

REPORT NUMBER: 214D-CAL-24-005

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

**Mercedes-Benz AG Stuttgart
2024 Mercedes-Benz CLA250 4Matic
4 Door Sedan**

NHTSA No: C20244300

**PREPARED BY:
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February 09, 2024

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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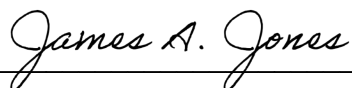
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Date: February 09, 2024

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16. Abstract A 31.00 km/h (19.3 mph), 75° oblique compliance test was conducted on the subject 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan 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 January 26, 2024. The impact velocity of the vehicle was 30.96 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was 300 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">Driver 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>255.898</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>44</td> <td>23.470</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>1179.447</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>2269.647</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	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	255.898	Maximum Thoracic Rib Deflection	mm	44	23.470	Total Abdominal Force	N	2500	1179.447	Pubic Symphysis Force	N	6000	2269.647
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Pubic Symphysis Force	N	6000	2269.647																									
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 2024 FMVSS 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH2217D00078. The purpose of this test was to evaluate side impact protection in a 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan. 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 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 30.96 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on January 26, 2024. 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 (ES-2re) dummy was placed in the driver 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	Driver ATD (ES2re)		
	Units	IARV	Result
Head Injury Criteria (HIC36)		1000	255.898
Upper Rib Deflection	mm	44	23.470
Mid Rib Deflection	mm	44	17.522
Lower Rib Deflection	mm	44	21.904
Abdominal Load (front)	N		442.659
Abdominal Load (mid)	N		378.131
Abdominal Load (rear)	N		373.667
Total Abdominal Force	N	2500	1179.447
Pubic Symphysis Force	N	6000	2269.647

SECTION 2

OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024

TEST VEHICLE INFORMATION AND OPTIONS

Make	Mercedes-Benz	Anti-Lock Brakes (ABS)	Yes
Model	CLA250 4Matic	All-Wheel Drive (AWD)	Yes
Body Style	Sedan	Traction Control System (TCS)	Yes
VIN	W1K5J4HB3RN453745	Electric Stability Control (ECS)	Yes
Body Color	Night Black	Curtain Airbags	Yes
Engine Displacement (L)	2.0	Torso Airbags – Front Seats	Yes
Type / No. Cylinders	I4	Torso Airbags – Rear Seats	No
Engine Placement	Transverse	Combination/Head Torso Bag	No
Transmission Type	Automatic	Pelvic Airbag – Front Seats	No
Transmission Speeds	8-Speed	Pelvis Airbag – Rear Seats	No
Overdrive	Yes	Knee Airbag – Driver	Yes
Final Drive	AWD	Knee Airbag – Front Passenger	Yes
Odometer Reading (mi)	9	Seat Belt Pretensioners – Front Seats	Yes
		Seat Belt Pretensioners – Rear Seats	Yes
		Seat Belt Load Limiter – Front Seats	Yes
		Seat Belt Load Limiter – Rear Seats	Yes
		Tire Pressure Monitoring System (TPMS)	Yes
		Tilt Steering Wheel	Yes
		Automatic Door Locks (ADL)	Yes
		Power Window Auto-reverse	Yes
		Power Seats	Yes
		Other Safety Restraint	N/A

DATA FROM CERTIFICATION LABEL

Manufactured By	Mercedes-Benz AG Stuttgart	GVWR (kg)	2120
Date of Manufacture	10/23	GVWR Front (kg)	1130
Vehicle Type	Passenger Car	GVWR Rear (kg)	1050

VEHICLE SEATING AND WEIGHT CAPACITY DATA

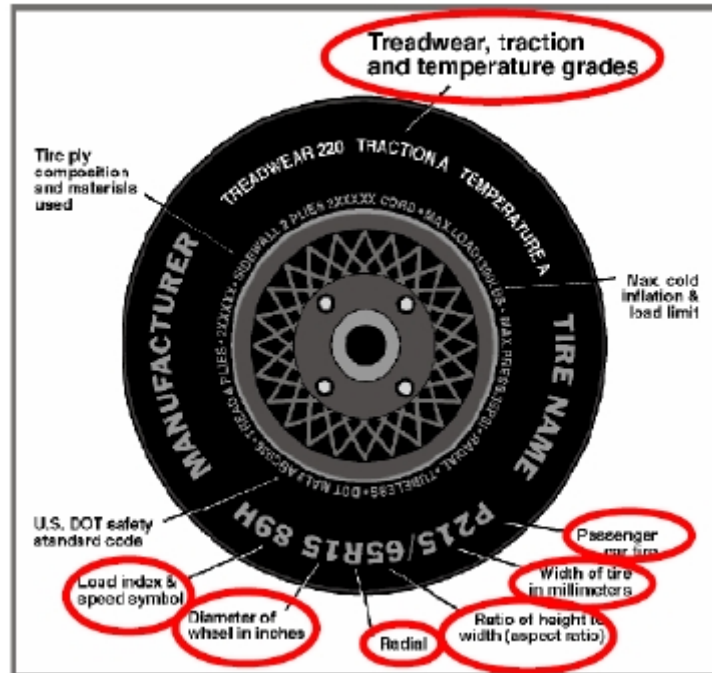
Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bucket	Bench	N/A	
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				401.0
Cargo Weight (RCLW) (kg)				60.8

DATA SHEET NO. 2 VEHICLE TIRE INFORMATION

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024

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



VEHICLE TIRE INFORMATION

Tire Placard	Front	Rear
Recommended Cold Pressure (kPa)	270	270
Recommended Tire Size	225/45R18	225/45R18
Tire Sidewall	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Tire Size on Vehicle	225/45R18	225/45R18
Tire Manufacturer Model	Continental	Continental
Tire Name	EcoContact 6	EcoContact 6
Tire Type	All Season	All Season
Tire Width	225	225
Aspect Ratio	45	45
Radial	Yes	Yes
Wheel Diameter	18"	18"
Load Index / Speed Symbol	91W	91W
Treadwear	420	420
Traction Grade	AA	AA
Temperature Grades	A	A

DATA SHEET NO. 3
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	237	246	216	221
Tire Placard	kPa	270	270	270	270

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	495.0	336.0		520.0	399.5		513.5	395.5	
Right	kg	489.0	318.0		497.0	360.5		502.0	362.5	
Ratio	%	60.1	39.9		57.2	42.8		57.3	42.7	
Totals	kg	984.0	654.0	1638.0	1017.0	760.0	1777.0	1015.5	758.0	1773.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1638.0	(A)
Weight of Test Dummy	kg	81.0	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	60.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1779.8	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	Fully Loaded	As Tested
Driver Door Sill Angle	Deg	+1.30	+1.80	+1.30
Front Passenger Sill Angle	Deg	-1.35	-2.25	-1.35
Front Bumper-Line Angle	Deg	+3.35	+3.80	+3.65
Rear Bumper-Line Angle	Deg	-0.15	+0.45	+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	2728
Vertical Impact Reference Line Aft of Front Axle	mm	1383

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	6.0
Spare Tire Tools	3.0
Trunk Plastic Trim	3.0
Ballast (if any)	14.0

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

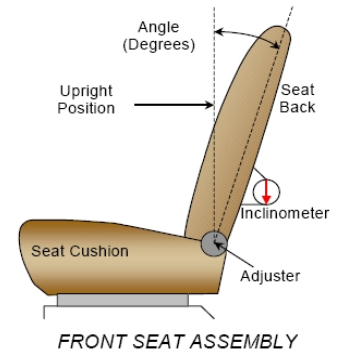
NHTSA No.: C20244300
Test Date: 01/26/2024

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	24.9
Front Passenger Seat	degrees	24.8

*Measurement taken on seatback



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	18.8	Max	52	67	82
		Mid	27	42	73
		Min	2	16	63
Front Passenger Seat	18.4	Max	50	66	86
		Mid	26	41	58
		Min	2	16	30

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Placed in Position #	
	mm	Detents*	mm	Detents*
Driver Seat	272	Power	136	Power
Front Passenger Seat	258	Power	129	Power

SEAT BELT ANCHORAGE ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	4	Uppermost

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024

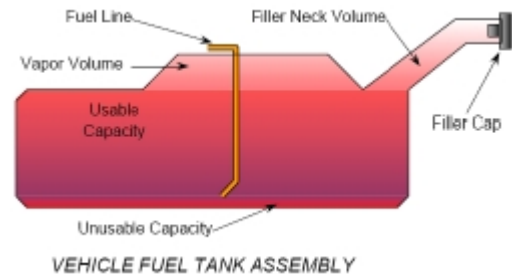
FUEL TANK CAPACITY DATA

Description	Liters
Usable Capacity of (Form No.1)	50.98
Usable Capacity of (Owner's Manual)	51.0
92 - 94% of Usable Capacity	46.9 - 47.9
Actual Amount of Solvent Used in Test	47.43

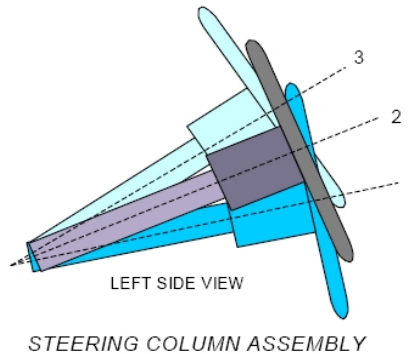
FUEL PUMP

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

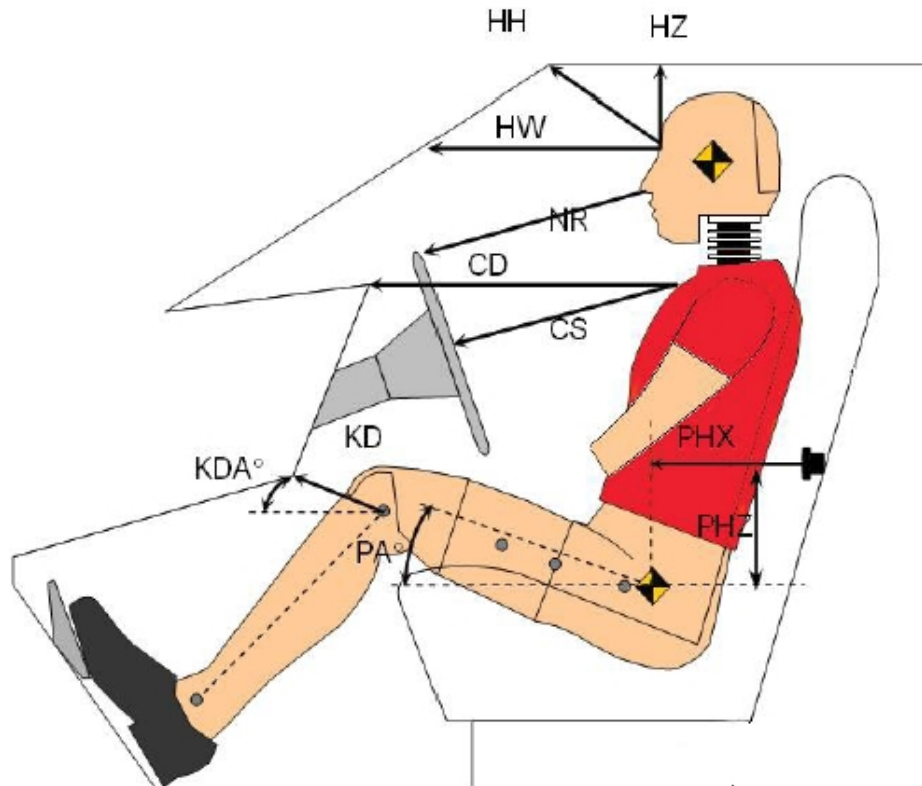


	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	16.9	
Geometric center - Position No. 2	19.3	
Uppermost - Position No. 3	21.6	
Telescoping Steering Wheel Travel		66
Test Position	19.4	33

DATA SHEET NO. 6
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024



Left Side View

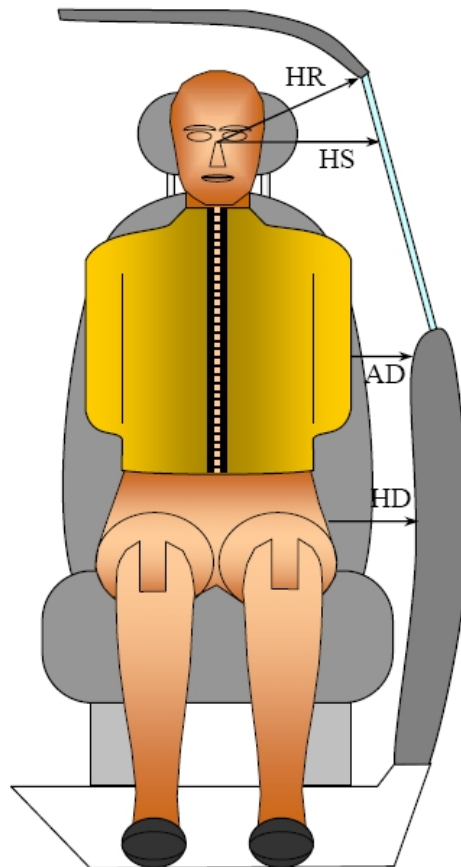
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	458	
HW	Head to Windshield	664	
HZ	Head to Roof Liner	160	
NR	Nose to Rim	450	
CD	Chest to Dash	679	
CS	Chest to Steering Wheel	401	
KD(L) / KDA(L)°	Left Knee to Dash	218	37.8
KD(R) / KDA(R)°	Right Knee to Dash	222	33.5
PAX°	Pelvic Tilt Angle (X-Axis)		25.2
PAY°	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	118	
PHZ	Hip Point to Striker (Z-Axis)	234	

DATA SHEET NO. 7
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024



FRONT VIEW OF DUMMY

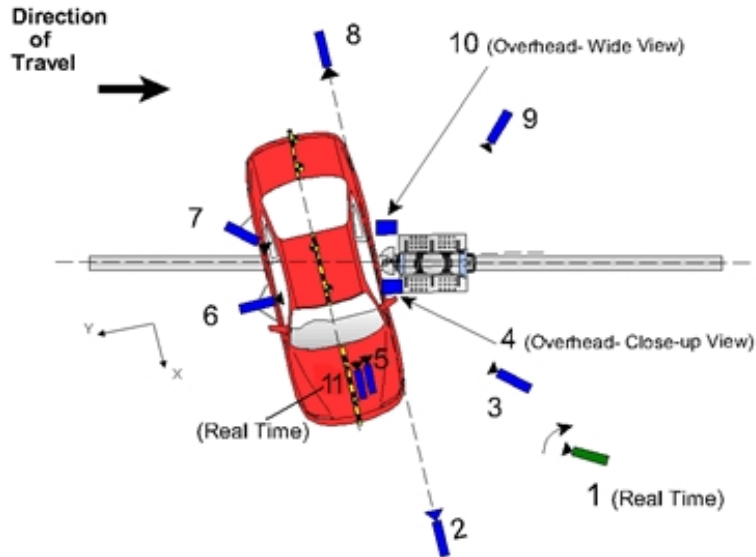
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver
HR	Head to Side Header	mm	182
HS	Head to Side Window	mm	312
AD	Arm to Door	mm	84
HD	H-Point to Door	mm	143

DATA SHEET NO. 8 **LOCATION OF CAMERA**

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024



CAMERA LOCATIONS AND DATA

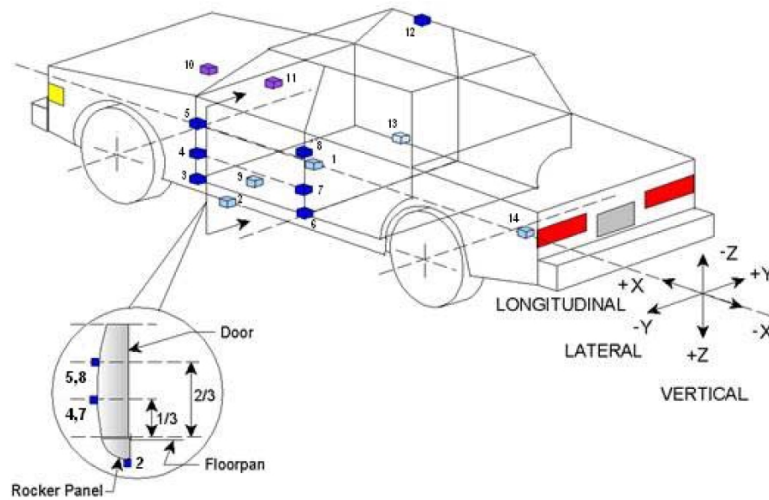
No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	30
2	Front ground level - impact view	7127	0	-1569	28	1000
3	Impact side 45° - forward pole view	4720	-866	-1422	24	1000
4	Overhead Close-up view of impact	0	0	-4375	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	-7806	0	-1397	28	1000
9	Impact side 45° - rearward pole view	-4001	-3653	-1435	24	1000
10	Overhead wide - view of impact	0	0	-9375	12.5	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: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2137	3	83
2	Left Floor Sill	2778	-648	119
3	A-Pillar Sill	3221	-624	79
4	A-Pillar Low	3241	-618	-106
5	A-Pillar Mid	3112	-631	-546
6	B-Pillar Sill	2257	-647	125
7	B-Pillar Low	2172	-678	-210
8	B-Pillar Mid	2126	-628	-519
9	Seat	2343	-531	185
10	Engine	3900	309	-291
11	Firewall	3646	78	-368
12	Roof	2456	569	-924
13	Right Floor Sill	2749	650	120
14	Rear Deck	706	30	13

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: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024

Loc. No	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Max	Time (ms)
1	Vehicle CG	X	g	4.13	93.05	-12.18	52.45
	Vehicle CG	Y	g	23.40	44.05	-1.30	184.25
	Vehicle CG	Z	g	12.71	54.45	-15.89	16.10
	Vehicle CG Resultant	N/A	g	26.29	52.05	0.03	-34.20
2	Floor Sill (Left)	Y	g	58.20	14.20	-33.92	34.45
3	A Pillar Sill	Y	g	42.52	17.60	-18.97	24.90
4	A Pillar Low	Y	g	31.60	121.20	-15.21	128.30
5	A Pillar Mid	Y	g	43.64	29.70	-29.87	34.05
6	B Pillar Sill	Y	g	75.16	19.00	-51.63	23.50
7	B Pillar Low	Y	g	119.21	19.65	-265.45	15.10
8	B Pillar Mid	Y	g	80.38	35.60	-75.31	13.90
9	Seat	Y	g	50.07	38.90	-18.54	44.60
10	Engine Top	X	g	3.70	128.55	-19.43	43.95
	Engine Top	Y	g	12.84	62.85	-2.85	203.70
11	Firewall	Y	g	13.70	47.80	-3.76	38.25
12	Roof	Y	g	27.87	44.10	-1.97	292.10
13	Floor Sill (Right)	Y	g	15.23	32.35	-2.47	162.25
14	Rear Deck	X	g	4.38	113.95	-8.79	57.30
	Rear Deck	Y	g	21.67	45.30	-2.55	144.50

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan NHTSA No.: C20244300
Test Facility: Calspan Test Date: 01/26/2024

Dummy Serial No. D037

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	9.50	106.60	-23.57	63.00
Lateral	Y	42.71	53.70	-6.37	82.75
Vertical	Z	19.97	42.40	-4.42	82.15
Resultant	N/A	46.35	51.10		
HIC36 (t1, t2)	N/A	255.90		t1 = 38.00	t2 = 65.55
THORAX DEFLECTION (mm)					
Upper Rib	Y	23.47	49.35	-3.65	24.95
Middle Rib	Y	17.52	47.55	-4.10	67.50
Lower Rib	Y	21.90	46.45	-1.35	122.50
ABDOMINAL FORCES (N)					
Front	Y	442.66	47.90	-20.36	16.75
Middle	Y	378.13	48.40	-7.29	15.60
Rear	Y	373.67	48.65	-16.74	124.45
SUM	N/A	1179.45	48.55		
PELVIS FORCES (N)					
Pubic Symphysis	Y	41.99	17.05	-2269.65	55.10

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

DATA SHEET NO. 12
POST-TEST OBSERVATIONS

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024

IMPACT POINT DATA

Measured Parameter	Units	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm	1383
Actual Impact Point - Aft of Front Axle	mm	1383
Difference	mm	0

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (ES2-re)
Head Contact	Side Header, Curtain Airbag & Headrest
Upper Torso Contact	Seatback & Torso/Pelvis Airbag
Lower Torso Contact	Seatback & Torso/Pelvis Airbag
Left Knee Contact	Driver Door Panel
Right Knee Contact	Left Knee

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	A-Pillar & B-Pillar buckled
Sill Separation	None
Windshield Damage	Cracked throughout
Side Window Damage	Driver window shattered and fell out
Other Notable Effects	None

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024

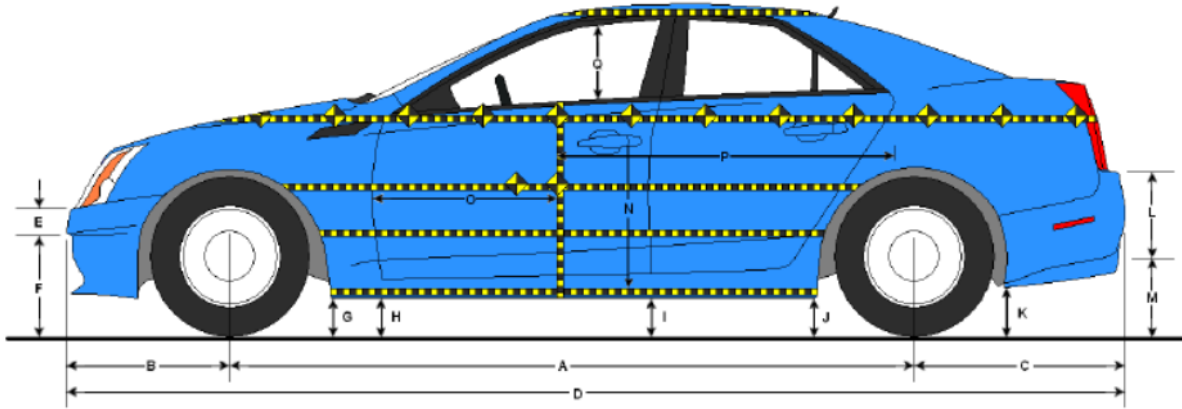
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024



LEFT SIDE VIEW

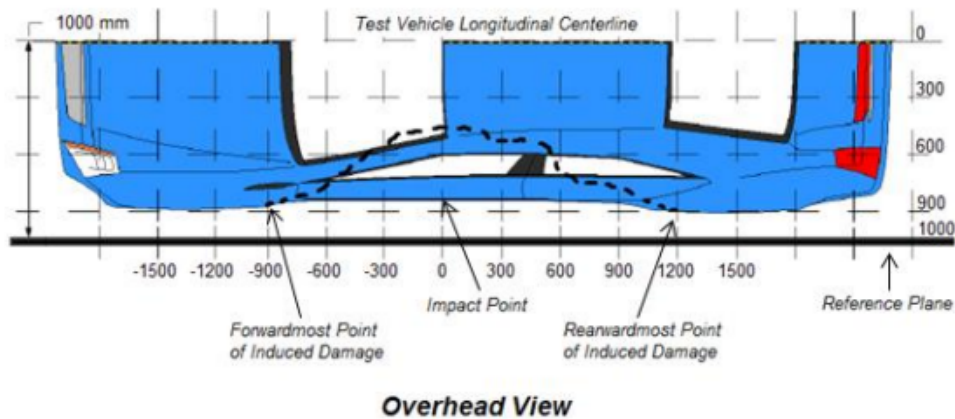
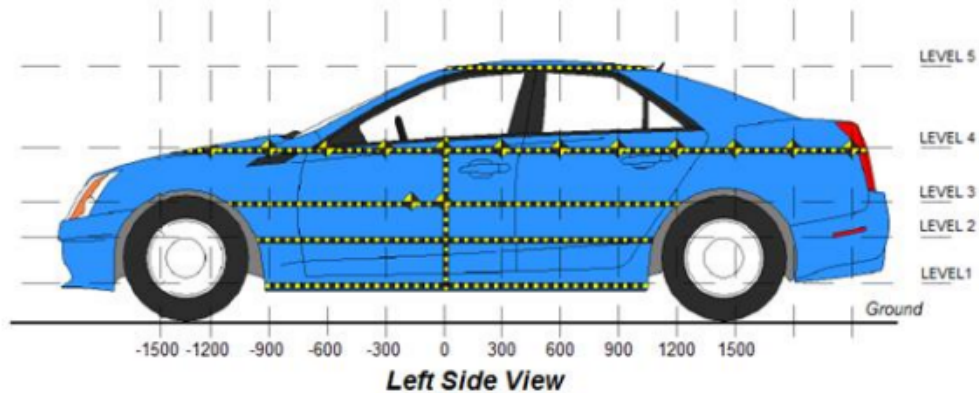
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

No.	Measurement Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2728	2665	-62
B	Front Axle to FSOV	930	967	37
C	Rear Axle to RSOV	1037	1031	-6
D	Total Vehicle Length at Centerline	4695	4664	-31
E	Front Bumper Thickness	155	155	0
F	Front Bumper Bottom to Ground	405	416	11
G	Sill Height at Front Wheel Well	145	148	3
H	Sill Height at Front Door Leading Edge	140	144	4
I	Sill Height at B Pillar	166	139	-27
J1	Sill Height at Rear Wheel Well	161	188	27
J2	Pinch Weld Height at Rear Wheel Well	188	201	13
K	Sill Height Aft of Rear Wheel Well	207	203	-4
L	Rear Bumper Thickness	150	150	0
M	Rear Bumper Bottom to Ground	440	426	-14
N	Sill Height to Window Bottom Sill	341	732	391
O	Front Door Leading Edge to Impact CL	864	805	-60
P	Rear Door Trailing Edge to Impact CL	1230	1156	-74
Q	Front Window Opening	341	358	17
R	Right Side Length	4557	4552	-6
S	Left Side Length	4557	4511	-47
T	Vehicle Width at B-Pillars	1807	1669	-138

DATA SHEET NO. 14
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	338	270	0
2	Occupant H-Point	mm	514	301	0
3	Mid-Door	mm	648	300	0
4	Window Sill	mm	932	245	0
5	Window Top	mm	1379	48	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: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
 Test Facility: Calspan

NHTSA No.: C20244300
 Test Date: 01/26/2024

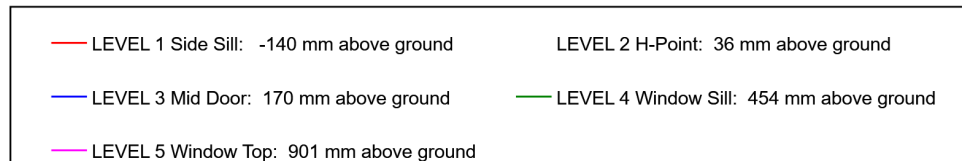
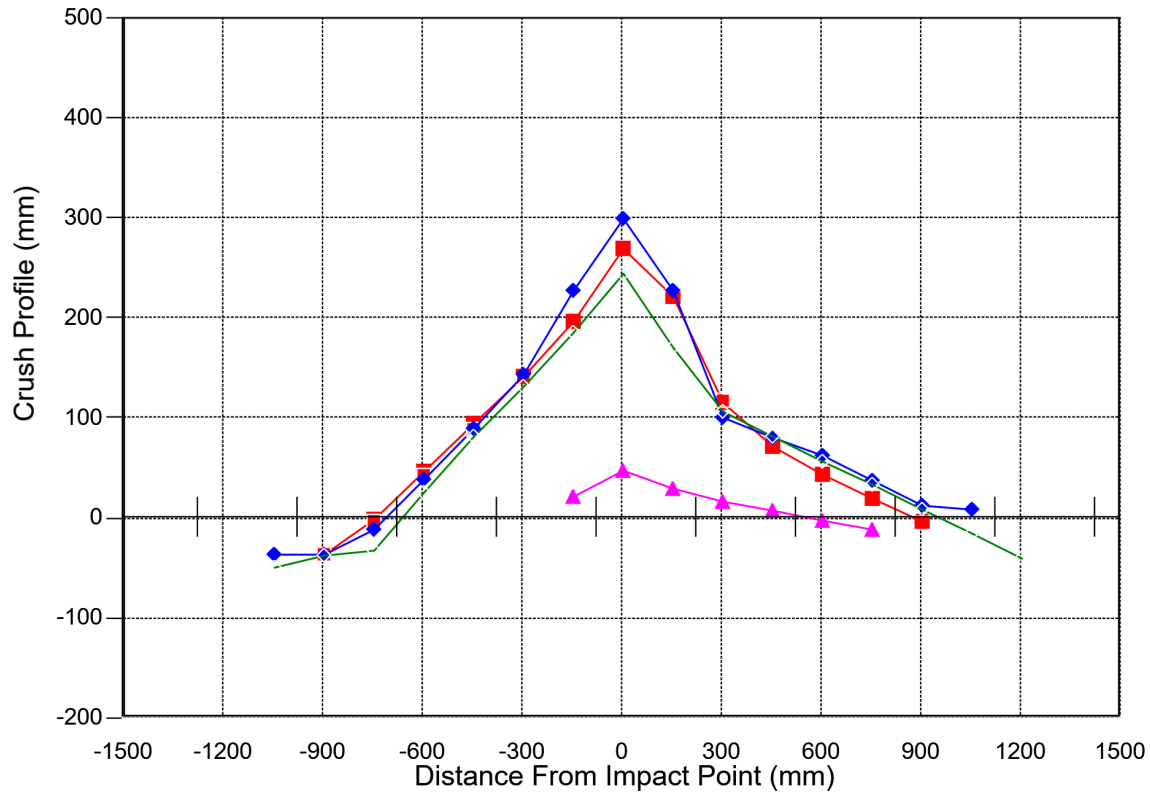
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050			909	789				945	838				-36	-49	
-900	879	896	898	801		915	932	934	838		-36	-36	-36	-37	
-750	877	891	896	809		878	894	907	841		-1	-3	-11	-32	
-600	877	893	897	833		830	850	858	807		47	43	39	26	
-450	875	895	898	823		780	806	808	741		95	89	90	82	
-300	874	897	898	828		732	760	754	696		142	137	144	132	
-150	872	898	897	833	583	675	670	669	647	561	197	228	228	186	22
0	871	899	896	838	592	601	598	596	593	544	270	301	300	245	48
150	869	900	895	840	591	647	666	667	669	561	222	234	228	171	30
300	867	901	893	842	588	751	783	792	735	571	116	118	101	107	17
450	865	901	891	843	582	793	814	810	761	574	72	87	81	82	8
600	865	899	891	845	565	821	838	828	788	567	44	61	63	57	-2
750	867	898	894	848	539	847	863	856	814	550	20	35	38	34	-11
900	872	900	900	852		875	891	887	843		-3	9	13	9	
1050			913	851				904	866				9	-15	
1200				853					893					-40	
1350															
1500															

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024

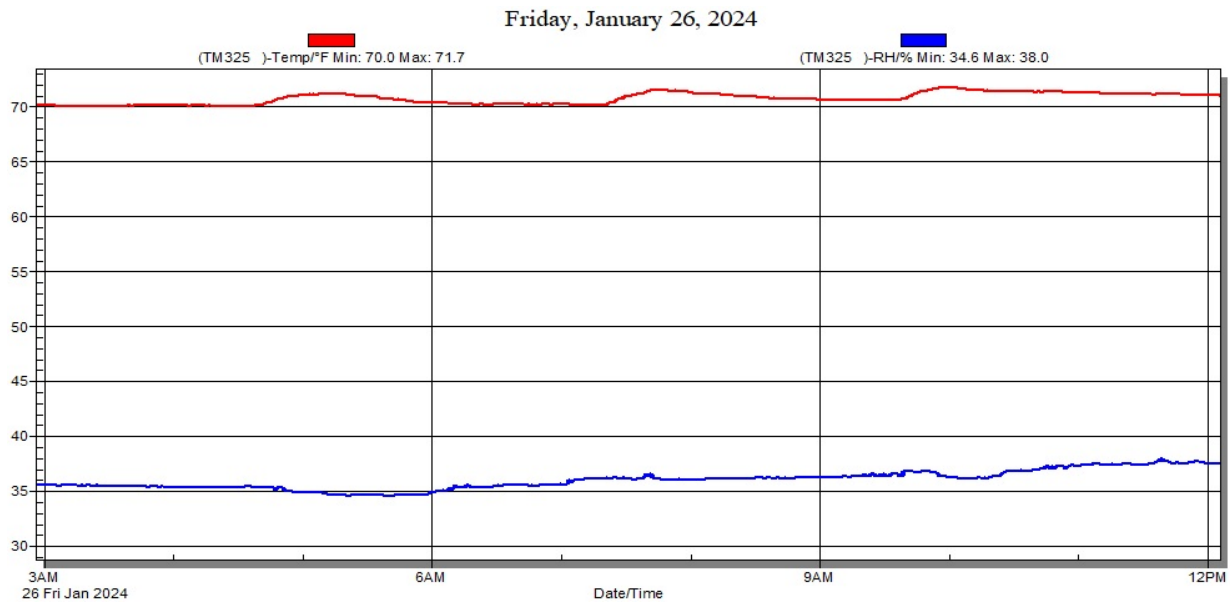


Vehicle Exterior Crush Measurements - Visual Representation

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

Test Vehicle: 2024 Mercedes-Benz CLA250 4Matic 4 Door Sedan
Test Facility: Calspan

NHTSA No.: C20244300
Test Date: 01/26/2024



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

APPENDIX I
PHOTOGRAPHS

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25	Close-Up View of Vehicle's Certification Label	I-15
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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 Left $\frac{3}{4}$ Front View of Vehicle and Pole



Figure A-8: Pre-Test Left $\frac{3}{4}$ Rear View of Vehicle and Pole



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

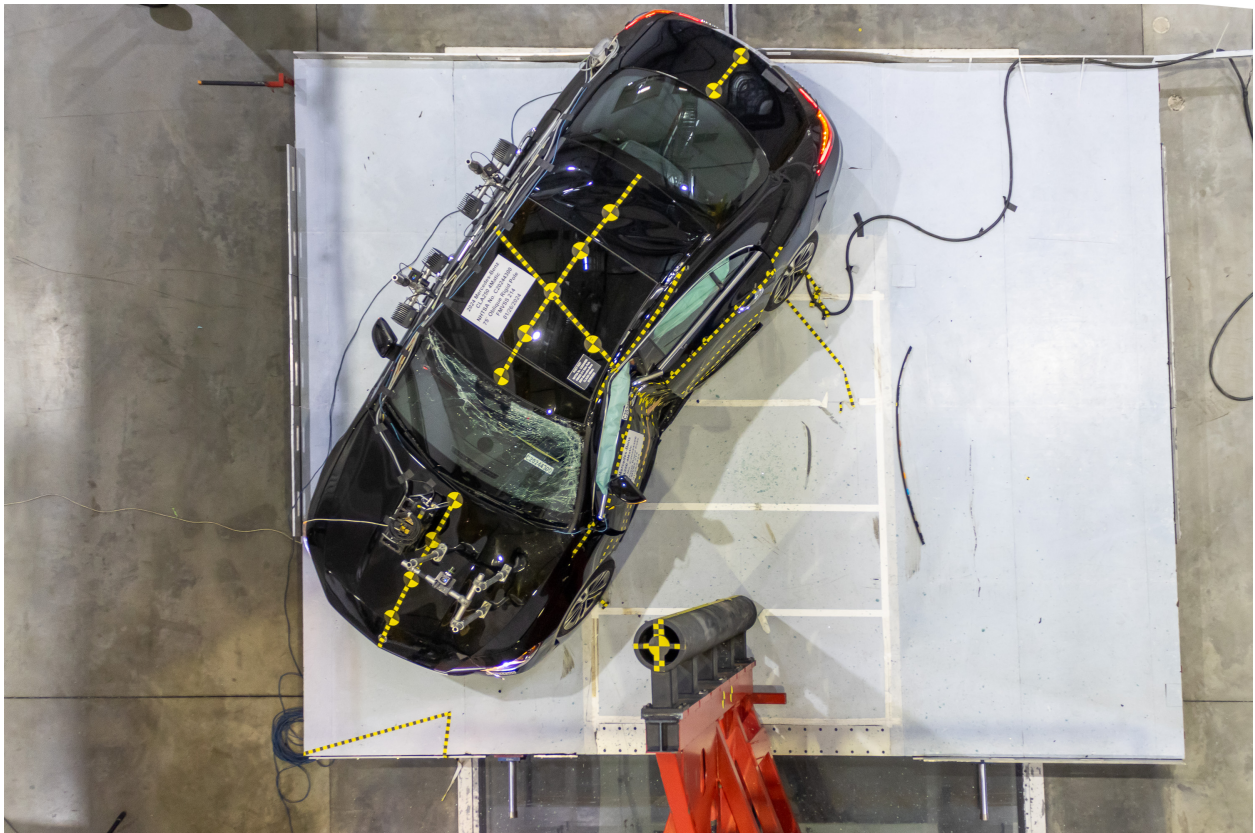


Figure A-10: Post-Test Overhead View of Test Vehicle



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

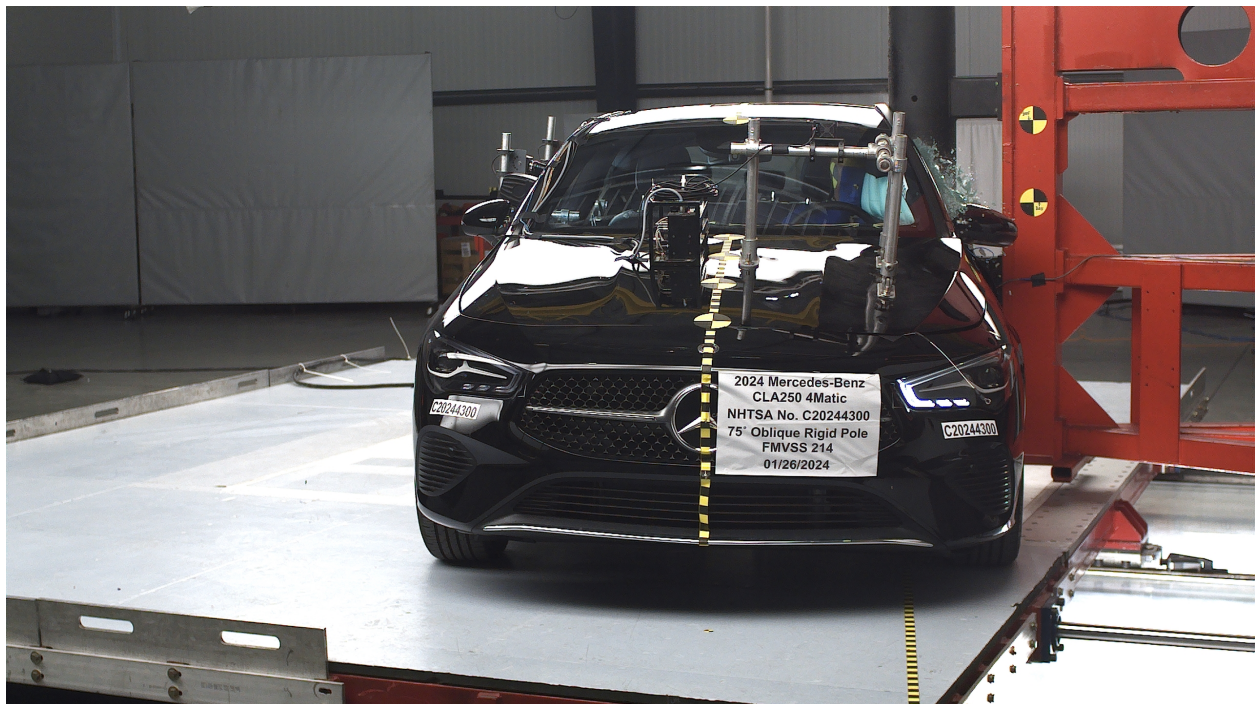


Figure A-20: Impact Event



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

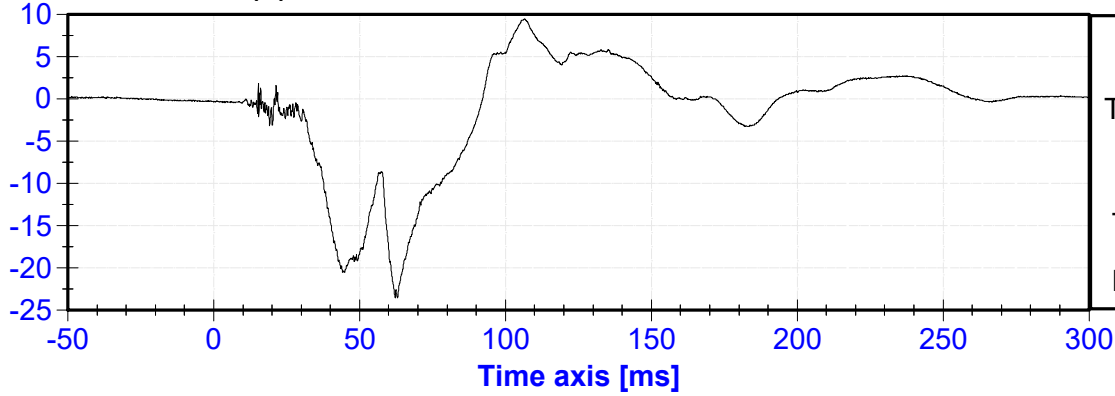
APPENDIX II
ES-2re DUMMY RESPONSE DATA TRACES

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7	ES-2re Head (Z) Velocity vs. Time	II-4
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13	ES-2re Lower Thorax Rib Deflection (Y) vs. Time	II-6
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17	ES-2re Sum of Abdomen Forces vs. Time	II-7
18	ES-2re Pubic Symphysis Force (Y) vs. Time	II-7

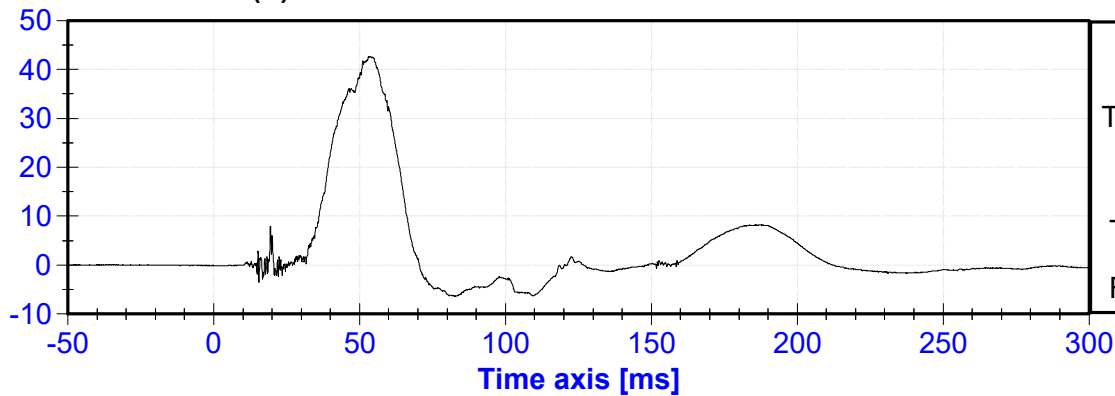
ACCELERATION [g's]

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



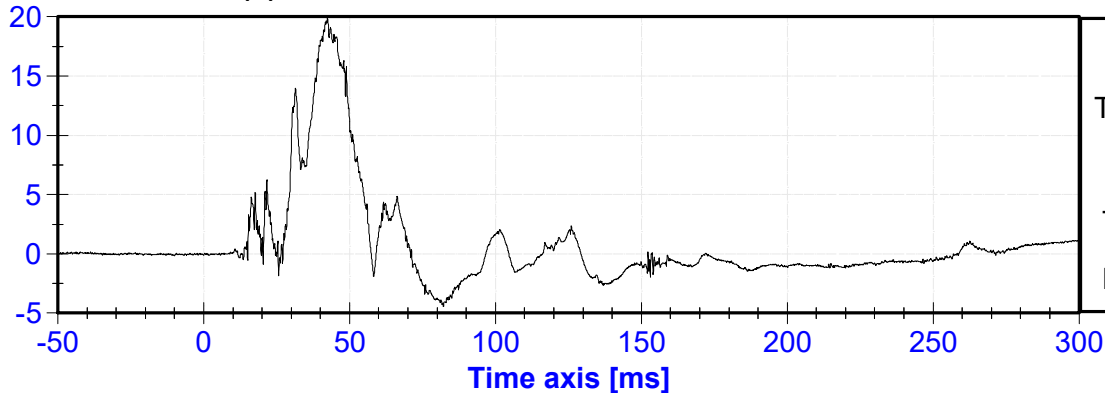
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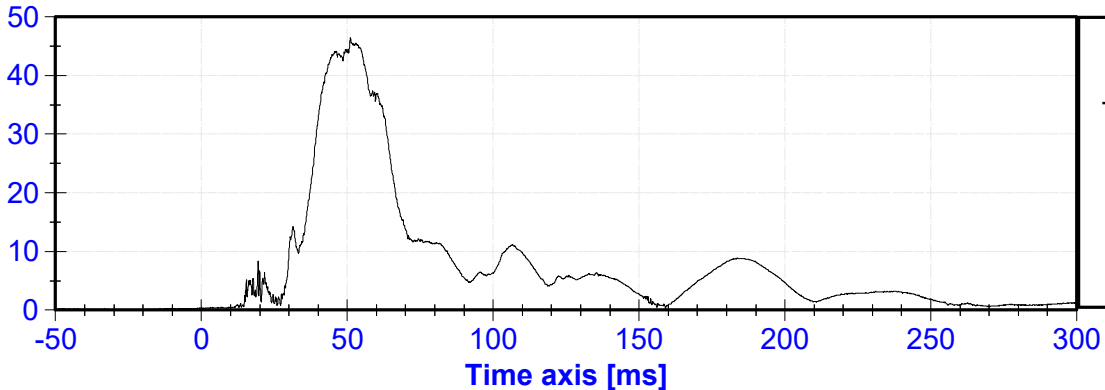
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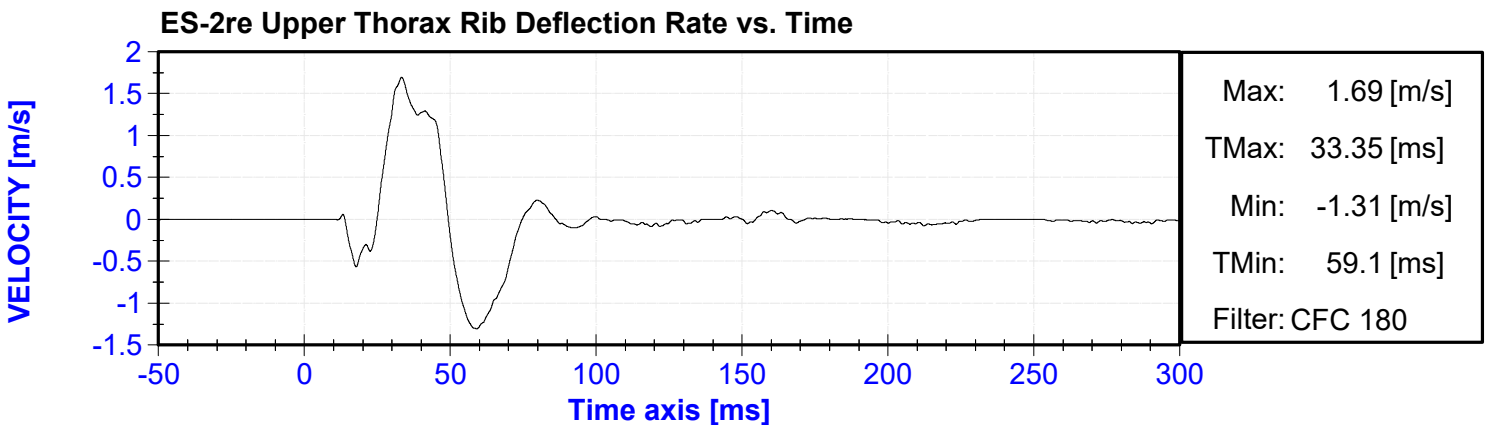
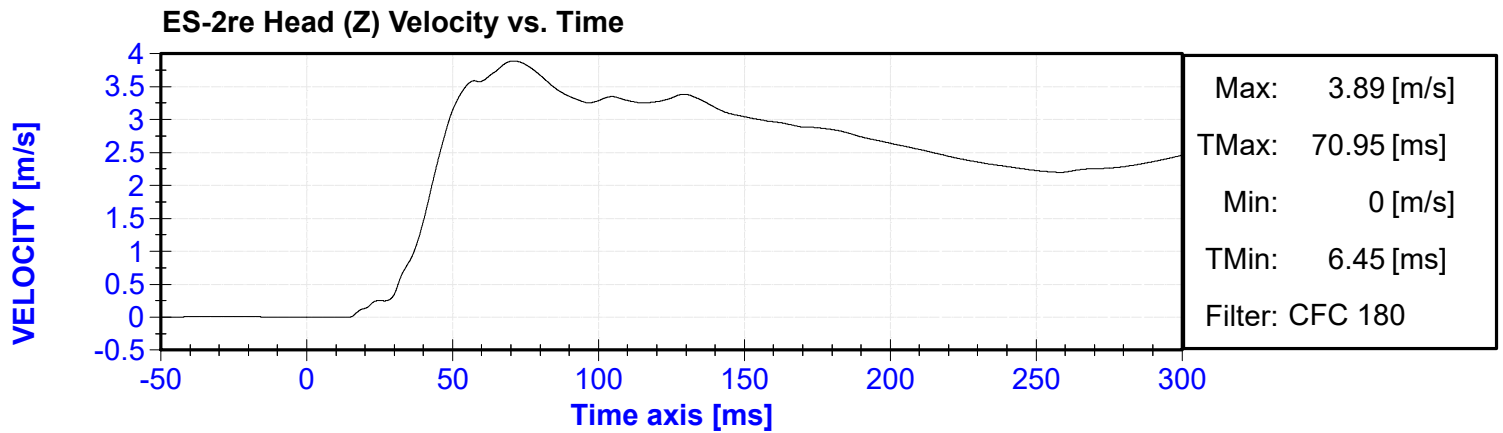
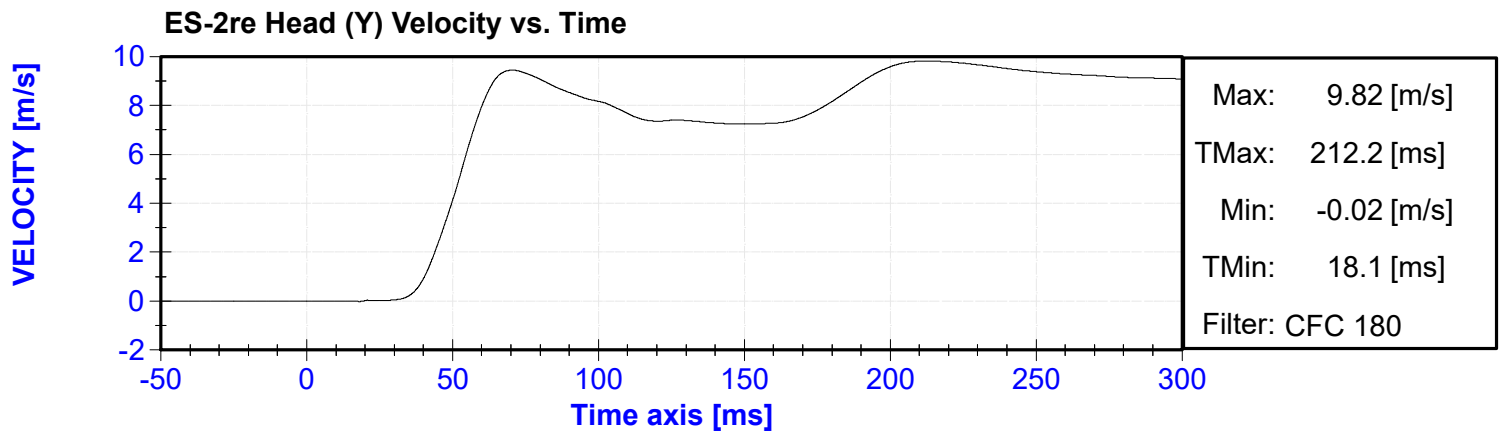
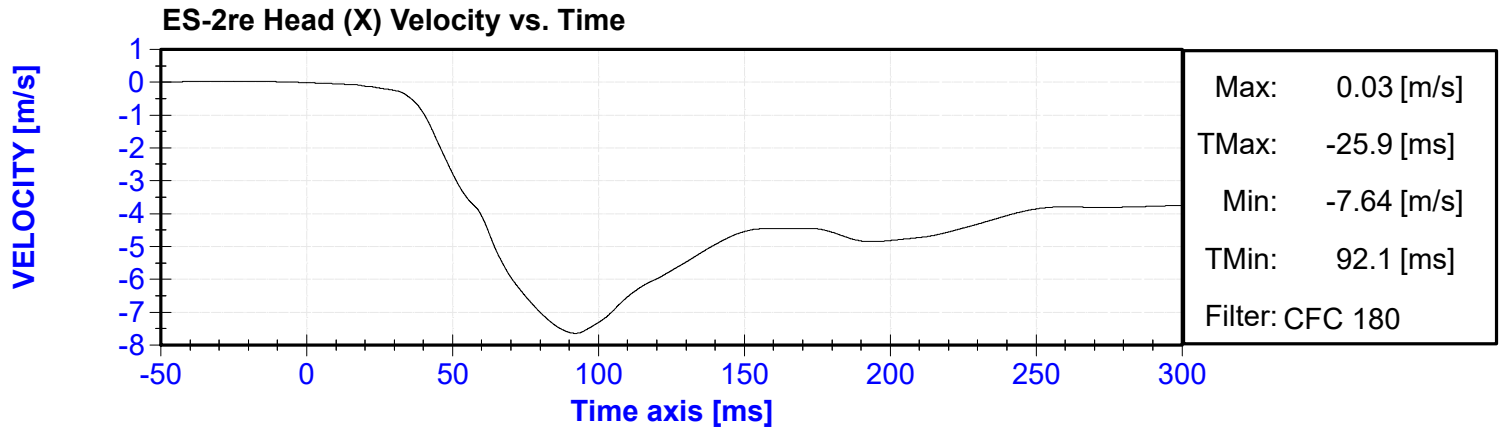
ES-2re Head (Z) Acceleration vs. Time

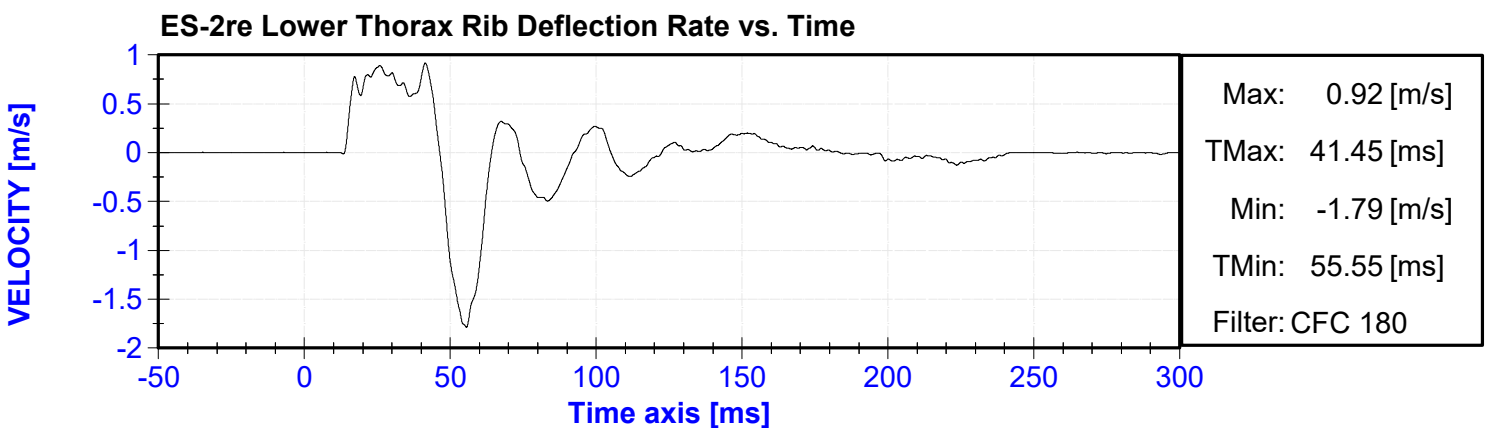
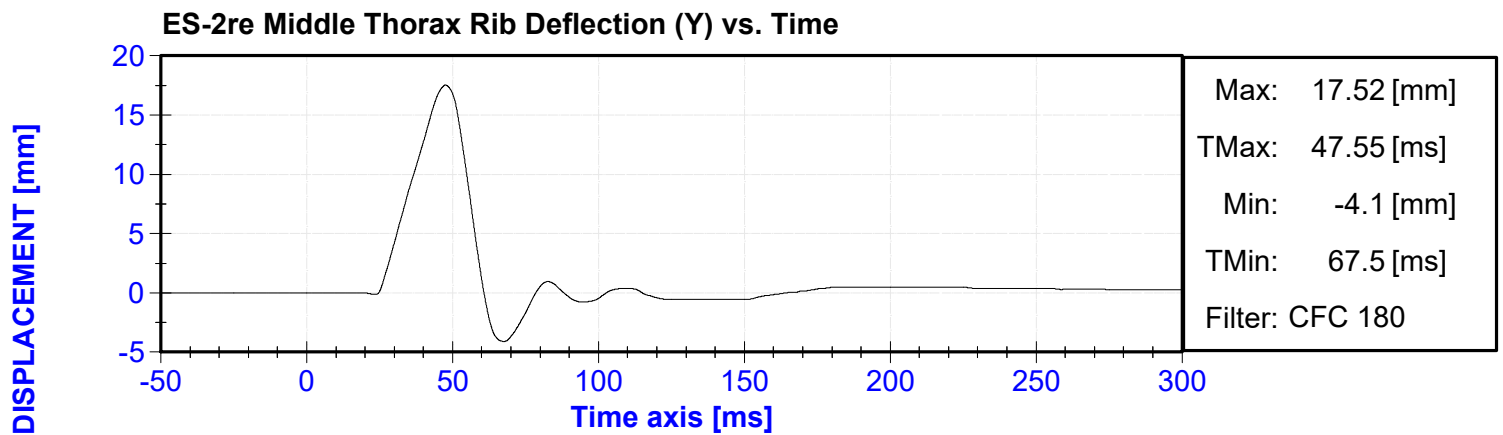
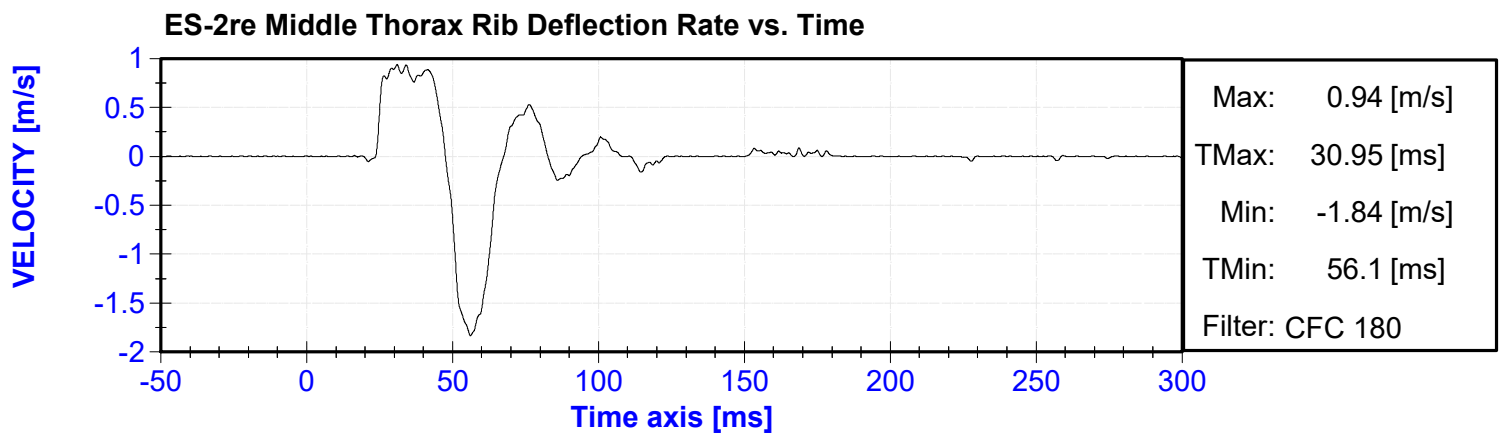
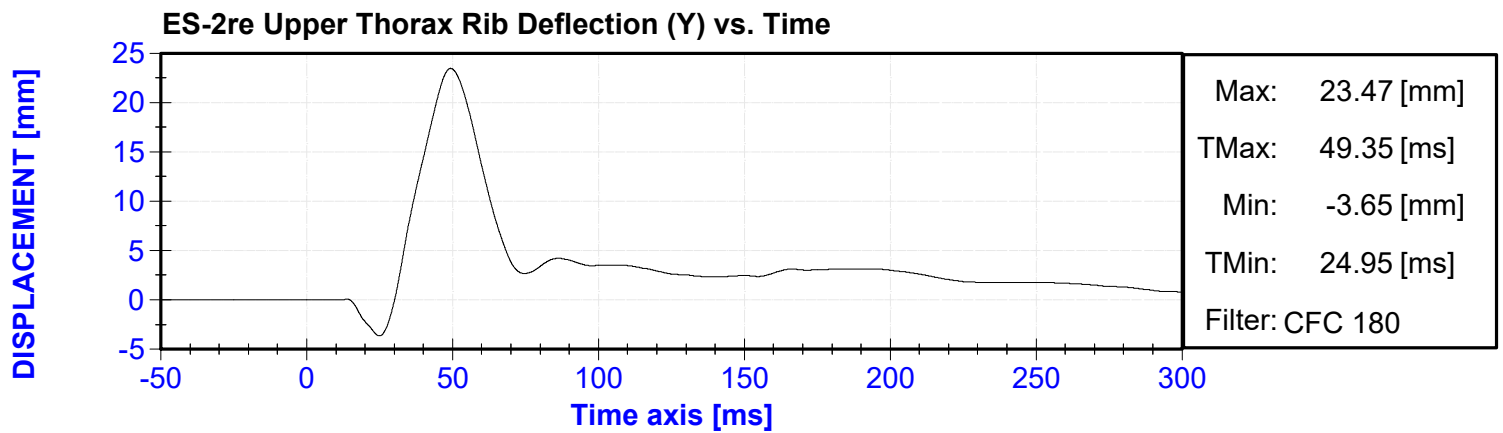


ACCELERATION [g's]

ES-2re Head Resultant Acceleration vs. Time

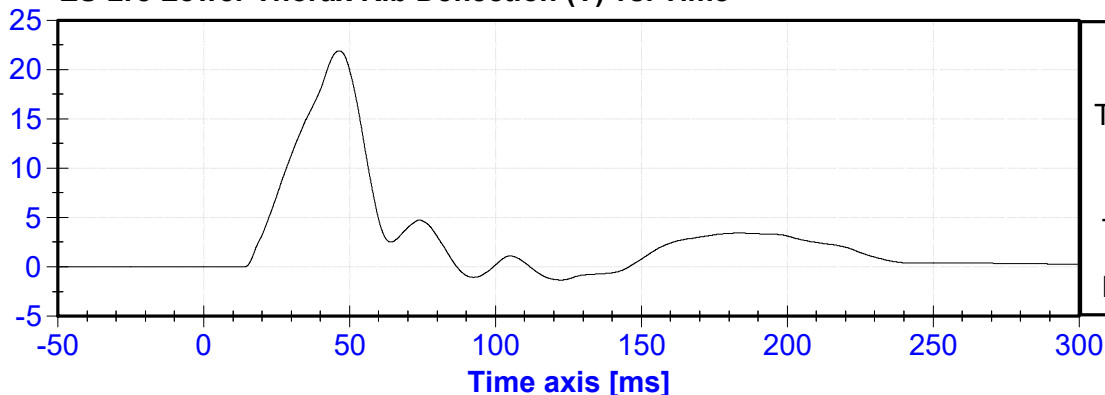






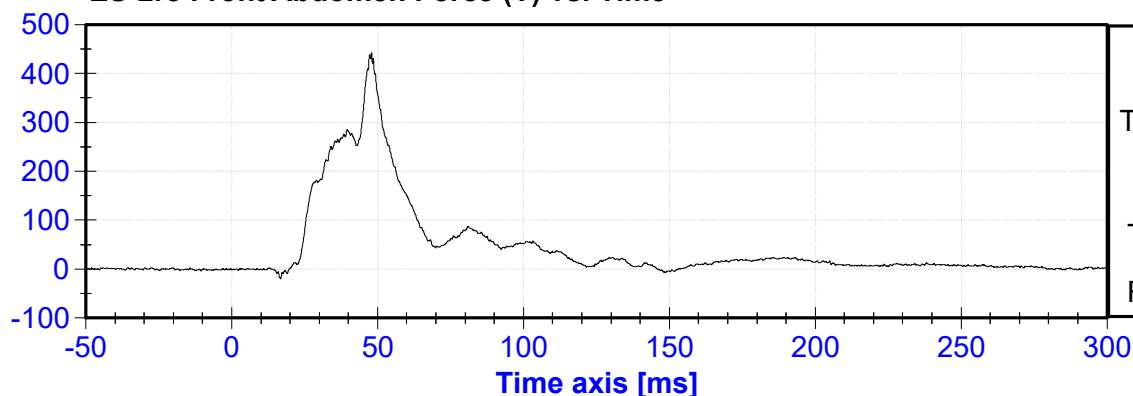
ES-2re Lower Thorax Rib Deflection (Y) vs. Time

DISPLACEMENT [mm]



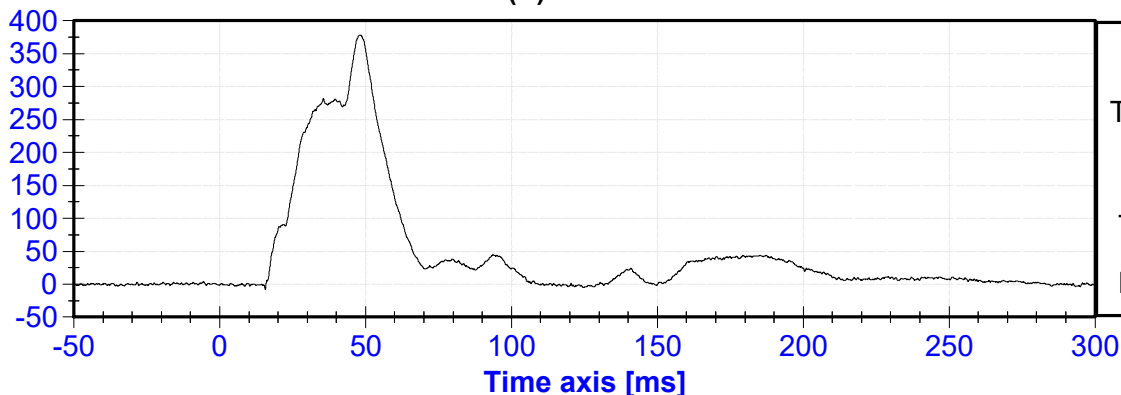
ES-2re Front Abdomen Force (Y) vs. Time

FORCE [N]



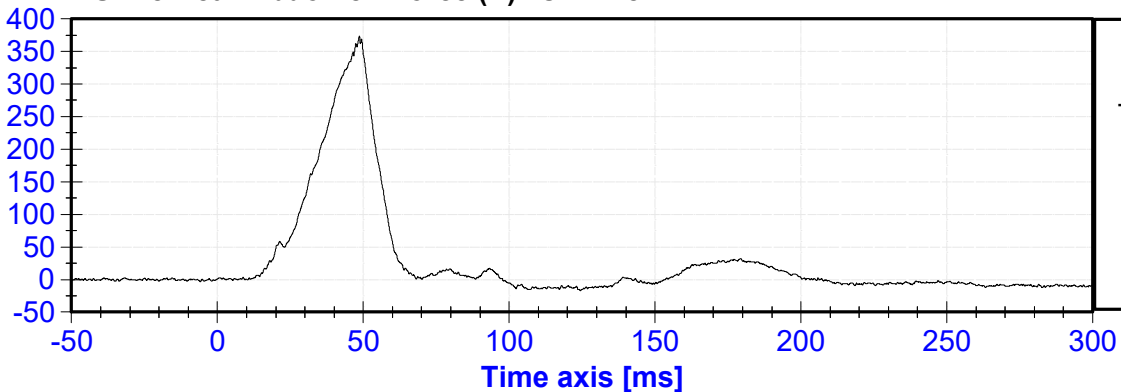
ES-2re Middle Abdomen Force (Y) vs. Time

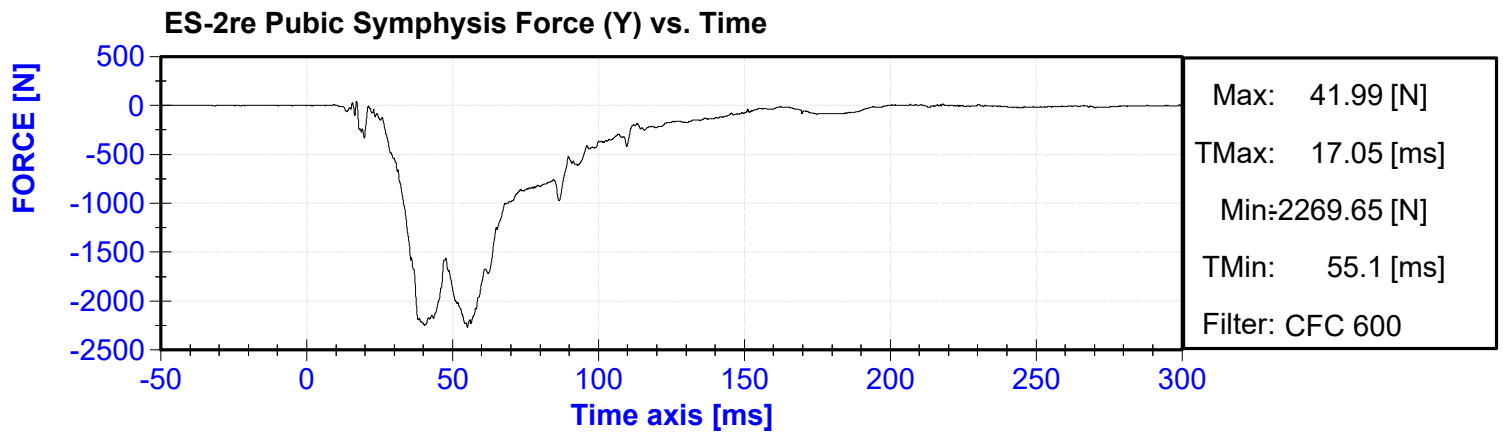
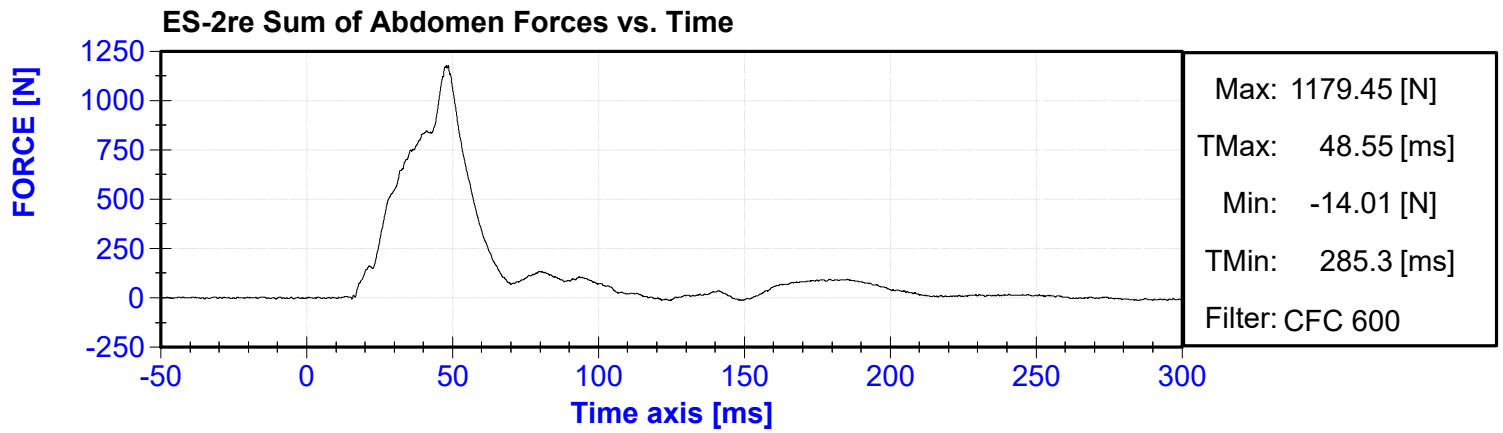
FORCE [N]



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

FORCE [N]



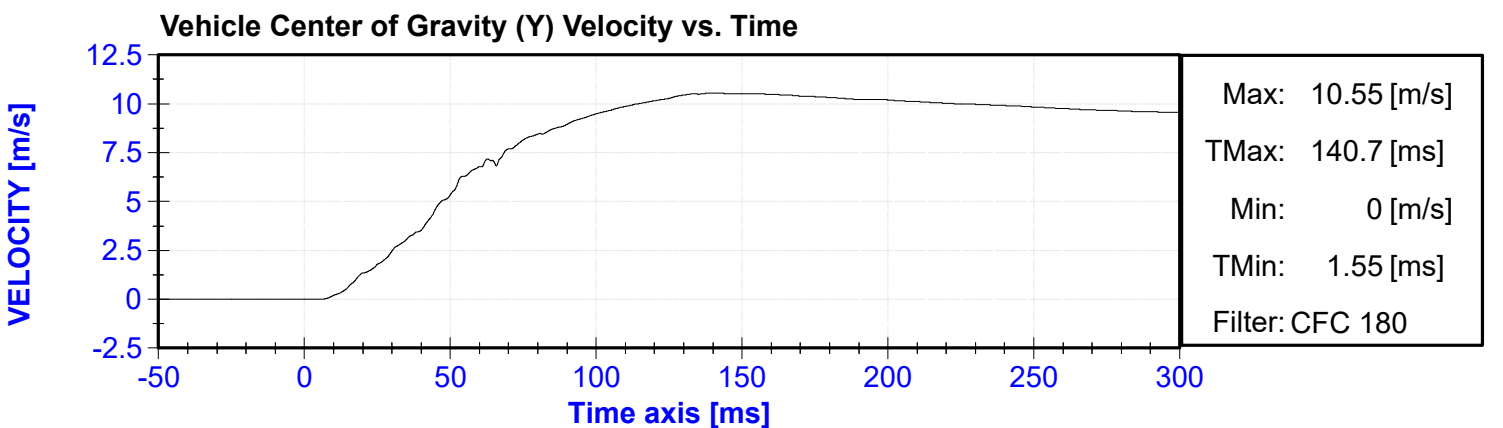
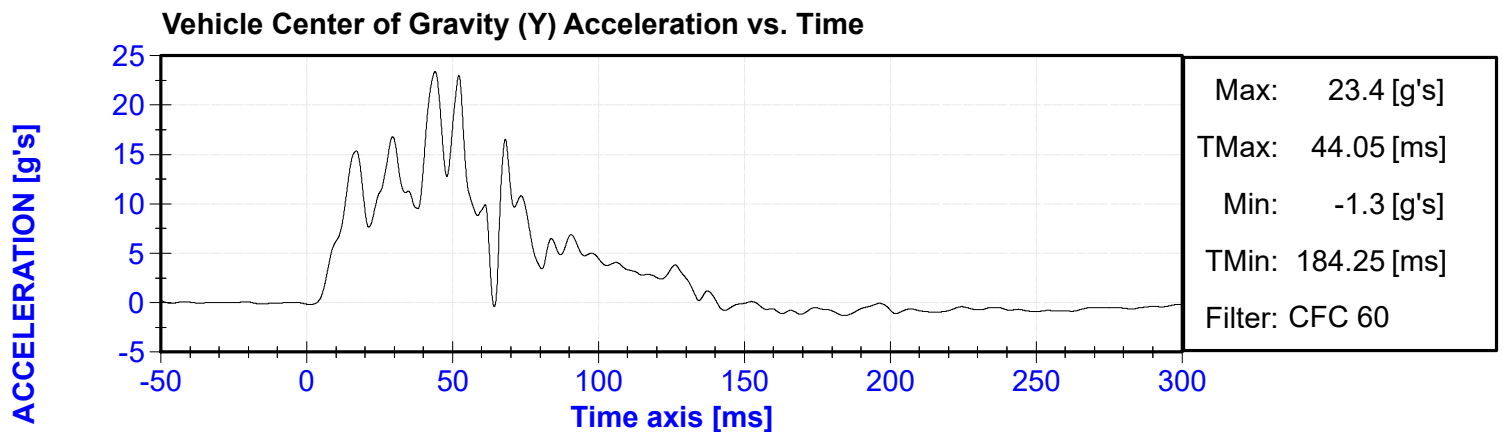
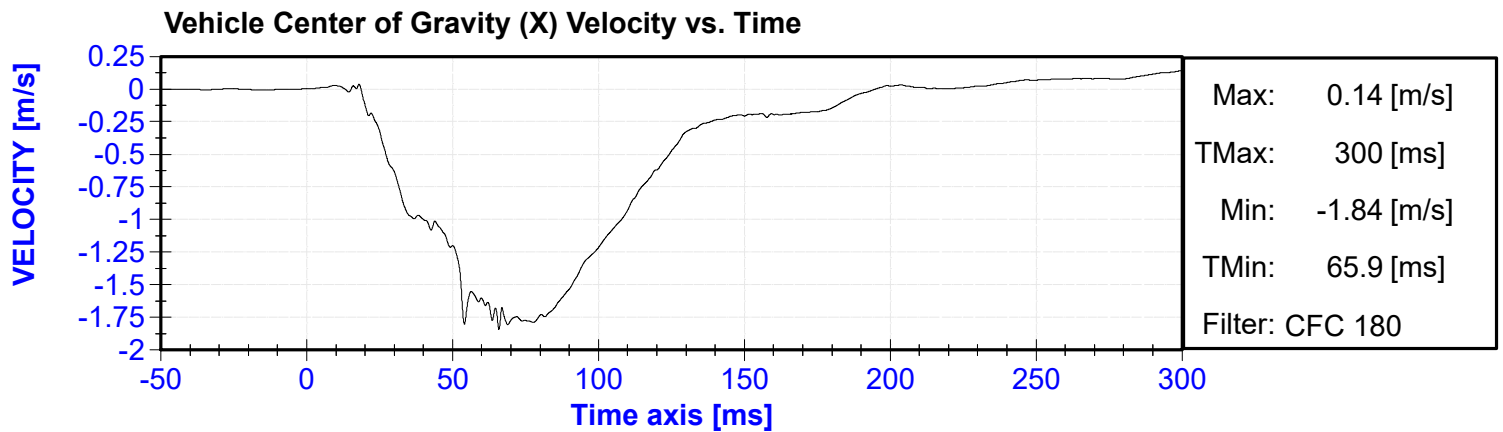
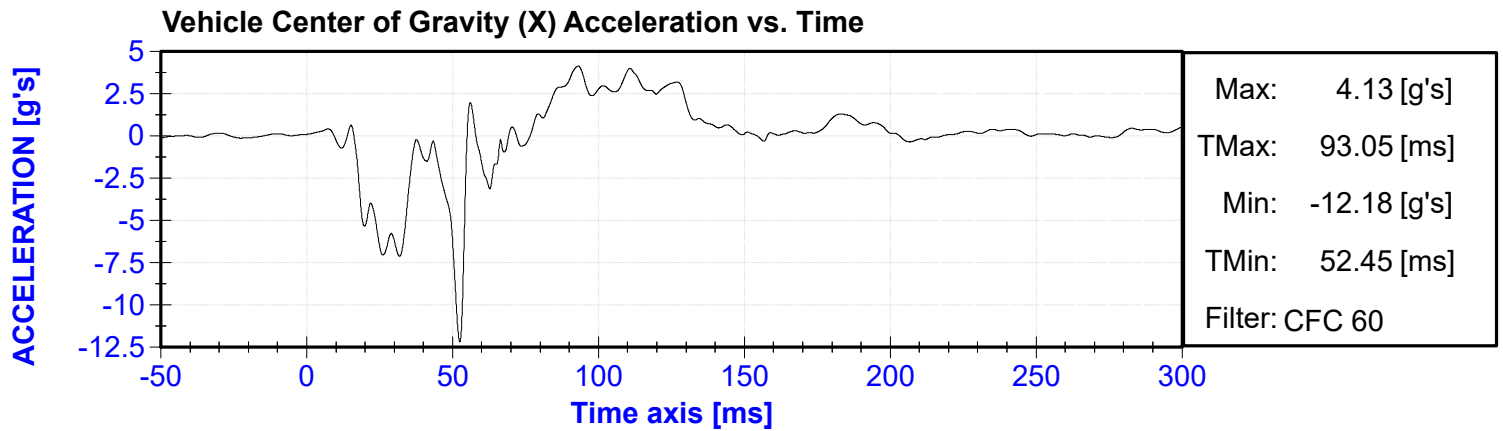


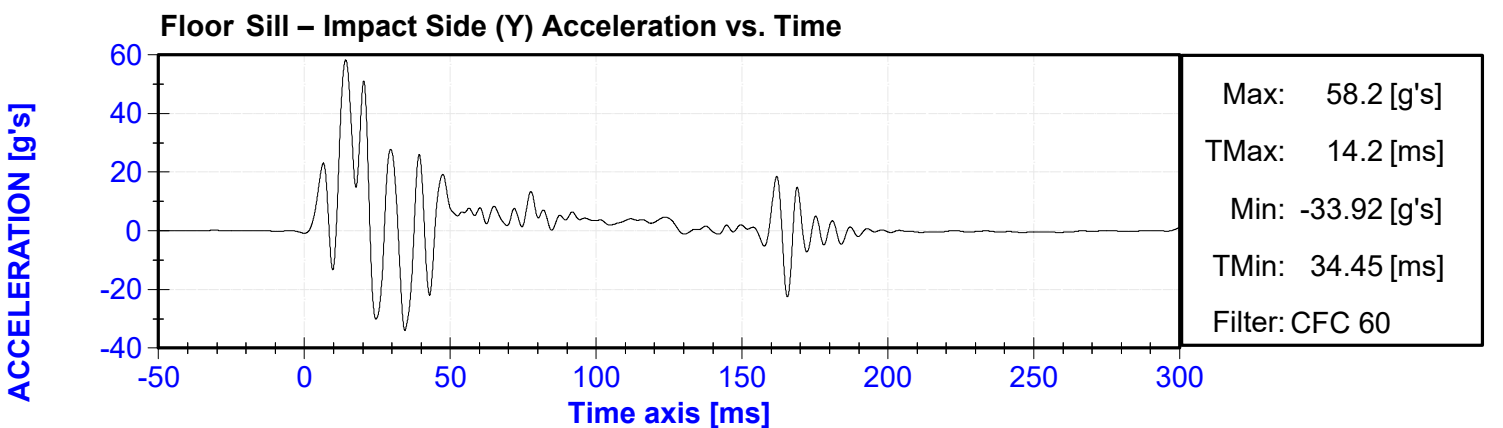
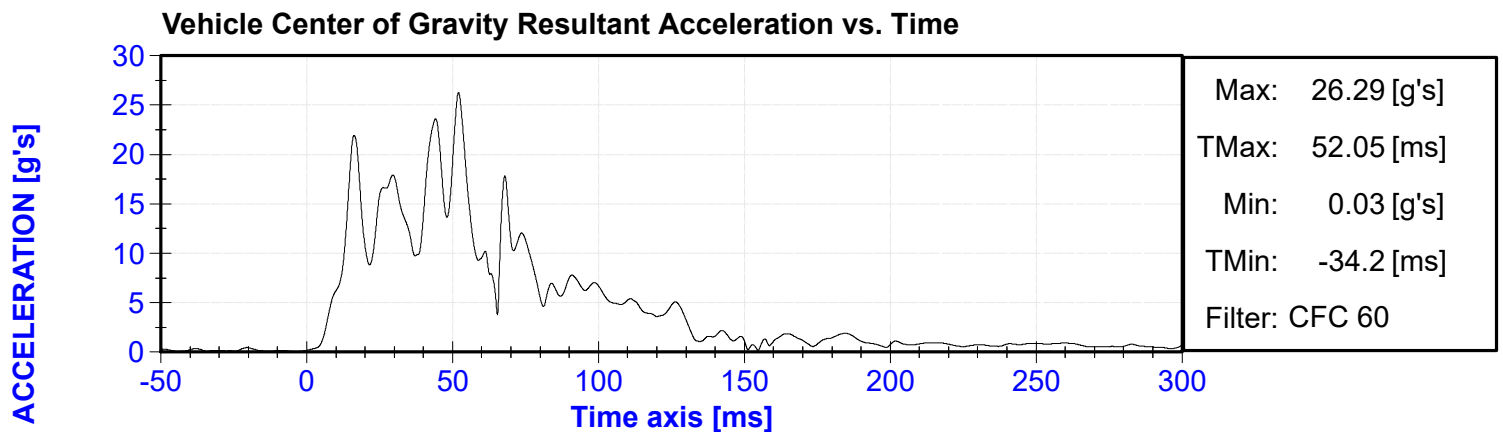
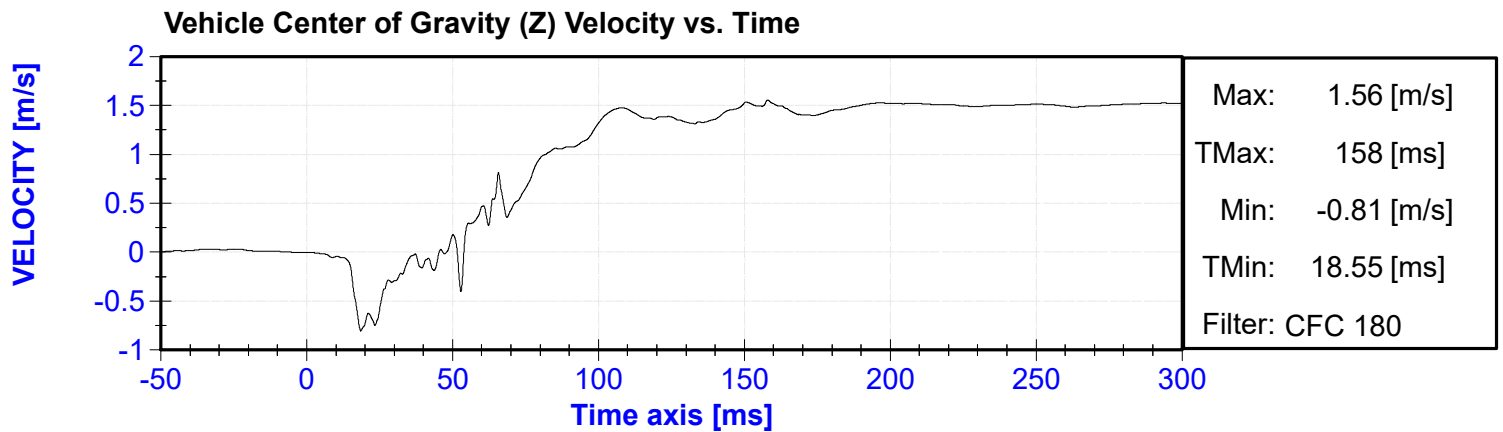
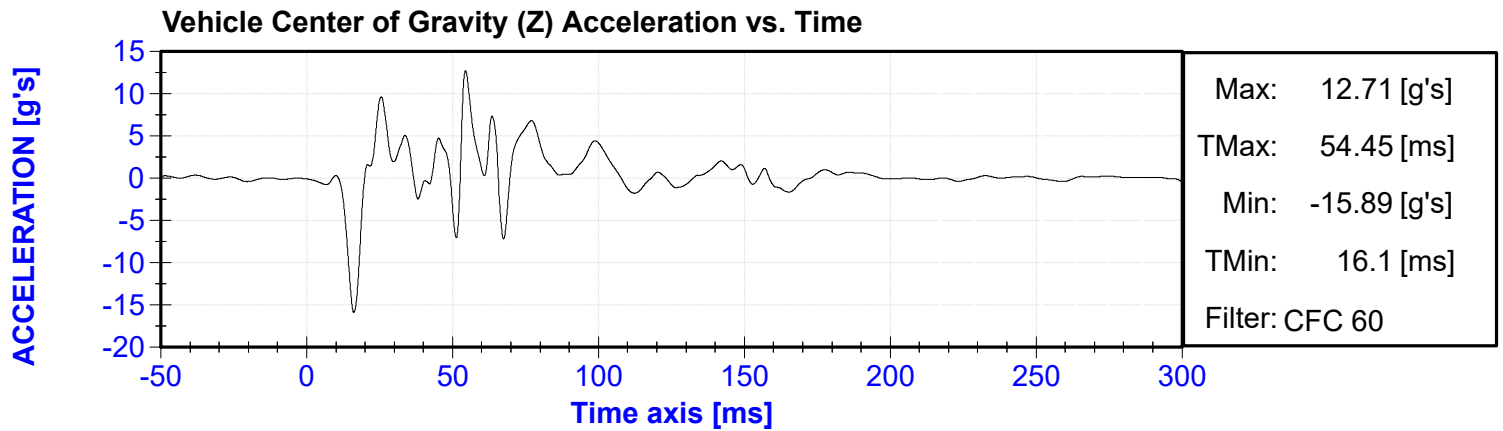
APPENDIX III

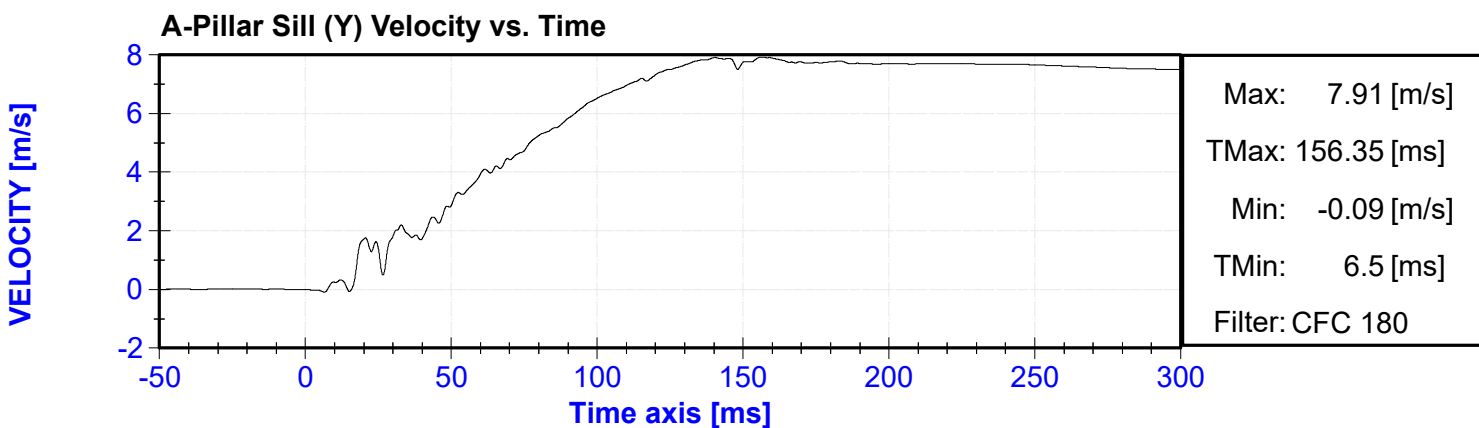
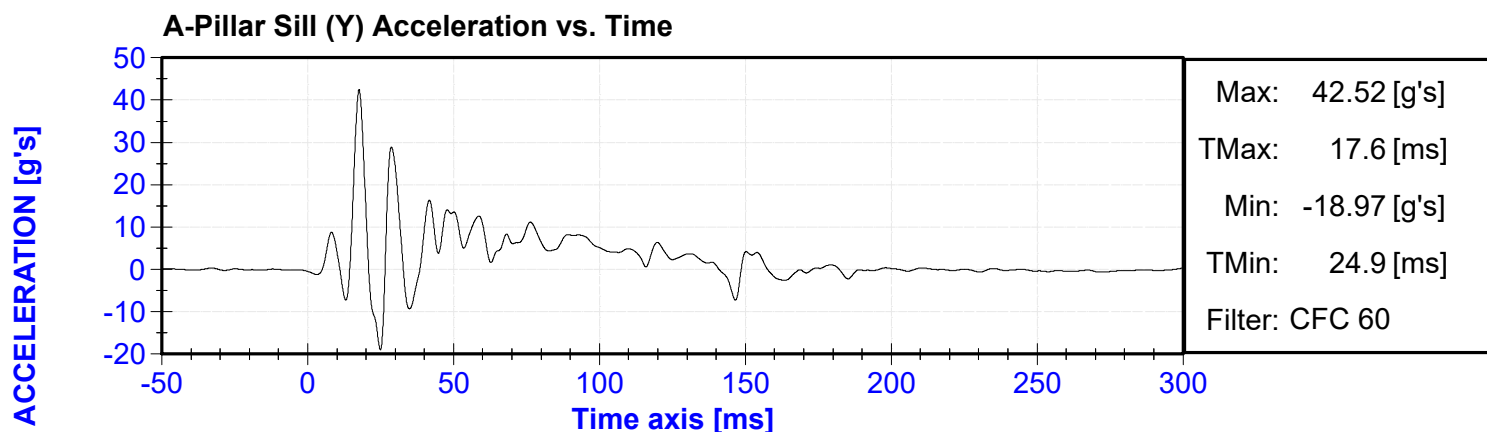
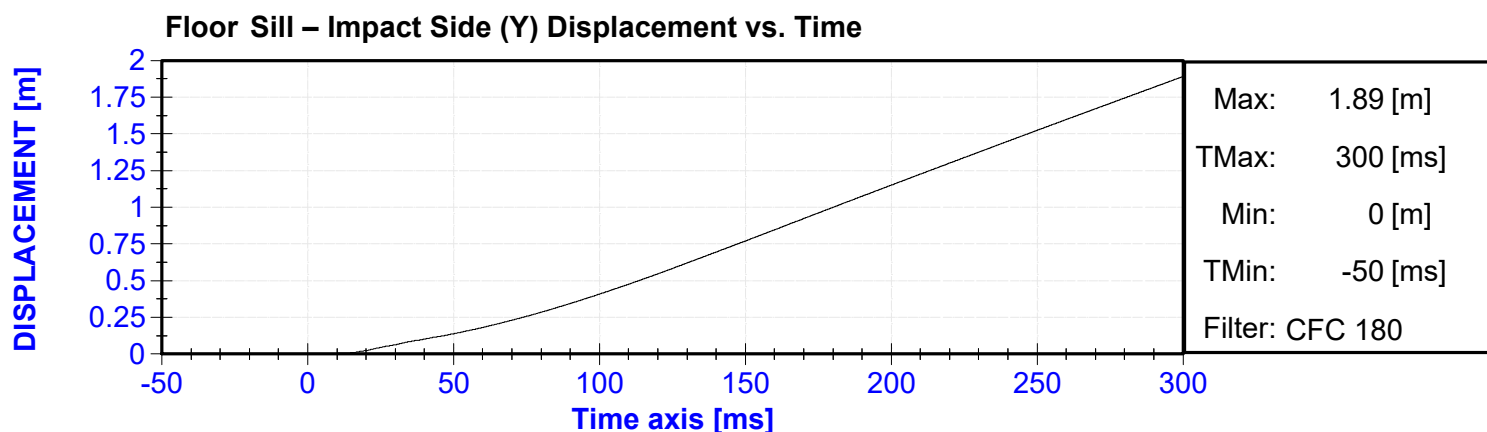
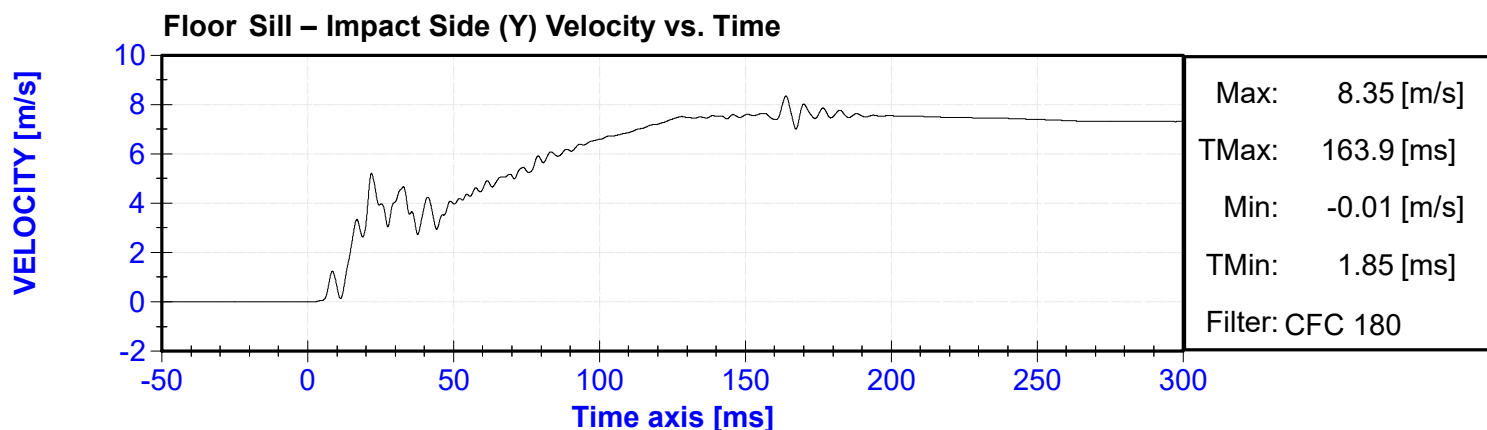
VEHICLE ACCELEROMETER RESPONSE DATA

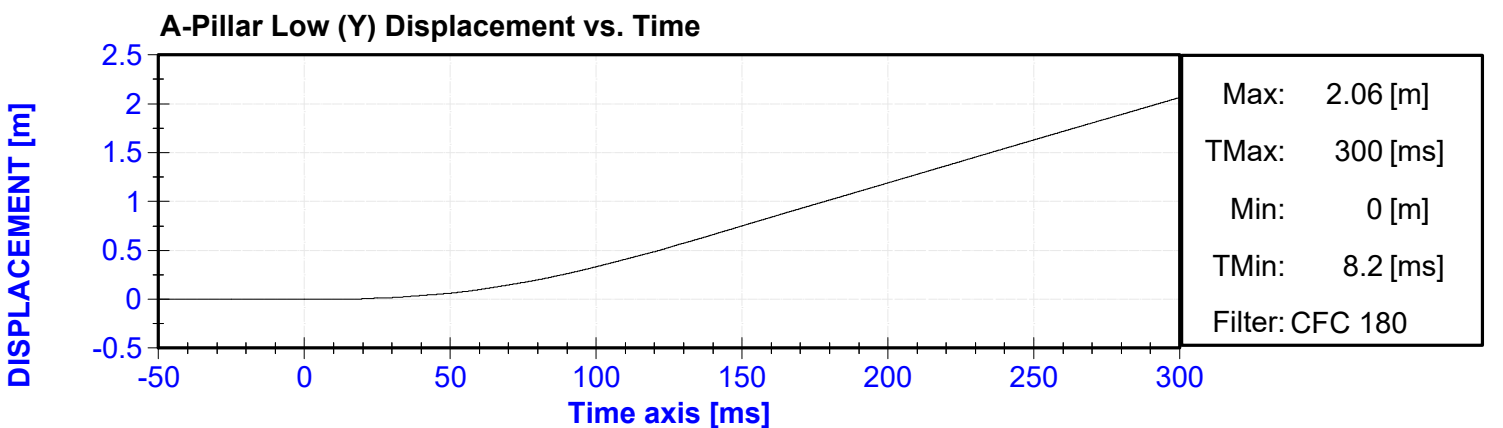
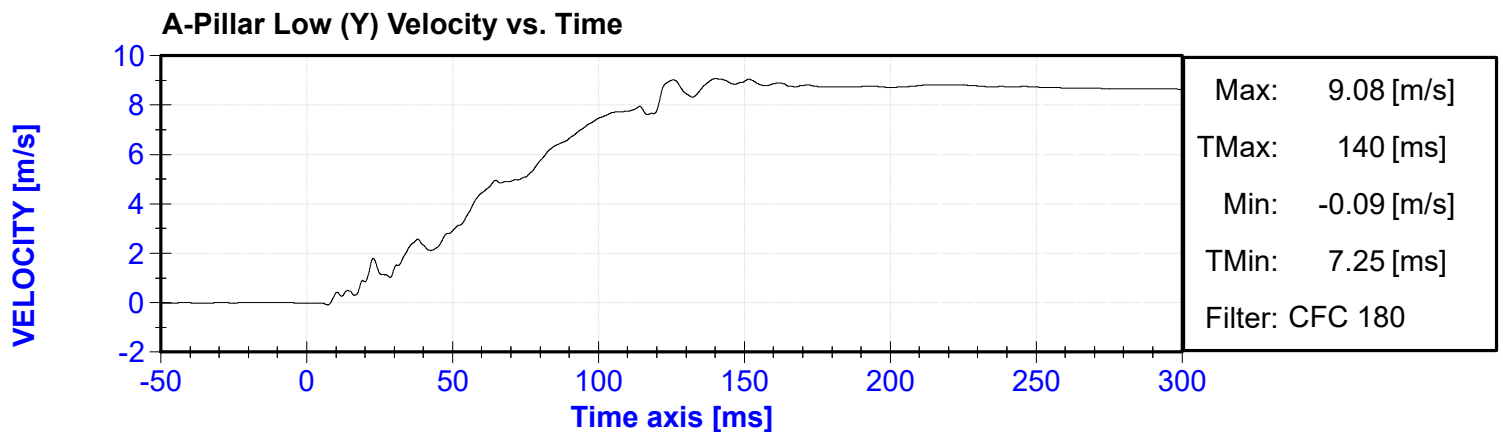
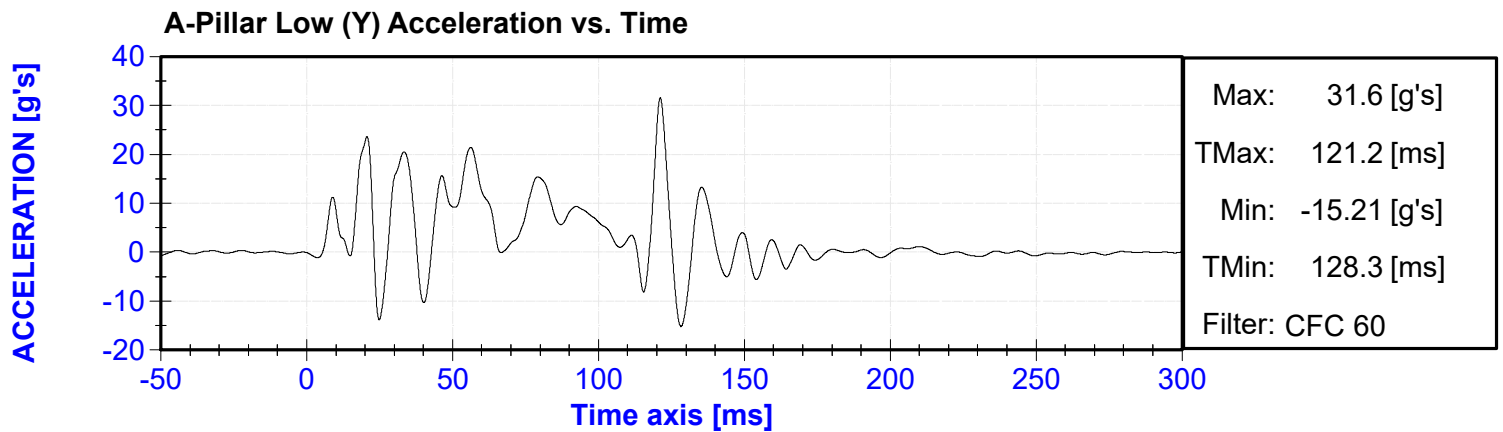
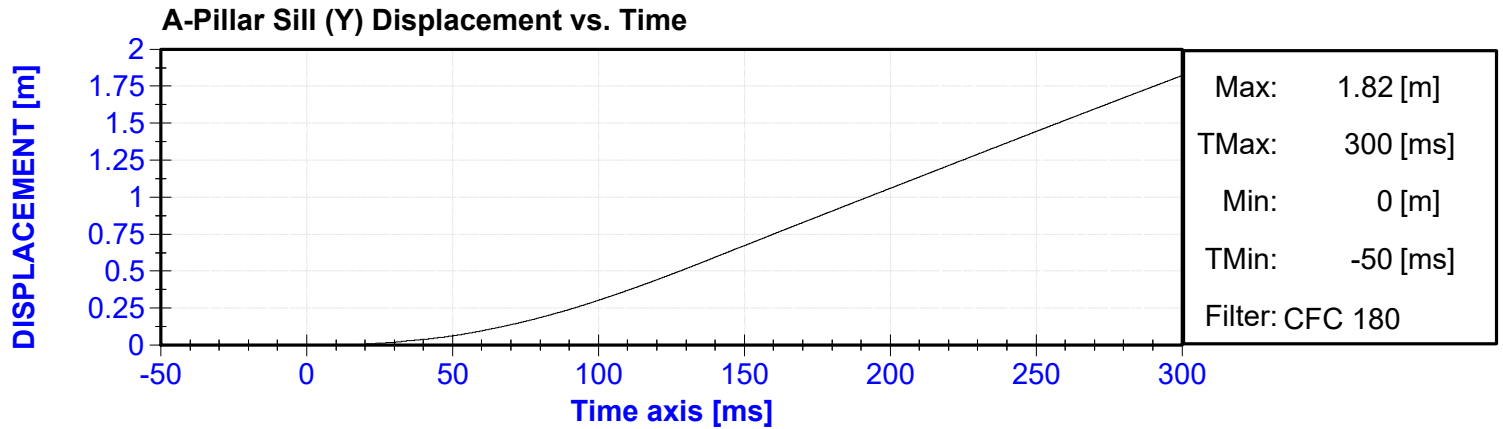
Table of Data Plots

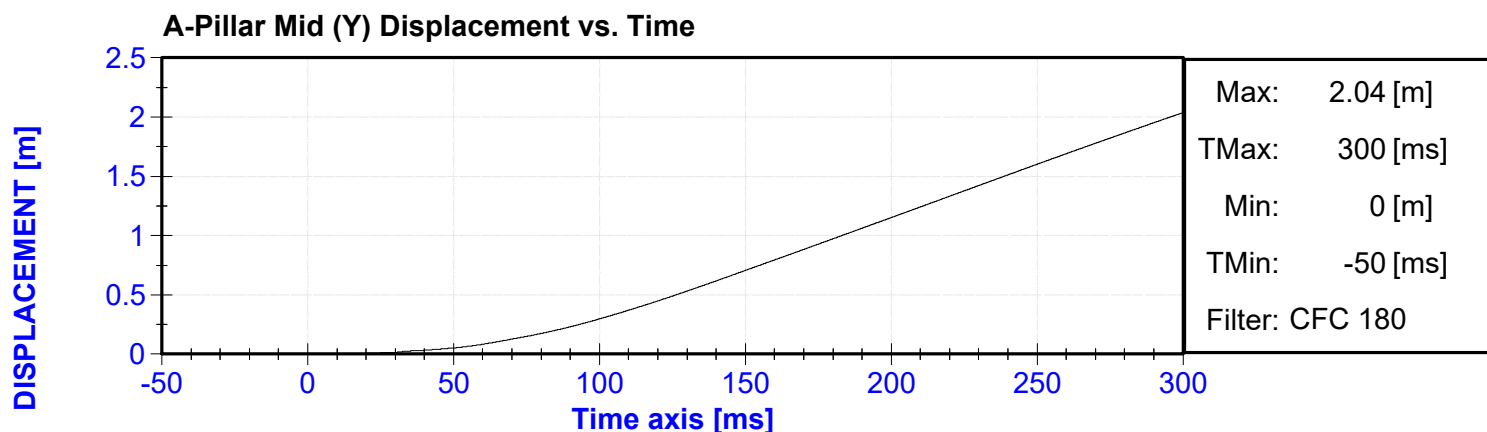
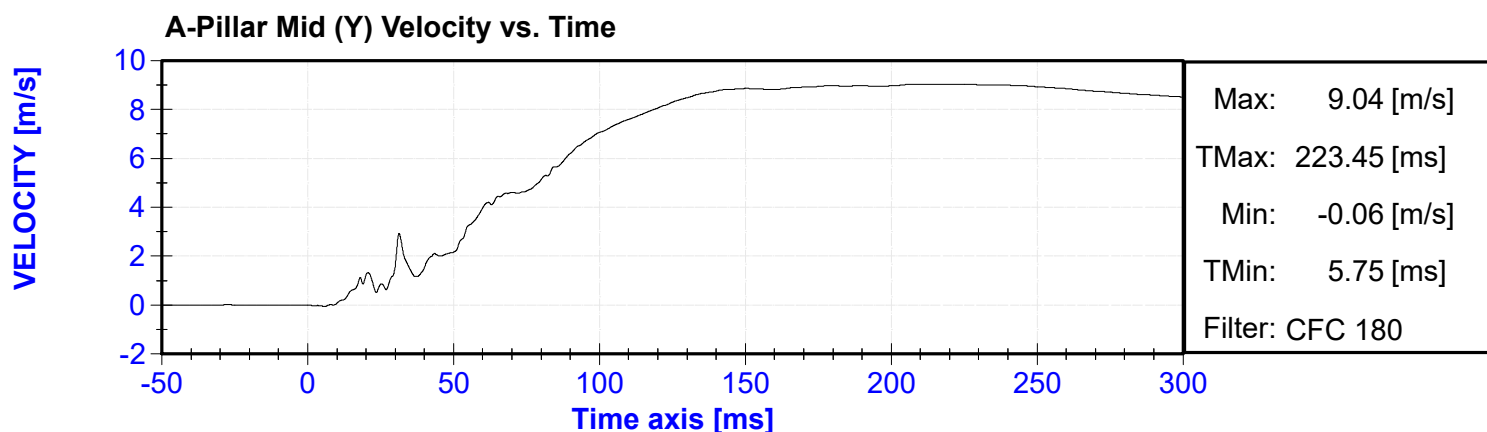
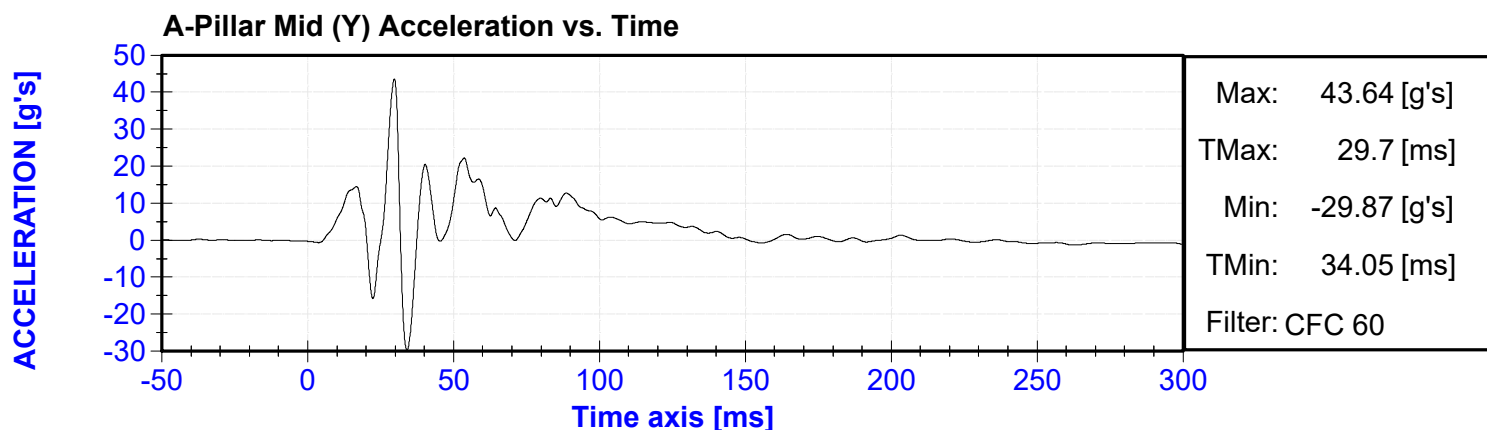
No.	Description	Page
1	Vehicle Center of Gravity (X) Acceleration vs. Time	III-3
2	Vehicle Center of Gravity (X) Velocity vs. Time	III-3
3	Vehicle Center of Gravity (Y) Acceleration vs. Time	III-3
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38	Roof (Y) Acceleration vs. Time	III-12
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40	Floor Sill – Non Impact Side (Y) Acceleration vs. Time	III-12
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44	Rear Deck (Y) Acceleration vs. Time	III-13
45	Rear Deck (Y) Velocity vs. Time	III-14



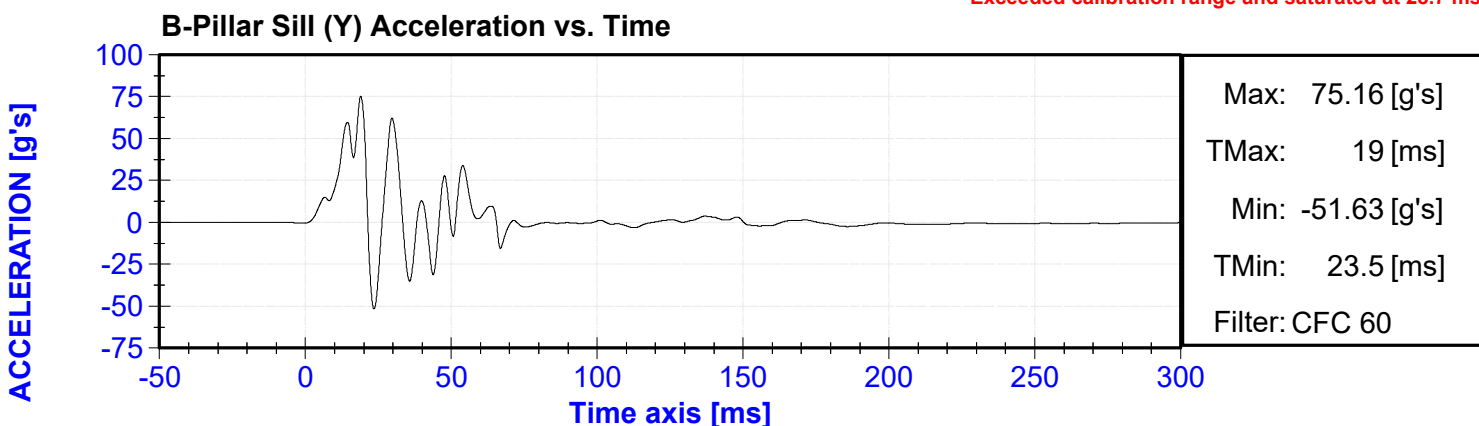


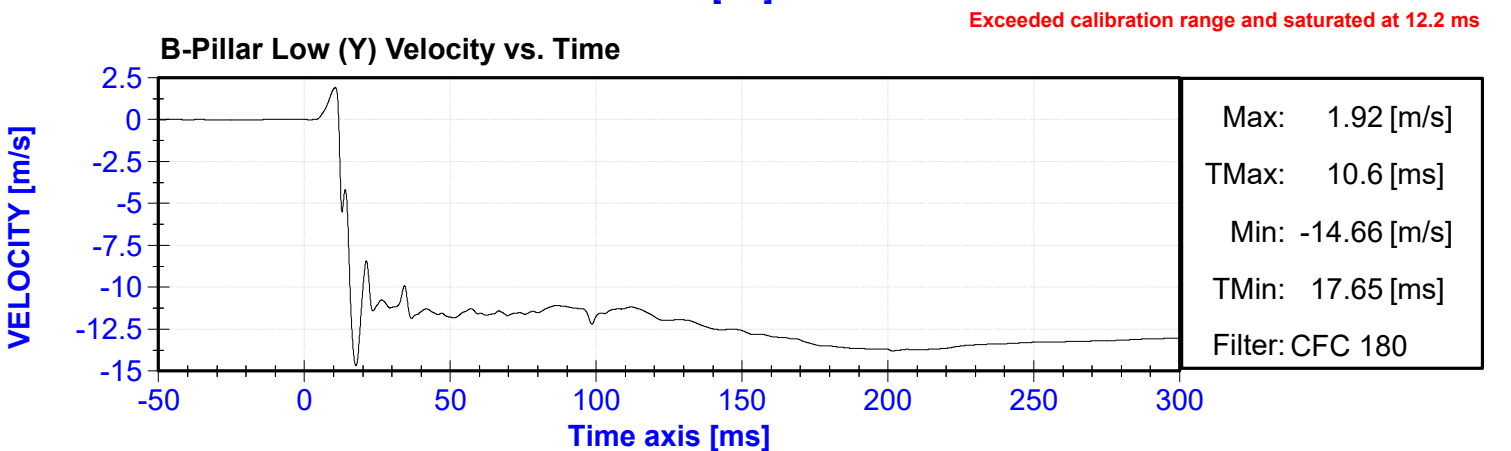
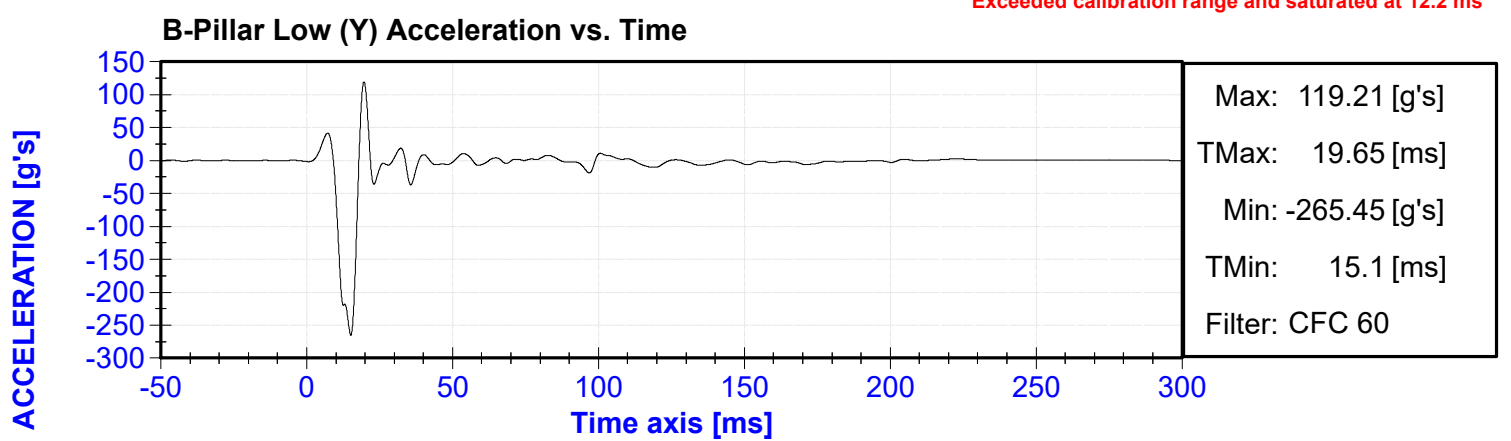
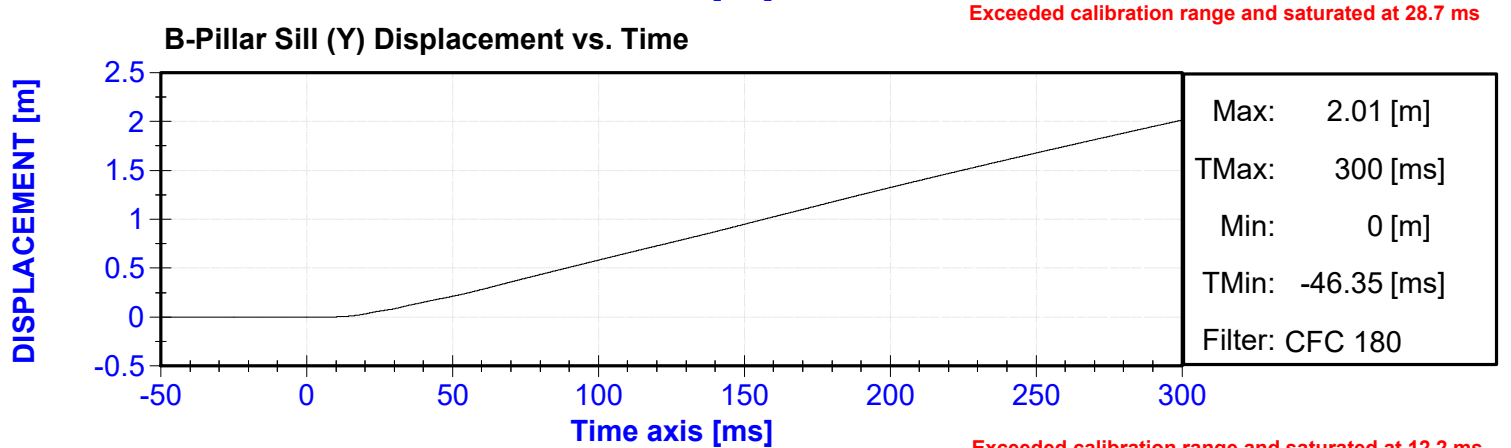
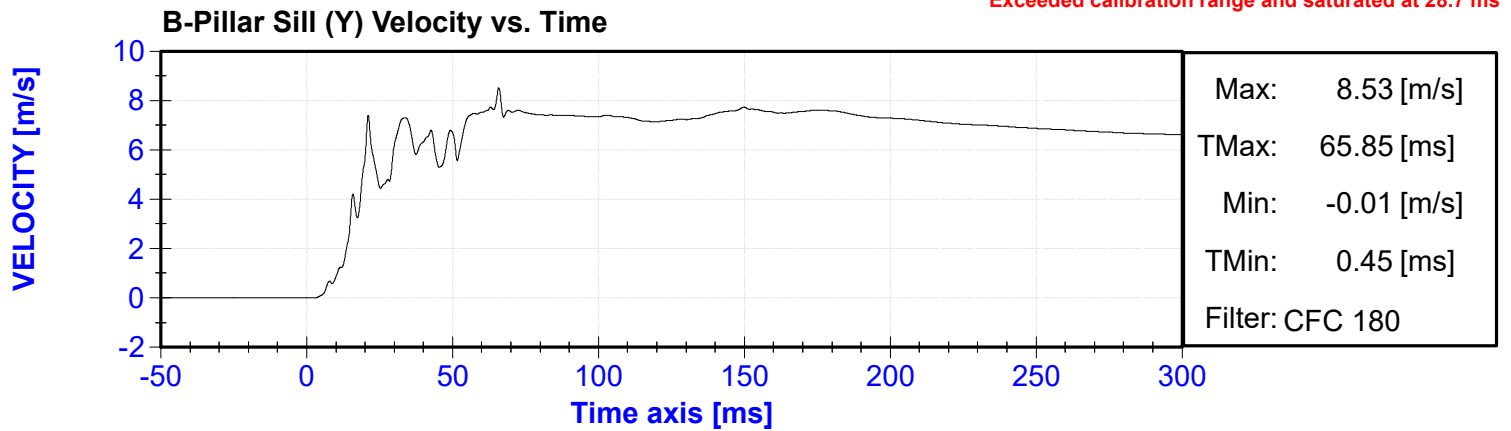






Exceeded calibration range and saturated at 28.7 ms

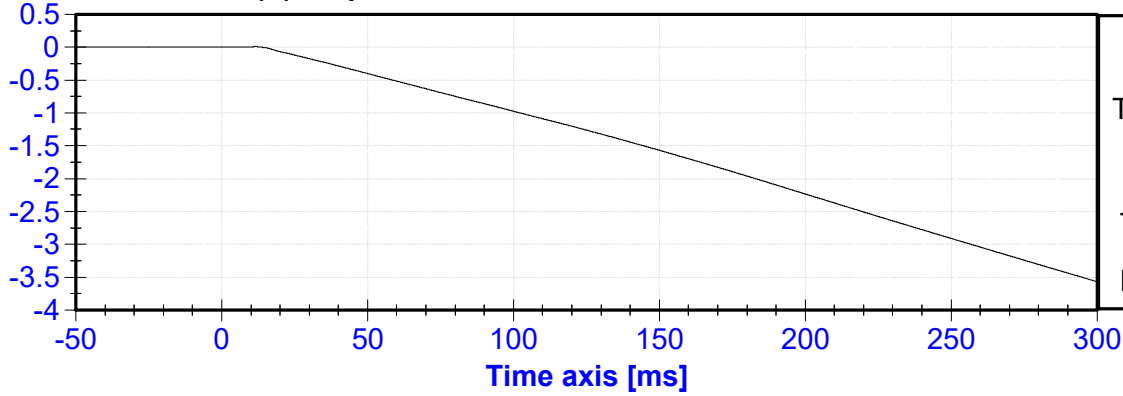




DISPLACEMENT [m]

B-Pillar Low (Y) Displacement vs. Time

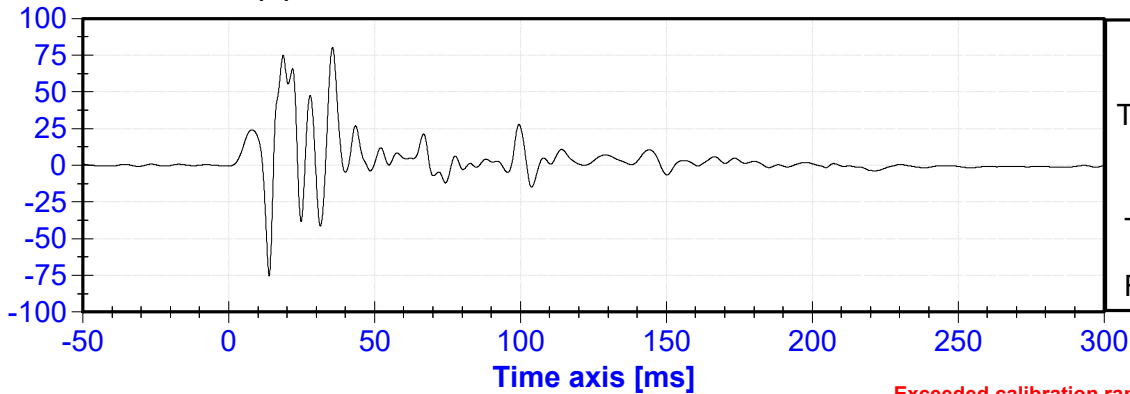
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ACCELERATION [g's]

B-Pillar Mid (Y) Acceleration vs. Time

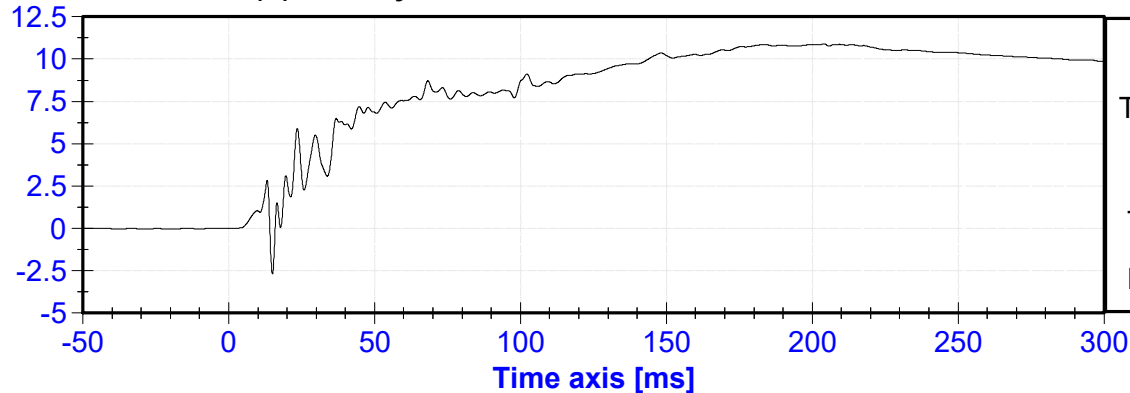
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VELOCITY [m/s]

B-Pillar Mid (Y) Velocity vs. Time

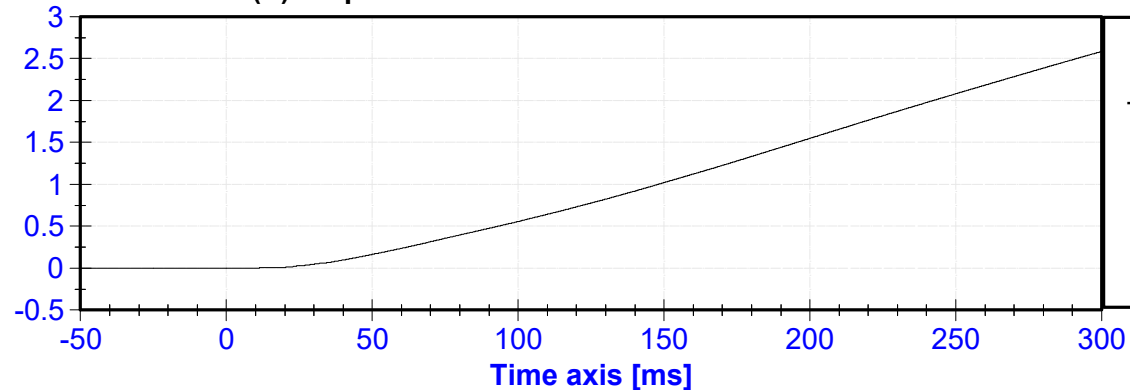
Exceeded calibration range and saturated at 13.8 ms

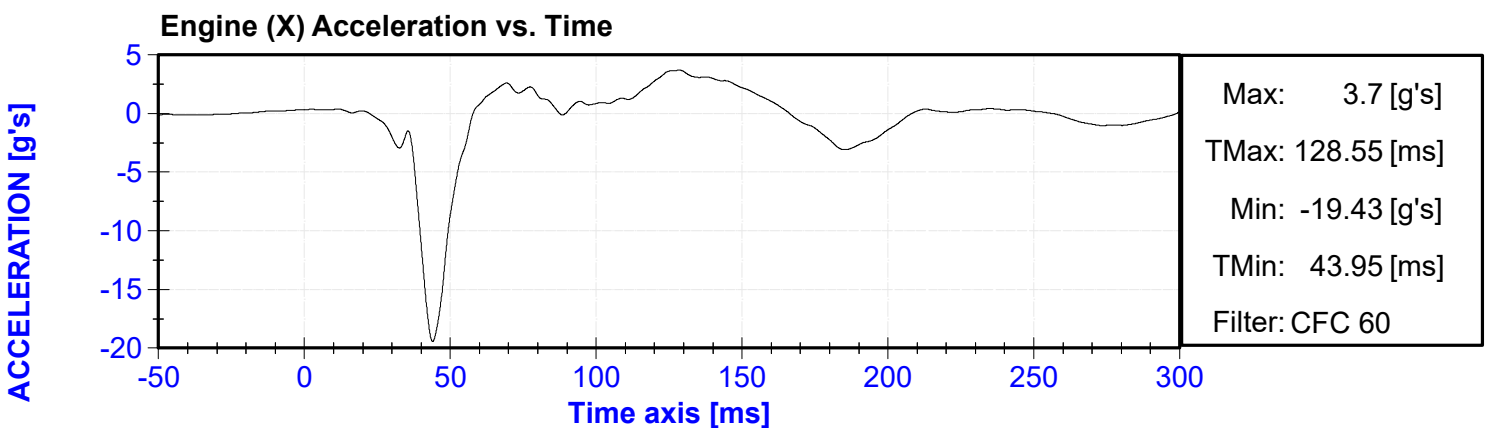
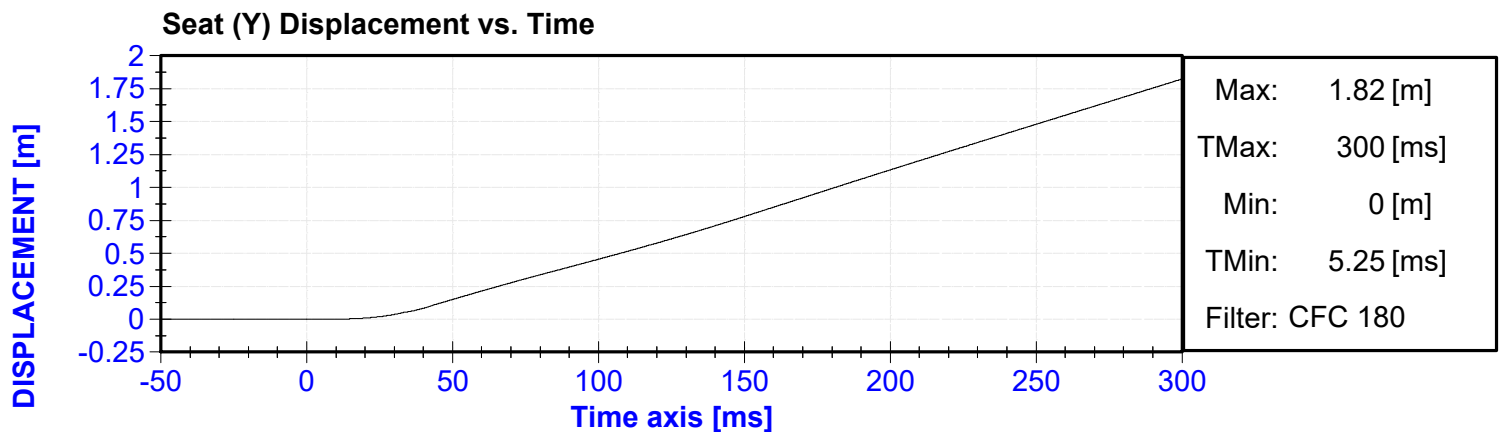
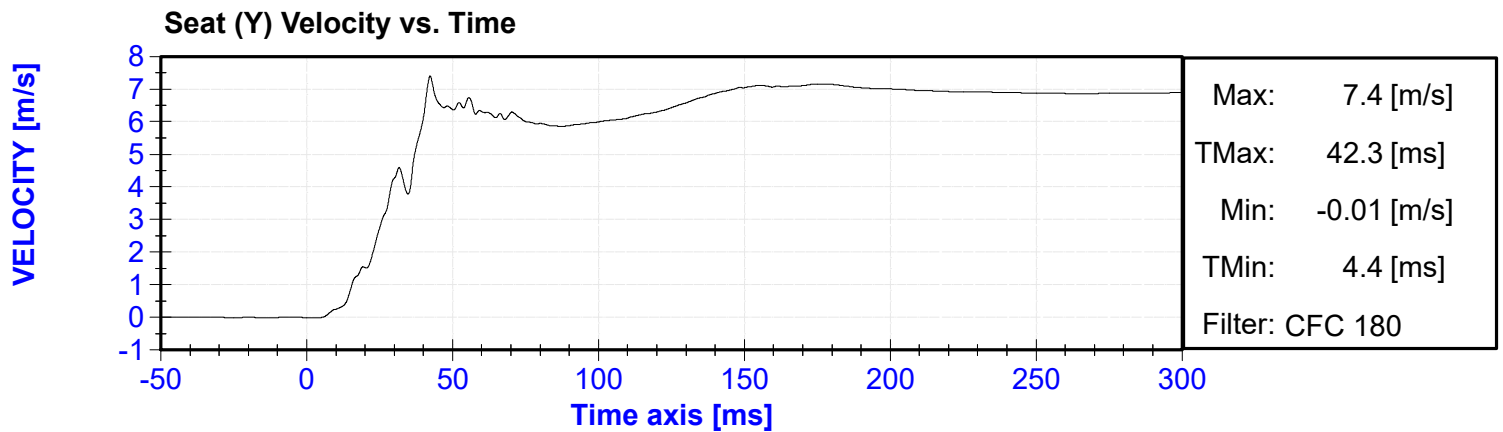
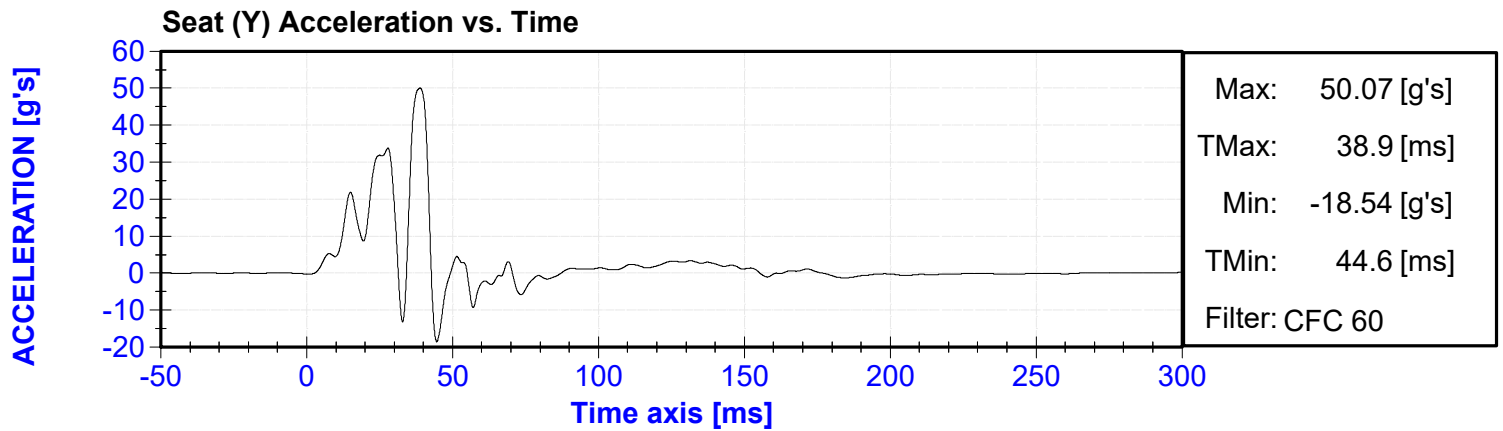


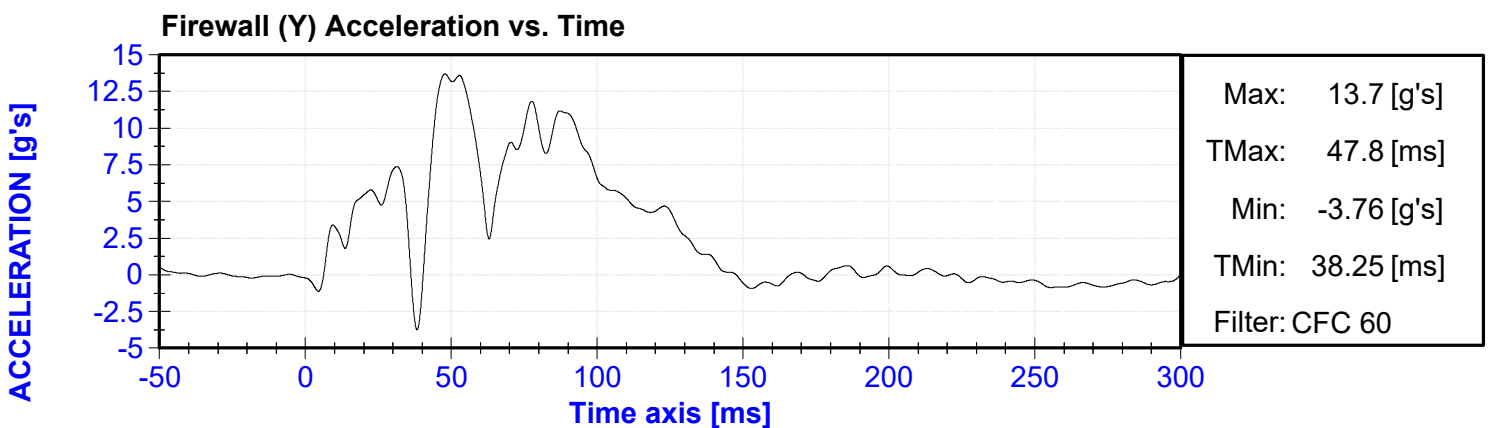
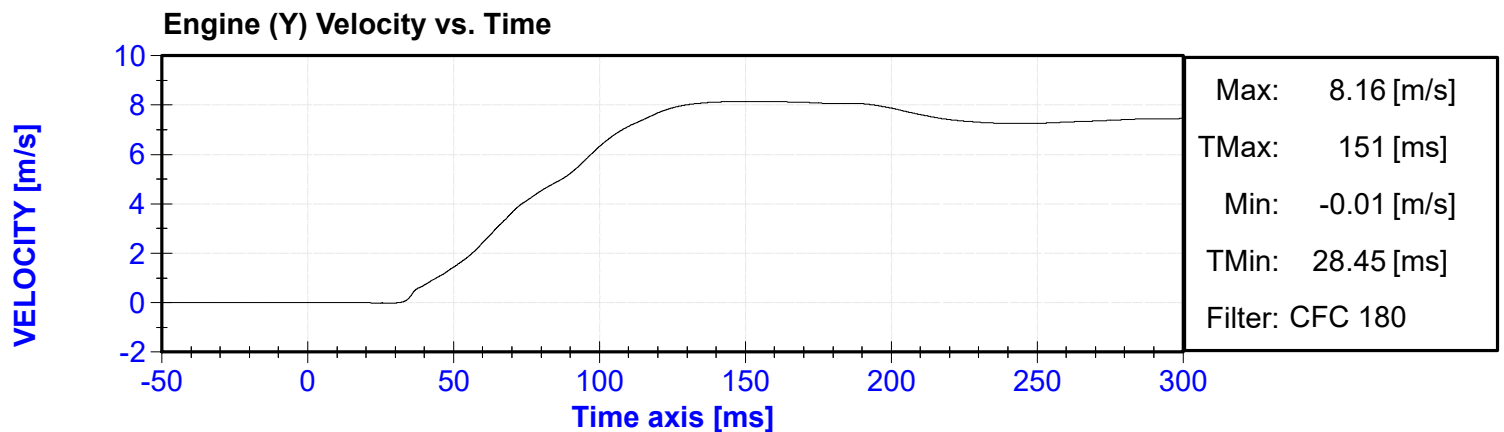
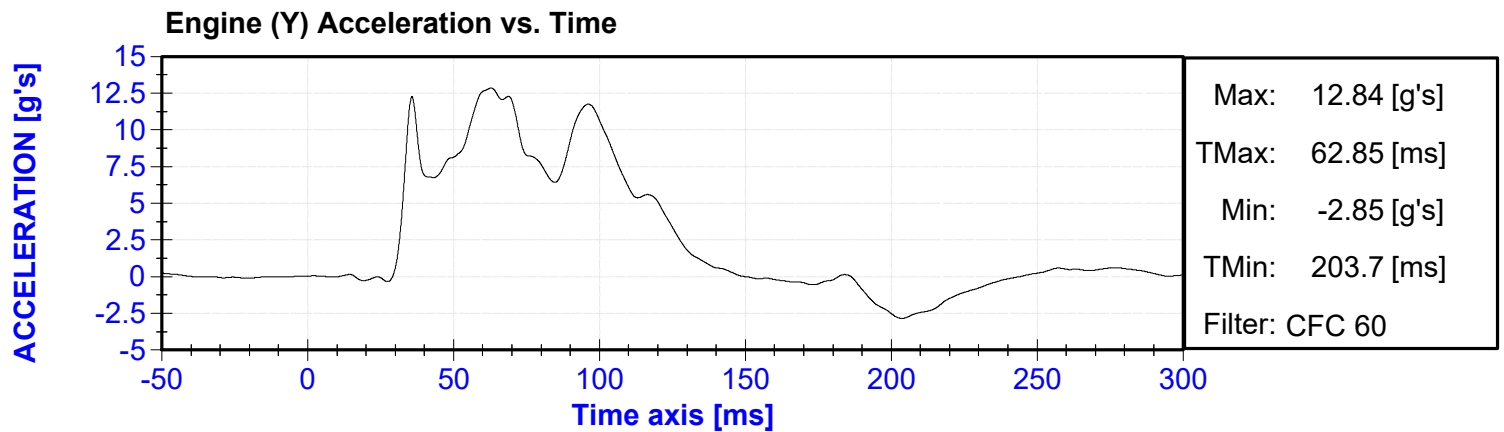
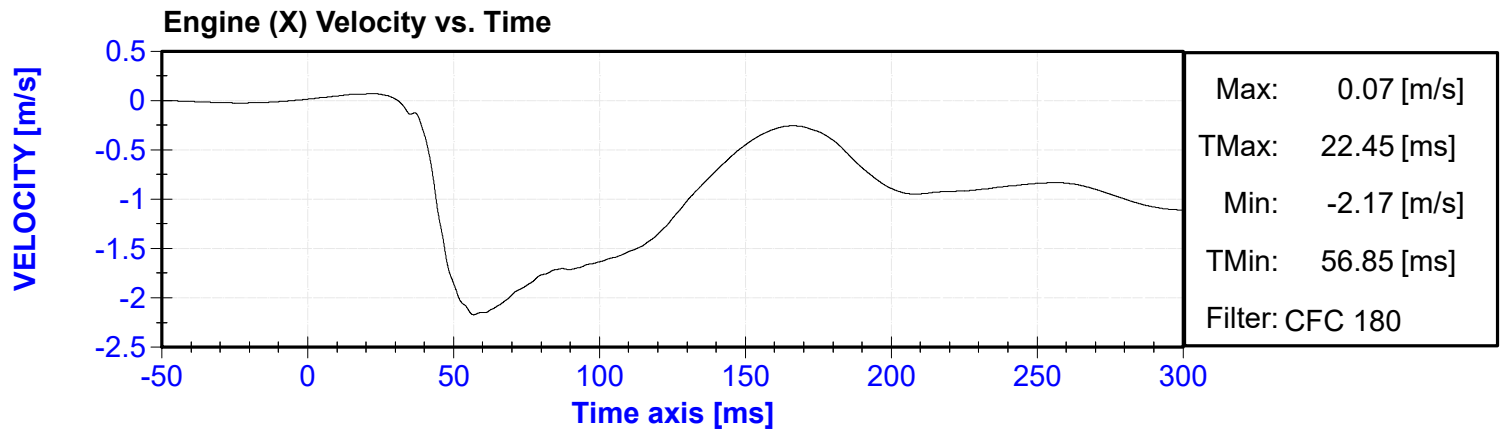
DISPLACEMENT [m]

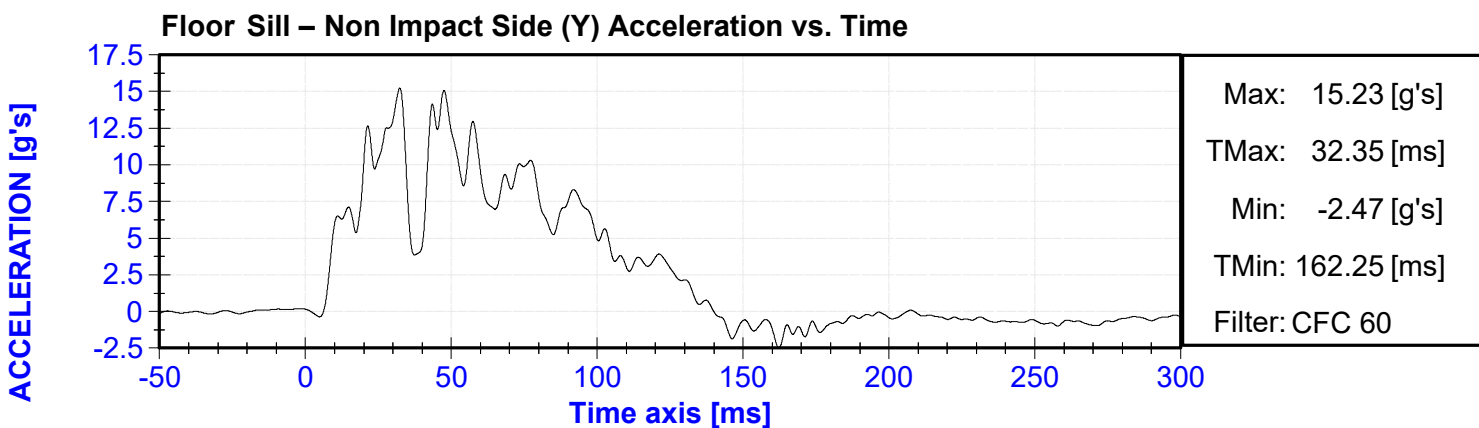
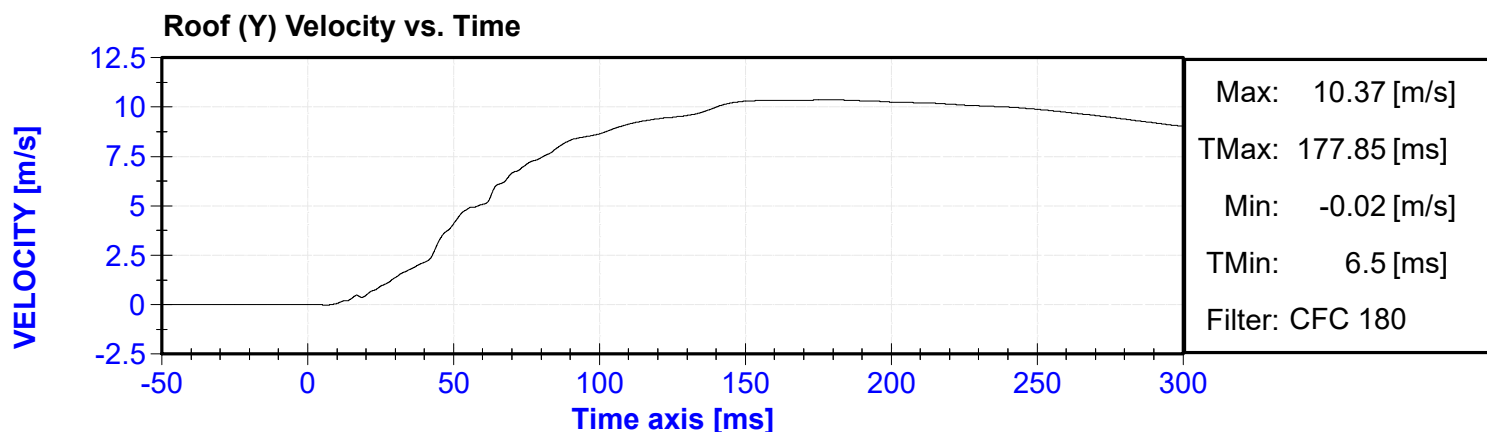
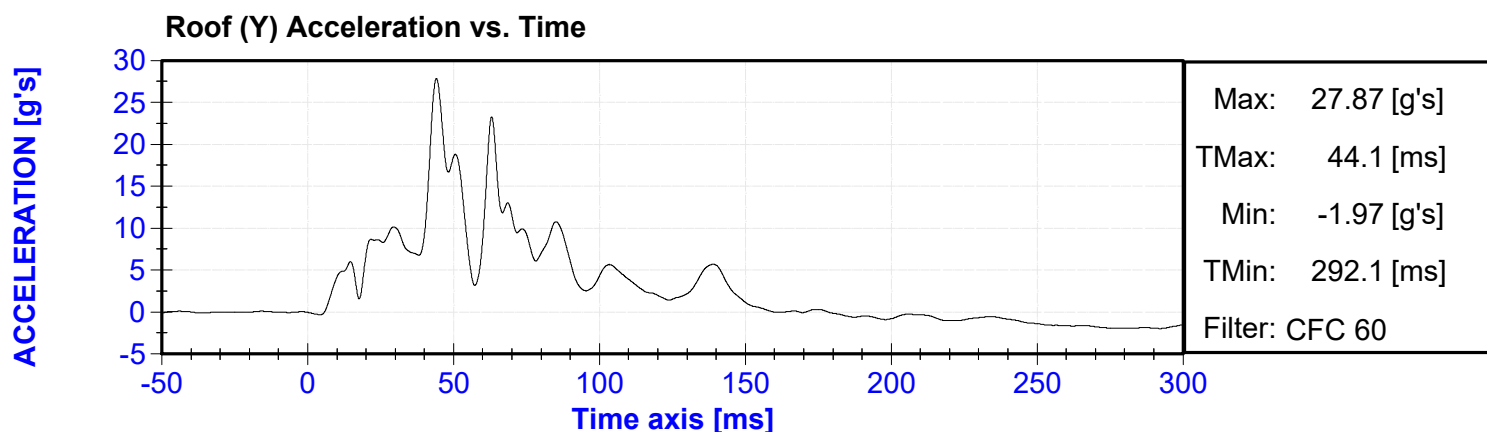
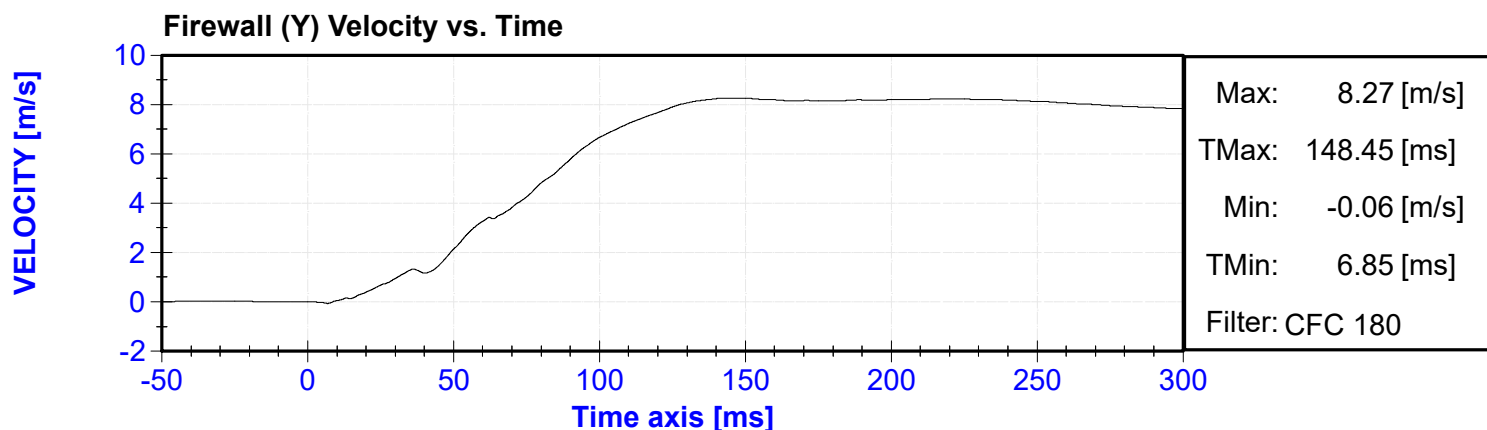
B-Pillar Mid (Y) Displacement vs. Time

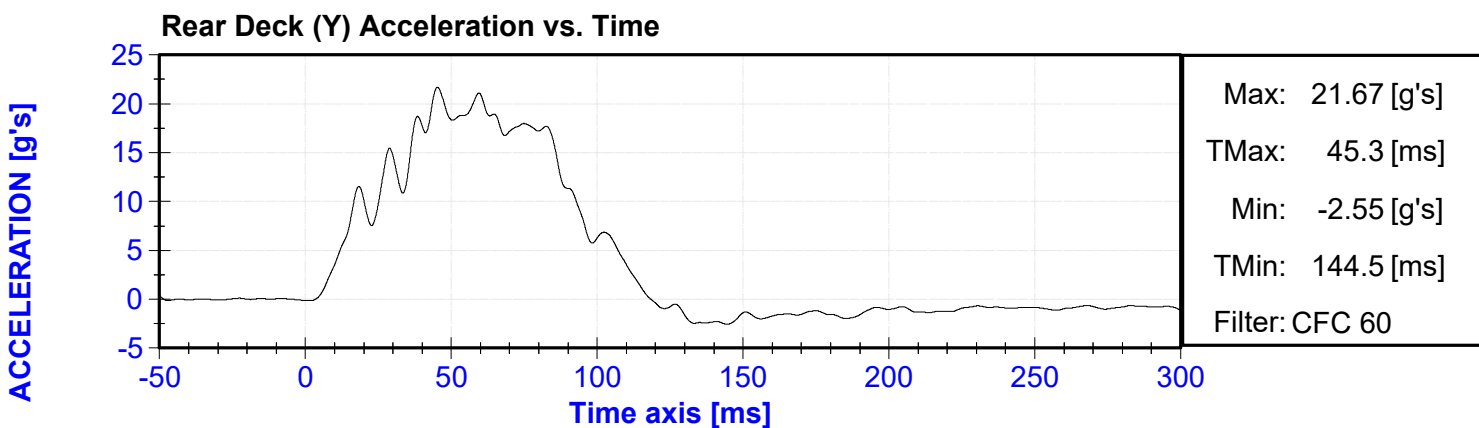
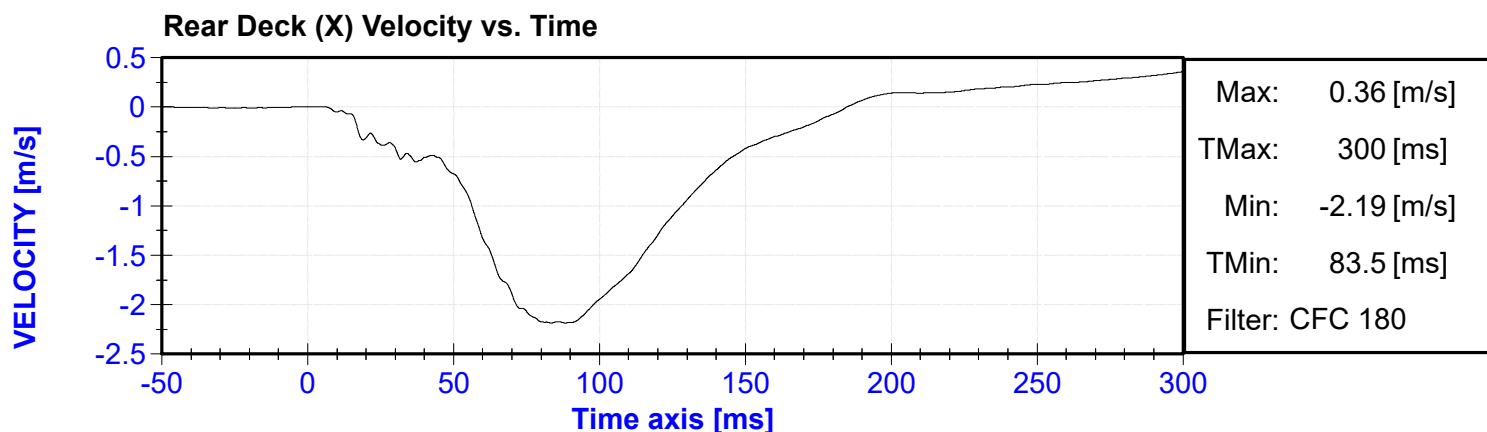
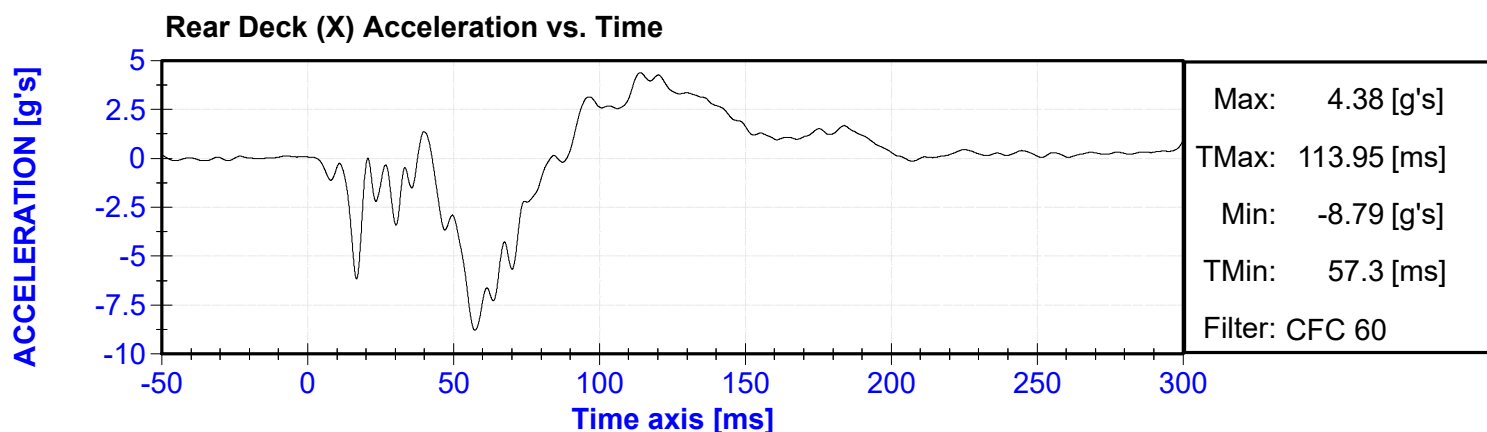
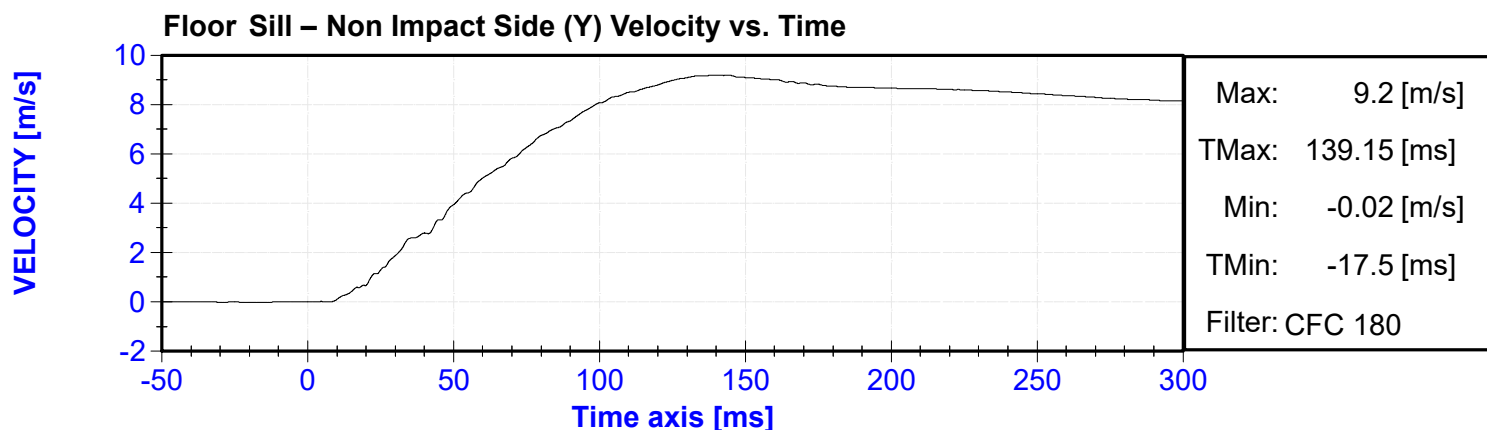
Exceeded calibration range and saturated at 13.8 ms

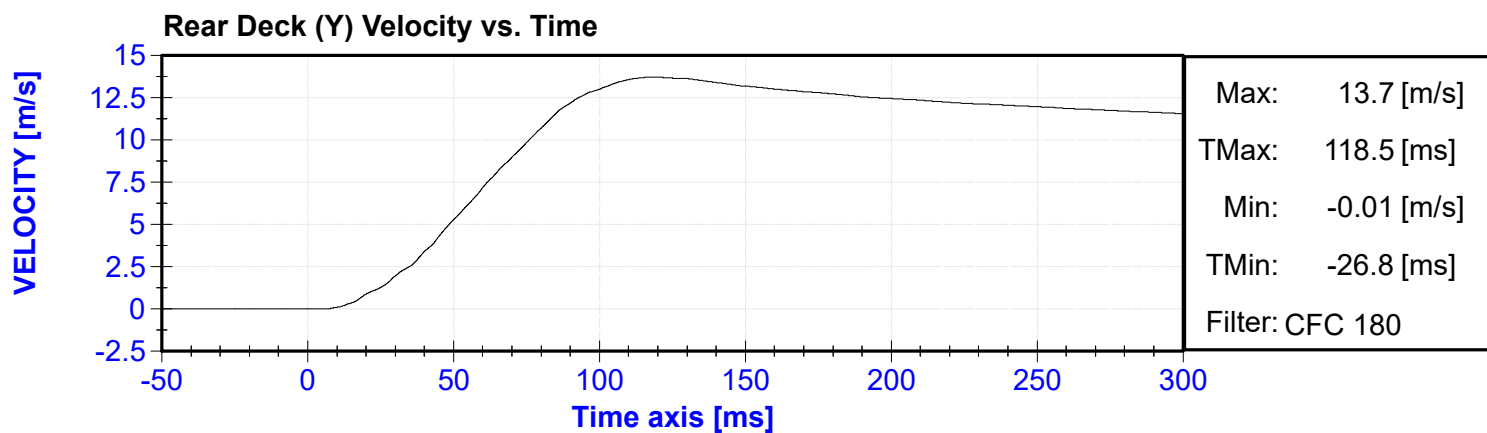












APPENDIX IV

PRE-TEST DUMMY PERFORMANCE CALIBRATION TEST DATA

(Subpart U, ES-2re)

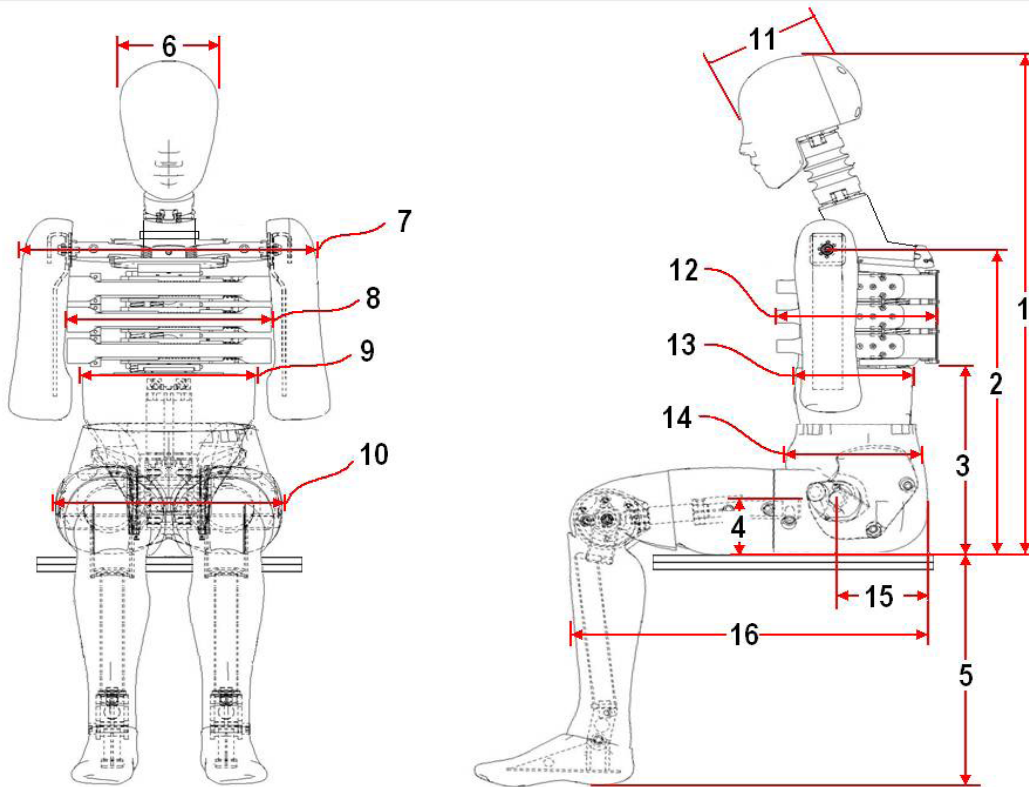


External Measurements - EuroSID-2re

Technician: T. Roseman

Date: 1/19/2024

Dummy Serial Number: D037



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	563	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	420	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	329	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	361	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	197	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	602	Pass

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

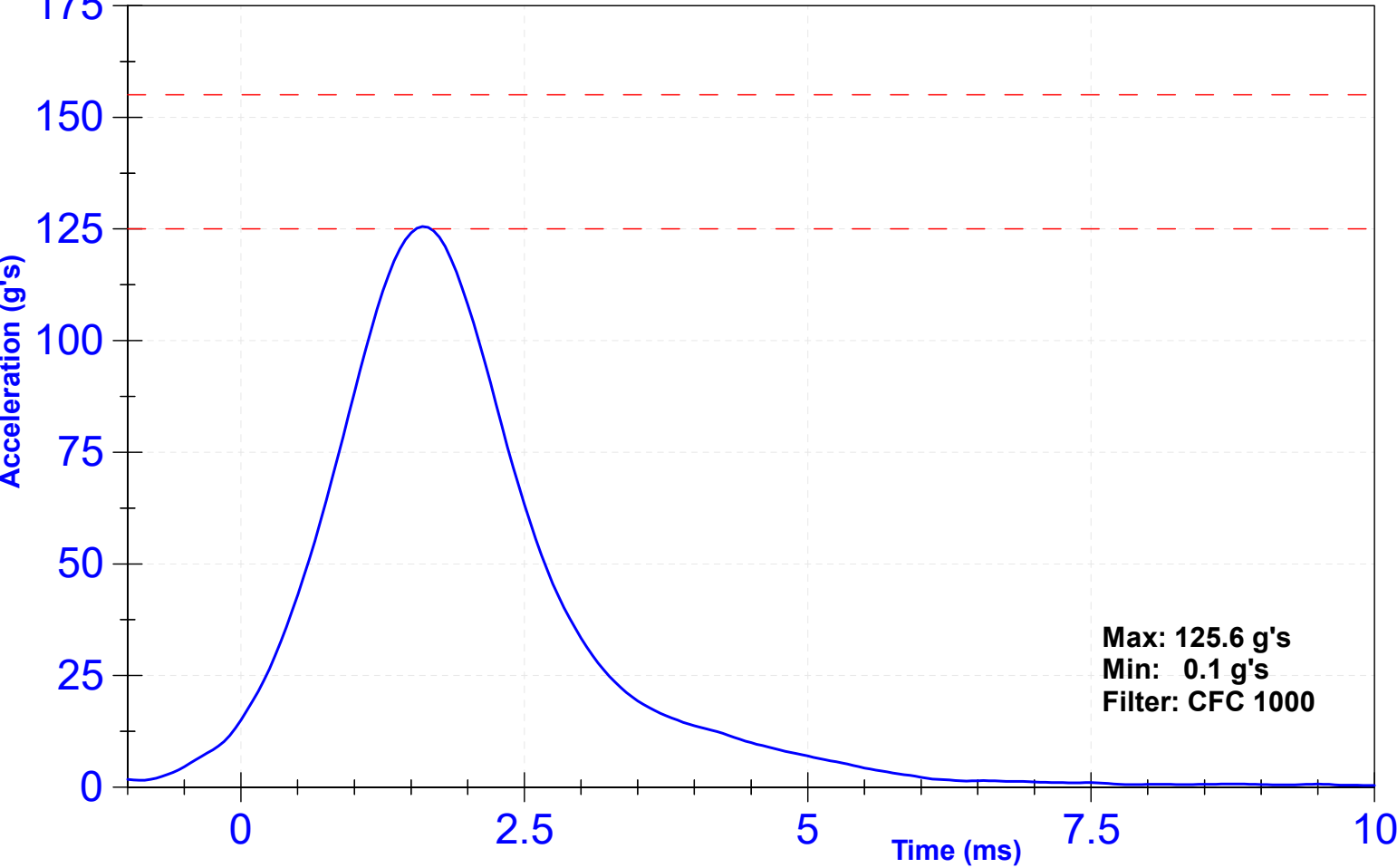
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Resultant Acceleration	125	155	g's	125.6	Pass
Oscillation	0	15	%	1.16	Pass
Fore-Aft Acceleration	-15	15	g's	8.6	Pass

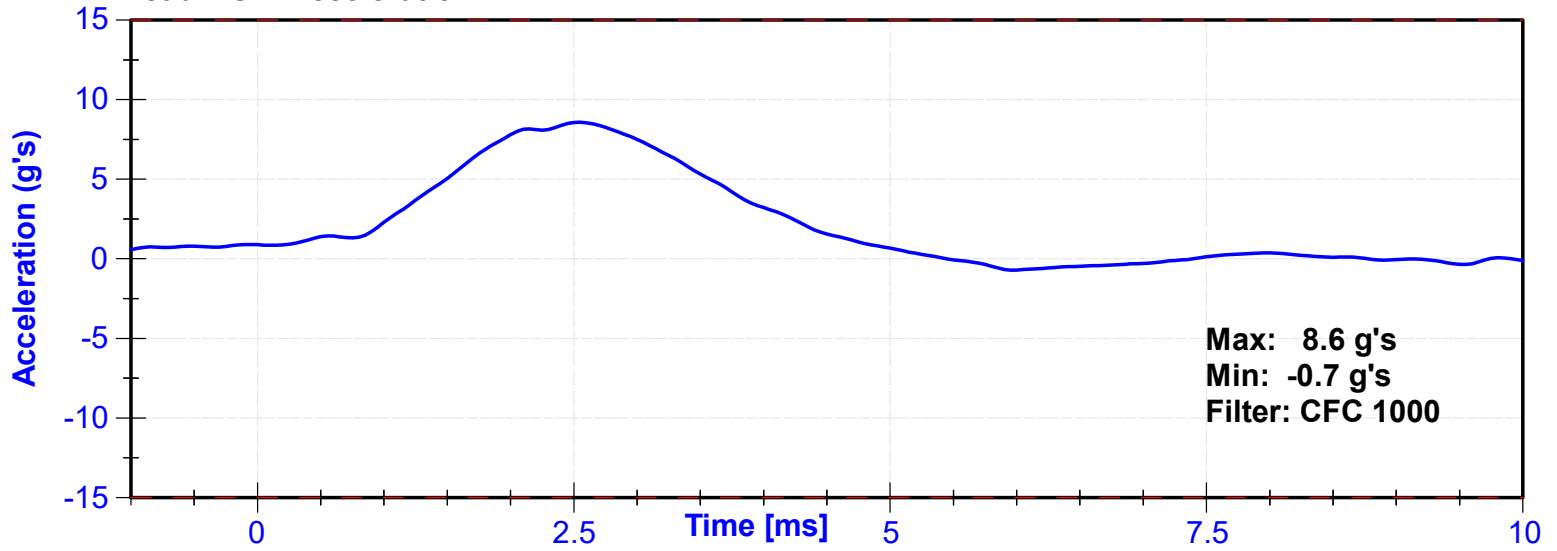
Transducer Calibrations

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

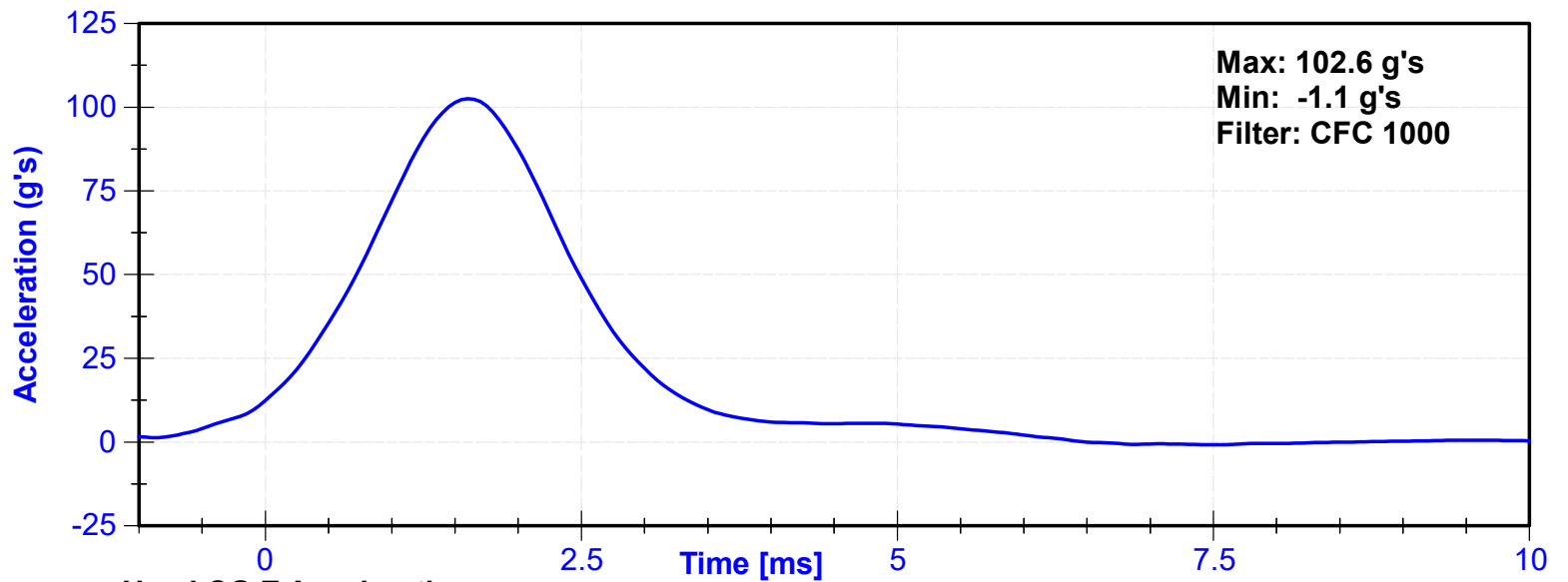
Resultant Acceleration



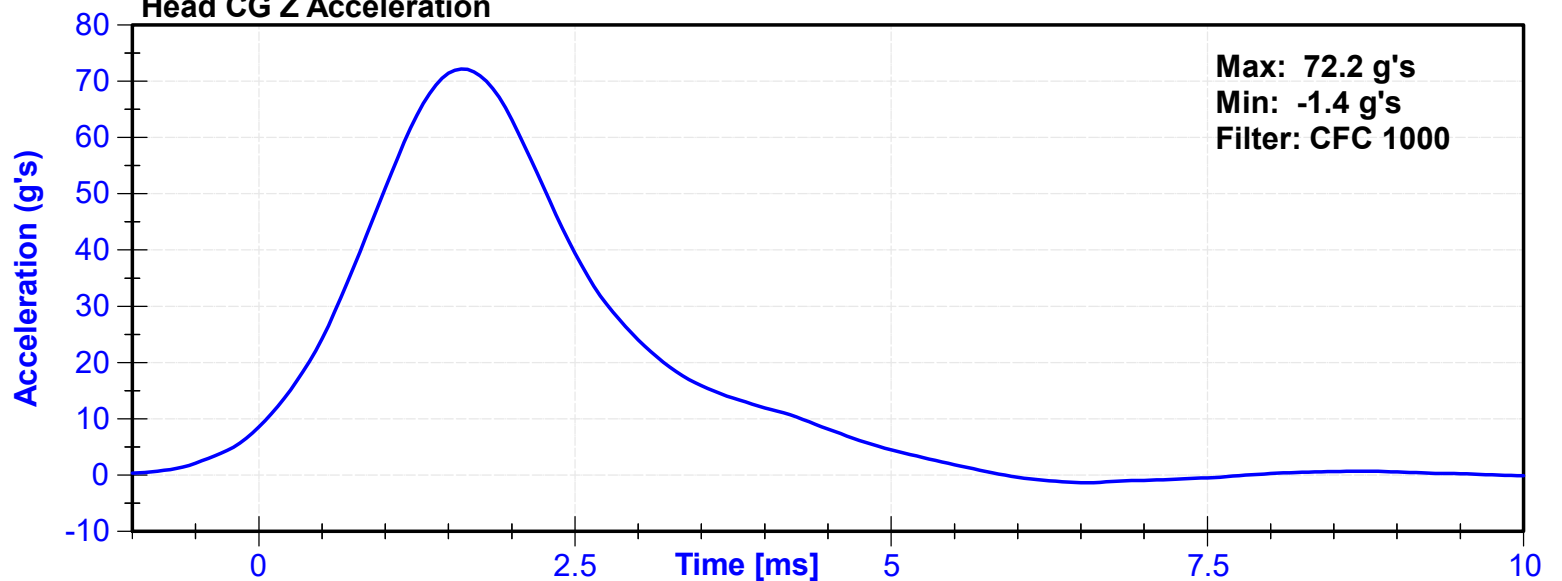
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



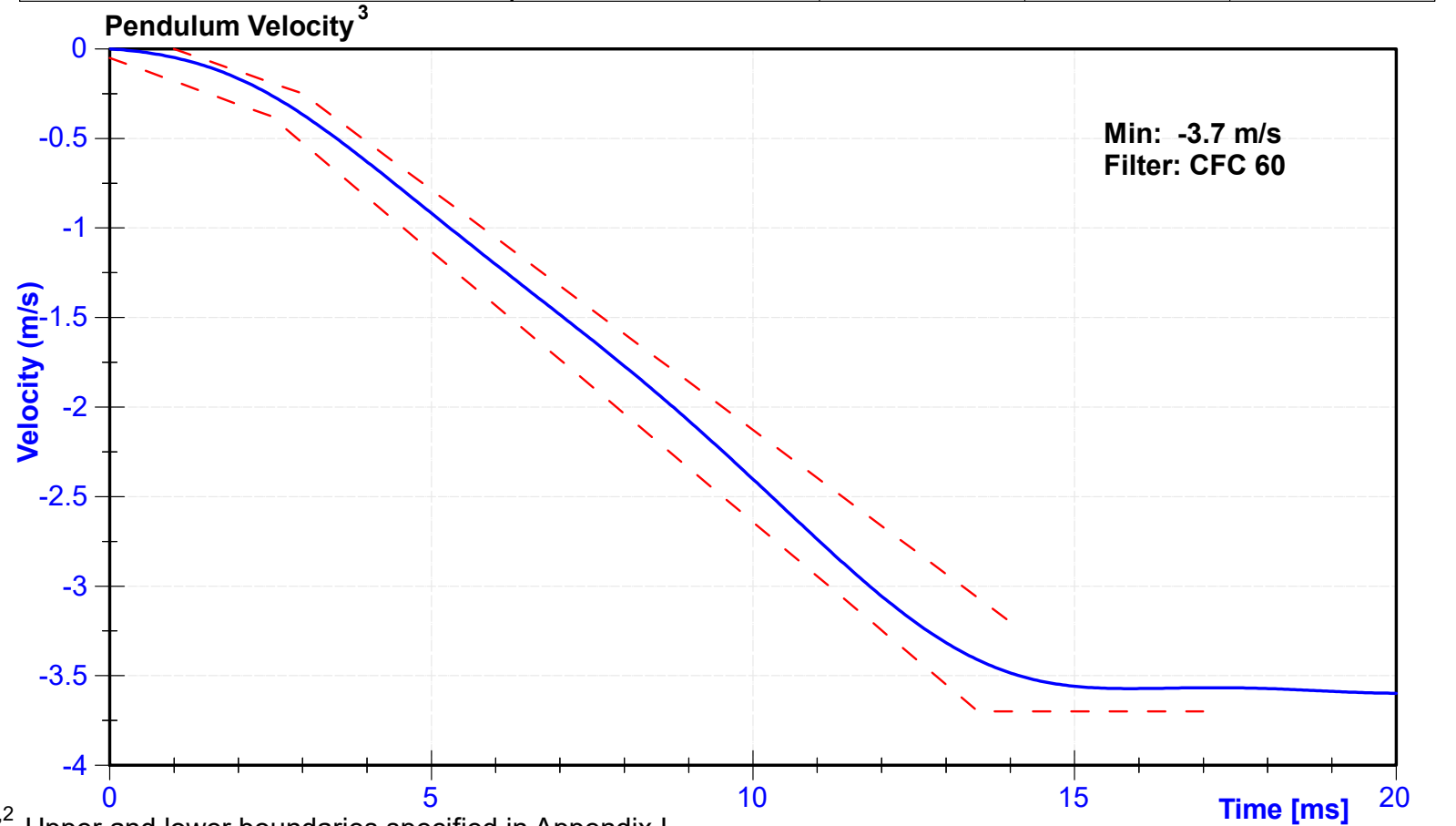
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

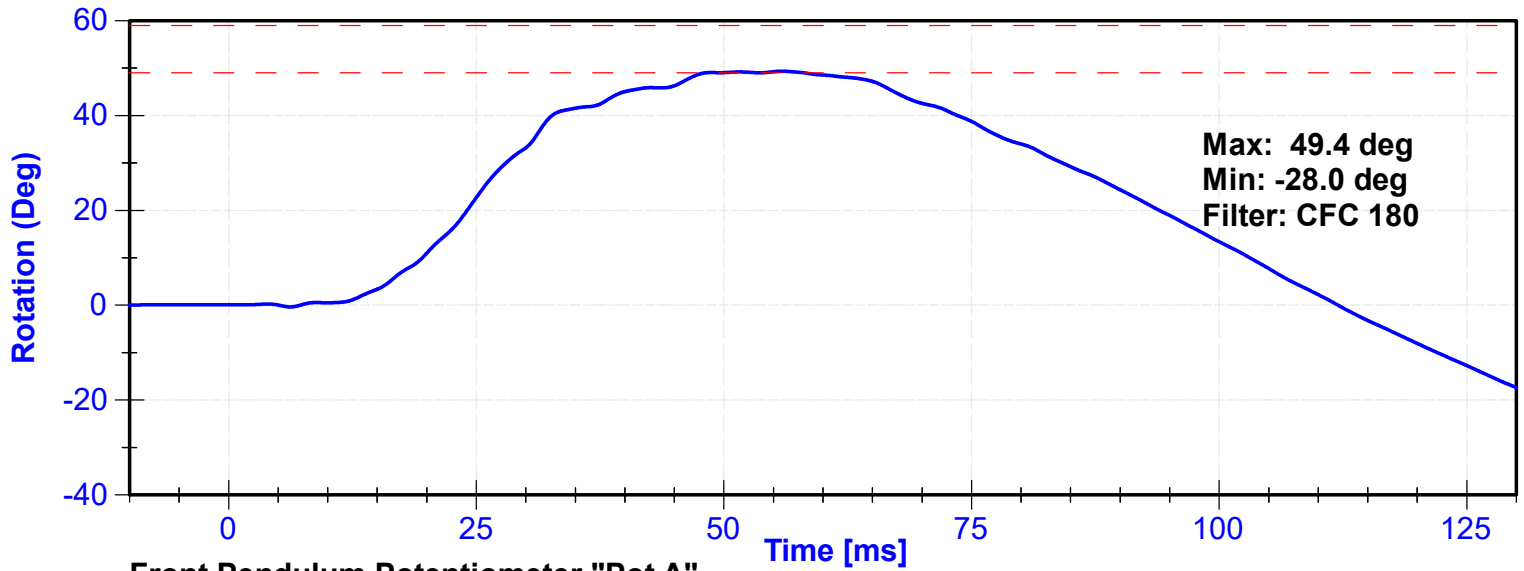
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	17	Pass
Velocity	3.3	3.5	m/s	3.35	Pass
Lateral Neck Rotation	49	59	deg	49.4	Pass
Time at Maximum Rotation	54	66	ms	55.8	Pass
Time of Rotation Decay from Maximum	53	88	ms	56.2	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

Transducer Calibrations

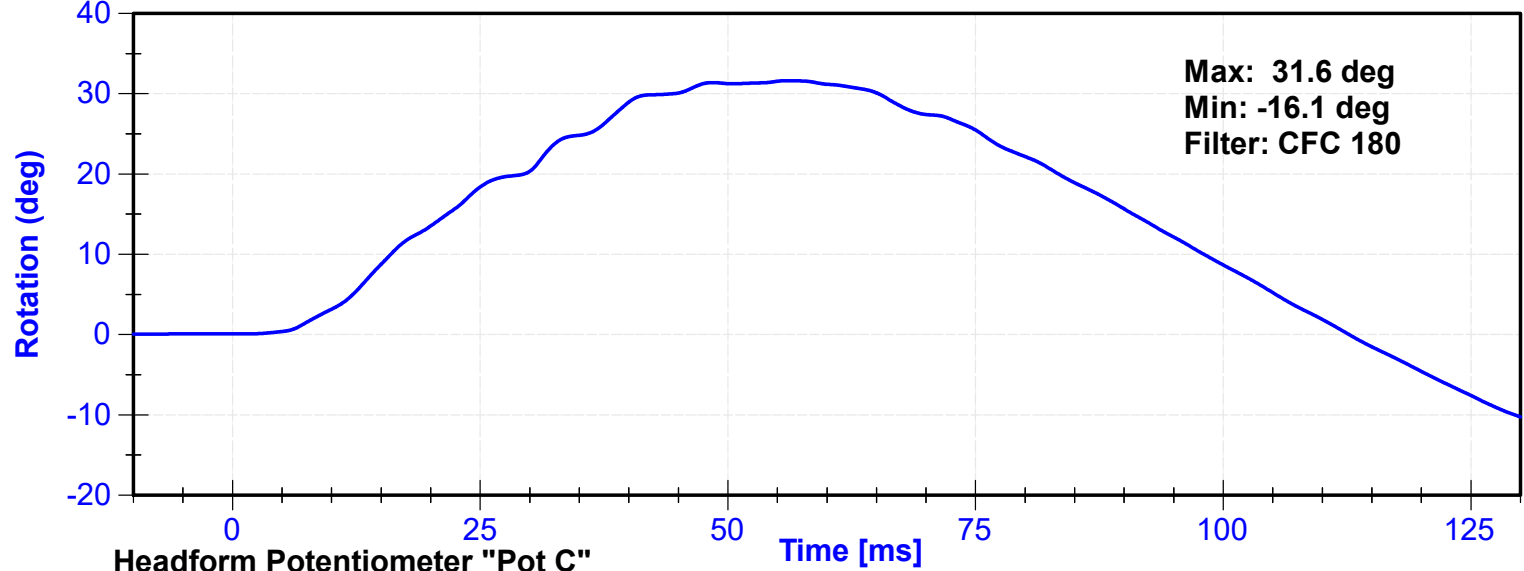
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Front Pendulum Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024



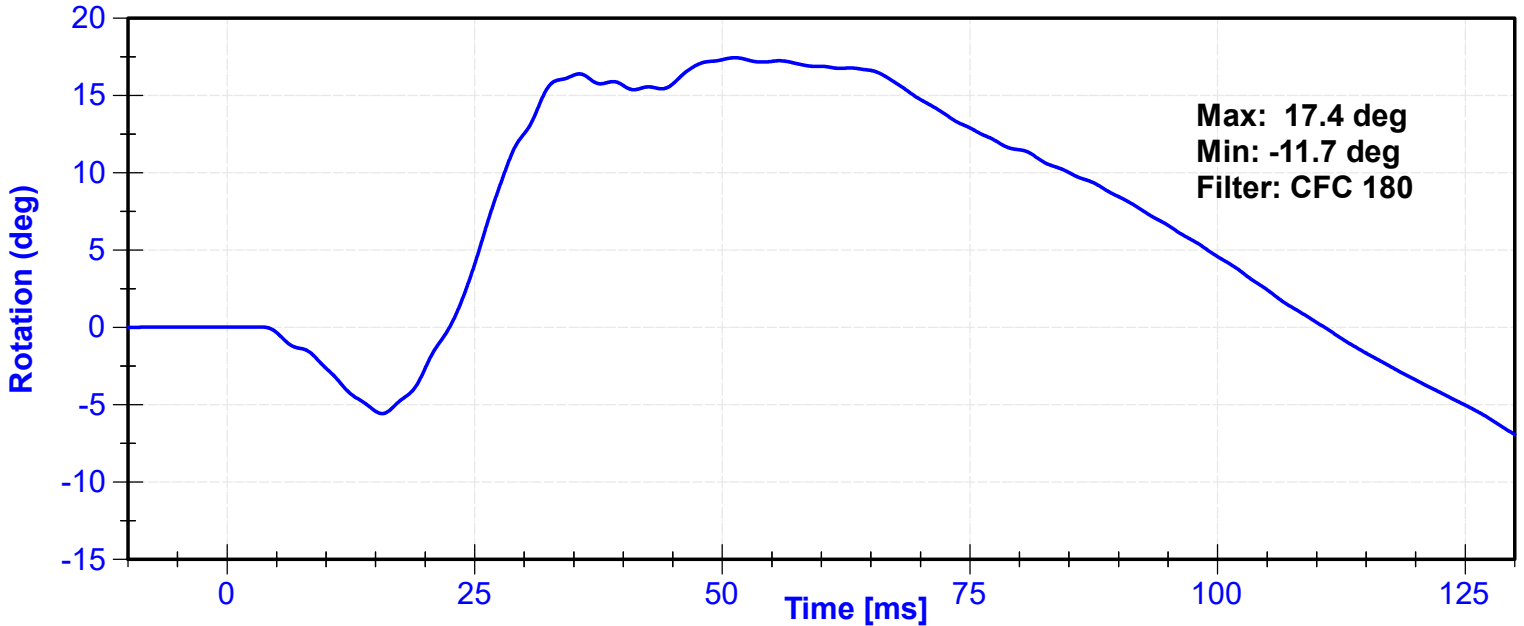
Neck Rotation



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

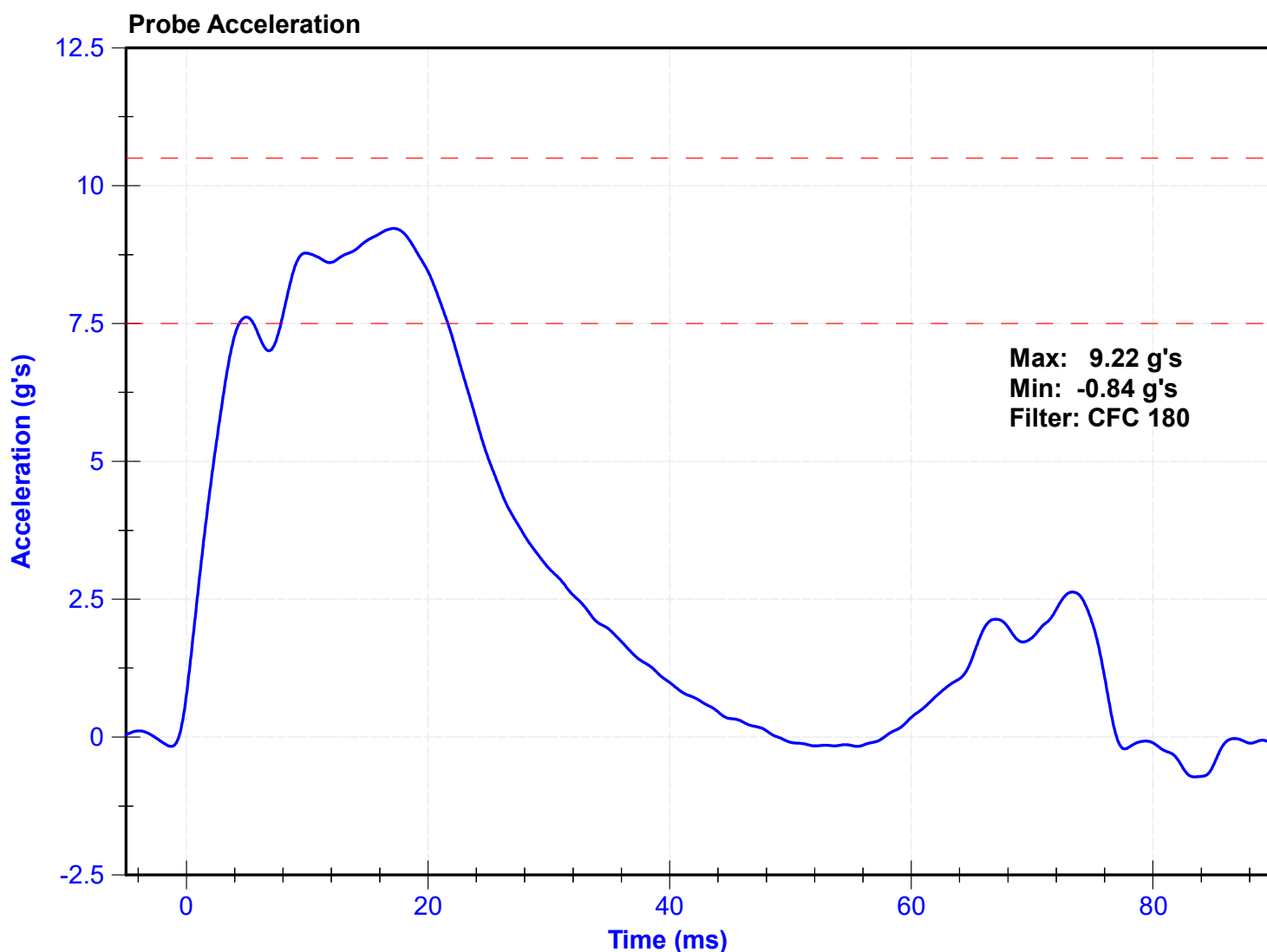
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	18	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	7.5	10.5	g's	9.22	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18619	9/29/2023	3/27/2024



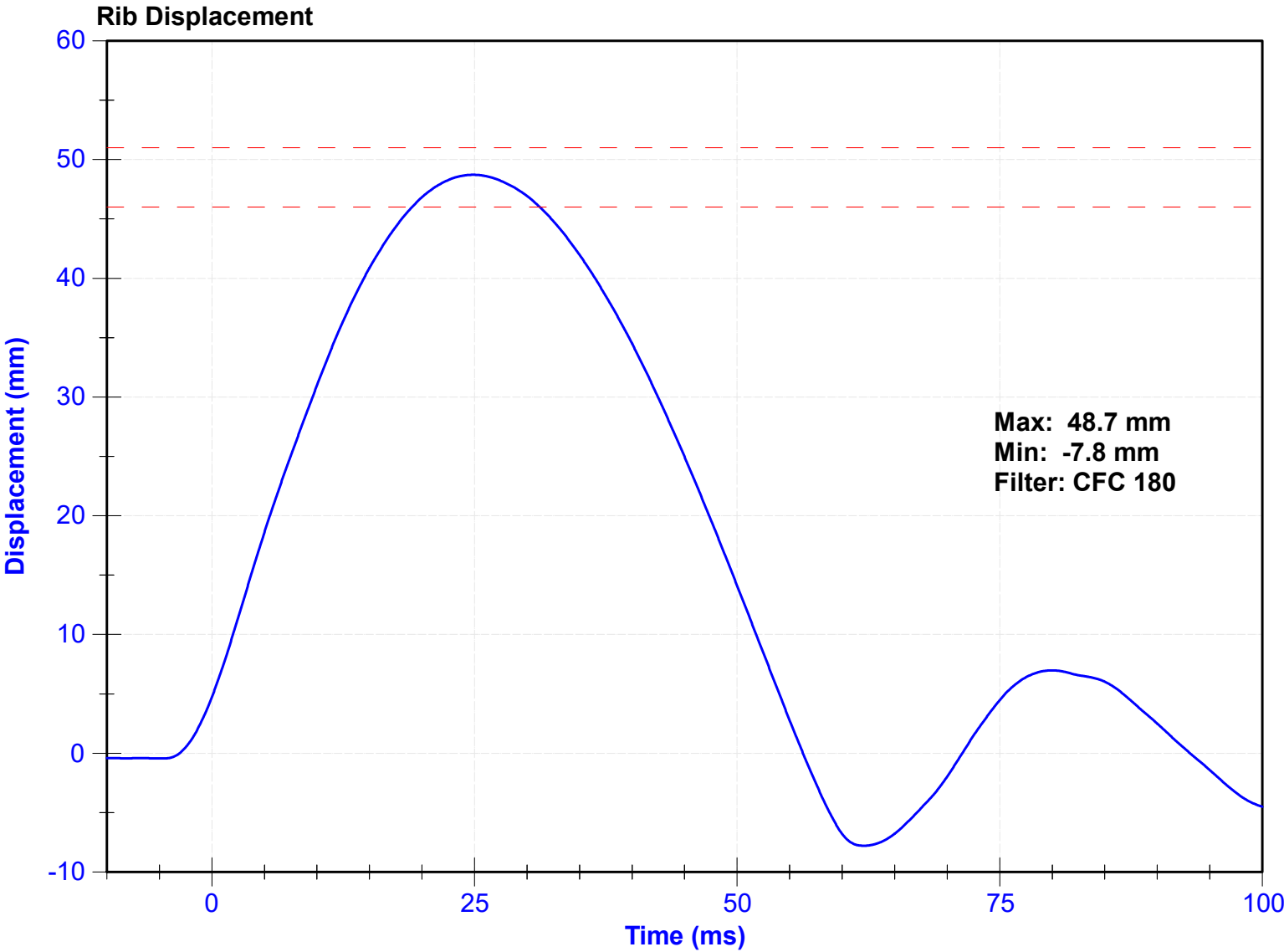
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	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



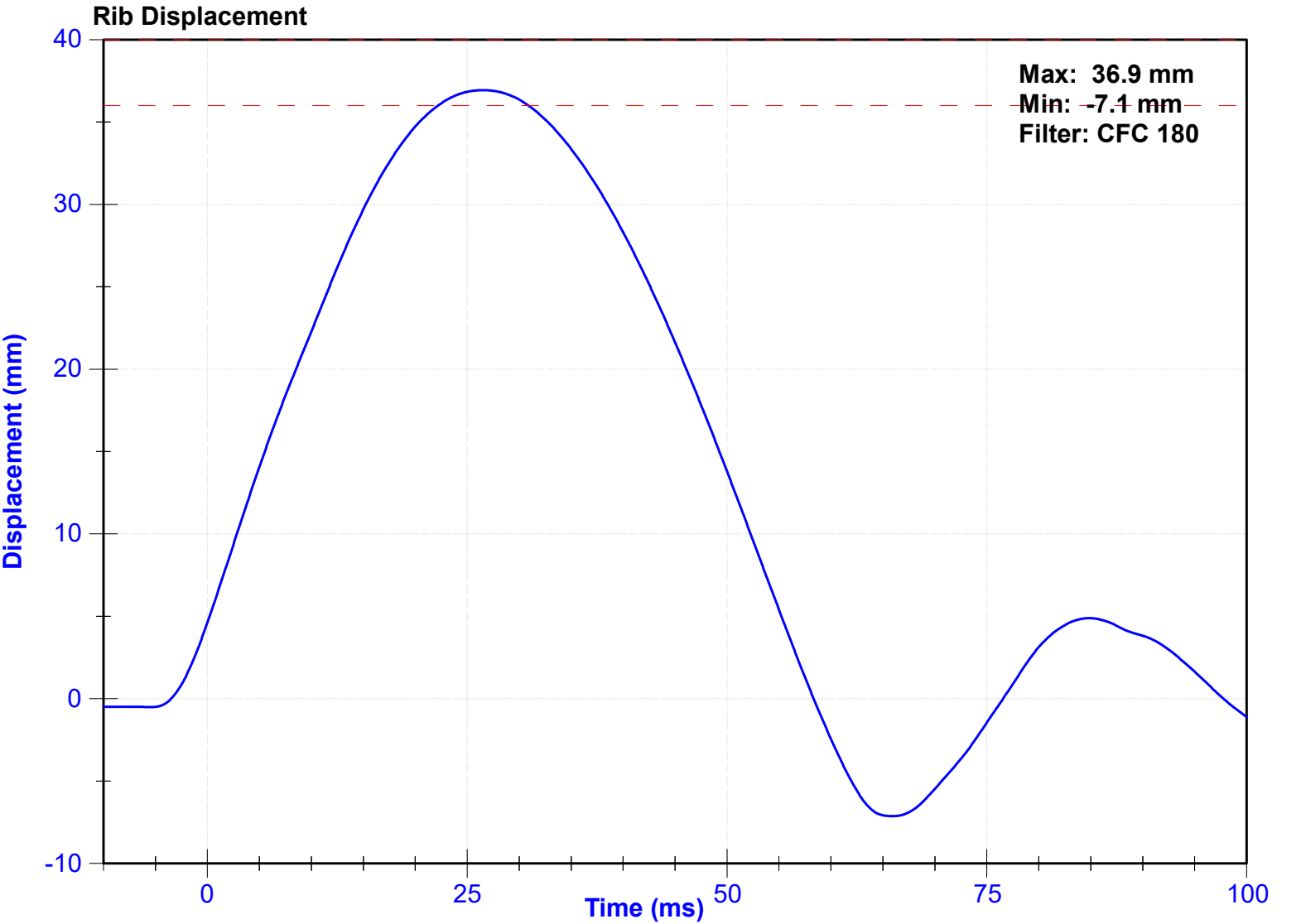
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Rib Displacement	36	40	mm	36.9	Pass

Transducer Calibrations

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



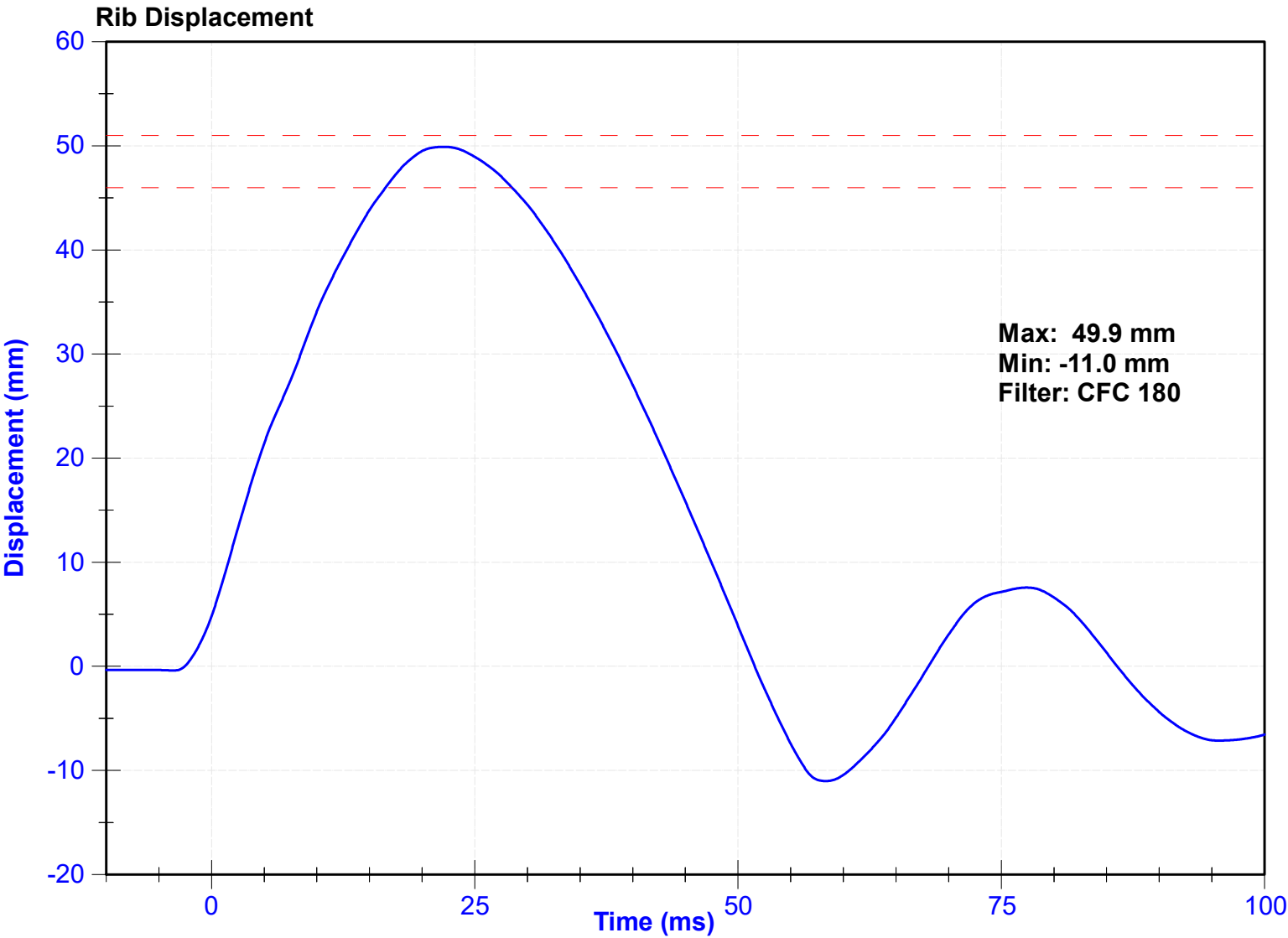
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Rib Displacement	46	51	mm	49.9	Pass

Transducer Calibrations

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



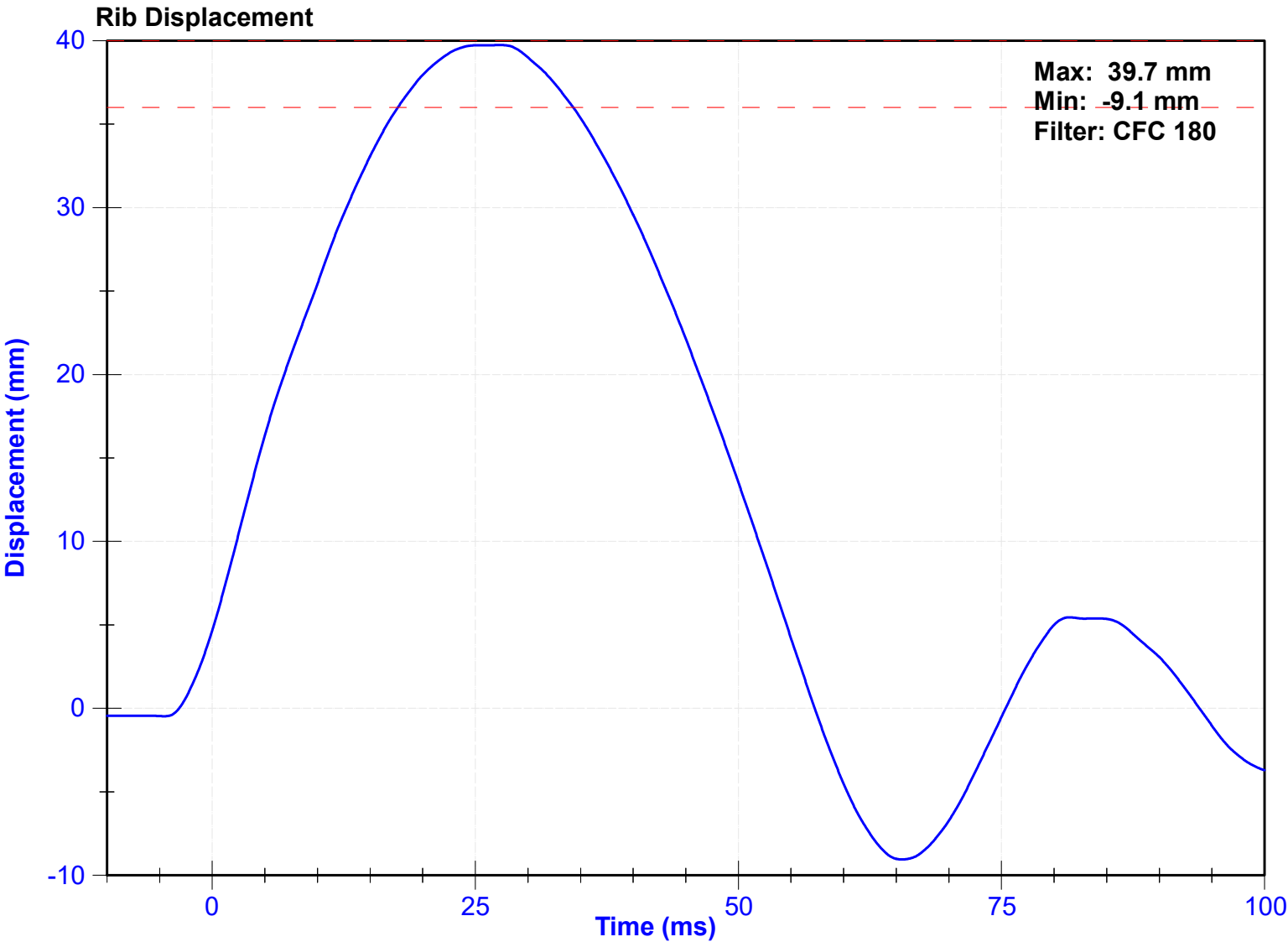
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Rib Displacement	36	40	mm	39.7	Pass

Transducer Calibrations

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



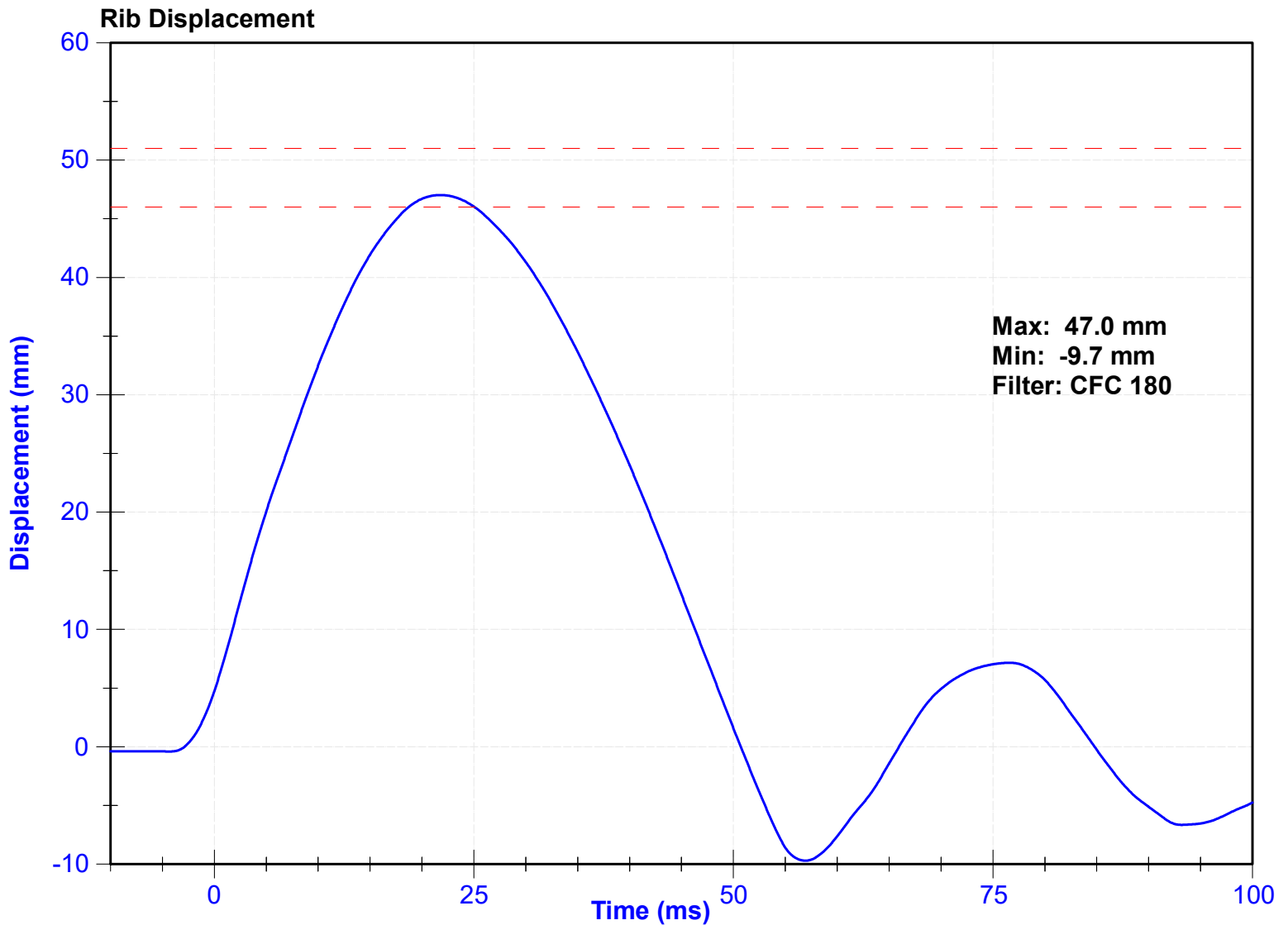
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Rib Displacement	46	51	mm	47.0	Pass

Transducer Calibrations

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



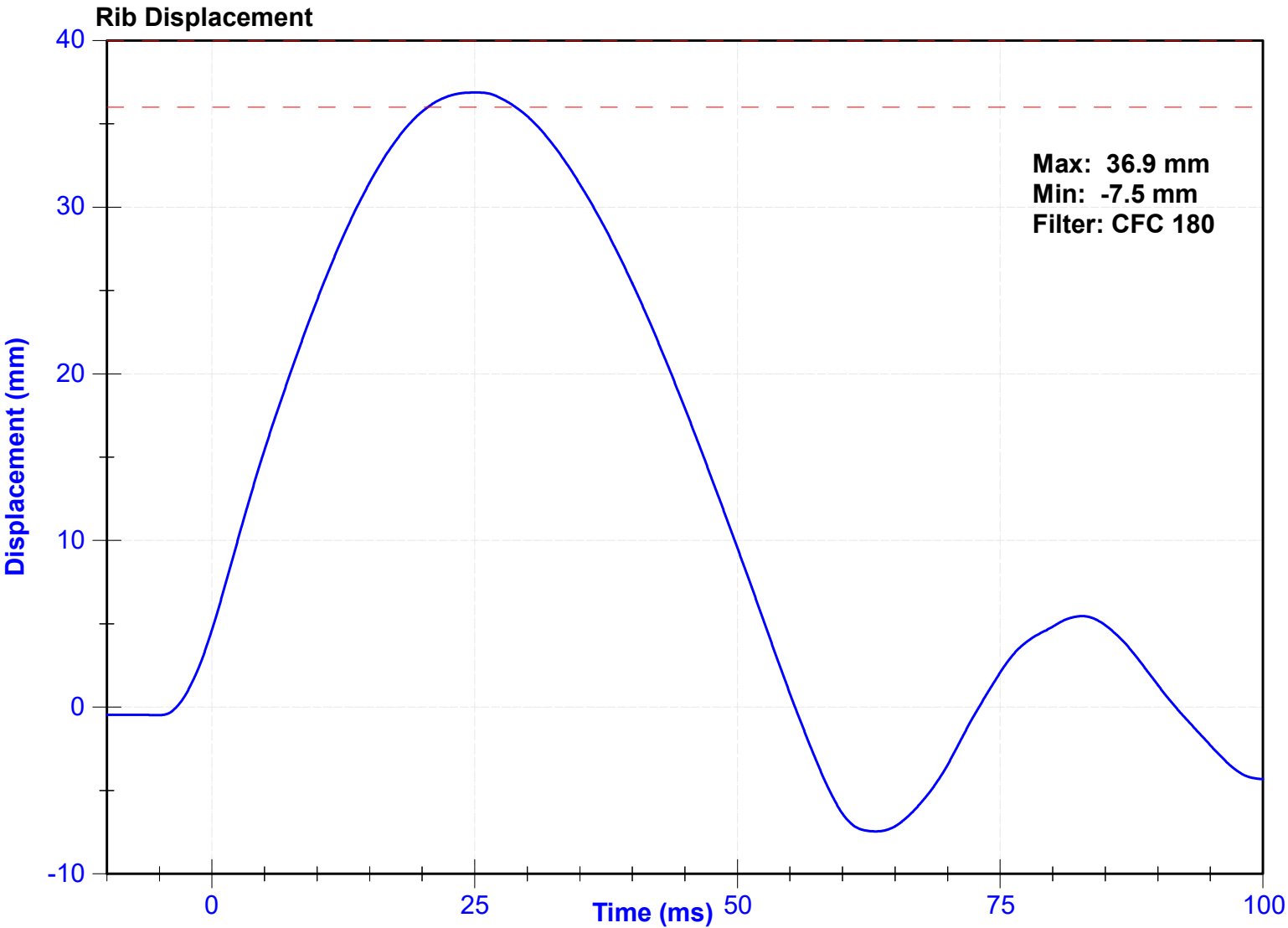
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	18	Pass
Rib Displacement	36	40	mm	36.9	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	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

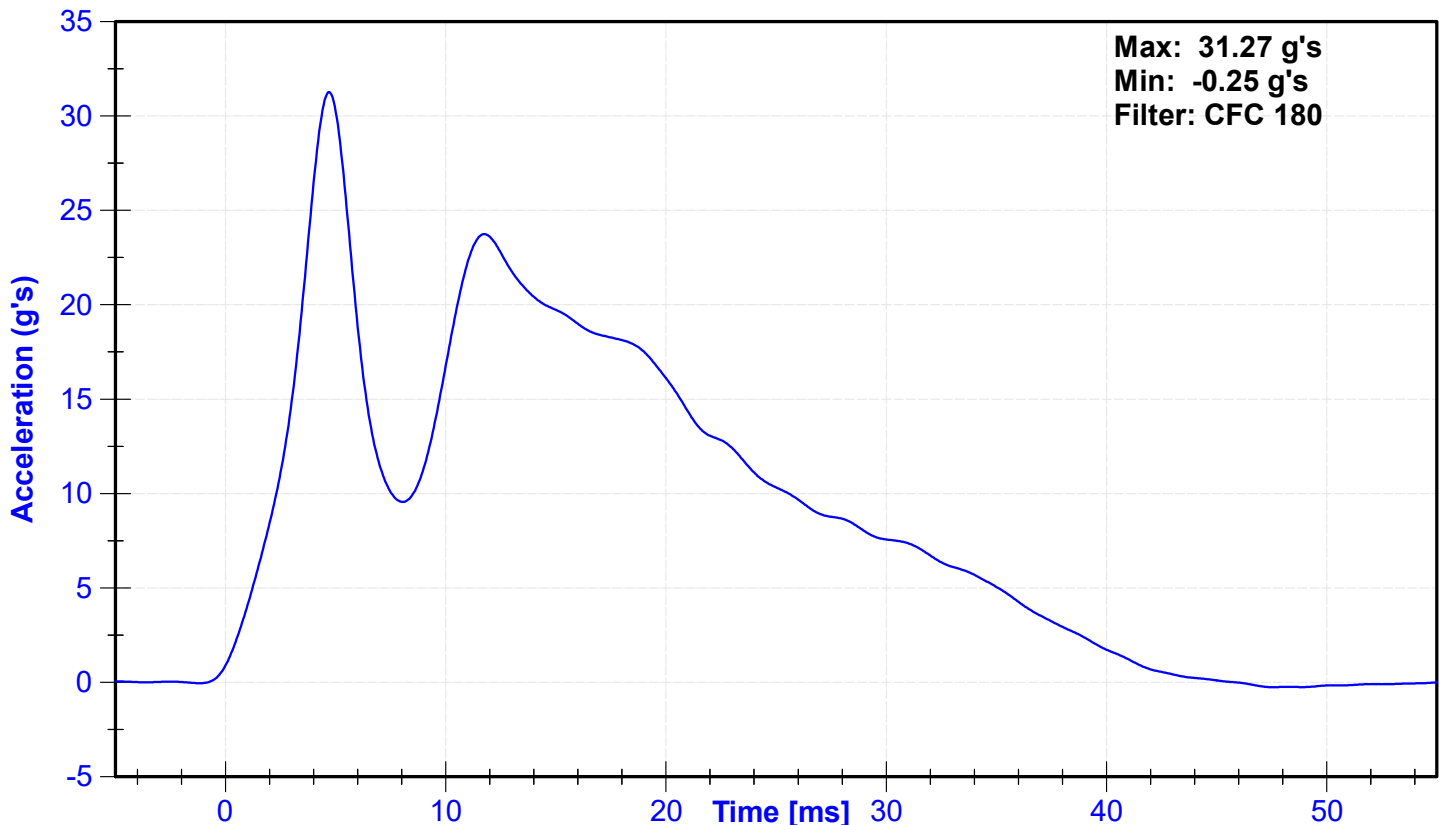
Results

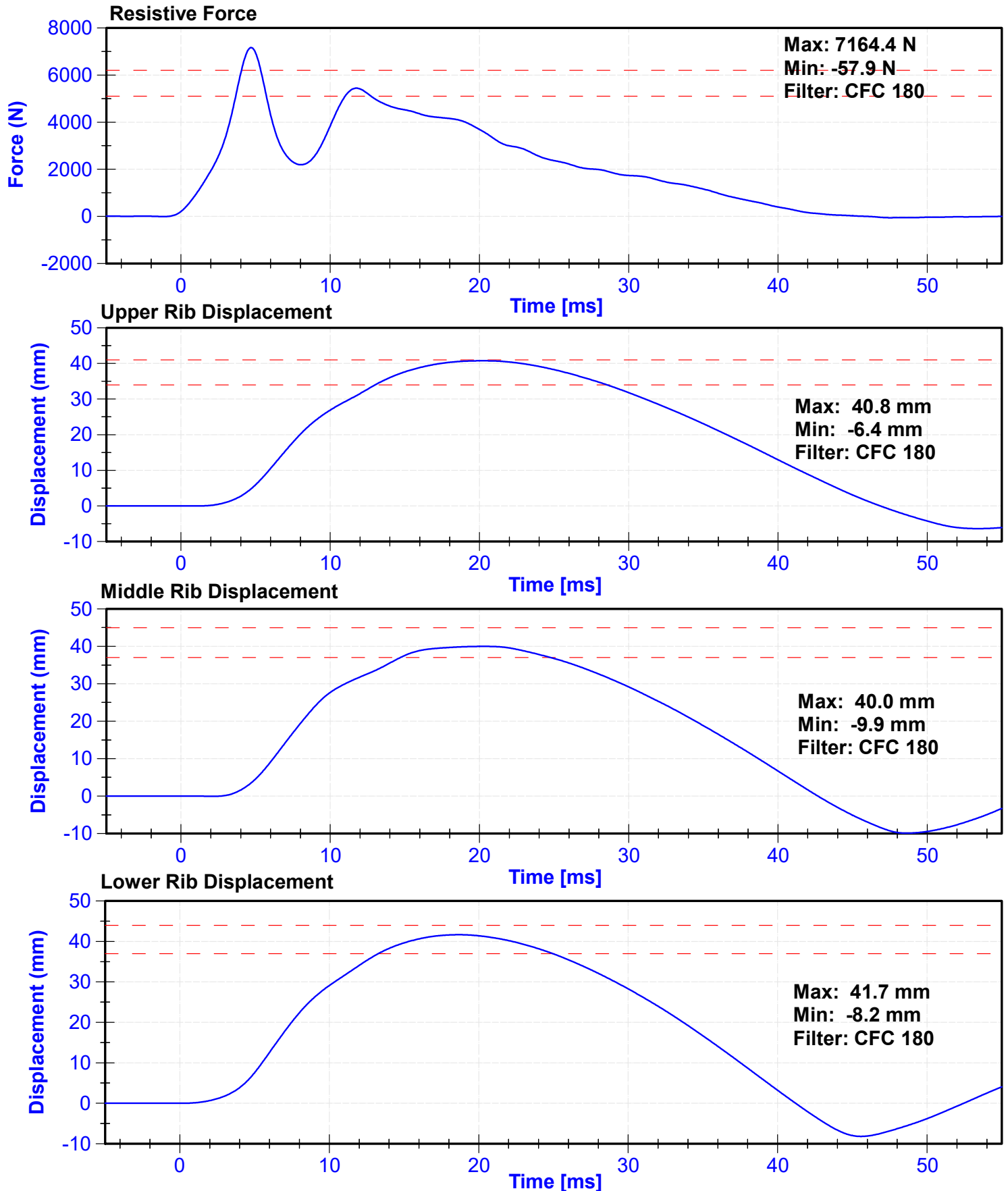
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	18	Pass
Velocity	5.4	5.6	m/s	5.52	Pass
Resistive Force after 6ms	5100	6200	N	5439.9	Pass
Upper Thorax Rib Deflection	34	41	mm	40.8	Pass
Mid Thorax Rib Deflection	37	45	mm	40.0	Pass
Lower Thorax Rib Deflection	37	44	mm	41.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Upper Thorax Rib Potentiometer	Honeywell	0552-03	8/7/2023	2/5/2024
Middle Thorax Rib Potentiometer	Honeywell	807	8/7/2023	2/5/2024
Lower Thorax Rib Potentiometer	Honeywell	0552-01	8/7/2023	2/5/2024

Probe Acceleration





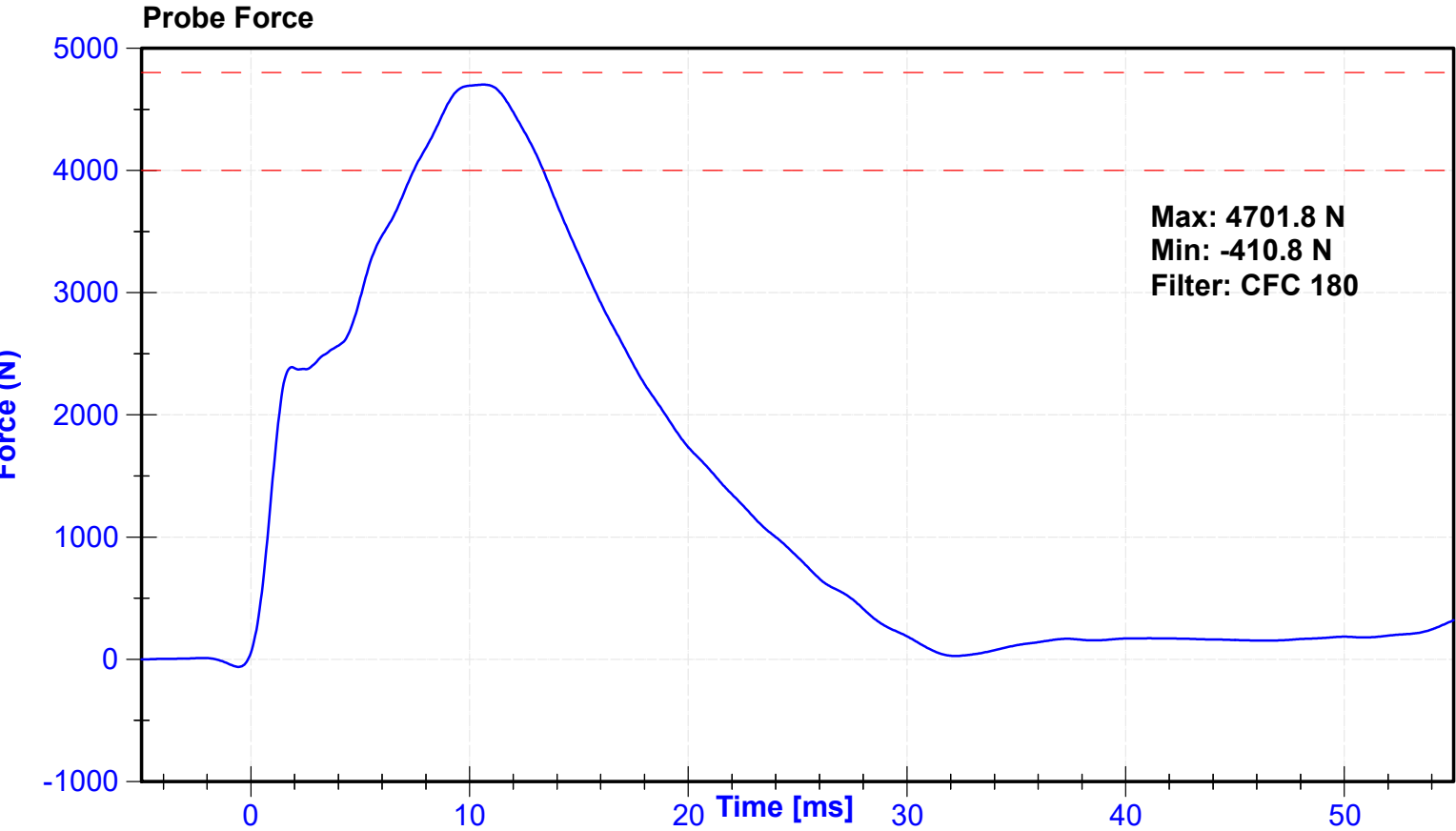
ATD Manufacturer	Denton	Test Technician	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

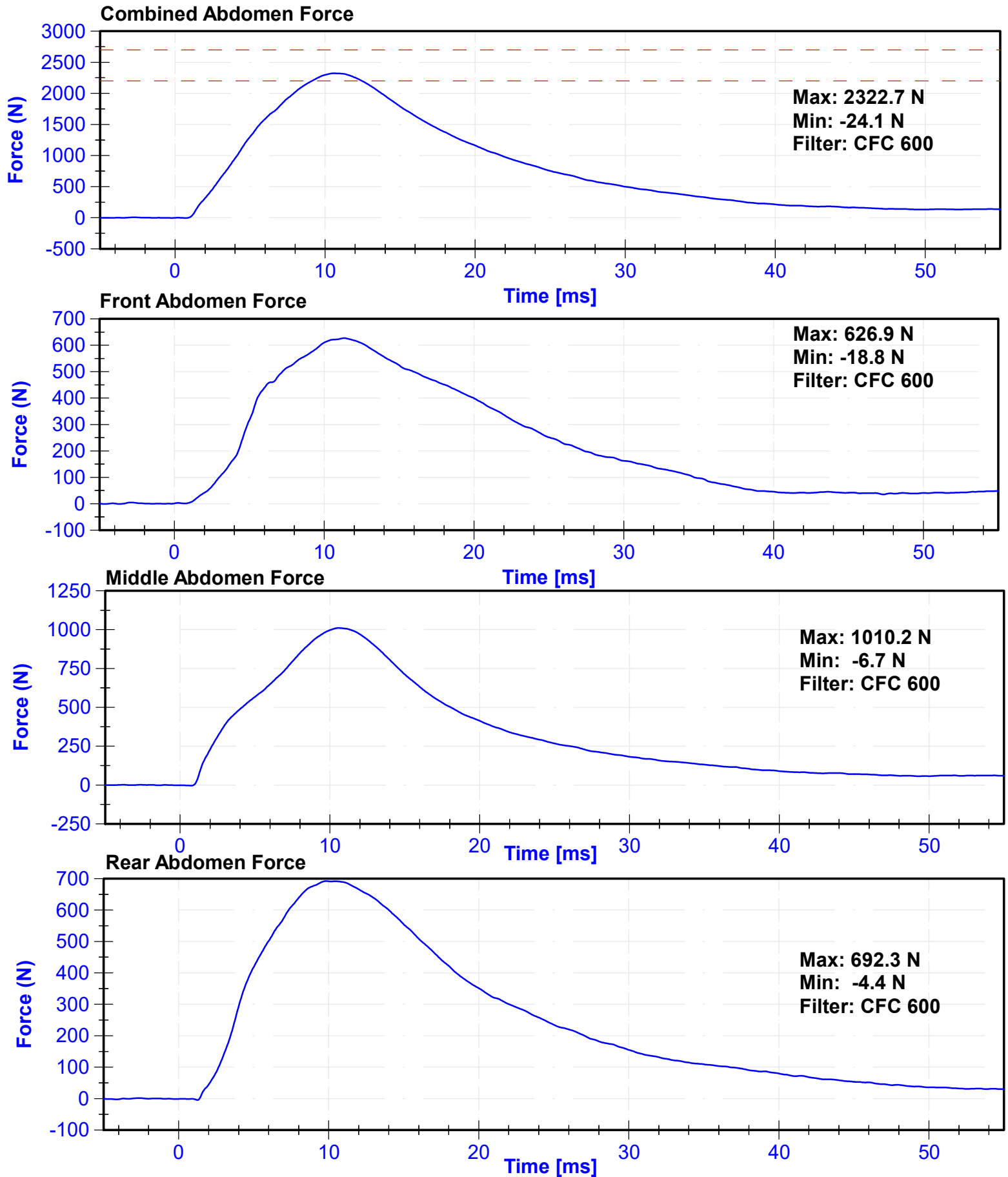
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	18	Pass
Velocity	3.9	4.1	m/s	4.01	Pass
Combined Abdomen Force	2200	2700	N	2322.7	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.60	Pass
Resistive Probe Force	4000	4800	N	4701.8	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.65	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
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





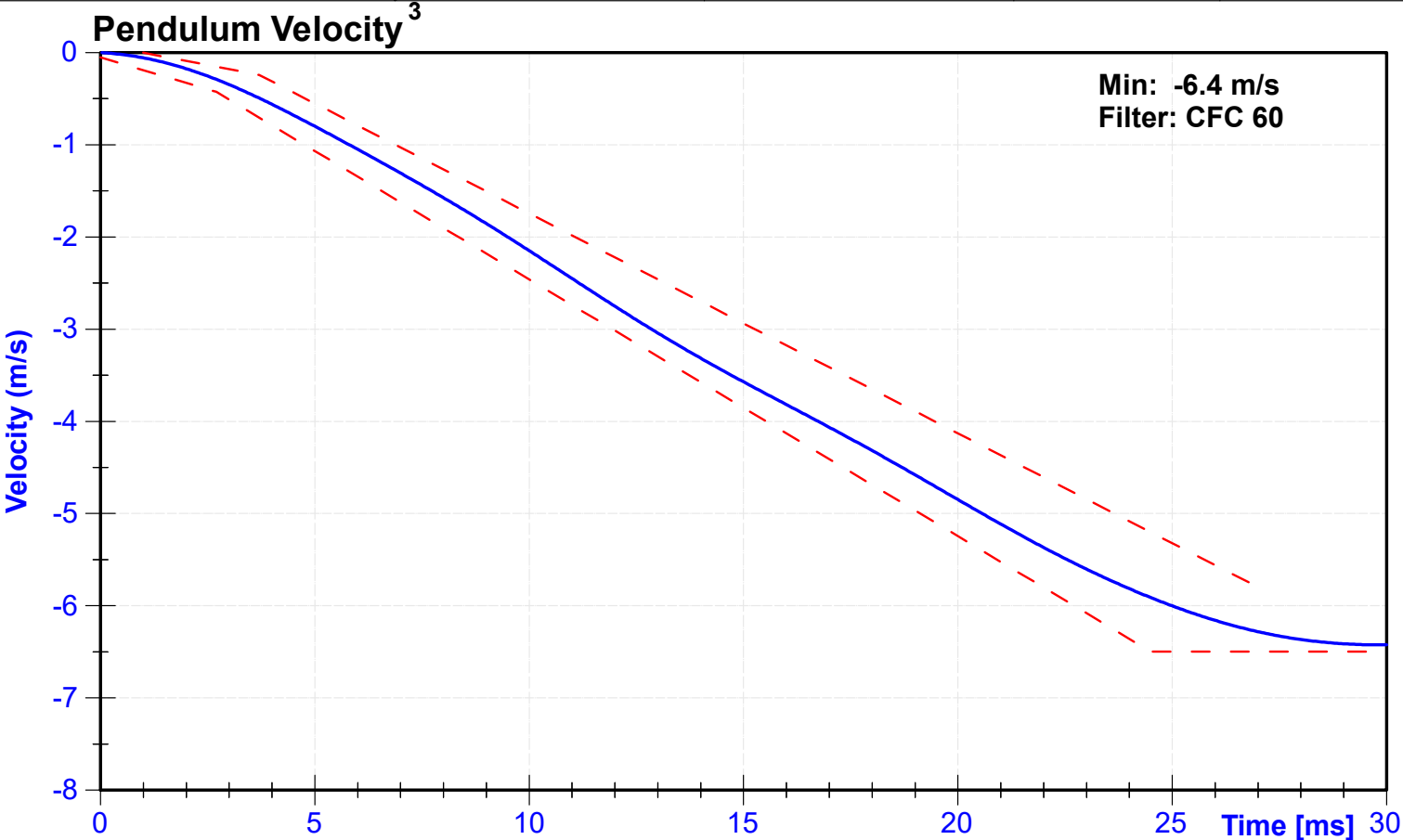
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	17	Pass
Velocity	5.95	6.15	m/s	5.984	Pass
Lateral Spine Rotation	45	55	deg	45.6	Pass
Time at Maximum Rotation	39	53	ms	42.1	Pass
Time of Decay to Zero Degrees	37	57	ms	38.4	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

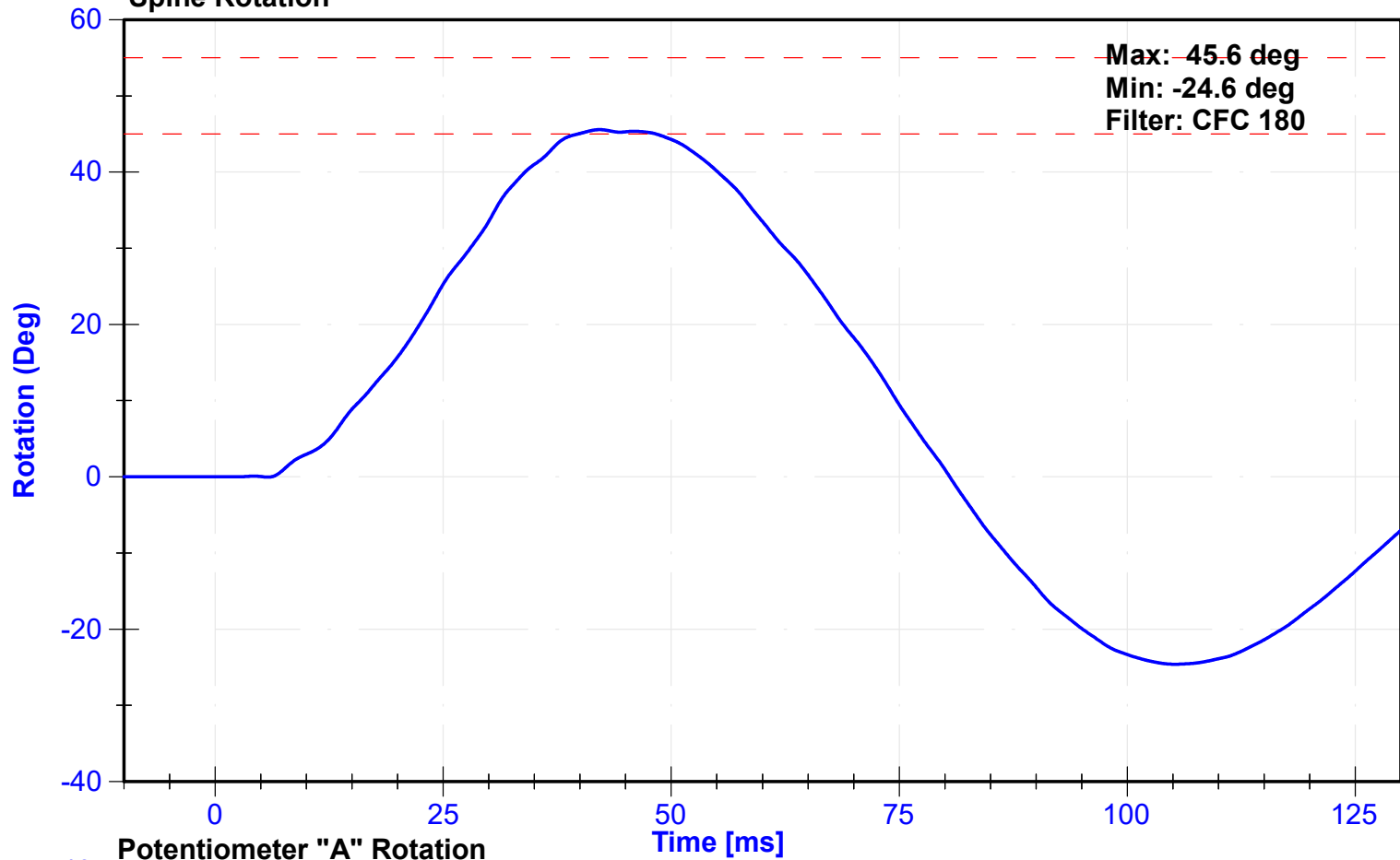
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Pendulum "A" Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Condyle "B" Potentiometer	Sfernice	095	9/29/2023	9/28/2024

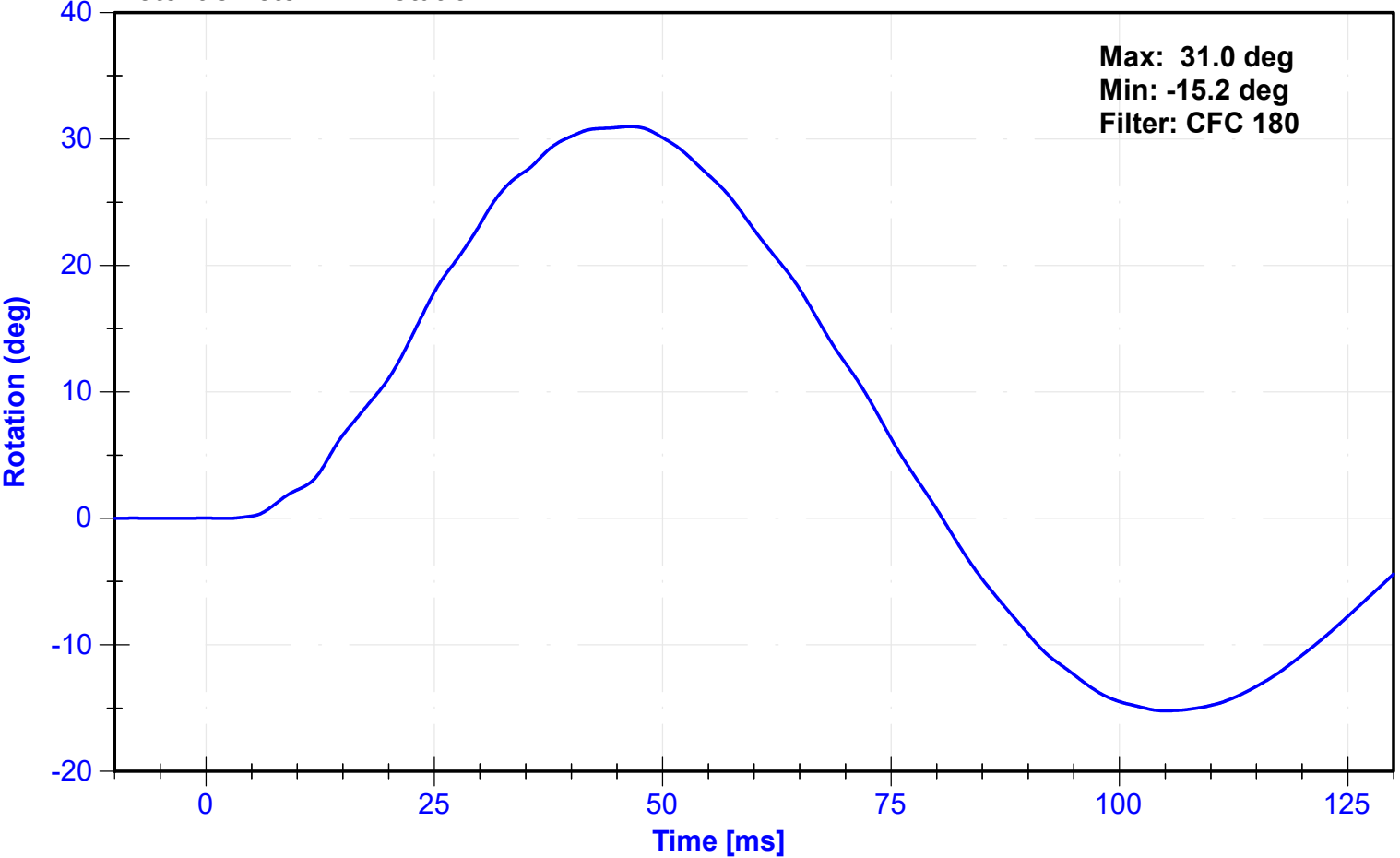


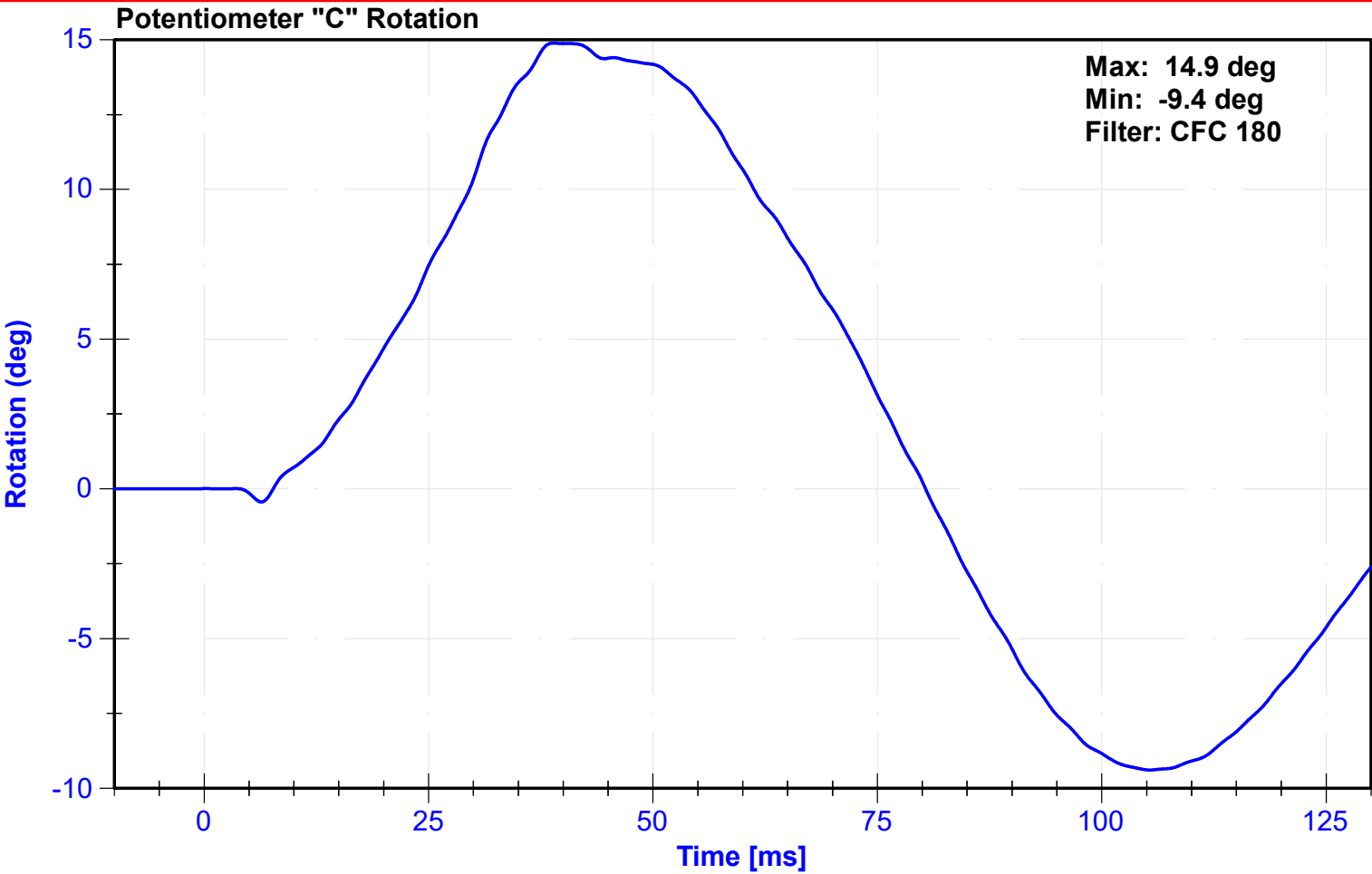
^{1,2} Upper and lower boundaries specified in Appendix I IV-19

Spine Rotation



Potentiometer "A" Rotation





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	D. Sakona
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

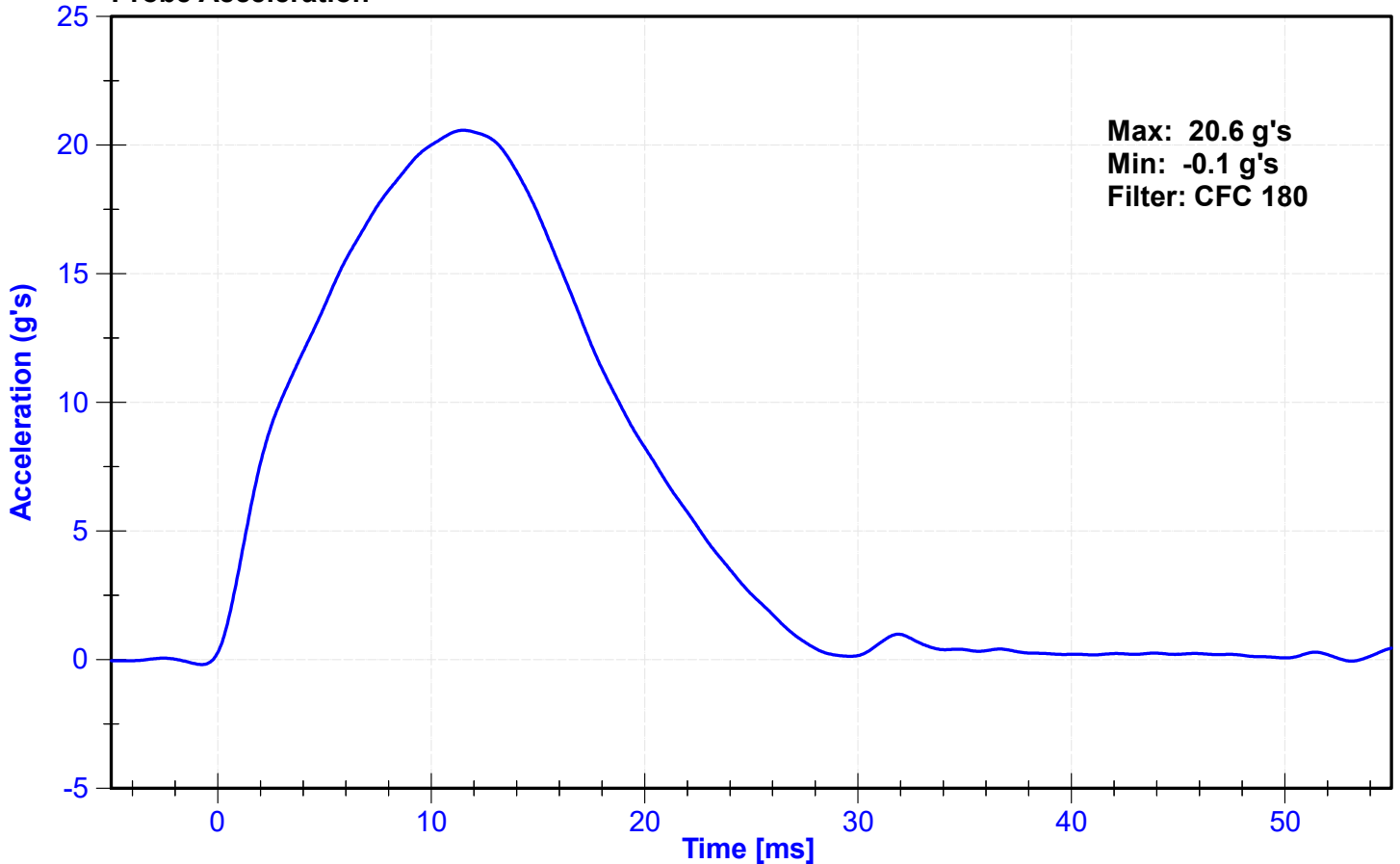
Results

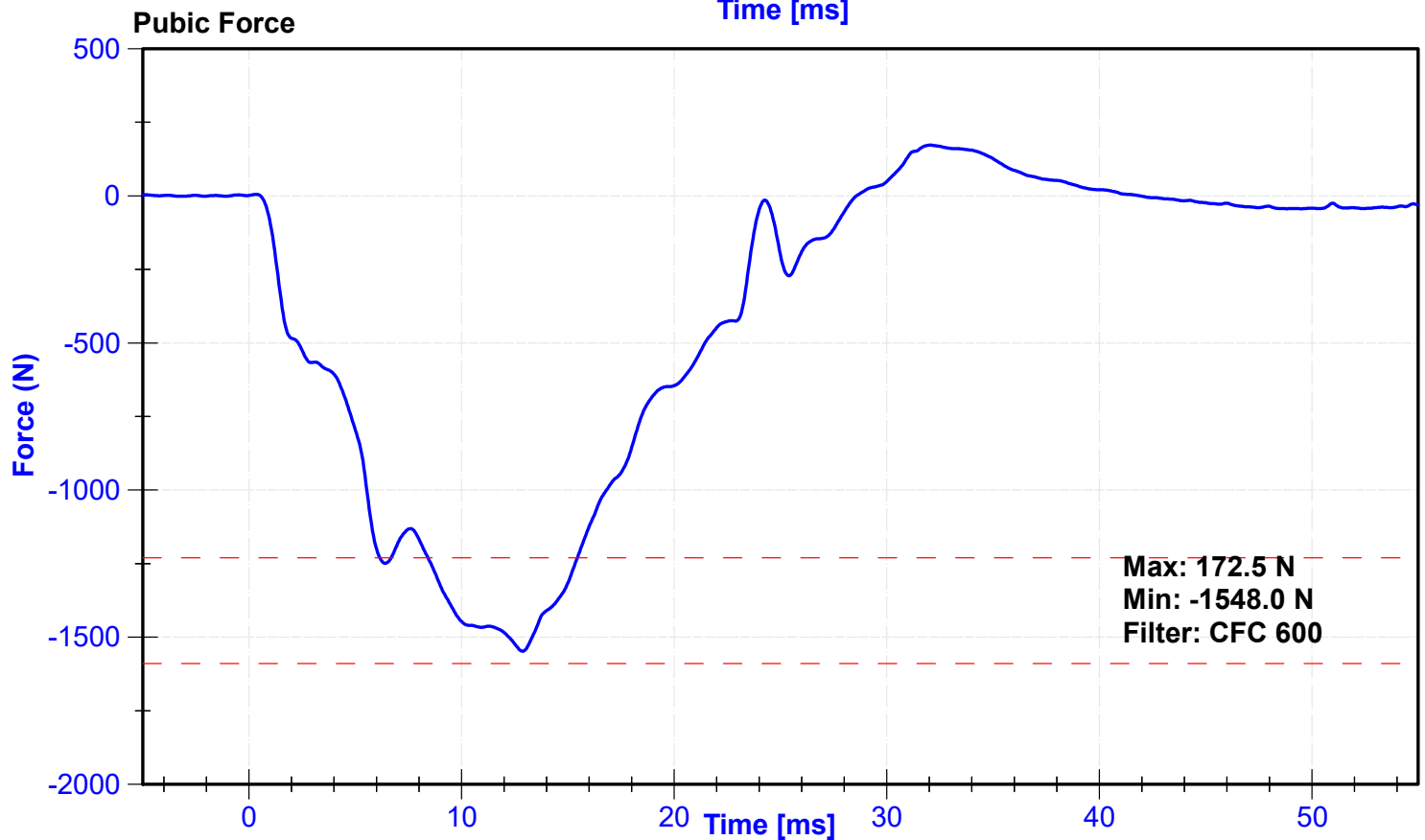
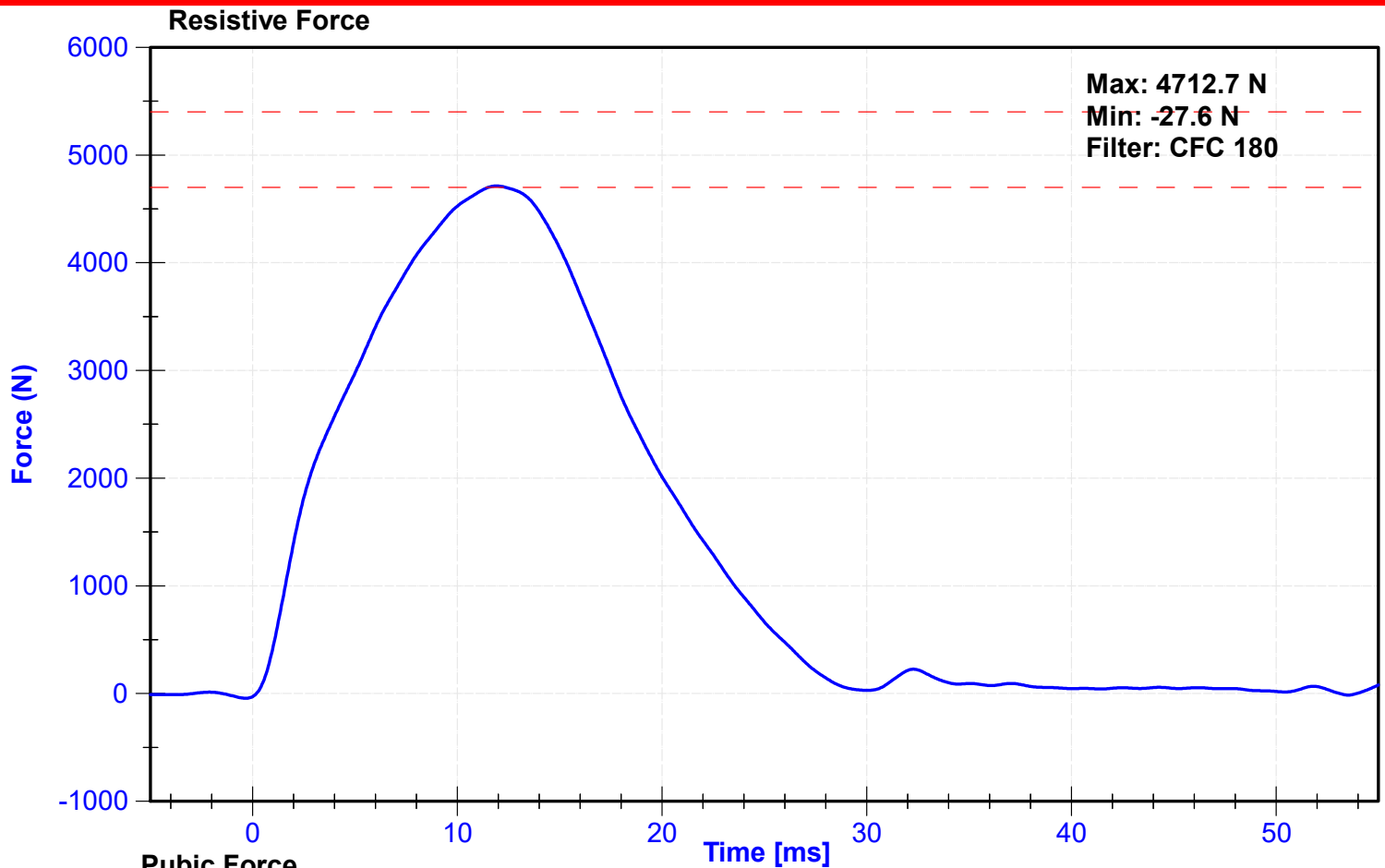
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	18	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Resistive Force	4700	5400	N	4712.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	11.90	Pass
Pubic Force	-1590	-1230	N	-1548.0	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.85	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024

Probe Acceleration





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

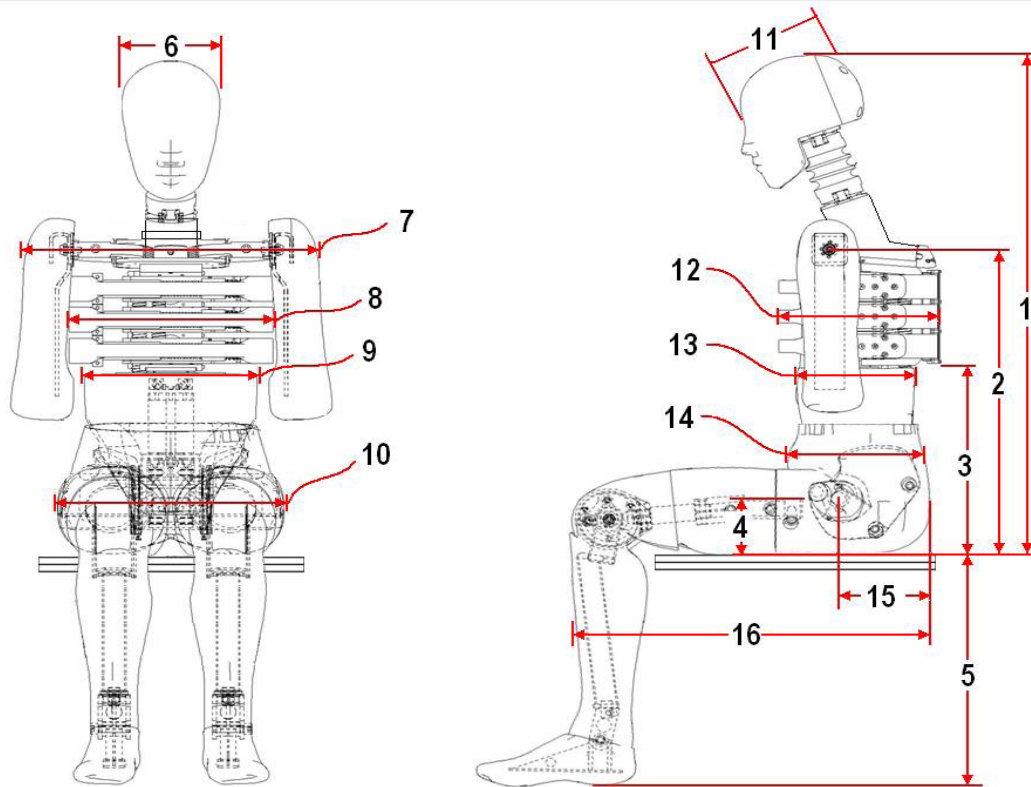


External Measurements - EuroSID-2re

Technician: T. Roseman

Date: 1/30/2024

Dummy Serial Number: D037



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	562	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	421	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	362	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	266	Pass
13	Abdomen Depth	194	204	197	Pass
14	Pelvis Depth	235	245	238	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	154	Pass
16	Back of Buttocks to Front Knee	597	615	602	Pass

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

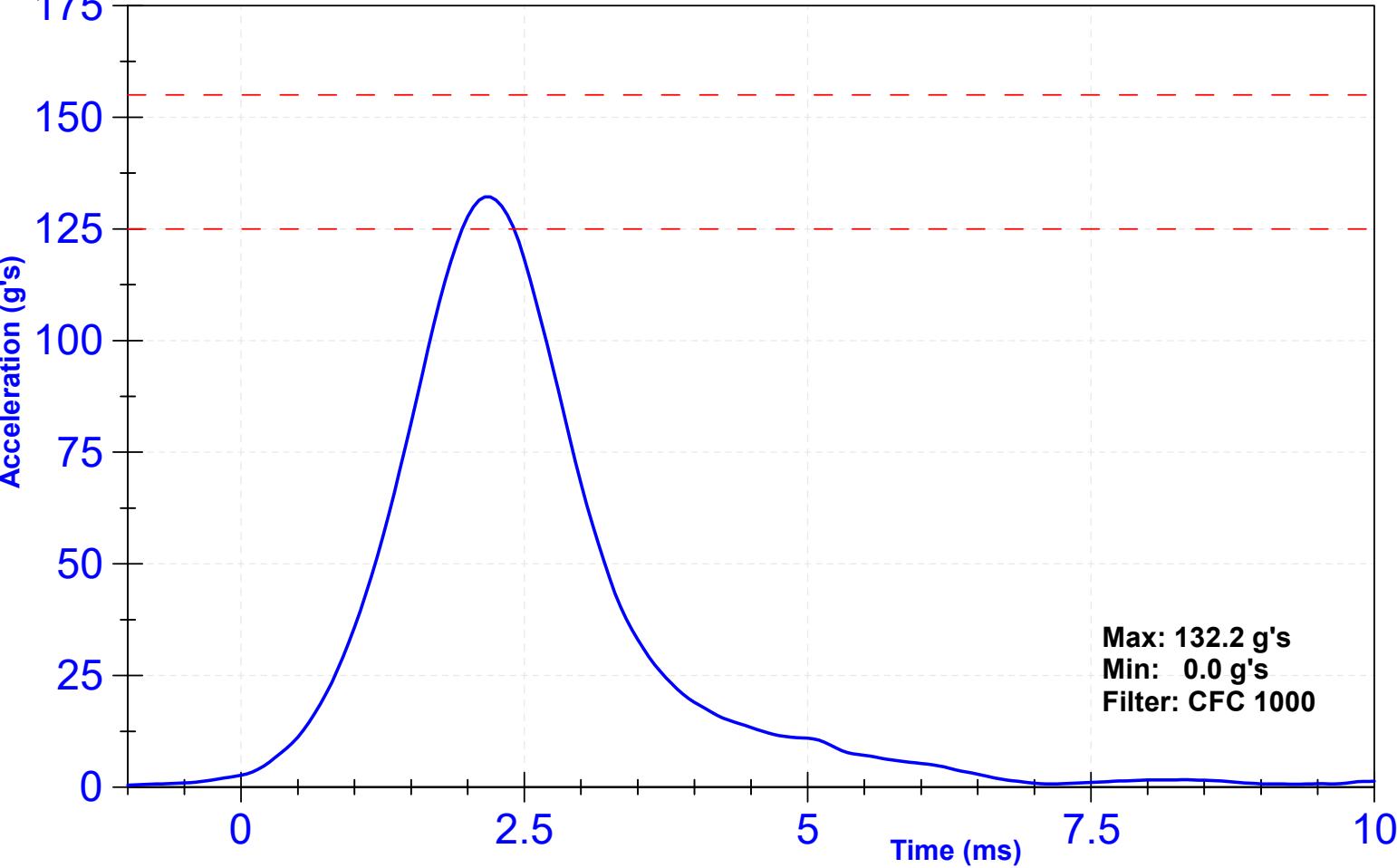
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	Pass
Resultant Acceleration	125	155	g's	132.2	Pass
Oscillation	0	15	%	1.57	Pass
Fore-Aft Acceleration	-15	15	g's	7.1	Pass

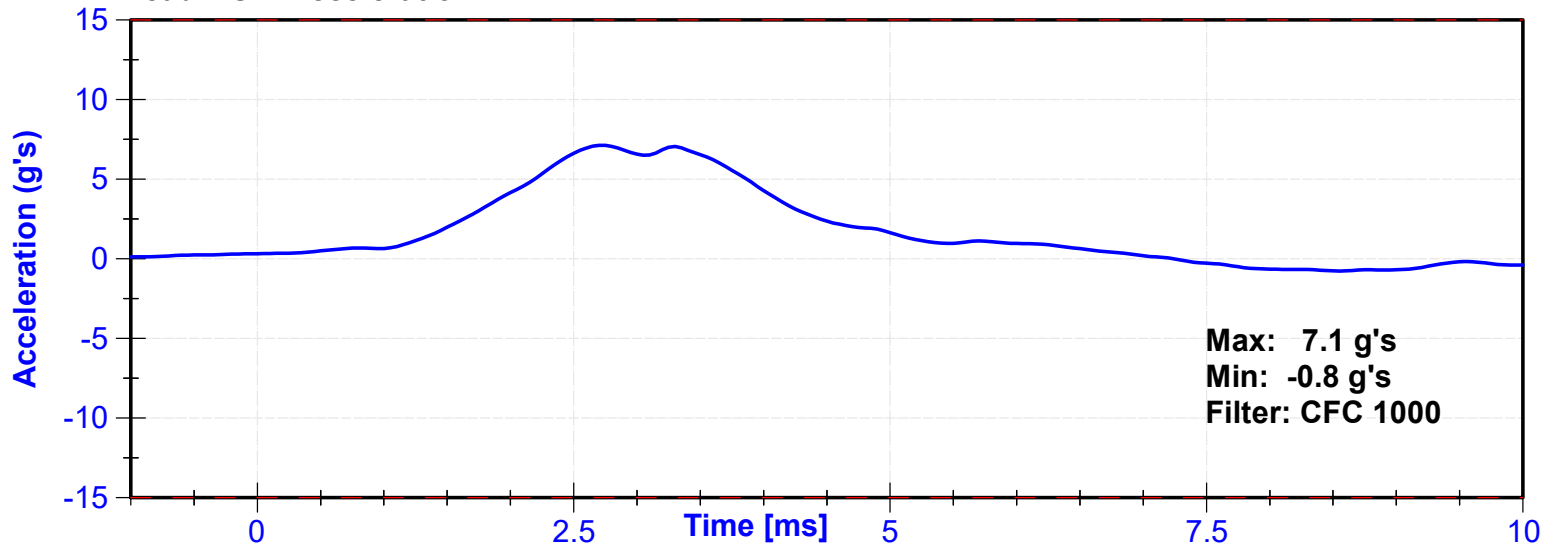
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	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

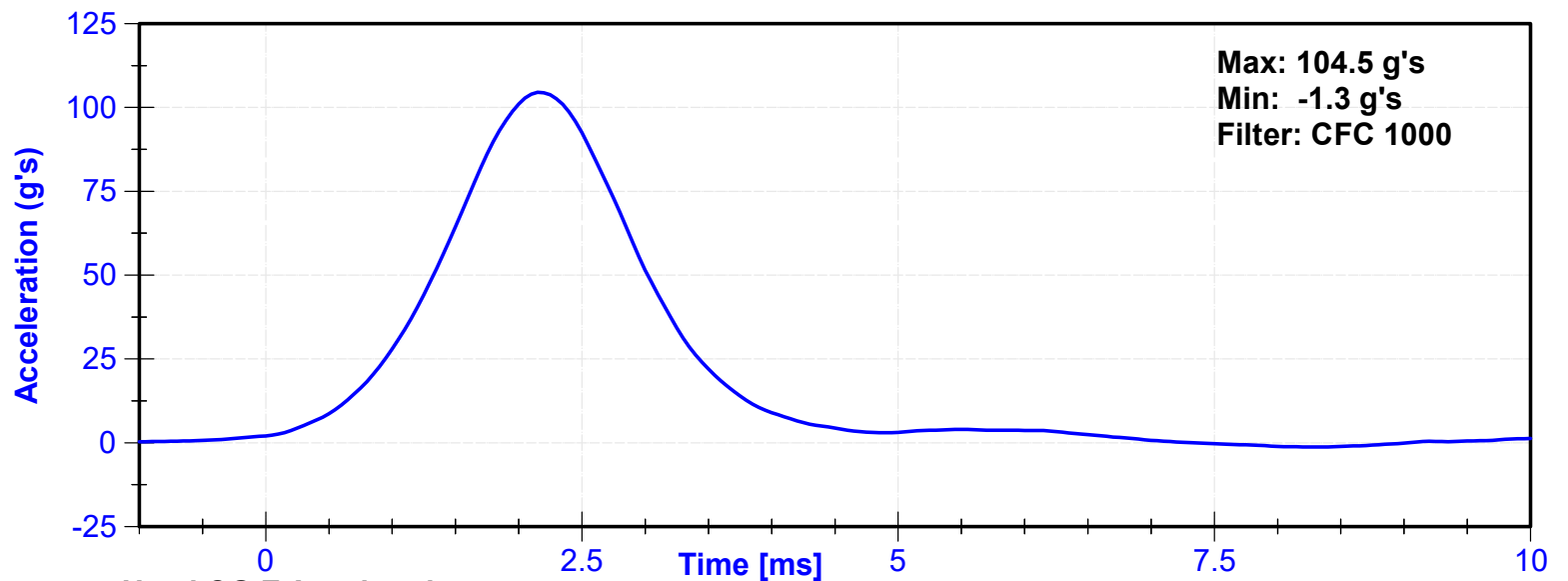
Resultant Acceleration



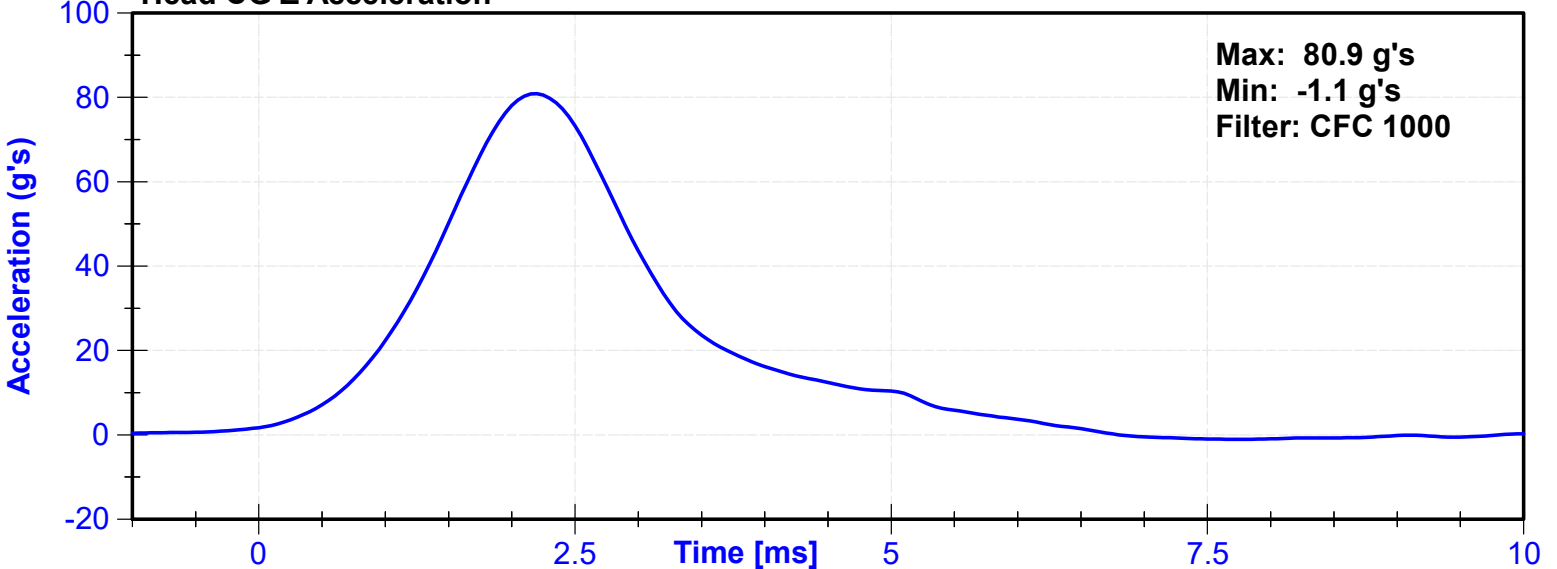
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



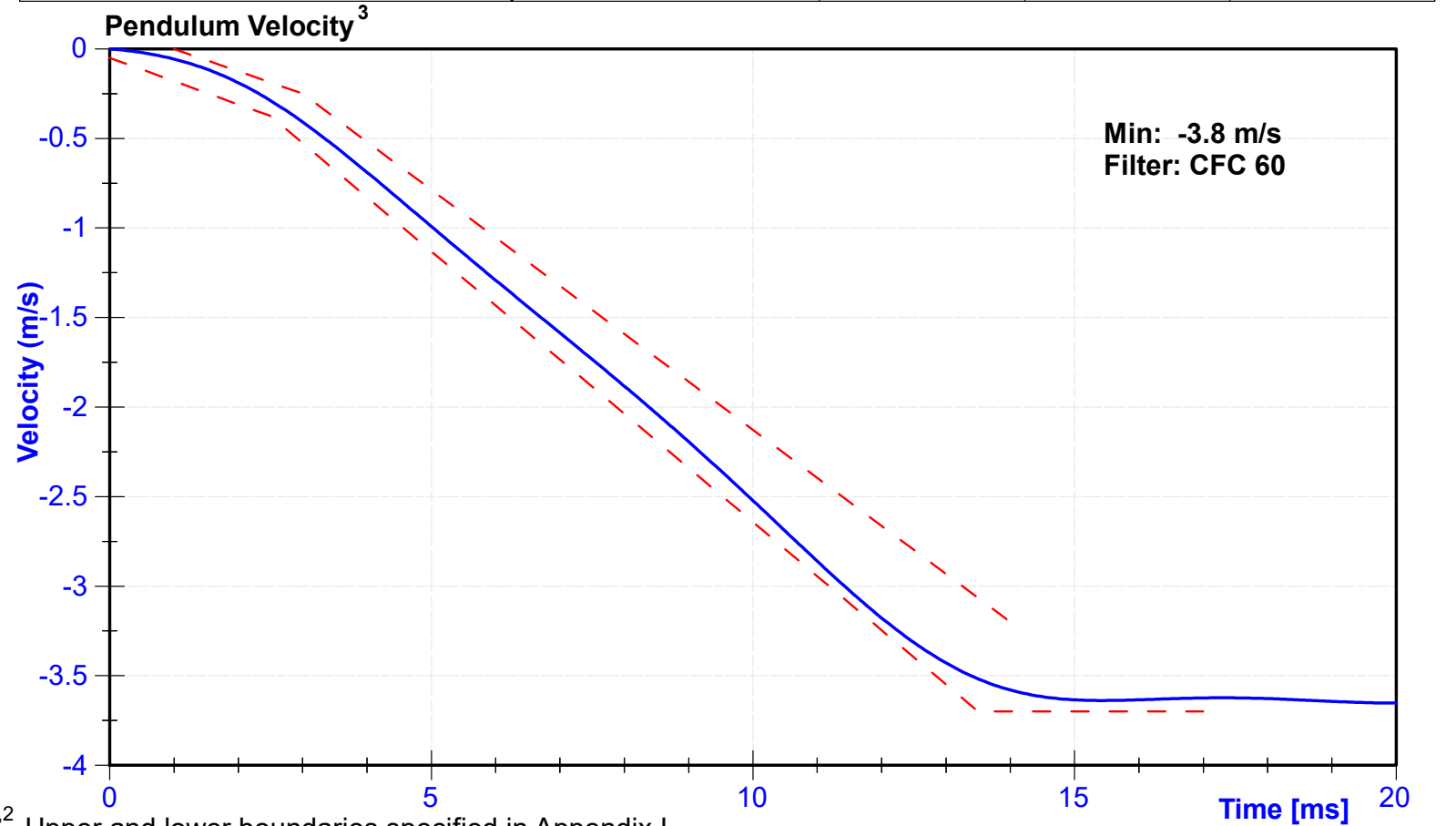
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	29	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	49.3	Pass
Time at Maximum Rotation	54	66	ms	56.5	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.4	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

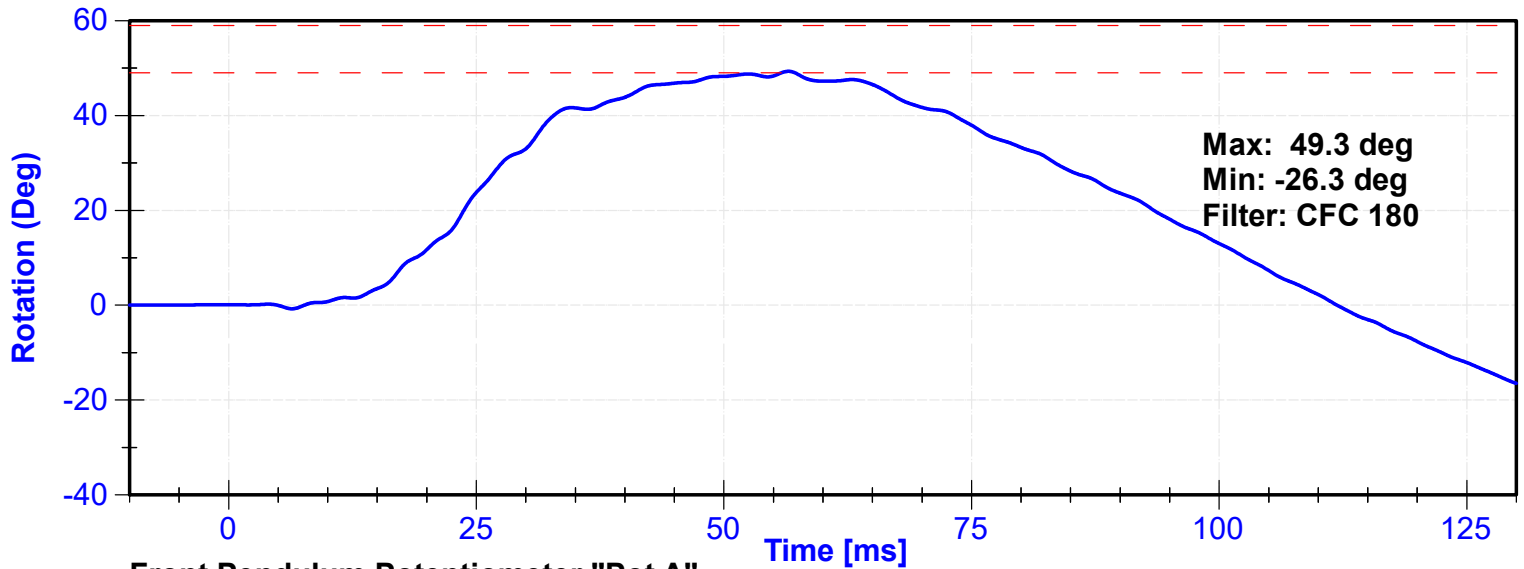
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Front Pendulum Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024

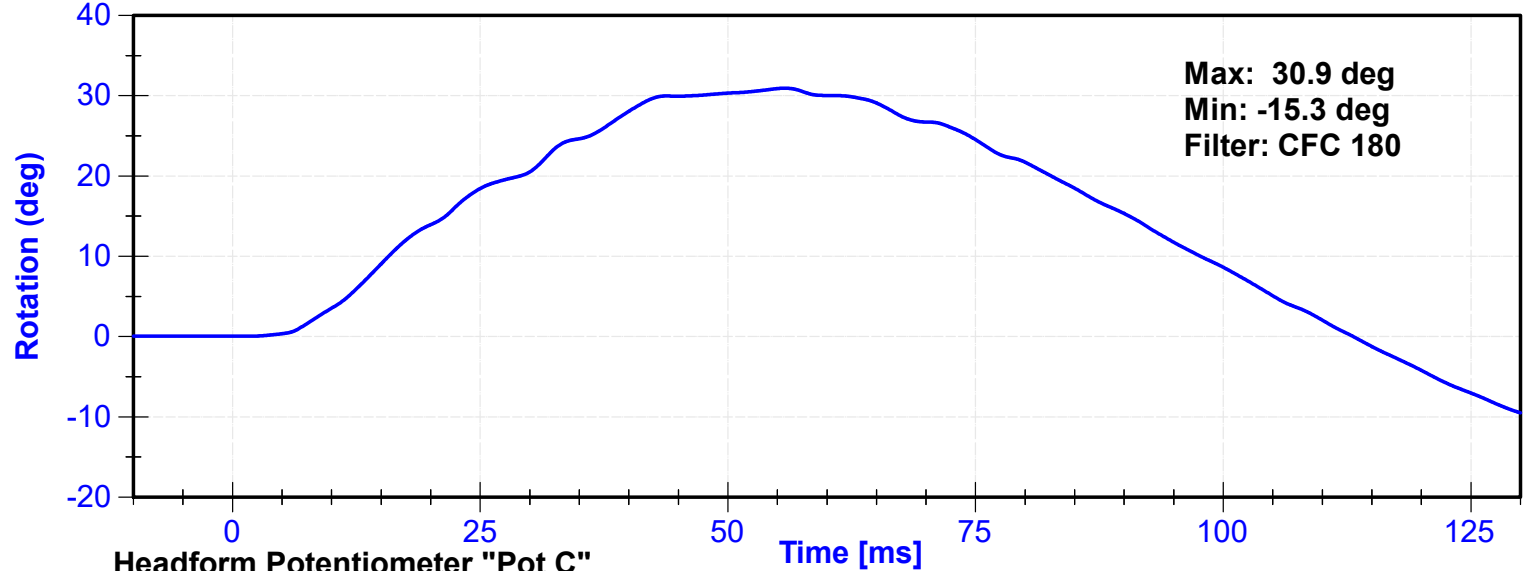


^{1,2} Upper and lower boundaries specified in Appendix I

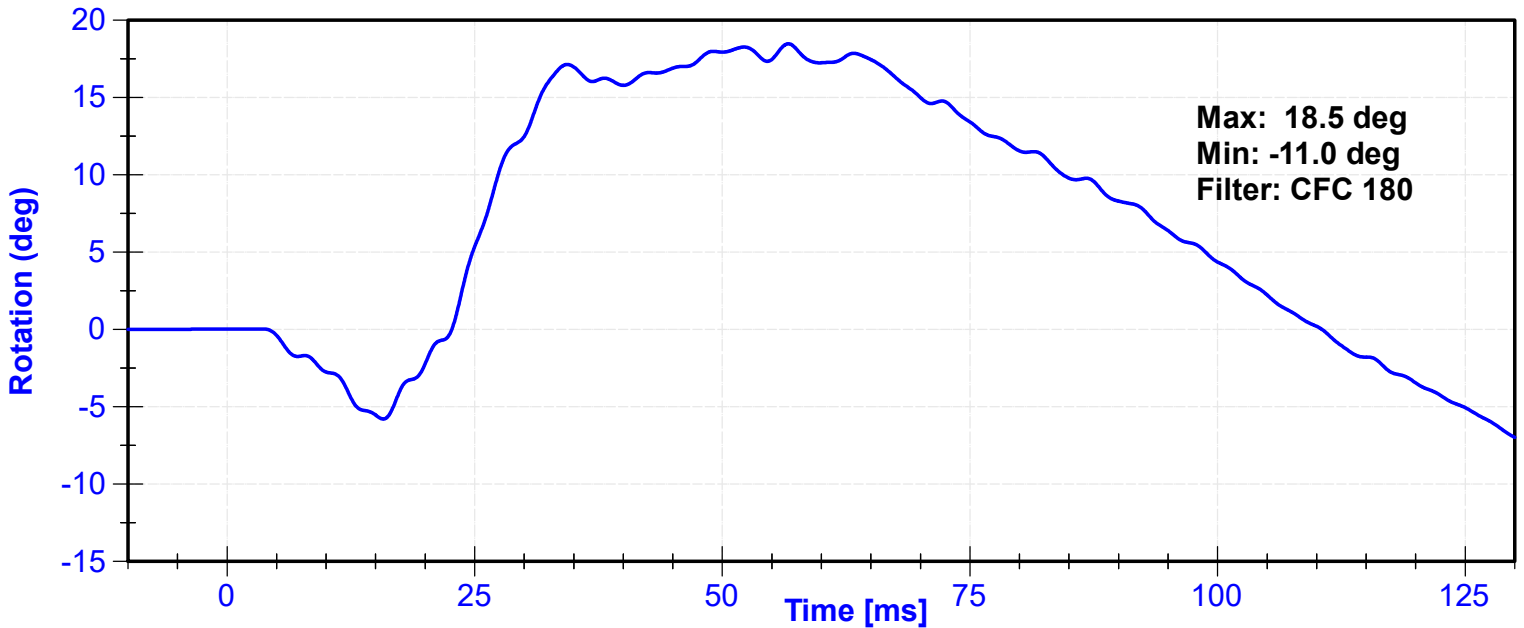
Neck Rotation



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. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

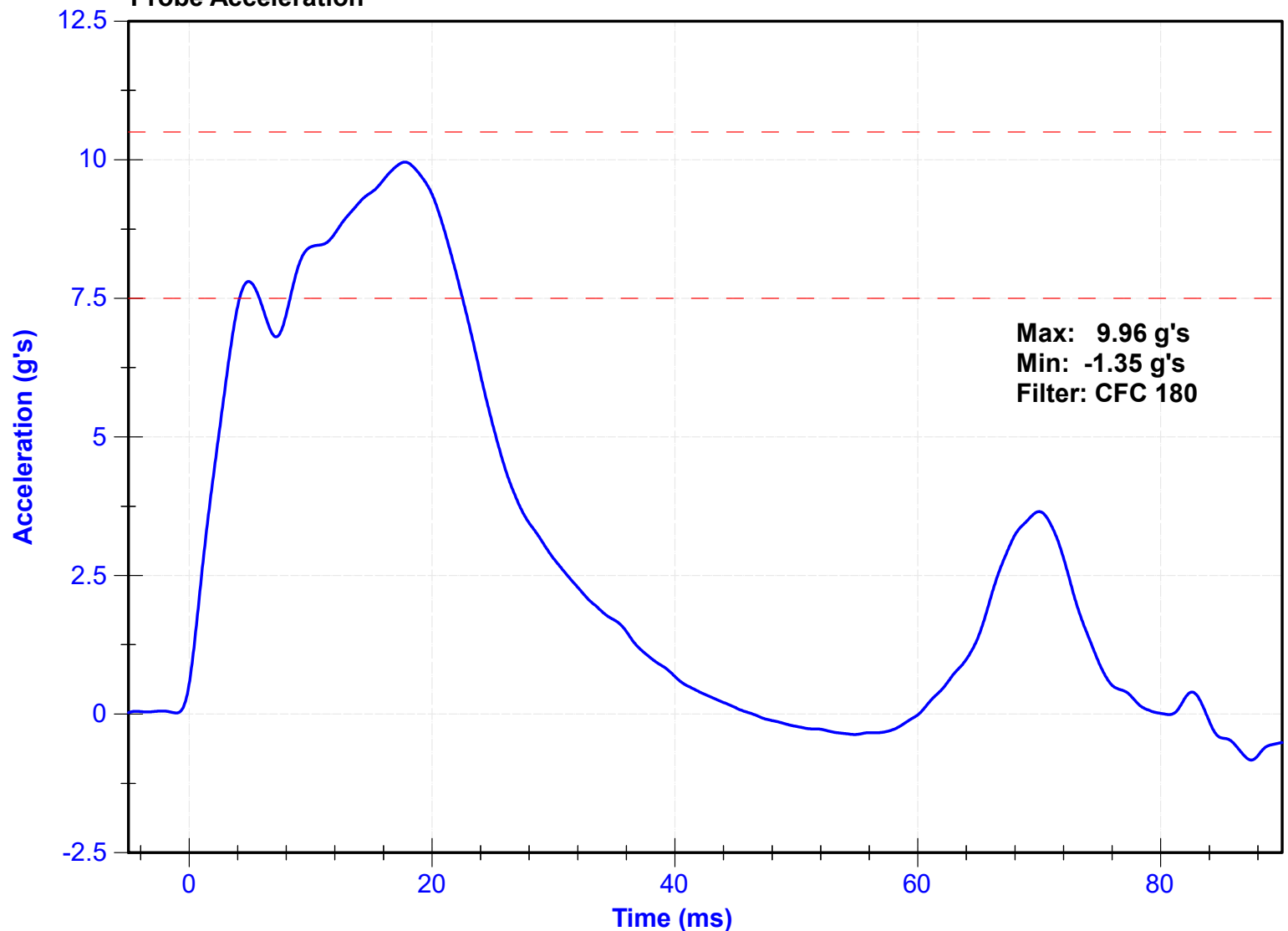
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	7.5	10.5	g's	9.96	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18619	9/29/2023	3/27/2024

Probe Acceleration



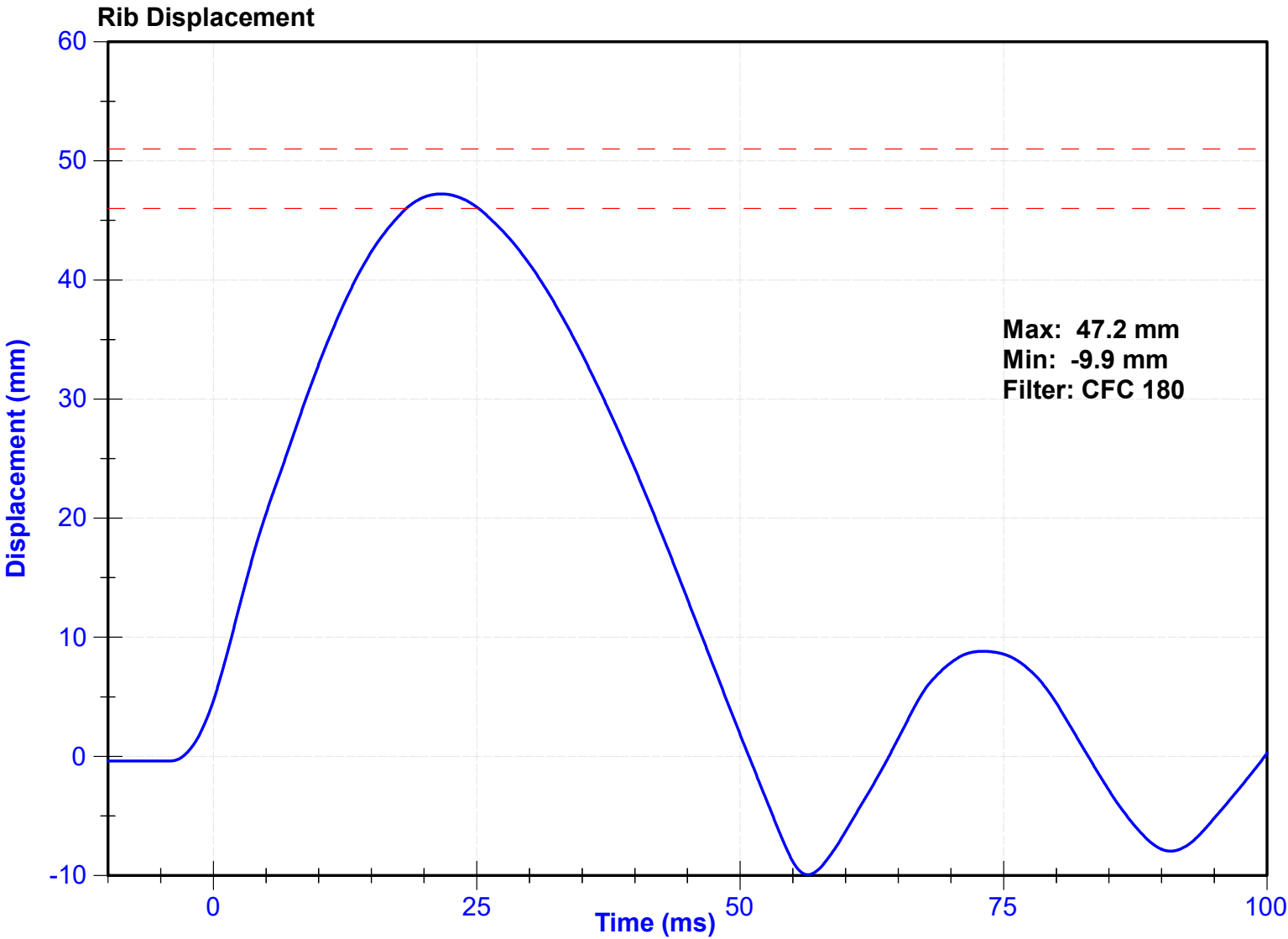
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	Pass
Rib Displacement	46	51	mm	47.2	Pass

Transducer Calibrations

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



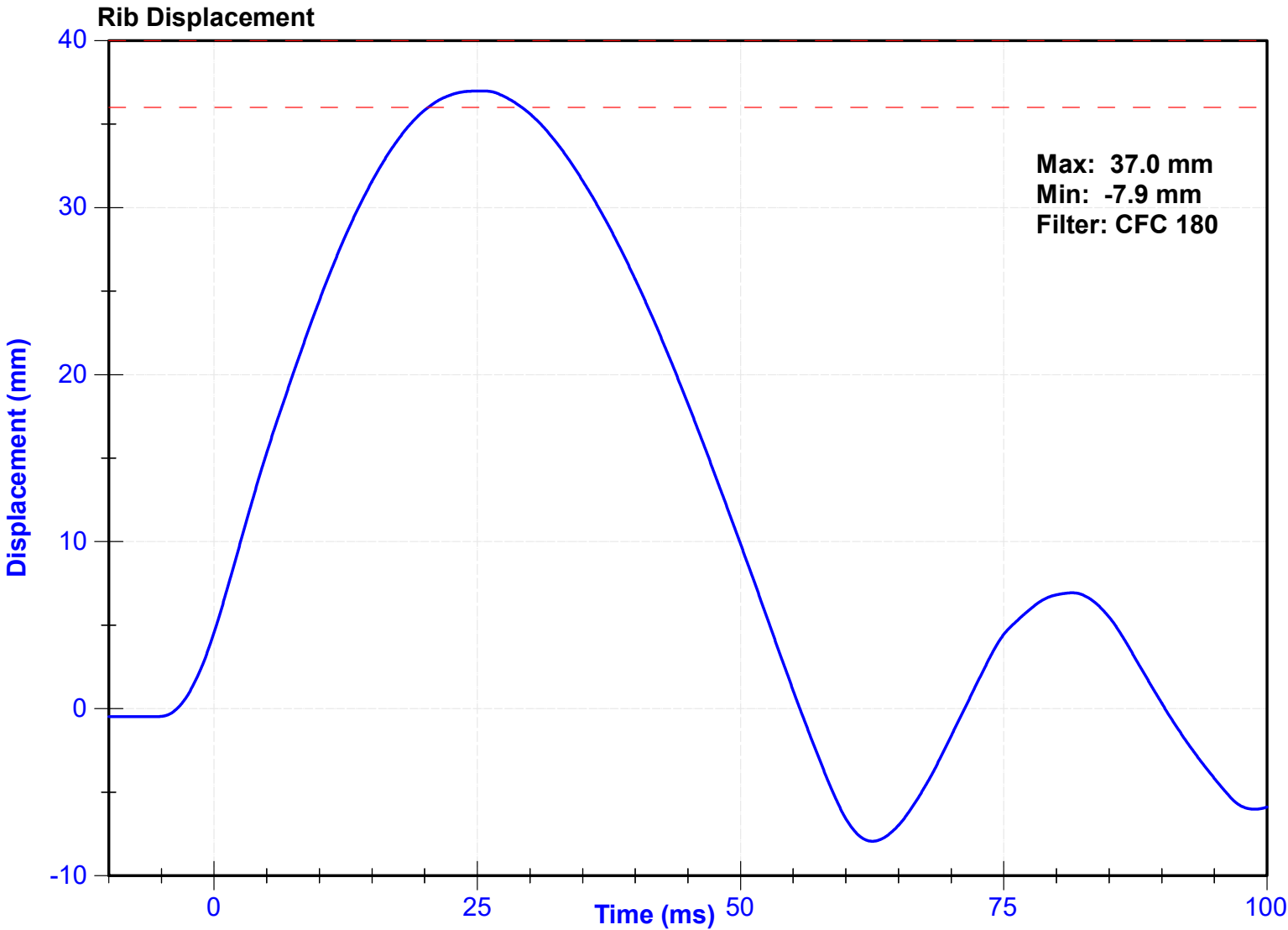
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	Pass
Rib Displacement	36	40	mm	37.0	Pass

Transducer Calibrations

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



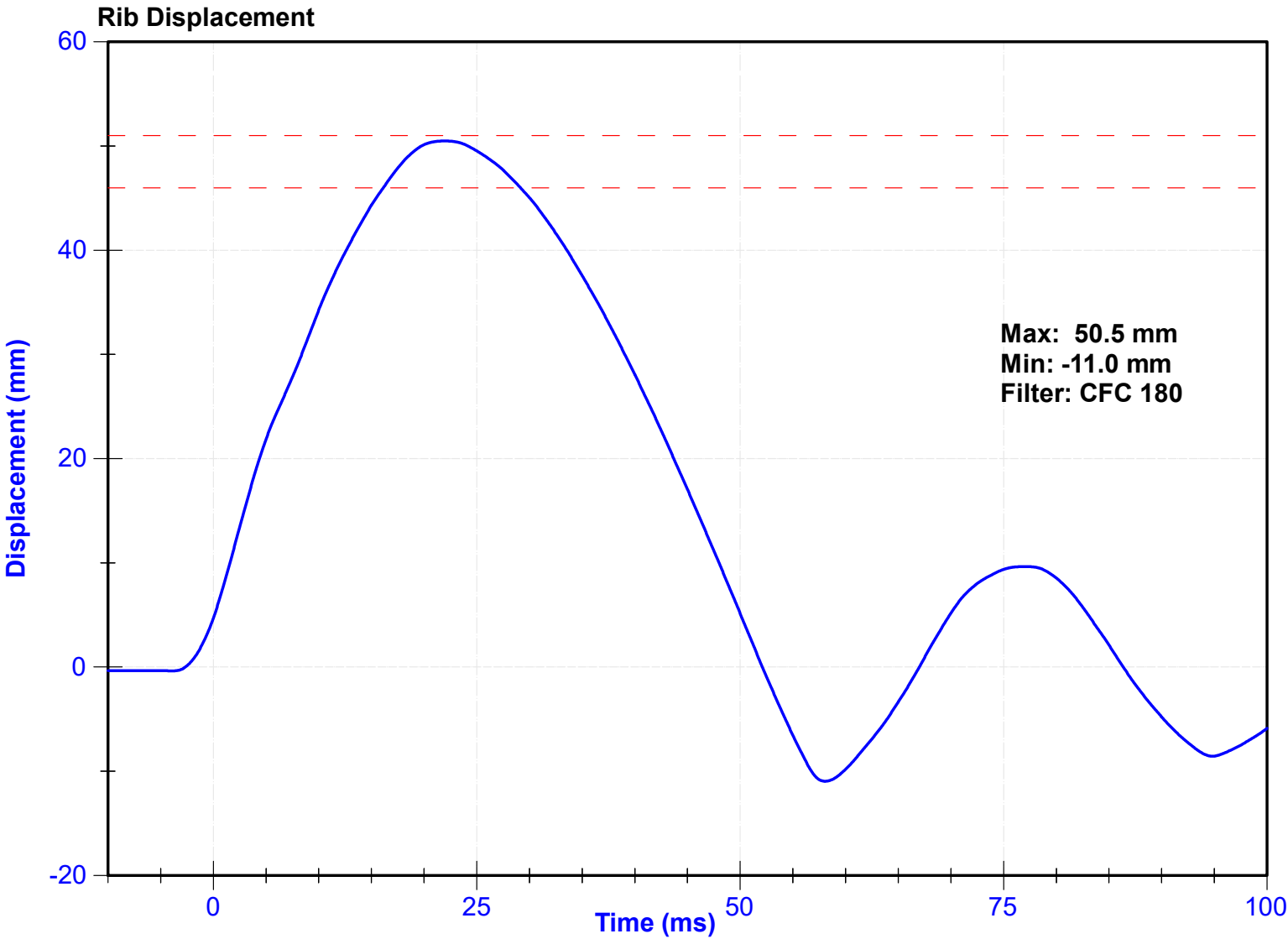
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	Pass
Rib Displacement	46	51	mm	50.5	Pass

Transducer Calibrations

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



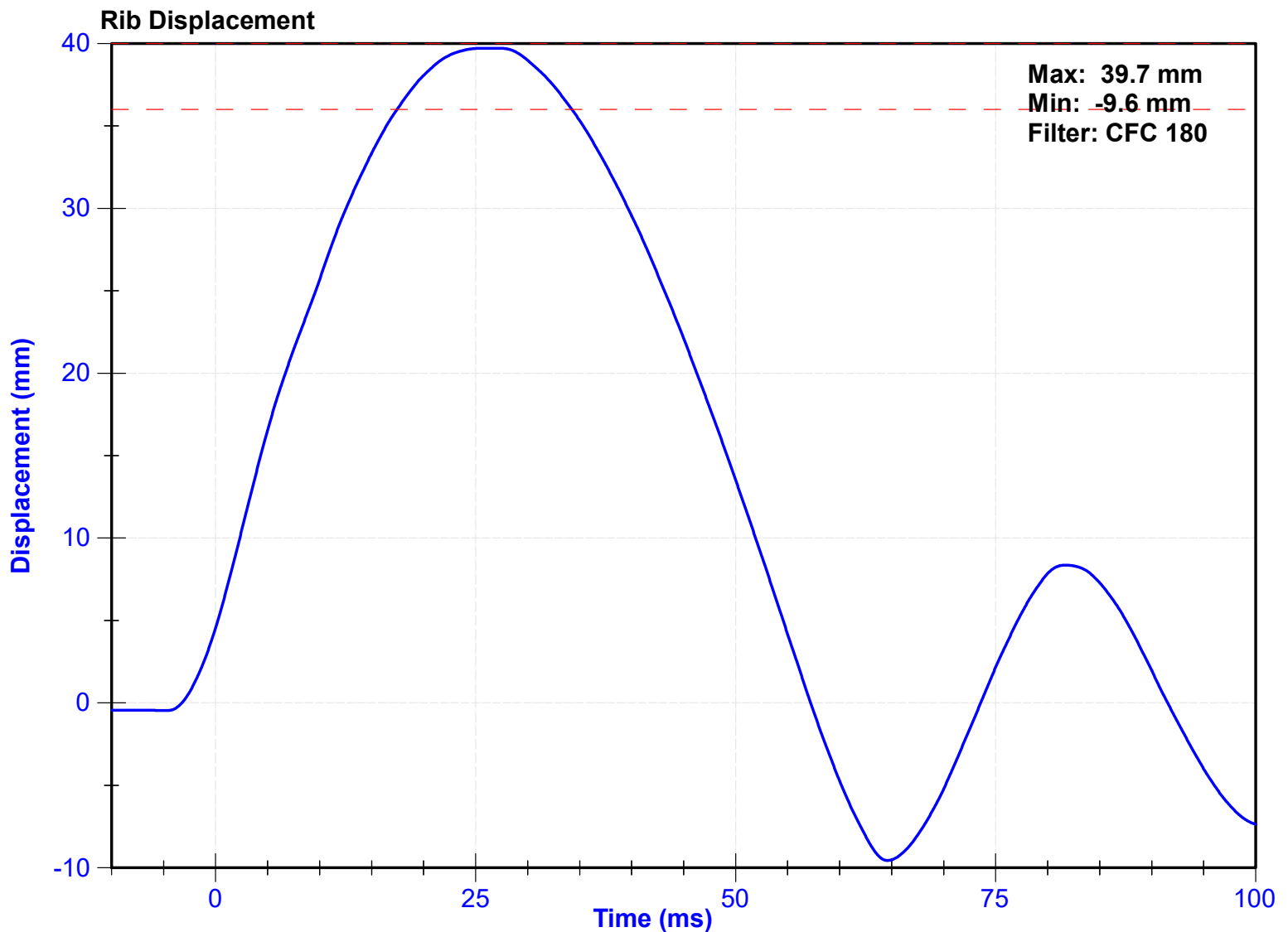
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	Pass
Rib Displacement	36	40	mm	39.7	Pass

Transducer Calibrations

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



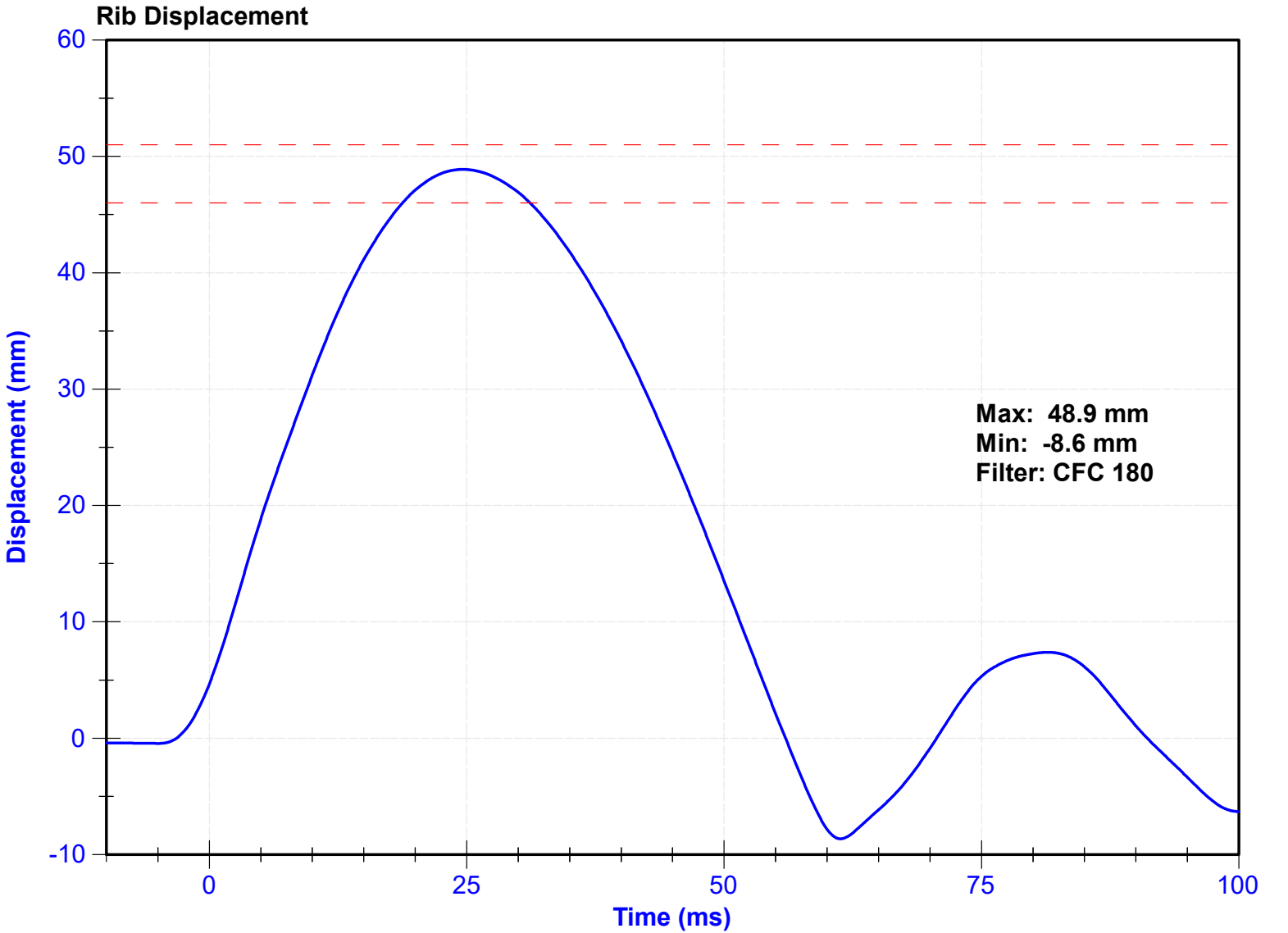
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	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



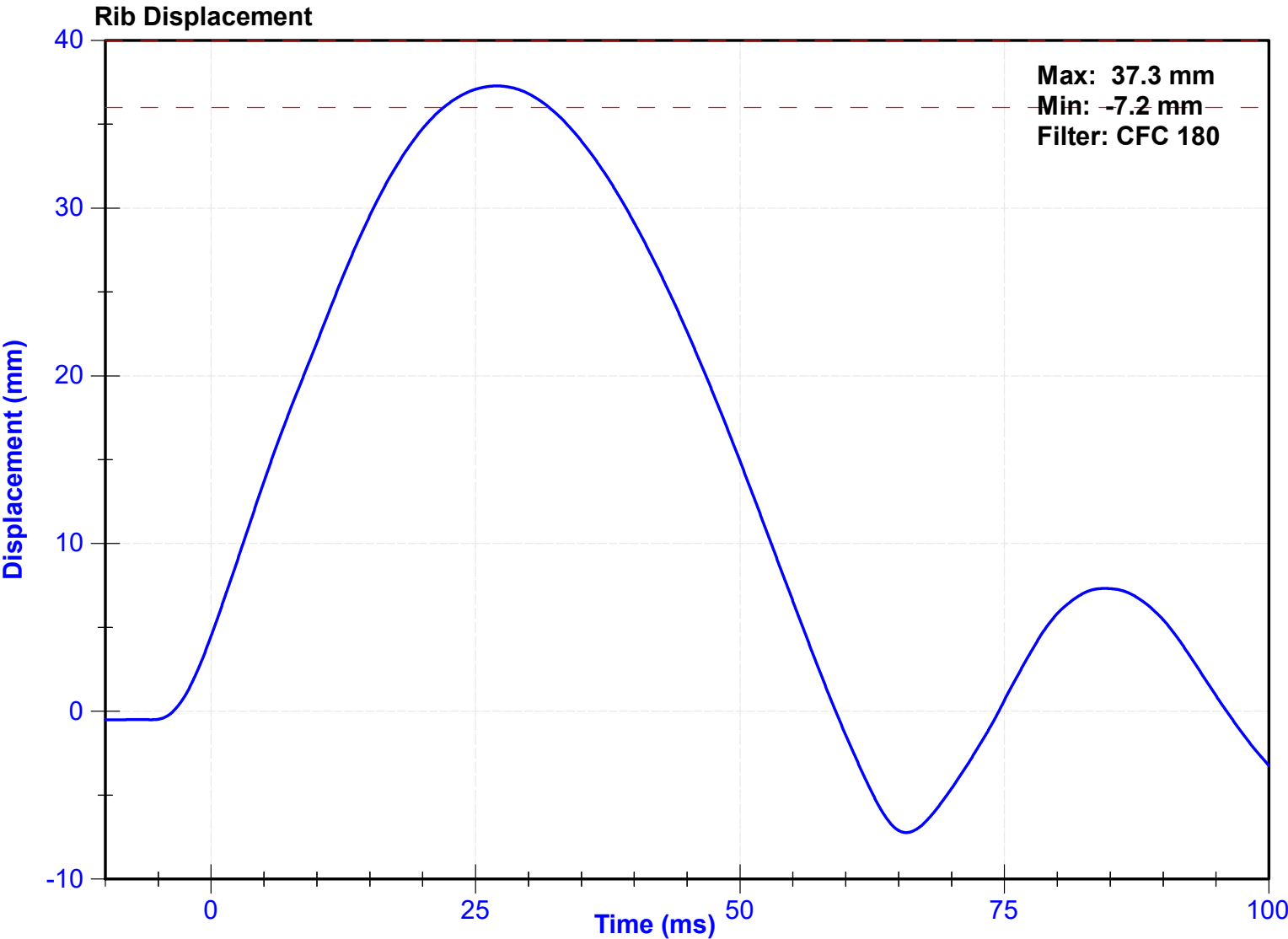
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	28	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. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

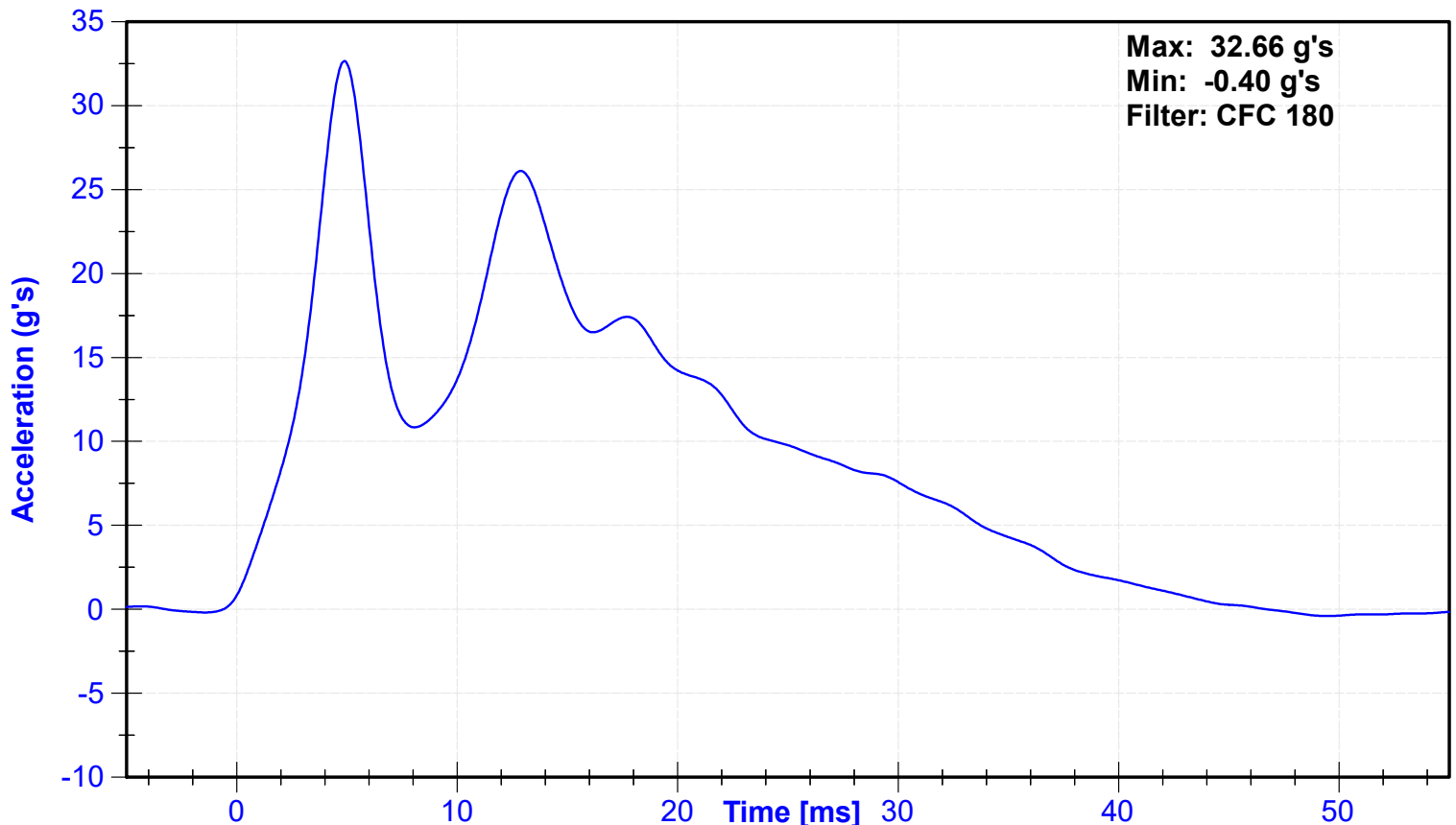
Results

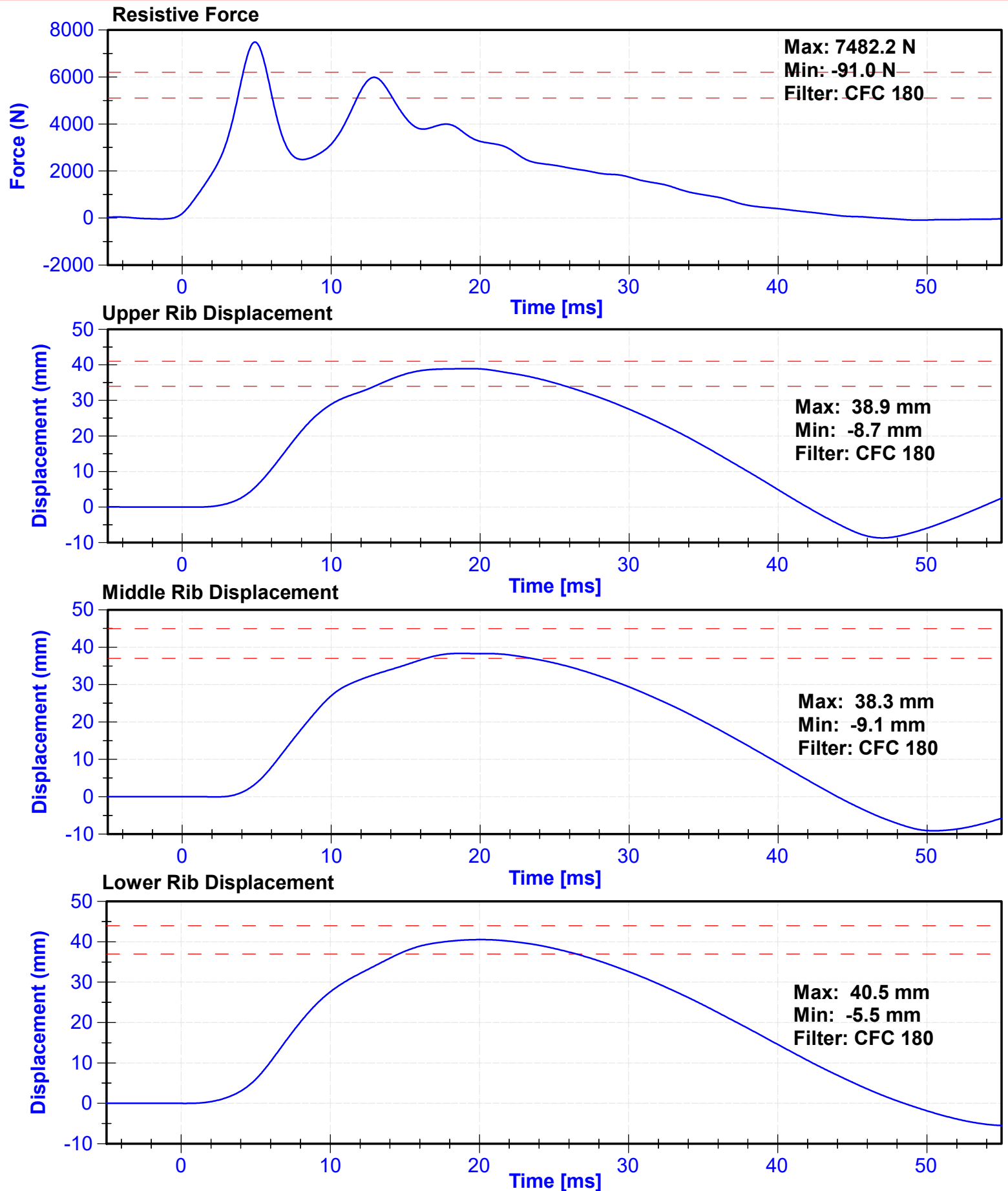
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	25	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	5983.4	Pass
Upper Thorax Rib Deflection	34	41	mm	38.9	Pass
Mid Thorax Rib Deflection	37	45	mm	38.3	Pass
Lower Thorax Rib Deflection	37	44	mm	40.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18619	9/29/2023	3/27/2024
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





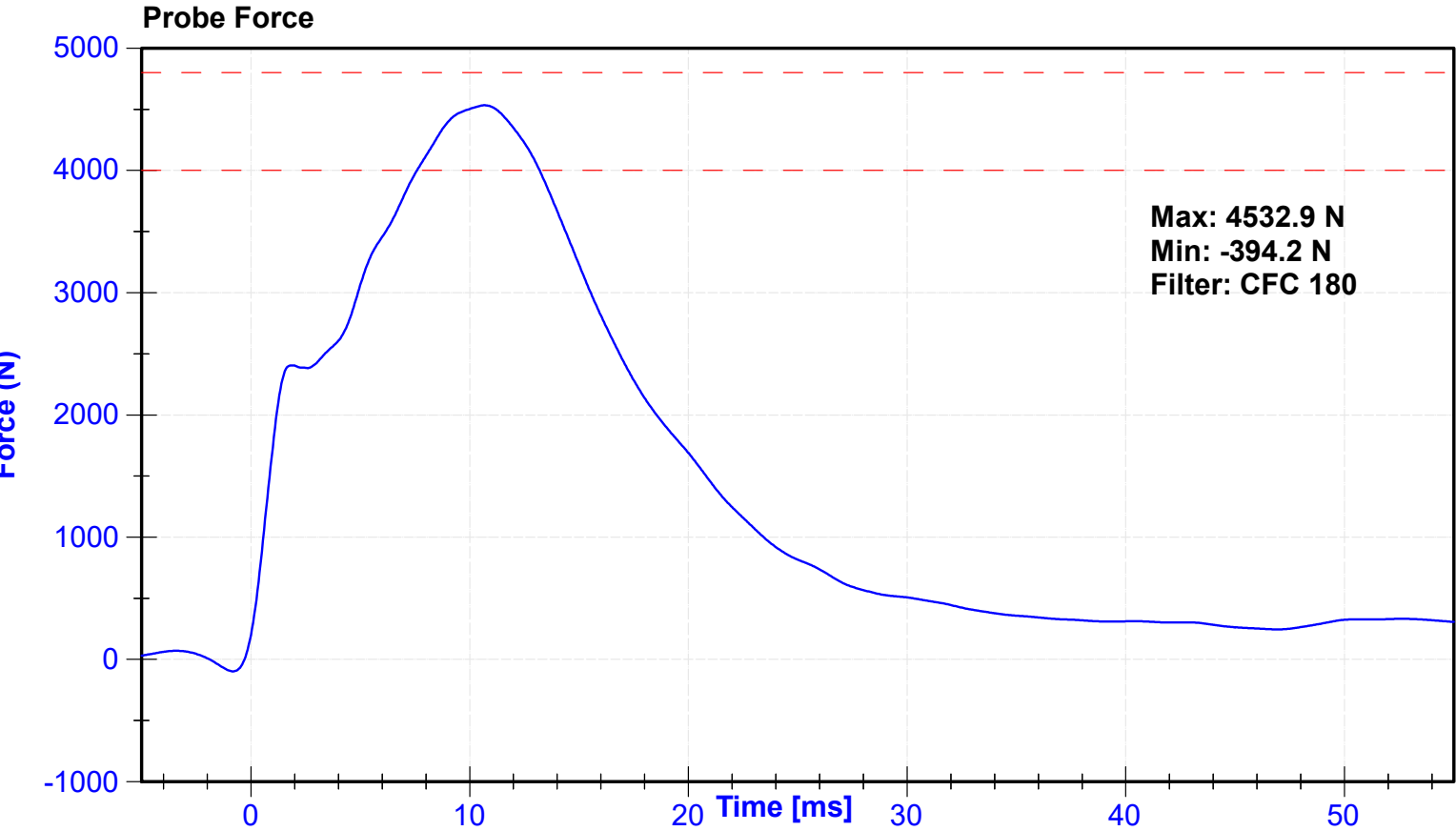
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

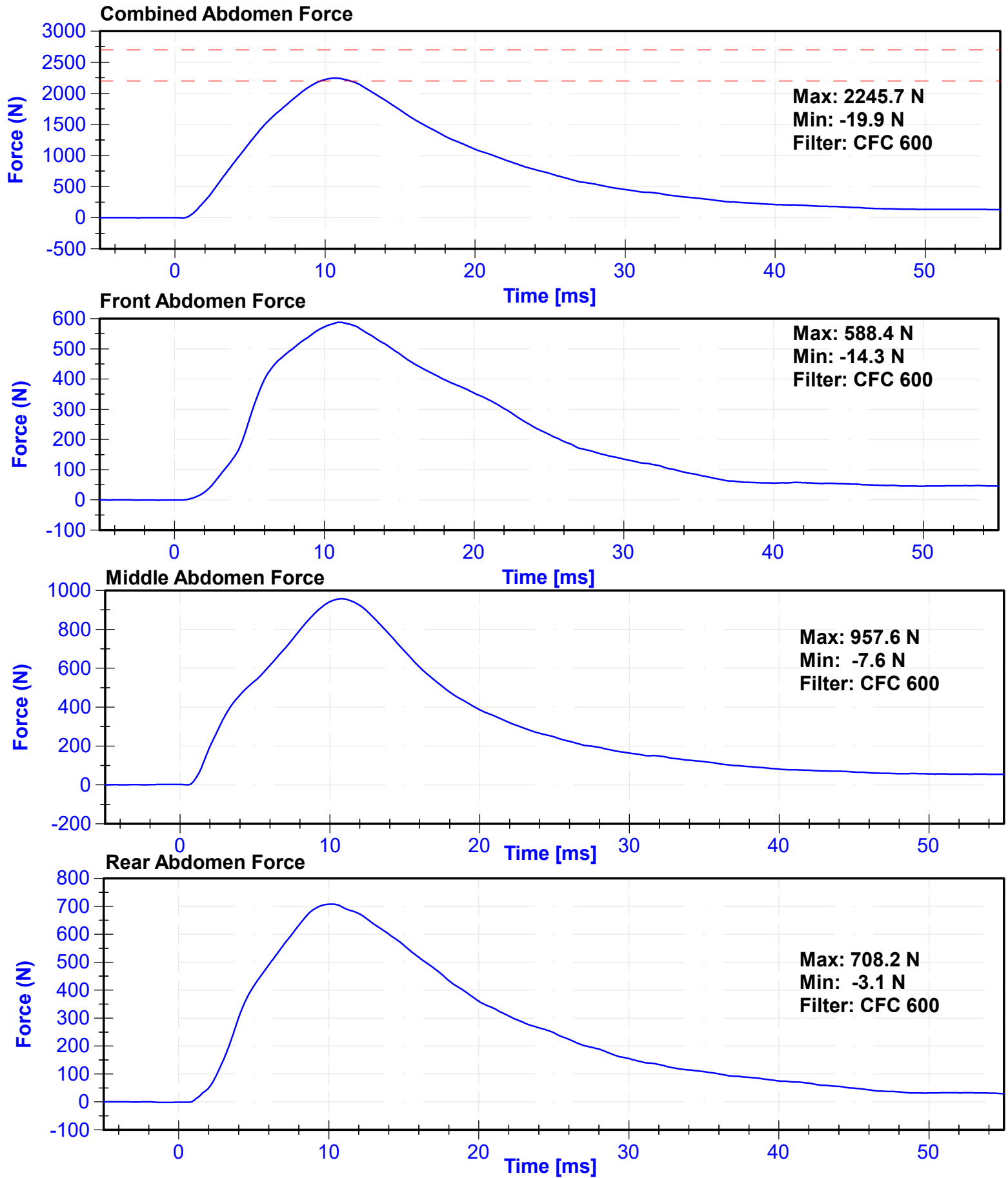
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	25	Pass
Velocity	3.9	4.1	m/s	4.03	Pass
Combined Abdomen Force	2200	2700	N	2245.7	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.65	Pass
Resistive Probe Force	4000	4800	N	4532.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.70	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
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





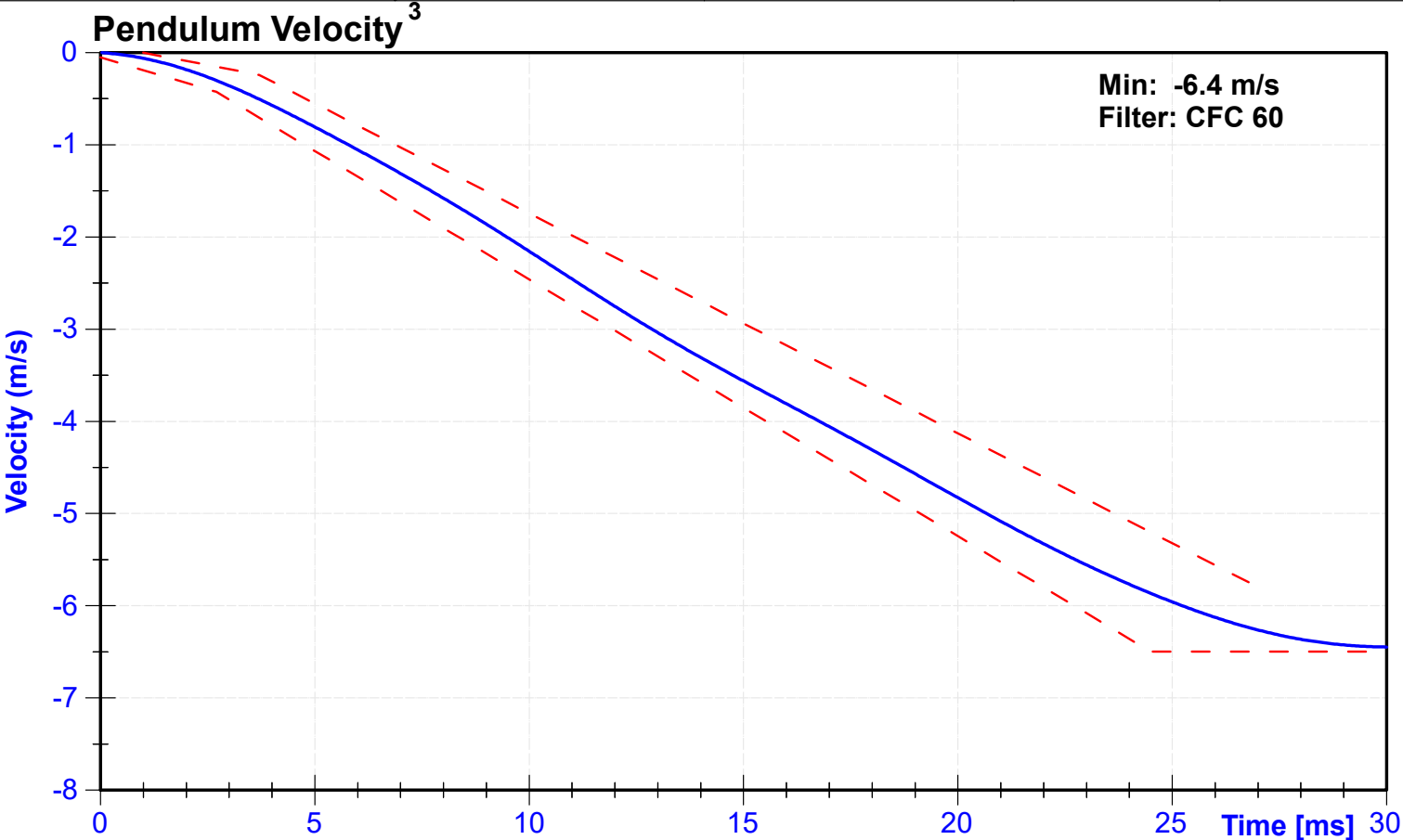
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

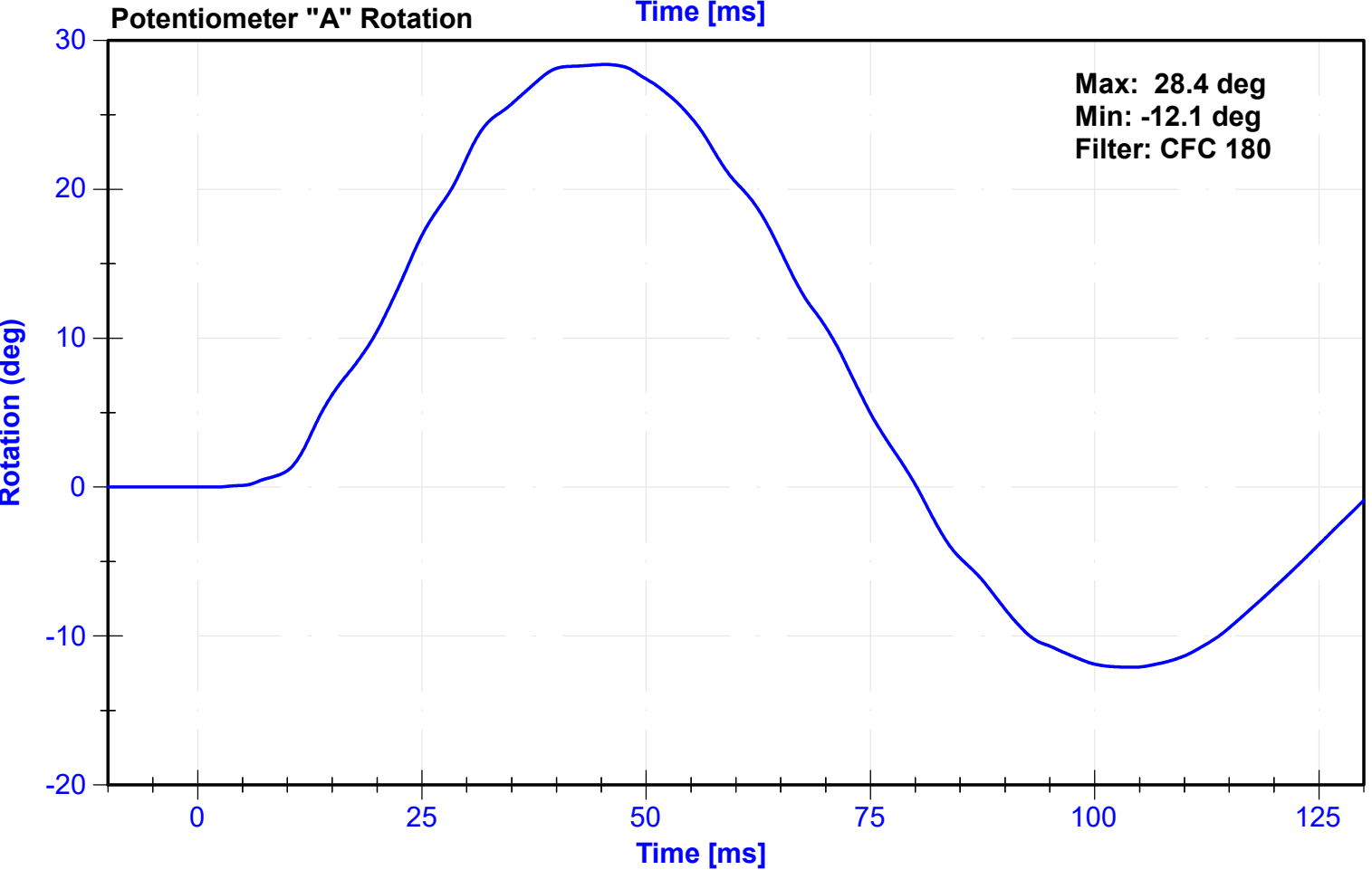
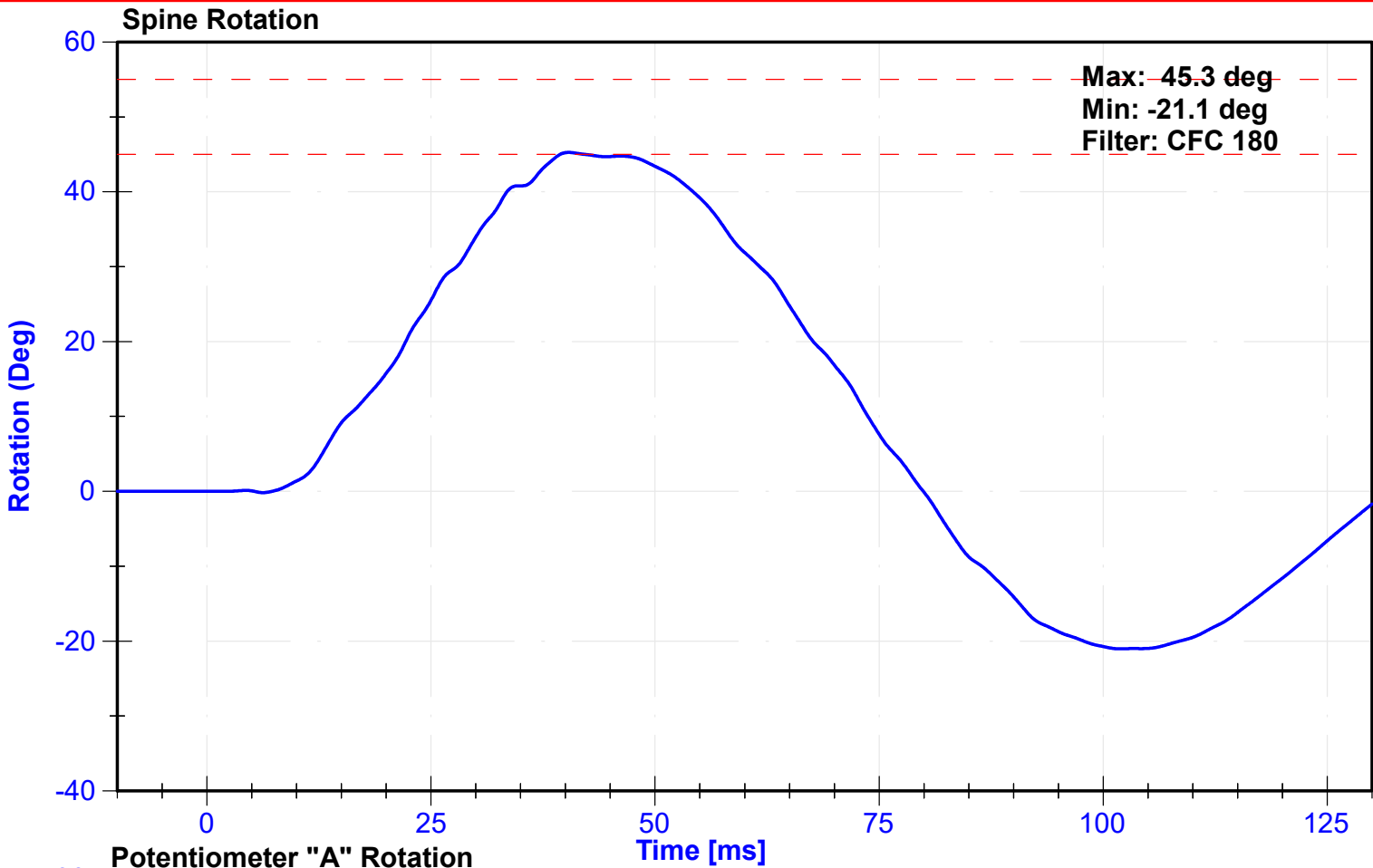
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	29	Pass
Velocity	5.95	6.15	m/s	6.013	Pass
Lateral Spine Rotation	45	55	deg	45.3	Pass
Time at Maximum Rotation	39	53	ms	40.3	Pass
Time of Decay to Zero Degrees	37	57	ms	39.6	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

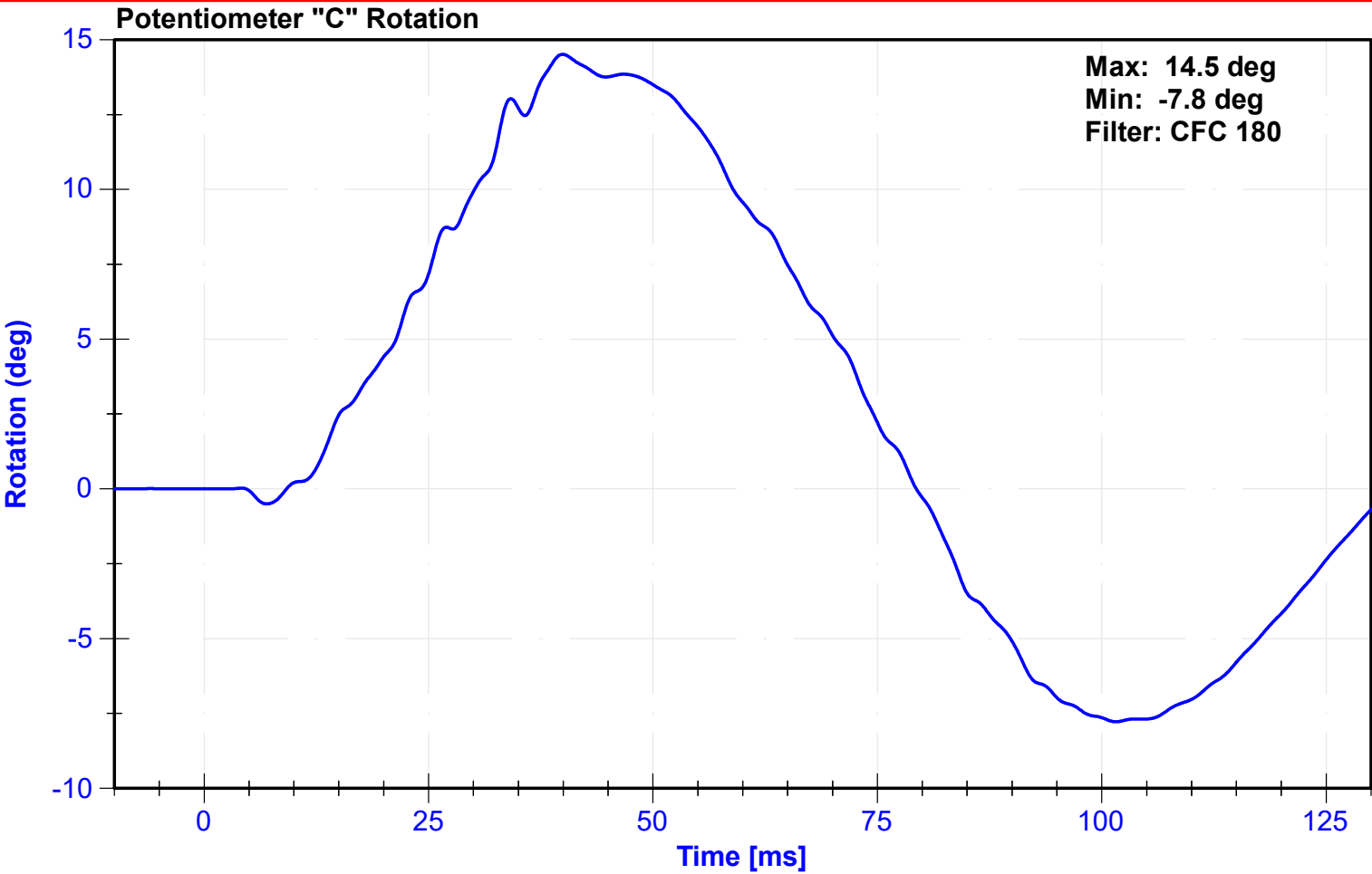
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Pendulum "A" Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Condyle "B" Potentiometer	Sfernice	095	9/29/2023	9/28/2024



^{1,2} Upper and lower boundaries specified in Appendix I
IV-42





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. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

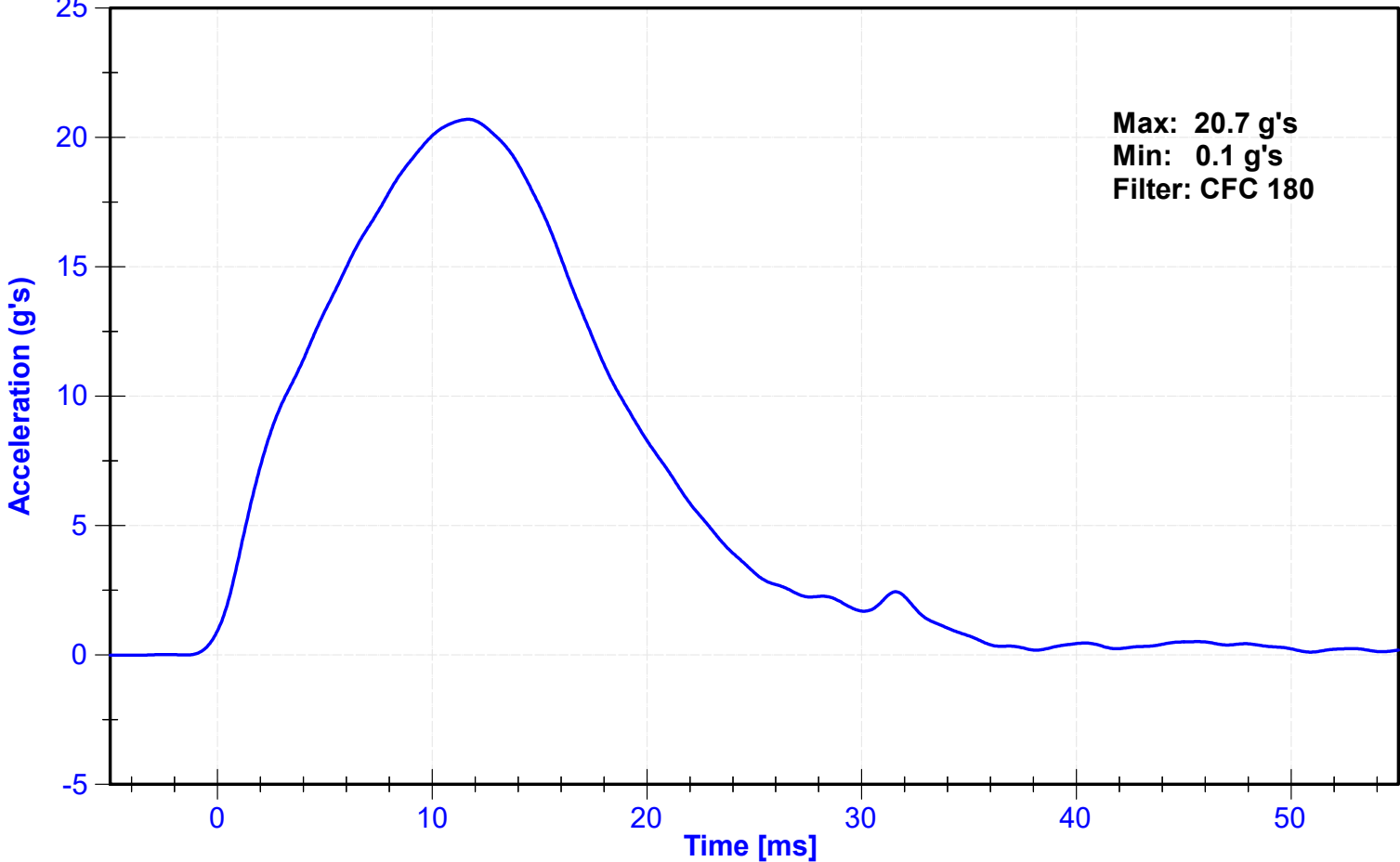
Results

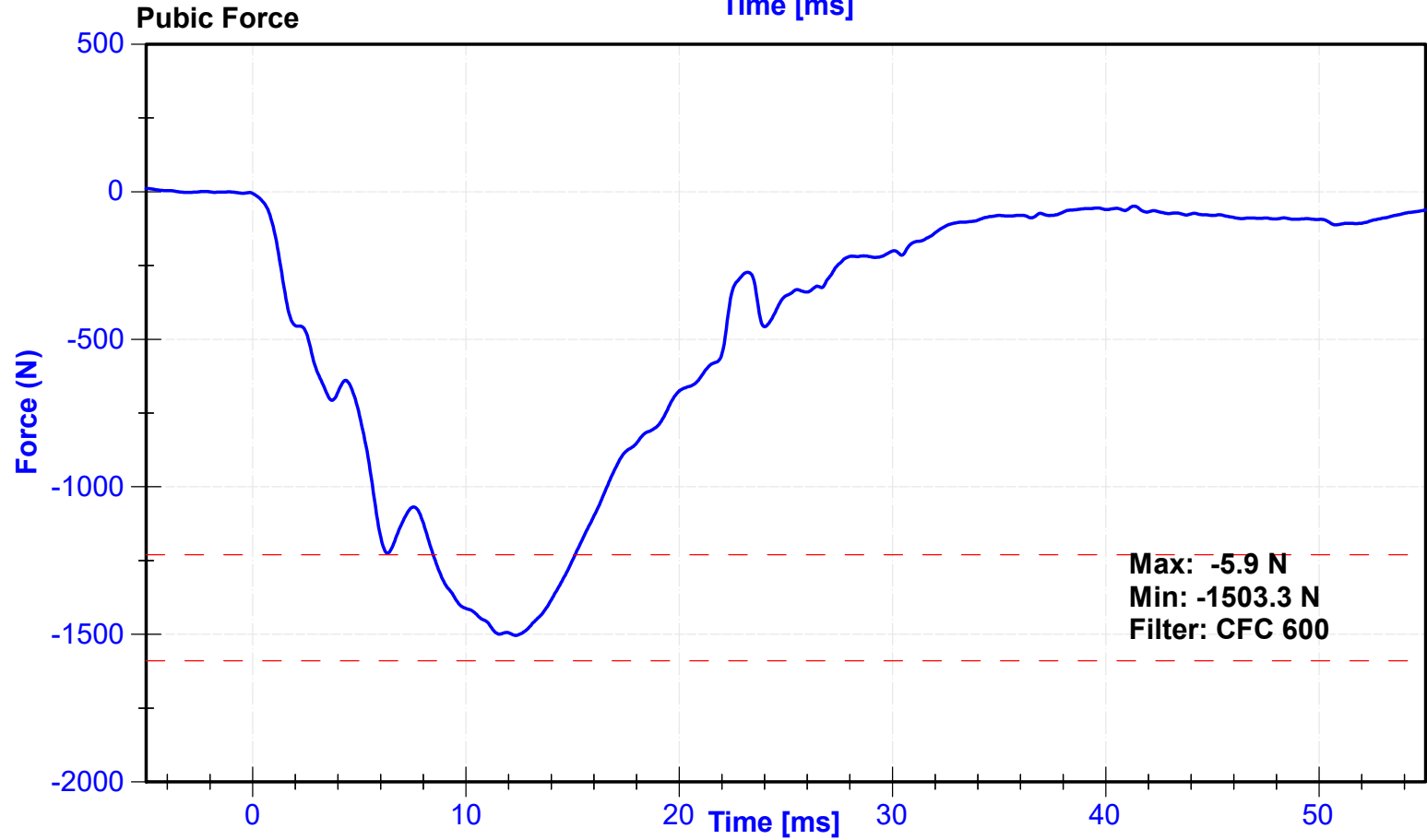
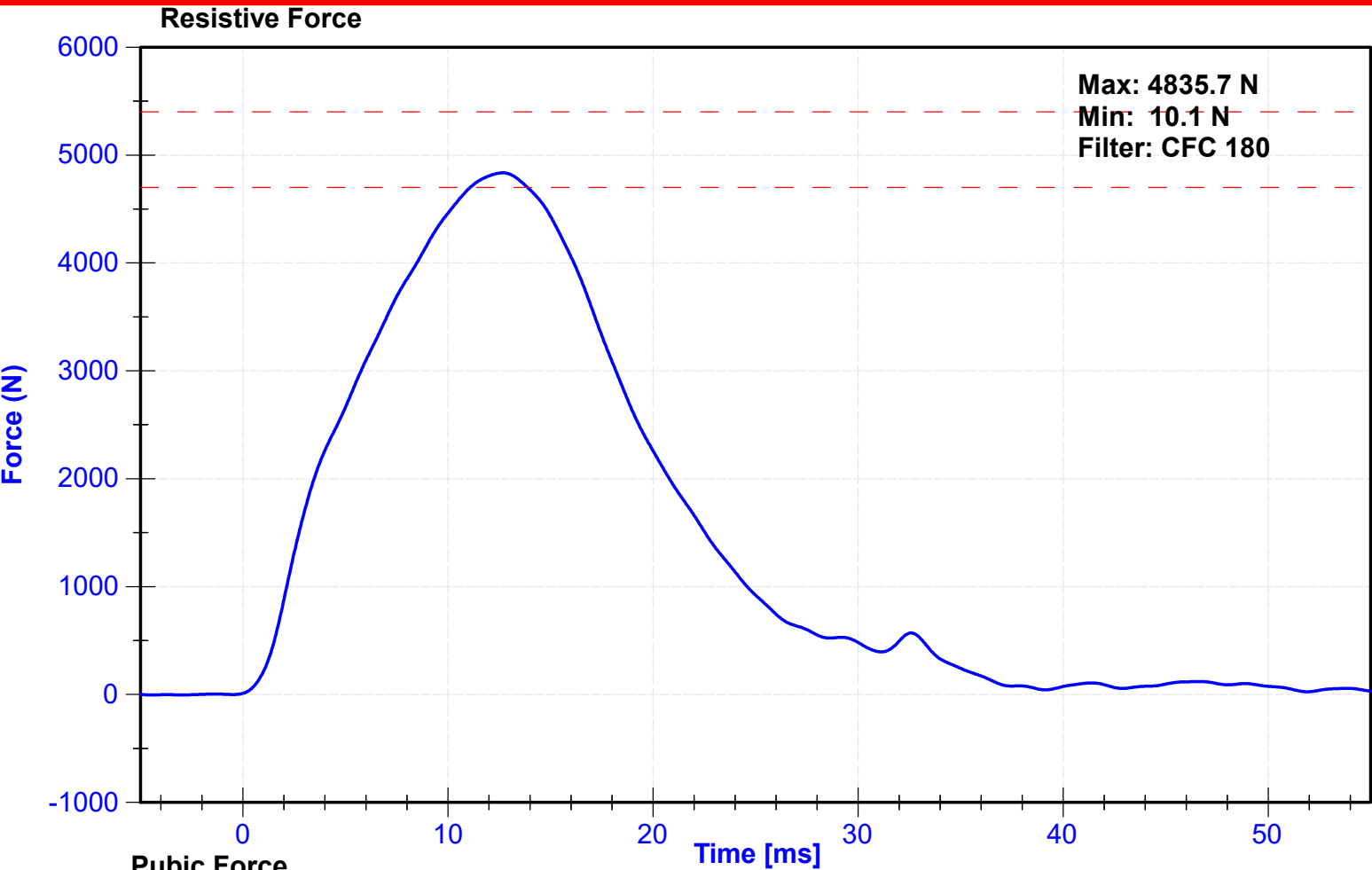
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Resistive Force	4700	5400	N	4835.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.65	Pass
Pubic Force	-1590	-1230	N	-1503.3	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.35	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18619	9/29/2023	3/27/2024
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024

Probe Acceleration





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	0552-03	Honeywell	08/07/2023
	Middle	Y	807	Honeywell	08/07/2023
	Lower	Y	0552-01	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	18618	Endevco	08/10/2023
		Z	18617	Endevco	08/10/2023
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	A250357	Measurement Specialties	09/26/2023
Vehicle Center of Gravity	Y	A274255	Measurement Specialties	09/26/2023
Vehicle Center of Gravity	Z	A405571	Measurement Specialties	10/06/2023
Left Floor Sill	Y	A405534	Measurement Specialties	12/08/2023
A-Pillar Sill	Y	A372822	Measurement Specialties	10/04/2023
A-Pillar Low	Y	A399942	Measurement Specialties	09/16/2023
A-Pillar Mid	Y	A398302	Measurement Specialties	09/23/2023
B-Pillar Sill	Y	A428004	Measurement Specialties	10/12/2023
B-Pillar Low	Y	G22610	Endevco	10/05/2023
B-Pillar Mid	Y	A352366	Measurement Specialties	12/08/2023
Driver Seat	Y	G23655	Endevco	12/08/2023
Engine Top	X	G22735	Endevco	10/10/2023
Engine Top	Y	G22761	Endevco	10/10/2023
Firewall	Y	A290945	Measurement Specialties	12/08/2023
Right Roof	Y	G23670	Endevco	09/26/2023
Right Floor Sill	Y	A315839	Measurement Specialties	08/15/2023
Rear Floorpan	X	A280861	Measurement Specialties	10/14/2023
Rear Floorpan	Y	A315810	Measurement Specialties	10/14/2023