

REPORT NUMBER: 214D-CAL-24-009

**SAFETY COMPLIANCE TESTING FOR FMVSS 214
SIDE IMPACT PROTECTION**

**Mitsubishi Motors Corporation
2024 Mitsubishi Outlander PHEV
5 Door SUV**

NHTSA No: C20245601

**PREPARED BY:
CALSPAN CORPORATION
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November 5, 2024

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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WEST Bldg. (NEF-240)
WASHINGTON, D.C. 20590**

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Date: November 5, 2024

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Date: November 5, 2024

FINAL REPORT ACCEPTANCE BY OVSC:

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Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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15. Supplementary Notes

16. Abstract
A 48/24 kph 90° Impact (Moving Deformable Barrier) Compliance Tests was conducted on the subject 2024 Mitsubishi Outlander PHEV 5 Door SUV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-214D-09 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 October 15, 2024.

The impact velocity of the Moving Deformable Barrier (MDB) was 53.06 kph, and the ambient temperature at the struck side (driver side) of the target vehicle at the time of impact was 21°C. The target vehicle post test maximum crush was 183 mm at level 3. The test vehicle's occupant performance is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	69.762
Maximum Rib Deflection	mm	44	16.448
Sum of Abdominal Forces	N	2500	351.535
Pubic Symphysis Force	N	6000	967.045

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	77.884
Lower Spine Resultant Acceleration	G	82	18.099
Sum of Acetabular and iliac forces	N	5525	984.538

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

17. Key Words Compliance Testing Side Impact Protection MDB 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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SECTION 1 PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test was conducted as part of the MY 2024 214 Side Impact Protection Compliance Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ923D000043. The purpose of this test was to evaluate side impact protection in a 2024 Mitsubishi Outlander PHEV 5 Door SUV. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure, TP-214D-09 dated September 2012.

SUMMARY

A 2024 Mitsubishi Outlander PHEV 5 Door SUV was impacted on the left side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 53.06 kph. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation's Transportation Test Operations Center in Buffalo, New York on October 15, 2024. Pre-test and post test photographs of the test vehicle, the MDB and test dummies are included in this report.

Test dummies were placed in both the driver and left rear designated seating positions according to instructions specified in the OVSC Test Procedure data September 2012. The side impact event was documented by 9 high speed cameras and two real time cameras. Camera locations and other pertinent camera information are included in this report.

The ES2re male dummy was instrumented with triaxial accelerometer packs located in the head, three rib displacement transducers located in the chest, three load cells located in the abdomen and a load cell located in the pubic symphysis.

The SID-1Is female dummy was instrumented with triaxial accelerometer packs located in the head and the spine and load cells located in the pubic symphysis and acetabulum. A summary of each dummy's configuration and performance verification test data has been included in this report along with the dummy response traces.

Injury readings for the dummies were recorded as follows:

INJURY READINGS

ES-2re Injury Criteria	Units	Max. Allowable IARV	Measured Value	Pass/Fail
HIC		1000	69.762	Pass
Upper Rib Deflection	mm	44	5.197	Pass
Mid Rib Deflection	mm		10.057	Pass
Lower Rib Deflection	mm		16.448	Pass
Abdominal Load (front)	N		75.120	
Abdominal Load (mid)	N		120.360	
Abdominal Load (rear)	N		225.693	
Total Abdomen Force	N	2500	351.535	Pass
Pubic Symphysis Force	N	6000	148.738	Pass

SID-IIs Injury Criteria	Units	Max. Allowable IARV	Measured Value	Pass/Fail
HIC		1000	77.884	Pass
Lower Spine Resultant Acceleration	g	82	18.099	Pass
Acetabular Force	N		939.614	
Iliac Force	N		112.109	
Sum of Acetabular & Iliac	N	5525	984.538	Pass

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: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

TEST VEHICLE INFORMATION AND OPTIONS

Make	Mitsubishi	Anti-Lock Brakes (ABS)	Yes
Model	Outlander PHEV	All-Wheel Drive (AWD)	Yes
Body Style	SUV	Traction Control System (TCS)	Yes
VIN	JA4T5UA98RZ0667	Electric Stability Control (ECS)	Yes
Body Color	Labrador Black Pearl	Side Curtain Airbags	Yes
Engine Displacement (L)	2.4	Torso Airbags – Front Seats	Yes
Type/No. Cylinders	I4	Torso Airbags – Rear Seats	Yes
Engine Placement	Transverse	Combination/Head Torso Bag	No
Transmission Type	Automatic	Pelvic Airbag – Front Seats	No
Transmission Speeds	Single Speed	Pelvis Airbag – Rear Seats	No
Overdrive	N/A	Knee Airbag – Driver	Yes
Final Drive	All Wheel Drive	Knee Airbag – Front Passenger	Yes
Odometer Reading (km/mi)	9 Mi	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	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Mitsubishi Motors Corporation	GVWR (kg)	2750
Date of Manufacture	APR 2024	GAWR Front (kg)	1385
Vehicle Type	MPV	GAWR Rear (kg)	1495

VEHICLE SEATING AND CAPACITY WEIGHT DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bench	Split Bench	Bench	
Designated Seating Capacity (DSC)	2	3	2	7
Capacity Weight (VCW) (kg)				525

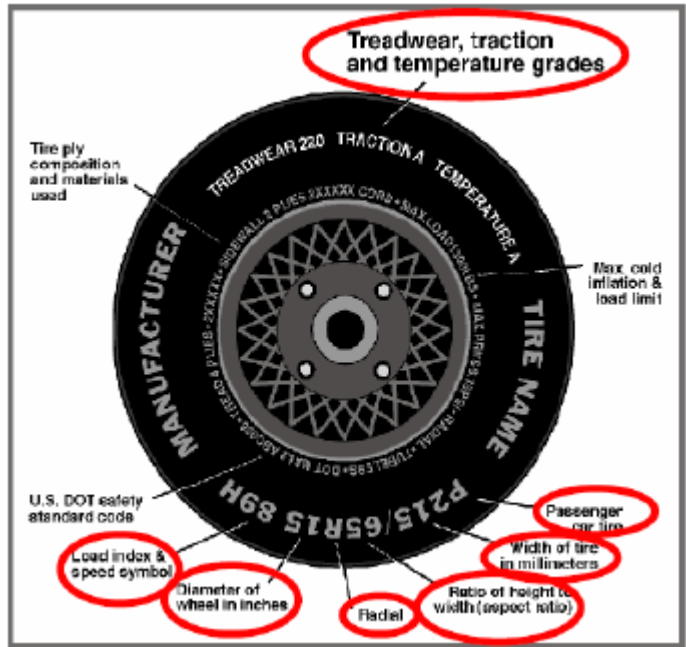
DATA SHEET NO. 2 VEHICLE TIRE INFORMATION

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

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)	260	260
Recommended Tire Size	P235/60R18	P235/60R18
Tire Sidewall	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Tire Size on Vehicle	P235/60R18	P235/60R18
Tire Manufacturer Model	Falken	Falken
Tire Name	ZIEX 2E001A	ZIEX 2E001A
Tire Type	All Season	All Season
Tire Width	235	235
Aspect Ratio	60	60
Radial	Yes	Yes
Wheel Diameter	18"	18"
Load Index/Speed Symbol	102H	102H
Treadwear	360	360
Traction Grade	A	A
Temperature Grade	A	A

**DATA SHEET NO. 3
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	231	238	240	265
As Tested	kPa	260	260	260	260

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	565	501		612	577		624	553	
Right	kg	569	481		573	532		594	518	
Ratio	%	53.6	46.4		51.7	48.3		53.2	46.8	
Totals	kg	1134	982	2116	1185	1109	2294	1218	1071	2289

TEST VEHICLE TARGET WEIGHT (TVTW) CALCULATION

Measured Parameter	Units	Value	
As Delivered Weight (UVW)	kg	2116	(A)
Weight of 2 P572 ATDs	kg	131	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	48.72	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2295.72	(A+B+C)

TEST VEHICLE ATTITUDES AND CG

Wheel Opening Location	Distance (grd to ref. point above wheel opening in mm)		Difference (mm)	Meets Requirement**
	Fully Loaded	As Tested		
Left Front	856	846	10	Yes
Right Front	862	852	10	Yes
Left Rear	872	864	8	Yes
Right Rear	881	871	10	Yes

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

CALCULATION OF VERTICAL IMPACT REFERENCE LINE

Measured Parameter	Units	Distance (mm)	Met Requirement
Test Vehicle Wheelbase	mm	2703	
Target Vertical Impact Reference Line Aft of Front Axle	mm	412	
Actual Impact Point Location (fore-aft, above - below)		0 / -13	Yes

Note: Fore or above the target impact point is positive (+). Aft or below the target impact point is negative (-)

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting & Trim	10
Jack & Tool Kit	7
Ballast (if any)	20.4

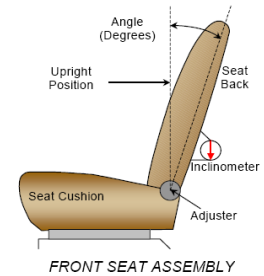
DATA SHEET NO. 3 (Continued)
SEAT AND SEAT BELT ANCHORAGE ADJUSTMENT DATA

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

SEAT BACK ANGLE ADJUSTMENT

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



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	64.5	33 (0-32)	7.2	9
Passenger w/Seated Dummy	71.5	39 (0-38)	5.8	9
Rear Seat	20.7	12 (0-11)	20.2	1

SEAT POSITIONING

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

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCR P Height Position	SCR P Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	16.5	36	Max	-	-	-
			Mid	-	-	-
			Min	27	36	45
Front Passenger Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	321	27 (0-26)	171	13
Front Passenger Seat	257	27 (0-26)	128.5	13
Rear Seat	220	23 (0-22)	220	22

SEAT BELT ANCHORAGE ADJUSTMENT

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

HEAD RESTRAINT ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	5 (0-4)	Uppermost

DATA SHEET NO. 4
FUEL SYSTEMS AND STEERING WHEEL POSITION DATA

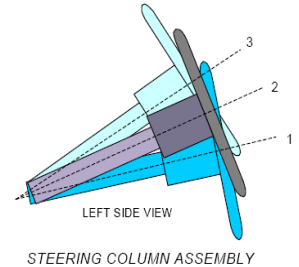
Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

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 Test Date: 10/15/2024

STEERING COLUMN ADJUSTMENT

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

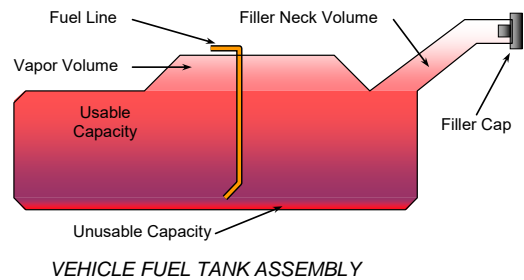
	Degrees	Fore / Aft Position (mm)
Lowermost – Position 1	22.4	
Geometric Center – Position 2	25.1	
Uppermost – Position 3	27.7	
Telescoping Steering Wheel Travel		60
Test Position	25.1	30



FUEL PUMP

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

The vehicle is equipped with an electric fuel pump.
The fuel filler neck is on the 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. The charging port is on the right rear of the vehicle.



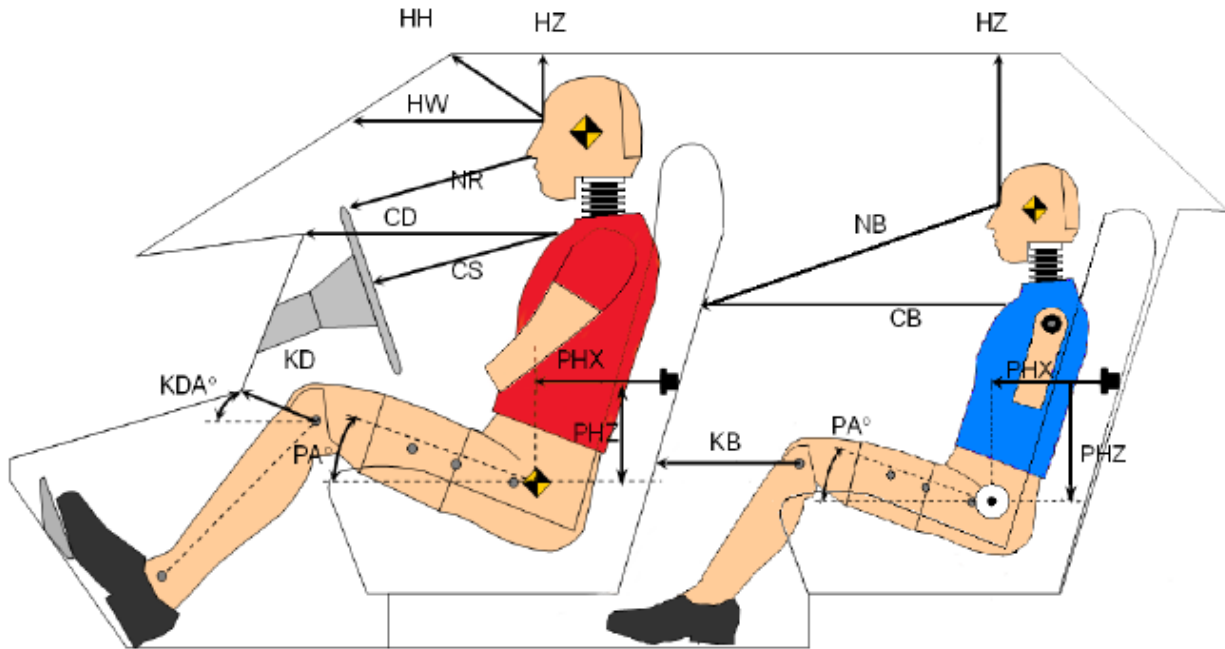
FUEL TANK CAPACITY DATA

Description	Liters
Usable Capacity - see Form No. 1	56.0
Usable Capacity - see Owner's Manual	56.0
92-94% of Usable Capacity	51.52 – 52.64
Actual Amount of Solvent Used in Test	52.08

**DATA SHEET NO. 5
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



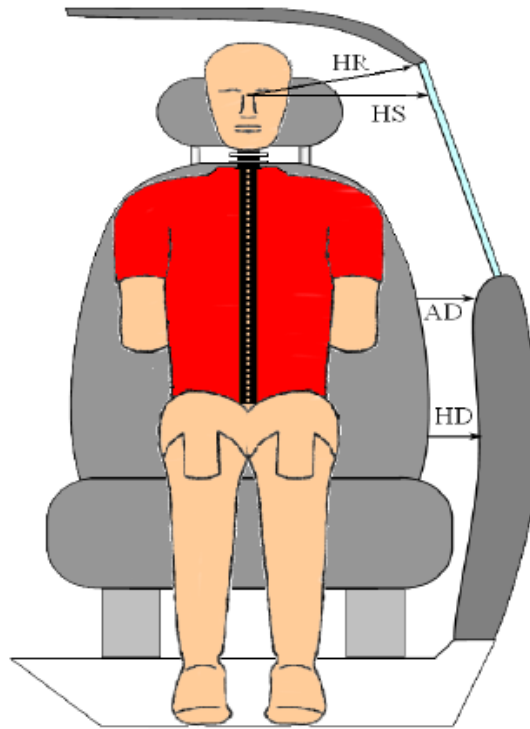
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	ES2-re		SID-IIs	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	427			
HW		Header to Windshield	703			
HZ	HZ	Head to Roof Liner	185		297	
NR	NB	Nose to Rim/Seat Back	460		560	
CD	CB	Chest to Dash/Seat Back	567		550	
CS		Chest to Steering Wheel	355			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	171	18.6	330	13.35
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	139	19.4	325	15.0
PAX°	PAX°	Pelvic Tilt Angle (X-Axis)		24.2		18.1
PAY°	PAY°	Pelvic Tilt Angle (Y-Axis)				0.3
PHX	PHX	Hip Point to Striker (X-Axis)	242		250	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	237		266	

**DATA SHEET NO. 6
DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



FRONT VIEW OF DUMMY

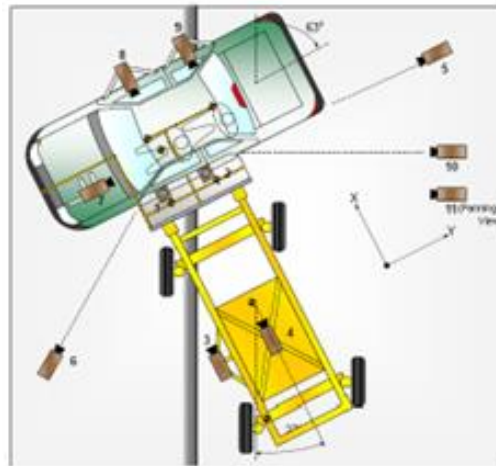
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Front Occupant	Rear Occupant
HR	Head To Side Header	mm	209	261
HS	Head to Side Window	mm	344	300
AD	Arm to Door	mm	90	142
HD	Hip Point to Door	mm	133	150

**DATA SHEET NO. 7
LOCATION OF CAMERAS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



CAMERA LOCATIONS AND DATA

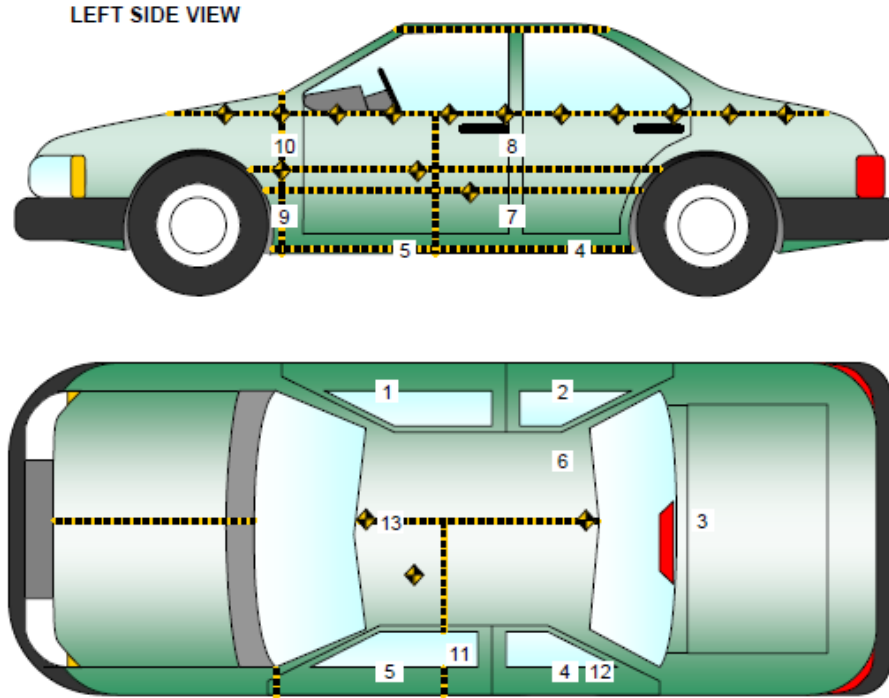
No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	334	-9220	25	1000
2	Overhead Close-up	0	0	-9220	12.5	1000
3	Impact Point Close-up				25	1000
4	Centerline of Impact (MDB)				8	1000
5	Right Side View	490	7845	-1516	28	1000
6	Left Side View	-2674	-5929	-1441	24	1000
7	Front Seat Occupant-Frontal View (OB)				25	1000
8	Front Seat Occupant-Side View (OB)				12.5	1000
9	Rear Passenger-Side View (OB)				12.5	1000
10	Real-time Coverage				Zoom	60

Notes: Reference: Impact Point projected to Ground
 +X = To Front of MDB, +Y = To Right of MDB, +Z = Down

**DATA SHEET NO. 8
TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Left (or Rt.) Sill at Front Seat	2866	643	232
2	Left (or Rt.) Sill at Rear Seat	1988	636	236
3	Rear Floorpan Above Axle	1187	196	69
4	Left (or Rt.) Sill at Rear Door	1954	-624	274
5	Left (or Rt.) Sill at Front Door	2984	-633	259
6	Left (or Rt.) Rear Occ. Compartment	2149	395	310
7	Left (or Rt.) B-Post Lower	2186	-685	88
8	Left (or Rt.) B-Post Middle	2132	-668	-430
9	Left (or Rt.) A-Post Lower	3282	-605	48
10	Left (or Rt.) A-Post Middle	3171	-651	-477
11	Front Seat Track	2369	-542	249
12	Rear Seat Track or Structure	1772	-561	157
13	Vehicle CG	1937	-29	259

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

DATA SHEET NO. 9
TEST VEHICLE ACCELEROMETER DATA SUMMARY

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

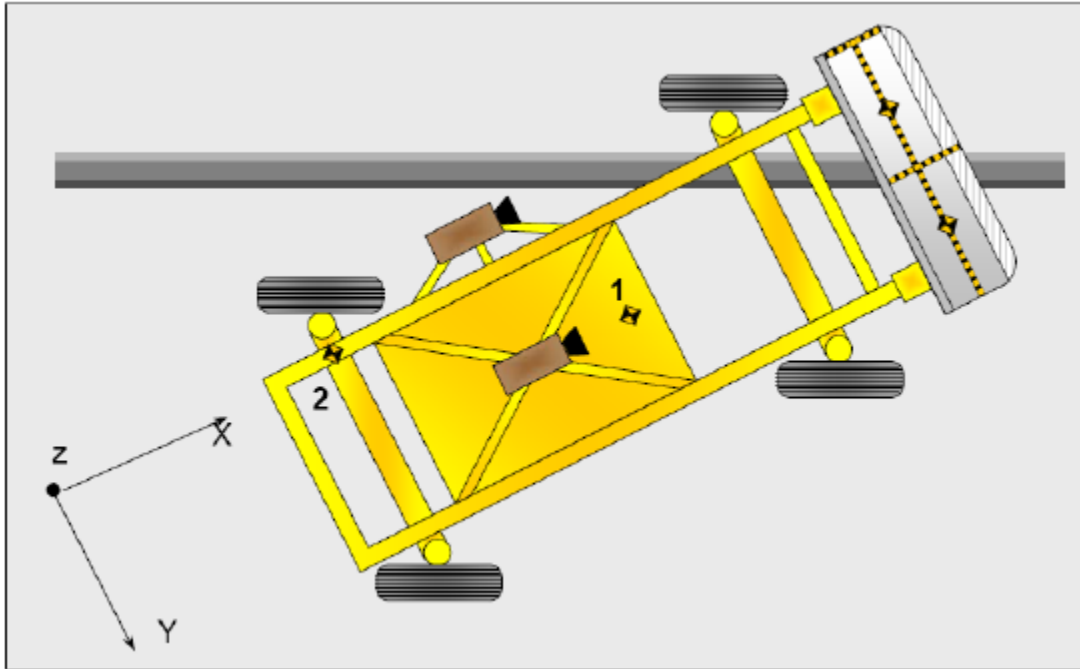
NHTSA No.: C20245601
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Loc No.	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Max	Time (ms)
1	Left (or Rt.) Sill at Front Seat	X	g	14.95	23.75	-15.99	18.65
		Y	g	20.64	27.25	-2.78	32.30
		Z	g	10.84	37.85	-19.56	43.40
		Resultant		25.02	42.55	0.01	-30.95
2	Left (or Rt.) Sill at Rear Seat	X	g	15.17	22.00	-16.44	17.60
		Y	g	22.94	27.55	-7.54	21.35
		Z	g	14.85	27.55	-29.04	21.80
		Resultant		33.41	21.80	0.01	-31.90
3	Rear Floorpan Above Axle	X	g	2.15	78.25	-4.82	19.75
		Y	g	18.86	7.30	-2.37	102.85
		Z	g	6.76	36.75	-4.54	22.90
		Resultant		19.01	7.20	0.02	-25.15
4	Left (or Rt.) Sill at Rear Door	Y	g	40.93	6.30	-17.14	11.80
5	Left (or Rt.) Sill at Front Door	Y	g	43.75	5.65	-40.38	12.50
6	Left (or Rt.) Rear Occ. Compartment	Y	g	18.79	9.45	-2.33	125.75
7	Left (or Rt.) B-Post Lower	Y	g	127.03	14.50	-89.66	17.75
8	Left (or Rt.) B-Post Middle	Y	g	107.27	8.80	-99.02	25.05
9	Left (or Rt.) A-Post Lower	Y	g	65.33	38.65	-47.93	33.30
10	Left (or Rt.) A-Post Middle	Y	g	39.19	22.30	-24.99	25.55
11	Front Seat Track	Y	g	18.68	9.75	-1.92	125.75
12	Rear Seat Track or Structure	Y	g	29.69	9.05	-1.77	102.35
13	Vehicle CG	X	g	2.73	14.40	-8.50	10.15
		Y	g	19.32	5.45	-2.25	98.85
		Z	g	16.75	42.55	-15.31	37.95
		Resultant		21.83	37.95	0.03	-12.75

DATA SHEET NO. 10
MDB ACCELEROMETER LOCATION DATA SUMMARY

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



Loc No.	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Max	Time (ms)
1	MDB CG	X	g	1.08	121.95	-22.16	32.80
		Y	g	1.15	58.80	-7.58	22.55
		Z	g	20.72	54.45	-8.72	26.30
		Resultant		24.63	34.45	0.03	-27.30
2	MDB Rear	X	g	2.64	88.75	-25.21	25.70
		Y	g	2.80	23.75	-4.22	58.30

**DATA SHEET NO. 11
MDB SUMMARY OF RESULTS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

MDB SPECIFICATIONS

Measurement Description	Requirement	Value
Overall Width of Framework Carriage	1241 – 1261	1,250
Overall Length Including Honeycomb Frame	4140 – 3990	4,120
Wheelbase of Framework Carriage	2566 – 2616	2,600
CG Location Aft of Front Axle		1,120
MDB Front Axle Weight		764
MDB Rear Axle Weight		594
MDB Total Weight	1356.5 – 1365.5	1358

SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	52.1 to 53.7	53.06
Trap No. 2 Velocity (Redundant)	km/h	52.1 to 53.7	53.18
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	223
B	Top of Bumper	533	800	Right	141
C	Mid-Level	686	800	Left	84
D	Top of Stack	813	800	Left	127

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	0
Vertical Offset (- down / + up)	mm	+/- 20 of Intended Impact Point	-13

DATA SHEET NO. 12
DUMMY INJURY RESPONSE DATA
(Subpart U, ES-2re)

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

Dummy Serial No. D037

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	3.95	154.75	-11.12	32.80
Lateral	Y	23.93	61.15	-8.29	34.55
Vertical	Z	9.26	15.05	-9.71	73.30
Resultant	N/A	26.96	63.90		
HIC36 (t1, t2)	N/A	69.76		t1 = 44.80	t2 = 80.80
THORAX DEFLECTION (mm)					
Upper Rib	Y	5.20	53.95	-9.22	20.40
Middle Rib	Y	10.06	64.00	-5.28	22.65
Lower Rib	Y	16.45	60.50	-0.01	287.10
ABDOMINAL FORCES (N)					
Front	Y	75.12	41.15	-29.95	14.95
Middle	Y	120.36	41.25	-9.72	100.35
Rear	Y	225.69	53.30	-8.18	116.00
SUM	N/A	351.54	41.40		
PELVIS FORCES (N)					
Pubic Symphysis	Y	148.74	64.25	-967.05	48.15

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

**DATA SHEET NO. 14
POST-TEST OBSERVATIONS**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Occupant	Rear Occupant
Head Contact	Curtain Airbag, Center Airbag, Headrest & Headliner	Curtain Airbag & Headrest
Upper Torso Contact	Seatback & Torso/Pelvis Airbag	Seatback & Torso/Pelvis Airbag
Lower Torso Contact	Seatback & Torso/Pelvis Airbag	Seatback & Torso/Pelvis Airbag
Left Knee Contact	Driver Door Trim	Passenger Door Trim
Right Knee Contact	Left Knee	Left Knee

POST-TEST DOOR PERFORMANCE

Description	Front	Rear
Left Side Doors	Jammed Shut	Jammed Shut
Right Side Doors	Closed & Operational	Closed & Operational
Hatch and Other Doors		Closed & Operational
Seat Movement	None	None
Seatback Failure	None	None

*Note: Description for door opening must be specific with the following three categories: Remained closed and operational, opened/unlatched during the crash, or jammed shut. Sometimes the door is jammed and unlatched. If the door cannot be opened, then note the door as jammed shut. If open, measurement must be taken for the width of the door opening (mm).

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	B-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	None
Other Notable Effects	None

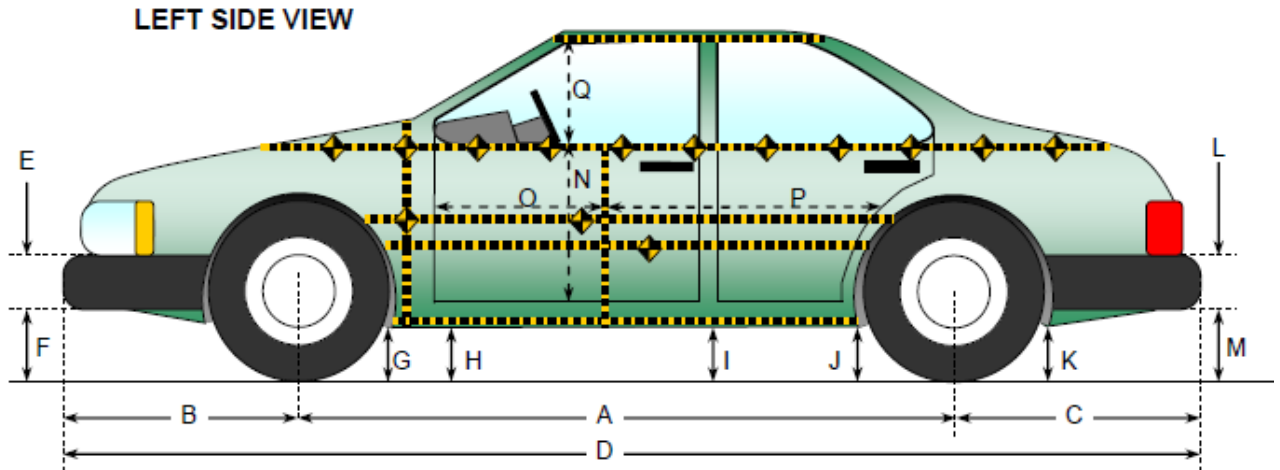
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Front Occupant		Rear Occupant	
	Installed	Deployed	Installed	Deployed
Frontal Airbag	Yes	No		
Side Torso Airbag	Yes	Yes	Yes	Yes
Head Airbag	No	N/A	No	N/A
Curtain Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Other – Driver Center Seat Airbag	Yes	Yes	No	N/A

DATA SHEET NO. 15
VEHICLE PRE TEST AND POST TEST MEASUREMENTS

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20245601
Test Date: 10/15/2024



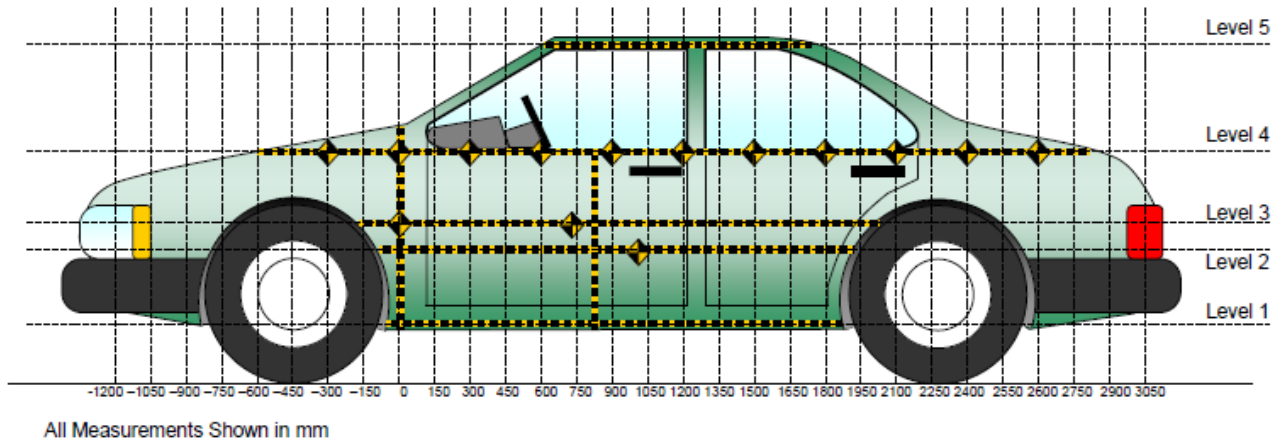
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2703	2697	-7
B	Front Axle to FSOV	968	974	6
C	Rear Axle to RSOV	1025	1024	-1
D	Total Length at Centerline	4696	4695	-1
E	Front Bumper Thickness	85	85	0
F	Front Bumper Bottom to Ground	491	500	9
G	Sill Height at Front Wheel Well	278	277	-1
H	Sill Height at Front Door Leading Edge	282	279	-3
I	Sill Height at B-Pillar	303	298	-5
J1	Sill Height at Rear Wheel Well	286	308	22
J2	Pinch Weld Height at Rear Wheel Well	277	276	-1
K	Sill Height Aft of Rear Wheel Well	308	293	-15
L	Rear Bumper Thickness	182	182	0
M	Rear Bumper Bottom to Ground	513	514	1
N	Sill Height to Bottom of Front Window Sill	878	848	-29
O	Front Door Leading Edge to Impact CL	787	787	-1
P	Rear Door Trailing Edge to Impact CL	1368	1340	-27
Q	Front Window Opening	465	481	16
R	Right Side Length	4616	4616	0
S	Left Side Length	4615	4614	-1
T	Vehicle Width at B-Pillars	1852	1776	-76

DATA SHEET NO. 16
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	423	121	450
2	Occupant Hip Point	mm	691	159	1650
3	Mid - Door	mm	769	183	1650
4	Window Sill	mm	1086	55	1800
5	Window Top	mm	1597	2	1800

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. 17
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20245601
Test Date: 10/15/2024

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
-900															
-750															
-600															
-450															
-300															
-150			930	818				934	821				-4	-3	
0		927	927	823			926	929	824			1	-2	-1	
150	909	923	926	828		799	815	830	848		110	108	96	-20	
300	909	916	922	838		789	816	797	857		120	100	125	-19	
450	910	911	919	849		789	802	783	869		121	109	136	-20	
600	910	908	917	859		795	785	779	876		115	123	138	-17	
750	909	907	916	868	600	806	778	776	878	601	103	129	140	-10	-1
900	908	906	915	874	619	813	780	775	877	620	95	126	140	-3	-1
1050	907	905	914	878	627	811	786	776	872	628	96	119	138	6	-1
1200	905	904	914	883	631	806	803	772	854	631	99	101	142	29	0
1350	902	903	913	886	632	804	767	750	855	631	98	136	163	31	1
1500	900	906	914	889	632	803	751	738	857	631	97	155	176	32	1
1650	899	912	918	888	631	802	753	735	852	630	97	159	183	36	1
1800	900	922	925	884	630	870	805	784	829	628	30	117	141	55	2
1950		927	927	894	627		916	876	851	625		11	51	43	2
2100				893	623				889	622				4	1
2250				873	618				864	616				9	2
2400				868	611				862	610				6	1
2550															
2700															
2850															
3000															

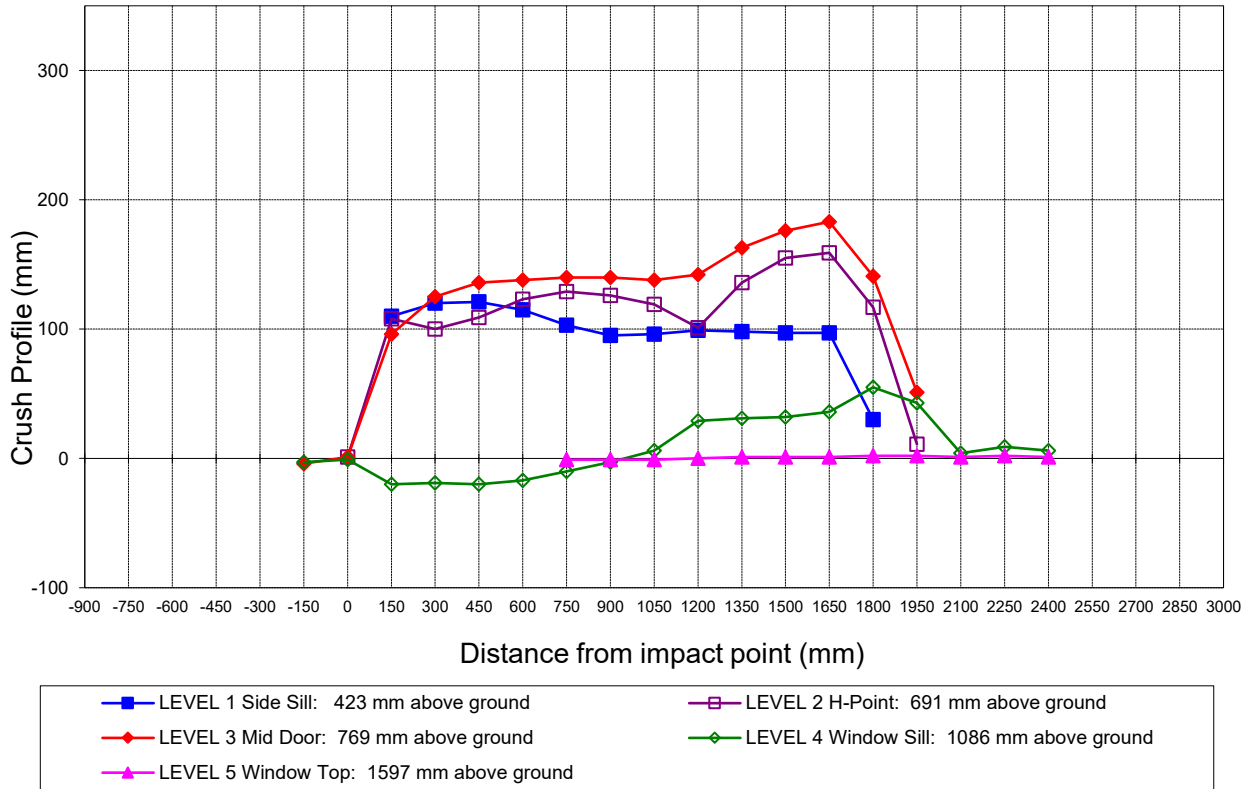
NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to test based on an estimated impact point.

DATA SHEET NO. 17
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024

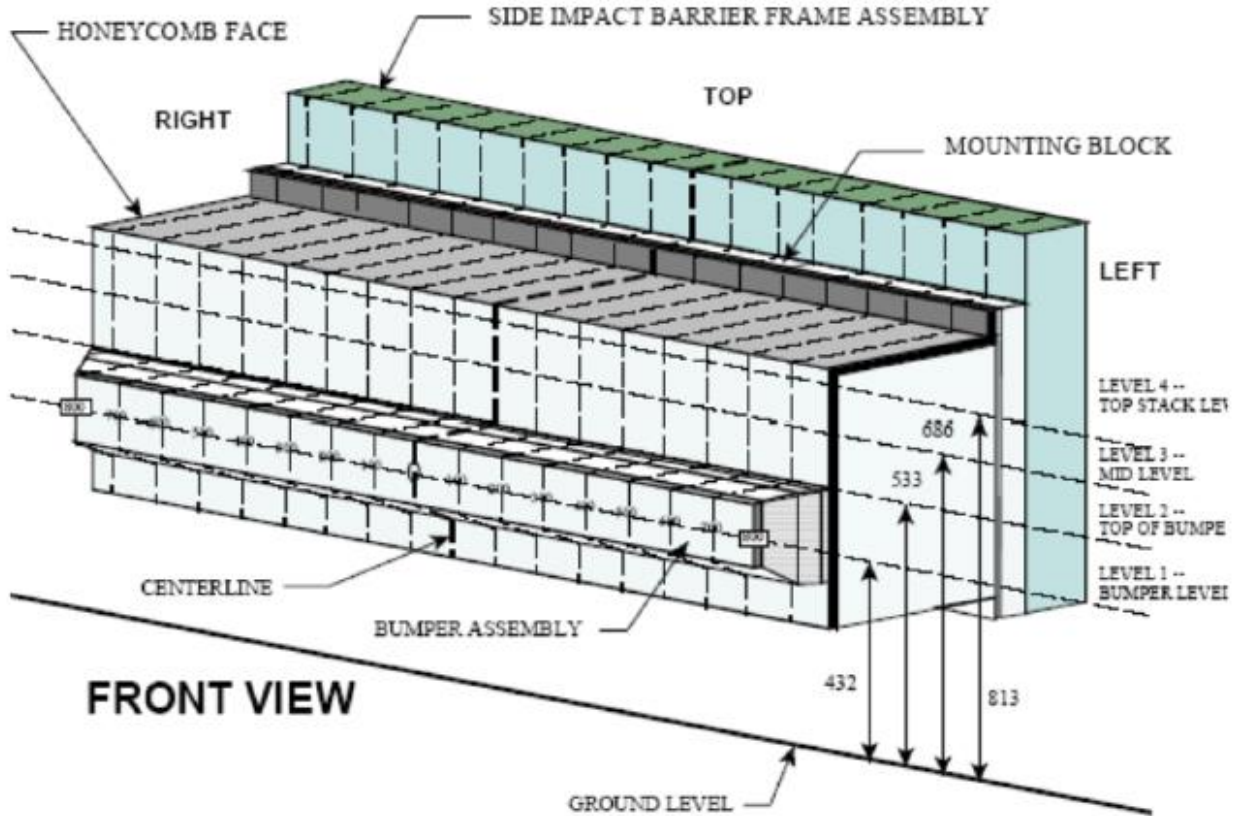
Vehicle Exterior Crush Measurements - Visual Representation



**DATA SHEET NO. 18
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)**

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20245601
 Test Date: 10/15/2024



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	223	208	207	205	204	203	200	198	193	184	178	174	170	166	163	164	174
2	141	140	140	135	136	135	130	123	117	109	103	98	96	91	88	93	124
3	57	42	43	48	61	81	64	49	42	35	32	31	39	48	59	65	84
4	27	16	17	23	42	69	63	50	46	46	44	50	57	58	70	93	127

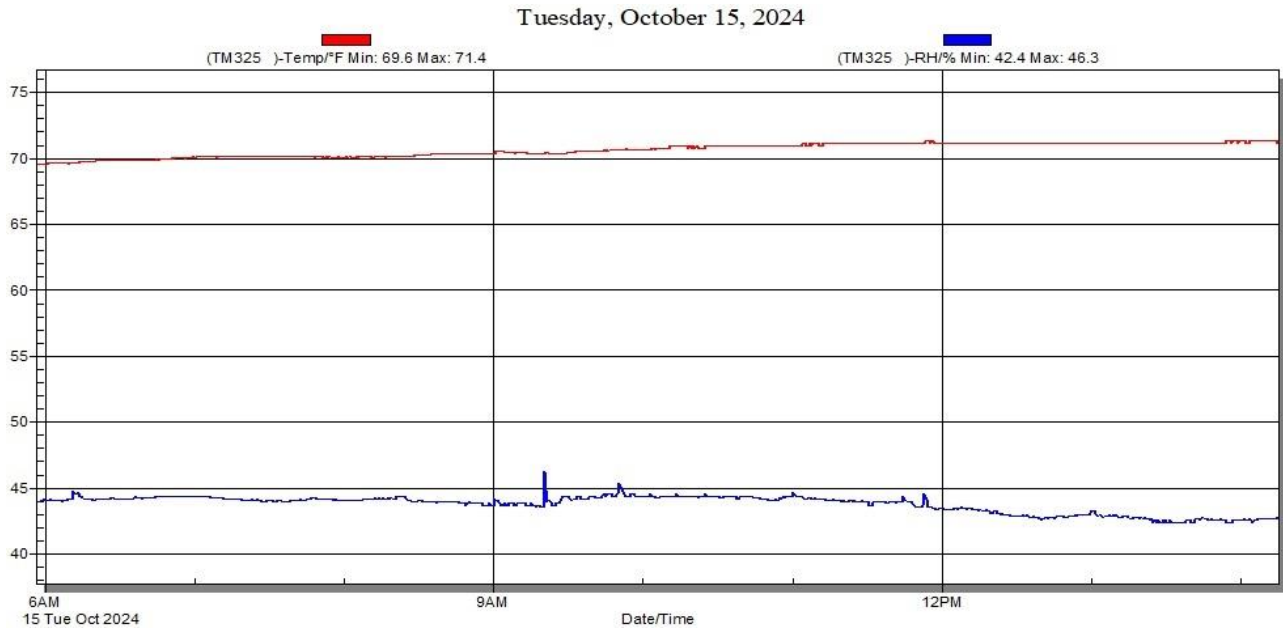
Reference:
 +X = Forward
 +Y = To Right
 +Z = Down

DATA SHEET NO. 19
DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2024 Mitsubishi Outlander PHEV 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20245601
Test Date: 10/15/2024

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



APPENDIX I
PHOTOGRAPHS

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



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

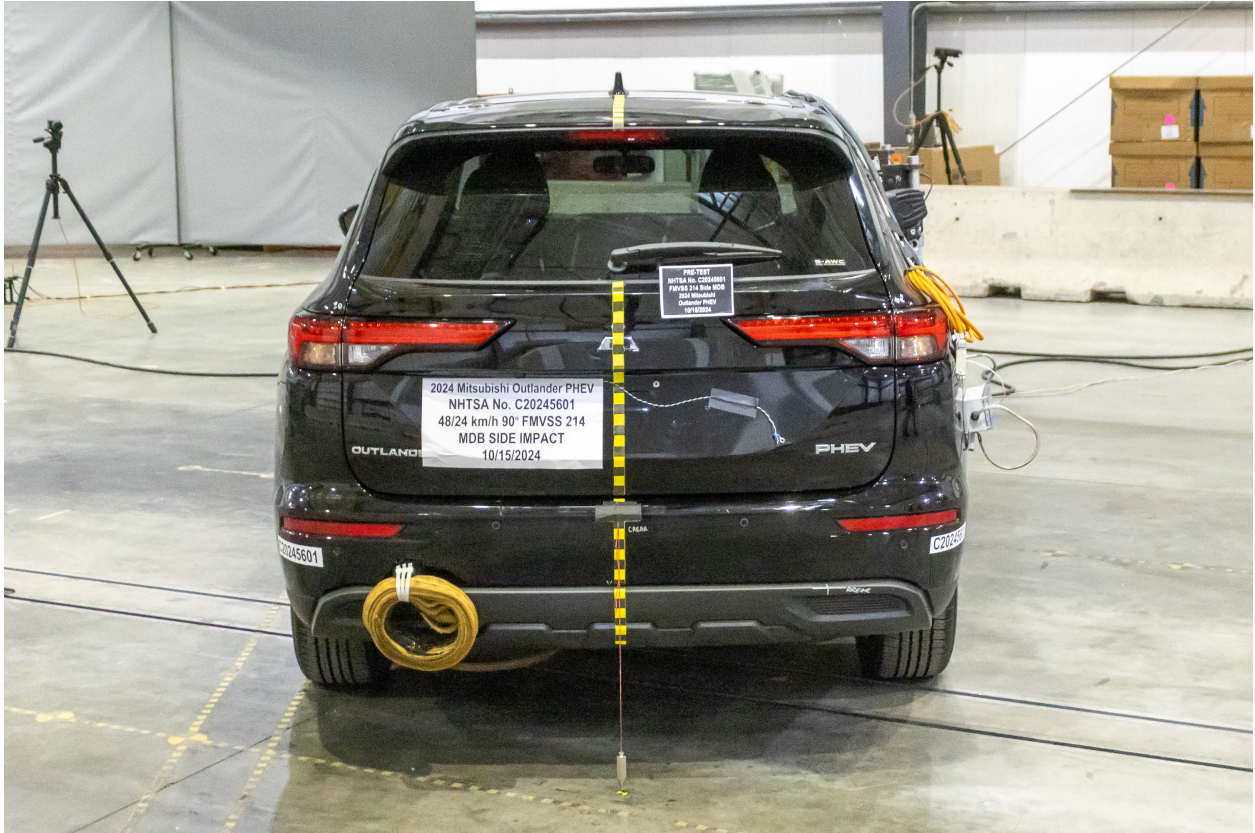


Figure A-3: Pre-Test Rear View of Test Vehicle



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 Frontal View of Impactor Face



Figure A-8: Post-Test Frontal View of Impactor Face



Figure A-9: Pre-Test Left Side View of Impactor Face



Figure A-10: Post-Test Left Side View of Impactor Face



Figure A-11: Pre-Test Right Side View of Impactor Face



Figure A-12: Post-Test Right Side View of Impactor Face



Figure A-13: Pre-Test Top View of Impactor Face



Figure A-14: Post-Test Top View of Impactor Face



Figure A-15: Pre-Test Overhead View of MDB Positioned Against Impact Side of Test Vehicle at Impact Location

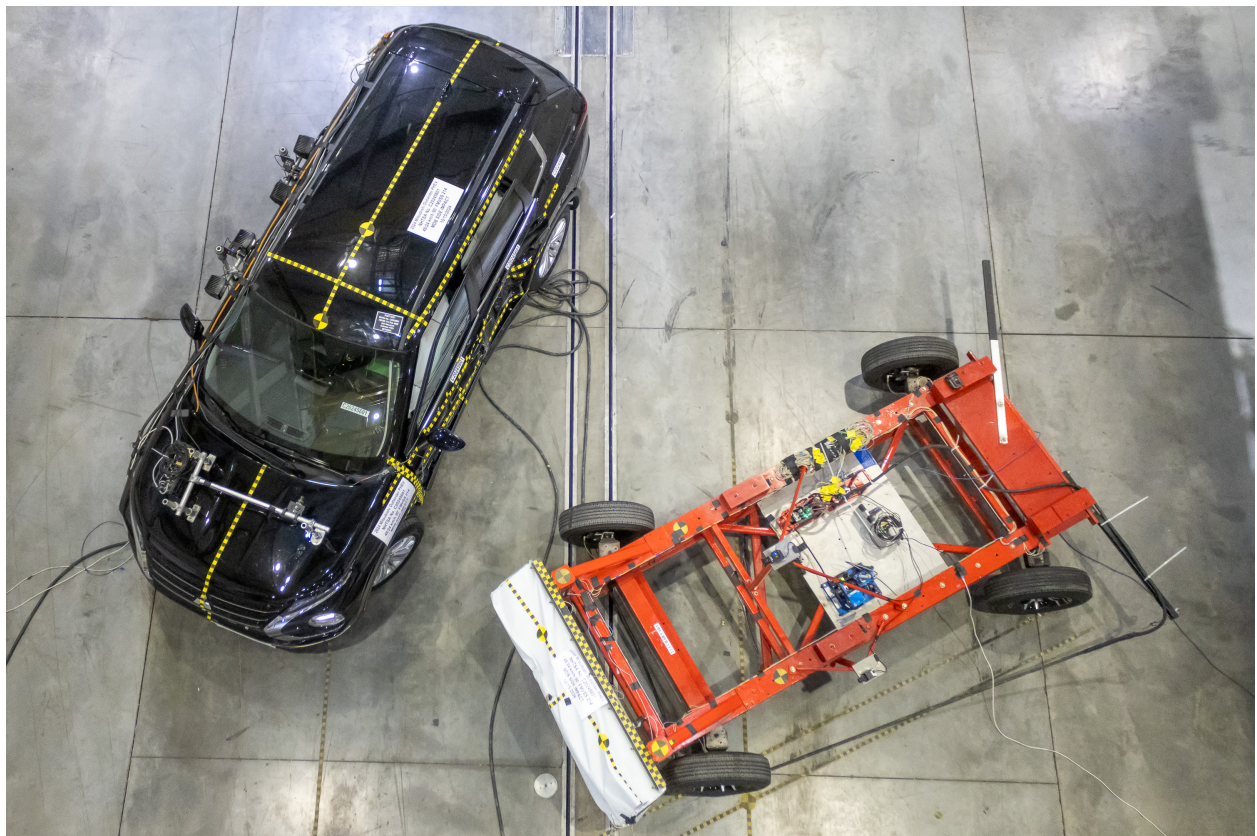


Figure A-16: Post-Test Overhead View of the MDB and Test Vehicle



Figure A-17: Pre-Test Front ES2-re in Final Seating Position (Door Open)



Figure A-18: Pre-Test Front ES2-re in Final Seating Position (Door Closed)



Figure A-19: Pre-Test Front ES2-re - Opposite Side View



Figure A-20: Post-Test Front ES2-re - Opposite Side View



Figure A-21: Pre-Test Rear SID in Final Seating Position (Door Open)



Figure A-22: Pre-Test Rear SID in Final Seating Position (Door Closed)



Figure A-23: Pre-Test Rear SID - Opposite Side View



Figure A-24: Post-Test Rear SID - Opposite Side View



Figure A-25: T (0) - Impact Event



Figure A-26: Post-Test Close-up View of Impact Point Target

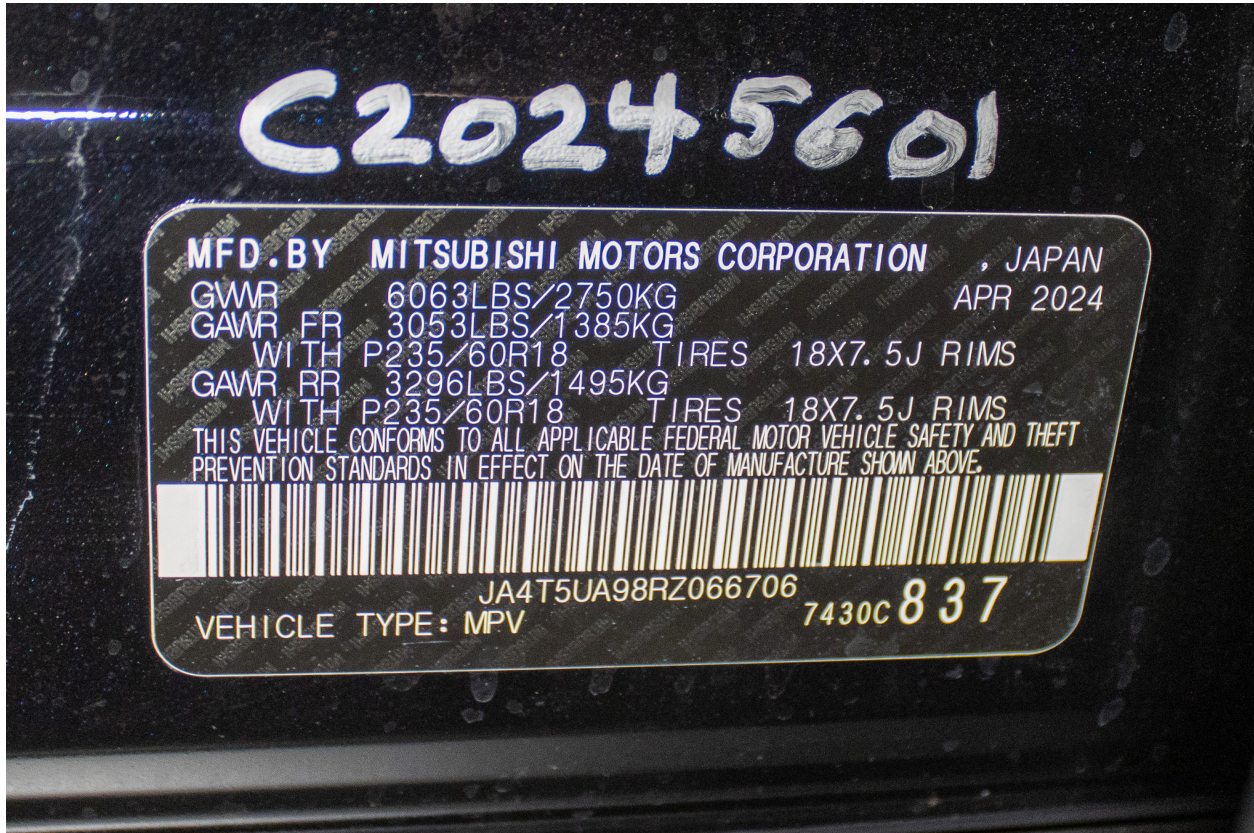


Figure A-27: Close-up View of Vehicle's Certification Label



Figure A-28: Post-Test Front Seat Occupant Area Showing Head & Torso Contact Regions



Figure A-29: Post-Test Rear Seat Occupant Area Showing Head & Torso Contact Regions



Figure A-30: Close-up View of Vehicle's Tire Placard

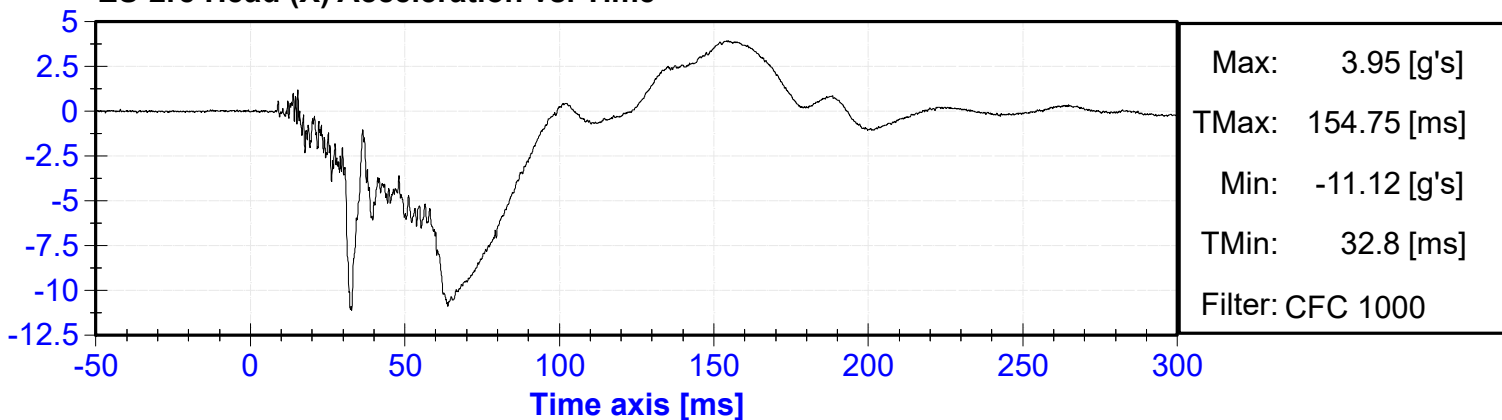
APPENDIX II
ES-2re DUMMY RESPONSE DATA TRACES

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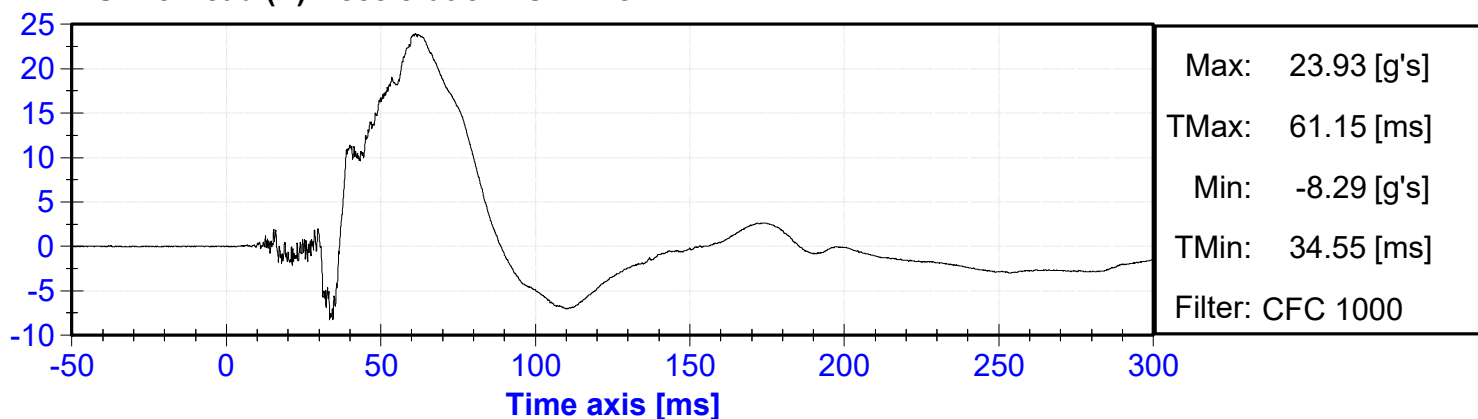
ACCELERATION [g's]

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



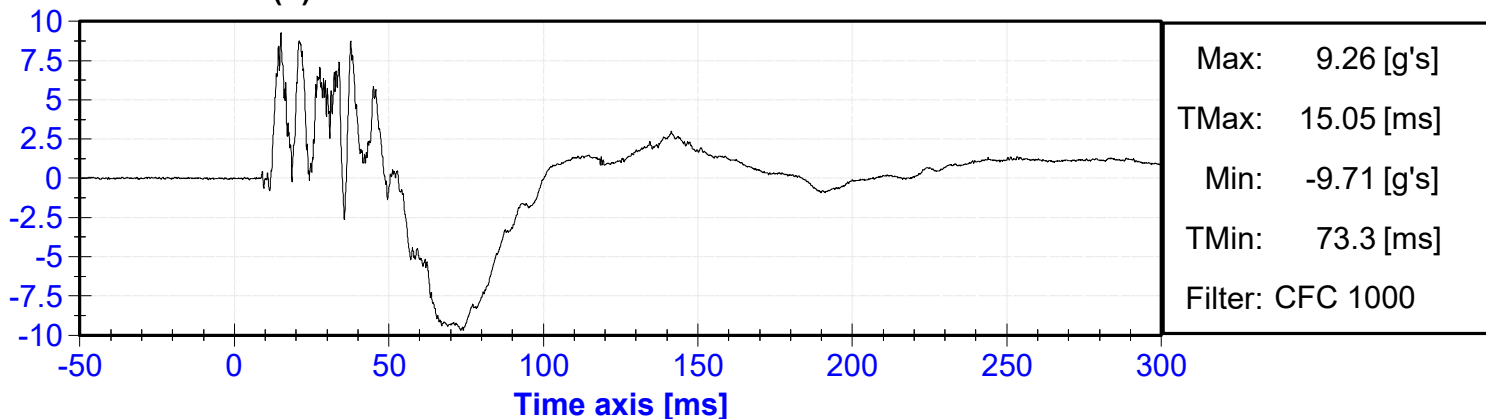
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ES-2re Head (Y) Acceleration vs. Time



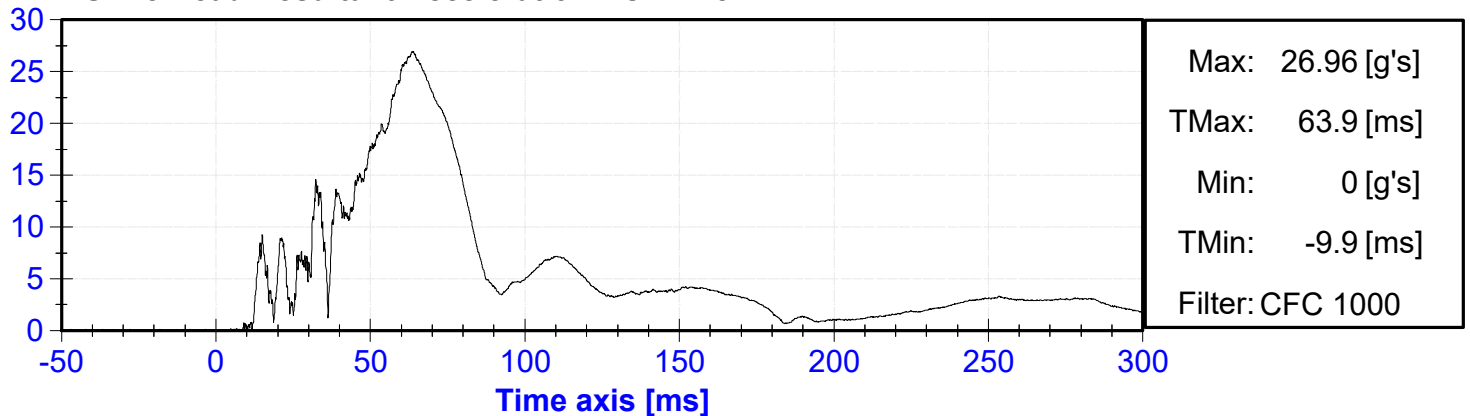
ACCELERATION [g's]

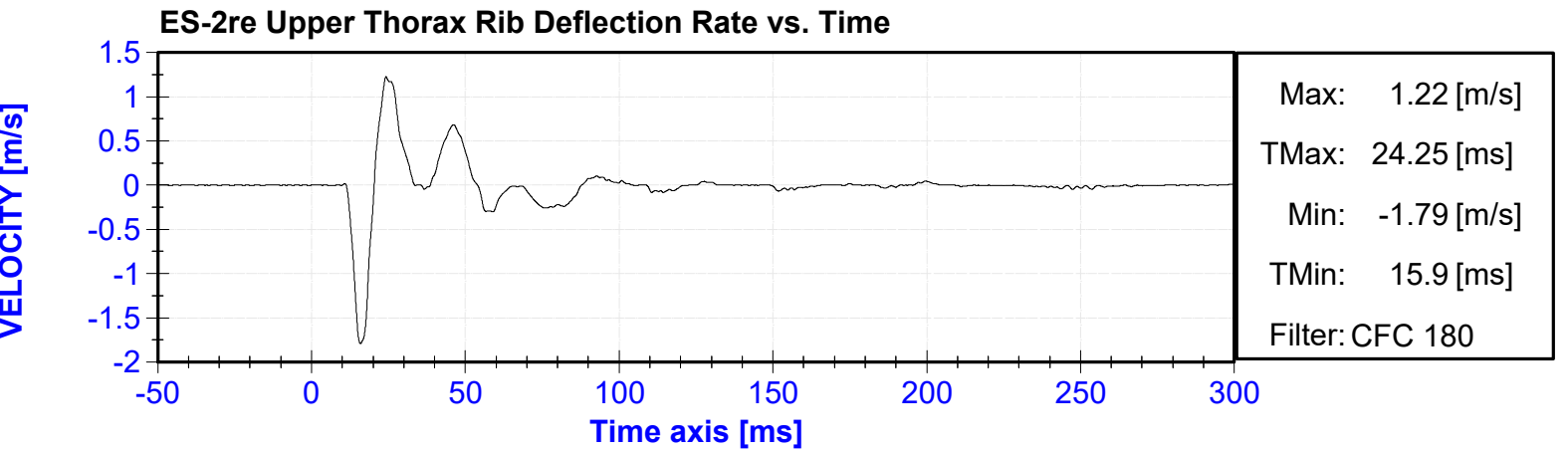
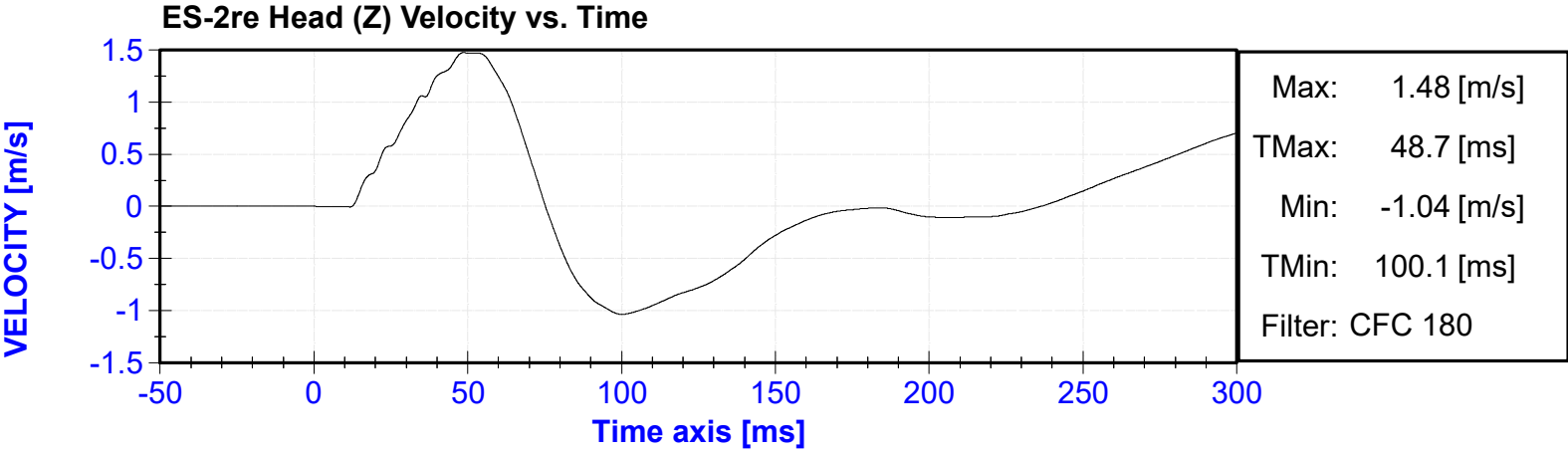
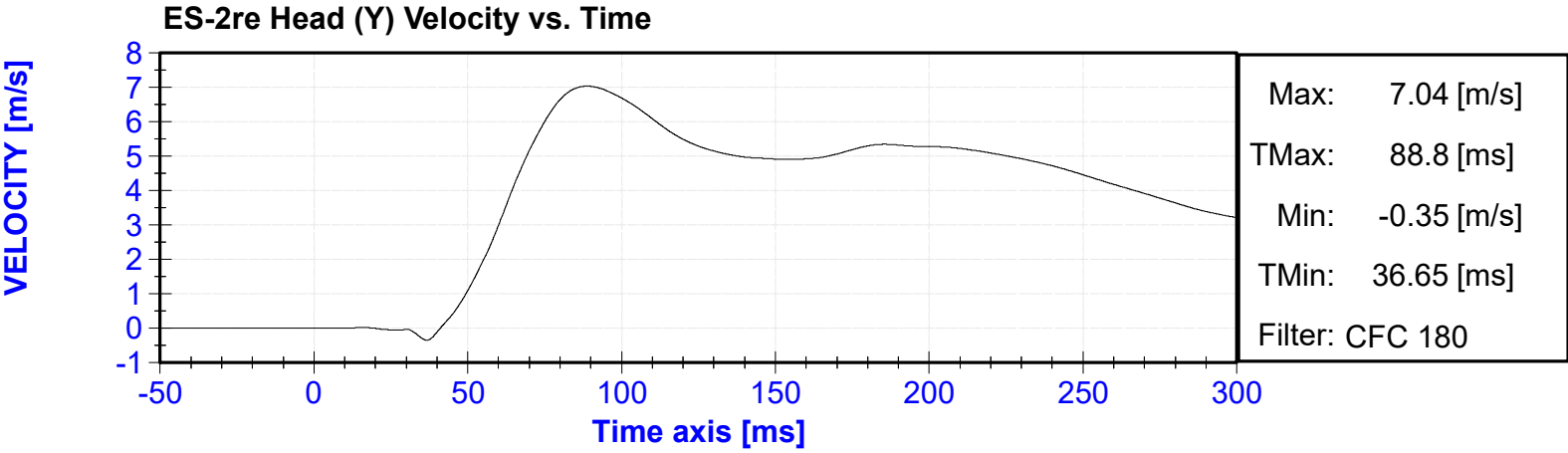
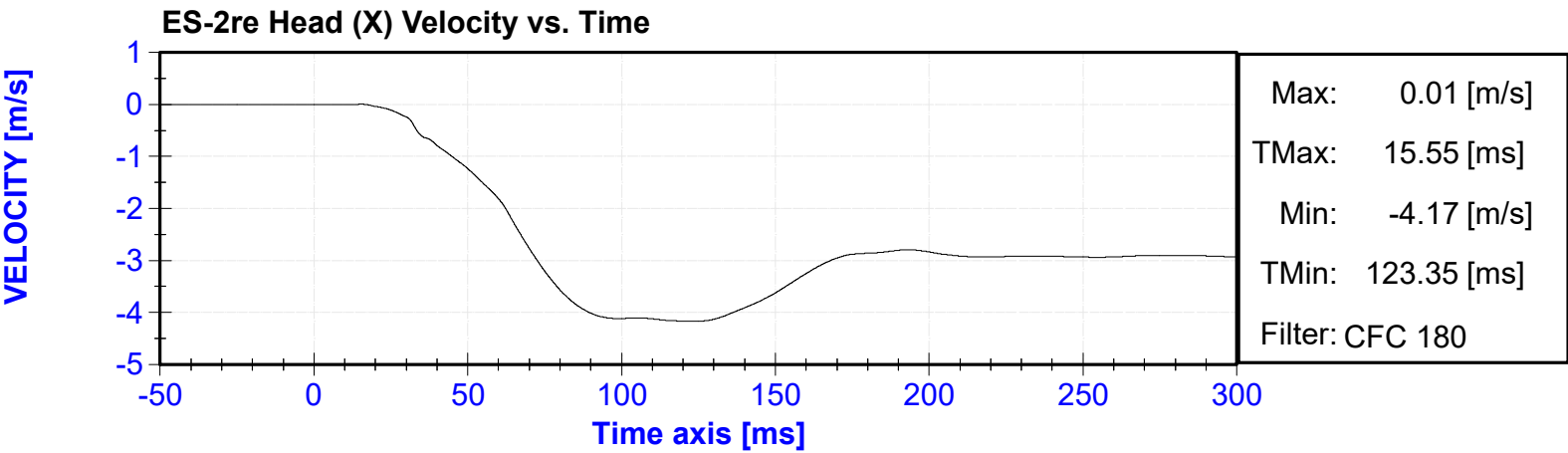
ES-2re Head (Z) Acceleration vs. Time



ACCELERATION [g's]

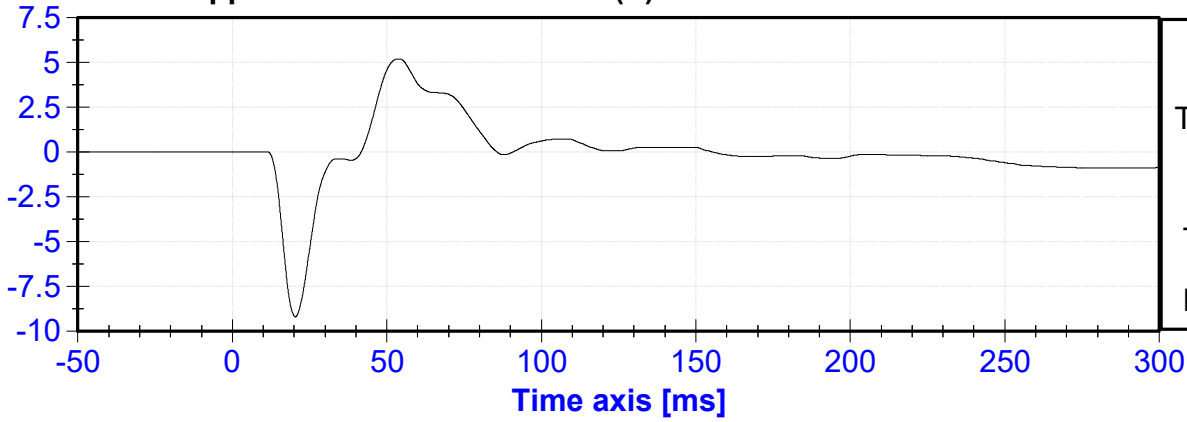
ES-2re Head Resultant Acceleration vs. Time





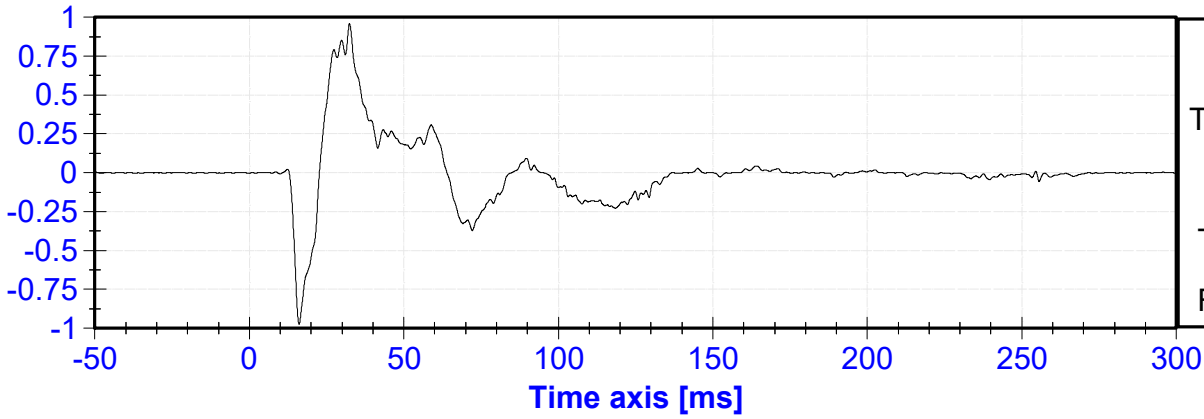
ES-2re Upper Thorax Rib Deflection (Y) vs. Time

DISPLACEMENT [mm]



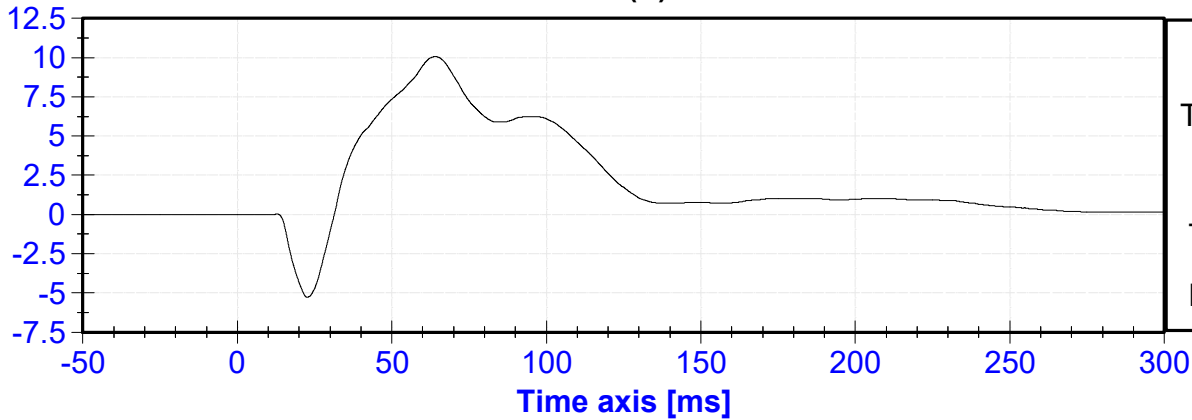
ES-2re Middle Thorax Rib Deflection Rate vs. Time

VELOCITY [m/s]



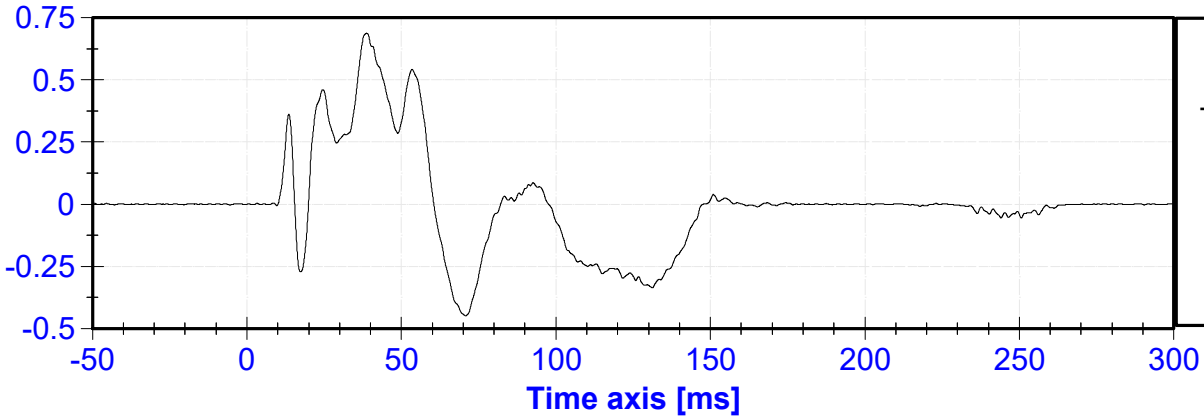
ES-2re Middle Thorax Rib Deflection (Y) vs. Time

DISPLACEMENT [mm]

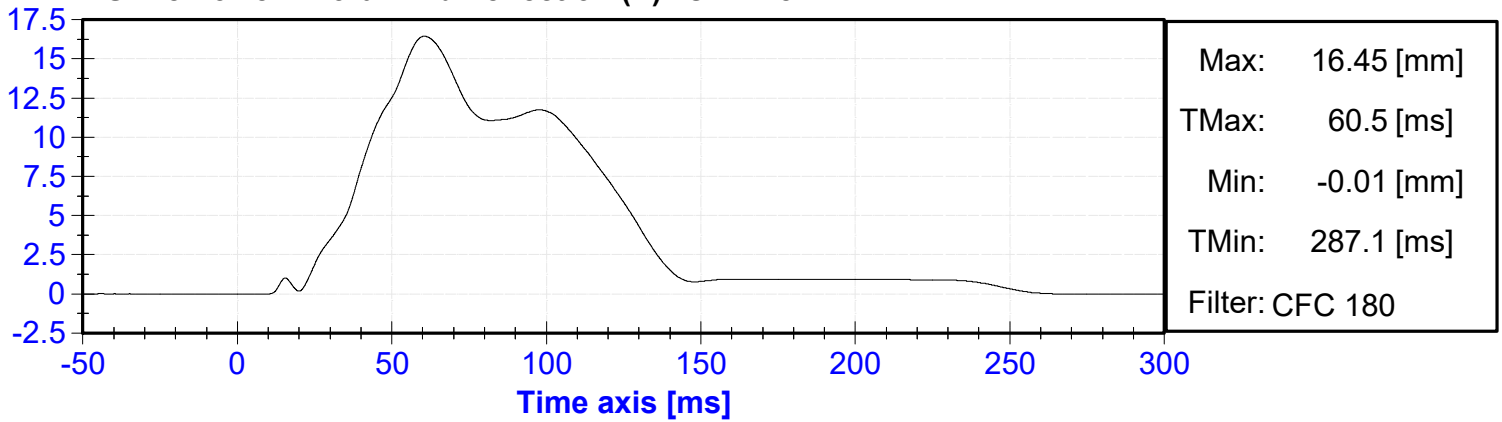


ES-2re Lower Thorax Rib Deflection Rate vs. Time

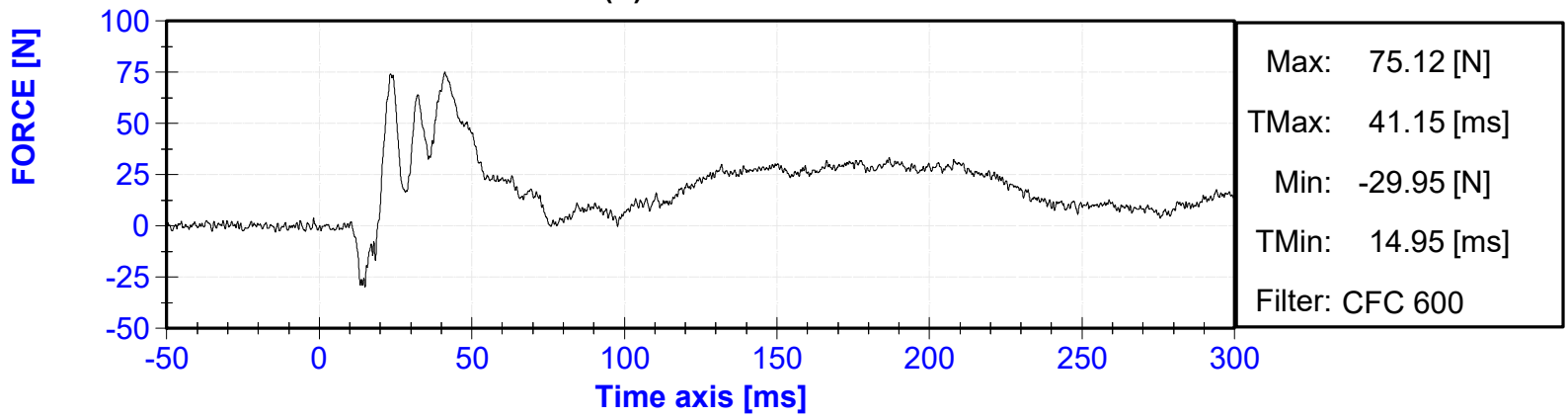
VELOCITY [m/s]



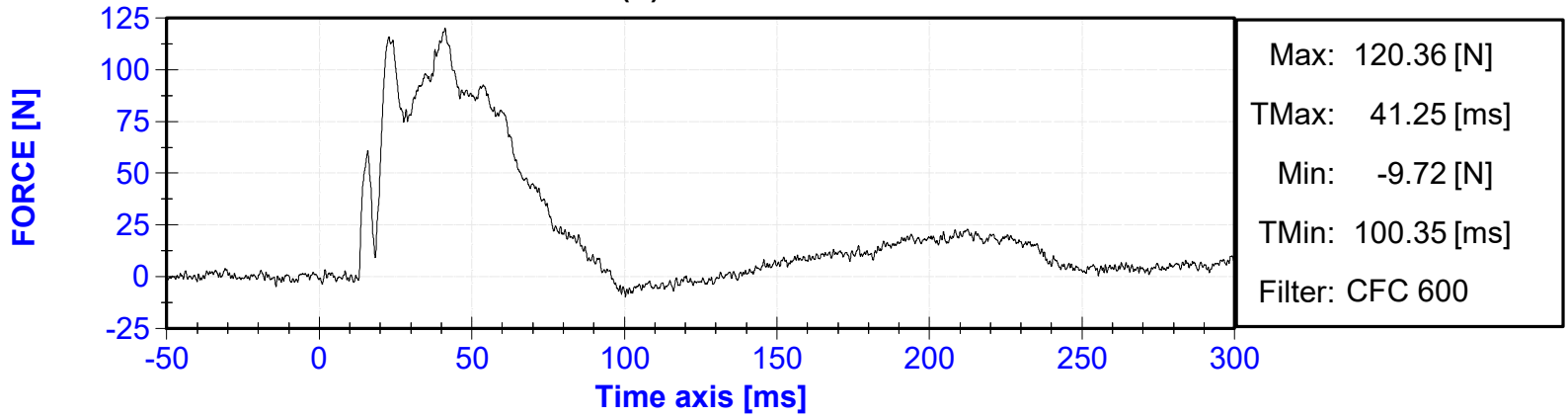
ES-2re Lower Thorax Rib Deflection (Y) vs. Time



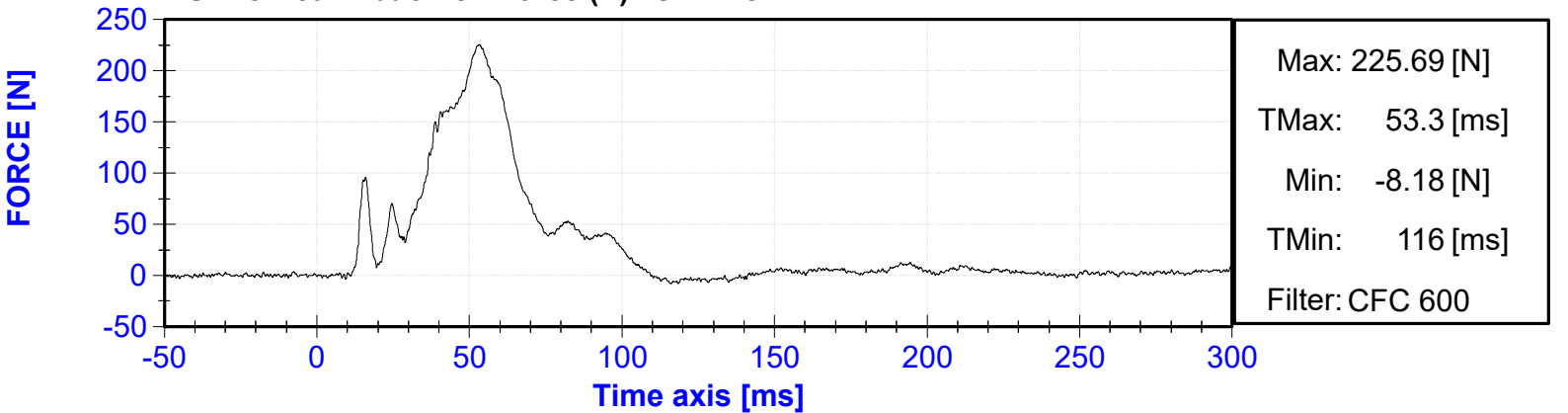
ES-2re Front Abdomen Force (Y) vs. Time



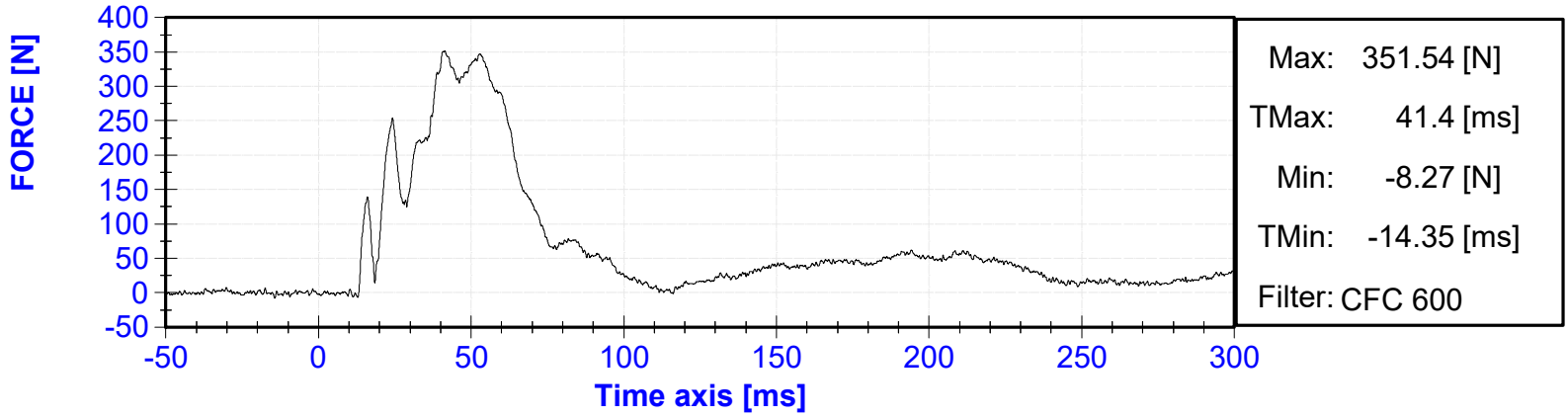
ES-2re Middle Abdomen Force (Y) vs. Time



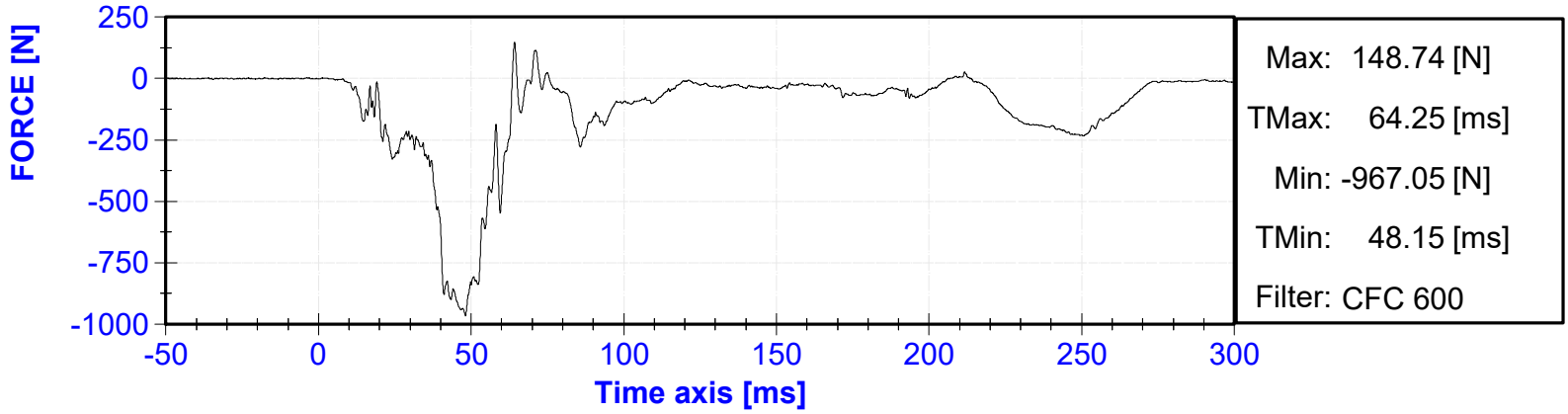
ES-2re Rear Abdomen Force (Y) vs. Time



ES-2re Sum of Abdomen Forces vs. Time



ES-2re Pubic Symphysis Force (Y) vs. Time



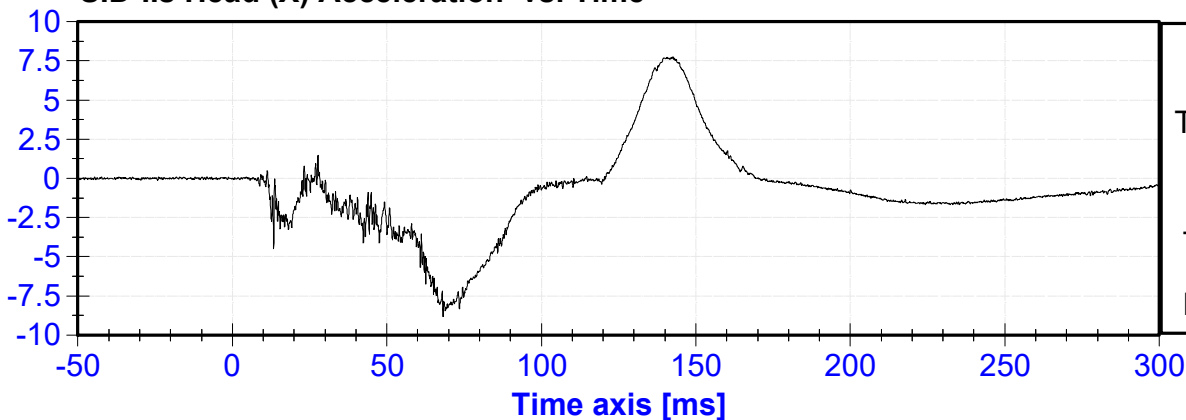
APPENDIX III
SID-IIs DUMMY RESPONSE DATA TRACES

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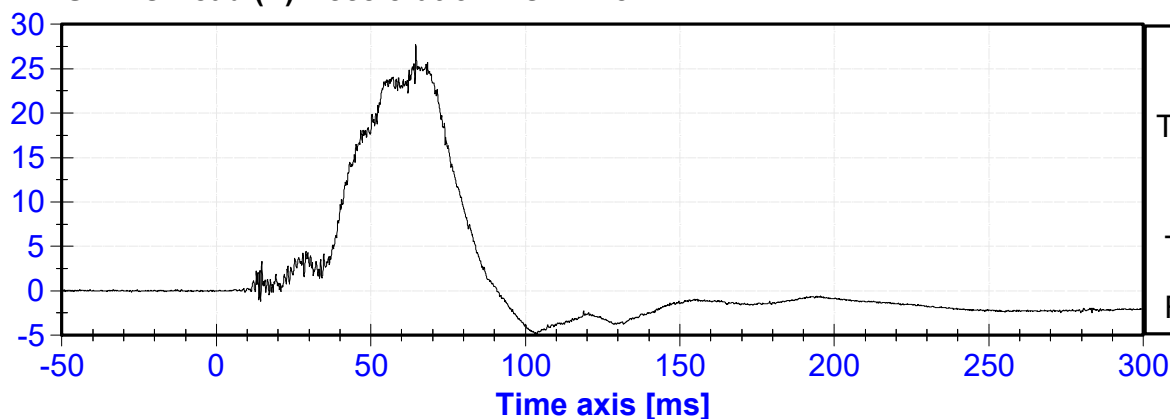
ACCELERATION [g's]

SID-IIs Head (X) Acceleration vs. Time



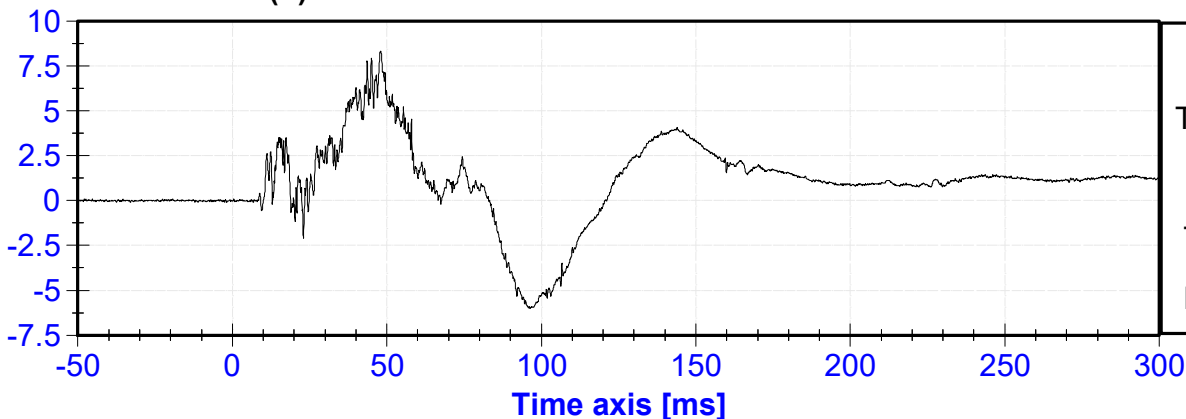
ACCELERATION [g's]

SID-IIs Head (Y) Acceleration vs. Time



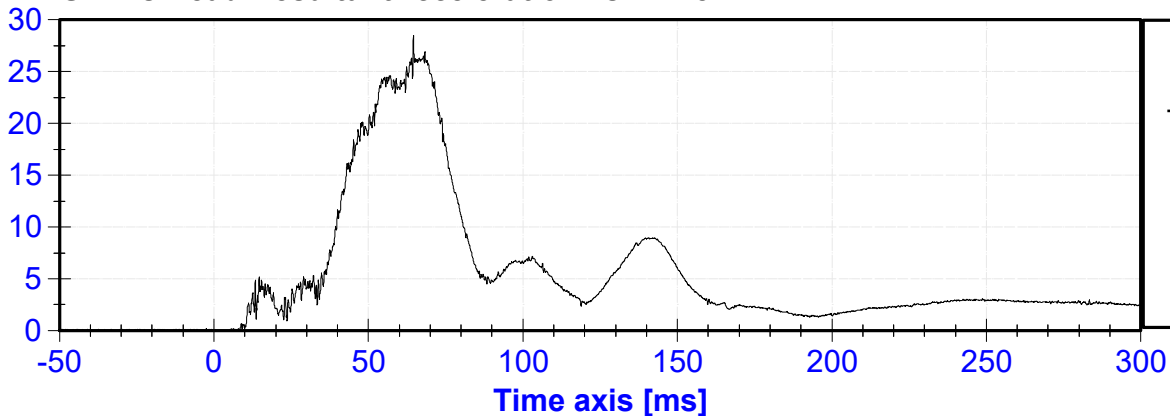
ACCELERATION [g's]

SID-IIs Head (Z) Acceleration vs. Time

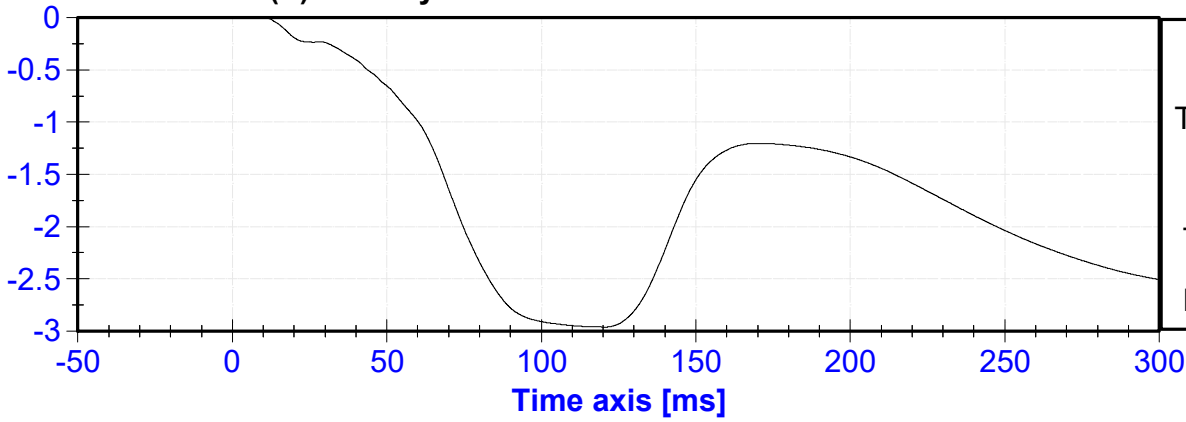


ACCELERATION [g's]

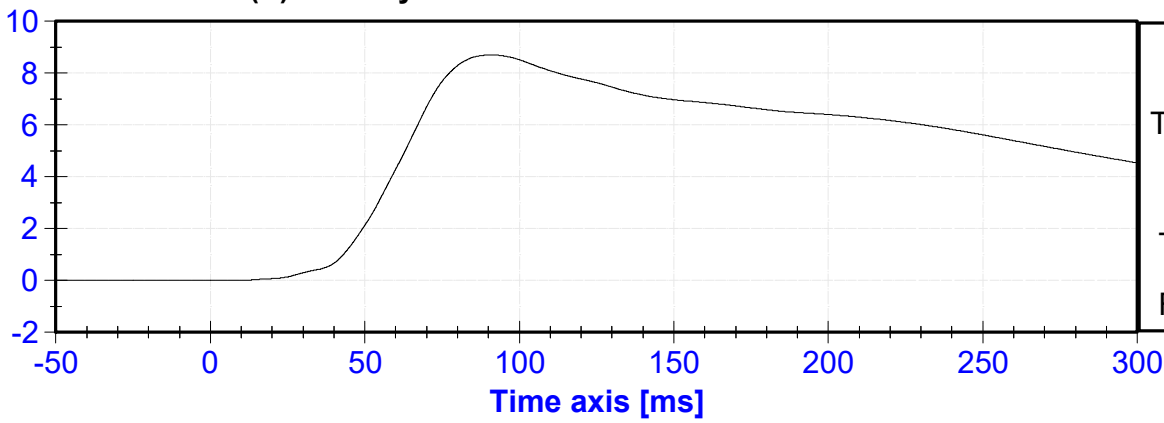
SID-IIs Head Resultant Acceleration vs. Time



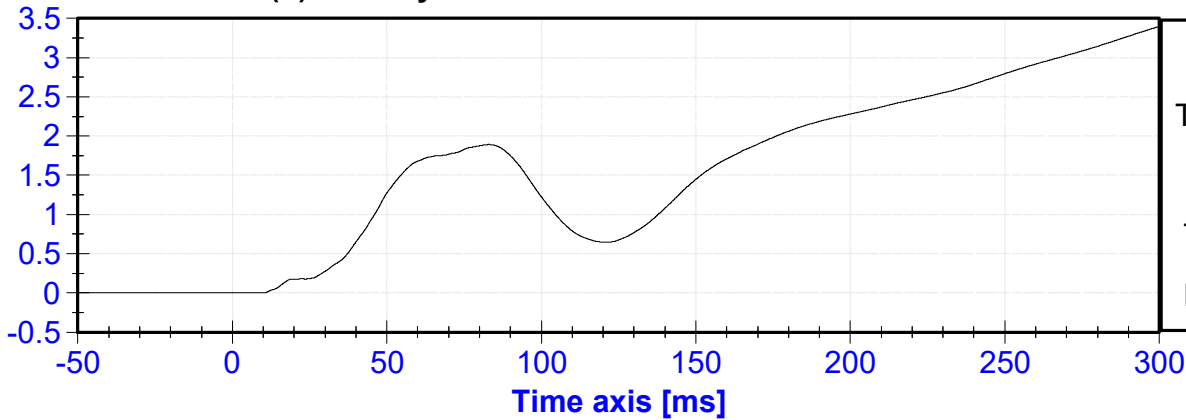
SID-IIs Head (X) Velocity vs. Time



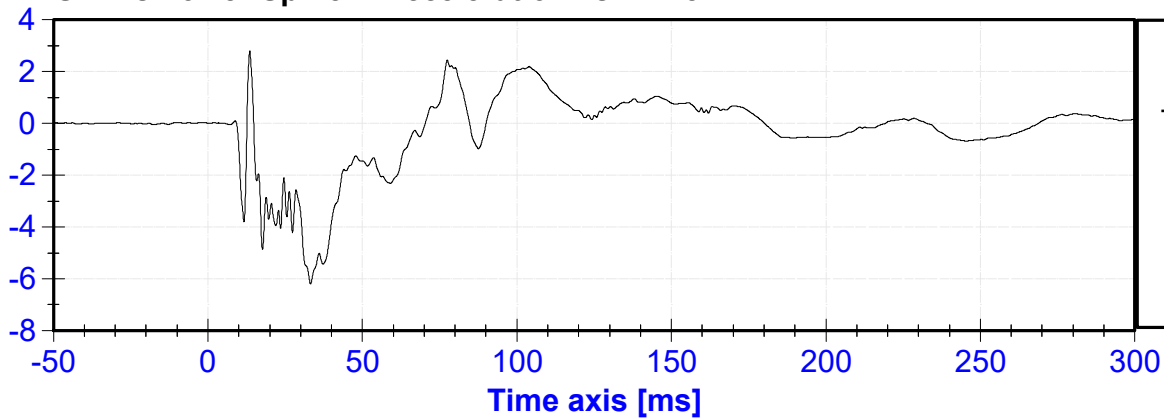
SID-IIs Head (Y) Velocity vs. Time



SID-IIs Head (Z) Velocity vs. Time

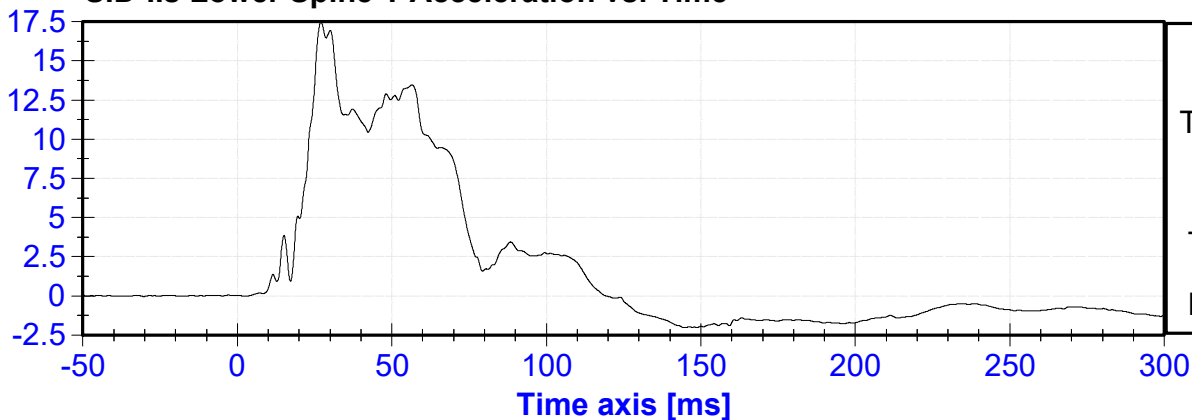


SID-IIs Lower Spine X Acceleration vs. Time



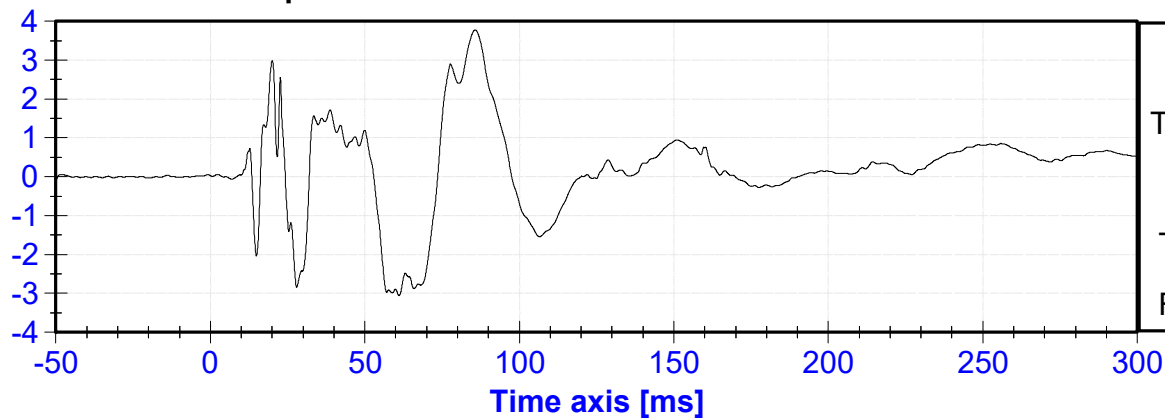
ACCELERATION [g's]

SID-IIs Lower Spine Y Acceleration vs. Time



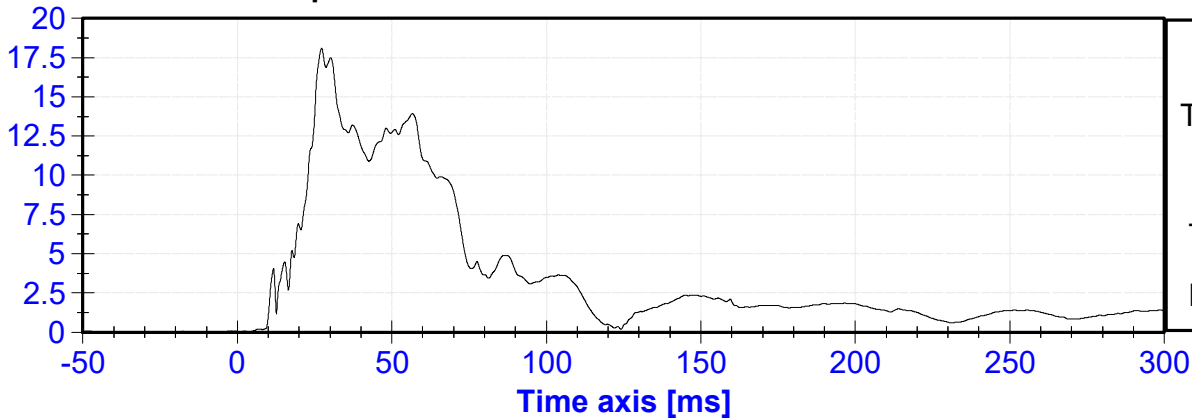
ACCELERATION [g's]

SID-IIs Lower Spine Z Acceleration vs. Time



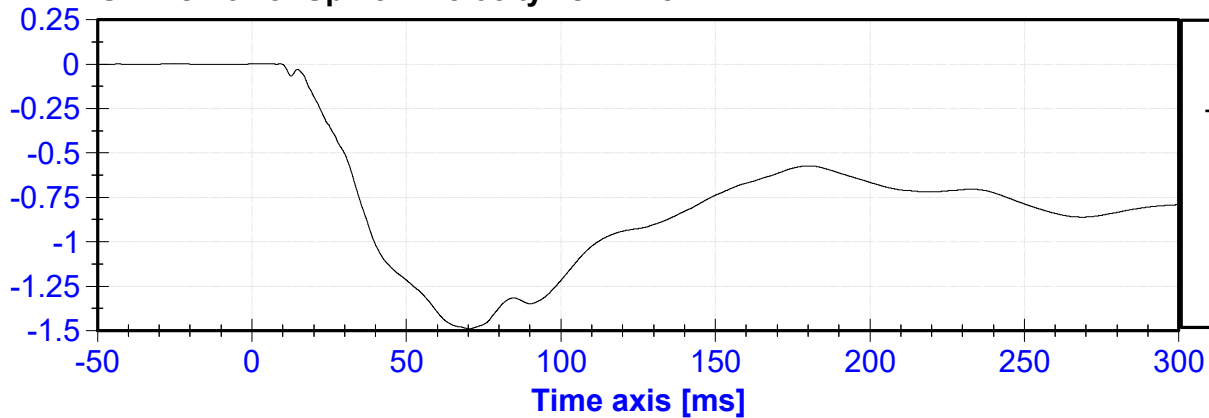
ACCELERATION [g's]

SID-IIs Lower Spine Resultant Acceleration vs. Time

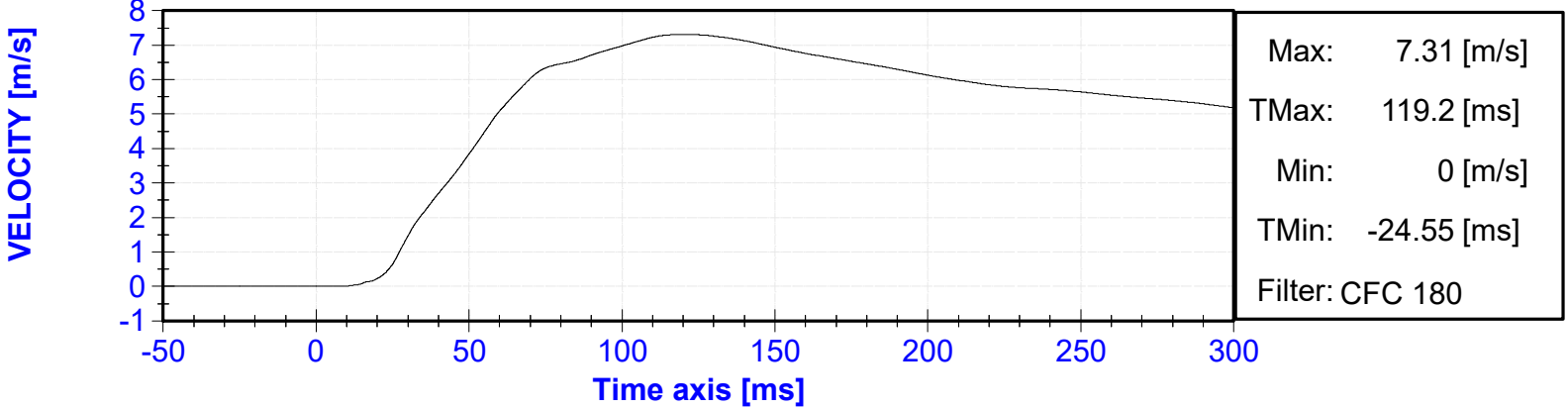


VELOCITY [m/s]

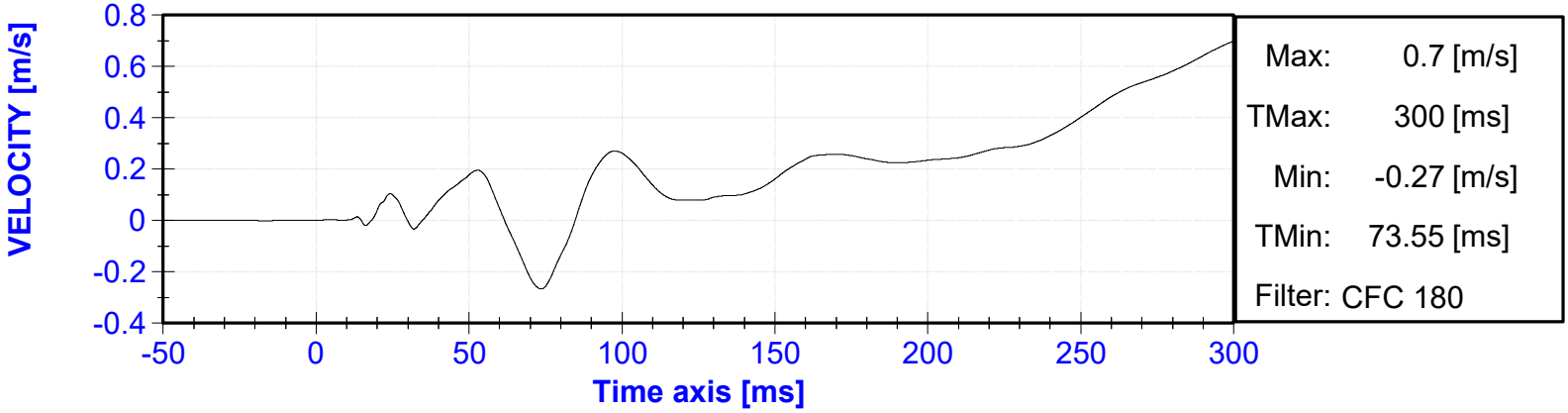
SID-IIs Lower Spine X Velocity vs. Time



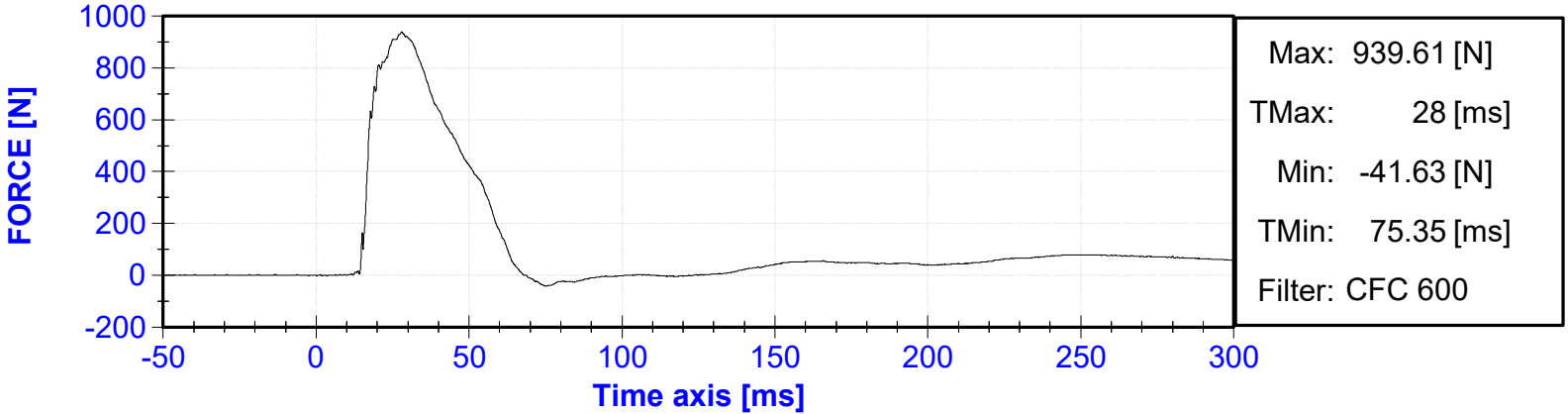
SID-IIs Lower Spine Y Velocity vs. Time



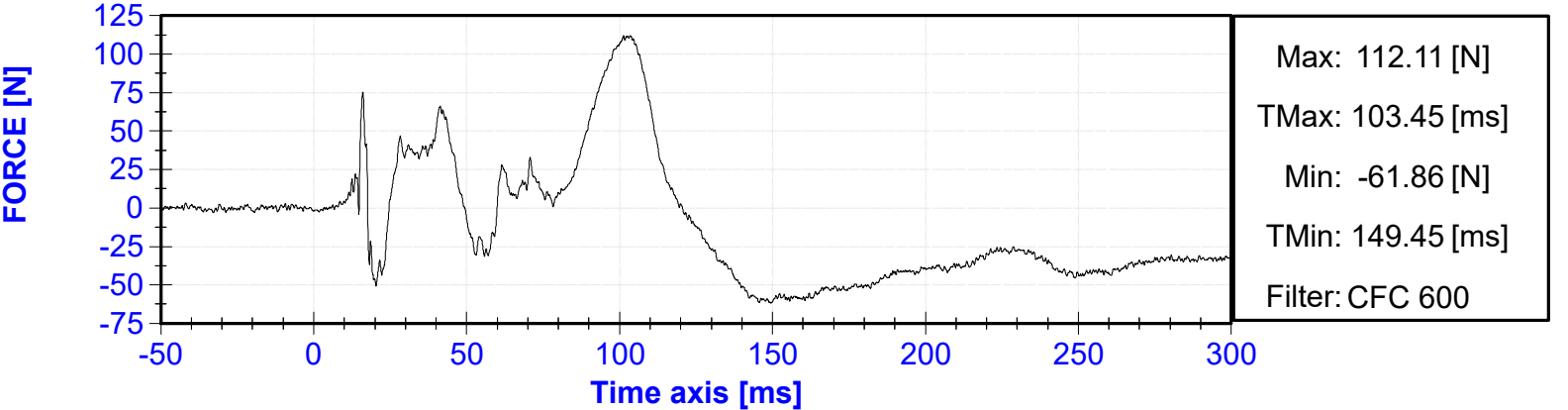
SID-IIs Lower Spine Z Velocity vs. Time



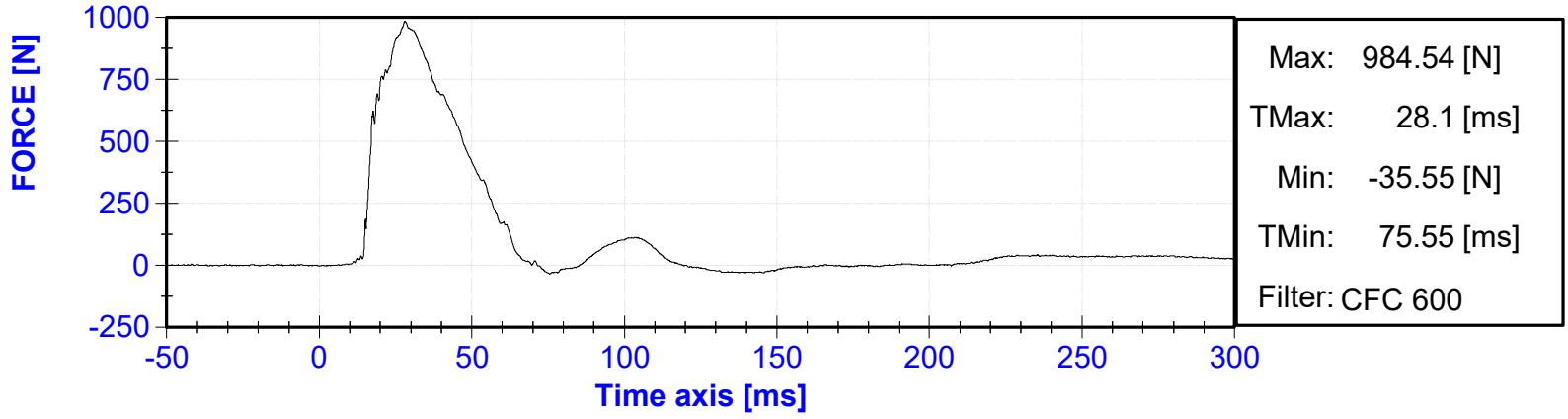
SID-IIs Acetabulum Force vs. Time



SID-IIs Iliac Force vs. Time



SID-IIs Sum of Iliac and Acetabulum Forces vs. Time



**APPENDIX IV
VEHICLE AND MDB ACCELEROMETER RESPONSE
DATA**

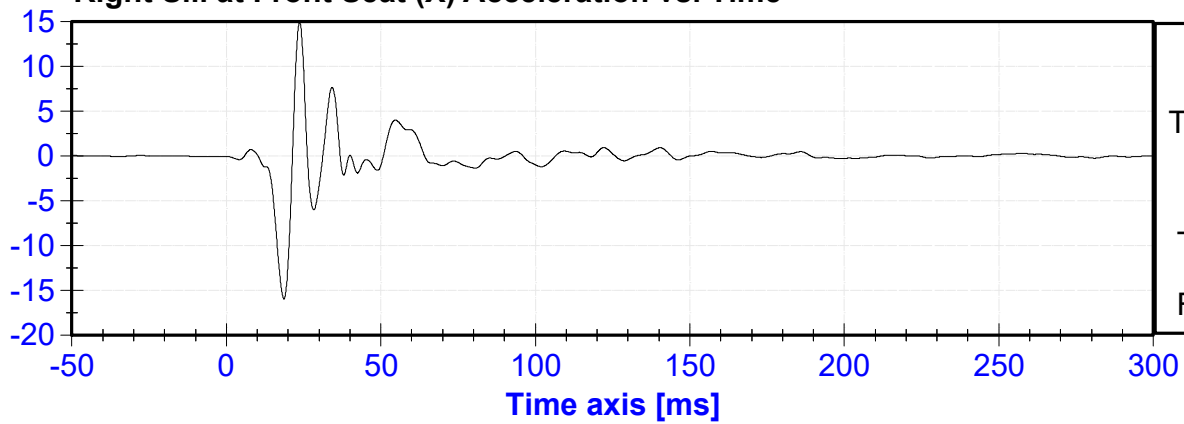
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ACCELERATION [g's]

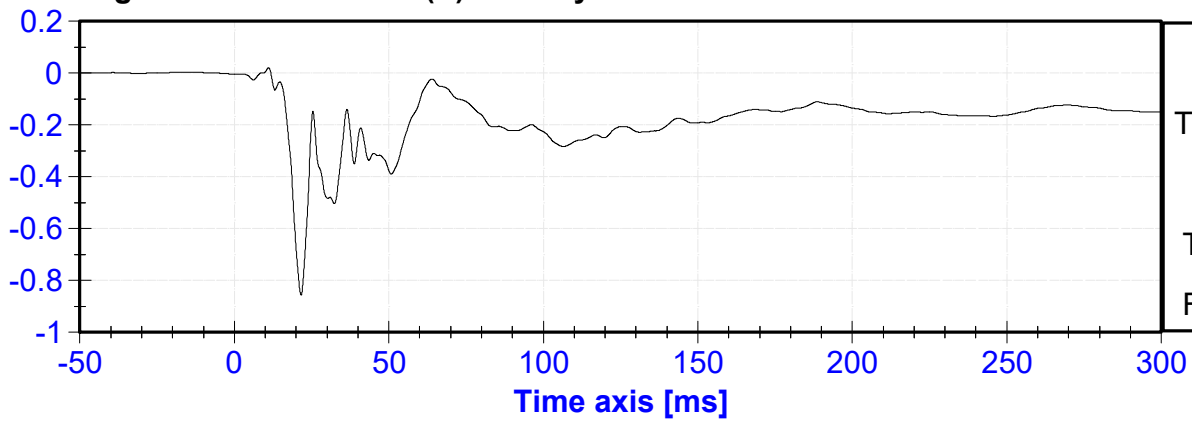
Right Sill at Front Seat (X) Acceleration vs. Time



Max:	14.95 [g's]
TMax:	23.75 [ms]
Min:	-15.99 [g's]
TMin:	18.65 [ms]
Filter:	CFC 60

VELOCITY [m/s]

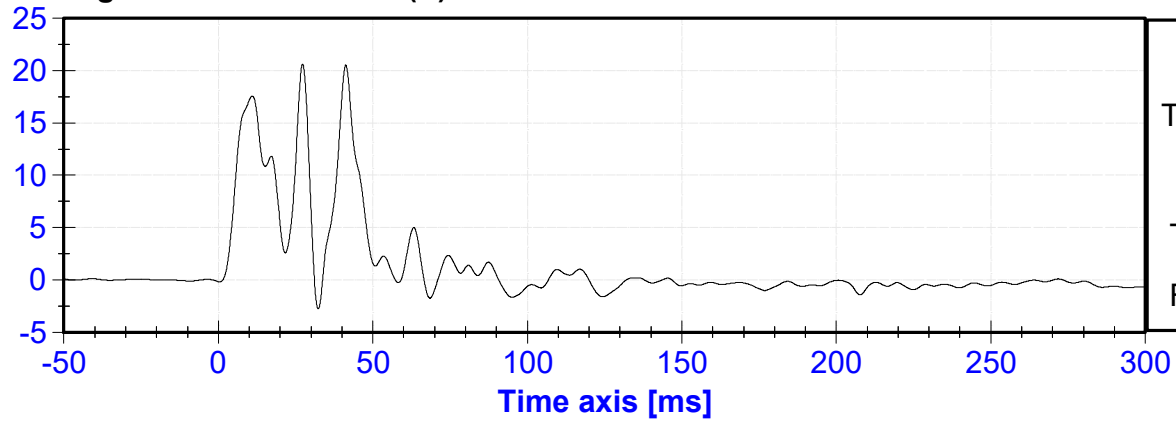
Right Sill at Front Seat (X) Velocity vs. Time



Max:	0.02 [m/s]
TMax:	11.05 [ms]
Min:	-0.86 [m/s]
TMin:	21.6 [ms]
Filter:	CFC 180

ACCELERATION [g's]

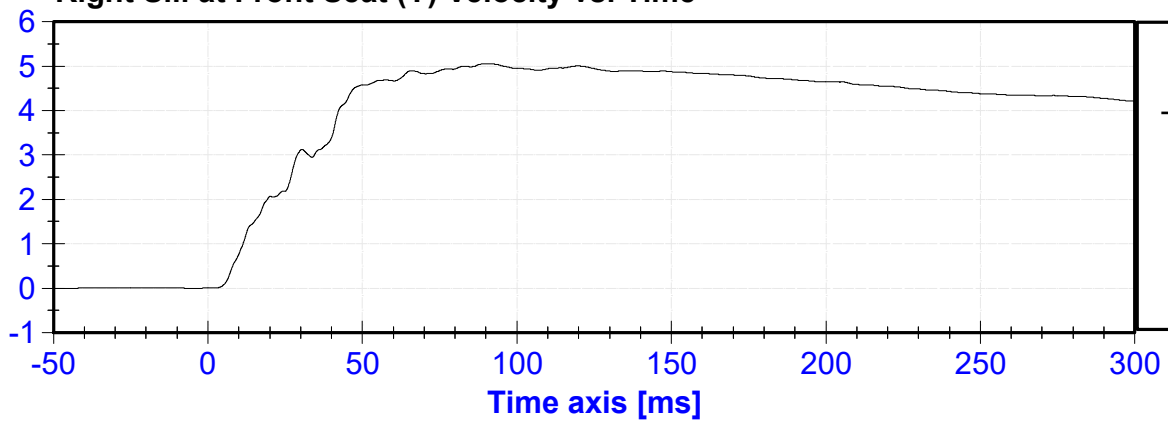
Right Sill at Front Seat (Y) Acceleration vs. Time



Max:	20.64 [g's]
TMax:	27.25 [ms]
Min:	-2.78 [g's]
TMin:	32.3 [ms]
Filter:	CFC 60

VELOCITY [m/s]

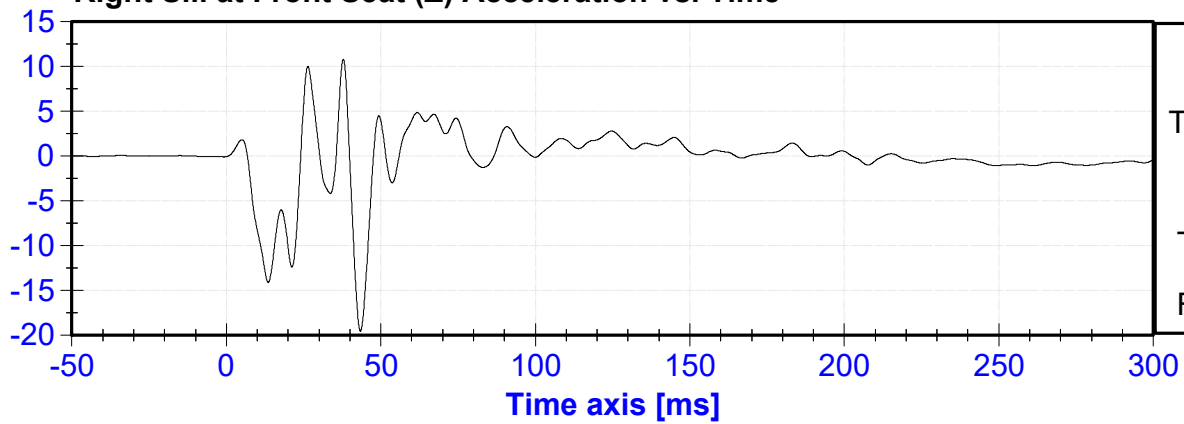
Right Sill at Front Seat (Y) Velocity vs. Time



Max:	5.06 [m/s]
TMax:	90.15 [ms]
Min:	0 [m/s]
TMin:	-44.85 [ms]
Filter:	CFC 180

ACCELERATION [g's]

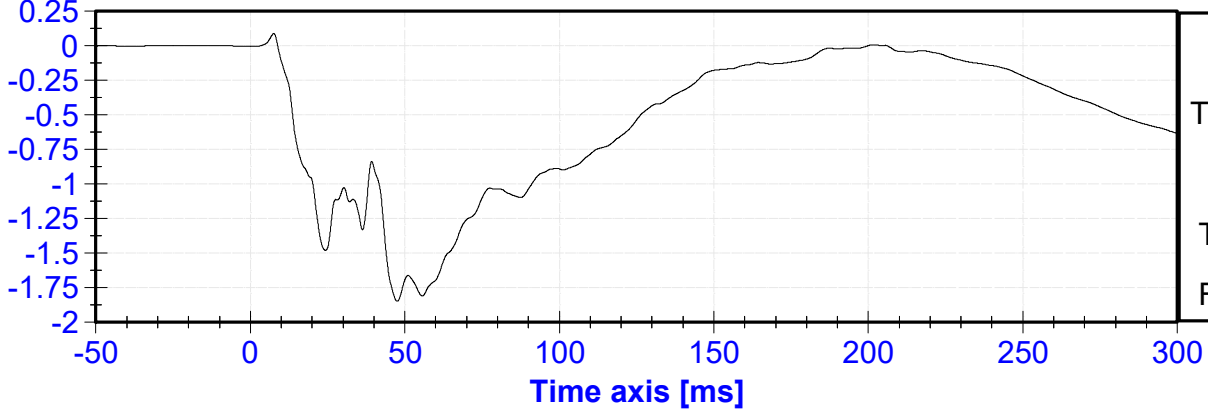
Right Sill at Front Seat (Z) Acceleration vs. Time



Max:	10.84 [g's]
TMax:	37.85 [ms]
Min:	-19.56 [g's]
TMin:	43.4 [ms]
Filter:	CFC 60

VELOCITY [m/s]

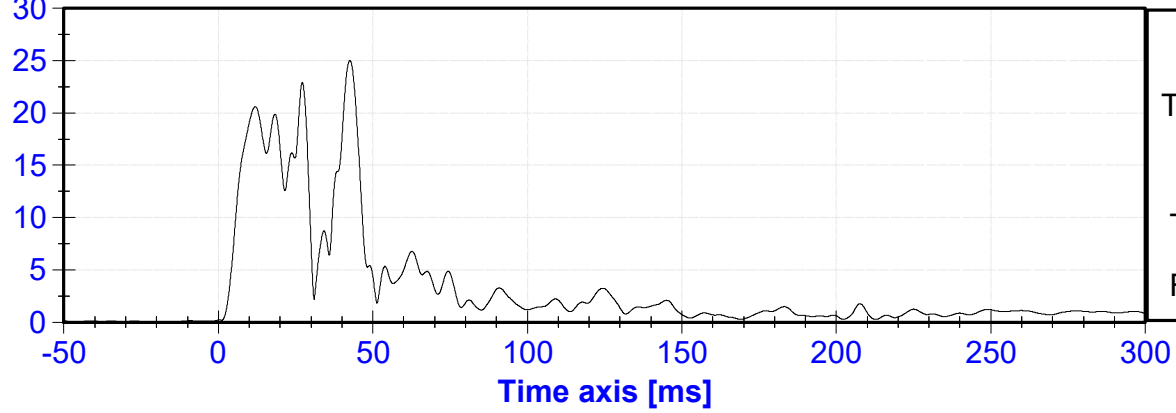
Right Sill at Front Seat (Z) Velocity vs. Time



Max:	0.09 [m/s]
TMax:	7.55 [ms]
Min:	-1.85 [m/s]
TMin:	47.5 [ms]
Filter:	CFC 180

ACCELERATION [g's]

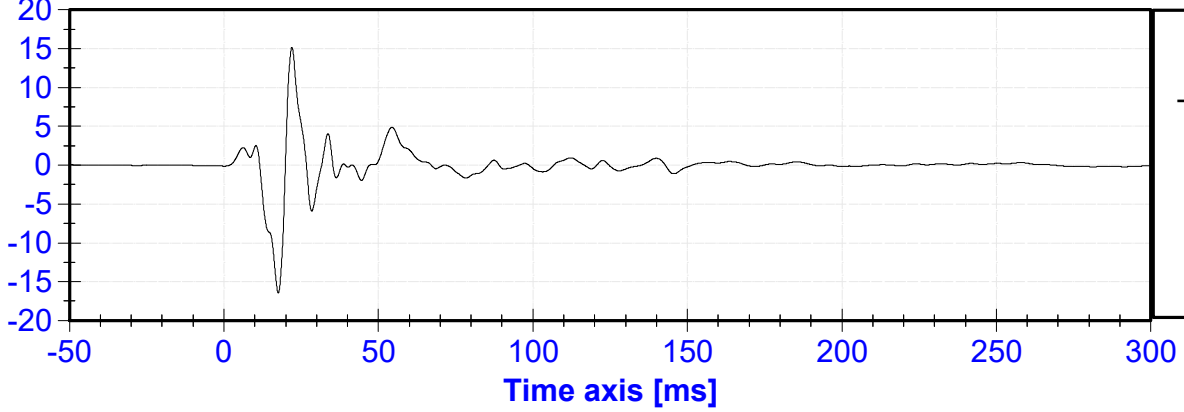
Right Sill at Front Seat Resultant vs. Time



Max:	25.02 [g's]
TMax:	42.55 [ms]
Min:	0.01 [g's]
TMin:	-30.95 [ms]
Filter:	CFC 60

ACCELERATION [g's]

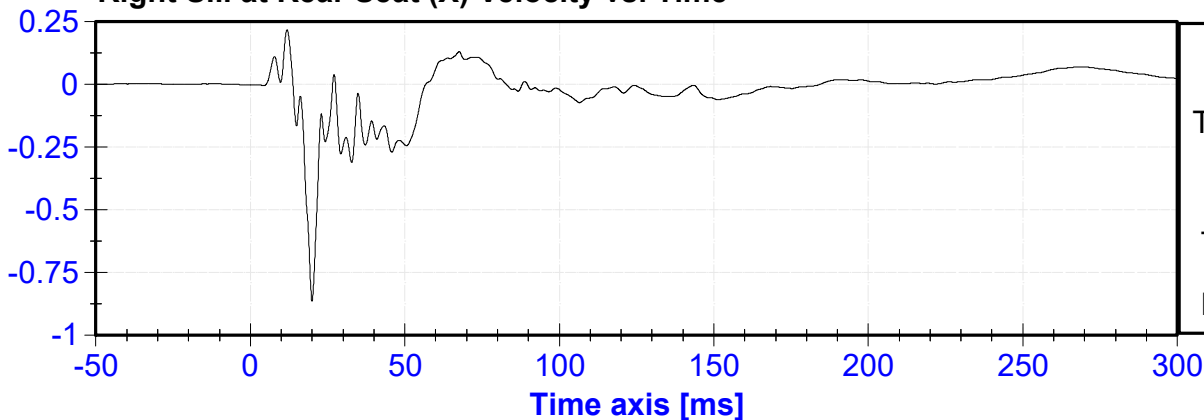
Right Sill at Rear Seat (X) Acceleration vs. Time



Max:	15.17 [g's]
TMax:	22 [ms]
Min:	-16.44 [g's]
TMin:	17.6 [ms]
Filter:	CFC 60

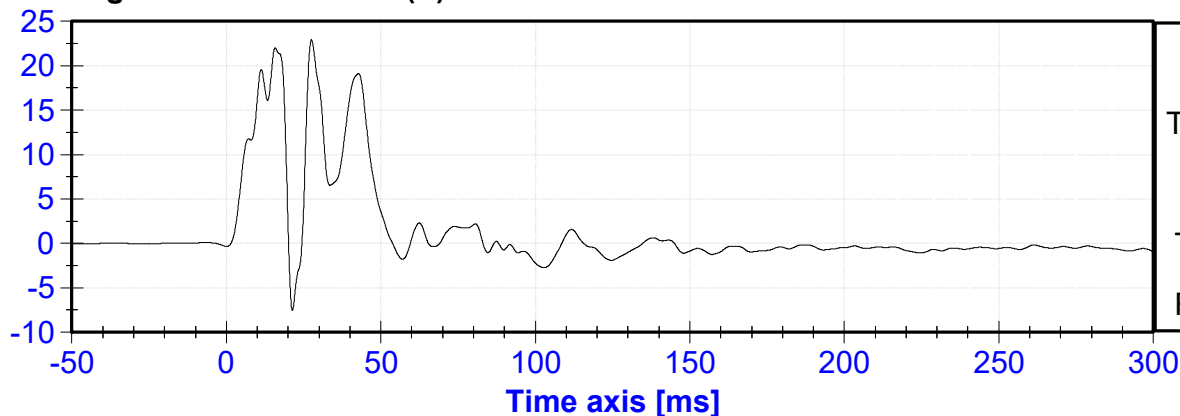
VELOCITY [m/s]

Right Sill at Rear Seat (X) Velocity vs. Time



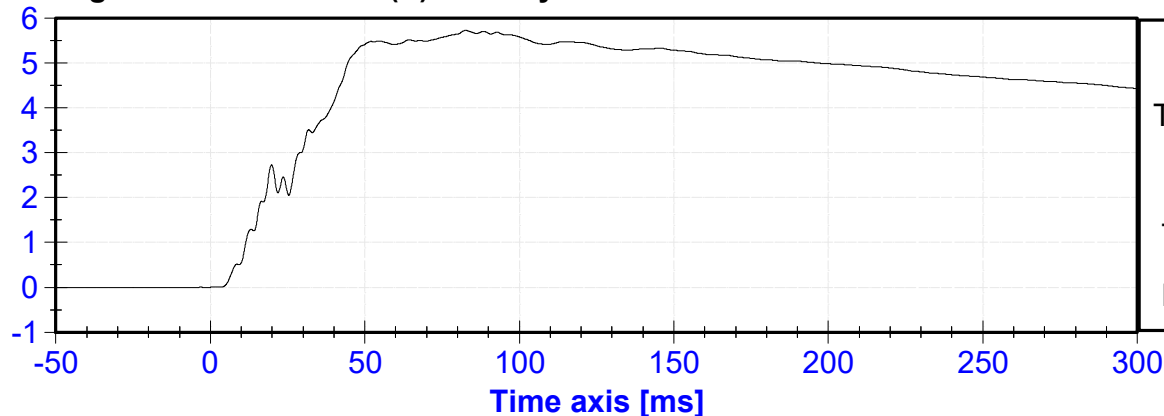
ACCELERATION [g's]

Right Sill at Rear Seat (Y) Acceleration vs. Time



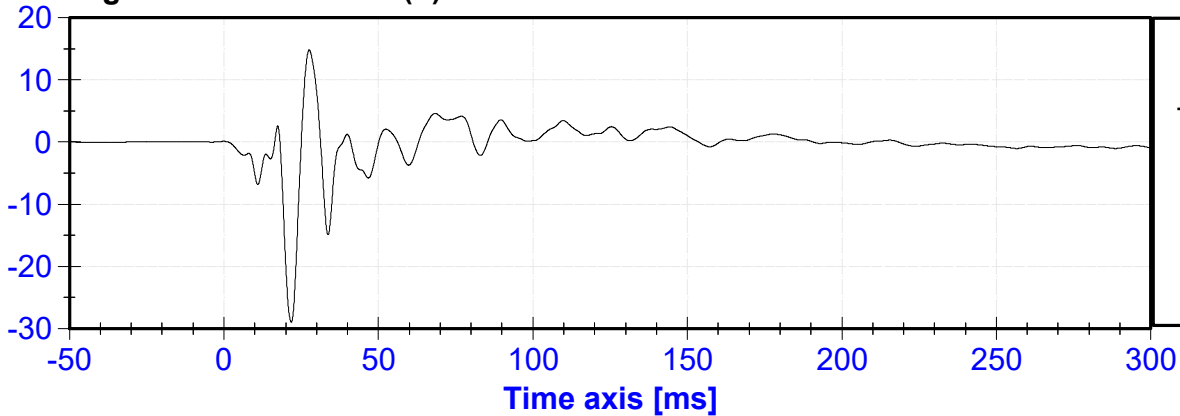
VELOCITY [m/s]

Right Sill at Rear Seat (Y) Velocity vs. Time

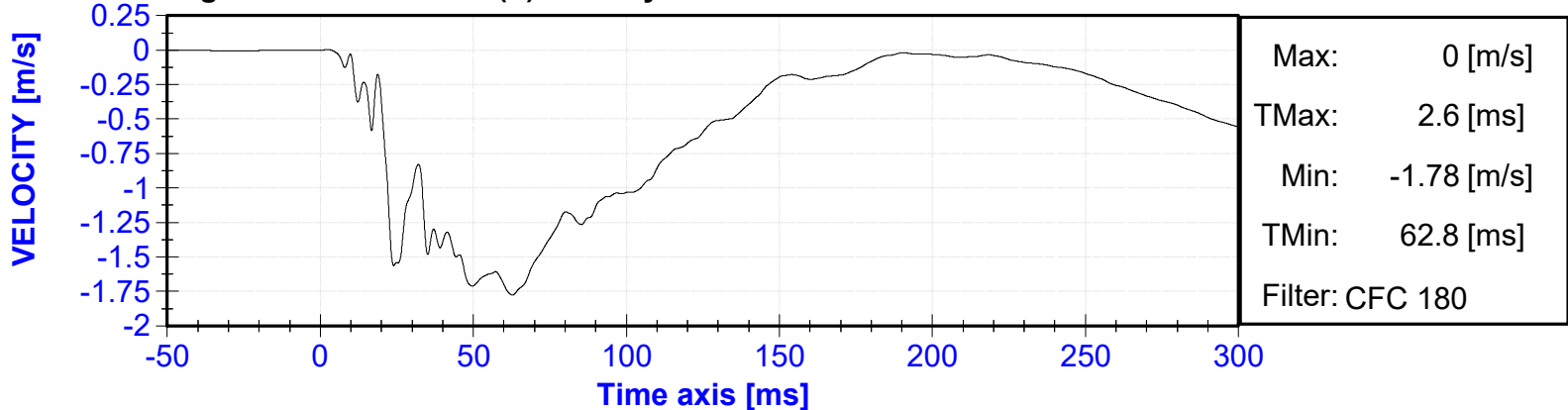


ACCELERATION [g's]

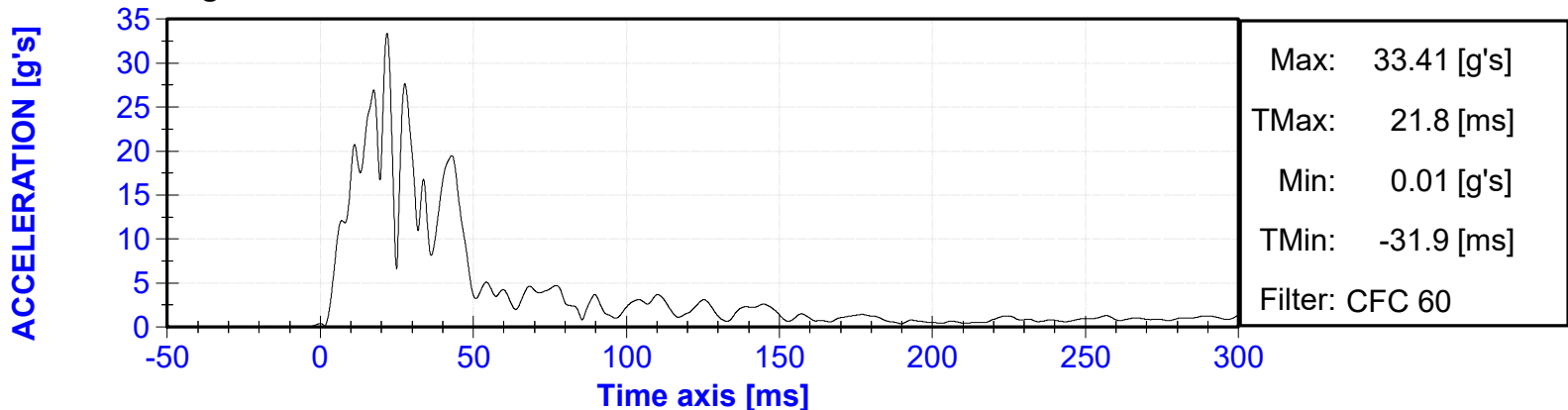
Right Sill at Rear Seat (Z) Acceleration vs. Time



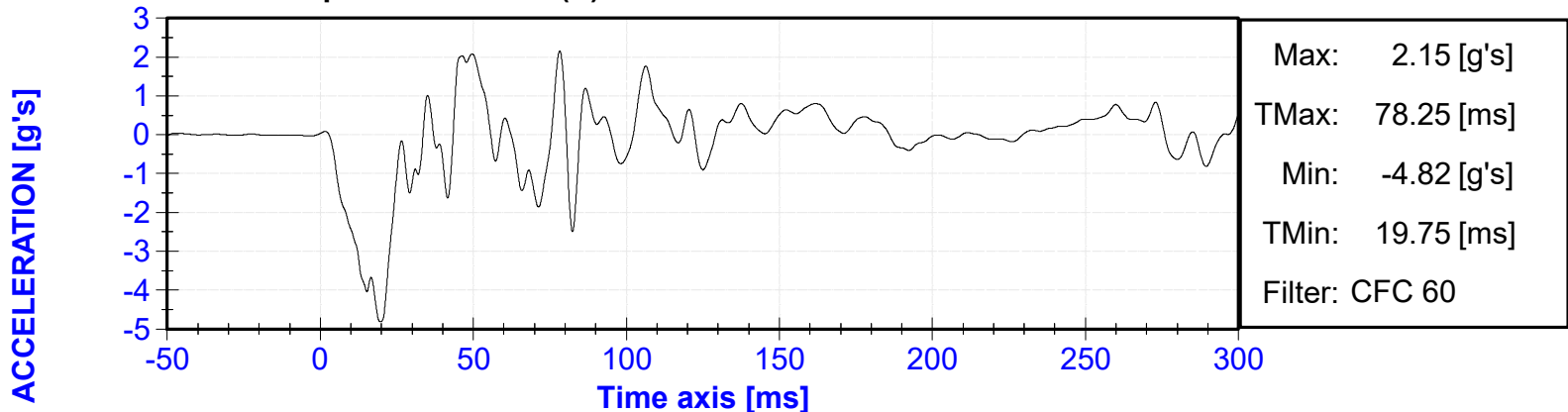
Right Sill at Rear Seat (Z) Velocity vs. Time



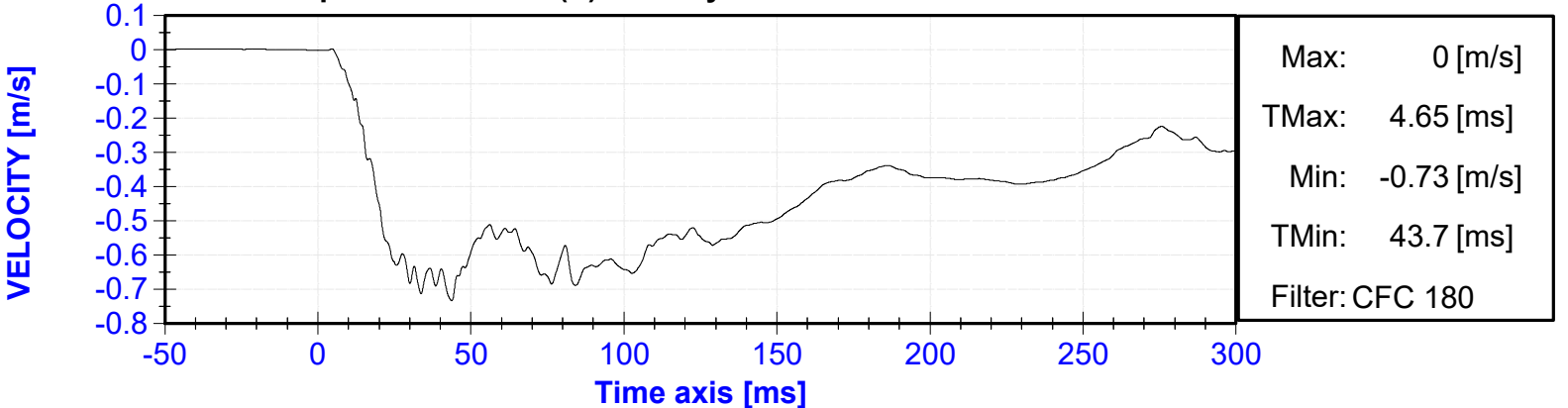
Right Sill at Rear Seat Resultant Acceleration vs. Time



Rear Floorpan Above Axle (X) Acceleration vs. Time

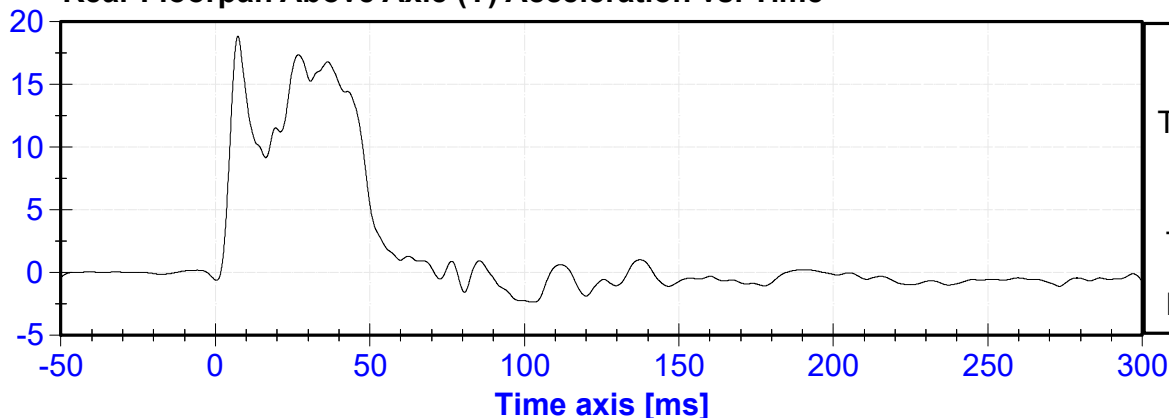


Rear Floorpan Above Axle (X) Velocity vs. Time



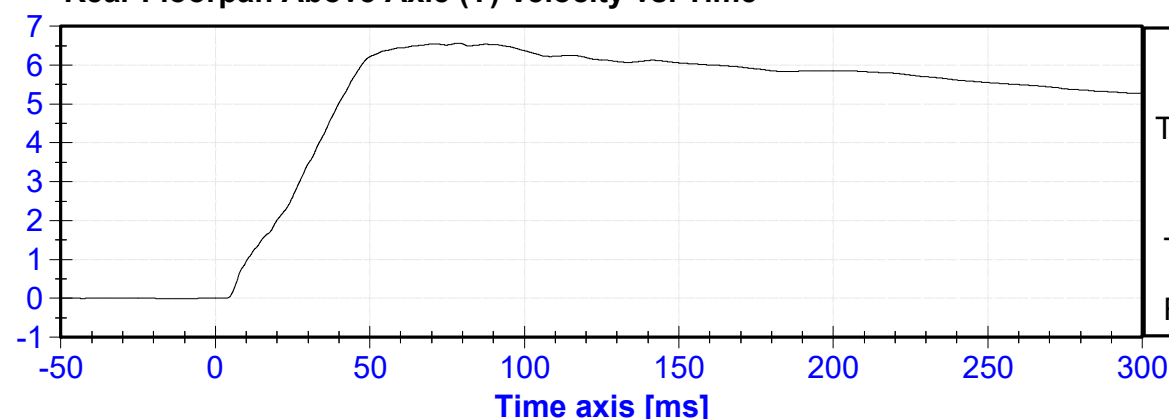
ACCELERATION [g's]

Rear Floorpan Above Axle (Y) Acceleration vs. Time



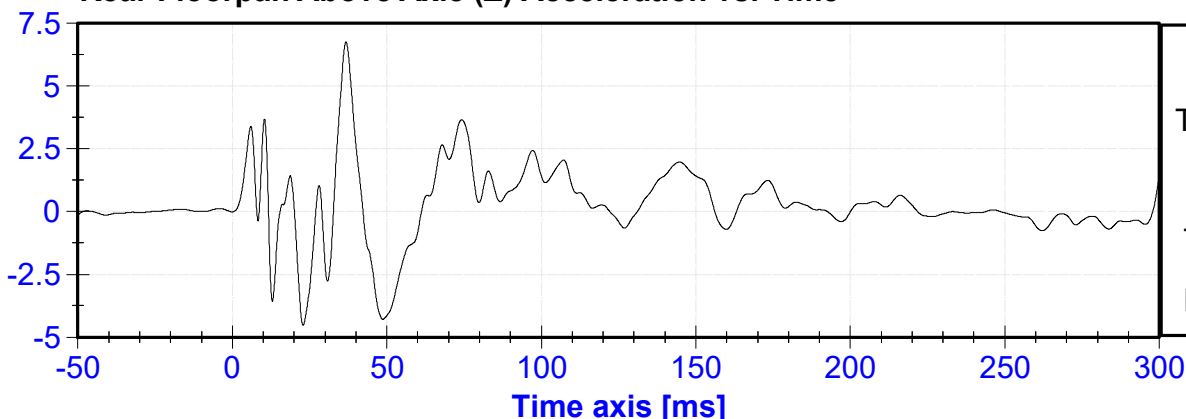
VELOCITY [m/s]

Rear Floorpan Above Axle (Y) Velocity vs. Time



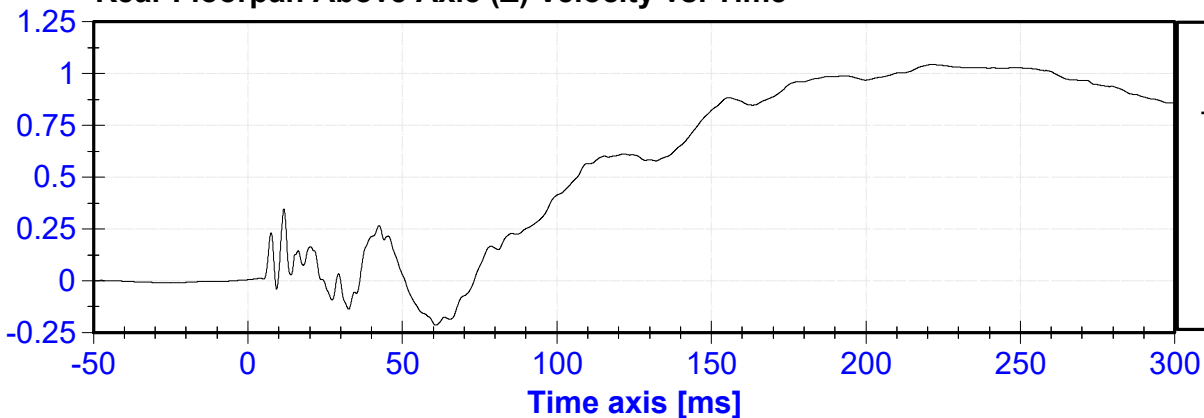
ACCELERATION [g's]

Rear Floorpan Above Axle (Z) Acceleration vs. Time



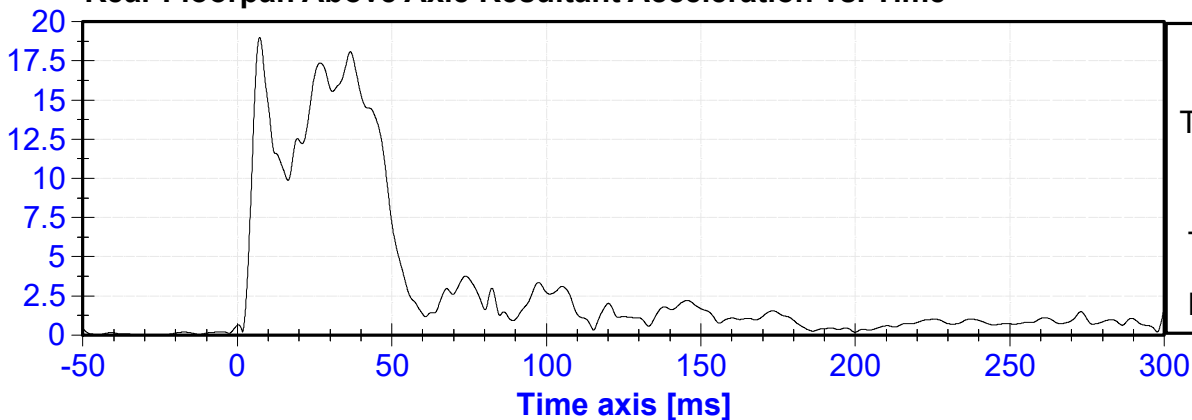
VELOCITY [m/s]

Rear Floorpan Above Axle (Z) Velocity vs. Time



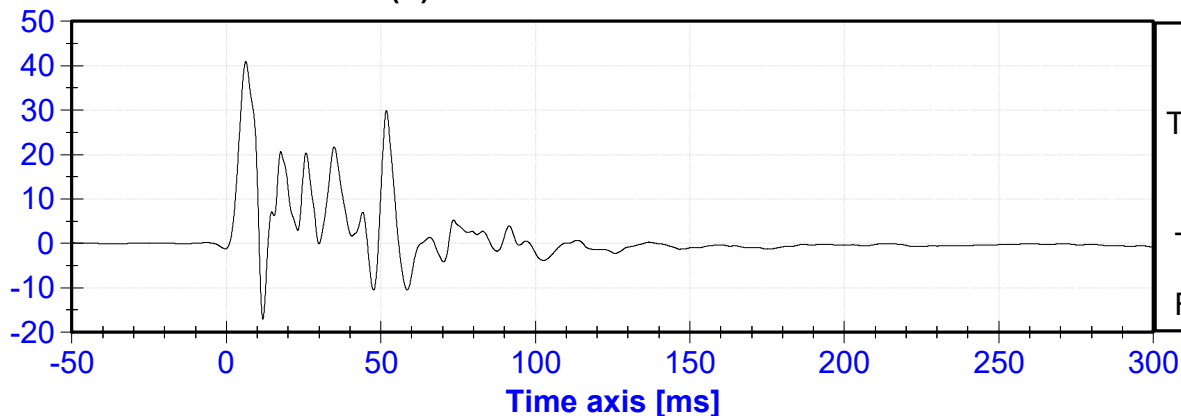
Rear Floorpan Above Axle Resultant Acceleration vs. Time

ACCELERATION [g's]



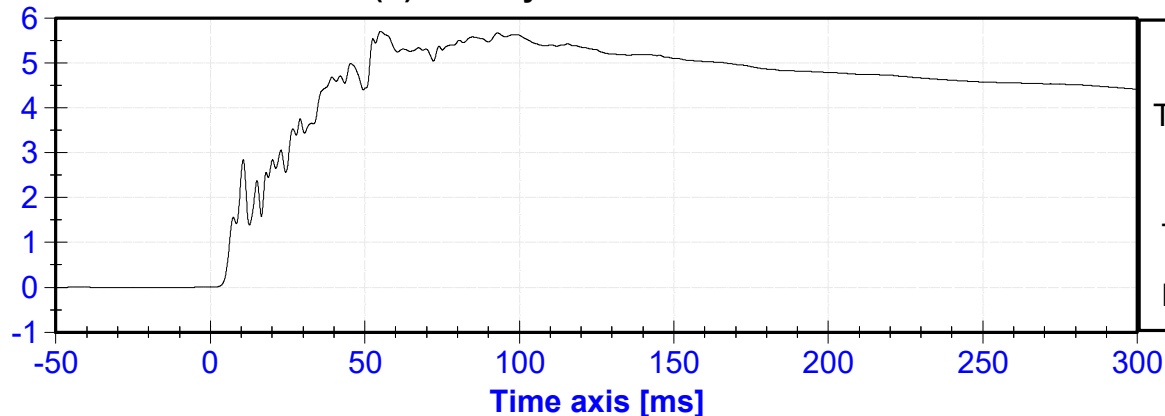
Left Sill at Rear Door (Y) Acceleration vs. Time

ACCELERATION [g's]



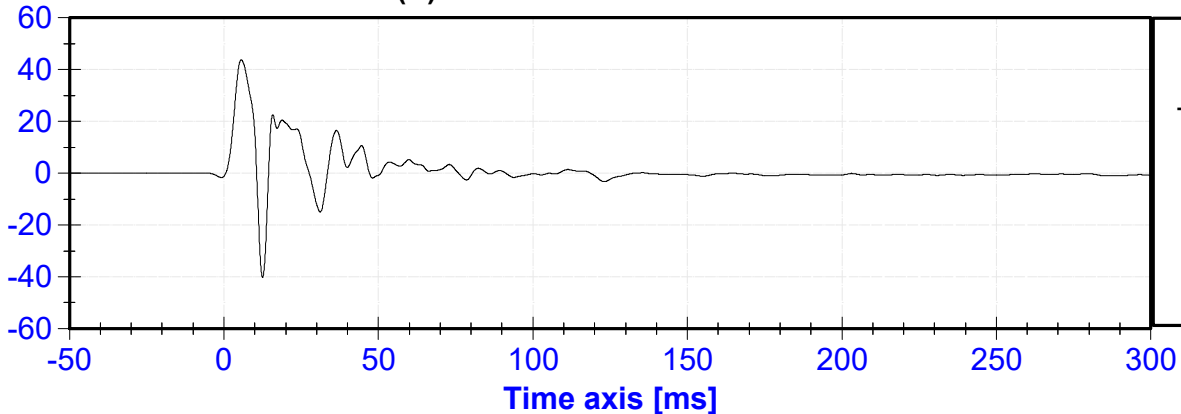
Left Sill at Rear Door (Y) Velocity vs. Time

VELOCITY [m/s]



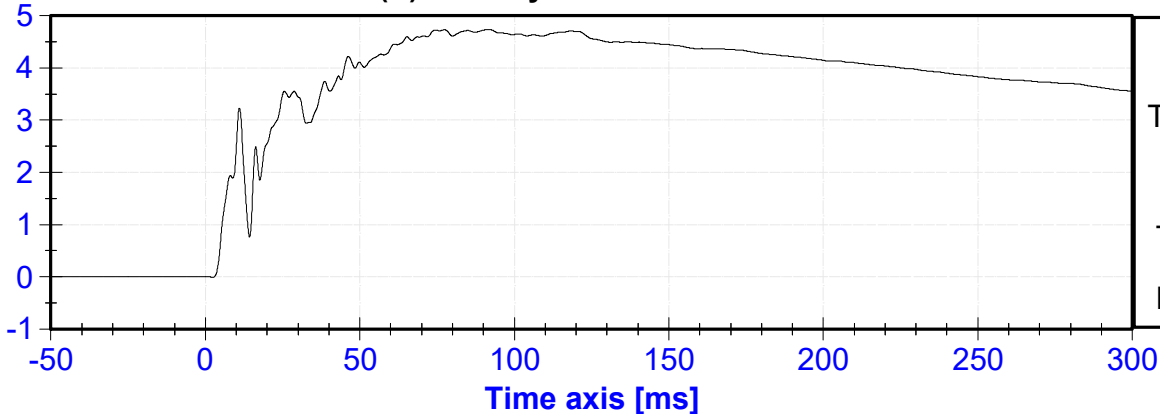
Left Sill at Front Door (Y) Acceleration vs. Time.

ACCELERATION [g's]



VELOCITY [m/s]

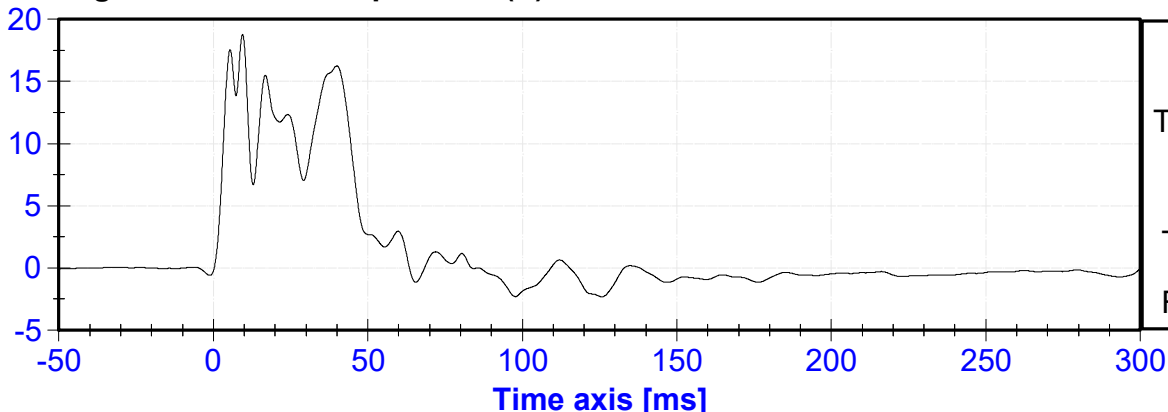
Left Sill at Front Door (Y) Velocity vs. Time



Max:	4.73 [m/s]
TMax:	91.55 [ms]
Min:	-0.01 [m/s]
TMin:	2.4 [ms]
Filter:	CFC 180

ACCELERATION [g's]

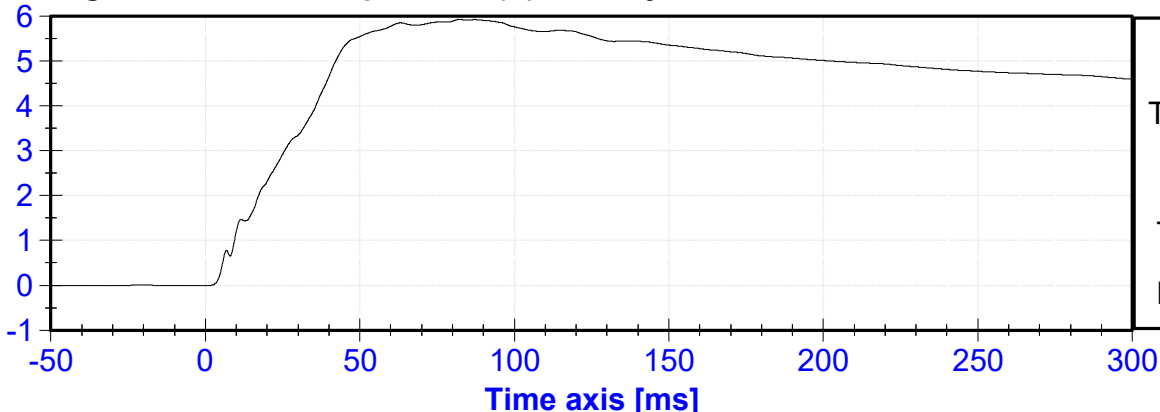
Right Rear Occ. Compartment(Y) Acceleration vs. Time



Max:	18.79 [g's]
TMax:	9.45 [ms]
Min:	-2.33 [g's]
TMin:	125.75 [ms]
Filter:	CFC 60

VELOCITY [m/s]

Right Rear Occ. Compartment(Y) Velocity vs. Time

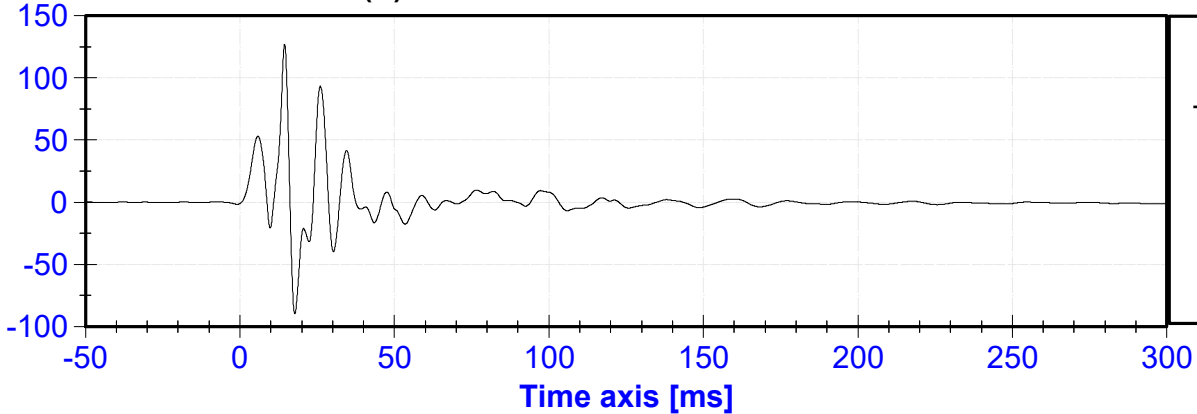


Max:	5.93 [m/s]
TMax:	82.25 [ms]
Min:	0 [m/s]
TMin:	-39.75 [ms]
Filter:	CFC 180

Exceeded calibration range and saturated at 14.2 ms

ACCELERATION [g's]

Left B-Post Lower (Y) Acceleration vs. Time

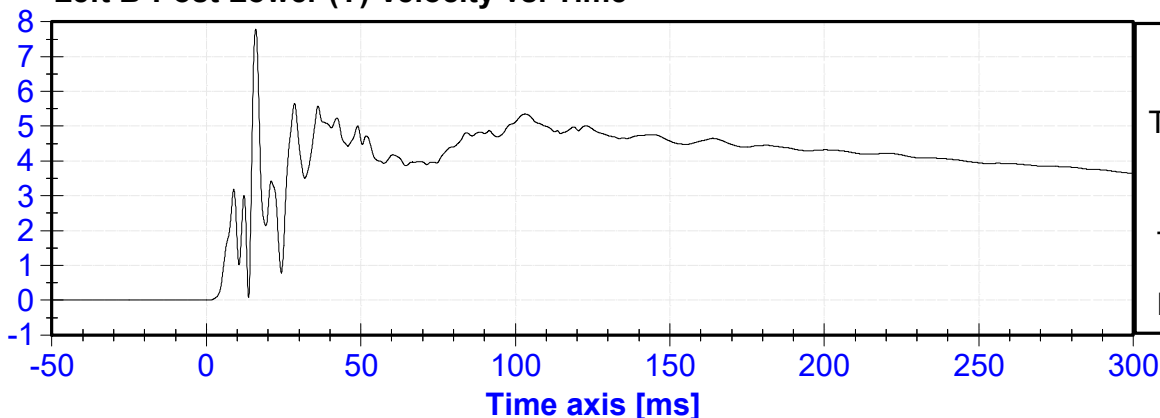


Max:	127.03 [g's]
TMax:	14.5 [ms]
Min:	-89.66 [g's]
TMin:	17.75 [ms]
Filter:	CFC 60

Exceeded calibration range and saturated at 14.2 ms

Left B-Post Lower (Y) Velocity vs. Time

VELOCITY [m/s]

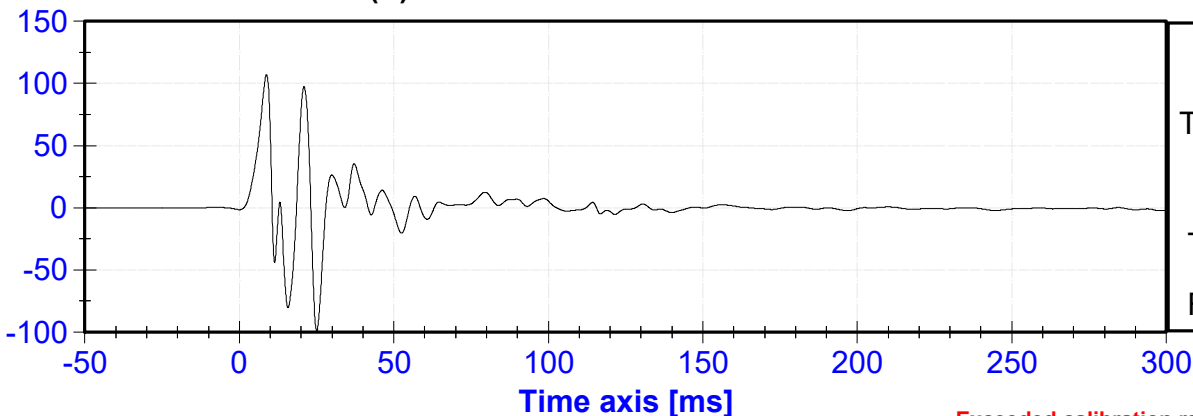


Max:	7.78 [m/s]
TMax:	15.95 [ms]
Min:	0 [m/s]
TMin:	-19.5 [ms]
Filter:	CFC 180

Exceeded calibration range and saturated at 9.8 ms

Left B-Post Middle (Y) Acceleration vs. Time

ACCELERATION [g's]

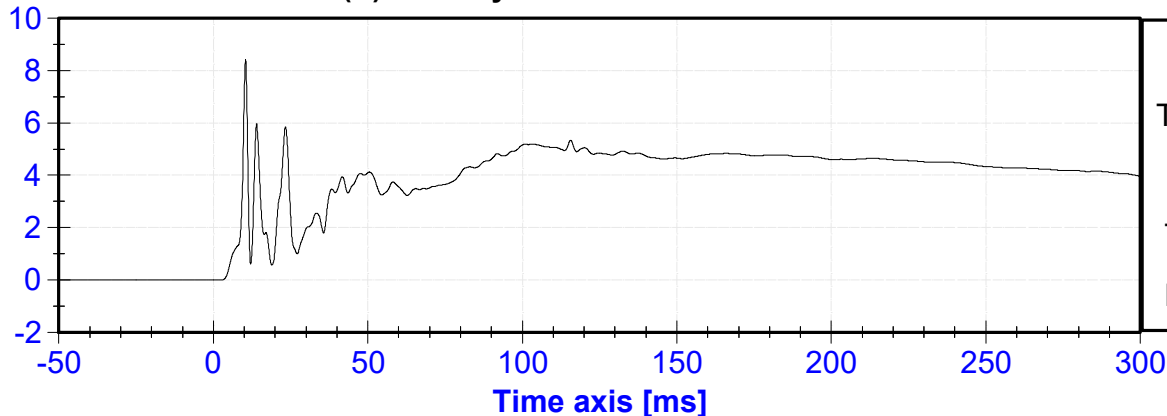


Max:	107.27 [g's]
TMax:	8.8 [ms]
Min:	-99.02 [g's]
TMin:	25.05 [ms]
Filter:	CFC 60

Exceeded calibration range and saturated at 9.8 ms

Left B-Post Middle (Y) Velocity vs. Time

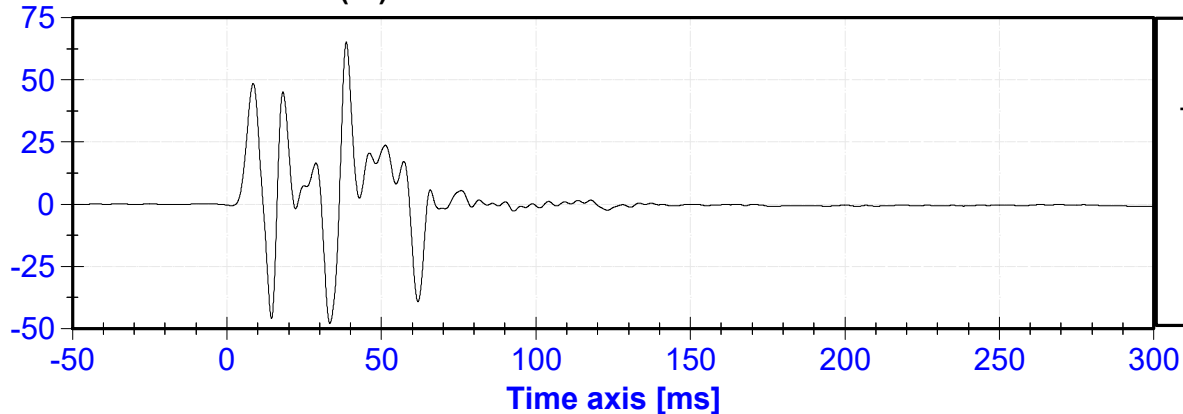
VELOCITY [m/s]



Max:	8.41 [m/s]
TMax:	10.4 [ms]
Min:	-0.01 [m/s]
TMin:	-20.45 [ms]
Filter:	CFC 180

Left A-Post Lower (Y) Acceleration vs. Time

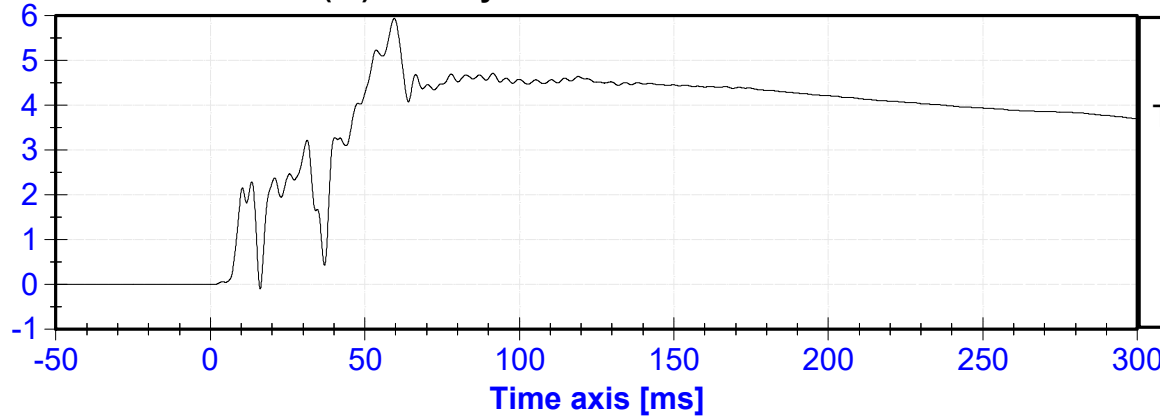
ACCELERATION [g's]



Max:	65.33 [g's]
TMax:	38.65 [ms]
Min:	-47.93 [g's]
TMin:	33.3 [ms]
Filter:	CFC 60

VELOCITY [m/s]

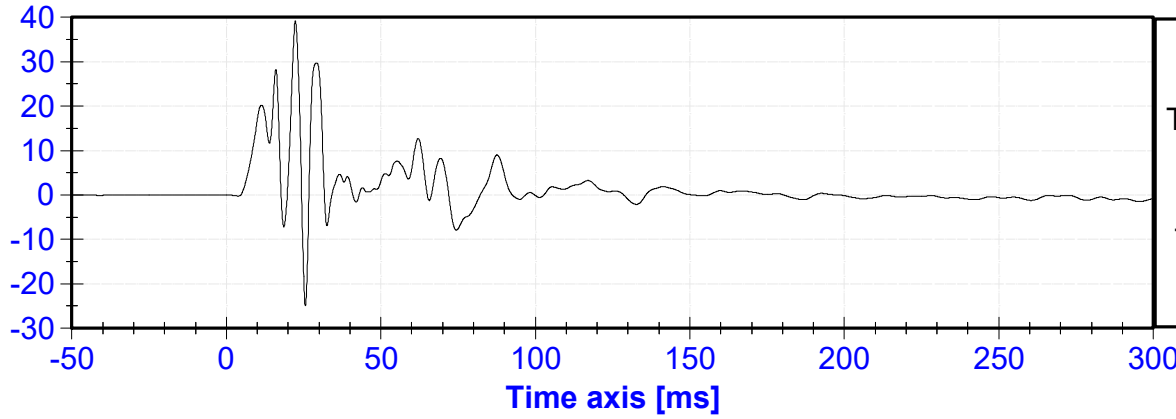
Left A-Post Lower (Y) Velocity vs. Time



Max:	5.94 [m/s]
TMax:	59.55 [ms]
Min:	-0.11 [m/s]
TMin:	16.1 [ms]
Filter:	CFC 180

ACCELERATION [g's]

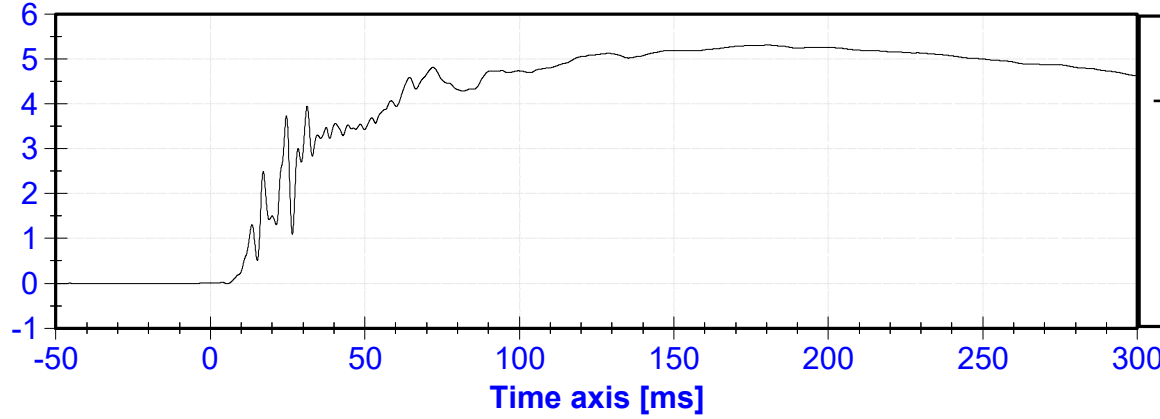
Left A-Post Middle (Y) Acceleration vs. Time



Max:	39.19 [g's]
TMax:	22.3 [ms]
Min:	-24.99 [g's]
TMin:	25.55 [ms]
Filter:	CFC 60

VELOCITY [m/s]

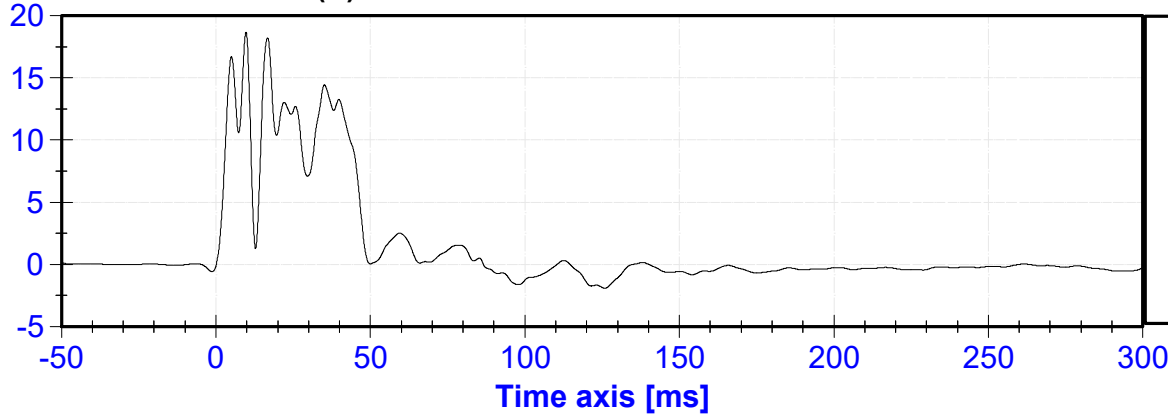
Left A-Post Middle (Y) Velocity vs. Time



Max:	5.31 [m/s]
TMax:	180.5 [ms]
Min:	-0.01 [m/s]
TMin:	5.45 [ms]
Filter:	CFC 180

ACCELERATION [g's]

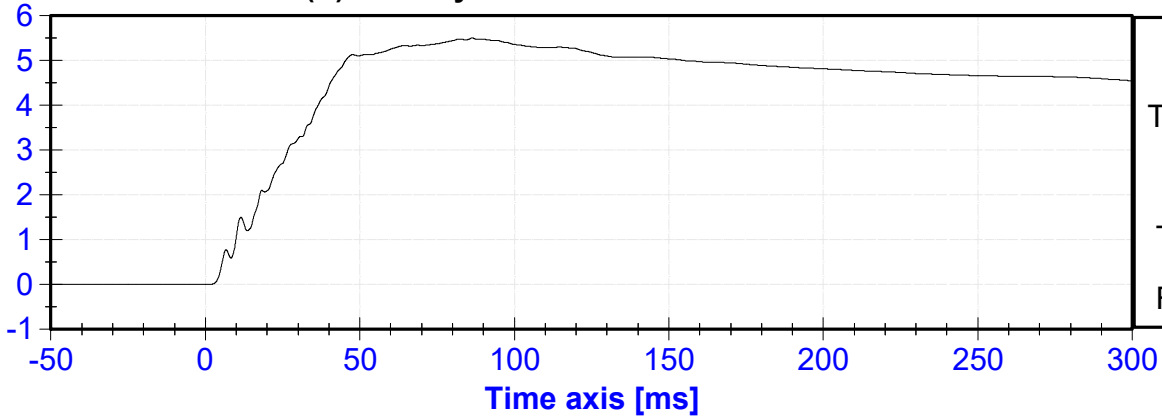
Front Seat Track (Y) Acceleration vs. Time



Max:	18.68 [g's]
TMax:	9.75 [ms]
Min:	-1.92 [g's]
TMin:	125.75 [ms]
Filter:	CFC 60

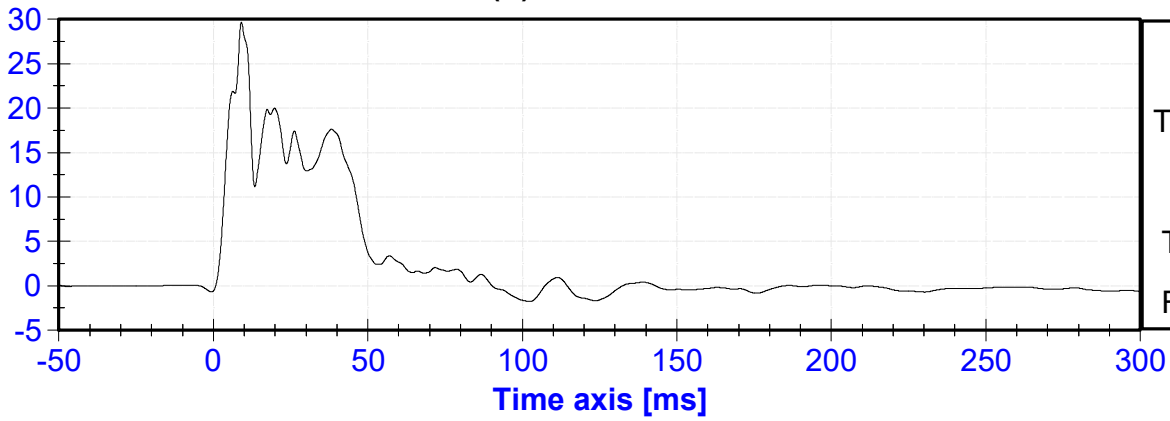
Front Seat Track (Y) Velocity vs. Time

VELOCITY [m/s]



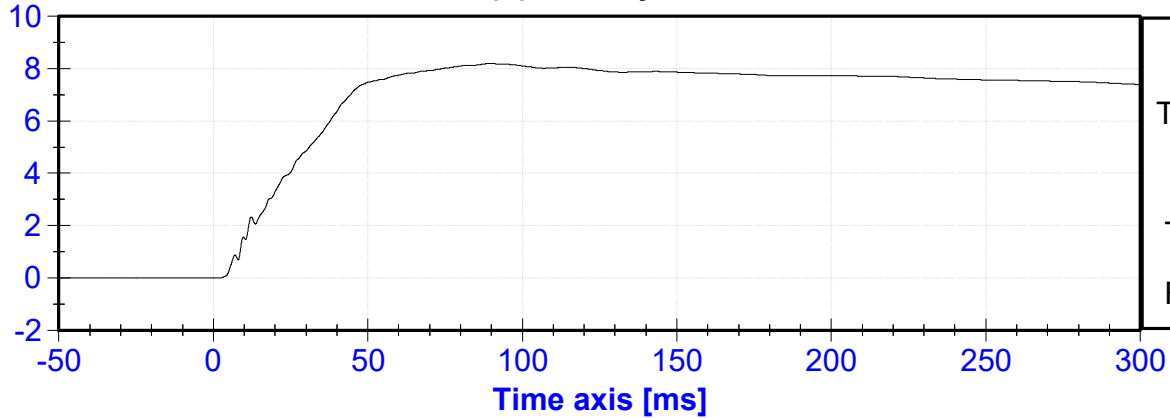
Rear Seat Track or Structure (Y) Acceleration vs. Time

ACCELERATION [g's]



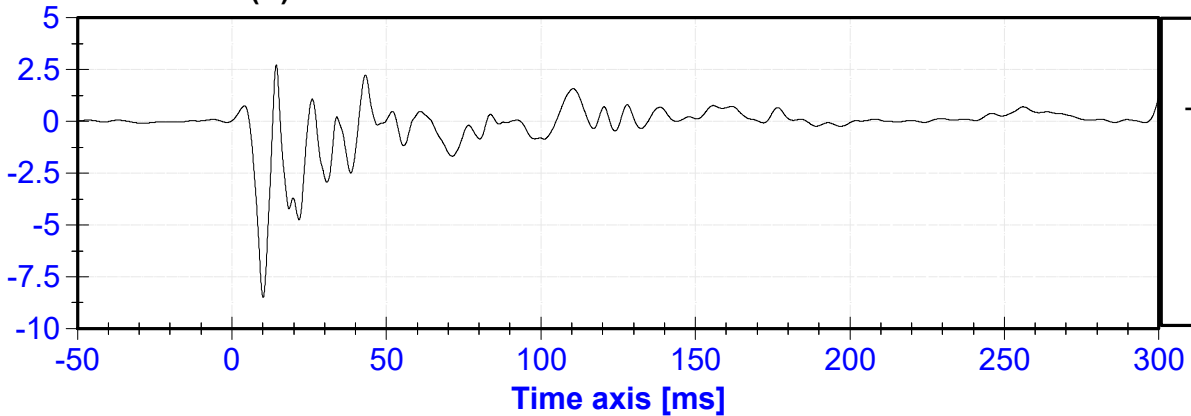
Rear Seat Track or Structure (Y) Velocity vs. Time

VELOCITY [m/s]



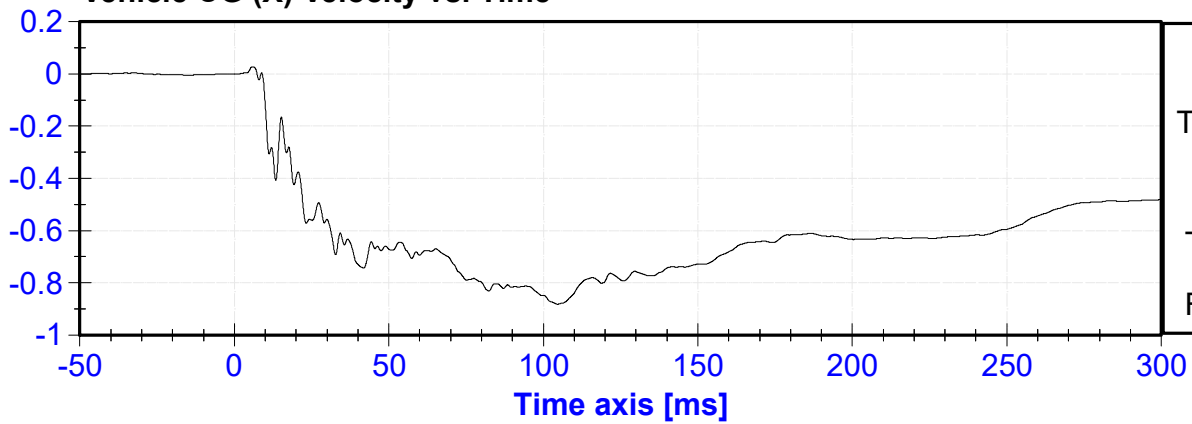
Vehicle CG (X) Acceleration vs. Time

ACCELERATION [g's]



VELOCITY [m/s]

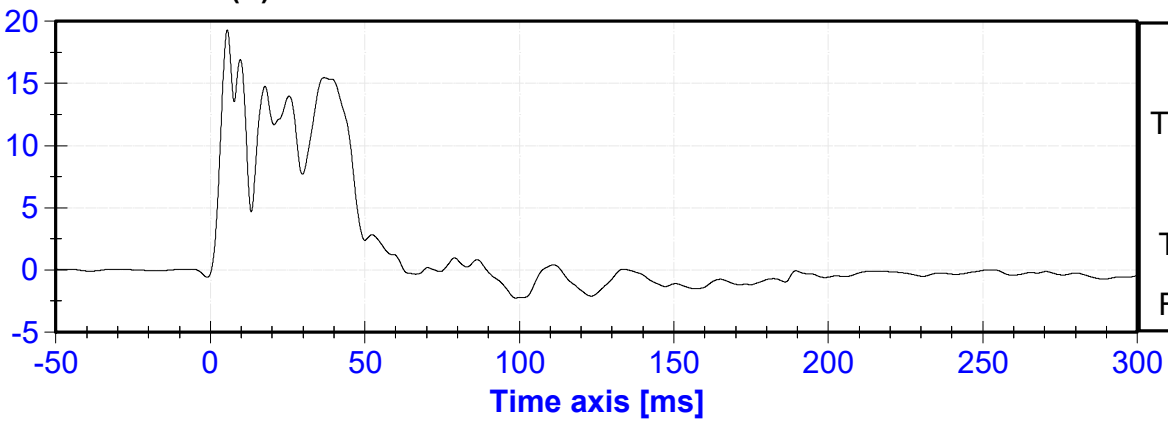
Vehicle CG (X) Velocity vs. Time



Max:	0.03 [m/s]
TMax:	5.9 [ms]
Min:	-0.88 [m/s]
TMin:	104.6 [ms]
Filter:	CFC 180

ACCELERATION [g's]

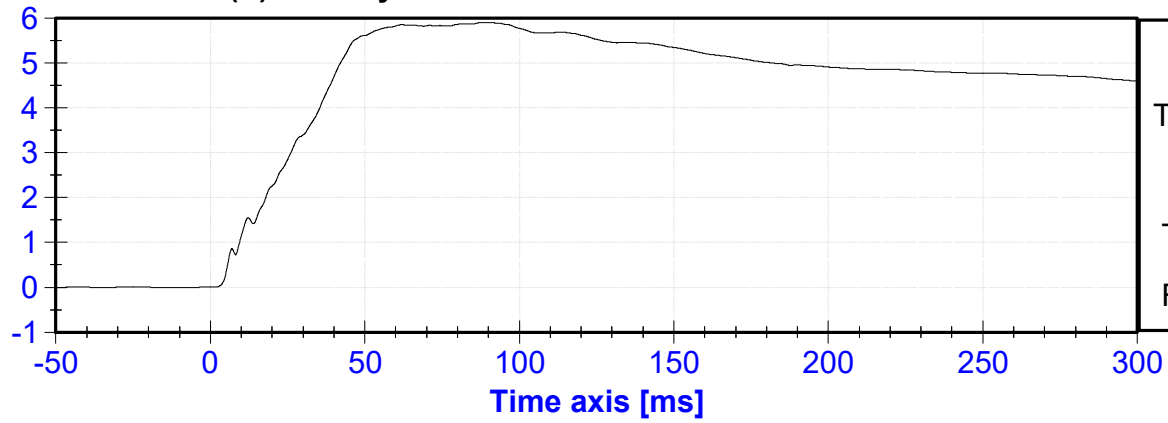
Vehicle CG (Y) Acceleration vs. Time



Max:	19.32 [g's]
TMax:	5.45 [ms]
Min:	-2.25 [g's]
TMin:	98.85 [ms]
Filter:	CFC 60

VELOCITY [m/s]

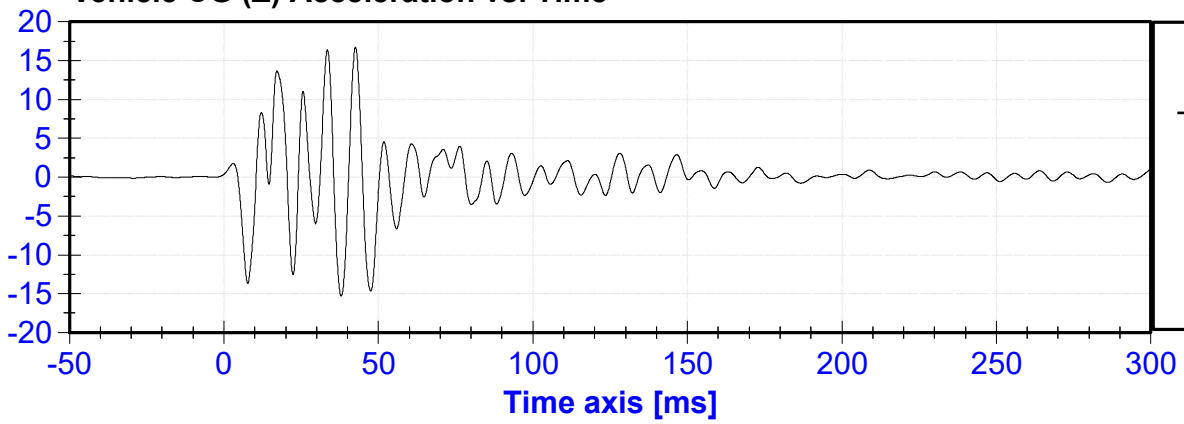
Vehicle CG (Y) Velocity vs. Time



Max:	5.91 [m/s]
TMax:	88.3 [ms]
Min:	0 [m/s]
TMin:	-12.9 [ms]
Filter:	CFC 180

ACCELERATION [g's]

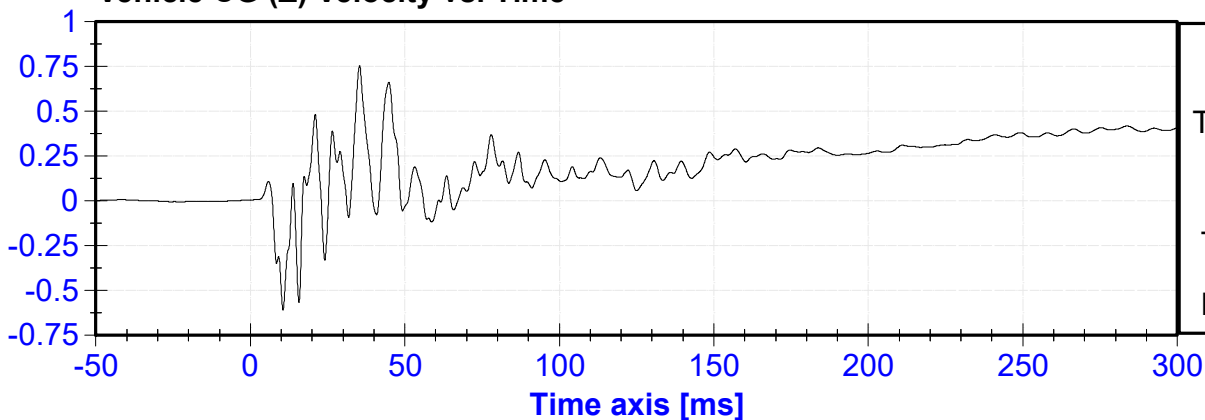
Vehicle CG (Z) Acceleration vs. Time



Max:	16.75 [g's]
TMax:	42.55 [ms]
Min:	-15.31 [g's]
TMin:	37.95 [ms]
Filter:	CFC 60

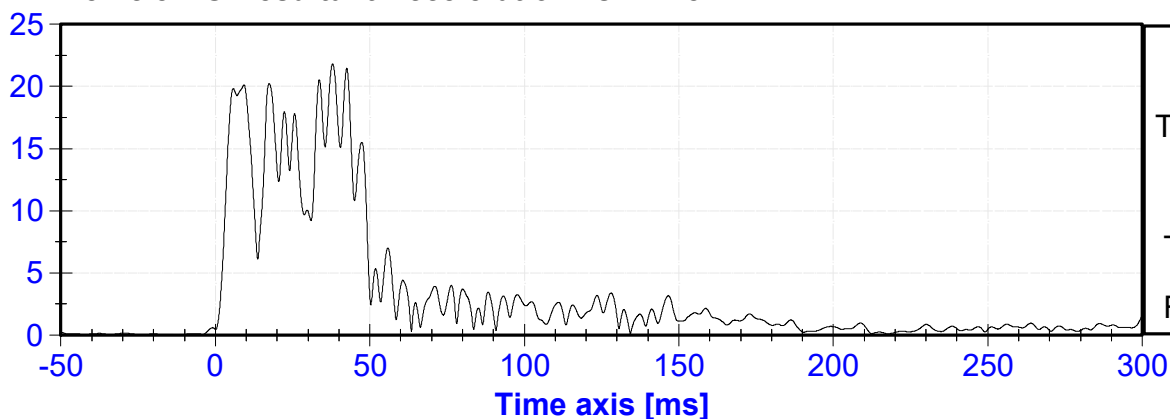
VELOCITY [m/s]

Vehicle CG (Z) Velocity vs. Time



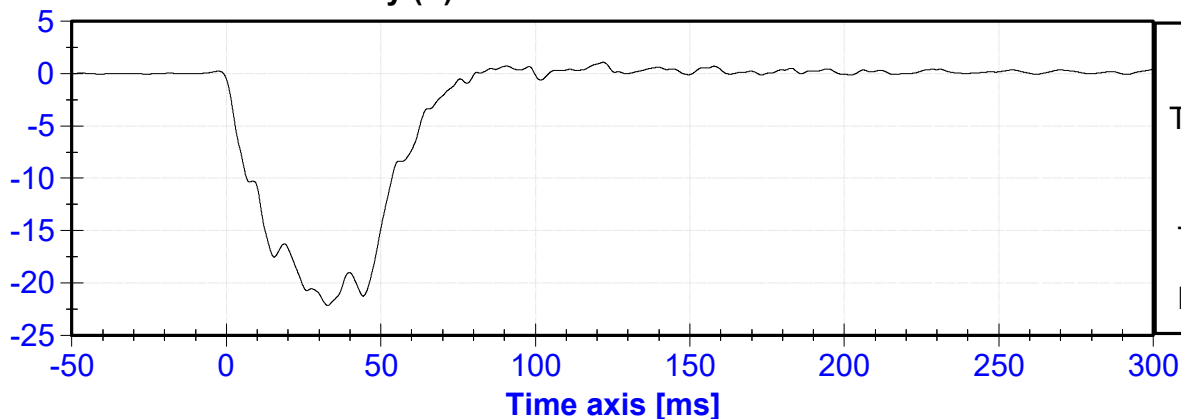
ACCELERATION [g's]

Vehicle CG Resultant Acceleration vs. Time



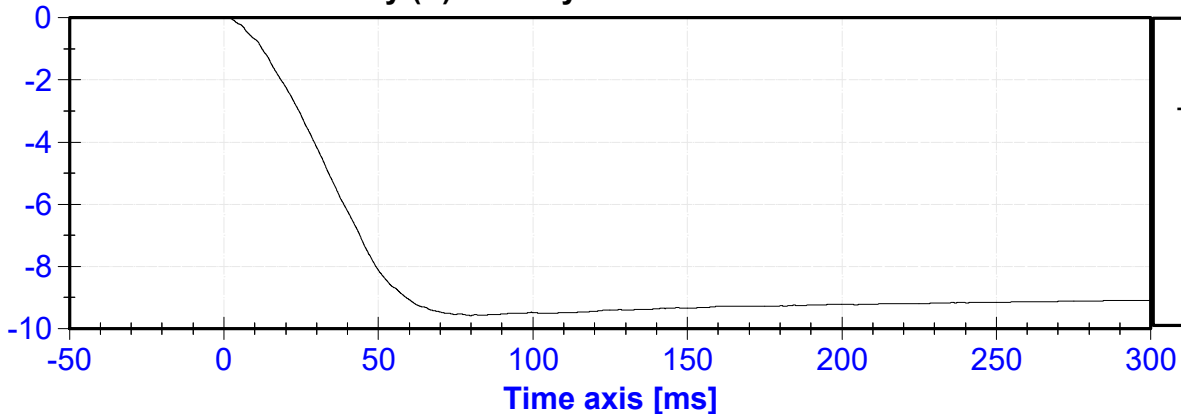
ACCELERATION [g's]

MDB Center of Gravity (X) Acceleration vs. Time



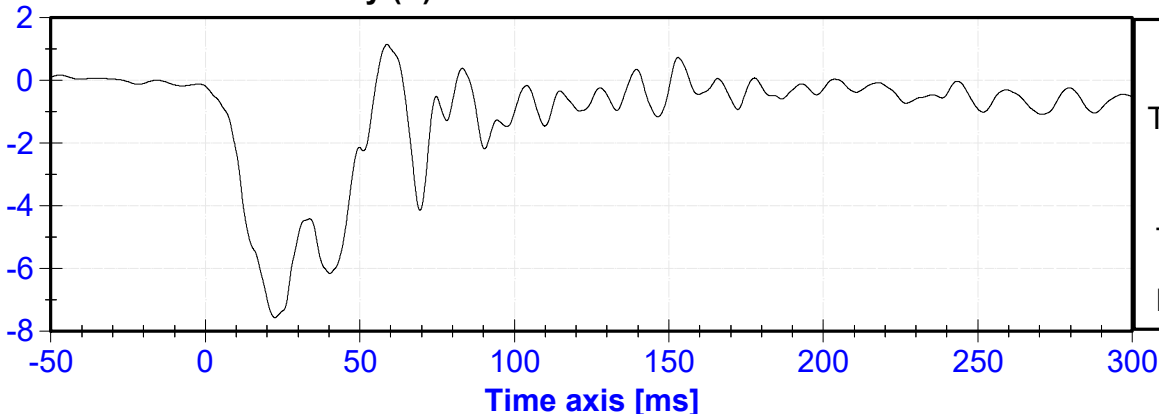
VELOCITY [m/s]

MDB Center of Gravity (X) Velocity vs. Time



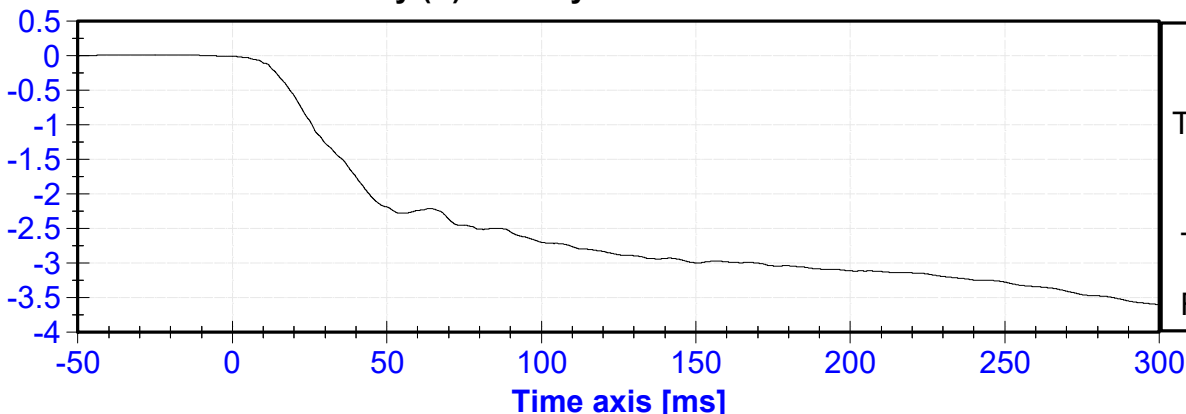
ACCELERATION [g's]

MDB Center of Gravity (Y) Acceleration vs. Time



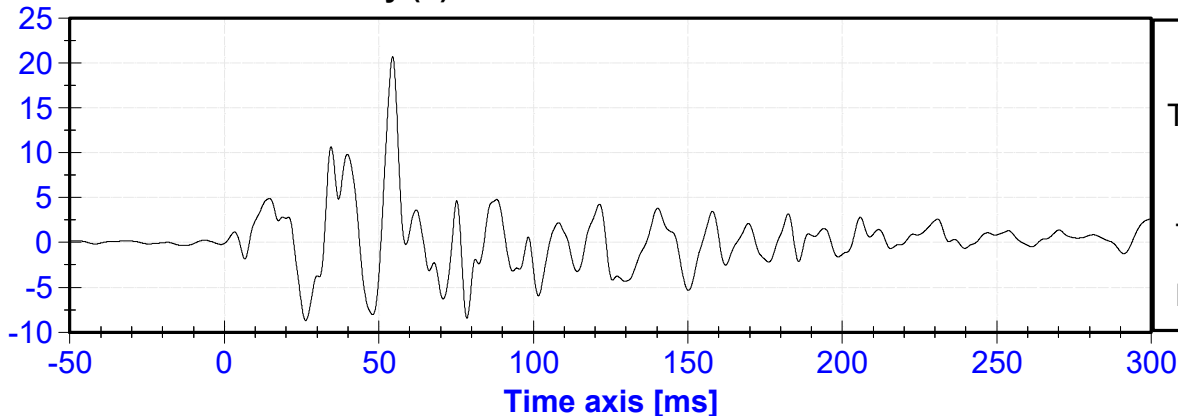
VELOCITY [m/s]

MDB Center of Gravity (Y) Velocity vs. Time



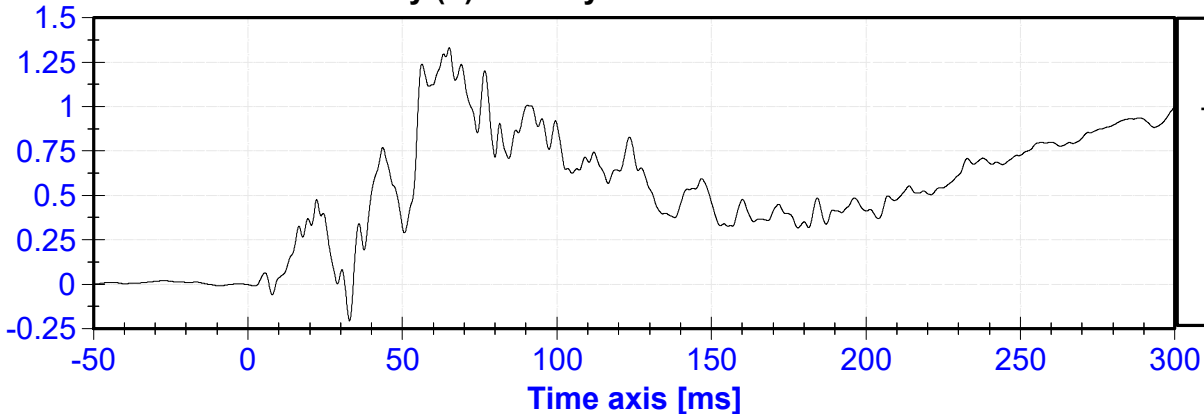
ACCELERATION [g's]

MDB Center of Gravity (Z) Acceleration vs. Time



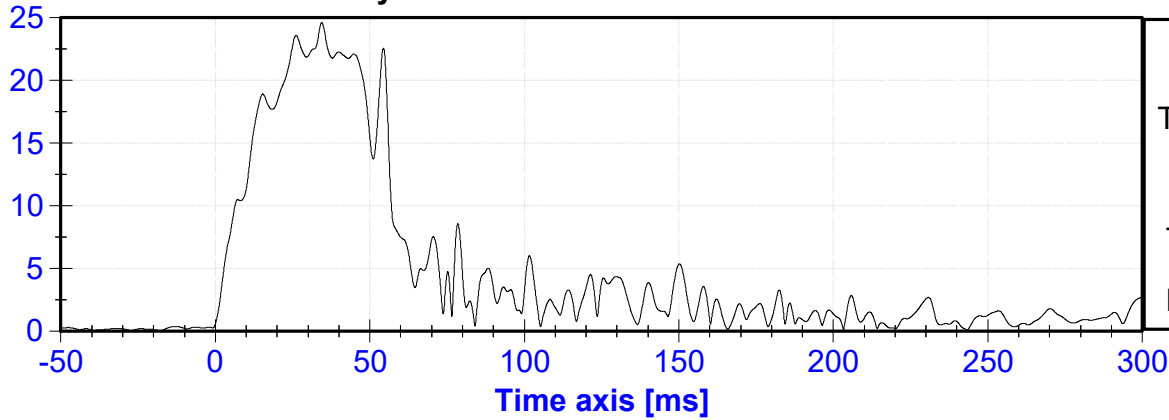
VELOCITY [m/s]

MDB Center of Gravity (Z) Velocity vs. Time



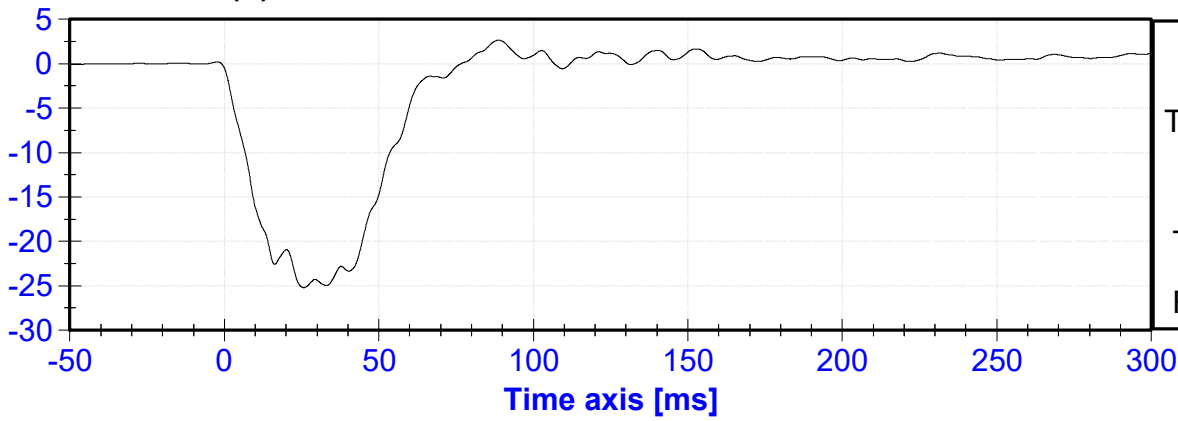
MDB Center of Gravity Resultant Acceleration vs. Time

ACCELERATION [g's]



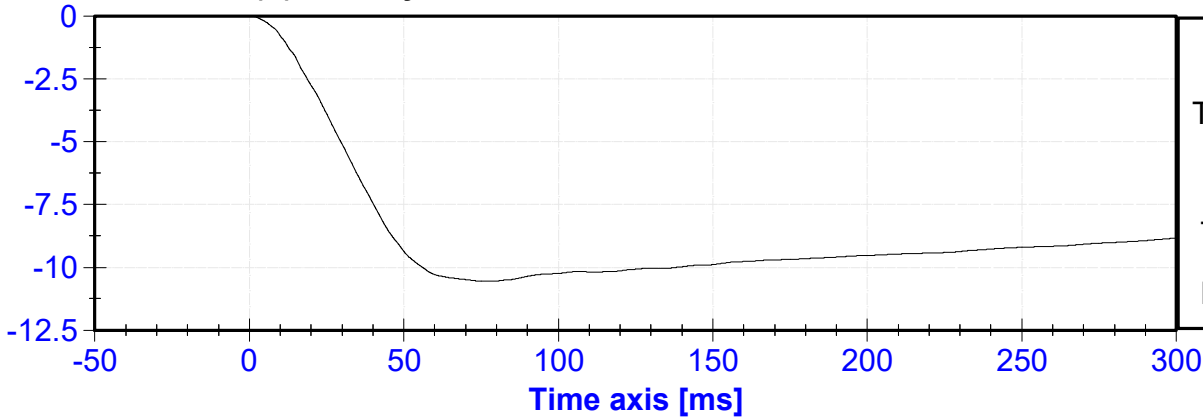
MDB Rear (X) Acceleration vs. Time

ACCELERATION [g's]



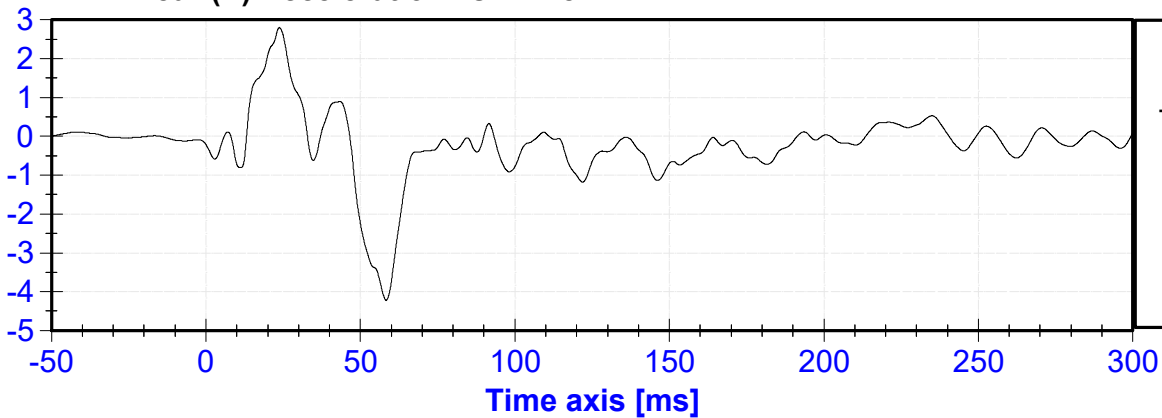
MDB Rear (X) Velocity vs. Time

VELOCITY [m/s]

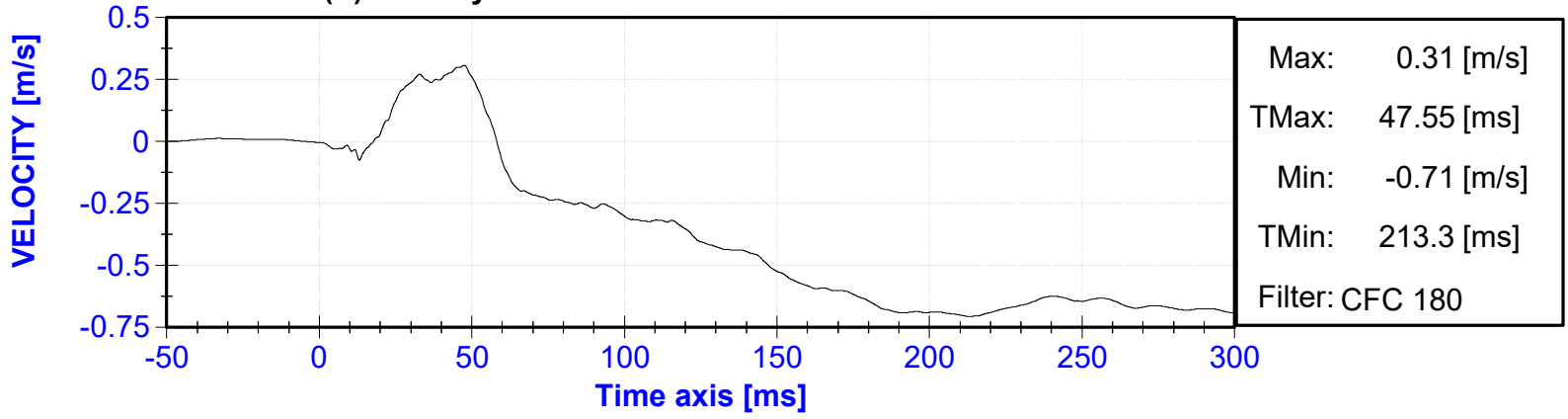


MDB Rear (Y) Acceleration vs. Time

ACCELERATION [g's]



MDB Rear (Y) Velocity vs. Time



APPENDIX V

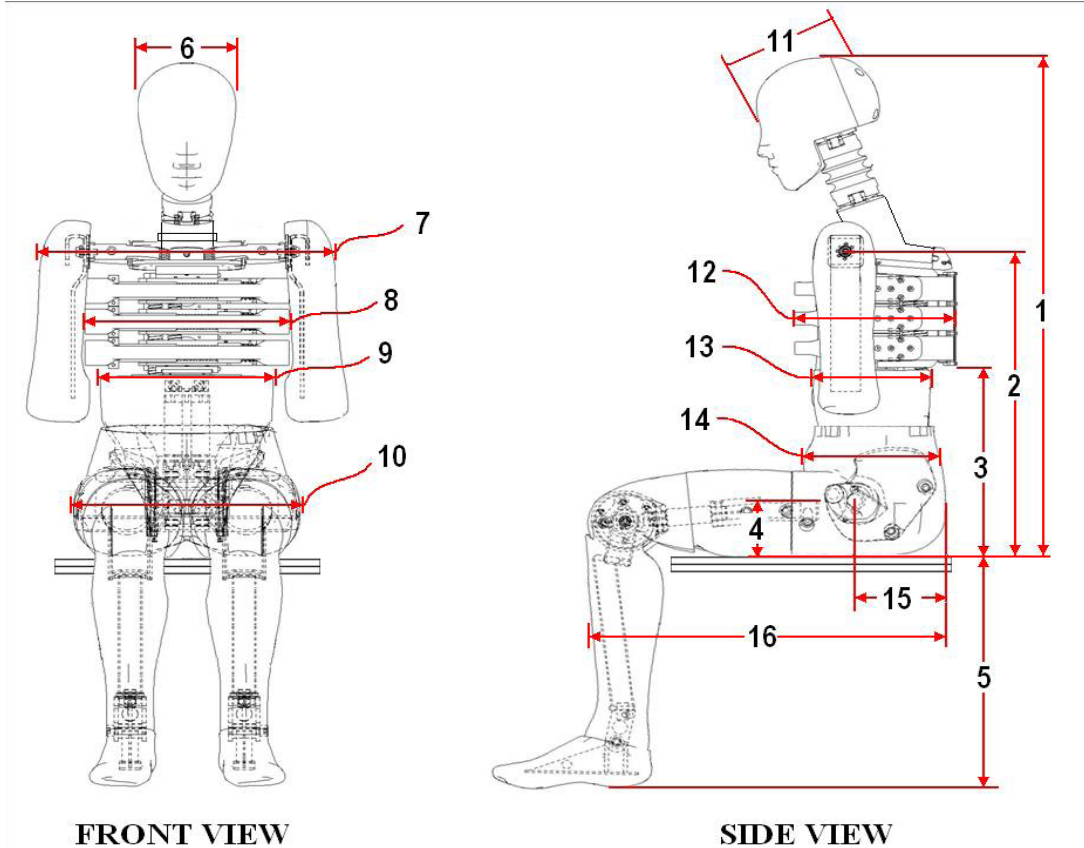
**PRE-TEST
ES-2re PERFORMANCE CALIBRATION TEST DATA**

External Measurements - EuroSID-2re

Technician: J. Rios

Date: 10/09/2024

Dummy Serial Number: D037



Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	565	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	154	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	328	Pass
9	Abdomen Width	273	287	282	Pass
10	Pelvis Lap Width	359	373	362	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	265	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	157	Pass
16	Back of Buttocks to Front Knee	597	615	607	Pass

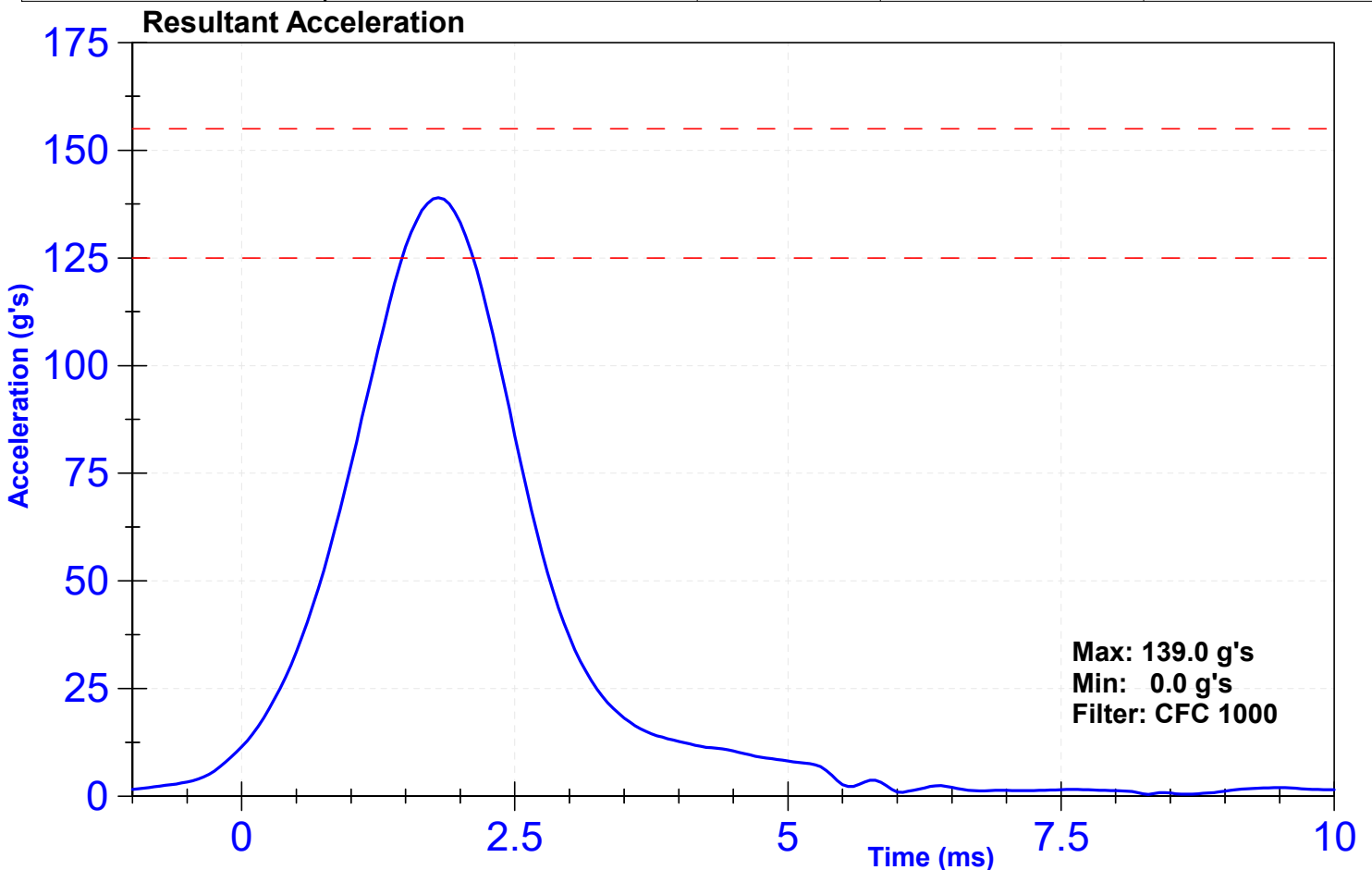
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

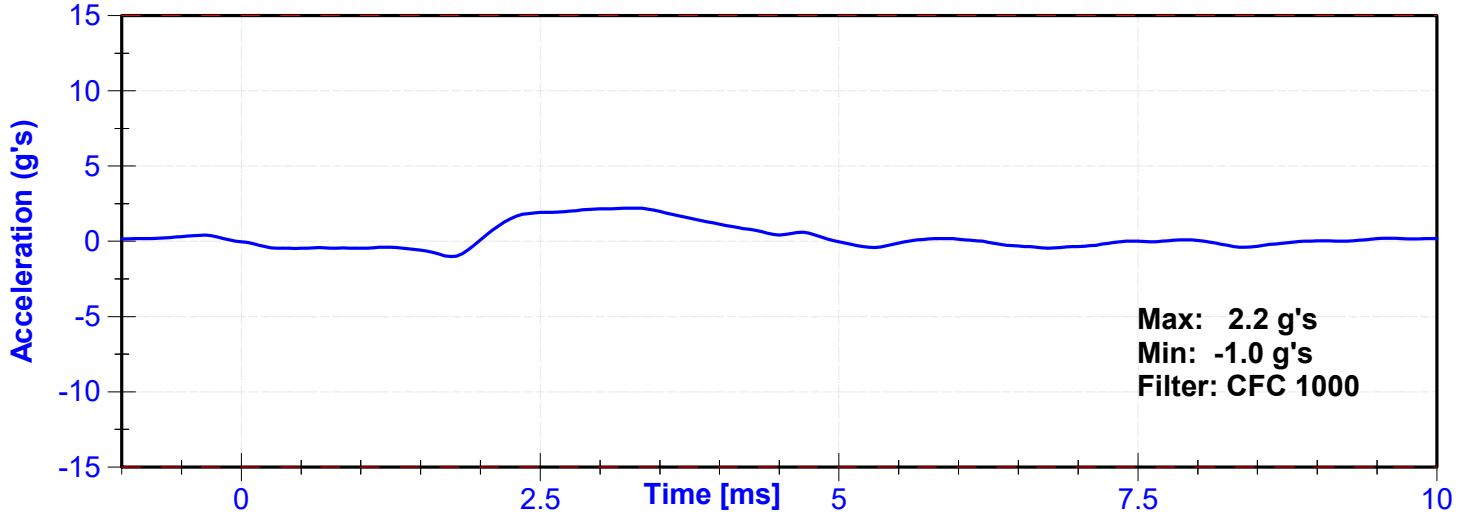
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	37	Pass
Resultant Acceleration	125	155	g's	139.0	Pass
Oscillation	0	15	%	2.63	Pass
Fore-Aft Acceleration	-15	15	g's	2.2	Pass

Transducer Calibrations

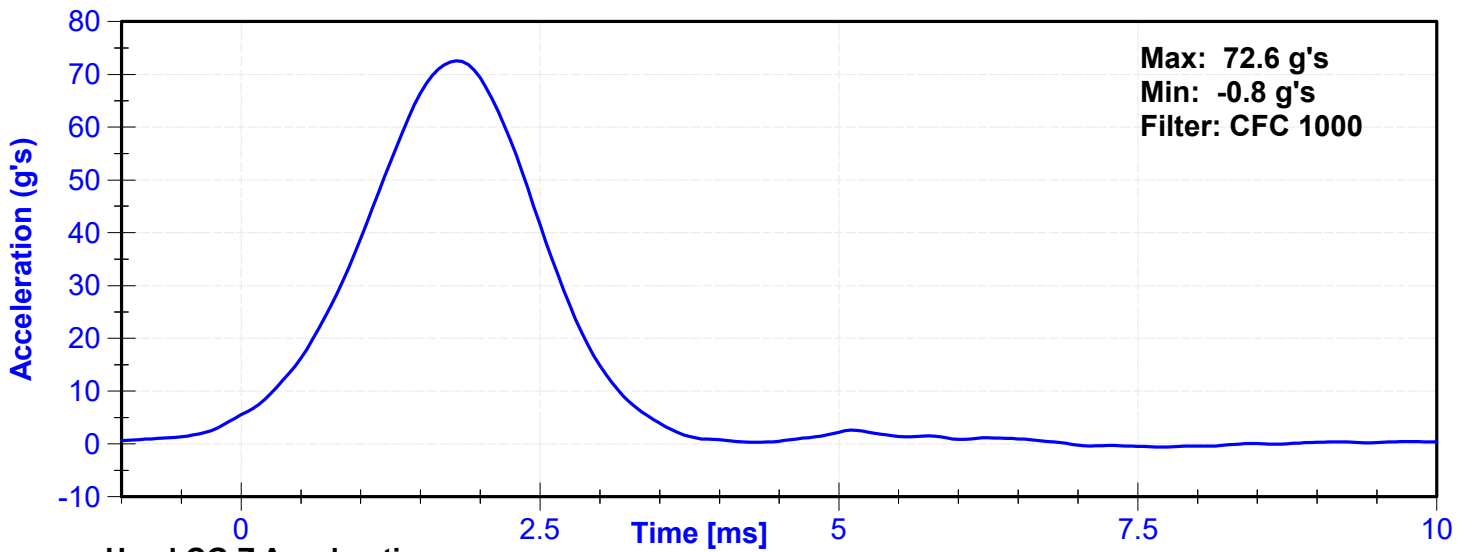
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	10/8/2024	4/6/2025
Y Accelerometer	Endevco	T22281	10/8/2024	4/6/2025
Z Accelerometer	Endevco	T26050	10/8/2024	4/6/2025



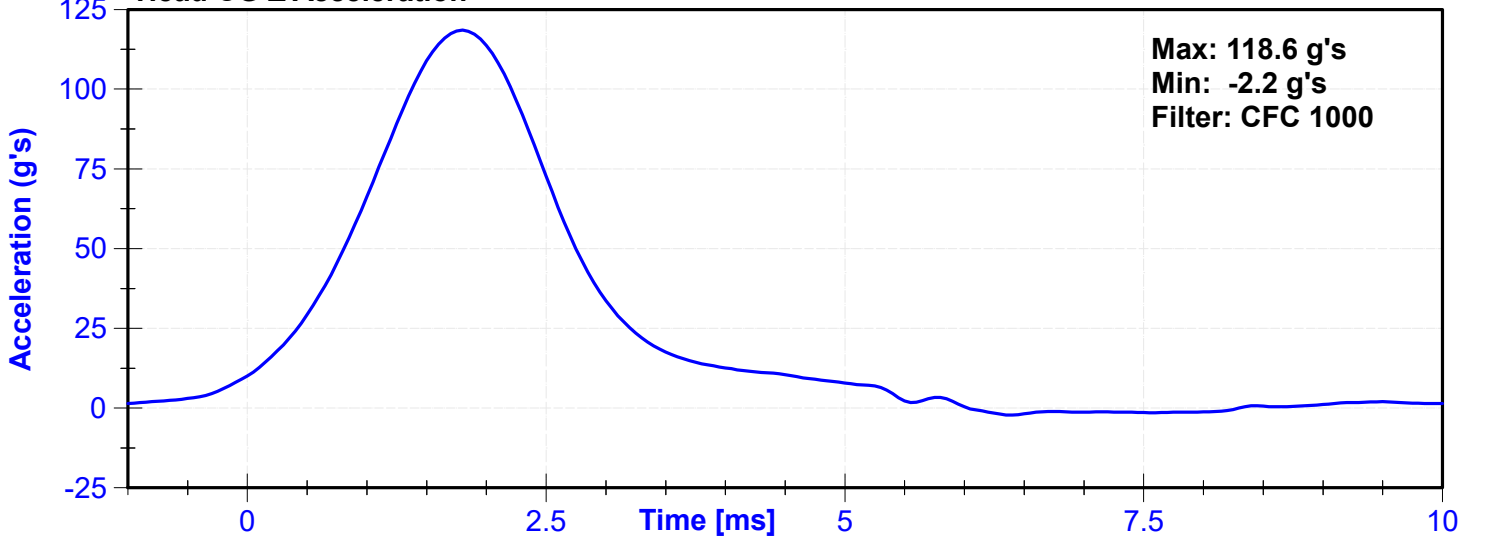
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



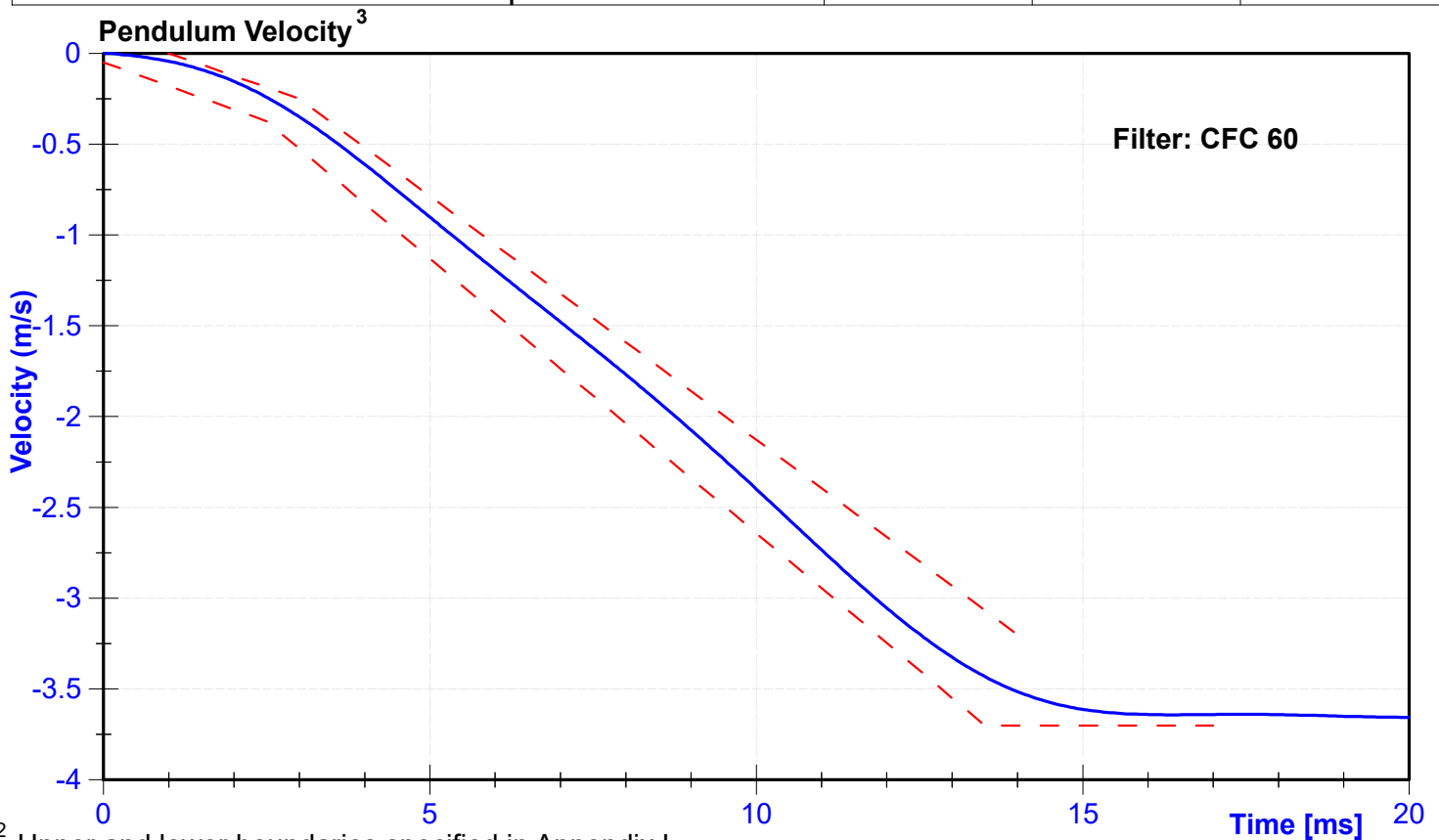
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

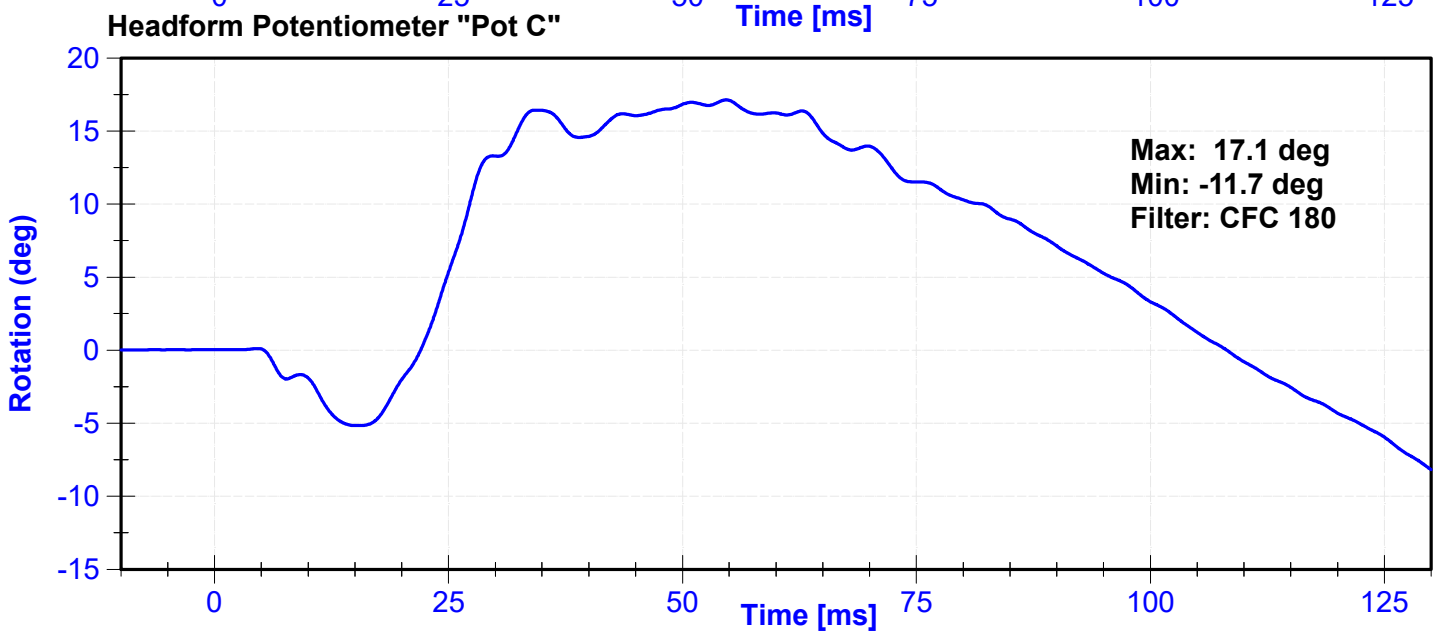
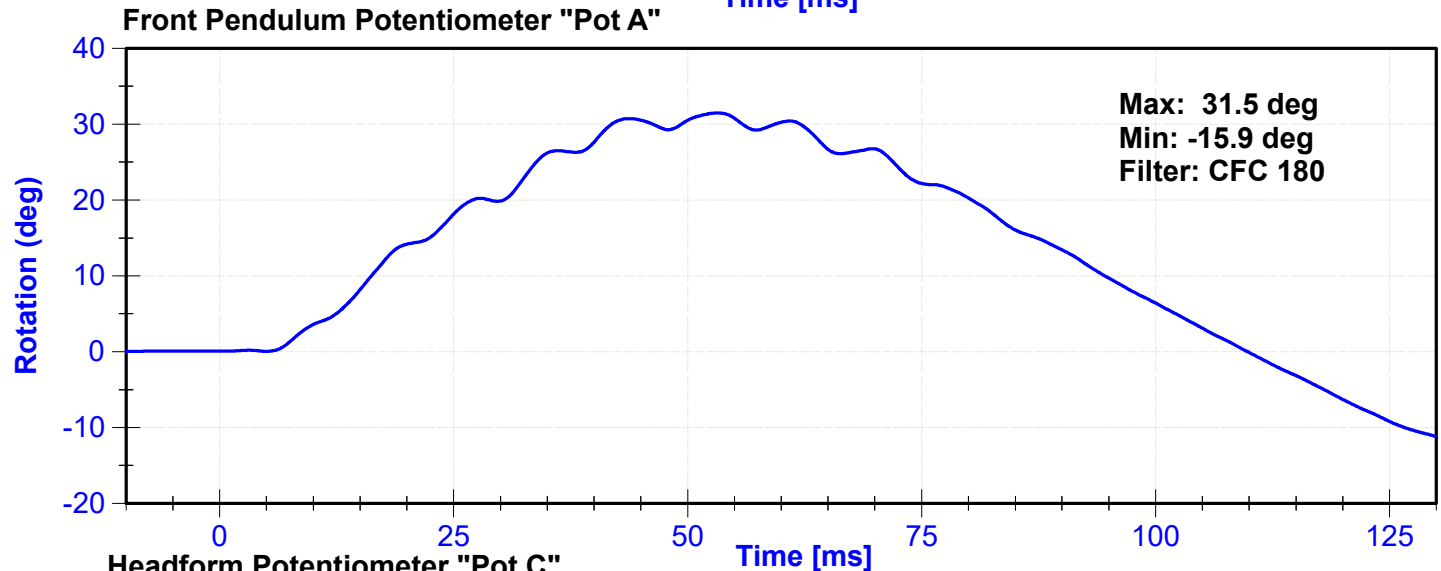
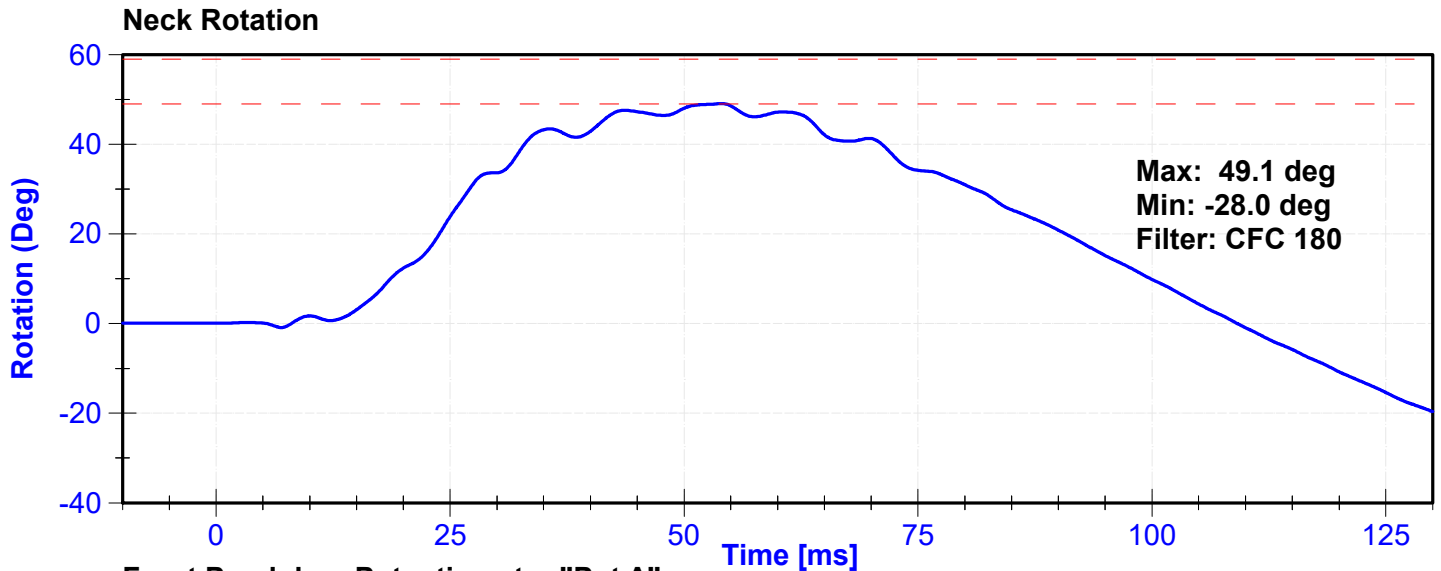
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	53.0	Pass
Velocity	3.3	3.5	m/s	3.46	Pass
Lateral Neck Rotation	49	59	deg	49.1	Pass
Time at Maximum Rotation	54	66	ms	54.0	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.2	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	4/29/2024	10/26/2024
Front Pendulum Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Headform Potentiometer	Sfernice	095	9/13/2024	9/13/2025



^{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
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

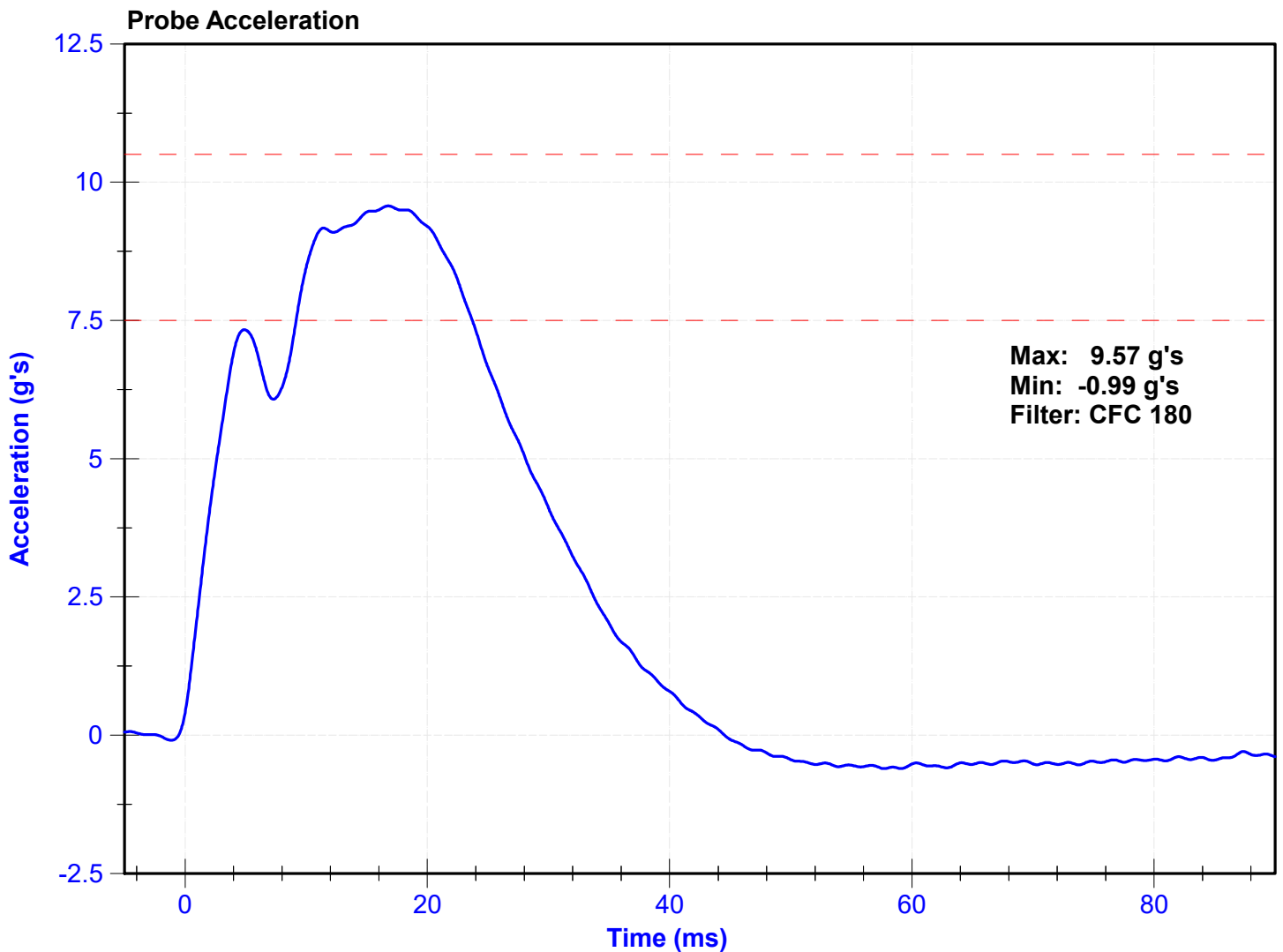
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	7.5	10.5	g's	9.57	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025



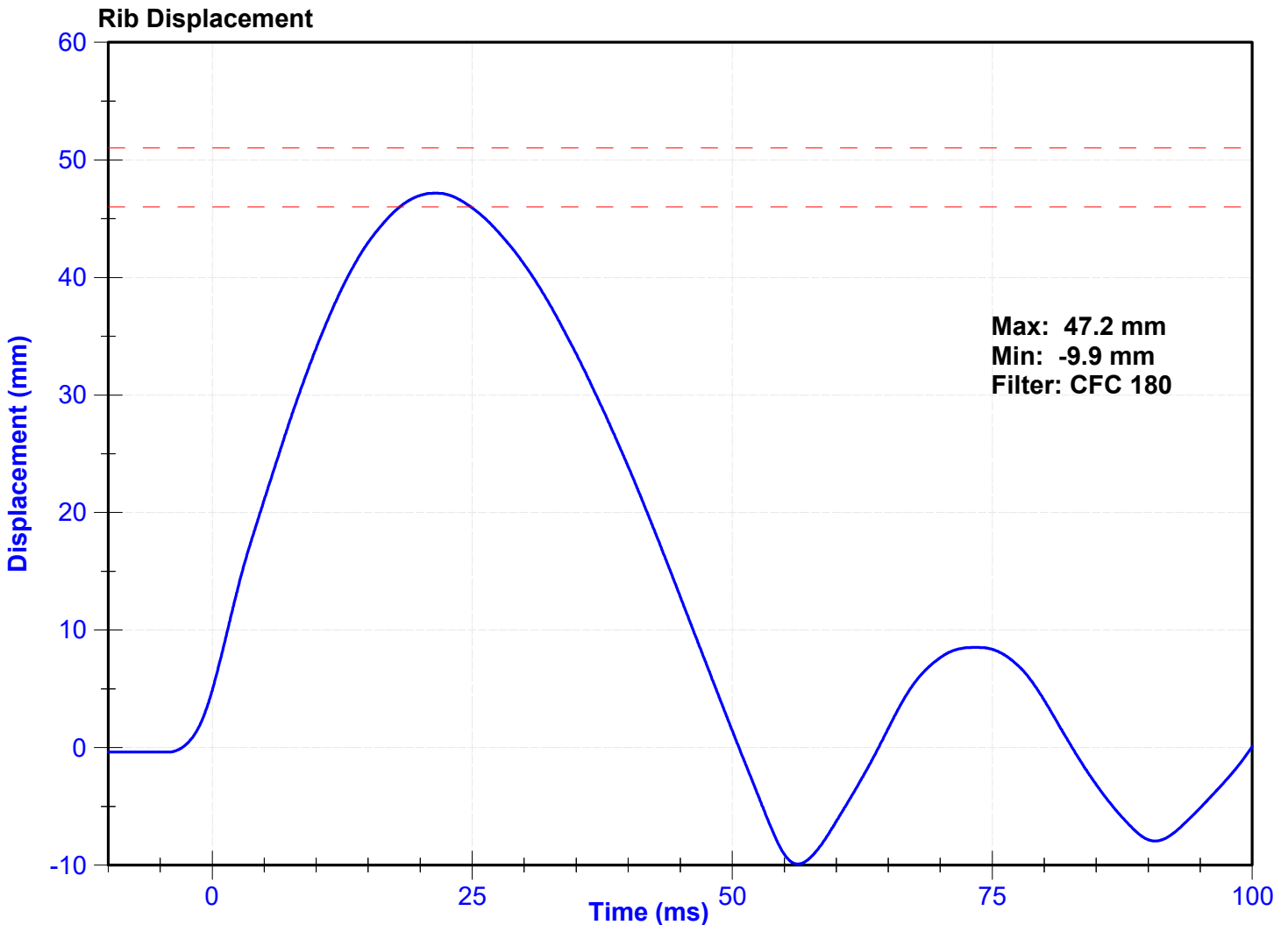
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	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	10/8/2024	4/8/2025



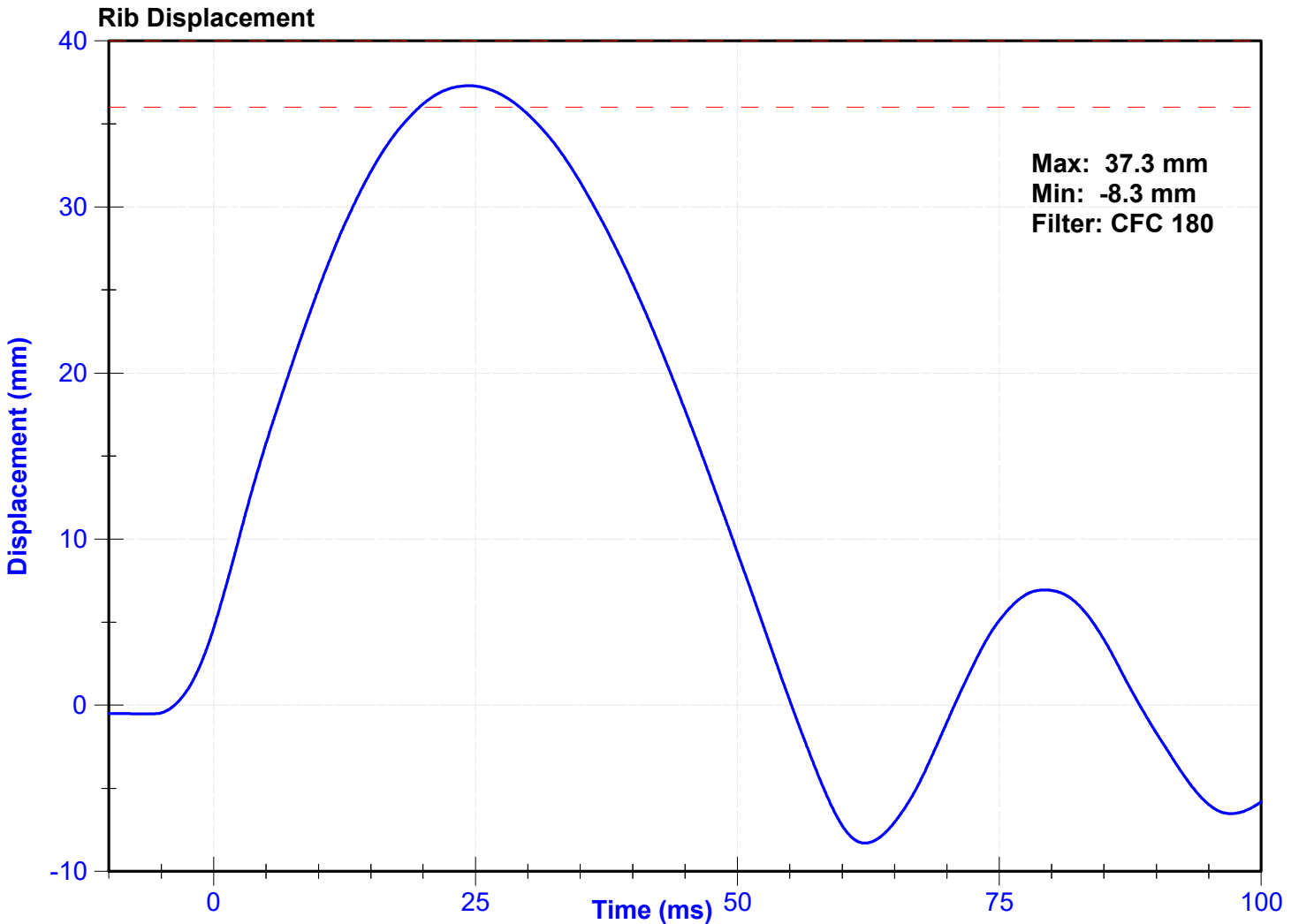
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	Pass
Rib Displacement	36	40	mm	37.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



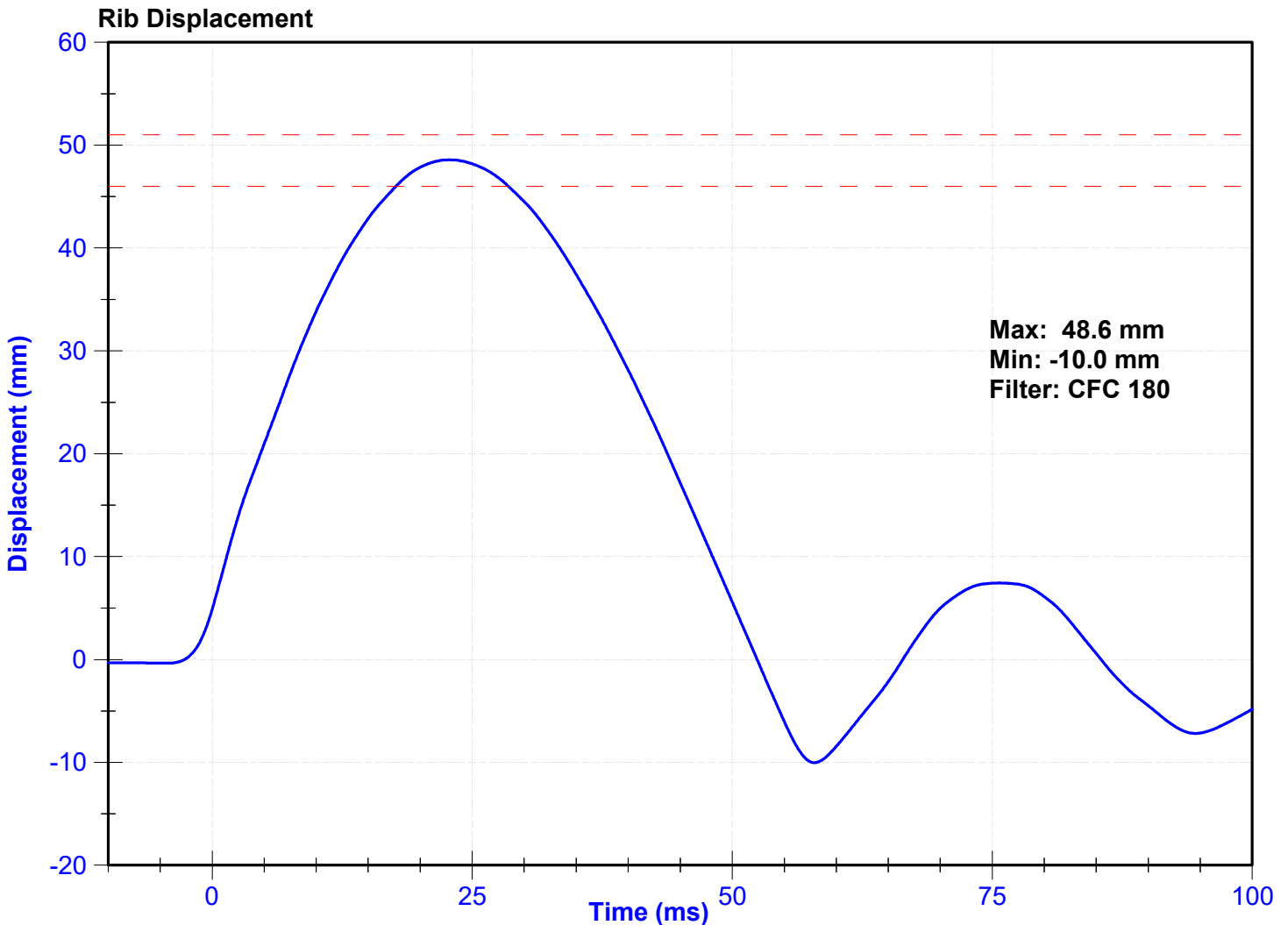
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



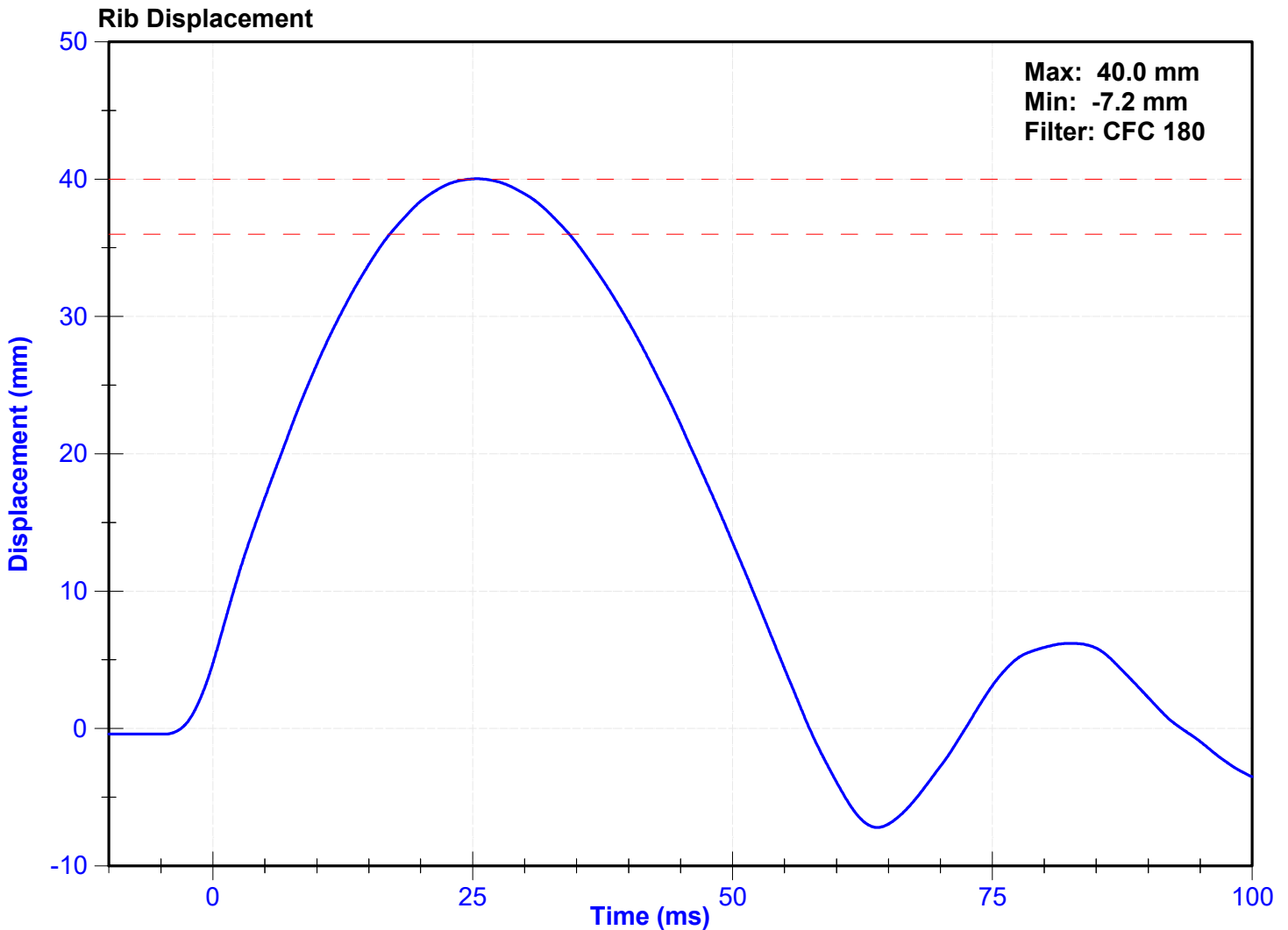
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	Pass
Rib Displacement	36	40	mm	40.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



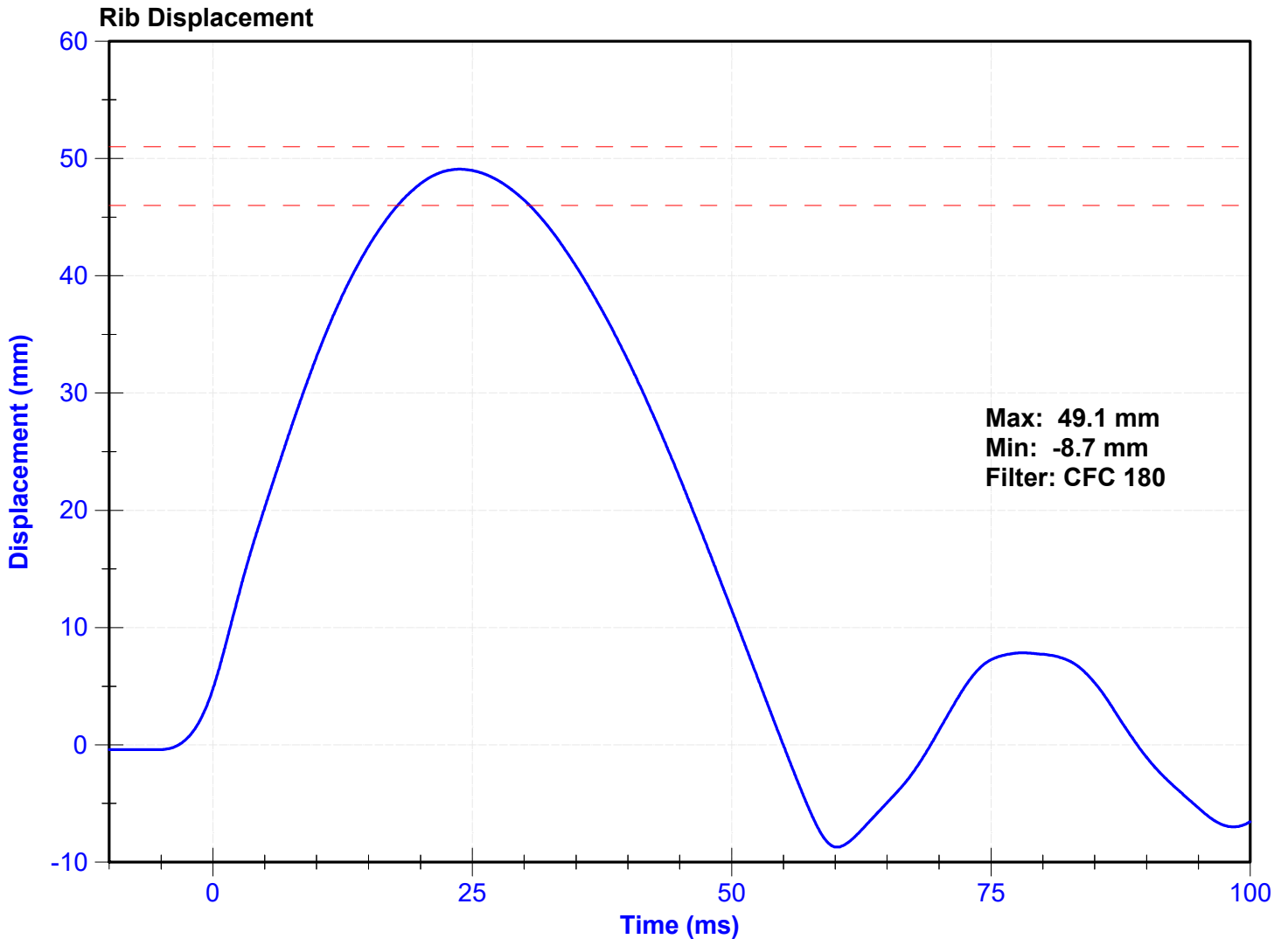
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	Pass
Rib Displacement	46	51	mm	49.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



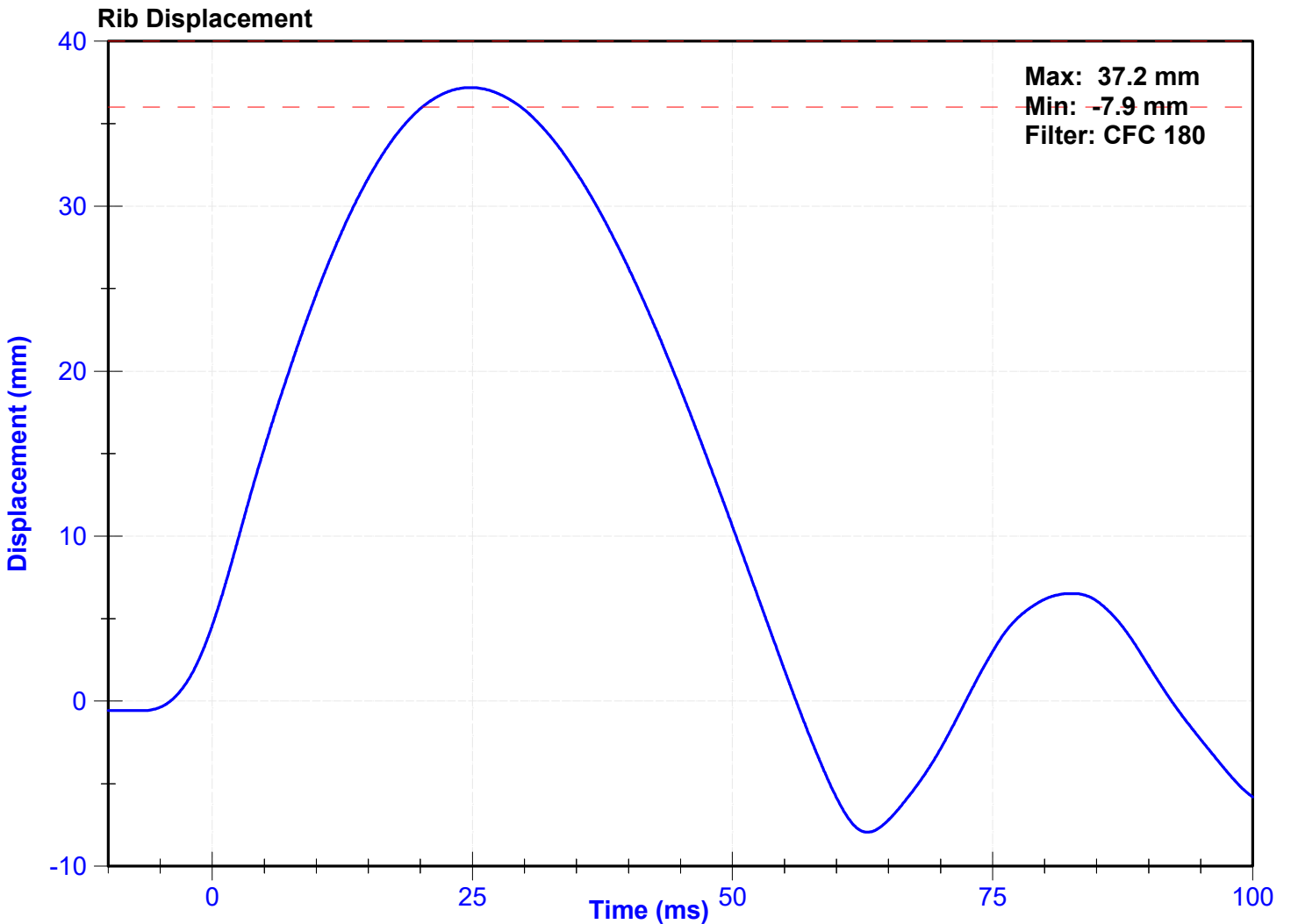
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	37	Pass
Rib Displacement	36	40	mm	37.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



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

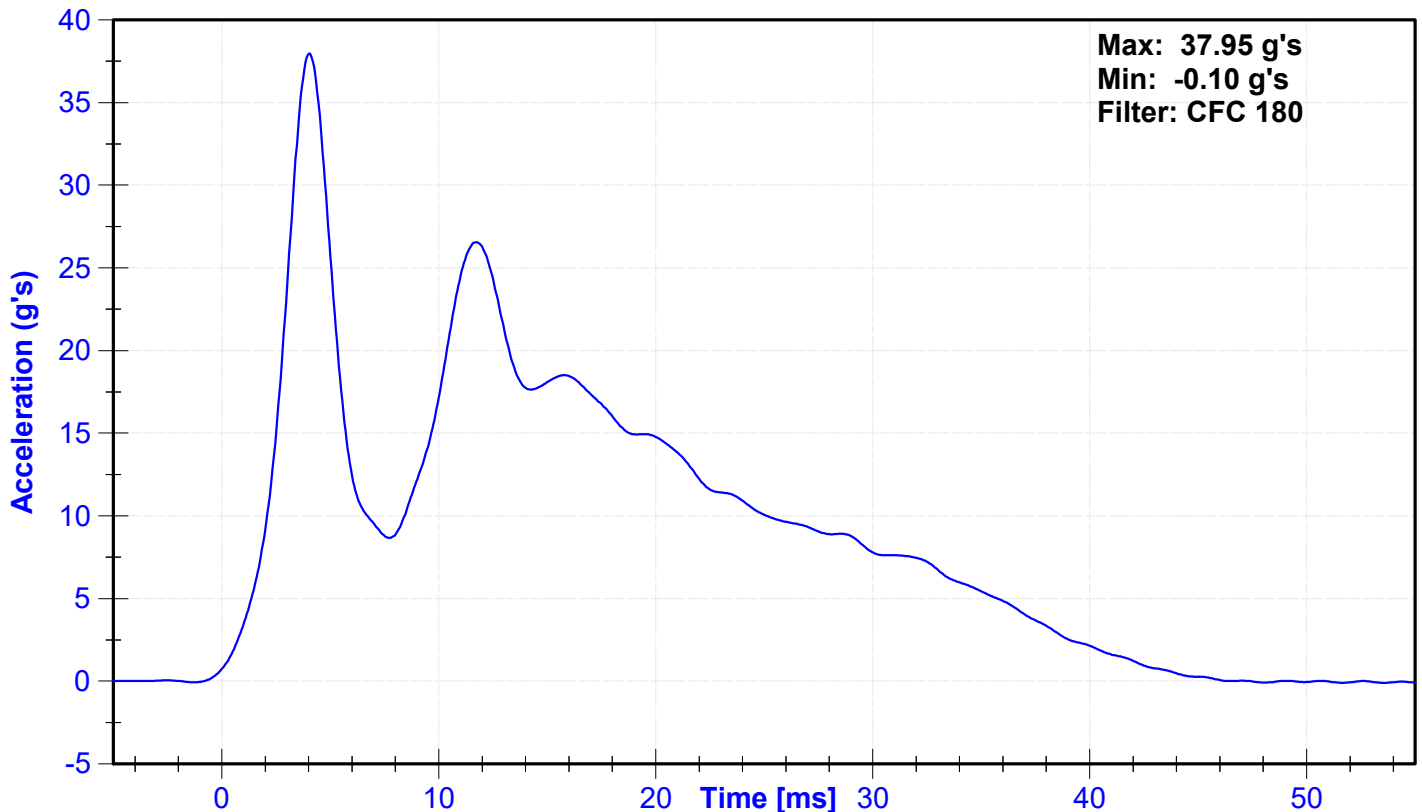
Results

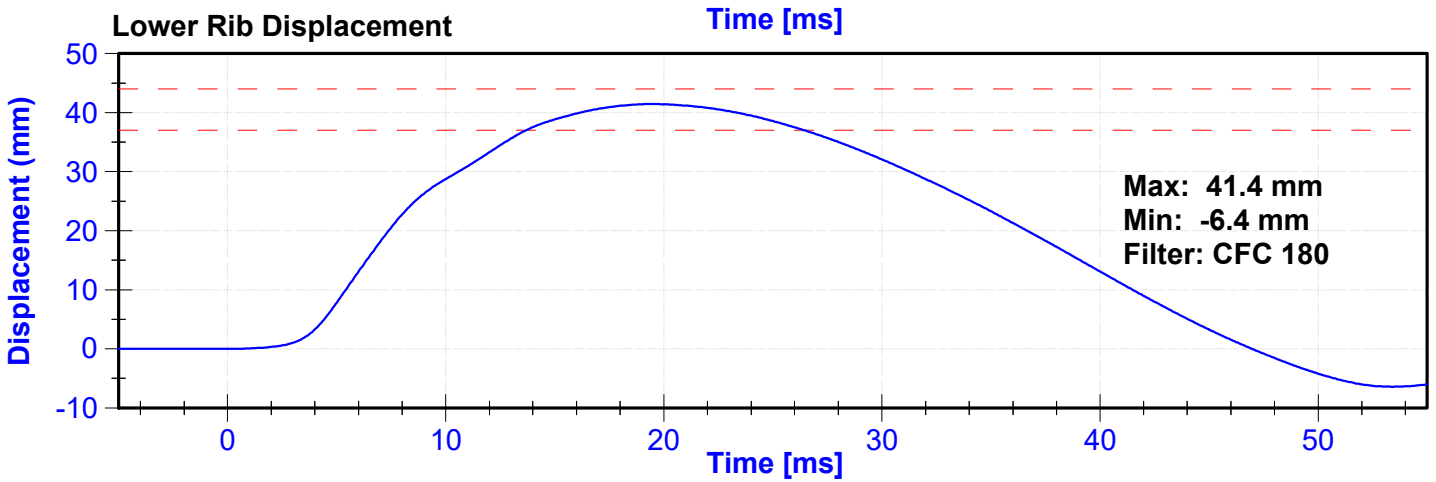
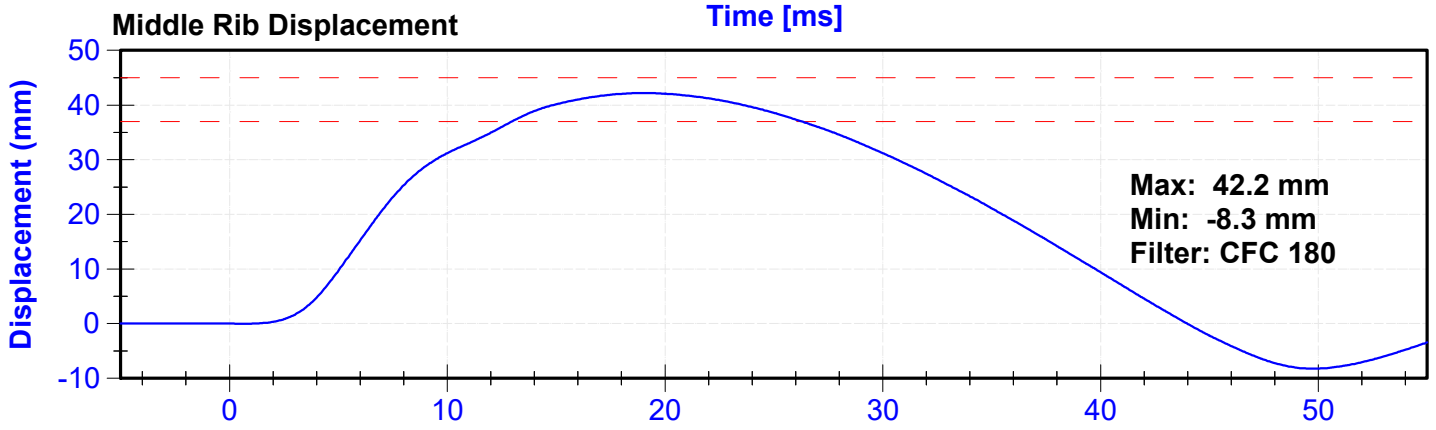
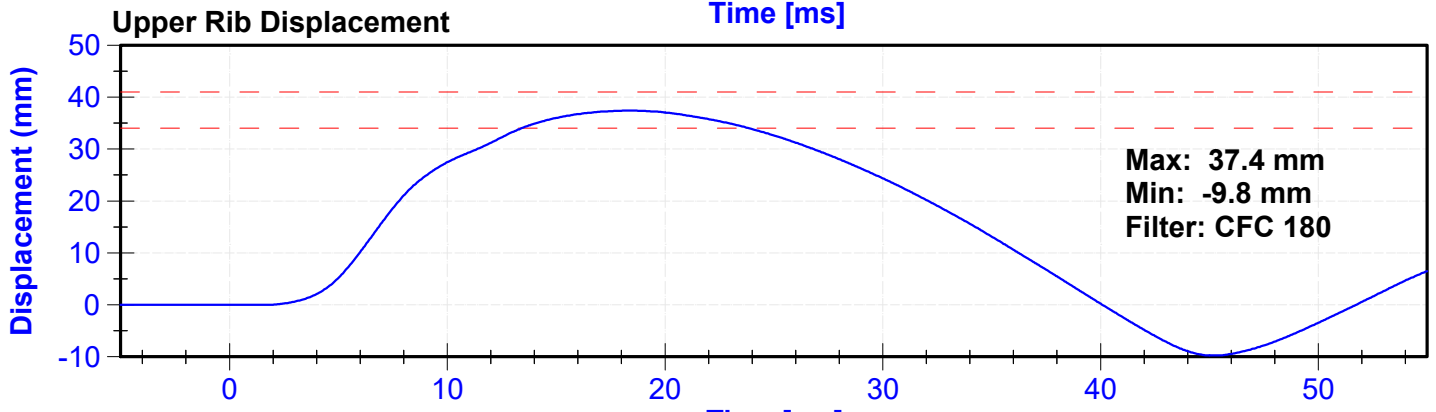
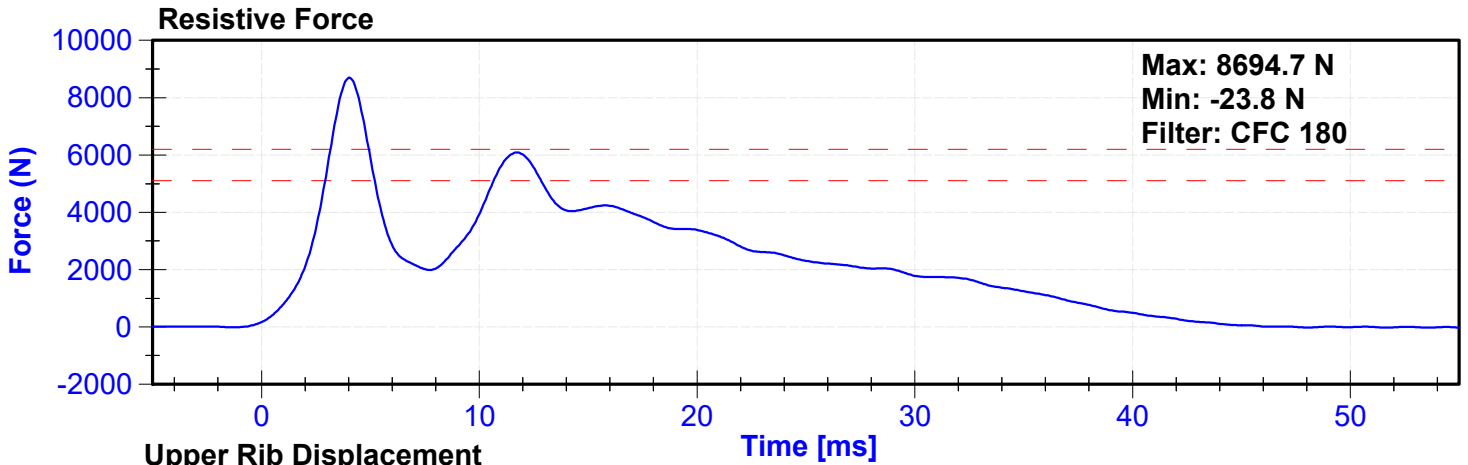
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	6083.6	Pass
Upper Thorax Rib Deflection	34	41	mm	37.4	Pass
Mid Thorax Rib Deflection	37	45	mm	42.2	Pass
Lower Thorax Rib Deflection	37	44	mm	41.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Upper Thorax Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025
Lower Thorax Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025

Probe Acceleration





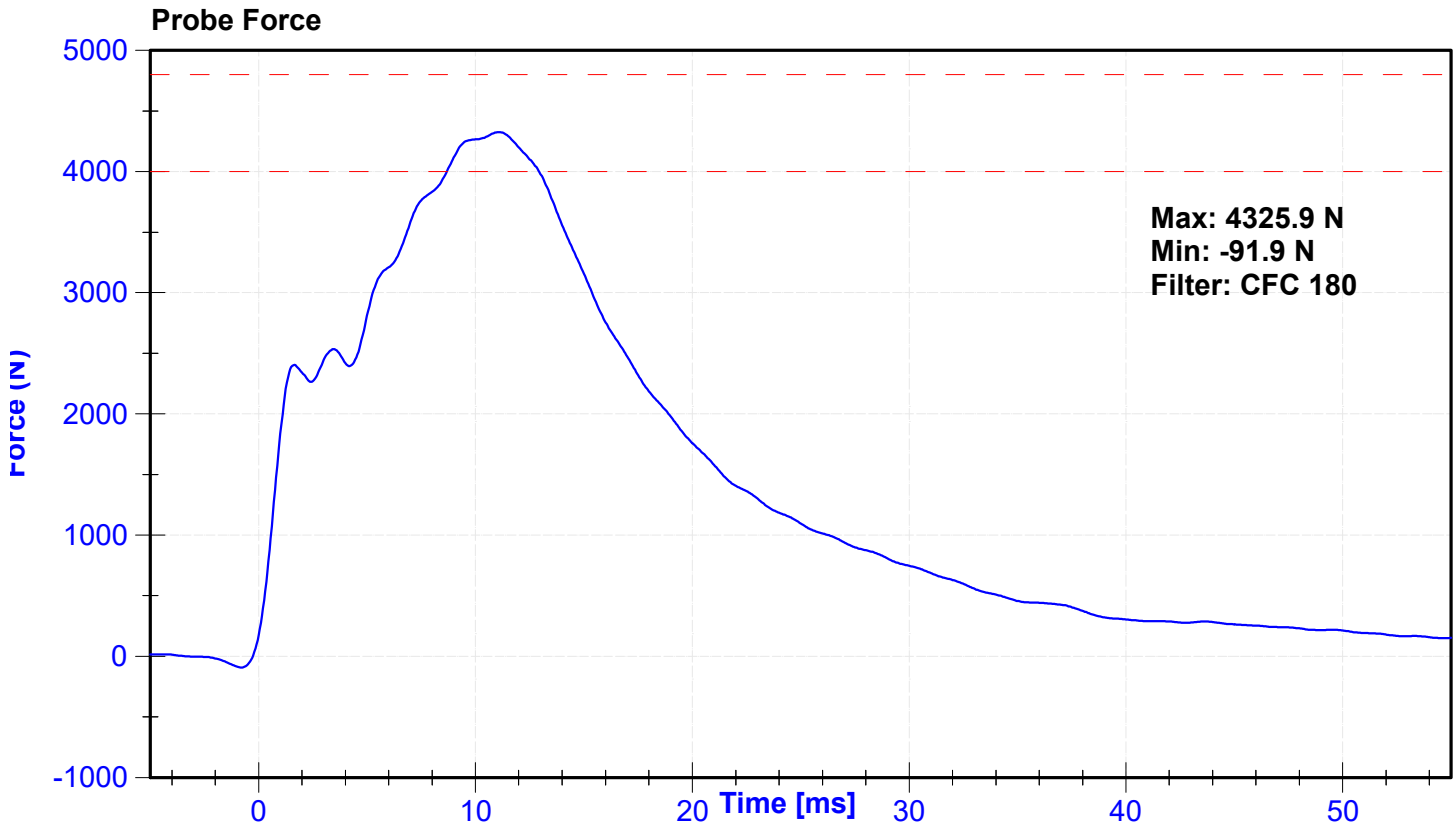
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

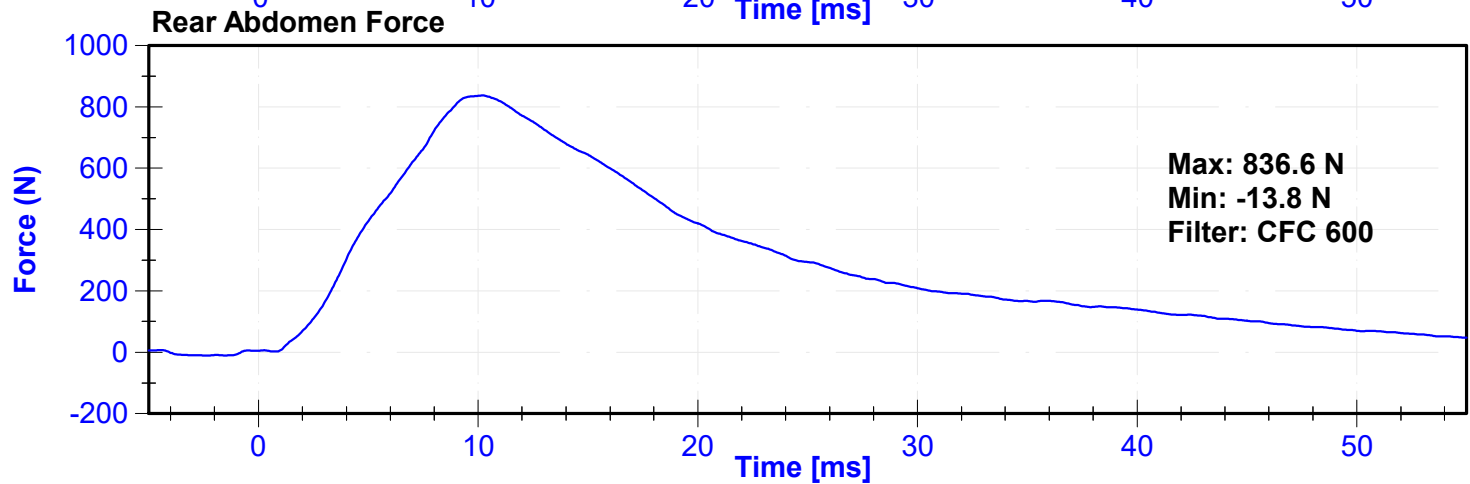
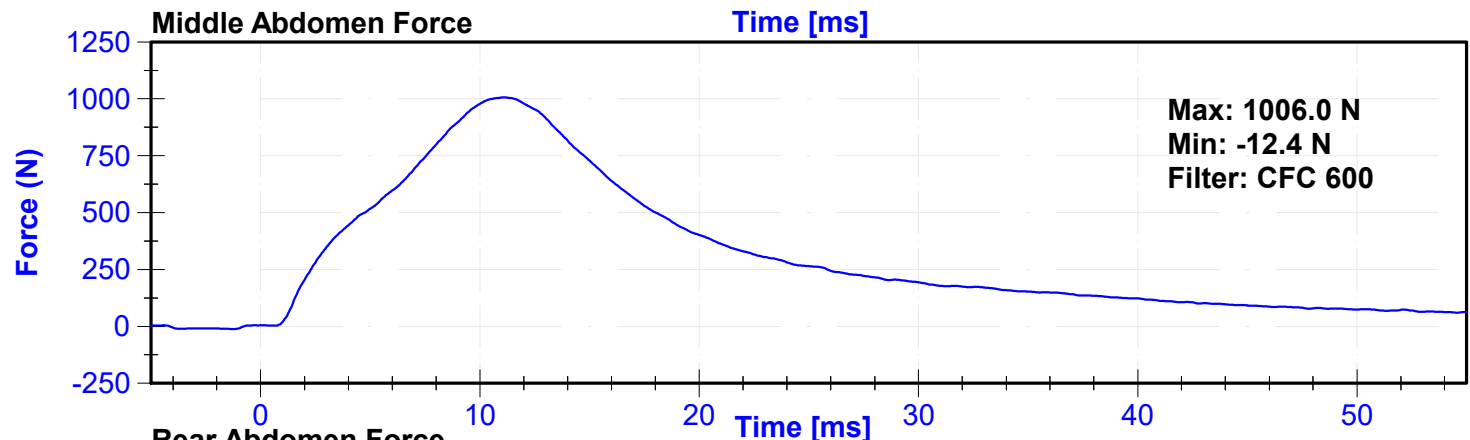
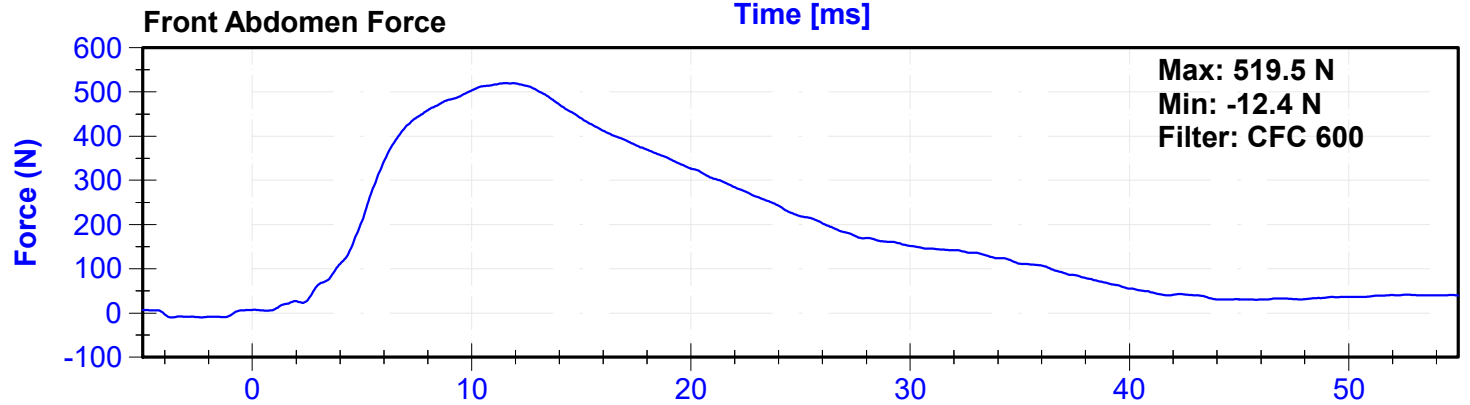
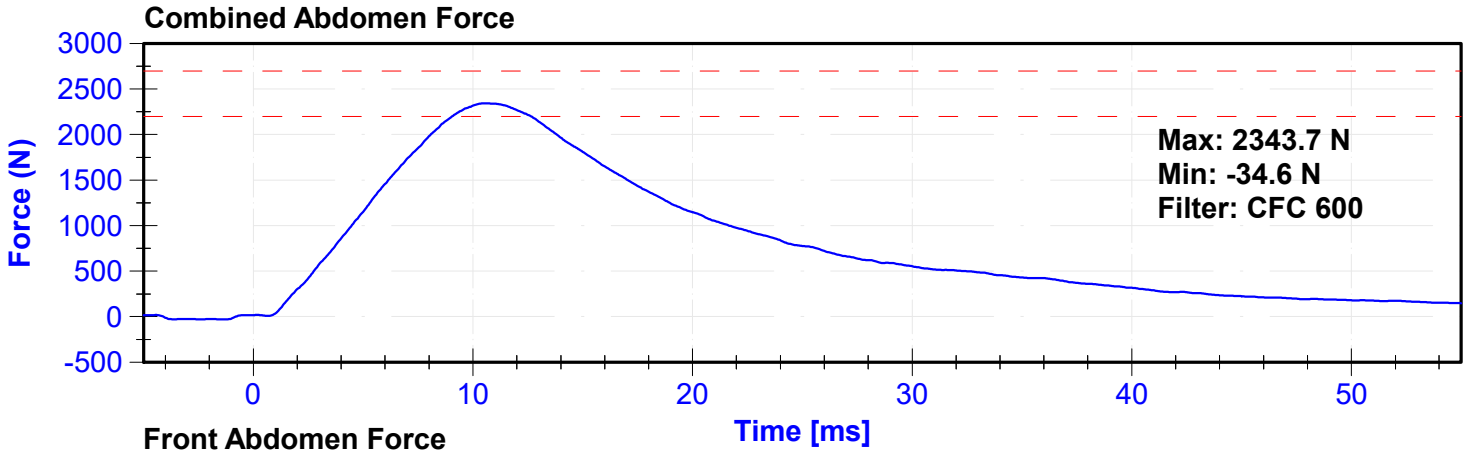
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	3.9	4.1	m/s	4.01	Pass
Combined Abdomen Force	2200	2700	N	2343.7	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.50	Pass
Resistive Probe Force	4000	4800	N	4325.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.05	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Front Abdomen Load Cell	Denton	1512	9/16/2024	9/16/2025
Middle Abdomen Load Cell	Denton	1526	9/16/2024	9/16/2025
Rear Abdomen Load Cell	Denton	1516	9/16/2024	9/16/2025





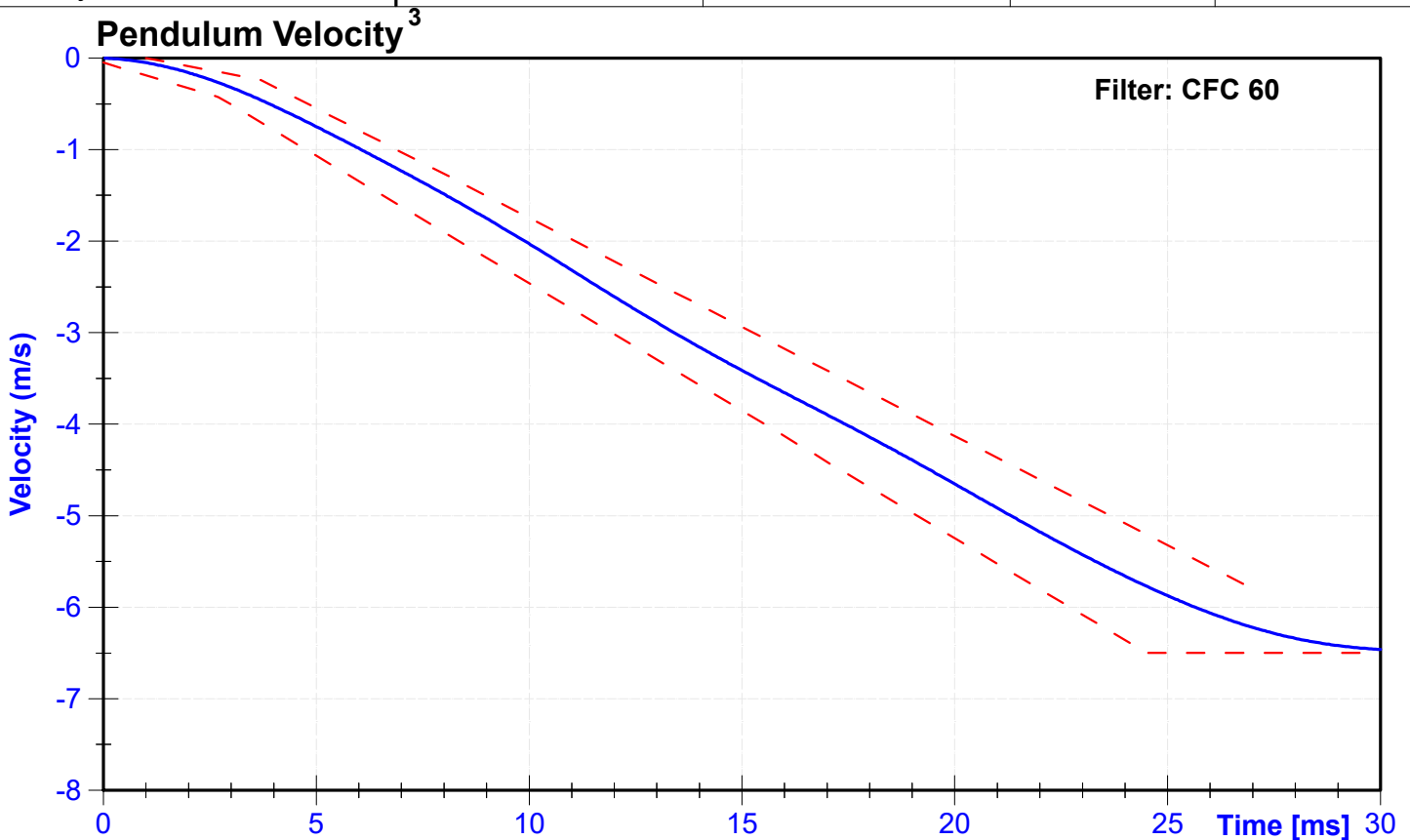
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

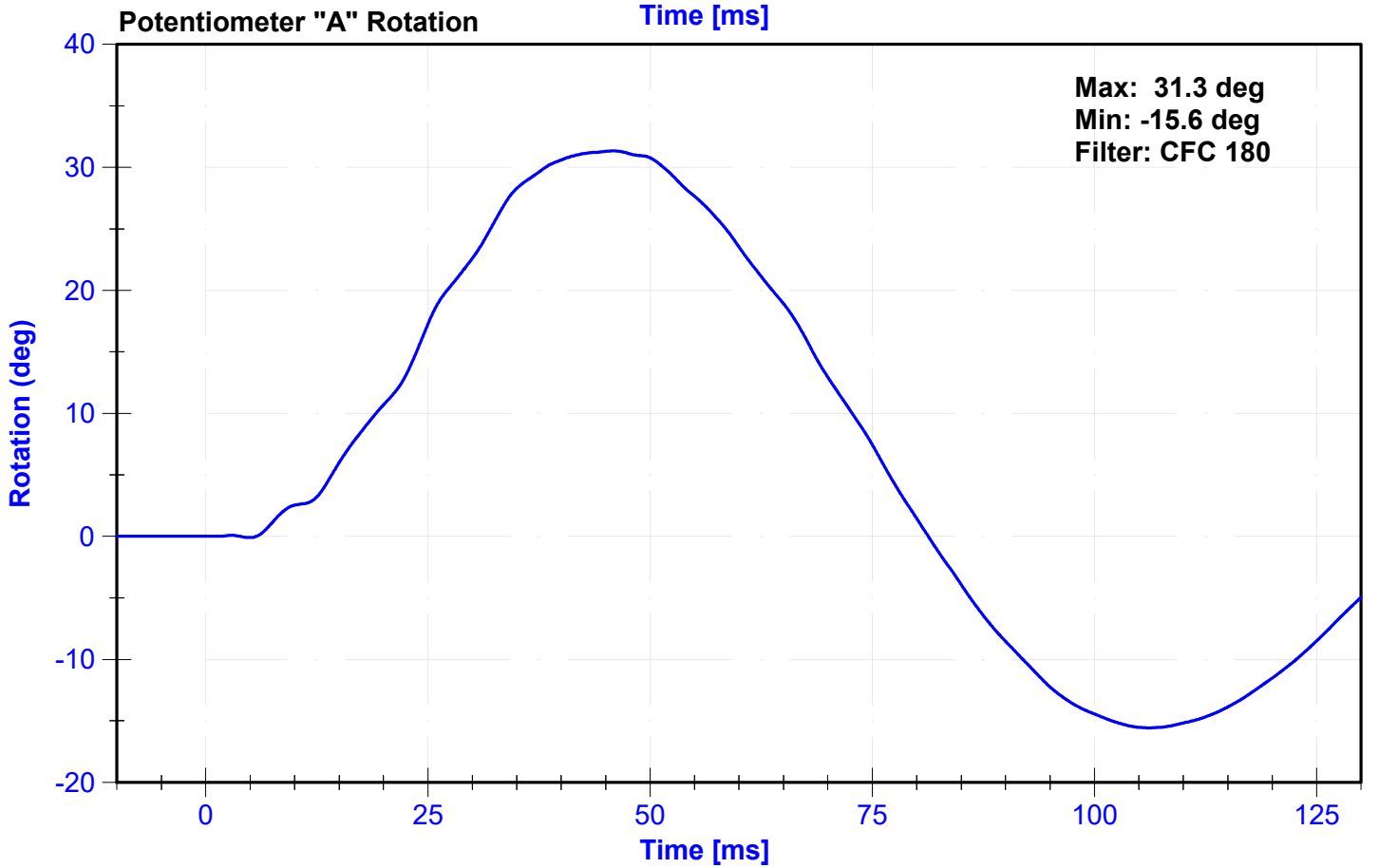
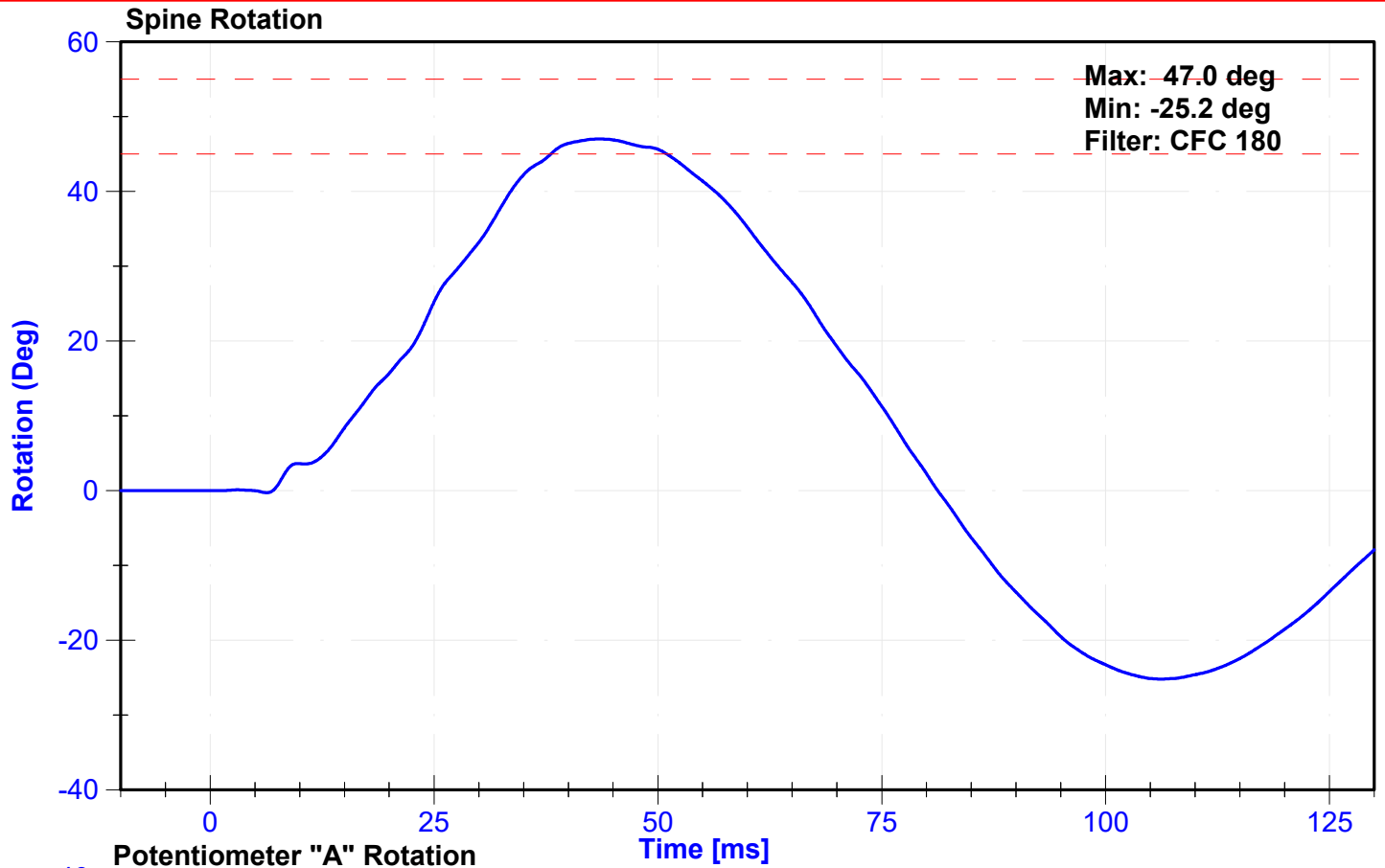
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	53.0	Pass
Velocity	5.95	6.15	m/s	6.130	Pass
Lateral Spine Rotation	45	55	deg	47.0	Pass
Time at Maximum Rotation	39	53	ms	43.4	Pass
Time of Decay to Zero Degrees	37	57	ms	37.8	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

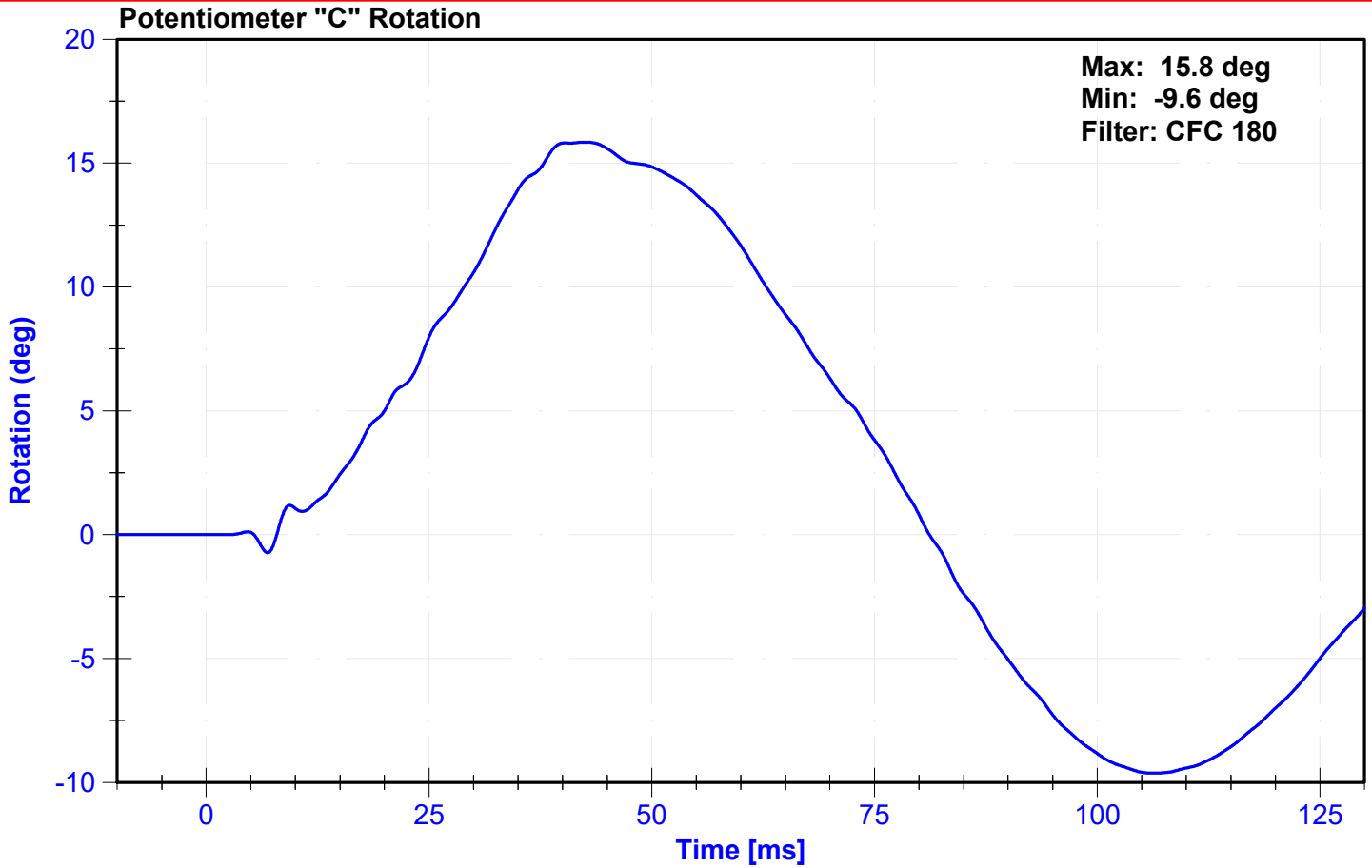
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum "A" Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Condyle "B" Potentiometer	Sfernice	095	9/13/2024	9/13/2025



^{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

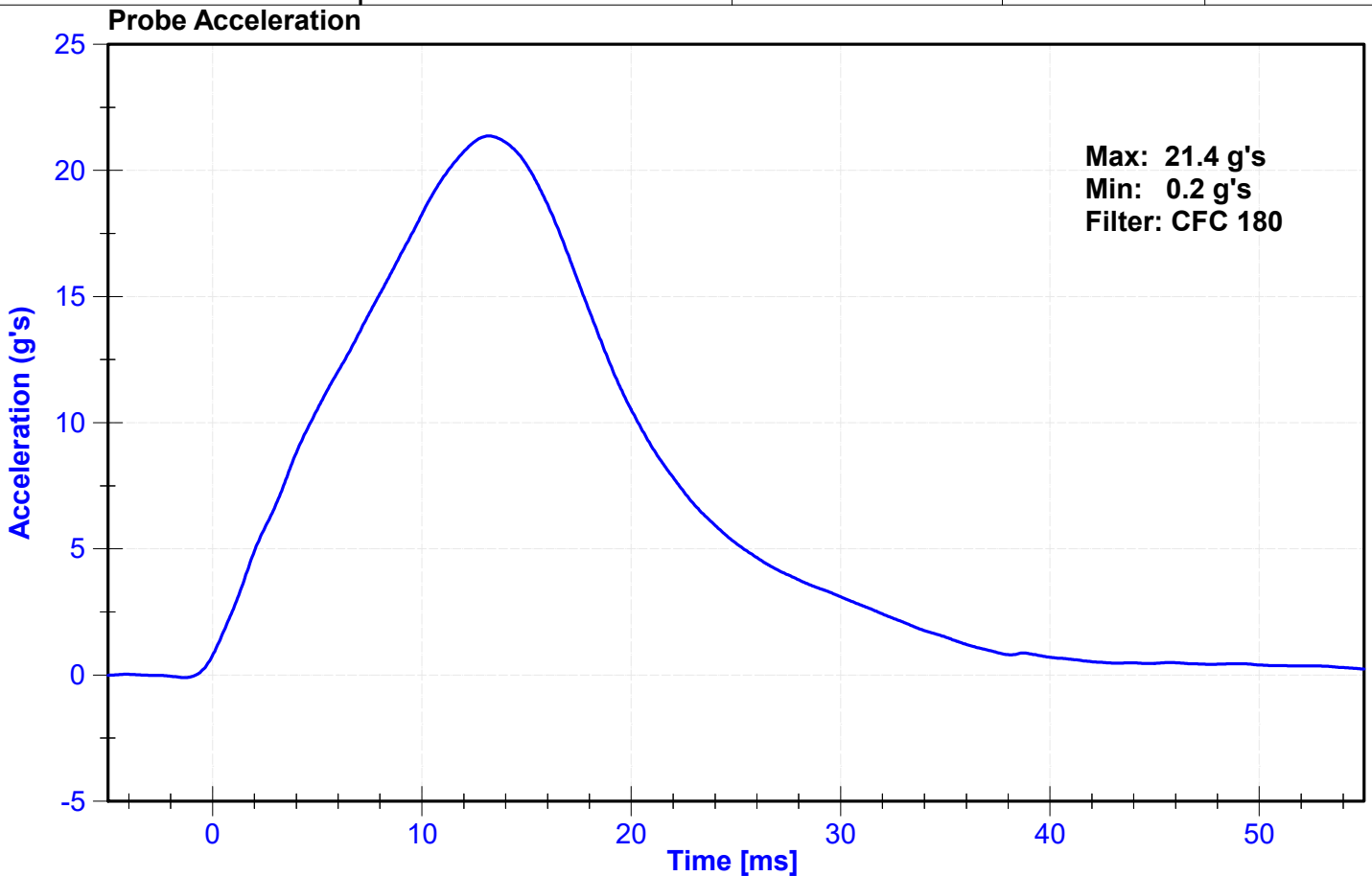
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

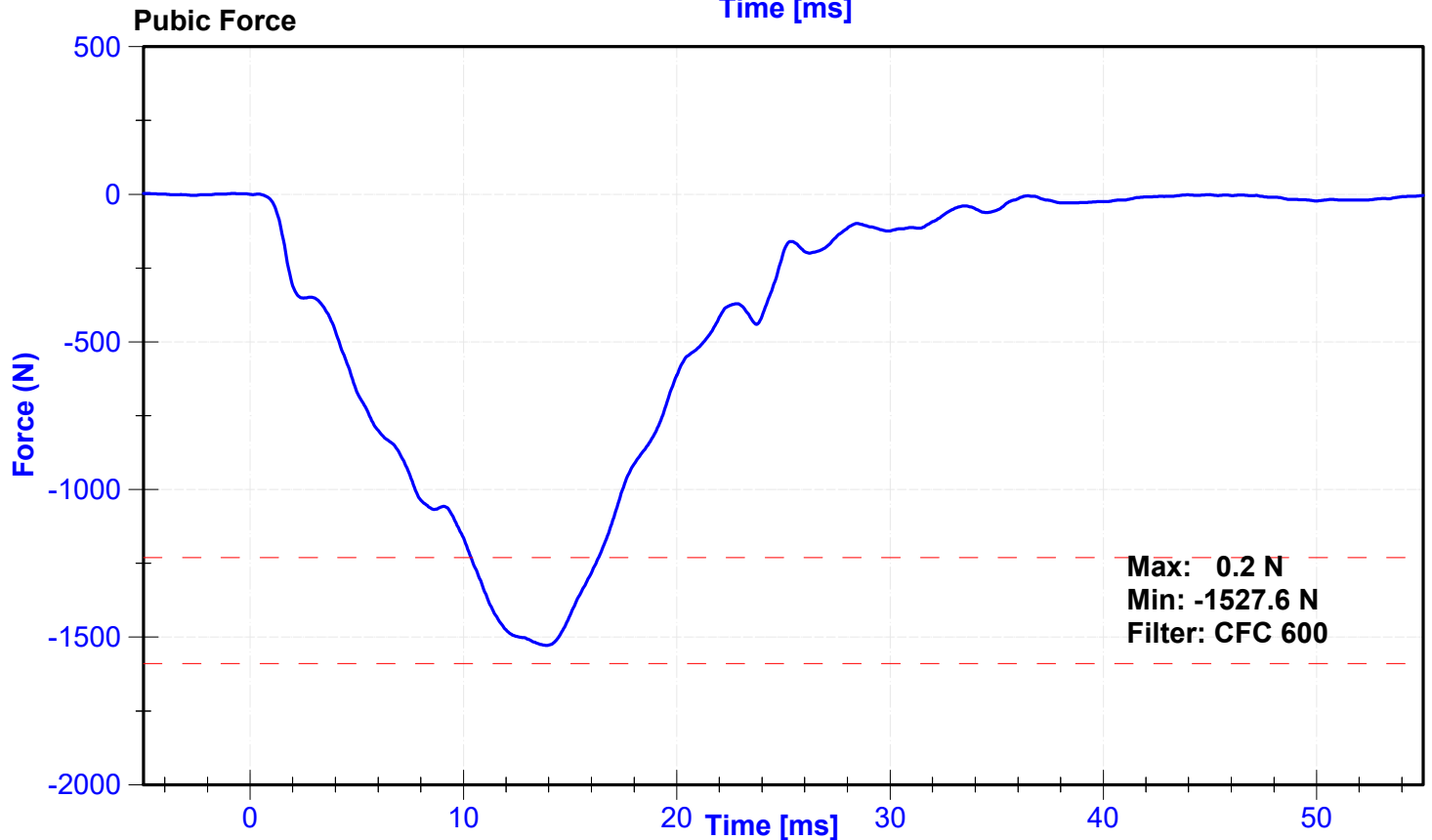
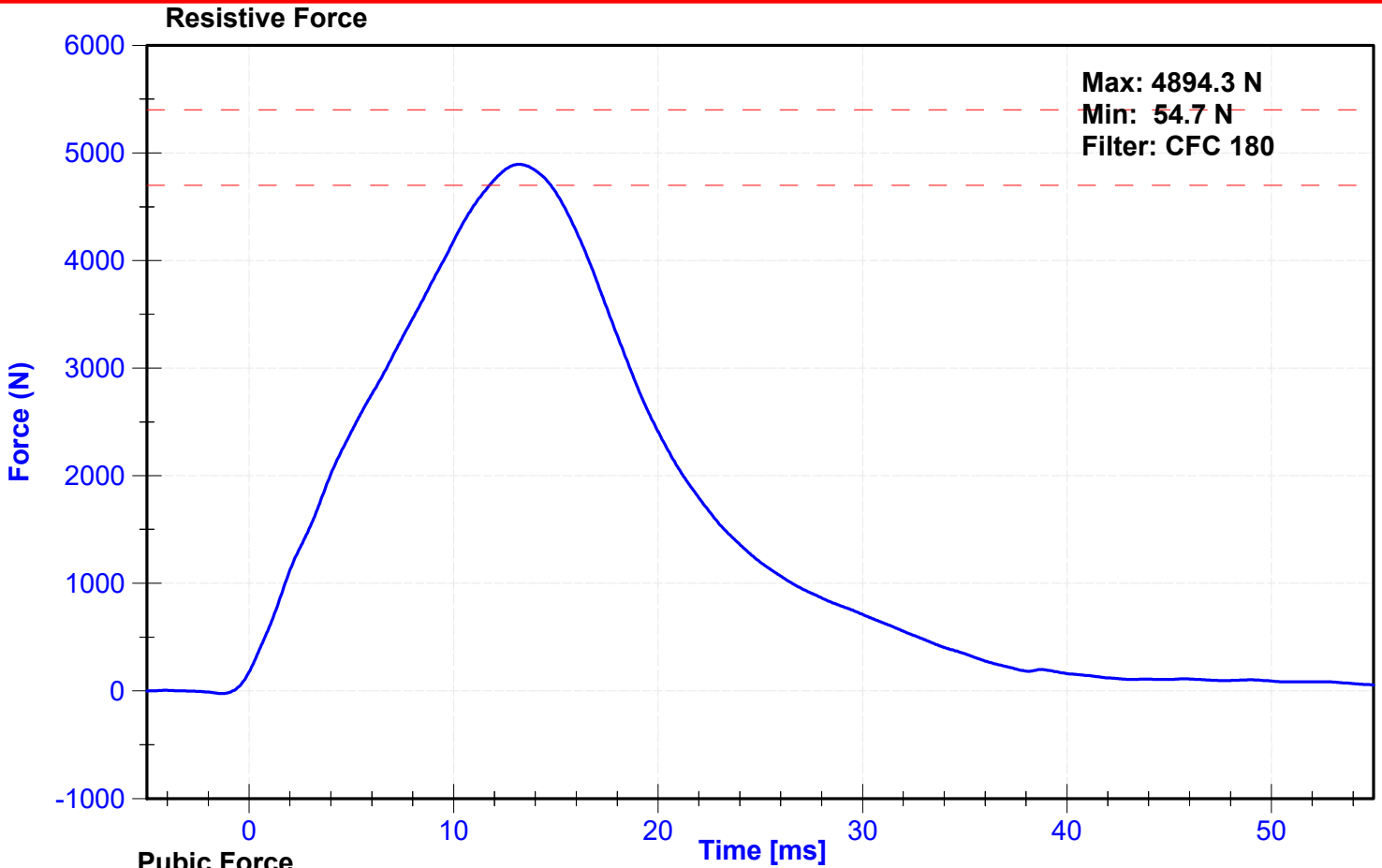
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Resistive Force	4700	5400	N	4894.3	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.20	Pass
Pubic Force	-1590	-1230	N	-1527.6	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.90	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Pubic Load Cell	Denton	464-FY	9/16/2024	9/16/2025





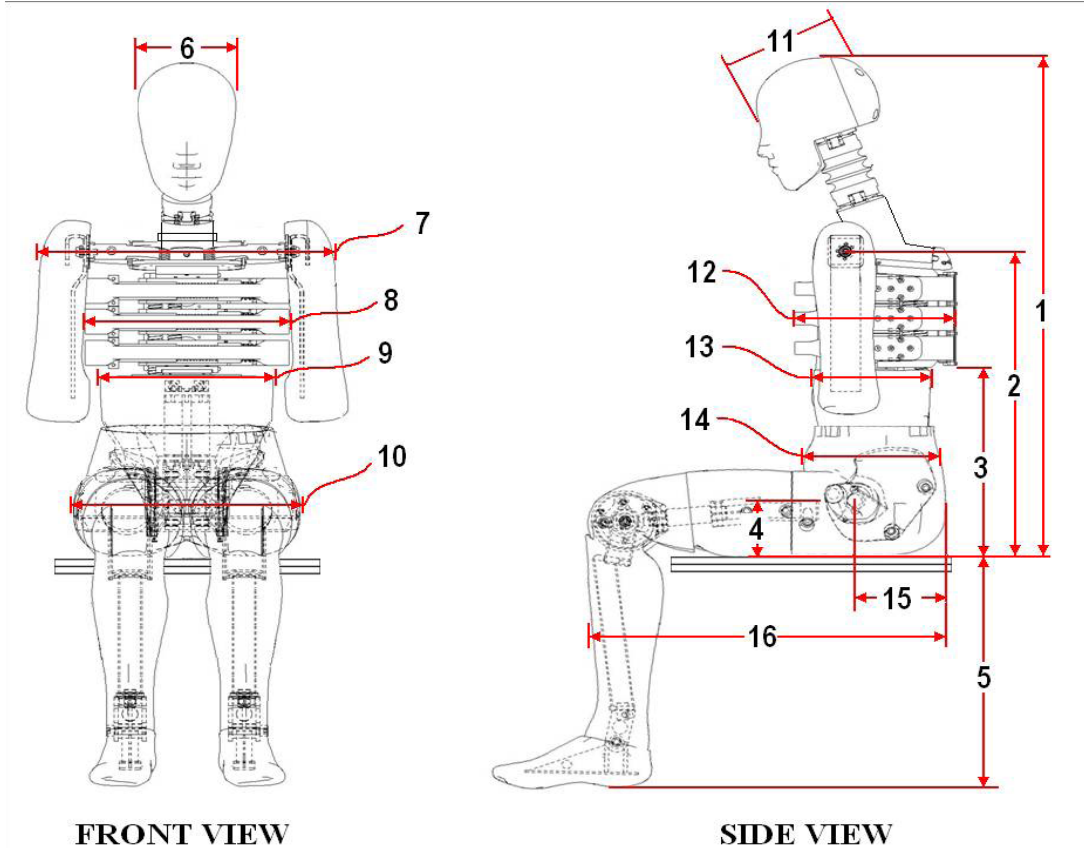
**POST-TEST
ES-2re PERFORMANCE CALIBRATION TEST DATA**

External Measurements - EuroSID-2re

Technician: J. Rios

Date: 10/22/2024

Dummy Serial Number: D037



Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	562	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	349	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	420	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	474	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	277	Pass
10	Pelvis Lap Width	359	373	372	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	265	Pass
13	Abdomen Depth	194	204	195	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	599	Pass

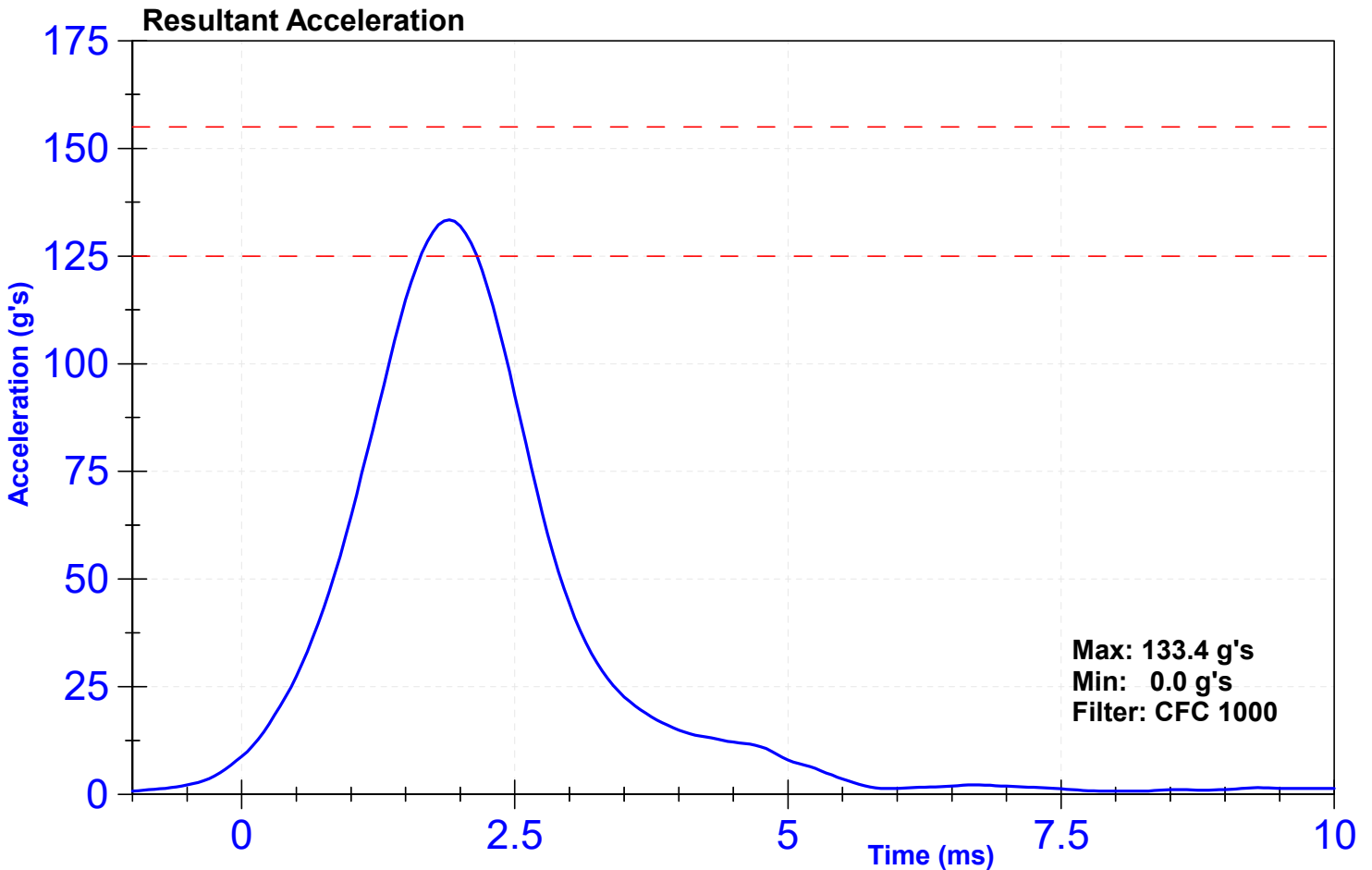
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

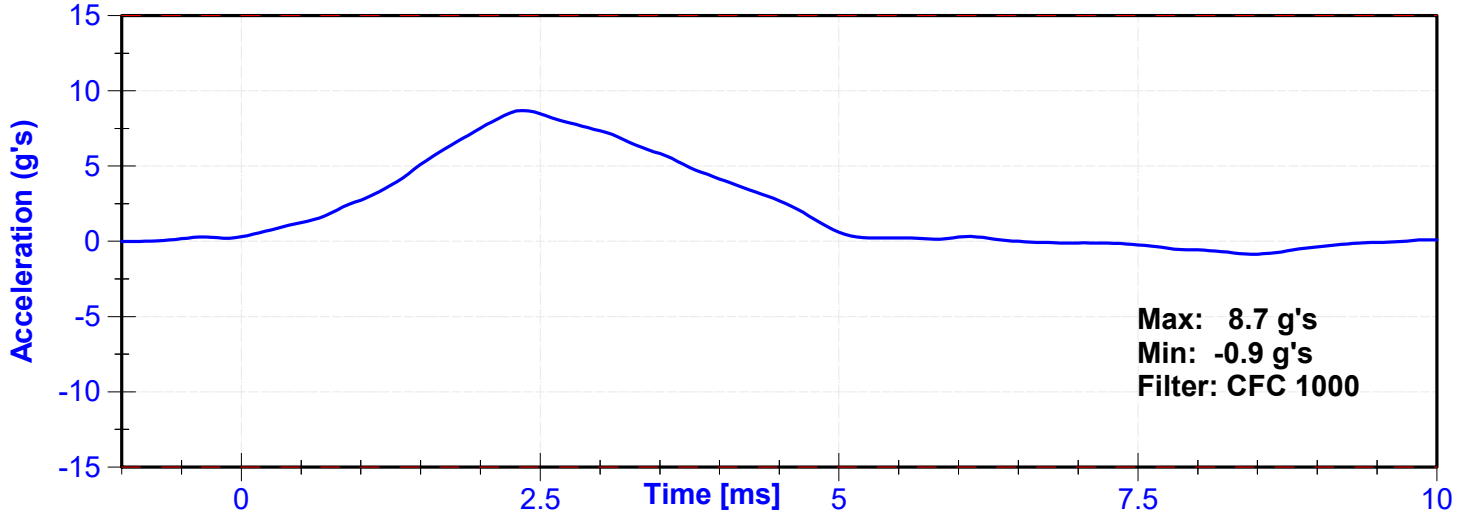
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	41	Pass
Resultant Acceleration	125	155	g's	133.4	Pass
Oscillation	0	15	%	1.63	Pass
Fore-Aft Acceleration	-15	15	g's	8.7	Pass

Transducer Calibrations

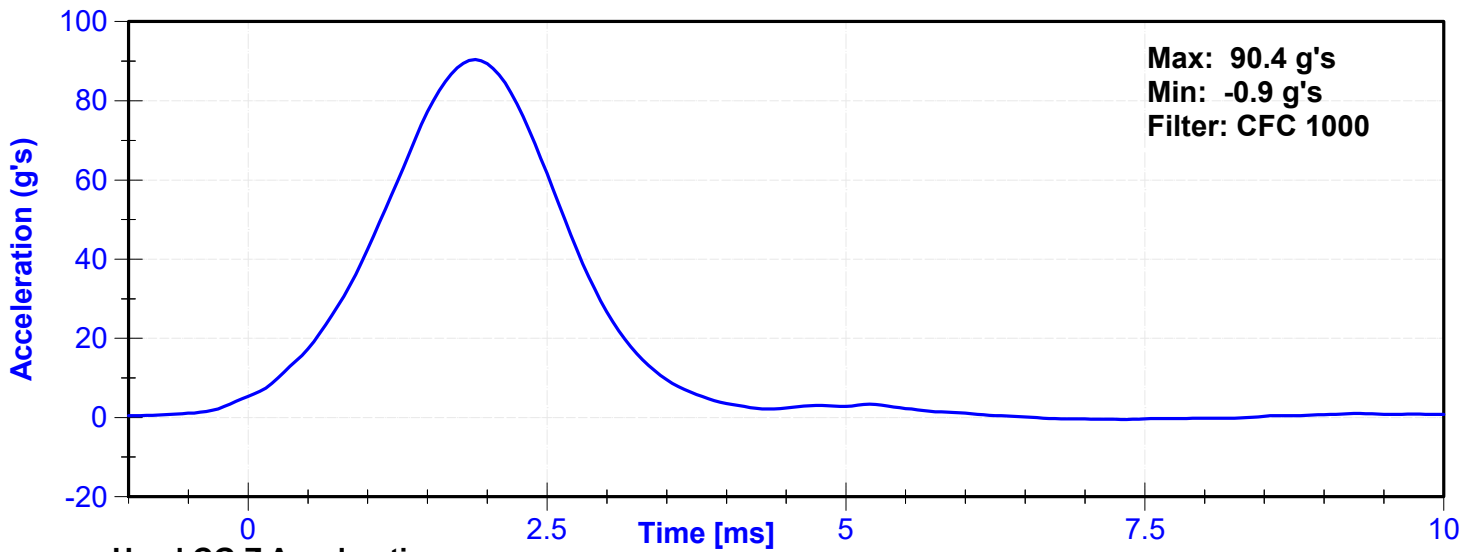
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	10/8/2024	4/6/2025
Y Accelerometer	Endevco	T22281	10/8/2024	4/6/2025
Z Accelerometer	Endevco	T26050	10/8/2024	4/6/2025



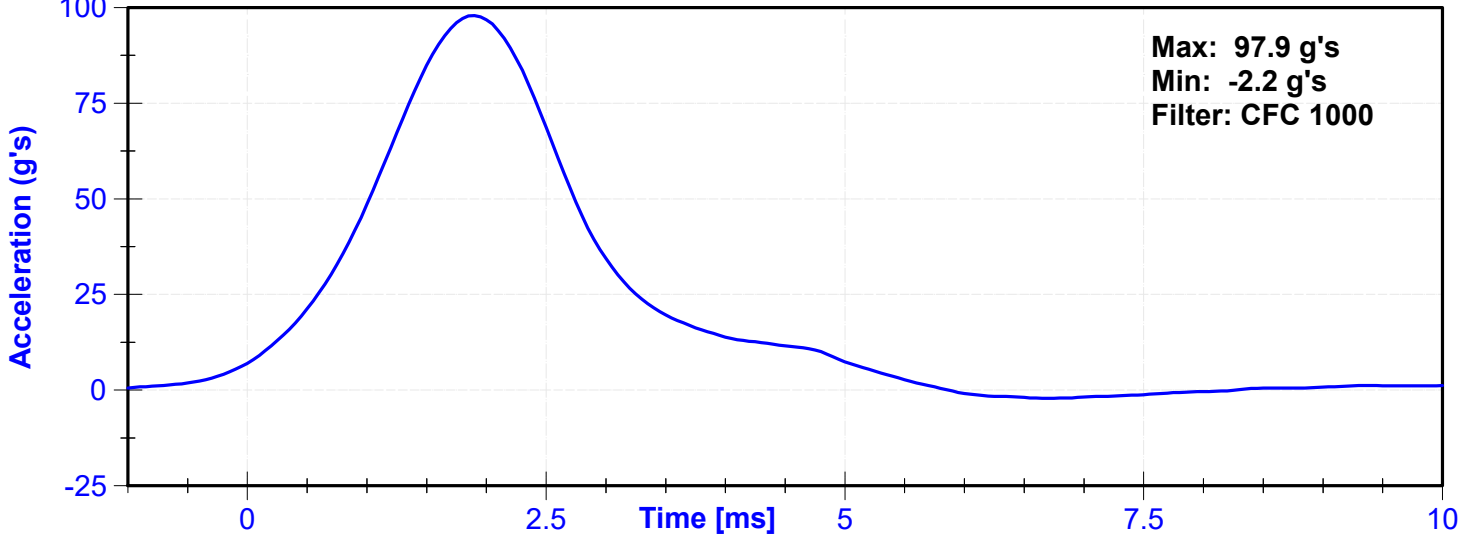
Head CG X Acceleration



Head CG Y Acceleration



Head CG Z Acceleration



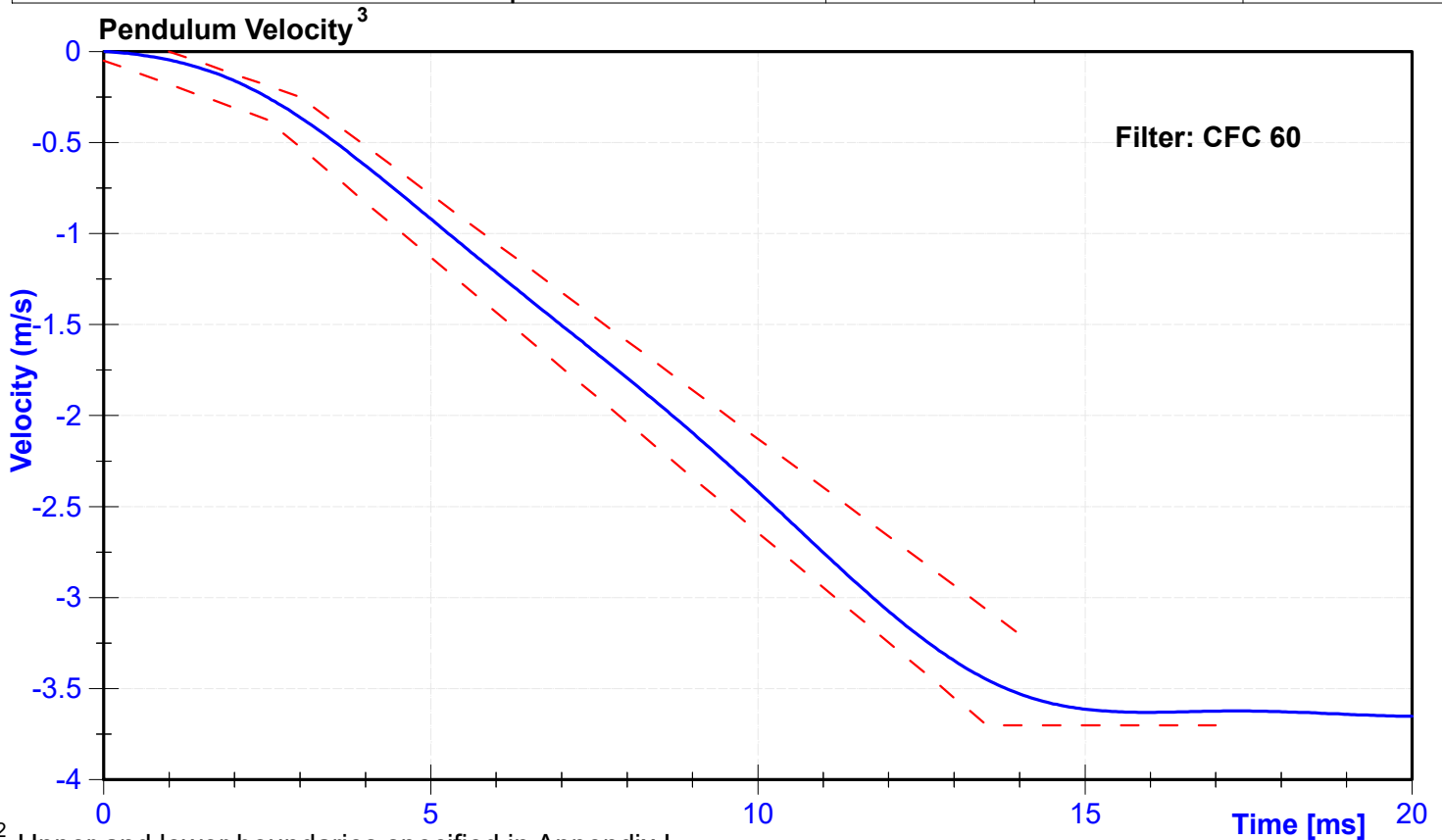
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

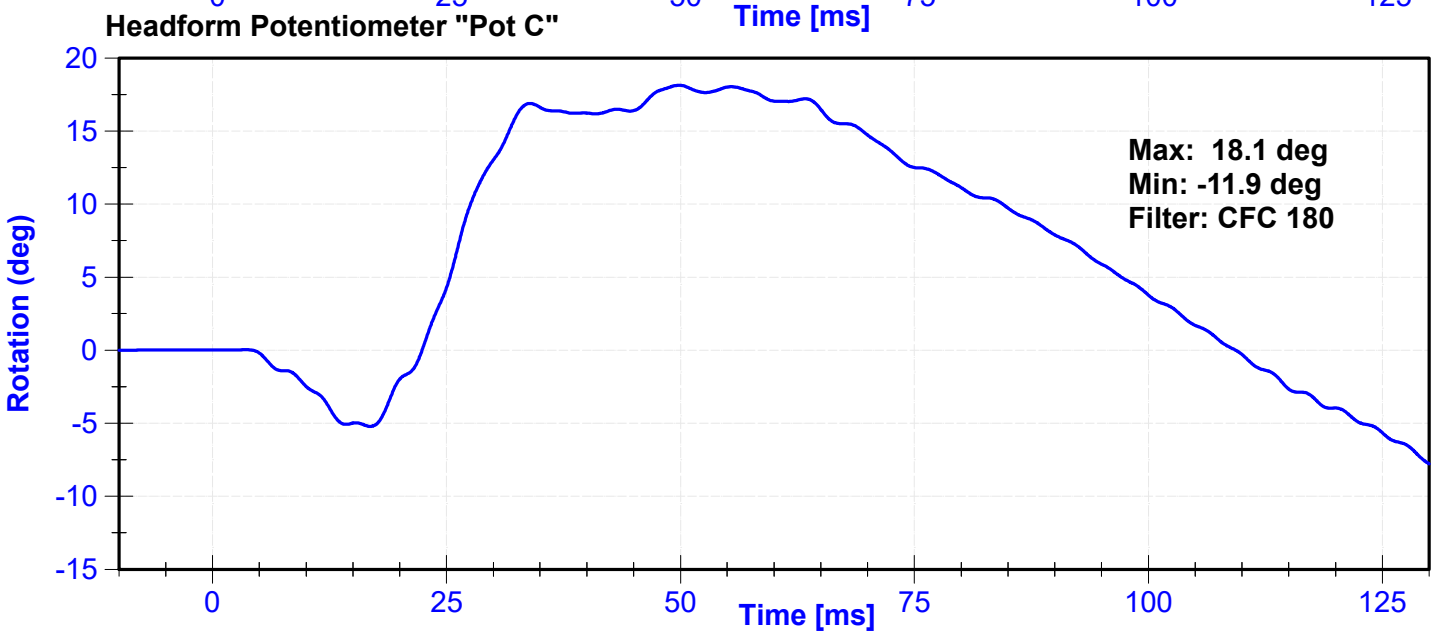
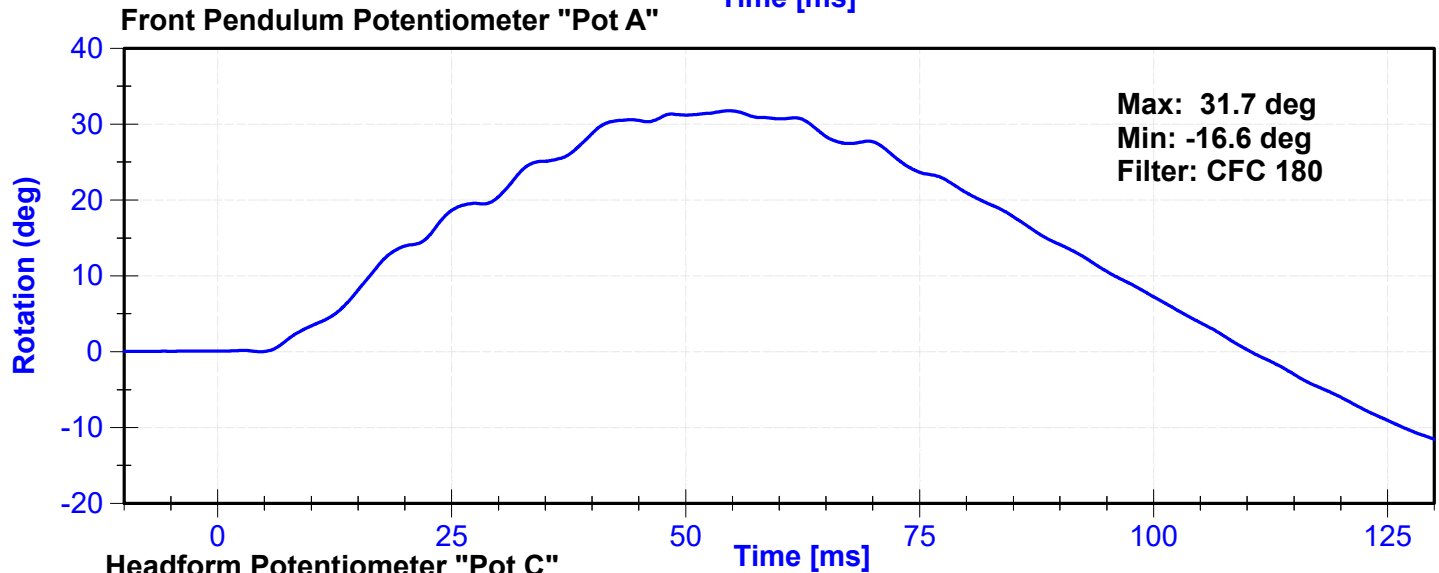
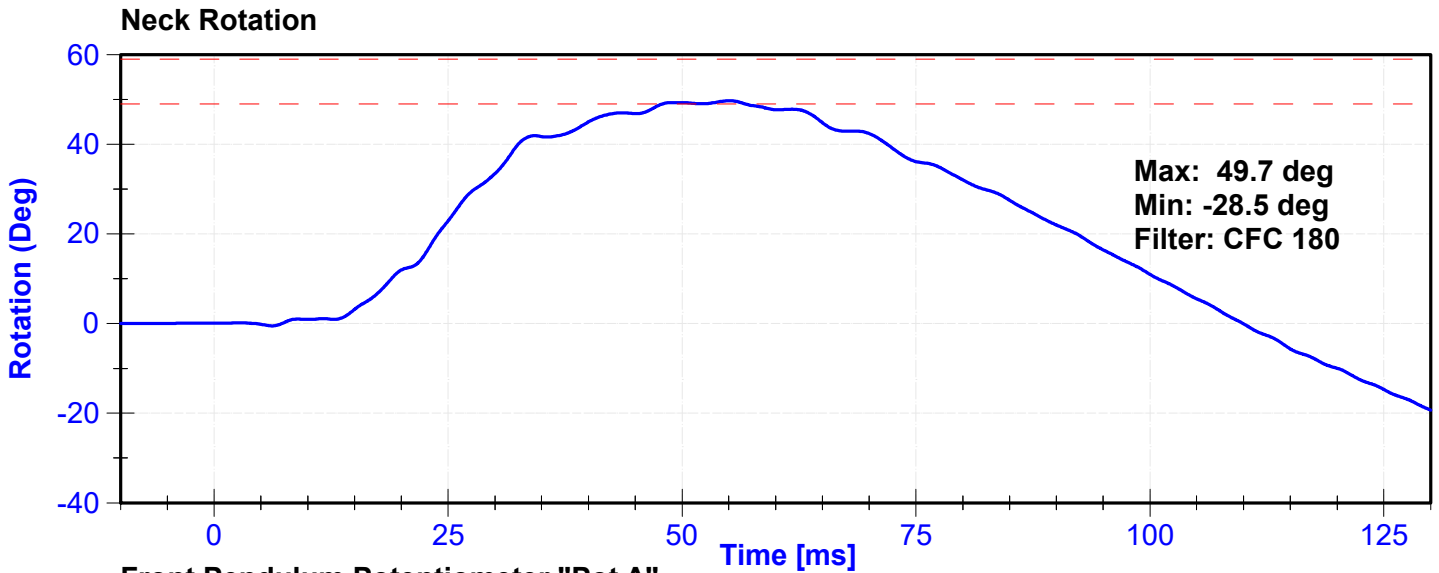
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	3.3	3.5	m/s	3.45	Pass
Lateral Neck Rotation	49	59	deg	49.7	Pass
Time at Maximum Rotation	54	66	ms	55.1	Pass
Time of Rotation Decay from Maximum	53	88	ms	54.9	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	4/29/2024	10/26/2024
Front Pendulum Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Headform Potentiometer	Sfernice	095	9/13/2024	9/13/2025



^{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
3.0	-0.25	2.5	-0.375
14.0	-3.20	13.5	-3.7
		17.0	-3.7

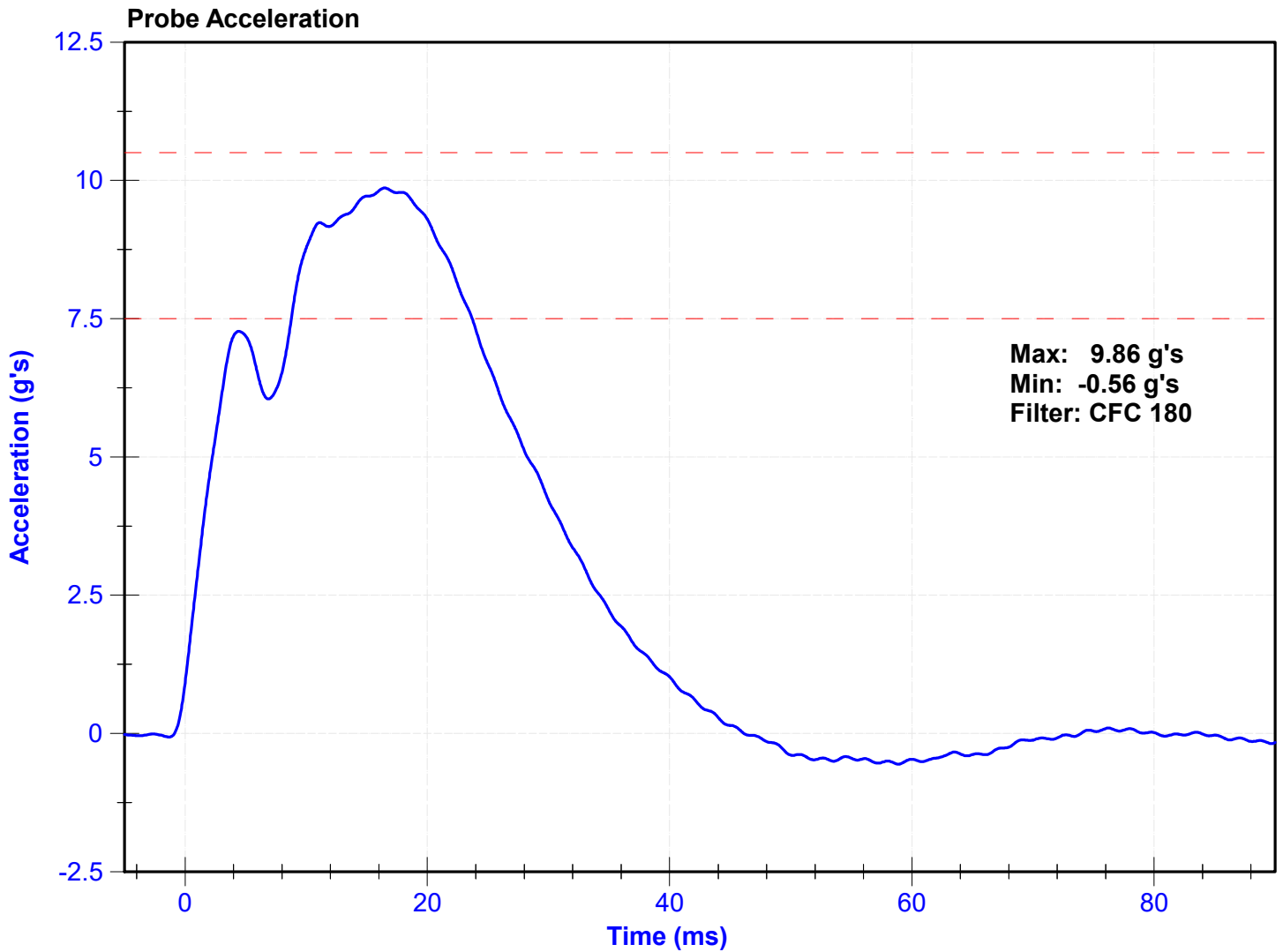
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	7.5	10.5	g's	9.86	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025



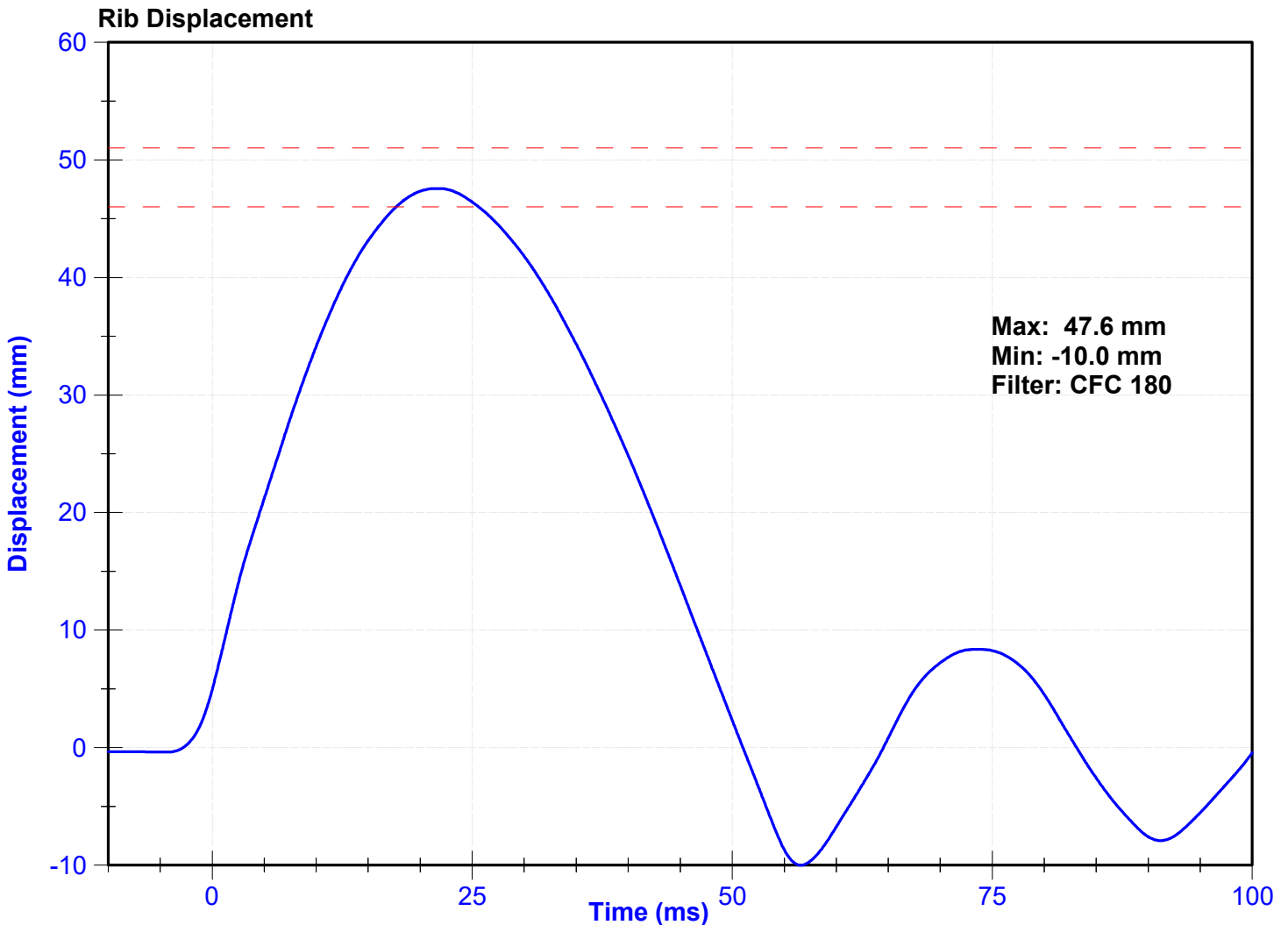
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	46	51	mm	47.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



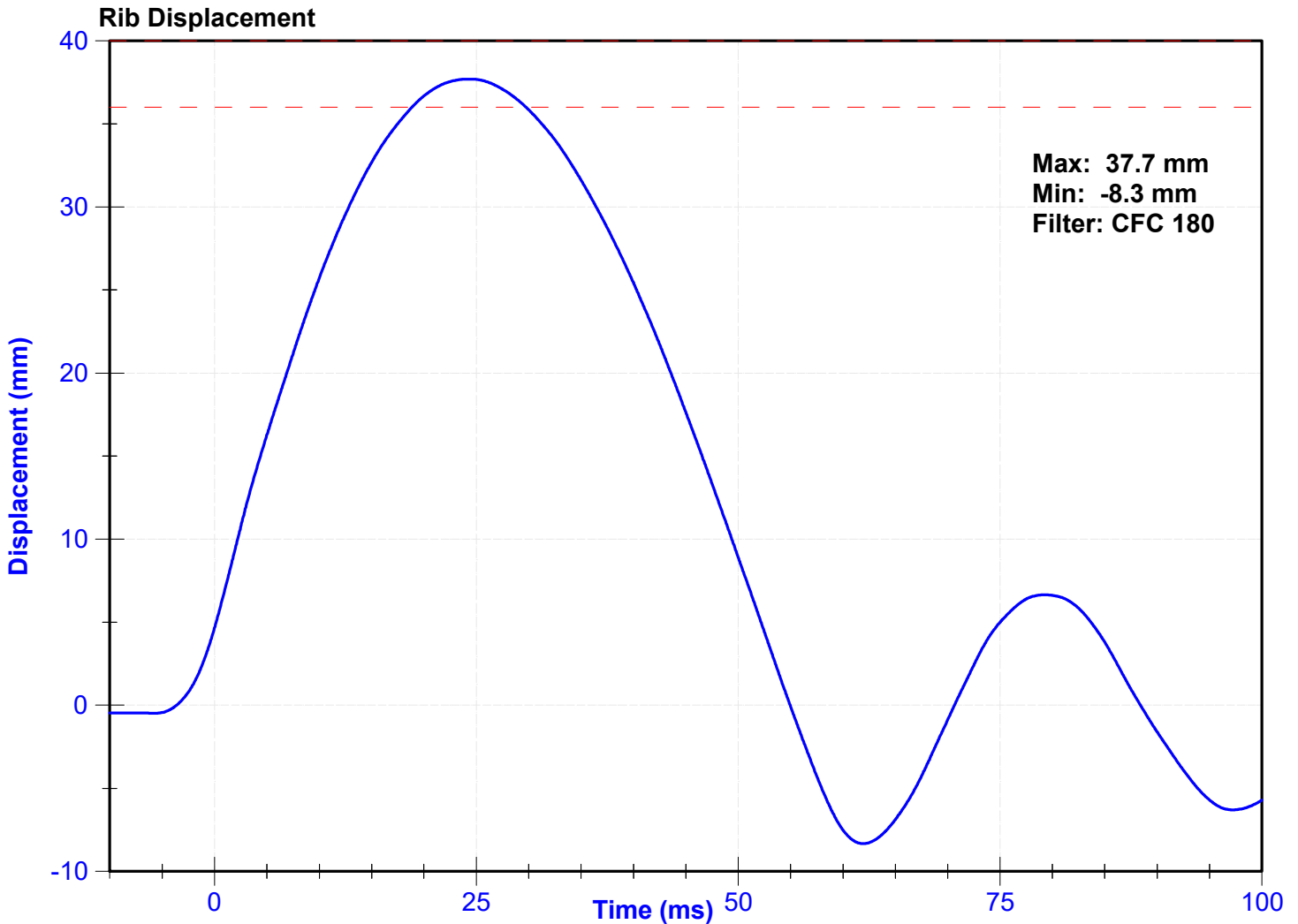
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ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025



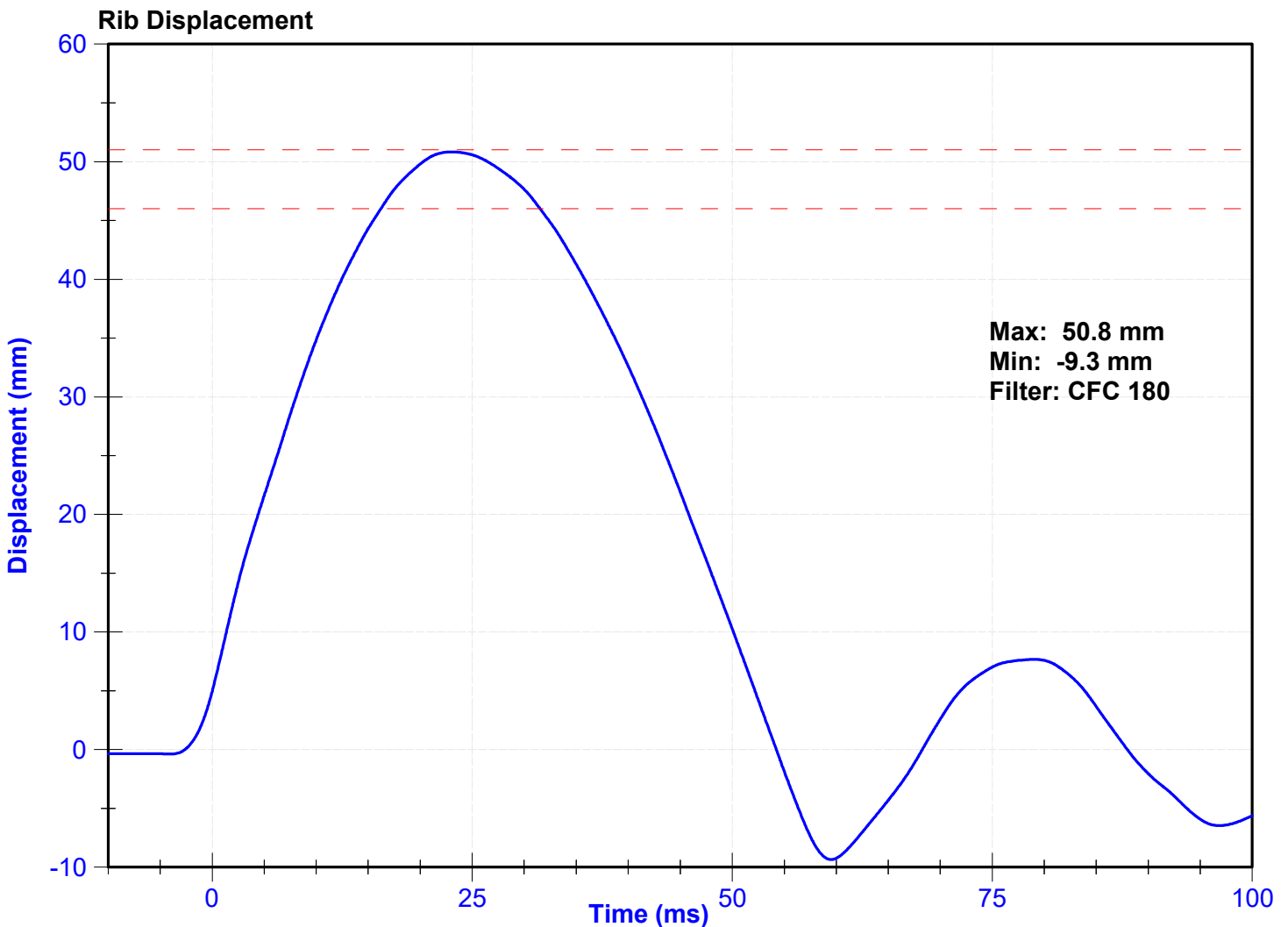
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	46	51	mm	50.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



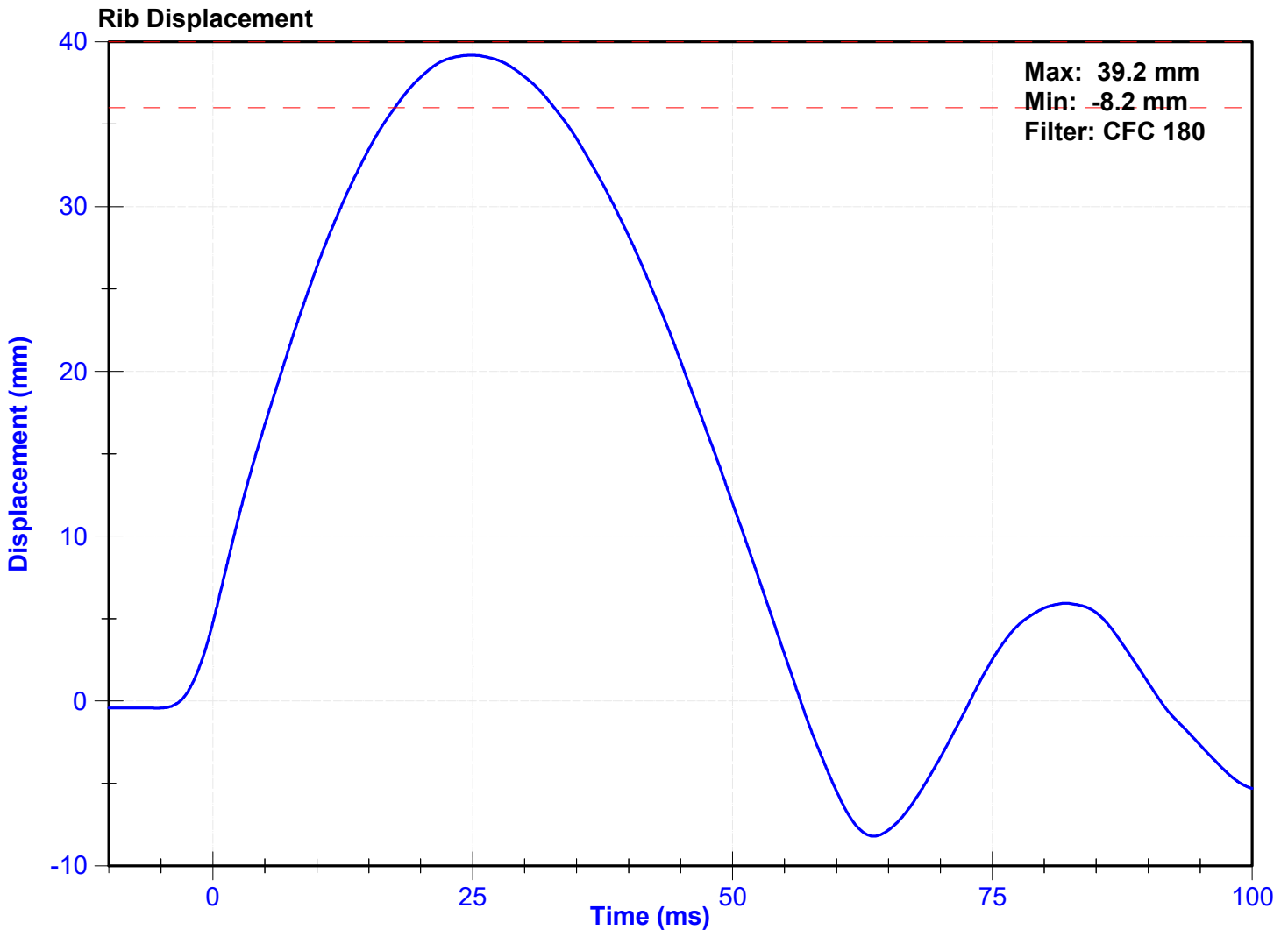
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ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	36	40	mm	39.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025



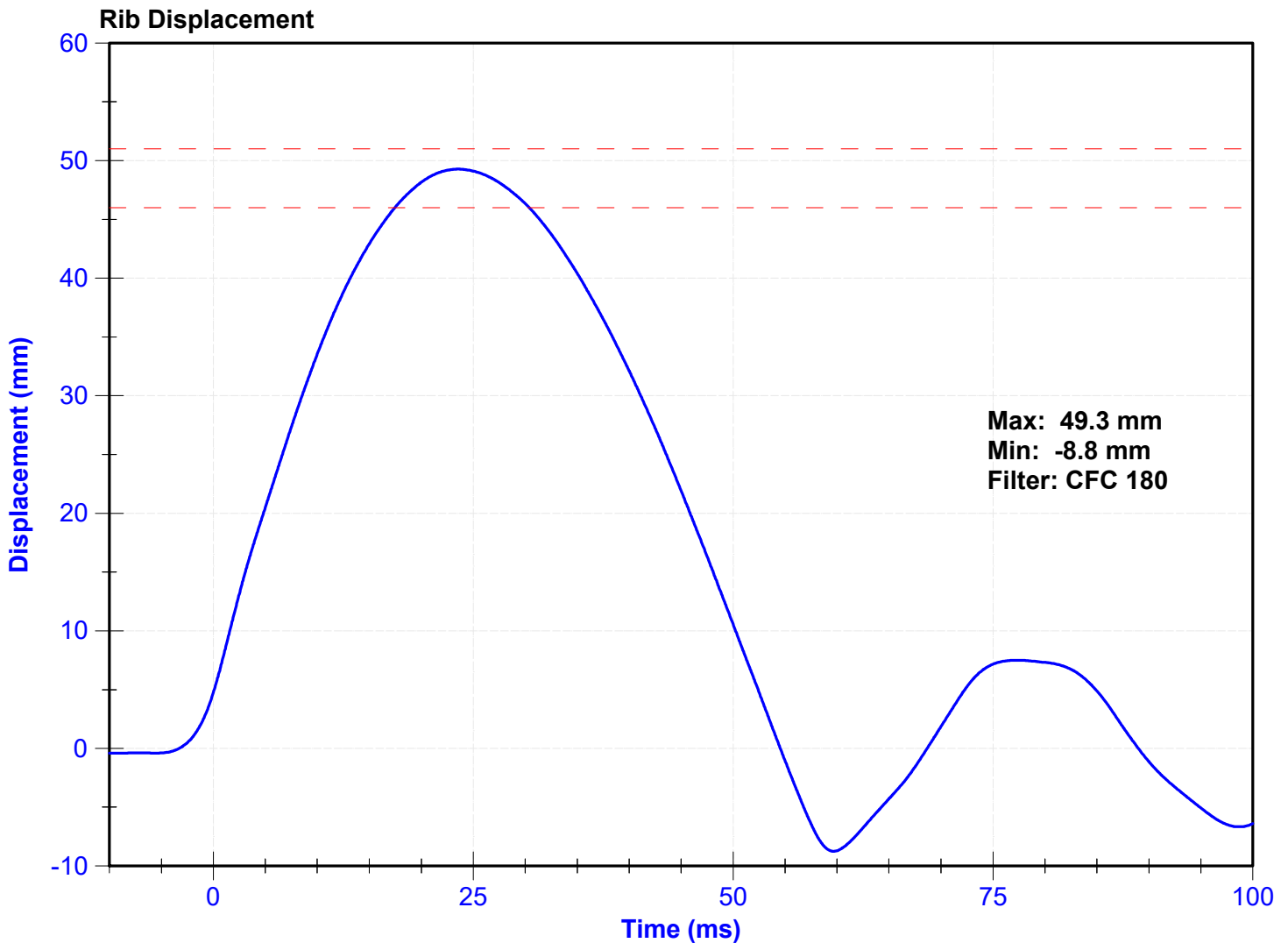
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	46	51	mm	49.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



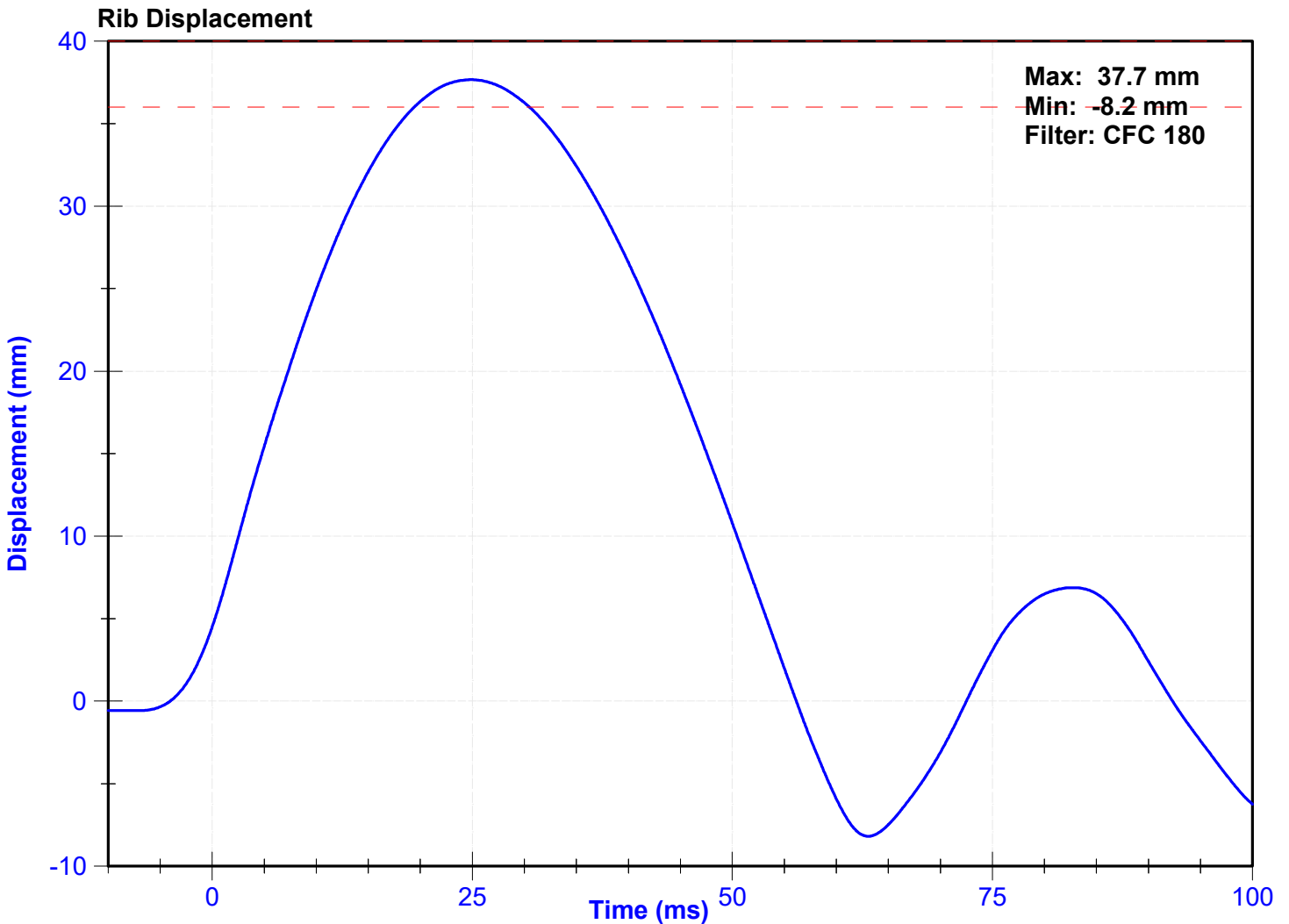
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ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Rib Displacement	36	40	mm	37.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025



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

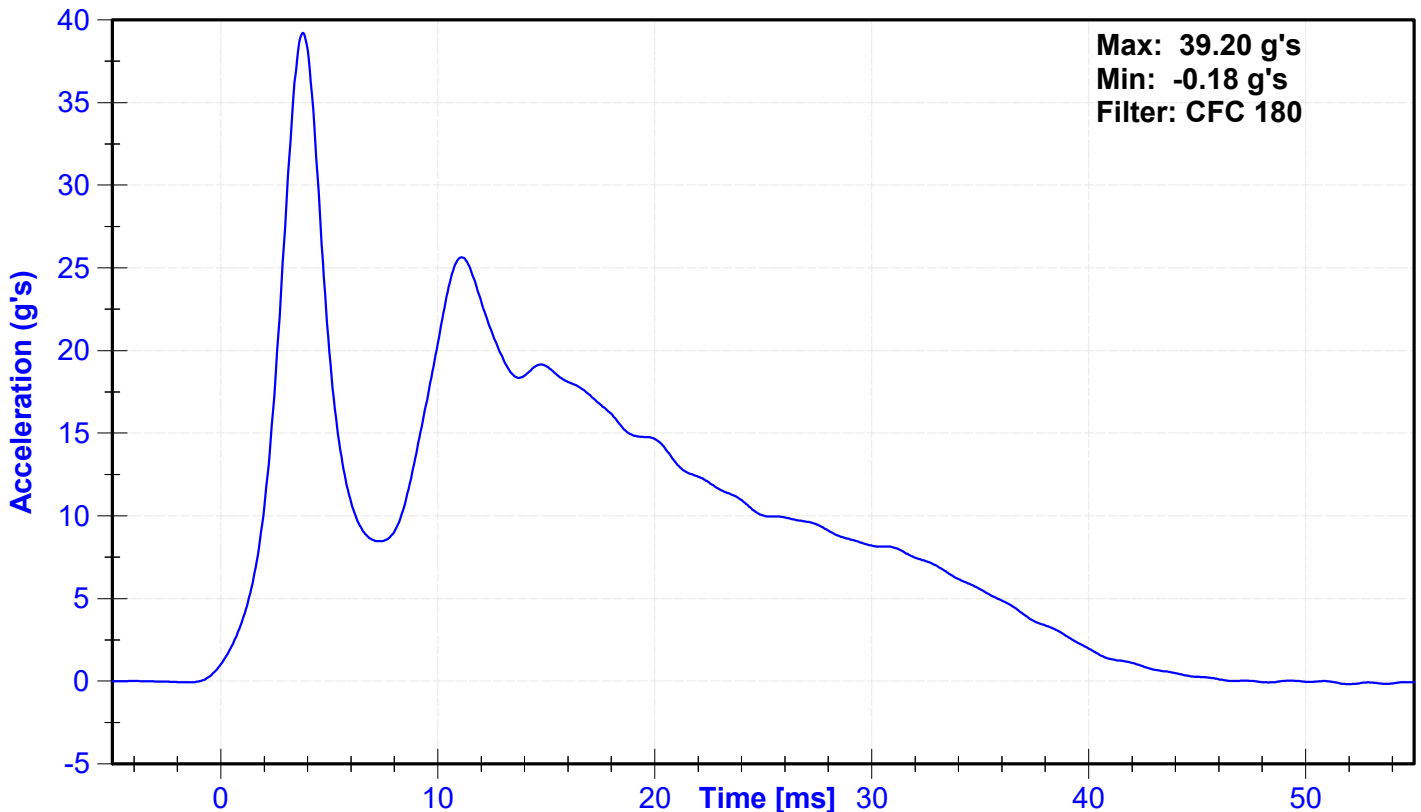
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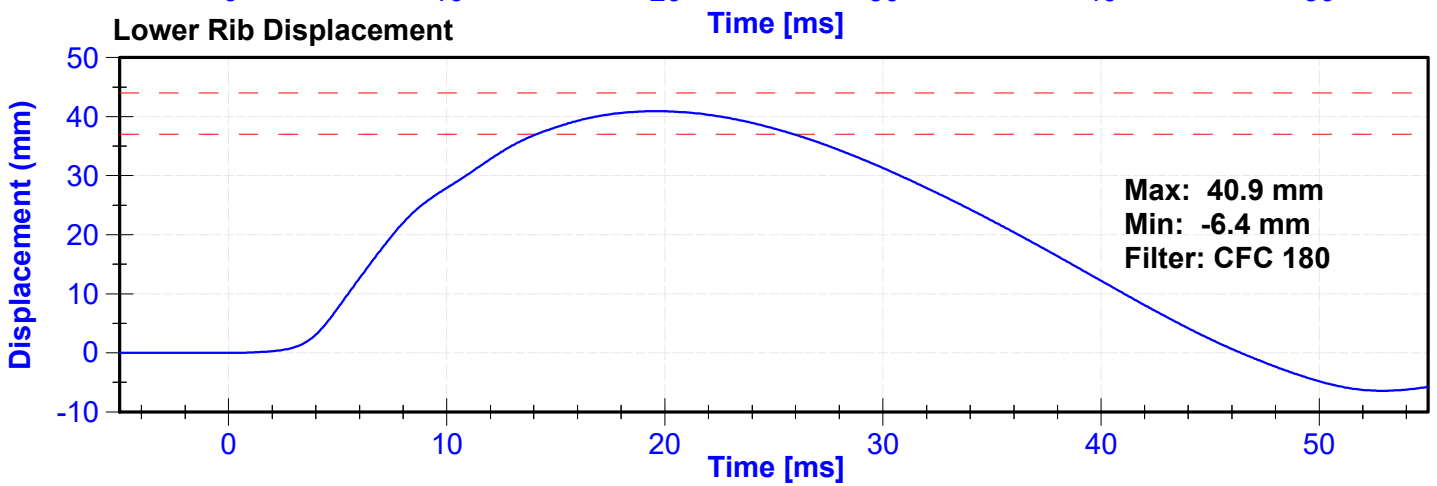
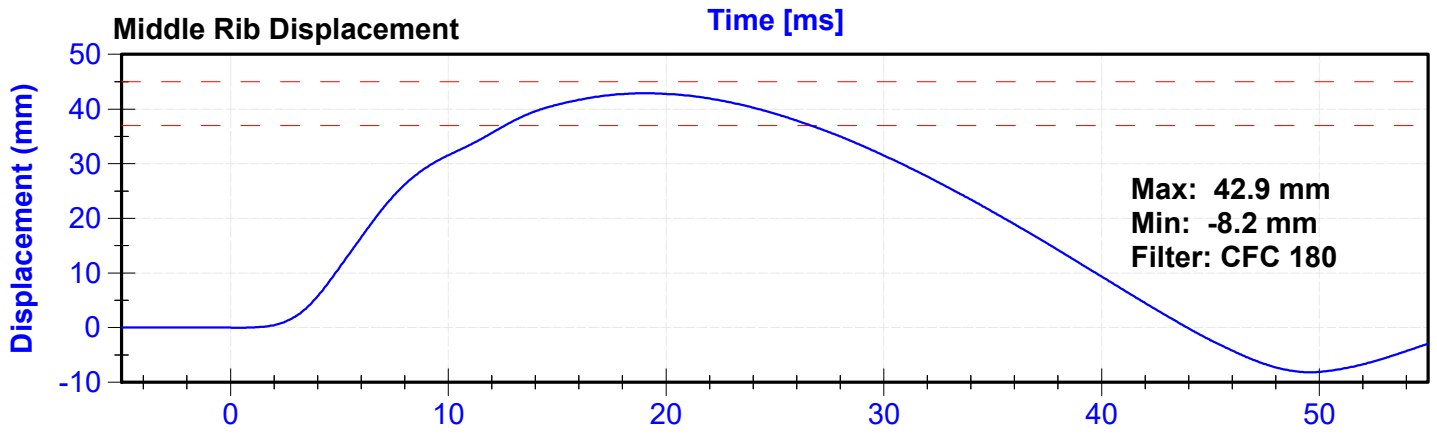
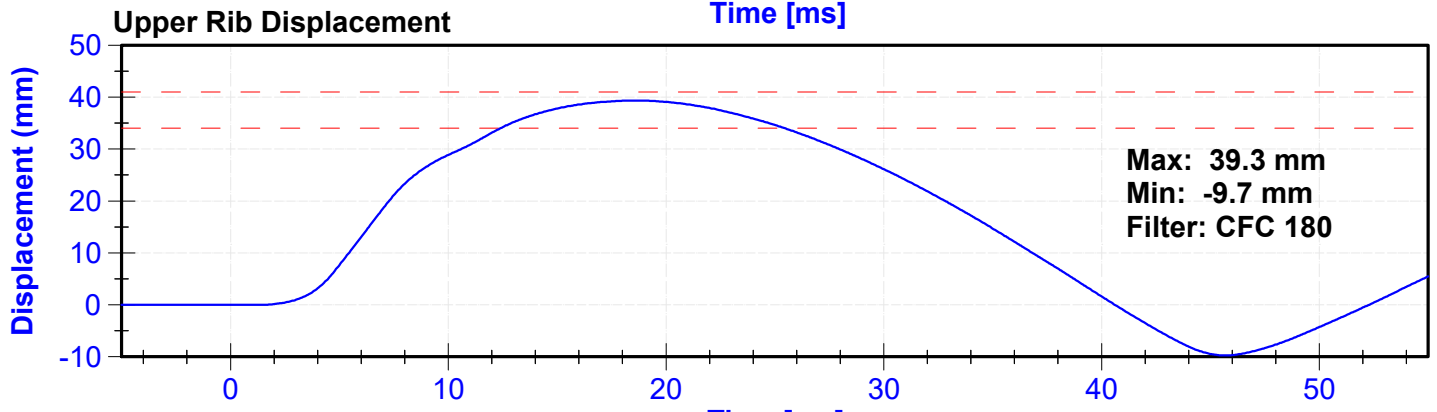
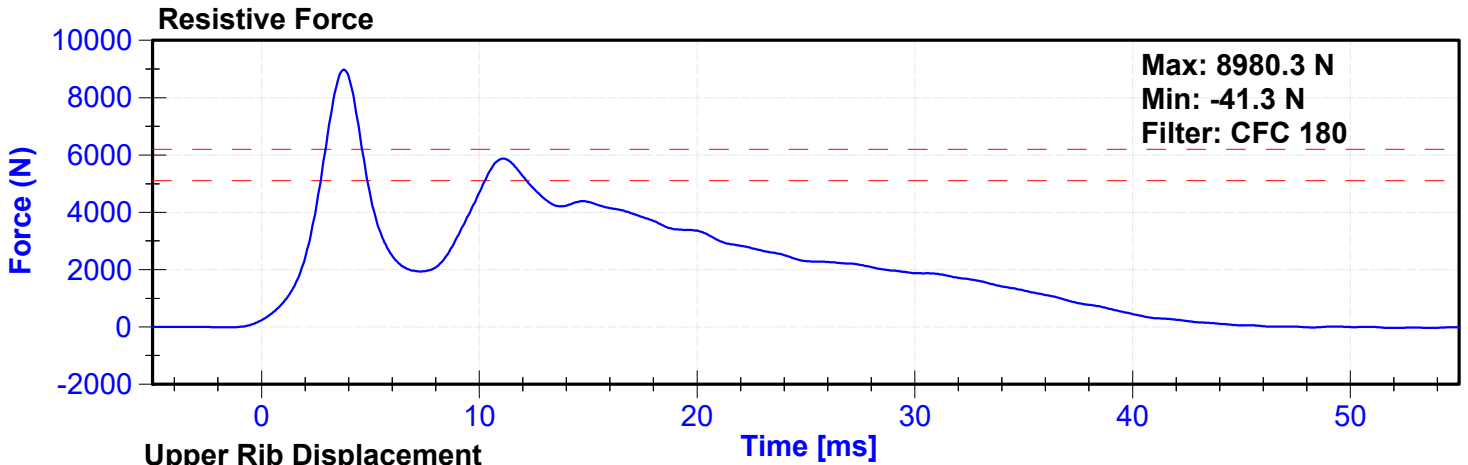
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	5874.4	Pass
Upper Thorax Rib Deflection	34	41	mm	39.3	Pass
Mid Thorax Rib Deflection	37	45	mm	42.9	Pass
Lower Thorax Rib Deflection	37	44	mm	40.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Upper Thorax Rib Potentiometer	Honeywell	0552-01	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Honeywell	807	10/8/2024	4/8/2025
Lower Thorax Rib Potentiometer	Honeywell	0552-03	10/8/2024	4/8/2025

Probe Acceleration





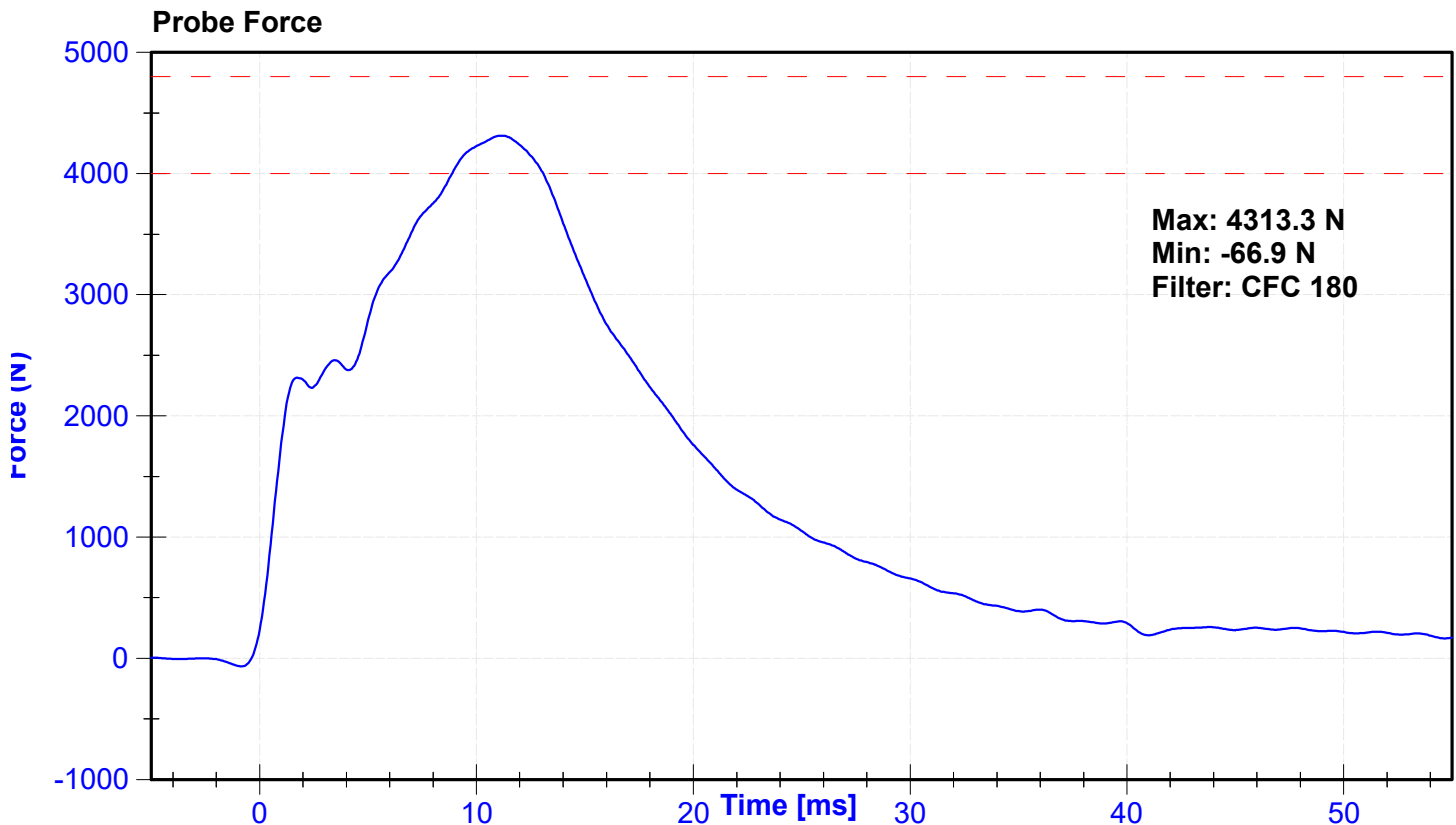
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

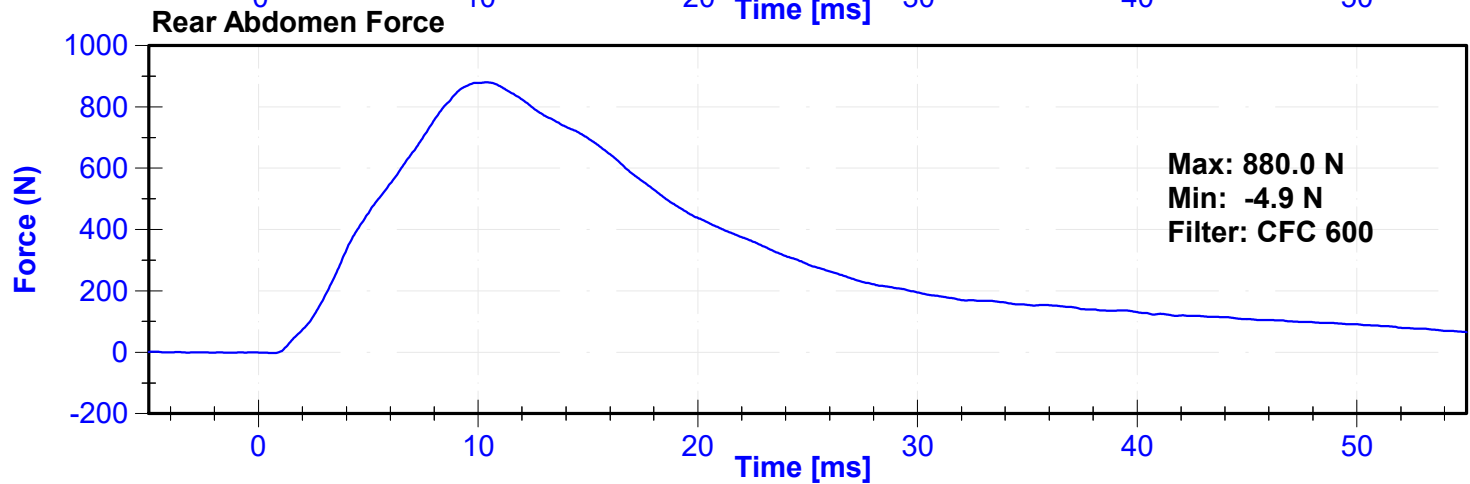
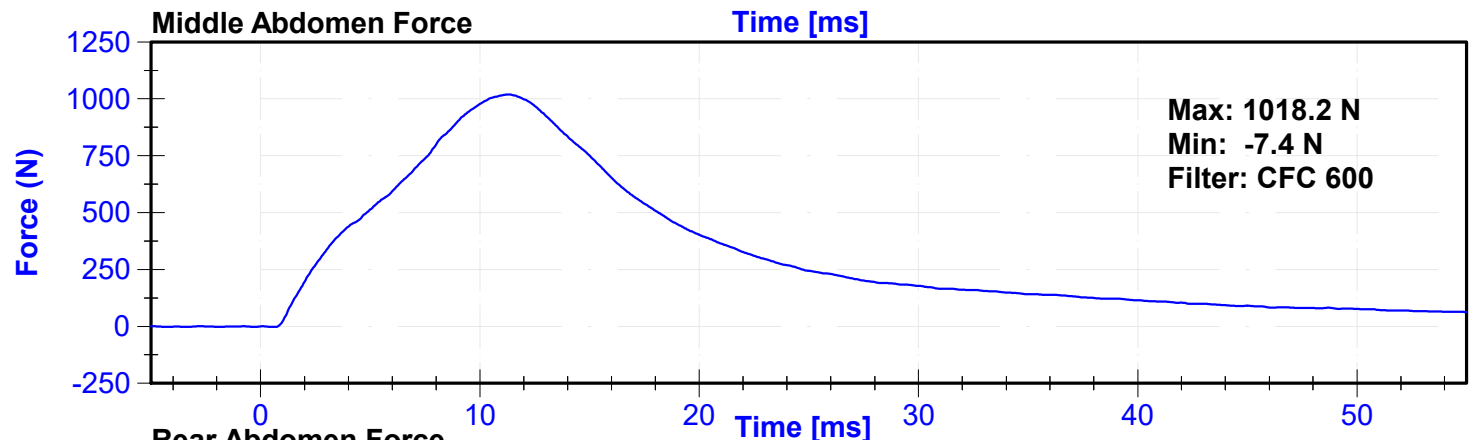
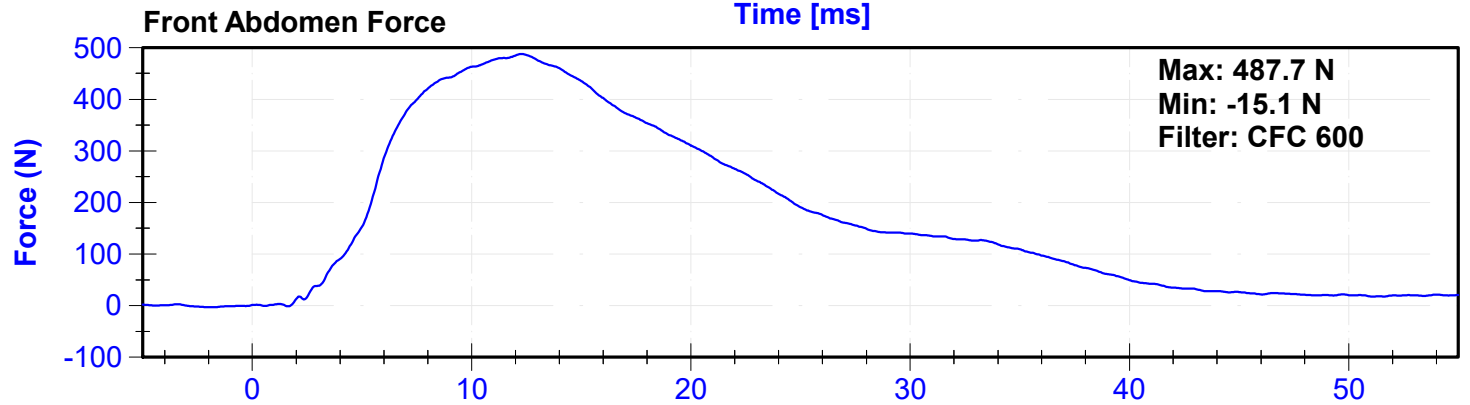
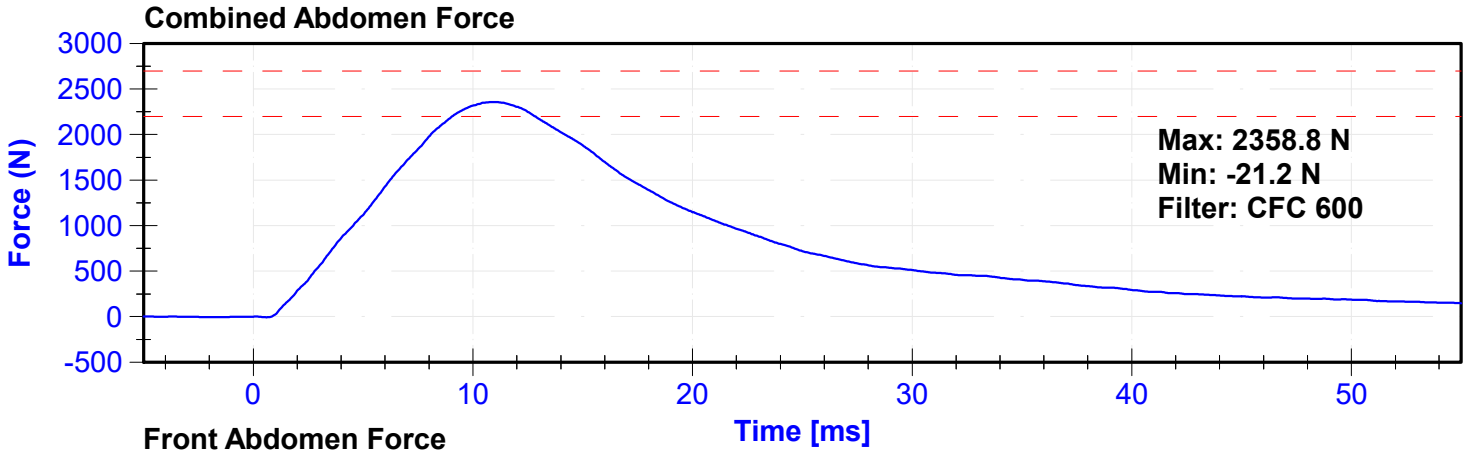
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	3.9	4.1	m/s	4.02	Pass
Combined Abdomen Force	2200	2700	N	2358.8	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.95	Pass
Resistive Probe Force	4000	4800	N	4313.3	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.15	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Front Abdomen Load Cell	Denton	1512	9/16/2024	9/16/2025
Middle Abdomen Load Cell	Denton	1526	9/16/2024	9/16/2025
Rear Abdomen Load Cell	Denton	1516	9/16/2024	9/16/2025





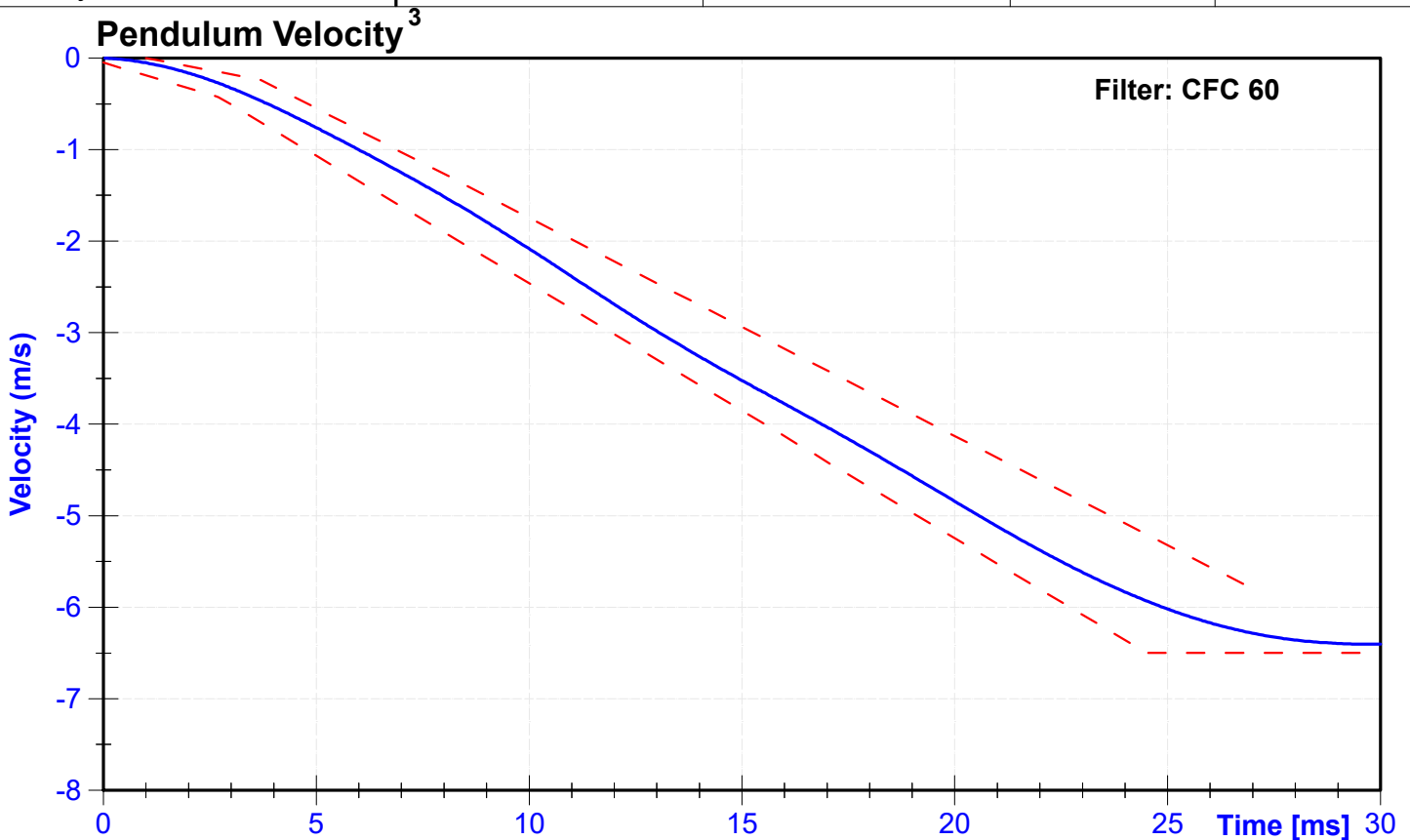
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

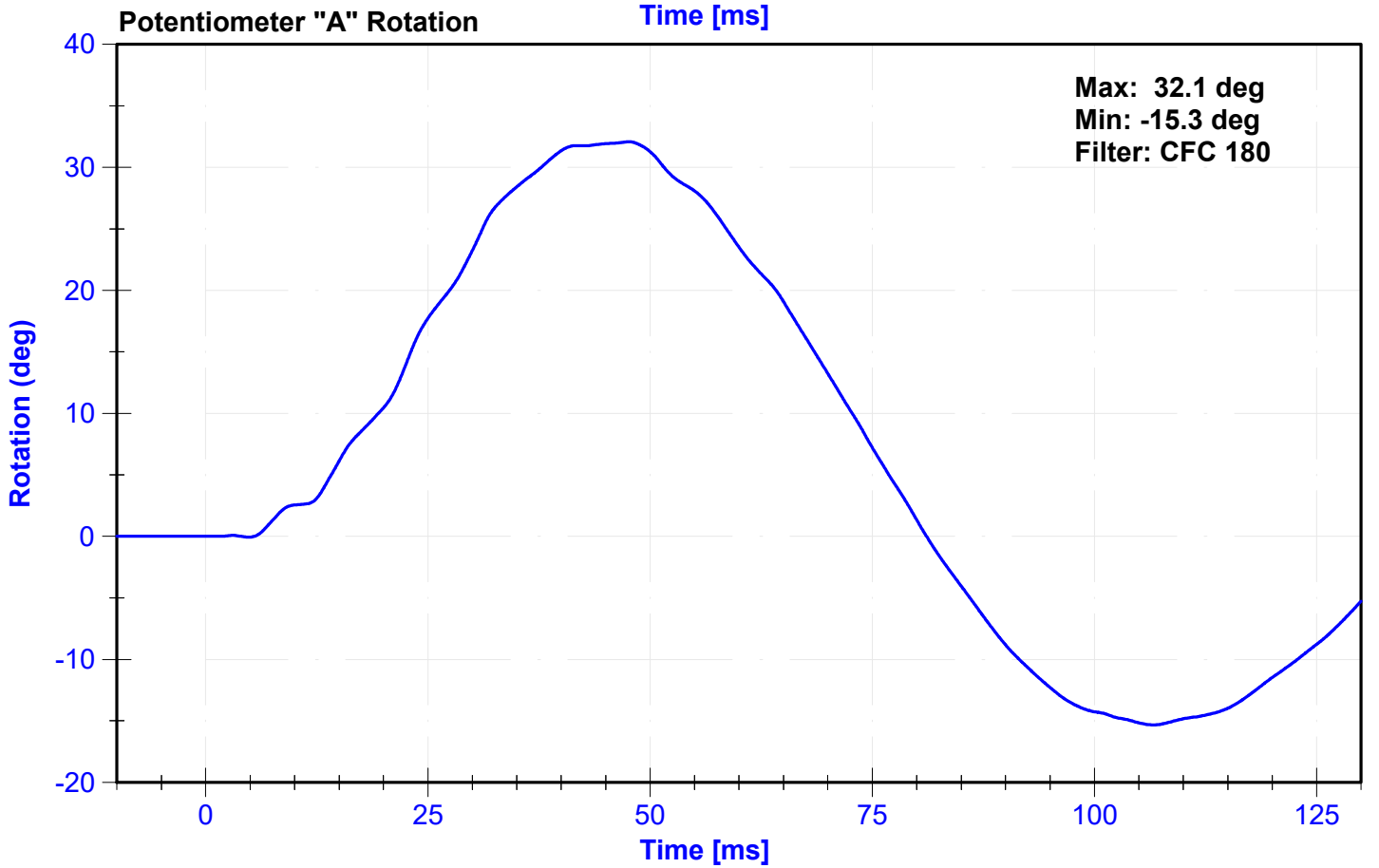
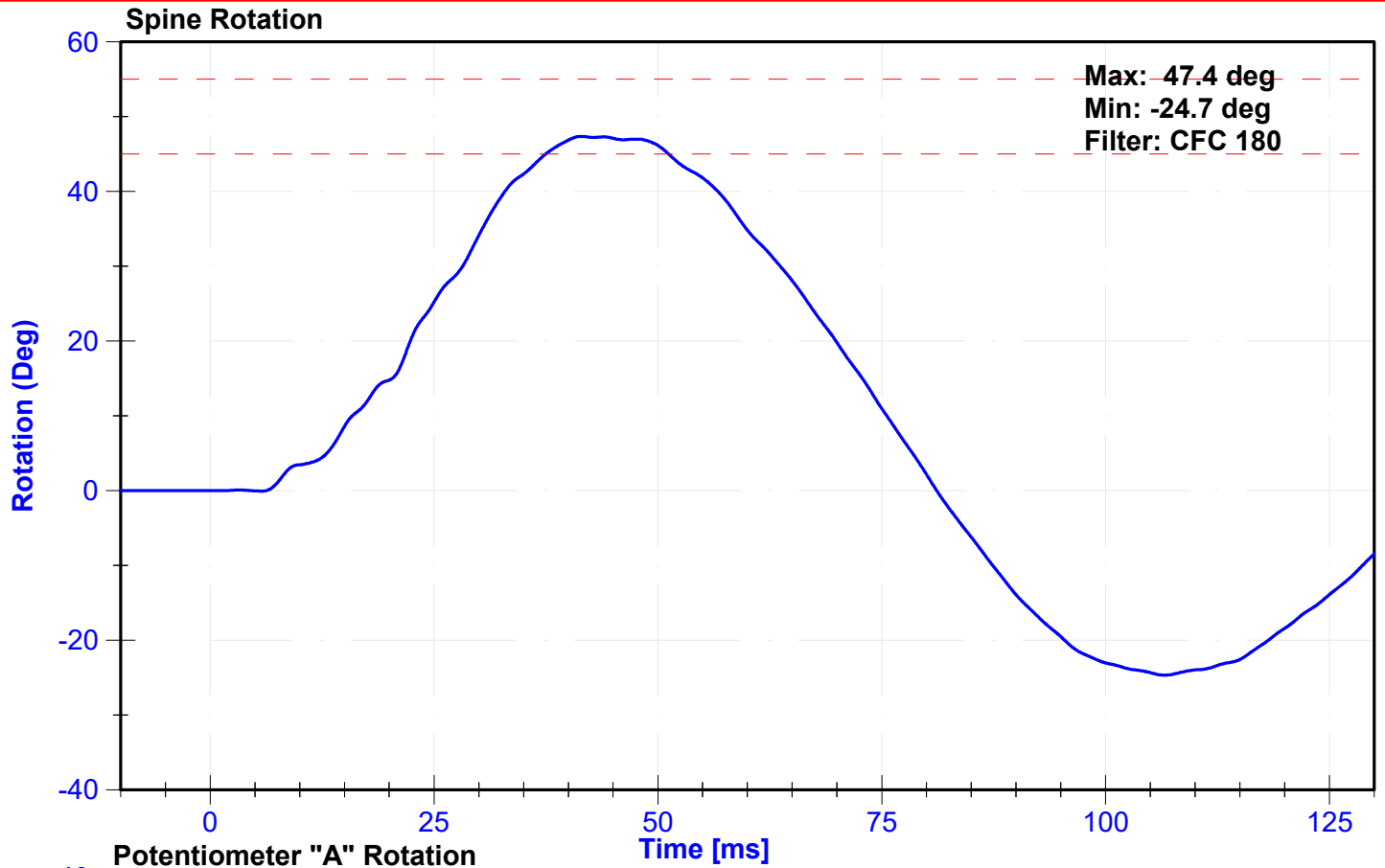
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Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	40	Pass
Velocity	5.95	6.15	m/s	6.122	Pass
Lateral Spine Rotation	45	55	deg	47.4	Pass
Time at Maximum Rotation	39	53	ms	41.4	Pass
Time of Decay to Zero Degrees	37	57	ms	39.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

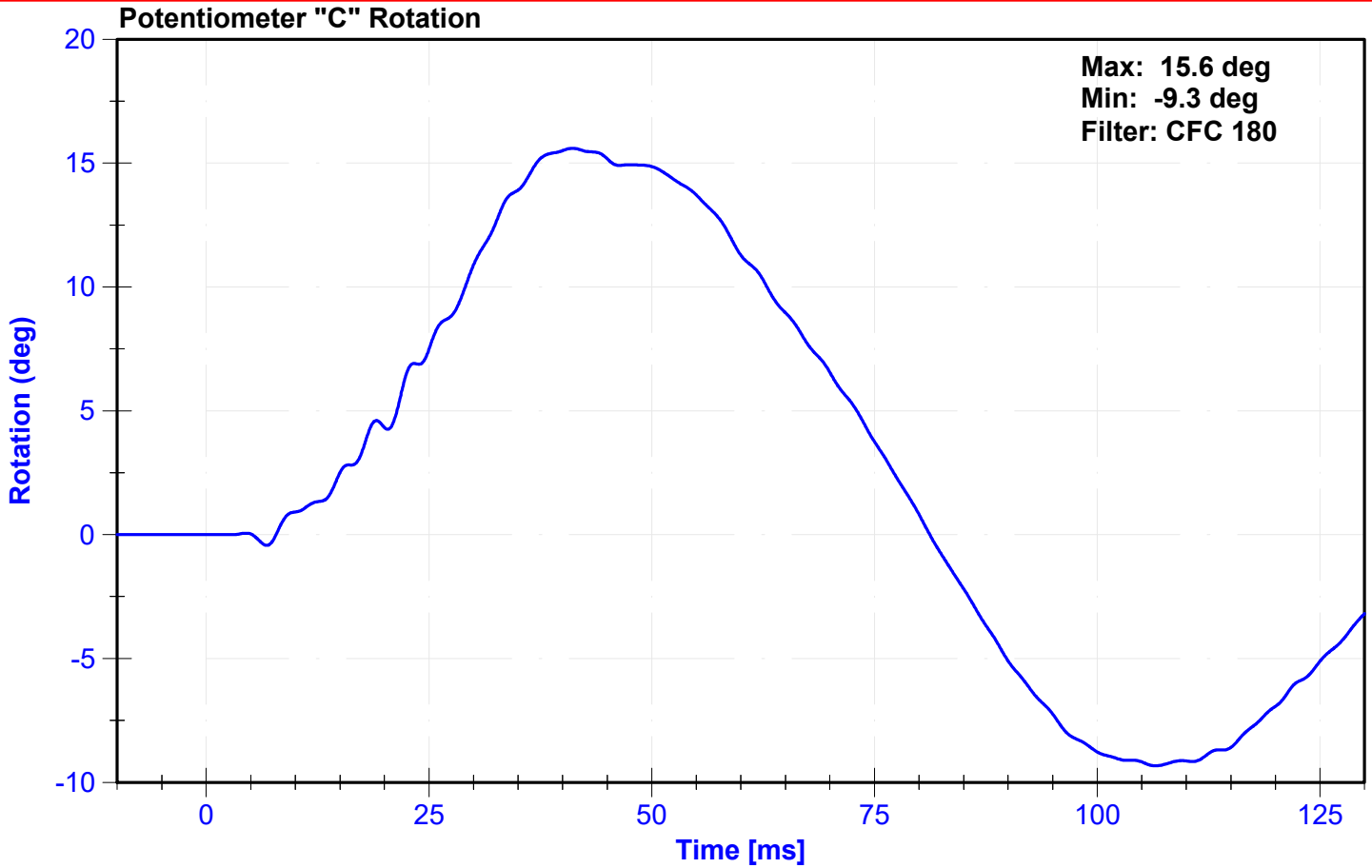
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum "A" Potentiometer	Sfernice	2247	9/13/2024	9/13/2025
Condyle "B" Potentiometer	Sfernice	095	9/13/2024	9/13/2025



^{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

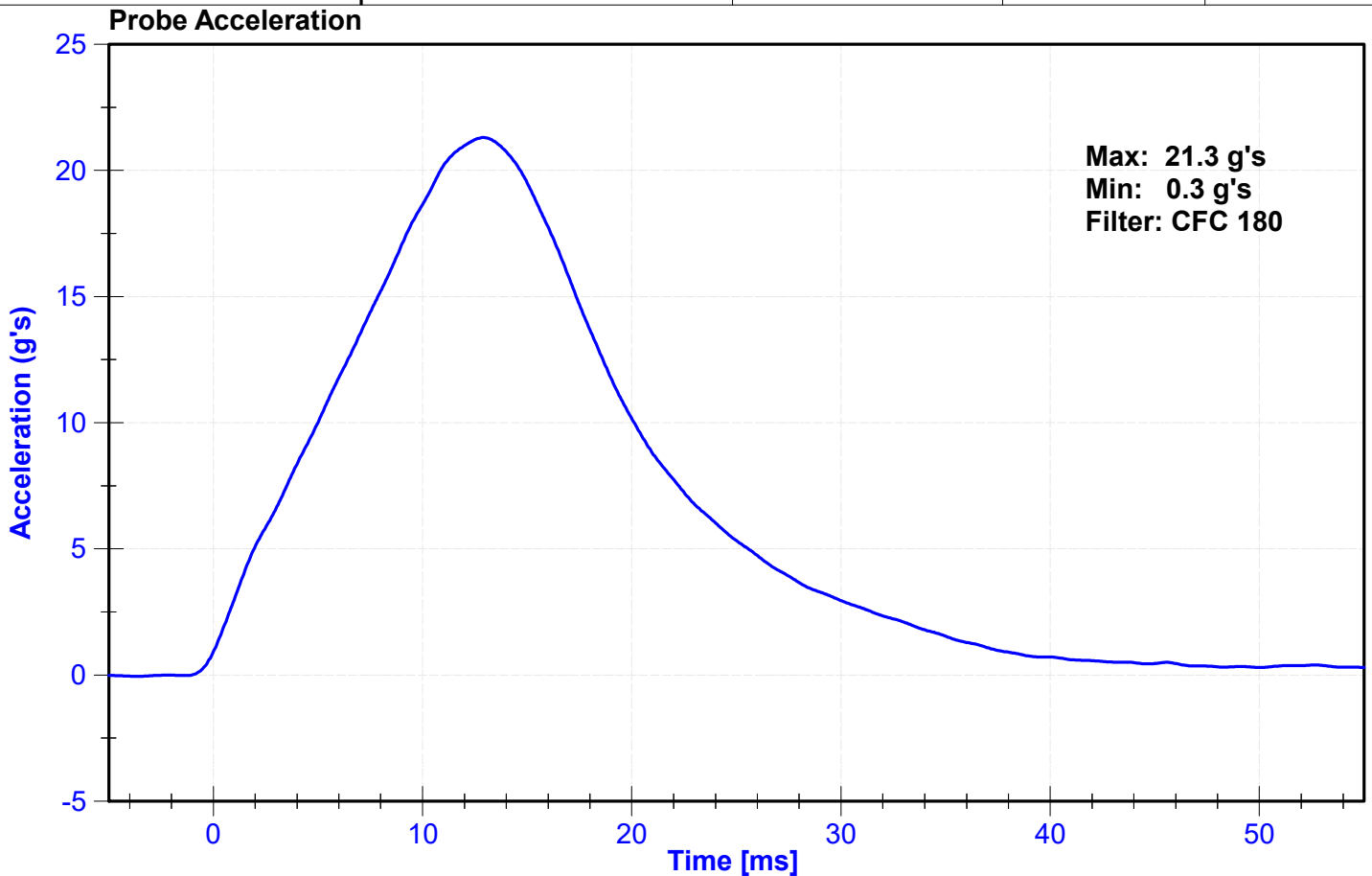
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

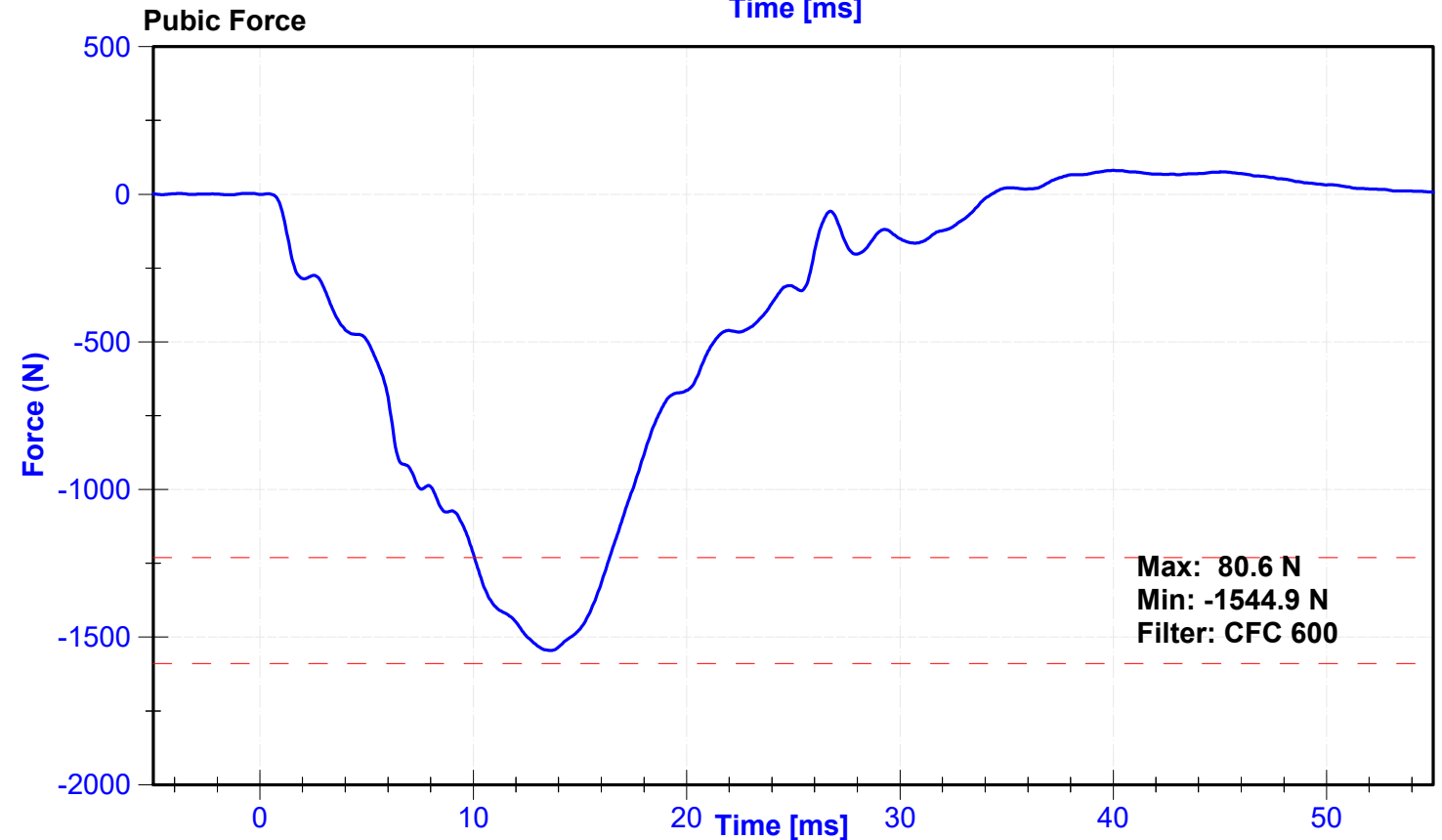
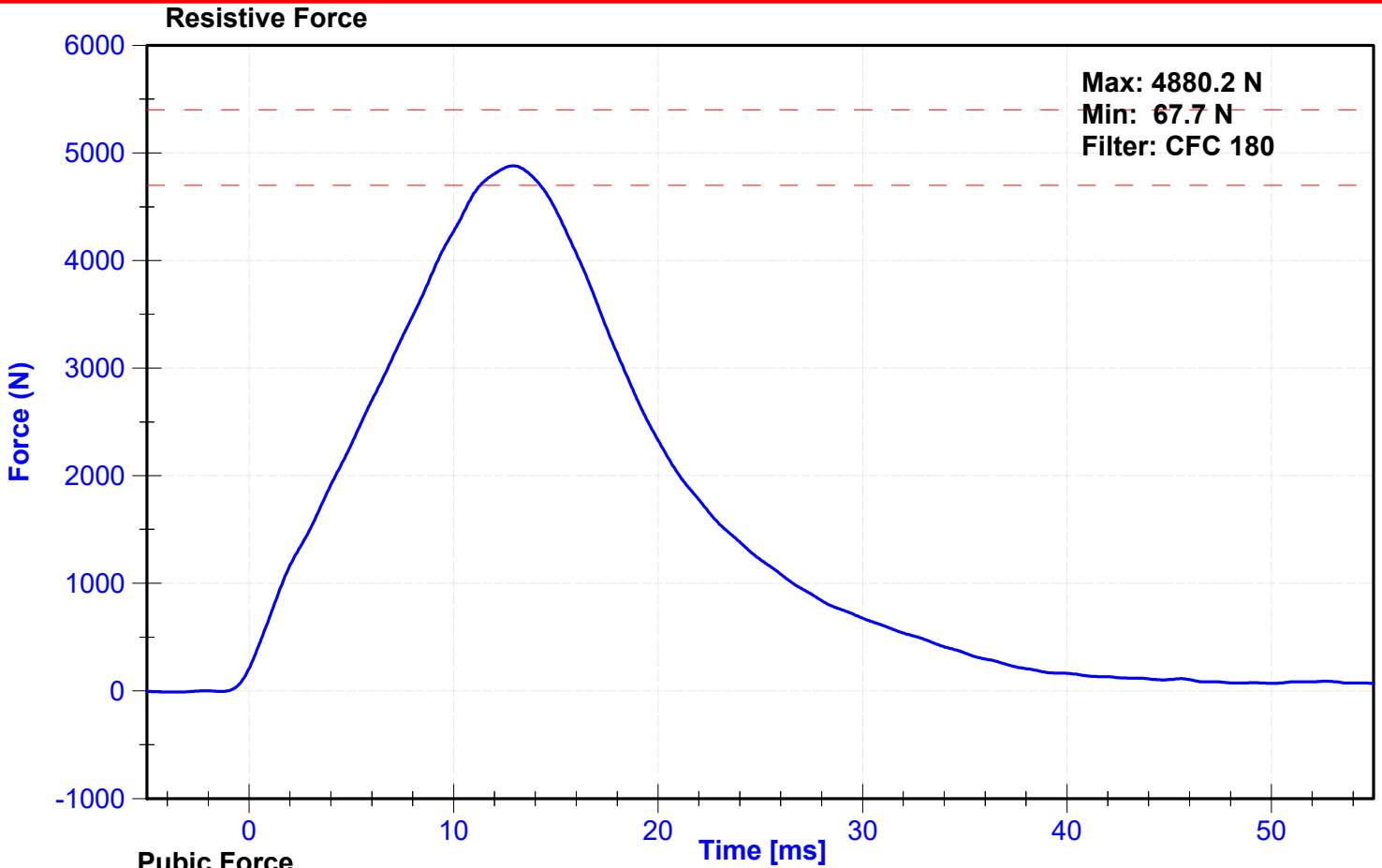
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Resistive Force	4700	5400	N	4880.2	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.90	Pass
Pubic Force	-1590	-1230	N	-1544.9	Pass
Time at Peak Pubic Force	12.2	17.0	ms	13.60	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18599	9/13/2024	3/12/2025
Pubic Load Cell	Denton	464-FY	9/16/2024	9/16/2025





APPENDIX VI
SID-Its PERFORMANCE CALIBRATION TEST DATA

**PRE-TEST
SID-IIs PERFORMANCE CALIBRATION TEST DATA**

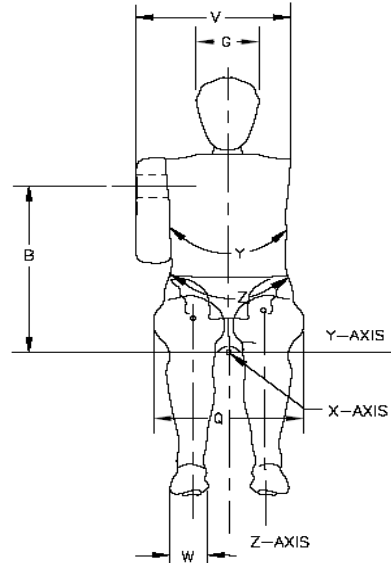
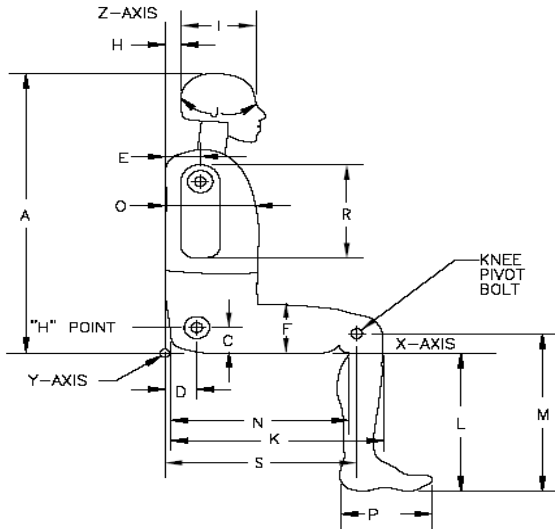


External Measurements - SID-IIs

Technician: J. Rios

Date: 10/11/2024

Dummy Serial Number: 224



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	444	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	99	Pass
F	Thigh Clearance	119	135	121	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	45	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	528	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	401	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	204	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	869	Pass
Z	Waist Circumference	761	791	772	Pass

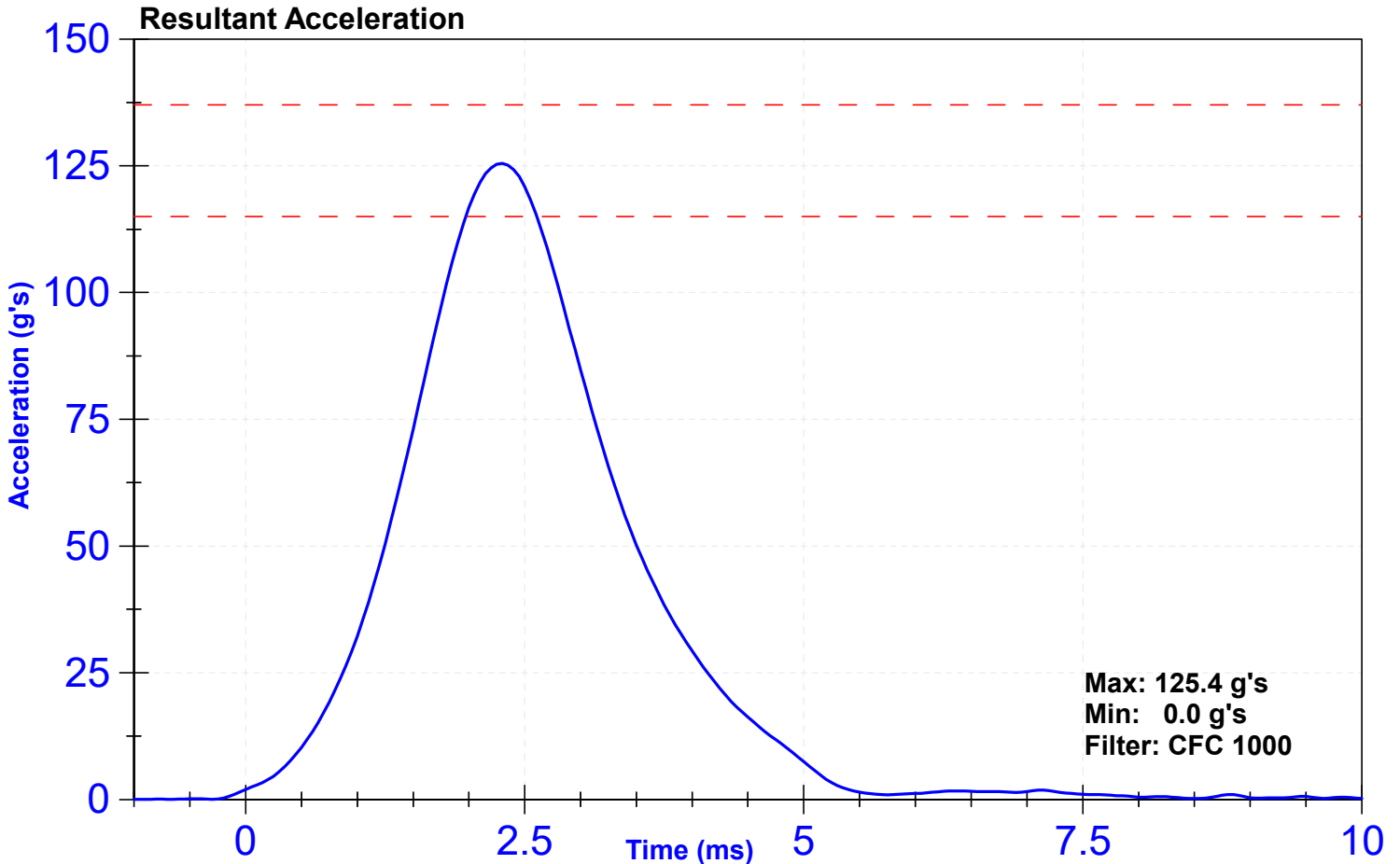
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

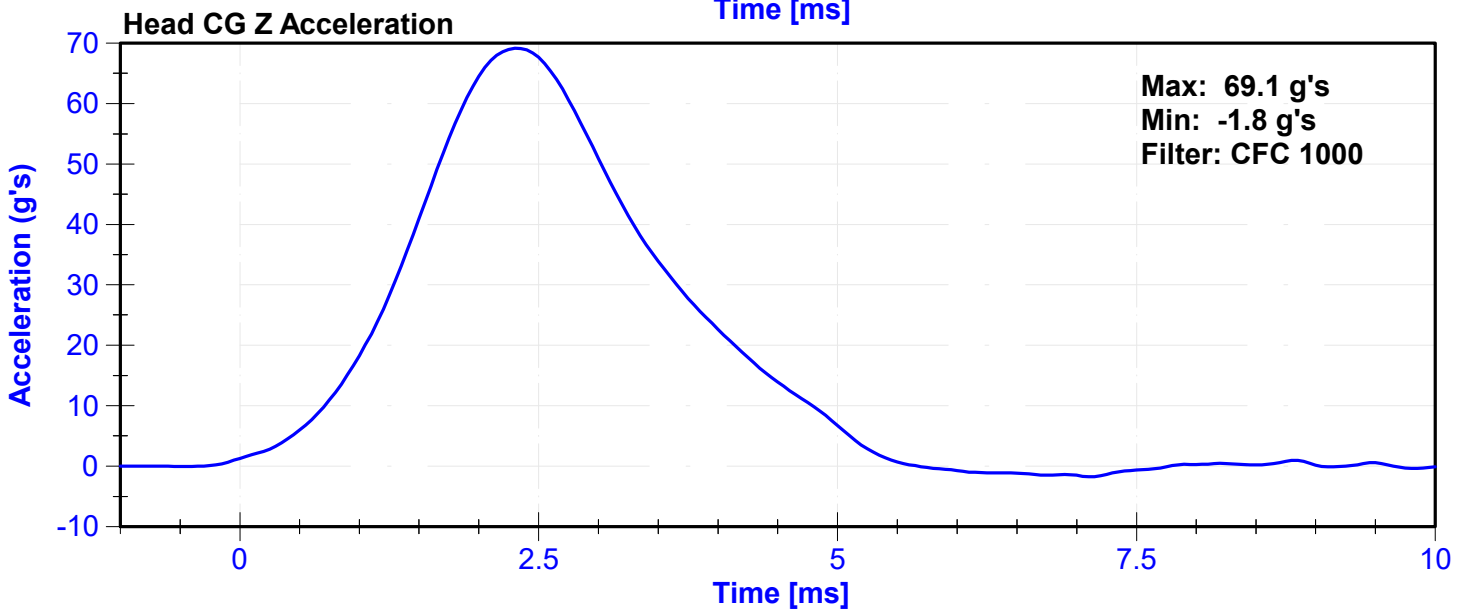
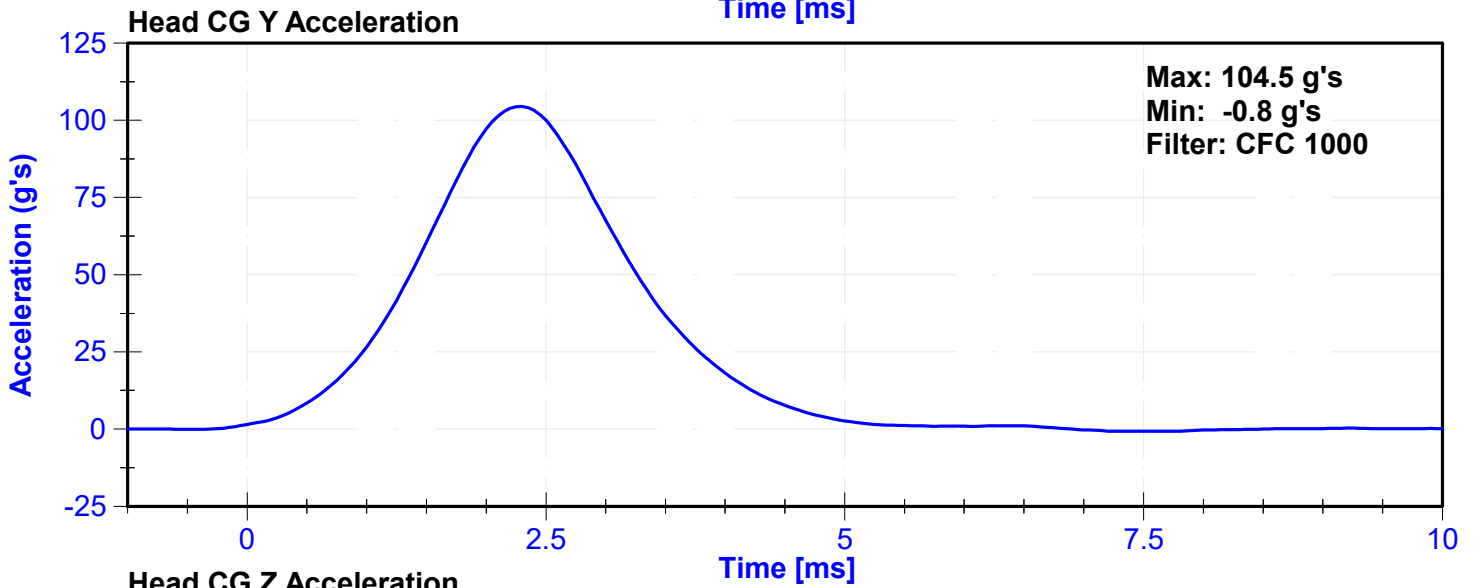
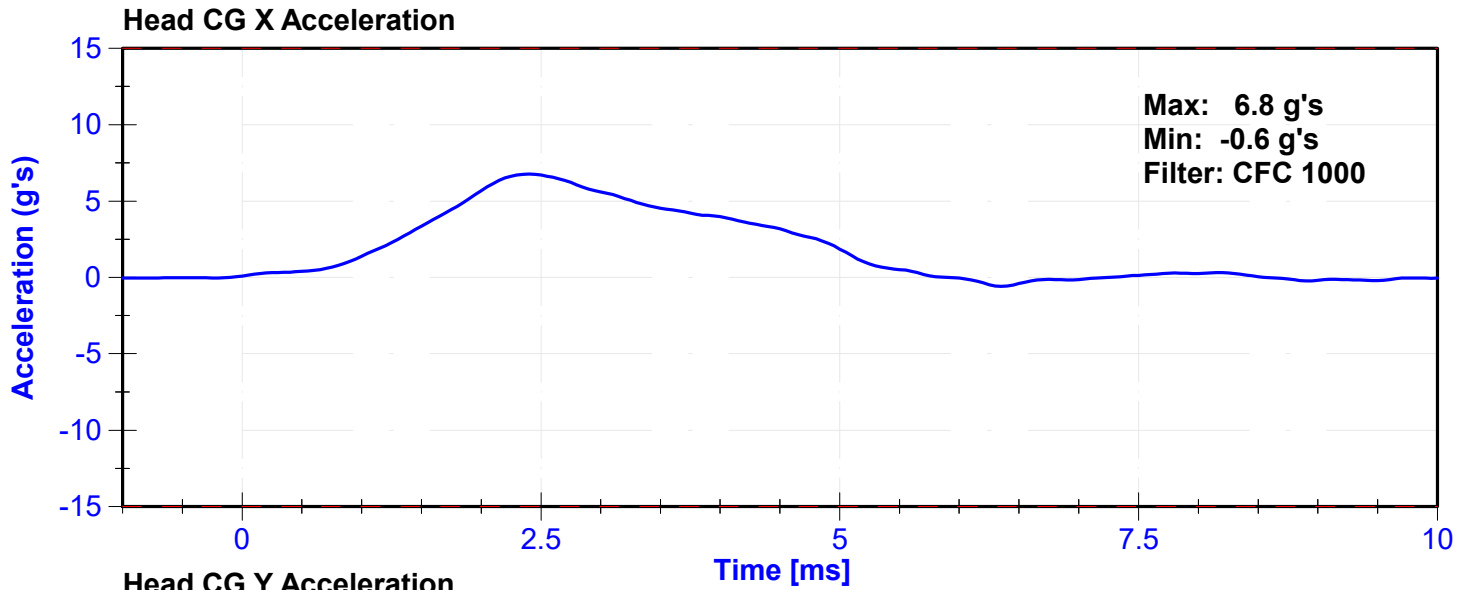
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	39	Pass
Resultant Acceleration	115	137	g's	125.4	Pass
Oscillation	0	15	%	1.4	Pass
Fore-Aft Acceleration	-15	15	g's	6.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P51884	10/8/2024	4/6/2025
Y Accelerometer	Endevco	P73161	10/8/2024	4/6/2025
Z Accelerometer	Endevco	P79588	10/8/2024	4/6/2025





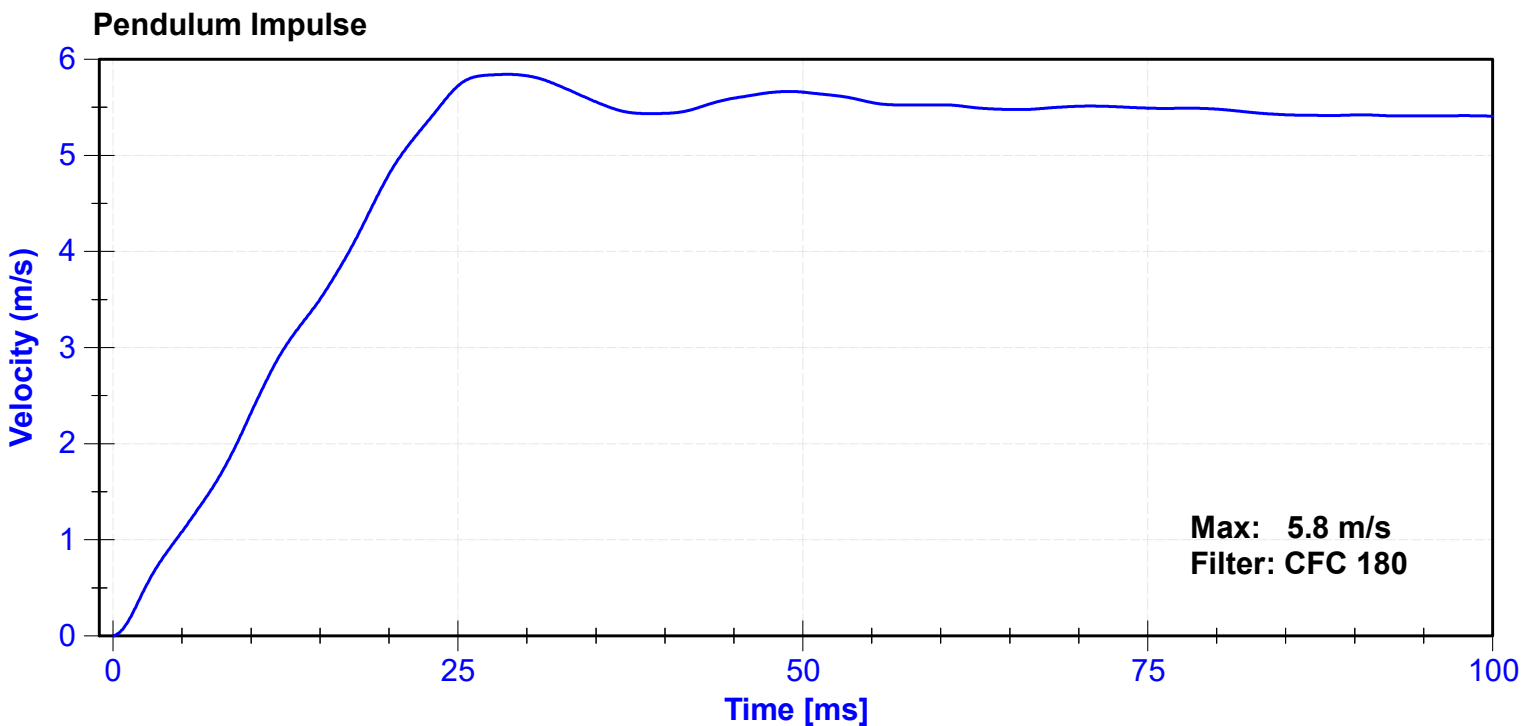
ATD Manufacturer	FTSS	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

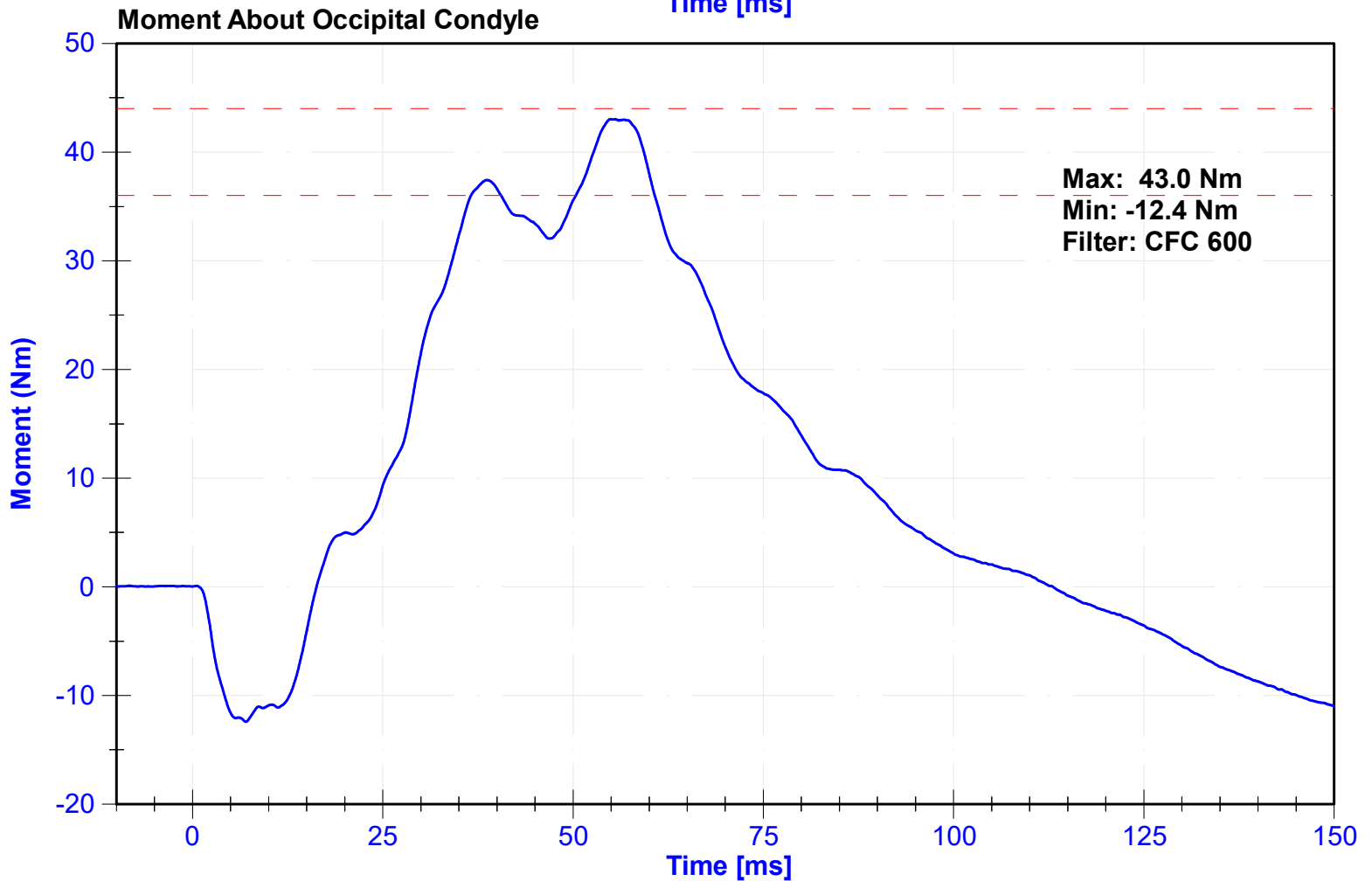
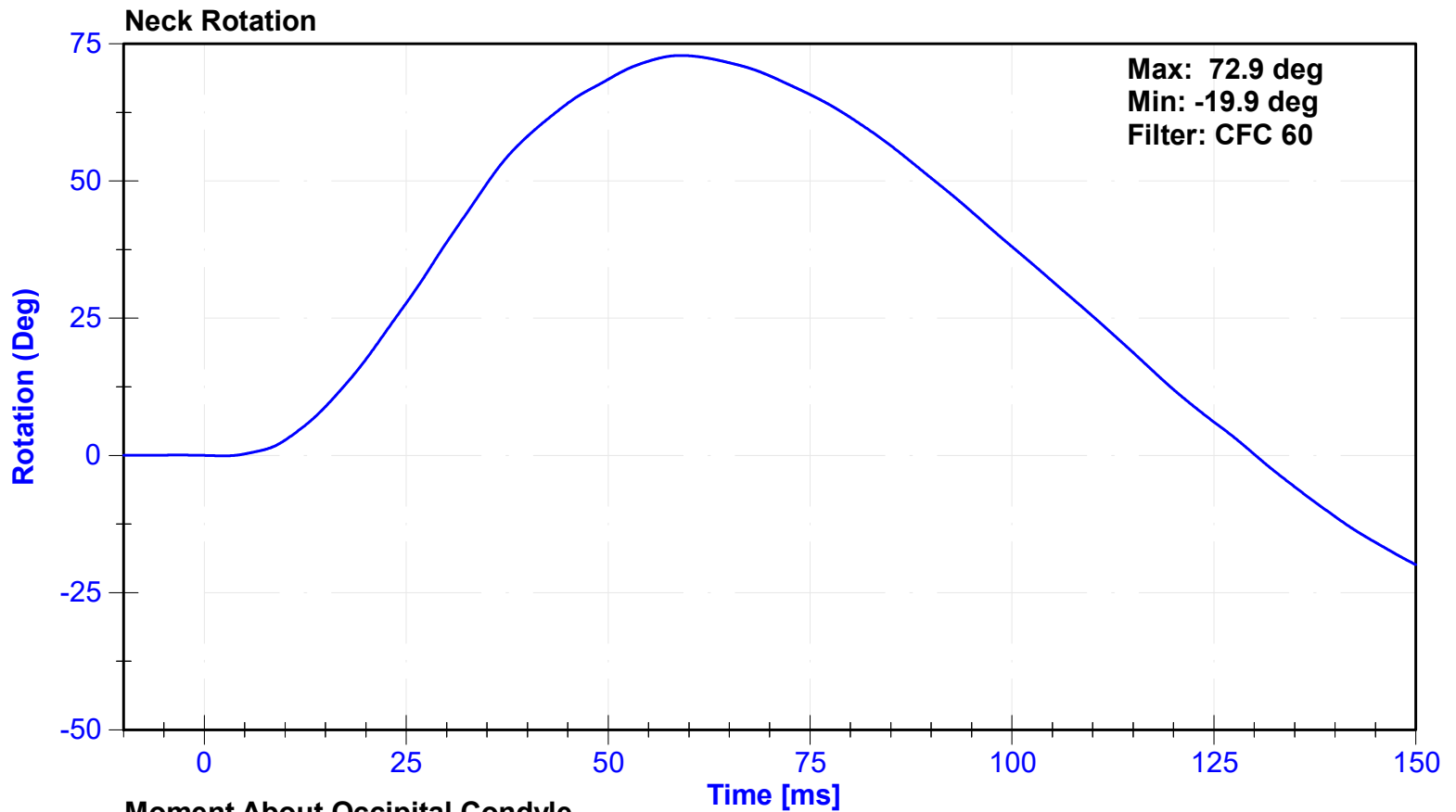
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	47	Pass
Velocity	5.51	5.63	m/s	5.510	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.32	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.50	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.80	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.72	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.84	Pass
Neck Rotation	71	81	deg	72.9	Pass
Time at Maximum Rotation	50	70	ms	59.0	Pass
Moment about the OC	36	44	Nm	43.0	Pass
Moment Decay to 0 Nm	102	126	ms	113.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	4/29/2024	10/26/2024
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

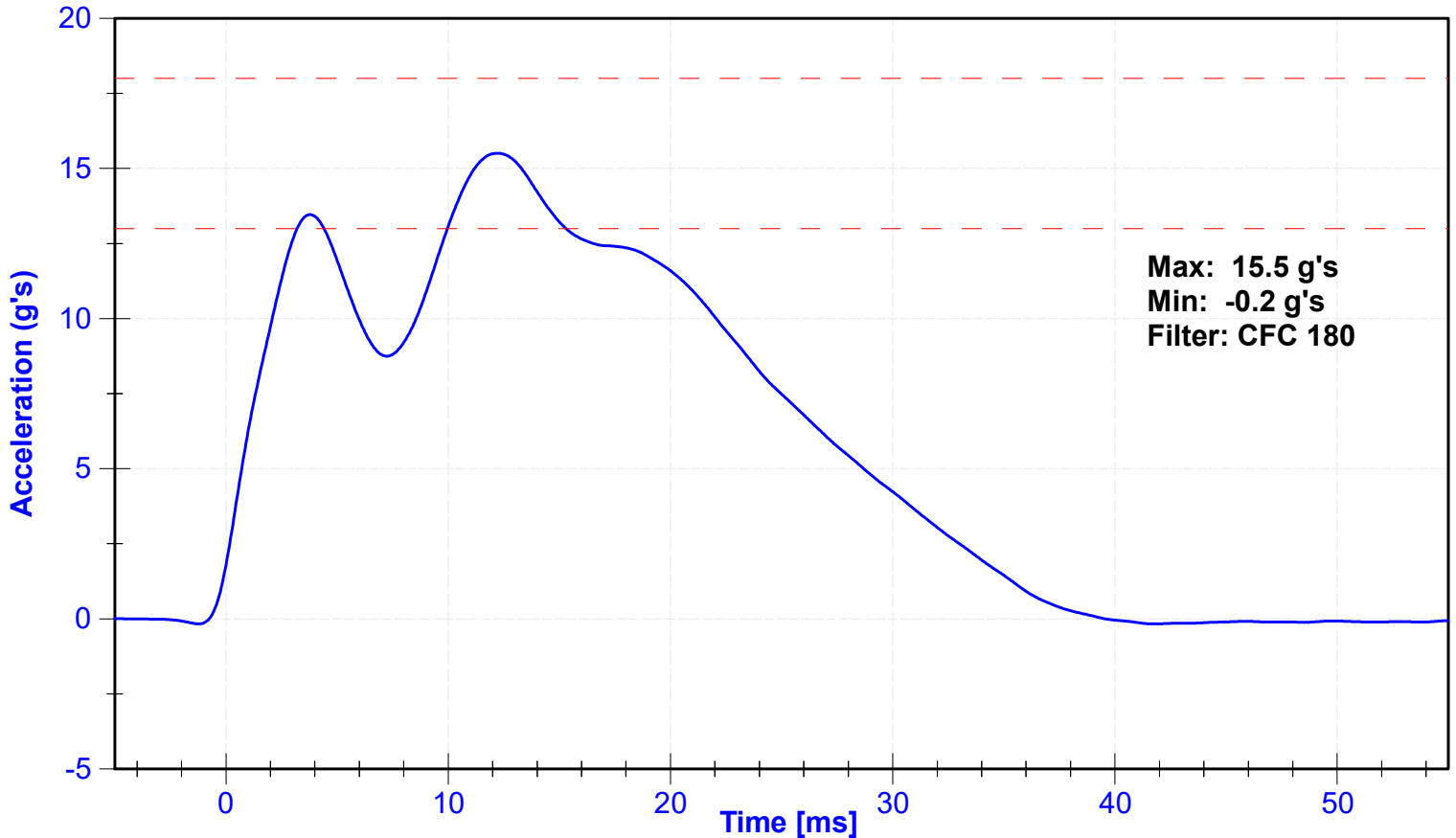
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	13	18	g's	15.5	Pass
Shoulder Deflection	28	37	mm	30.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.8	Pass

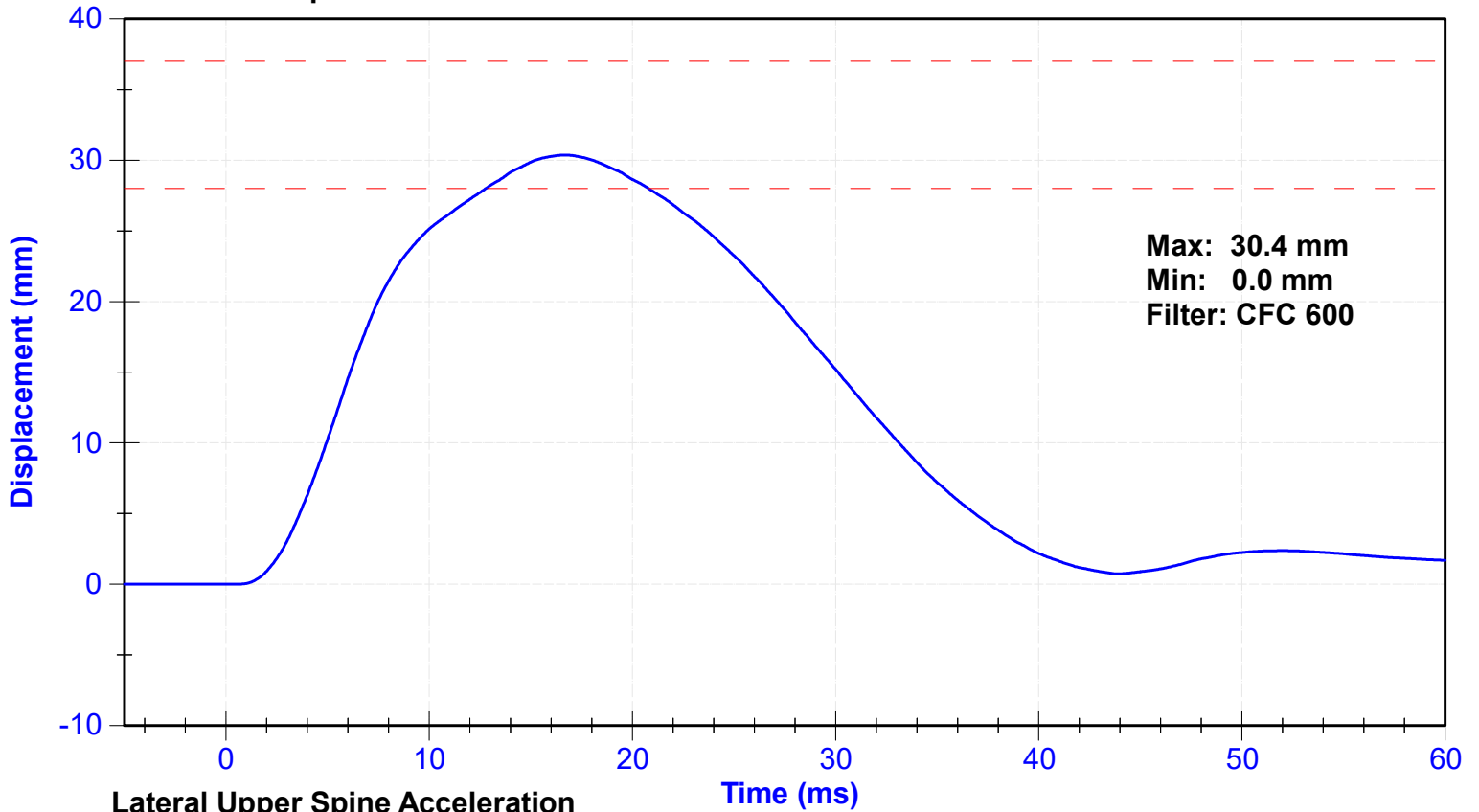
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025

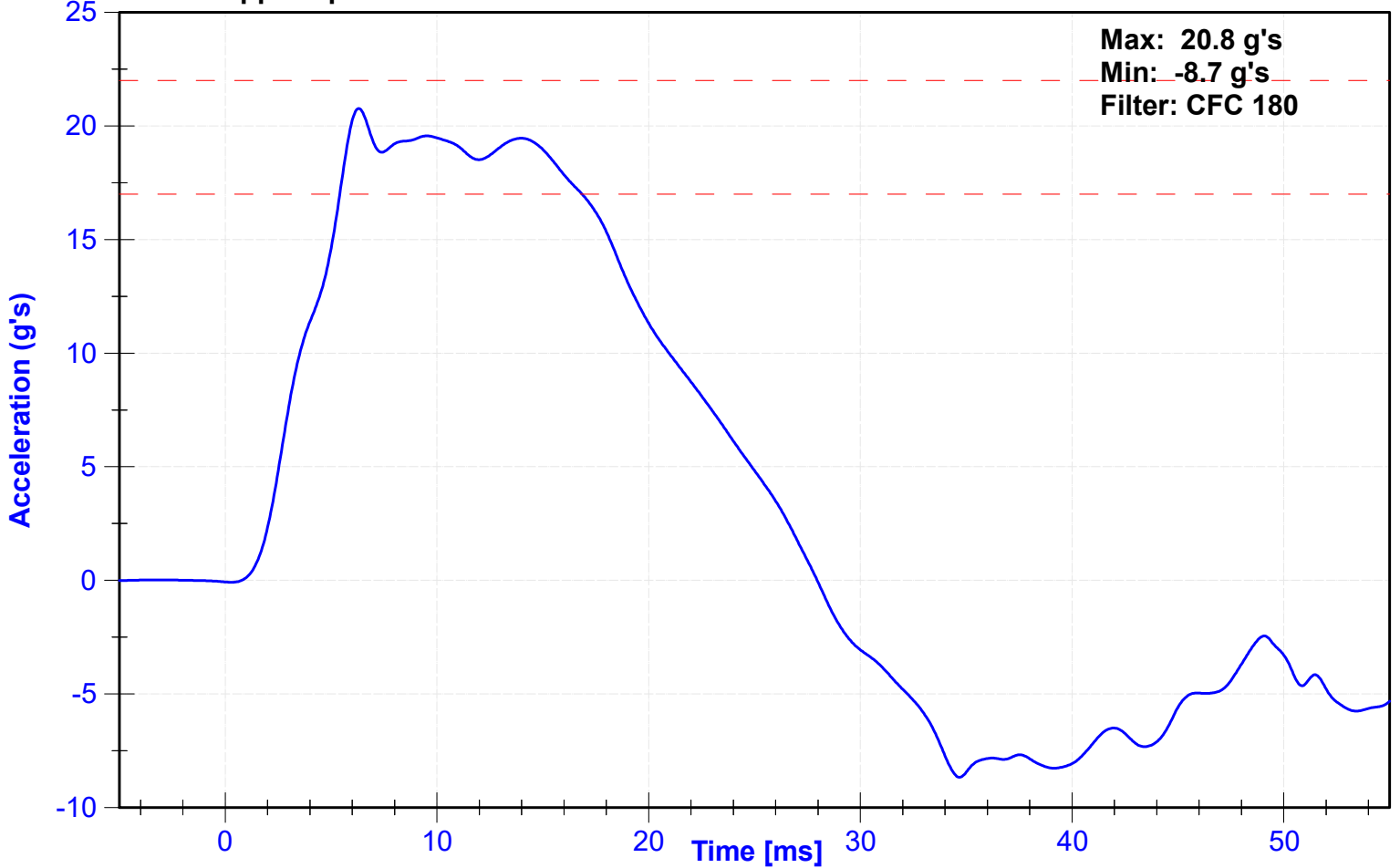
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



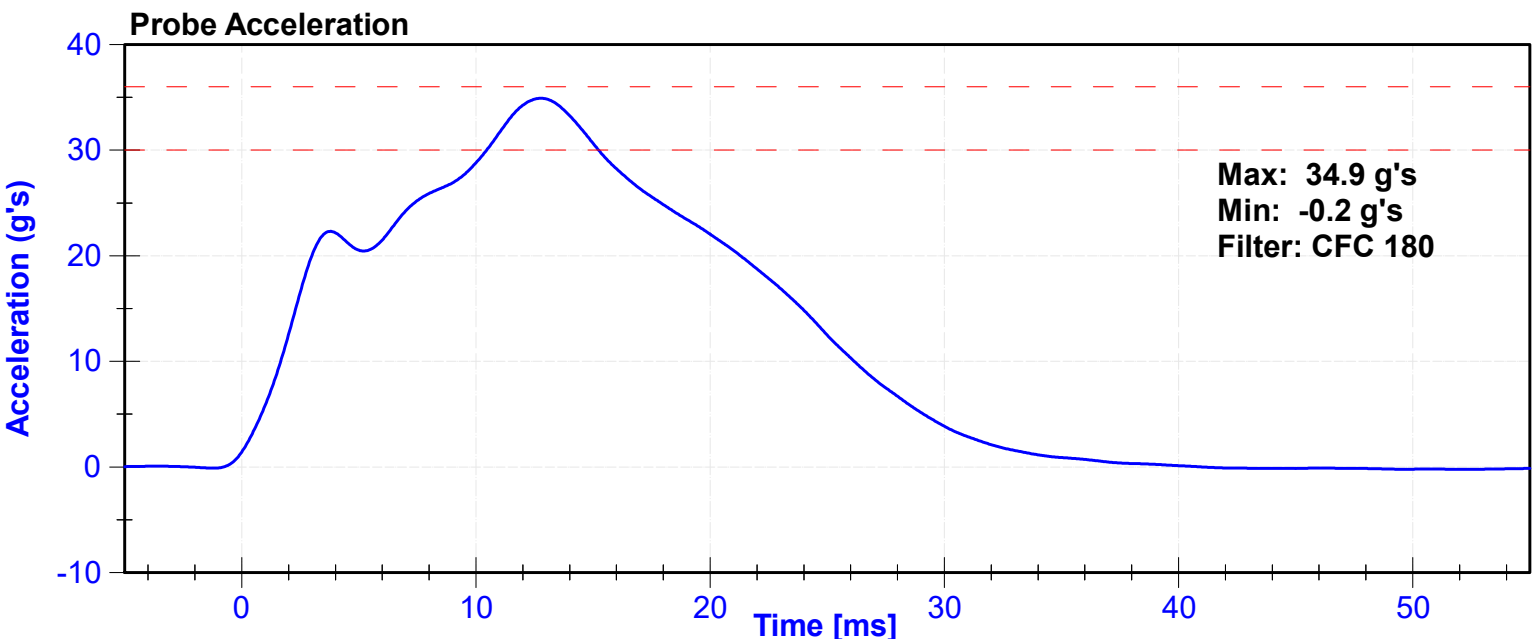
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

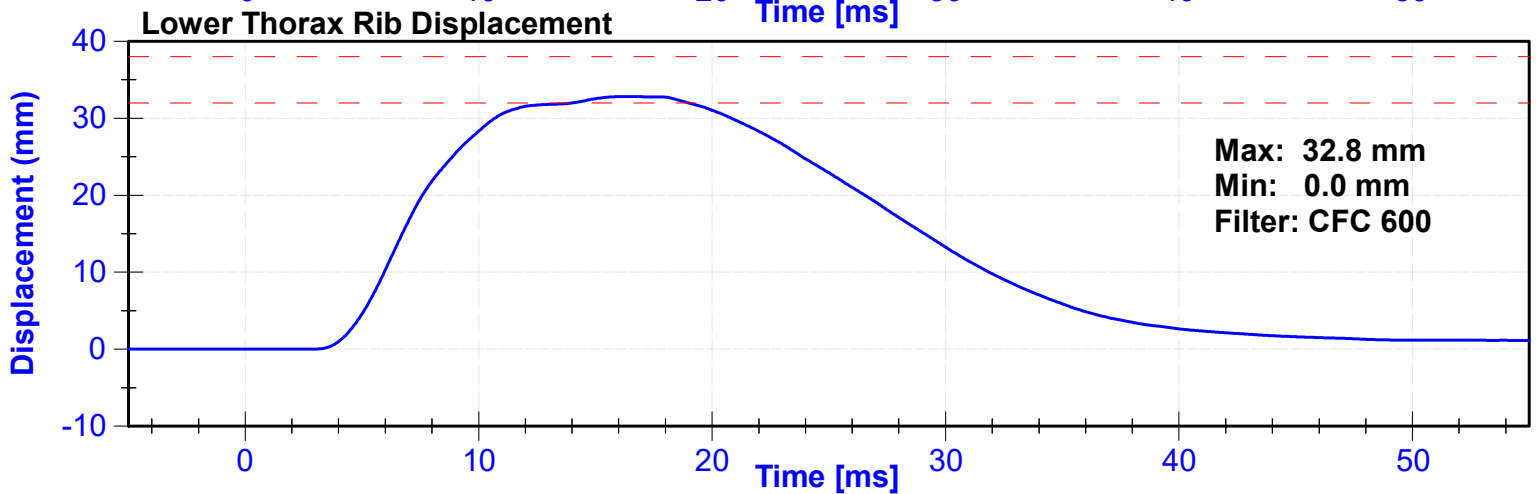
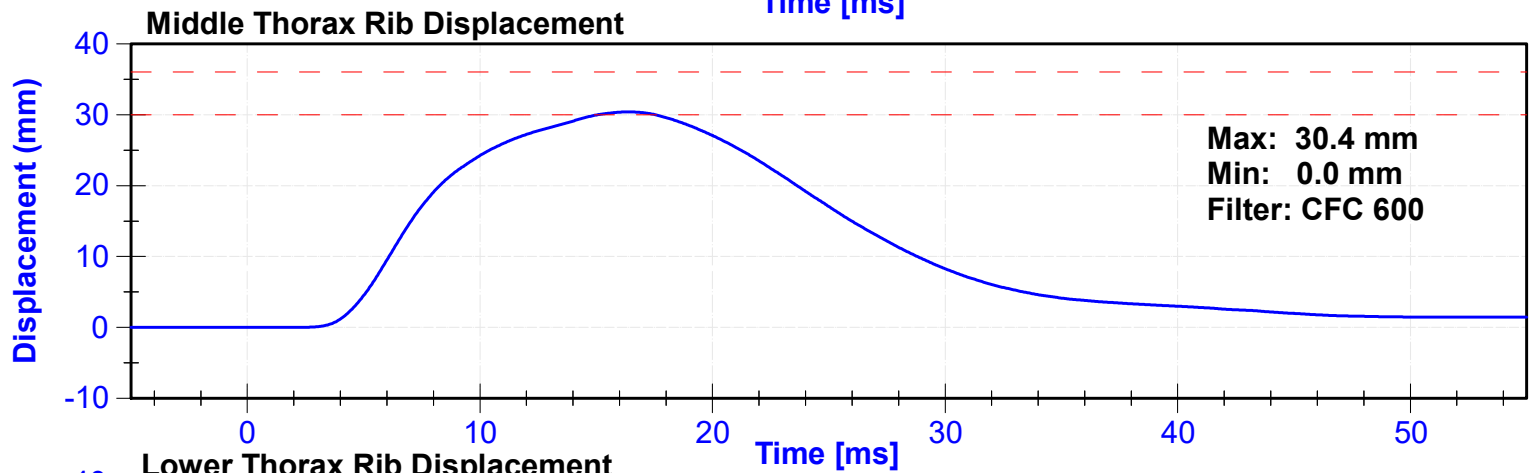
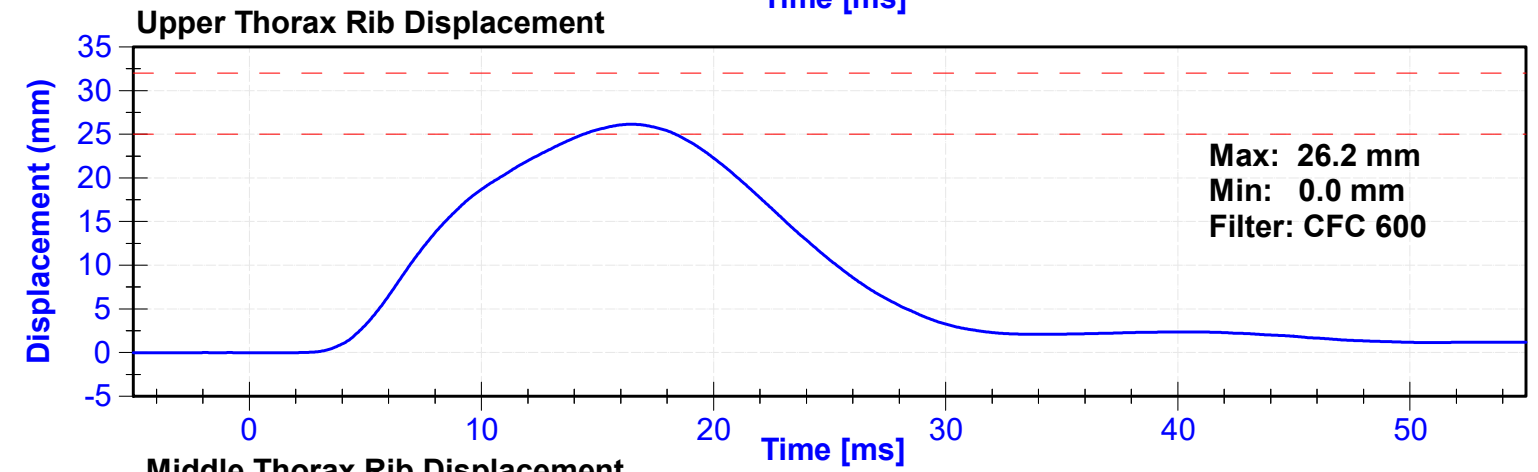
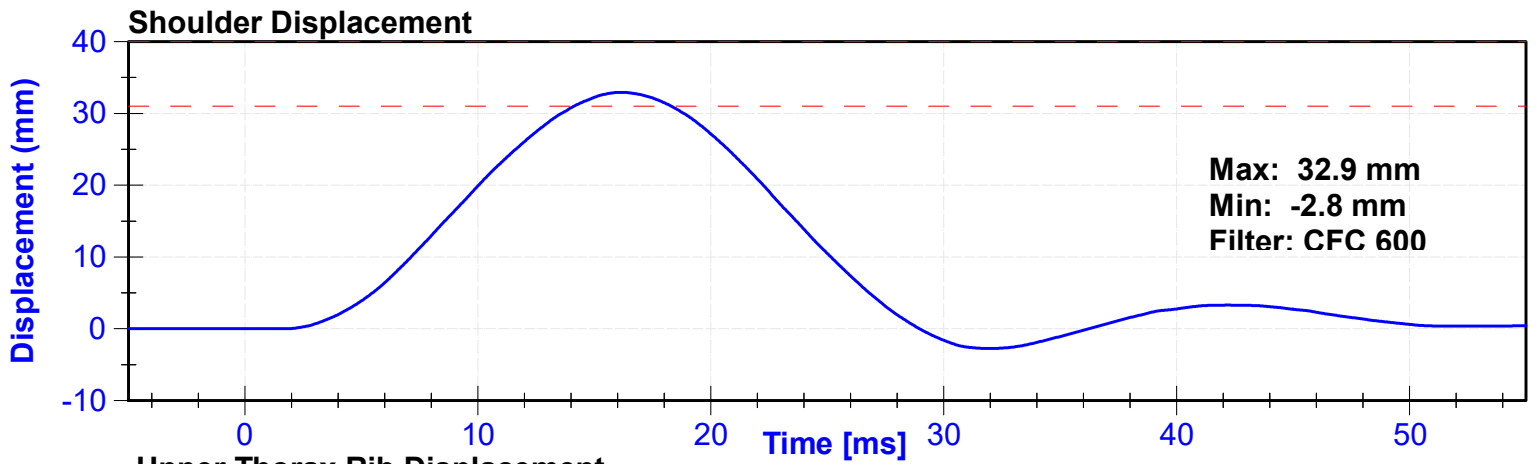
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration after 5 ms	30	36	g's	34.9	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.6	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.5	Pass
Shoulder Deflection	31	40	mm	32.9	Pass
Upper Thorax Rib Deflection	25	32	mm	26.2	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	32.8	Pass

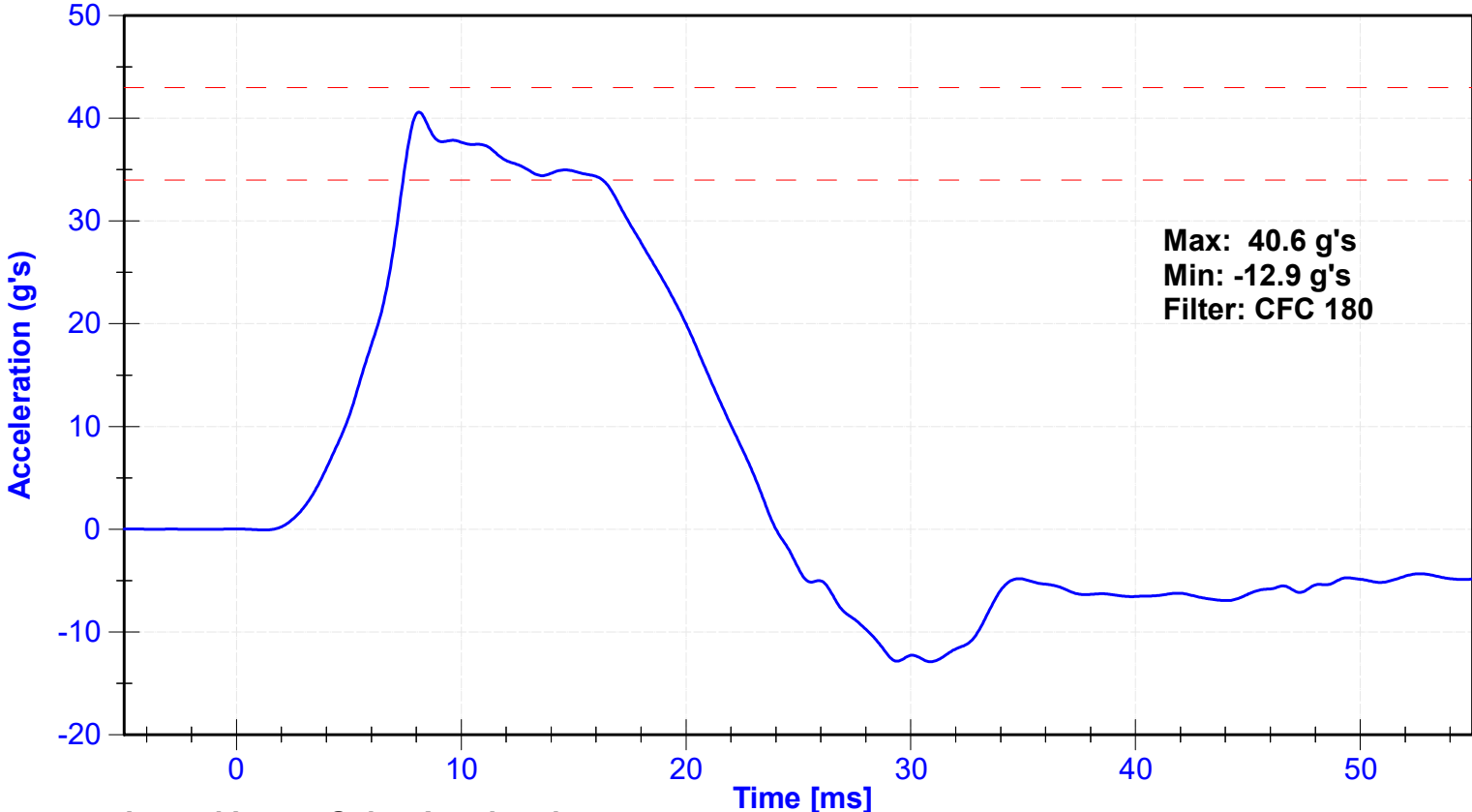
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine T1 Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Upper Spine T12 Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

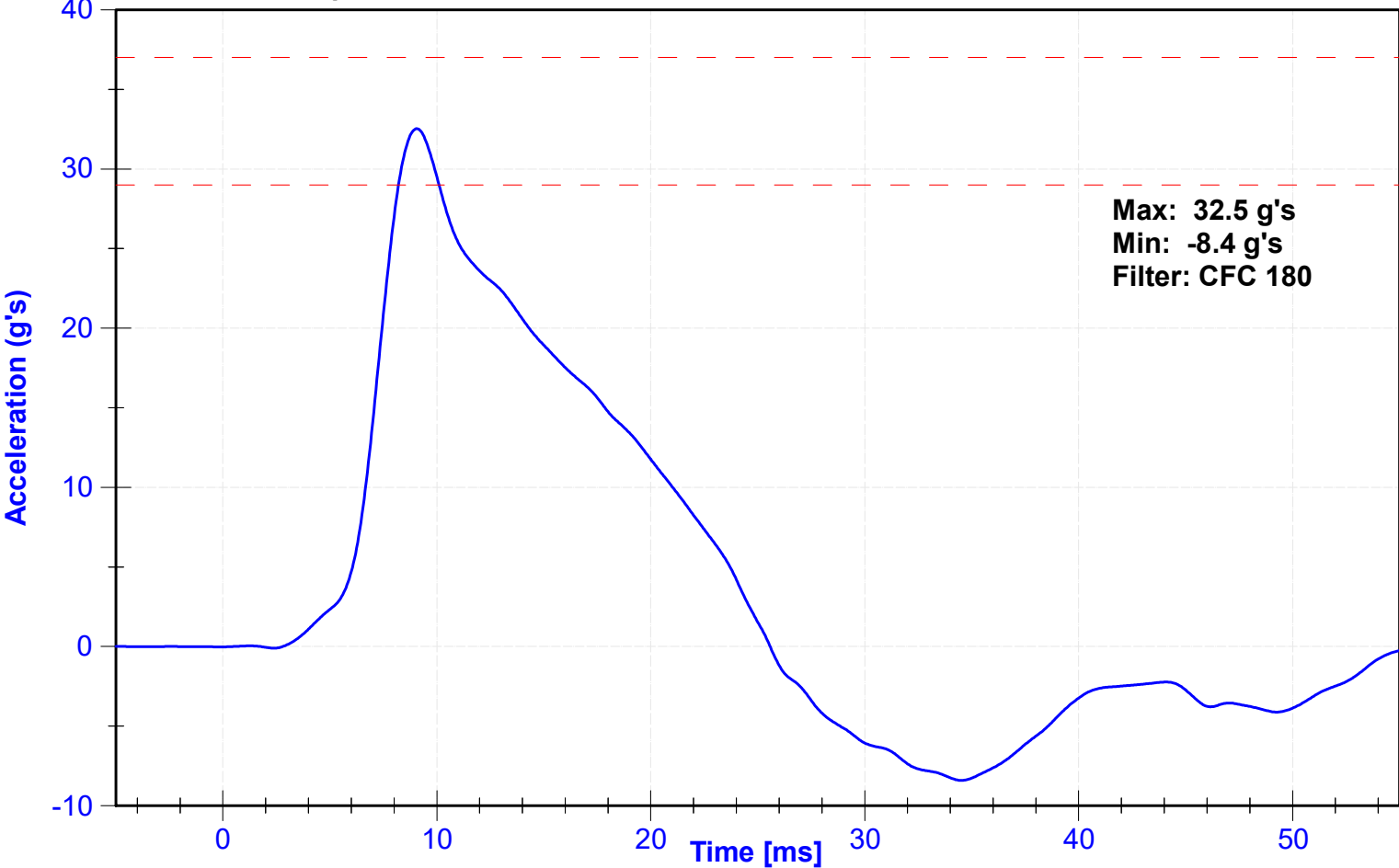




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



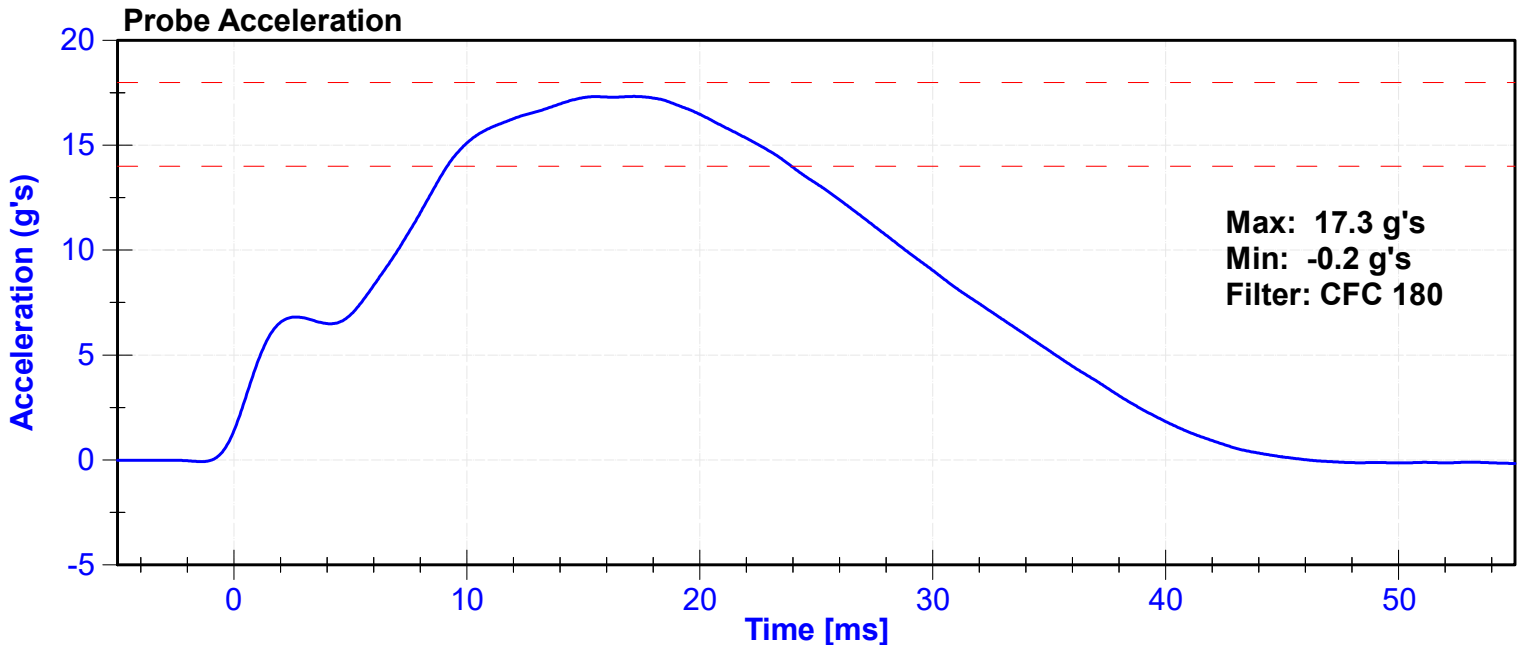
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

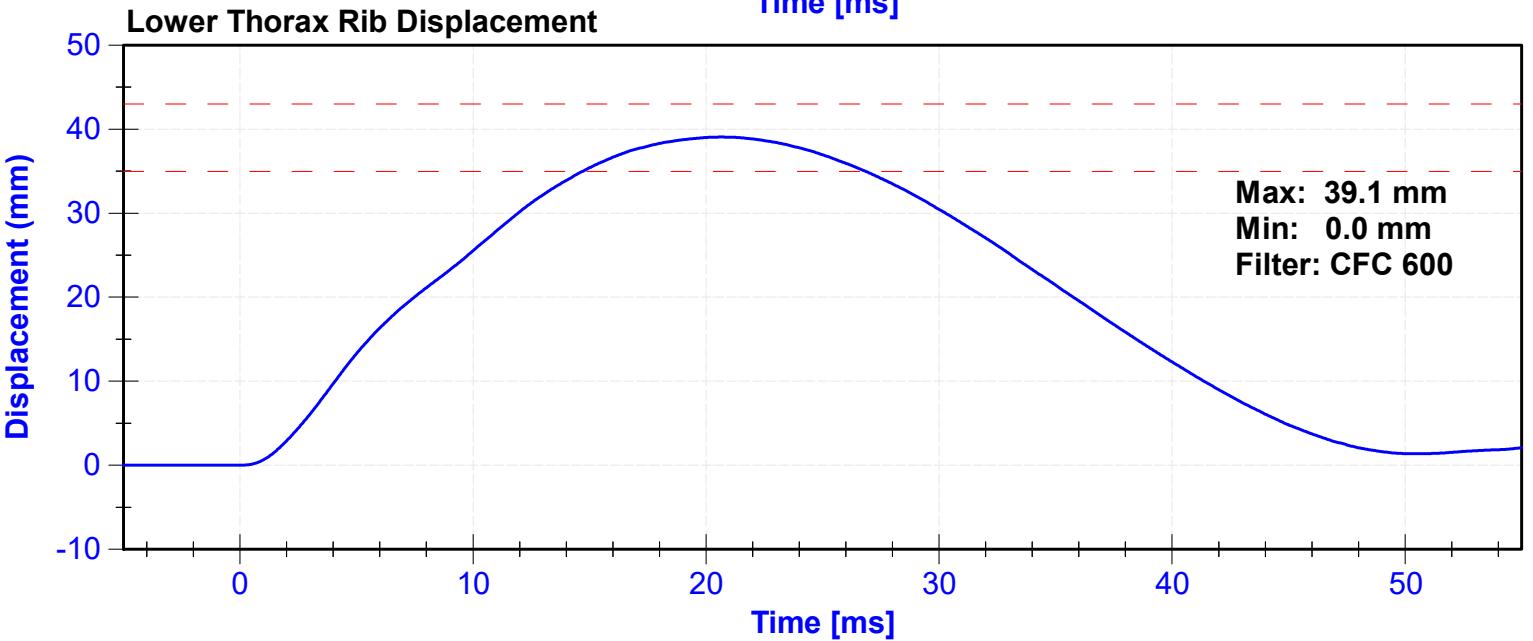
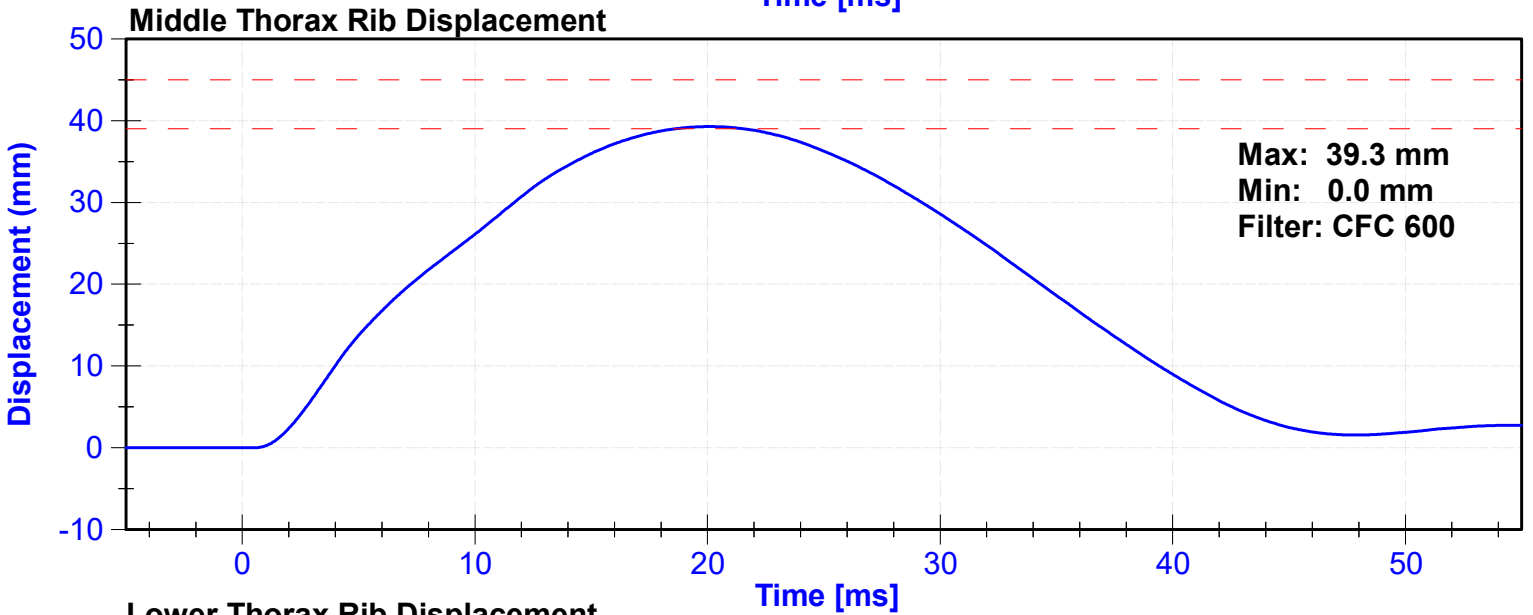
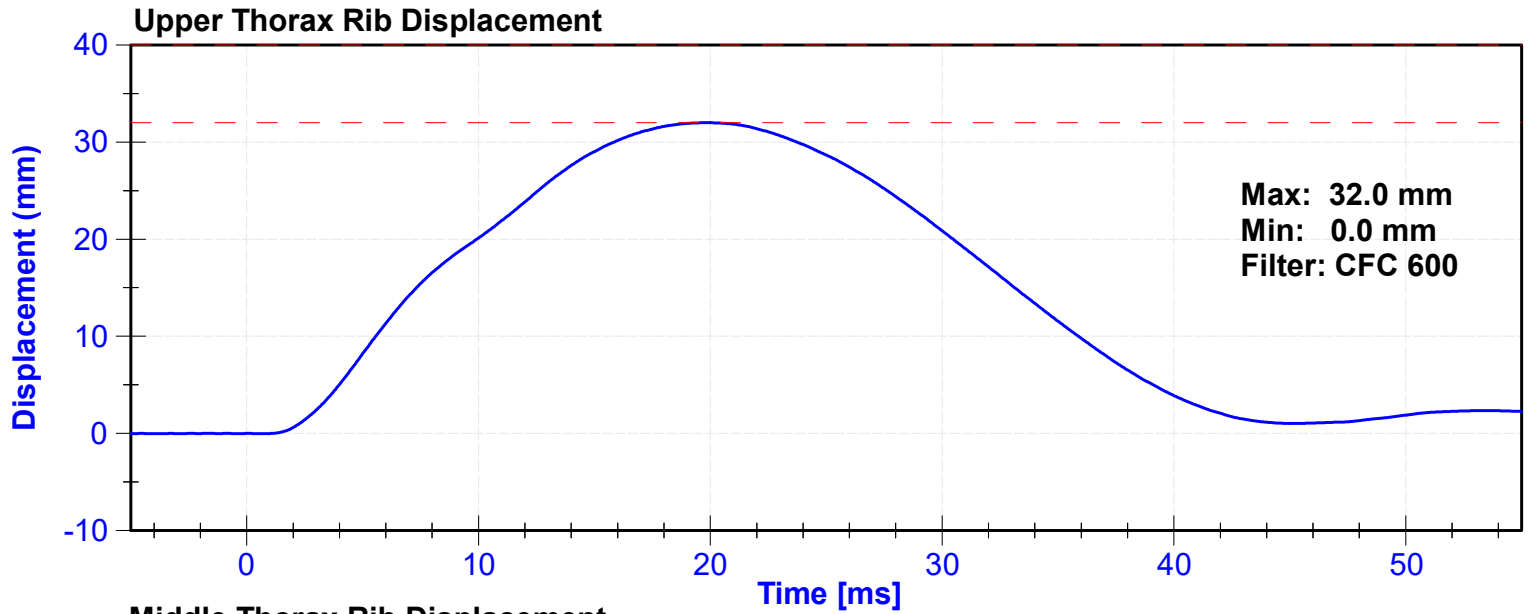
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	14	18	g's	17.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.7	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.1	Pass
Upper Thorax Rib Deflection	32	40	mm	32.0	Pass
Middle Thorax Rib Deflection	39	45	mm	39.3	Pass
Lower Thorax Rib Deflection	35	43	mm	39.1	Pass

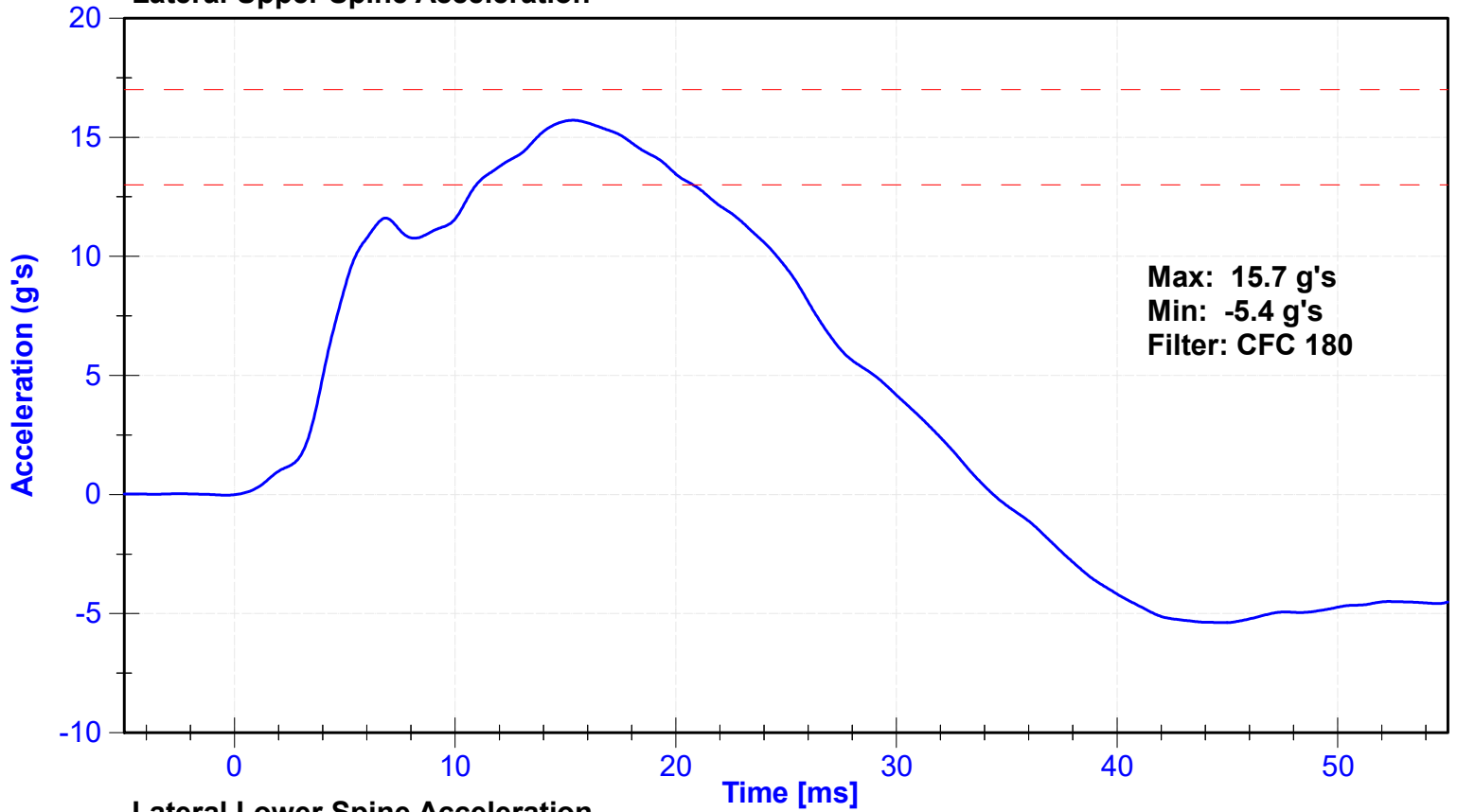
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

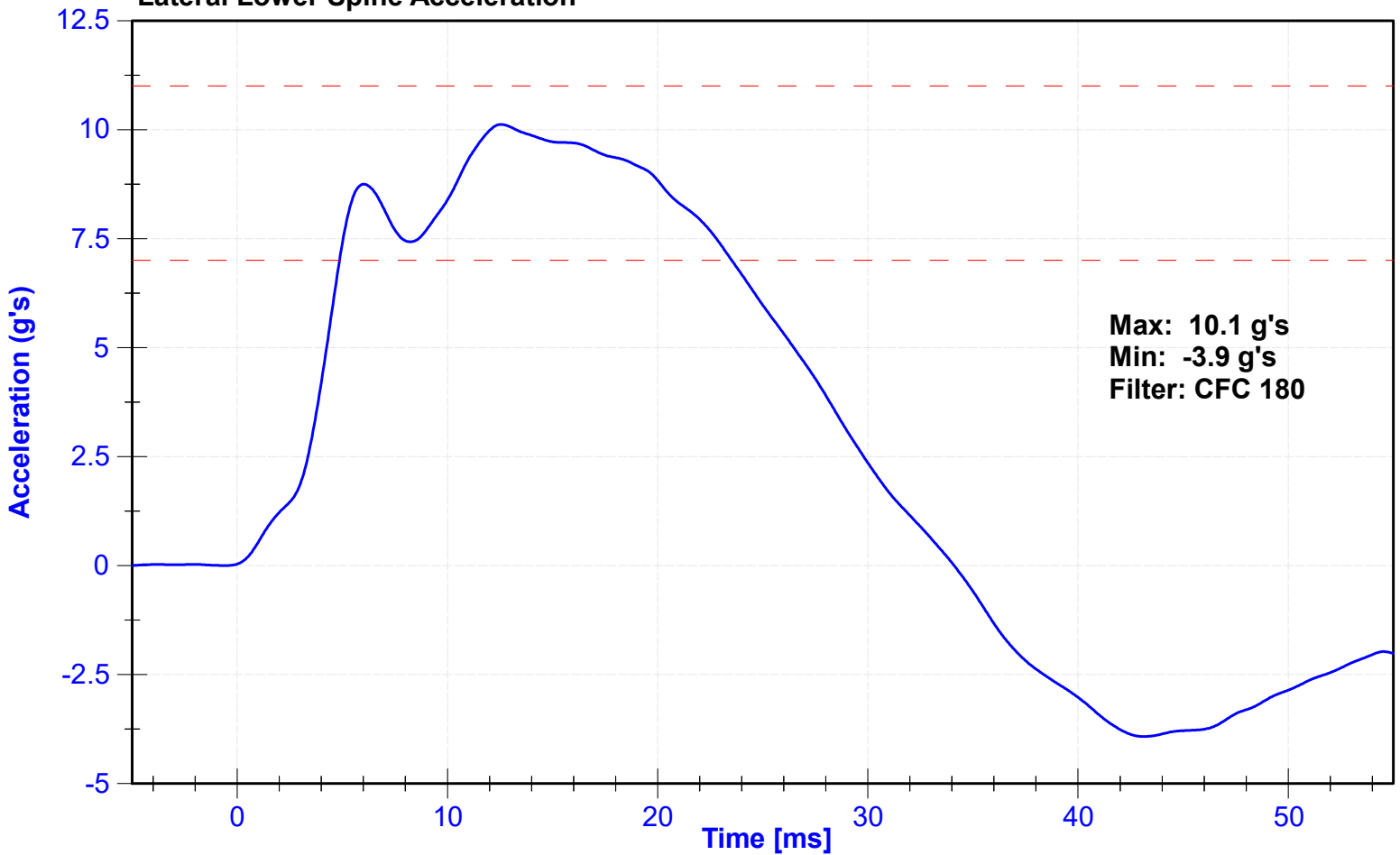




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

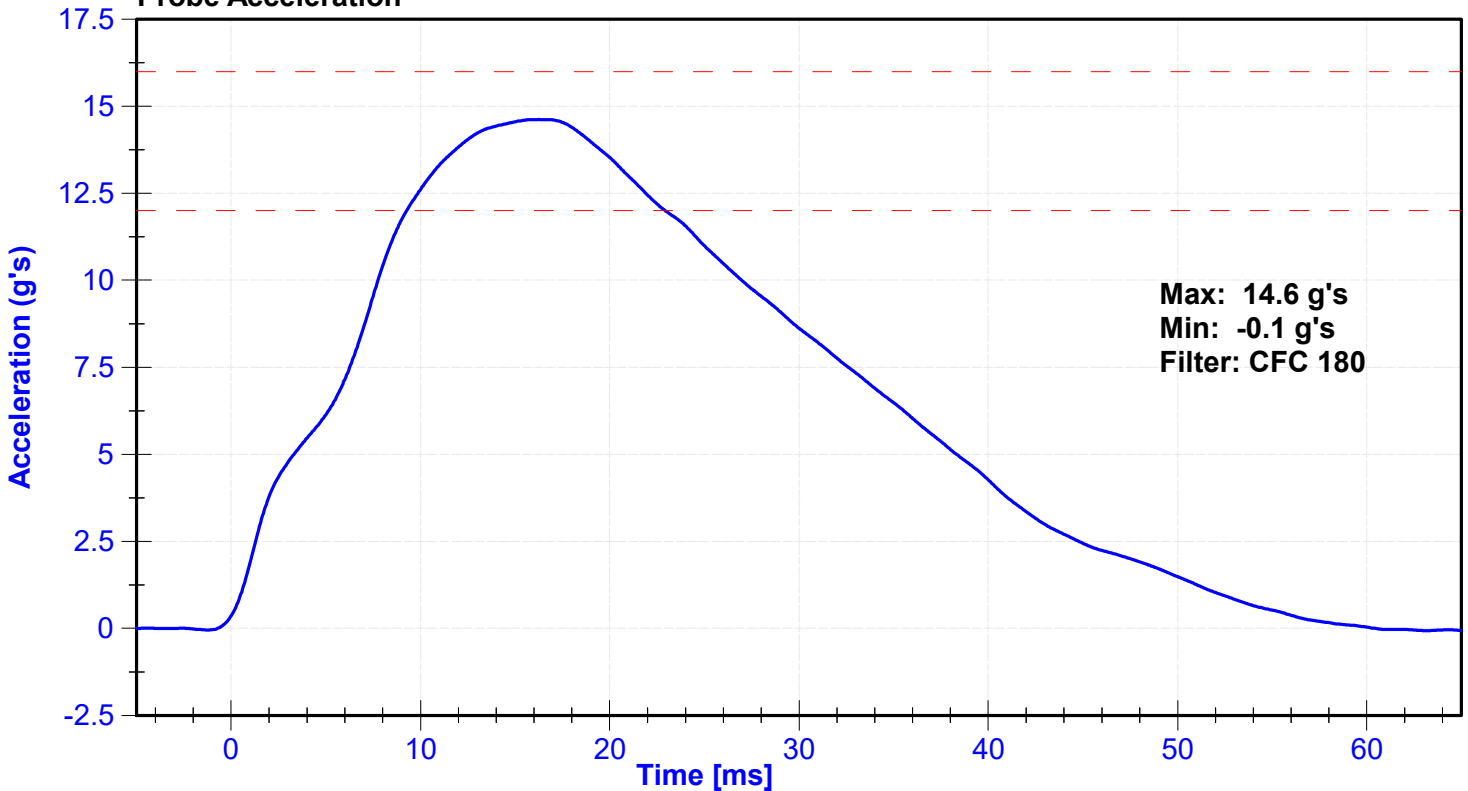
Results

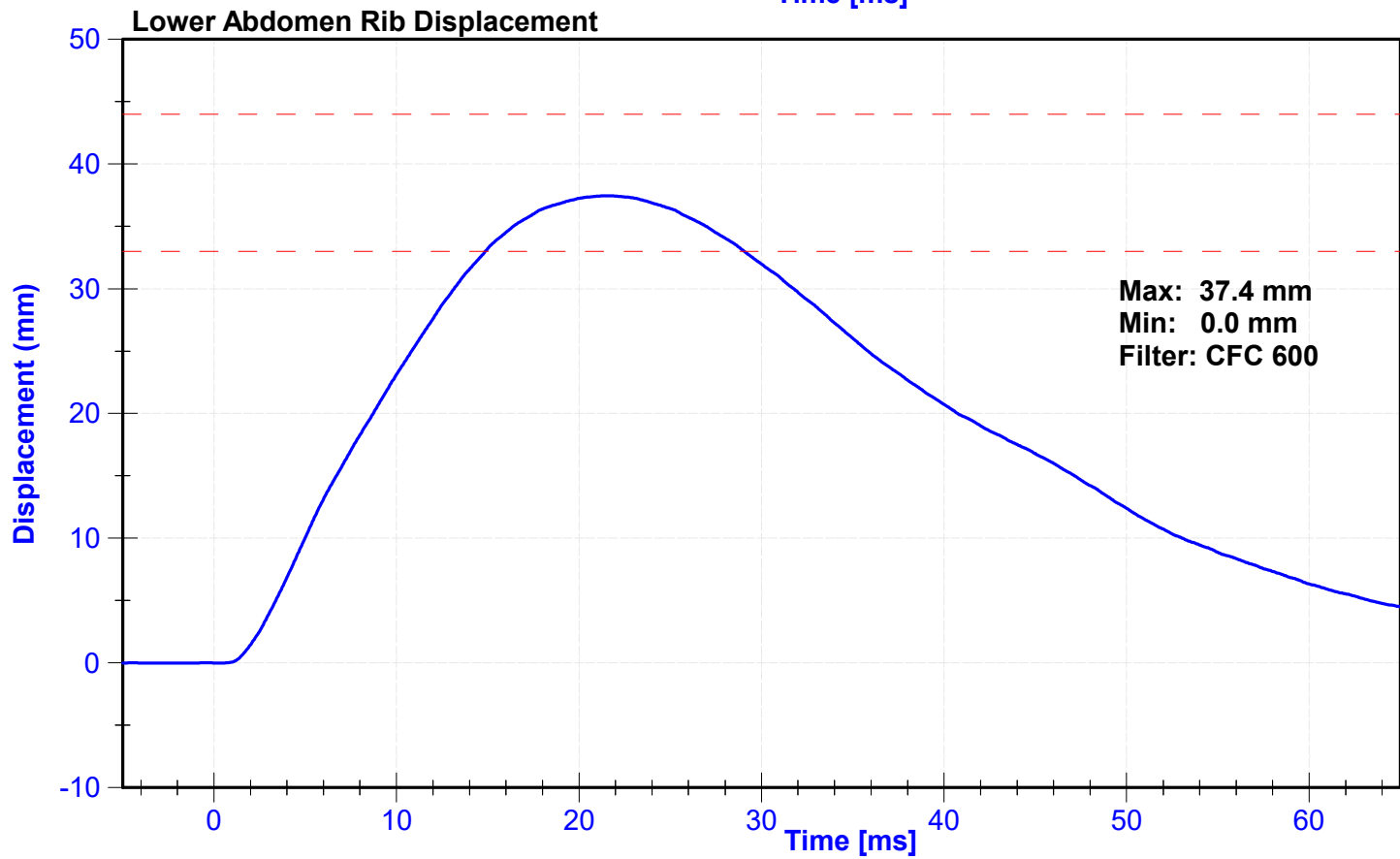
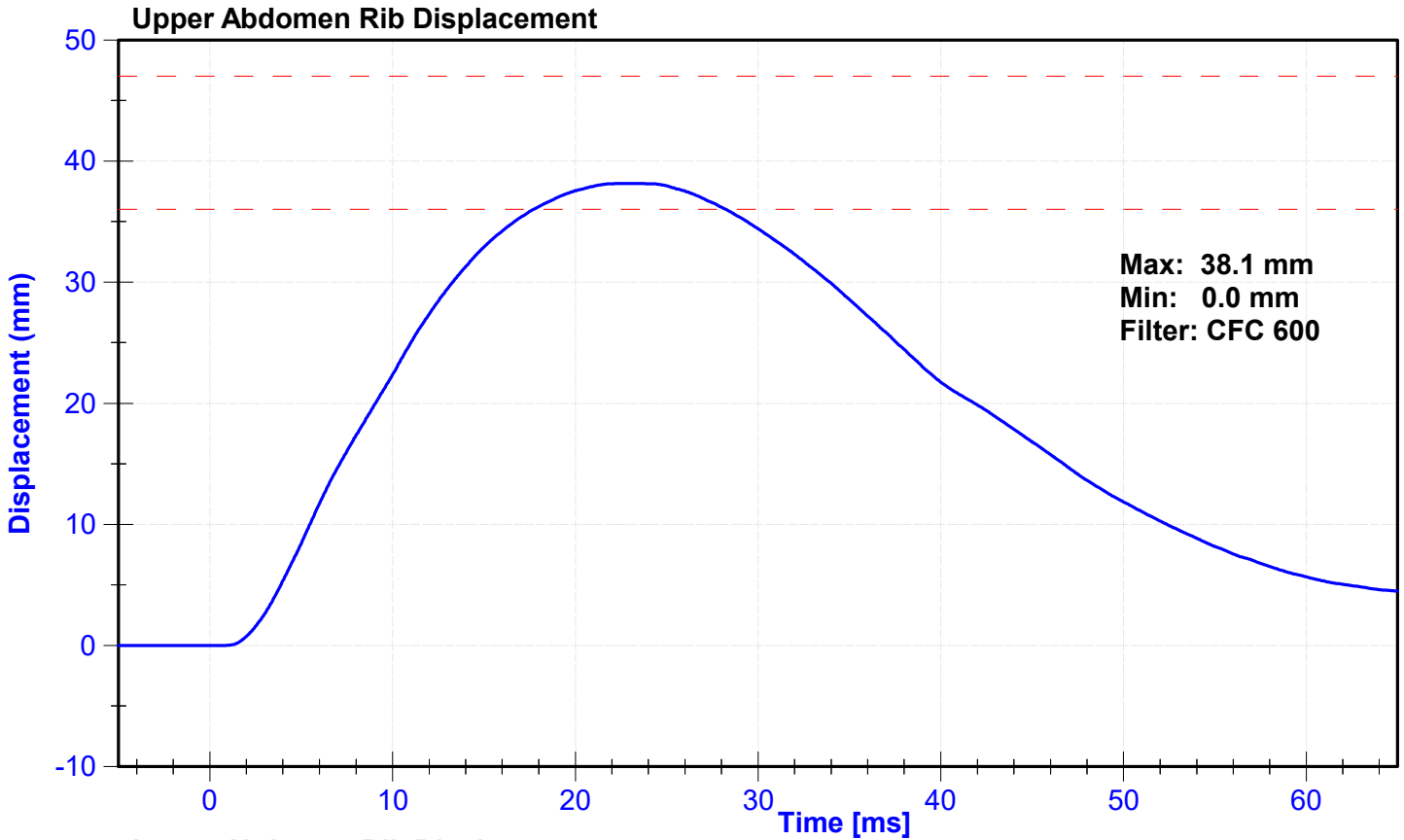
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	12	16	g's	14.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.4	Pass
Upper Abdomen Rib Deflection	36	47	mm	38.1	Pass
Lower Abdomen Rib Deflection	33	44	mm	37.4	Pass

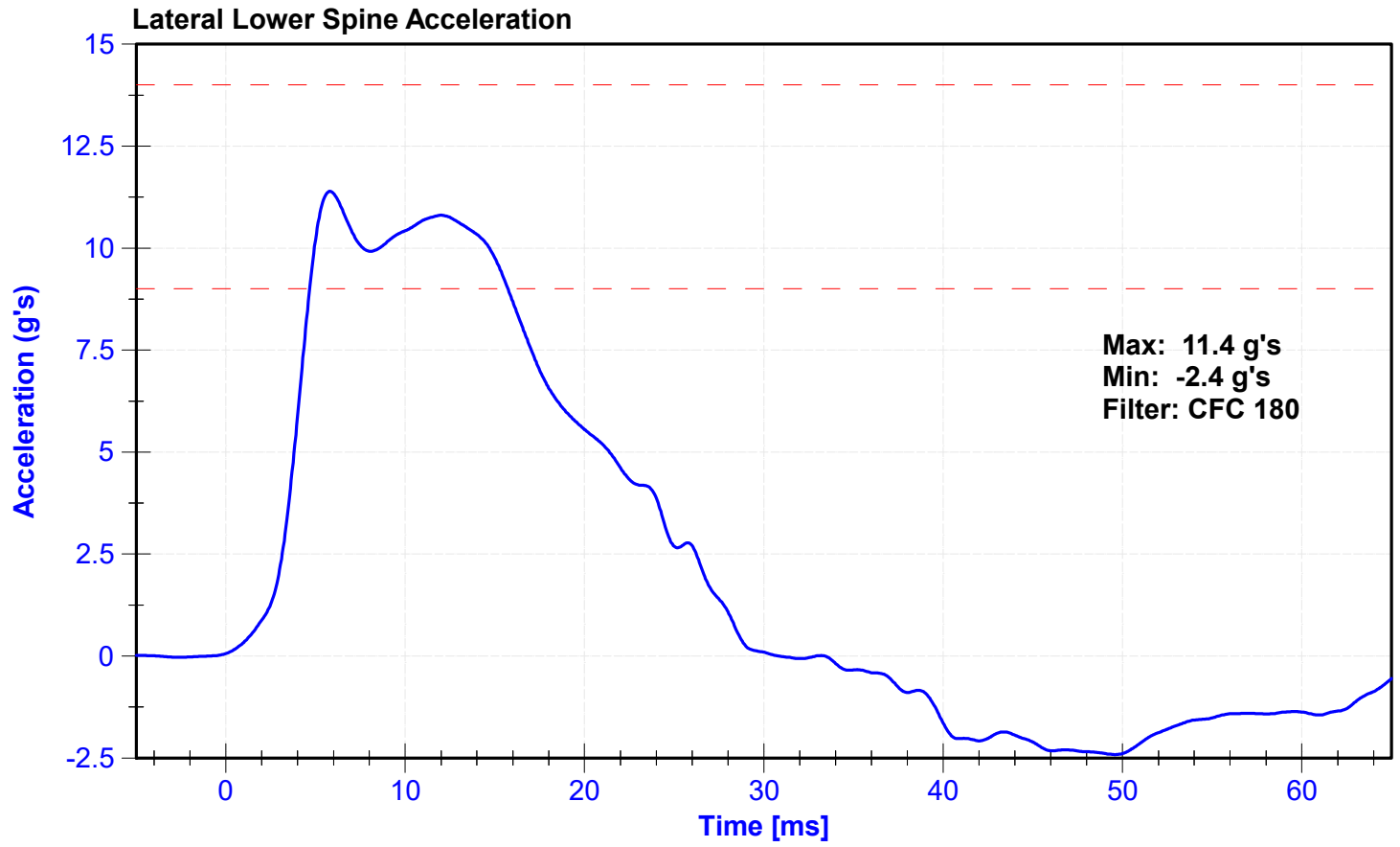
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Abdomen Rib Potentiometer	Servo	DS-058GFE	10/8/2024	4/8/2025
Lower Abdomen Rib Potentiometer	Servo	1256GFE	10/8/2024	4/8/2025

Probe Acceleration







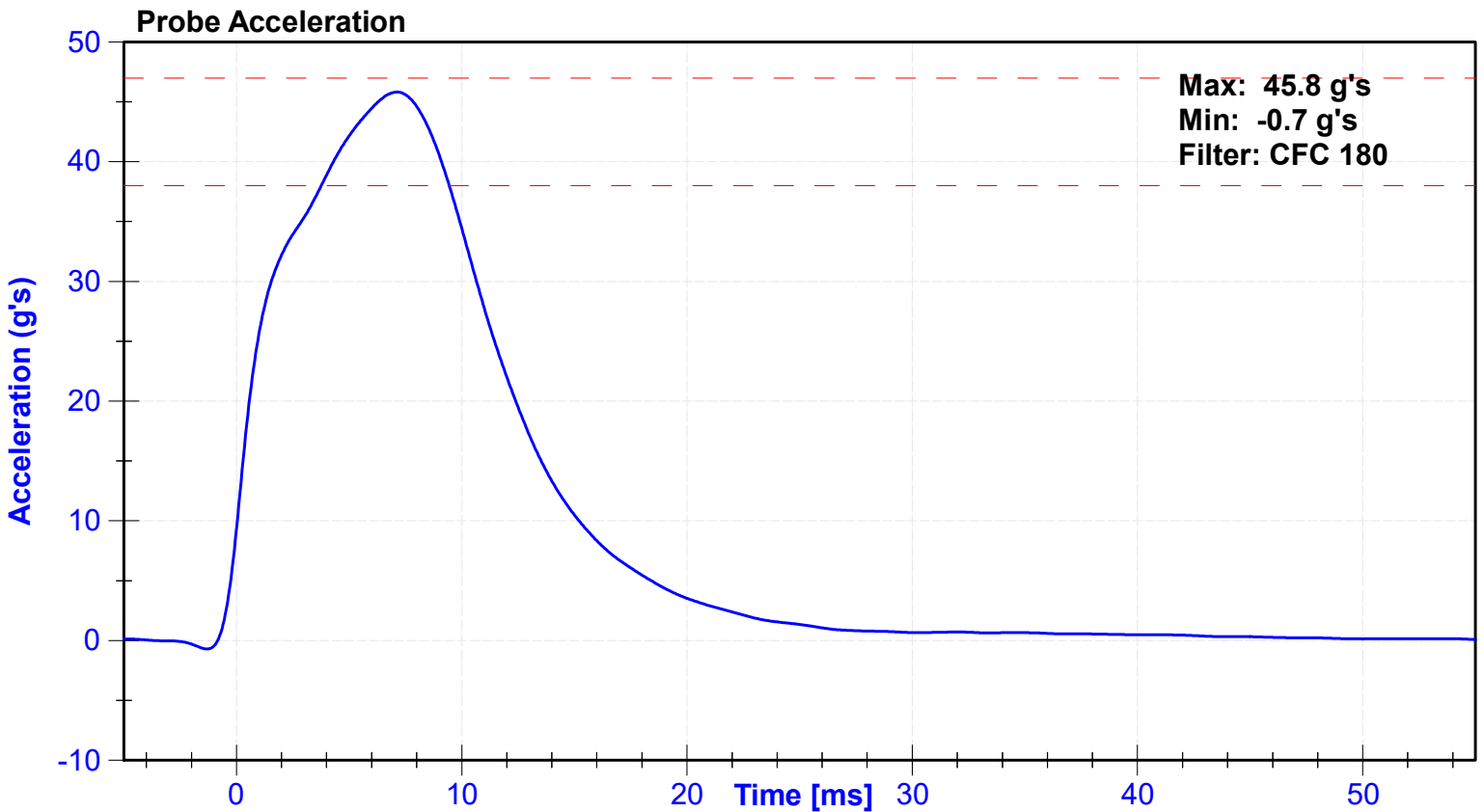
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

Results

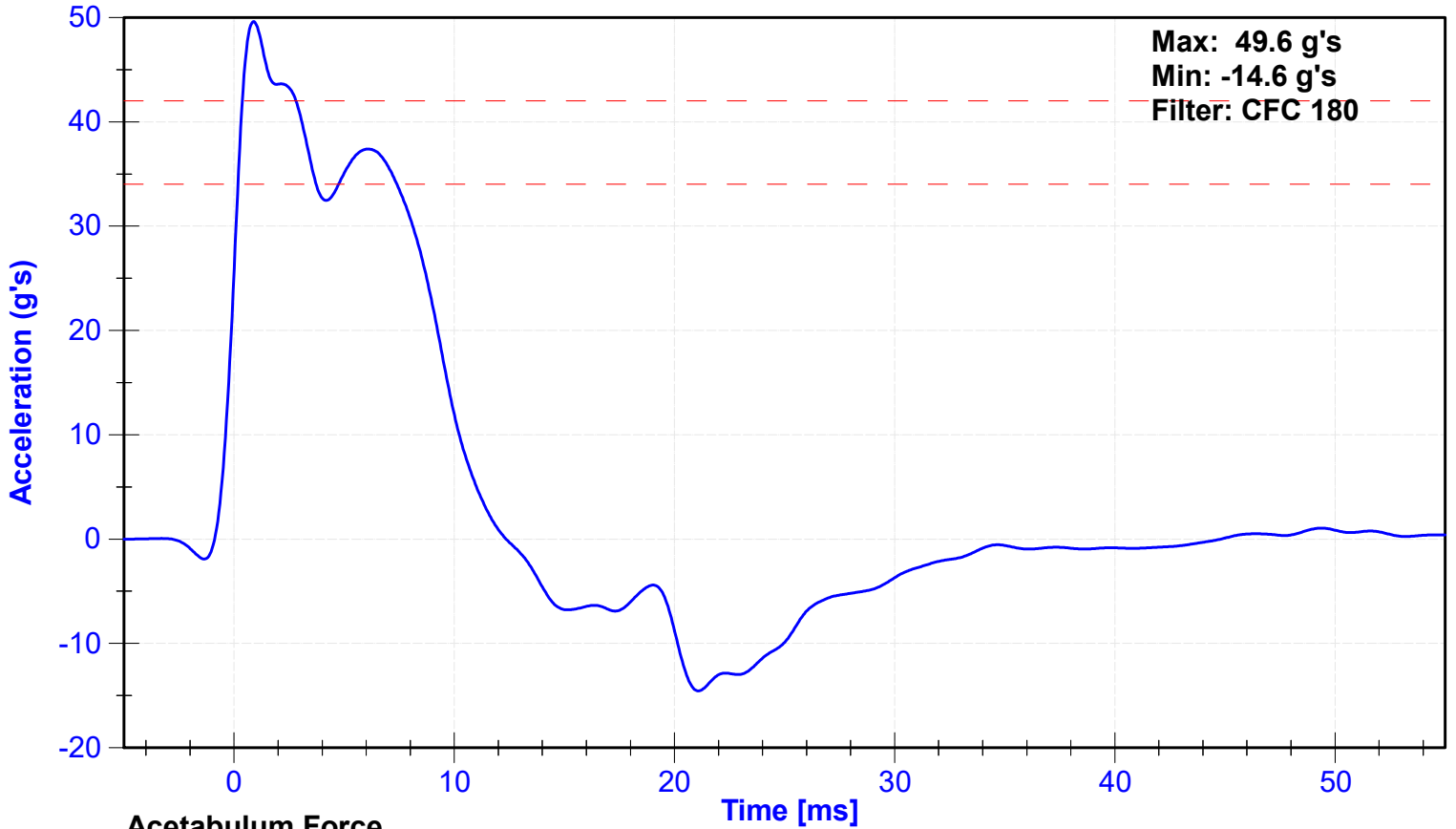
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	6.6	6.8	m/s	6.65	Pass
Probe Acceleration	38	47	g's	45.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	37.4	Pass
Acetabulum Force	3600	4300	N	4122.5	Pass

Transducer Calibrations

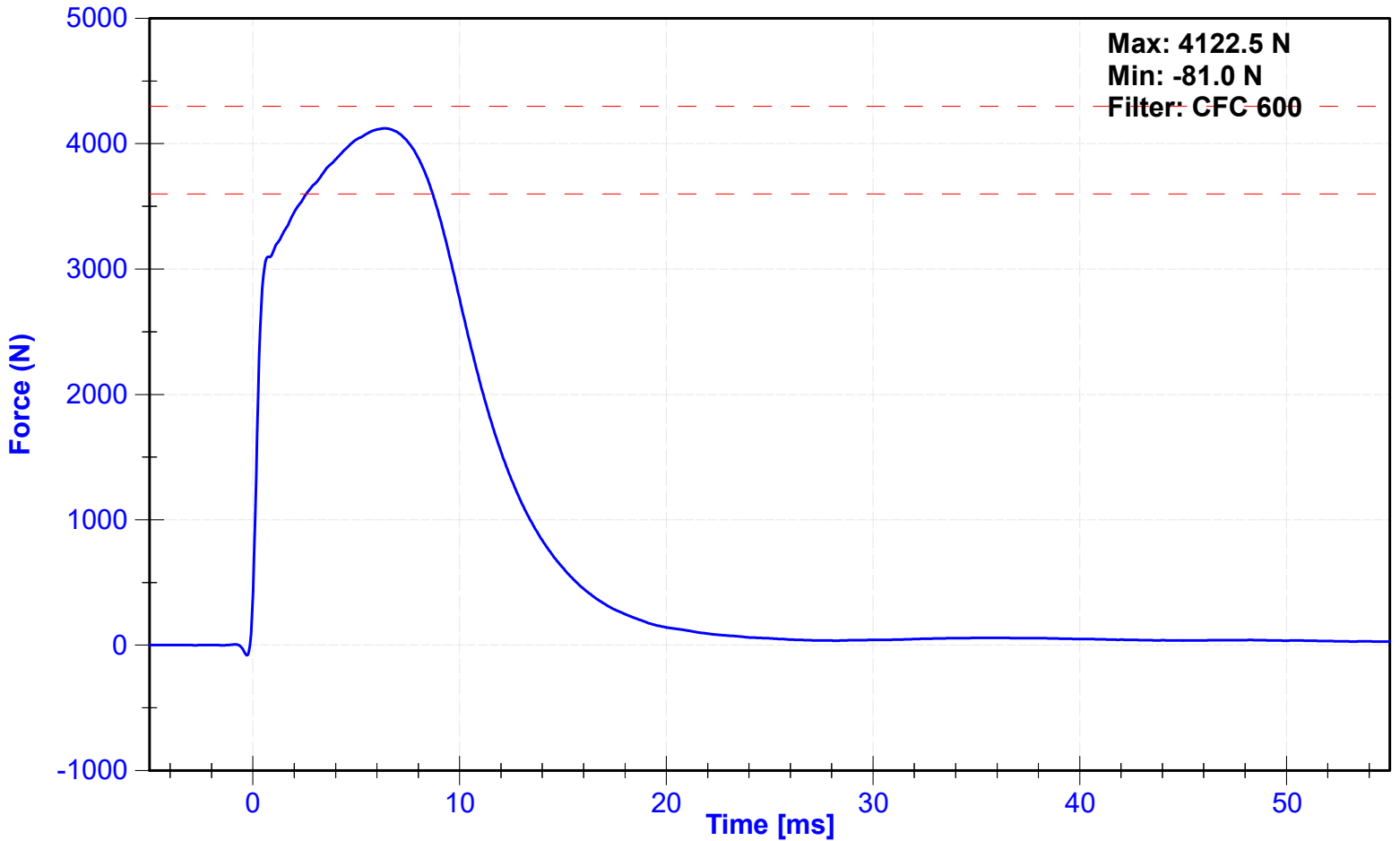
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Acetabulum Load Cell	Denton	267-FY	9/16/2024	9/16/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





Cent

SID-ILs Pelvis Plug Certification Test

Plug S/N 16776

Test Number 23586

Report Number 23643

Test Date 7/25/2022 7:48:15 AM

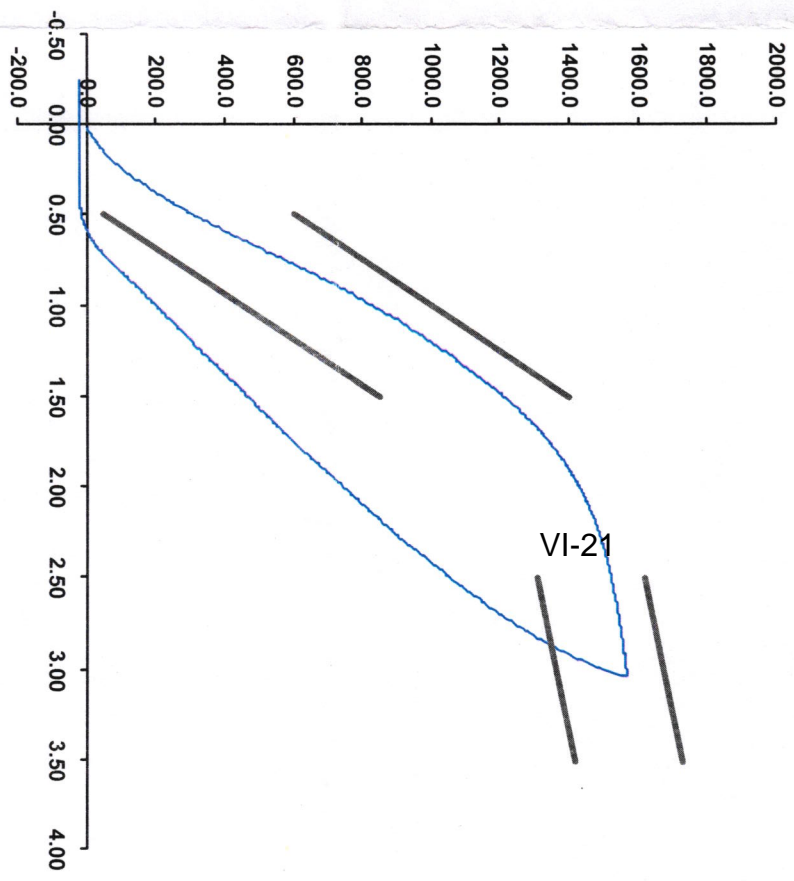
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	315	50	600
Force @ 1.5 mm (N)	1,215	850	1,400
Force @ 2.5 mm (N)	1,522	1,306	1,618
Force @ 3.0 mm (N)	1,566	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 25-Jul-22
SACO Research

By: Date: 7/25/22

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



Non Impact

SID-11s Pelvis Plug Certification Test

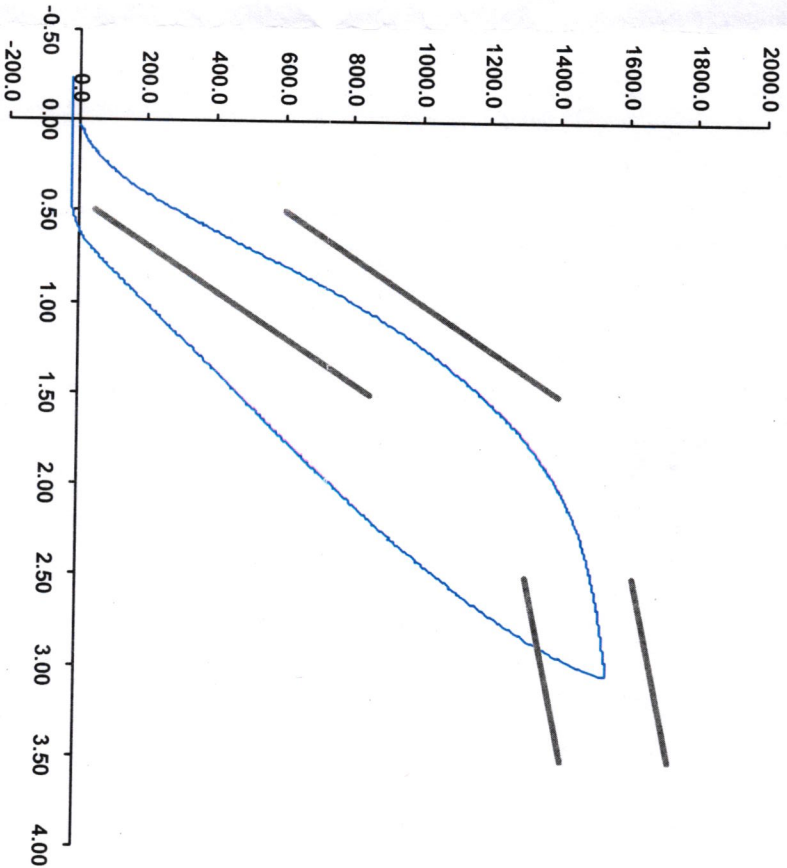
Plug S/N 16771
Test Number 23581
Report Number 23638
Test Date 7/25/2022 7:37:58 AM

Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator
Part Number 180-4450

Template No 107 25-Jul-22
SACCO Research

By: [Signature] Date: 7/25/22

SACCO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



Impacc

SID-IIS Pelvis Plug Certification Test

Plug S/N 16770

Test Number 23580

Report Number 23637

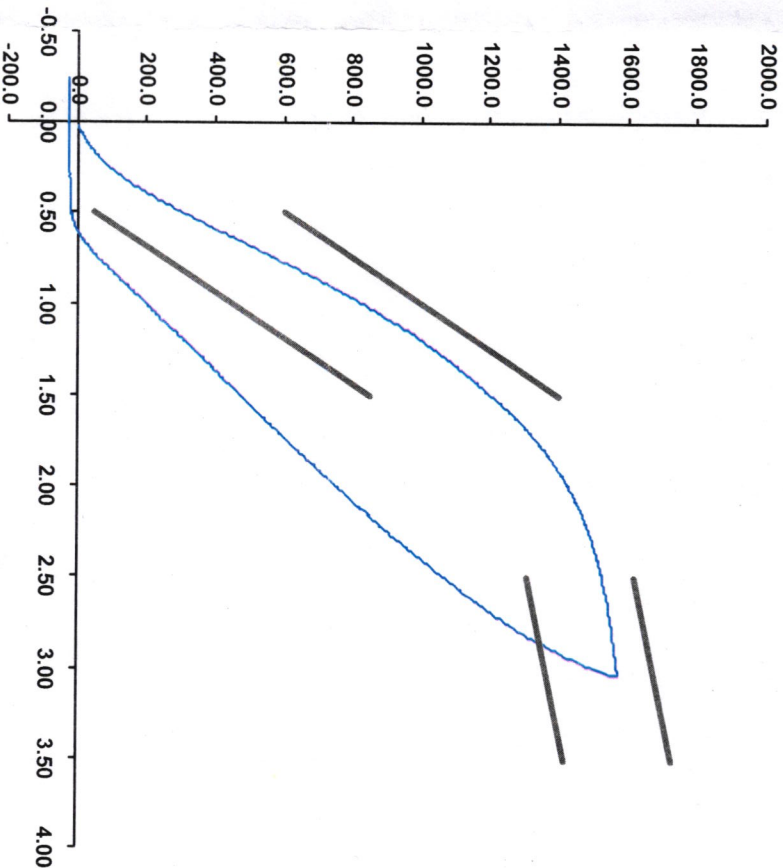
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Test Results	Spec Min	Spec Max
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Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 25-Jul-22
SACO Research

By:

Date: 7/25/22

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

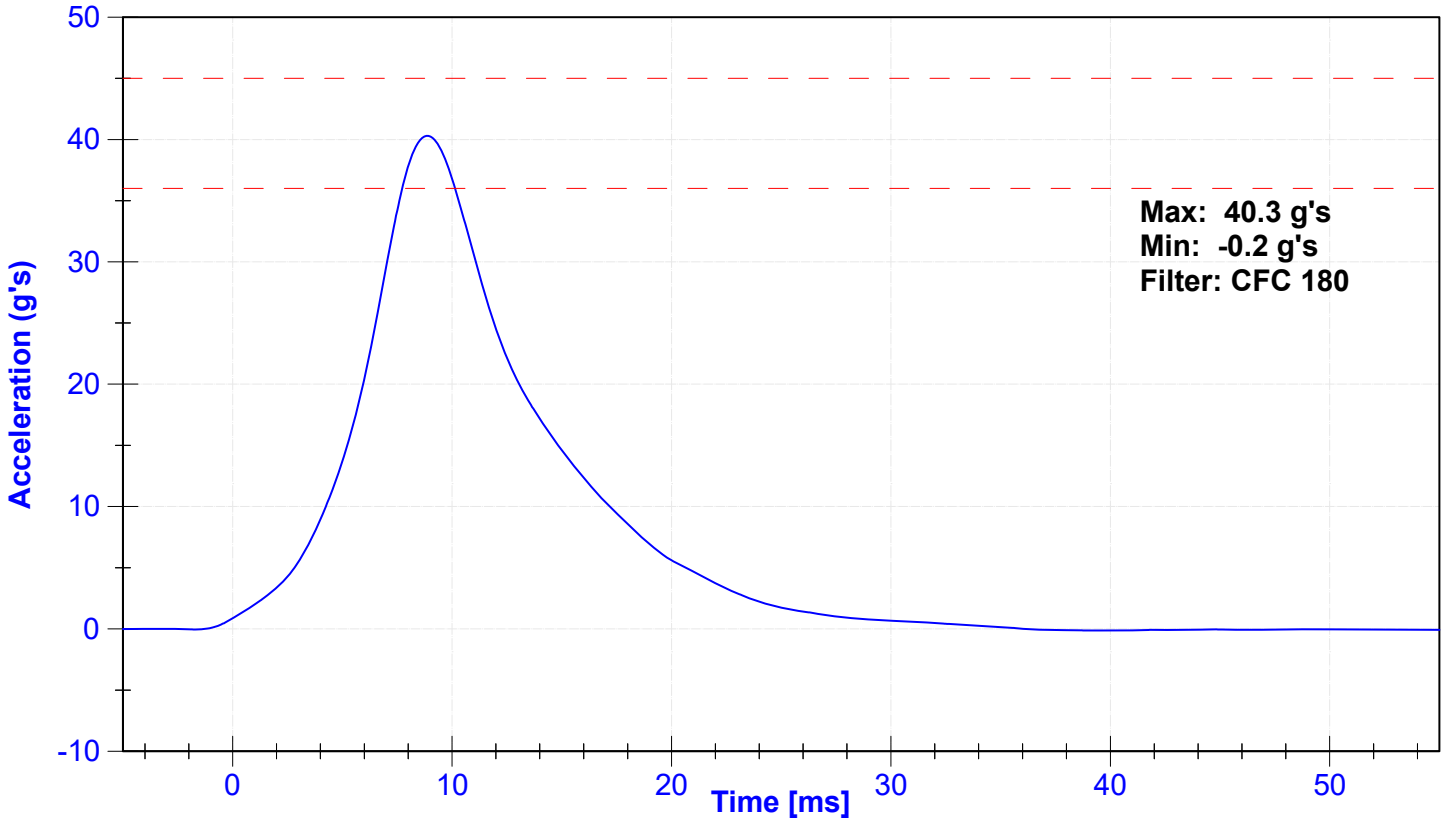
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	37	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	36	45	g's	40.3	Pass
Lateral Pelvis Acceleration	28	39	g's	30.9	Pass
Iliac Force	4100	5100	N	4406.7	Pass

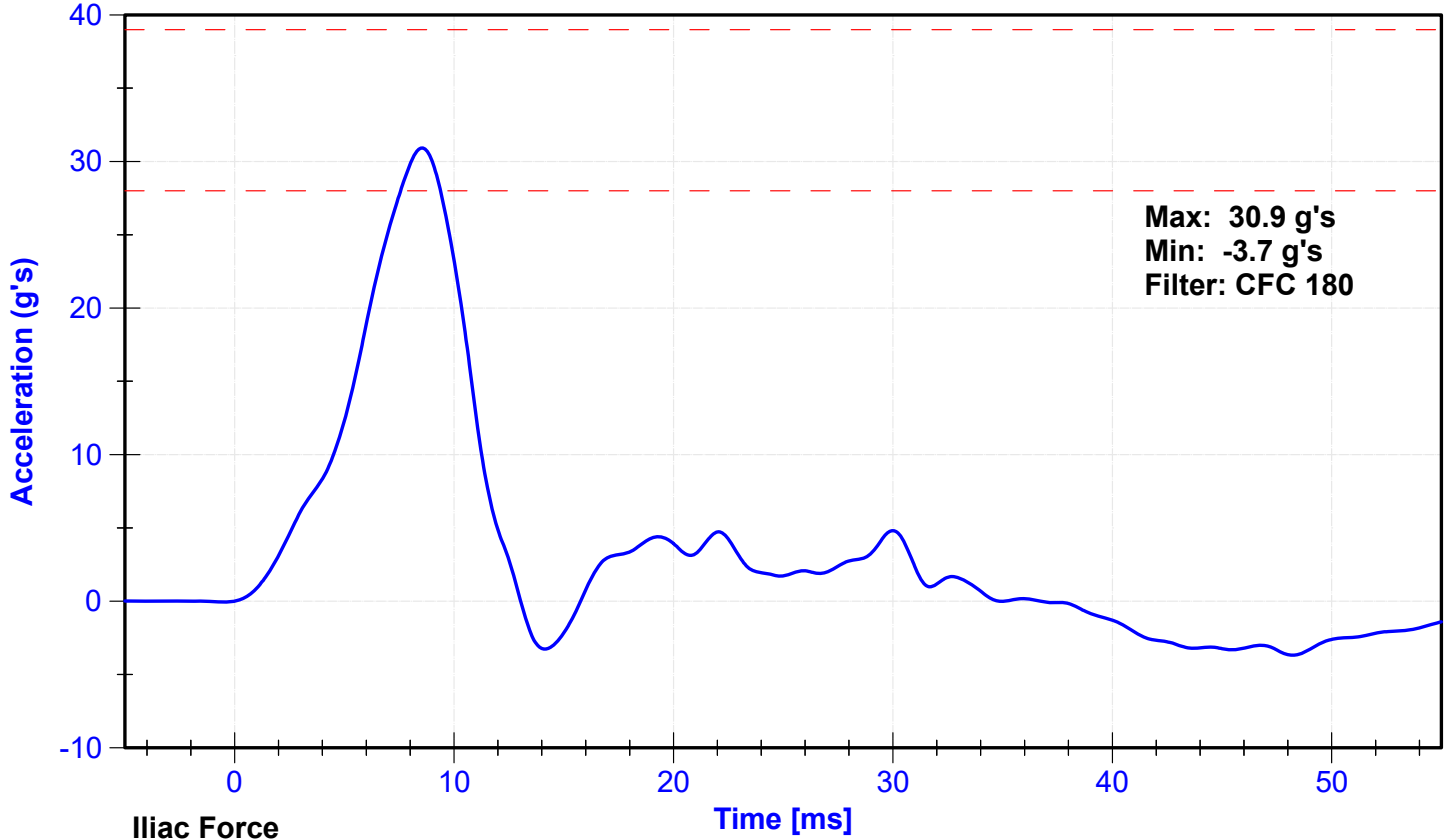
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Iliac Load Cell	Denton	280-FY	9/16/2024	9/16/2025

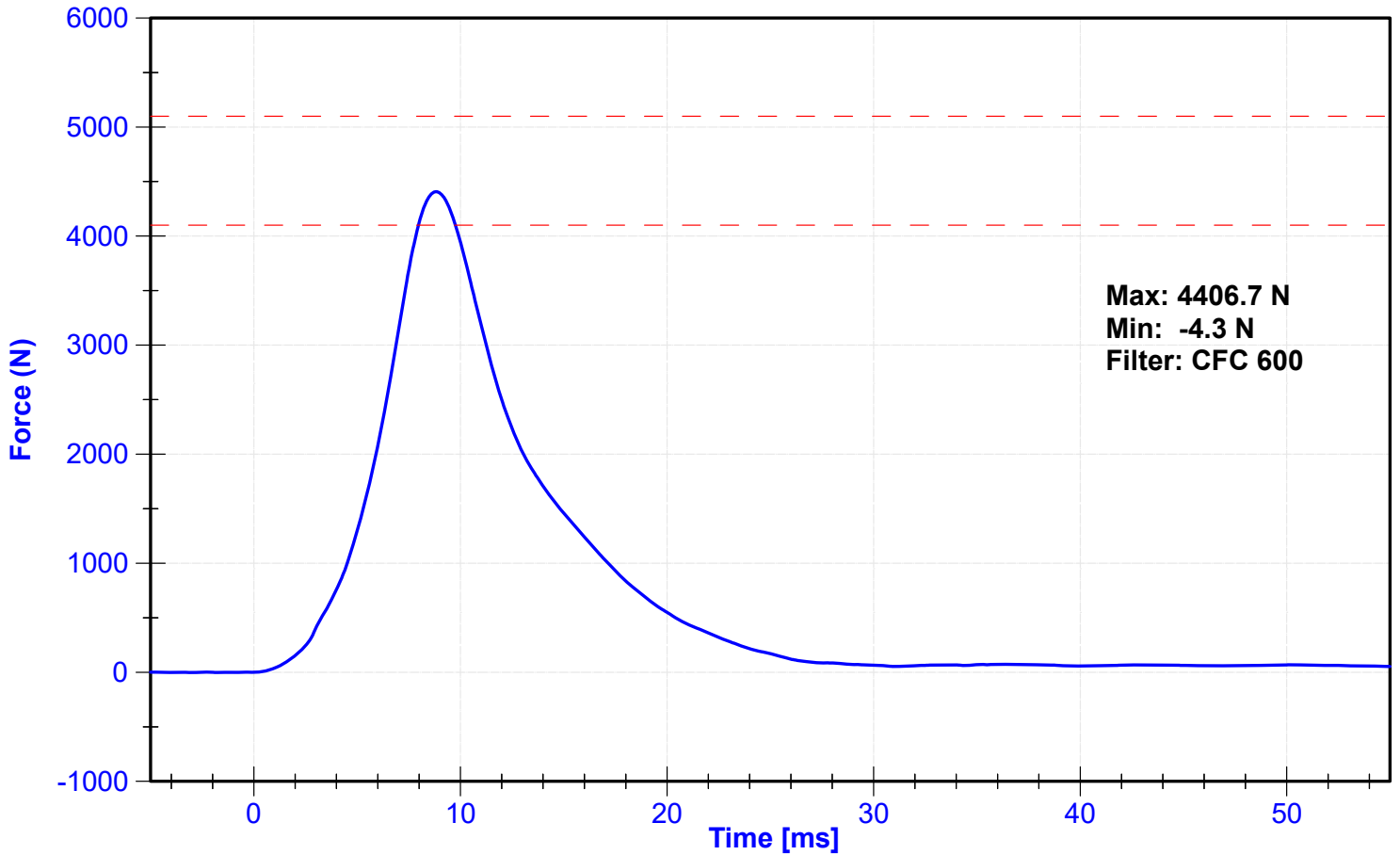
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



**POST-TEST
SID-IIs PERFORMANCE CALIBRATION TEST DATA**

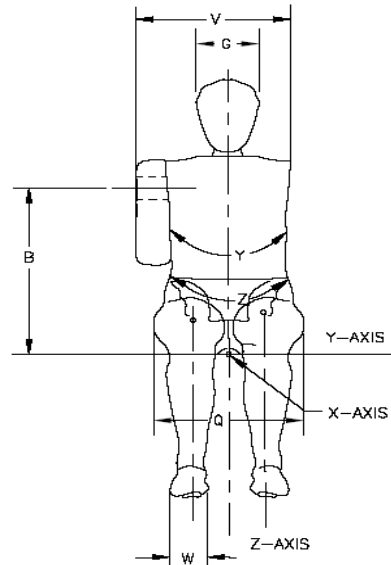
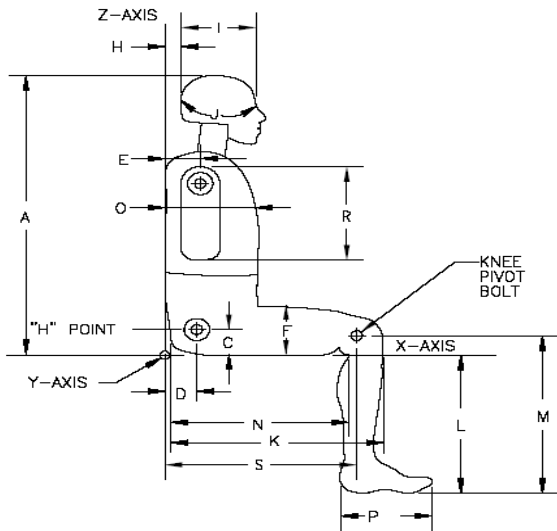


External Measurements - SID-IIs

Technician: J. Rios

Date: 10/23/2024

Dummy Serial Number: 224



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	785	Pass
B	Shoulder Pivot Height	437	453	444	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	145	Pass
E	Shoulder Pivot from Backline	97	107	98	Pass
F	Thigh Clearance	119	135	121	Pass
G	Head Breadth	140	148	142	Pass
H	Head Back from Backline	40	46	45	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	544	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	404	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	253	Pass
S	Knee Joint to seatback	477	493	489	Pass
V	Shoulder Width	341	357	350	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	871	Pass
Z	Waist Circumference	761	791	773	Pass

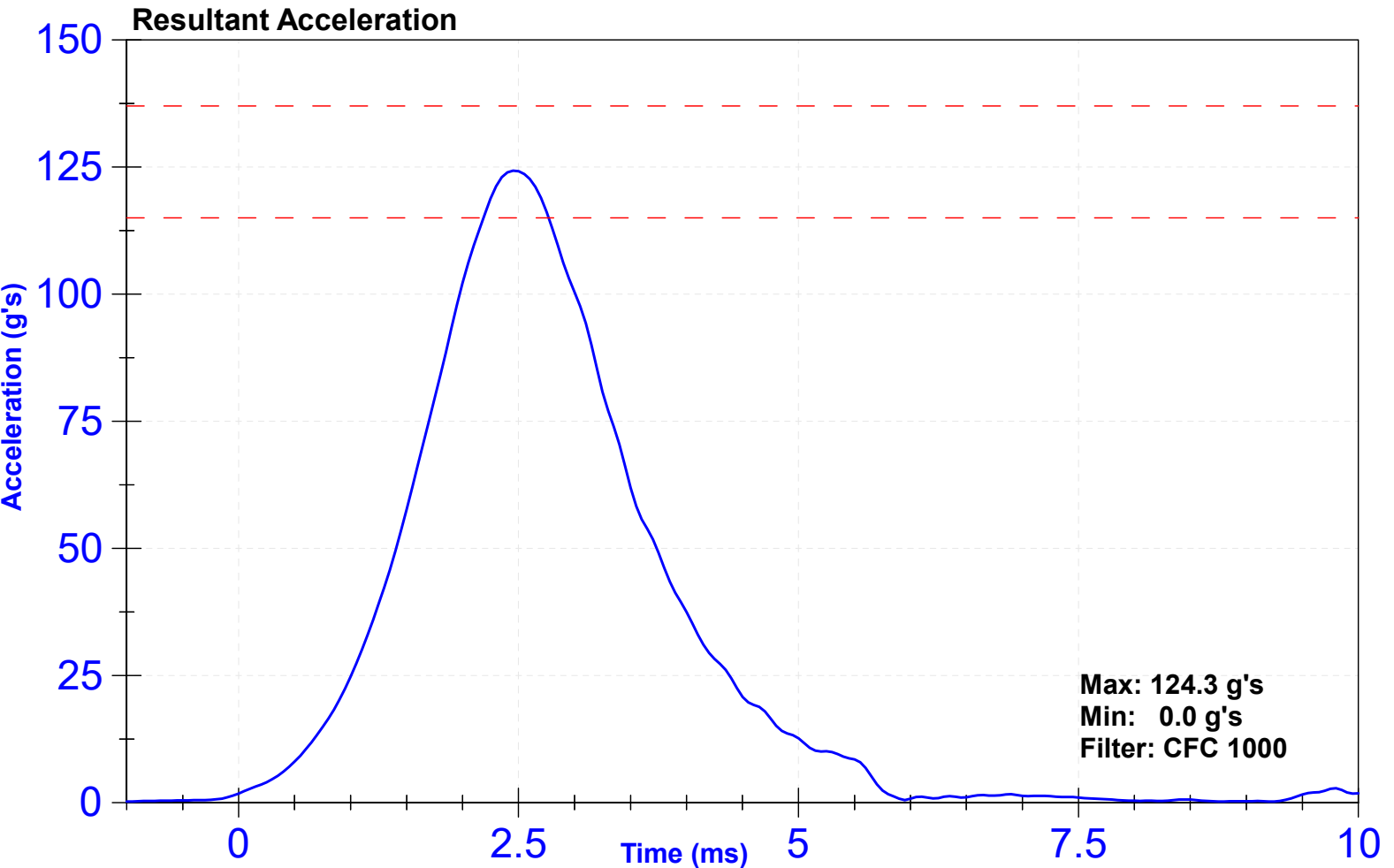
ATD Manufacturer	FTSS	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

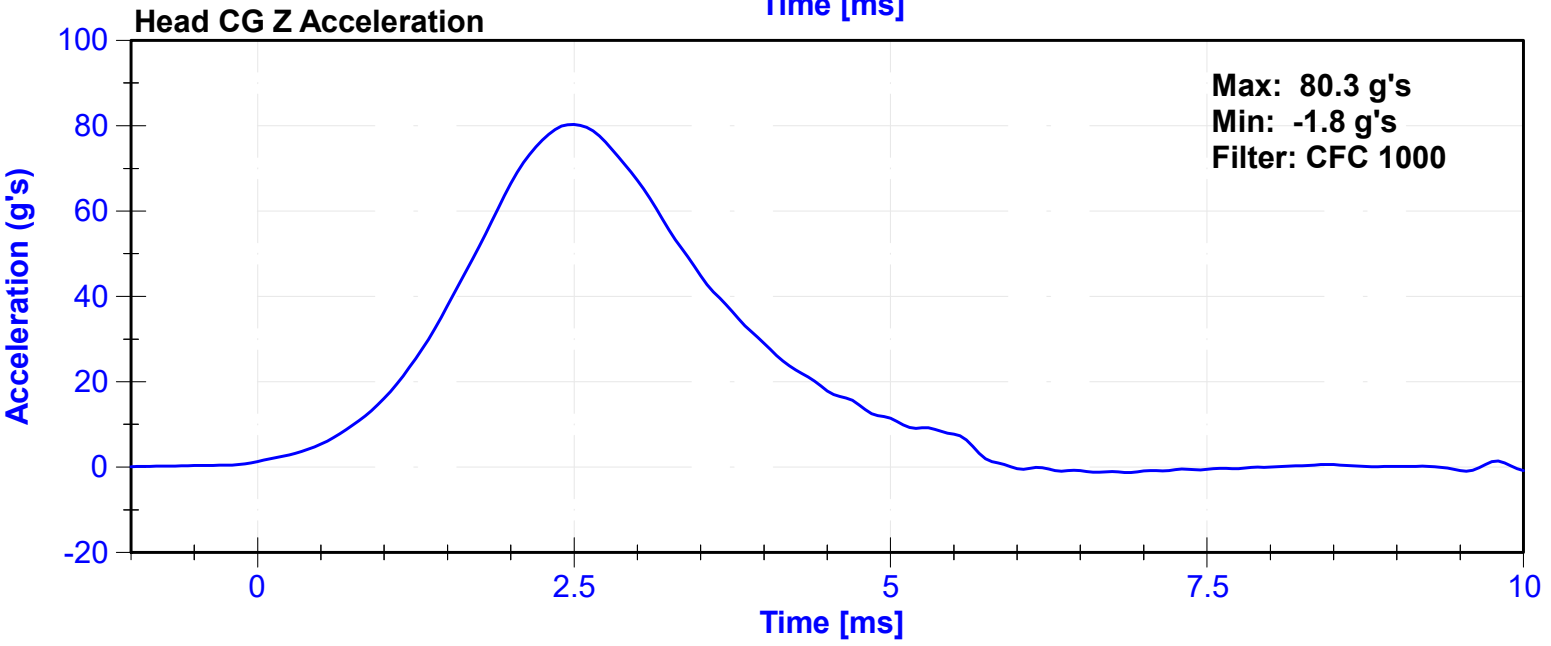
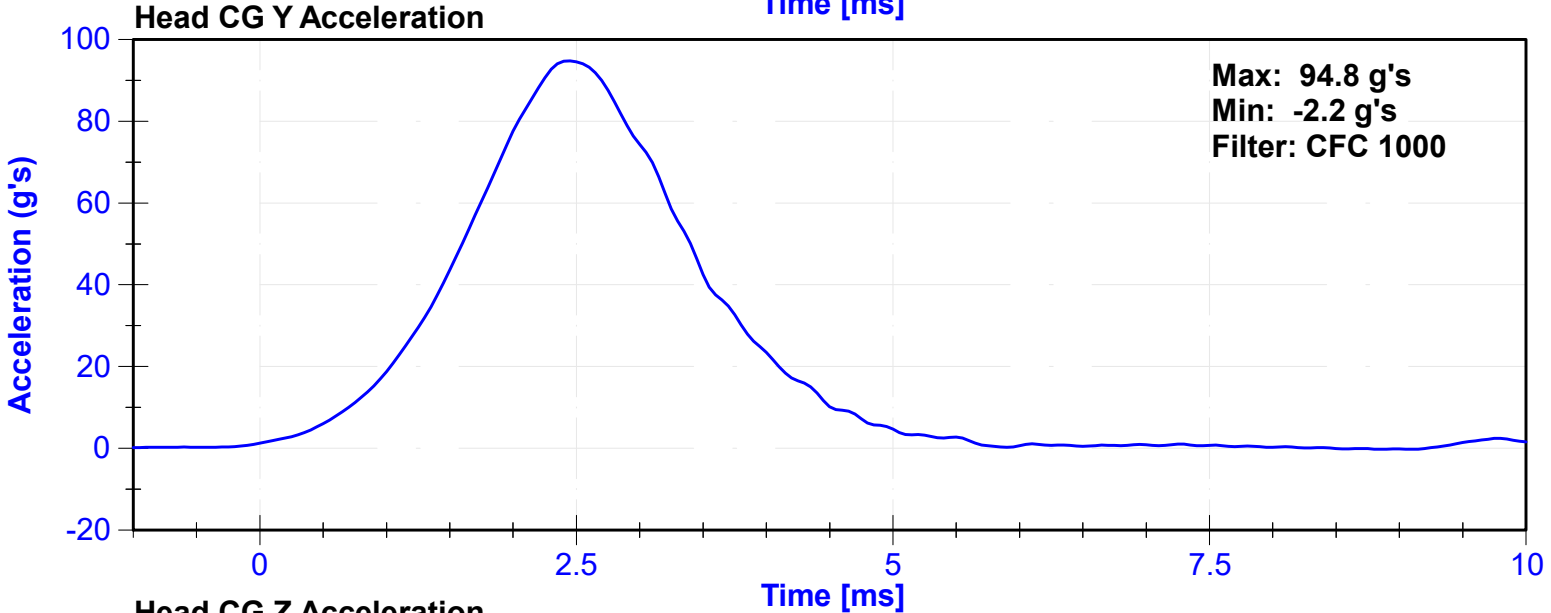
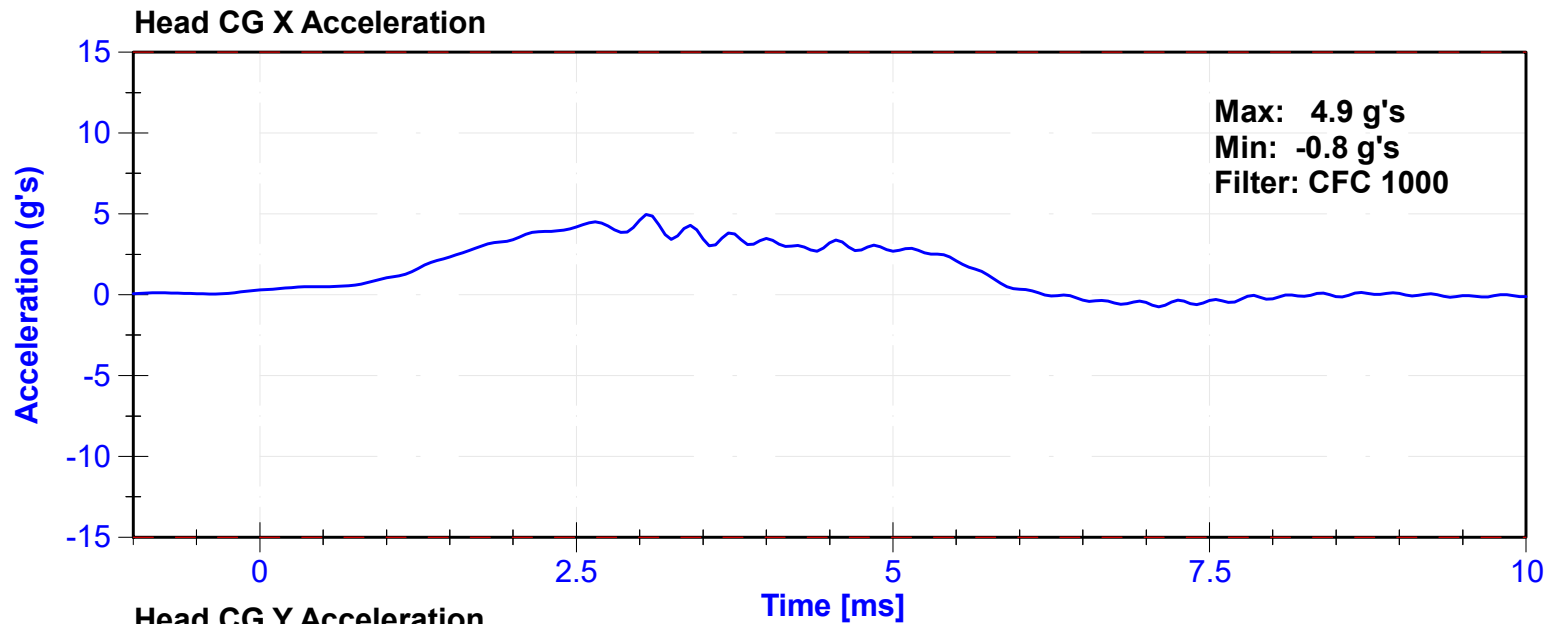
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	40	Pass
Resultant Acceleration	115	137	g's	124.3	Pass
Oscillation	0	15	%	8.1	Pass
Fore-Aft Acceleration	-15	15	g's	4.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P51884	10/8/2024	4/6/2025
Y Accelerometer	Endevco	P73161	10/8/2024	4/6/2025
Z Accelerometer	Endevco	P79588	10/8/2024	4/6/2025





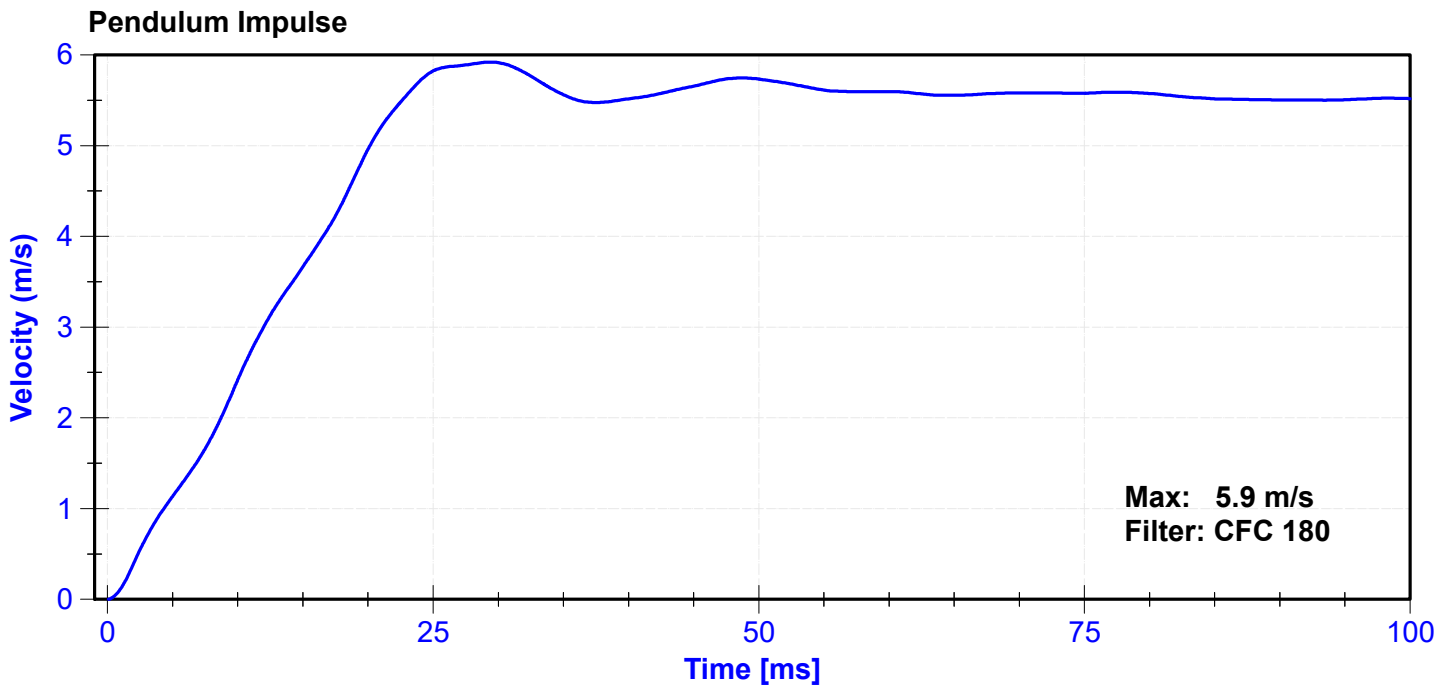
ATD Manufacturer	FTSS	Test Technician	J. Rios
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

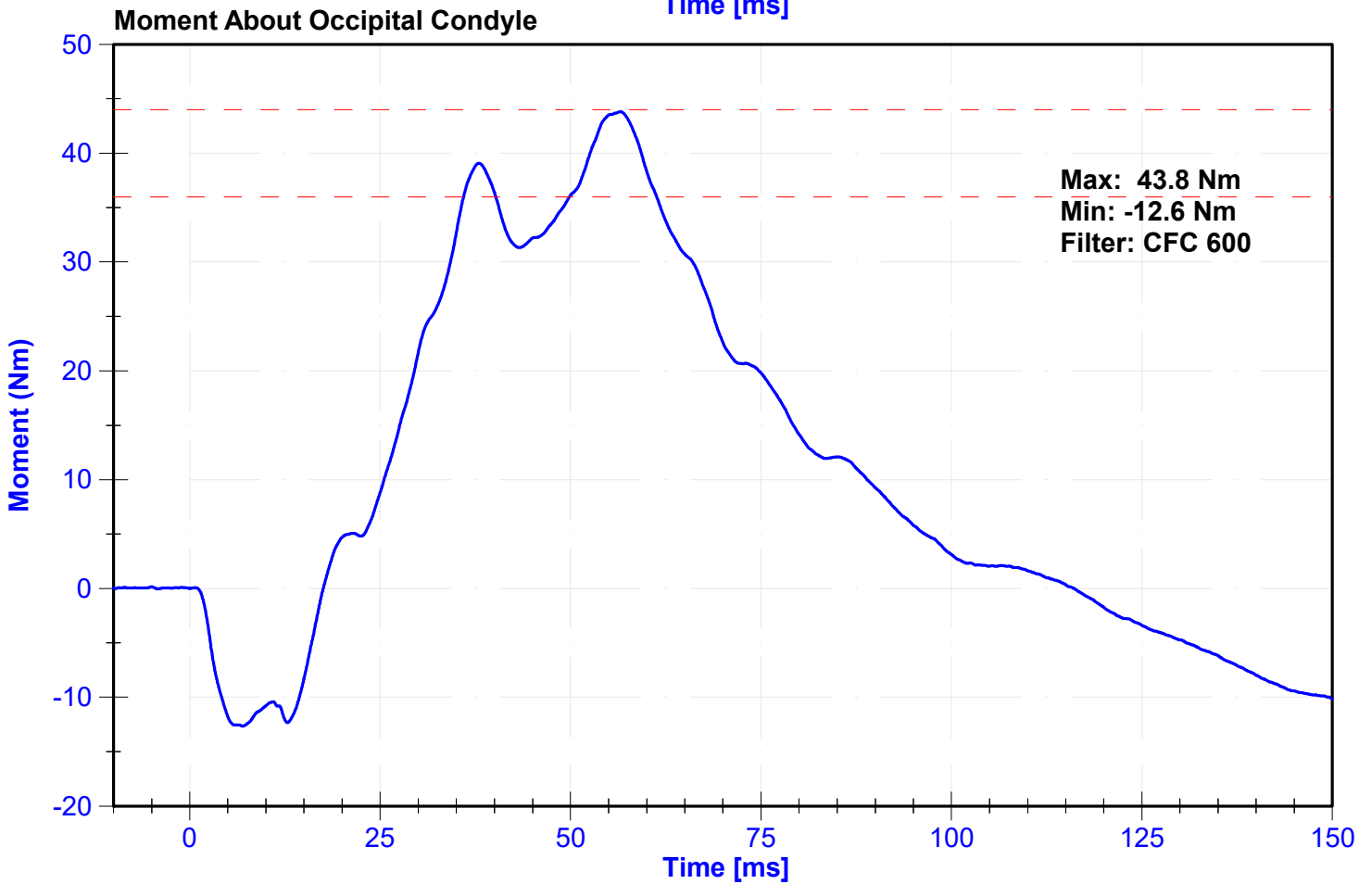
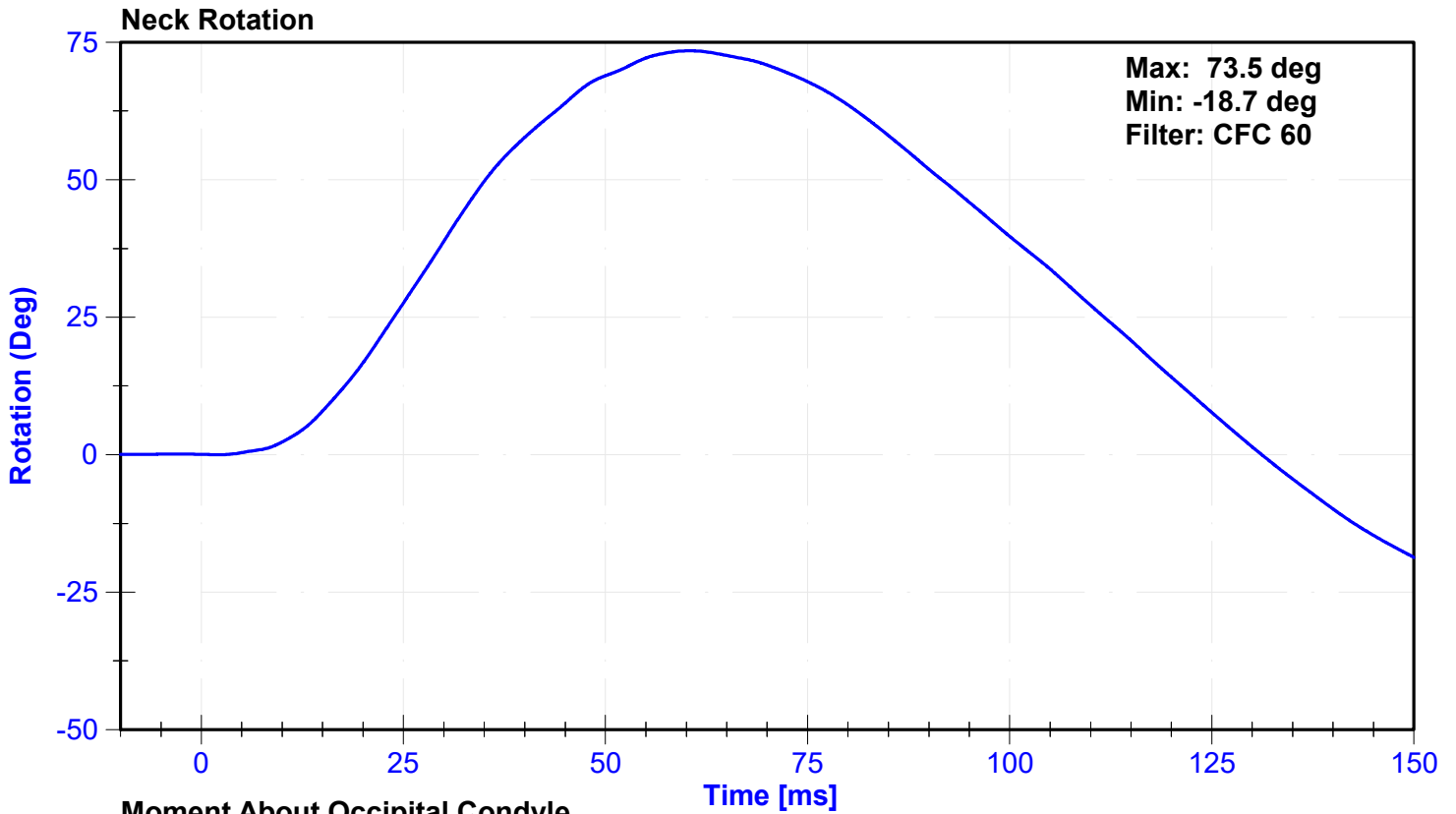
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	35	Pass
Velocity	5.51	5.63	m/s	5.557	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.42	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.67	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.96	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.82	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.92	Pass
Neck Rotation	71	81	deg	73.5	Pass
Time at Maximum Rotation	50	70	ms	60.4	Pass
Moment about the OC	36	44	Nm	43.8	Pass
Moment Decay to 0 Nm	102	126	ms	116.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	7231C-750	4/29/2024	10/26/2024
Pendulum Potentiometer	Servo	4961	9/23/2024	9/23/2025
Condyle Potentiometer	Servo	DS185	9/23/2024	9/23/2025
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

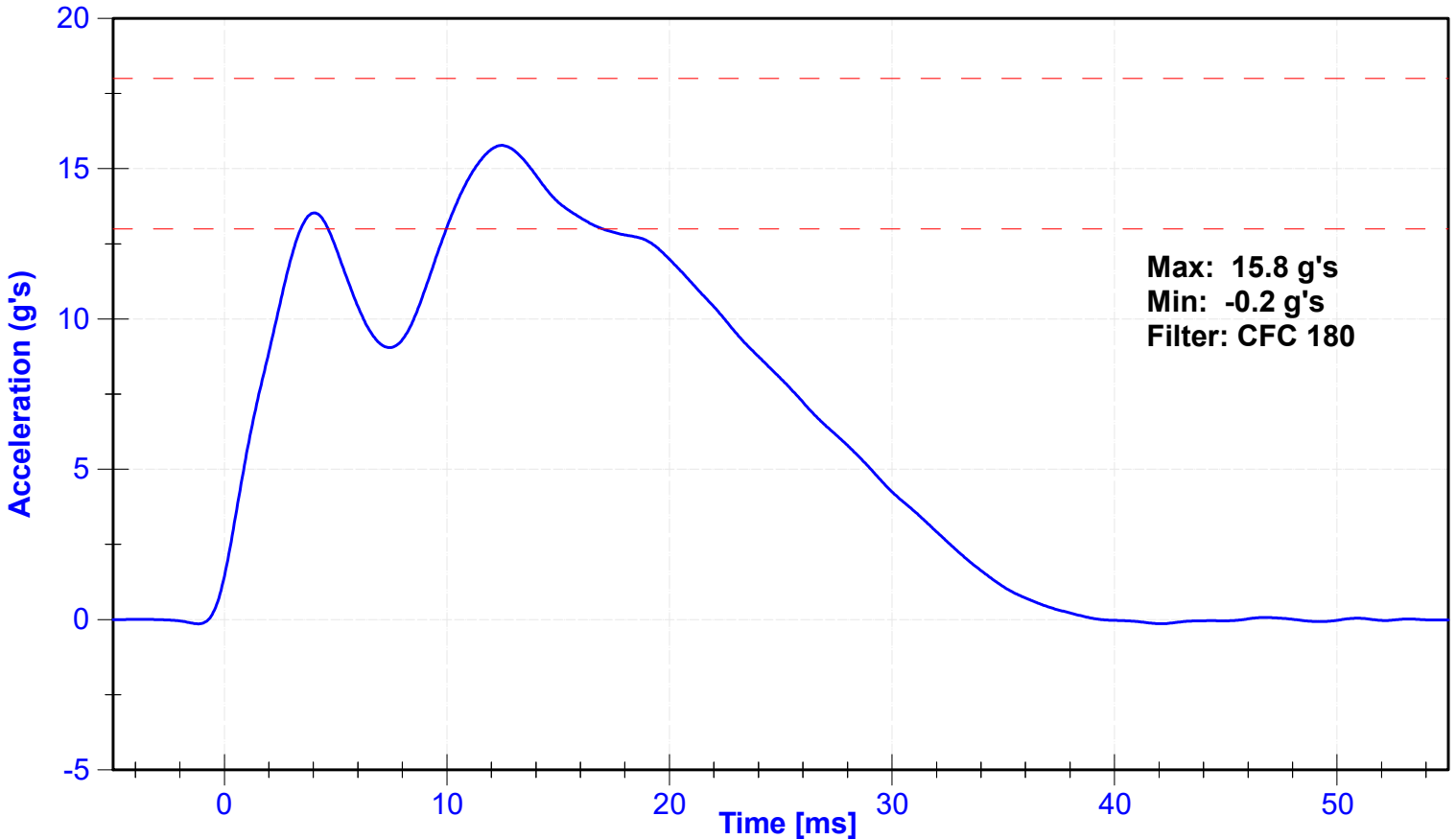
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	13	18	g's	15.8	Pass
Shoulder Deflection	28	37	mm	30.1	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.5	Pass

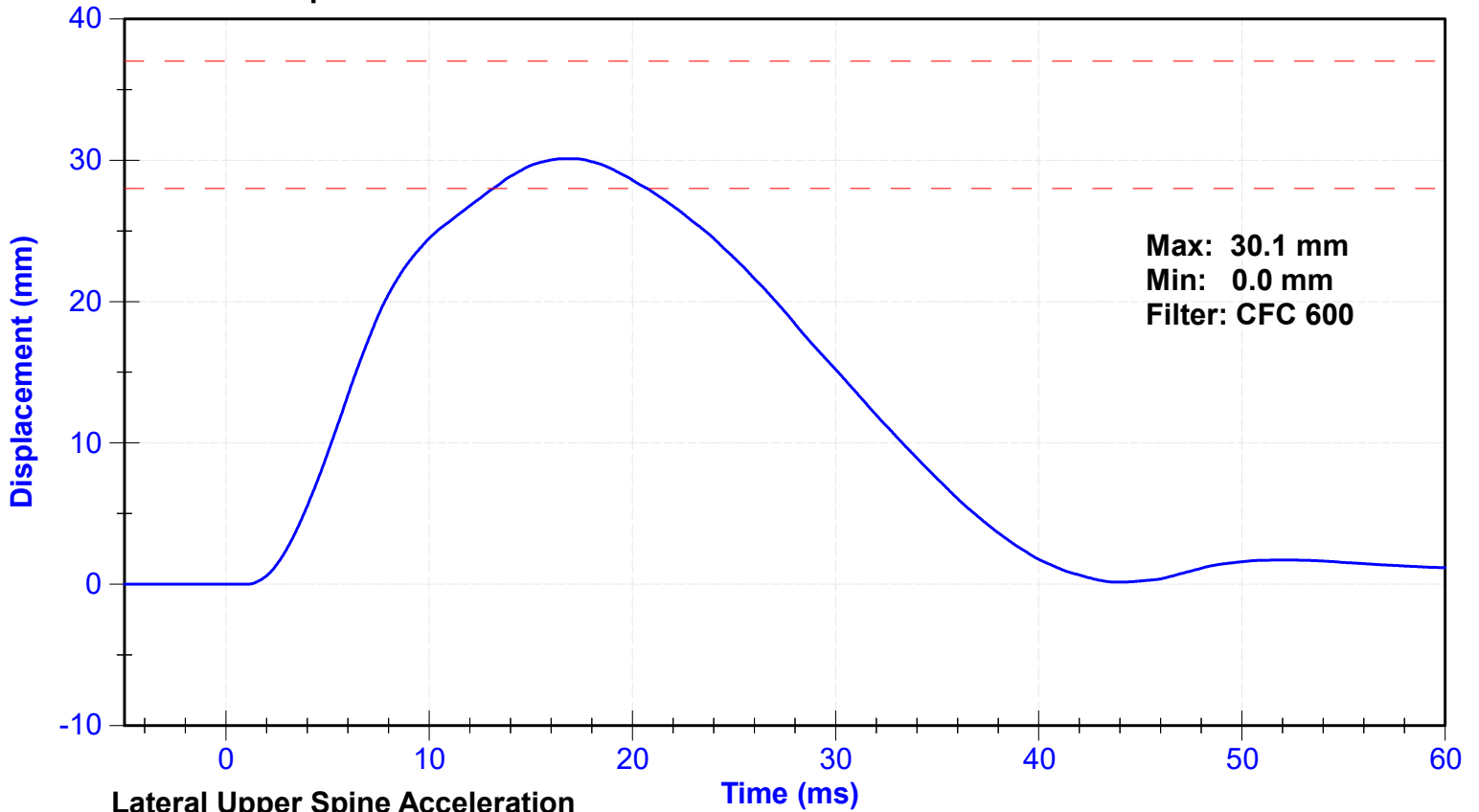
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025

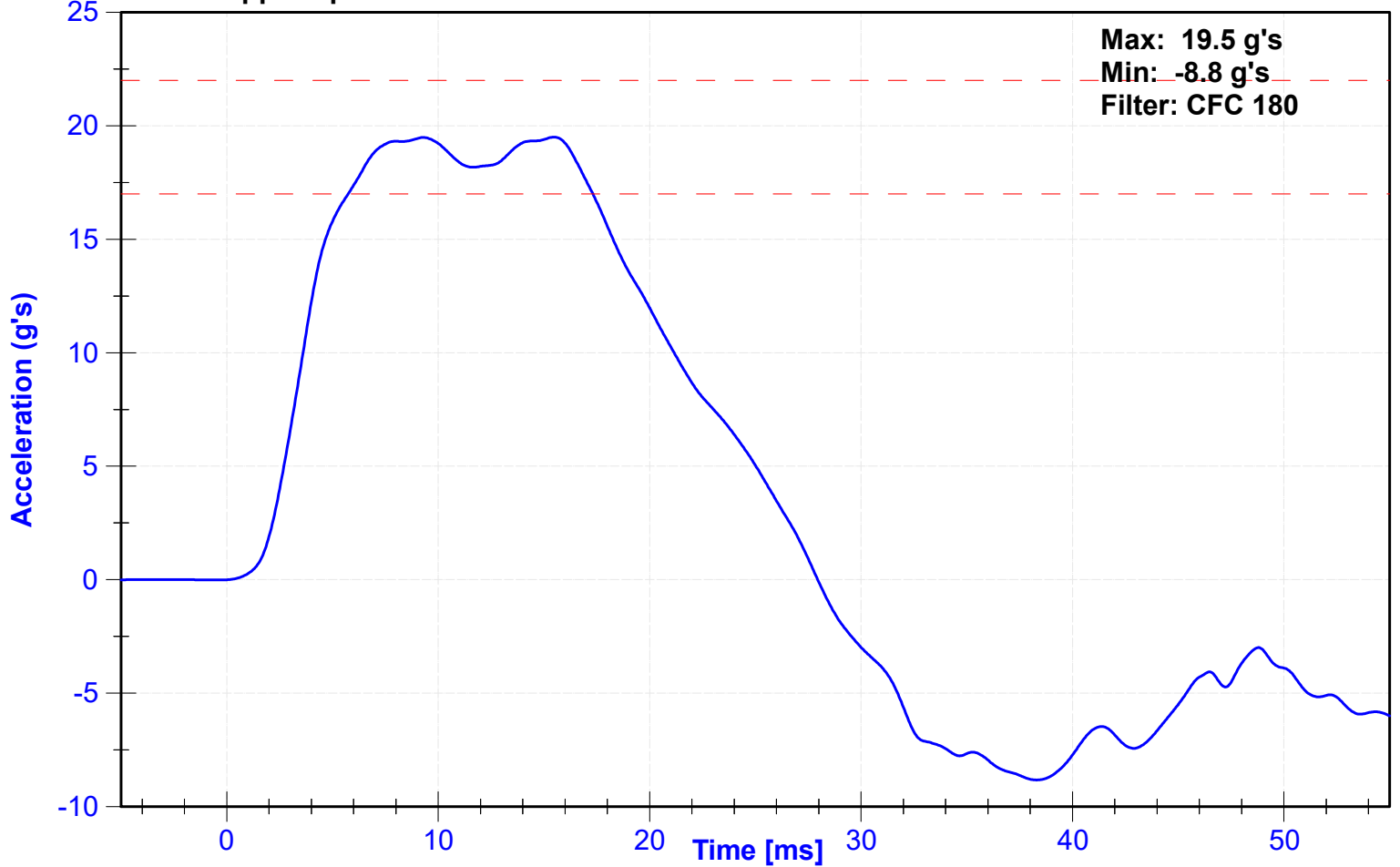
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



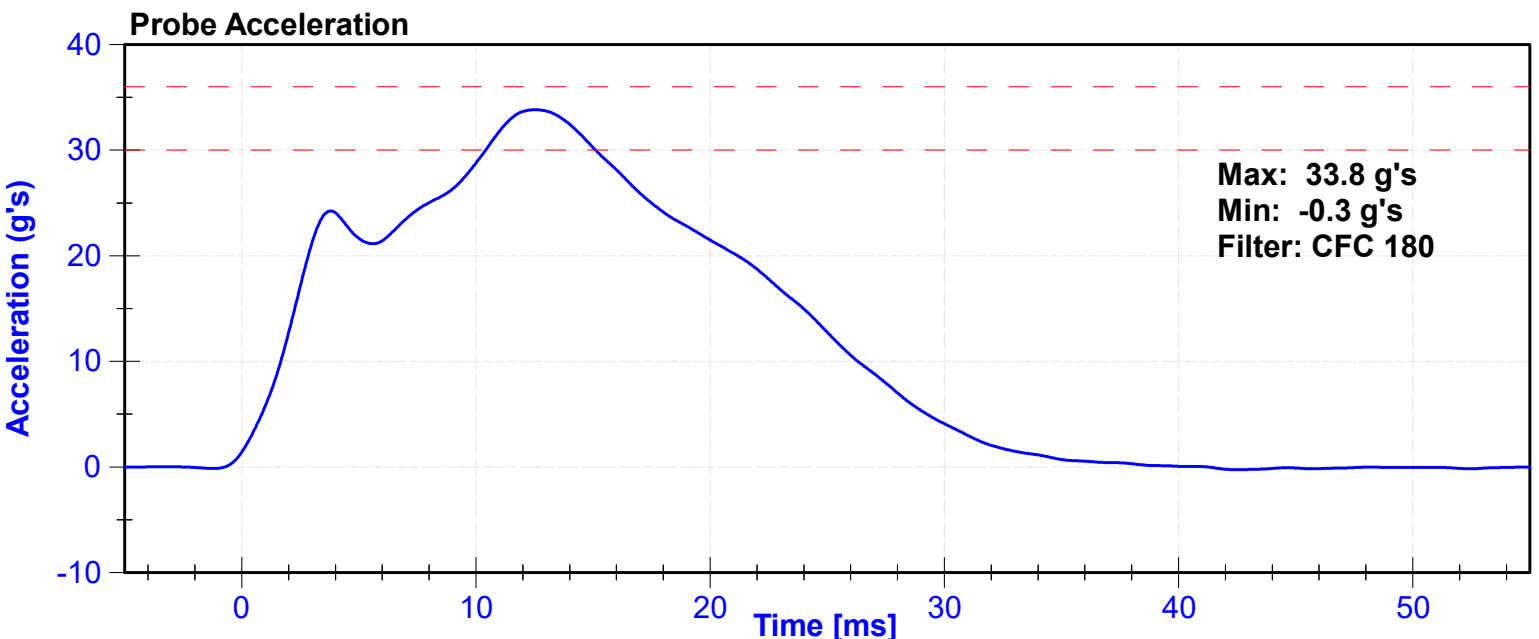
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

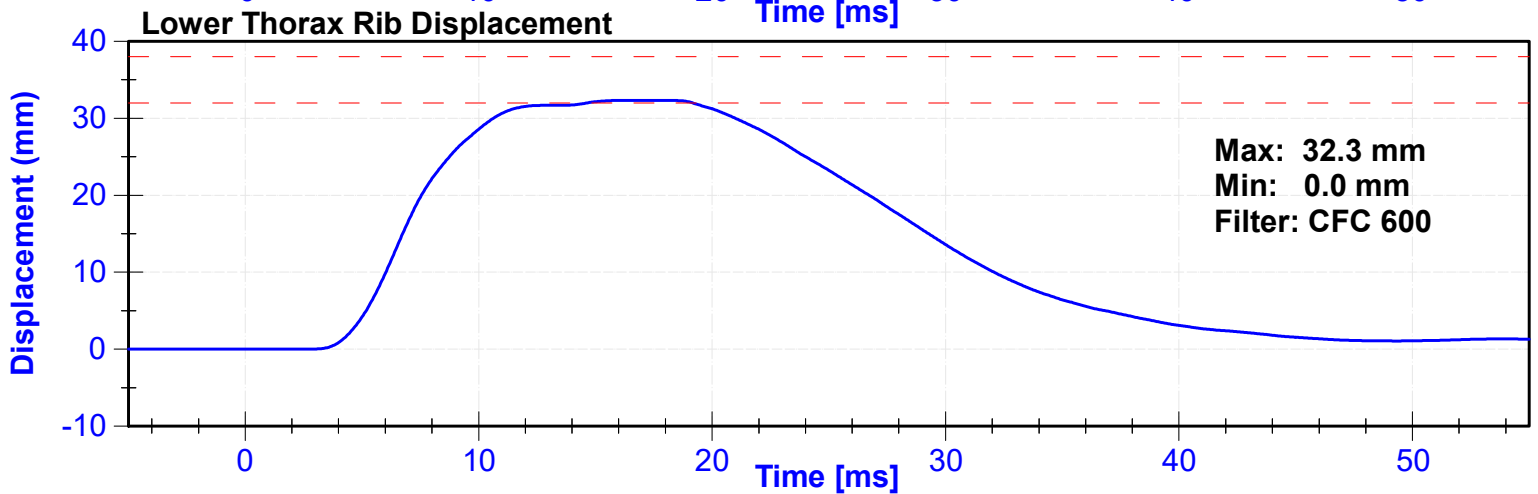
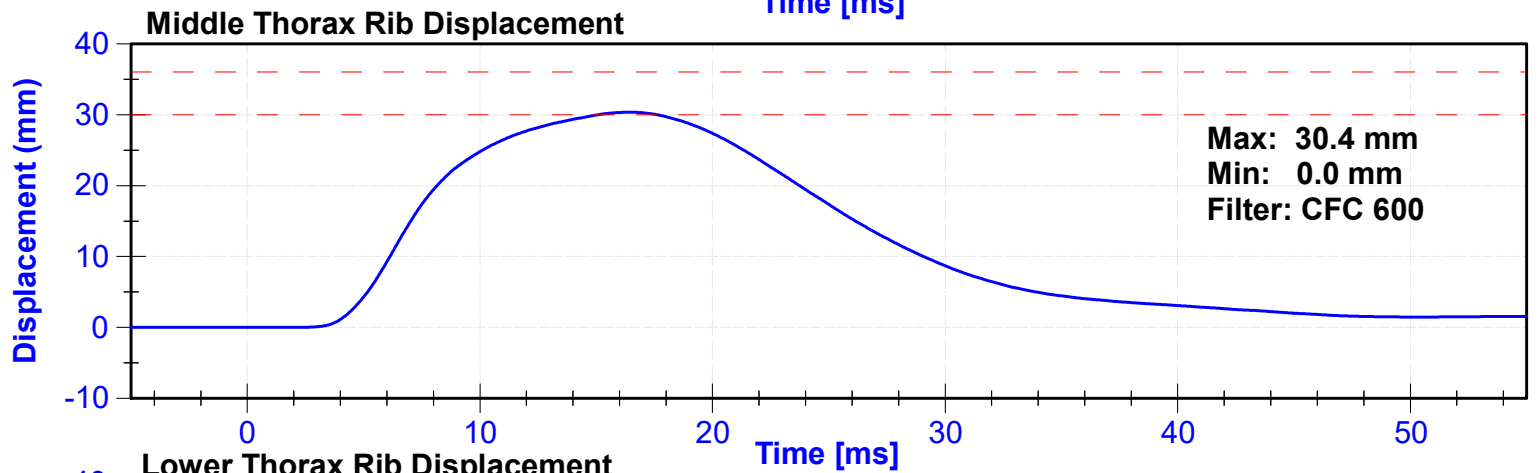
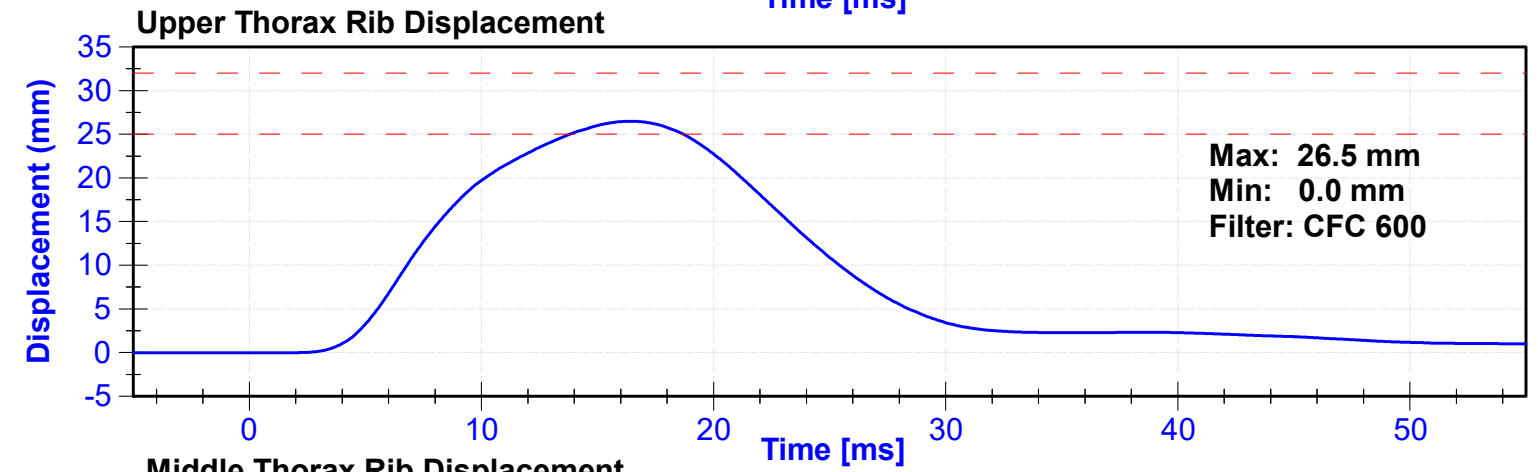
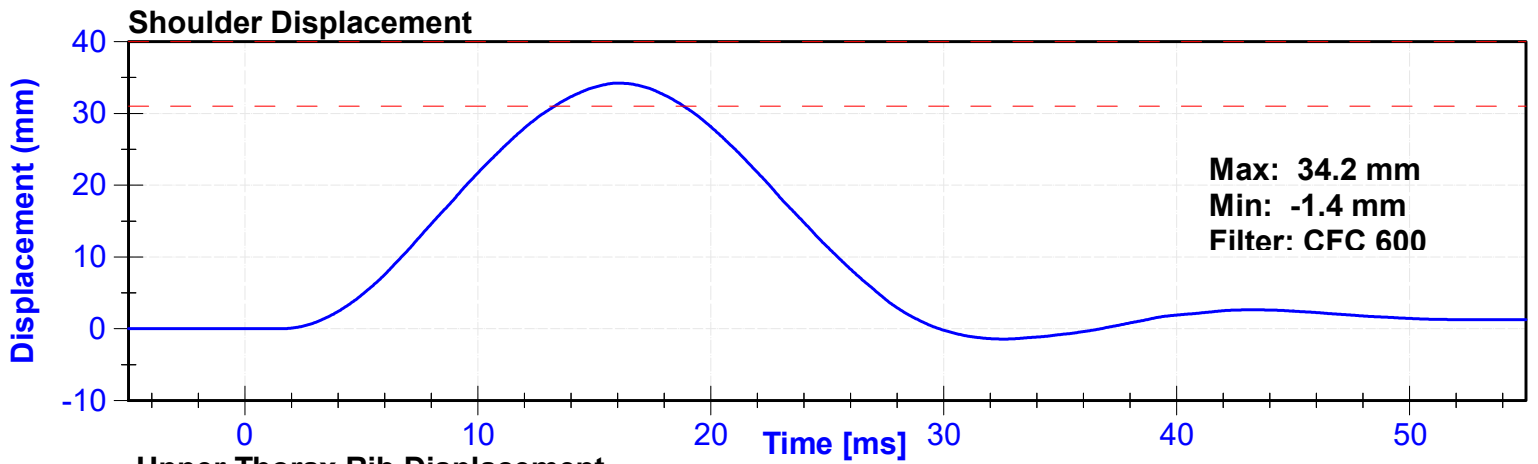
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration after 5 ms	30	36	g's	33.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.0	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.0	Pass
Shoulder Deflection	31	40	mm	34.2	Pass
Upper Thorax Rib Deflection	25	32	mm	26.5	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	32.3	Pass

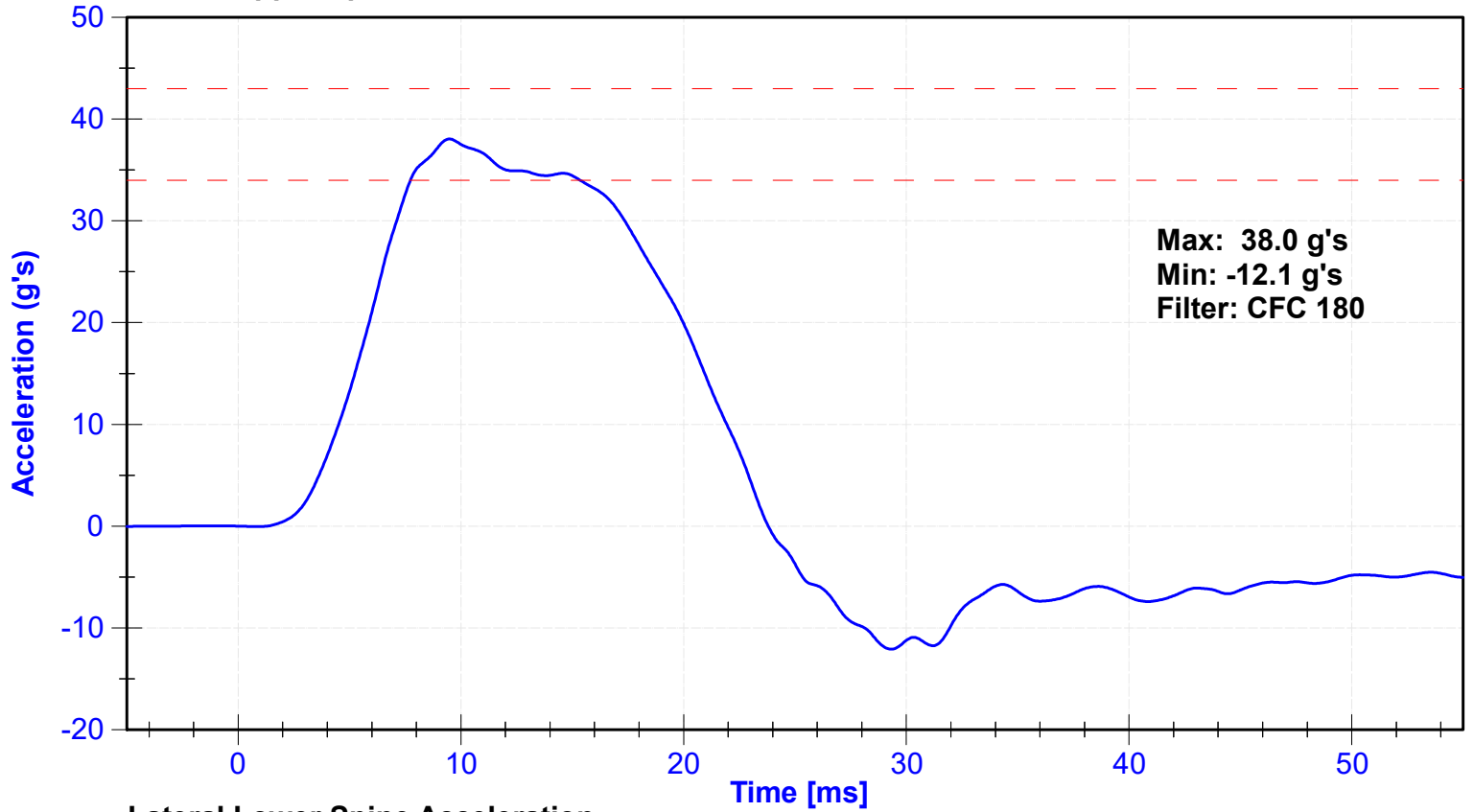
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine T1 Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Upper Spine T12 Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Shoulder Potentiometer	Servo	829GFE	10/8/2024	4/8/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025

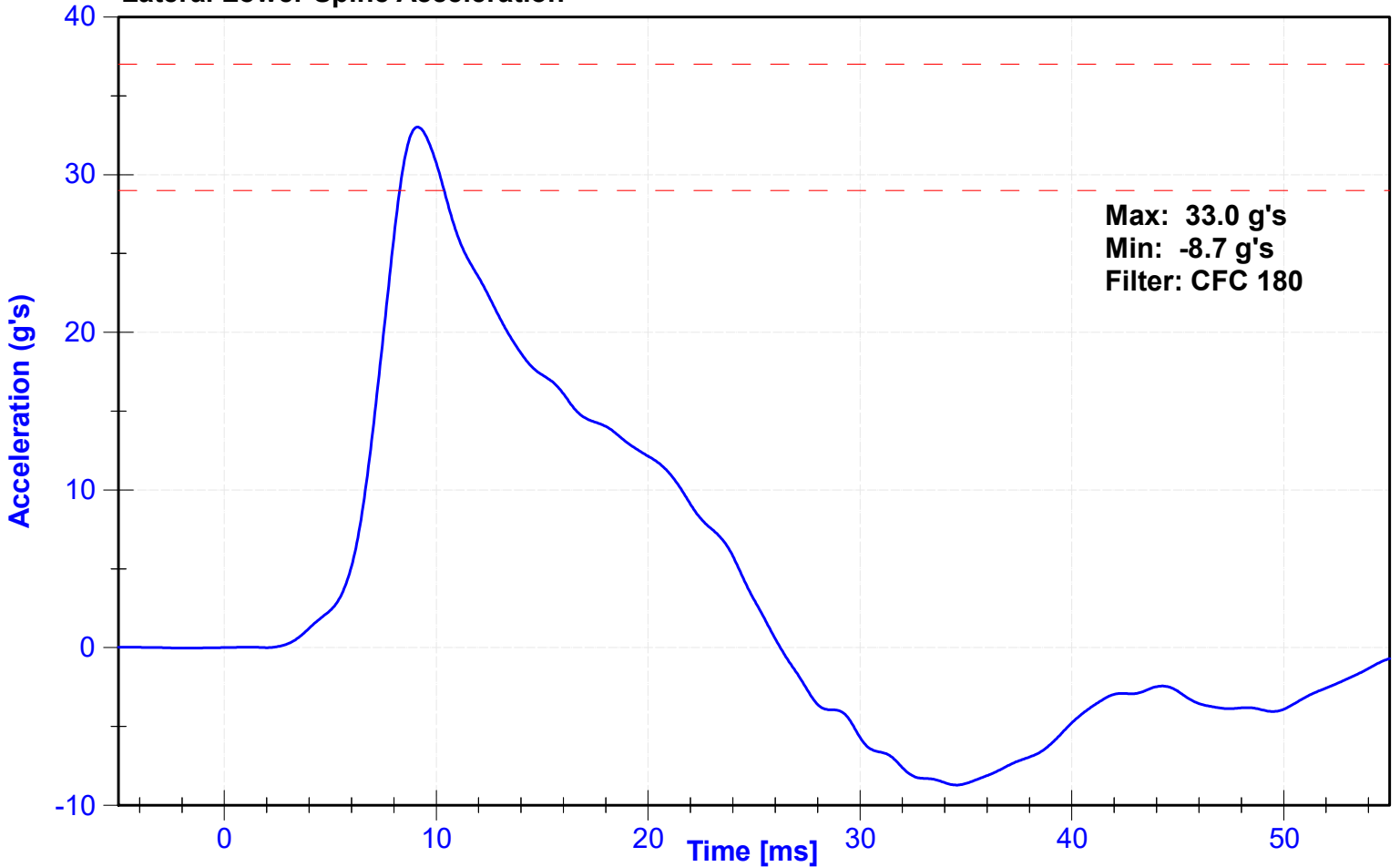




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



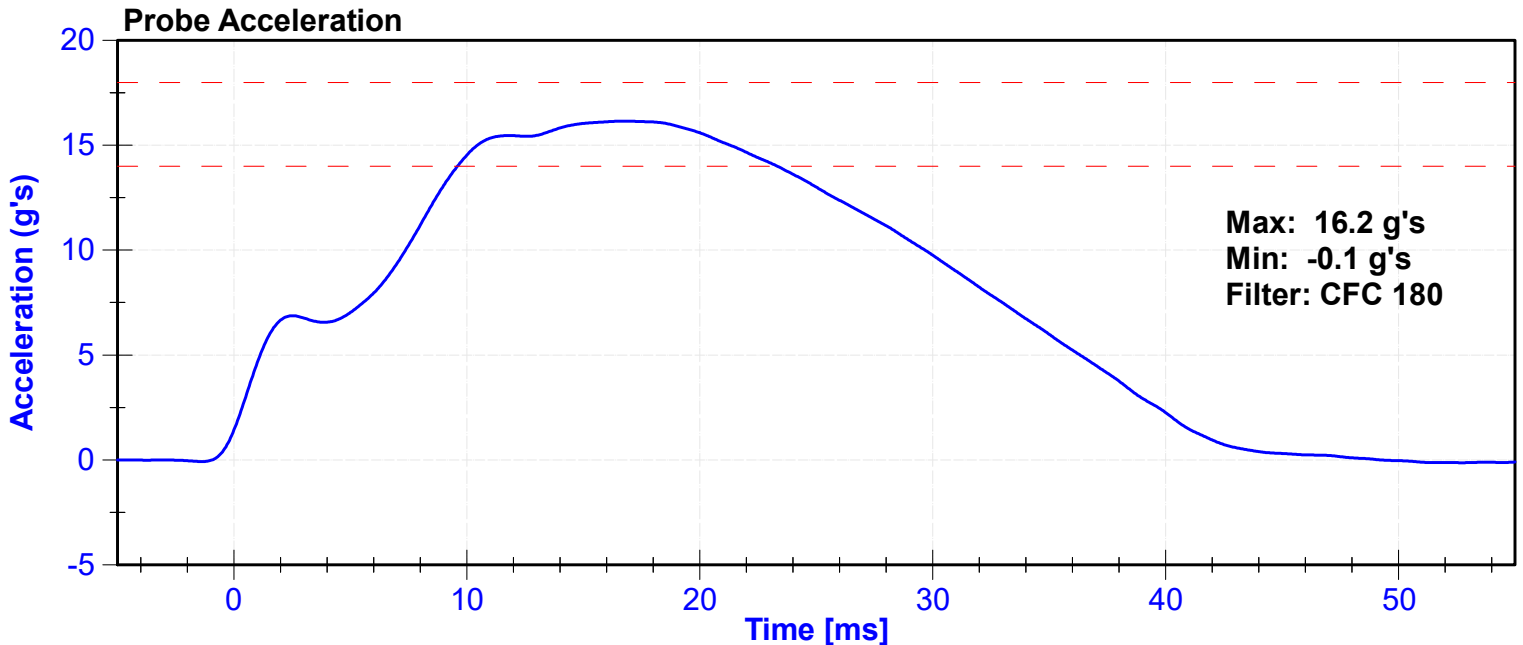
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

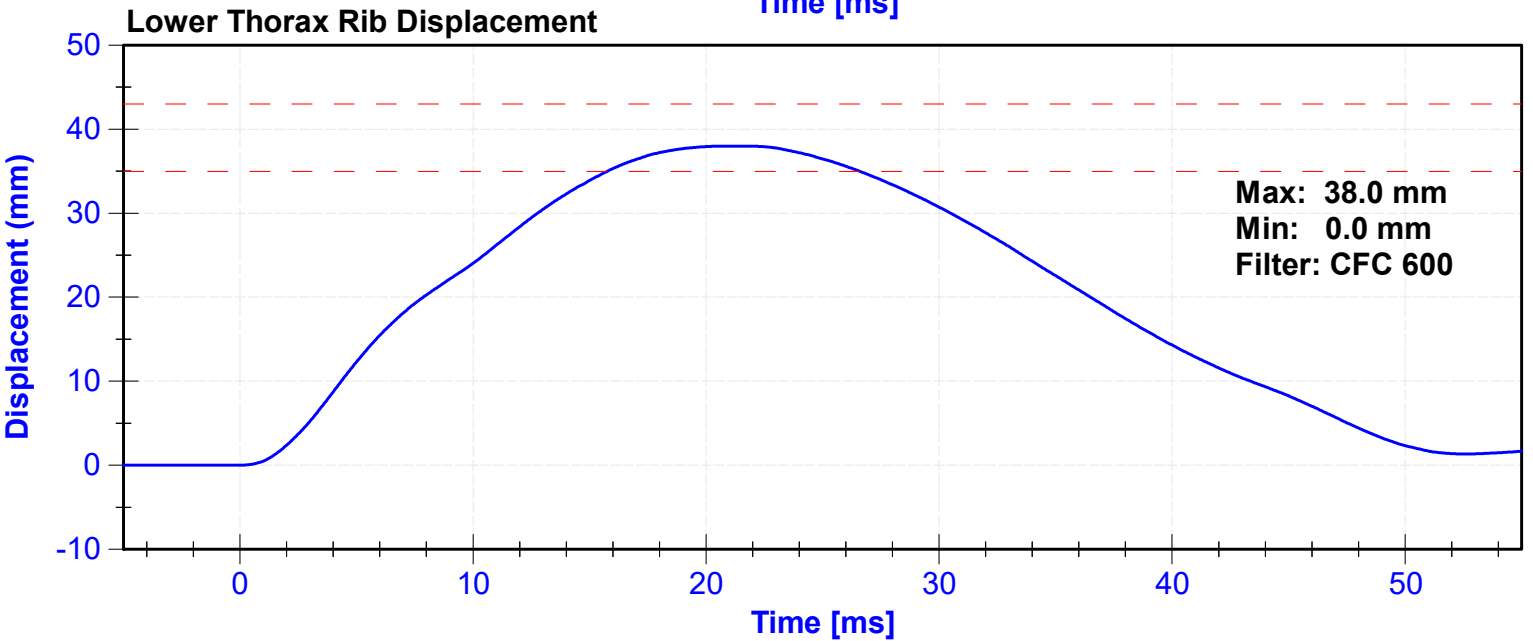
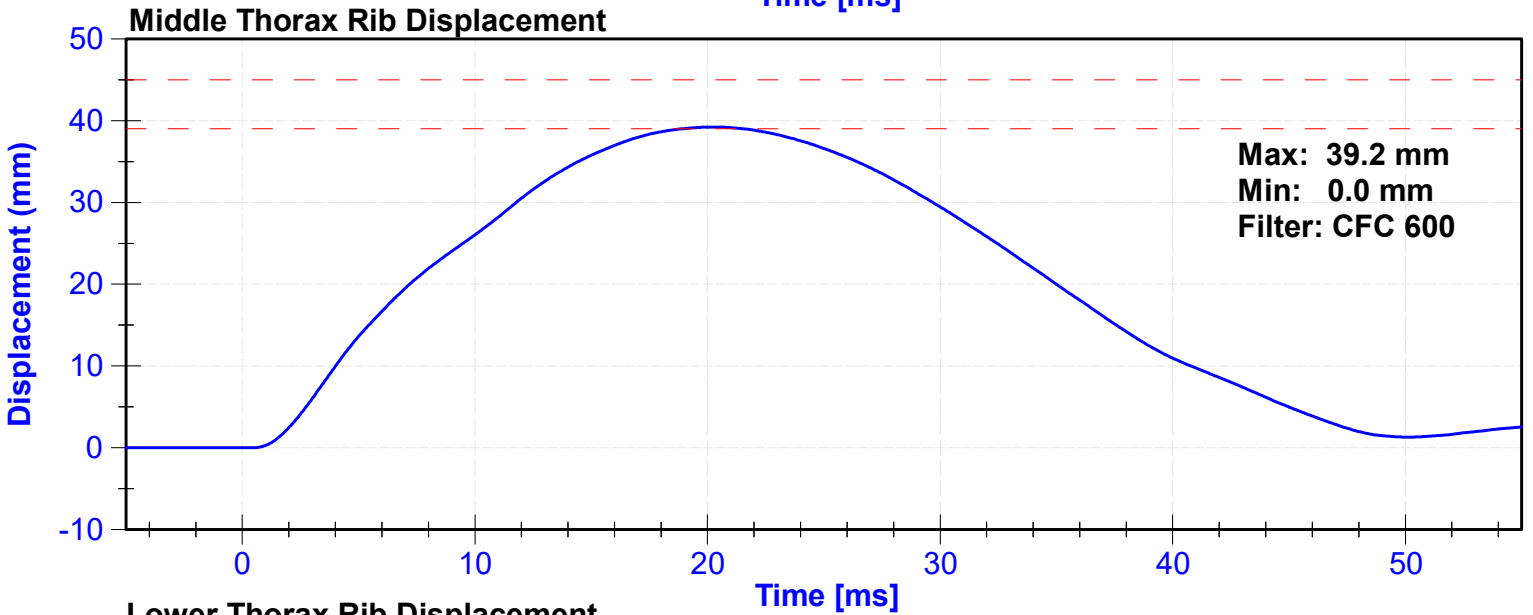
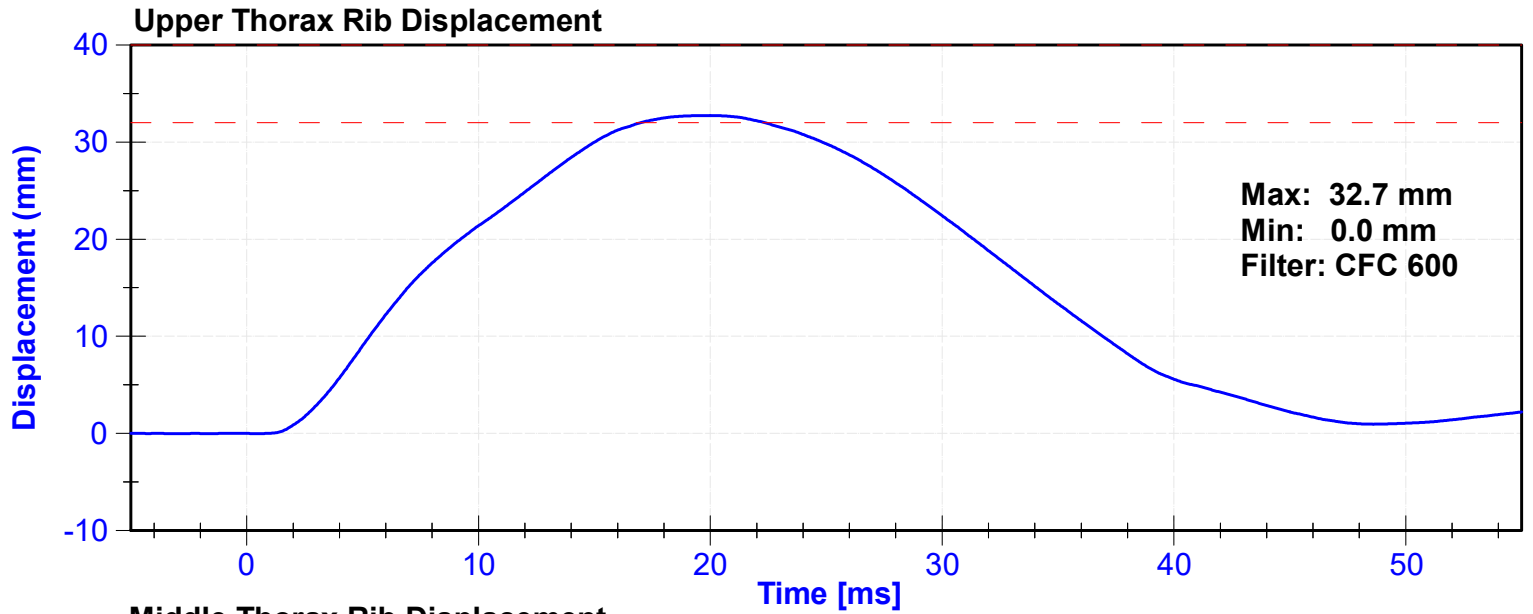
Results

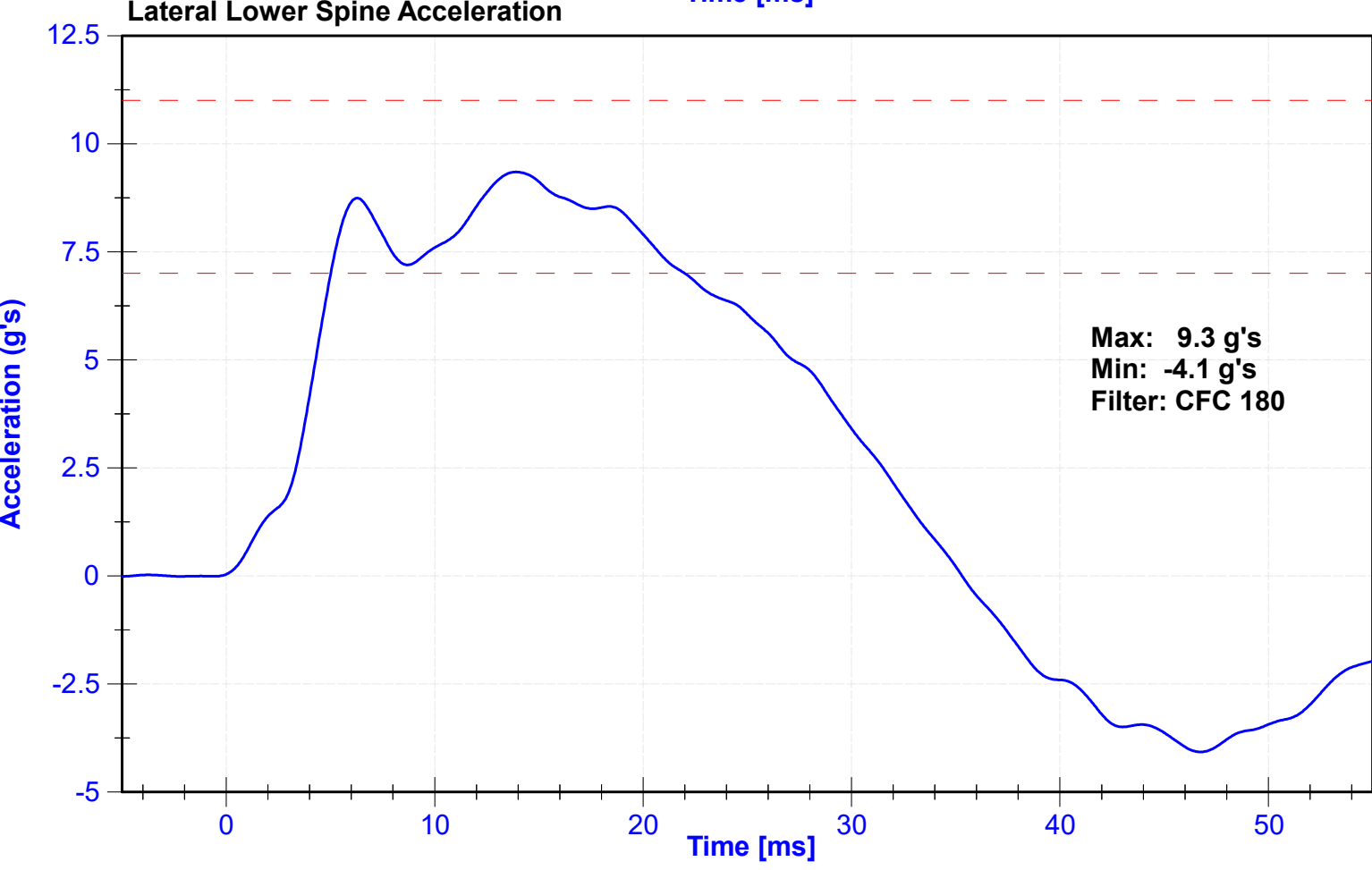
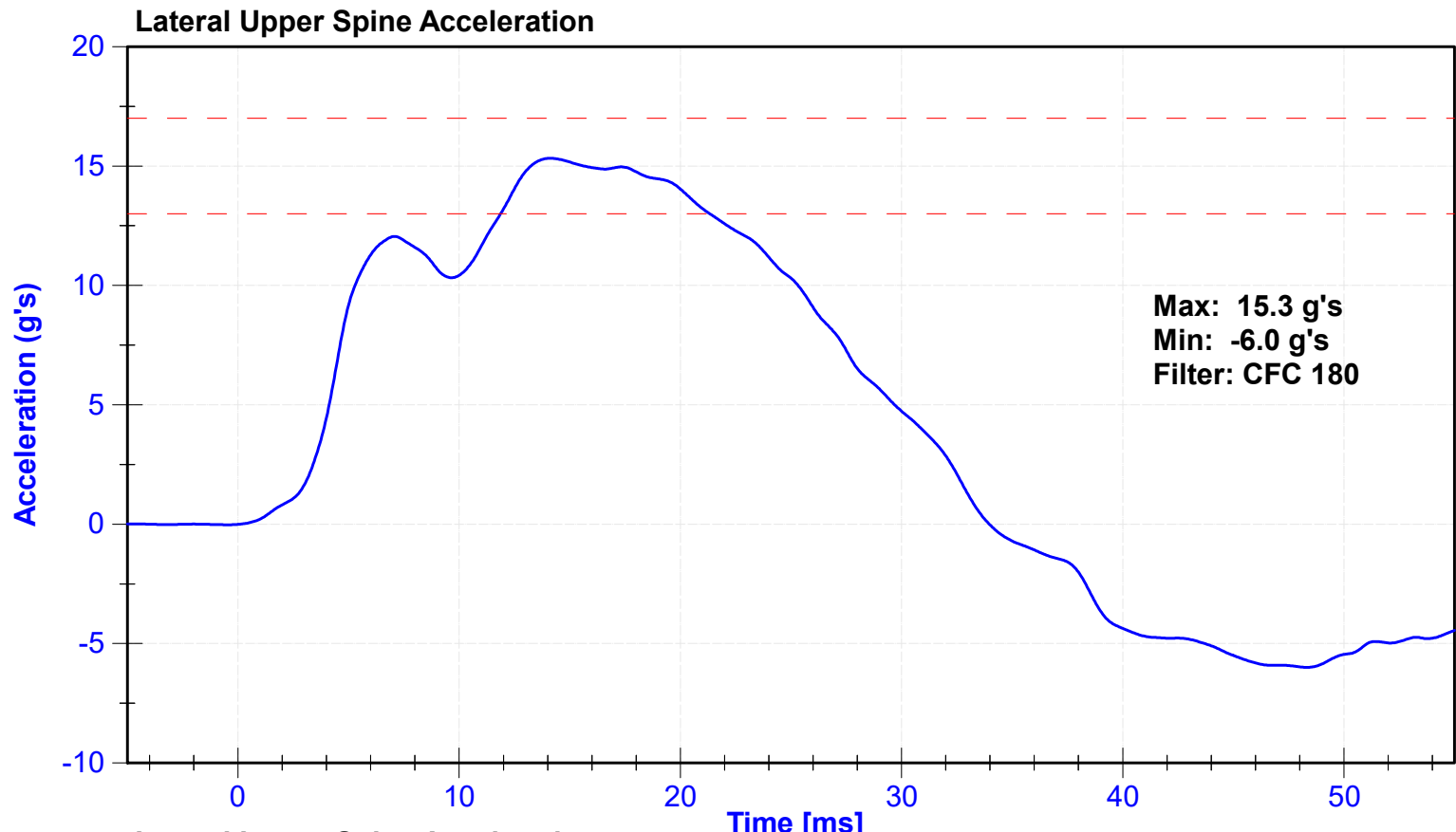
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	14	18	g's	16.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	15.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.3	Pass
Upper Thorax Rib Deflection	32	40	mm	32.7	Pass
Middle Thorax Rib Deflection	39	45	mm	39.2	Pass
Lower Thorax Rib Deflection	35	43	mm	38.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Upper Spine Y Accelerometer	Endevco	P58883	10/8/2024	4/6/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Thorax Rib Potentiometer	Servo	DS-049GFE	10/8/2024	4/8/2025
Middle Thorax Rib Potentiometer	Servo	080GFE	10/9/2024	4/9/2025
Lower Thorax Rib Potentiometer	Servo	076GFE	10/8/2024	4/8/2025







ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

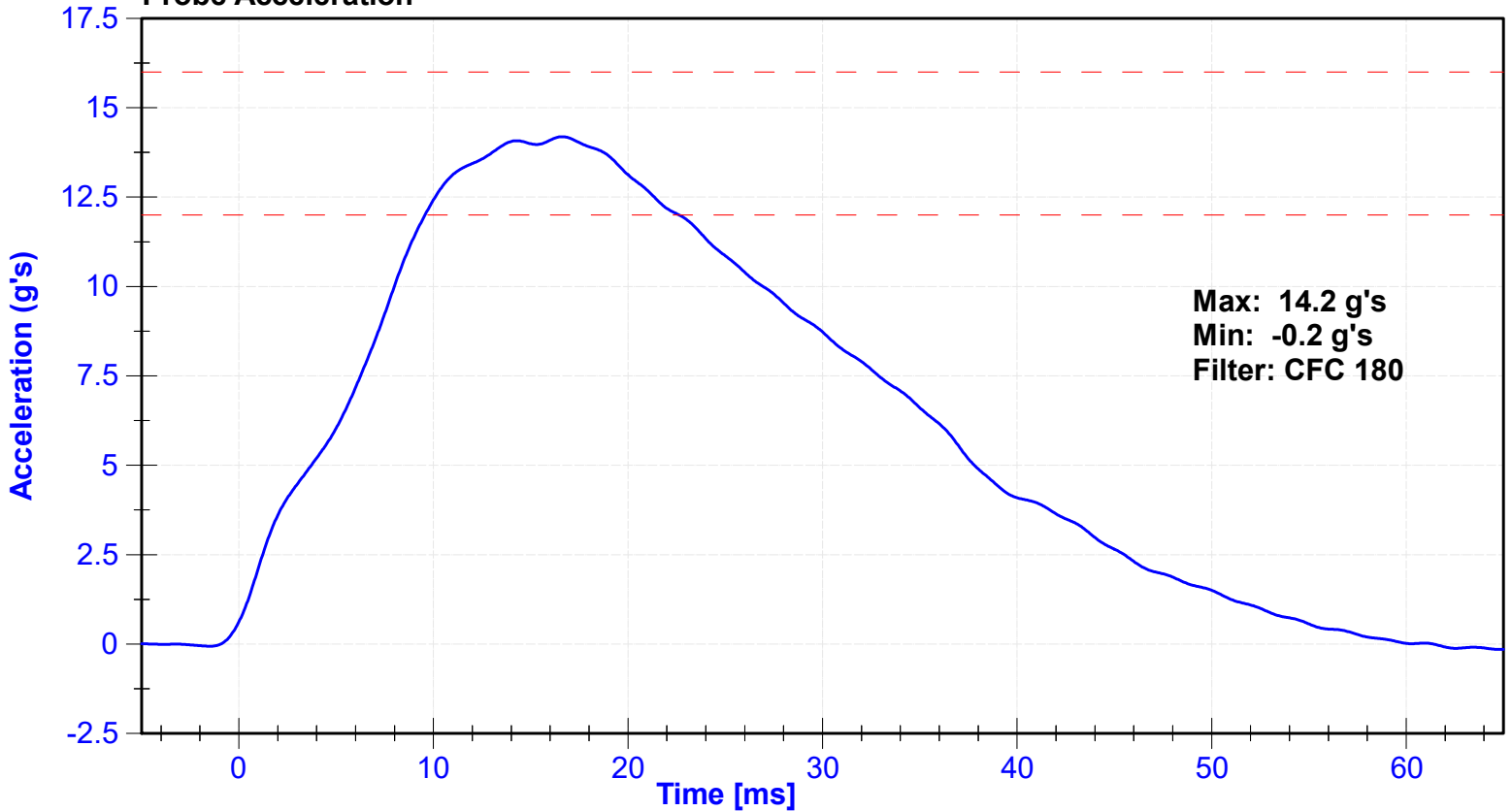
Results

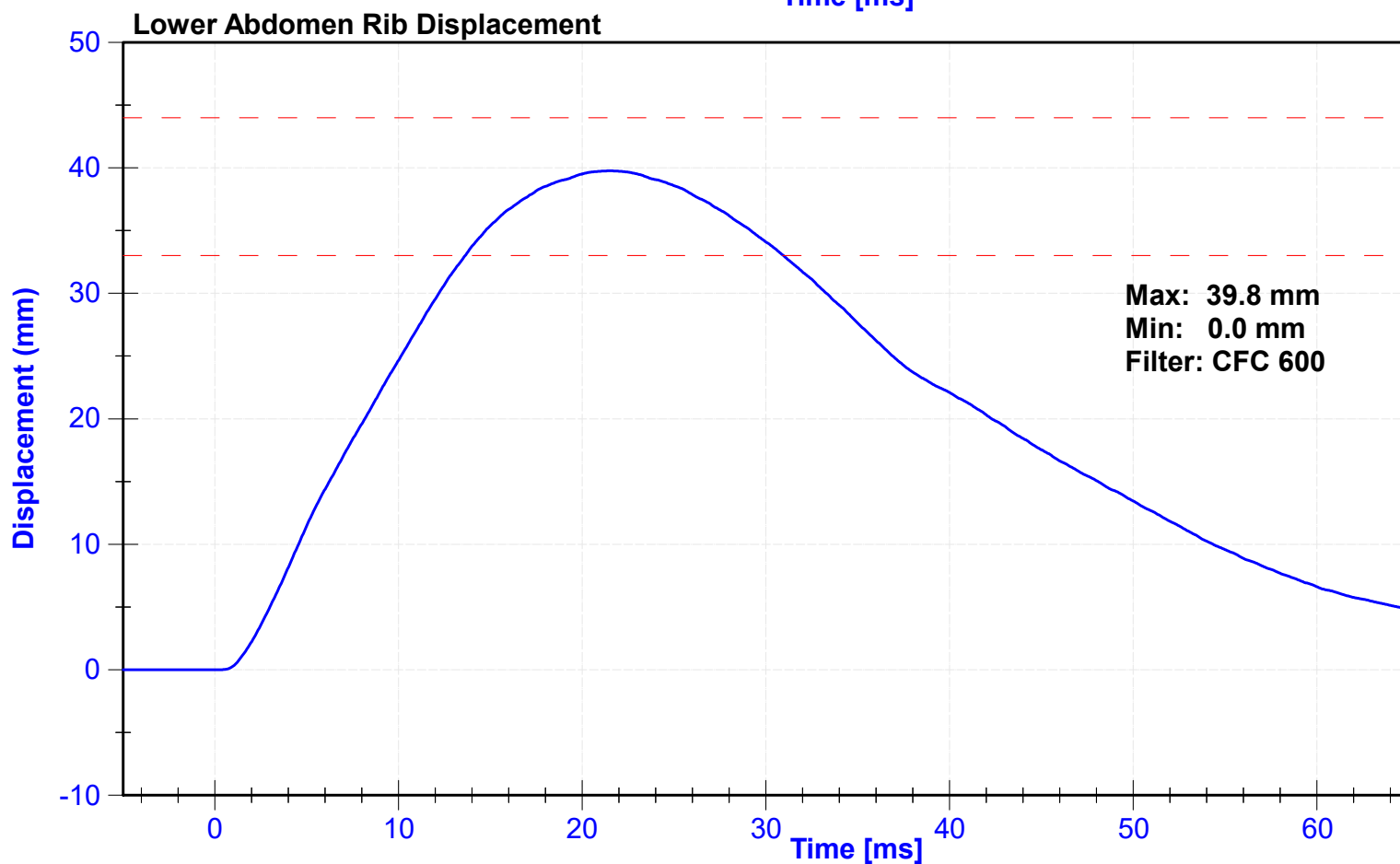
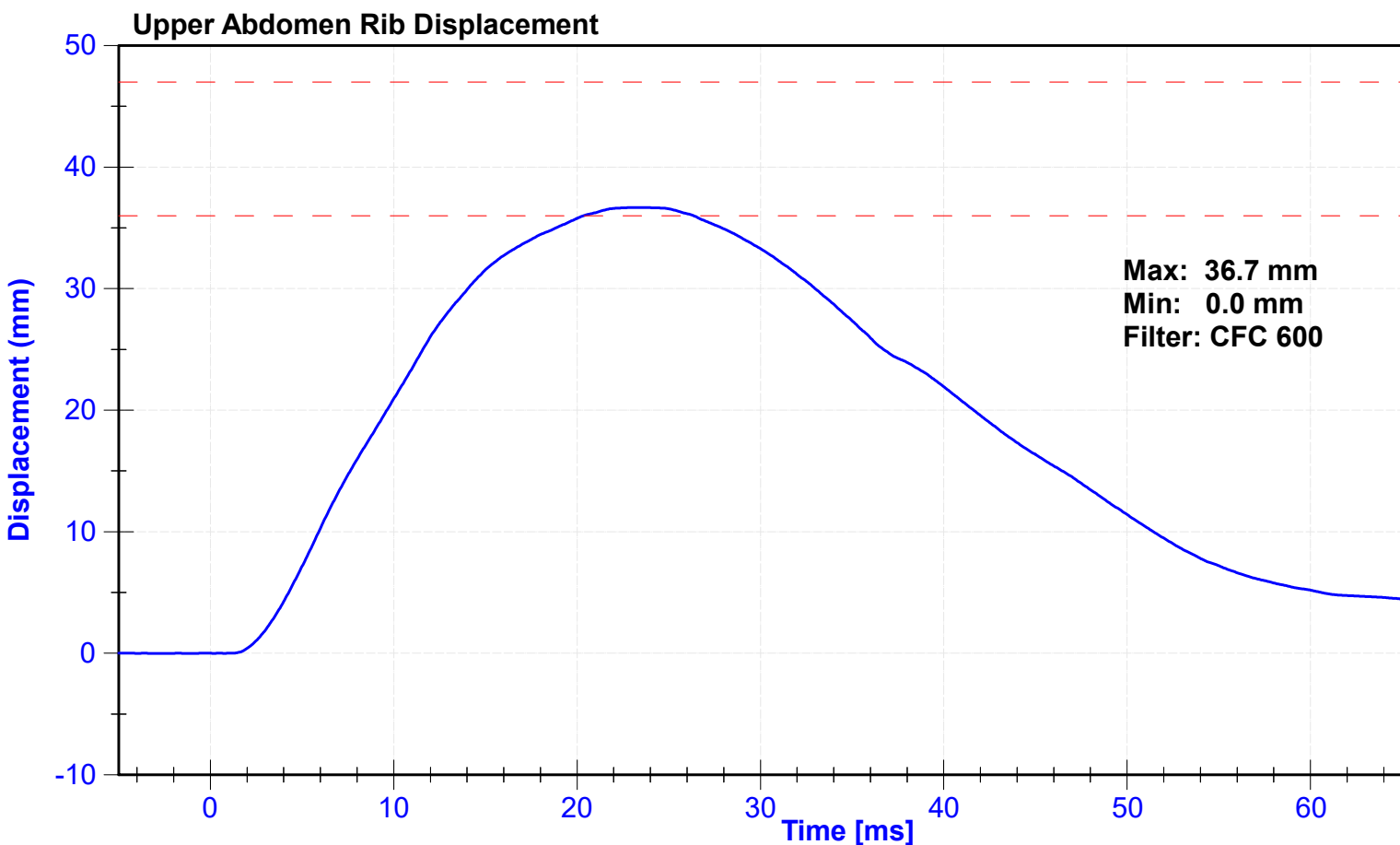
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Probe Acceleration	12	16	g's	14.2	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	36.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	39.8	Pass

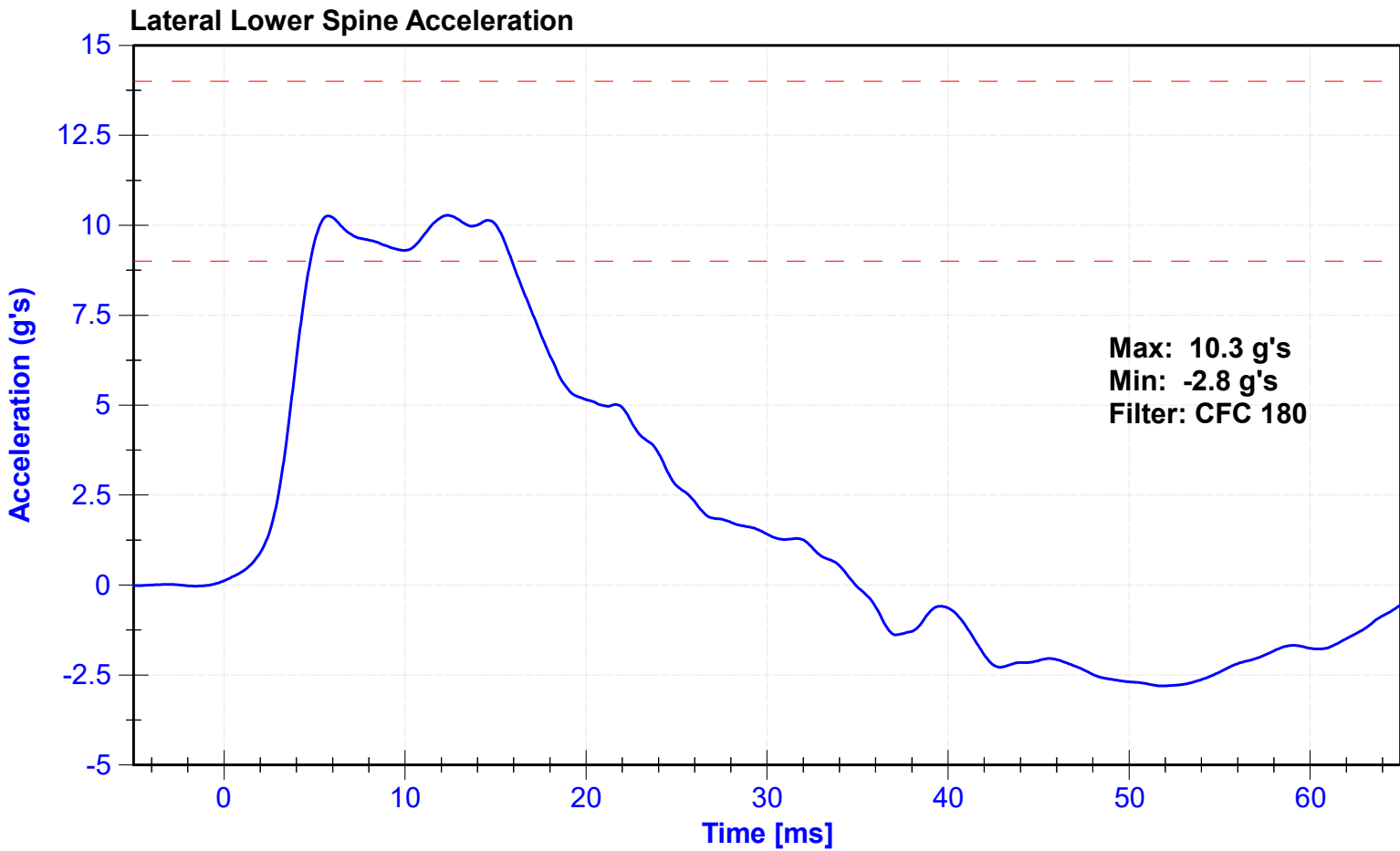
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Lower Spine Y Accelerometer	Endevco	T20906	10/8/2024	4/6/2025
Upper Abdomen Rib Potentiometer	Servo	DS-058GFE	10/8/2024	4/8/2025
Lower Abdomen Rib Potentiometer	Servo	1256GFE	10/8/2024	4/8/2025

Probe Acceleration







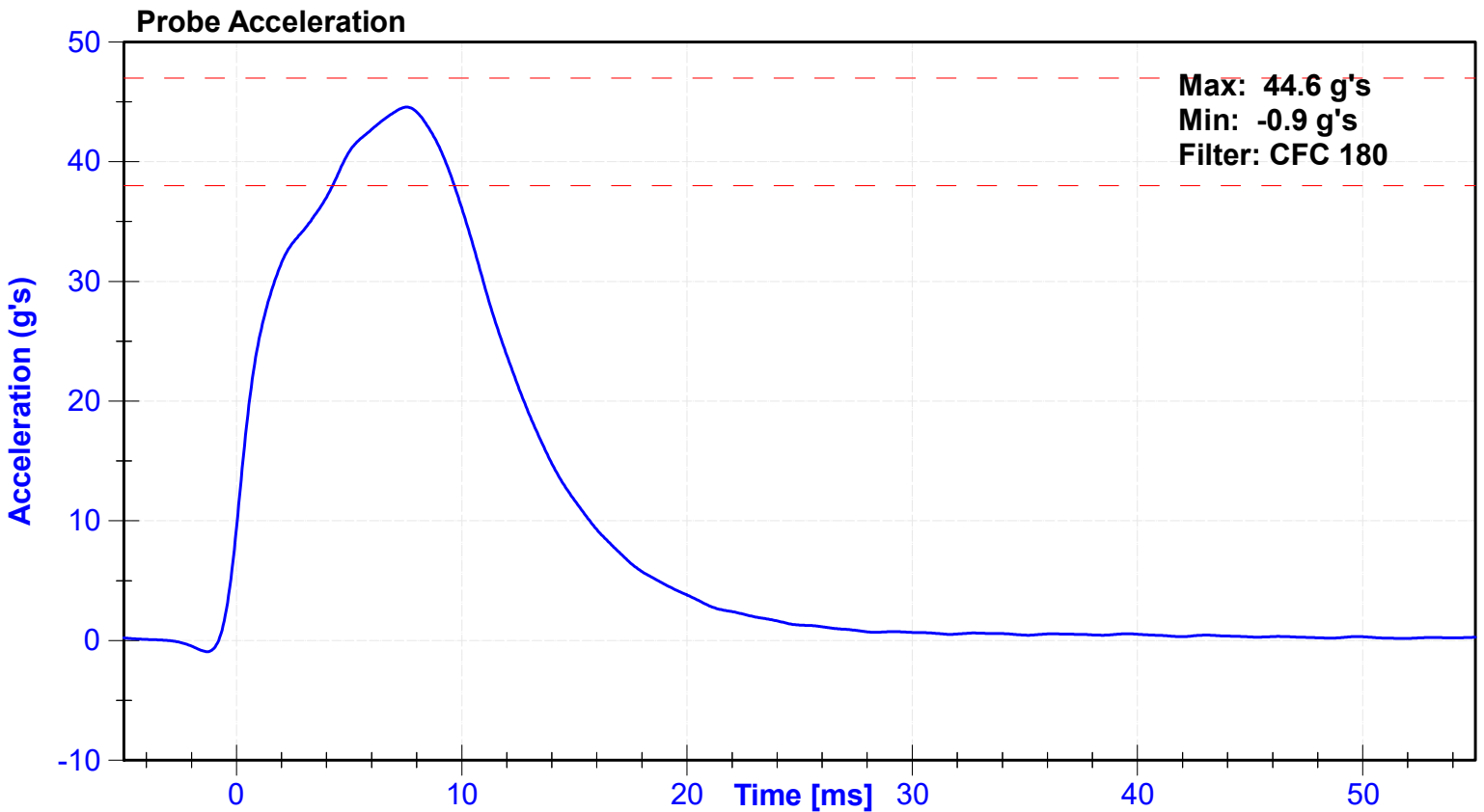
ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

Results

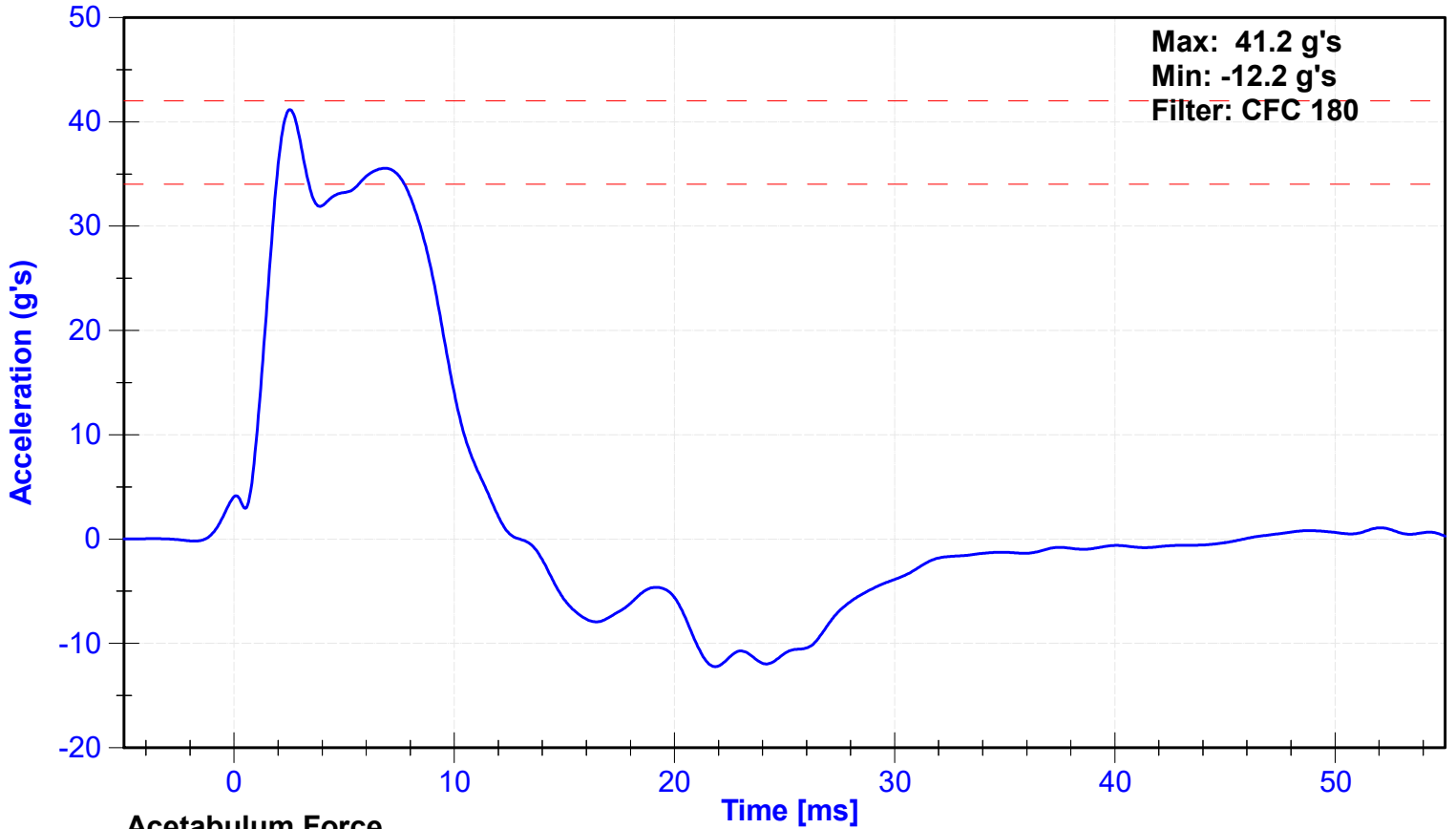
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	6.6	6.8	m/s	6.64	Pass
Probe Acceleration	38	47	g's	44.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	35.5	Pass
Acetabulum Force	3600	4300	N	4015.7	Pass

Transducer Calibrations

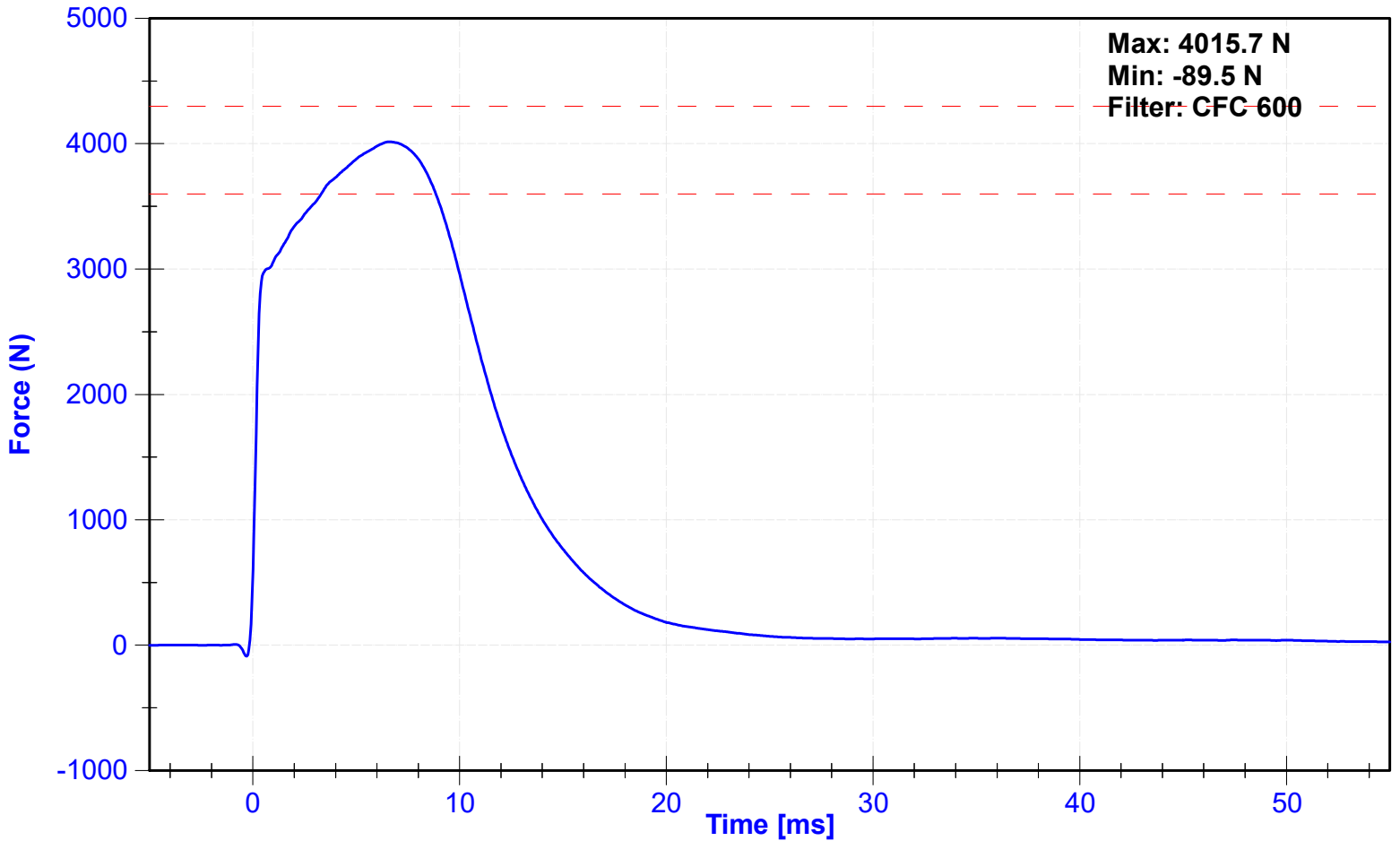
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Acetabulum Load Cell	Denton	267-FY	9/16/2024	9/16/2025
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

Plug S/N 16658
 Test Number 23433
 Report Number 23490
 Test Date 7/21/2022 11:40:19 AM

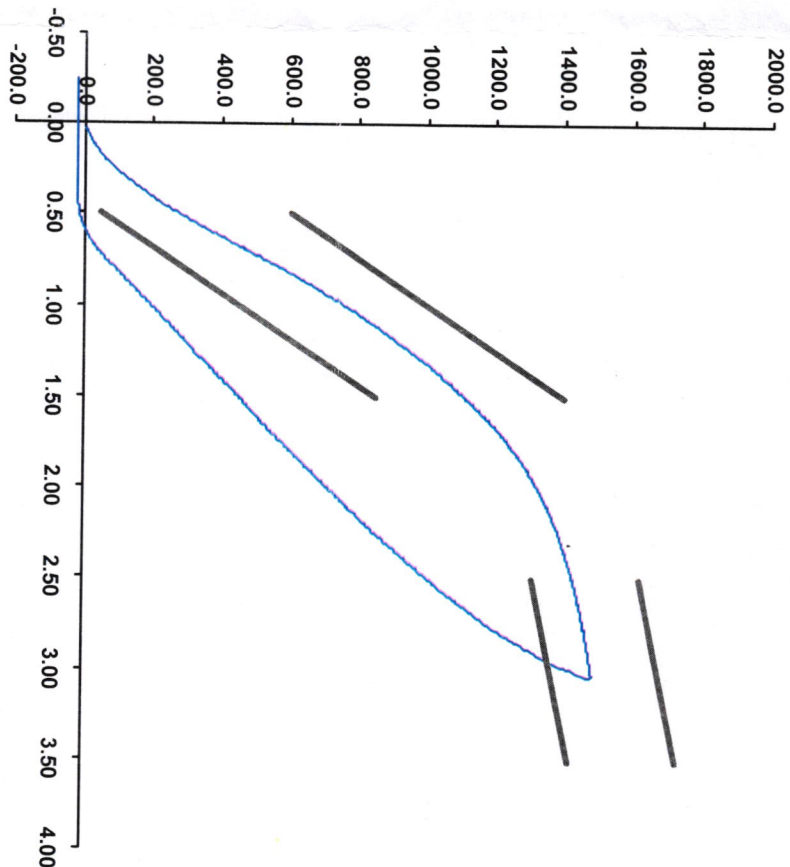
CENT 10/23/24

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
 Load Cell S/N (F1360947), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes: 224

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 21-Jul-22
 SACO Research

By: DC Date: 7/21/22

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



Non Impact 10/23/24

SID-IIs Pelvis Plug Certification Test

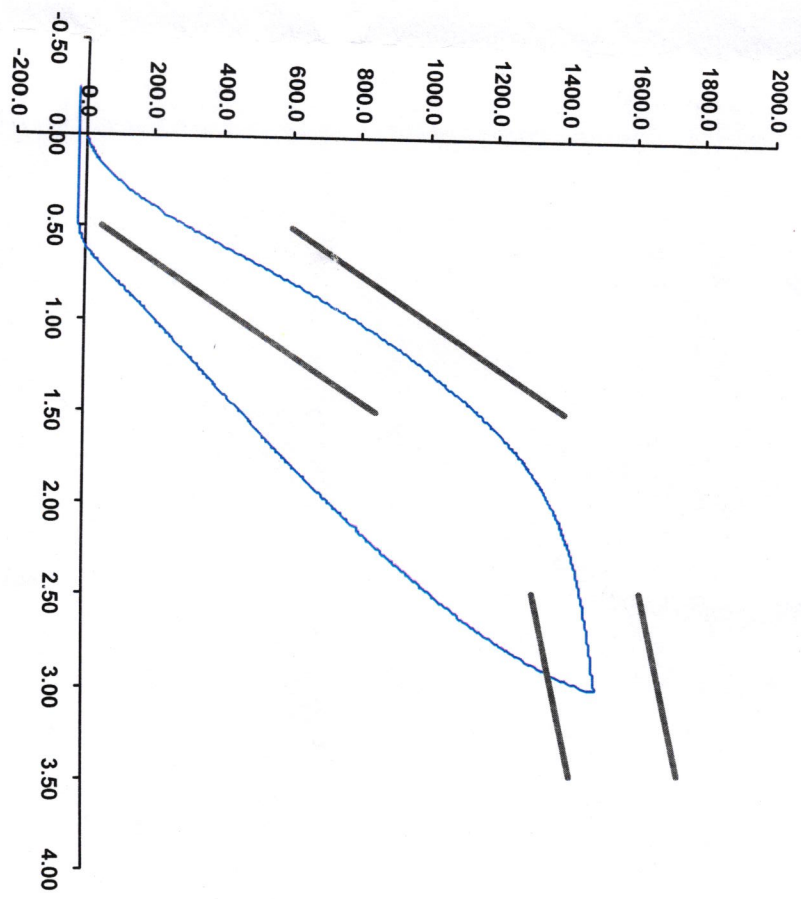
Plug S/N 16705
Test Number 23505
Report Number 23562
Test Date 7/22/2022 11:28:58 AM

Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
 Load Cell S/N (F1360947), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)

Notes: 224



Operator

Part Number 180-4450

Template No 107
SACO Research 22-Jul-22

By: DC

Date: 7/22/22

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



SID-11s Pelvis Plug Certification Test

Plug S/N 16704
Test Number 23504
Report Number 23561
Test Date 7/22/2022 11:27:45 AM

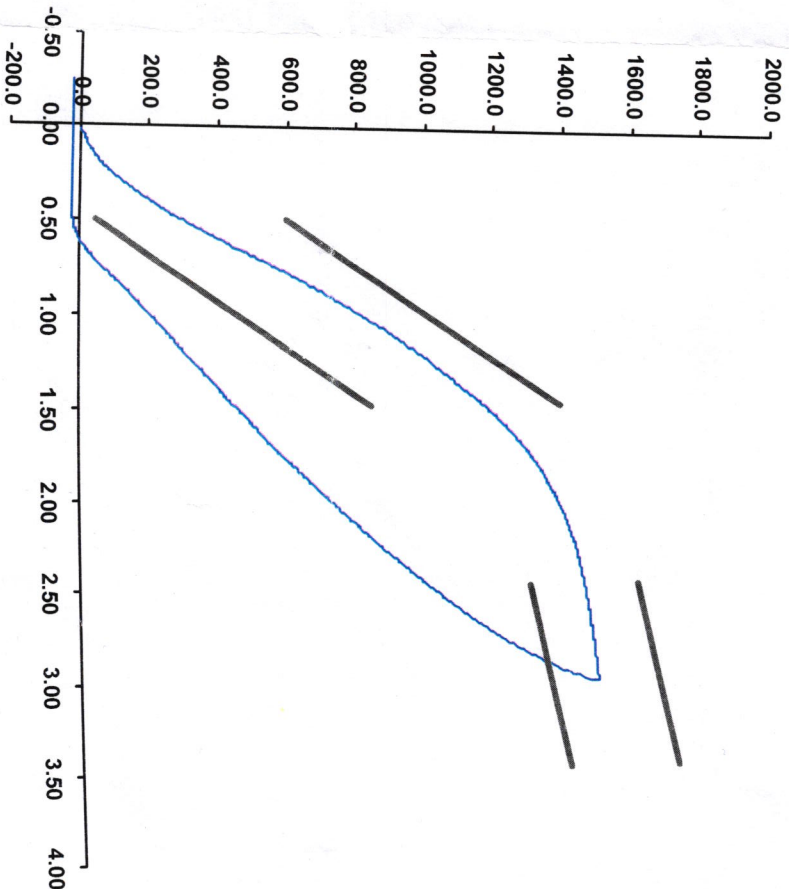
Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50	600
Force @ 1.5 mm (N)	850	1,400
Force @ 2.5 mm (N)	1,306	1,618
Force @ 3.0 mm (N)	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes: 224

Impact 7/24/24

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107
SACO Research 22-Jul-22

By: DC Date: 7/22/22

SACO Research 41735 Elm St. #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

ATD Manufacturer	Humanetics	Test Technician	K. Konieczny
ATD Serial Number	224	Laboratory Supervisor	C. Mantell

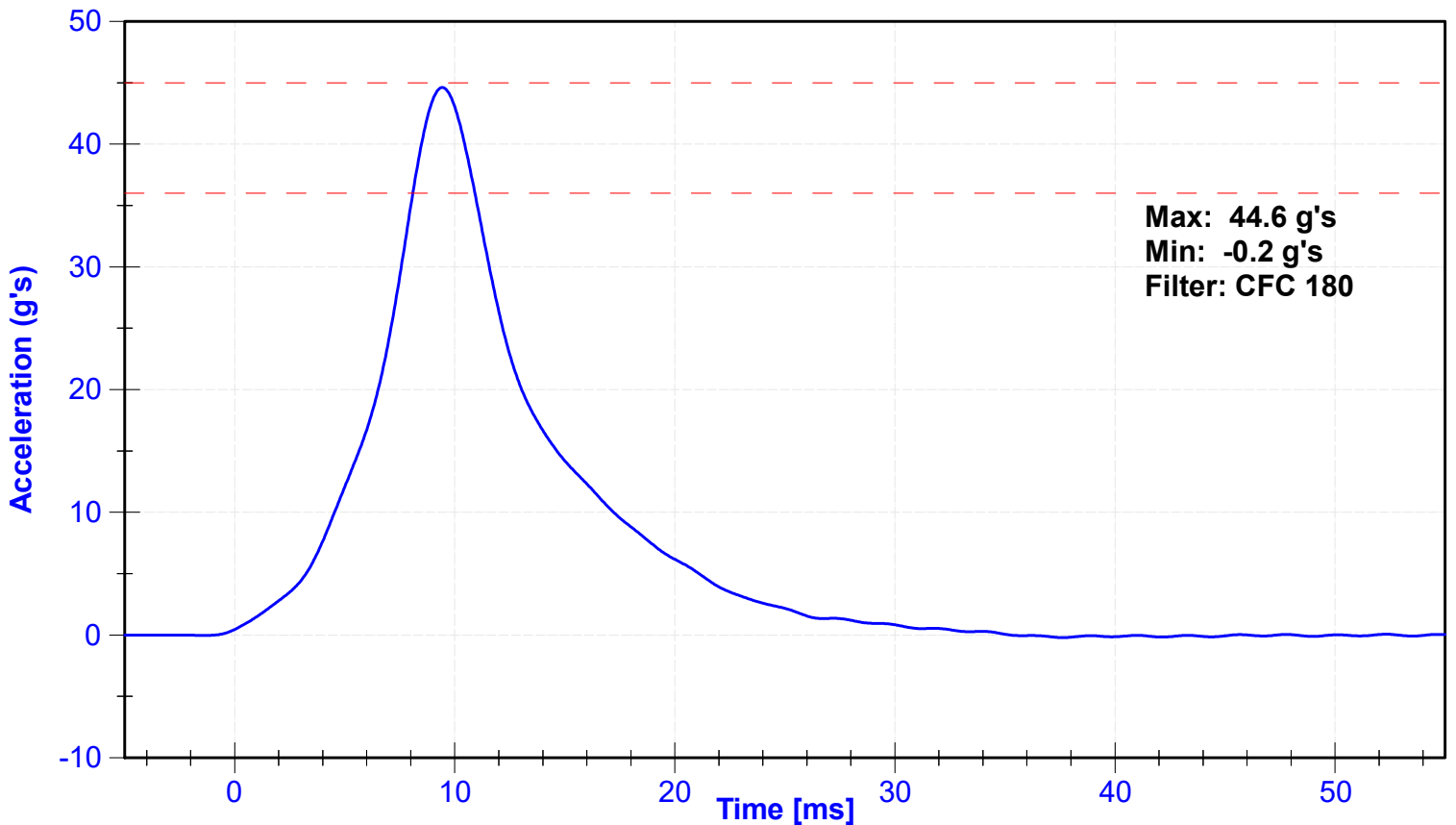
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40	Pass
Velocity	4.2	4.4	m/s	4.29	Pass
Probe Acceleration	36	45	g's	44.6	Pass
Lateral Pelvis Acceleration	28	39	g's	35.4	Pass
Iliac Force	4100	5100	N	4853.0	Pass

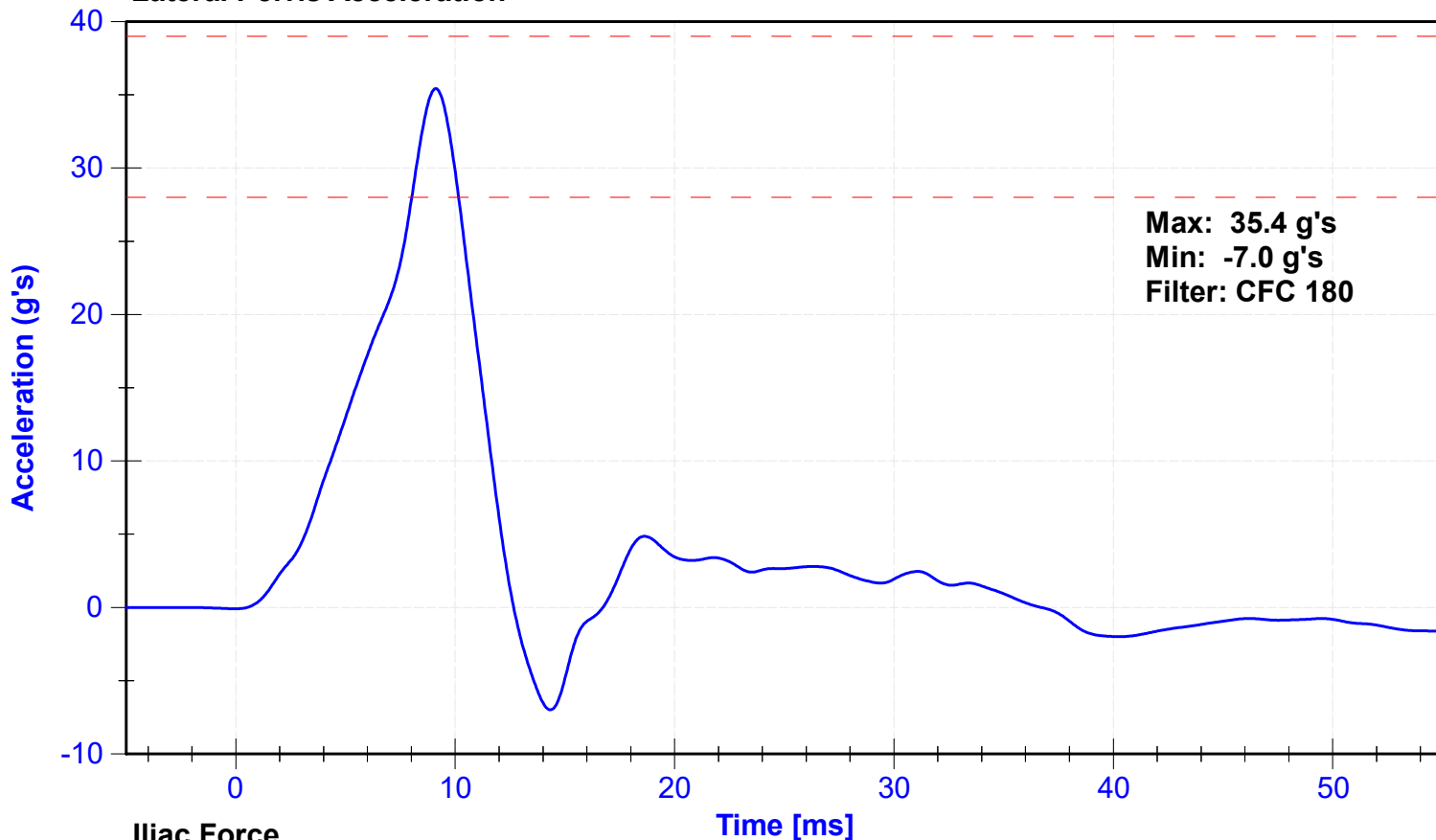
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18527	8/2/2024	1/29/2025
Pelvis Y Accelerometer	Endevco	P63987	10/8/2024	4/6/2025
Iliac Load Cell	Denton	280-FY	9/16/2024	9/16/2025

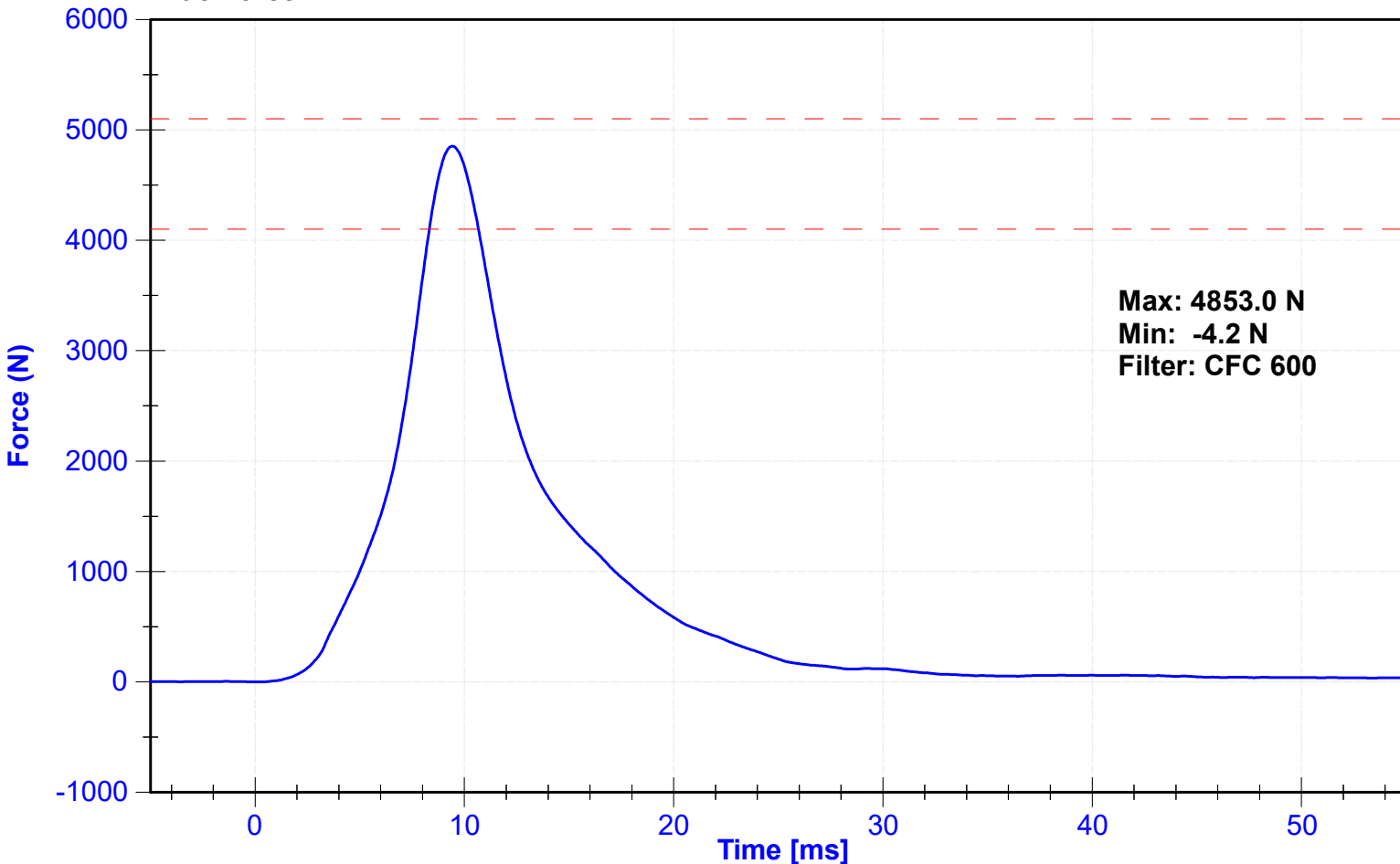
Probe Acceleration



Lateral Pelvis Acceleration



Iliac Force



APPENDIX VII

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

TABLE 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N D037		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	T21724	Endevco	10/08/2024
		Y	T22281	Endevco	10/08/2024
		Z	T26050	Endevco	10/08/2024
	Redundant	X	T21682	Endevco	10/08/2024
		Y	T25989	Endevco	10/08/2024
		Z	T25864	Endevco	10/08/2024
Thorax Rib Displacement Potentiometers	Upper	Y	0552-01	Honeywell	10/08/2024
	Middle	Y	807	Honeywell	10/08/2024
	Lower	Y	0552-03	Honeywell	10/08/2024
Abdomen Load Cells	Forward	Y	1512	Denton	09/16/2024
	Middle	Y	1526	Denton	09/16/2024
	Rear	Y	1516	Denton	09/16/2024
Lower Spine Accelerometers (T12)		X	P71278	Endevco	10/08/2024
		Y	18595	Endevco	10/08/2024
		Z	18509	Endevco	10/08/2024
Pubic Symphysis Load Cell		Y	464-FY	Denton	09/16/2024

TABLE 2 – Dummy Instrumentation (SID-IIs)

			SID-IIs S/N 224			
			Serial Number	Manufacturer	Calibration Date	
Head Accelerometers	Primary	X	P51884	Endevco	10/08/2024	
		Y	P73161	Endevco	10/08/2024	
		Z	P79588	Endevco	10/08/2024	
	Redundant	X	P74963	Endevco	10/08/2024	
		Y	P58864	Endevco	10/08/2024	
		Z	P52030	Endevco	10/08/2024	
Displacement Potentiometers	Thoracic Rib	Upper	Y	DS-049GFE	Servo	10/08/2024
		Middle	Y	080GFE	Servo	10/09/2024
		Lower	Y	076GFE	Servo	10/08/2024
	Abdominal Rib	Upper	Y	DS-058GFE	Servo	10/08/2024
		Lower	Y	1256GFE	Servo	10/08/2024
Lower Spine Accelerometers (T12)		X	P82326	Endevco	10/08/2024	
		Y	T20906	Endevco	10/08/2024	
		Z	T21176	Endevco	10/08/2024	
Acetabulum Load Cell		Y	267-FY	Denton	09/16/2024	
Iliac Wing Load Cell		Y	280-FY	Denton	09/16/2024	
Pelvis Plug (struck side)			16770	SACO	07/25/2022	
Pelvis Plug (non-struck side)			16771	SACO	07/25/2022	

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A399940	Measurement Specialties	09/19/2024
	Vehicle Center of Gravity	Y	A399946	Measurement Specialties	09/19/2024
	Vehicle Center of Gravity	Z	A431363	Measurement Specialties	09/19/2024
2	Right Sill at Front Seat	X	G25348	Endevco	09/26/2024
	Right Sill at Front Seat	Y	G25368	Endevco	09/26/2024
	Right Sill at Front Seat	Z	G25375	Endevco	09/26/2024
3	Right Sill at Rear Seat	X	G25249	Endevco	09/25/2024
	Right Sill at Rear Seat	Y	G25353	Endevco	09/25/2024
	Right Sill at Rear Seat	Z	G25363	Endevco	09/25/2024
4	Left Sill at Front Door	Y	G25988	Endevco	07/18/2024
5	Left Sill at Rear Door	Y	G25989	Endevco	07/18/2024
6	Left A-Post Lower	Y	G25992	Endevco	07/18/2024
7	Left A-Post Middle	Y	G25876	Endevco	06/04/2024
8	Left B-Post Lower	Y	G25983	Endevco	07/18/2024
9	Left B-Post Middle	Y	G25982	Endevco	07/18/2024
10	Front Seat Track	Y	G25874	Endevco	06/03/2024
11	Rear Seat Track or Structure	Y	G25877	Endevco	06/04/2024
12	Right Rear Occ. Compartment	Y	G25987	Endevco	07/18/2024
13	Rear Floorpan Above Axle	X	A373240	Measurement Specialties	09/25/2024
	Rear Floorpan Above Axle	Y	A373246	Measurement Specialties	09/25/2024
	Rear Floorpan Above Axle	Z	A374360	Measurement Specialties	09/25/2024

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle CG Acceleration vs. Time	X	A374299	Measurement Specialties	08/01/2024
Vehicle CG Acceleration vs. Time	Y	A399983	Measurement Specialties	08/01/2024
Vehicle CG Velocity vs. Time	Y	Calculated	Measurement Specialties	08/01/2024
Vehicle CG Acceleration vs. Time	Z	G23881	Endevco	08/01/2024
Vehicle CG Velocity vs. Time	Z	Calculated	Endevco	08/01/2024
Vehicle CG Resultant Acceleration vs. Time	R	Calculated	Measurement Specialties	08/01/2024