

REPORT NUMBER: 214P-CAL-23-010

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

**Toyota Motor Corporation
2023 Toyota GR Corolla
5 Door Hatchback**

NHTSA No: C20235101

**PREPARED BY:
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September 5, 2023

FINAL REPORT

**PREPARED FOR:
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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WASHINGTON, D.C. 20590**

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9-13-2023
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TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract A 31.00 km/h (19.3 mph), 285° oblique compliance test was conducted on the subject 2023 Toyota GR Corolla 5 Door Hatchback 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. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on August 22, 2023. The impact velocity of the vehicle was 30.97 km/h, and the ambient temperature at the struck (passenger's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was -307 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Front Passenger ATD (ES-2re)</th> </tr> <tr> <th>Units</th> <th>IARV</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td>1000</td> <td>226.353</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>21.934</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>740.868</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>2348.798</td> </tr> </tbody> </table> 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.						Measurement Description	Front Passenger ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	226.353	Maximum Thoracic Rib Deflection	mm	44	21.934	Total Abdominal Force	N	2500	740.868	Pubic Symphysis Force	N	6000	2348.798
Measurement Description	Front Passenger ATD (ES-2re)																											
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Pubic Symphysis Force	N	6000	2348.798																									
17. Key Words Compliance Testing Side Impact Protection Pole Test ES-2re SID-IIs				18. Distribution Statement 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 2023 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 2023 Toyota GR Corolla 5 Door Hatchback. 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 2023 Toyota GR Corolla 5 Door Hatchback. The subject vehicle was towed into the rigid pole at an angle of 285° and a velocity of 30.97 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on August 22, 2023. 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-01 Test Procedure, dated September 2012. The side impact event was documented by nine High Speed Cameras and one 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
Head Injury Criteria (HIC36)		1000	226.353
Upper Rib Deflection	mm	44	21.934
Mid Rib Deflection	mm	44	17.854
Lower Rib Deflection	mm	44	18.529
Abdominal Load (front)	N		150.767
Abdominal Load (mid)	N		185.188
Abdominal Load (rear)	N		435.934
Total Abdominal Force	N	2500	740.868
Pubic Symphysis Force	N	6000	2348.798

SECTION 2

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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DATA SHEET NO. 1
TEST VEHICLE INFORMATION AND OPTIONS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback

NHTSA No.: C20235101

Test Facility: Calspan

Test Date: 08/22/2023

TEST VEHICLE INFORMATION AND OPTIONS

Make	Toyota	Anti-Lock Brakes (ABS)	Yes
Model	GR Corolla	All-Wheel Drive (AWD)	Yes
Body Style	5 Door Hatchback	Traction Control System (TCS)	Yes
VIN	JTNABAAE3PA004901	Electric Stability Control (ECS)	Yes
Body Color	Red	Curtain Airbags	Yes
Engine Displacement (L)	1.6	Torso Airbags – Front Seats	Yes
Type / No. Cylinders	I3 Turbo	Torso Airbags – Rear Seats	Yes
Engine Placement	Transverse	Combination/Head Torso Bag	No
Transmission Type	Manual	Pelvic Airbag – Front Seats	No
Transmission Speeds	6-speed	Pelvis Airbag – Rear Seats	No
Overdrive	No	Knee Airbag – Driver	Yes
Final Drive	AWD	Knee Airbag – Front Passenger	No
Odometer Reading (mi)	11 miles	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	No
		Other Safety Restraint - Seat Cushion Airbag	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Toyota Motor Corporation	GVWR (kg)	1914
Date of Manufacture	05/23	GVWR Front (kg)	1050
Vehicle Type	Passenger Car	GVWR Rear (kg)	971

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bucket	Split Bench	N/A	
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				400
Cargo Weight (RCLW) (kg)				41.8

DATA SHEET NO. 2

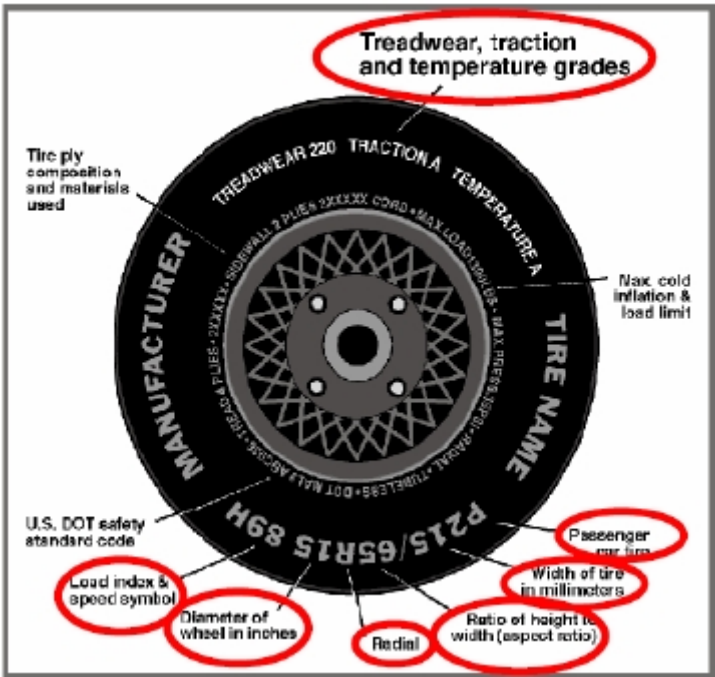
VEHICLE TIRE INFORMATION

Test Vehicle:	2023 Toyota GR Corolla 5 Door Hatchback
Test Facility:	Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023

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)	240	230
Recommended Tire Size	235/40ZR18	235/40ZR18
Tire Sidewall	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Tire Size on Vehicle	235/40ZR18	235/40ZR18
Tire Manufacturer Model	Michelin	Michelin
Tire Name	Pilot Sport	Pilot Sport
Tire Type	Summer	Summer
Tire Width	235	235
Aspect Ratio	40	40
Radial	Yes	Yes
Wheel Diameter	18"	18"
Load Index / Speed Symbol	95Y	95Y
Treadwear	320	320
Traction Grade	AA	AA
Temperature Grades	A	A

DATA SHEET NO. 3
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	337	330	344	342
Tire Placard	kPa	240	240	230	230

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	447	300		456	343		454	338	
Right	kg	419	324		449	363		451	365	
Ratio	%	58.1	41.8		56.2	43.8		56.3	43.7	
Totals	kg	866	624	1490	905	706	1611	905	703	1608

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1490	(A)
Weight of Test Dummy	kg	81	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	41.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1612.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	Fully Loaded	As Tested
Driver Door Sill Angle	Deg	+0.20	-0.65	+0.20
Front Passenger Sill Angle	Deg	-0.25	+0.30	-0.20
Front Bumper-Line Angle	Deg	+0.55	-0.05	+0.10
Rear Bumper-Line Angle	Deg	-0.05	+0.35	+0.35

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	2639
Vertical Impact Reference Line Aft of Front Axle	mm	1269

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting and Tool Kit	6
Left Headlight and Tail Light	5
Roof Rail Cross Bars	6
Front Bumper Fascia	8
Engine Cover with Air Ducts	2
Ballast (if any)	0

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

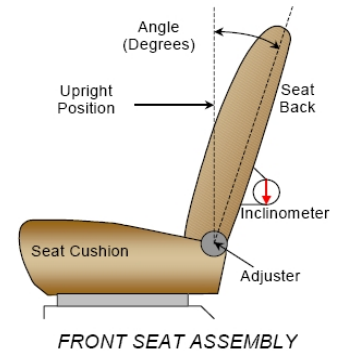
Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023

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	Degrees	4.0
Front Passenger Seat	Degrees	3.8



SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	SCR P Height Position	SCR P Height (mm)		
			Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	13.9	Max	-	-	-
		Mid	-	-	-
		Min	18	28	38
Front Passenger Seat	Fixed	Max			
		Mid			
		Min			

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Placed in Position #	
	mm	Detents	mm	Detents
Driver Seat	260	27 (0-26)	130	13
Front Passenger Seat	260	27 (0-26)	130	13

SEAT BELT ANCHORAGE ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Front Passenger Seat	4 (0-3)	Uppermost

HEAD RESTRAINT ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Front Passenger Seat	3 (0-2)	Uppermost

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023

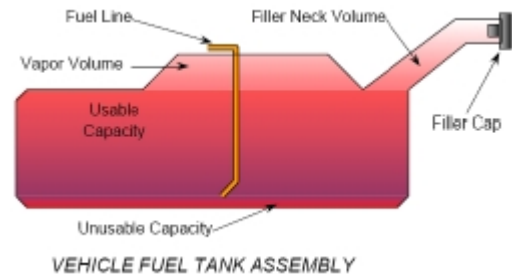
FUEL TANK CAPACITY

Description	Liters
Usable Capacity of (Form No.1)	50.0
Usable Capacity of (Owner's Manual)	50.0
92 - 94% of Usable Capacity	46.0 - 47.0
Actual Amount of Solvent Used in Test	46.4

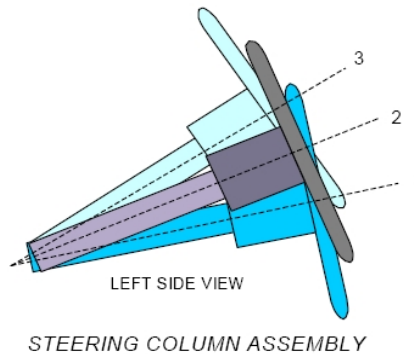
FUEL PUMP

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.



STEERING COLUMN POSITIONS

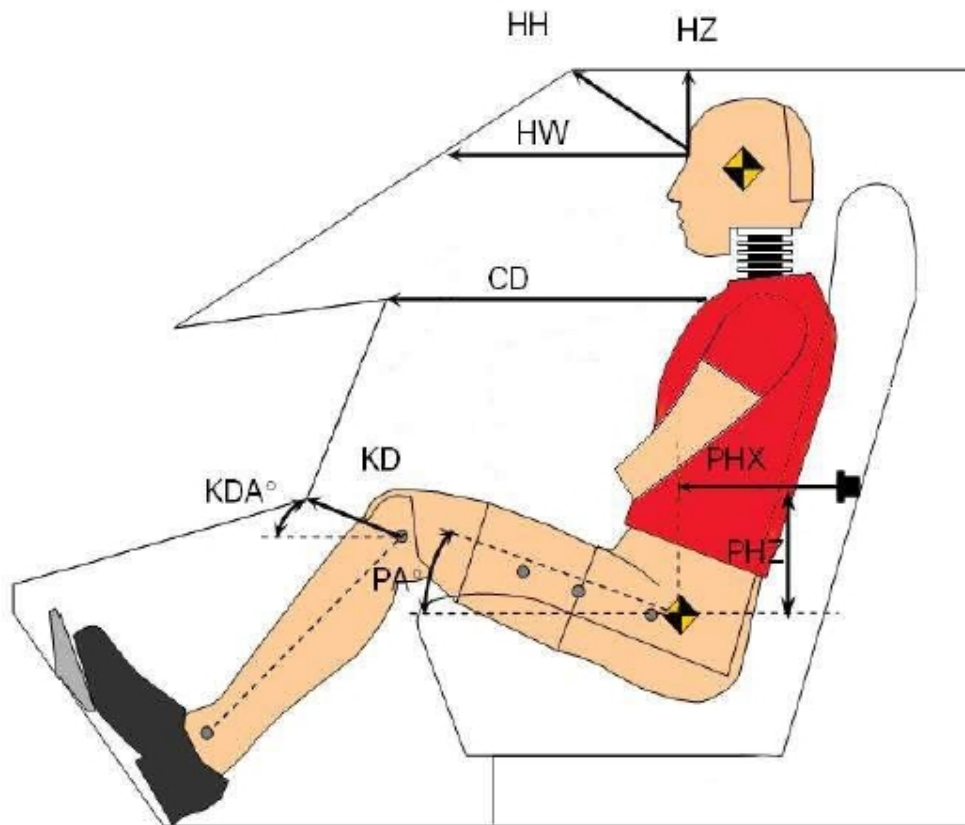


	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	18.7	
Geometric center - Position No. 2	20.7	
Uppermost - Position No. 3	22.6	
Telescoping Steering Wheel Travel		50
Test Position	20.7	25

DATA SHEET NO. 6
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023



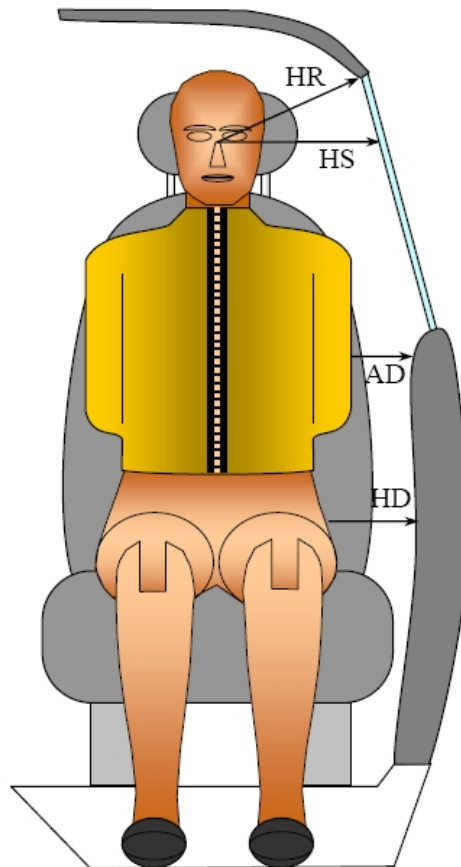
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Front Passenger	
		Length (mm)	Angle (°)
HH	Head to Header	369	
HW	Head to Windshield	596	
HZ	Head to Roof Liner	150	
ND	Nose to Dash	567	
CD	Chest to Dash	494	
KD(L) / KDA(L)°	Left Knee to Dash	152	43.0
KD(R) / KDA(R)°	Right Knee to Dash	165	41.5
PAX°	Pelvic Tilt Angle (X-Axis)		24.6
PAY°	Pelvic Tilt Angle (Y-Axis)		1.0
PHX	Hip Point to Striker (X-Axis)	199	
PHZ	Hip Point to Striker (Z-Axis)	217	

DATA SHEET NO. 7
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023



FRONT VIEW OF DUMMY

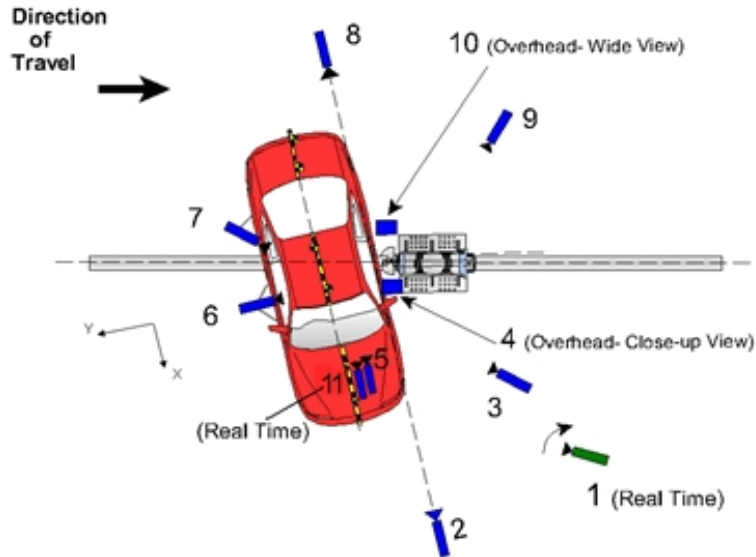
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Front Passenger
HR	Head to Side Header	mm	180
HS	Head to Side Window	mm	321
AD	Arm to Door	mm	72
HD	H-Point to Door	mm	152

DATA SHEET NO. 8 LOCATION OF CAMERAS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023



CAMERA LOCATIONS AND DATA

CAMERA LOCATIONS AND DATA

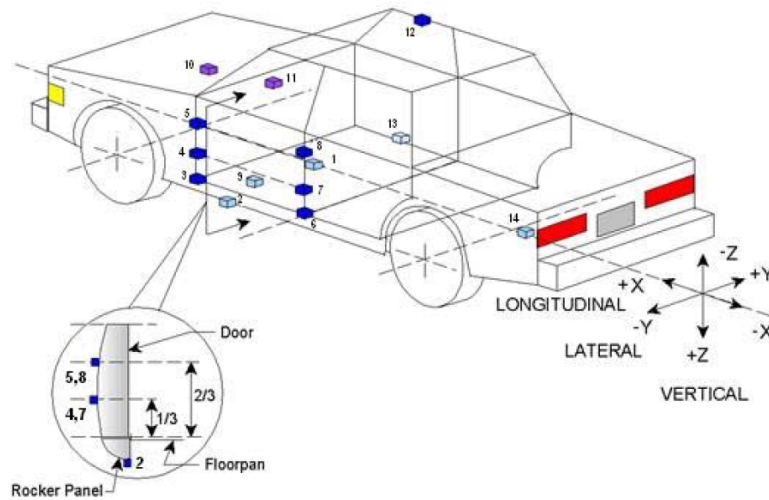
No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front ground level - impact view	-7120	-408	-1430	28	1000
3	Impact side 45° - forward pole view	-5464	1016	-1394	24	1000
4	Overhead Close-up view of impact	0	0	-8992	28	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				12.5	1000
8	Rear ground level - impact view	7697	-220	-1395	28	1000
9	Impact side 45° - rearward pole view	4871	3017	-1415	24	1000
10	Overhead wide - view of impact	0	-349	-8992	16	1000

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 75° angle to the rigid pole.

DATA SHEET NO. 9
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2336	29	586
2	Left Floor Sill	2585	667	366
3	A-Pillar Sill	2900	653	373
4	A-Pillar Low	2913	632	583
5	A-Pillar Mid	2949	612	1034
6	B-Pillar Sill	1995	658	390
7	B-Pillar Low	1926	657	688
8	B-Pillar Mid	1872	627	958
9	Seat	2260	585	362
10	Engine	3664	330	853
11	Firewall	3649	309	889
12	Roof	1767	-519	1446
13	Right Floor Sill	2581	-667	360
14	Rear Deck	934	3	540

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: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023

Loc. No	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Vehicle CG	X	g	9.58	38.10	-12.71	24.50
	Vehicle CG	Y	g	22.66	39.90	-32.96	23.70
	Vehicle CG	Z	g	10.55	37.00	-8.92	19.65
	Vehicle CG Resultant	N/A	g	35.24	24.00	0.11	-14.00
2	Floor Sill (Left)	Y	g	1.27	25.60	-20.55	29.50
3	A Pillar Sill	Y	g	8.20	42.05	-35.65	15.90
4	A Pillar Low	Y	g	8.90	43.15	-26.98	38.20
5	A Pillar Mid	Y	g	40.62	29.35	-58.52	24.75
6	B Pillar Sill	Y	g	110.09	17.60	-116.48	14.10
7	B Pillar Low	Y	g	58.96	21.15	-202.05	16.75
8	B Pillar Mid	Y	g	78.06	13.20	-73.65	9.60
9	Seat	Y	g	11.97	42.40	-40.76	14.00
10	Engine Top	X	g	5.83	103.15	-16.51	35.55
	Engine Top	Y	g	2.94	183.90	-14.82	42.70
11	Firewall	Y	g	1.48	238.60	-14.64	15.70
12	Roof	Y	g	2.05	250.90	-25.08	47.40
13	Floor Sill (Right)	Y	g	29.63	42.45	-52.05	13.40
14	Rear Deck	X	g	2.02	163.50	-5.72	34.35
	Rear Deck	Y	g	1.68	176.25	-17.26	62.25

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback NHTSA No.: C20235101
 Test Facility: Calspan Test Date: 08/22/2023

Dummy Serial No. D037

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	3.31	15.85	-15.90	60.10
Lateral	Y	12.27	111.35	-40.28	58.20
Vertical	Z	12.61	19.30	-6.00	63.95
Resultant	N/A	43.26	59.60		
HIC36 (t1, t2)	N/A	226.35		t1 = 38.45	t2 = 74.45
THORAX DEFLECTION (mm)					
Upper Rib	Y	21.93	50.15	-1.41	300.00
Middle Rib	Y	17.85	47.75	-1.19	85.00
Lower Rib	Y	18.53	47.20	0.00	-23.60
ABDOMINAL FORCES (N)					
Front	Y	150.77	62.35	-34.68	16.60
Middle	Y	185.19	49.30	-13.04	299.65
Rear	Y	435.93	47.00	-13.06	297.95
SUM	N/A	740.87	48.25		
PELVIS FORCES (N)					
Pubic Symphysis	Y	41.25	12.70	-2348.80	50.20

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

DATA SHEET NO. 12
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023

IMPACT POINT DATA

Measured Parameter	Units	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm	1269
Actual Impact Point - Aft of Front Axle	mm	1267
Difference	mm	2

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Passenger Seat Dummy (ES2re)
Head Contact	Curtain Airbag, Side Header, and Head Restraint
Upper Torso Contact	Seat Back
Lower Torso Contact	Seat Back
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
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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	B-Pillar & C Pillar Buckled
Sill Separation	None
Windshield Damage	Cracked Throughout
Side Window Damage	Struck Side Front Passenger Window Shattered Completely
Other Notable Effects	Roof Cracked and Separated Along Roof Line

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023

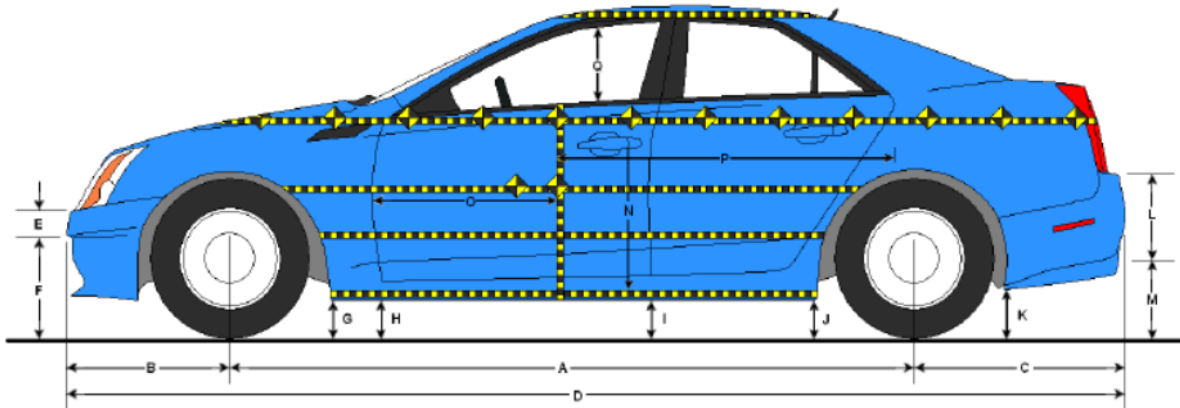
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Front Occupant	
	Mounted	Deployed
Front Airbag	Yes	No
Knee Airbag	No	N/A
Curtain Airbag	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	Yes
Seat Belt Pretensioner	Yes	Yes
Seat Belt Load Limiter	Yes	Yes
Other - Seat Cushion Airbag	Yes	No

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023



LEFT SIDE VIEW

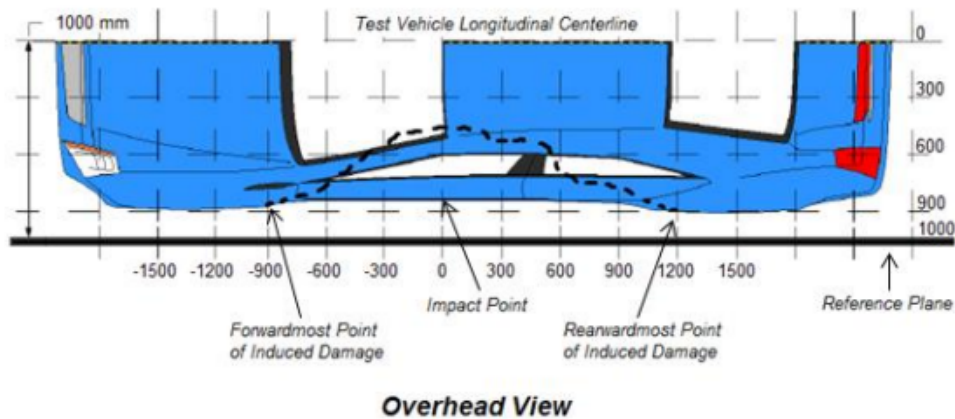
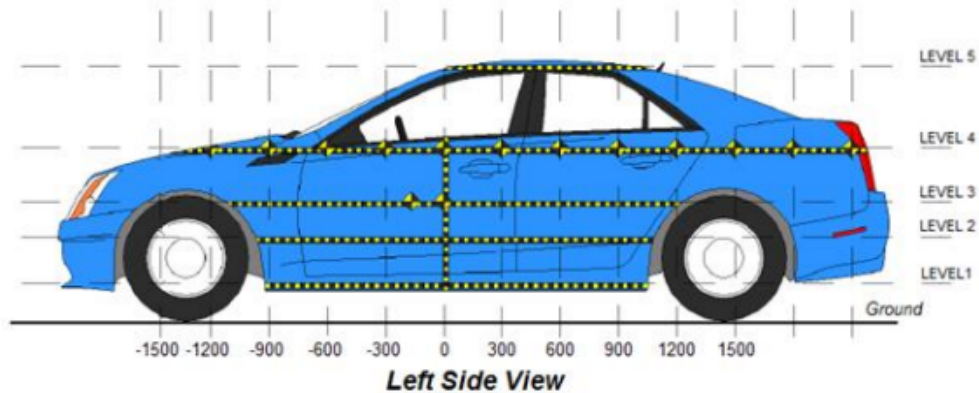
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

No.	Measurement Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2639	2654	15
B	Front Axle to FSOV	848	820	-28
C	Rear Axle to RSOV	824	822	-2
D	Total Vehicle Length at Centerline	4312	4297	-15
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	426	441	15
G	Sill Height at Front Wheel Well	172	168	-4
H	Sill Height at Front Door Leading Edge	172	172	0
I	Sill Height at B Pillar	182	170	-12
J1	Sill Height at Rear Wheel Well	185	183	-2
J2	Pinch Weld Height at Rear Wheel Well	191	207	16
K	Sill Height Aft of Rear Wheel Well	215	230	15
L	Rear Bumper Thickness	180	180	0
M	Rear Bumper Bottom to Ground	368	378	10
N	Sill Height to Window Bottom Sill	799	818	19
O	Front Door Leading Edge to Impact CL	784	738	-46
P	Rear Door Trailing Edge to Impact CL	1222	1137	-86
Q	Front Window Opening	367	393	26
R	Right Side Length	4164	4138	-26
S	Left Side Length	4164	4163	-1
T	Vehicle Width at B-Pillars	1798	1645	-153

DATA SHEET NO. 14
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	571	282	0
2	Occupant H-Point	mm	818	291	0
3	Mid-Door	mm	881	307	0
4	Window Sill	mm	1202	263	0
5	Window Top	mm	1748	37	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: 2023 Toyota GR Corolla 5 Door Hatchback
 Test Facility: Calspan

NHTSA No.: C20235101
 Test Date: 08/22/2023

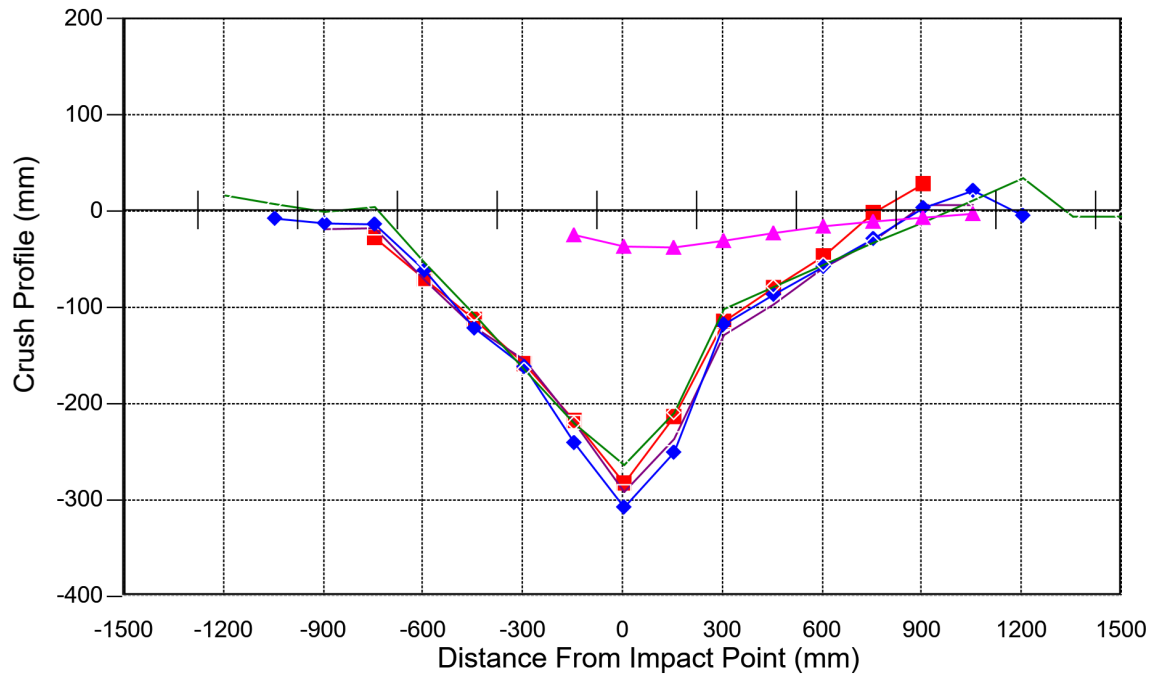
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200				-763					-780					17	
-1050			-915	-780				-908	-788				-7	8	
-900		-908	-904	-789			-890	-892	-789			-18	-12	0	
-750	-867	-883	-883	-797		-840	-866	-870	-802		-27	-17	-13	5	
-600	-864	-879	-884	-852		-794	-808	-823	-799		-70	-71	-61	-53	
-450	-868	-877	-886	-817		-756	-757	-765	-710		-112	-120	-121	-107	
-300	-871	-876	-887	-828		-713	-722	-726	-664		-158	-154	-161	-164	
-150	-872	-876	-888	-838	-558	-655	-657	-648	-618	-534	-217	-219	-240	-220	-24
0	-871	-876	-889	-845	-574	-589	-585	-582	-582	-538	-282	-291	-307	-263	-36
150	-869	-876	-889	-850	-578	-656	-640	-639	-641	-541	-213	-236	-250	-209	-37
300	-867	-876	-887	-851	-580	-753	-748	-770	-750	-550	-114	-128	-117	-101	-30
450	-863	-874	-885	-847	-579	-784	-778	-799	-769	-557	-79	-96	-86	-78	-22
600	-859	-873	-883	-842	-576	-813	-815	-826	-787	-561	-46	-58	-57	-55	-15
750	-870	-874	-882	-837	-567	-869	-844	-854	-805	-557	-1	-30	-28	-32	-10
900	-889	-899	-895	-836	-551	-918	-906	-899	-825	-545	29	7	4	-11	-6
1050		-912	-912	-838	-525		-919	-934	-850	-523		7	22	12	-2
1200			-922	-837				-918	-872				-4	35	
1350				-833					-828					-5	
1500				-820					-815					-5	

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023



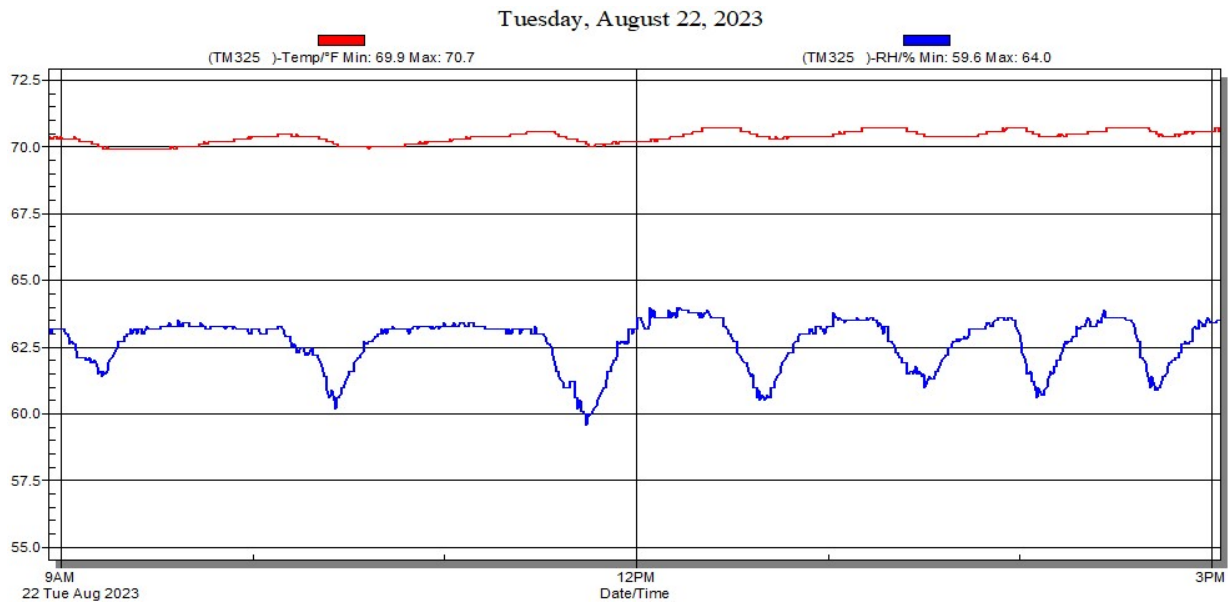
LEVEL 1 Side Sill: 324 mm above ground	LEVEL 2 H-Point: 532 mm above ground
LEVEL 3 Mid Door: 666 mm above ground	LEVEL 4 Window Sill: 932 mm above ground
LEVEL 5 Window Top: 1403 mm above ground	

Vehicle Exterior Crush Measurements - Visual Representation

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

Test Vehicle: 2023 Toyota GR Corolla 5 Door Hatchback
Test Facility: Calspan

NHTSA No.: C20235101
Test Date: 08/22/2023



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

APPENDIX I
PHOTOGRAPHS

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2	Post Test Frontal View of Test Vehicle	I-3
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4	Post-Test Rear View of Test Vehicle	I-4
5	Pre-Test Impacted Side View of Test Vehicle	I-5
6	Post-Test Impacted Side View of Test Vehicle	I-5
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8	Pre-Test Right $\frac{3}{4}$ Rear View of Vehicle and Pole	I-6
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16	Pre-Test Dummy Shoulder and Door Top View	I-10
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18	Pre-Test Interior of Front Door Closed (through opposite window)	I-11
19	Post-Test Interior of Front Door Showing Dummy Impact Locations	I-12
20	Impact Event	I-12
21	Post-Test Impact Zone Close-Up View	I-13
22	Post-Test $\frac{3}{4}$ Front View of Impact Zone	I-13
23	Post-Test $\frac{3}{4}$ Rear View of Impact Zone	I-14
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25	Close-Up View of Vehicle's Certification Label	I-15
26	Close-Up View of Vehicle's Tire Placard Label	I-15



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



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



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

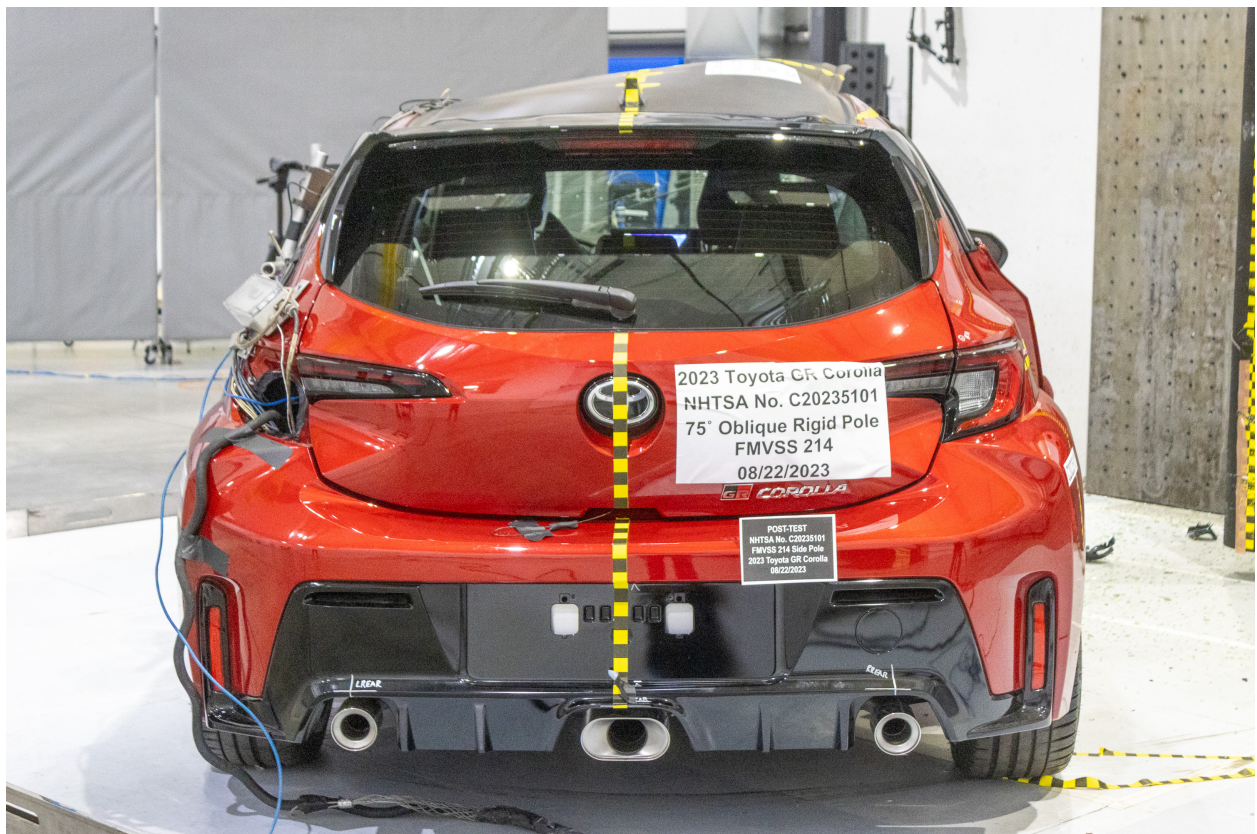


Figure A-4: Post-Test Rear View of Test Vehicle



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 $\frac{3}{4}$ Front View of Vehicle and Pole



Figure A-8: Pre-Test Right $\frac{3}{4}$ 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



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



Figure A-22: Post-Test $\frac{3}{4}$ Front View of Impact Zone



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



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



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

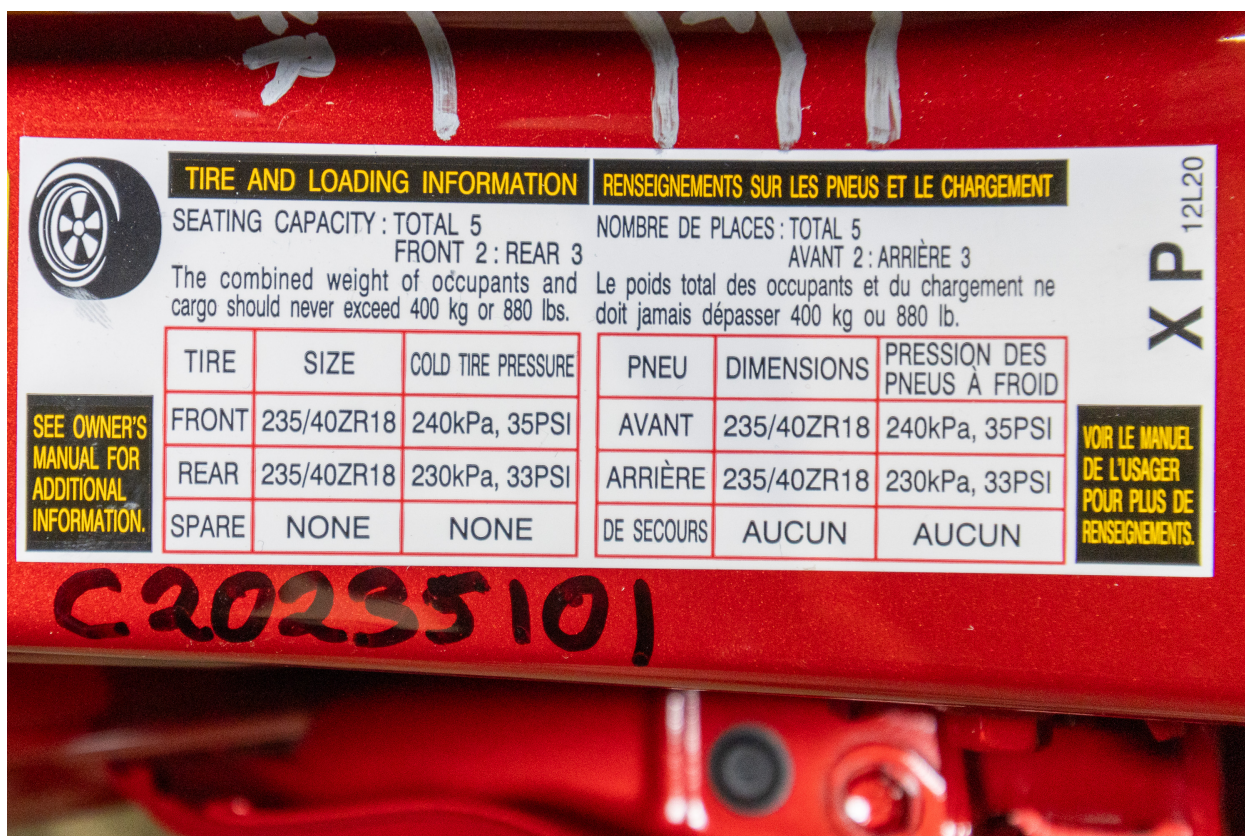
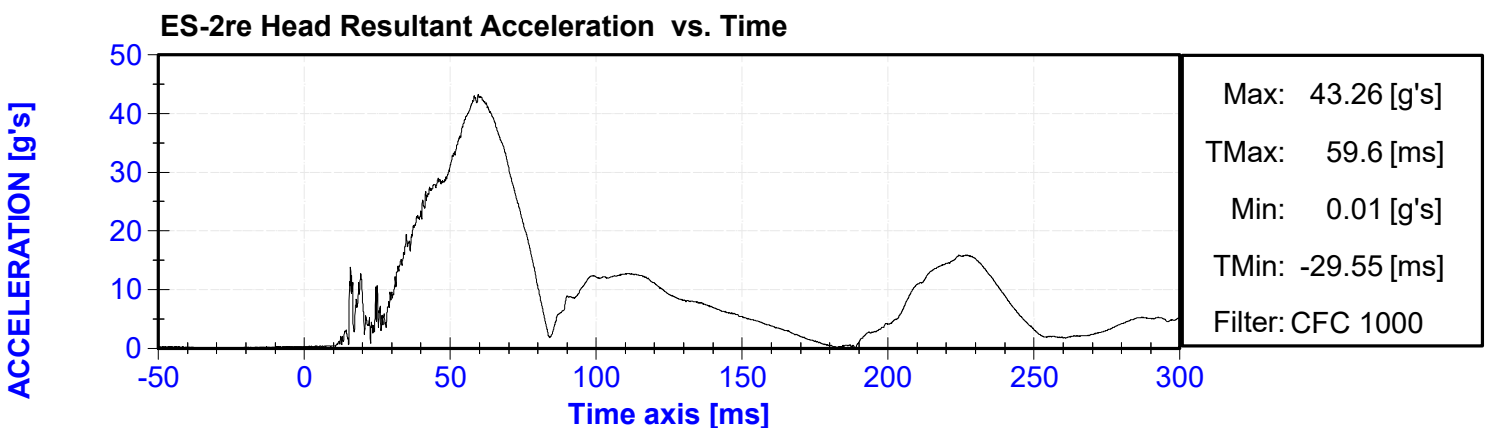
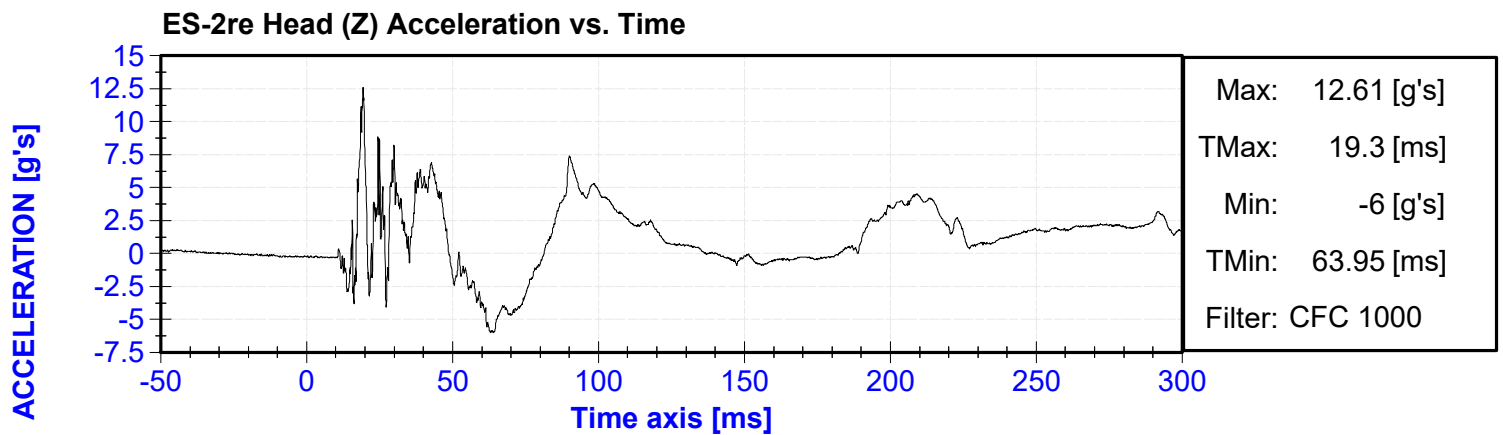
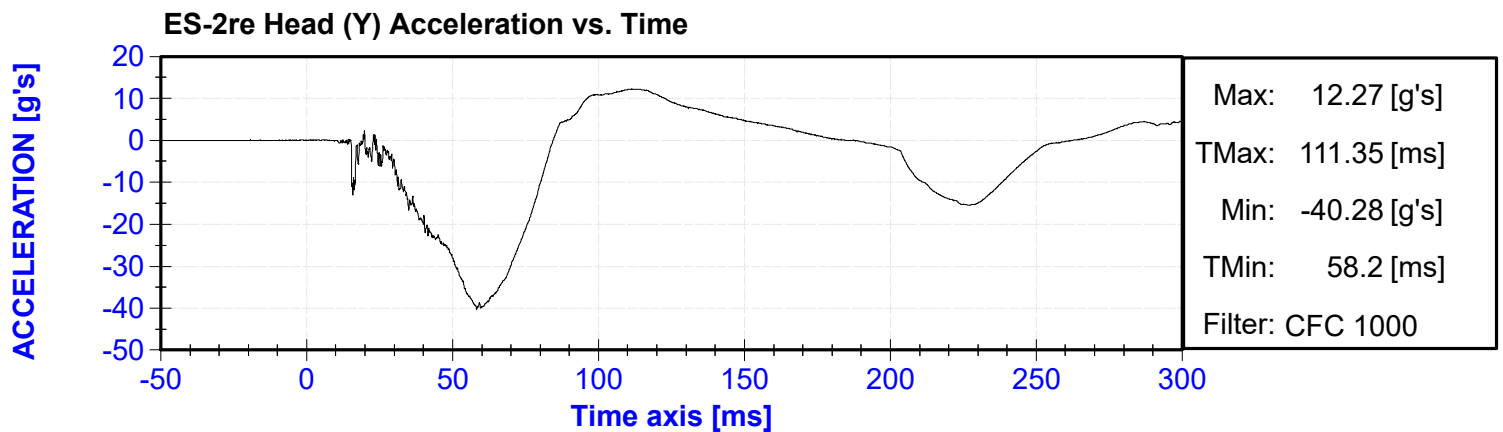
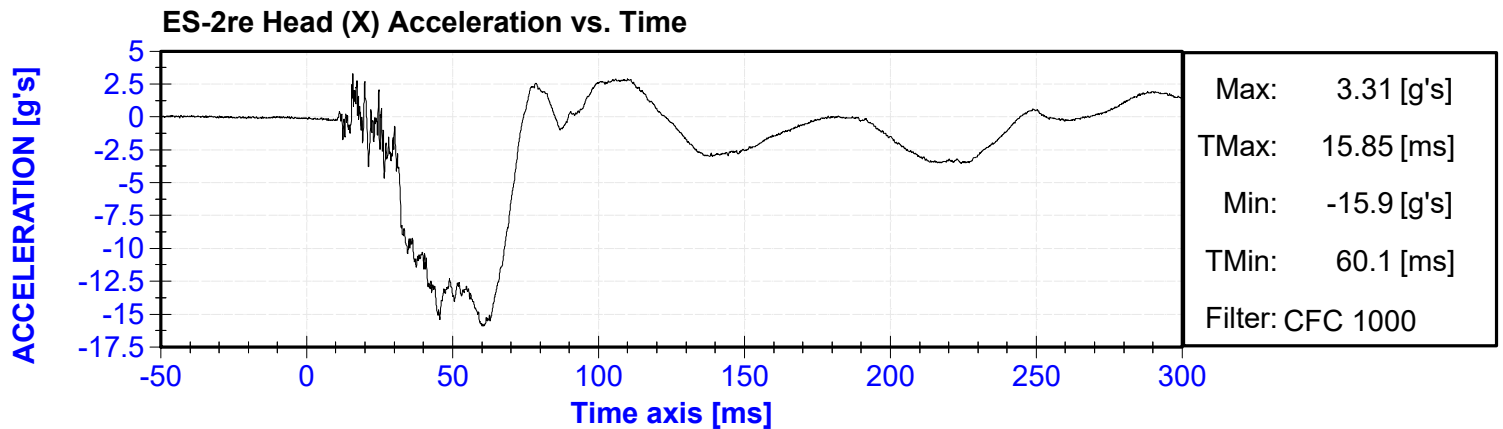


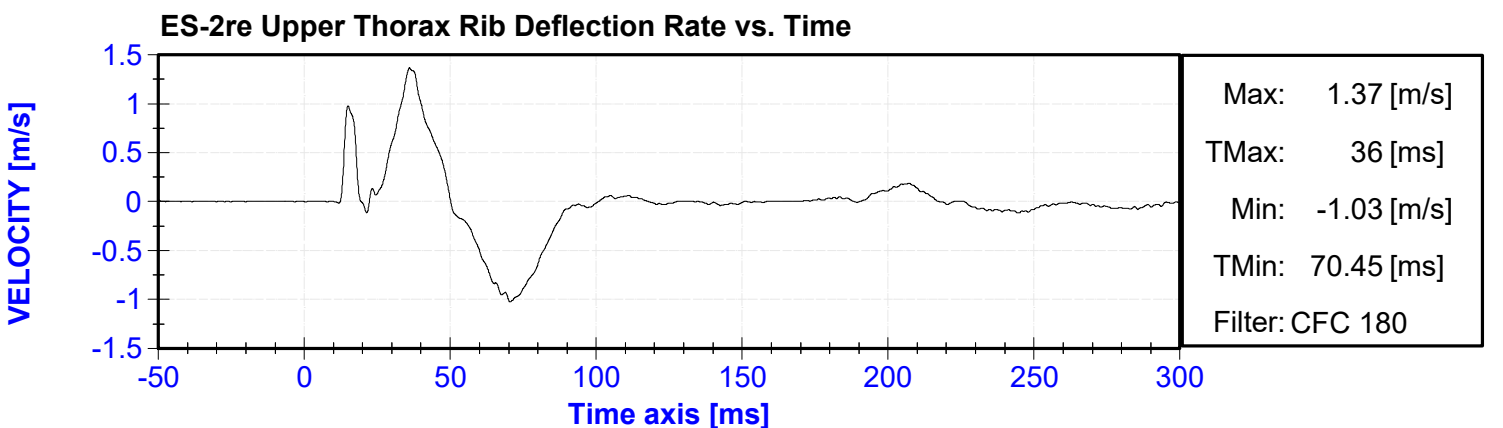
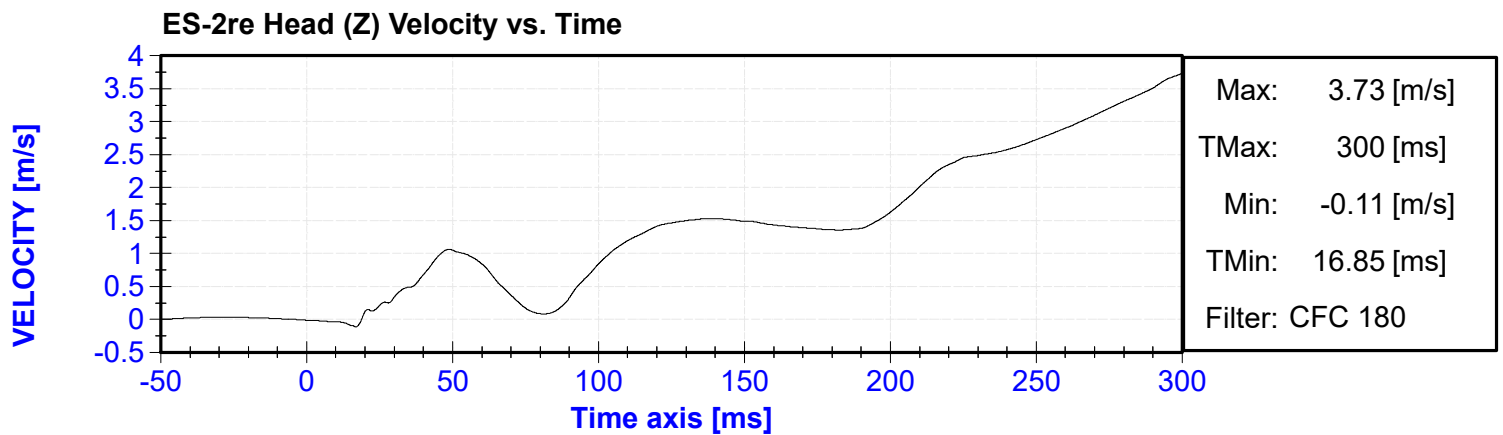
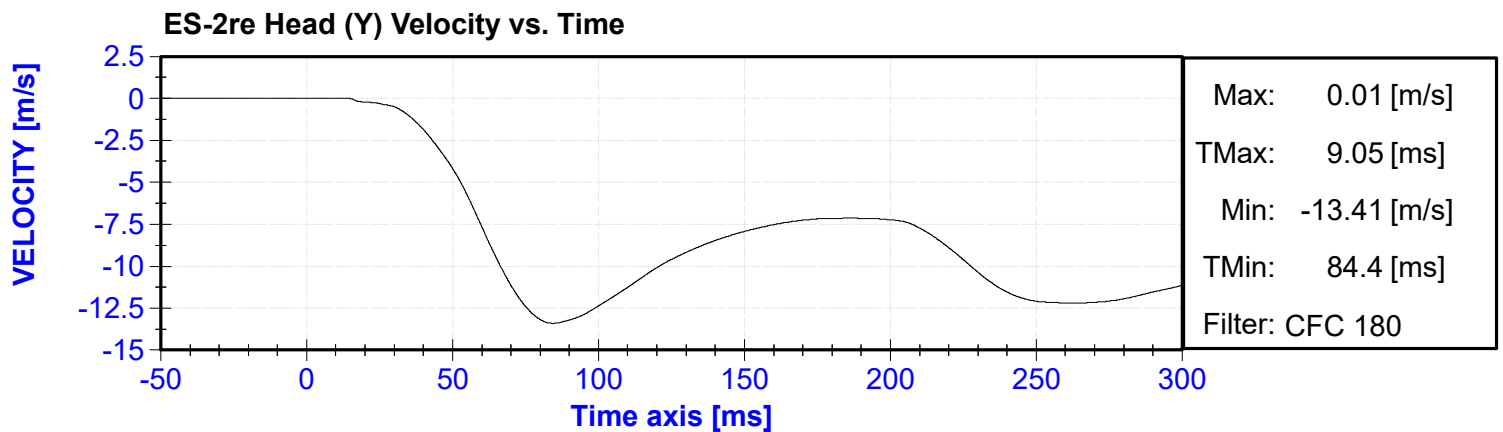
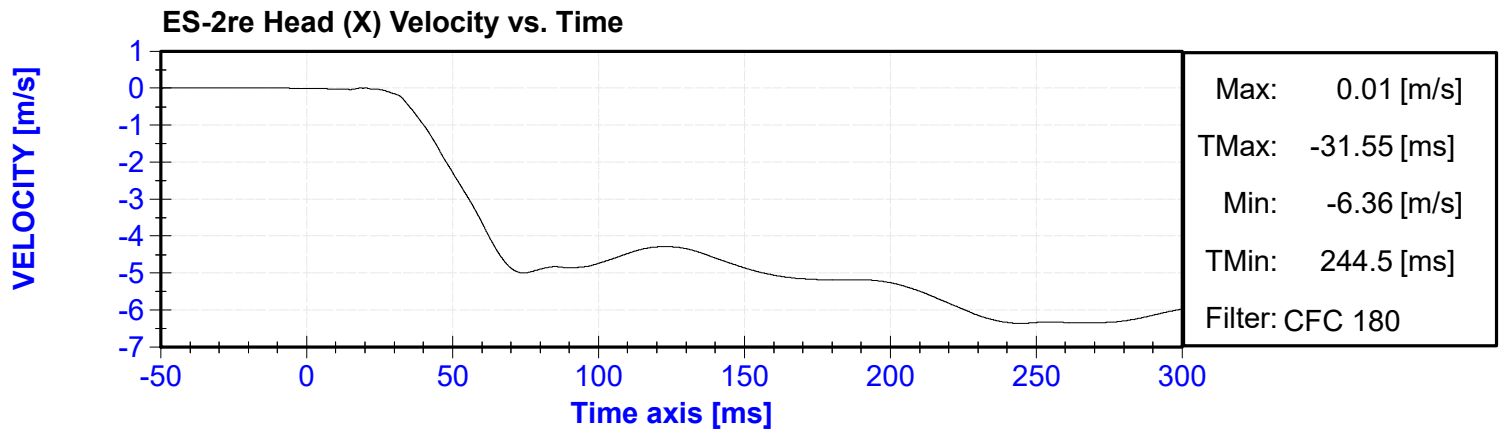
Figure A-26: Close-Up View of Vehicle's Tire Placard Label

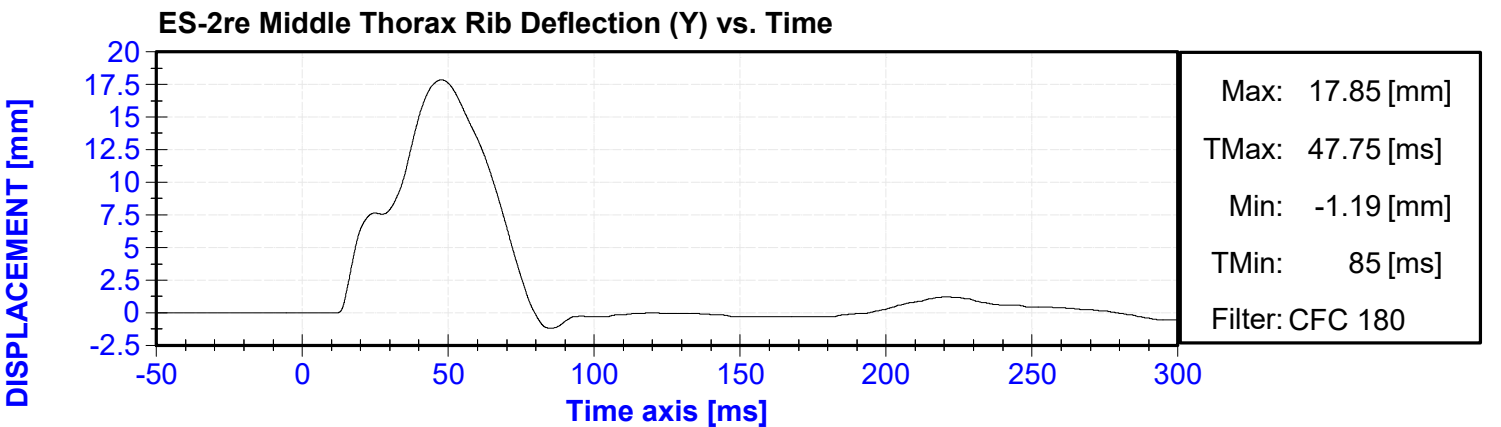
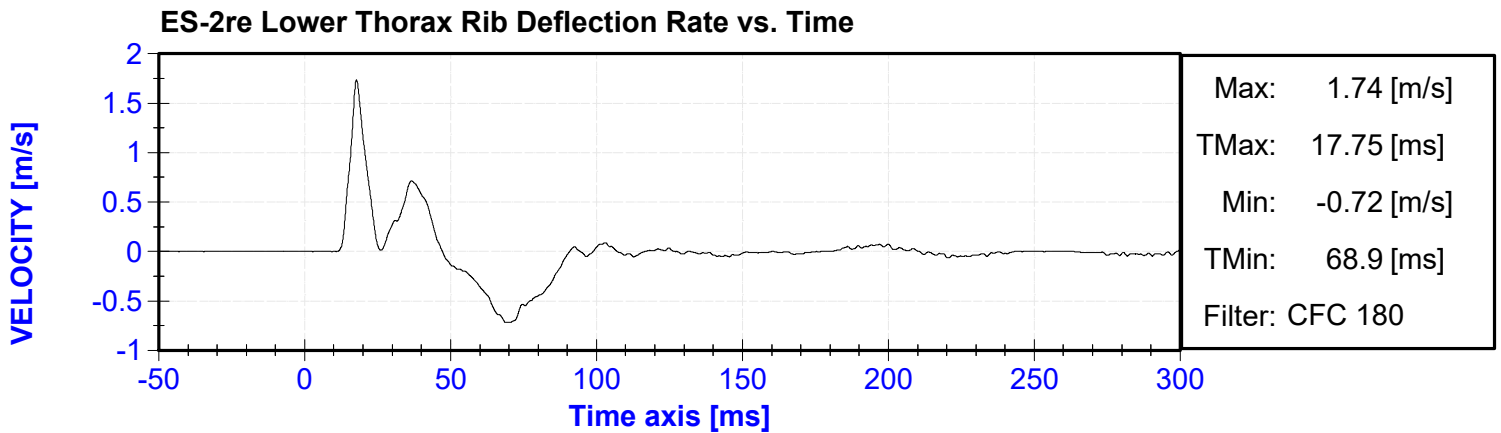
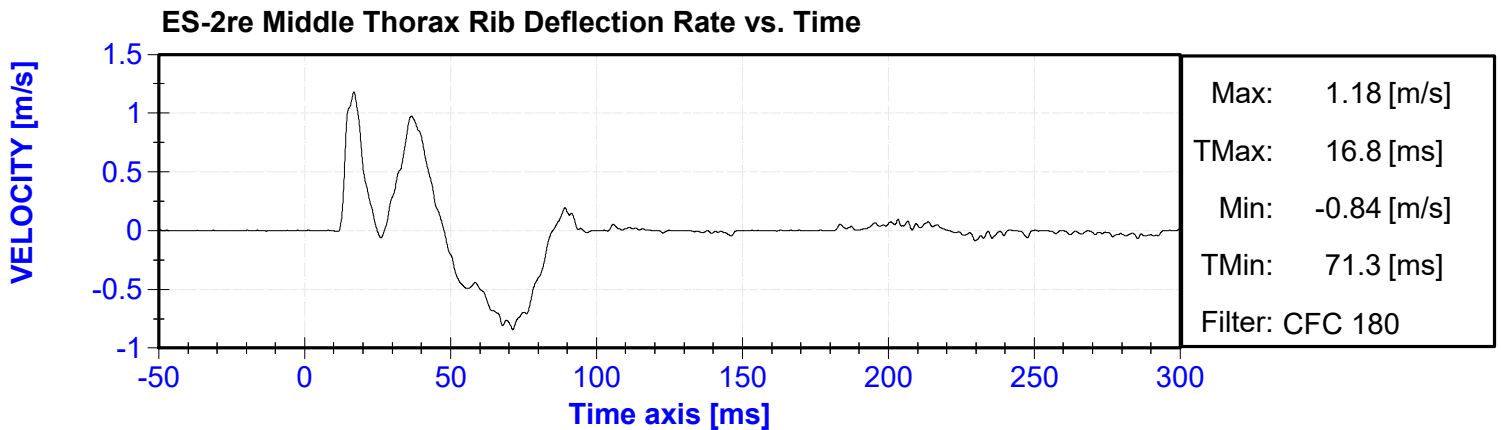
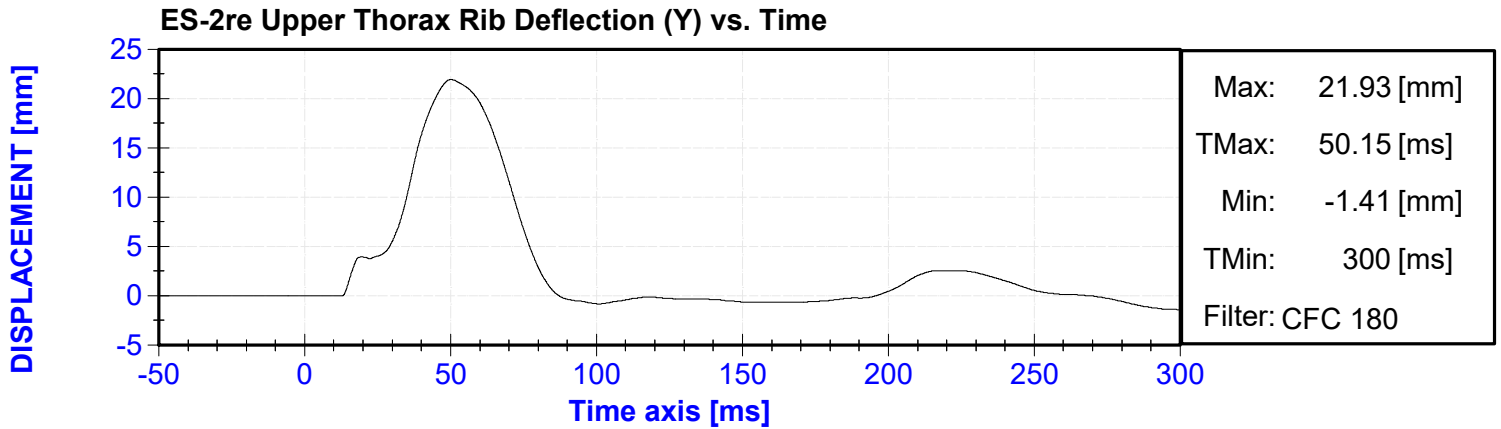
APPENDIX II
ES-2re DUMMY RESPONSE DATA TRACES

Table of Data Plots

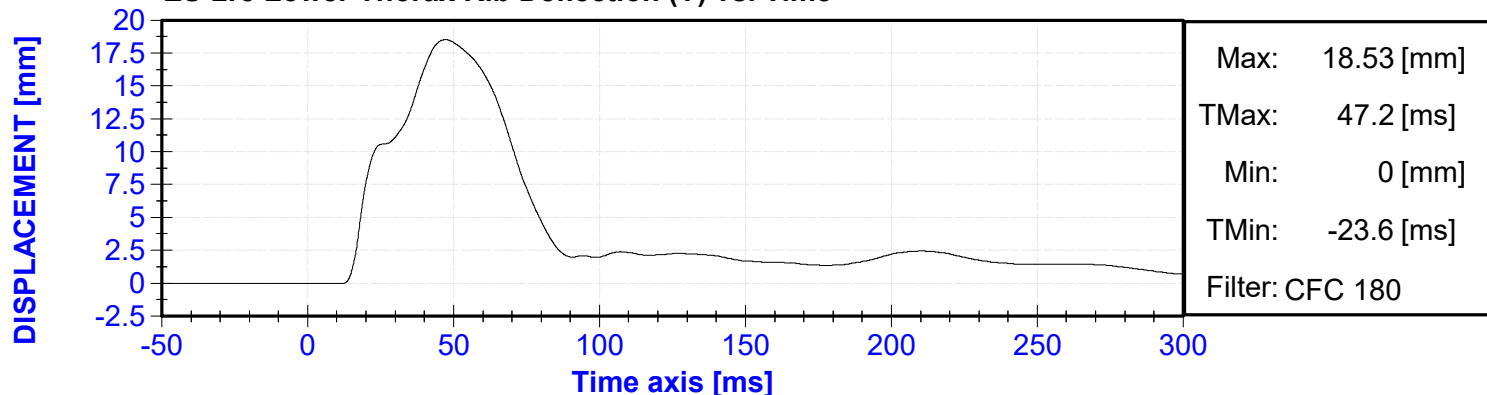
No.	Description	Page
1	ES-2re Head (X) Acceleration vs. Time	II-3
2	ES-2re Head (Y) Acceleration vs. Time	II-3
3	ES-2re Head (Z) Acceleration vs. Time	II-3
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10	ES-2re Middle Thorax Rib Deflection Rate vs. Time	II-5
11	ES-2re Lower Thorax Rib Deflection Rate vs. Time	II-5
12	ES-2re Middle Thorax Rib Deflection (Y) vs. Time	II-5
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16	ES-2re Rear Abdomen Force (Y) vs. Time	II-6
17	ES-2re Sum of Abdomen Forces vs. Time	II-7
18	ES-2re Pubic Symphysis Force (Y) vs. Time	II-7



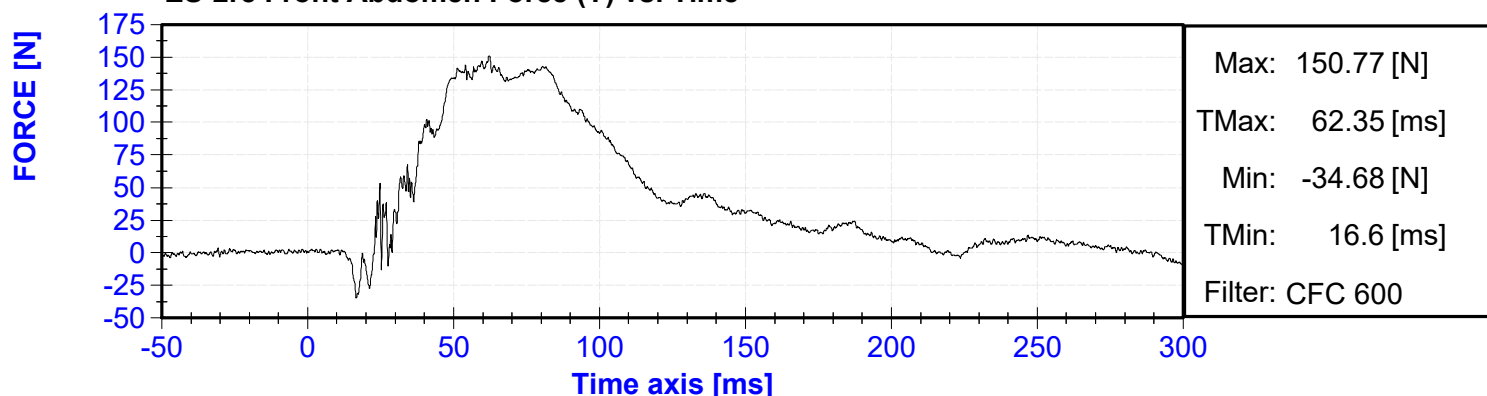




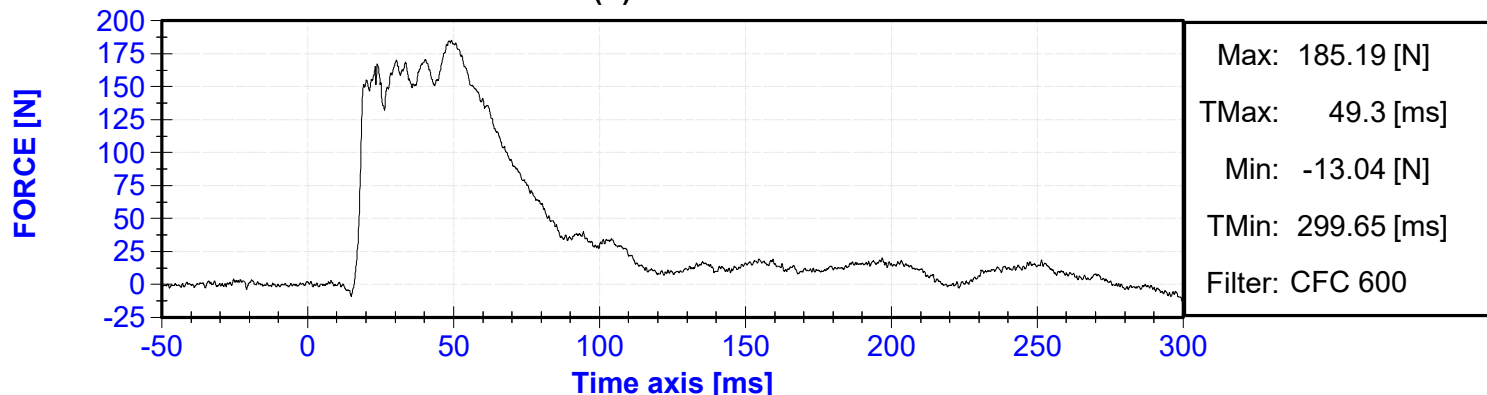
ES-2re Lower Thorax Rib Deflection (Y) vs. Time



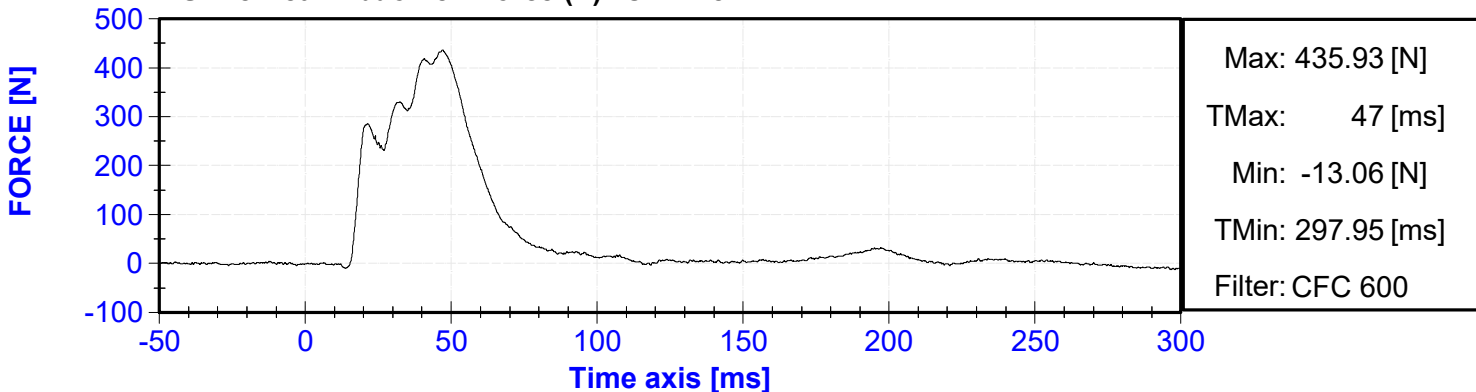
ES-2re Front Abdomen Force (Y) vs. Time

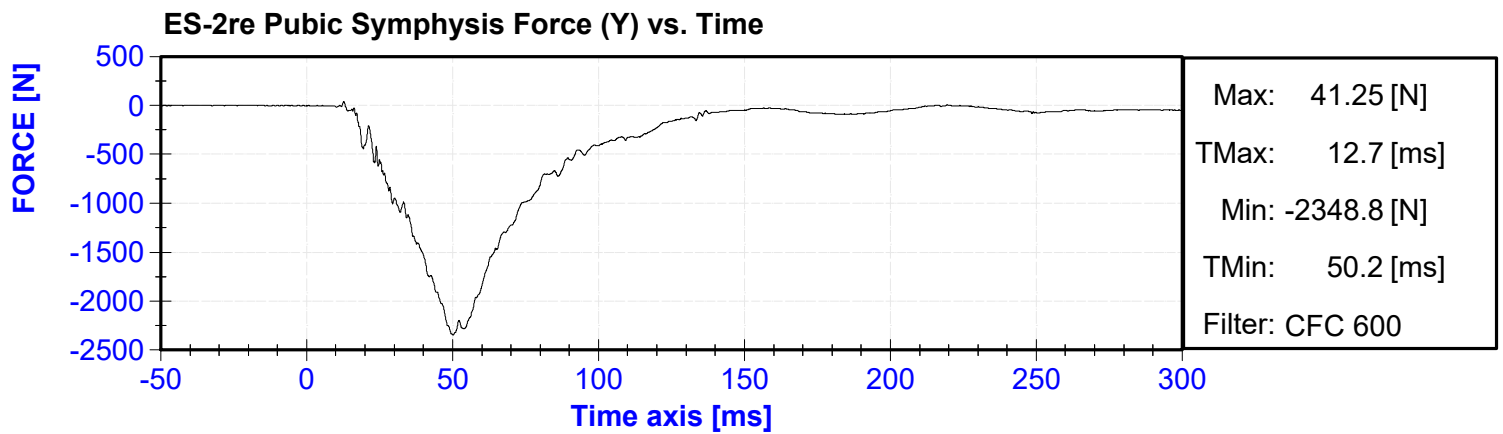
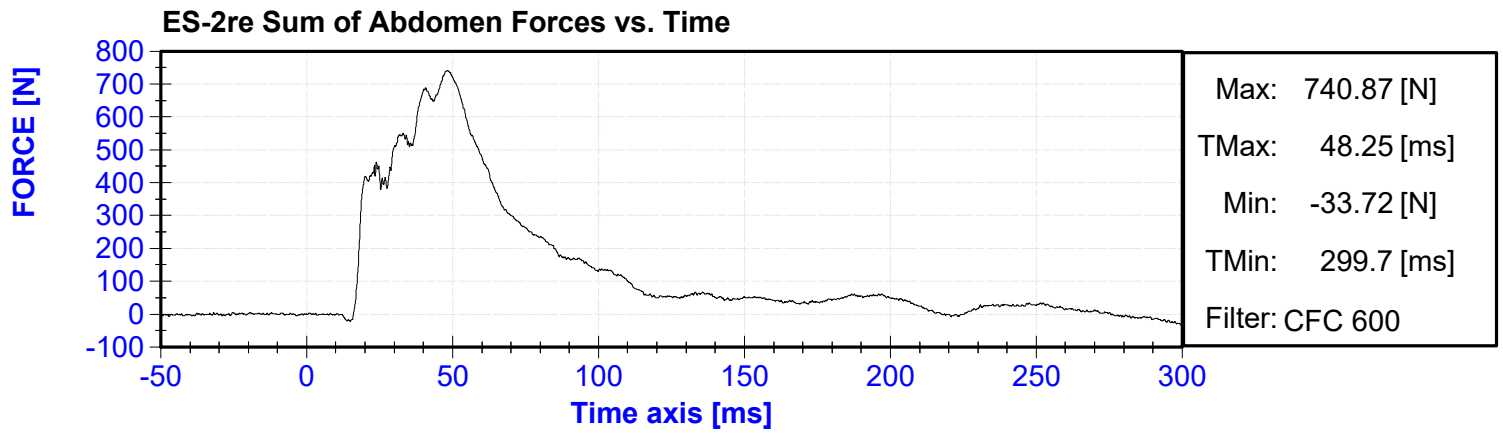


ES-2re Middle Abdomen Force (Y) vs. Time



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



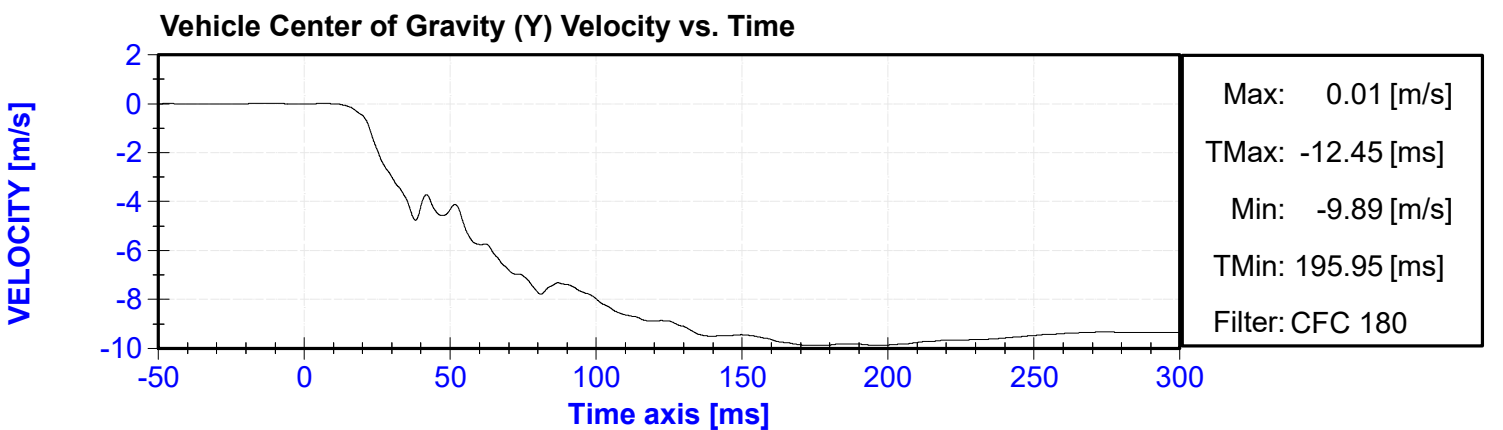
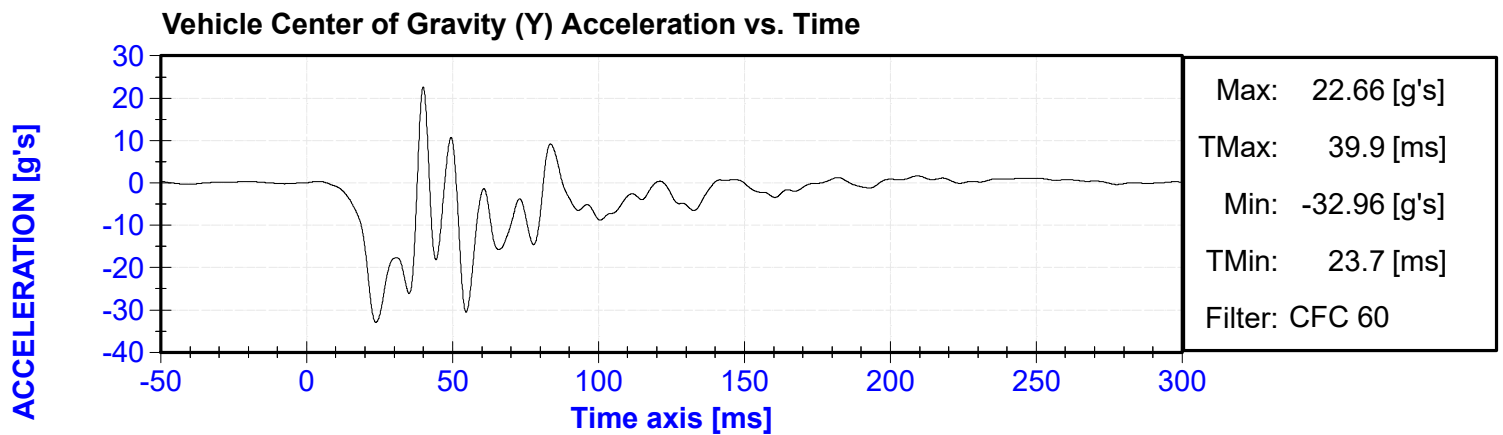
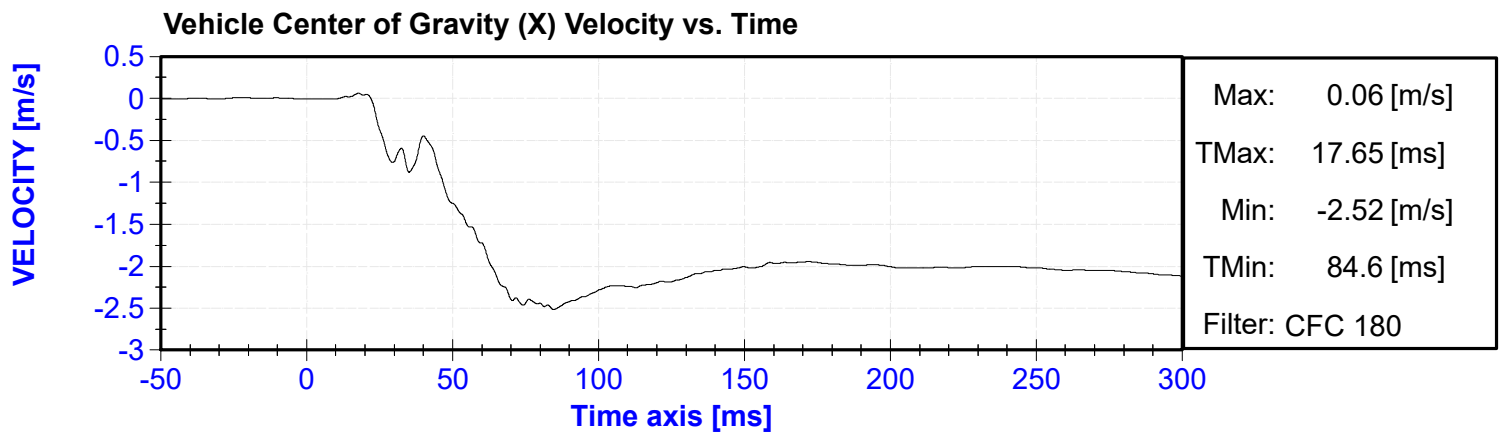
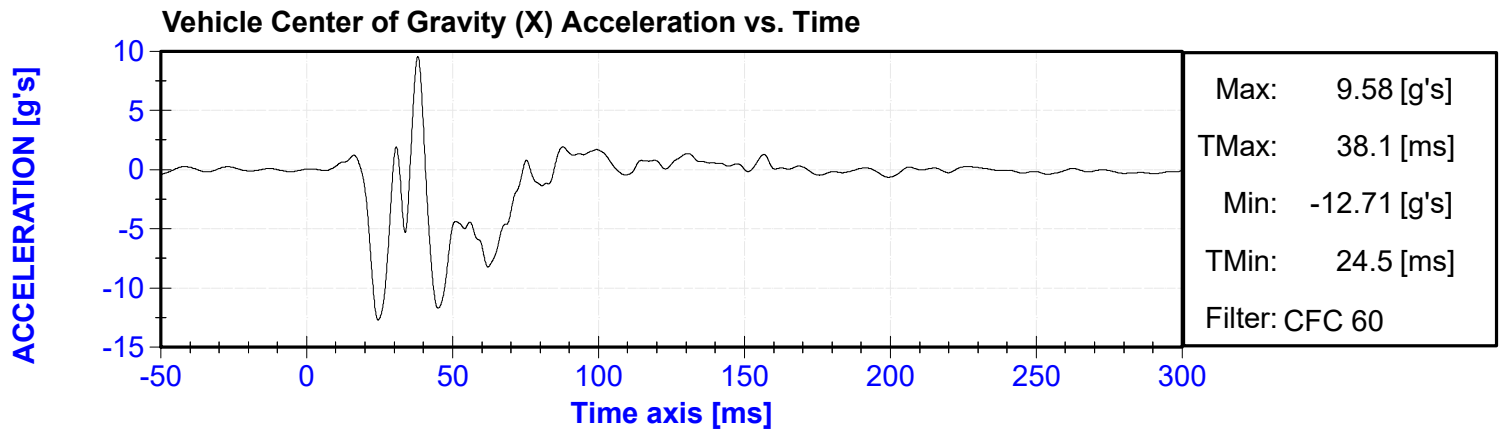


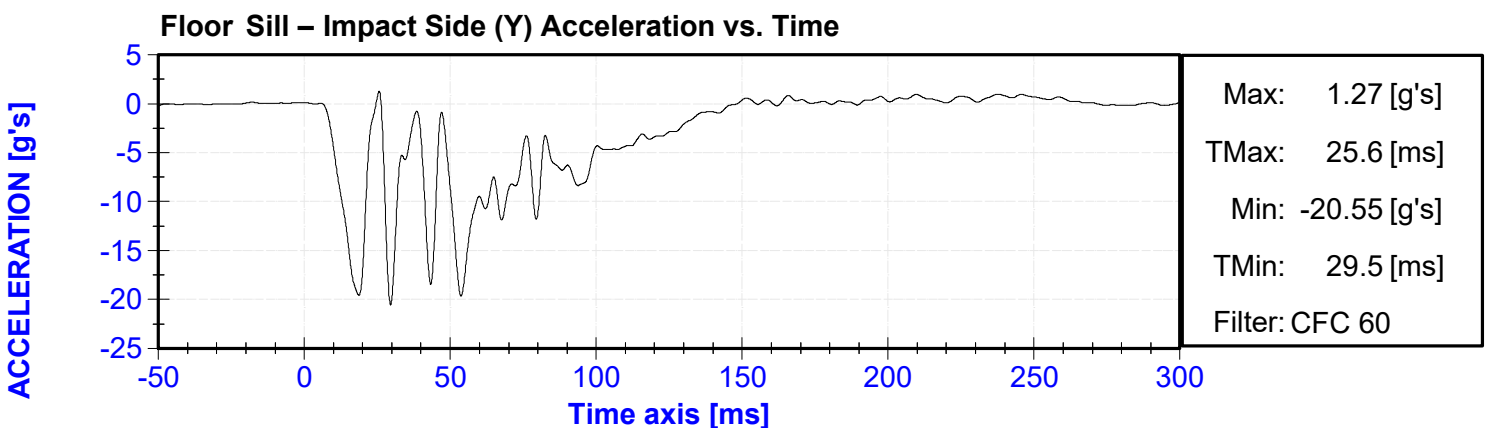
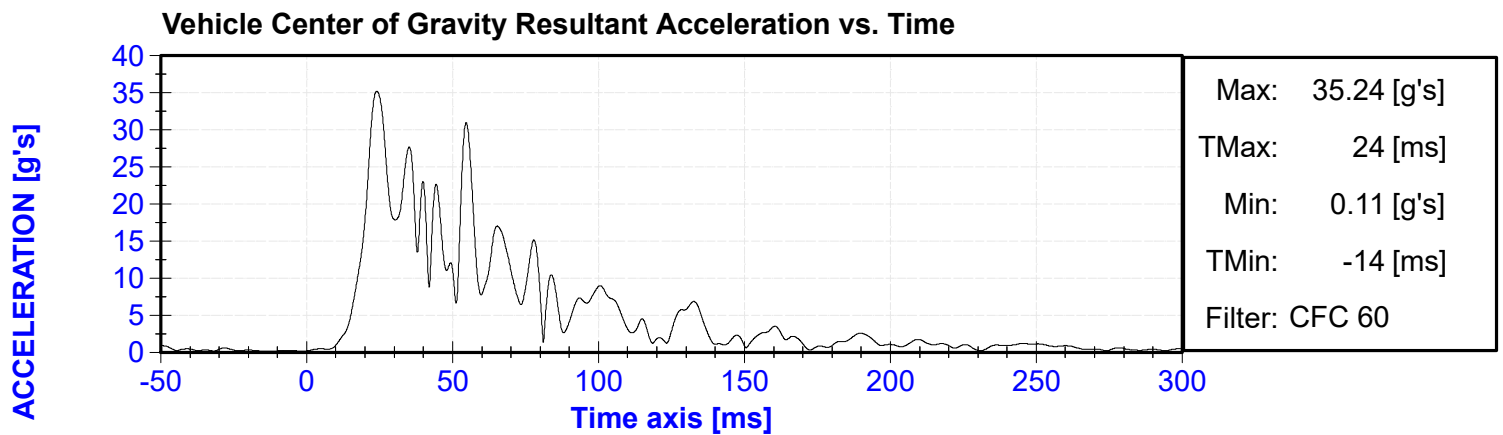
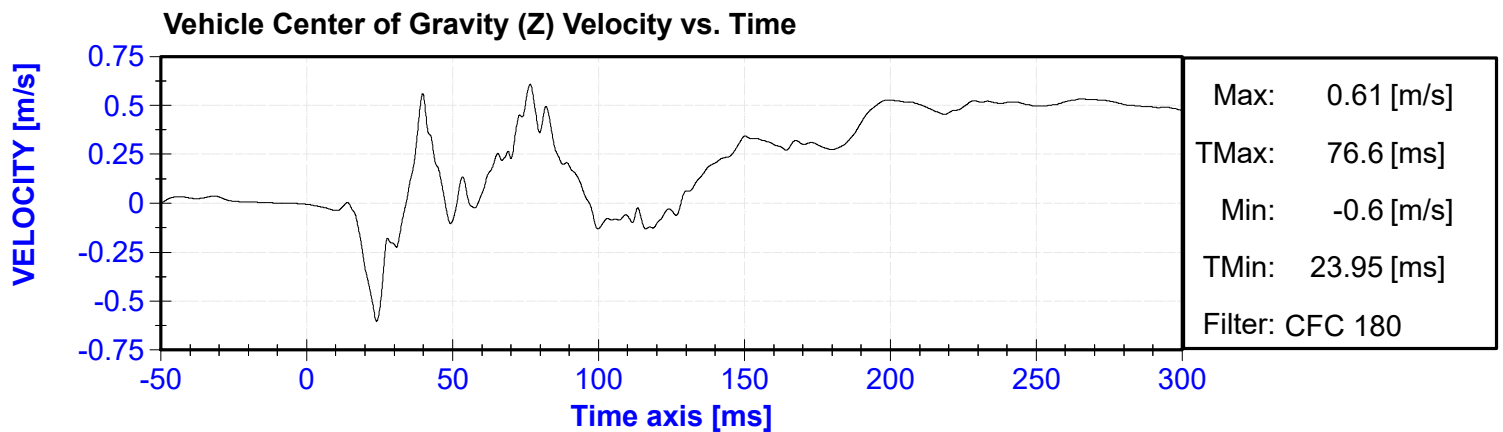
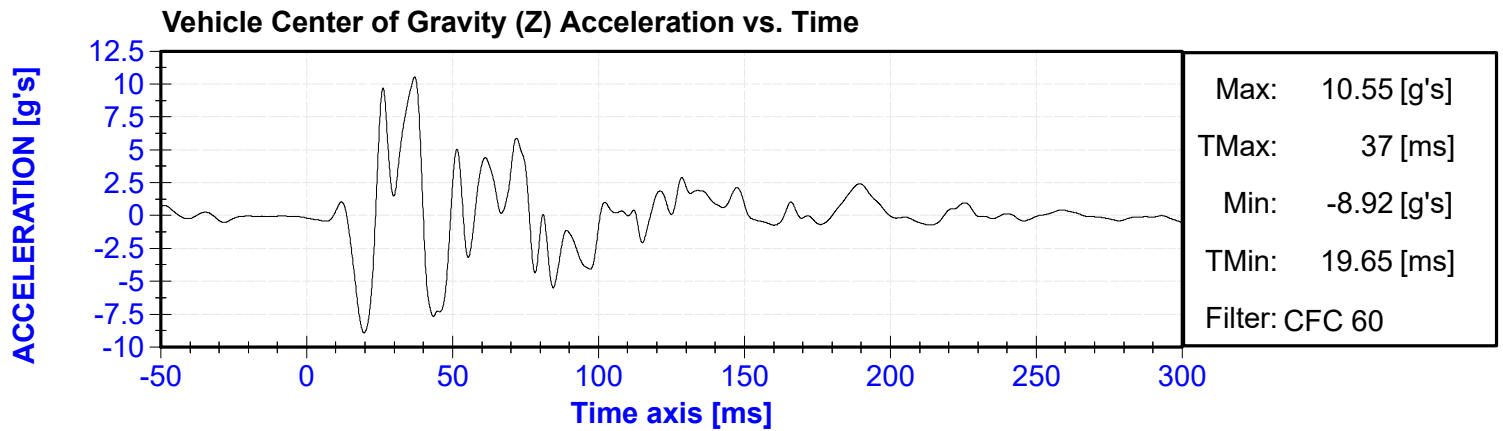
APPENDIX III

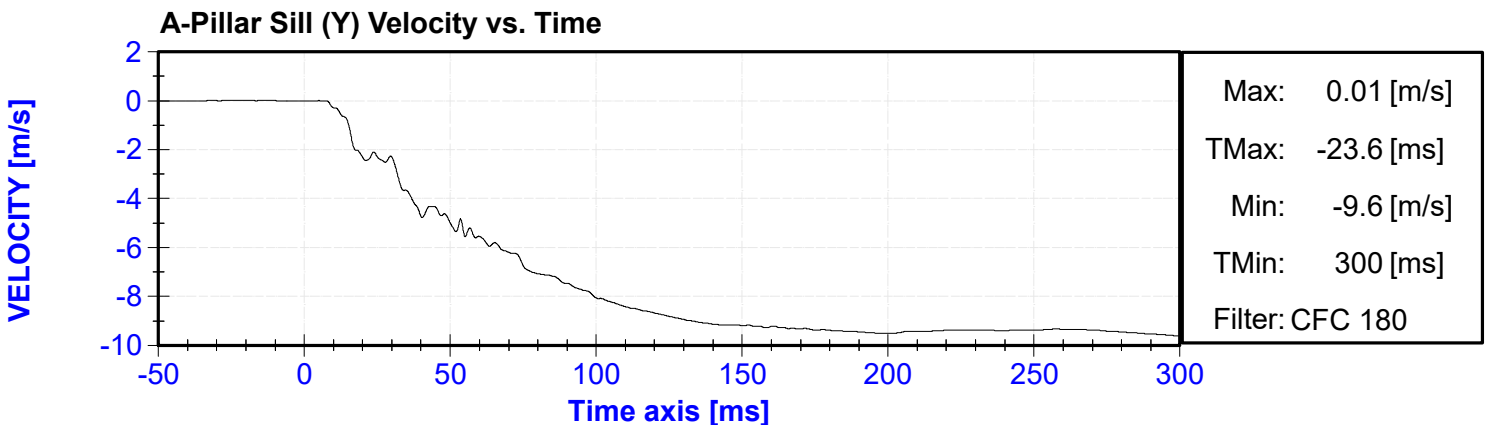
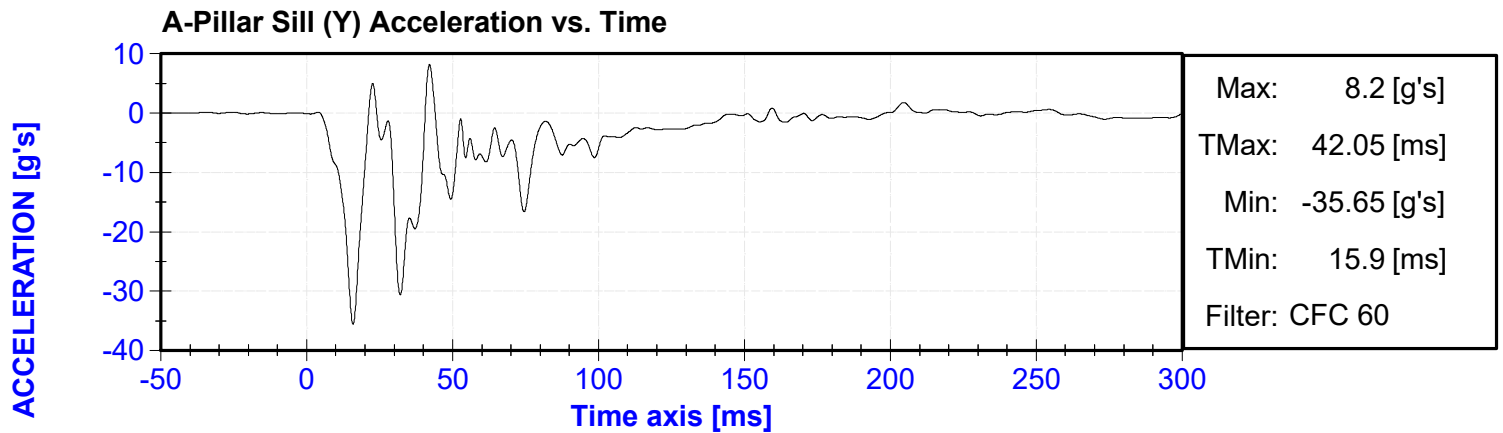
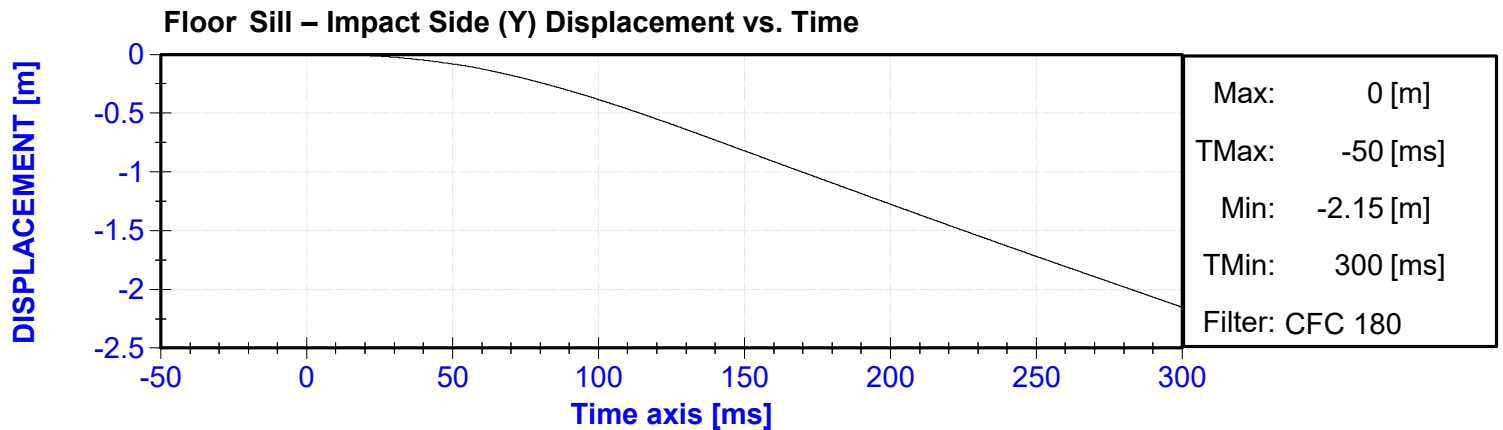
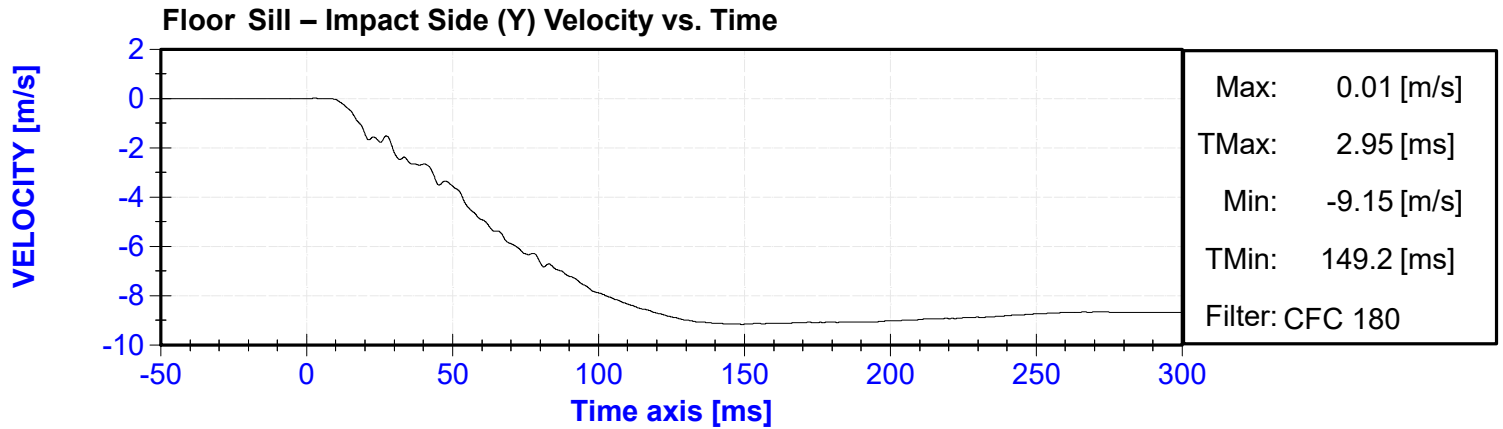
VEHICLE ACCELEROMETER RESPONSE DATA

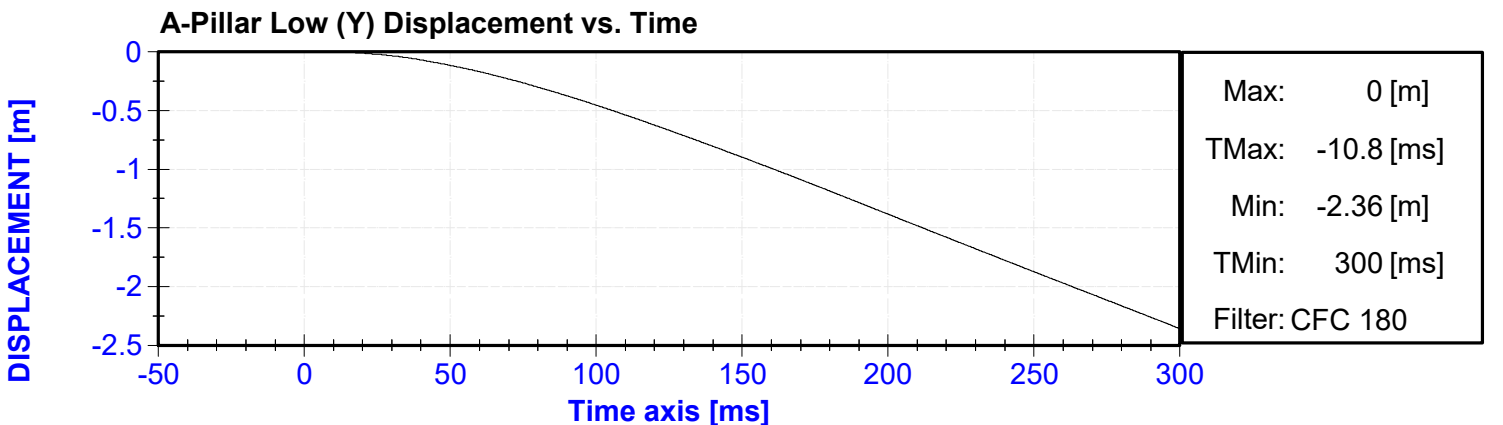
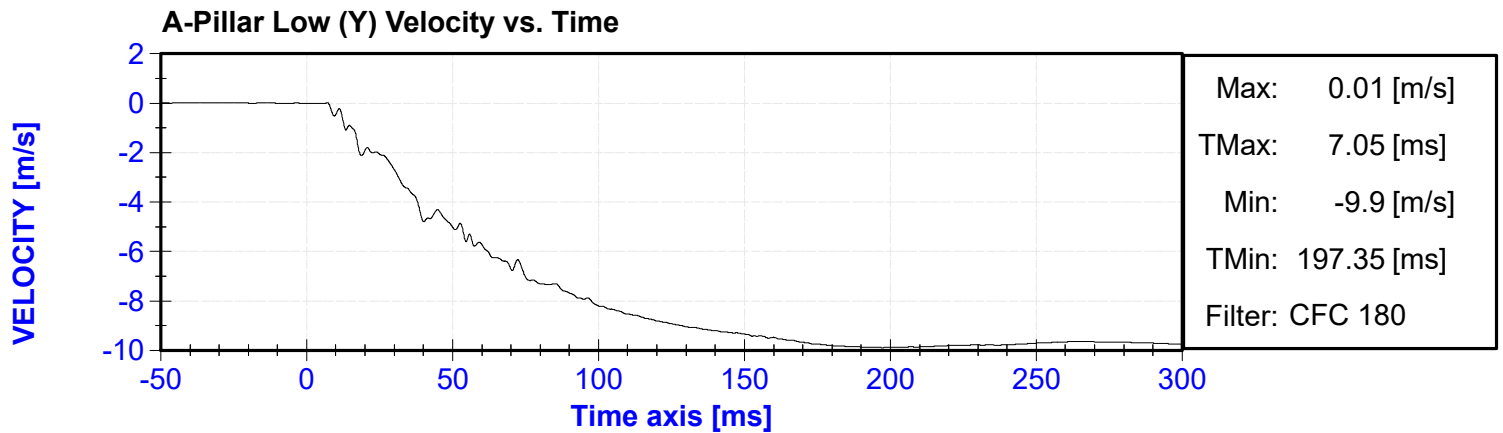
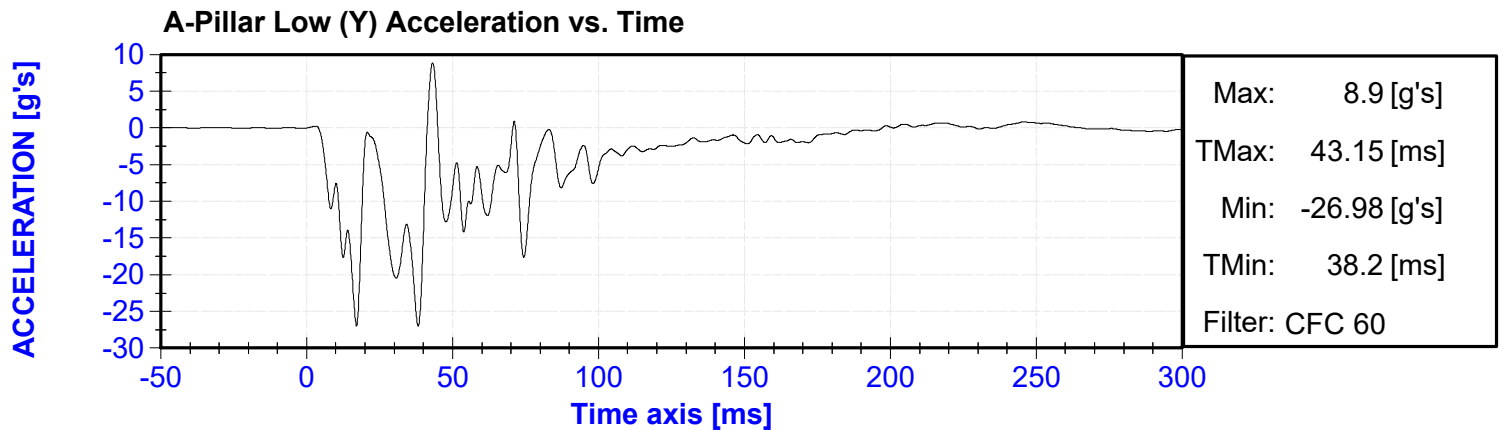
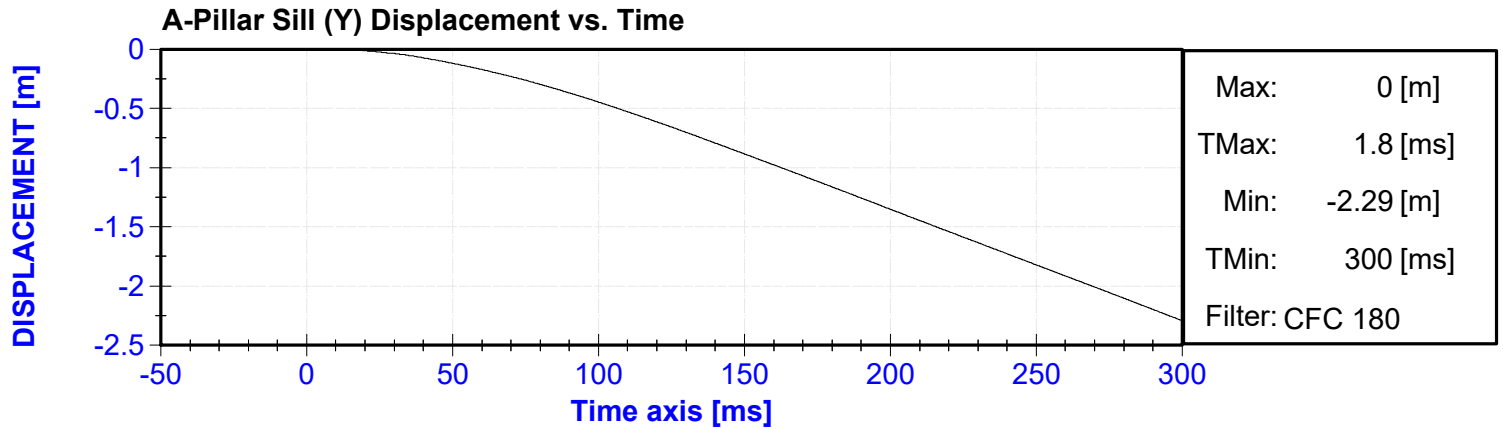
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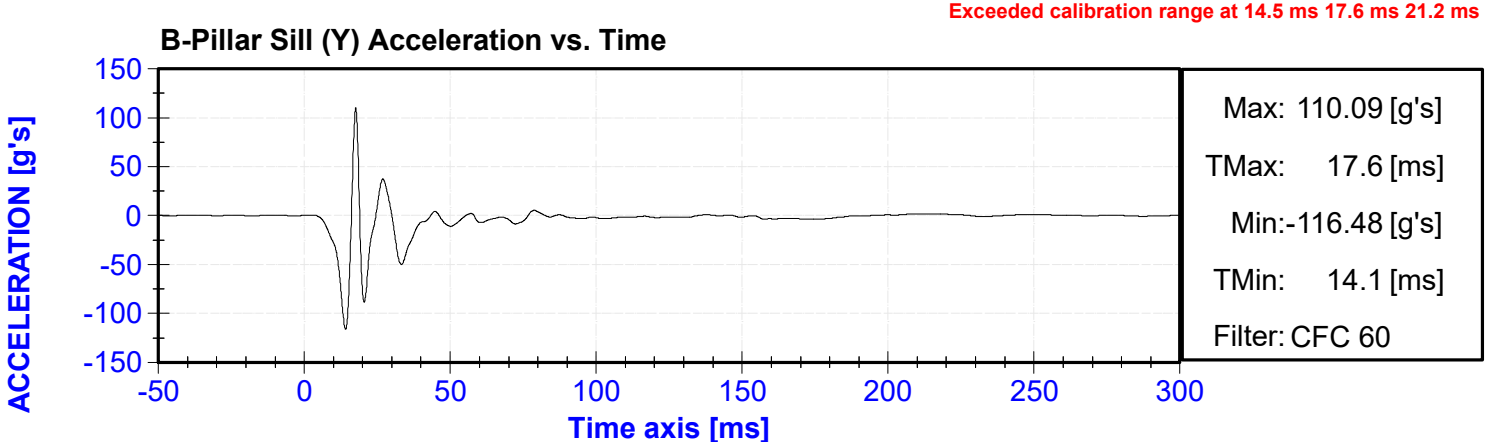
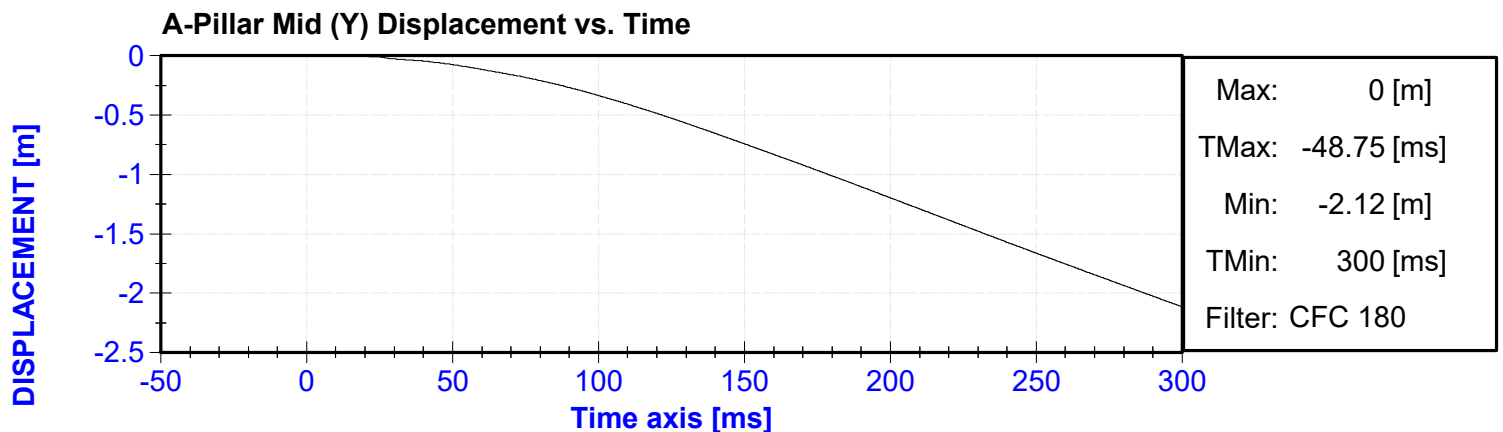
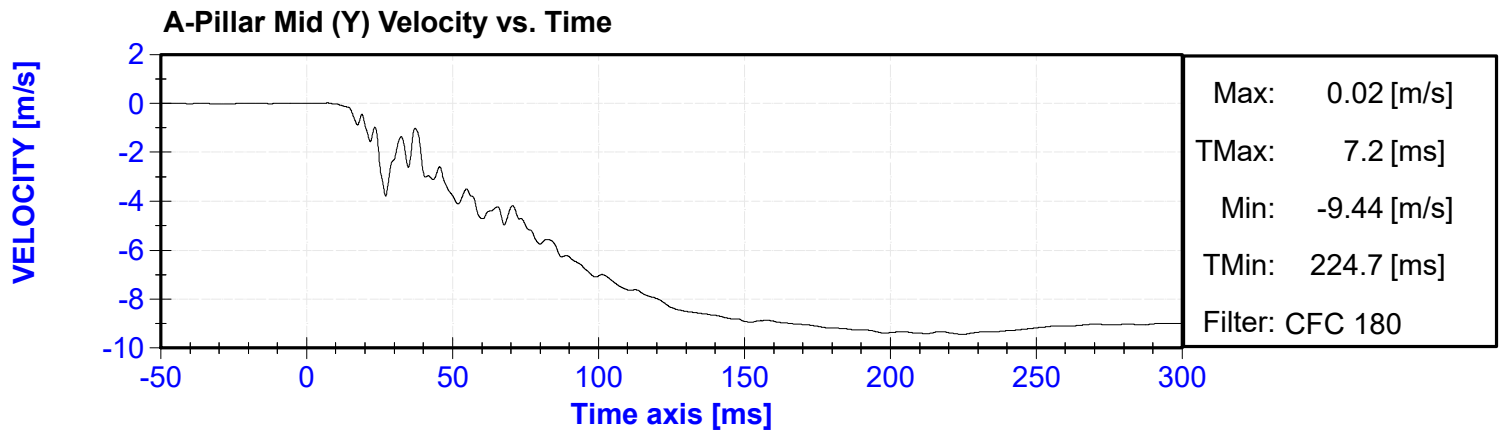
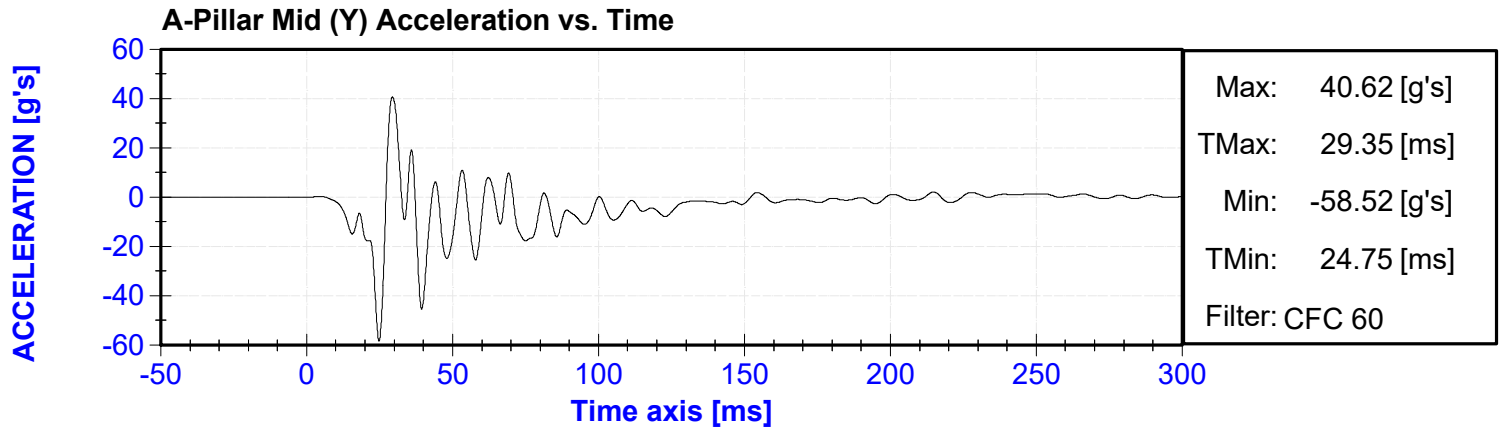
No.	Description	Page
1	Vehicle Center of Gravity (X) Acceleration vs. Time	III-3
2	Vehicle Center of Gravity (X) Velocity vs. Time	III-3
3	Vehicle Center of Gravity (Y) Acceleration vs. Time	III-3
4	Vehicle Center of Gravity (Y) Velocity vs. Time	III-3
5	Vehicle Center of Gravity (Z) Acceleration vs. Time	III-4
6	Vehicle Center of Gravity (Z) Velocity vs. Time	III-4
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9	Floor Sill – Impact Side (Y) Velocity vs. Time	III-5
10	Floor Sill – Impact Side (Y) Displacement vs. Time	III-5
11	A-Pillar Sill (Y) Acceleration vs. Time	III-5
12	A-Pillar Sill (Y) Velocity vs. Time	III-5
13	A-Pillar Sill (Y) Displacement vs. Time	III-6
14	A-Pillar Low (Y) Acceleration vs. Time	III-6
15	A-Pillar Low (Y) Velocity vs. Time	III-6
16	A-Pillar Low (Y) Displacement vs. Time	III-6
17	A-Pillar Mid (Y) Acceleration vs. Time	III-7
18	A-Pillar Mid (Y) Velocity vs. Time	III-7
19	A-Pillar Mid (Y) Displacement vs. Time	III-7
20	B-Pillar Sill (Y) Acceleration vs. Time	III-7
21	B-Pillar Sill (Y) Velocity vs. Time	III-8
22	B-Pillar Sill (Y) Displacement vs. Time	III-8
23	B-Pillar Low (Y) Acceleration vs. Time	III-8
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25	B-Pillar Low (Y) Displacement vs. Time	III-9
26	B-Pillar Mid (Y) Acceleration vs. Time	III-9
27	B-Pillar Mid (Y) Velocity vs. Time	III-9
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29	Seat (Y) Acceleration vs. Time	III-10
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32	Engine (X) Acceleration vs. Time	III-10
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37	Firewall (Y) Velocity vs. Time	III-12
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40	Floor Sill – Non Impact Side (Y) Acceleration vs. Time	III-12
41	Floor Sill – Non Impact Side (Y) Velocity vs. Time	III-13
42	Rear Deck (X) Acceleration vs. Time	III-13
43	Rear Deck (X) Velocity vs. Time	III-13
44	Rear Deck (Y) Acceleration vs. Time	III-13
45	Rear Deck (Y) Velocity vs. Time	III-14



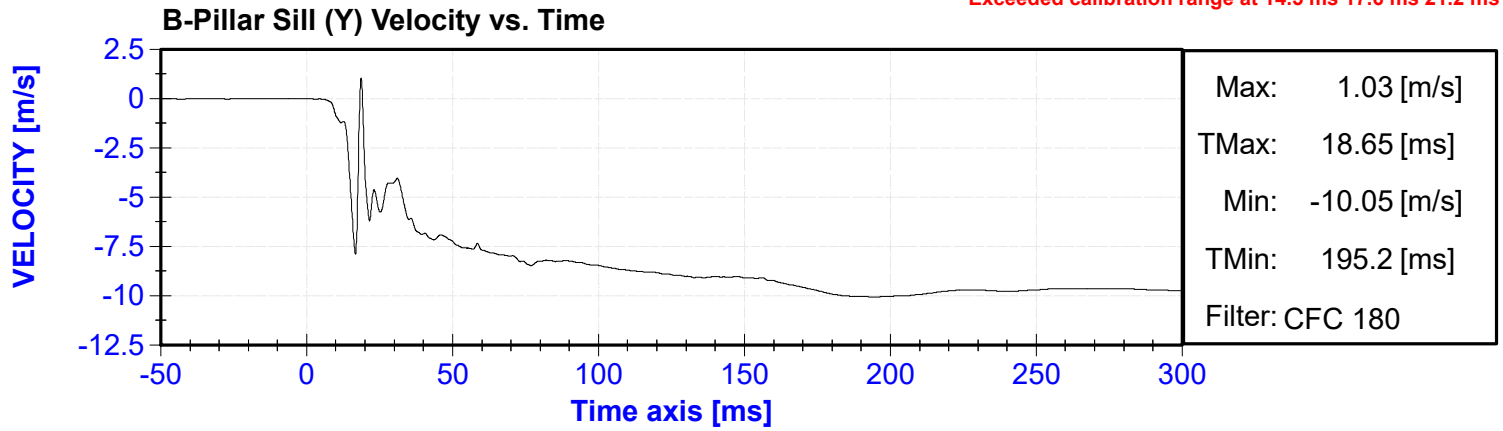




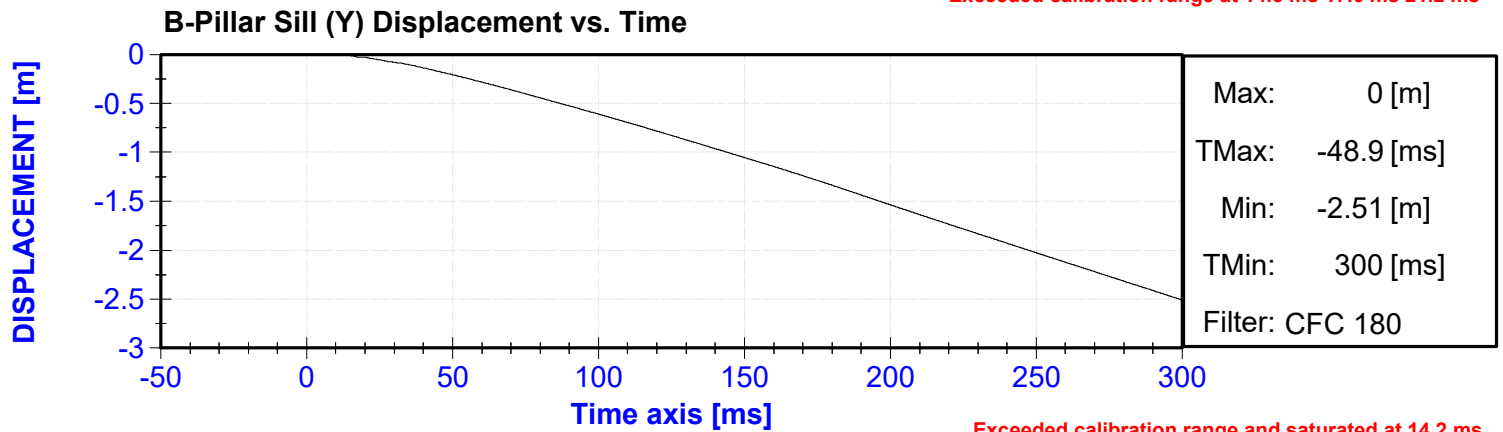




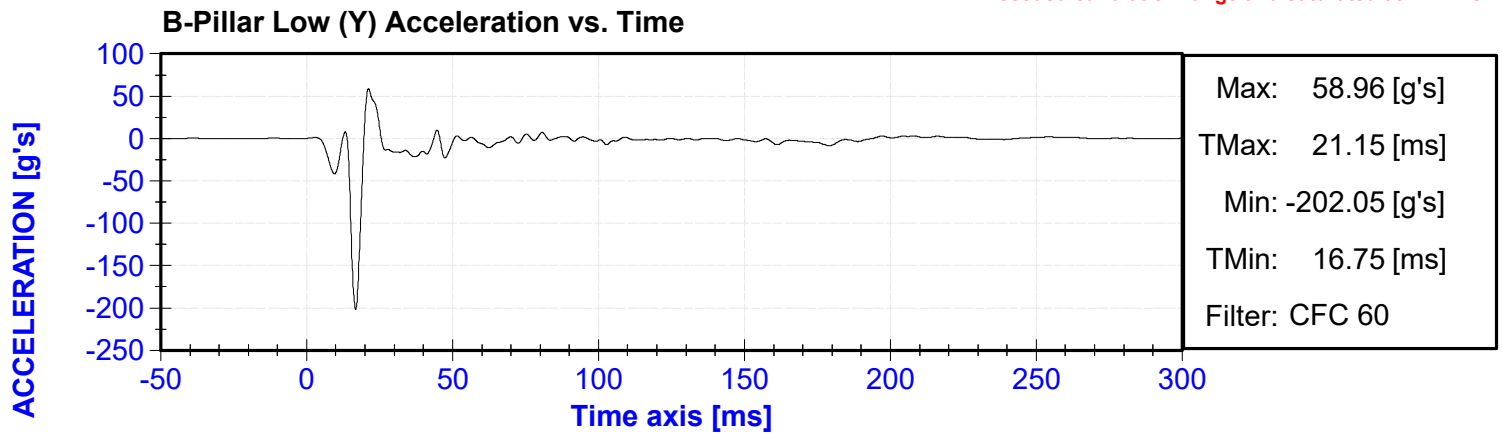
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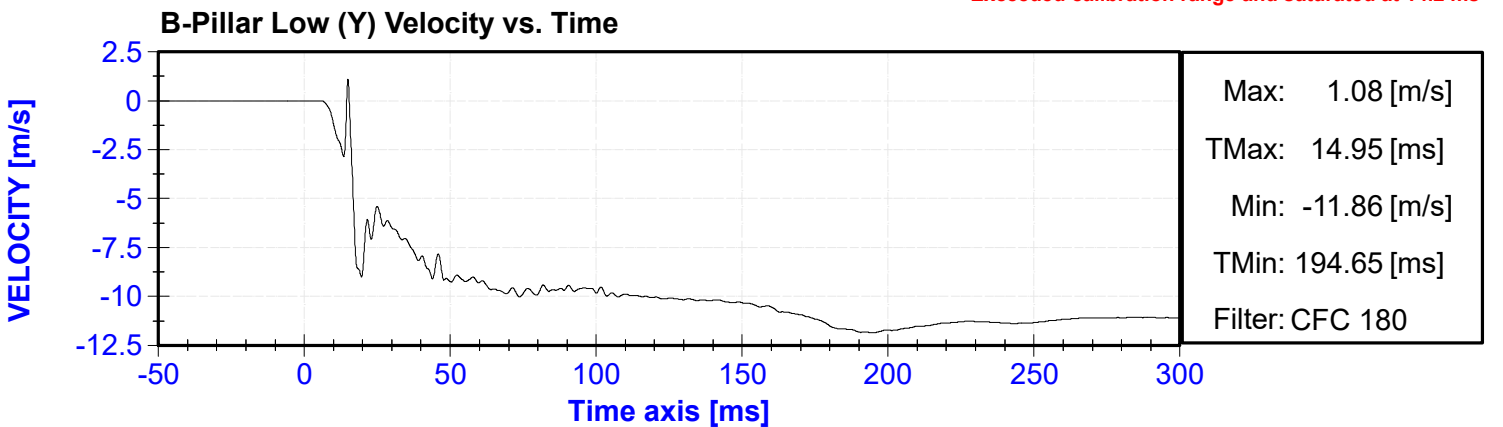
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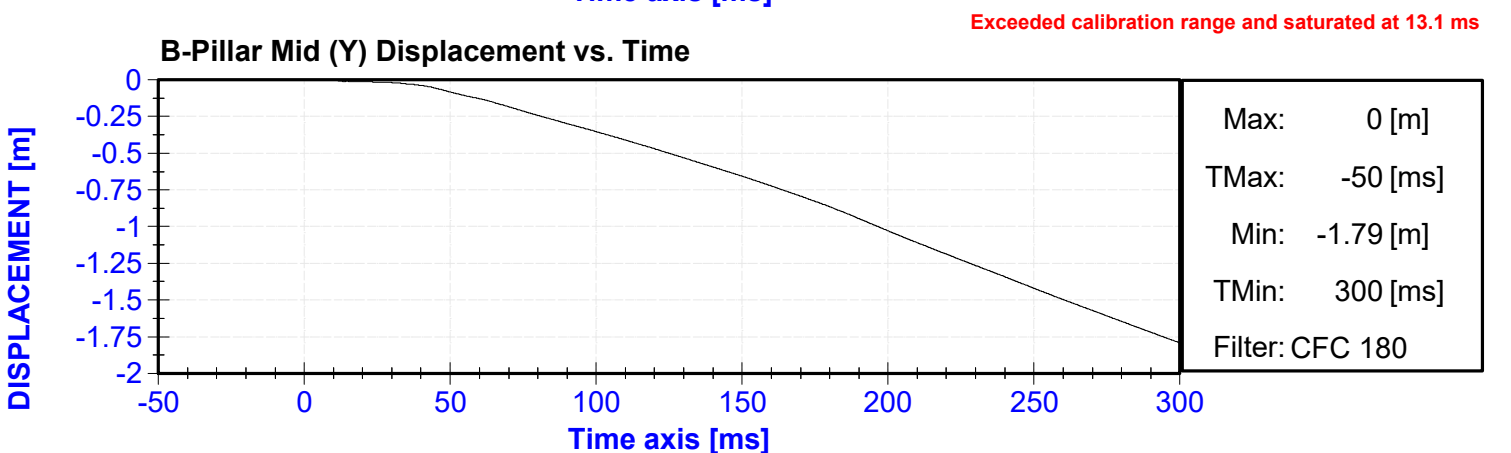
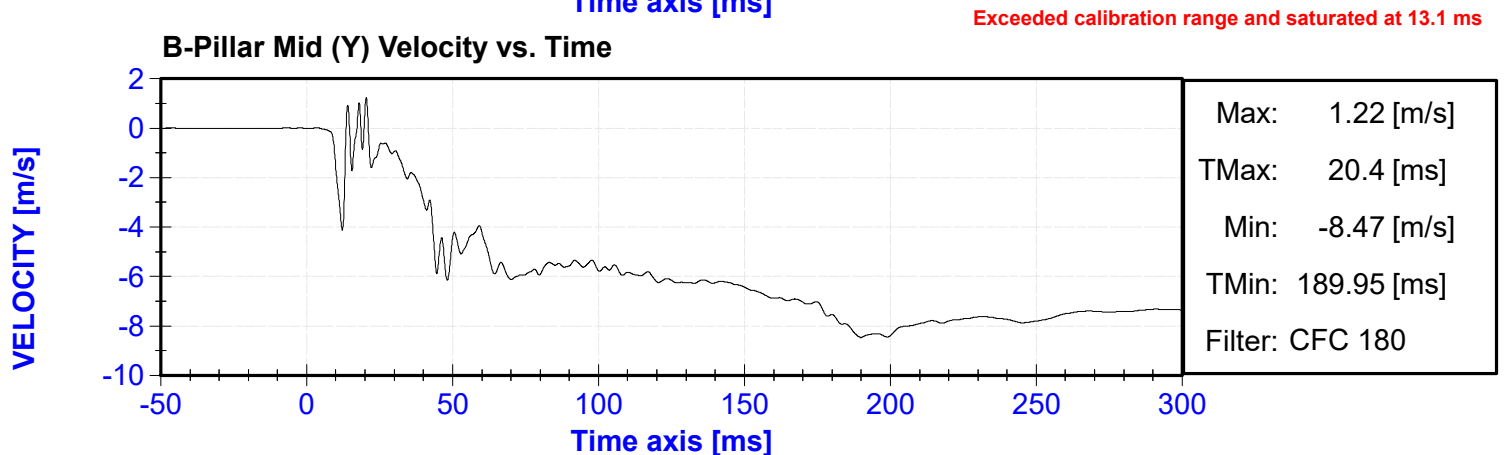
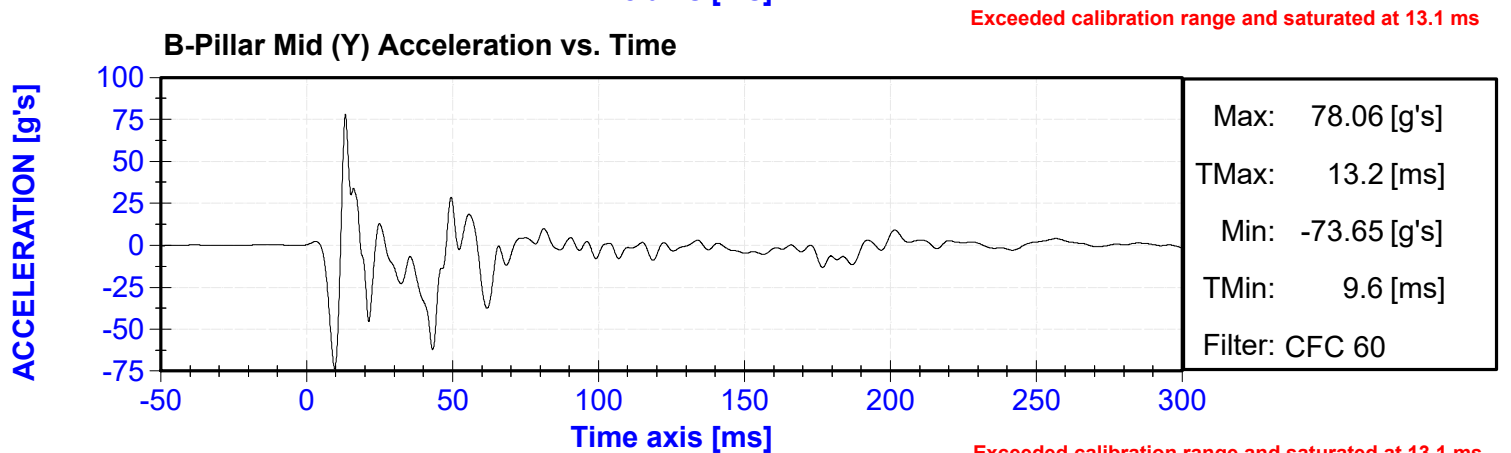
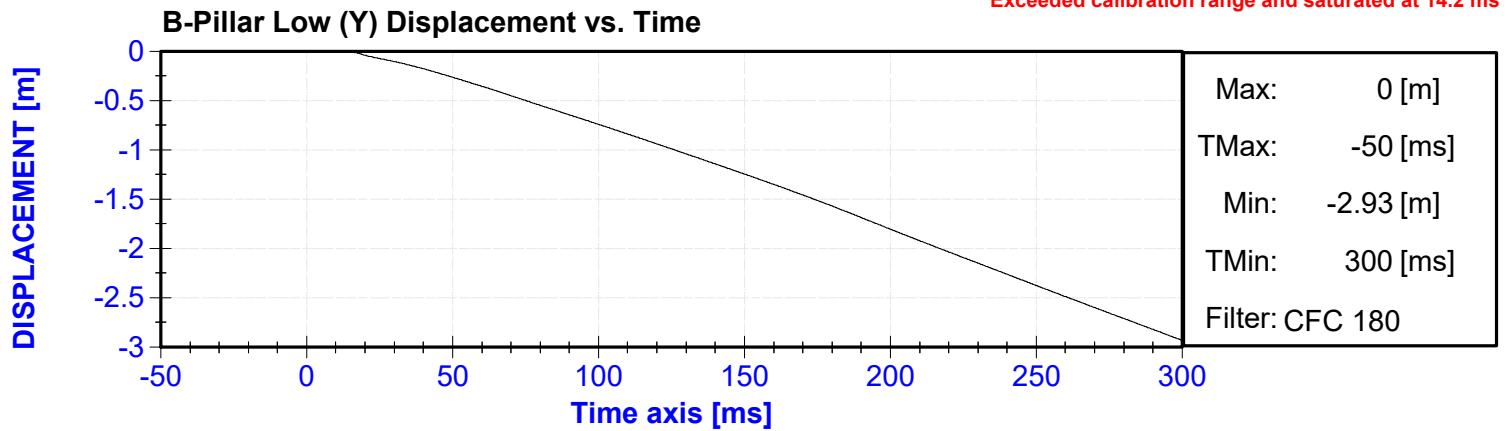


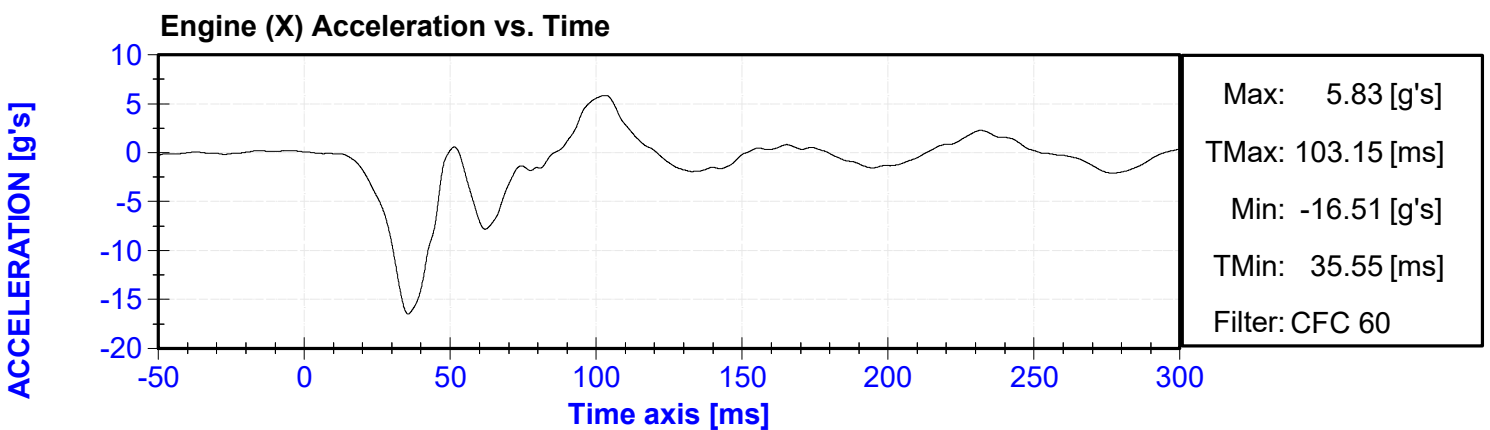
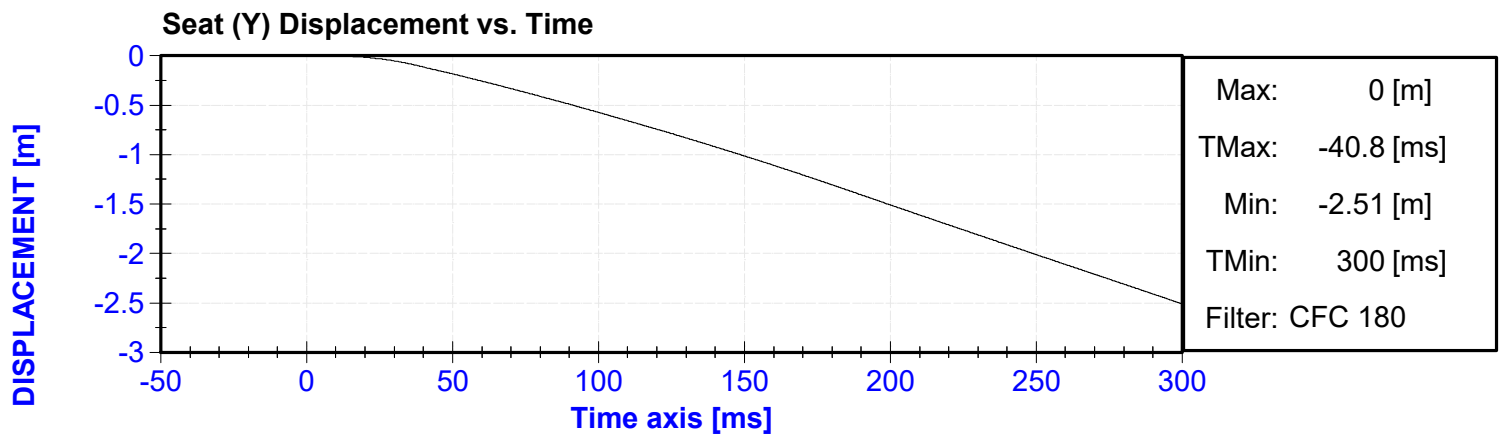
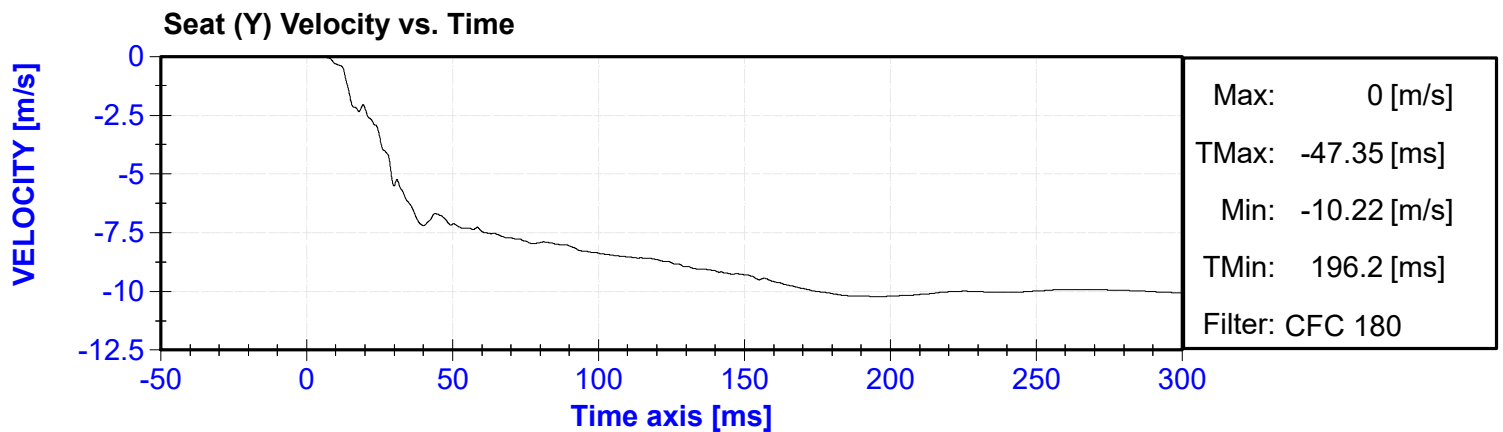
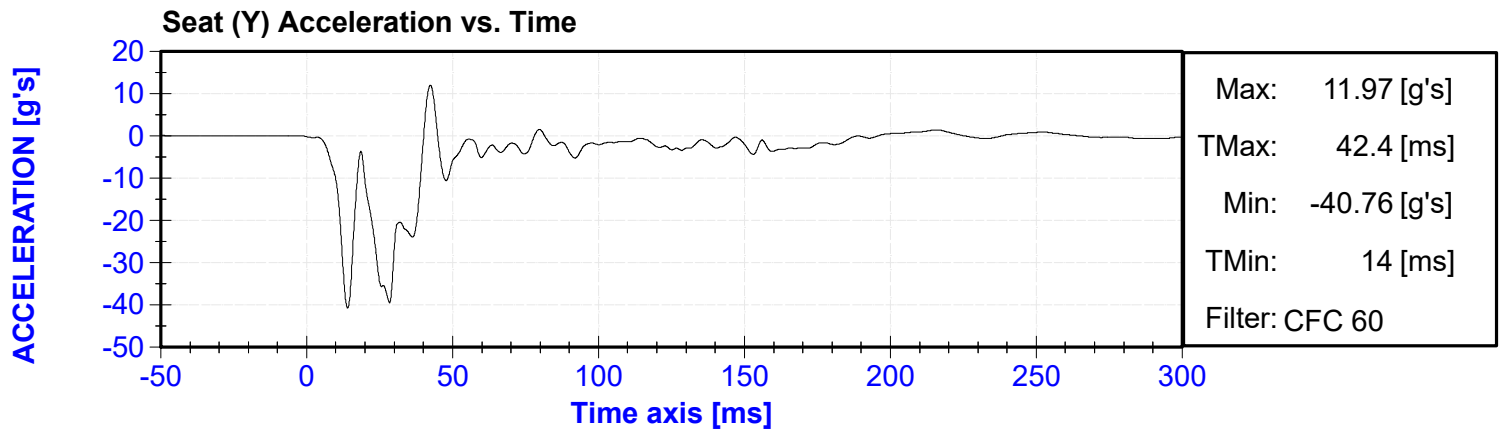
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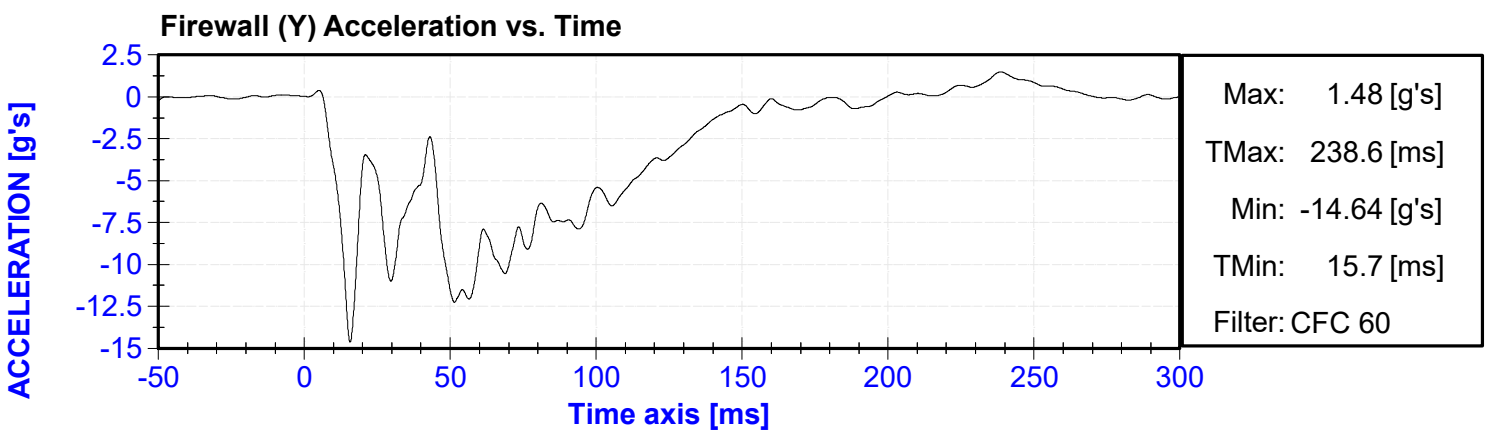
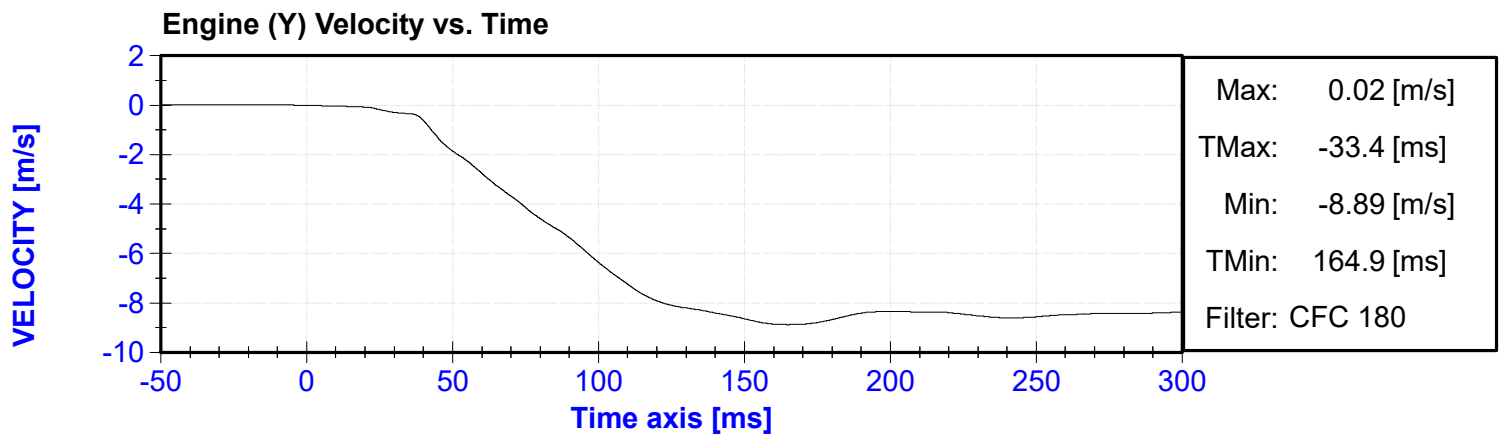
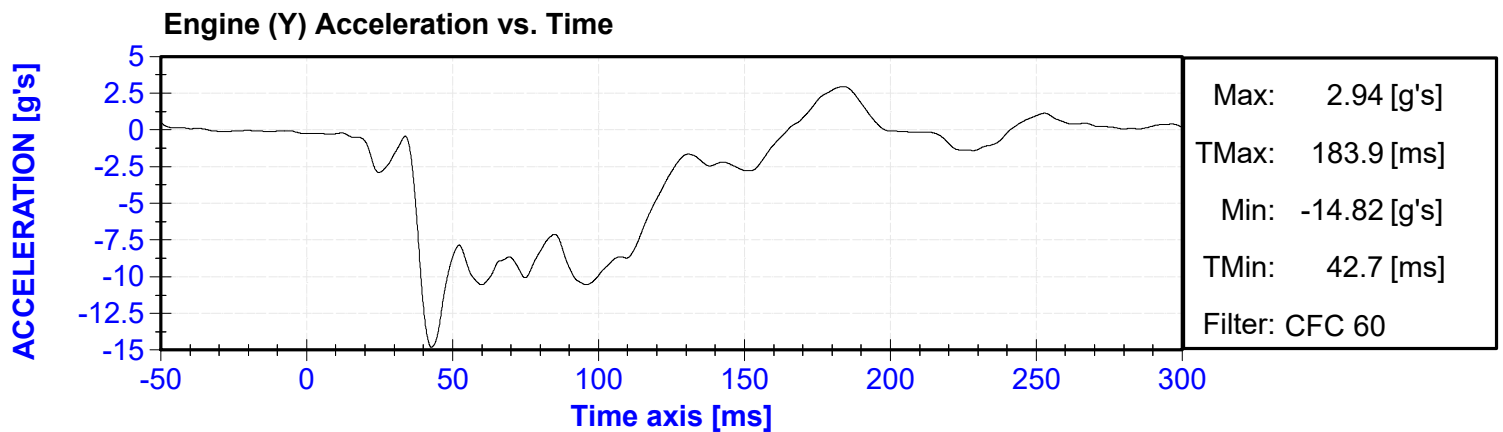
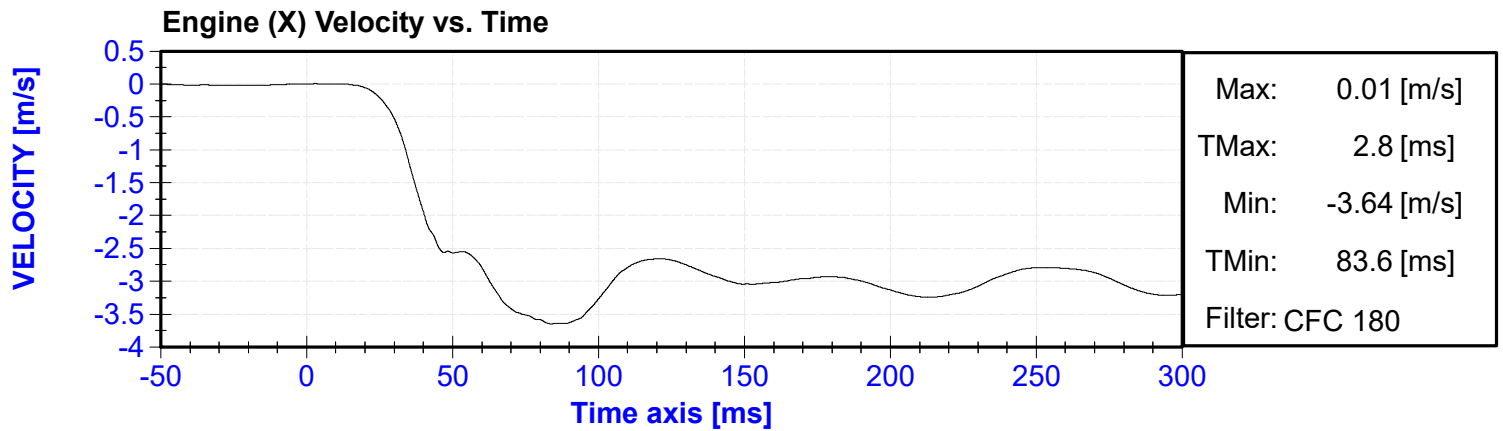


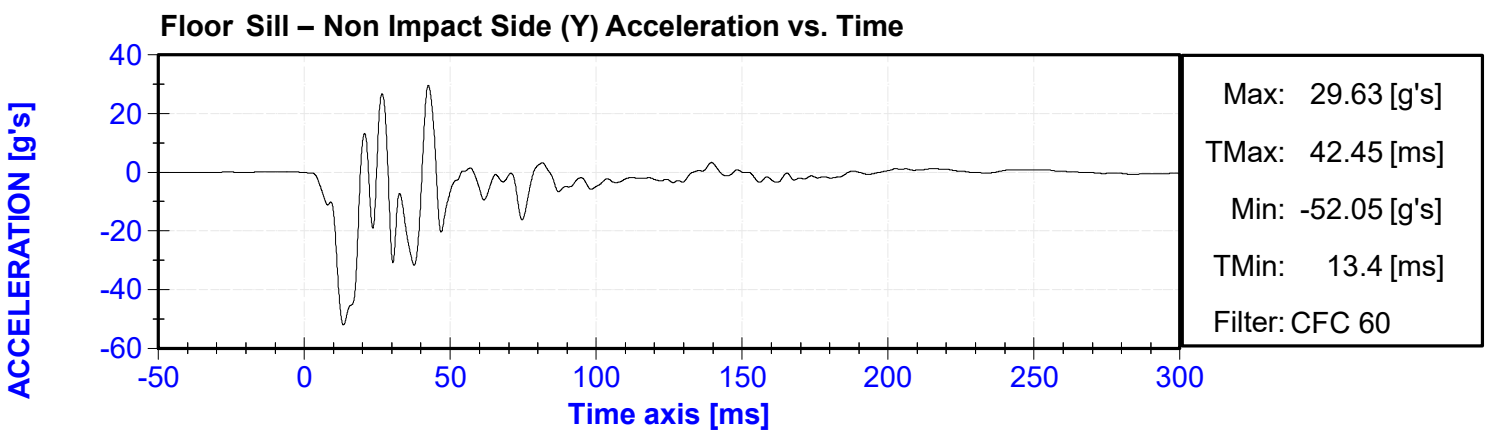
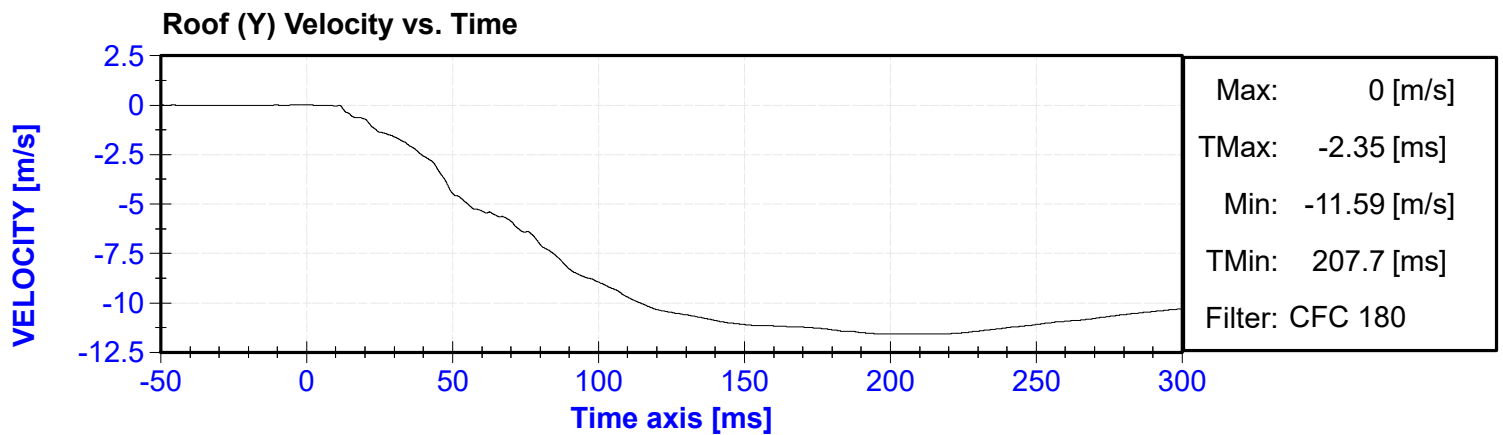
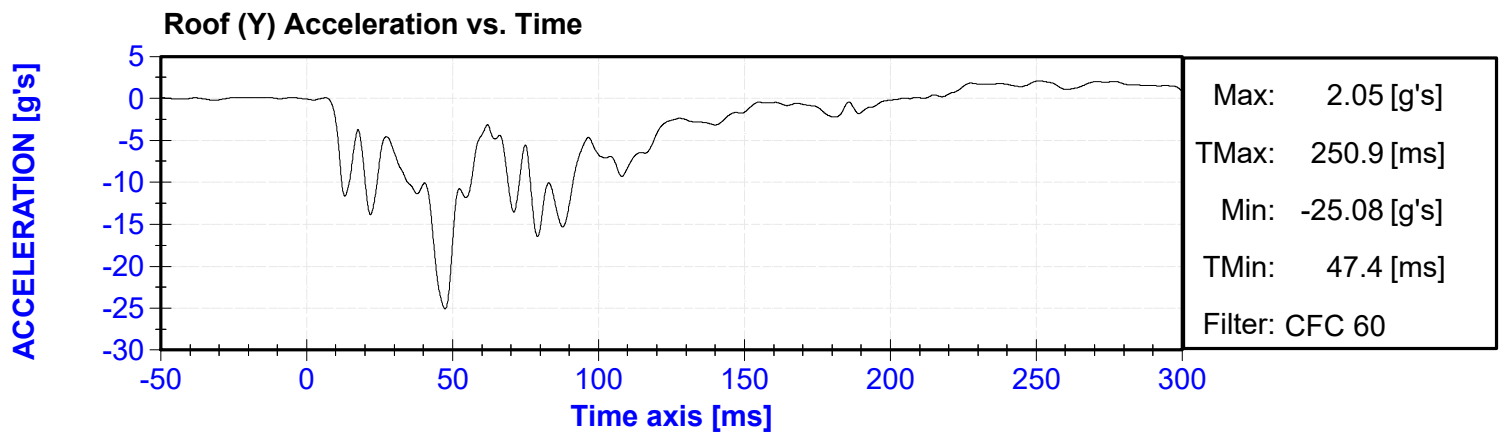
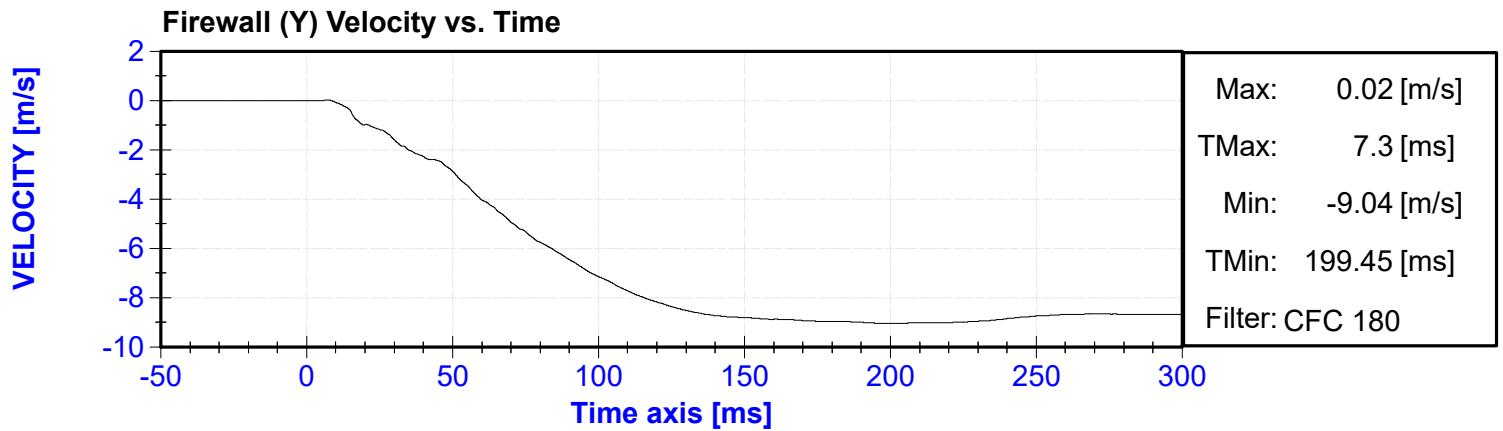
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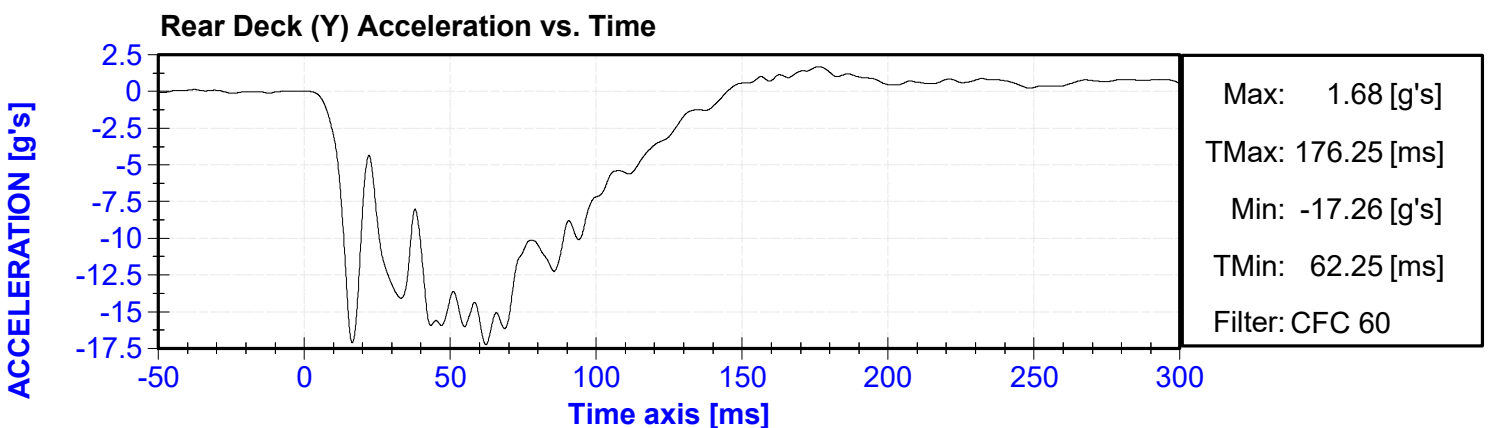
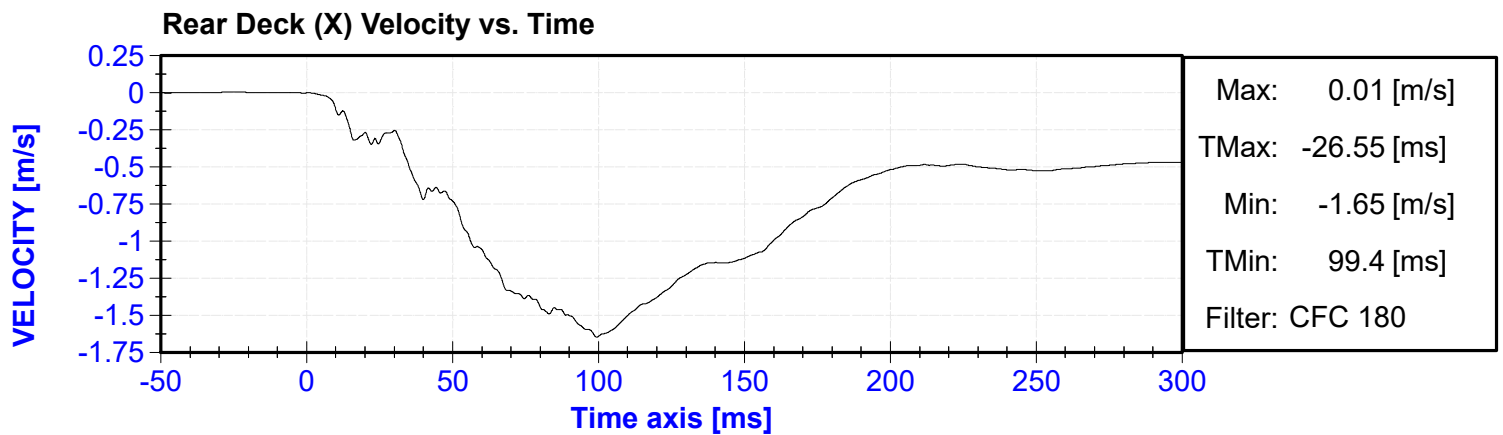
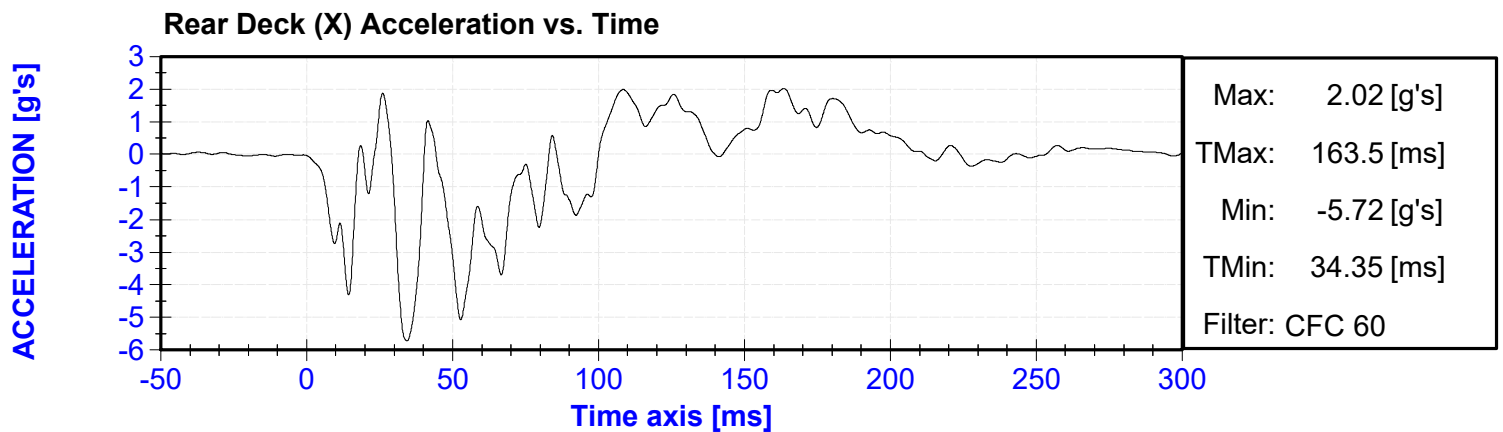
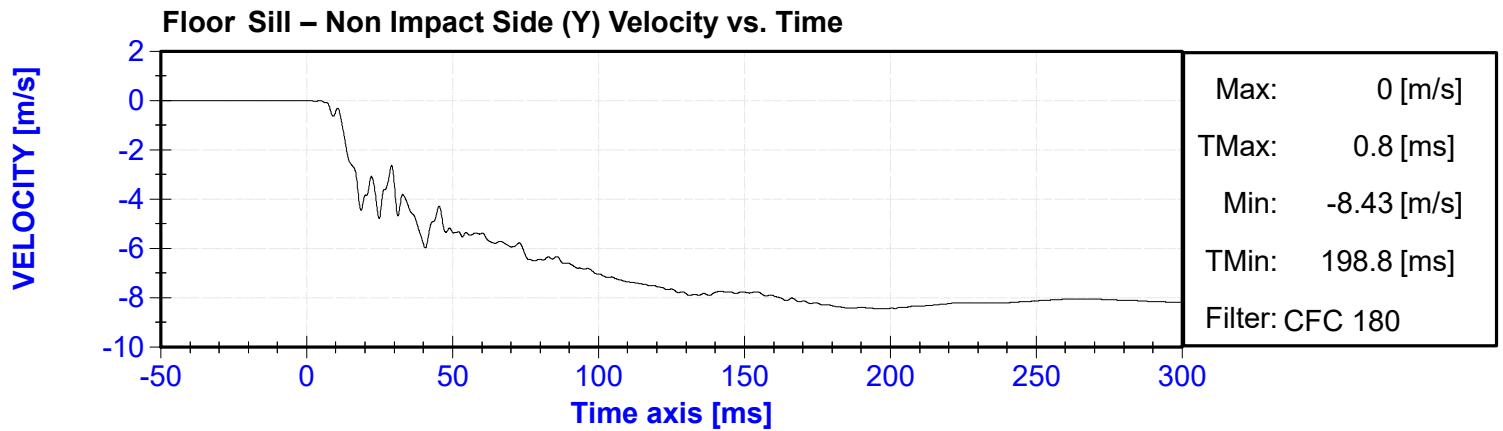


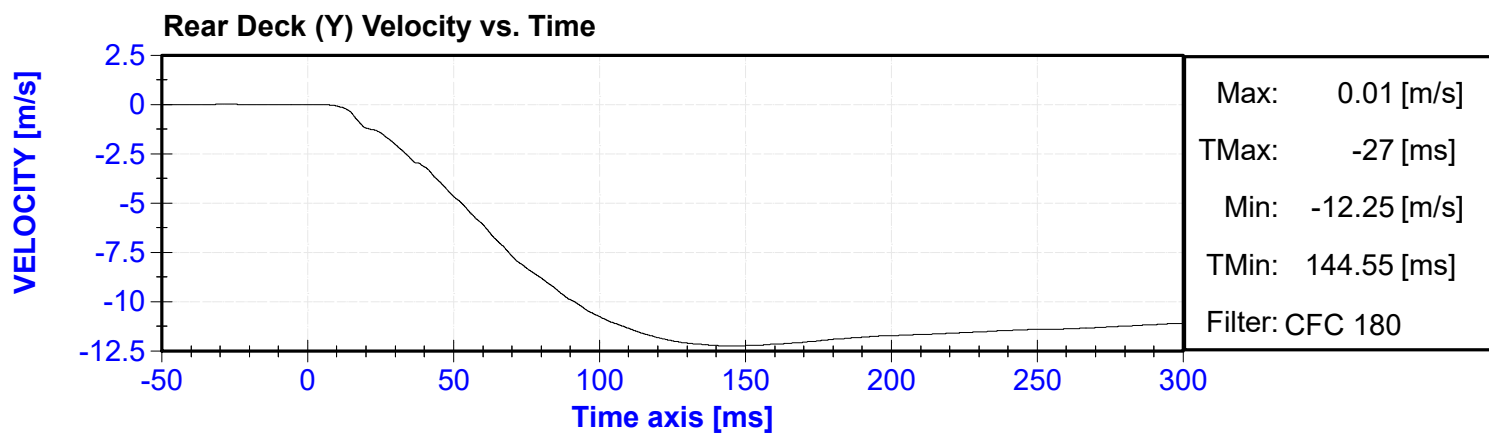












APPENDIX IV

PRE-TEST DUMMY PERFORMANCE CALIBRATION TEST DATA

(Subpart U, ES-2re)

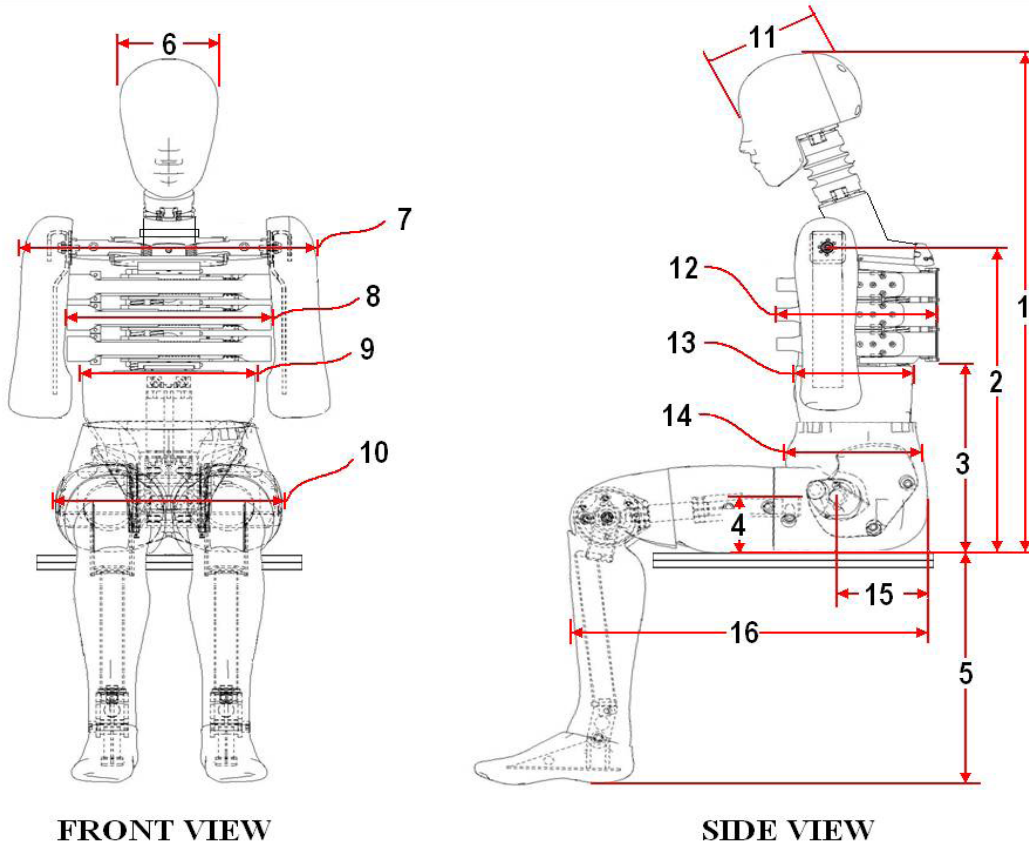


External Measurements - EuroSID-2re

Technician: K. Brogan

Date: 08/17/2023

Dummy Serial Number: D037



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	911	Pass
2	Seat to Shoulder Joint	558	572	566	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	353	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	422	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	364	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	197	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	606	Pass

ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

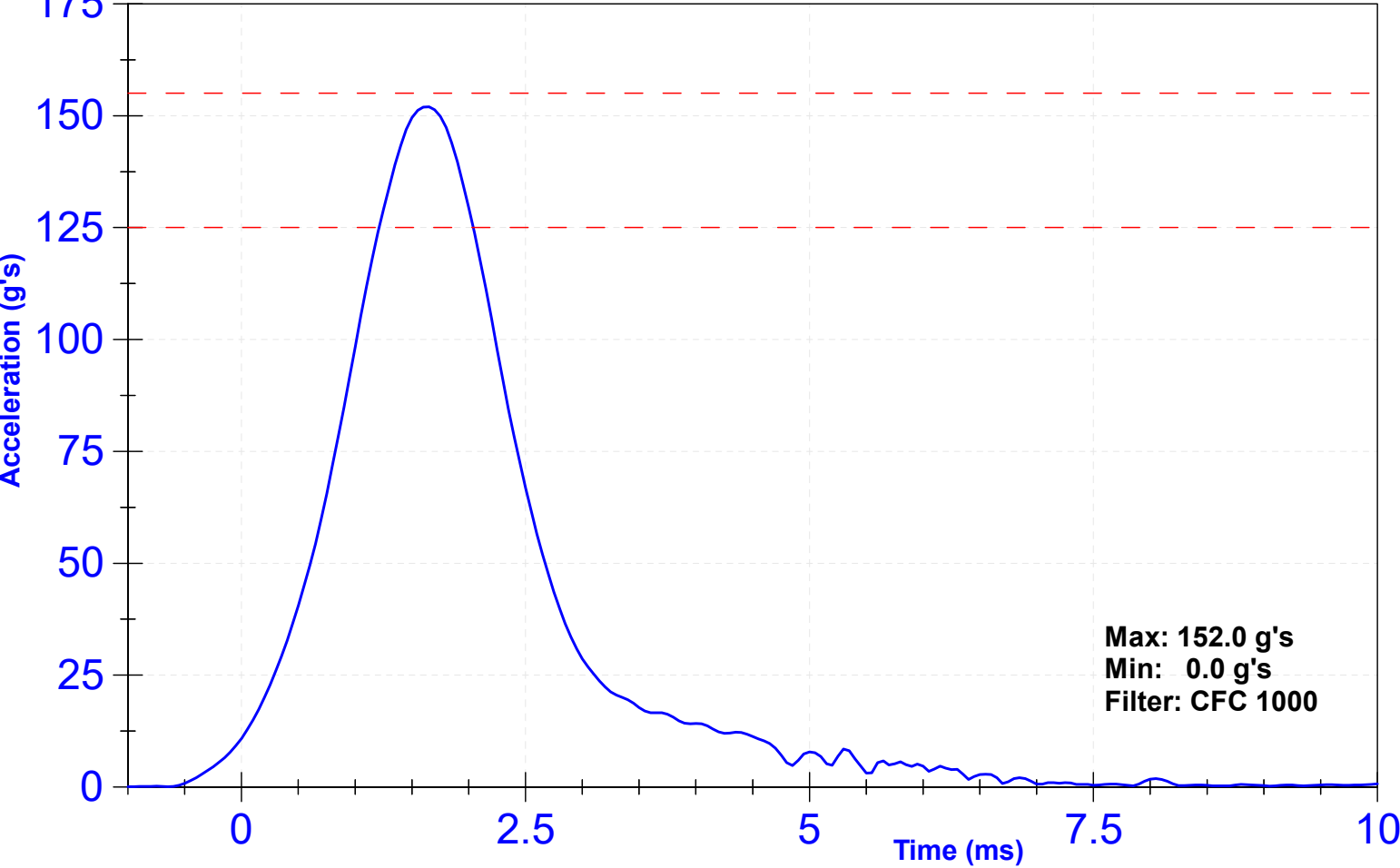
Results

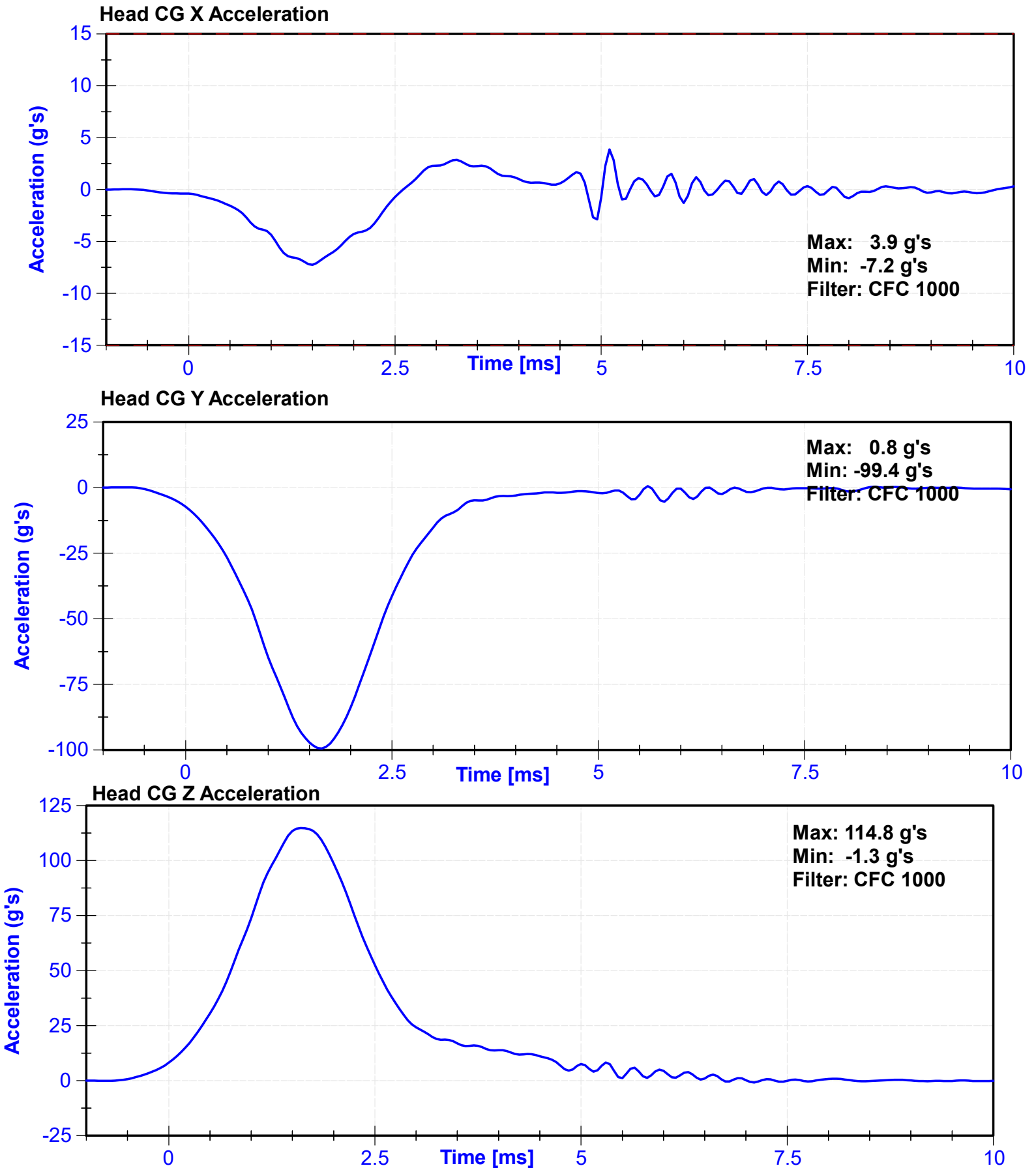
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	51.0	Pass
Resultant Acceleration	125	155	g's	152.0	Pass
Oscillation	0	15	%	10.91	Pass
Fore-Aft Acceleration	-15	15	g's	-7.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	8/8/2023	2/4/2024
Y Accelerometer	Endevco	T22281	8/8/2023	2/4/2024
Z Accelerometer	Endevco	T26050	8/8/2023	2/4/2024

Resultant Acceleration





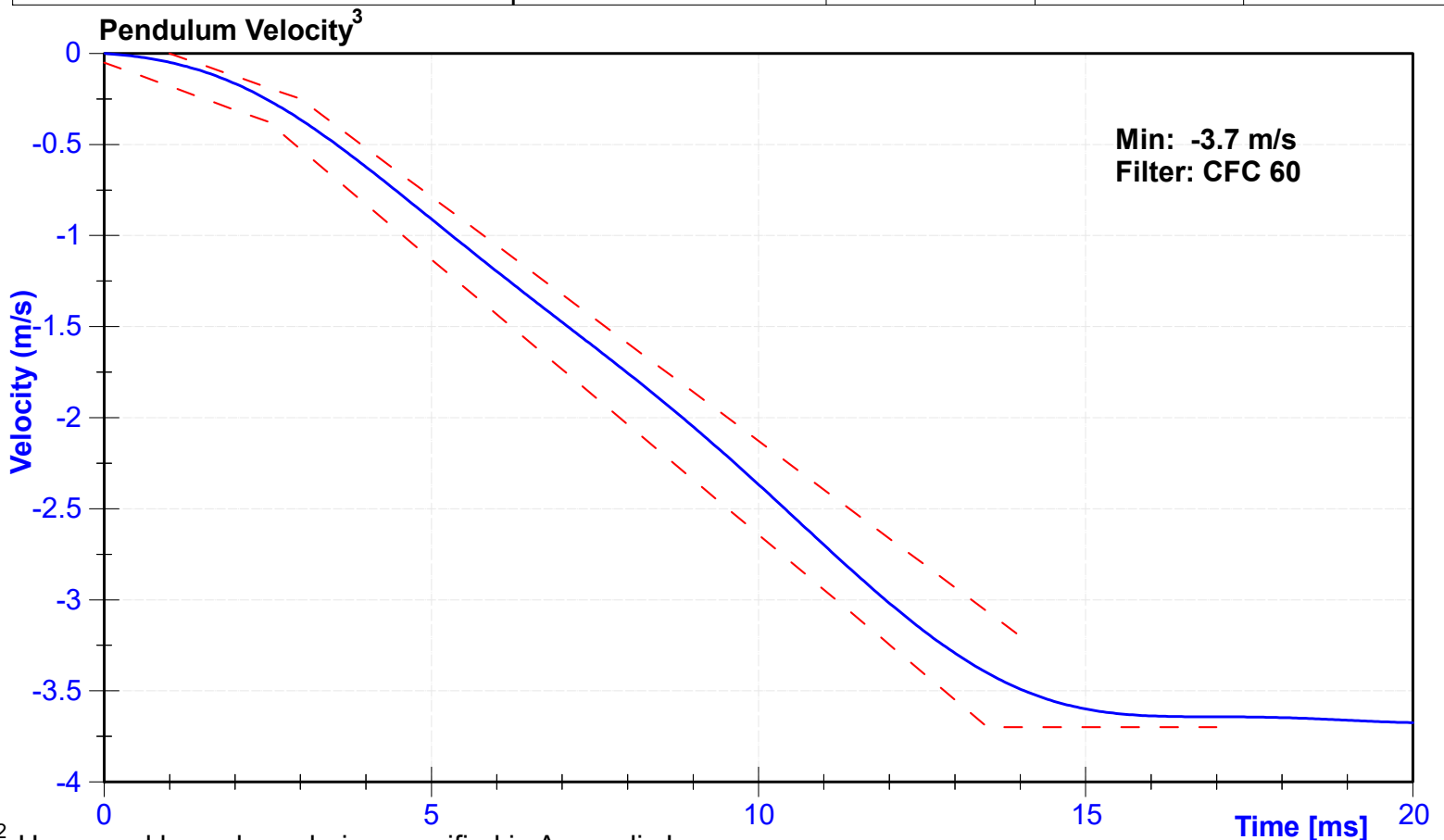
ATD Manufacturer	FTSS	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	60	Pass
Velocity	3.3	3.5	m/s	3.44	Pass
Lateral Neck Rotation	49	59	deg	50.7	Pass
Time at Maximum Rotation	54	66	ms	54.0	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.0	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

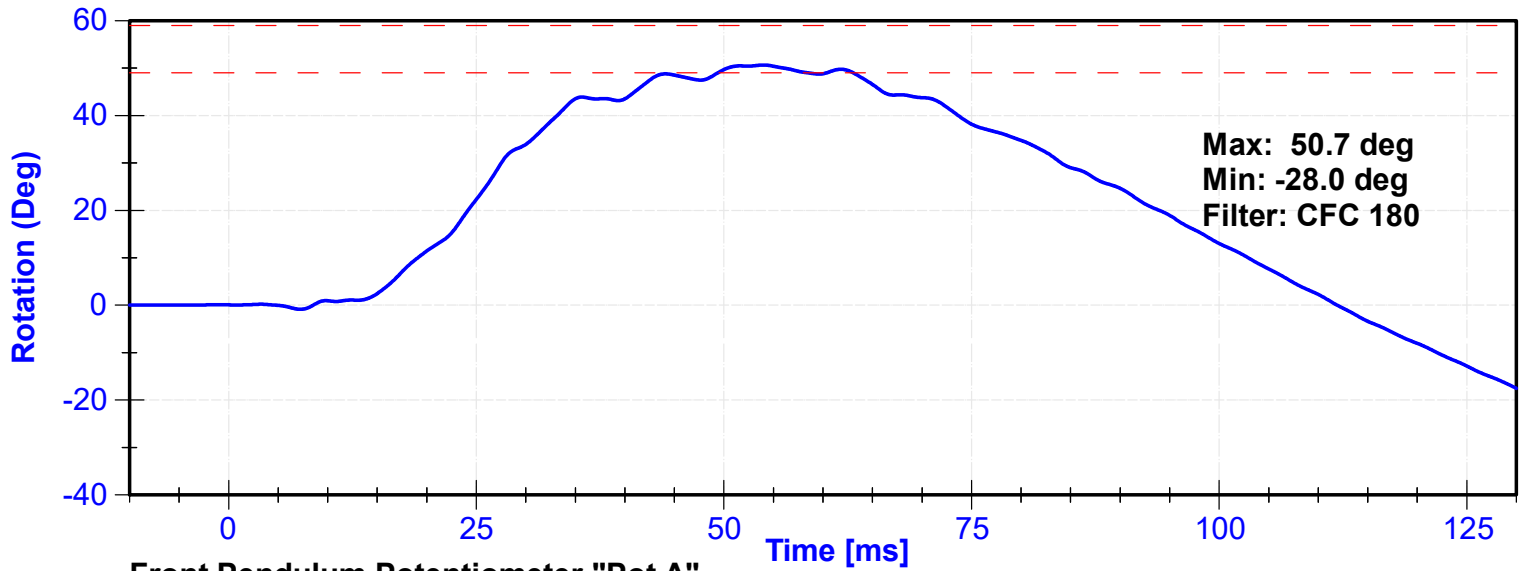
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023

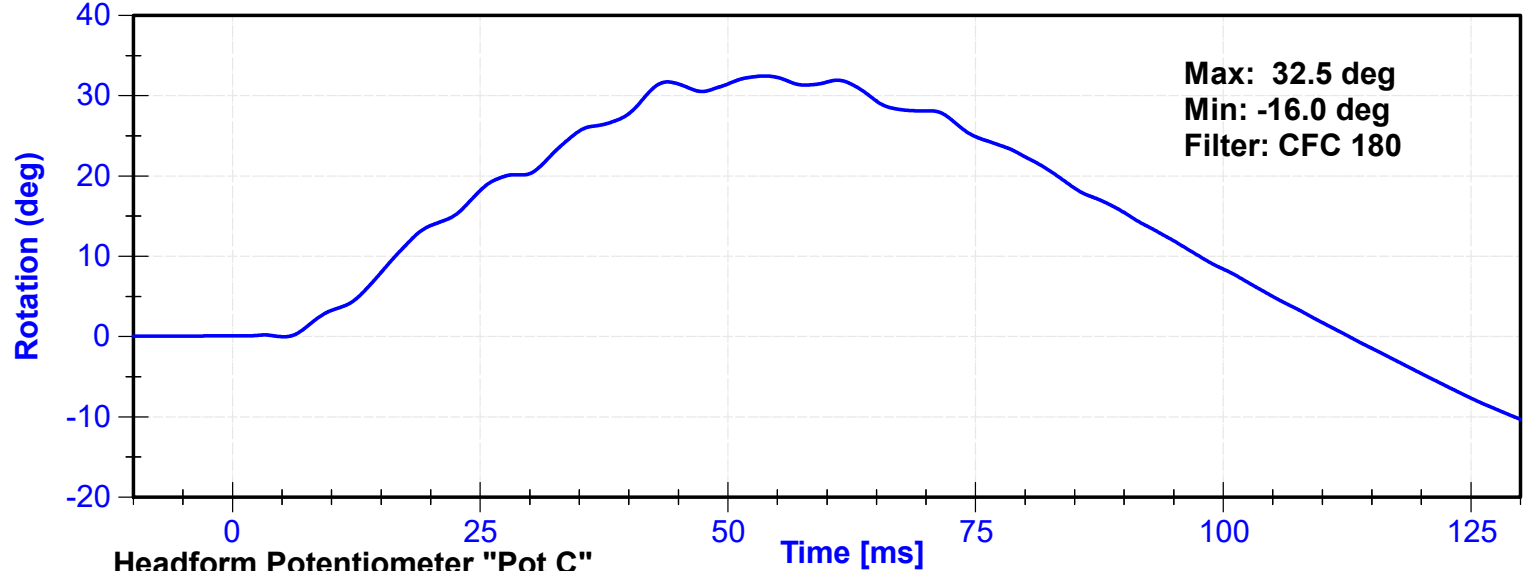


^{1,2} Upper and lower boundaries specified in Appendix I

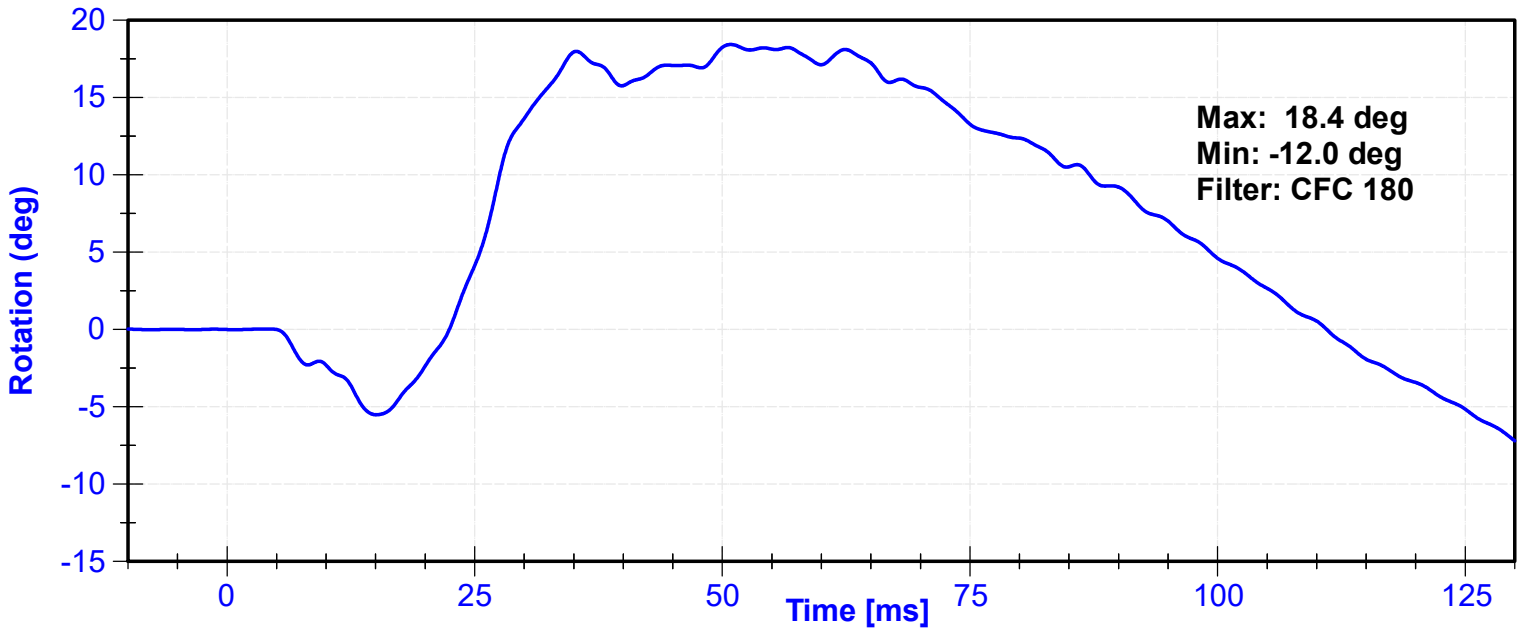
Neck Rotation



Front Pendulum Potentiometer "Pot A"



Headform Potentiometer "Pot C"



Appendix I

² Upper Boundary Corridor		¹ Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

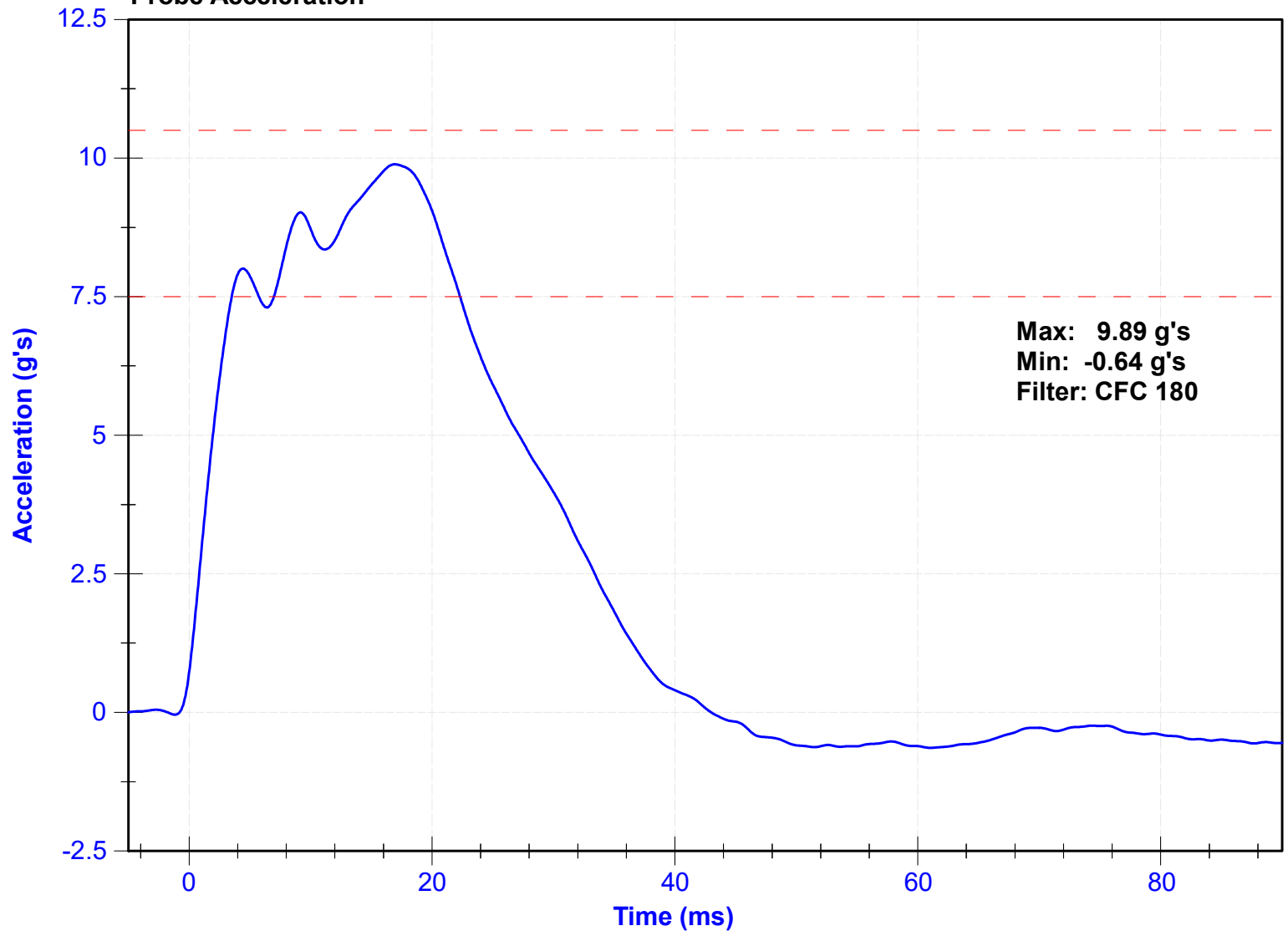
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	60	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	7.5	10.5	g's	9.89	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023

Probe Acceleration



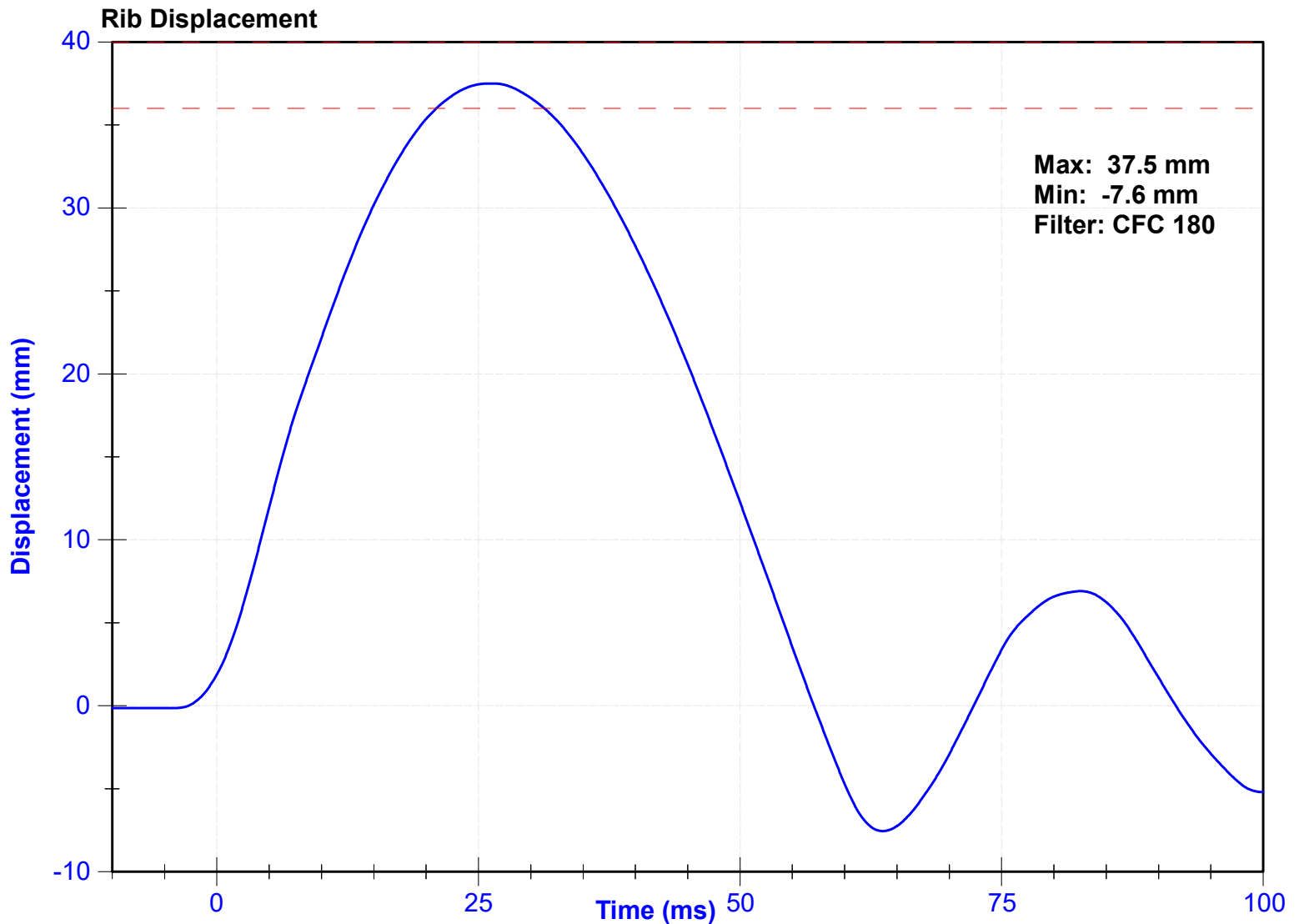
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024



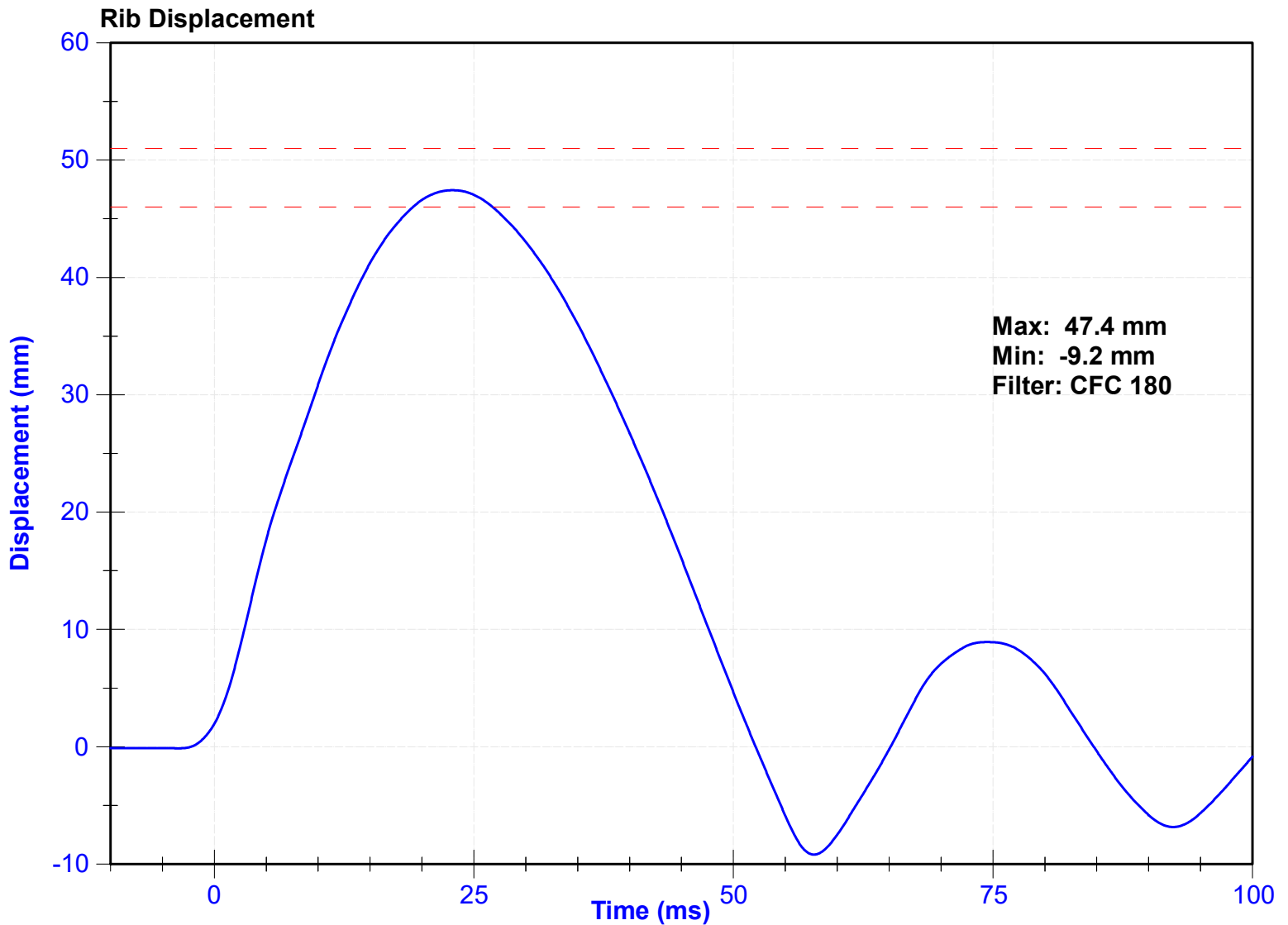
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	47.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024



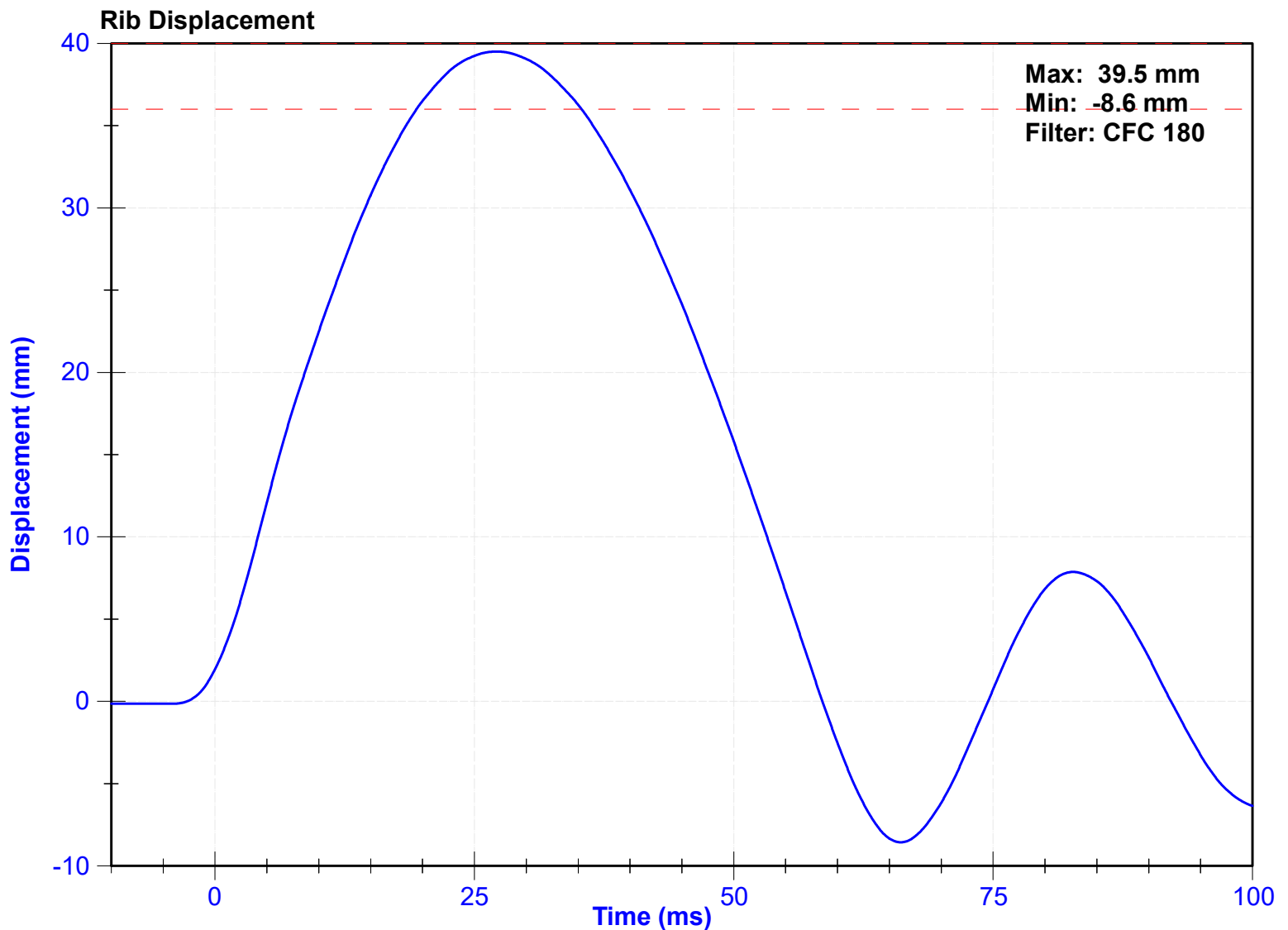
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	39.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024



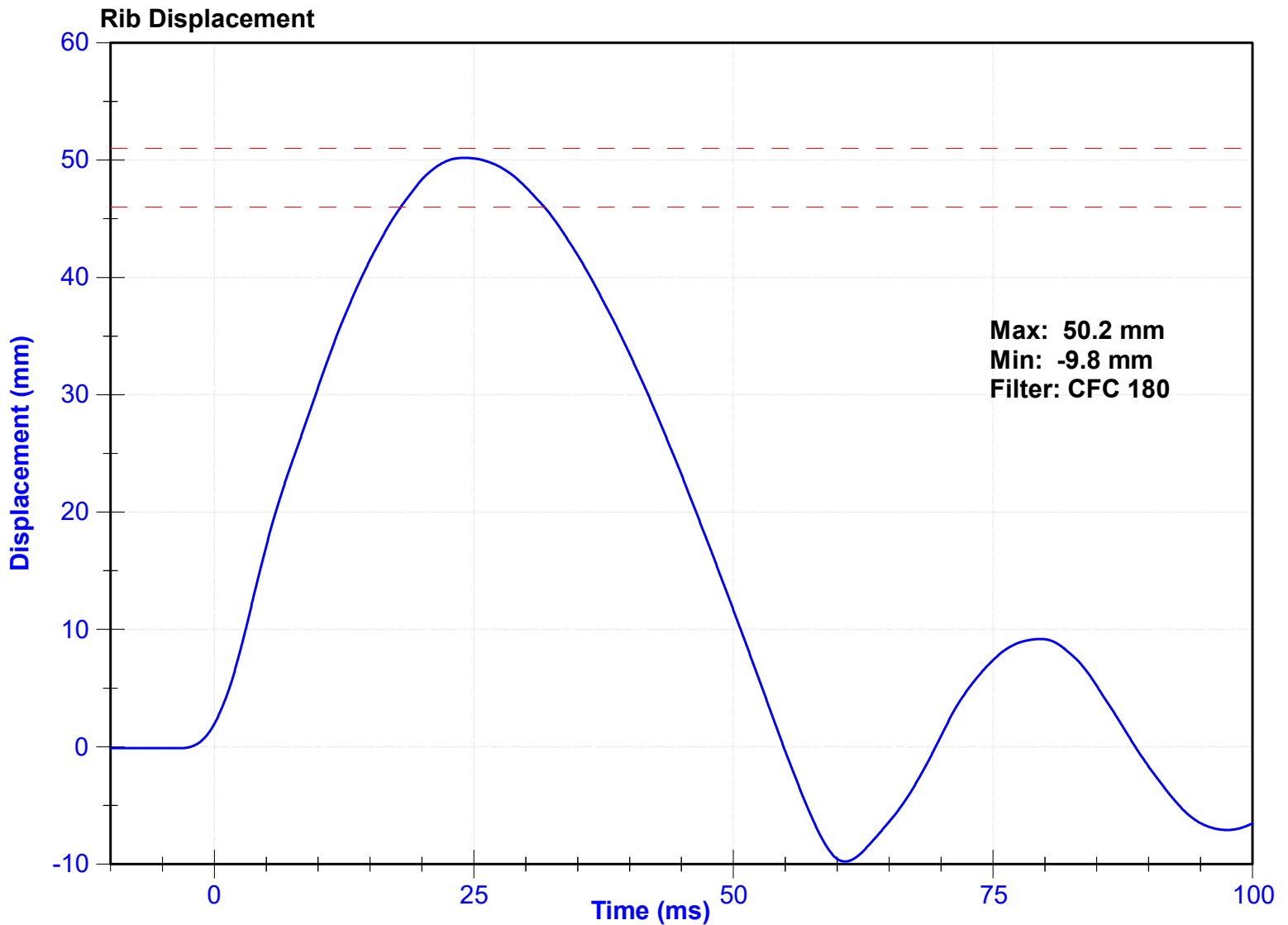
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	50.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024



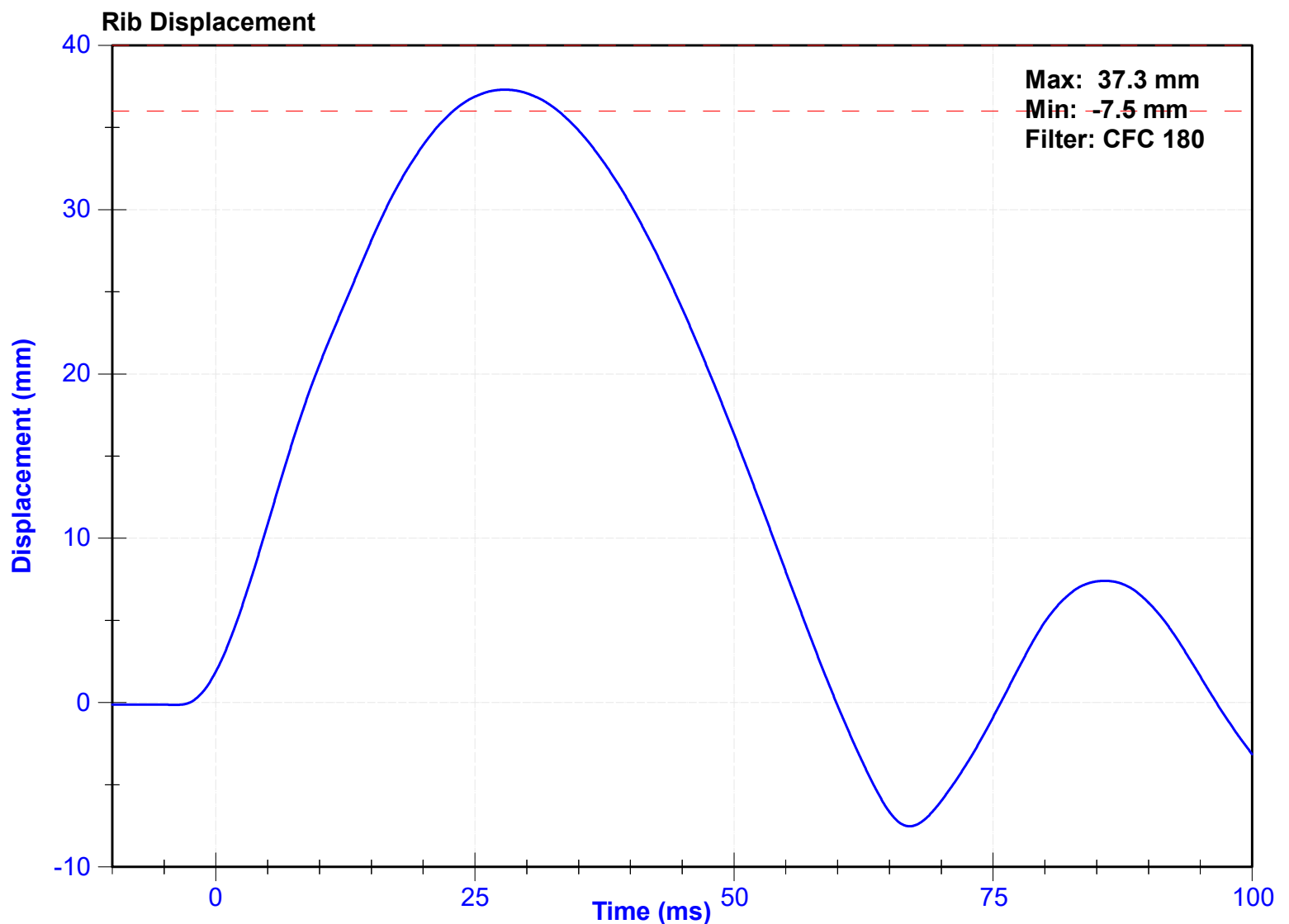
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	36	40	mm	37.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024



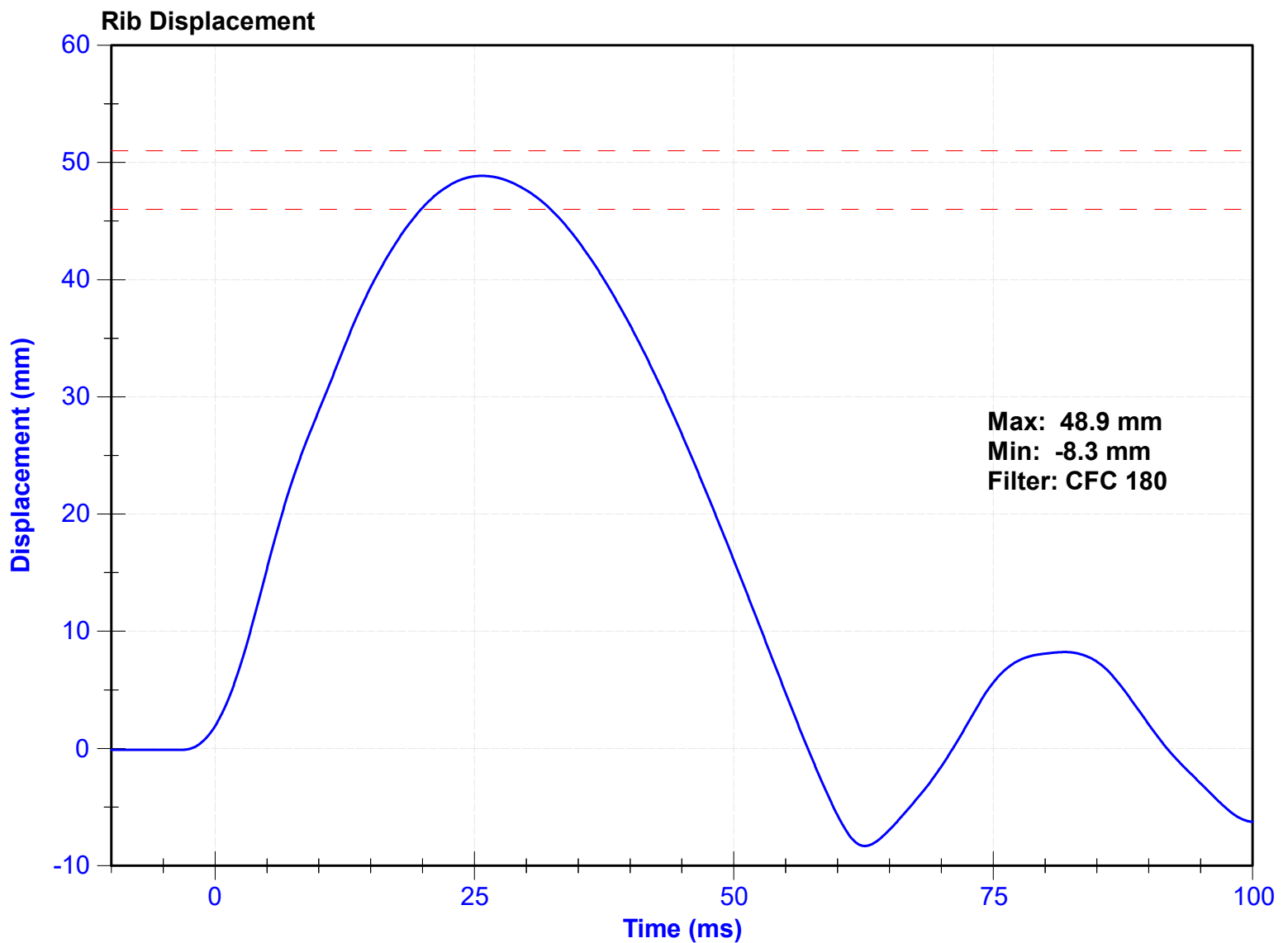
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	57	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024



ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

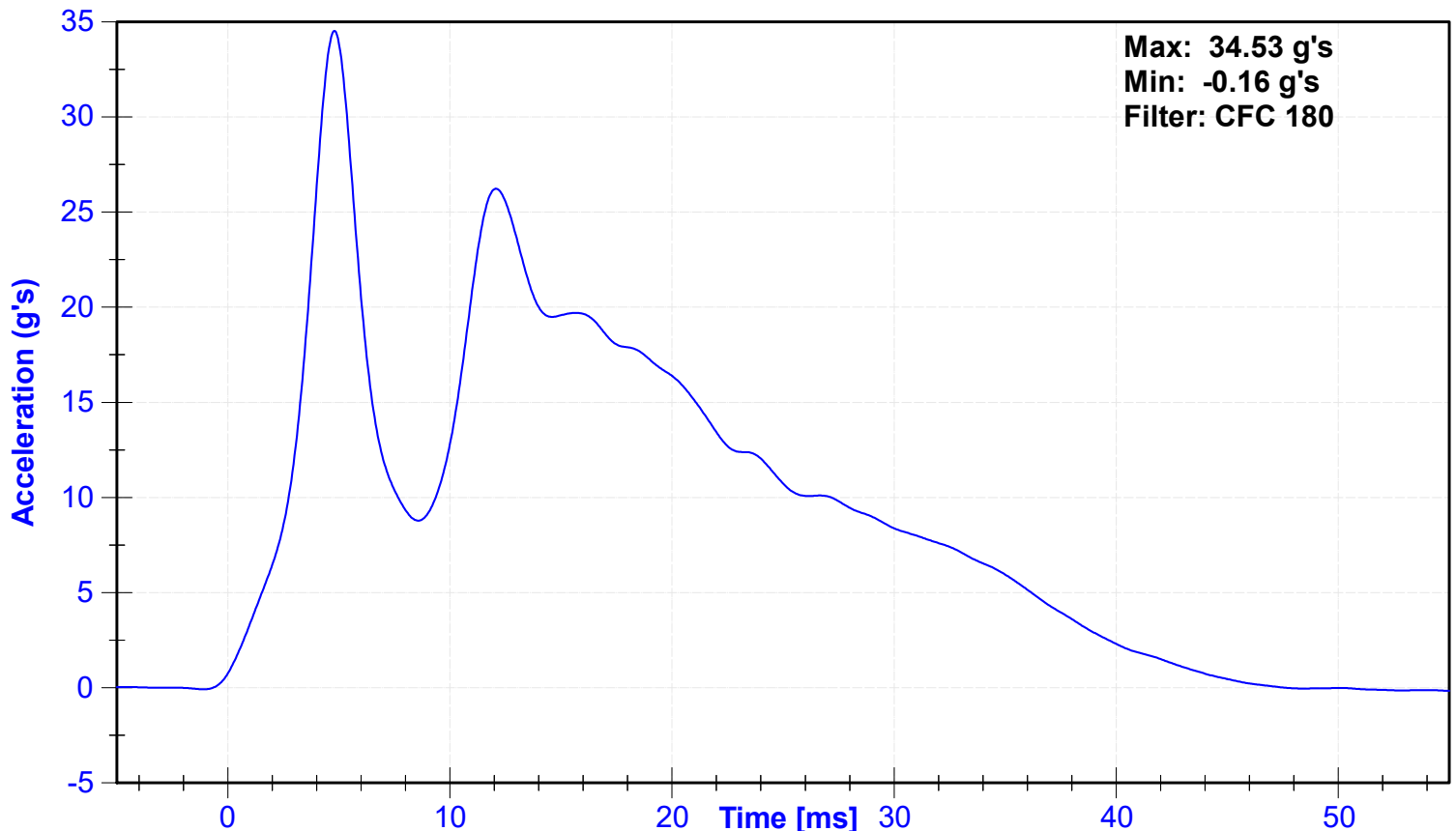
Results

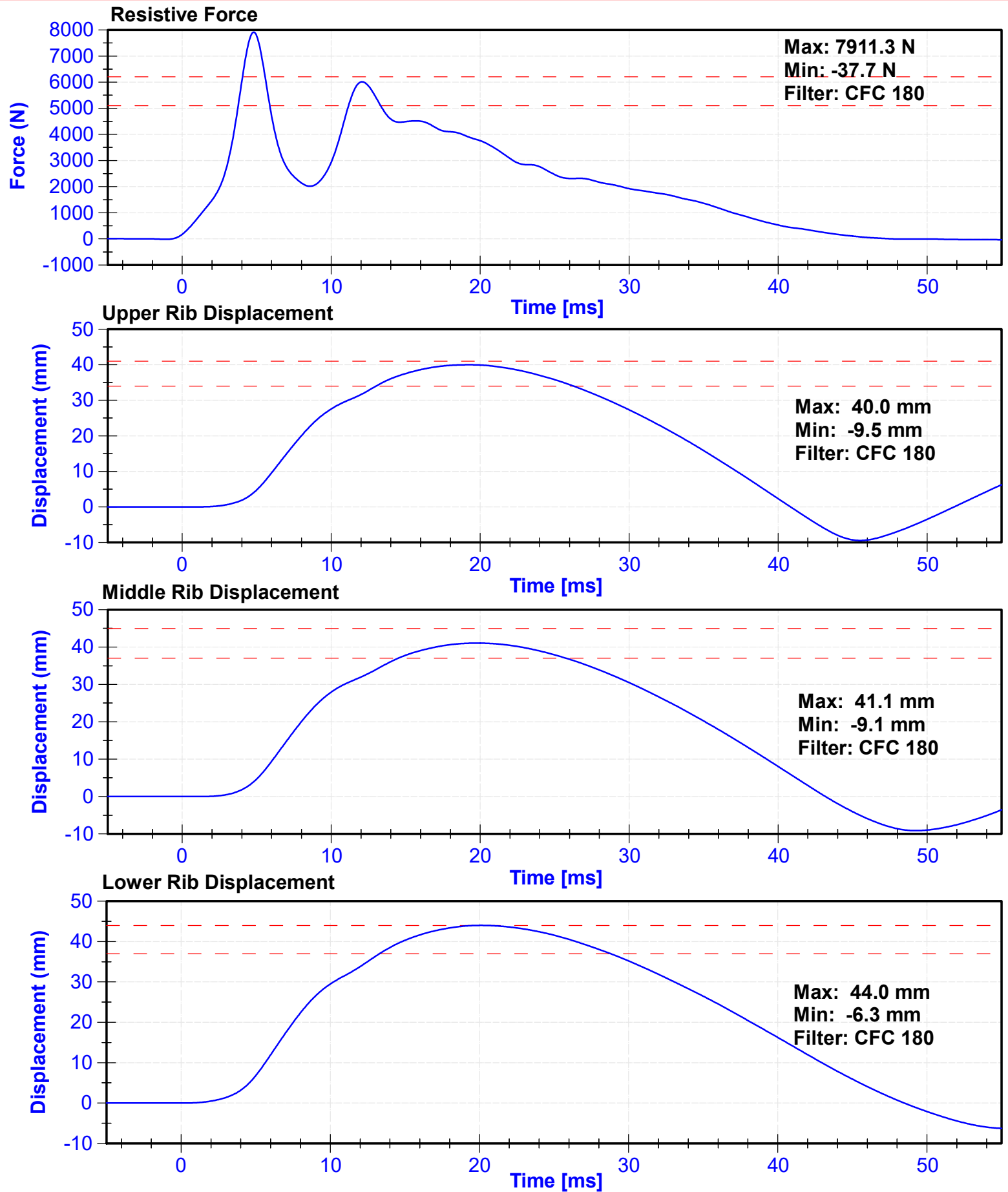
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	60	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	6010.8	Pass
Upper Thorax Rib Deflection	34	41	mm	40.0	Pass
Mid Thorax Rib Deflection	37	45	mm	41.1	Pass
Lower Thorax Rib Deflection	37	44	mm	44.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Thorax Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024
Middle Thorax Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024
Lower Thorax Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024

Probe Acceleration





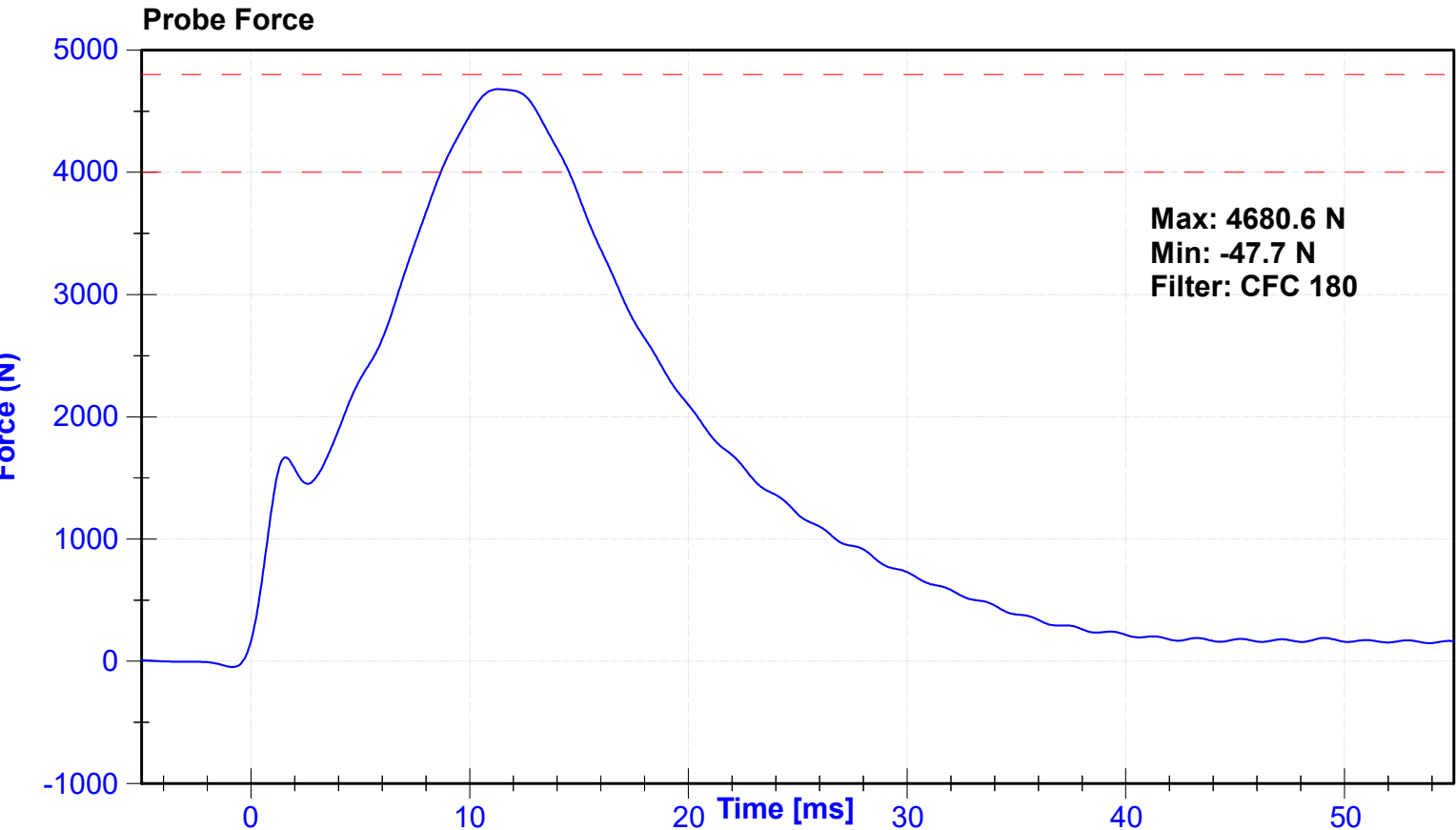
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

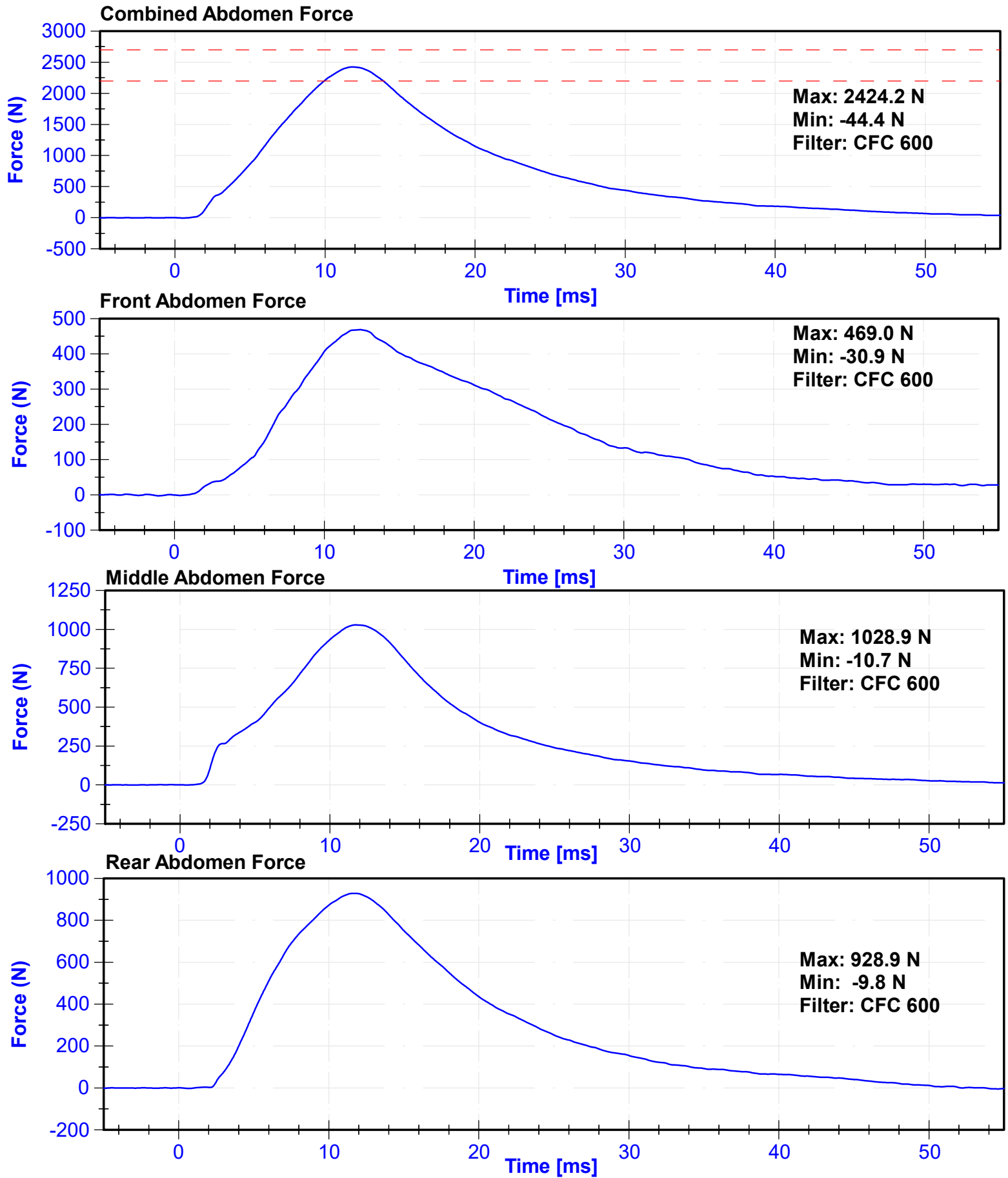
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	59	Pass
Velocity	3.9	4.1	m/s	3.94	Pass
Combined Abdomen Force	2200	2700	N	2424.2	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.85	Pass
Resistive Probe Force	4000	4800	N	4680.6	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.30	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Front Abdomen Load Cell	Denton	1440	8/8/2023	8/7/2024
Middle Abdomen Load Cell	Denton	1525	8/8/2023	8/7/2024
Rear Abdomen Load Cell	Denton	1528	8/8/2023	8/7/2024





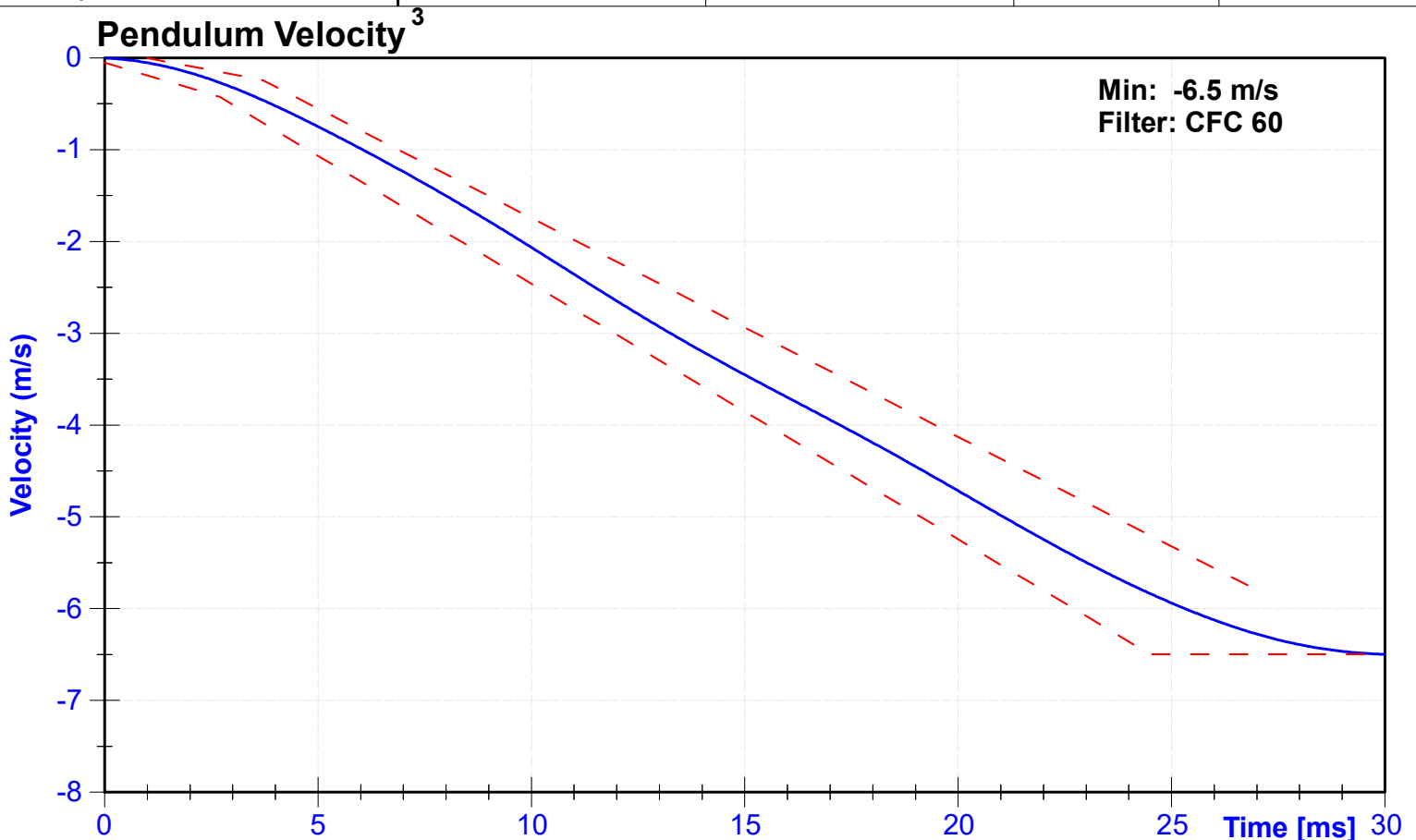
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

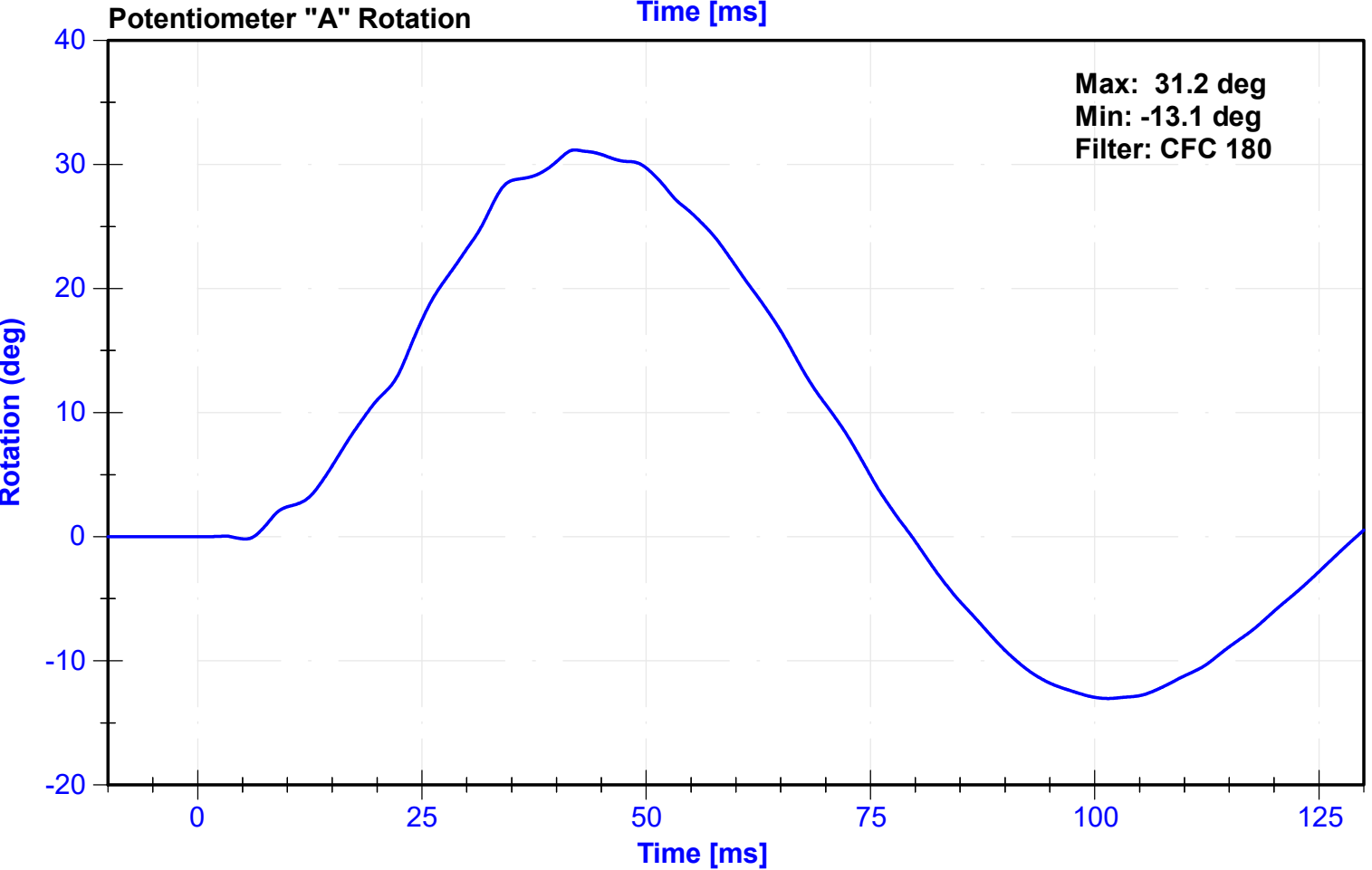
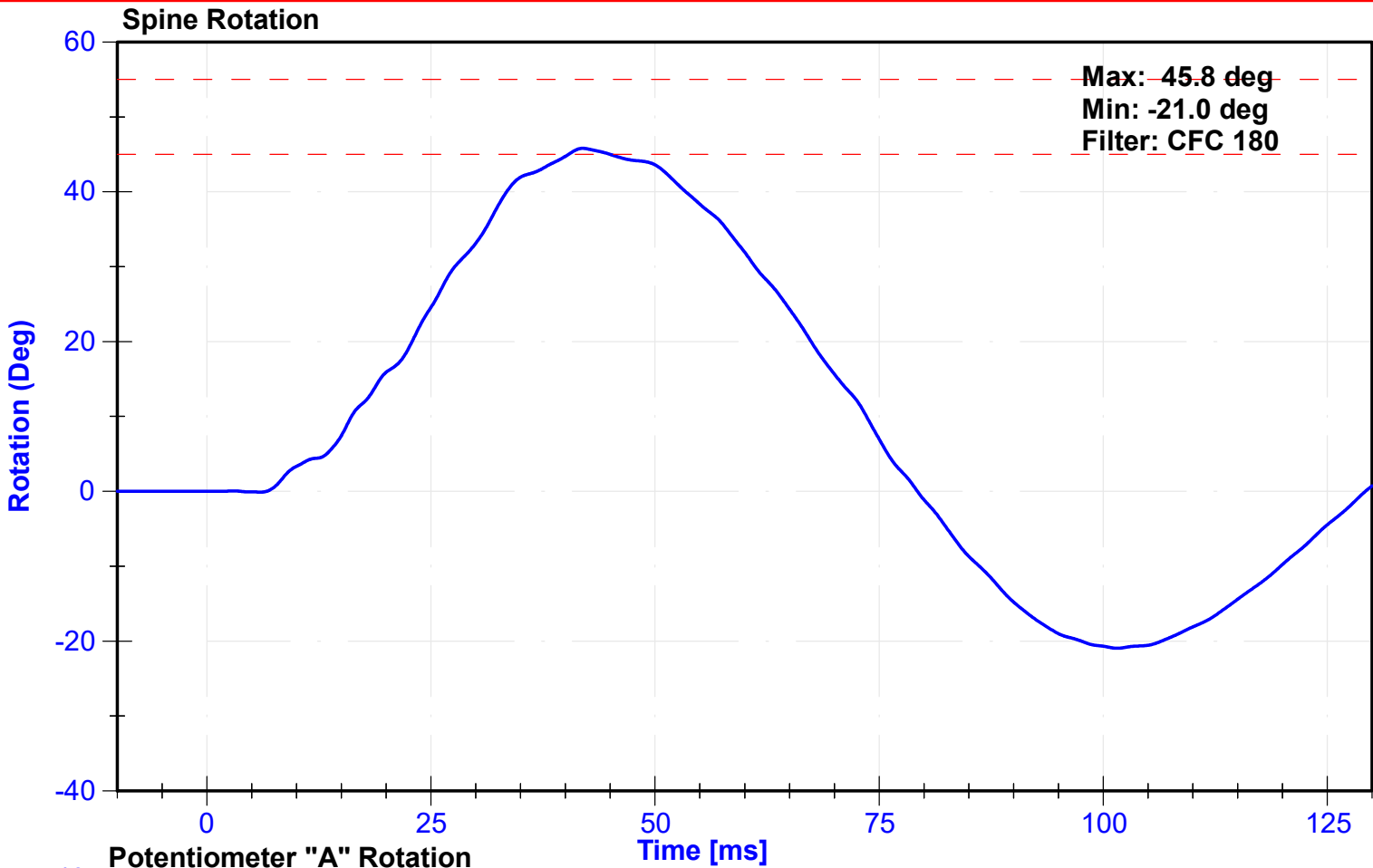
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	57	Pass
Velocity	5.95	6.15	m/s	6.064	Pass
Lateral Spine Rotation	45	55	deg	45.8	Pass
Time at Maximum Rotation	39	53	ms	41.9	Pass
Time of Decay to Zero Degrees	37	57	ms	37.3	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

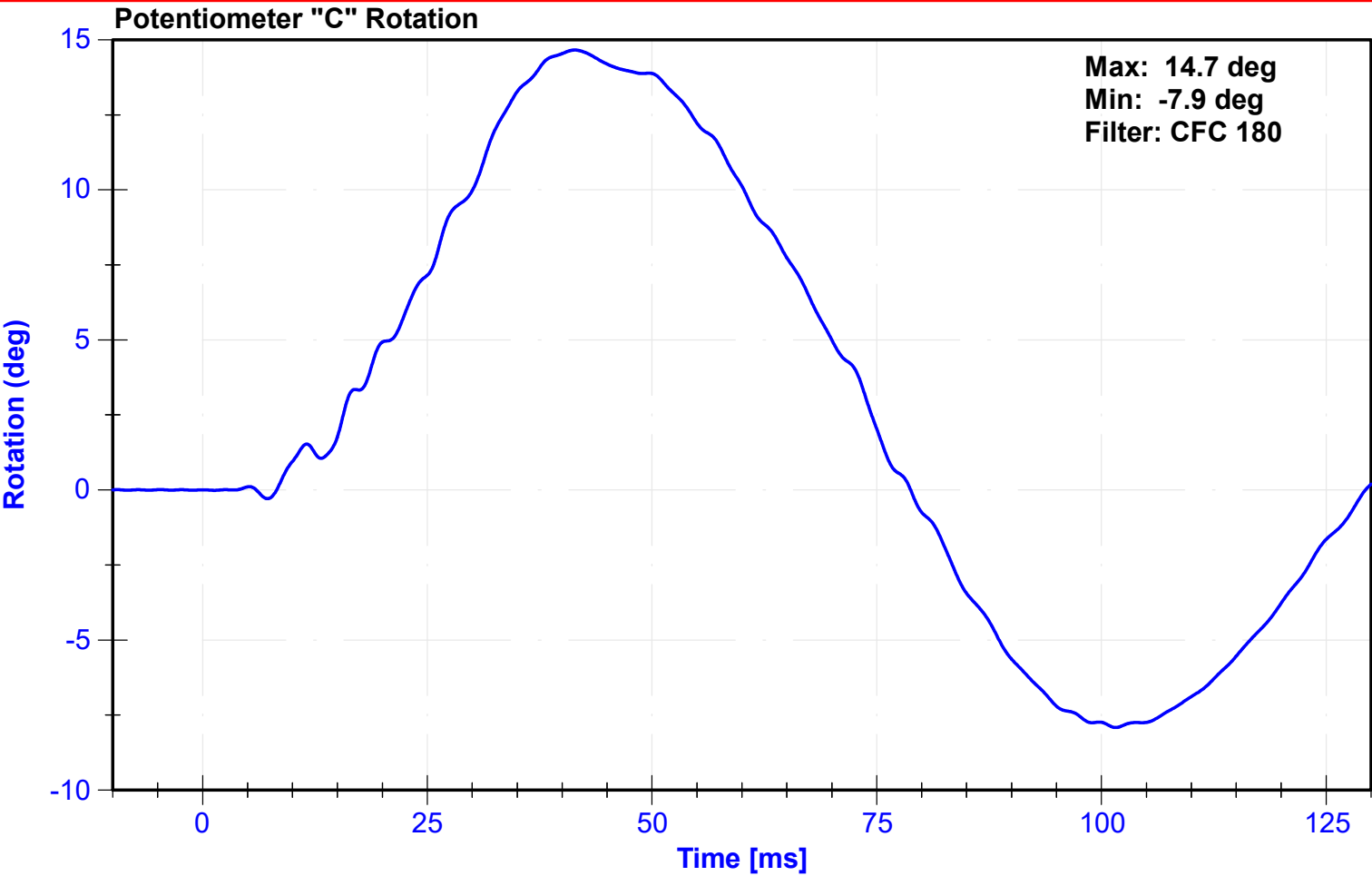
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



^{1,2} Upper and lower boundaries specified in Appendix I





Appendix I

² Upper Boundary Corridor		¹ Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

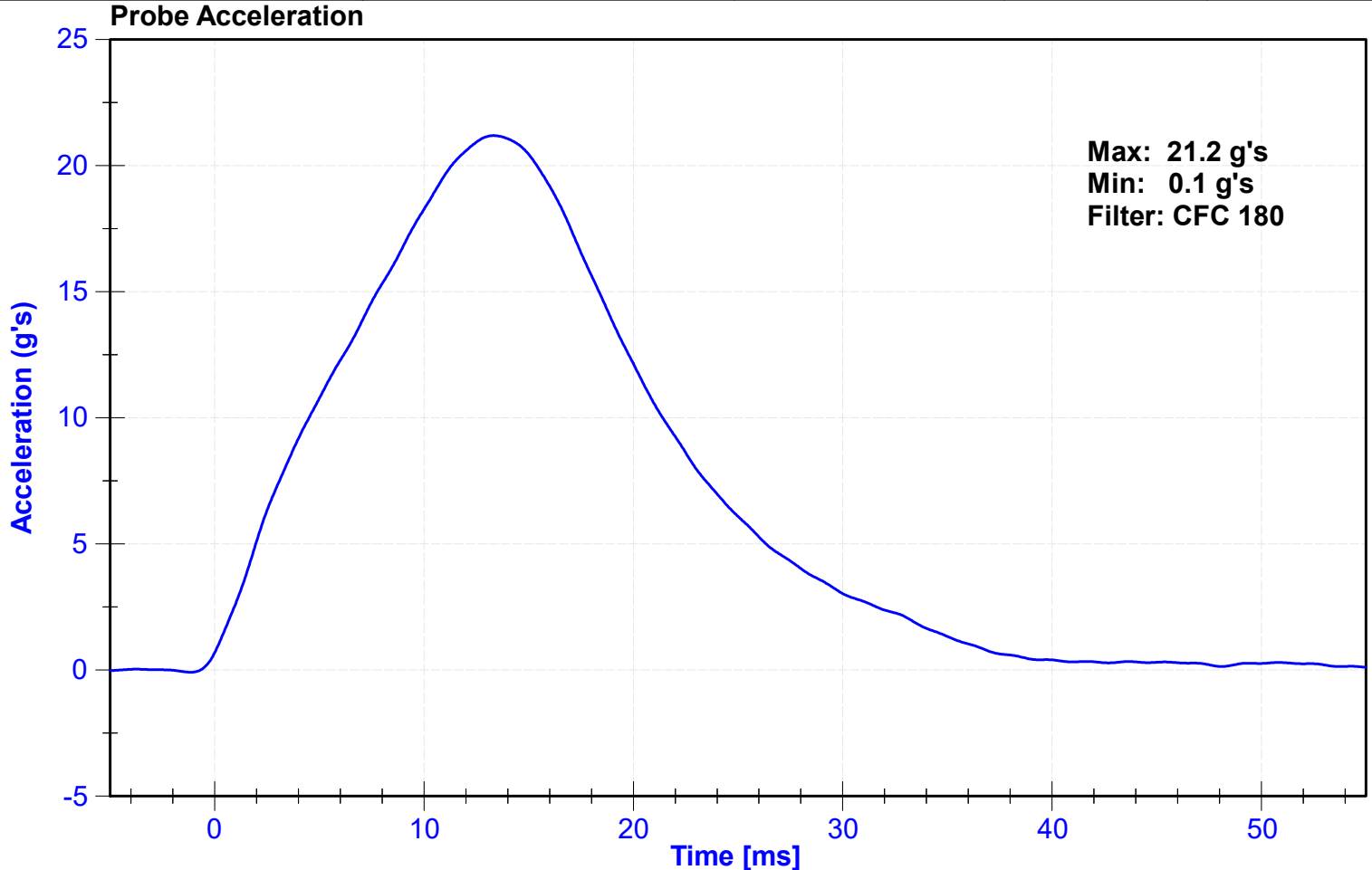
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

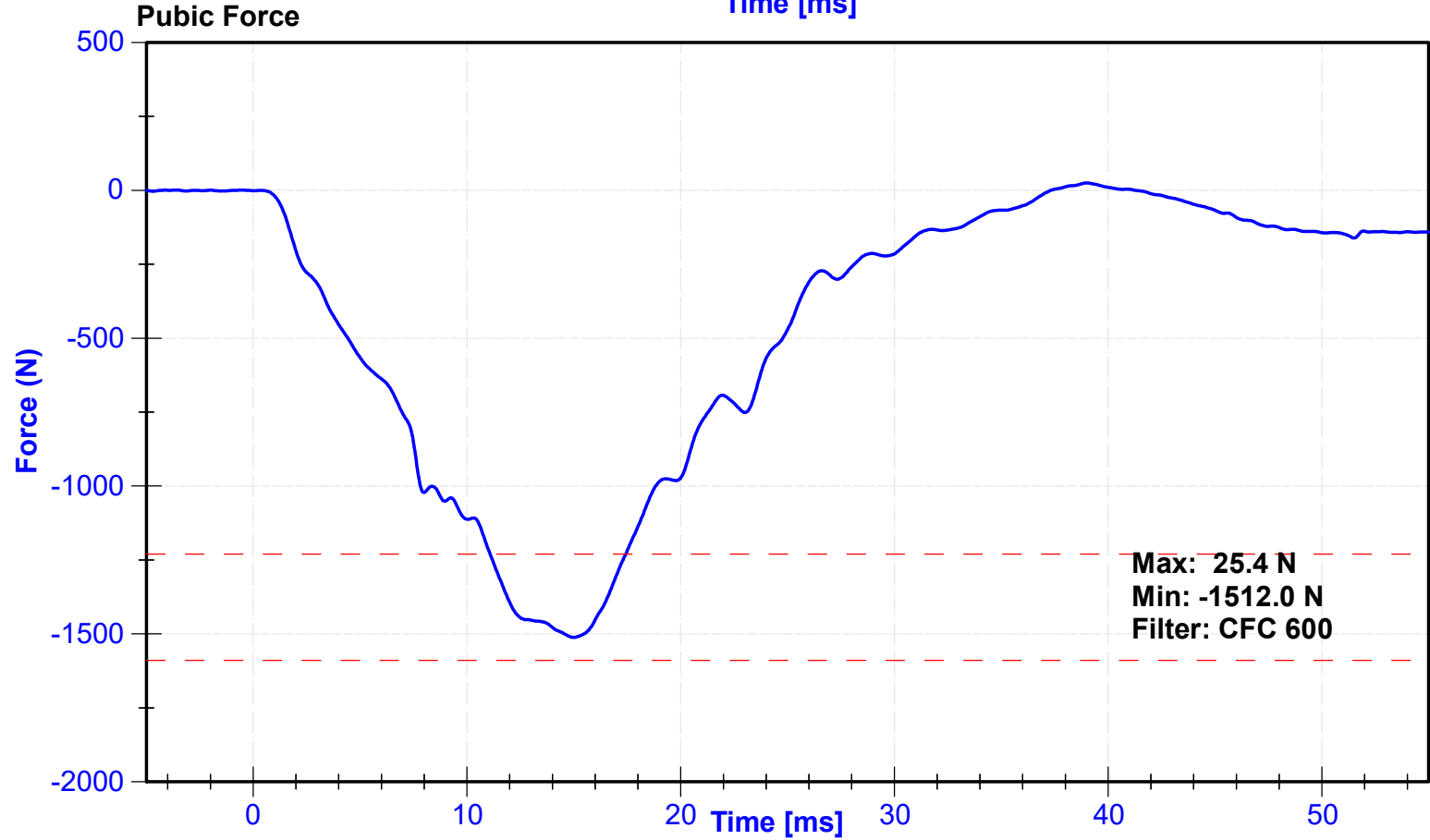
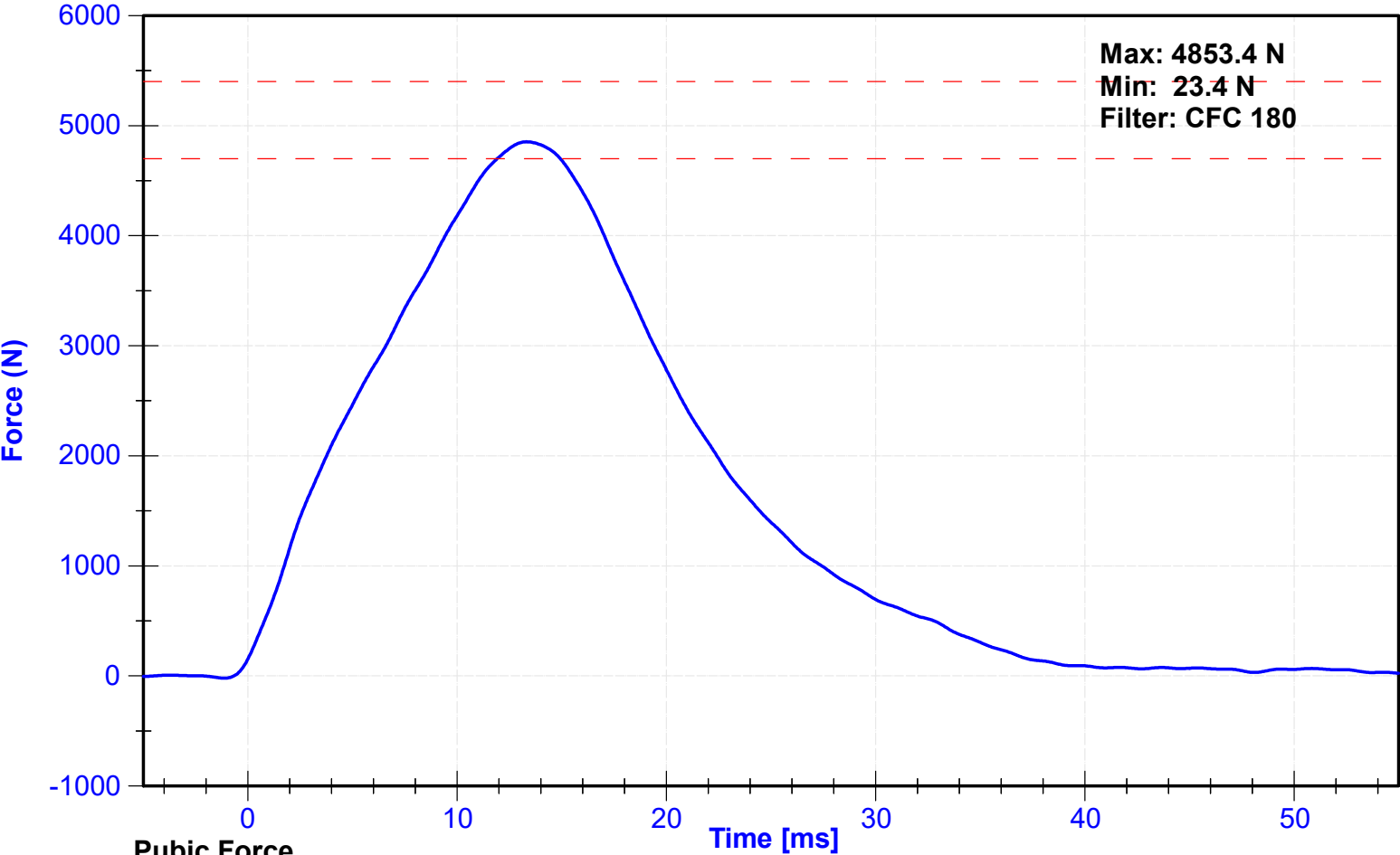
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	59	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Resistive Force	4700	5400	N	4853.4	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.30	Pass
Pubic Force	-1590	-1230	N	-1512.0	Pass
Time at Peak Pubic Force	12.2	17.0	ms	15.00	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024



Resistive Force



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

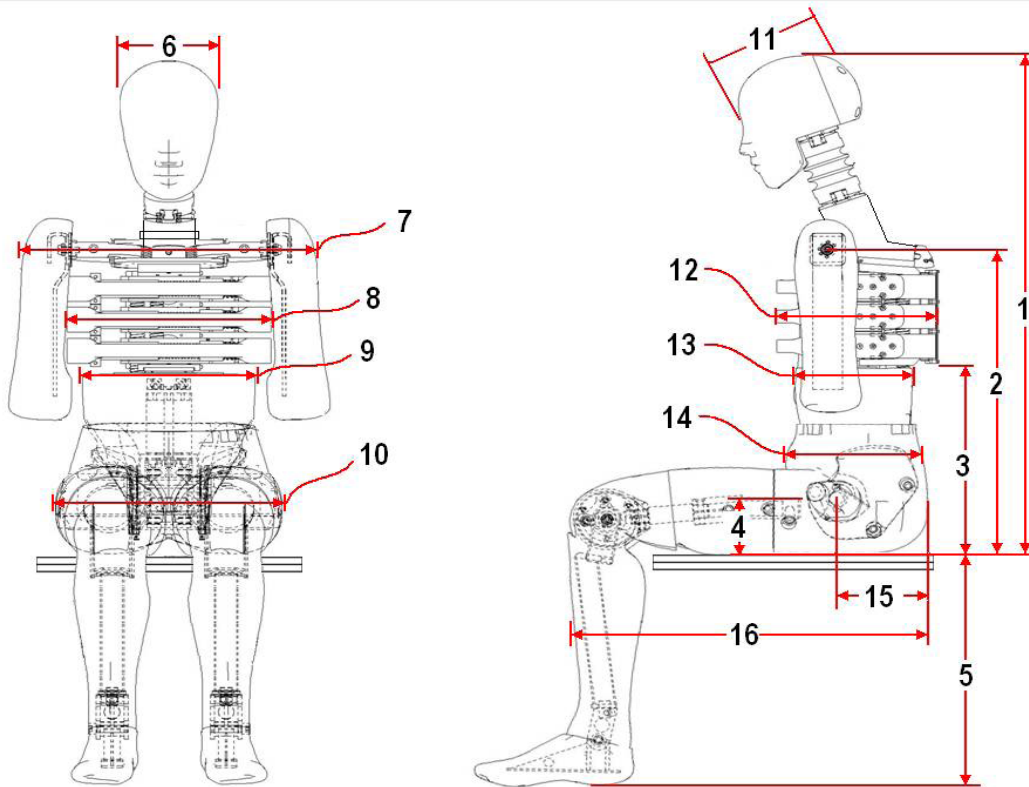


External Measurements - EuroSID-2re

Technician: K. Brogan

Date: 08/28/2023

Dummy Serial Number: D037



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	564	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	423	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	471	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	364	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	241	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	605	Pass

ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

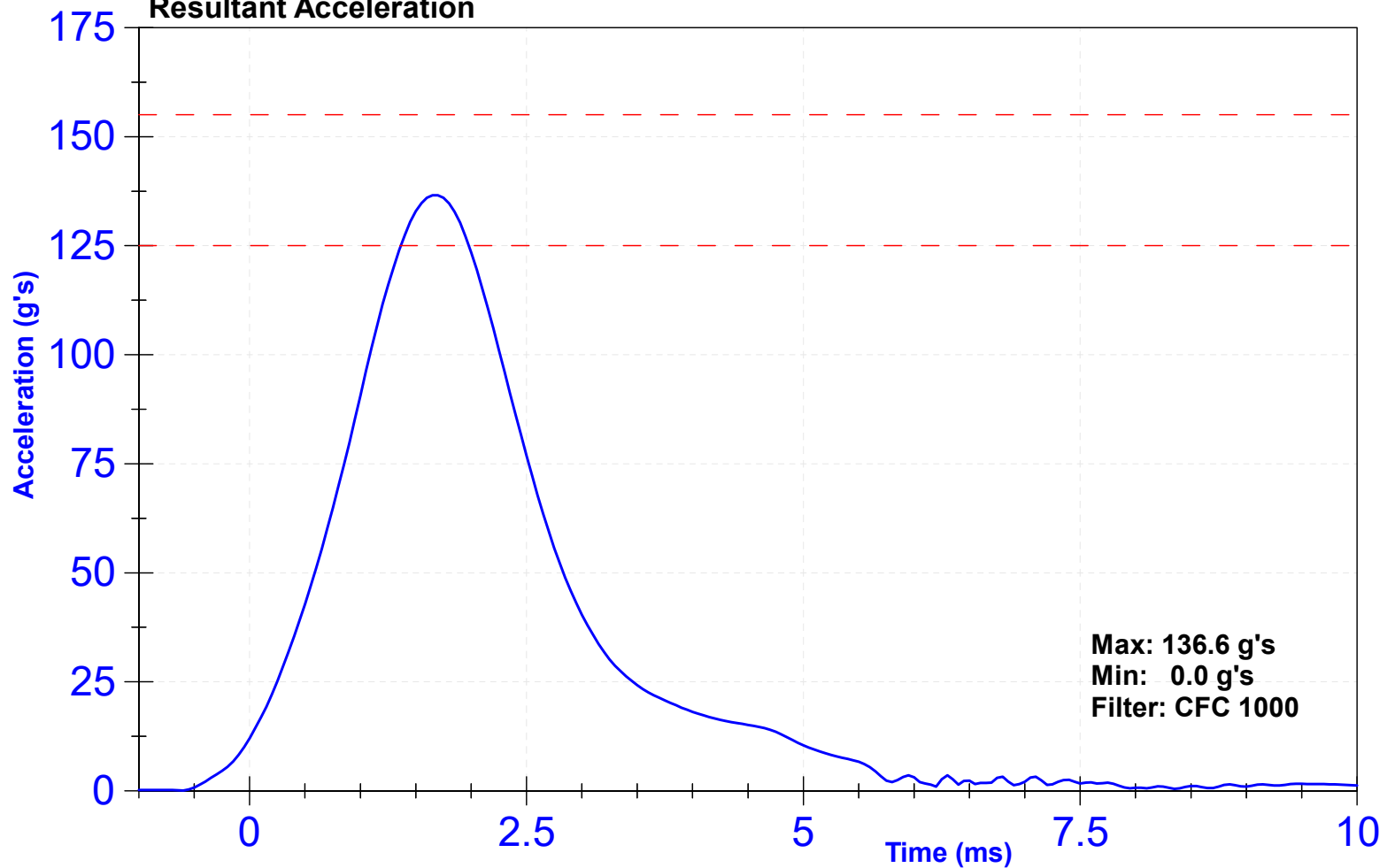
Results

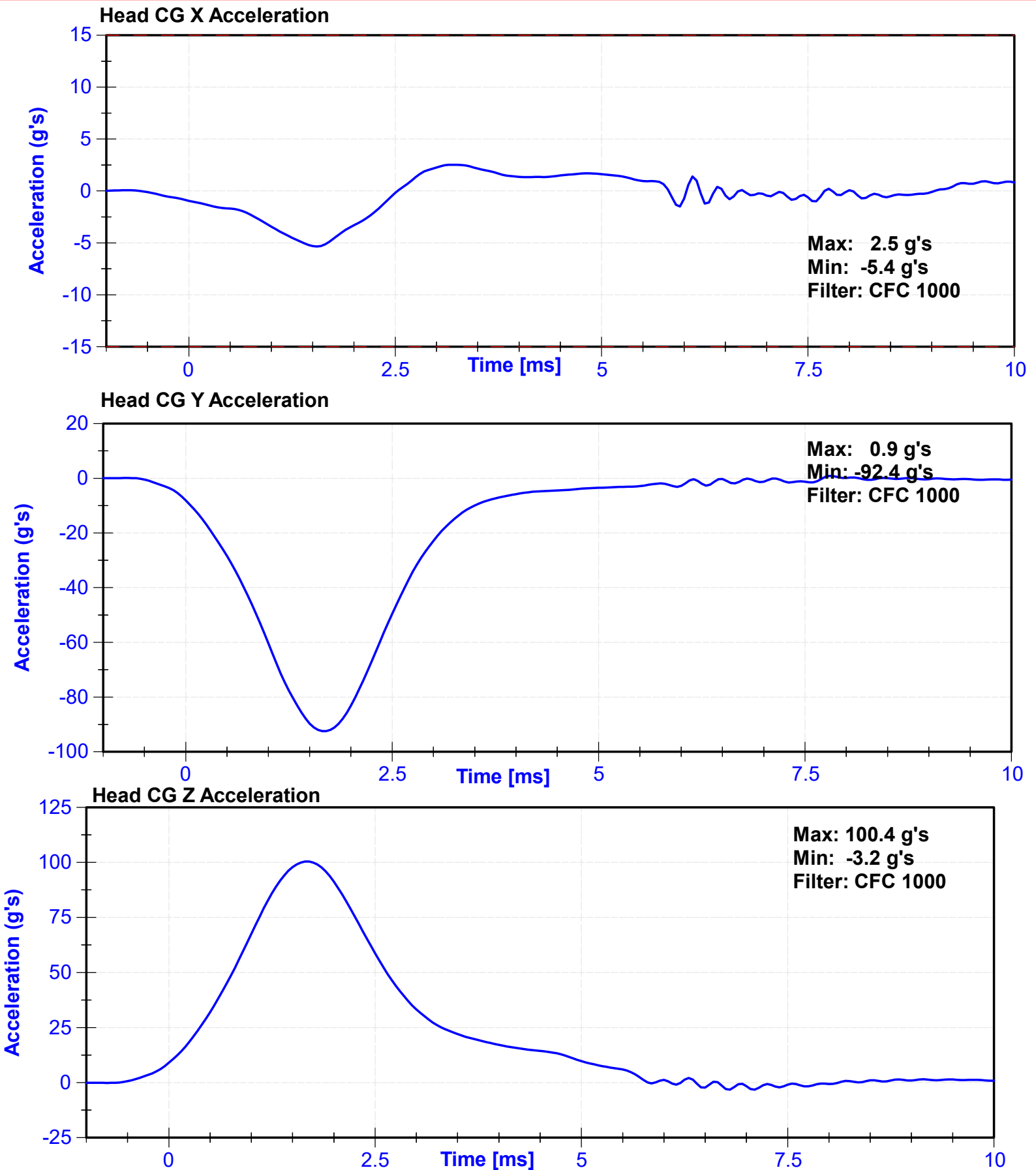
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.4	Pass
Humidity	10	70	%	51	Pass
Resultant Acceleration	125	155	g's	136.6	Pass
Oscillation	0	15	%	2.61	Pass
Fore-Aft Acceleration	-15	15	g's	-5.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	8/8/2023	2/4/2024
Y Accelerometer	Endevco	T22281	8/8/2023	2/4/2024
Z Accelerometer	Endevco	T26050	8/8/2023	2/4/2024

Resultant Acceleration





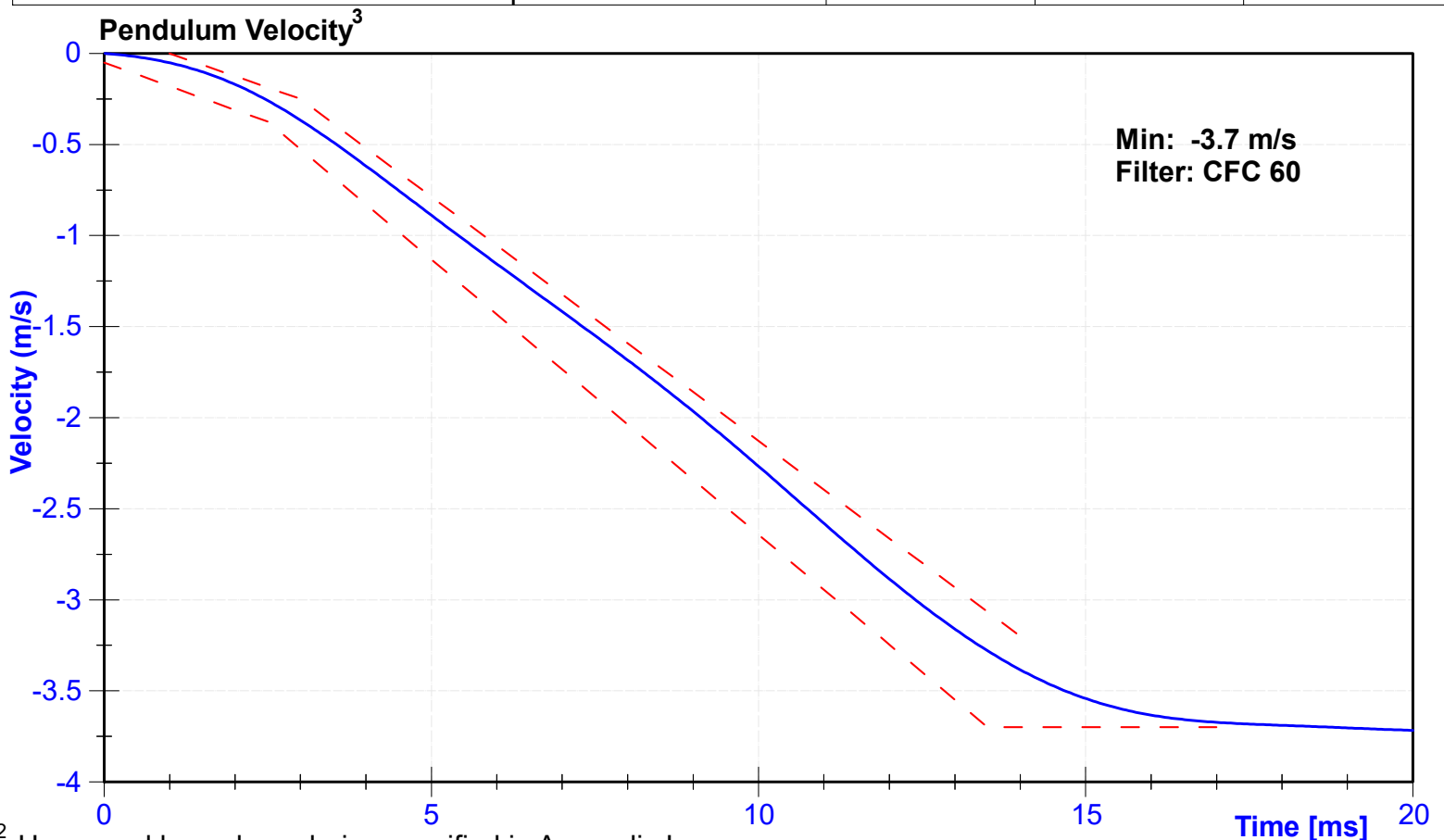
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	65.6	Pass
Velocity	3.3	3.5	m/s	3.44	Pass
Lateral Neck Rotation	49	59	deg	50.2	Pass
Time at Maximum Rotation	54	66	ms	54.0	Pass
Time of Rotation Decay from Maximum	53	88	ms	58.0	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

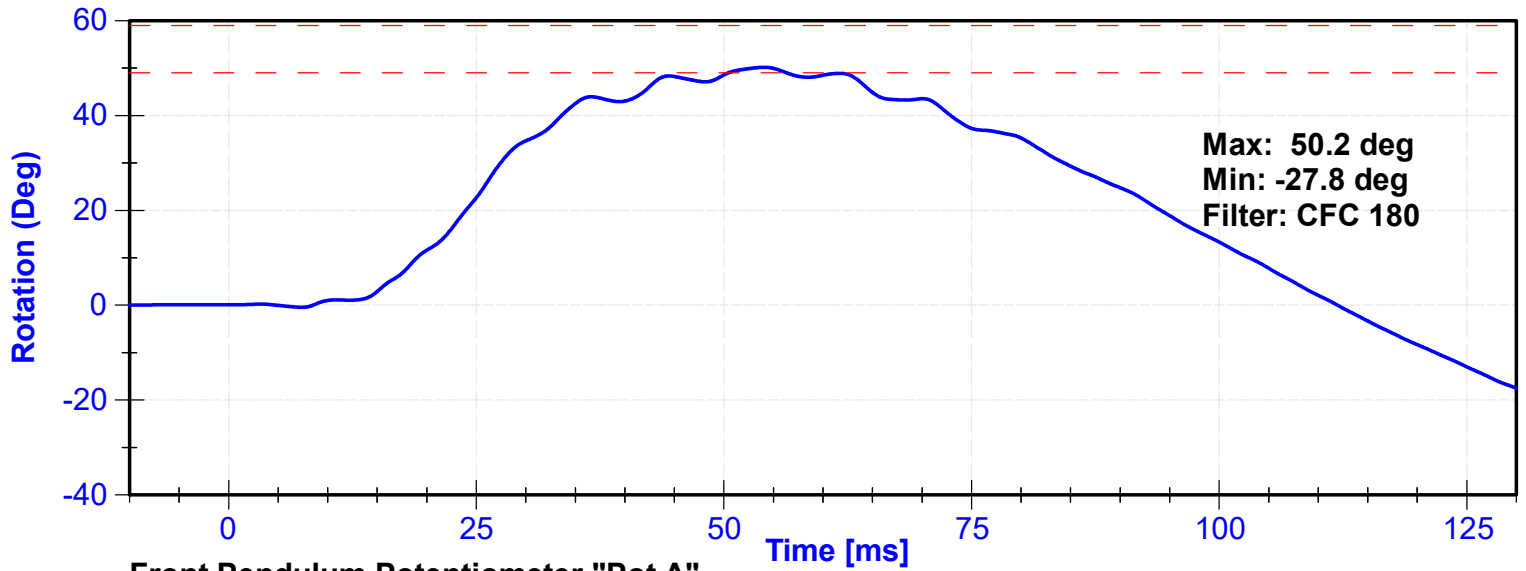
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Front Pendulum Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Headform Potentiometer	Sfernice	095	10/5/2022	10/5/2023

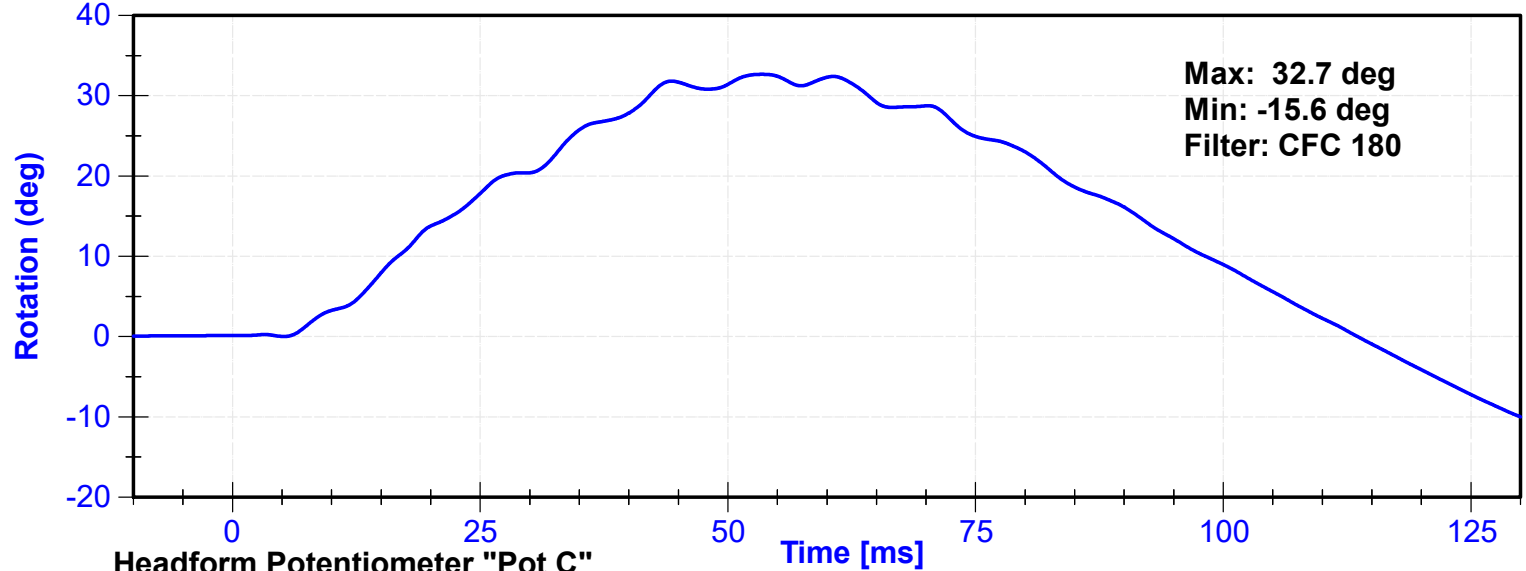


^{1,2} Upper and lower boundaries specified in Appendix I

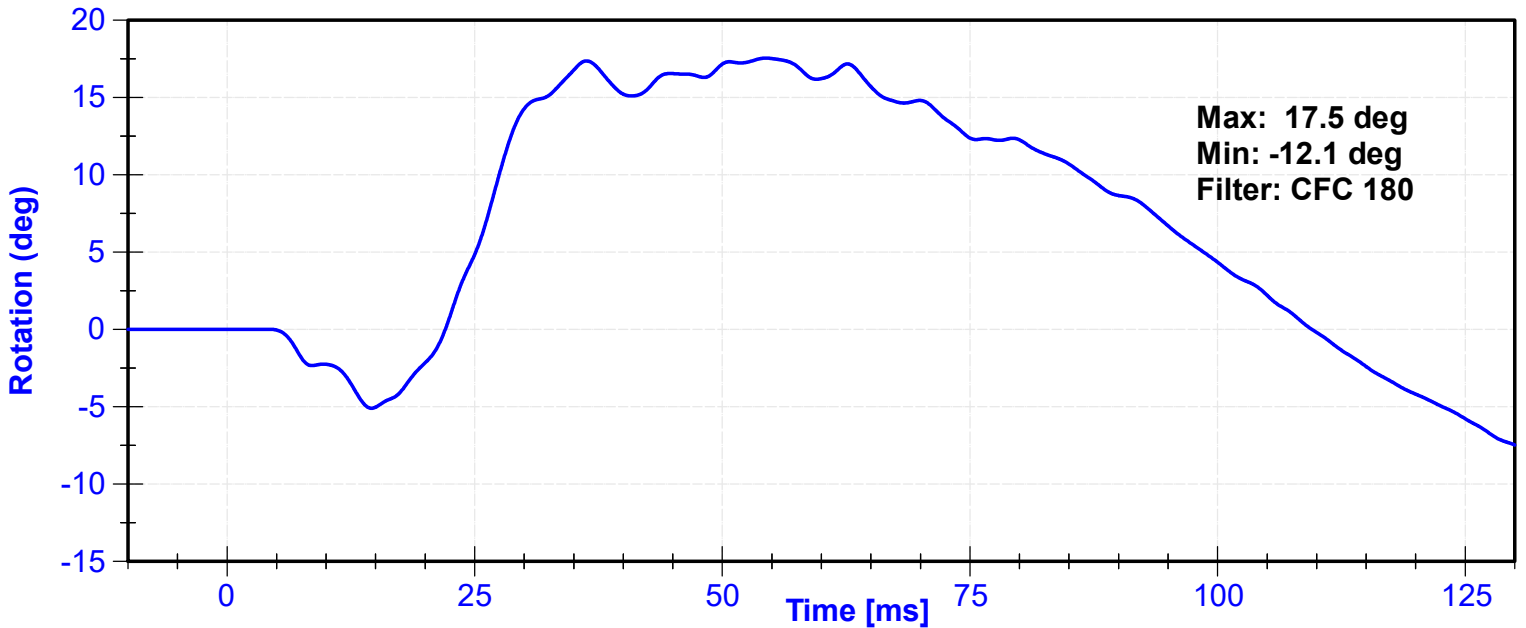
Neck Rotation



Front Pendulum Potentiometer "Pot A"



Headform Potentiometer "Pot C"



Appendix I

² Upper Boundary Corridor		¹ Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

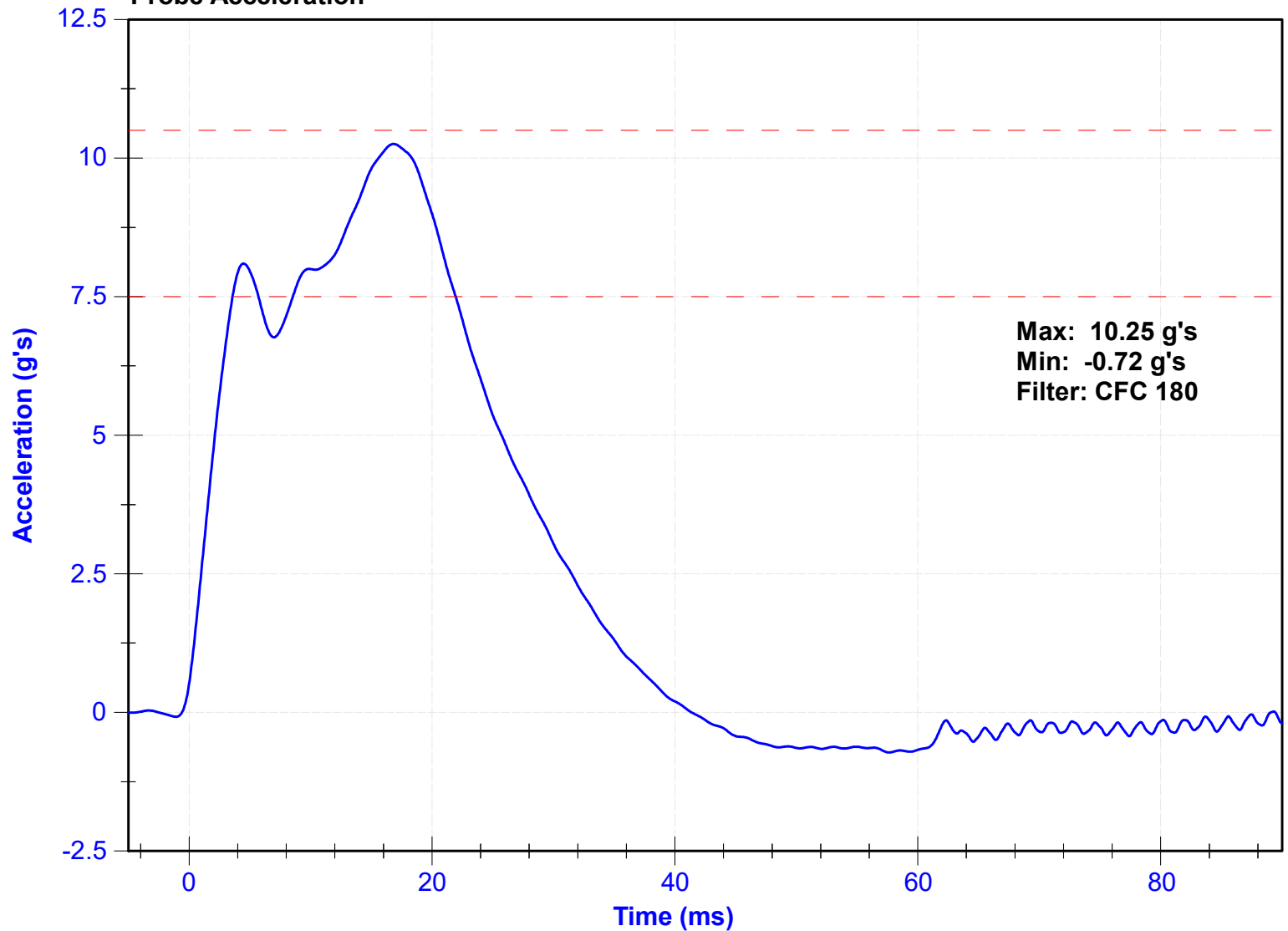
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	54	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	7.5	10.5	g's	10.25	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023

Probe Acceleration



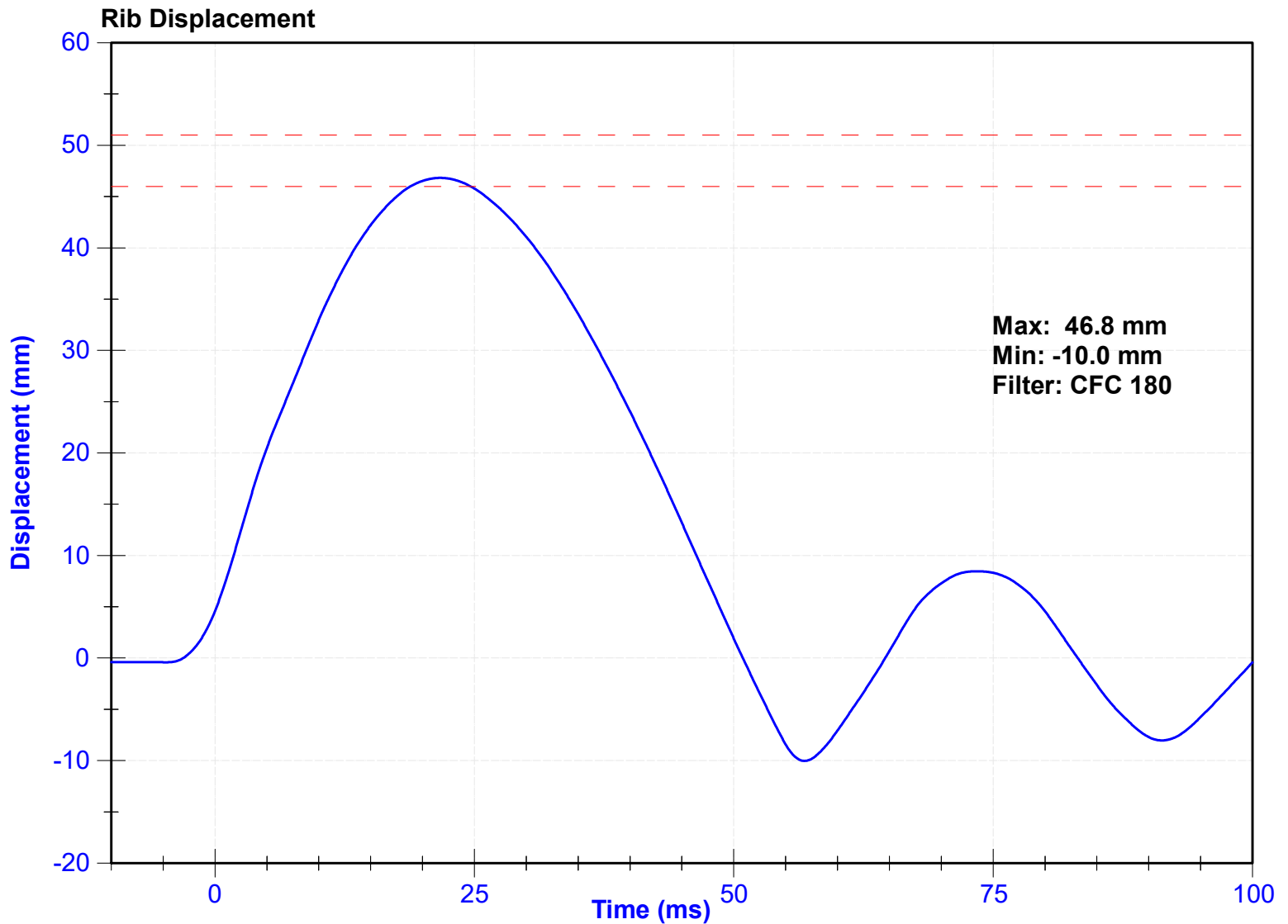
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	46.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024



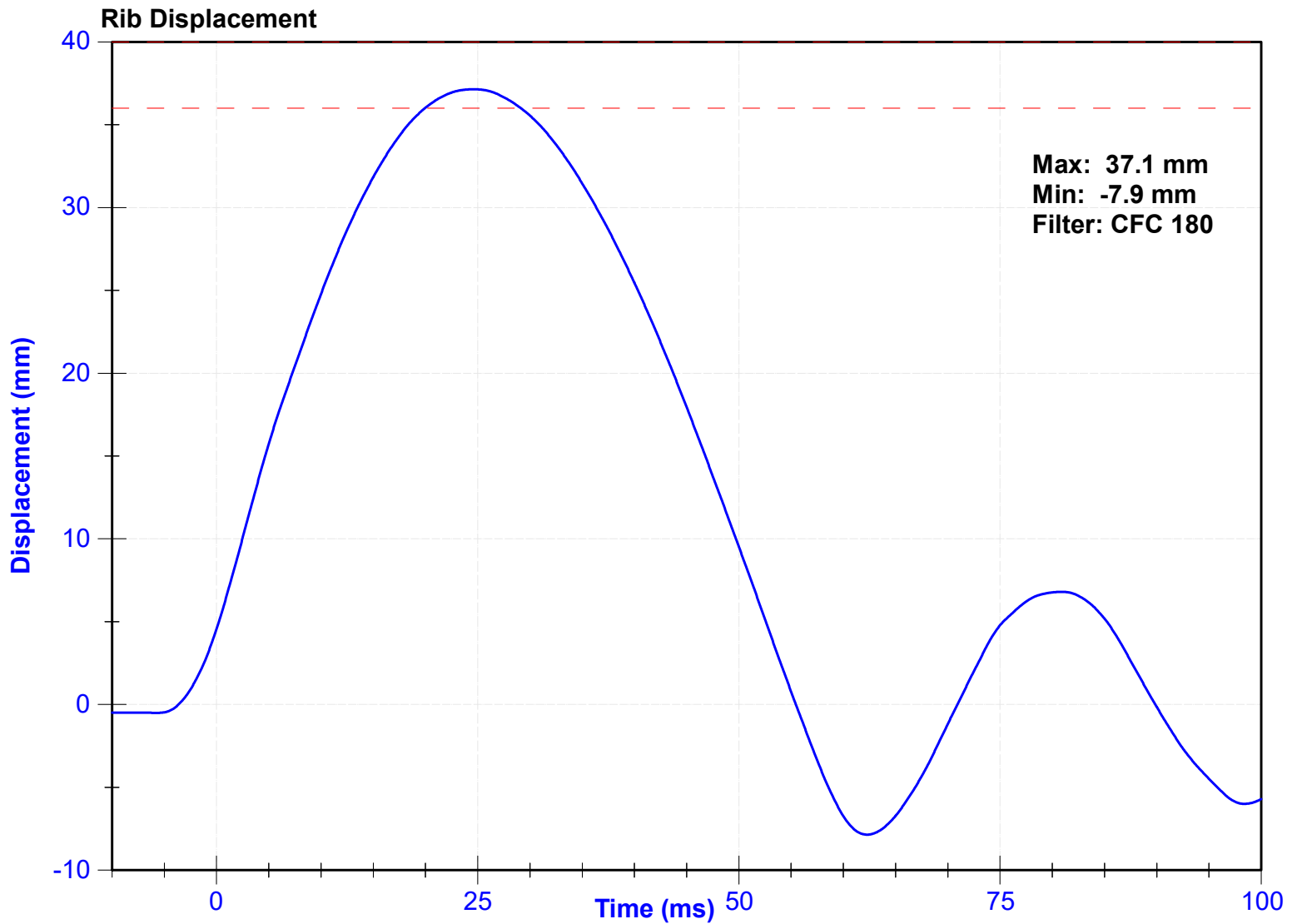
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	37.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024



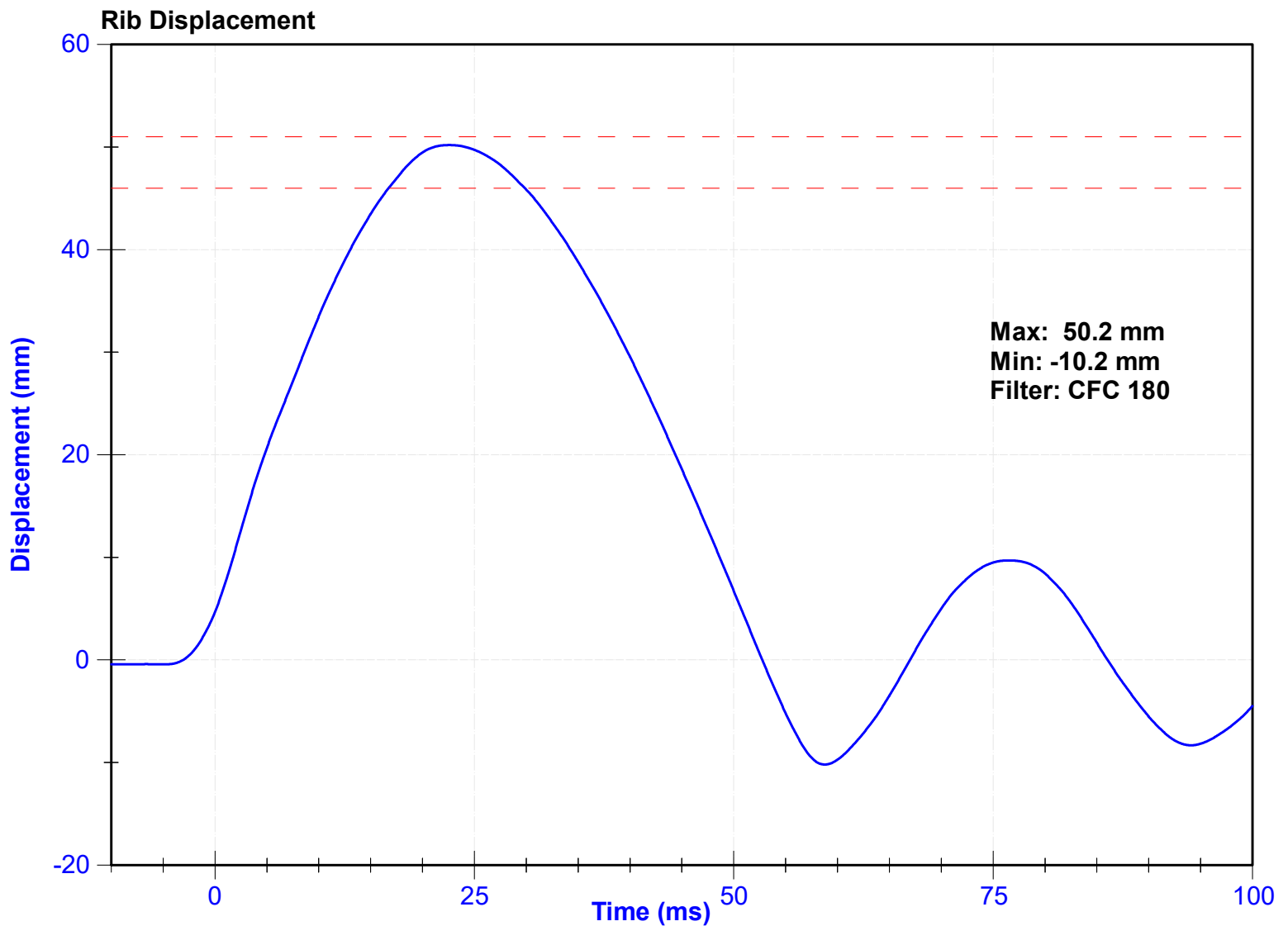
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	43	Pass
Rib Displacement	46	51	mm	50.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024



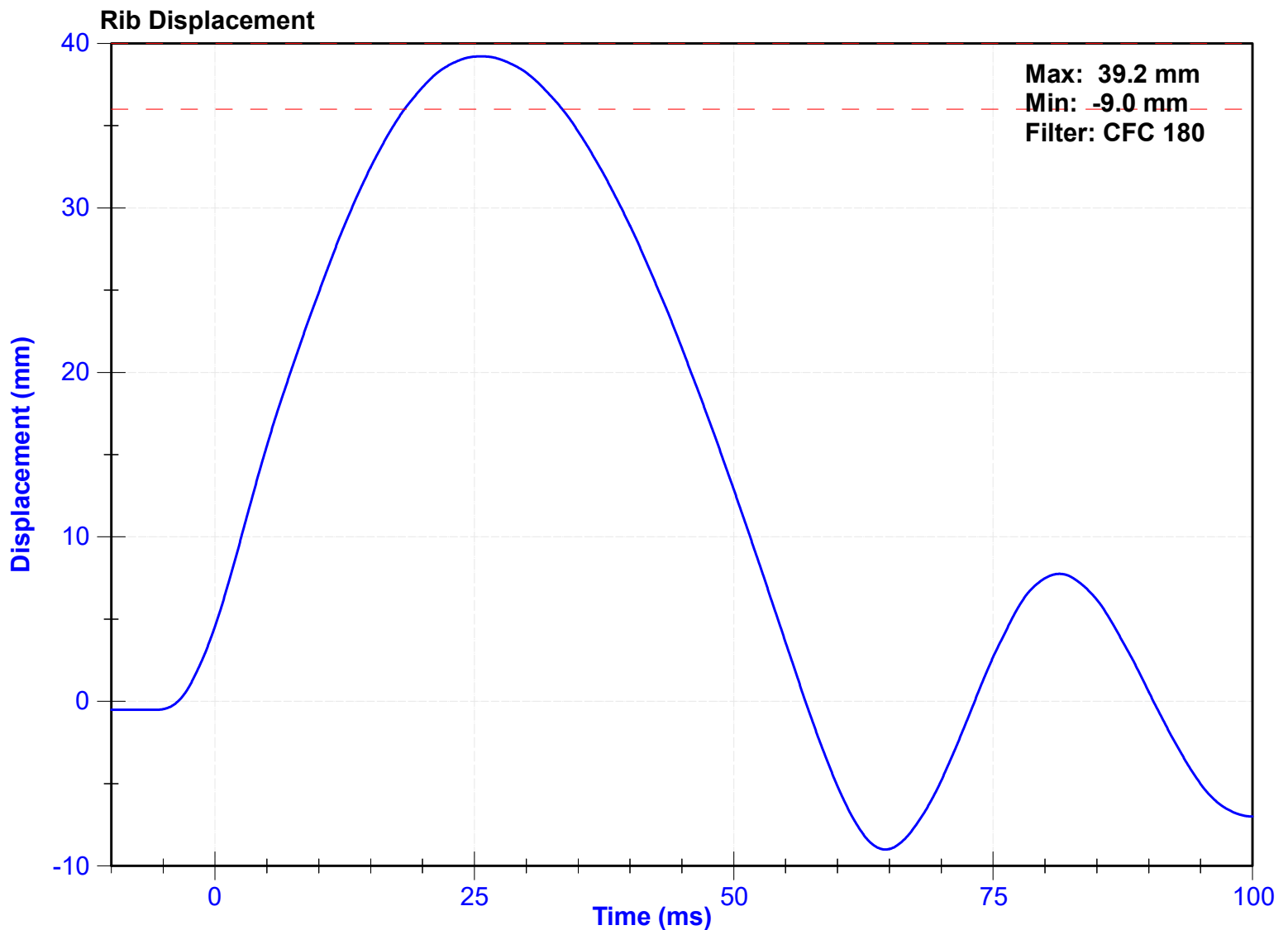
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	43	Pass
Rib Displacement	36	40	mm	39.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024



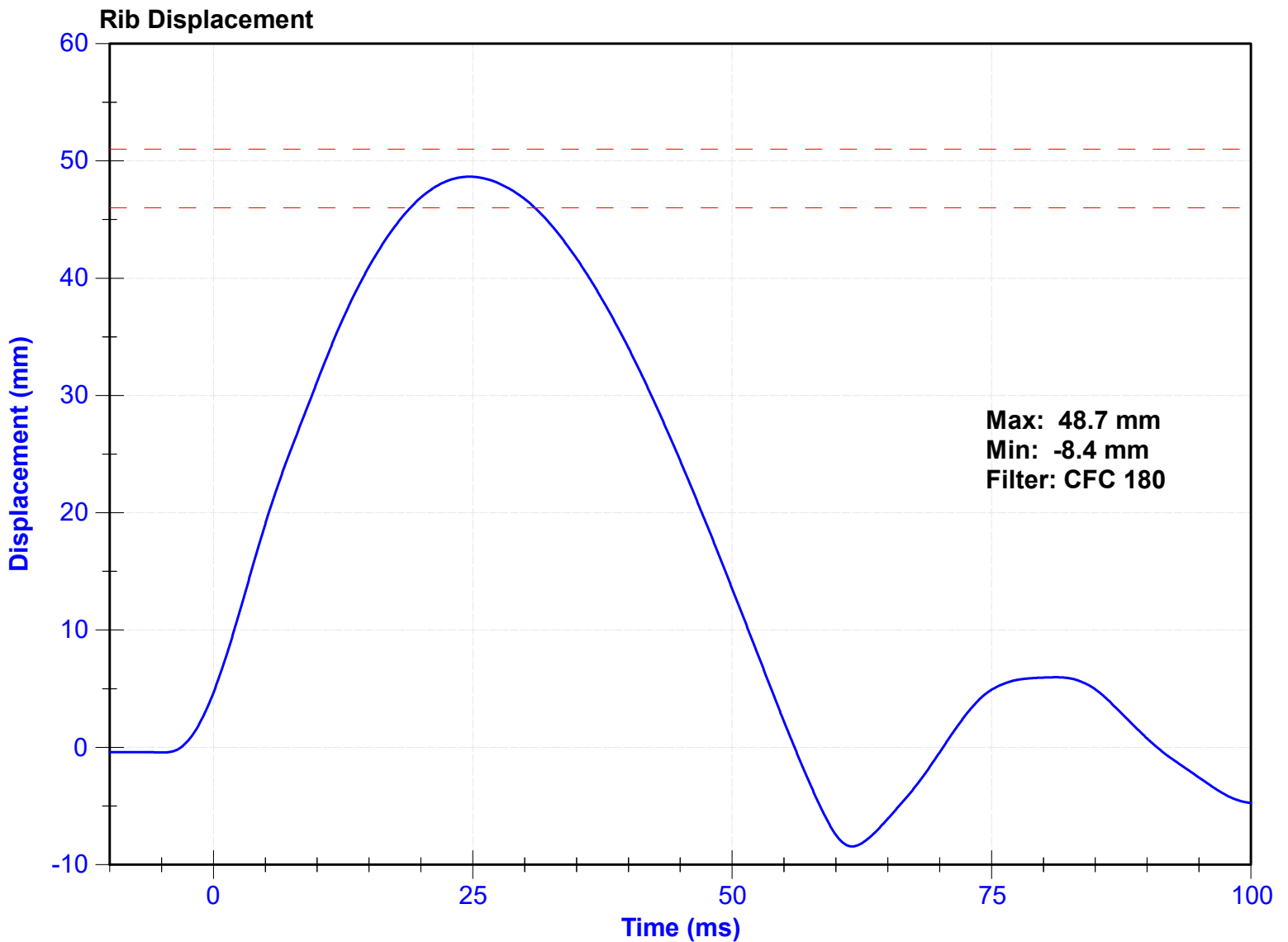
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	43	Pass
Rib Displacement	46	51	mm	48.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024



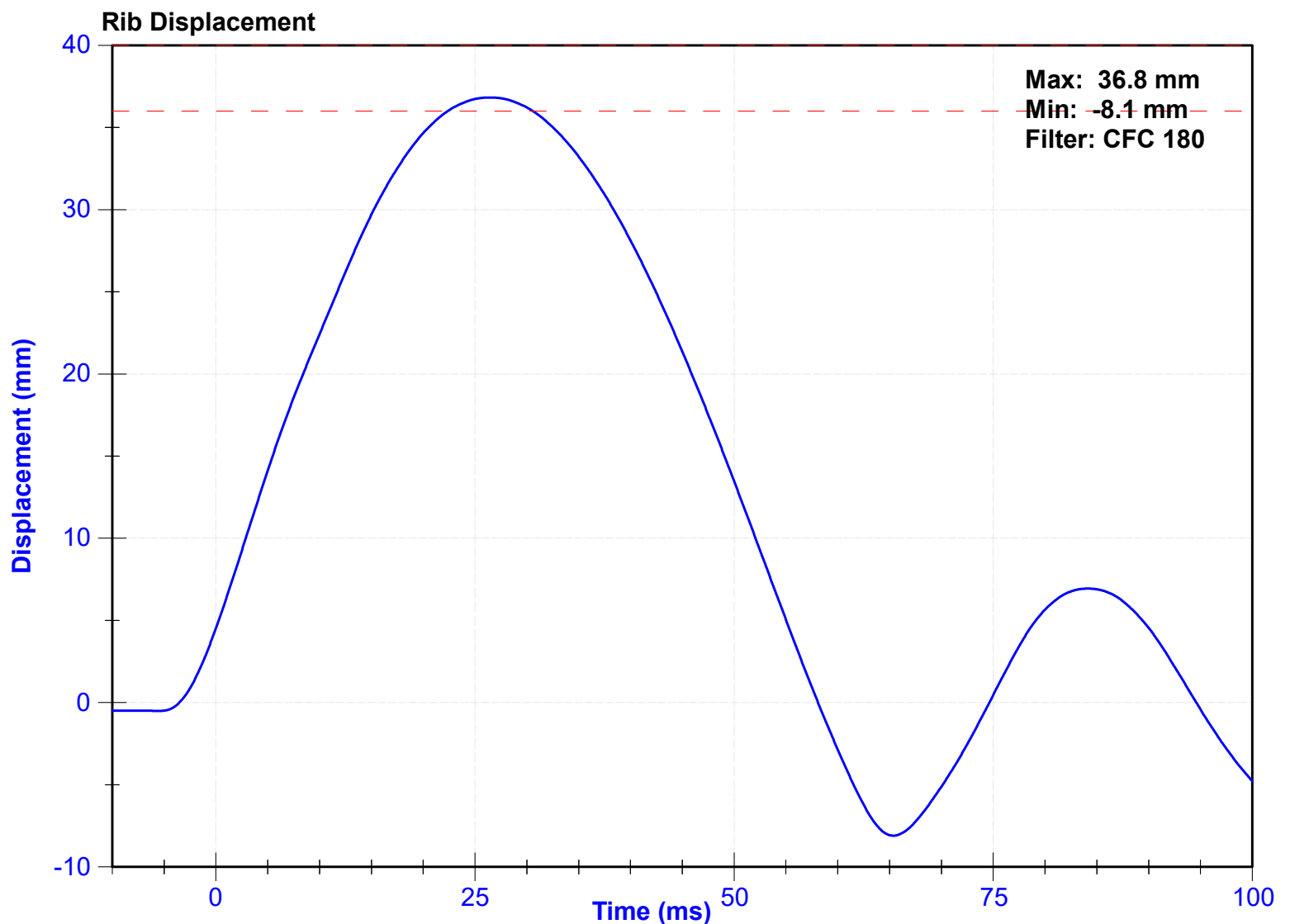
ATD Manufacturer	Denton	Test Technician	J.Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	43	Pass
Rib Displacement	36	40	mm	36.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024



ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

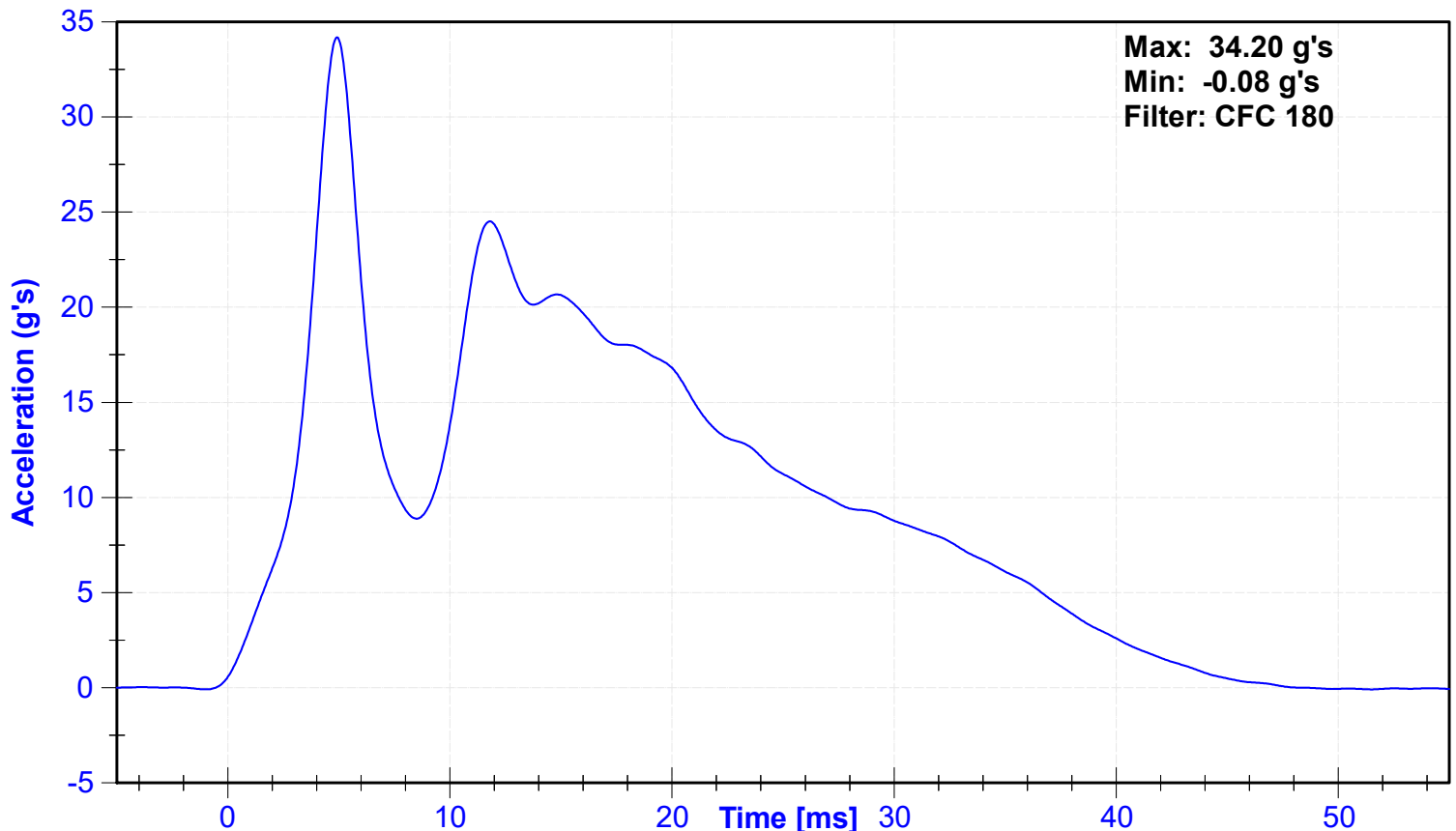
Results

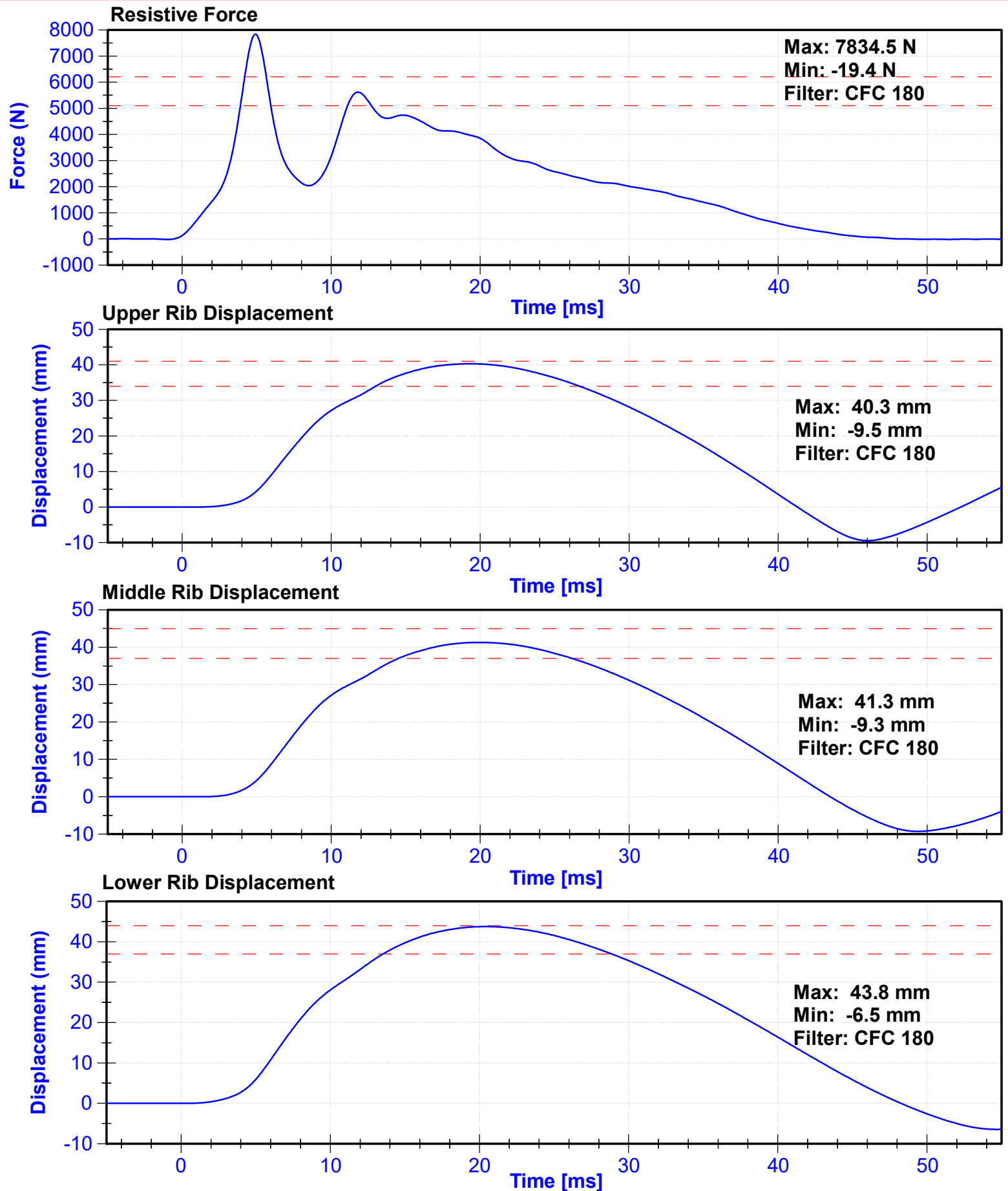
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	5616.6	Pass
Upper Thorax Rib Deflection	34	41	mm	40.3	Pass
Mid Thorax Rib Deflection	37	45	mm	41.3	Pass
Lower Thorax Rib Deflection	37	44	mm	43.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Upper Thorax Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024
Middle Thorax Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024
Lower Thorax Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024

Probe Acceleration





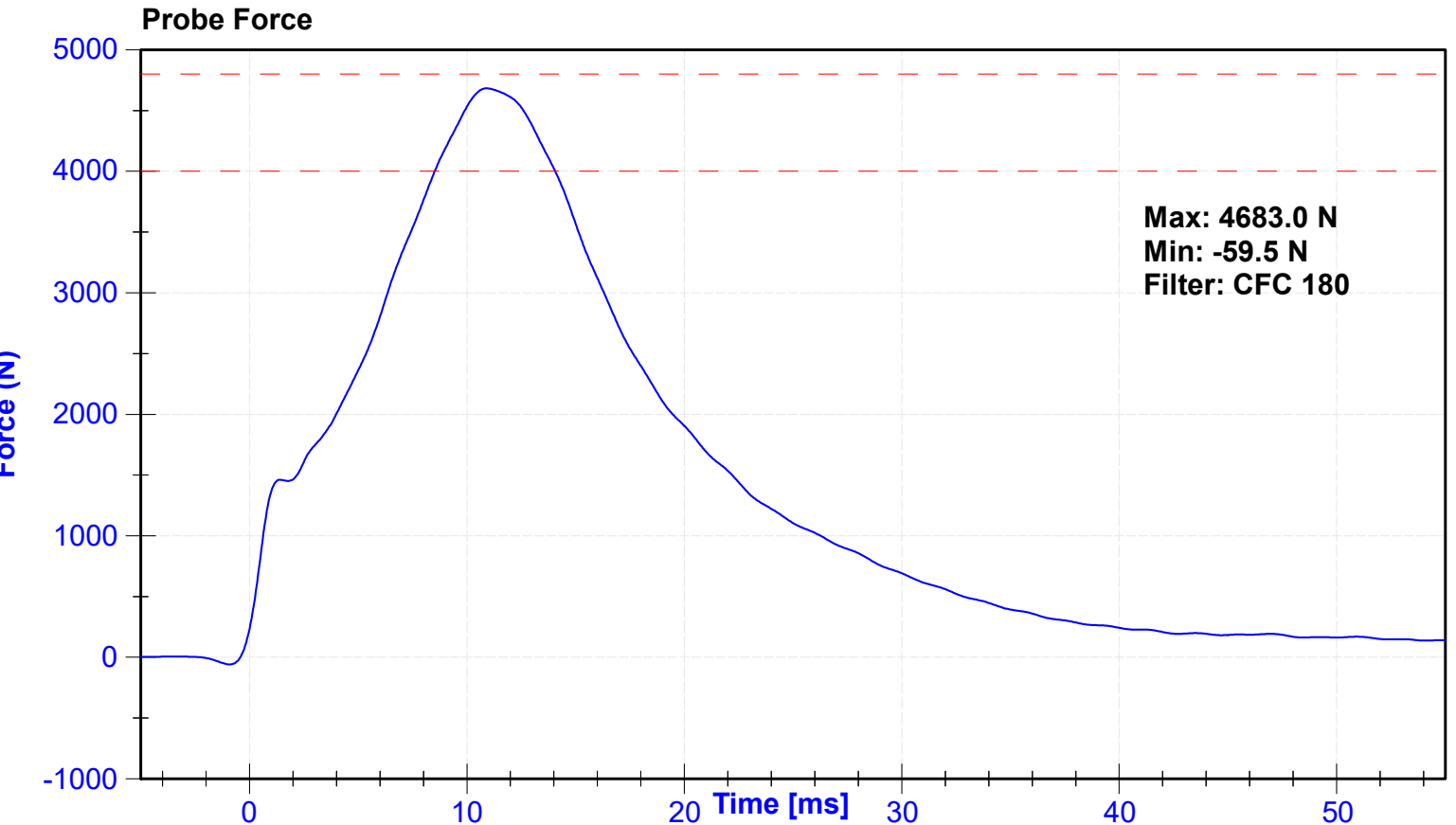
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

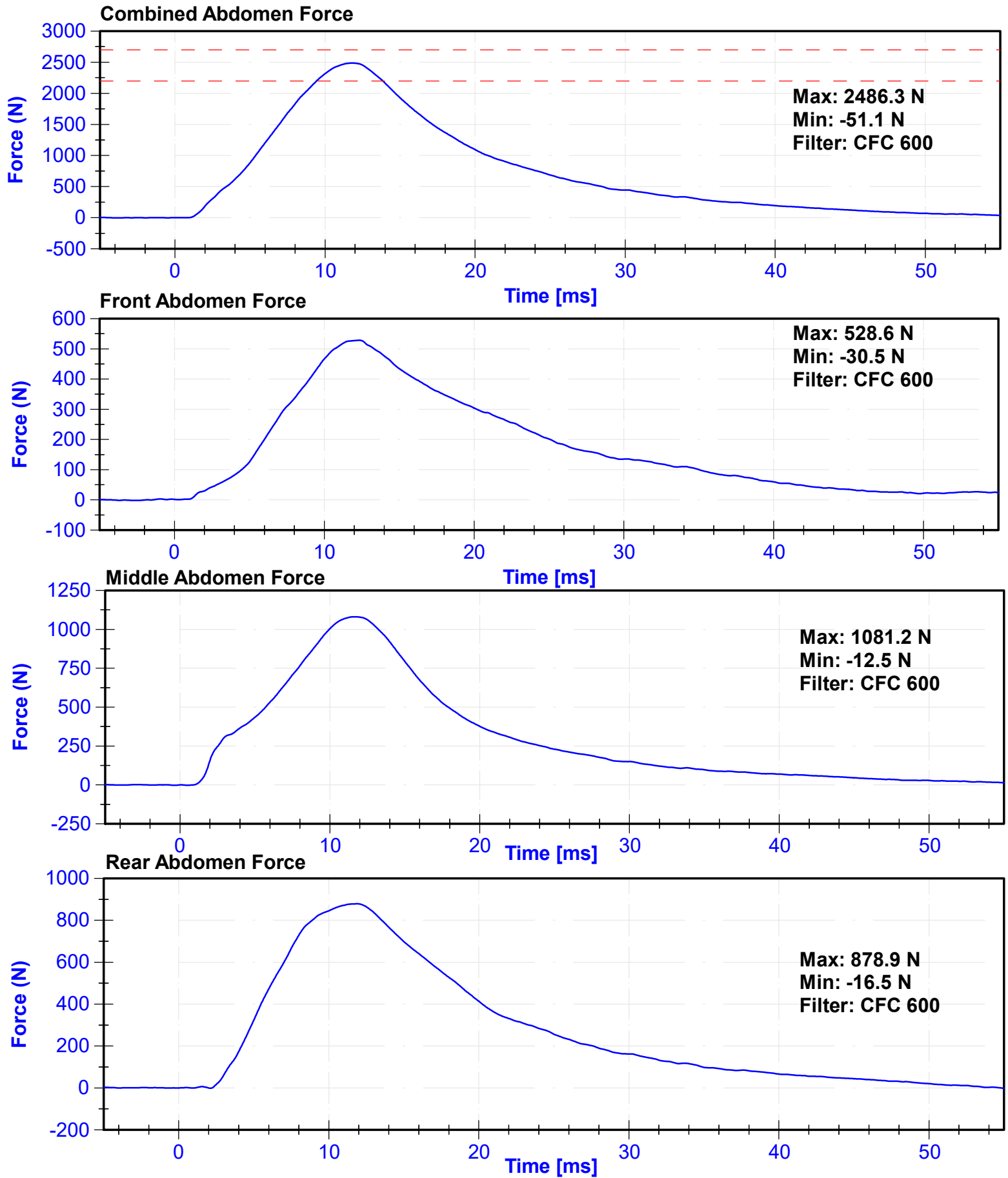
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51	Pass
Velocity	3.9	4.1	m/s	3.95	Pass
Combined Abdomen Force	2200	2700	N	2486.3	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	11.85	Pass
Resistive Probe Force	4000	4800	N	4683.0	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.90	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Front Abdomen Load Cell	Denton	1440	8/8/2023	8/7/2024
Middle Abdomen Load Cell	Denton	1525	8/8/2023	8/7/2024
Rear Abdomen Load Cell	Denton	1528	8/8/2023	8/7/2024





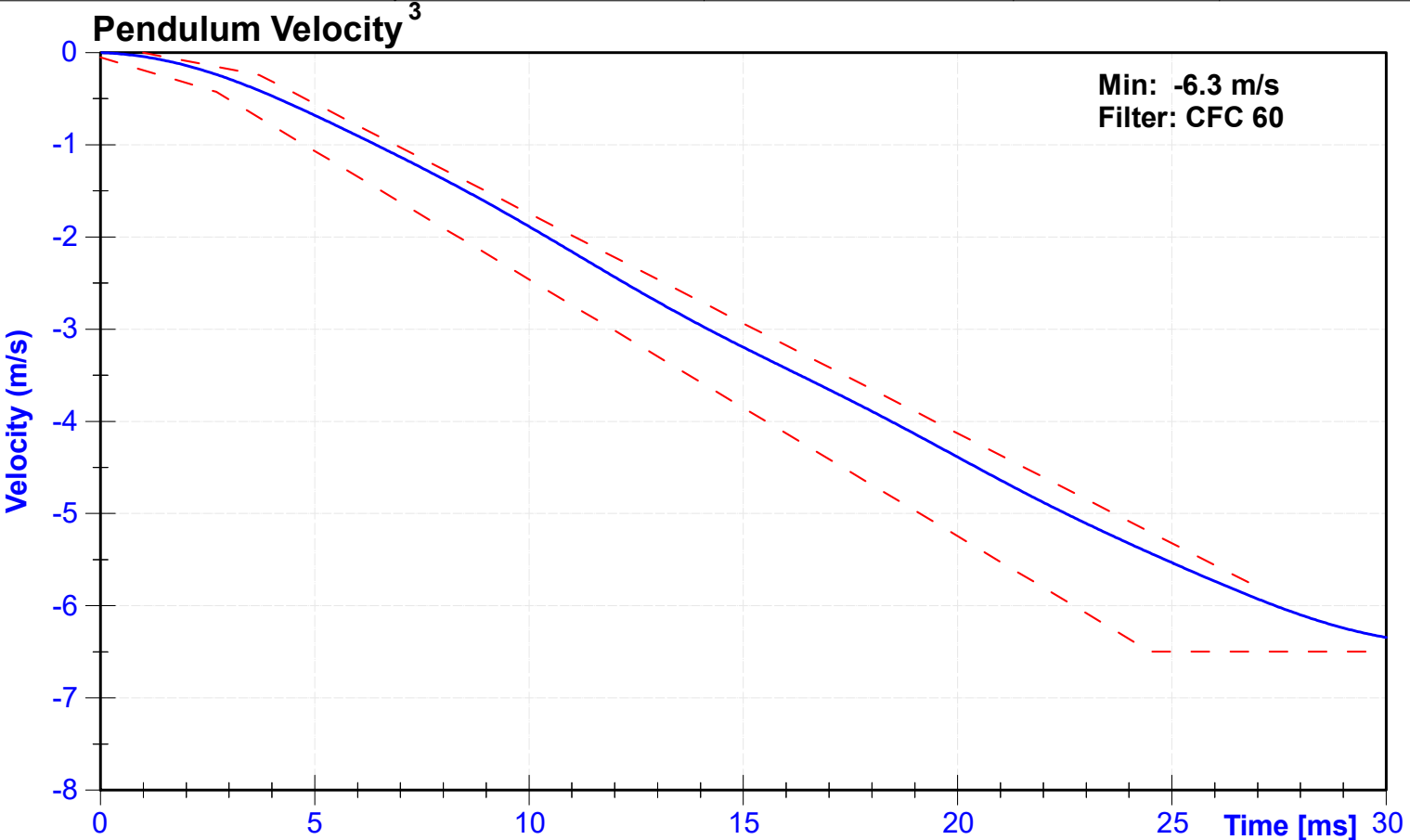
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

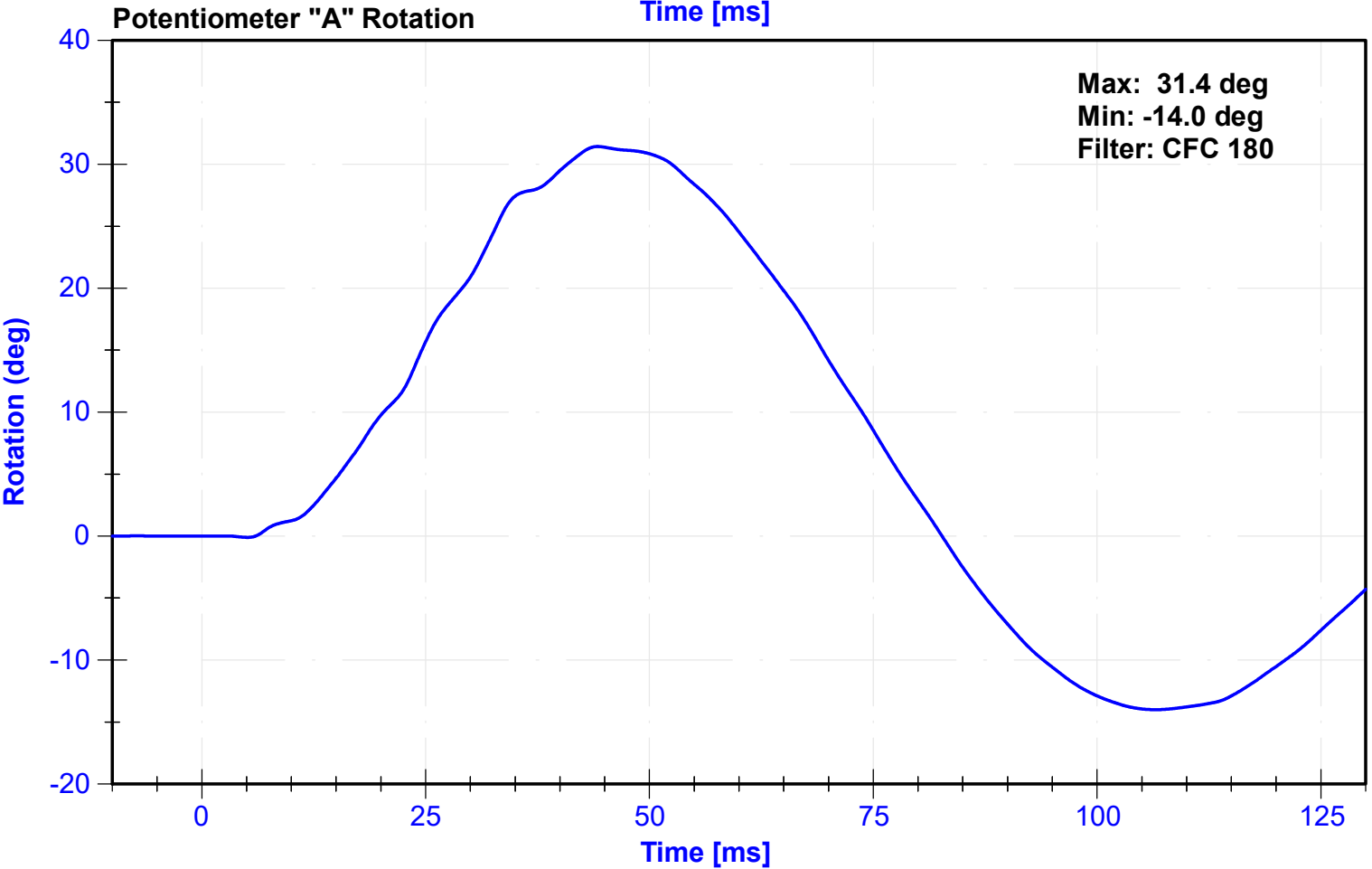
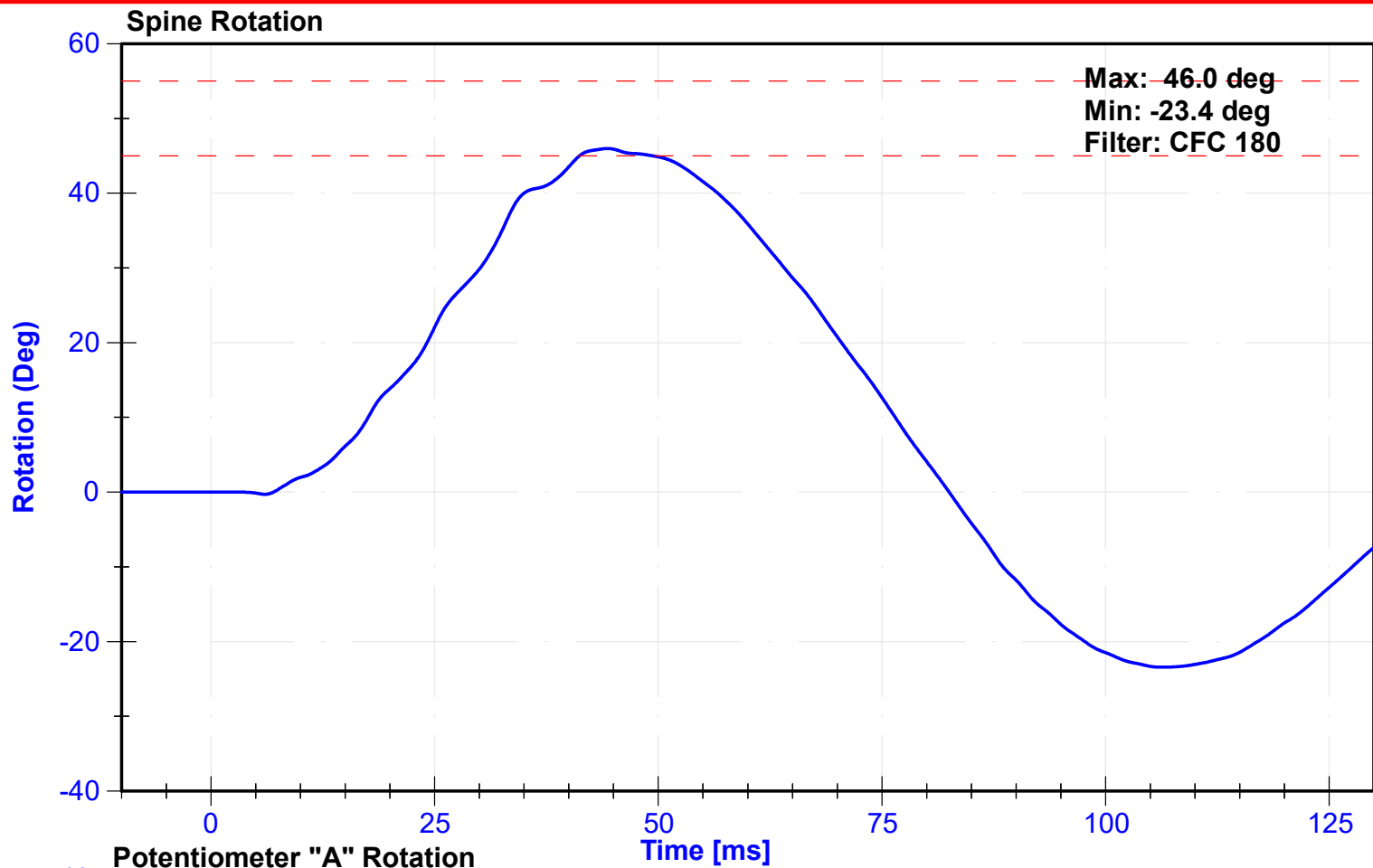
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	64	Pass
Velocity	5.95	6.15	m/s	6.030	Pass
Lateral Spine Rotation	45	55	deg	46.0	Pass
Time at Maximum Rotation	39	53	ms	44.3	Pass
Time of Decay to Zero Degrees	37	57	ms	38.2	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

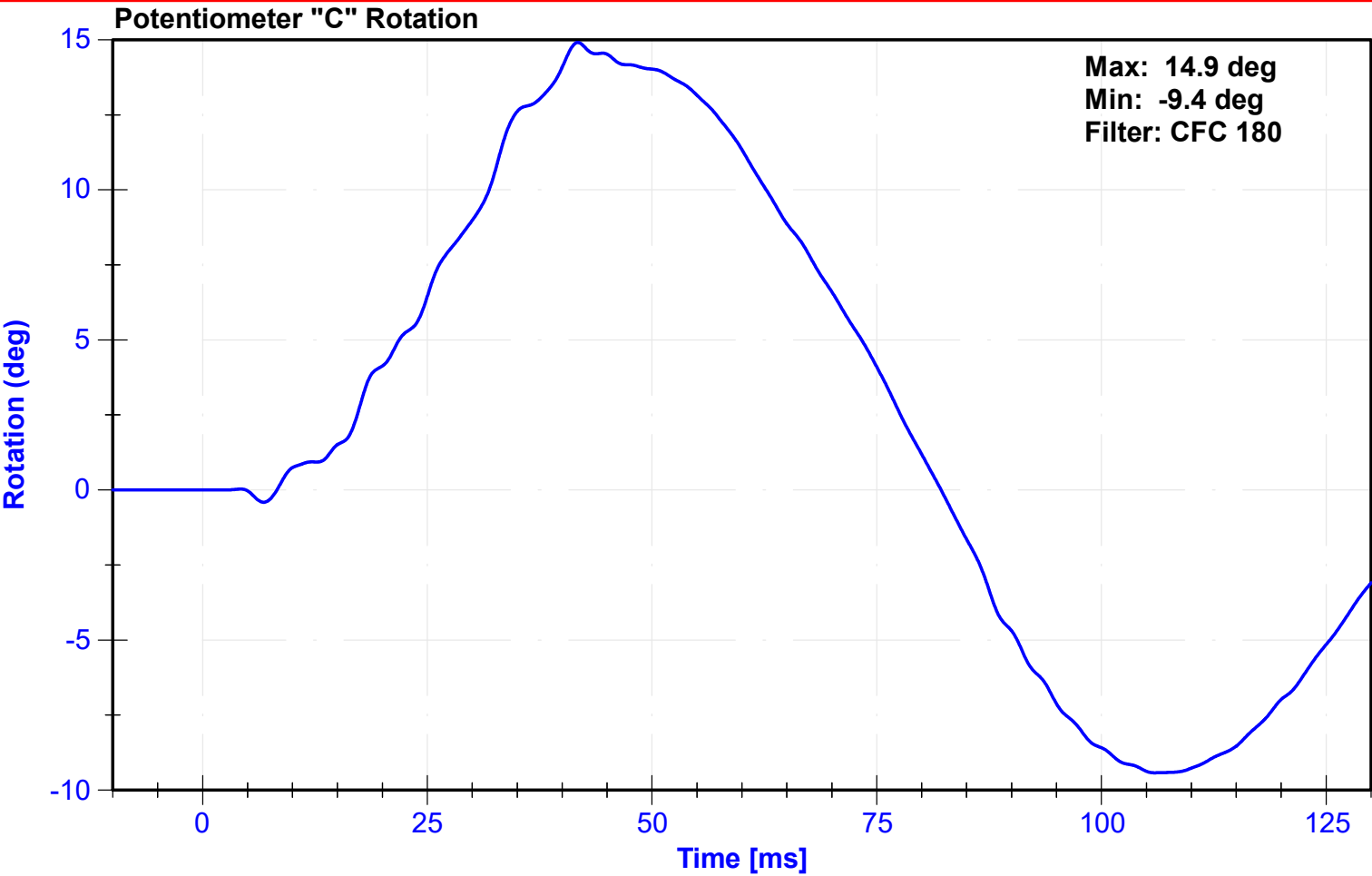
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/26/2022	10/26/2023
Pendulum "A" Potentiometer	Sfernice	094	10/5/2022	10/5/2023
Condyle "B" Potentiometer	Sfernice	095	10/5/2022	10/5/2023



^{1,2} Upper and lower boundaries specified in Appendix I
 IV-41





Appendix I

² Upper Boundary Corridor		¹ Lower Boundary Corridor	
Time (ms)	Velocity (m/s)	Time (ms)	Velocity (m/s)
1.0	0.00	0.0	-0.05
3.7	-0.24	2.7	-0.425
27.0	-5.80	24.5	-6.5
		30.0	-6.5

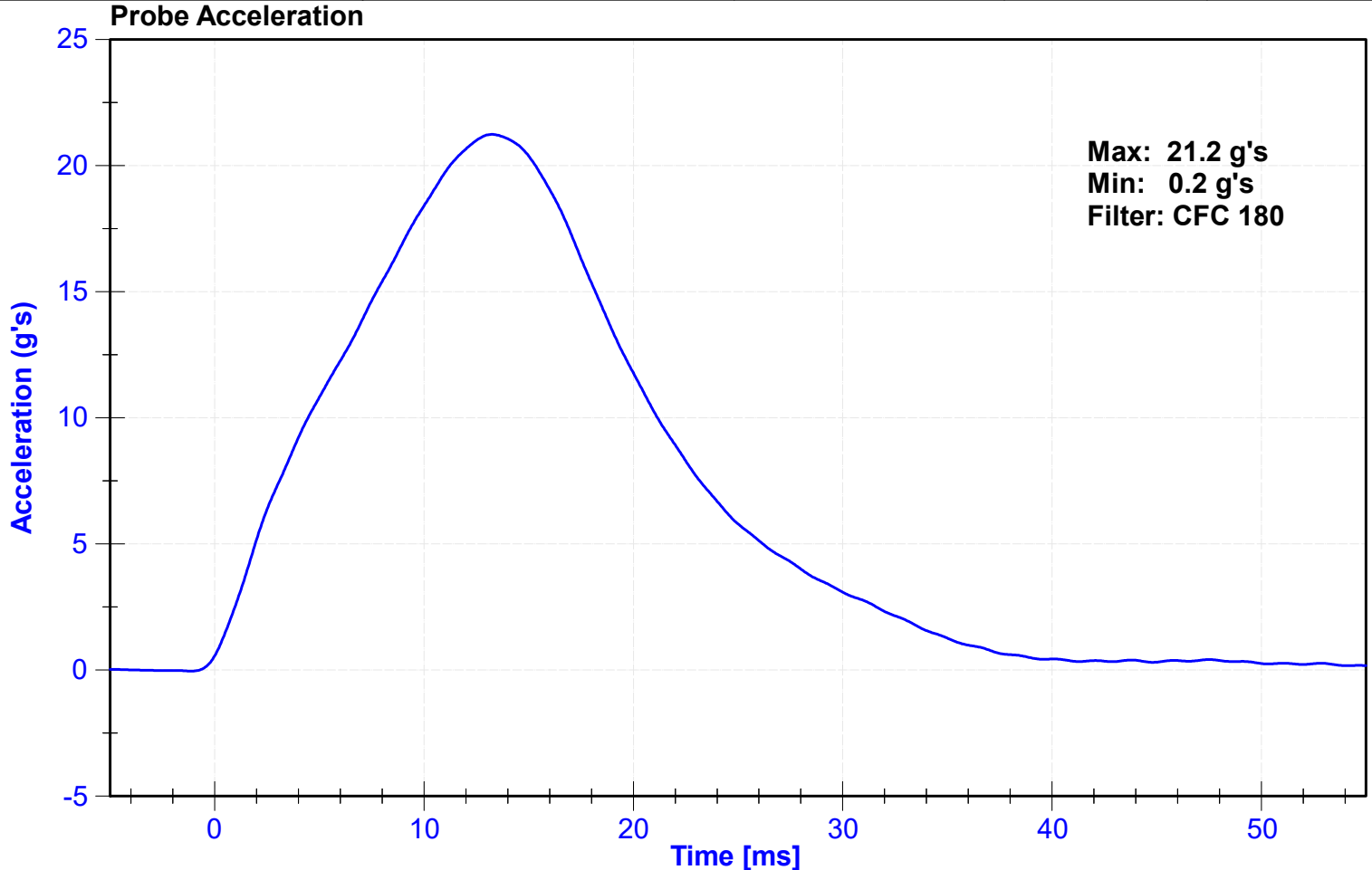
ATD Manufacturer	Denton	Test Technician	J. Miller
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

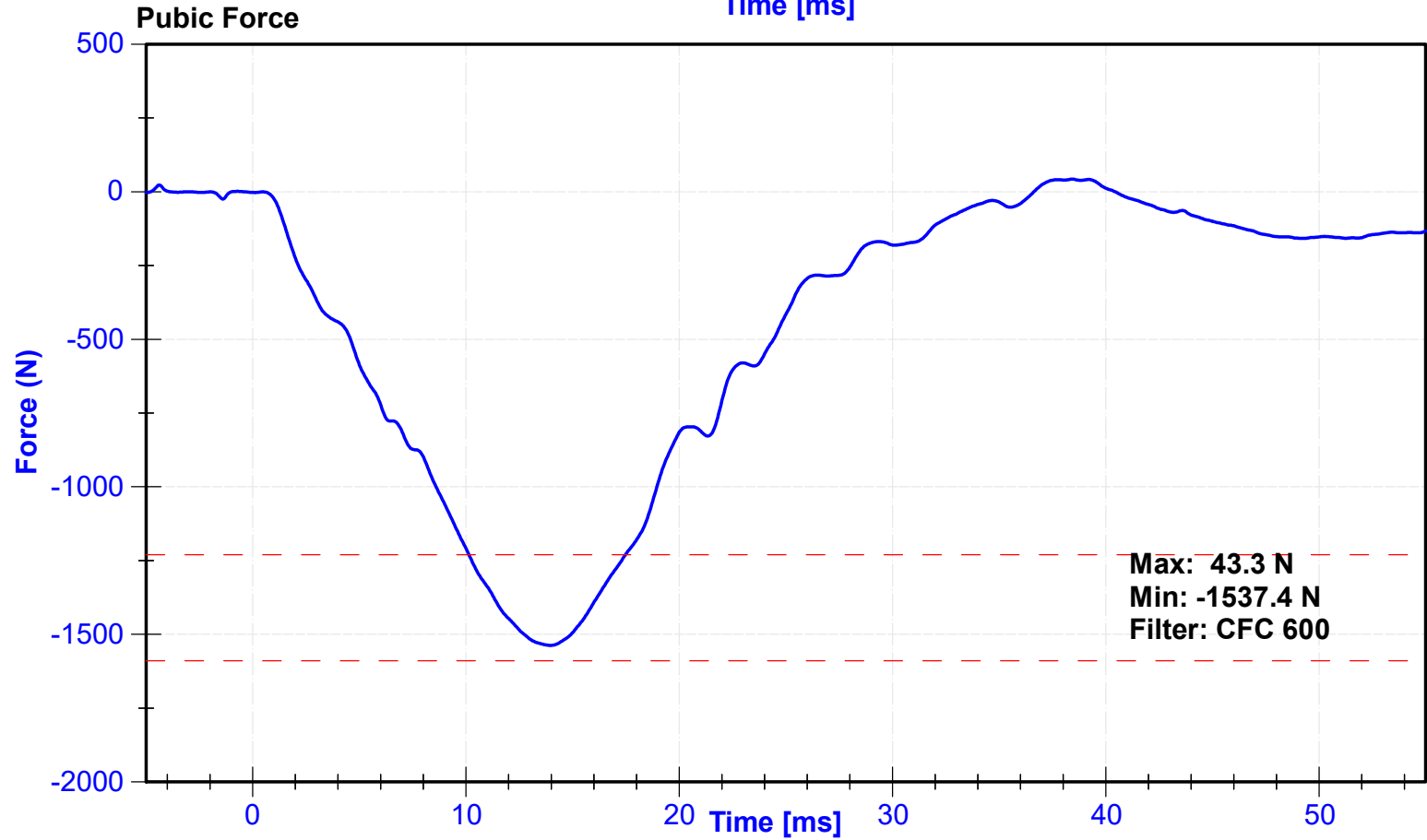
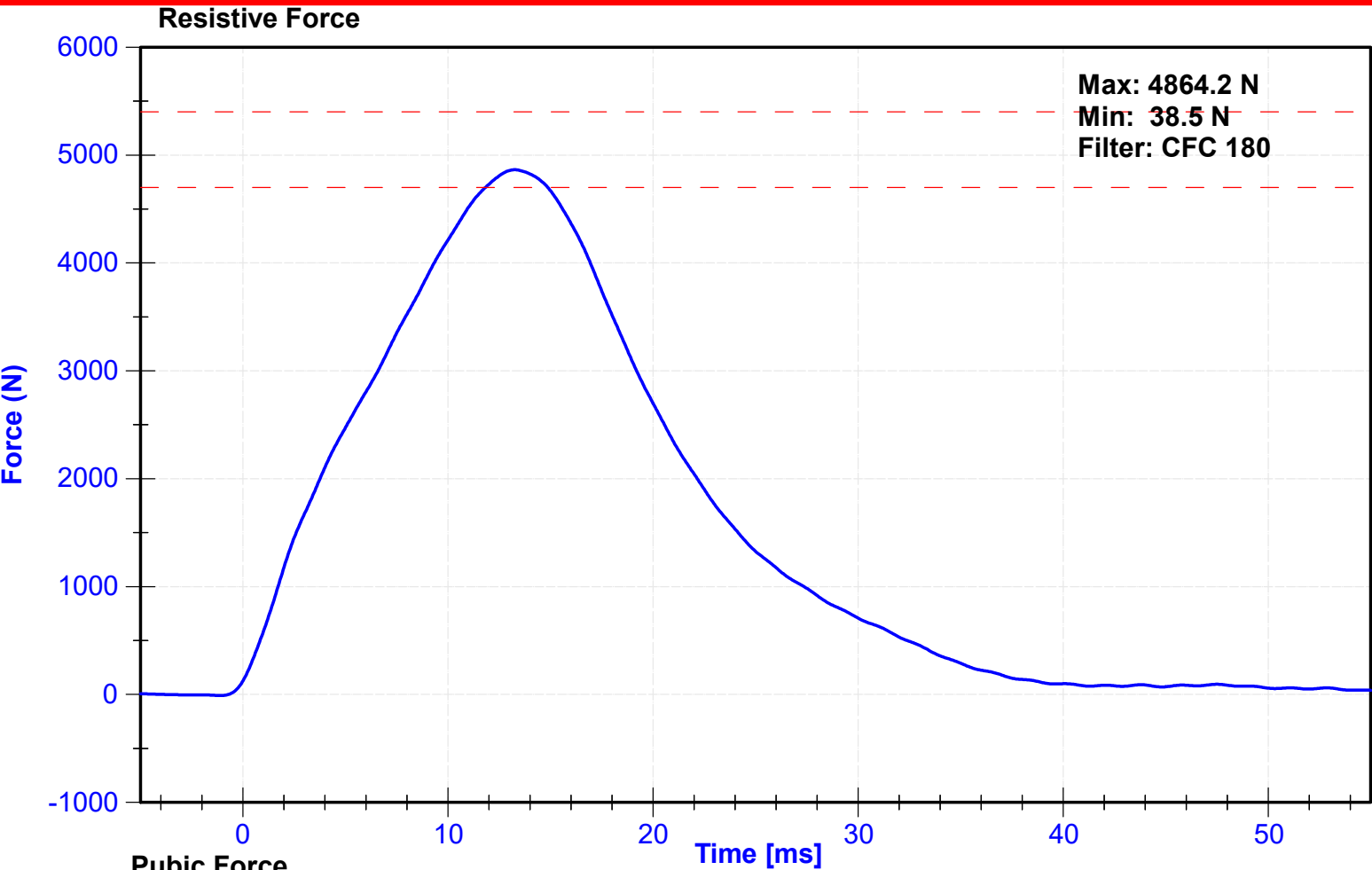
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Resistive Force	4700	5400	N	4864.2	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.25	Pass
Pubic Force	-1590	-1230	N	-1537.4	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.95	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	P51736	10/25/2022	10/25/2023
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024





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	T21724	Endevco	08/08/2023
		Y	T22281	Endevco	08/08/2023
		Z	T26050	Endevco	08/08/2023
	Redundant	X	T21682	Endevco	08/08/2023
		Y	T25989	Endevco	08/08/2023
		Z	T25864	Endevco	08/08/2023
Thorax Rib Displacement Potentiometers	Upper	Y	0552-01	Honeywell	08/07/2023
	Middle	Y	807	Honeywell	08/07/2023
	Lower	Y	0552-03	Honeywell	08/07/2023
Abdomen Load Cells	Forward	Y	1440	Denton	08/08/2023
	Middle	Y	1525	Denton	08/08/2023
	Rear	Y	1528	Denton	08/08/2023
Lower Spine Accelerometers (T12)		X	P71278	Endevco	08/08/2023
		Y	P71276	Endevco	08/08/2023
		Z	T23573	Endevco	08/08/2023
Pubic Symphysis Load Cell		Y	456-FY	Denton	08/08/2023

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	G22823	Endevco	07/28/2023
Vehicle Center of Gravity	Y	G22825	Endevco	07/28/2023
Vehicle Center of Gravity	Z	A280830	Measurement Specialties	07/28/2023
Left Floor Sill	Y	A428011	Measurement Specialties	08/01/2023
A-Pillar Sill	Y	G22614	Endevco	06/21/2023
A-Pillar Low	Y	G22798	Endevco	07/31/2023
A-Pillar Mid	Y	G22447	Endevco	07/17/2023
B-Pillar Sill	Y	A374304	Measurement Specialties	08/16/2023
B-Pillar Low	Y	G22917	Endevco	08/16/2023
B-Pillar Mid	Y	G22687	Endevco	08/15/2023
Driver Seat	Y	G22810	Endevco	08/16/2023
Engine Top	X	A350927	Measurement Specialties	08/07/2023
Engine Top	Y	A370948	Measurement Specialties	08/07/2023
Firewall	Y	G22637	Endevco	06/26/2023
Right Roof	Y	A315773	Measurement Specialties	08/17/2023
Right Floor Sill	Y	G22662	Endevco	07/17/2023
Rear Floorpan	X	A431204	Measurement Specialties	05/03/2023
Rear Floorpan	Y	A431207	Measurement Specialties	05/03/2023