REPORT NUMBER: SINCAP-CAL-16-003

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

Volvo Car Corporation
2016 Volvo S60i
Four Door Sedan

NHTSA No: O20165901

PREPARED BY:
CALSPAN CORPORATION
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January 14, 2016

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

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Vanessa Hansen, Test Engineer Edward Dutton , Senior Test Engineer	**8. Performing Organization Report No.** CAL-DOT-2016-003
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations P.O. Box 400 Buffalo, New York 14225	**10. Work Unit No.**
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15. *Supplementary Notes*

16. *Abstract*

A 55/28, (61.90 kph / 38.5 mph), 90^0 Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2016 Volvo S60i four door sedan in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on November 24, 2015.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.60 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 236mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	94.400
Maximum Thoracic Rib Deflection	mm	44	28.774
Total Abdominal Force	N	2500	1269.423
Pubic Symphysis Force	N	6000	1544.855

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	486.405
Lower Spine Resultant Acceleration	G	82	65.212
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3141.112
Maximum Thoracic Rib Deflection	mm	38*	31.070
Maximum Abdominal Rib Deflection	mm	45*	27.836

** Proposed IARV*

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

17. Key Words	18. Distribution Statement
New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave. SE Washington, D.C. 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2016 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00352. The purpose of this test is to generate comparative side impact performance in a 2016 Volvo S60i four door sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A 2016 Volvo S60i four door sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.60 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation's Transportation Test Operations Center in Buffalo, New York on November 24, 2015. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
Public symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (T12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in APPENDIX C of this report. Appendix D of this report contains the test equipment and instrumentation calibration data.

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	94.400
Maximum Thorax Rib Deflection	mm	44	28.774
Combined Abdominal Force	N	2500	1269.423
Pubic Symphysis Force	N	6000	1544.855

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	486.405
Lower Spine (T12) Resultant Acceleration	G	82	65.212
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3141.112
Maximum Thoracic Rib Deflection	mm	38*	31.070
Maximum Abdominal Rib Deflection	mm	45*	27.836

*Proposed IARV

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis Airbag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other				

GENERAL COMMENTS:

1. P1 serial number – F034
2. P4 serial number – 303

Data Anomalies:

- None

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

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, Seat Belt, Steering Wheel Adjustment and Fuel System Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and Instrumentation Data

Data Sheet No. 6 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

Data Sheet No. 13 – Vehicle and MDB Damage Profile Distances

Data Sheet No. 14 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 15 – Dummy/Vehicle Temperature and Humidity Stabilization Data

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20165901
Model Year	2016
Make	Volvo
Model	S60i
Body Style	Four Door Sedan
VIN	LYV402FM9GB087692
Body Color	Red
Odometer Reading (km/mi)	35.4 km / 22 mi
Engine Displacement (L)	2.0
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Volvo Car Corporation
Date of Manufacture	05/15
Vehicle Type	Passenger

GVWR (kg)	2118
GAWR Front (kg)	1150
GAWR Rear (kg)	1009

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	-	5	
Capacity Weight (VCW) (kg)				455	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				114.8	(A-B)

VEHICLE SEAT TYPE

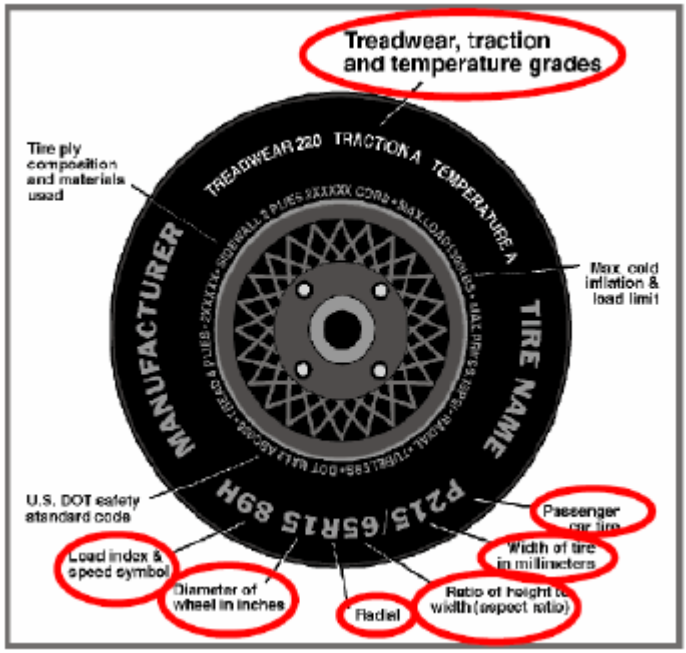
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable W/ Lever	Adjustable W/ Knob
Front Seat	X						X
Rear or Second Row Seat			X		X		
Third Row seat							

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

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015

VEHICLE TIRE INFORMATION

Collected for year, make, model, & VIN, all items circled in red, tire manufacturer and tire name.



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold Pressure (kPa)	260	260
Recommended Tire Size	P235/40R19	P235/40R19
Tire Size on Vehicle	P235/40R19	P235/40R19
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Cinturado P7	Cinturado P7
Treadwear	500	500
Traction	A	A
Temperature Grade	A	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	96V	96V
Tire Material	Rubber	Rubber
DOT Safety Code Left	93FCR2444914	93FCR2444914
DOT Safety Code Right	93FCR2444914	93FCR2444914

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

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	260	260	260	260
Tire Placard	kPa	260	260	260	260
Owner's Manual	kPa	260	260	260	260
As Tested	kPa	260	260	260	260

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	555	291		553	430		591	410	
Right	kg	482	353		531	403		485	439	
Ratio	%	61.7%	38.3%		56.5%	43.5%		55.9%	64.1%	
Totals	kg	1037	644	1681	1084	833	1917	1076	849	1925

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1681	(A)
Sum of Actual Weight of 2 P572 ATDS Used	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	114.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1922.8	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range

(i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? [X] **Yes** [ ] **No**

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement**
LF	mm	706	706	Yes
RF	mm	710	708	Yes
RR	mm	690	690	Yes
LR	mm	680	680	Yes
Vehicle CG (Aft of Front Axle)	mm	1260	1241	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	32	36	

**** The "As Tested" vehicle attitude measurements must be equal to or within ± 10mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirements".*

Test height adjustable suspension setting, if applicable: N/A

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

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	8
Tail Light	1
Spare Tire & Jack	4
Passenger Side Windows	8
Ballast / Equipment Added	59

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

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passengers' seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	23.3	12.1	17.7
Front Passenger Seat	23.7	12.9	18.3
Front Center Seat*			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed

**if applicable*

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	17.7	14	Max	58	72	85
			Mid	31	42	58
			Min	0	14	28
Front Passenger Seat	18.3	10	Max	56	65	78
			Mid	29	36	47
			Min	0	10	22
Front Center Seat*	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat*	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

**if applicable*

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

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

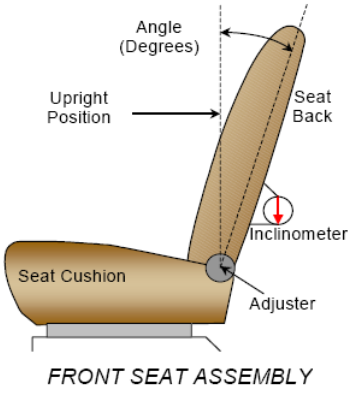
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	255	N/A	127.5	N/A
Front Passenger Seat	220	N/A	110	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed	Fixed

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/ Seated Dummy	-7.4 to 65.7	N/A	19.8	N/A
Front Passenger Seat	-7.6 to 65.5	N/A	19.9	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat w/ Seated Dummy	FIXED	FIXED	FIXED	FIXED
Non-Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Rear Center Seat*	FIXED	FIXED	FIXED	FIXED

**if applicable*

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

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. For this test zero is defined as the uppermost position.

	Total # of Positions	Placed in Position #
Driver Seat	4 (0 – 3)	0 – Uppermost
Rear Seat	1	FIXED

HEAD RESTRAINT ADJUSTMENT

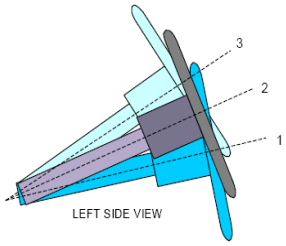
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	FIXED	FIXED
Rear Seat	FIXED	FIXED

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

	Degrees	Fore/Aft Position (mm)
Lowermost – Position 1	21	
Geometric Center – Position 2	24.05	
Uppermost – Position 3	27.1	
Telescoping Steering Wheel Travel		50
Test Position	24.05	25

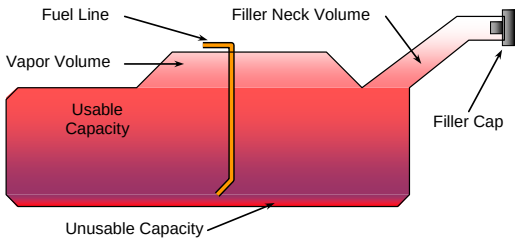


STEERING COLUMN ASSEMBLY

FUEL PUMP

Describe the fuel pump type, details about how it operates, and the location of the fuel filler neck.

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



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

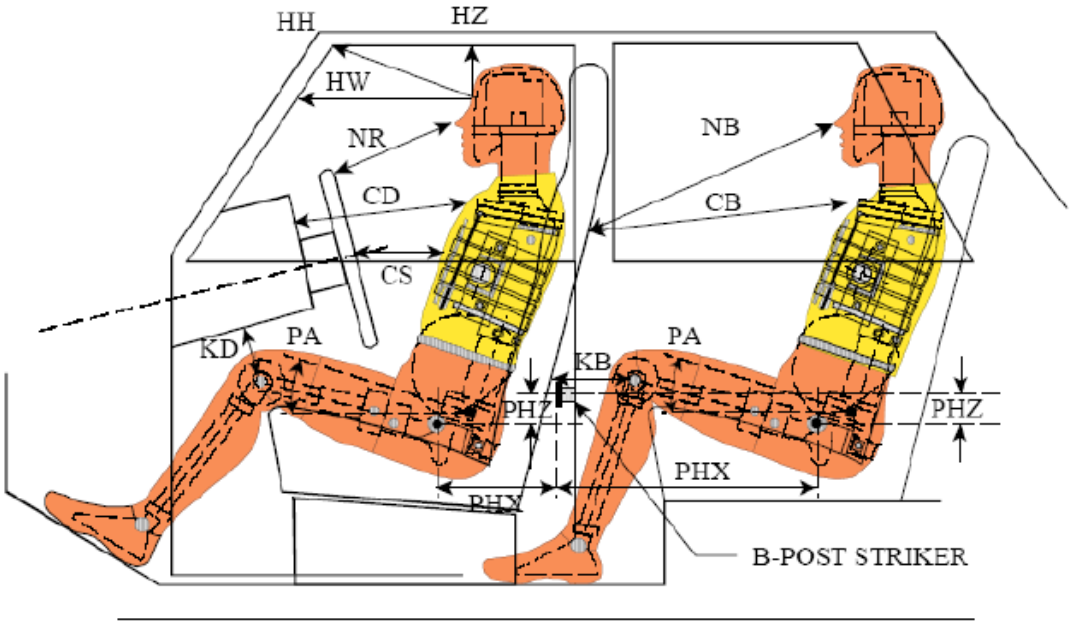
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	67.5
Usable Capacity of "Optional Tank" (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	67.5
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	62.8
Actual Amount of Solvent Used in Test	62.8
1/3 of Usable Capacity	22.5

Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in Form No. 1? [X] **Yes** [ ] **No**

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

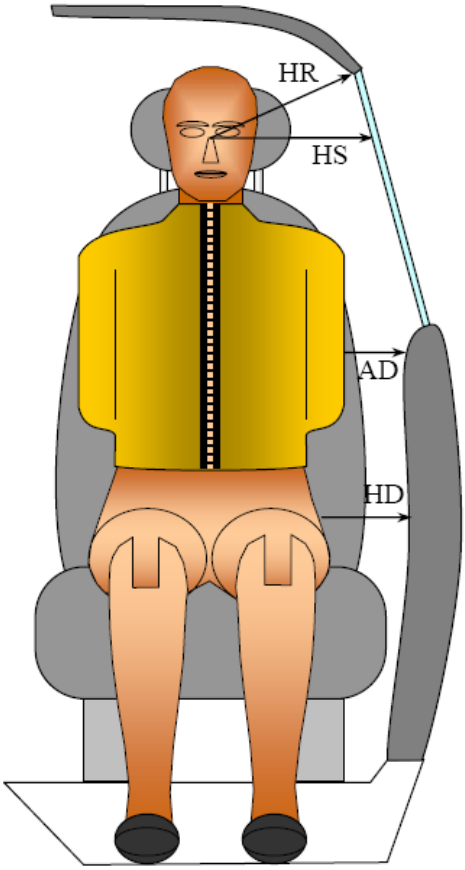
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F034)		Passenger (Serial No. 303)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	398			
HW		Header to Windshield	658			
HZ	HZ	Head to Roof Liner	168		254	
NR	NB	Nose to Rim/Seat Back	457		612	
CD	CB	Chest to Dash/Seat Back	618		582	
CS		Chest to Steering Wheel	350			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	248	21.2	326	9.8
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	212	26.4	323	9.6
PAX°	PAX°	Pelvic Tilt Angle X		23.6		21.4
	PAY°	Pelvic Tilt Angle Y				0.3
PHX	PHX	Hip Point to Striker (X-Axis)	149		216	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	108		245	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



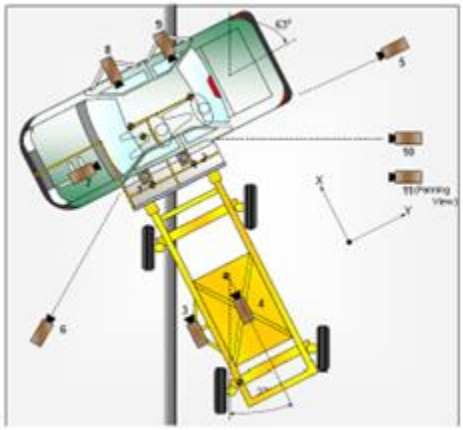
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F034)	Passenger (Serial No. 303)
HR	Head to Side Header	mm	184	249
HS	Head to Side Window	mm	325	380
AD	Arm to Door	mm	108	148
HD	Hip Point to Door	mm	156	174

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	99	839	-5326	14	1000
2	Overhead Close-up	593	839	-5326	28	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	838	-1587	12.5	1000
5	Rear	0	10011	-1197	24	1000
6	Left Front	-3241	-4826	-1182	24	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-time Left Rear				Zoom	60
11	Real-time In run				Zoom	60

Notes: *Reference: Impact Point projected to Ground*
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down
**All measurements accurate to ± 6 mm.*

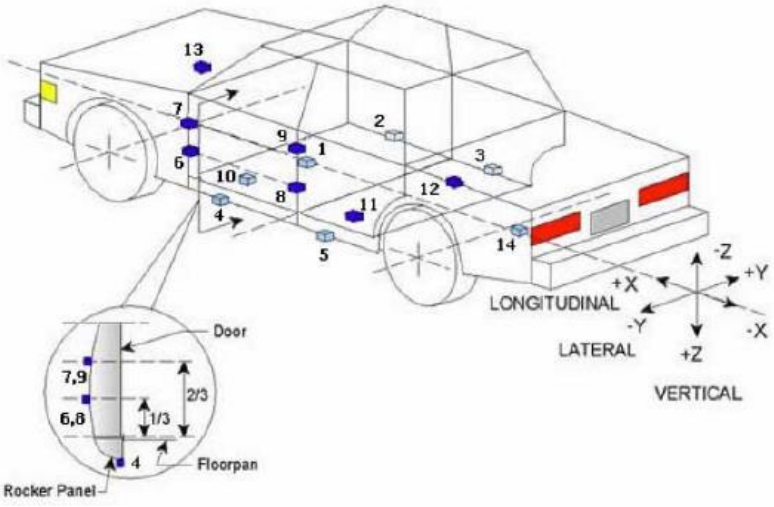
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	7
Total	62

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015



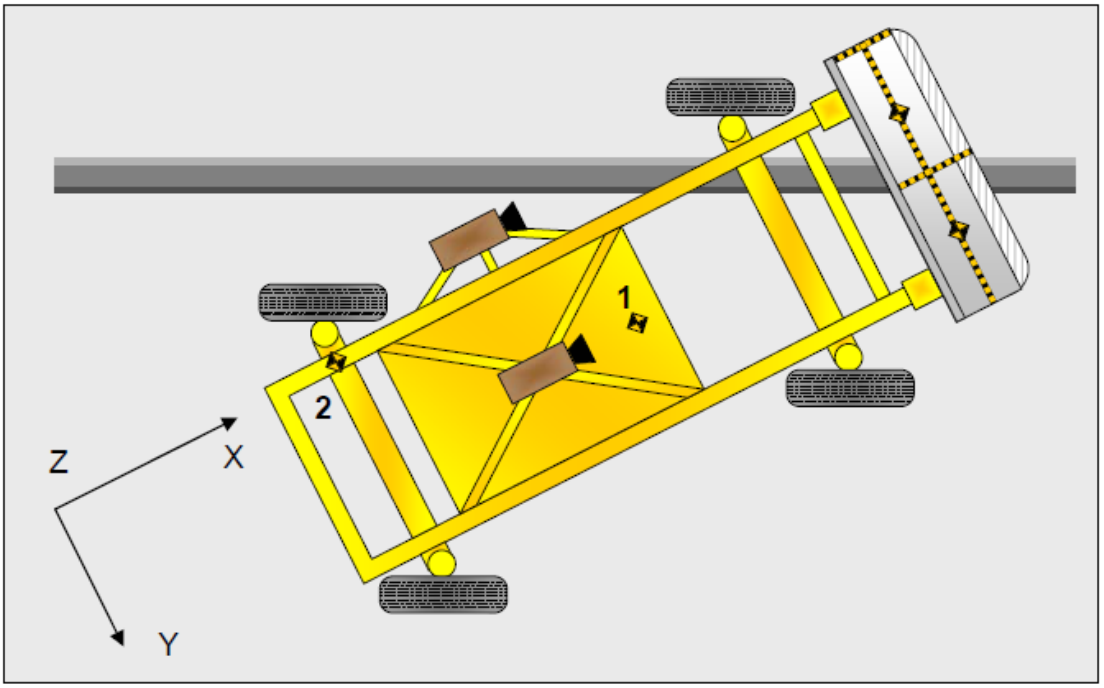
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2861	-5	64
2	Right Sill at Front Seat	2820	727	-115
3	Right Sill at Rear Seat	1935	717	-104
4	Left Sill at Front Door	2817	-712	-124
5	Left Sill at Rear Door	1942	-714	-113
6	A-Post Lower	3221	-685	85
7	A-Post Middle	3185	-669	518
8	B-Post Lower	2232	-694	48
9	B-Post Middle	2186	-694	279
10	Front Seat Track	2286	-558	-177
11	Rear Seat Structure	1689	-588	-56
12	Rt. Rear Occ. Compartment	2105	391	-269
13	Engine Block	3994	278	325
14	Rear Above Axle	1087	12	13

Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	1859	0	-330
2	MDB Rear	386	-660	-660

Reference: X – Face of MDB (+ forward)
Y – MDB centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag	Curtain Airbag
Top of Head	Side Headliner	Curtain Airbag & Headrest
Left Side of Head	Curtain Airbag & Side Headliner	Curtain Airbag
Back of Head	Curtain Airbag & Side Headliner	Curtain Airbag & Headrest
Left Shoulder	Torso/Pelvis Airbag & B-Pillar	Passenger Door
Upper Torso	Seatback	Seatback & Passenger Door
Lower Torso	Seatback	Seatback & Passenger Door
Left Hip	Seatback	Seatpan
Left Knee	None	Passenger Door

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/ Other
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	No
Total Separation from Vehicle at Hinges or Latches	0	0	0	0	0
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Width of Opening at Striker (mm)	0	0	0	0	0

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Remained in good condition
Sill Separation	None
Windshield Damage	None
Side Window Damage	Rear Passenger Window Shattered
Other Notable Effects	None

DATA SHEET NO. 8 … (CONTINUED)
POST-TEST OBSERVATIONS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2857
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		489
Actual Impact Point (Aft of Frontal Axle)	mm		491
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	-2
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	-10

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1,250
Overall Length Including Honeycomb Frame	4,120
Wheelbase of Framework Carriage	2,600
CG Location of Front Axle	1,120

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	392.5	297.5	690.0
Right	kg	386.0	291.5	677.5
Ratio	%	57.4%	42.6%	100.0%
Totals	kg	778.5	589.0	1367.5

SPEED AND ANGLE AT IMPACT DATA

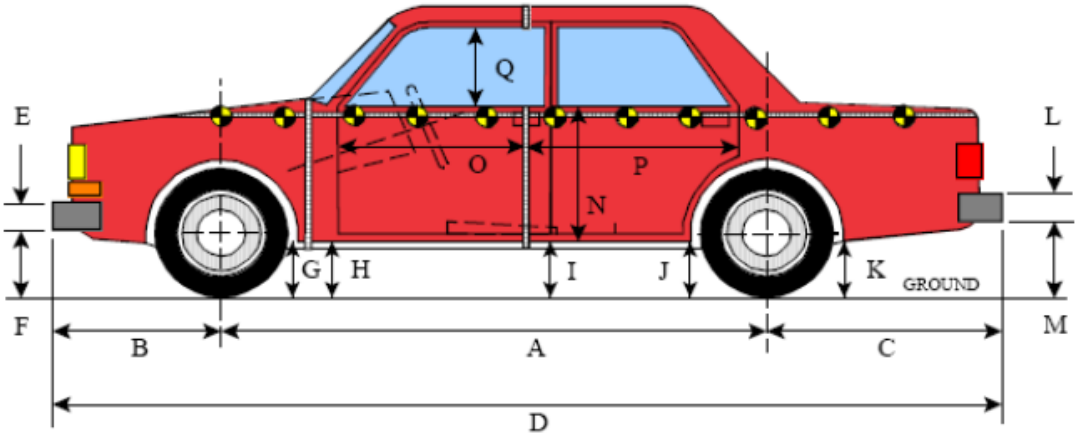
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.60
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.62
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	192
B	Top of Bumper	533	800	Left	149
C	Mid-Level	686	800	Left	181
D	Top of Stack	813	800	Left	169

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015



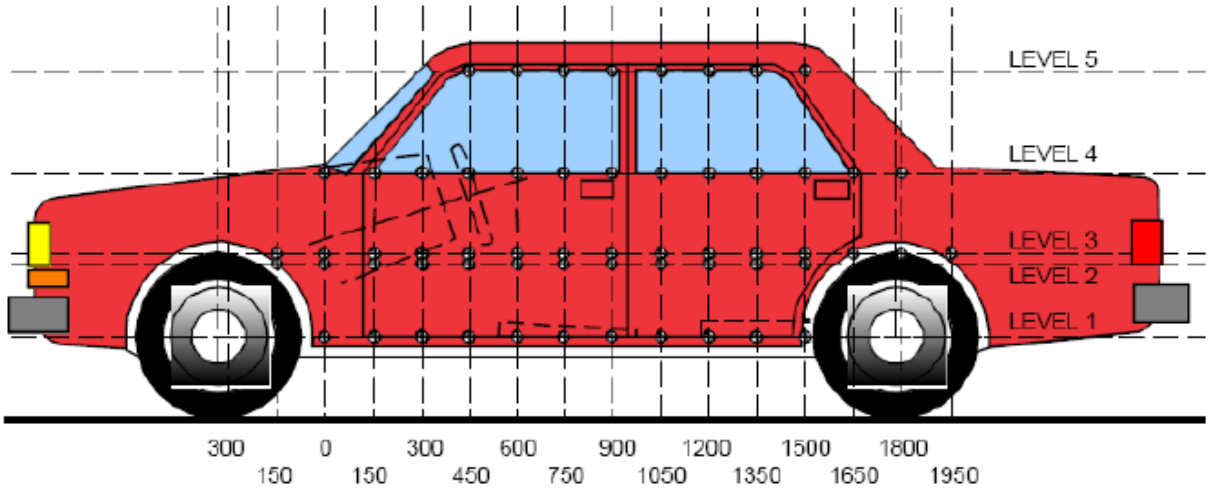
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2857	2832	-25
B	Front Axle to FSOV	944	969	25
C	Rear Axle to RSOV	914	916	1
D	Total Length at Centerline	4711	4716	5
E	Front Bumper Thickness	80	80	0
F	Front Bumper Bottom to Ground	413	417	4
G	Sill Height at Front Wheel Well	160	165	5
H	Sill Height at Front Door Leading Edge	158	158	0
I	Sill Height at B Pillar	181	166	-15
J1	Sill Height at Rear Wheel Well	163	145	-18
J2	Pinch Weld Height at Rear Wheel Well	172	192	20
K	Sill Height Aft of Rear Wheel Well	229	231	2
L	Rear Bumper Thickness	210	210	0
M	Rear Bumper Bottom to Ground	366	371	5
N	Sill Height to Window Bottom of Front Window Sill	721	643	-78
O	Front Door Leading Edge to Impact CL	796	787	-9
P	Rear Door Trailing Edge to Impact CL	1350	1305	-45
Q	Front Window Opening	425	432	7
R	Right Side Length	4612	4617	5
S	Left Side Length	4609	4608	-1
T	Maximum Vehicle Width	1824	1675	-149

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	244	50	750
2	Driver Hip Point	mm	530	236	1650
3	Mid-Door	mm	668	228	1650
4	Window Sill	mm	907	162	1500
5	Window Top	mm	1406	0	1200

*window top level bent outward from original position

NOTE: *The above measurements should be taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.*

DATA SHEET NO. 11 … (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2016 Volvo S60i four door sedan NHTSA No.: O20165901
Test Program: NCAP Side MDB Impact Test Test Date: 11/24/2015

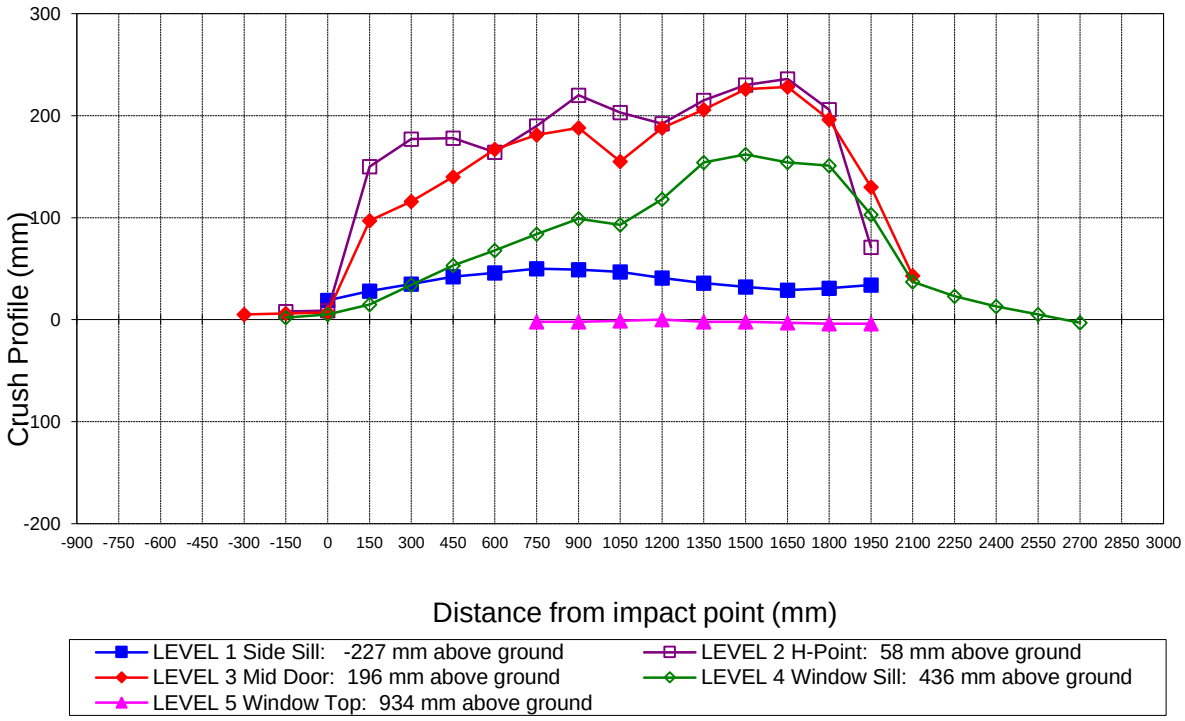
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300			911					906					5		
-150		906	904	815			898	898	813			8	6	2	
0	861	898	898	826		842	889	891	821		19	9	7	5	
150	863	895	898	836		835	745	801	821		28	150	97	15	
300	865	898	902	847		830	721	786	813		35	177	116	34	
450	866	901	906	858		824	723	766	805		42	178	140	53	
600	866	903	909	867		820	739	742	799		46	164	167	68	
750	866	904	911	876	426	816	714	730	792	428	50	190	181	84	-2
900	865	904	912	883	570	816	684	724	784	572	49	220	188	99	-2
1050	864	903	912	887	603	817	700	757	794	604	47	203	155	93	-1
1200	861	899	908	890	606	820	707	720	772	606	41	192	188	118	0
1350	859	895	904	890	607	823	680	698	736	609	36	215	206	154	-2
1500	857	891	900	888	607	825	661	674	726	609	32	230	226	162	-2
1650	854	889	898	885	604	825	653	670	731	607	29	236	228	154	-3
1800	851	890	898	885	586	820	684	702	734	590	31	206	196	151	-4
1950	848	897	900	871	466	814	826	770	768	470	34	71	130	103	-4
2100			910	883				867	846				43	37	
2250				878					855					23	
2400				870					857					13	
2550				857					852					5	
2700				838					841					-3	
2850															
3000															

NOTE: *Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition.*
Vehicle measurements forward of the vertical impact reference line are negative.
The crush profile grid is established prior to test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

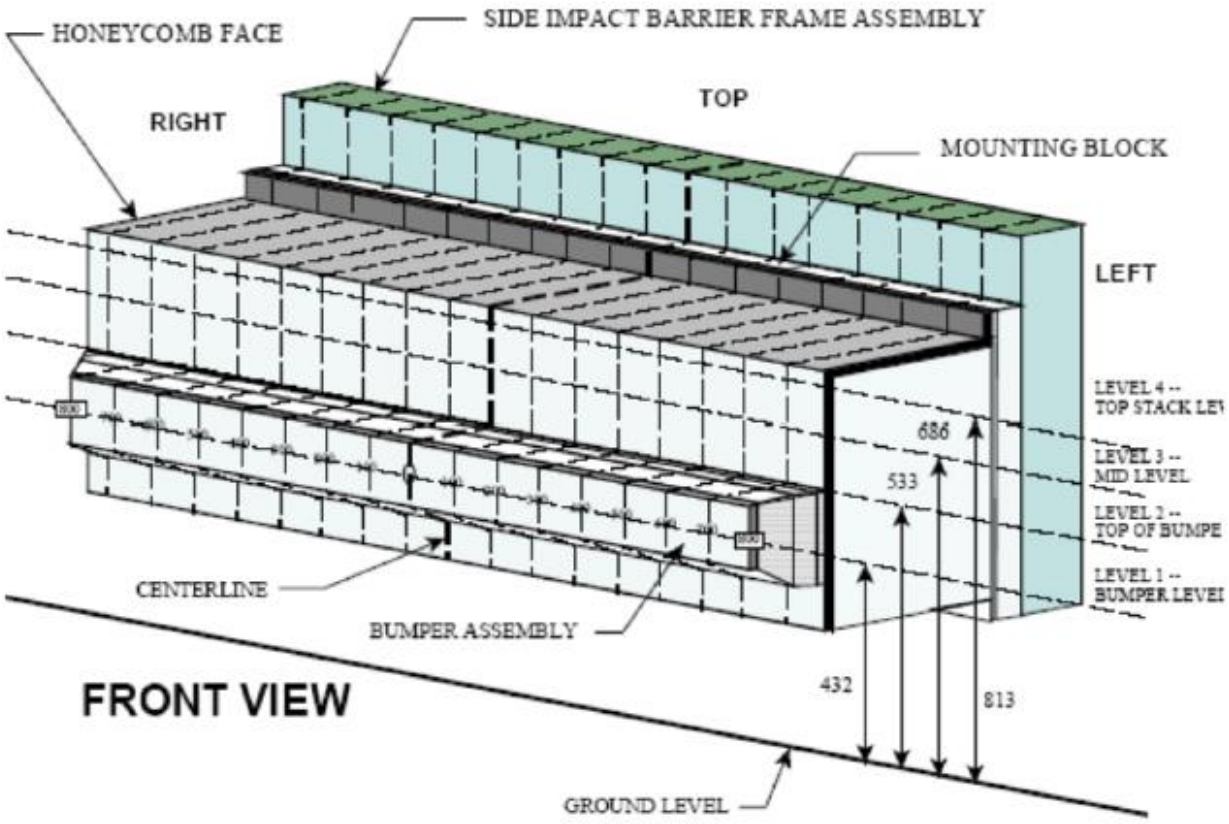
Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



NOTE: Dimensions are shown in millimeters, mm

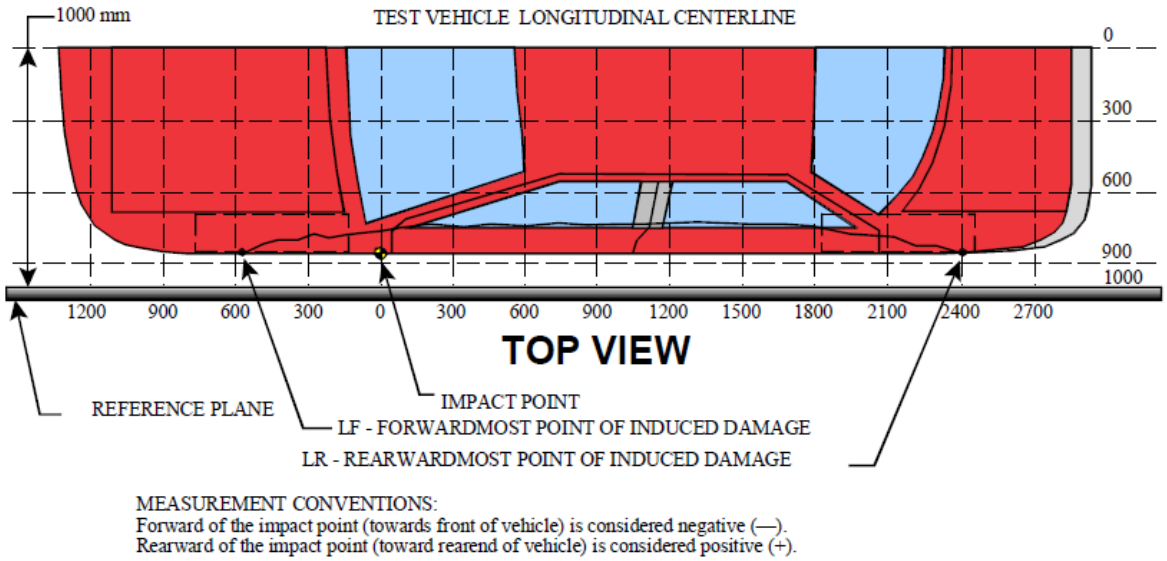
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	163	152	145	144	145	147	148	150	152	153	156	159	162	165	168	177	192
2	88	63	56	54	55	62	76	88	78	69	114	118	122	126	131	137	149
3	45	25	25	30	37	55	87	100	77	61	50	48	53	68	92	127	181
4	50	34	22	26	44	74	120	99	91	88	82	98	105	120	125	143	169

DATA SHEET NO. 13
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015

For guidance regarding damage profile distance measurements, pelase refer to the latest version of the *NHTSA Test Reference Guide, Volume 1: Vehicle Tests.*



MEASUREMENT CONVENTIONS:
Forward of the impact point (towards front of vehicle) is considered negative (—).
Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-150	3	94	89	5
2	300	3	202	101	101
3	750	3	263	90	173
4	1200	3	265	90	175
5	1650	3	329	102	227
6	2100	3	133	90	43

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	192
2	480 mm left of center	1	163
3	160 mm left of center	1	154
4	160 mm right of center	1	149
5	480 mm right of center	1	144
6	800 mm right of center	1	163

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015
Test Time:	12:48 PM	Temperature:	21˚C

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

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

C. For the following 25 minutes: (Maximum allowable is 1 oz./minute) — 0 oz.

D. Spillage Details: — No Spillage Occurred

FMVSS NO. 301 STATIC ROLLOVER DATA

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	72	300	372
90° to 180°	63	300	363
180° to 270°	62	300	362
270° to 360°	68	300	368

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

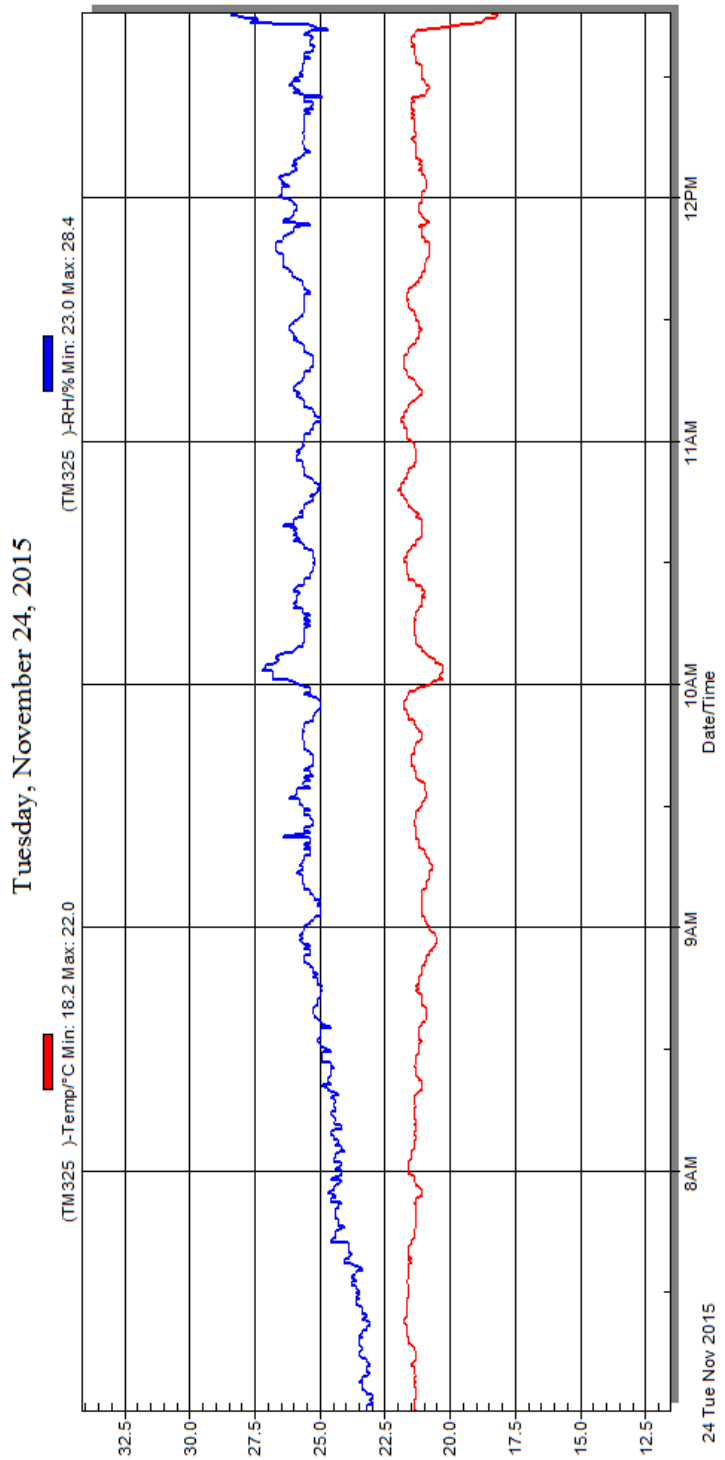
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER 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. 15
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle:	2016 Volvo S60i four door sedan	NHTSA No.:	O20165901
Test Program:	NCAP Side MDB Impact Test	Test Date:	11/24/2015



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

APPENDIX A

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Figure A-5: Pre-Test Left Front ¾ View of Test Vehicle

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Figure A-7: Pre-Test Left Side View of Test Vehicle

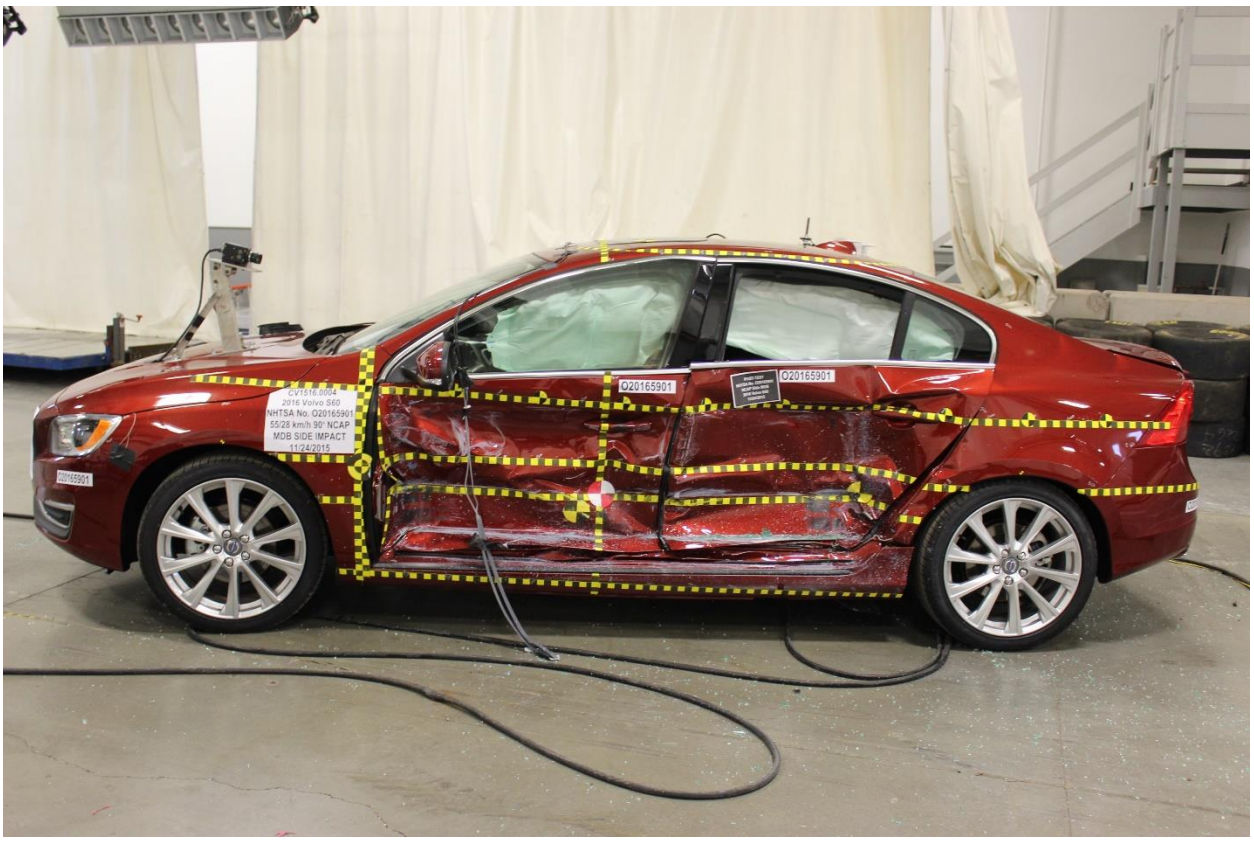

Figure A-8: Post-Test Left Side View of Test Vehicle

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

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Figure A-13: Pre-Test Right Side View of Test Vehicle

Figure A-14: Post-Test Right Side View of Test Vehicle

Figure A-15: Pre-Test Overhead View of the Test Area

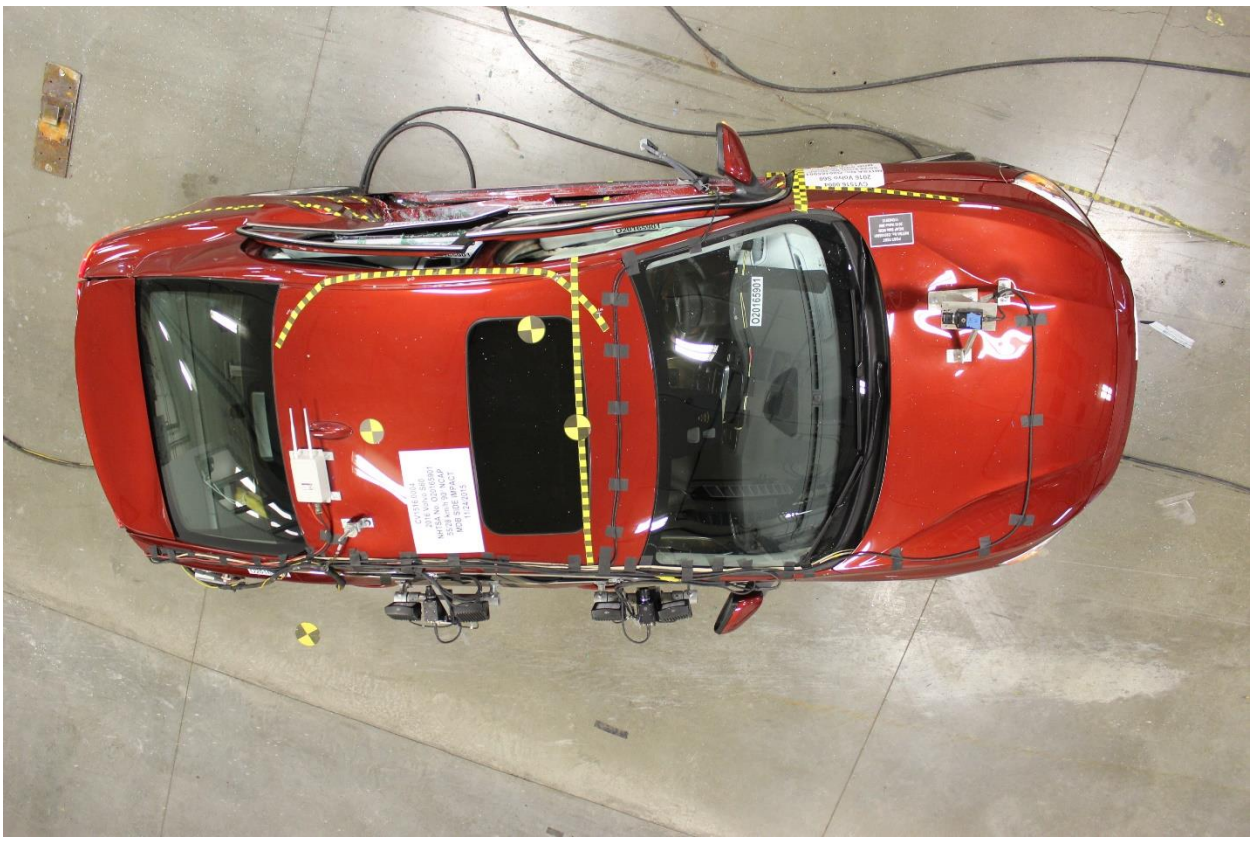

Figure A-16: Post-Test Overhead View of Test Area

Figure A-17: Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle

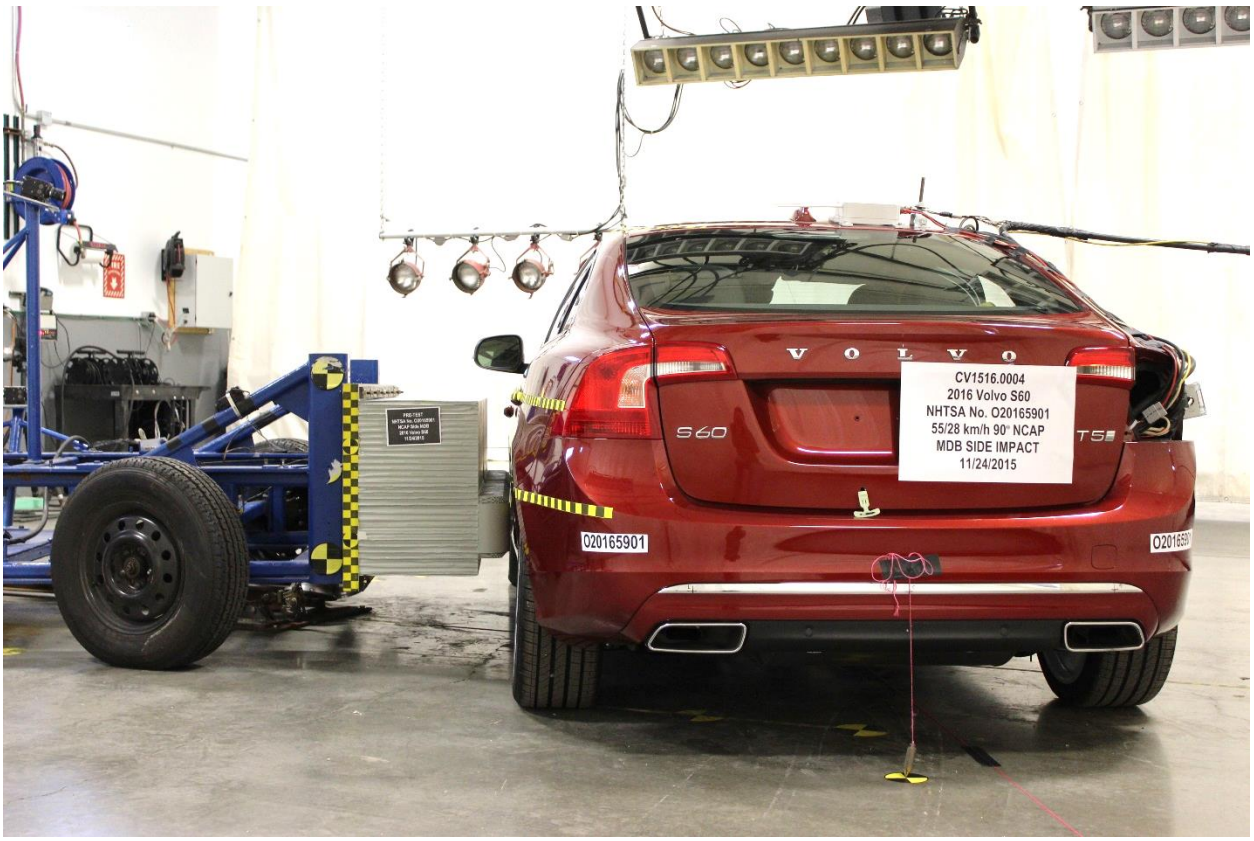

Figure A-18: Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle

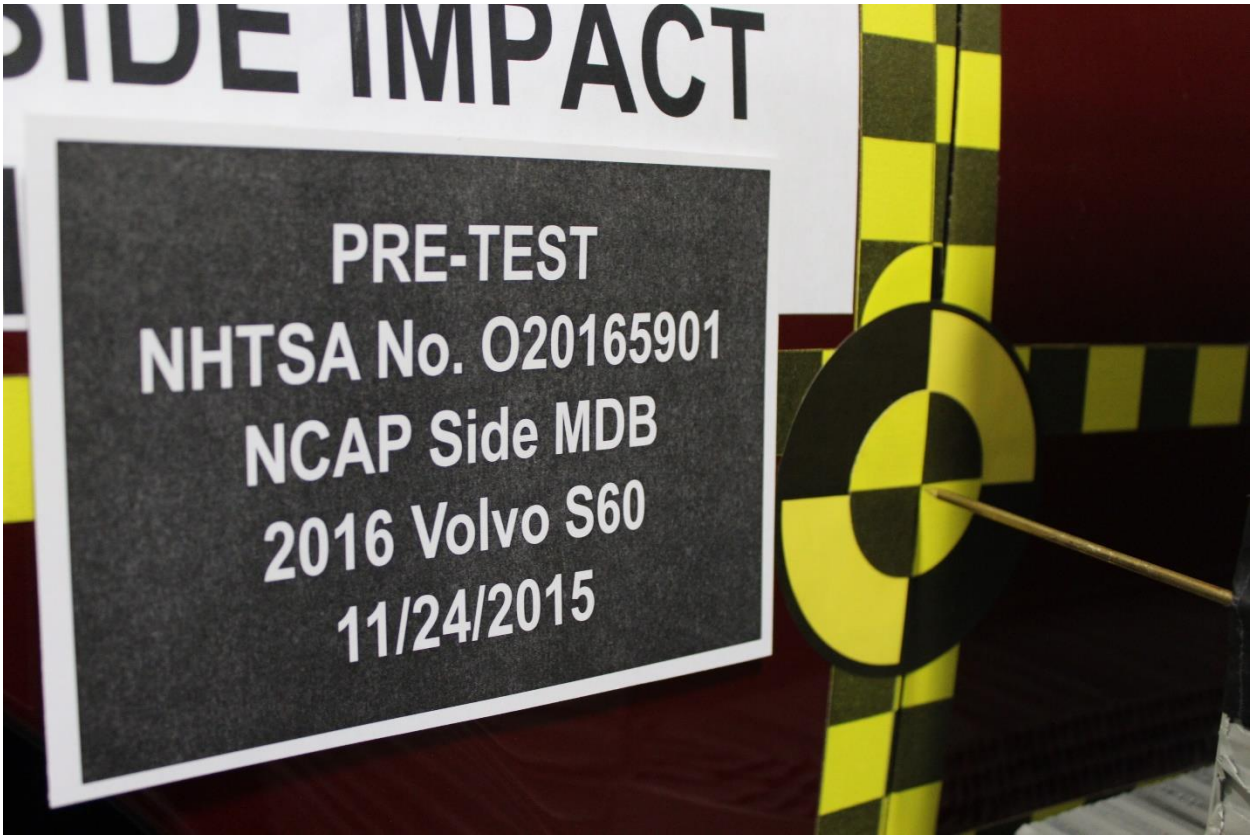

Figure A-19: Pre-Test Close-up View of Impact Point Target

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Figure A-22: Post-Test Left Front Door Latch Close-Up

Figure A-23: Pre-Test Left Rear Door Latch Close-Up

Figure A-24: Post-Test Left Rear Door Latch Close-Up

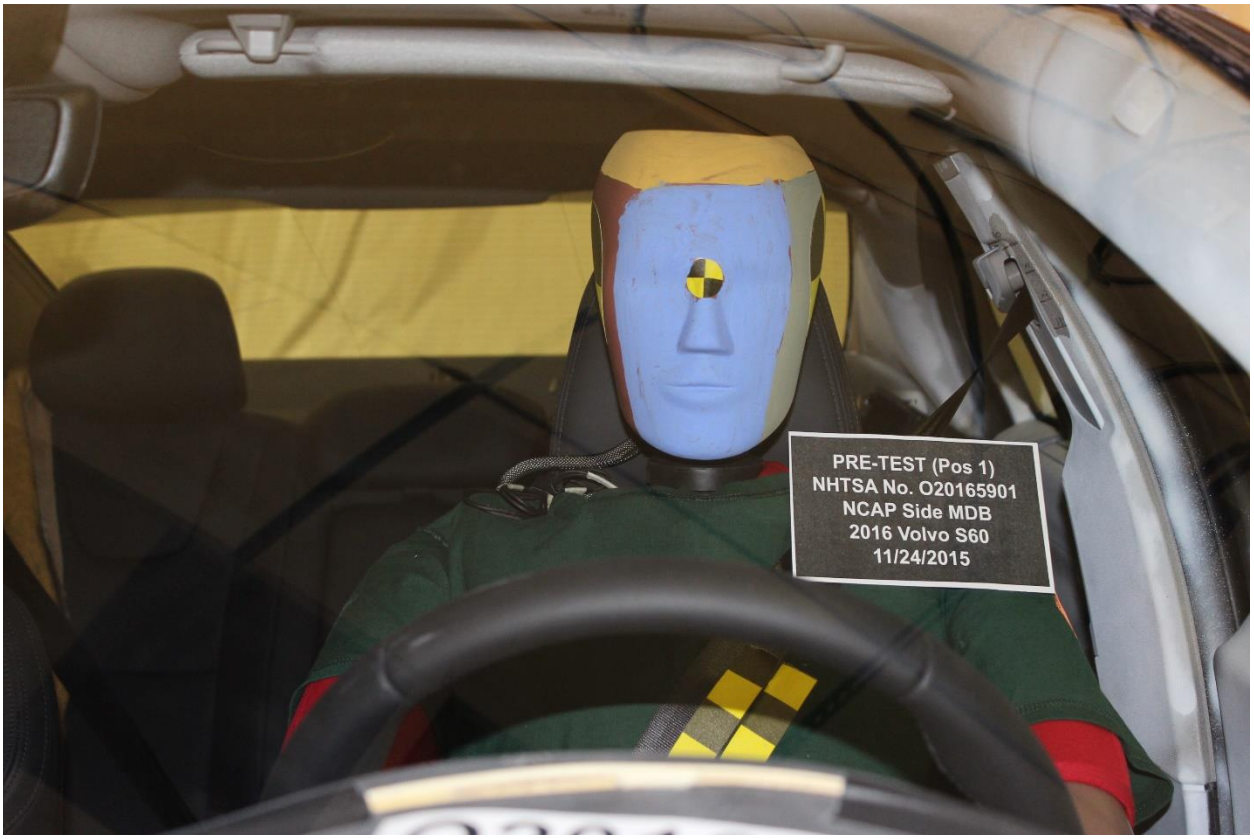

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Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning

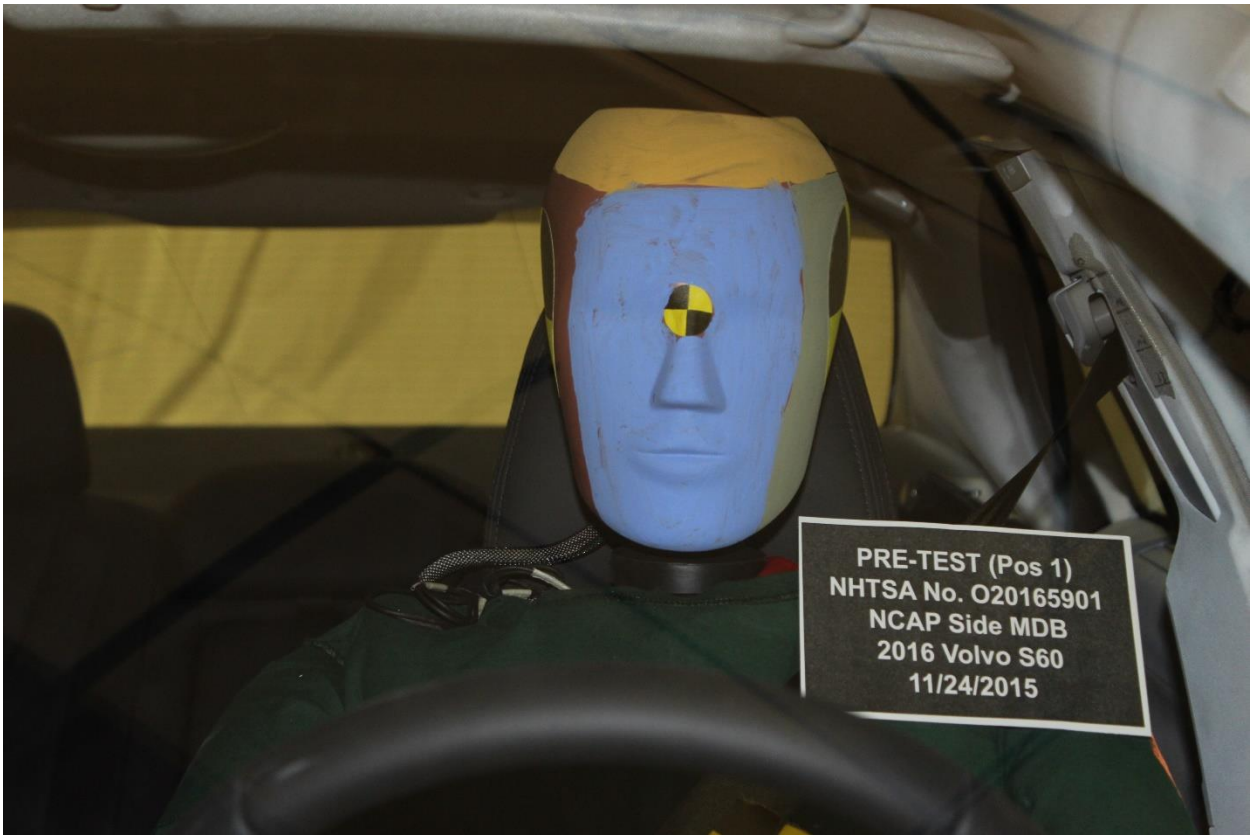

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Photo Not Applicable

Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View

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Figure A-58: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning

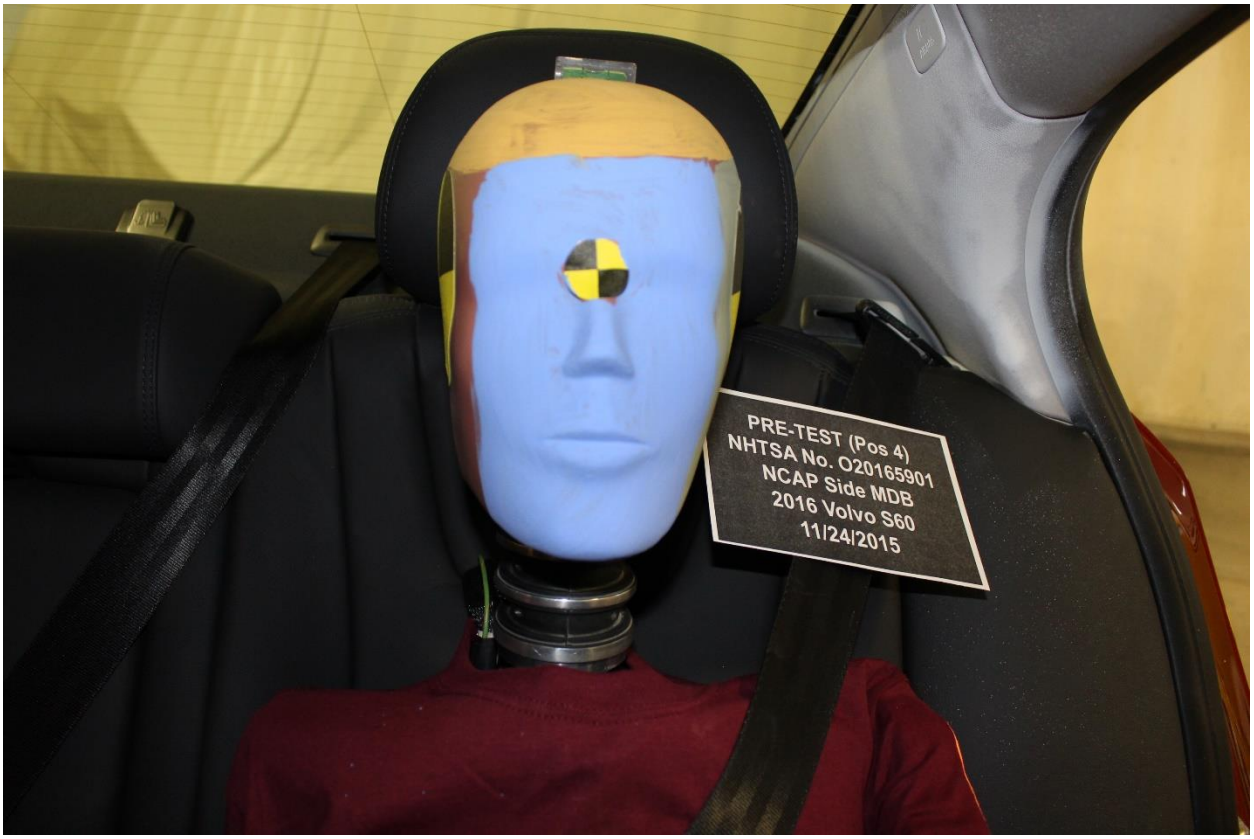

Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning

Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

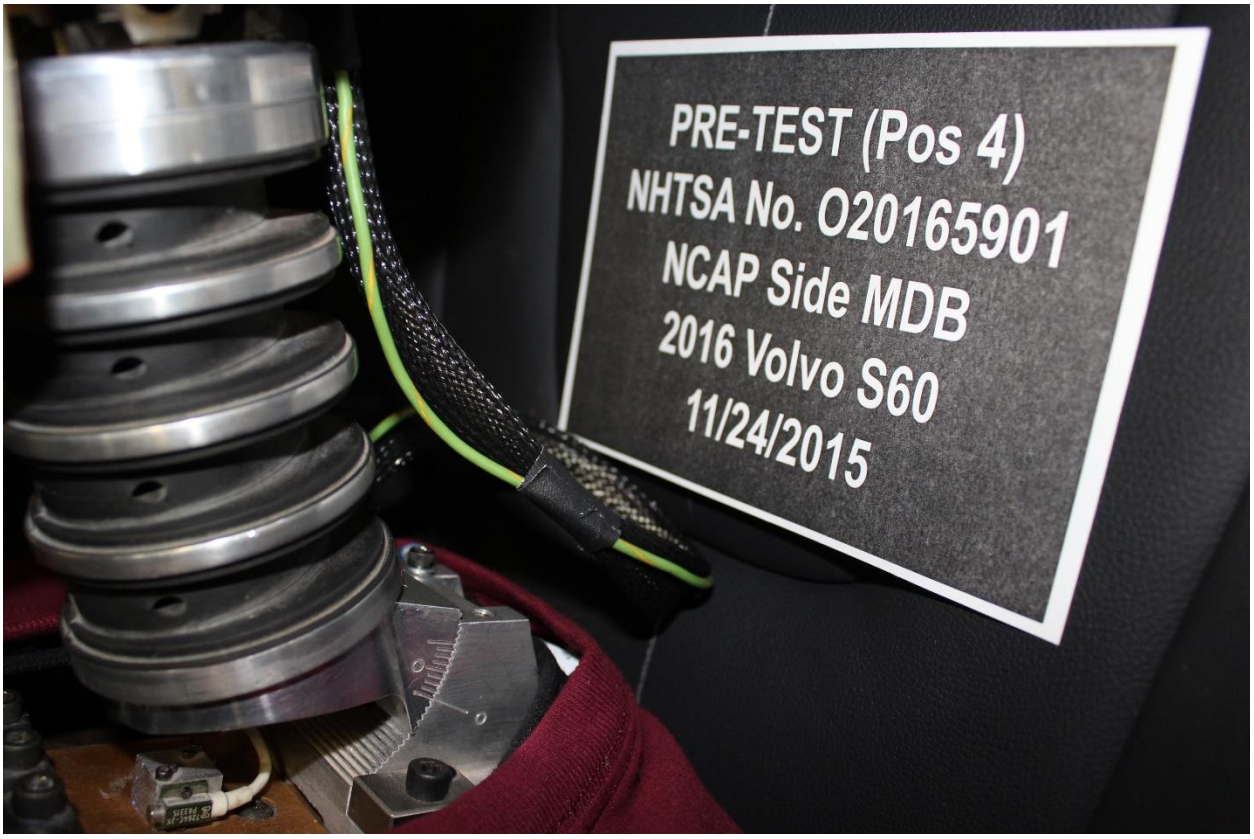

Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

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Photo Not Applicable

Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View

Figure A-79: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View

Photo Not Applicable

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Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Figure A-82: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck

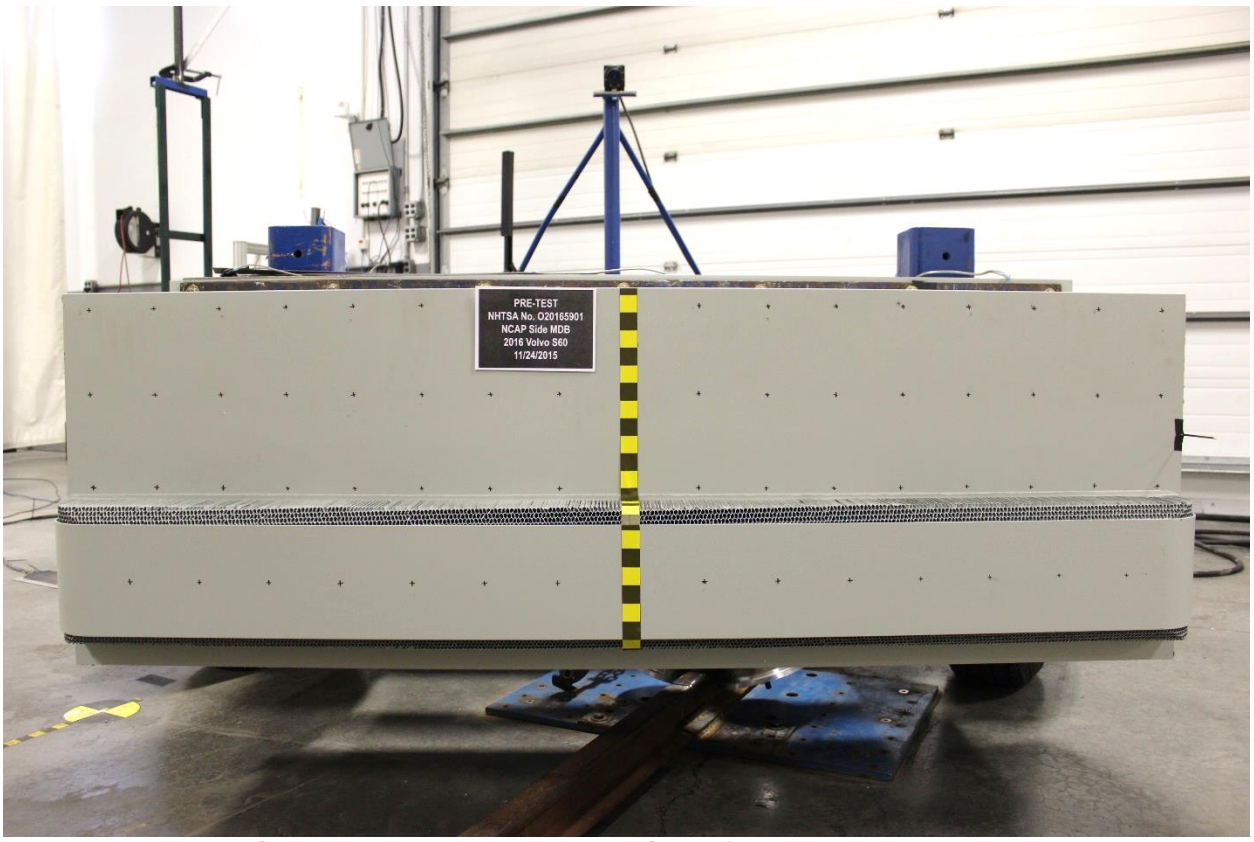

Figure A-84: Pre-Test Front View of MDB Impactor Face

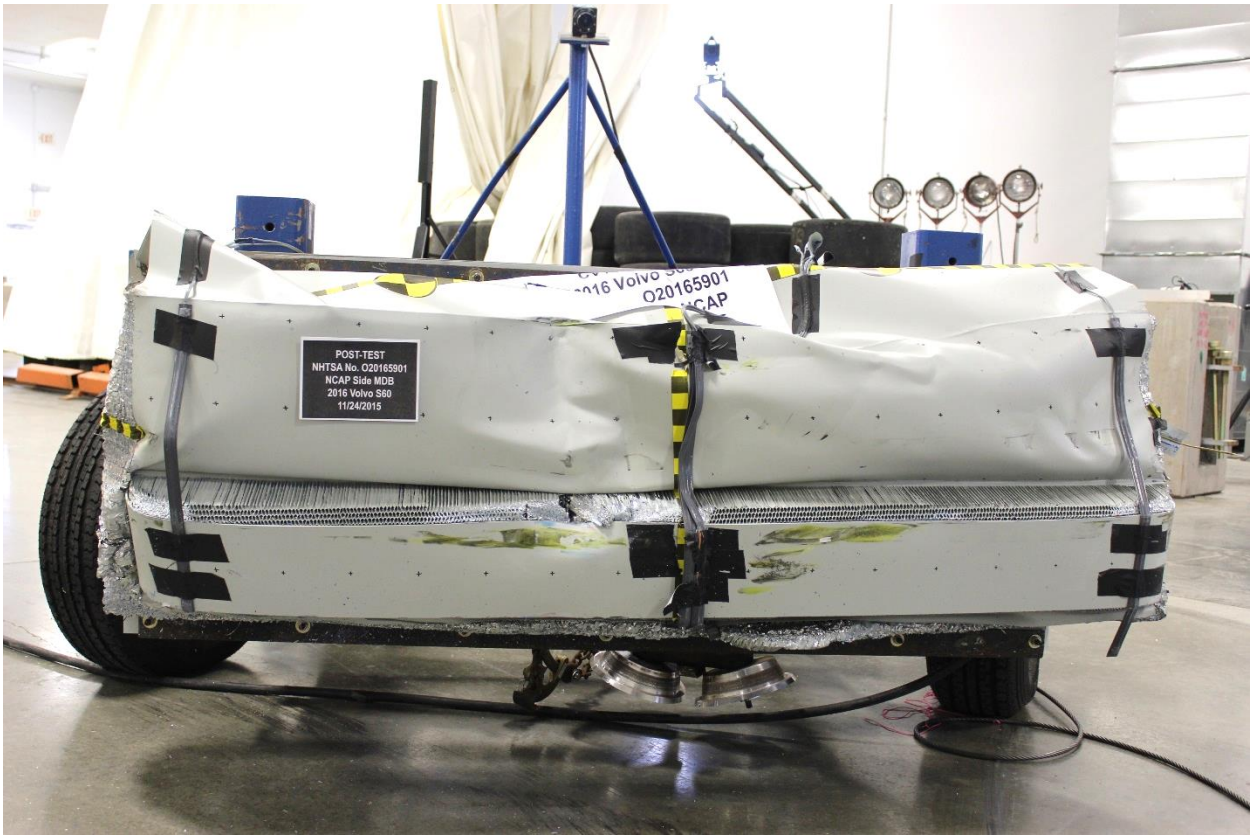

Figure A-85: Post-Test Front View of MDB Impactor Face

Figure A-86: Pre-Test Top View of MDB Impactor Face

Figure A-87: Post-Test Top View of MDB Impactor Face

Figure A-88: Pre-Test Left Side View of MDB Impactor Face

Figure A-89: Post-Test Left Side View of MDB Impactor Face

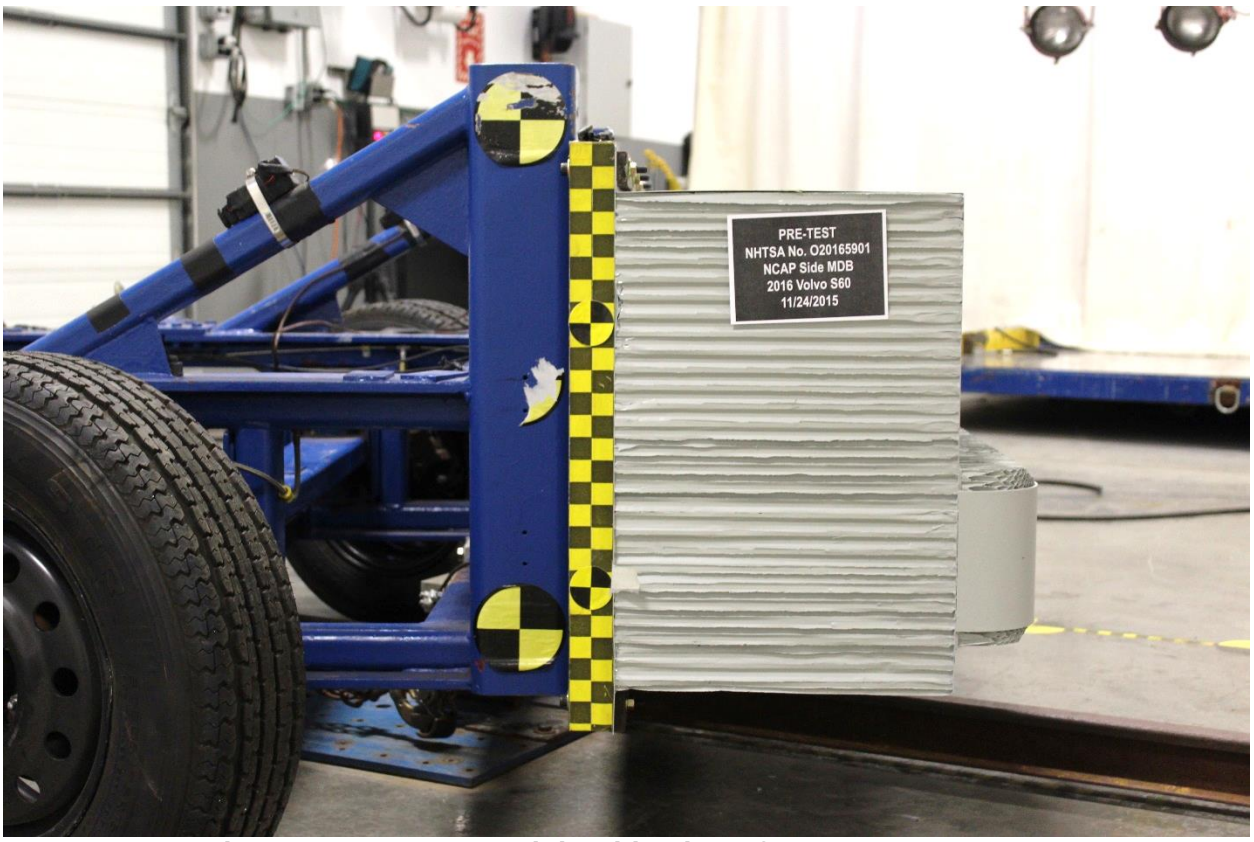

Figure A-90: Pre-Test Right Side View of MDB Impactor Face

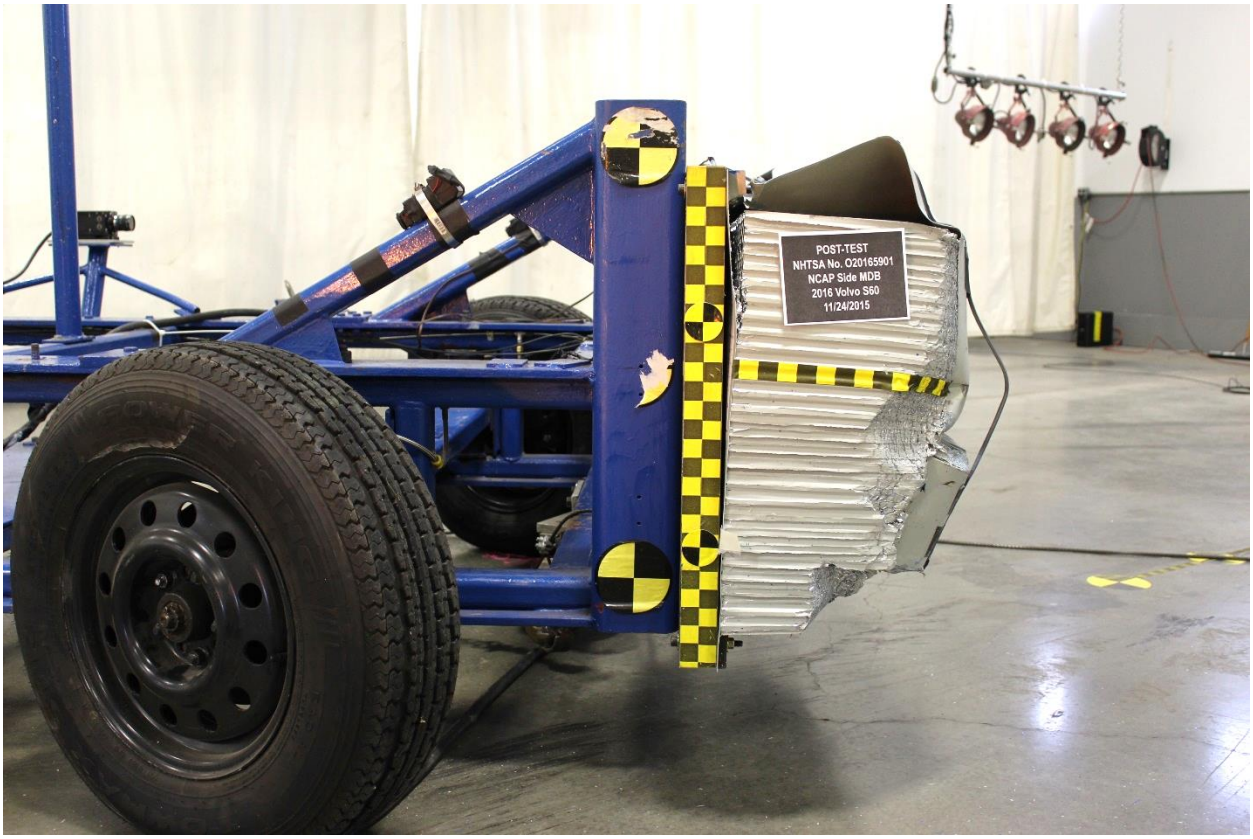

Figure A-91: Post-Test Right Side View of MDB Impactor Face

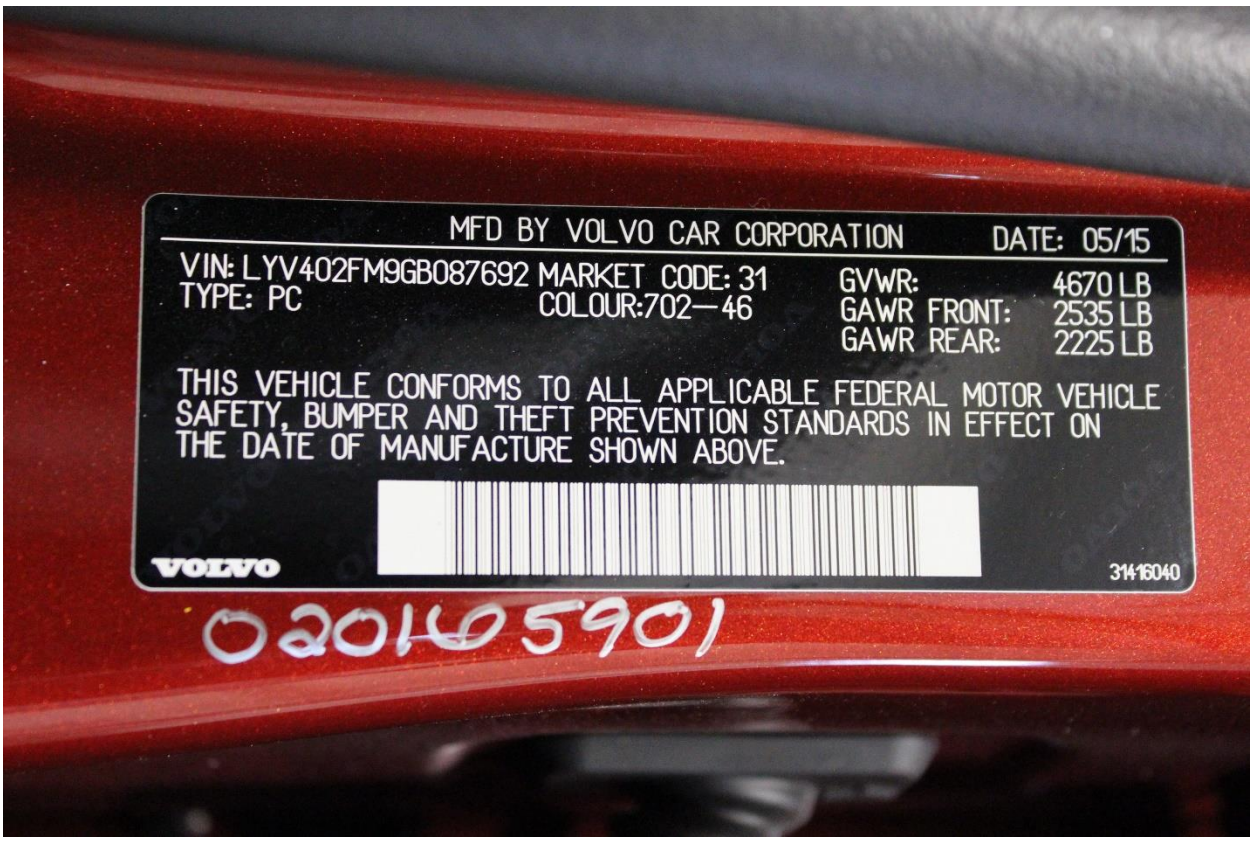

Figure A-92: Close-Up View of Vehicle's Certification Label

Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

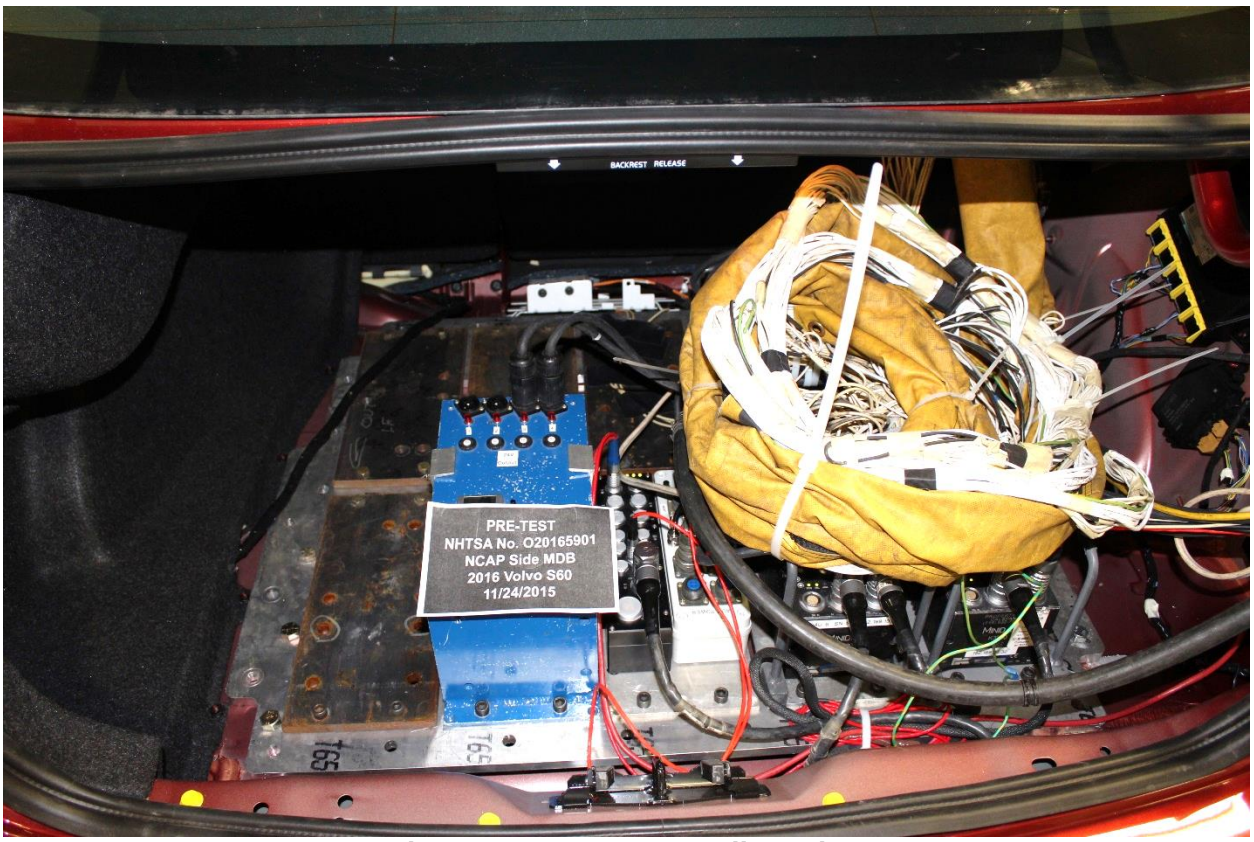

Figure A-94: Pre-Test Ballast View

Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out

Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

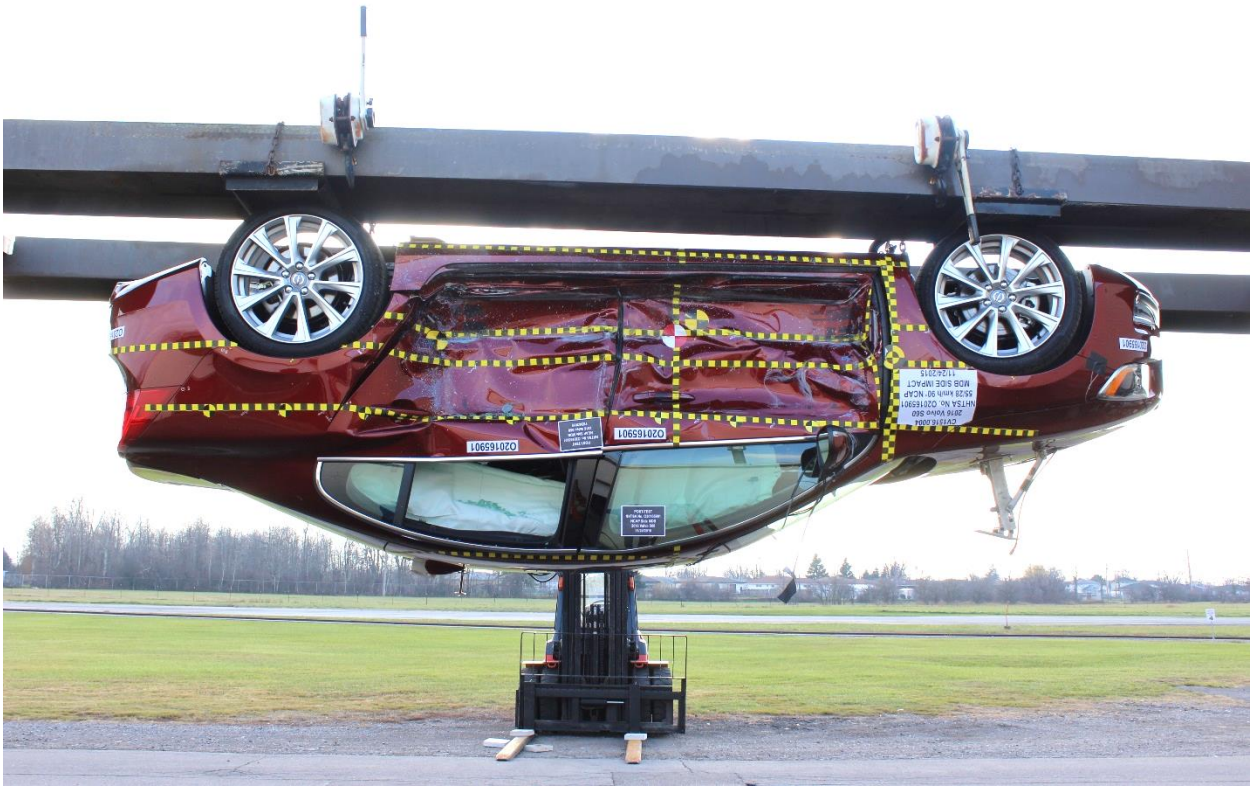

Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees

Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-101: Impact Event

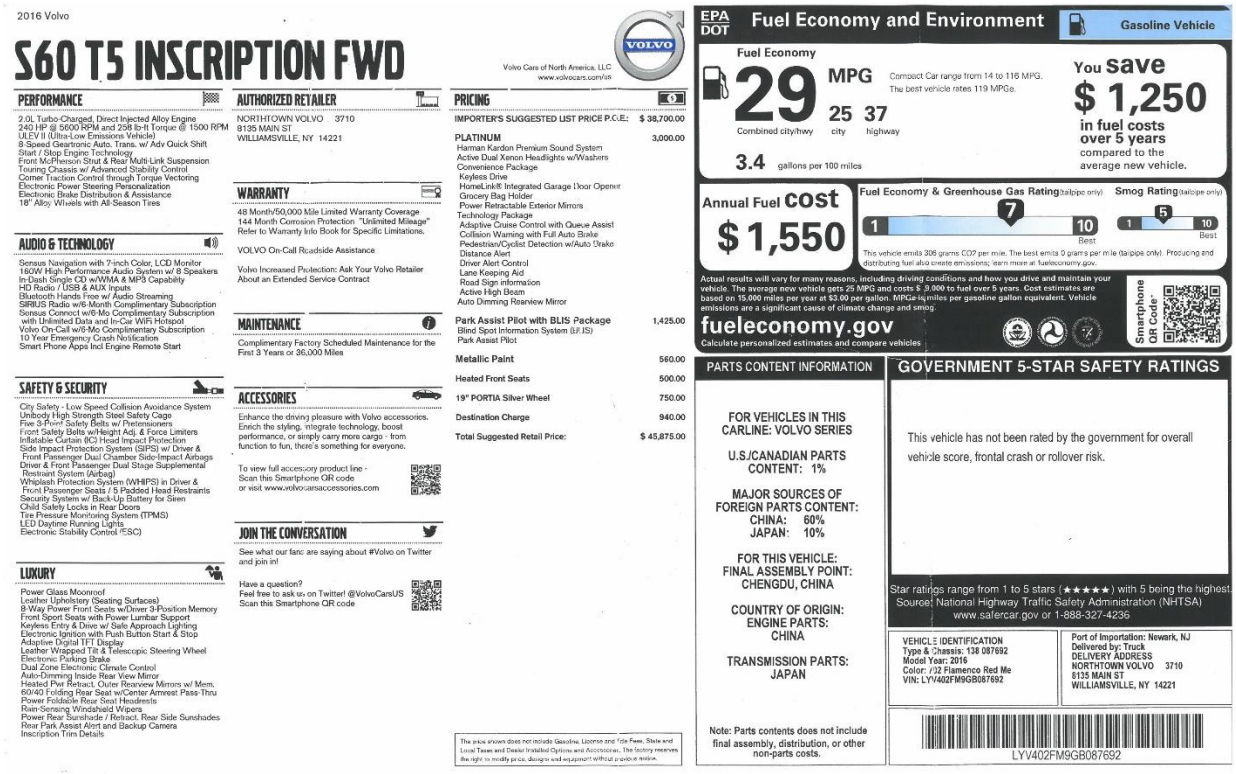

Figure A-102: Monroney Label

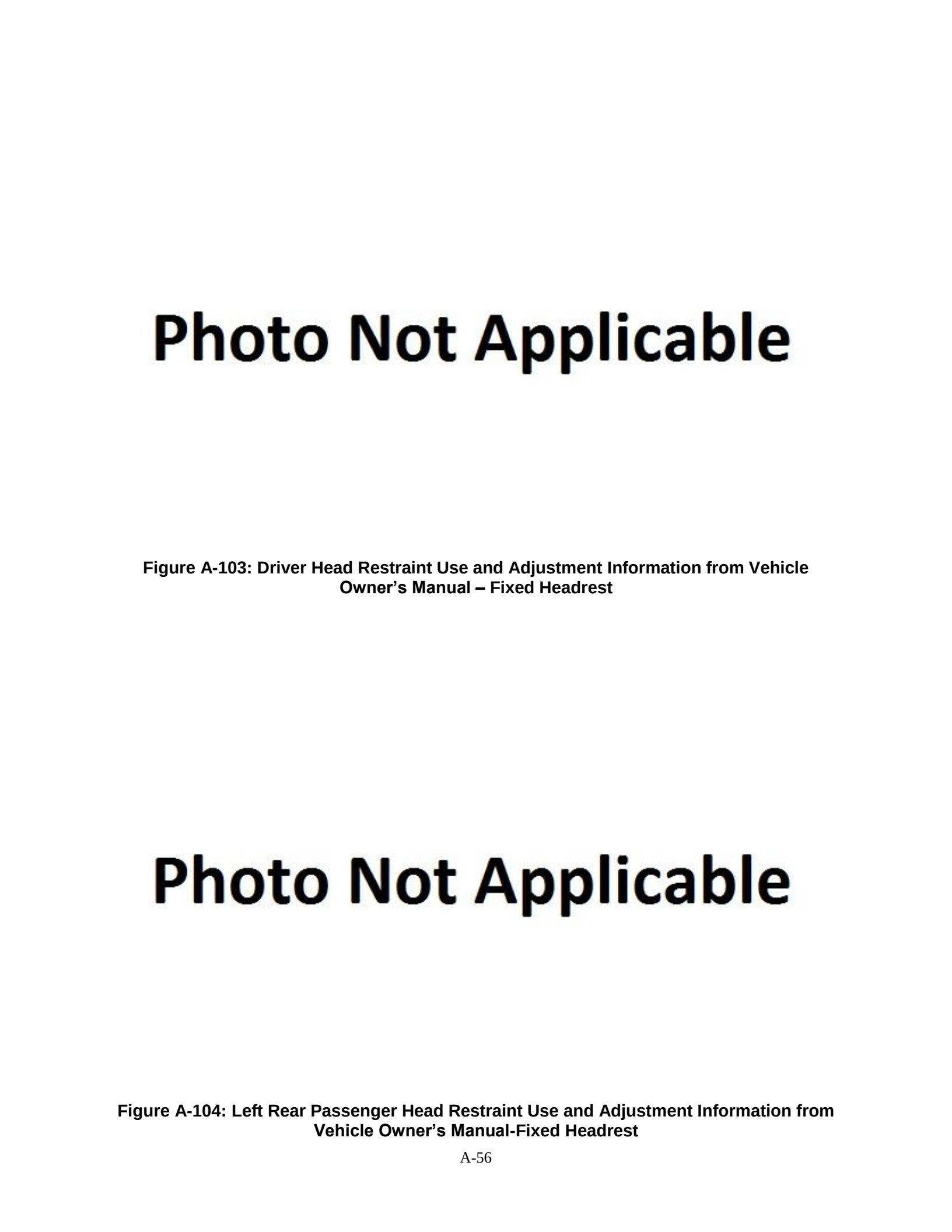

Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual – Fixed Headrest

Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual-Fixed Headrest

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

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The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

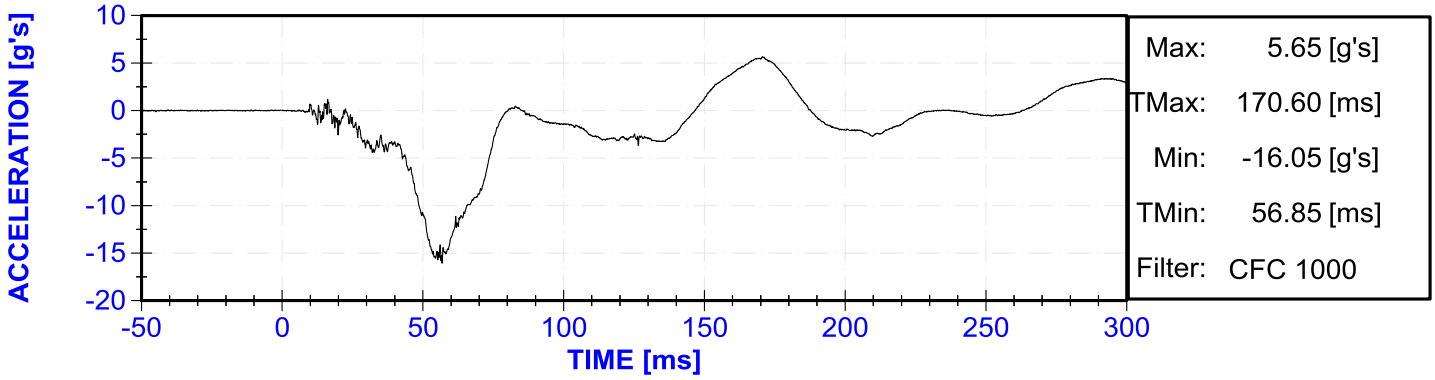
Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

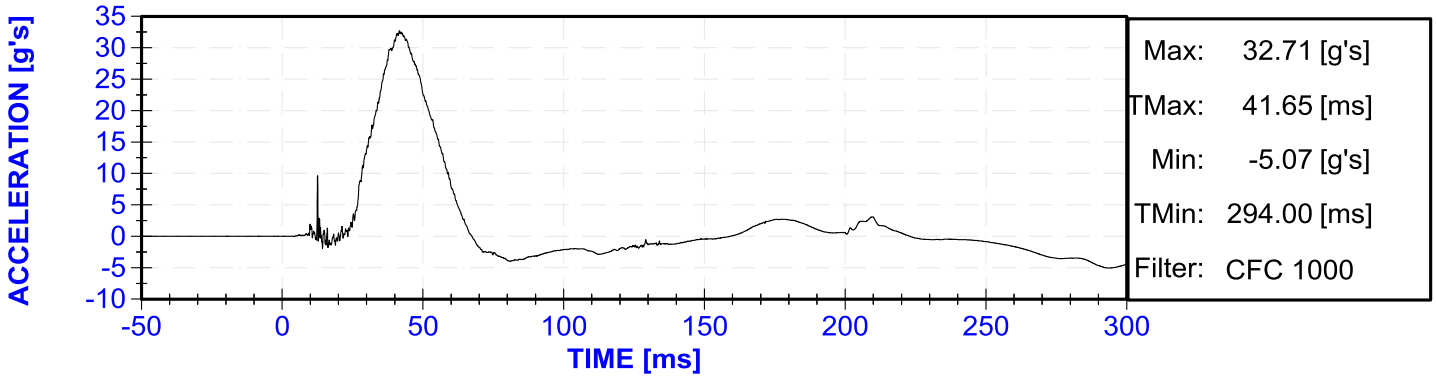
MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

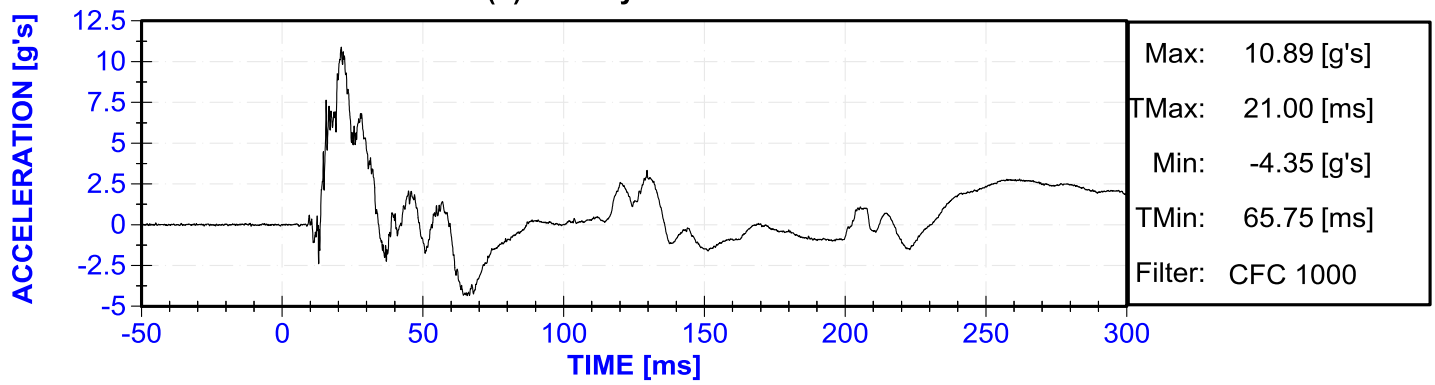
Driver Head Acceleration (X) Primary vs. Time



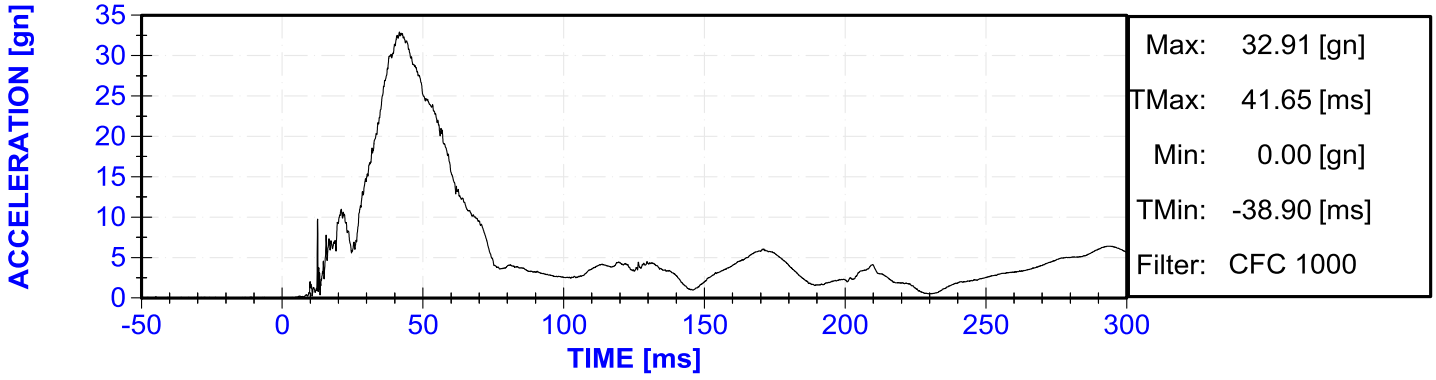
Driver Head Acceleration (Y) Primary vs. Time



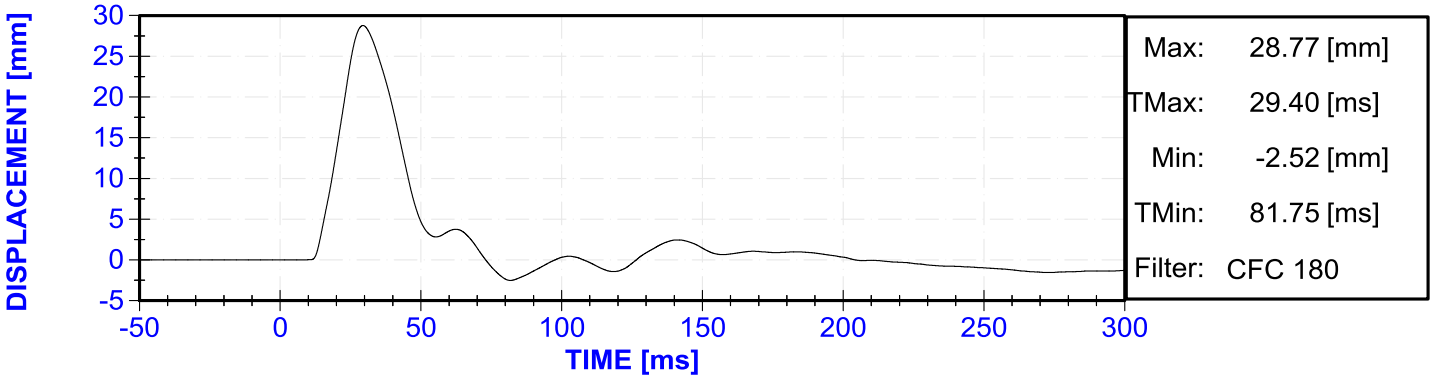
Driver Head Acceleration (Z) Primary vs. Time



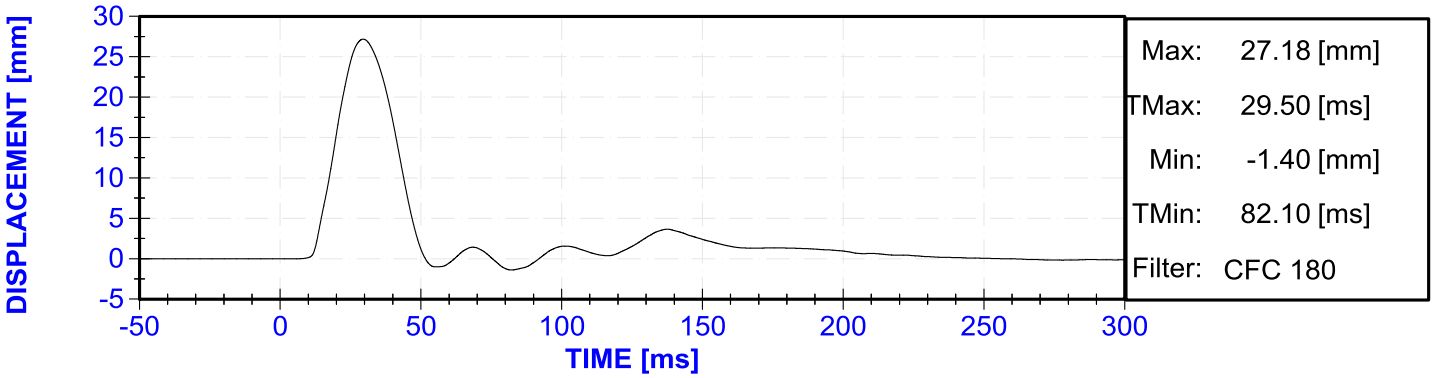
Driver Head Resultant Acceleration Primary vs. Time



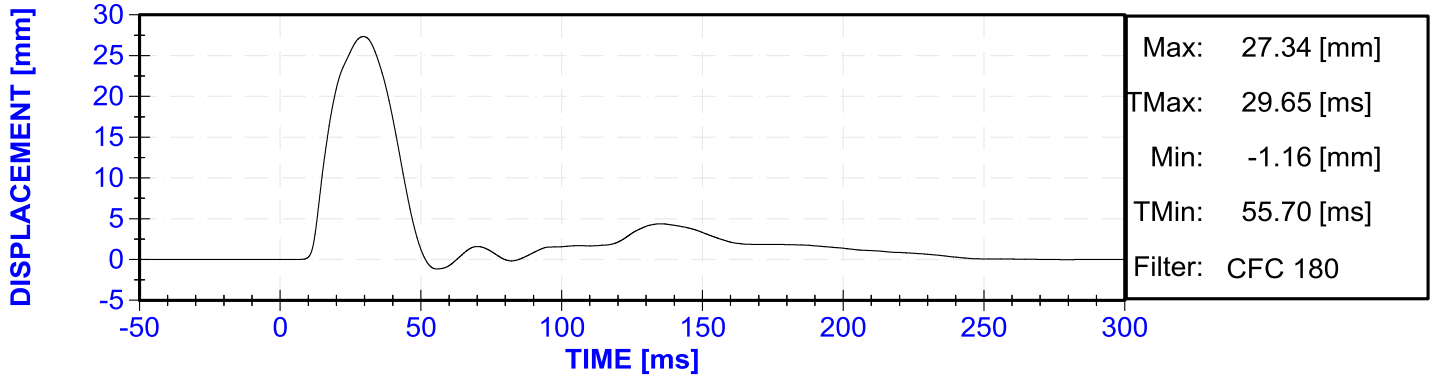
Driver Upper Thorax Rib Deflection (Y) vs. Time



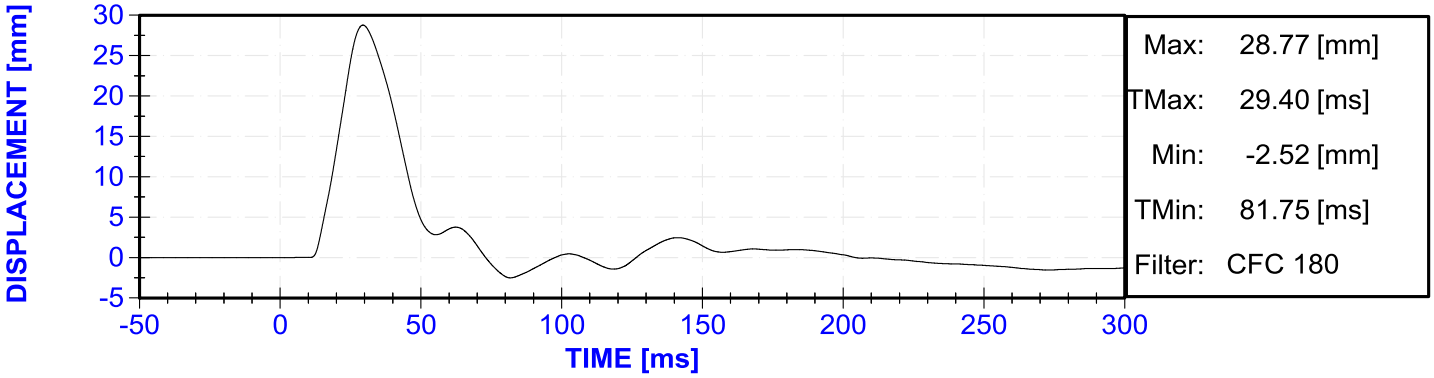
Driver Middle Thorax Rib Deflection (Y) vs. Time



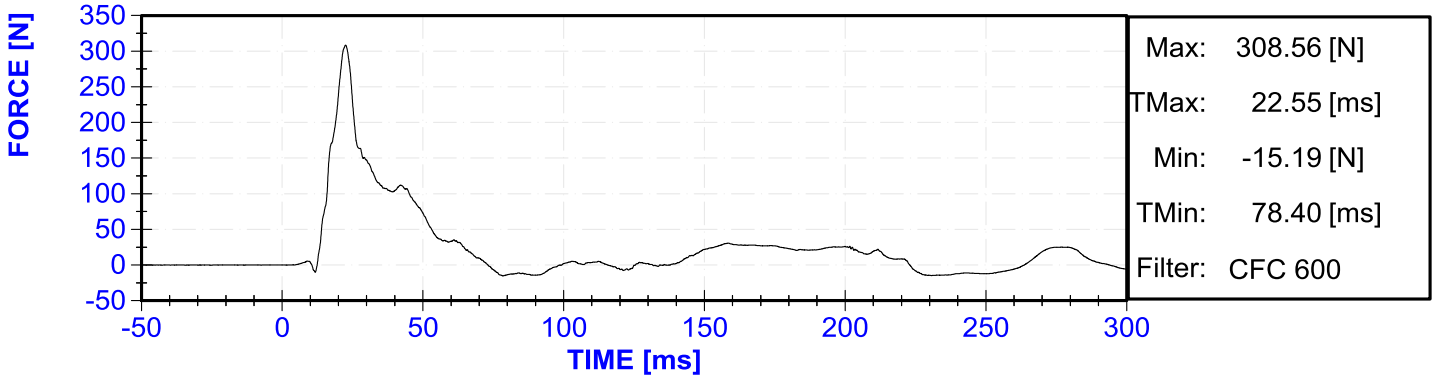
Driver Lower Thorax Rib Deflection (Y) vs. Time



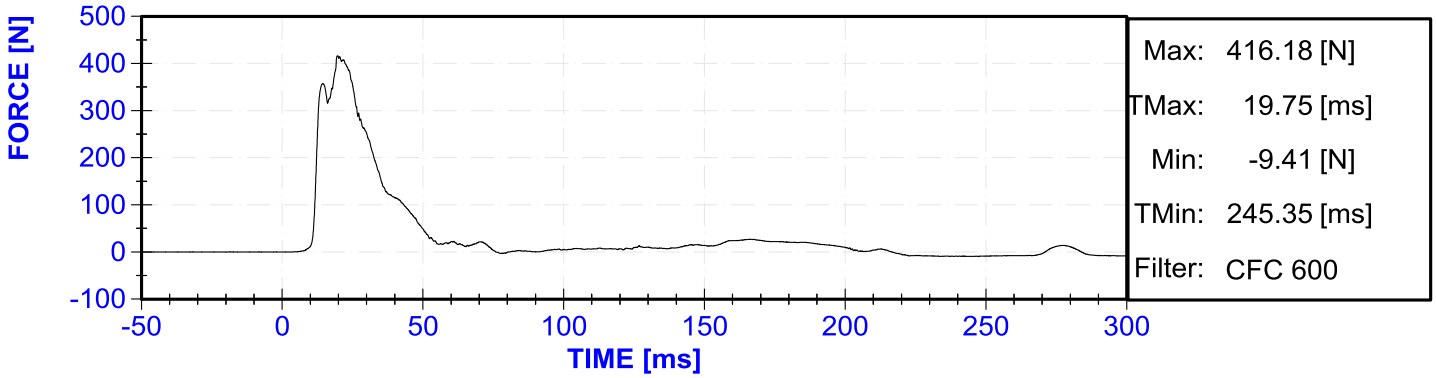
Driver Thorax Rib Deflection Maximum vs. Time



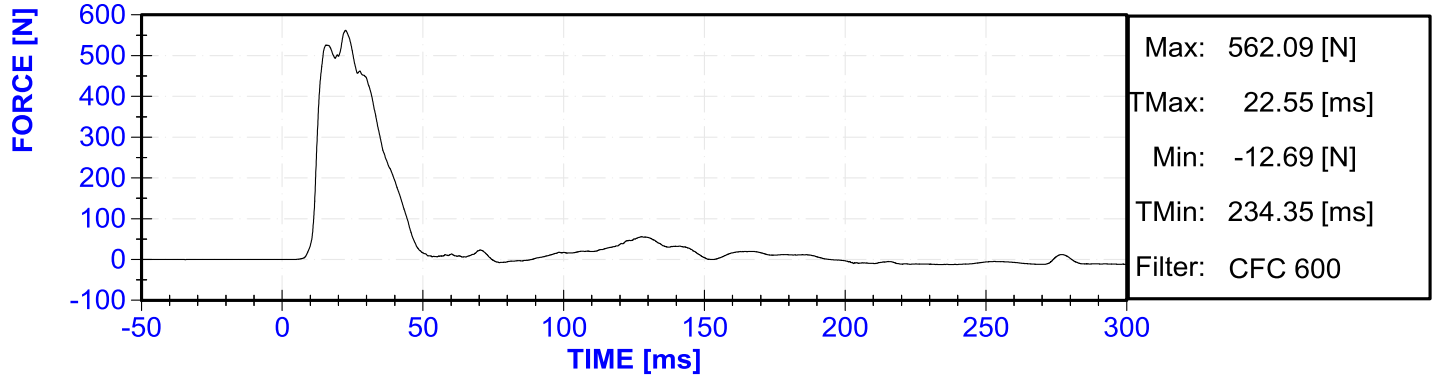
Driver Anterior Abdominal Force (Y) vs. Time



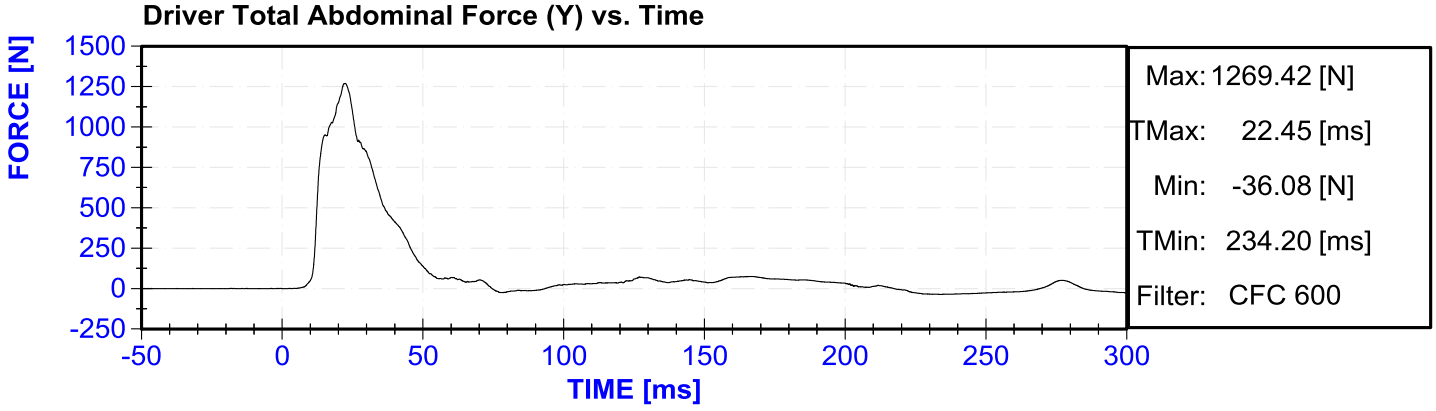
Driver Middle Abdominal Force (Y) vs. Time



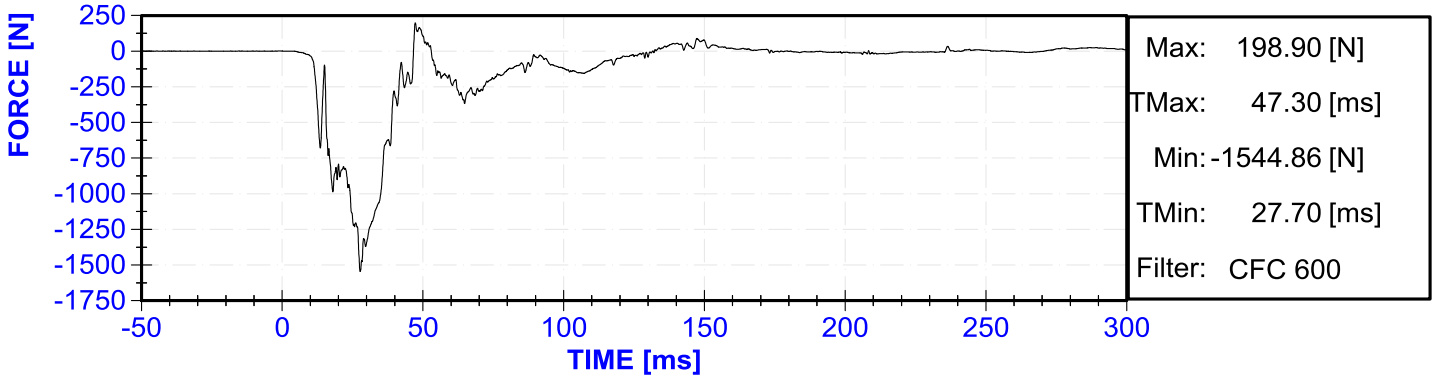
Driver Posterior Abdominal Force (Y) vs. Time



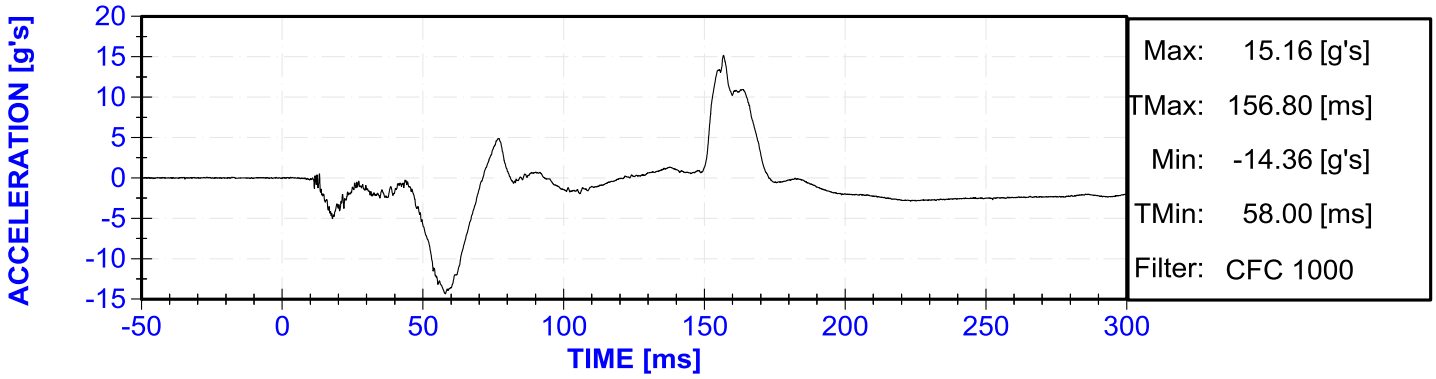
Driver Total Abdominal Force (Y) vs. Time



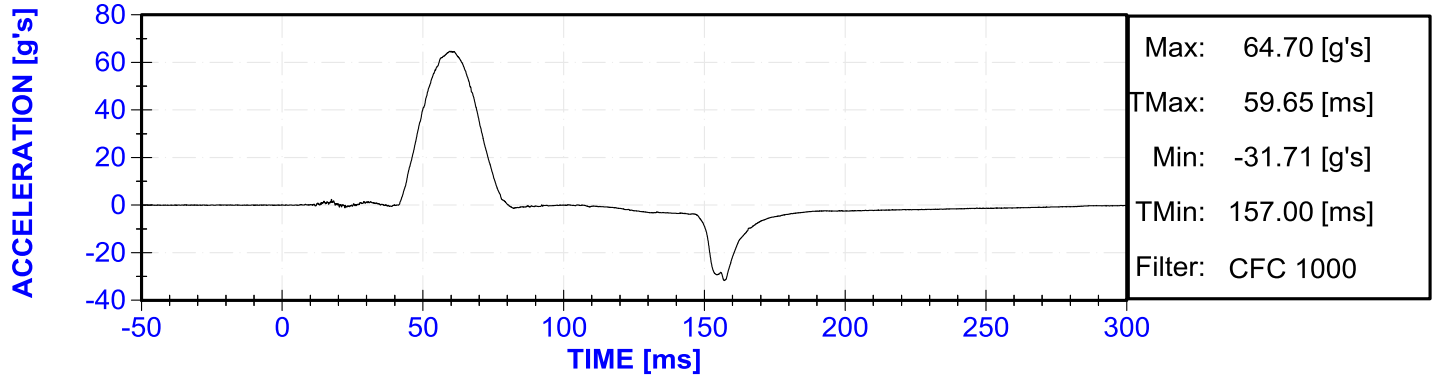
Driver Pubic Symphysis Force (Y) vs. Time



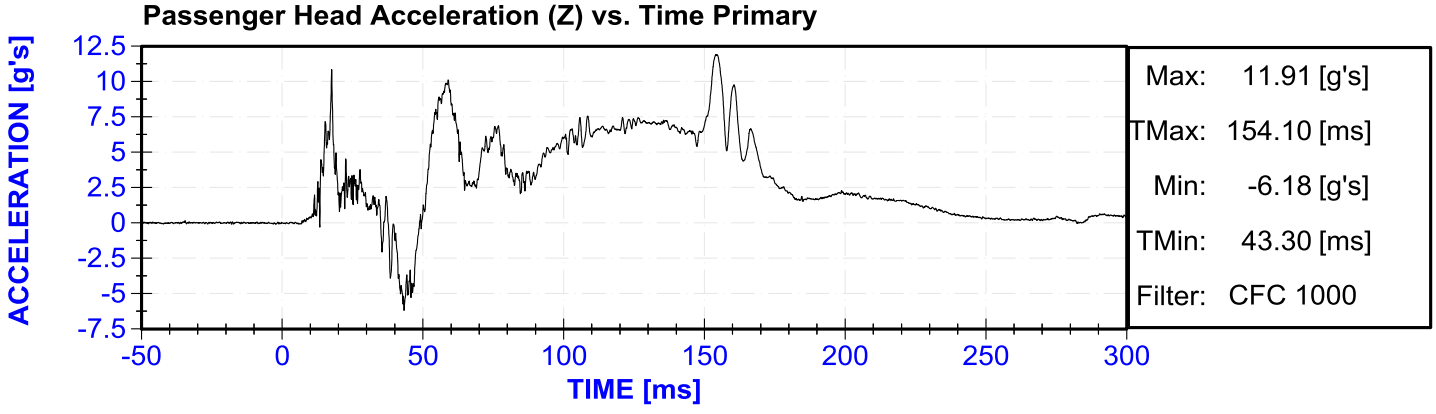
Passenger Head Acceleration (X) vs. Time Primary



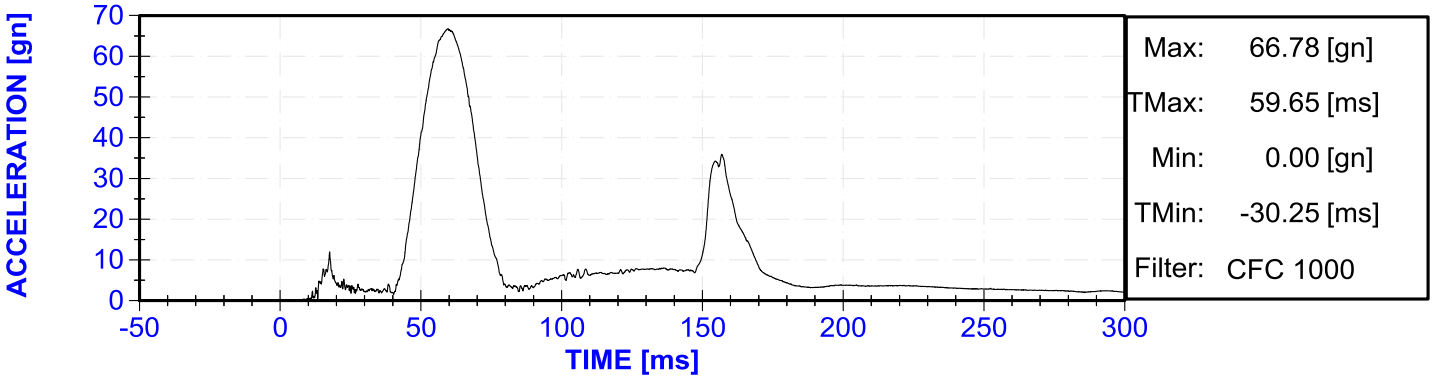
Passenger Head Acceleration (Y) vs. Time Primary



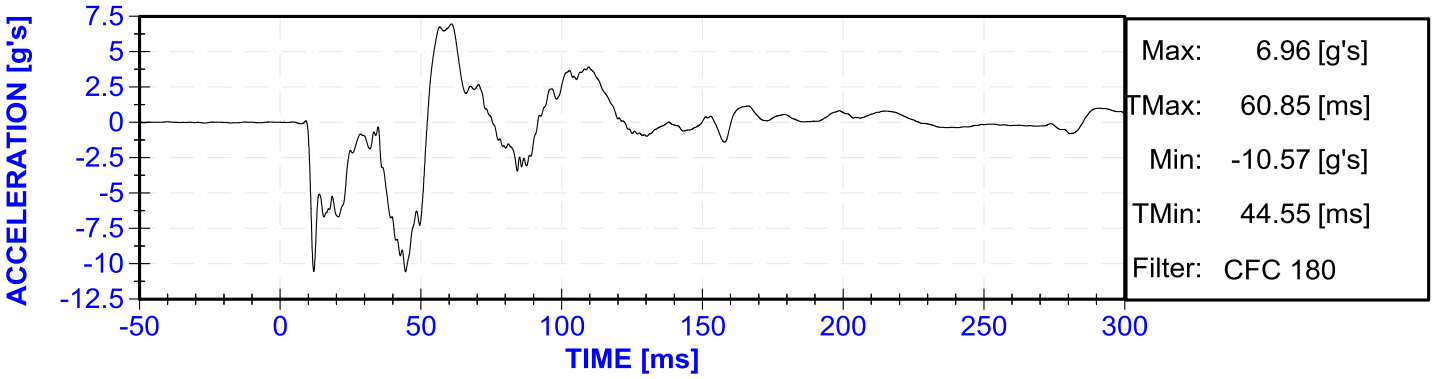
Passenger Head Acceleration (Z) vs. Time Primary



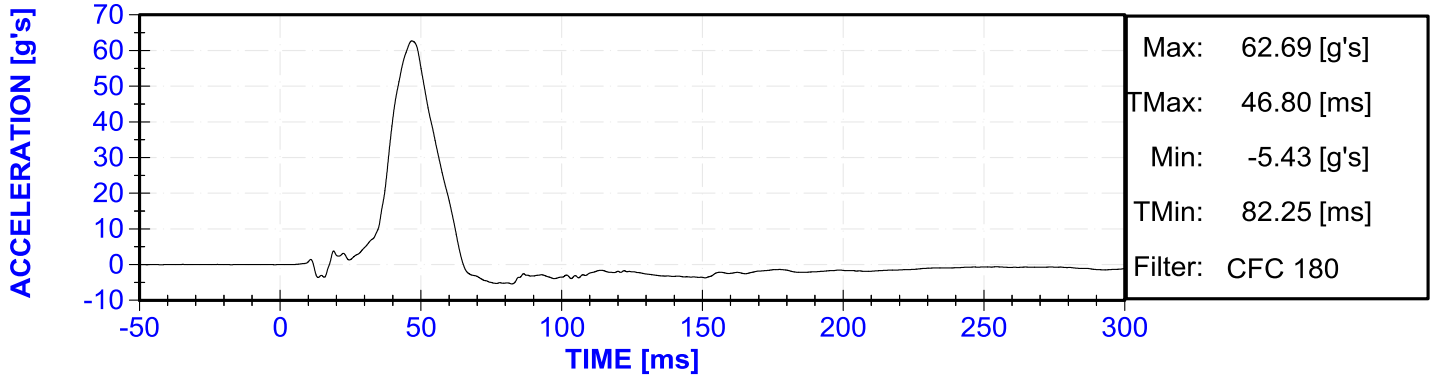
Passenger Head Resultant Acceleration Primary vs. Time



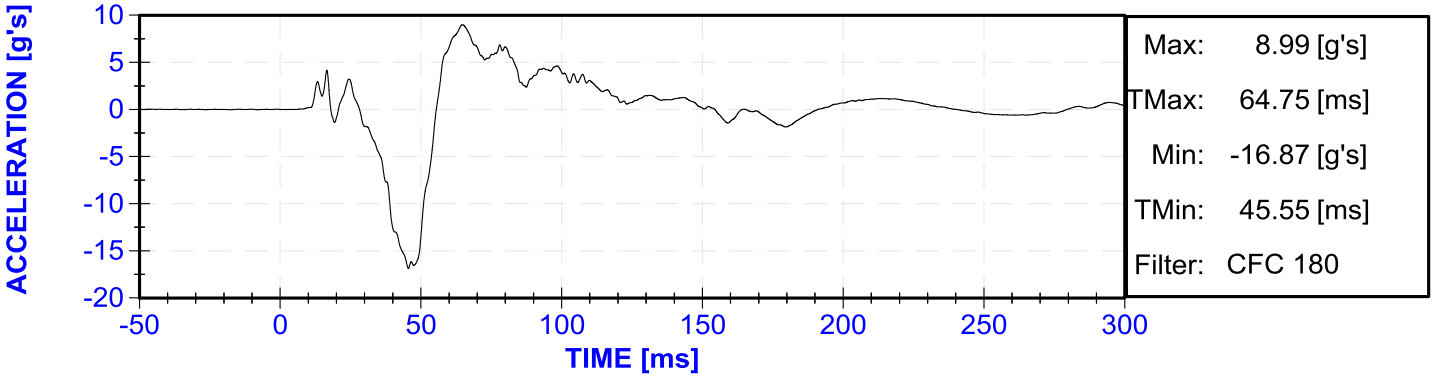
Passenger Lower Spine T12 Acceleration (X) vs. Time



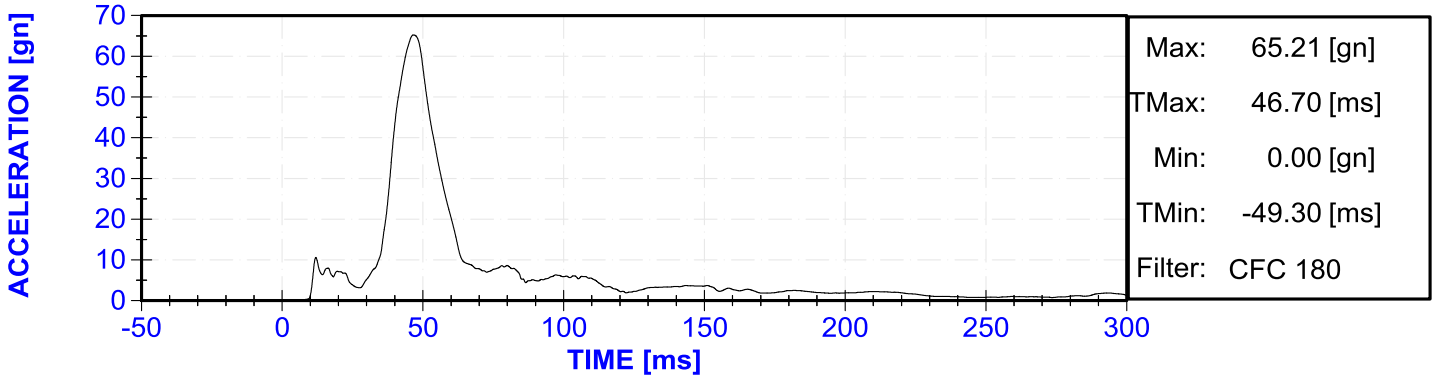
Passenger Lower Spine T12 Acceleration (Y) vs. Time



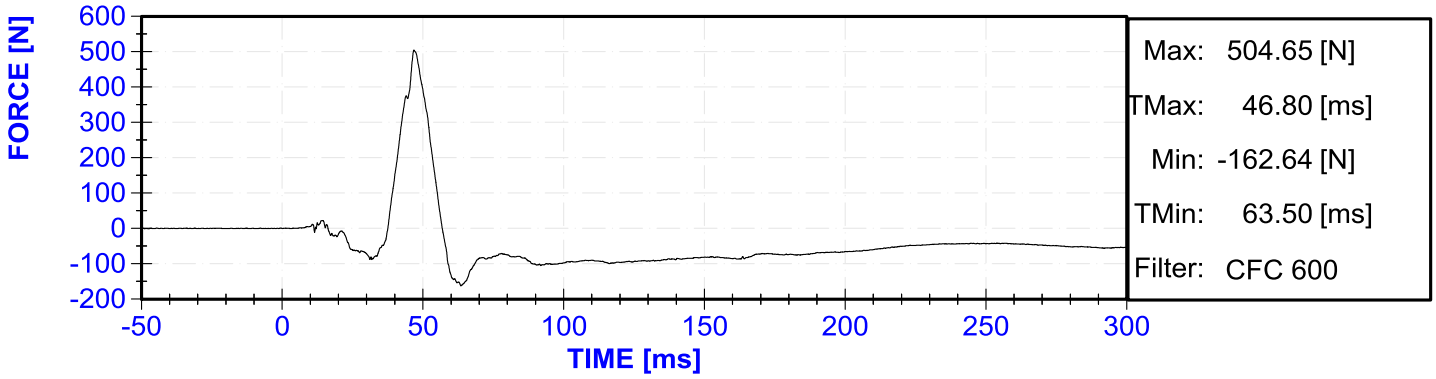
Passenger Lower Spine T12 Acceleration (Z) vs. Time



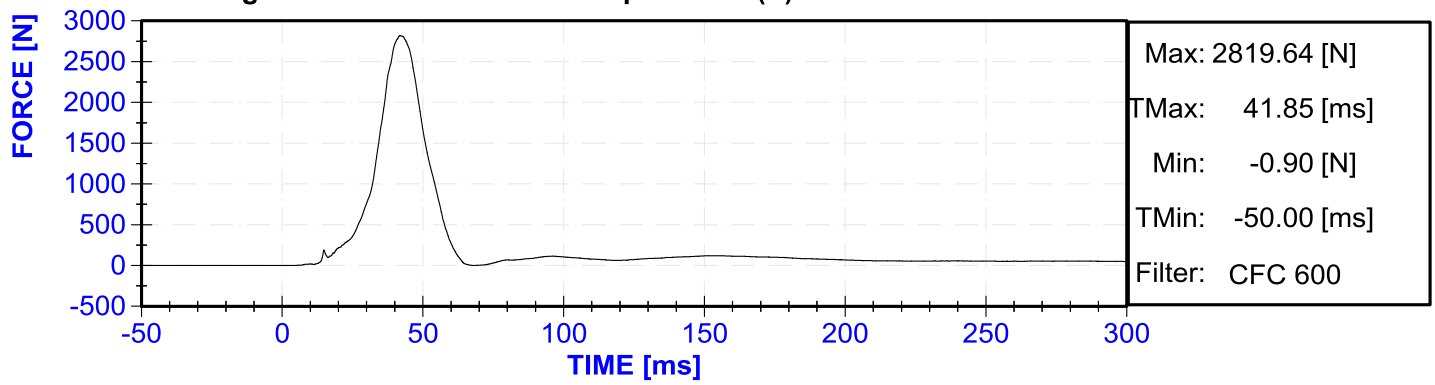
Passenger Lower Spine T12 Resultant Acceleration vs. Time



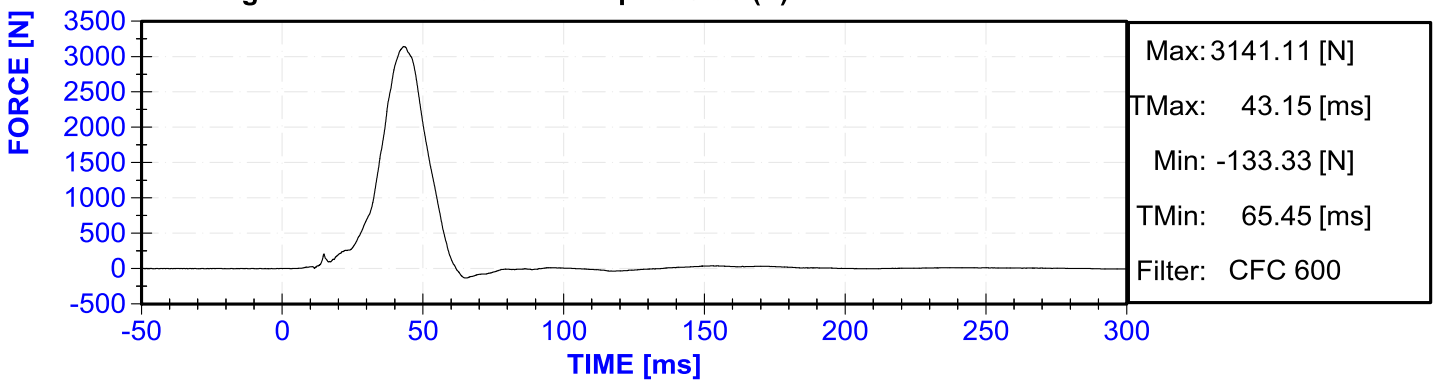
Passenger Iliac Force on Impact Side (Y) vs. Time



Passenger Acetabulum Force on Impact Side (Y) vs. Time



Passenger Total Pelvic Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

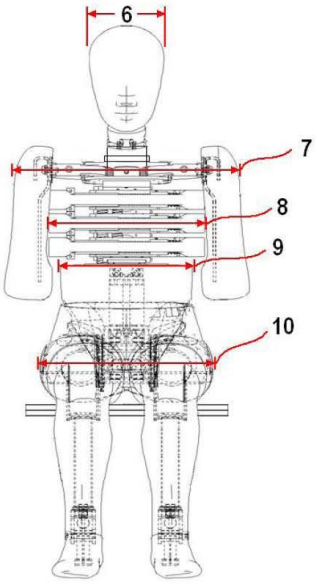
SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

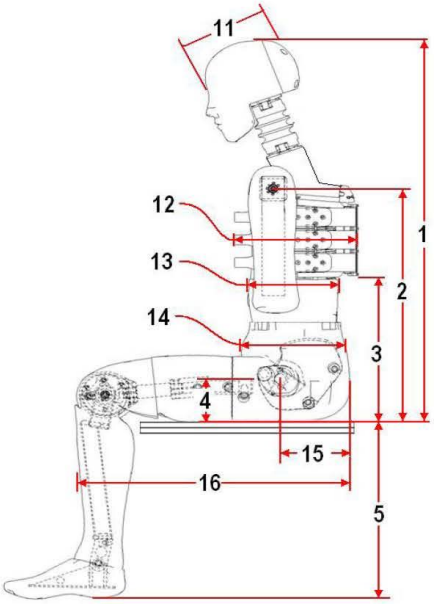
External Measurements - EuroSID-2re

Technician: M. Geesey Date: 11/12/2015

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	560	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	349	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	415	Pass
6	Head Width	152	158	154	Pass
7	Shoulder/Arm Width	461	479	478	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	369	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	267	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	603	Pass

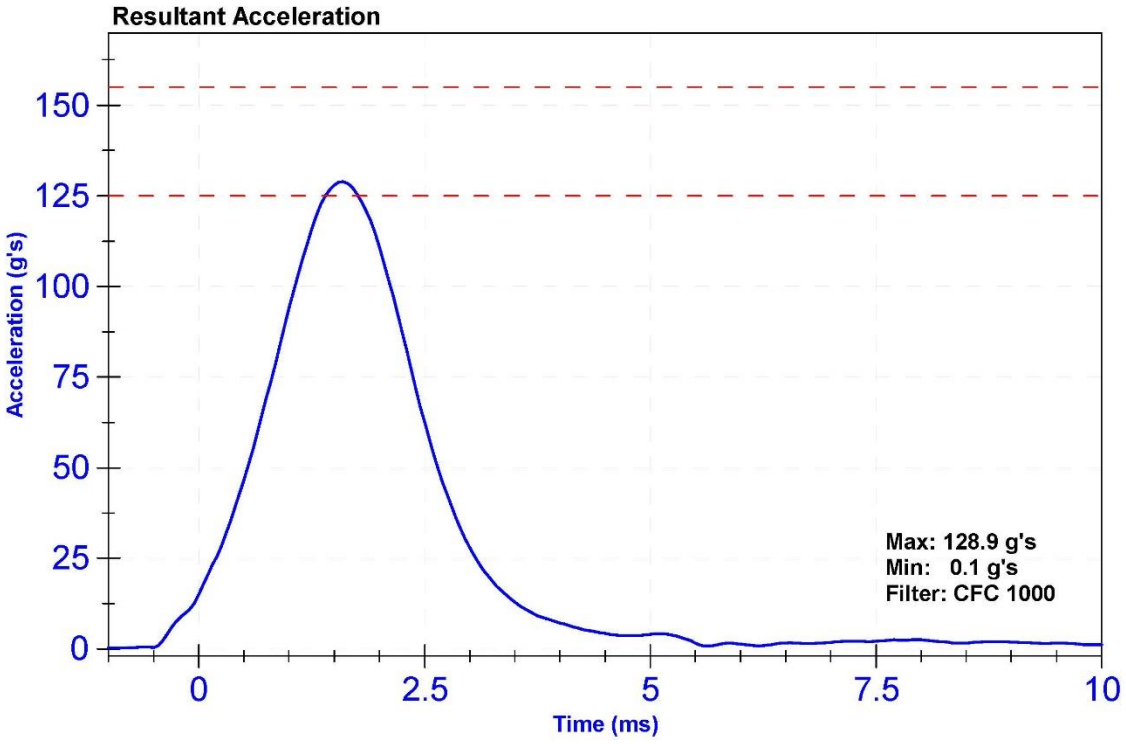
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	FO34	Laboratory Supervisor	M. Goehle

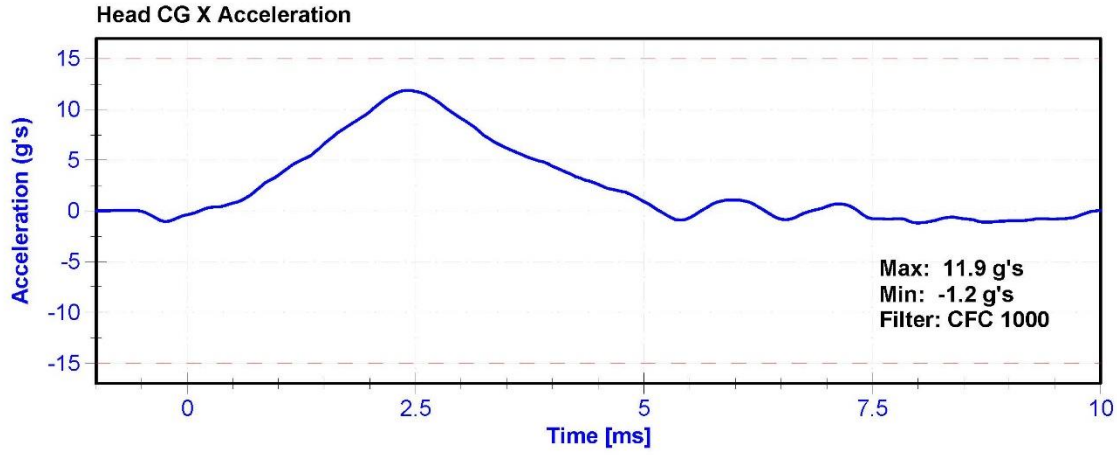
Results

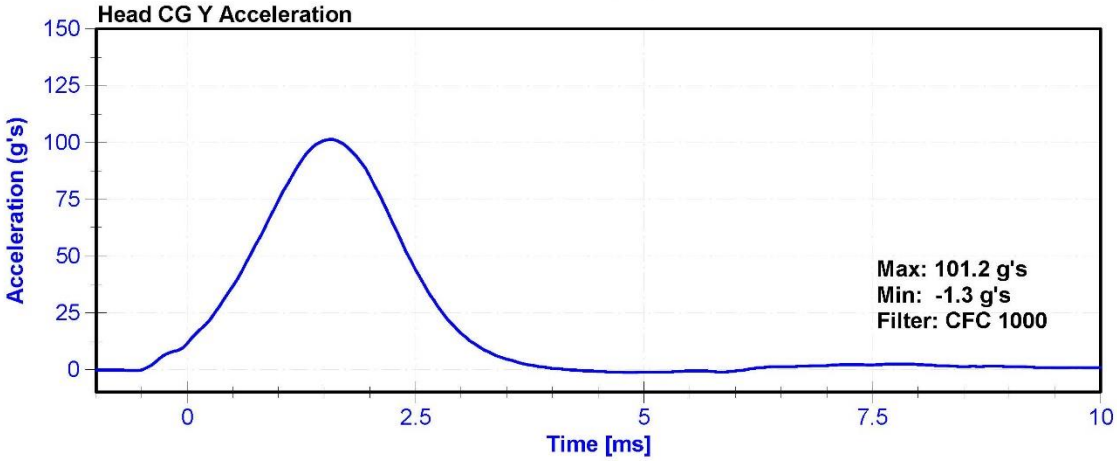
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	29.5	Pass
Resultant Acceleration	125	155	g's	128.9	Pass
Oscillation	0	15	%	3.22	Pass
Fore-Aft Acceleration	-15	15	g's	11.9	Pass

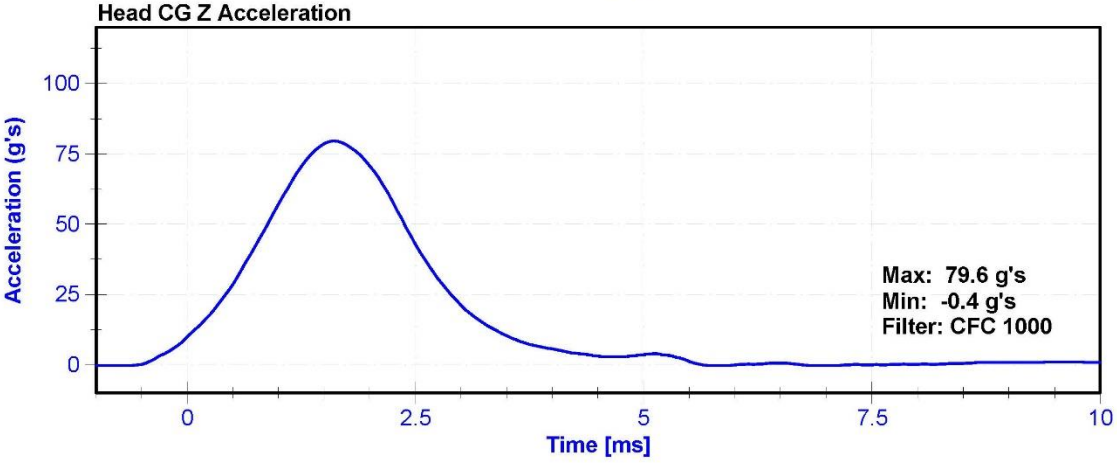
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58904	10/19/2015	4/18/2016
Y Accelerometer	ENDEVCO 7264CT	AC-P58911	10/19/2015	4/18/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P58776	10/19/2015	4/18/2016




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 11.9 g's
Min: -1.2 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]
Max: 101.2 g's
Min: -1.3 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]
Max: 79.6 g's
Min: -0.4 g's
Filter: CFC 1000

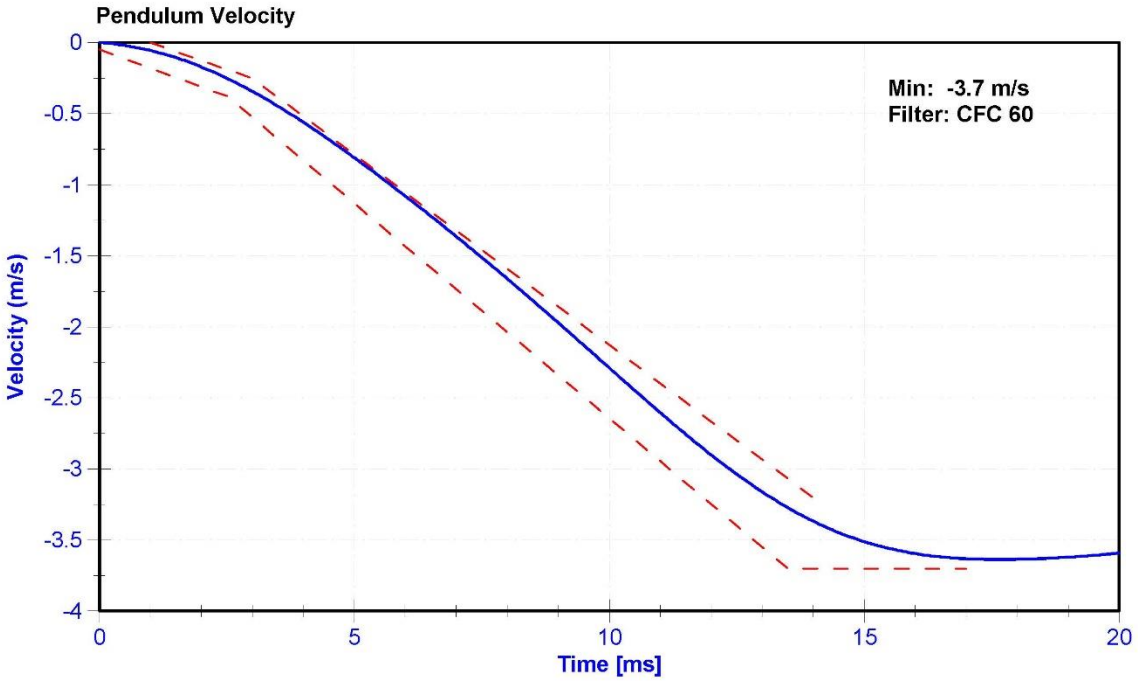
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

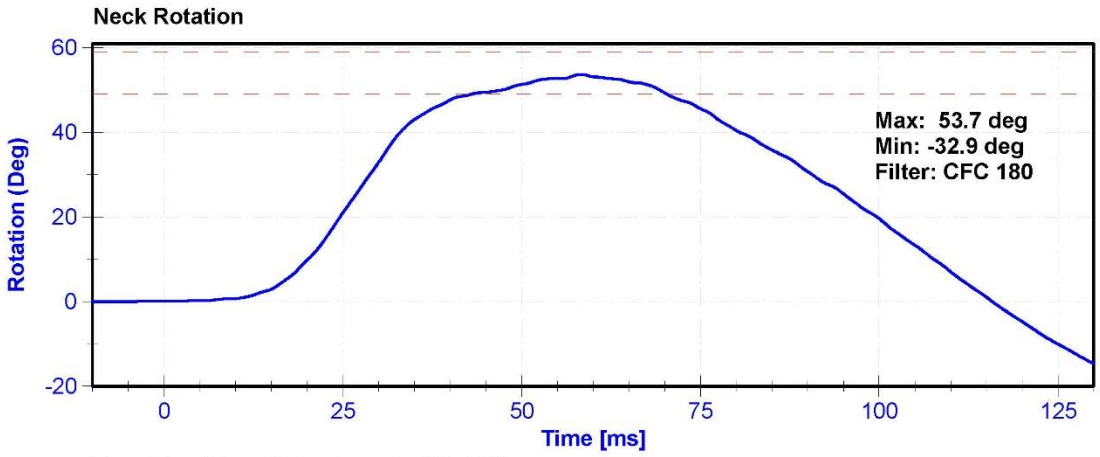
Results

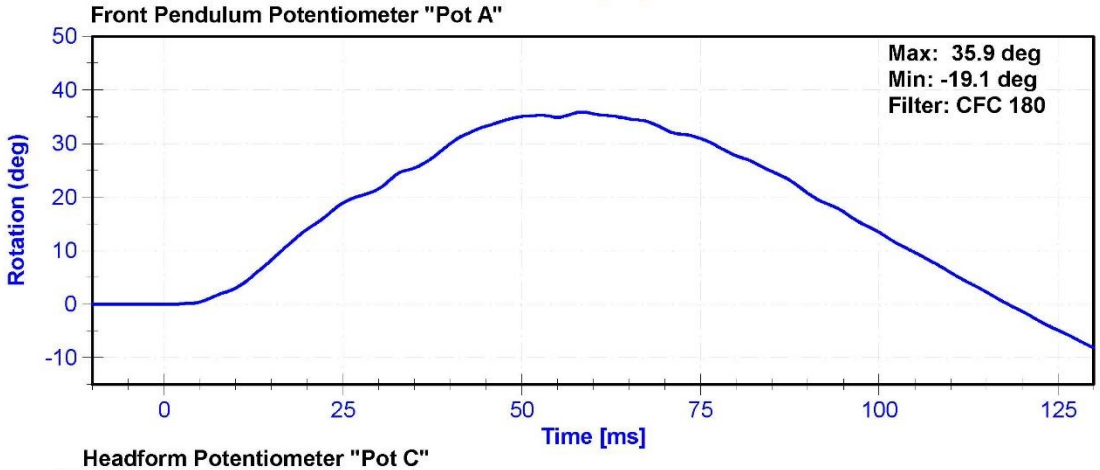
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	30.5	Pass
Velocity	3.3	3.5	m/s	3.46	Pass
Lateral Neck Rotation	49	59	deg	53.7	Pass
Time at Maximum Rotation	54	66	ms	58.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	57.5	Pass

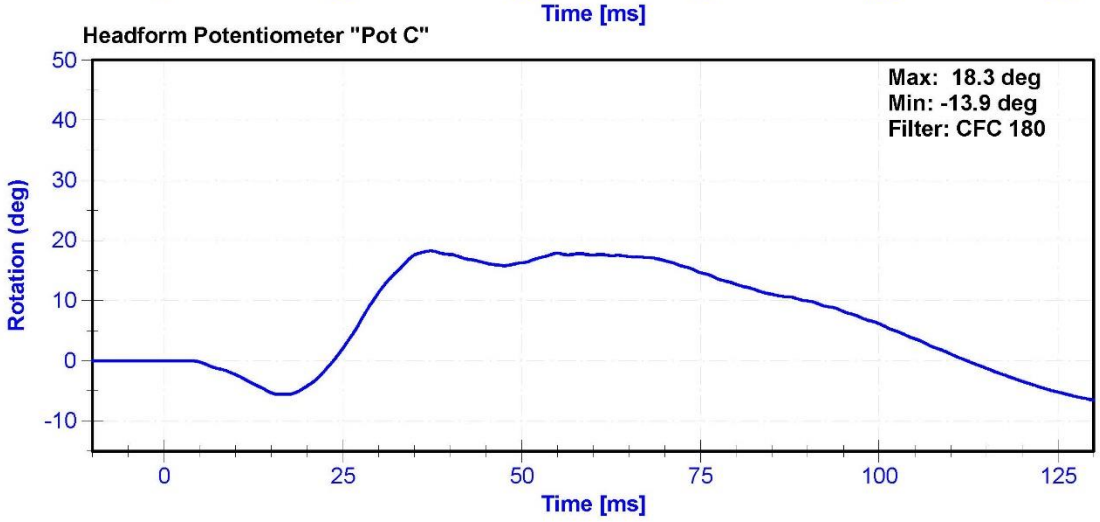
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Front Pendulum Potentiometer	SP22G	DS-094	9/24/2015	9/23/2016
Headform Potentiometer	SP22G	DS-095	9/24/2015	9/23/2016




Neck Rotation
Rotation (Deg)
60
40
20
0
-20
0
25
50
75
100
125
Time [ms]
Max: 53.7 deg
Min: -32.9 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
50
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]
Max: 35.9 deg
Min: -19.1 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
50
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]
Max: 18.3 deg
Min: -13.9 deg
Filter: CFC 180

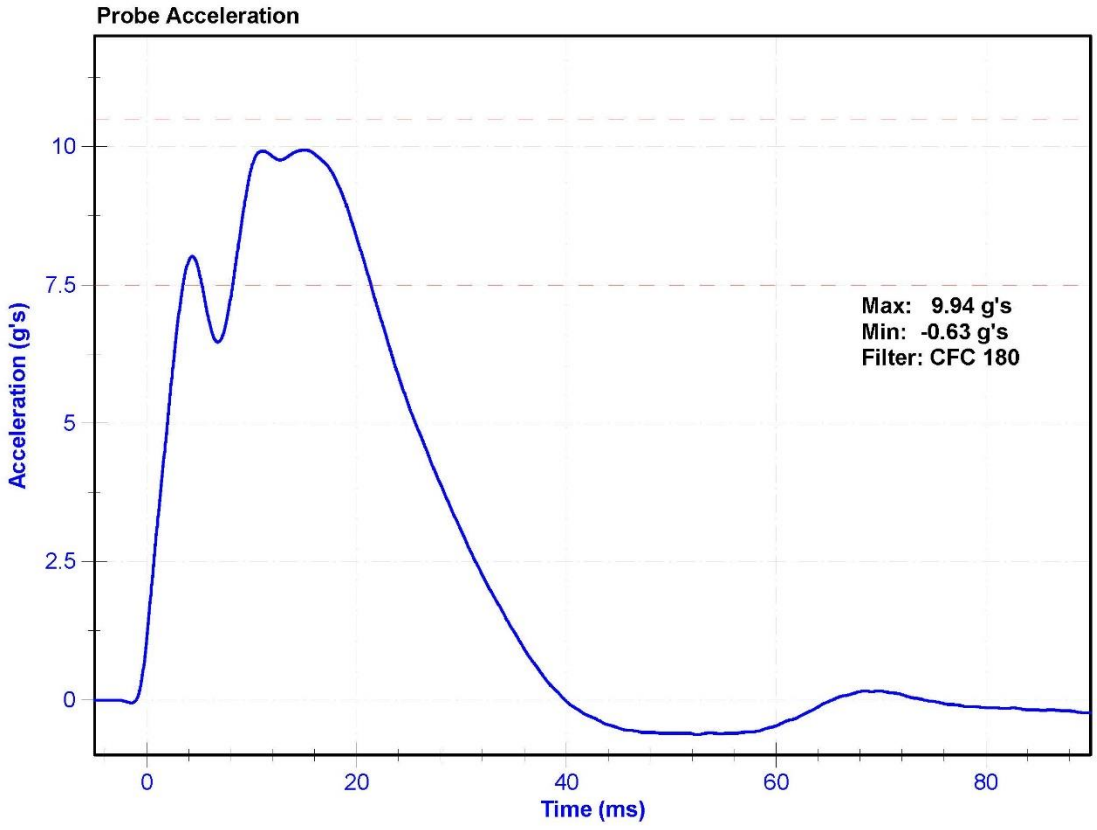
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	44.7	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	7.5	10.5	g's	9.94	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016



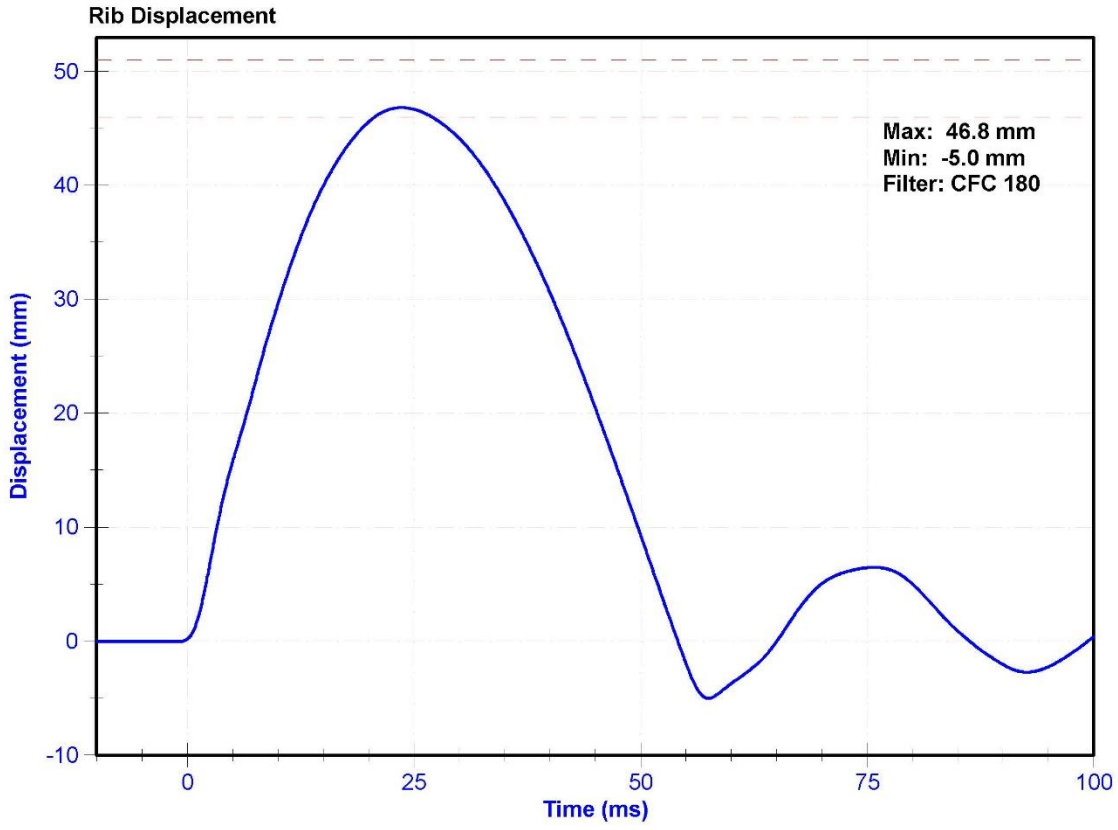
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	29.1	Pass
Rib Displacement	46	51	mm	46.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016



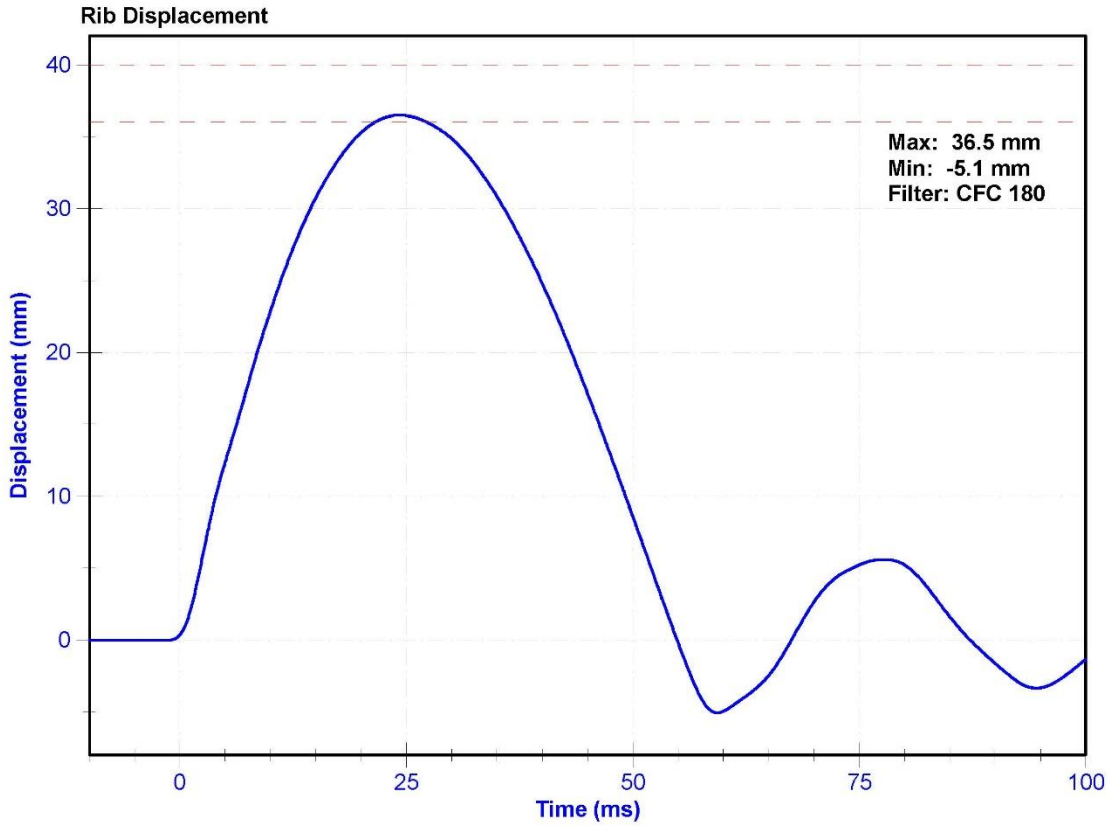
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	29.1	Pass
Rib Displacement	36	40	mm	36.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016



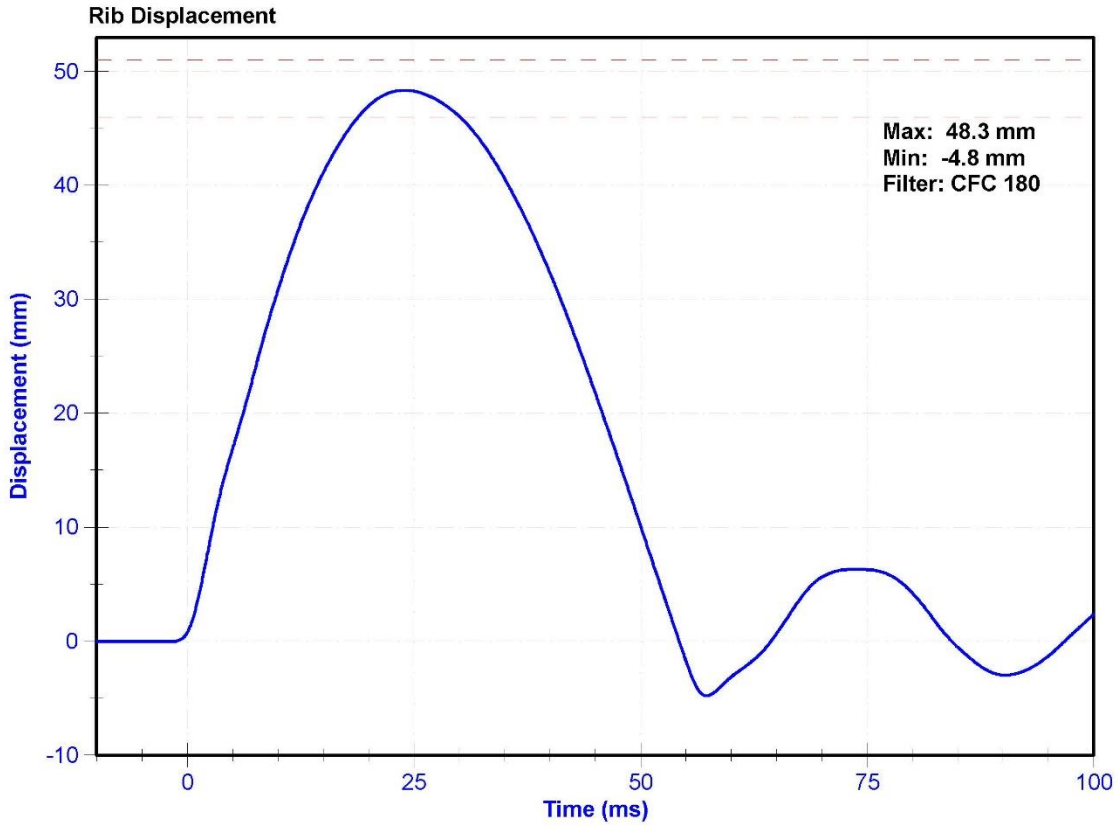
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	37.6	Pass
Rib Displacement	46	51	mm	48.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016



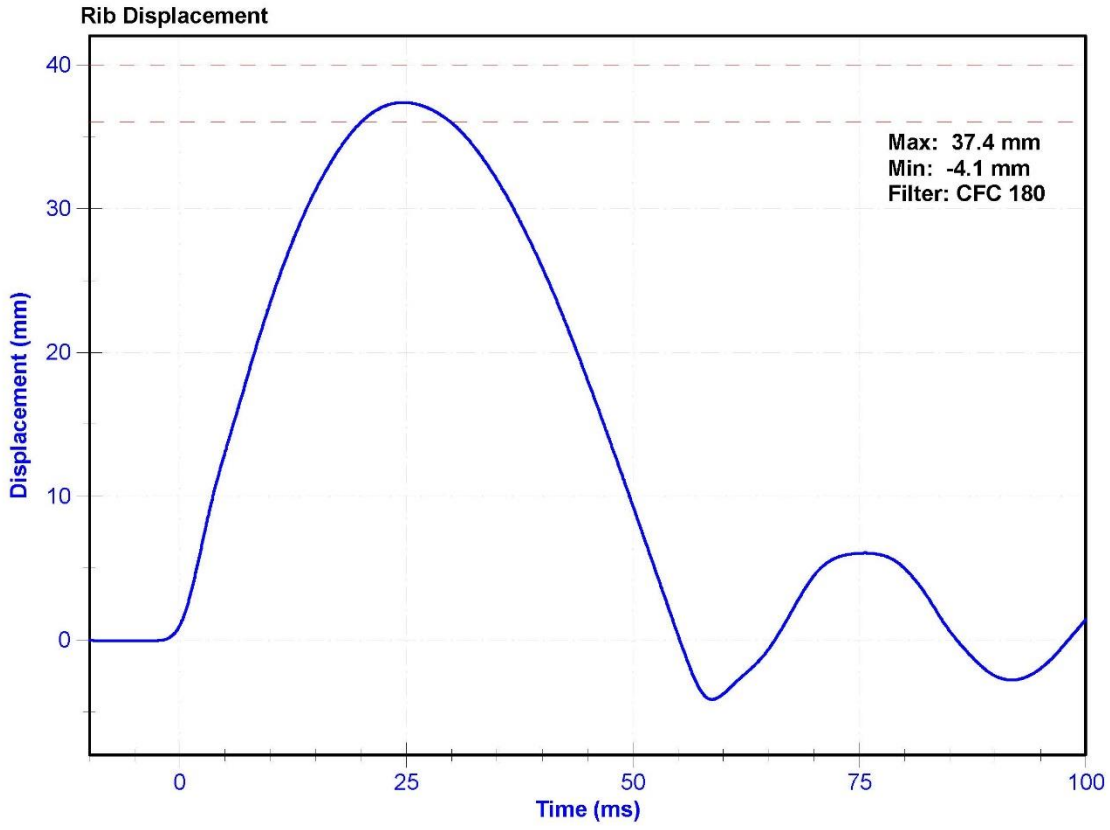
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	37.6	Pass
Rib Displacement	36	40	mm	37.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016



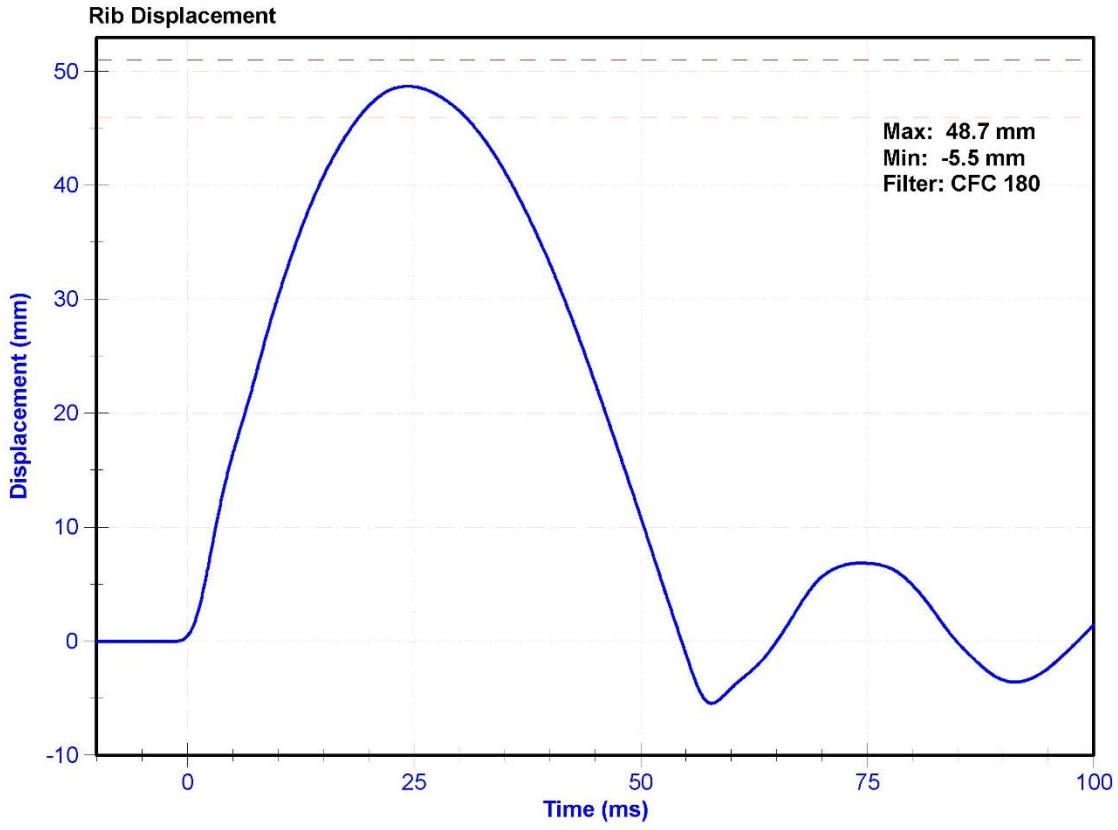
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	37.8	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016



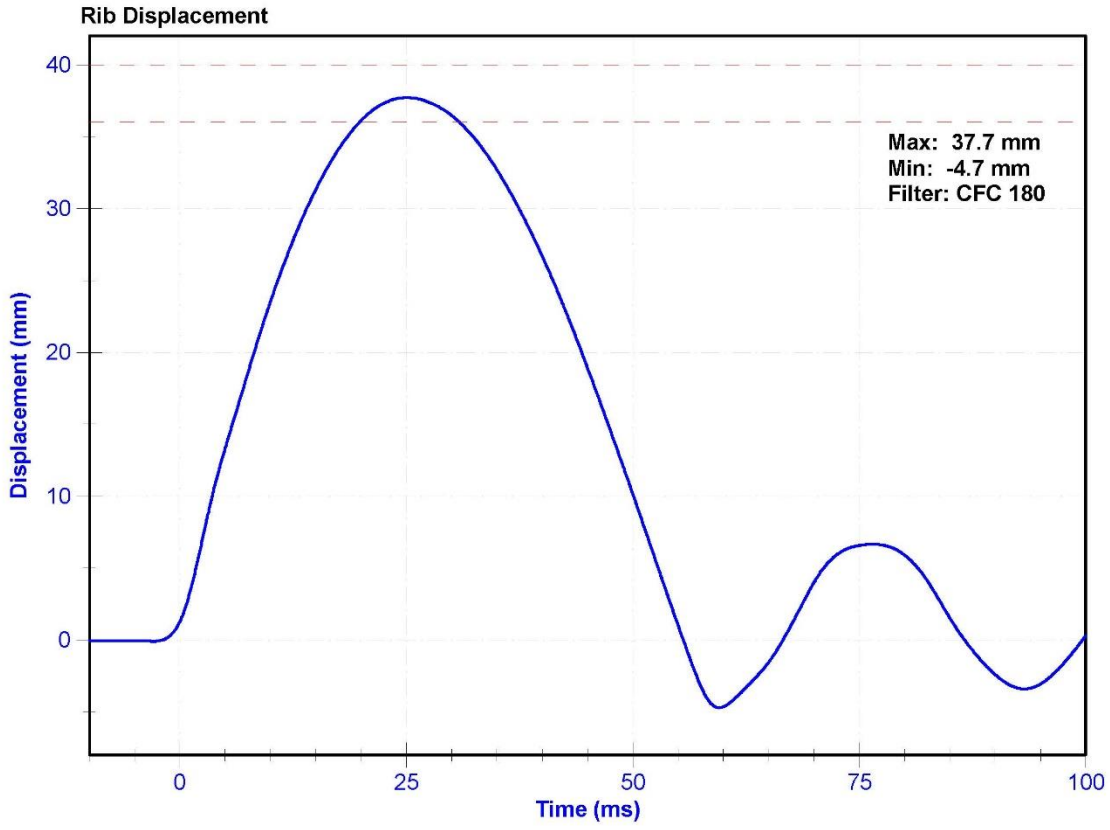
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	36.1	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016



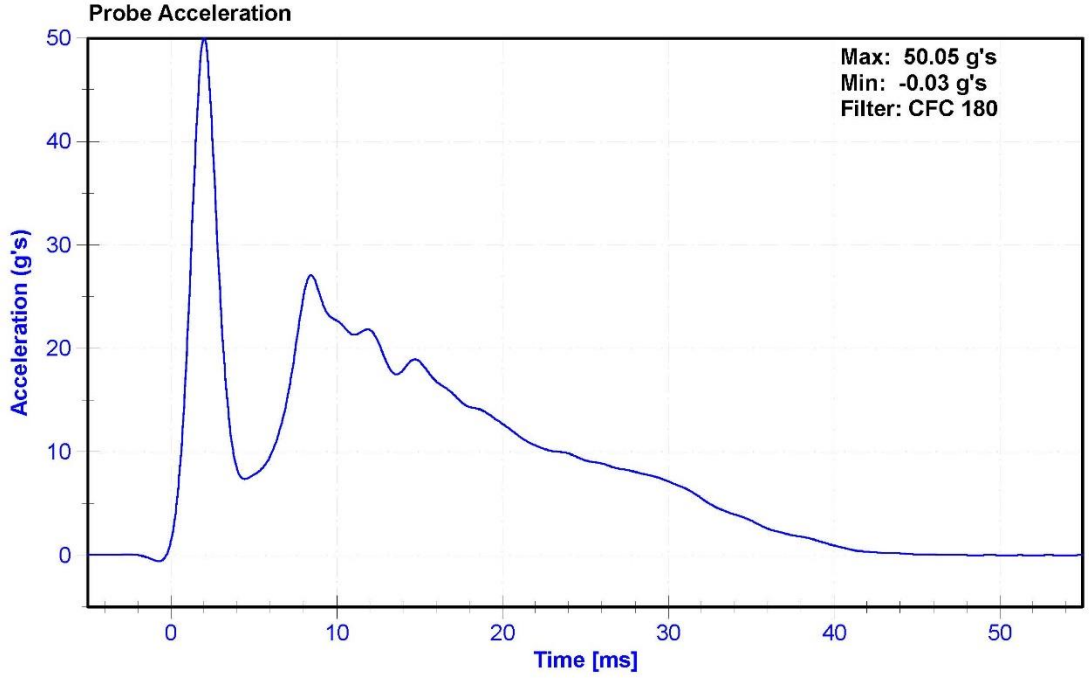
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

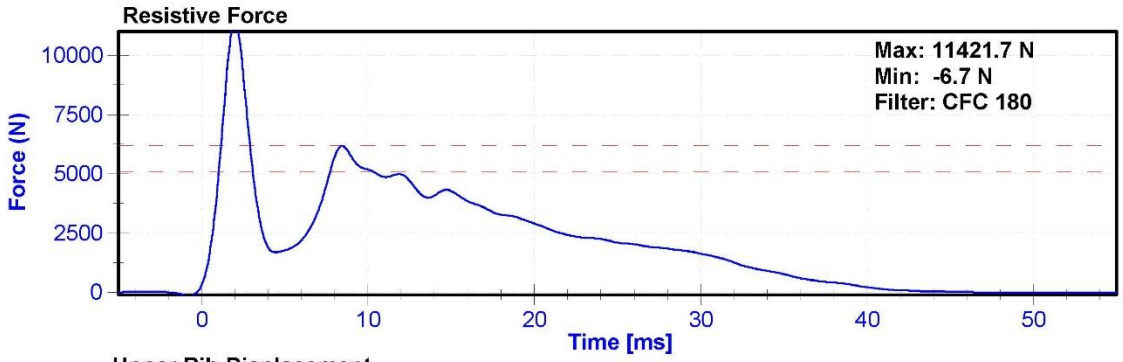
Results

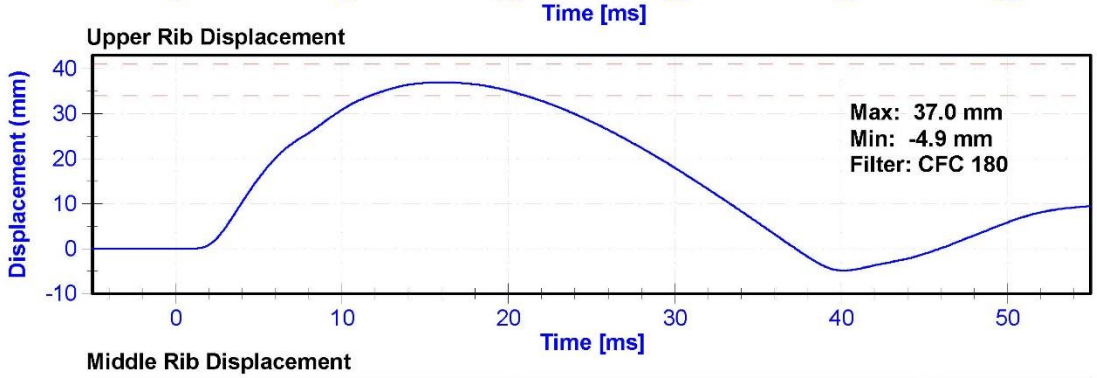
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	43.1	Pass
Velocity	5.4	5.6	m/s	5.40	Pass
Resistive Force after 6ms	5,100	6,200	N	6178.1	Pass
Upper Thorax Rib Deflection	34	41	mm	37.0	Pass
Mid Thorax Rib Deflection	37	45	mm	40.4	Pass
Lower Thorax Rib Deflection	37	44	mm	40.3	Pass

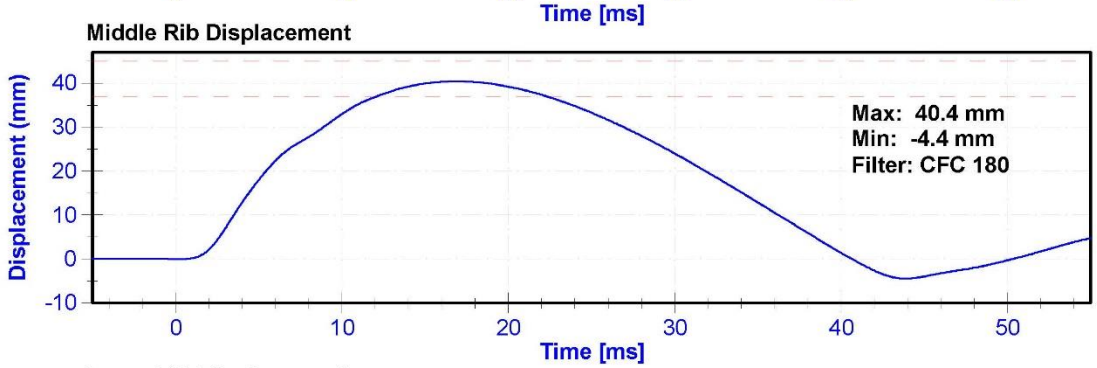
Transducer Calibrations

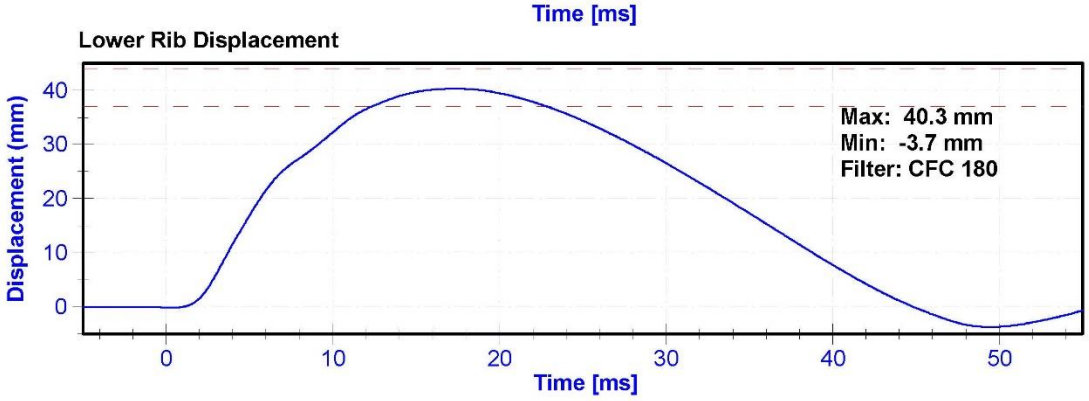
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016




Resistive Force
Force (N)
10000
7500
5000
2500
0
Max: 11421.7 N
Min: -6.7 N
Filter: CFC 180
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Displacement (mm)
40
30
20
10
0
-10
Max: 37.0 mm
Min: -4.9 mm
Filter: CFC 180
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Displacement (mm)
40
30
20
10
0
-10
Max: 40.4 mm
Min: -4.4 mm
Filter: CFC 180
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Displacement (mm)
40
30
20
10
0
Max: 40.3 mm
Min: -3.7 mm
Filter: CFC 180
0
10
20
30
40
50
Time [ms]

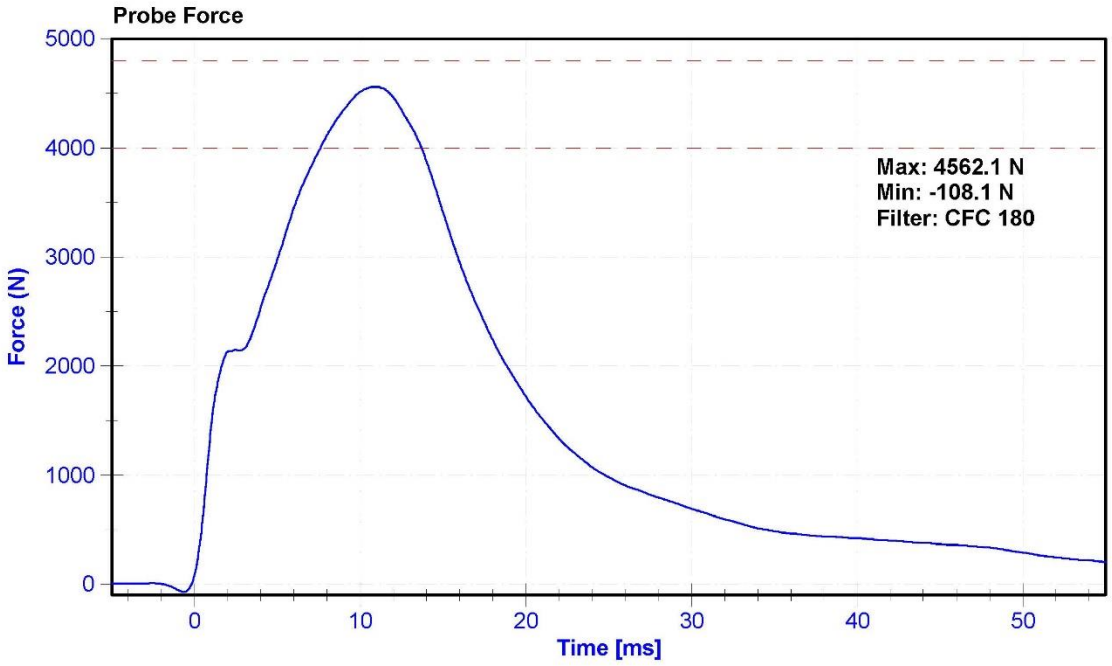
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

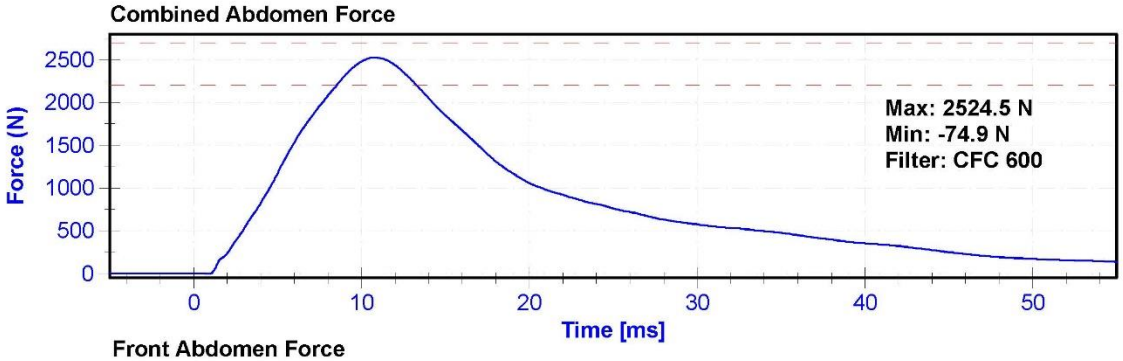
Results

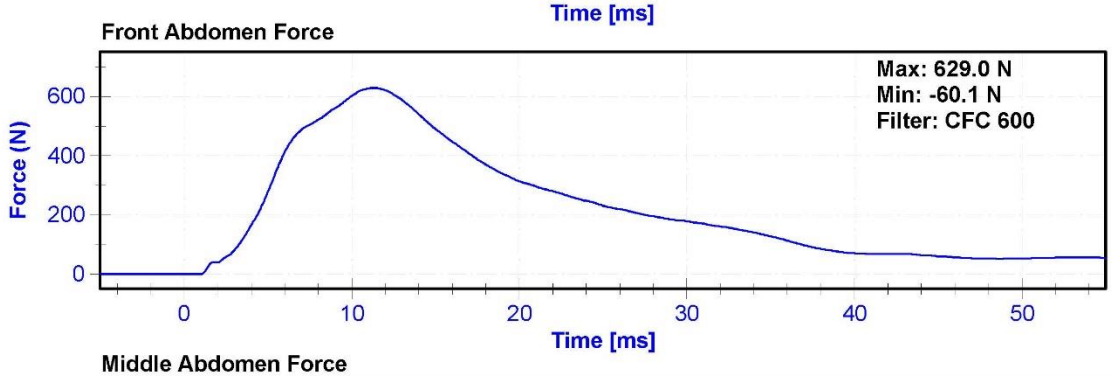
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	3.9	4.1	m/s	4.00	Pass
Combined Abdomen Force	2,200	2,700	N	2524.5	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.70	Pass
Resistive Probe Force	4,000	4,800	N	4562.1	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.80	Pass

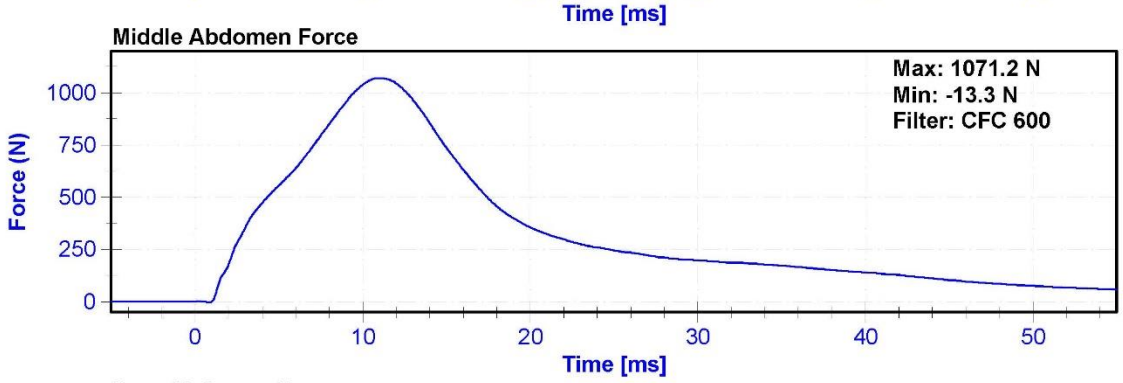
Transducer Calibrations

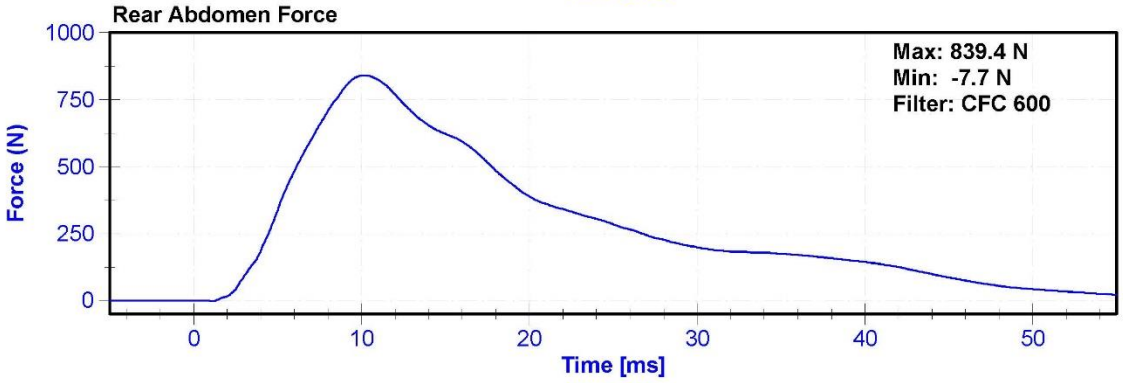
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Front Abdomen Load Cell	DENTON 2631	LC-1512	6/25/2015	6/24/2016
Middle Abdomen Load Cell	DENTON 2631	LC-1526	6/25/2015	6/24/2016
Rear Abdomen Load Cell	DENTON 2631	LC-1516	6/25/2015	6/24/2016




Combined Abdomen Force
Force (N)
2500
2000
1500
1000
500
0
0
10
20
30
40
50
Time [ms]
Max: 2524.5 N
Min: -74.9 N
Filter: CFC 600


Front Abdomen Force
Force (N)
600
400
200
0
0
10
20
30
40
50
Time [ms]
Max: 629.0 N
Min: -60.1 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
1000
750
500
250
0
0
10
20
30
40
50
Time [ms]
Max: 1071.2 N
Min: -13.3 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
1000
750
500
250
0
0
10
20
30
40
50
Time [ms]
Max: 839.4 N
Min: -7.7 N
Filter: CFC 600

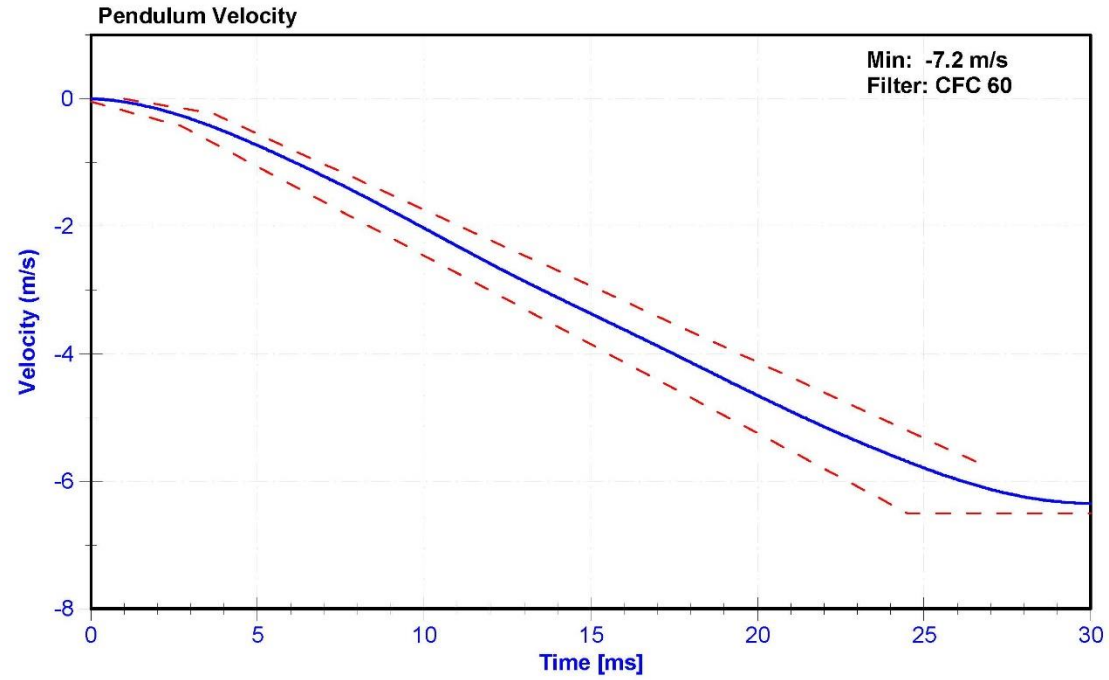
ATD Manufacturer	FTSS	Test Technician	M. Goehle
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

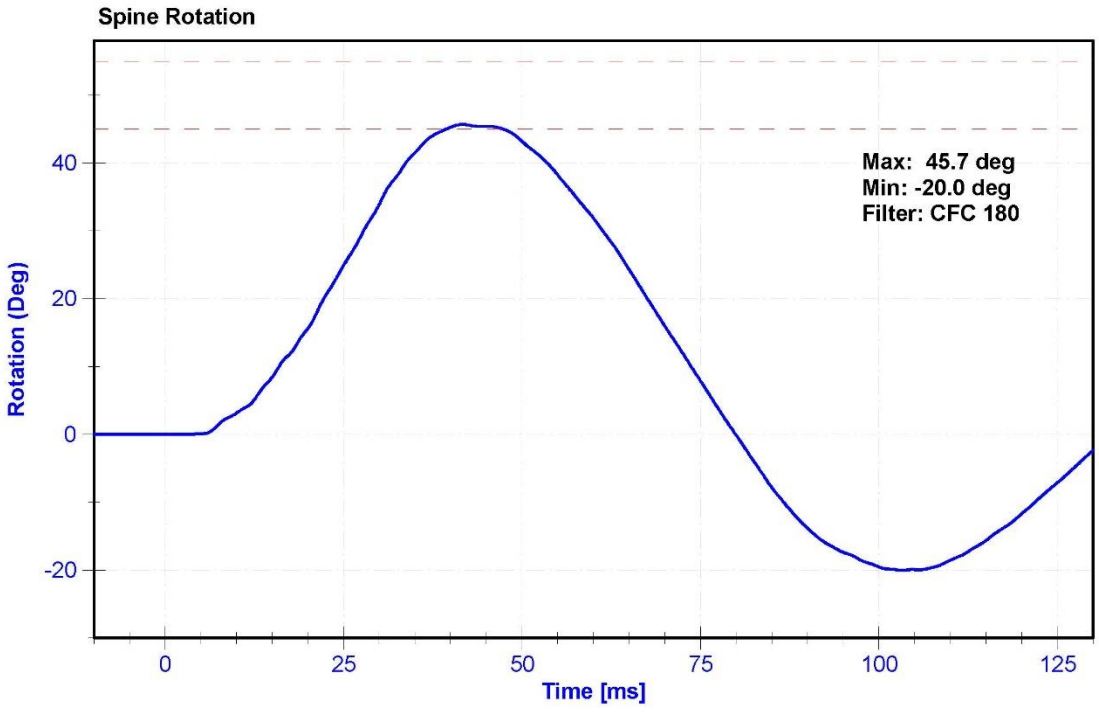
Results

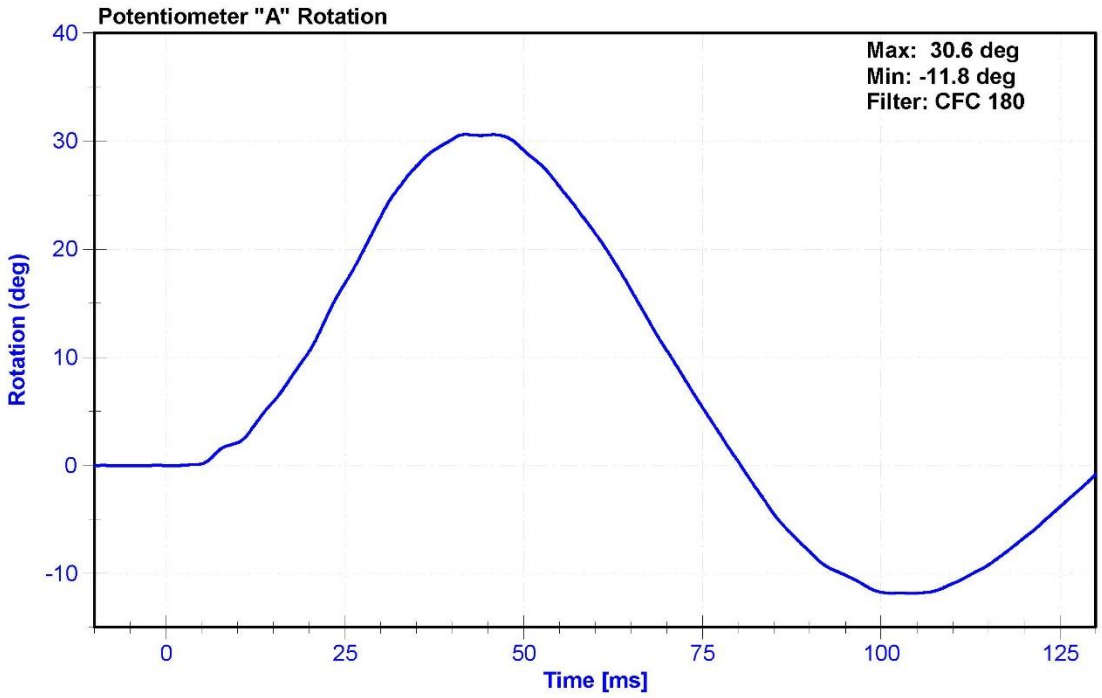
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	25.4	Pass
Velocity	5.95	6.15	m/s	6.068	Pass
Lateral Spine Rotation	45	55	deg	45.7	Pass
Time at Maximum Rotation	39	53	ms	41.6	Pass
Time of Decay to Zero Degrees	37	57	ms	38.3	Pass
Pulse within Corridor?	-	-	-	Yes	Pass

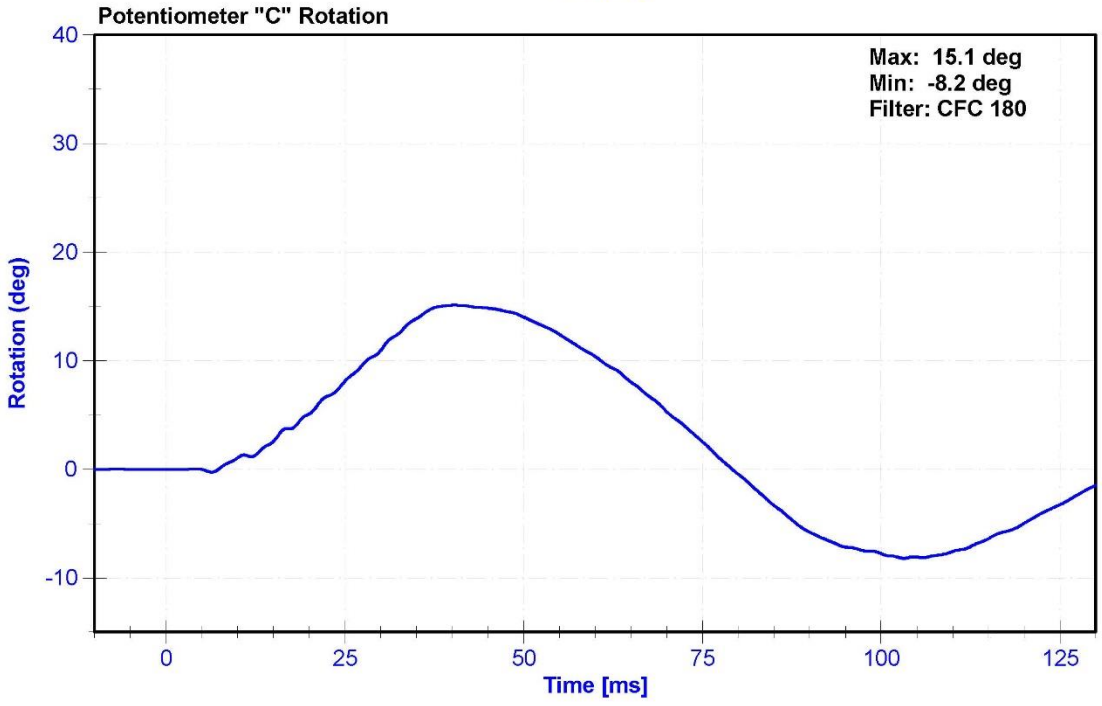
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum "A" Potentiometer	SP22G	DS-094	9/24/2015	9/23/2016
Condyle "B" Potentiometer	SP22G	DS-095	9/24/2015	9/23/2016


Pendulum Velocity
Min: -7.2 m/s
Filter: CFC 60
Velocity (m/s)
0
-2
-4
-6
-8
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 45.7 deg
Min: -20.0 deg
Filter: CFC 180
Rotation (Deg)
40
20
0
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 30.6 deg
Min: -11.8 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 15.1 deg
Min: -8.2 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]

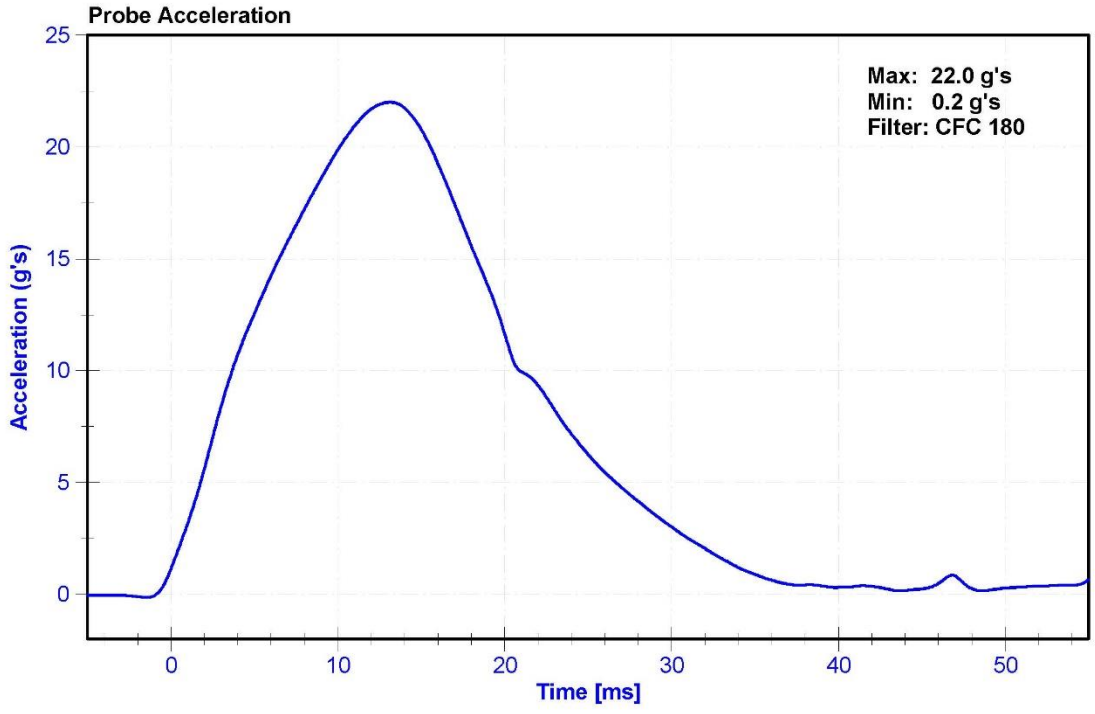
ATD Manufacturer	FTSS	Test Technician	R. Weil
ATD Serial Number	F034	Laboratory Supervisor	M. Goehle

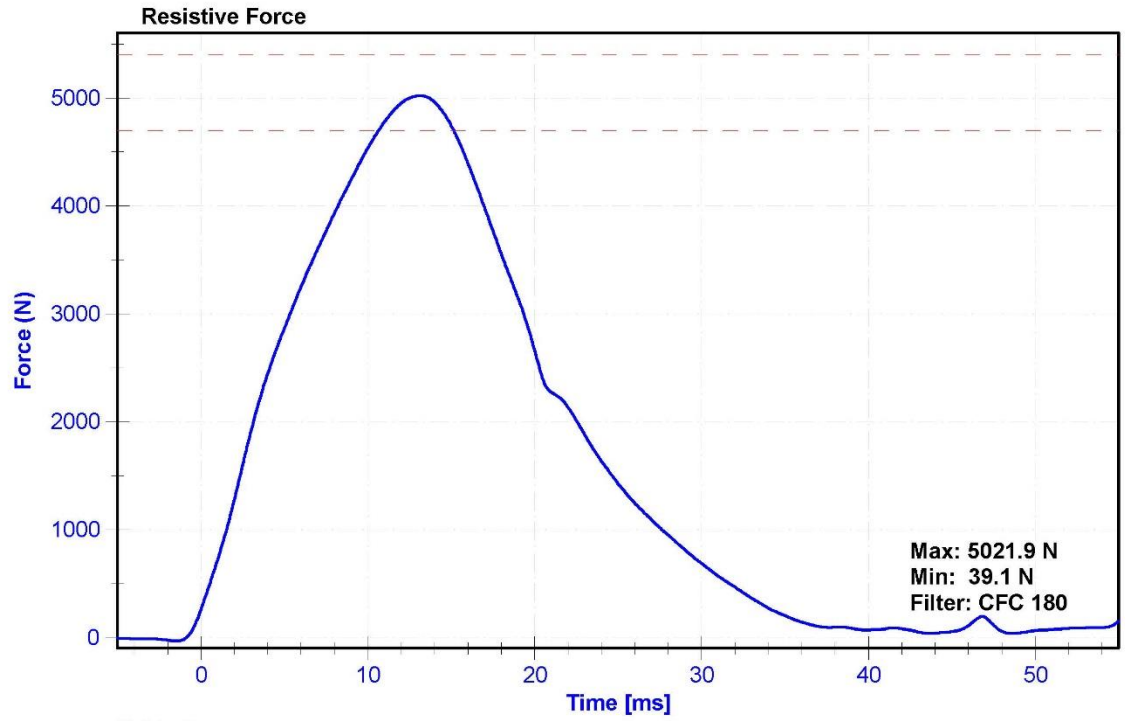
Results

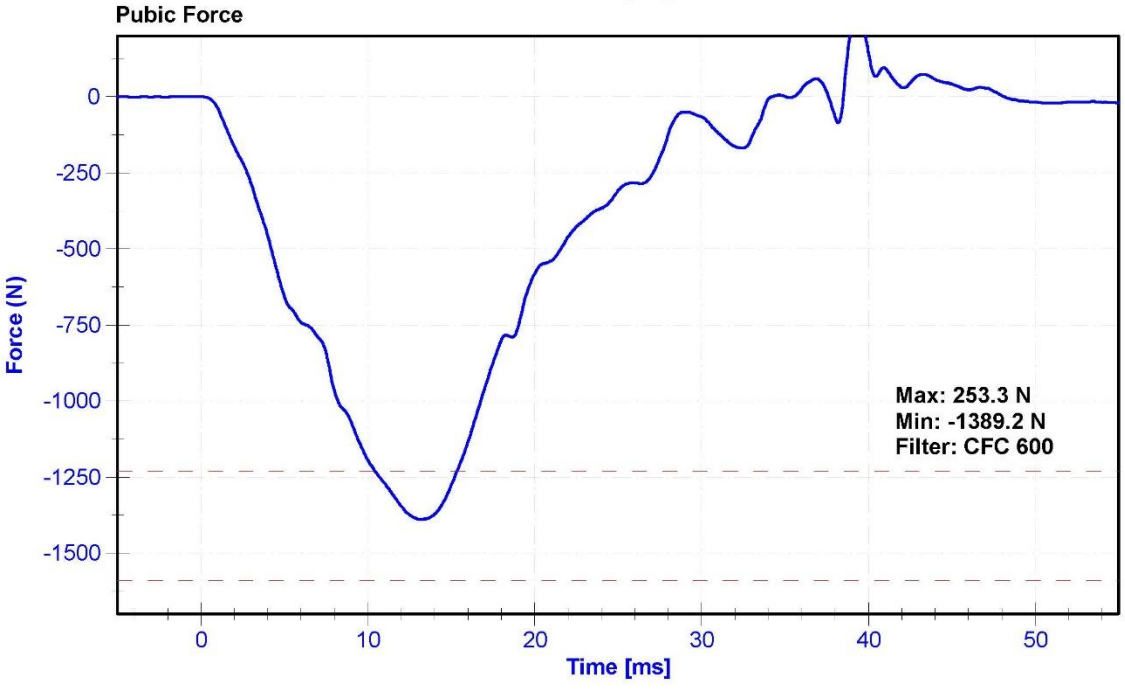
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	39.9	Pass
Velocity	4.2	4.4	m/s	4.30	Pass
Resistive Force	4,700	5,400	N	5021.9	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.15	Pass
Pubic Force	-1,590	-1,230	N	-1389.2	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.15	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pubic Load Cell	Denton 3096JFL	LC-465Fy	6/25/2015	6/24/2016




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 5021.9 N
Min: 39.1 N
Filter: CFC 180


Pubic Force
Force (N)
0
-250
-500
-750
-1000
-1250
-1500
0
10
20
30
40
50
Time [ms]
Max: 253.3 N
Min: -1389.2 N
Filter: CFC 600

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

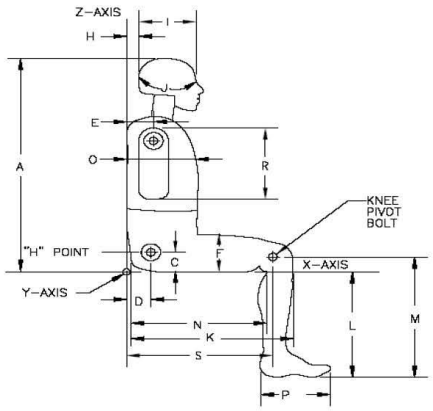
SERIAL No: 303

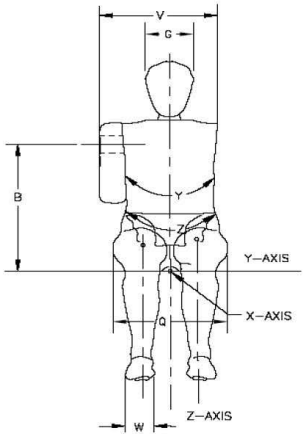
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: M. Geesey Date: 11/11/2015

Dummy Serial Number: 303





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	147	Pass
E	Shoulder Pivot from Backline	97	107	102	Pass
F	Thigh Clearance	119	135	130	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	529	Pass
L	Popliteal Height	343	369	356	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	436	Pass
O	Chest Depth w/o jacket	195	211	203	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	870	Pass
Z	Waist Circumference	761	791	770	Pass

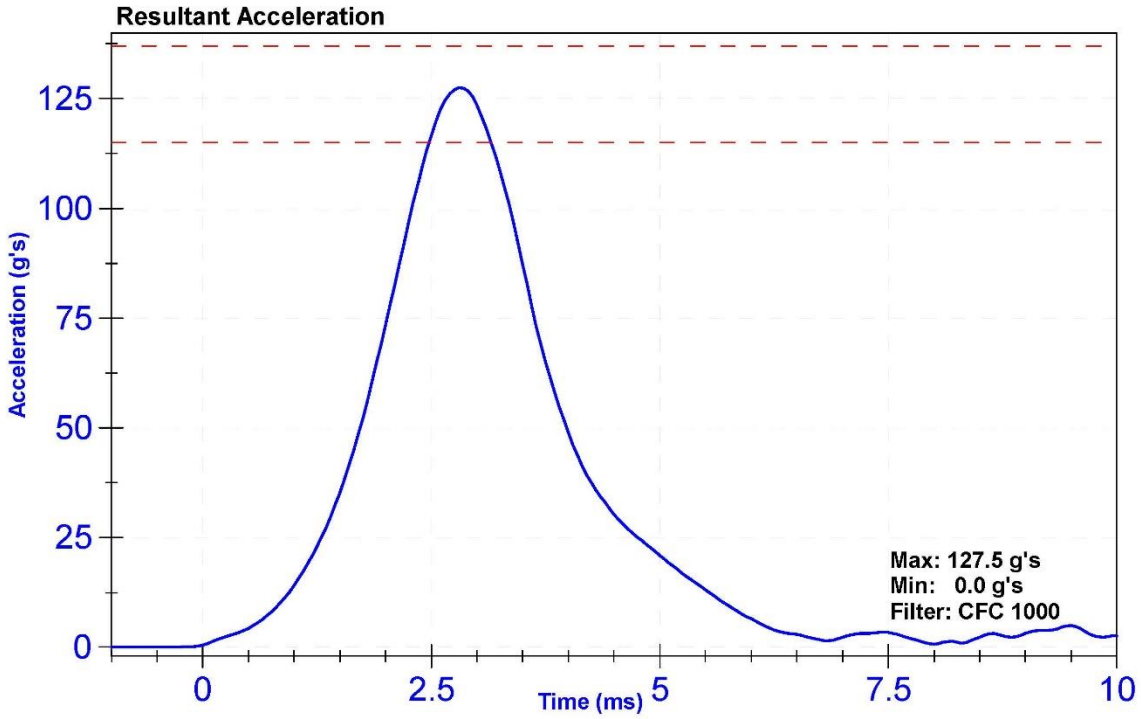
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

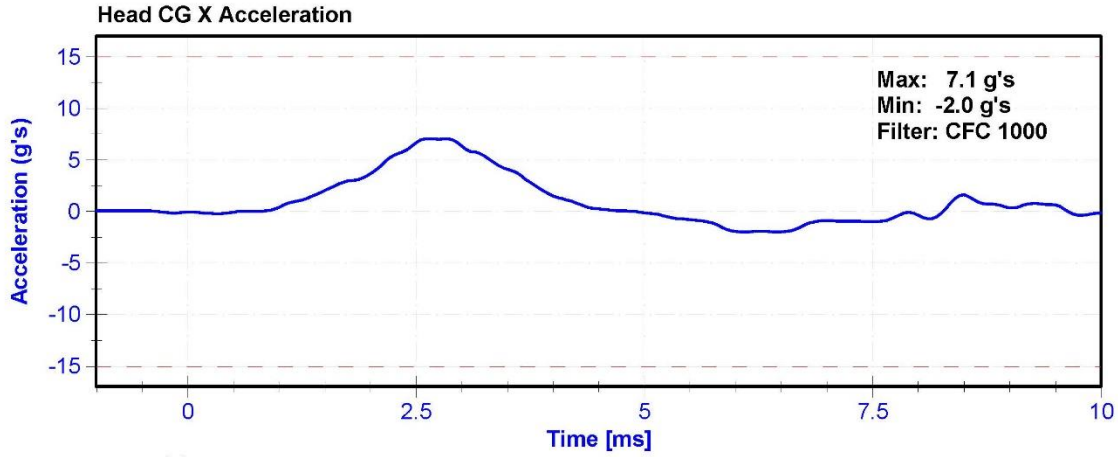
Results

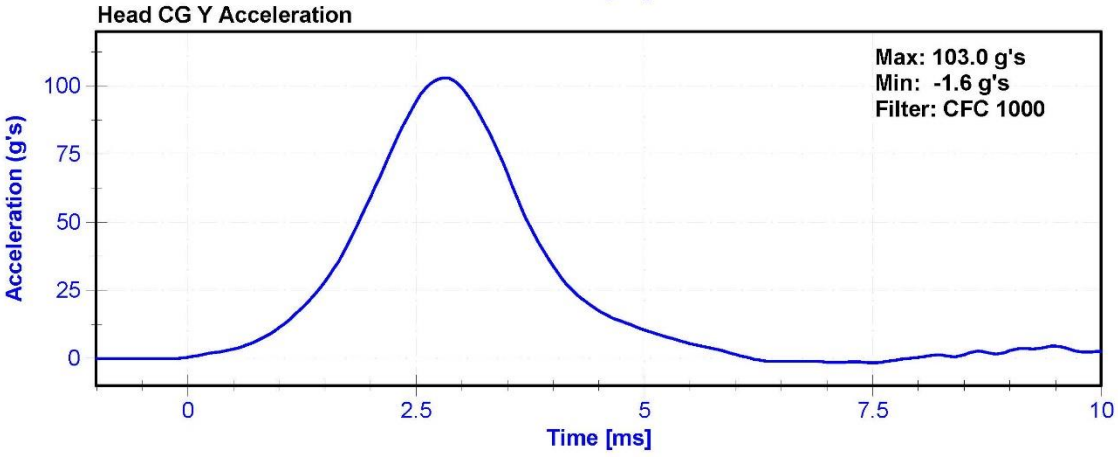
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22	Pass
Humidity	10	70	%	30.9	Pass
Resultant Acceleration	115	137	g's	127.5	Pass
Oscillation	0	15	%	3.8	Pass
Fore-Aft Acceleration	-15	15	g's	7.1	Pass

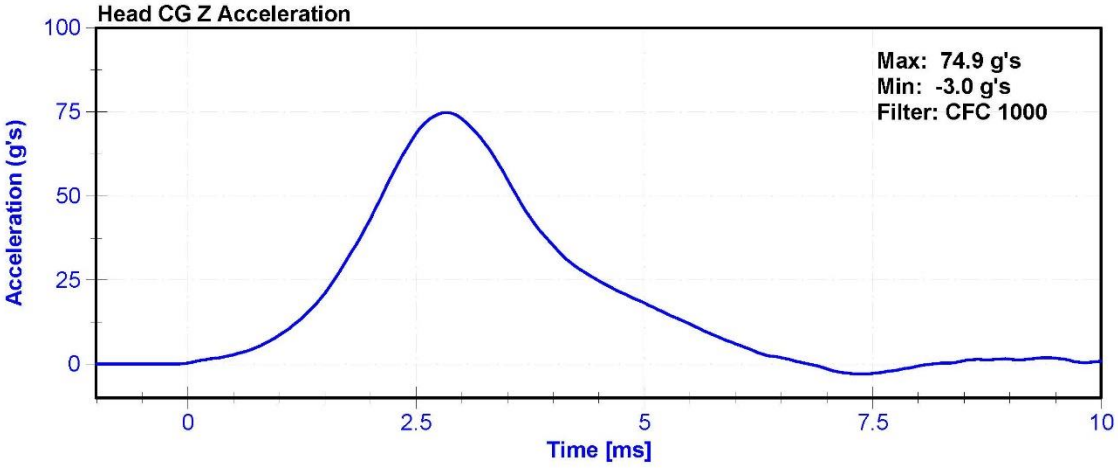
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P83420	10/16/2015	4/15/2016
Y Accelerometer	ENDEVCO 7264	AC-P52040	10/14/2015	4/13/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P58737	10/14/2015	4/13/2016




Head CG X Acceleration
Max: 7.1 g's
Min: -2.0 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 103.0 g's
Min: -1.6 g's
Filter: CFC 1000
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 74.9 g's
Min: -3.0 g's
Filter: CFC 1000
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]

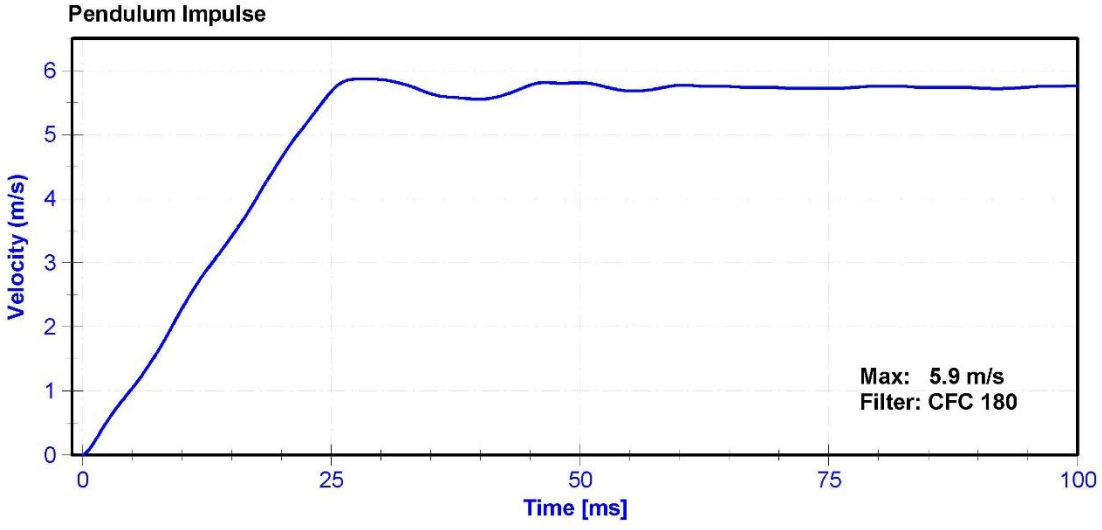
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

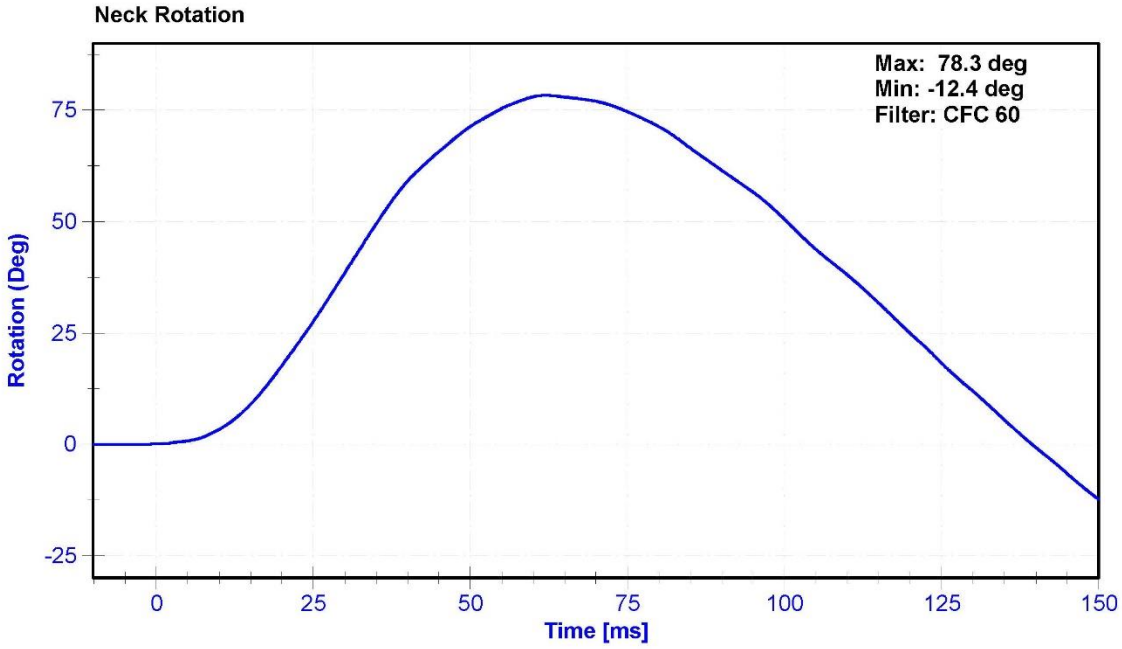
Results

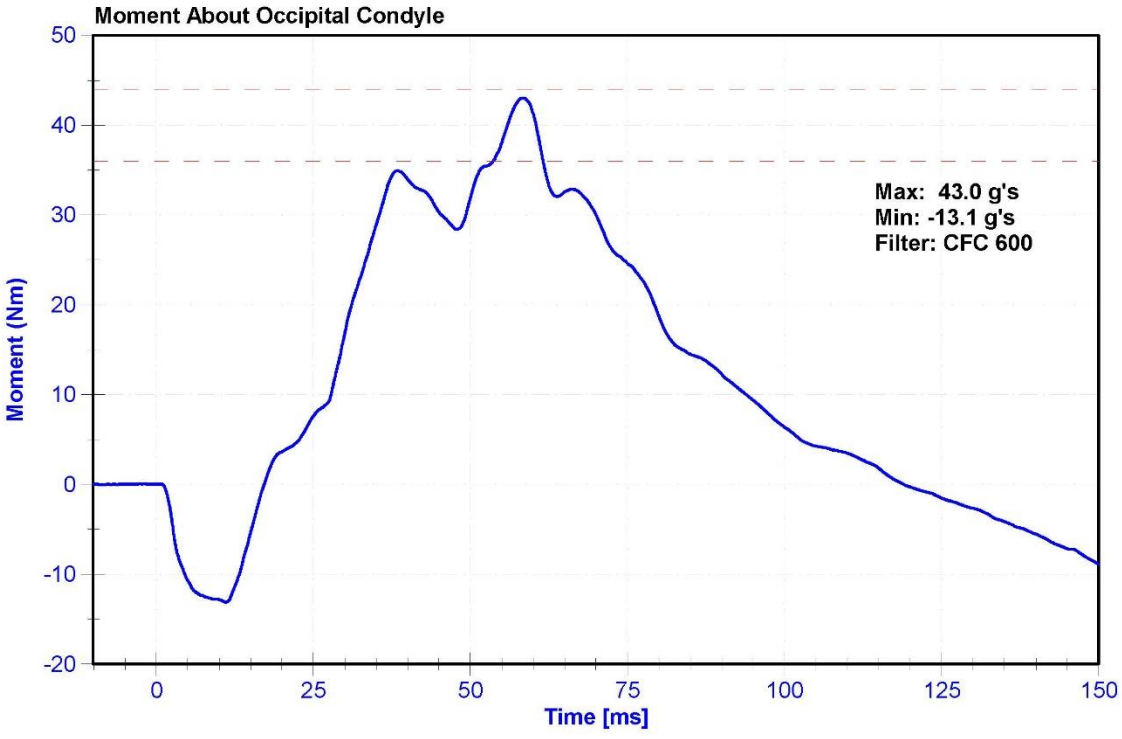
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	29.5	Pass
Velocity	5.51	5.63	m/s	5.583	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.28	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.41	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.64	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.67	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.87	Pass
Neck Rotation	71	81	deg	78.3	Pass
Time at Maximum Rotation	50	70	ms	61.9	Pass
Moment about the OC	36	44	Nm	43.0	Pass
Moment Decay to 0 Nm	102	126	ms	119.0	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	Denton 78051-342	DS-184Pend	9/24/2015	9/23/2016
Condyle Potentiometer	Denton 78051-342	DS-185Pend	9/25/2015	9/24/2016
Upper Neck Load Cell	Denton 1716A	LC-2019Fy	6/29/2015	6/28/2016




Neck Rotation
Max: 78.3 deg
Min: -12.4 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.0 g's
Min: -13.1 g's
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

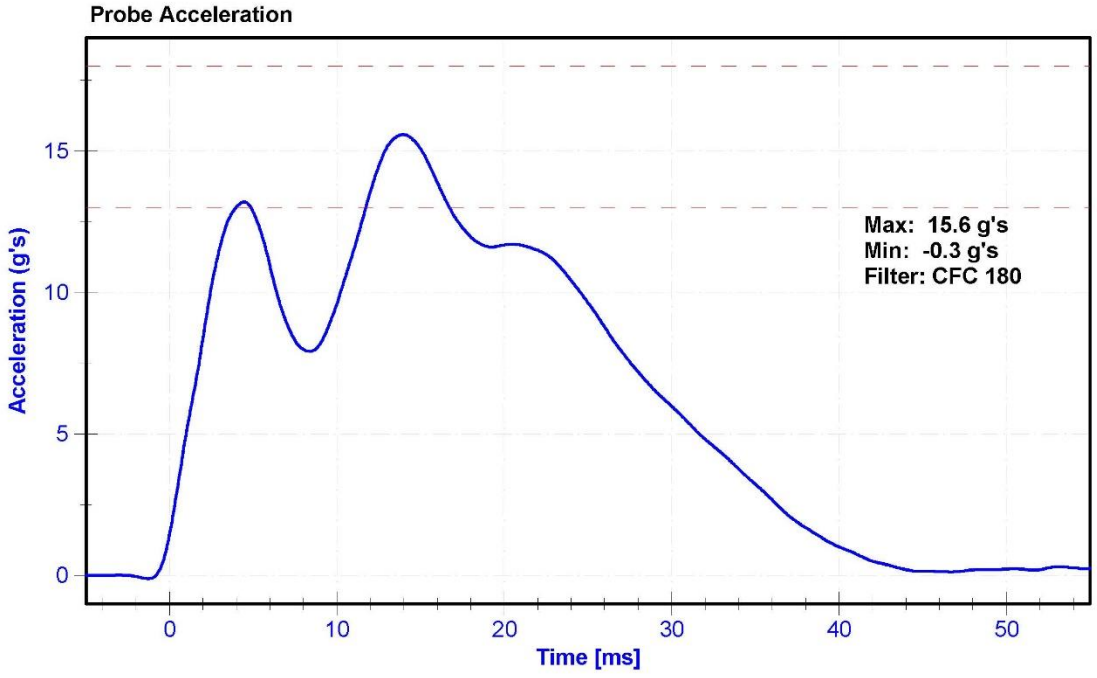
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

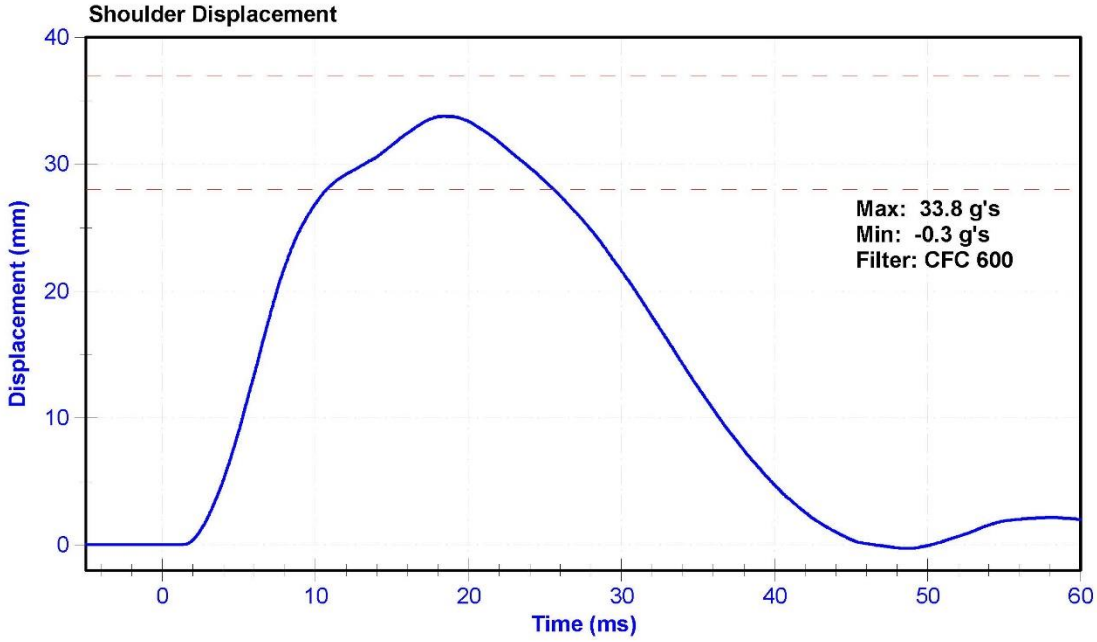
Results

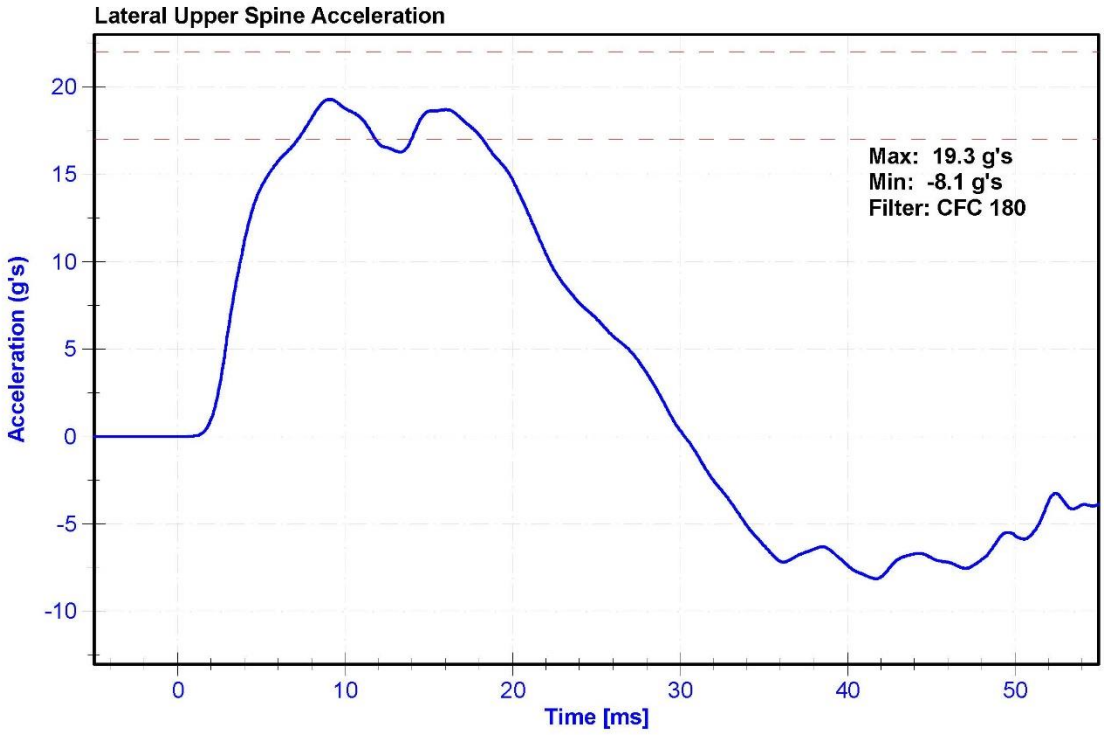
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	44	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	13	18	g's	15.6	Pass
Shoulder Deflection	28	37	mm	33.8	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Shoulder Potentiometer	Servo 08TC1-3725	DS-008GFE	10/19/2015	10/18/2016
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 33.8 g's
Min: -0.3 g's
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.3 g's
Min: -8.1 g's
Filter: CFC 180

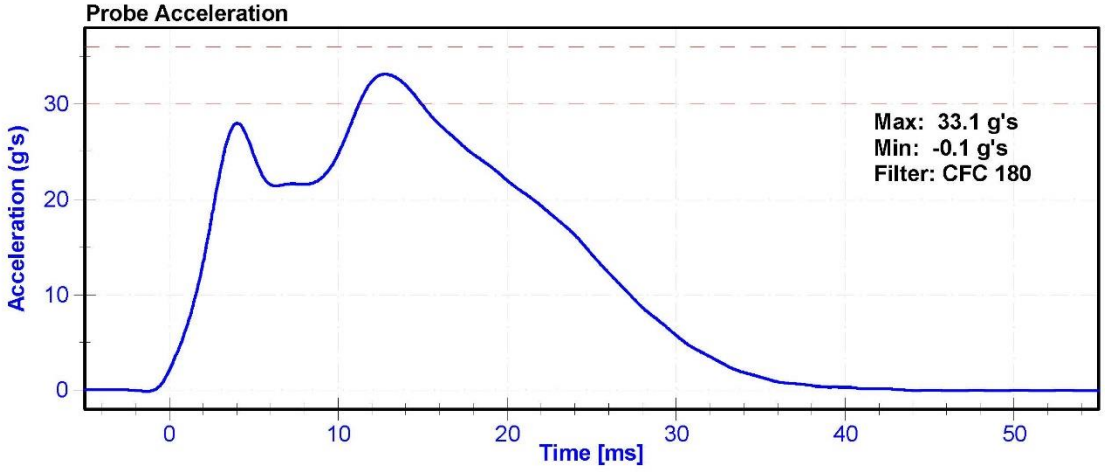
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

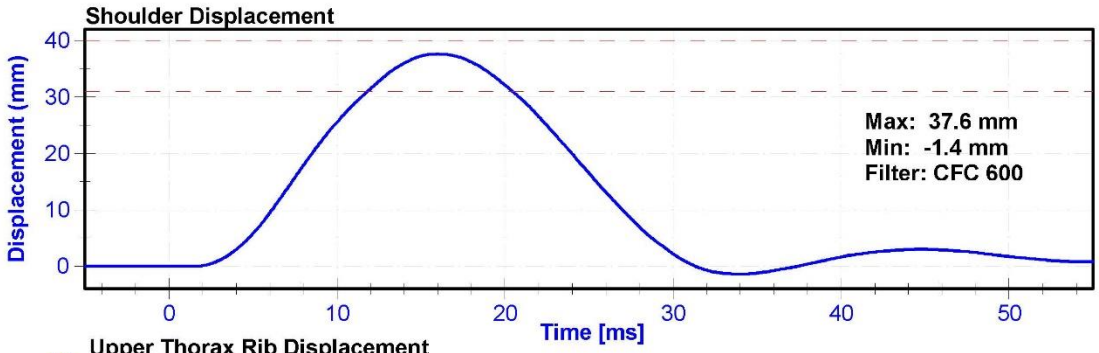
Results

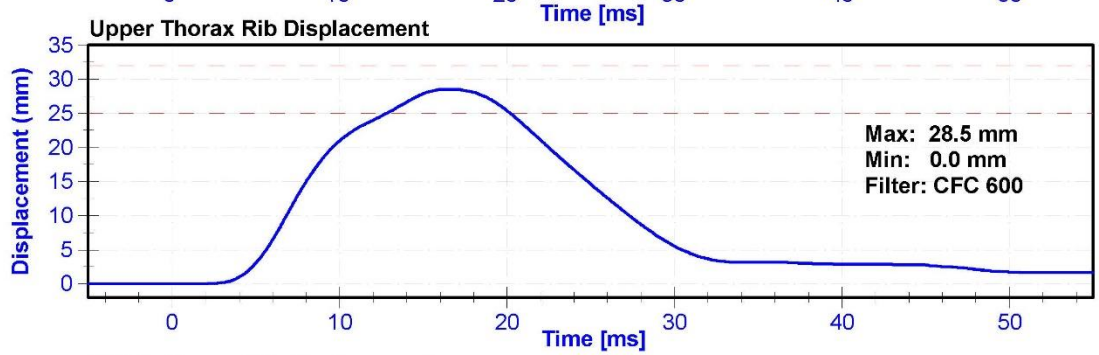
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	44.1	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration after 5 ms	30	36	g's	33.1	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.9	Pass
Shoulder Deflection	31	40	mm	37.6	Pass
Upper Thorax Rib Deflection	25	32	mm	28.5	Pass
Mid Thorax Rib Deflection	30	36	mm	32.8	Pass
Lower Thorax Rib Deflection	32	38	mm	34.6	Pass

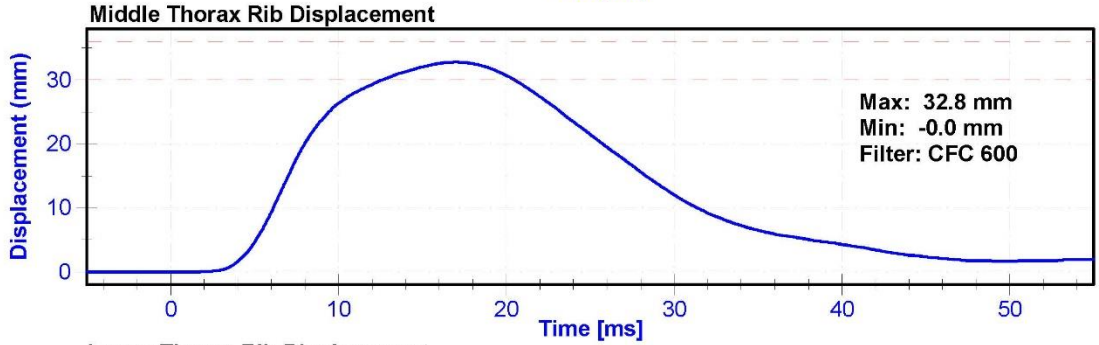
Transducer Calibrations

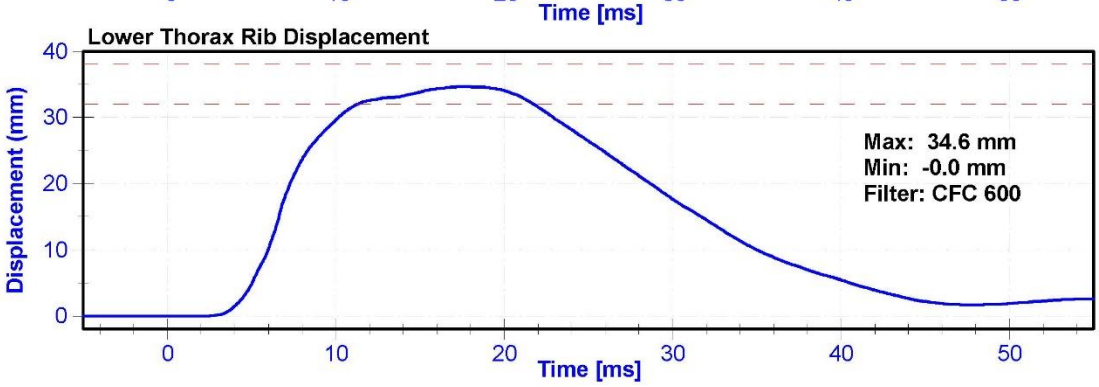
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Shoulder Potentiometer	Servo 08TC1-3725	DS-008GFE	10/19/2015	10/18/2016
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	10/19/2015	10/18/2016

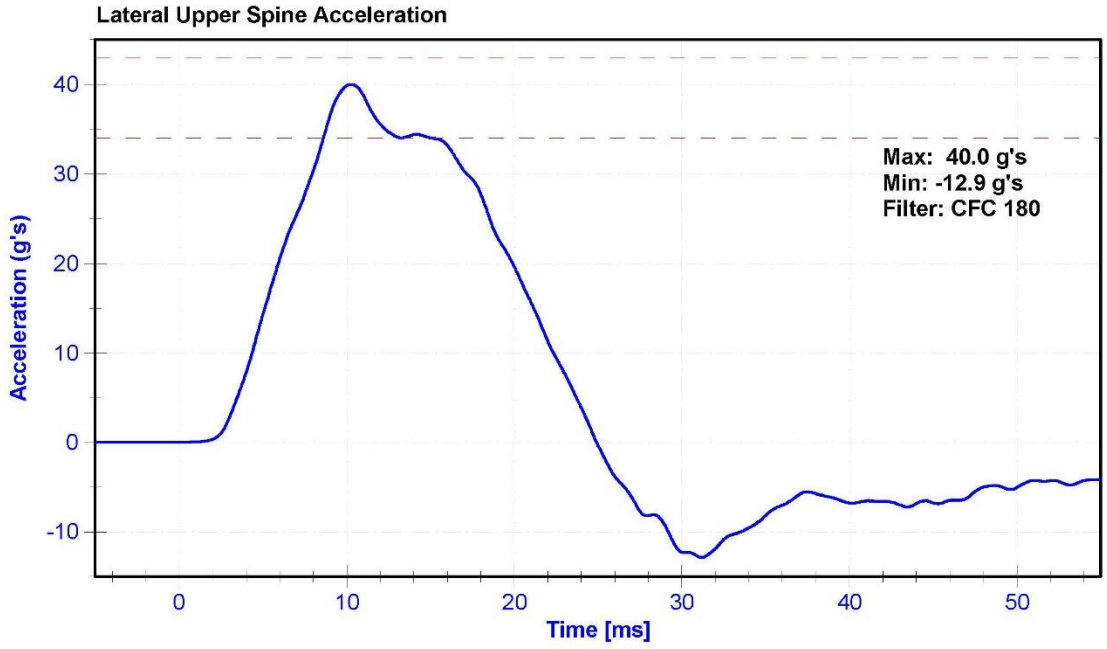


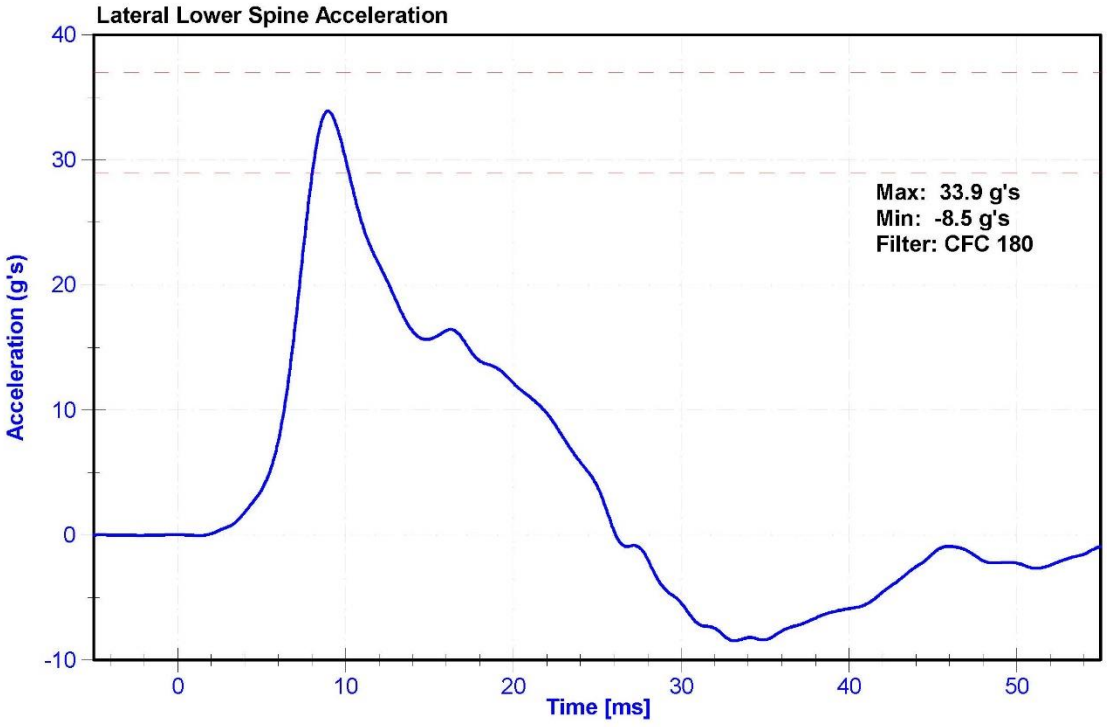

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 37.6 mm
Min: -1.4 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.5 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.8 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.6 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 40.0 g's
Min: -12.9 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 33.9 g's
Min: -8.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

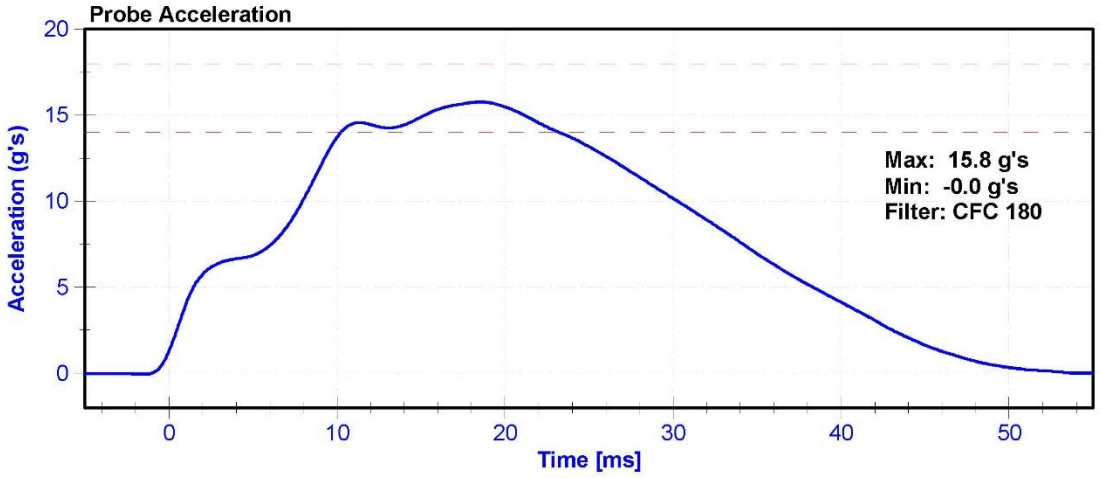
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

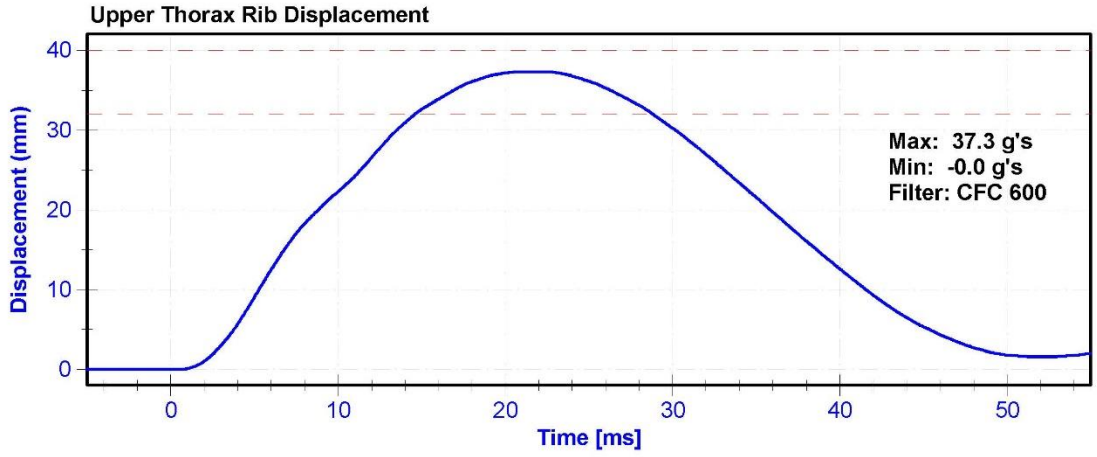
Results

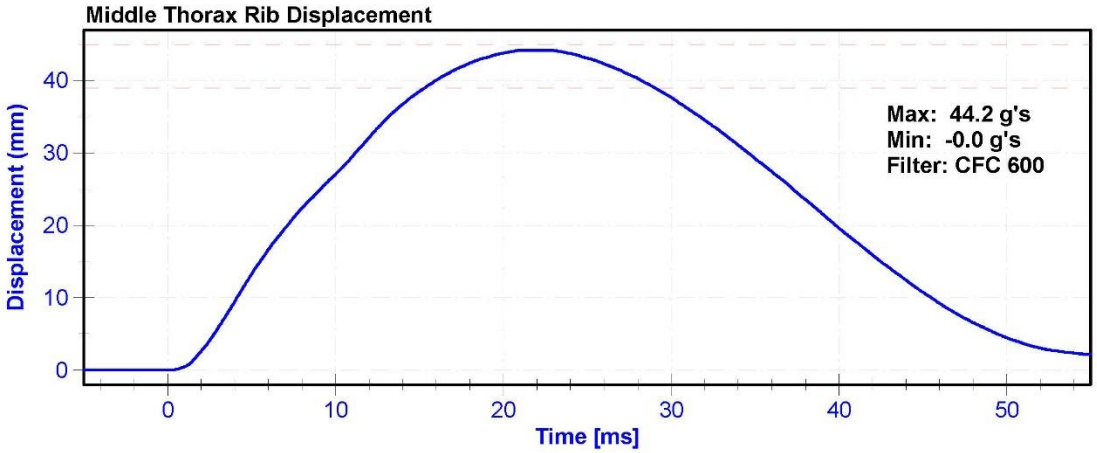
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	43.6	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	14	18	g's	15.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.6	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.8	Pass
Upper Thorax Rib Deflection	32	40	mm	37.3	Pass
Middle Thorax Rib Deflection	39	45	mm	44.2	Pass
Lower Thorax Rib Deflection	35	43	mm	42.9	Pass

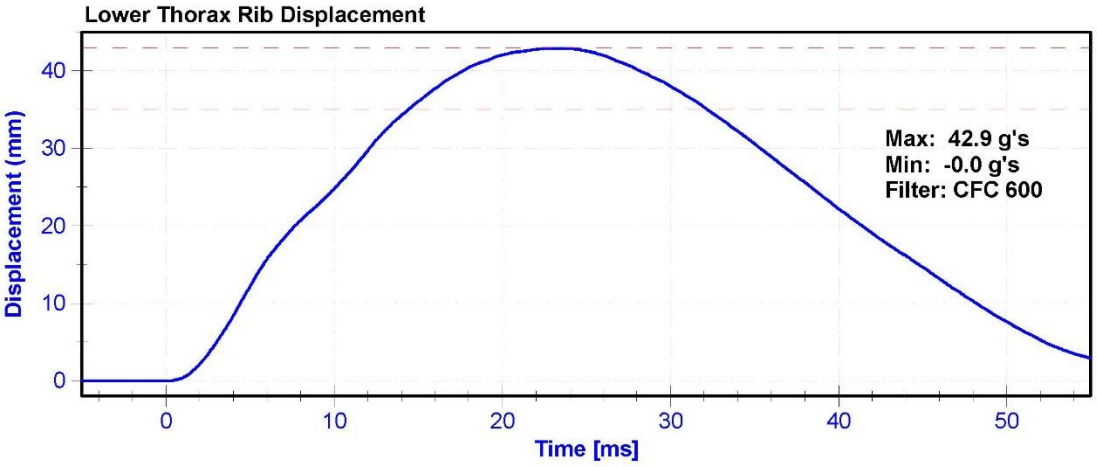
Transducer Calibrations

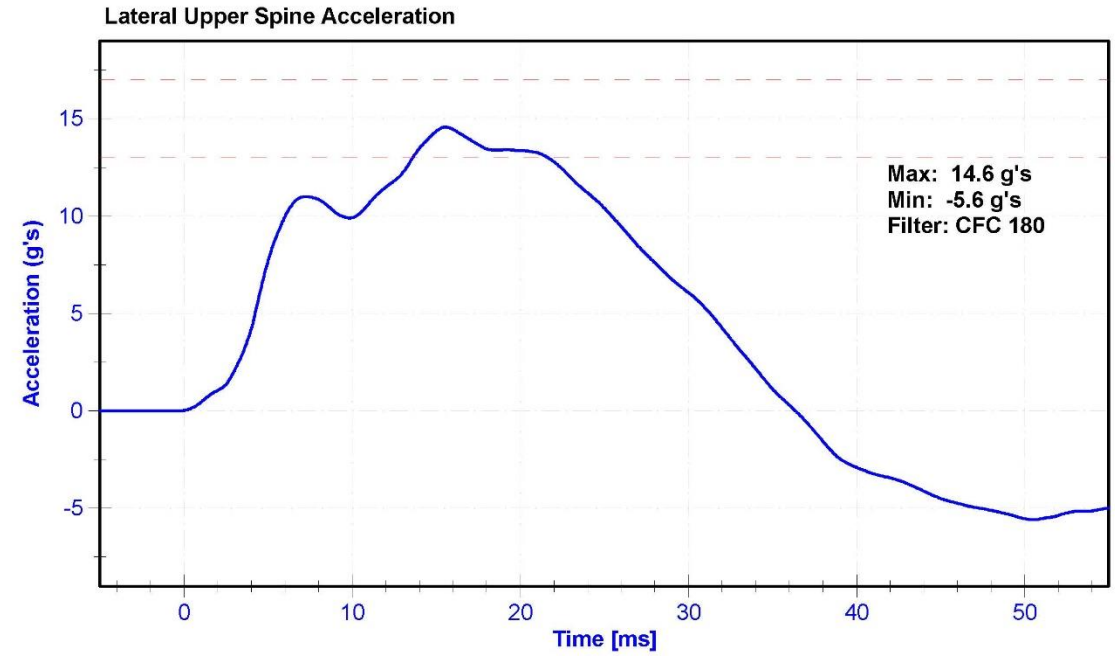
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	10/19/2015	10/18/2016

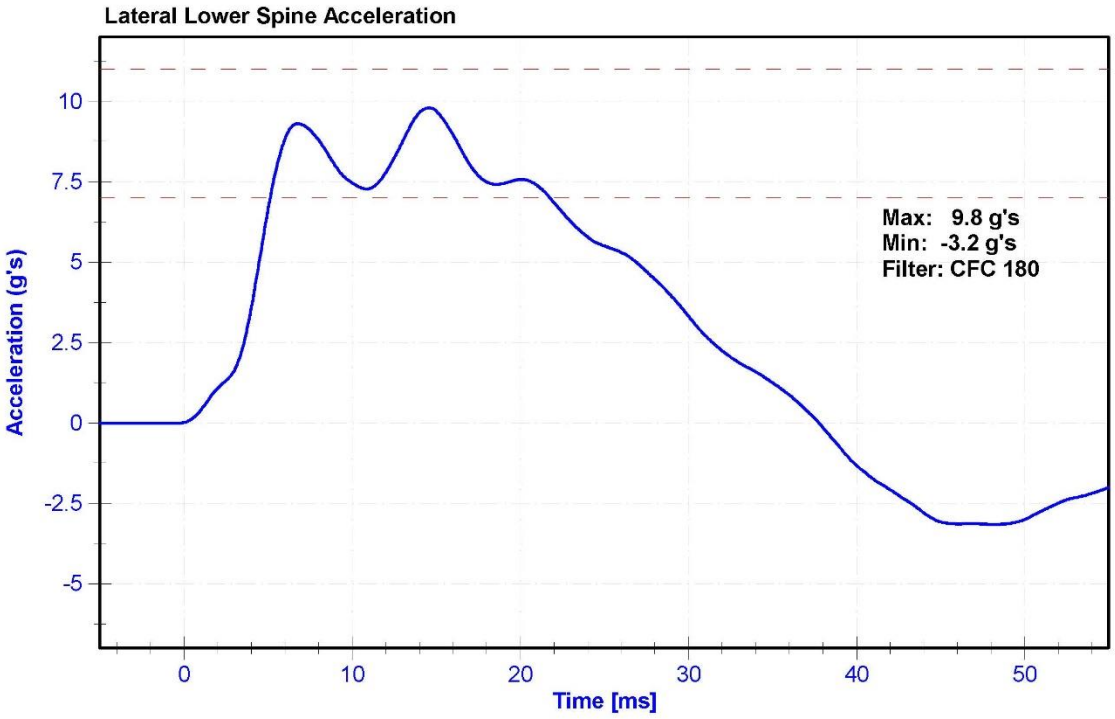



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.3 g's
Min: -0.0 g's
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 44.2 g's
Min: -0.0 g's
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.9 g's
Min: -0.0 g's
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.6 g's
Min: -5.6 g's
Filter: CFC 180
Acceleration (g's)
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]


Lateral Lower Spine Acceleration
Max: 9.8 g's
Min: -3.2 g's
Filter: CFC 180
Acceleration (g's)
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]

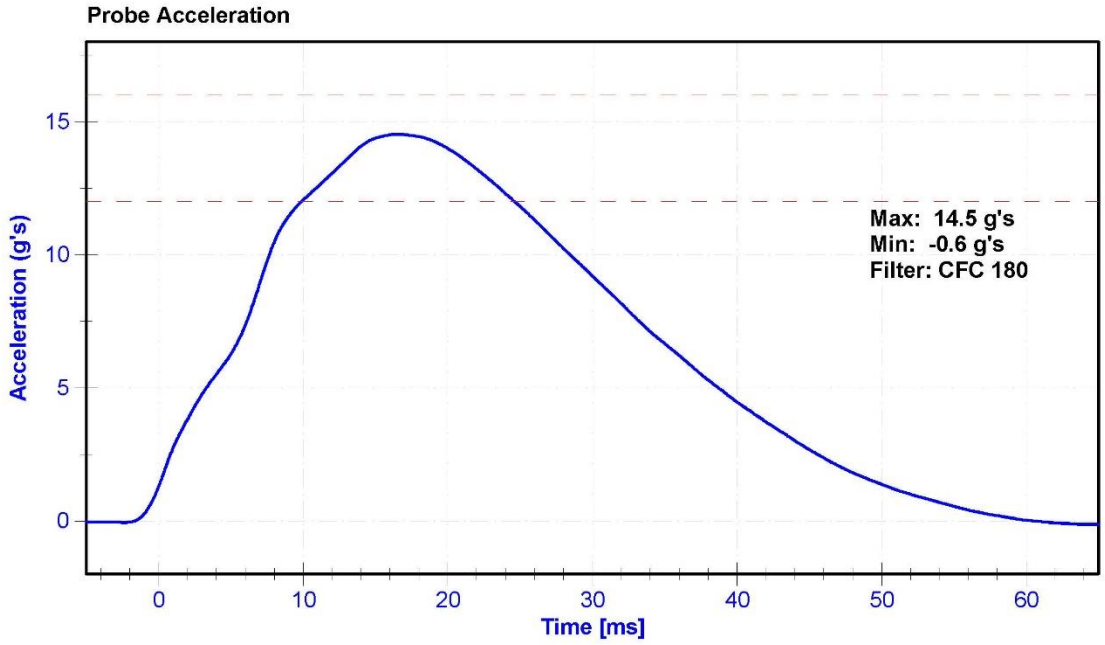
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

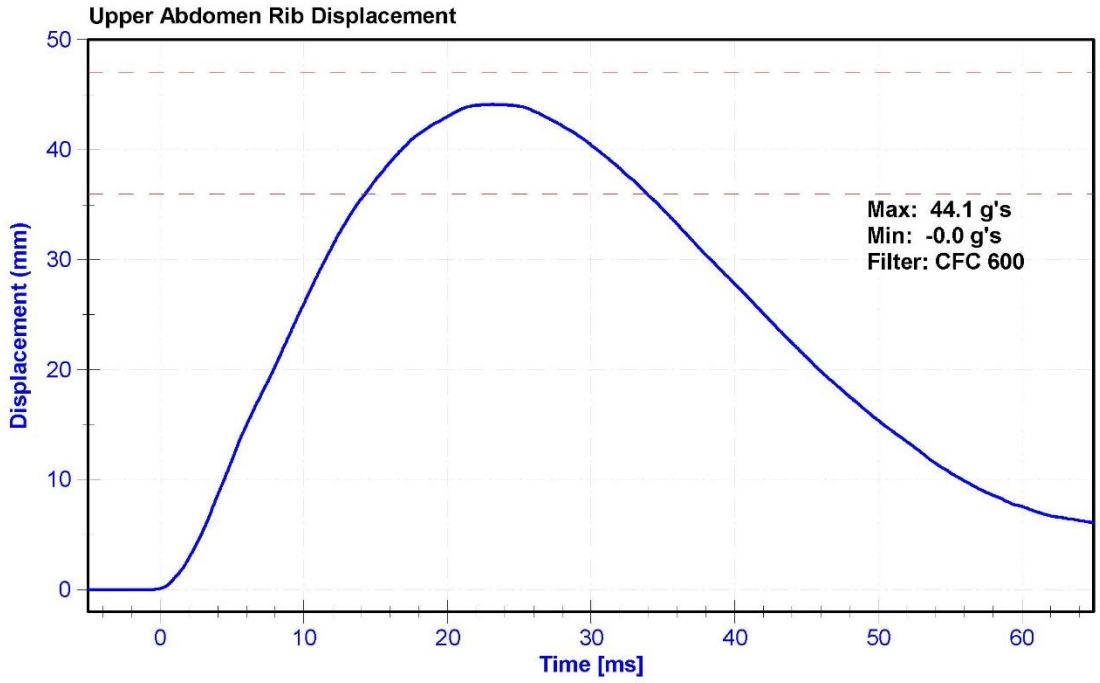
Results

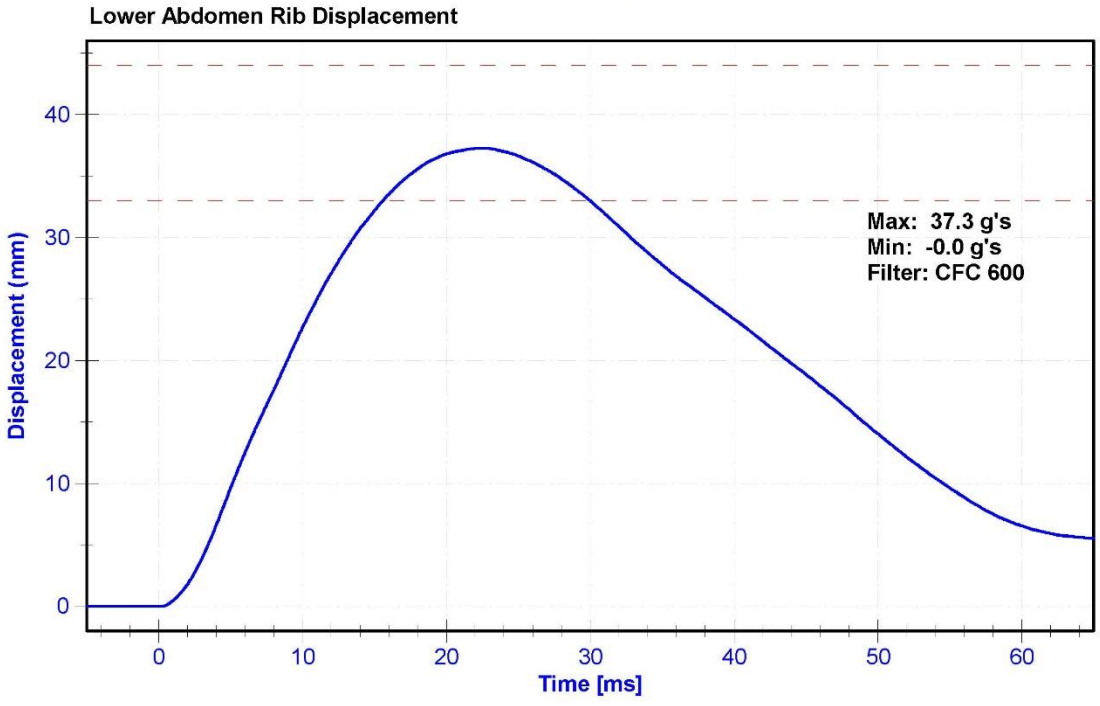
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	44.0	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	12	16	g's	14.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.9	Pass
Upper Abdomen Rib Deflection	36	47	mm	44.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	37.3	Pass

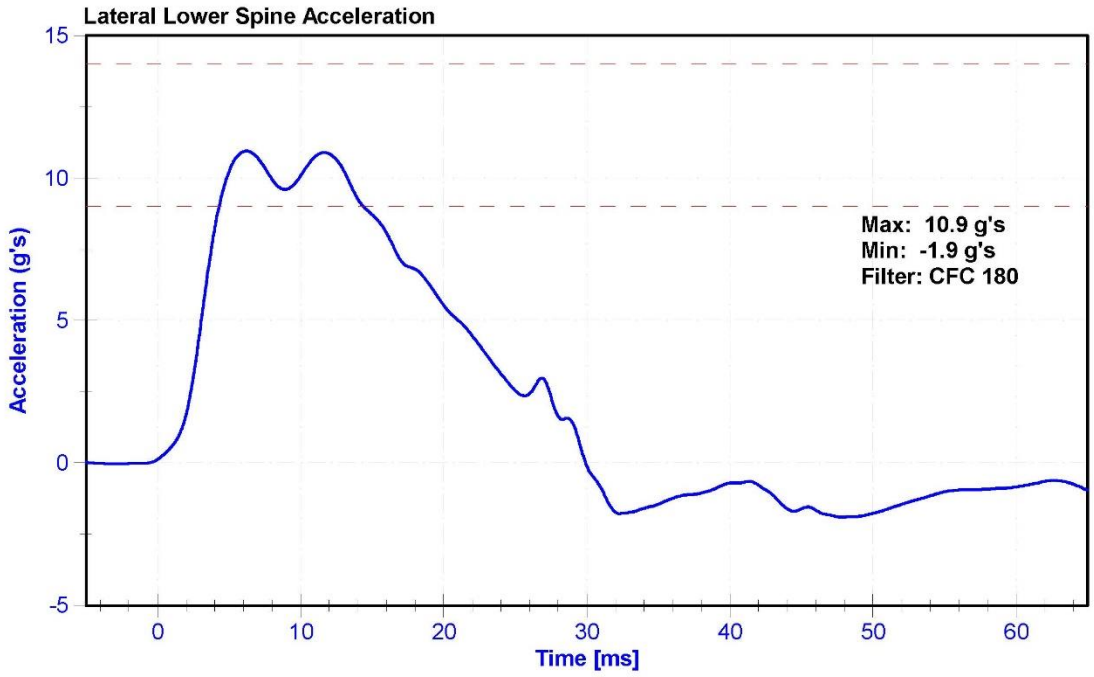
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Upper Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-1274GFE	10/19/2015	10/18/2016
Lower Abdomen Rib Potentiometer	Servo 08CT1-3745	DS-2316GFE	10/28/2015	10/27/2016

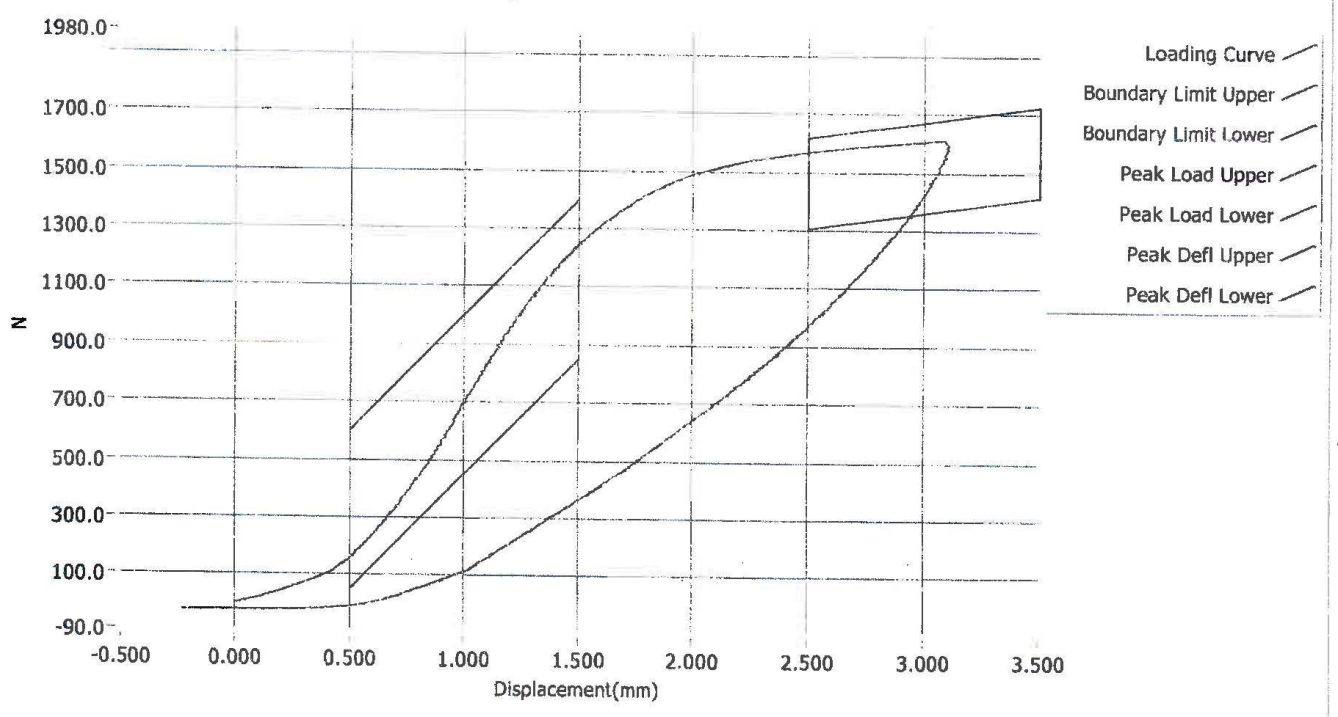



Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 44.1 g's
Min: -0.0 g's
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.3 g's
Min: -0.0 g's
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
10
5
0
-5
0
10
20
30
40
50
60
Time [ms]
Max: 10.9 g's
Min: -1.9 g's
Filter: CFC 180

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

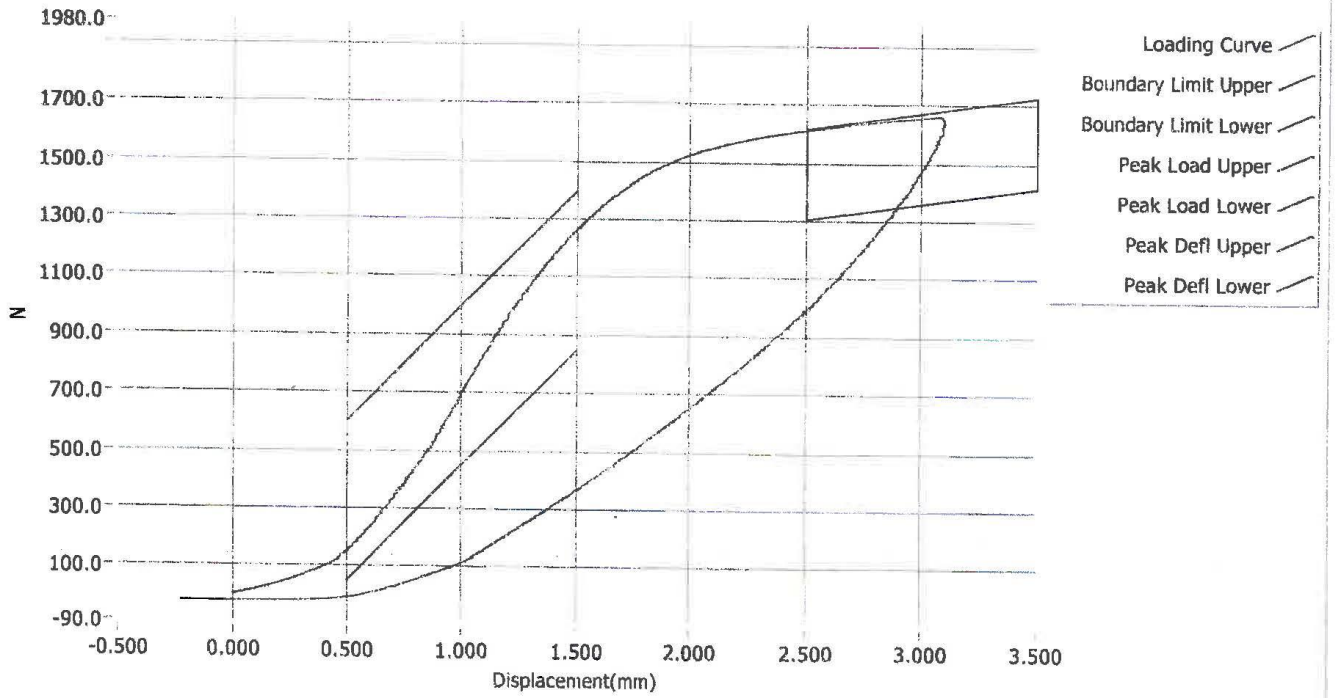
CERTIFICATION
11/11/5 MKG

Test ID	Part Serial Number	Test Date	Test Time
	49022	12/7/2011	1:13 AM

Cert ID	ATD Serial Number	ATD Type
	N/A	SIDIIs

Current Date : 12/7/2011 Current Time : 01:13:51

Resultant Data - SIDIIs Plug Compression



ATD Calibration Lab

CRASH
11/11/15 MKG

Test ID	Part Serial Number	Test Date	Test Time
	48973	12/6/2011	10:09 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/6/2011 Current Time : 22:10:07

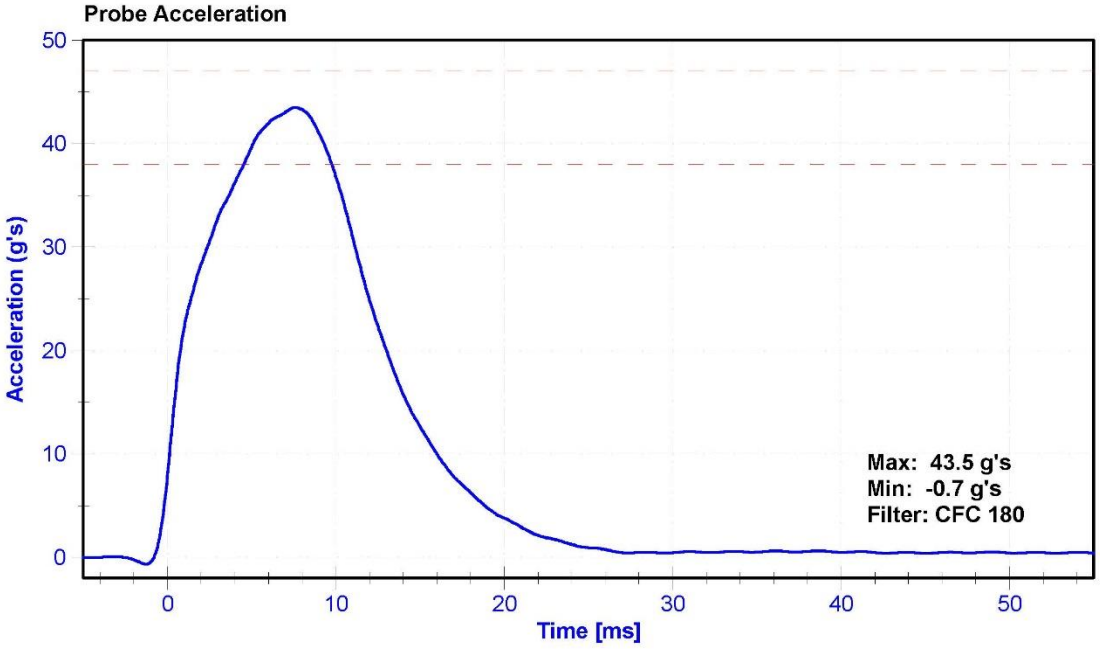
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

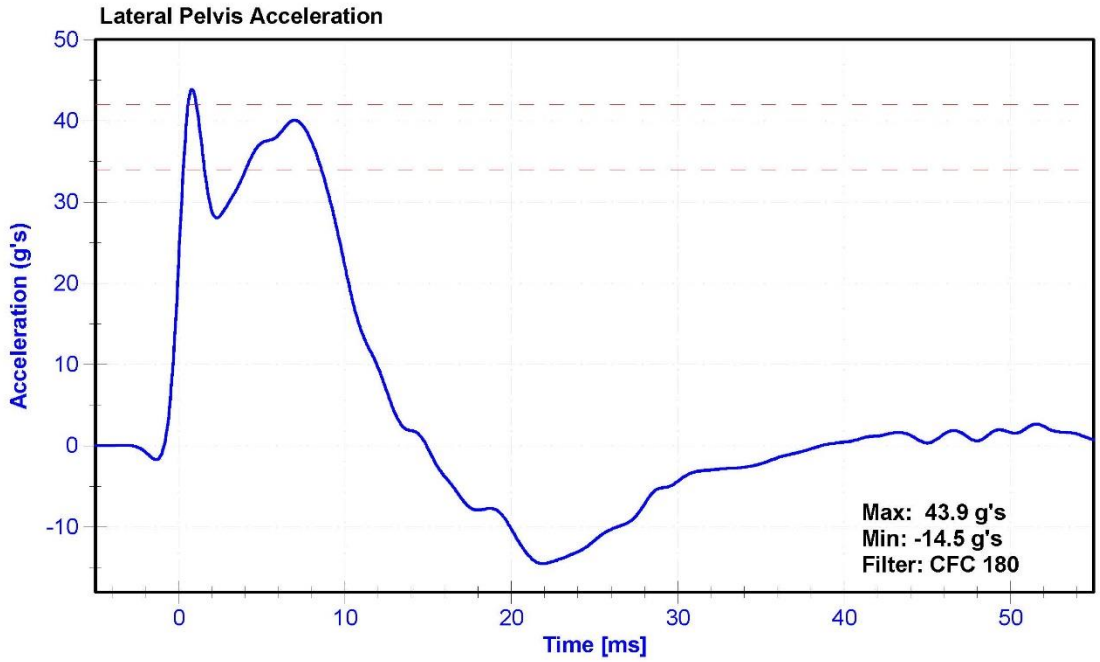
Results

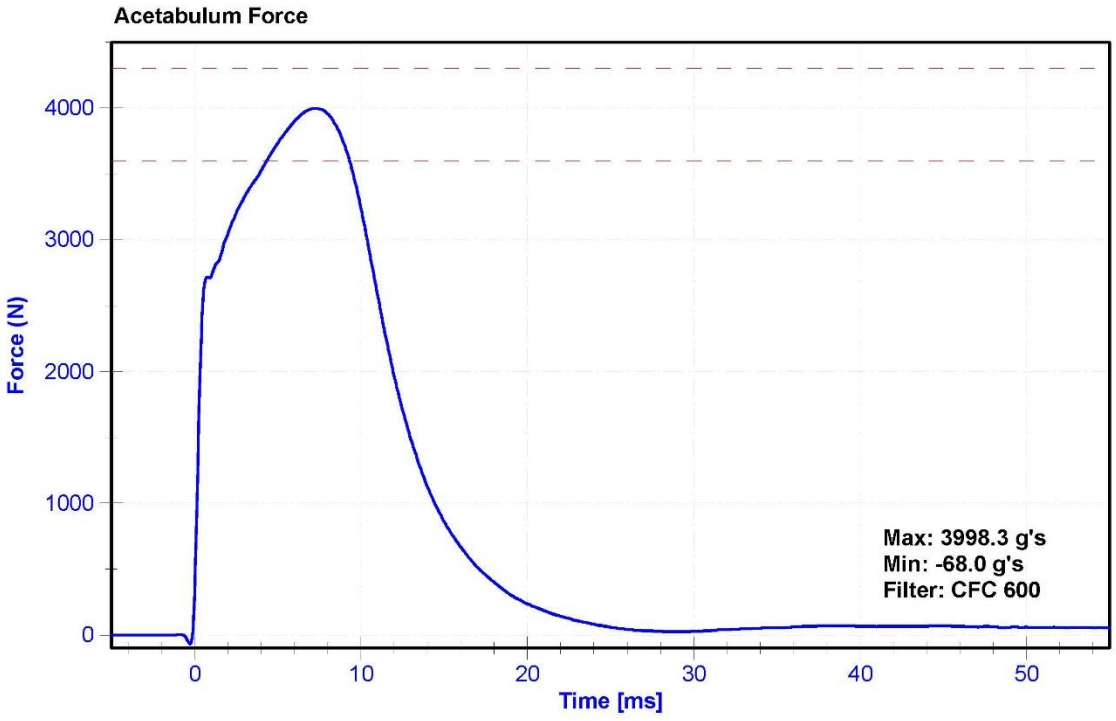
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	47.3	Pass
Velocity	6.6	6.8	m/s	6.61	Pass
Probe Acceleration	38	47	g's	43.5	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.1	Pass
Acetabulum Force	3,600	4,300	N	3998.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pelvis Y Accelerometer	ENDEVCO 7264	AC-P51259	10/19/2015	4/18/2016
Acetabulum Load Cell	Denton IF-520	LC-236Fy	6/29/2015	6/28/2016
Certification Plug	Humanetics	49022	12/07/2011	N/A
Crash Test Plug	Humanetics	48973	12/06/2011	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 43.9 g's
Min: -14.5 g's
Filter: CFC 180


Acetabulum Force
Force (N)
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 3998.3 g's
Min: -68.0 g's
Filter: CFC 600

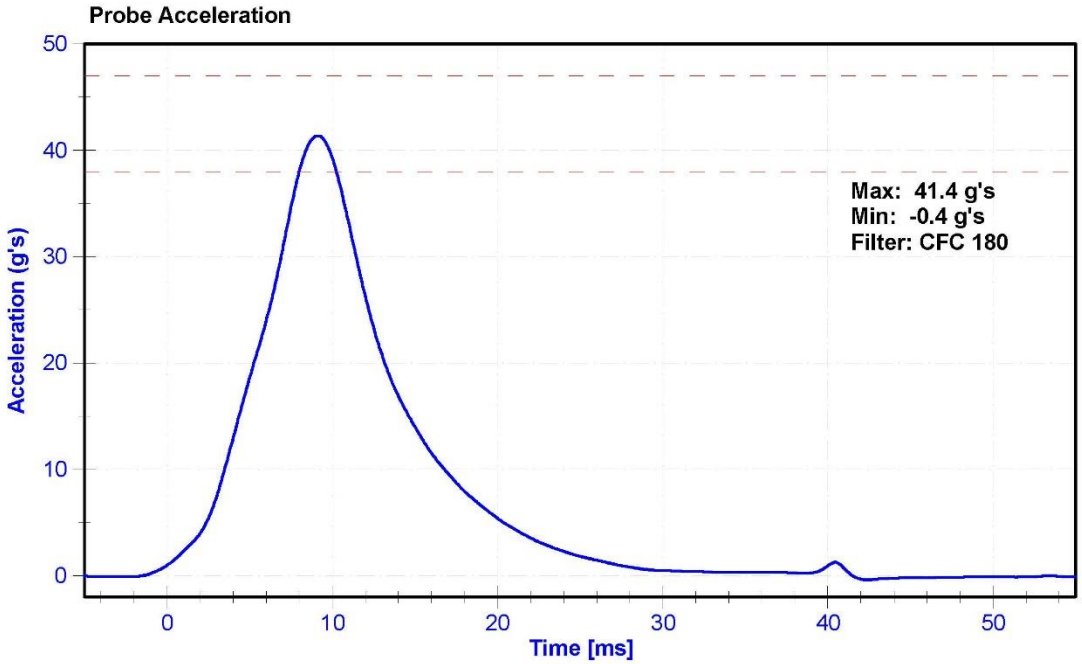
ATD Manufacturer	FTSS	Test Technician	M. Geesey
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

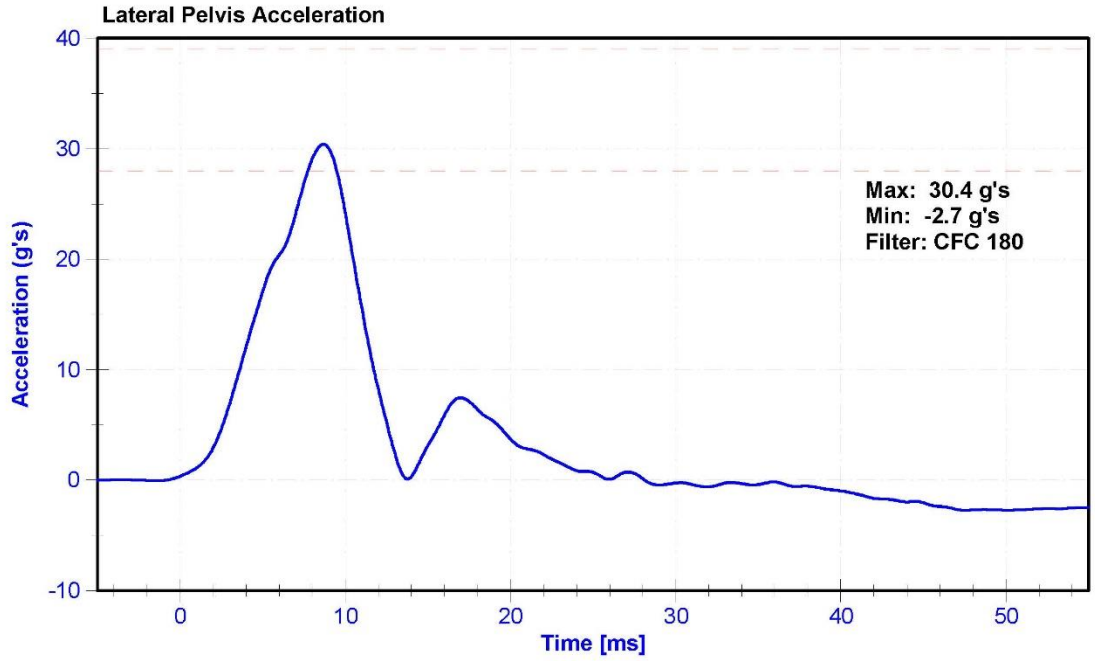
Results

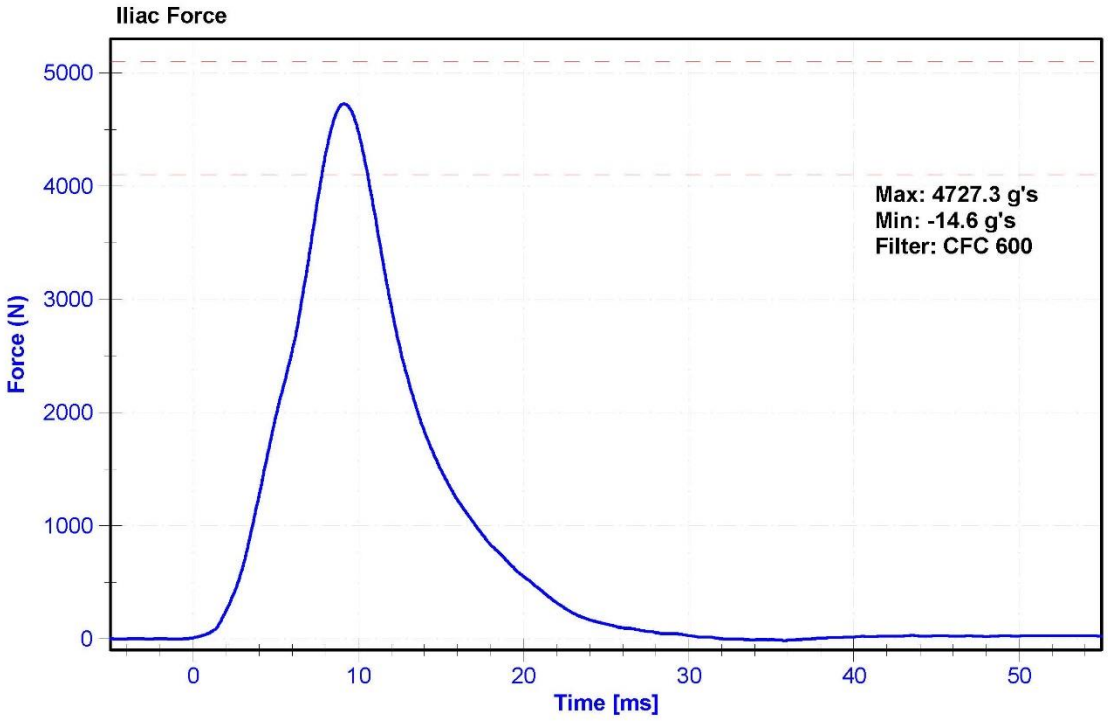
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	47.3	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	41.4	Pass
Lateral Pelvis Acceleration	28	39	g's	30.4	Pass
Iliac Force	4,100	5,100	N	4727.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pelvis Y Accelerometer	ENDEVCO 7264	AC-P51259	10/19/2015	4/18/2016
Iliac Load Cell	DENTON 3228J	LC-285Fy	7/21/2015	7/20/2016




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 30.4 g's
Min: -2.7 g's
Filter: CFC 180


Iliac Force
Force (N)
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 4727.3 g's
Min: -14.6 g's
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

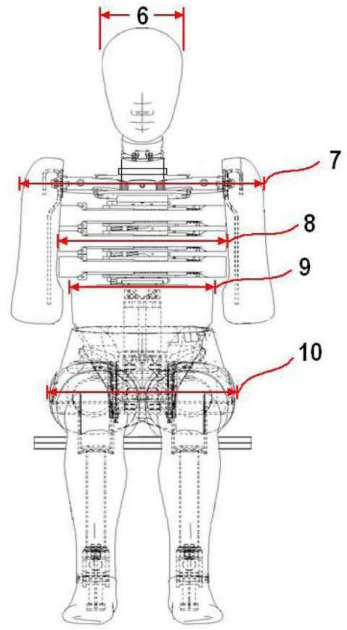
EUROSID 2 (ES-2RE) MALE – DRIVER ATD

SERIAL NO: F034 (CONFIGURED FOR LEFT SIDE IMPACT)

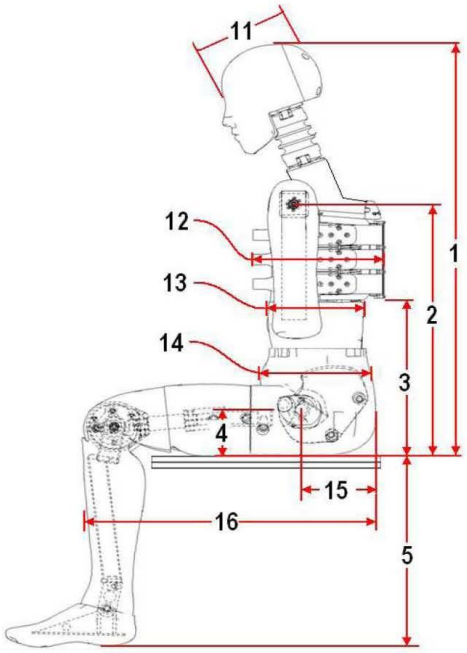
External Measurements - EuroSID-2re

Technician: M.Hartung Date: 12/1/2015

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	909	Pass
2	Seat to Shoulder Joint	558	572	560	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	99	Pass
5	Sole to Seat, Sitting	333	451	412	Pass
6	Head Width	152	158	154	Pass
7	Shoulder/Arm Width	461	479	475	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	284	Pass
10	Pelvis Lap Width	359	373	368	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	198	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	603	Pass

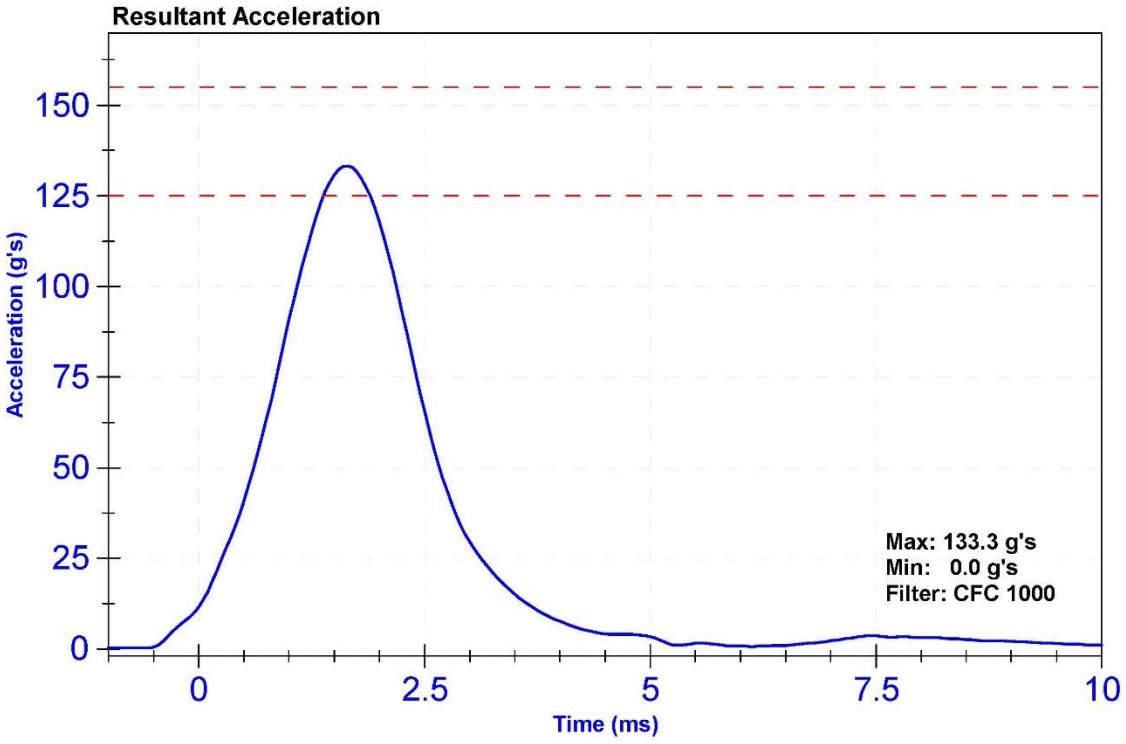
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

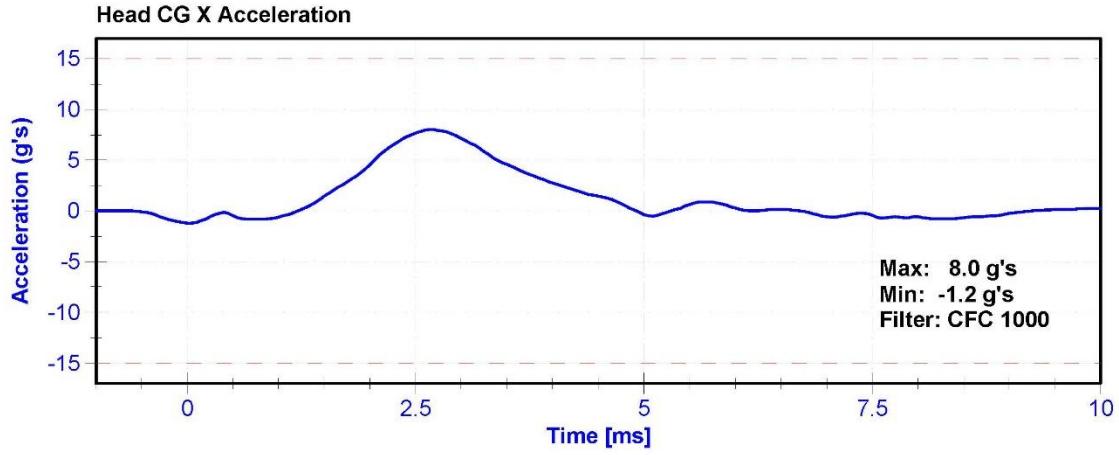
Results

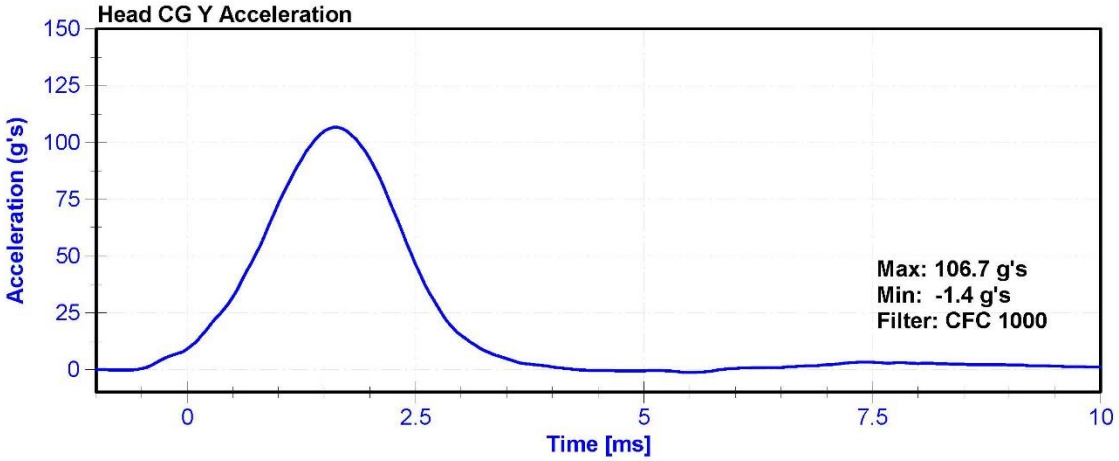
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	22.8	Pass
Resultant Acceleration	125	155	g's	133.3	Pass
Oscillation	0	15	%	3.04	Pass
Fore-Aft Acceleration	-15	15	g's	8.0	Pass

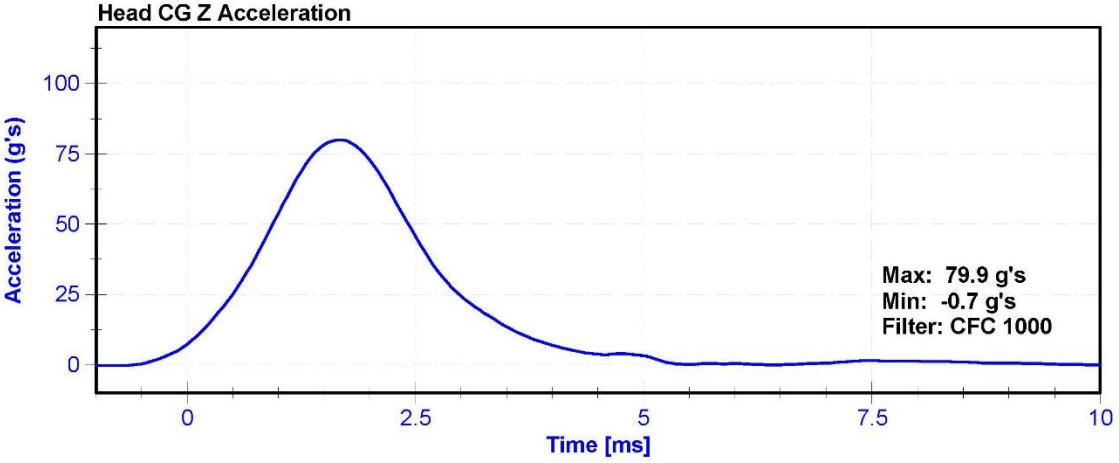
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58904	10/19/2015	4/18/2016
Y Accelerometer	ENDEVCO 7264CT	AC-P58911	10/19/2015	4/18/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P58776	10/19/2015	4/18/2016




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 8.0 g's
Min: -1.2 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
150
125
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]
Max: 106.7 g's
Min: -1.4 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]
Max: 79.9 g's
Min: -0.7 g's
Filter: CFC 1000

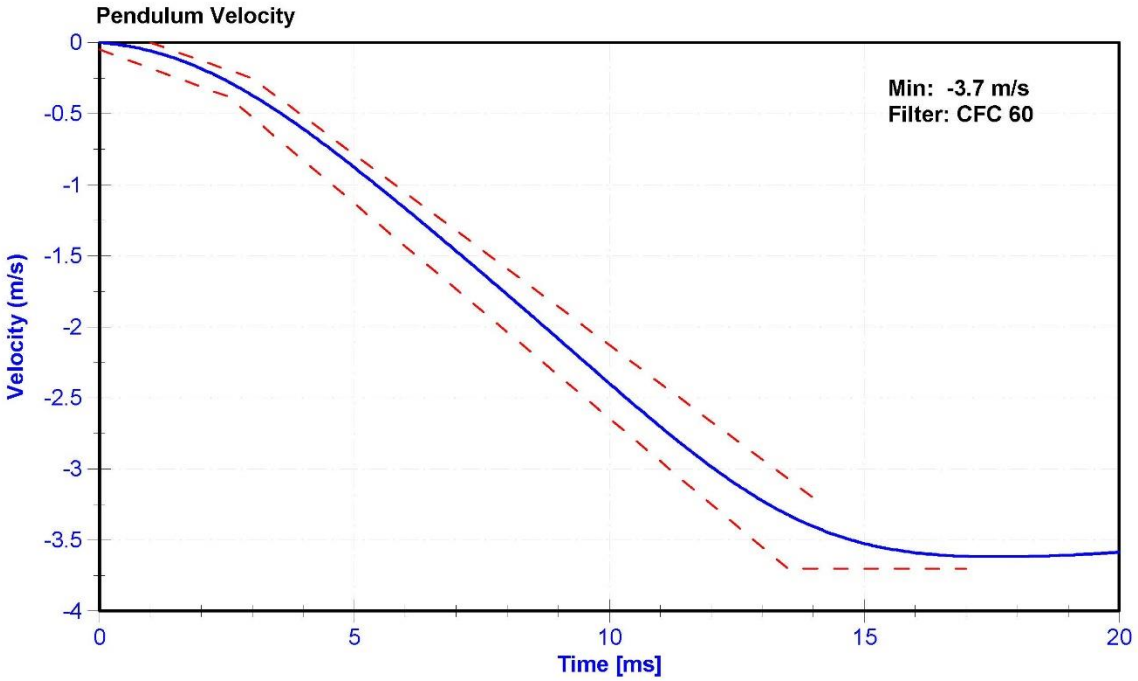
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

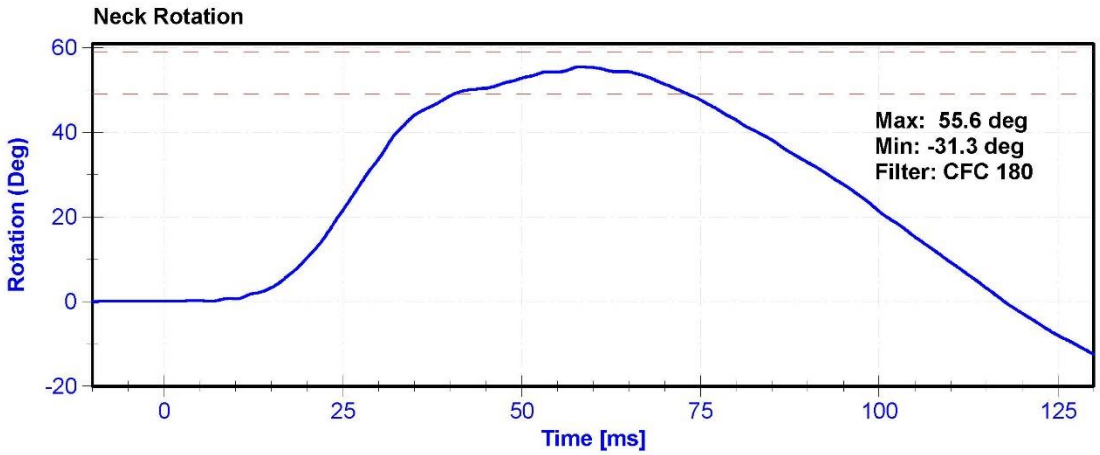
Results

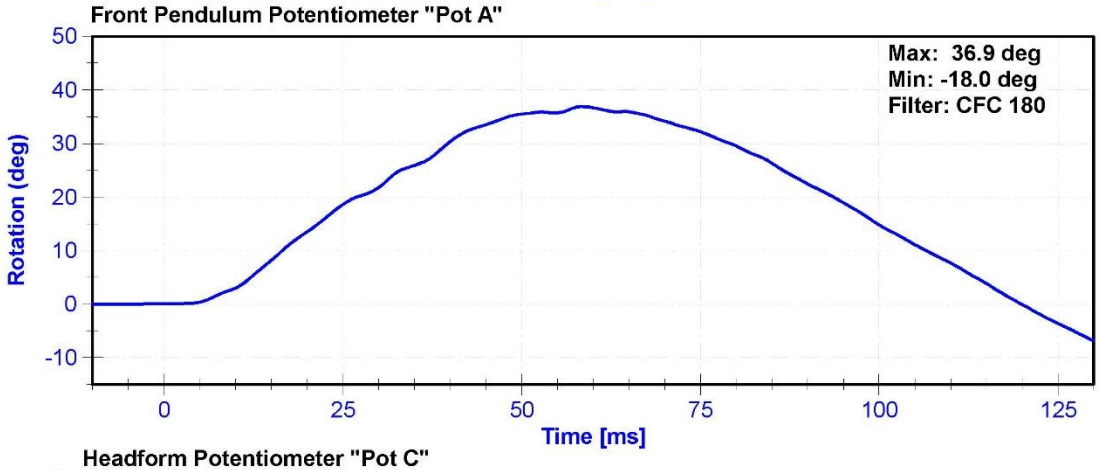
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	23.3	Pass
Velocity	3.3	3.5	m/s	3.45	Pass
Lateral Neck Rotation	49	59	deg	55.6	Pass
Time at Maximum Rotation	54	66	ms	58.2	Pass
Time of Rotation Decay from Maximum	53	88	ms	59.3	Pass

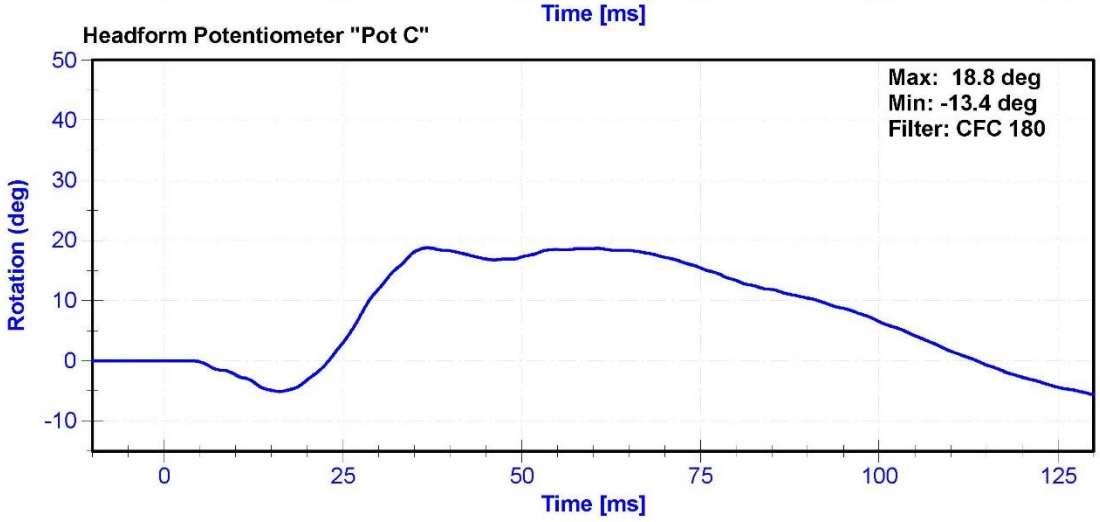
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Front Pendulum Potentiometer	SP22G	DS-094	9/24/2015	9/23/2016
Headform Potentiometer	SP22G	DS-095	9/24/2015	9/23/2016




Neck Rotation
Rotation (Deg)
60
40
20
0
-20
0
25
50
75
100
125
Time [ms]
Max: 55.6 deg
Min: -31.3 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
50
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]
Max: 36.9 deg
Min: -18.0 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
50
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]
Max: 18.8 deg
Min: -13.4 deg
Filter: CFC 180

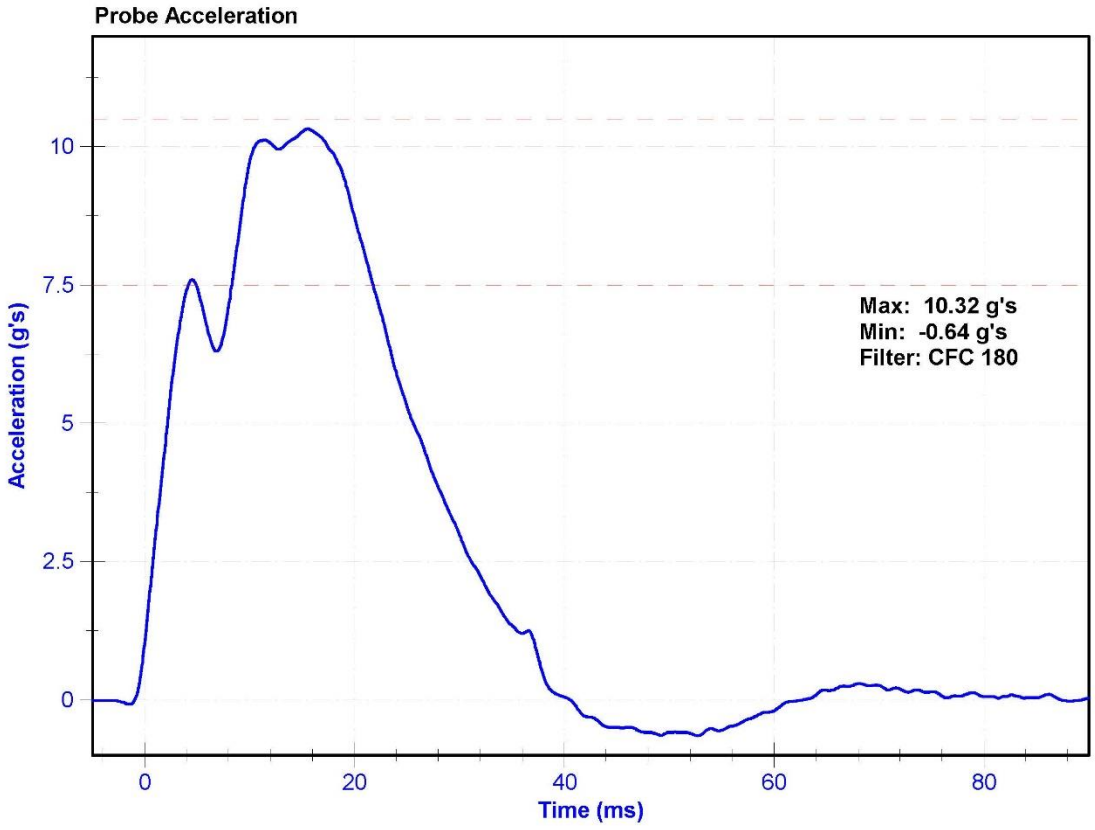
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	21.6	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	7.5	10.5	g's	10.32	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016



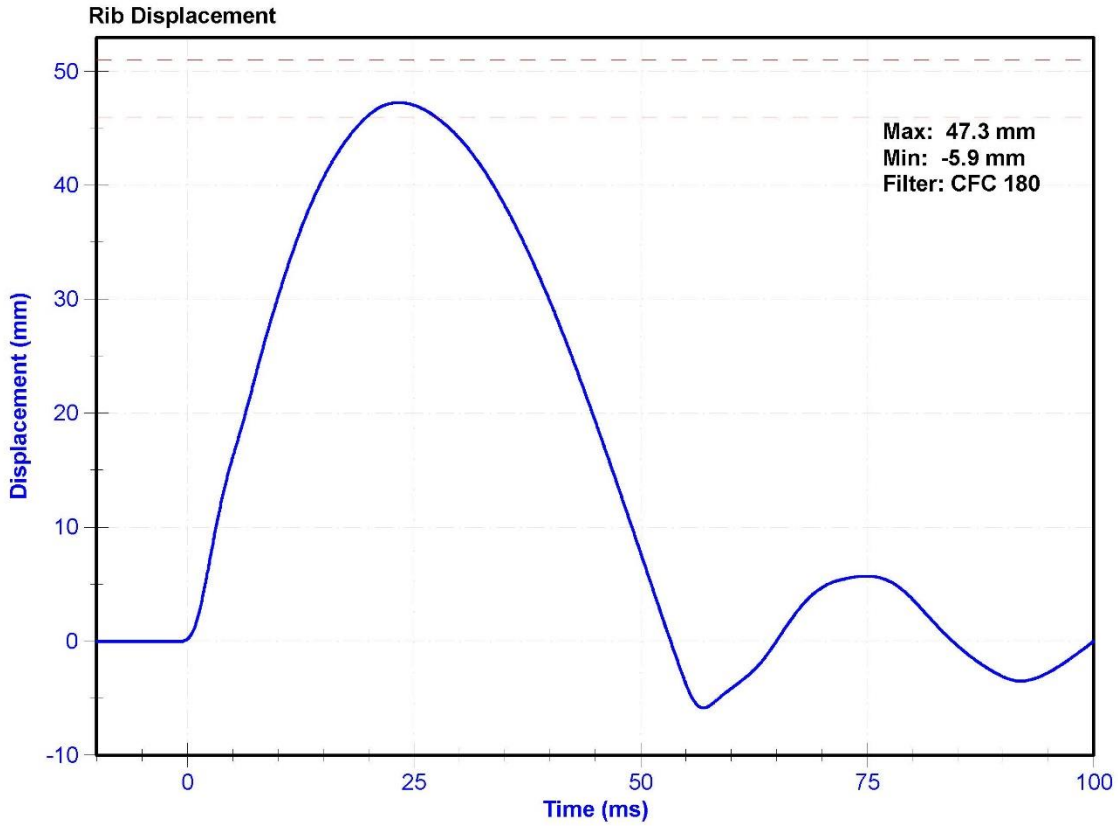
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	46	51	mm	47.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016



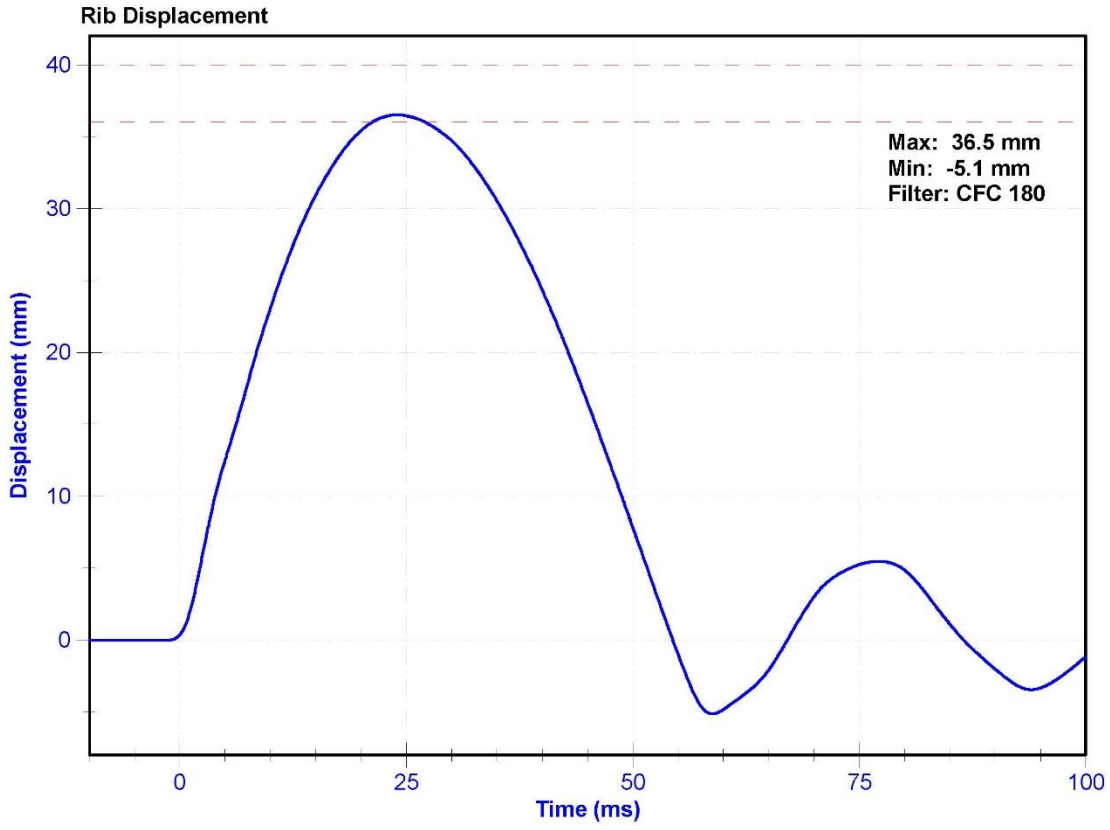
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	36	40	mm	36.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016



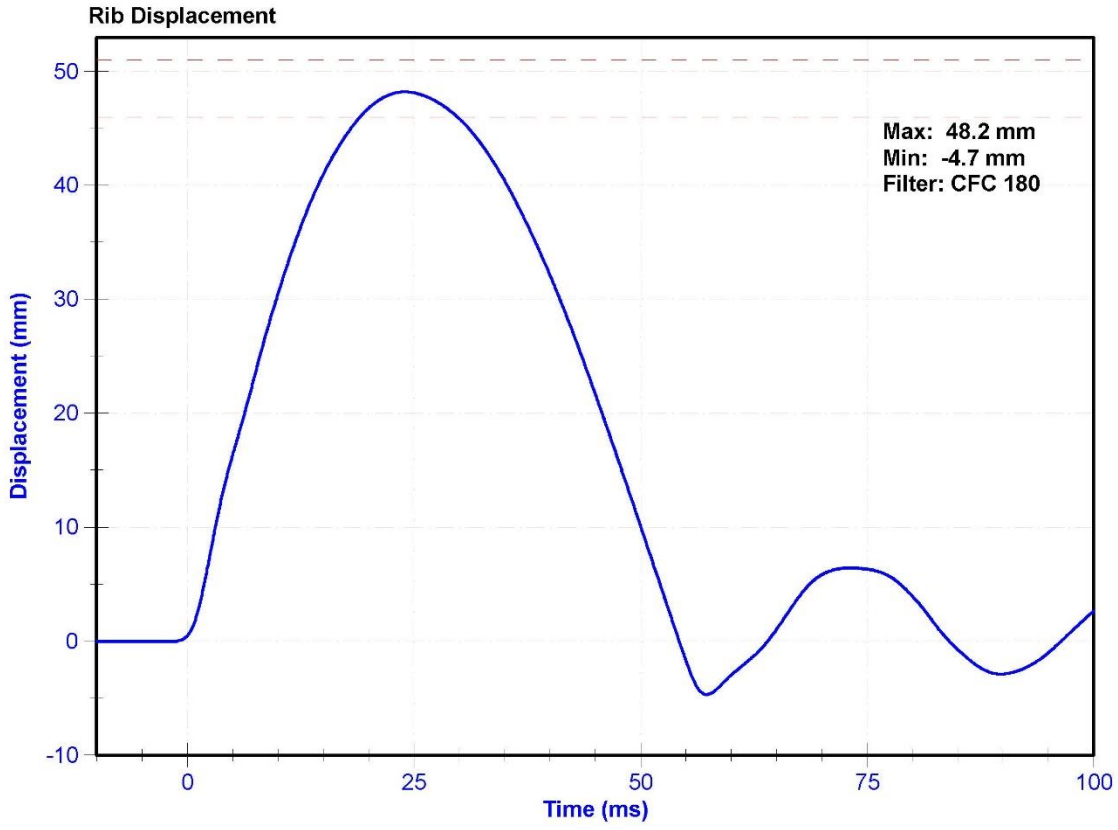
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	46	51	mm	48.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016



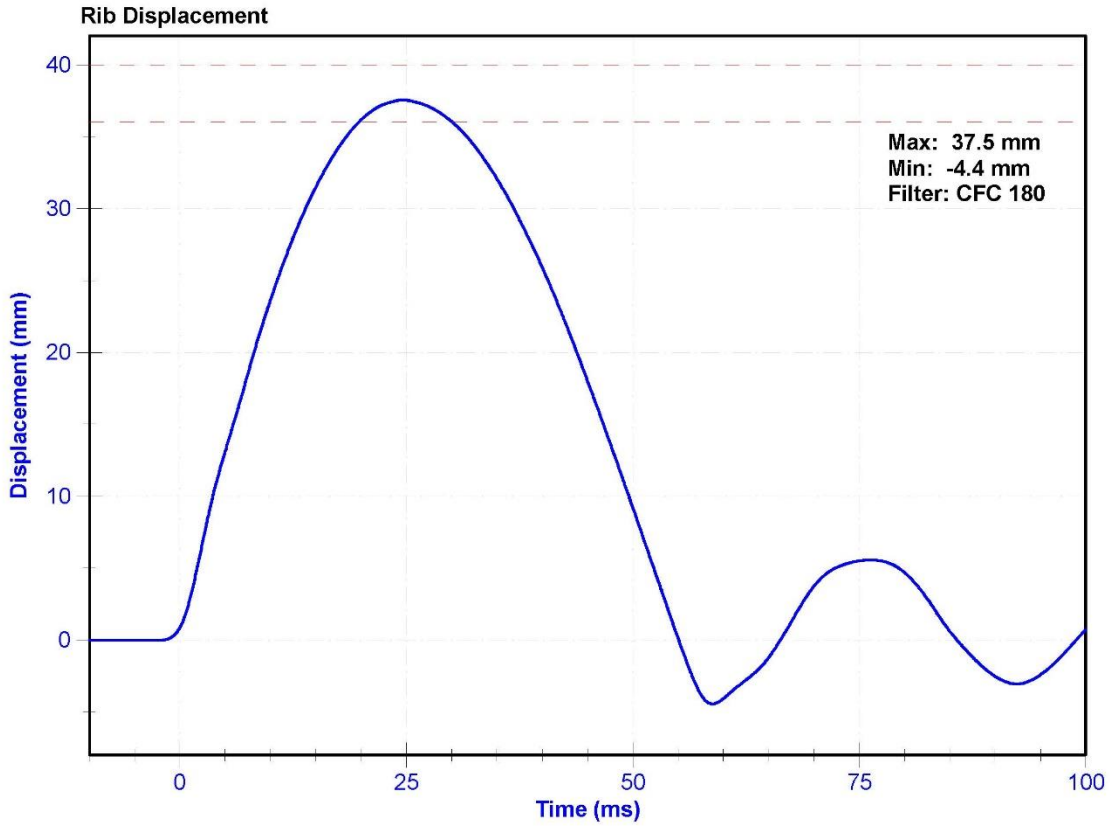
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016



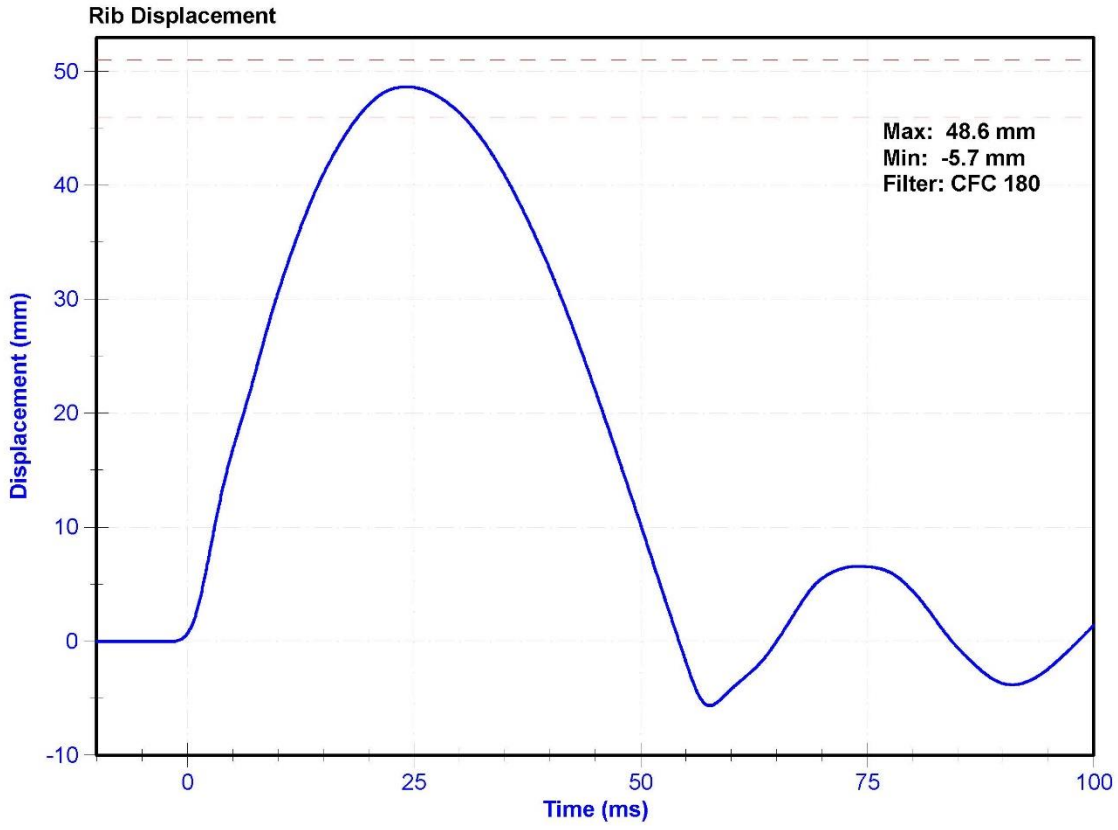
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016



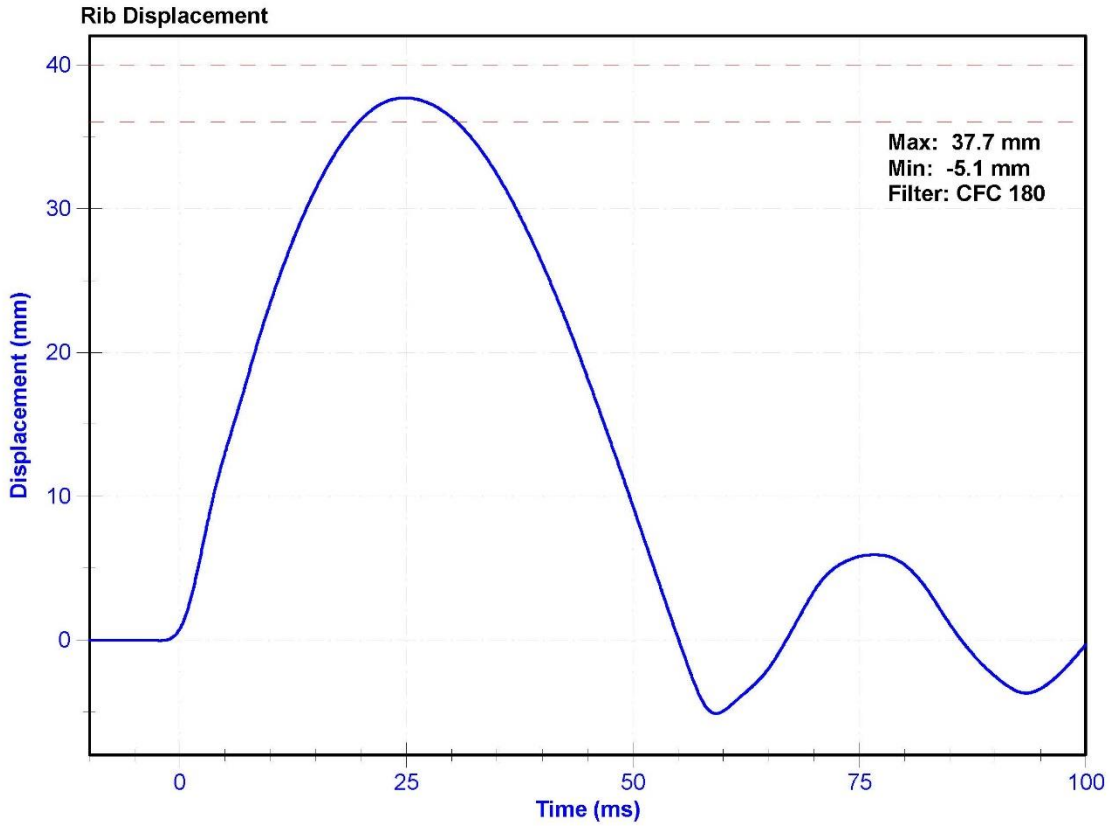
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	22.4	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016



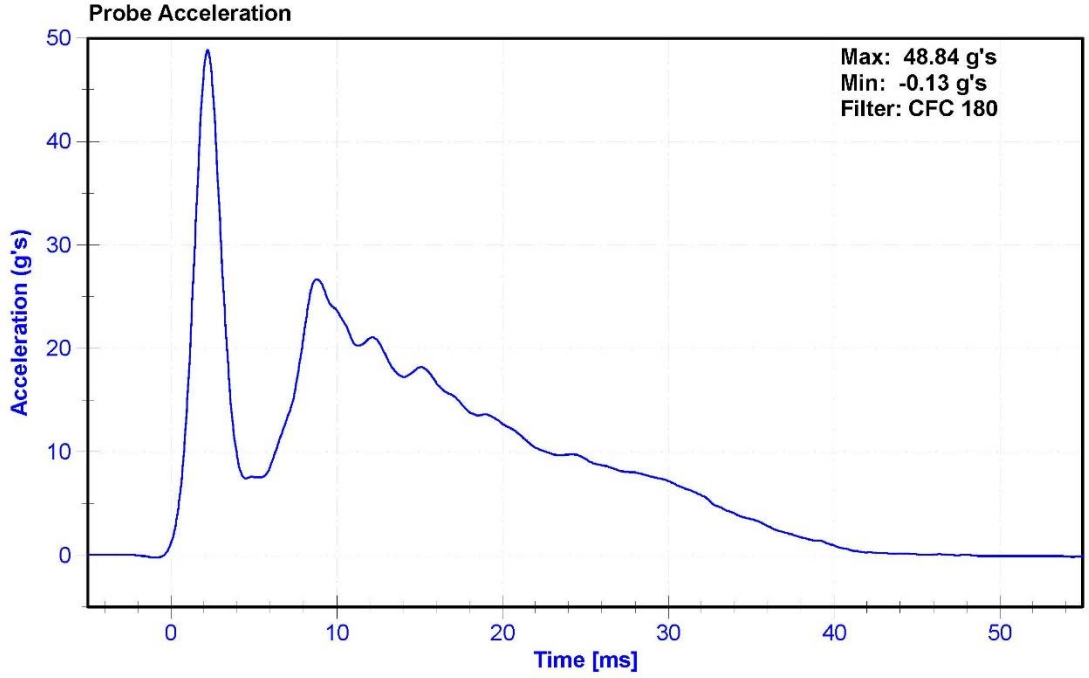
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

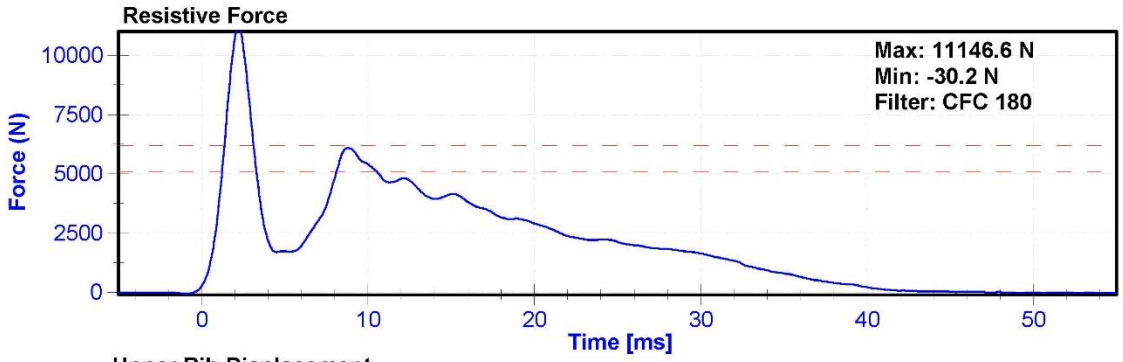
Results

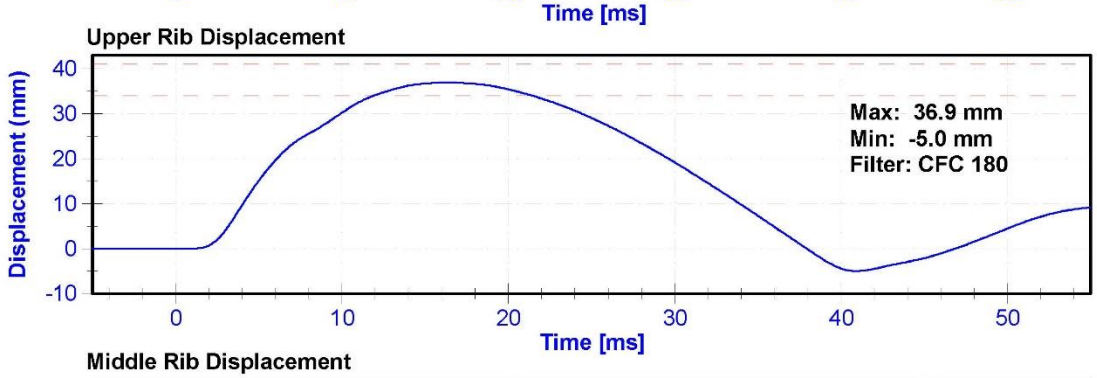
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	21.5	Pass
Velocity	5.4	5.6	m/s	5.40	Pass
Resistive Force after 6ms	5,100	6,200	N	6087.0	Pass
Upper Thorax Rib Deflection	34	41	mm	36.9	Pass
Mid Thorax Rib Deflection	37	45	mm	40.5	Pass
Lower Thorax Rib Deflection	37	44	mm	39.6	Pass

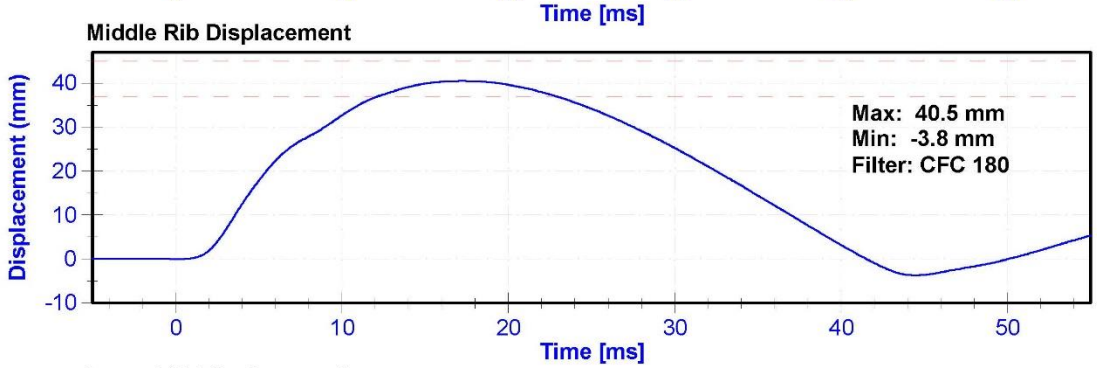
Transducer Calibrations

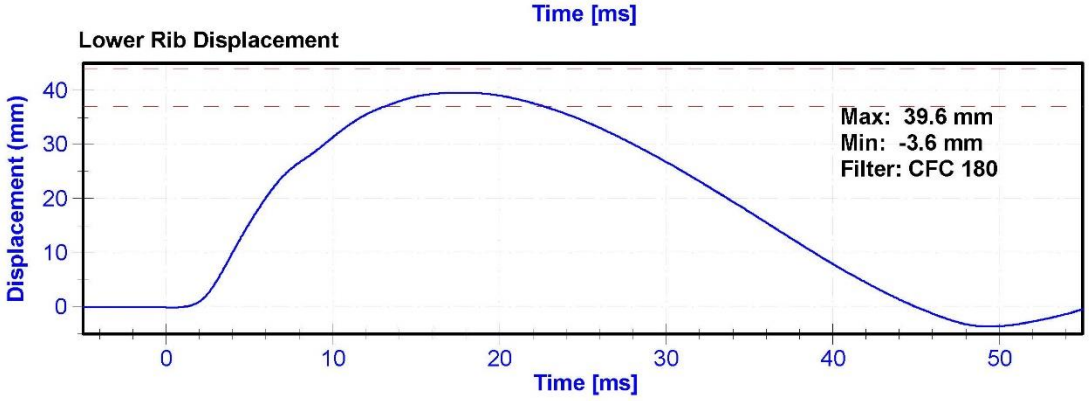
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	10/19/2015	10/18/2016




Resistive Force
Force (N)
10000
7500
5000
2500
0
0
10
20
30
40
50
Time [ms]
Max: 11146.6 N
Min: -30.2 N
Filter: CFC 180


Upper Rib Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 36.9 mm
Min: -5.0 mm
Filter: CFC 180


Middle Rib Displacement
Displacement (mm)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 40.5 mm
Min: -3.8 mm
Filter: CFC 180


Lower Rib Displacement
Displacement (mm)
40
30
20
10
0
0
10
20
30
40
50
Time [ms]
Max: 39.6 mm
Min: -3.6 mm
Filter: CFC 180

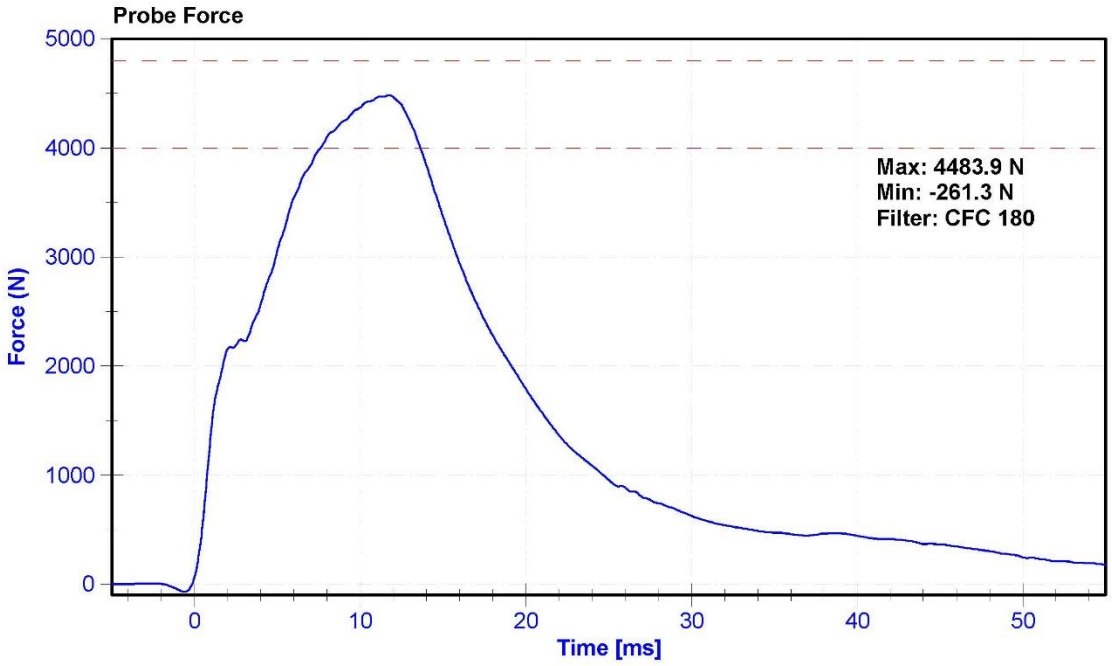
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

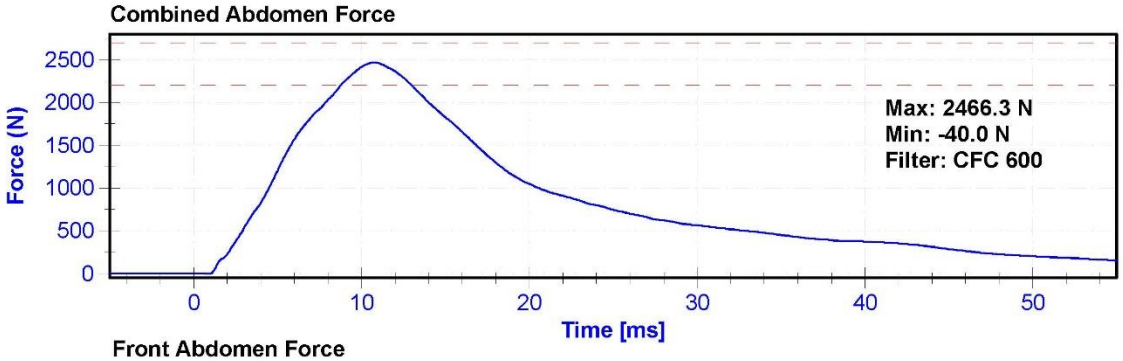
Results

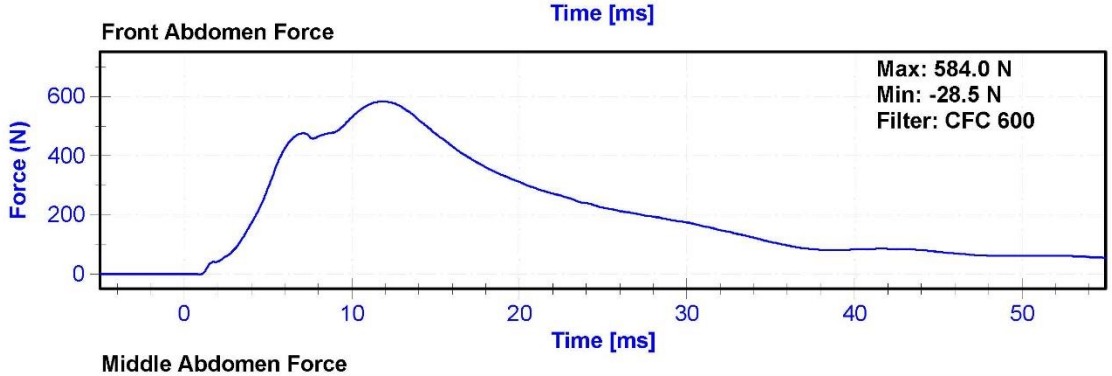
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	22.2	Pass
Velocity	3.9	4.1	m/s	4.01	Pass
Combined Abdomen Force	2,200	2,700	N	2466.3	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.75	Pass
Resistive Probe Force	4,000	4,800	N	4483.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.75	Pass

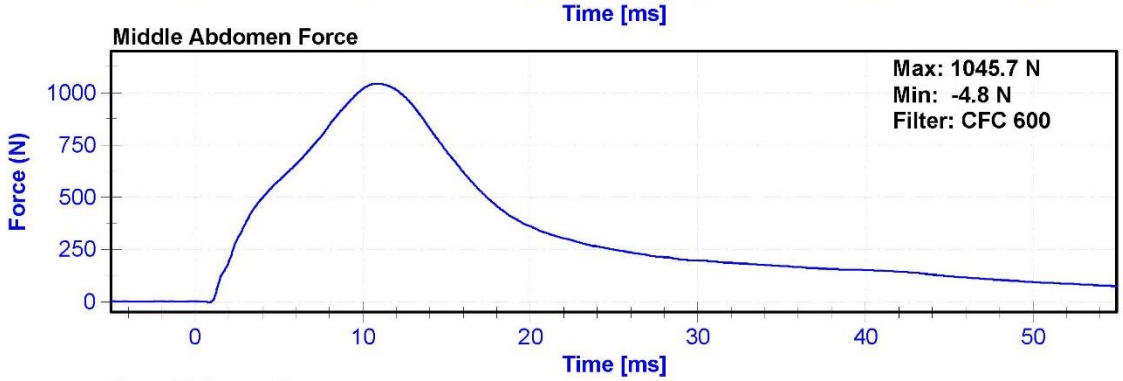
Transducer Calibrations

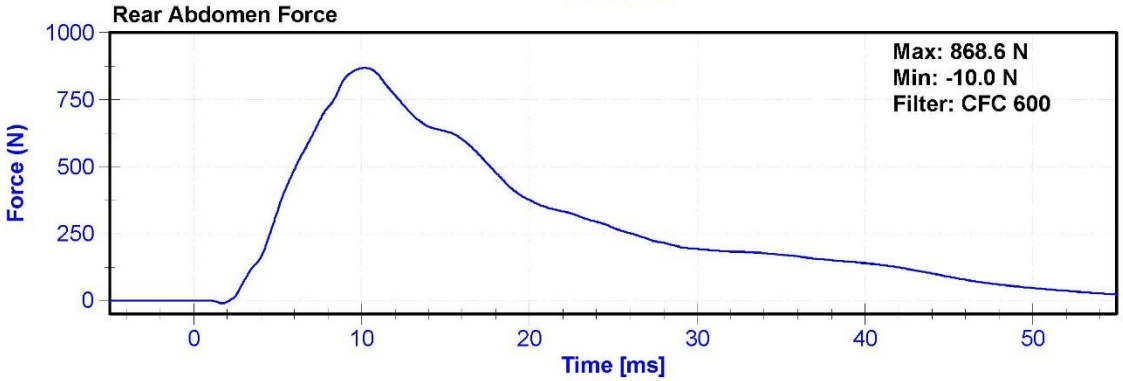
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Front Abdomen Load Cell	DENTON 2631	LC-1512	6/25/2015	6/24/2016
Middle Abdomen Load Cell	DENTON 2631	LC-1526	6/25/2015	6/24/2016
Rear Abdomen Load Cell	DENTON 2631	LC-1516	6/25/2015	6/24/2016




Combined Abdomen Force
Force (N)
2500
2000
1500
1000
500
0
0
10
20
30
40
50
Time [ms]
Max: 2466.3 N
Min: -40.0 N
Filter: CFC 600


Front Abdomen Force
Force (N)
600
400
200
0
0
10
20
30
40
50
Time [ms]
Max: 584.0 N
Min: -28.5 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
1000
750
500
250
0
0
10
20
30
40
50
Time [ms]
Max: 1045.7 N
Min: -4.8 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
1000
750
500
250
0
0
10
20
30
40
50
Time [ms]
Max: 868.6 N
Min: -10.0 N
Filter: CFC 600

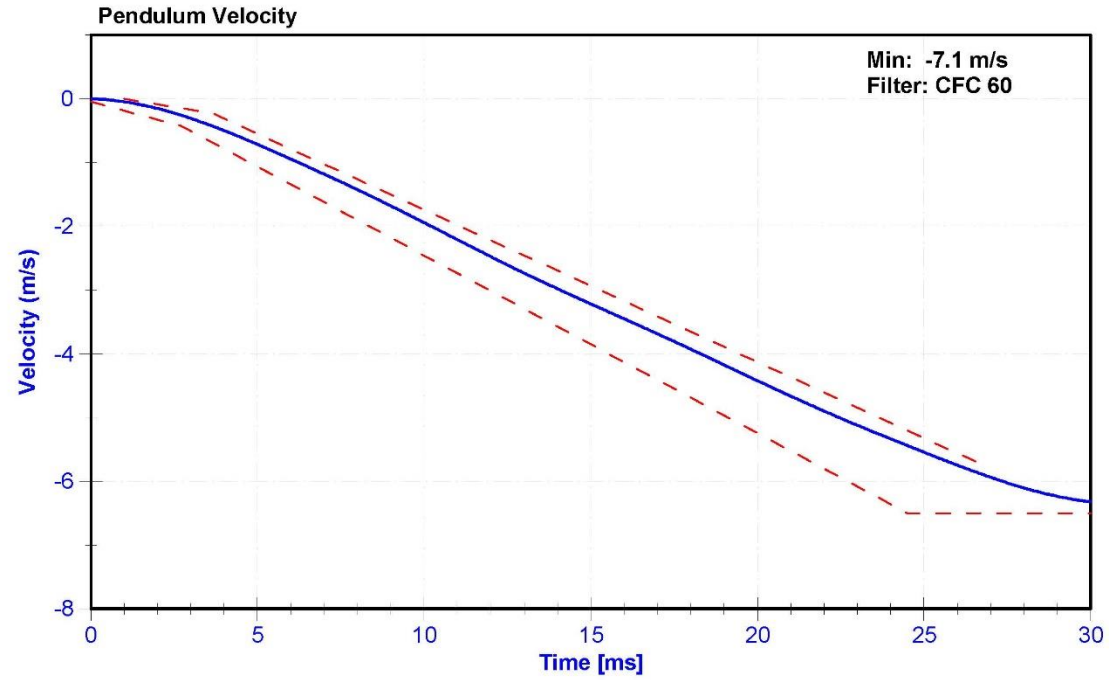
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

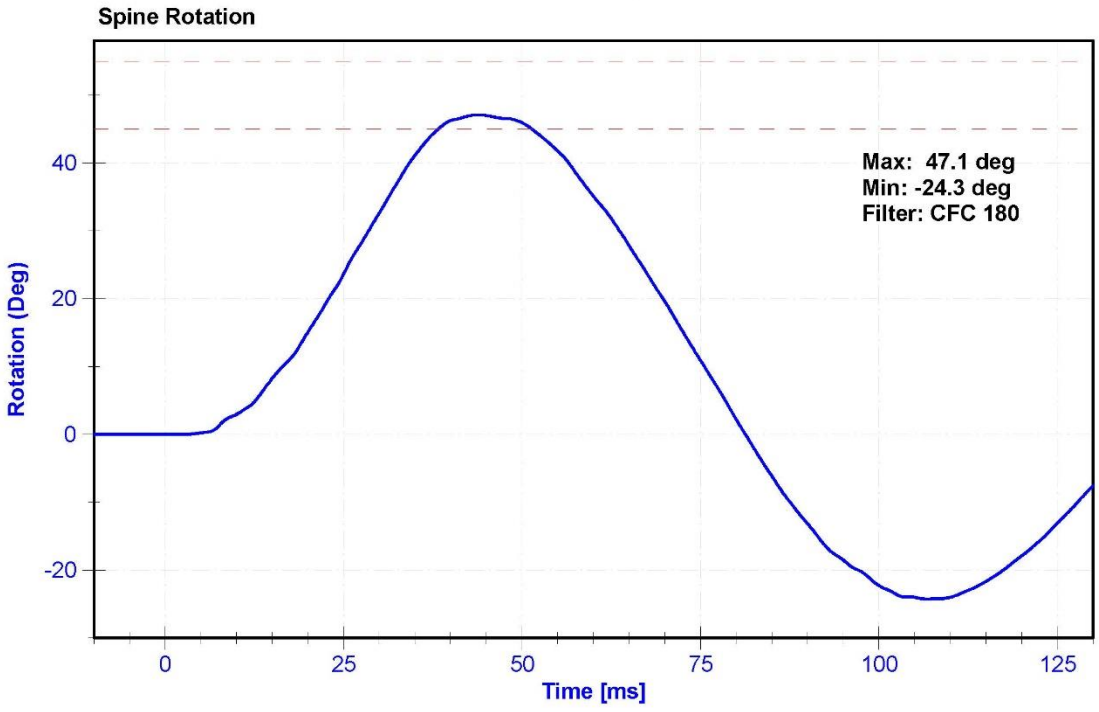
Results

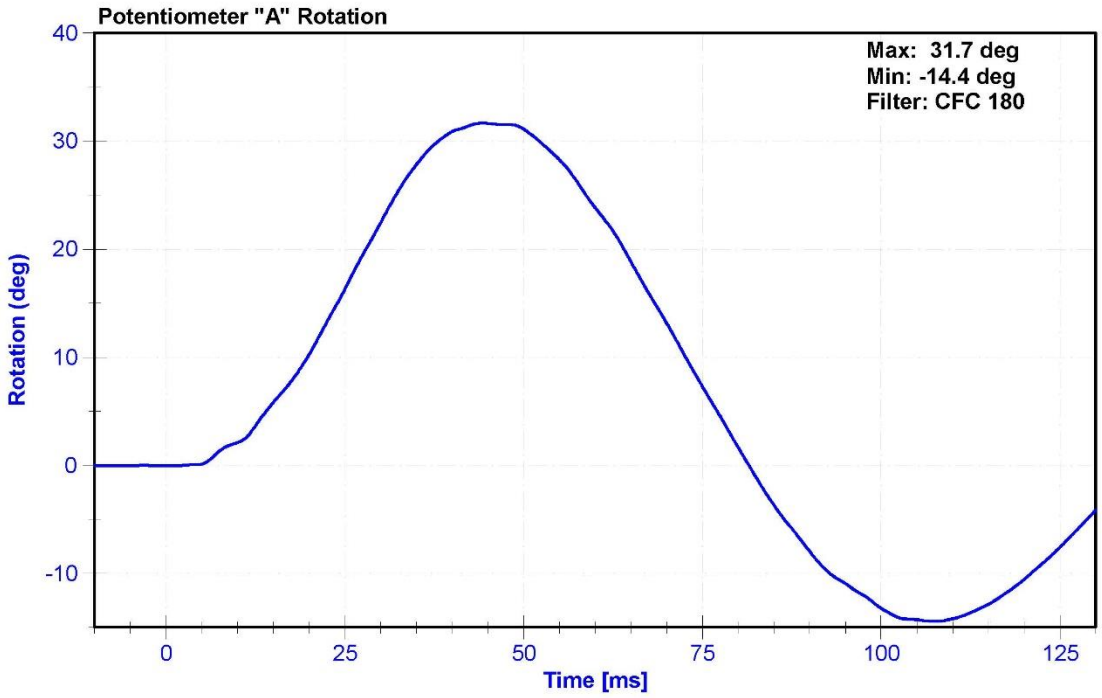
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	22.5	Pass
Velocity	5.95	6.15	m/s	6.068	Pass
Lateral Spine Rotation	45	55	deg	47.1	Pass
Time at Maximum Rotation	39	53	ms	43.8	Pass
Time of Decay to Zero Degrees	37	57	ms	37.5	Pass
Pulse within Corridor?	-	-	-	Yes	

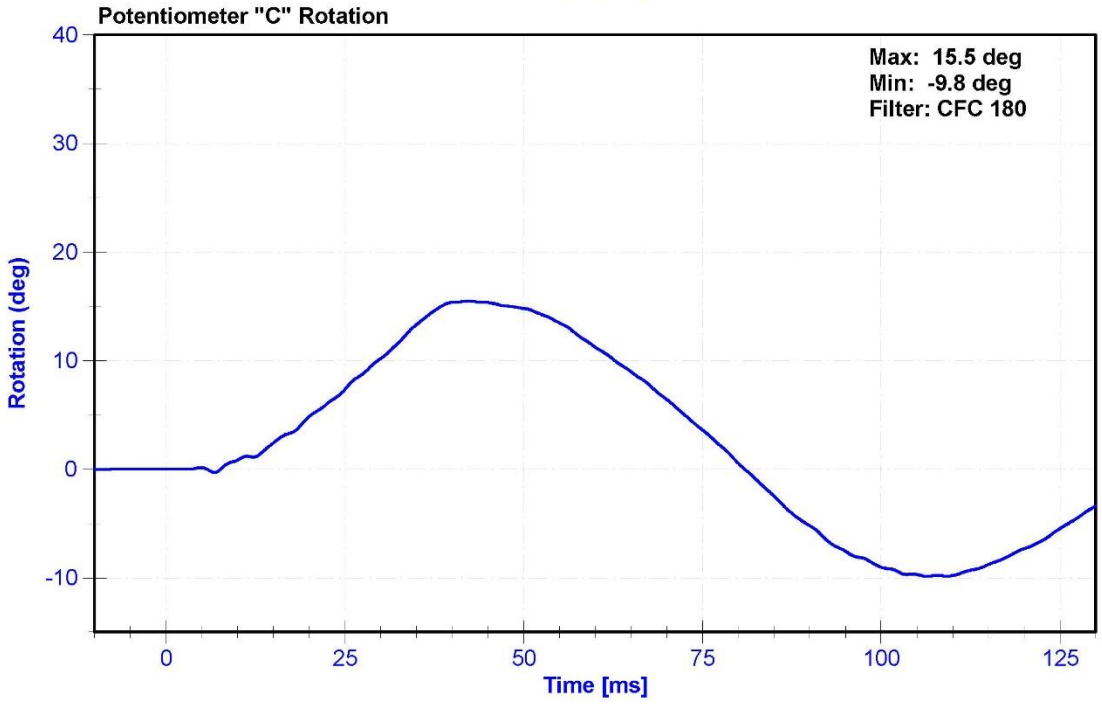
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/7/2015	5/6/2016
Pendulum "A" Potentiometer	SP22G	DS-094	9/24/2015	9/23/2016
Condyle "B" Potentiometer	SP22G	DS-095	9/24/2015	9/23/2016


Pendulum Velocity
Min: -7.1 m/s
Filter: CFC 60
Velocity (m/s)
0
-2
-4
-6
-8
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 47.1 deg
Min: -24.3 deg
Filter: CFC 180
Rotation (Deg)
40
20
0
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 31.7 deg
Min: -14.4 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 15.5 deg
Min: -9.8 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
0
25
50
75
100
125
Time [ms]

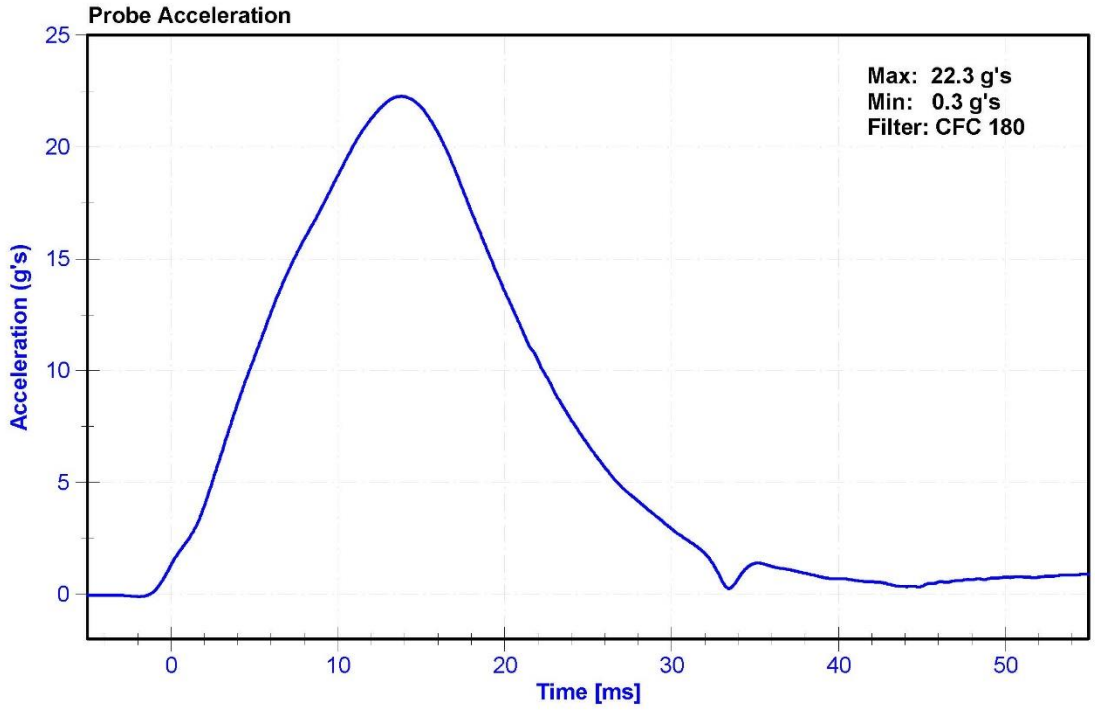
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	F034	Laboratory Supervisor	M.Goehle

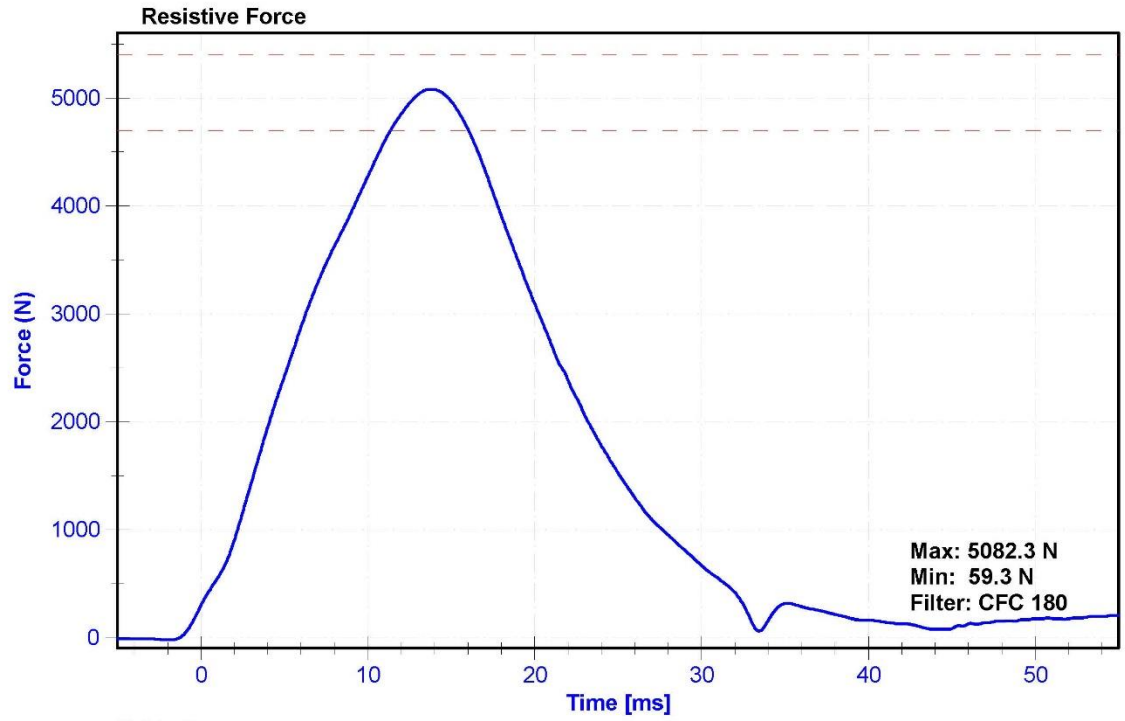
Results

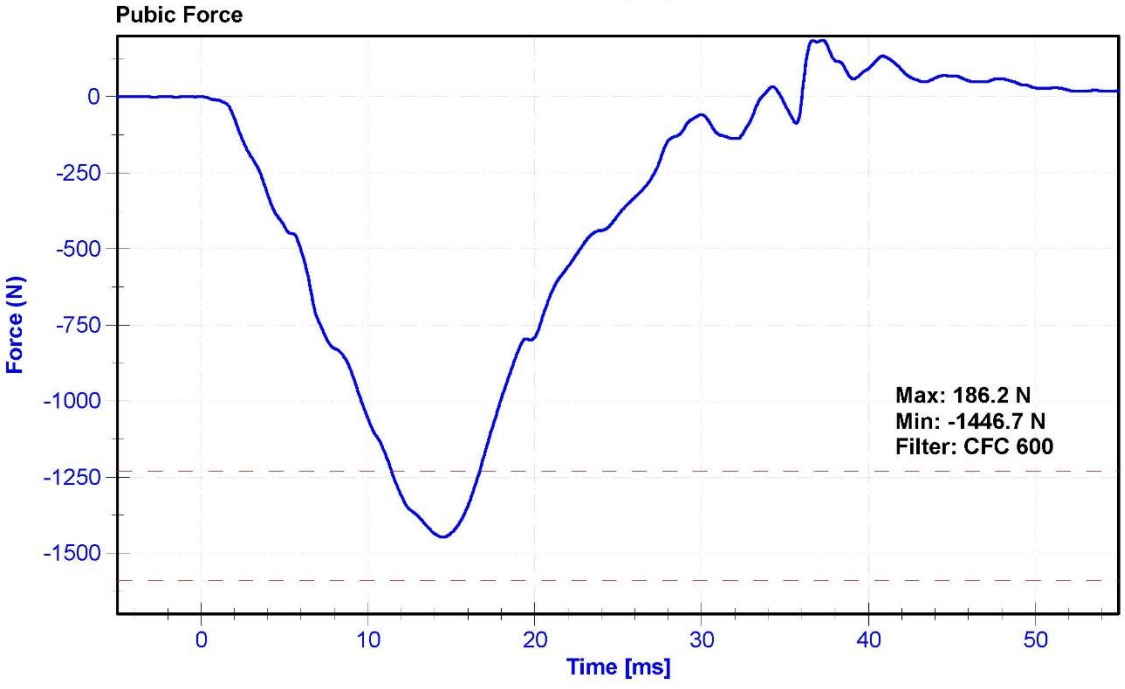
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	21.7	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Resistive Force	4,700	5,400	N	5082.3	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.80	Pass
Pubic Force	-1,590	-1,230	N	-1446.7	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.50	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pubic Load Cell	Denton 3096JFL	LC-465Fy	6/25/2015	6/24/2016




Resistive Force
Force (N)
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 5082.3 N
Min: 59.3 N
Filter: CFC 180


Pubic Force
Force (N)
0
-250
-500
-750
-1000
-1250
-1500
0
10
20
30
40
50
Time [ms]
Max: 186.2 N
Min: -1446.7 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

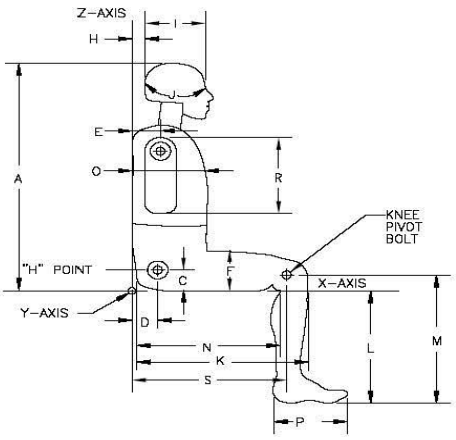
SERIAL No: 303

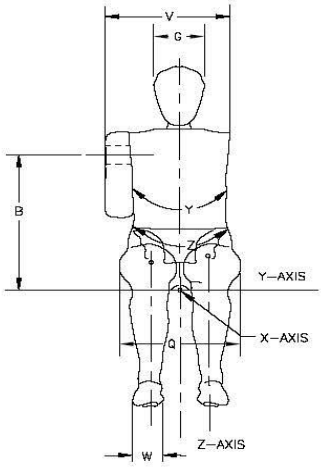
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: M.Hartung Date: 12/1/2015

Dummy Serial Number: 303





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	86	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	102	Pass
F	Thigh Clearance	119	135	131	Pass
G	Head Breadth	140	148	145	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	353	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	436	Pass
O	Chest Depth w/o jacket	195	211	202	Pass
P	Foot Length	216	232	224	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	488	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	86	Pass
Y	Chest Circumference w/jacket	851	881	871	Pass
Z	Waist Circumference	761	791	772	Pass

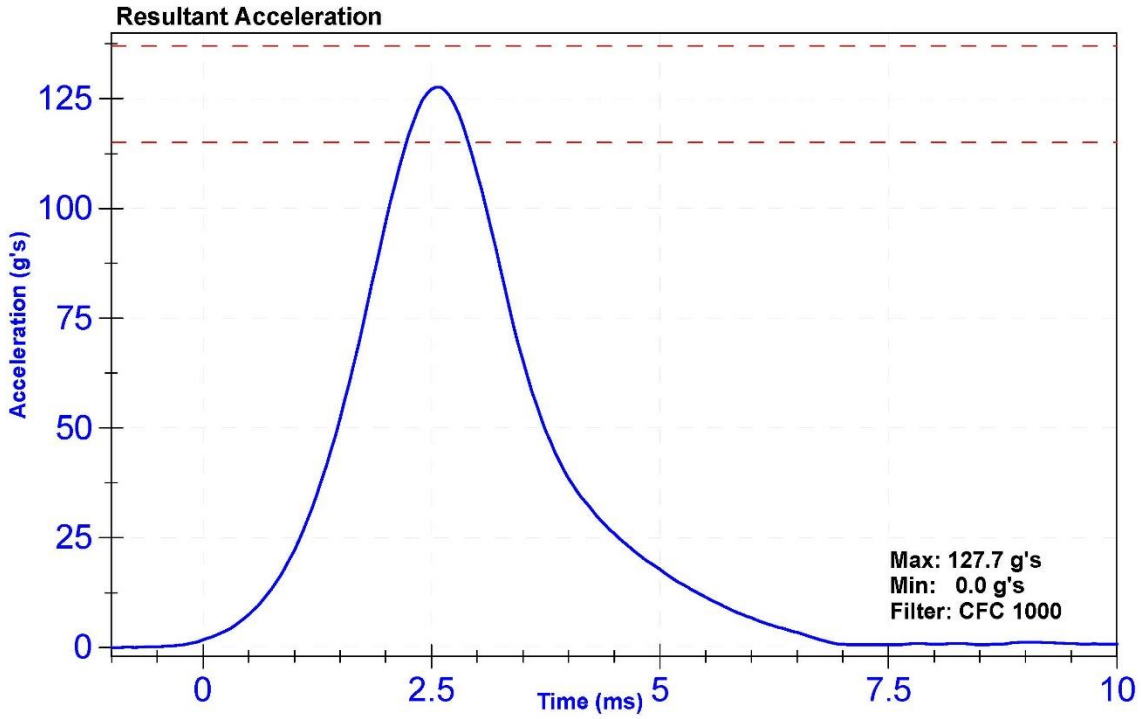
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

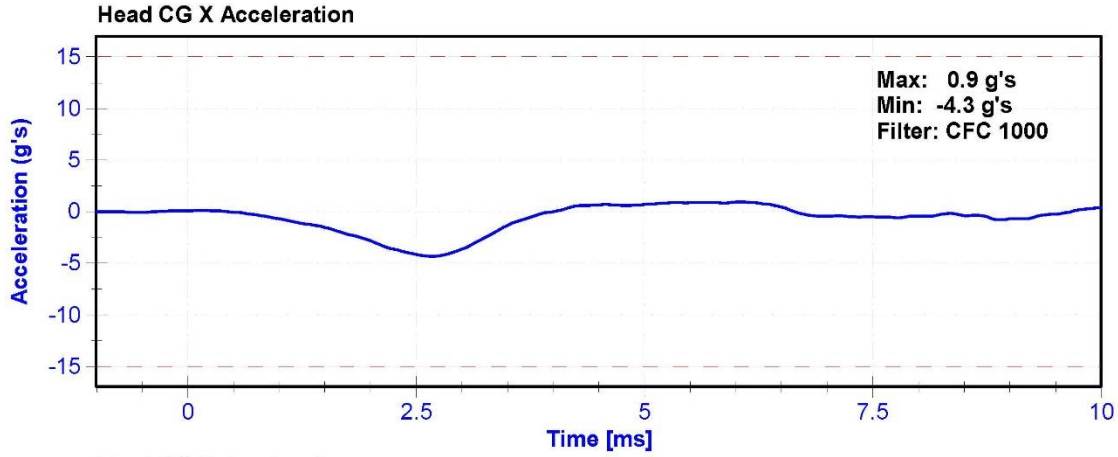
Results

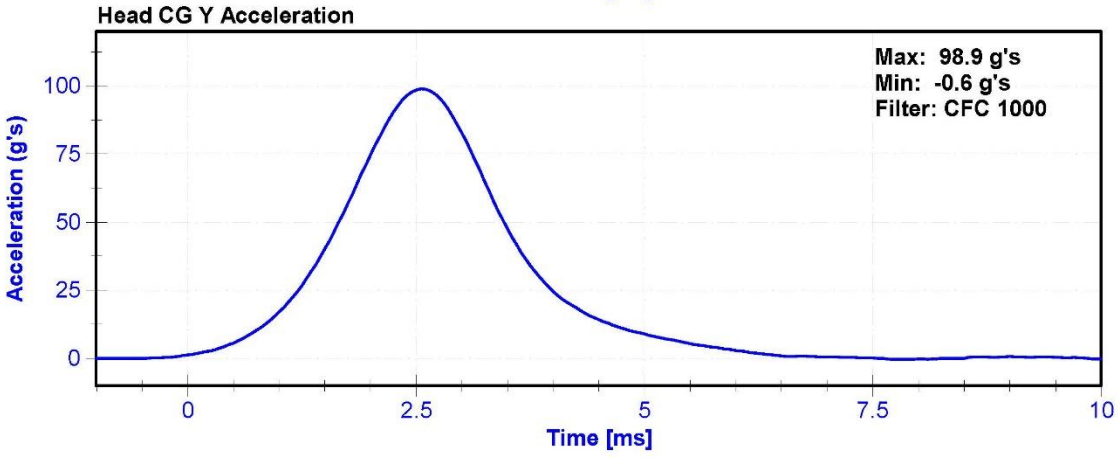
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	37	Pass
Resultant Acceleration	115	137	g's	127.7	Pass
Oscillation	0	15	%	0.9	Pass
Fore-Aft Acceleration	-15	15	g's	-4.3	Pass

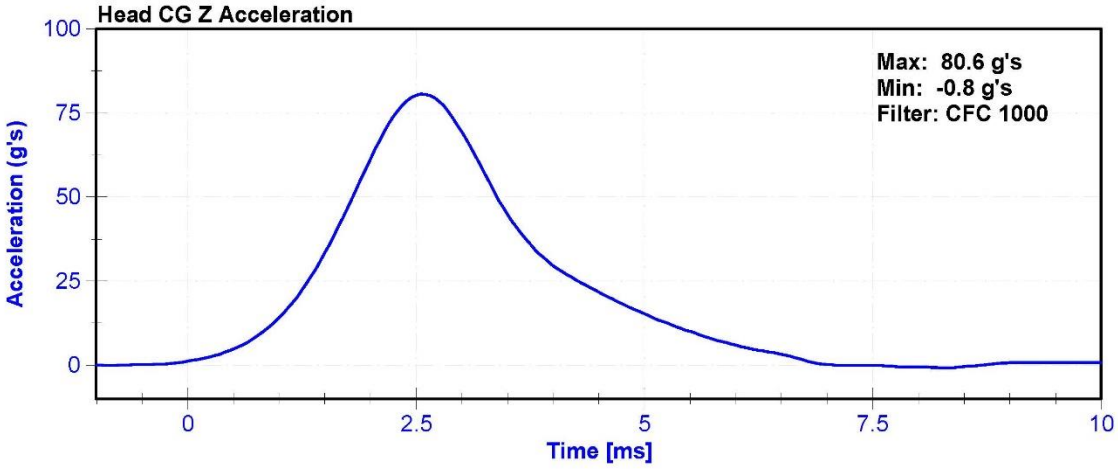
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P83420	10/16/2015	4/15/2016
Y Accelerometer	ENDEVCO 7264	AC-P52040	10/14/2015	4/13/2016
Z Accelerometer	ENDEVCO 7264CT	AC-P58737	10/14/2015	4/13/2016




Head CG X Acceleration
Max: 0.9 g's
Min: -4.3 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 98.9 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 80.6 g's
Min: -0.8 g's
Filter: CFC 1000
Acceleration (g's)
100
75
50
25
0
0
2.5
5
7.5
10
Time [ms]

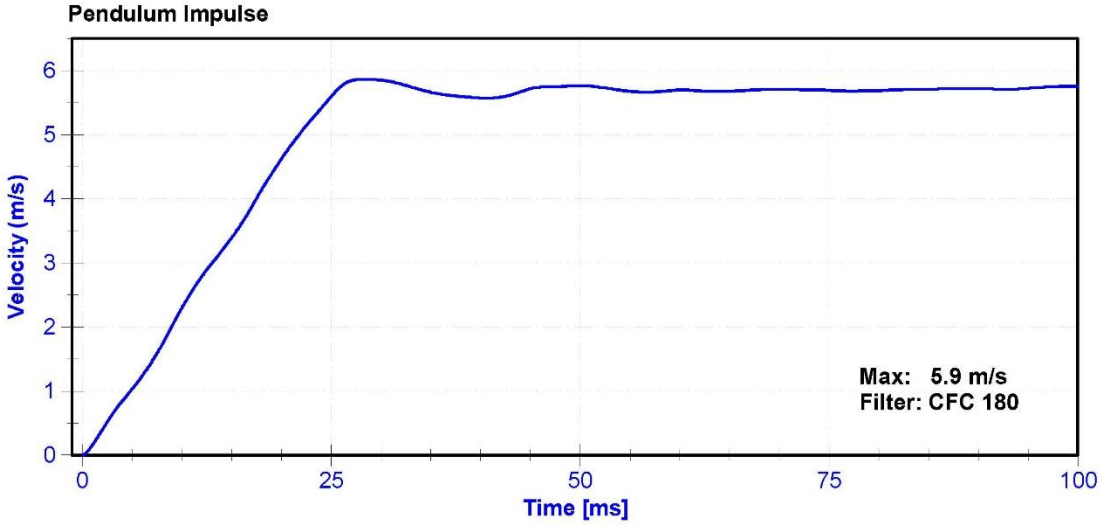
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

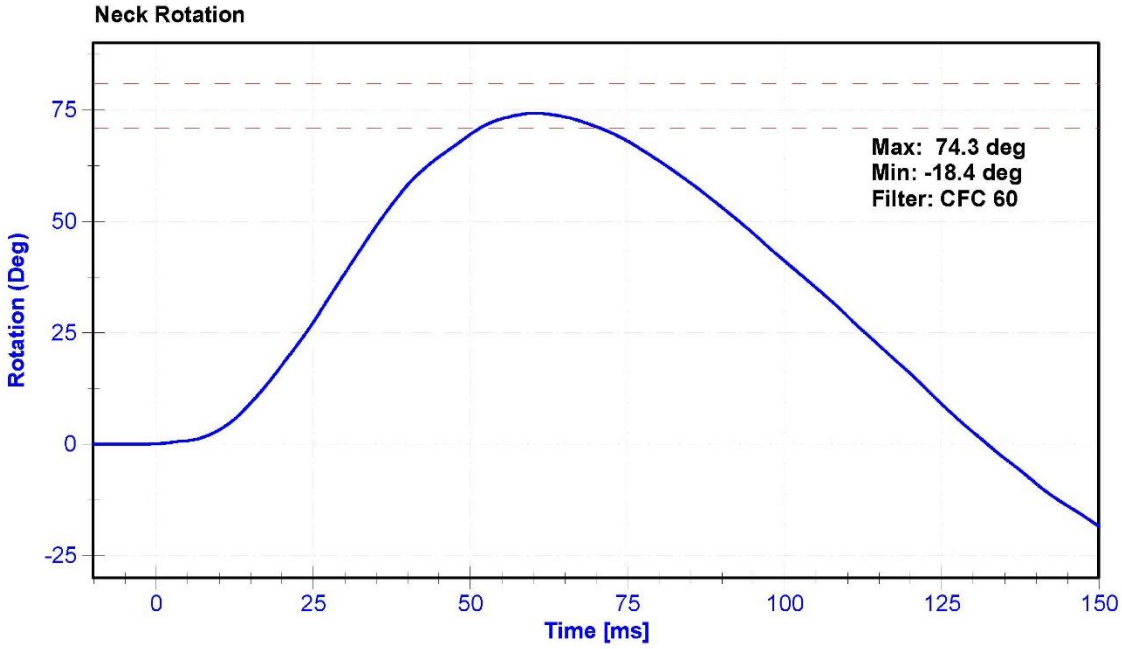
Results

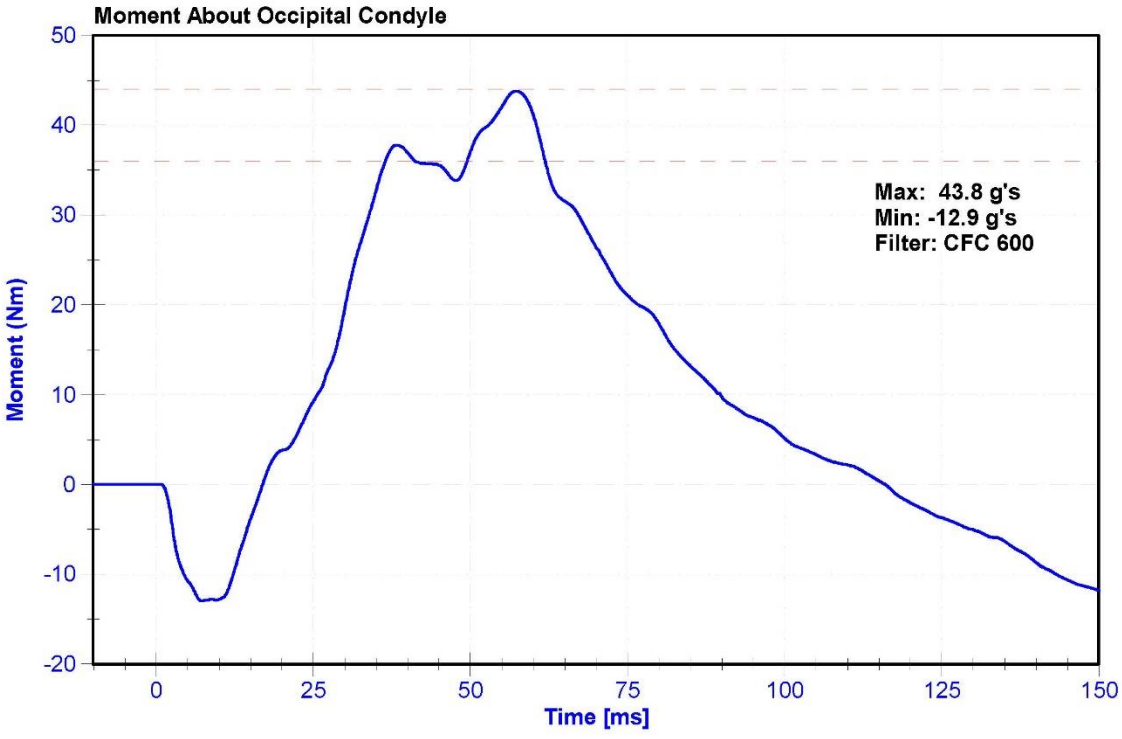
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	36	Pass
Velocity	5.51	5.63	m/s	5.583	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.30	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.39	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.63	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.60	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.87	Pass
Neck Rotation	71	81	deg	74.3	Pass
Time at Maximum Rotation	50	70	ms	60.2	Pass
Moment about the OC	36	44	Nm	43.8	Pass
Moment Decay to 0 Nm	102	126	ms	116.0	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	Denton 78051-342	DS-184Pend	9/24/2015	9/23/2016
Condyle Potentiometer	Denton 78051-342	DS-185Pend	9/25/2015	9/24/2016
Upper Neck Load Cell	Denton 1716A	LC-1916Fy	6/29/2015	6/28/2016




Neck Rotation
Max: 74.3 deg
Min: -18.4 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.8 g's
Min: -12.9 g's
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

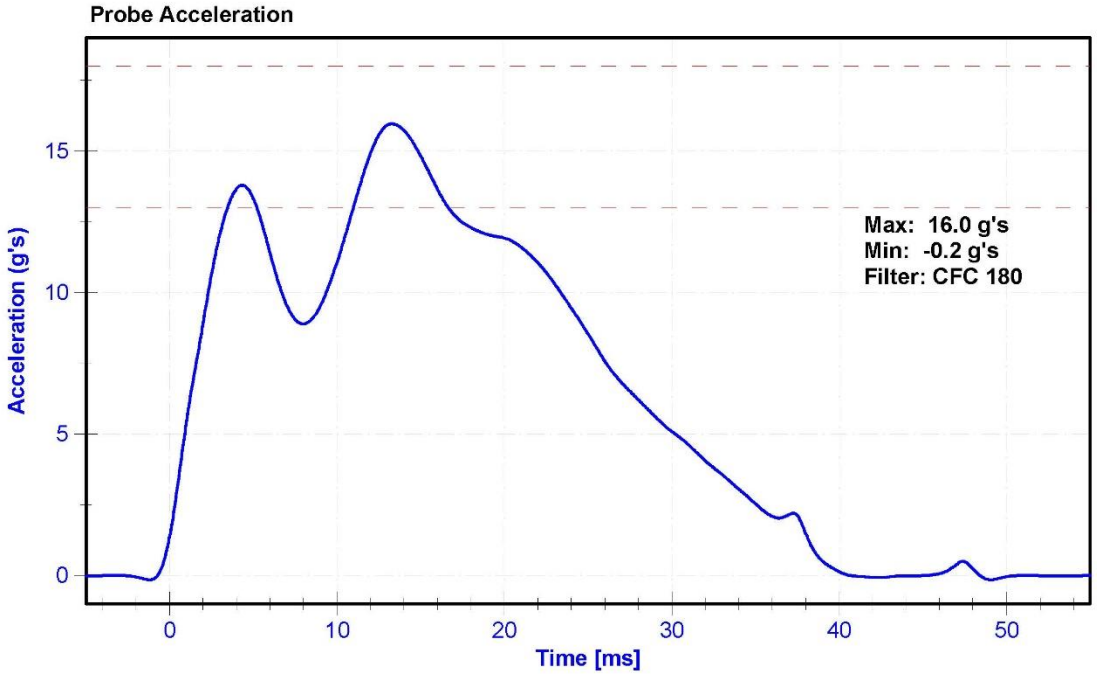
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

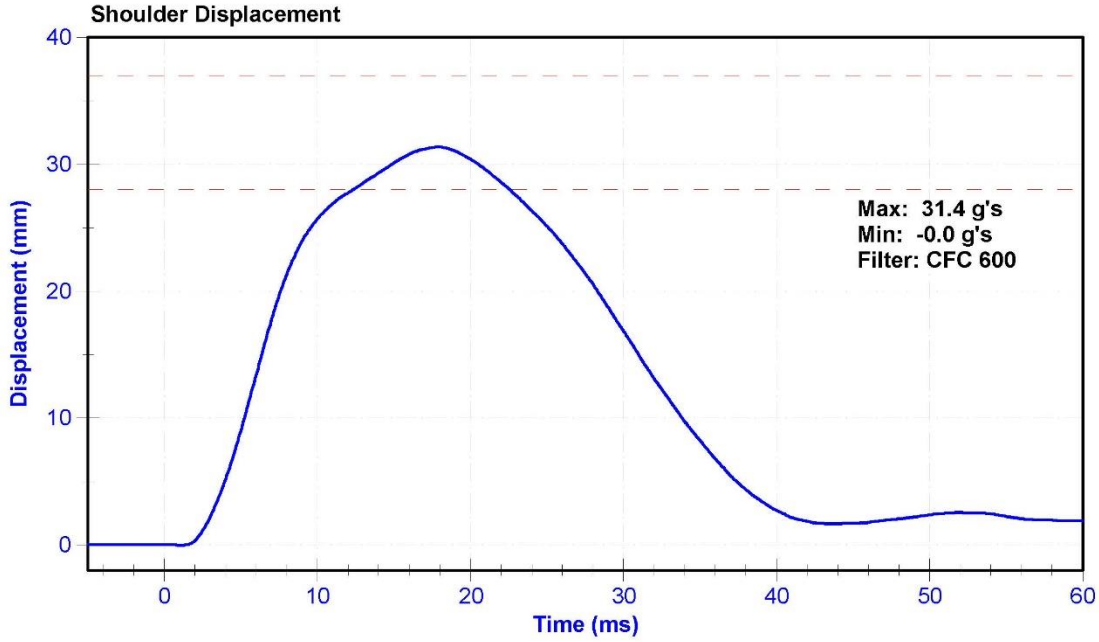
Results

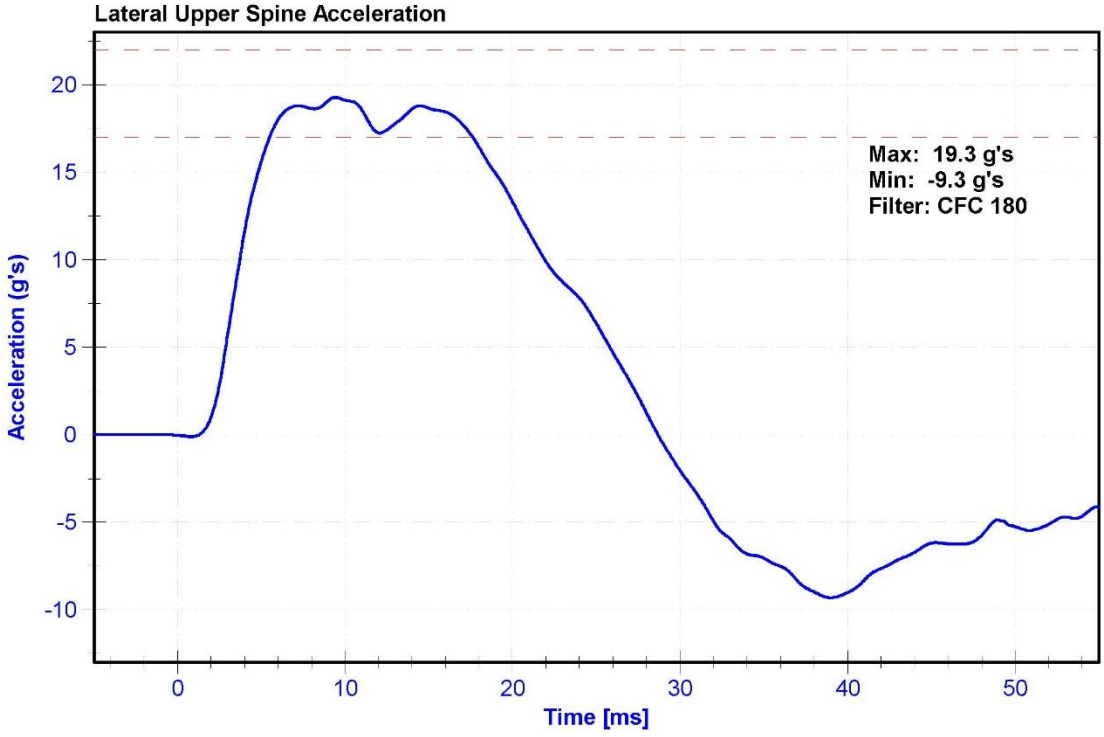
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	34.6	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	13	18	g's	16.0	Pass
Shoulder Deflection	28	37	mm	31.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Shoulder Potentiometer	Servo 08TC1-3725	DS-008GFE	10/19/2015	10/18/2016
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 31.4 g's
Min: -0.0 g's
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.3 g's
Min: -9.3 g's
Filter: CFC 180

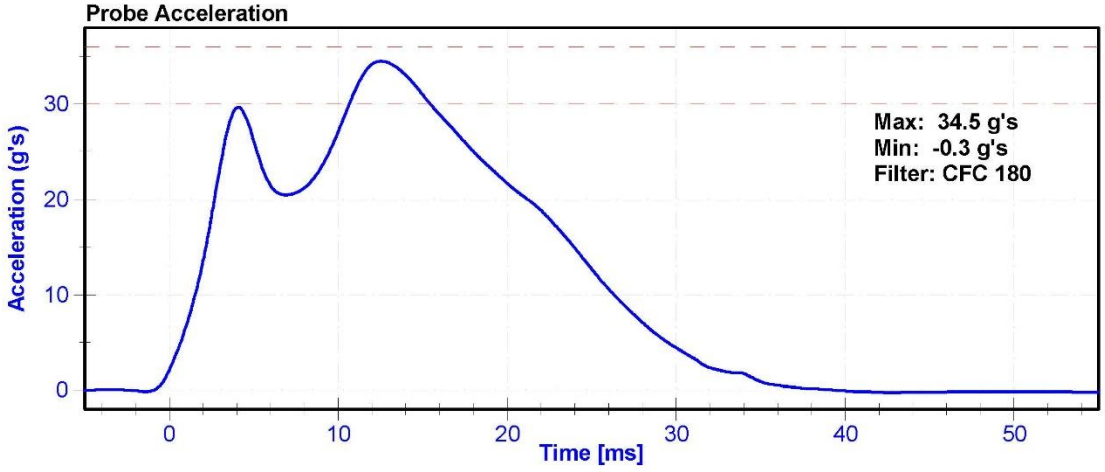
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

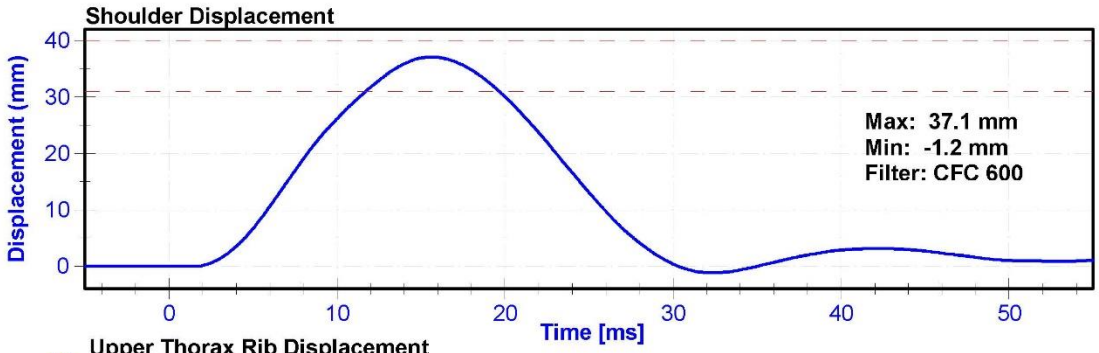
Results

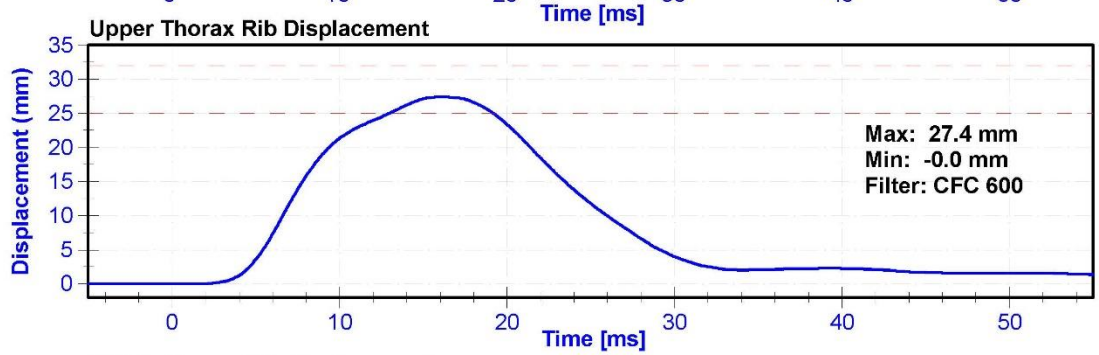
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	35.7	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration after 5 ms	30	36	g's	34.5	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.9	Pass
Lateral Lower Spine Acceleration	29	37	g's	34.9	Pass
Shoulder Deflection	31	40	mm	37.1	Pass
Upper Thorax Rib Deflection	25	32	mm	27.4	Pass
Mid Thorax Rib Deflection	30	36	mm	31.0	Pass
Lower Thorax Rib Deflection	32	38	mm	32.3	Pass

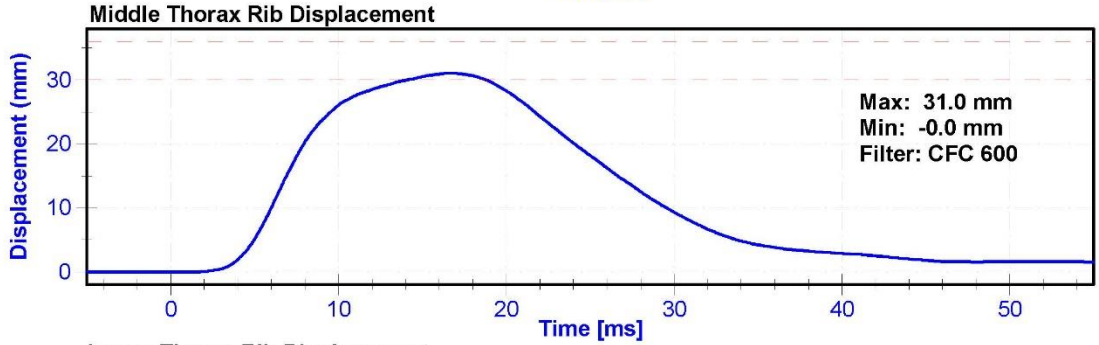
Transducer Calibrations

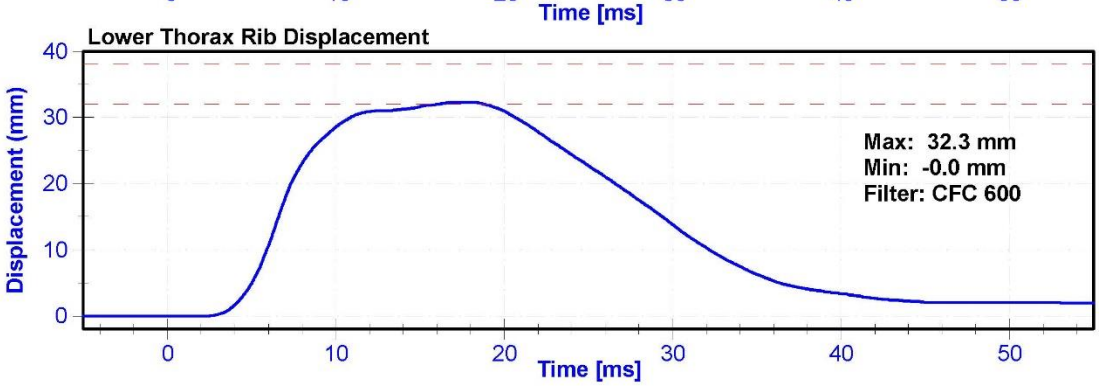
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Shoulder Potentiometer	Servo 08TC1-3725	DS-008GFE	10/19/2015	10/18/2016
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	10/19/2015	10/18/2016

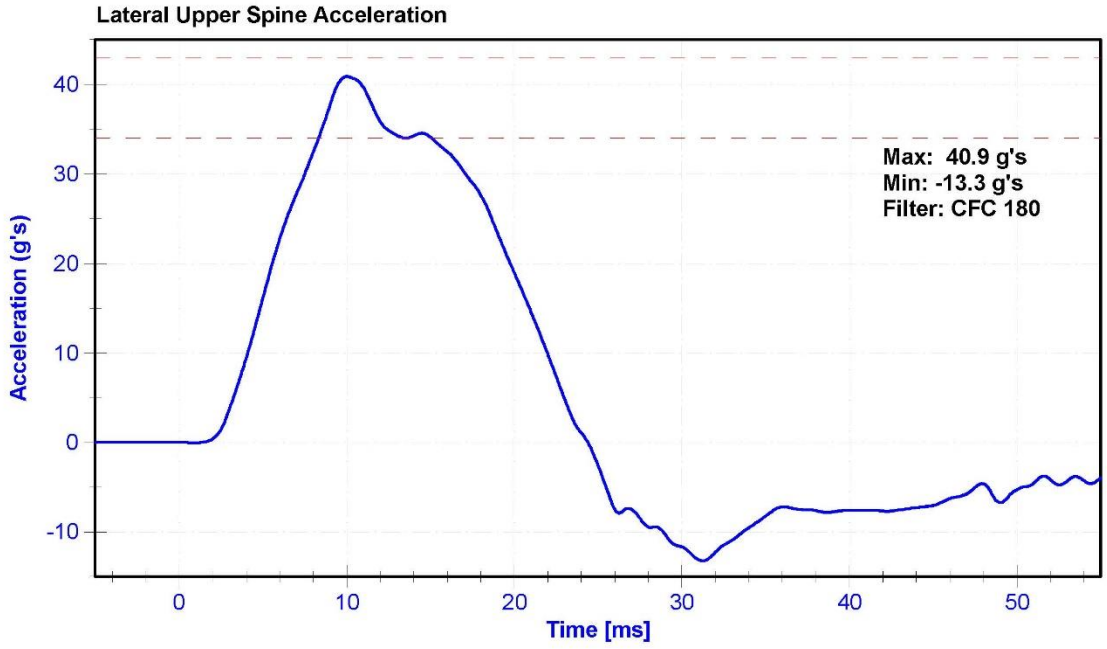


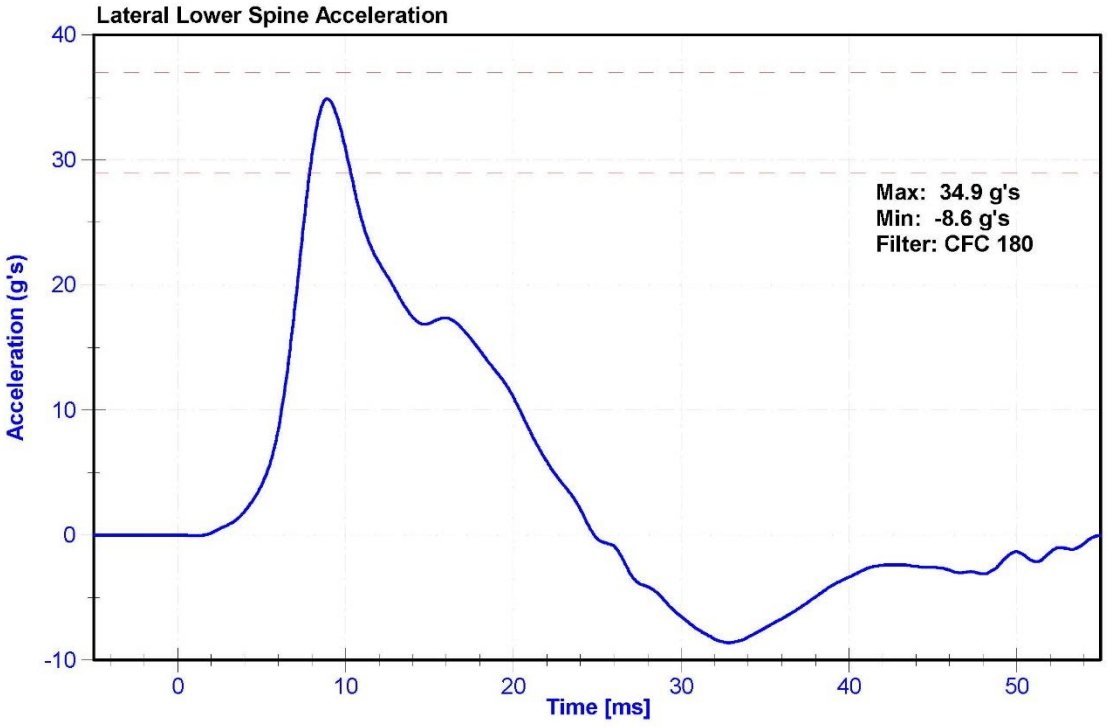

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 37.1 mm
Min: -1.2 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.4 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.0 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.3 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 40.9 g's
Min: -13.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 34.9 g's
Min: -8.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

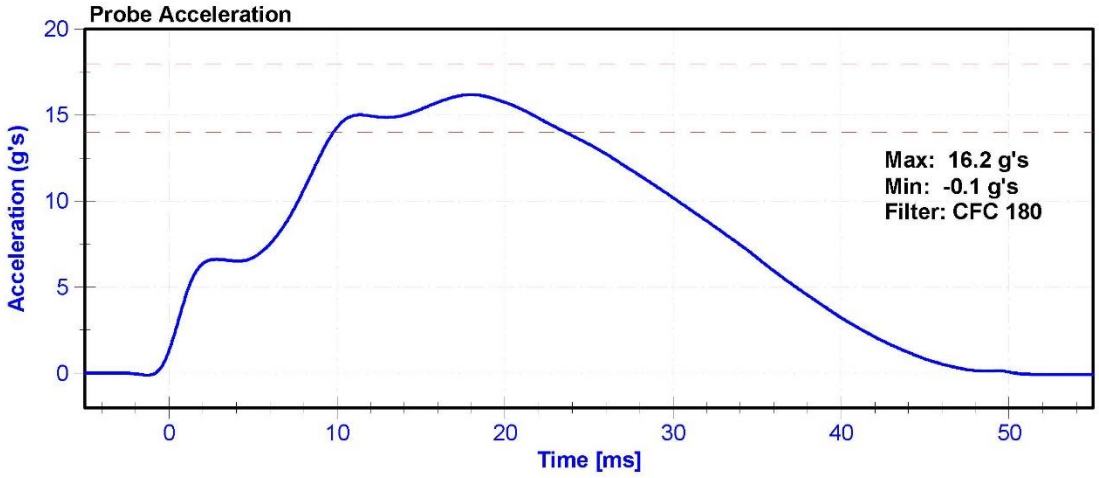
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

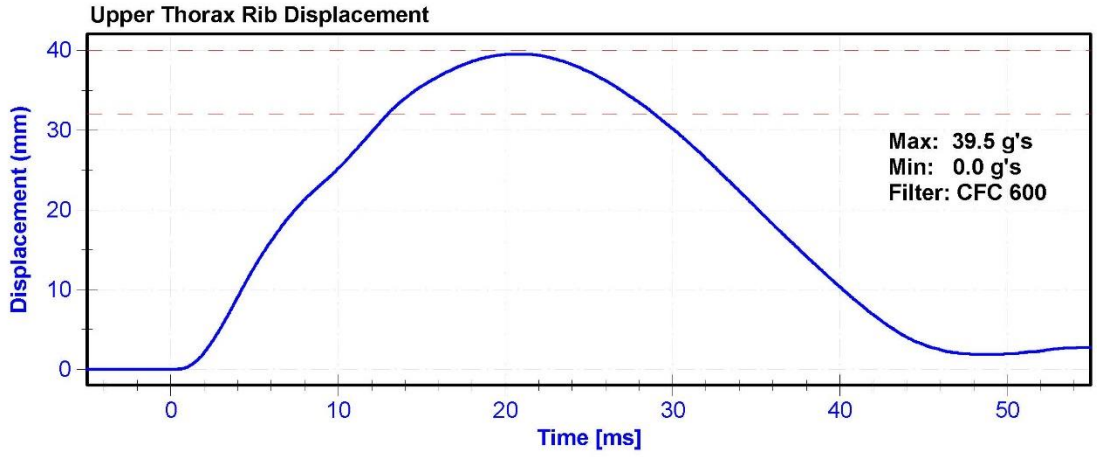
Results

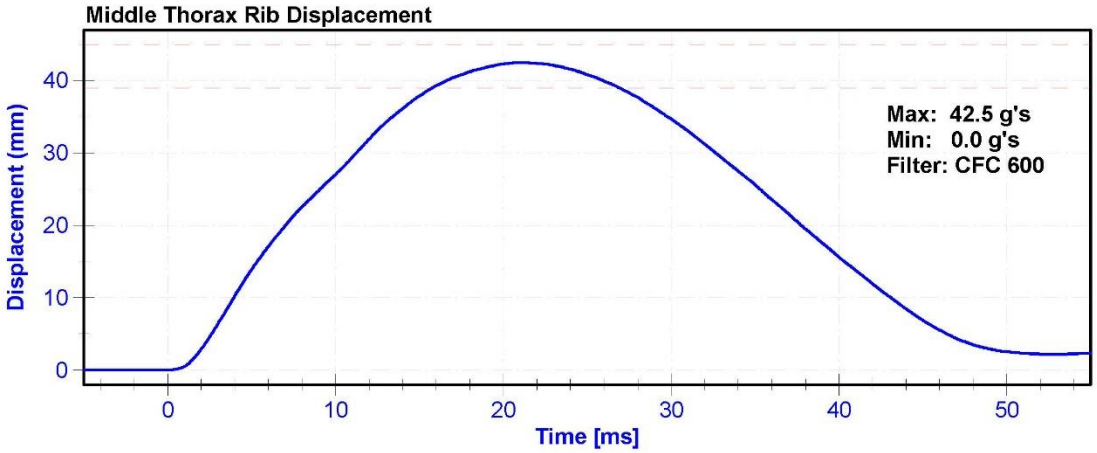
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	36.5	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	14	18	g's	16.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.8	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.4	Pass
Upper Thorax Rib Deflection	32	40	mm	39.5	Pass
Middle Thorax Rib Deflection	39	45	mm	42.5	Pass
Lower Thorax Rib Deflection	35	43	mm	36.1	Pass

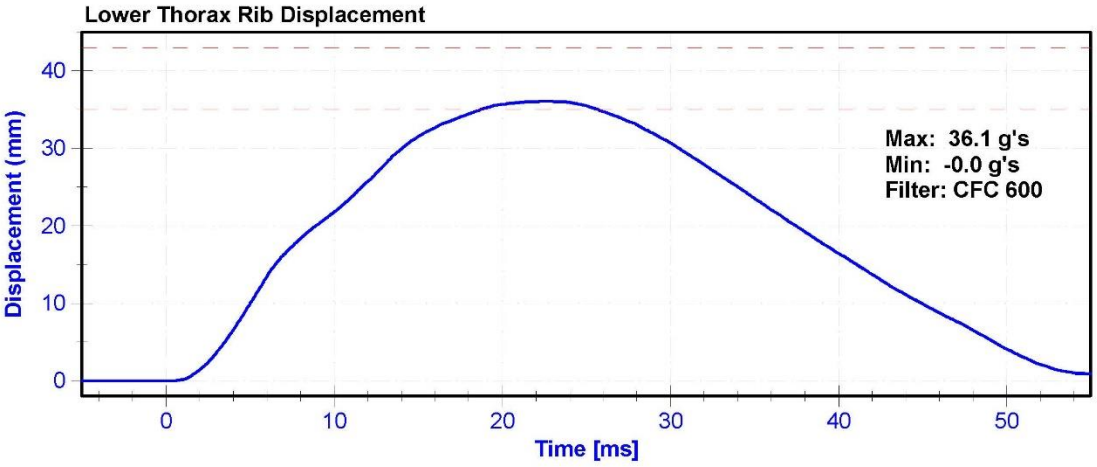
Transducer Calibrations

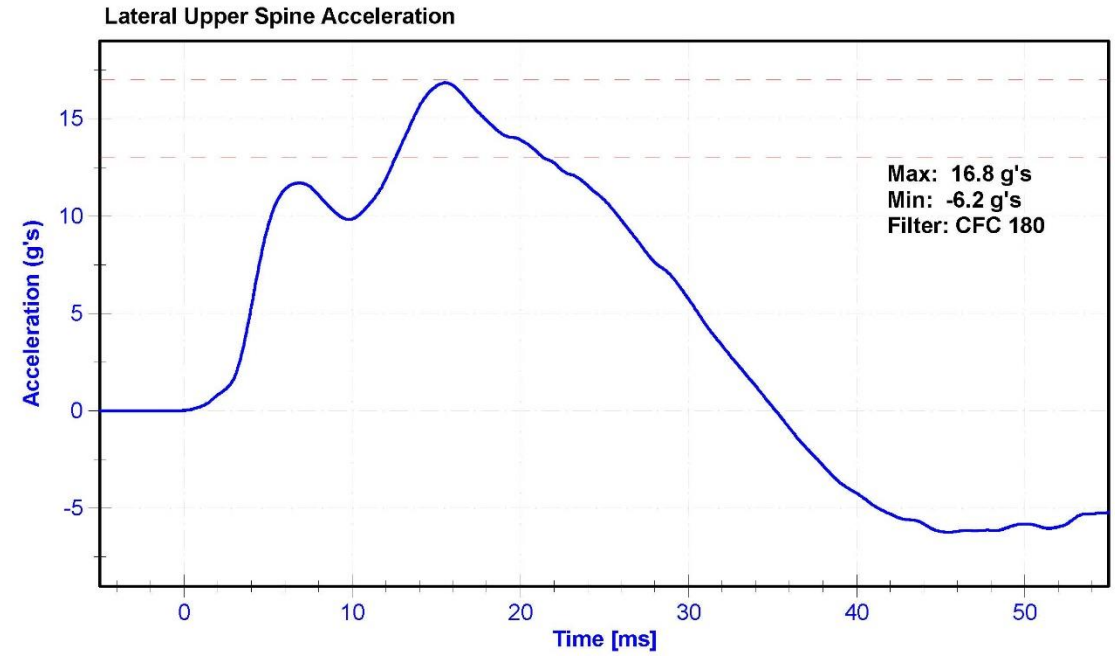
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63315	10/19/2015	4/18/2016
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Upper Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1199GFE	10/19/2015	10/18/2016
Middle Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1246GFE	10/19/2015	10/18/2016
Lower Thorax Rib Potentiometer	Servo 08CT1-3725	DS-1256GFE	10/19/2015	10/18/2016

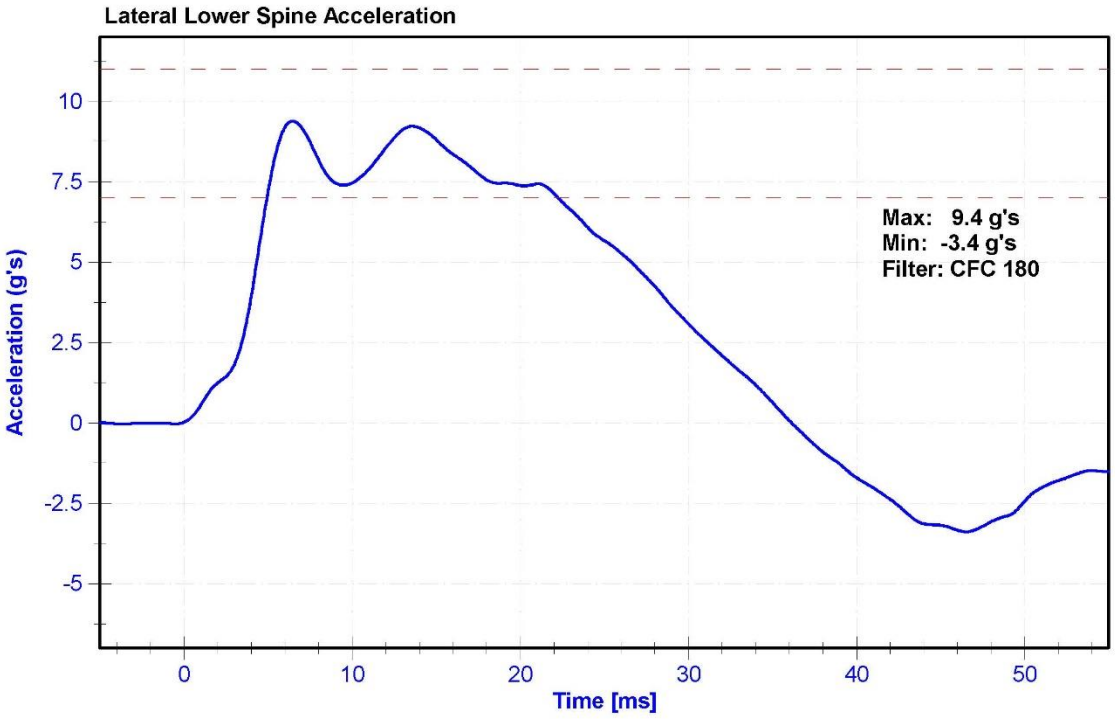



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.5 g's
Min: 0.0 g's
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.5 g's
Min: 0.0 g's
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.1 g's
Min: -0.0 g's
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
15
10
5
0
-5
0
10
20
30
40
50
Time [ms]
Max: 16.8 g's
Min: -6.2 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.4 g's
Min: -3.4 g's
Filter: CFC 180

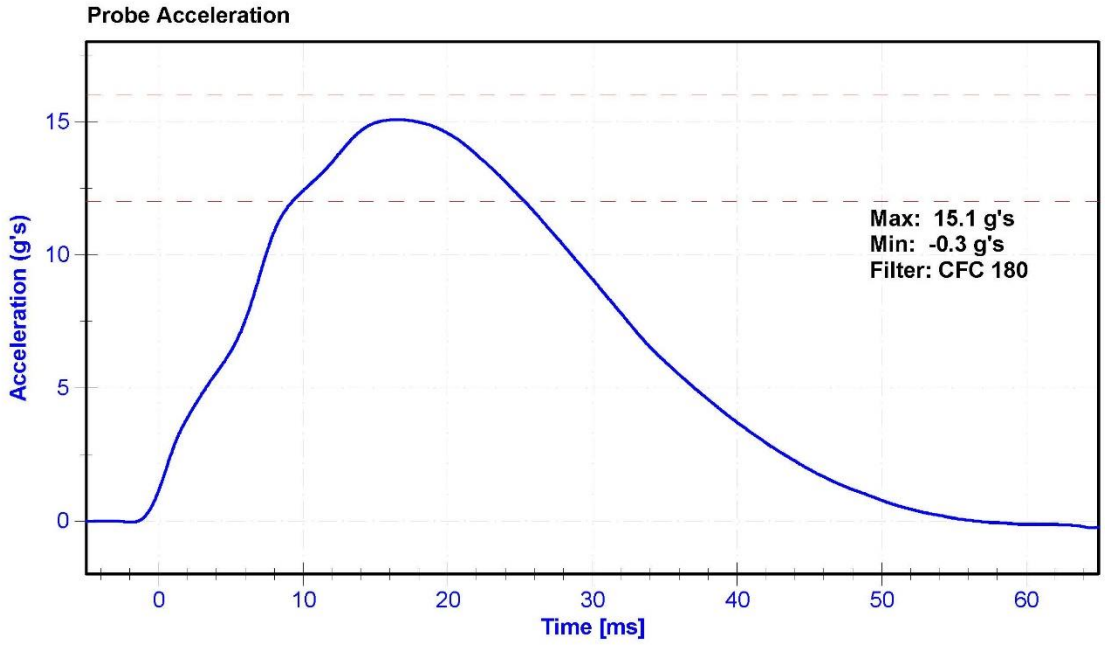
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

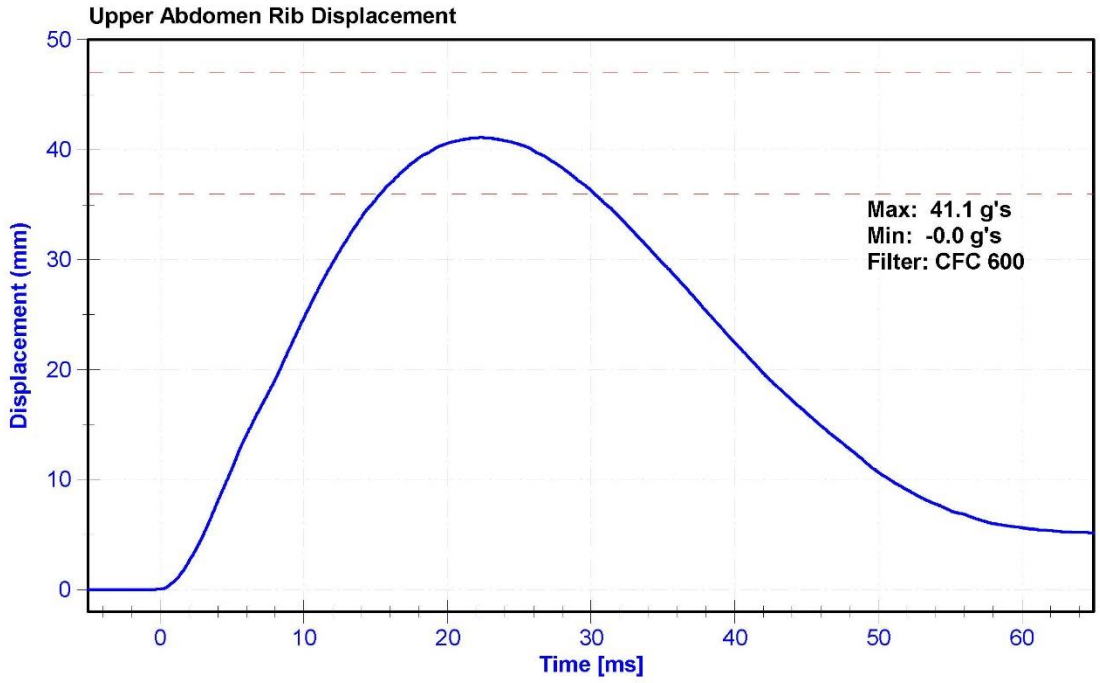
Results

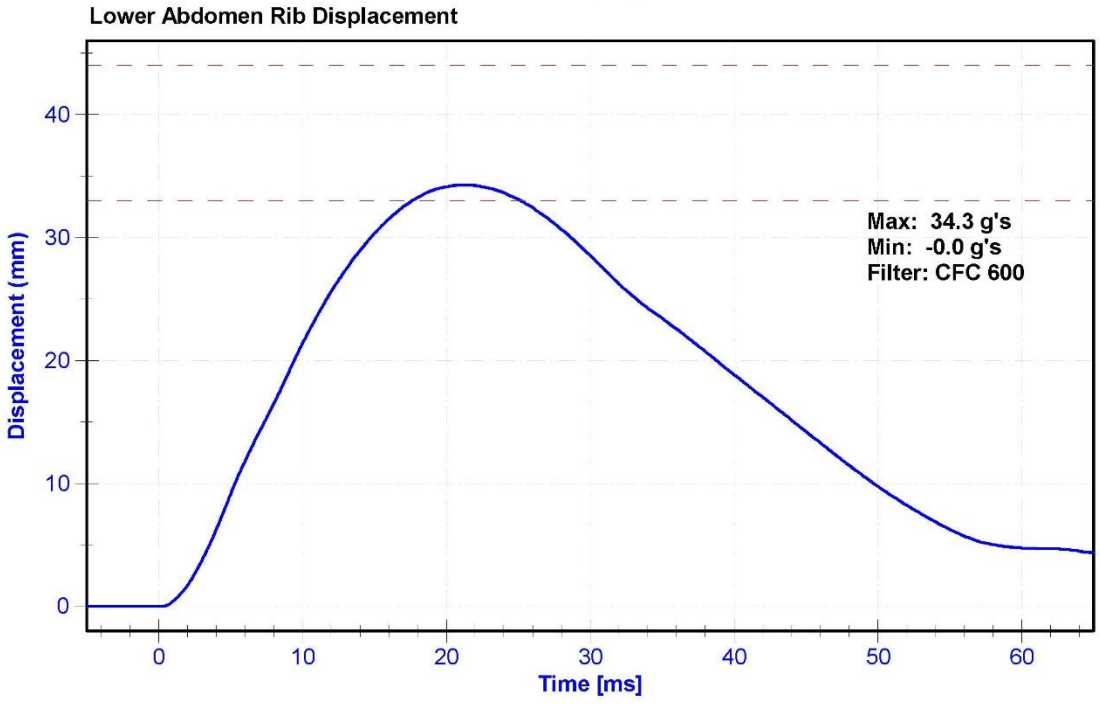
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	36.9	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	12	16	g's	15.1	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.4	Pass
Upper Abdomen Rib Deflection	36	47	mm	41.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	34.3	Pass

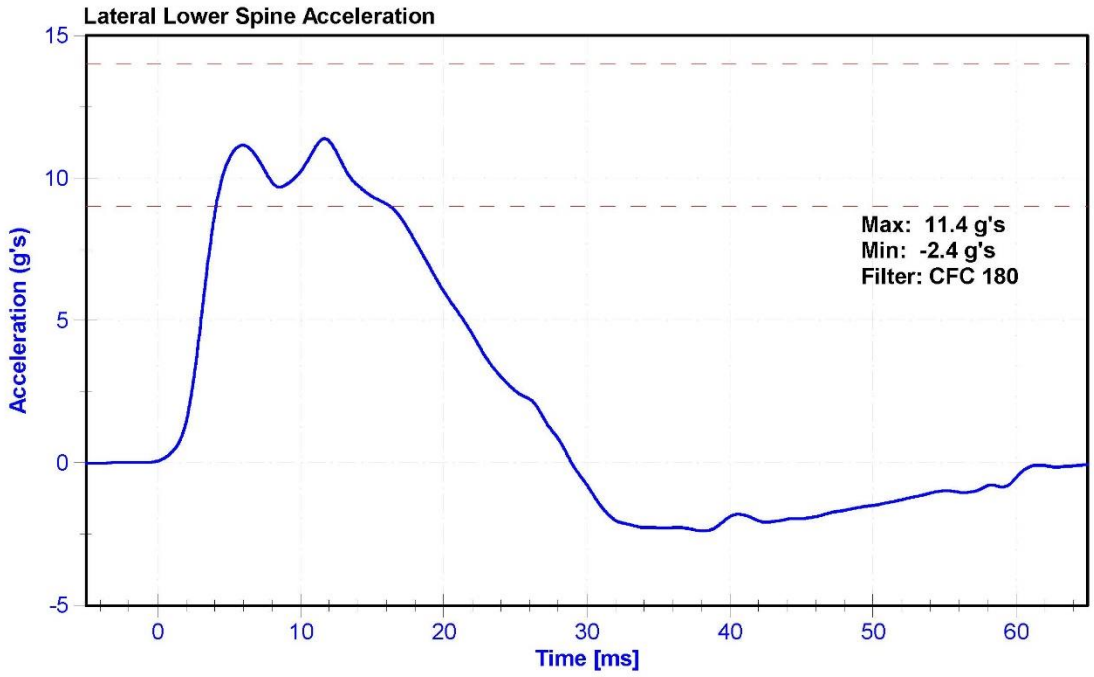
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/19/2015	4/18/2016
Upper Abdomen Rib Potentiometer	Servo 08CT1-3725	DS-1274GFE	10/19/2015	10/18/2016
Lower Abdomen Rib Potentiometer	Servo 08CT1-3745	DS-2316GFE	10/28/2015	10/27/2016

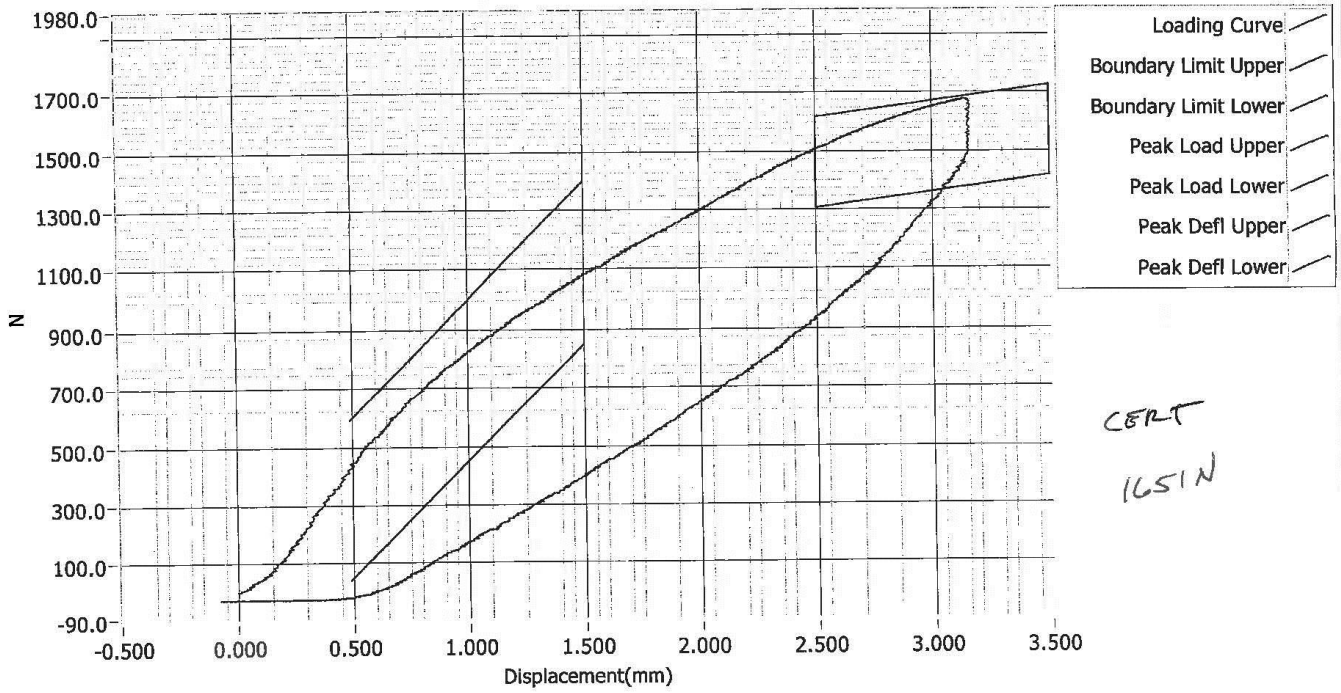



Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.1 g's
Min: -0.0 g's
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.3 g's
Min: -0.0 g's
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
10
5
0
-5
0
10
20
30
40
50
60
Time [ms]
Max: 11.4 g's
Min: -2.4 g's
Filter: CFC 180

Resultant Data - SIDIIs Plug Compression



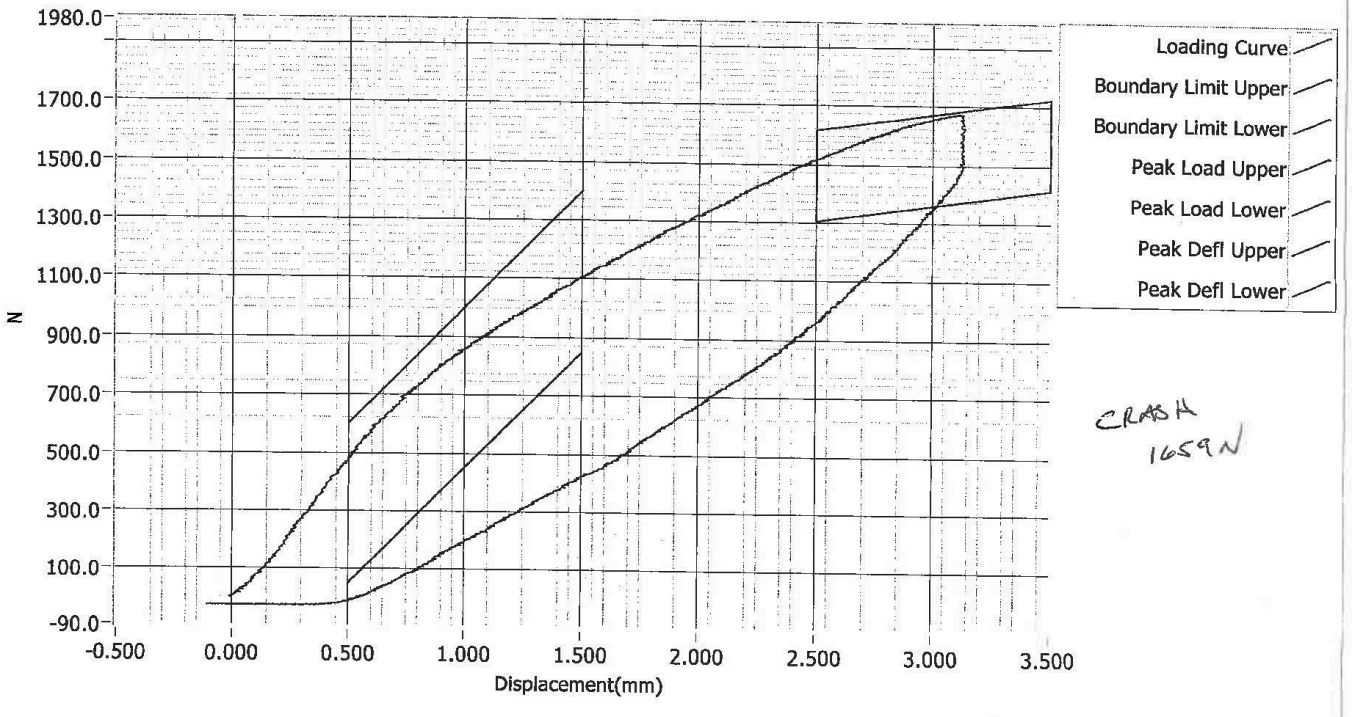
CERT
1651N

ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	81136	12/4/2014	11:38 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/4/2014 Current Time : 23:40:19

Resultant Data - SIDIIs Plug Compression



CRASH
1659N

ATD Calibration Lab

Test ID	Part Serial Number	Test Date	Test Time
	81132	12/4/2014	11:25 PM
Cert ID	ATD Serial Number	ATD Type	
	N/A	SIDIIs	

Current Date : 12/4/2014 Current Time : 23:27:24

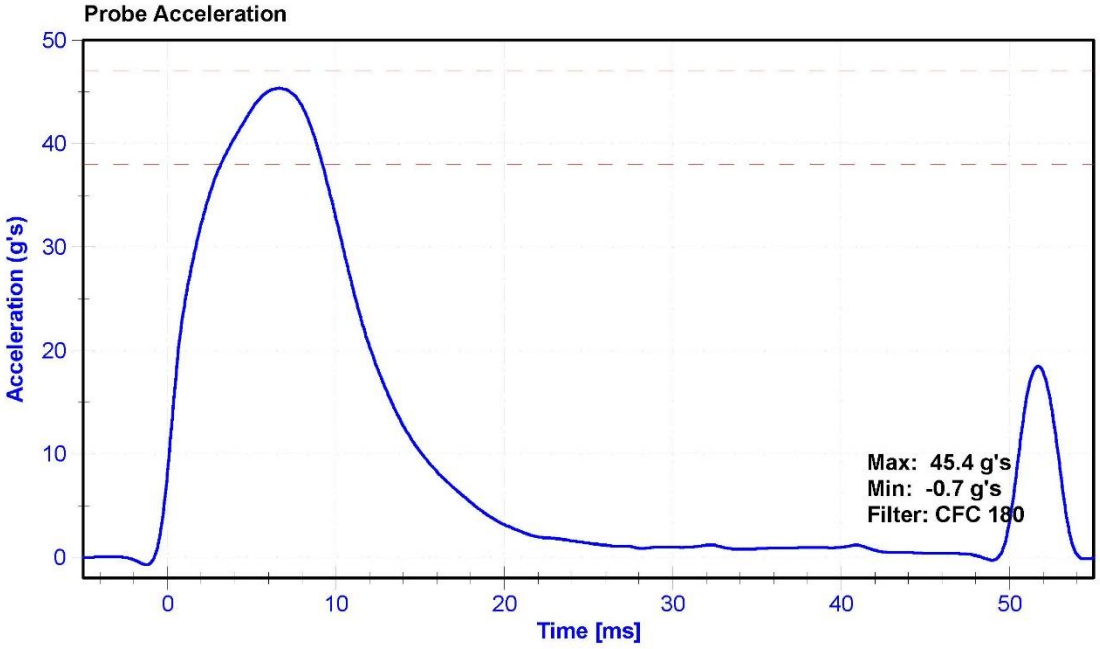
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M. Goehle

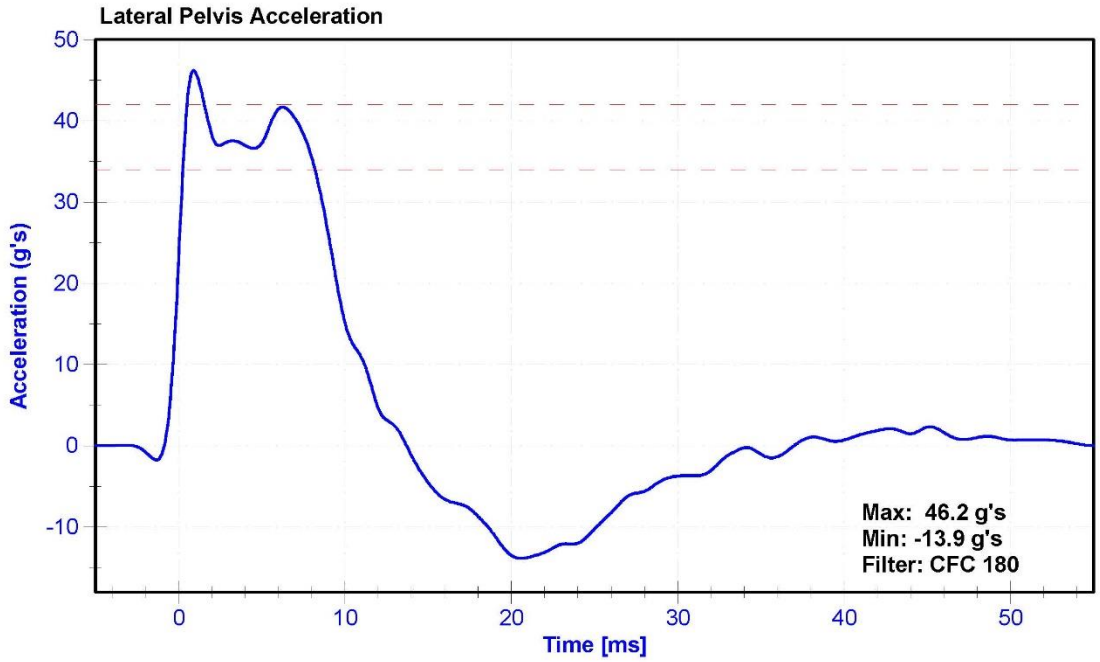
Results

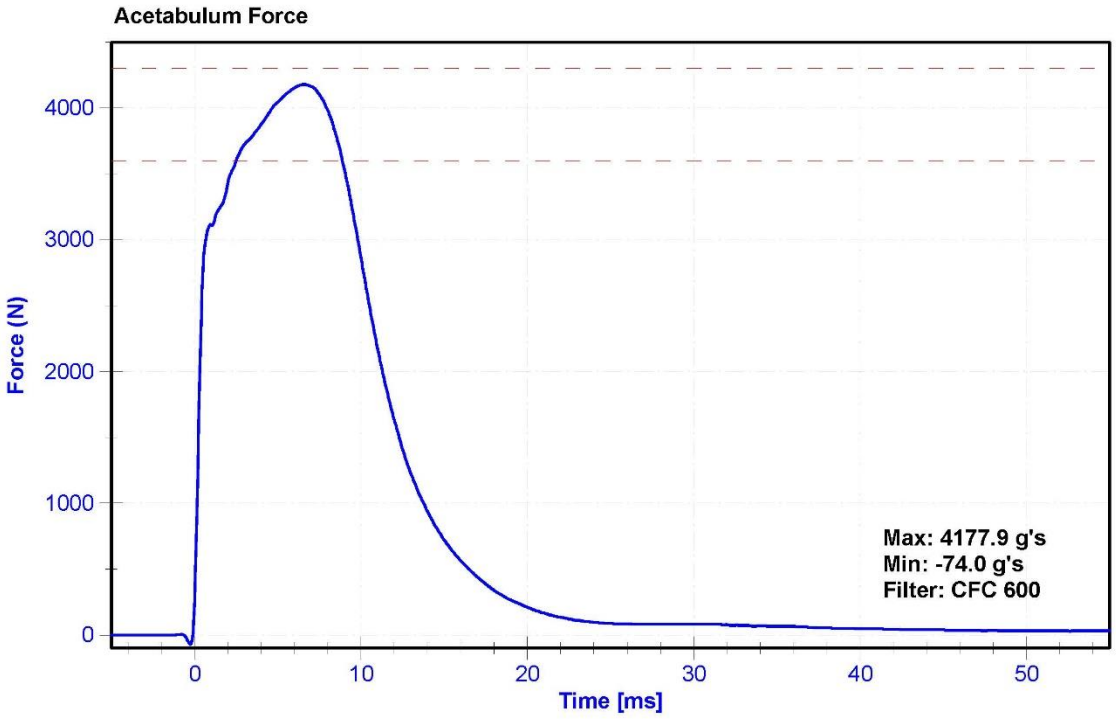
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	40.8	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	45.4	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.7	Pass
Acetabulum Force	3,600	4,300	N	4177.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pelvis Y Accelerometer	ENDEVCO 7264	AC-P51259	10/19/2015	4/18/2016
Acetabulum Load Cell	Denton IF-520	LC-236Fy	6/29/2015	6/28/2016
Certification Plug	Humanetics	81136	12/04/14	N/A
Crash Test Plug	Humanetics	81132	12/04/2014	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 46.2 g's
Min: -13.9 g's
Filter: CFC 180


Acetabulum Force
Force (N)
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 4177.9 g's
Min: -74.0 g's
Filter: CFC 600

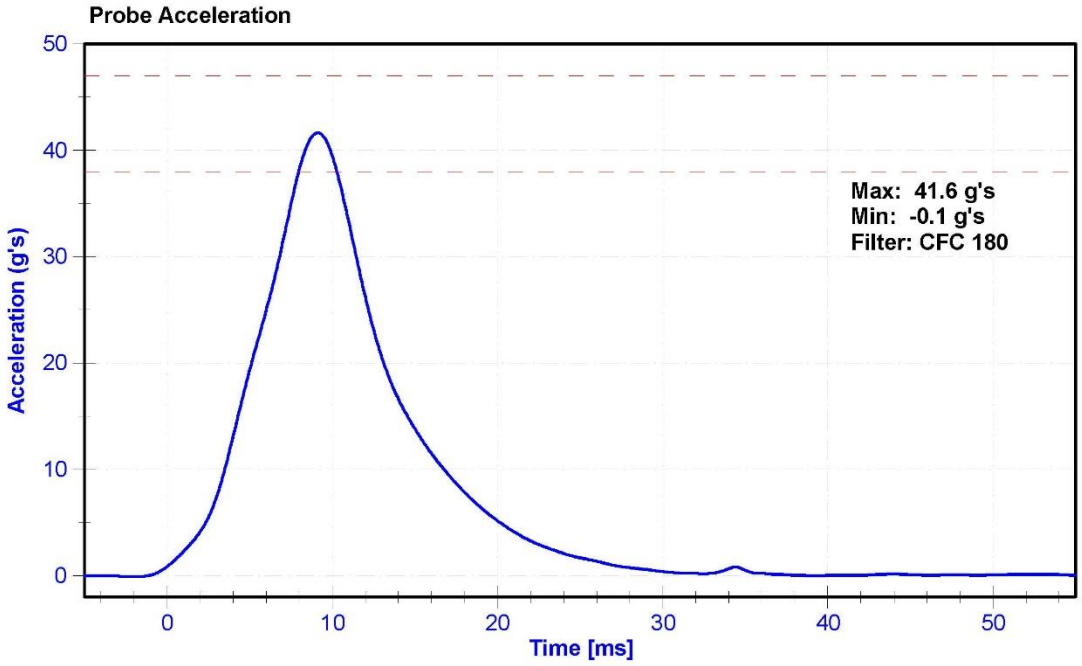
ATD Manufacturer	FTSS	Test Technician	M.Hartung
ATD Serial Number	303	Laboratory Supervisor	M.Goehle

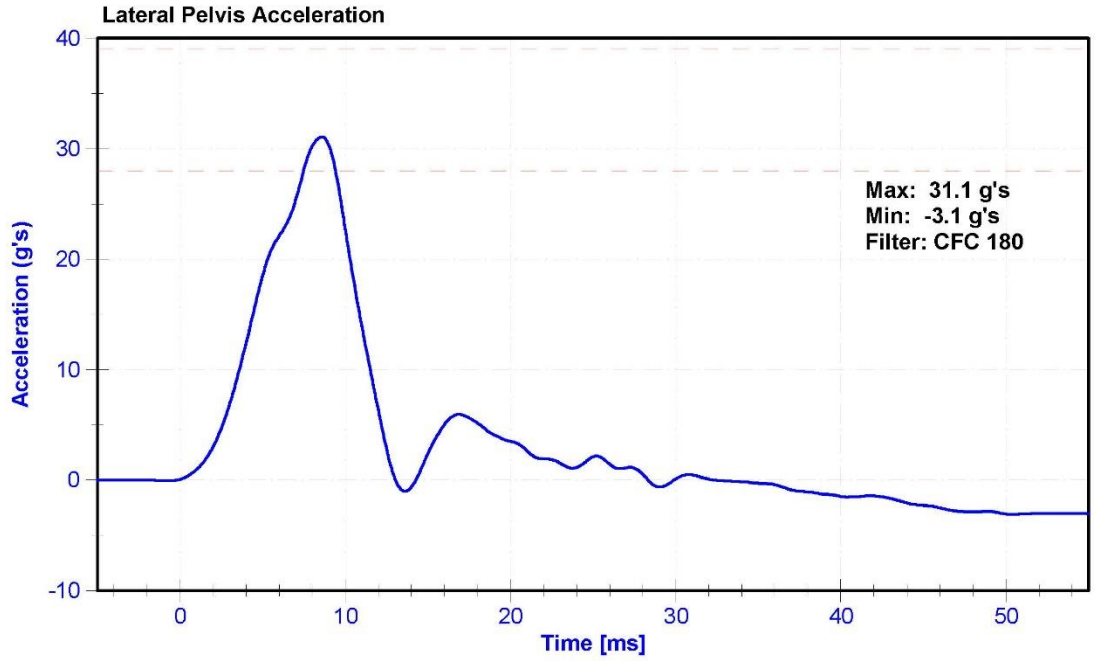
Results

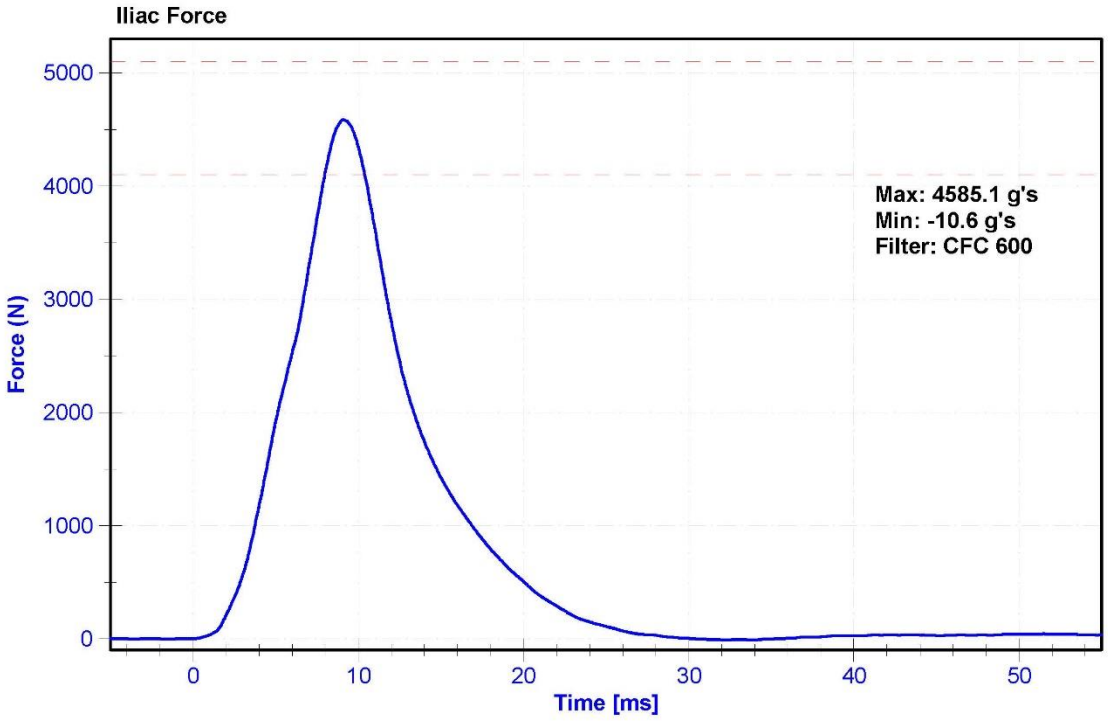
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	30.8	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	36	45	g's	41.6	Pass
Lateral Pelvis Acceleration	28	39	g's	31.1	Pass
Iliac Force	4,100	5,100	N	4585.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C14972	8/13/2015	2/11/2016
Pelvis Y Accelerometer	ENDEVCO 7264	AC-P51259	10/19/2015	4/18/2016
Iliac Load Cell	DENTON 3228J	LC-285Fy	7/21/2015	7/20/2016




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 31.1 g's
Min: -3.1 g's
Filter: CFC 180


Iliac Force
Force (N)
5000
4000
3000
2000
1000
0
0
10
20
30
40
50
Time [ms]
Max: 4585.1 g's
Min: -10.6 g's
Filter: CFC 600

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: F034		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	AC-P58904	ENDEVCO	10/19/2015
		Y	AC-P58911	ENDEVCO	10/19/2015
		Z	AC-P58776	ENDEVCO	10/19/2015
	Redundant	X	AC-P58887	ENDEVCO	10/19/2015
		Y	AC-P58888	ENDEVCO	10/19/2015
		Z	AC-P51734	ENDEVCO	10/19/2015
Thorax Rib Displacement Potentiometers	Upper	Y	DS-183GFE	Honeywell	10/19/2015
	Middle	Y	DS-184GFE	Honeywell	10/19/2015
	Lower	Y	DS-182GFE	Honeywell	10/19/2015
Abdomen Load Cells	Forward	Y	LC-1512	DENTON	6/25/2015
	Middle	Y	LC-1526	DENTON	6/25/2015
	Rear	Y	LC-1516	DENTON	6/25/2015
Lower Spine Accelerometers (T12)		X	AC-P52079	ENDEVCO	10/16/2015
		Y	AC-P51948	ENDEVCO	10/16/2015
		Z	AC-P51269	ENDEVCO	10/16/2015
Pubic Symphysis Load Cell		Y	LC-465Fy	DENTON	6/25/2015

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: 303		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	AC-P83420	ENDEVCO	10/16/2015
			Y	AC-P52040	ENDEVCO	10/14/2015
			Z	AC-P58737	ENDEVCO	10/14/2015
		Redundant	X	AC-P51668	ENDEVCO	10/14/2015
			Y	AC-P51327	ENDEVCO	10/14/2015
			Z	AC-P51695	ENDEVCO	10/14/2015
Displacement Potentiometers	Thoracic Rib	Upper	Y	DS-1199GFE	SERVO	10/19/2015
		Middle	Y	DS-1246GFE	SERVO	10/19/2015
		Lower	Y	DS-1256GFE	SERVO	10/19/2015
	Abdominal Rib	Upper	Y	DS-1274GFE	SERVO	10/19/2015
		Lower	Y	DS-2316GFE	SERVO	10/28/2015
Lower Spine Accelerometers (T12)			X	AC-P51945	ENDEVCO	10/19/2015
			Y	AC-P51974	ENDEVCO	10/19/2015
			Z	AC-P51946	ENDEVCO	10/19/2015
Acetabulum Load Cell			Y	LC-236Fy	DENTON	6/29/2015
Iliac Wing Load Cell			Y	LC-285Fy	DENTON	7/21/2015
Pelvis Plug (struck side)				48973	HUMANETICS	12/6/2011
Pelvis Plug (non-struck side)				-	-	-

Table 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	AC-A127665	MSI 1201	10/7/2015
	Vehicle Center of Gravity	Y	AC-A156921	MSI 1201	10/9/2015
	Vehicle Center of Gravity	Z	AC-A156950	MSI 1201	10/8/2015
2	Right Sill at Front Seat	X	AC-A127663	MSI 1201	10/9/2015
	Right Sill at Front Seat	Y	AC-A005916	MSI 1201	10/9/2015
	Right Sill at Front Seat	Z	AC-A156912	MSI 1201	10/15/2015
3	Right Sill at Rear Seat	X	AC-A120630	MSI 1201	10/9/2015
	Right Sill at Rear Seat	Y	AC-A156948	MSI 1201	10/9/2015
	Right Sill at Rear Seat	Z	AC-A156935	MSI 1201	10/19/2015
4	Left Sill at Front Door	Y	AC-A156941	MSI 1201	10/9/2015
5	Left Sill at Rear Door	Y	AC-A079084	MSI 1201	10/8/2015
6	Left A-Post Lower	Y	AC-A156937	MSI 1201	10/9/2015
7	Left A-Post Middle	Y	AC-A112908	MSI 1201	10/9/2015
8	Left B-Post Lower	Y	AC-A112915	MSI 1201	11/17/2015
9	Left B-Post Middle	Y	AC-A081451	MSI 1201	10/9/2015
10	Front Seat Track	Y	AC-A127673	MSI 1201	9/17/2015
11	Rear Seat Track or Structure	Y	AC-A081416	MSI 1201	11/17/2015
12	Right Rear Occ. Compartment	Y	AC-A002413	MSI 1201	11/17/2015
13	Engine Block	X	AC-A156919	MSI 1201	10/9/2015
	Engine Block	Y	AC-A156927	MSI 1201	10/9/2015
14	Rear Floorpan Above Axle	X	AC-A156947	MSI 1201	10/9/2015
	Rear Floorpan Above Axle	Y	AC-A156943	MSI 1201	10/9/2015
	Rear Floorpan Above Axle	Z	AC-A126821	MSI 1201	11/17/2015

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	AC-C14901	ENDEVCO	6/15/2015
MDB Center of Gravity	Y	AC-CP30	ENDEVCO	6/15/2015
MDB Center of Gravity	Z	AC-C16680	ENDEVCO	6/15/2015
Left Frame at Rear Axle Centerline	X	AC-AH5M8	ENDEVCO	6/15/2015
Left Frame at Rear Axle Centerline	Y	AC-C16499	ENDEVCO	6/15/2015