

REPORT NUMBER: 214D-CAL-24-003

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

**General Motors LLC
2024 Cadillac Lyriq
5 Door SUV**

NHTSA No: C20240111

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



June 04, 2024

FINAL REPORT

**PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE. S.E.
WEST Bldg. (NEF-240)
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Administration, in response to Contract Number 693JJ923D000043.

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Date: June 04, 2024

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Date: June 04, 2024

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by

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 Cadillac Lyriq 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 May 21, 2024. The impact velocity of the Moving Deformable Barrier (MDB) was 53.04 kph, and the ambient temperature at the struck (driver side) of the target vehicle at the time of impact was 21°C. The target vehicle post-test maximum crush was 166 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Measurement Description</th> <th colspan="3" style="text-align: center;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td style="text-align: center;">1000</td> <td style="text-align: center;">38.974</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">19.779</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">622.378</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">882.625</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Measurement Description</th> <th colspan="3" style="text-align: center;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC36)</td> <td></td> <td style="text-align: center;">1000</td> <td style="text-align: center;">76.747</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td style="text-align: center;">G</td> <td style="text-align: center;">82</td> <td style="text-align: center;">25.375</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38</td> <td style="text-align: center;">5.188</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45</td> <td style="text-align: center;">10.682</td> </tr> </tbody> </table>				Measurement Description	Driver ATD (ES-2re)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	38.974	Maximum Thoracic Rib Deflection	mm	44	19.779	Total Abdominal Force	N	2500	622.378	Pubic Symphysis Force	N	6000	882.625	Measurement Description	Passenger ATD (SID-IIs)			Units	IARV	Result	Head Injury Criteria (HIC36)		1000	76.747	Lower Spine Resultant Acceleration	G	82	25.375	Maximum Thoracic Rib Deflection	mm	38	5.188	Maximum Abdominal Rib Deflection	mm	45	10.682
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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 FMVSS 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 Cadillac Lyriq 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 Cadillac Lyriq 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 53.04 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 May 21, 2024. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies are included in this report.

Test dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OVSC Test Procedure, dated September 2012. The side impact event was documented by 9 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-ILs 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
Head Injury Criteria (HIC36)		1000	38.974	Pass
Upper Rib Deflection	mm	44	11.070	Pass
Mid Rib Deflection	mm	44	15.527	Pass
Lower Rib Deflection	mm	44	19.779	Pass
Abdominal Load (front)	N		192.131	
Abdominal Load (mid)	N		221.041	
Abdominal Load (rear)	N		217.790	
Total Abdominal Force	N	2500	622.378	Pass
Pubic Symphysis Force	N	6000	882.625	Pass

INJURY READINGS

SIDIIIs Injury Criteria	Units	Max. Allowable IARV	Measured Value	Pass/Fail
Head Injury Criteria (HIC36)		1000	76.747	Pass
Lower Spine Resultant Acceleration	G	82	25.375	Pass
Acetabulum Force	N		1365.843	
Iliac Force	N		82.542	
Sum of Acetabular and Iliac	N	5525	1346.681	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 Cadillac Lyriq 5 Door SUV

NHTSA No.: C20240111

Test Facility: Calspan

Test Date: 05/21/2024

TEST VEHICLE INFORMATION AND OPTIONS

Make	Cadillac	Anti-Lock Brakes (ABS)	Yes
Model	Lyriq	All-Wheel Drive (AWD)	No
Body Style	5 Door SUV	Traction Control System (TCS)	Yes
VIN	1GYKPRRK0RZ104312	Electric Stability Control (ECS)	Yes
Body Color	Emerald Lake Metallic	Curtain Airbags	Yes
Engine Displacement (L)	N/A	Torso Airbags – Front Seats	Yes
Type / No. Cylinders	Electric Vehicle	Torso Airbags – Rear Seats	No
Engine Placement	N/A	Combination/Head Torso Bag	No
Transmission Type	Automatic	Pelvic Airbag – Front Seats	No
Transmission Speeds	Direct Drive	Pelvis Airbag – Rear Seats	No
Overdrive	N/A	Knee Airbag – Driver	Yes
Final Drive	Rear Wheel Drive	Knee Airbag – Front Passenger	Yes
Odometer Reading	175 miles	Seat Belt Pretensioners – Front Seats	Yes
		Seat Belt Pretensioners – Rear Seats	Yes
		Seat Belt Load Limiter – Front Seats	Yes
		Seat Belt Load Limiter – Rear Seats	Yes
		Tire Pressure Monitoring System (TPMS)	Yes
		Tilt Steering Wheel	Yes
		Automatic Door Locks (ADL)	Yes
		Power Window Auto-reverse	Yes
		Power Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC	GVWR (kg)	3050
Date of Manufacture	08/23	GVWR Front (kg)	1550
Vehicle Type	MPV	GVWR Rear (kg)	1700

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats (Bench or Bucket)	Bucket	Split Bench	N/A	
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				475

DATA SHEET NO. 1 ... (CONTINUED)

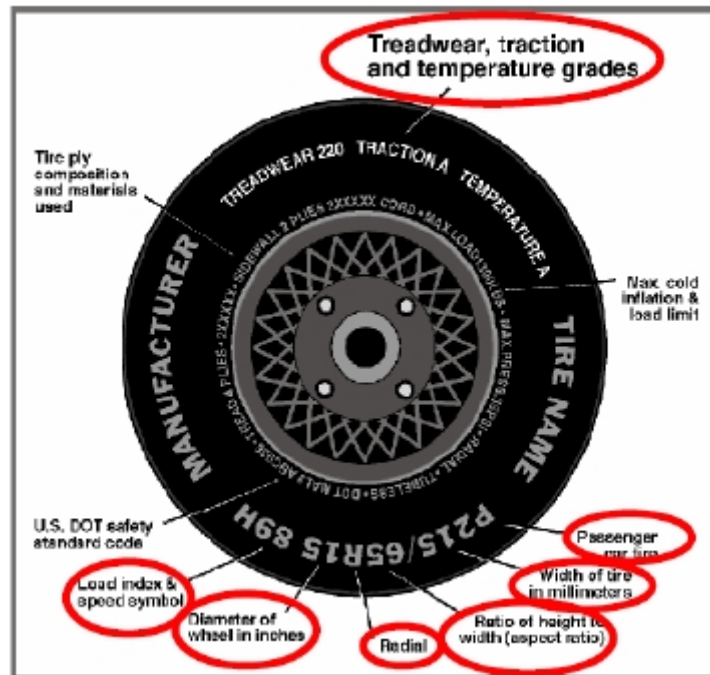
VEHICLE TIRE INFORMATION

Test Vehicle:	2024 Cadillac Lyriq 5 Door SUV
Test Facility:	Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

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)	290	290
Recommended Tire Size	265/50R20	265/50R20
Tire Sidewall	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Tire Size on Vehicle	265/50R20	265/50R20
Tire Manufacturer Model	Michelin	Michelin
Tire Name	Primacy	Primacy
Tire Type	All Season	All Season
Tire Width	265	265
Aspect Ratio	50	50
Radial	Yes	Yes
Wheel Diameter	20"	20"
Load Index / Speed Symbol	107H	107H
Treadwear	540	540
Traction Grade	A	A
Temperature Grades	A	A

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	298	297	298	297
Tire Placard	kPa	290	290	290	290

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			Fully Loaded			As Tested		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	619	661		672	778		668	781	
Right	kg	613	352		618	745		622	733	
Ratio	%	48.4	51.6		45.9	54.1		46.0	54.0	
Totals	kg	1232	1313	2545	1290	1523	2813	1290	1514	2804

TARGET TEST WEIGHT (TVTW) CALCULATION

Measured Parameter	Units	Value	
As Delivered Weight (UVW)	kg	2545	(A)
Weight of 2 P572 ATDs	kg	131	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	134.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2810.8	(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	882	886	4	Yes
Right Front	888	884	4	Yes
Left Rear	880	885	5	Yes
Right Rear	886	882	4	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".

MDB IMPACT POINT DATA

Measured Parameter	Distance (mm)	Met Requirement
Test Vehicle Wheelbase	3094	
Target Vertical Impact Reference Line Aft of Front Axle	508	Yes
Actual Impact Point Location (fore-aft, above - below)	+2 / -12	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	20
Rear Speaker	2
High Voltage Charger	4
Ballast (if any)	90

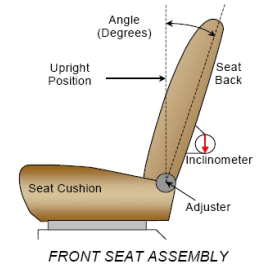
DATA SHEET NO. 3
SEAT AND SEAT BELT ANCHORAGE ADJUSTMENT DATA

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

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	40.6	Power	0.35	Power
Front Passenger Seat	40.5	Power	0.0	Power

*Measured on seat back per Form 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	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	14.7	4	Max	63	67	70
			Mid	32	36	39
			Min	0	4	7
Front Passenger Seat	14.0	4	Max	63	66	70
			Mid	32	35	39
			Min	0	4	7

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	259	Power	129.5	Power
Front Passenger Seat	258	Power	129	Power

SEAT BELT ANCHORAGE ADJUSTMENT

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

HEAD RESTRAINT ADJUSTMENT

Seat	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	Uppermost
Rear Seat	2 (0-1)	Lowermost

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

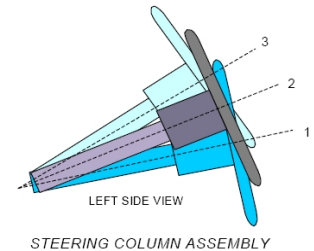
Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024

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.

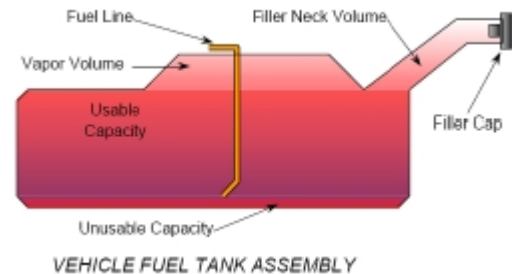
	Degrees	Fore / Aft Position (mm)
Lowermost - Position No. 1	17.2	
Geometric center - Position No. 2	19.3	
Uppermost - Position No. 3	21.3	
Telescoping Steering Wheel Travel		53
Test Position	19.3	26.5



FUEL PUMP

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

The vehicle is an electric vehicle. The charge port is on the left front side of the vehicle.



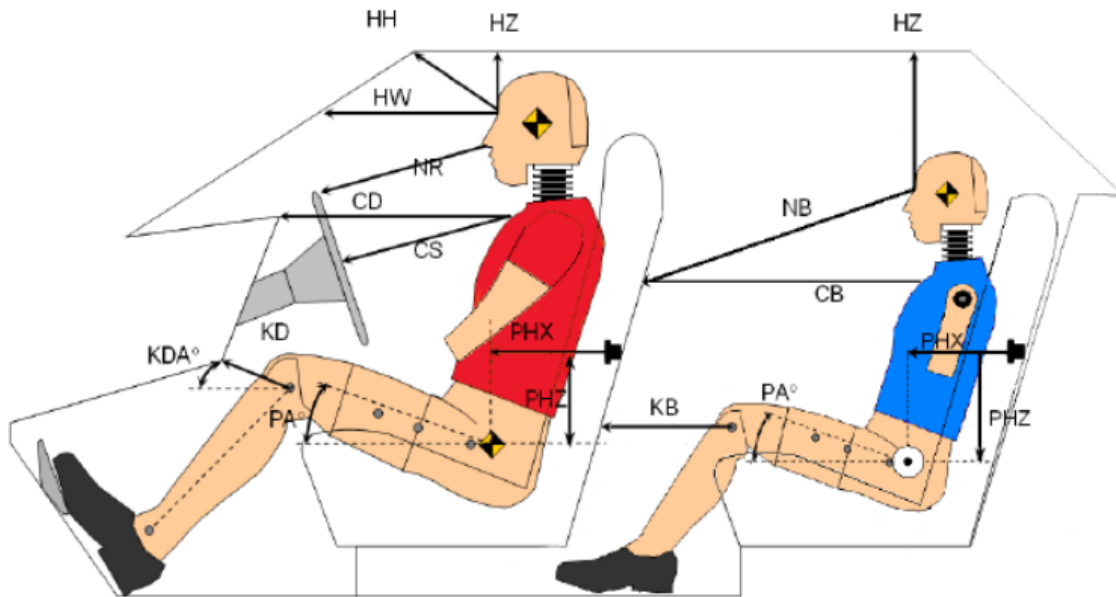
FUEL TANK CAPACITY

Description	Liters
Usable Capacity of - Form No.1	
Usable Capacity of - Owner's Manual	
92 - 94% of Usable Capacity	
Actual Amount of Solvent Used in Test	Electric Vehicle

DATA SHEET NO. 5
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024



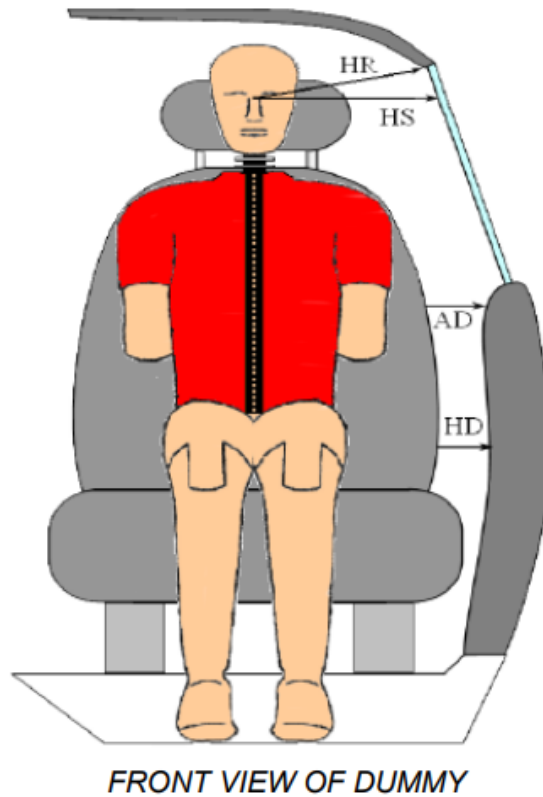
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Code	Pass. Code	Description	ES2-re		SID-IIs	
			Length (mm)	Angle	Length (mm)	Angle
HH		Head to Header	395			
HW		Head to Windshield	695			
HZ	HZ	Head to Roof Liner	224		297	
NR	NB	Nose to Rim	445		573	
CD	CB	Chest to Dash	645		564	
CS		Chest to Steering Wheel	430			
KD(L) / KDA(L)°	KB(L) / KBA(L)°	Left Knee to Dash	257	29.1	305	40.8
KD(R) / KDA(R)°	KB(R) / KBA(R)°	Right Knee to Dash	250	32.5	304	43.7
PA°	PA°	Pelvic Tilt Angle (X-Axis)		19.9		21.8
PHX	PHX	Hip Point to Striker (X-Axis)	196		205	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	144		234	

DATA SHEET NO. 6
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024



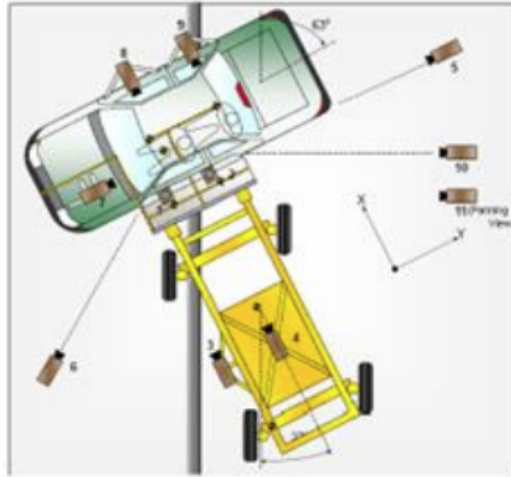
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Front Occupant	Rear Occupant
HR	Head to Side Header	mm	200	253
HS	Head to Side Window	mm	351	412
AD	Arm to Door	mm	92	174
HD	Hip Point to Door	mm	160	173

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

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024



CAMERA LOCATIONS AND DATA

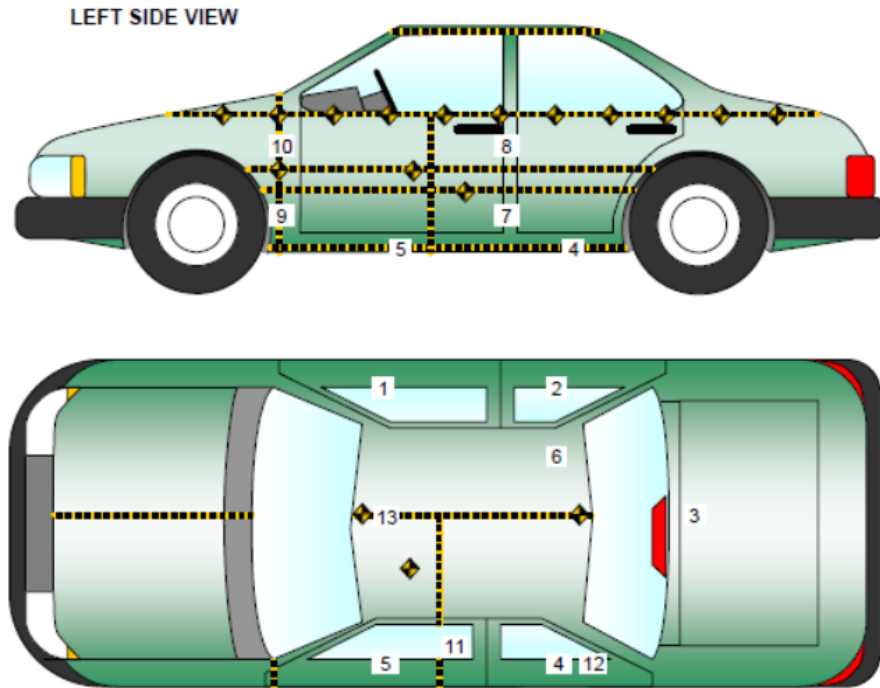
No.	Camera View	Location (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	0	0	-8241	12.5	1000
2	Overhead Close-up	0	0	-8241	24	1000
3	Impact Point Close-up				25	1000
4	Centerline of Impact (MDB)				8	1000
5	Right Side View	0	8885	-1521	28	1000
6	Left Side View	-2652	-5685	-1599	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	30

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 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Left (or Rt.) Sill at Front Seat	2994	706	211
2	Left (or Rt.) Sill at Rear Seat	2009	706	213
3	Rear Floorpan Above Axle	665	5	44
4	Left (or Rt.) Sill at Front Door	2001	-703	235
5	Left (or Rt.) Sill at Rear Door	3074	-703	233
6	Left (or Rt.) Rear Occ. Compartment	2179	451	278
7	Left (or Rt.) B-Post Lower	2293	-710	-36
8	Left (or Rt.) B-Post Middle	2224	-696	-403
9	Left (or Rt.) A-Post Lower	3448	-674	-39
10	Left (or Rt.) A-Post Middle	3308	-697	-507
11	Front Seat Track	2473	-581	200
12	Rear Seat Track or Structure	1842	238	178
13	Vehicle CG	2021	-22	254

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 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

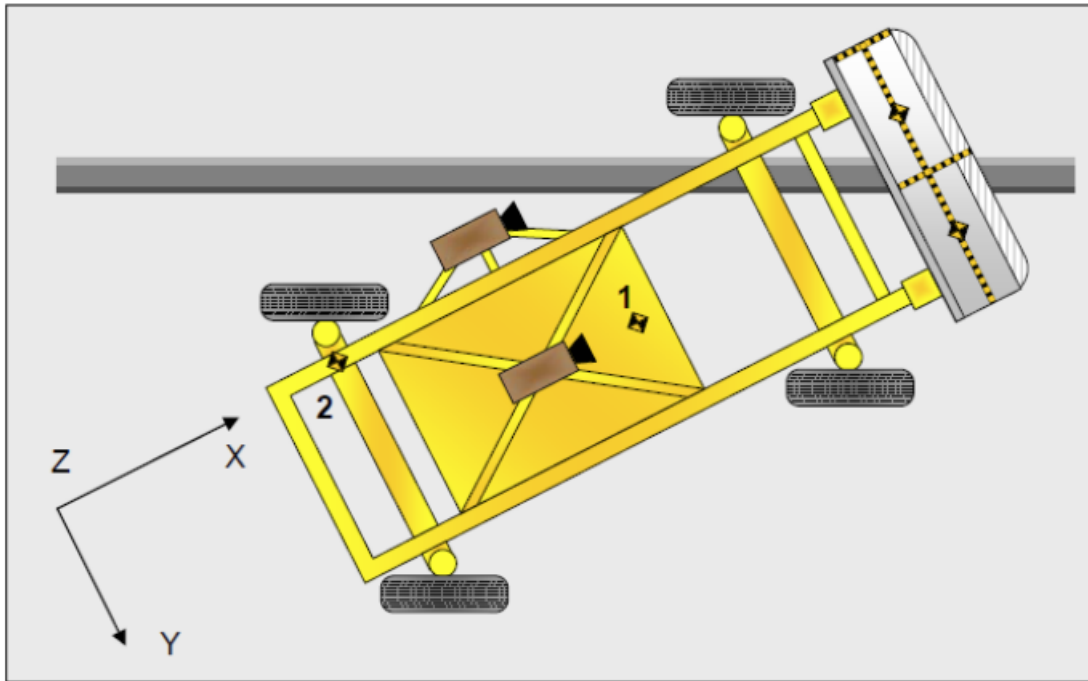
NHTSA No.: C20240111
Test Date: 05/21/2024

Loc. No	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Min	Time (ms)
1	Left (or Rt.) Sill at Front Seat	X	g	2.22	55.05	-4.06	27.20
	Left (or Rt.) Sill at Front Seat	Y	g	12.47	22.15	-1.84	108.65
	Left (or Rt.) Sill at Front Seat	Z	g	2.24	65.15	-5.51	11.25
	Left (or Rt.) Sill at Front Seat Resultant	N/A	g	12.71	22.40	0.02	-46.65
2	Left (or Rt.) Sill at Rear Seat	X	g	1.54	56.25	-5.71	27.30
	Left (or Rt.) Sill at Rear Seat	Y	g	13.49	9.10	-1.52	291.60
	Left (or Rt.) Sill at Rear Seat	Z	g	3.30	58.85	-11.37	22.50
	Left (or Rt.) Sill at Rear Seat Resultant	N/A	g	17.56	22.55	0.01	-23.90
3	Rear Floor Pan Above Axle	X	g	1.12	59.70	-3.00	32.25
	Rear Floor Pan Above Axle	Y	g	13.50	9.65	-1.71	150.60
	Rear Floor Pan Above Axle	Z	g	3.00	20.60	-3.84	9.70
	Rear Floor Pan Above Axle Resultant	N/A	g	14.08	9.60	0.04	-10.65
4	Left (or Rt.) Sill at Rear Door	Y	g	14.08	14.55	-1.48	290.40
5	Left (or Rt.) Sill at Front Door	Y	g	31.97	40.40	-14.13	43.50
6	Left (or Rt.) Rear Occ. Compartment	Y	g	12.70	8.80	-2.07	136.65
7	Left (or Rt.) B-Post Lower	Y	g	151.94	18.00	-62.52	13.20
8	Left (or Rt.) B-Post Middle	Y	g	130.85	14.95	-116.23	22.60
9	Left (or Rt.) A-Post Lower	Y	g	254.36	58.90	-168.43	54.40
10	Left (or Rt.) A-Post Middle	Y	g	72.08	36.85	-46.94	30.65
11	Front Seat Track	Y	g	13.77	25.00	-1.40	291.20
12	Rear Seat Track or Structure	Y	g	12.98	8.70	-1.78	144.70
13	Vehicle CG	X	g	1.45	63.00	-4.70	22.30
	Vehicle CG	Y	g	12.18	8.45	-1.78	118.55
	Vehicle CG	Z	g	10.07	10.95	-4.77	16.05
	Vehicle CG Resultant	N/A	g	13.41	10.70	0.04	-32.70

DATA SHEET NO. 10
MDB ACCELEROMETER LOCATIONS DATA SUMMARY

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024



MDB ACCELEROMETER LOCATIONS

Loc No.	Description	Axes	Units	Peak Values (g's)			
				Max	Time (ms)	Min	Time (ms)
1	MDB CG	X	g	1.31	153.95	-23.67	34.50
		Y	g	1.35	65.30	-5.73	47.90
		Z	g	15.16	34.95	-19.49	27.30
		Resultant		28.56	34.85	0.00	-42.40
2	MDB Rear	Y	g	2.54	128.80	-25.15	37.50
		Z	g	3.46	28.60	-3.97	63.40

DATA SHEET NO. 11
MDB SUMMARY OF RESULTS

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

MDB SPECIFICATIONS

Measurement Description	Requirement	Value
Overall Width of Framework Carriage	1241- 1261	1250
Overall Length Including Honeycomb Frame	4140 - 3990	4120
Wheelbase of Framework Carriage	2566 -2616	2600
CG Location of Front Axle		1120
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	53.04
Trap No. 2 Velocity (Redundant)	km/h	52.1 to 53.7	53.15
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	500	Right	231
B	Top of Bumper	533	800	Left	154
C	Mid-Level	686	800	Left	123
D	Top of Stack	813	800	Left	140

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+2
Vertical Offset (- down / + up)	mm	+/- 20 of Intended Impact Point	-12

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

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV NHTSA No.: C20240111
Test Facility: Calspan Test Date: 05/21/2024

Dummy Serial No. D037

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	4.41	227.80	-10.34	68.60
Lateral	Y	24.43	52.90	-4.97	271.00
Vertical	Z	10.34	23.35	-4.91	71.30
Resultant	N/A	25.25	52.15		
HIC36 (t1, t2)	N/A	38.97		t1 = 44.25	t2 = 72.00
THORAX DEFLECTION (mm)					
Upper Rib	Y	11.07	52.05	-6.04	26.10
Middle Rib	Y	15.53	46.00	-0.07	86.55
Lower Rib	Y	19.78	45.60	0.00	-15.00
ABDOMINAL FORCES (N)					
Front	Y	192.13	36.85	-25.21	16.45
Middle	Y	221.04	42.35	-9.53	104.85
Rear	Y	217.79	45.00	-8.14	213.40
SUM	N/A	622.38	45.05		
PELVIS FORCES (N)					
Pubic Symphysis	Y	251.32	218.35	-882.63	63.35

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

DATA SHEET NO. 13
DUMMY INJURY RESPONSE DATA
(Subpart V, SIDIIIs)

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV NHTSA No.: C20240111
Test Facility: Calspan Test Date: 05/21/2024

Dummy Serial No. 261

Description	Axes	Positive Direction		Negative Direction	
		MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)					
Longitudinal	X	4.22	218.15	-5.41	62.50
Lateral	Y	29.15	78.20	-11.97	219.45
Vertical	Z	3.48	220.10	-5.80	73.70
Resultant	N/A	29.90	77.40		
HIC36 (t1, t2)	N/A	76.75		t1 = 65.10	t2 = 92.95
LOWER SPINE (g)					
Longitudinal	X	7.96	82.20	-7.02	61.20
Lateral	Y	24.87	70.75	-4.99	252.00
Vertical	Z	2.97	105.30	-3.14	69.00
Resultant	N/A	25.38	70.65	0.01	-22.90
PELVIS FORCES (N)					
Acetabular	Y	1365.84	72.95	-33.56	115.00
Iliac	Y	82.54	54.10	-78.04	84.15

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

DATA SHEET NO. 14
POST-TEST OBSERVATIONS

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Occupant	Rear Occupant
Face Contact	Curtain Airbag & Side Header	None
Top of Head Contact	Side Header	Curtain Airbag
Left Side of Head Contact	Curtain Airbag & Side Header	Curtain Airbag
Back of Head Contact	Curtain Airbag, Side Header, and Head Restraint	Center Rear Head Restraint
Left Shoulder Contact	Curtain Airbag	Door Trim
Upper Torso	Torso/Pelvis Airbag & Seat Back	C-Pillar Trim & Door Trim
Lower Torso	Torso/Pelvis Airbag & Seat Back	Door Trim
Left Knee Contact	None	Door Trim
Left Hip Contact	Torso/Pelvis Airbag	Seat Pan & Door Trim

POST-TEST DOOR PERFORMANCE

Description	Front	Rear
Left Side Doors	Jammed Shut	Jammed Shut
Right Side Doors	Remained Closed & Operational	Remained Closed & Operational
Hatch and Other Doors	N/A	Remained 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

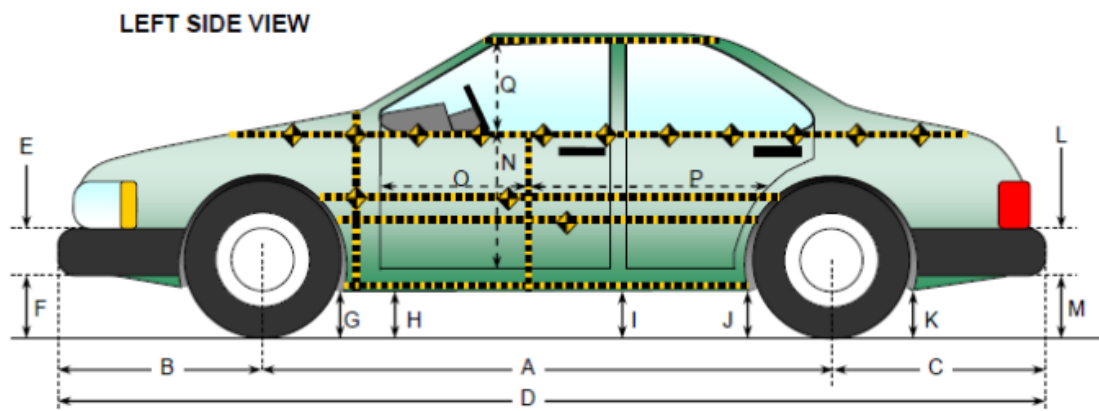
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 15
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024



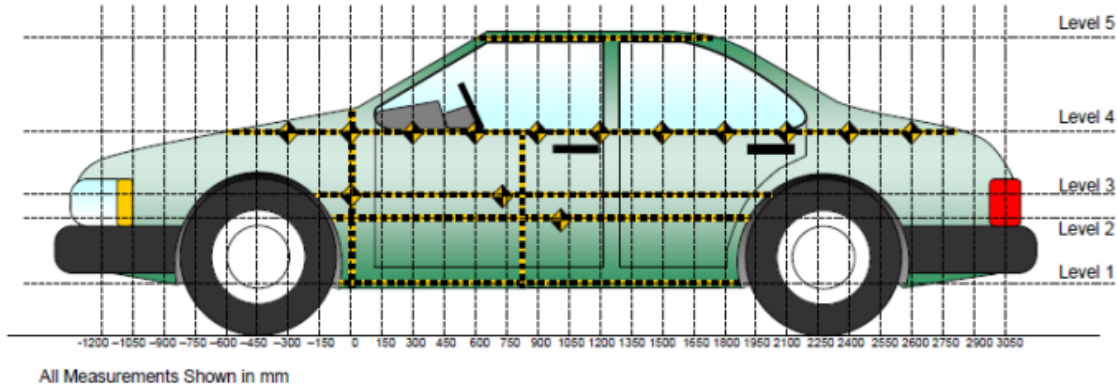
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code.	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3094	3097	3
B	Front Axle to FSOV	898	897	-1
C	Rear Axle to RSOV	1001	1001	0
D2	Total Vehicle Length at Centerline	4996	4996	-1
E	Front Bumper Thickness	115	115	0
F	Front Bumper Bottom to Ground	464	470	6
G	Sill Height at Front Wheel Well	224	231	7
H	Sill Height at Front Door Leading Edge	230	232	2
I	Sill Height at B Pillar	231	234	3
J1	Sill Height at Rear Wheel Well	223	225	2
J2	Pinch Weld Height at Rear Wheel Well	212	215	3
K	Sill Height Aft of Rear Wheel Well	276	279	3
L	Rear Bumper Thickness	90	90	0
M	Rear Bumper Bottom to Ground	529	528	-1
N	Sill Height to Window Bottom of Front Window Sill	901	881	-20
O	Front Door Leading Edge to Impact CL	668	667	0
P	Rear Door Trailing Edge to Impact CL	1555	1533	-22
Q	Front Window Opening	386	383	-3
R	Right Side Length	4867	4867	1
S	Left Side Length	4866	4866	0
T	Vehicle Width at B-Pillars	1956	1875	-81

DATA SHEET NO.16 **TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
 Test Facility: Calspan

NHTSA No.: C20240111
 Test Date: 05/21/2024



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	239	25	1650
2	Occupant H-Point	mm	589	157	1650
3	Mid-Door	mm	649	166	1650
4	Window Sill	mm	1054	33	1500
5	Window Top	mm	1489	1	2100

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 PROFILES**

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV

NHTSA No.: C20240111

Test Facility: Calspan

Test Date: 05/21/2024

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

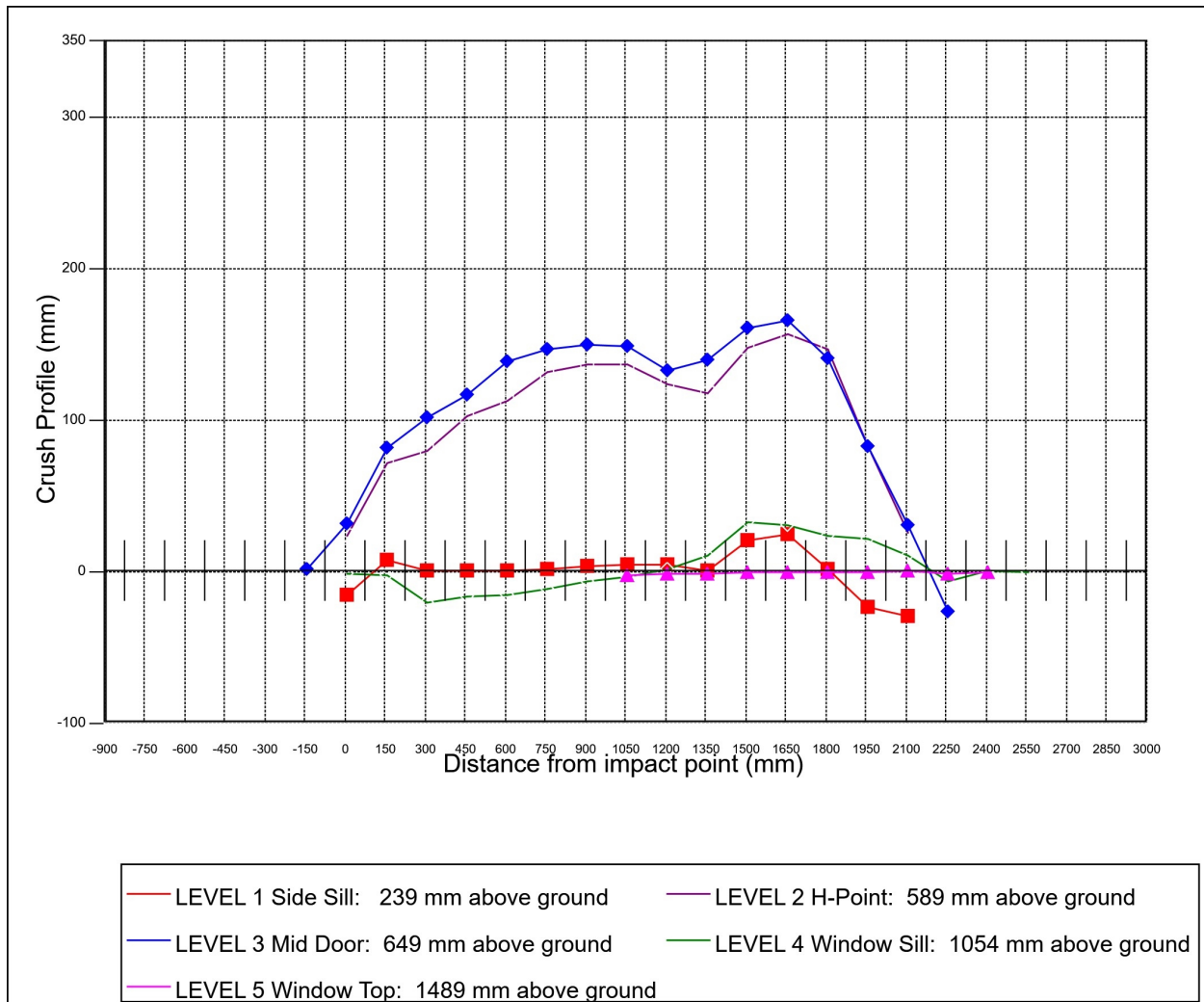
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300															
-150			984					982					2		
0	941	979	979	815		956	955	947	816		-15	24	32	-1	
150	925	972	974	862		917	900	892	864		8	72	82	-2	
300	920	971	974	876		919	891	872	896		1	80	102	-20	
450	918	970	973	898		917	867	856	914		1	103	117	-16	
600	916	969	972	890		915	856	833	905		1	113	139	-15	
750	916	968	970	893		914	836	823	904		2	132	147	-11	
900	916	966	968	896		912	829	818	902		4	137	150	-6	
1050	916	965	966	896	654	911	828	817	899	656	5	137	149	-3	-2
1200	915	963	963	898	664	910	839	830	896	665	5	124	133	2	-1
1350	912	962	960	896	666	911	844	820	885	667	1	118	140	11	-1
1500	911	963	959	897	666	890	815	798	864	666	21	148	161	33	0
1650	911	964	958	895	663	886	807	792	864	663	25	157	166	31	0
1800	912	966	959	892	658	910	819	818	868	658	2	147	141	24	0
1950	918	971	965	887	648	941	888	882	865	648	-23	83	83	22	0
2100	931	981	979	884	635	960	955	948	873	634	-29	26	31	11	1
2250			987	878	616			1013	884	617			-26	-6	-1
2400				872	584				871	584				1	0
2550				863					863					0	
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 the test based on an estimated impact point. The final distance from impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy’s head.

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

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024

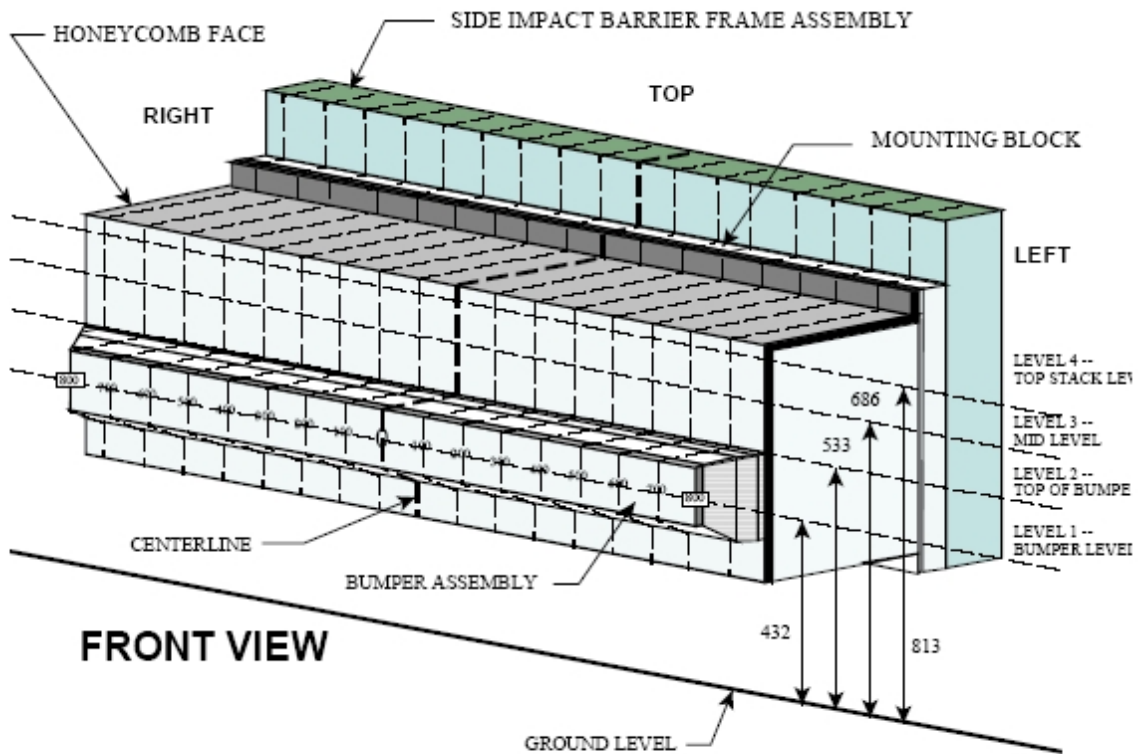


Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO.18 EXTERIOR STATIC CRUSH FOR IMPACT FACE

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024



NOTE: Dimensions are shown in millimeters, mm

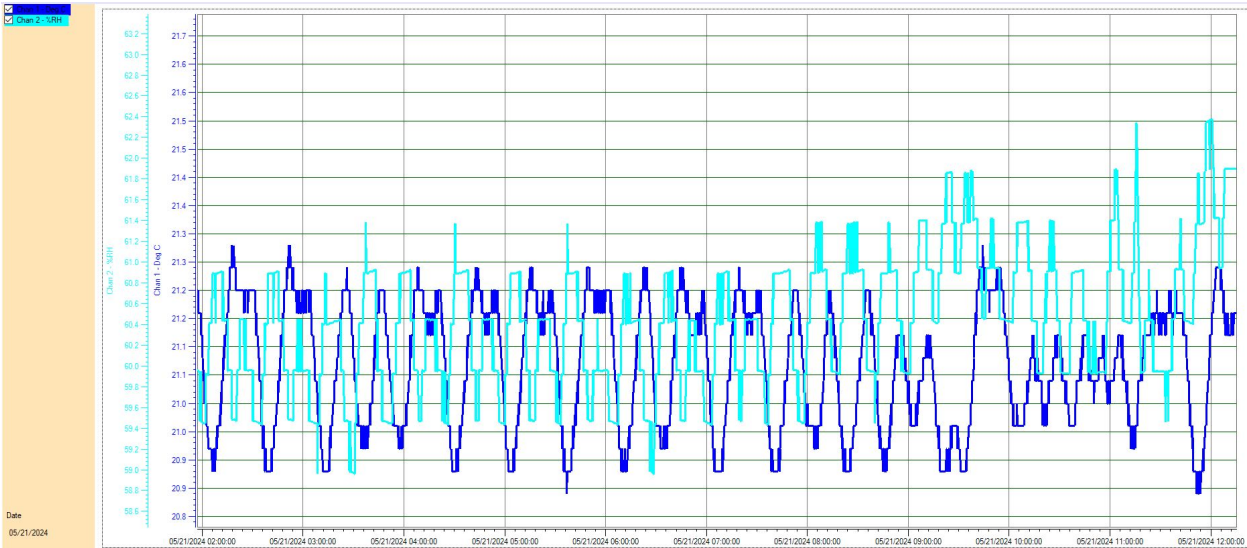
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
1	230	230	229	231	229	225	219	211	205	211	219	225	229	231	229	230	230
2	151	152	153	151	151	146	138	133	128	133	138	146	151	151	153	152	151
3	63	59	60	68	68	74	52	42	38	42	52	74	68	68	60	59	63
4	58	45	53	72	66	67	39	35	38	35	39	67	66	72	53	45	58

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

Test Vehicle: 2024 Cadillac Lyriq 5 Door SUV
Test Facility: Calspan

NHTSA No.: C20240111
Test Date: 05/21/2024



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

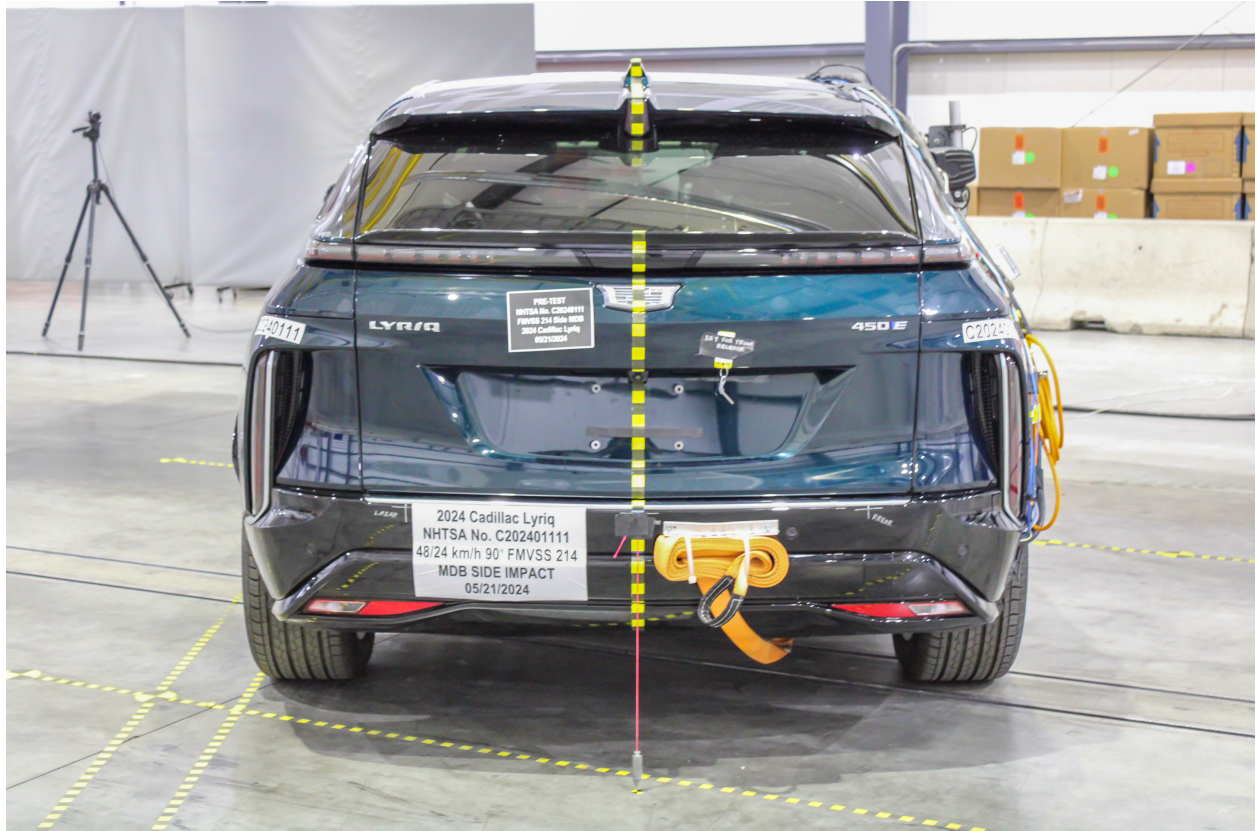


Figure A-3: Pre-Test Rear View of Test Vehicle



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

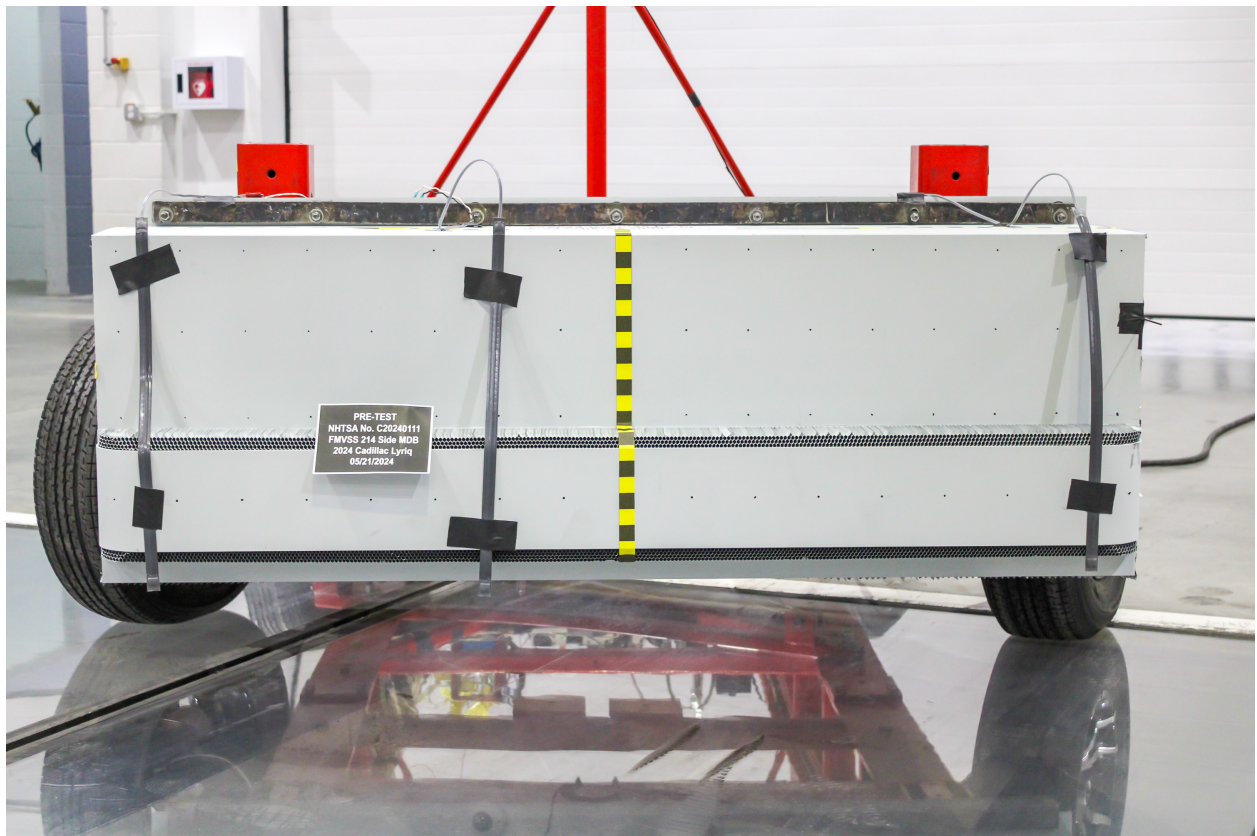


Figure A-7: Pre-Test Frontal View of Impactor Face



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

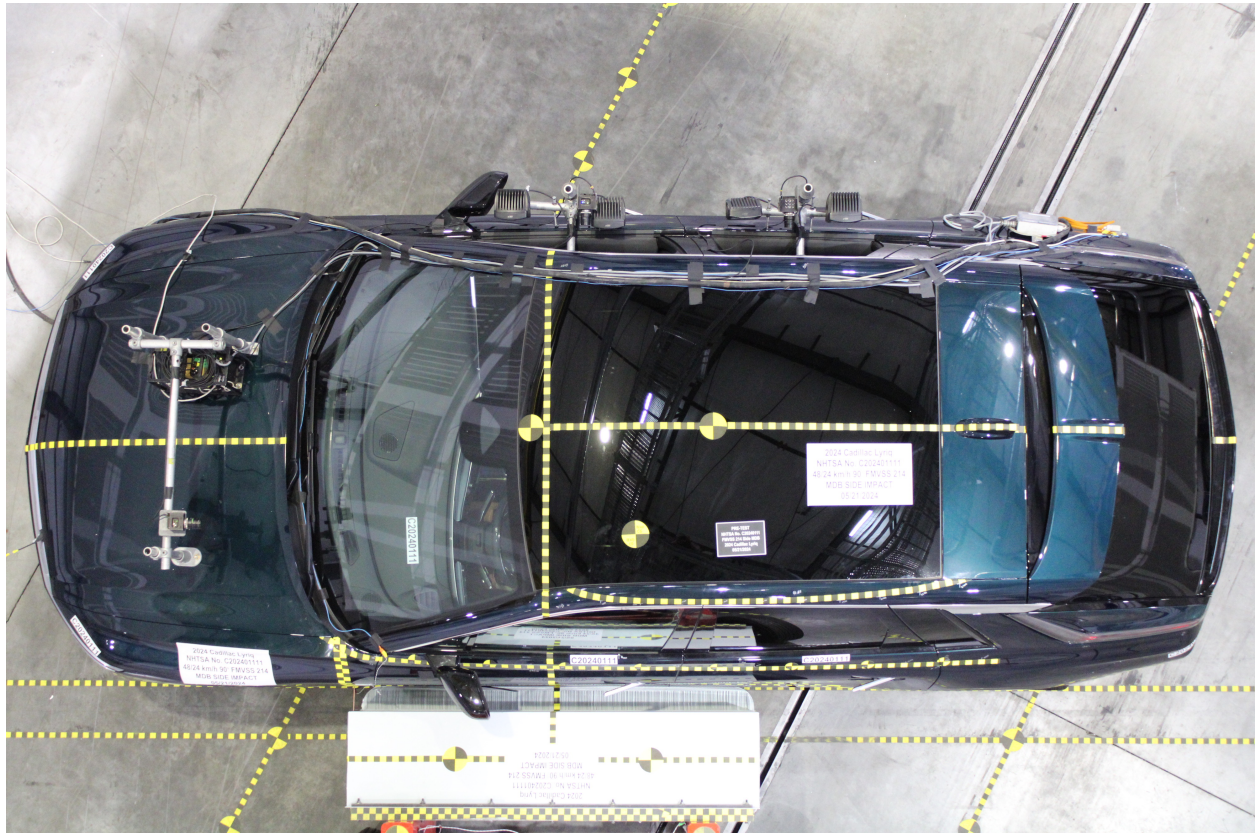


Figure A-15: Pre-Test Overhead View of MDB Positioned Against Impact Side of Test Vehicle at Impact Location

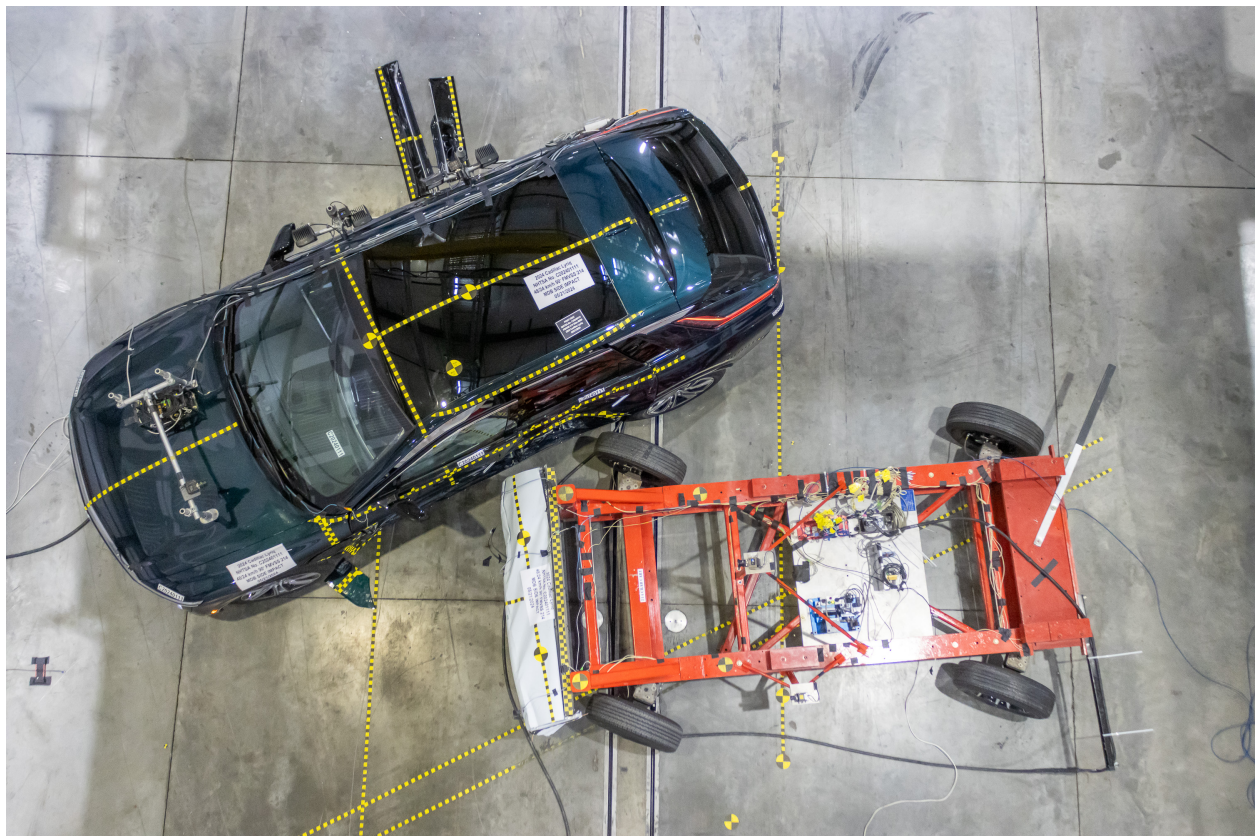


Figure A-16: Post-Test Overhead View of the MDB and Test Vehicle



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

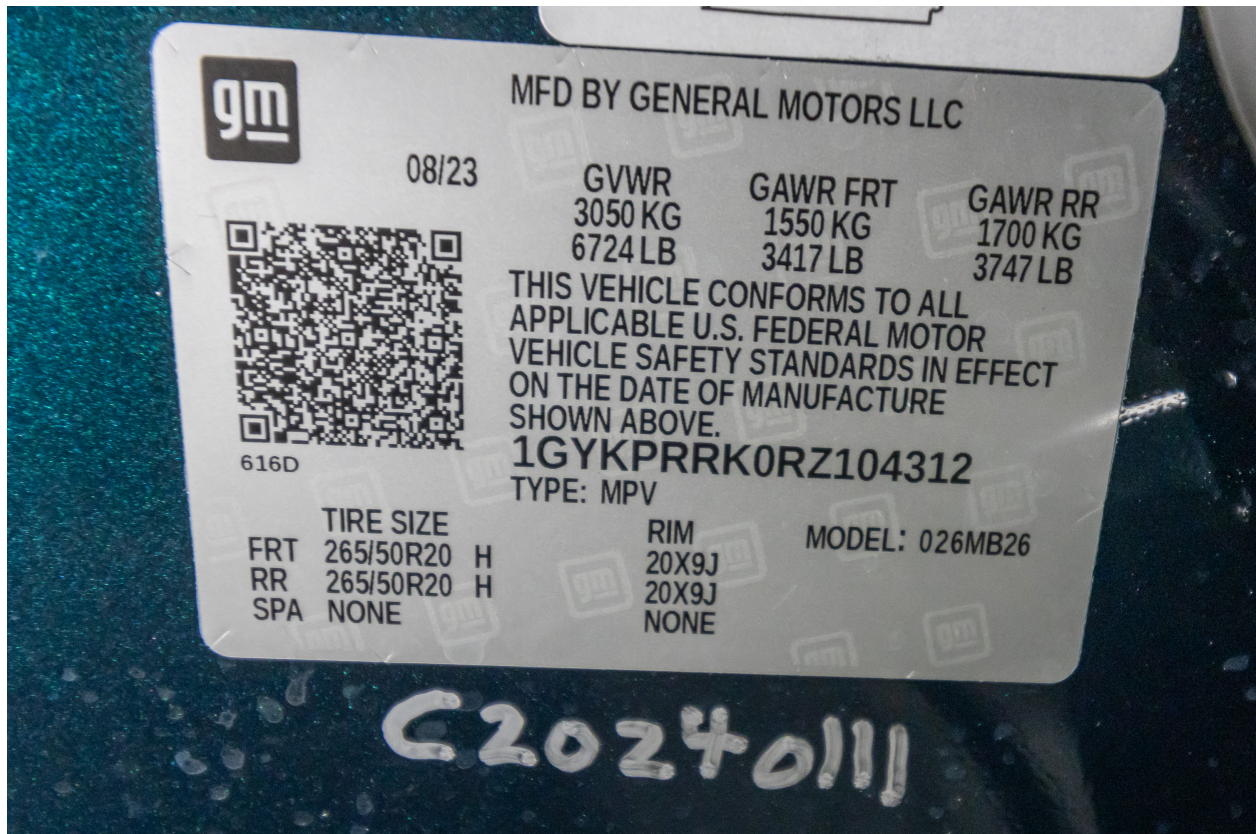


Figure A-27: Close-up View of Vehicle's Certification Label



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

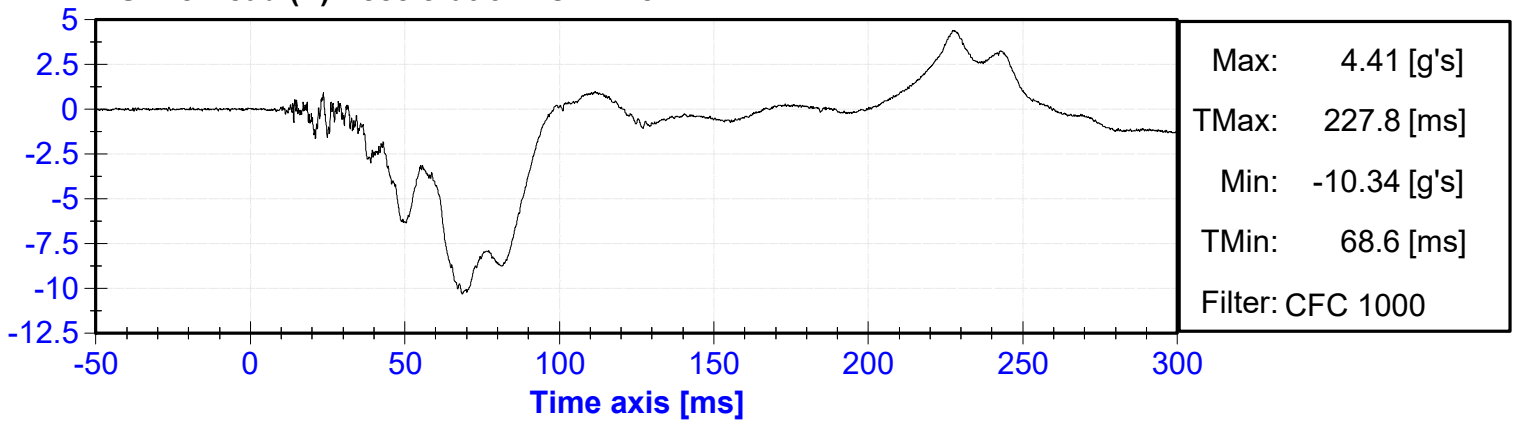
APPENDIX II

ES-2re DUMMY RESPONSE DATA TRACES

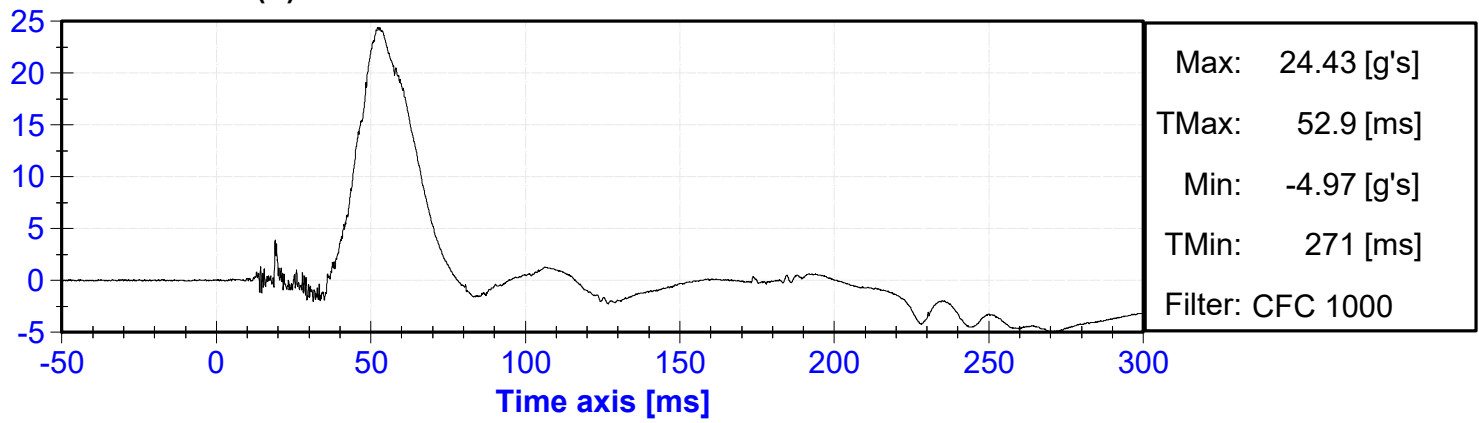
Table of Data Plots

No.	Description	Page
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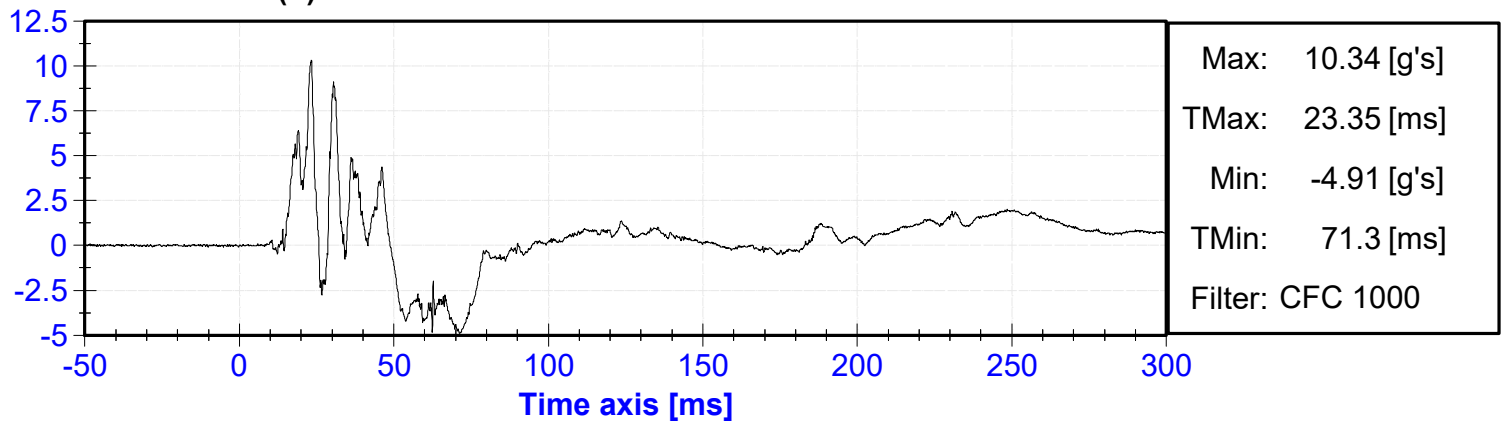
ES-2re Head (X) Acceleration vs. Time



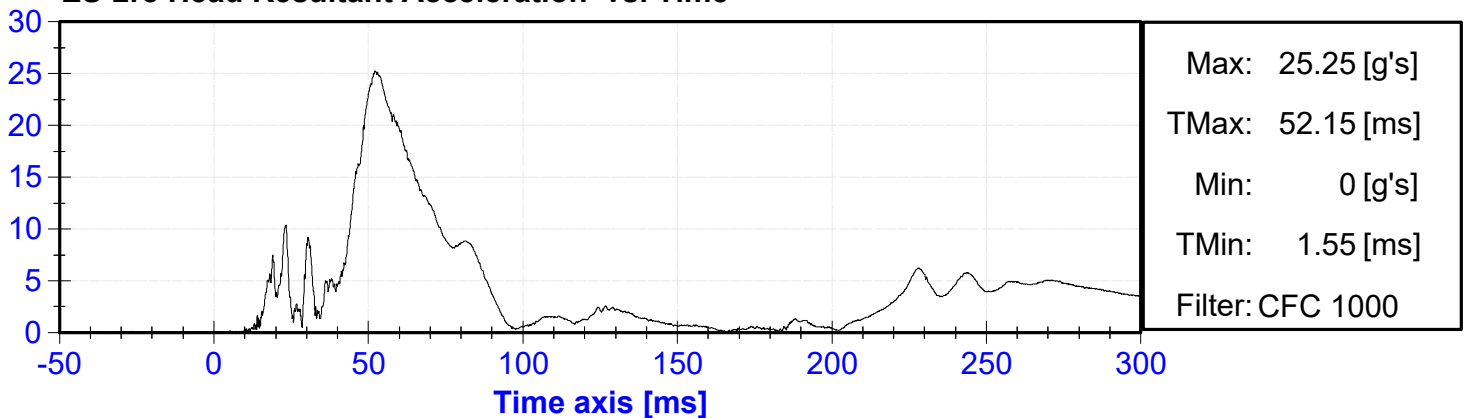
ES-2re Head (Y) Acceleration vs. Time



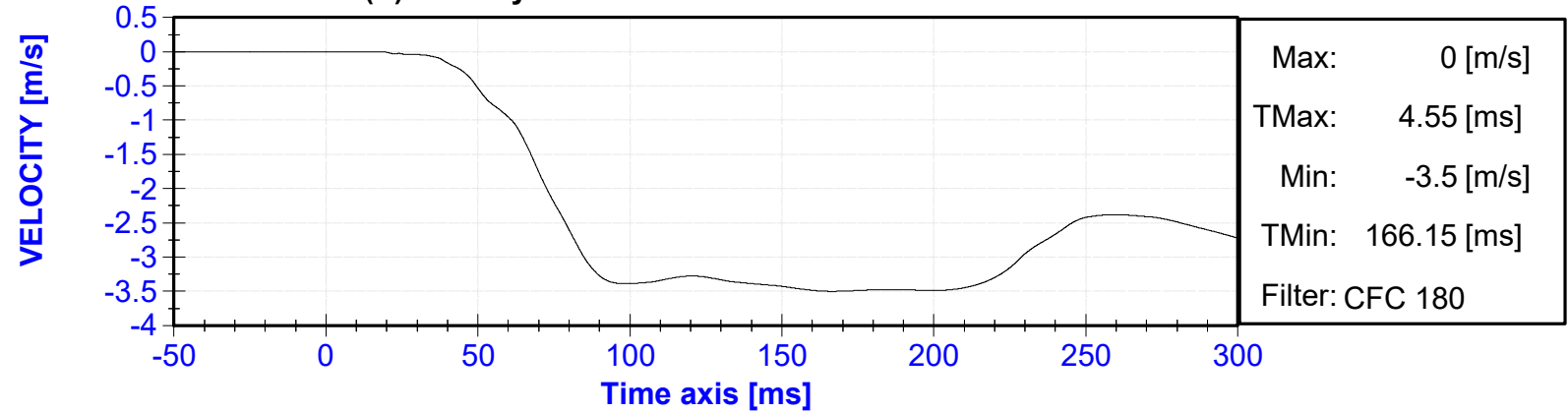
ES-2re Head (Z) Acceleration vs. Time



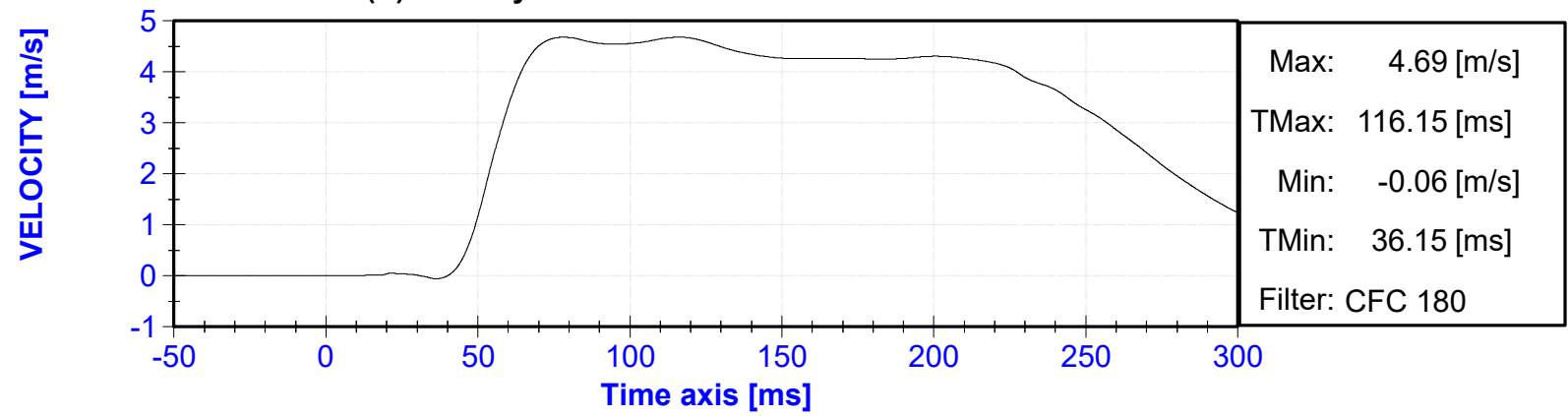
ES-2re Head Resultant Acceleration vs. Time



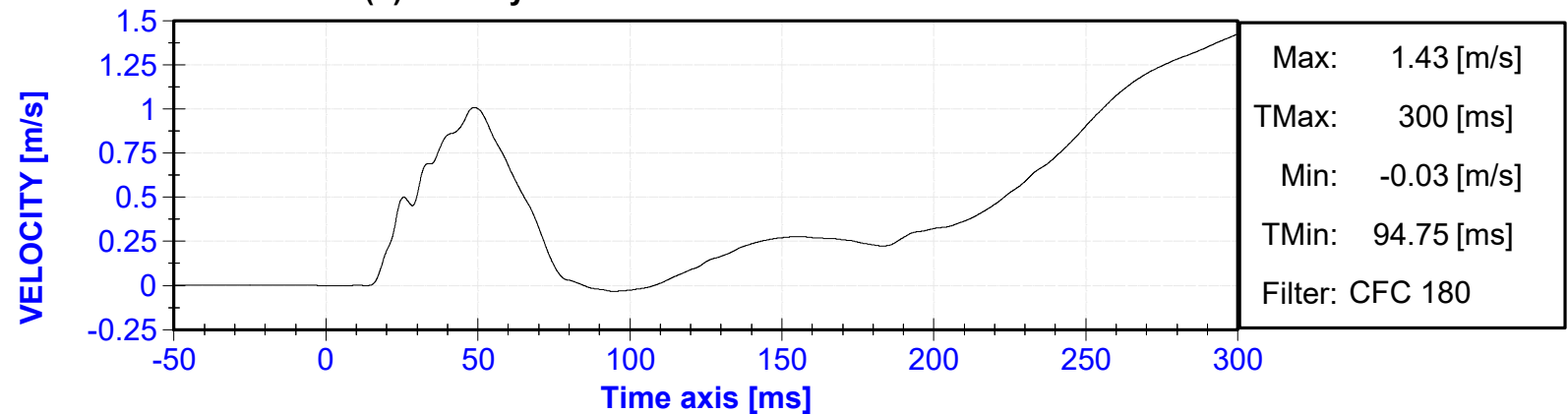
ES-2re Head (X) Velocity vs. Time



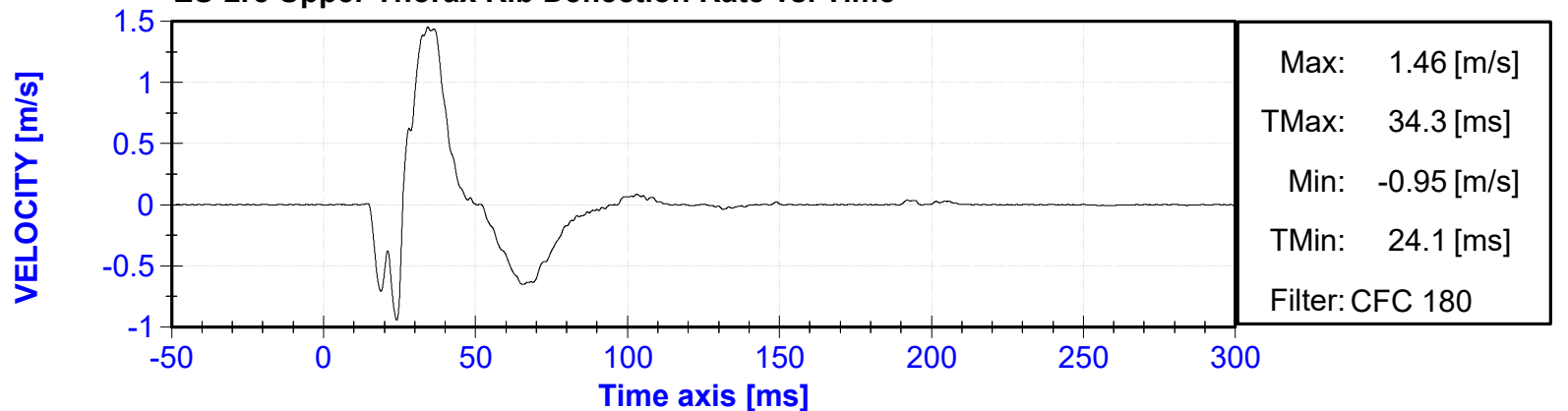
ES-2re Head (Y) Velocity vs. Time



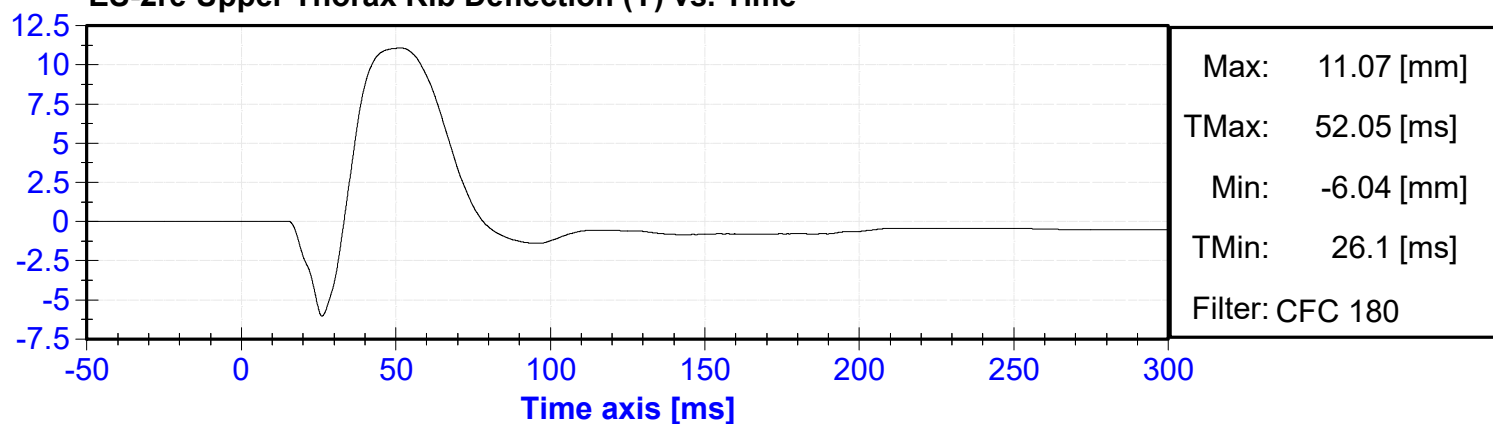
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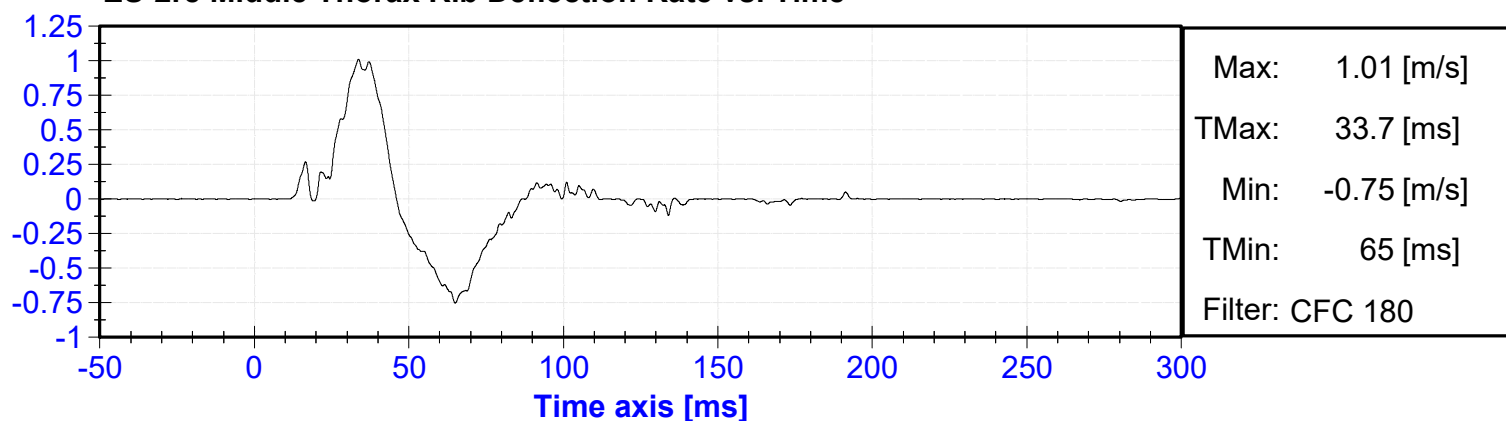
ES-2re Upper Thorax Rib Deflection Rate vs. Time



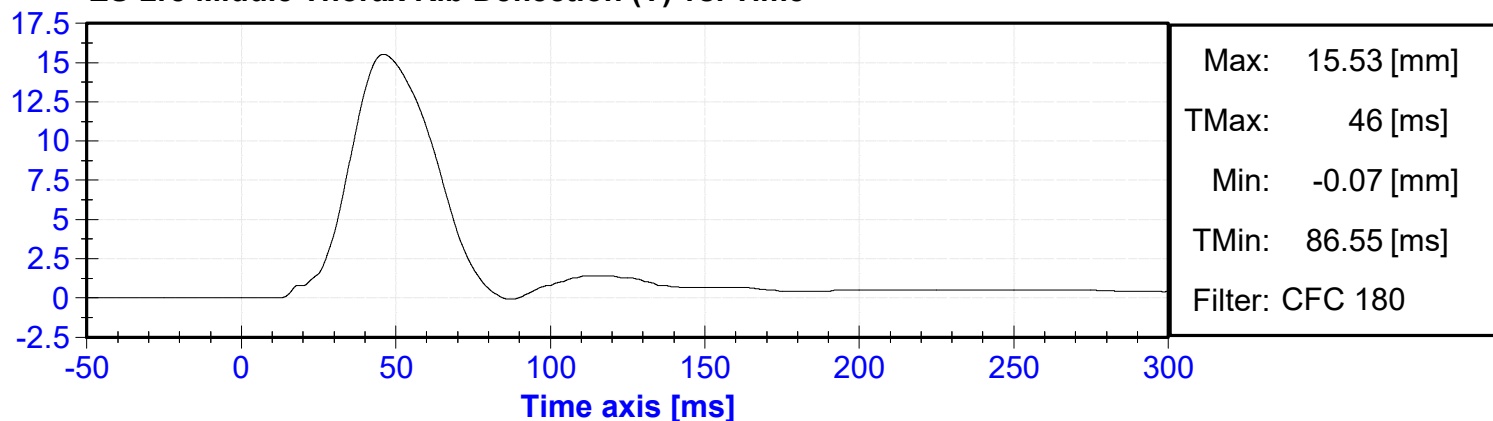
ES-2re Upper Thorax Rib Deflection (Y) vs. Time



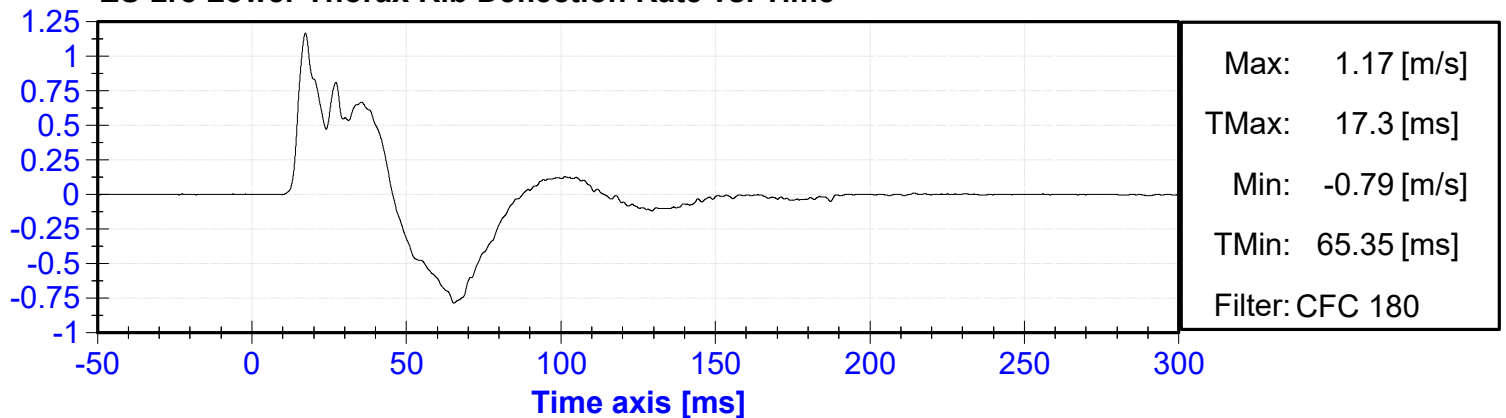
ES-2re Middle Thorax Rib Deflection Rate vs. Time



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

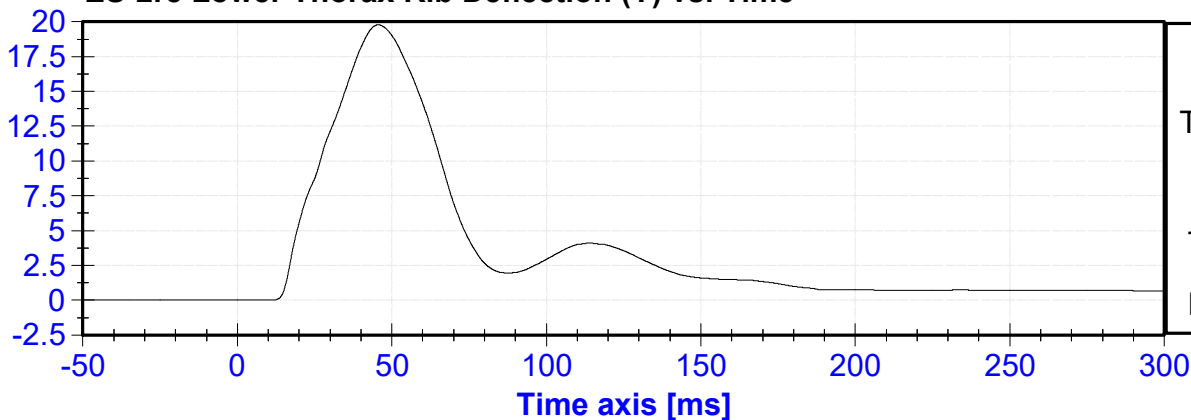


ES-2re Lower Thorax Rib Deflection Rate vs. Time



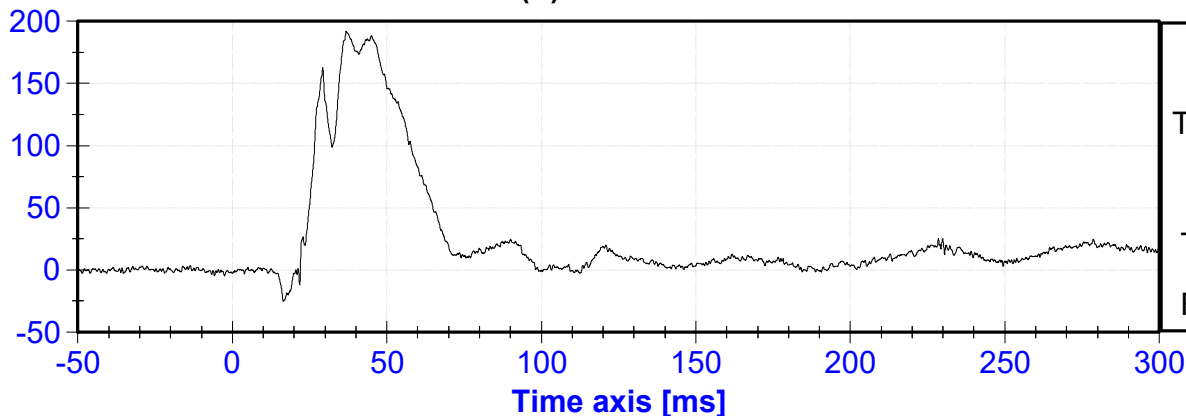
ES-2re Lower Thorax Rib Deflection (Y) vs. Time

DISPLACEMENT [mm]



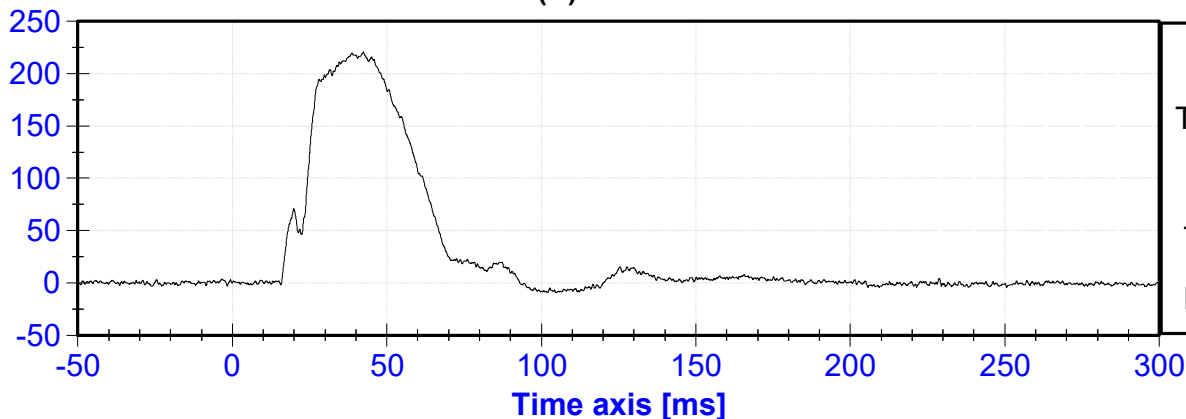
ES-2re Front Abdomen Force (Y) vs. Time

FORCE [N]



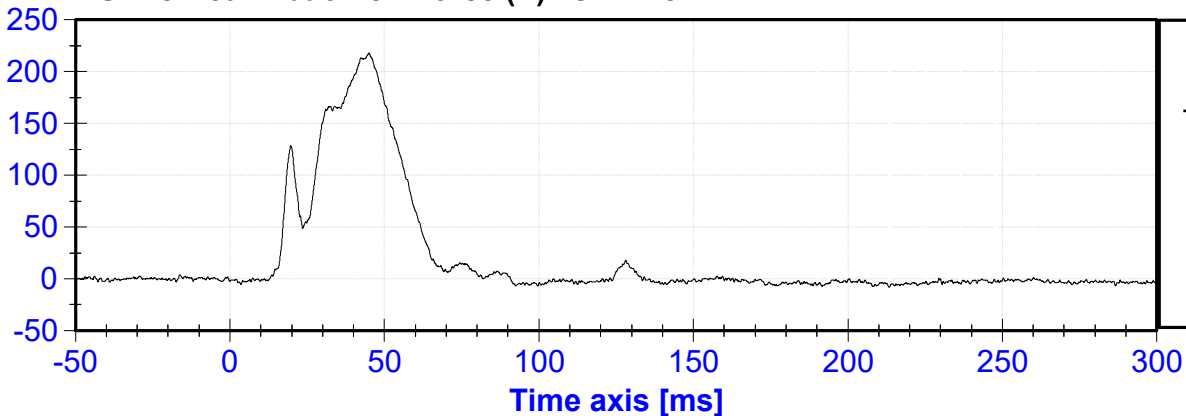
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FORCE [N]

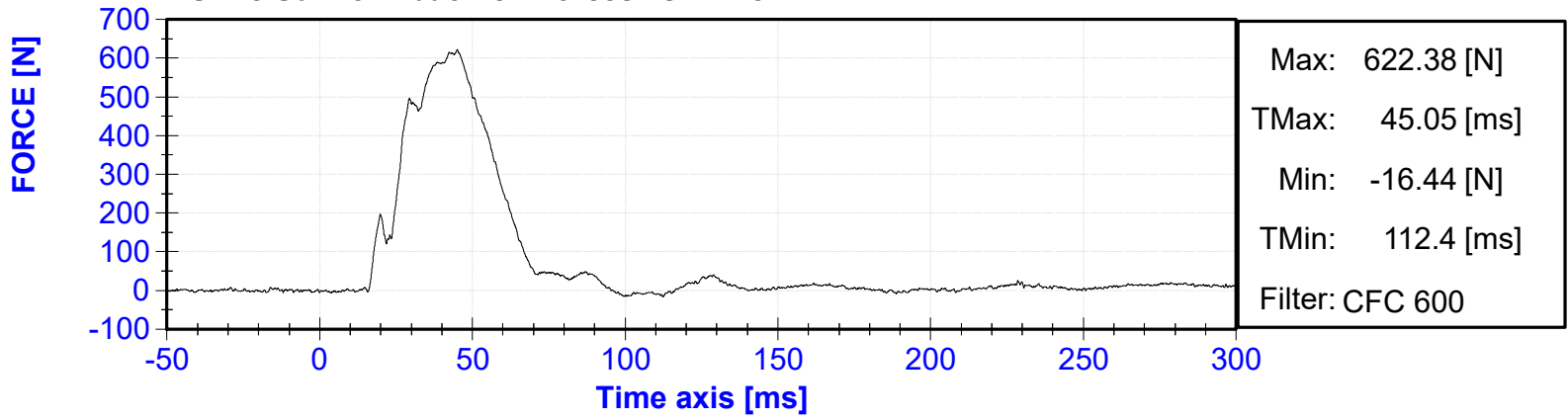


ES-2re Rear Abdomen Force (Y) vs. Time

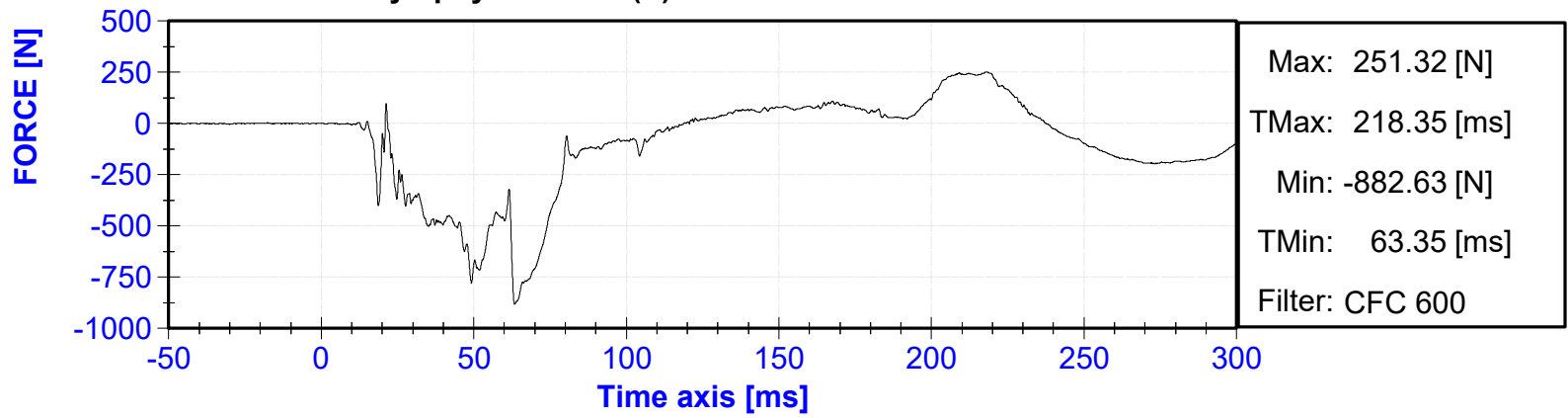
FORCE [N]



ES-2re Sum of Abdomen Forces vs. Time



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



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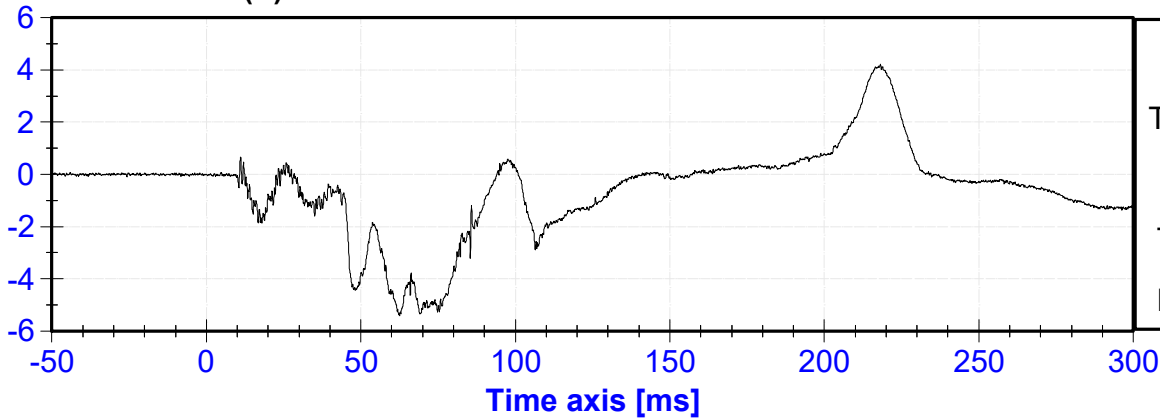
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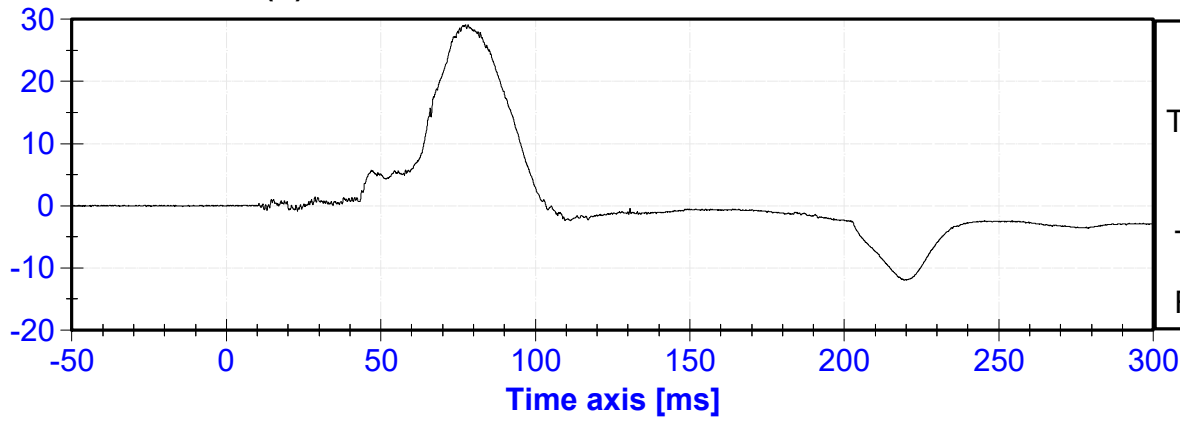
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ACCELERATION [g's]



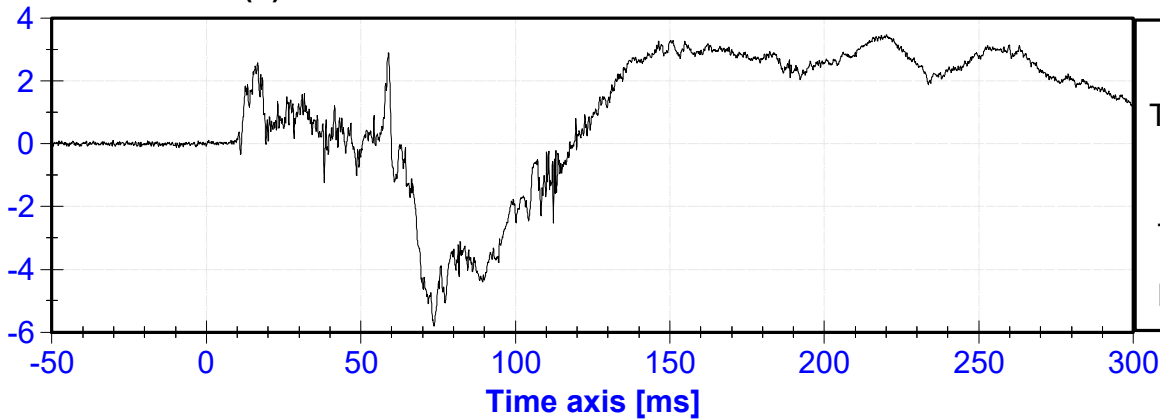
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ACCELERATION [g's]



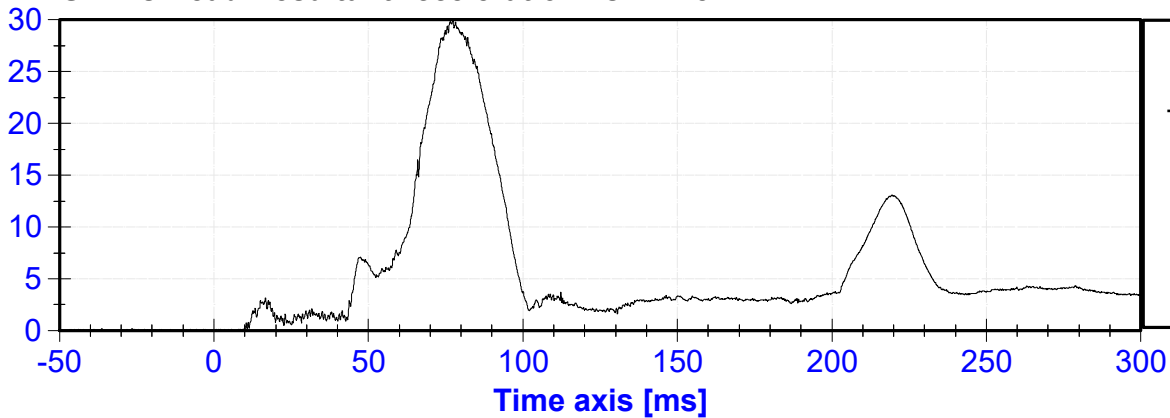
SID-IIs Head (Z) Acceleration vs. Time

ACCELERATION [g's]



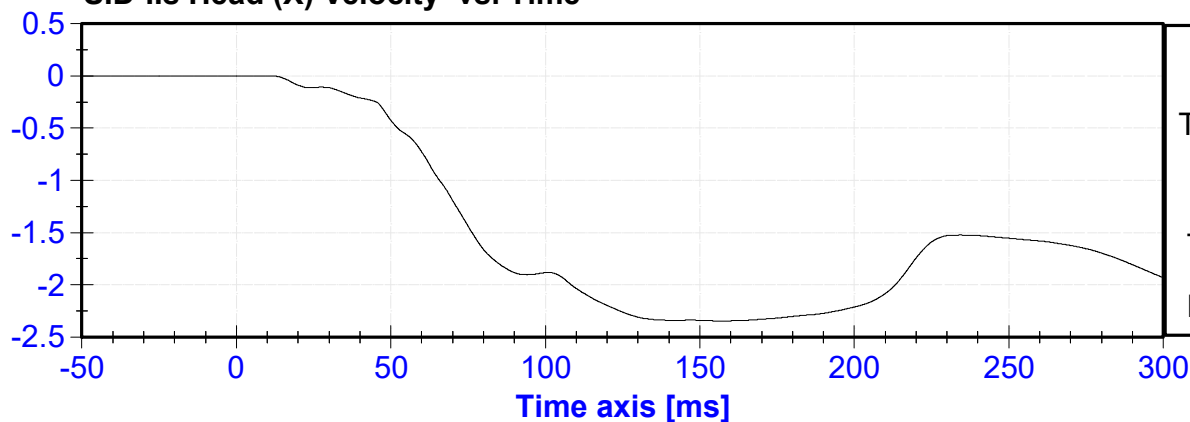
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ACCELERATION [g's]



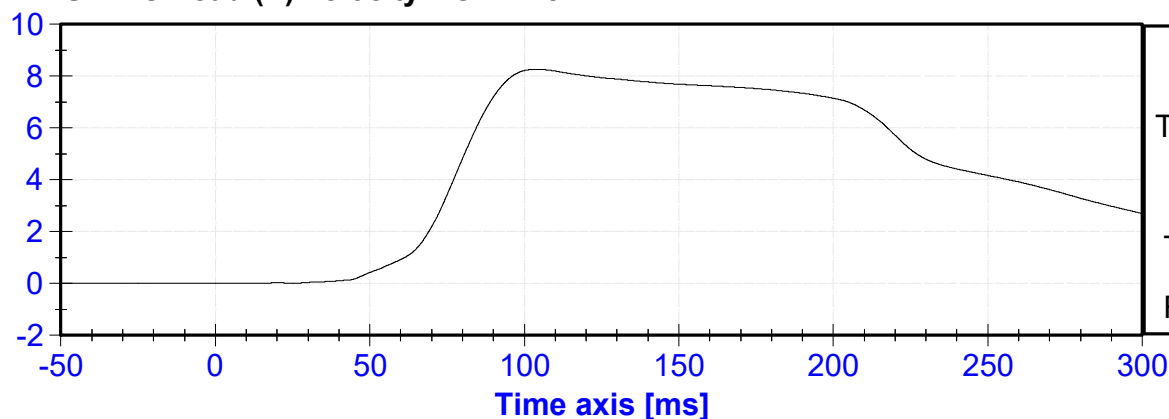
SID-IIs Head (X) Velocity vs. Time

VELOCITY [m/s]



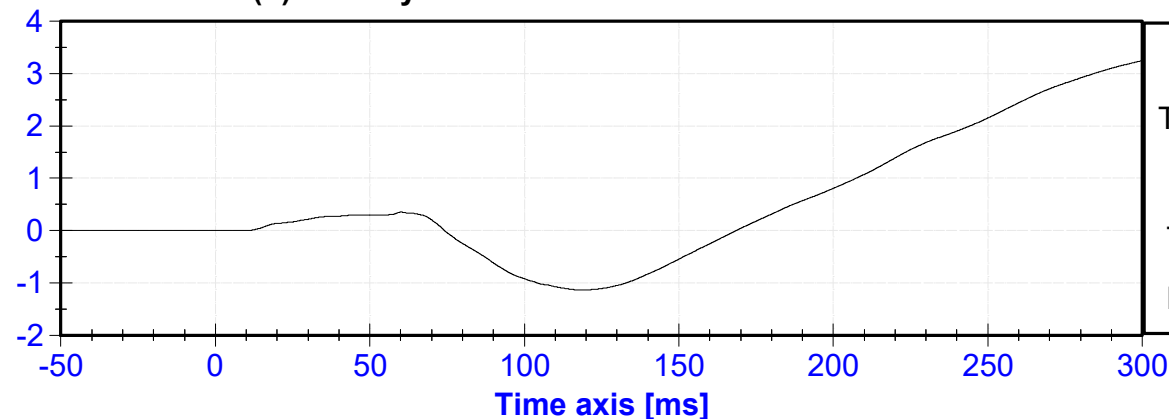
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VELOCITY [m/s]



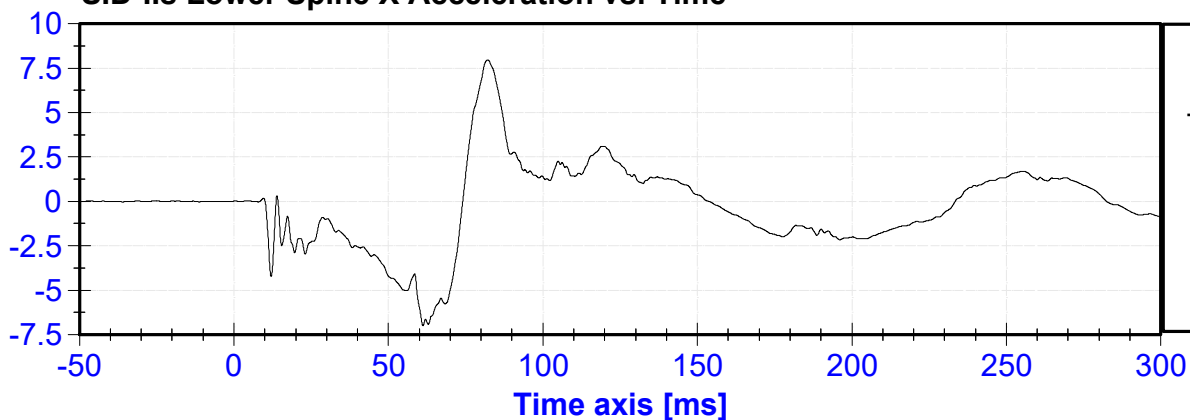
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VELOCITY [m/s]



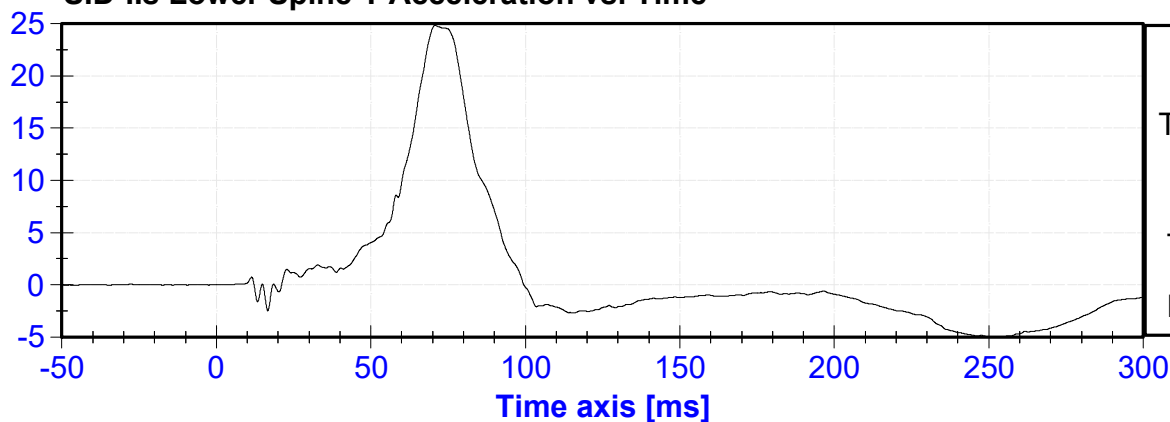
SID-IIs Lower Spine X Acceleration vs. Time

ACCELERATION [g's]



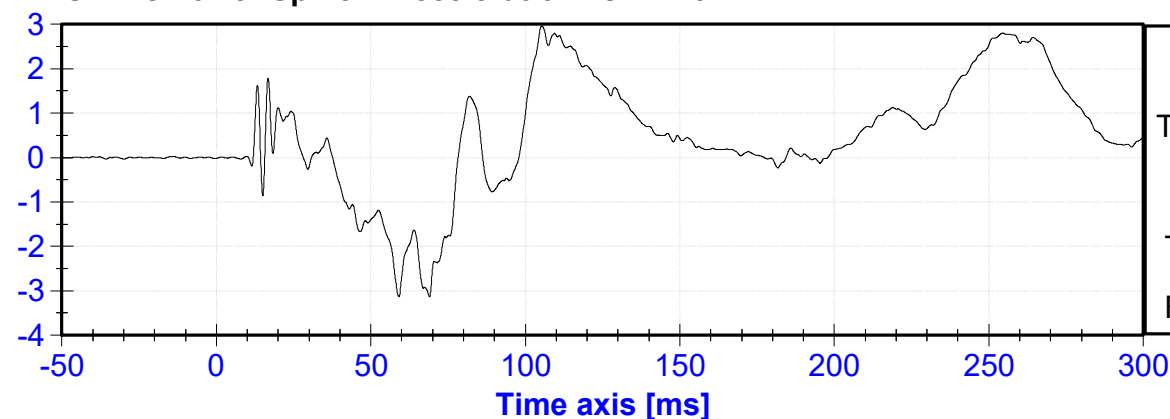
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ACCELERATION [g's]



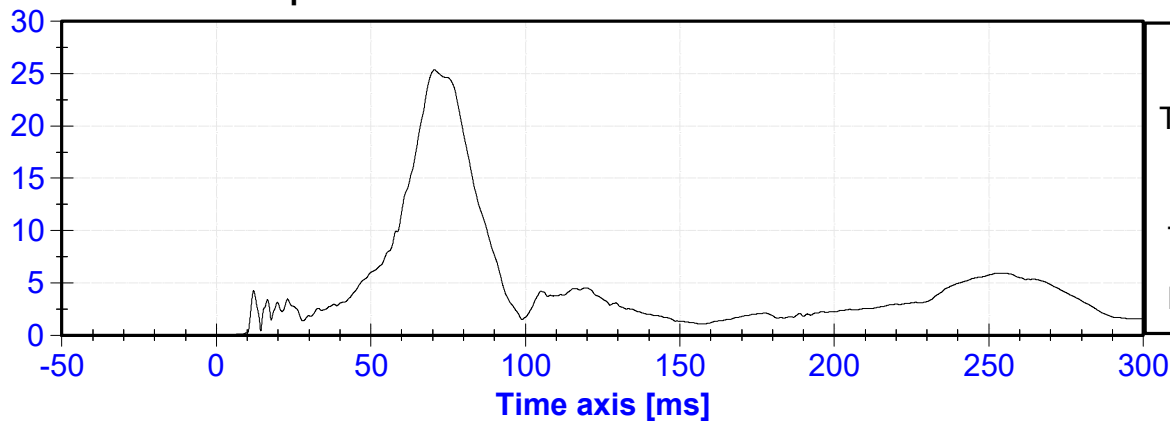
SID-IIs Lower Spine Z Acceleration vs. Time

ACCELERATION [g's]



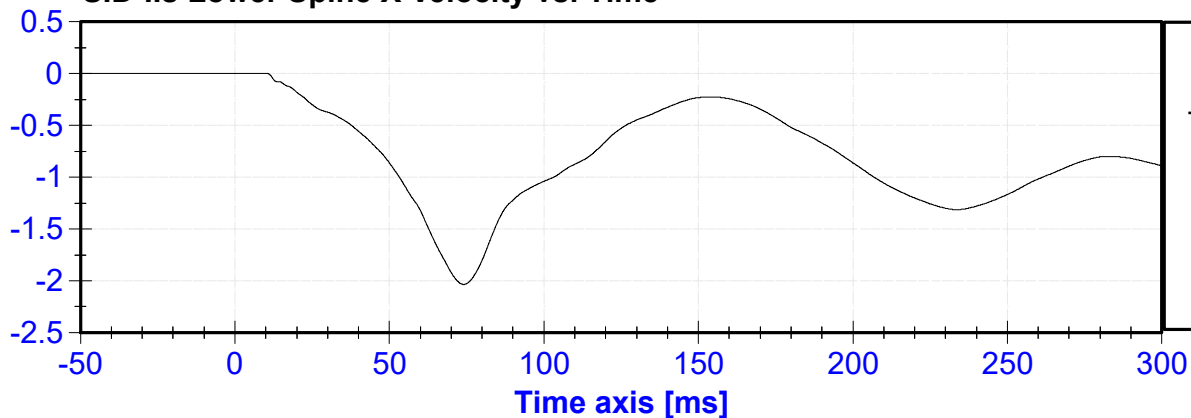
SID-IIs Lower Spine Resultant Acceleration vs. Time

ACCELERATION [g's]

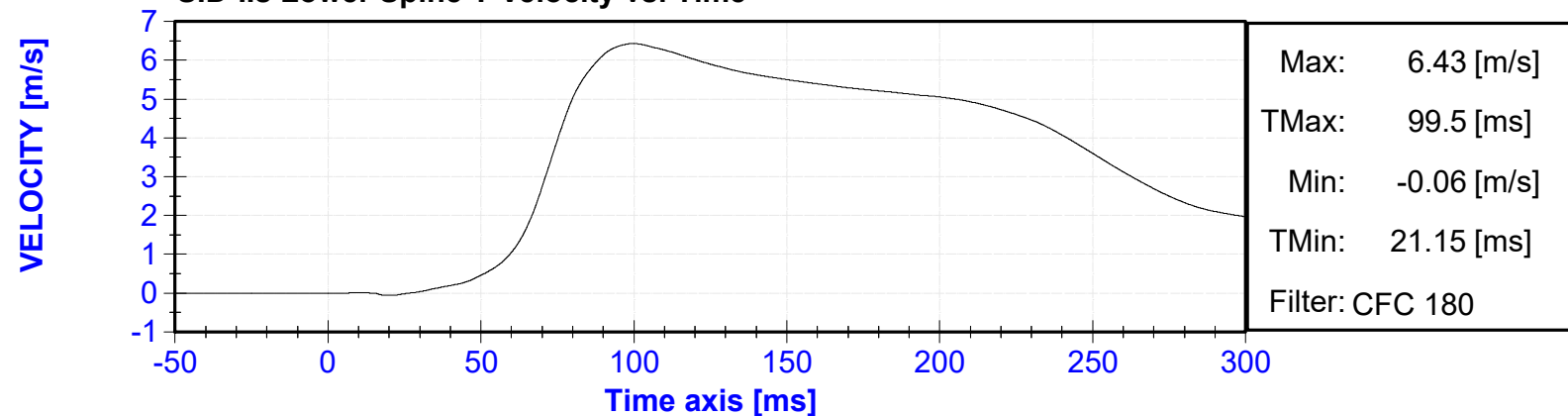


SID-IIs Lower Spine X Velocity vs. Time

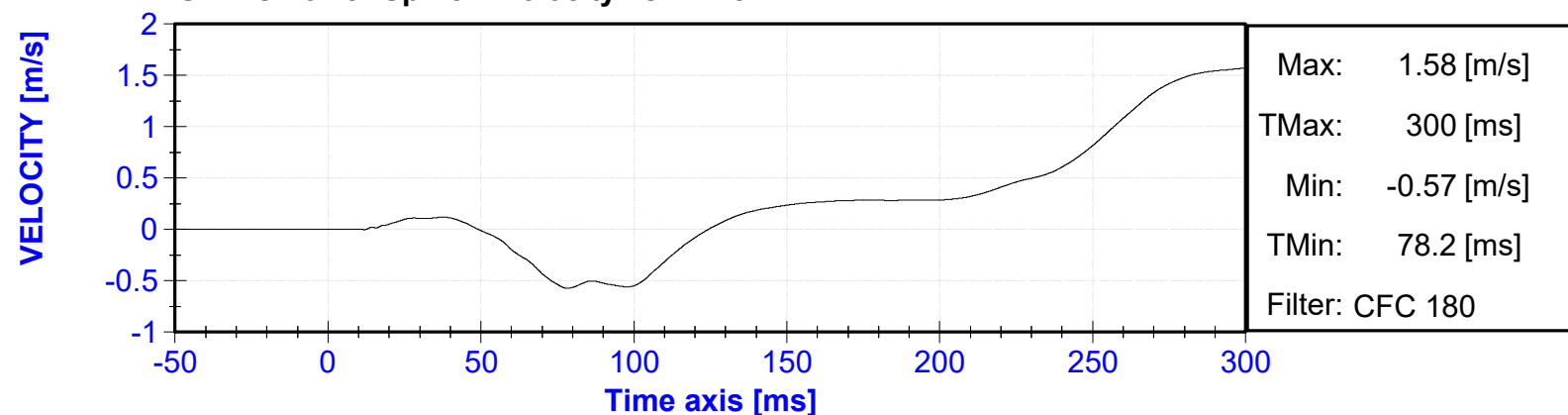
VELOCITY [m/s]



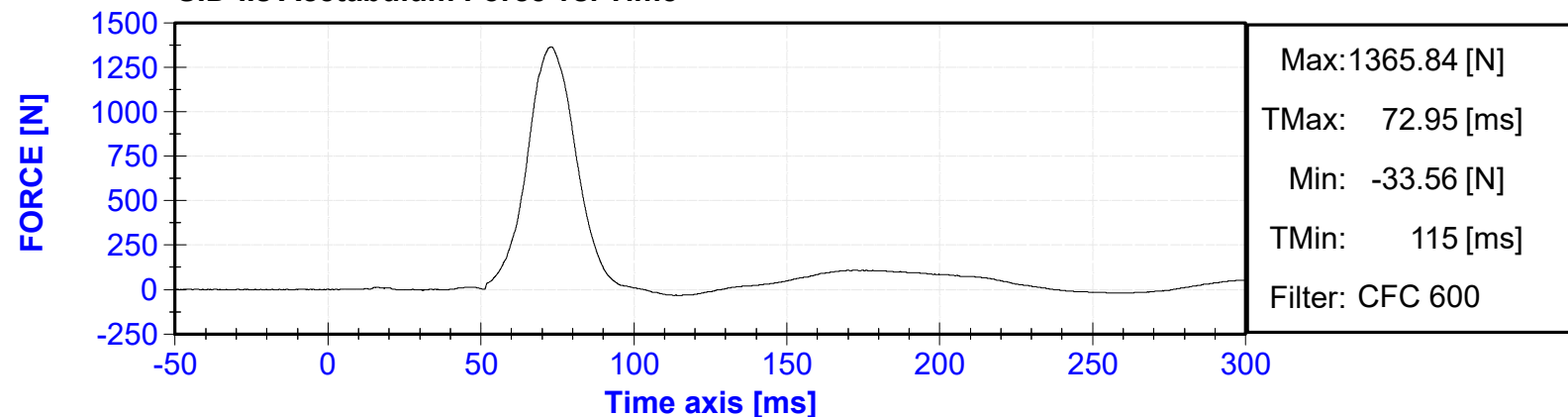
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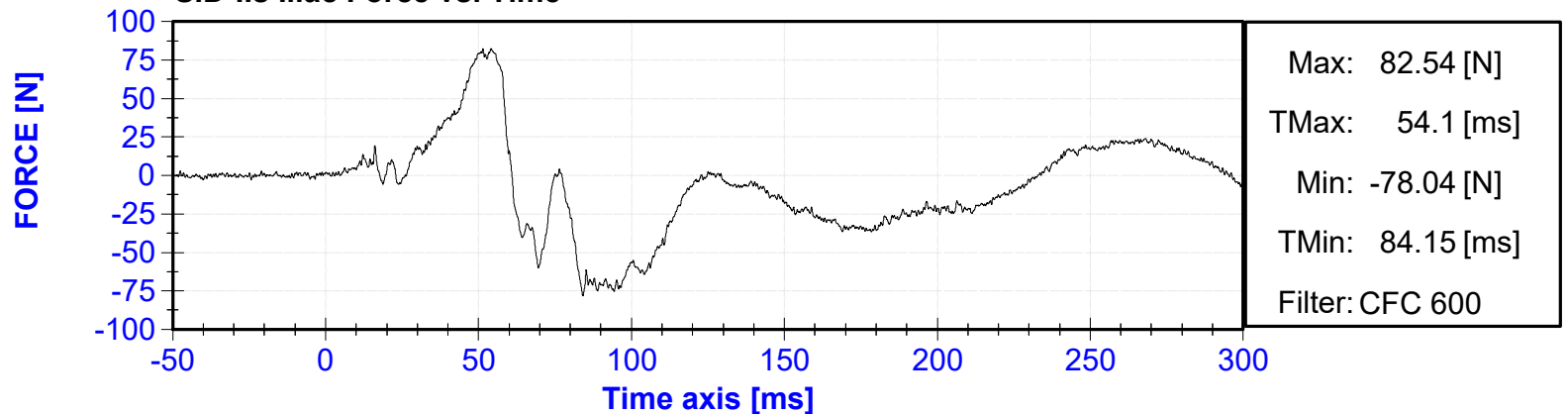
SID-IIs Lower Spine Z Velocity vs. Time



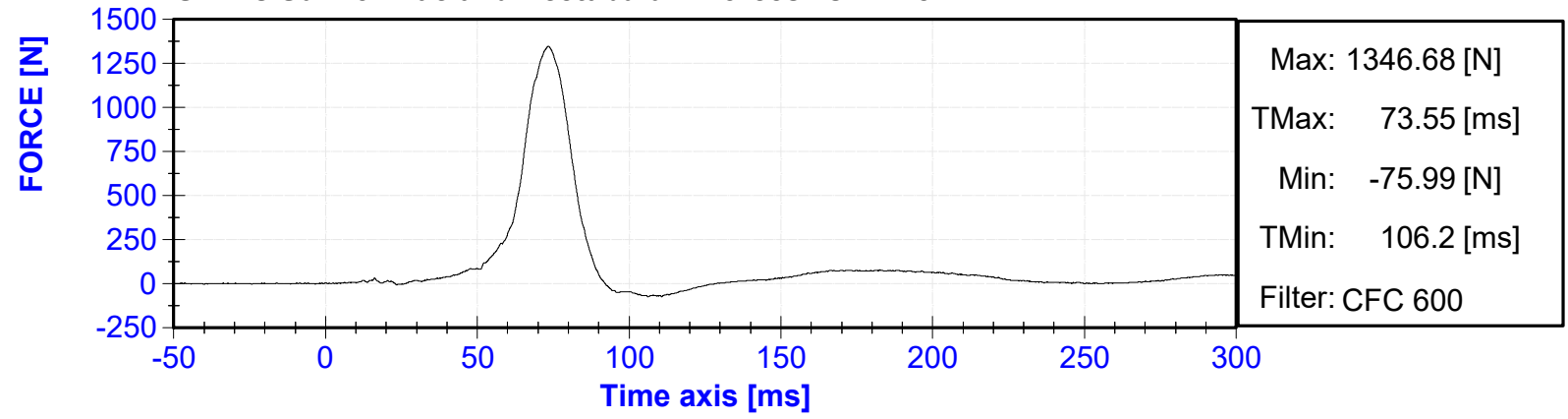
SID-IIs Acetabulum Force vs. Time



SID-IIs Iliac Force vs. Time



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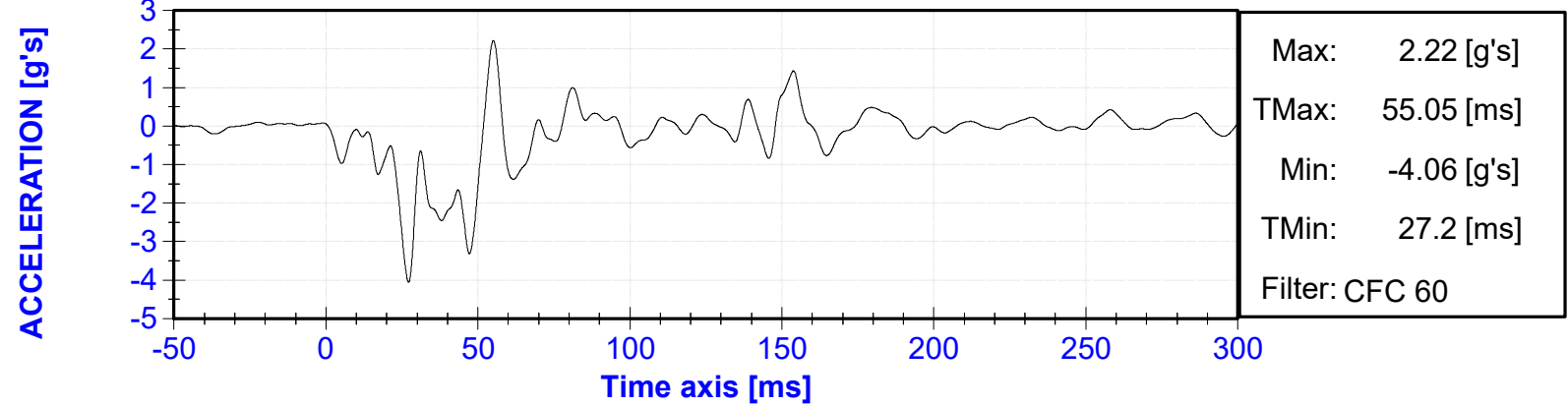
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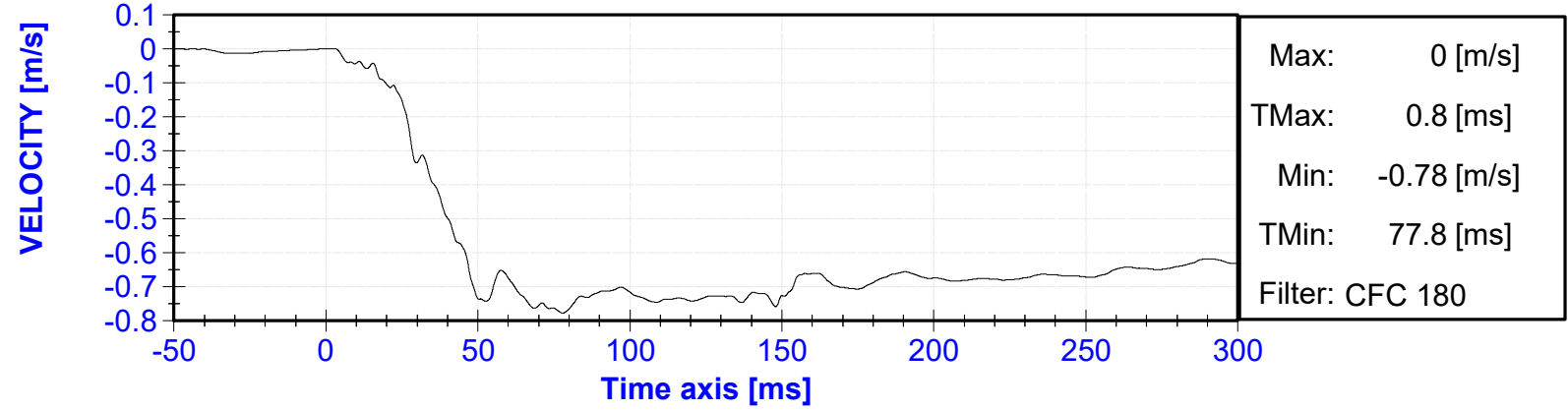
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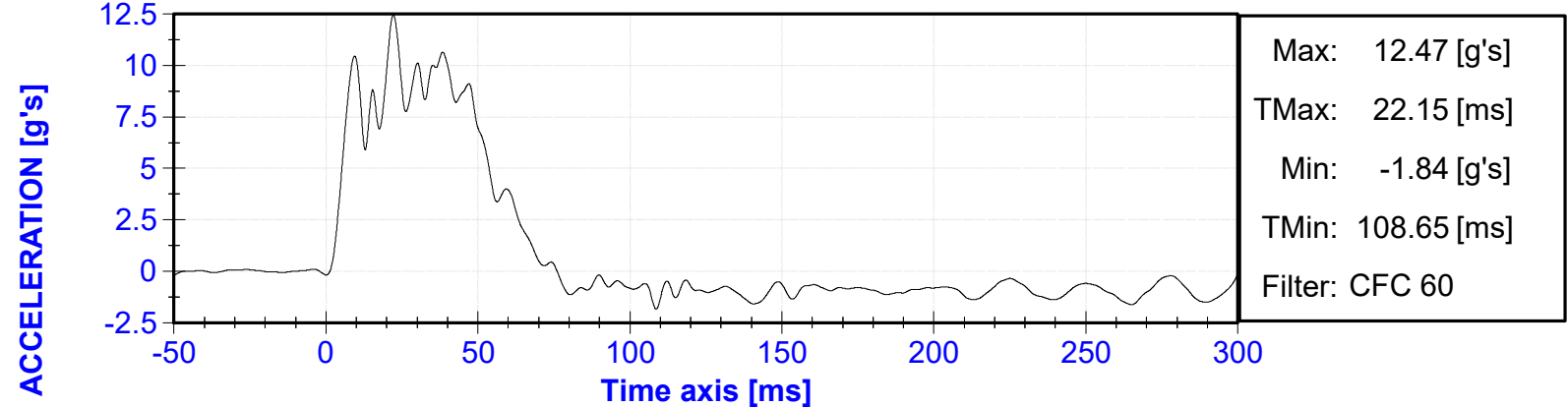
Right Sill at Front Seat (X) Acceleration vs. Time



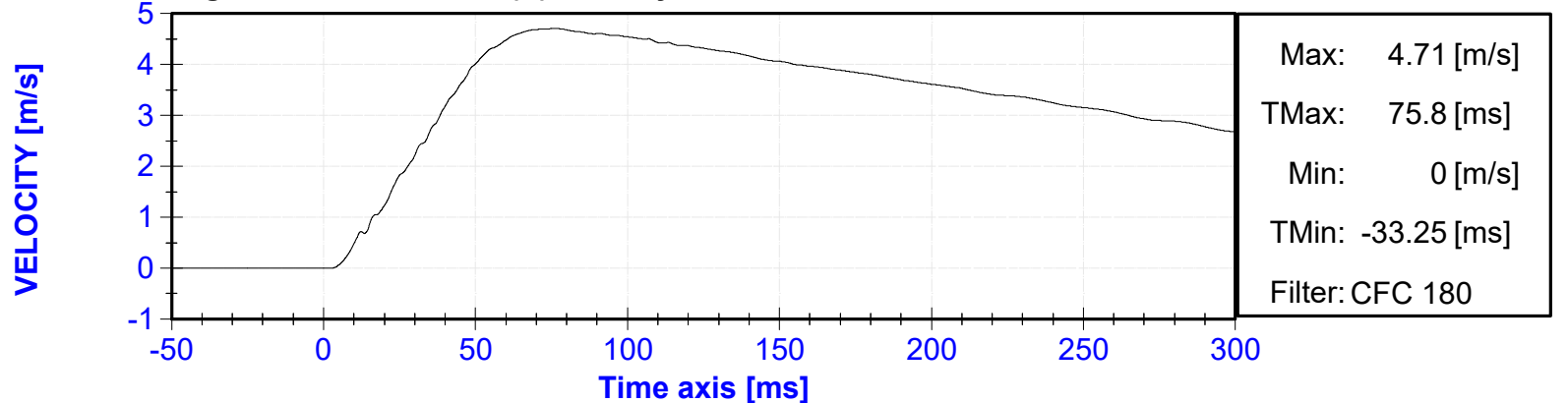
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Right Sill at Front Seat (Y) Acceleration vs. Time

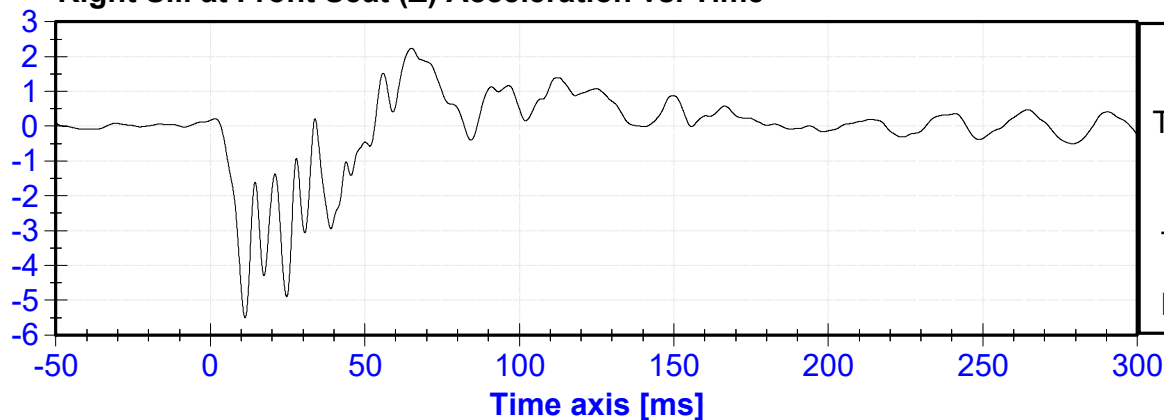


Right Sill at Front Seat (Y) Velocity vs. Time



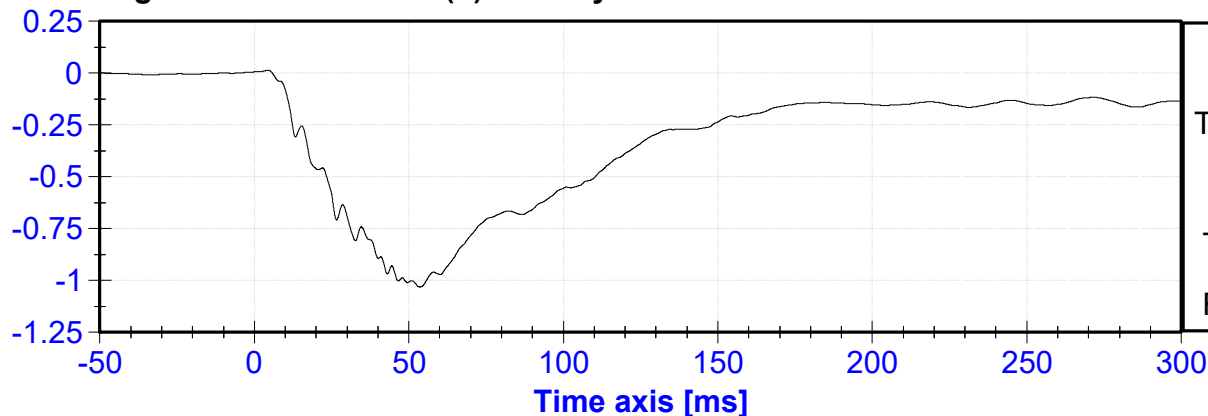
Right Sill at Front Seat (Z) Acceleration vs. Time

ACCELERATION [g's]



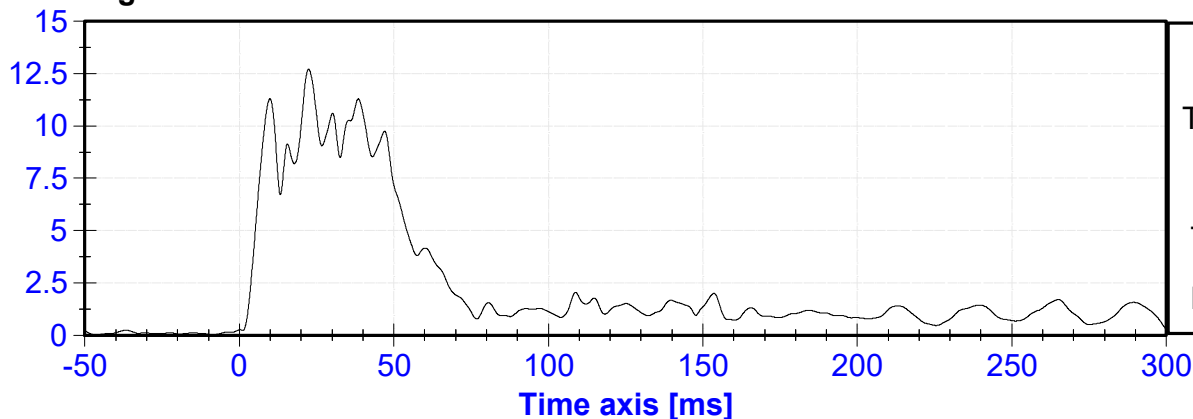
Right Sill at Front Seat (Z) Velocity vs. Time

VELOCITY [m/s]



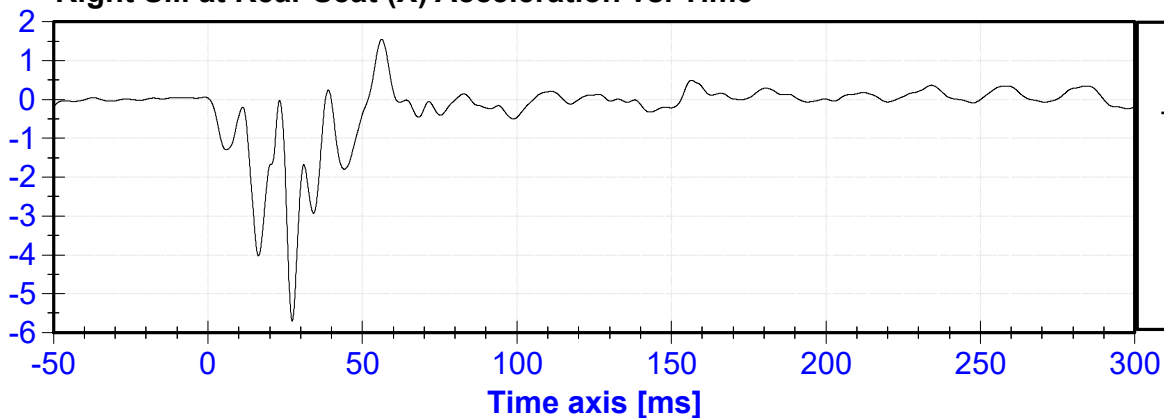
Right Sill at Front Seat Resultant vs. Time

ACCELERATION [g's]



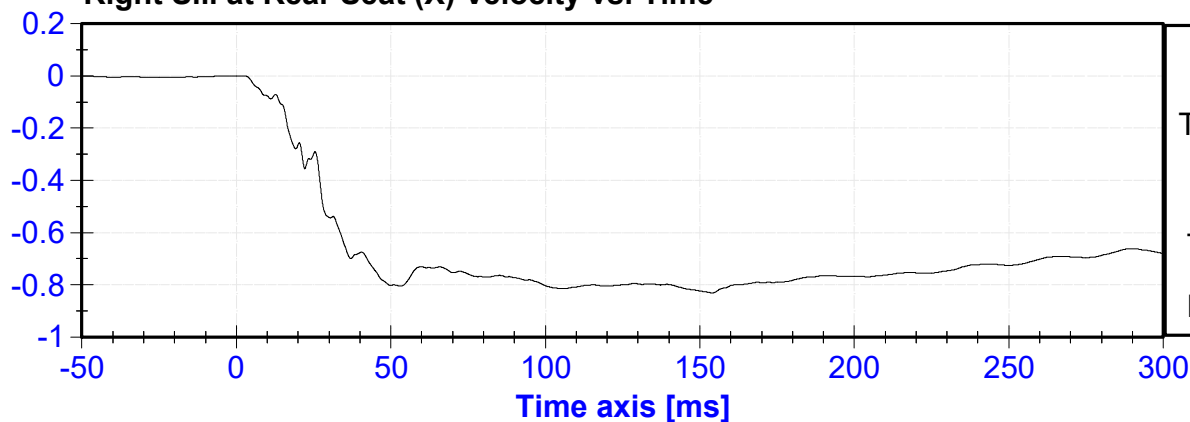
Right Sill at Rear Seat (X) Acceleration vs. Time

ACCELERATION [g's]



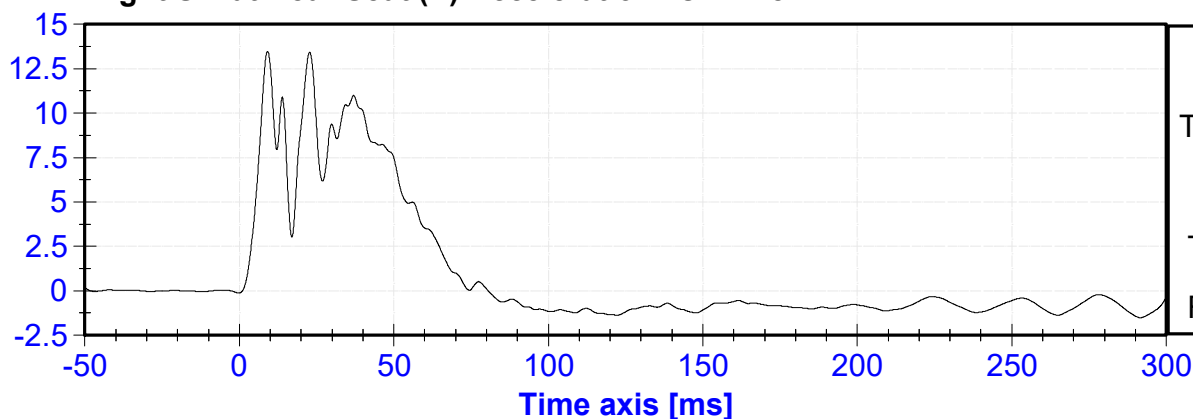
Right Sill at Rear Seat (X) Velocity vs. Time

VELOCITY [m/s]



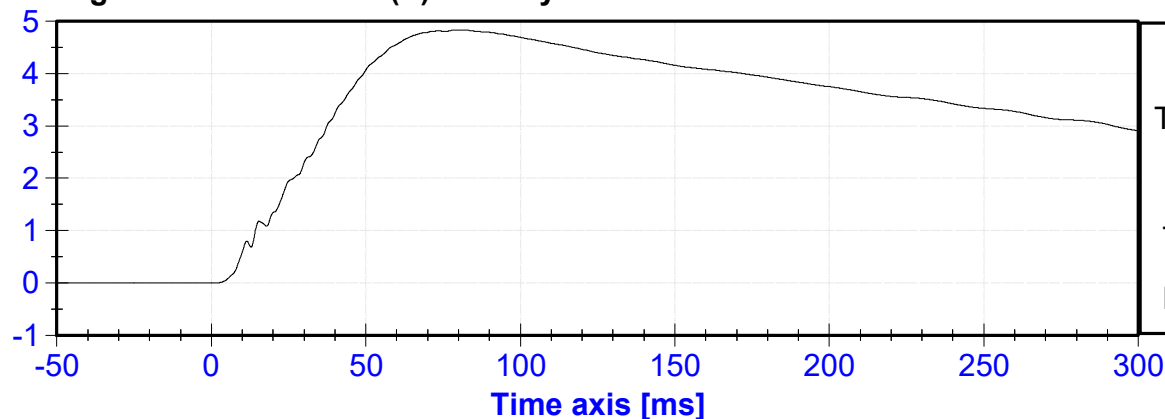
Right Sill at Rear Seat (Y) Acceleration vs. Time

ACCELERATION [g's]



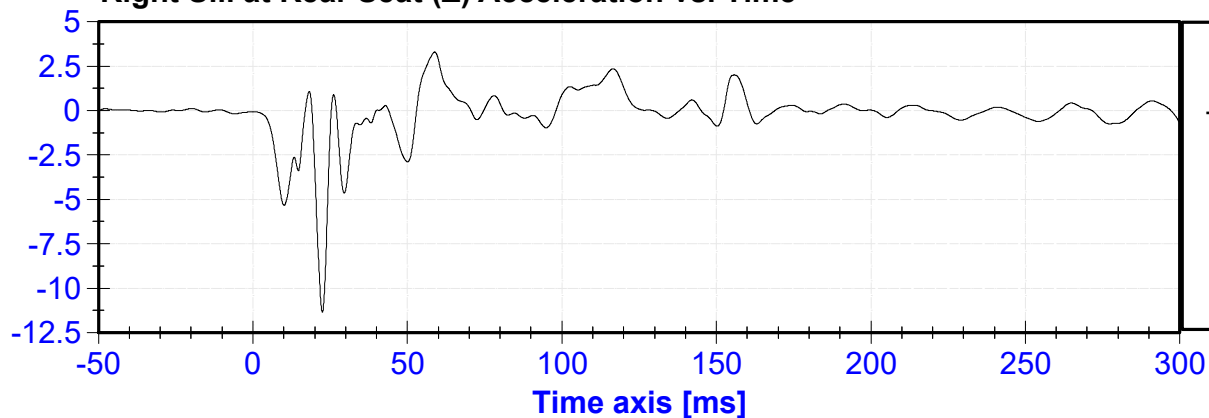
Right Sill at Rear Seat (Y) Velocity vs. Time

VELOCITY [m/s]

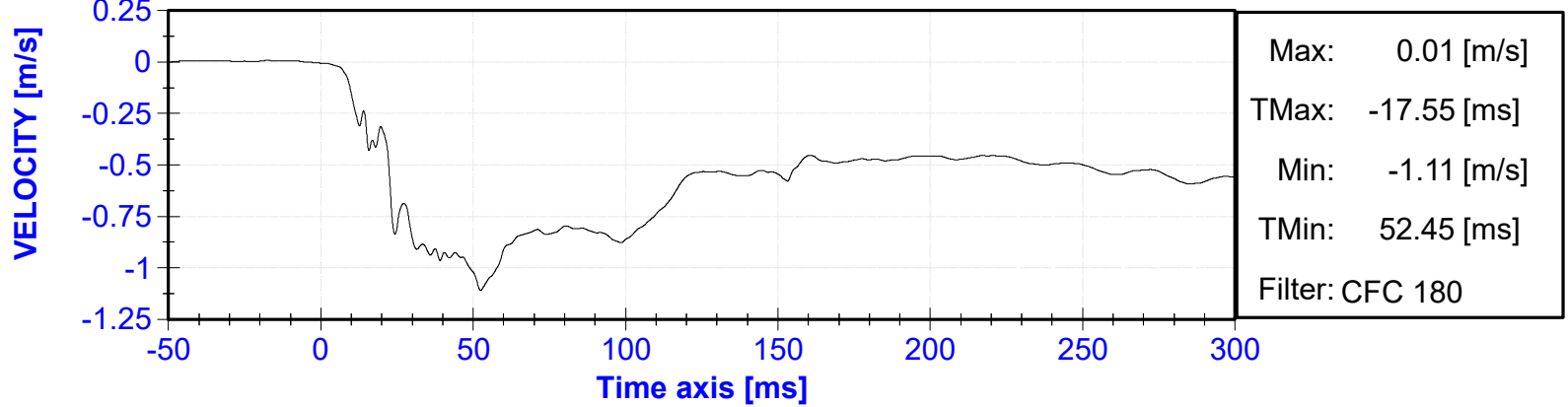


Right Sill at Rear Seat (Z) Acceleration vs. Time

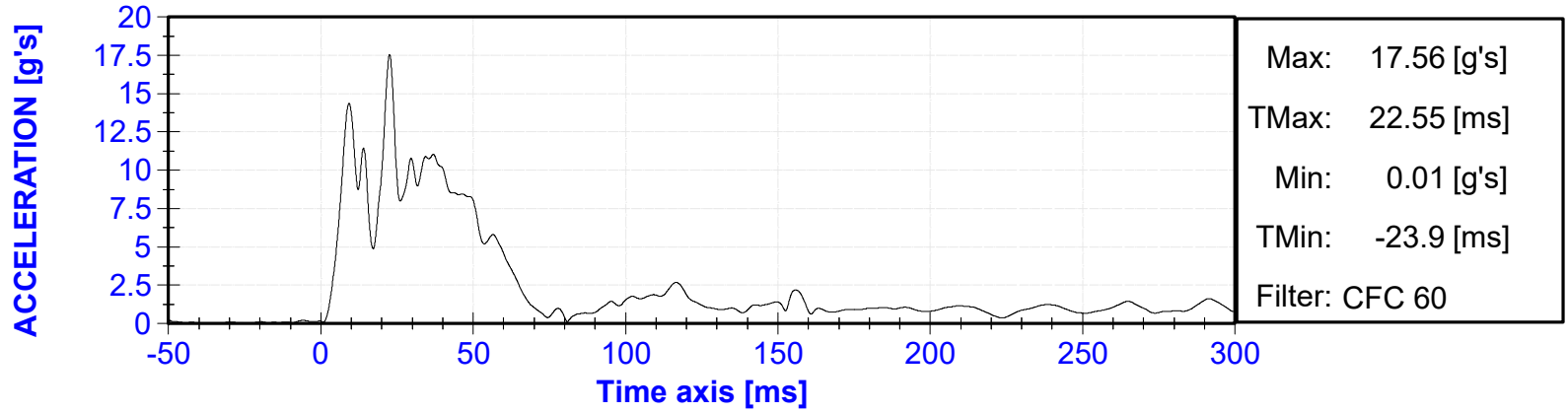
ACCELERATION [g's]



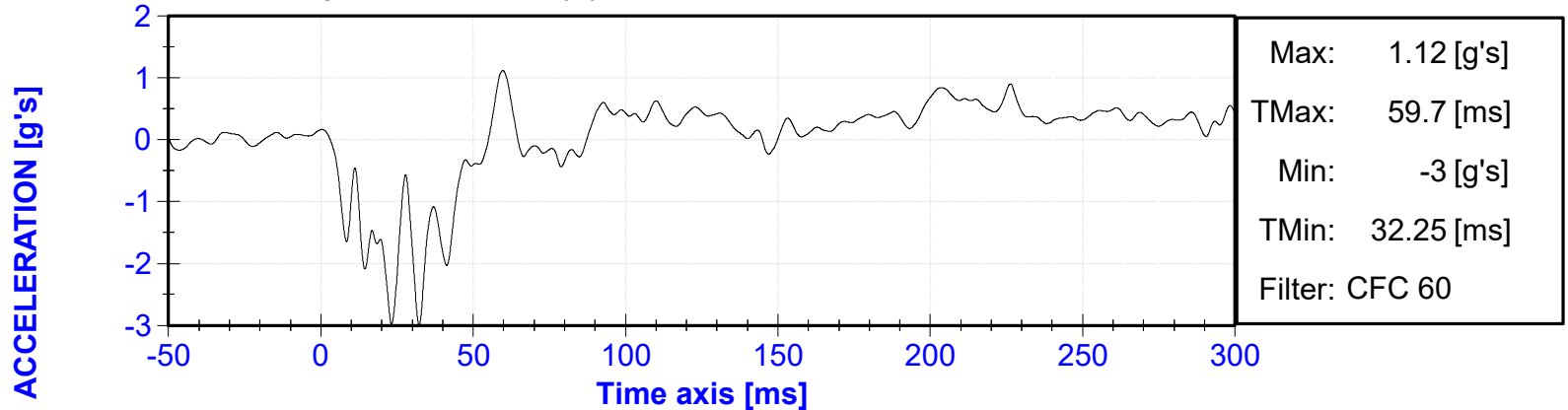
Right Sill at Rear Seat (Z) Velocity vs. Time



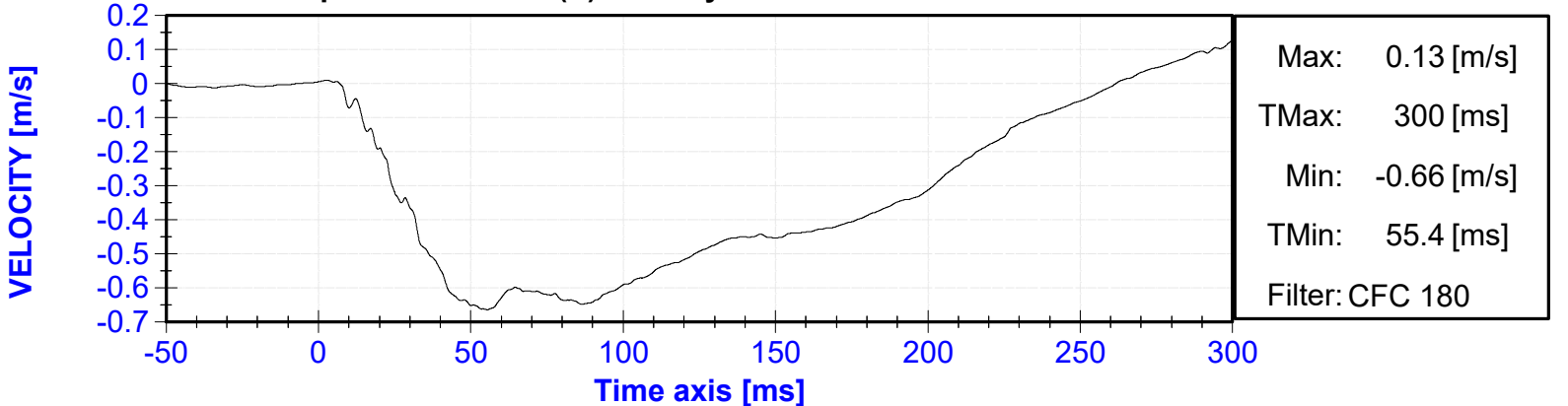
Right Sill at Rear Seat Resultant Acceleration vs. Time



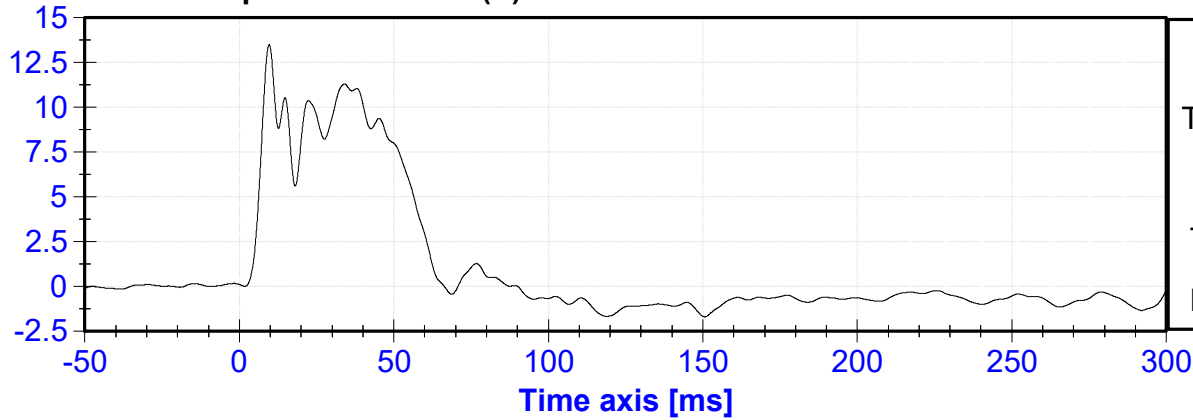
Rear Floorpan Above Axle (X) Acceleration vs. Time



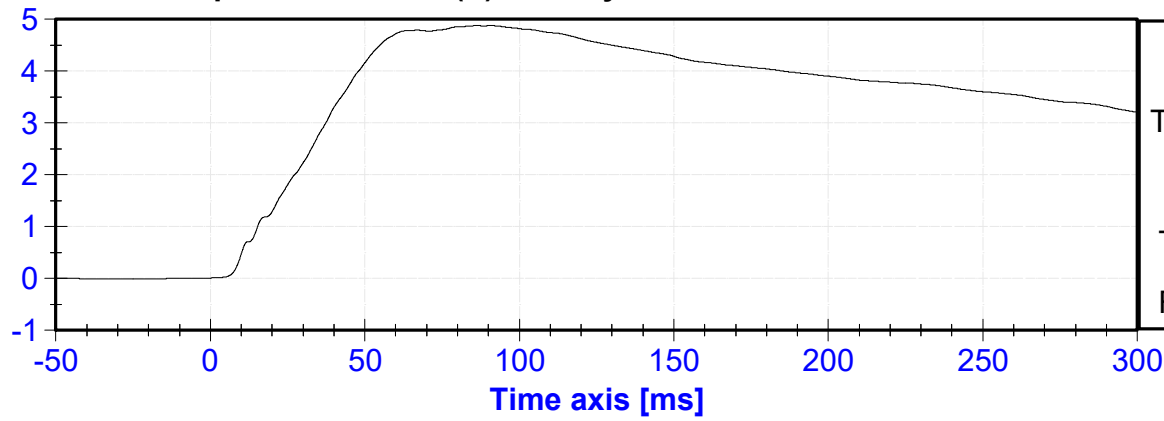
Rear Floorpan Above Axle (X) Velocity vs. Time



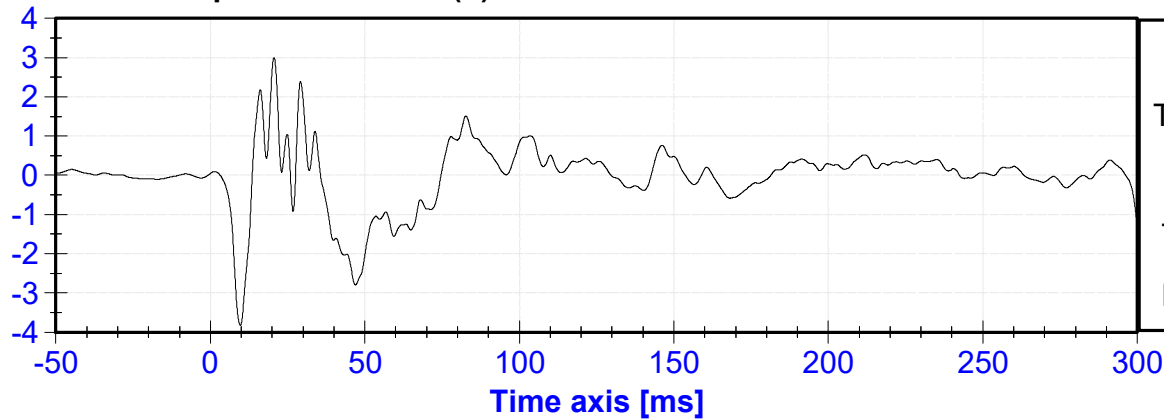
Rear Floorpan Above Axle (Y) Acceleration vs. Time



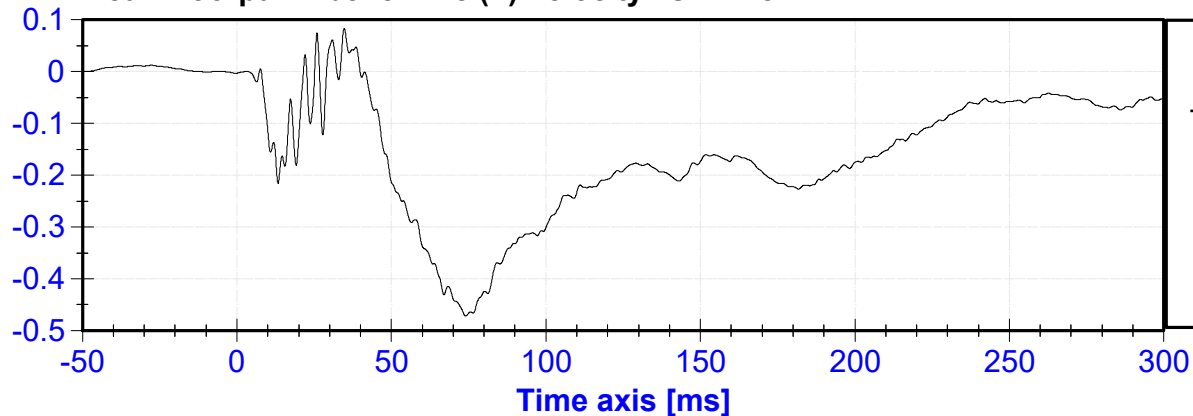
Rear Floorpan Above Axle (Y) Velocity vs. Time



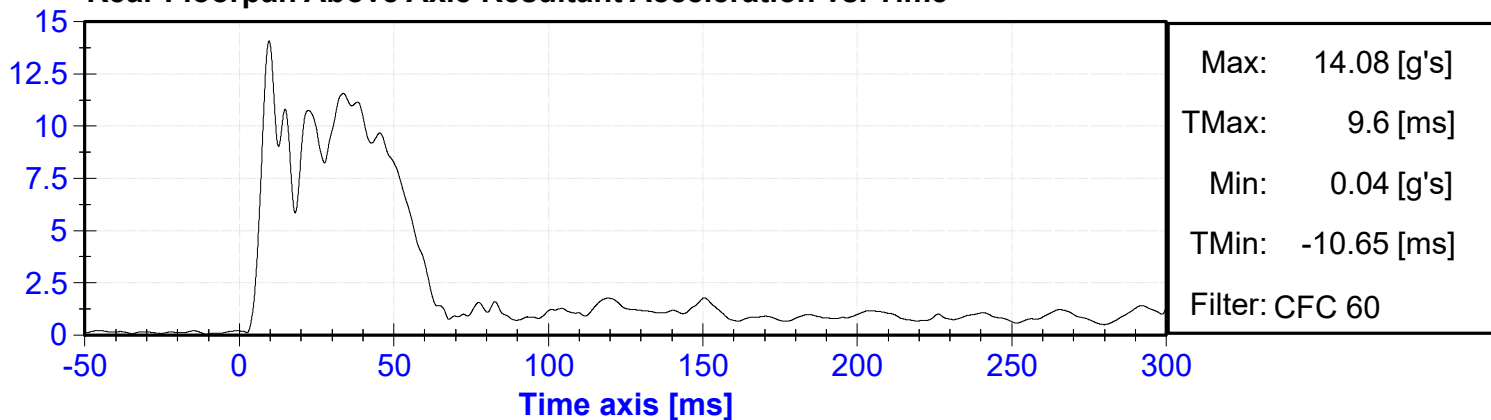
Rear Floorpan Above Axle (Z) Acceleration vs. Time



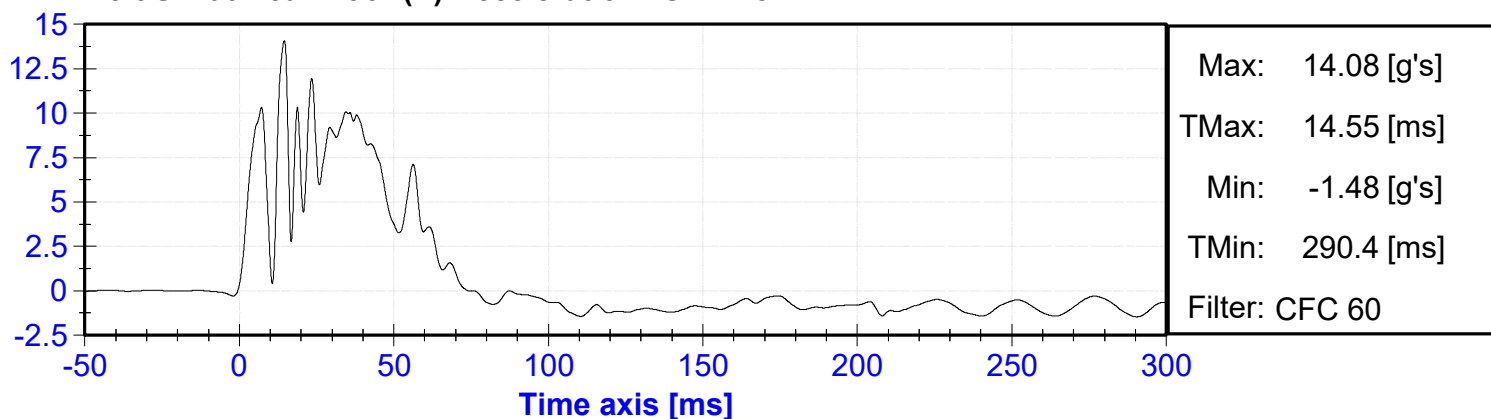
Rear Floorpan Above Axle (Z) Velocity vs. Time



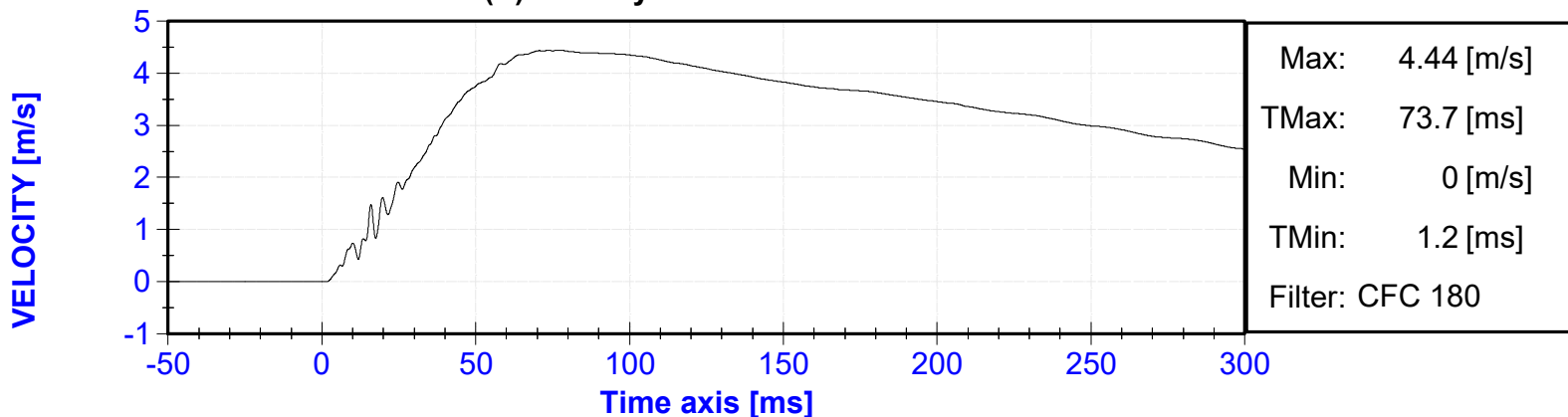
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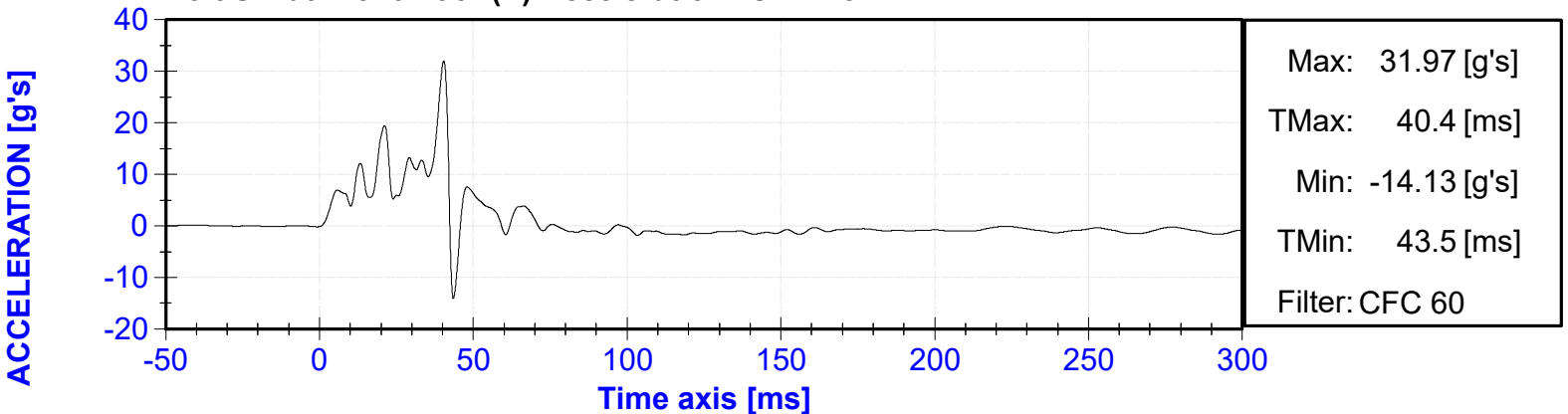
Left Sill at Rear Door (Y) Acceleration vs. Time



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

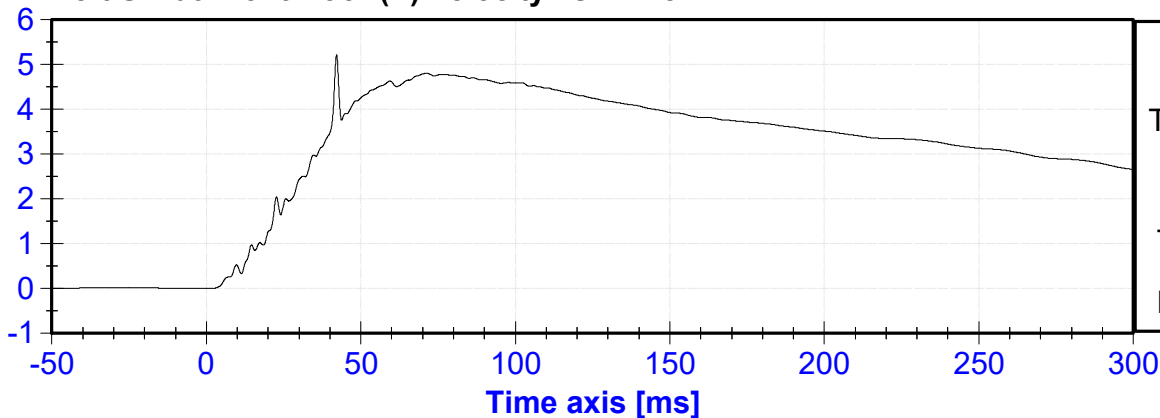


Left Sill at Front Door (Y) Acceleration vs. Time.



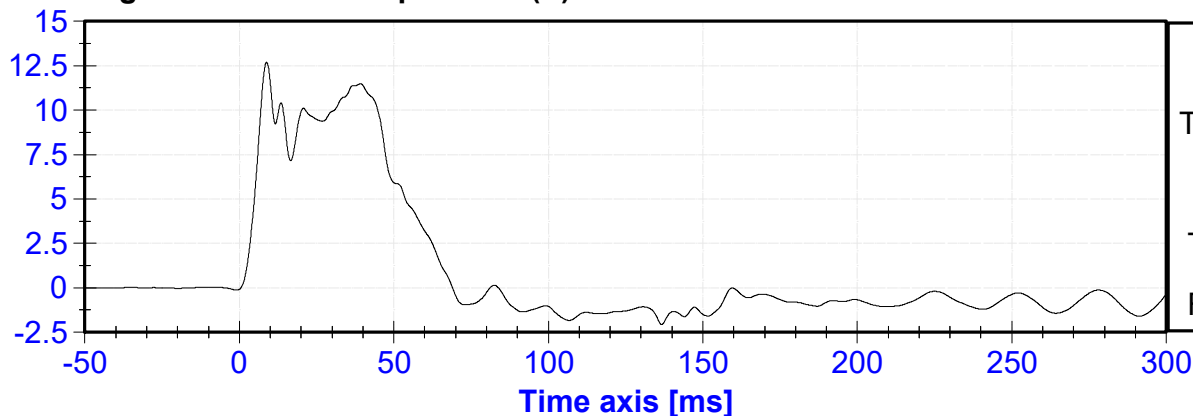
Left Sill at Front Door (Y) Velocity vs. Time

VELOCITY [m/s]



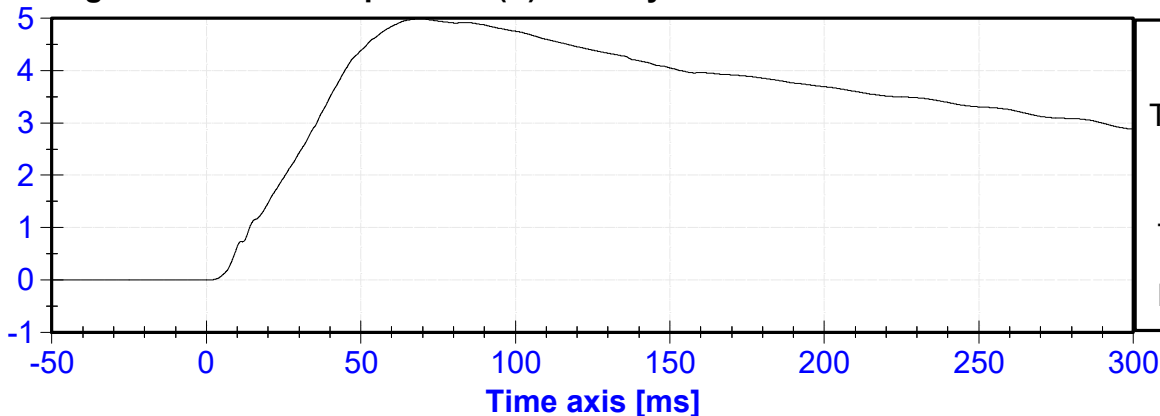
Right Rear Occ. Compartment(Y) Acceleration vs. Time

ACCELERATION [g's]



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

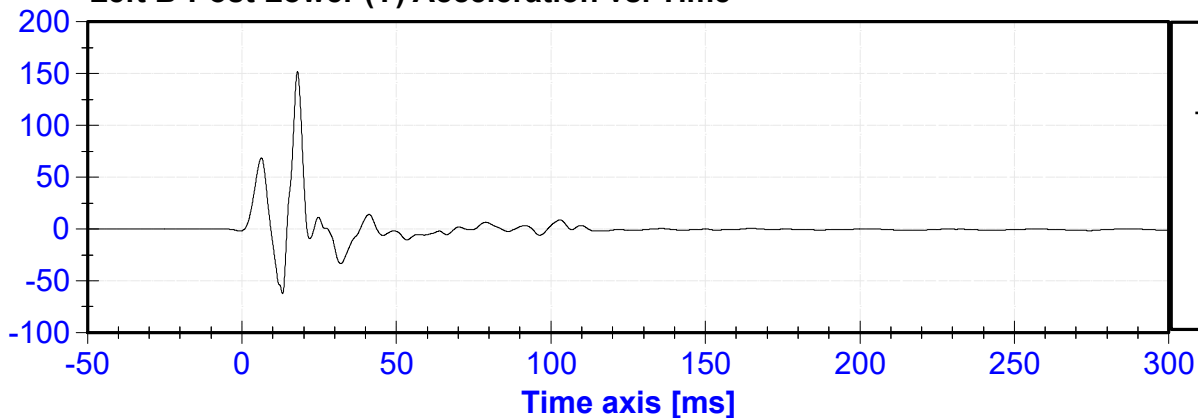
VELOCITY [m/s]



Exceeded calibration range and saturated at 11.1 ms

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

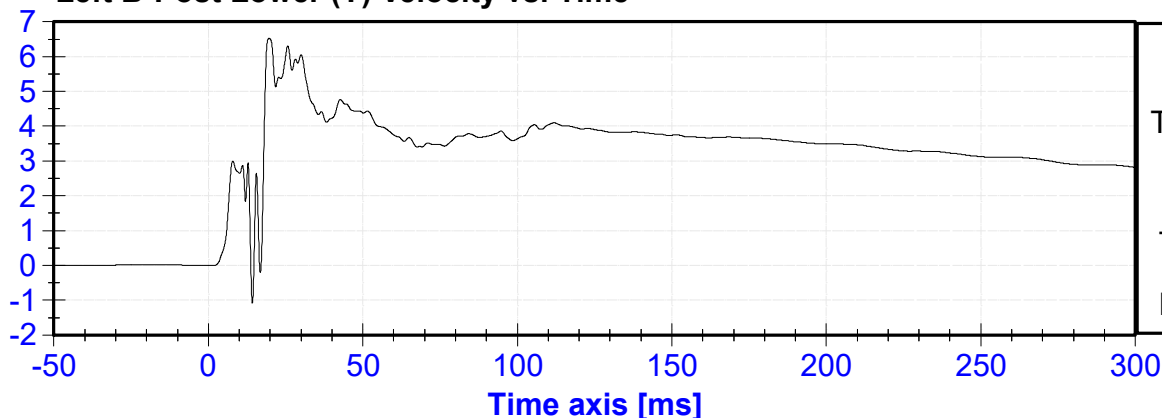
ACCELERATION [g's]



Exceeded calibration range and saturated at 11.1 ms

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

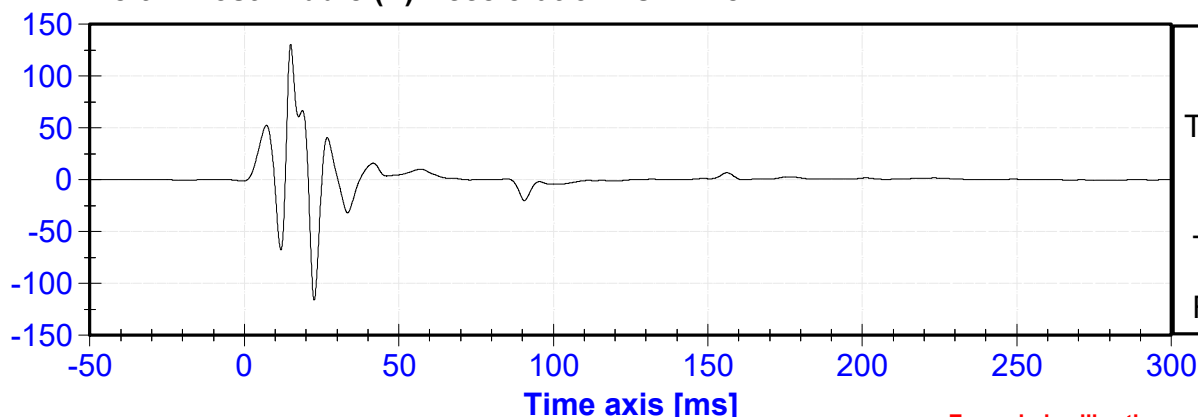
VELOCITY [m/s]



Exceeded calibration range and saturated at 13.6 ms

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

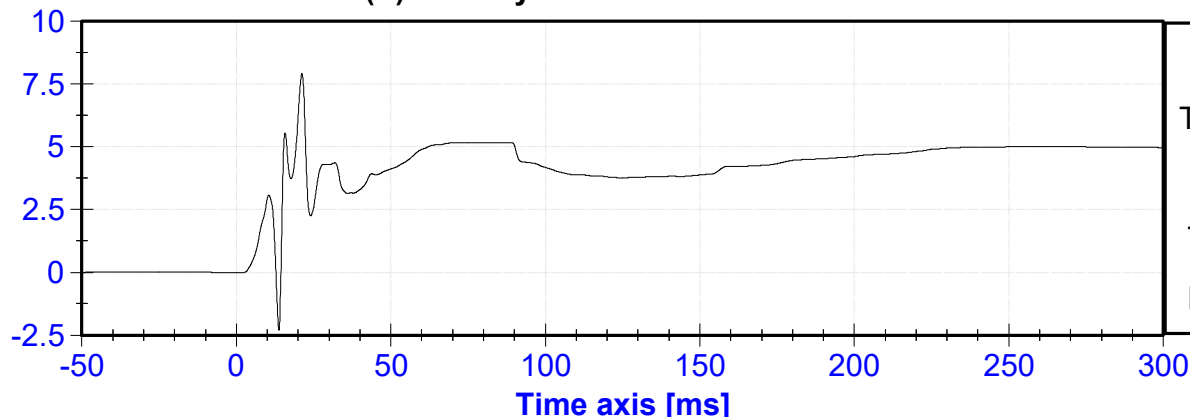
ACCELERATION [g's]



Exceeded calibration range and saturated at 13.6 ms

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

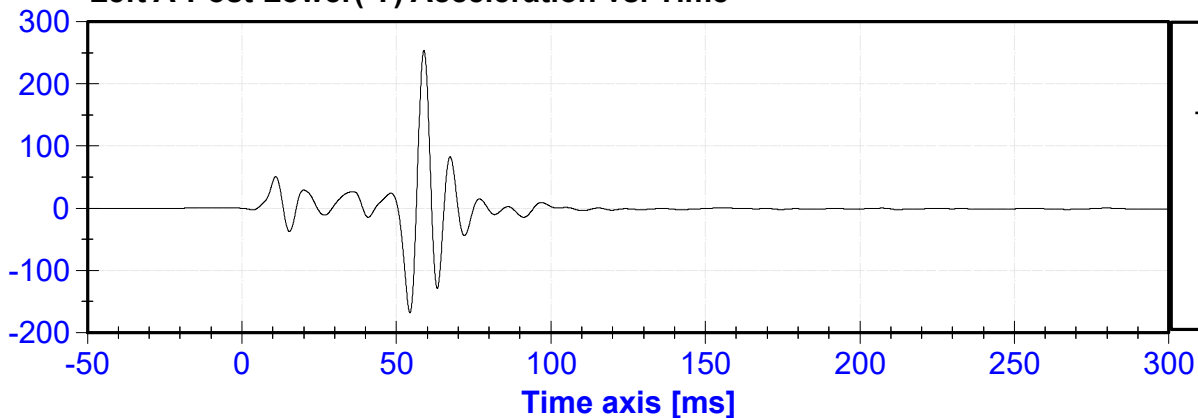
VELOCITY [m/s]



Questionable data after 13.6 ms

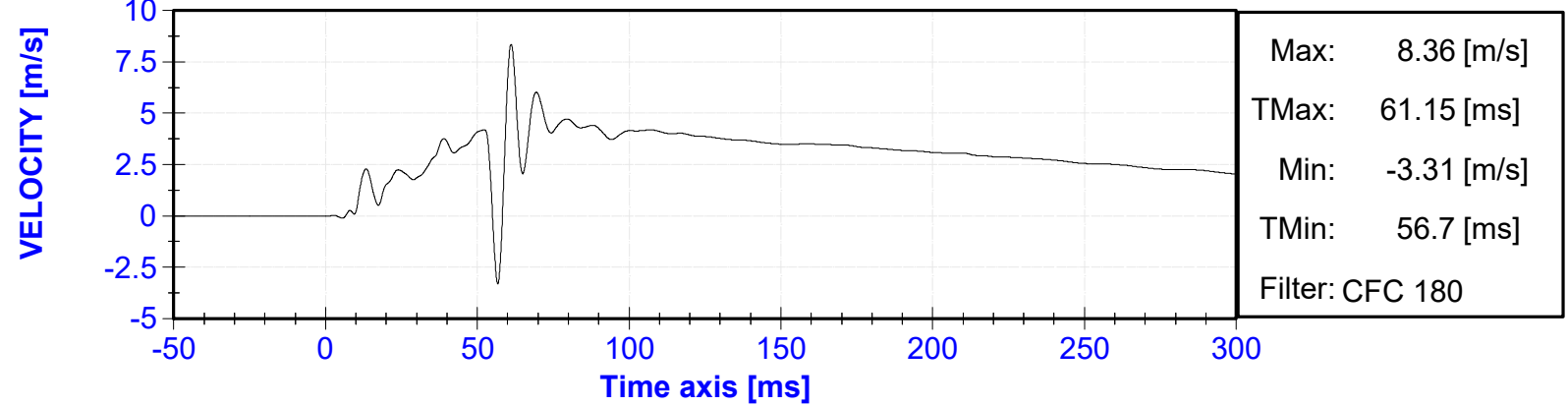
Left A-Post Lower (Y) Acceleration vs. Time

ACCELERATION [g's]

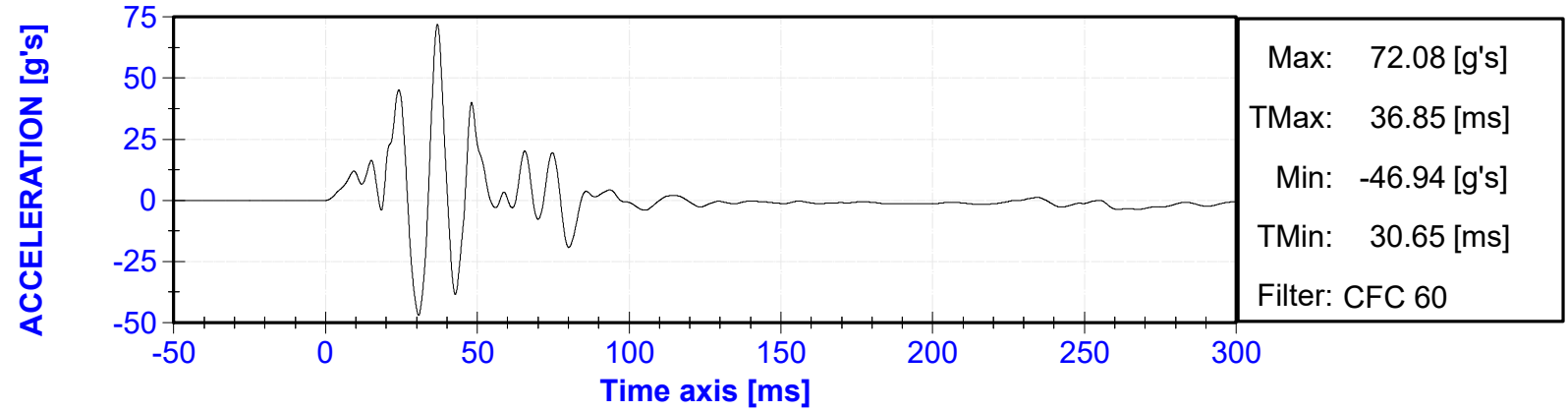


Questionable data after 13.6 ms

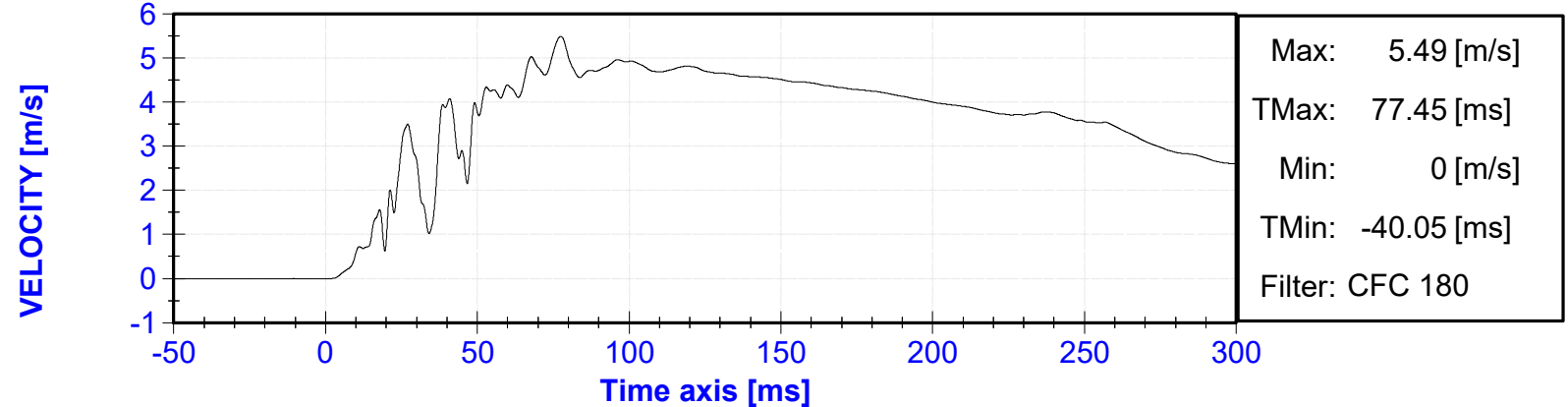
Left A-Post Lower(Y) Velocity vs. Time



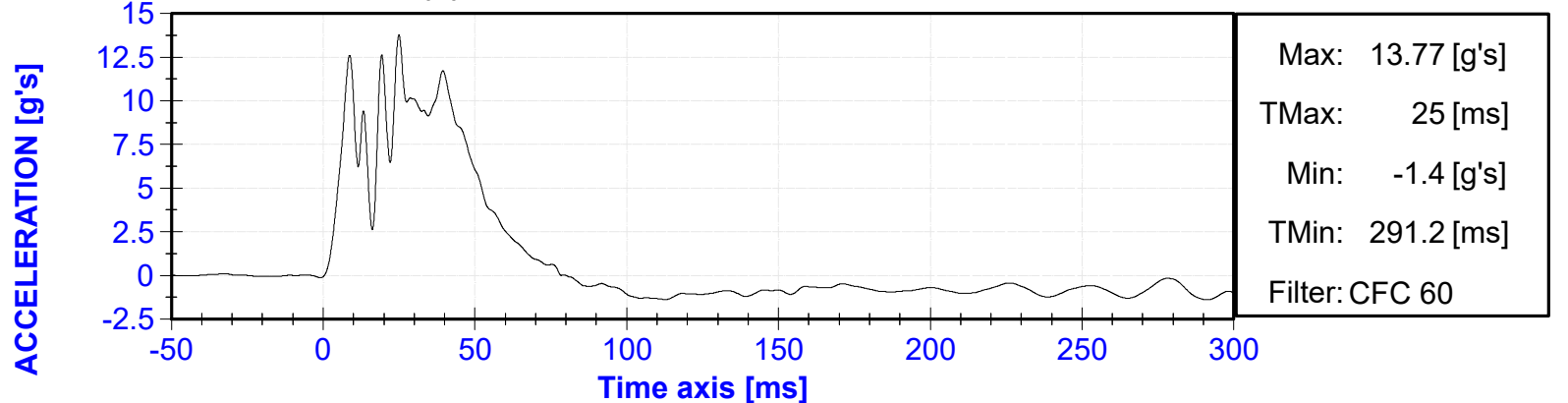
Left A-Post Middle (Y) Acceleration vs. Time



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

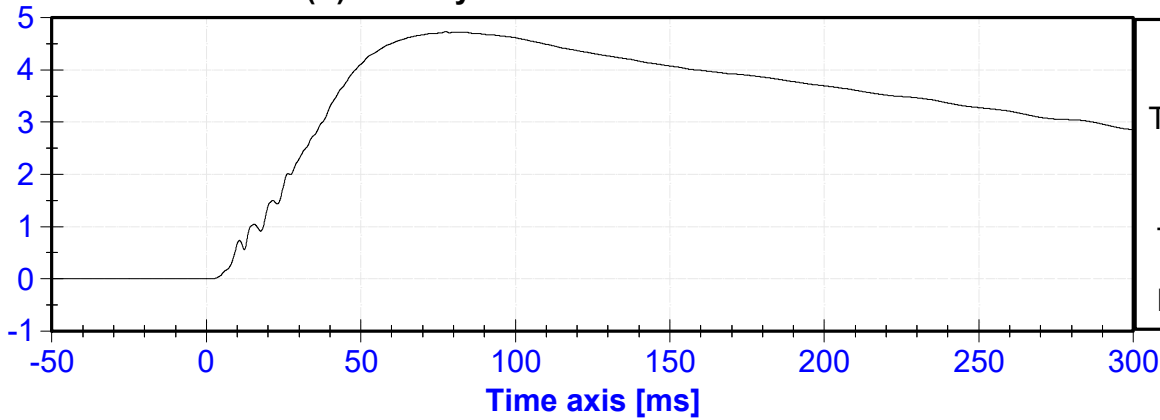


Front Seat Track (Y) Acceleration vs. Time



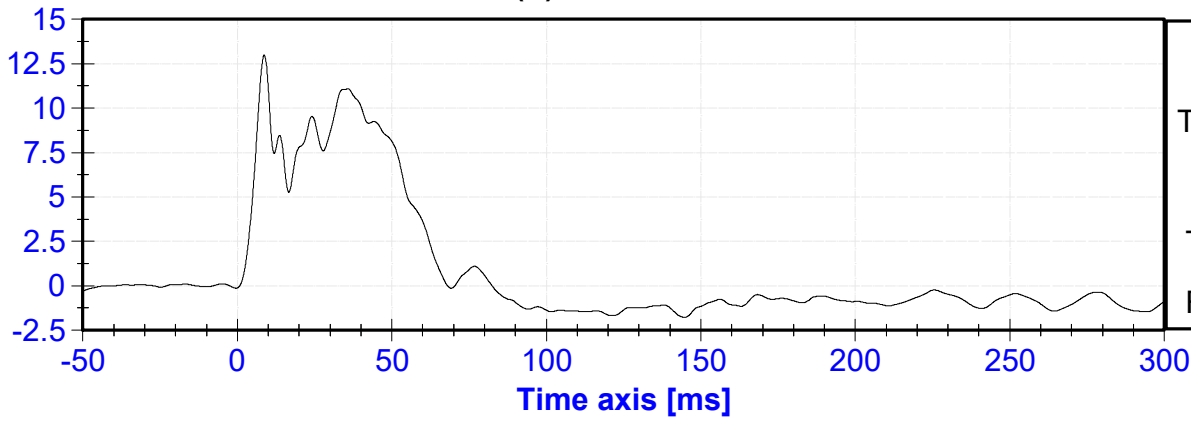
Front Seat Track (Y) Velocity vs. Time

VELOCITY [m/s]



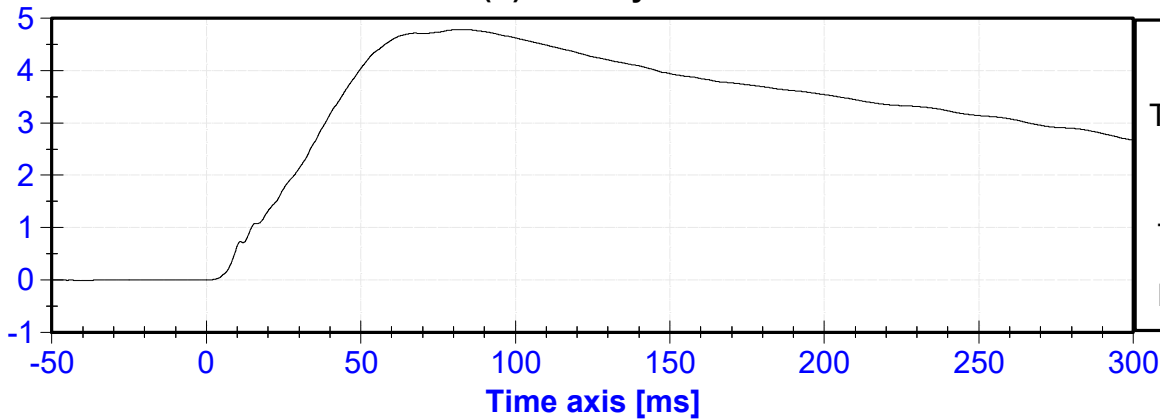
Rear Seat Track or Structure (Y) Acceleration vs. Time

ACCELERATION [g's]



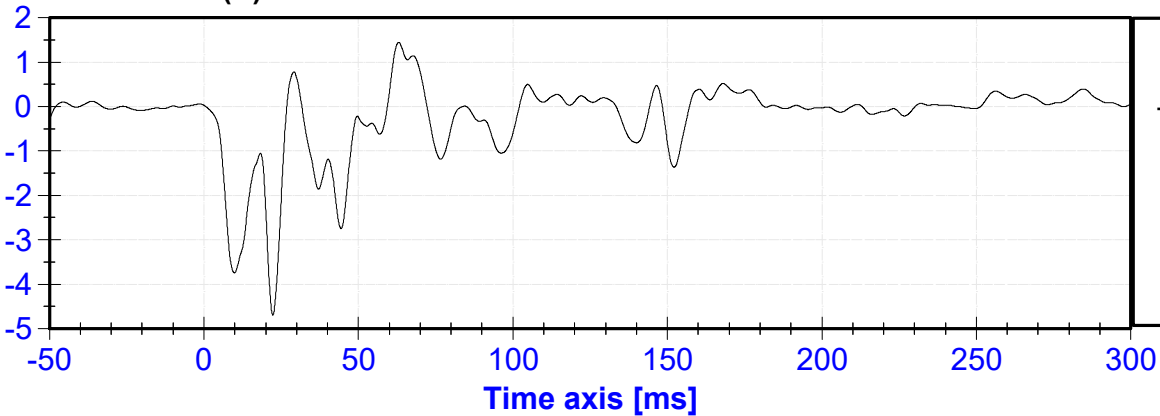
Rear Seat Track or Structure (Y) Velocity vs. Time

VELOCITY [m/s]



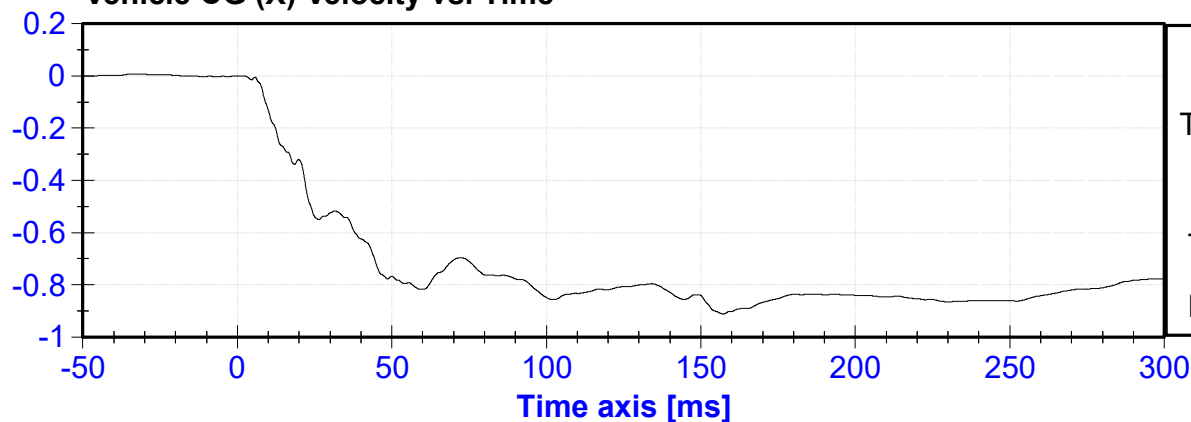
Vehicle CG (X) Acceleration vs. Time

ACCELERATION [g's]



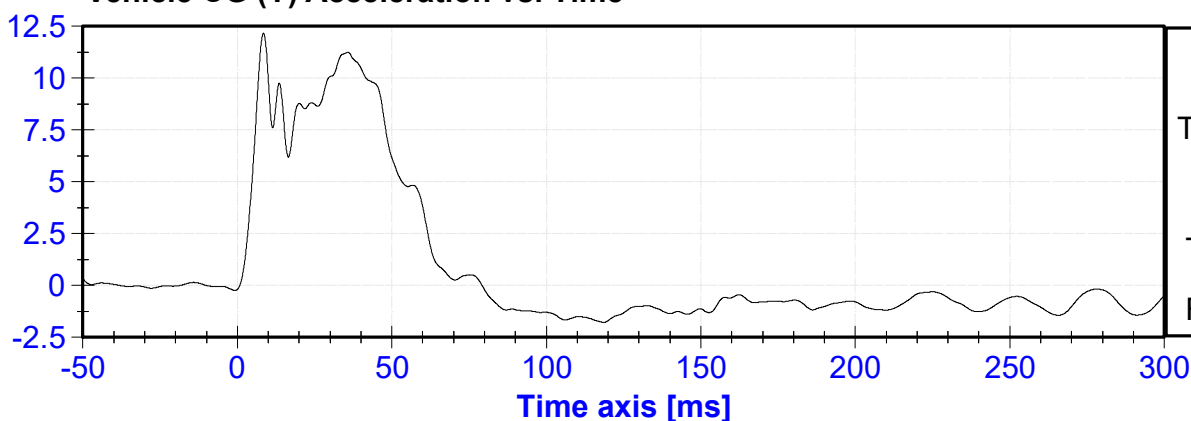
Vehicle CG (X) Velocity vs. Time

VELOCITY [m/s]



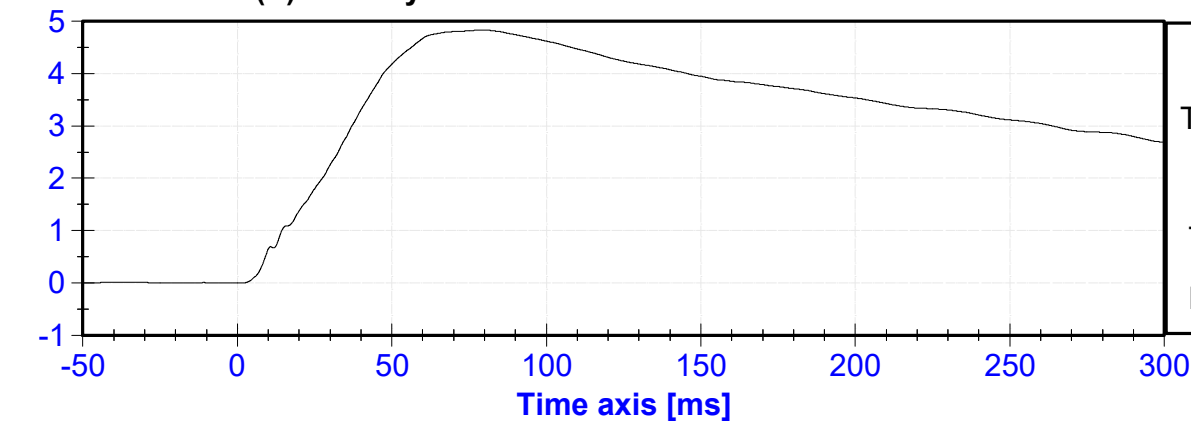
Vehicle CG (Y) Acceleration vs. Time

ACCELERATION [g's]



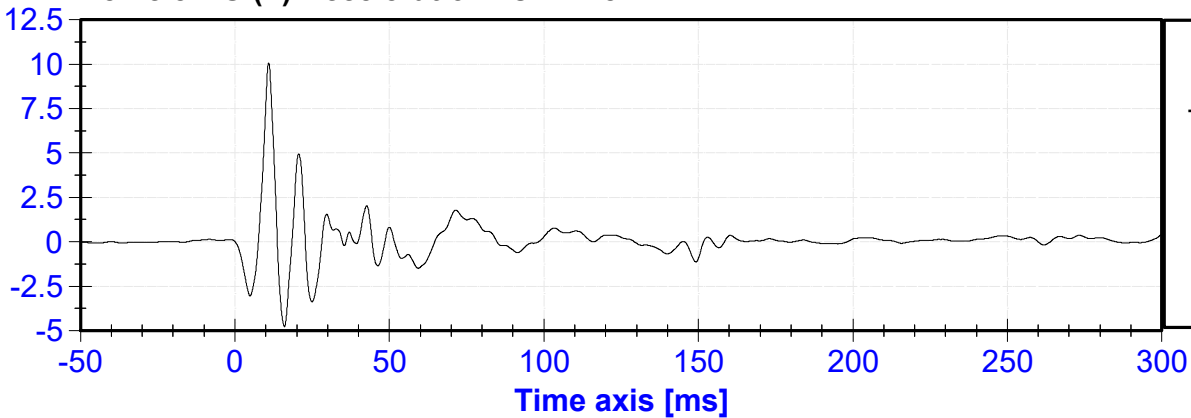
Vehicle CG (Y) Velocity vs. Time

VELOCITY [m/s]

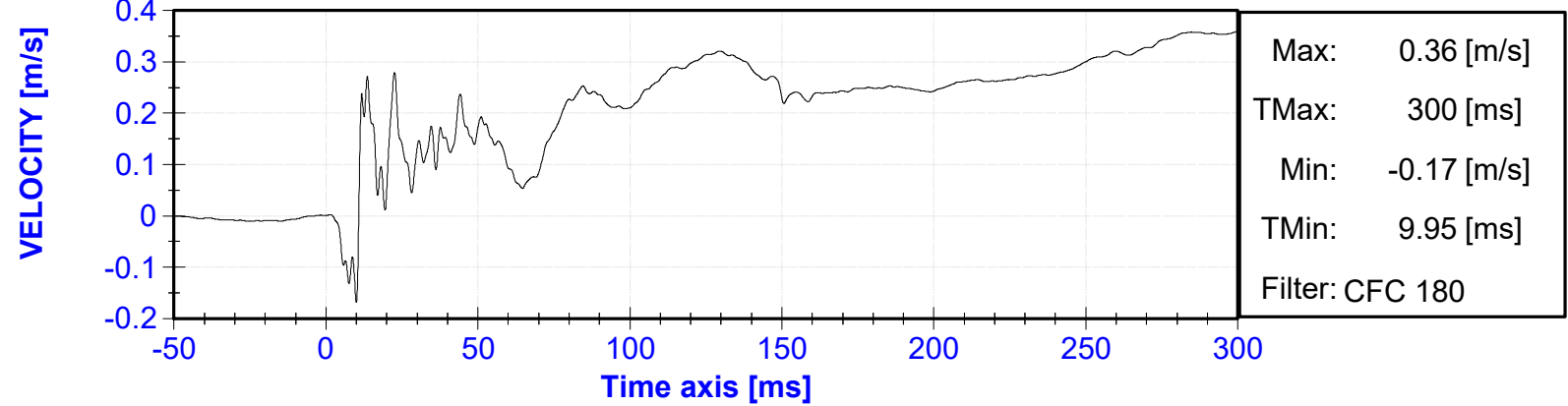


Vehicle CG (Z) Acceleration vs. Time

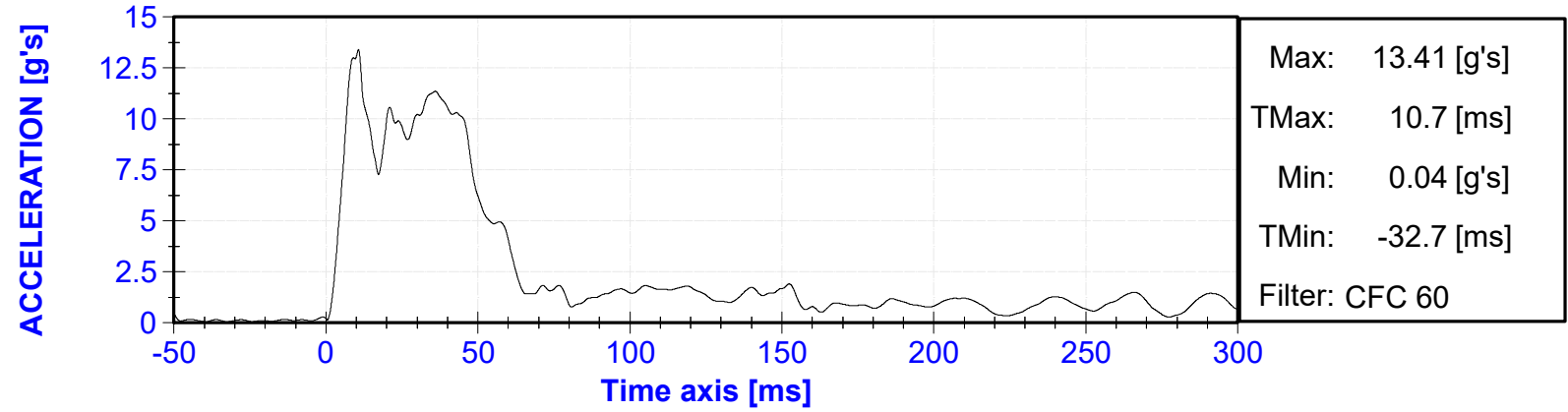
ACCELERATION [g's]



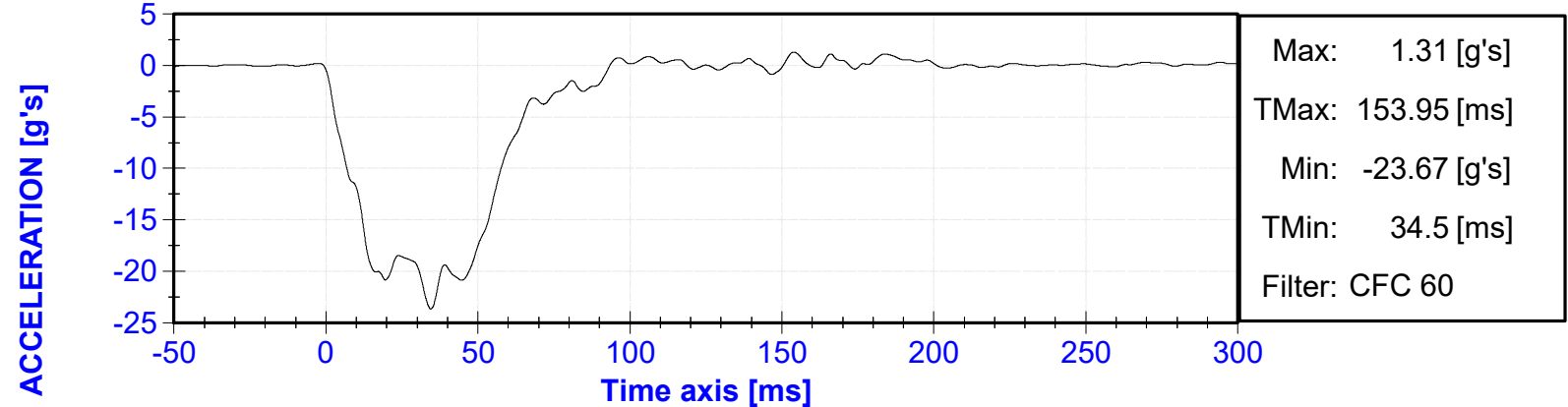
Vehicle CG (Z) Velocity vs. Time



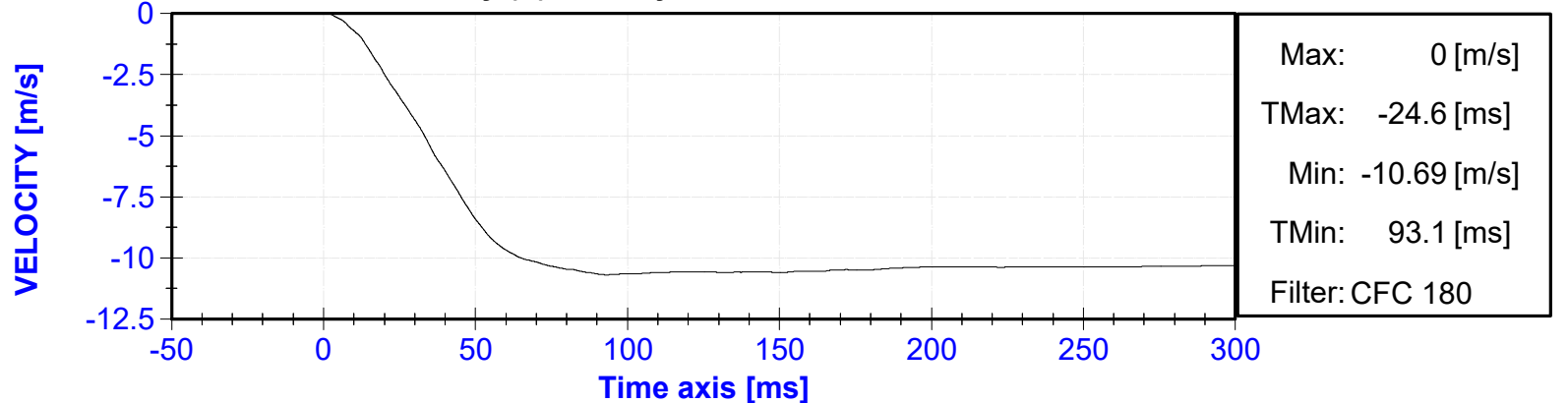
Vehicle CG Resultant Acceleration vs. Time



MDB Center of Gravity (X) Acceleration vs. Time

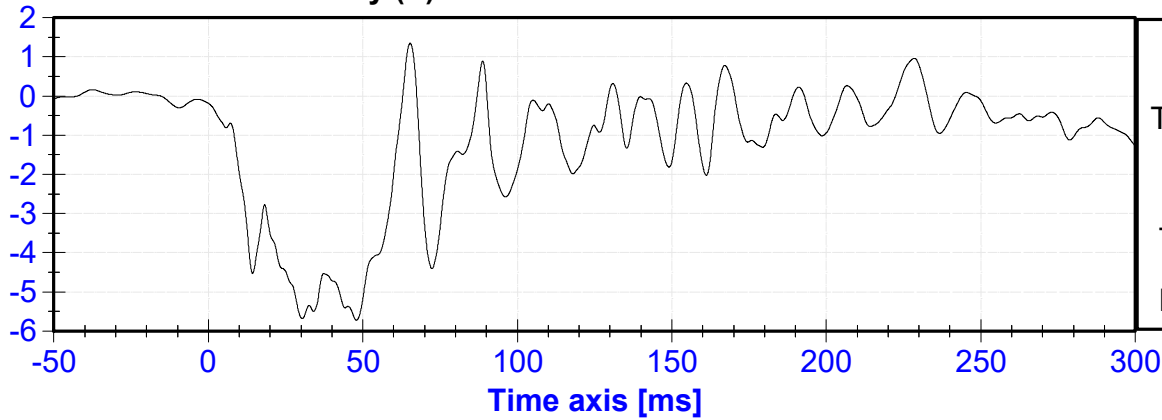


MDB Center of Gravity (X) Velocity vs. Time



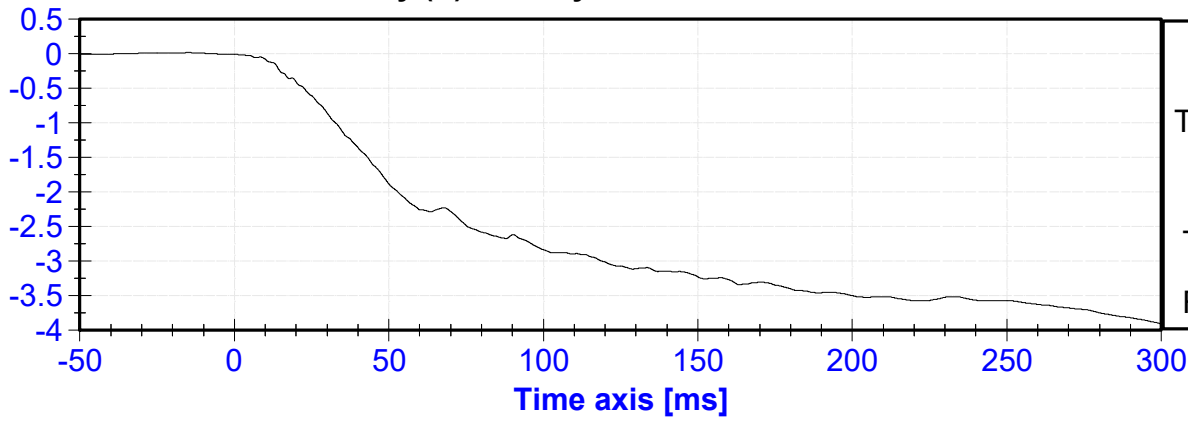
MDB Center of Gravity (Y) Acceleration vs. Time

ACCELERATION [g's]



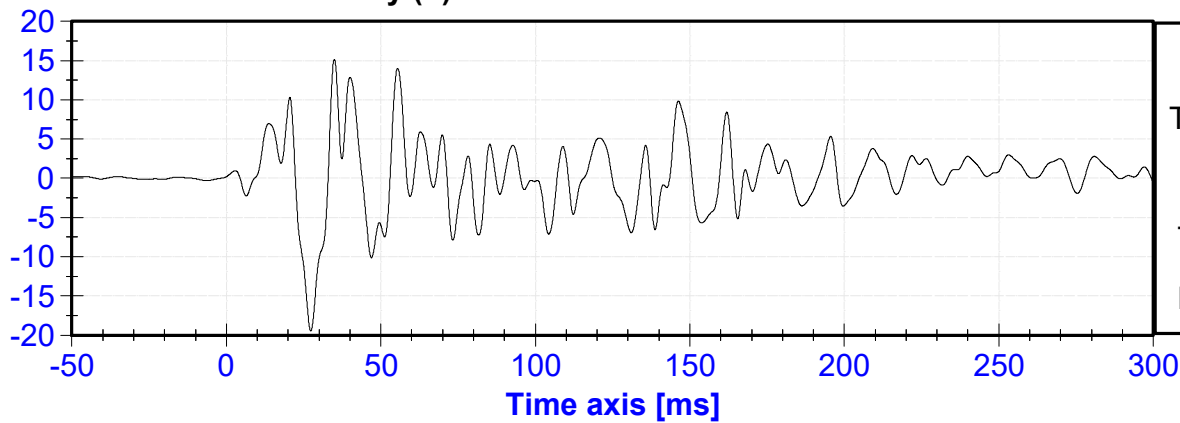
MDB Center of Gravity (Y) Velocity vs. Time

VELOCITY [m/s]



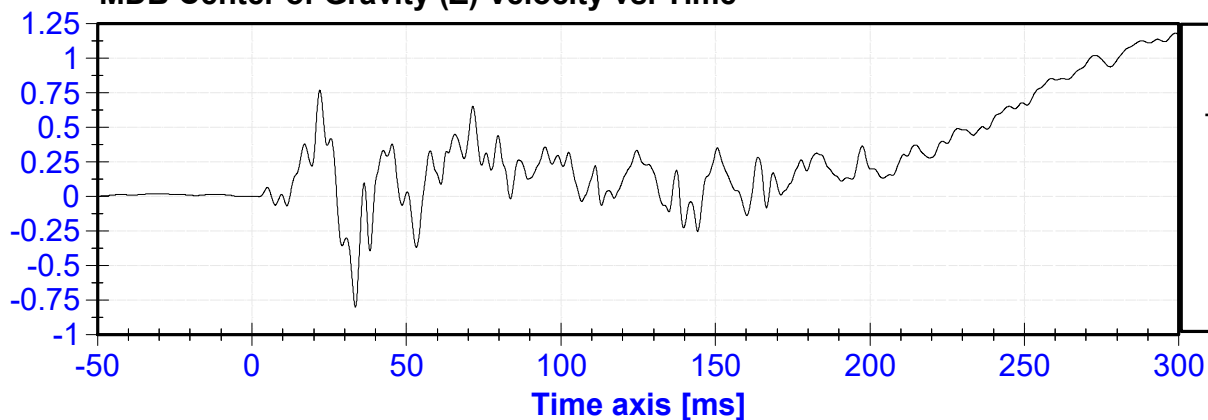
MDB Center of Gravity (Z) Acceleration vs. Time

ACCELERATION [g's]



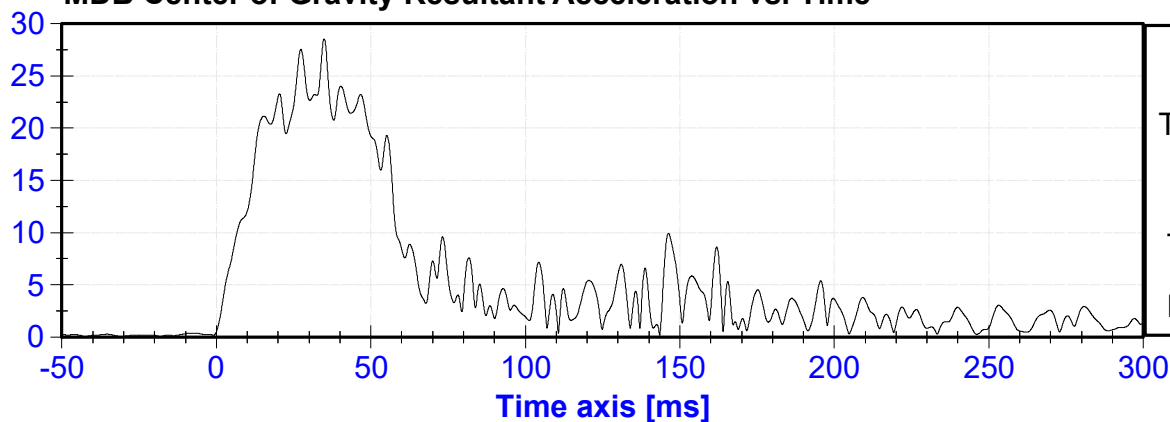
MDB Center of Gravity (Z) Velocity vs. Time

VELOCITY [m/s]



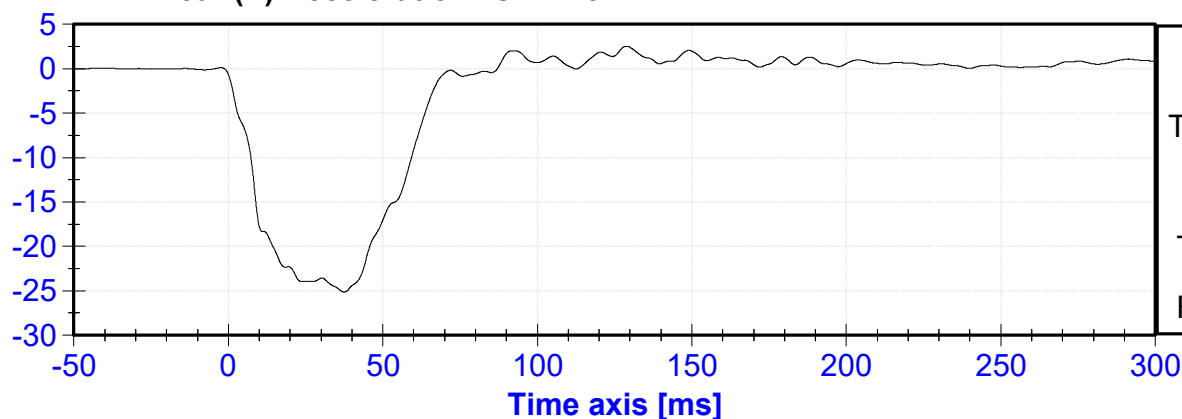
MDB Center of Gravity Resultant Acceleration vs. Time

ACCELERATION [g's]



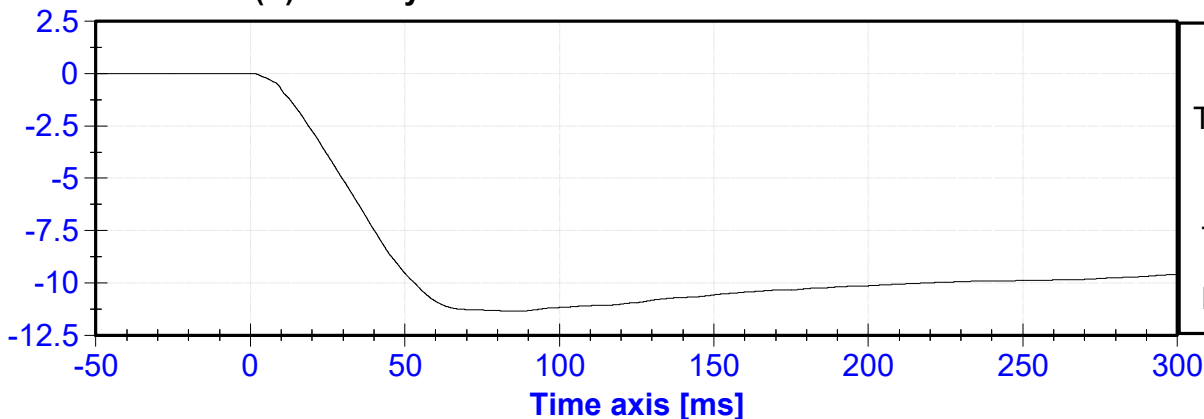
MDB Rear (X) Acceleration vs. Time

ACCELERATION [g's]



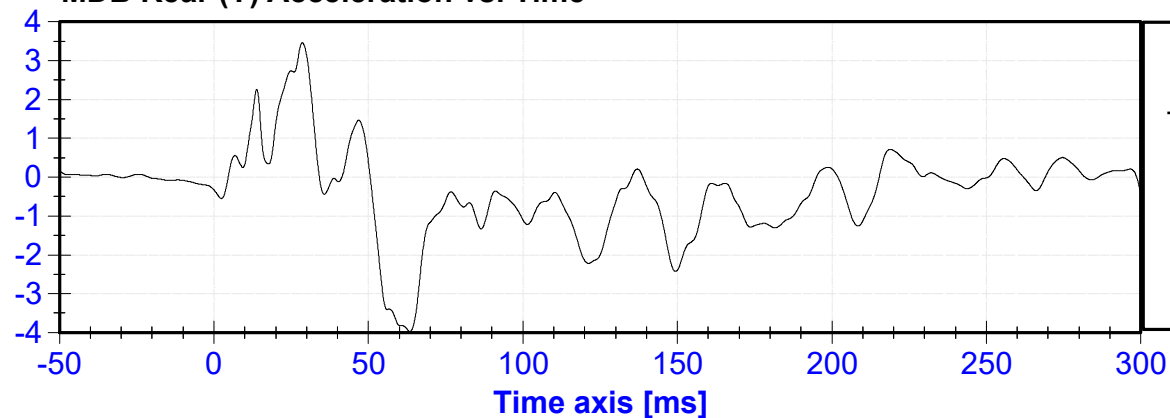
MDB Rear (X) Velocity vs. Time

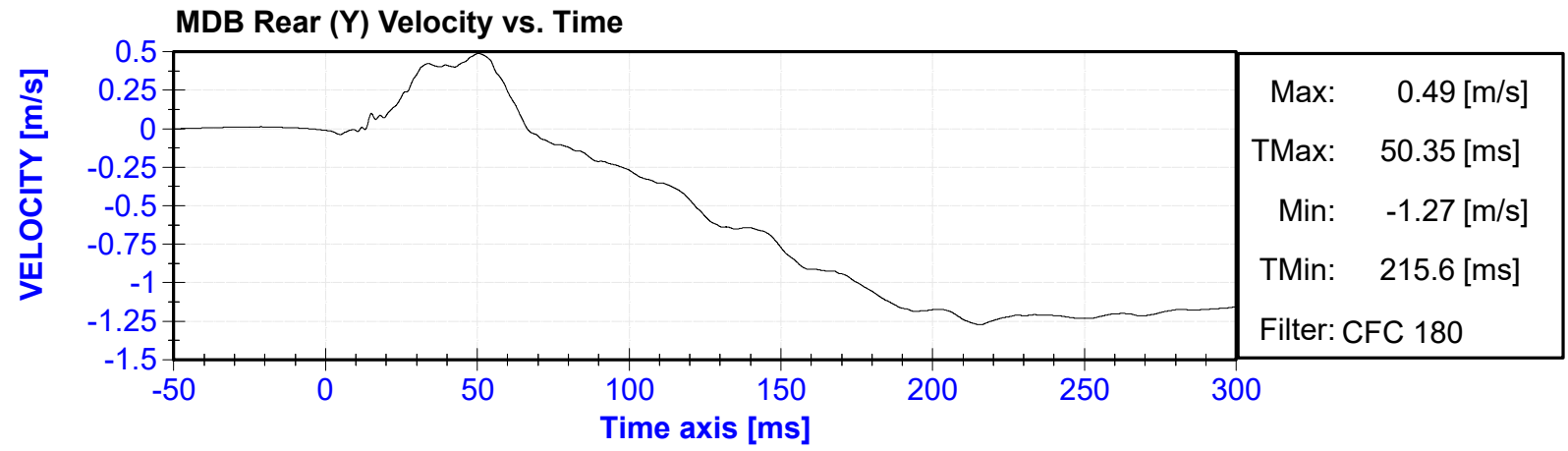
VELOCITY [m/s]



MDB Rear (Y) Acceleration vs. Time

ACCELERATION [g's]





APPENDIX V

PRE-TEST ES-2re PERFORMANCE CALIBRATION TEST DATA

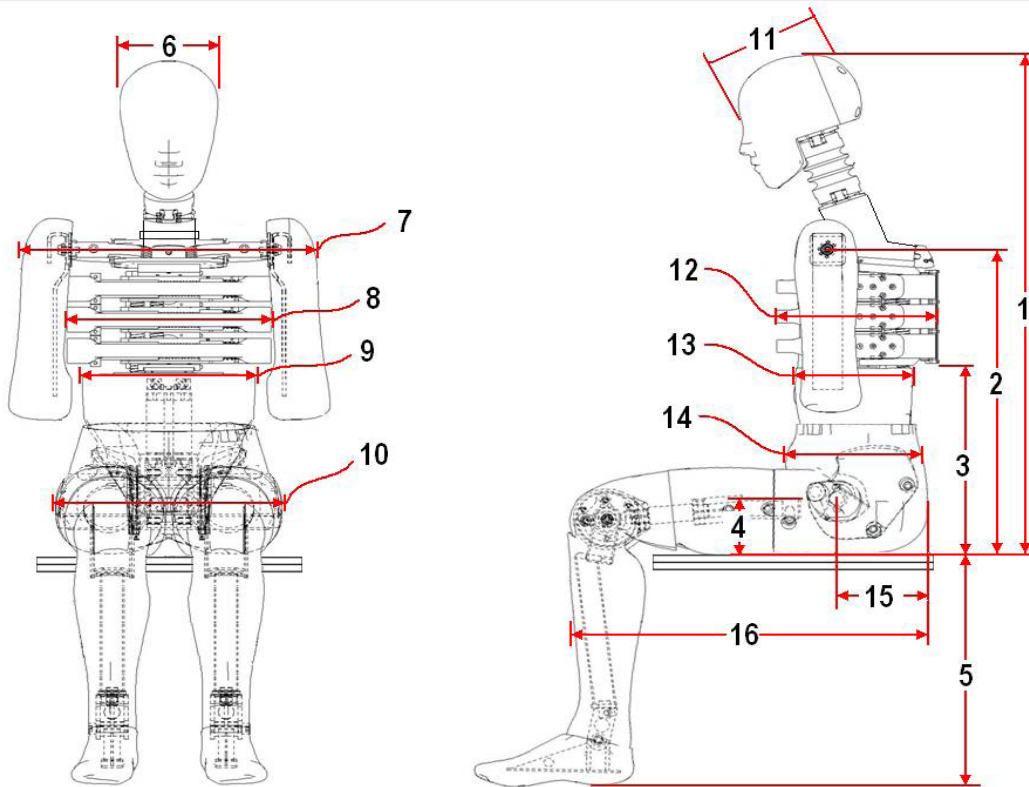


External Measurements - EuroSID-2re

Technician: T. Roseman

Date: 4/22/2024

Dummy Serial Number: D037



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	562	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	421	Pass
6	Head Width	152	158	155	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	283	Pass
10	Pelvis Lap Width	359	373	362	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	267	Pass
13	Abdomen Depth	194	204	198	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	607	Pass

ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

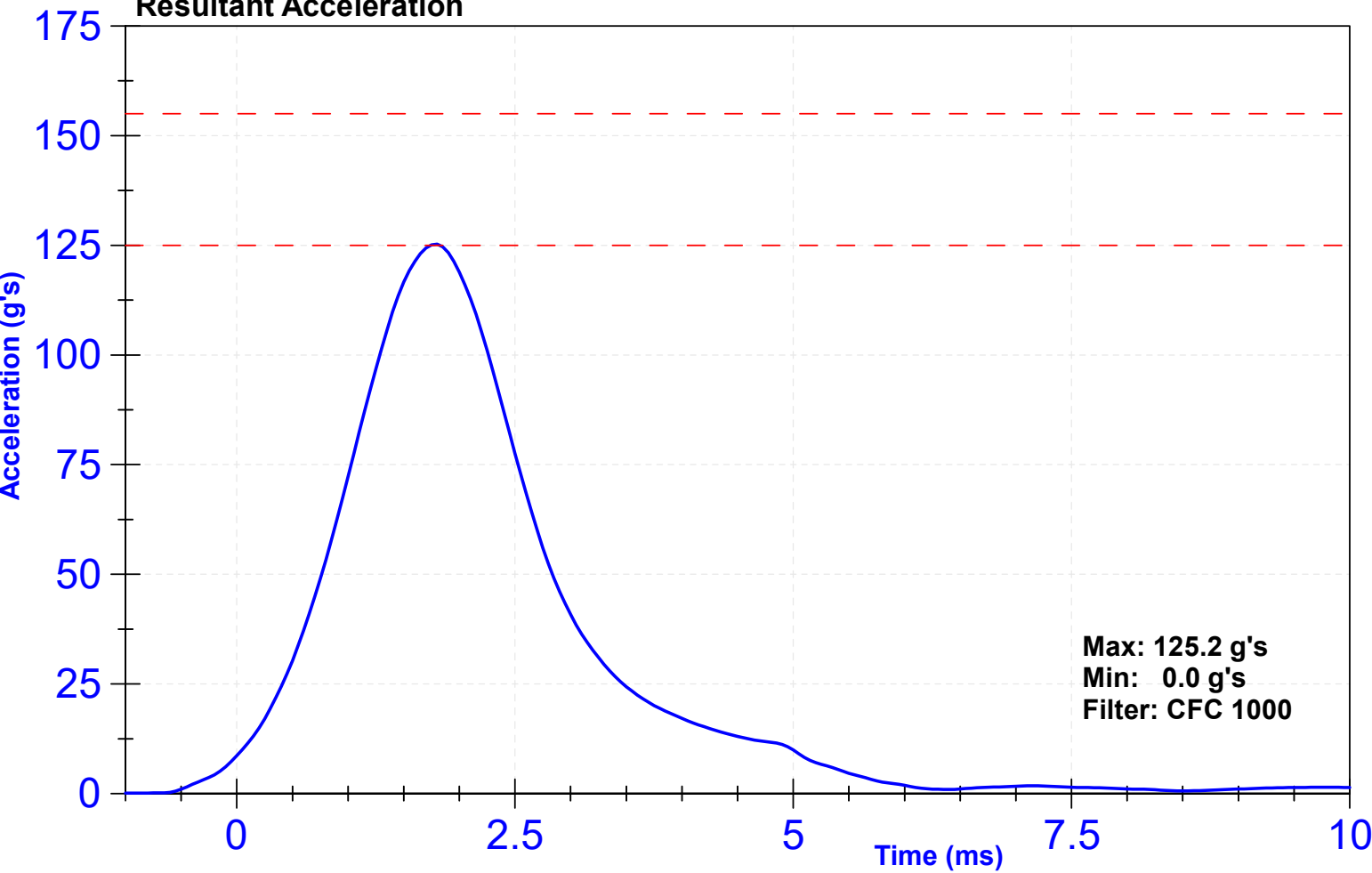
Results

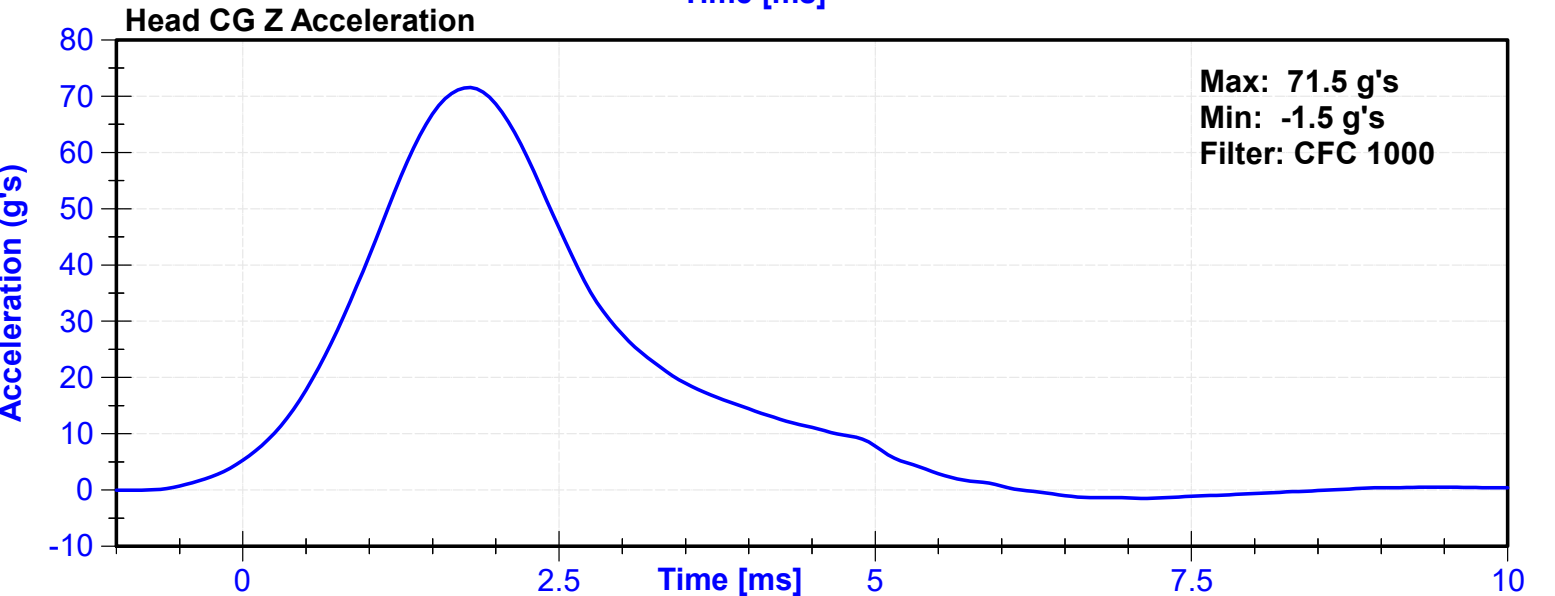
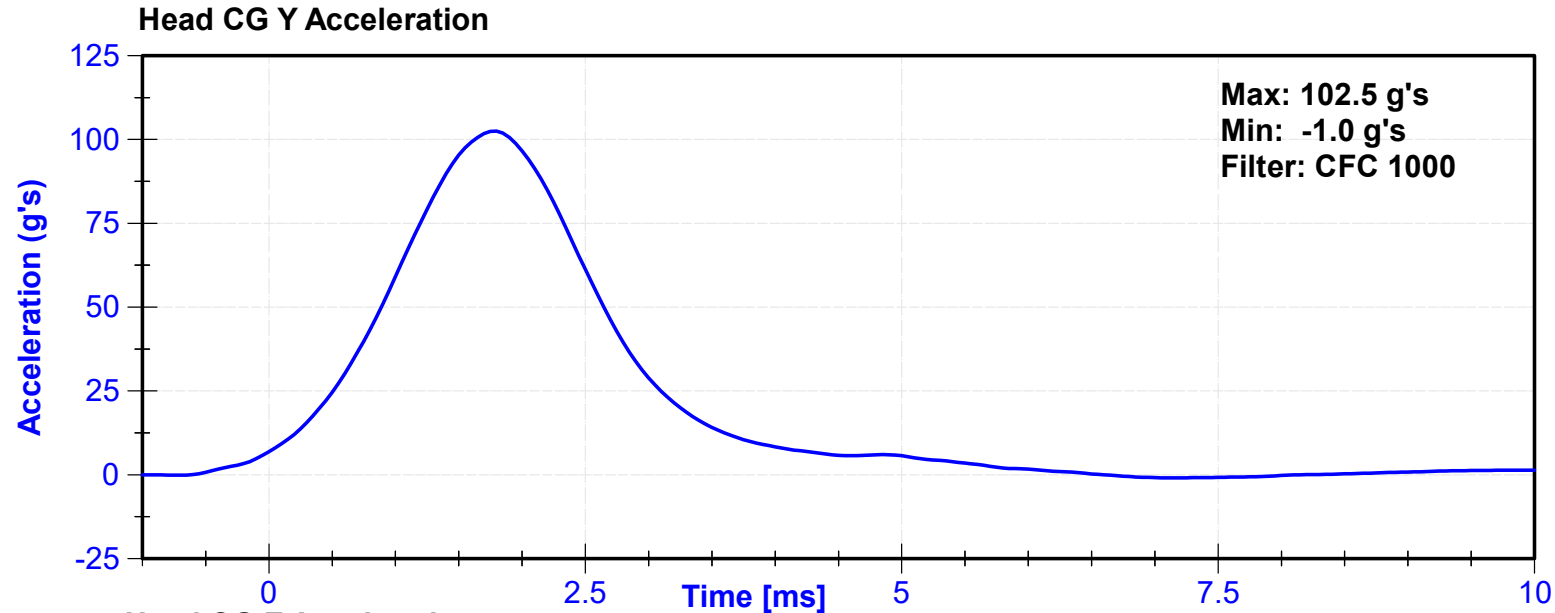
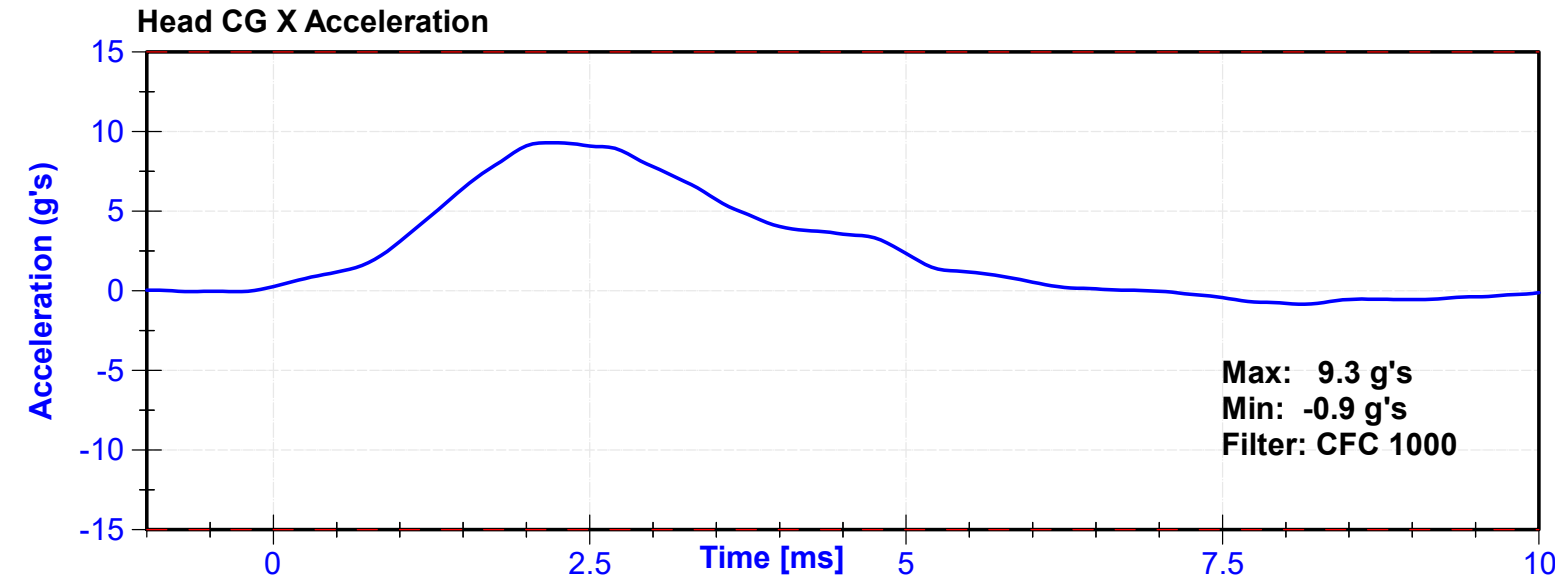
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	33.1	Pass
Resultant Acceleration	125	155	g's	125.2	Pass
Oscillation	0	15	%	1.43	Pass
Fore-Aft Acceleration	-15	15	g's	9.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	2/1/2024	7/30/2024
Y Accelerometer	Endevco	T22281	2/1/2024	7/30/2024
Z Accelerometer	Endevco	T26050	2/1/2024	7/30/2024

Resultant Acceleration





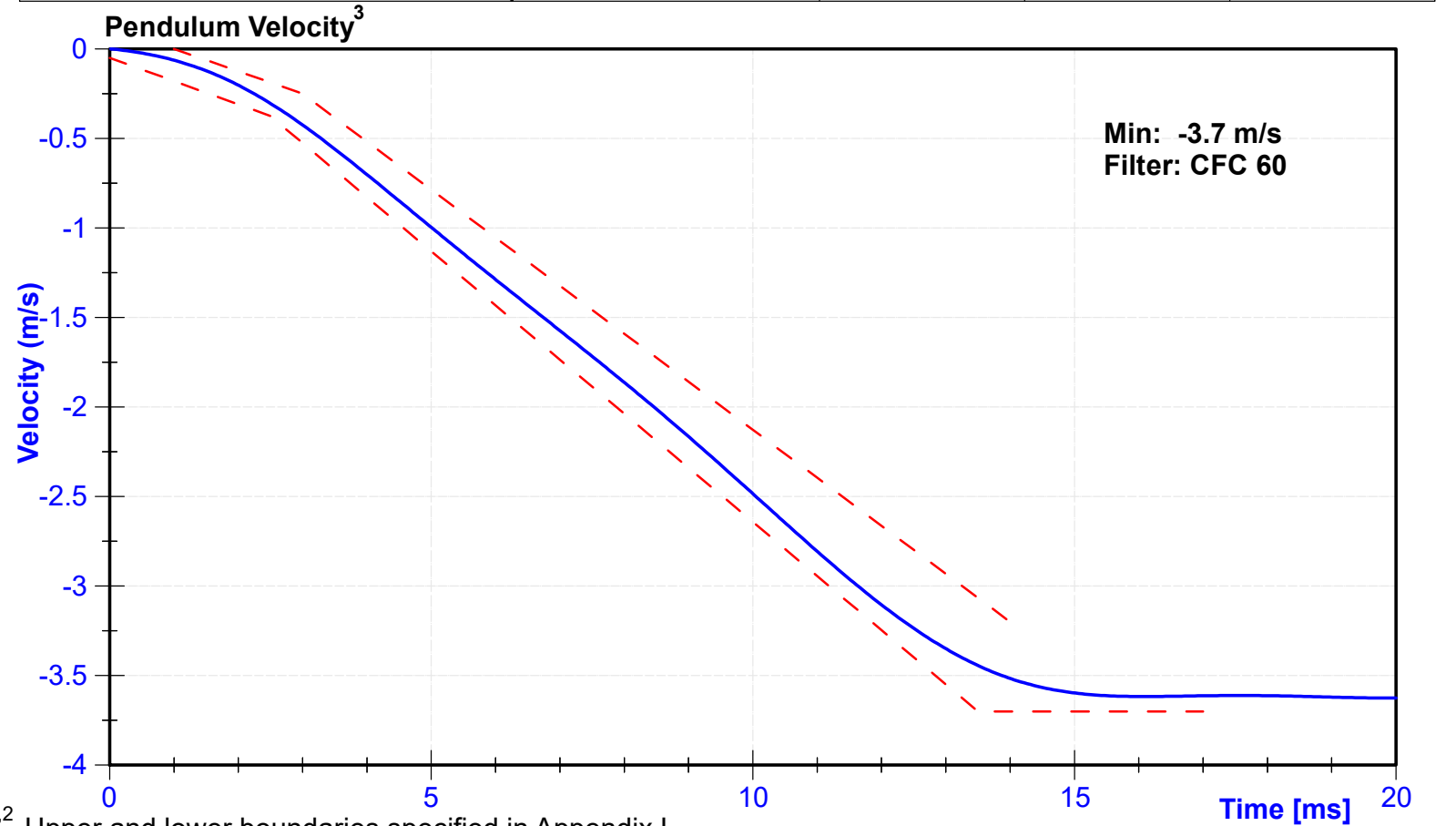
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

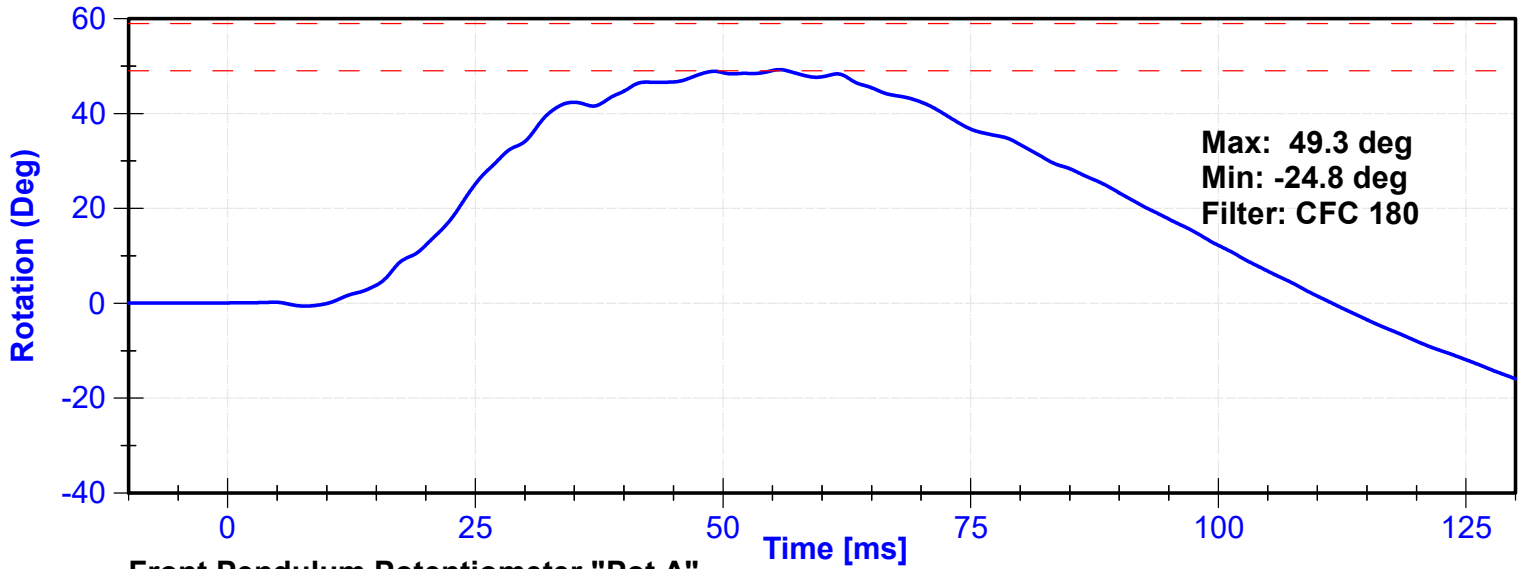
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	32	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	49.3	Pass
Time at Maximum Rotation	54	66	ms	55.7	Pass
Time of Rotation Decay from Maximum	53	88	ms	55.8	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

Transducer Calibrations

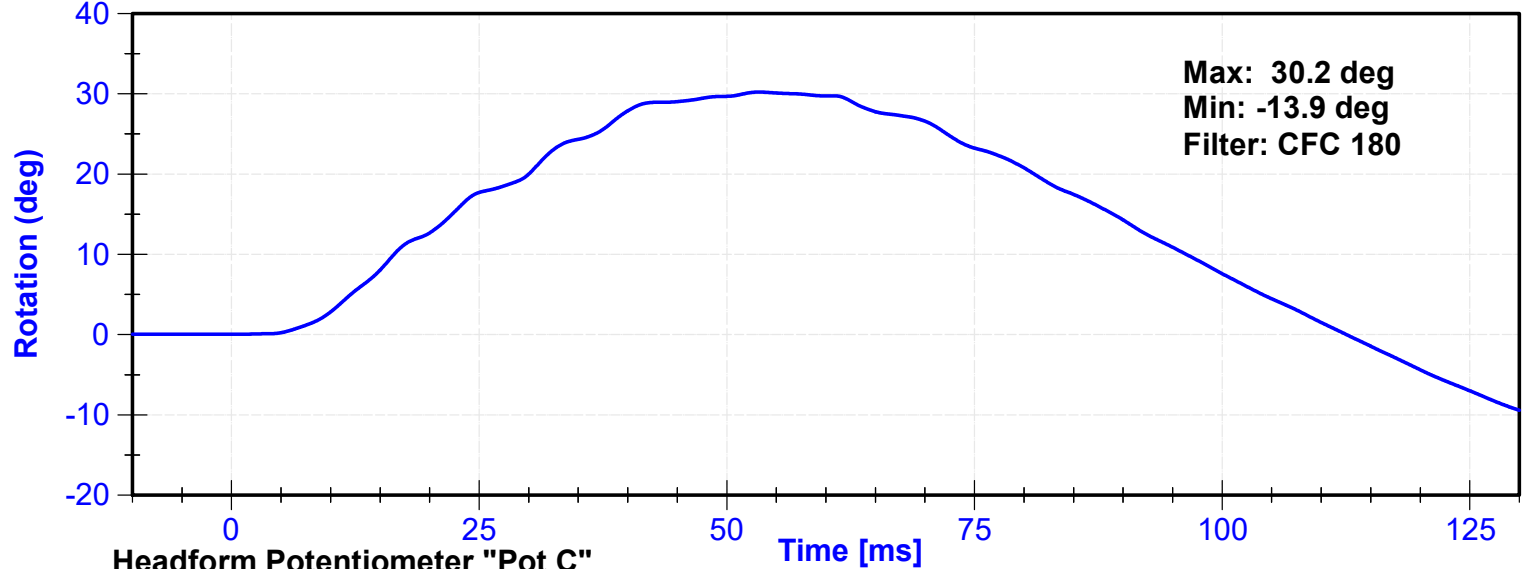
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	10/31/2023	4/28/2024
Front Pendulum Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024



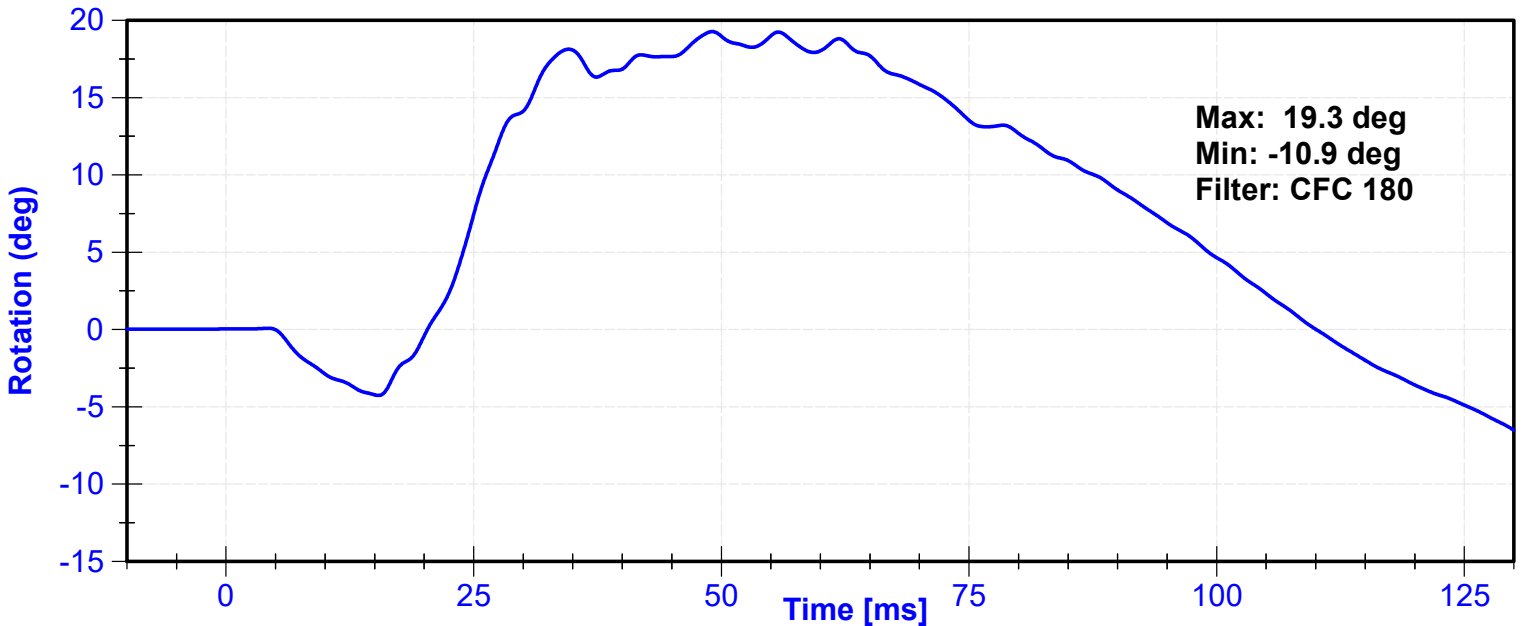
Neck Rotation



Front Pendulum Potentiometer "Pot A"



Headform Potentiometer "Pot C"



Appendix I

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

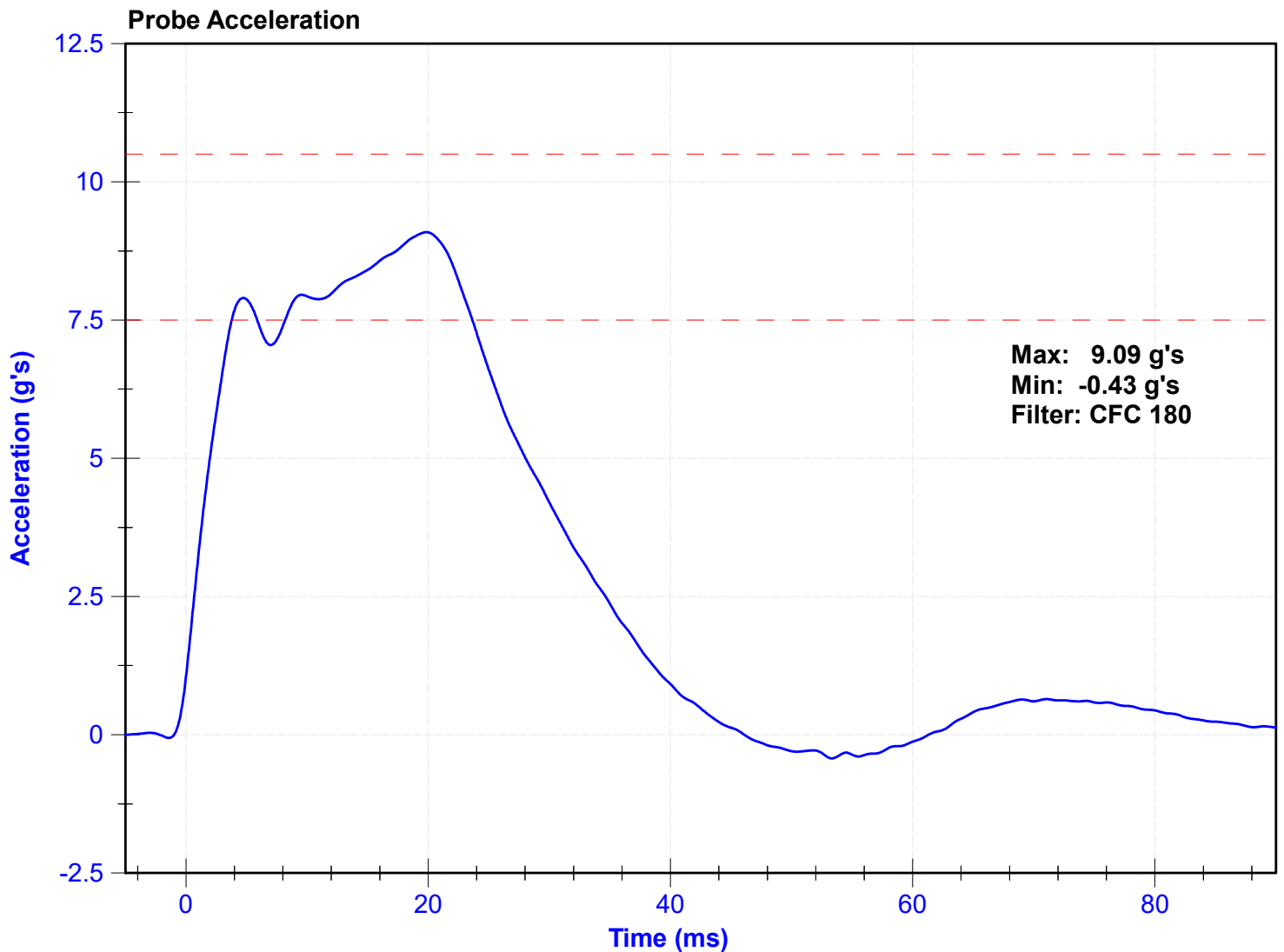
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	7.5	10.5	g's	9.09	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024



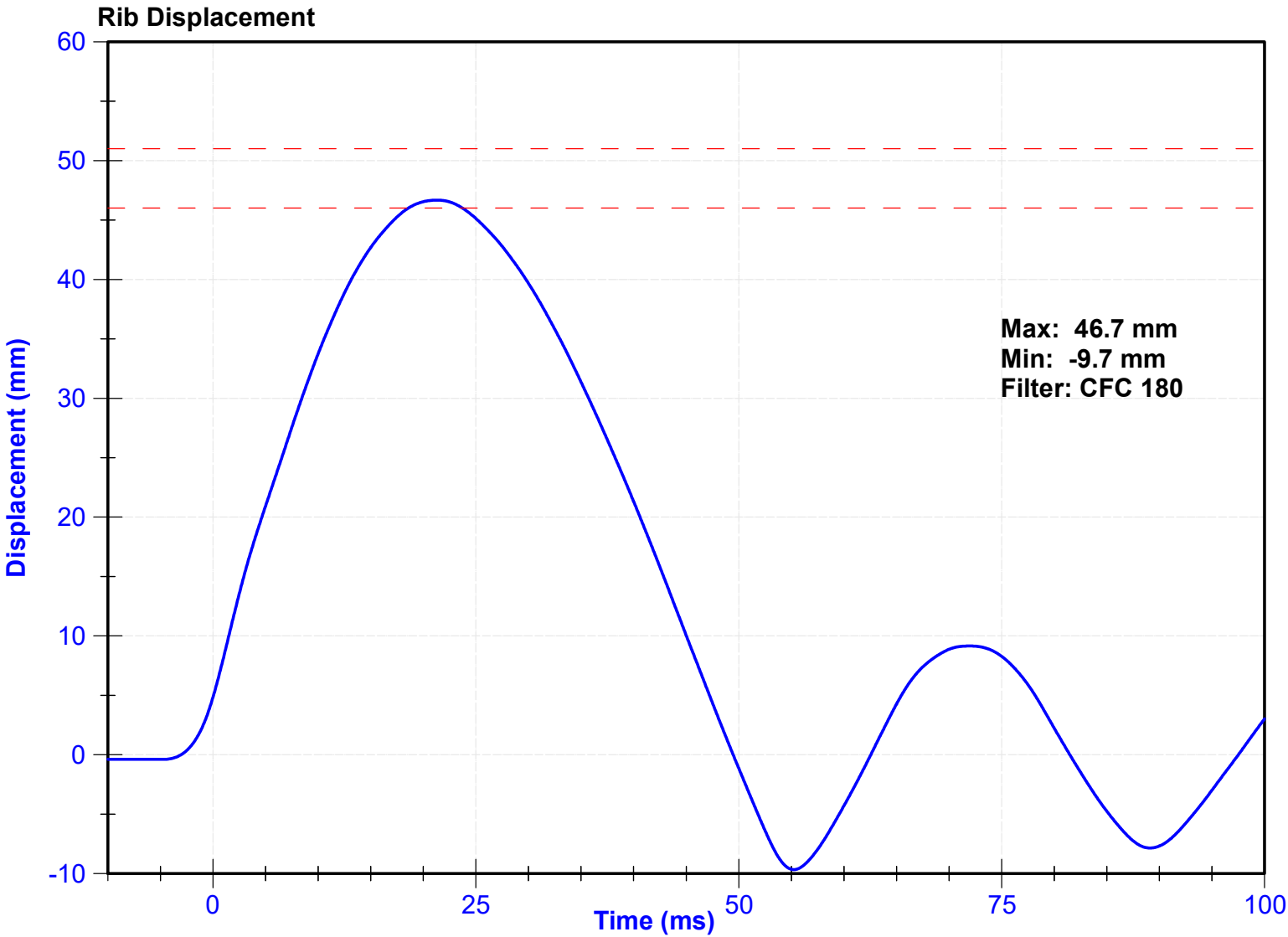
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	46.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024



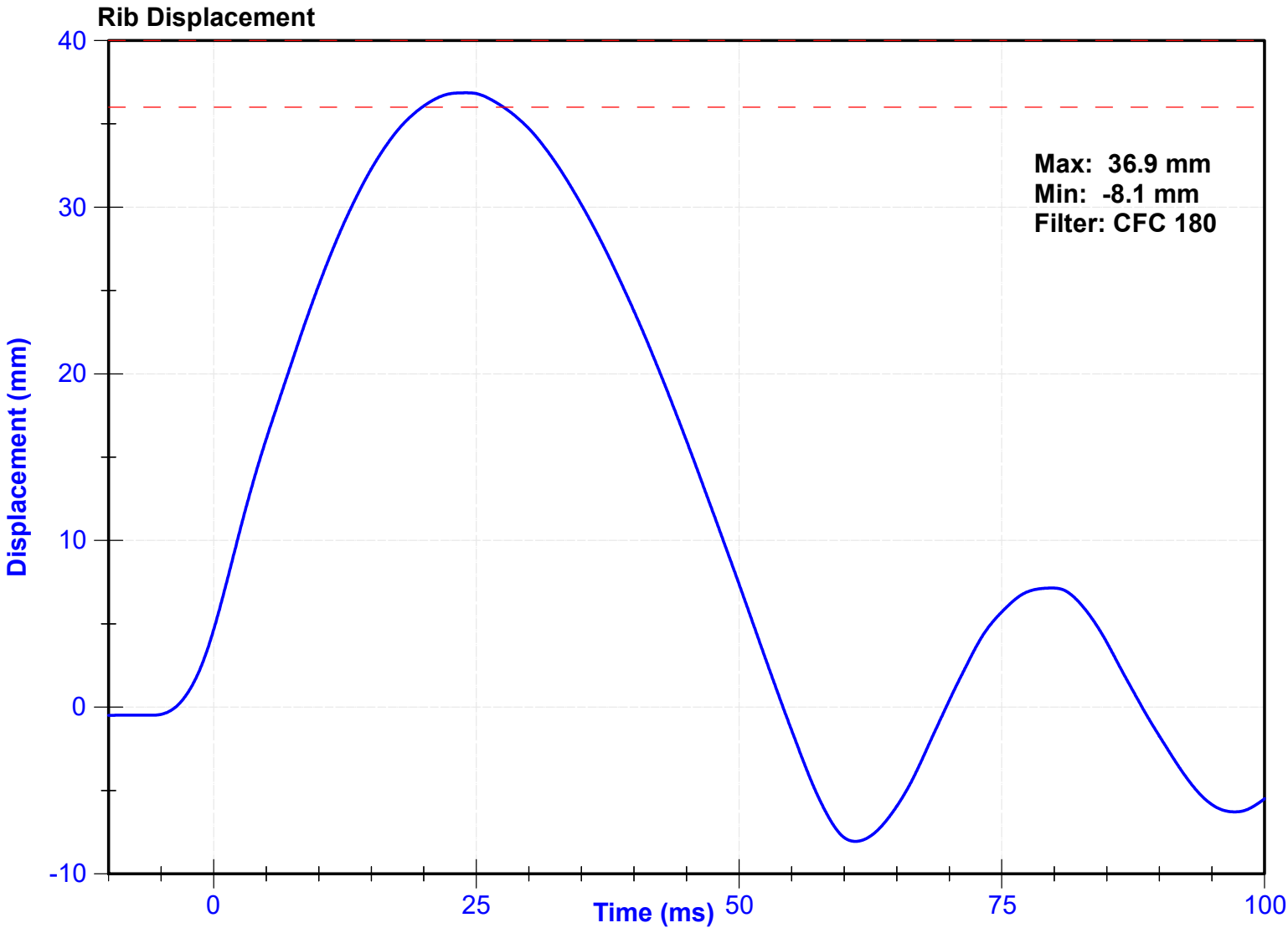
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	36.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024



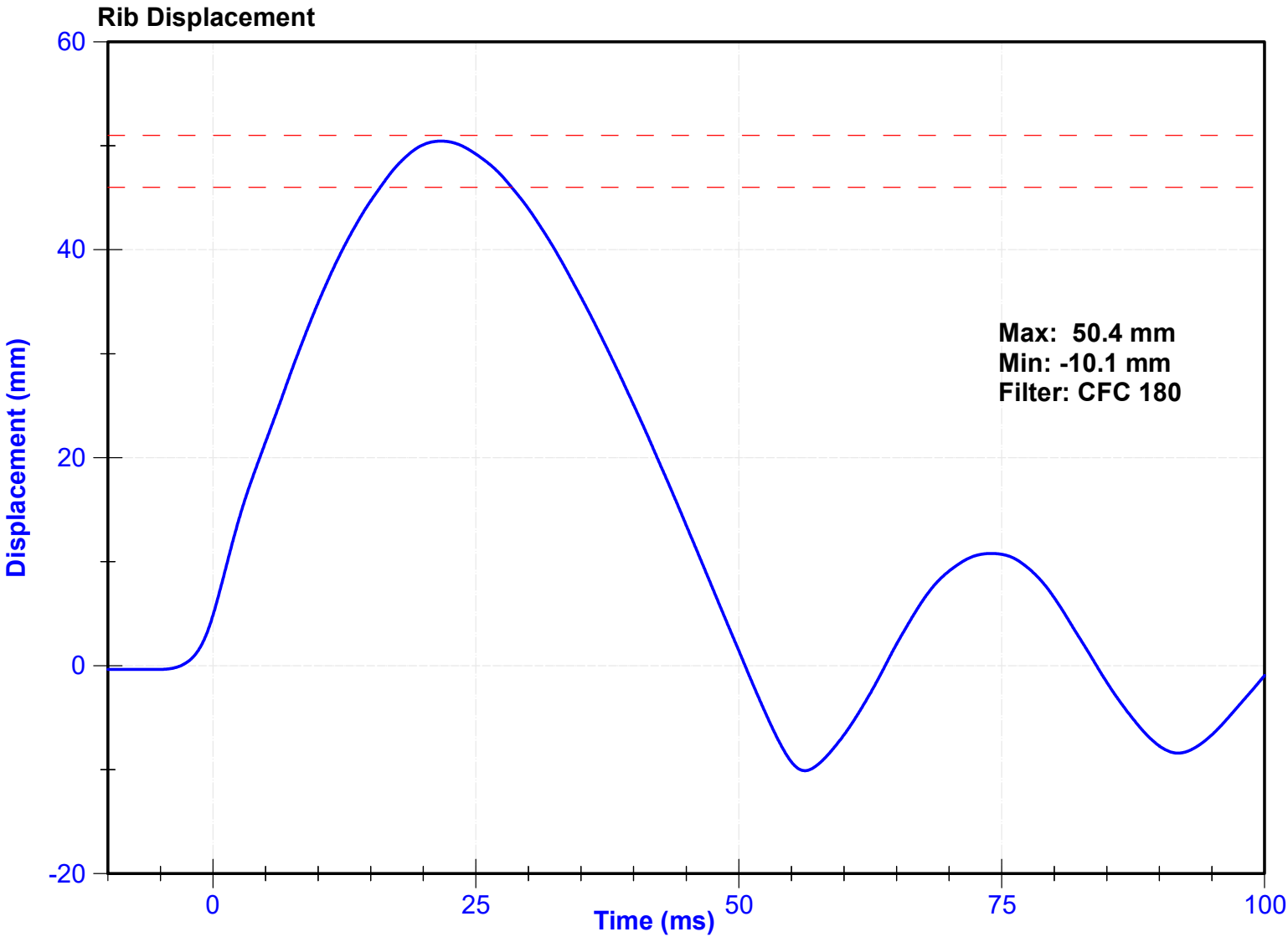
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	50.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024



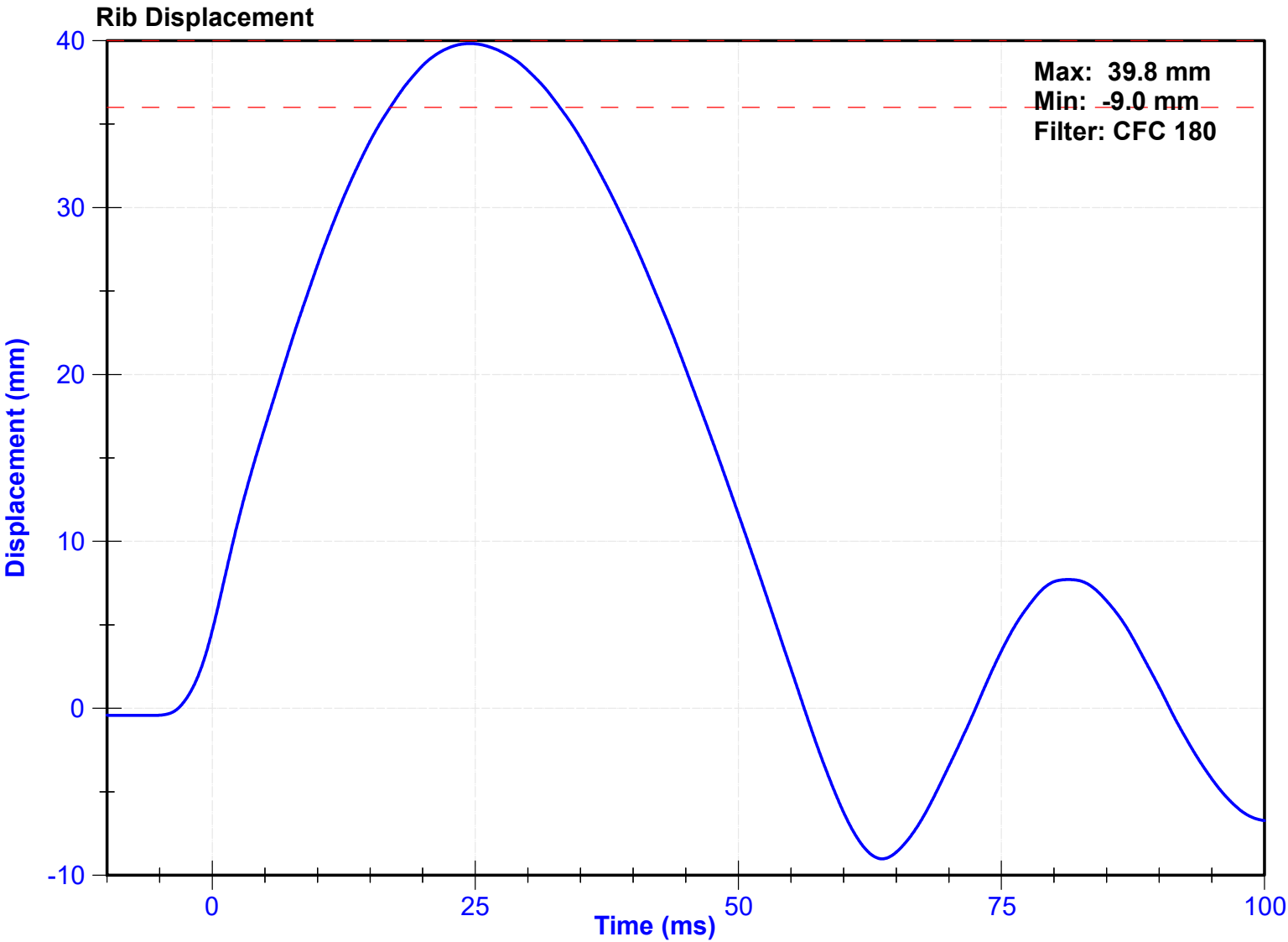
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	39.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024



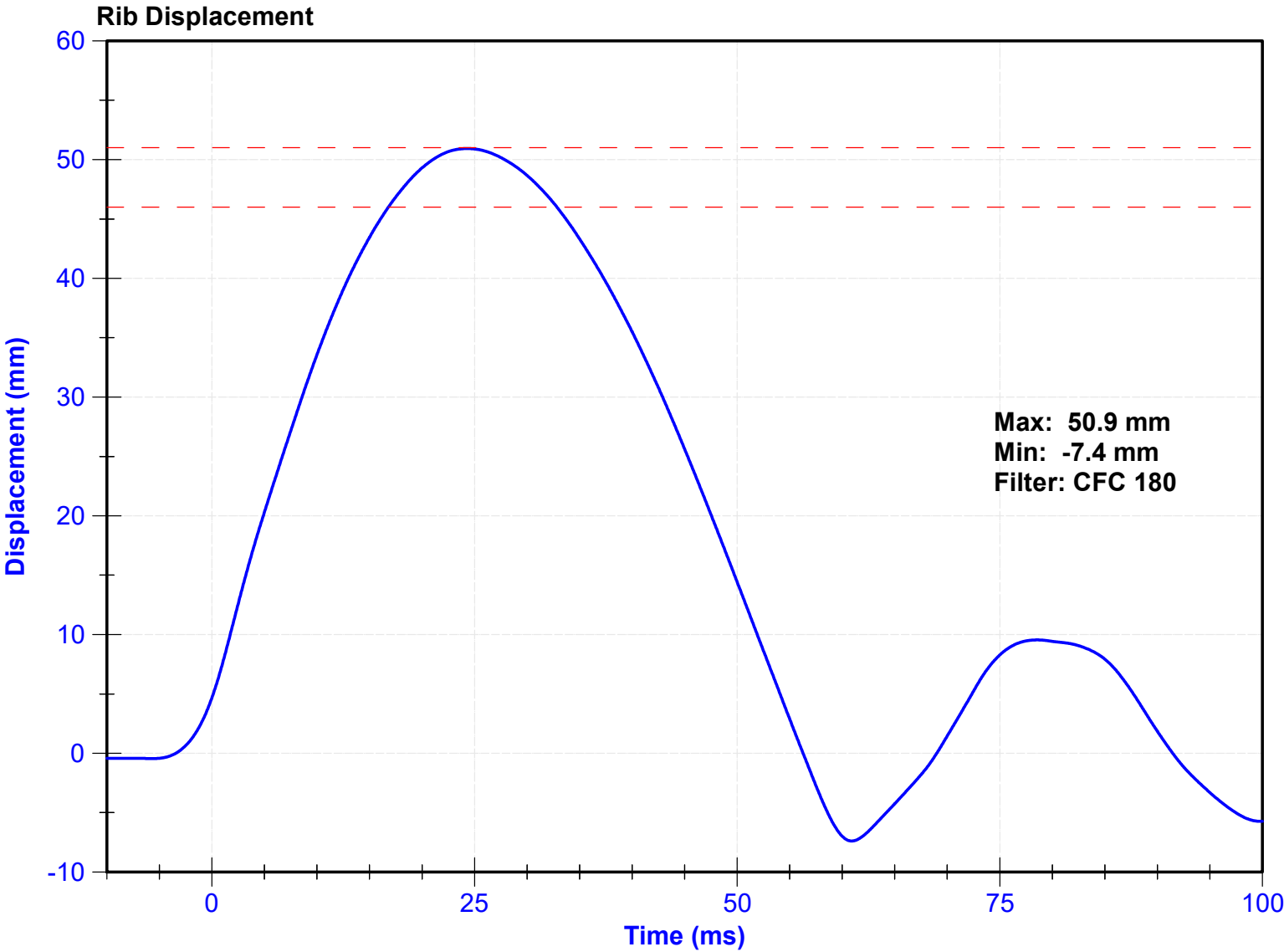
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	50.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	1/31/2024	7/31/2024



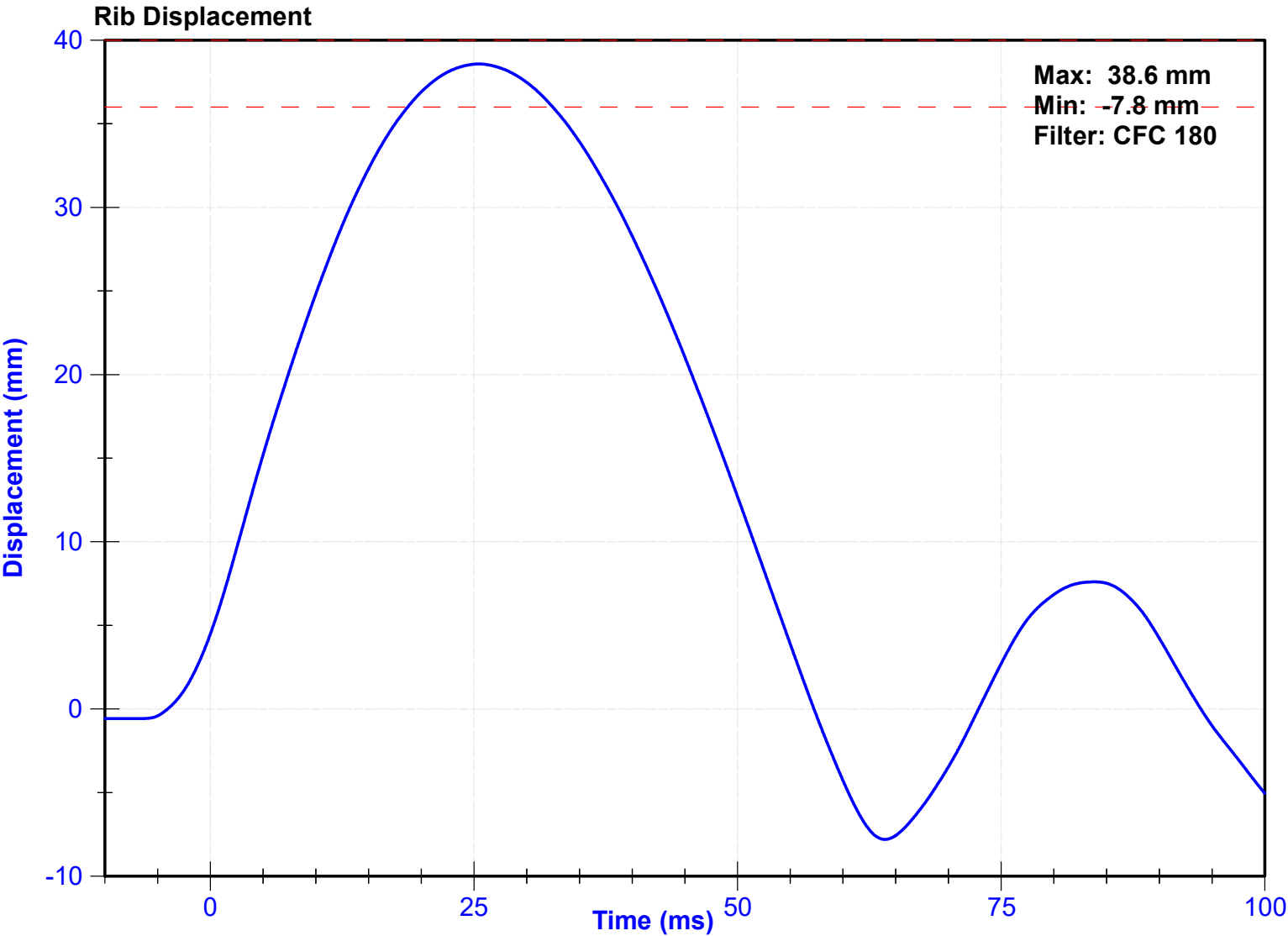
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	38.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	1/31/2024	7/31/2024



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

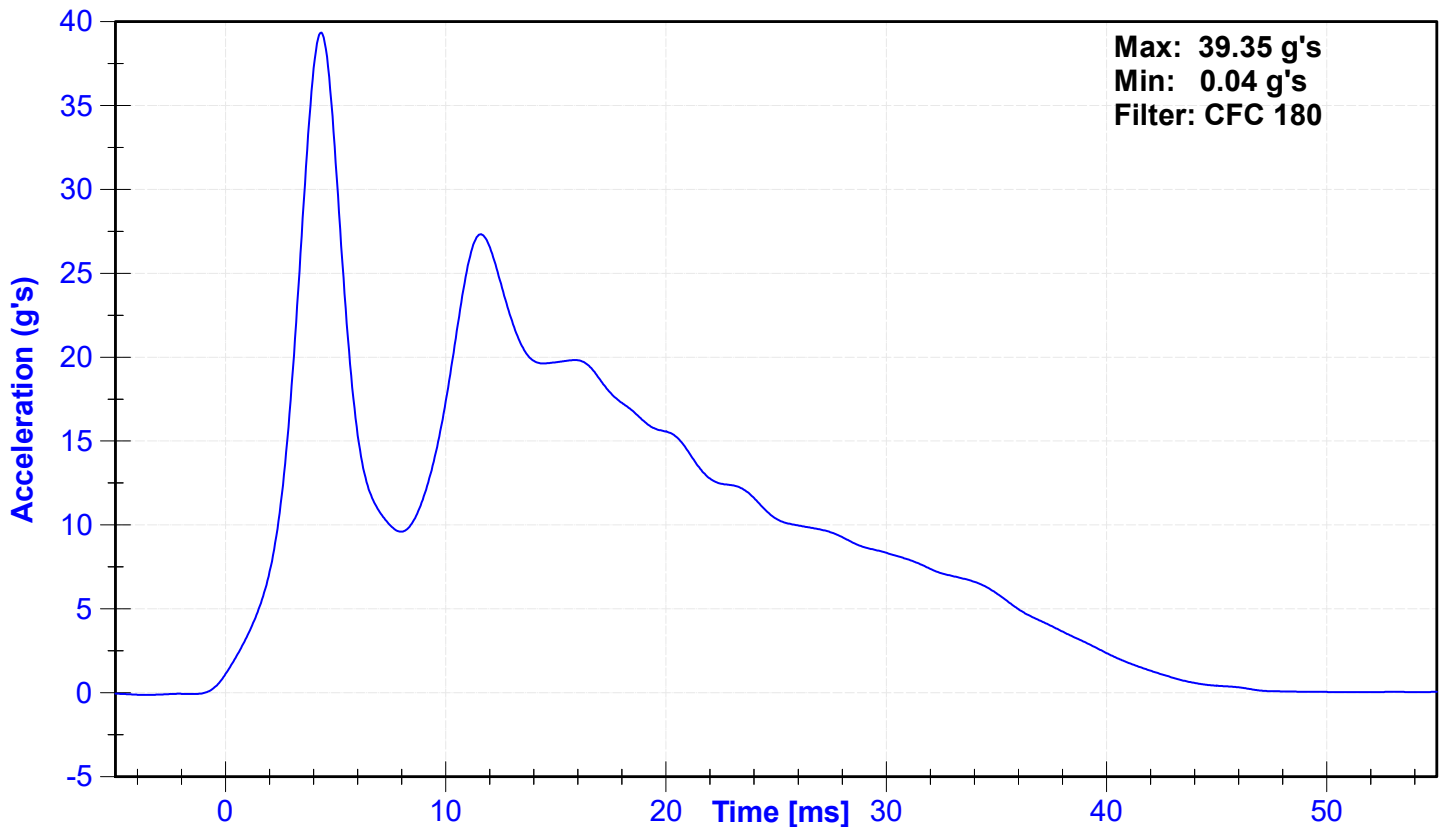
Results

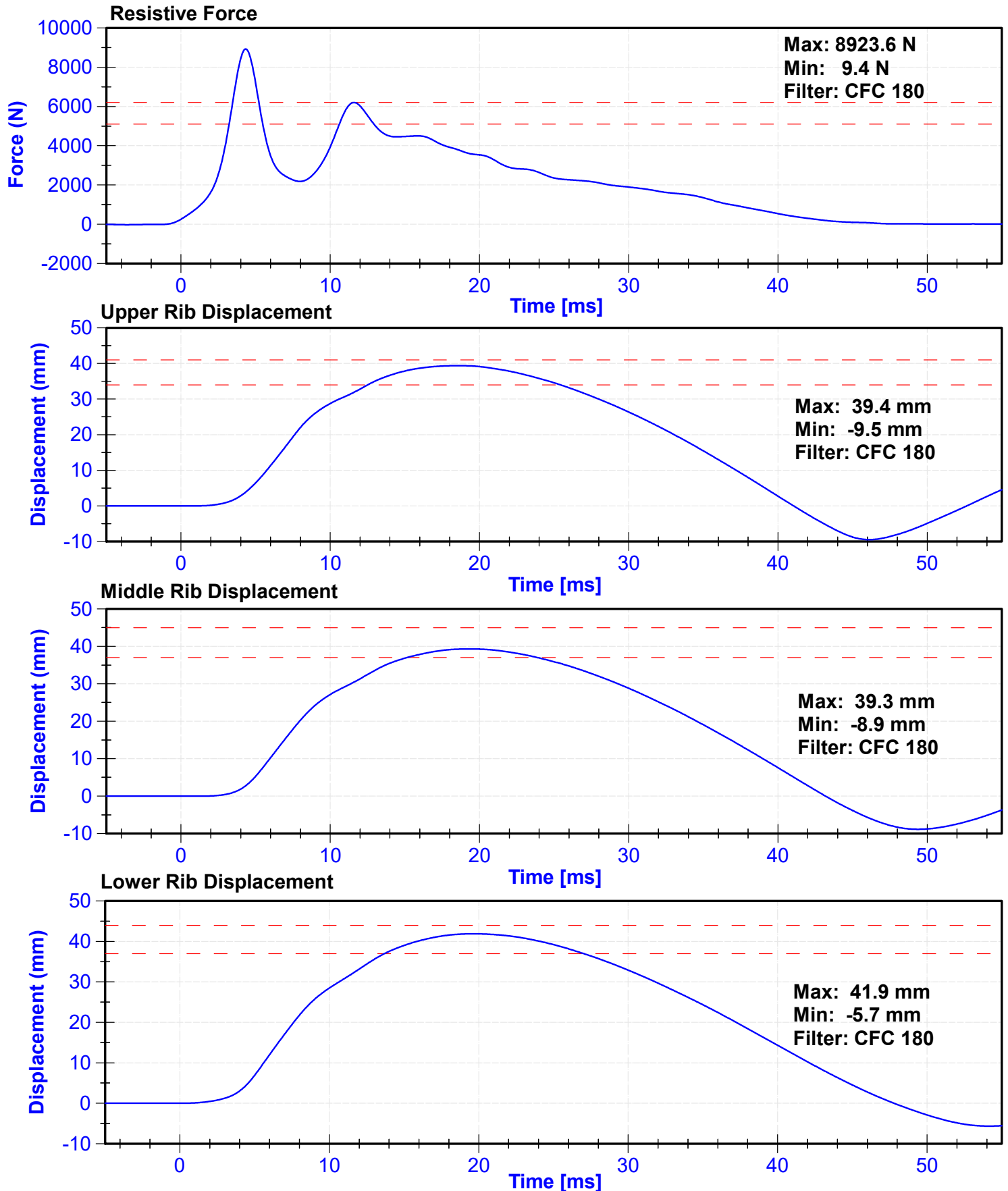
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	5.4	5.6	m/s	5.53	Pass
Resistive Force after 6ms	5100	6200	N	6198.5	Pass
Upper Thorax Rib Deflection	34	41	mm	39.4	Pass
Mid Thorax Rib Deflection	37	45	mm	39.3	Pass
Lower Thorax Rib Deflection	37	44	mm	41.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Thorax Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024
Middle Thorax Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024
Lower Thorax Rib Potentiometer	Honeywell	0552-03	1/31/2024	7/31/2024

Probe Acceleration





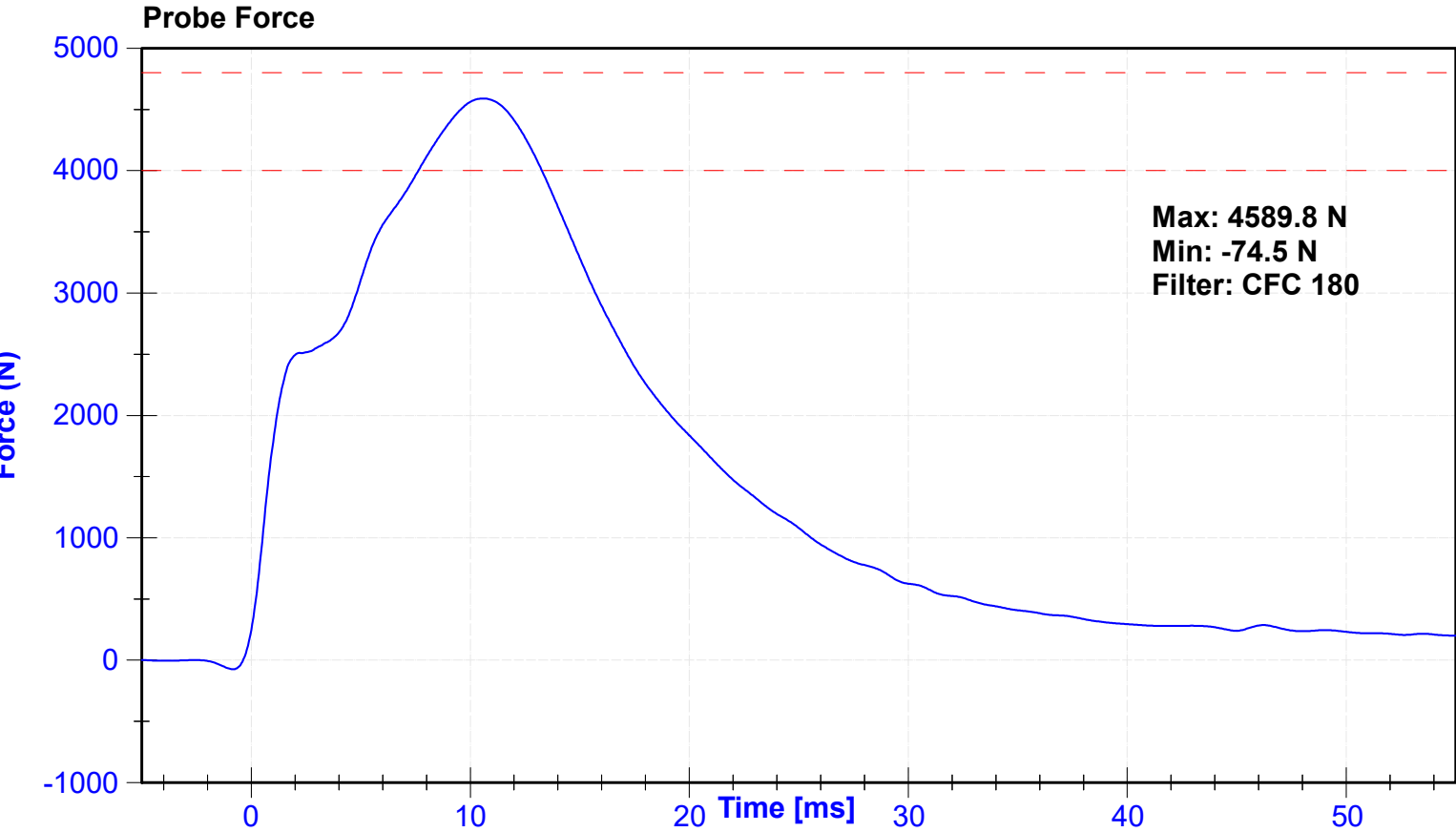
ATD Manufacturer	Denton	Test Technician	J. Rios
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

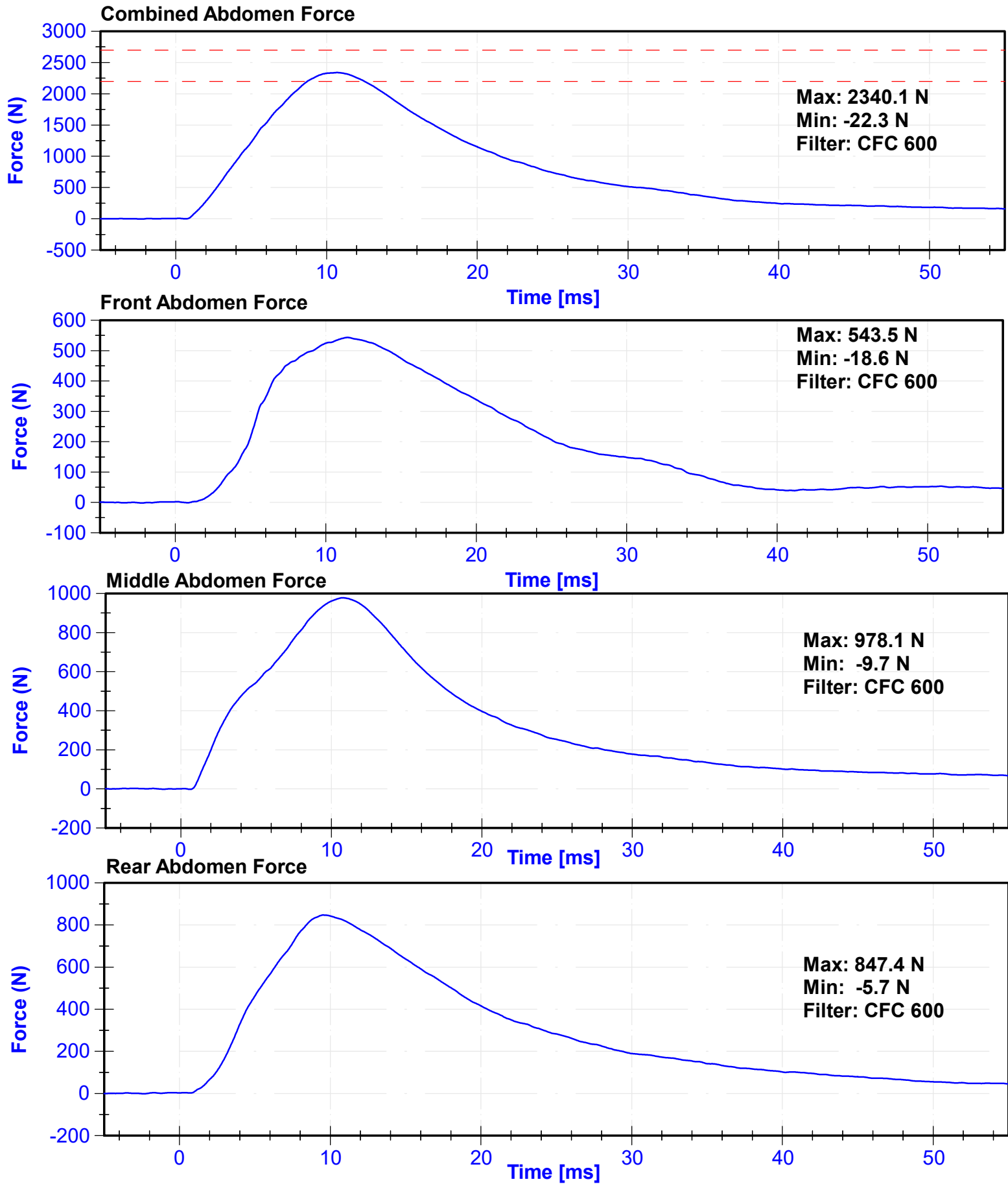
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	3.99	Pass
Combined Abdomen Force	2200	2700	N	2340.1	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.70	Pass
Resistive Probe Force	4000	4800	N	4589.8	Pass
Time at Peak Resistive Force	10.6	13.0	ms	10.60	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Front Abdomen Load Cell	Denton	1440	8/8/2023	8/7/2024
Middle Abdomen Load Cell	Denton	1525	8/8/2023	8/7/2024
Rear Abdomen Load Cell	Denton	1528	8/8/2023	8/7/2024





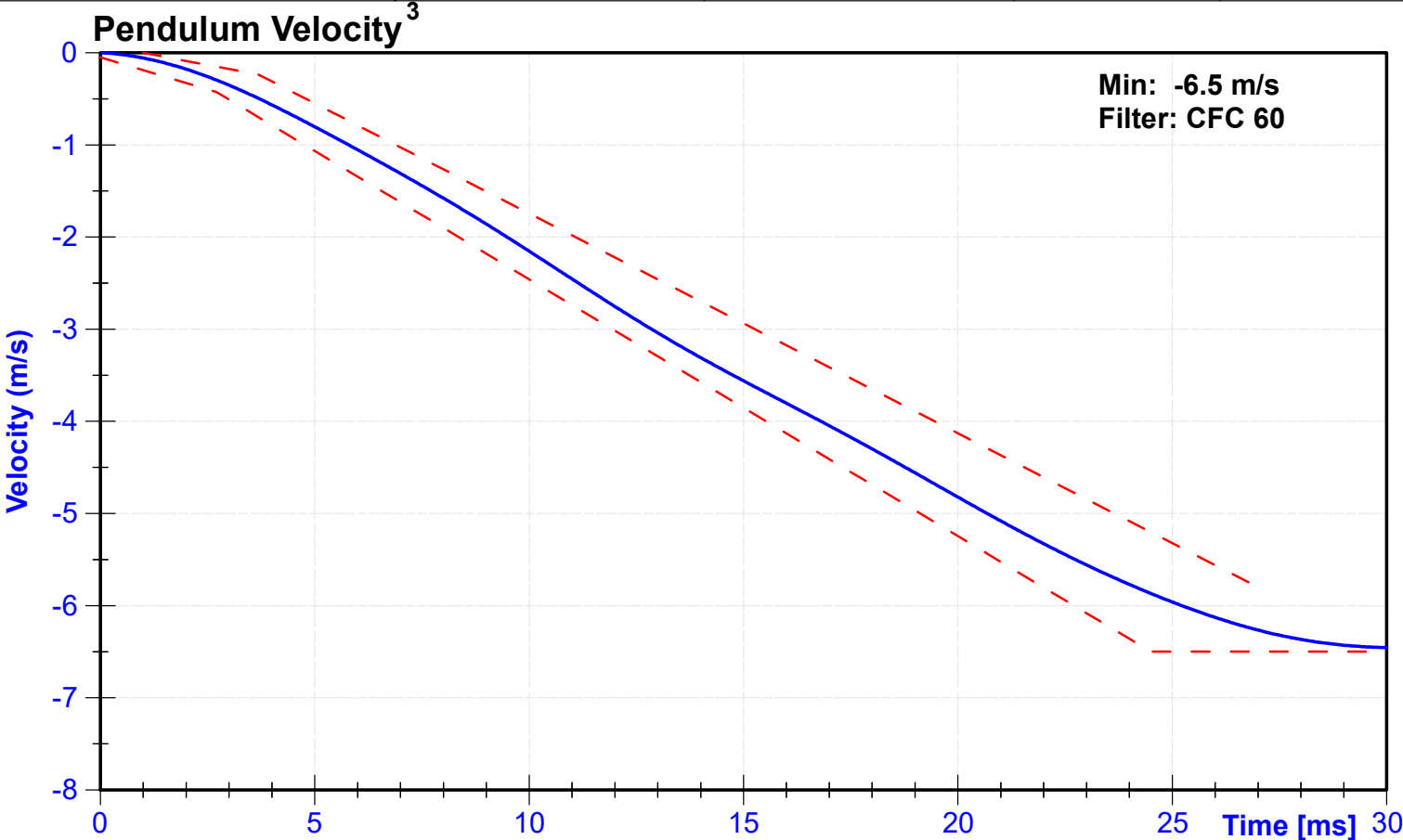
ATD Manufacturer	Denton	Test Technician	T. Roseman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	32	Pass
Velocity	5.95	6.15	m/s	6.011	Pass
Lateral Spine Rotation	45	55	deg	45.3	Pass
Time at Maximum Rotation	39	53	ms	42.1	Pass
Time of Decay to Zero Degrees	37	57	ms	39.4	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

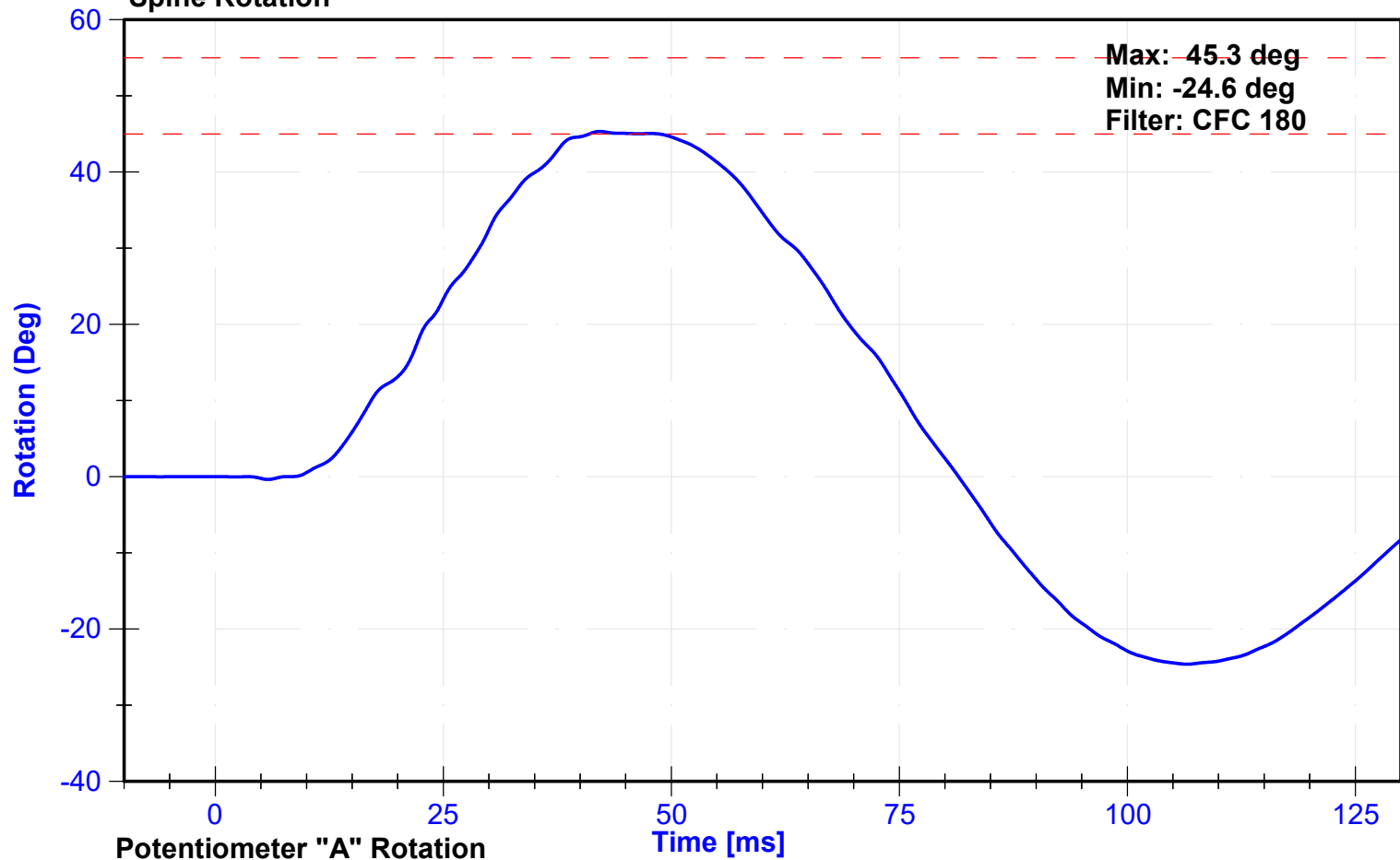
Transducer Calibrations

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

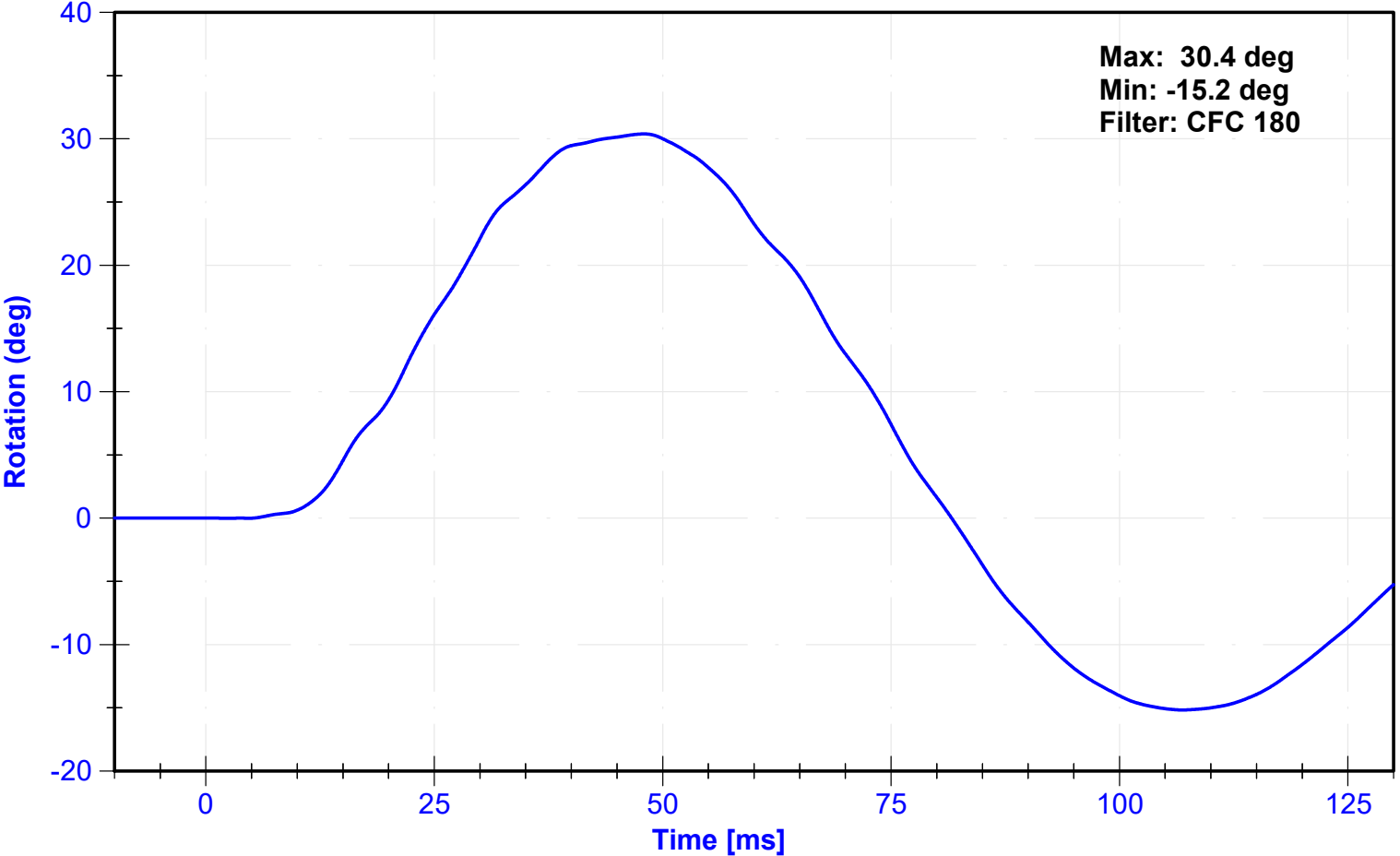


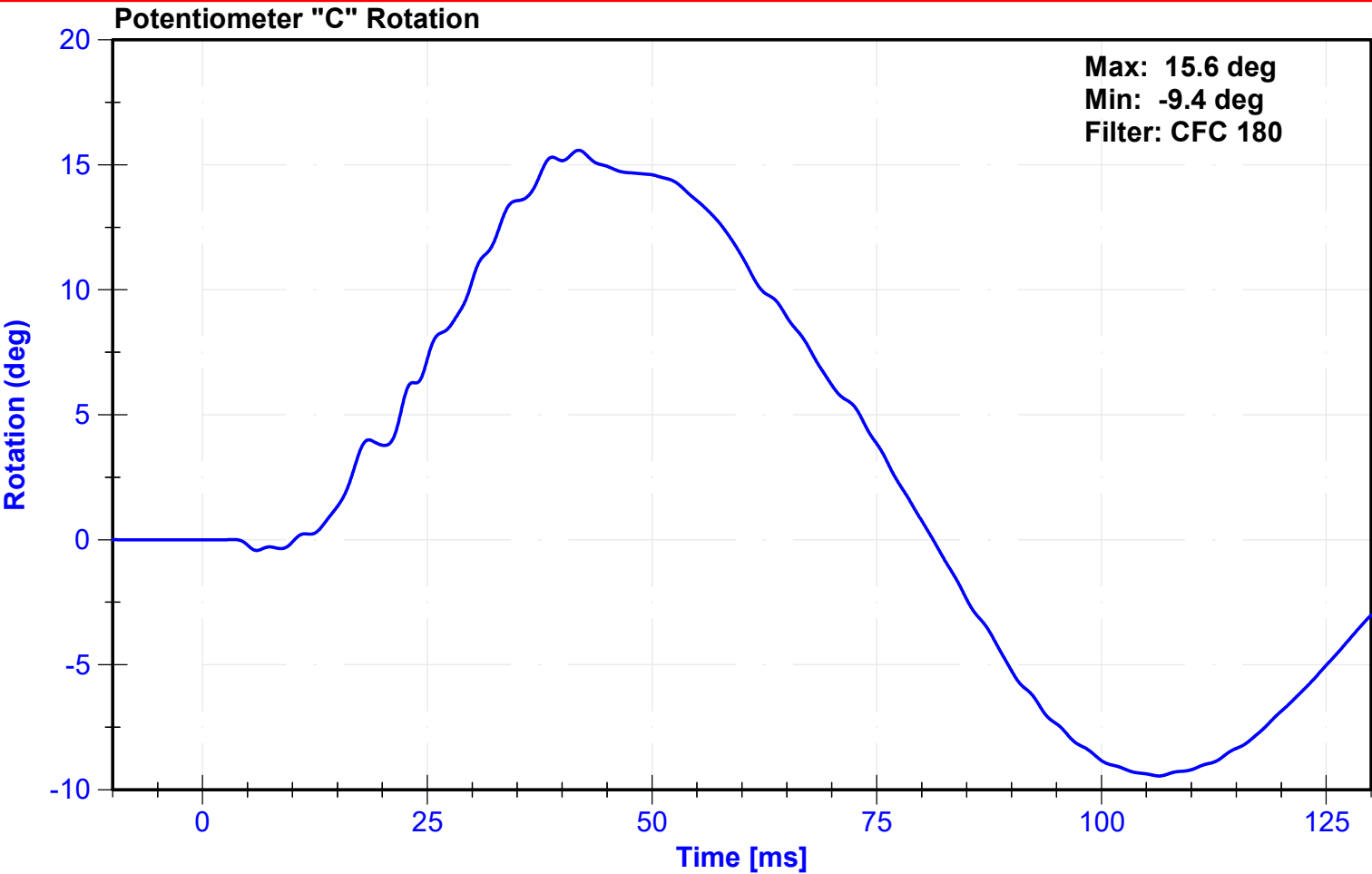
^{1,2} Upper and lower boundaries specified in Appendix I V-19

Spine Rotation



Potentiometer "A" Rotation





Appendix I

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

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

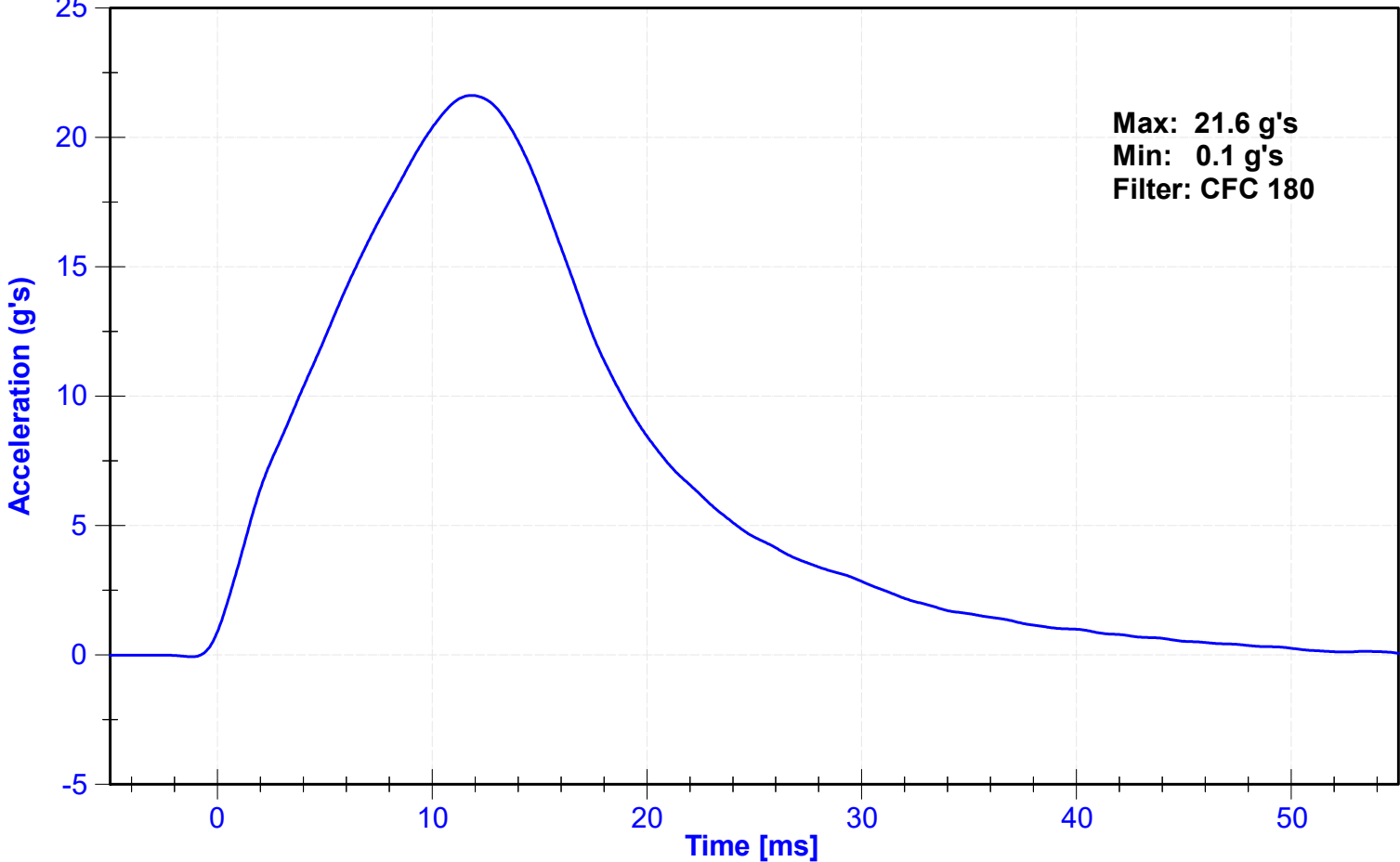
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.28	Pass
Resistive Force	4700	5400	N	4952.4	Pass
Time at Peak Resistive Force	11.8	16.1	ms	11.85	Pass
Pubic Force	-1590	-1230	N	-1409.6	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.50	Pass

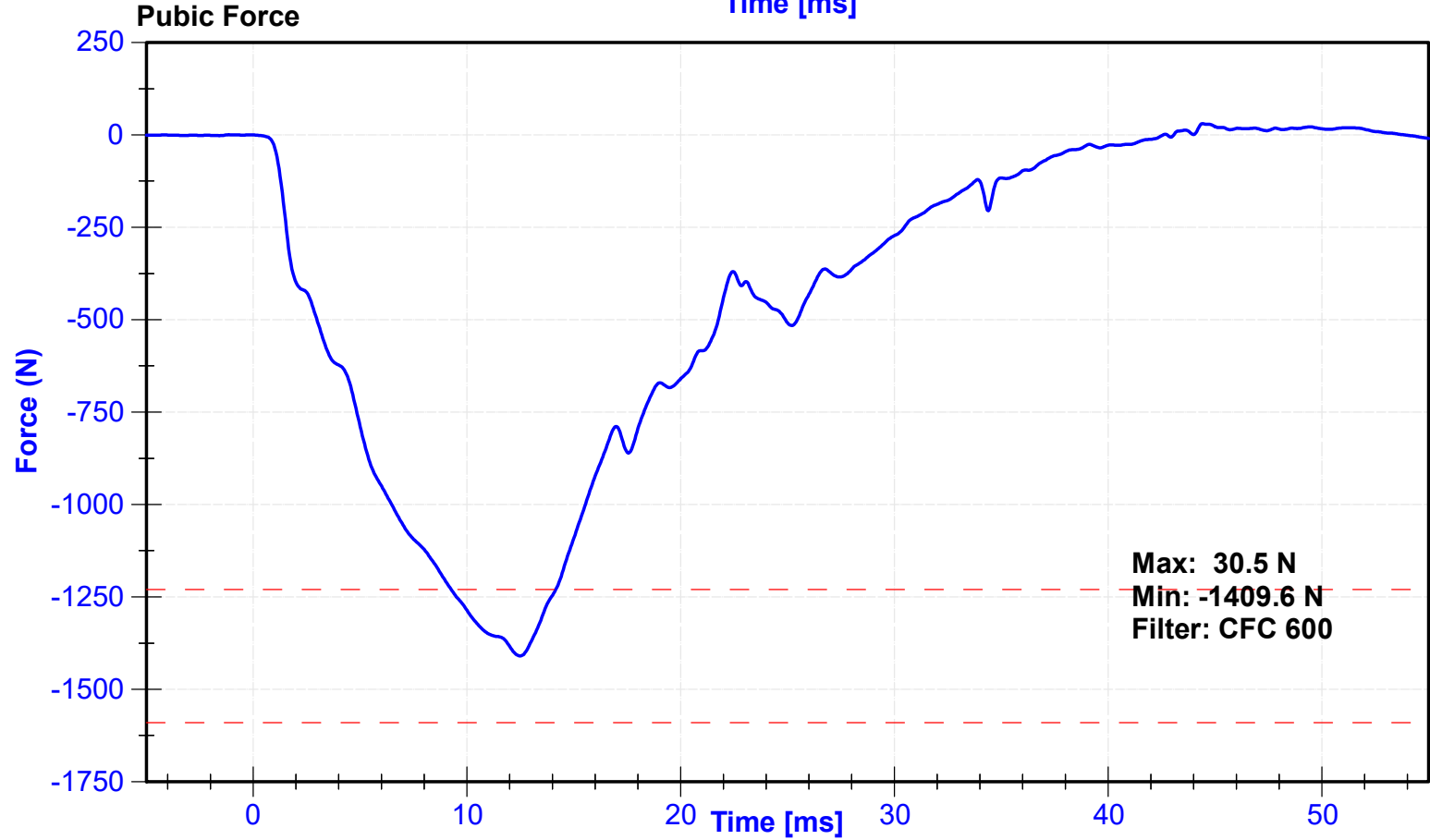
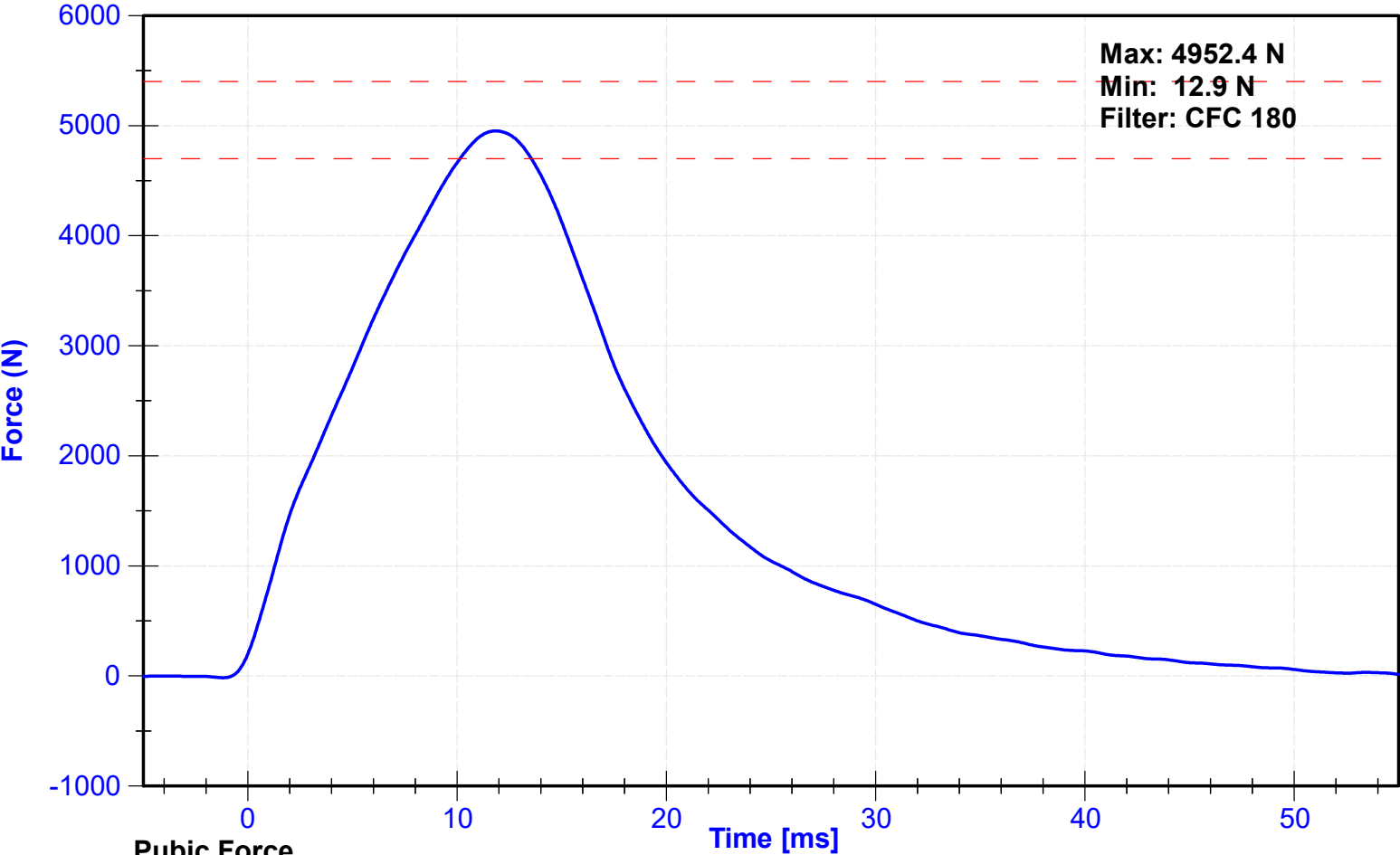
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024

Probe Acceleration



Resistive Force



POST-TEST
ES-2re PERFORMANCE CALIBRATION TEST DATA

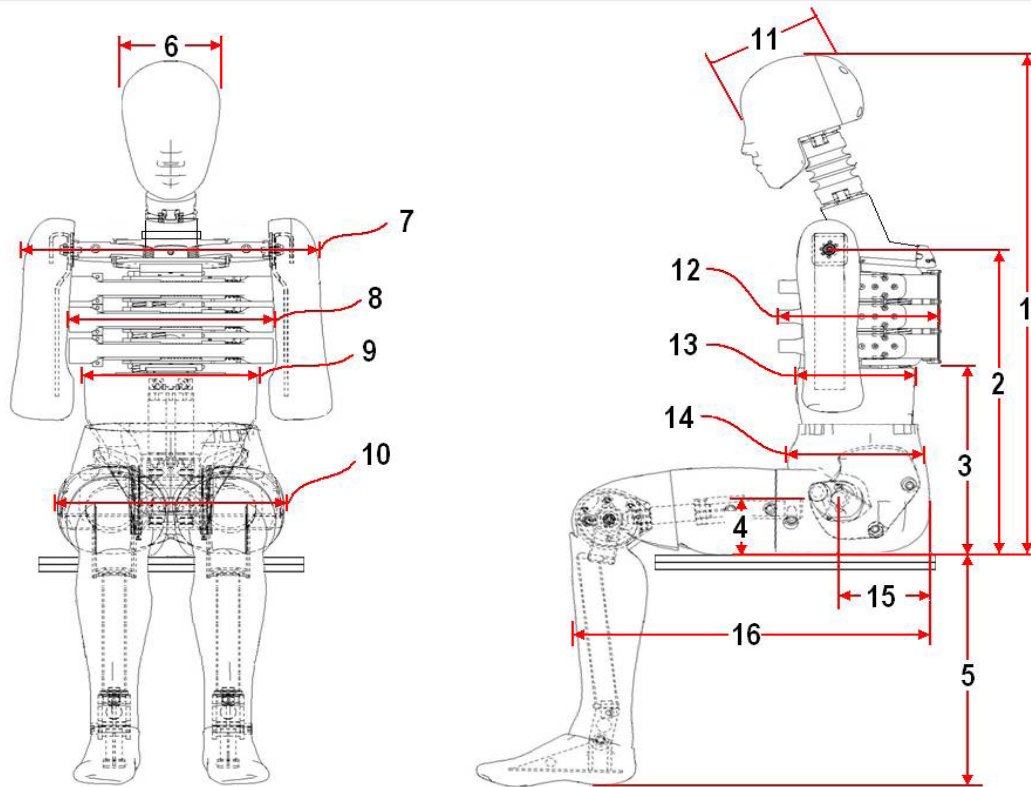


External Measurements - EuroSID-2re

Technician: T. Roseman

Date: 5/30/2024

Dummy Serial Number: D037



FRONT VIEW

SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	908	Pass
2	Seat to Shoulder Joint	558	572	562	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	354	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	420	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	472	Pass
8	Thorax Width	322	332	330	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	362	Pass
11	Head Depth	196	206	199	Pass
12	Thorax Depth	262	272	265	Pass
13	Abdomen Depth	194	204	198	Pass
14	Pelvis Depth	235	245	238	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	603	Pass

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

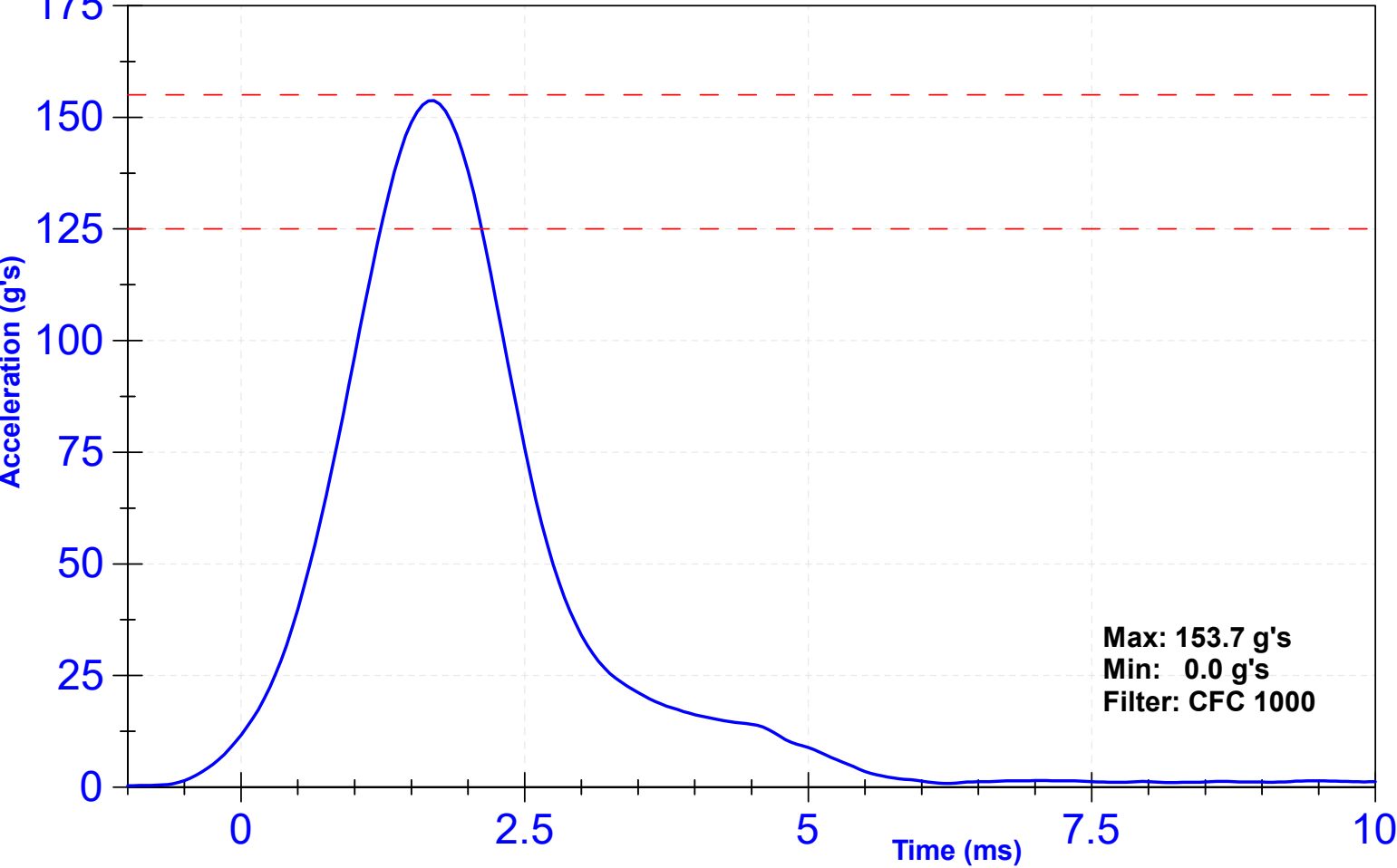
Results

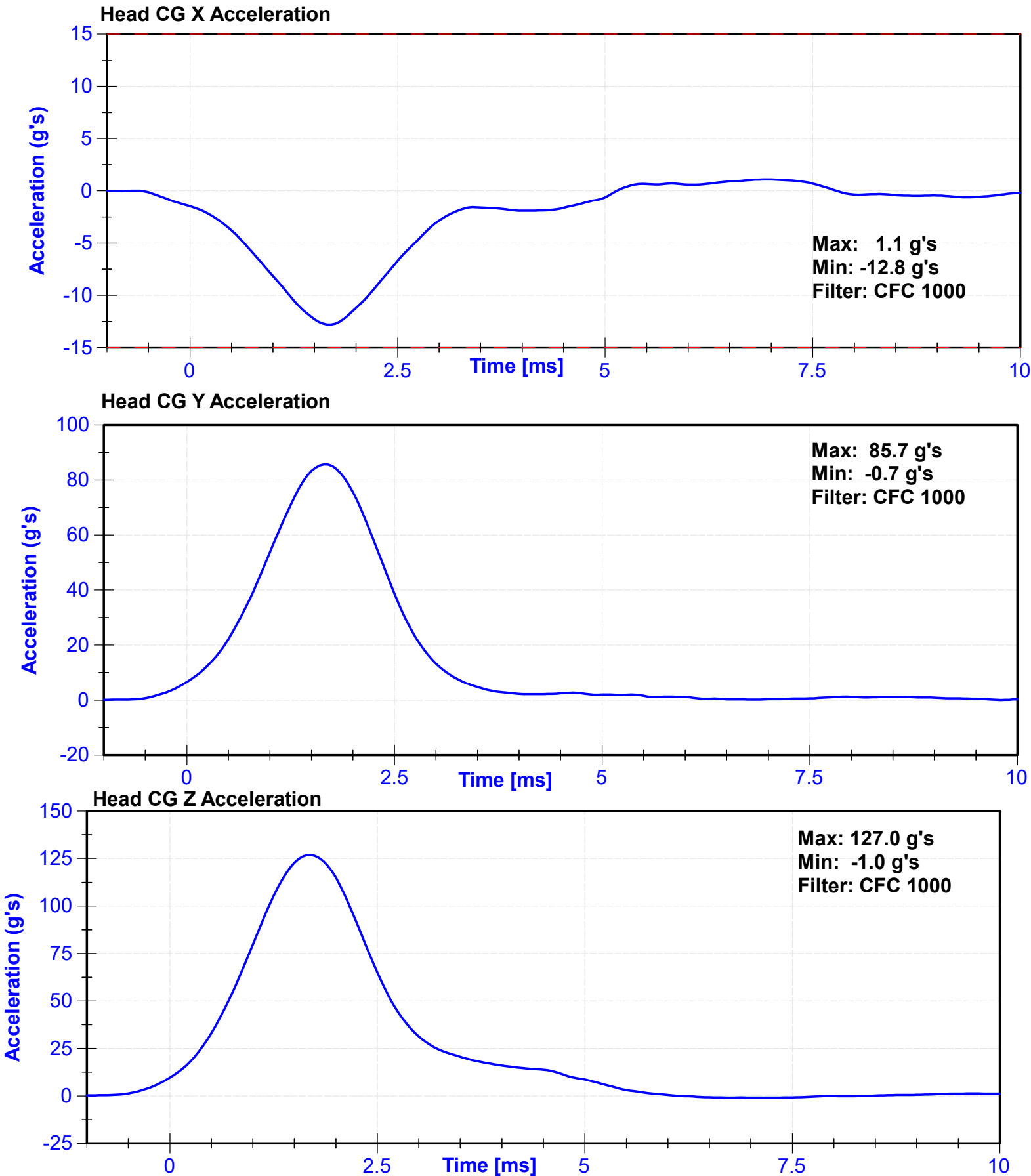
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	33.1	Pass
Resultant Acceleration	125	155	g's	153.7	Pass
Oscillation	0	15	%	0.96	Pass
Fore-Aft Acceleration	-15	15	g's	-12.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	Endevco	T21724	2/1/2024	7/30/2024
Y Accelerometer	Endevco	T22281	2/1/2024	7/30/2024
Z Accelerometer	Endevco	T26050	2/1/2024	7/30/2024

Resultant Acceleration





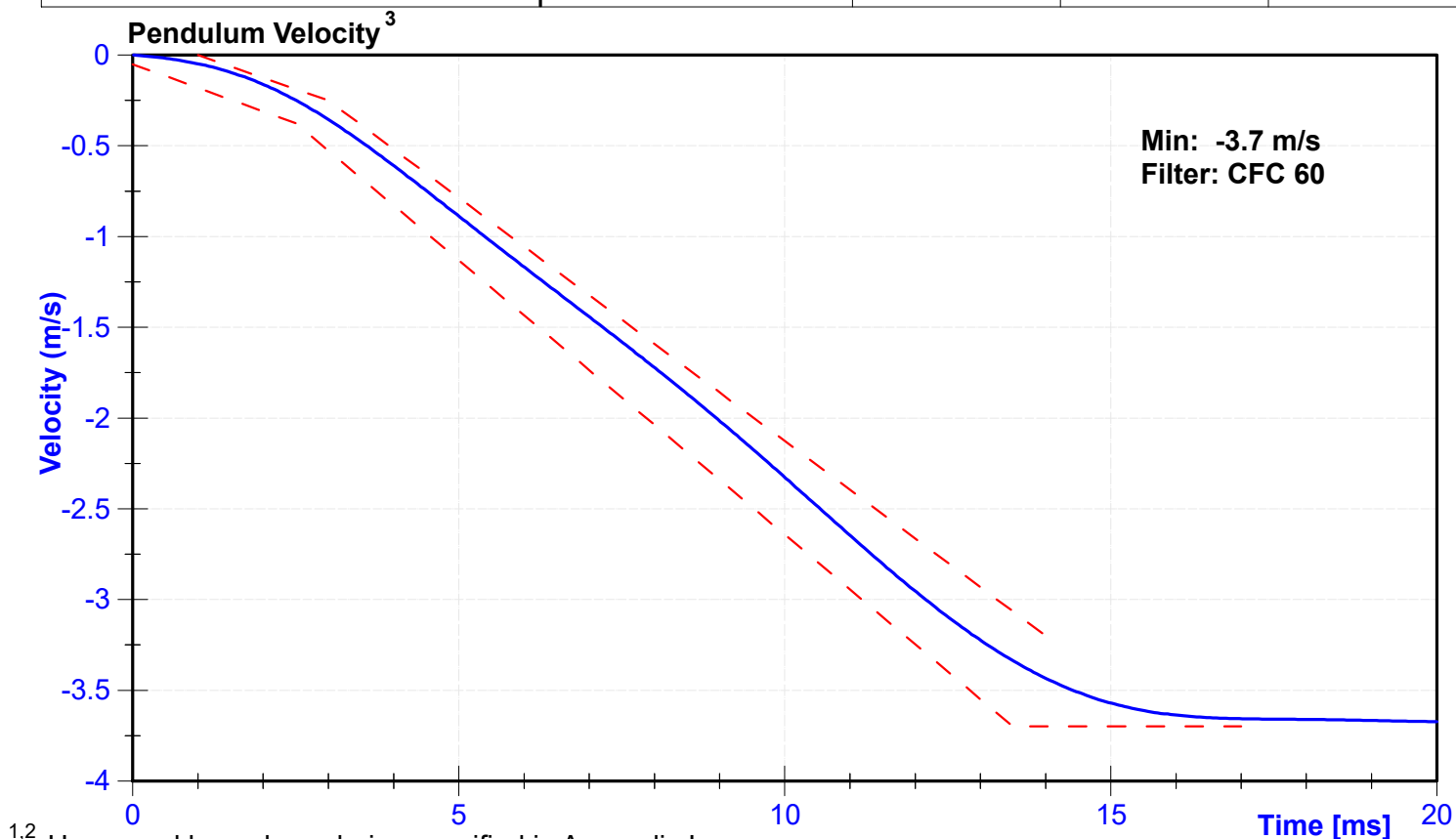
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

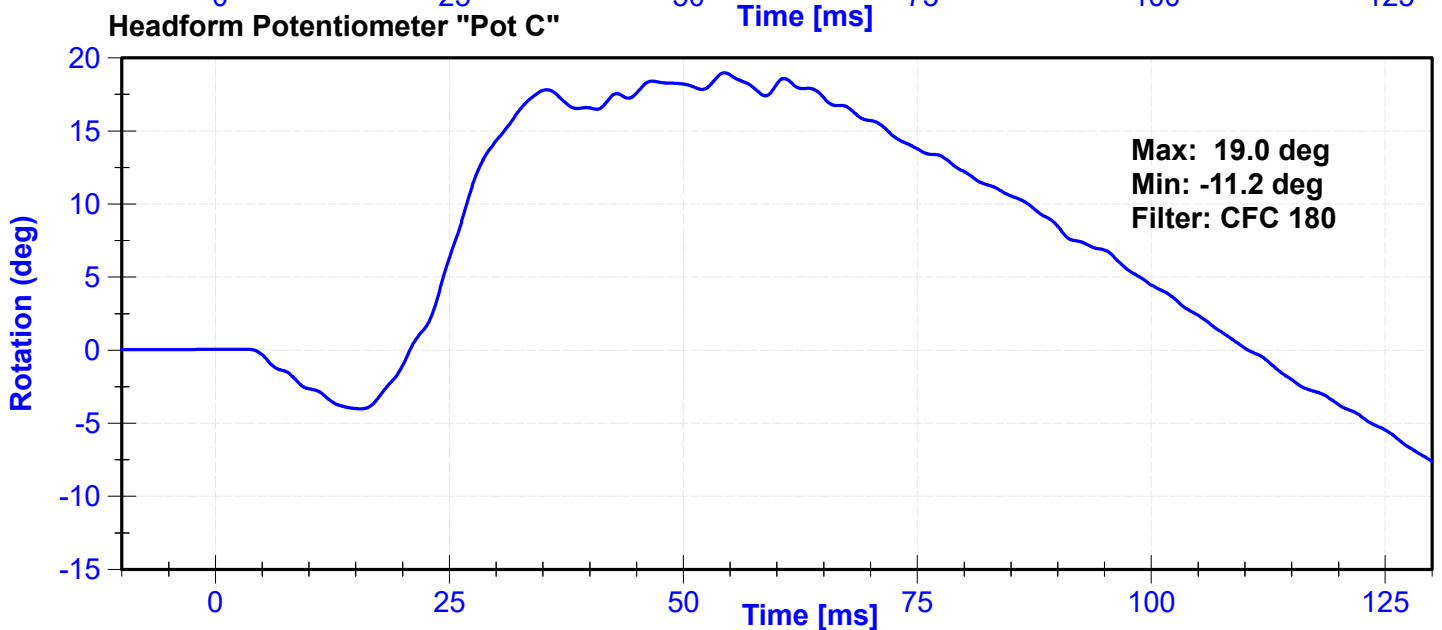
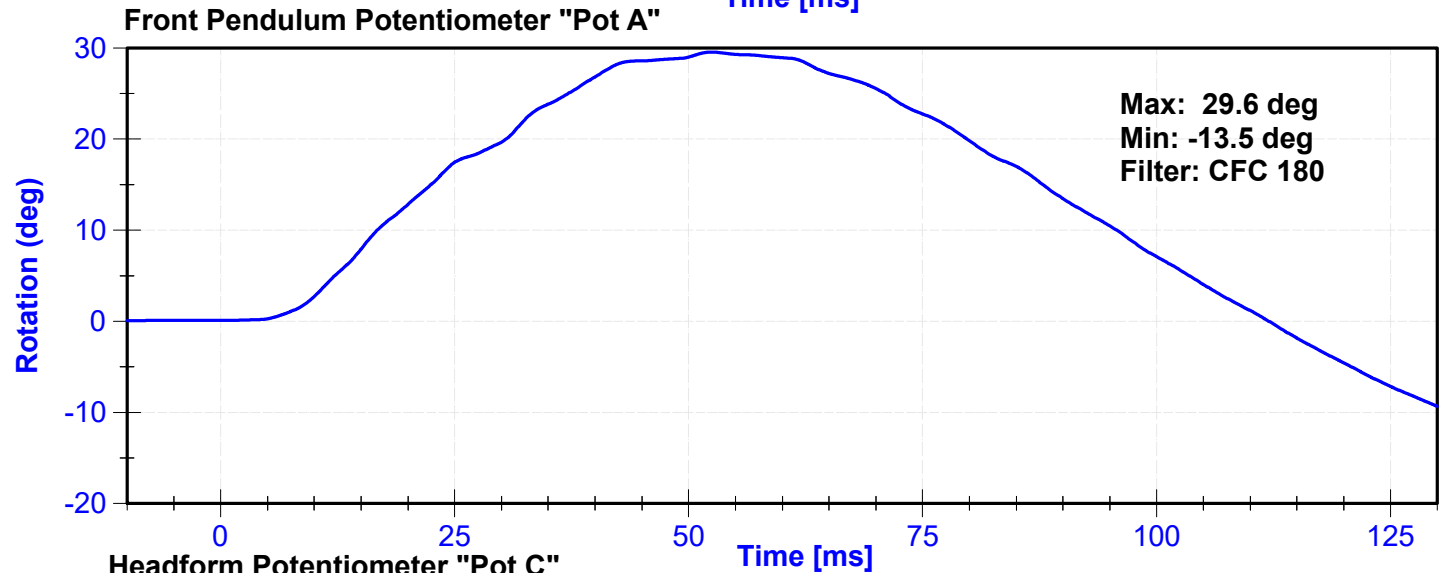
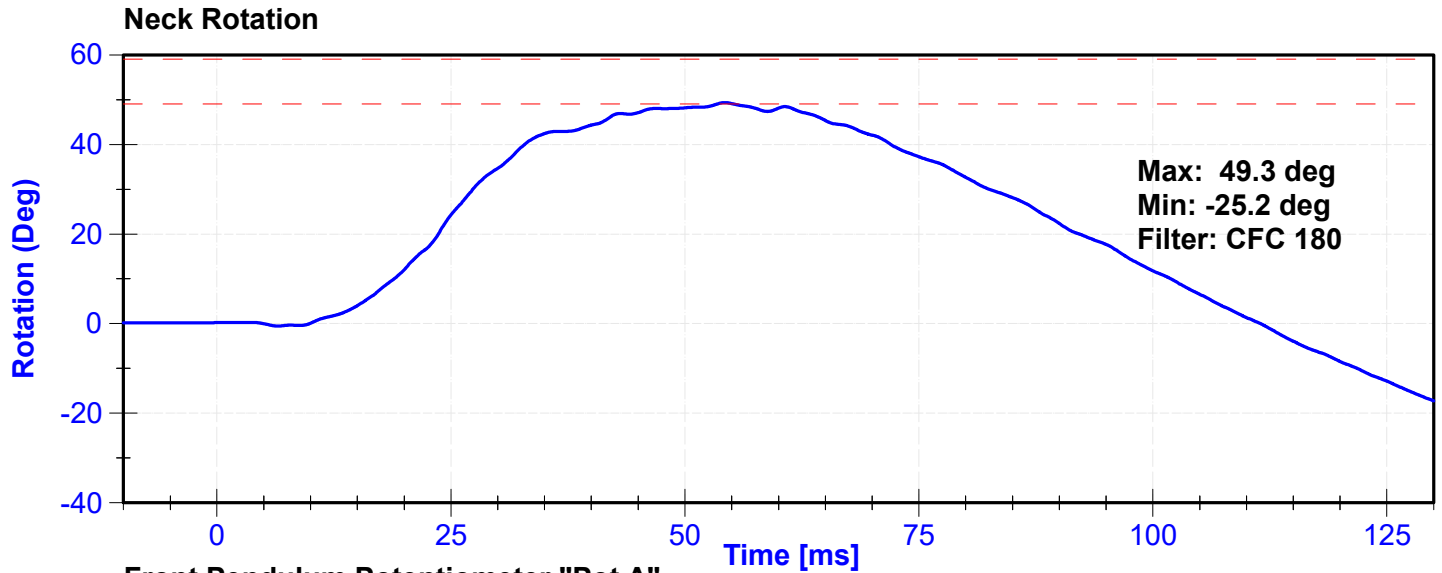
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	49	Pass
Velocity	3.3	3.5	m/s	3.43	Pass
Lateral Neck Rotation	49	59	deg	49.3	Pass
Time at Maximum Rotation	54	66	ms	54.3	Pass
Time of Rotation Decay from Maximum	53	88	ms	57.2	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	12/5/2023	12/4/2024
Headform Potentiometer	Sfernice	095	9/29/2023	9/28/2024





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

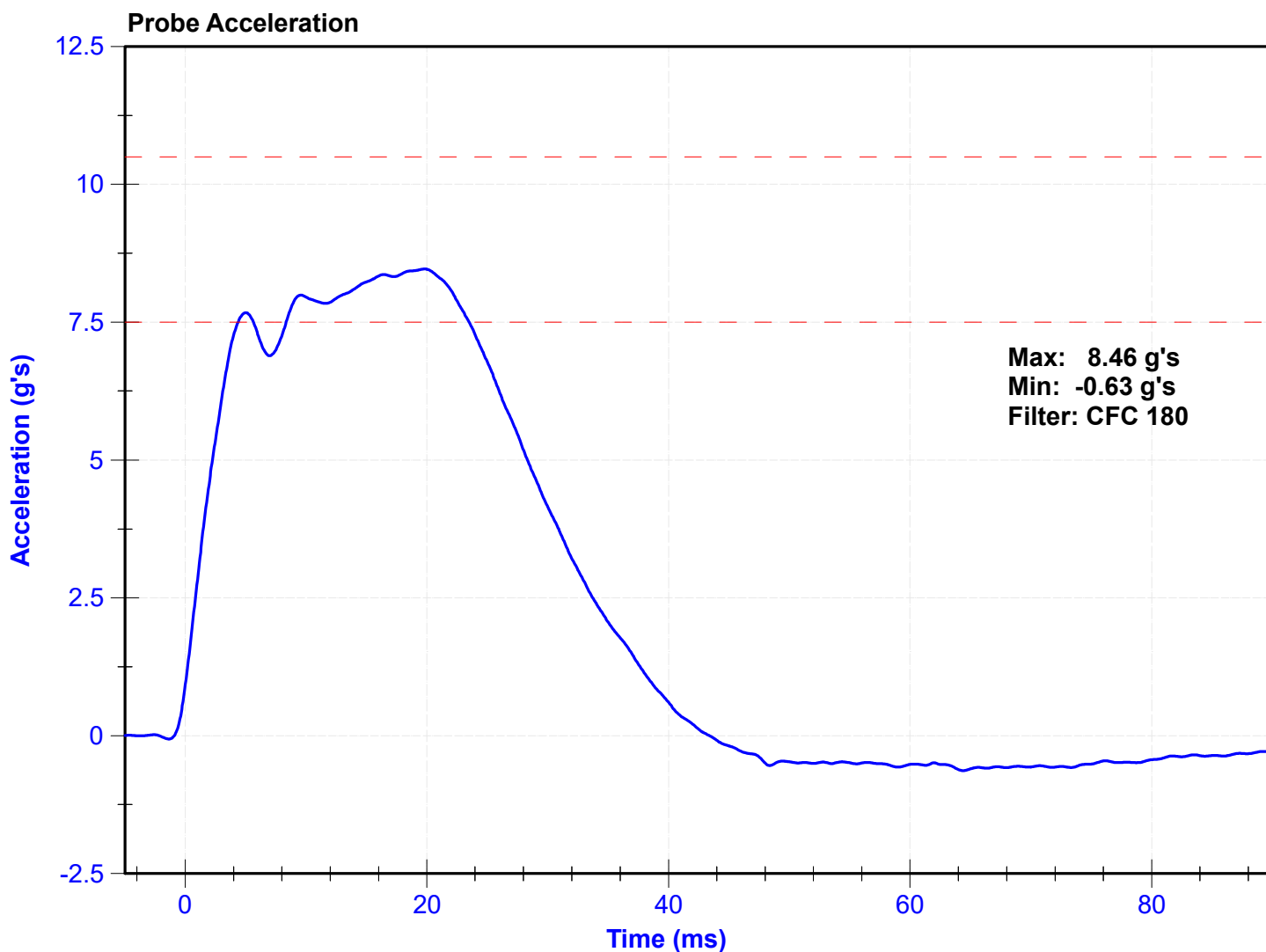
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	7.5	10.5	g's	8.46	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024



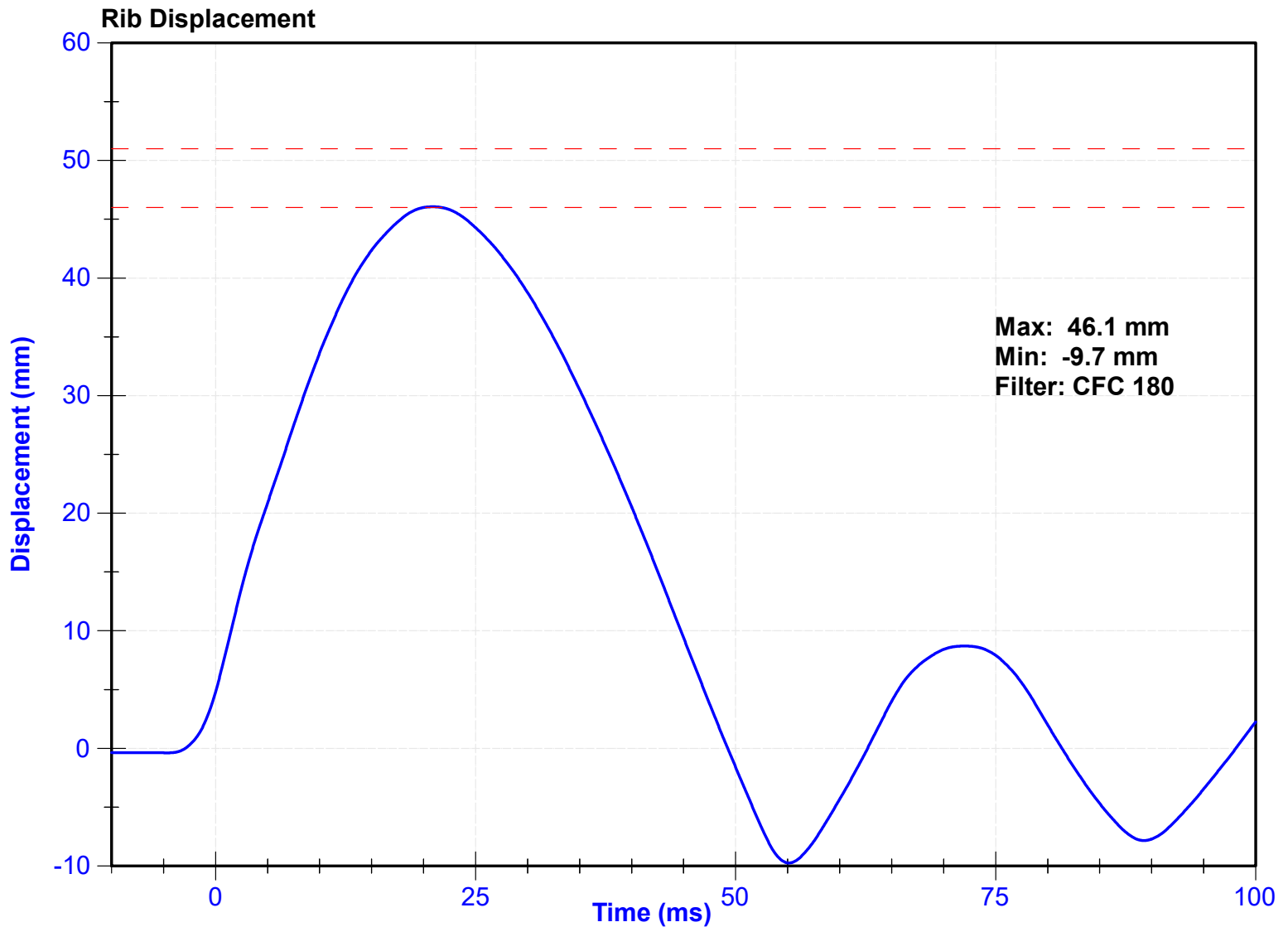
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	46.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024



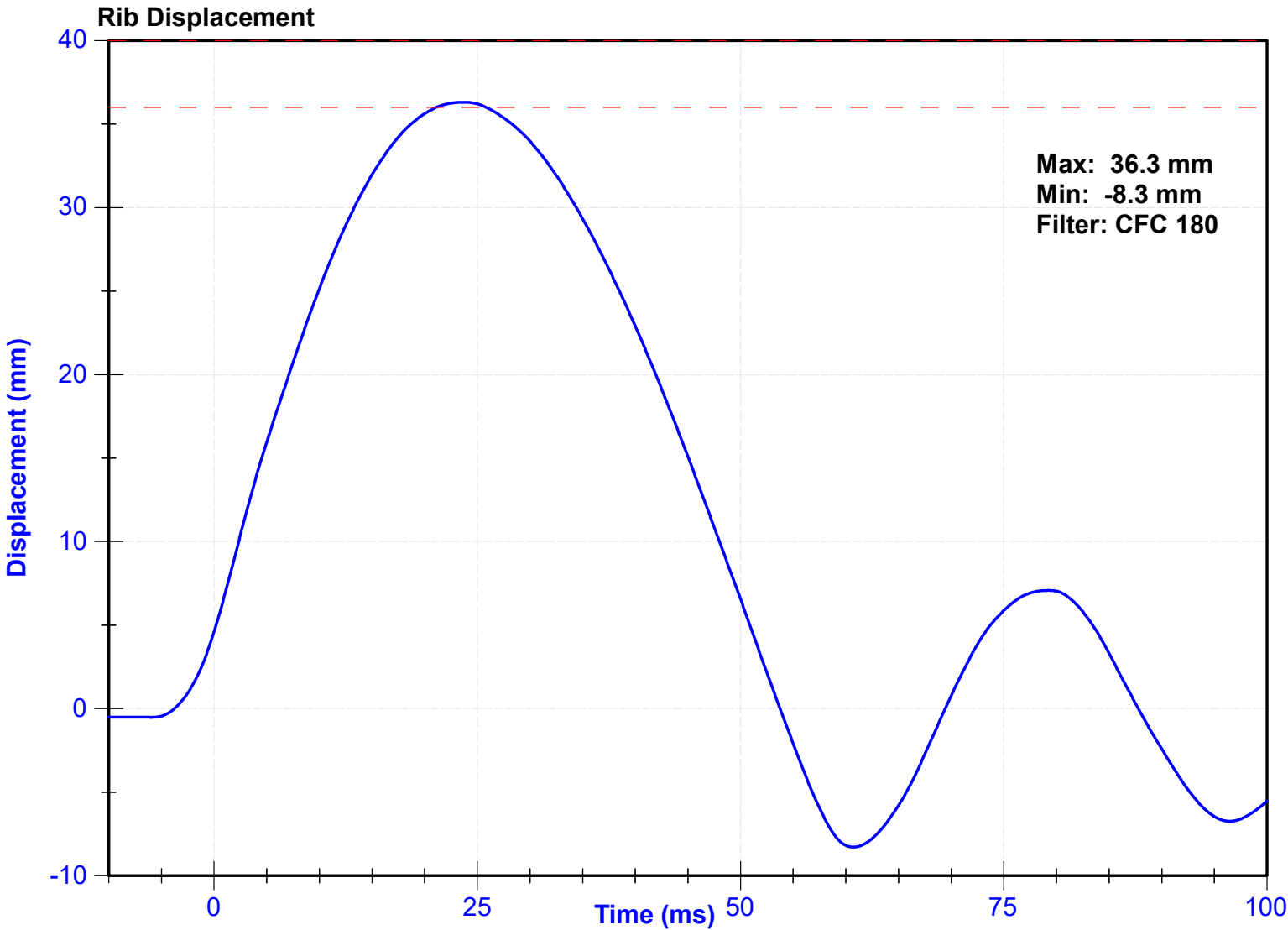
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	36.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024



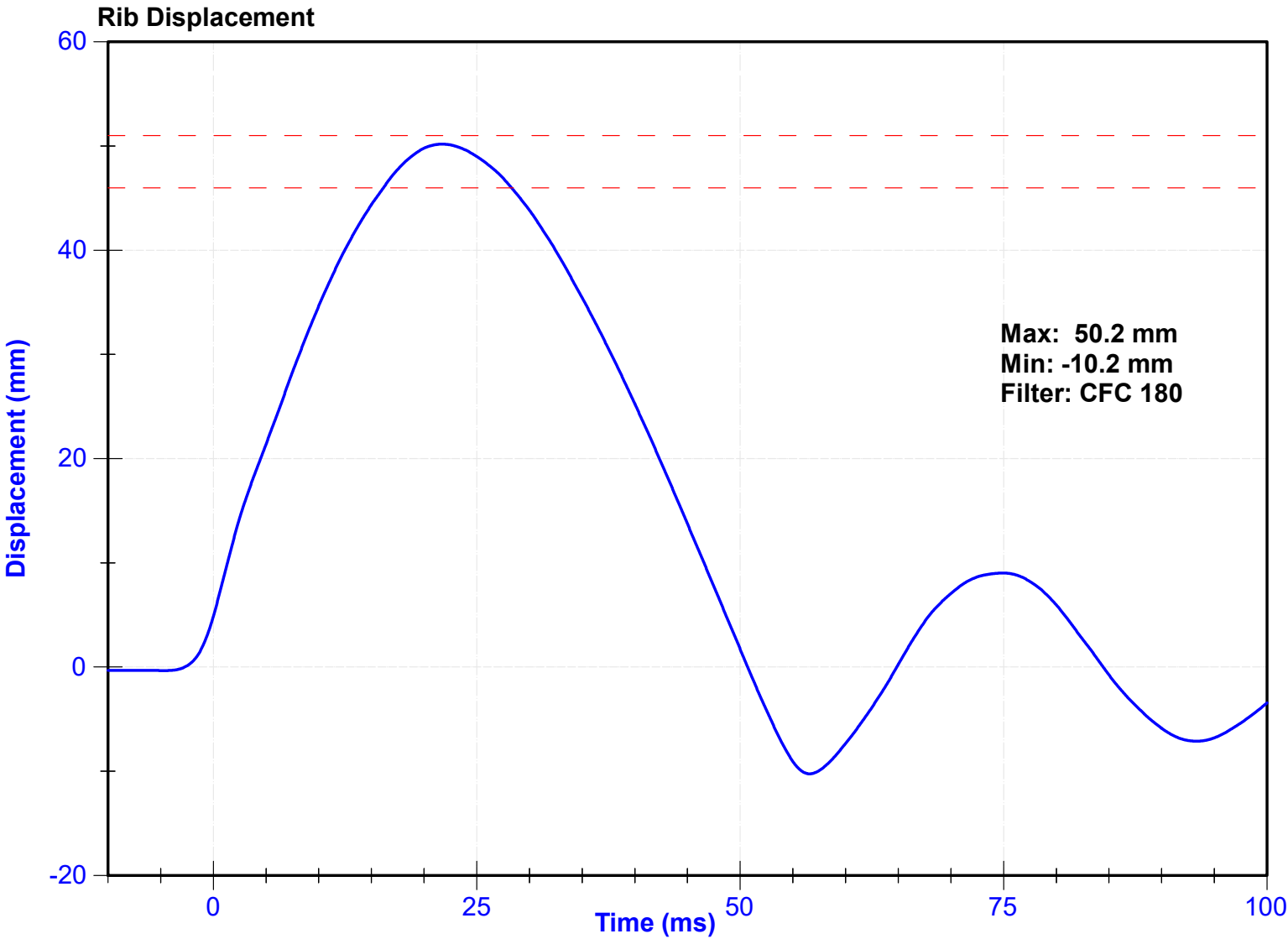
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	50.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024



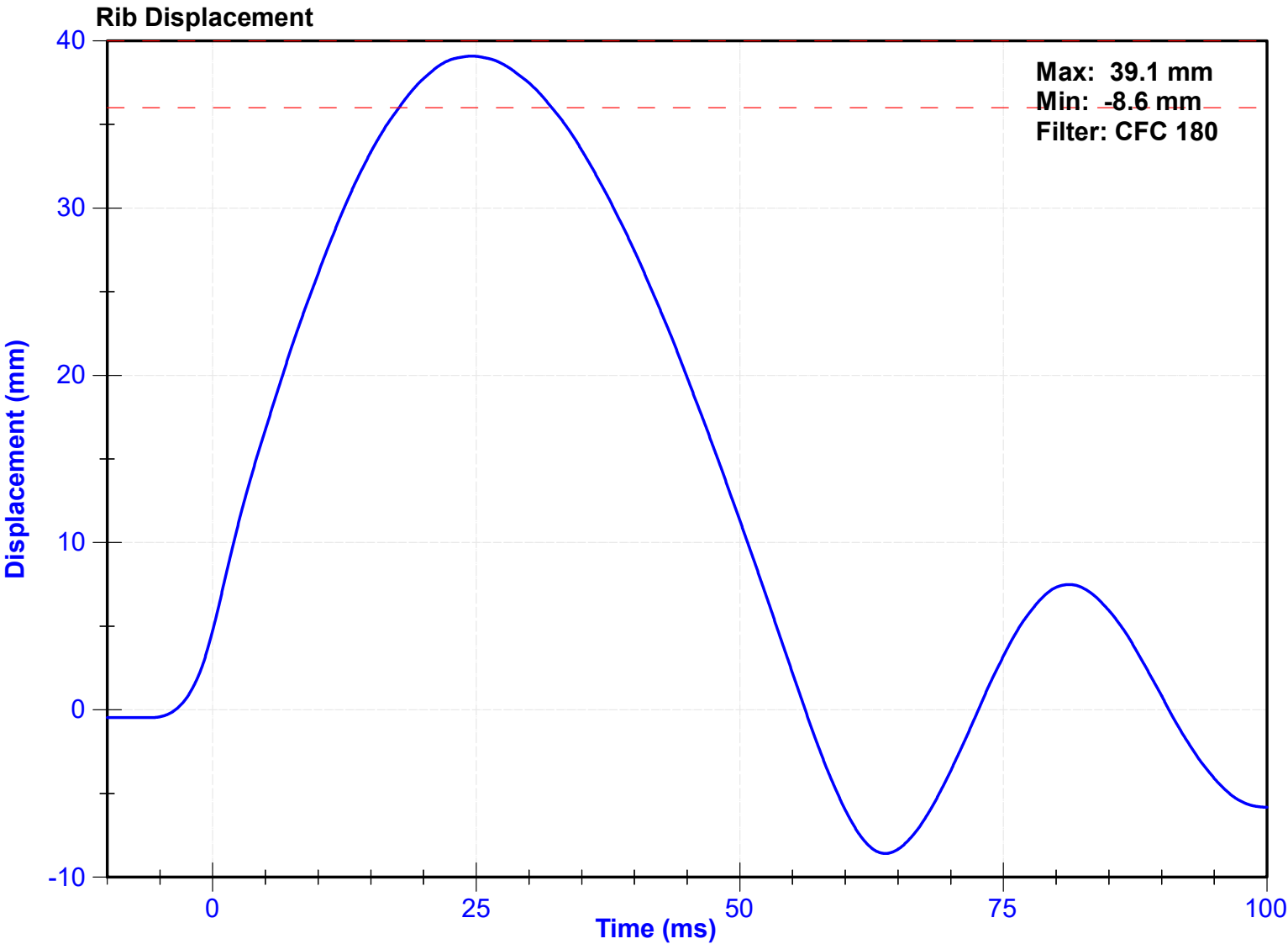
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	39.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024



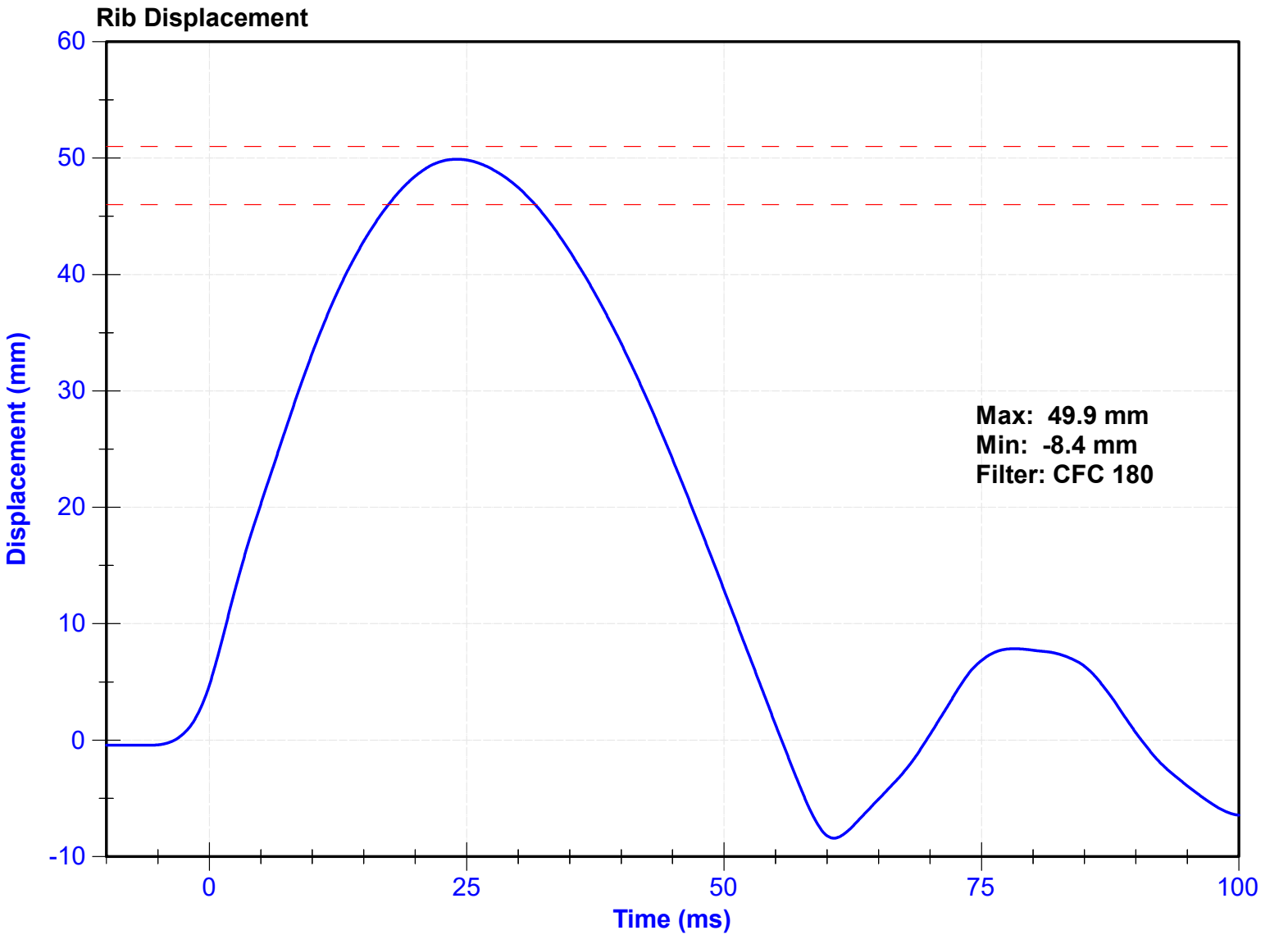
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	46	51	mm	49.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	1/31/2024	7/31/2024



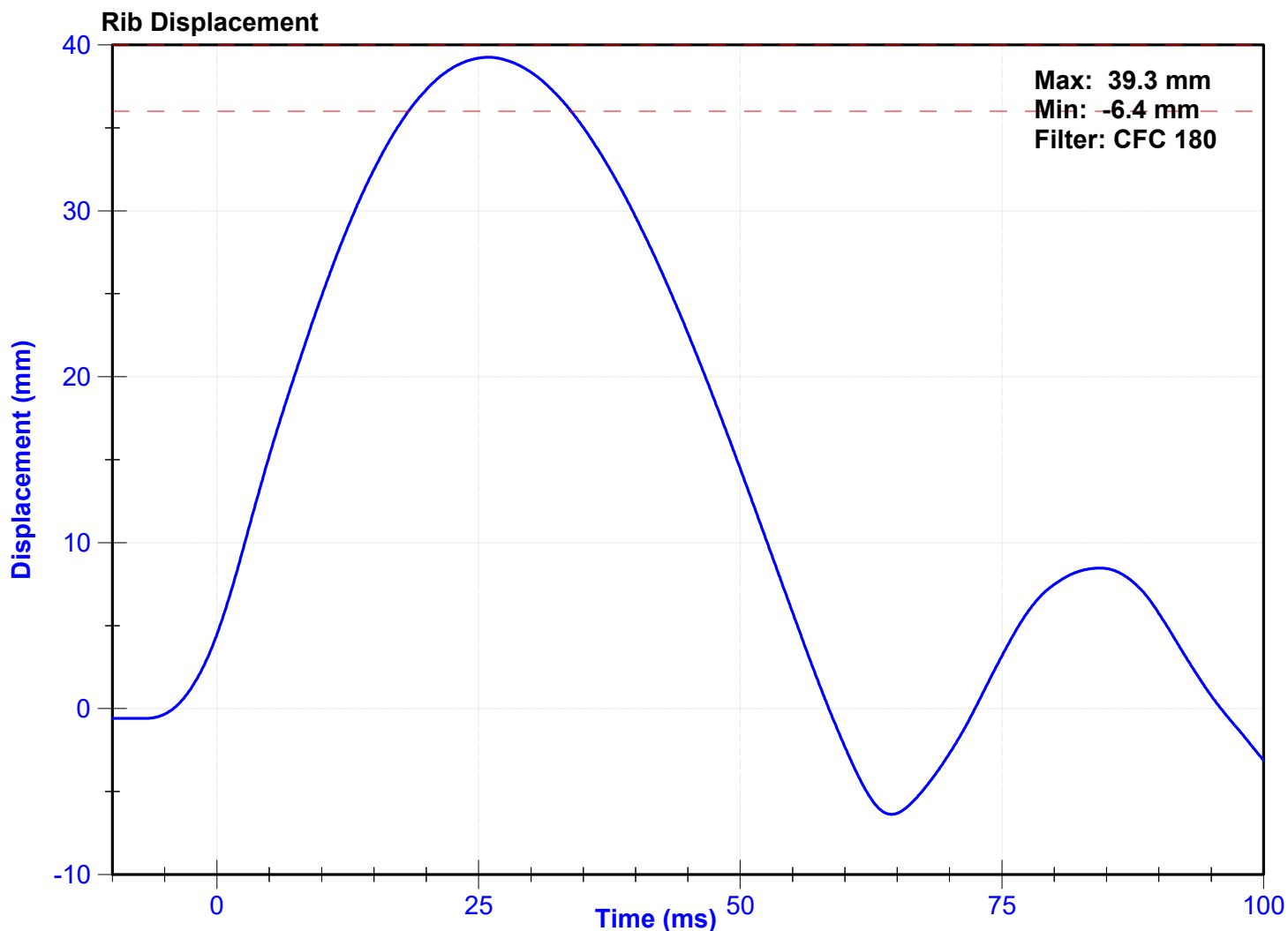
ATD Manufacturer	Denton	Test Technician	J.Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	44	Pass
Rib Displacement	36	40	mm	39.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell	0552-03	31-Jan-24	31-Jul-24



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

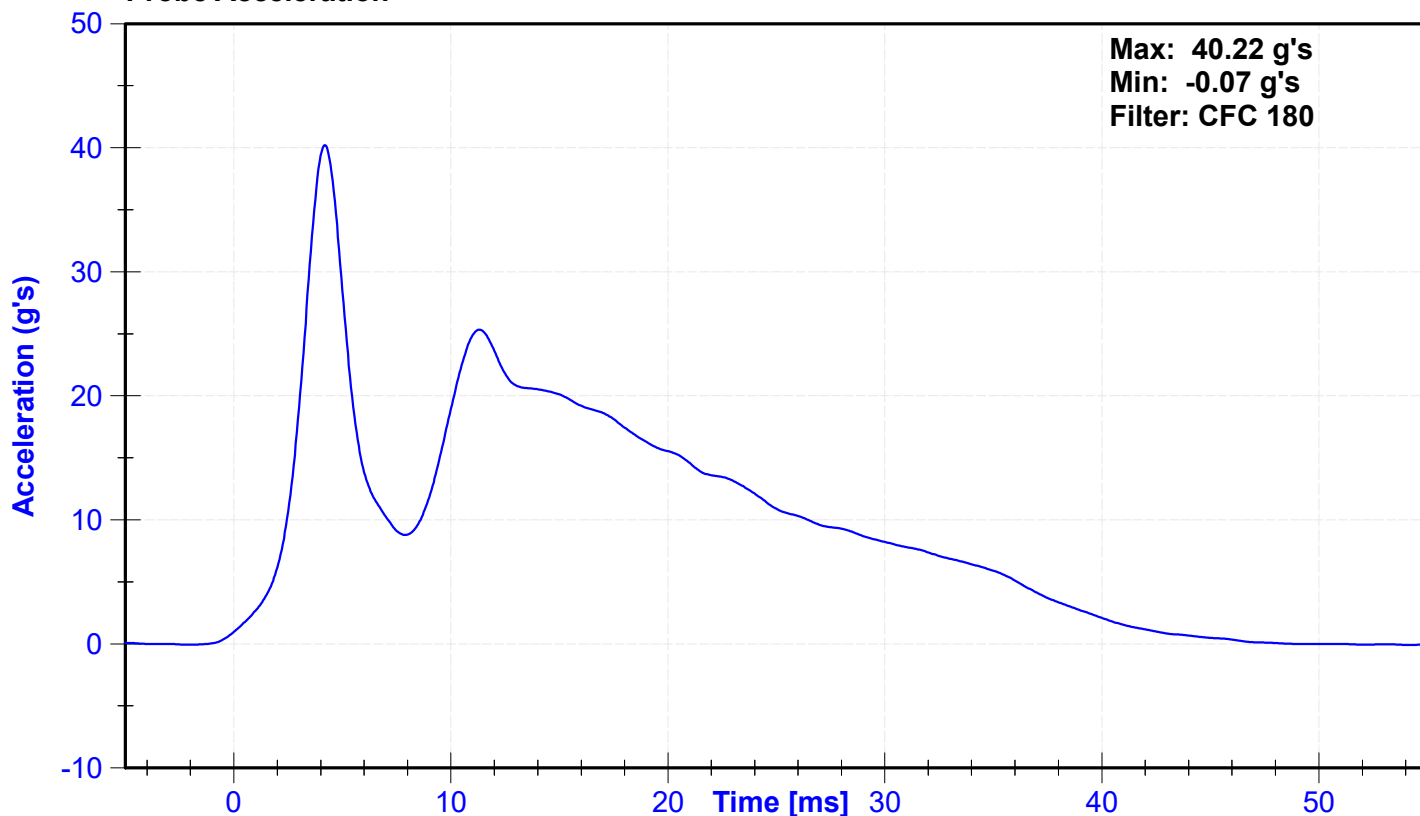
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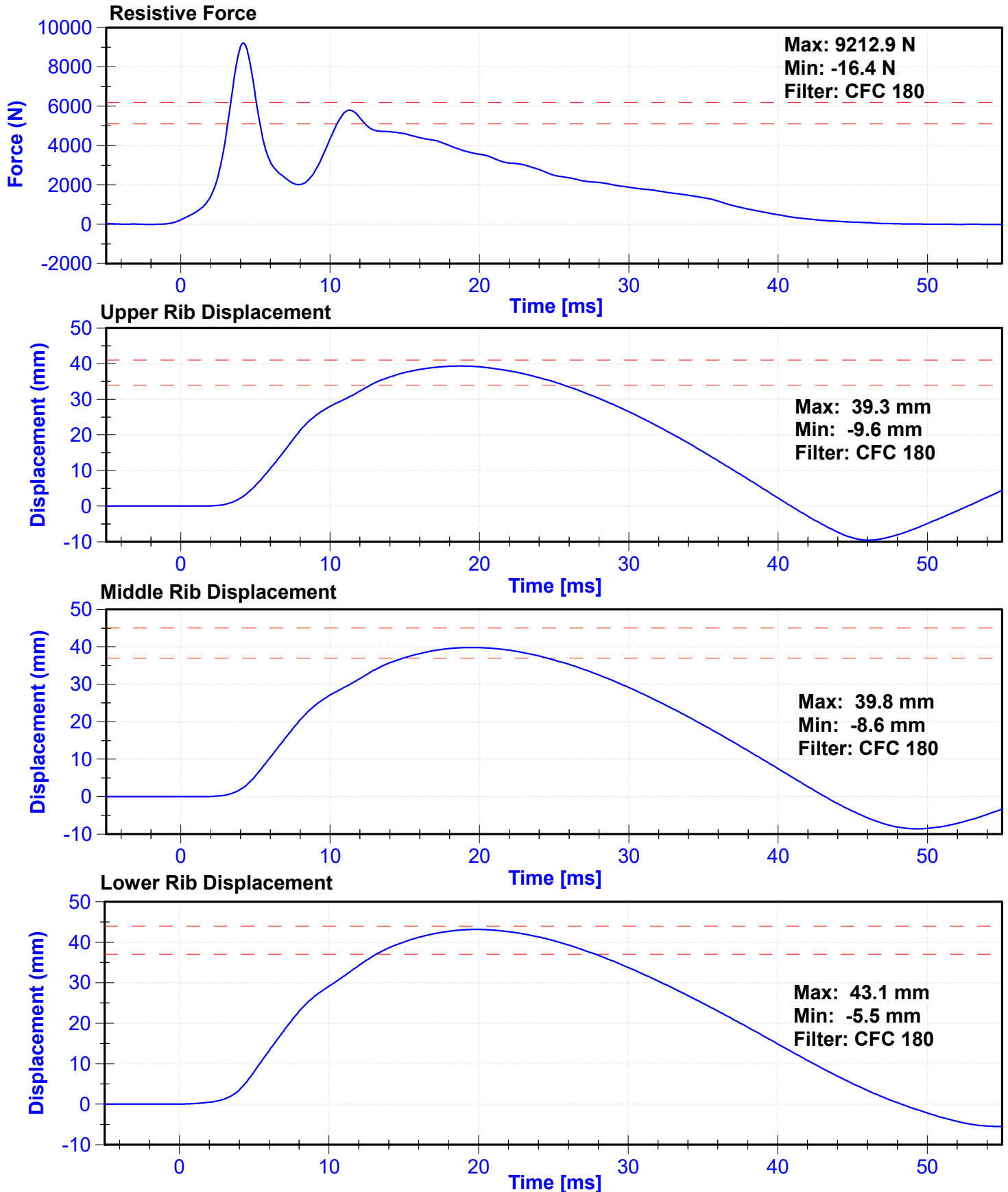
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	5.4	5.6	m/s	5.46	Pass
Resistive Force after 6ms	5100	6200	N	5805.1	Pass
Upper Thorax Rib Deflection	34	41	mm	39.3	Pass
Mid Thorax Rib Deflection	37	45	mm	39.8	Pass
Lower Thorax Rib Deflection	37	44	mm	43.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Thorax Rib Potentiometer	Honeywell	0552-01	1/31/2024	7/31/2024
Middle Thorax Rib Potentiometer	Honeywell	807	1/31/2024	7/31/2024
Lower Thorax Rib Potentiometer	Honeywell	0552-03	1/31/2024	7/31/2024

Probe Acceleration





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

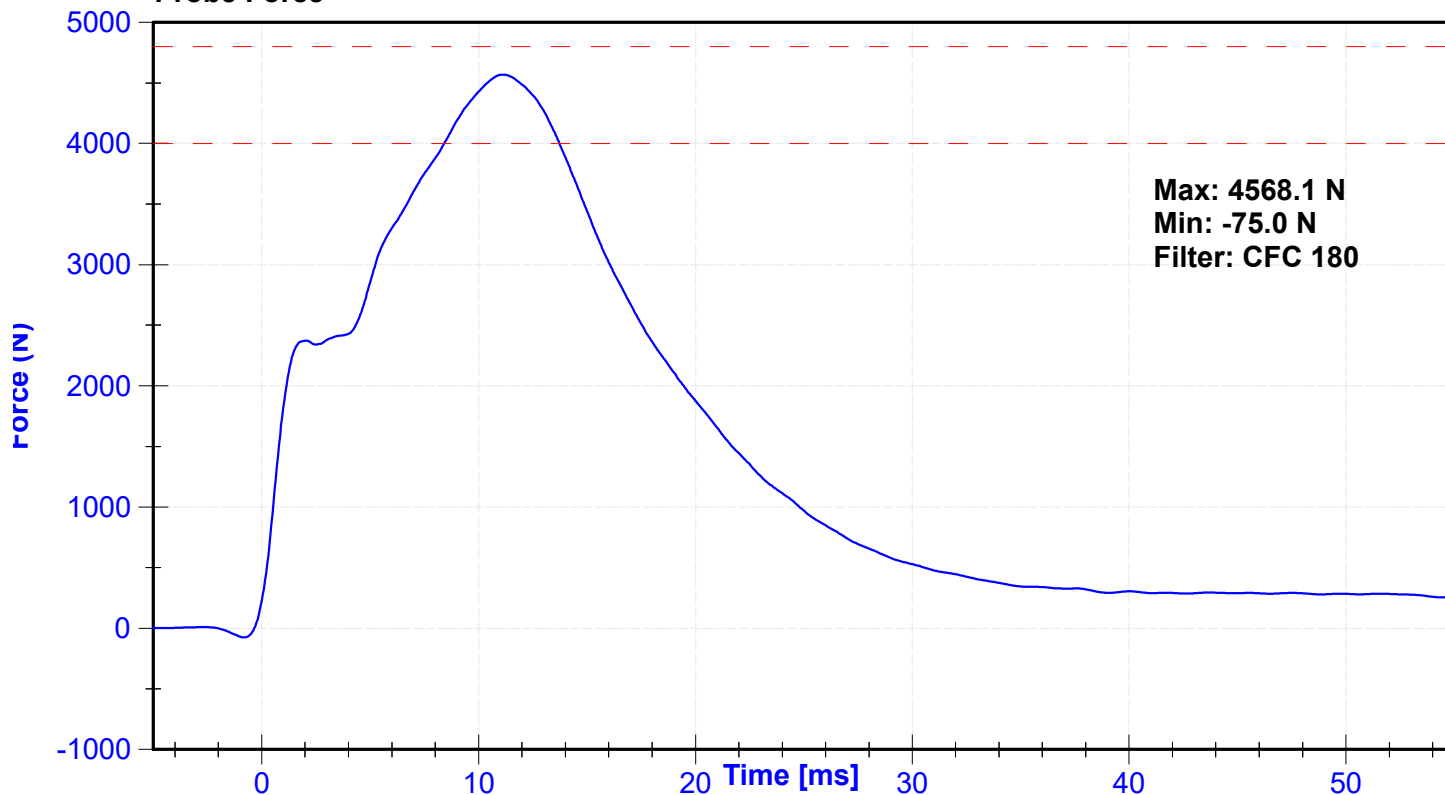
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	3.9	4.1	m/s	4.02	Pass
Combined Abdomen Force	2200	2700	N	2374.3	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.90	Pass
Resistive Probe Force	4000	4800	N	4568.1	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.15	Pass

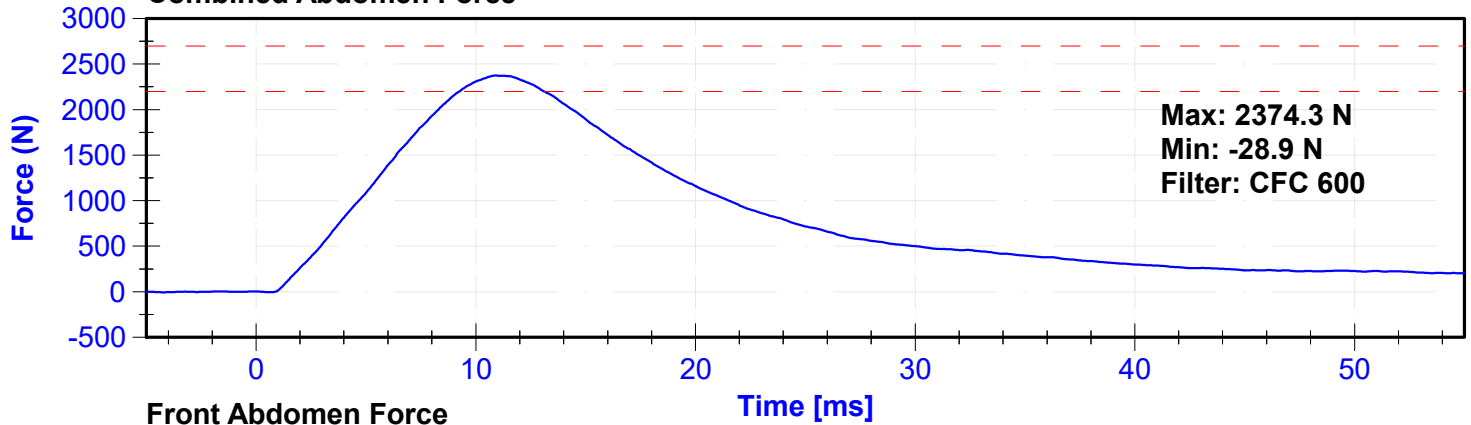
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Front Abdomen Load Cell	Denton	1440	8/8/2023	8/7/2024
Middle Abdomen Load Cell	Denton	1525	8/8/2023	8/7/2024
Rear Abdomen Load Cell	Denton	1528	8/8/2023	8/7/2024

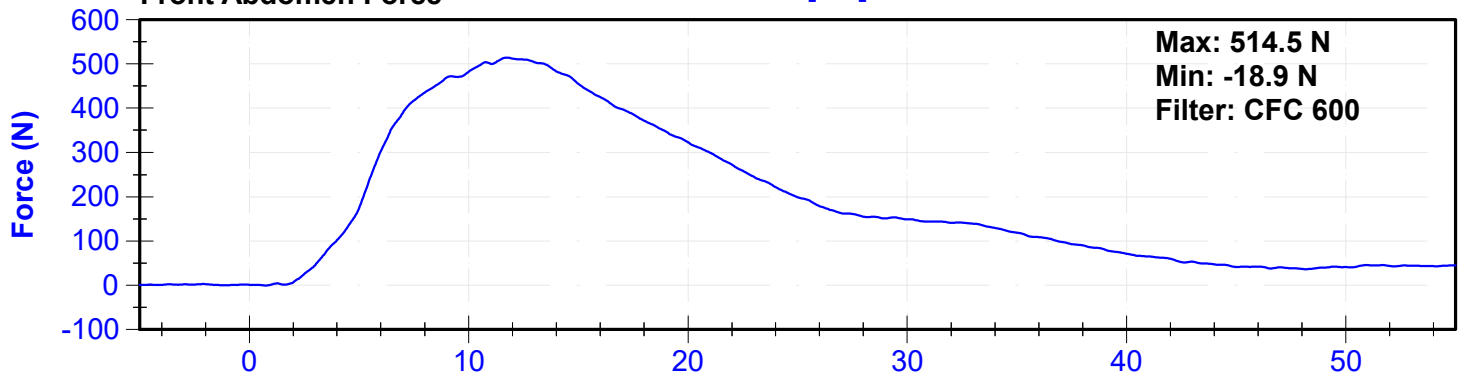
Probe Force



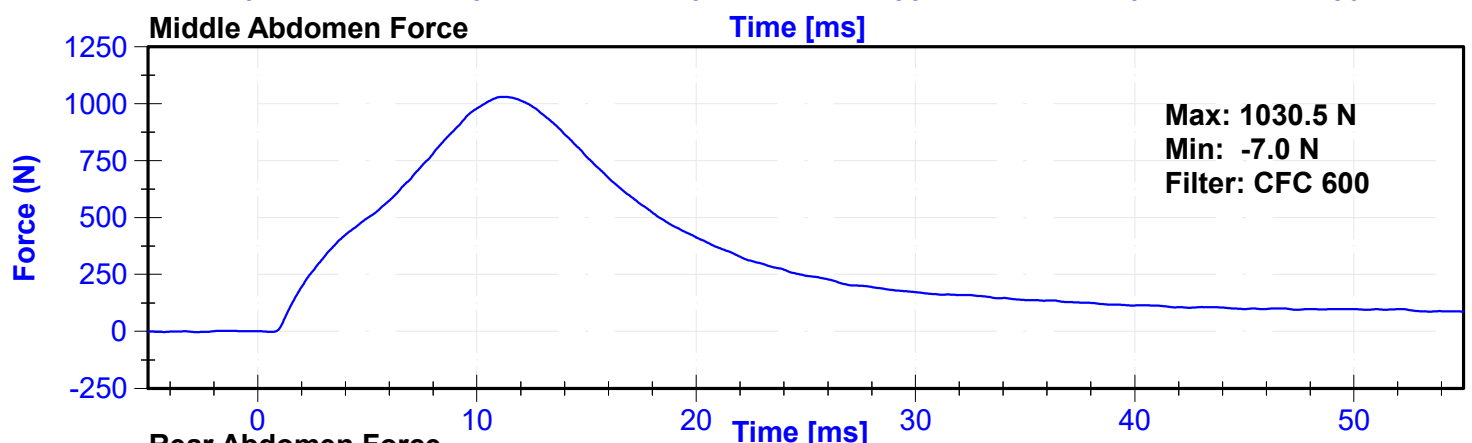
Combined Abdomen Force



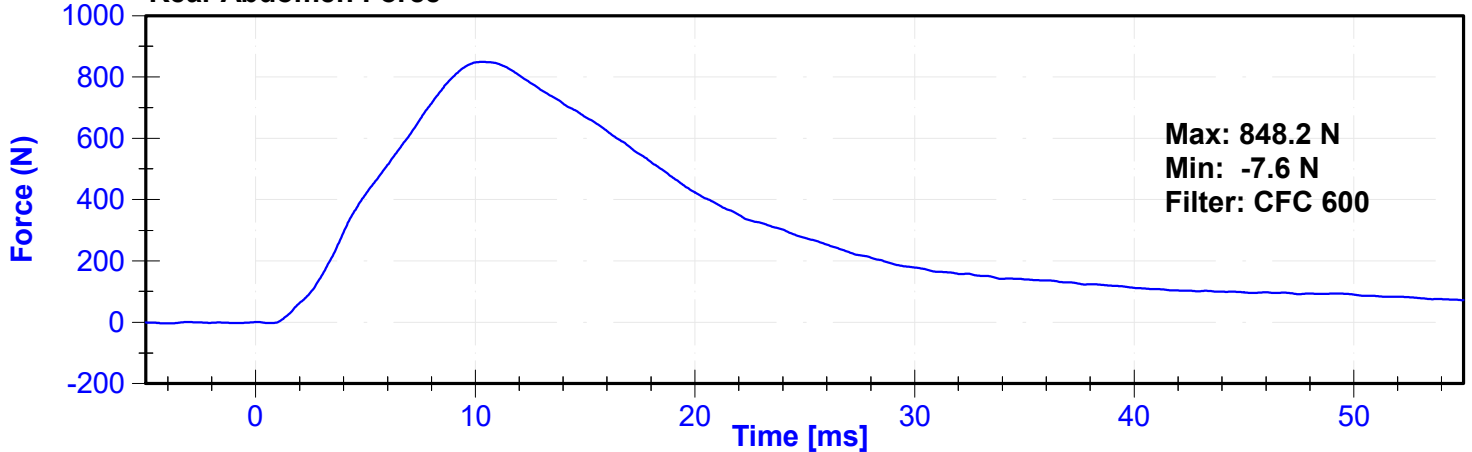
Front Abdomen Force



Middle Abdomen Force



Rear Abdomen Force



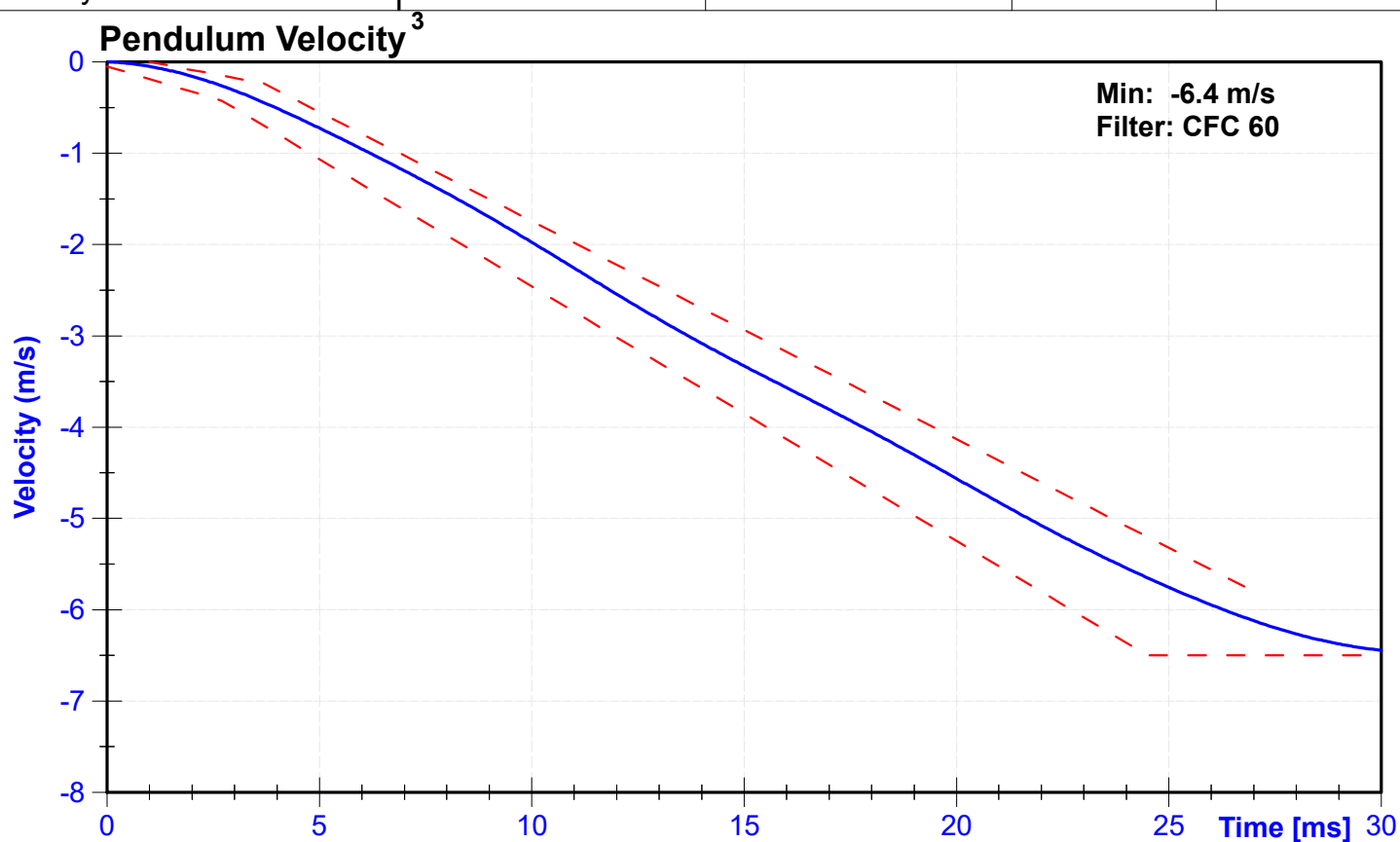
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

Results

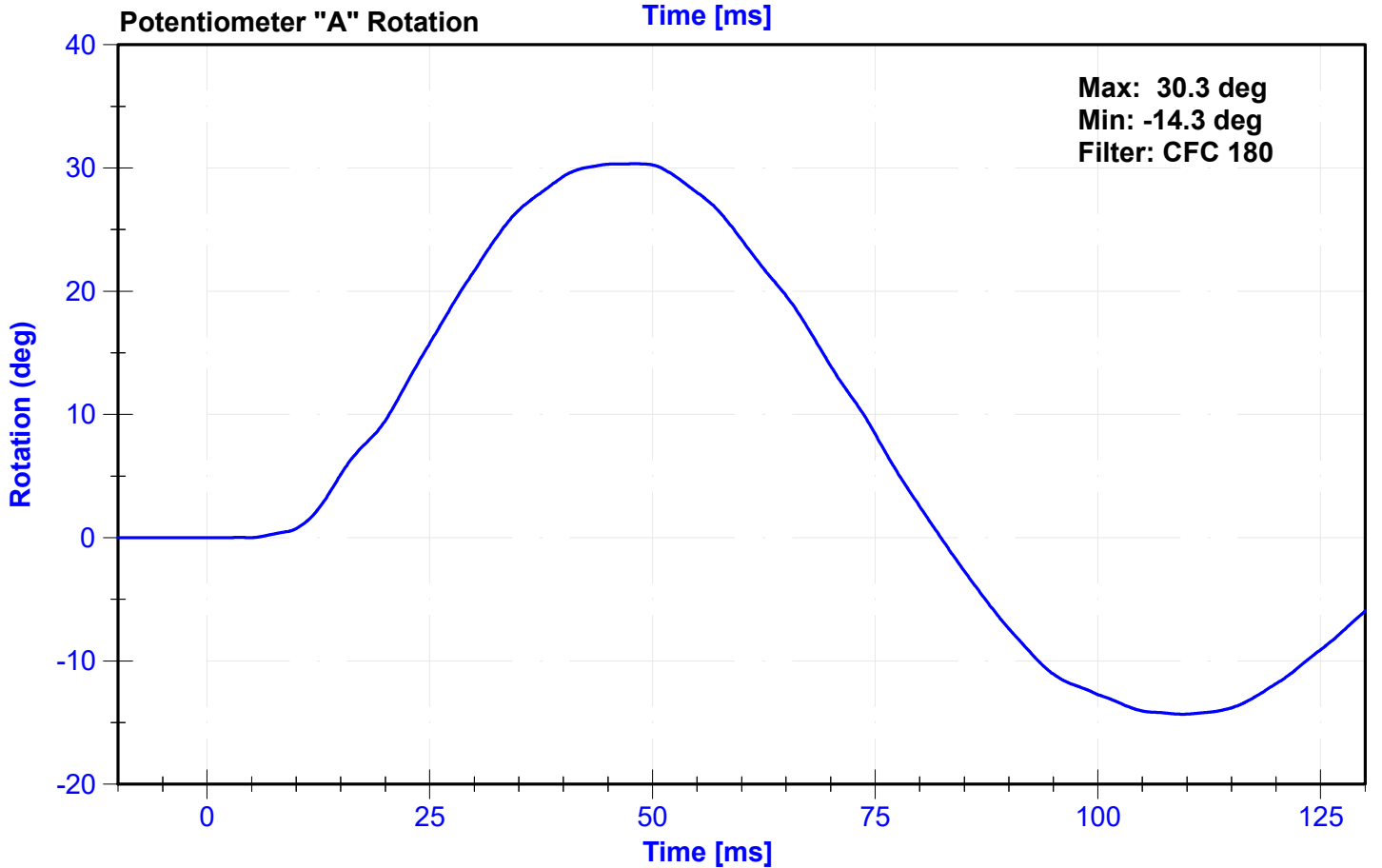
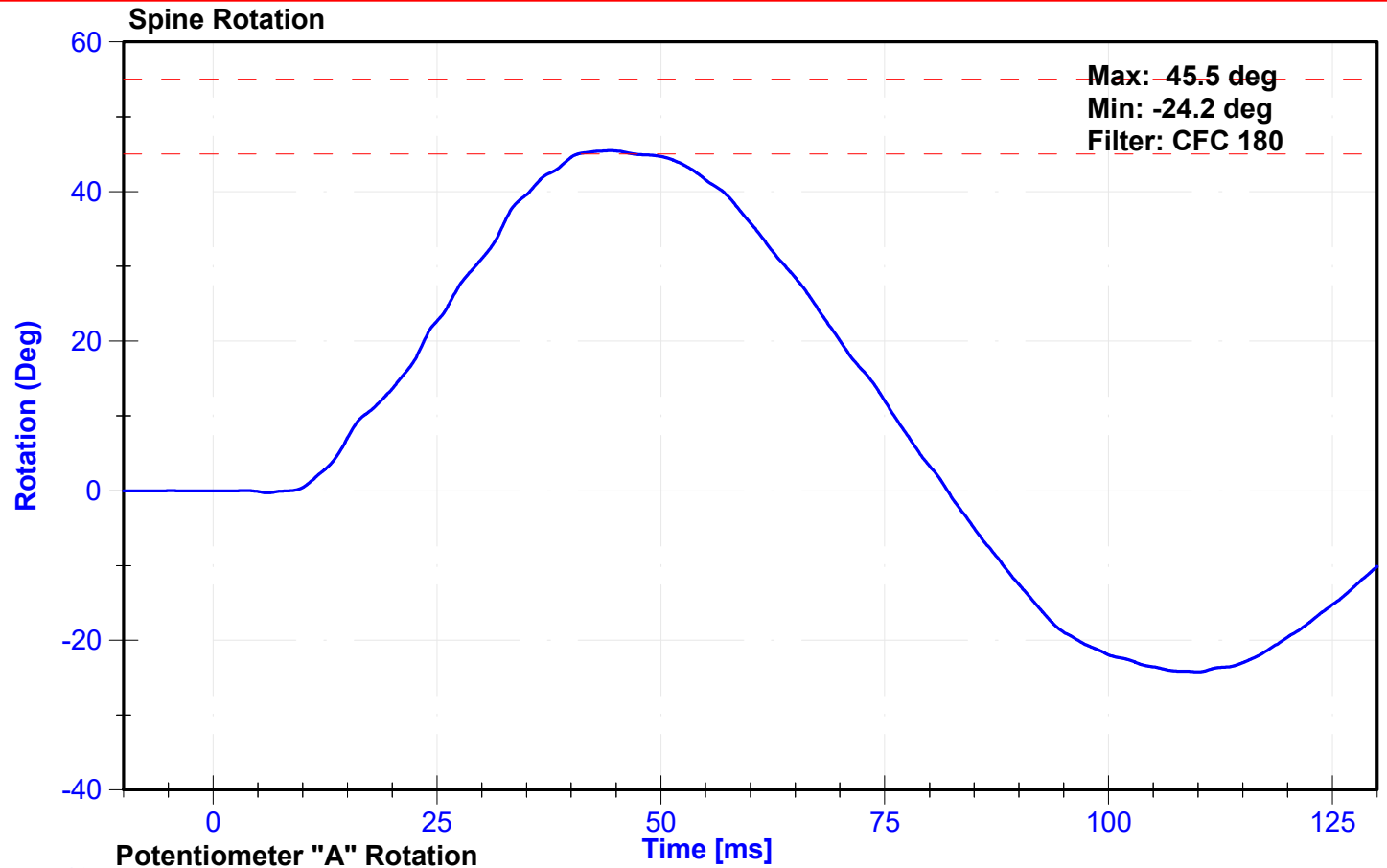
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	49	Pass
Velocity	5.95	6.15	m/s	6.088	Pass
Lateral Spine Rotation	45	55	deg	45.5	Pass
Time at Maximum Rotation	39	53	ms	44.4	Pass
Time of Decay to Zero Degrees	37	57	ms	37.7	Pass
Pendulum Velocity Overall Corridor	Lower Boundary ¹	Upper Boundary ²	m/s	See Plot ³	Pass

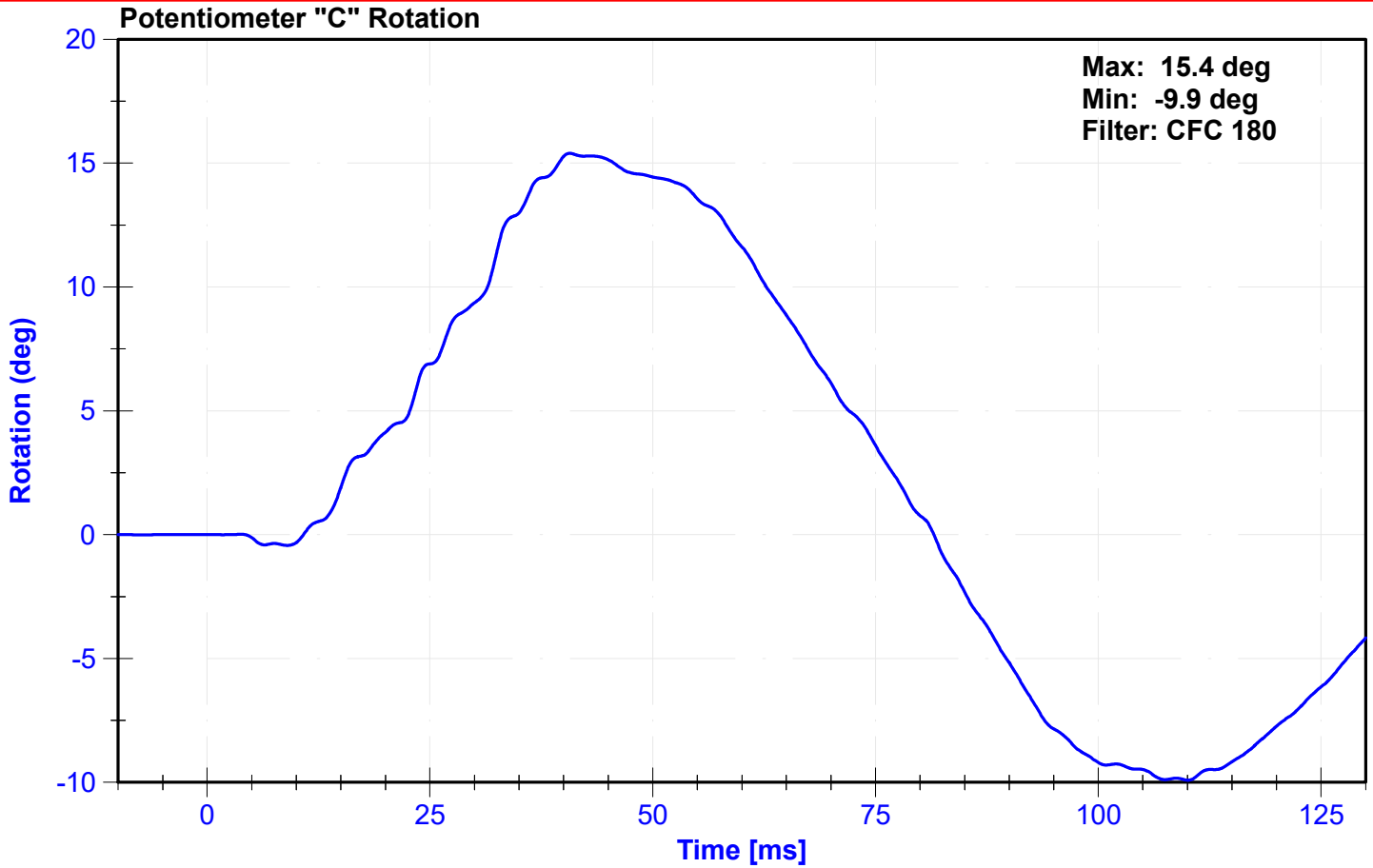
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	C16503	4/29/2024	10/26/2024
Pendulum "A" Potentiometer	Sfernice	2247	12/5/2023	12/4/2024
Condyle "B" Potentiometer	Sfernice	095	9/29/2023	9/28/2024



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





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

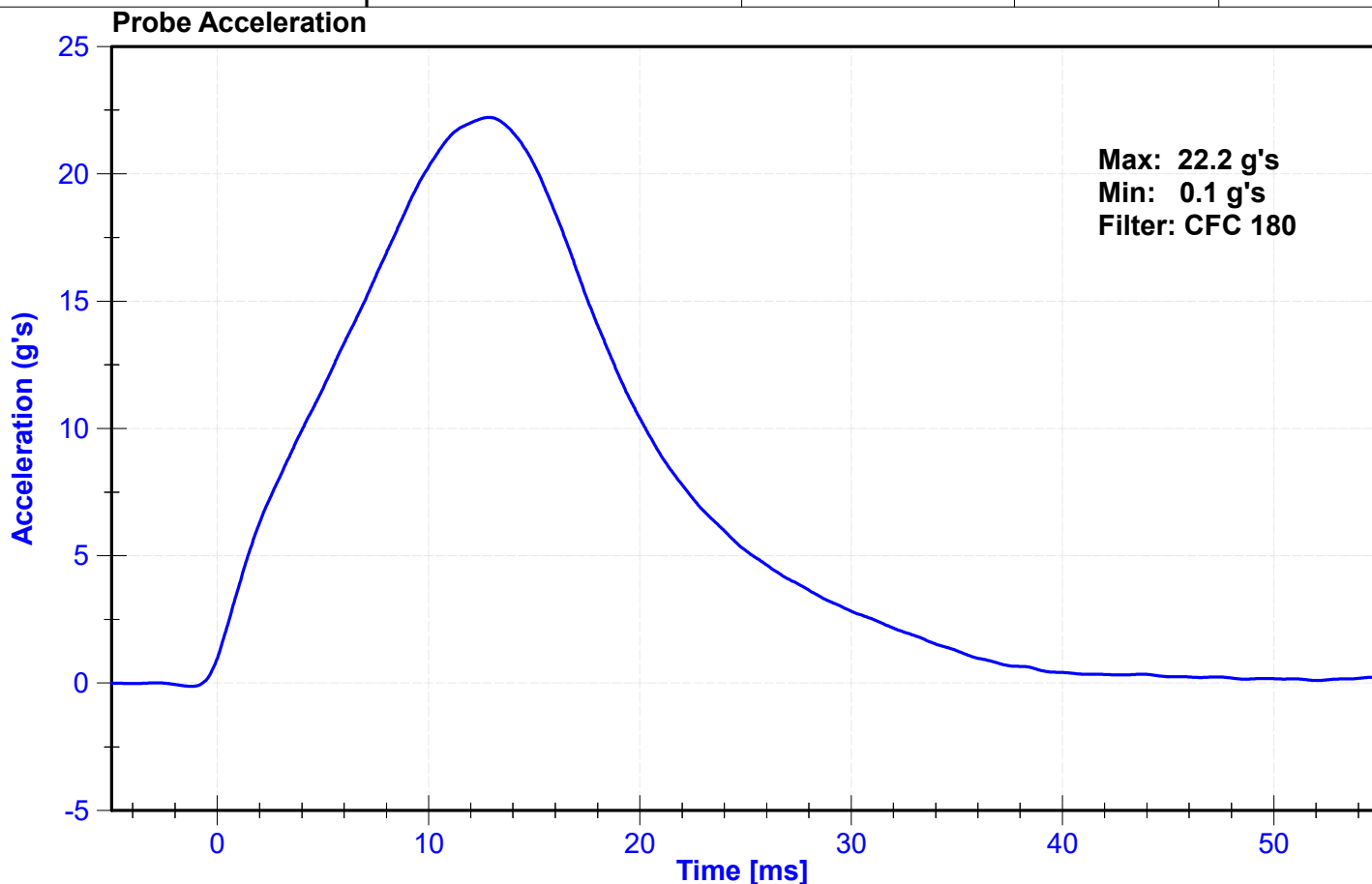
ATD Manufacturer	Denton	Test Technician	J. Kinderman
ATD Serial Number	D037	Laboratory Supervisor	C. Mantell

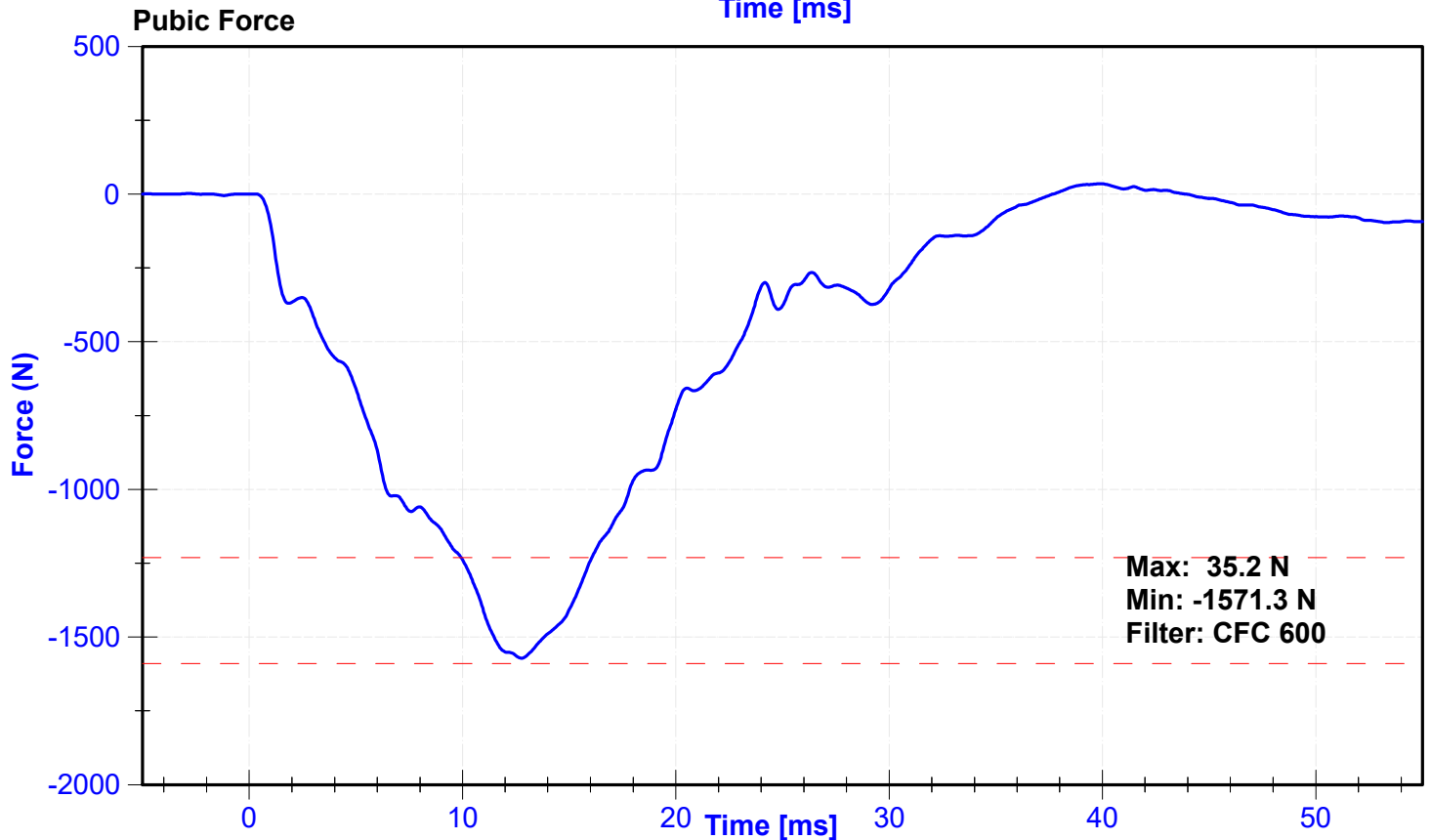
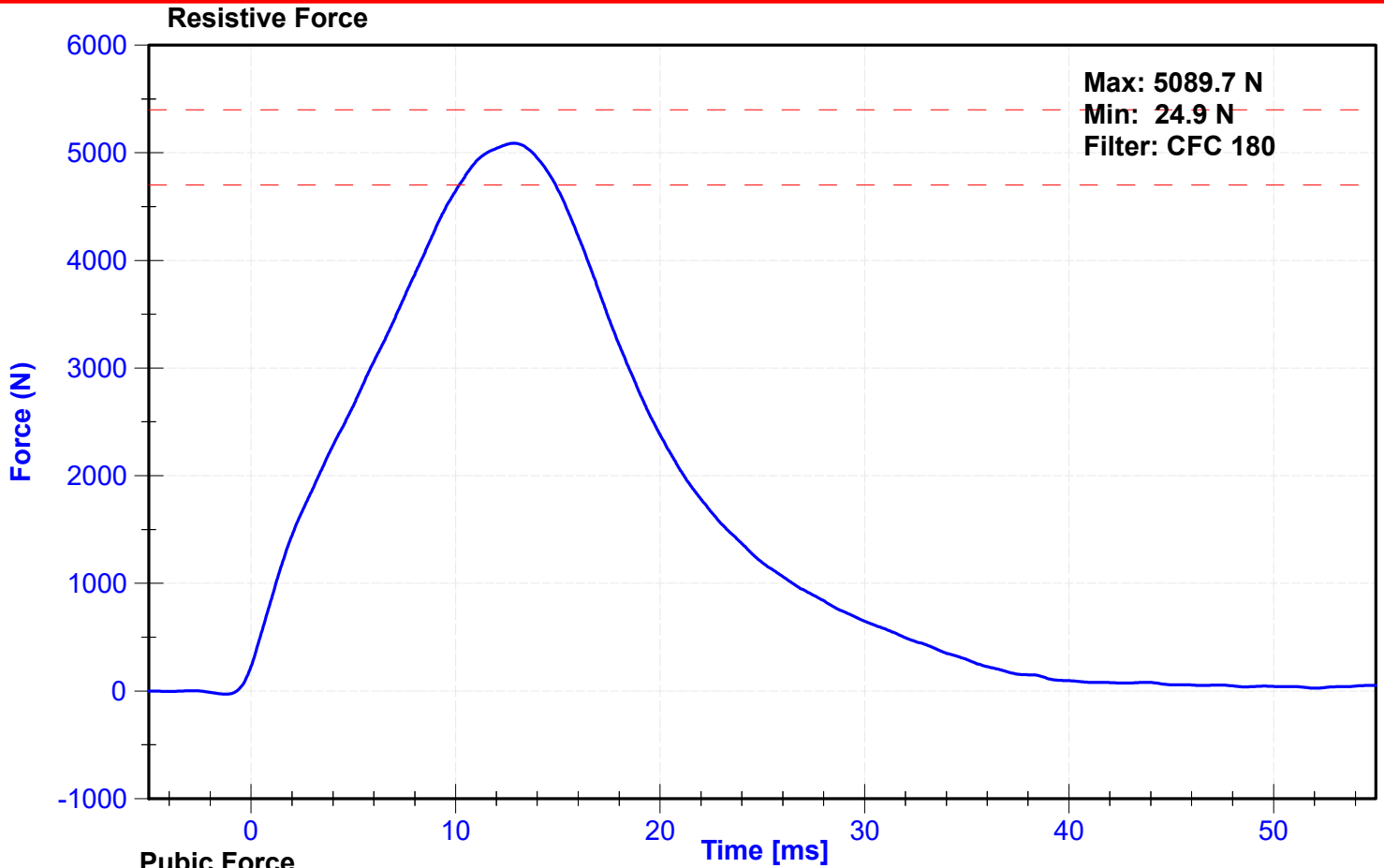
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	27	Pass
Velocity	4.2	4.4	m/s	4.24	Pass
Resistive Force	4700	5400	N	5089.7	Pass
Time at Peak Resistive Force	11.8	16.1	ms	12.85	Pass
Pubic Force	-1590	-1230	N	-1571.3	Pass
Time at Peak Pubic Force	12.2	17.0	ms	12.75	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pubic Load Cell	Denton	456-FY	8/8/2023	8/7/2024





APPENDIX VI
SID-Is PERFORMANCE CALIBRATION TEST DATA

PRE-TEST
SID-IIs PERFORMANCE CALIBRATION TEST DATA

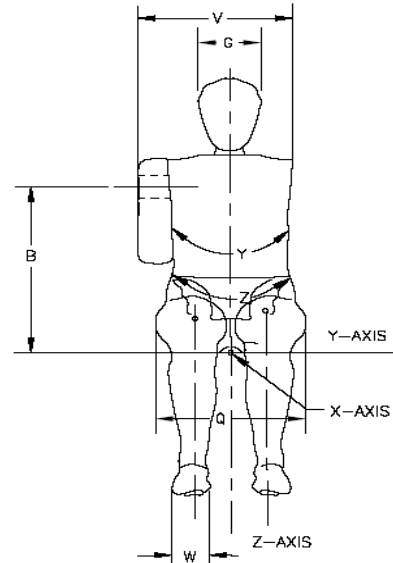
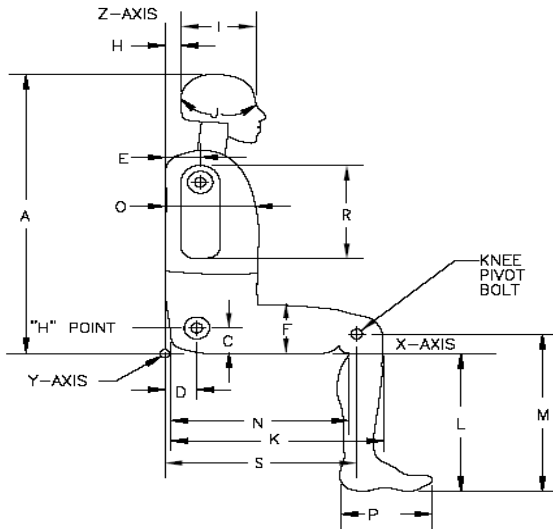


External Measurements - SID-IIs

Technician: K. Brogan

Date: 05/17/2024

Dummy Serial Number: 261



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	104	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	180	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	354	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	431	Pass
O	Chest Depth w/o jacket	195	211	206	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	483	Pass
V	Shoulder Width	341	357	349	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	871	Pass
Z	Waist Circumference	761	791	775	Pass

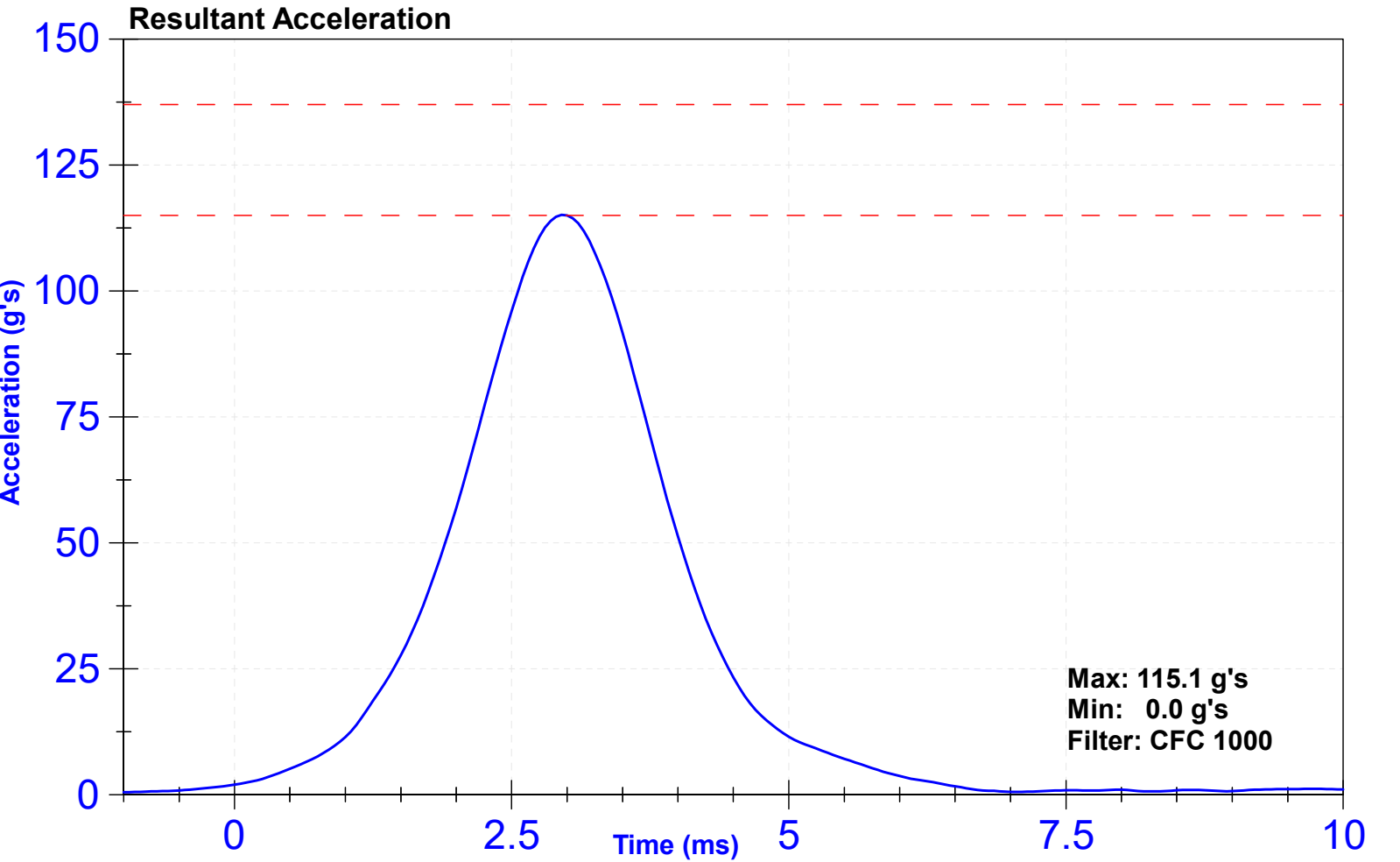
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C .Mantell

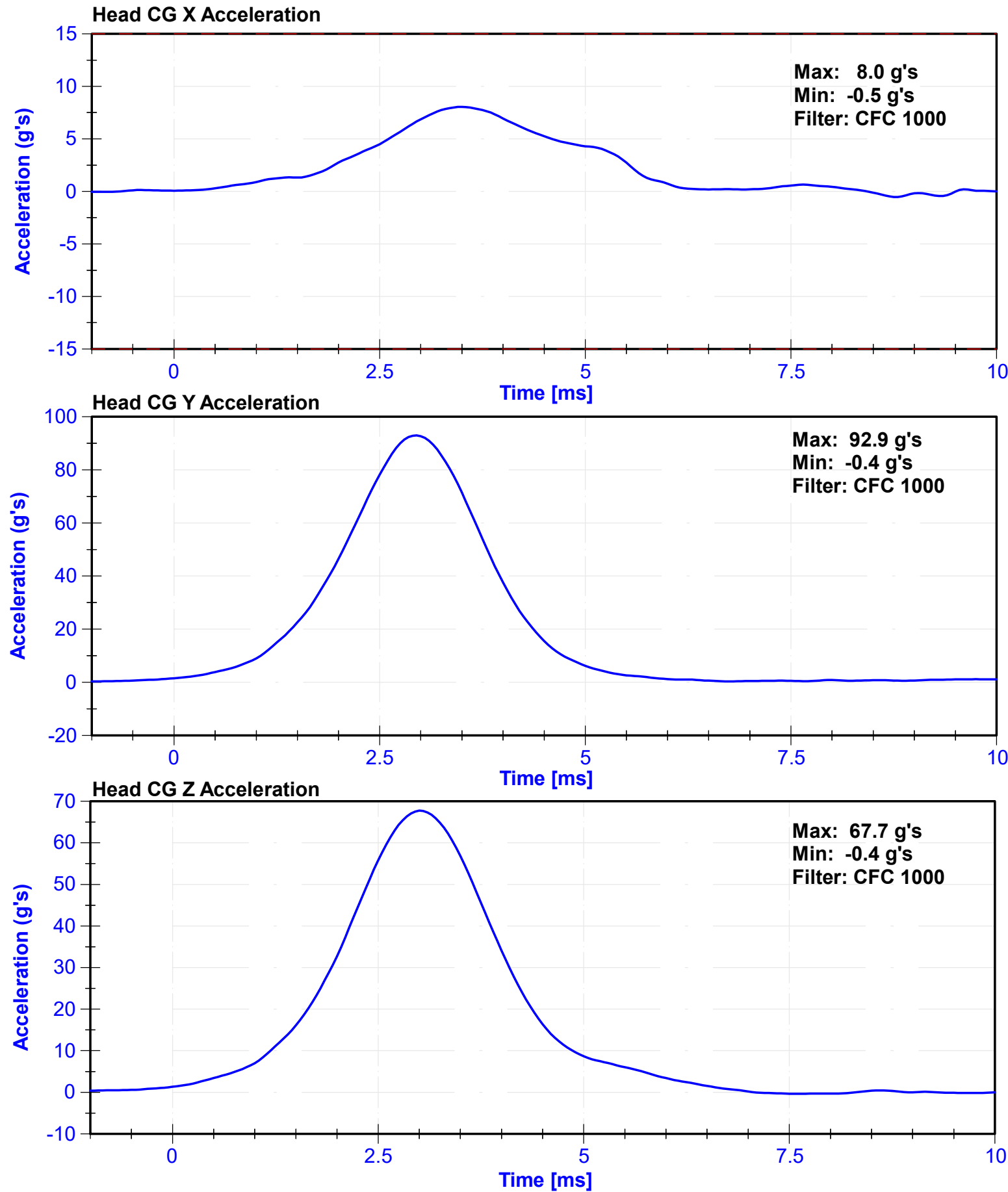
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	43	Pass
Resultant Acceleration	115	137	g's	115.1	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	8.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P68067	5/15/2024	11/11/2024
Y Accelerometer	Endevco	P18567	5/15/2024	11/11/2024
Z Accelerometer	Endevco	P49163	5/15/2024	11/11/2024





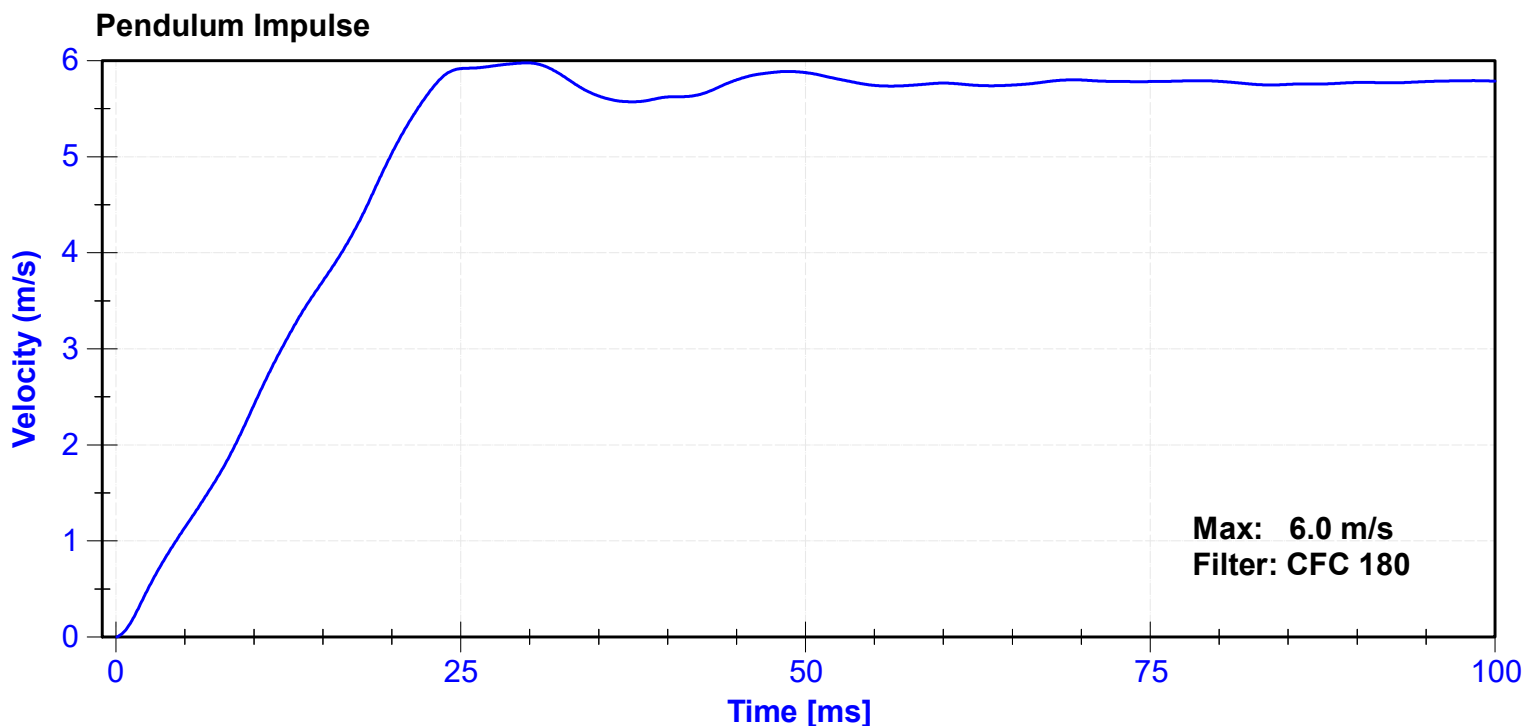
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

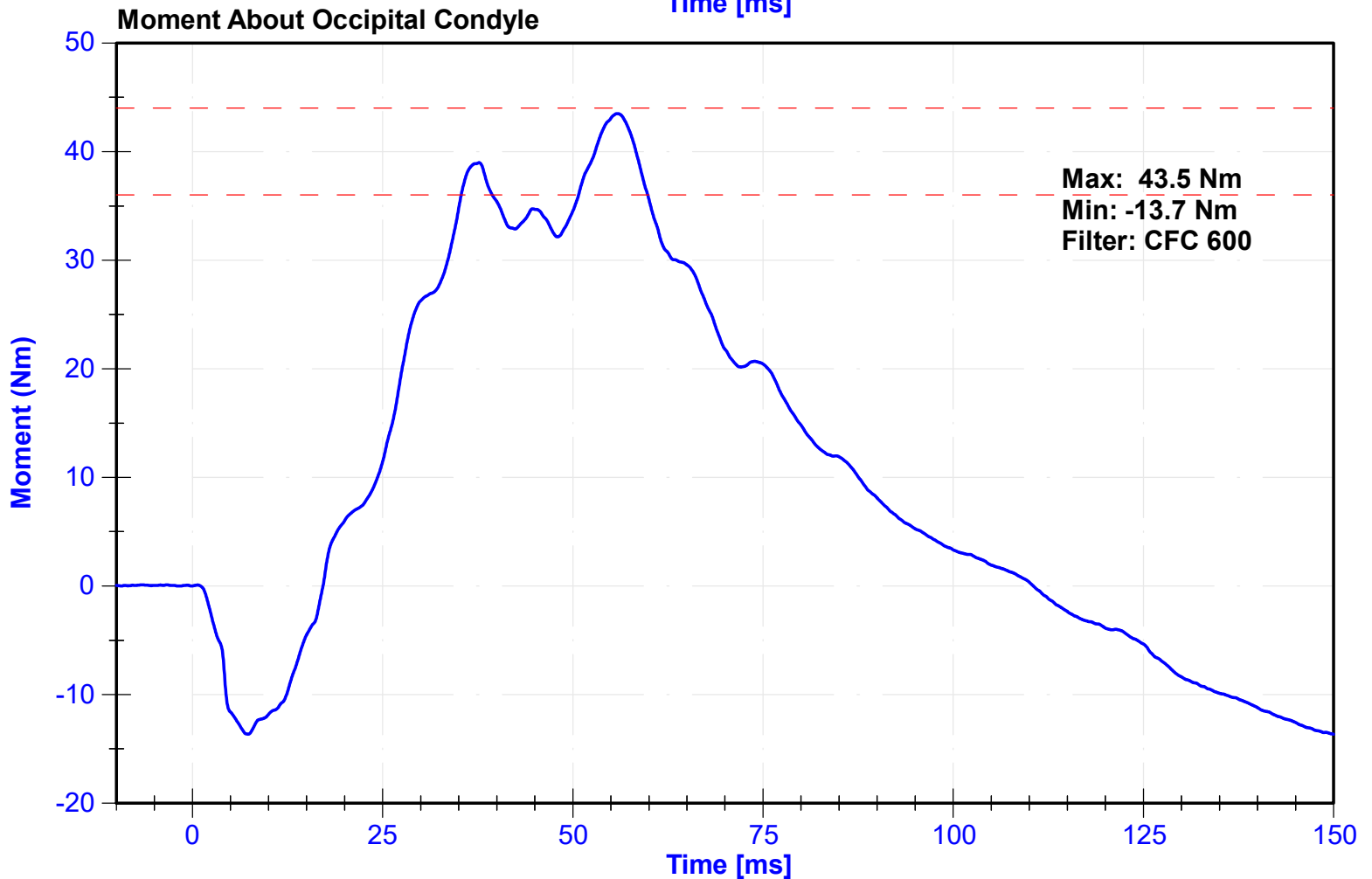
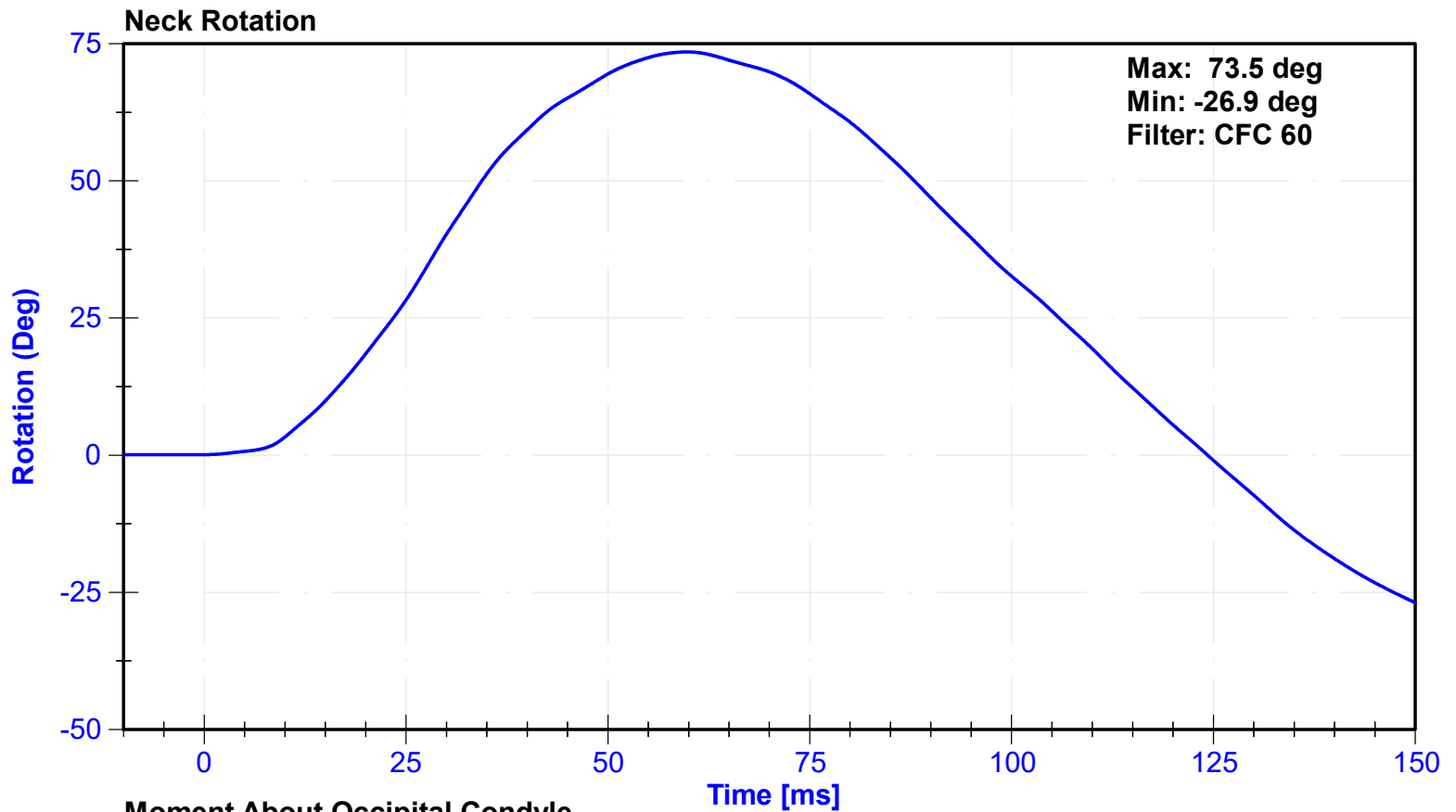
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	48	Pass
Velocity	5.51	5.63	m/s	5.548	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.42	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.70	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	5.03	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.92	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.98	Pass
Neck Rotation	71	81	deg	73.5	Pass
Time at Maximum Rotation	50	70	ms	59.8	Pass
Moment about the OC	36	44	Nm	43.5	Pass
Moment Decay to 0 Nm	102	126	ms	110.5	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	10/2/2023	10/1/2024
Condyle Potentiometer	Servo	DS185	10/2/2023	10/1/2024
Upper Neck Load Cell	Denton	1716ATF_2184-FY	5/18/2023	5/17/2024





ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

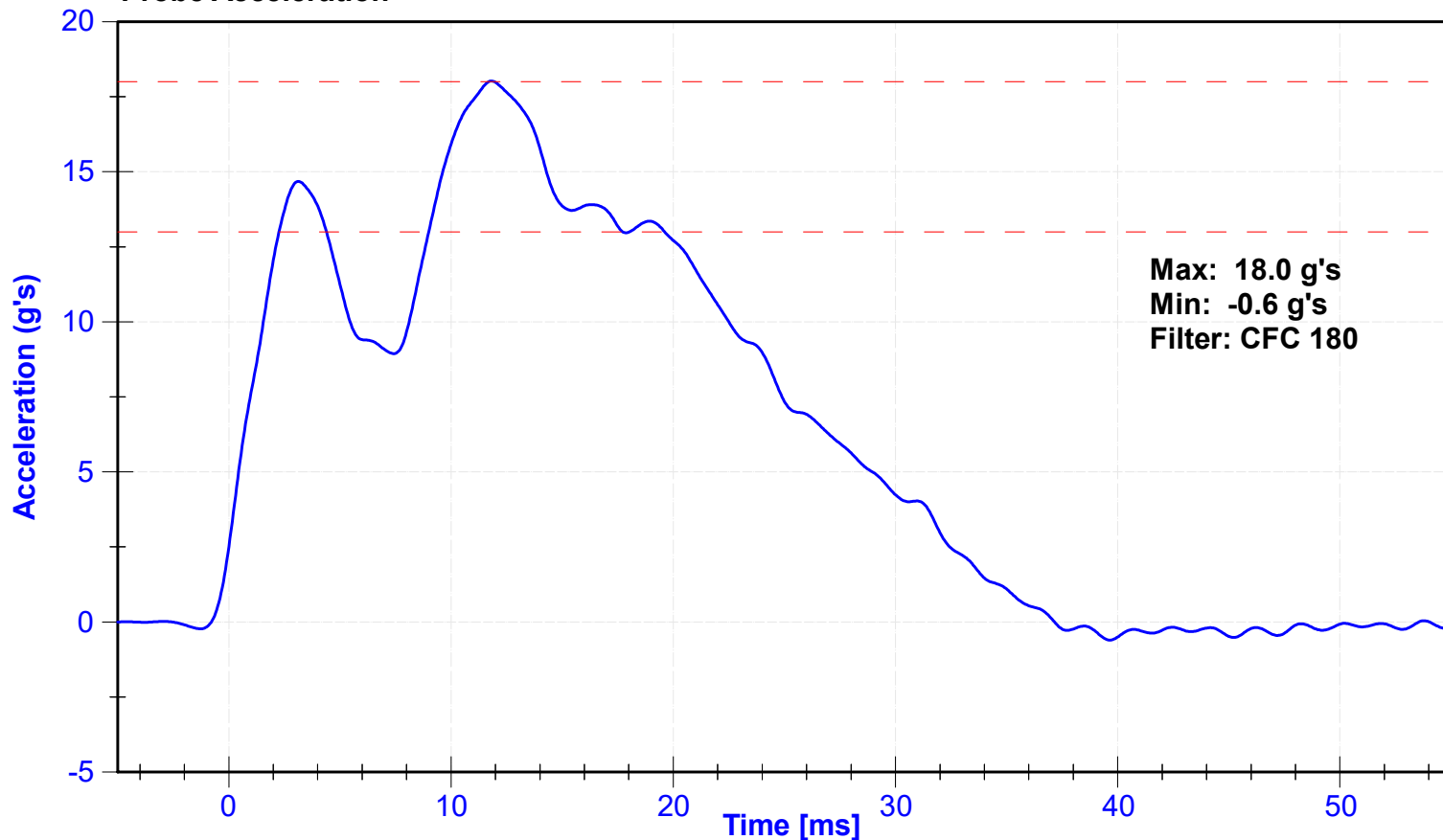
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.31	Pass
Probe Acceleration	13	18	g's	18.0	Pass
Shoulder Deflection	28	37	mm	30.3	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.4	Pass

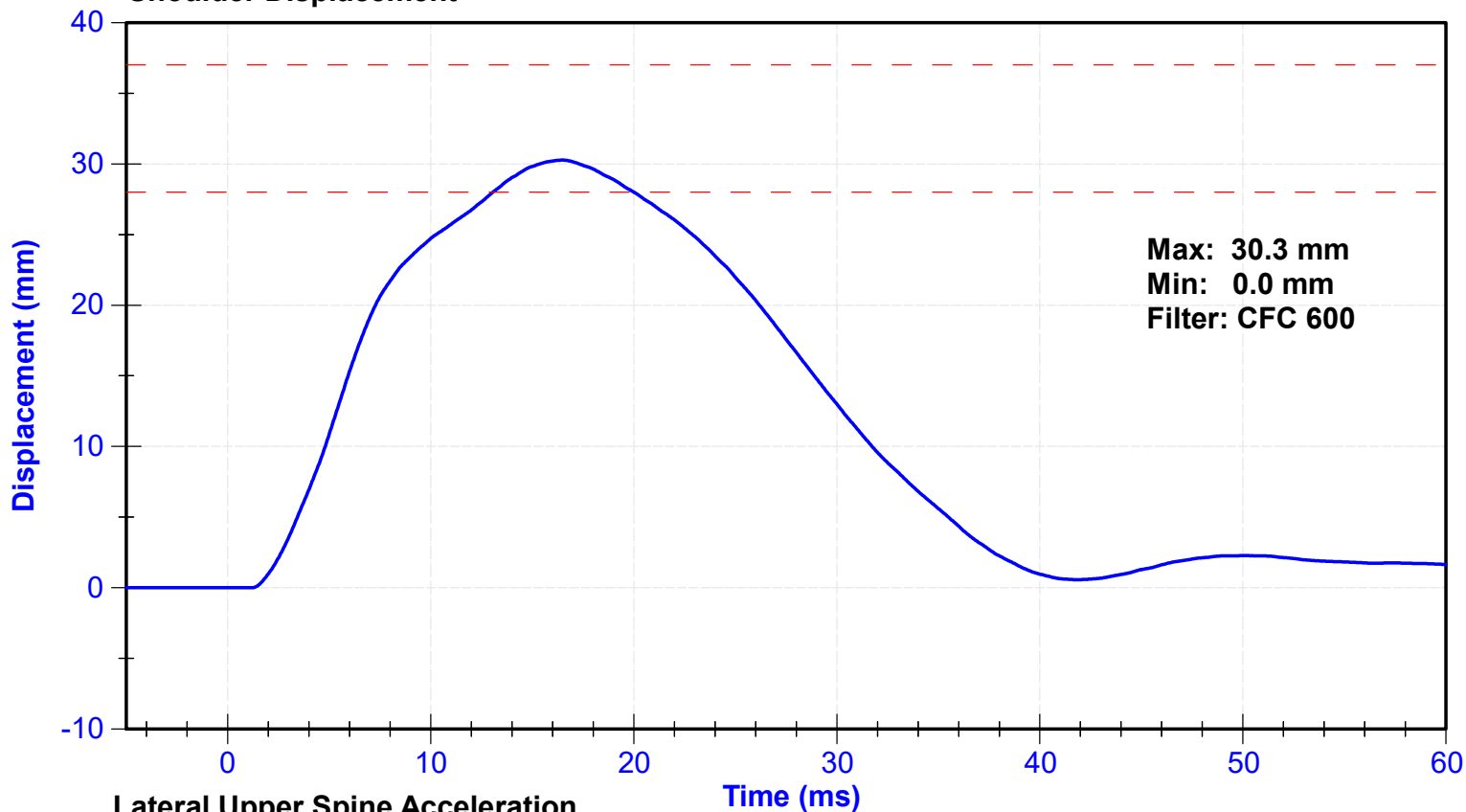
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Shoulder Potentiometer	Servo	572GFE	5/16/2024	11/14/2024
Upper Spine Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024

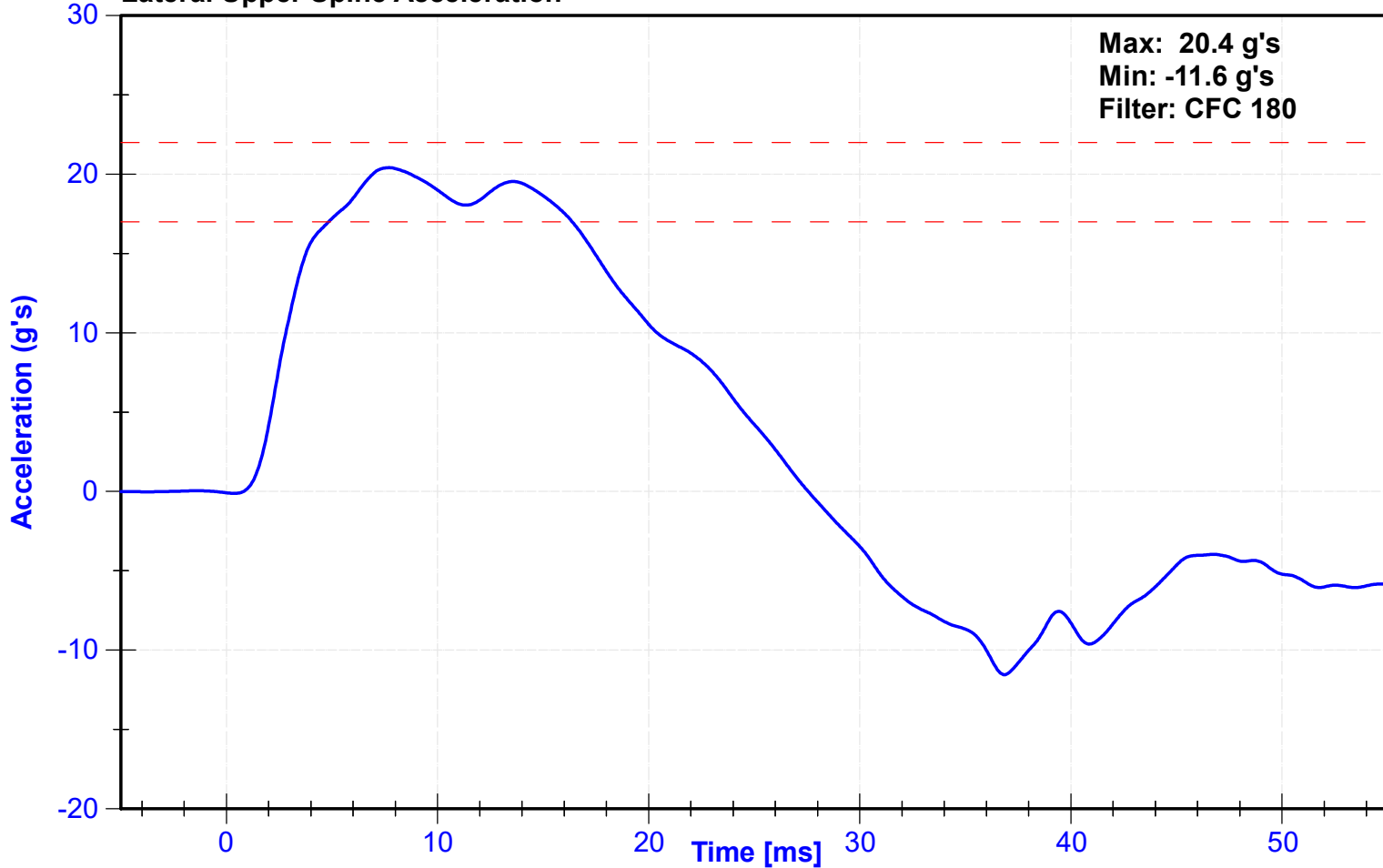
Probe Acceleration



Shoulder Displacement



Lateral Upper Spine Acceleration



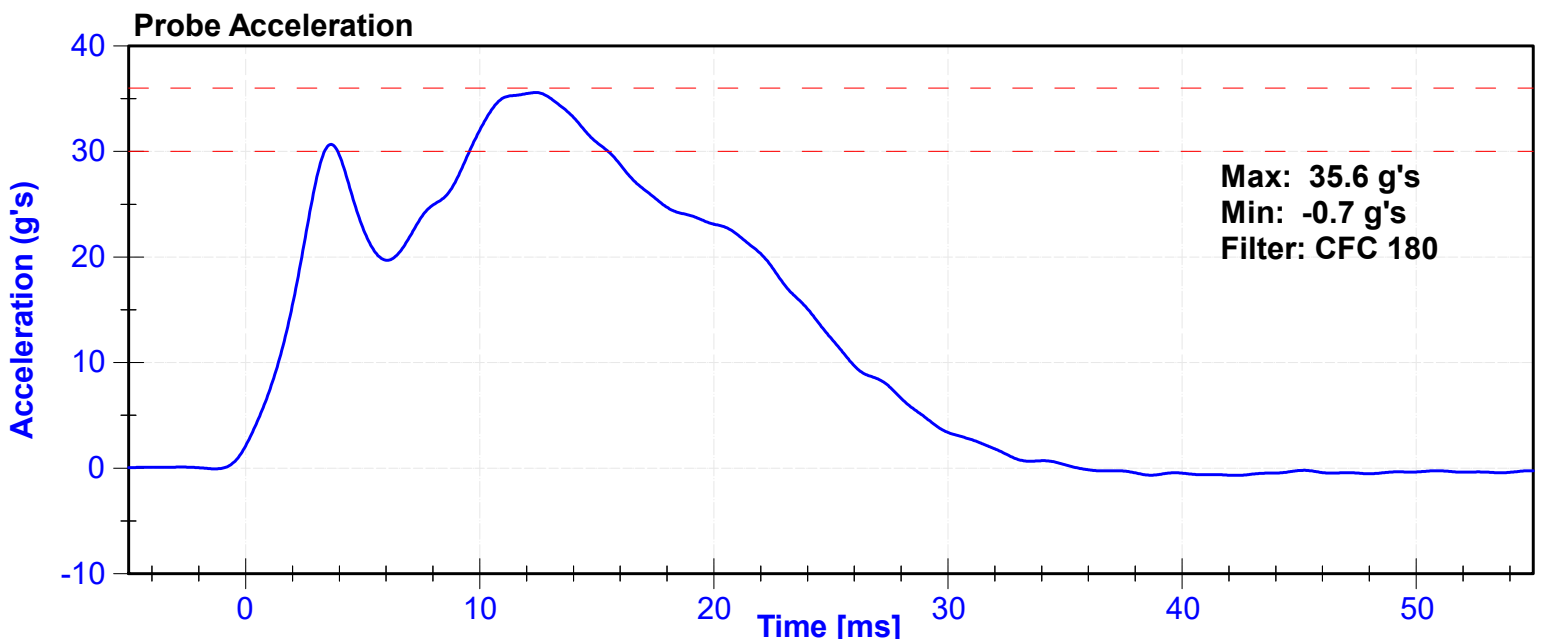
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

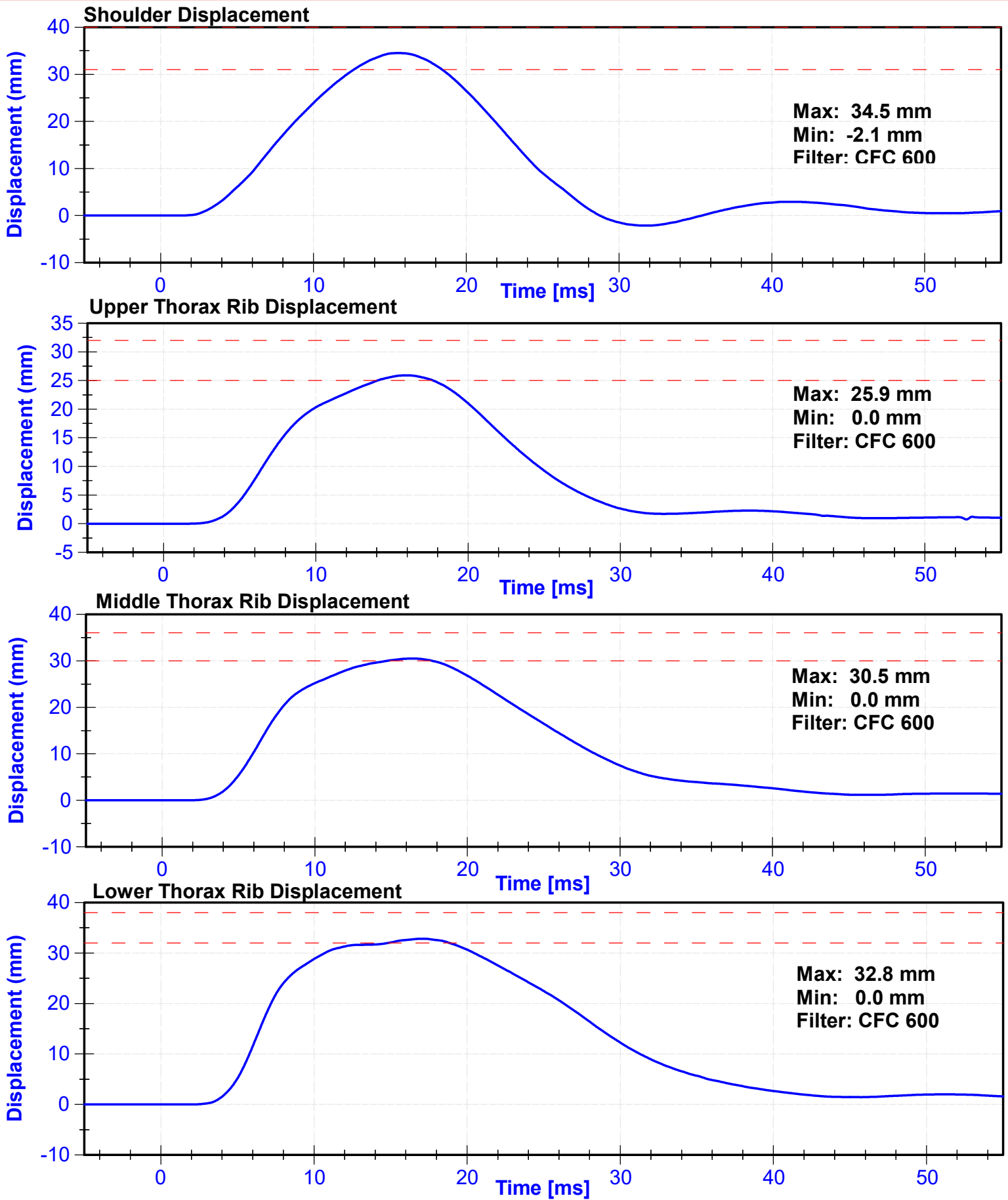
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	35.6	Pass
Lateral Upper Spine Acceleration	34	43	g's	41.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.8	Pass
Shoulder Deflection	31	40	mm	34.5	Pass
Upper Thorax Rib Deflection	25	32	mm	25.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.5	Pass
Lower Thorax Rib Deflection	32	38	mm	32.8	Pass

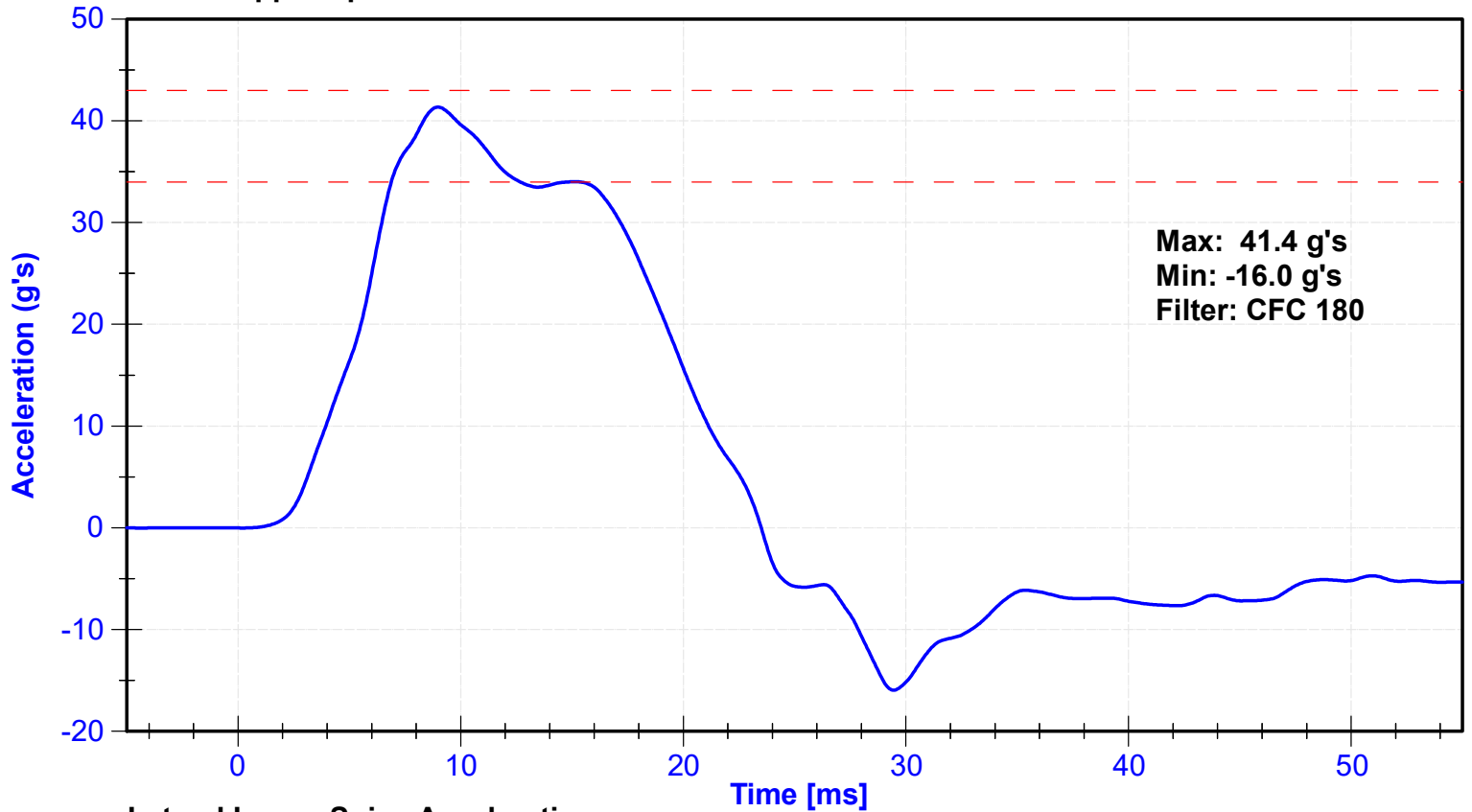
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine T1 Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024
Upper Spine T12 Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Shoulder Potentiometer	Servo	572GFE	5/16/2024	11/14/2024
Upper Thorax Rib Potentiometer	Servo	062GFE	5/16/2024	11/14/2024
Middle Thorax Rib Potentiometer	Servo	528GFE	5/16/2024	11/14/2024
Lower Thorax Rib Potentiometer	Servo	513GFE	5/16/2024	11/14/2024

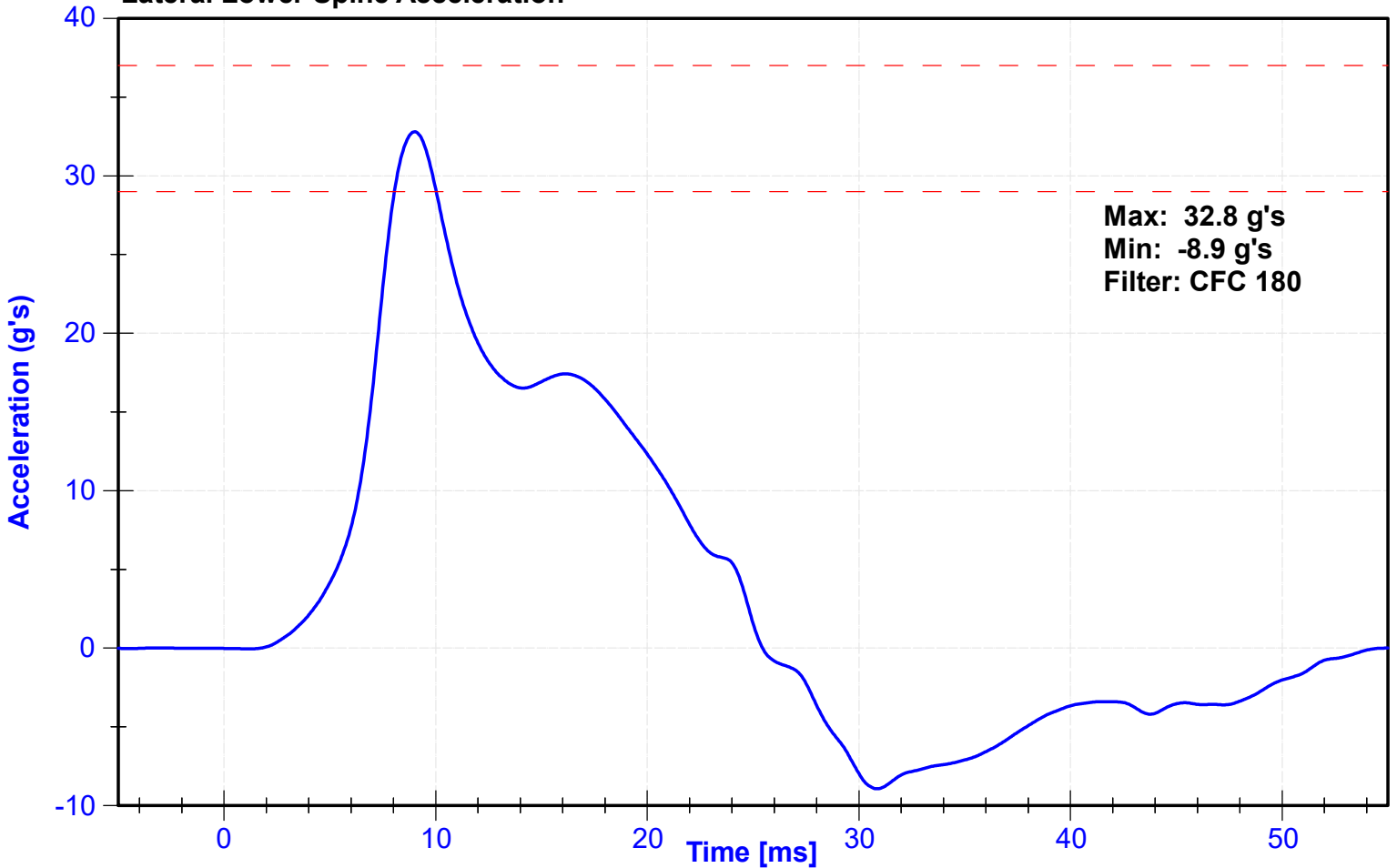




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



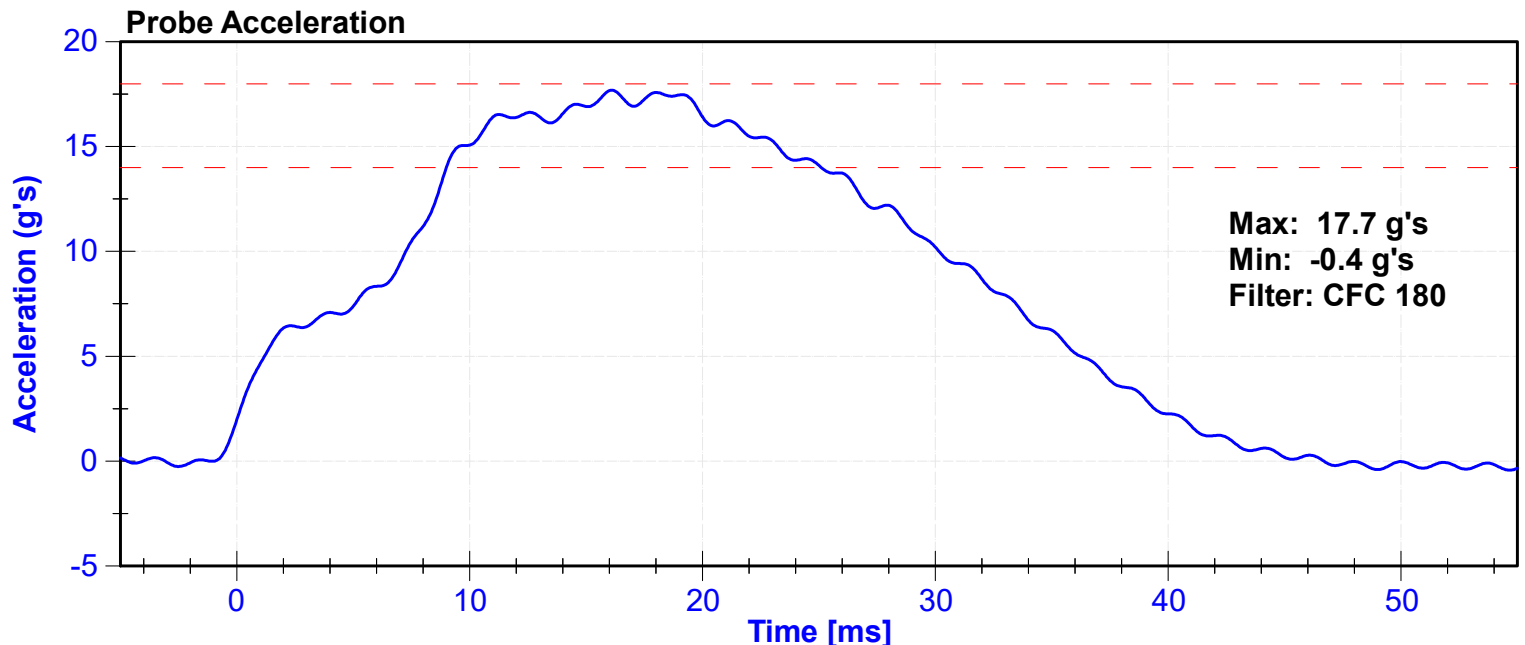
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

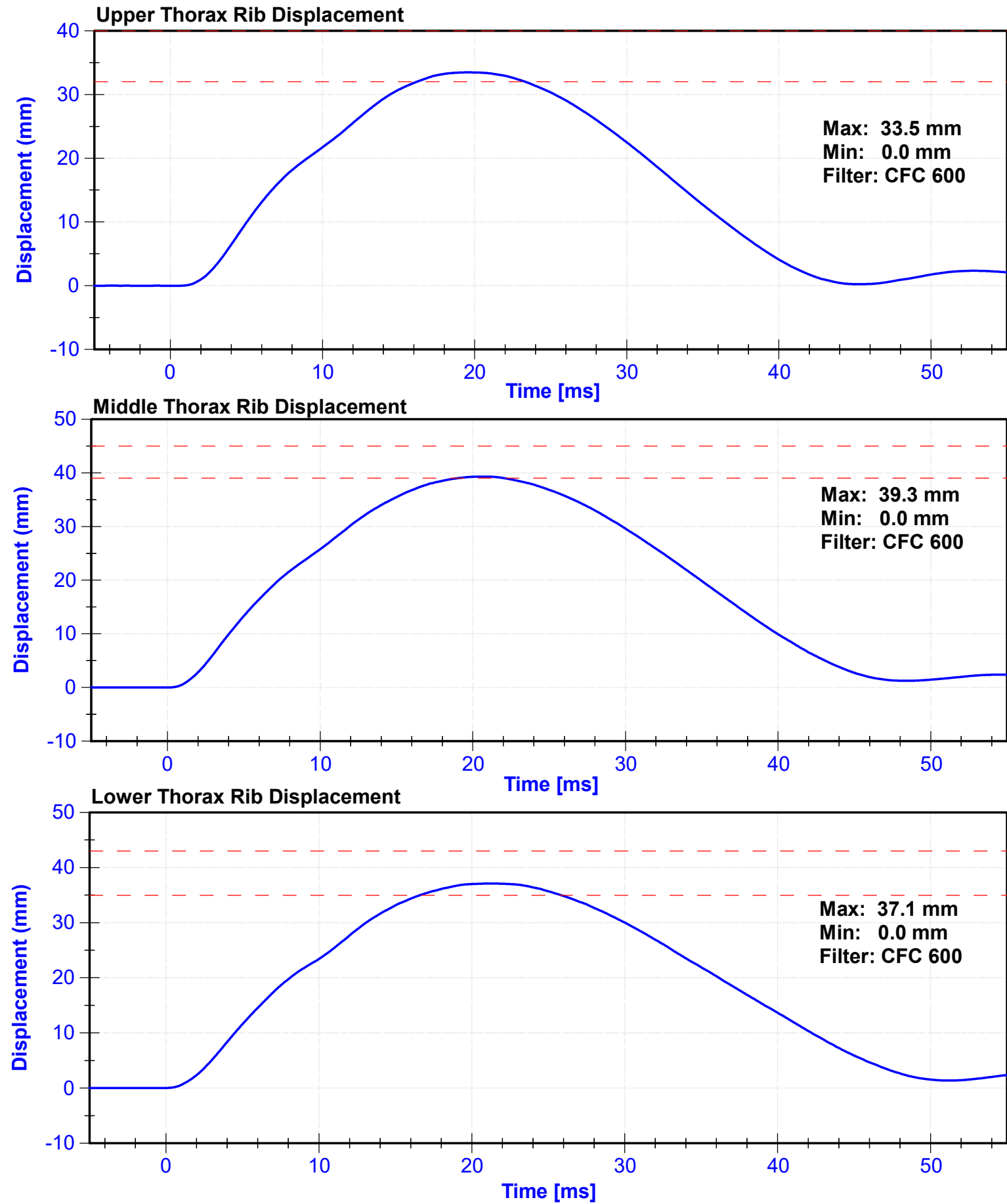
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	14	18	g's	17.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.9	Pass
Upper Thorax Rib Deflection	32	40	mm	33.5	Pass
Middle Thorax Rib Deflection	39	45	mm	39.3	Pass
Lower Thorax Rib Deflection	35	43	mm	37.1	Pass

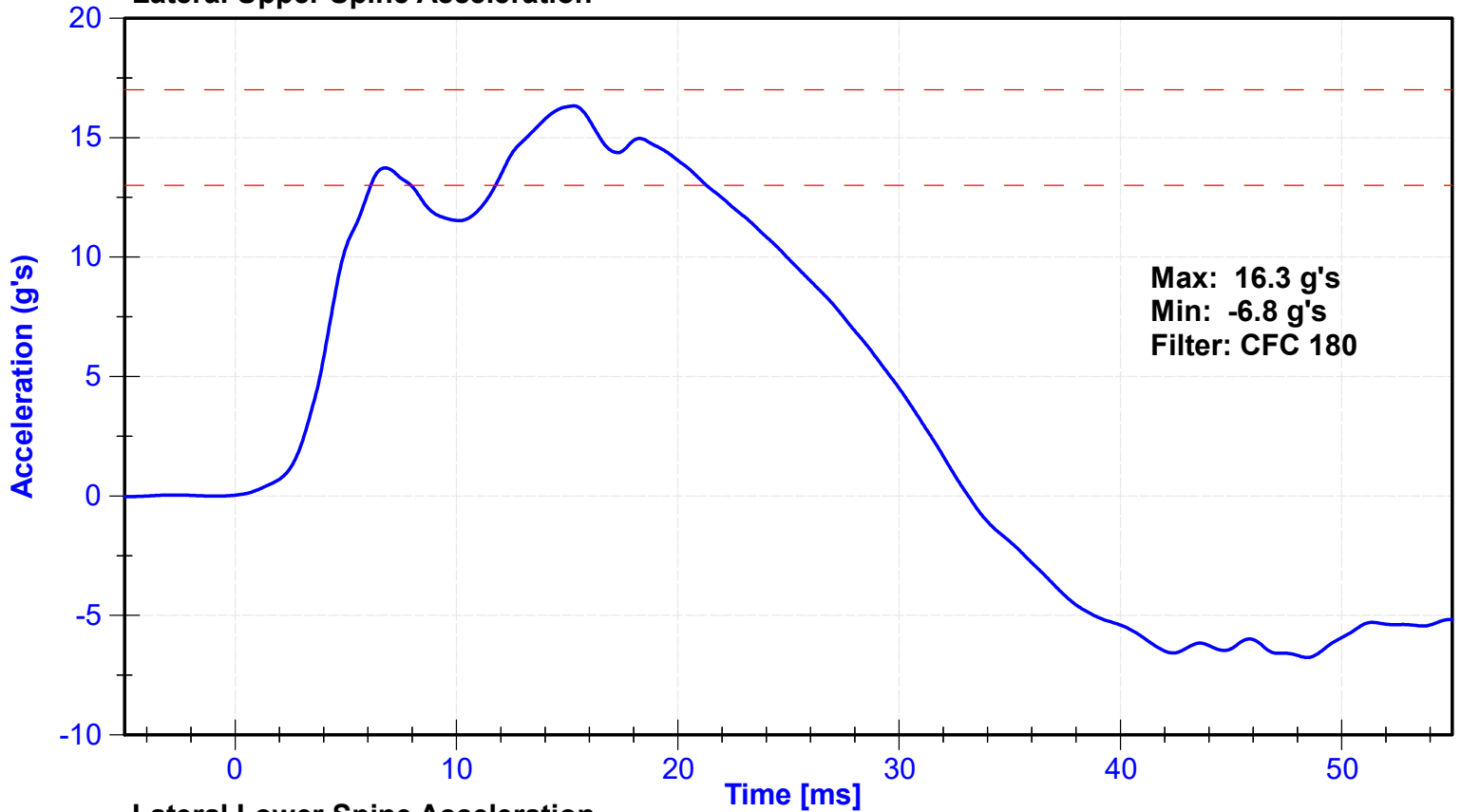
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024
Lower Spine Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Upper Thorax Rib Potentiometer	Servo	062GFE	5/16/2024	11/14/2024
Middle Thorax Rib Potentiometer	Servo	528GFE	5/16/2024	11/14/2024
Lower Thorax Rib Potentiometer	Servo	513GFE	5/16/2024	11/14/2024

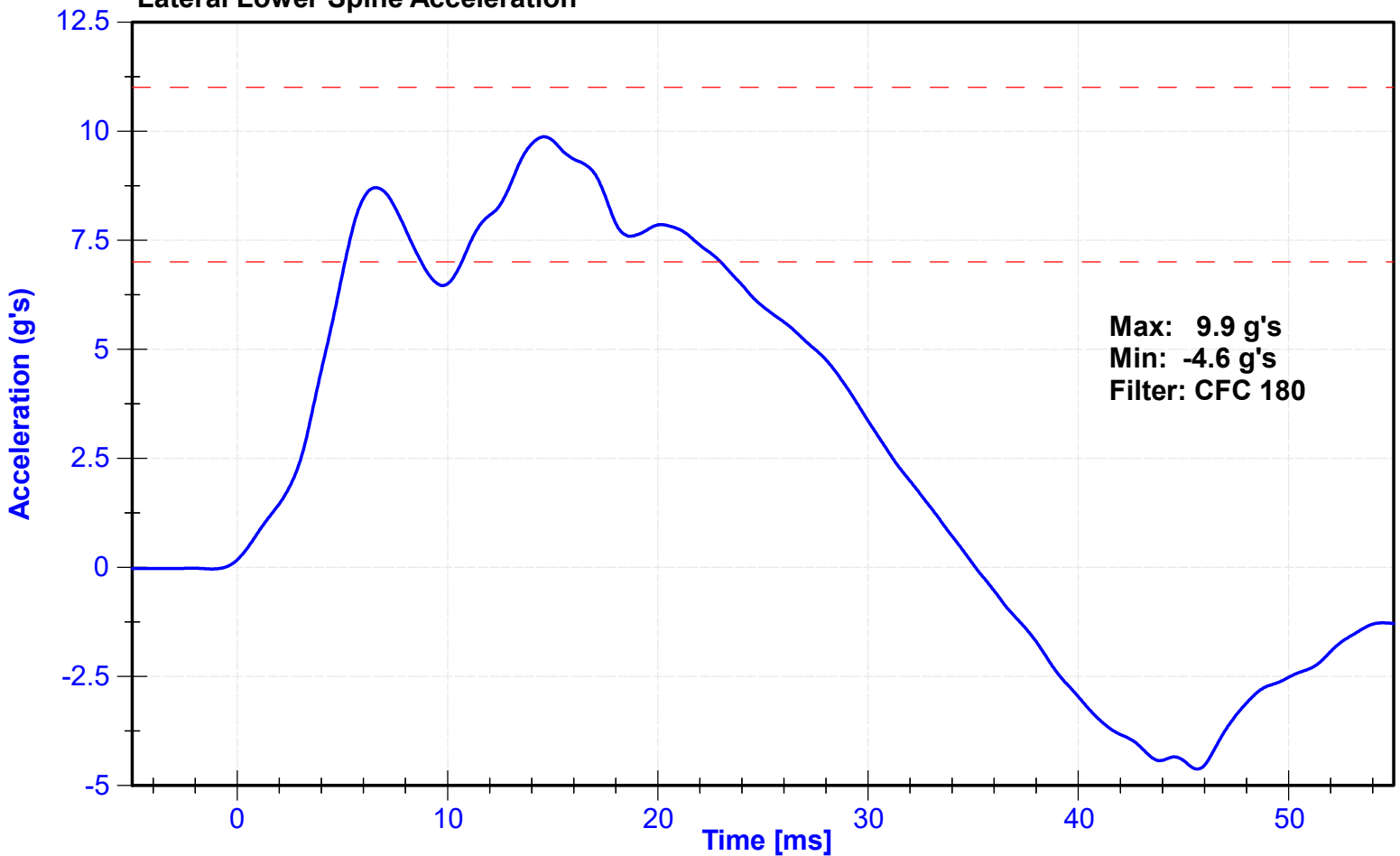




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



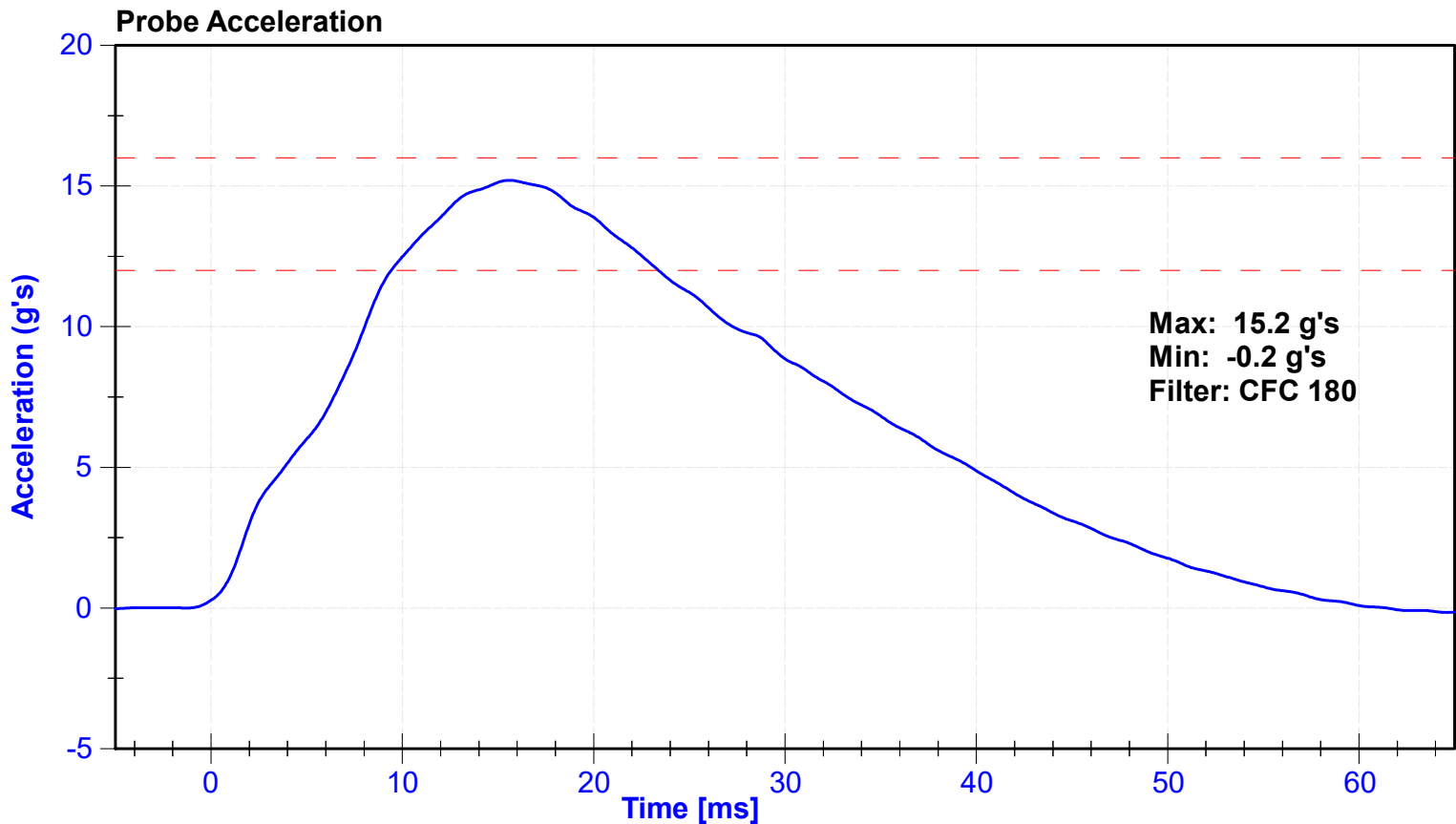
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

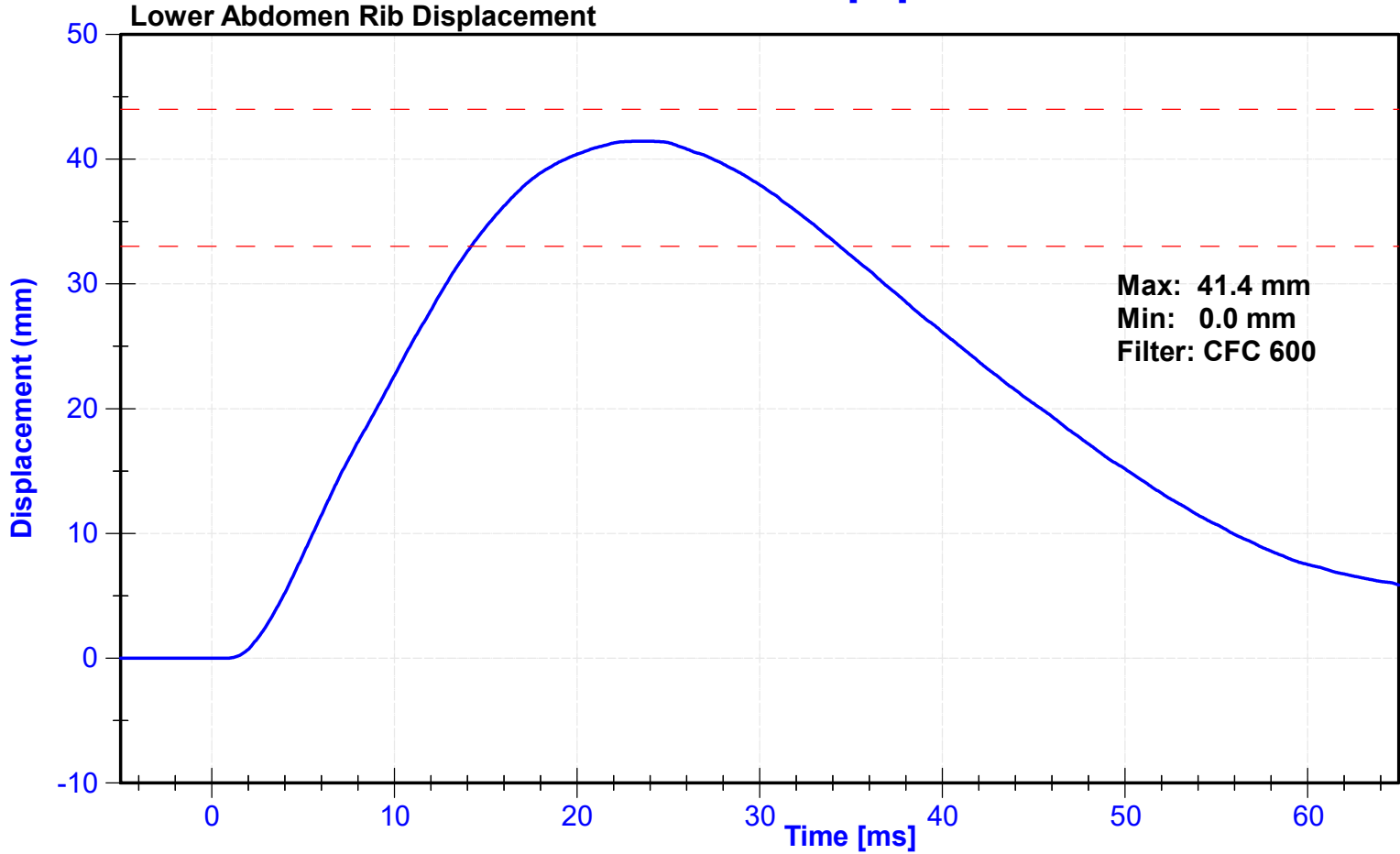
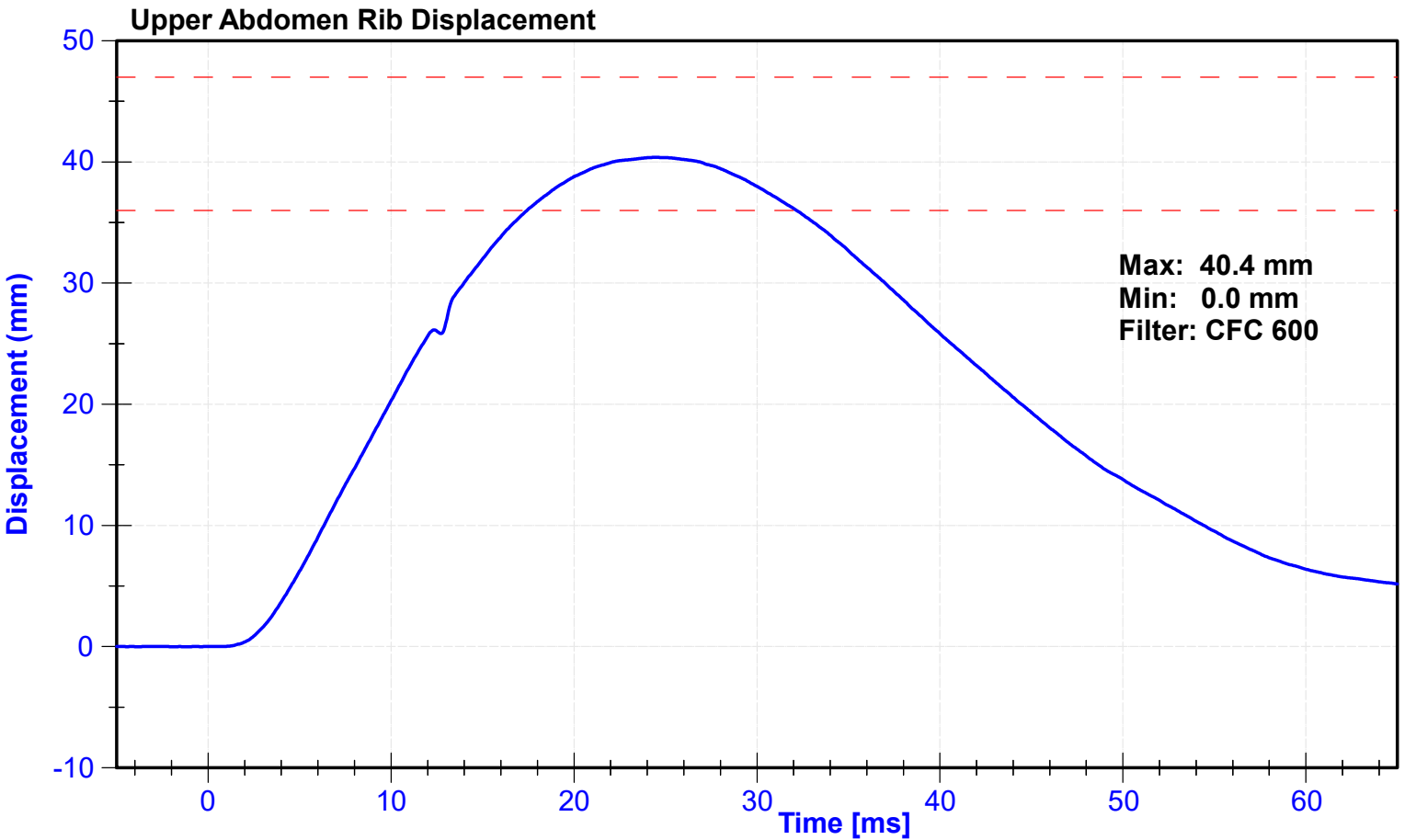
Results

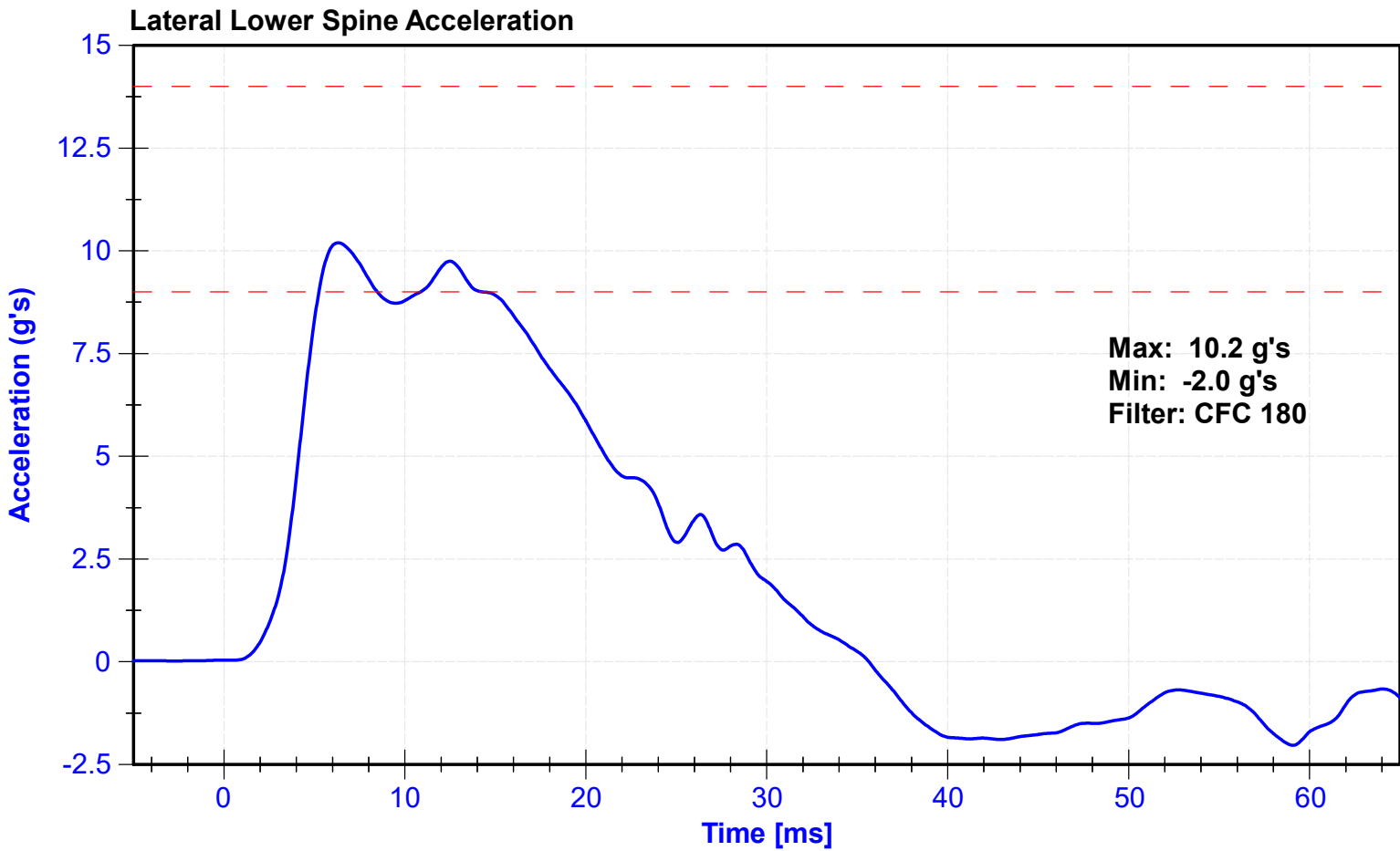
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	12	16	g's	15.2	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.2	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Lower Spine Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Upper Abdomen Rib Potentiometer	Servo	342GFE	5/16/2024	11/14/2024
Lower Abdomen Rib Potentiometer	Servo	512GFE	5/16/2024	11/14/2024







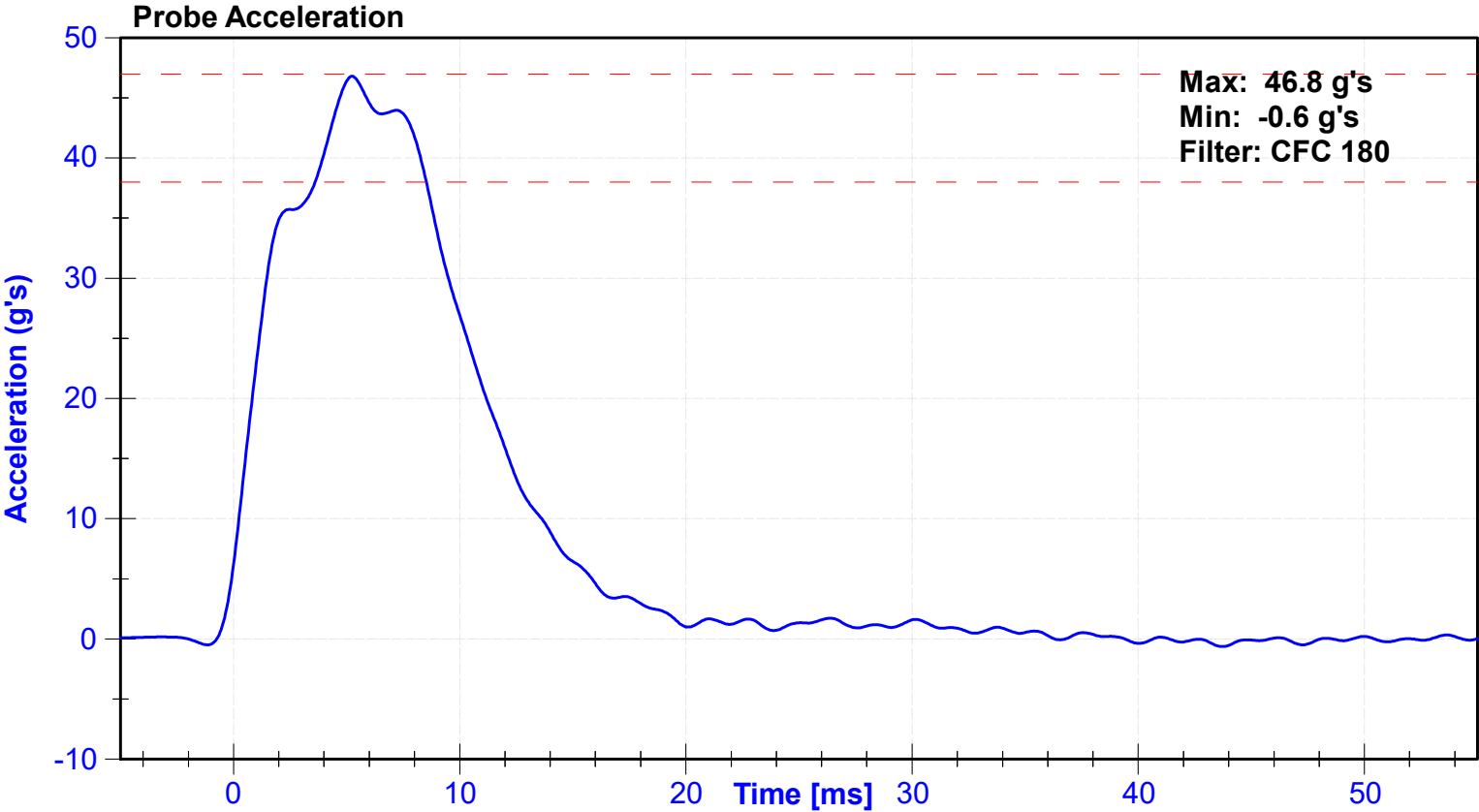
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

Results

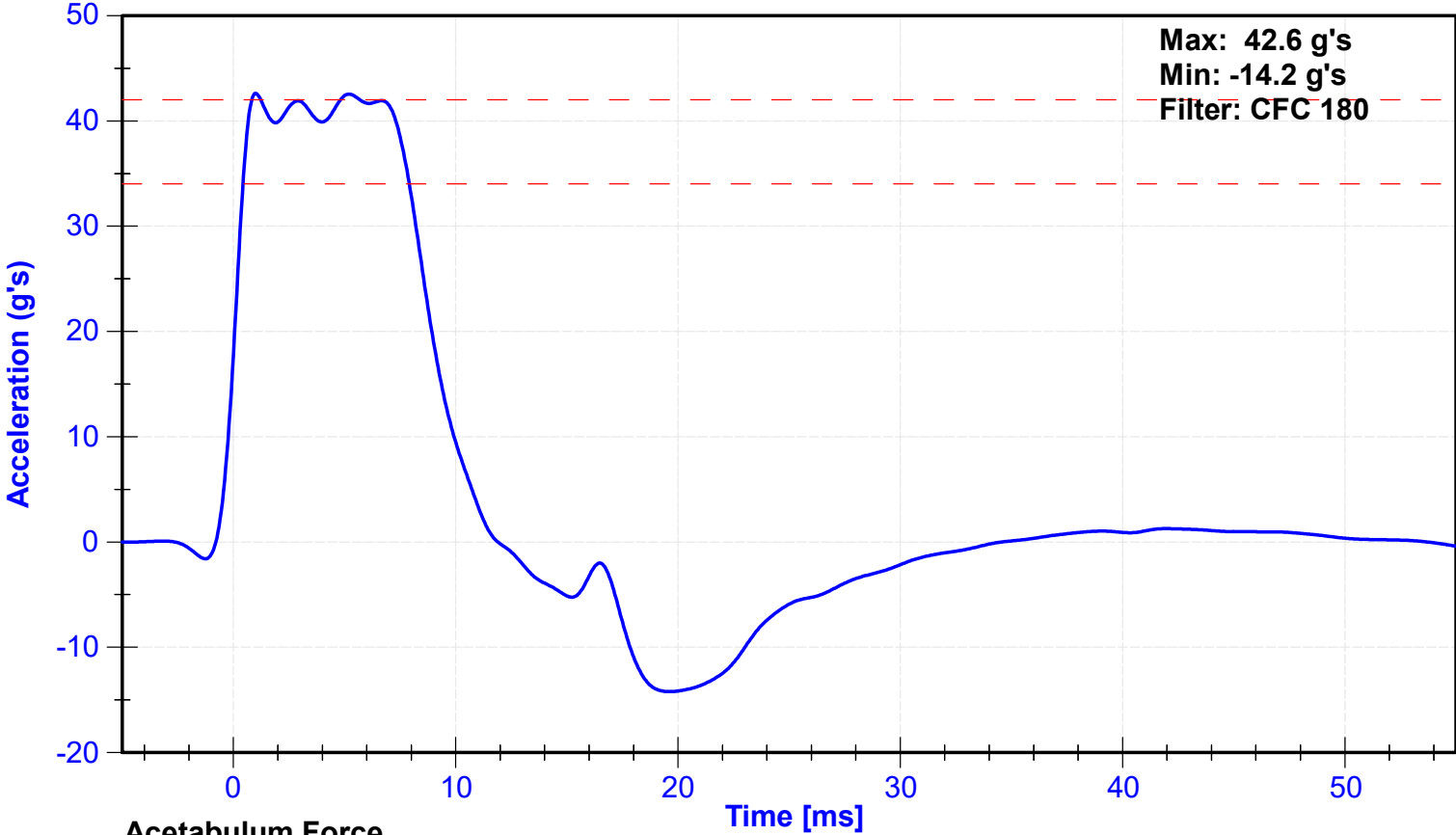
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration	38	47	g's	46.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.9	Pass
Acetabulum Force	3600	4300	N	4104.7	Pass

Transducer Calibrations

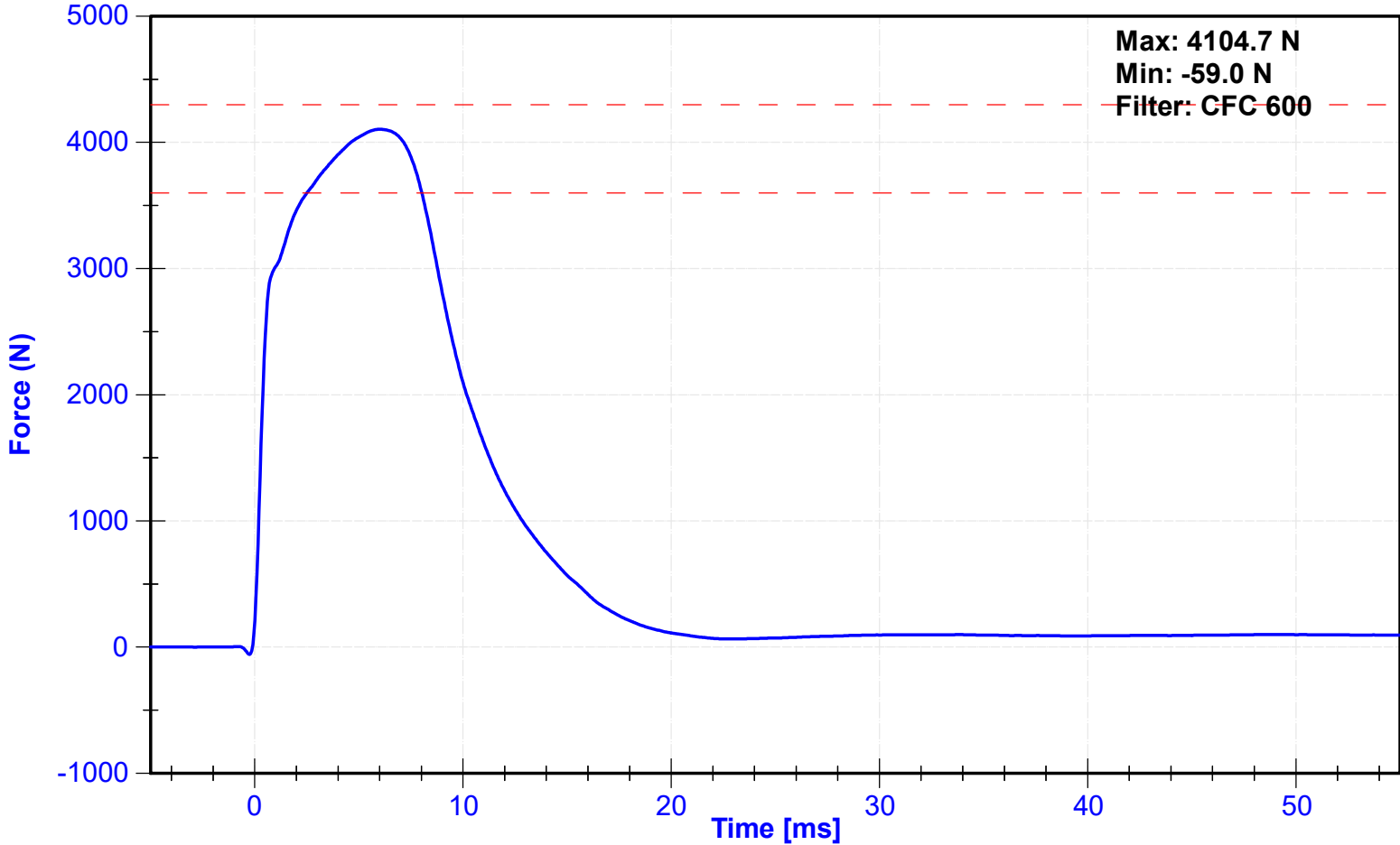
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	T29392	5/15/2024	11/11/2024
Acetabulum Load Cell	FTSS	236-FY	12/5/2023	12/4/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

Plug S/N 16302

Test Number 22868

Report Number 22925

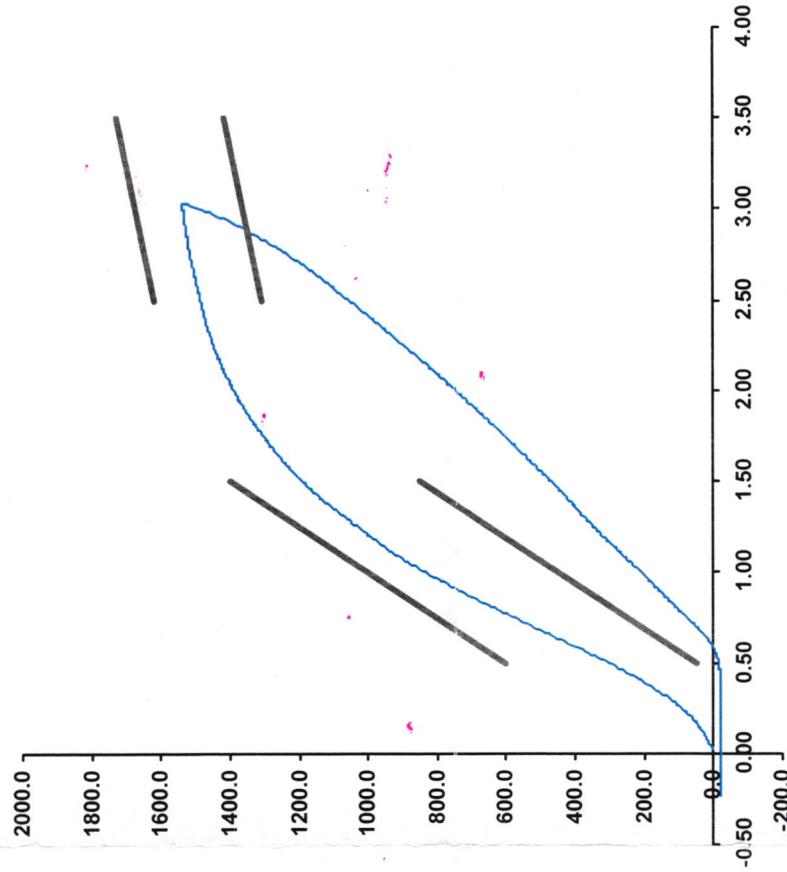
Test Date 5/20/2022 10:34:10 AM

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 (FI360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes: **261 CERT PLUG**
5/17/24

Force (-N) vs Extension (-mm)



Operator	Part Number 180-4450
Template No 107	20-May-22
SACO Research	

By: **DC** Date: **5/20/2022**
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



SID-IIs Pelvis Plug Certification Test

Plug S/N 16538

Test Number 23322

Report Number 23379

Test Date 7/15/2022 8:59:52 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

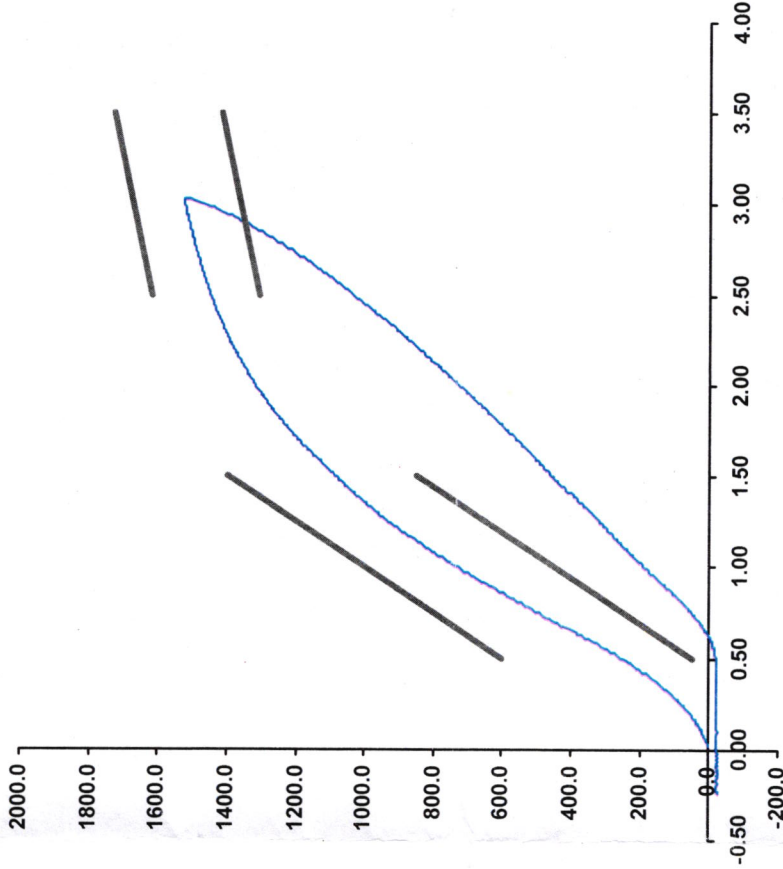
Testing Machine STM-20 5965542

Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes:



CRASH

Operator	Part Number 180-4450
Template No 107	15-Jul-22
SACO Research	By: <u>DC</u> Date: <u>7/15/22</u>



SID-IIs Pelvis Plug Certification Test

Plug S/N 16415

Test Number 22984

Report Number 23042

Test Date 5/23/2022 10:18:13 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 (FI360947) 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 23-May-22

SACO Research

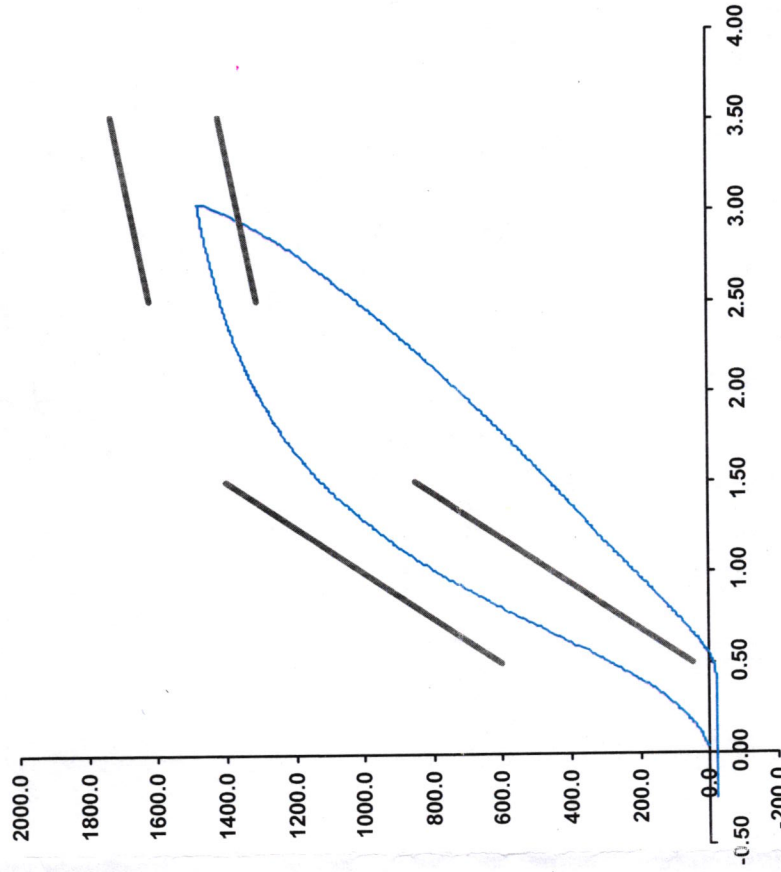
By: DC

Date: 5/23/2022

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

Non-Impact

Force (-N) vs Extension (-mm)



ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

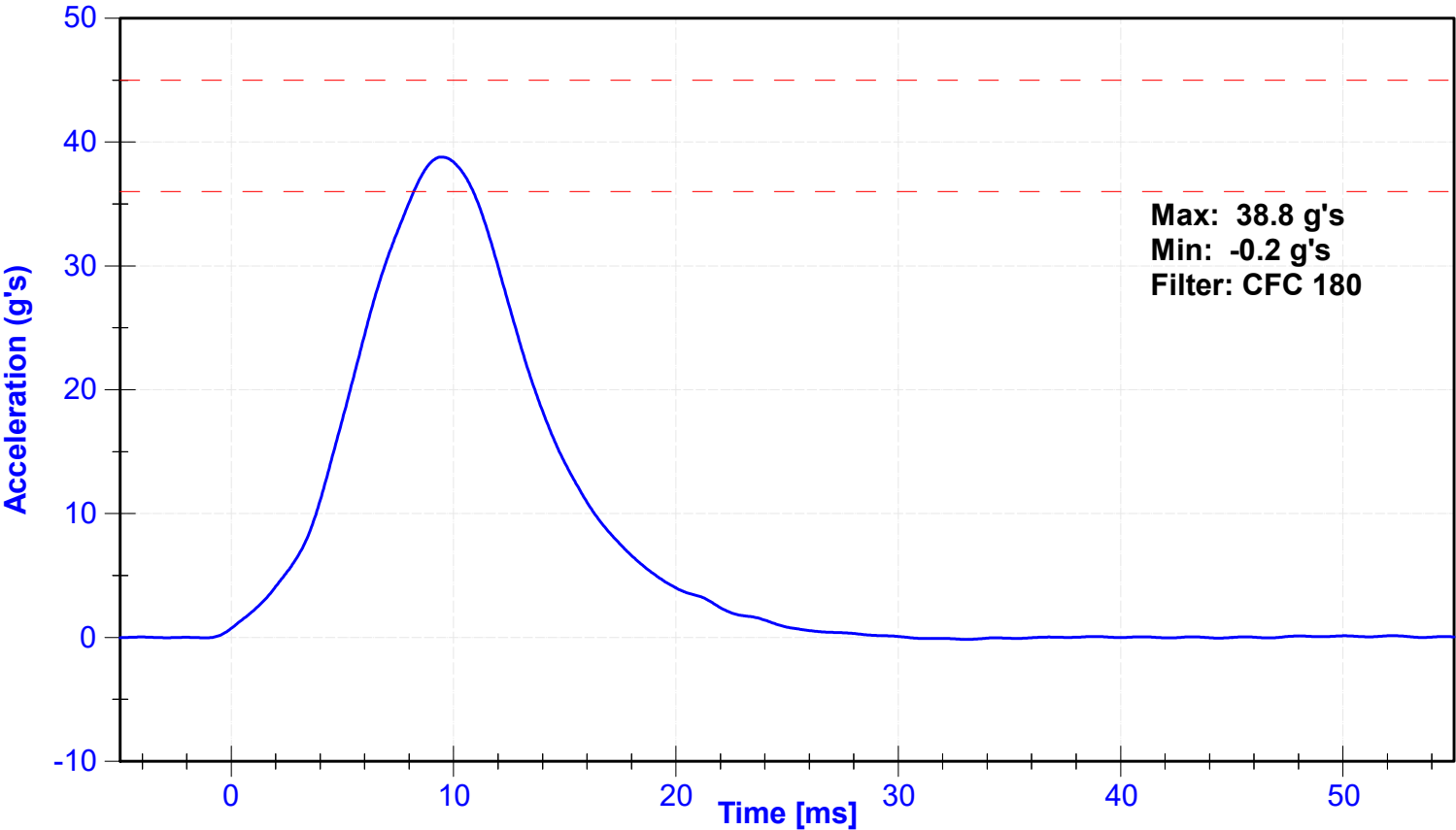
Results

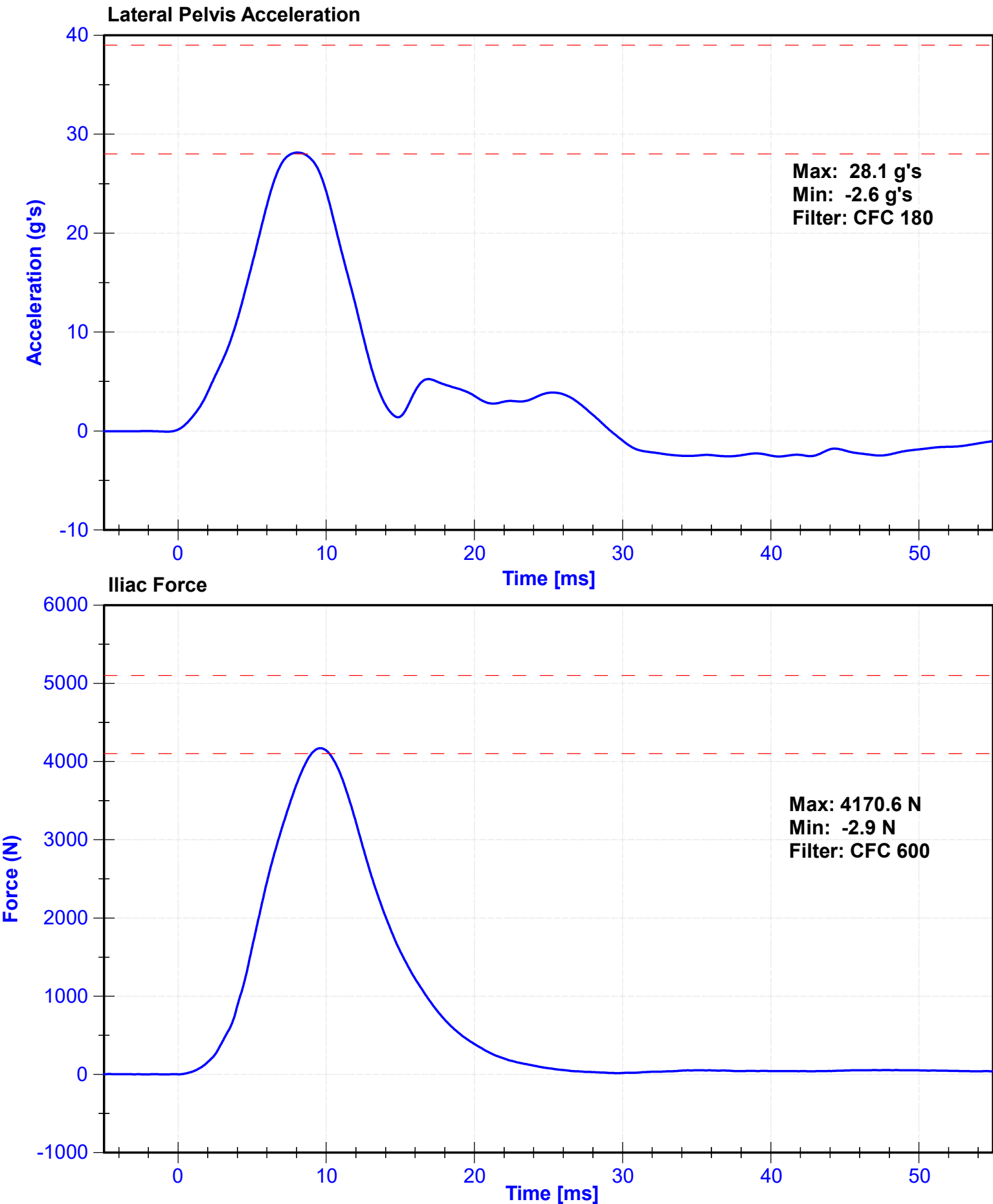
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.34	Pass
Probe Acceleration	36	45	g's	38.8	Pass
Lateral Pelvis Acceleration	28	39	g's	28.1	Pass
Iliac Force	4100	5100	N	4170.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	T29392	5/15/2024	11/11/2024
Iliac Load Cell	Denton	290-FY	12/5/2023	12/4/2024

Probe Acceleration





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

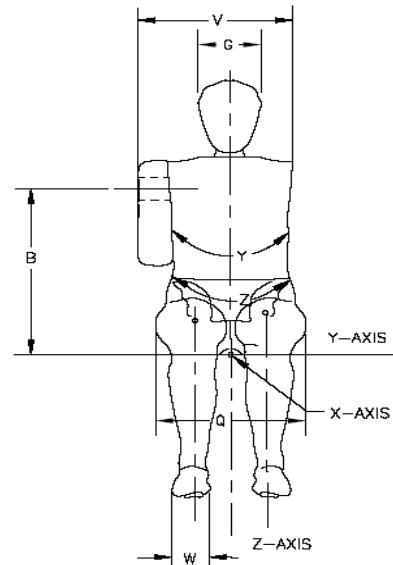
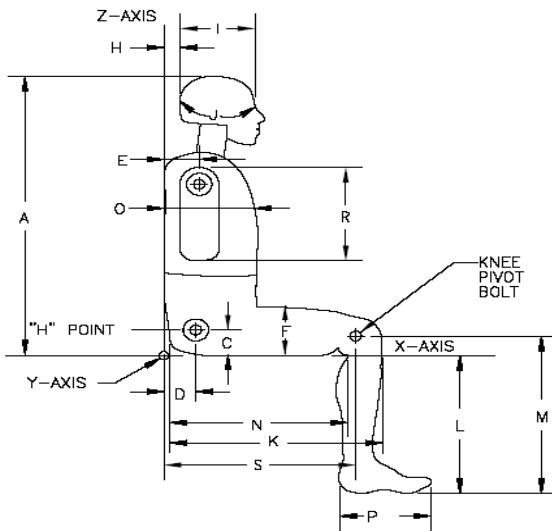


External Measurements - SID-IIs

Technician: K. Brogan

Date: 05/31/2024

Dummy Serial Number: 261



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	82	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	180	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	530	Pass
L	Popliteal Height	343	369	354	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	206	Pass
P	Foot Length	216	232	223	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	317	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	483	Pass
V	Shoulder Width	341	357	347	Pass
W	Foot Width	78	94	84	Pass
Y	Chest Circumference w/jacket	851	881	871	Pass
Z	Waist Circumference	761	791	774	Pass

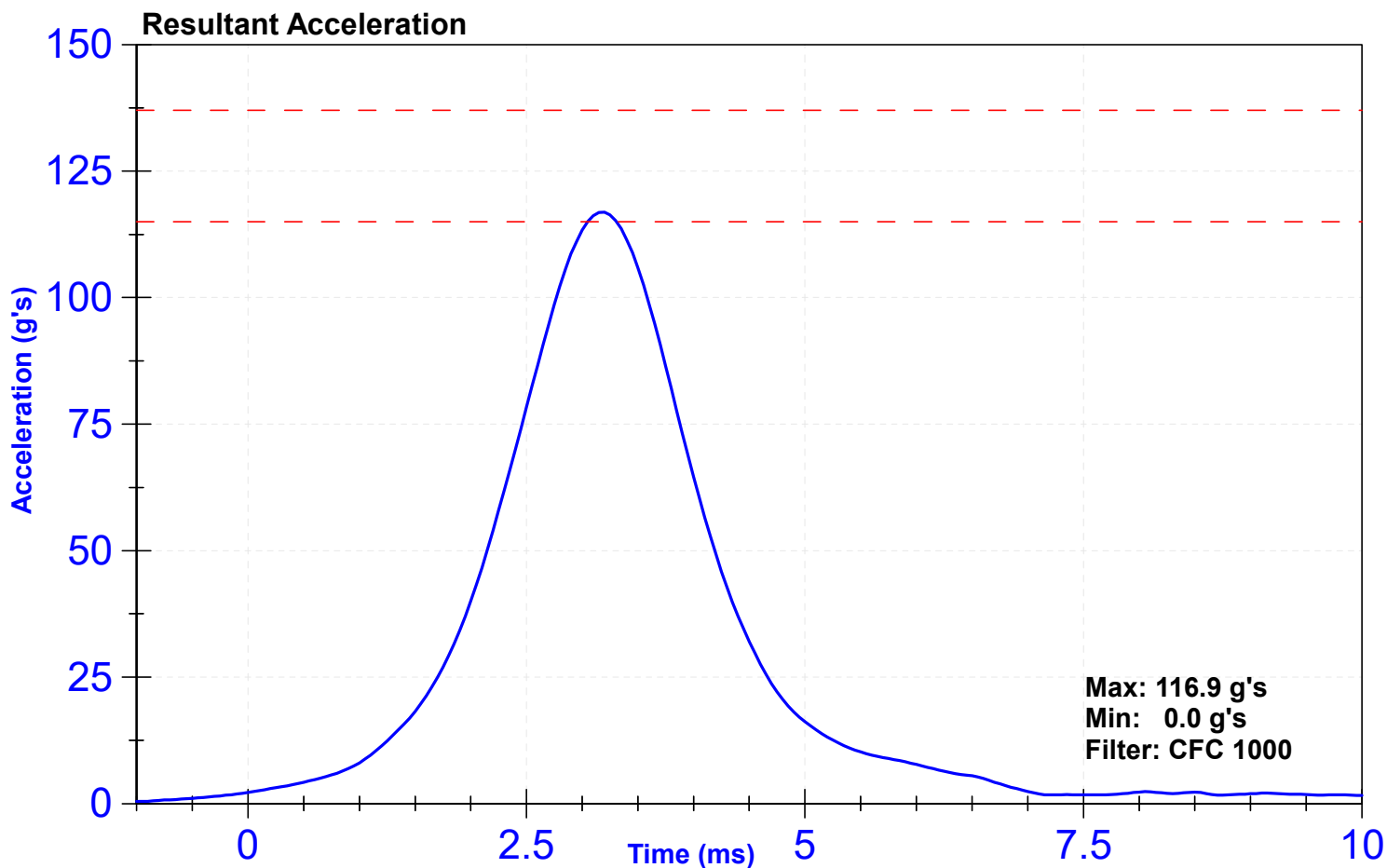
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C .Mantell

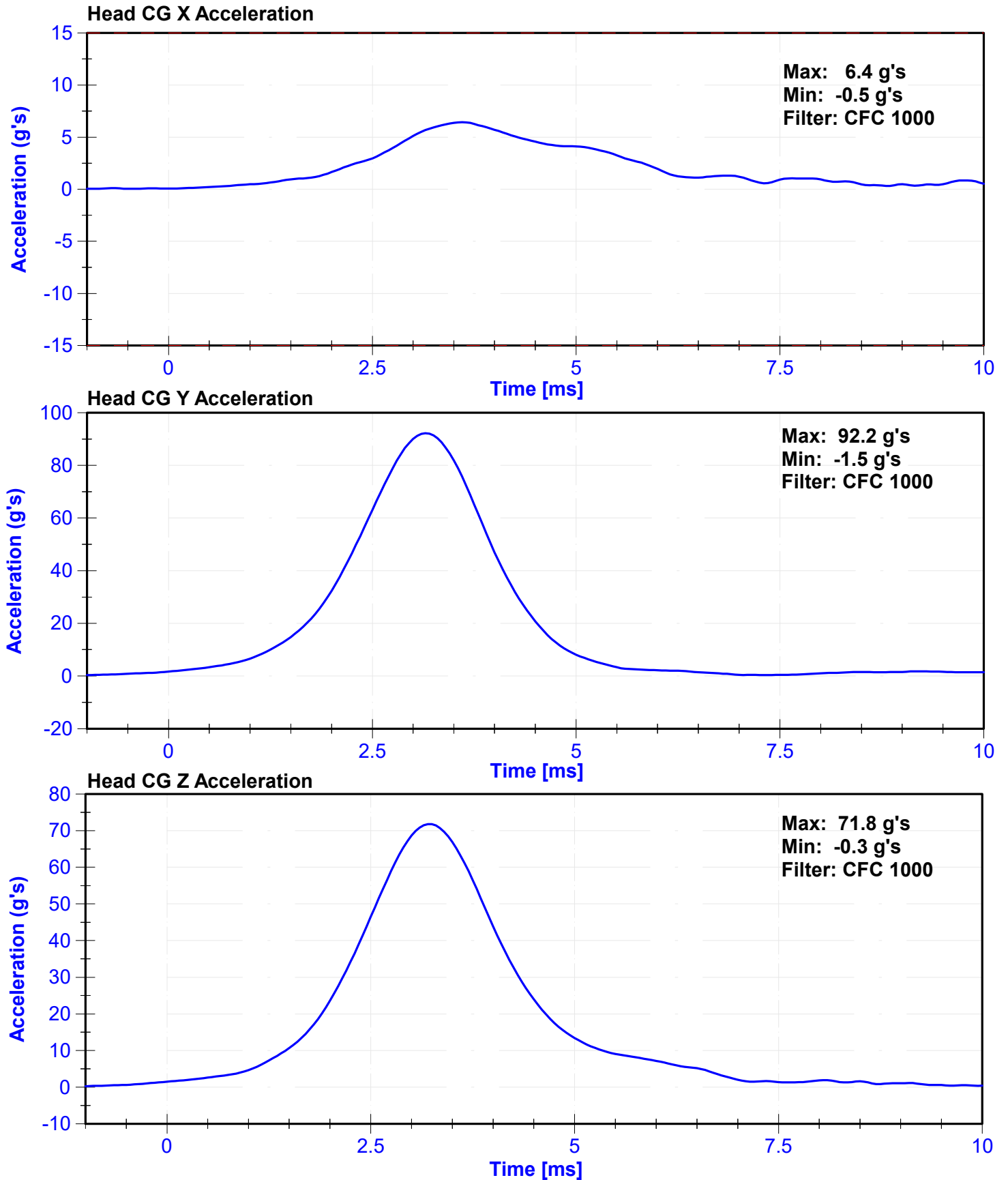
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	43	Pass
Resultant Acceleration	115	137	g's	116.9	Pass
Oscillation	0	15	%	2.0	Pass
Fore-Aft Acceleration	-15	15	g's	6.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibratio Date	Calibratio Due Date
X Accelerometer	Endevco	P68067	5/15/2024	11/11/2024
Y Accelerometer	Endevco	P18567	5/15/2024	11/11/2024
Z Accelerometer	Endevco	P49163	5/15/2024	11/11/2024





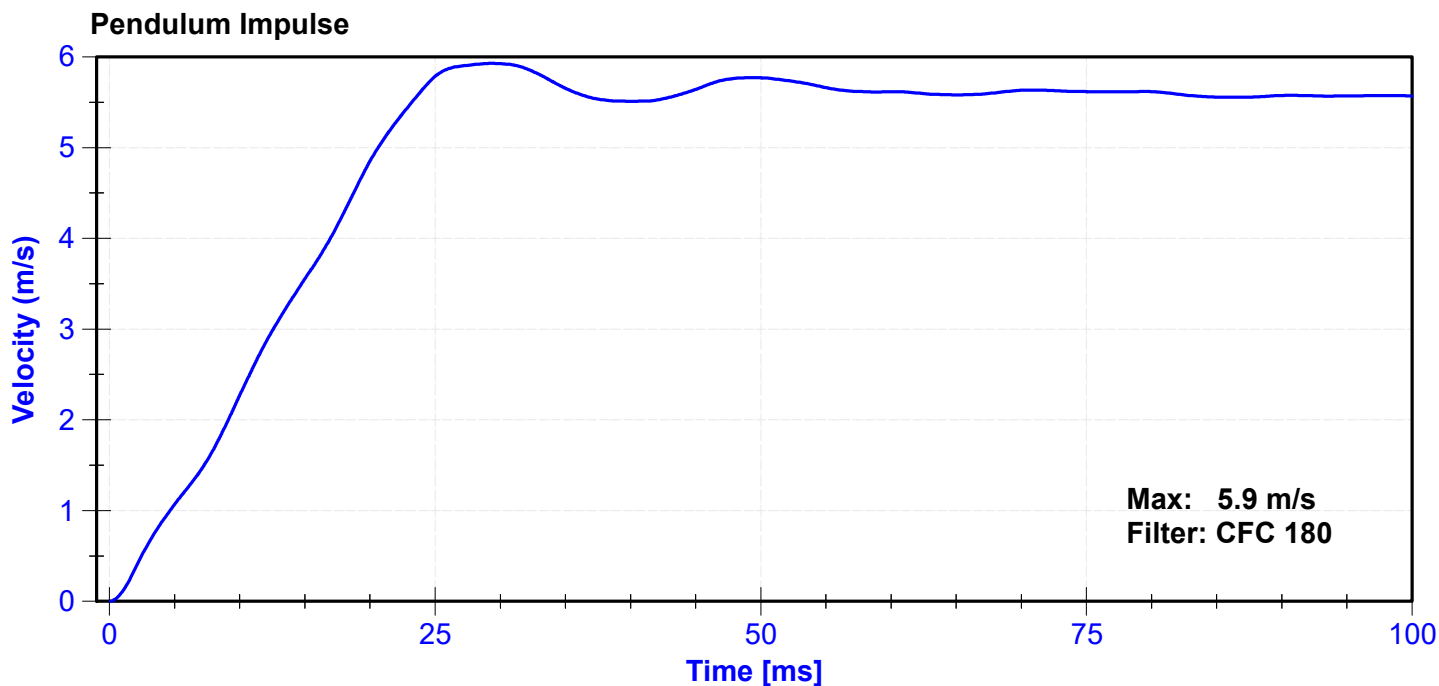
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

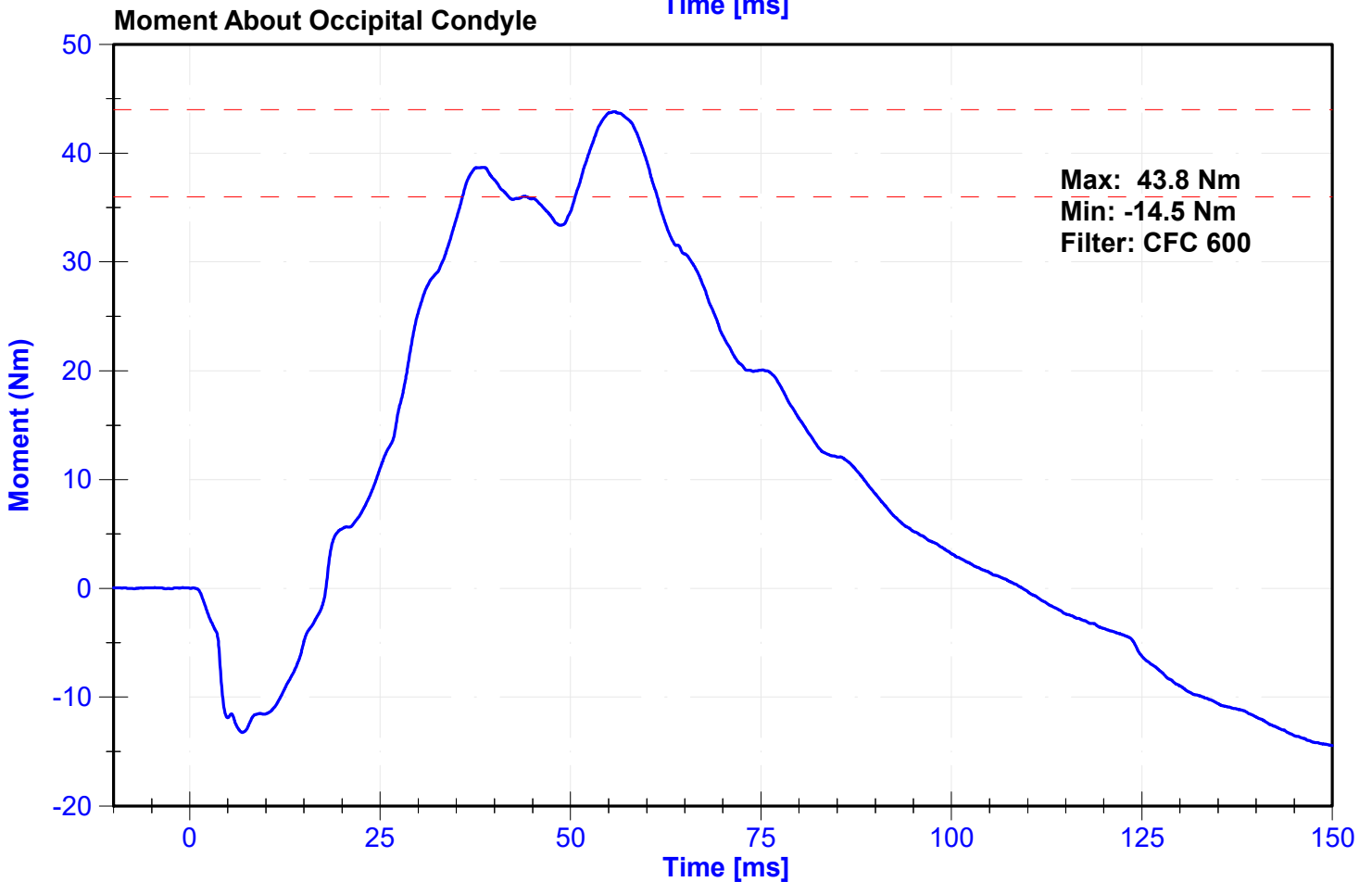
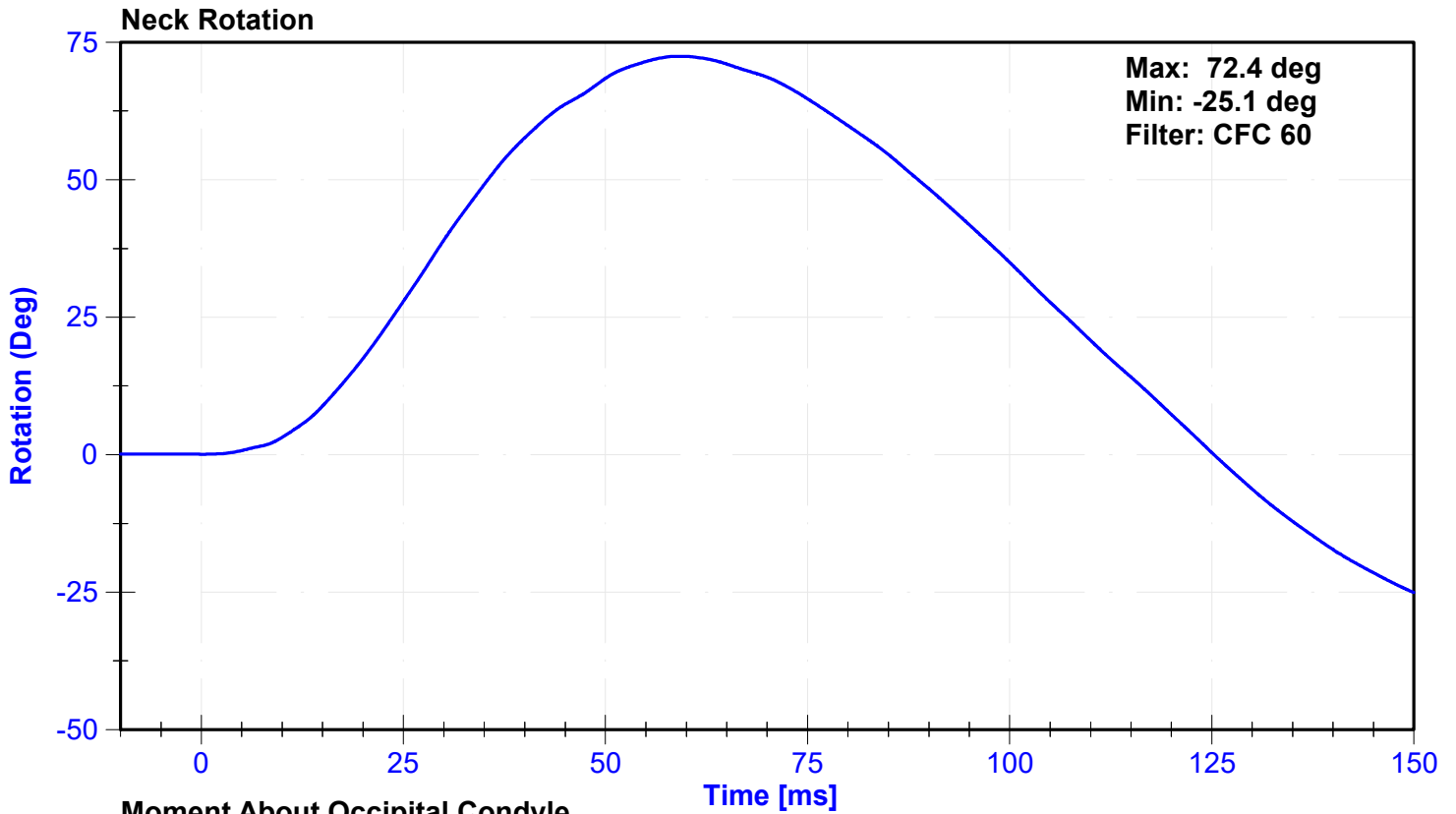
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	52	Pass
Velocity	5.51	5.63	m/s	5.545	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.27	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.55	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.85	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.78	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.93	Pass
Neck Rotation	71	81	deg	72.4	Pass
Time at Maximum Rotation	50	70	ms	59.1	Pass
Moment about the OC	36	44	Nm	43.8	Pass
Moment Decay to 0 Nm	102	126	ms	109.4	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	10/2/2023	10/1/2024
Condyle Potentiometer	Servo	DS185	10/2/2023	10/1/2024
Upper Neck Load Cell	Denton	1716A_2187-FY	12/5/2023	12/4/2024





ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

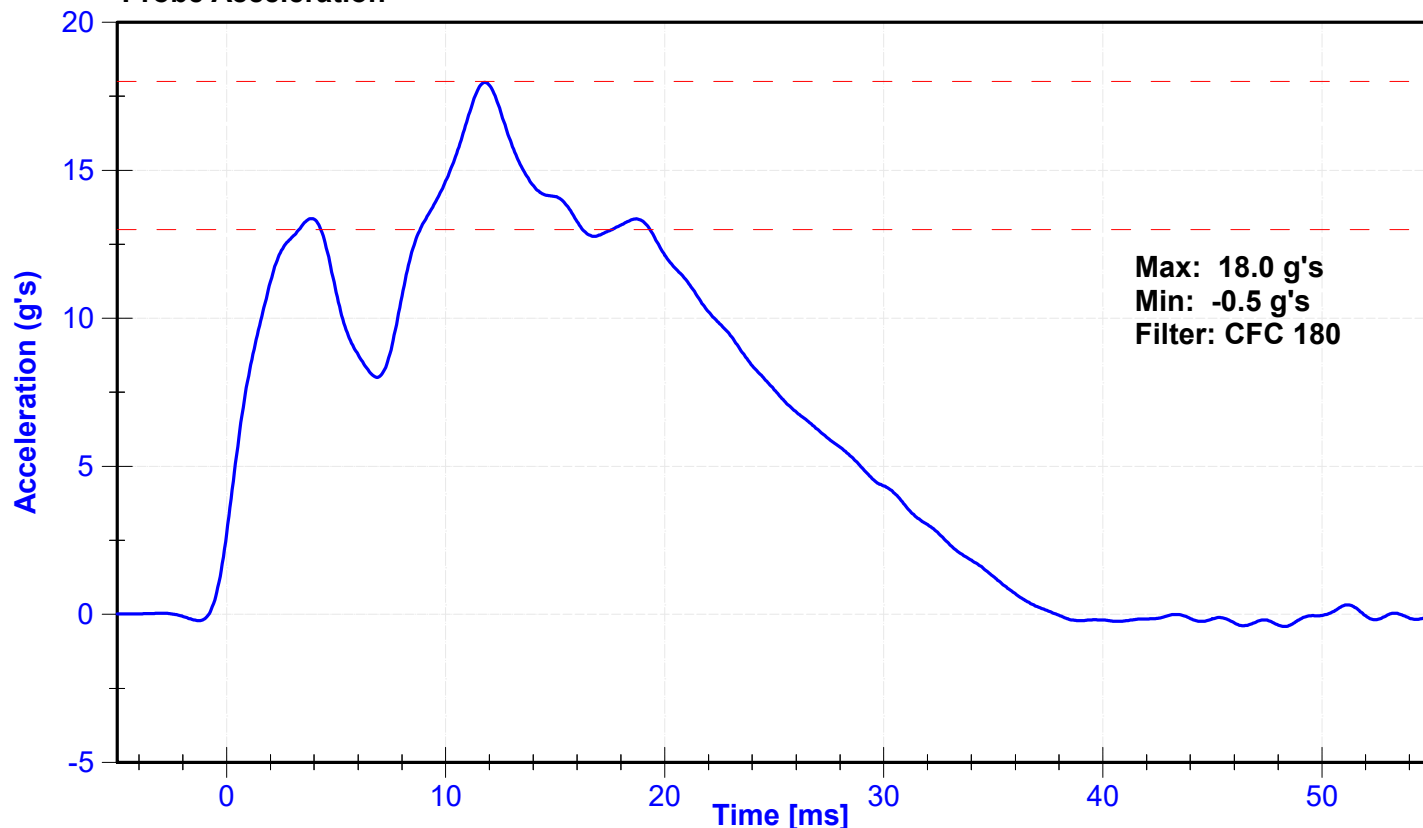
Results

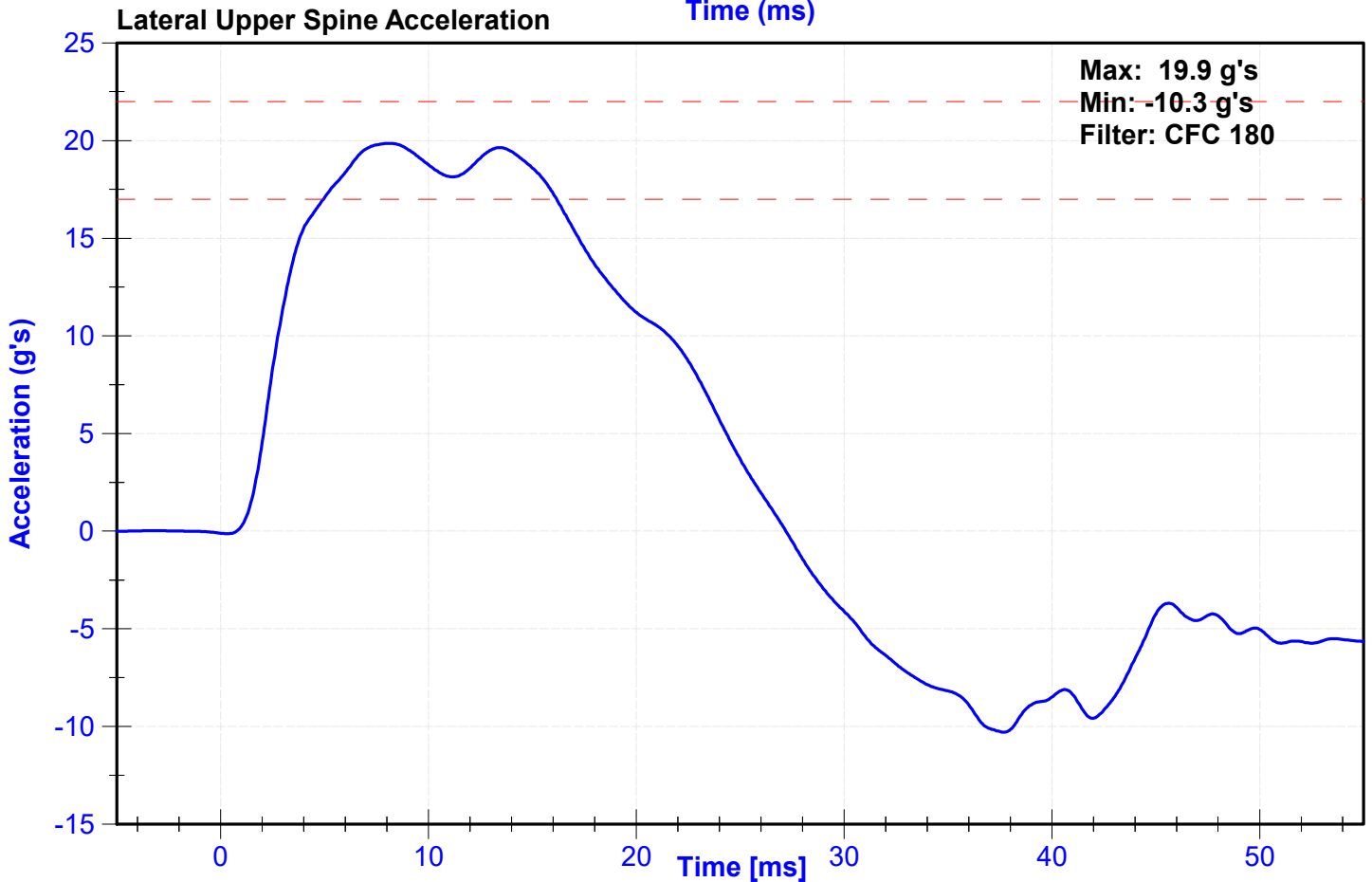
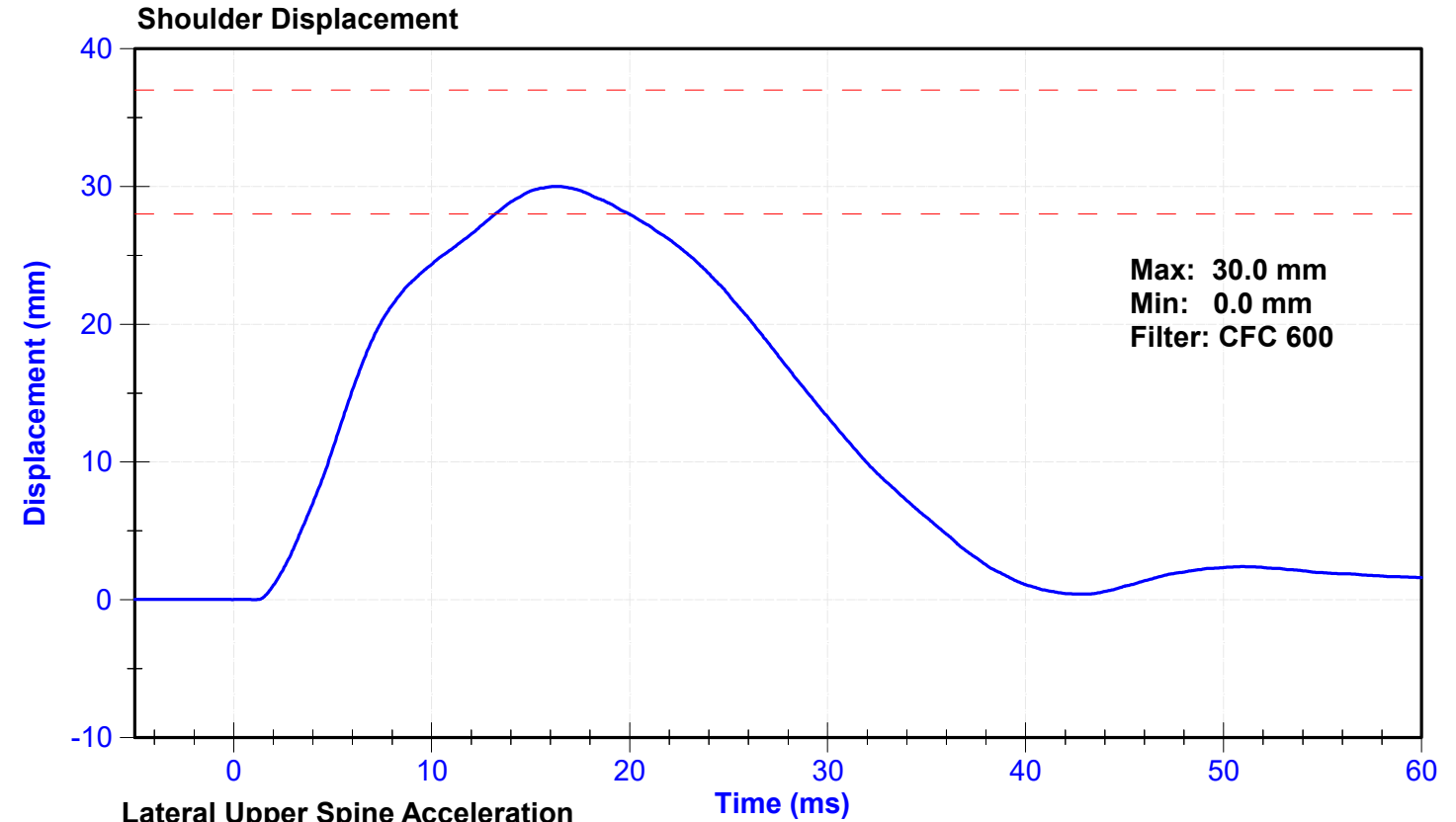
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	18.0	Pass
Shoulder Deflection	28	37	mm	30.0	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Shoulder Potentiometer	Servo	572GFE	5/16/2024	11/14/2024
Upper Spine Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024

Probe Acceleration





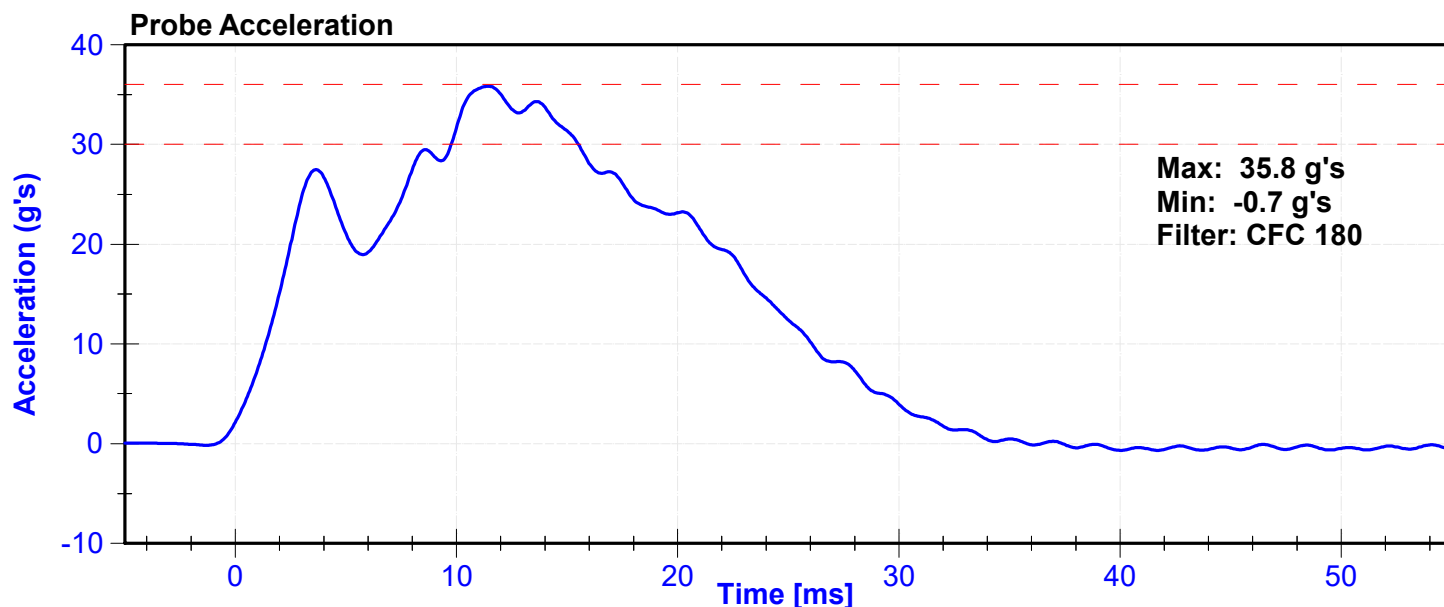
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

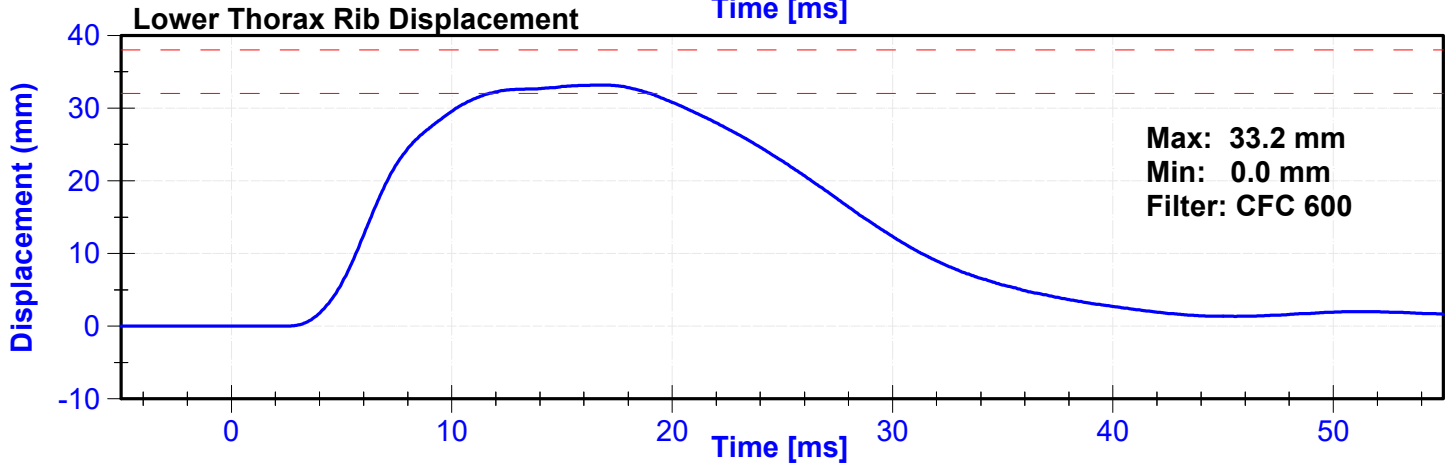
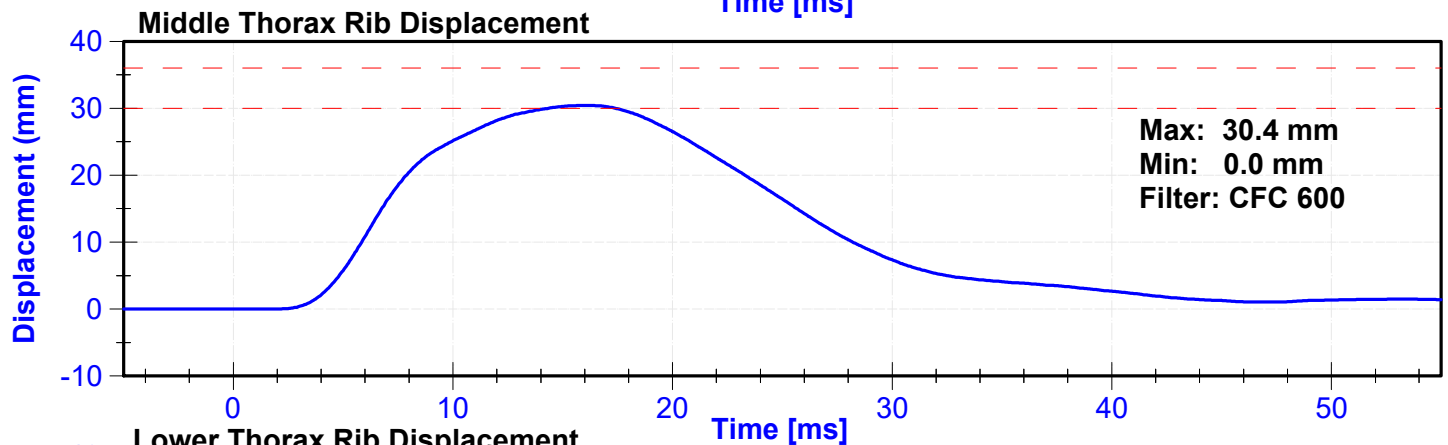
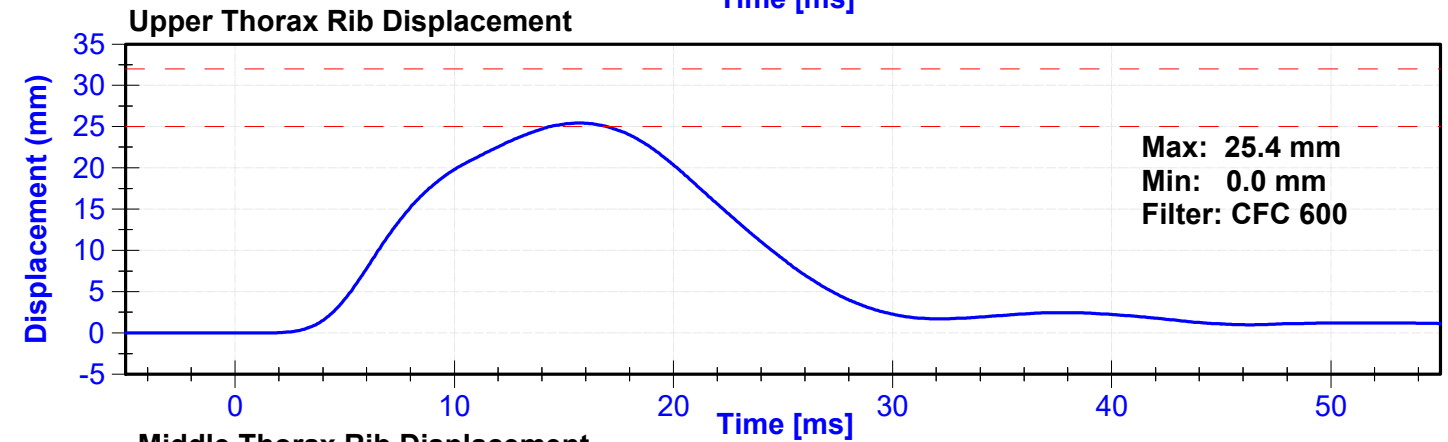
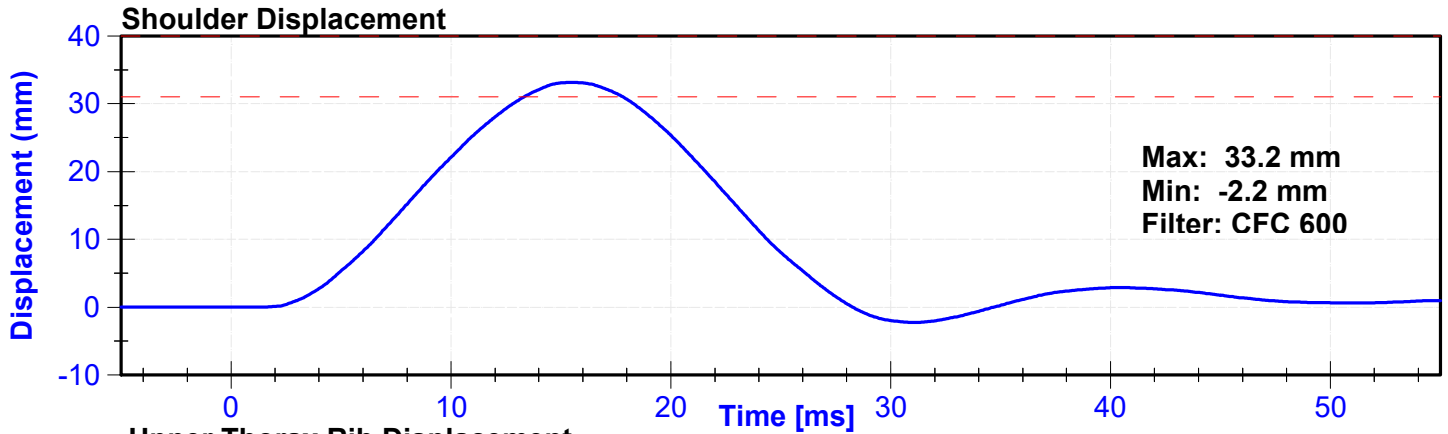
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	35.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	41.6	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.5	Pass
Shoulder Deflection	31	40	mm	33.2	Pass
Upper Thorax Rib Deflection	25	32	mm	25.4	Pass
Mid Thorax Rib Deflection	30	36	mm	30.4	Pass
Lower Thorax Rib Deflection	32	38	mm	33.2	Pass

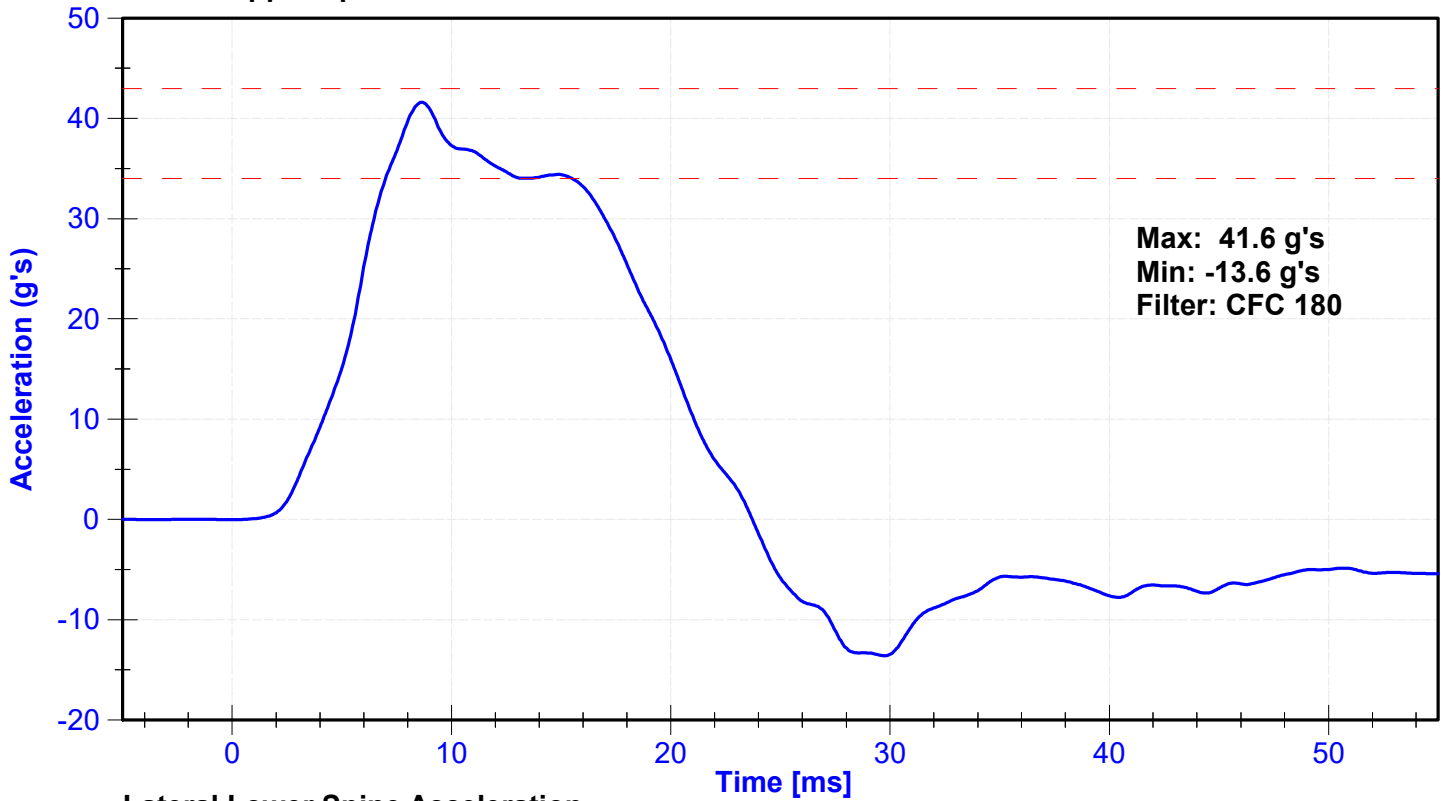
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine T1 Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024
Upper Spine T12 Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Shoulder Potentiometer	Servo	572GFE	5/16/2024	11/14/2024
Upper Thorax Rib Potentiometer	Servo	062GFE	5/16/2024	11/14/2024
Middle Thorax Rib Potentiometer	Servo	528GFE	5/16/2024	11/14/2024
Lower Thorax Rib Potentiometer	Servo	513GFE	5/16/2024	11/14/2024

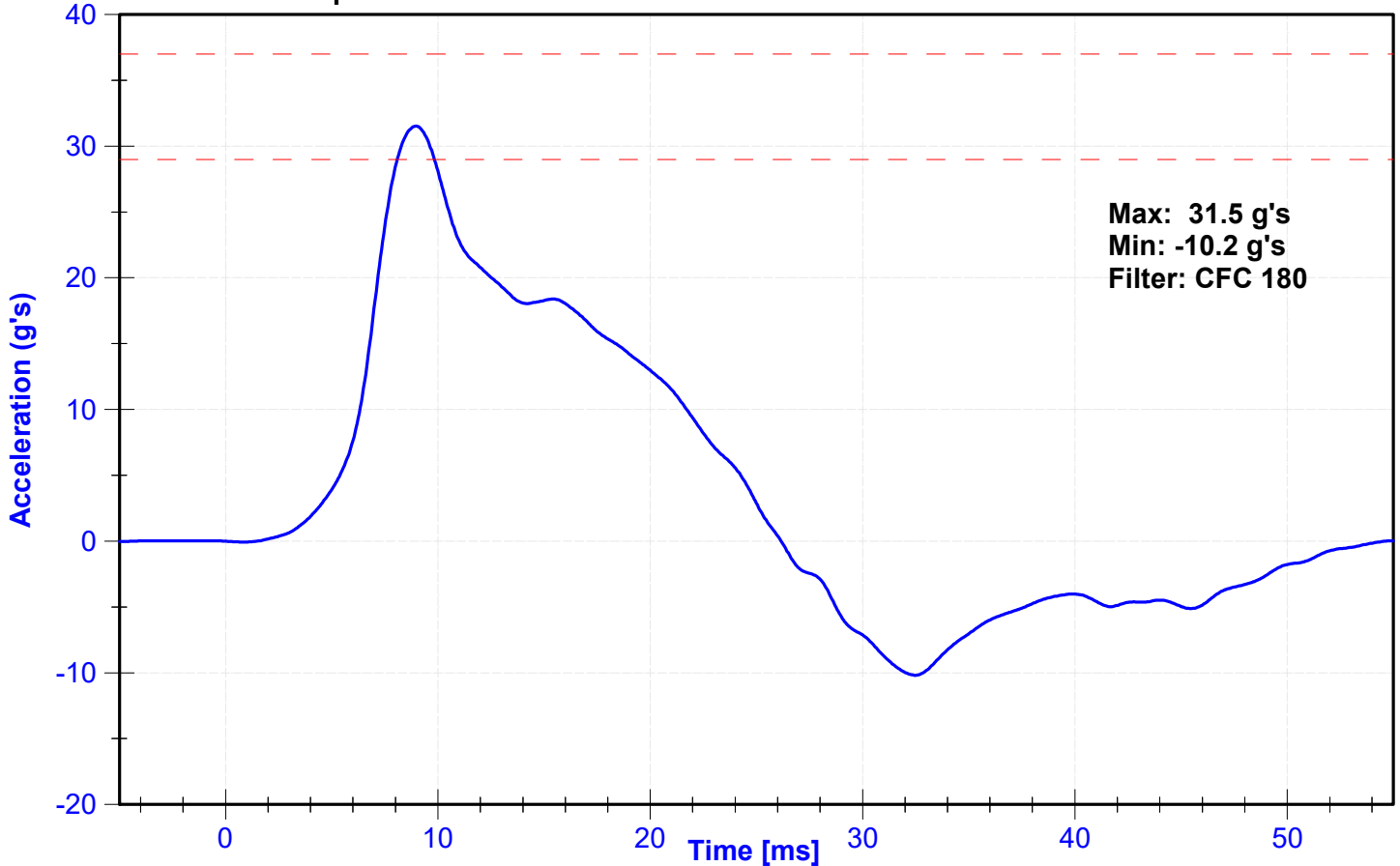




Lateral Upper Spine Acceleration



Lateral Lower Spine Acceleration



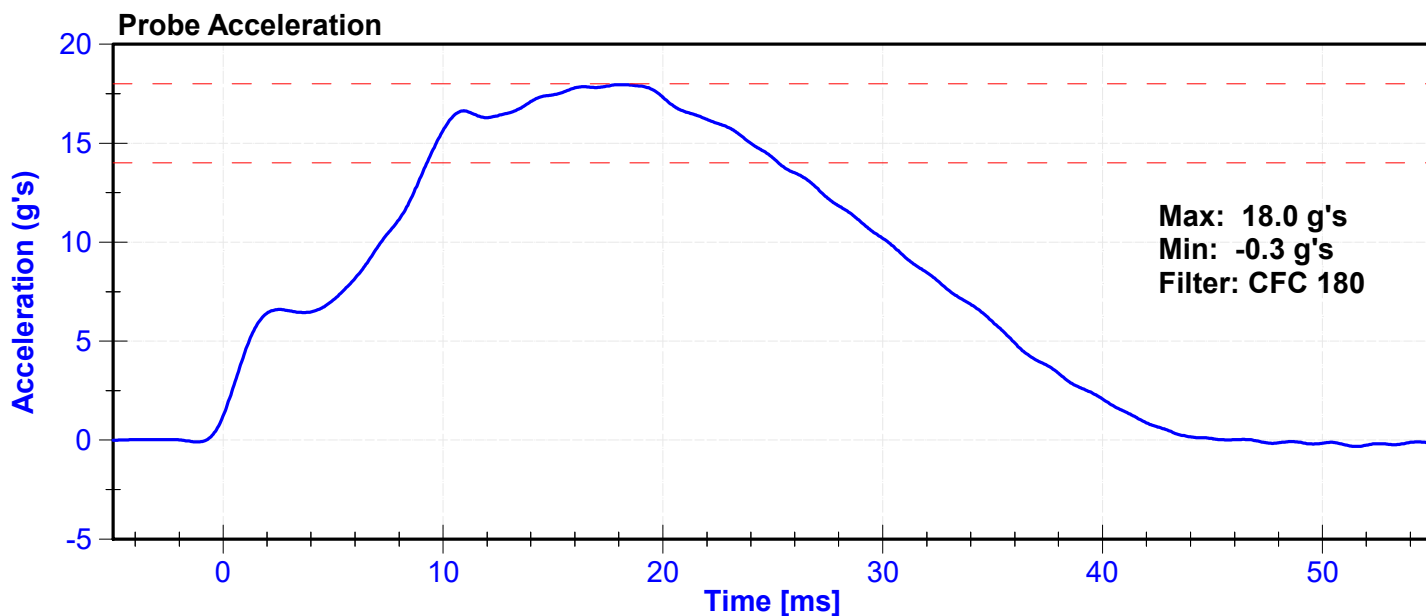
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

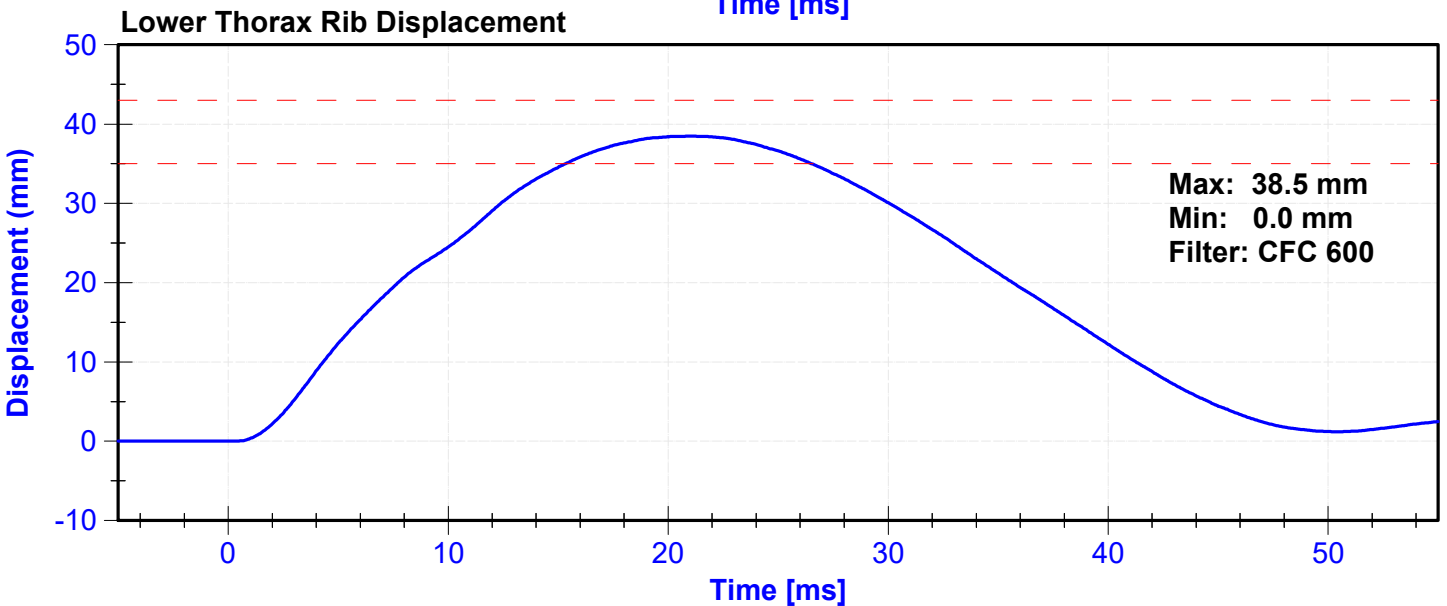
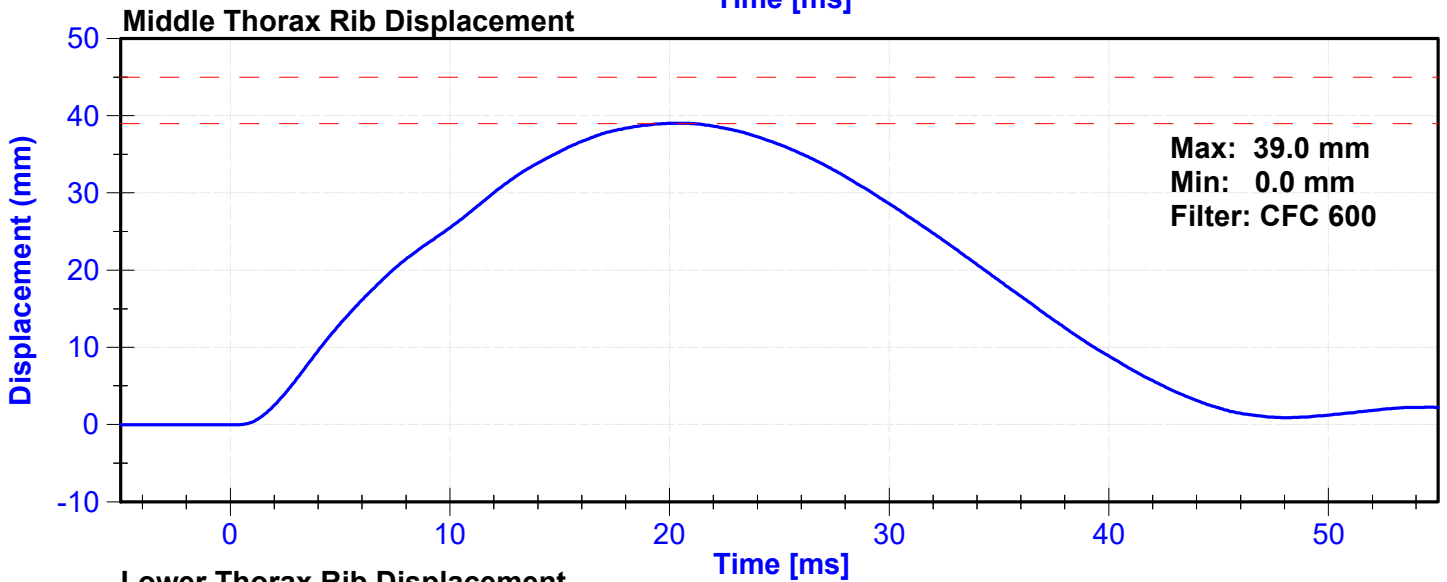
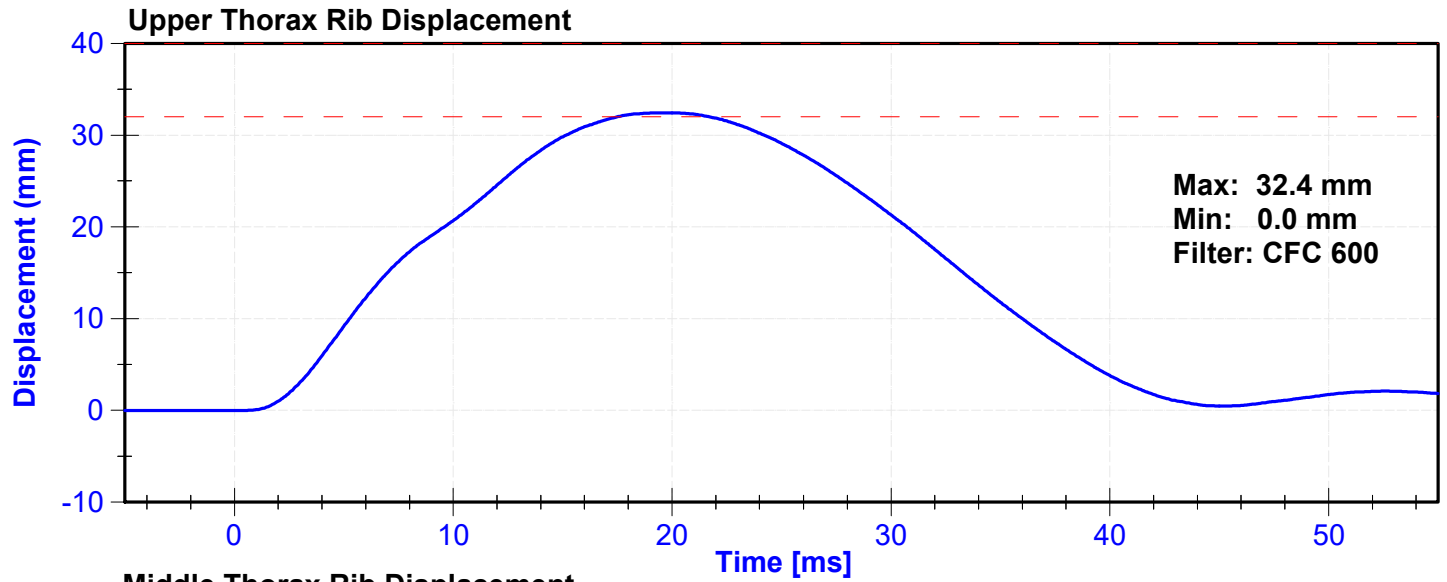
Results

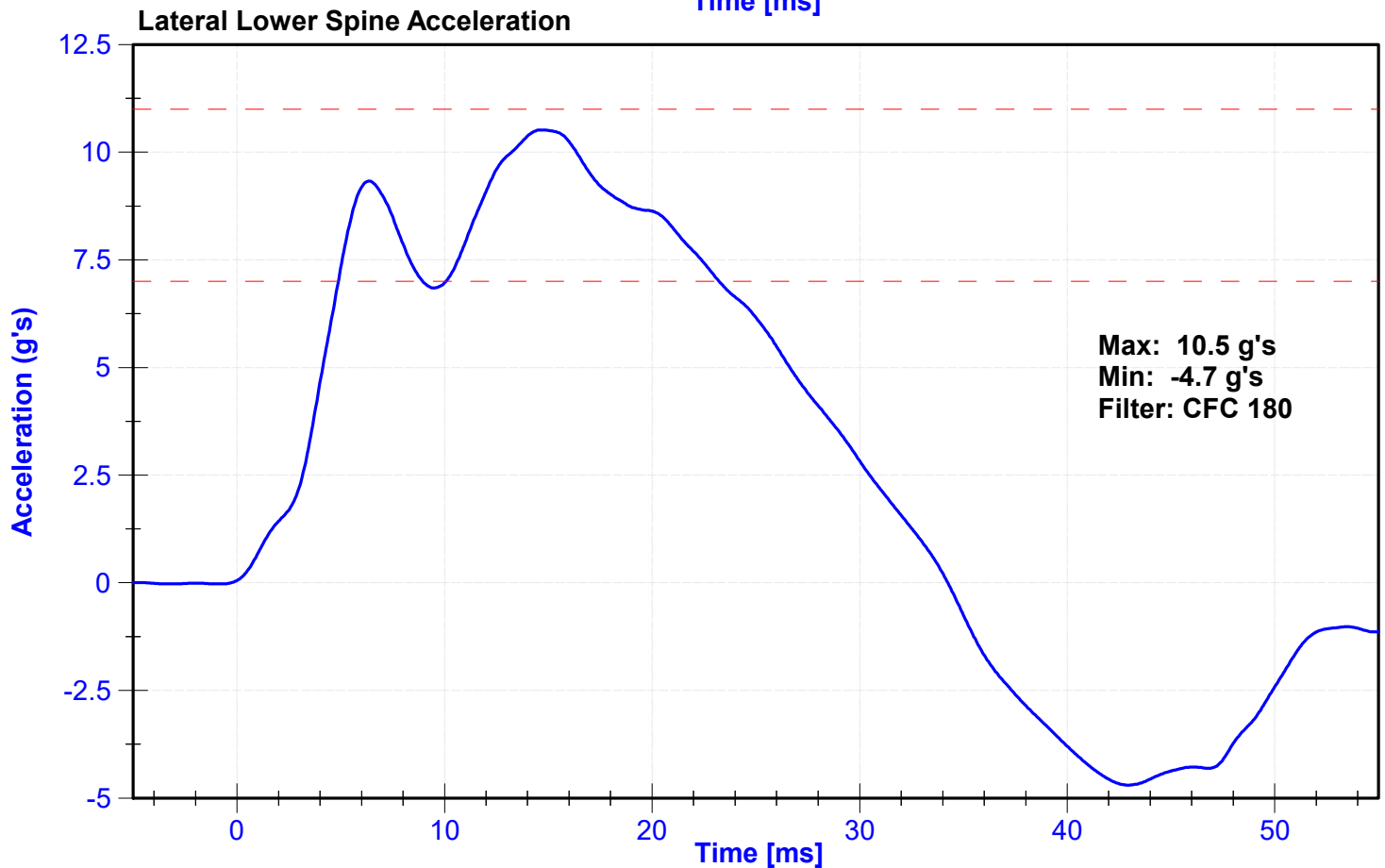
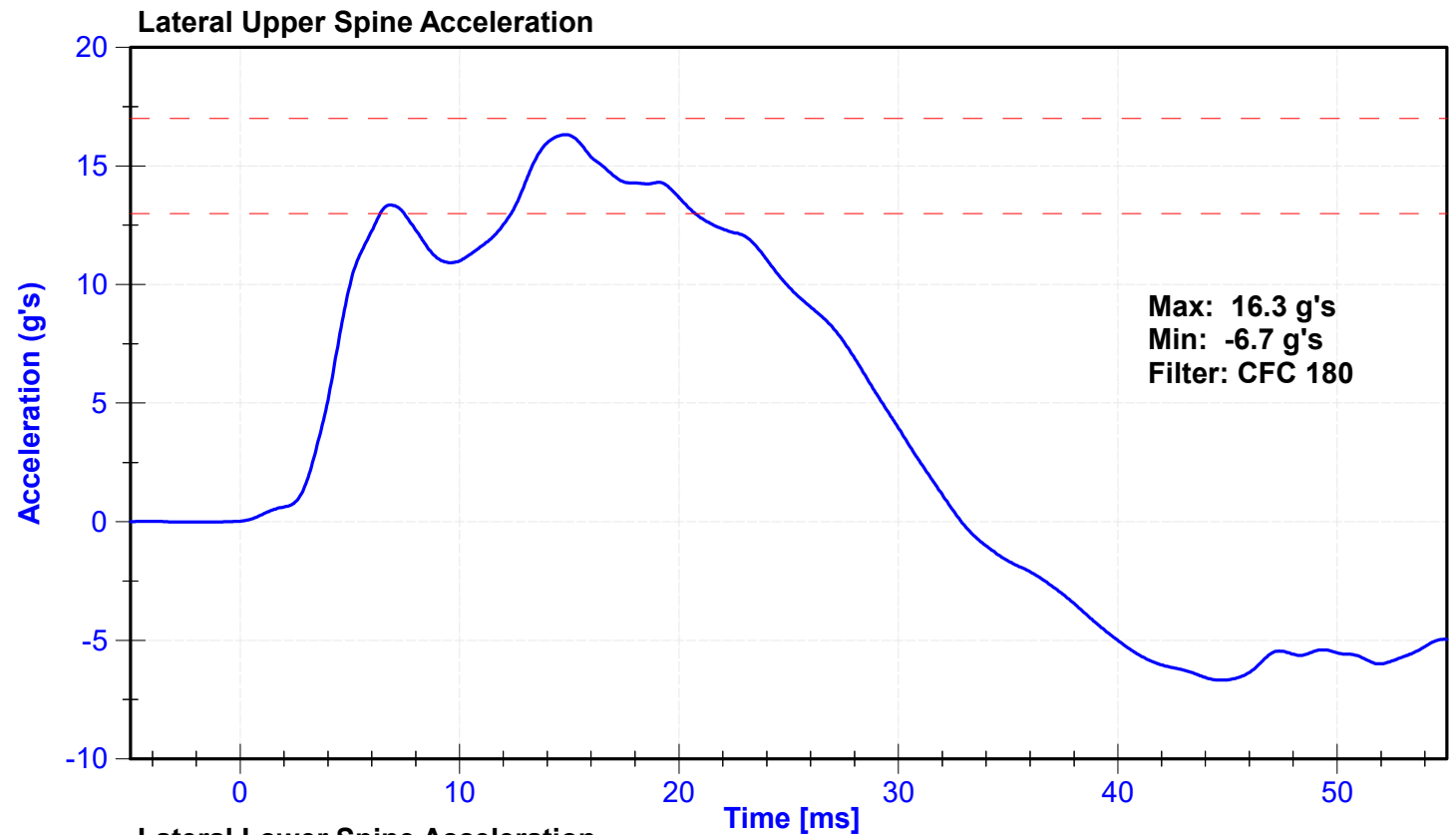
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	14	18	g's	18.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	16.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.5	Pass
Upper Thorax Rib Deflection	32	40	mm	32.4	Pass
Middle Thorax Rib Deflection	39	45	mm	39.0	Pass
Lower Thorax Rib Deflection	35	43	mm	38.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Upper Spine Y Accelerometer	Endevco	P94678	5/15/2024	11/11/2024
Lower Spine Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Upper Thorax Rib Potentiometer	Servo	062GFE	5/16/2024	11/14/2024
Middle Thorax Rib Potentiometer	Servo	528GFE	5/16/2024	11/14/2024
Lower Thorax Rib Potentiometer	Servo	513GFE	5/16/2024	11/14/2024







ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

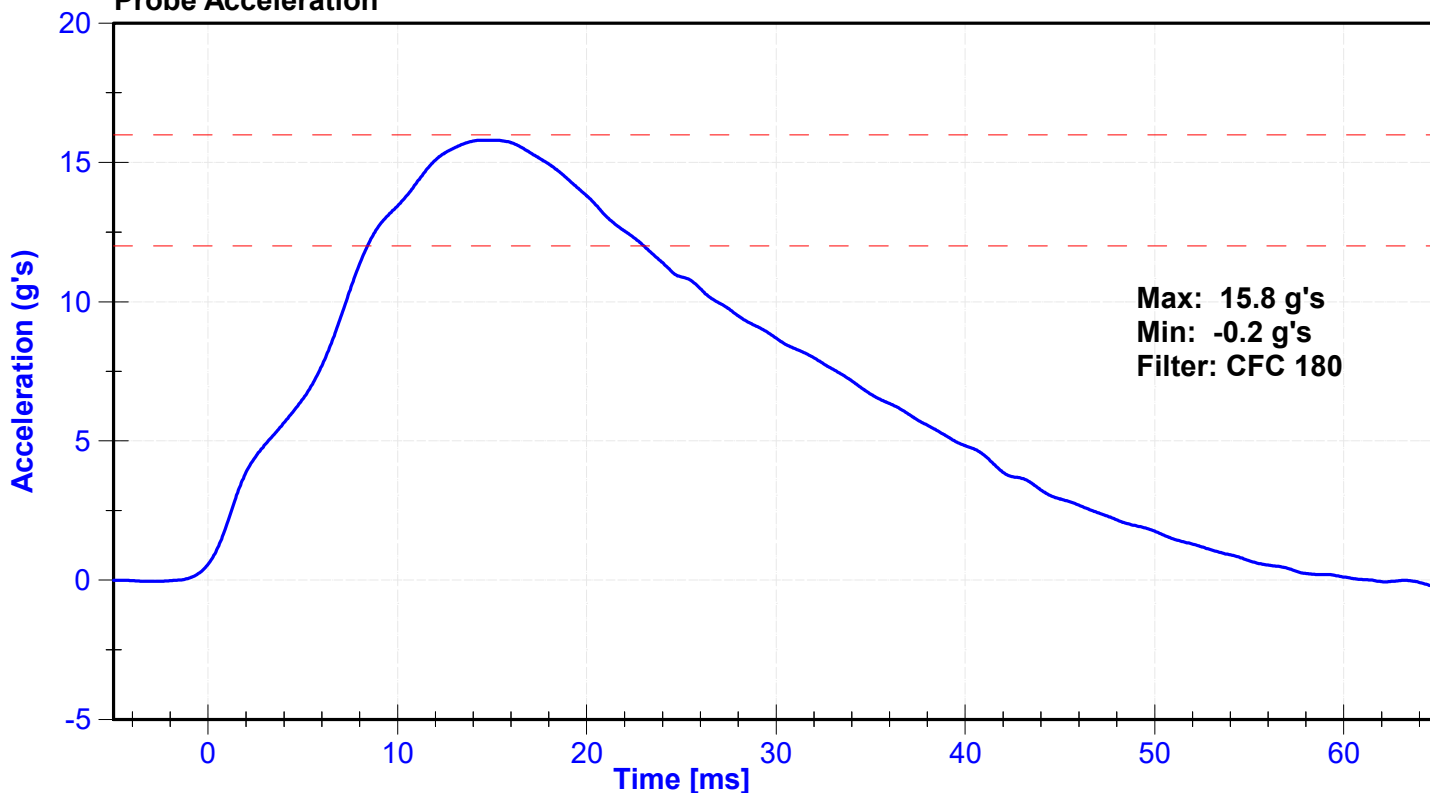
Results

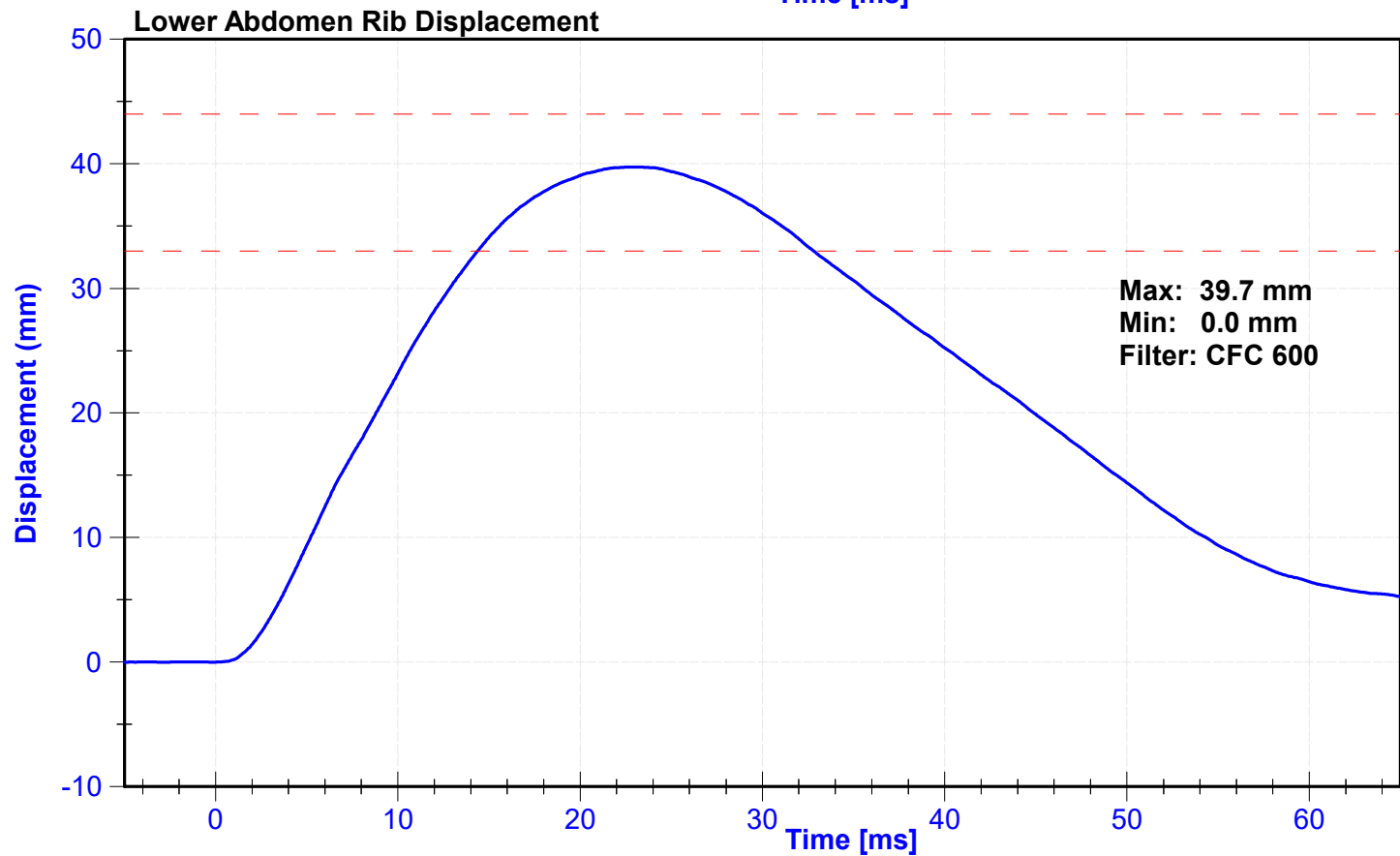
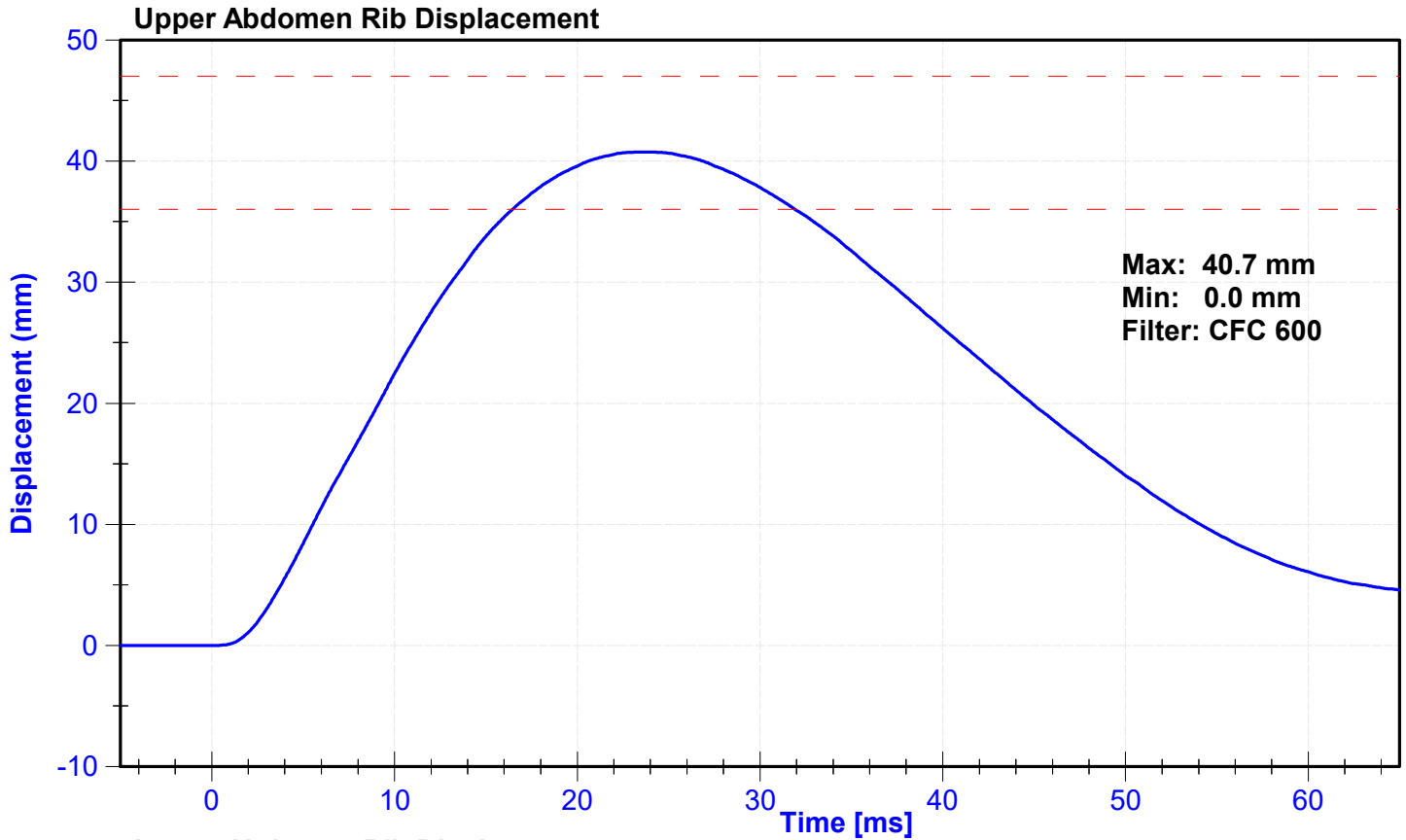
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	12	16	g's	15.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.8	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.7	Pass
Lower Abdomen Rib Deflection	33	44	mm	39.7	Pass

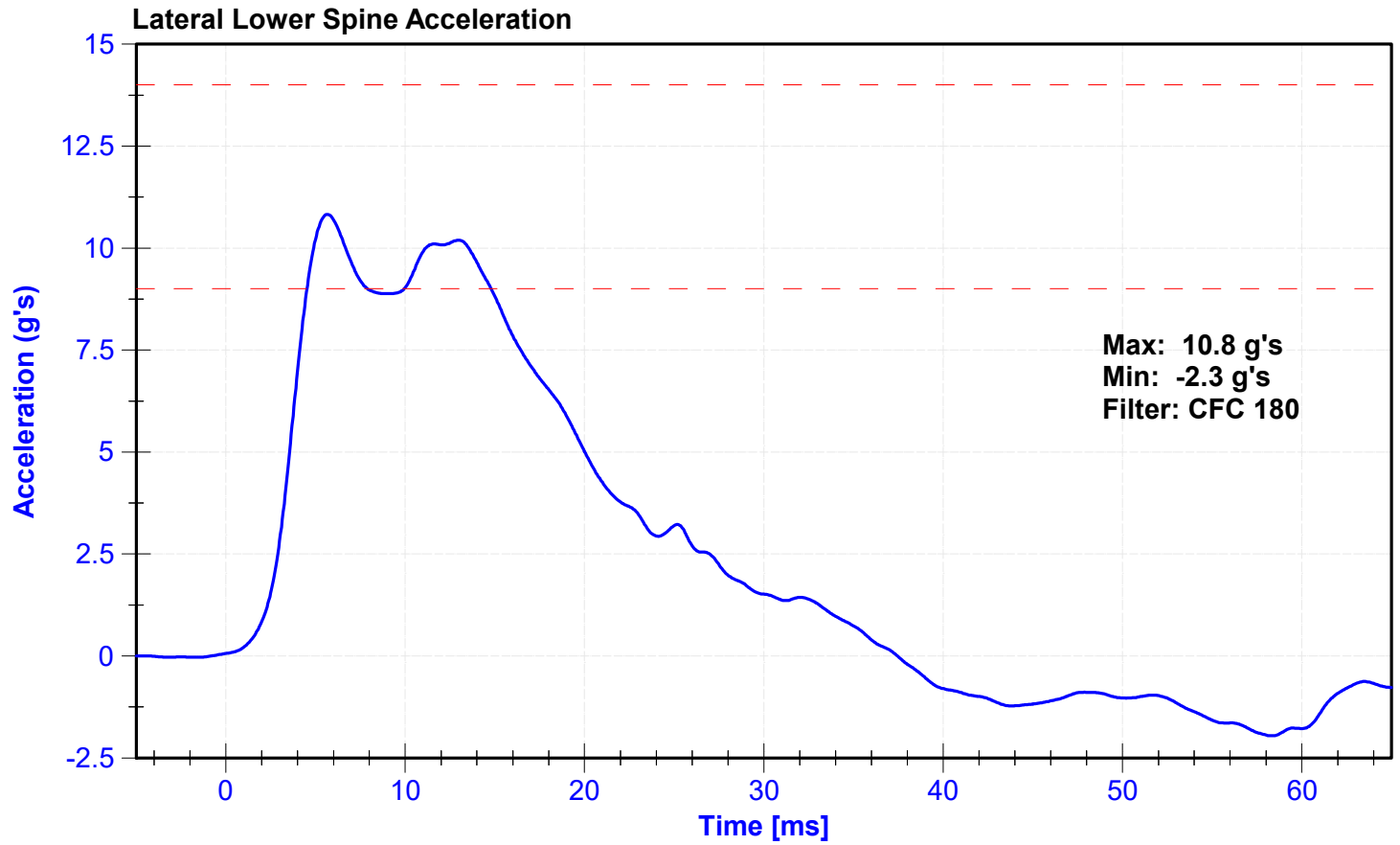
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Lower Spine Y Accelerometer	Endevco	P58744	5/15/2024	11/11/2024
Upper Abdomen Rib Potentiometer	Servo	342GFE	5/16/2024	11/14/2024
Lower Abdomen Rib Potentiometer	Servo	512GFE	5/16/2024	11/14/2024

Probe Acceleration







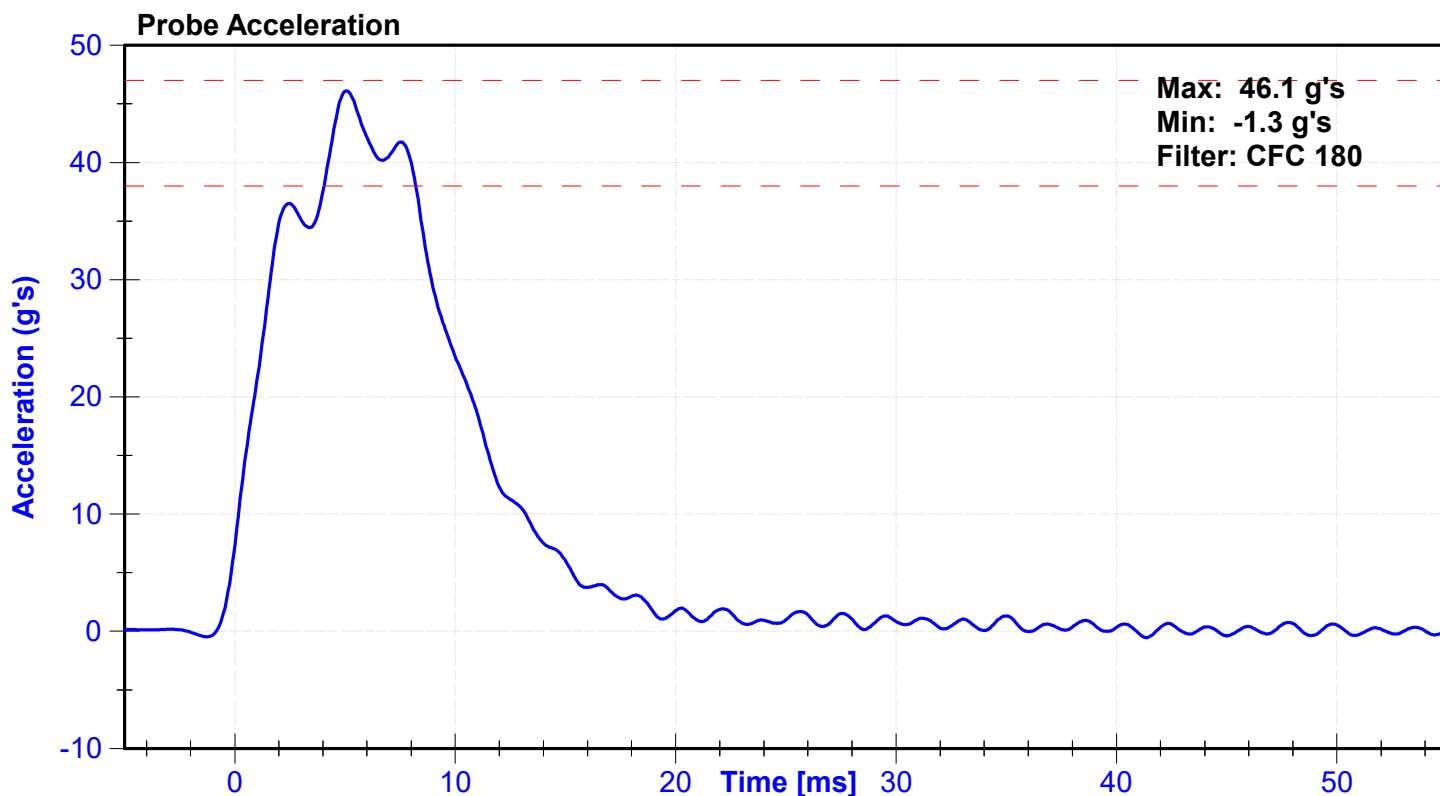
ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

Results

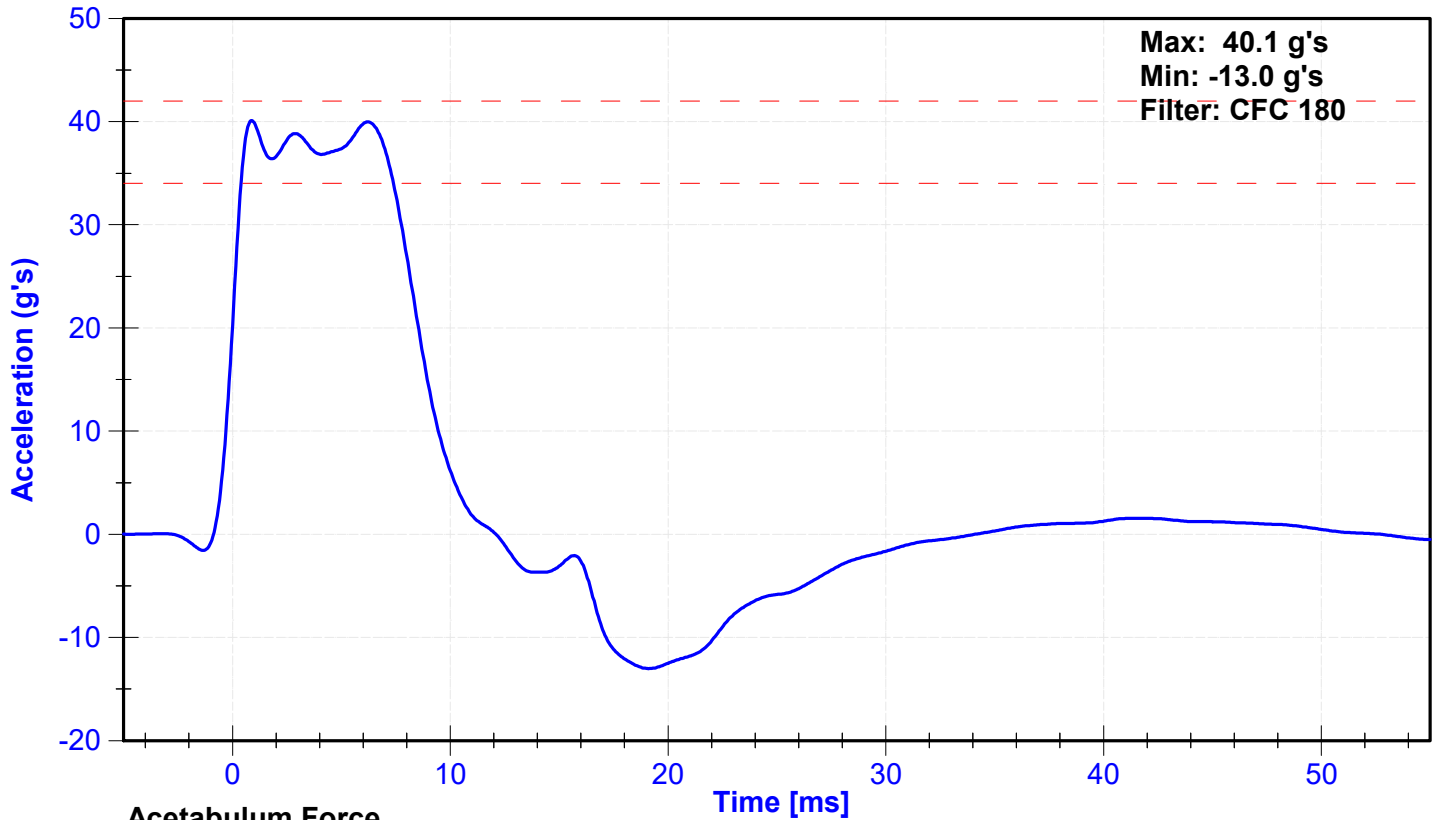
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration	38	47	g's	46.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	40.0	Pass
Acetabulum Force	3600	4300	N	4141.8	Pass

Transducer Calibrations

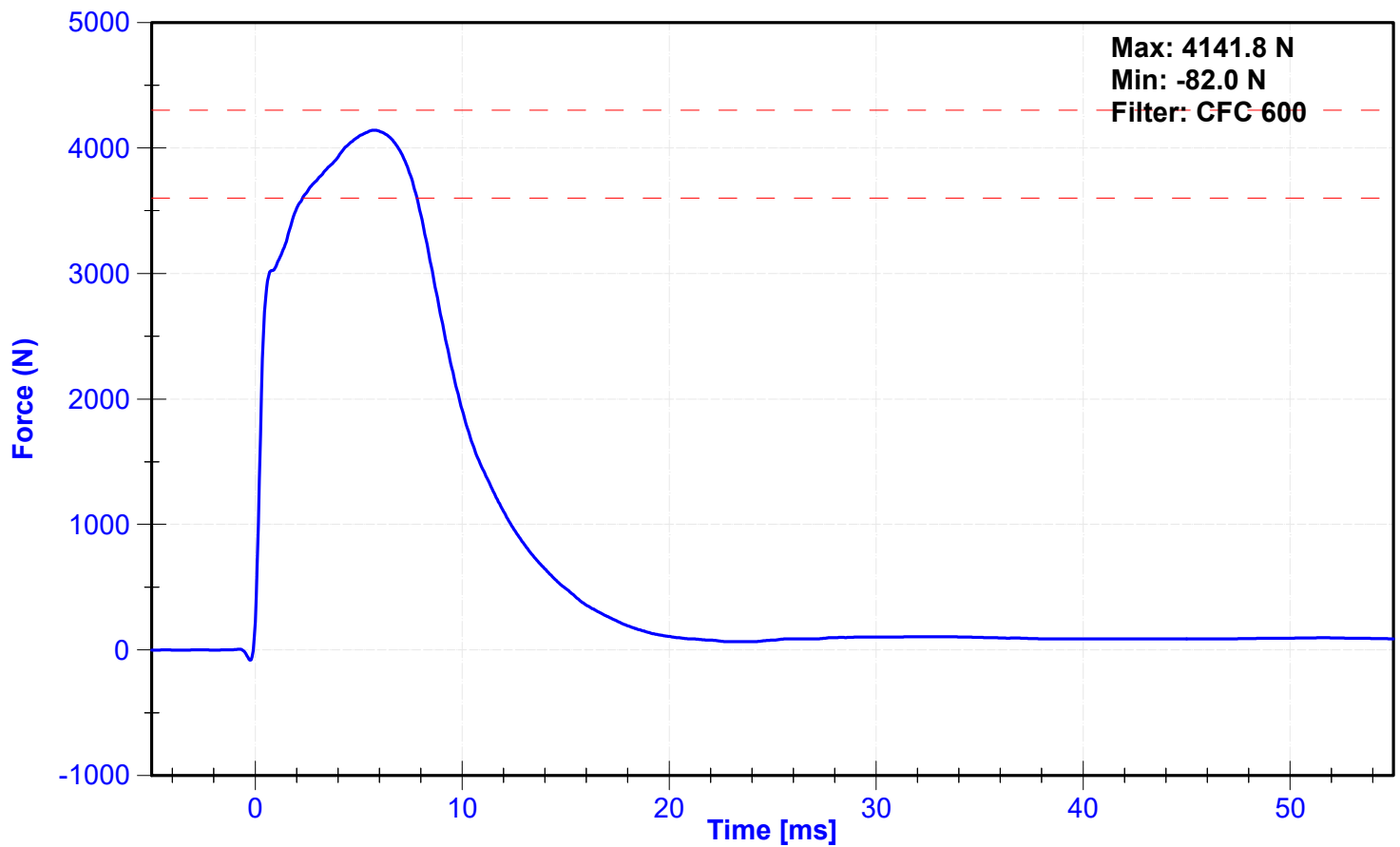
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	T29392	5/15/2024	11/11/2024
Acetabulum Load Cell	FTSS	236-FY	12/5/2023	12/4/2024
Certification Plug	SACO			N/A
Crash Test Plug	SACO			N/A



Lateral Pelvis Acceleration



Acetabulum Force





SID-IIs Pelvis Plug Certification Test

Plug S/N 16330

Test Number 22896

Report Number 22953

Test Date 5/20/2022 11:33:01 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

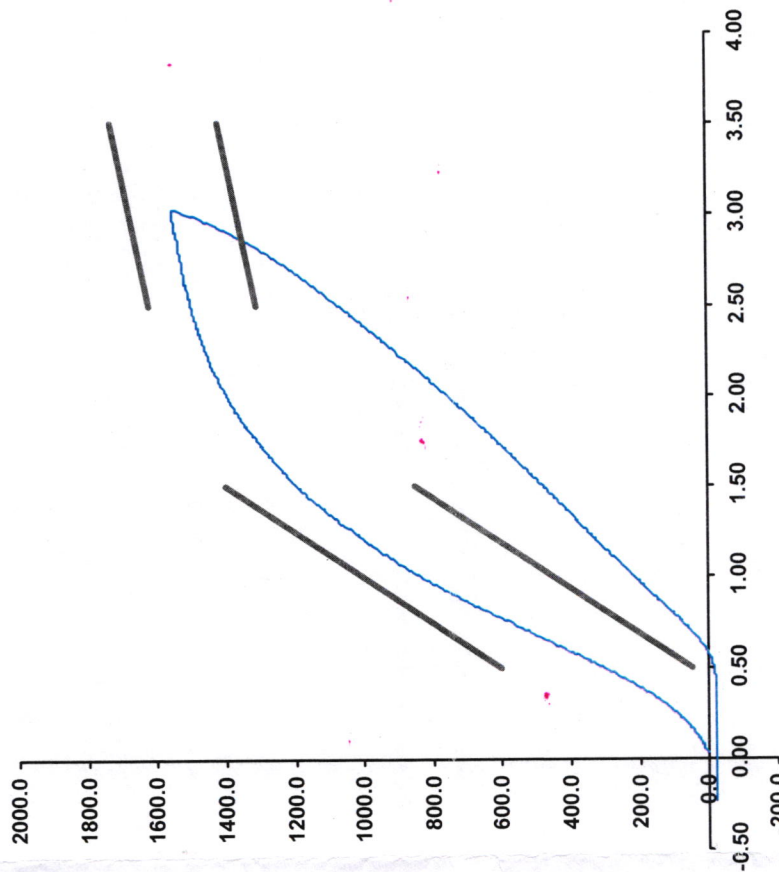
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes: *Check Plug 261 5/31/24*

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-May-22

SACO Research

By : *DC* Date : *5/20/2022*
 SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



SID-11s Pelvis Plug Certification Test

Plug S/N 15785

Test Number 20685

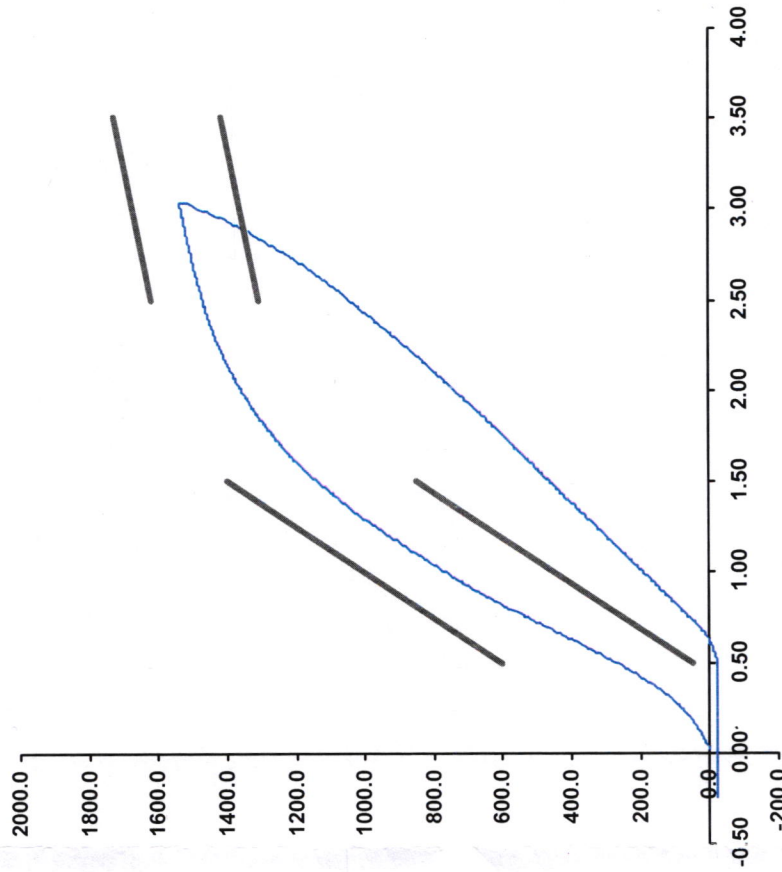
Report Number 20739

Test Date 10/15/2021 8:25:13 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 (FI360947), Units (LBS) 1000
 Crosshead Speed (mm / min) or Rate 12.7
 Extension or Position Measured by XHD_100 (XHD100)
 Notes: CLASH PLUG 261 5/31/24

Force (-N) vs Extension (-mm)



Operator
 Part Number 180-4450

Template No 107 15-Oct-21
 SACO Research

By: DC Date: 10/15/21
 SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



SID-IIs Pelvis Plug Certification Test

Plug S/N 16554

Test Number 23338

Report Number 23395

Test Date 7/15/2022 9:37:07 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

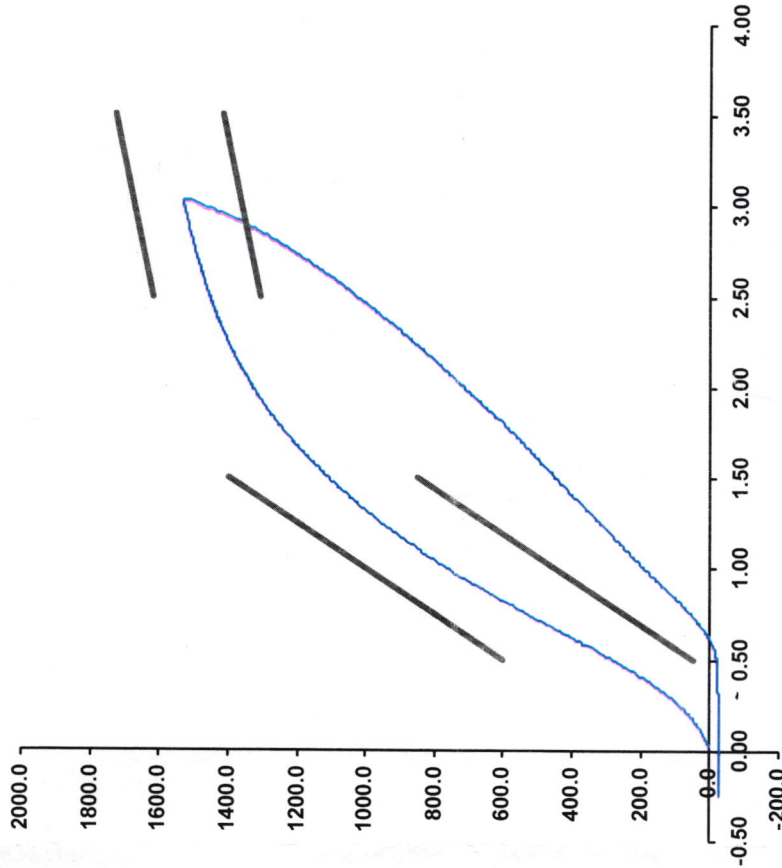
Load Cell S/N (F1360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7

Extension or Position Measured by XHD_100 (XHD100)

Notes: *Now Impact Plug 261 5/31/24*

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 15-Jul-22

SACO Research

By: *DC* Date: *7/15/22*
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

ATD Manufacturer	FTSS	Test Technician	T. Roseman
ATD Serial Number	261	Laboratory Supervisor	C. Mantell

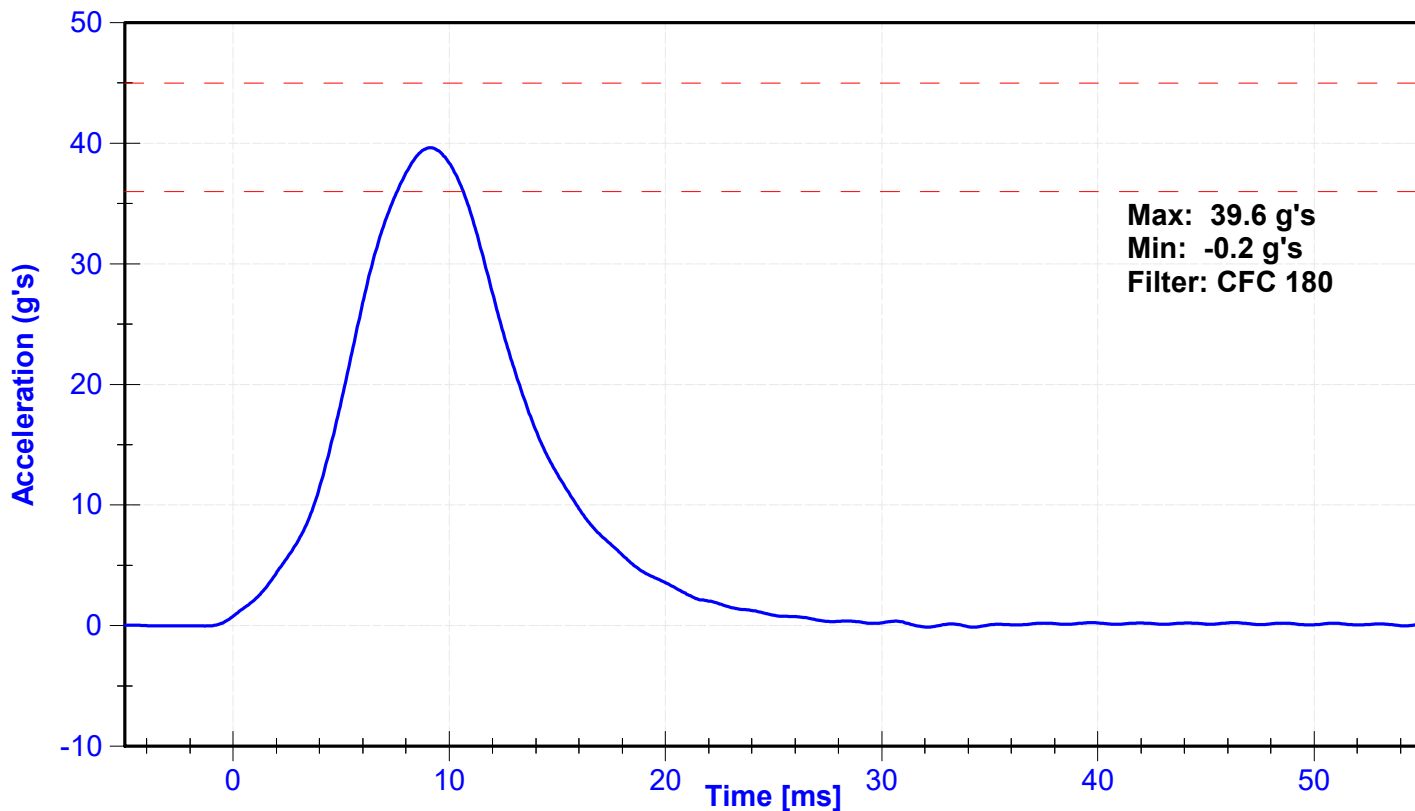
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	45.0	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	36	45	g's	39.6	Pass
Lateral Pelvis Acceleration	28	39	g's	28.7	Pass
Iliac Force	4100	5100	N	4333.9	Pass

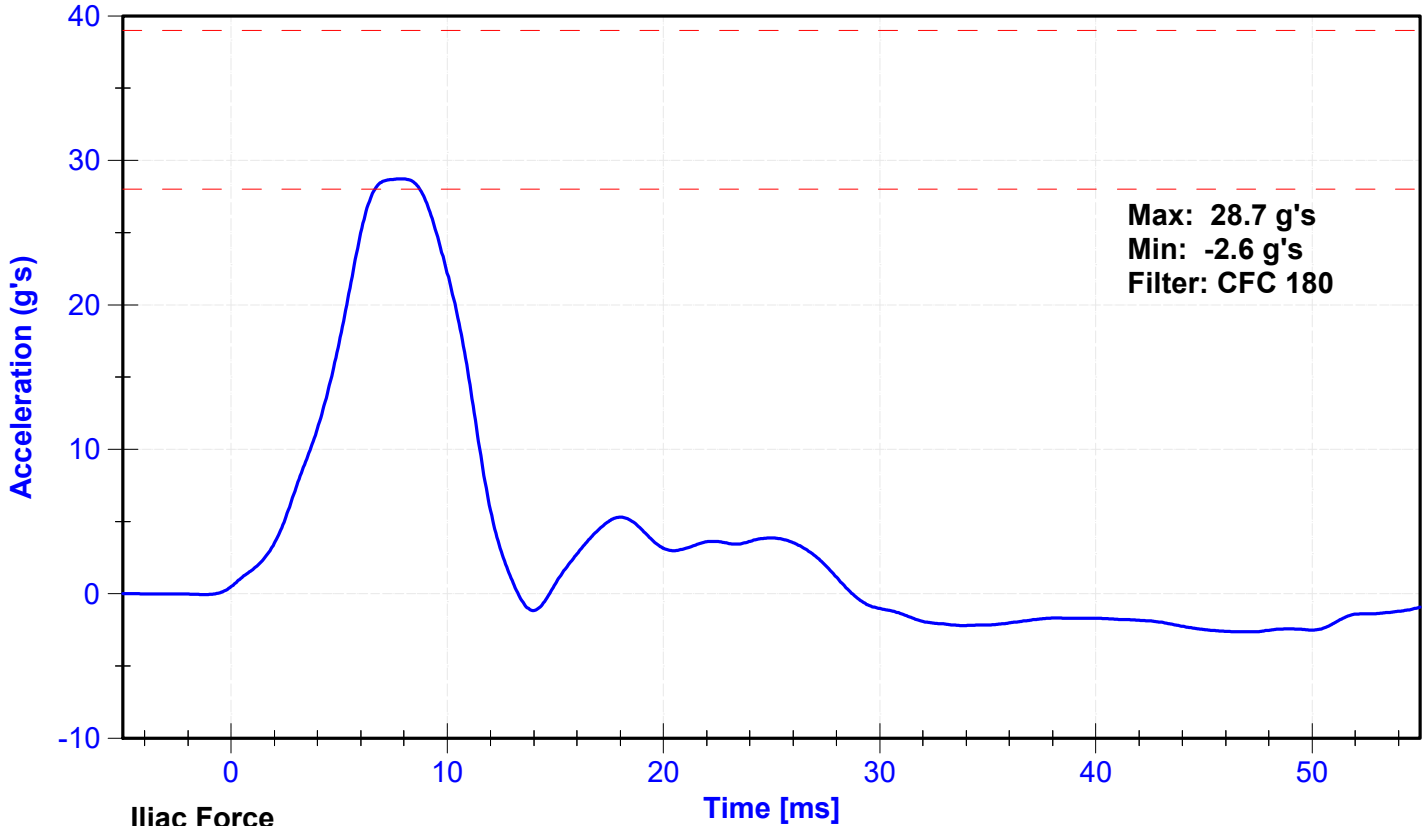
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco	18587	11/20/2023	11/19/2024
Pelvis Y Accelerometer	Endevco	T29392	5/15/2024	11/11/2024
Iliac Load Cell	Denton	290-FY	12/5/2023	12/4/2024

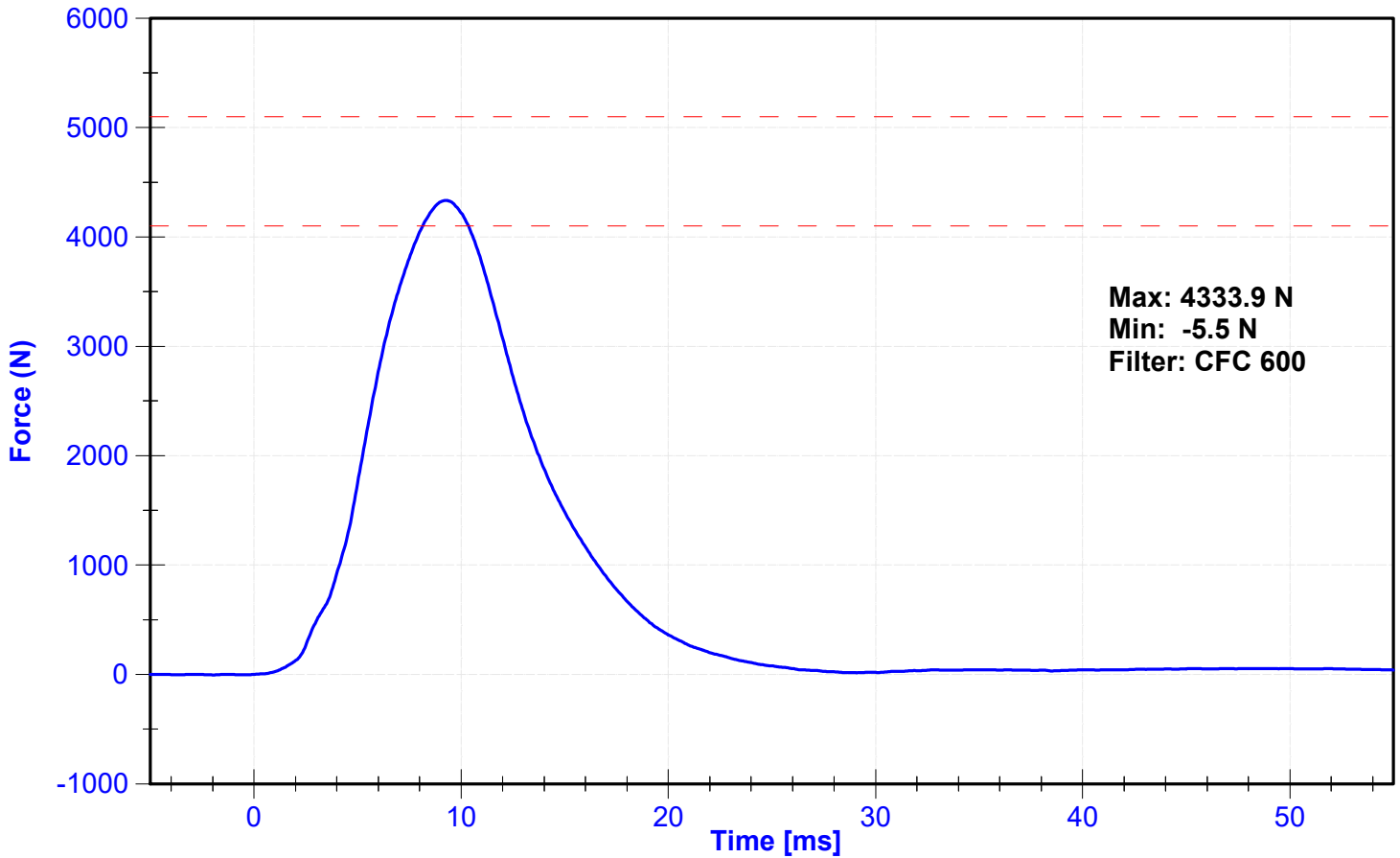
Probe Acceleration



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	02/01/2024
		Y	T22281	Endevco	02/01/2024
		Z	T26050	Endevco	02/01/2024
	Redundant	X	T21682	Endevco	02/01/2024
		Y	T25989	Endevco	02/01/2024
		Z	T25864	Endevco	02/01/2024
Thorax Rib Displacement Potentiometers	Upper	Y	0552-01	Honeywell	01/31/2024
	Middle	Y	807	Honeywell	01/31/2024
	Lower	Y	0552-03	Honeywell	01/31/2024
Abdomen Load Cells	Forward	Y	1440	Denton	08/08/2023
	Middle	Y	1525	Denton	08/08/2023
	Rear	Y	1528	Denton	08/08/2023
Lower Spine Accelerometers (T12)		X	P71278	Endevco	02/01/2024
		Y	18595	Endevco	04/04/2024
		Z	18509	Endevco	04/04/2024
Pubic Symphysis Load Cell		Y	456-FY	Denton	08/08/2023

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 261		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P68067	Endevco	05/15/2024
			Y	P18567	Endevco	05/15/2024
			Z	P49163	Endevco	05/15/2024
		Redundant	X	T26041	Endevco	05/15/2024
			Y	T22409	Endevco	05/15/2024
			Z	T26086	Endevco	05/15/2024
Displacement Potentiometers	Thoracic Rib	Upper	Y	062GFE	Servo	05/16/2024
		Middle	Y	528GFE	Servo	05/16/2024
		Lower	Y	513GFE	Servo	05/16/2024
	Abdominal Rib	Upper	Y	342GFE	Servo	05/16/2024
		Lower	Y	512GFE	Servo	05/16/2024
Lower Spine Accelerometers (T12)			X	T22340	Endevco	05/15/2024
			Y	P58744	Endevco	05/15/2024
			Z	T22124	Endevco	05/15/2024
Acetabulum Load Cell			Y	236-FY	FTSS	12/05/2023
Iliac Wing Load Cell			Y	290-FY	Denton	12/05/2023
Pelvis Plug (struck side)				16538	SACO	07/15/2022
Pelvis Plug (non-struck side)				16415	SACO	05/23/2022

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A315883	Measurement Specialties	04/25/2024
Vehicle Center of Gravity	Y	A370956	Measurement Specialties	04/25/2024
Vehicle Center of Gravity	Z	A370958	Measurement Specialties	04/25/2024
Right Sill at Front Seat	X	A372876	Measurement Specialties	03/18/2024
Right Sill at Front Seat	Y	A373177	Measurement Specialties	03/18/2024
Right Sill at Front Seat	Z	A373178	Measurement Specialties	03/18/2024
Right Sill at Rear Seat	X	G21412	Endevco	02/12/2024
Right Sill at Rear Seat	Y	G22233	Endevco	02/12/2024
Right Sill at Rear Seat	Z	A398644	Measurement Specialties	02/12/2024
Left Sill at Front Door	Y	A373248	Measurement Specialties	02/13/2024
Left Sill at Rear Door	Y	G22607	Endevco	02/19/2024
Left A-Post Lower	Y	G24970	Endevco	01/10/2024
Left A-Post Middle	Y	G24639	Endevco	11/29/2023
Left B-Post Lower	Y	A400036	Measurement Specialties	02/14/2024
Left B-Post Middle	Y	A370932	Measurement Specialties	02/15/2024
Front Seat Track	Y	G24305	Endevco	05/10/2024
Rear Seat Track or Structure	Y	A373194	Measurement Specialties	05/10/2024
Right Rear Occ. Compartment	Y	A405544	Measurement Specialties	05/10/2024
Rear Floorpan Above Axle	X	A255886	Measurement Specialties	03/15/2024
Rear Floorpan Above Axle	Y	A280017	Measurement Specialties	03/15/2024
Rear Floorpan Above Axle	Z	A284231	Measurement Specialties	03/15/2024

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle CG Acceleration vs. Time	X	A315905	Measurement Specialties	02/16/2024
Vehicle CG Acceleration vs. Time	Y	A315970	Measurement Specialties	02/16/2024
Vehicle CG Velocity vs. Time	Y	Calculated	Measurement Specialties	02/16/2024
Vehicle CG Acceleration vs. Time	Z	A335459	Measurement Specialties	02/16/2024
Vehicle CG Velocity vs. Time	Z	Calculated	Measurement Specialties	02/16/2024
Vehicle CG Resultant Acceleration vs. Time	R	Calculated	Measurement Specialties	02/16/2024

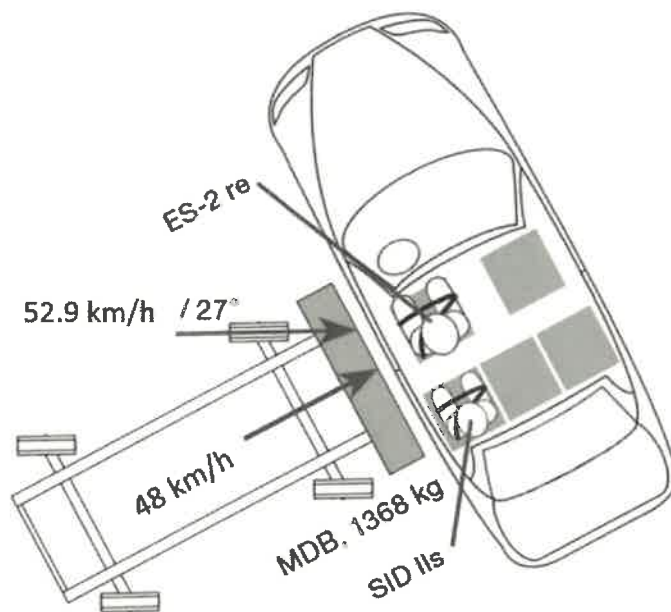
APPENDIX VIII
CHECK SHEETS

Federal Motor Vehicle Safety Standards

Work Instructions: FMVSS 214

Side Impact Moving Deformable Barrier Test

Work Instructions Aligned with U.S. D.O.T. National Highway Traffic Safety Administration's
Laboratory Test Procedure for FMVSS 214:
Side Impact Moving Deformable Barrier



Customer:

JCRSH-00006 – Need 305 Photos & Measurements



C20240111

VIN: 1GYKPRRK0RZ104312

693JJ923D000043

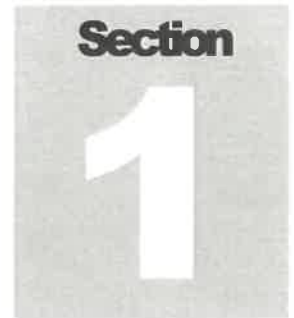
CAL6183_C

Lead Test Engineer: Vanessa Hansen

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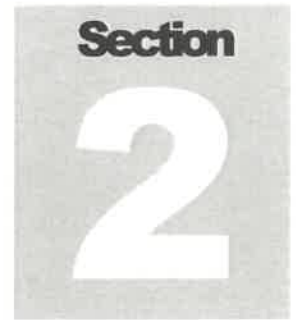


Project Set-up

Instruction: Insert Engineer's Checklist, Customer's Statement of Work or Test Request after this tab.



- Inserted Completed Engineer's Checklist.
- Inserted Customer's SOW / Test Request.
- Inserted Copy of the Form 1.



Vehicle Inspection

Instruction: Complete the checked task:

☒
☐

Fully Complete the Following Section.

The Following Section Does Not Need to be Completed.

Incoming Vehicle Checklist:

Performed by:	MP	Date:	5/20/24
---------------	----	-------	---------

Complete the following fields:

Dealer	Sport Cadillac
Date vehicle arrived:	5/7/24
Model Year	2024
Make	Cadillac
Model	Lyriq

Verify the following and place a checkmark in the appropriate box. Any variances must be reported to the Technical Director within 2 working days of the vehicle's arrival:

Yes	No	
☒	☐	All options listed on the 'window sticker' are present on the test vehicle.
☒	☐	Tires and wheel rims are the same as listed.
☒	☐	There are no dents or other interior or exterior flaws.
☒	☐	The vehicle has been properly prepared and is in running condition.
☒	☐	The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.
☒	☐	Proper fuel filler cap is supplied on the test vehicle.
☒	☐	Spare tire, jack, lug wrench and tool kit (if applicable) is located in the vehicle cargo area.
☒	☐	The odometer reflects that the vehicle has been driven less than or equal to 200 miles.
☒	☐	The VIN (vehicle identification number) matches the number supplied by NHTSA.
☒	☐	Vehicle is equipped / matches description provided by NHTSA.
☒	☐	Vehicle warning lights (i.e. check engine, SRS, etc.) are not illuminated.
☒	☐	Floor mats come with vehicle (front and rear). Verify with window sticker.
☒	☐	Is vehicle a hybrid or full electric vehicle that requires FMVSS 305?

Vehicle Condition Checklist:

Performed by:

MP

Date:

5/20/24

Complete the following fields:

Make	Cadillac	Anti-lock Brakes (ABS)	Y
Model	Lyria	All-Wheel Drive (AWD)	N
Body Style	SPR SUV	Traction Control System (TCS)	Y
Vin	1GYKPRRK0RZ104312	Electronic Stability Control (ECS)	Y
Body Color	Emerald Lake metallic	Side Curtain Airbags	Y
Engine Disp (liters)	NA	Torso Airbag – Front Seats	Y
Number of Cylinders	EV	Torso Airbag – Rear Seats	N
Engine Placement	NA	Combination/Head Torso Bag	N
Transmission Type	Automatic	Pelvic Airbag – Front Seats	N
Transmission Speeds	Direct Drive	Pelvic Airbag – Rear Seats	N
Overdrive	N	Knee Airbag – Driver	Y
Final Drive	Rear Wheel Drive	Knee Airbag – Front Passenger	Y
Odometer Reading	175mp	Seat Belt Pretensioners – Front Seats	Y
		Seat Belt Pretensioners – Rear Seats	Y
		Seat Belt Load Limiters – Front Seats	Y
		Seat Belt Load Limiters – Rear Seats	Y
		Tire Pressure Monitoring System (TPMS)	Y
		Tilt Steering Wheel	Y
		Automatic Door Locks (ADL)	Y
		Power Window Auto-reverse	Y
		Power Seats	Y

Yes No



Does owner's manual provide instructions to turn off automatic door locks?

¹ These items are in addition to the Form 1 Report of Vehicle Condition and are required for The Data Sheet No. 1 General Test and Vehicle Parameters.

Tinted Glass	Y	Am/FM CD	Y
Power Brakes	Y	Power Windows	Y
Front Disc	Y	Other	NA
Rear Disc	Y		
Bucket Seats	Y		
Air Conditioning	Y		

Take the following photographs (Refer to the sample photo set if necessary):

Initial:

-  Close-up view of Vehicle's Tire Placard Label (No. 30)
-  Close up view of Vehicle's Certification Label (No. 27)
-  Front View
-  Left Front $\frac{3}{4}$ View
-  Left Side View
-  Left Rear $\frac{3}{4}$ View
-  Rear View
-  Right Rear $\frac{3}{4}$ View
-  Right Side View
-  Right Front $\frac{3}{4}$ View
-  Monroney Label

General Vehicle Data:

Performed by:

MP

Date:

5/20/24

Yes No



Does owner's manual provide instructions to turn off automatic door locks?

Data from Certification Label

Manufactured By

General Motors LLC

GVWR

3050

kg

Date of Manufacture

08/23

GAWR Front

1550

kg

Vehicle Type

MPV

GAWR Rear

1700

kg

Vehicle Seating and Weight Capacity Data

	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	0	5
Vehicle Capacity Weight (VCW)				(A) 475 kg
DSC x 68.04 kg				(B) 340.2 kg
Load Reduction				(C) NA kg
Rated Cargo and Luggage Weight (RCLW)				(A-B-C) 134.8 kg

Vehicle Seat Type (Check one of the following)

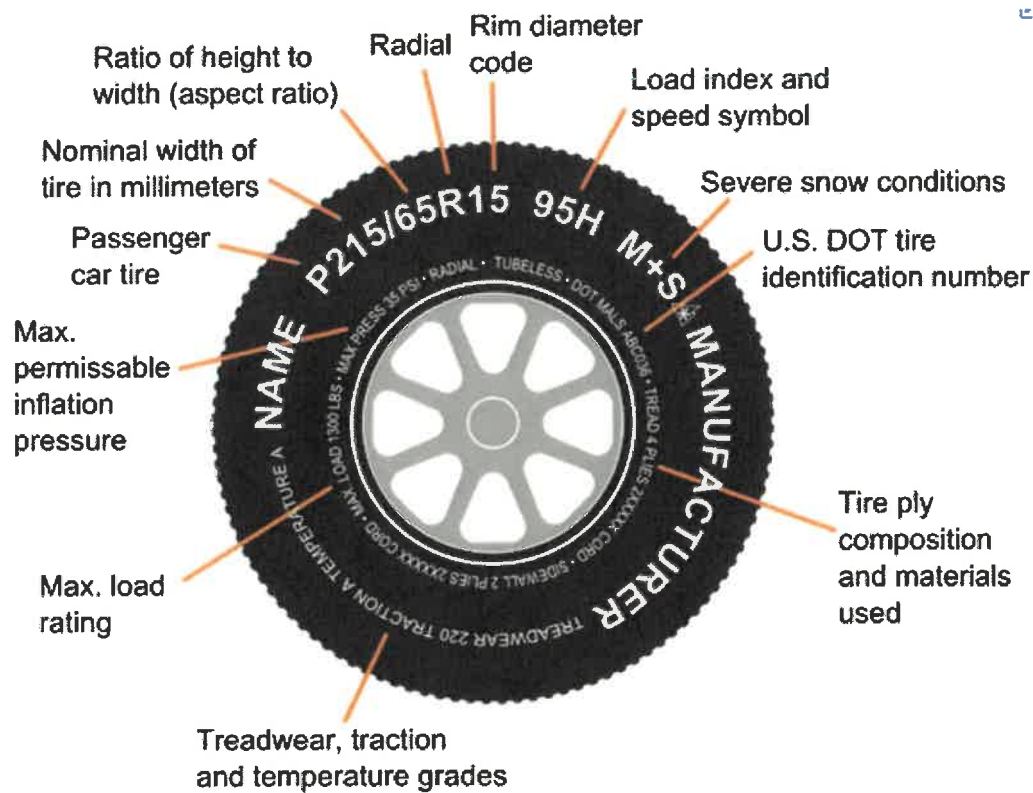
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable w/Lever	Adjustable w/Knob
Front Seat	X						X
Rear or Second Row Seat			X			X	
Third Row Seat	NA						

Please list other pertinent Optional Equipment below:

None

Tire Placard Information	Front	Rear
Recommended Cold Tire Pressure (kPa)	290	290
Recommended Tire Size	265/50 R20	265/50 R20

Tire Sidewall Information	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Tire Size on Vehicle	265/50 R20	265/50 R20
Tire Manufacturer Model	Michelin ^{PS} Primary	Michelin
Tire Name	Primary All Season	Primary All Season
Tire Type	All Season	All Season
Tire Width	265	265
Aspect Ratio	50	50
Radial	Yes	Yes
Wheel Diameter	20"	20"
Load Index/Speed Symbol	107H	107H
Tread Wear	540	540
Traction Grade	A	A
Temperature Grade	A	A



Section

3

Attitudes, Weights, Mechanical Prep & Electrical Connections

Weight - As Delivered Condition:

Performed by:

N/A

Date:

Initial:

NA

Drain the fuel from the fuel tank.

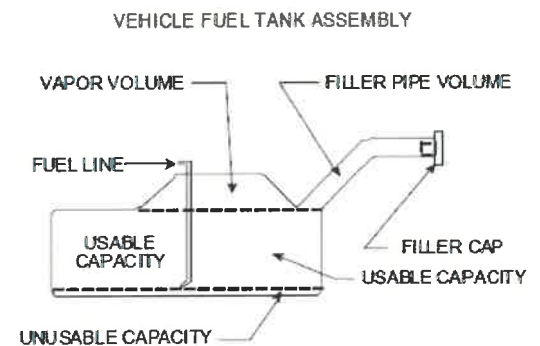
NA

Run engine until all fuel remaining in the fuel delivery system is used and engine stops.

NA

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

N/A



Yes No

NA

Is the vehicle equipped with an electric fuel pump?

NA

If yes, does the pump normally operate when the vehicle's electrical system is activated?

Initial:

- NA** Record the usable fuel tank capacity of both standard and optional (if applicable) fuel tanks in the space provided below as stated in the supplied FORM1.
- NA** Record the fuel tank capacity of both standard and optional (if applicable) fuel tanks as supplied in the owner's manual in the space provided below.
- NA** Calculate 1/3 of the usable capacity of the tank(s) (as supplied on Form 1) and record the calculated value in the space provided below.
- NA** Calculate 93% of the usable capacity of the fuel tank(s) and record the calculated value in the space provided below.
- NA** Using gasoline, fill the fuel tank to 100% of the usable capacity as supplied on Form 1.
- NA** Record the amount of fuel added for the "As Delivered" weight condition in the space provided below.

Note: Stoddard solvent shall be free of debris. It is considered debris-free only if upon filtering with a 10 micron filter, no solid debris is retained on the filter media or in any conduit, container or vessel upstream from the filter paper (e.g. debris is not allowed to be present in the funnel, pump or container).

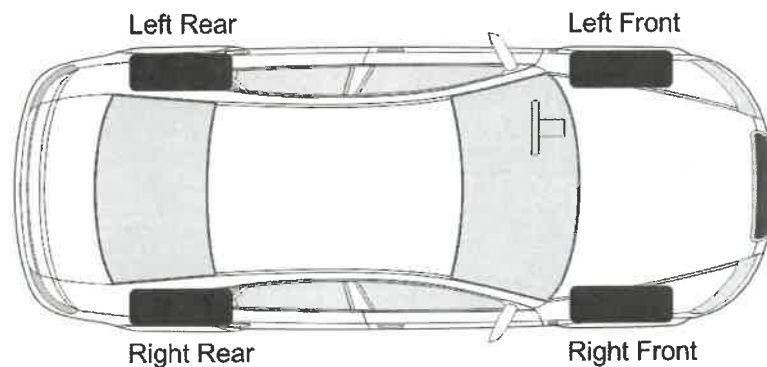
Fuel Tank Capacity Data

Usable Capacity of "Standard Tank" (see Form No. 1)	NA	liters
Usable Capacity of "Optional Tank" (see Form No. 1)		liters
Usable Capacity of Standard Tank (see Owner's Manual)		liters
Usable Capacity of Optional Tank (see Owner's Manual)		liters
1/3 of Usable Capacity		liters
93% of Usable Capacity		liters
Gasoline to Achieve 100% of Capacity (As Delivered)		liters

Initial:

- N/A** Crank the engine to fill the fuel delivery system with gasoline
- LC** Fill the coolant system to capacity.
- N/A** Fill the engine with motor oil to the maximum mark on the dip stick.
- N/A** Fill the transmission with transmission fluid to full capacity.
- LC** Fill the brake reservoir with brake fluid to its normal level.
- LC** Fill the windshield washer reservoir to capacity.
- LC** Inflate the tires to the cold tire pressure indicated on the tire placard. If no tire placard is available, inflate the tires to the recommended pressure in the owner's manual and record the pressure for each tire in the space provided below.

	Units	LF	RF	LR	RR
As Delivered	kpa	298	297	298	297
Tire Placard	kpa	290	290	290	290
Owner's Manual	kpa	290	290	290	290
Tire Pressure Gage Unique Identifier:			400650		



Initial:
LC+JL

Weigh the vehicle at each wheel and add the weights together to determine the "As Delivered" (or "Unloaded Vehicle") weight.

LC

Record the weight measurements and Weight Scale's Unique Identifier in the space provided below.

		As Delivered (UVW)		
	Units	Front Axle	Rear Axle	Total
Left	kg	619	661	$W_{Left} = 1280$
Right	kg	613	652	$W_{Right} = 1265$
Ratio	%	48.4 %	51.6 %	
Totals	kg	$W_F = 1232$	$W_R = 1313$	2545 ✓
Weight Scale Unique Identifier:		400519		

Initial:
LC

Calculate the Rated Cargo and Luggage Weight (RCLW) and record this value in the space provided below. For trucks, MPV's or Buses - **If the RCLW calculated is greater than 136 kg, use 136 kg as the RCLW.**

LC

Calculate the Test Vehicle Target Weight by adding the "As Delivered" weight, the RCLW, and the weight of the fully instrumented dummies in the space provided below.

Rated Cargo and Luggage Weight Calculation

	Units	Value	
Vehicle Capacity Weight (VCW - From Vehicle Placard)	kg	475	(A) ✓
Reduced Load Capacity (if Applicable)	kg	—	(B) ✓
Designated Seating Capacity (DSC - From Vehicle Placard)		5	(C) ✓
Rated Cargo and Luggage Weight (RCLW)	kg	134.8	$(C \times 68.04 \text{ kg}) - (A-B)$ ✓
Is the RCLW > 136 kg? If yes use 136 kg as RCLW	kg	—	

Target Test Weight Calculation

	Units	Value	
Total As Delivered Weight (UVW = Unloaded Vehicle Wgt.)	kg	2545	(A) ✓
Actual Weight of 1 – ES-2re ATD & 1 – SID-III's ATD (Ask ATD Lab for specific ATD Weight)	kg	131	(B) ✓
Rated Cargo / Luggage Weight (RCLW)	kg	134.8	(C) ✓
Calculated Vehicle Target Weight (TVTW)	kg	2810.8	$(A+B+C)$ ✓
Target Test Weight (min):	kg	2801.8	$(A+B+C) - 9.0 \text{ kg}$ ✓
Target Test Weight (max):	kg	2806.3	$(A+B+C) - 4.5 \text{ kg}$ ✓

Attitude - As Delivered Condition:

Performed by:

Jake L & Luke C

Date:

5/16/27

Note: Do not lift the vehicle off the ground until the attitude measurements have been taken.

Initial:

JL

With the vehicle in the "As Delivered" weight condition, place it on a flat, level surface.

JL

Place transmission in neutral. Note: If the vehicle has an Auto-Leveling, the ignition must be set to the "on" position. If the vehicle is equipped with a self-adjusting hydraulic system, contact the COTR for further guidance on attitude measurements.

JL

Exercise the suspension by rolling the vehicle forward and rearward approximately 4 to 6 feet. Repeat this step three to four additional times.

JL

Mark a point on each vehicle body above the center of each wheel.

JL

Measure the perpendicular distance from the level surface to the four (4) points marked on the vehicle and record each.

Vehicle Attitudes

Units

LF

RF

LR

RR

As Delivered

mm

893

890

903

903

Tape Measure Unique Identifier:

400602

CG - As Delivered Condition:

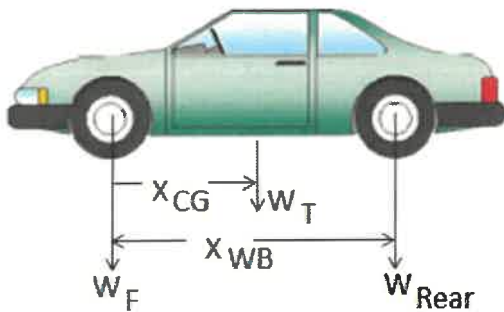
Performed by:

MP

Date:

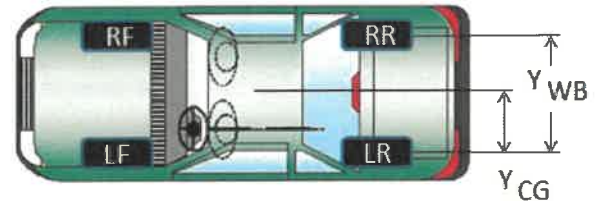
5/20/24
Initial:
MP

Measure and record the vehicle distances and copy the weights from the previous section in the space provided below in order to calculate the vehicle CG aft of the front axle.

Center of Gravity Calculation:


$$X_{CG} = \frac{X_{WB} \times W_{Rear}}{W_{Total}}$$

(From Front Axle)



$$Y_{CG} = \frac{Y_{WB} \times W_{Right}}{W_{Total}}$$

(From Left Wheel Centerline)

X_{CG}	=	X_{WB}	X	W_{Rear}	
<i>1596</i> <i>3094</i> mm	=	<i>3094</i> mm	X	<i>1313</i> kg	
				<i>2545</i> kg	
				W_{Total}	

Y_{CG}	=	Y_{WB}	X	W_{Right}	
<i>1686</i> mm	=	<i>1686</i> mm	X	<i>1265</i> kg	
<i>843</i>				<i>2545</i> kg	
				W_{Total}	<i>838</i>

Test Vehicle Center of Gravity (CG)

Vehicle CG (Aft of Front Axle)

Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)

Units

 As
Delivered

mm

1596
 X_{CG}

mm

5
 Y_{CG}

Weight – Fully Loaded Condition:

Performed by:

Luke C + Jake L

Date:

5-16-24

Initial:

LC+JL

With the vehicle in the "As Delivered" weight condition, load the vehicle with the ballast equal to the RCLW placed in the luggage or load carrying/cargo area. Center the load over the longitudinal centerline of the vehicle.

LC

Place the weight of the fully instrumented test dummy (with clothes and shoes) into the appropriate seating positions. **(Ask ATD Lab for specific ATD Weight)**

LC

Reference weight: Driver 178.6 lbs.

LC

Reference weight: Rear Passenger 110.2 lbs.

LC+JL

Weigh the vehicle at each wheel and add the weights together to determine the "Fully Loaded" weight. Record the weight measurements in the space provided below.

		Fully Loaded		
	Units	Front Axle	Rear Axle	Total
Left	kg	672	778	$W_{Left} = 1450$
Right	kg	618	745	$W_{Right} = 1363$
Ratio	%	45.9 %	54.1 %	
Totals	kg	$W_F = 1290$	$W_R = 1523$	2813
Weight Scales Unique Identifier:		400519		

Attitude - Fully Loaded Condition:

Performed by:

Luke C + Jake L

Date:

5-16-24

Initial:

LC

With the vehicle in the "Fully Loaded" weight condition, place it on a flat, level surface.

Note: If the vehicle has an Auto-Leveling, the ignition must be set to the "on" position. If the vehicle is equipped with a self-adjusting hydraulic system, contact the COTR for further guidance on attitude measurements.

JL

Exercise the suspension by rolling the vehicle forward and rearward approximately 4 to 6 feet. Repeat this step three to four additional times.

JL

Measure the perpendicular distance from the level surface to the four (4) points previously marked on the vehicle and record each in the space provided below.

JL

Record the Unique Identifier of the inclinometer used to complete these measurements in the space provided below.

Vehicle Attitudes

Units

LF

RF

LR

RR

Fully Loaded

mm

882

888

880

886

Tape Measure Unique Identifier:

400602

CG - Fully Loaded Condition:

Performed by:

MP

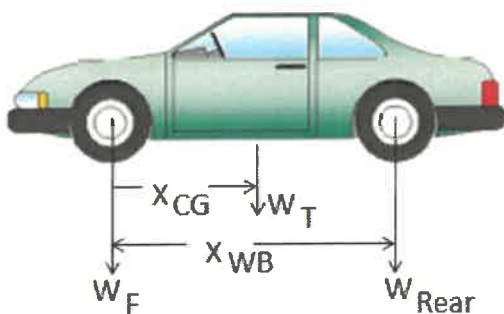
Date:

5/20/24

Initial:

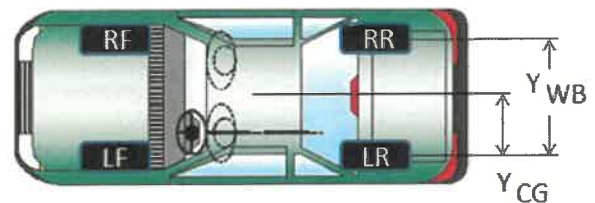
MP

Measure and record the vehicle distances and copy the weights from the previous section in the space provided below in order to calculate the vehicle CG aft of the front axle and left (+) / right (-) from the longitudinal centerline.

Center of Gravity Calculation:


$$X_{CG} = \frac{X_{WB} \times W_{Rear}}{W_{Total}}$$

(From Front Axle)



$$Y_{CG} = \frac{Y_{WB} \times W_{Right}}{W_{Total}}$$

(From Left Wheel Centerline)

$$X_{CG} = \frac{X_{WB} \times W_{Rear}}{W_{Total}}$$

$1675 \text{ mm} = \frac{3094 \text{ mm} \times 1523 \text{ kg}}{2813 \text{ kg}}$

$$Y_{CG} = \frac{Y_{WB} \times W_{Right}}{W_{Total}}$$

$\frac{1686 \text{ mm}}{2} = \frac{1686 \text{ mm} \times 1363 \text{ kg}}{2813 \text{ kg}}$

Test Vehicle Center of Gravity (CG)

Vehicle CG (Aft of Front Axle)

Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)

Units	As Delivered	
mm	1675	X _{CG}
mm	26	Y _{CG}

Drain Fuel and Paint Vehicle:

Performed by:

Luke C + JAKE L

Date:

5-16-24

Initial:

LC+JL

Remove the ballast weight (RCLW) from the cargo area.

N/A

Drain the fuel tank. Use caution when draining the fuel. Do not damage or remove any fuel system components.

N/A

 Using purple dyed Stoddard solvent fill the tank to 93 % ($\pm 1\%$) of the usable capacity as supplied on Form 1 found in a previous section.

Record this amount of Stoddard solvent in the space provided below along with the Unique Identifier of the meter used to conduct this task.

Record this amount on the inside of the fuel filler lid.

Actual Amount of Solvent Used in Test

liters

Pump Meter Unique Identifier

Yes No

 Is the Actual Amount of Solvent Used in the test equal to 93% $\pm$ 1% of the Usable Capacity stated in on Form No. 1?

Initial:

JL

Disable all side airbags on the non-struck side of the vehicle per manufacturer's instructions. If manufacturer will be here for the test confirm that the manufacturer has disabled these airbags prior to conducting the test.

N/A

Disable vehicle Daytime Running Lights (if equipped).

LC

Remove horn fuse.

N/A

Tape off interior airbag covers, instrument cluster, transmission gear selector, and airbag cut-off switch (if equipped).

LC

Paint vehicle interior surfaces such as the instrument panel, A-post trim panels, door trim panels, console, etc., with flat white paint. Note: Do not paint points marked on dash if they are present before painting. Note: The air bag indicator light on the dash shall NOT be painted so as to be visible prior to testing. Also be sure not to paint over passenger air bag indicator light.

LC

Black out mirrors.

LC

Place driver and passenger front windows in the fully open position. Place all other windows and vents in the fully closed position unless otherwise specified by the COTR.

LC

Adjustable cowl tops or other adjustable panels in front of the windshield should be placed in the position used under normal operation during inclement weather.

N/A

Evacuate refrigerant.

N/A

Tap brakes for abort.

N/A

Drain the engine oil *

N/A

Drain the transmission fluid *

N/A

Drain the transfer case (4WD) *

N/A

Drain the engine coolant *

LC

Drain the windshield washer fluid *

N/A

Drain the power steering fluid *

JL

Connect 305 monitoring and make sure engineer takes required 305 photos

LC

Install 305 tow hook to rear of vehicle

*Note: Ensure that no fluids are leaking from the vehicle after being drained. Seal any leaks before vehicle is transported to the test track.

Mechanical Preparation:

Performed by:

LUKE C + JAKE L

Date:

5-16-24

Initial:

LC + LC

Remove trunk carpeting, spare tire and jack (in trunk). Note: Per the NHTSA procedure, the spare tire, rear radio speakers, interior door trim and windows on the non-struck side, outboard mirrors on non-struck side taillights and rear bumper can be removed – IF NECESSARY. Refer to the Form 1 for a list of components that the manufacturer will allowed to be removed from the vehicle.

Equipment that is no longer on the test vehicle:

Description	Weight	Description	Weight
Trunk carpeting	20 kg		kg
Spare tire	— kg		kg
Jack	— kg		kg
Rear speaker	# 2 kg		kg
Tail light	— kg		kg
CHARGER KIT	4 kg		kg

Weight Scale Unique Identifier:

400519

Explanation for equipment removal:

Instrumentation PLATE + CABLES

Initial:		Description	Qty.
LC	1	Trunk Release NOT FOR REAR. Cut trunk release cable inside of vehicle and route outside to rear deck lid.	1
LC	2	Hood Release NOT FOR FRONTAL. Cut hood release cable near fender and tape to bumper.	1
JL	3	Instrumentation Plate Install instrumentation plate in trunk. Note location of all fuel components and use caution when drilling holes.	1
N/A	4	Abort Package Install abort package on instrumentation plate leading to rear brakes. Verify no leaks.	0
N/A	5	Roof Camera Mount Interior T-Bar, stay clear of side curtain air bags when drilling.	0
JL	6	Side Door Camera Mount	2
LC	7	Hood Camera Mount	1
N/A	8	Toe Pan Camera Mount Place seat in test position. Install toe pan camera in corresponding footwell area as far back as possible. Check for fuel lines before drilling.	0
JL	9	LED Light On the camera mount, attach (2) LED lights to either side of each camera (2 in total).	3
N/A	10	Remote Battery and Cable Route remote battery cable over the vehicle on the non-struck side to the monitor box. Not needed for AGM type battery.	0
JL+LC	11	Battery Monitor Box Mount the battery monitor box to the right rear corner / non-struck corner.	1
	12	Umbilical Hangar	1

N/A

Attach the umbilical hanger to rear quarter panel on same side as umbilical

N/A	13	Air Bag Monitor	0
-----	----	------------------------	---

As per test request, connect inductive pickup to corresponding airbag positive (+) wire.

N/A	14	Overhead Target Bar	0
-----	----	----------------------------	---

Refer to Vehicle Targeting section

LC

	15	Trigger	2
--	----	----------------	---

Tape (2) triggers centered on the front hood and run cables to the truck / cargo area. Leave 2 feet of cable slack on hood.

	16	Flash Unit	0
--	----	-------------------	---

N/A Attach flash units.

	17	LED Light Box	1
--	----	----------------------	---

B6

Mount one LED Light box to the instrumentation plate.

B6

	18	Camera Network Box	1
--	----	---------------------------	---

Mount on instrumentation plate or rear floor pan depending on camera placement. Only 1 cable per camera, no extensions.

	19	Breakout Box / Hub	1
--	----	---------------------------	---

SK

Mount Breakout Box hub to instrumentation plate.

SK

	20	DAU (KI/MINI)	3
--	----	----------------------	---

Mount (3) DAUs to the instrumentation plate.

N/A	21	Wireless Antenna	1
		Mount (1) wireless antenna within the trunk / cargo compartment.	
N/A	22	Speed Trap Bar	0
		Fasten speed trap bar to rear bumper of vehicle, opposite side of umbilical. (395 mm minimum height)	
	23	25ft Camera Cable	3
B6			
	24	IDT Camera	3
B6		Mount (2) IDT cameras to the onboard camera mounts.	
N/A	25	GoPro Camera	0
N/A	26	Seat Belt Displacement Sensor	0
		Screw displacement sensor bracket to corresponding pillar in line with seat belt at thorax height as per dummy placement	
N/A	27	Seat Belt Load Cell	0
		(See Form 1) - Place (2) seat belt load cells on the front driver's seat. Place (2) seat belt load cells on the front passenger seat.	

Onboard Camera Installation:

Performed by:

BG

Date:

5/20/24

BG

Install Camera Hub with Power & Trigger Cables

BG

Install On-Board Camera's & Cables to Mounts

BG

Check to make sure all required camera views are met. If not readjust camera mounts until all required views are met. (See photo references below)

BG

Verify the Battery is fully charged

BG

Install On-Board Lights Battery Box & ensure all light cables reach the box. If they do not install extension cables.

BG

Tie down all wiring related to the cameras and lights

BG

Pin all onboard cameras & camera bars to stabilize images during the impact.

High speed camera and light mounts photo reference:

High speed camera (1000 fps): Camera #7 – Onboard Dummy Front View and two LED lights to capture the following field of view:



High speed camera (1000 fps): Camera #8 –Onboard Dummy Side View and two LED lights to capture the following field of view:



High speed camera (1000 fps): Camera #9 – Onboard Dummy Rear Passenger Side View and two LED lights to capture the following field of view:



Section

4

Seat Positioning, Seat Setting, H- Point & Targeting

1st Row Seat Positioning – Reference Marks:

Performed by:

Kyle Glarb

Date:

5-15-24

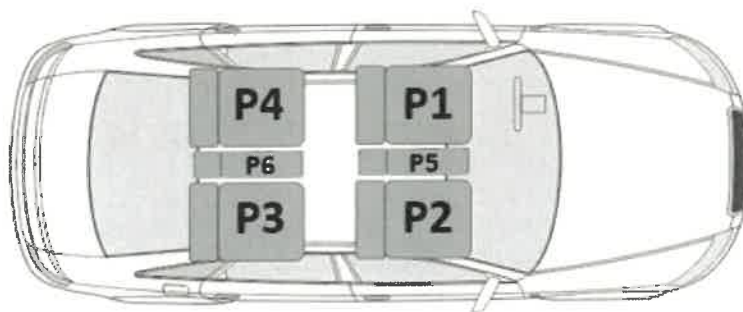
Tape Measure Unique Identifier:

400602

Inclinator Unique Identifier:

401471

Instructions: In this section there are three sets of check marks. The first row corresponds with the front driver seat (P1), the second row corresponds with the front center seat (P5) and the third row corresponds with the front passenger seat (P2).



Setting the Seats - Driver, Front Center, and Front Passenger Seats

Set the driver, front center (if applicable), and front passenger seats accordingly:

Initial Settings

Initial:

KLG

1. Determine the Seat Type

Visually inspect the front seats to determine its type (i.e., bucket or bench).

Driver Seat:

Bench

Bucket

☒

Front Outboard Passenger Seat:

Bench

Bucket

☒

Front Center Seat:

Bench

Bucket

N/A

P1

P5

P2

KLG

N/A

KLG

2. Position lumbar supports

Position the seat's adjustable lumbar supports to the lowest, retracted or deflated adjustment positions.

☐

N/A, No lumbar adjustment

N/A N/A N/A

3. Position additional supports

Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.



N/A, No additional support adjustment

N/A N/A N/A

4. Position leg supports

Position an additional leg support system in its rearmost position.



N/A, No additional support adjustment

HAG HAG

5.2.1. Position head restraint

Using any adjustment of the head restraint, position it to its highest position.

HAG HAG

5.2.2. Using any adjustment of the head restraint, position it to the full forward position. If it rotates, rotate it such that the head restraint extends as far forward as possible. Record the position of the head restraint in the space below.



N/A – The test vehicle is equipped with automatically adjusting head restraints or there is no head restraint adjustment.

Head Restraint Adjustment

Total # of Positions

Placed in Position #

Driver Seat

H₀ - 3

H₀

HAG HAG

6. Mark the longitudinal centerline of the seat



6.1 Driver's seat:

If adjustable, place the seat back in its most vertical (upright) position. For bucket seats, locate and **mark** for reference the intersection of a vertical longitudinal plane that passes through the SgRP and the seat cushion upper surface, seat back and head restraint. For bench seats, draw a line along the intersection of a vertical longitudinal plane that passes through the centerline of the steering wheel and the seat cushion upper surface, seat back and head restraint.

HAG HAG

7. Mark the range of seat travel

Prior to marking the seat, move the seat through its full range of motion using all available controls. Separately, operate each control to determine whether it moves the seat and/or seat cushion primarily in the fore-aft or up-down directions.

Seat Fore/Aft Positioning	Total Fore/Aft Travel	Placed in Position #
Driver	259 mm	129.5 mm
Front Passenger Seat	258 mm	129 mm

Front Center Seat

N/A

N/A

N/A N/A N/A

7.1 Mark a point (seat cushion reference point - **SCR**P) on the side of the seat cushion that is between 150 mm and 250 mm from the front edge of the seat cushion. For seat cushions that move up and down independently from the seat housing, mark the point on the side of the cushion in an area that will not be obscured by the seat housing when the seat cushion is at its lowest height position.

7.2 Draw a horizontal line (seat cushion reference line - **SCR**L) through the **SCR**P.

7.3 Use only the controls that primarily move the seat in the fore-aft direction to move the **SCR**P to the rearmost position.

7.4 If the seat cushion adjusts fore-aft, independent of the seat back, use only the controls that primarily move the seat cushion in the fore-aft direction to move the **SCR**P to the rearmost position.

N/A No independent fore-aft seat cushion adjustment

293

7.5 Use any part of any control, other than the parts just used for fore-aft positioning, to determine the range of angles of the **SCR**L and to set the **SCR**L at mid-angle. Record the maximum, minimum and midangles in the table below;

Max	Min	Mid	FDP
18.8	10.5	14.7	14.7
18.1	9.9	14.0	14.0
N/A	N/A	N/A	

7.6 If the seat and/or seat cushion height is adjustable, use any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, to put the **SCR**P in its lowest position with the **SCR**L angle at the mid-angle found in 7.5.

N/A No independent fore-aft seat cushion adjustment

7.7 Use only the controls that primarily move the seat in the fore-aft direction to verify the seat is in the rearmost position.

SCR L
Driver Seat
Front Passenger Seat
Front Center Seat

N/A	N/A	N/A

7.8 Use only the controls that primarily move the seat in the fore-aft direction to **mark** the fore-aft seat positions. **Mark** each position so that there is a visual indication when the seat is at a particular position. For manual seats, move the seat forward one detent at a time and **mark** each detent. For power seats, **mark** only the rearmost, middle, and foremost positions. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the closest adjustment position to the rear of the mid-point), and R for rearmost.

7.9 Use only the controls that primarily move the seat in the fore-aft direction to move the **SCR** to the rearmost position.

7.10 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find the maximum, minimum, and middle height of the **SCR** with the **SCRL** at the mid-angle determined in 7.5 by measuring from the **SCR** to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights on the table below.

N/A No independent fore-aft seat cushion adjustment

7.11 Use only the controls that primarily move the seat and/or seat cushion in the fore-aft direction to place the **SCR** at the mid-fore-aft position.

7.12 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find the maximum, minimum, and middle height of the **SCR** with the **SCRL** at the mid-angle determined in 7.5 by measuring from the **SCR** to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights on the table below.

7.13 Use only the controls that primarily move the seat in the fore-aft direction to place the **SCR** at the full forward position.

7.14 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find and visually **mark** the maximum, minimum, and middle height of the **SCR** with the **SCRL** at the midangle determined in 7.5 by measuring from the **SCR** to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights and SCRL mid-angle on the table below.

Seat	SCRL Mid-Angle (7.5)	SCR P Height Position	SCR P Height (mm)		
			Rearmost (7.10)	Mid-fore/aft (7.12)	Full forward (7.14)
Driver Seat	14.7	Max	63	67	70
		Mid	63 32	36	39
		Min	0	(4)	7
Front Passenger Seat	14.0	Max	63	66	70
		Mid	32	35	39
		Min	0	(4)	7
Front Center Seat	N/A	Max	N/A	N/A	N/A
		Mid	↓	↓	↓
		Min	↓	↓	↓

MR
N/A
MR

8. For adjustable seat backs, position the seat back at the foremost stop. Mark each position of adjustment from the foremost to rearmost stops so that there is a visual indication when the seat back is at a particular position.

For manually adjustable seat backs (with detents), move the seat back rearward one detent at a time and mark each detent. Label the rearmost, middle, and foremost positions with the measured detent. If no middle detent exists, label the next most-rearward detent to the middle position.

For power seat backs (no detents), move the seat back rearward one degree at a time and mark each angle. Angles should be measured at the location on the seat (head restraint, seat back, plastic trim, etc.) as indicated by the manufacturer on Form No. 1. Label the rearmost, middle, and foremost positions with the measured angle.

Record the range of angles in degrees and detents in the space provided below. Visually mark and label for future reference the rear seat back angle, if adjustable, as provided by the manufacturer on Form No. 1 for the 50th percentile (ES-2re) male dummy in a Side MDB test.

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents *	Degree	Detent *
Driver Seat w/ Seated Dummy	+ 40.6	POWERED	- 0.2 ^{0.35}	POWERED
Front Passenger Seat	+ 40.5	POWERED	+ 0.0	POWERED
Front Center Seat	N/A	N/A	N/A	N/A

☒ ☐ ☒

8. Mark the seat belt upper anchorage positions

Mark for reference each vertical position of a manually adjustable seat belt upper anchorage.

Mark and label each position with the following: H for highest, M"X" for mid-positions (where "X" stands for 1, 2, 3, etc. and 1 is used for the highest mid-position), and L for lowest.



N/A No independent fore-aft seat cushion adjustment

☒ 9. Mark the steering wheel position

Is the steering wheel adjustable up and down and/or in and out?



Yes, go to 9.1



No - Check Sheet completed.

☒ 9.1 Find and **mark** for future reference each up and down position. Label three of the positions with the following: H for highest, M for mid-position (if there is no mid-position, label the next lowest adjustment position), and L for lowest.



N/A steering wheel is not adjustable up and down

☒ 9.2 Find and **mark** for future reference each -in- and -out- position. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the next rearmost adjustment position), and R for rearmost.

2nd Row Seat Positioning – Reference Marks:

Performed by:

Myle Glueb

Date:

5-15-24

Tape Measure Unique Identifier:

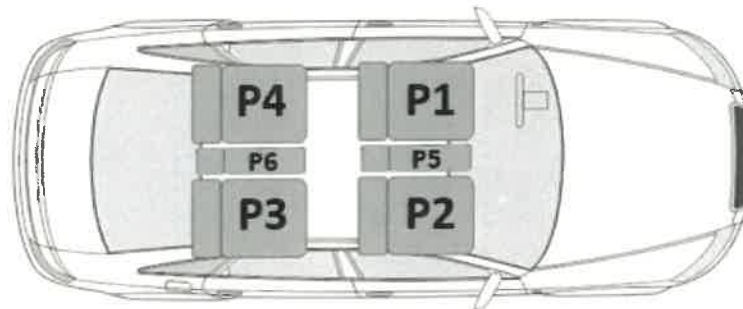
400602

Inclinometer Unique Identifier:

~~*401241*~~ *401471*

MAG 5-15-24

Instructions: In this section there are three sets of check marks. The first row corresponds with the rear struck side seat (left rear seat P4), the second row corresponds with the rear center seat (P6) and the third row corresponds with the rear outboard passenger seat (P3).



Setting the Seats - Driver, Front Center, and Front Passenger Seats

Set the driver, front center (if applicable), and front passenger seats accordingly:

Initial Settings

Initial:

MAG

1. Determine the Seat Type

Visually inspect the front seats to determine its type (i.e., bucket or bench).

Struck Side Rear Passenger Seat:

Bench ☒

Bucket ☐

Non-Struck Side Passenger Seat:

Bench ☒

Bucket ☐

Rear Center Seat:

Bench ☒

Bucket ☐

P4 *N/A* P6 *N/A* P3 *N/A*

2. Position lumbar supports

Position the seat's adjustable lumbar supports to the lowest, retracted or deflated adjustment positions.



N/A, No lumbar adjustment

N/A
FIRE D
TOP

3. Position additional supports

Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.



N/A, No additional support adjustment

N/A

4. Position leg supports

Position an additional leg support system in its rearmost position.



N/A, No additional support adjustment

N/A

5.2.1. Position head restraint

Does the adjustable head restraint have a non-use position as defined by FMVSS No. 202a?

N/A

Yes - Set the head restraint to the lowest position using the procedure described by the manufacturer. Record position in table below. Go to step 6.



No – go to step 5.1.2

Head Restraint Adjustment

Total # of Positions

Placed in Position #

Rear Passenger Seat

1 - 1

1 (LOWEST)

N/A

5.1.2. Using any adjustment of the head restraint, position it to its lowest position.

N/A

5.1.3 Using any adjustment of the head restraint, position it to the full forward position. If it rotates, rotate it such that the head restraint extends as far forward as possible.



N/A – The test vehicle is equipped with automatically adjusting head restraints or there is no head restraint adjustment.

N/A

6. Mark the longitudinal centerline of the seat



6.1 Driver's seat:

If adjustable, place the seat back in its most vertical (upright) position. For bucket seats, locate and mark for reference the intersection of a vertical longitudinal plane that passes through the SgRP and the seat cushion upper surface, seat back and head restraint. For bench seats, draw a line along the intersection of a vertical longitudinal plane that passes through the centerline of the steering wheel and the seat cushion upper surface, seat back and head restraint.

Fixed Fixed Fixed

7. Mark the range of seat travel

Prior to marking the seat, move the seat through its full range of motion using all available controls. Separately, operate each control to determine whether it moves the seat and/or seat cushion primarily in the fore-aft or up-down directions.

Seat Fore/Aft Positioning	Total Fore/Aft Travel	Placed in Position #
Struck Side Rear Seat	Fixed	Fixed
Non-Struck Side Rear Seat	↓	↓
Rear Center Seat	↓	↓

Fixed Fixed Fixed

Fixed Fixed Fixed

Fixed Fixed Fixed

Fixed Fixed Fixed

Fixed Fixed Fixed

7.1 Mark a point (seat cushion reference point - **SCRCP**) on the side of the seat cushion that is between 150 mm and 250 mm from the front edge of the seat cushion. For seat cushions that move up and down independently from the seat housing, mark the point on the side of the cushion in an area that will not be obscured by the seat housing when the seat cushion is at its lowest height position.

7.2 Draw a horizontal line (seat cushion reference line - **SCRL**) through the **SCRCP**.

7.3 Use only the controls that primarily move the seat in the fore-aft direction to move the **SCRCP** to the rearmost position.

7.4 If the seat cushion adjusts fore-aft, independent of the seat back, use only the controls that primarily move the seat cushion in the fore-aft direction to move the **SCRCP** to the rearmost position.

Fixed N/A No independent fore-aft seat cushion adjustment

7.5 Use any part of any control, other than the parts just used for fore-aft positioning, to determine the range of angles of the **SCRL** and to set the **SCRL** at mid-angle. Record the maximum, minimum and midangles in the table below;

SCRL°	Max	Min	Mid
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	↓	↓	↓
Rear Center Seat	↓	↓	↓

[illegible]

7.6 If the seat and/or seat cushion height is adjustable, use any part of any control other than the parts which primarily move the seat or seat cushion fore-aft, to put the **SCR**P in its lowest position with the **SC**RL angle at the mid-angle found in 7.5.

N/A No independent fore-aft seat cushion adjustment

7.7 Use only the controls that primarily move the seat in the fore-aft direction to verify the seat is in the rearmost position.

7.8 Use only the controls that primarily move the seat in the fore-aft direction to **mark** the fore-aft seat positions. **Mark** each position so that there is a visual indication when the seat is at a particular position. For manual seats, move the seat forward one detent at a time and **mark** each detent. For power seats, **mark** only the rearmost, middle, and foremost positions. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the closest adjustment position to the rear of the mid-point), and R for rearmost.

7.9 Use only the controls that primarily move the seat in the fore-aft direction to move the **SCR** to the rearmost position.

7.10 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find the maximum, minimum, and middle height of the **SCR**P with the **SC**RL at the mid-angle determined in 7.5 by measuring from the **SCR**P to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights on the table below.

N/A No independent fore-aft seat cushion adjustment

7.11 Use only the controls that primarily move the seat and/or seat cushion in the fore-aft direction to place the **SCR** at the mid-fore-aft position.

7.12 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find the maximum, minimum, and middle height of the **SCR**P with the **SCR**L at the mid-angle determined in 7.5 by measuring from the **SCR**P to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights on the table below.

7.13 Use only the controls that primarily move the seat in the fore-aft direction to place the **SCRIP** at the full forward position.

7.14 Use any part of any control, other than the parts which primarily move the seat or seat cushion fore-aft, to find and visually **mark** the maximum, minimum, and middle height of the **SCR_P** with the **SCR_L** at the midangle determined in 7.5 by measuring from the **SCR_P** to a reference point on the floor pan or sill. Record the maximum, minimum and middle heights and SCR_L mid-angle on the table below.

Seat	SCRL Mid-Angle (7.5)	SCR Height Position	SCR Height (mm)		
			Rearmost (7.10)	Mid-fore/aft (7.12)	Full forward (7.14)
Struck Side Rear Seat	FIXED	Max	N/A	N/A	N/A
		Mid			
		Min			
Non-Struck Side Rear Seat		Max			
		Mid			
		Min			
Rear Center Seat		Max			
		Mid			
		Min			

HLG
FIXED TO PL
RLG

8. For adjustable seat backs, position the seat back at the foremost stop. Mark each position of adjustment from the foremost to rearmost stops so that there is a visual indication when the seat back is at a particular position.

For manually adjustable seat backs (with detents), move the seat back rearward one detent at a time and mark each detent. Label the rearmost, middle, and foremost positions with the measured detent. If no middle detent exists, label the next most-rearward detent to the middle position.

For power seat backs (no detents), move the seat back rearward one degree at a time and mark each angle. Angles should be measured at the location on the seat (head restraint, seat back, plastic trim, etc.) as indicated by the manufacturer on Form No. 1. Label the rearmost, middle, and foremost positions with the measured angle.

Record the range of angles in degrees and detents in the space provided below. Visually mark and label for future reference the rear seat back angle, if adjustable, as provided by the manufacturer on Form No. 1 for the 5th percentile (SID-IIs) female dummy in a Side MDB test.

detent oper from 1

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents *	Degree	Detent *
Struck Side Rear Seat (P4)	28.5	0-1	23.5 <i>24.00</i>	0
Non-Struck Side Rear Seat (P3)	28.5	0-1	23.5	0
Rear Center Seat (P6)	— FIXED TO		P4	—

☒ FIXED
 ☒ N/A
 ☒ FIXED

9. Mark the seat belt upper anchorage positions

Mark for reference each vertical position of a manually adjustable seat belt upper anchorage.

Mark and label each position with the following: H for highest, M"X" for mid-positions (where "X" stands for 1, 2, 3, etc. and 1 is used for the highest mid-position), and L for lowest.



N/A No independent fore-aft seat cushion adjustment

N/A

10. Mark the steering wheel position

Is the steering wheel adjustable up and down and/or in and out?



Yes, go to 9.1



No - Check Sheet completed.

N/A

10.1 Find and **mark** for future reference each up and down position. Label three of the positions with the following: H for highest, M for mid-position (if there is no mid-position, label the next lowest adjustment position), and L for lowest.



N/A steering wheel is not adjustable up and down

N/A

10.2 Find and **mark** for future reference each -in- and -out- position. Label three of the positions with the following: F for foremost, M for mid-position (if there is no mid-position, label the next rearmost adjustment position), and R for rearmost.

H-Point Left Front Seat (Position 1):

Performed by:

Hyle Glab

Date:

5-15-24

Initial:

Hyle

Place a piece of muslin cloth over seat area.

Place H-point machine in center of seat. Note: If vehicle is a bench seat, then the center is aligned with the center of the steering column. For the passenger seat, the center is found by placing the machine the same distance outboard from the vehicle centerline as for the driver seat. If the seat is a bucket, place the H-point machine on the seat centerline.

Attach leg assemblies. T-bar parallel to ground and perpendicular to vehicle centerline. T-bar set at 15.8, legs set at 16.3 for 50th percentile.

Position right driver's foot on un-depressed accelerator pedal. Insert pin in right foot to ensure angle is not less than 87 degrees. Sole on pedal and heel as far forward as possible. Left knee is placed same distance from H-point machine centerline as right knee.

Position knees 254 mm apart. Place feet as far forward as possible.

Apply lower leg and thigh weights.

Tilt back pan forward. Pull T-bar forward then release to allow machine to slide back into seat.

Apply a 22 pound rearward load at the intersection of hip angle and T-bar. Apply load twice.

Return back plane to seat back.

Prevent H-point machine from sliding forward for the rest of the procedure.

Install buttock and torso weights.

Move back plane forward and rock 3 times over a 10 degree arc.

Lift each leg and allow it to fall into place. Make sure seat pan is level (i.e. no roll) and return back pan to seat back.

Apply force to the back pan to either: (1) Increase hip angle 3 degrees. (2) Maximum of 15 pounds.

Record H-Point Machine Torso Angle in the space provided below.

Record H-Point Machine Hip Point location in the space provided below.

Place H-point target sticker on outside of vehicle door.

H-Point Machine Torso Angle

21.9 degrees

H-Point Machine Hip Angle

99 degrees

Seatback Angle (Headrest Post)

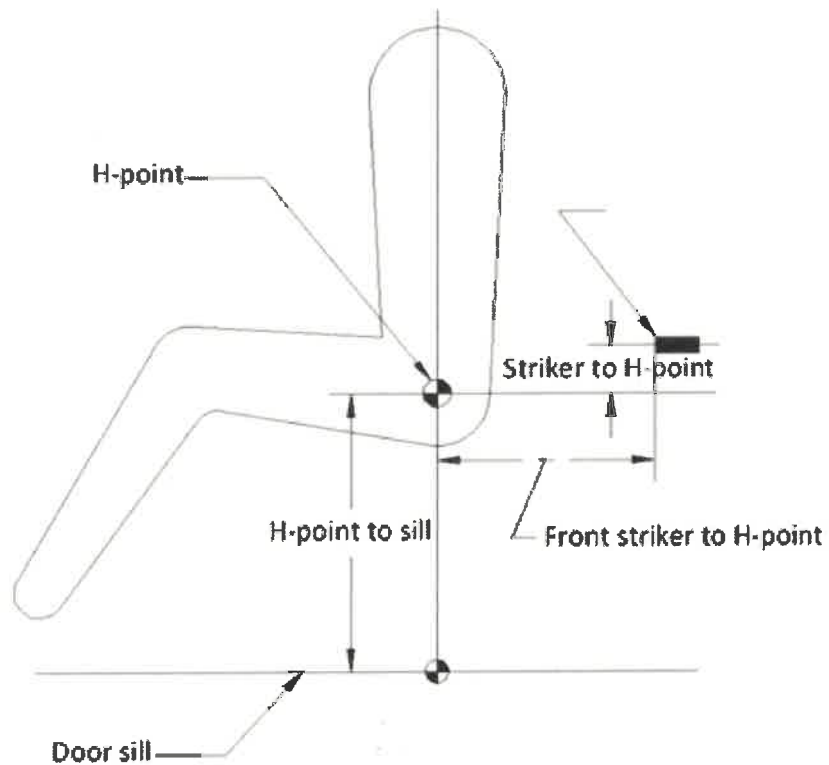
+0.0 degrees

Hip Point: X (fore/aft of striker)

191.1 mm

Z (above/below striker)

151.0 mm



1st Row Seat Positioning – Setting Seats

Performed by:

Myle Glarb

Date:

S-15-24

Tape Measure Unique Identifier:

400602

Inclinometer Unique Identifier:

401471

Instructions: In this section there are three sets of check marks. The first row corresponds with the front driver seat (P1), the second row corresponds with the front center seat (P5) and the third row corresponds with the front passenger seat (P2).

Setting the Seats - Driver, Front Center, and Front Passenger Seats

Set the driver, front center (if applicable), and front passenger seats accordingly:

Initial:

P1

P5

P2

KAG NNA KAG

UNA



1. Set the seat for a (ES-2re) test dummy

Using the reference marks on the seat, set the seat in the mid fore-aft, lowest height at mid seat cushion angle position as follows;

1.1 Using the control that primarily moves the seat fore and aft, move the **SCR** to the mid-travel (i.e., mid-fore aft) position.

1.2 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft set the height of the **SCR_P** to the minimum height, with the **SCR_L** set as closely as possible to the mid-angle.

1.3 Set the seat back angle at the manufacturer's nominal design riding position for a 50th percentile adult male in the manner specified by the manufacturer. If the position is not specified, set the seat back at the first detent rearward of 25° from vertical.

Seat Back Angle +0.0°

N/A The seat back does not adjust.

Using any adjustment of the head restraint, position it to its highest position. Using any adjustment of the head restraint, position it to the full forward position.

2nd Row Seat Positioning – Setting Seats

Performed by:

Kyle GlauB

Date:

5-15-24

Tape Measure Unique Identifier:

400602

Inclinometer Unique Identifier:

401471

Instructions: In this section there are three sets of check marks. The first row corresponds with the rear struck side seat (left rear seat P4), the second row corresponds with the rear center seat (P6) and the third row corresponds with the rear outboard passenger seat (P3).

Setting the Seats - Rear Struck Side Seat, Rear Center, and Rear Outboard Seats

Using the reference marks determined in the previous section, set the seats accordingly for a SID-IIs ATD:

Set the seat at rearmost fore/aft position, lowest height at mid-angle.

Initial:

P4	P6	P3
KAG	Fixed TOP	KAG
KAG		KAG
KAG	+	KAG

1.1 Using the control that primarily moves the seat fore and aft, move the **SCR**P to the rearmost position.

1.2 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the height of the **SCR**P to the lowest height, with the **SC**RL set as closely as possible to the mid-angle.

☐ N/A The seat is not adjustable.

1.3 Fully recline the seat back

☐ N/A The seat back does not adjust.

Setting Steering Wheel & Seat Belt Adjustment

Performed by:

Kyle Glaub

Date:

5-14-24

Tape Measure Unique Identifier:

400602

Inclinometer Unique Identifier:

401471

Setting Steering Wheel, Seat Belt Anchorages, Belt Guides, etc.

Steering Wheel Adjustment - If the steering wheel is adjustable up and down and/or in and out complete the following steps to set the final steering wheel location:

Initial:

NAC

11. Set the steering wheel to the mid-position

Use the markings to position the steering wheel hub at the geometric center of full range of driving positions including any telescoping positions or if applicable, the next lowest detent position. Complete the following table

N/A steering wheel does not adjust.

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.

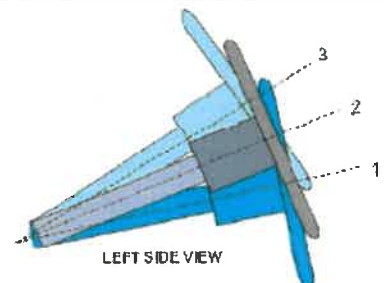
	Degrees	Fore / Aft Position (mm)
Lowermost, Position No. 1	17.2	
Geometric Center, Position No. 2	19.3	
Uppermost, Position No. 3	21.3	
Telescoping Steering Wheel Travel		53
Test Position	19.3	26.5

Reference distance from ceiling to center of steering wheel. Mark point in ceiling.

440 mm

Reference distance from front of dash to steering wheel. Mark points on dash and steering wheel.

180 mm



Adjustable Seat Belt Anchorages

Initial:

NAC

Place adjustable seat belt anchorages in the nominal adjustment position in accordance with the manufacturer's data on Form No. 1 for a 50th percentile (ES-2re) male adult occupant and a 5th percentile (SID-IIs) female adult occupant.

Note the position of the seat belt anchorages in the space provided below.

	Total # of Positions	Placed in Position #
Driver Seat	H ₀ - 3	H ₀
Rear Passenger Seat	FIXED	FIXED

N/A

Seat Belt Guides: Usage of seat belt guides should be set in accordance with instructions included in the vehicle owner's manual or in Form No. 1.

Photographic Tape & Measurements

Performed by:

Kyle Glarb

Date:

5-15-24

Initial:

KAG

Align the left edge of 25 mm (1 inch) wide yellow/black checkerboard tape along the vertical impact reference line as defined below. Reference illustrations can be found on the next page.

For passenger vehicles

Test Vehicle Wheelbase Length	Vertical Impact Reference Line Location
Less than or equal to 2,896 mm	940 mm +/- 5 mm forward of wheelbase centerline
Greater than 2,896 mm	508 mm +/- 5 mm rearward of front axle centerline

For multipurpose vehicles, sport utility vehicles, light trucks and vans:

Test Vehicle Wheelbase Length	Vertical Impact Reference Line Location
Less than or equal to 2,489 mm	305 mm +/- 5 mm rearward of front axle centerline
Greater than 2,489 mm but less than 2,896 mm	940 mm +/- 5 mm forward of wheelbase centerline
Greater than 2,896 mm	508 mm +/- 5 mm rearward of front axle centerline

Note: For different wheelbase versions of the same model vehicle, the vertical impact reference line may be determined by the following procedure:

- Select the shortest wheelbase version of the same model and locate the vertical impact reference line as described above.
- Measure the distance between the SgRP and the vertical impact reference line.
- Maintain the same distance between the seating reference point and the vertical impact reference line for the version being tested as that distance between the seating reference point and vertical impact reference line for the shortest wheelbase version.

KAG

Measure the distance from the front axle to the edge of the tape used to denote the vertical impact reference line and record the measurement in the space provided below.

Impact Point Location:

Vehicle Wheel Base

Wheelbase Midpoint

 Vertical Impact Reference Line Location (Taken from above table)
 If Wheel Base is greater than 2,896 mm than use 508 mm

Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)

Units
Value

mm

3094.494 ✓

mm

1547.247

mm

508 ✓

mm

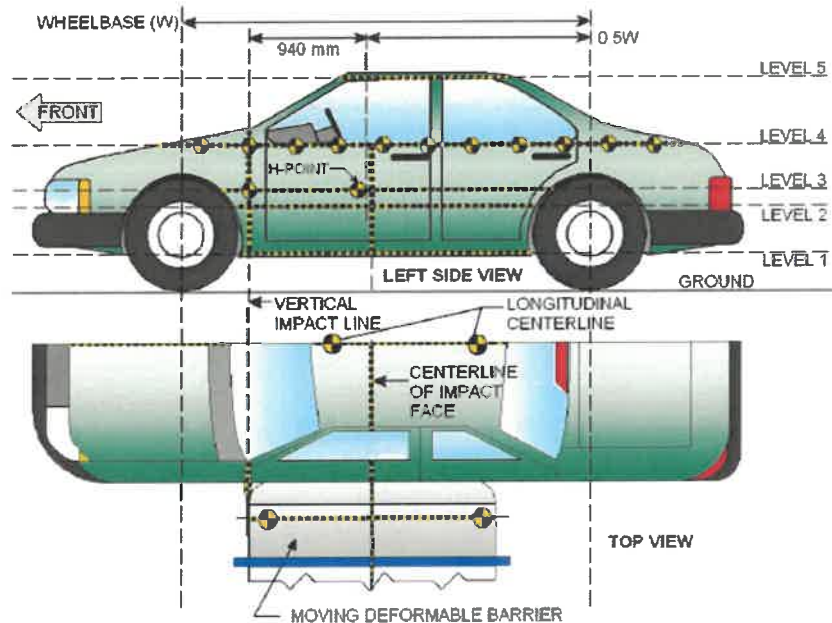
~~1547.247~~ 508 ✓

Front axle centerline = 4097.076

HAC

Place 25 mm (1 inch) wide yellow/black checkerboard tape shall be placed on the vehicle such that when the barrier is properly aligned with the test for impact, the tape coincides with the vertical centerline of the barrier's impact face. See below figures.

The tape should be extended across the roof of the vehicle (90° angle to the test vehicle longitudinal centerline) to provide a reference for the overhead camera coverage.



HAC

Affix 25 mm (1 inch) wide yellow/black checkerboard tape horizontally along the impact side of the test vehicle at LEVEL 1 – Top of side sill: Affix tape along the door sill from the front to the rear wheel-wells.

HAC

Affix 25 mm (1 inch) wide yellow/black checkerboard tape horizontally along the impact side of the test vehicle at LEVEL 2 – Occupant Hip Point: Project the location of the driver dummy's hip point laterally through the door to its exterior panel. Affix tape to the side body panels so that the tape intersects the hip point.

HAC

Affix 25 mm (1 inch) wide yellow/black checkerboard tape horizontally along the impact side of the test vehicle at LEVEL 3 – Mid-door: Measure the height of the front door body panel at two different locations that are at least 600 mm apart. Take the average of the two measurements. Mark this point on the exterior door panel. Affix tape to the side body panels so that the tape intersects this point.

HAC

Affix 25 mm (1 inch) wide yellow/black checkerboard tape horizontally along the impact side of the test vehicle at LEVEL 4 – Window sill: Affix tape just below the front door window sill.

HAC

Affix 25 mm (1 inch) wide yellow/black checkerboard tape horizontally along the impact side of the test vehicle at LEVEL 5 – Top of window: Affix tape just above the top of the front door window.

Note: The following measurements should be taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative. All measurements are in millimeters (mm). Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. The crush profile grid is established prior to the test based on an estimated impact point.

Affix Targets to the Struck side of the Test Vehicle

Initial:

HAG Place a 50 mm (2 inch) diameter target on the vehicle at mid-door height and along the left edge of the vertical impact reference line. The tip of the welding rod will be located in the center of the target.

HAG Affix targets, labeled appropriately (if applicable) to the front door or side panel to denote the hip pivot center of the test driver dummy. Use a 100 mm (4 inch) diameter target and label with "HP".

HAG Affix targets, labeled appropriately (if applicable), along LEVEL 4, window sill tape line, at every 300 mm. Use 50 mm (2 inch) diameter targets.

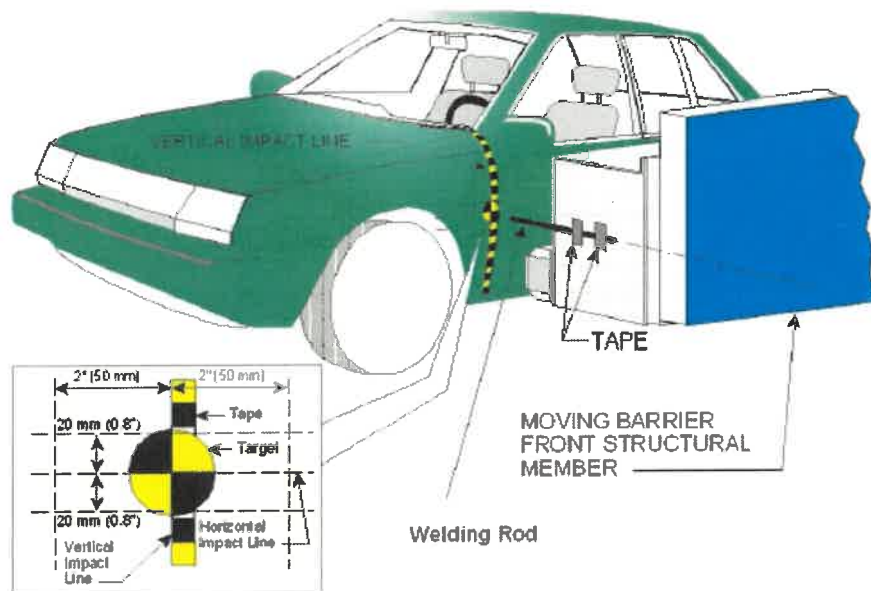
HAG Affix 25 mm (1 inch) wide checkerboard tape on the hood and roof along the longitudinal centerline of the entire vehicle (excluding glazing surfaces). ←

HAG Affix two (4-inch) diameter targets approximately 700mm apart on the roof's longitudinal centerline.

If the vehicle has a sunroof, do not affix any targets to any glazing. Maximize the distance between the targets assuring that the targets only lie on the roof's body panel.

Roof Target Dia. 100 mm

Distance between target centers: 700 mm



Pre-Test Measurements:

Performed by:

Kyle Glaub

Date:

5-16-24

Instructions: Read through the following instruction PRIOR to measuring the following locations using the FARO arm.

Vehicle Coordinate System:

X – Rear Surface of Vehicle (+ forward)

Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ down)

Exterior Vehicle Measurements:

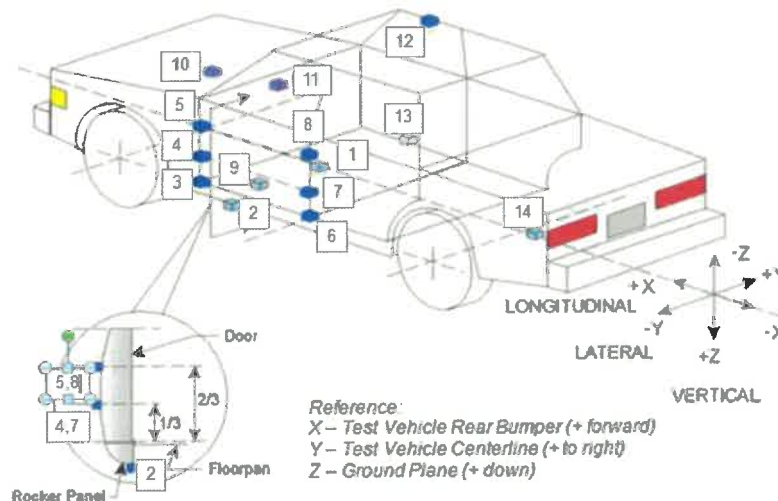
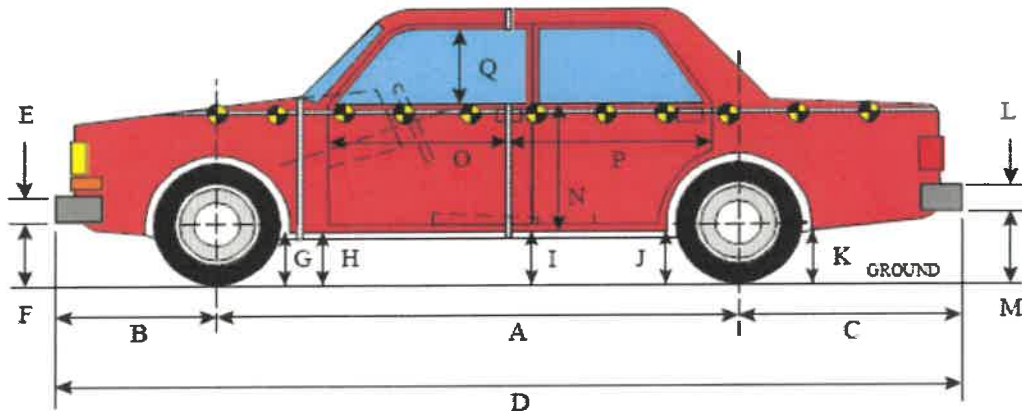
FARO Unique Identifier:

50587

Initial:

KAG

Review the below illustrations.



Initial:

KAC Confirm vehicle is in the "As Tested" configuration.

KAC Establish a fixed reference plane that is perpendicular to the vehicle's longitudinal centerline.

Ground Plane Reference Points -----

Initial:

KAC Gplane - Ground Plane Reference Points Left, Front, Right and Rear.

Wheelbase / Vehicle Length -----

Initial:

KAC LFW - Left Front Wheel.

KAC LRW - Left Rear Wheel.

KAC RFW - Right Front Wheel.

KAC RRW - Right Rear Wheel.

KAC RFRONT - Right Front (X19)

KAC CFRONT - Center of Front (X1)

KAC LFRONT - Left Front (X20)

KAC RREAR - Right Rear

KAC CREAR - Center of Rear

KAC LREAR - Left Rear

KAC NUP - N Upper Point

KAC NLOW - N Lower Point

KAC OFRNT - O Front Point

KAC OPMID - O Rear Point / P Front Point

KAC PREAR - P Rear Point

KAC QUP - Front Window Opening – Take uppermost point on front window to obtain window vertical distance measurement

KAC QLOW – Front Window Opening – Take lowermost point on front window to obtain window vertical distance movement

KAC RBPW - Right B Pillar Point (*Taken at vertical tangency point*)

KAC LBPW - Left B Pillar Point (*Taken at vertical tangency point*)

Vehicle Floor Pan Measurements / P1 Floor Pan / Interior -----

Initial:

 P1 STRIKER – Center of P1 Striker Bolt

Vehicle Floor Pan Measurements / P2 Floor Pan / Interior -----

Initial:

 P2 STRIKER – Center of P2 Striker Bolt

Crush Measurements (Previously Taken in Vehicle & Photographic Targets Section)-----

Initial:

 C1 - Vehicle Crush Measurement #1 – Sill Top

 C2 - Vehicle Crush Measurement #2 – Occupant Hip Point

 C3 - Vehicle Crush Measurement #3 – Mid Door

 C4 - Vehicle Crush Measurement #4 – Window Sill

 C5 - Vehicle Crush Measurement #5 – Window Top

Accelerometer Measurements-----

Initial:

 ACC 1 – Right Front Sill

 ACC 2 – Right Rear Sill

 ACC 3 – Rear Floor Pan

 ACC 4 – Left Rear Sill

 ACC 5 – Left Front Sill

 ACC 6 – Right Rear Occupant Compartment

 ACC 7 – Left B-Pillar Low

 ACC 8 – Left B-Pillar Mid

 ACC 9 – Left A-Pillar Low

 ACC 10 – Left A-Pillar Middle

 ACC 11 – Front Seat Track

 ACC 12 – Rear Seat Track

 ACC 13 – Vehicle CG

Hand Measurements
Initial:

NM	Hand measure	E	Front Bumper Thickness - (The vertical height of the front bumper fascia)	115 mm
d/M	Hand measure	F	Front Bumper Bottom to Ground - (Vertical distance from ground to the bottom of the front bumper fascia)	464 mm
NM	Hand measure	G	Sill Height at Front Wheel Well - (Vertical distance from ground to the sill at the front wheel well opening)	224 mm
NM	Hand measure	H	Sill Height at Front Door Leading Edge - (Vertical distance from ground to the sill at the front door seam)	230 mm
NM	Hand measure	I	Sill Height at B-Pillar - (Vertical distance from ground to the sill in line with the front door striker or B-pillar if no striker exists)	231 mm
NM	Hand measure	J1	Sill Height at Rear Wheel Well - (Vertical distance from ground to the sill at the rear wheel well opening)	223 mm
NM	Hand measure	J2	Pinch Weld Height at Rear Wheel Well - (Vertical distance from ground to the pinch weld at the rear wheel well opening)	212 mm
NM	Hand measure	K	Sill Height Aft of Rear Wheel Well - (Vertical distance from ground to the vehicle sheet body at the rear of the rear tire's wheel well)	276 mm
NM	Hand measure	L	Thickness or height of rear bumper at center.	90 mm
NM	Hand measure	M	Distance from bottom of bumper to ground at center.	529 mm
Tape Measure Unique Identifier Used to conduct measurements				—

Initial:

1646 Record the following information below (needed to generate the QuickLook).

Wheelbase Left Side

3096.939 mm

Wheelbase Right Side

3092.048 mm

Vehicle Width at B-Pillar

1955.948 mm

Vehicle Length Left Side

4865.556 mm

Vehicle Length Center

4996.312 mm

Vehicle Length Right Side

4866.572 mm



Vehicle Instrumentation

Instrumentation Installation:

Performed by:

Colin Browning

Date:

5-14-24

Note: It is the Technician's responsibility to verify that all instrumentation and associated wiring is in good working condition and calibrated.

Initial:

- ☒ Review the customer's test request or statement of work for the list of desired instrumentation.
- ☒ Create Calspan Excel channel request.
- ☒ Generate photo placards.
- ☒ Verify that the placards match the desired instrumentation list.
- ☒ Print and cut out photo placards.
- ☒ Acquire instrumentation, verify functionality, that it has been calibrated and that its calibration has not expired or is within two weeks of needing to be calibrated.
- ☒ Install instrumentation in the following locations using two-face tape, hot melt or screws as appropriate. Use single accelerometers that have been pre-assembled as dual or tri-packs as appropriate). Then take a close-up photo of the installed instrumentation and corresponding photo placard followed by an overall photo. See Figure 5 below for vehicle accelerometer locations.

Install	Photo Close	Photo Overall
---------	-------------	---------------

- | | | | |
|-------------------------------------|-------------------------------------|-------------------------------------|---|
| ☒ | ☒ | ☒ | <i>Right Sill @ Front Seat</i> – Triaxial accelerometer mounted on the opposite side to the impacted side sill at the front seat to provide Ax, Ay and Az data: ACC 1 – Location 1. |
| ☒ | ☒ | ☒ | <i>Right Sill @ Rear Seat</i> – Triaxial accelerometer mounted on the opposite side to the impacted side sill at the rear seat to provide Ax, Ay and Az data: ACC 2 – Location 2. |
| ☒ | ☒ | ☒ | <i>Rear Floor Pan Above Axle</i> – Triaxial accelerometer mounted on the rear floor pan above the axle to provide Ax, Ay and Az data: ACC 3 - Location 3. |
| ☒ | ☒ | ☒ | <i>Left Sill @ Rear Door</i> – Uniaxial accelerometer mounted on the impacted side sill in line longitudinally with the center of the widest portion of the front door and located under the sill inward of pinch welds to provide Ay data: ACC 4 – Location 4. |
| ☒ | ☒ | ☒ | <i>Left Sill @ Front Door</i> – Uniaxial accelerometer mounted on the impacted side sill in line longitudinally with the center of the widest portion of the rear door and located under the sill inward of pinch welds to provide Ay data: ACC 5 – Location 5. |



Right Rear Occupant Compartment – Uniaxial accelerometer mounted in the rear occupant compartment to provide Ay data: ACC 6 – Location 6.



Left B-Post Lower – Uniaxial accelerometer mounted on the impacted lower B-Pillar (located 1/3 the distance from the floor to the bottom of the door's window opening) to provide Ay data: ACC 7 – Location 7.



Left B-Post Middle – Uniaxial accelerometer mounted on the impacted middle A-Pillar (located 2/3 the distance from the floor to the bottom of the doors window opening) to provide Ay data: ACC 8 – Location 8.



Left A-Post Lower – Uniaxial accelerometer mounted on the impacted lower A-Pillar (located 1/3 the distance from the floor to the bottom of the doors window opening) to provide Ay data: ACC 9 – Location 9.



Left A-Post Middle – Uniaxial accelerometer mounted on the impacted middle A-Pillar (located 2/3 the distance from the floor to the bottom of the doors window opening) to provide Ay data: ACC 10 – Location 10.



Front Seat Track – Uniaxial accelerometer mounted on the front seat track nearest the impacted door and approximately aligned with the driver hip point to provide Ay data: ACC 11 – Location 11.

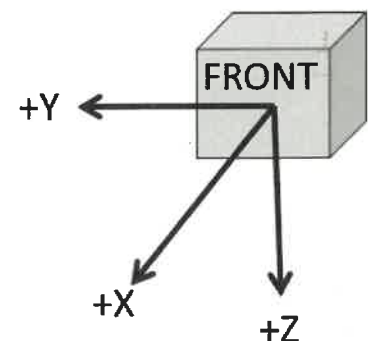
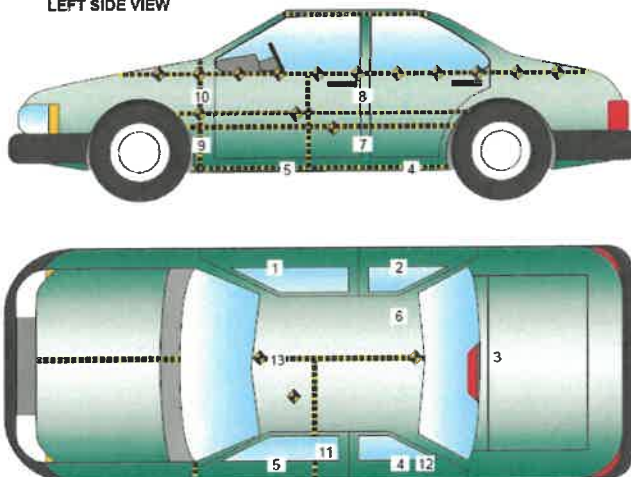


Rear Seat Track or Structure – Uniaxial accelerometer mounted on the rear seat structure (if easily accessible) nearest the impacted door and approximately aligned with the dummy's hip pivot point to provide Ay data: ACC 12 – Location 12.



Vehicle CG – One triaxial accelerometer mounted to the floorpan at the longitudinal and lateral location of the vehicle CG to measure accelerations in the x, y, and z directions: ACC 13 - Location 13.

LEFT SIDE VIEW



Onboard Test Equipment Installation:

Performed by:

SK, MP

Date:

5/21/24

Note: It is the Technician's responsibility to verify that all instrumentation and associated wiring is in good working condition and calibrated. Verify that all DAU's calibration has not expired. This section MUST be completed prior to installation to prevent unnecessary delays.

Initial:

SK

Inspect cables for damage prior to installation.

SK

When installing any instrumentation cables, leave slack for strain relief.

SK

Connect 4 DAU's in series with crash link cables, starting with breakout box.

SK

Plug in all accelerometer LEMO connectors into DAU's, ensuring a tight fit. Verify lock engaged.

SK

Plug in battery monitor cable, ensuring a tight fit. Verify lock engaged.

SK

Connect 2 trigger BNC connectors into breakout box.

SK

Connect WIFI to Ki-Hub interface.

SK

Connect abort to breakout box power wire.

MP

Connect LED light LEMO connector to battery box.

MP

Connect trigger 1 port to camera in port using corresponding cable.

MP

Check functionality of SRS light.



Verification of Vehicle, ATD & Facility Readiness

Instruction: Insert ATD and Facility checklists after this tab.



Inserted ATD Checklist.



Inserted Facility Checklist.



Inserted MDB Checklist.

Weight – As Tested Condition:

Performed by:

Jake Lambert

Date:

5/17/24

Initial:

JL

Load the appropriate dummies (with umbilical cord) into the appropriate seating position.

(Ask ATD Lab for specific ATD Weight)



Reference weight:

Driver

178.6

lbs.



Reference weight: Left Rear Passenger

110.2

lbs.

JL

Weigh the vehicle at each wheel and add the weights to determine the "As Tested" weight.

JL

Record the weight measurements and scale unique identifier in the space provided below.

JL

Verify that the "As Tested" weight is within the Target Test Weight (min) and Target Test Weight (max) determined in the Weight – As Delivered section.

Note: Adjust the weight of the test vehicle by either adding ballast or removing vehicle components in accordance with the manufacturer's data provided by the COTR on Form No. 1. If the calculated Test Vehicle Target Weight is exceeded immediately contact the Technical Director.

JL

Record the weight of any added ballast in the space provided on the next page.

JL

Record any vehicle components that were removed and their associated total weight in the space provided on the next page.

JL

Check to make sure the "As Tested" weight is similar to the "Fully Loaded" weight distribution

JL

Record the Unique Identifier of the weight scales used to weigh the vehicle in the box below.

Weight Scales Unique Identifier

400323

	Units	As Tested		Total
		Front Axle	Rear Axle	
Left	kg	668	781	$W_{Left} = 1.449$
Right	kg	622	733	$W_{Right} = 1.355$
Ratio	%	46	54	
Totals	kg	$W_F = 1.290$	$W_R = 1.514$	2.804 ✓

Target Test Weight Minimum

2801.8

kg

Target Test Weight Maximum

2806.3

kg

Weight of ballast added to meet TVTW

Description	Weight
Ballast	90 kg
	IN Trunk

Yes No

☒ ☐

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Weight -4.5 kg to -9.0 kg)?

If no, indicate in the space provided below the equipment that was removed and its associated weight to meet this requirement.

Equipment that was removed to meet test weight:

N/A

Explanation for equipment removal: ²

N/A

Vehicle components removed to meet TVTW

Description	Weight
N/A	kg
	kg
	kg

CG – As Tested Condition:

Performed by:

MP

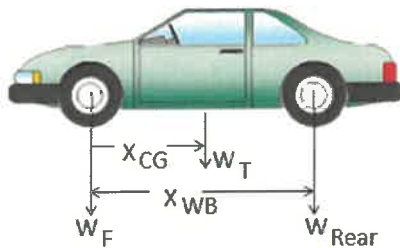
Date:

5/20/24

Initial:

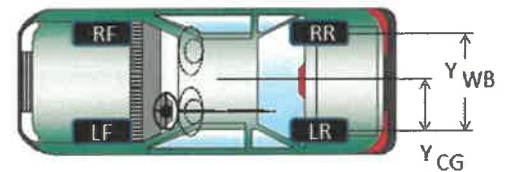
MF

Measure and record the vehicle distances and copy the weights from the previous section in the space provided below in order to calculate the vehicle CG aft of the front axle and left (+) / right (-) from the longitudinal centerline.

Center of Gravity Calculation:


$$X_{CG} = \frac{X_{WB} \times W_{Rear}}{W_{Total}}$$

(From Front Axle)



$$Y_{CG} = \frac{Y_{WB} \times W_{Right}}{W_{Total}}$$

(From Left Wheel Centerline)

$$X_{CG} = \frac{X_{WB} \times W_{Rear}}{W_{Total}}$$

$$1671 \text{ mm} = \frac{3094 \text{ mm} \times 1514 \text{ kg}}{2804 \text{ kg}}$$

 W_{Total}

$$Y_{CG} = \frac{Y_{WB} \times W_{Right}}{W_{Total}}$$

$$\frac{1686 \text{ mm}}{2} = \frac{1686 \text{ mm} \times 13.55 \text{ kg}}{2804 \text{ kg}}$$

 W_{Total}

815

Test Vehicle Center of Gravity (CG)

	Units	As Tested	
Vehicle CG (Aft of Front Axle)	mm	1671	X_{CG}
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	28	Y_{CG}

Vehicle Verification:

Engineer's Name:

MP

Date:

5/20/24

Complete the following steps before transporting the vehicle to the Crash Hall.

Initial:

MP

Review and verify that all prior sections of this workbook have been completed.

MP

Review all Pre-Test photos for content, field of view, clarity and exposure.

MP

Conduct a visual inspection of the vehicle to verify that it has been properly prepared. Note: For OEM's verify that the vehicle reflects the customer's statement of work or test request.

MP

Verify that the SRS light is not illuminated.

MP

Verify Non-struck side airbags have been disabled.

MP

Verify battery voltage is sufficient without charger – Wait 1 minute.

MP

12 Volt or HEV State of Charge

MP

Verify that the vehicle has the proper instrumentation.

MP

Verify that ATD is ready and have the proper instrumentation. Verify tilt sensor is installed in ES-2re.

MP

Electric vehicle SOC check.

MP

Verify that placards have been placed on vehicle and contain up-to-date information.

MP

Affix large placards to vehicle.

MP

Verify that small photograph placards are in test binder with vehicle.

Install Honeycomb

Performed by:

DB/CH/TP

Date:

5/21/24

Instructions: Read through the following instruction PRIOR to measuring the following locations. See reference images on next page.

Exterior MDB Measurements:

The maximum static crush of the MDB's honeycomb face shall be measured pre-test in the longitudinal direction at the following vertical installation height locations (see **Figure 14 Below**):

- (1) Center of Bumper Level = **432 mm** above ground level
- (2) Top of Bumper Level = **533 mm** above ground level
- (3) Mid Level = **686 mm** above ground level
- (4) Top-Stack Level = **813 mm** above ground level

Pre-test measurements are taken (from a reference plane perpendicular to and 1,000 mm from the MDB's longitudinal centerline) across the barrier face at 100 mm intervals at each of the four levels specified.

Initial:

TP

Take Level 1 measurements every 100 mm (i.e. L1 800ROC to L1 800LOC) – Center of Bumper Level

TP

Take Level 2 measurements every 100 mm (i.e. L2 800ROC to L2 800LOC) – Top of Bumper Level

TP

Take Level 3 measurements every 100 mm (i.e. L3 800ROC to L3 800LOC) – Mid Level

TP

Take Level 4 measurements every 100 mm (i.e. L4 800ROC to L4 800LOC) – Top-Stack Level

MDB Photographic Targets and Tape:

Performed by:

TP/CH

Date:

5/21/24

See reference images on next page.

Initial:

TP

Place 25 mm (1 inch) wide yellow/black checkerboard tape along the top of the honeycomb barrier face centerline.

TP

Place 25 mm (1 inch) wide yellow/black checkerboard tape along front of the honeycomb barrier face centerline.

TP

Place 25 mm (1 inch) wide yellow/black checkerboard tape along the top of the left edge of the honeycomb barrier face, to align with the vertical impact reference line of the test vehicle.

TP

Place 25 mm (1 inch) wide yellow/black checkerboard tape along the front of the left edge of the honeycomb barrier face, to align with the vertical impact reference line of the test vehicle.

TP

Place two [102 mm diameter (4")] targets on top of the barrier face 400 mm from the barrier centerline.

TP

Verify [102 mm diameter (4")] photographic target on the MDB at the rear cross member accelerometer location on the left side of the frame.

TP

Verify CG marker and other known location markers are visible and labeled on the MDB in the overhead view.

Align Vehicle & MDB

Performed by:

MP /mm

Date:

5/20/24

Initial:

MP

Transport vehicle to South Crash Hall and attach battery charger.

MP

Place placards on vehicle.

MP

Verify that vehicle's tire pressures match the tire pressures listed on the tire placard. If a tire is low, add air and notify Test Engineer.

Tire Pressures	Units	LF	RF	LR	RR
As Tested	kpa	290	290	290	290

Initial:

MP

Position vehicle on the side impact pad along 27 degree line and align with MDB.

Note: When the MDB is properly positioned such that it is contacting the vehicle at the initial point of contact along struck side of the vehicle, strike a plane perpendicular to the ground that is coincident with the MDB impact face and is parallel to the vehicle's longitudinal centerline. Accordingly, this plane should form an angle of 63 degrees (± 0.5 degrees) with the direction of forward motion of the MDB.

MP

Mark the floor at this location. This line should extend past the front and rear of the vehicle when it is properly positioned.

MP

Hold vehicle in place with parking brake.

MP

Place automatic transmission in NEUTRAL, manual in SECOND gear

MP

Check if vehicle attitudes fall into test range. (If attitude is lower than fully loaded condition, vehicle wheels may need to be momentarily lifted off ground)

MP

Attach plumb bobs to center of front and rear vehicle bumpers.

MP

Mark cement beneath vehicle plumb bobs

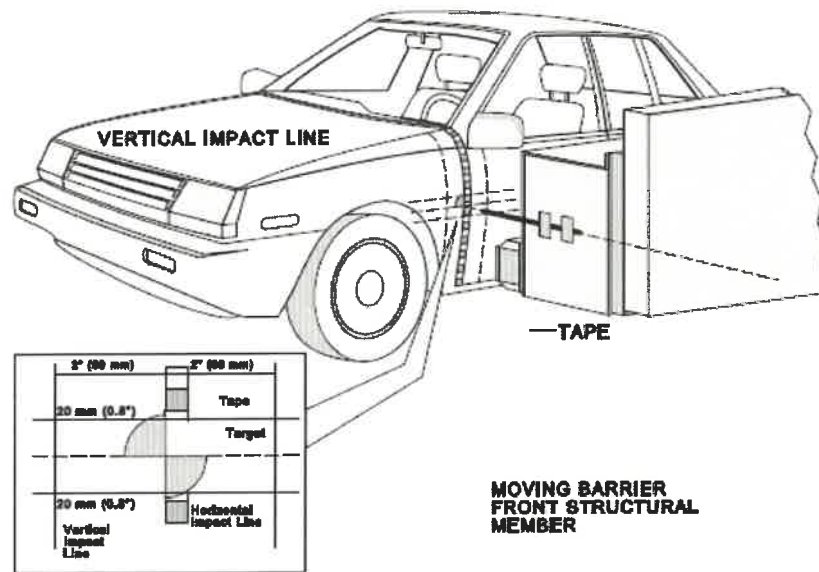
NA

Re-attach battery charger to vehicle.

MP

Attach sharpened welding rod along the left side vertical surface of the honeycomb barrier in the horizontal plane level with the mid-door of the test vehicle (Level 3 target). Welding rod shall be positioned and attached with duct tape so as to contact the test vehicle body sheet metal during pre-test setup when MDB is positioned against the side of the test vehicle. The tip should be located in the center of the target.

Continued on next page.



Initial:

- MP** Place inch tape on barrier sides at H-point level
- NA** Measure and record the vertical height of level 3 impact targets
Left Side: **NA** mm
- NM** Check speed trap and barrier release distance
- MP** Locate camera trigger on floor
 - MP** Confirm welding rod will not contact trigger first.
- AP** Inspect and take the necessary steps so that the Crash Hall is neat, clean, and arranged in an orderly manner.

Distance between triggers 1530mm



High Speed Camera Set-Up

Camera Set-up:

Performed by:

36

Date:

5/20/24

General Requirements:

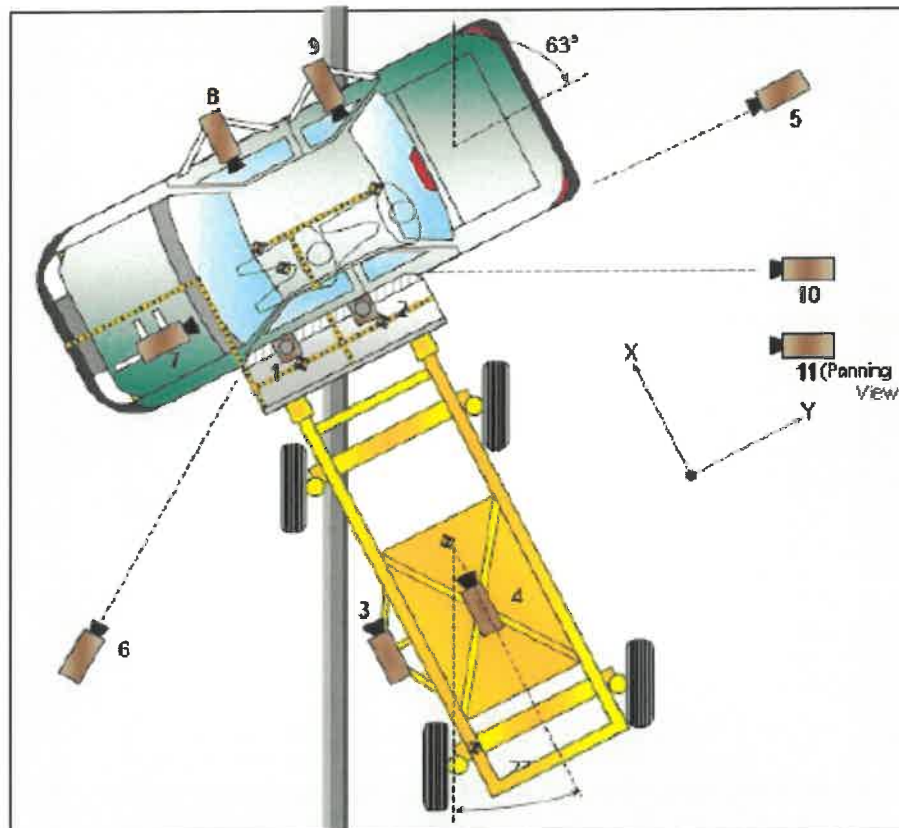
High-speed digital cameras that operate at a minimum speed of 1000 frames per second (fps) for at least 10 ms before the vehicle contacts the barrier and for at least 300 ms after the vehicle contacts the barrier.

Glare or lights showing on any glass area (closed windows or vents) must be minimized so that views of the dummies during the test are visible for video analysis.

A time zero (T(0)) impact event marker (flash or strobe unit) to indicate when the test vehicle contacts the barrier must be present in each high speed video camera view.

The test laboratory's name or logo shall not appear in any high-speed videos. Note that for the real time, the test laboratory's name shall only appear in the documentary real-time video as part of the title frame.

Locate the following cameras and set field of view:



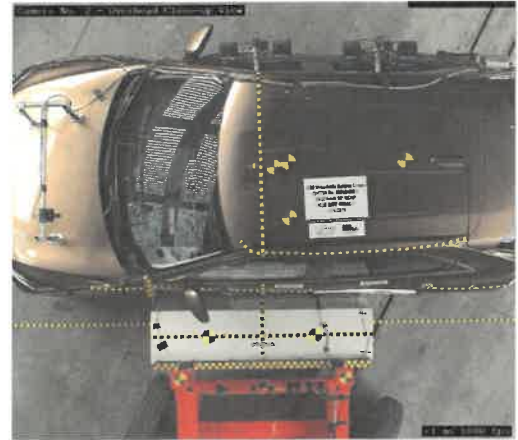
Camera 1: Overhead Wide View: High-Speed overhead camera to view target vehicle dynamics and positioned directly above the impact plane between the target vehicle and the MDB.

- ☒ Establish field of view (FOV); start w/ 12.5 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:
1020



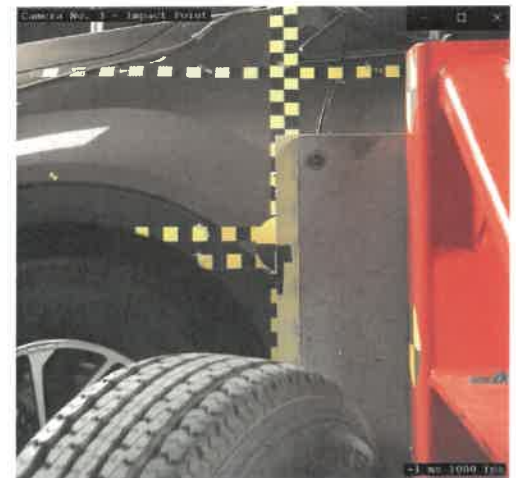
Camera 2: Overhead Close-Up View: A high-speed overhead camera to provide close-up view of the impact plane (should include view of photograph targets on centerline of test vehicle and photograph targets on top of MDB barrier face) and positioned adjacent to Camera No.1.

- ☒ Establish field of view (FOV); start w/ 24 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:
0014



Camera 3: Impact Point: A high-speed digital camera positioned along the impactor's face left vertical edge to cover target vehicle impact point during side impact event. The initial contact between the tip of the welding rod and test vehicle shall be recorded by Camera No. 3.

- ☒ Establish field of view (FOV); start w/ 25 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:
1011



Camera 4: Struck-Side View at Impact: A high-speed digital camera, positioned on MDB's centerline to view struck side of test vehicle during the side impact event.

- ☒ Establish field of view (FOV); start w/ **8 mm** lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:

1032



Camera 5: Rear Impact View of Struck Side: A high-speed right side view camera to cover both the MDB and the target vehicle during the side impact event.

- ☒ Establish field of view (FOV); start w/ **28 mm** lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:

0051



Camera 6: Front Oblique Impact View of Struck Side: A high-speed left side view camera to cover the motion of the target vehicle after impact.

- ☒ Establish field of view (FOV); start w/ **24 mm** lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier:

1006



Camera 7: Driver Dummy Front View (Onboard): A high-speed camera to provide front view of the front dummy through the vehicles windshield from above the engine compartment. (Should be sufficiently raised above the hood structure and positioned such that it shows not only curtain air bag deployment in relation to the dummy's head, but also torso air bag deployment in relation to the dummy's chest, if applicable.)

- ☒ Establish field of view (FOV); start w/ 25 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier: 1016
- ☒ Verify all mounts and piping have been pinned and secured.



Camera 8: Driver Dummy Side View (Onboard): A high-speed camera to view across the test vehicle's occupant compartment to record the lateral motion of the front dummy during and after side impact.

- ☒ Establish field of view (FOV); start w/ 12.5 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier: 1033
- ☒ Verify all mounts and piping have been pinned and secured.



Camera 9: Rear Passenger Dummy Side View

(Onboard): A high-speed camera to view across the test vehicle's occupant compartment to record the lateral motion of the rear dummy during and after side impact.

- ☒ Establish field of view (FOV); start w/ 12.5 mm lens.
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera
- ☒ Record Camera's Unique Identifier: 1012
- ☒ Verify all mounts and piping have been pinned and secured.



Camera 11: Real-Time Pan View of Impact: Real-time (24-30 fps) camera to provide the following pre-test, test, and post-test coverage.

- ☒ Establish field of view (FOV).
- ☒ Confirm placards & strobe are in FOV.
- ☒ Focus camera (Focus on ATD's and not placards)
- ☒ Record Camera's Unique Identifier: Insta 360



Camera Location - Data Sheet:

Performed by:

B6

Date:

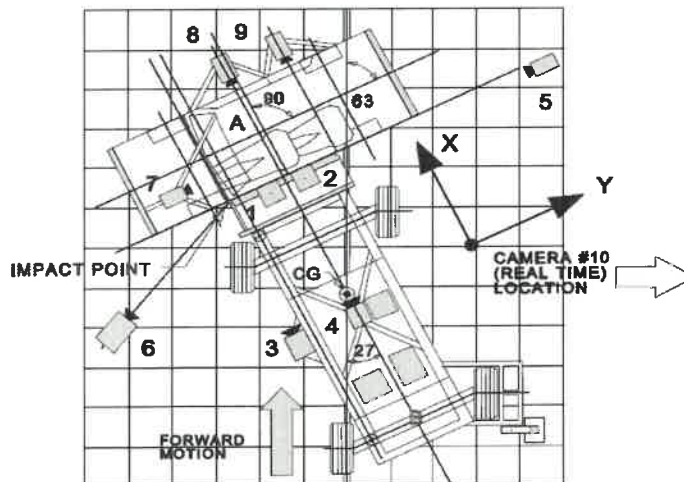
5/20/24

Camera Locations:

No.	Camera View	Location			Lens (mm)	Operating Frame Rate
		X (mm)	Y (mm)	Z (mm)		
1	Overhead Overall	0	0	-8241	12.5	1000
2	Overhead Close-Up	0	0	-8241	24	
3	Impact Point Close-up (MDB)				25	
4	Centerline of Impact (MDB)				8	
5	Right Side View	0	8085	-1521	28	
6	Left Side View	-2682	-5685	-1599	24	
7	Front Seat Occupant – Frontal View (OB)				25	
8	Front Seat Occupant – Side View (OB)				12.5	
9	Rear Passenger – Side View (OB)				12.5	
10	Real Time Coverage				Zoom	30
Measuring Device Unique Identifier:		400618				

*COORDINATES

Specifically, the X and Y coordinates shall reference the designated impact point on the target vehicle's struck side and the Z coordinate shall reference the ground (+X = forward of impact, +Y = right of impact, +Z = Down). The coordinate system shall be aligned with the test vehicle's struck side.



Camera Control Software

Performed by:

B6

Date:

3/20/24

Instructions: Verify the following software settings and functions are correct

Initial:

- B6 Appropriate software exposure settings (determined during exposure setup with overhead lights on)
- B6 Color balance and check corrections (performed during exposure setup with overhead lights on)
- B6 Pre and post-trigger recorded frames – minimum 10 pre-trigger, 300 post-trigger
- B6 Record mode is 'circular', trigger configuration is 'SWC'
- B6 Trigger checks are performed and all cameras trigger properly
- B6 Auto download is activated and set to download to correct file path on control PC
- B6 After all configuration settings are set, camera configuration is saved
- B6 Download to SD card on camera



Test Set-up & Execution

Data Acquisition Software Setup:

Performed by:

5U

Date:

5/21/24

Initial:

54

Verify signals from critical channels are operational and reasonable BEFORE installing ATD.

Yes No

54

Verify firing of airbag(s) with customer, or monitoring and confirm timing pretensions.

54

Load the Crash Test Plan.

54

Verify Test Plan has been reviewed by process engineer and customer.

Process Engineer
Approval:

GM

Date:

5/20/24

54

Place copy of Test Plan after this page for reference.

54

Verify dummies are attached to data acquisition boxes and are grounded.

54

Verify crash link cables are installed.

54

Verify communication cables are attached to the vehicle.

54

Verify wireless box is communicating with DAU's

54

Verify KT interface shows 30-36 volts at the vehicle.

Record Vehicle 1 Voltage

30

Record Vehicle 2 Voltage:

30

54

Verify KT data channels CAC's and polarities.

54

Add the ES-2re, SID-IIs, Vehicle, and Mobile Deformable Barrier assemblies to the Signals tab.

54

Verify vehicle is communicating with DAU's.

54

Verify mobile deformable barrier is communicating with DAU's.

54

Select Auto-ID from the Signals tab and verify there are no transducers identified.

54

Perform electrical check on Signals tab and verify there are no errors.

Record Number of Channels:

71

54

Perform electrical check on Samplers tab and verify there are no errors.

54

Record Vehicle DAU Serial Numbers:

DTs

54

Record Mobile Deformable Barrier DAU Serial Number:

PT

54

Perform electrical check on Triggers tab to test the trigger and verify there are no errors.

54

Tie down umbilicals and verify adequate cable slack.

Pre-Test Photos & Video Prior to Seating:

Performed by:

MP/MP

Date:

5/21/24

Note: Clear and properly focused digital still photographs in .jpg format with a minimum dots-per-inch (DPI) of 180 shall be taken. A vehicle information placard placed parallel with the camera, identifying the test vehicle model as well as the barrier and NHTSA number, along with an indication of whether the photo was taken pre-test shall appear in each photograph and be legible. All photographs must be in landscape view / orientation. Glare or light from any illuminated or reflective surface shall be minimized while taking photographs. Reference sample photo set.

Initial: Video of MDB:

MP

Overhead View of MDB

Initial: Photos of Vehicle against Barrier:

MP

No. 15 – Pretest Overhead View of MDB Positioned Against Impact Side of Test Vehicle at Impact Location.

MP

Move MDB back from vehicle and then take below photos and real time video.

Initial: Photos of MDB:

MP

No. 7 – Pretest Frontal View of Impactor Face

MP

No. 13 – Pretest Top View of Impactor Face

MP

No. 9 – Pretest Left Side View of Impactor Face

MP

No. 11 – Pretest Right Side View of Impactor Face

Initial: Video of MDB

MP

Left side view of MDB

MP

Right side view of MDB

MP

Front view of MDB

Initial: Vehicle Surrounds

MP

No. 1 – Pretest Frontal View of Test Vehicle

MP

No. 5 – Pretest Impacted Side View of Test Vehicle

MP

No. 3 – Pretest Rear View of Test Vehicle

Initial:

MP

Move MDB to start position, attach tow and abort cables and check onboard abort.

Positioning SID-IIs in Rear Left Position:

Performed by:

MP

Date:

5/21/24

Initial:

MP

1. Set the seat at rearmost fore/aft position, lowest height at mid-angle

MP

1.1 Using the control that primarily moves the seat fore and aft, move the **SCR**P to the rearmost position.

MP

1.2 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the height of the **SCR**P to the lowest height, with the **SC**RL set as closely as possible to the mid-angle.

MP

N/A The seat is not adjustable.

MP

1.3 Fully recline the seat back

N/A The seat back does not adjust.

MP

3. Place the test dummy in the seat

Position the dummy in the seat such that the midsagittal plane is coincident with the longitudinal centerline markings on the seat cushion, seat back and head restraint. Place the dummy in the seat with the legs at an angle of 120° to the thighs. The calves should not be touching the seat cushion.

MP

4. Hold down the dummy's thighs and push rearward on the upper torso to maximize the pelvic angle.

MP

5. Set the angle between the legs and the thighs to 120°.

MP

6. Set the transverse distance between the centers of the front of the knees at 160 to 170 mm. (6.3 to 6.7 inches). Center the knee separation with respect to the longitudinal centerline markings of the seat cushion

MP

Record Knee Separation 165

MP

7. Push rearward on the dummy's knees until the pelvis contacts the seat back, or the backs of the calves contact the seat cushion, whichever occurs first.

Pelvis contacted seat back.

MP

Calves contacted seat cushion.

MP

8. Gently rock the upper torso $\pm 5^\circ$ arc (approximately 51 mm (2 inches)) side-to-side three times.

MP

9. If needed, extend the legs until the feet do not contact the floor pan. The thighs should be resting on the seat cushion.

MP

10. With the feet perpendicular to the legs, place the heels on the floor pan. If a heel will not contact the floor pan, place it as close to the floor pan as possible.

MP

11. For vehicles without adjustable seat backs, adjust the lower neck bracket to level the head as much as possible. For vehicles with adjustable seat backs, while holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform of the head is level to within $\pm 0.5^\circ$, making sure that the pelvis does not interfere with the seat bight.

mp

12. If it is not possible to orient the head level within $\pm 0.5^\circ$ minimize the angle.

mp

13. Measure and set the dummy's pelvic angle using the pelvic angle gauge. The angle is set to $20.0^\circ \pm 2.5^\circ$. If this is not possible, adjust the pelvic angle as close to 20.0° as possible while keeping the transverse instrumentation platform of the head as level as possible.

14. Passenger foot positioning

mp

14.1 Place the passenger's feet flat on the floor pan.

mp

14.2 If the either foot does not contact the floor pan, place the foot parallel to the floor and place the leg as perpendicular to the thigh as possible.

mp

15. Passenger arm/hand positioning

Place the rear dummy's upper arm such that the angle between the projection of the arm centerline on the midsagittal plane of the dummy and the thoracic spine centerline is $45^\circ \pm 5^\circ$.

mp

16. Seatbelt Placement

Place the seatbelt around the test dummy and fasten latch.

SK/MP

Belt in cabling / umbilicals

Positioning ES-2re Male in Driver Position

Performed by:

Nick Marshall

Date:

5/21/24

Initial:

mm

7. Place the test dummy in the seat

mm

7.1 Move the seat and seat back rearward as necessary to get the test dummy in the seat.

mm

7.2 Position the test dummy in the seat such that its plane of symmetry (i.e., mid-sagittal plane) is coincident with the longitudinal centerline marking on the seat cushion, seat back and head restraint.

mm

7.3 Bend the upper torso forward and then lay it back against the seat back. Push the shoulders of the dummy fully rearward.

mm

7.4 Remove the foam blocks from the pelvis flesh.

mm

7.5 Position the dummy so that it sits square and level in the seat.

mm

7.6 Repeat steps 1 thru 1.3 within "1st Row Seat Positioning – Setting Seats" to set the seat at the mid-fore aft position

mm

7.7 Maneuver the dummy's pelvis until the M3 hole on its back plate is within a circle with a radius of 10 mm round the H-point location (x,z) determined by the H-point machine.

mm

7.8 Position the pelvis of the dummy such that a horizontal (lateral) line passing through the dummy's hip pivot center is perpendicular to the longitudinal center plane of the seat.

mm

7.9 Measure the angle using the tilt angle sensor installed in the test dummy. Verify that the line through the dummy's hip pivot center is horizontal with a maximum inclination of $\pm 2^\circ$.

mm

7.10 Is the pelvis tilt angle within spec. $\pm 2^\circ$?



Yes - Record the tilt angle and measure and record the X and Z location of the dummy's hip pivot center on the chart below;

Dummy hip pivot center location		
Tilt Angle	-0.2	°
X(fore/aft) of striker	196	(mm)
Z(above/below) striker	144	(mm)



No, go back to step 7.2 and repeat steps to re-adjust the position of the test dummy.



Proper position cannot be achieved, contact COTR immediately.

mm

7.11.1 Foot Placement - For test dummy placed in driver seating position

mm

7.11.2 Without inducing pelvis or torso movement, place the right foot of the dummy on the un-pressed accelerator pedal with the heel resting as far forward as possible on the floor pan.

mm

7.11.3 Set the left foot perpendicular to the lower leg with the heel resting on the floor pan in the same lateral line as the right heel.

mm

7.11.4 If possible within these constraints, place the thighs of the dummy in contact with the seat cushion.

mm

7.12 Arm Placement

Place the dummy's upper arms such that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is $40^{\circ} \pm 5^{\circ}$.

mm

8. Seatbelt Placement

Place the seatbelt around the test dummy and fasten latch.

mm

Belt in Cabling / umbilical's

mm

Affix targets, labeled appropriately (if applicable) to the front door or side panel to denote the hip pivot center of the test driver and rear passenger dummy. Use a 100 mm (4 inch) diameter target and label with "HP".

Dummy Measurement:

Performed by:

MP/UM

Date:

5/21/24

Initial:

MP

Once the dummy is properly positioned, and the seat belt has been fastened over the dummy's chest, align a 150 mm (6-inch) segment of yellow/red checkerboard tape with the outboard edge of the shoulder belt portion of the seat belt such that it will be visible in Camera View No. 11.

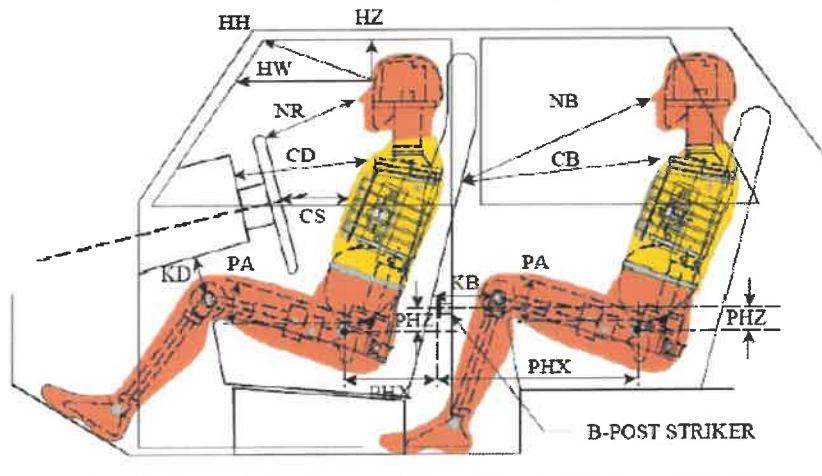
MP

Place a second 150 mm (6-inch) segment of yellow/red checkerboard tape on the dummy's chest such that it is aligned with the first segment that was placed along the outboard edge of the shoulder belt. The two checkerboard tape segments should be cut and positioned such that the colors for each square-inch section alternate on either side of the edge of the shoulder belt.

MP

Record the final position of the dummy after it is seated in the test vehicle by taking the measurements indicated on the next page (accurate to ± 3 mm).

Tape Measure Unique Identifier:



LEFT SIDE VIEW

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

HH HEAD TO HEADER – Measure the distance from the point where the dummy's nose meets his forehead (between the eyes) to the furthest point forward on the header.

HW HEAD TO WINDSHIELD – Measure the distance from the point where the dummy's nose meets his forehead (between the eyes) to a point on the windshield directly in front of it. Use a level or plumb-bob.

HZ HEAD TO ROOF LINER – Measure the distance from the point where the dummy's nose meets his forehead (between the eyes) to the point on the roof directly above it. Use a level or plumb-bob.

NR NOSE TO RIM – Measure the distance from the tip of the dummy's nose to the closest point on the top of the steering wheel rim.

CD CHEST TO DASHBOARD – Place a tape measure on the tip of the dummy's chin and rotate 125 mm of it downward toward the dummy to the point of contact on the transverse center of the dummy's chest. Mark this point with a 25 mm (1 inch) diameter target. Measure the distance from this point to the closest point on the dashboard either between the upper part of the steering wheel between the hub and the rim, or measure to the dashboard placing the tape measure above the rim, whichever is a shorter measurement.

CS CHEST TO STEERING WHEEL – Measure the distance from the center of the steering wheel hub to the dummy's chest. Use a level. Mark this location on the dummy's chest with a 25 mm (1 inch) diameter target.

KDL/KDR LEFT AND RIGHT KNEES TO DASHBOARD – Measure the distance from the center of the knee pivot bolt's outer surface to the closest point forward acquired by swinging the tape measure in continually larger arcs until it contacts the dashboard.

KDAL/KDAR KNEE TO DASHBOARD ANGLE – Using the line representing the length measurement of the knee to the dashboard above, measure the angle between that line and the horizontal.

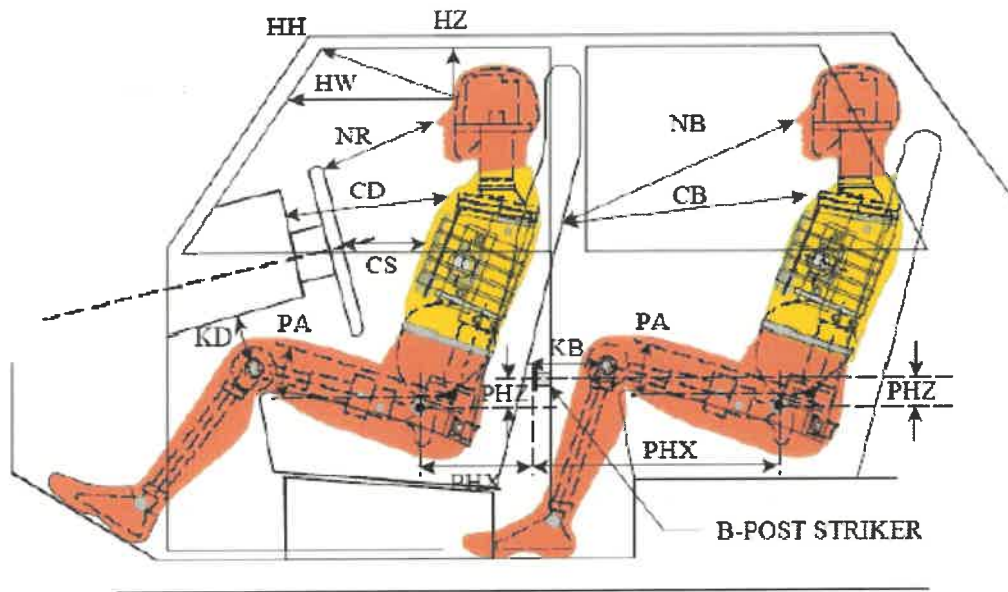
PAX PELVIC TILT ANGLE (X) – Measure by inserting the pelvic angle gauge into the Hip Point gauging hole (actual pivot center of the dummy's torso and thighs) on the dummy and taking this angle with respect to the horizontal. Alternatively, record the pelvic tilt angle X measured by tilt sensors installed in the test dummy.

PAY PELVIC TILT ANGLE (Y) – Measure by inserting the pelvic angle gauge into the Hip Point gauging hole (actual pivot center of the dummy's torso and thighs) on the dummy and taking this angle with respect to the vertical. Alternatively, record the pelvic tilt angle Y measured by tilt sensors installed in the test dummy.

PHX HIP POINT TO STRIKER (X) – Locate a point on the front door striker and project this point (with a level) vertically downward. Measure the distance horizontally from the pivot center of the dummy's torso and thigh to the point it intersects with the level.

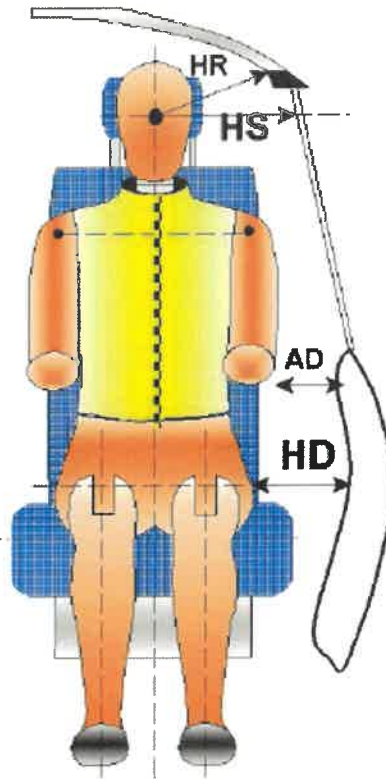
PHZ HIP POINT TO STRIKER (Z) – Locate a point on the front door striker and project this point (preferably, with a level) horizontally toward the pivot center of the dummy's torso and thigh. Measure the distance vertically from the pivot center of the dummy's torso and thigh to the point it intersects with the level.

Note: The B-pillar striker will be used as the reference point for PHX & PHZ measurements.


LEFT SIDE VIEW

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

Code	Measurement Description	ATD Driver Unique Identifier: <u>0037</u>		ATD Passenger Unique Identifier: <u>261</u>	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH	Header to Header	395			
HW	Head to Windshield	695			
HZ	Head to Roof Liner	224		297	
NR	Nose to Rim	445 450		573	
CD	Chest to Dashboard	645		564	
CS	Chest to Steering Wheel	430			
KDL/KDAL°	Left Knee to Dash	257	29.1	305	40.8
KDR/KDAR°	Right Knee to Dash	250	32.5	304	43.7
PAX°	Pelvic Tilt Angle (X-axis)		19.9		21.8
PAY°	Pelvic Tilt Angle (Y-Axis)		-0.2		0.3
PHX	Hip Point to Striker (X-Axis)	196		205	
PHZ	Hip Point to Striker (Z-axis)	144		234	



Code	Measurement Location	Units	Driver	Rear Passenger
HR	Head to Side Header	mm	200	253
HS	Head to Side Window	mm	351	412
AD	Arm to Door	mm	92	174
HD	Hip Point to Door	mm	160	173

HR HEAD TO SIDE HEADER – Measure the shortest distance from the point where the dummy's nose meets his forehead (between the eyes) to the side edge of the header just above the window frame, directly adjacent to the dummy.

HS HEAD TO SIDE WINDOW – Measure the distance horizontally from the point where the dummy's nose meets his forehead (between the eyes) to the outside of the side window. In order to take this measurement, roll the window down to the exact height that allows a level measurement. Use a level.

AD ARM TO DOOR – Measure the distance from the center of the bottom of the outboard arm segment where it meets the driver or passenger dummy's torso to the closest point on the door.

HD HIP POINT TO DOOR – Project a point horizontally from the pivot center of the dummy's torso and thigh, outward to the edge of the pelvis plug. Measure the distance horizontally from this point to the closest point on the door panel. Use a level.

Inch Tape, Cables & Chalking:

Performed by:

MP/NM

Date:

5/21/24

Initial:

SK

Check cable routing. Take precaution to ensure that cable bundle is routed over the front seat armrest/console such that it allows sufficient slack and does not preclude or restrict dummy movement during impact. Duct tape may be used to secure the cable bundle to the front seat armrest/console to prevent cable damage, and to permanently set the necessary amount of slack.

SK

Belt in cabling / umbilical's.

SK

Zip tie down cabling in trunk.

MP

Place inch tape on the dummy chest and shoulder belt in order to show the belt pretensioner deploy during the impact event.

NM

Chalk ATD(s)

Parts of the anthropomorphic testing devices shall be coated with colored chalk/water solutions to show contact points with the vehicle's interior, with their own components (such as head to knee contact), and with each other. The chalk/water solution shall be applied after final dummy positioning.

Note: Face chalk should extend below the chin.

Dummy Part	Driver
Face (Do not paint sides)	Blue
Top of Head (Stop painting at skull cap)	Yellow
Outer Side of Head	Green
Back of Head (skull cap)	Red
Outer Shoulder	Orange
Outer Hip	Red



Dummy Part	Color
Face	Blue
Top of Head	Yellow
Side of Head	Green
Back of Head	Red
Shoulder	Orange
Hip	Red

Attitude - As Tested Condition:

Performed by:

MP

Date:

5/2/24

Initial:

MP

With the vehicle in the "As Tested" weight condition, place it on a flat, level surface.

Note: If the vehicle has an Auto-Leveling, the ignition must be set to the "on" position. If the vehicle is equipped with a self-adjusting hydraulic system, contact the COTR for further guidance on attitude measurements.

MP

Verify that the "As Tested" vehicle attitude measurements are equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. If any "As Tested" attitude measurements do not meet this requirement, adjust the load by shifting ballast, instrumentation, and/or cameras. If, after repeating these steps, any of the "As Tested" attitude measurements do not meet the requirement, contact the Technical Director.

Note: The "As Tested" vehicle attitude measurements **shall be taken within an hour of impact** to ensure the proper attitude is met.

Test Vehicle Attitudes and CG	As Delivered	Units	Fully Loaded	As Tested	Meets Requirements ***	
					Yes	No
Left Front	893	mm	882	886	X	
Right Front	890	mm	888	884	X	
Right Rear	903	mm	886	882	X	
Left Rear	903	mm	880	885	X	
Vehicle CG (Aft of Front Axle)		mm	1675			
Vehicle CG (Left+)/Right(-) from Longitudinal Centerline)		mm	26			

*** 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.

Pre-Test Photos:

Performed by:



Date:

5-21-24

Note: Clear and properly focused digital still photographs in .jpg format with a minimum dots-per-inch (DPI) of 180 shall be taken. A vehicle information placard placed parallel with the camera, identifying the test vehicle model as well as the barrier and NHTSA number, along with an indication of whether the photo was taken pre-test shall appear in each photograph and be legible. All photographs must be in landscape view / orientation. Glare or light from any illuminated or reflective surface shall be minimized while taking photographs. Reference sample photo set!

Initial: Photos With Driver Positioned in Vehicle



No. 17 – Pretest Front SID in Final Seating Position (Door Open)



No. 18 – Pretest Front SID in Final Seating Position (Door Closed)



No. 19 – Pretest Front SID – Opposite Side View



No. *21 – Pretest Rear SID in Final Seating Position (Door Open)



No. 22. – Pretest Rear SID in Final Seating Position (Door Closed)



No. 23. – Pretest Rear SID – Opposite Side View

* - Applies to vehicles with 4 or more side doors

Pre-Test Video:

Performed by:

MP

Date:

5/21/24

A real-time camera (24-30 fps) shall be used to document the pre-test and post-test condition of the test vehicle in addition to the pre-test and post-test positions of the test dummies, including, but not limited to, the placement of the lap and shoulder belts. Particular attention must be exercised to fully document the proper closing of all vehicle doors, including any rear hatchback or tailgate.

Initial: Videos of Vehicle

MP

Impact side view of vehicle

MP

Rear view of vehicle

MP

Non-impact side view of vehicle

MP

Front view of vehicle

MP

View of gas cap being attached to filler pipe

Initial: Videos of Dummy Position (including, placement of lap and shoulder belt on the dummy)

MP

Side View of ES-2re in front seat (struck-side door open)

MP

Side view of SID-IIs in rear seat (struck-side door open)

MP

Side view of ES-2re in front seat (doors closed)

MP

Side view of SID-IIs in rear seat (doors closed)

Review Post-Test Assignments with Staff:

Performed by:

MP/UM

Date:

5/21/24

Initial:

MP

Review with the Staff their post-impact order of events and assignments.

While the Test Engineer is taking post-test photos, the following personnel need to be completing the following tasks. During this time, please make sure customers are staying in the observation room and that each one of you stay clear in order not to be photographed. Furthermore, no instrumentation or equipment shall be removed from the test vehicle at this time. Assignments are as follows:

- Camera Personnel – Need to be downloading high speed video and verifying that acceptable video was captured by all cameras.
- Data Personnel – Need to download all instrumentation data and identify questionable and lost channels.
- Facility Personnel – Need to have equipment in hand to capture any Stoddard leaks.

Once the Test Engineer has informed the Staff that post-test photos have been taken. Assignments are as follows:

- Camera Personnel – Check and document any type of equipment damage. If video was lost or is of poor quality, inspect equipment and identify root cause. Please document all findings.
- Data Personnel – For any questionable and lost channels, inspect cabling and instrumentation to identify root cause. Please document findings.
- Facility Personnel – Clean up impact area.

Verify Vehicle & Set-Up / Go / No-Go:

Performed by:

MP / NM

Date:

5/21/24

Initial:

- ☒ Review workbook for completeness [NM] 305 HV Check
- ☒ Remove head level from ATD
- ☒ Verify plumb bobs have been removed from vehicle
- ☒ Verify Non-struck side airbags have been disabled
- ☒ Seat Belt Guides – Usage of seat belt guides should be in accords with instructions included in the vehicle owner's manual or in Form No. 1.
- ☒ Adjustable Armrests – Place any adjustable armrest in the retracted position.
- ☒ Accelerator Pedal – If the vehicle has an adjustable accelerator pedal, adjust it to the full forward position.
- ☒ Doors – Place all doors (including a hatchback or tailgate) in the fully closed and latched position. Check instrument panel telltales just prior to the test to ensure that all doors and hatches are closed.
In all instances, all side doors should be unlocked pre-test.
- ☒ Door Locks – Verify that the locks on *all side doors* are unlocked.
- ☒ Floor Mats - If the vehicle is equipped with optional all-weather (rubber) floor mats, remove them from prior to test. If the vehicle is equipped with carpeted floor mats, or if all-weather floor mats are standard equipment, place them in their proper locations prior to test.
- ☒ Windows - Verify that the driver and passenger front windows are in the fully closed position. Verify that all other windows and vents in the fully closed position unless otherwise specified by the COTR.
- ☒ Transmission Engagement:
 1. Manual Transmission – Place manual transmissions in neutral.
 2. Automatic Transmission – Place automatic transmissions in neutral.
- ☒ Parking Brake Engagement – Engage the parking brake.
- ☒ Verify speed traps are reset. (Primary and Secondary)
- ☒ Confirm fuel collectors are ready at the barrier.
- ☒ Escort customer to Observation Room – explain to them that they need to stay in the Observation Room until the Test Engineer comes to get them (at minimum, until after the post-test photos have been taken).
- ☒ Verify tow skate attached to tow hooks (visual inspection).

- ☒ NA Disconnect battery charger. Verify vehicle battery power is sufficient without charger on (wait 1 minute then should have at least 12.75 volts and stable).
- ☒ NP Turn real time cameras on.
- ☒ NP Verify cameras are Armed and ready.
- ☒ NP Ignition Switch –
Place the key in the ignition and switch it to the “ON” position and have SRS light observed by visitor. Check to ensure that the “Airbag Readiness Indicator” shows the airbag system as being functional. If it is a PUSH start vehicle, test must be conducted in 5 min from “Key on”.
- ☒ NP If there is any delay over 5 minutes, verify SRS light is still OK.
- ☒ NP Verify tow operator has completed their checklist.
- ☒ NP Verify impact speed.

Initial:

- ☒ NP Trigger Check
- ☒ OL Abort Check.
- ☒ NP Speed Trap Check
- ☒ NM Verify Speed Trap Location
- ☒ NP Safety Check
- ☒ NP Reviewed all sections of this binder for completeness.
- ☒ LHP Facility Ready for Test

☒	READY for test	Date:	5/21/24
☐	NOT READY to be tested		
☐	Corrections made now READY for test	Date:	
☐	NOT READY for test		

OEM Inspection of Set-up:

Performed by:

MP/NM

Date:

5/21/24

Initial:

MP/NM

Setup real time cameras on both sides of vehicle [Lens must be pointed toward ATD].

MP/NM

Turn on cameras and start recording.

MP/NM

Get OEM and notify them that they have 35 minutes to inspect dummy positioning.

MP/NM

Escort OEM to conference room immediately after dummy positioning inspection.

Tow System & DAS Checklist:

Tow Engineer's Name:

OL

Today's Date:

5/21/24

DAS Engineer's Name:

SK

Today's Date:

5/21/24

Reference VERF Drive Operation Steps:

Please place copy of associated documentation following this page.

Reference VERF DAS Operation Steps:

Please place copy of associated documentation following this page.

Note Speed Requirement: 52.9 kph ± 0.8 kph

Impact Speed:

Performed by:

MP

Date:

5/21/24

Initial:

MP

Remind the DAS operator to look over the Quick Look to determine whether data is near its limits or not. If yes, the operator should look at the traces (i.e. spike or wave form). If a redundant exists, the redundant data should be reviewed to determine whether its traces are the same or different. If it is determined that something is not right with the primary, the operator should use the redundant in the Quick Look and to include a note in the comments section that the redundant was used.

MP

Immediately after impact, record the time of impact in the space provided below.

JH

Photograph speed trap read-out and record values in the space provided below.

Time of Impact:

11:26 AM

Vehicle Speed Trap Readout (Primary):

53.04 kph Primary

53.15 kph Redundant

Trap Location
(from barrier) closest mm

Speed Trap Unique Identifier: 400472

Vehicle Speed Trap Readout (Secondary):

53.18 kph Primary

53.18 kph Redundant

Trap Location
(from barrier) furthest mm

Speed Trap Unique Identifier: 400432

Impact Location:

Performed by:

MP

Date:

5/21/24

Initial:

MP

With the vehicle in the "As Tested" weight condition, place it on a flat, level surface.

Impact Location:

506

mm

Actual impact point (aft of front axle)

+ 2

mm

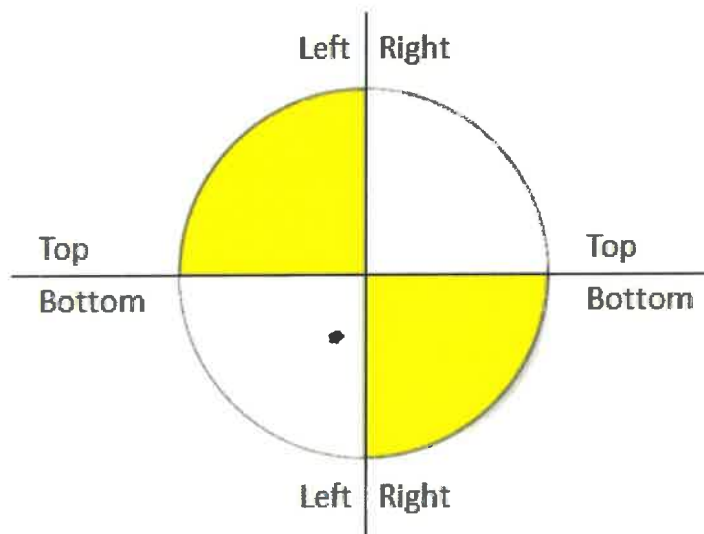
to Right / Left (Circle One) – must be within ± 50 mm (+ Forward / - Rearward)

- 12

mm

Up / Down (Circle One) – must be within ± 20 mm (+ Up / - Down)

Looking at the impacted target, draw / indicate the location of the impact on this illustration:



+/- 50 mm Horizontal ("+" = Forward, "-" = Rearward)

+/- 20 mm Vertical ("+" = Down, "-" = Up)

Post-Test Observations – Vehicle As Is

Performed by:

MP/NM

Date:

5/21/24

Instructions: Please completely fill in the below tables. If unsure, take additional photographs and please include any observations. Be as descriptive as possible.

Dummy Contact Location	Driver	Rear Passenger
Face Contact	Side header, Curtain	NM P4 CAB Nose
Top of Head Contact	Side Header, Curtain	P4 CAB
Left Side of Head Contact	Side header, Curtain	P4 CAB
Back of Head Contact	Head Rest, Side header, Curtain	P5 Head Rest
Left Shoulder Contact	Curtain	Door Trim
Upper Torso Contact	Seatback, Seat AB	C-Pillar, Door trim
Lower Torso Contact	Seatback, Seat AB	Door trim
Left Knee Contact	Nose	Door trim
Left Hip Contact	Seat AB	Seat Pan, Door trim.

Supplemental Restraint System	Struck Side Driver		Non-Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal airbag	Y	N		
Knee airbag	Y	N		
Side airbag 1 – Curtain Airbag	Y	Y	Y	Y
Side airbag 2 – Torso Airbag	N	N/A	N	N/A
Side airbag 3 – Torso / Pelvis Airbag	Y	Y	N	N/A
Seat belt pretensioner	Y	Y	Y	Y
Seat belt load limiter	Y	Y	Y	Y
Other – Seat Cushion Airbag	N	N/A	N	N/A

Post-Test Hand Measurements

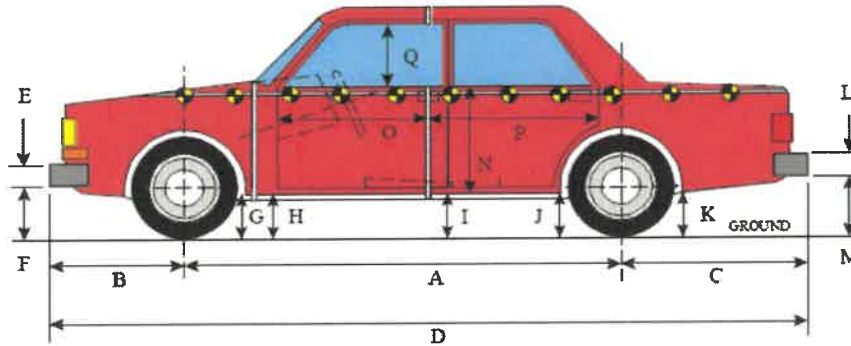
Performed by:

MP/NM

Date:

5/21/24

Note: All measurements must be taken in the As Tested Condition (Fully loaded with instrumentation & ATD)



1674mm

Initial:

NM	Hand measure	E	Front Bumper Thickness - (The vertical height of the front bumper fascia)	115	mm
NM	Hand measure	F	Front Bumper Bottom to Ground - (Vertical distance from ground to the bottom of the front bumper fascia)	470	mm
NM	Hand measure	G	Sill Height at Front Wheel Well - (Vertical distance from ground to the sill at the front wheel well opening)	231	mm
NM	Hand measure	H	Sill Height at Front Door Leading Edge - (Vertical distance from ground to the sill at the front door seam)	232	mm
NM	Hand measure	I	Sill Height at B-Pillar - (Vertical distance from ground to the sill in line with the front door striker or B-pillar if no striker exists)	234	mm
NM	Hand measure	J1	Sill Height at Rear Wheel Well - (Vertical distance from ground to the sill at the rear wheel well opening)	225	mm
NM	Hand measure	J2	Pinch Weld Height at Rear Wheel Well - (Vertical distance from ground to the pinch weld at the rear wheel well opening)	215	mm
NM	Hand measure	K	Sill Height Aft of Rear Wheel Well - (Vertical distance from ground to the vehicle sheet body at the rear of the rear tire's wheel well)	279	mm
NM	Hand measure	L	Thickness or height of rear bumper at center.	90 528	mm
NM	Hand measure	M	Distance from bottom of bumper to ground at center.	528 90	mm

Tape Measure Unique Identifier Used to conduct measurements

Post-Test Photos – Vehicle As Is:

Performed by:

H

Date:

5-21-24

Note: Clear and properly focused digital still photographs in .jpg format with a minimum dots-per-inch (DPI) of 180 shall be taken. A vehicle information placard placed parallel with the camera, identifying the test vehicle model as well as the MDB and NHTSA number, along with an indication of whether the photo was taken post-test shall appear in each photograph and be legible. All photographs must be in landscape view / orientation. Glare or light from any illuminated or reflective surface shall be minimized while taking photographs.

Initial: Vehicle

-  No. 2 – Post test Frontal View of Test Vehicle
-  No. 6 – Post test Impacted Side View of Test Vehicle
-  No. 4 – Post test Rear View of Test Vehicle
-  No. 16 – Post test Overhead View of the MDB and Test Vehicle
-  No. 25 – Post-Test T(0) – Impact Event
-  No. 26 – Post test Close-up View of Impact Point Target

Initial: Photos of MDB

-  No. 8 – Post test Frontal View of Impactor Face
-  No. 14 – Post test Top View of Impactor Face
-  No. 10 – Post test Left Side View of Impactor Face
-  No. 12 – Post test Right Side View of Impactor Face

Initial: With Dummy's Positioned in Vehicle

-  No. 20 – Post test Front SID – Opposite Side View
-  No. 24 – Post test Rear SID – Opposite Side View

Post-Test Video:

Performed by:

TB

Date:

5/21/24

A real-time camera (24-30 fps) shall be used to document the pre-test and post-test condition of the test vehicle in addition to the pre-test and post-test positions of the test dummies, including, but not limited to, the placement of the lap and shoulder belts. Particular attention must be exercised to fully document the proper closing of all vehicle doors, including any rear hatchback or tailgate.

Initial: MDB

TB

View of MDB and vehicle – front of vehicle

TB

View of MDB and vehicle – rear of vehicle

TB

View of MDB and vehicle – ¼ front

TB

View of MDB and vehicle – ¼ rear

TB

View of MDB and vehicle – parallel to impact door

Initial: Vehicle

TB

View of impact point – close-up

TB

View of impacted side (vehicle removed)

TB

View of front of car

TB

View of rear of car

TB

View of inside front door (dummy removed)

TB

View of inside rear door (dummy removed)

TB

Any other vehicle anomalies if applicable

Initial: Test Dummies

TB

View of front ES-2re – parallel to impact door

TB

View of rear SID-IIs – parallel to impact door

TB

View of front ES-2re – thru opposite window

TB

View of rear SID-IIs – thru opposite window

Post-Test Photos:

Performed by:

H

Date:

5-21-24

Note: Clear and properly focused digital still photographs in .jpg format with a minimum dots-per-inch (DPI) of 180 shall be taken. A vehicle information placard placed parallel with the camera, identifying the test vehicle model as well as the barrier and NHTSA number, along with an indication of whether the photo was taken pre-test shall appear in each photograph and be legible. All photographs must be in landscape view / orientation. Glare or light from any illuminated or reflective surface shall be minimized while taking photographs. Reference sample photo set!

Initial: Photos With Dummy's Not in Vehicle

H

No. 28 – Post test Front Seat Occupant Area showing head and torso contact regions (Test dummy removed)

H

No. 29 – Post test Rear Seat Occupant Area showing head and torso contact regions (Test dummy removed)

Post-Test Observations – Doors Open:

Performed by:

MP

Date:

5/21/24

Instructions: Please completely fill in the below tables. If unsure, take additional photographs and please include any observations and be descriptive as possible.

Doors

For each door, note whether: the door remained closed and operational, whether the door totally separated from the vehicle at the hinges or latches, the door disengaged from the latched position, the latch separated from the striker, the hinge components separated from each other, the latch or hinge systems pulled out of their anchorages, or the door was jammed shut. All applicable conditions should be noted. Video analysis should also be used to verify whether any door, including the rear hatch, opened during the impact event.

Initial:

MP

Inspect the door at the striker, if the door is open at the striker post, take measurements of the door opening at the location and record it in the space provided below.

MP

If there is a failure with any door, door component, or door opening, notify the Data Processing Engineer to include such information on the Quick Look Report.

Instructions: For the next two tables, indicate “Yes”, “No” or “N/A”

Post Test Door Performance	Struck Side		Non-Struck Side		Rear Hatch / Other Door
	Front	Rear	Front	Rear	
Remained closed and operational	N	N	Y	Y	Y
Total separation from vehicle at hinges or latches	N	N	N	N	N
Latch or hinge systems pulled out of their anchorages	N	N	N	N	N
Latch separated from striker	N	N	N	N	N
Jammed shut	Y	Y	N	N	N
If door opened at striker, record width of opening at striker (mm)	0	0	0	0	0

Seat Movement and Structural Observations

In the space provided below, note any seat or seat back movement or disengagement. Also, note any structural observations pertaining to the pillars, sill, window, and windshield. In particular, describe the amount of deformation to the struck-side pillars and struck side sill. Note whether there was damage to the front windshield area and if so, where the damage occurred. A similar assessment should be made for the side windows. Any other notable effects from the impact should also be indicated.

Instructions: For the next two tables, indicate "Yes", "No" or "N/A"

Post Test Seat Performance	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat movement along seat track	N	N/A	N	N/A
Seat disengagement from floor pan	N	N	N	N
Seat back movement from initial position	N	N	N	N
Seat back collapse	N	N	N	N

Post Test Structural Observations	Observations and Conclusions
Pillar performance	B-pillar Buckled
Sill separation	none
Windshield damage	none
Side window damage	none
Other notable effects	none

Post-Test Data Checklist:

Performed by:

MP/NM | SK

Date:

5/21/24

Initial:

MP

Confirm video has been downloaded.

MP

Confirm data has been downloaded.

SK

Download ATD / vehicle temperature data.

OL/SK

Read and review Questionable Data Channel list.

OL

Remind staff not to remove equipment from vehicle until questionable channel list / questionable channels have been inspected.

SK

Inspect questionable instrumentation/cabling before removal from vehicle, take photos, and document damage.

SK

Tag damaged equipment and remove from service.

SK

Authorize equipment to be removed.

Critical Results:

Performed by:

MP/NM

Date:

5/21/24

The following deliverables were met:

MP

Impact speed within 52.9 km/h $\pm$ 0.8 km/h (32.9 mph $\pm$ 0.5 mph).

MP

Impact angle within 27° $\pm$ 1°

MP

Impact point within $\pm$ 50 mm (Horizontal offset from the vertical impact line)

Driver ATD (ES-2re) Dummy Injury Data:

MP

Head – Head Injury Criterion (HIC) (36) may not exceed 1000.

MP

Maximum Thoracic Rib Deflection – The sum of thoracic rib deflection may not exceed 44 mm.

MP

Total Abdominal Force – The sum of abdominal forces may not exceed 2,500 N (562 lbf.).

MP

Pubic Symphysis Force – The sum of pubic symphysis forces may not exceed 6,000 N (1349 lbf.).

NA

Notify customer if injury criteria limit is exceeded.

(Reference Table)

ES-2re Injury Criteria	Max. Allowable IARV
	Units
HIC	1000
Upper Rib Deflection (mm)	
Mid. Rib Deflection (mm)	44 mm
Lower Rib Deflection (mm)	
Abdominal Load (front) (N)	
Abdominal Load (mid) (N)	
Abdominal Load (rear) (N)	
Sum of Abdominal Forces (N)	2.5 kN
Pubic Symphysis (N)	6 kN

Passenger ATD (SID-IIs) Dummy Injury Data:

- MP** Head – Head Injury Criterion (HIC) (36) may not exceed 1000.
- MP** Lower Spine – The resultant spine acceleration may not exceed 82 g.
- MP** Pelvis – The sum of the acetabular and iliac pelvic forces may not exceed 5,525 N (1,242 lbf.).
- N/A** Notify customer if injury criteria limit is exceeded.

(Reference Table)	
SID-IIs Injury Criteria	Max. Allowable IARV
HIC	1000
Max. Spine Acceleration (g)	82
Acetabular (N)	
Iliac (N)	
Sum of Acetabular and Iliac (N)	5525

* Proposed IARV

Door Opening Criteria:

- MP** Any side door that is struck by the mdb shall not separate totally from the vehicle.
- MP** Any door (including a rear hatchback or tailgate) that is not struck by the MDB must meet the following requirements:
 - The door shall not disengage from the latched position.
 - The latch shall not separate from the striker, and the hinge components shall not separate from each other or from their attachment to the vehicle.
 - Neither the latch nor the hinge systems of the door shall pull out of their anchorages.

Notify Customer – Test Executed:

Performed by:

MP

Date:

5/21/24

Informed COTR that test was conducted:

Initial:

☒

Via e-mail

Date:

5/22/2024

☐

Via voice mail message

☒

Via live conversation

TOM Comments:

None

tr 6183

Post Test Measurements

Performed by:

Even Glassman

Date:

5/24/24

Initial:

EG

Measure using the FARO arm the vertical distance from ground to each level (top edge of the tapeline) along the vertical impact reference line.

FARO Unique Identifier:

12395

EG

Using the FARO arm, take Level 1 measurements every 150 mm (i.e. L1 900P to L1 2850P) - Top of side sill (top edge of the tapeline)

EG

Using the FARO arm, take Level 2 measurements every 150 mm (i.e. L2 900P to L2 2850P) - Occupant Hip Point (top edge of the tapeline)

EG

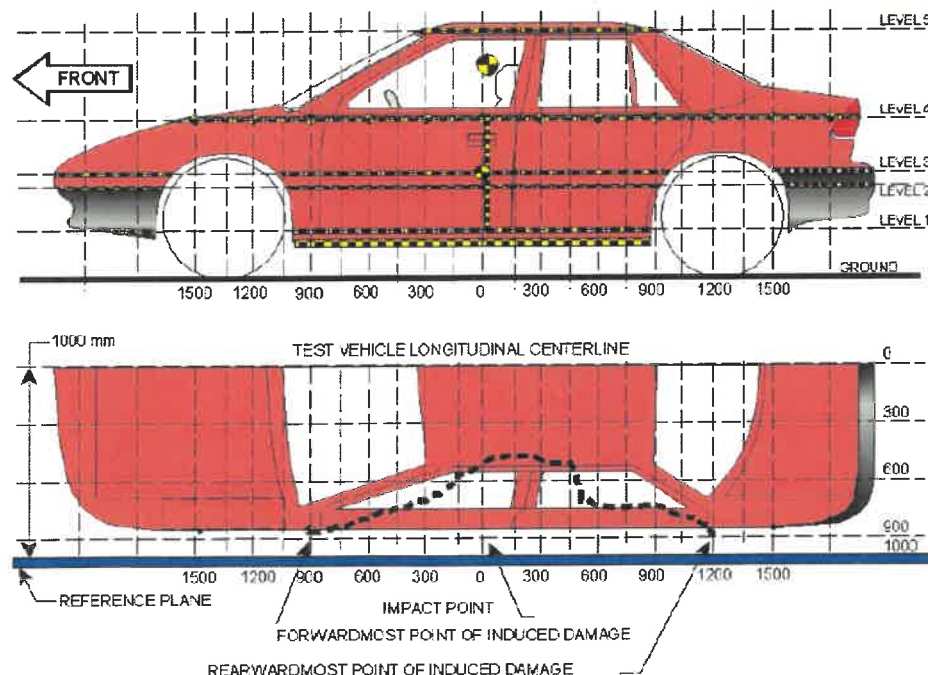
Using the FARO arm, take Level 3 measurements every 150 mm (i.e. L3 900P to L3 2850P) - Mid-door (top edge of the tapeline)

EG

Using the FARO arm, take Level 4 measurements every 150 mm (i.e. L4 900P to L4 2850P) - Window sill (top edge of the tapeline)

EG

Using the FARO arm, take Level 5 measurements every 150 mm (L5 900P to L5 2850P) - Top of window (top edge of the tapeline)



Left Side View – All measurements in (mm) with tolerance of +/- 3 mm

Initial:

- EL** LFW - Left Front Wheel.
- EL** LRW - Left Rear Wheel.
- EL** RFW - Right Front Wheel.
- EL** RRW - Right Rear Wheel.
- EL** RFRONT - Right Front (X19)
- EL** CFRONT - Center of Front (X1)
- EL** LFRONT - Left Front (X20)
- EL** RREAR - Right Rear
- EL** CREAR - Center of Rear
- EL** LREAR - Left Rear
- EL** NUP - N Upper Point
- EL** NLOW - N Lower Point
- EL** OFRNT - O Front Point
- EL** OPMID - O Rear Point / P Front Point
- EL** PREAR - P Rear Point
- EL** QUP - Front Window Opening – Take uppermost point on front window to obtain window vertical distance measurement
- EL** QLOW – Front Window Opening – Take lowermost point on front window to obtain window vertical distance movement
- EL** RBPW - Right B Pillar Point (*Taken at vertical tangency point*)
- EL** LBPW - Left B Pillar Point (*Taken at vertical tangency point*)

Vehicle Floor Pan Measurements / P2 Floor Pan / Interior -----

Initial:

- EL** P2 STRIKER – Center of P2 Striker Bolt

tr 6183

Post-Test Exterior Static Crush for Impactor Face

Performed by:

Evan Blossman

Date:

5/24/24

Instructions: Read through the following instruction PRIOR to measuring the following locations using the FARO arm.

Exterior MDB Measurements:

FARO Unique Identifier:

12395

The maximum static crush of the MDB's honeycomb face shall be measured post-test in the longitudinal direction at the following vertical locations (see **Figure 14 Below**):

- (1) Center of Bumper Level = **432** mm above ground level
- (2) Top of Bumper Level = **533** mm above ground level
- (3) Mid Level = **686** mm above ground level
- (4) Top-Stack Level = **813** mm above ground level

Post-test measurements are taken (from a reference plane perpendicular to and 1,000 mm from the MDB's longitudinal centerline) across the barrier face at 100 mm intervals at each of the four levels specified.

Initial:

EB

Using the FARO arm, take Level 1 measurements every 100 mm (i.e. L1 800ROC to L1 800LOC) – Center of Bumper Level

EB

Using the FARO arm, take Level 2 measurements every 100 mm (i.e. L2 800ROC to L2 800LOC) – Top of Bumper Level

EB

Using the FARO arm, take Level 3 measurements every 100 mm (i.e. L3 800ROC to L3 800LOC) – Mid Level

EB

Using the FARO arm, take Level 4 measurements every 100 mm (i.e. L4 800ROC to L4 800LOC) – Top-Stack Level

Conversions:

SI* (MODERN METRIC) CONVERSION FACTORS				
Table of APPROXIMATE CONVERSIONS TO SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yards	0.836	square meters	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.765	cubic meters	m ³
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE				
°F	Fahrenheit	$5 \times (F-32) \div 9$ or $(F-32) \div 1.8$	Temperature is in exact degrees Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
Force and Pressure or Stress				
lbf	poundforce	4.45	newtons	N
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa

Revision History:

Revision Level:	Revision Date:	Comments:
R00	7/7/2017	Initial Issue as Work Instruction Test Template.
R01	11/21/2019	Complete Rewrite.
R02	11/11/2022	Relocated various sections and procedures to better align with work flow. • Added to Quality System, Security provisions added • Removed duplicate and not applicable steps/procedures • Increased details within various steps & procedures to improve clarity

Approved:



Edward Dutton, Crash Operations ManagerDate: 11/26/19