REPORT NUMBER: 214P-CAL-19-001

SAFETY COMPLIANCE TESTING FOR FMVSS 214
DYNAMIC SIDE IMPACT PROTECTION
RIGID POLE TEST

FCA US LLC
2019 Dodge Ram
Four Door Truck

NHTSA No: C20190306

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

February 5, 2019

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE. S.E.
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-17-D-00078.

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Prepared by: Amila Perera Date: February 5, 2019

Amila Perera, Senior Test Engineer

Approved by: Vanessa Hansen Date: February 5, 2019

Vanessa Hansen, Operations Manager

FINAL REPORT ACCEPTANCE BY OVSC:

_____

Accepted by

Date: _____

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Final Report of 214P Compliance Test Side Impact Protection Testing of a 2019 Dodge Ram 1500 Truck NHTSA No.: C20190306	February 5, 2019
	6. Performing Organization Code CAL
7. Author(s) Amila Perera, Senior Test Engineer Vanessa Hansen, Operations Manager	**8. Performing Organization Report No.** CAL-DOT-2019-001
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operation P.O. Box 400 Buffalo, New York 14225	**10. Work Unit No.**
	11. Contract or Grant No. DTNH22-17-D-00078
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-240) 1200 New Jersey Ave., SE, Room W43-503 Washington, D.C. 20590	**13. Type of Report and Period Covered:** Final Test Report, December 13, 2018 - February 5, 2019
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15. *Supplementary Notes*

16. *Abstract*

A 31.00 km/h (19.3 mph), 285° oblique compliance test was conducted on the subject 2019 Dodge Ram Truck in accordance with the specifications of the Office of Vehicle Safety Compliance TP-214P-01 for the determination of FMVSS No.214 Side Impact Protection compliance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on December 13, 2018.

The impact velocity of the vehicle was 30.86 km/h, and the ambient temperature at the struck (Front passenger's) side of the target vehicle was 21.1°C. The target vehicle's maximum post-test static crush was 301 mm located at level 3. 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	204.062
Maximum Thoracic Rib Deflection	mm	44	19.127
Total Abdominal Force	N	2500	1279.805
Pubic Symphysis Force	N	6000	2084.759

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
Compliance Testing Side Impact Protection Pole Test ES-2re	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services (TIS) Room E12-100 East Bldg. 1200 New Jersey Ave. Washington, D.C. 20590 Telephone No. (202) 366-2588

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Form DOT F1700.7 (8-72)

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SECTION 1
PURPOSE AND SUMMARY OF TEST

PURPOSE

This side impact test was conducted as part of the FY 2019 FMVSS 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-17-D-00078. The purpose of this test was to evaluate side impact protection in a 2019 Dodge Ram 1500 truck. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure, TP-214P-01 dated September 2012.

SUMMARY

A rigid pole side impact test was conducted on a 2019 Dodge Ram 1500. The subject vehicle was towed into the rigid pole at an angle of 285^{o} and a velocity of 30.86 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on December 13, 2018. Pre-test and post-test photographs of the test vehicle and side impact dummy (ES2re) are included in Appendix I of this report.

One Part 572U (ES2re) dummy was placed in the front passenger designated seating position according to instructions specified in the TP-214P-01Test Procedure, dated September 2012. The side impact event was documented by nine High Speed Cameras and two real time camera.

The ES2re male dummy was instrumented accordingly:

- 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

Appendix II contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix IV of this report. Appendix V identifies all serial numbers, manufacturers, and calibration dates for test equipment, dummy sensors, potentiometers, and load cells used to collect data during the test.

Injury readings for the ES2re dummy were recorded as follows:

INJURY READINGS

Measurement Description	Front Passenger ATD (ES2re)		
	Units	IARV	Result
HIC_{36}		1000	204.062
Upper Rib Deflection	mm	44	18.122
Mid Rib Deflection	mm		19.127
Lower Rib Deflection	mm		17.943
Abdominal Load (front)	N		381.967
Abdominal Load (mid)	N		424.503
Abdominal Load (rear)	N		509.35
Sum of Abdomen Forces	N	2500	1279.805
Pubic Symphysis	N	6000	2084.76

SECTION 2

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

DATA SHEET NO. 1
TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018

TEST VEHICLE INFORMATION AND OPTIONS

Make	Dodge
Model	Ram
Body Style	Truck
VIN	1C6RRECT8KN567828
Body Color	Charcoal Gray
Engine Displacement (L)	5.7
Type/No. Cylinders	V8
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	Rear Wheel Drive
Odometer Reading	30 miles

Anti-Lock Brakes (ABS)	Yes
All-Wheel Drive (AWD)	No
Traction Control System (TCS)	Yes
Electric Stability Control (ECS)	Yes
Curtain Airbags	Yes
Torso Airbags – Front Seats	Yes
Torso Airbags – Rear Seats	No
Combination/Head Torso Bag	No
Pelvic Airbag – Front Seats	No
Pelvis Airbag – Rear Seats	No
Knee Airbag – Driver	No
Knee Airbag – Front Passenger	No
Seat Belt Pretensioners – Front Seats	Yes
Seat Belt Pretensioners – Rear Seats	No
Seat Belt Load Limiter – Front Seats	Yes
Seat Belt Load Limiter – Rear Seats	No
Tire Pressure Monitoring System (TPMS)	Yes
Tilt Steering Wheel	Yes
Automatic Door Locks (ADL)	Yes
Power Window Auto-reverse	Yes
Power Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	05/18
Vehicle Type	Truck

GVWR (kg)	3130
GAWR Front (kg)	1679
GAWR Rear (kg)	1860

VEHICLE SEATING AND CAPACITY WEIGHT DATA

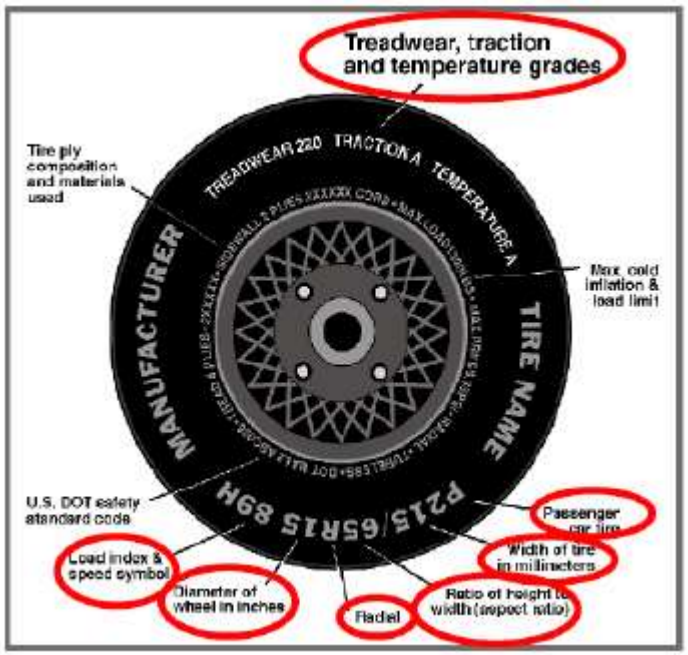
Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bucket	Bench	N/A	
Designated Seating Capacity (DSC)	3	3	N/A	6
Capacity Weight (VCW) (kg)				887
Cargo Weight (RCLW) (kg)				136

DATA SHEET NO. 2
VEHICLE TIRE INFORMATION

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018

VEHICLE TIRE INFORMATION

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



TIRE SIDEWALL INFORMATION

Tire Placard	Front	Rear
Recommended Cold Pressure (kPa)	250	250
Recommended Tire Size	P275/65R18	P275/65R18
Tire Sidewall	**Front**	**Rear**
Maximum Tire Pressure (kPa)	300	300
Tire Size on Vehicle	P275/65R18	P275/65R18
Tire Manufacturer Model	Bridgestone	Bridgestone
Tire Name	Dueler H/T	Dueler H/T
Tire Type	All Weather	All Weather
Tire Width	275	275
Aspect Ratio	65	65
Radial	Yes	Yes
Wheel Diameter	18”	18”
Load Index/Speed Symbol	116T	116T
Treadwear	520	520
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	240	240	240	240
As Tested	kPa	250	250	250	250

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	680	481		695	546		683	557	
Right	kg	655	469		708	550		700	555	
Ratio	%	58	42		56	44		56	44	
Totals	kg	1335	950	2285	1403	1096	2499	1383	1112	2495

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
As Delivered Weight (UVW)	kg	2285	(A)
Weight of Test Dummy	kg	81	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	136	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2502	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	Fully Loaded	As Tested
Right Door Sill Angle	Deg	-1.45	-1.25	-1.30
Left Door Sill Angle	Deg	-0.90	-0.70	-0.70
Front Bumper – Line Angle	Deg	0.05	0.25	0.20
Rear Bumper – Line Angle	Deg	-0.25	-0.20	-0.20

ND = Nose Down (-), NU = Nose Up (+), LD = Left Down (-), LU = Left Up (+)

CALCULATION OF VERTICAL IMPACT REFERENCE LINE

Measured Parameter	Units	Value
Test Vehicle Wheelbase	mm	3576
Vertical Impact Reference Line Aft of Front Axle	mm	1370

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

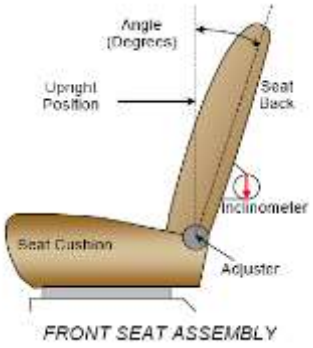
Component Description	Weight (kg)
None	N/A
Ballast (if any)	105

DATA SHEET NO. 4
SEAT AND SEAT BELT ANCHORAGE ADJUSTMENT DATA

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018

SEAT BACK ANGLE ADJUSTMENT

The driver and passenger seat backs are positioned to the manufacturer's designated angle provided in the Form1.



	Units	Seat Back Angle
Driver Seat	deg	0.5
Front Passenger Seat	deg	0.5

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (º)	SCRP Height Position	SCRP Height (mm)		
			Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	14.0	Max	Fixed	Fixed	Fixed
		Mid	Fixed	Fixed	Fixed
		Min	Fixed	Fixed	Fixed
Front Passenger Seat	14.0	Max	Fixed	Fixed	Fixed
		Mid	Fixed	Fixed	Fixed
		Min	Fixed	Fixed	Fixed

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Placed in Position #	
	mm	Detents*	mm	Detents*
Driver Seat	220	33 (0-32)	110	16
Front Passenger Seat	220	33(0-32)	110	16

SEAT BELT ANCHORAGE ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	5	0 – Uppermost
Passenger Seat	5	0 – Uppermost

HEAD RESTRAINT ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	5	0 – Uppermost
Passenger Seat	5	0 – Uppermost

DATA SHEET NO. 5
FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018

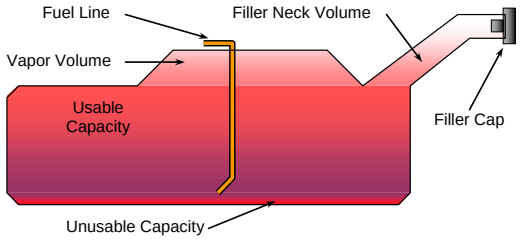
FUEL TANK CAPACITY DATA

Description	Liters
Usable Capacity (Form No. 1)	98.4
Usable Capacity (Owner's Manual)	98.4
92 - 94% of Usable Capacity	90.5 – 92.5
Actual Amount of Solvent Used in Test	91.5

FUEL PUMP

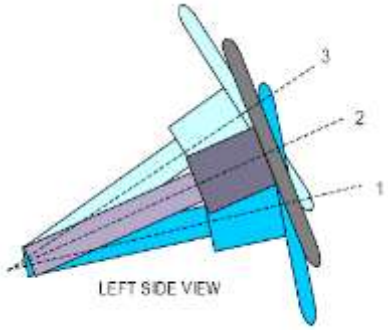
Describe the operation of the fuel pump.

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



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

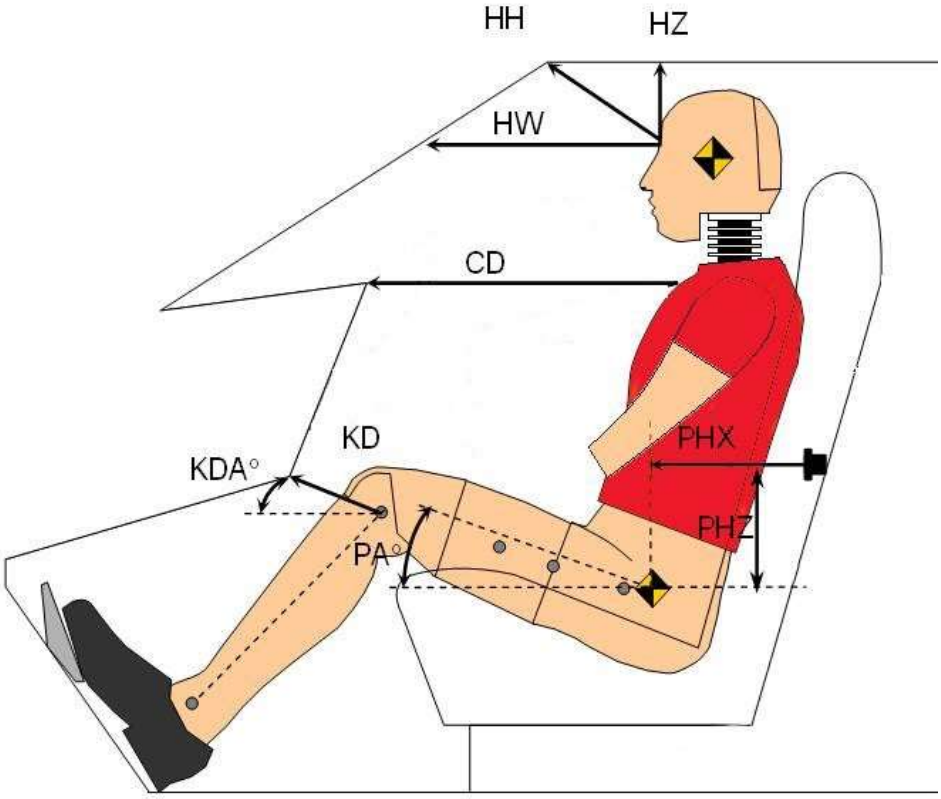


STEERING COLUMN ASSEMBLY

	Degrees	Fore / Aft Position (mm)
Lowermost – Position 1	19.7	
Geometric Center – Position 2	22.2	
Uppermost – Position 3	24.7	
Telescoping Steering Wheel Travel		60
Test Position	22.2	30

DATA SHEET NO. 6
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

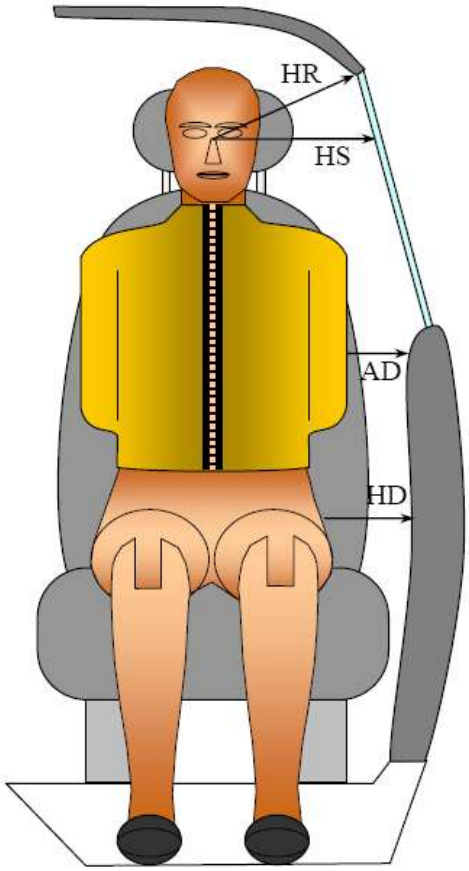


DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Front Passenger	
		Length (mm)	Angle (◦)
HH	Head to Header	428	
HW	Head to Windshield	632	
HZ	Head to Roof Liner	151	
CD	Chest to Dash	618	
KD(L) / KDA(L)◦	Left Knee to Dash	143	30.8
KD(R) / KDA(R)◦	Right Knee to Dash	163	24.6
PAX◦	Pelvic Tilt Angle (X-Axis)		19.1
PAY◦	Pelvic Tilt Angle (Y-Axis)		-0.5
PHX	Hip Point to Striker (X-Axis)	196	
PHZ	Hip Point to Striker (Z-Axis)	12	

DATA SHEET NO. 7
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018



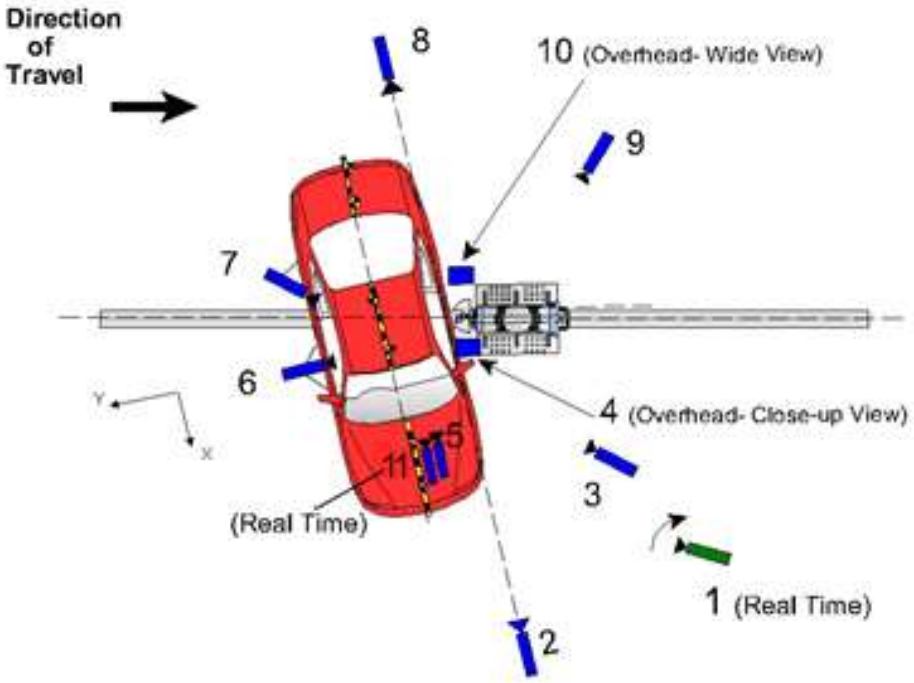
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Front Passenger
HR	Head To Side Header	mm	180
HS	Head to Side Window	mm	316
AD	Arm to Door	mm	95
HD	Hip Point to Door	mm	146

DATA SHEET NO. 8
LOCATION OF CAMERAS

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018



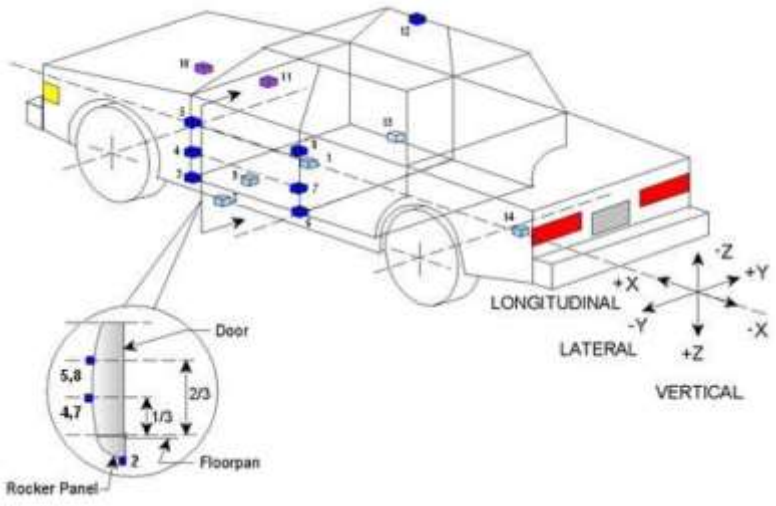
CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front Impact View	7761	0	1400	28	1000
3	45° Front Impact View	-5201	-1098	1441	24	1000
4	Overhead Close Up View	0	0	9370	35	1000
5	Dummy Front View				25	1000
6	Dummy Side View				8	1000
7	Dummy Rear Oblique View				8	1000
8	Rear Impact View	8320	0	1487	28	1000
9	45° Rear Impact View	3390	3584	1484	24	1000
10	Overhead Wide View	0	0	9370	12.5	1000
11	Real-time (24 - 30 fps) - dummy front view				Zoom	60

Notes: Reference - From Point of Impact for X and Y; from Ground for Z
+X = Forward of vehicle, +Y = Right of vehicle, +Z = Down
** All measurements accurate to ± 6 mm. Vehicle is at a 285º angle to the rigid pole.*

DATA SHEET NO. 9
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	3579	4	-271
2	Left Floor Sill	3942	805	-9
3	A-Pillar Sill	4221	745	-75
4	A-Pillar Low	4245	740	-321
5	A-Pillar Mid	4166	741	-807
6	B-Pillar Sill	3119	750	-45
7	B-Pillar Low	3120	784	-383
8	B-Pillar Mid	3115	779	-635
9	Seat	3387	669	-126
10	Engine	4805	48	-519
11	Firewall	4402	-103	-568
12	Roof	2927	-608	-1332
13	Left Floor Sill	3913	-802	-11
14	Left Deck	2096	9	-247

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

DATA SHEET NO. 10
TEST VEHICLE ACCELEROMETER DATA SUMMARY

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

Loc No.	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Max	Time (ms)
1	Vehicle CG	X	g	15.12	76.40	-14.16	91.45
		Y	g	20.48	81.55	-33.76	70.90
		Z	g	18.08	72.50	-6.65	19.65
		Resultant		36.45	71.20	0.04	-15.05
2	Floor Sill (Impact Side)	Y	g	2.49	48.60	-19.92	69.45
3	A Pillar Sill	Y	g	74.92	51.30	-102.80	55.95
4	A Pillar Low	Y	g	55.73	72.95	-66.66	86.35
5	A Pillar Mid	Y	g	1.49	65.75	-28.06	47.10
6	B Pillar Sill	Y	g	18.40	87.15	-30.98	15.70
7	B Pillar Low	Y	g	38.09	14.65	-77.24	18.15
8	B Pillar Mid	Y	g	34.61	13.40	-99.04	20.90
9	Seat	Y	g	49.80	50.00	-48.74	26.35
10	Engine	X	g	3.11	115.05	-17.77	66.25
		Y	g	6.08	41.30	-24.66	65.35
11	Firewall	Y	g	0.62	5.05	-17.40	45.10
12	Roof	Y	g	9.62	59.90	-30.70	42.00
13	Floor Sill	Y	g	3.25	76.20	-23.22	29.15
14	Rear Deck	X	g	3.39	96.35	-10.82	50.40
		Y	g	19.74	67.65	-27.63	45.60

DATA SHEET NO. 11
DUMMY INJURY RESPONSE DATA
(Subpart U, ES-2re)

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

Dummy Serial No. D037

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	10.22	132.55	-27.32	55.45
Lateral	Y	10.02	98.75	-42.14	50.80
Vertical	Z	6.76	22.65	-8.29	83.20
Resultant	N/A	49.07	54.70		
HIC36 (t1, t2)	N/A	204.06		**t1 =** 43.65	**t2 =** 65.70
THORAX DEFLECTION (mm)					
Upper Rib	Y	18.12	54.90	-4.61	20.30
Middle Rib	Y	19.13	48.45	-1.56	110.75
Lower Rib	Y	17.94	46.40	-0.71	297.05
ABDOMINAL FORCES (N)					
Front	Y	381.97	47.25	-30.588	16.2
Middle	Y	424.50	47.95	-9.325	15.9
Rear	Y	509.35	50.15	-8.039	180.1
SUM	N/A	1279.80	48.50		
PELVIS FORCES (N)					
Pubic Symphysis	Y	1.604	-48.35	-2084.76	60.75

Reference: Positive Direction - Longitudinal (X) = forward
- Lateral (Y) = to right
- Vertical (Z) = down

DATA SHEET NO. 12
POST-TEST OBSERVATIONS

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

IMPACT POINT DATA

Measured Parameter		Units	Value
Vertical Impact Ref Line	- Aft of Front Axle, Intended Impact Pt	mm	1370
Actual Impact Point	- Aft of Front Axle	mm	1373
Difference		mm	3

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Passenger Seat Dummy (ES-2re)
Head Contact	Curtain Airbag & Side Header
Upper Torso Contact	Curtain Airbag & Passenger Door
Lower Torso Contact	Torso Airbag
Left Knee Contact	Right Knee
Right Knee Contact	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	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
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
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 Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar, B-Pillar & C-Pillar Buckled
Sill Separation	None
Windshield Damage	Cracks throughout
Side Window Damage	Cracks throughout the front passenger window

DATA SHEET NO. 12
POST-TEST OBSERVATIONS (CONTINUED)

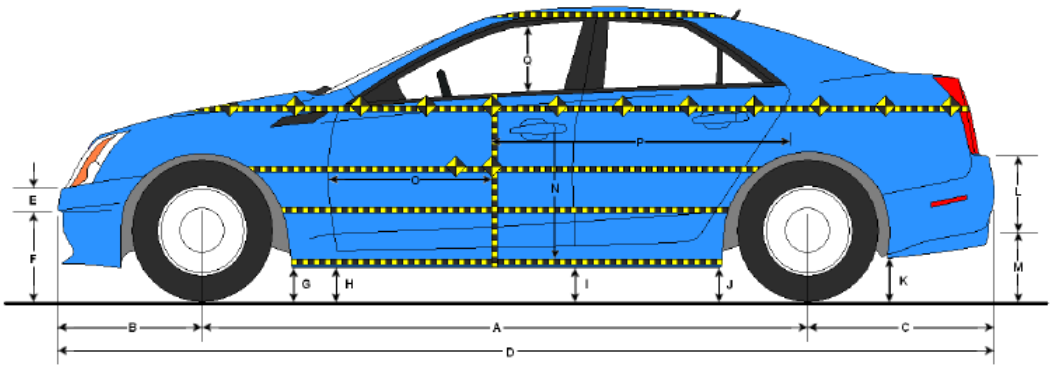
Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Front Occupant	
	Mounted	Deployed
Frontal Airbag	Yes	No
Side Torso Airbag	Yes	Yes
Head Airbag	No	N/A
Curtain Airbag	Yes	Yes
Seat Belt Pretensioner	Yes	Yes
Other		

DATA SHEET NO. 13
VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018



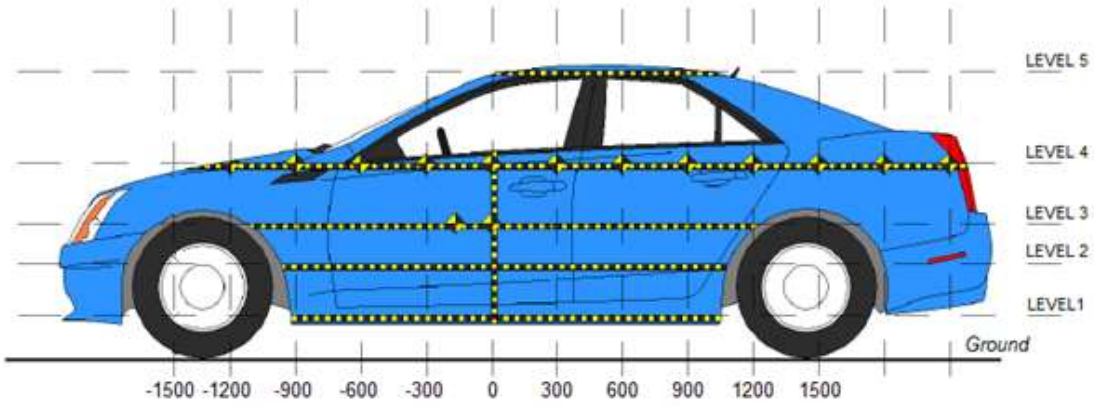
LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

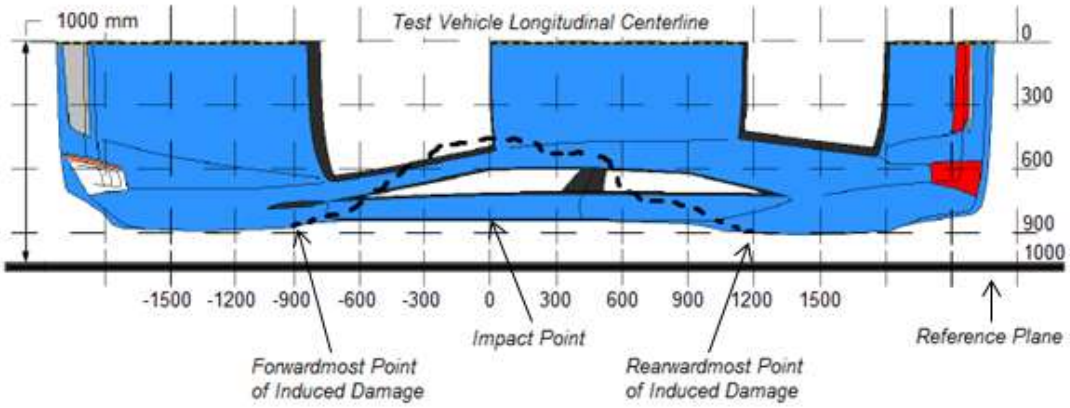
Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	3576	3545	31
B	Front Axle to FSOV	1005	1049	-44
C	Rear Axle to RSOV	1235	1251	-16
D	Total Length at Centerline	5815	5845	-30
E	Front Bumper Thickness	270	270	0
F	Front Bumper Bottom to Ground	394	403	-9
G	Sill Height at Front Wheel Well	313	320	-7
H	Sill Height at Front Door Leading Edge	330	335	-5
I	Sill Height at B-Pillar	351	350	1
J1	Sill Height at Rear Wheel Well	314	304	10
J2	Pinch Weld Height at Rear Wheel Well	359	376	-17
K	Sill Height Aft of Rear Wheel Well	392	414	-22
L	Rear Bumper Thickness	220	220	0
M	Rear Bumper Bottom to Ground	513	507	6
N	Sill Height to Bottom of Front Window Sill	922	935	-13
O	Front Door Leading Edge to Impact CL	815	761	54
P	Rear Door Trailing Edge to Impact CL	1109	1004	105
Q	Front Window Opening	517	538	-21
R	Right Side Length	5748	5694	54
S	Left Side Length	5750	5725	25
T	Vehicle Width at B-Pillars	2031	1918	113

DATA SHEET NO. 14
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018



Left Side View



Overhead View

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	429	232	0
2	Occupant Hip Point	mm	957	297	0
3	Mid - Door	mm	875	301	0
4	Window Sill	mm	1265	269	0
5	Window Top	mm	1853	63	0

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. 14
VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

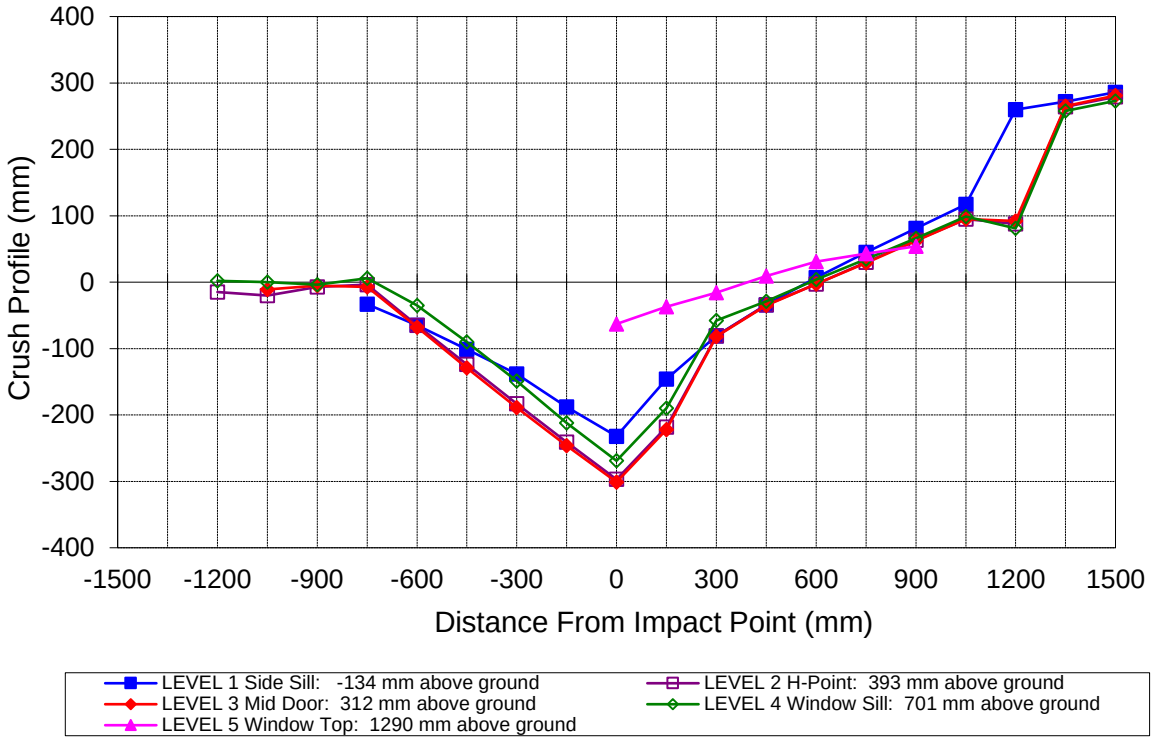
Test Vehicle: 2019 Dodge Ram 1500 NHTSA No.: C20190306
Test Facility: Calspan Test Date: 12/13/2018

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
-1500															
-1350															
-1200		-1011		-880			-996		-882			-15		2	
-1050		-1010	-1011	-902			-990	-1000	-902			-20	-11	0	
-900		-1006	-1009	-918			-999	-1004	-914			-7	-5	-4	
-750	-954	-1001	-1003	-925		-921	-997	-996	-931		-33	-4	-7	6	
-600	-937	-997	-998	-935		-872	-932	-930	-900		-65	-65	-68	-35	
-450	-935	-993	-994	-943		-834	-869	-865	-853		-101	-124	-129	-90	
-300	-936	-991	-992	-949		-798	-808	-803	-800		-138	-183	-189	-149	
-150	-936	-991	-993	-955		-748	-750	-747	-743		-188	-241	-246	-212	
0	-935	-992	-995	-960	-702	-703	-695	-694	-691	-639	-232	-297	-301	-269	-63
150	-935	-994	-997	-964	-712	-789	-776	-775	-774	-675	-146	-218	-222	-190	-37
300	-932	-995	-998	-968	-719	-851	-914	-916	-910	-703	-81	-81	-82	-58	-16
450	-930	-996	-1000	-973	-725	-896	-962	-965	-944	-734	-34	-34	-35	-29	9
600	-928	-997	-1002	-976	-728	-935	-994	-999	-980	-759	7	-3	-3	4	31
750	-927	-997	-1003	-978	-731	-972	-1027	-1032	-1013	-774	45	30	29	35	43
900	-924	-996	-1002	-979	-731	-1005	-1059	-1064	-1045	-785	81	63	62	66	54
1050	-916	-993	-999	-976		-1033	-1088	-1094	-1075		117	95	95	99	
1200	-895	-961	-961	-940		-1155	-1049	-1053	-1021		260	88	92	81	
1350	-903	-977	-981	-954		-1175	-1241	-1246	-1212		272	264	265	258	
1500	-914	-987	-989	-956		-1200	-1266	-1270	-1229		286	279	281	273	

DATA SHEET NO. 14
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

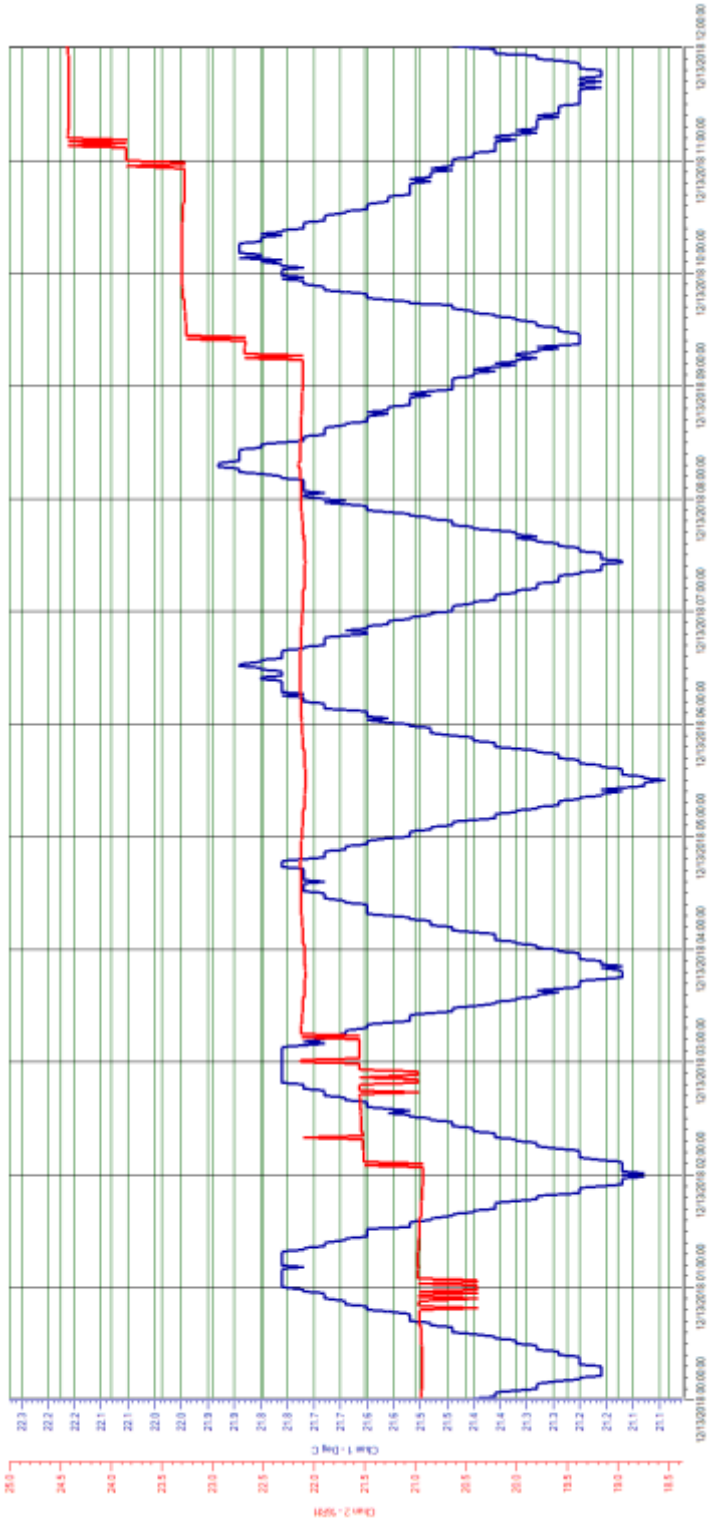
Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 16
DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle:	2019 Dodge Ram 1500	NHTSA No.:	C20190306
Test Facility:	Calspan	Test Date:	12/13/2018



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

APPENDIX I

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

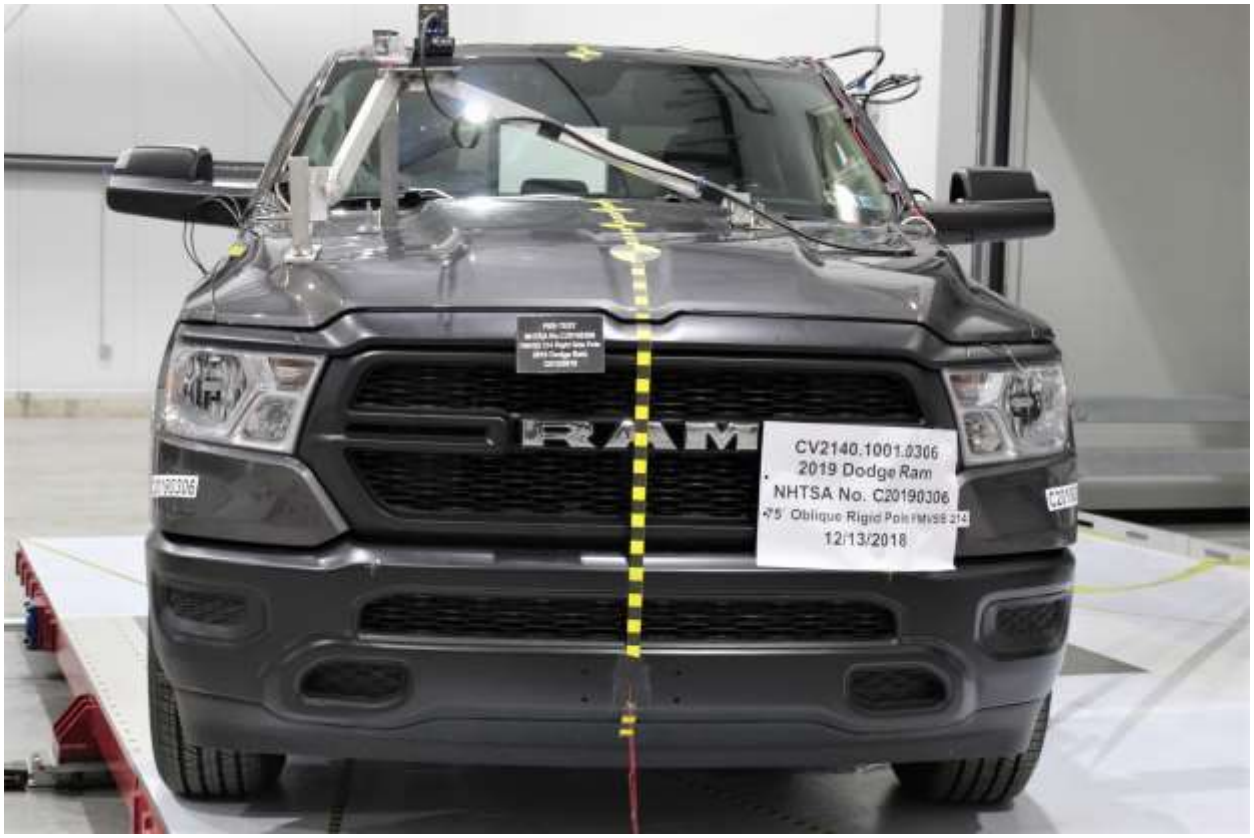


Figure A-1: Pre-Test Frontal View of Test Vehicle

Figure A-2: Pre-Test Frontal View of Test Vehicle

Figure A-3: Pre-Test Rear View of Test Vehicle

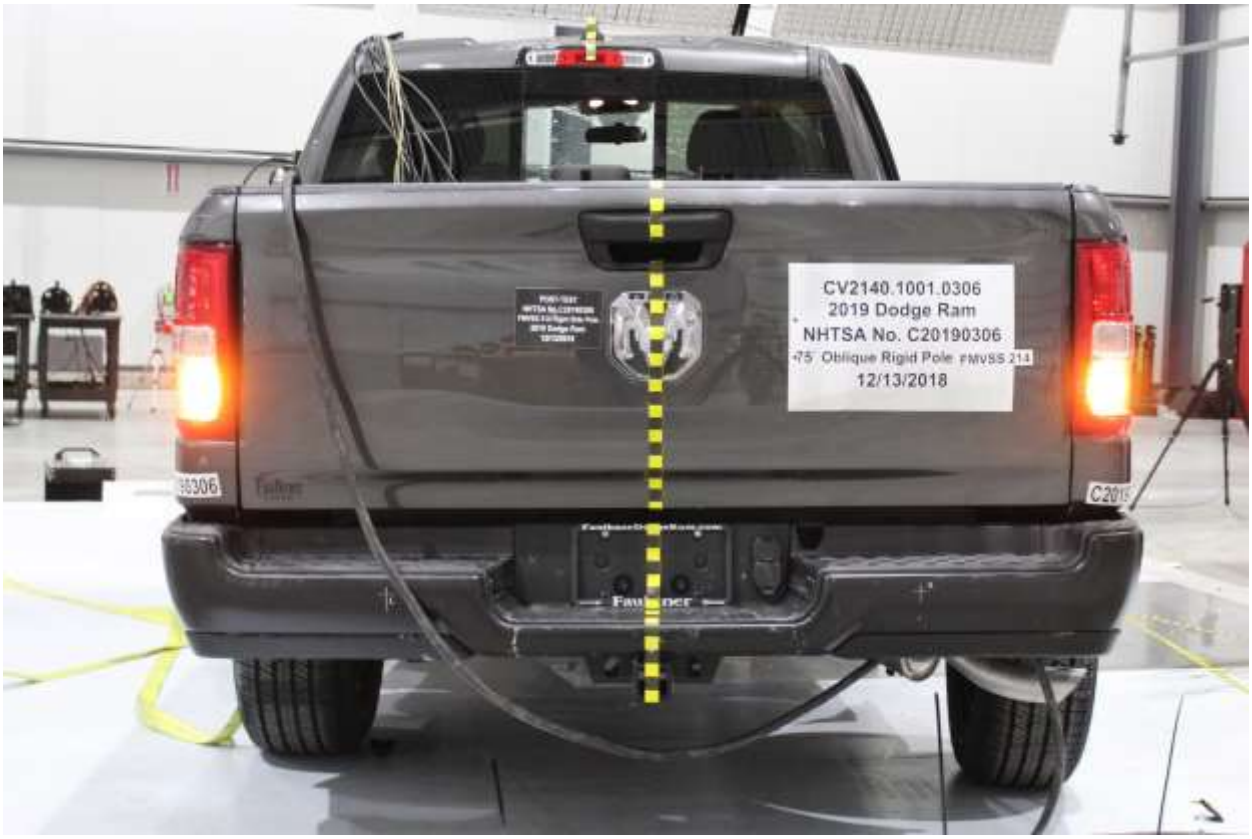


Figure A-4: Post-Test Rear View of Test Vehicle

Figure A-5: Pre-Test Impacted Side View of Test Vehicle

Figure A-6: Post-Test Impacted Side View of Test Vehicle

Figure A-7: Pre-Test Right ¾ Front View of Vehicle and Pole

Figure A-8: Pre-Test Right ¾ Rear View of Vehicle and Pole

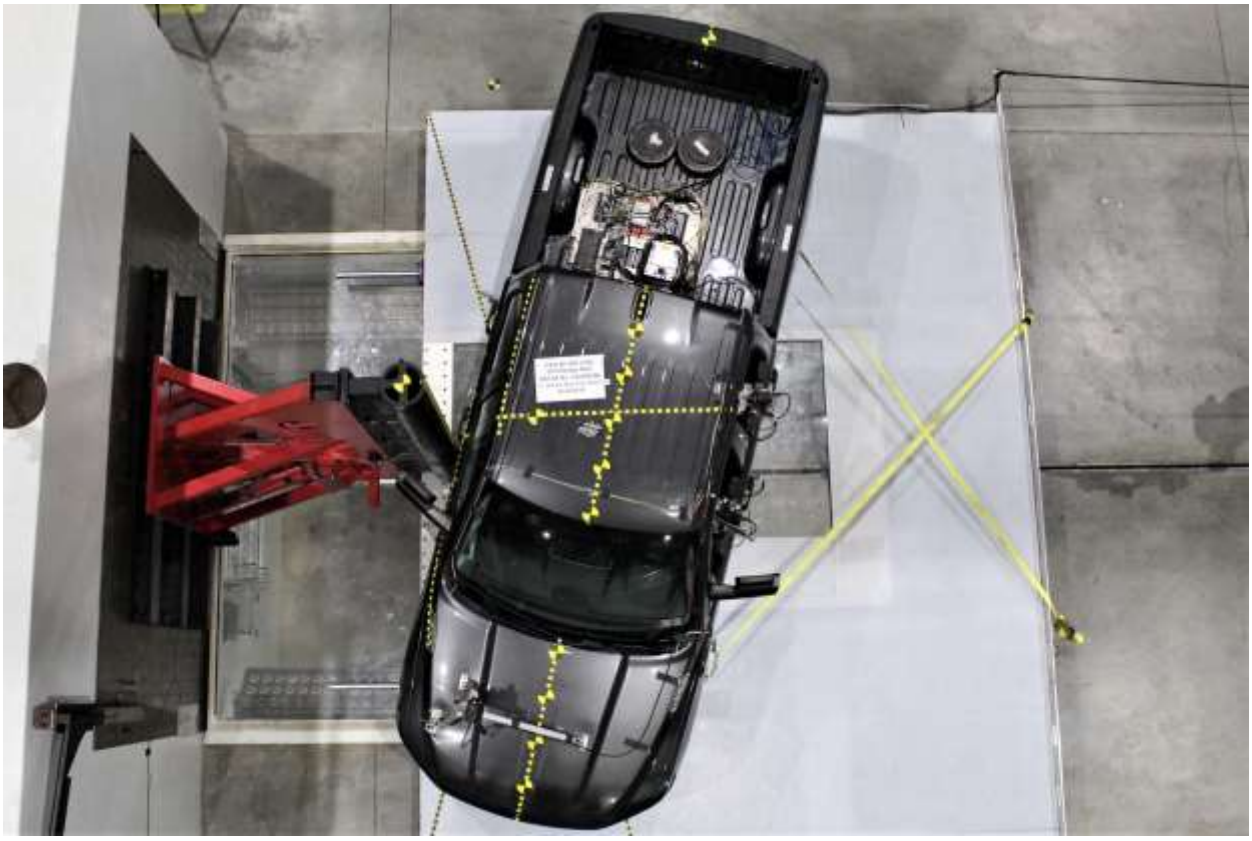


Figure A-9: Pre-Test Overhead View of Test Vehicle

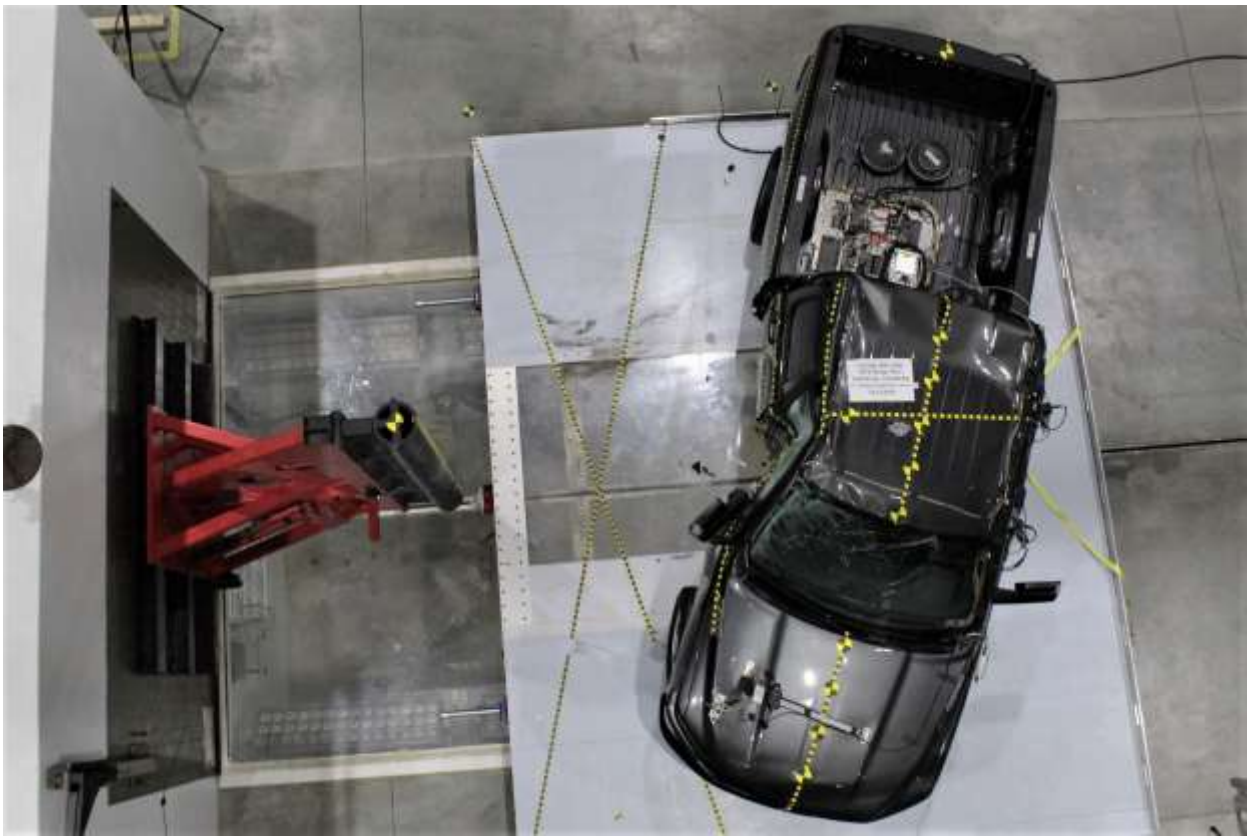


Figure A-10: Post-Test Overhead View of Test Vehicle

Figure A-11: Pre-Test Dummy Through Opposite Window

Figure A-12: Post-Test Dummy Through Opposite Window

Figure A-13: Pre-Test Close-Up of Dummy with Door Closed (Impact Side)

Figure A-14: Post-Test Close-Up of Dummy with Door Closed (Impact Side)

Figure A-15: Pre-Test Dummy with Door Open

Figure A-16: Pre-Test Dummy Shoulder and Door Top View

Figure A-17: Post-Test Dummy Shoulder and Door Top View

Figure A-18: Pre-Test Interior of Front Door Closed (through opposite window)

Figure A-19: Post-Test Interior of Front Door Showing Dummy Impact Locations

Figure A-20: Impact Event (struck side)

Figure A-21: Post-Test Impact Zone Close-Up View

Figure A-22: Post-Test ¾ Front View of Impact Zone

Figure A-23: Post-Test ¾ Rear View of Impact Zone

Figure A-24: Close-Up View of Impact Point Target

Figure A-25: Close-Up View of Vehicle's Certification Label

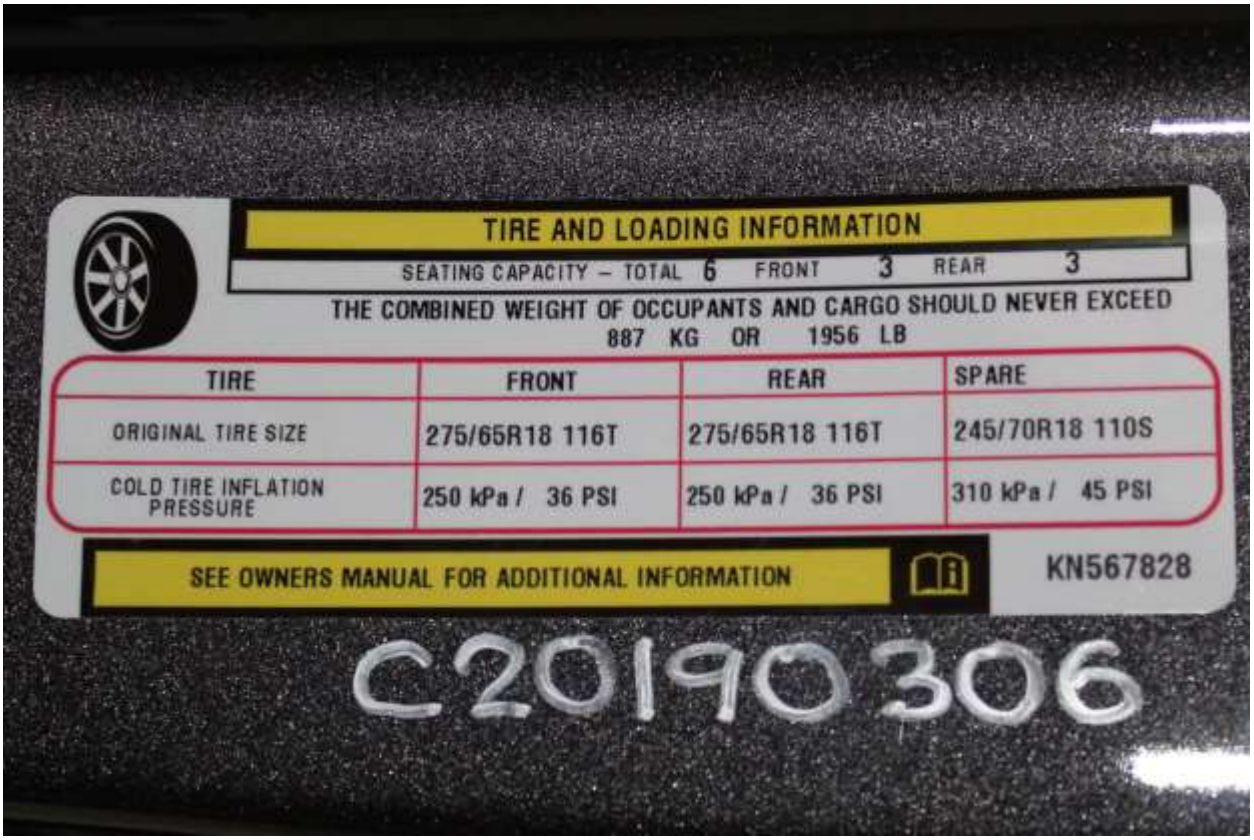


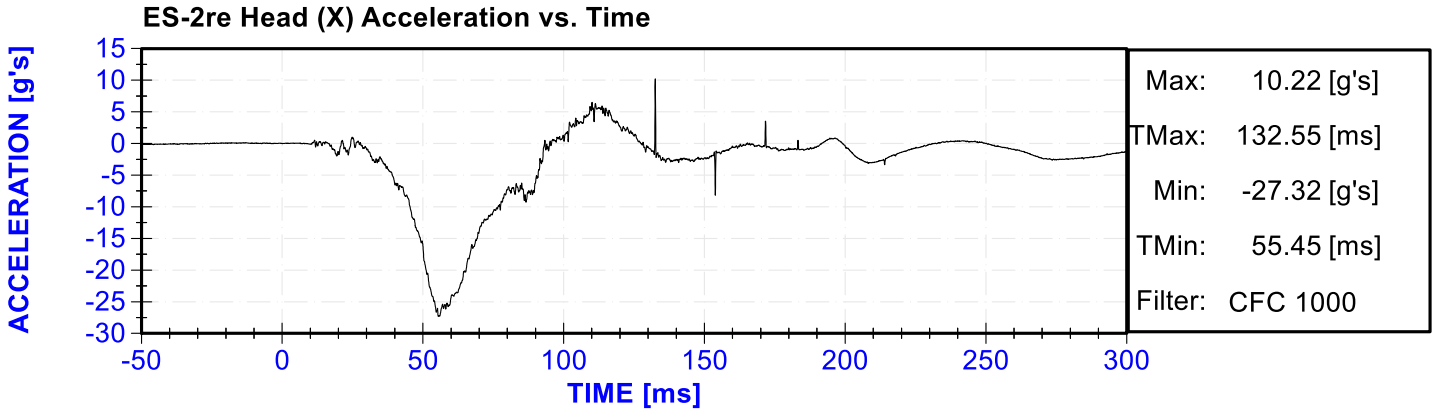
Figure A-26: Close-Up View of Vehicle's Tire Placard Label

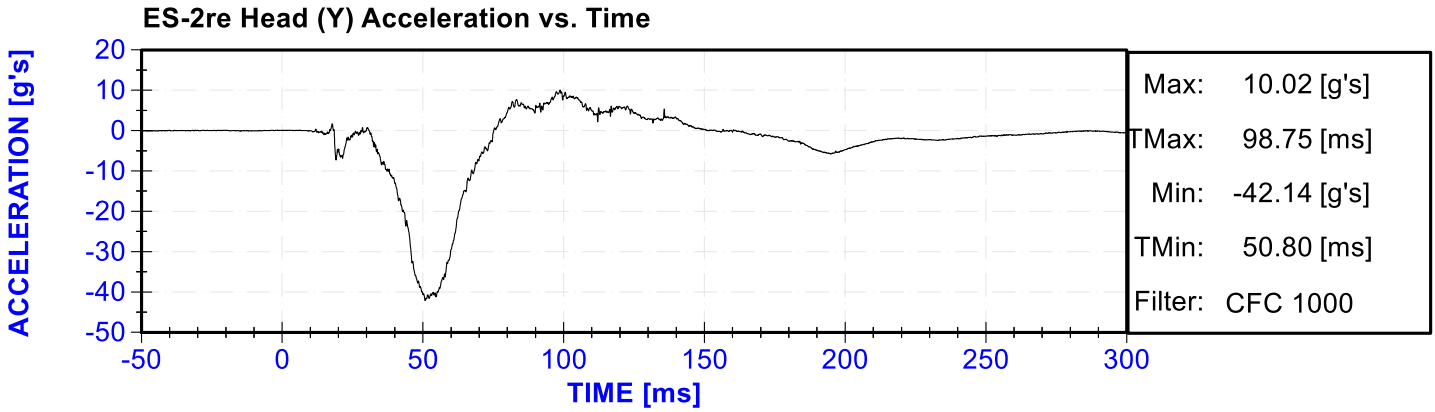
APPENDIX II

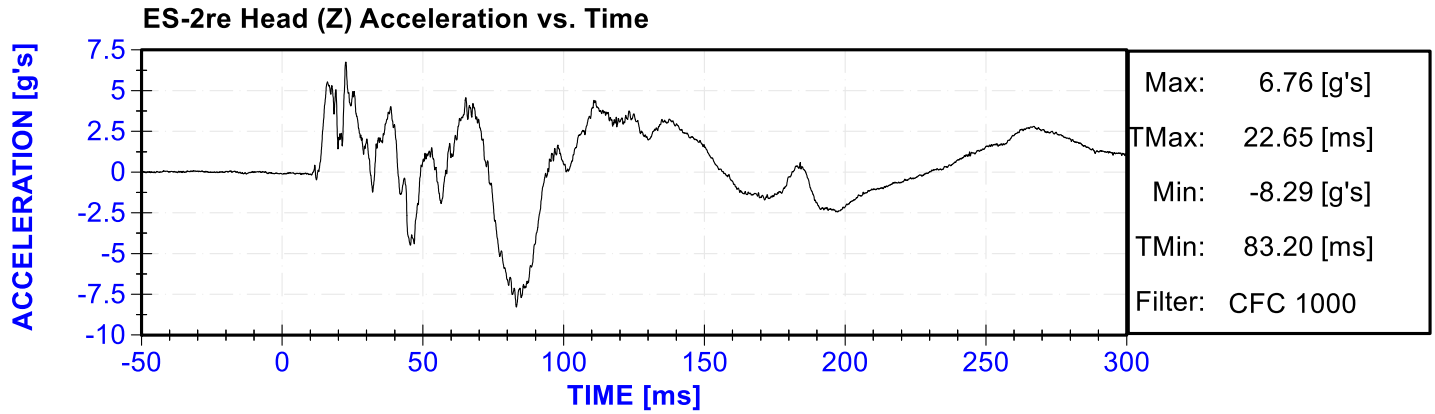
TABLE OF DATA PLOTS for ES-2re
Dummy Instrumentation Plots
FILTERED DATA

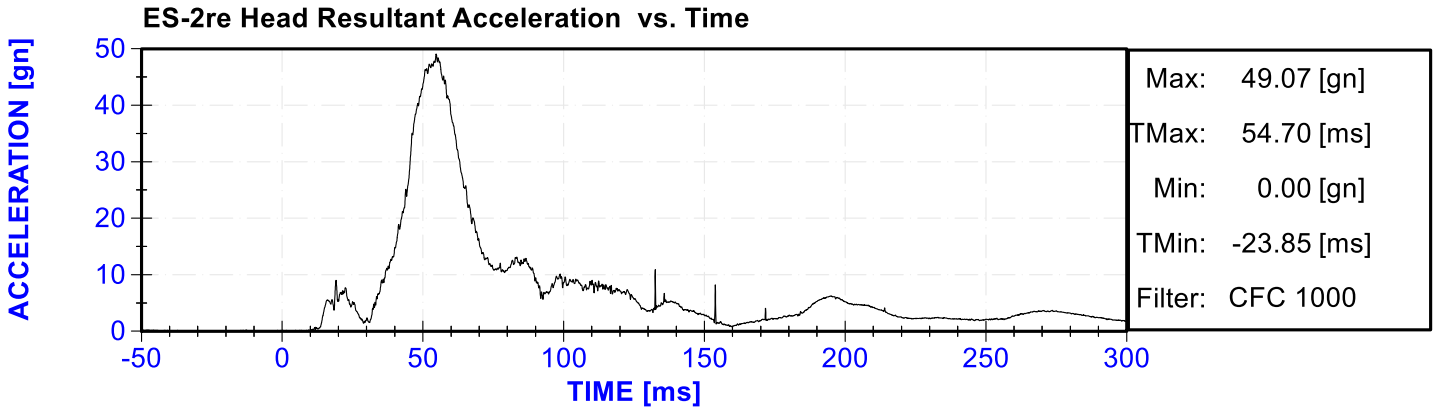
The following data plots shall be included in this appendix in the order indicated below:

Table of Data Plots

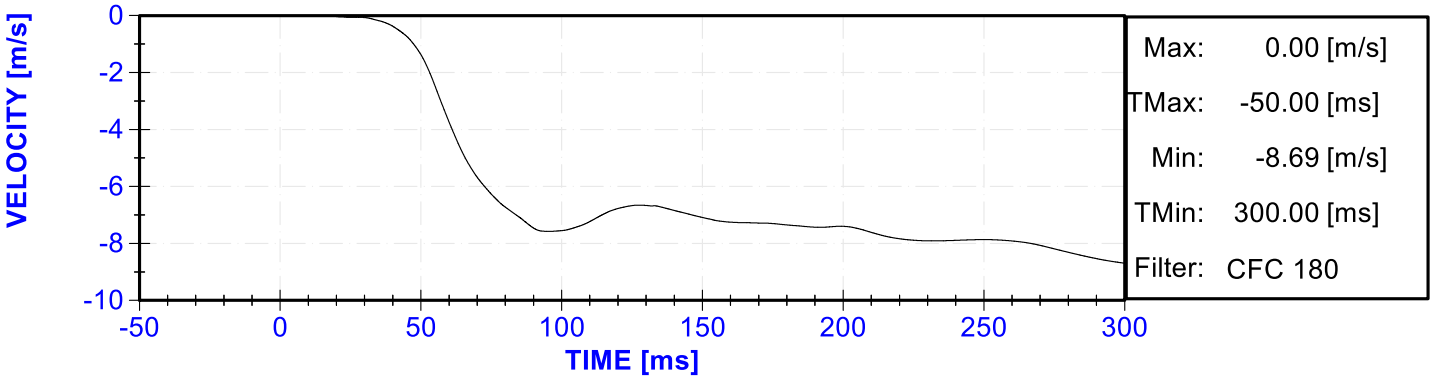

ES-2re Head (X) Acceleration vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 10.22 [g's]
TMax: 132.55 [ms]
Min: -27.32 [g's]
TMin: 55.45 [ms]
Filter: CFC 1000


ES-2re Head (Y) Acceleration vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 10.02 [g's]
TMax: 98.75 [ms]
Min: -42.14 [g's]
TMin: 50.80 [ms]
Filter: CFC 1000

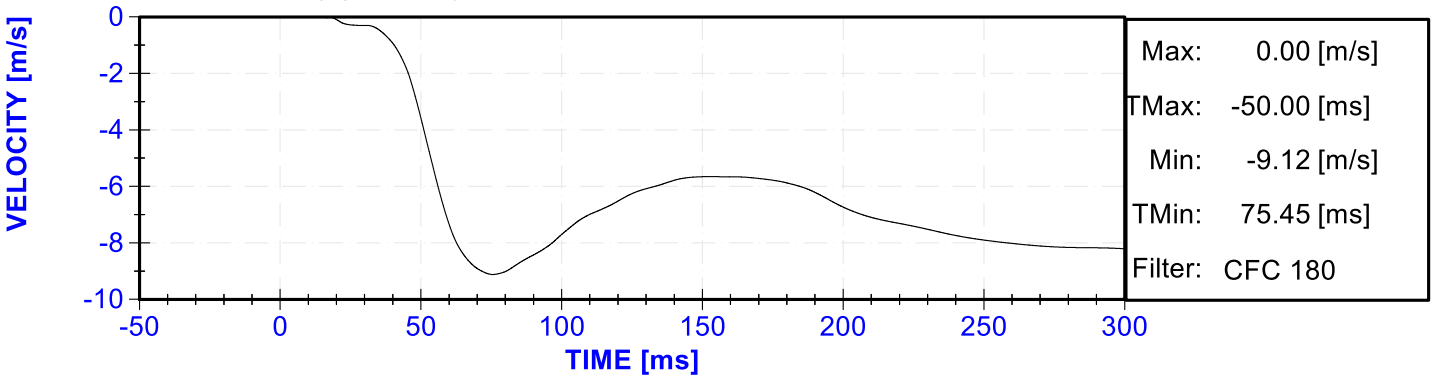

ES-2re Head (Z) Acceleration vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 6.76 [g's]
TMax: 22.65 [ms]
Min: -8.29 [g's]
TMin: 83.20 [ms]
Filter: CFC 1000


ES-2re Head Resultant Acceleration vs. Time
ACCELERATION [gn]
TIME [ms]
Max: 49.07 [gn]
TMax: 54.70 [ms]
Min: 0.00 [gn]
TMin: -23.85 [ms]
Filter: CFC 1000

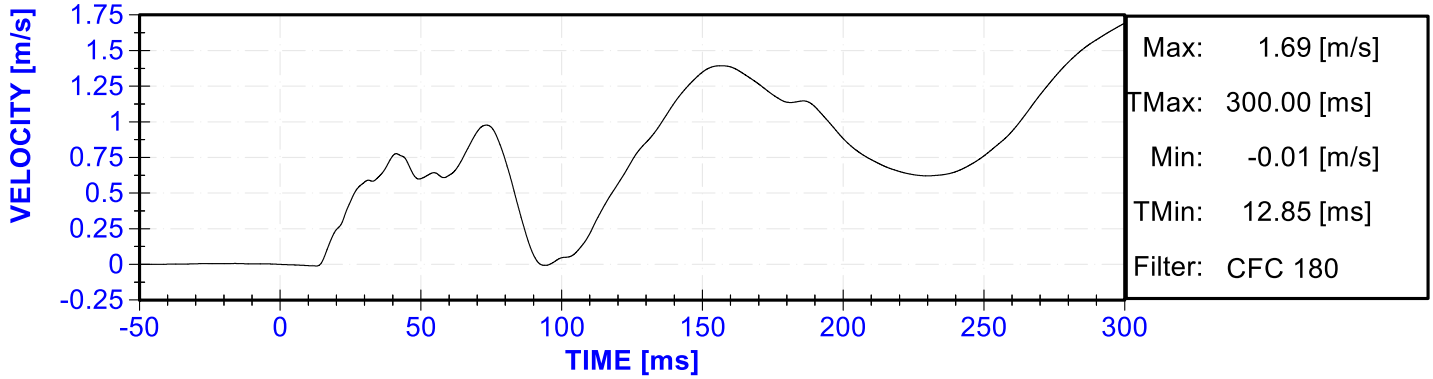
ES-2re Head (X) Velocity vs. Time



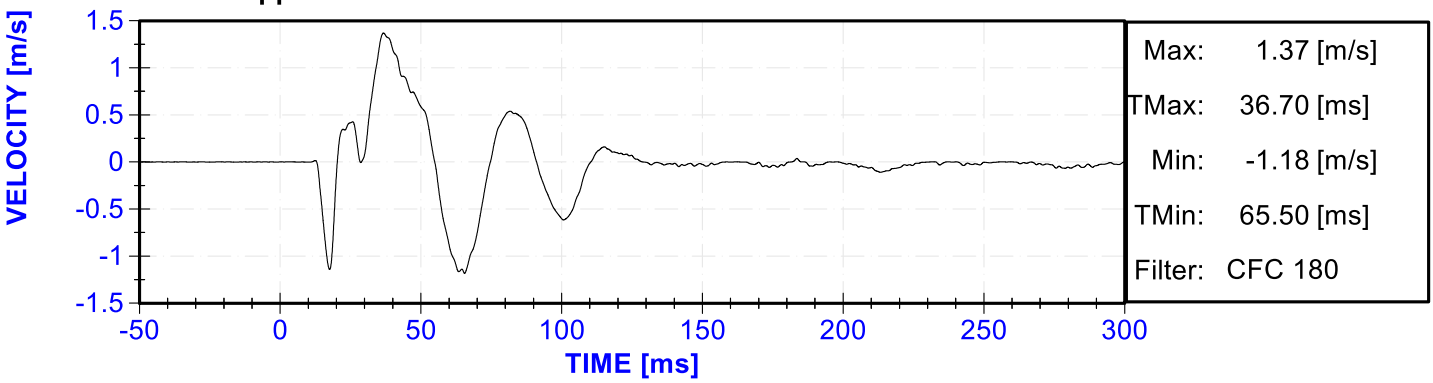
ES-2re Head (Y) Velocity vs. Time



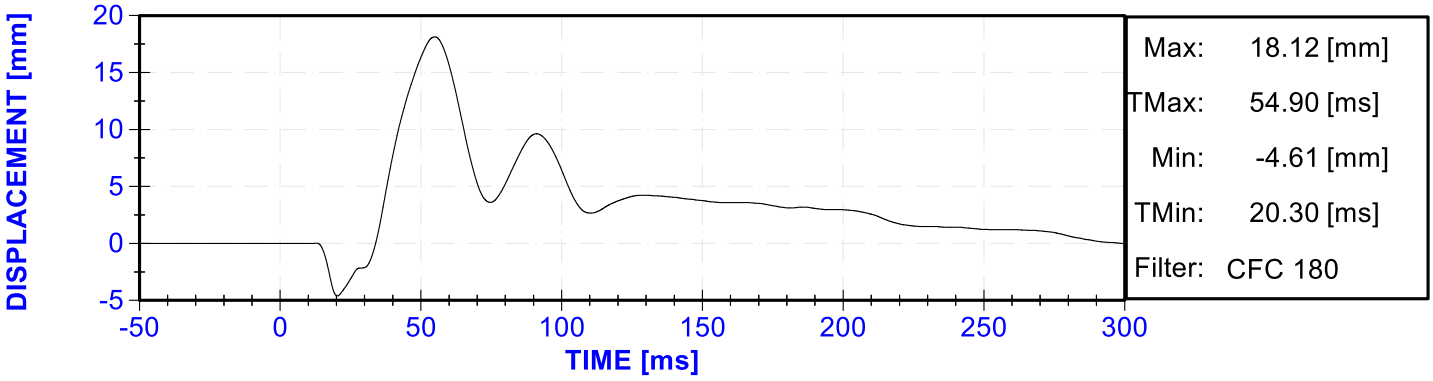
ES-2re Head (Z) Velocity vs. Time



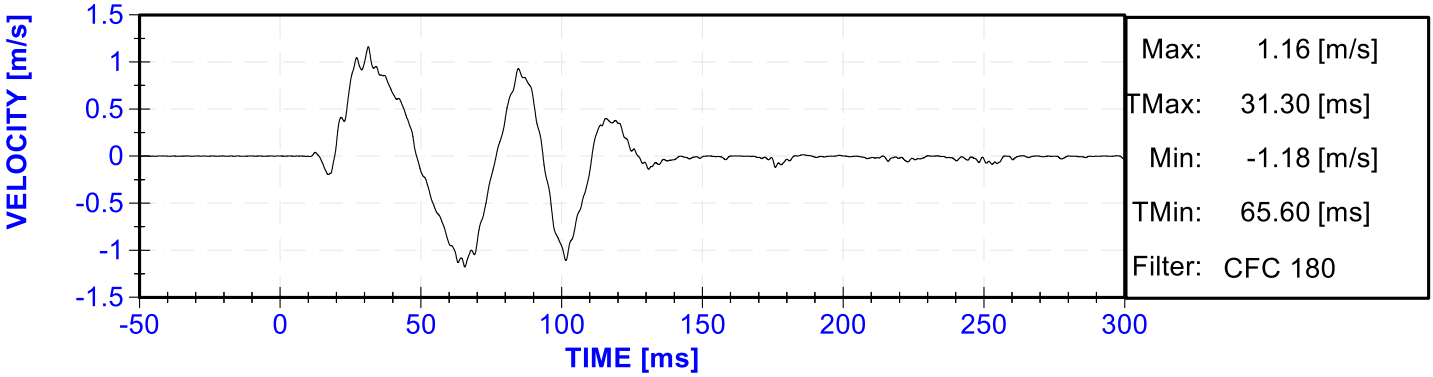
ES-2re Upper Thorax Rib Deflection Rate vs. Time



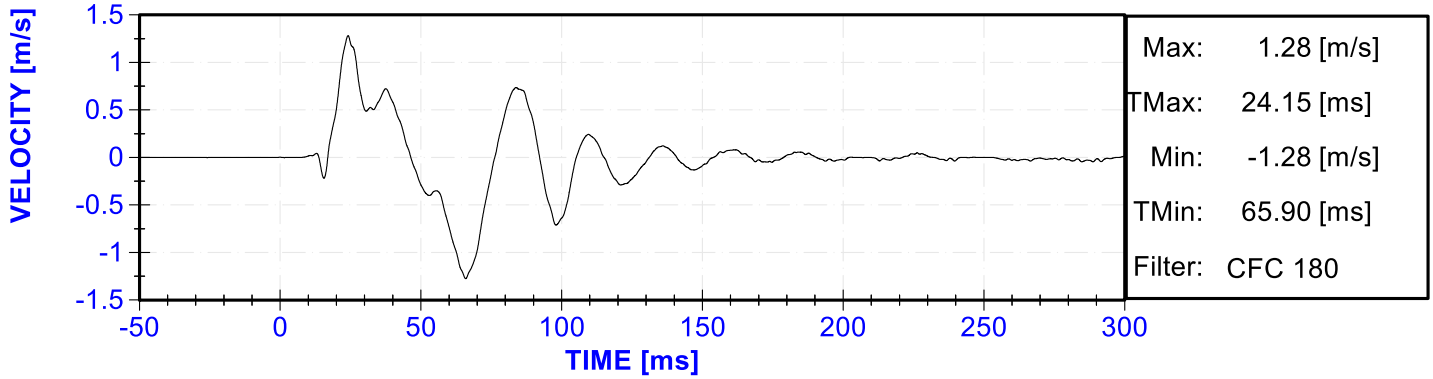
ES-2re Upper Thorax Rib Deflection (Y) vs. Time



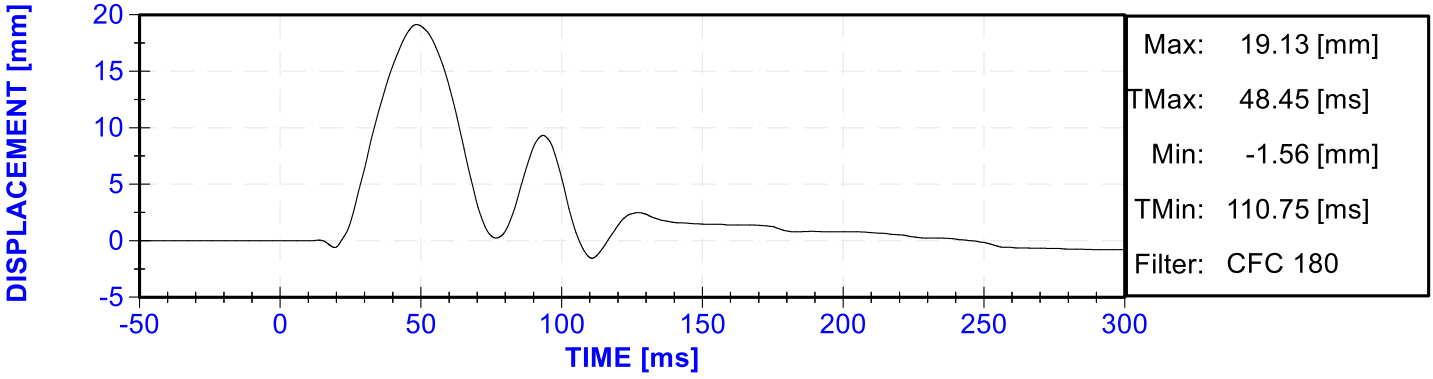
ES-2re Middle Thorax Rib Deflection Rate vs. Time



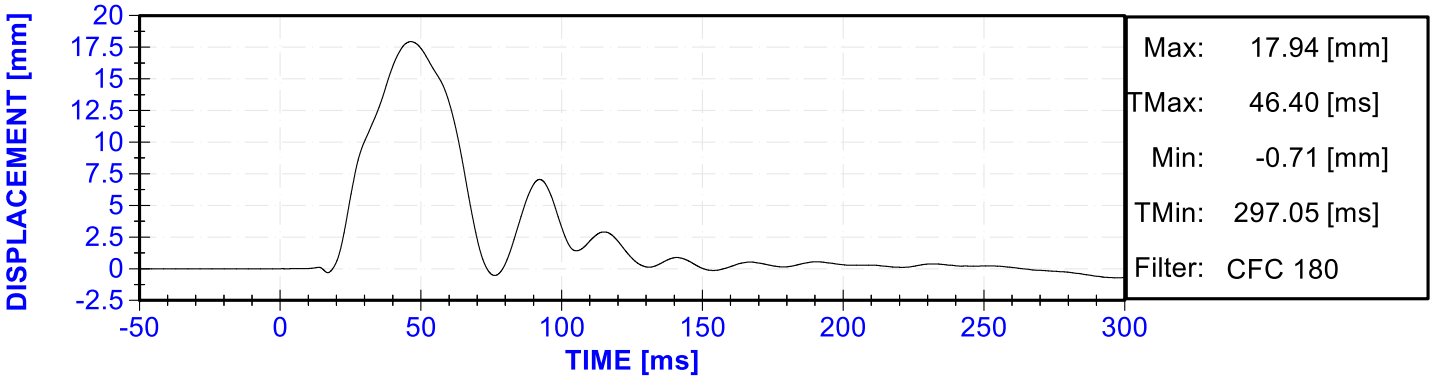
ES-2re Lower Thorax Rib Deflection Rate vs. Time



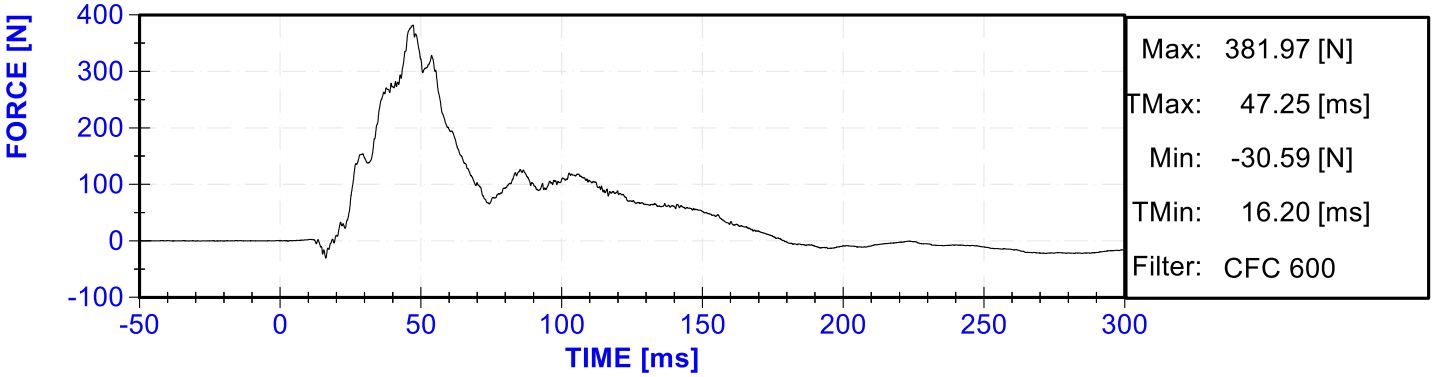
ES-2re Middle Thorax Rib Deflection (Y) vs. Time



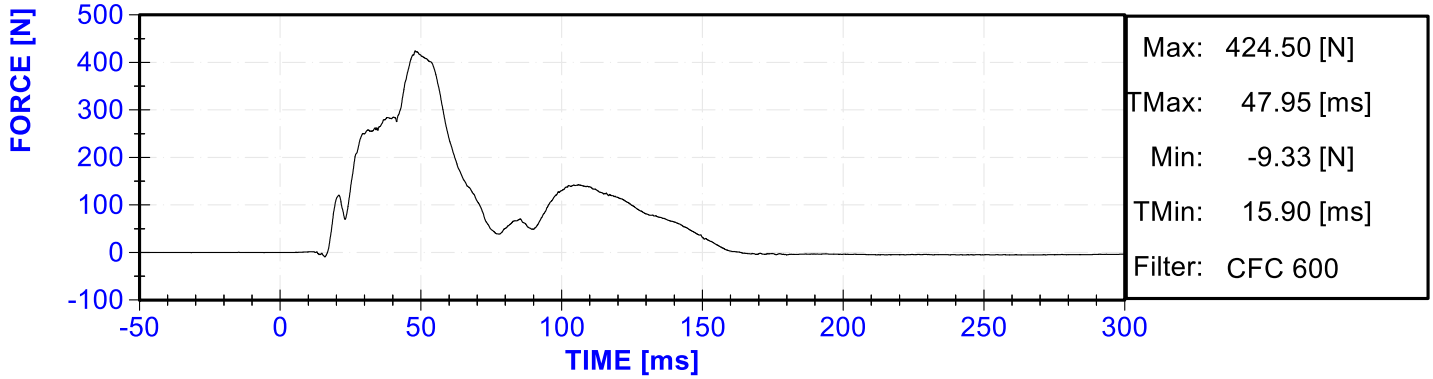
ES-2re Lower Thorax Rib Deflection (Y) vs. Time



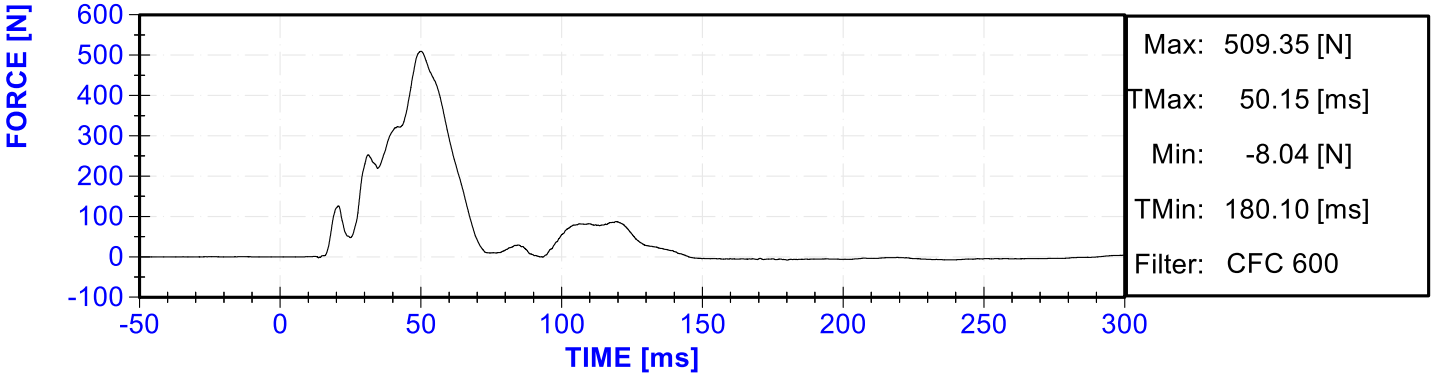
ES-2re Front Abdomen Force (Y) vs. Time

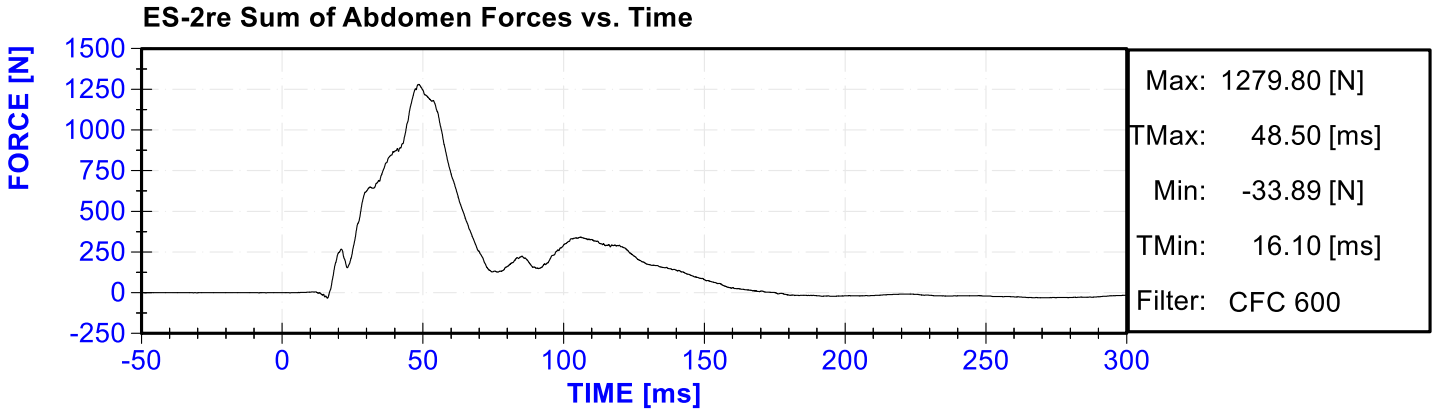


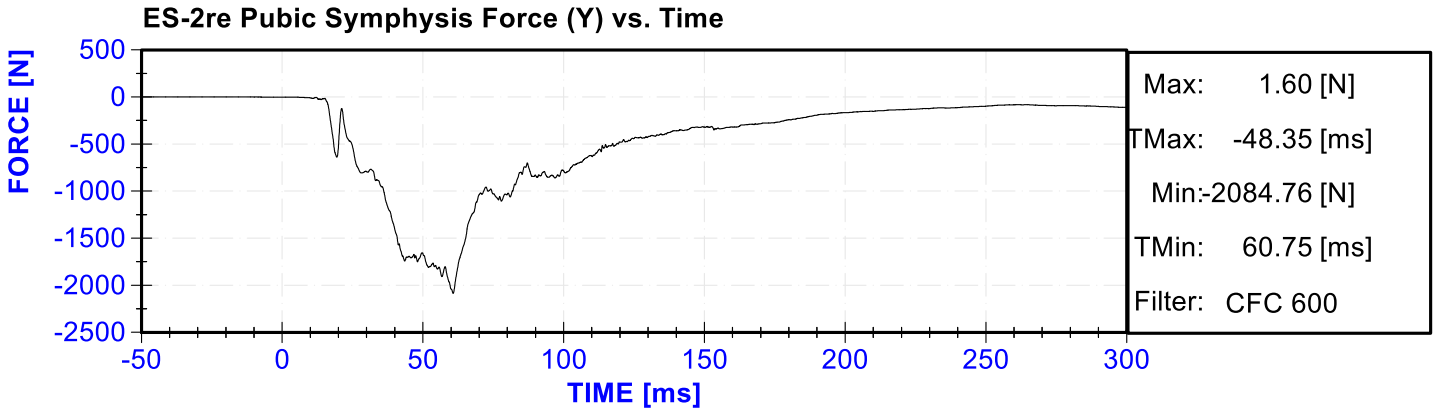
ES-2re Middle Abdomen Force (Y) vs. Time



ES-2re Rear Abdomen Force (Y) vs. Time



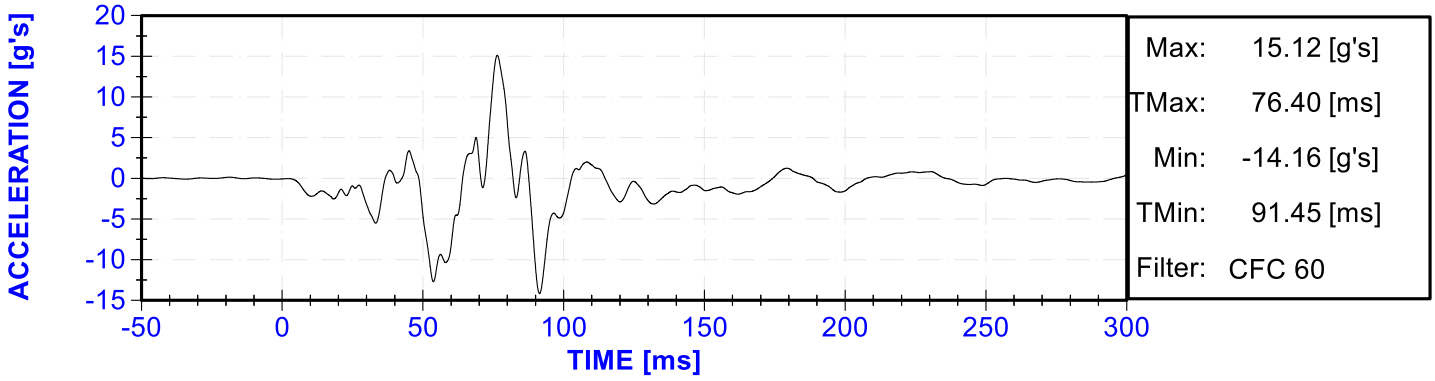

ES-2re Sum of Abdomen Forces vs. Time
FORCE [N]
1500
1250
1000
750
500
250
0
-250
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1279.80 [N]
TMax: 48.50 [ms]
Min: -33.89 [N]
TMin: 16.10 [ms]
Filter: CFC 600


ES-2re Pubic Symphysis Force (Y) vs. Time
FORCE [N]
500
0
-500
-1000
-1500
-2000
-2500
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1.60 [N]
TMax: -48.35 [ms]
Min:-2084.76 [N]
TMin: 60.75 [ms]
Filter: CFC 600

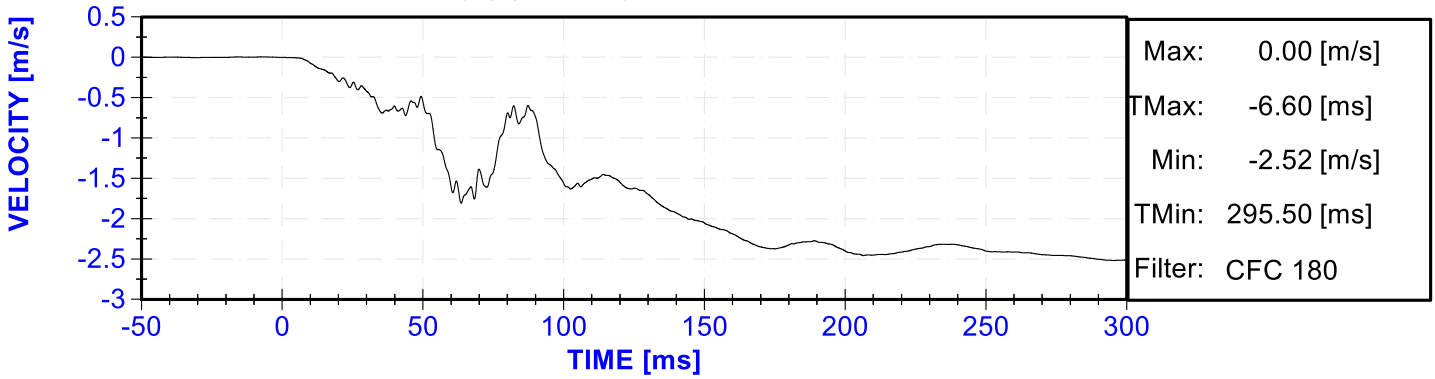
APPENDIX III
VEHICLE ACCELEROMETER RESPONSE DATA

Table of Data Plots

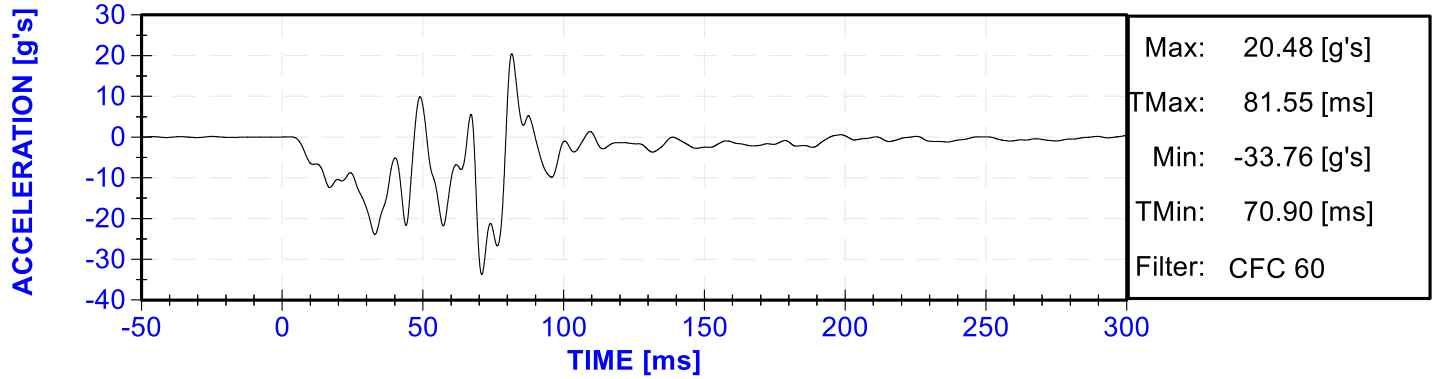
Vehicle Center of Gravity (X) Acceleration vs. Time



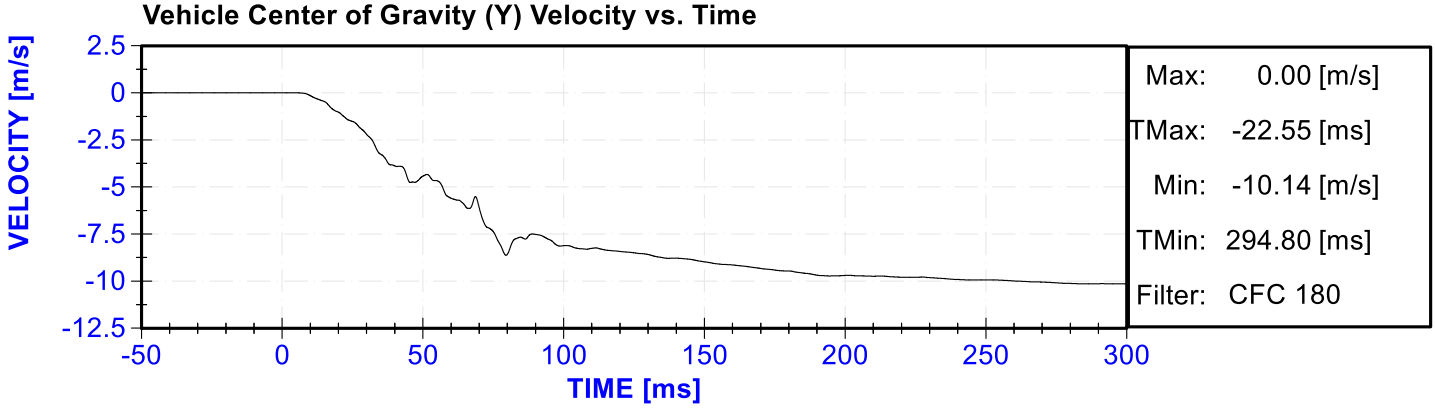
Vehicle Center of Gravity (X) Velocity vs. Time



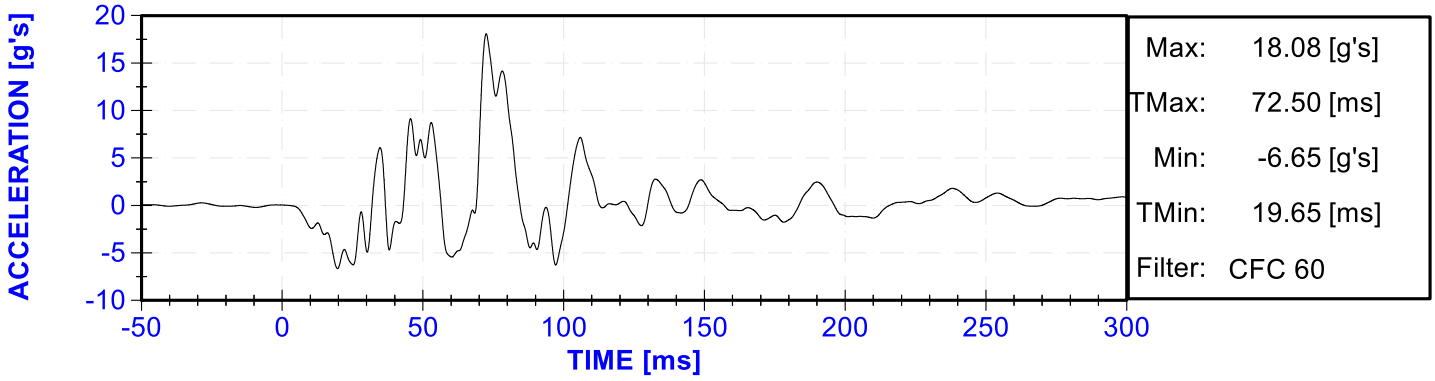
Vehicle Center of Gravity (Y) Acceleration vs. Time



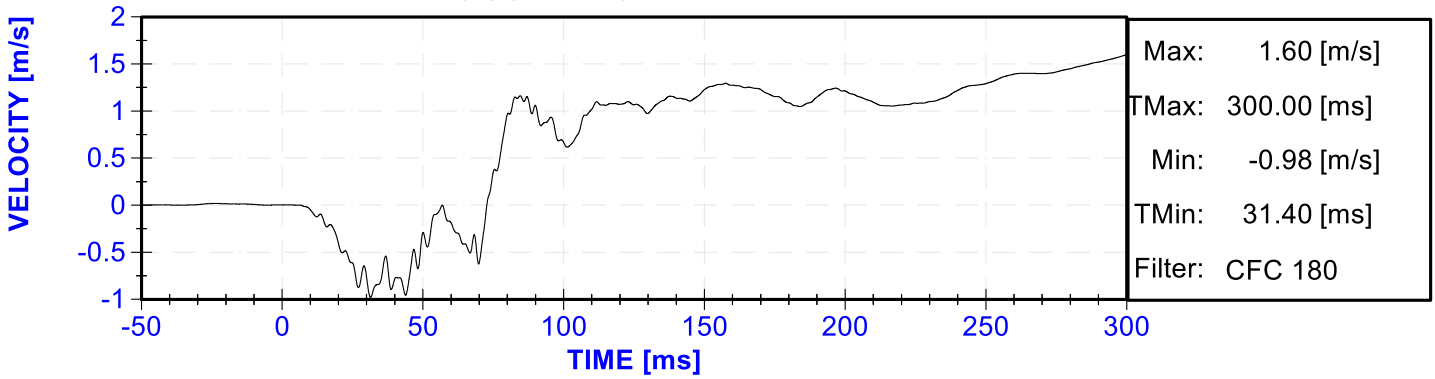
Vehicle Center of Gravity (Y) Velocity vs. Time



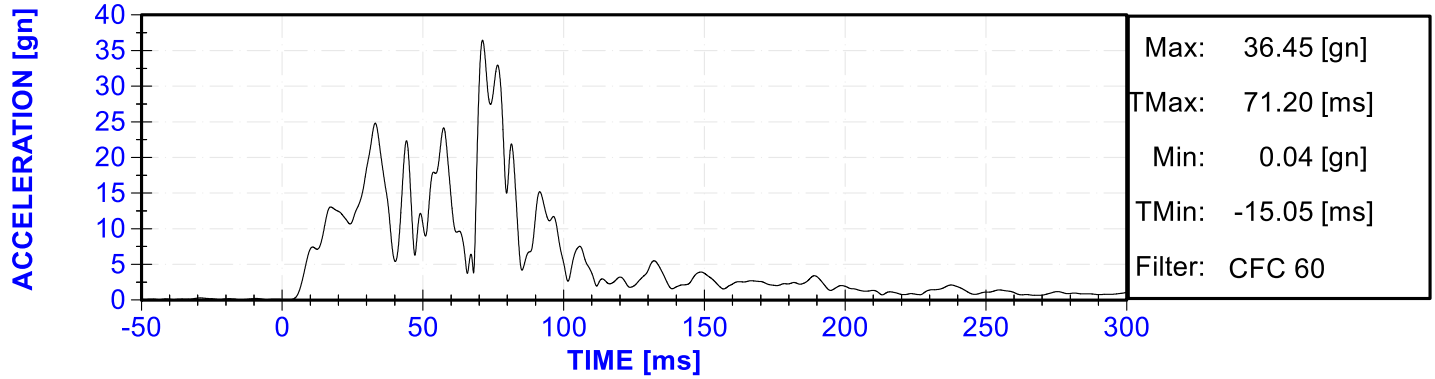
Vehicle Center of Gravity (Z) Acceleration vs. Time



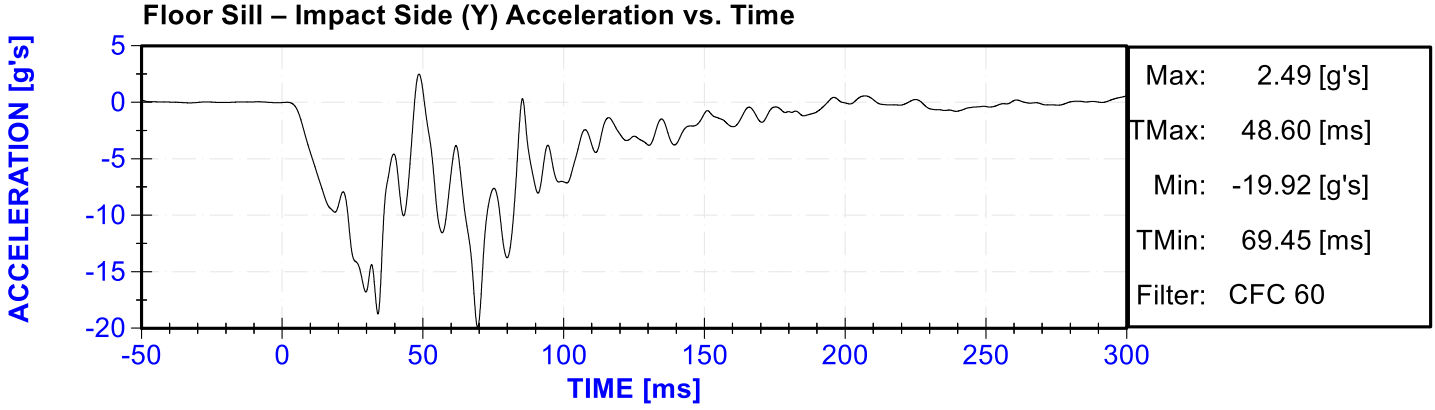
Vehicle Center of Gravity (Z) Velocity vs. Time



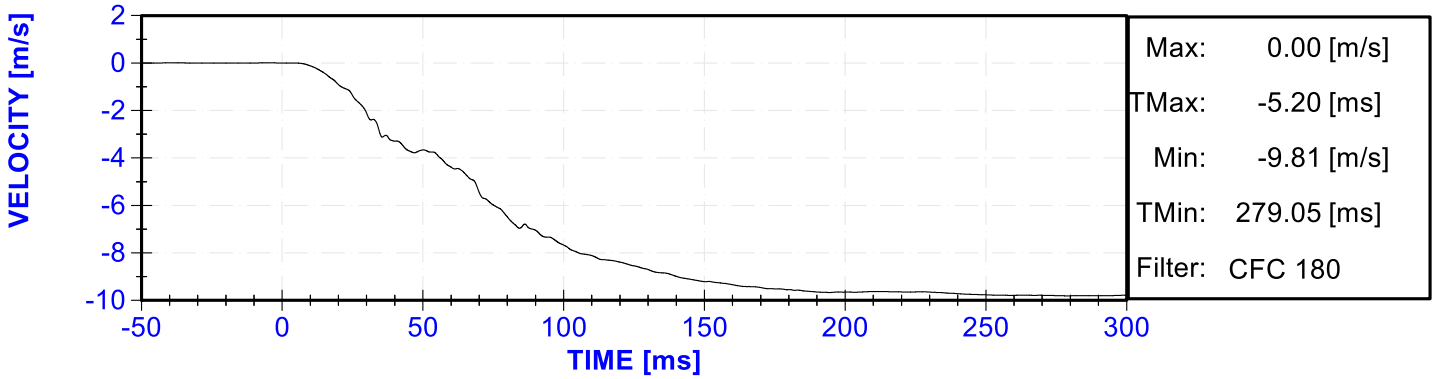
Vehicle Center of Gravity Resultant Acceleration vs. Time



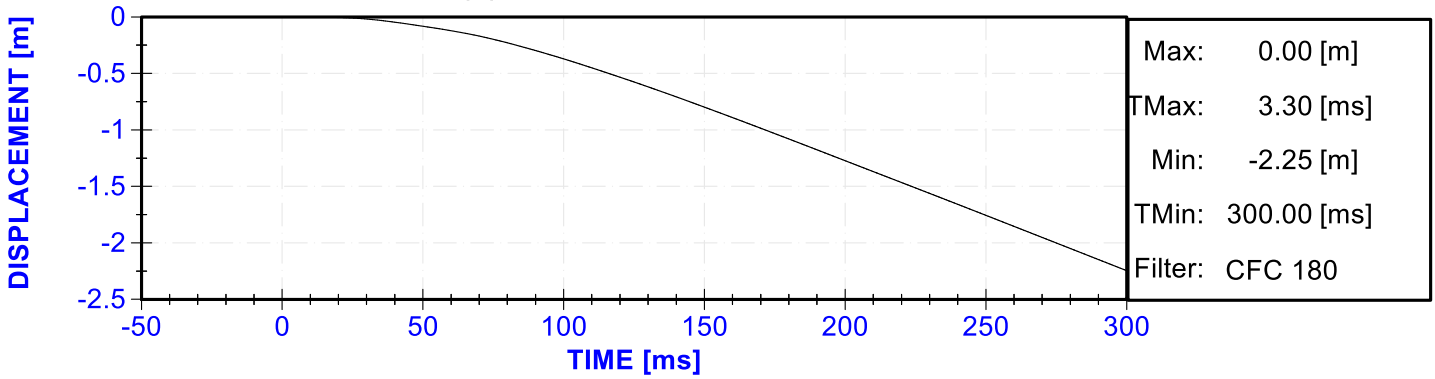
Floor Sill – Impact Side (Y) Acceleration vs. Time



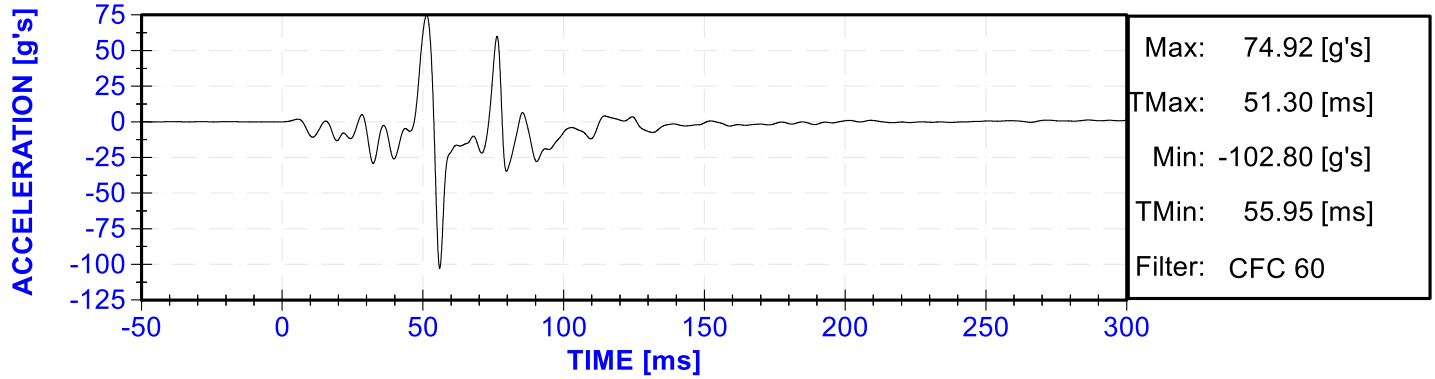
Floor Sill – Impact Side (Y) Velocity vs. Time



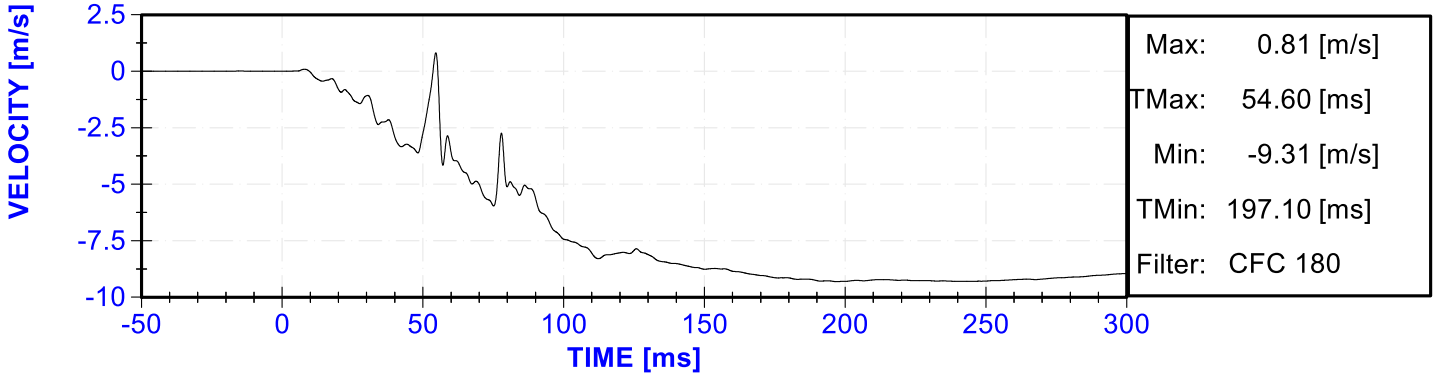
Floor Sill – Impact Side (Y) Displacement vs. Time



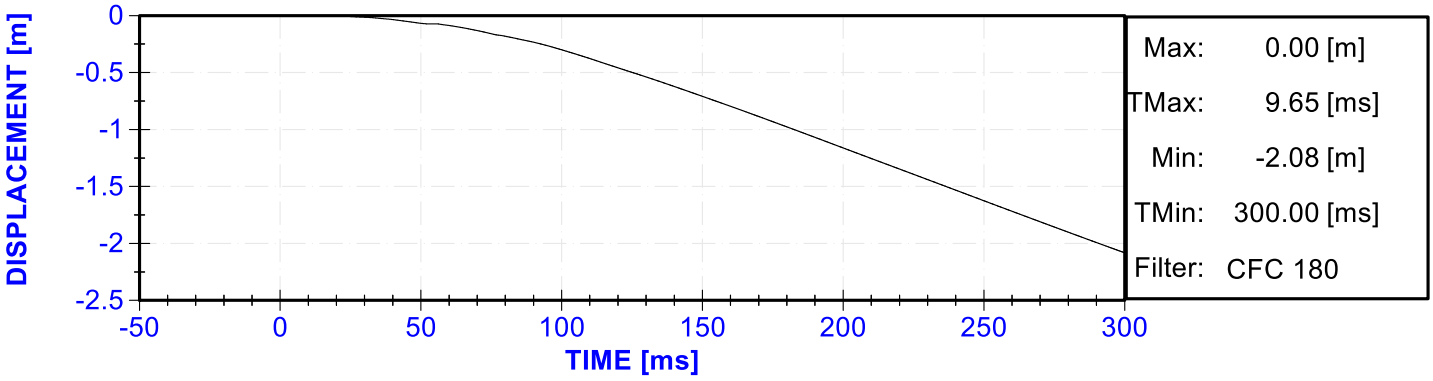
A-Pillar Sill (Y) Acceleration vs. Time



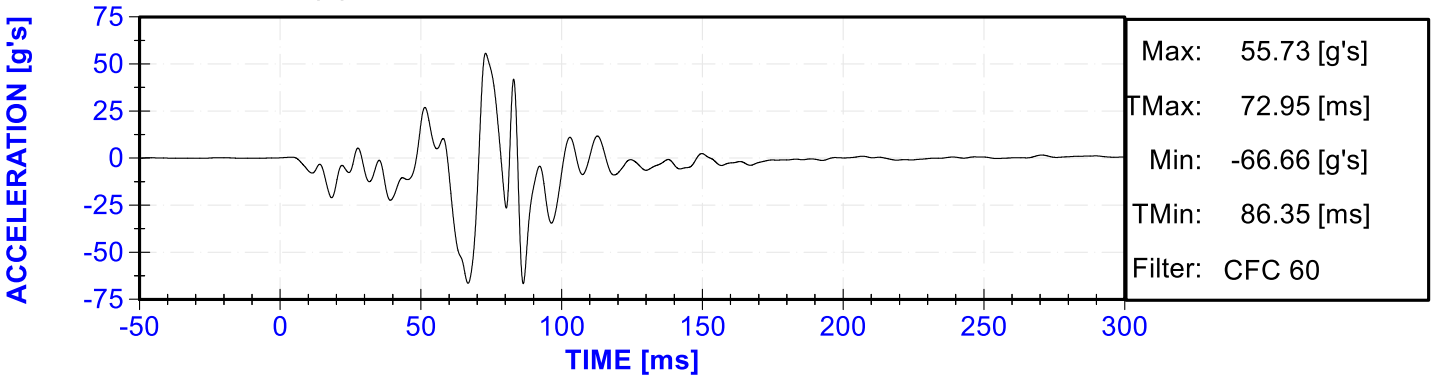
A-Pillar Sill (Y) Velocity vs. Time



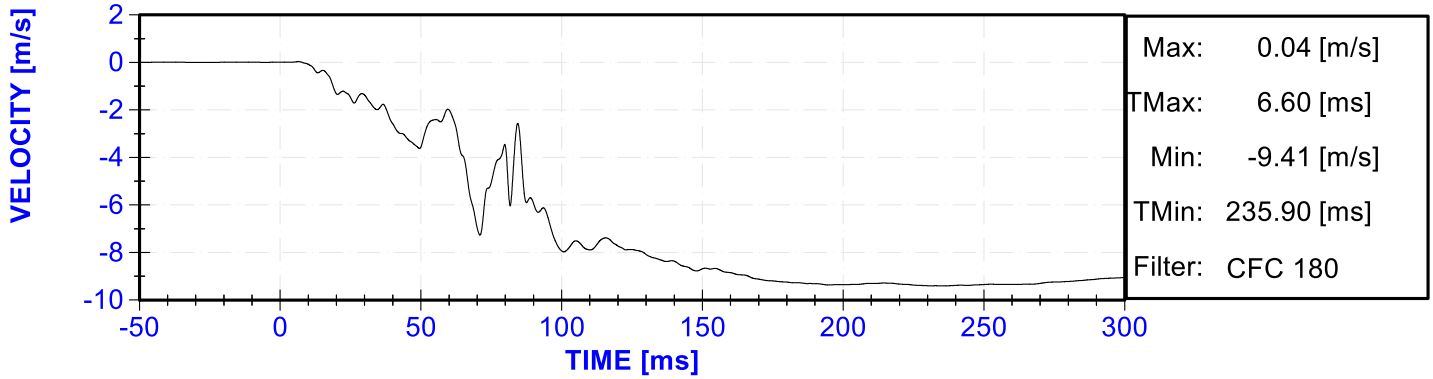
A-Pillar Sill (Y) Displacement vs. Time



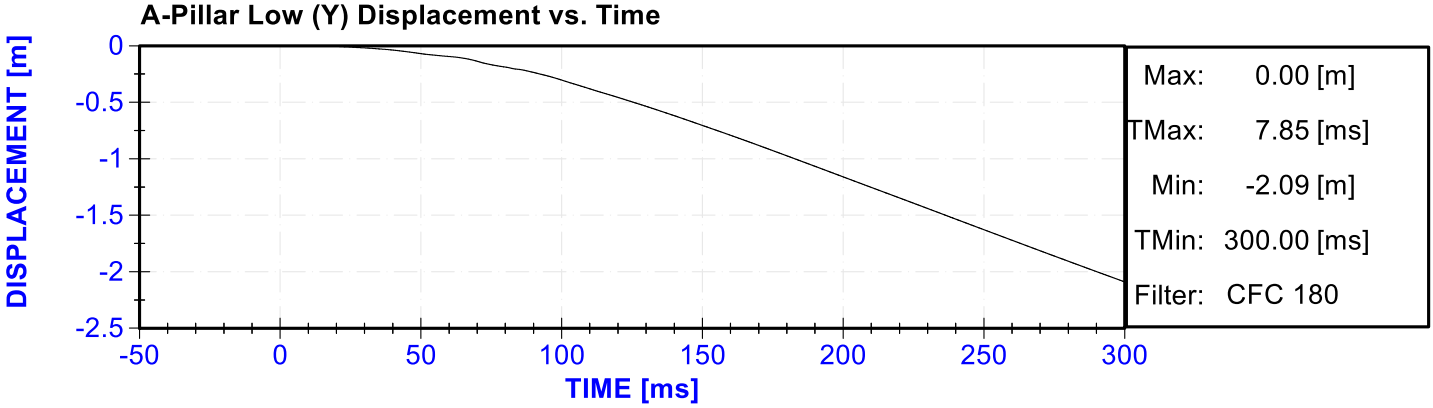
A-Pillar Low (Y) Acceleration vs. Time

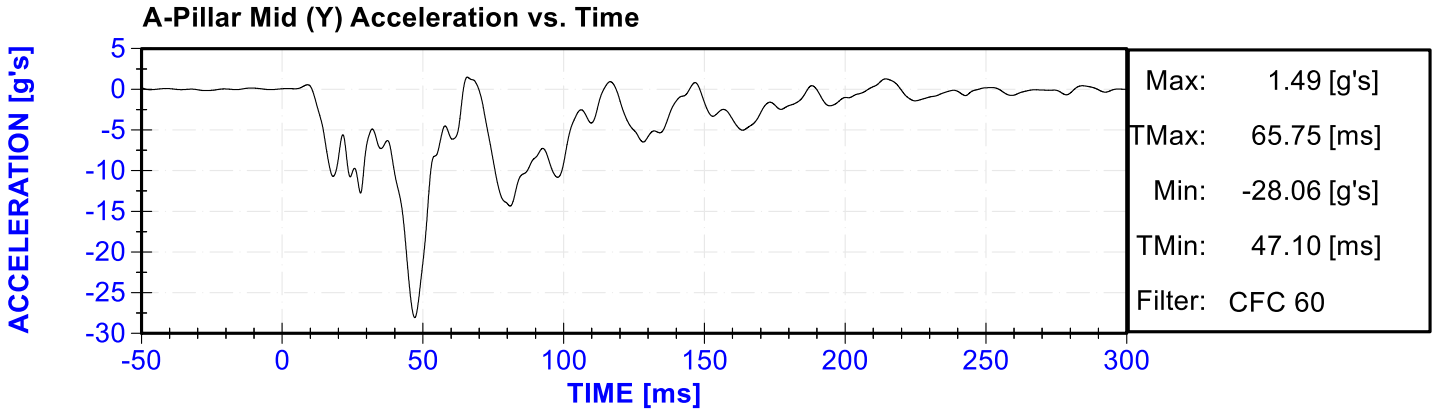


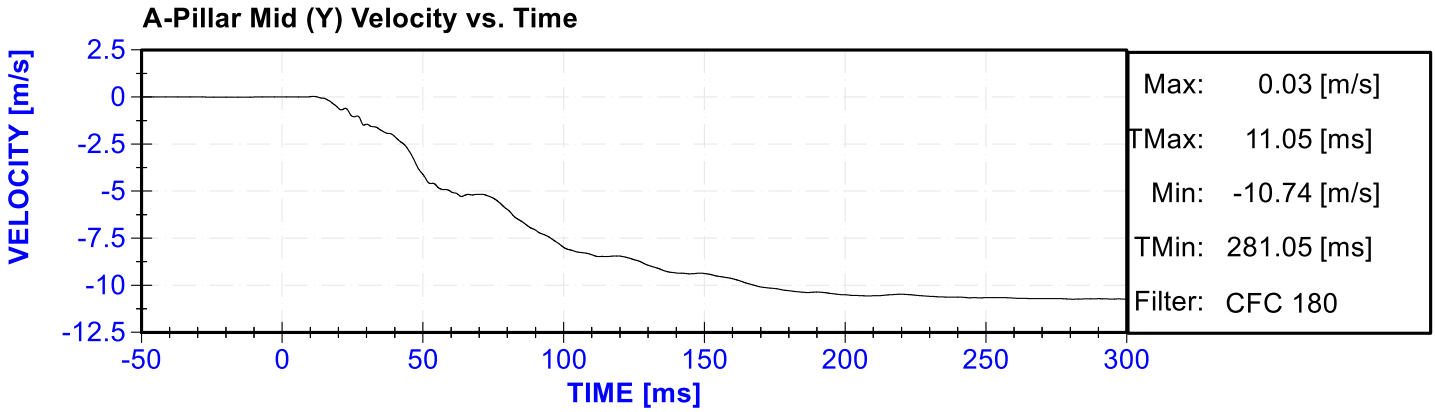
A-Pillar Low (Y) Velocity vs. Time

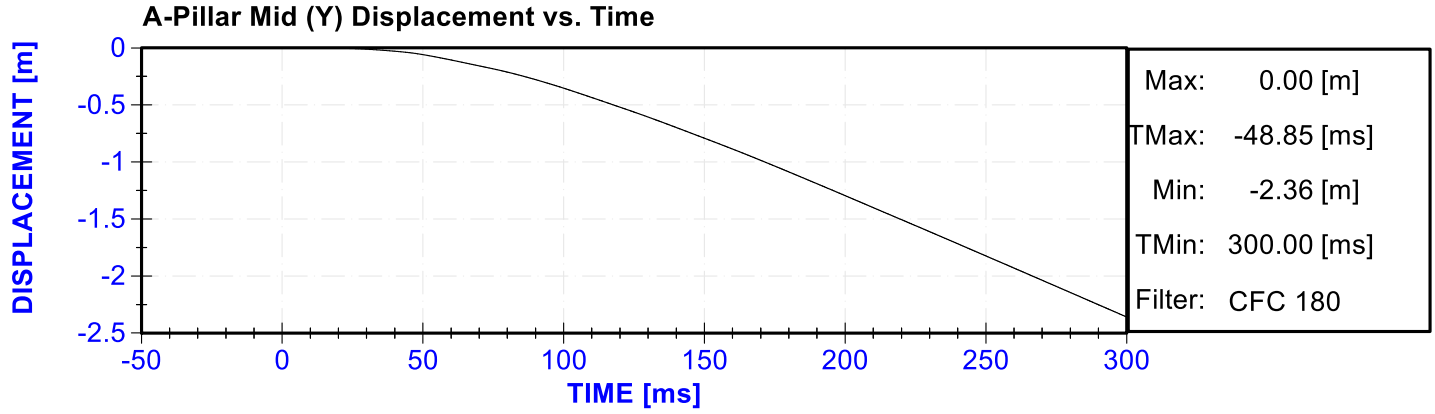


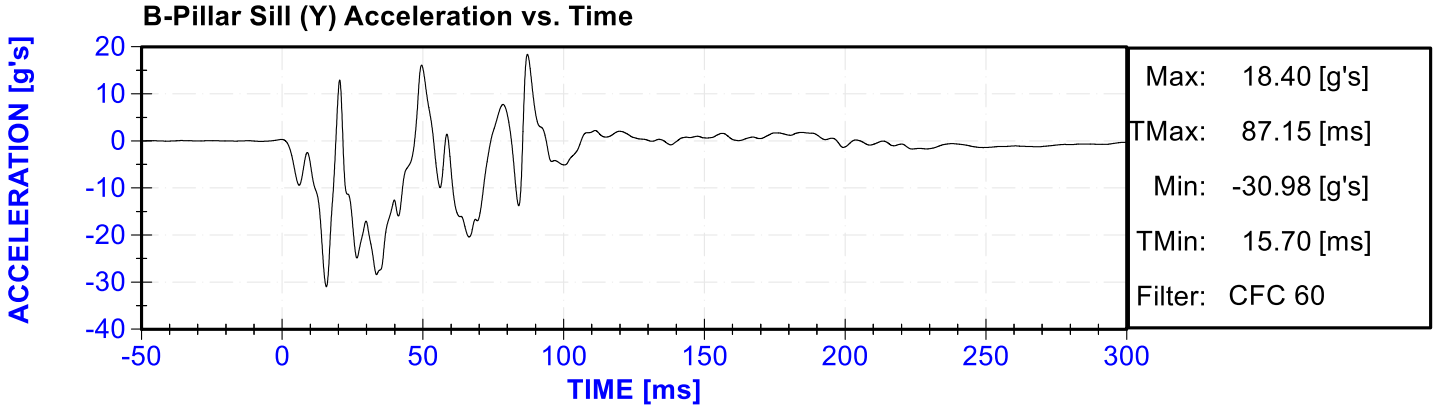
A-Pillar Low (Y) Displacement vs. Time



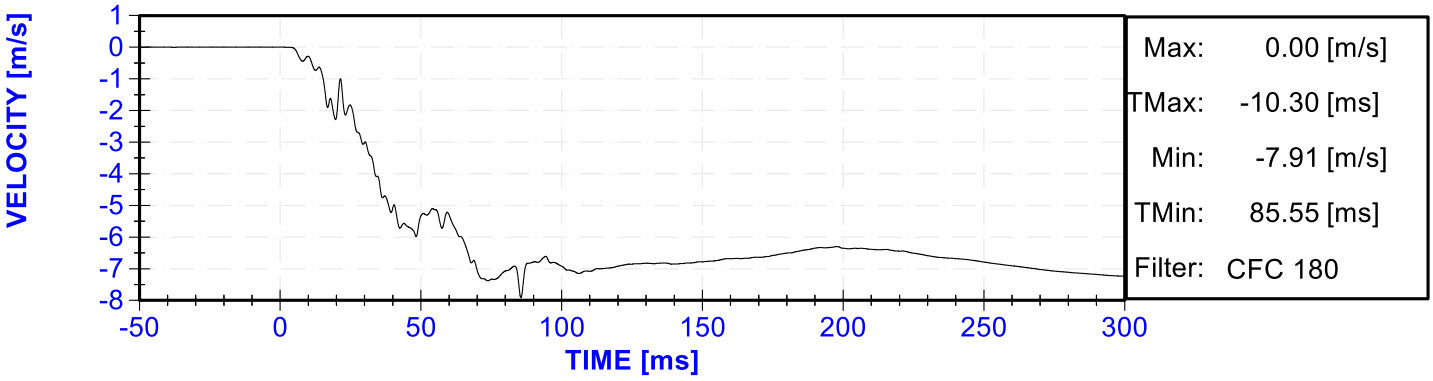

A-Pillar Mid (Y) Acceleration vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 1.49 [g's]
TMax: 65.75 [ms]
Min: -28.06 [g's]
TMin: 47.10 [ms]
Filter: CFC 60


A-Pillar Mid (Y) Velocity vs. Time
VELOCITY [m/s]
TIME [ms]
Max: 0.03 [m/s]
TMax: 11.05 [ms]
Min: -10.74 [m/s]
TMin: 281.05 [ms]
Filter: CFC 180

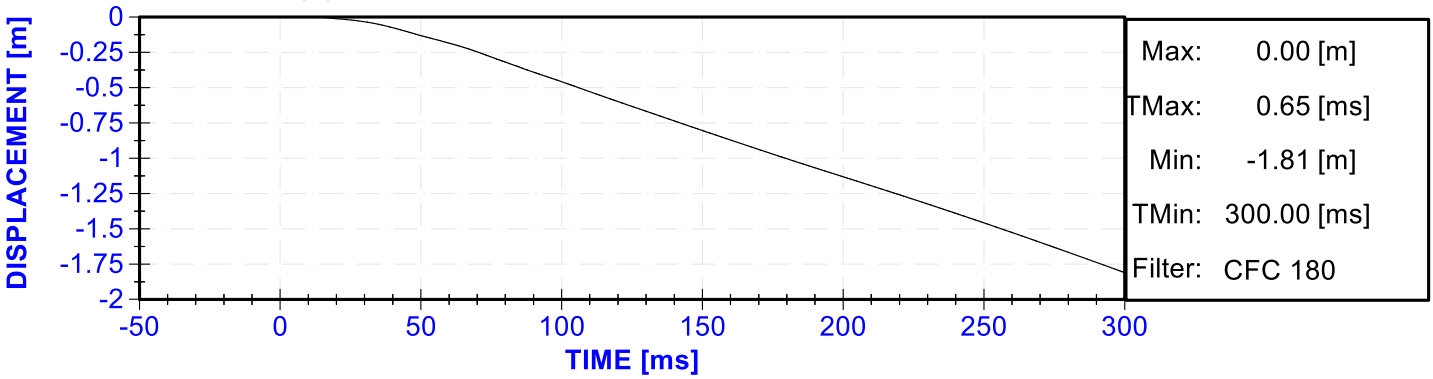

A-Pillar Mid (Y) Displacement vs. Time
DISPLACEMENT [m]
TIME [ms]
Max: 0.00 [m]
TMax: -48.85 [ms]
Min: -2.36 [m]
TMin: 300.00 [ms]
Filter: CFC 180


B-Pillar Sill (Y) Acceleration vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 18.40 [g's]
TMax: 87.15 [ms]
Min: -30.98 [g's]
TMin: 15.70 [ms]
Filter: CFC 60

B-Pillar Sill (Y) Velocity vs. Time

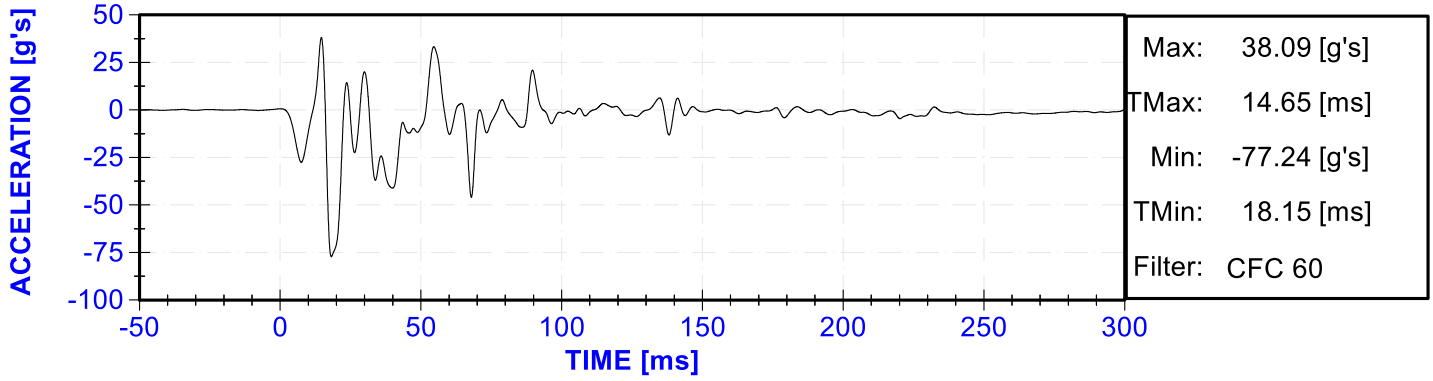


B-Pillar Sill (Y) Displacement vs. Time



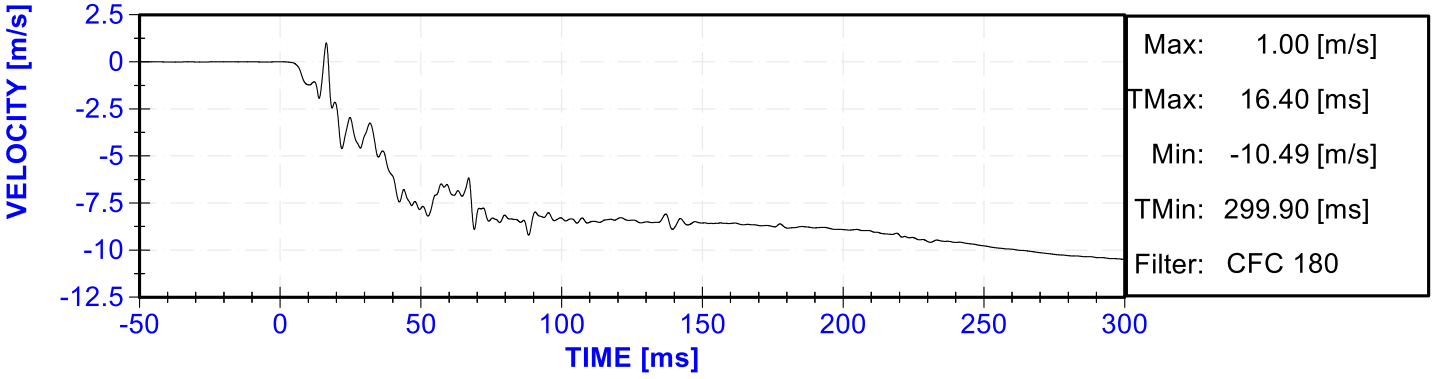
B-Pillar Low (Y) Acceleration vs. Time

Exceeded calibration range at 13.2ms



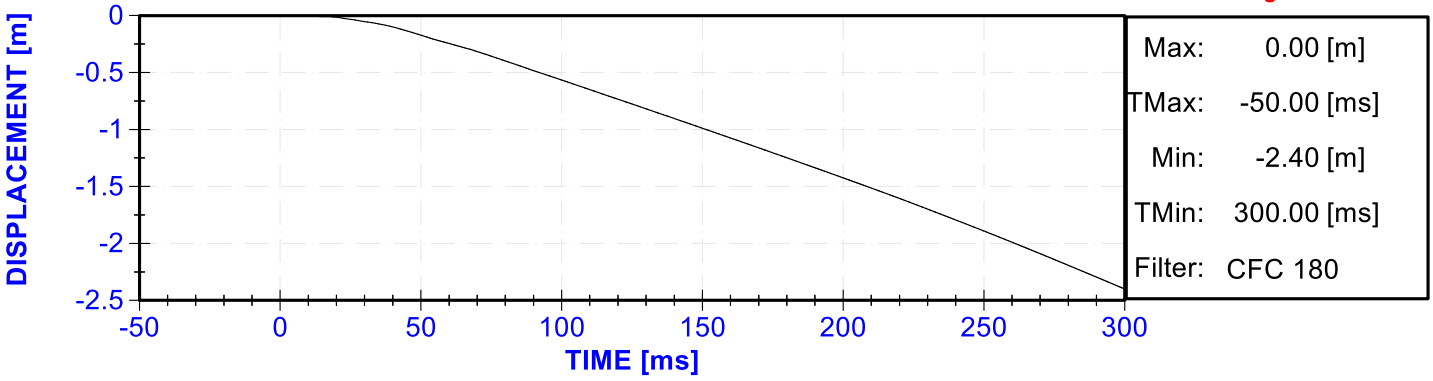
B-Pillar Low (Y) Velocity vs. Time

Exceeded calibration range at 13.2ms



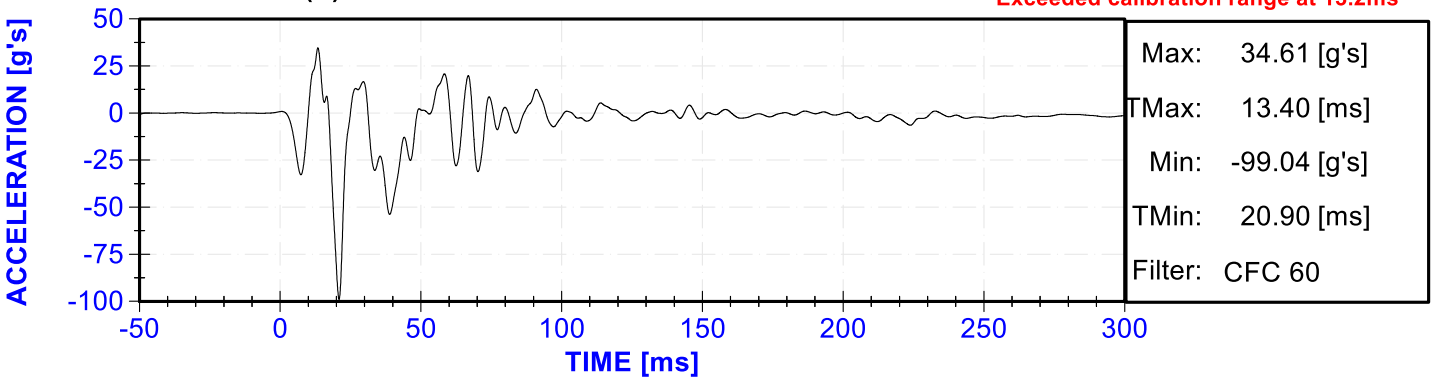
B-Pillar Low (Y) Displacement vs. Time

Exceeded calibration range at 13.2ms



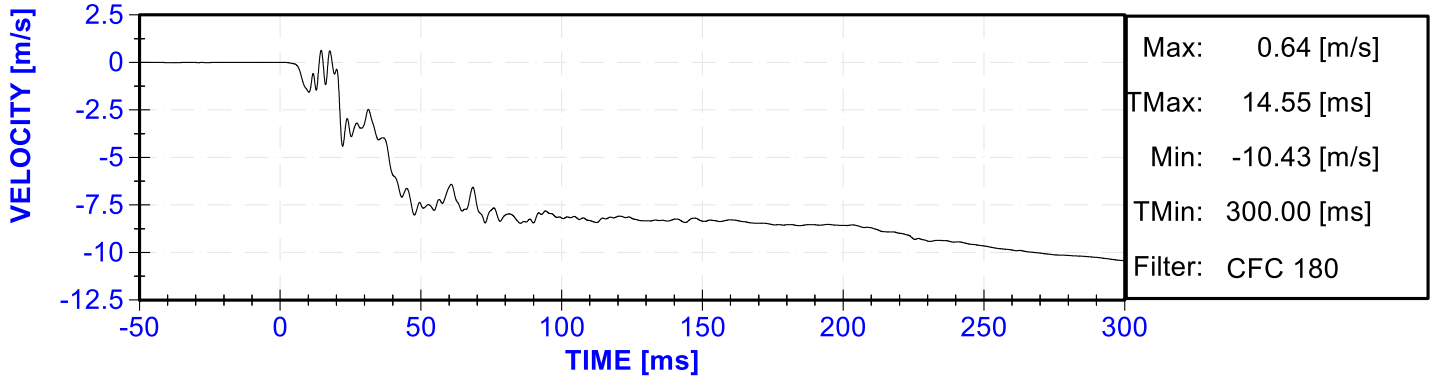
B-Pillar Mid (Y) Acceleration vs. Time

Exceeded calibration range at 13.2ms



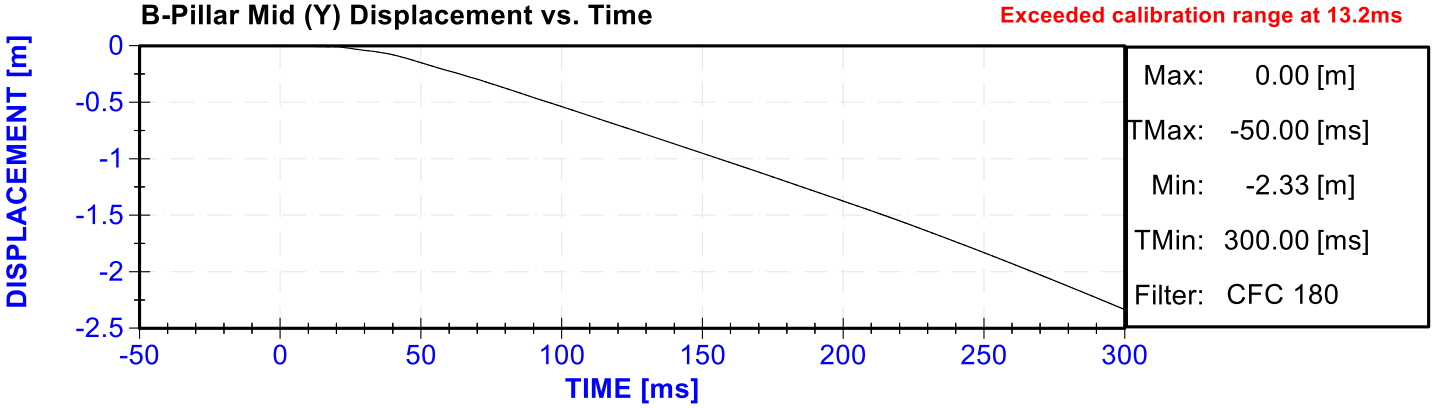
B-Pillar Mid (Y) Velocity vs. Time

Exceeded calibration range at 13.2ms

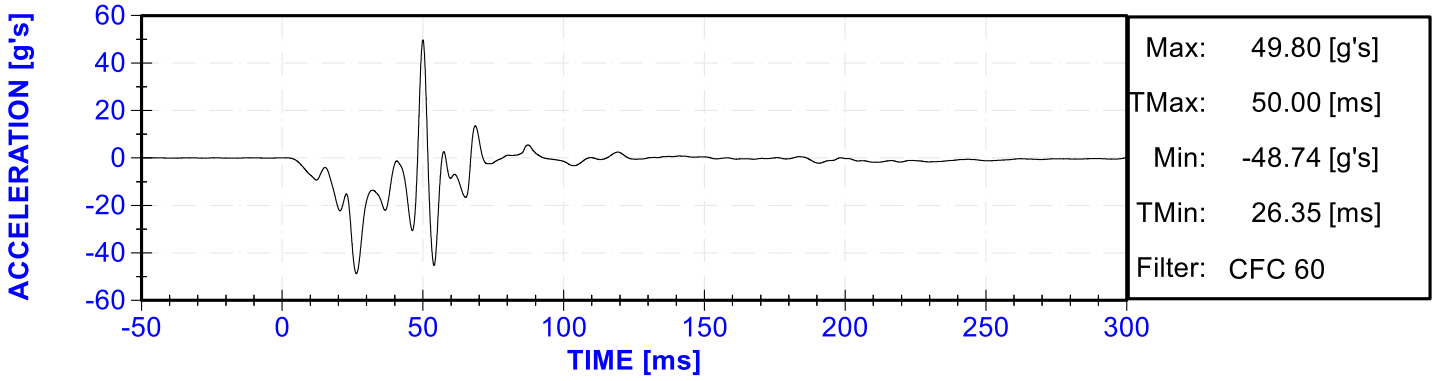


B-Pillar Mid (Y) Displacement vs. Time

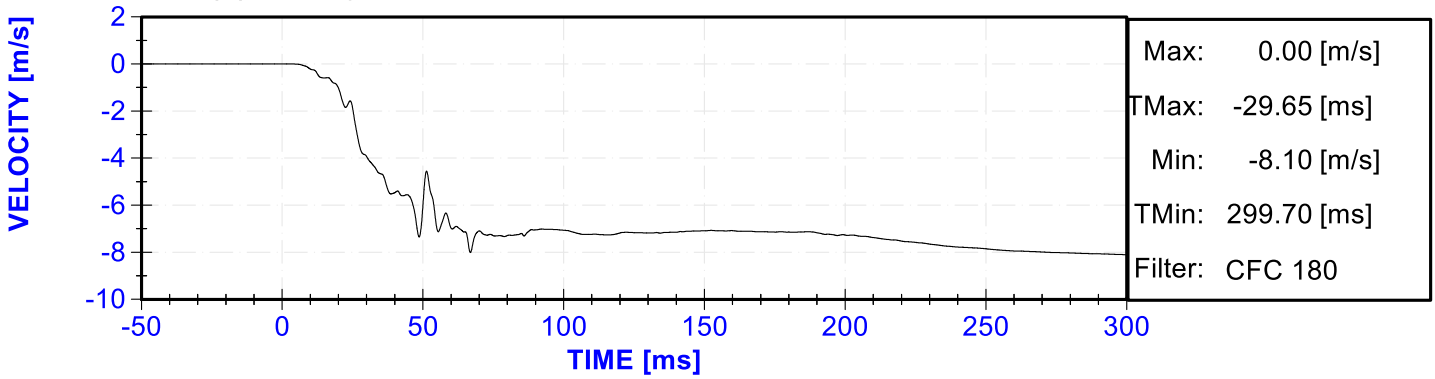
Exceeded calibration range at 13.2ms



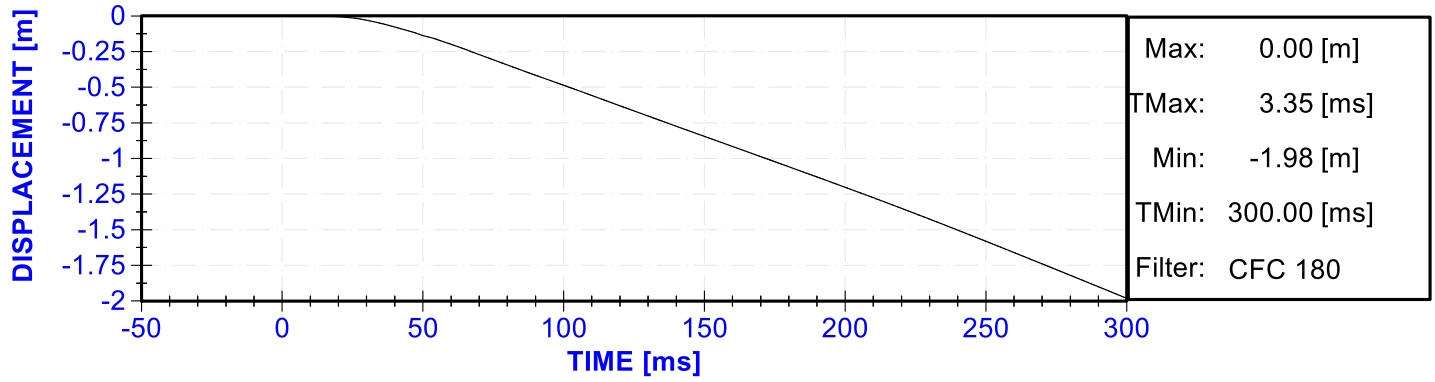
Seat (Y) Acceleration vs. Time



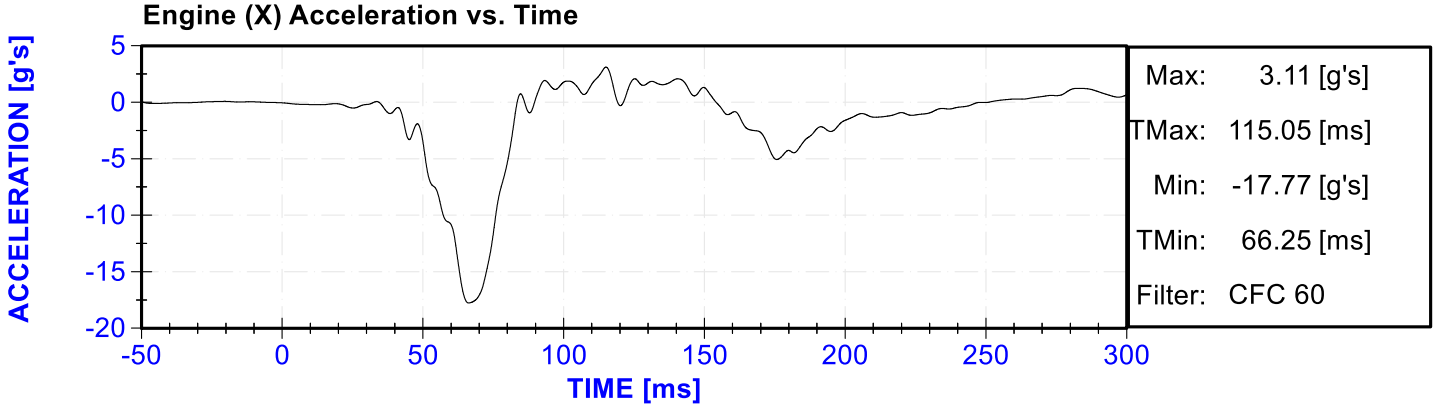
Seat (Y) Velocity vs. Time

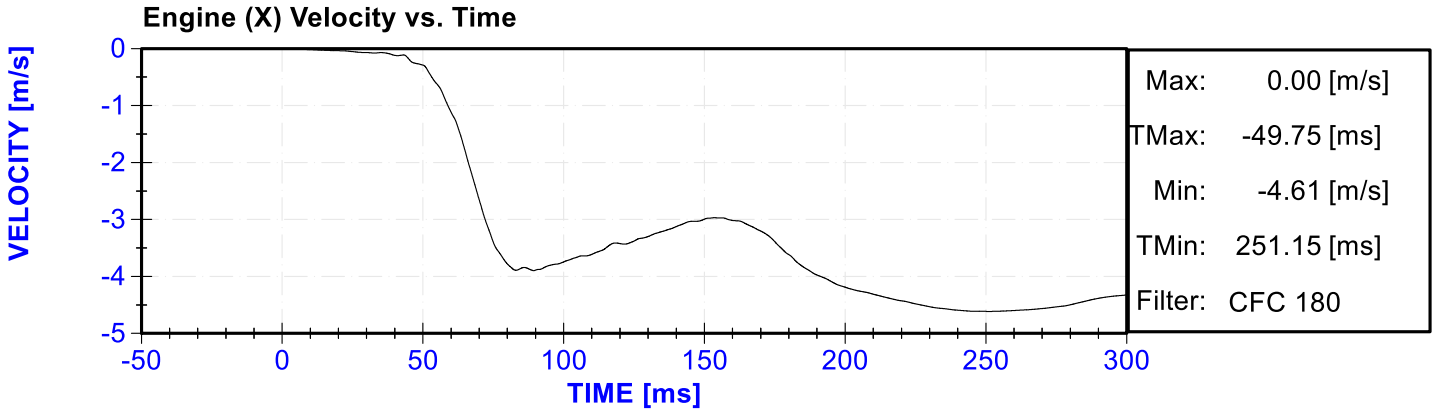


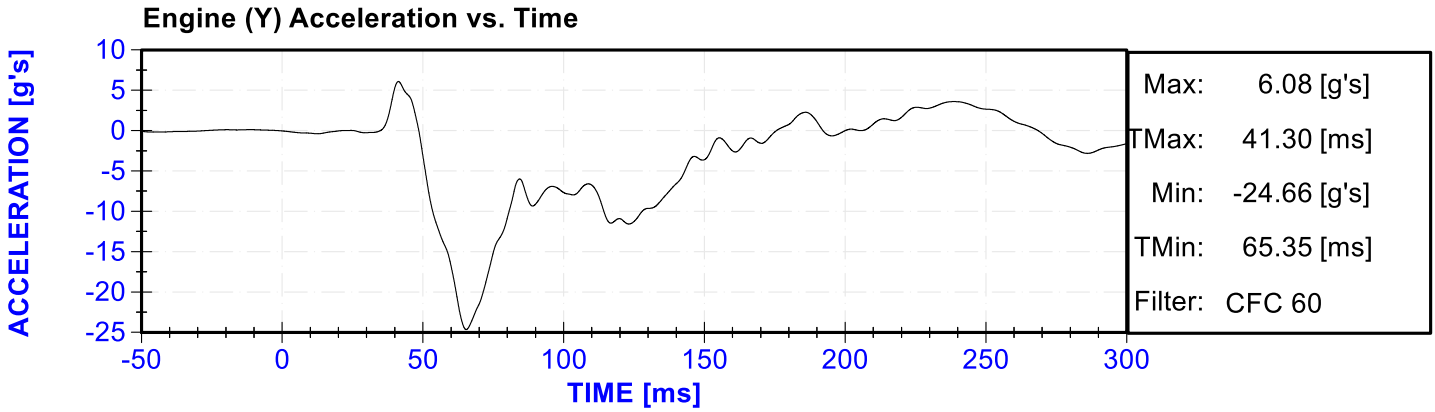
Seat (Y) Displacement vs. Time

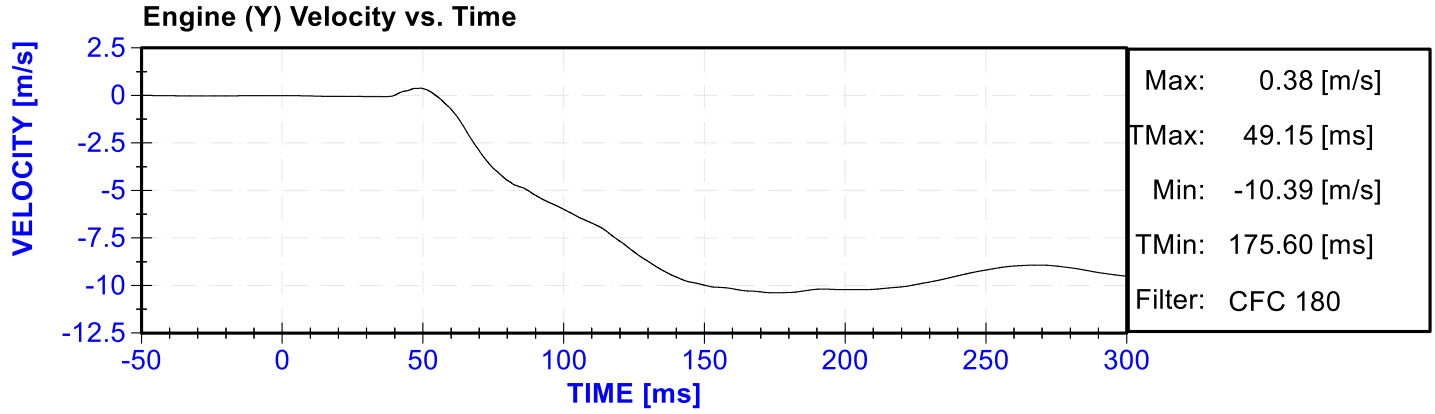


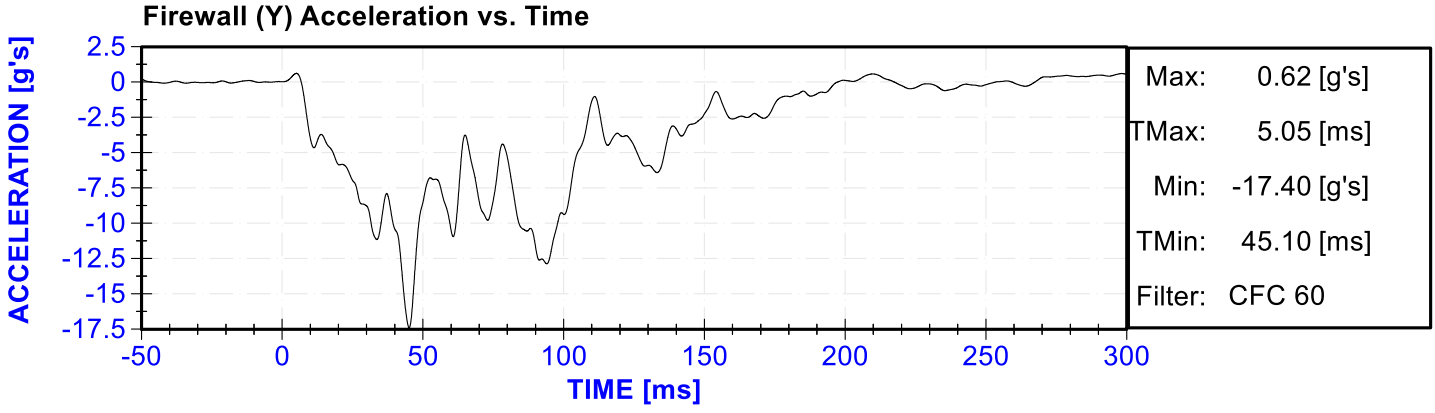
Engine (X) Acceleration vs. Time



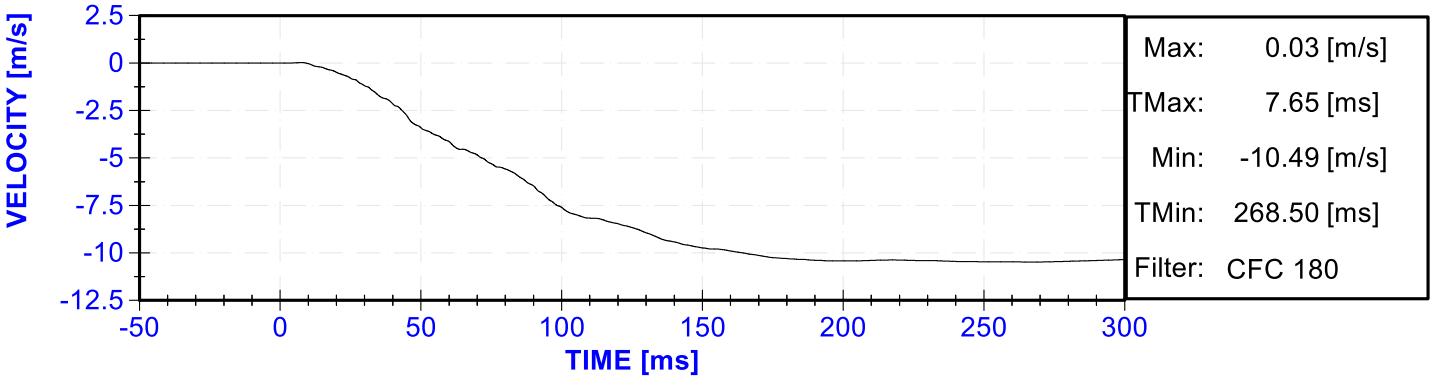

Engine (X) Velocity vs. Time
VELOCITY [m/s]
0
-1
-2
-3
-4
-5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.00 [m/s]
TMax: -49.75 [ms]
Min: -4.61 [m/s]
TMin: 251.15 [ms]
Filter: CFC 180


Engine (Y) Acceleration vs. Time
ACCELERATION [g's]
10
5
0
-5
-10
-15
-20
-25
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 6.08 [g's]
TMax: 41.30 [ms]
Min: -24.66 [g's]
TMin: 65.35 [ms]
Filter: CFC 60

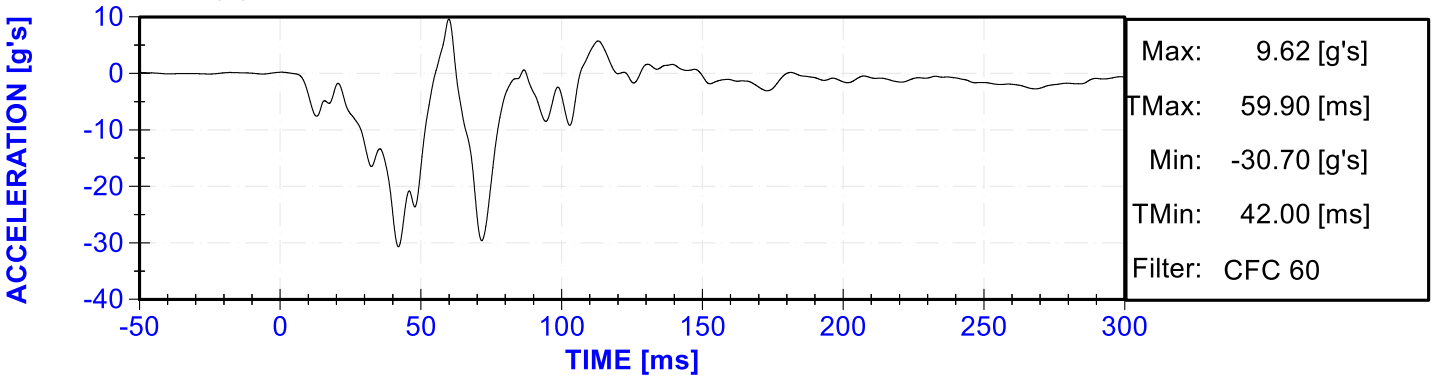

Engine (Y) Velocity vs. Time
VELOCITY [m/s]
2.5
0
-2.5
-5
-7.5
-10
-12.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.38 [m/s]
TMax: 49.15 [ms]
Min: -10.39 [m/s]
TMin: 175.60 [ms]
Filter: CFC 180


Firewall (Y) Acceleration vs. Time
ACCELERATION [g's]
2.5
0
-2.5
-5
-7.5
-10
-12.5
-15
-17.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.62 [g's]
TMax: 5.05 [ms]
Min: -17.40 [g's]
TMin: 45.10 [ms]
Filter: CFC 60

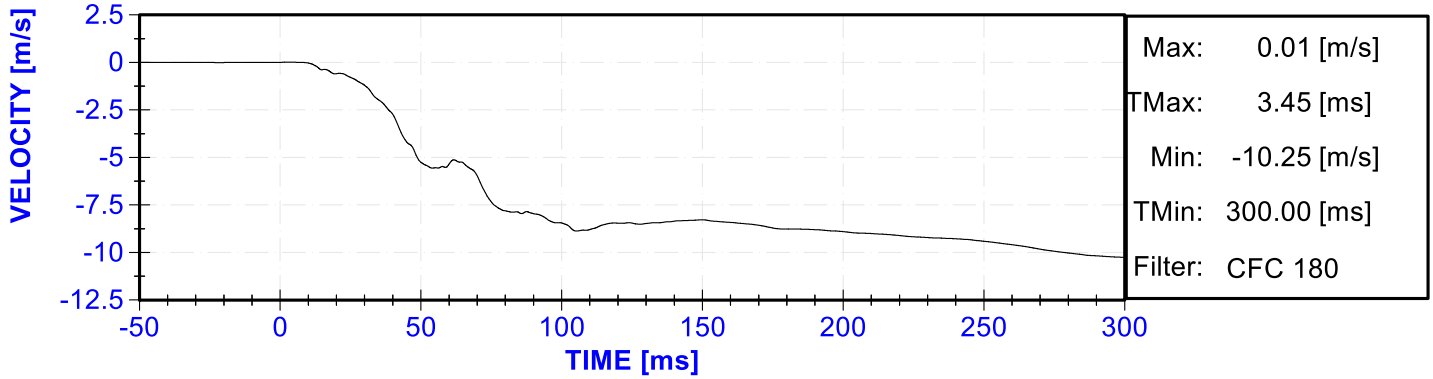
Firewall (Y) Velocity vs. Time



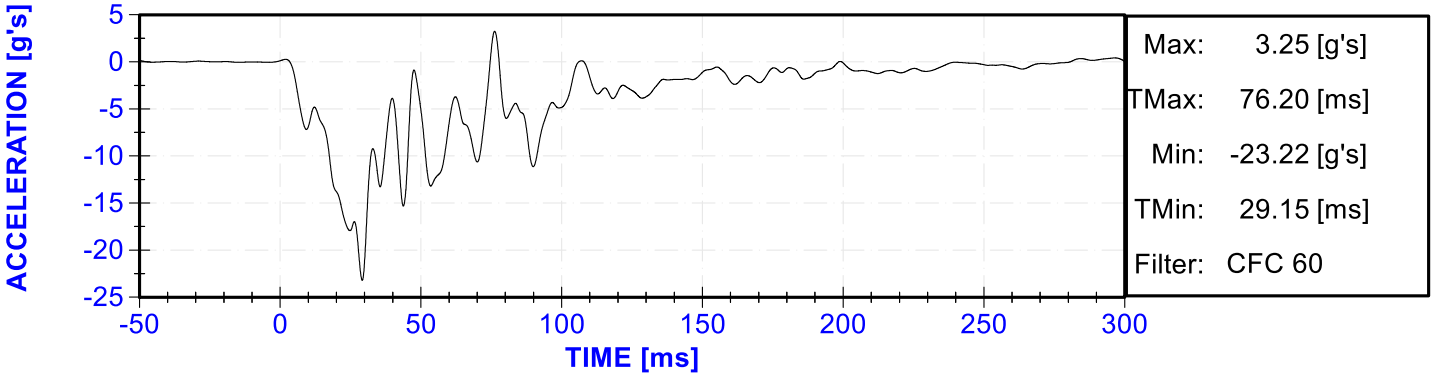
Roof (Y) Acceleration vs. Time



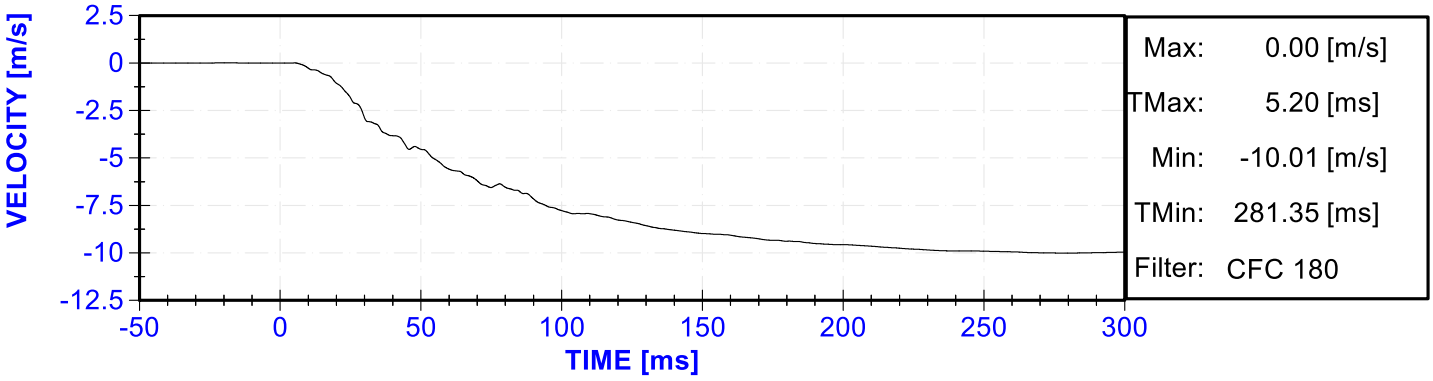
Roof (Y) Velocity vs. Time



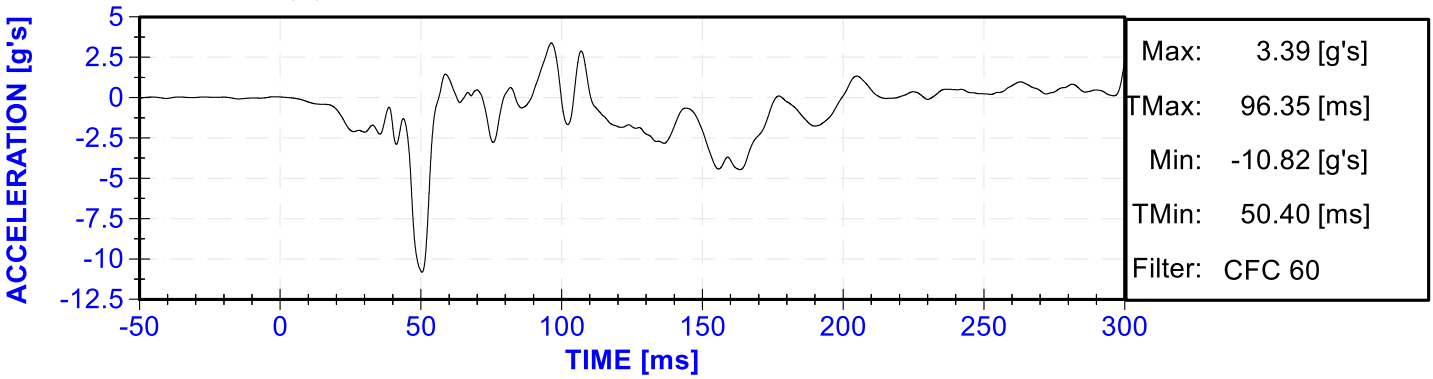
Floor Sill – Non Impact Side (Y) Acceleration vs. Time



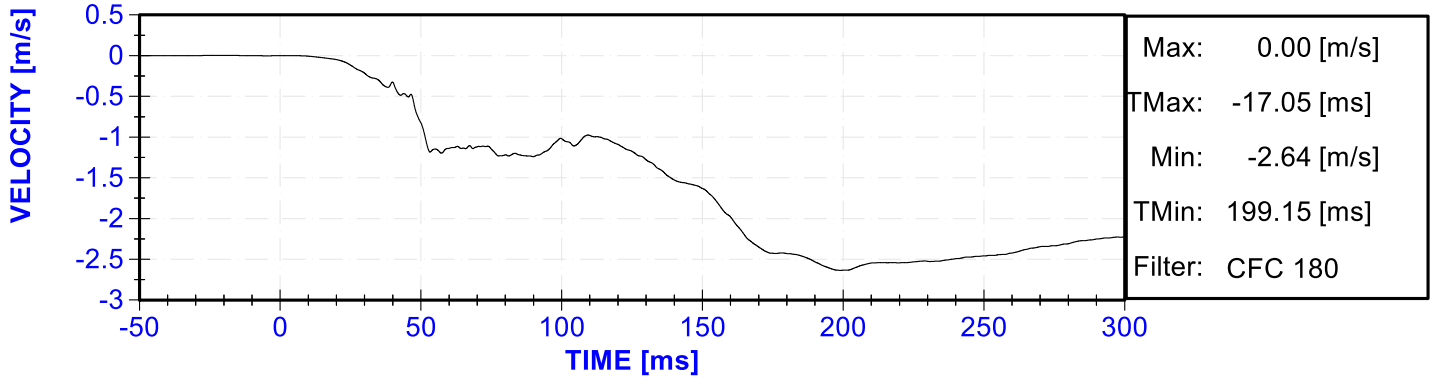
Floor Sill – Non Impact Side (Y) Velocity vs. Time



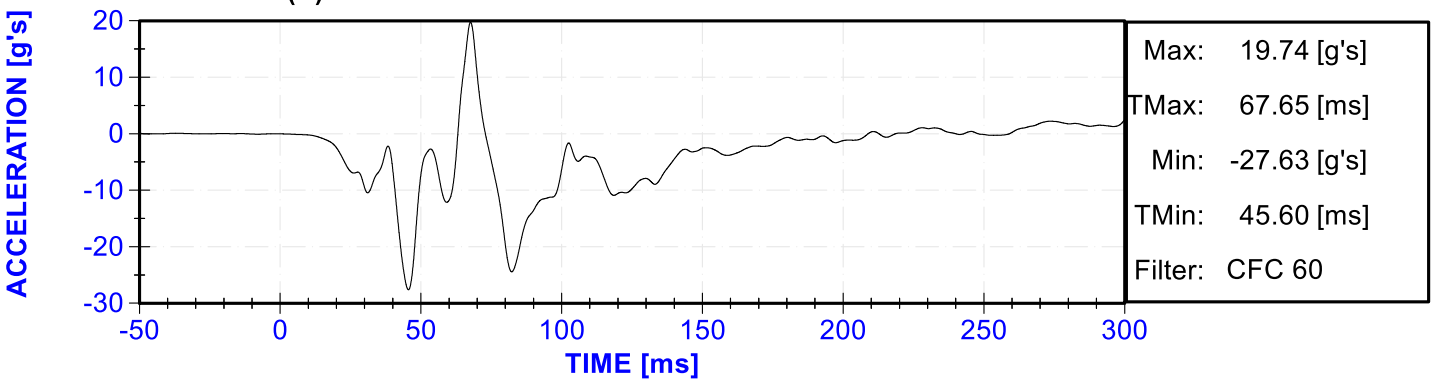
Rear Deck (X) Acceleration vs. Time

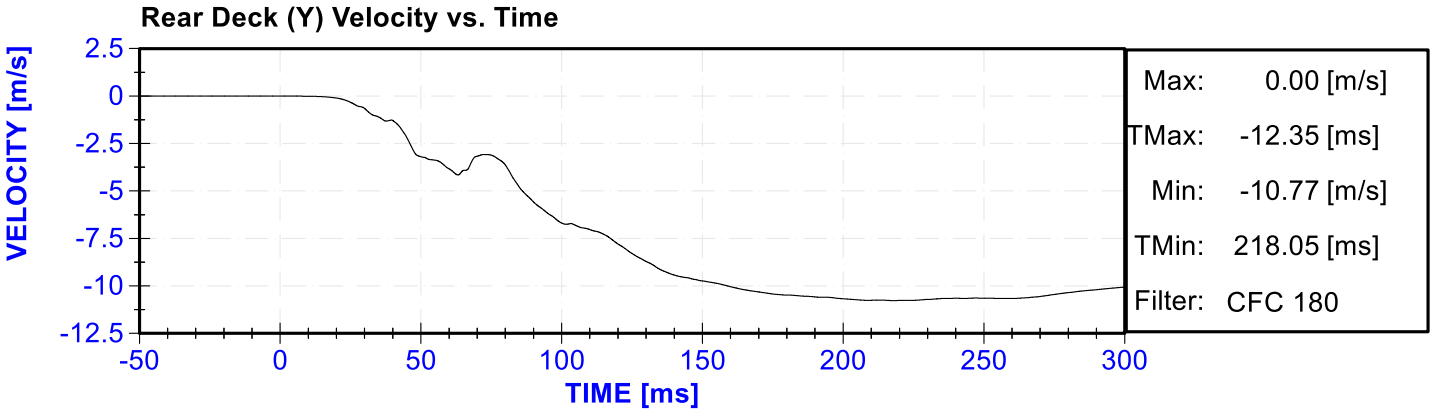


Rear Deck (X) Velocity vs. Time



Rear Deck (Y) Acceleration vs. Time




Rear Deck (Y) Velocity vs. Time
VELOCITY [m/s]
2.5
0
-2.5
-5
-7.5
-10
-12.5
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 0.00 [m/s]
TMax: -12.35 [ms]
Min: -10.77 [m/s]
TMin: 218.05 [ms]
Filter: CFC 180

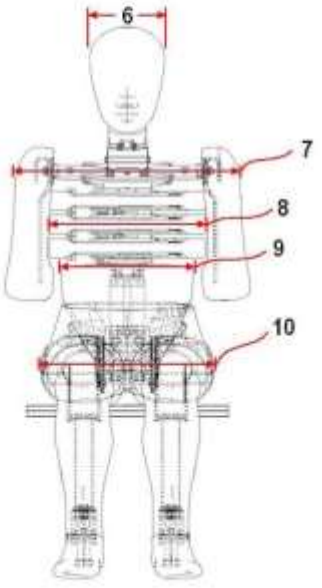
APPENDIX IV

PRE-TEST DUMMY PERFORMANCE CALIBRATION TEST DATA
(Subpart U, ES-2re)

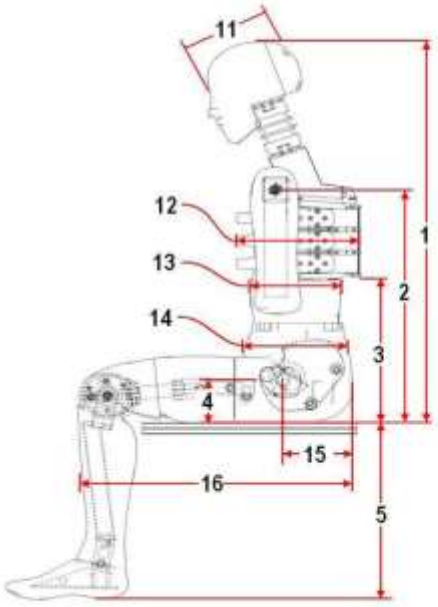
External Measurements - EuroSID-2re

Technician: K. Dutton Date: 12/6/2018

Dummy Serial Number: D037



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	912	Pass
2	Seat to Shoulder Joint	558	572	566	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	350	Pass
4	Seat to Hip Joint (center of bolt)	97	103	102	Pass
5	Sole to Seat, Sitting	333	451	399	Pass
6	Head Width	152	158	156	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	326	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	242	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

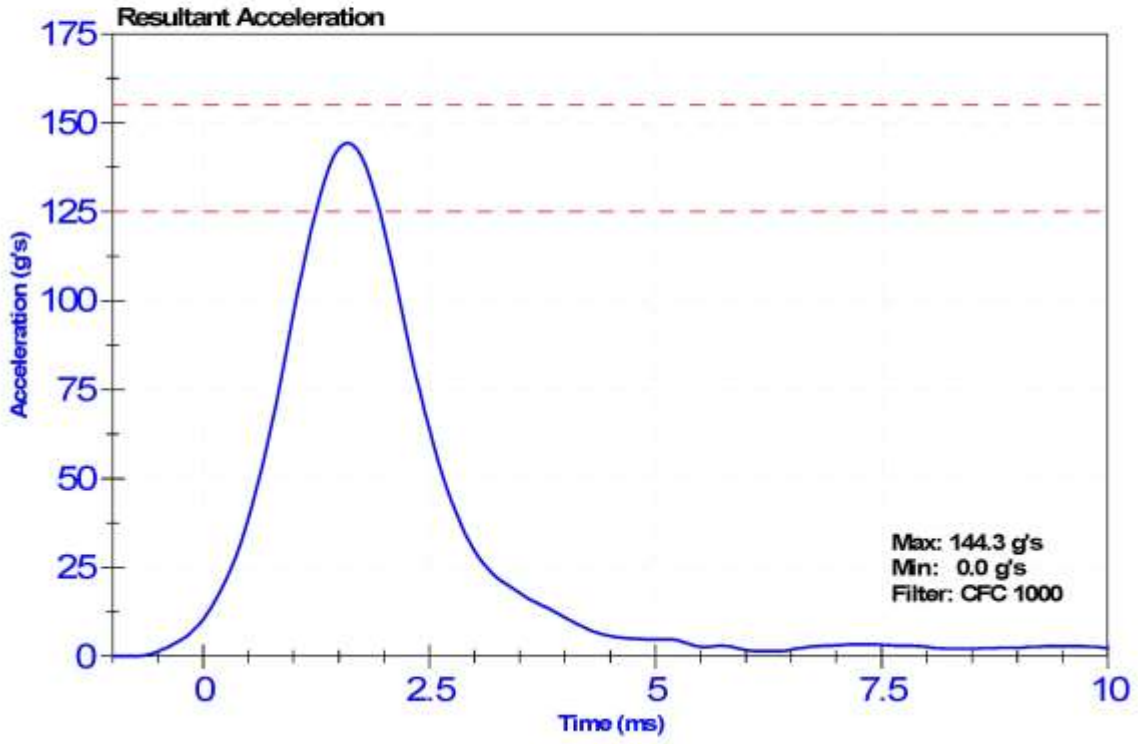
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

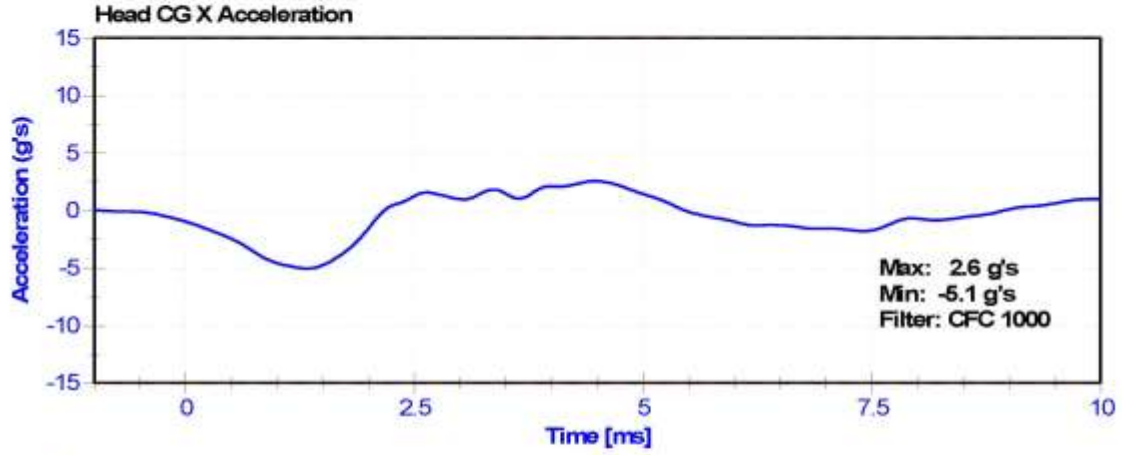
Results

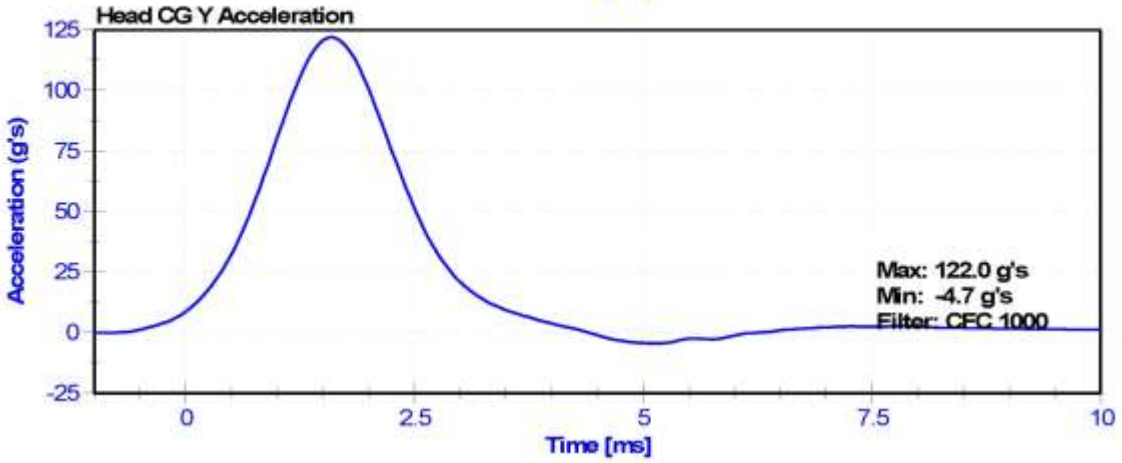
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	20.7	Pass
Resultant Acceleration	125	155	g's	144.3	Pass
Oscillation	0	15	%	3.34	Pass
Fore-Aft Acceleration	-15	15	g's	2.6	Pass

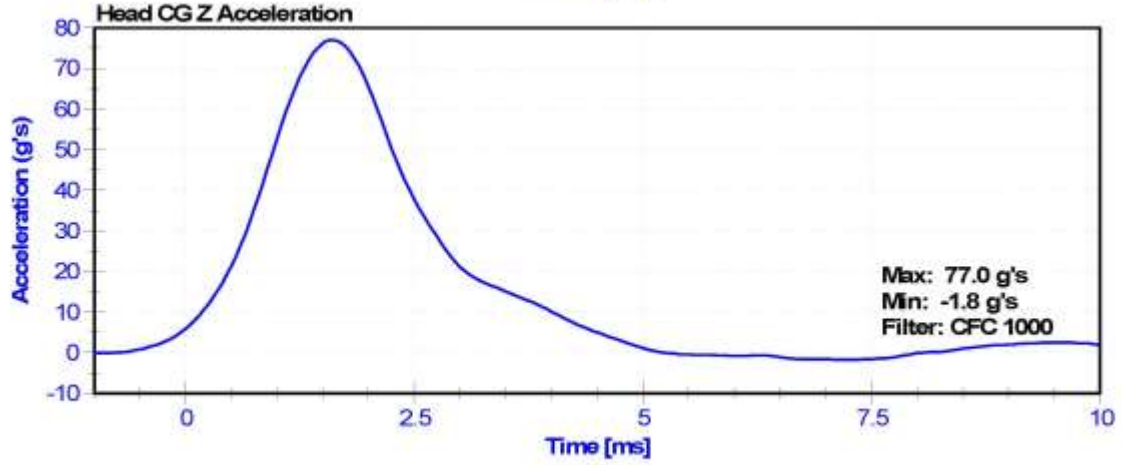
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P66940	10/5/2018	4/5/2019
Y Accelerometer	MSI 64CM30	AC-MS25917	10/5/2018	4/5/2019
Z Accelerometer	Endevco 7264C	AC-P94090	10/5/2018	4/5/2019




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 2.6 g's
Min: -5.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 122.0 g's
Min: -4.7 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 77.0 g's
Min: -1.8 g's
Filter: CFC 1000

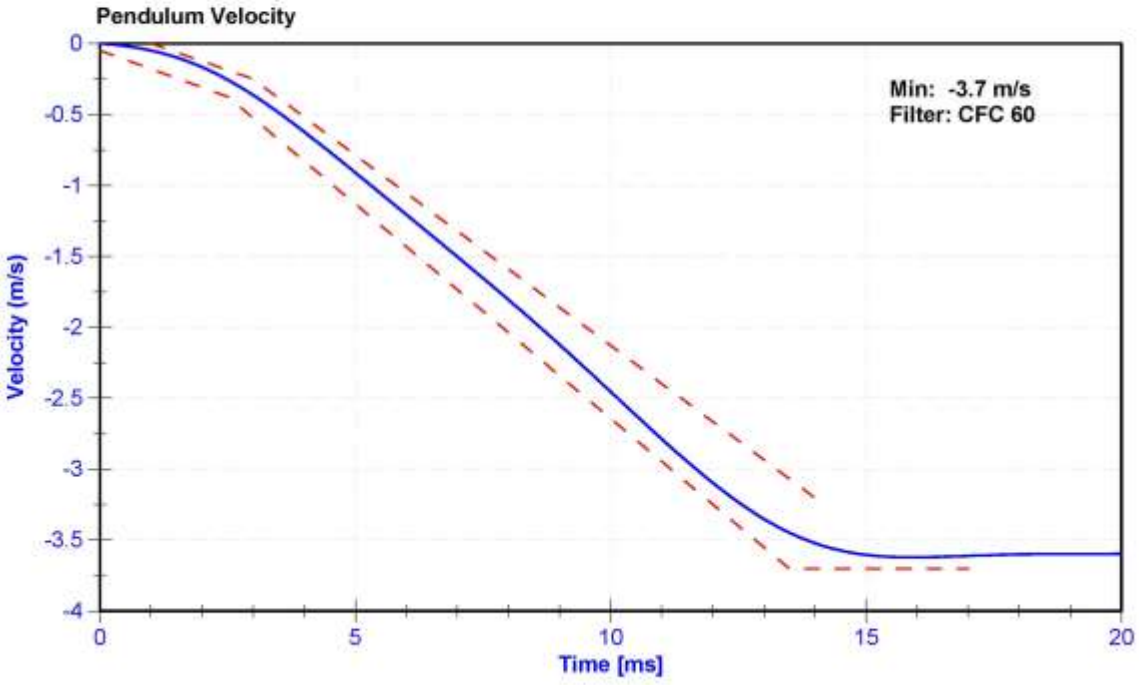
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

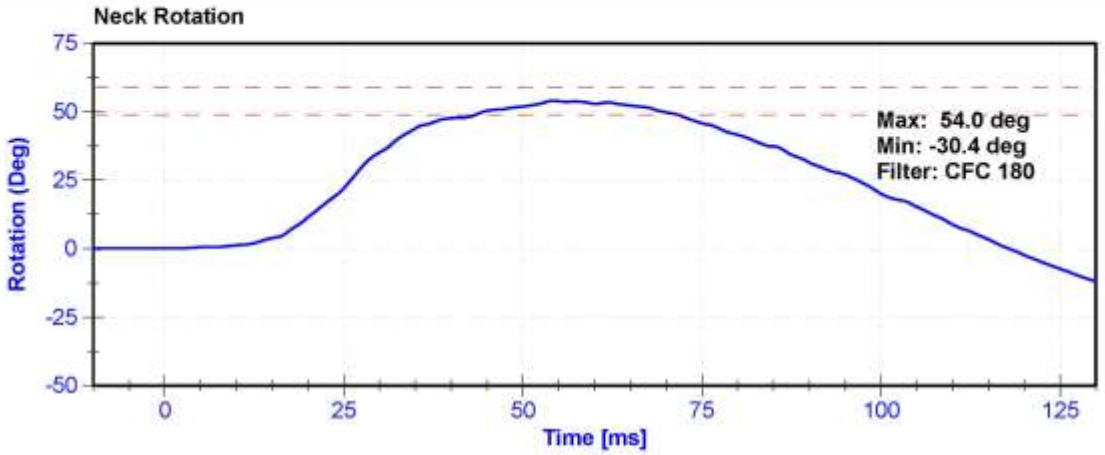
Results

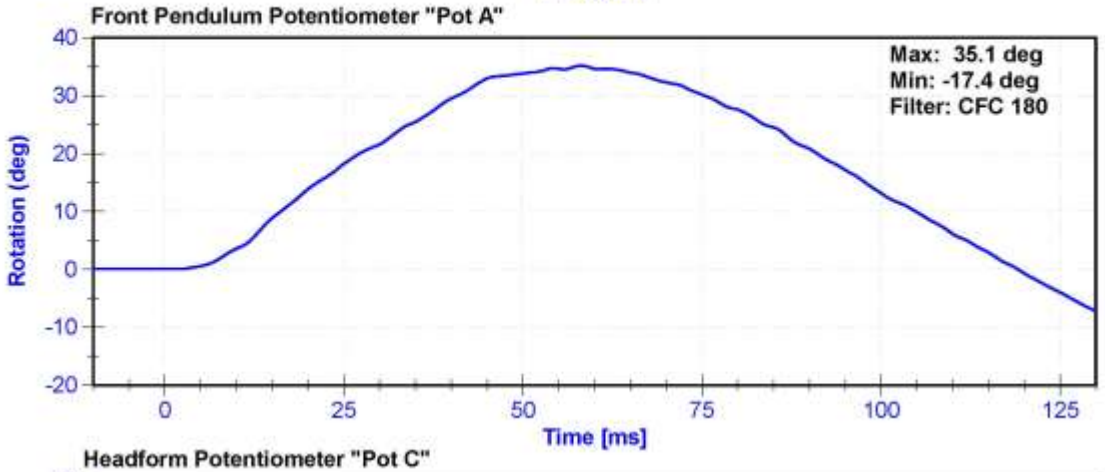
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	24.5	Pass
Velocity	3.3	3.5	m/s	3.40	Pass
Lateral Neck Rotation	49	59	deg	54.0	Pass
Time at Maximum Rotation	54	66	ms	54.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	63.6	Pass

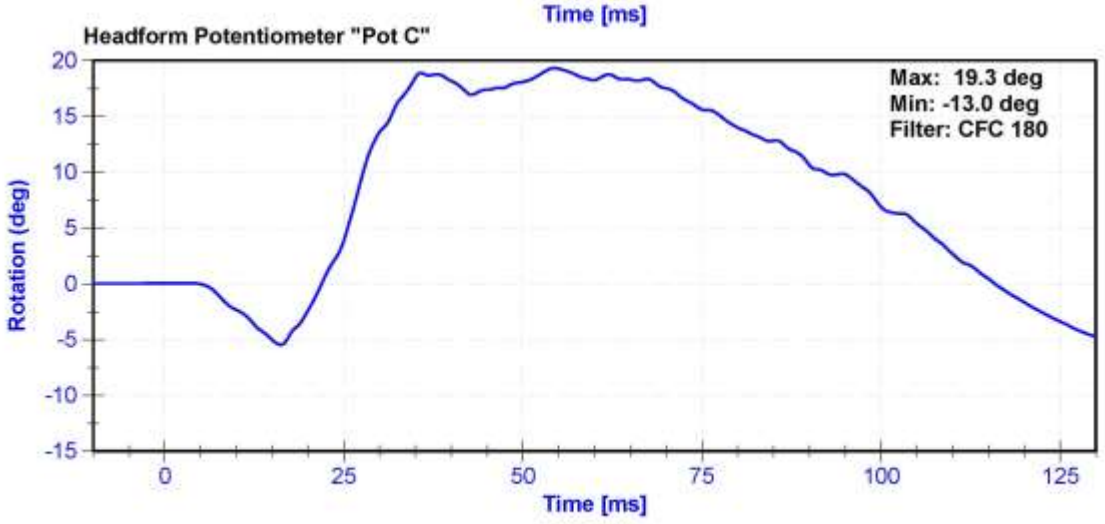
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Front Pendulum Potentiometer	SP22G	DS-094	10/31/2018	10/31/2019
Headform Potentiometer	SP22G	DS-095	10/31/2018	10/31/2019




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 54.0 deg
Min: -30.4 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 35.1 deg
Min: -17.4 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 19.3 deg
Min: -13.0 deg
Filter: CFC 180

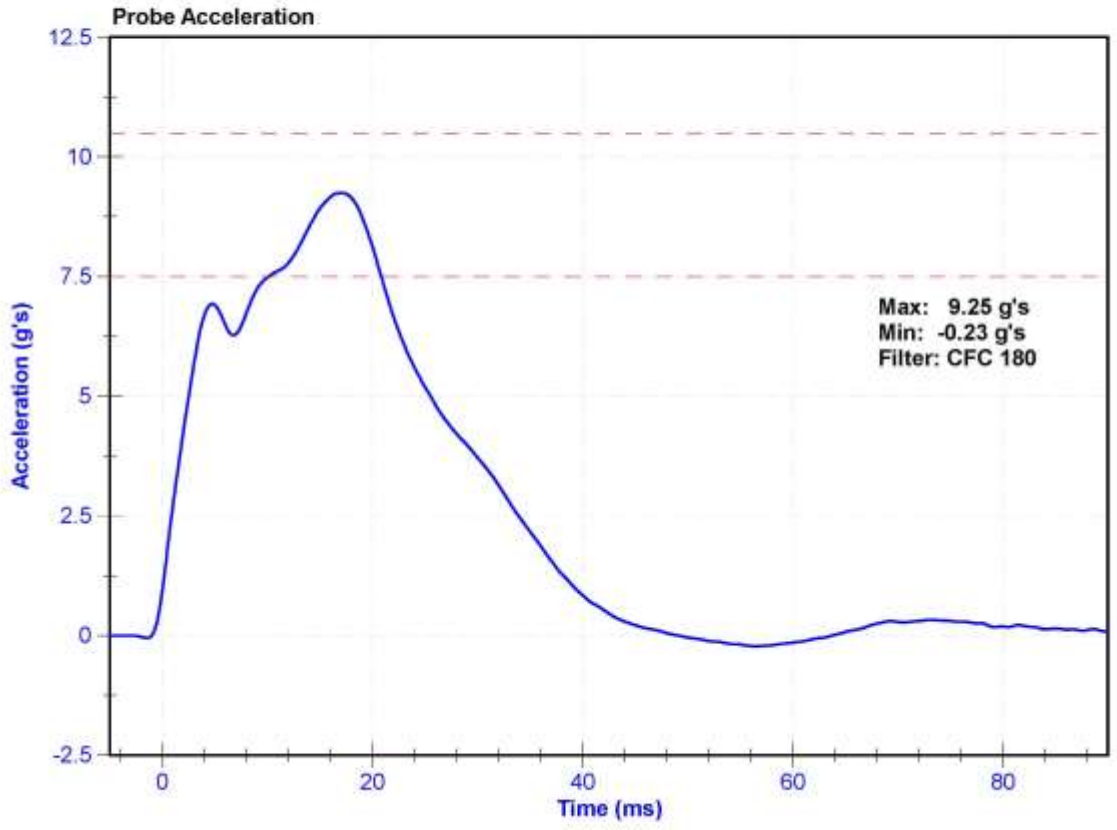
ATD Manufacturer	Denton	Test Technician	K. Dutton
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	22.9	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	7.5	10.5	g's	9.25	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P23904	4/28/2018	4/28/2019



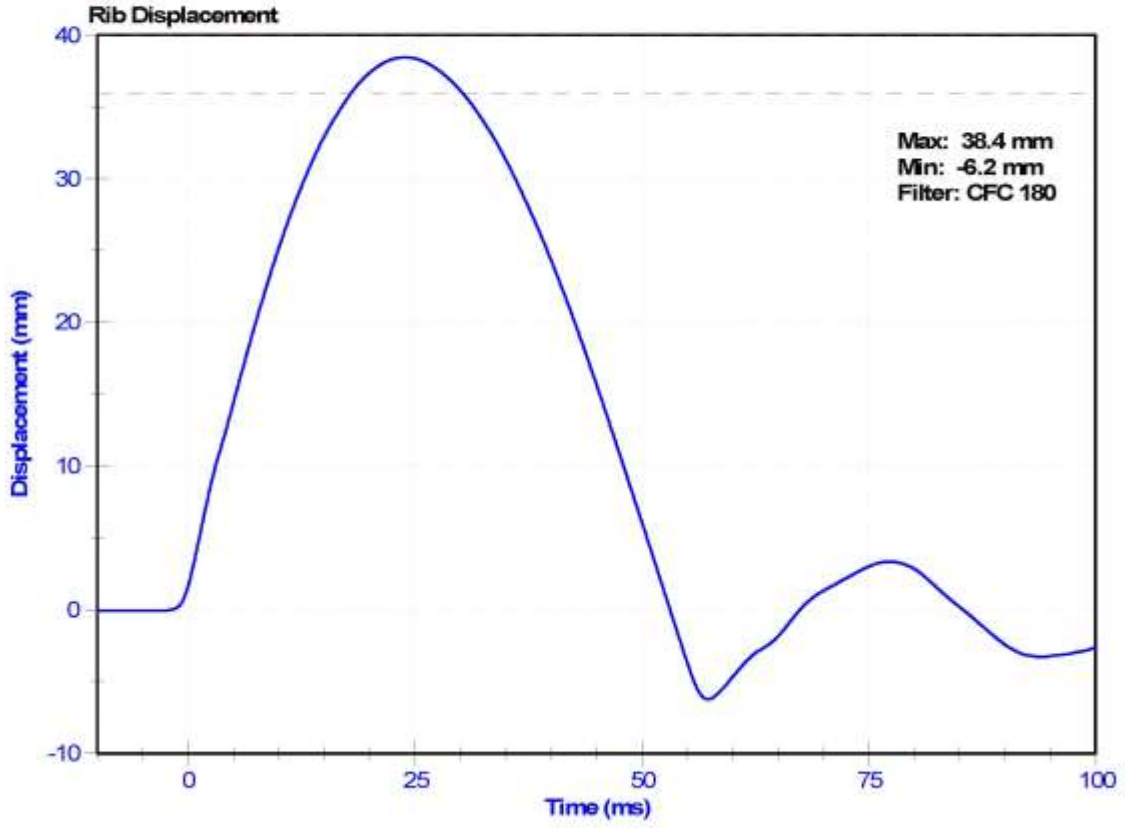
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	25.3	Pass
Rib Displacement	36	40	mm	38.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-01GFE	11/27/2018	11/27/2019



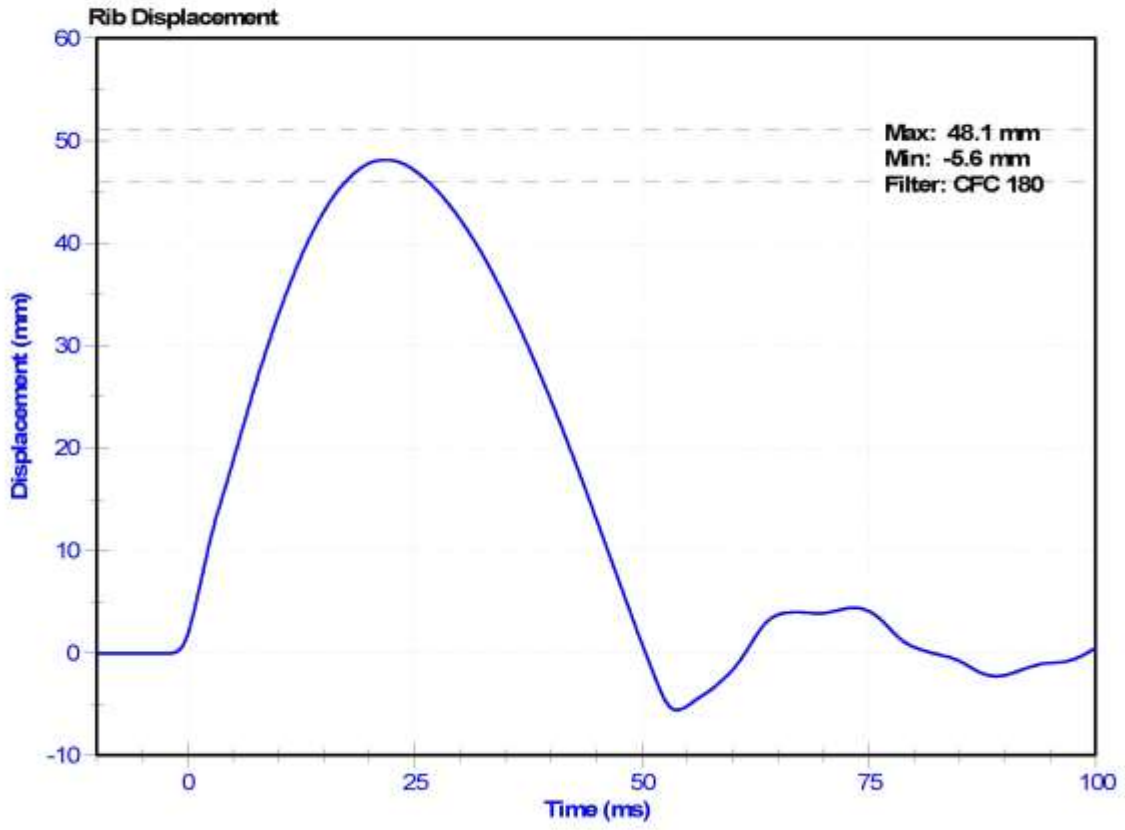
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	24.8	Pass
Rib Displacement	46	51	mm	48.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-01GFE	11/27/2018	11/27/2019



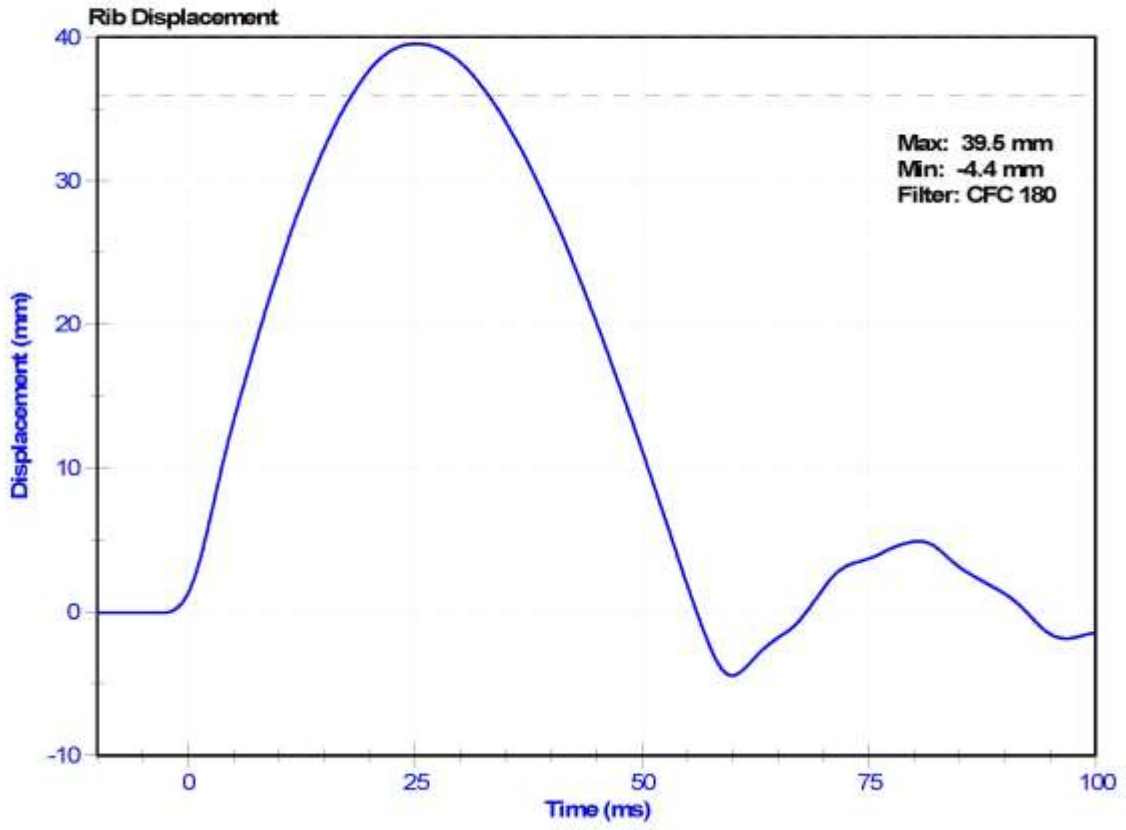
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	26.0	Pass
Rib Displacement	36	40	mm	39.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019



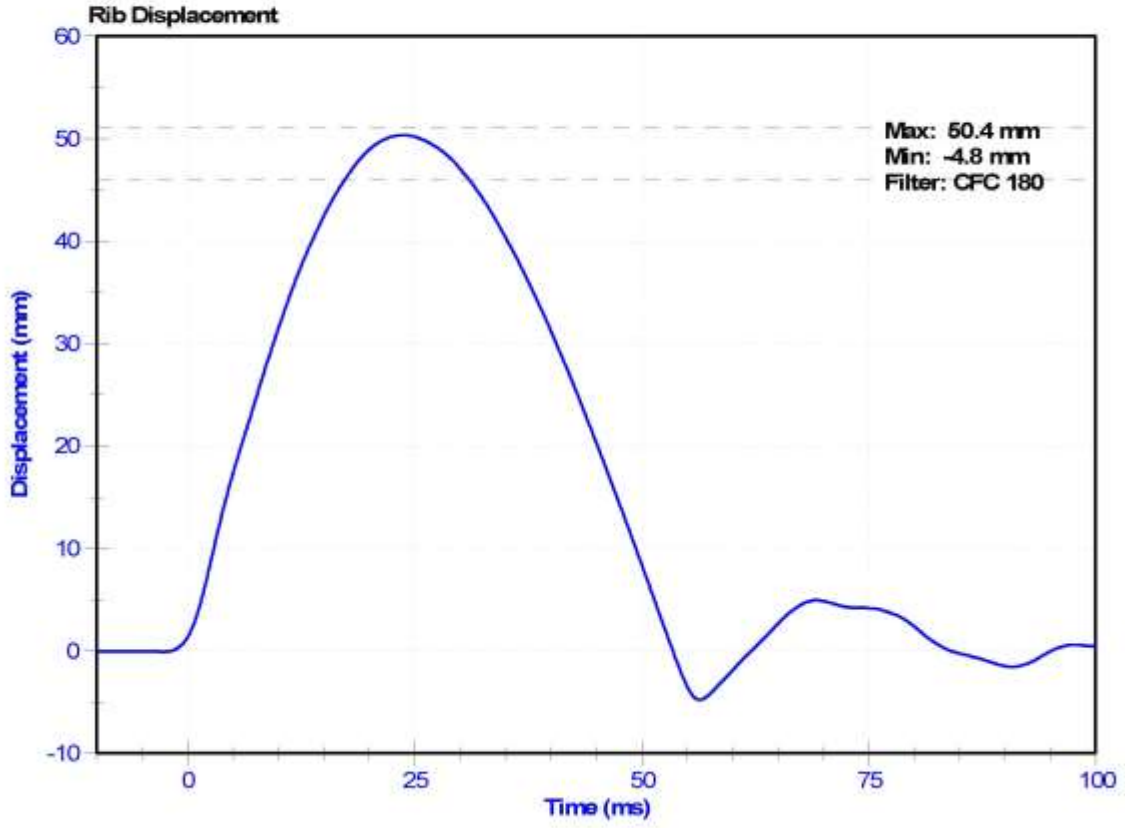
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	25.6	Pass
Rib Displacement	46	51	mm	50.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019



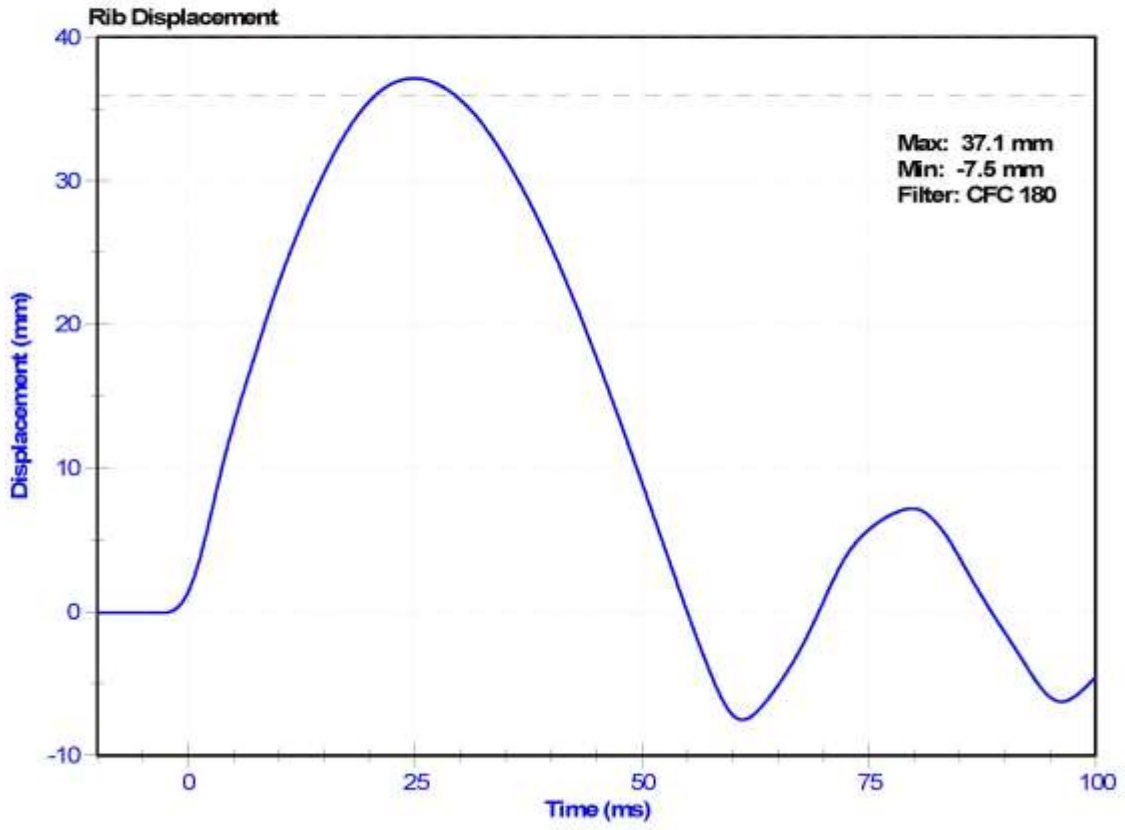
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	25.9	Pass
Rib Displacement	36	40	mm	37.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-03GFE	11/27/2018	11/27/2019



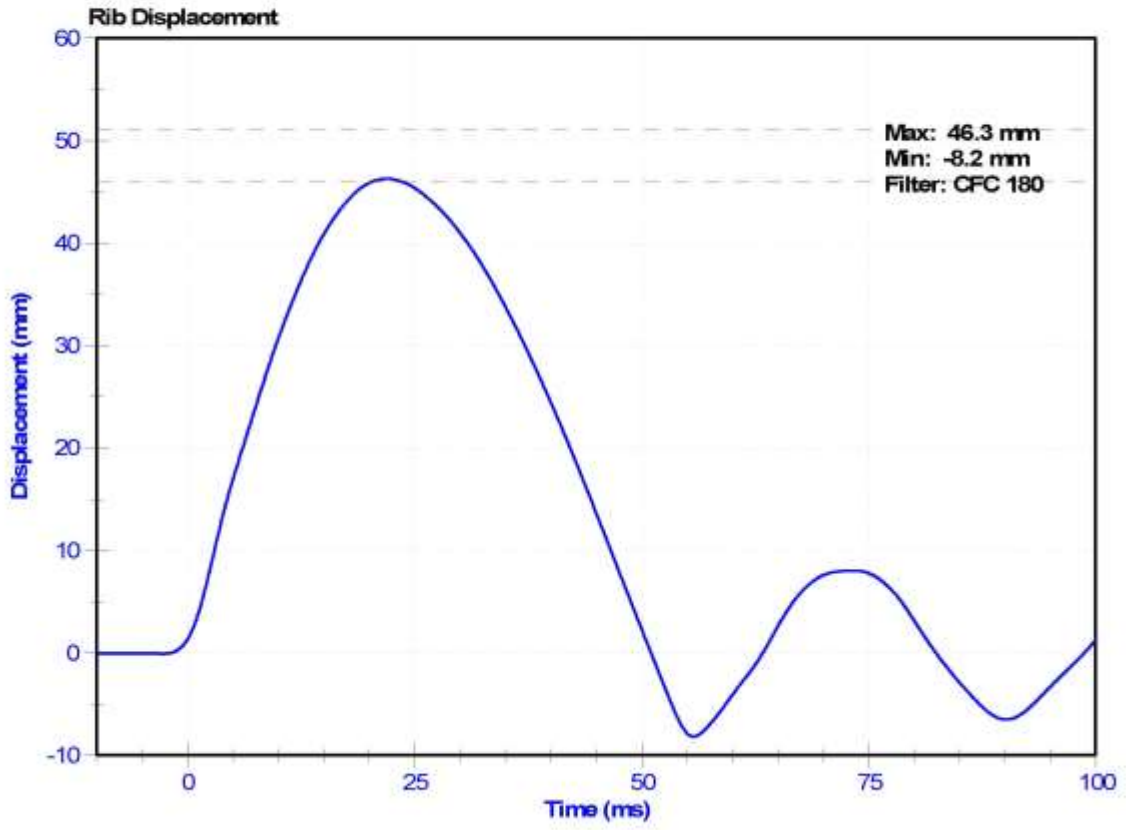
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	25.9	Pass
Rib Displacement	46	51	mm	46.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-03GFE	11/27/2018	11/27/2019



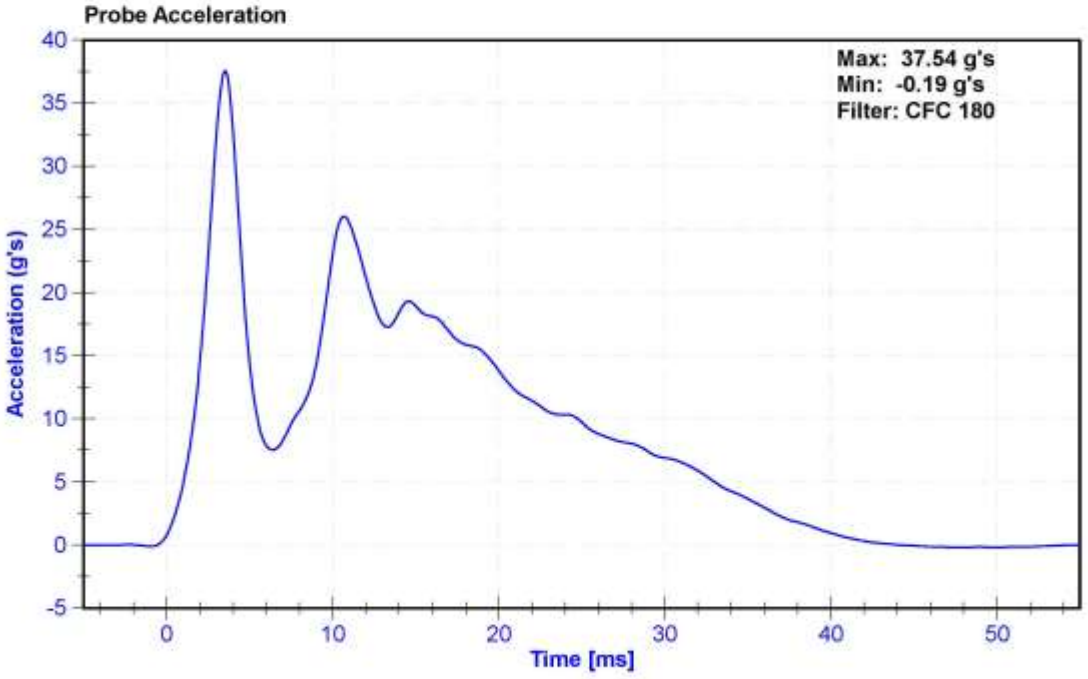
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

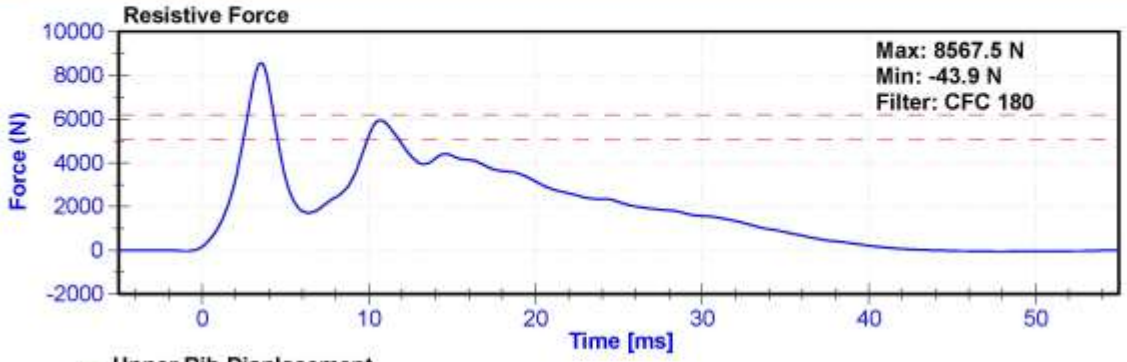
Results

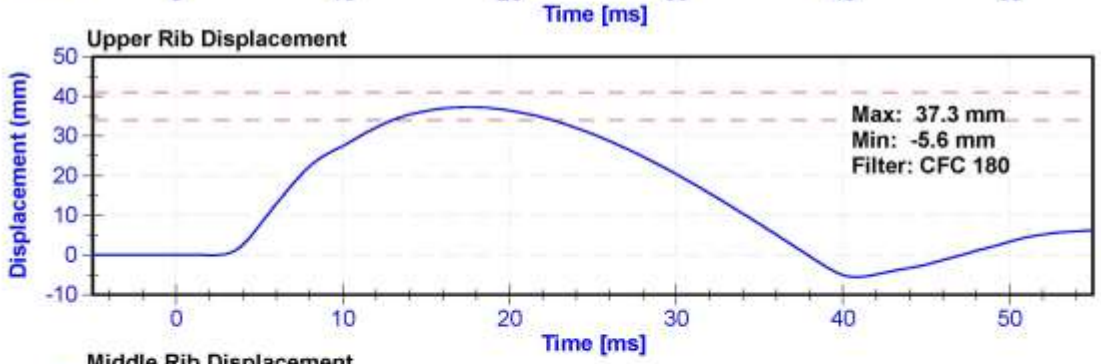
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	22.7	Pass
Velocity	5.4	5.6	m/s	5.57	Pass
Resistive Force after 6ms	5100	6200	N	5936.8	Pass
Upper Thorax Rib Deflection	34	41	mm	37.3	Pass
Mid Thorax Rib Deflection	37	45	mm	44.2	Pass
Lower Thorax Rib Deflection	37	44	mm	39.3	Pass

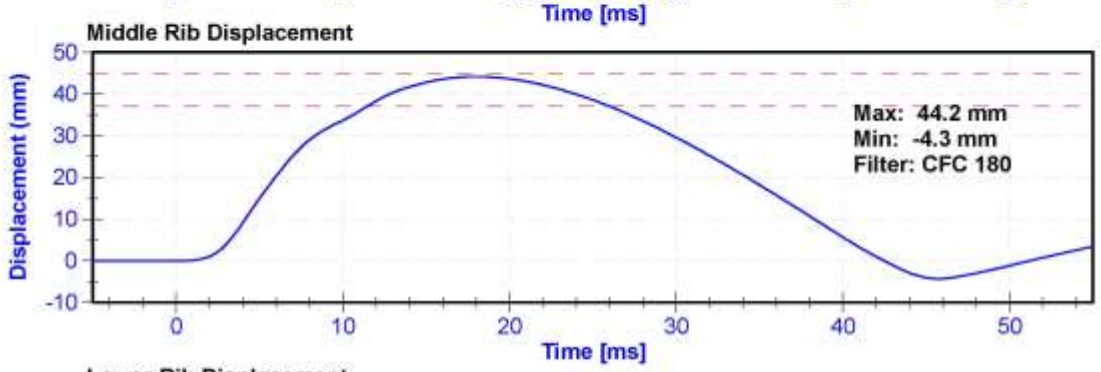
Transducer Calibrations

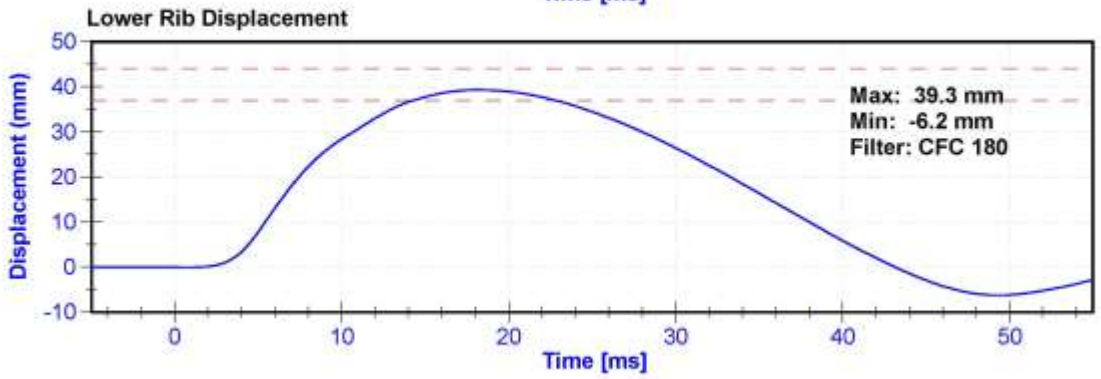
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Upper Thorax Rib Potentiometer	Honeywell MLT-38000201	DS-0552-01GFE	11/28/2018	11/28/2019
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019
Lower Thorax Rib Potentiometer	Honeywell MLT-38000202	DS-0552-03GFE	11/27/2018	11/27/2019




Resistive Force
Max: 8567.5 N
Min: -43.9 N
Filter: CFC 180
Force (N)
Time [ms]


Upper Rib Displacement
Max: 37.3 mm
Min: -5.6 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Middle Rib Displacement
Max: 44.2 mm
Min: -4.3 mm
Filter: CFC 180
Displacement (mm)
Time [ms]


Lower Rib Displacement
Max: 39.3 mm
Min: -6.2 mm
Filter: CFC 180
Displacement (mm)
Time [ms]

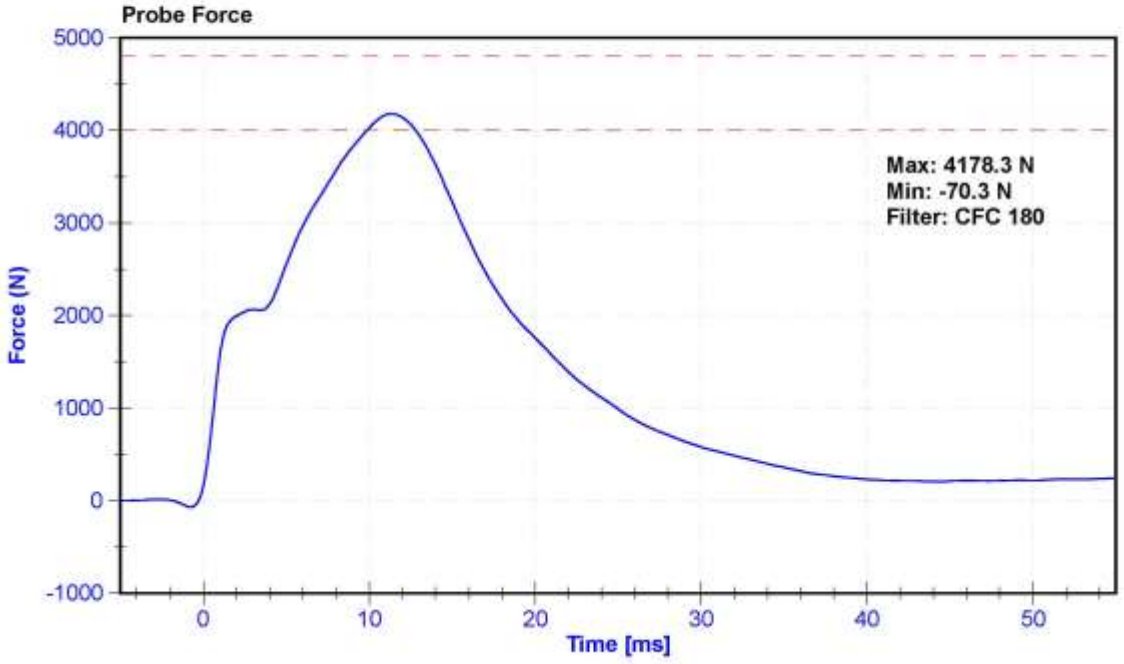
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

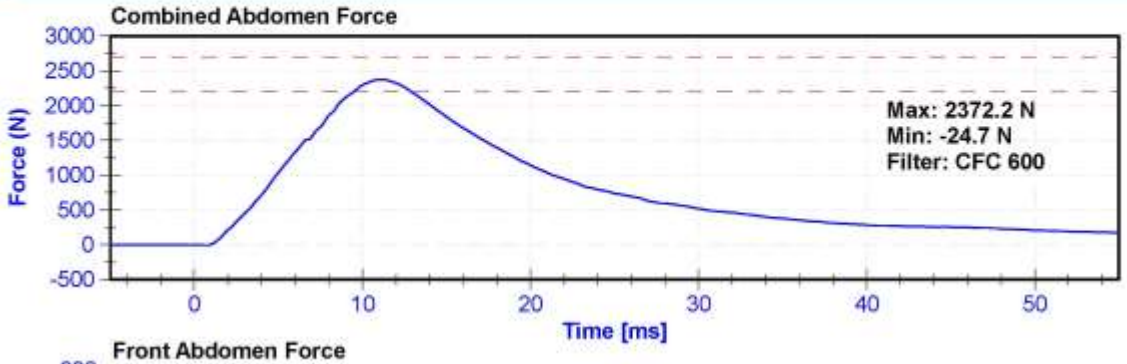
Results

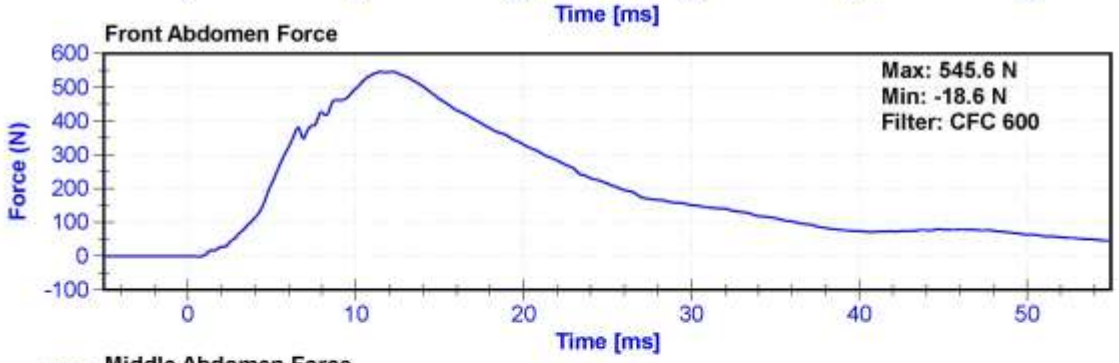
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	33.1	Pass
Velocity	3.9	4.1	m/s	4.09	Pass
Combined Abdomen Force	2200	2700	N	2372.2	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.15	Pass
Resistive Probe Force	4000	4800	N	4178.3	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.35	Pass

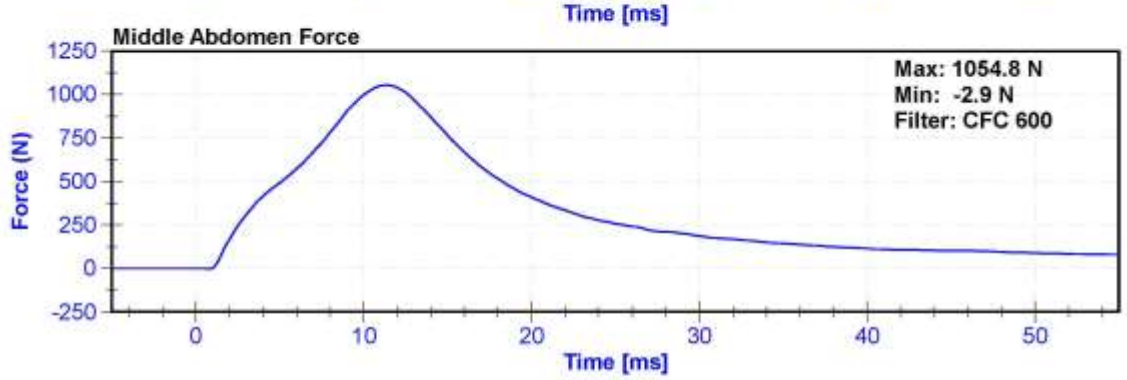
Transducer Calibrations

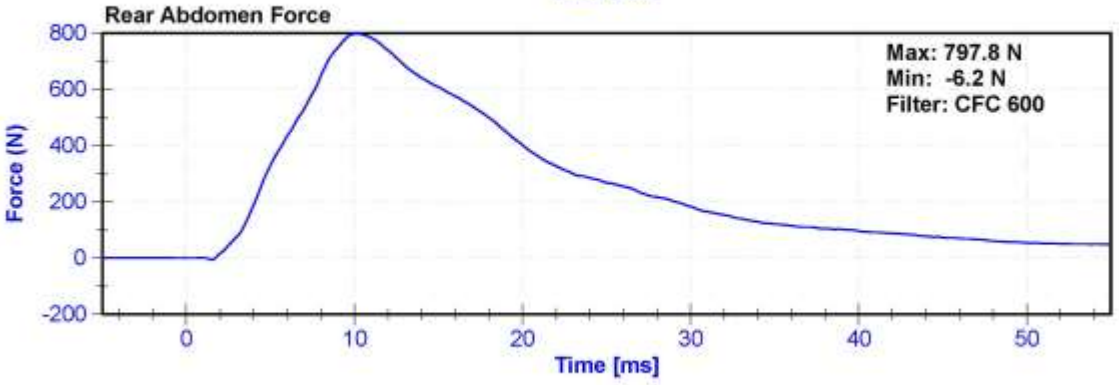
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Front Abdomen Load Cell	DENTON IF-600	LC-200	10/4/2018	10/4/2019
Middle Abdomen Load Cell	DENTON 2631	LC-1529	10/4/2018	10/4/2019
Rear Abdomen Load Cell	DENTON IF-600	LC-1533	10/4/2018	10/4/2019




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2372.2 N
Min: -24.7 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 545.6 N
Min: -18.6 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1054.8 N
Min: -2.9 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 797.8 N
Min: -6.2 N
Filter: CFC 600

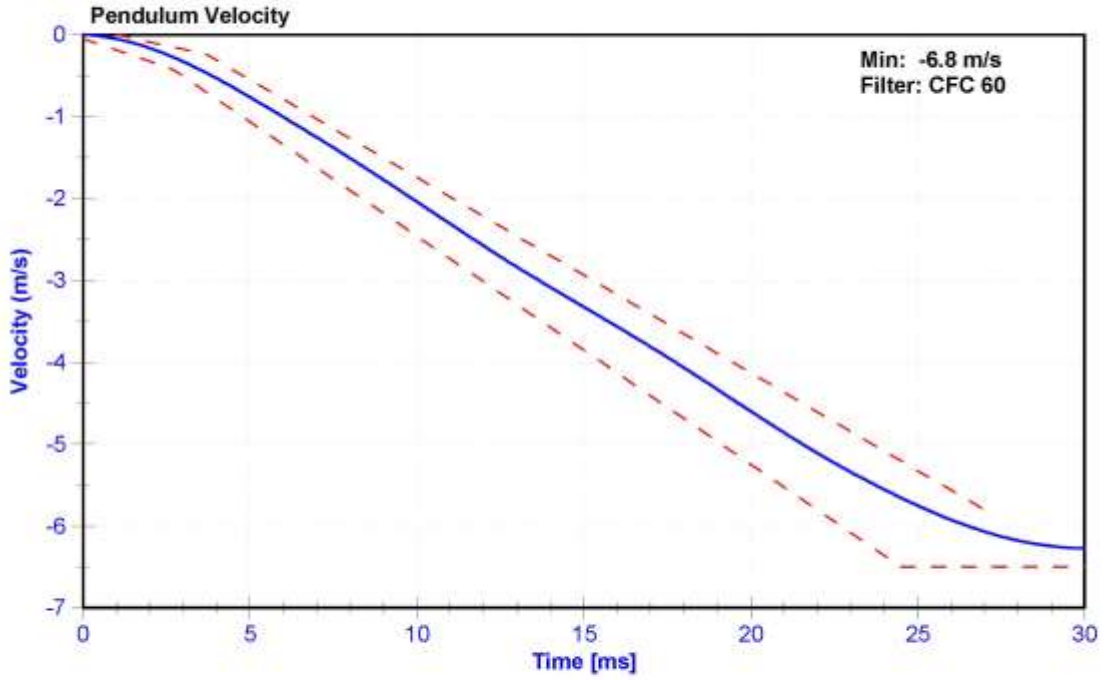
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

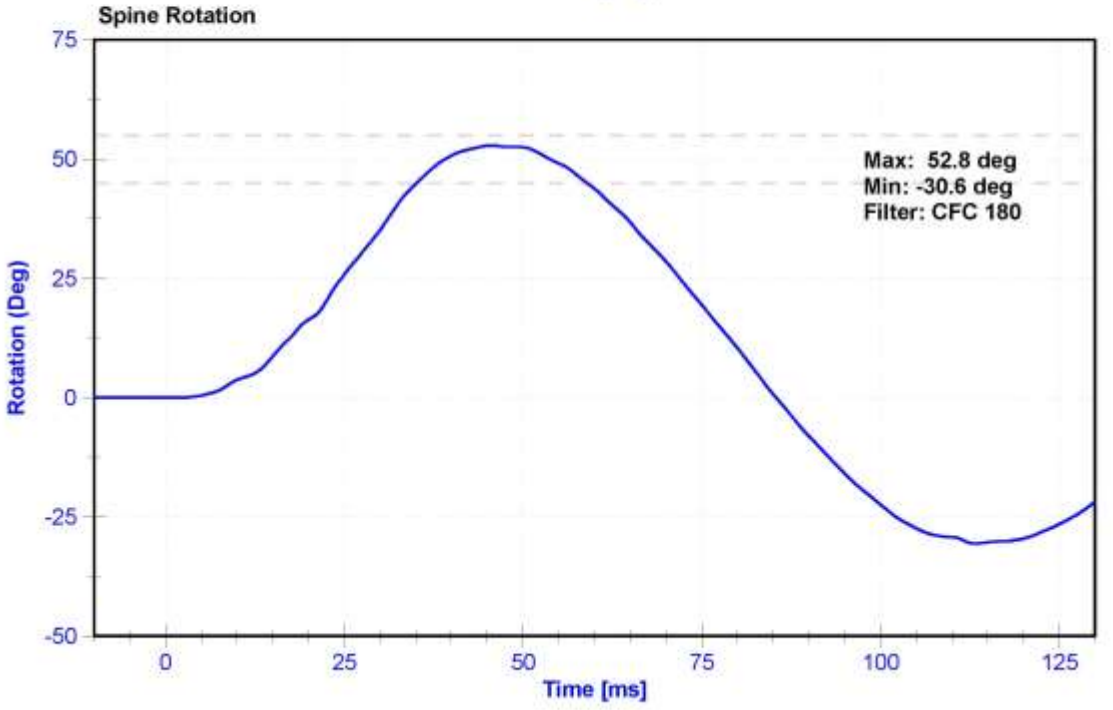
Results

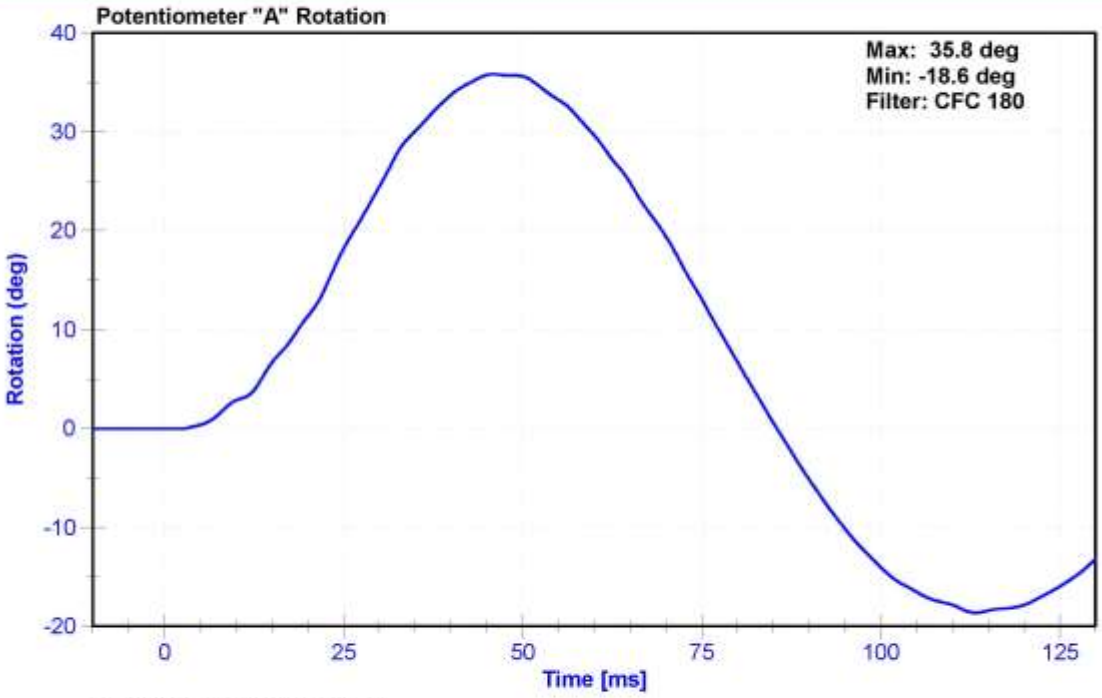
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	25.2	Pass
Velocity	5.95	6.15	m/s	6.113	Pass
Lateral Spine Rotation	45	55	deg	52.8	Pass
Time at Maximum Rotation	39	53	ms	45.5	Pass
Time of Decay to Zero Degrees	37	57	ms	39.9	Pass
Pulse within Corridor?	-	-	-		

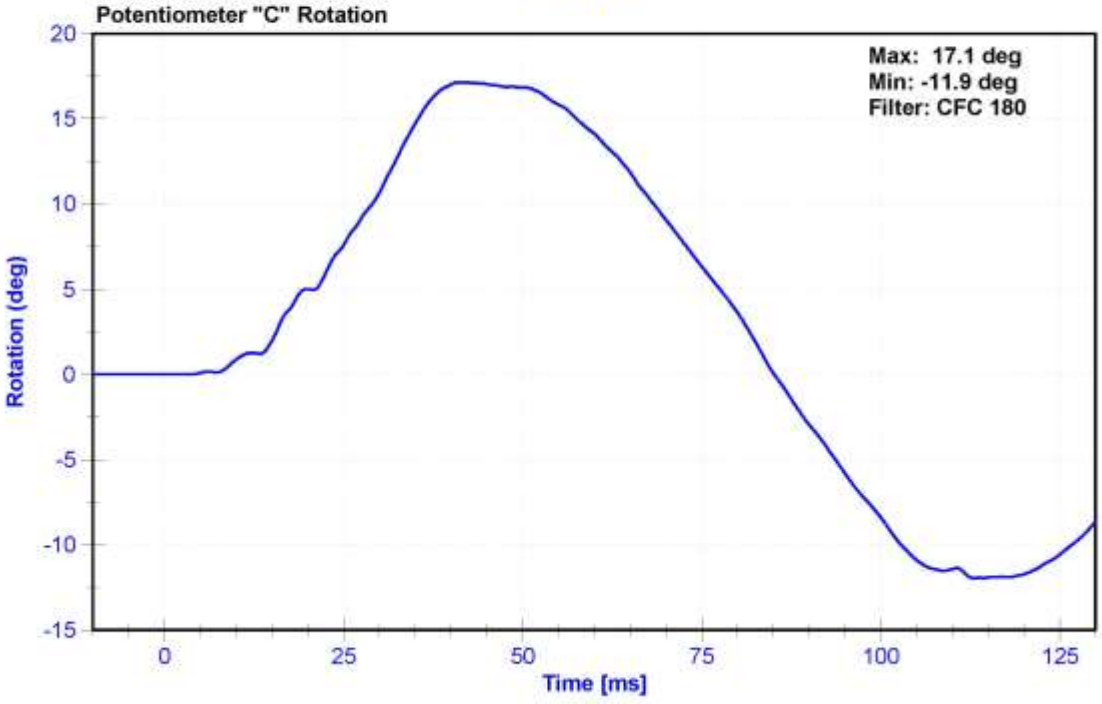
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum "A" Potentiometer	SP22G	DS-094	10/31/2018	10/31/2019
Condyle "B" Potentiometer	SP22G	DS-095	10/31/2018	10/31/2019


Pendulum Velocity
Min: -6.8 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 52.8 deg
Min: -30.6 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 35.8 deg
Min: -18.6 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 17.1 deg
Min: -11.9 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

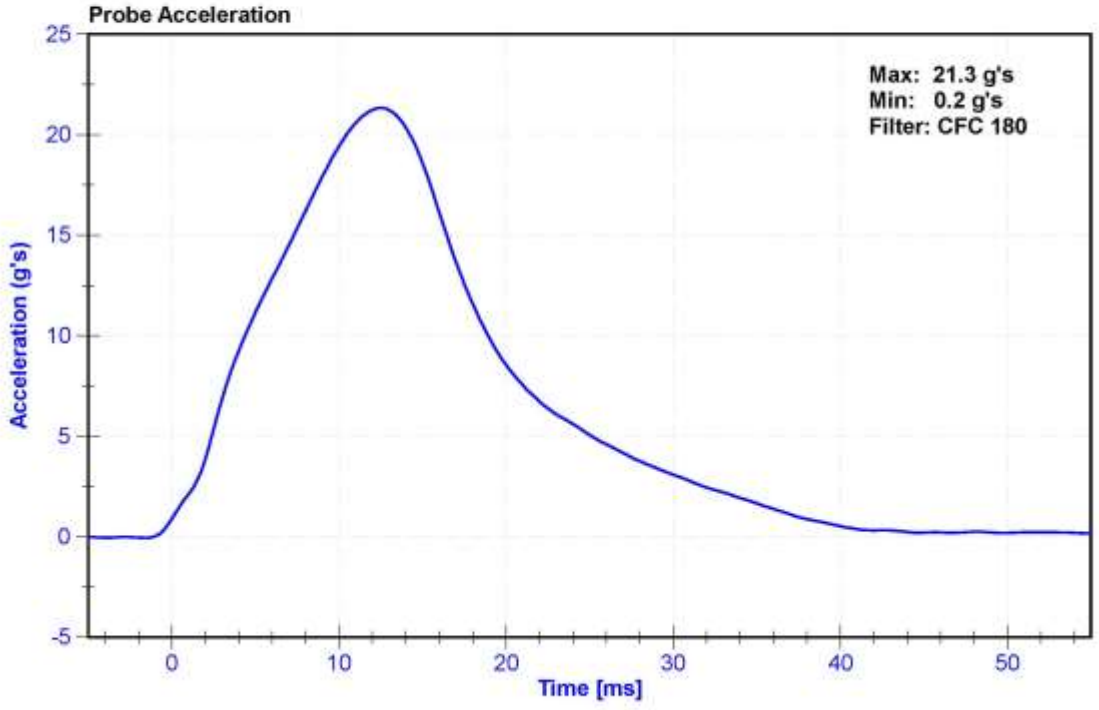
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

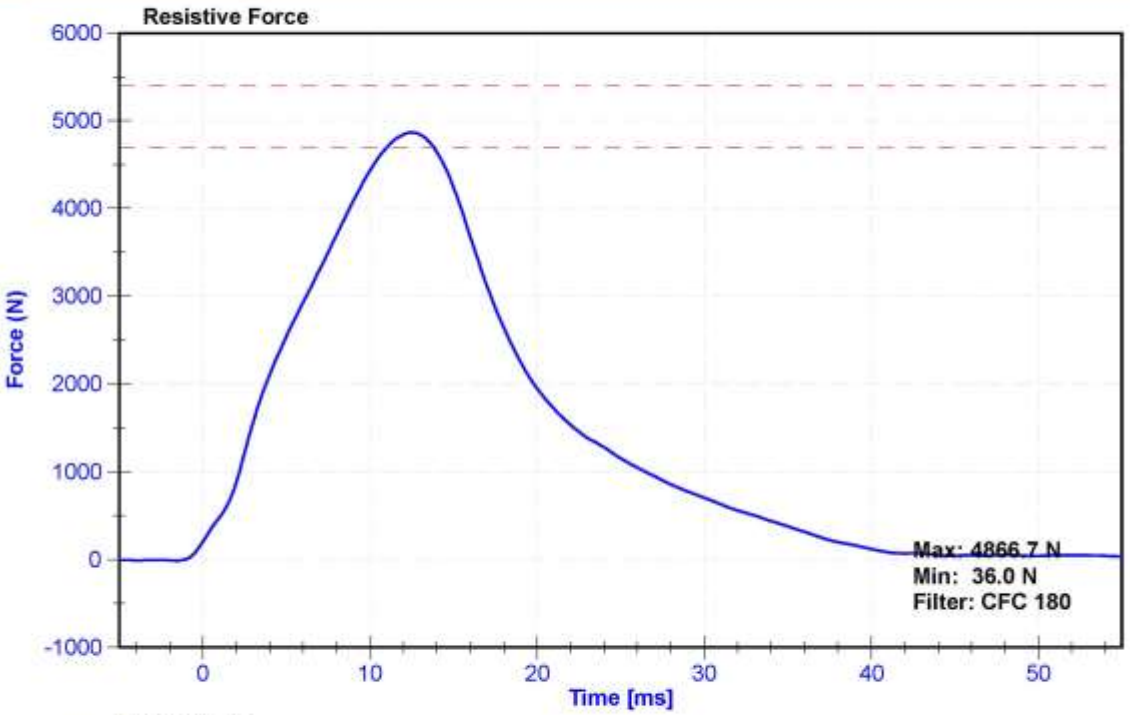
Results

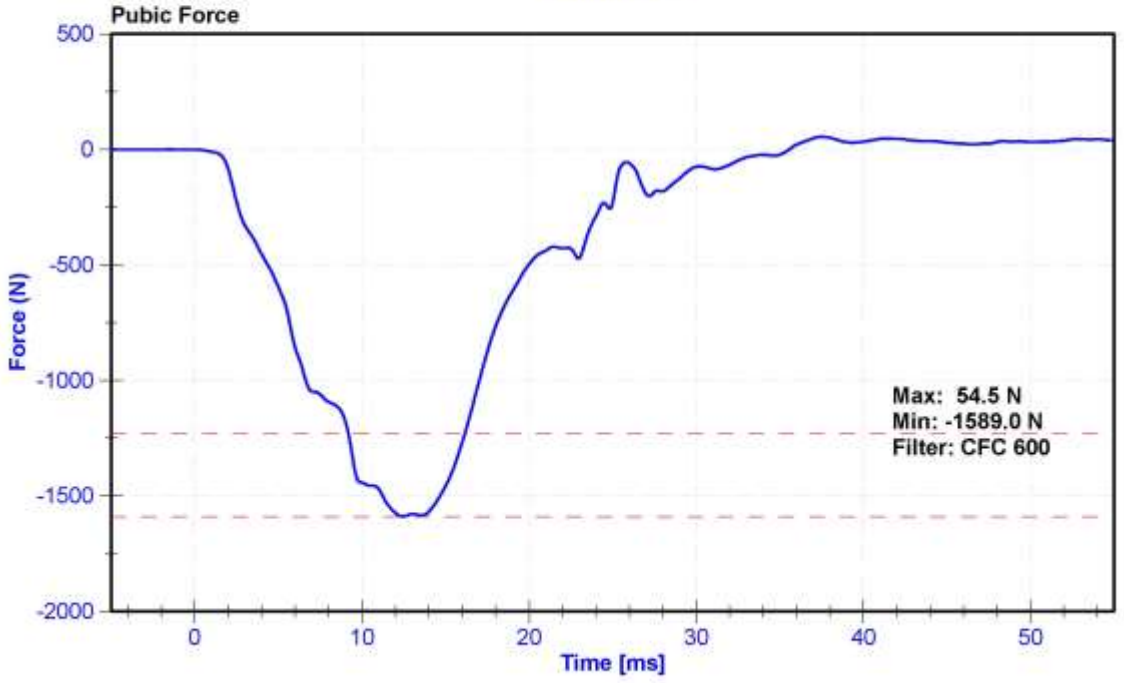
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	24.7	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Resistive Force	4700	5400	N	4866.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.50	Pass
Pubic Force	-1590	-1230	N	-1589.0	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.45	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Pubic Load Cell	Humanetics IF-556	LC-139 Fy GFE	10/4/2018	10/4/2019




Resistive Force
6000
5000
4000
3000
2000
1000
0
-1000
Force (N)
0
10
20
30
40
50
Time [ms]
Max: 4866.7 N
Min: 36.0 N
Filter: CFC 180

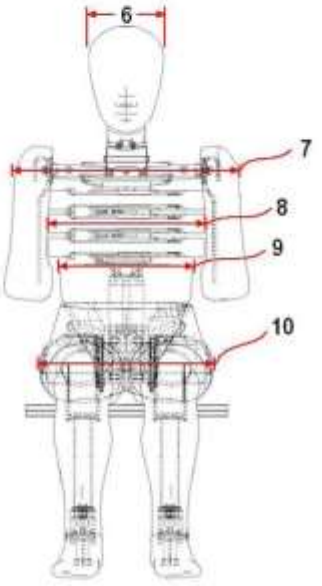

Pubic Force
500
0
-500
-1000
-1500
-2000
Force (N)
0
10
20
30
40
50
Time [ms]
Max: 54.5 N
Min: -1589.0 N
Filter: CFC 600

POST-TEST DUMMY PERFORMANCE CALIBRATION TEST DATA
(Subpart U, ES-2re)

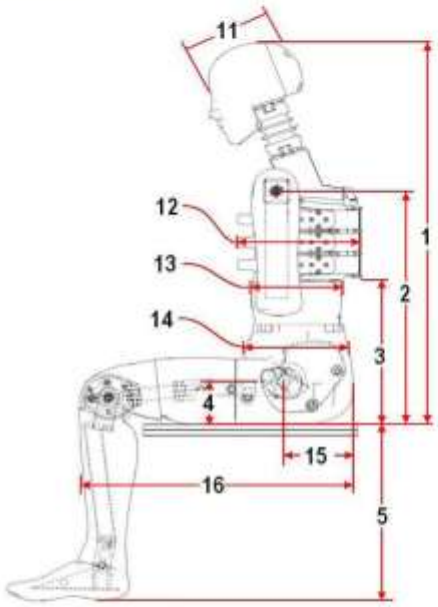
External Measurements - EuroSID-2re

Technician: K. Dutton Date: 12/14/2018

Dummy Serial Number: D037



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	912	Pass
2	Seat to Shoulder Joint	558	572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	351	Pass
4	Seat to Hip Joint (center of bolt)	97	103	102	Pass
5	Sole to Seat, Sitting	333	451	405	Pass
6	Head Width	152	158	156	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	326	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	365	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	269	Pass
13	Abdomen Depth	194	204	200	Pass
14	Pelvis Depth	235	245	242	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	609	Pass

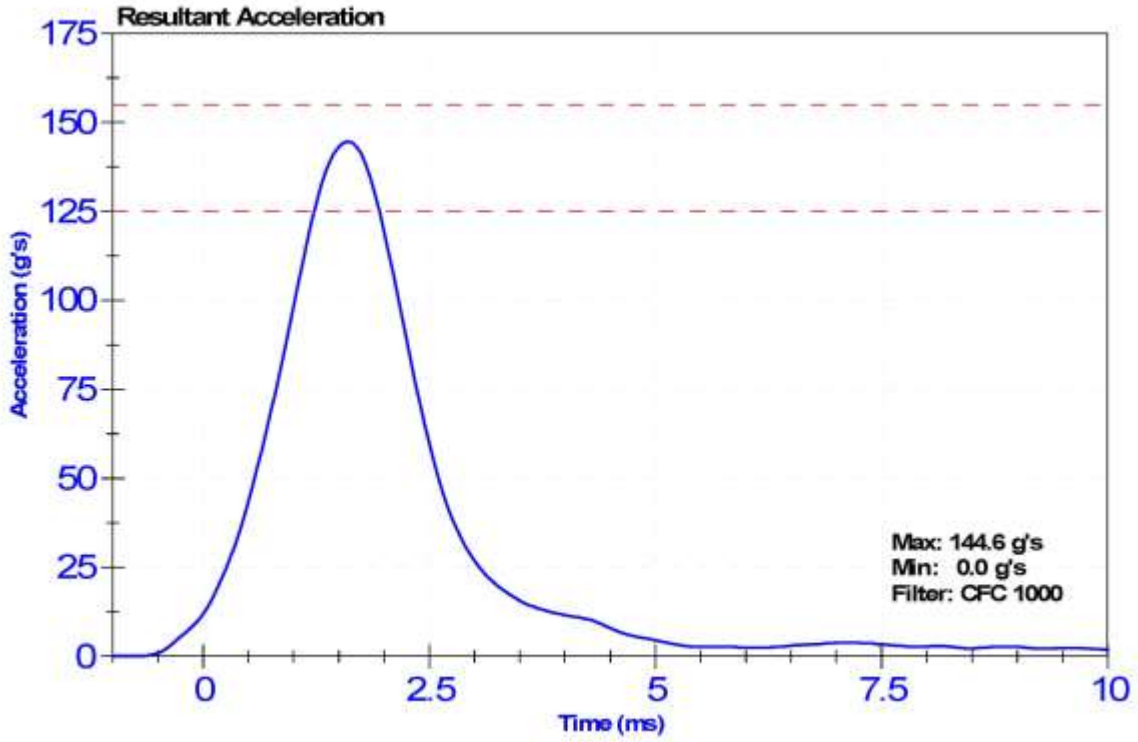
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

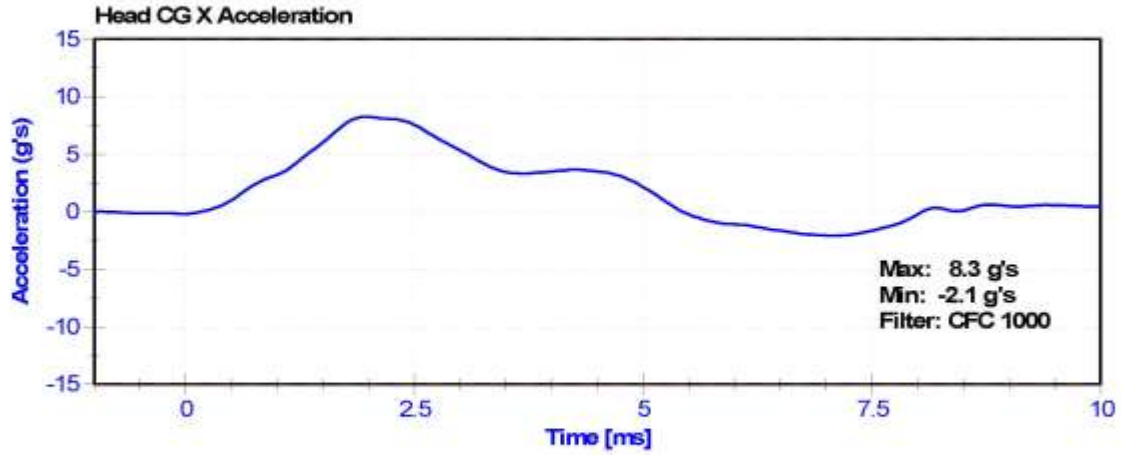
Results

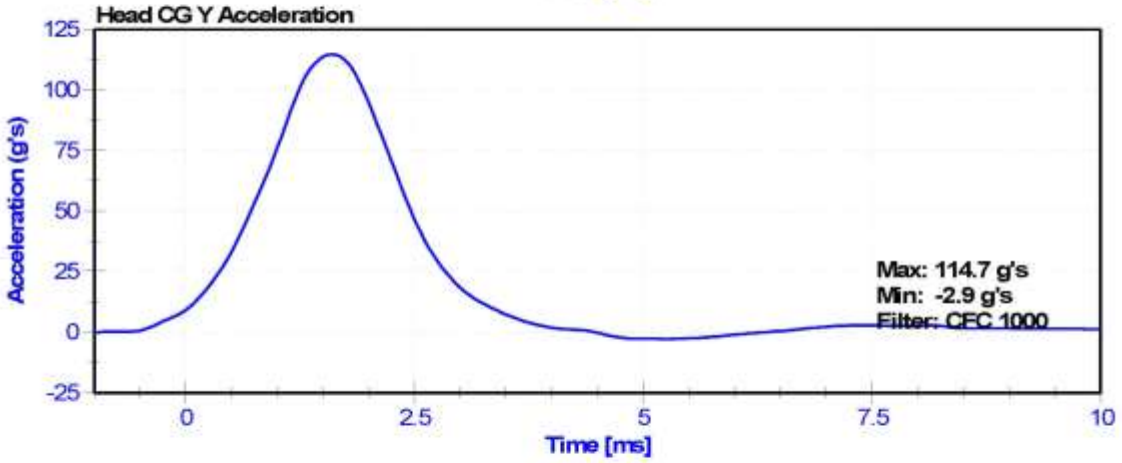
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	28.2	Pass
Resultant Acceleration	125	155	g's	144.6	Pass
Oscillation	0	15	%	2.62	Pass
Fore-Aft Acceleration	-15	15	g's	8.3	Pass

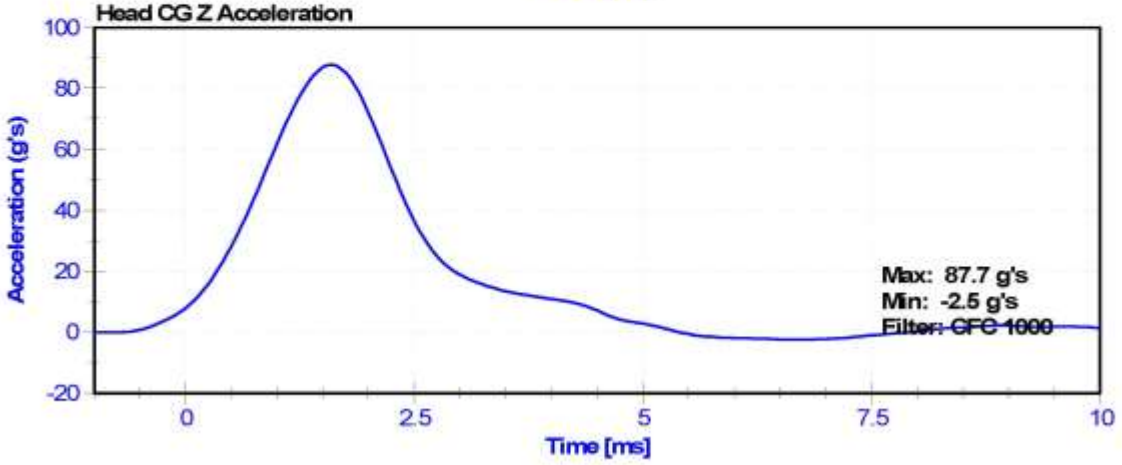
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P66940	10/5/2018	4/5/2019
Y Accelerometer	MSI 64CM30	AC-MS25917	10/5/2018	4/5/2019
Z Accelerometer	Endevco 7264C	AC-P94090	10/5/2018	4/5/2019




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 8.3 g's
Min: -2.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 114.7 g's
Min: -2.9 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]
Max: 87.7 g's
Min: -2.5 g's
Filter: CFC 1000

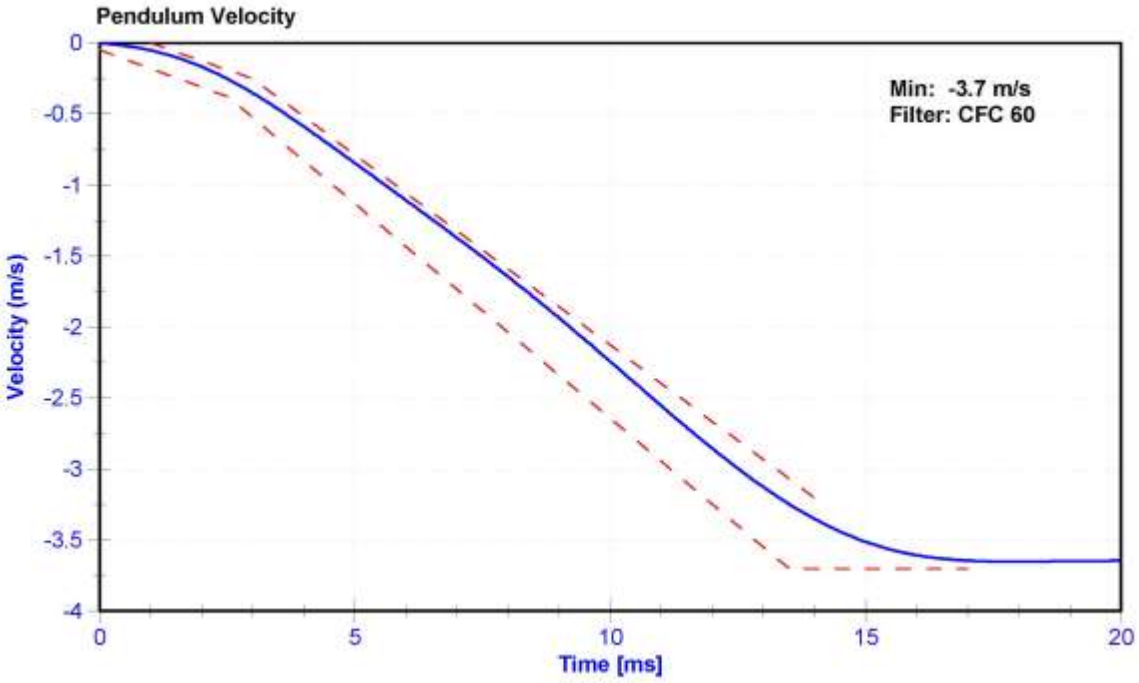
ATD Manufacturer	Denton	Test Technician	K. Dutton
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

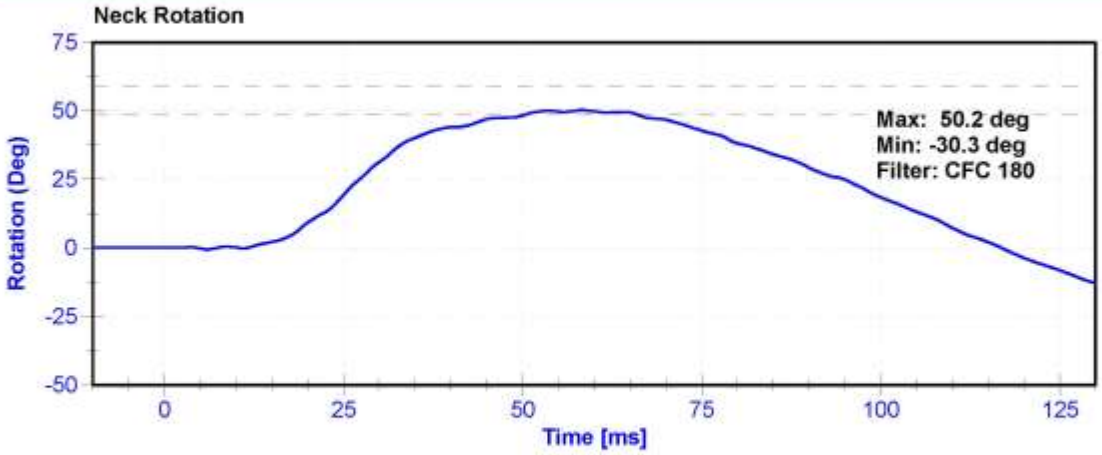
Results

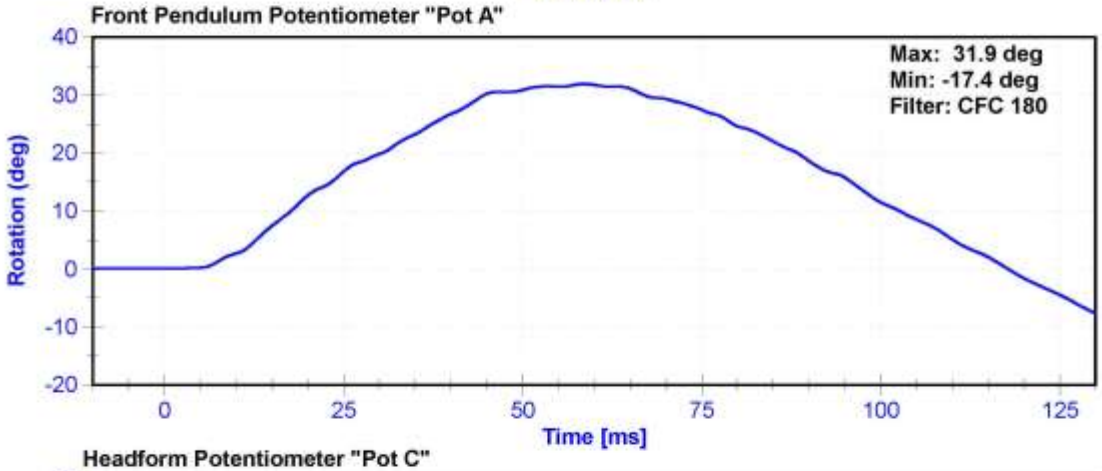
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	34.1	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	50.2	Pass
Time at Maximum Rotation	54	66	ms	58.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.5	Pass

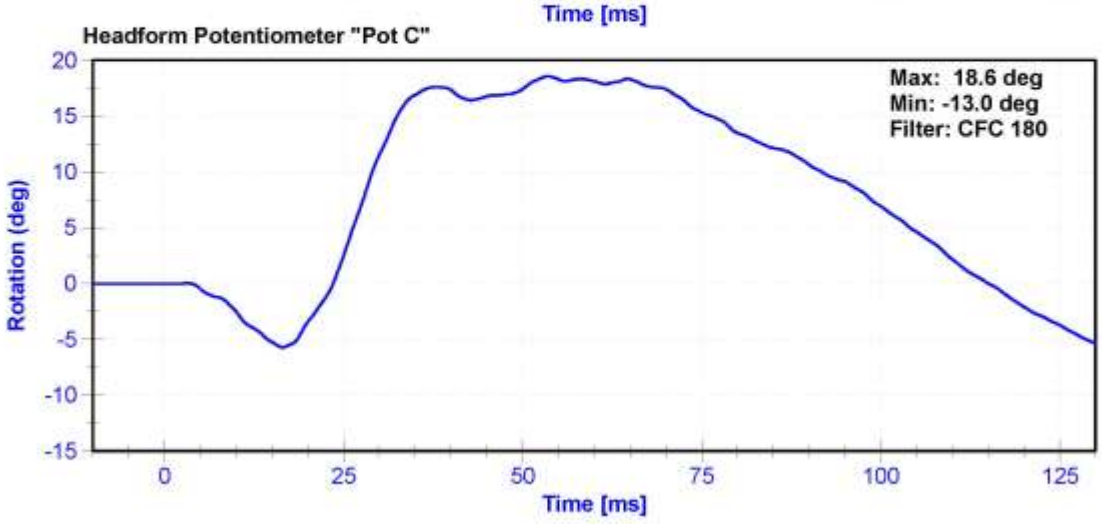
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Front Pendulum Potentiometer	SP22G	DS-094	10/31/2018	10/31/2019
Headform Potentiometer	SP22G	DS-095	10/31/2018	10/31/2019




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 50.2 deg
Min: -30.3 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 31.9 deg
Min: -17.4 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.6 deg
Min: -13.0 deg
Filter: CFC 180

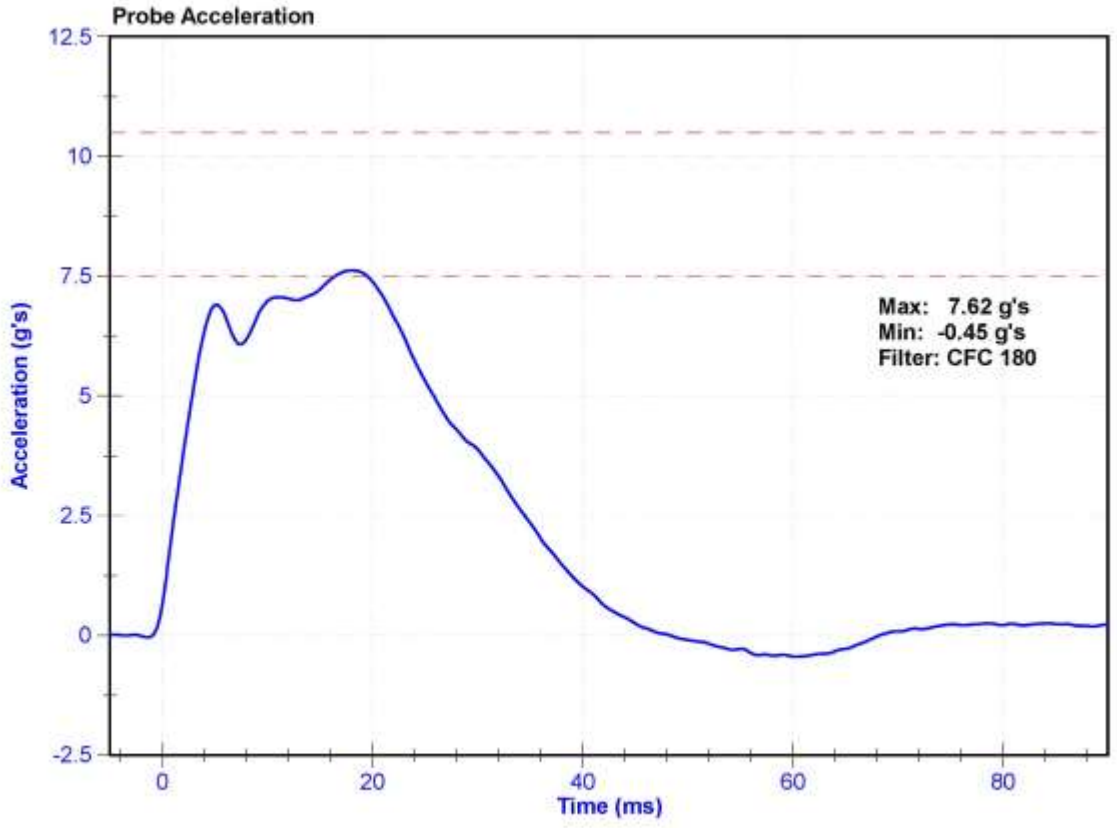
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	20.6	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	7.5	10.5	g's	7.62	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019



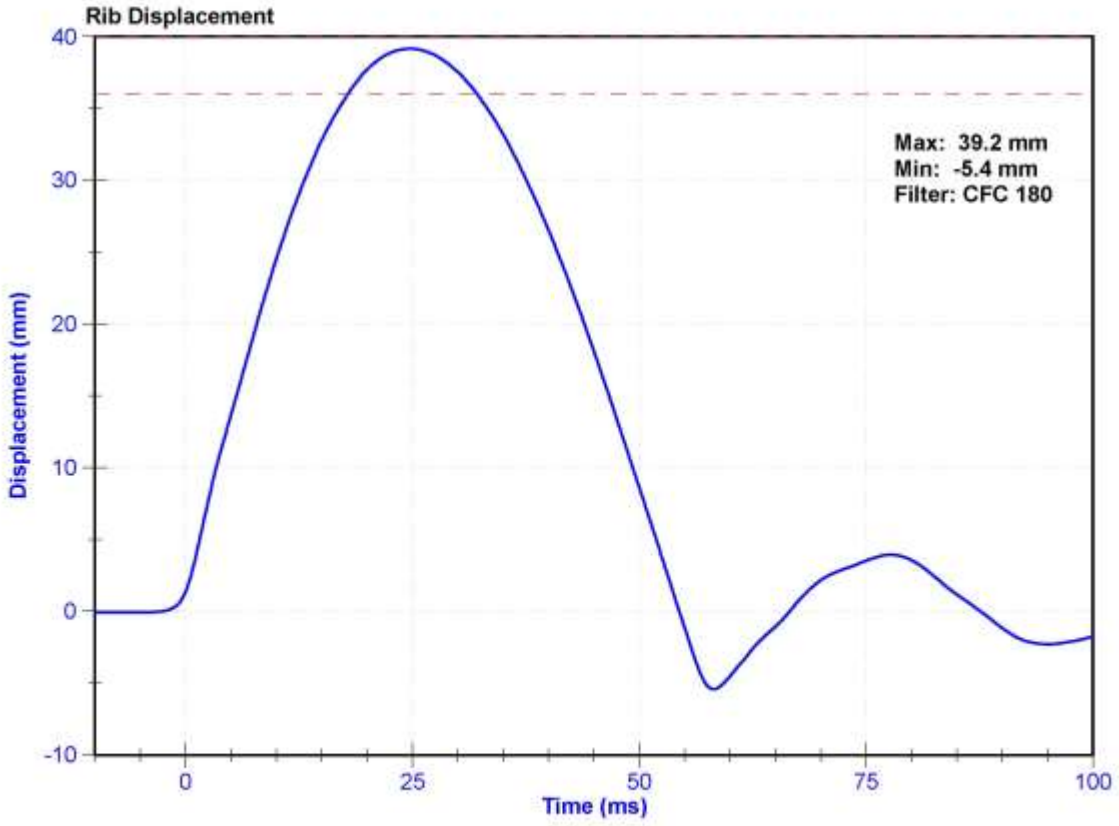
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.1	Pass
Humidity	10	70	%	25.3	Pass
Rib Displacement	36	40	mm	39.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-01GFE	11/28/2018	11/28/2019



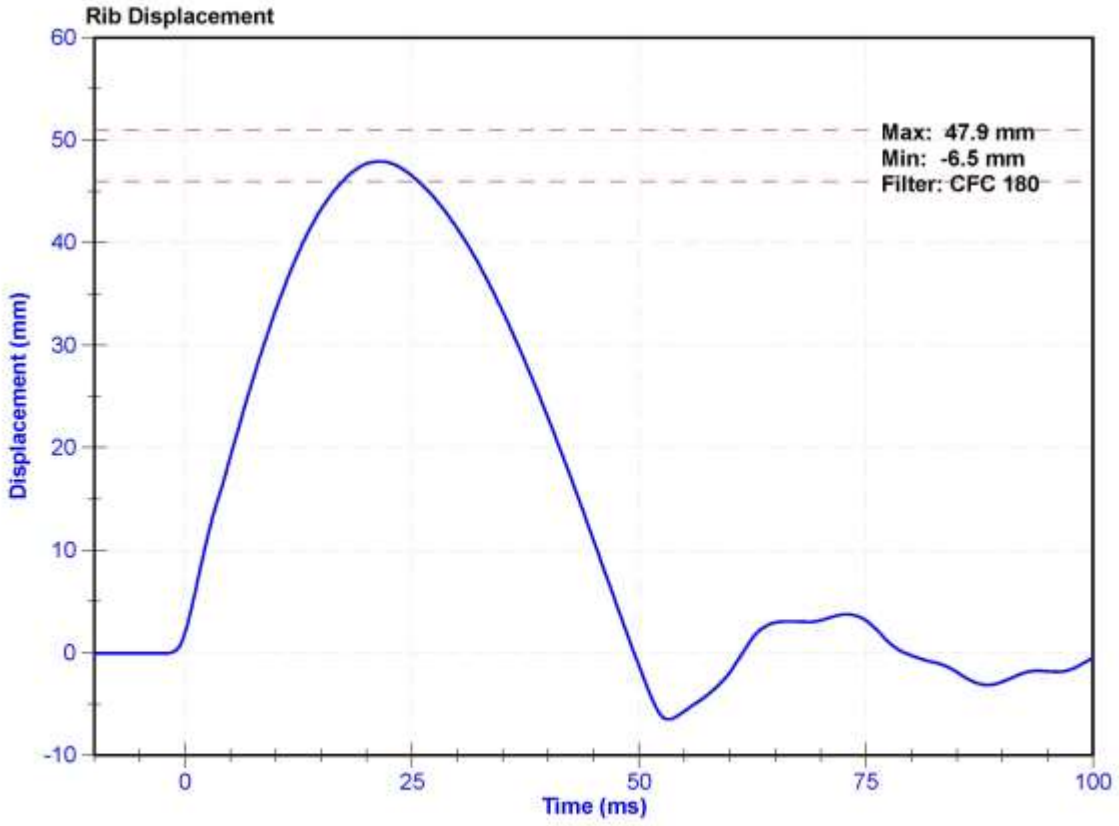
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	28.2	Pass
Rib Displacement	46	51	mm	47.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-01GFE	11/28/2018	11/28/2019



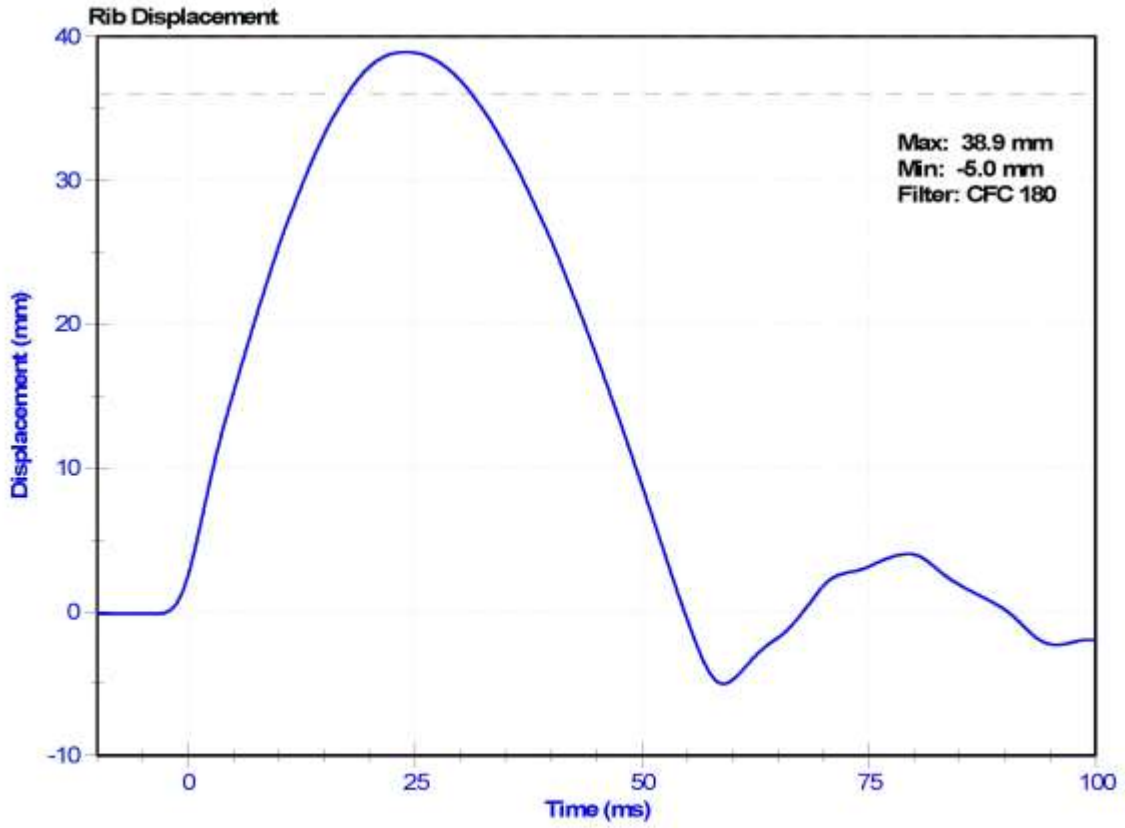
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K.Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	36	40	mm	38.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019



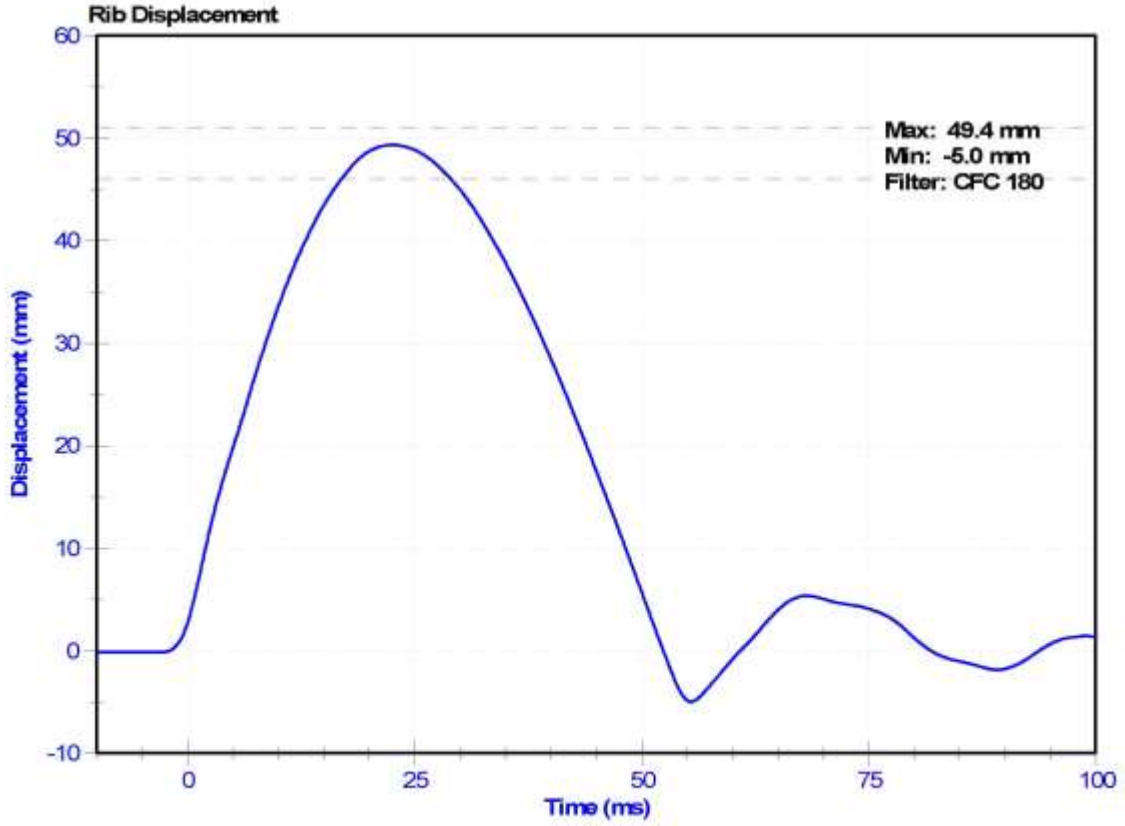
ATD Manufacturer	Denton	Test Technician	D.Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K.Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	20.9	Pass
Rib Displacement	46	51	mm	49.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019



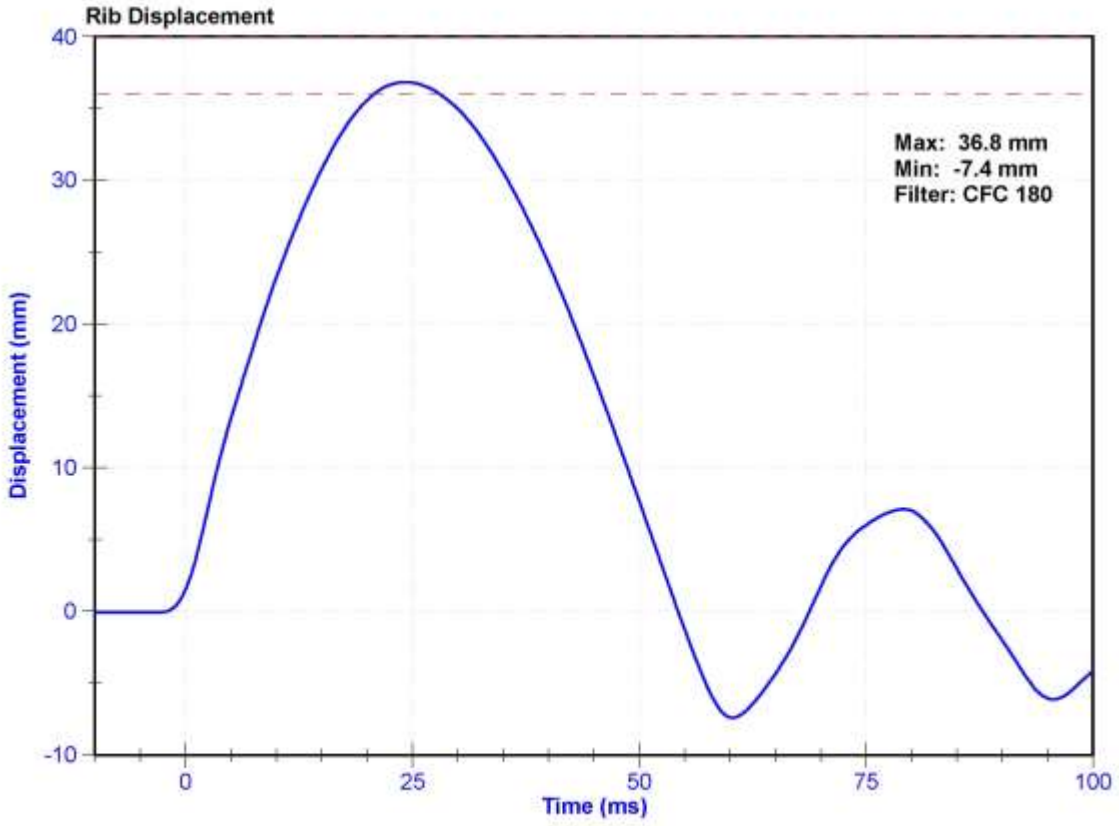
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	28.2	Pass
Rib Displacement	36	40	mm	36.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-03GFE	11/27/2018	11/27/2019



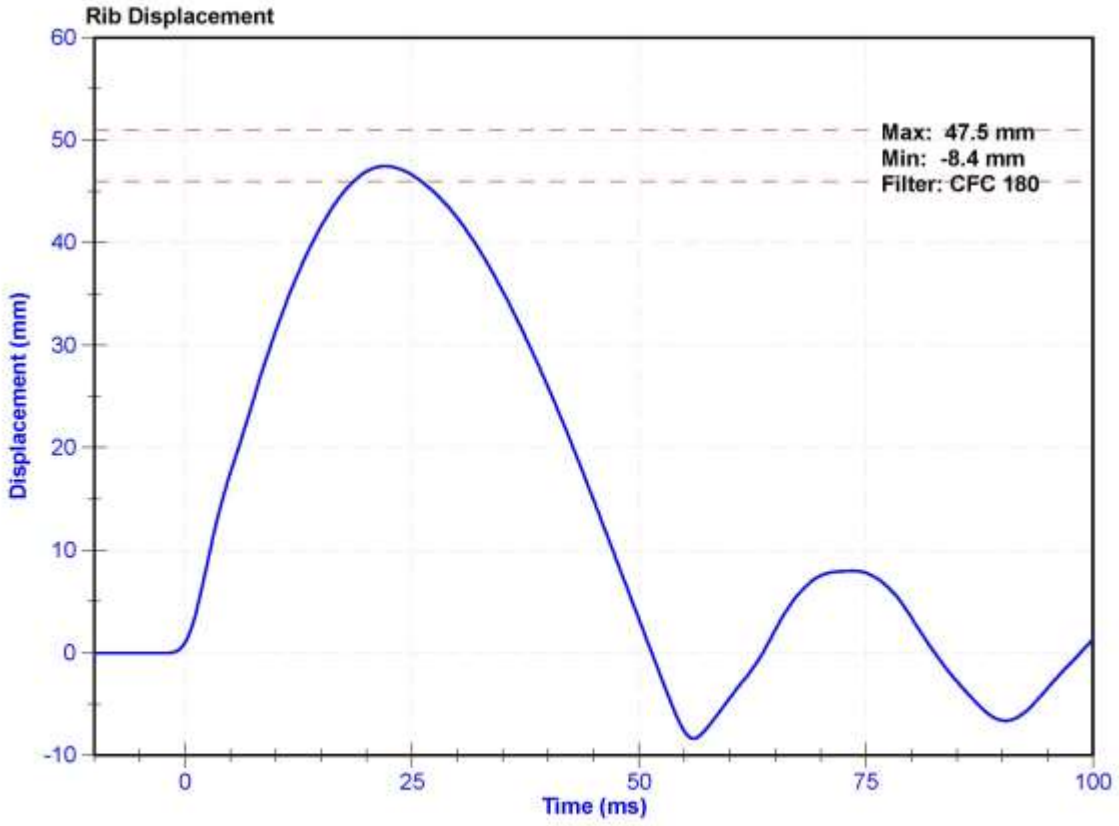
ATD Manufacturer	Denton	Test Technician	C. Mantell
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.6	Pass
Humidity	10	70	%	28.2	Pass
Rib Displacement	46	51	mm	47.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-0552-03GFE	11/27/2018	11/27/2019



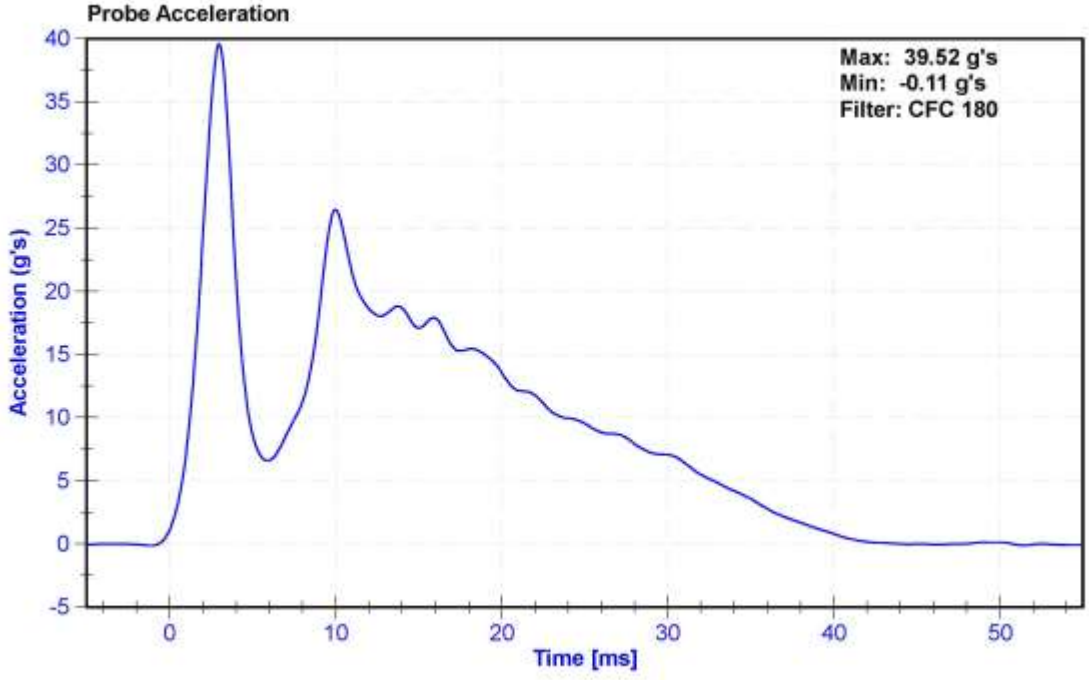
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

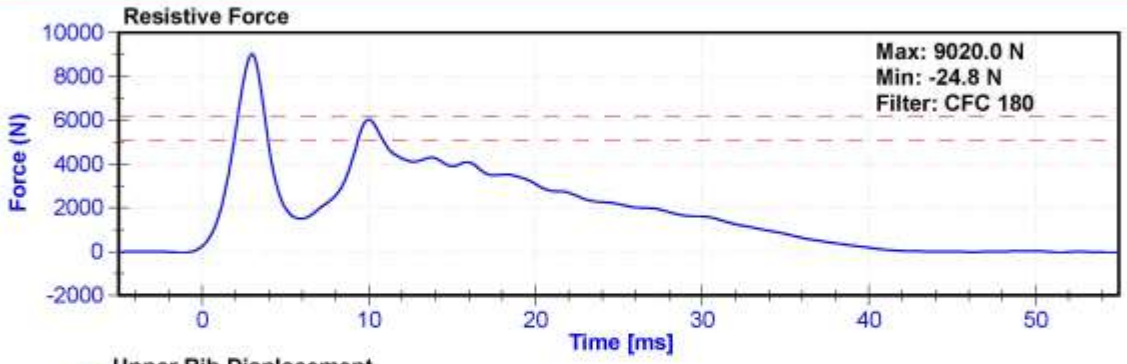
Results

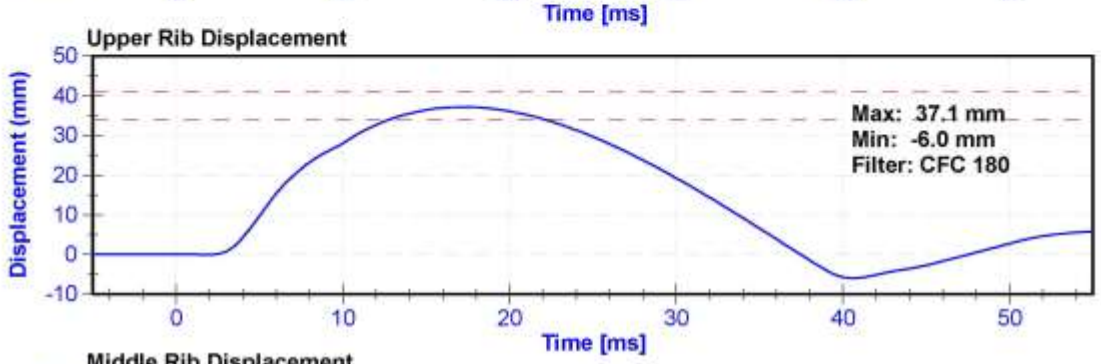
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	23.9	Pass
Velocity	5.4	5.6	m/s	5.50	Pass
Resistive Force after 6ms	5100	6200	N	6035.0	Pass
Upper Thorax Rib Deflection	34	41	mm	37.1	Pass
Mid Thorax Rib Deflection	37	45	mm	44.5	Pass
Lower Thorax Rib Deflection	37	44	mm	39.7	Pass

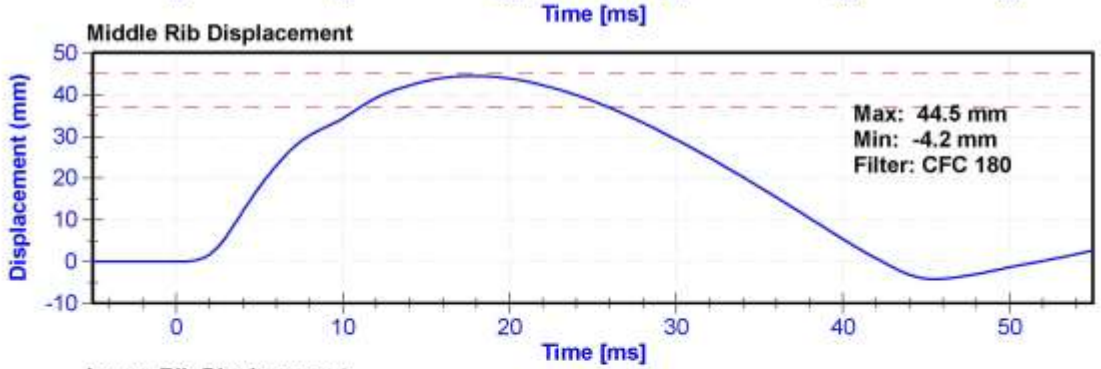
Transducer Calibrations

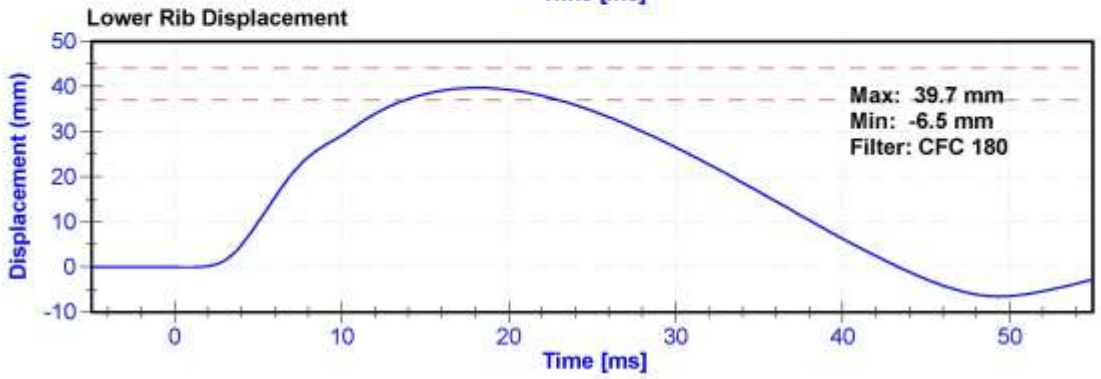
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-0552-01GFE	11/28/2018	11/28/2019
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-807GFE	11/27/2018	11/27/2019
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-0552-03GFE	11/27/2018	11/27/2019




Resistive Force
Max: 9020.0 N
Min: -24.8 N
Filter: CFC 180
Force (N)
10000
8000
6000
4000
2000
0
-2000
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 37.1 mm
Min: -6.0 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 44.5 mm
Min: -4.2 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 39.7 mm
Min: -6.5 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

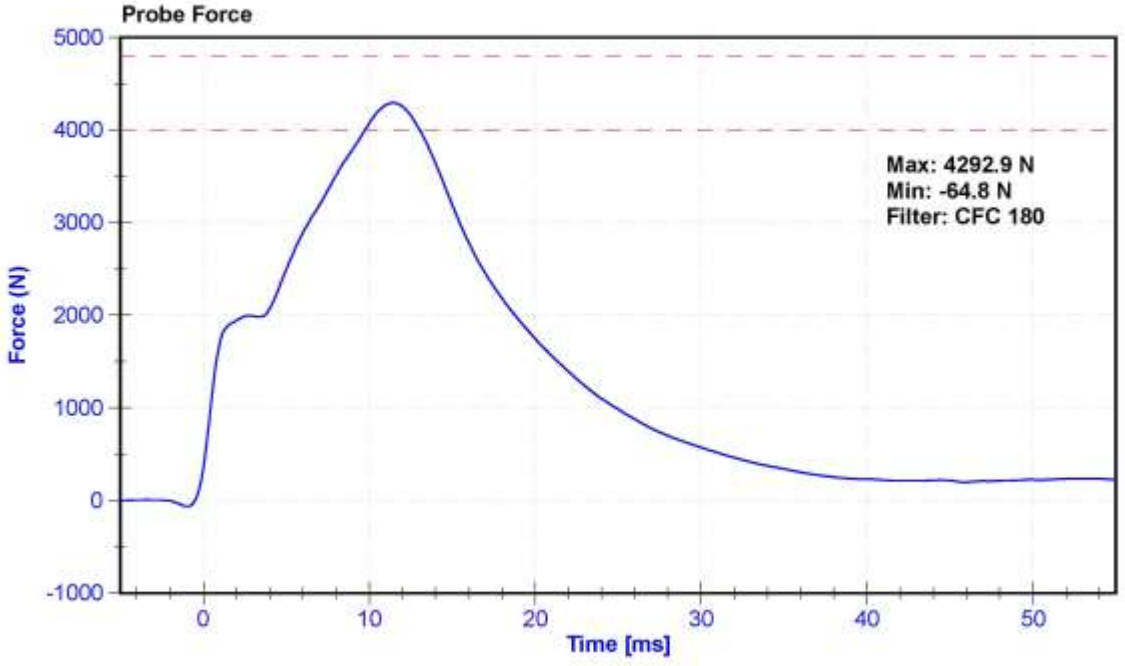
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

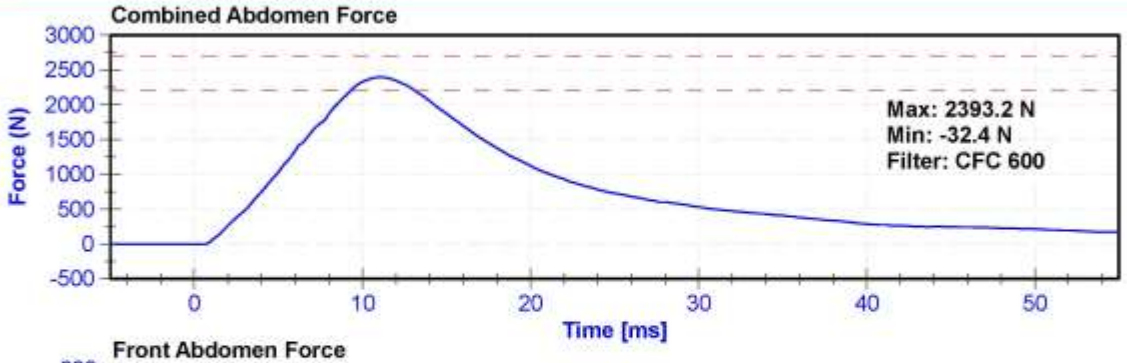
Results

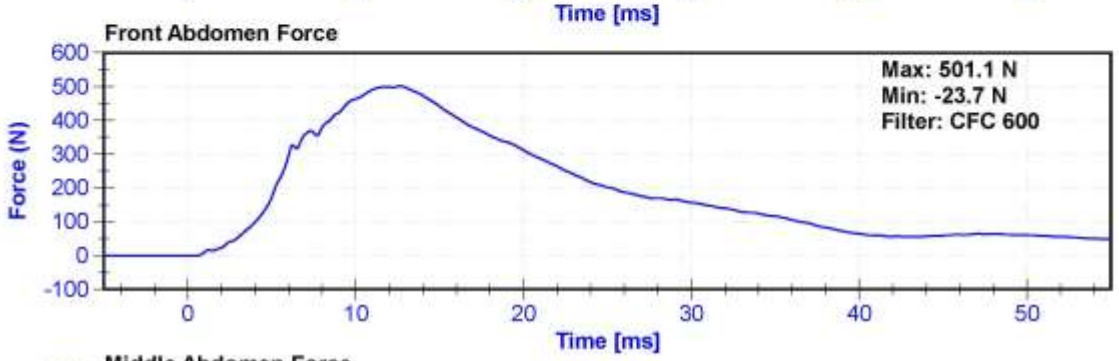
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	20.6	Pass
Velocity	3.9	4.1	m/s	4.04	Pass
Combined Abdomen Force	2200	2700	N	2393.2	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.10	Pass
Resistive Probe Force	4000	4800	N	4292.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.45	Pass

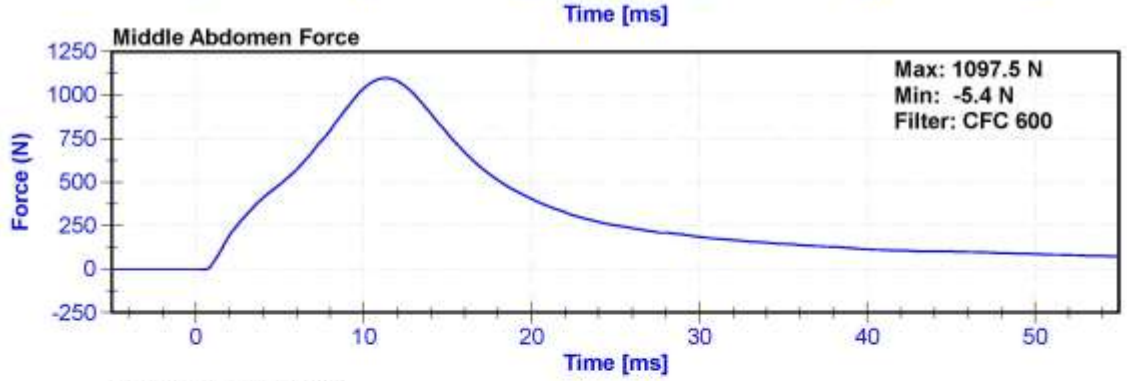
Transducer Calibrations

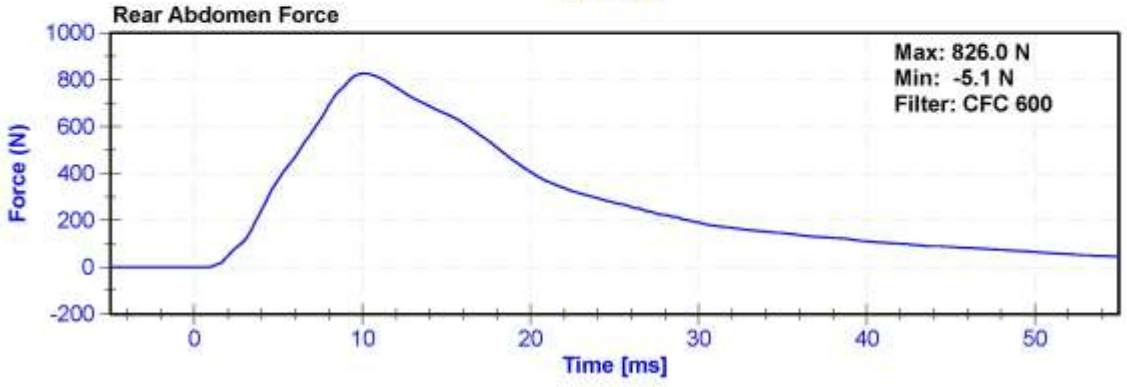
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Front Abdomen Load Cell	DENTON IF-600	LC-200	10/4/2018	10/4/2019
Middle Abdomen Load Cell	DENTON 2631	LC-1529	10/4/2018	10/4/2019
Rear Abdomen Load Cell	DENTON IF-600	LC-1533	10/4/2018	10/4/2019




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2393.2 N
Min: -32.4 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 501.1 N
Min: -23.7 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1097.5 N
Min: -5.4 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 826.0 N
Min: -5.1 N
Filter: CFC 600

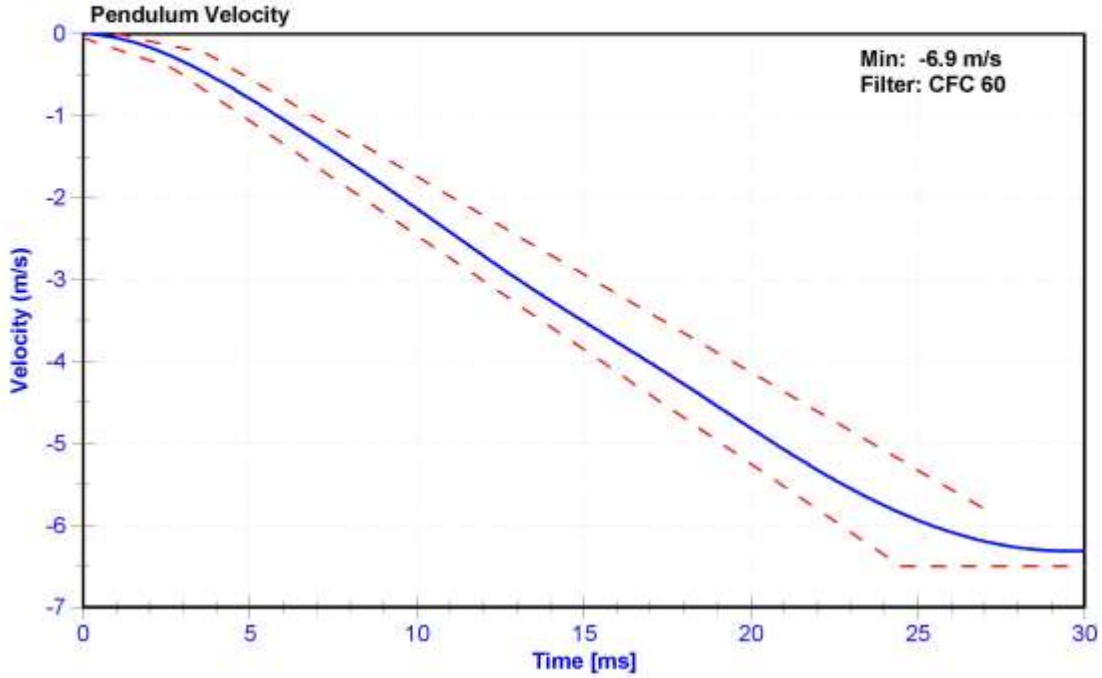
ATD Manufacturer	Humanetics	Test Technician	K. Dutton
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

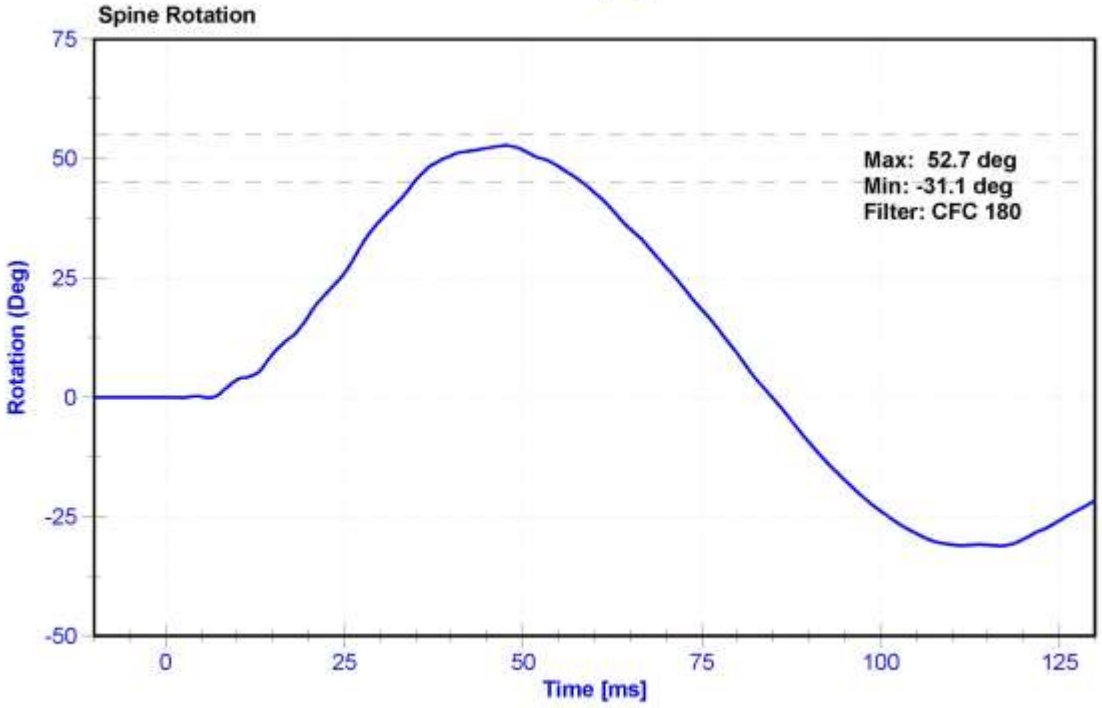
Results

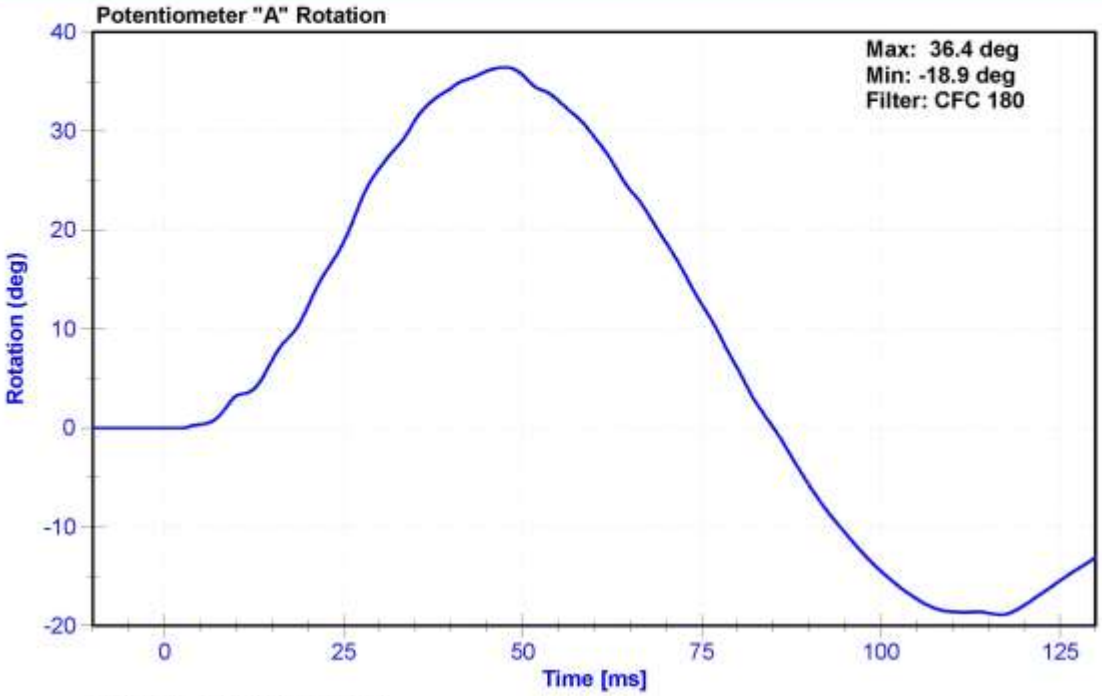
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	34.3	Pass
Velocity	5.95	6.15	m/s	6.113	Pass
Lateral Spine Rotation	45	55	deg	52.7	Pass
Time at Maximum Rotation	39	53	ms	47.6	Pass
Time of Decay to Zero Degrees	37	57	ms	37.3	Pass
Pulse within Corridor?	-	-	-		

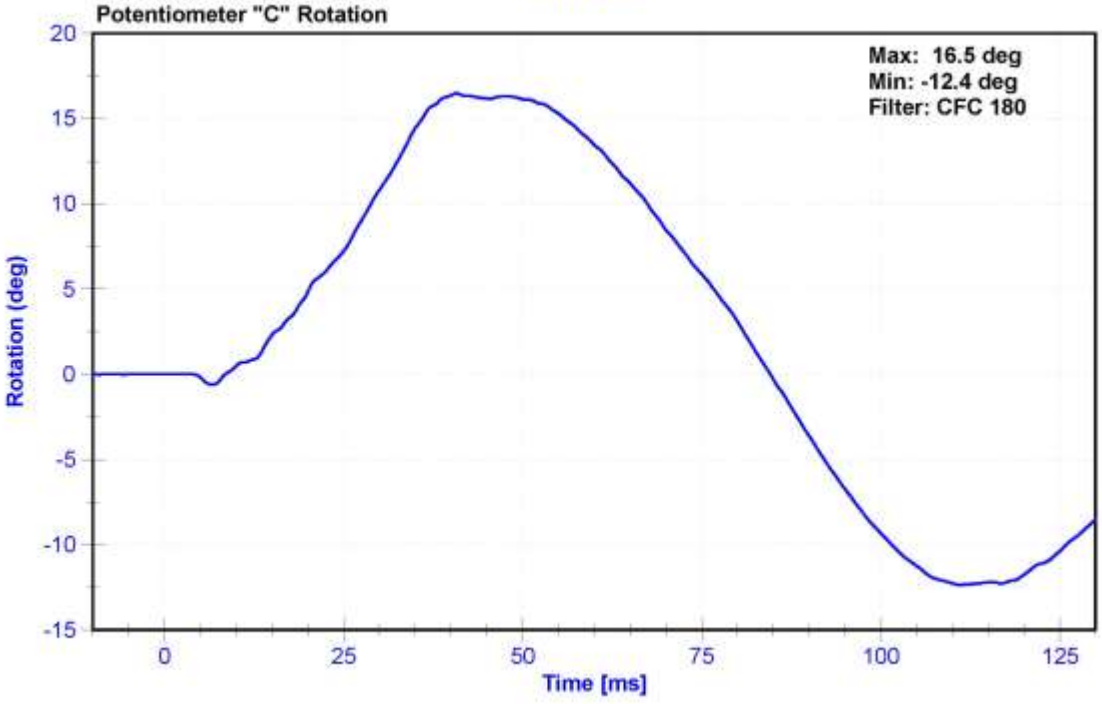
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum "A" Potentiometer	SP22G	DS-094	10/31/2018	10/31/2019
Condyle "B" Potentiometer	SP22G	DS-095	10/31/2018	10/31/2019


Pendulum Velocity
Min: -6.9 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 52.7 deg
Min: -31.1 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 36.4 deg
Min: -18.9 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 16.5 deg
Min: -12.4 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

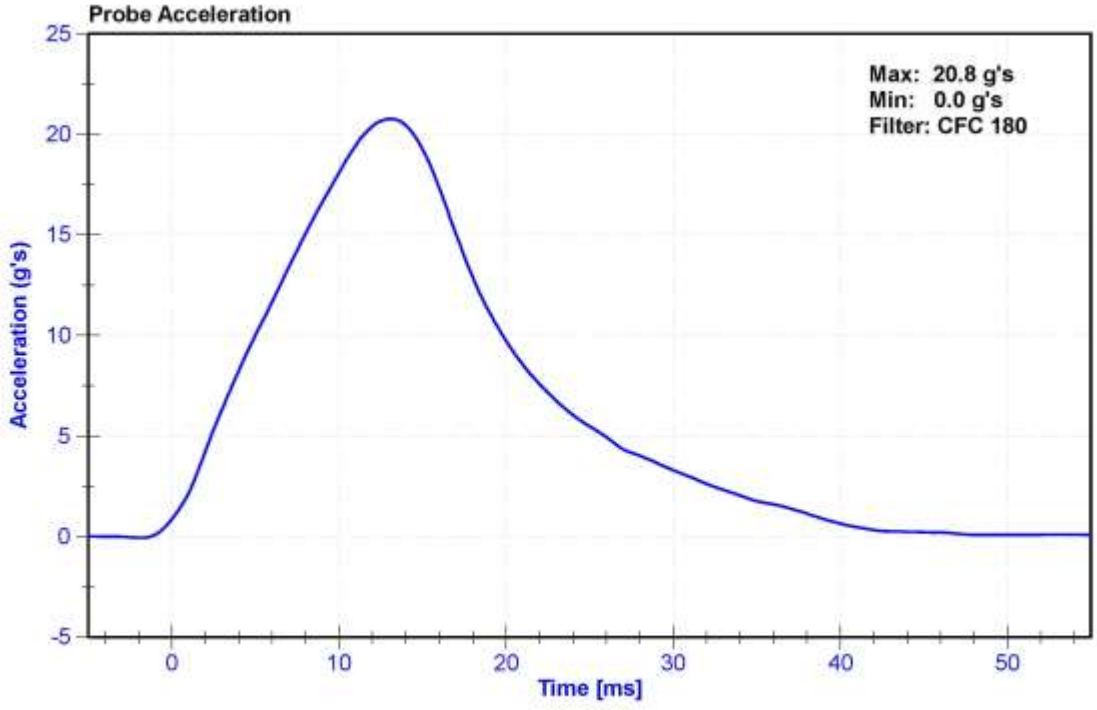
ATD Manufacturer	Denton	Test Technician	D. Reinhard
ATD Serial Number	D037	Laboratory Supervisor	K. Brogan

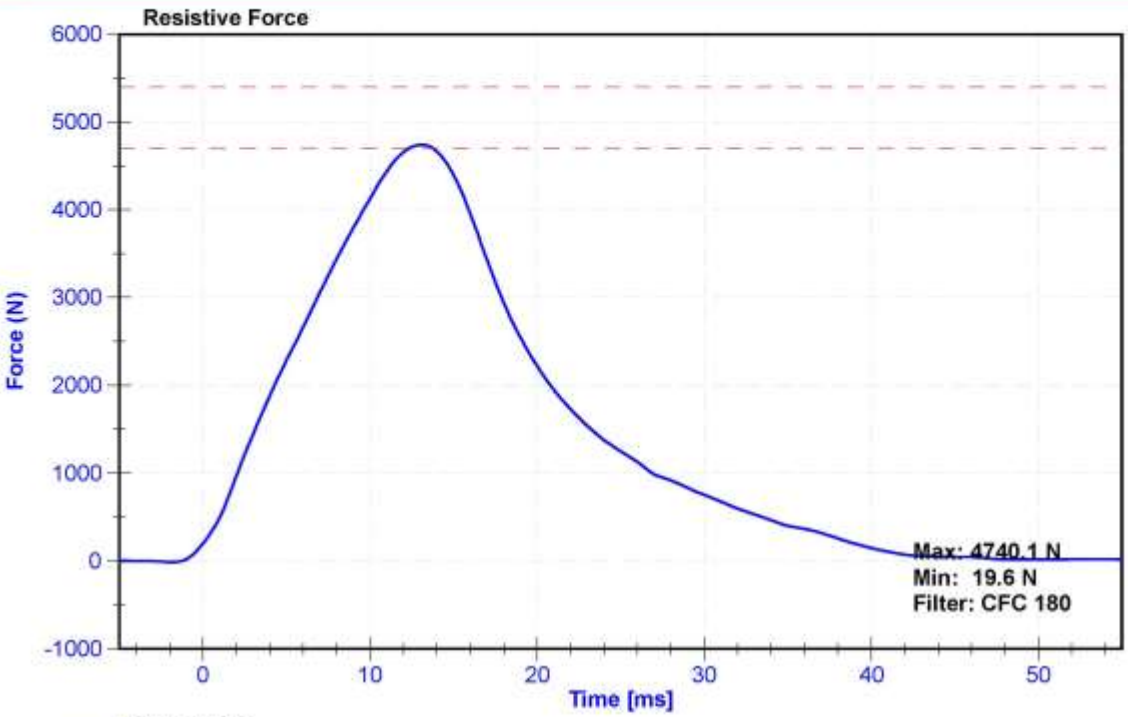
Results

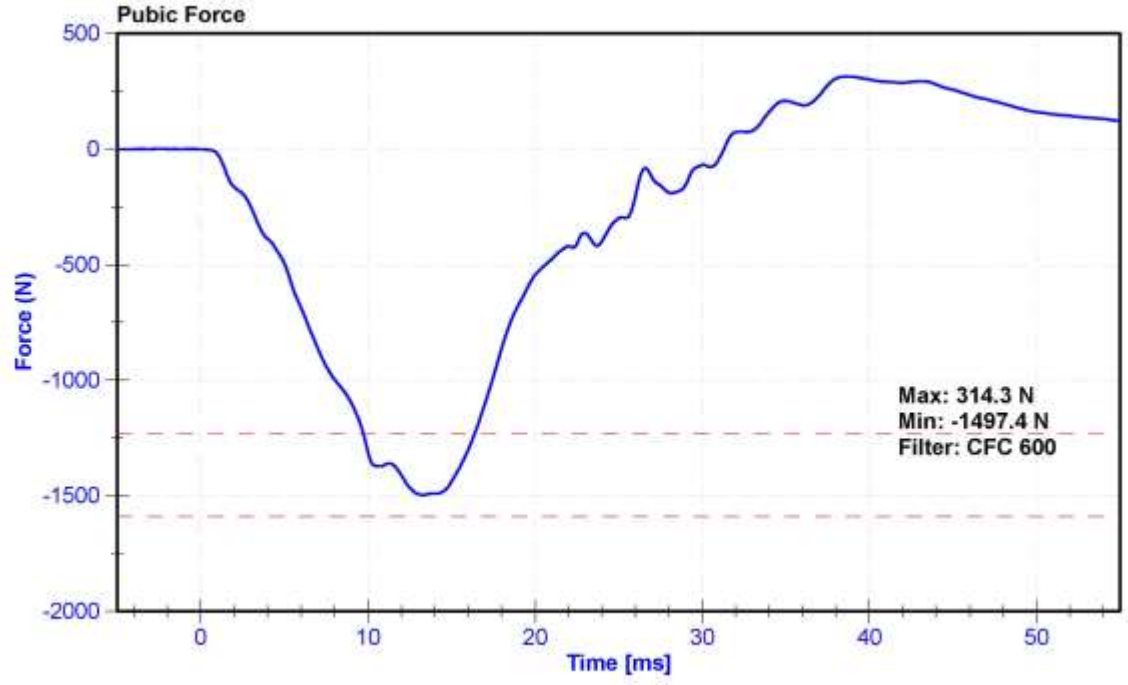
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Resistive Force	4700	5400	N	4740.1	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.10	Pass
Pubic Force	-1590	-1230	N	-1497.4	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.30	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Pubic Load Cell	Humanetics IF-556	LC-139 Fy GFE	10/4/2018	10/4/2019




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4740.1 N
Min: 19.6 N
Filter: CFC 180


Pubic Force
Force (N)
500
0
-500
-1000
-1500
-2000
0
10
20
30
40
50
Time [ms]
Max: 314.3 N
Min: -1497.4 N
Filter: CFC 600

APPENDIX V

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: D037		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	AC-P66940	ENDEVCO	10/5/2018
		Y	AC-MS25917	MSI 64CM30	10/5/2018
		Z	AC-P94392	ENDEVCO	10/10/2018
	Redundant	X	AC-P78520	ENDEVCO	10/5/2018
		Y	AC-MS25920	MSI 64CM30	10/5/2018
		Z	AC-P94090	ENDEVCO	10/5/2018
Thorax Rib Displacement Potentiometers	Upper	Y	DS-0552-01GFE	Honeywell	11/28/2018
	Middle	Y	DS-807GFE	Honeywell	11/27/2018
	Lower	Y	DS-0552-03GFE	Honeywell	11/27/2018
Abdomen Load Cells	Forward	Y	LC-200	DENTON	10/4/2018
	Middle	Y	LC-1529	DENTON	10/4/2018
	Rear	Y	LC-1533	DENTON	12/4/2018
Lower Spine Accelerometers (T12)		X	AC-P94951	ENDEVCO	11/16/2018
		Y	AC-MS25941	MSI 64CM30	11/16/2018
		Z	AC-MS25879	MSI 64CM30	11/16/2018
Pubic Symphysis Load Cell		Y	LC-139 Fy GFE	Humanetics IF-556	10/4/2018

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	AC-A192214	MSI 1201-1000	6/26/2018
Vehicle Center of Gravity	Y	AC-A217564	MSI 1201-1000	6/26/2018
Vehicle Center of Gravity	Z	AC-A254670	MSI 1201-1000	6/22/2018
Left Floor Sill	Y	AC-A217568	MSI 1201-1000	8/22/2018
A-Pillar Sill	Y	AC-A196602	MSI 1201-1000	6/26/2018
A-Pillar Low	Y	AC-A247205	MSI 1201-1000	8/22/2018
A-Pillar Mid	Y	AC-A217558	MSI 1201-1000	9/20/2018
B-Pillar Sill	Y	AC-A217581	MSI 1201-1000	10/12/2018
B-Pillar Low	Y	AC-A250362	MSI 1201-1000	1/29/2018
B-Pillar Mid	Y	AC-A255868	MSI 1201-1000	3/23/2018
Driver Seat	Y	AC-A250346	MSI 1201-1000	10/3/2018
Engine Top	X	AC-A217553	MSI 1201-1000	10/29/2018
Engine Top	Y	AC-A217559	MSI 1201-1000	10/29/2018
Firewall	Y	AC-A250372	MSI 1201-1000	8/17/2018
Right Roof	Y	AC-A196609	MSI 1201-1000	6/28/2018
Right Floor Sill	Y	AC-A250376	MSI 1201-1000	10/3/2018
Rear Floorpan	X	AC-A197058	MSI 1201-1000	6/26/2018
Rear Floorpan	Y	AC-A250345	MSI 1201-1014	8/17/2018