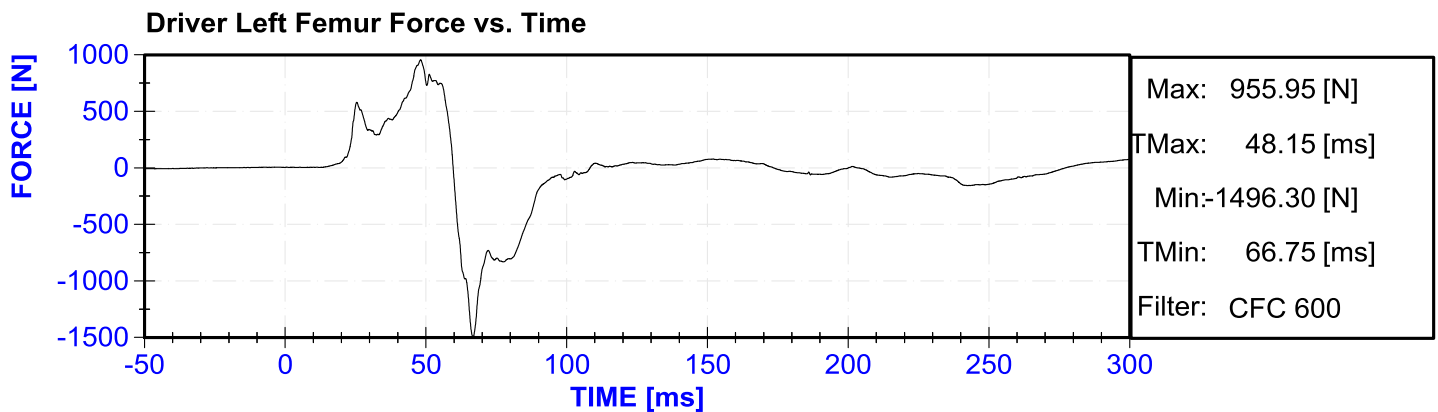
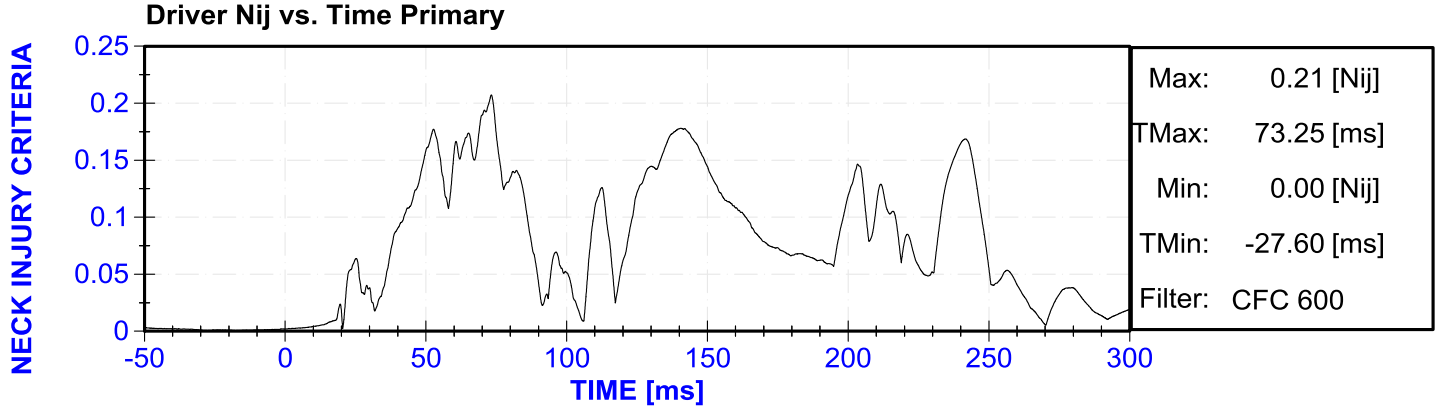
Table of Data Plots

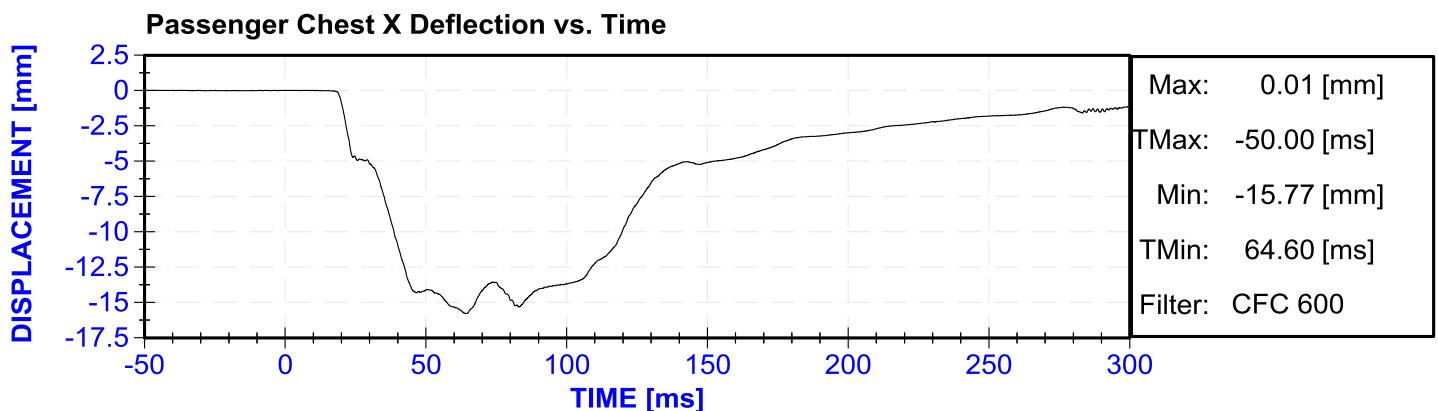
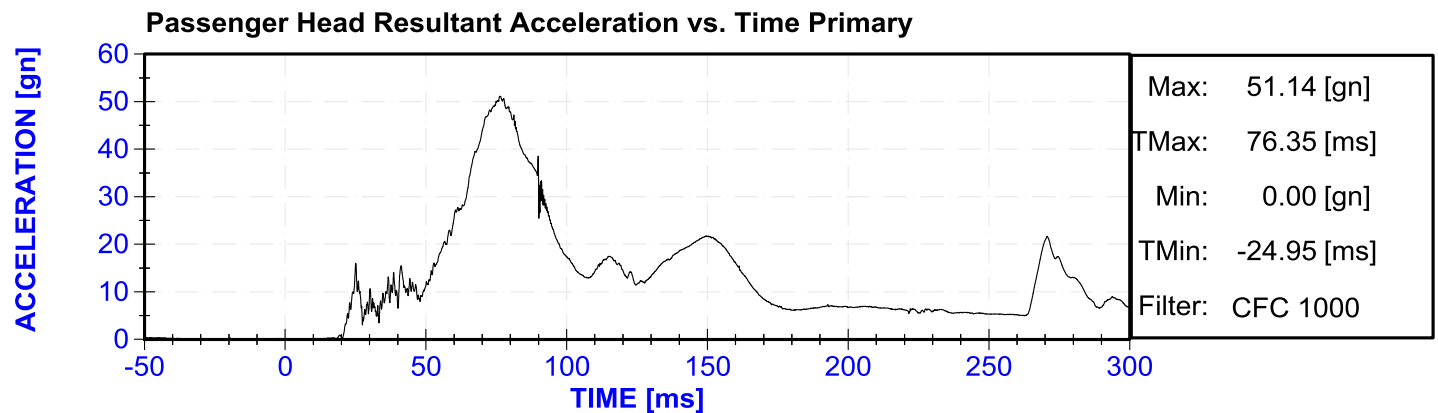
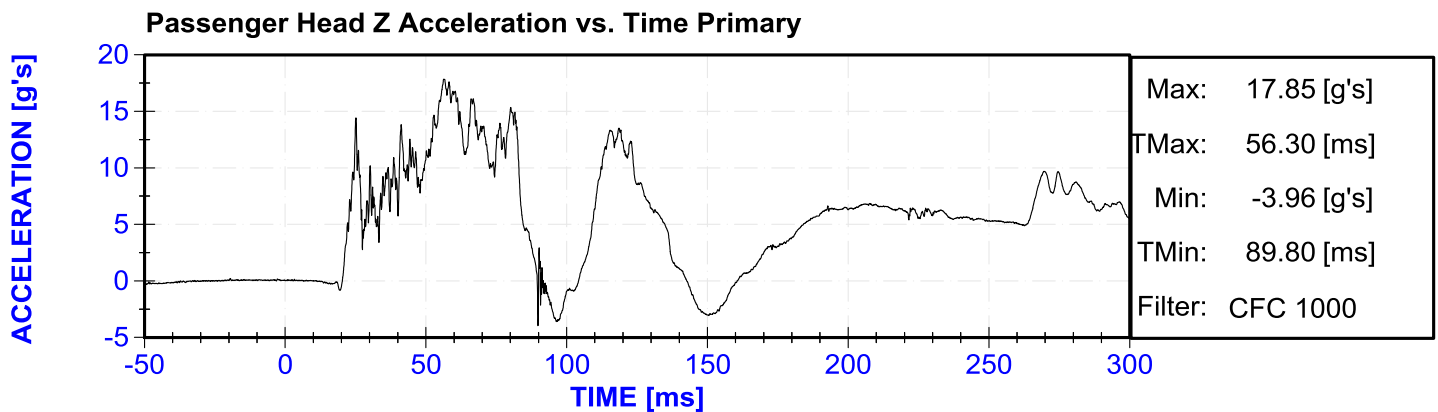
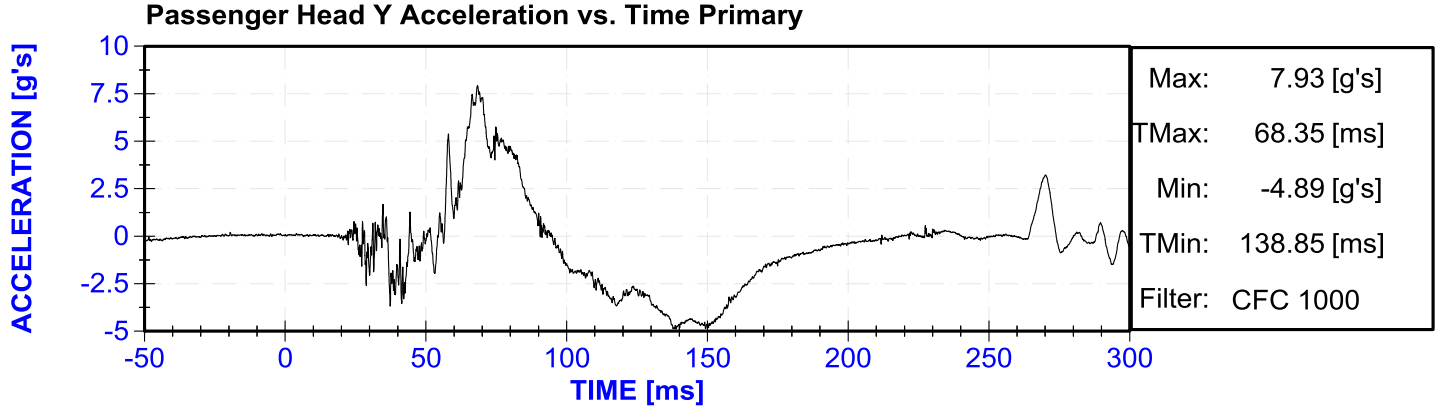
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Plot 1	Driver Head X Acceleration vs. Time Primary	B-3
Plot 2	Driver Head Y Acceleration vs. Time Primary	B-3
Plot 3	Driver Head Z Acceleration vs. Time Primary	B-3
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-3
Plot 5	Driver Chest X Deflection vs. Time	B-4
Plot 6	Driver Chest X Acceleration vs. Time Primary	B-4
Plot 7	Driver Chest Y Acceleration vs. Time Primary	B-4
Plot 8	Driver Chest Z Acceleration vs. Time Primary	B-4
Plot 9	Driver Chest Resultant Acceleration vs. Time Primary	B-5
Plot 10	Driver Upper Neck Force X vs. Time Primary	B-5
Plot 11	Driver Upper Neck Force Z vs. Time Primary	B-5
Plot 12	Driver Upper Neck Moment Y vs. Time Primary	B-5
Plot 13	Driver Nij vs. Time Primary	B-6
Plot 14	Driver Left Femur Force vs. Time	B-6
Plot 15	Driver Right Femur Force vs. Time	B-6
Plot 16	Passenger Head X Acceleration vs. Time Primary	B-6
Plot 17	Passenger Head Y Acceleration vs. Time Primary	B-7
Plot 18	Passenger Head Z Acceleration vs. Time Primary	B-7
Plot 19	Passenger Head Resultant Acceleration vs. Time Primary	B-7
Plot 20	Passenger Chest X Deflection vs. Time	B-7
Plot 21	Passenger Chest X Acceleration vs. Time Primary	B-8
Plot 22	Passenger Chest Y Acceleration vs. Time Primary	B-8
Plot 23	Passenger Chest Z Acceleration vs. Time Primary	B-8
Plot 24	Passenger Chest Resultant Acceleration vs. Time Primary	B-8
Plot 25	Passenger Upper Neck Force X vs. Time Primary	B-9
Plot 26	Passenger Upper Neck Force Z vs. Time Primary	B-9
Plot 27	Passenger Upper Neck Moment Y vs. Time Primary	B-9
Plot 28	Passenger Nij vs. Time Primary	B-9
Plot 29	Passenger Left Femur Force vs. Time	B-10
Plot 30	Passenger Right Femur Force vs. Time	B-10

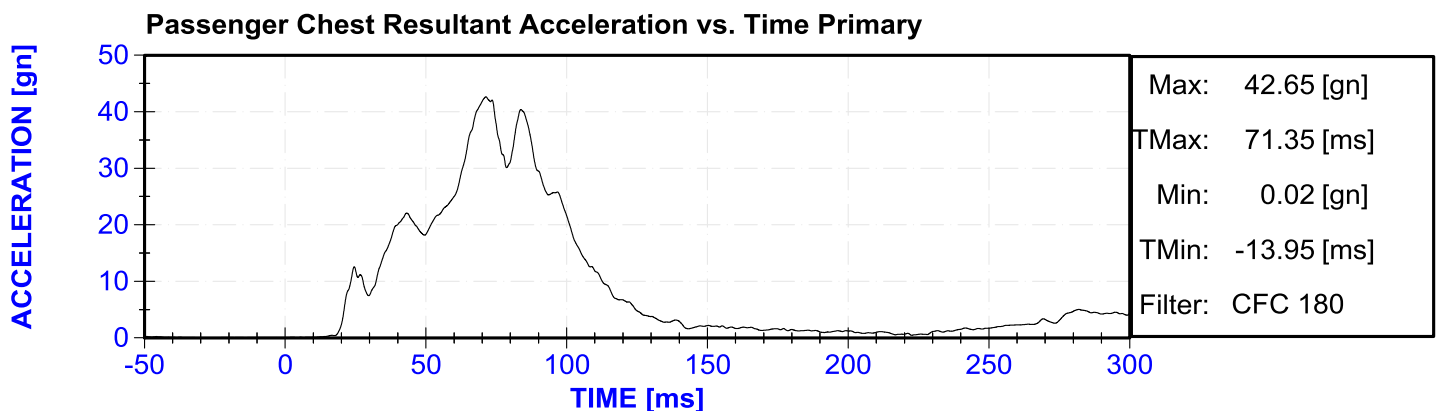
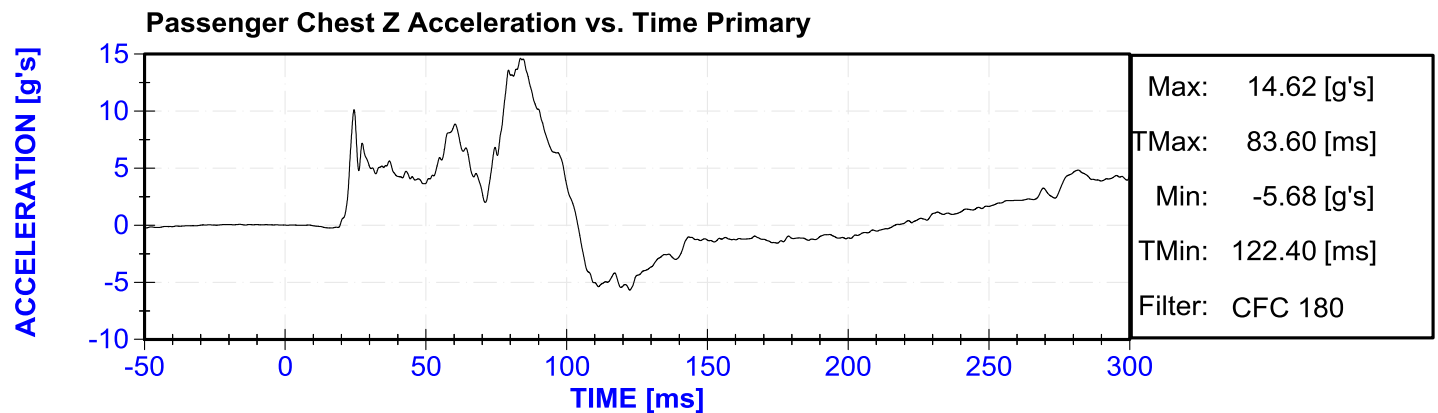
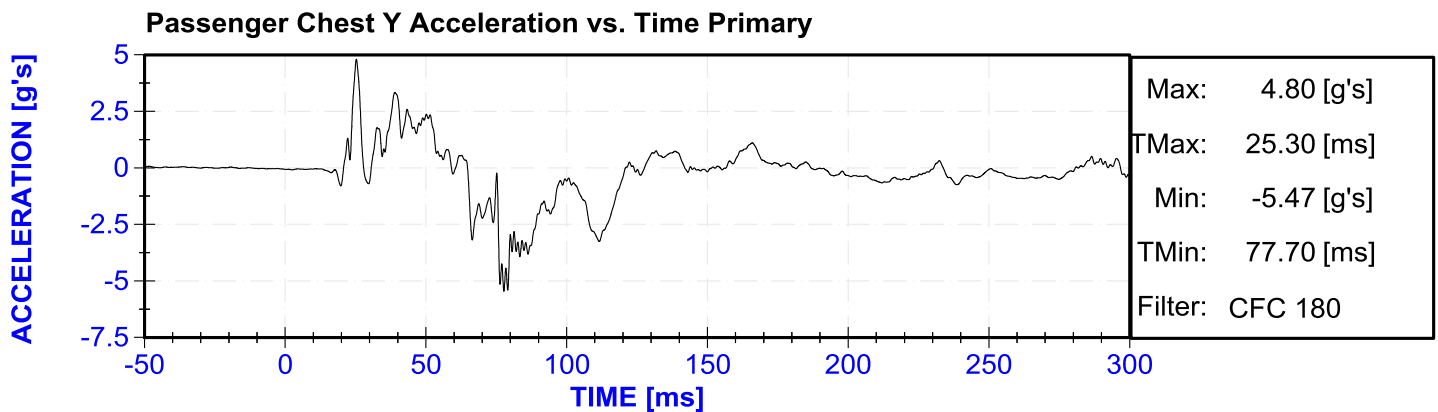
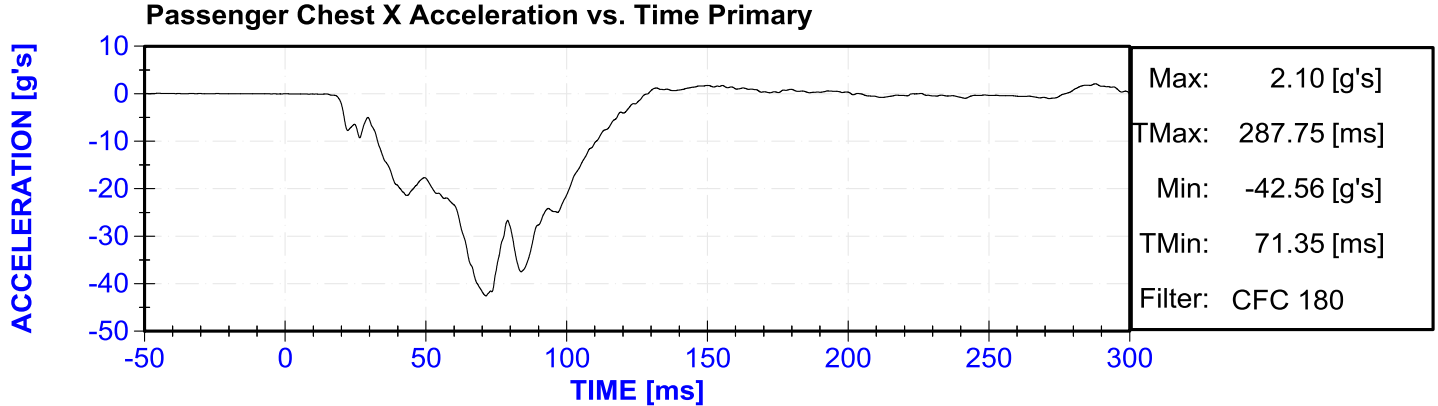


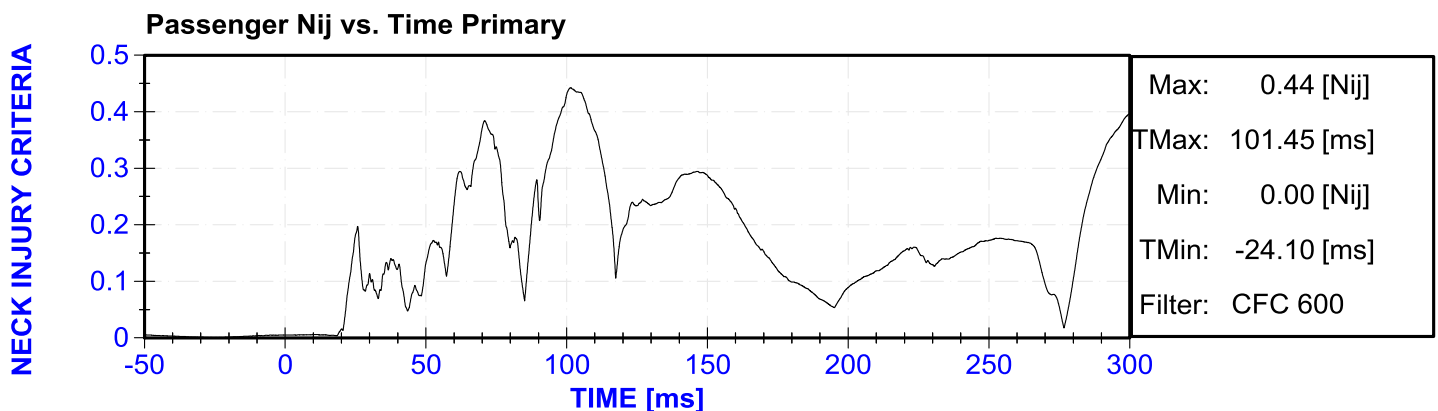
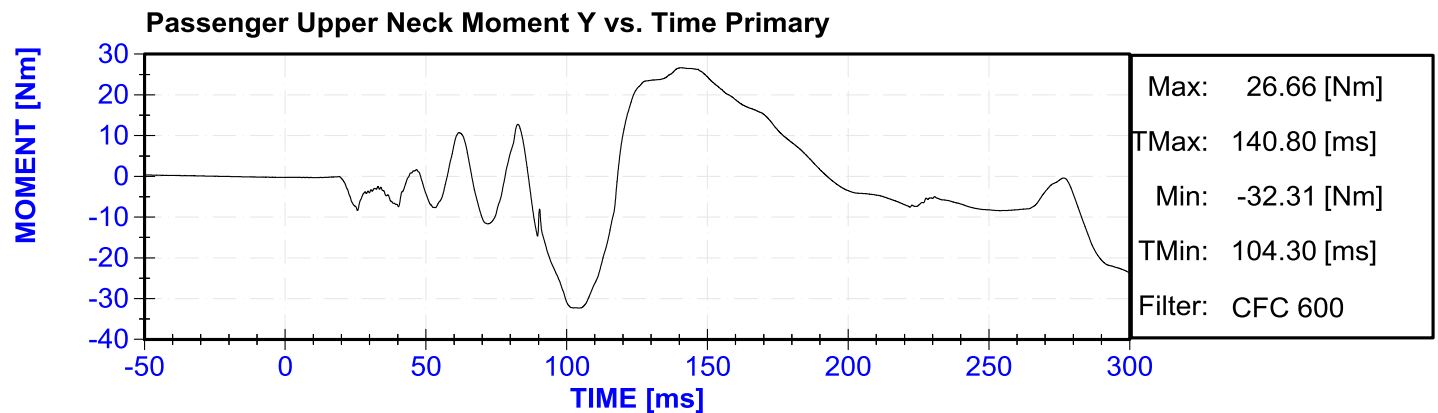
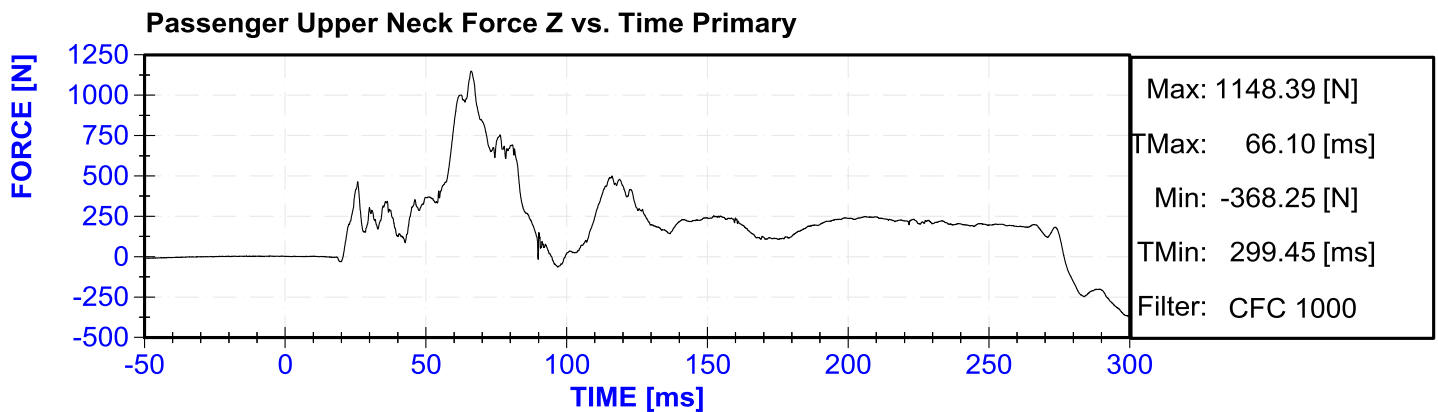
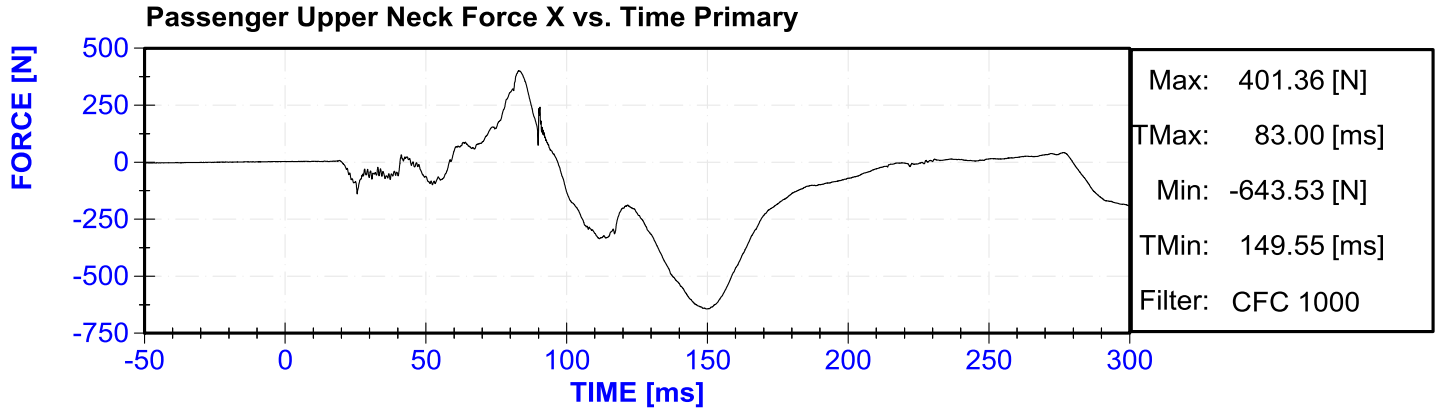




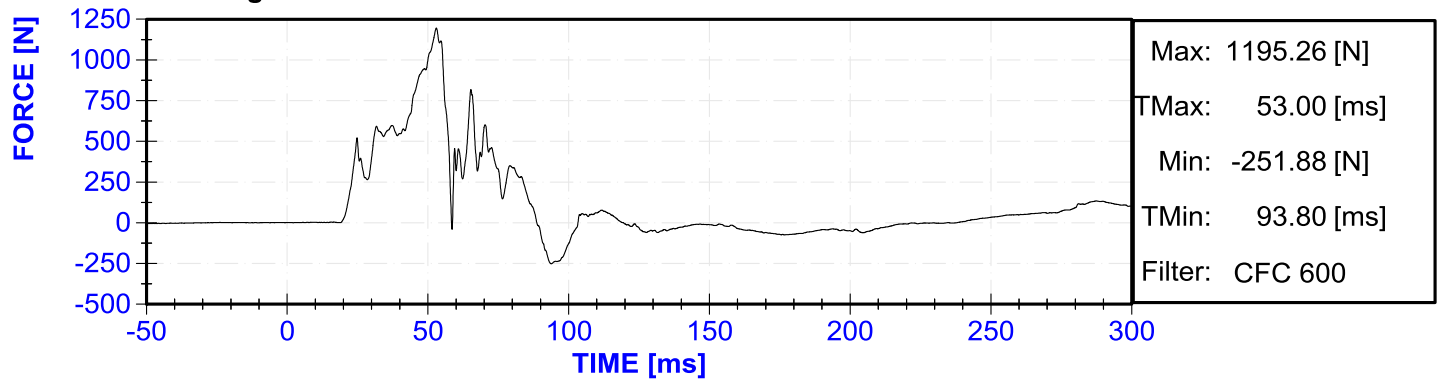




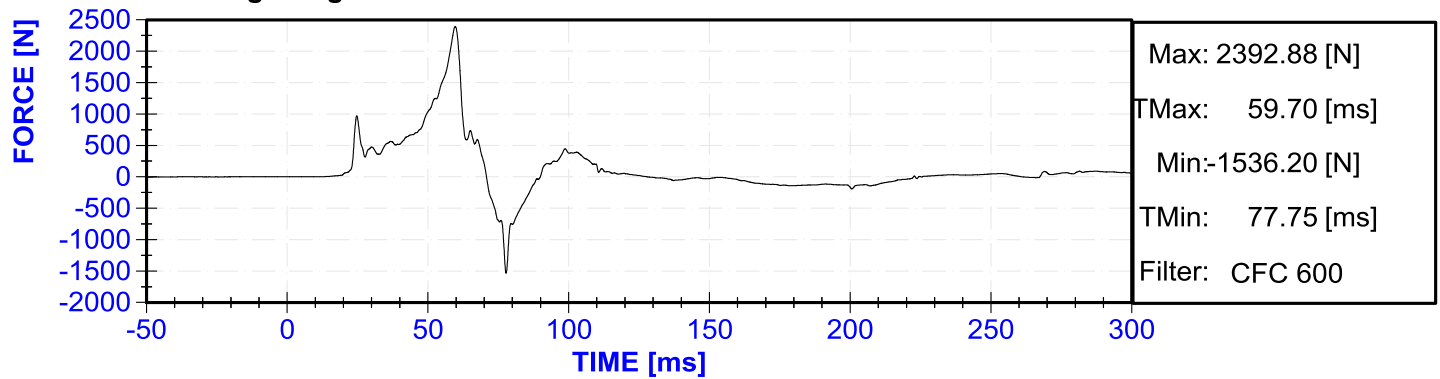




Passenger Left Femur Force vs. Time



Passenger Right Femur Force vs. Time



APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046



Date: 2/11/2016

FIG 111
Attachment

NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

NOTE: FIGURE REFERENCED TO THE ERECT SEATED POSITION.
The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

HYBRID III Exterior Body Dimensions - Front View

HYBRID III Exterior Body Dimensions - Side View

Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.7	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	8.0	Pass
K	Buttock to Knee Length	22.8	23.8	23.3	Pass
L	Popliteal Height	16.9	17.9	17.2	Pass
M	Knee Pivot Height	19.1	19.7	19.2	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	17.0	Pass
W	Foot Breadth	3.6	4.2	4.0	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.1	Pass
Z	Waist Circumference	32.9	34.1	33.5	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.1	Pass

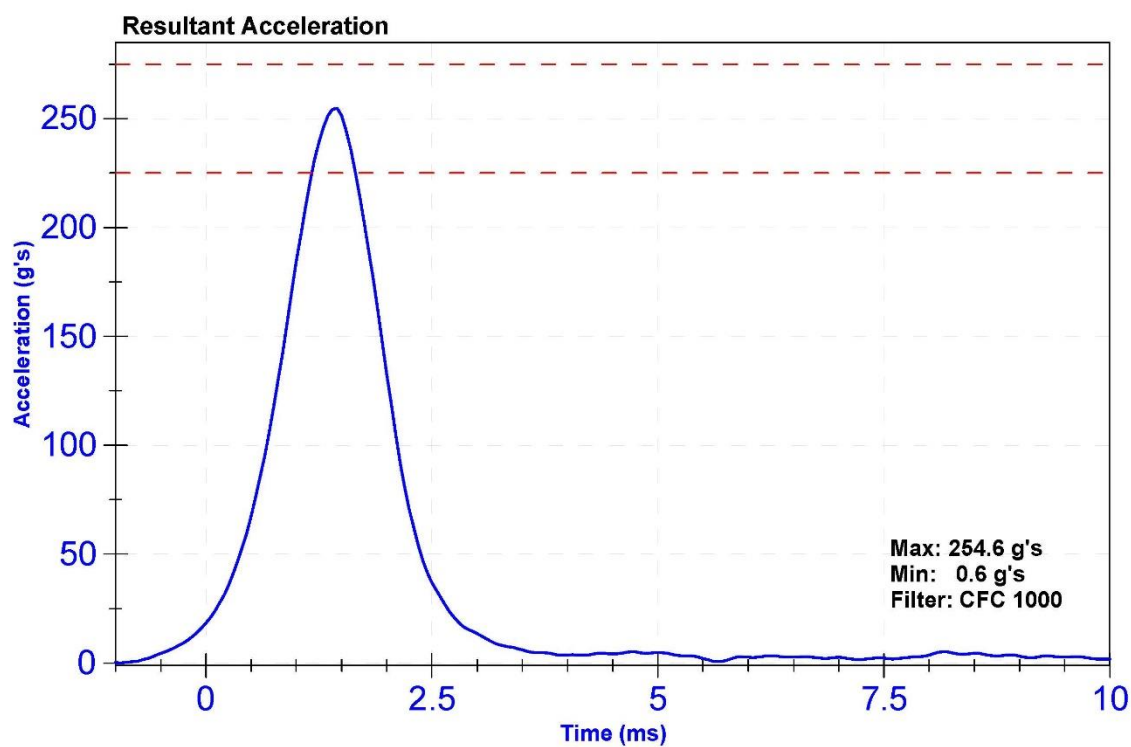
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

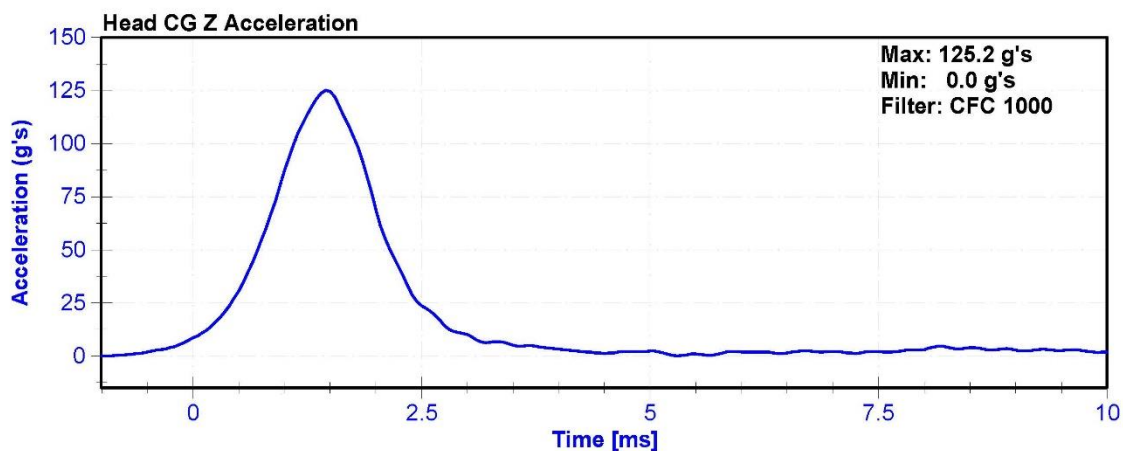
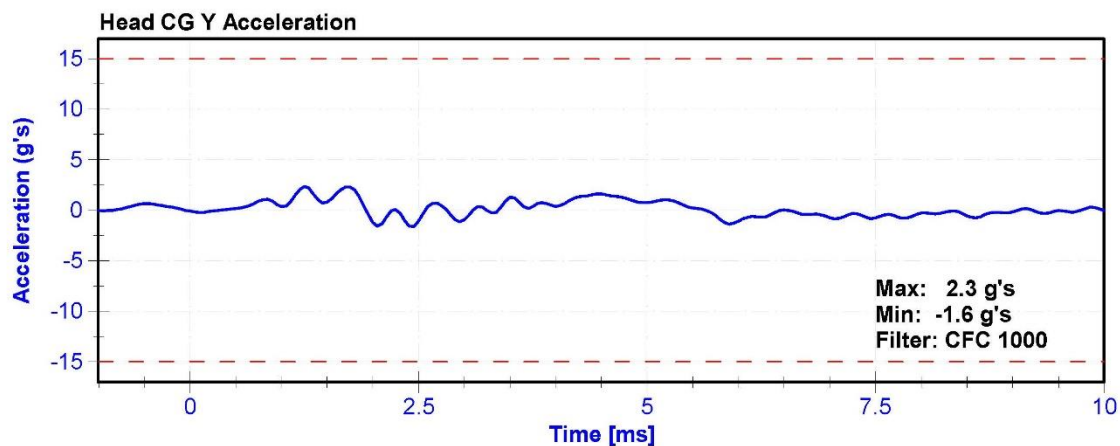
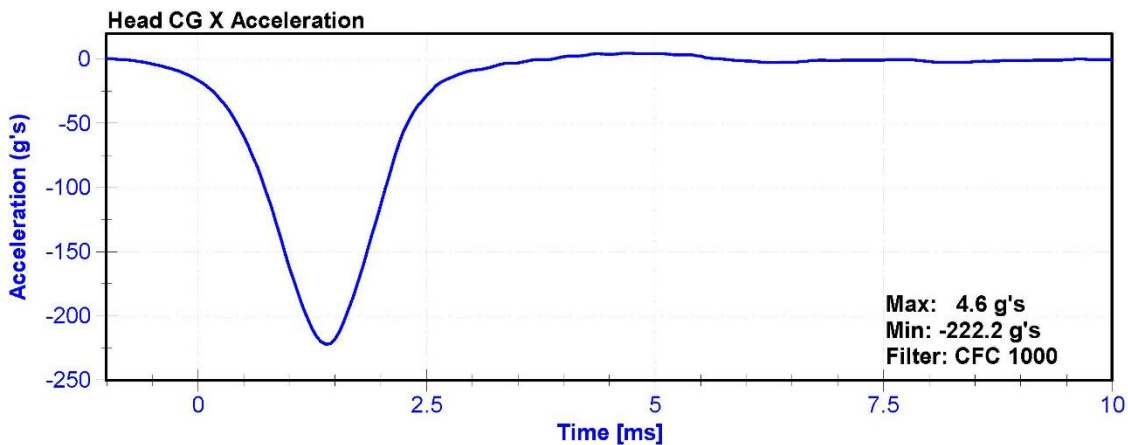
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.7	Pass
Humidity	10	70	%	14.3	Pass
Resultant Acceleration	225	275	g's	254.6	Pass
Oscillation	0	10	%	2.0	Pass
Lateral Acceleration	-15	15	g's	2.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	12/3/2015	6/2/2016
Y Accelerometer	ENDEVCO 7264	AC-P12359	12/3/2015	6/2/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	12/3/2015	6/2/2016





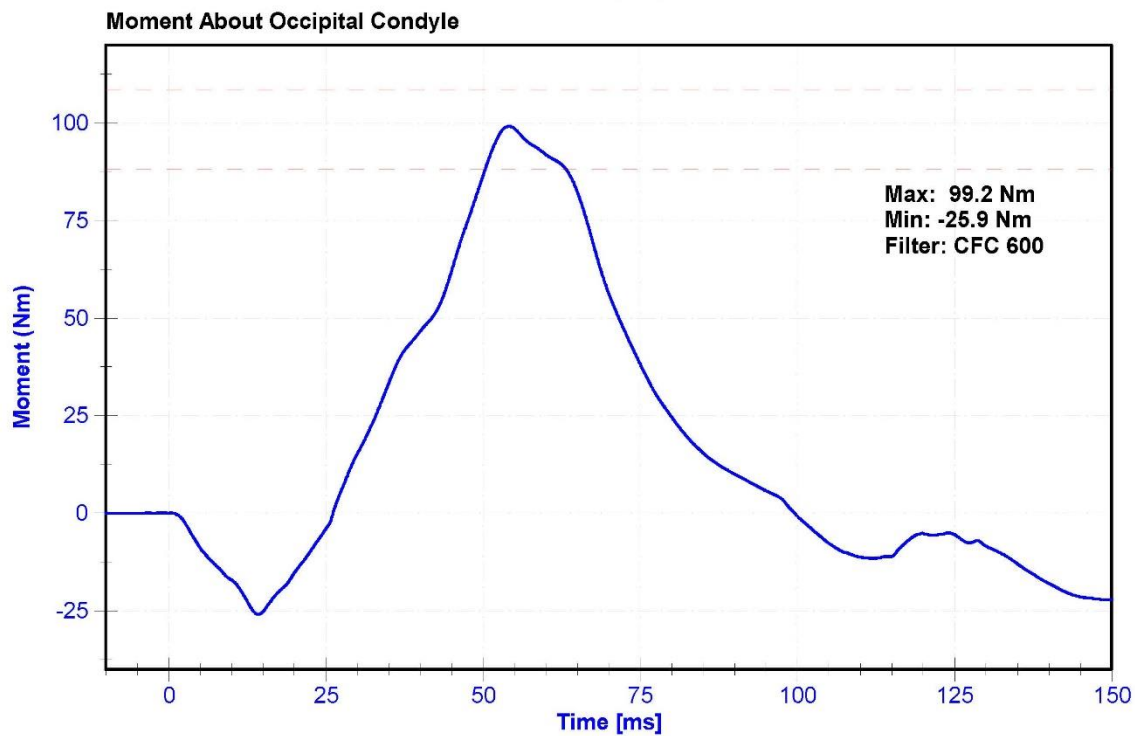
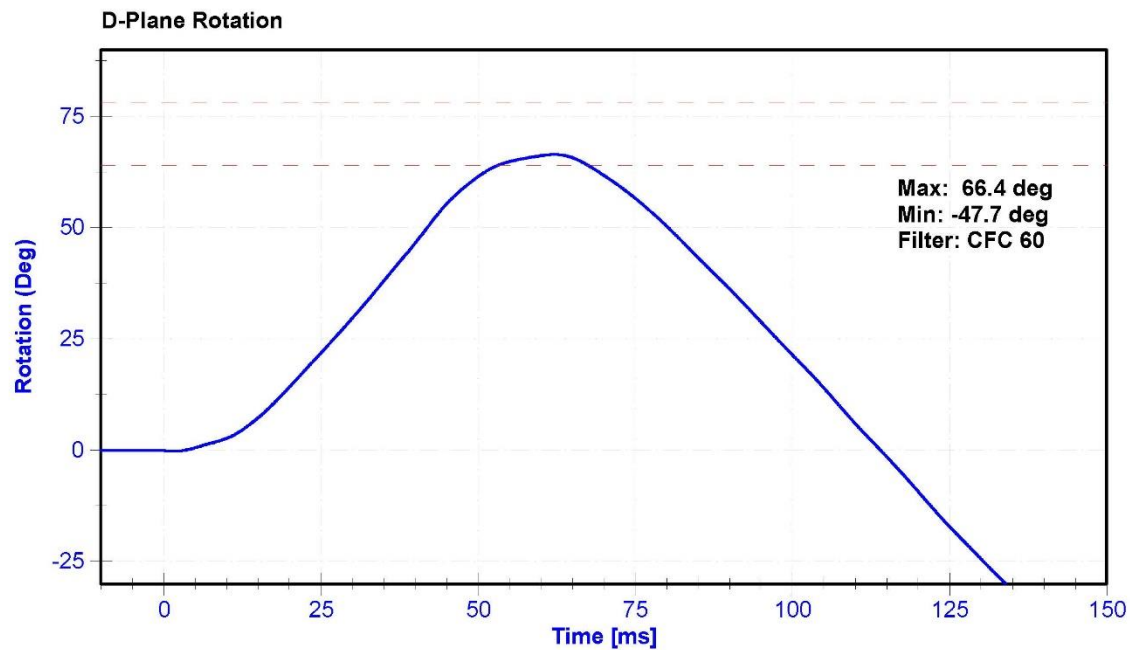
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

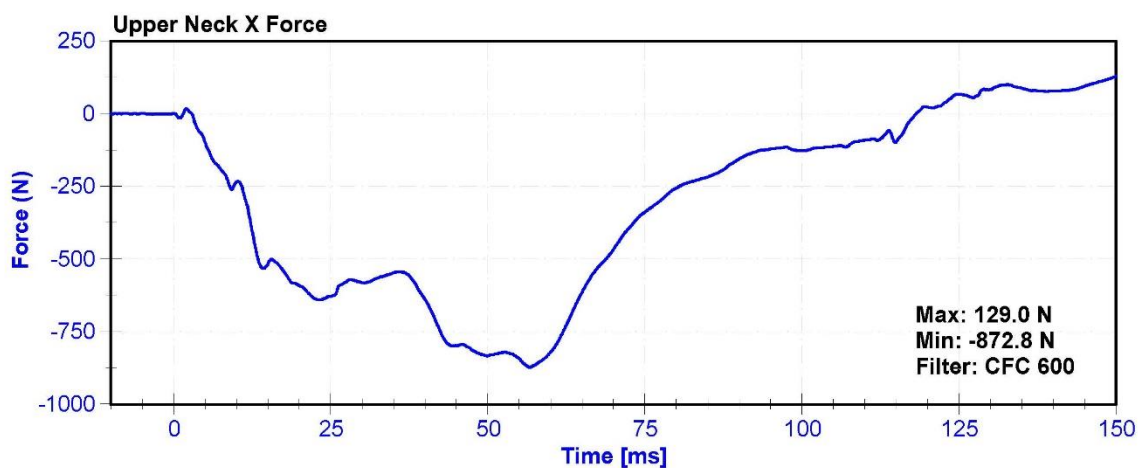
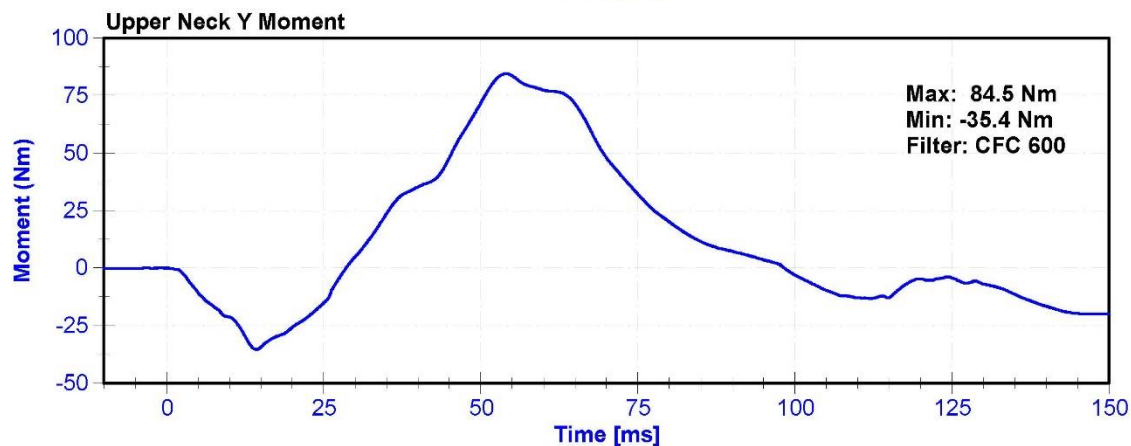
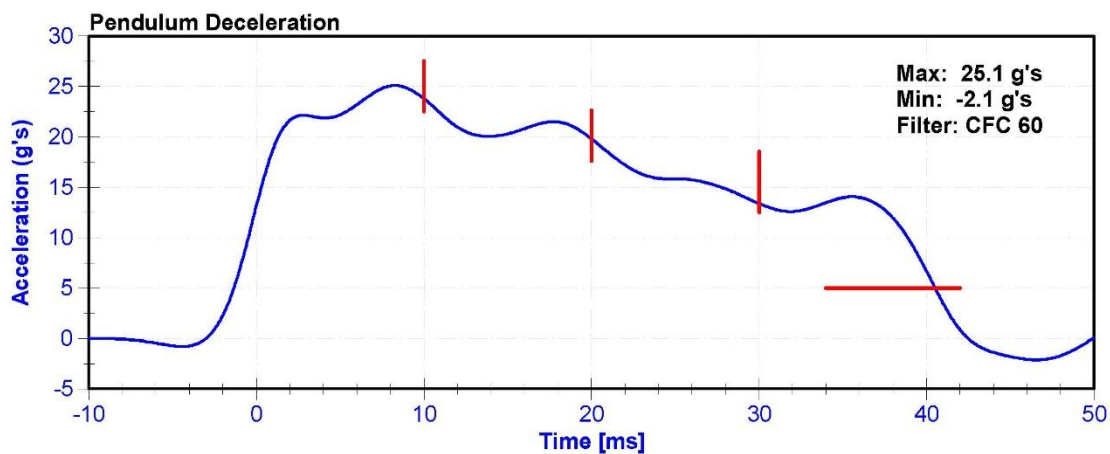
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	19.4	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	23.78	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	19.79	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	13.38	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.1	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	40.5	Pass
Maximum D Plane Rotation	64	78	deg	66.4	Pass
Time to Maximum Rotation	57	64	ms	62.1	Pass
Rotation Decay to Zero	113	127	ms	114.0	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	99.24	Pass
Time to Maximum Moment	47	58	ms	54.1	Pass
Moment Decay to Zero	97	107	ms	99.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/18/2015	5/17/2016





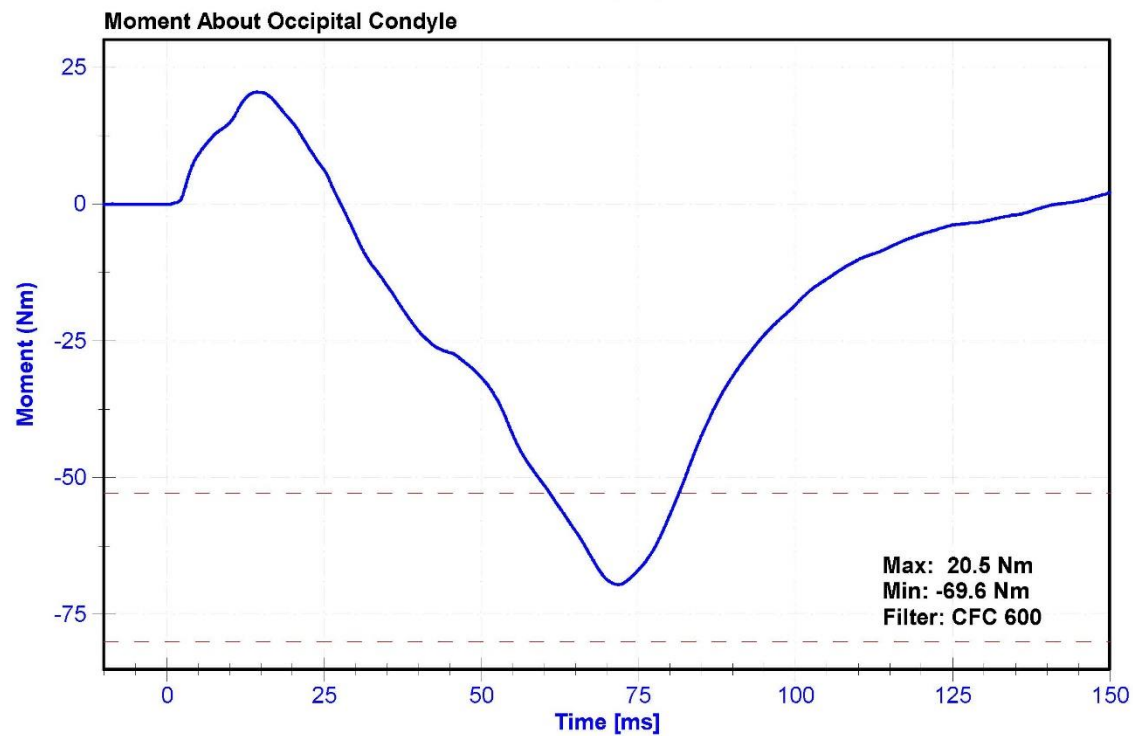
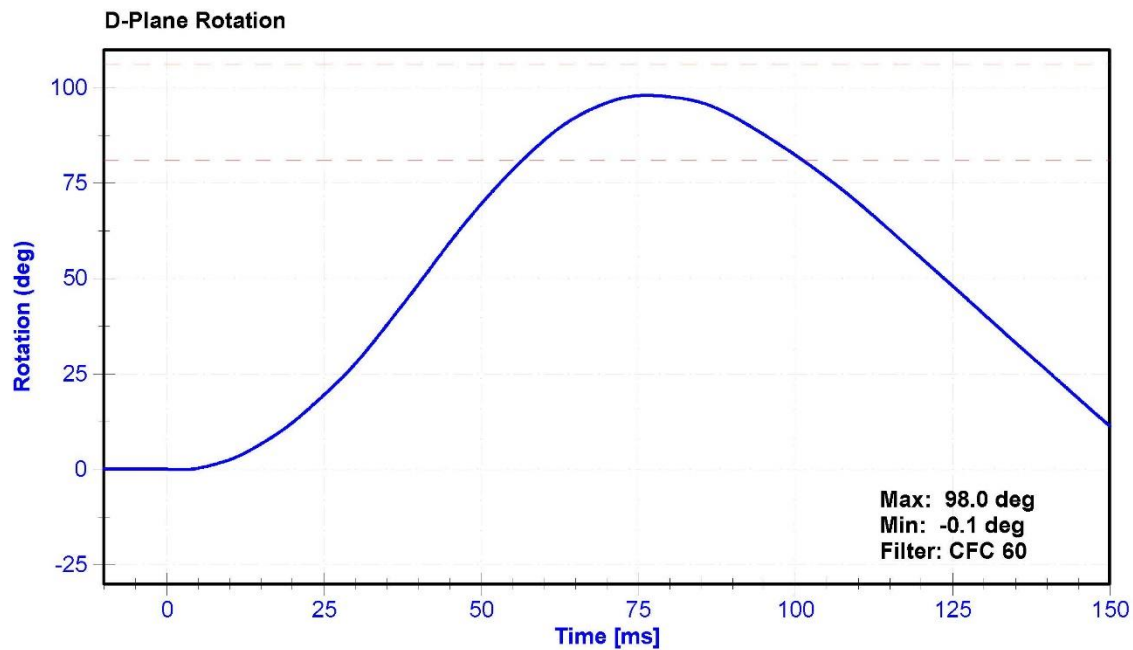
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ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

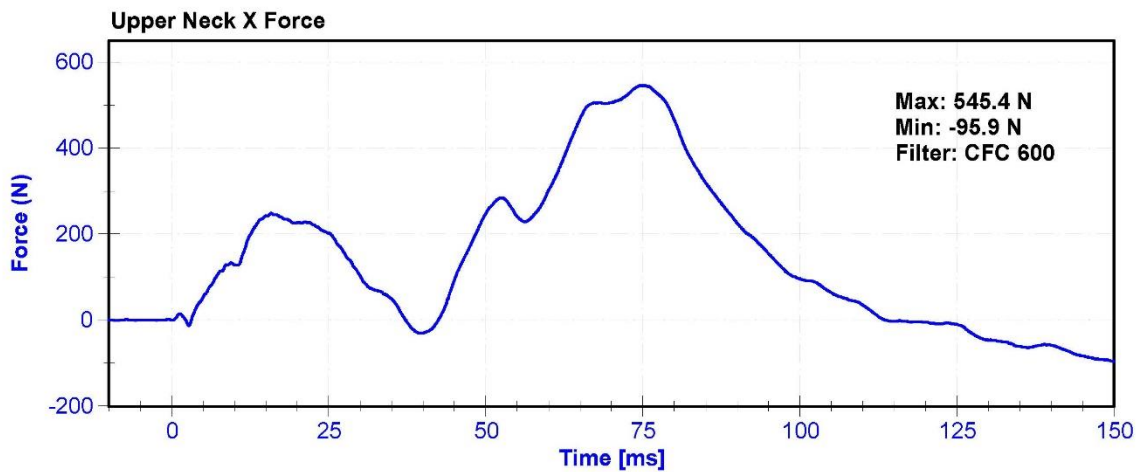
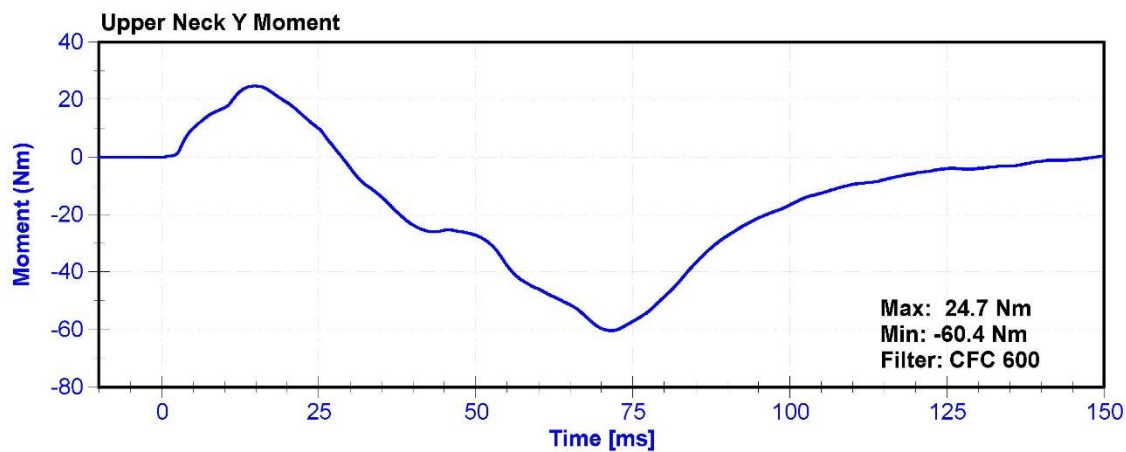
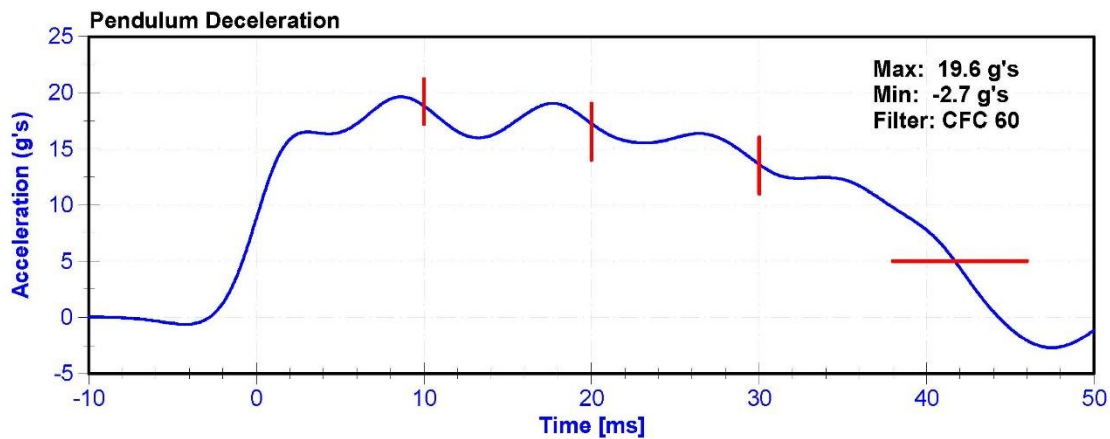
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	22.5	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	18.81	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.2	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.6	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.6	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	41.7	Pass
Maximum D Plane Rotation	81	106	deg	98.0	Pass
Time to Maximum Rotation	72	82	ms	76.3	Pass
Rotation Decay to Zero	147	174	ms	158.4	Pass
Minimum Moment About OC	-80	-52.9	Nm	-69.56	Pass
Time to Minimum Moment	65	79	ms	71.9	Pass
Moment Decay to Zero	120	148	ms	141.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/18/2015	5/17/2016





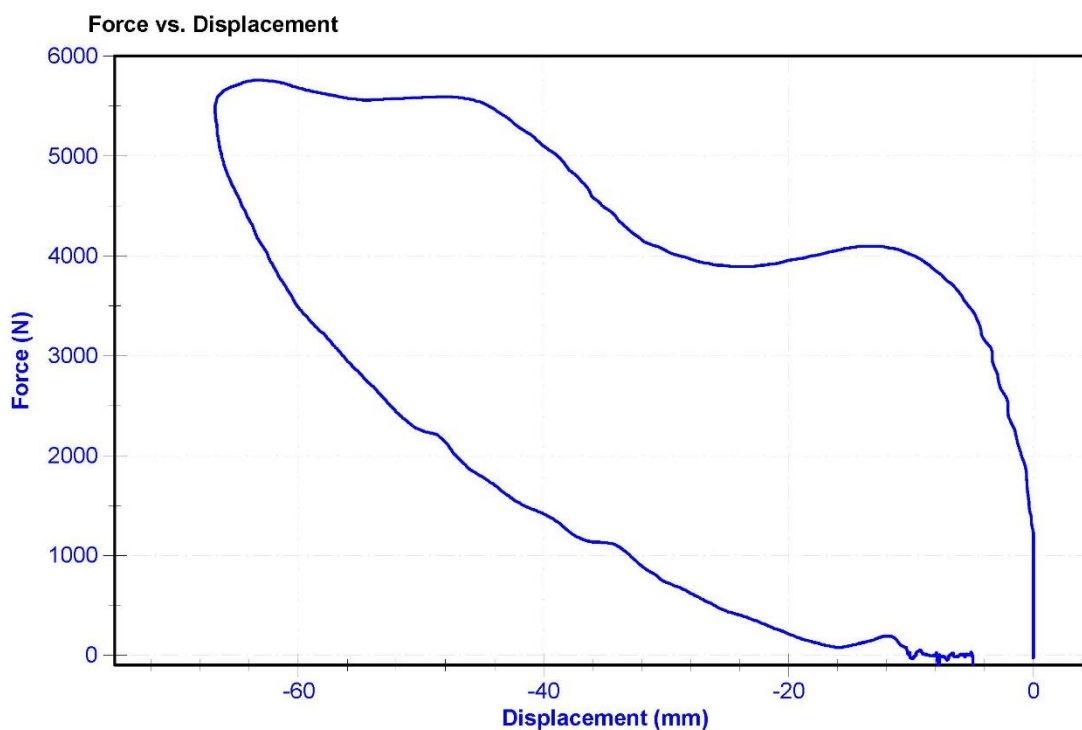
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

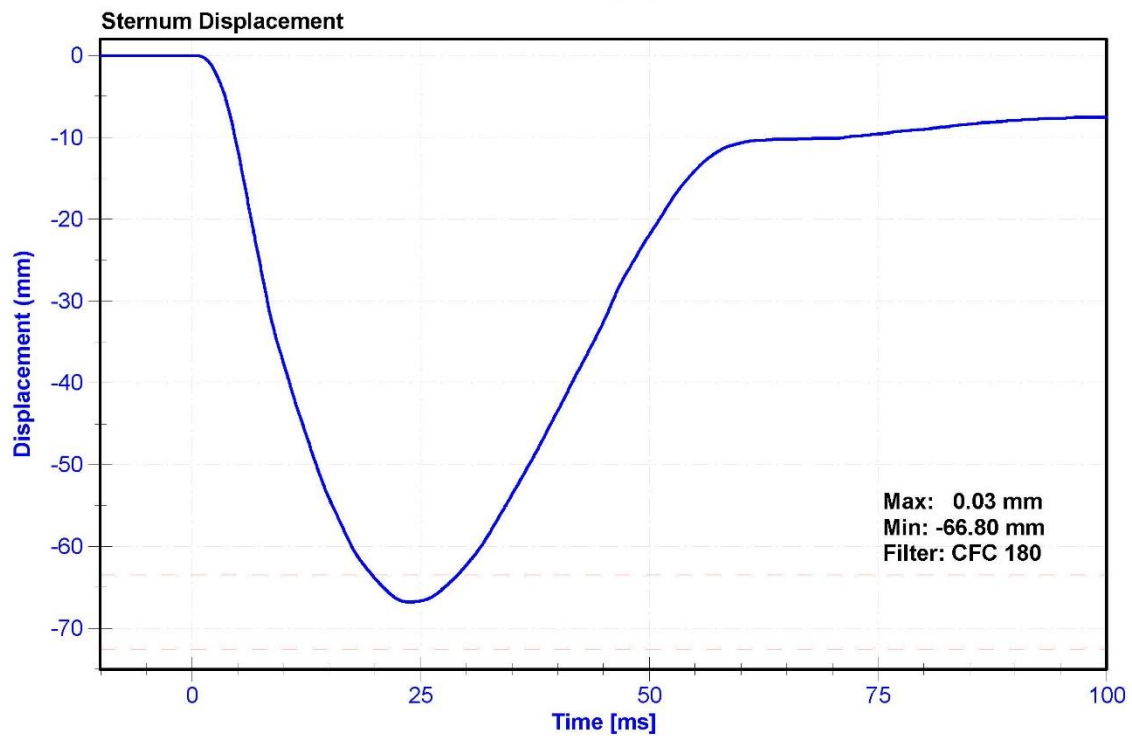
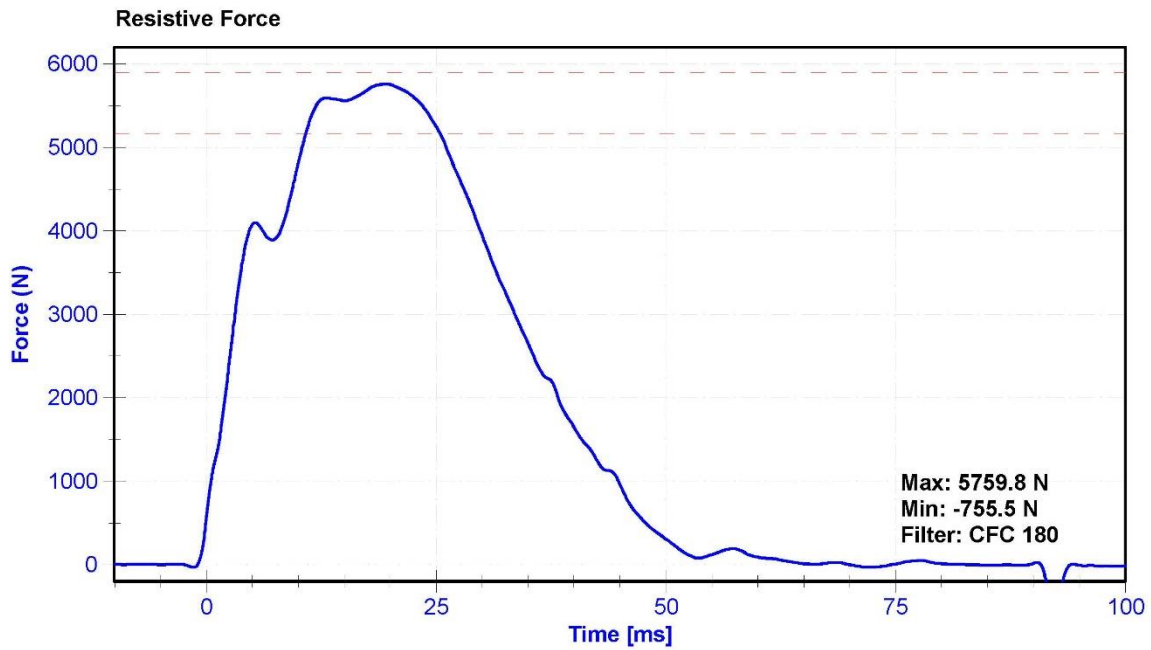
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	20.5	Pass
Velocity	6.59	6.83	m/s	6.773	Pass
Chest Displacement	-72.6	-63.5	mm	-66.80	Pass
Resistive Force	5160	5894	N	5759.8	Pass
Hysteresis	65	85	%	69.9	Pass

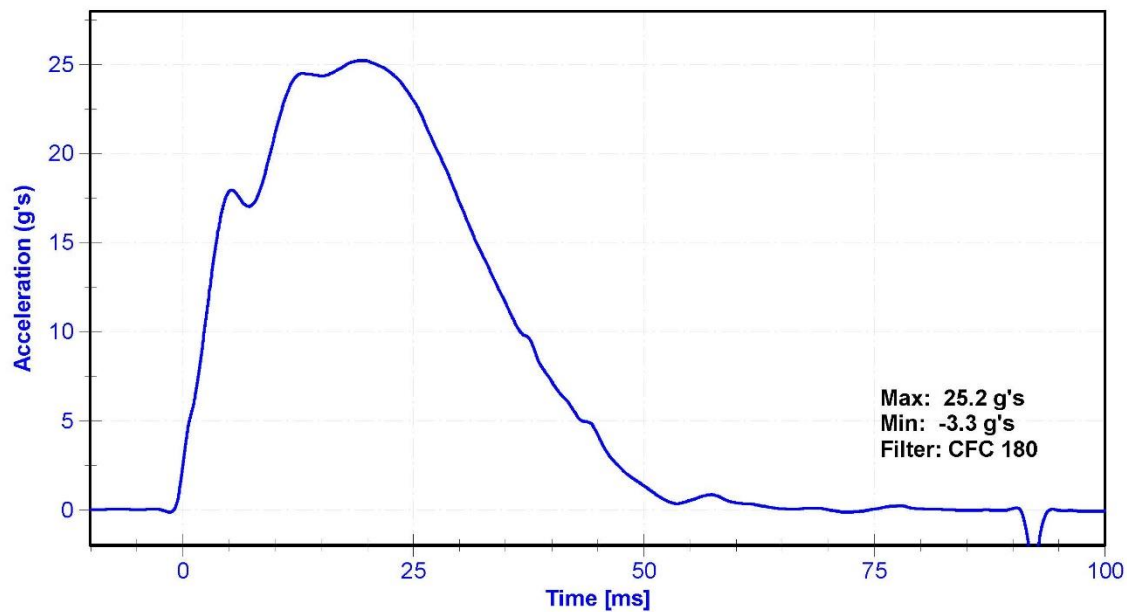
Transducer Calibrations

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Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016
Chest Potentiometer	Servo 14CB1-2897	DS-1046	6/2/2015	6/1/2016

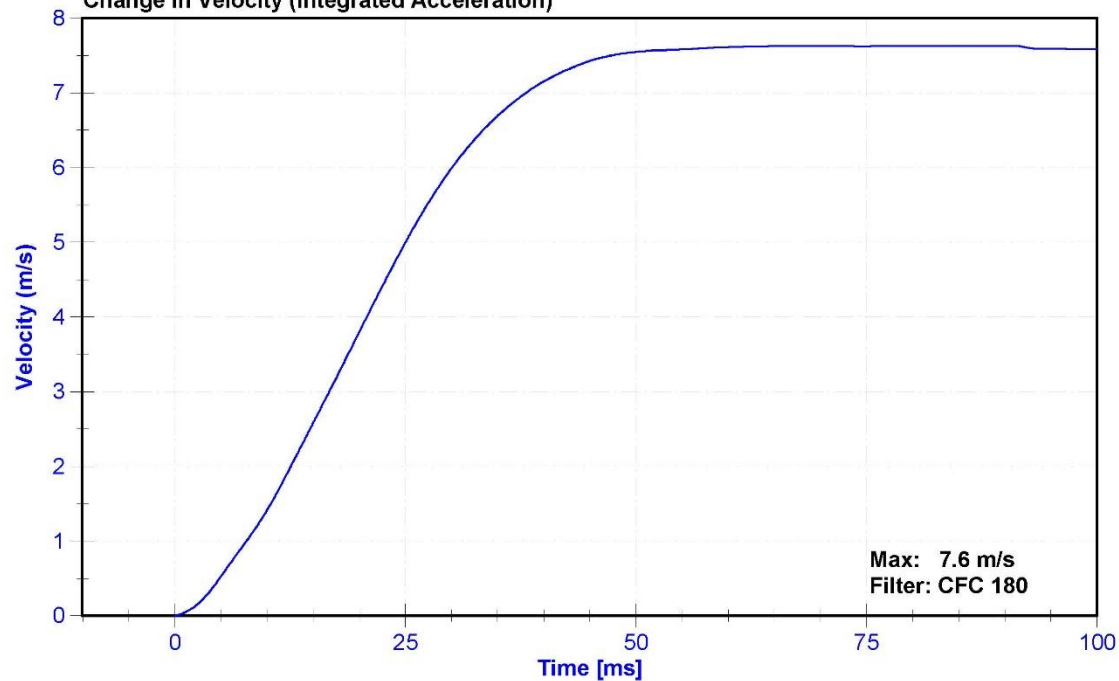




Probe Acceleration



Change in Velocity (Integrated Acceleration)



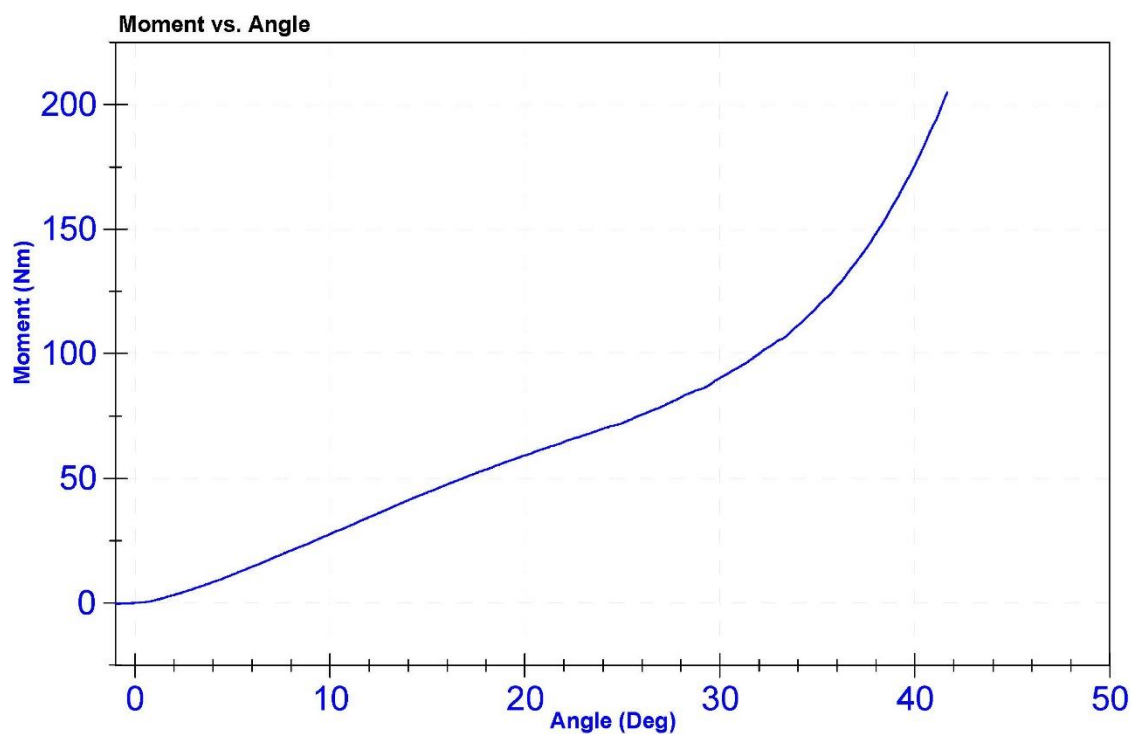
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.9	Pass
Humidity	10	70	%	22.1	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	41.6	Pass
Moment at 30 degrees	0	94.9	Nm	90.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	DS-0008	3/13/2015	3/12/2016
Load Cell	Key Trans 2301-02	LC-115 My	3/30/2015	3/29/2016



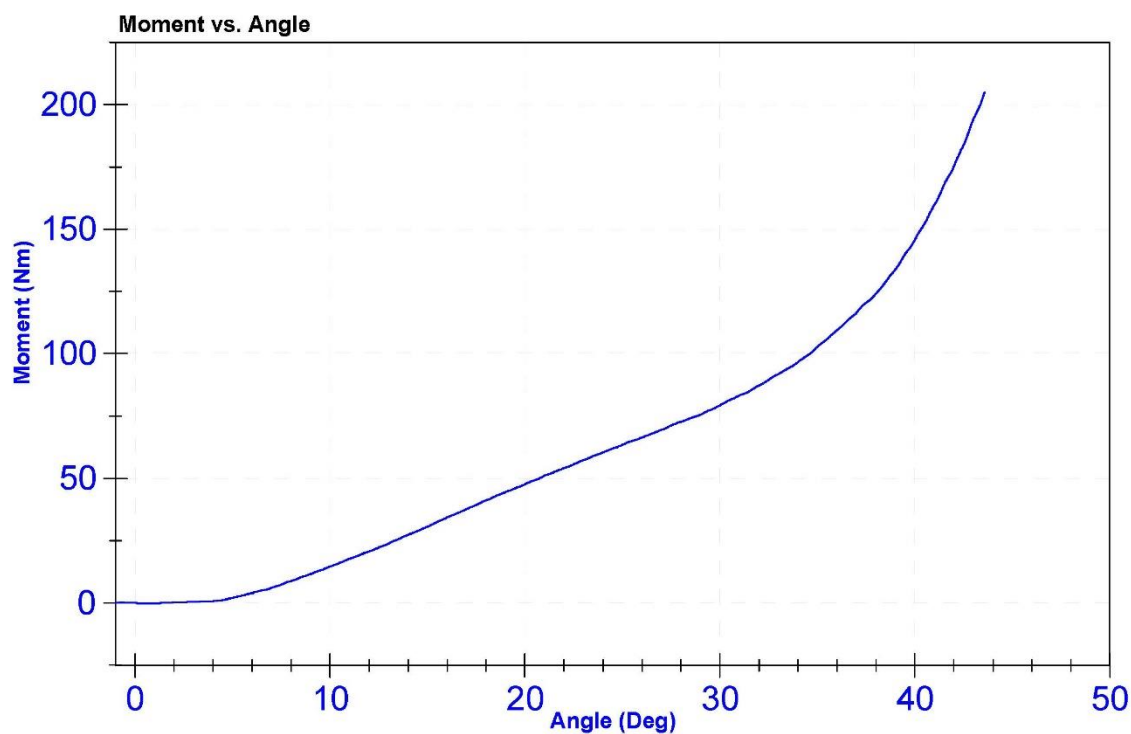
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.9	Pass
Humidity	10	70	%	22.1	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.5	Pass
Moment at 30 degrees	0	94.9	Nm	79.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Servo 14CB1-3615	DS-0008	3/13/2015	3/12/2016
Load Cell	Key Trans 2301-02	LC-115 My	3/30/2015	3/29/2016



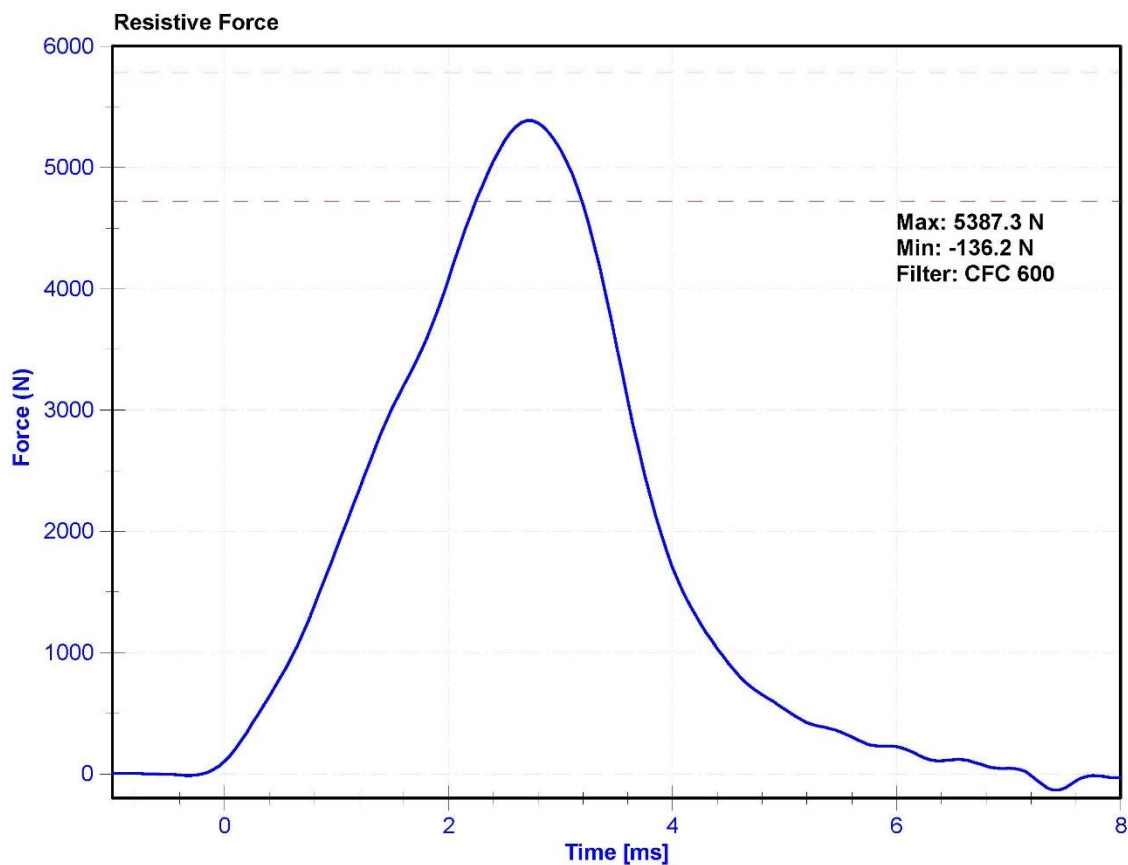
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

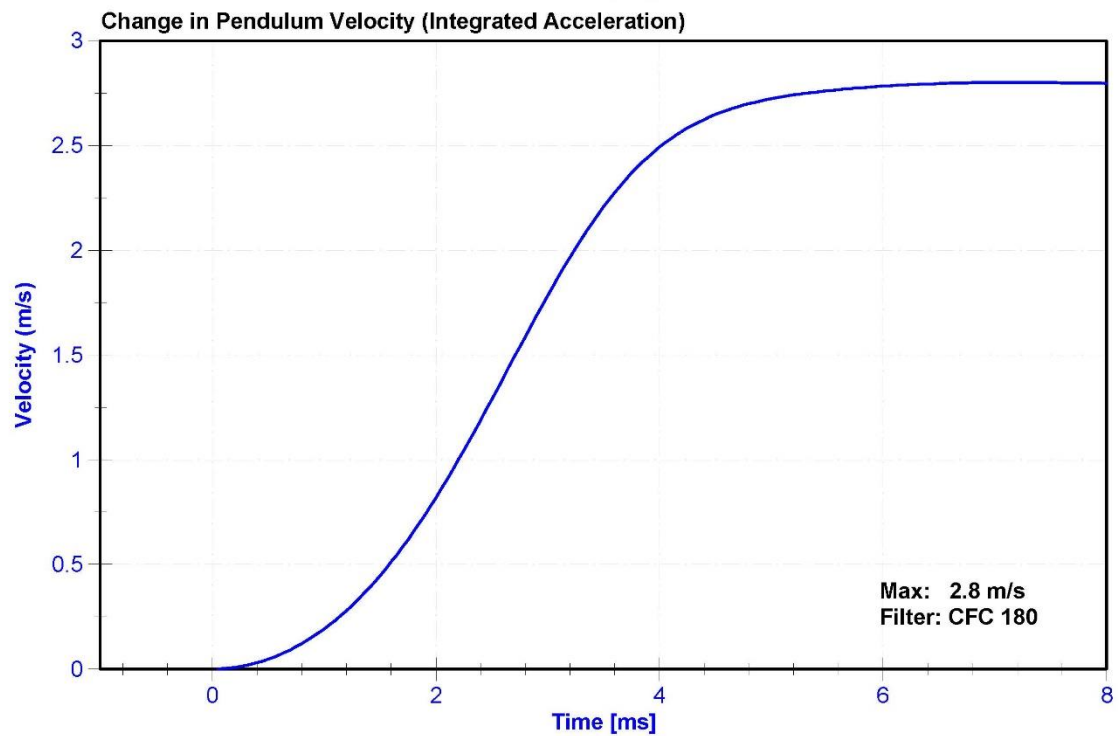
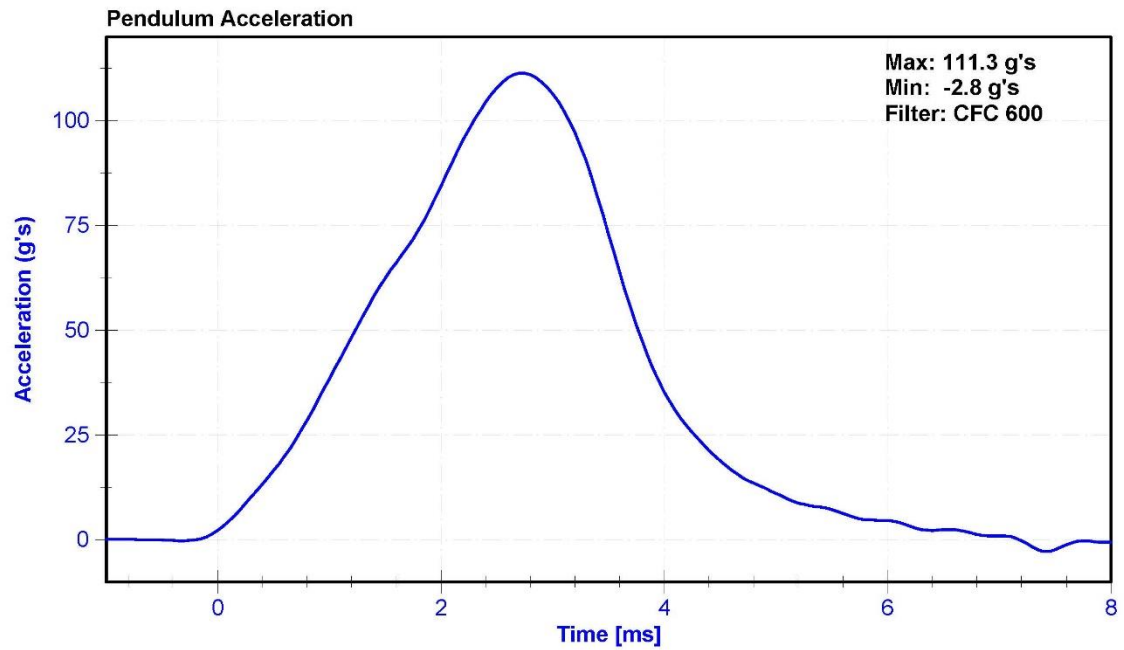
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21	Pass
Humidity	10	70	%	24.3	Pass
Velocity	2.07	2.13	m/s	2.088	Pass
Maximum Resistive Force	4720	5780	N	5387.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





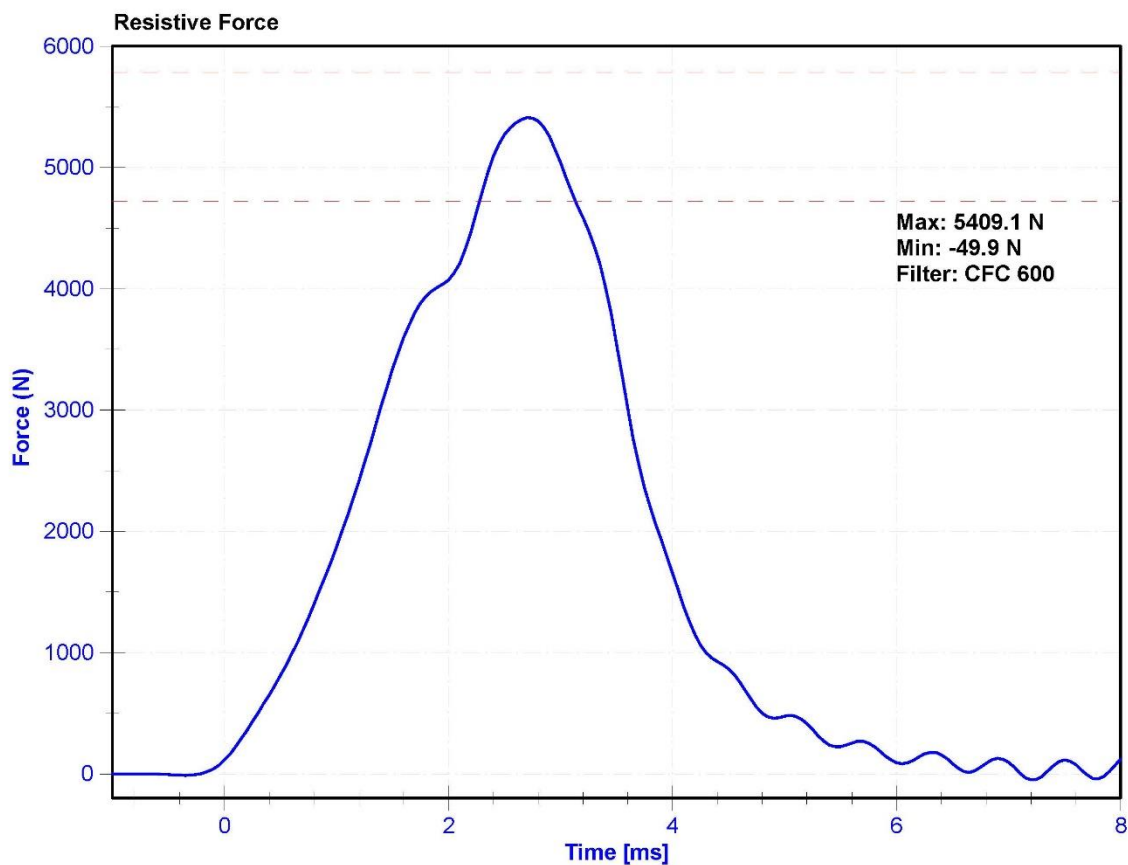
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	1046	Laboratory Supervisor	M.Goehle

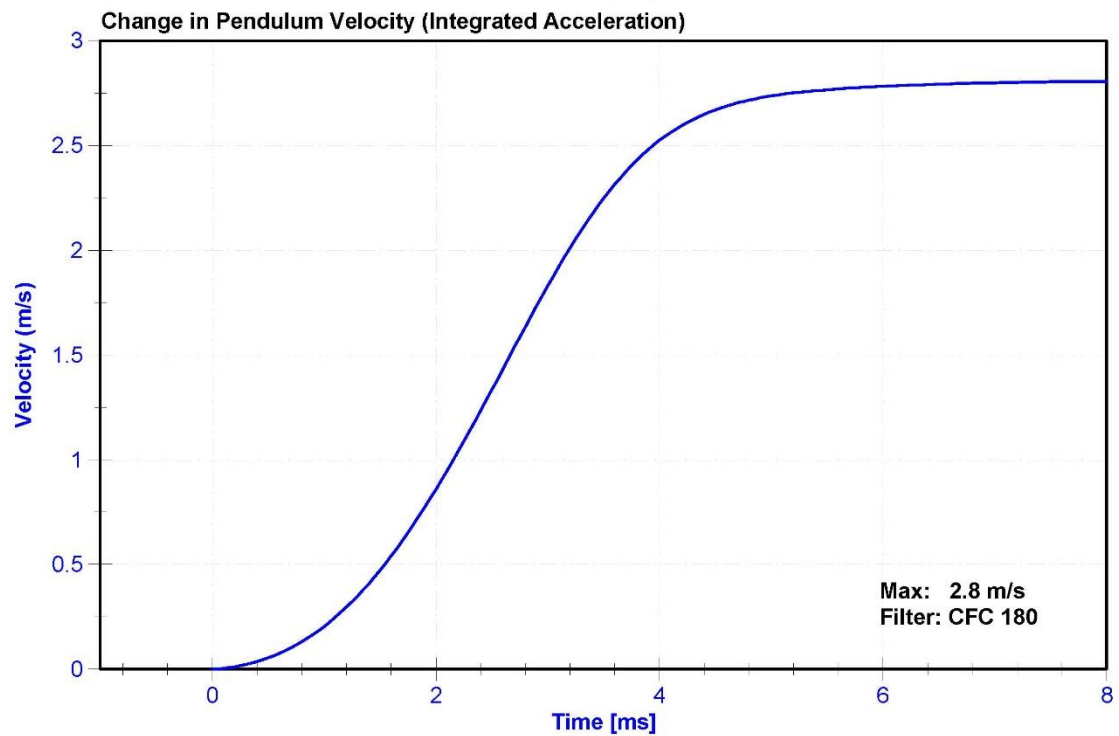
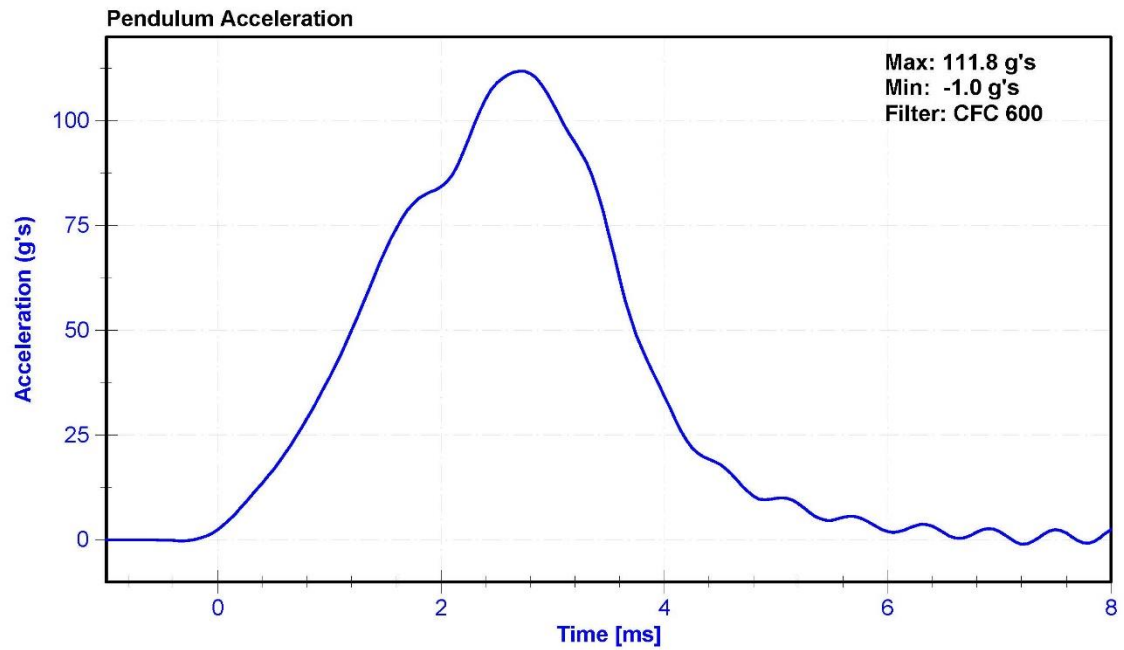
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21	Pass
Humidity	10	70	%	24.3	Pass
Velocity	2.07	2.13	m/s	2.086	Pass
Maximum Resistive Force	4720	5780	N	5409.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





CALIBRATION TEST RESULTS

PRE-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 288

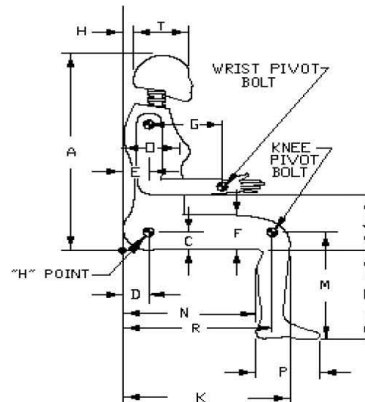
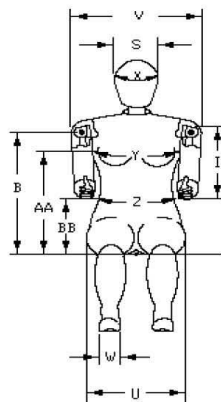


External Measurements - Hybrid 3 - 5th Female

Technician: M. Geesey

Date: 2/11/2016

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	439	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	75	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	247	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	540	Pass
L	Popliteal Height	356	376	367	Pass
M	Knee Pivot Height	394	419	399	Pass
N	Buttock Popliteal Length	414	439	431	Pass
O	Chest Depth without Jacket	175	191	178	Pass
P	Foot Length (right)	219	234	223	Pass
R	Buttock To Knee Pivot Length	457	483	460	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	304	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	82	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	855	Pass
Z	Waist Circumference	460	790	780	Pass
AA	Reference Location (Chest Circumference)	333	358	342	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

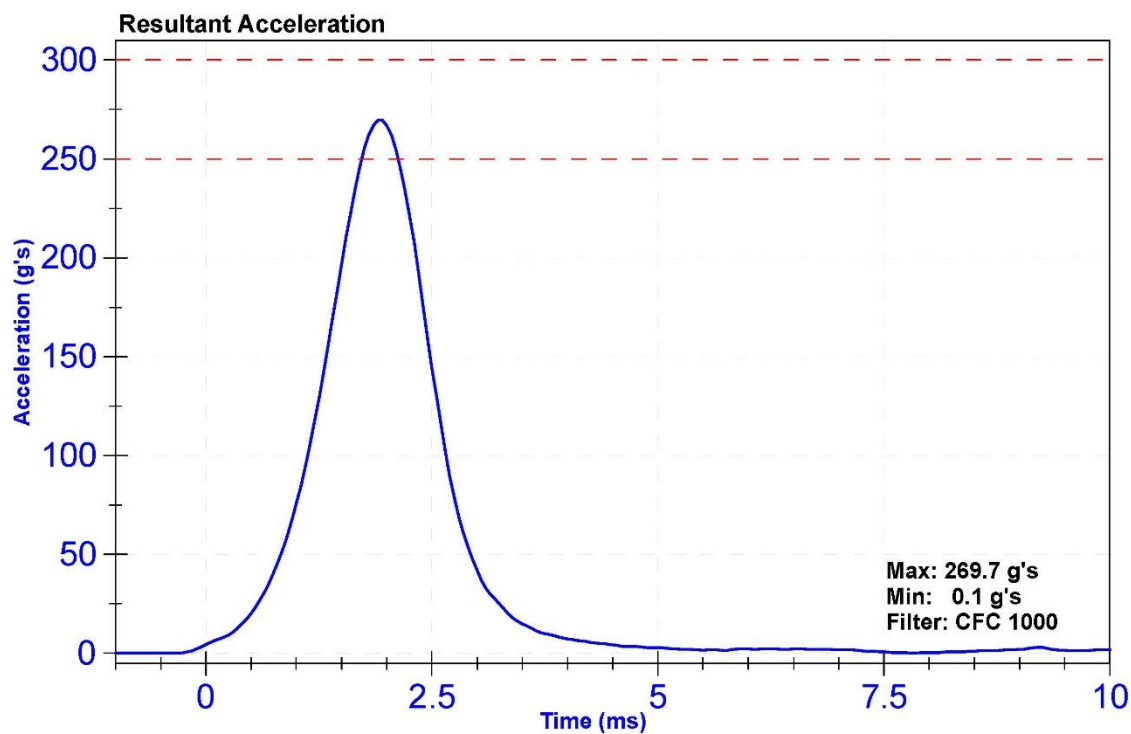
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

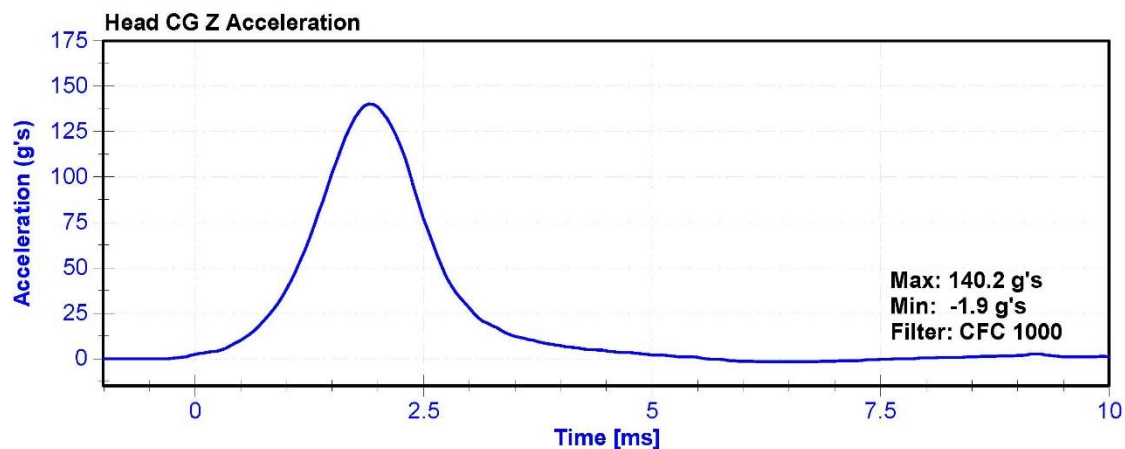
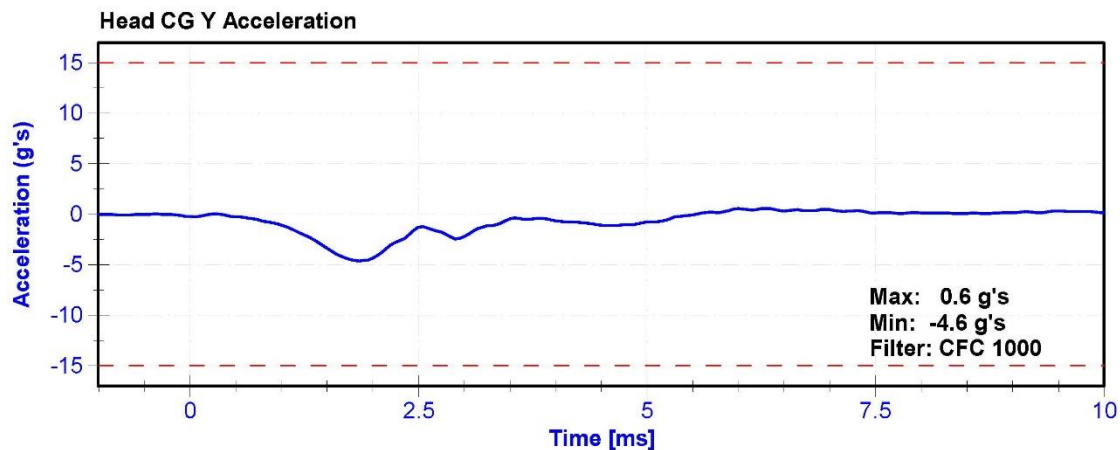
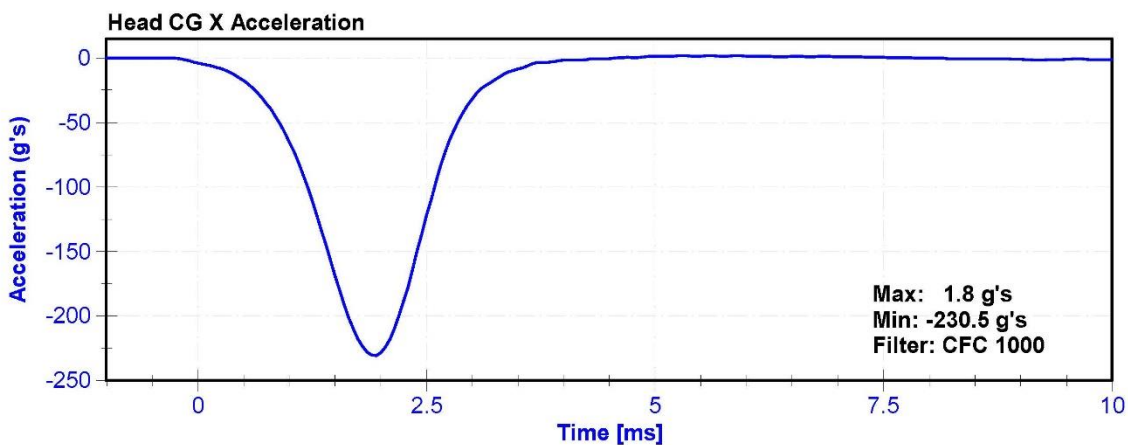
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.7	Pass
Humidity	10	70	%	22.2	Pass
Resultant Acceleration	250	300	g's	269.7	Pass
Oscillation	0	10	%	1.1	Pass
Lateral Acceleration	-15	15	g's	-4.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	12/9/2015	6/8/2016
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	12/9/2015	6/8/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	12/9/2015	6/8/2016





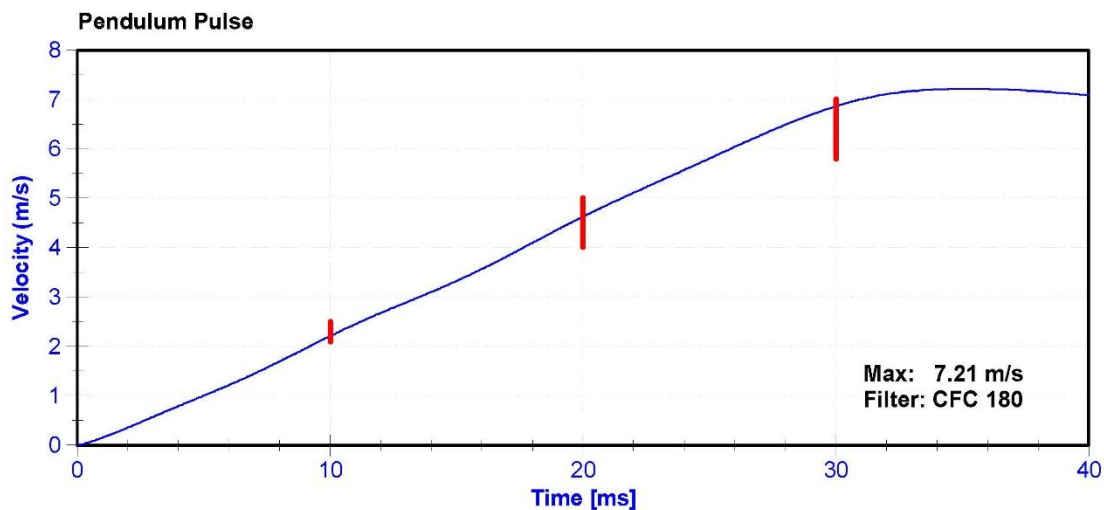
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

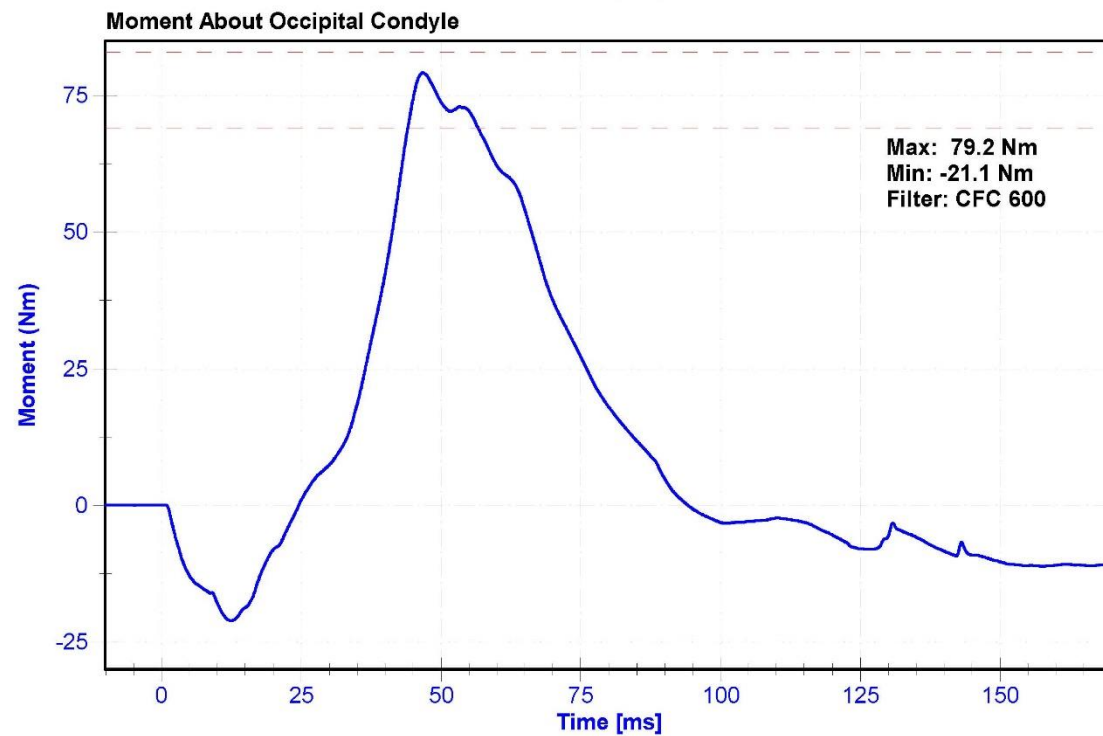
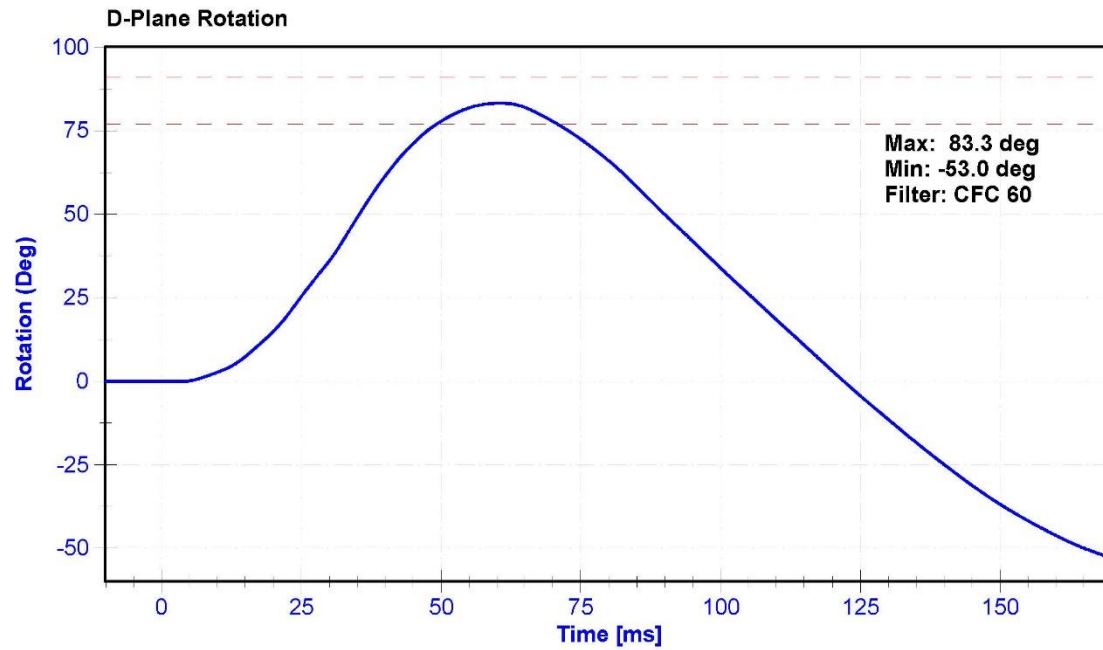
Results

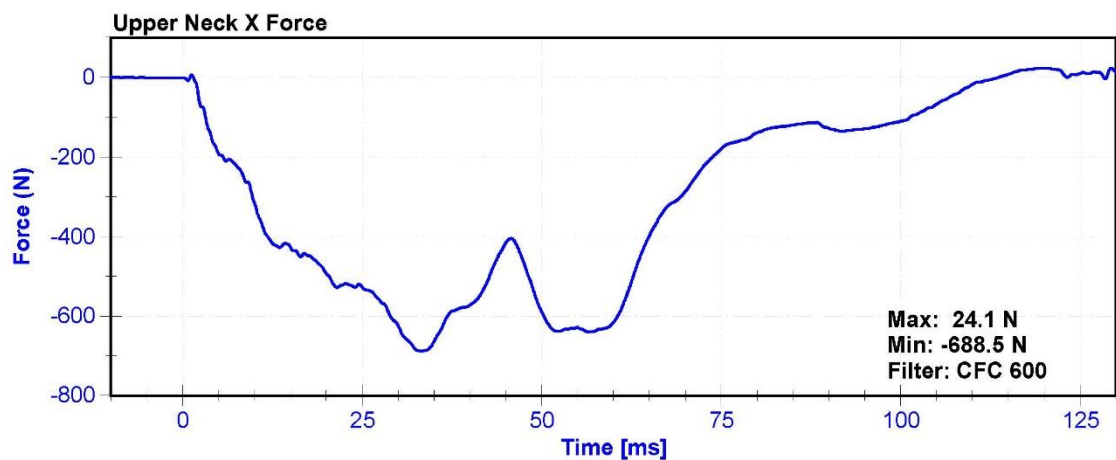
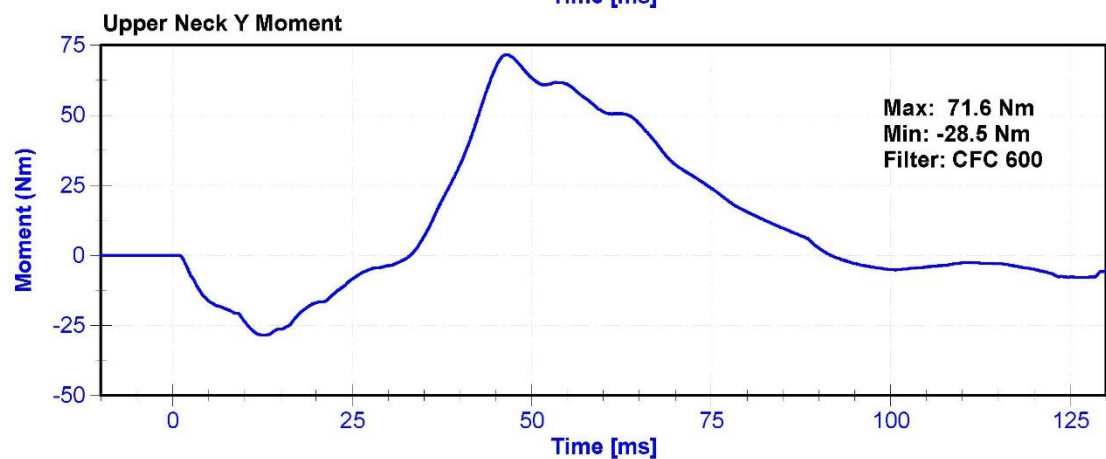
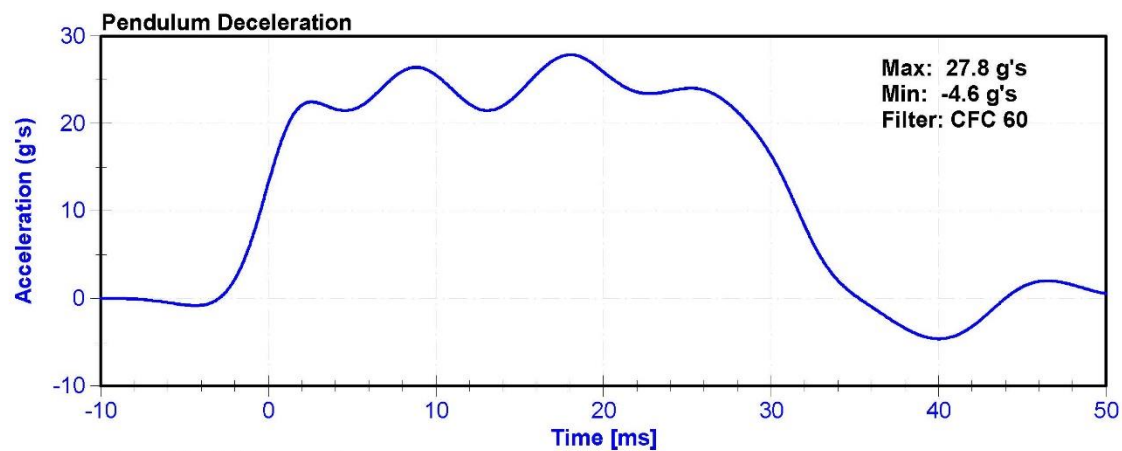
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	20.2	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.21	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.63	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.86	Pass
Max D Plane Rotation	77	91	deg	83.3	Pass
Max Moment During Rotation Interval	69	83	Nm	79.2	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/13/2015	5/12/2016







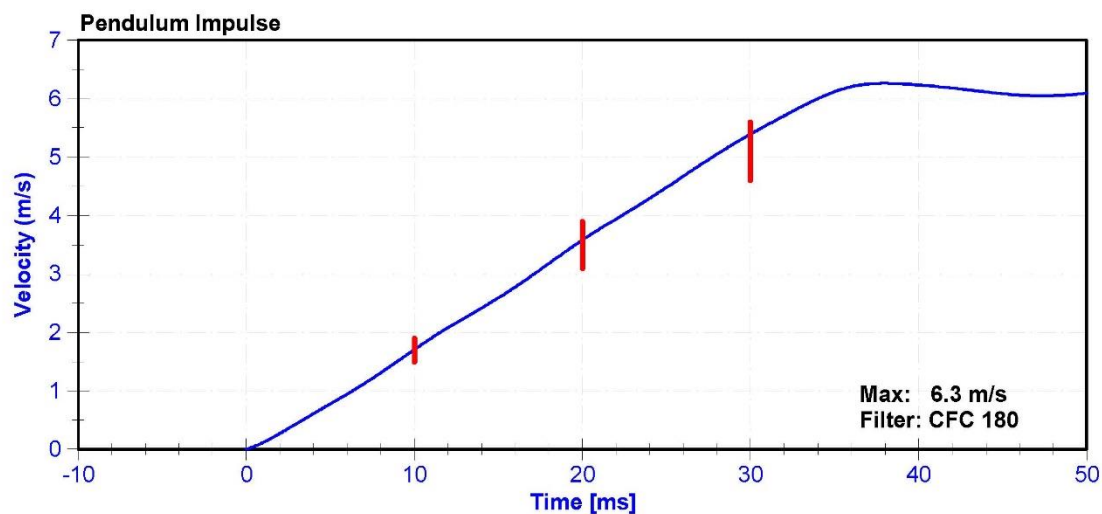
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

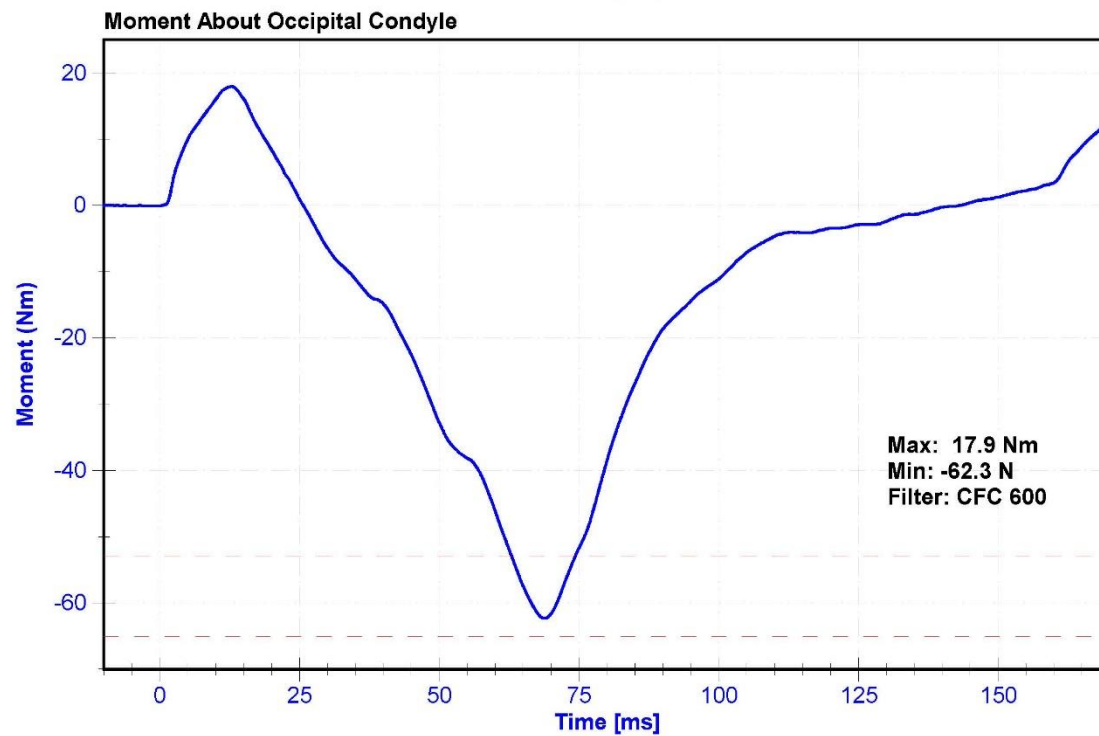
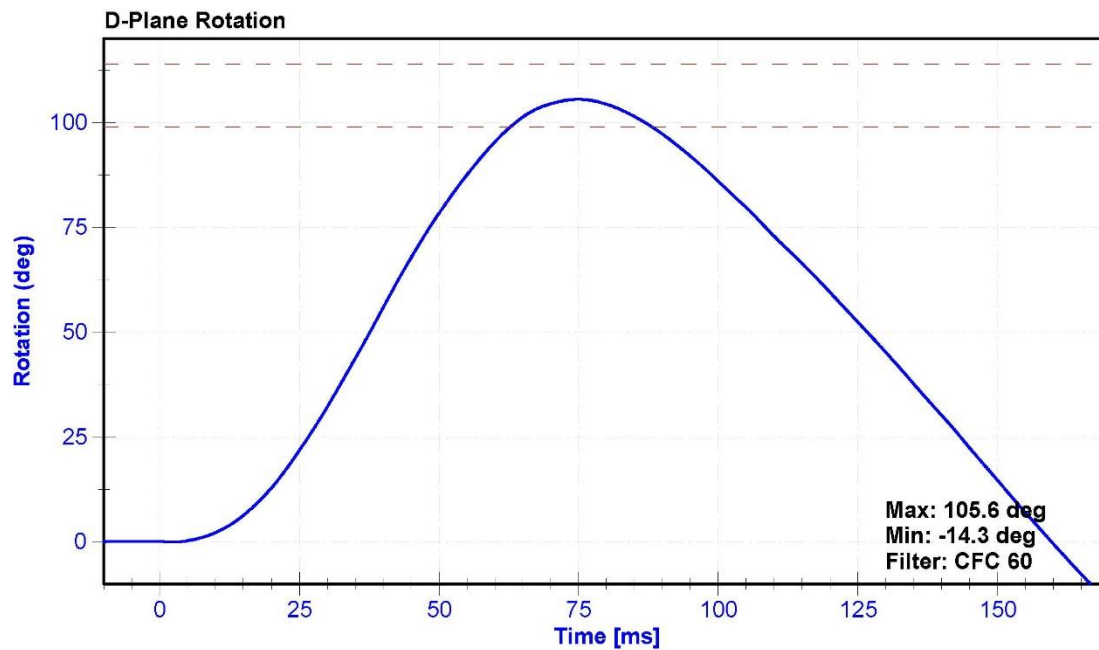
Results

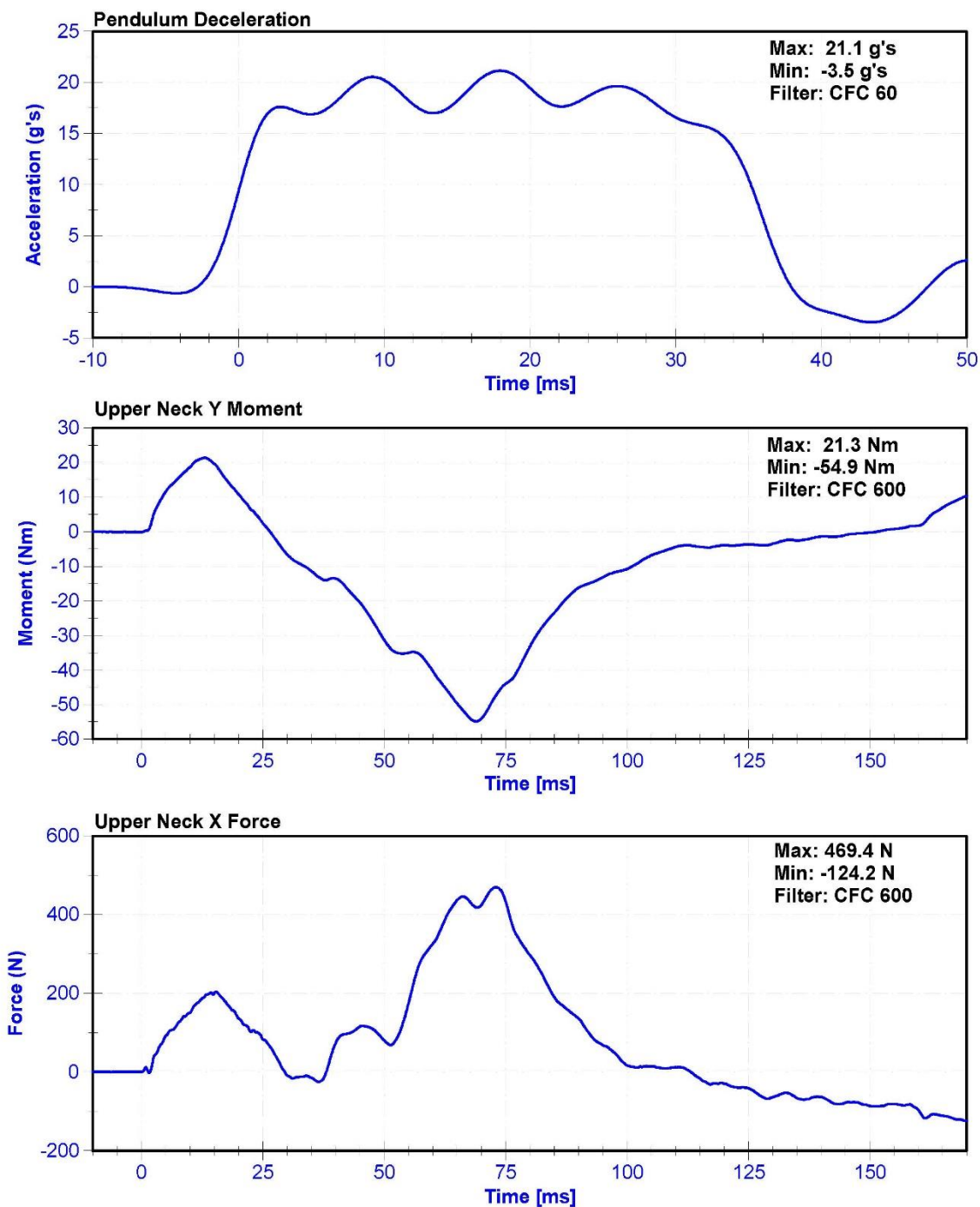
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	21.4	Pass
Velocity	5.95	6.19	m/s	6.068	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.71	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.58	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.39	Pass
D Plane Rotation	99	114	deg	105.6	Pass
Moment During Rotation Interval	-65	-53	Nm	-62.3	Pass
Moment Decay to -10Nm	94	114	ms	101.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/13/2015	5/12/2016







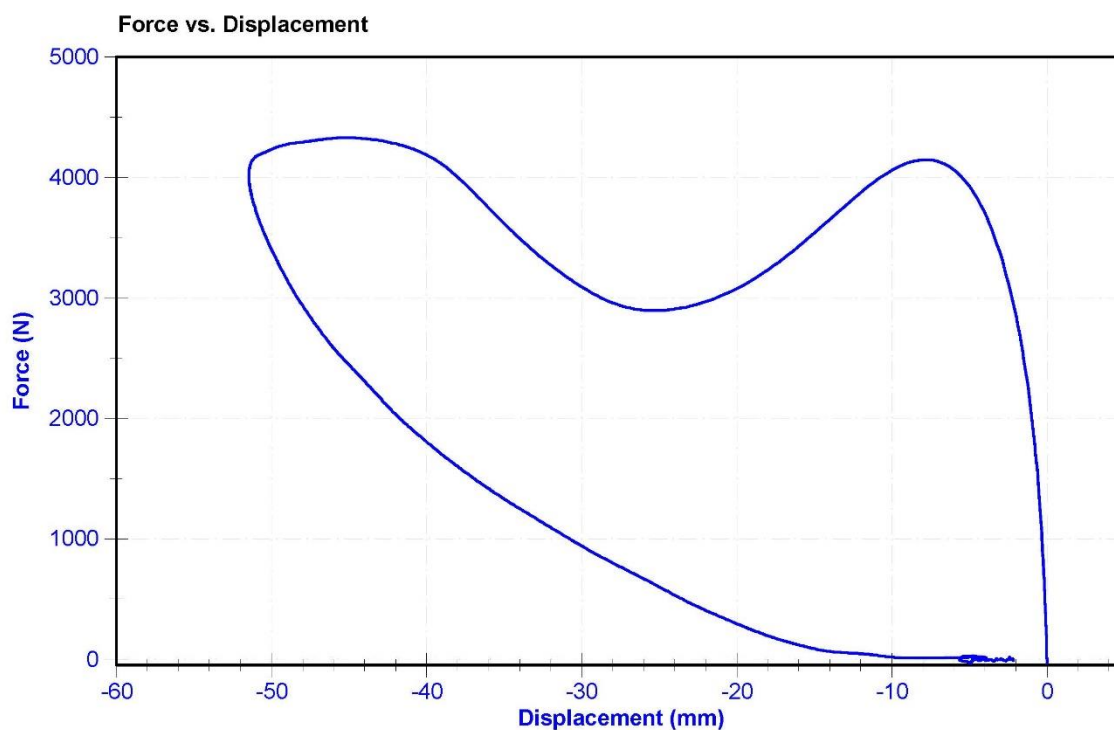
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

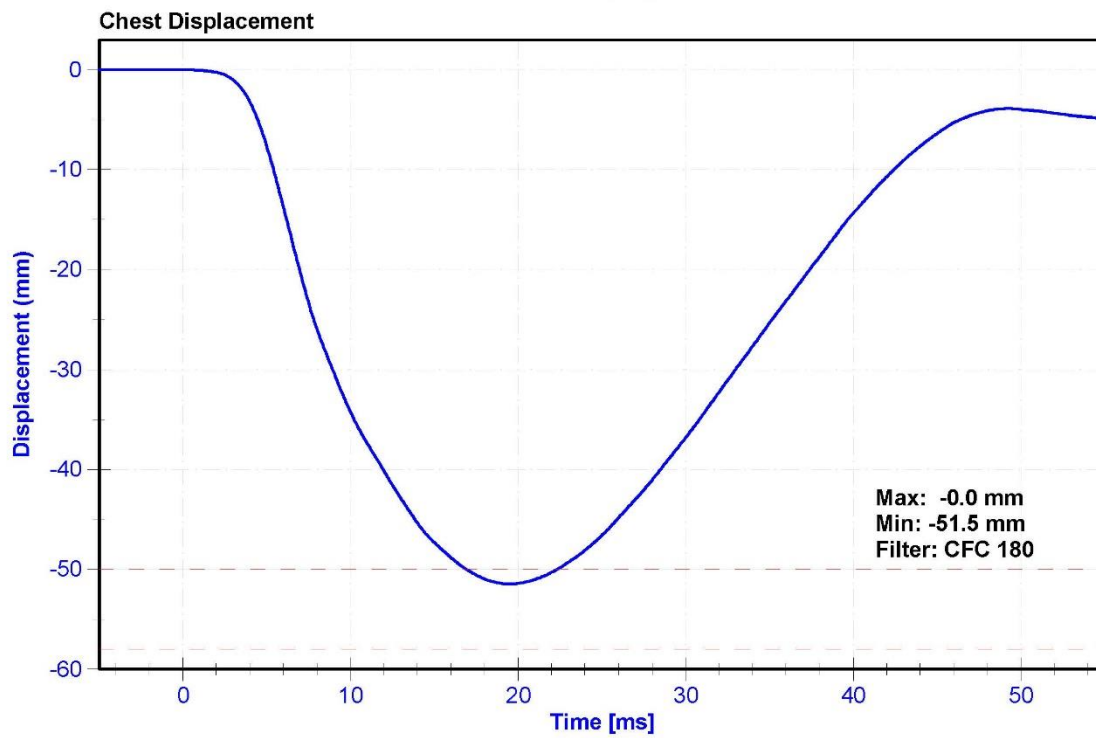
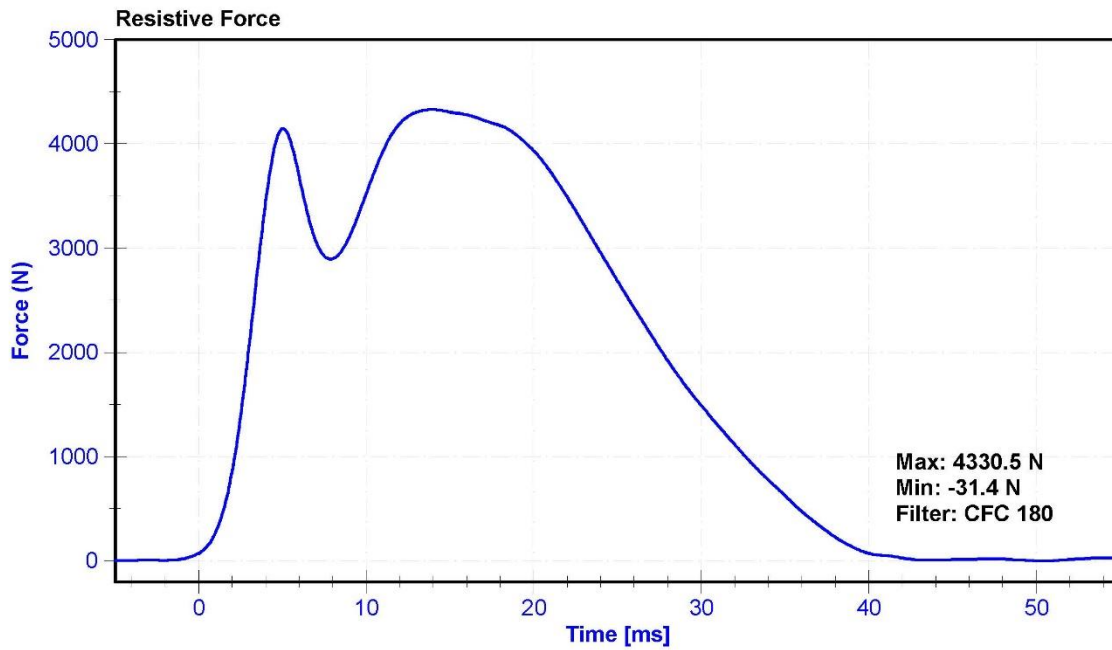
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	25	Pass
Velocity	6.59	6.83	m/s	6.684	Pass
Chest Deflection	-58	-50	mm	-51.5	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4234.0	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4330.5	Pass
Hysteresis	69	85	%	72.5	Pass

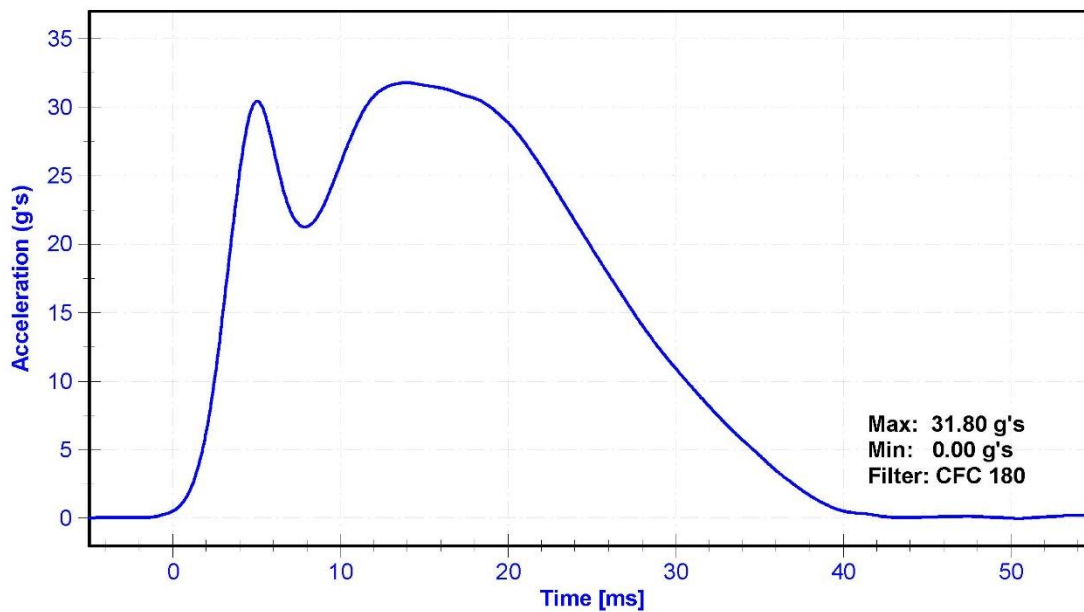
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/18/2015	9/17/2016

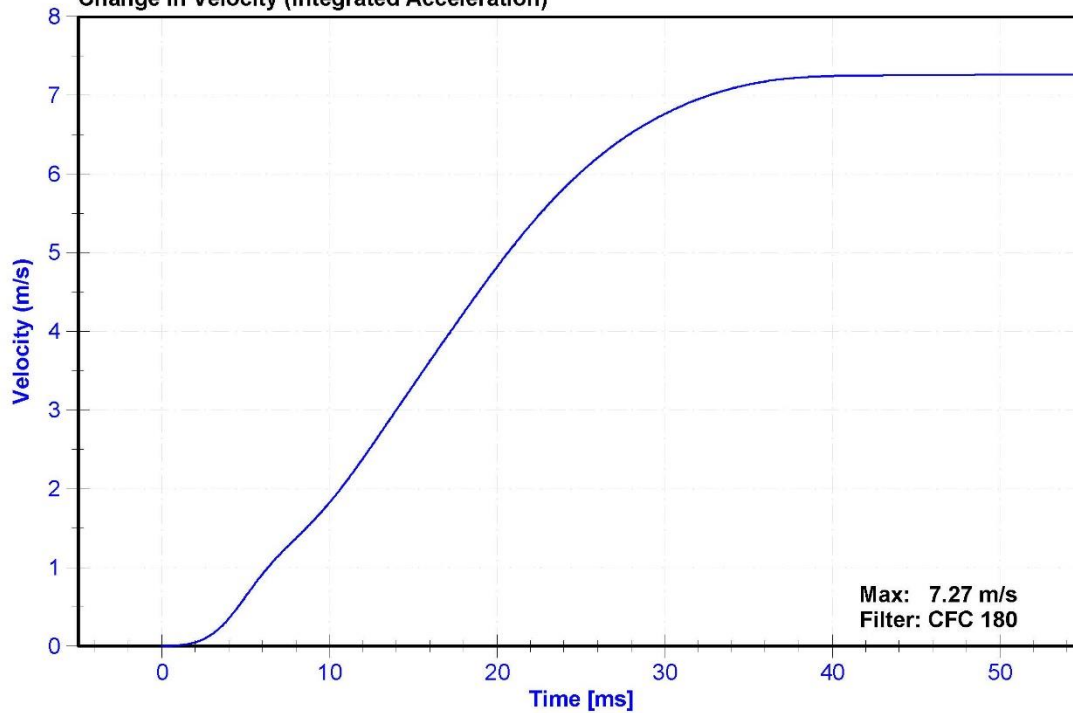




Probe Acceleration



Change in Velocity (Integrated Acceleration)



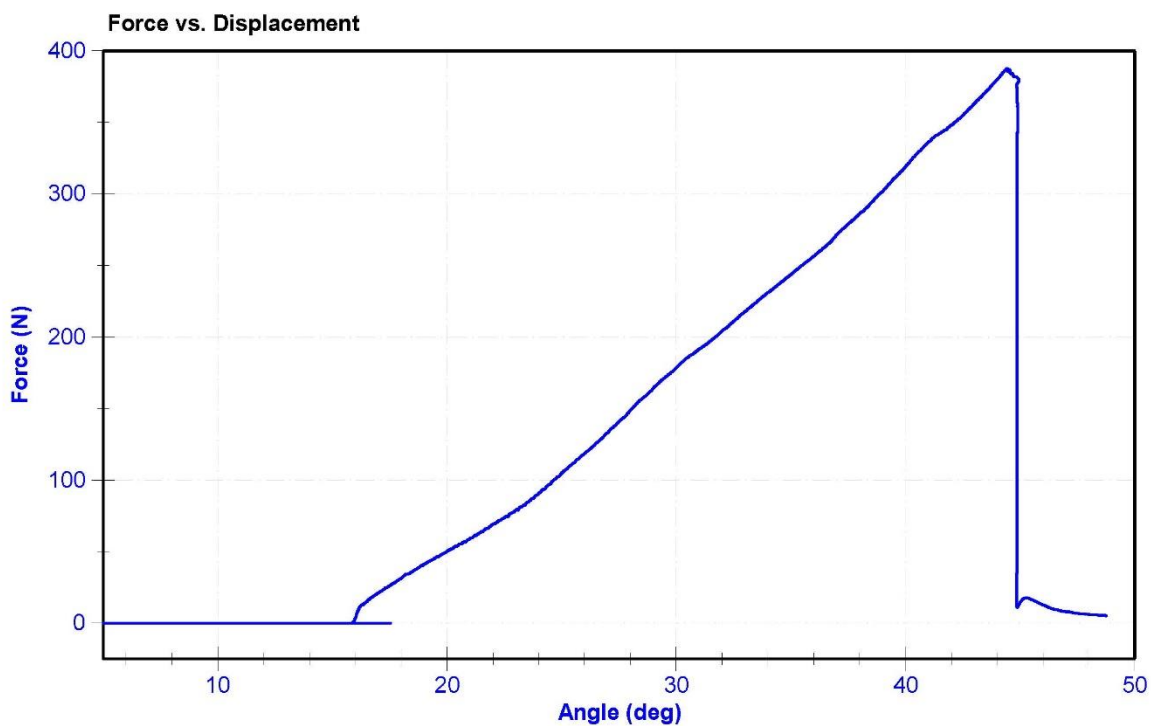
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	288	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.5	Pass
Humidity	10	70	%	20.1	Pass
Initial Angle	0	20	deg	15.9	Pass
Force at 45 Degrees	320	390	N	387.7	Pass
Return Angle Relative to Initial	0	8	deg	6.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	8/14/2015	8/13/2016
Load Cell	Interface SML-200	LC-493319	8/13/2015	8/12/2016



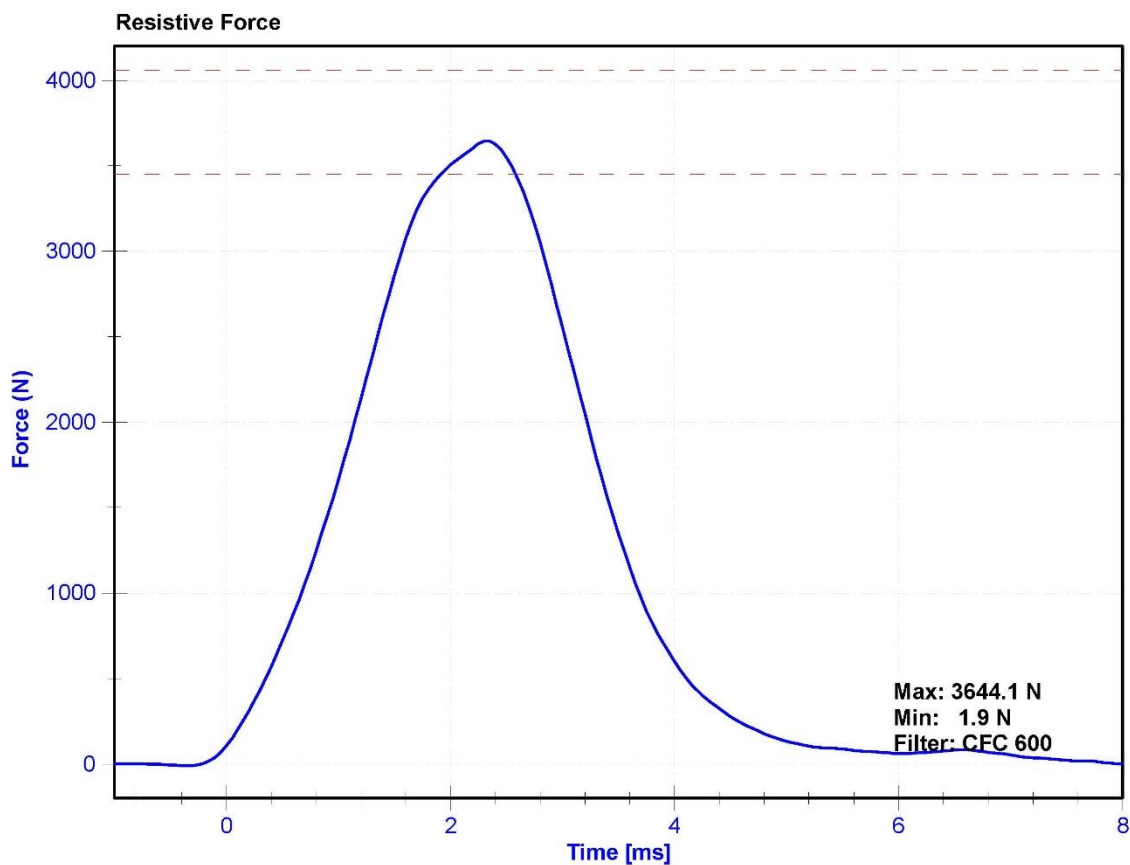
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

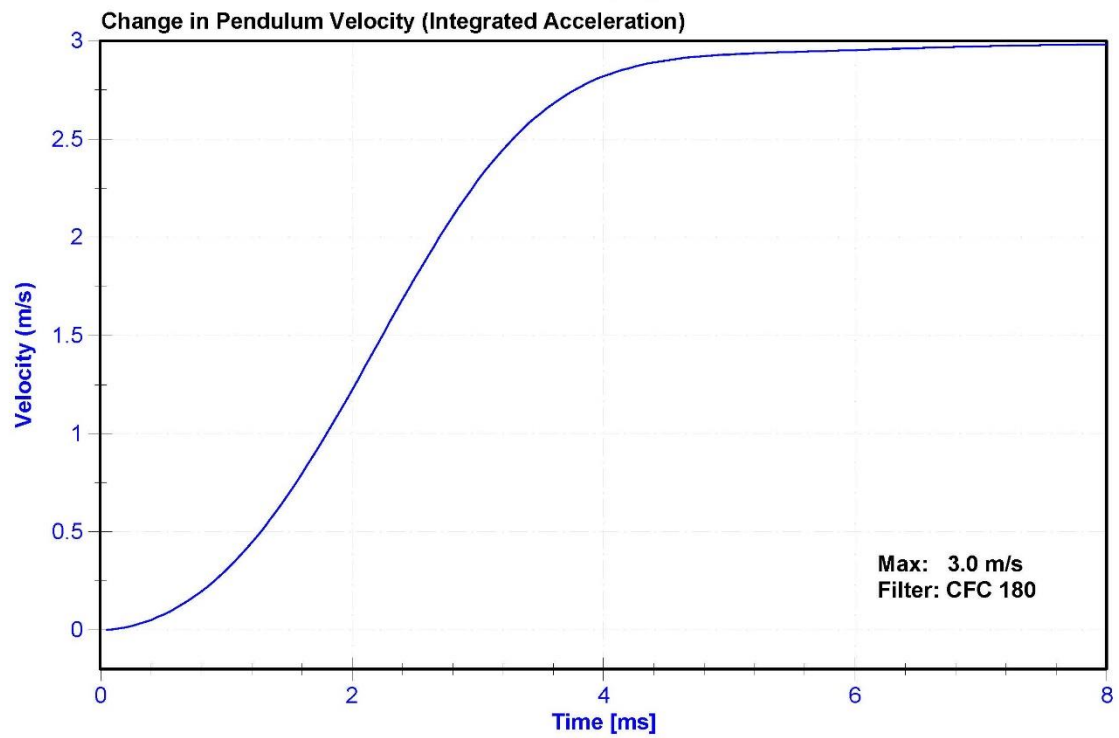
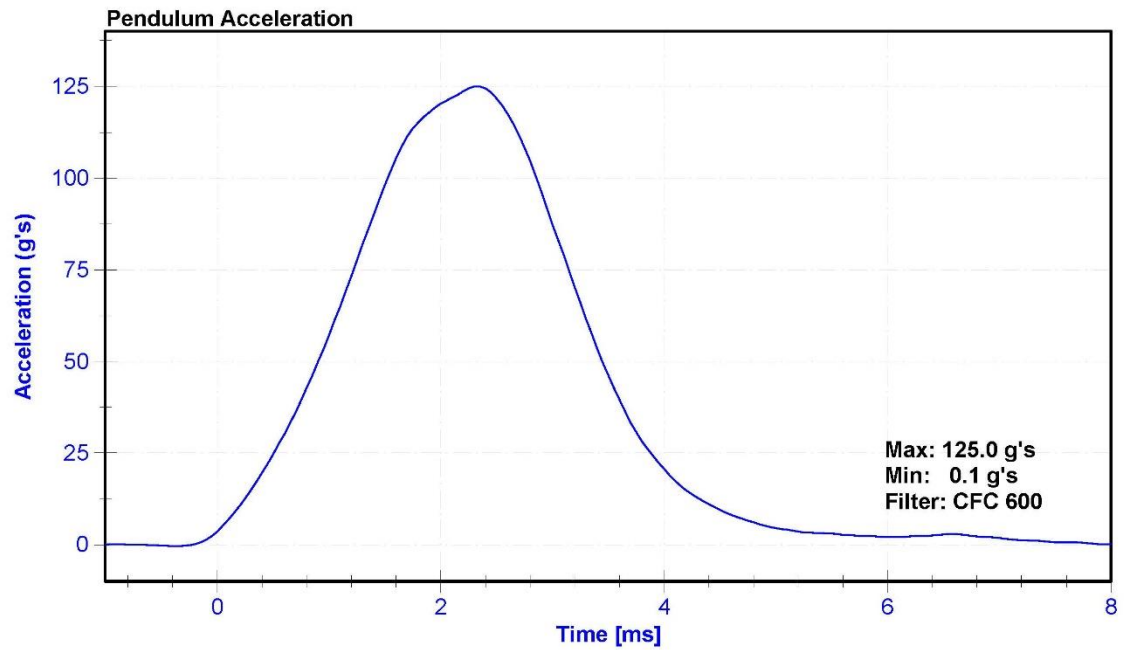
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	24.4	Pass
Velocity	2.07	2.13	m/s	2.102	Pass
Resistive Force	3450	4060	N	3644.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





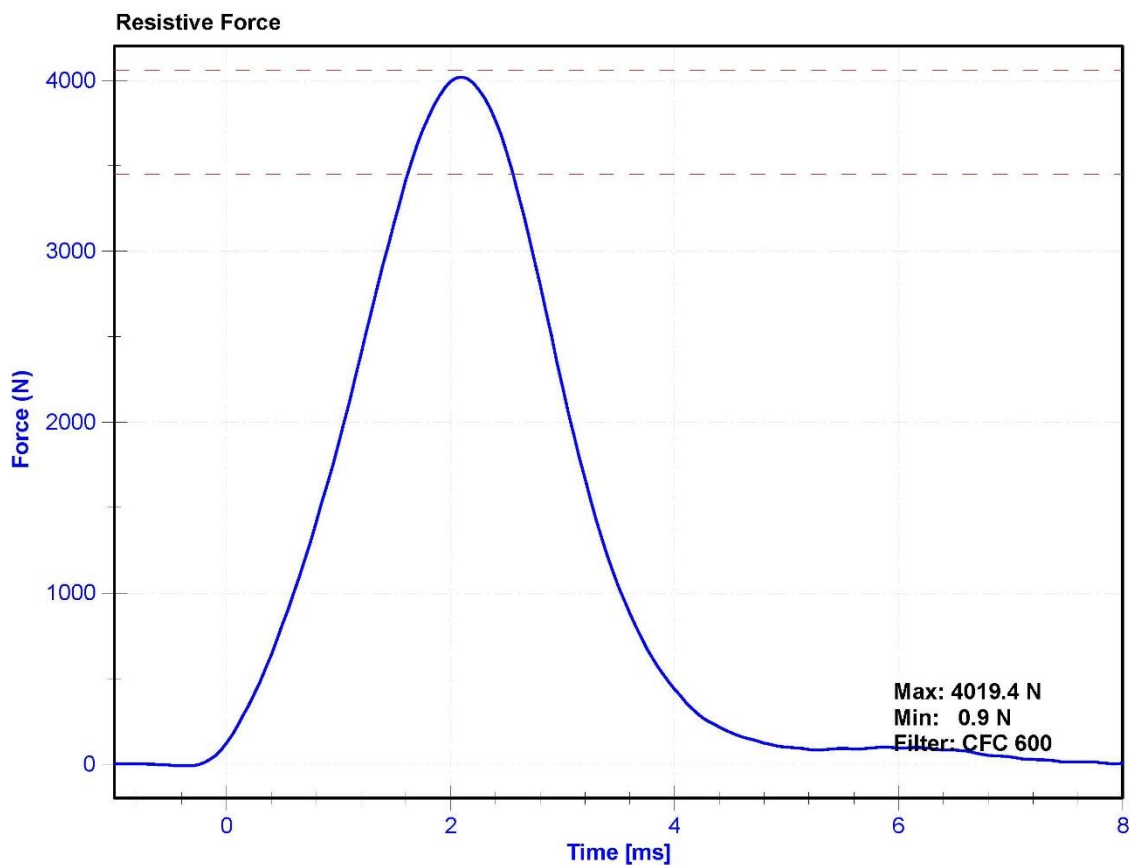
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

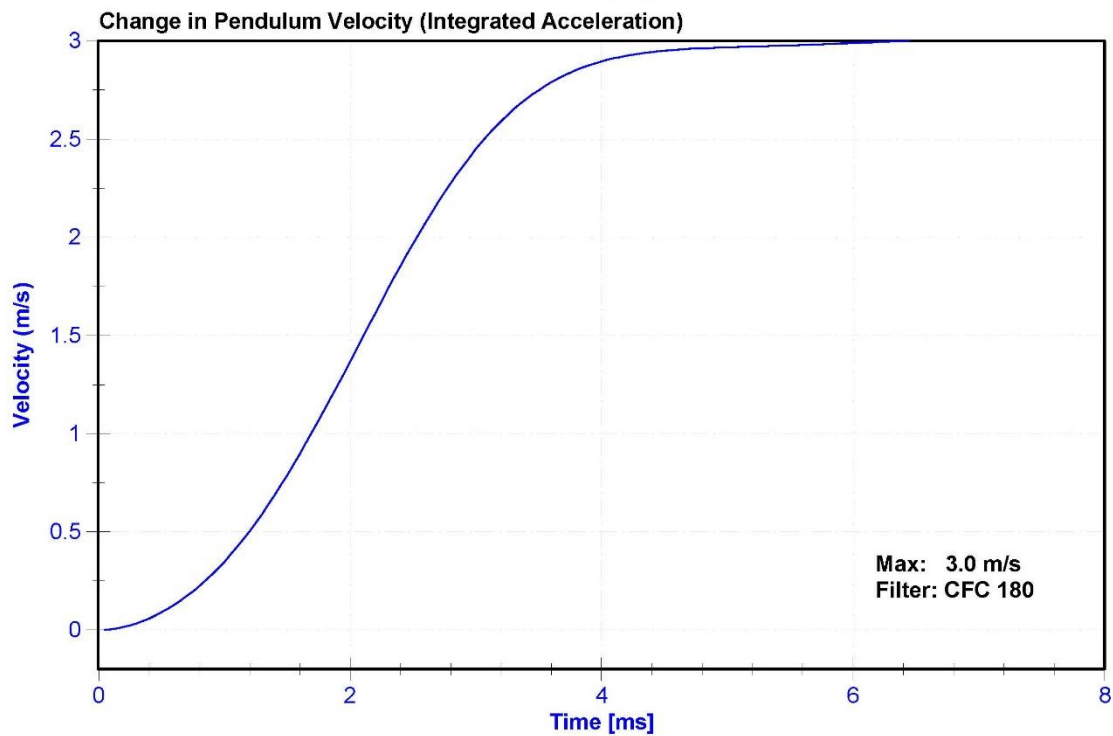
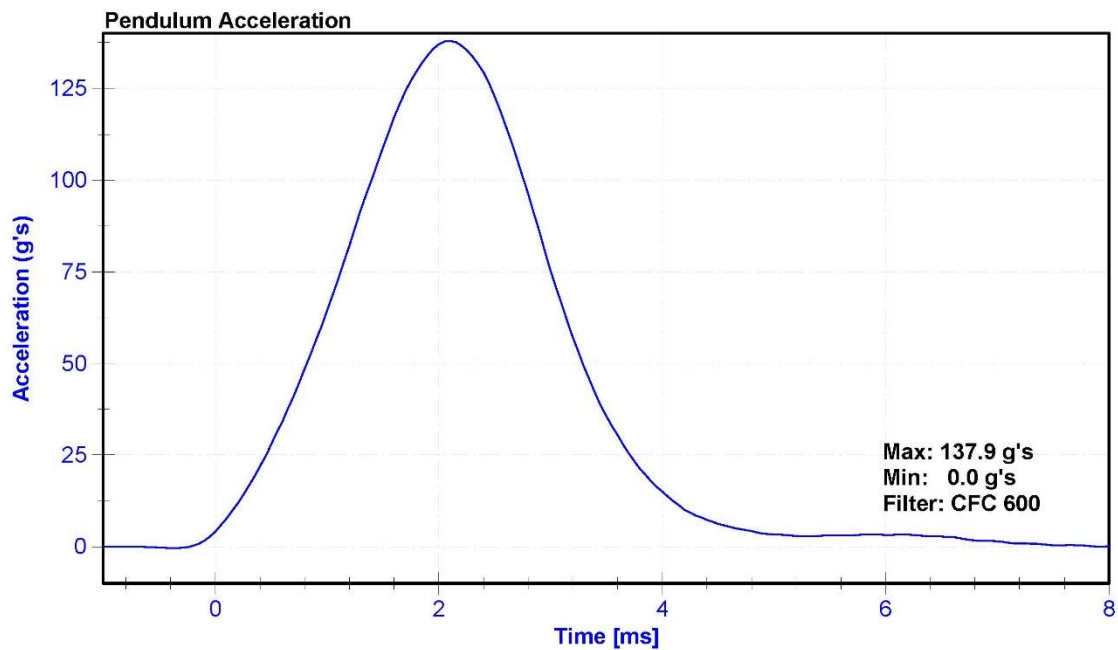
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	24.4	Pass
Velocity	2.07	2.13	m/s	2.104	Pass
Resistive Force	3450	4060	N	4019.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 50TH PERCENTILE MALE - DRIVER ATD

SERIAL NO: 1046

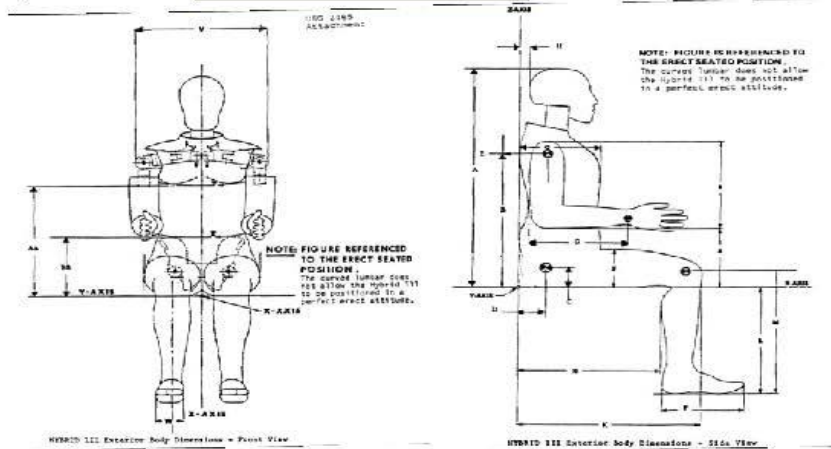


External Measurements - Hybrid 3 - 50th Male

Technician: M. Goehle

Date: 4/7/2016

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	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.5	Pass
F	Thigh Clearance	5.5	6.1	5.7	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.2	Pass
J	Elbow Rest Height	7.5	8.3	8.0	Pass
K	Buttock to Knee Length	22.8	23.8	23.2	Pass
L	Popliteal Height	16.9	17.9	17.2	Pass
M	Knee Pivot Height	19.1	19.7	19.2	Pass
N	Buttock Popliteal Length	17.8	18.8	18.3	Pass
O	Chest Depth without Jacket	8.4	9.0	8.6	Pass
P	Foot Length (right)	9.9	10.5	10.1	Pass
V	Shoulder Breadth	16.3	17.2	17.0	Pass
W	Foot Breadth	3.6	4.2	4.0	Pass
Y	Chest Circumference with Jacket	38.2	39.4	39.1	Pass
Z	Waist Circumference	32.9	34.1	33.5	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

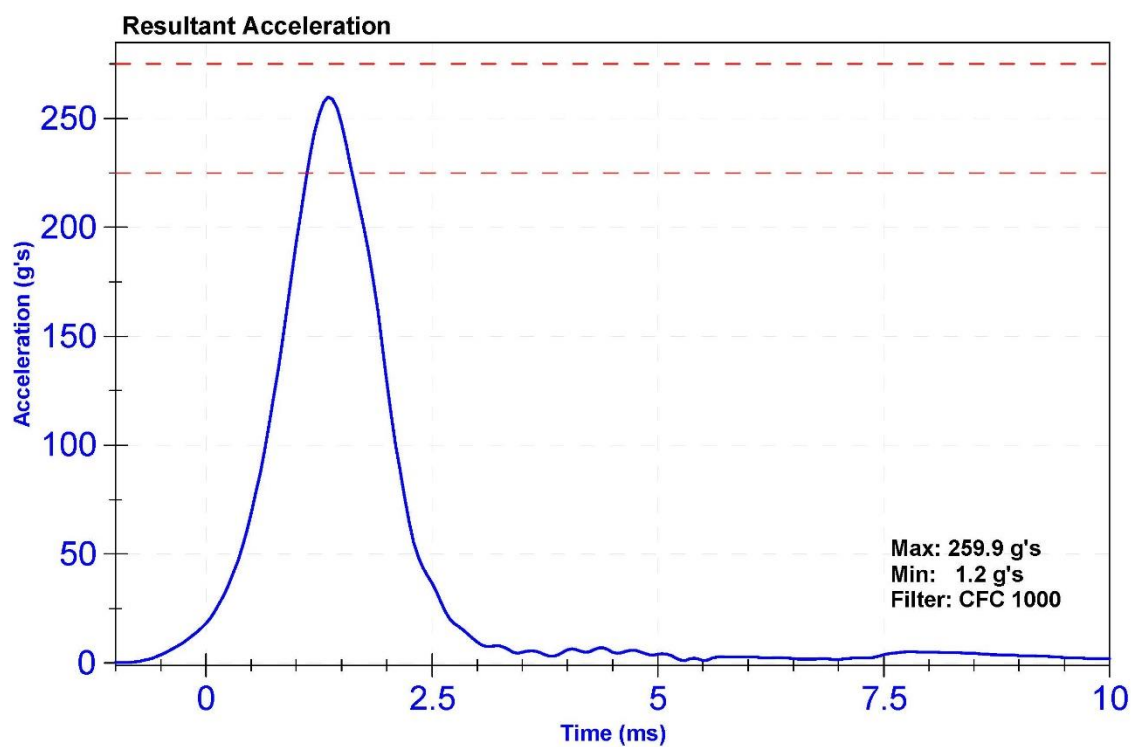
ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

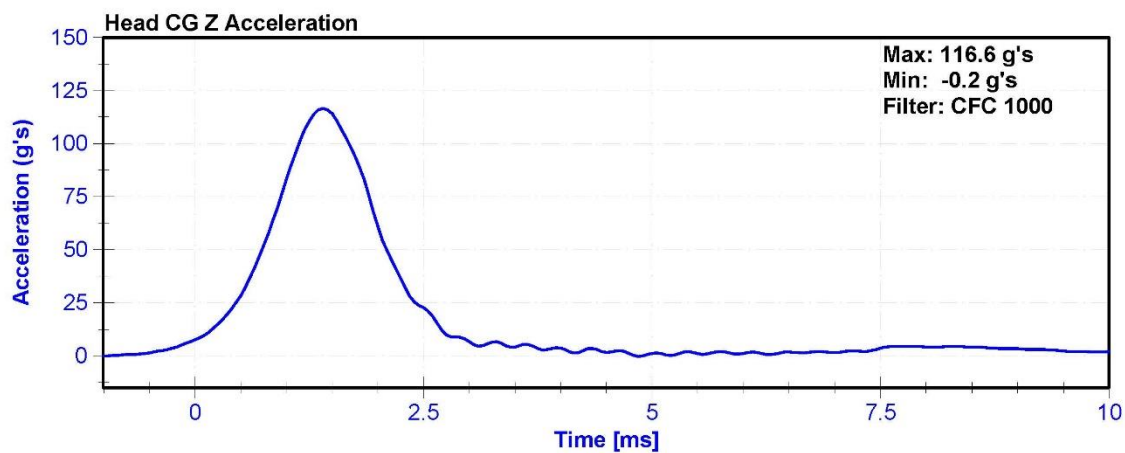
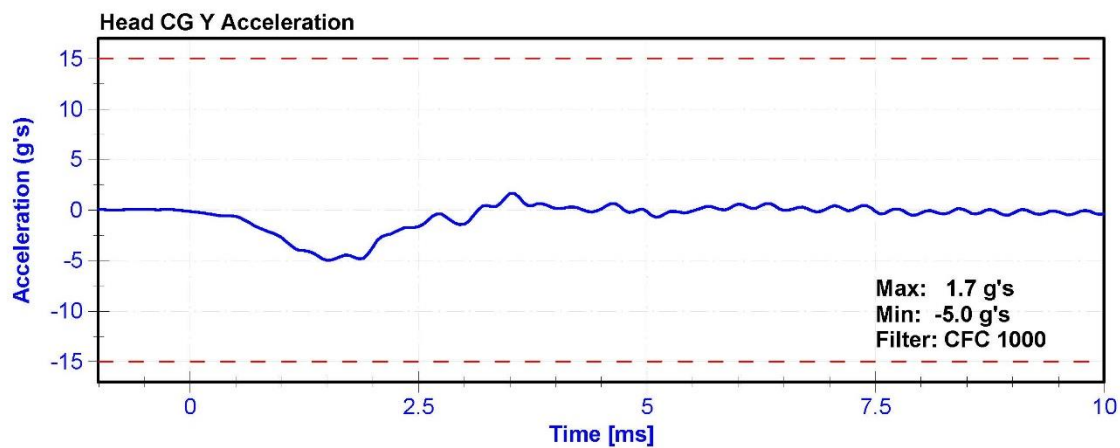
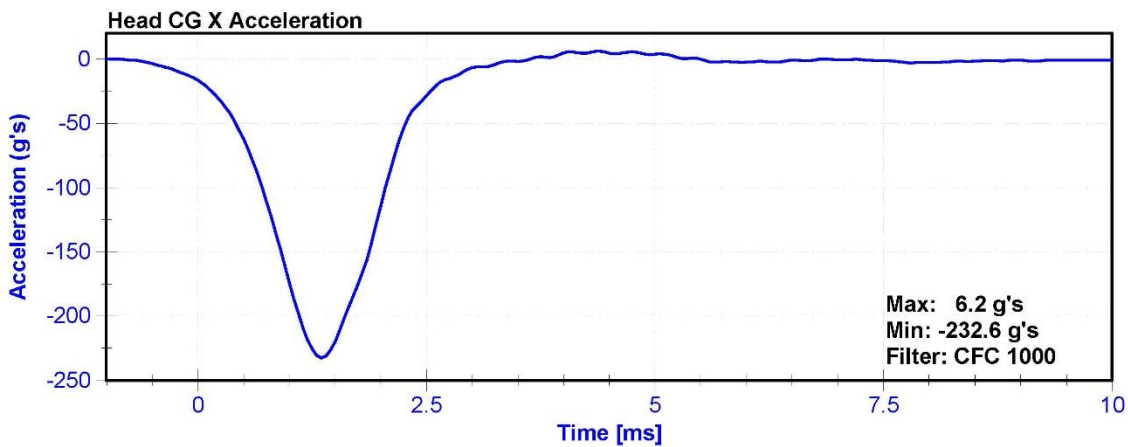
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	19.2	Pass
Resultant Acceleration	225	275	g's	259.9	Pass
Oscillation	0	10	%	3.6	Pass
Lateral Acceleration	-15	15	g's	-5.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58871	12/3/2015	6/2/2016
Y Accelerometer	ENDEVCO 7264	AC-P12359	12/3/2015	6/2/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P52133	12/3/2015	6/2/2016





ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

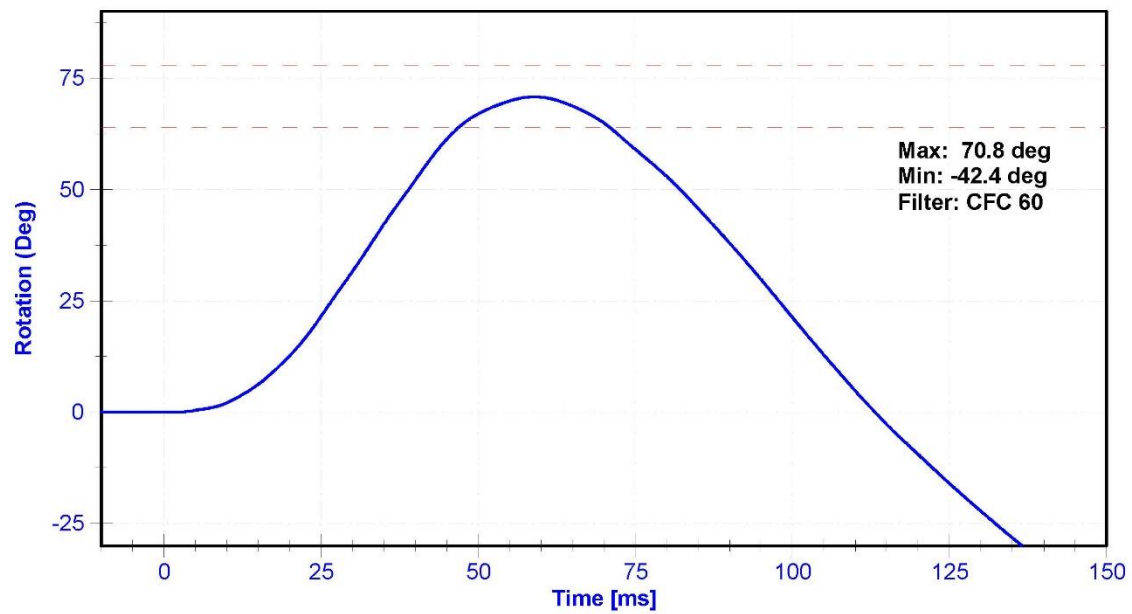
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	19.0	Pass
Velocity	6.89	7.13	m/s	6.979	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	23.76	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	21.74	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	16.91	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	24.5	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	37.3	Pass
Maximum D Plane Rotation	64	78	deg	70.8	Pass
Time to Maximum Rotation	57	64	ms	58.9	Pass
Rotation Decay to Zero	113	127	ms	113.1	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	96.08	Pass
Time to Maximum Moment	47	58	ms	49.0	Pass
Moment Decay to Zero	97	107	ms	99.1	Pass

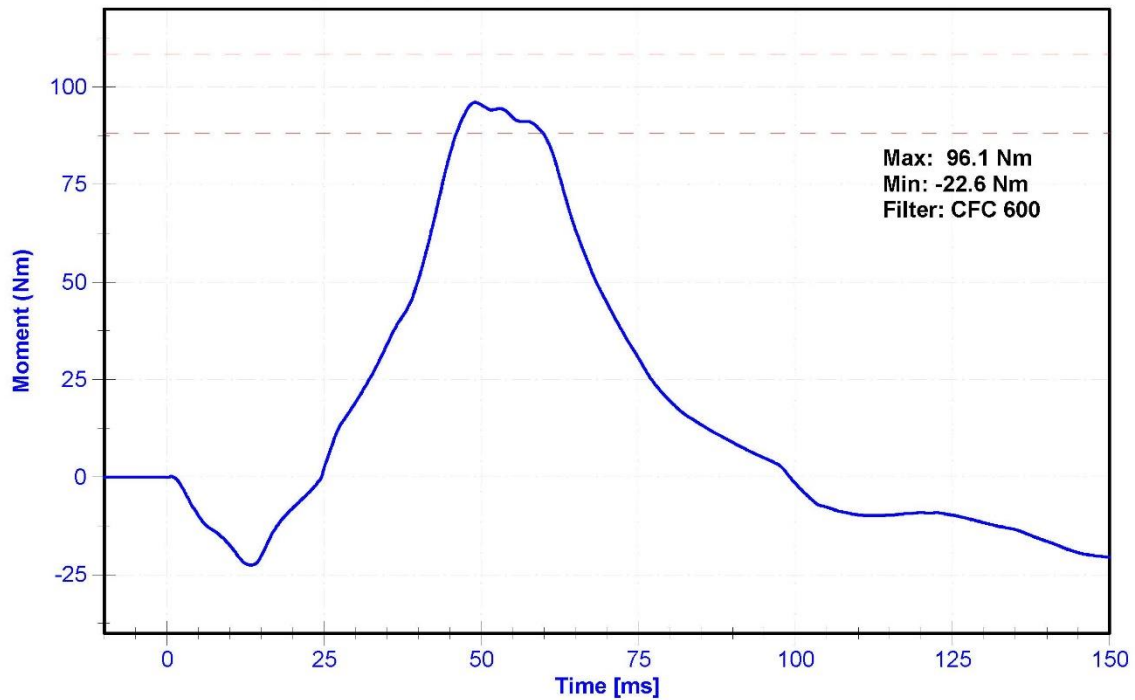
Transducer Calibrations

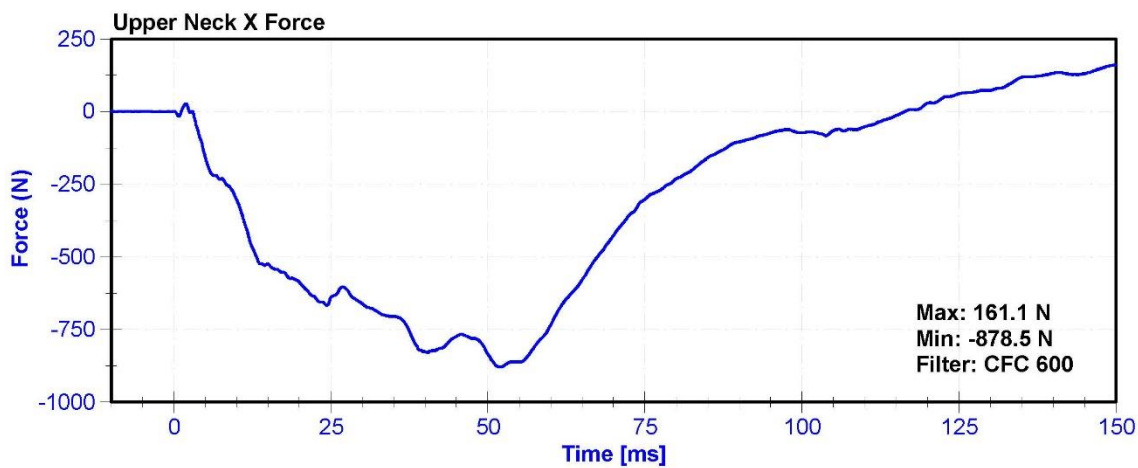
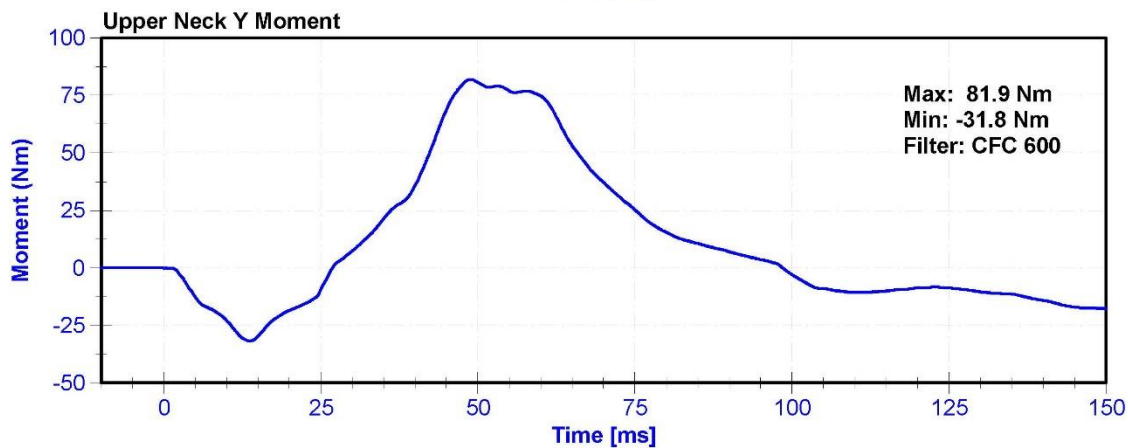
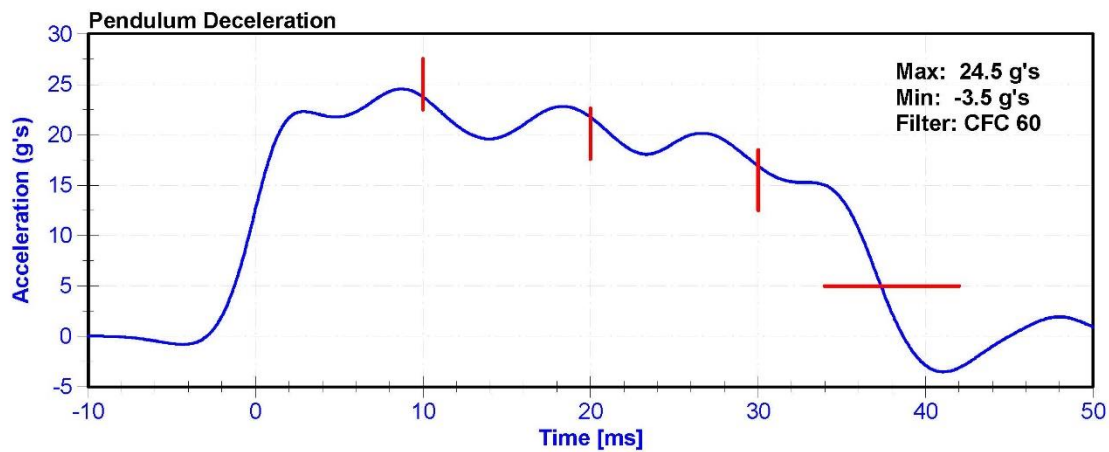
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/18/2015	5/17/2016

D-Plane Rotation



Moment About Occipital Condyle





ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

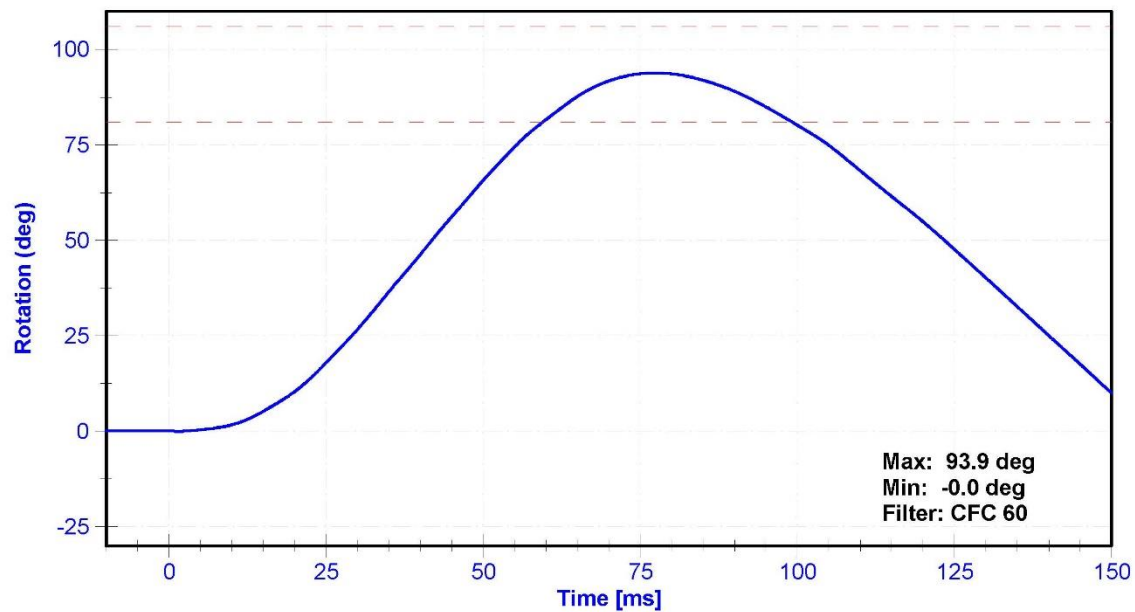
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	29.2	Pass
Velocity	5.94	6.19	m/s	6.068	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	17.86	Pass
Pendulum Deceleration at 20ms	14	19	g's	16.4	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.3	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	18.7	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.6	Pass
Maximum D Plane Rotation	81	106	deg	93.9	Pass
Time to Maximum Rotation	72	82	ms	77.3	Pass
Rotation Decay to Zero	147	174	ms	156.5	Pass
Minimum Moment About OC	-80	-52.9	Nm	-62.81	Pass
Time to Minimum Moment	65	79	ms	72.5	Pass
Moment Decay to Zero	120	148	ms	140.5	Pass

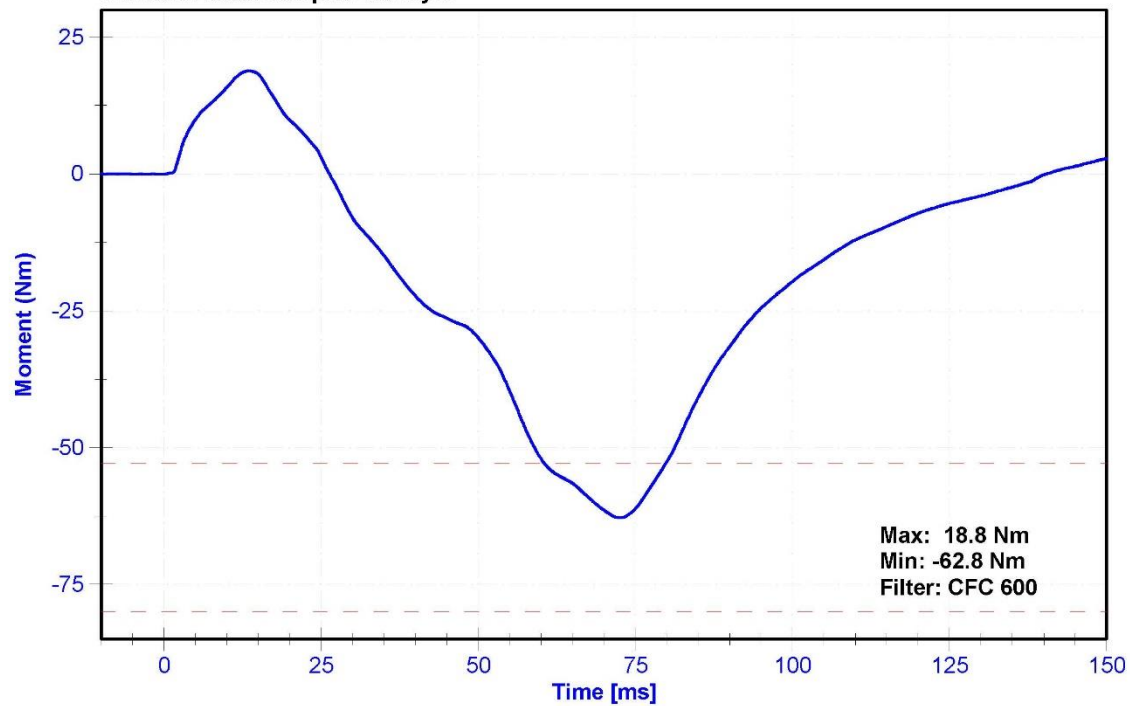
Transducer Calibrations

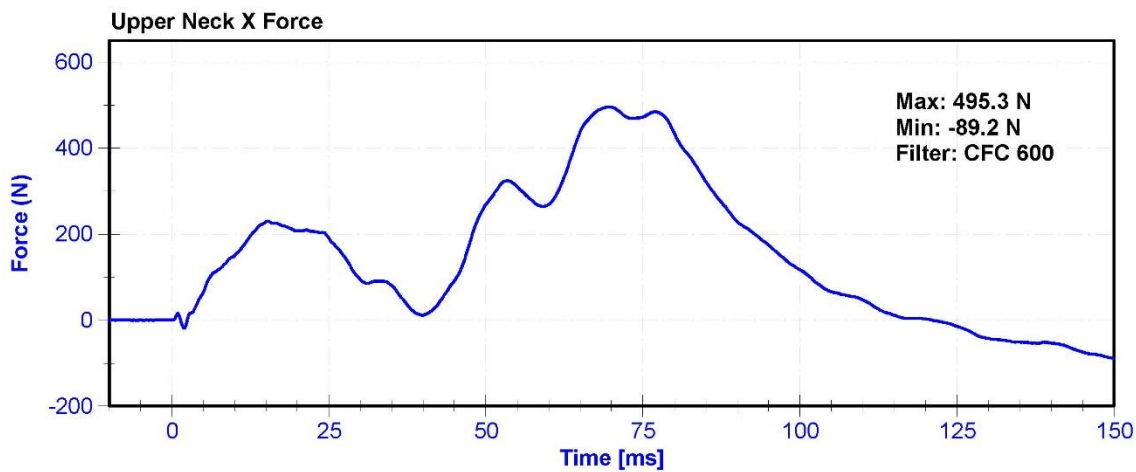
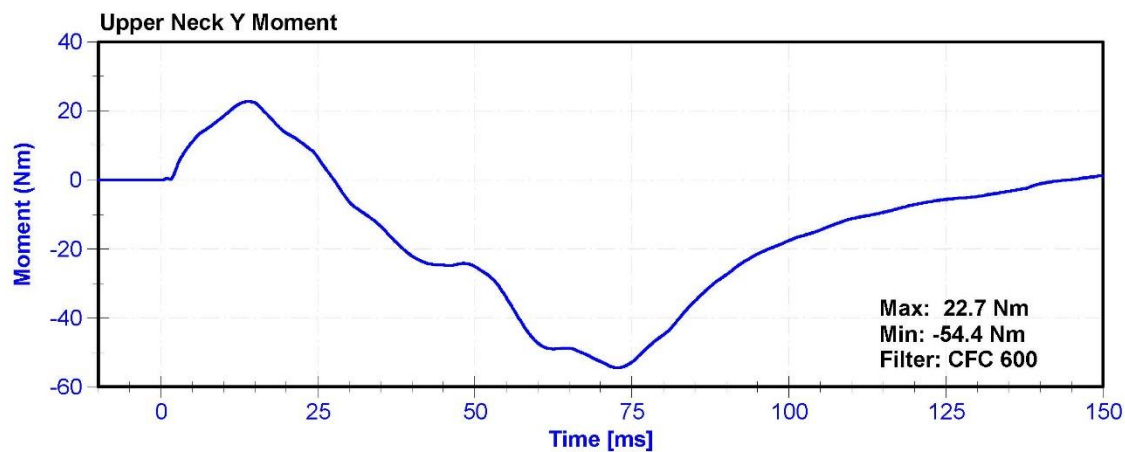
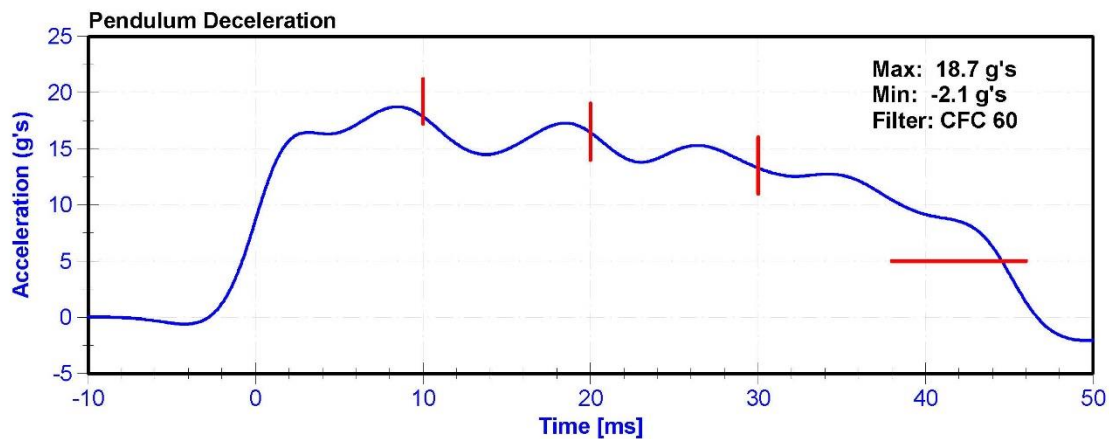
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2186Fx	5/18/2015	5/17/2016

D-Plane Rotation



Moment About Occipital Condyle





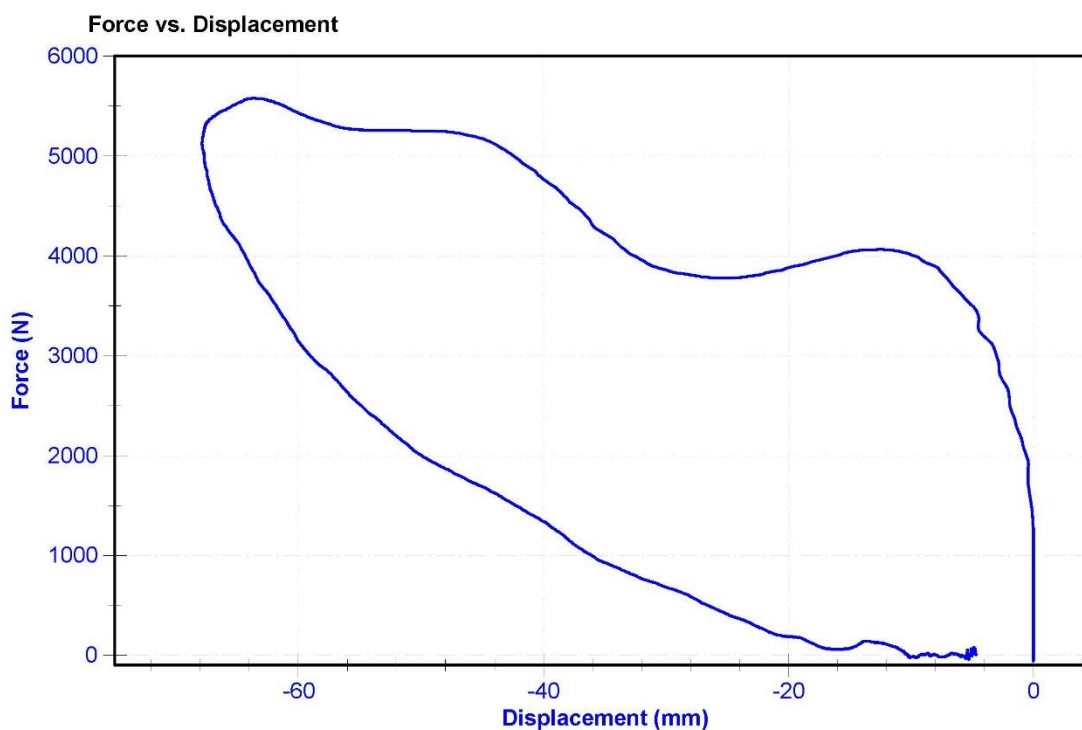
ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

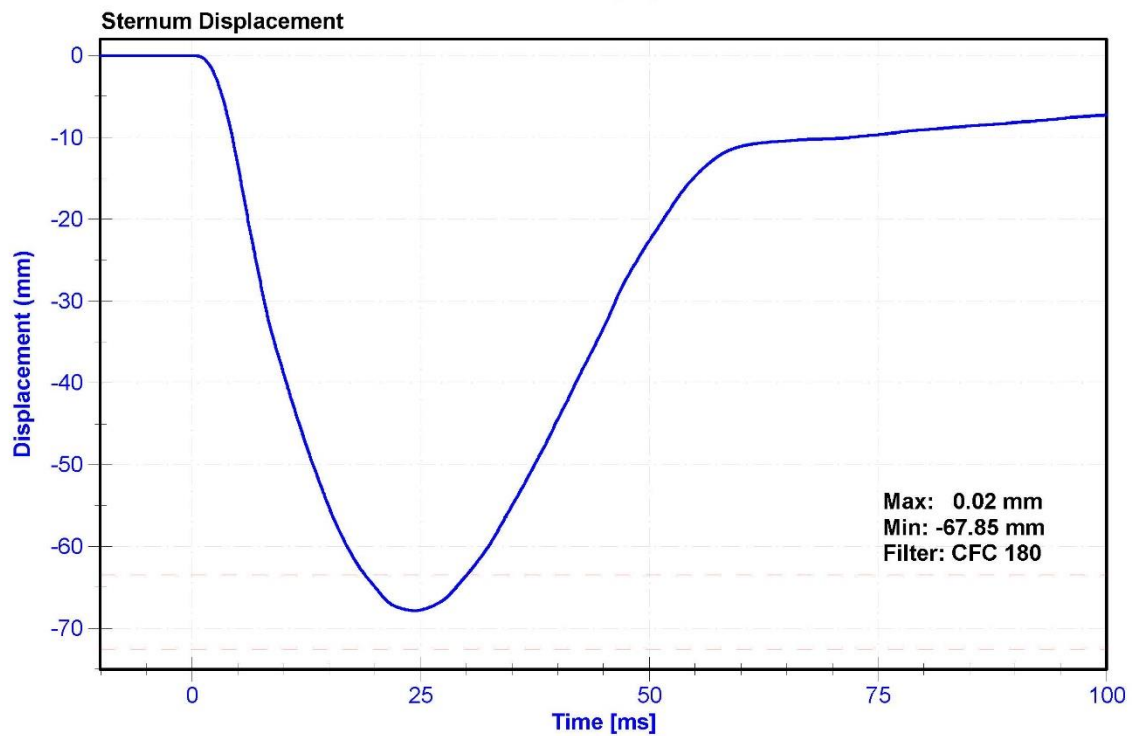
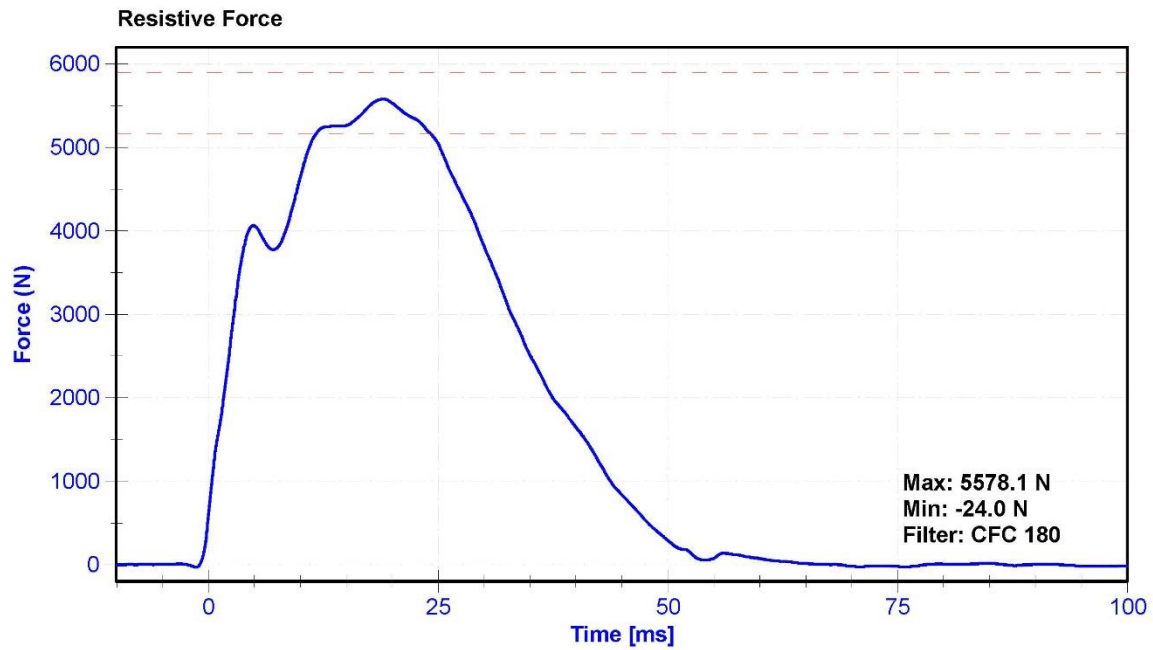
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	16	Pass
Velocity	6.59	6.83	m/s	6.670	Pass
Chest Displacement	-72.6	-63.5	mm	-67.85	Pass
Resistive Force	5160	5894	N	5578.1	Pass
Hysteresis	65	85	%	70.7	Pass

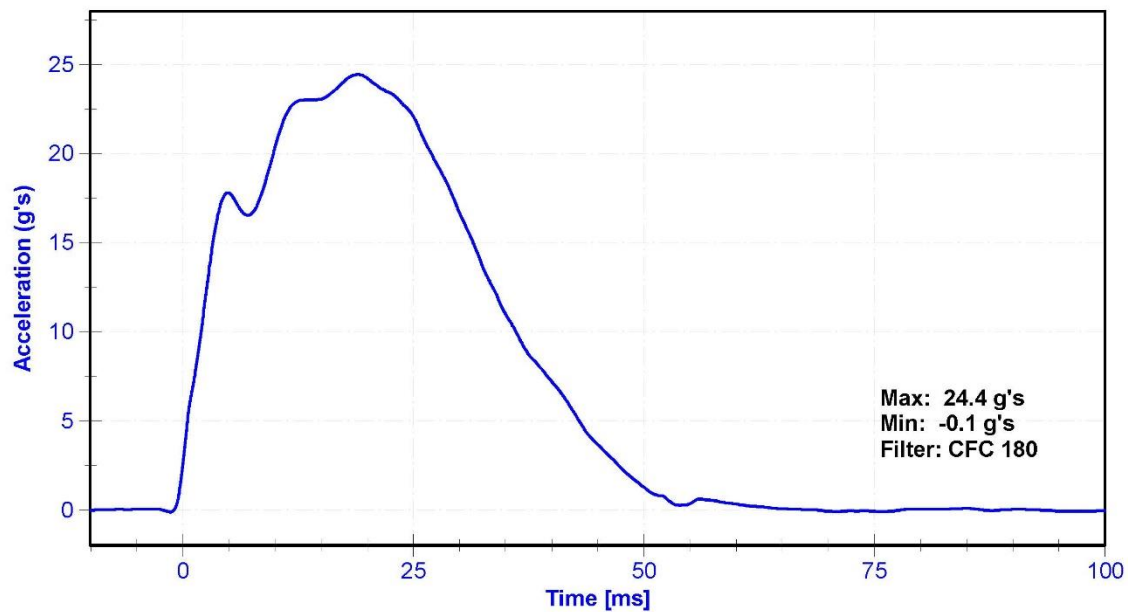
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016
Chest Potentiometer	Servo 14CB1-2897	DS-1046	6/2/2015	6/1/2016

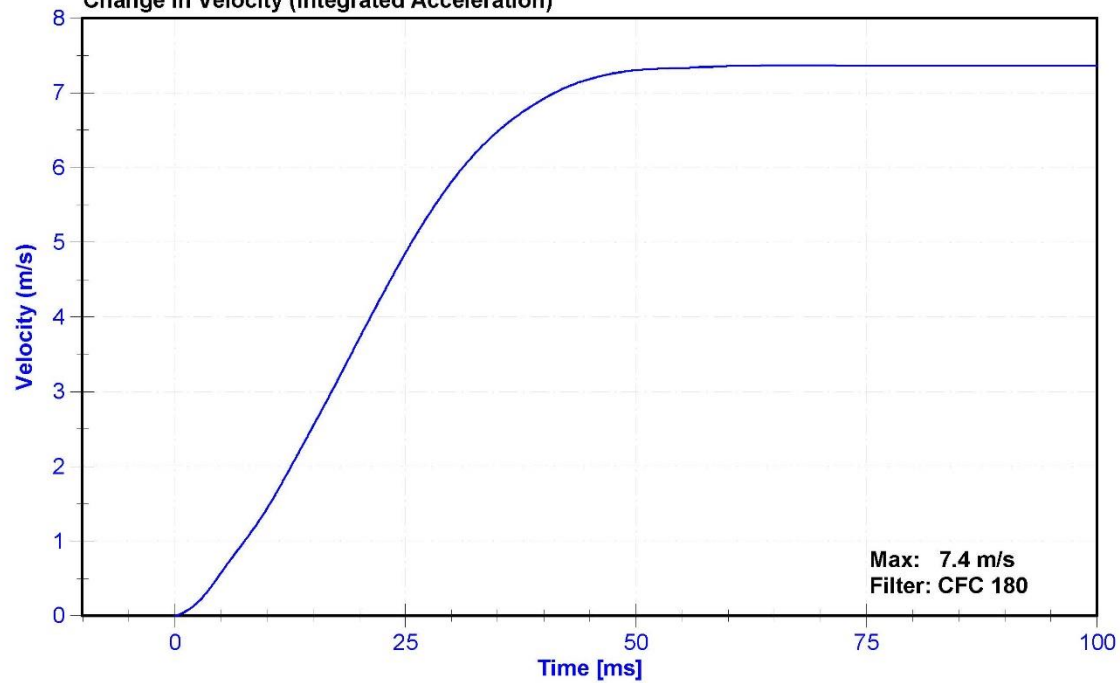




Probe Acceleration



Change in Velocity (Integrated Acceleration)



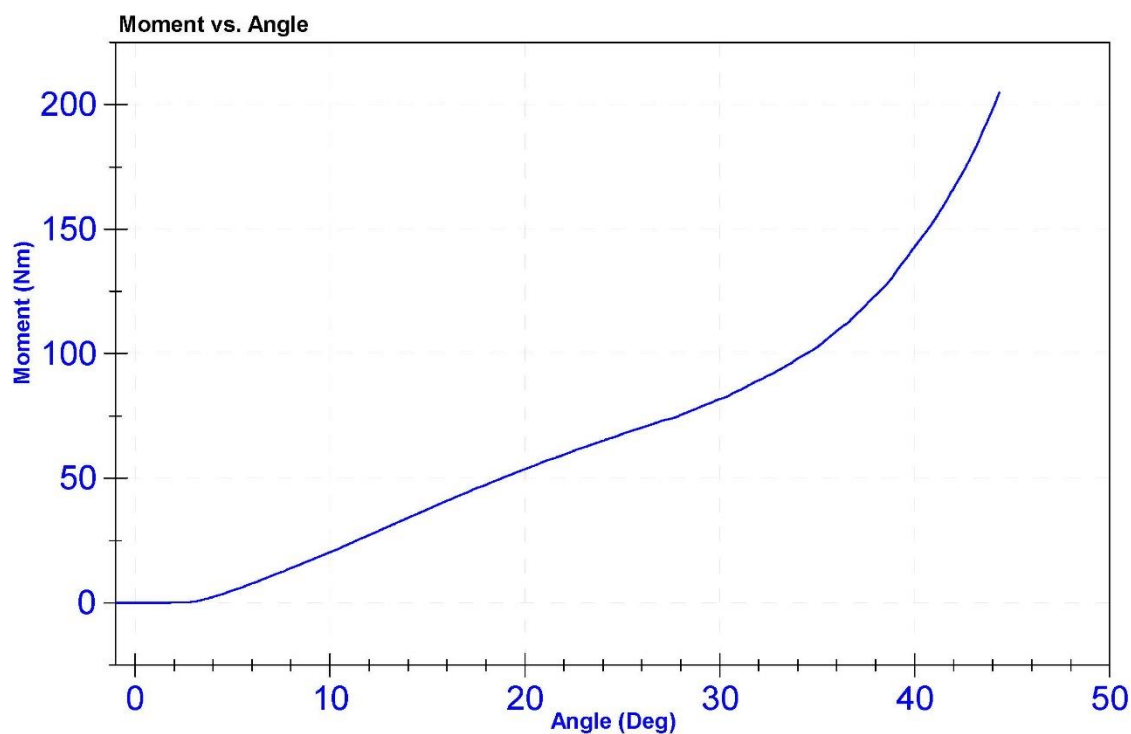
ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	20.4	Pass
Average Velocity	5	10	deg/s	7.5	Pass
Angle at 203Nm	40	50	deg	44.2	Pass
Moment at 30 degrees	0	94.9	Nm	81.7	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	10/3/2015	10/2/2016



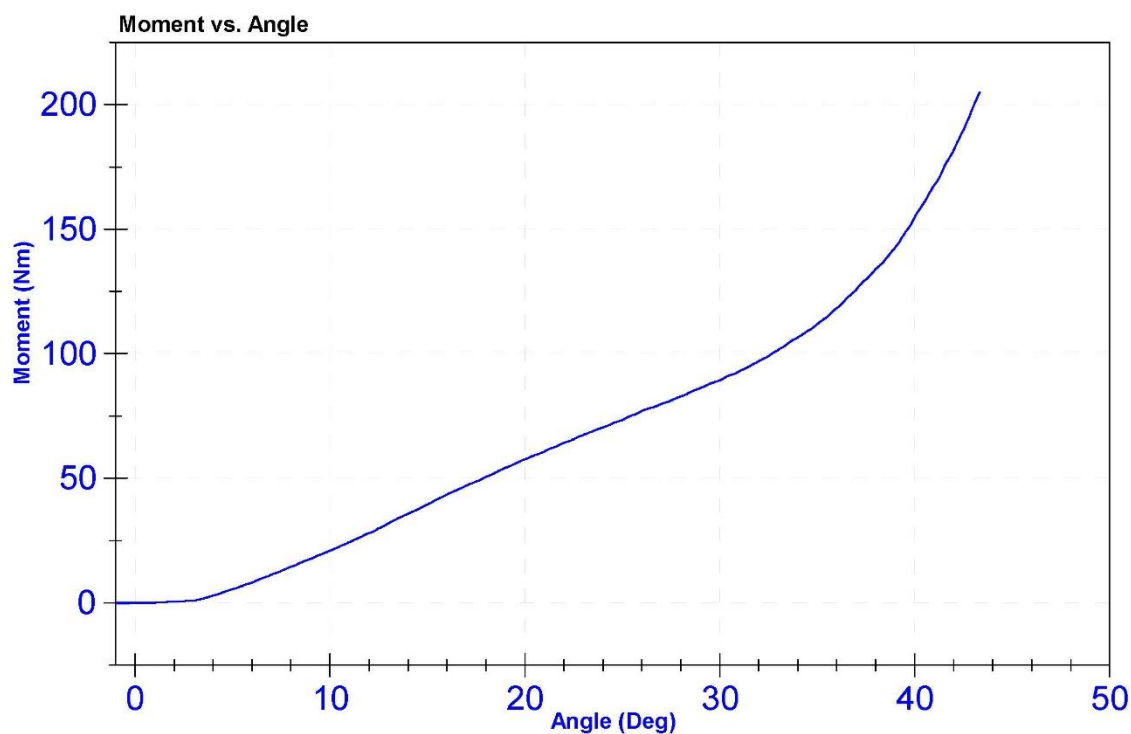
ATD Manufacturer	Humanetics	Test Technician	R. Weil
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.8	Pass
Humidity	10	70	%	20.4	Pass
Average Velocity	5	10	deg/s	7.4	Pass
Angle at 203Nm	40	50	deg	43.2	Pass
Moment at 30 degrees	0	94.9	Nm	89.3	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	10/3/2015	10/2/2016



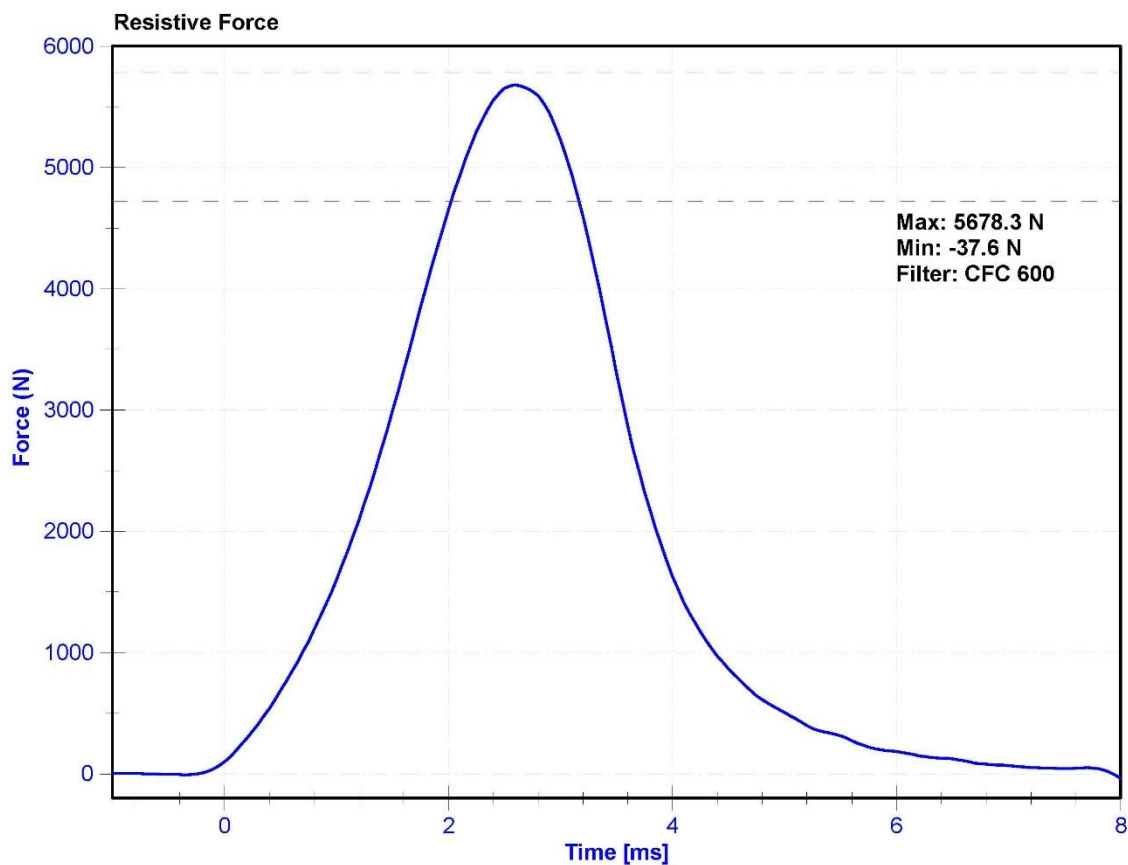
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

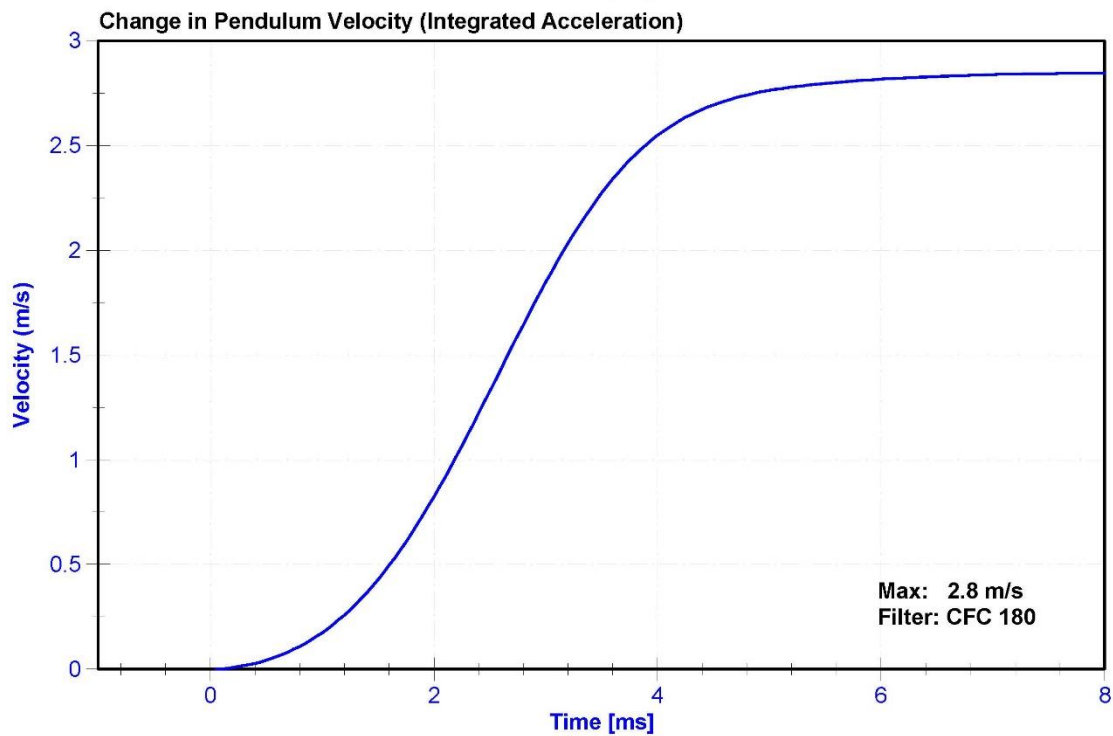
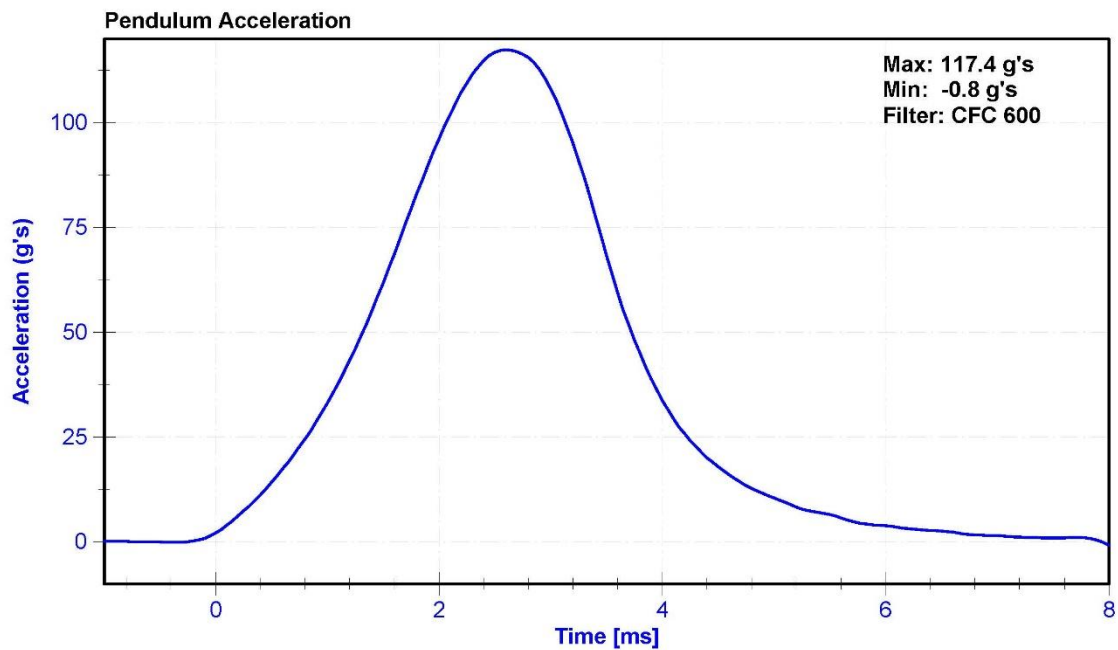
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	16.5	Pass
Velocity	2.07	2.13	m/s	2.088	Pass
Maximum Resistive Force	4720	5780	N	5678.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





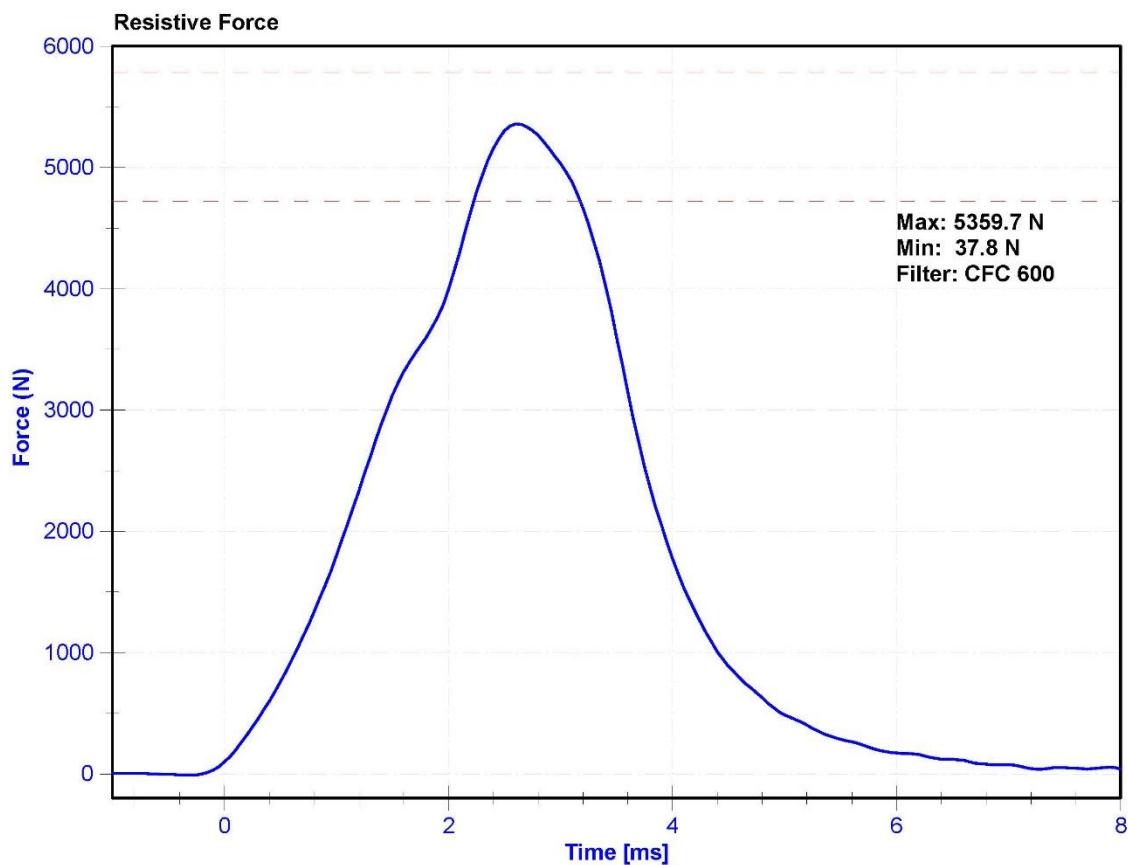
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	1046	Laboratory Supervisor	M. Goehle

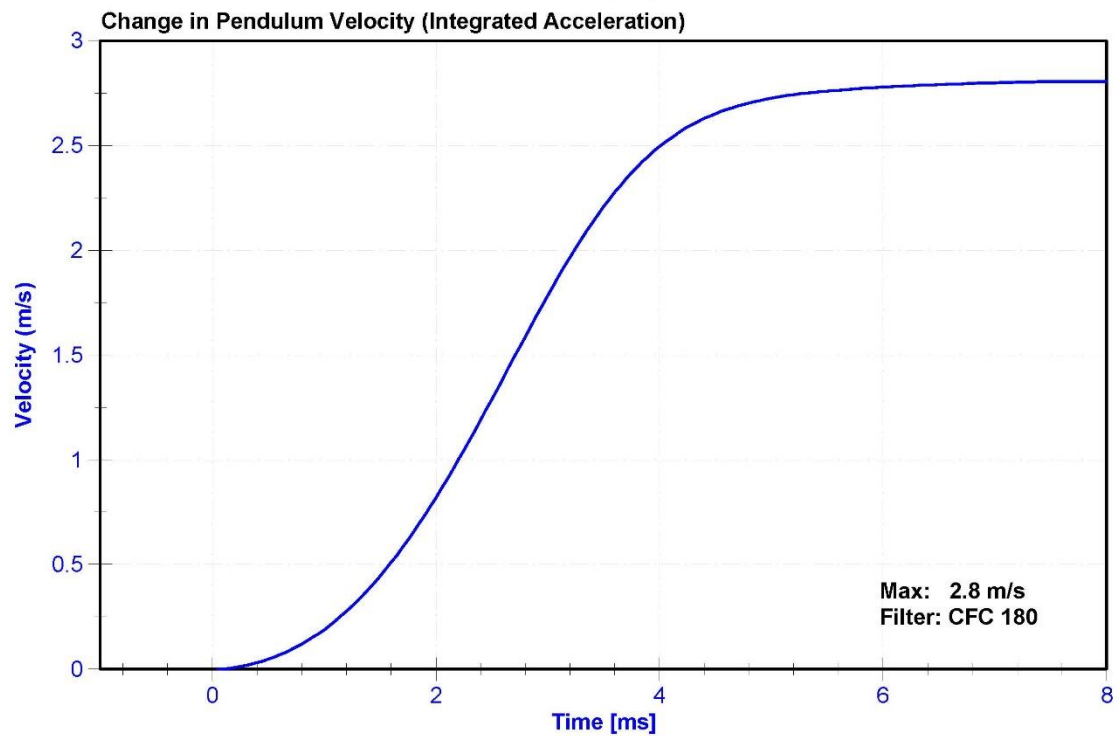
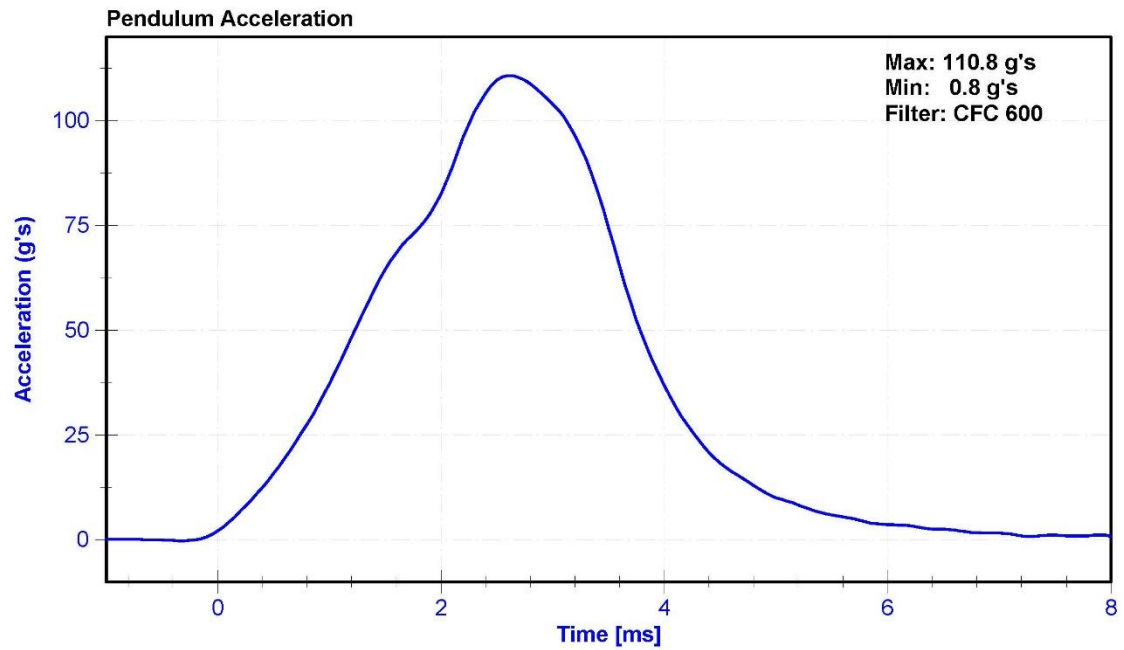
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	19.9	Pass
Velocity	2.07	2.13	m/s	2.091	Pass
Maximum Resistive Force	4720	5780	N	5359.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





CALIBRATION TEST RESULTS

POST-TEST

HYBRID III 5TH PERCENTILE FEMALE - PASSENGER ATD

SERIAL NO: 288

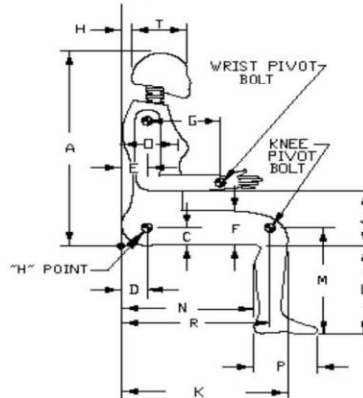
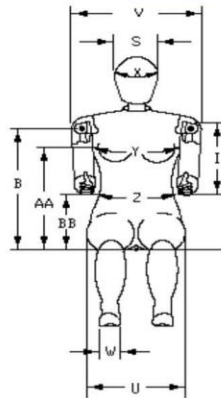


External Measurements - Hybrid 3 - 5th Female

Technician: M. Goehle

Date: 4/11/2016

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	75	Pass
F	Thigh Clearance	119	135	124	Pass
G	Back of Elbow to Wrist Pivot	244	259	247	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	540	Pass
L	Popliteal Height	356	376	367	Pass
M	Knee Pivot Height	394	419	399	Pass
N	Buttock Popliteal Length	414	439	431	Pass
O	Chest Depth without Jacket	175	191	178	Pass
P	Foot Length (right)	219	234	223	Pass
R	Buttock To Knee Pivot Length	457	483	460	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	182	Pass
U	Hip Breadth	300	315	304	Pass
V	Shoulder Breadth	351	366	360	Pass
W	Foot Breadth	79	94	82	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	855	Pass
Z	Waist Circumference	460	790	780	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

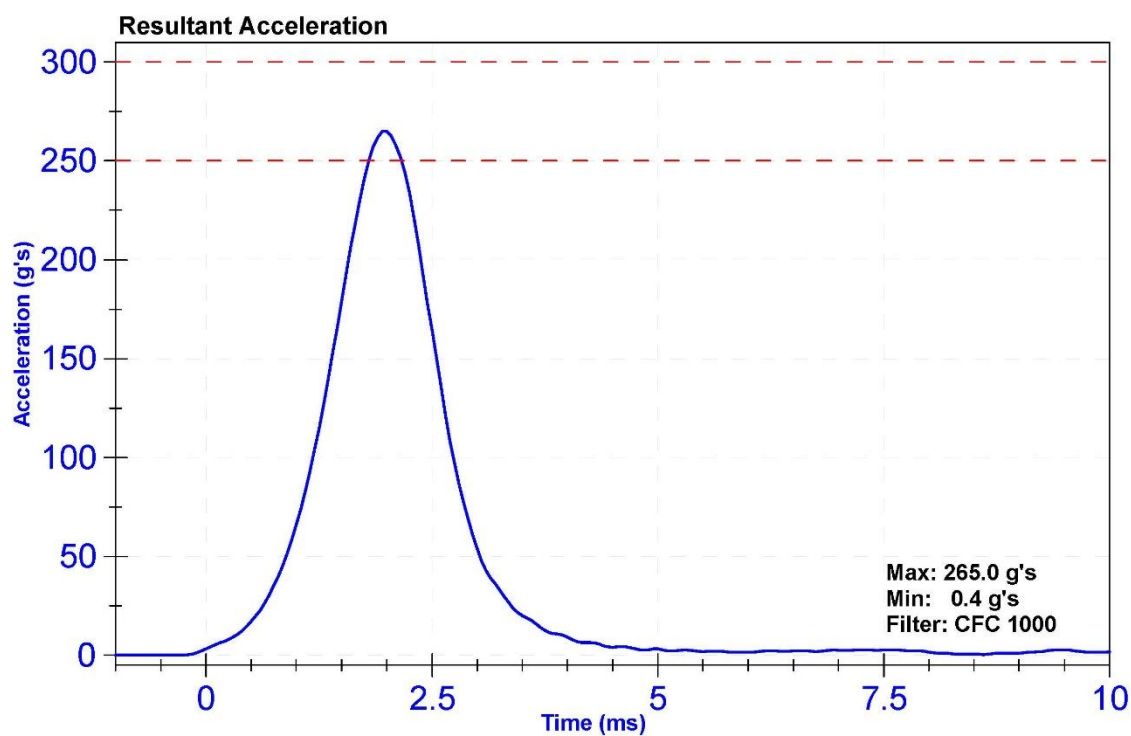
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

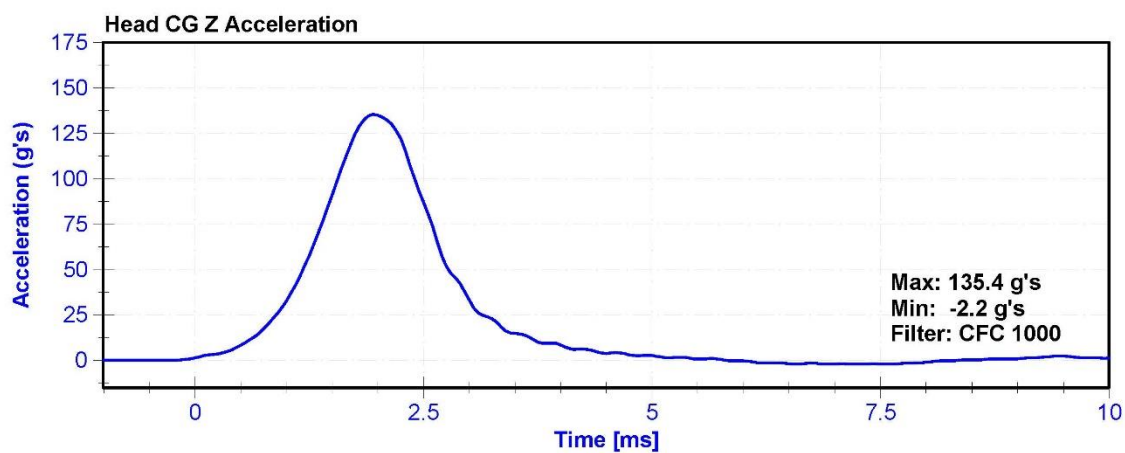
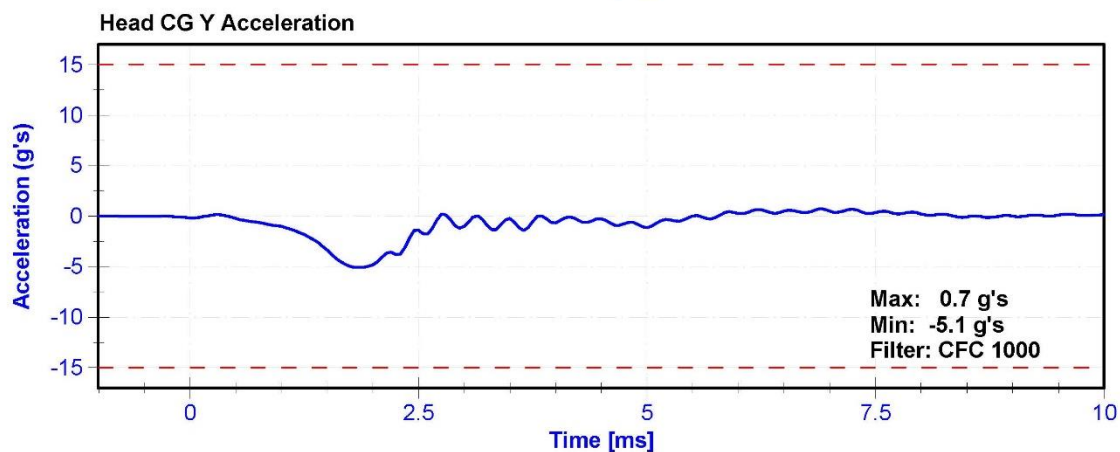
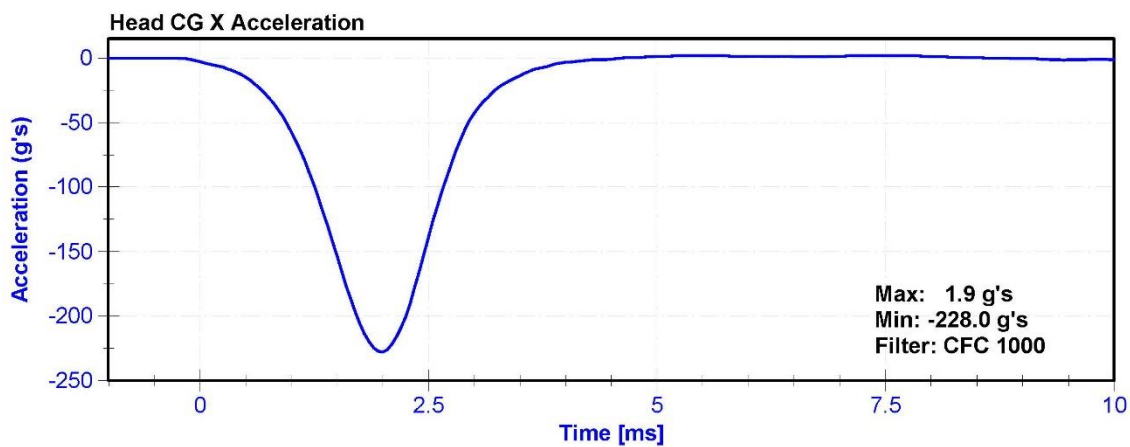
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.9	Pass
Humidity	10	70	%	21	Pass
Resultant Acceleration	250	300	g's	265.0	Pass
Oscillation	0	10	%	2.4	Pass
Lateral Acceleration	-15	15	g's	-5.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P80337	12/9/2015	6/8/2016
Y Accelerometer	ENDEVCO 7264CT	AC-P80265	12/9/2015	6/8/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P83418	12/9/2015	6/8/2016





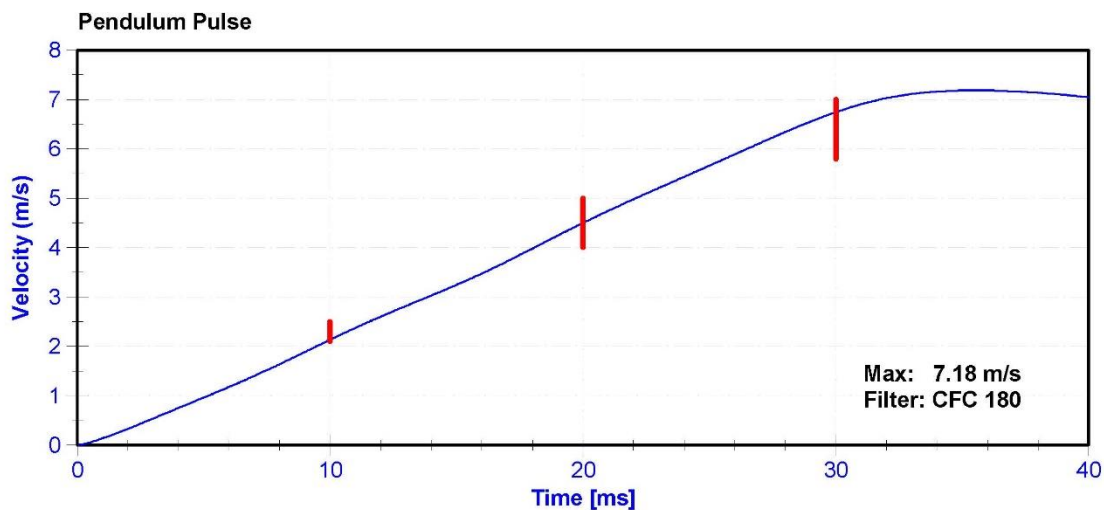
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

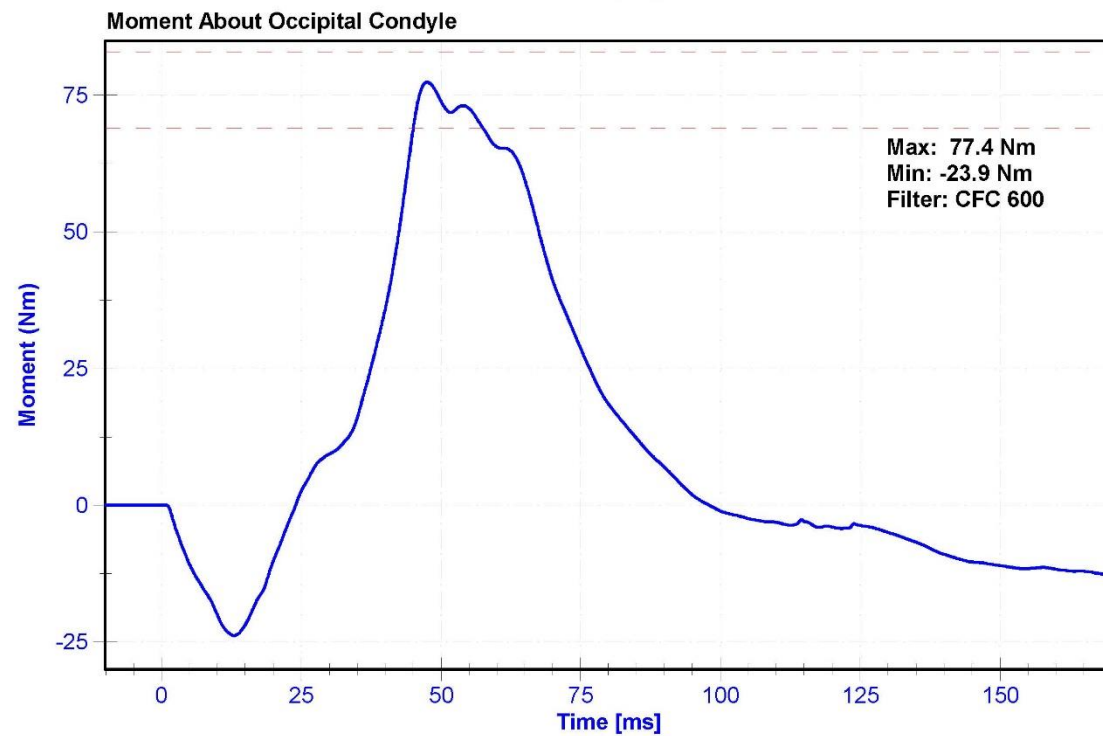
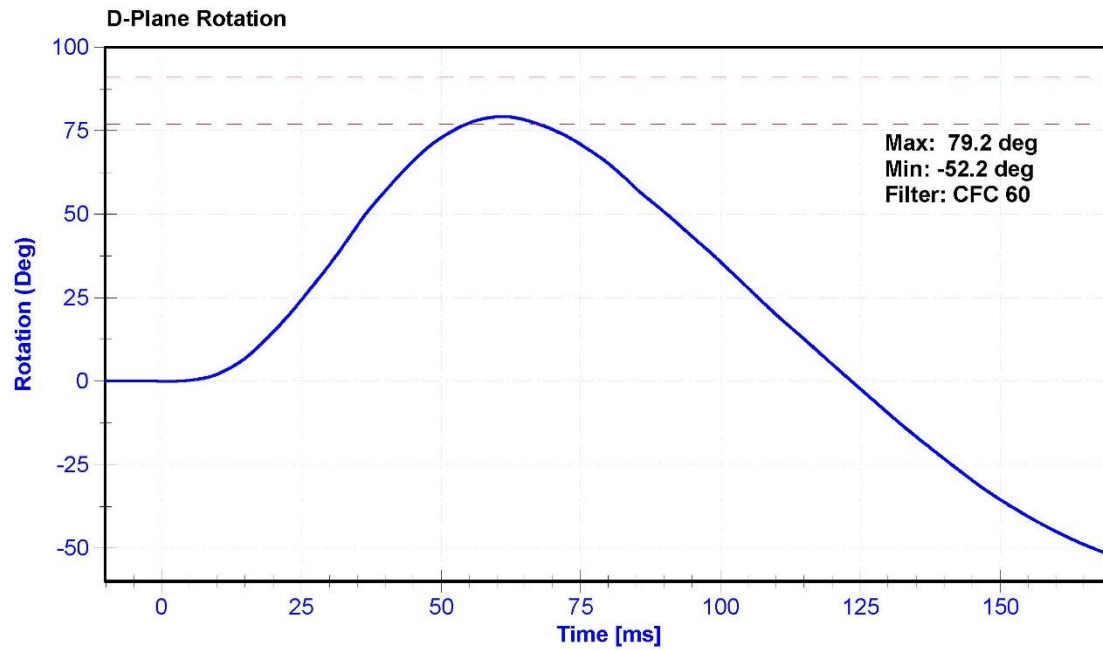
Results

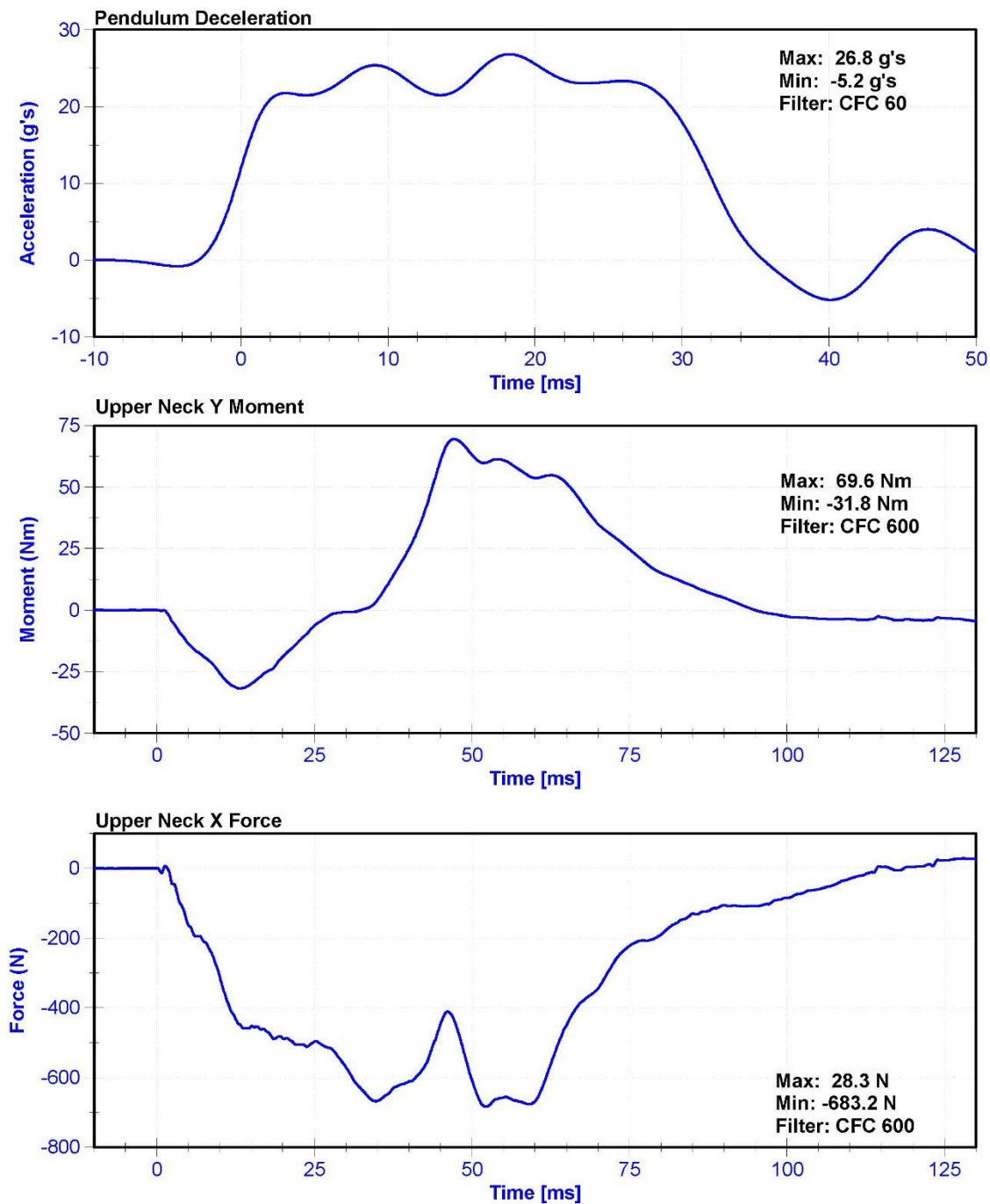
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	30.2	Pass
Velocity	6.89	7.13	m/s	7.037	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.14	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.50	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.74	Pass
Max D Plane Rotation	77	91	deg	79.2	Pass
Max Moment During Rotation Interval	69	83	Nm	77.4	Pass
Moment Decay to 10.0 Nm	80	100	ms	86.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/13/2015	5/12/2016







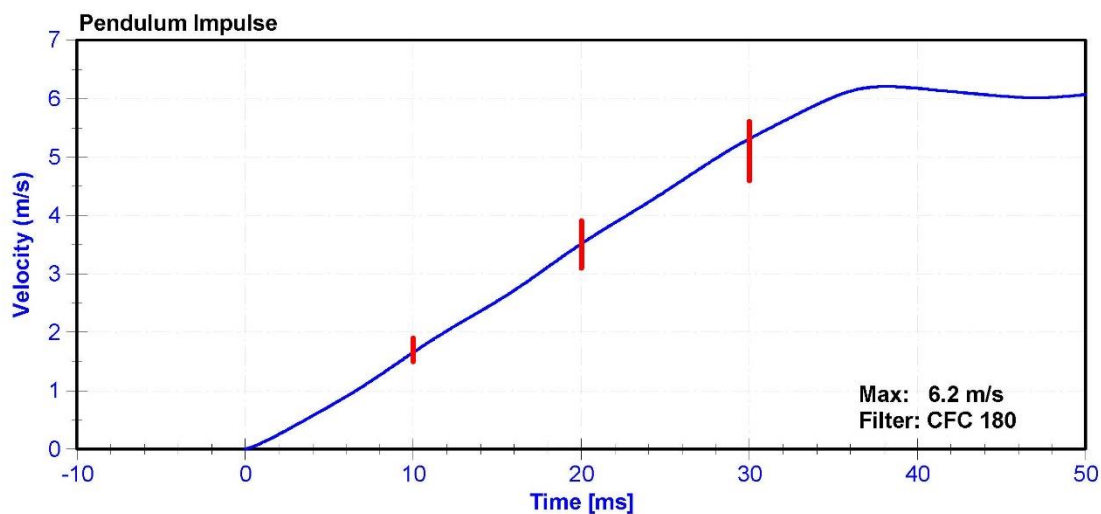
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

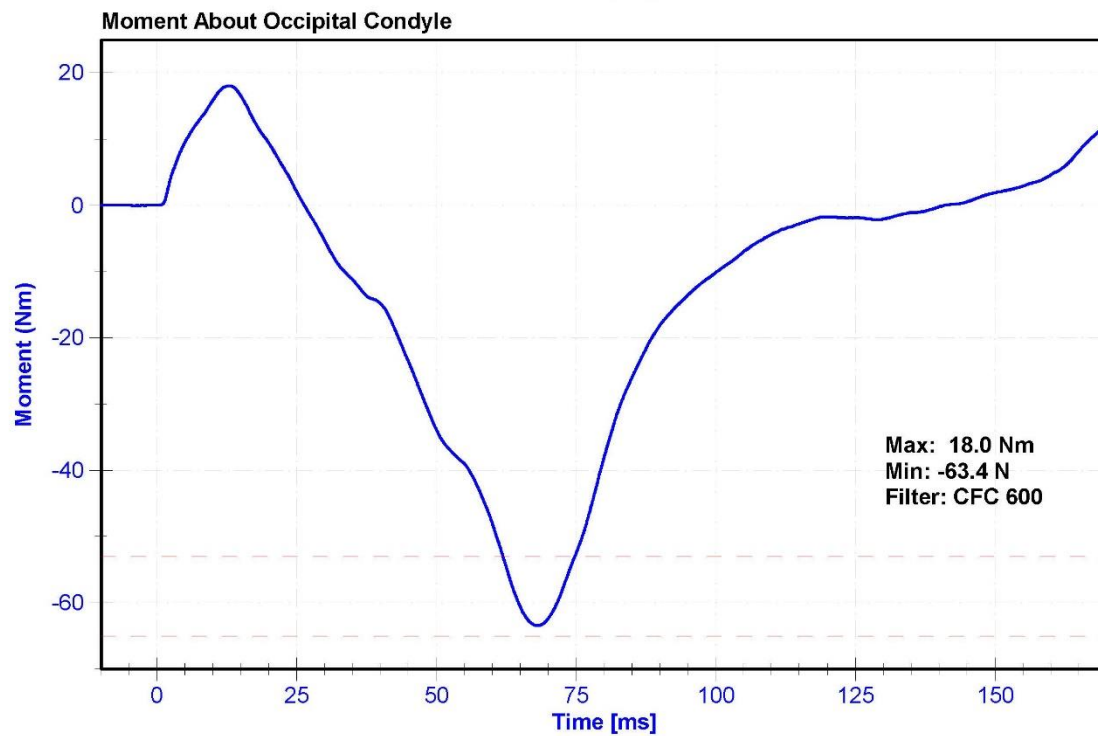
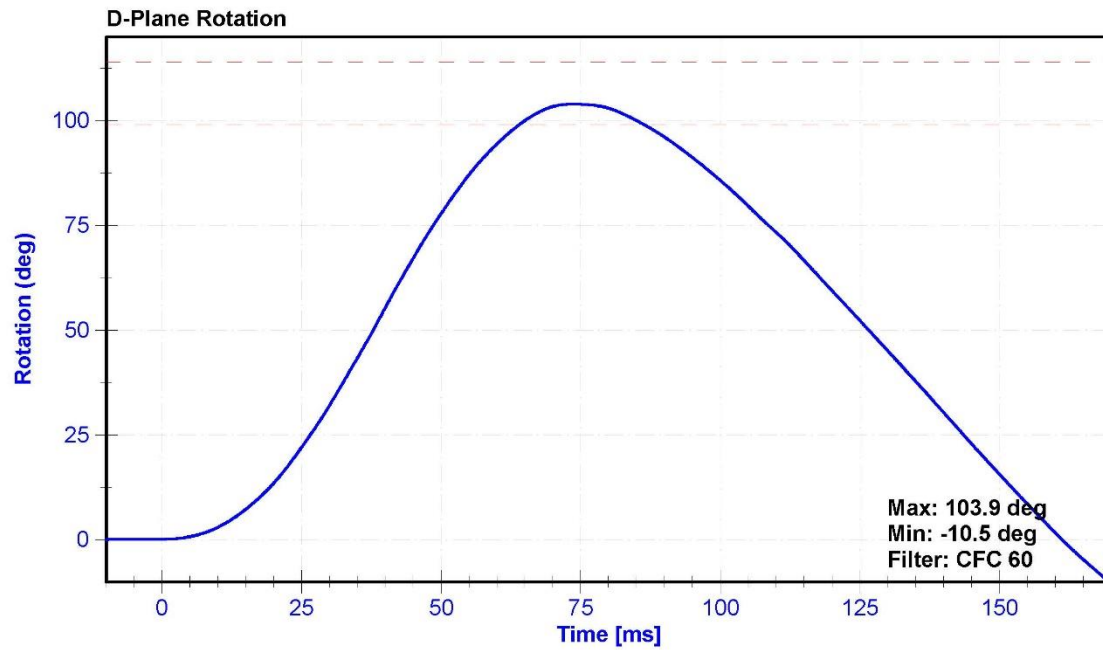
Results

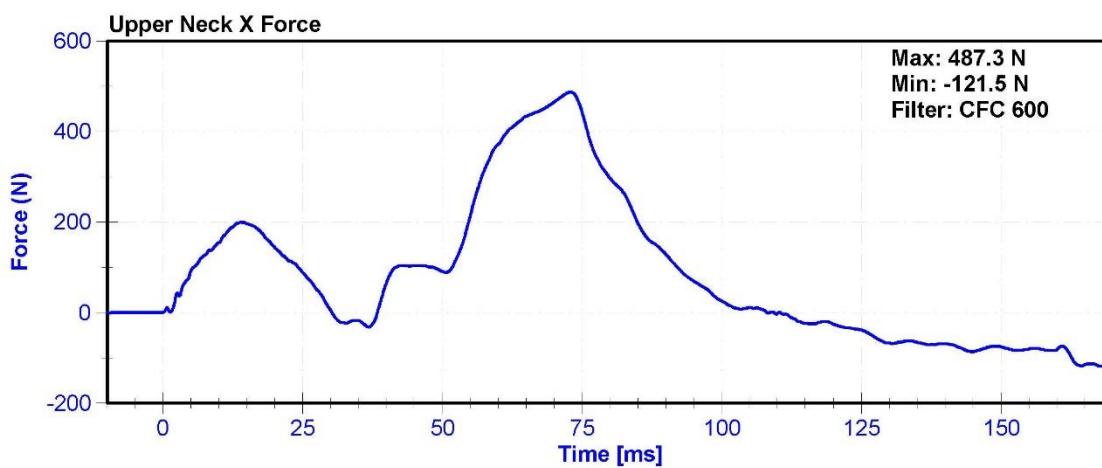
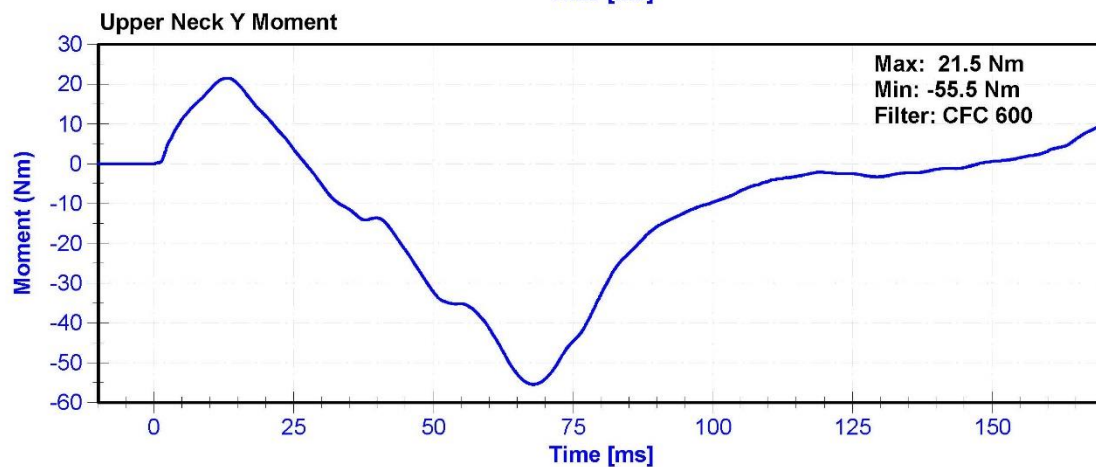
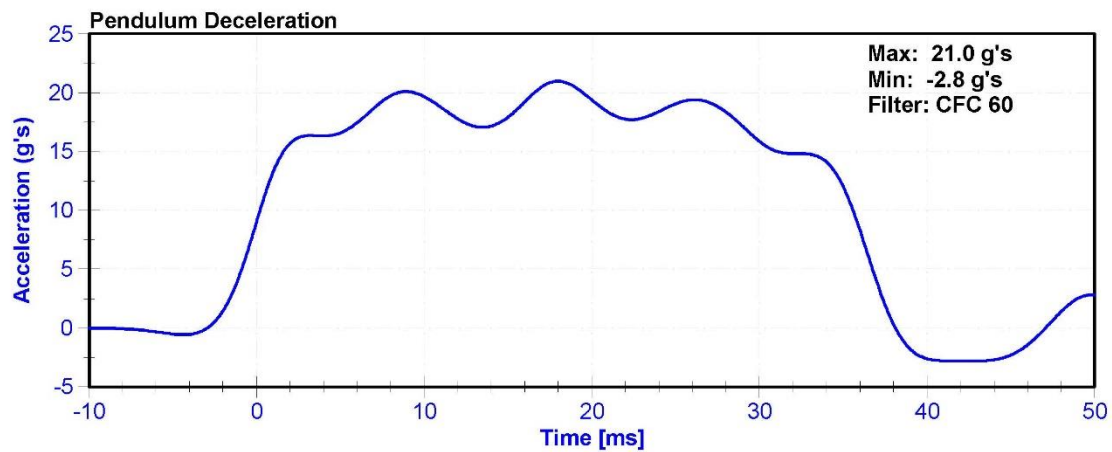
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	21.1	Pass
Velocity	5.95	6.19	m/s	6.025	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.66	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.52	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.31	Pass
D Plane Rotation	99	114	deg	103.9	Pass
Moment During Rotation Interval	-65	-53	Nm	-63.4	Pass
Moment Decay to -10Nm	94	114	ms	100.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum Potentiometer	ETI SP22G	DS-PendPot	9/28/2015	9/27/2016
Condyle Potentiometer	ETI SP22G	DS-CondPot	9/28/2015	9/27/2016
Upper Neck Load Cell	DENTON 1716A	LC-2206Fx	5/13/2015	5/12/2016







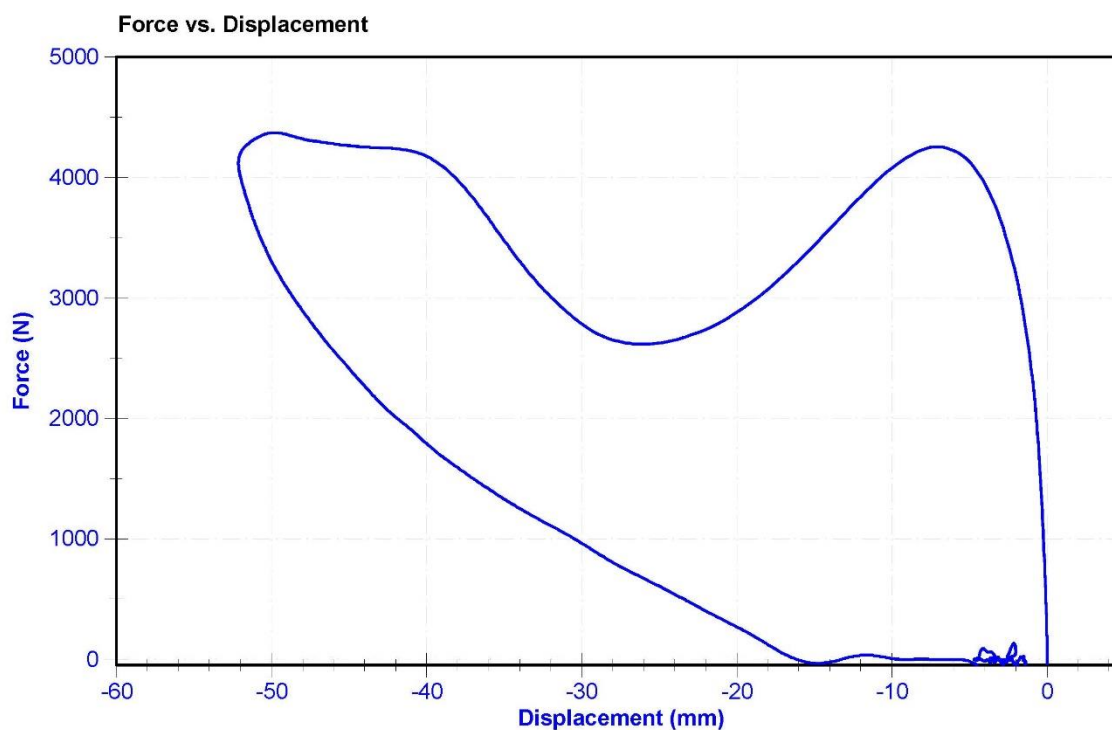
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

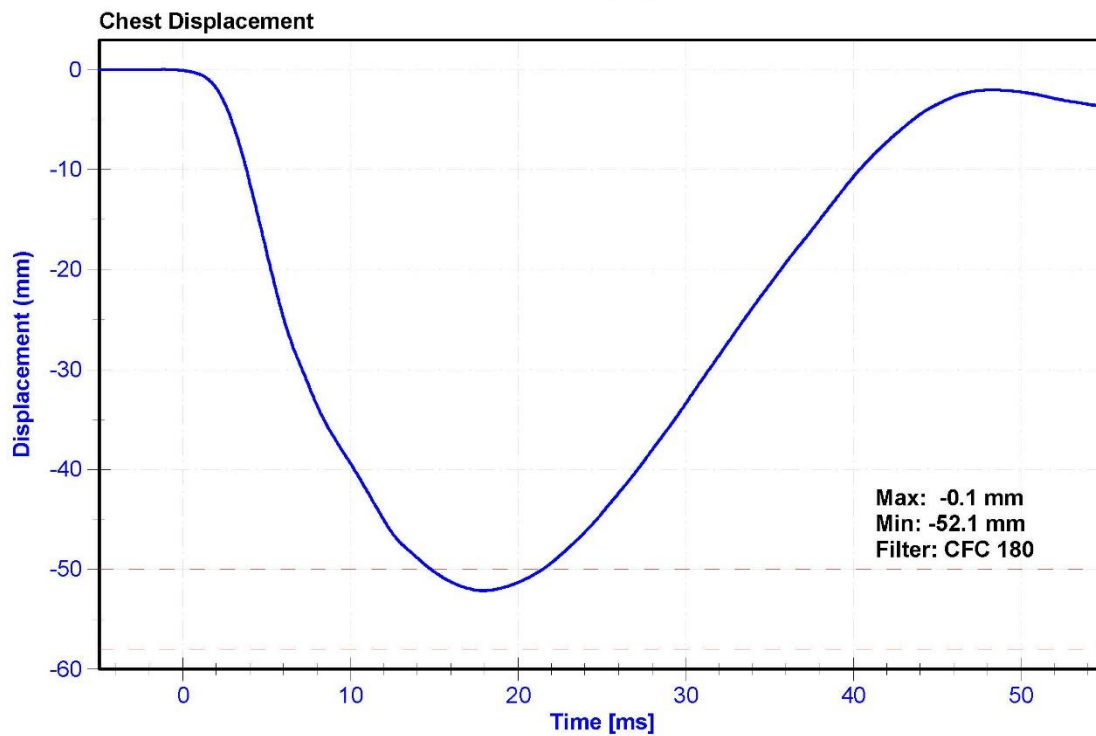
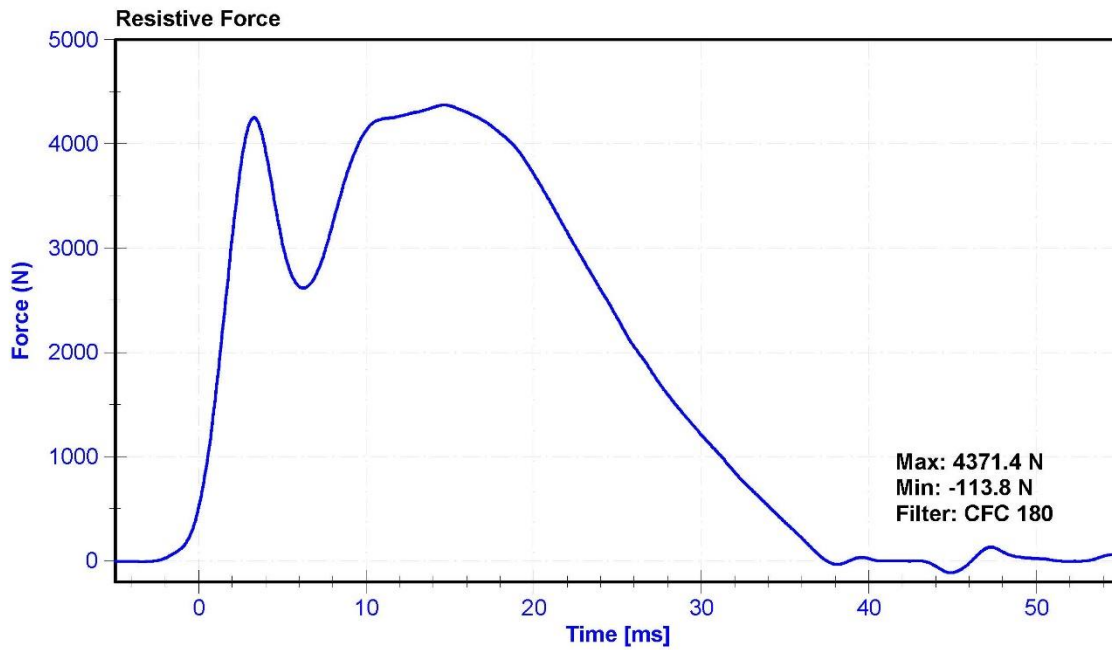
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	22.9	Pass
Velocity	6.59	6.83	m/s	6.655	Pass
Chest Deflection	-58	-50	mm	-52.1	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4370.9	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4371.4	Pass
Hysteresis	69	85	%	71.7	Pass

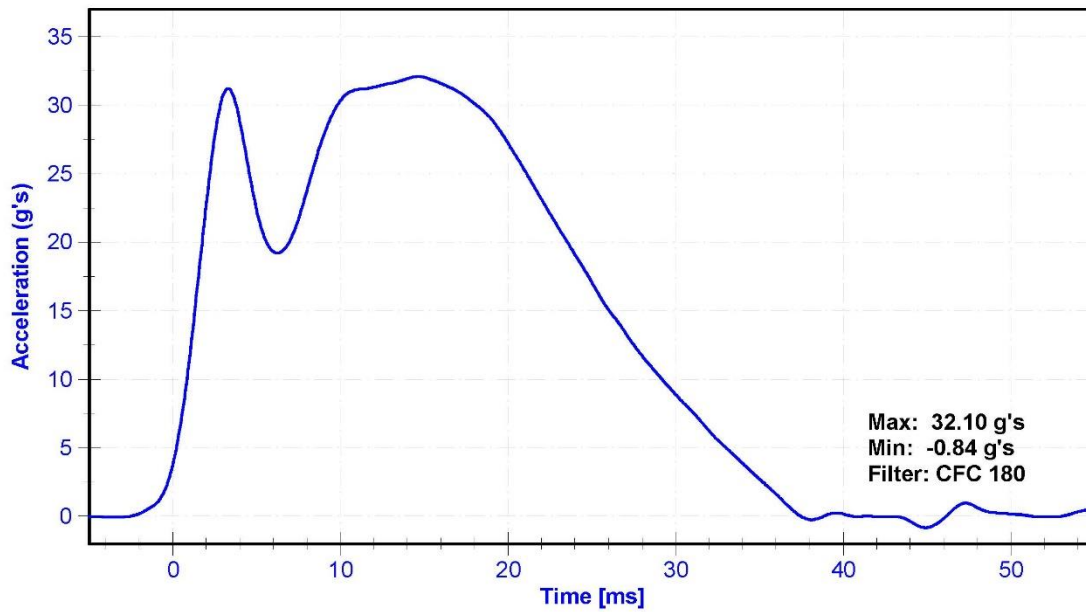
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016
Chest Potentiometer	SERVO 14CB1-2897	DS-288	9/18/2015	9/17/2016

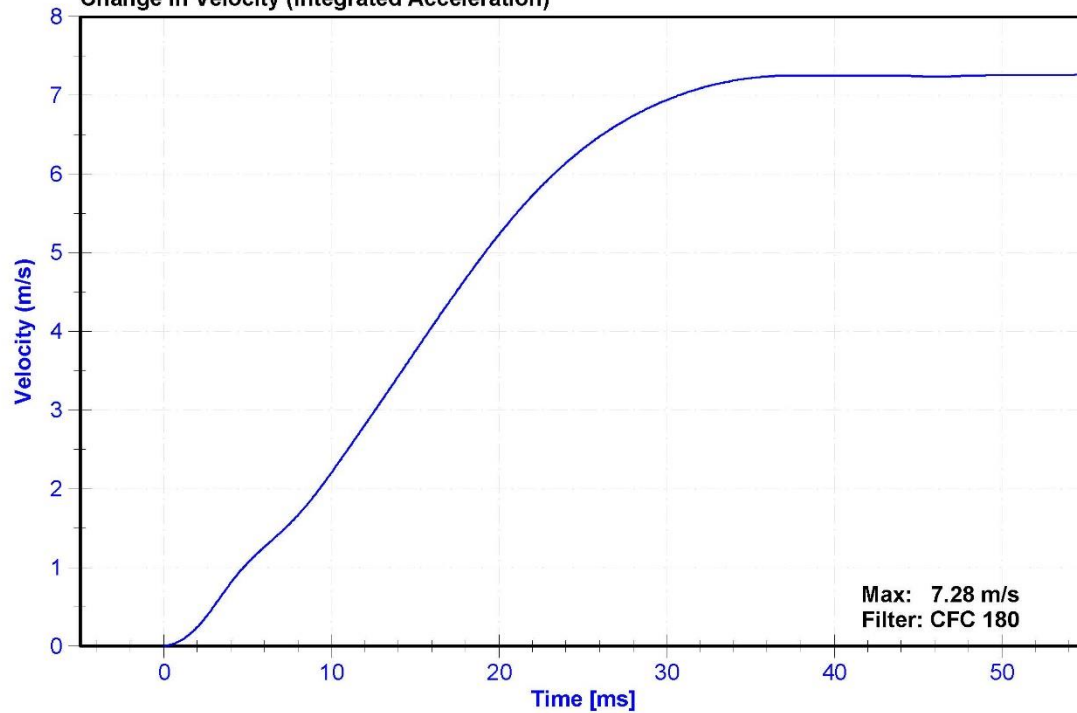




Probe Acceleration



Change in Velocity (Integrated Acceleration)



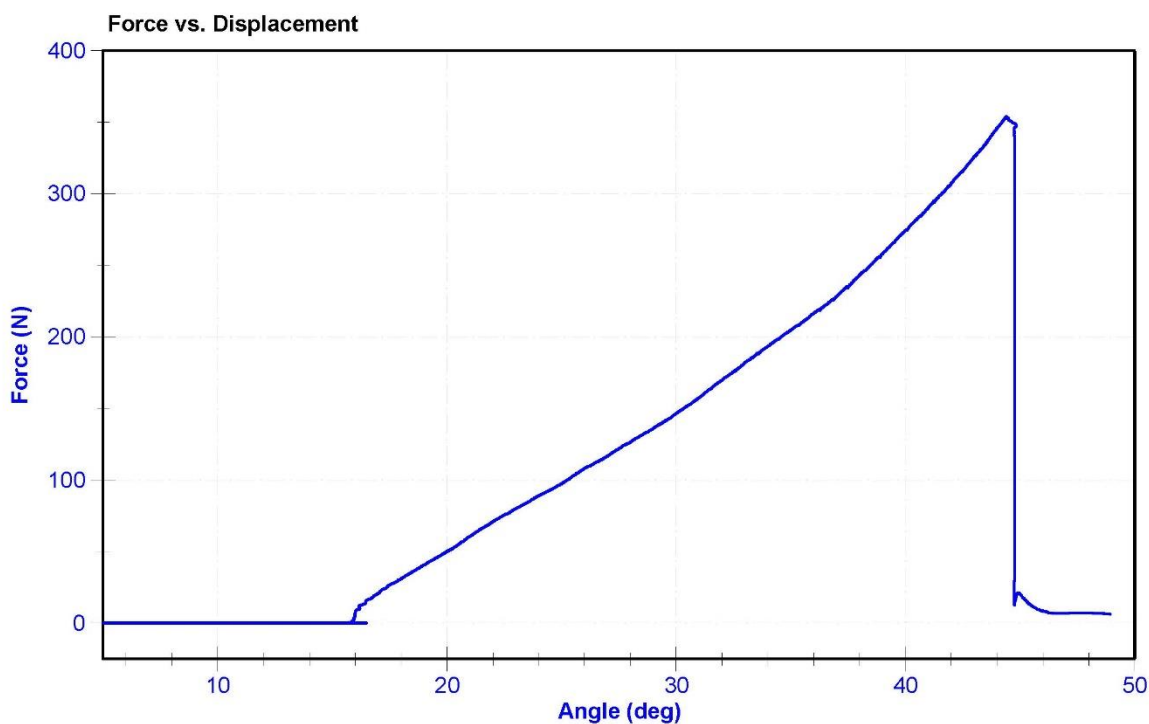
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	21.7	Pass
Humidity	10	70	%	31.2	Pass
Initial Angle	0	20	deg	15.4	Pass
Force at 45 Degrees	320	390	N	353.9	Pass
Return Angle Relative to Initial	0	8	deg	5.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	8/14/2015	8/13/2016
Load Cell	Interface SML-200	LC-493319	8/13/2015	8/12/2016



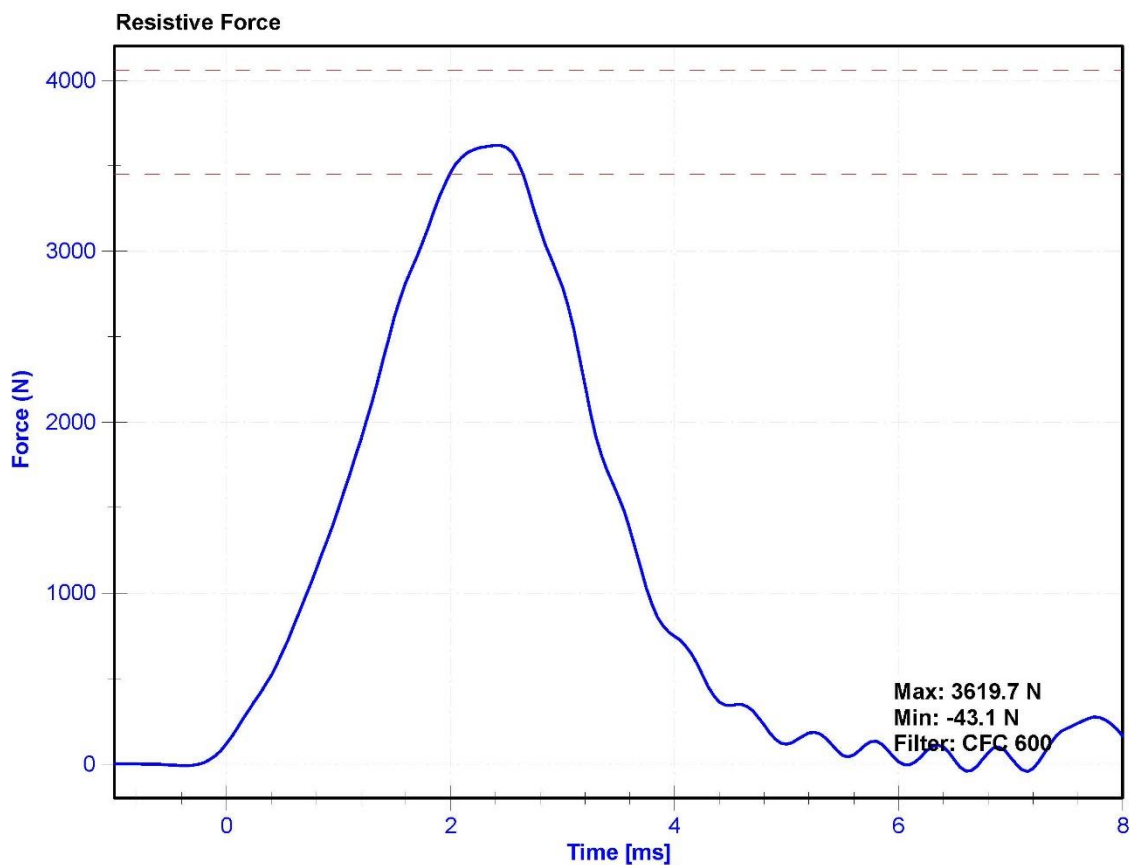
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	288	Laboratory Supervisor	M. Goehle

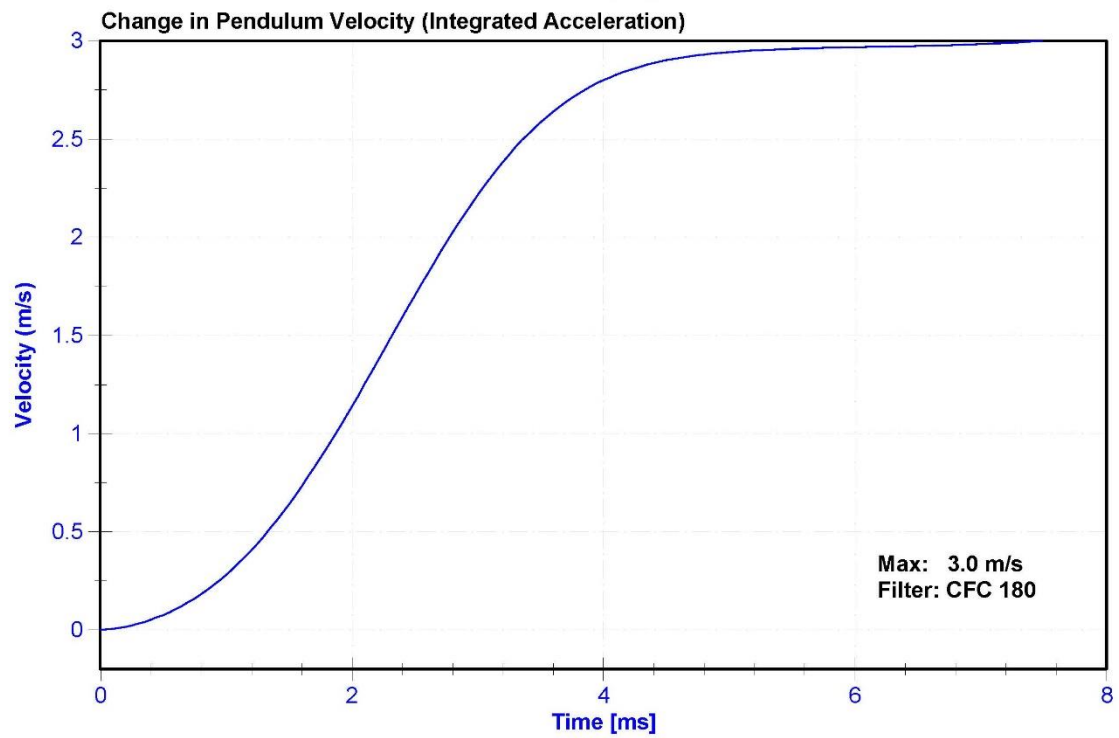
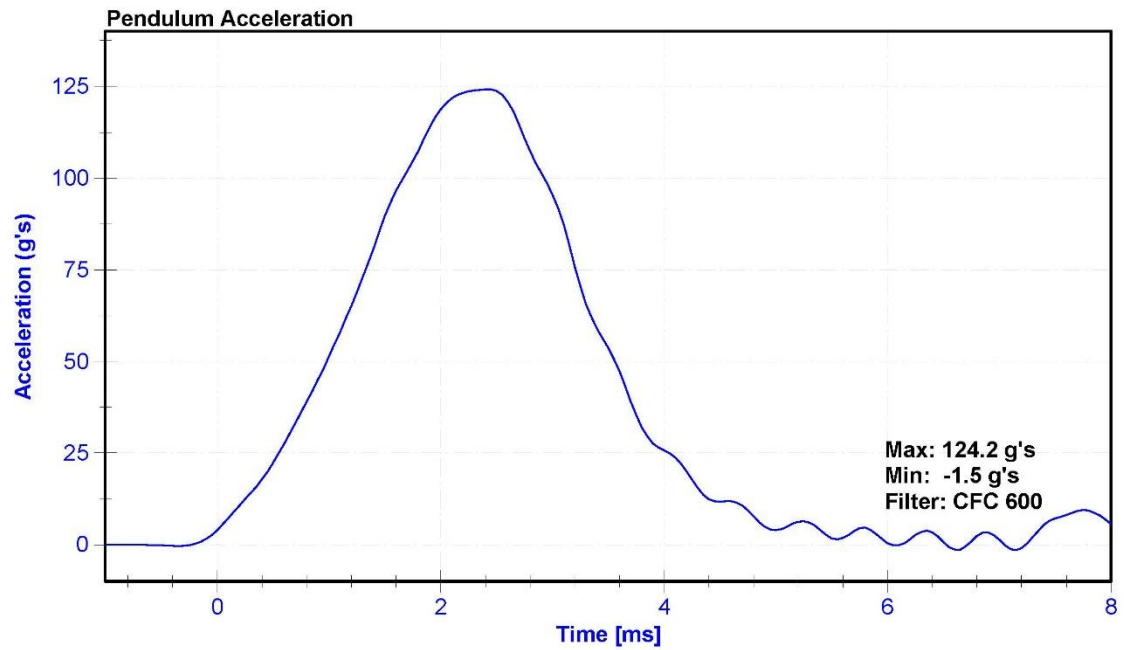
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.1	Pass
Humidity	10	70	%	22.3	Pass
Velocity	2.07	2.13	m/s	2.127	Pass
Resistive Force	3450	4060	N	3619.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016





ATD Manufacturer	FTSS	Test Technician	R. Weil
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	21.1	Pass
Humidity	10	70	%	22.3	Pass
Velocity	2.07	2.13	m/s	2.124	Pass
Resistive Force	3450	4060	N	3898.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23155	1/13/2016	7/14/2016

