**REPORT NUMBER: SINCAP-CAL-24-002**

# NEW CAR ASSESSMENT PROGRAM (NCAP)
# MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

**Hyundai Motor Company**
**2024 Hyundai Kona**
**5 Door SUV**

**NHTSA No: M20244205**

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

**December 18, 2024**

**FINAL REPORT**

**PREPARED FOR:**
**U. S. DEPARTMENT OF TRANSPORTATION**
**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**
**OFFICE OF CRASHWORTHINESS STANDARDS**
**MAIL CODE: NRM-110**
**1200 NEW JERSEY AVE SE**
**WASHINGTON, D.C. 20590**

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Prepared by:  Date: December 18, 2024
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Approved by:  Date: December 18, 2024
Quinn Porzio, Test Engineer

**FINAL REPORT ACCEPTANCE BY OCWS:**

_____
Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

_____
COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

# TECHNICAL REPORT DOCUMENTATION PAGE

| | | |
|---|---|---|
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| ***15. Supplementary Notes*** | | |

***16. Abstract***

A 55/28, (61.90kph / 38.5 mph), 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2024 Hyundai Kona 5 Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP MDB Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on May 22, 2024.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.09 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was 200 mm located at level 3. The test vehicle's occupant performance data is as follows:

| Measurement Description | Driver ATD (ES-2re) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria (HIC36) | | 1000 | 123.530 |
| Maximum Thorax Rib Deflection | mm | 44 | 23.844 |
| Total Abdominal Force | N | 2500 | 700.548 |
| Pubic Symphysis Force | N | 6000 | 1548.757 |
| Lower Spine (T12) Resultant Acceleration | G | 82* | 31.763 |
| **Measurement Description** | **Passenger ATD (SID-IIs)** | | |
| | **Units** | **IARV** | **Result** |
| Head Injury Criteria (HIC36) | | 1000 | 220.613 |
| Maximum Thorax Rib Deflection | mm | 38* | 9.900 |
| Lower Spine (T12) Resultant Acceleration | G | 82 | 69.669 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3873.402 |
| Maximum Abdominal Rib Deflection | mm | 45* | 42.941 |

**Proposed IARV*

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

| | |
|---|---|
| ***17. Key Words***<br>New Car Assessment Program (NCAP)<br>Side Impact<br>MDB<br>ES-2re<br>SID-IIs | ***18. Distribution Statement***<br>Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services Division<br>1200 New Jersey Ave. SE<br>Washington, D.C. 20590 |

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## SECTION 1

## TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2024 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2024 Hyundai Kona  5 Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

## SECTION 2
## SUMMARY OF TEST RESULTS

A 2024 Hyundai Kona 5 Door SUV was impacted on the left (driver's) 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 62.09 km/h. 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 22, 2024. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated March 2020. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
Public symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (T12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in APPENDIX C of this report. Appendix D of this report contains the test equipment and instrumentation calibration data.

## DUMMY INJURY VALUES

| Measurement Description | Driver ATD (ES-2re) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria (HIC36) | | 1000 | 123.530 |
| Maximum Thorax Rib Deflection | mm | 44 | 23.844 |
| Total Abdominal Force | N | 2500 | 700.548 |
| Pubic Symphysis Force | N | 6000 | 1548.757 |
| Lower Spine (T12) Resultant Acceleration | G | 82* | 31.763 |

| Measurement Description | Passenger ATD (SID-IIs) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria (HIC36) | | 1000 | 220.613 |
| Maximum Thorax Rib Deflection | mm | 38* | 9.900 |
| Lower Spine (T12) Resultant Acceleration | G | 82 | 69.669 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3873.402 |
| Maximum Abdominal Rib Deflection | mm | 45* | 42.941 |

**Proposed IARV*

## SUPPLEMENTAL RESTRAINT INFORMATION

| Restraint Type | Left Front (Driver) Occupant Location 1 | | Left Rear (Passenger) Occupant Location 4 | |
|---|---|---|---|---|
| | Mounted | Deployed | Mounted | Deployed |
| Front Airbag | Yes | No | | |
| Knee Airbag | No | N/A | | |
| Side Airbag 1 - Curtain | Yes | Yes | Yes | Yes |
| Side Airbag 2 - Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | Yes | Yes |
| Seat Belt Load Limiter | Yes | Yes | Yes | Yes |
| Other | | | | |

**GENERAL COMMENTS:**

1. P1 serial number - F033
2. P4 serial number - 300

**Data Anomalies:**

The following channel was questionable for:

- Left B-Pillar Lower Y Acceleration, Exceeded calibration range at 12 ms
- Left B-Pillar Middle Y Acceleration, Exceeded calibration range and saturated at 10.8 ms

## SECTION 3

## OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 - General Test and Vehicle Parameter Data

Data Sheet No. 2 - Seat, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data

Data Sheet No. 3 - Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 - Dummy Lateral Clearance Dimensions

Data Sheet No. 5 - Camera and Instrumentation Data

Data Sheet No. 6 - Test Vehicle Accelerometer Locations

Data Sheet No. 7- MDB Accelerometer Locations

Data Sheet No. 8 - Post-Test Observations

Data Sheet No. 9 - MDB Summary of Results

Data Sheet No. 10 - Test Vehicle Profile Measurements

Data Sheet No. 11 - Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 - MDB Exterior Static Crush Measurements

Data Sheet No. 13 - Vehicle and MDB Damage Profile Distances

Data Sheet No. 14 - FMVSS No. 301 Static Rollover Results

Data Sheet No. 15 - Dummy / Vehicle Temperature and Humidity Stabilization Data

## DATA SHEET NO. 1
## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Hyundai Kona 5 Door SUV | NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test | Test Date: 05/22/2024

### TEST VEHICLE INFORMATION AND OPTIONS

| | |
|---|---|
| NHTSA No. | M20244205 |
| Model Year | 2024 |
| Make | Hyundai |
| Model | Kona |
| Body Style | SUV |
| VIN | KM8HB3AB1RU100091 |
| Body Color | Neoteric Yellow |
| Odometer Reading (km/mi) | 27 miles |
| Engine Displacement (L) | 2.0 |
| Type / No. Cylinders | I4 |
| Engine Placement | Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | Intelligent Variable |
| Overdrive | Yes |
| Final Drive | Front Wheel Drive |
| Roof Rack | No |
| Sunroof / T-Top | No |
| Running Boards | No |
| Tilt Steering Wheel | Yes |
| Power Seats | Yes |
| Anti-Lock Brakes (ABS) | Yes |

| | |
|---|---|
| Traction Control System (TCS) | Yes |
| Auto-Leveling System | No |
| Automatic Door Locks (ADL) | Yes |
| Power Window Auto-Reverse | Yes |
| Other Optional Feature | N/A |
| Driver Front Airbag | Yes |
| Driver Curtain Airbag | Yes |
| Driver Head/Torso Airbag | No |
| Driver Torso Airbag | No |
| Driver Torso / Pelvis Airbag | Yes |
| Driver Pelvis Airbag | No |
| Driver Knee Airbag | No |
| Rear Pass. Curtain Airbag | Yes |
| Rear Pass. Head / Torso Airbag | No |
| Rear Pass. Torso Airbag | No |
| Rear Pass. Torso / Pelvis Airbag | No |
| Rear Pass. Pelvis Airbag | No |
| Driver Seat Belt Pretensioner | Yes |
| Rear Pass. Seat Belt Pretensioner | Yes |
| Driver Load Limiter | Yes |
| Rear Pass. Load Limiter | Yes |
| Other Safety Restraint | N/A |

Does owner's manual provide instructions to turn off automatic door locks? **No**

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | Hyundai Motor Company |
| Date of Manufacture | DEC/2023 |
| Vehicle Type | MPV |

| | |
|---|---|
| GVWR (KG) | 1855 |
| GVWR Front (KG) | 1100 |
| GVWR Rear (KG) | 887 |

### VEHICLE SEATING AND WEIGHT CAPACITY DATA

| Measured Parameter | Front | Rear | Third | Total | |
|---|---|---|---|---|---|
| Designated Seating Capacity (DSC) | 2 | 3 | N/A | 5 | |
| Vehicle Capacity Weight (VCW) (kg) | | | | 390 | (A) |
| DSC x 68.0 kg | | | | 340 | (B) |
| Cargo Weight (RCLW) (kg) | | | | 50 | (A-B) |

### VEHICLE SEAT TYPE

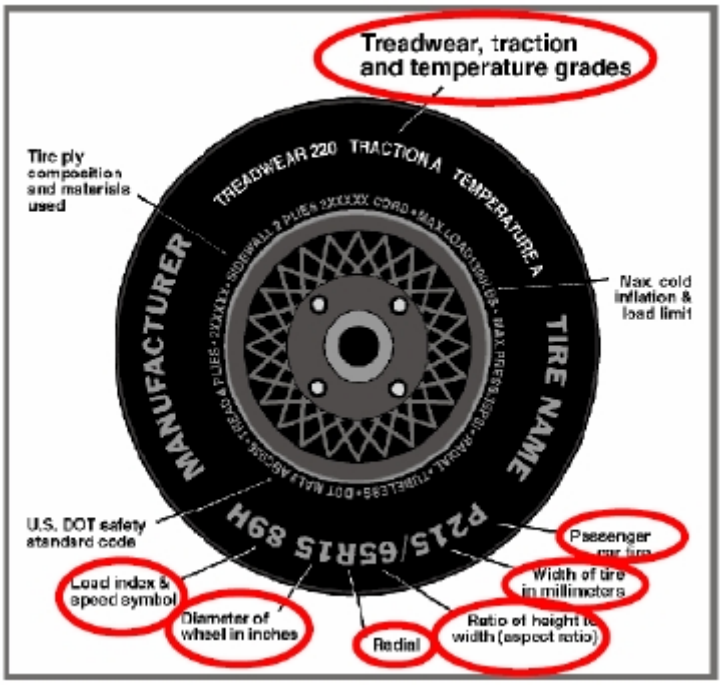
| Seating Location | Type Of Seat Pan | | | | Type Of Seat Back | | |
|---|---|---|---|---|---|---|---|
| | Bucket | Bench | Split Bench | Contour | Fixed | Adjustable | |
| | | | | | | W/ Lever | W/ Knob |
| Front | X | | | | | | X |
| Rear or Second Row Seat | | | X | | | X | |
| Third Row Seat | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

## DATA SHEET NO. 1 … (CONTINUED)
## GENERAL TEST AND VEHICLE PARAMETER DATA

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

### VEHICLE TIRE INFORMATION

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




### TIRE SIDEWALL INFORMATION

| Measured Parameter | Front | Rear |
|---|---|---|
| Maximum Tire Pressure (kPa) | 350 | 350 |
| Cold Pressure (kPa) | 230 | 230 |
| Recommended Tire Size | 215/55R18 | 215/55R18 |
| Tire Size on Vehicle | 215/55R18 | 215/55R18 |
| Tire Manufacturer | Kumho | Kumho |
| Tire Model | Solus TA51 | Solus TA51 |
| Treadwear | 540 | 540 |
| Traction | A | A |
| Temperature Grades | A | A |
| Tire Plies Sidewall | 2 Polyester | 2 Polyester |
| Tire Plies Body | 2 Steel, 2 Polyester, 1 Nylon | 2 Steel, 2 Polyester, 1 Nylon |
| Load Index / Speed Symbol | 95V | 95V |
| Tire Material | Rubber | Rubber |
| DOT Safety Code Left | 12797YATC4923 | 12797YATC4923 |
| DOT Safety Code Right | 12797YATC4923 | 12797YATC4923 |

## DATA SHEET NO. 1 … (CONTINUED)
## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Hyundai Kona 5 Door SUV NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test Test Date: 05/22/2024

### TIRE PRESSURES

| | Units | LF | RF | LR | RR |
|---|---|---|---|---|---|
| As Delivered | kPa | 228 | 237 | 241 | 237 |
| Tire Placard | kPa | 230 | 230 | 230 | 230 |
| Owner's Manual | kPa | 230 | 230 | 230 | 230 |
| As Tested | kPa | 230 | 230 | 230 | 230 |

### MDB TIRE SPECIFICATIONS

| | Units | Requirements | LF | RF | LR | RR |
|---|---|---|---|---|---|---|
| Tire Size | | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 |
| Tire Pressure | kPa | 200 ± 21 | 207 | 207 | 207 | 207 |

### TEST VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Front | Rear | Total | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 420 | 286 | | 463 | 346 | | 461 | 363 | |
| Right | kg | 429 | 262 | | 450 | 308 | | 442 | 308 | |
| Ratio | % | 60.8 | 39.2 | | 58.3 | 41.7 | | 57.4 | 42.6 | |
| Totals | kg | 849 | 548 | 1397 | 913 | 654 | 1567 | 903 | 671 | 1574 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|---|---|---|
| Total As Delivered Weight (UVW) | kg | 1397 | (A) |
| Actual Weight of 2 P572V (ES-2re and SID-IIs) ATDs Used | kg | 127 | (B) |
| Rated Cargo / Luggage Weight (RCLW) | kg | 50 | (C) |
| Calculated Vehicle Target Weight (TVTW) | kg | 1574 | (A+B+C) |

**Does the measured As Test Vehicle Weight lie within the required weight range**

**(i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)?** [X] **Yes** [ ] **No**

### TEST VEHICLE ATTITUDES AND CG

| Measurement Description | Units | As Tested | Fully Loaded | Meets Rqmt*** |
|---|---|---|---|---|
| LF | mm | 888 | 886 | Yes |
| RF | mm | 889 | 895 | Yes |
| RR | mm | 922 | 920 | Yes |
| LR | mm | 914 | 910 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1111 | 1135 | |
| Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline) | mm | +26 | +37 | |

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

**Test height adjustable suspension setting, if applicable:** N/A

## DATA SHEET NO. 1 … (CONTINUED)
## GENERAL TEST AND VEHICLE PARAMETER DATA

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

### WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

| Component Description | Weight (kg) |
|---|---|
| Trunk Carpeting | 14.5 |
| Spare Tire | 12 |
| Jack | 3.5 |
| | |
| Ballast / Equipment Added | 5 |

### TEST SURFACE MARKINGS

| | Distance from 63° Impact Location Line (mm) |
|---|---|
| Fore 25 mm target | 928 |
| Aft 25 mm target | 926 |
| Pre-Impact Angle Line | 232 |

| Parallel Track Target | X Location (mm) | Y Location (mm) |
|---|---|---|
| A | 0 | 0 |
| B | 2955 | 1555 |
| C | 2955 | 3355 |
| D | 0 | 3000 |

**DATA SHEET NO. 2**
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

**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 passenger's seats should be set to the rear-most, lowest, mid-angle position*

**SCRL ANGLE RANGE**

| Seat | SCRL(°) | | |
|---|---|---|---|
| | Max | Min | Mid |
| Driver Seat | 20.5 | 12.3 | 16.4 |
| Front Passenger Seat | 15.8 | 12.6 | 14.2 |
| Front Center Seat | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed |

**SEAT HEIGHT AND ANGLE**

| Seat | As Tested SCRL Angle (Mid) (°) | As Tested SCRP Height (mm) | SCRP Height Position | SCRP Height (mm) | | |
|---|---|---|---|---|---|---|
| | | | | Rearmost | Mid-Fore / Aft | Forward-Most |
| Driver Seat | 16.4 | 14 | Max | 71 | 82 | 92 |
| | | | Mid | 37 | 49 | 60 |
| | | | Min | 4 | 14 | 25 |
| Front Passenger Seat | 14.2 | 22 | Max | - | - | - |
| | | | Mid | - | - | - |
| | | | Min | 12 | 22 | 32 |
| Front Center Seat* | | | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Struck Side Rear Seat | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Non-Struck Side Rear Seat | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Rear Center Seat* | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |

**If applicable*

## DATA SHEET NO. 2 … (CONTINUED)
## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2024 Hyundai Kona 5 Door SUV
NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test
Test Date: 05/22/2024

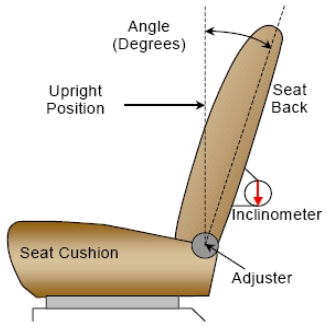
### SEAT FORE / AFT POSITION

| Seat | Total Fore / Aft Travel | | Test Position from Forward most Position | |
|---|---|---|---|---|
| | mm | Detents* | mm | Detents* |
| Driver Seat | 258 | Power | 129 | Power |
| Front Passenger Seat | 247 | 63 (0-62) | 123.5 | 31 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed | Fixed |

*if applicable*

### 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.*



FRONT SEAT ASSEMBLY

| Seat | Total Seat Back Angle Range | | Test Position from Most Upright | |
|---|---|---|---|---|
| | Degrees | Detents* | Degrees | Detents* |
| Driver Seat | 63.7 | Power | 0.75 | Power |
| Front Passenger Seat | 57.8 | 31 (0-30) | 0.7 | 6 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | 5.5 | 2 (0-1) | 17.3 | 0 |
| Non-Struck Side Rear Seat | 5.5 | 2 (0-1) | 17.3 | 0 |
| Rear Center Seat | 5.5 | 2 (0-1) | 17.3 | 0 |

*if applicable*

**DATA SHEET NO. 2 … (CONTINUED)**
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

## SEAT BELT ANCHORAGE ADJUSTMENT

*Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. For this test zero is defined as the uppermost position.*

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

## HEAD RESTRAINT ADJUSTMENT

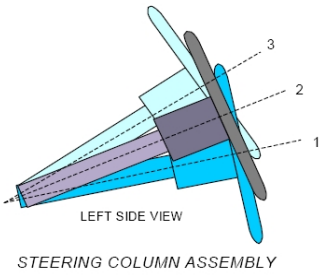
*The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.*

| Seat | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 6 (0-5) | Uppermost |
| Rear Seat | 3 (0-2) | Lowermost |

## 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 | 22.1 | |
| Geometric center - Position No. 2 | 24.7 | |
| Uppermost - Position No. 3 | 27.3 | |
| Telescoping Steering Wheel Travel | | 54 |
| Test Position | 24.7 | 27 |

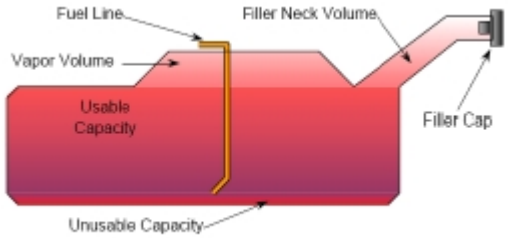


STEERING COLUMN ASSEMBLY

## FUEL PUMP

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

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



VEHICLE FUEL TANK ASSEMBLY

**DATA SHEET NO. 2 … (CONTINUED)**
**SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

**FUEL TANK CAPACITY**

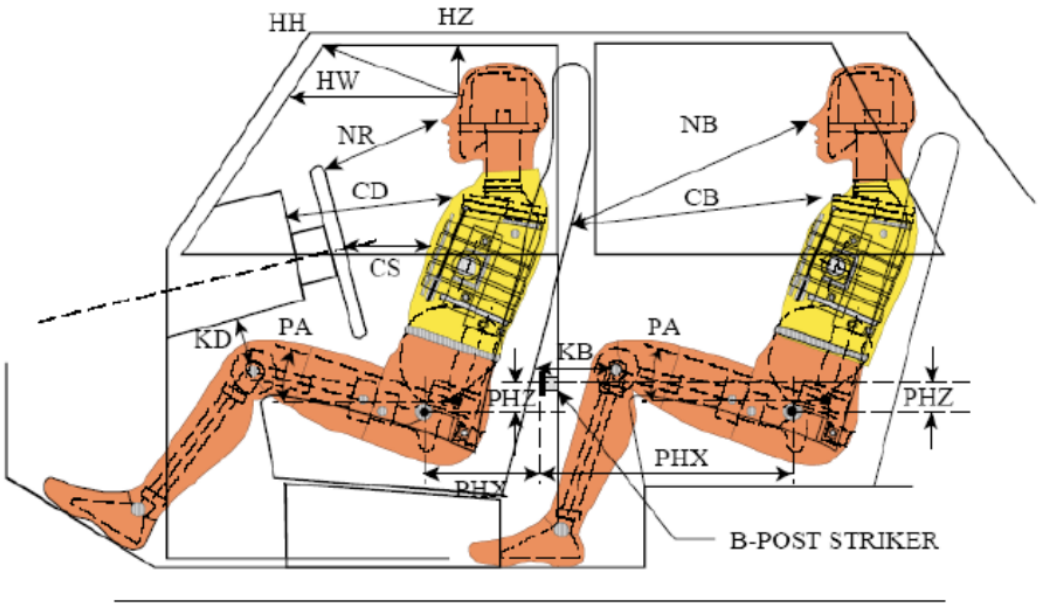
| Description | Liters |
|---|---|
| Usable Capacity of “Standard Tank” (see Form No. 1) | 47 |
| Usable Capacity of “Optional Tank” (see Form No. 1) | N/A |
| Usable Capacity of “Standard Tank” (see Owner’s Manual) | 47 |
| Usable Capacity of “Optional Tank” (see Owner’s Manual) | N/A |
| 93% of Usable Capacity | 43.7 |
| Actual Amount of Solvent Used in Test | 43.7 |
| 1/3 of Usable Capacity | 15.6 |

Is the Actual Amount of Solvent Used in the test equal to 93% ±1% of the Usable Capacity stated in Form No. 1? [X] **Yes** [ ] **No**

**DATA SHEET NO. 3**
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

## DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION



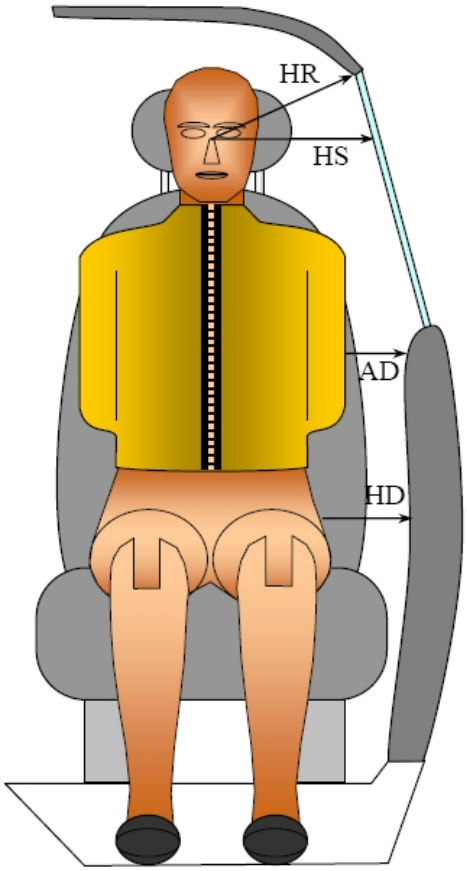

LEFT SIDE VIEW

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

| Driver Code | Pass. Code | Description | Driver (Serial No. F033) | | Left Rear Passenger (Serial No. 300) | |
|---|---|---|---|---|---|---|
| | | | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| HH | | Header to Header | 358 | | | |
| HW | | Header to Windshield | 576 | | | |
| HZ | HZ | Head to Roof Liner | 198 | | 290 | |
| NR | NB | Nose to Rim/Seat Back | 425 | | 548 | |
| CD | CB | Chest to Dash/Seat Back | 654 | | 564 | |
| CS | | Chest to Steering Wheel | 382 | | | |
| KD(L)/KDA(L)° | KB(L)/KBA(L)° | Left Knee to Dash/Seat Back | 223 | 29.0 | 302 | 9.2 |
| KD(R)/KDA(R)° | KB(R)/KBA(R)° | Right Knee to Dash/Seat Back | 225 | 19.3 | 291 | 8.9 |
| PAX° | PAX° | Pelvic Tilt Angle X | | 17.4 | | 20.4 |
| | PAY° | Pelvic Tilt Angle Y | | | | 0.2 |
| PHX | PHX | Hip Point to Striker (X-Axis) | 183 | | 246 | |
| PHZ | PHZ | Hip Point to Striker (Z-Axis) | 297 | | 252 | |

**DATA SHEET NO. 4**
**DUMMY LATERAL CLEARANCE DIMENSIONS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |



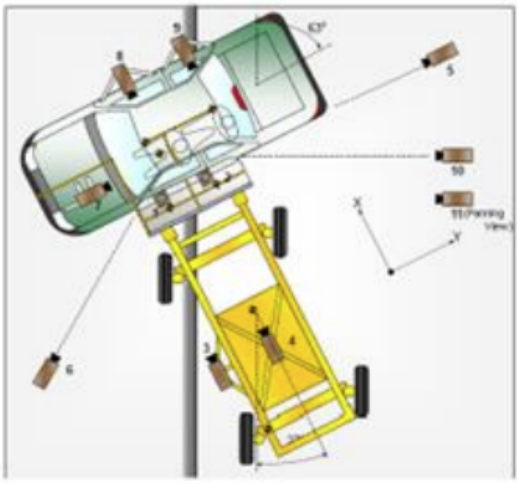

*FRONT VIEW OF DUMMY*

**DUMMY LATERAL CLEARANCE DIMENSION INFORMATION**

| Code | Measurement Description | Units | Driver (Serial No. F033) | Left Rear Passenger (Serial No. 300) |
|---|---|---|---|---|
| HR | Head to Side Header | mm | 224 | 258 |
| HS | Head to Side Window | mm | 324 | 352 |
| AD | Arm to Door | mm | 108 | 158 |
| HD | Hip Point to Door | mm | 173 | 175 |

**DATA SHEET NO. 5**
**CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2024 Hyundai Kona 5 Door SUV
NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test
Test Date: 05/22/2024



**CAMERA LOCATIONS AND DATA**

| No. | Camera View | Location (mm) | | | Lens (mm) | Speed (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Overhead Overall | 0 | 0 | -8243 | 12.5 | 1000 |
| 2 | Overhead Close-up | 0 | 0 | -8243 | 24 | 1000 |
| 3 | Left Impact Point (MDB) | -1470 | 0 | -847 | 25 | 1000 |
| 4 | Side Overall (MDB) | -1140 | 878 | -1587 | 8 | 1000 |
| 5 | Rear | 0 | 8640 | -1545 | 28 | 1000 |
| 6 | Left Front | -2485 | -5490 | -1597 | 24 | 1000 |
| 7 | Driver Front (OB) | | | | 25 | 1000 |
| 8 | Driver Side (OB) | | | | 12.5 | 1000 |
| 9 | Passenger Side (OB) | | | | 12.5 | 1000 |
| 10 | Real-time Left Rear | | | | Zoom | 30 |
| 11 | Real-time In Run | | | | Zoom | 30 |

*Notes:* *Reference: Impact Point projected to Ground*
*+X = To Front of MDB, +Y = To Right of MDB, +Z = Down*
** All measurements accurate to ± 6 mm.*

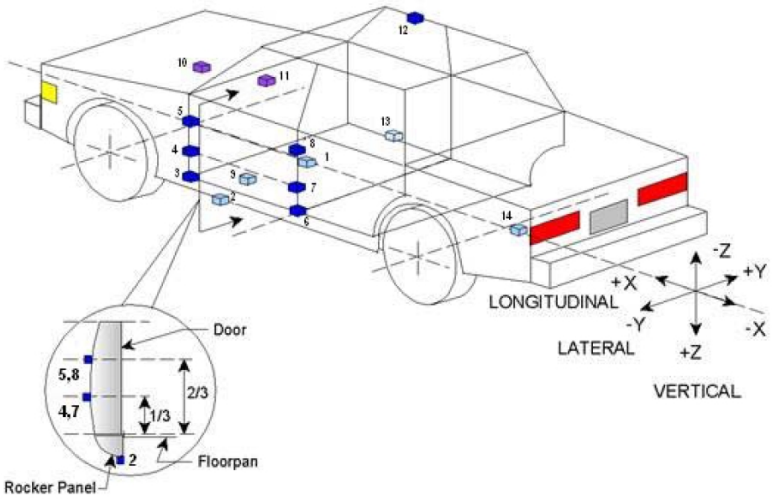
If applicable, explain why camera(s) did not operate as intended: All cameras operated as intended.

**INSTRUMENTATION**

| | |
|---|---|
| Driver Dummy Channels | 16 |
| Passenger Dummy Channels | 16 |
| Vehicle Structure Accelerometers | 23 |
| MDB Accelerometers | 7 |
| Total | 62 |

**DATA SHEET NO. 6**
**TEST VEHICLE ACCELEROMETER LOCATIONS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |



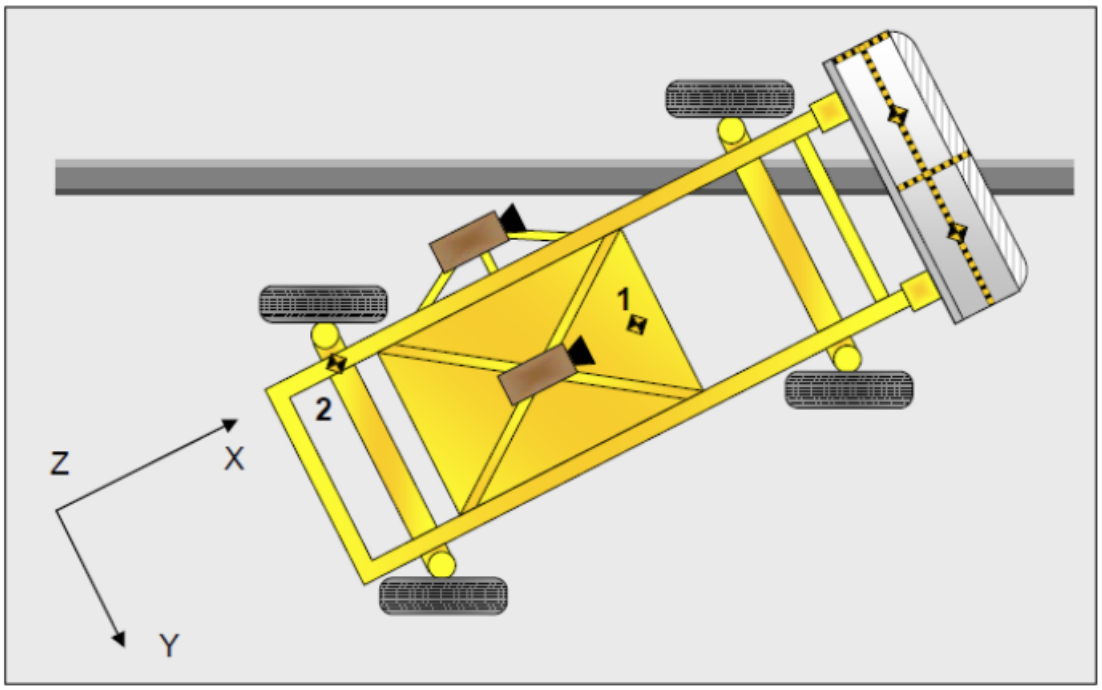

**TEST VEHICLE ACCELEROMETER LOCATIONS**

| No. | Accelerometer Location | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Vehicle CG | 1900 | 4 | 119 |
| 2 | Right Sill at Front Seat | 2562 | 665 | 149 |
| 3 | Right Sill at Rear Seat | 1725 | 663 | 147 |
| 4 | Left Sill at Front Door | 2543 | -664 | 153 |
| 5 | Left Sill at Rear Door | 1742 | -665 | 150 |
| 6 | A-Post Lower | 3051 | -629 | -55 |
| 7 | A-Post Middle | 2929 | -661 | -582 |
| 8 | B-Post Lower | 1954 | -673 | -161 |
| 9 | B-Post Middle | 1921 | -668 | -513 |
| 10 | Front Seat Track | 2294 | -554 | 156 |
| 11 | Rear Seat Structure | 1655 | -355 | 160 |
| 12 | Rt. Rear Occ. Compartment | 1907 | 411 | 265 |
| 13 | Engine Block | 3696 | 187 | -337 |
| 14 | Rear Above Axle | 866 | -8 | 75 |

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

**DATA SHEET NO. 7**
**MDB ACCELEROMETER LOCATIONS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |




**MDB ACCELEROMETER LOCATIONS**

| No. | Accelerometer Location | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | MDB CG | 1859 | 0 | -330 |
| 2 | MDB Rear | 386 | -660 | -660 |

*Reference:* *X – Face of MDB (+forward)*
*Y – MDB centerline (+ to right)*
*Z – Ground plane (+down)*

**Width between left and right contact switches (mm):** 1502

## DATA SHEET NO. 8
## POST-TEST OBSERVATIONS

Test Vehicle: 2024 Hyundai Kona 5 Door SUV NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test Test Date: 05/22/2024

### TEST DUMMY INFORMATION AND CONTACT POINTS

| Description | Front Seat Dummy (ES-2re) | Rear Seat Dummy (SID-IIs) |
|---|---|---|
| Face | Curtain Airbag | Curtain Airbag |
| Top of Head | Curtain Airbag & Side Header | Curtain Airbag |
| Left Side of Head | Curtain Airbag | Curtain Airbag |
| Back of Head | Curtain Airbag & Head Restraint | Curtain Airbag & Middle Rear Seat |
| Left Shoulder | Curtain Airbag | Seatback & Passenger Door |
| Upper Torso | Seatback & Torso/Pelvis Airbag | Seatback & Passenger Door |
| Lower Torso | Seatback | Seatback & Passenger Door |
| Left Hip | Seat Pan & Torso/Pelvis Airbag | Seat Pan & Passenger Door |
| Left Knee | Driver Door | Passenger Door |

### POST-TEST DOOR PERFORMANCE

| Description | Struck Side | | Non-Struck Side | | Rear Hatch/ Other |
|---|---|---|---|---|---|
| | Front | Rear | Front | Rear | |
| Remained Closed and Operational | No | No | Yes | Yes | Yes |
| Total Separation from Vehicle at Hinges or Latches | No | No | No | No | No |
| Latch or Hinge Systems Pulled Out of Their Anchorages | No | No | No | No | No |
| Disengaged from Latched Position | No | No | No | No | No |
| Latch Separated from Striker | No | No | No | No | No |
| Jammed Shut | Yes | Yes | No | No | No |
| If Door Opened at Striker, Width of Opening at Striker (mm) | 0 | 0 | 0 | 0 | 0 |

### POST-TEST SEAT PERFORMANCE

| Description | Struck Side | | Non-Struck Side | |
|---|---|---|---|---|
| | Front | Rear | Front | Rear |
| Seat Movement Along Seat Track | No | No | No | No |
| Seat Disengagement from Floor Pan | No | No | No | No |
| Seat Back Movement from Initial Position | No | No | No | No |
| Seat Back Collapse | No | No | No | No |

### POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|---|---|
| Pillar Performance | B-Pillar & C-Pillar buckled |
| Sill Separation | None |
| Windshield Damage | None |
| Side Window Damage | Left rear passenger window shattered during impact |
| Other Notable Effects | None |

## DATA SHEET NO. 8 … (CONTINUED)
## POST-TEST OBSERVATIONS

Test Vehicle: 2024 Hyundai Kona 5 Door SUV NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test Test Date: 05/22/2024

### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Type | Struck Side Driver | | Struck Side Rear Passenger | |
|---|---|---|---|---|
| | Mounted | Deployed | Mounted | Deployed |
| Front Airbag | Yes | No | | |
| Knee Airbag | No | N/A | | |
| Side Airbag 1 - Curtain | Yes | Yes | Yes | Yes |
| Side Airbag 2 - Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | Yes | Yes |
| Seat Belt Load Limiter | Yes | Yes | Yes | Yes |
| Other | | | | |

### IMPACT POINT LOCATION DATA

| Measured Parameter | Units | Tolerance | Value |
|---|---|---|---|
| Vehicle Wheel Base | mm | | 2663 |
| Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point) | mm | | 391 |
| Actual Impact Point (Aft of Frontal Axle) | mm | | 395 |
| Horizontal Offset (+ forward / - rearward) | mm | +/- 50 of Intended Impact Point | -4 |
| Vertical Offset (+ down / - up) | mm | +/- 20 of Intended Impact Point | -1 |

## DATA SHEET NO. 9
## MDB SUMMARY OF RESULTS

Test Vehicle: 2024 Hyundai Kona 5 Door SUV
NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test
Test Date: 05/22/2024

### MDB SPECIFICATIONS

| Measurement Description | Length (mm) |
|---|---|
| Overall Width of Framework Carriage | 1250 |
| Overall Length Including Honeycomb Frame | 4120 |
| Wheelbase of Framework Carriage | 2591 |
| CG Location of Front Axle | 1122 |

### MDB WEIGHTS

| | Units | Front Axle | Rear Axle | Total |
|---|---|---|---|---|
| Left | kg | 396 | 291.5 | 687.5 |
| Right | kg | 377.5 | 301 | 678.5 |
| Ratio | % | 56.6 | 43.4 | 100 |
| Totals | kg | 773.5 | 592.5 | 1366 |

### SPEED AND ANGLE AT IMPACT DATA

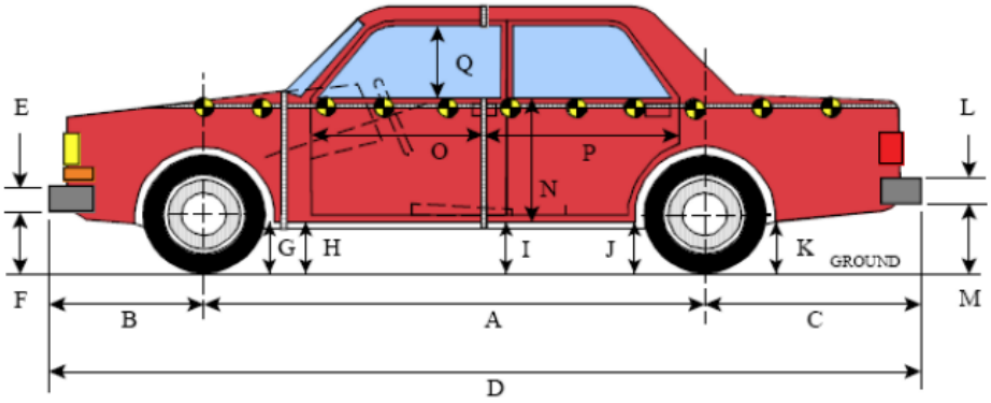
| Measured Parameter | Units | Requirement | Value |
|---|---|---|---|
| Trap No. 1 Velocity (Primary) | km/h | 61.10 to 62.70 | 62.09 |
| Trap No. 2 Velocity (Redundant) | km/h | 61.10 to 62.70 | 62.22 |
| MDB CL to Target Vehicle CL | degrees | 88.5 to 91.5 | 90.0 |
| MDB Forward Line of Motion to Target Vehicle CL | degrees | 62.5 to 63.5 | 63.0 |
| MDB Crabbed angle to MDB Forward Line of Motion | degrees | 26.0 to 28.0 | 27.0 |

### MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

| Vertical Location | | | From Centerline | | Maximum Crush (mm) |
|---|---|---|---|---|---|
| Row | Description | Height (mm) | Distance (mm) | Direction | |
| A | Center of Bumper | 432 | 800 | Left | 196 |
| B | Top of Bumper | 533 | 800 | Left | 119 |
| C | Mid-Level | 686 | 800 | Left | 126 |
| D | Top of Stack | 813 | 800 | Left | 155 |

**DATA SHEET NO. 10**
**TEST VEHICLE PROFILE MEASUREMENTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |



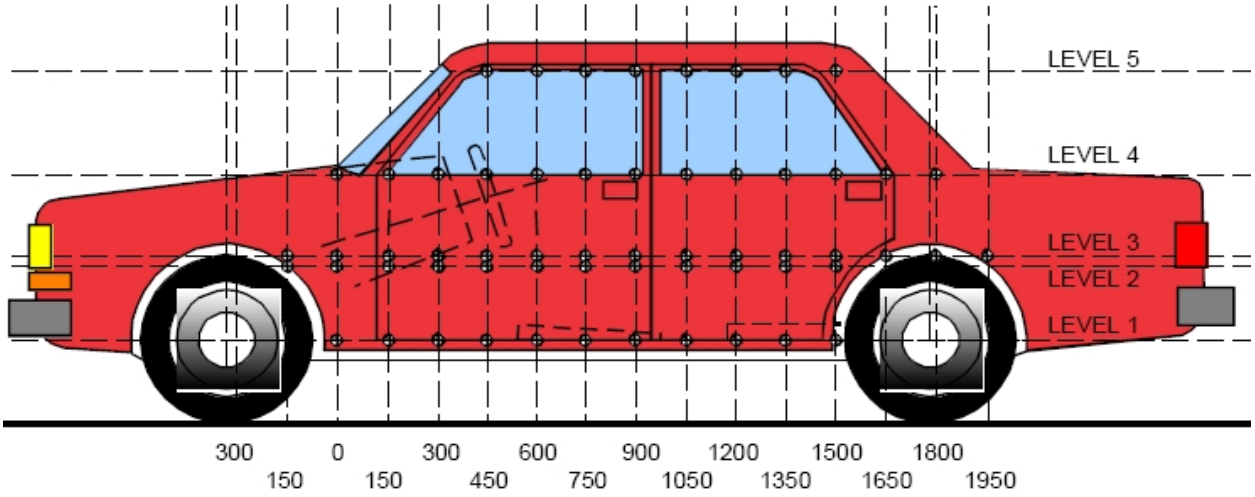

**LEFT SIDE VIEW**
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

| Code. | Measurement Description | Pre-Test | Post-Test | Change |
|---|---|---|---|---|
| A | Wheelbase | 2663 | 2653 | -10 |
| B | Front Axle to FSOV | 859 | 870 | 11 |
| C | Rear Axle to RSOV | 831 | 827 | -4 |
| D | Total Length at Centerline | 4352 | 4350 | -2 |
| E | Front Bumper Thickness | 100 | 100 | 0 |
| F | Front Bumper Bottom to Ground | 460 | 453 | -7 |
| G | Sill Height at Front Wheel Well | 227 | 229 | 2 |
| H | Sill Height at Front Door Leading Edge | 227 | 218 | -9 |
| I | Sill Height at B Pillar | 230 | 214 | -16 |
| J1 | Sill Height at Rear Wheel Well | 232 | 232 | 0 |
| J2 | Pinch Weld Height at Rear Wheel Well | 214 | 215 | 1 |
| K | Sill Height Aft of Rear Wheel Well | 271 | 282 | 11 |
| L | Rear Bumper Thickness | 105 | 105 | 0 |
| M | Rear Bumper Bottom to Ground | 423 | 429 | 6 |
| N | Sill Height to Bottom of Front Window Sill | 802 | 783 | -19 |
| O | Front Door Leading Edge to Impact CL | 741 | 736 | -5 |
| P | Rear Door Trailing Edge to Impact CL | 1336 | 1298 | -38 |
| Q | Front Window Opening | 405 | 402 | -3 |
| R | Right Side Length | 4305 | 4306 | 1 |
| S | Left Side Length | 4308 | 4307 | -1 |
| T | Maximum Vehicle Width | 1798 | 1691 | -107 |
| U | Front Wheel Track Width | 1590 | 1586 | -4 |
| V | Rear Wheel Track Width | 1592 | 1596 | 4 |

**DATA SHEET NO.11**
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |




**LEFT SIDE VIEW**

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

| Level | Measurement Description | Units | Height Above Ground | Maximum Exterior Static Crush | Distance from Impact |
|---|---|---|---|---|---|
| 1 | Sill Top | mm | 346 | 84 | 1200 |
| 2 | Driver H-Point | mm | 612 | 161 | 1350 |
| 3 | Mid-Door | mm | 736 | 200 | 1650 |
| 4 | Window Sill | mm | 1025 | 106 | 1650 |
| 5 | Window Top | mm | 1511 | 7 | 1350 |

***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.11 … (CONTINUED)
## TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Hyundai Kona 5 Door SUV | NHTSA No.: M20244205
Test Program: NCAP Side MDB Impact Test | Test Date: 05/22/2024

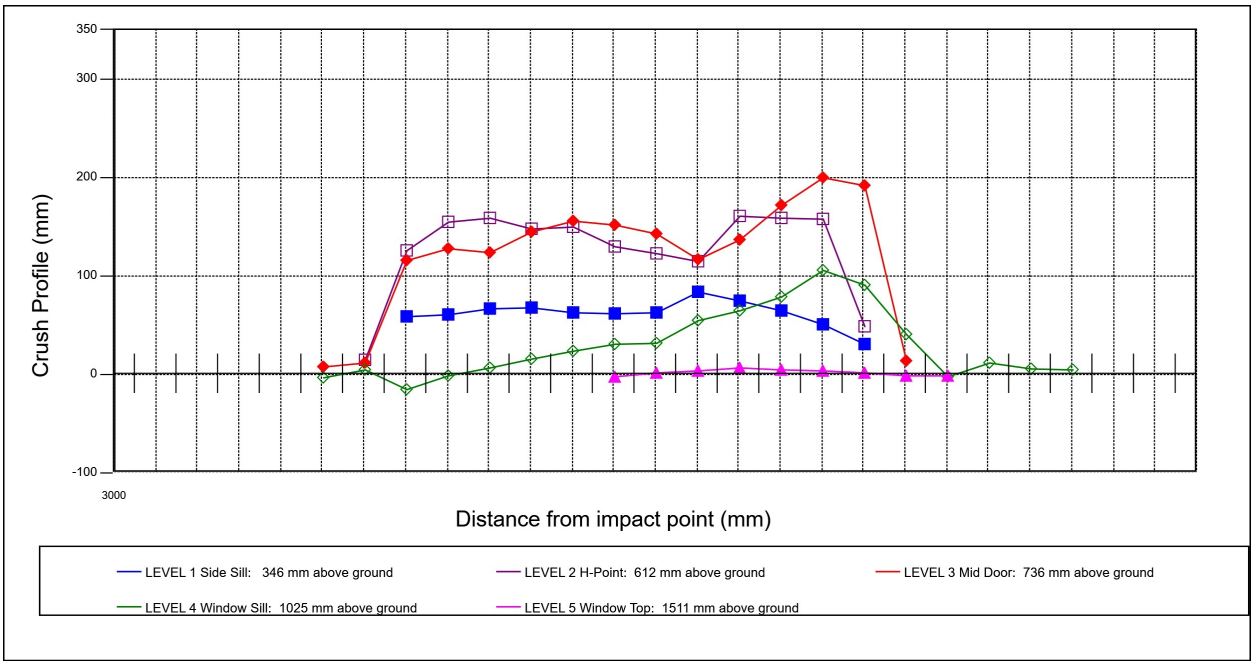
### EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

| | Pre-Test | | | | | Post-Test | | | | | Crush | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -900 | | | | | | | | | | | | | | | |
| -750 | | | | | | | | | | | | | | | |
| -600 | | | | | | | | | | | | | | | |
| -450 | | | | | | | | | | | | | | | |
| -300 | | | | | | | | | | | | | | | |
| -150 | | | 915 | 801 | | | | 907 | 804 | | | | 8 | -3 | |
| 0 | | 909 | 909 | 812 | | | 894 | 892 | 807 | | | 15 | 17 | 5 | |
| 150 | 888 | 891 | 895 | 822 | | 829 | 765 | 779 | 837 | | 59 | 126 | 116 | -15 | |
| 300 | 887 | 889 | 895 | 840 | | 826 | 734 | 767 | 841 | | 61 | 155 | 128 | -1 | |
| 450 | 886 | 889 | 894 | 848 | | 819 | 730 | 770 | 841 | | 67 | 159 | 124 | 7 | |
| 600 | 885 | 888 | 893 | 857 | | 817 | 740 | 748 | 841 | | 68 | 148 | 145 | 16 | |
| 750 | 883 | 891 | 892 | 863 | | 820 | 741 | 736 | 839 | | 63 | 150 | 156 | 24 | |
| 900 | 882 | 895 | 890 | 865 | 619 | 820 | 765 | 738 | 834 | 621 | 62 | 130 | 152 | 31 | -2 |
| 1050 | 880 | 898 | 894 | 888 | 623 | 817 | 775 | 751 | 856 | 621 | 63 | 123 | 143 | 32 | 2 |
| 1200 | 877 | 900 | 899 | 873 | 622 | 793 | 785 | 782 | 818 | 618 | 84 | 115 | 117 | 55 | 4 |
| 1350 | 876 | 900 | 902 | 873 | 619 | 801 | 739 | 765 | 808 | 612 | 75 | 161 | 137 | 65 | 7 |
| 1500 | 874 | 901 | 904 | 870 | 615 | 809 | 742 | 732 | 791 | 610 | 65 | 159 | 172 | 79 | 5 |
| 1650 | 875 | 901 | 906 | 867 | 612 | 824 | 743 | 706 | 761 | 608 | 51 | 158 | 200 | 106 | 4 |
| 1800 | 878 | 902 | 906 | 868 | 606 | 847 | 853 | 714 | 777 | 604 | 31 | 49 | 192 | 91 | 2 |
| 1950 | | | 914 | 857 | 596 | | | 900 | 816 | 597 | | | 14 | 41 | -1 |
| 2100 | | | | 866 | 577 | | | | 868 | 578 | | | | -2 | -1 |
| 2250 | | | | 861 | | | | | 849 | | | | | 12 | |
| 2400 | | | | 855 | | | | | 849 | | | | | 6 | |
| 2550 | | | | 844 | | | | | 839 | | | | | 5 | |
| 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.11 … (CONTINUED)
## TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

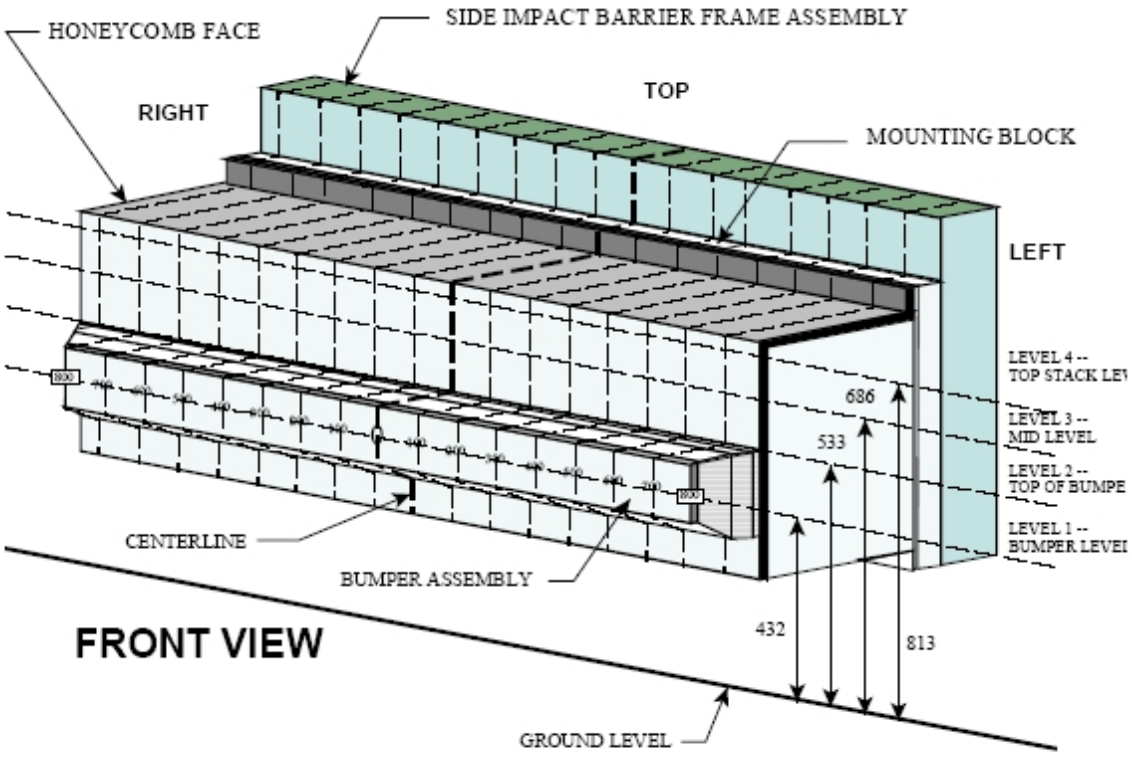
| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |




**Vehicle Exterior Crush Measurements - Visual Representation**

**DATA SHEET NO.12**
**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |




NOTE: Dimensions are shown in millimeters, mm

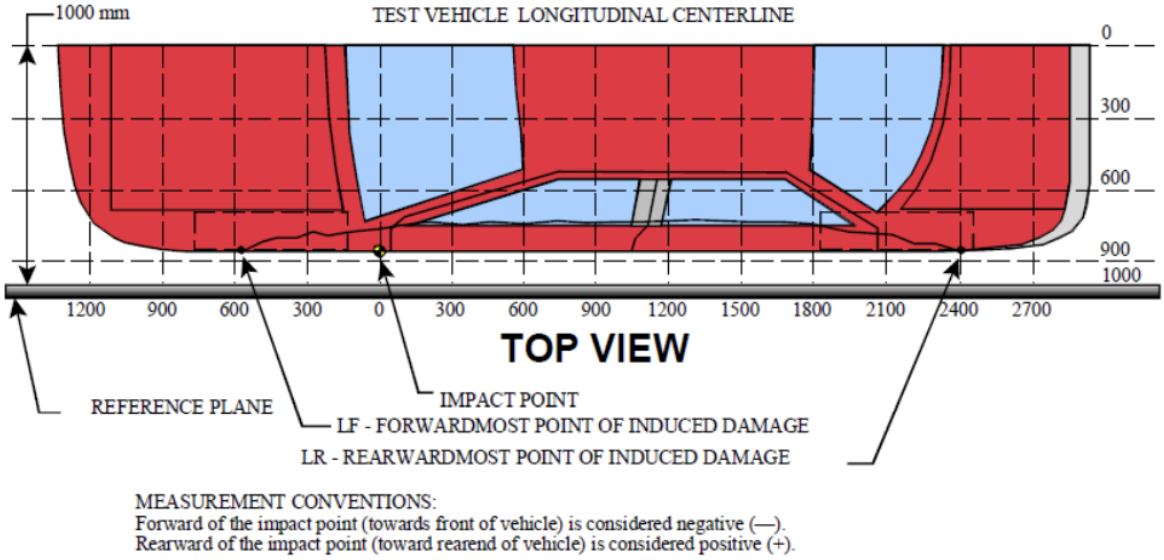
## DEFORMABLE BARRIER STATIC CRUSH

| Stack Level | Distance Right of Center | | | | | | | | C/L | Distance Left of Center | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 800 | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 1 | 165 | 161 | 158 | 160 | 162 | 165 | 167 | 169 | 163 | 159 | 160 | 161 | 163 | 165 | 168 | 172 | 196 |
| 2 | 89 | 88 | 89 | 91 | 93 | 103 | 106 | 92 | 88 | 85 | 87 | 90 | 94 | 94 | 97 | 100 | 119 |
| 3 | 25 | 28 | 43 | 64 | 66 | 85 | 90 | 67 | 53 | 43 | 40 | 40 | 43 | 49 | 63 | 80 | 126 |
| 4 | 64 | 30 | 24 | 32 | 48 | 76 | 77 | 69 | 56 | 64 | 71 | 71 | 66 | 80 | 94 | 117 | 155 |

**DATA SHEET NO.13**
**VEHICLE AND MDB DAMAGE PROFILE DISTANCE**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |

For guidance regarding damage profile distance measurements, please refer to the latest version of the *NHTSA Test Reference Guide, Volume 1: Vehicle Tests.*




MEASUREMENT CONVENTIONS:
Forward of the impact point (towards front of vehicle) is considered negative (—).
Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

**VEHICLE DAMAGE PROFILE DISTANCES**

| DPD | Distance From Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | -150 | 3 | 93 | 85 | 8 |
| 2 | 270 | 3 | 231 | 105 | 126 |
| 3 | 690 | 3 | 259 | 108 | 151 |
| 4 | 1110 | 3 | 237 | 104 | 133 |
| 5 | 1530 | 3 | 273 | 96 | 177 |
| 6 | 1950 | 3 | 100 | 86 | 14 |

**MDB DAMAGE PROFILE DISTANCES**

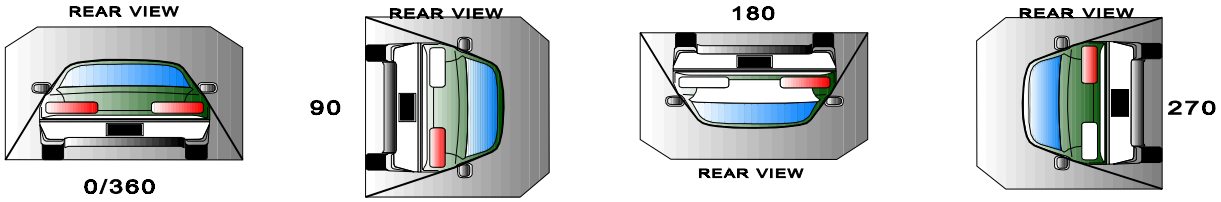
| DPD | Distance From Center of MDB | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | 800 mm left of center | 1 | 309 | 505 | -196 |
| 2 | 480 mm left of center | 1 | 349 | 514 | -165 |
| 3 | 160 mm left of center | 1 | 354 | 514 | -160 |
| 4 | 160 mm right of center | 1 | 346 | 513 | -168 |
| 5 | 480 mm right of center | 1 | 353 | 513 | -160 |
| 6 | 800 mm right of center | 1 | 336 | 501 | -165 |

**DATA SHEET NO.14**
**FMVSS NO.301 STATIC ROLLOVER RESULTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |
| Test Time: | 10:28 AM | Temperature: | 21 °C |

A. From impact until vehicle motion ceases: 0 oz
(Maximum allowable is 1 oz.)
B. For the 5-minute period after motion ceases: 0 oz
(Maximum allowable is 5 oz.)
C. For the following 25 minutes: 0 oz
(Maximum allowable is 1 oz.)

D. Spillage Detail: No Spillage Occured




**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase | Rotation Time | Hold Time | Total Time |
|---|---|---|---|
| 0° to 90° | 72 | 300 | 372 |
| 90° to 180° | 61 | 300 | 361 |
| 180° to 270° | 63 | 300 | 363 |
| 270° to 360° | 68 | 300 | 368 |

**FMVSS 301 SPILLAGE TABLE**

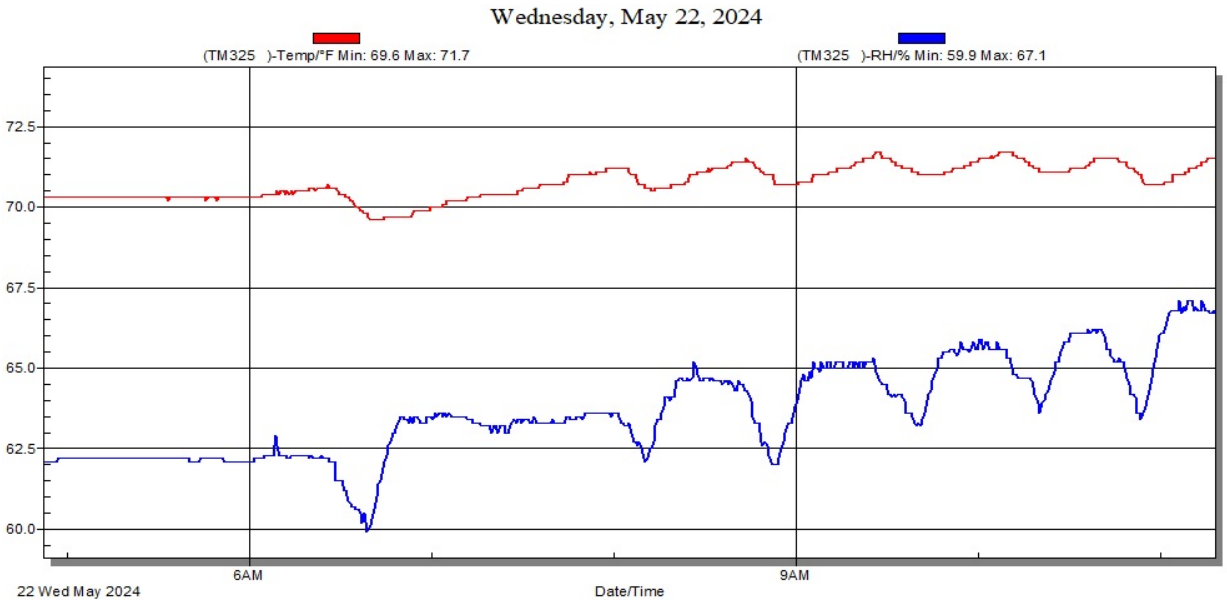
| Test Phase | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|---|---|---|---|---|
| 0° to 90° | 0 | 0 | 0 | |
| 90° to 180° | 0 | 0 | 0 | |
| 180° to 270° | 0 | 0 | 0 | |
| 270° to 360° | 0 | 0 | 0 | |

**SOLVENT SPILLAGE LOCATION TABLE**

| Test Phase | Spillage Location |
|---|---|
| 0° to 90° | No Spillage Occurred |
| 90° to 180° | No Spillage Occurred |
| 180° to 270° | No Spillage Occurred |
| 270° to 360° | No Spillage Occurred |

**DATA SHEET NO. 15**
**DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2024 Hyundai Kona 5 Door SUV | NHTSA No.: | M20244205 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 05/22/2024 |




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

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# PHOTOGRAPHS

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**Figure A-1: As Delivered Right Front ¾ View of Test Vehicle**




**Figure A-2: As Delivered Left Rear ¾ View of Test Vehicle**




**Figure A-3: Pre-Test Frontal View of Test Vehicle**




**Figure A-4: Post-Test Frontal View of Test Vehicle**




**Figure A-5: Pre-Test Left Front ¾ View of Test Vehicle**




**Figure A-6: Post-Test Left Front ¾ View of Test Vehicle**




**Figure A-7: Pre-Test Left Side View of Test Vehicle**




**Figure A-8: Post-Test Left Side View of Test Vehicle**




**Figure A-9: Pre-Test Left Rear ¾ View of Test Vehicle**




**Figure A-10: Post-Test Left Rear ¾ View of Test Vehicle**




**Figure A-11: Pre-Test Rear View of Test Vehicle**




**Figure A-12: Post-Test Rear View of Test Vehicle**




**Figure A-13: Pre-Test Right Side View of Test Vehicle**




**Figure A-14: Post-Test Right Side View of Test Vehicle**




**Figure A-15: Pre-Test Overhead View of Test Area**

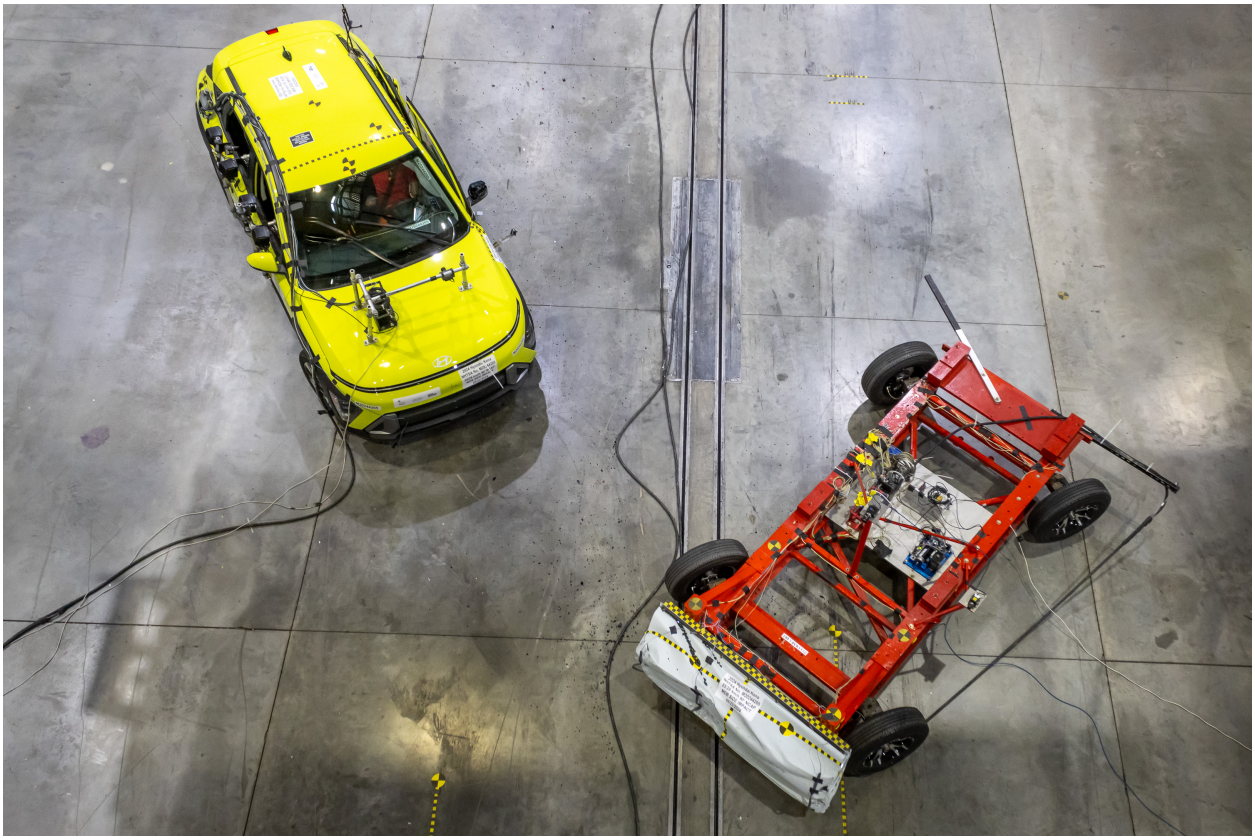


**Figure A-16: Post-Test Overhead View of Test Area**




**Figure A-17: Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle**




**Figure A-18: Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle**




**Figure A-19: Pre-Test Close-Up View of Impact Point Target**




**Figure A-20: Post-Test Close-up View of Impact Point Target**

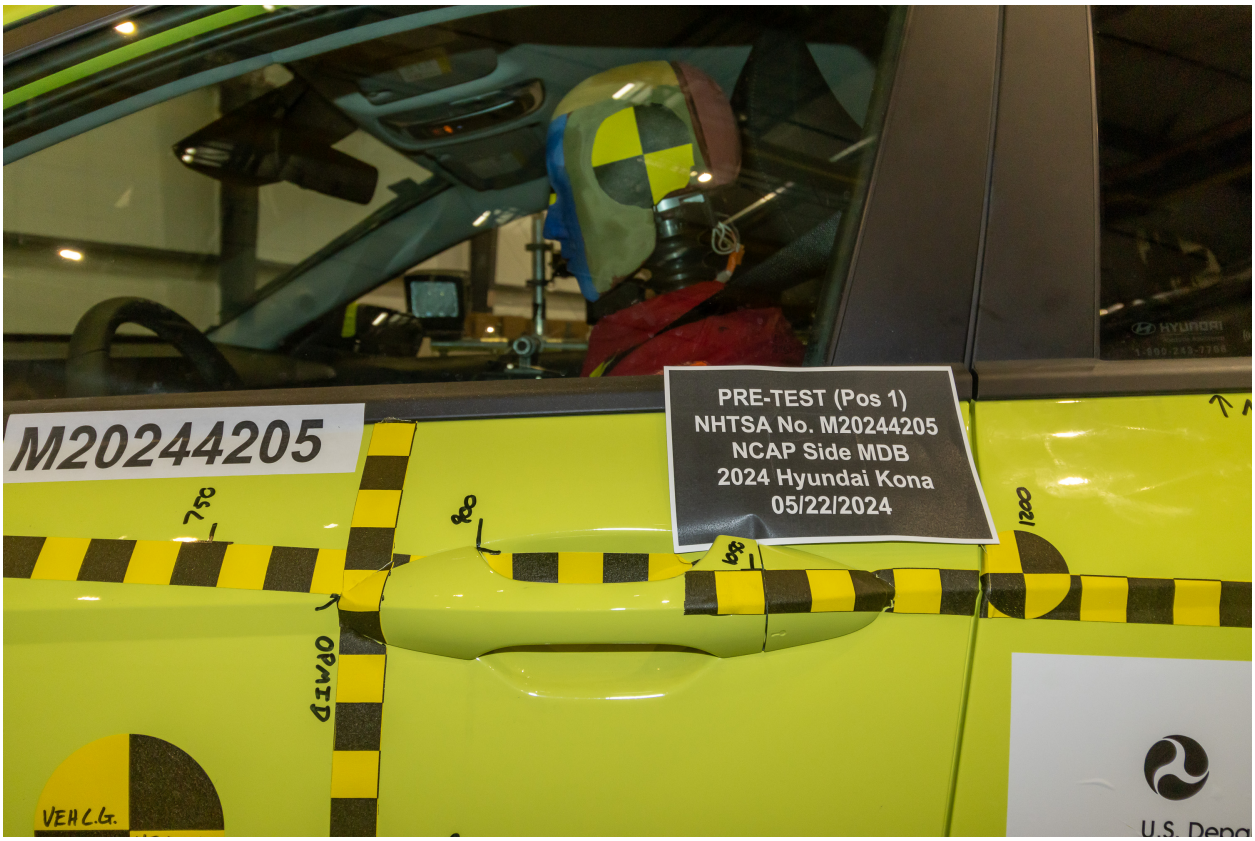



**Figure A-21: Pre-Test Left Front Door Latch Close-Up**




**Figure A-22: Post-Test Left Front Door Latch Close-Up**




**Figure A-23: Pre-Test Left Rear Door Latch Close-Up**




**Figure A-24: Post-Test Left Rear Door Latch Close-Up**




**Figure A-25: Pre-Test Front Close-up View of Driver Dummy**

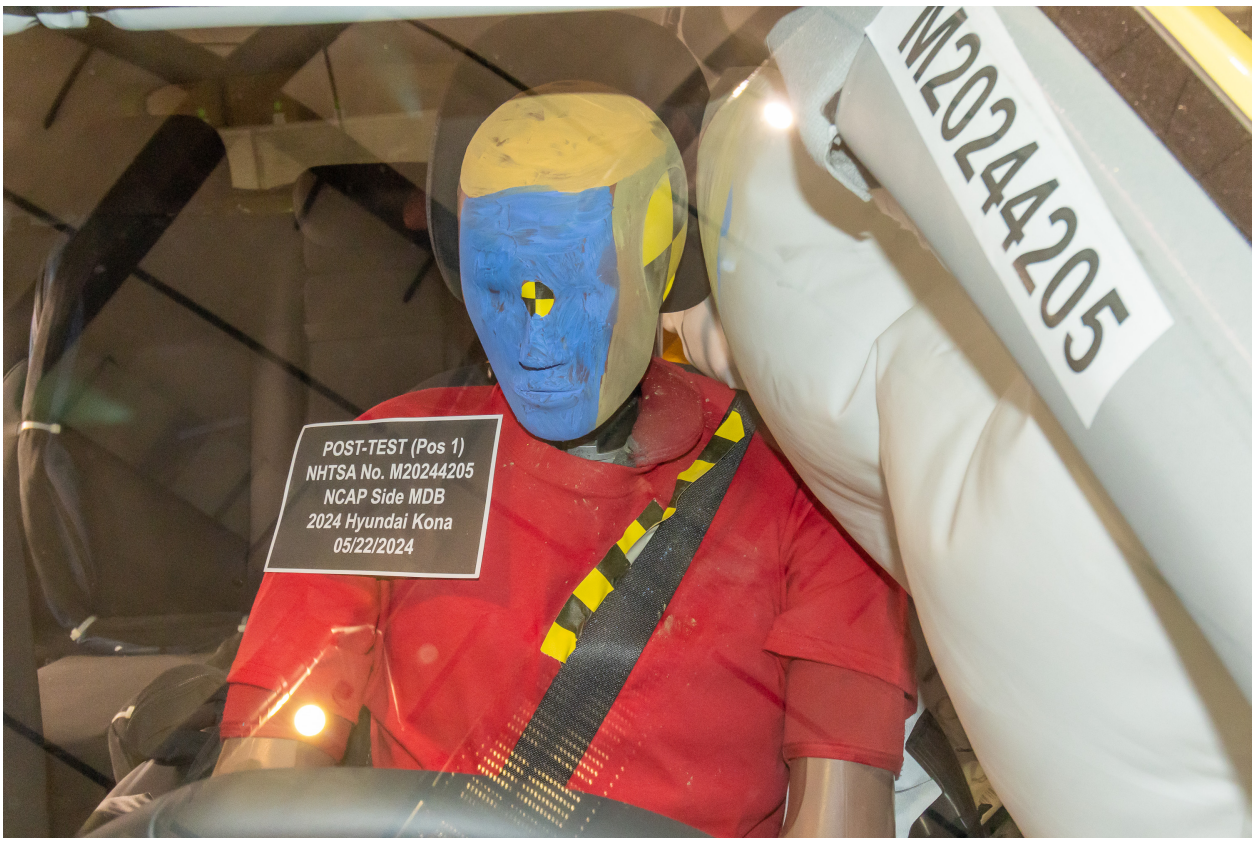



**Figure A-26: Post-Test Front Close-up View of Driver Dummy**




**Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking**




**Figure A-28: Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View**




**Figure A-29: Post-Test Left Side View of Driver Dummy Shoulder and Door Top View**




**Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning**




**Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint**




**Figure A-32: Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning**




**Figure A-33: Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan**




**Figure A-34: Pre-Test Placement of Driver Dummy's Feet**




**Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy**




**Figure A-36: Pre-Test Left Side View of Steering Wheel**




**Figure A-37: View of Disengaged Parking Brake**




**Figure A-38: Pre-Test View of Parking Brake**




**Figure A-39: Pre-Test Close-Up Left Side View of Driver Seat Track**




**Figure A-40: Pre-Test Close-Up Left Side View of Driver Seat Back**




**Figure A-41: Pre-Test Close-Up View of Driver Seat Back or Head Restraint**




**Figure A-42: Pre-Test Driver Dummy and Door Clearance View**




**Figure A-43: Post-Test Driver Dummy and Door Clearance View**




**Figure A-44: Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment**




**Figure A-45: Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment**




**Figure A-46: Pre-Test Driver Inner Door Panel View**




**Figure A-47: Post-Test Driver Inner Door Panel View**




**Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View**




**Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Air bag View**




**Figure A-50: Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View**




**Figure A-51: Post-Test Driver Dummy Close-Up Torso Contact with Side Air bag View**




**Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact View**




**Figure A-53: Post-Test Driver Dummy Close-Up Pelvis Contact with Side Air bag View**




**Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View**




**Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking**




**Figure A-56: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View**




**Figure A-57: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View**




**Figure A-58: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning**

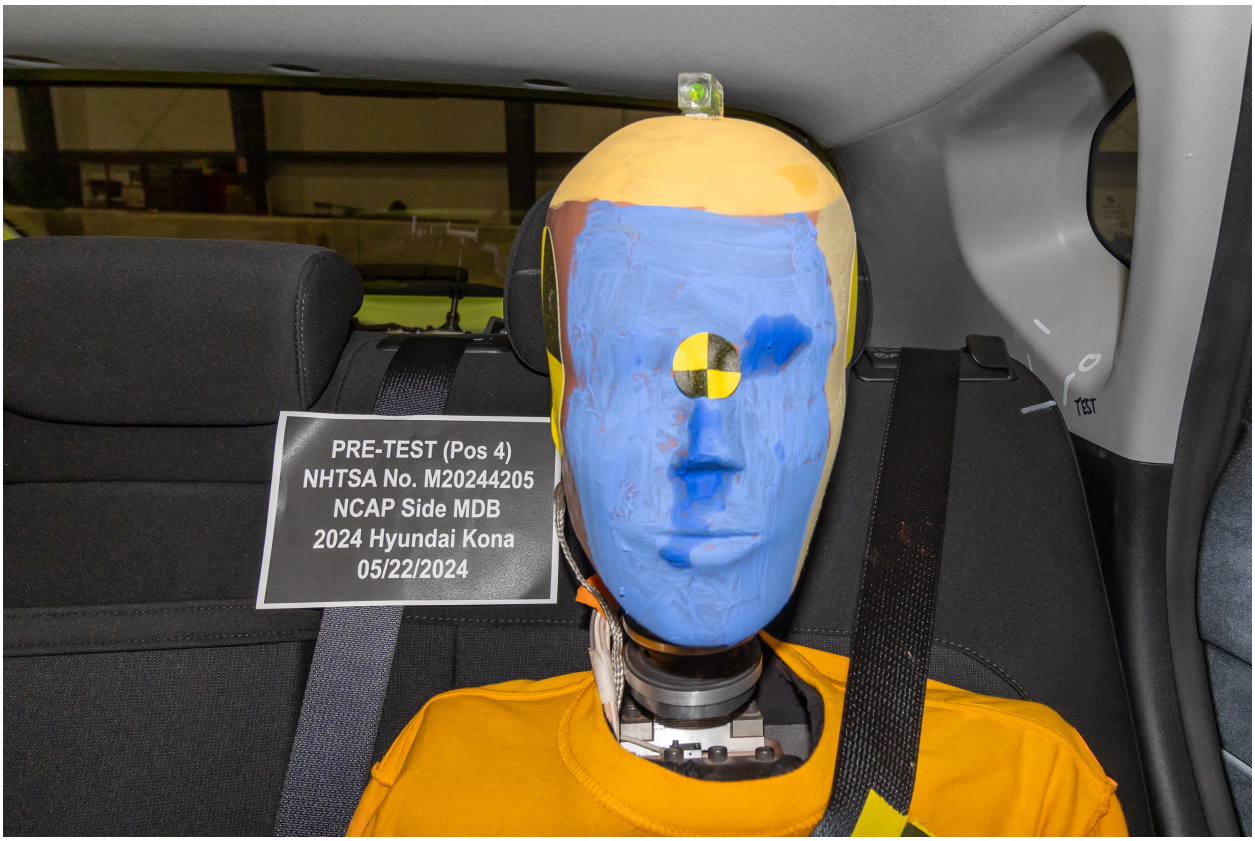



**Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint**




**Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning**




**Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan**




**Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket**




**Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level**




**Figure A-64: Pre-Test Placement of Rear Passenger Dummy's Feet**




**Figure A-65: Pre-Test View of Belt Anchorage for Rear Passenger Dummy**




**Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track**




**Figure A-67: Pre-test Close-Up Left Side View of Rear Passenger Seat Back**

Photo Not Available

**Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint**

Photo Not Available

**Figure A-69: Pre-Test Rear Passenger Dummy and Door Clearance View**




**Figure A-70: Post-Test Rear Passenger Dummy and Door Clearance View**




**Figure A-71: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment**




**Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment**




**Figure A-73: Pre-Test Rear Passenger Inner Door Panel View**




**Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Dummy Contact Locations**




**Figure A-75: Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View**




**Figure A-76: Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Air bag View**




**Figure A-77: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View**

Photo Not Applicable

**Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Air bag View**




**Figure A-79: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View**

Photo Not Applicable

**Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Air bag View**




**Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View**




**Figure A-82: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck**




**Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck**




**Figure A-84: Pre-Test Front View of MDB Impactor Face**




**Figure A-85: Post-Test Front View of MDB Impactor Face**




**Figure A-86: Pre-Test Top View of MDB Impactor Face**




**Figure A-87: Post-Test Top View of MDB Impactor Face**




**Figure A-88: Pre-Test Left Side View of MDB Impactor Face**

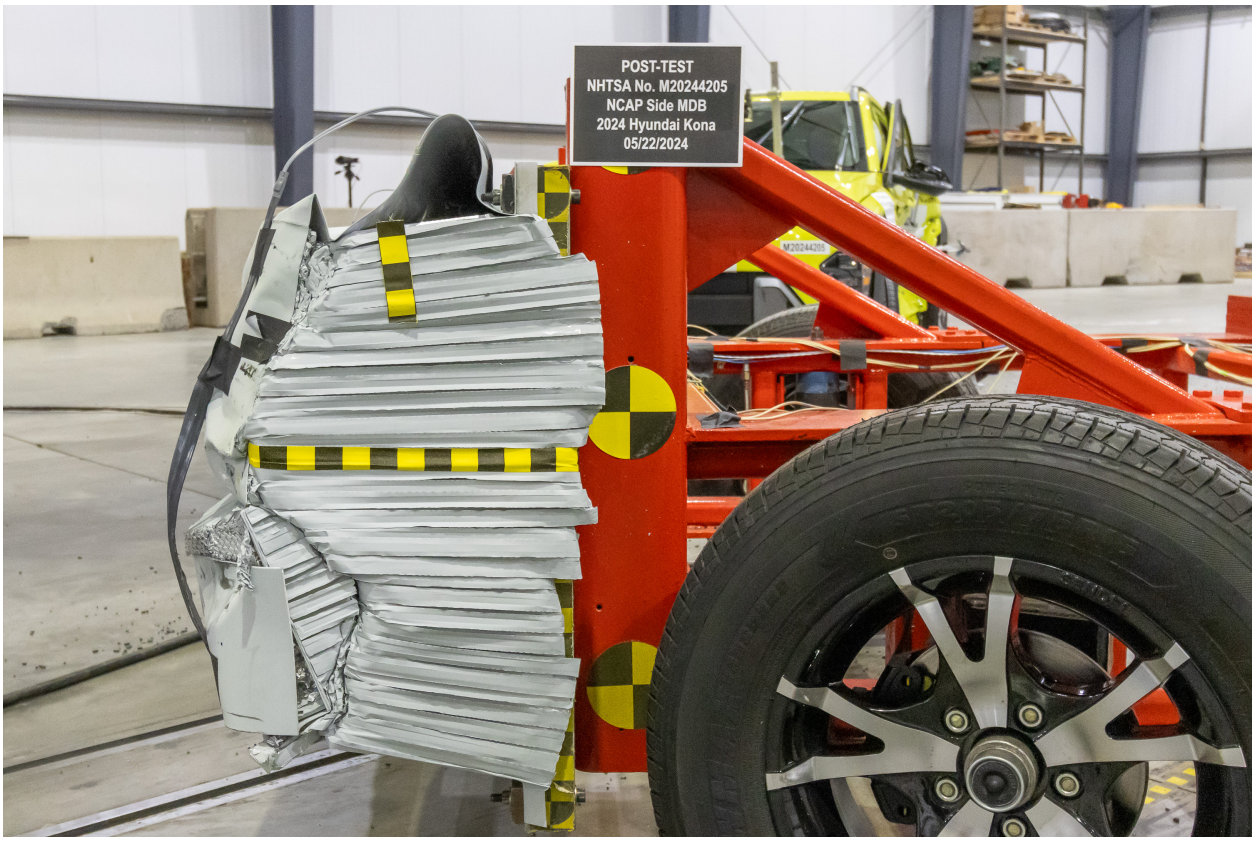



**Figure A-89: Post-Test Left Side View of MDB Impactor Face**




**Figure A-90: Pre-Test Right Side View of MDB Impactor Face**




**Figure A-91: Post-Test Right Side View of MDB Impactor Face**




**Figure A-92: Close-Up View of Vehicle's Certification Label**

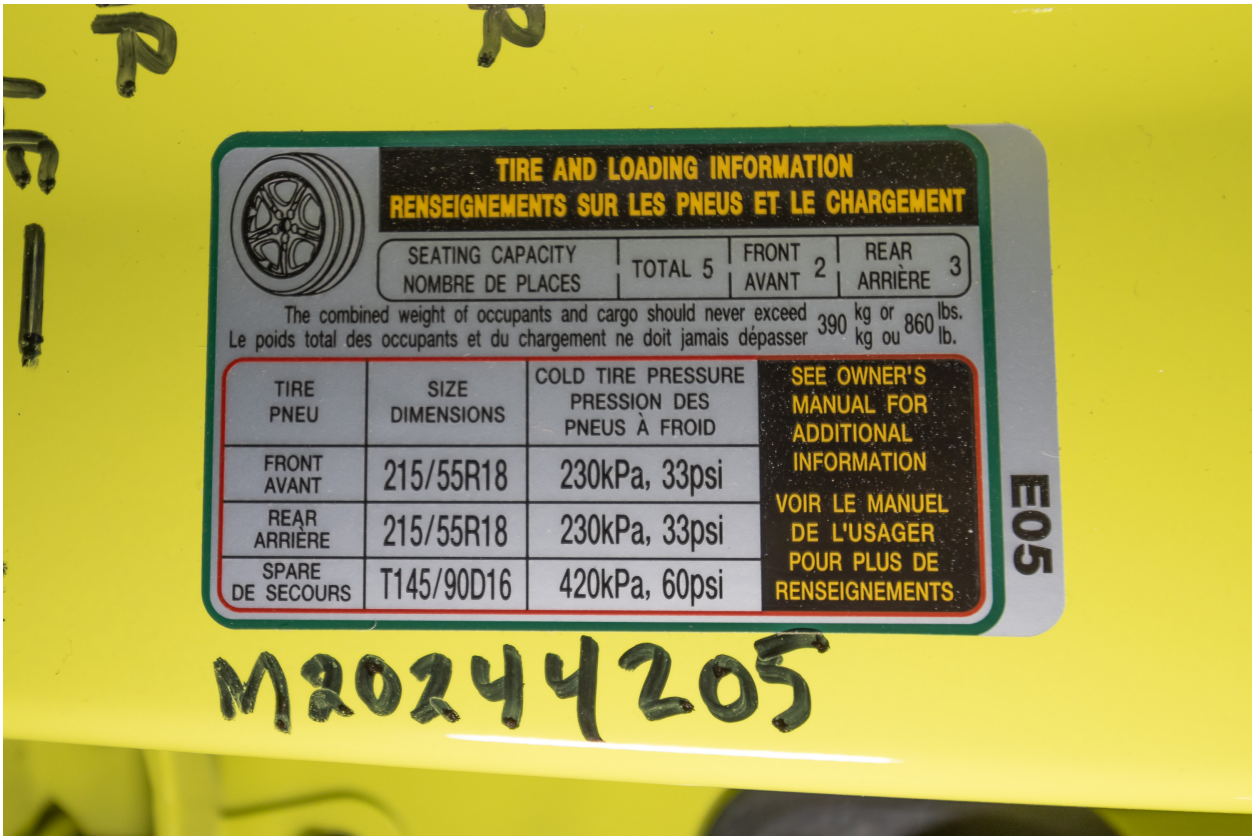



**Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label**

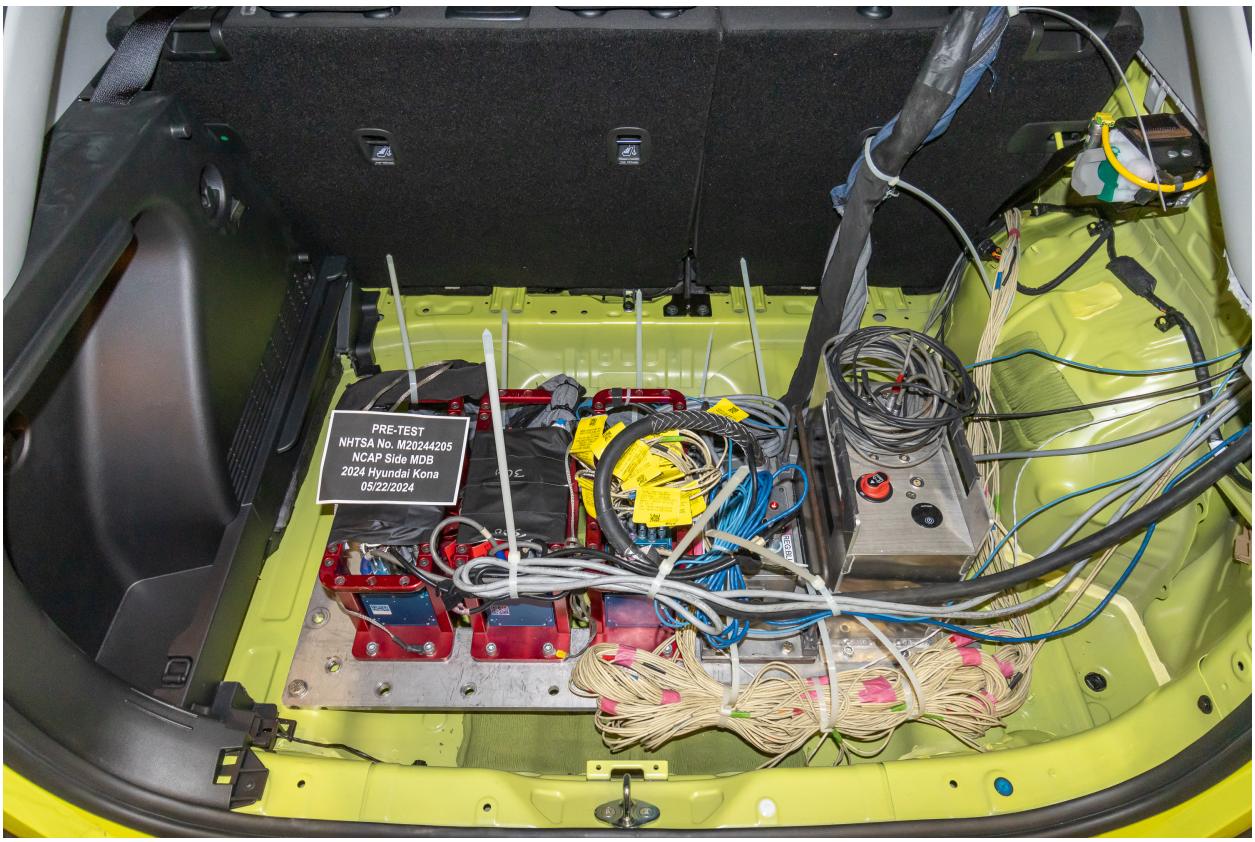



**Figure A-94: Pre-Test Ballast View**




**Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out**




**Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees**




**Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees**

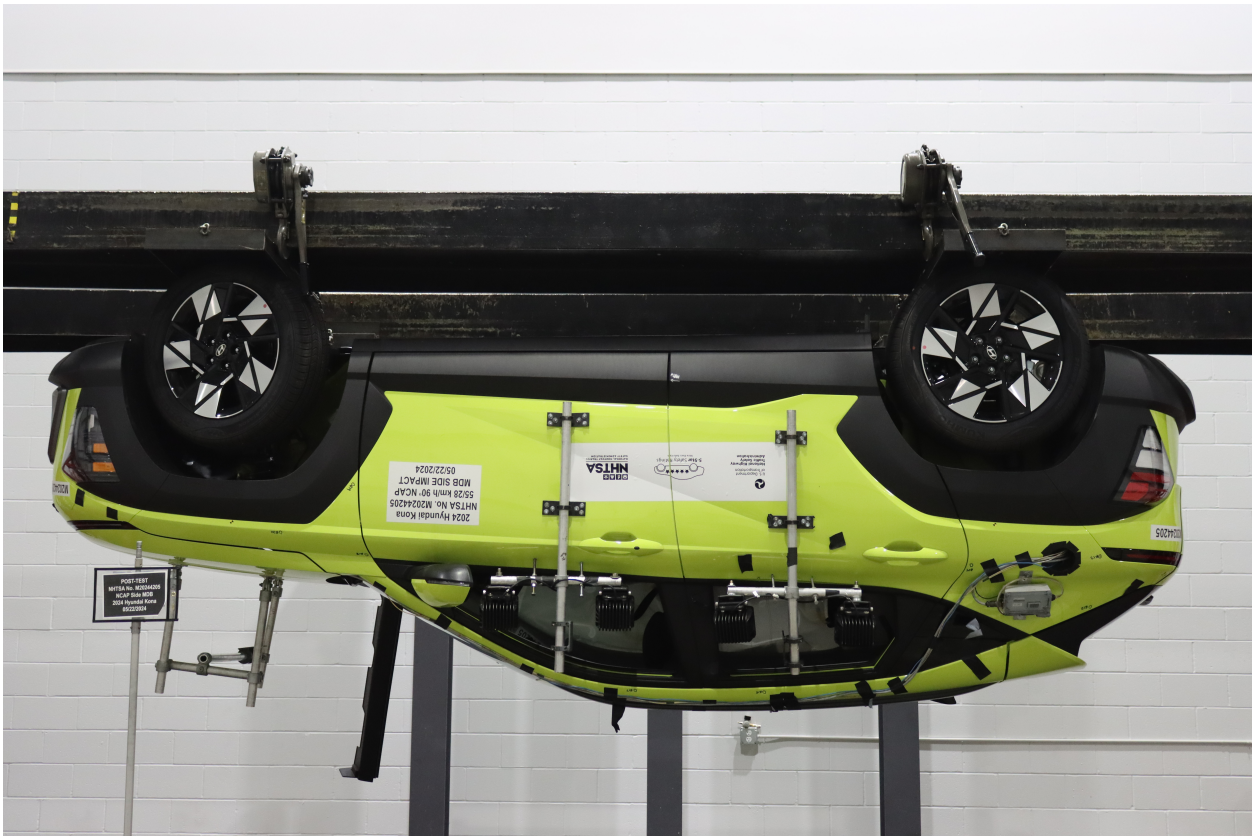


**Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees**

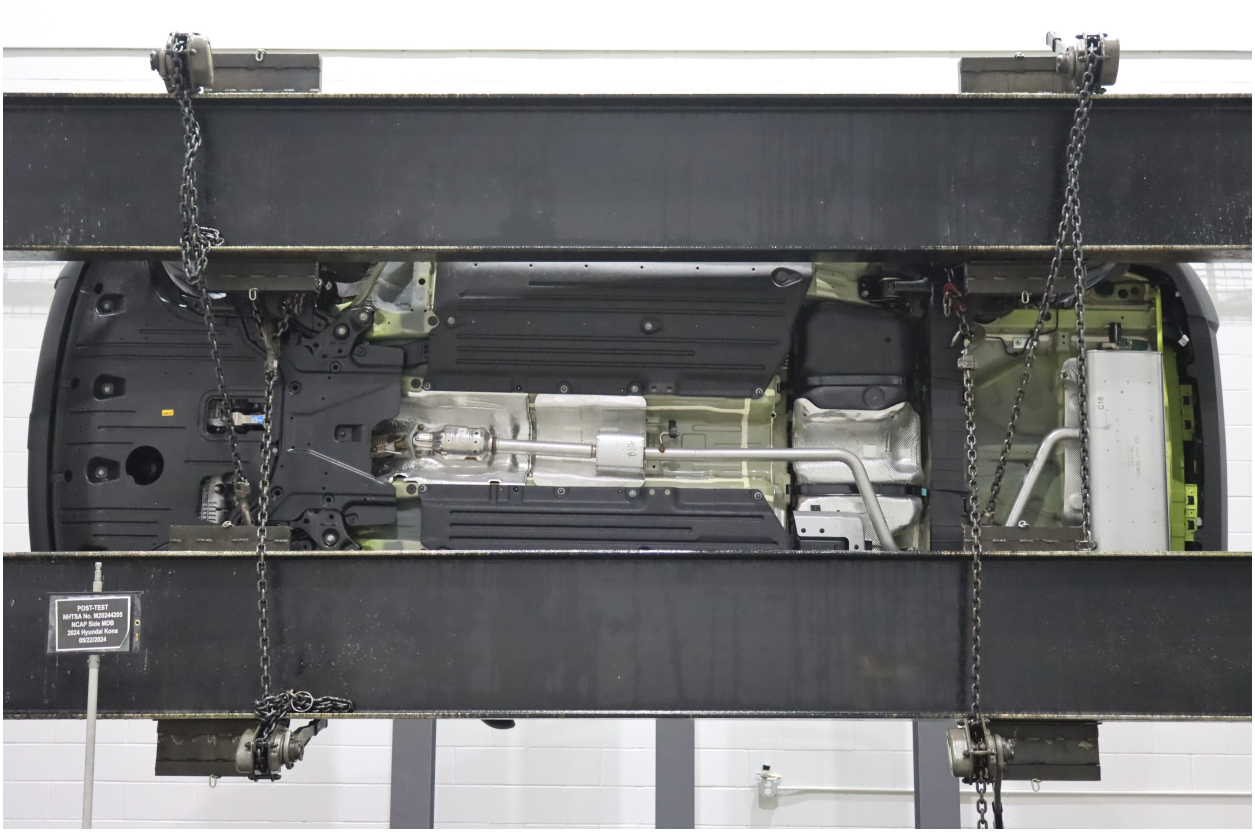



**Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees**




**Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees**




**Figure A-101: Impact Event**

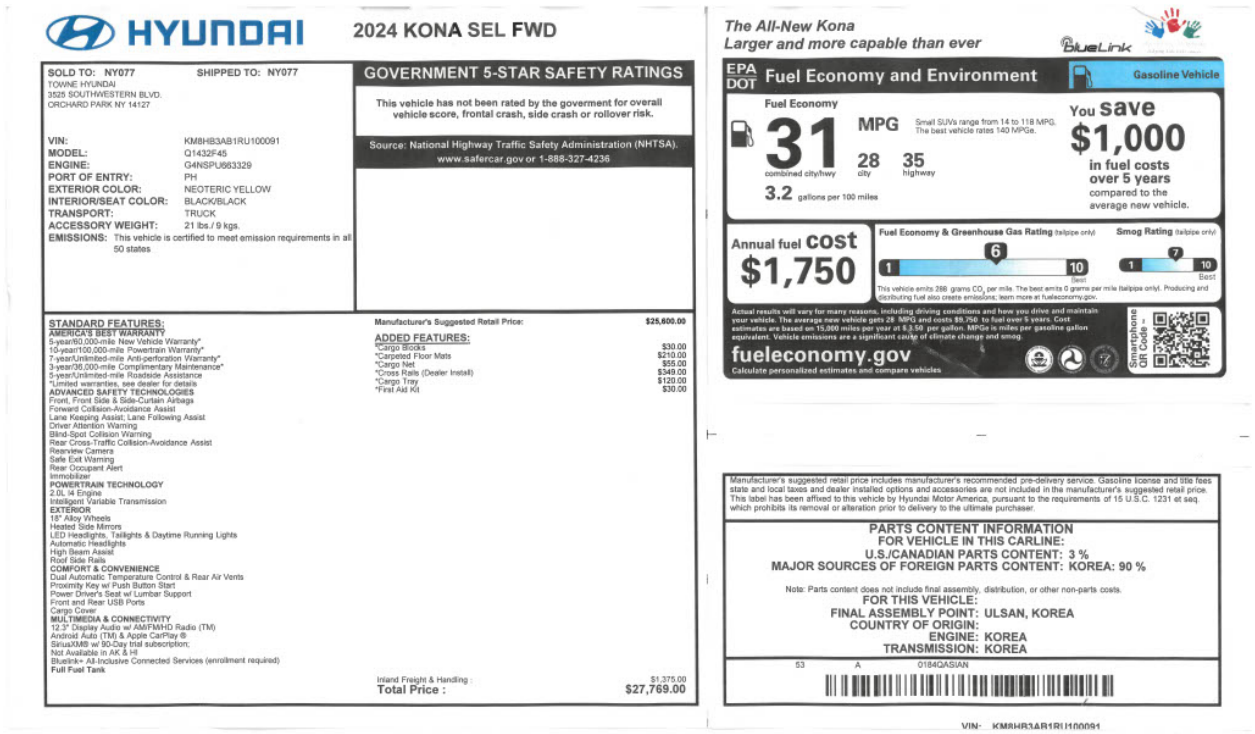



**Figure A-102: Monroney Label**

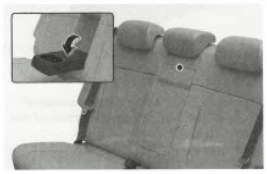
**⚠ WARNING**

Lock the seatback properly. In a collision or sudden stop, an unlocked seatback may allow cargo to move forward with great force and may result in serious injury or death.

**⚠ WARNING**

Cargo should always be secured to prevent it from moving in a collision and causing serious injury or death to the vehicle occupants. Do not place objects in the rear seats, because they cannot be properly secured and may hit the front seat occupants in a collision.

***Armrest***



The armrest is located in the center of the rear seat. Pull the armrest down from the seatback to use it.

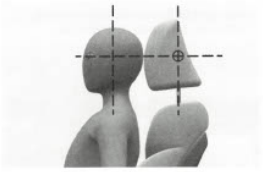
## Head restraint

The vehicle's front and rear seats have adjustable head restraints. The head restraints provide comfort for passengers, but more importantly they are designed to help protect passengers from whiplash and other neck and spinal injuries during an accident, especially in a

**⚠ WARNING**

To reduce the risk of serious injury or death in an accident, take the following precautions when adjusting your head restraints:

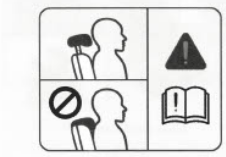
- Always adjust the head restraints properly for all passengers BEFORE starting the vehicle.
- Never let anyone ride in a seat with the head restraint removed or reversed.
- Adjust the head restraints so that the middle of the head restraint is at the same height as the top of the eyes.



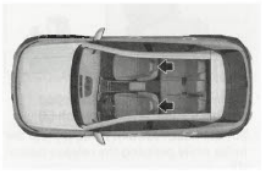
- Never adjust the head restraint position of the driver's seat when the vehicle is moving.
- Adjust the head restraint as close to the passenger's head as possible. Do not use a seat cushion that holds the body away from the seatback.
- Make sure the head restraint locks into position after adjusting it.

**⚠ WARNING**

When passengers are sitting on the rear seats, always raise the head restraints above the lowest stored position.

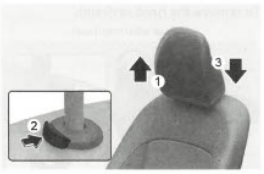


***Front seat head restraints***



The driver's and front passenger's seats are equipped with adjustable head restraints for the passengers safety and comfort.

**Adjusting the height up and down**



To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Press and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).

***NOTICE***



If you recline the seatback towards the front with the head restraint and seat cushion raised, the head restraint may come in contact with the sunvisor or other parts of the vehicle.

**Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual**



**Removal/Reinstall**

To remove the head restraint:

Manual adjustment seat



Power adjustment seat



1. Recline the seatback (2) with the seatback angle lever or switch (1).
2. Pull up the head restraint to the upmost position and press the release button (3) to remove the head restraint (4).

**⚠ WARNING**

Never allow anyone to travel in a seat with the head restraint removed.

To reinstall the head restraint:

Manual adjustment seat



Power adjustment seat

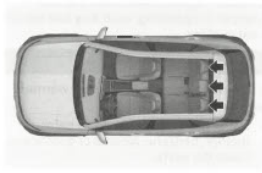


1. Recline the seat back by pressing seatback angle lever or switch (3).
2. Put the head restraint poles (2) into the holes while pressing the release button (1).
3. Adjust the head restraint to the appropriate height.
4. Adjust the seatback angle (4) with the seatback angle lever or switch (3).

**⚠ WARNING**

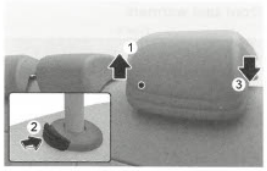
Always make sure the head restraint locks into position after reinstalling and adjusting it properly.

***Rear seat head restraints***



The rear seats are equipped with head restraints in all the seating positions for the passenger's safety and comfort.

**Adjusting the height up and down**



To raise the head restraint:

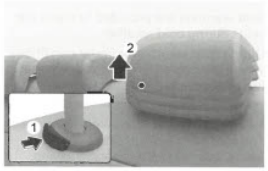
1. Pull it up to the desired position (1).

To lower the head restraint:

1. Press and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).

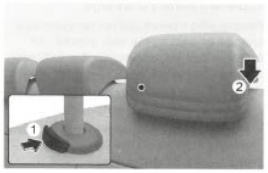
**Removal/Reinstallation**

To remove the head restraint:



1. Raise the head restraint as far as it can go.
2. Press the head restraint release button (1) while pulling up the head restraint (2).

To reinstall the head restraint:



1. Put the head restraint poles into the holes (2) while pressing the release button (1).
2. Adjust the head restraint to the appropriate height.

**Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual**

# APPENDIX B
# VEHICLE AND DUMMY RESPONSE DATA TRACES

# Table of Data Plots
# Driver Dummy Instrumentation Plots


| Fig. | Description | Page |
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| Plot 1 | Driver Head Acceleration (X) Primary vs. Time | B-5 |
| Plot 2 | Driver Head Acceleration (Y) Primary vs. Time | B-5 |
| Plot 3 | Driver Head Acceleration (Z) Primary vs. Time | B-5 |
| Plot 4 | Driver Head Resultant Acceleration Primary vs. Time | B-5 |
| Plot 5 | Driver Upper Thorax Rib Deflection (Y) vs. Time | B-6 |
| Plot 6 | Driver Middle Thorax Rib Deflection (Y) vs. Time | B-6 |
| Plot 7 | Driver Lower Thorax Rib Deflection (Y) vs. Time | B-6 |
| Plot 8 | Driver Thorax Rib Deflection Maximum vs. Time | B-6 |
| Plot 9 | Driver Anterior Abdominal Force (Y) vs. Time | B-7 |
| Plot 10 | Driver Middle Abdominal Force (Y) vs. Time | B-7 |
| Plot 11 | Driver Posterior Abdominal Force (Y) vs. Time | B-7 |
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| Plot 15 | Passenger Head Acceleration (Y) vs. Time Primary | B-8 |
| Plot 16 | Passenger Head Acceleration (Z) vs. Time Primary | B-8 |
| Plot 17 | Passenger Head Resultant Acceleration Primary vs. Time | B-9 |
| Plot 18 | Passenger Lower Spine T12 Acceleration (X) vs. Time | B-9 |
| Plot 19 | Passenger Lower Spine T12 Acceleration (Y) vs. Time | B-9 |
| Plot 20 | Passenger Lower Spine T12 Acceleration (Z) vs. Time | B-9 |
| Plot 21 | Passenger Lower Spine T12 Resultant Acceleration vs. Time | B-10 |
| Plot 22 | Passenger Iliac Force on Impact Side (Y) vs. Time | B-10 |
| Plot 23 | Passenger Acetabulum Force on Impact Side (Y) vs. Time | B-10 |
| Plot 24 | Passenger Total Pelvic Force on Impact Side (Y) vs. Time | B-10 |

**The following additional dummy and vehicle response data can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.gov**

## Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

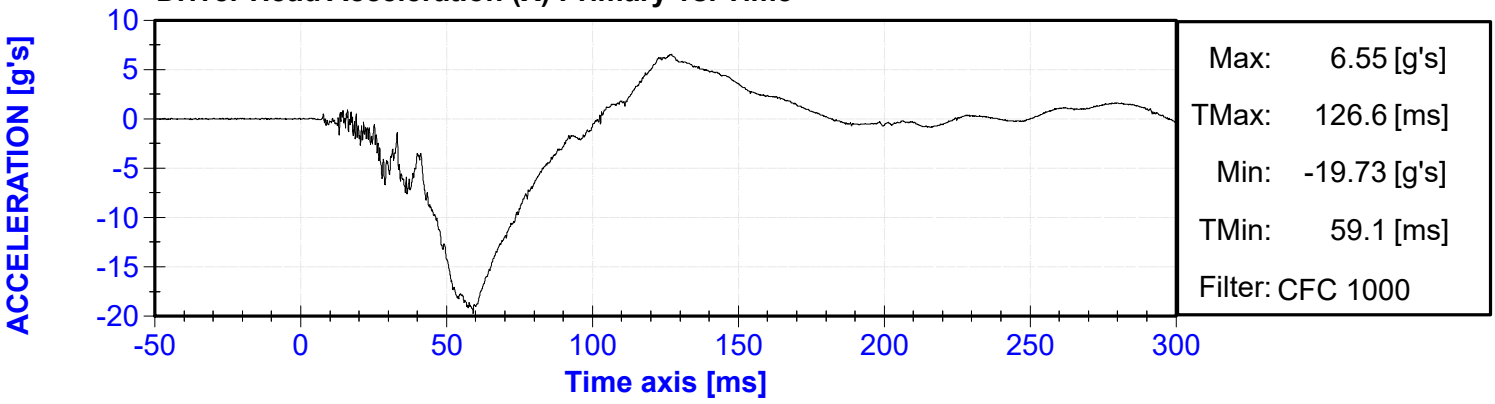
## Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

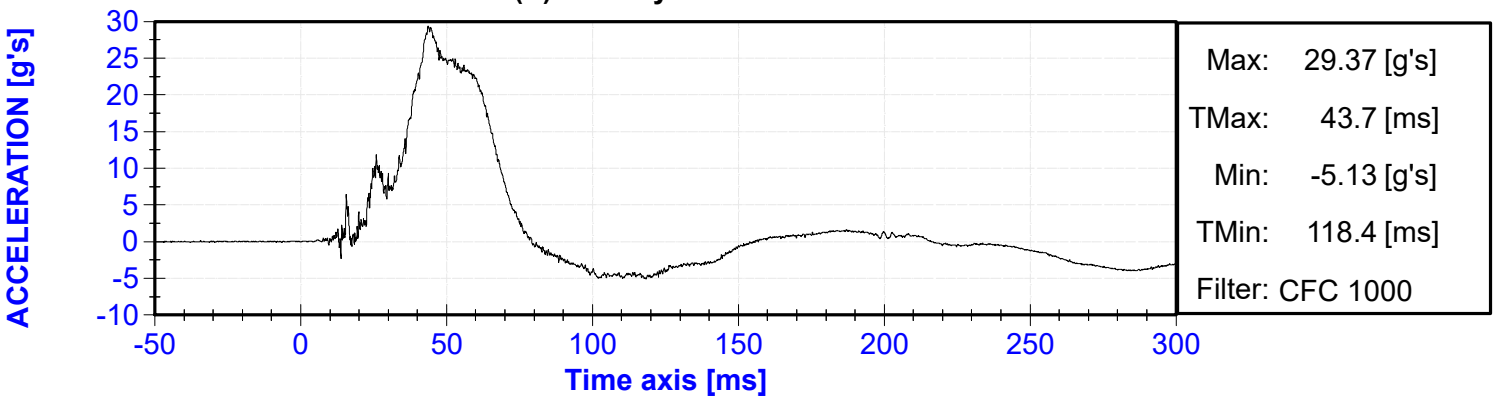
## MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

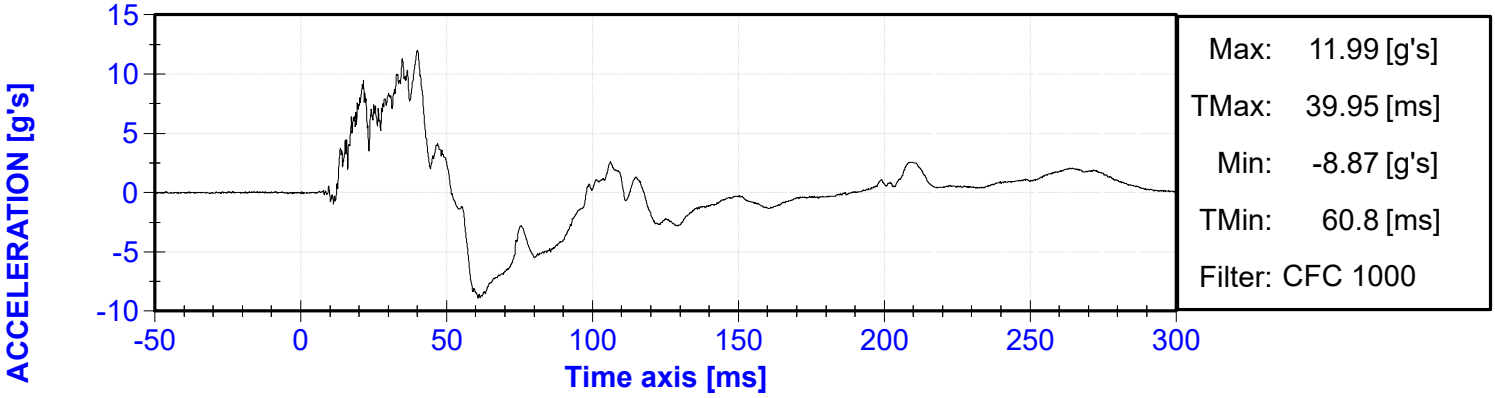
Driver Head Acceleration (X) Primary vs. Time



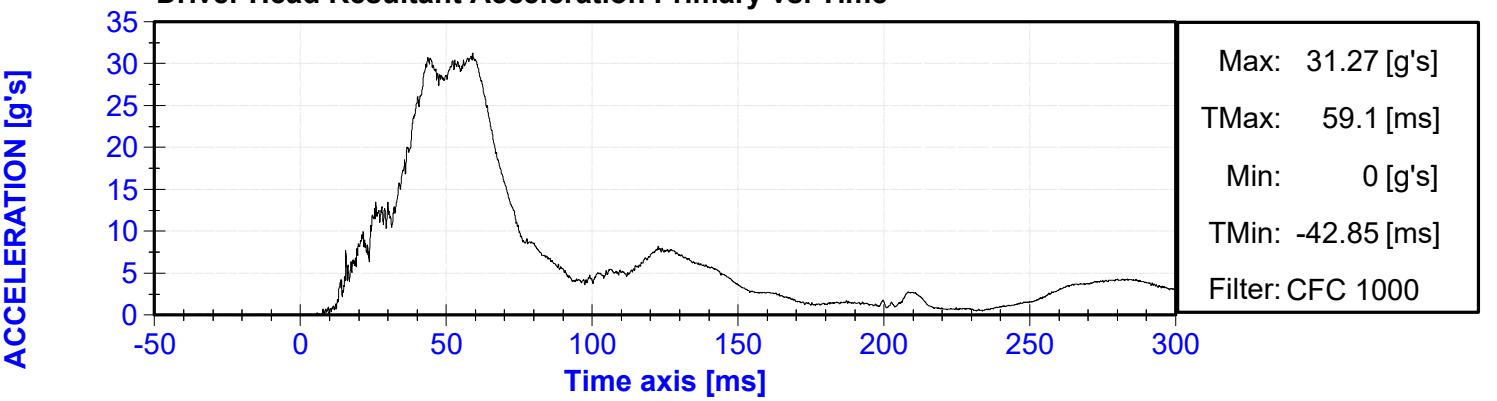

Driver Head Acceleration (Y) Primary vs. Time



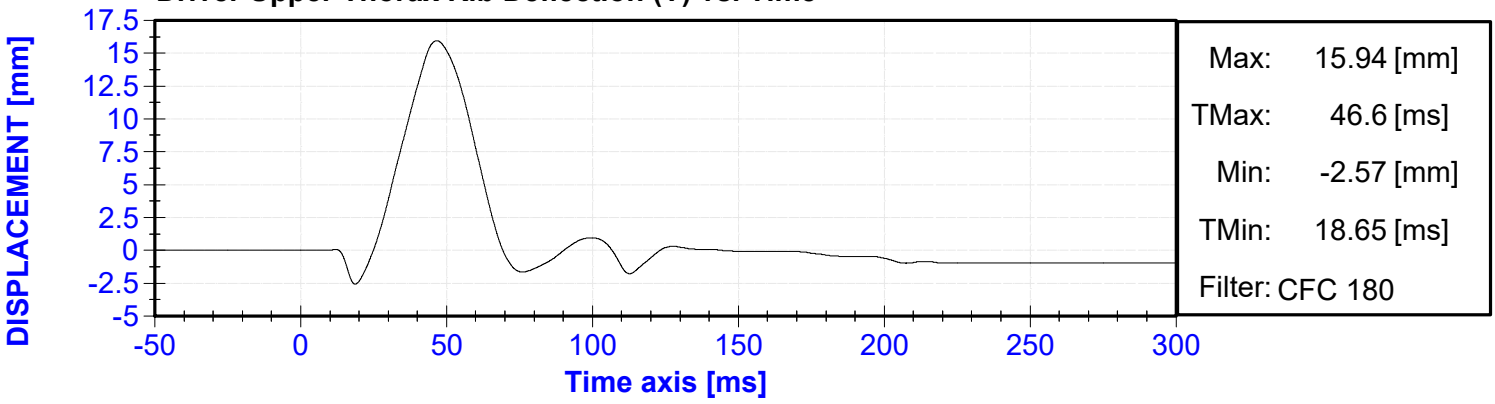

Driver Head Acceleration (Z) Primary vs. Time



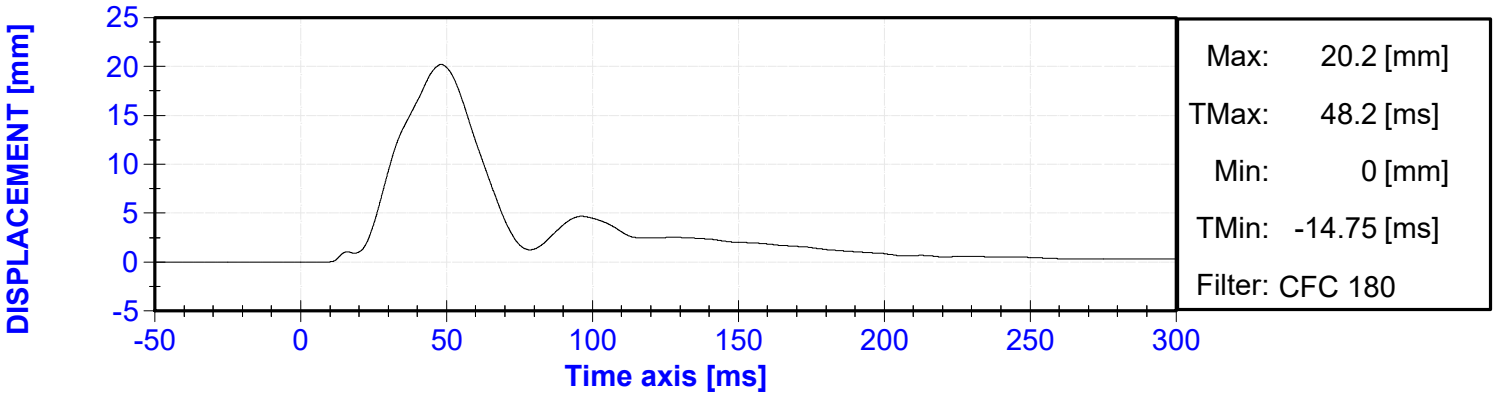

Driver Head Resultant Acceleration Primary vs. Time



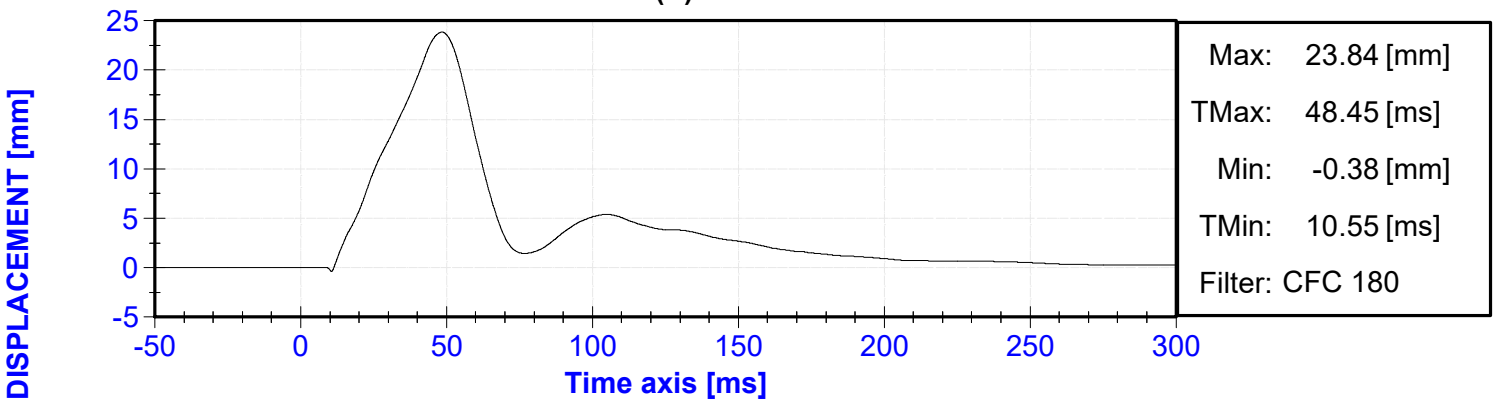
### Driver Upper Thorax Rib Deflection (Y) vs. Time



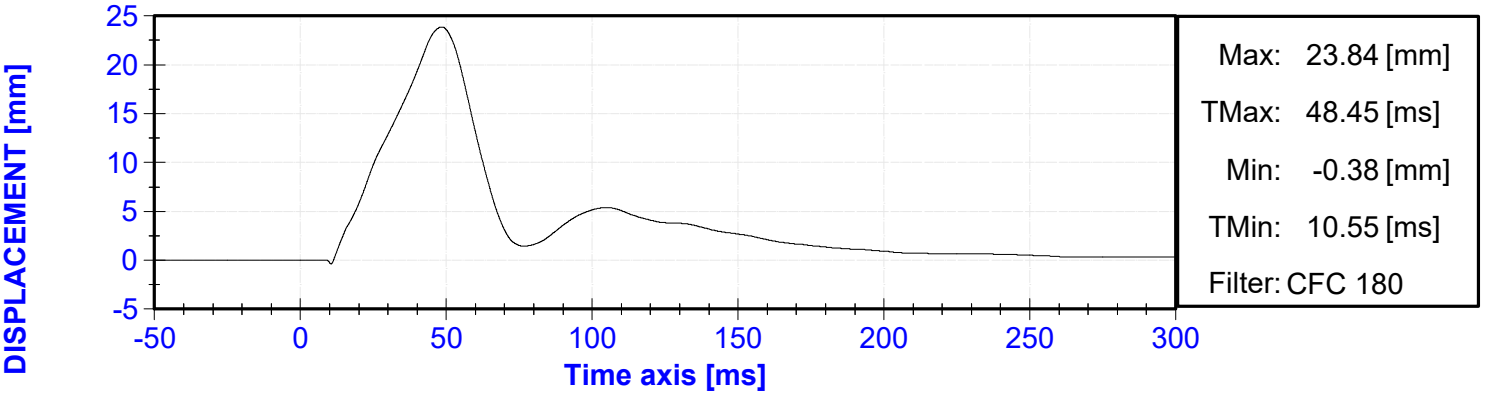

### Driver Middle Thorax Rib Deflection (Y) vs. Time



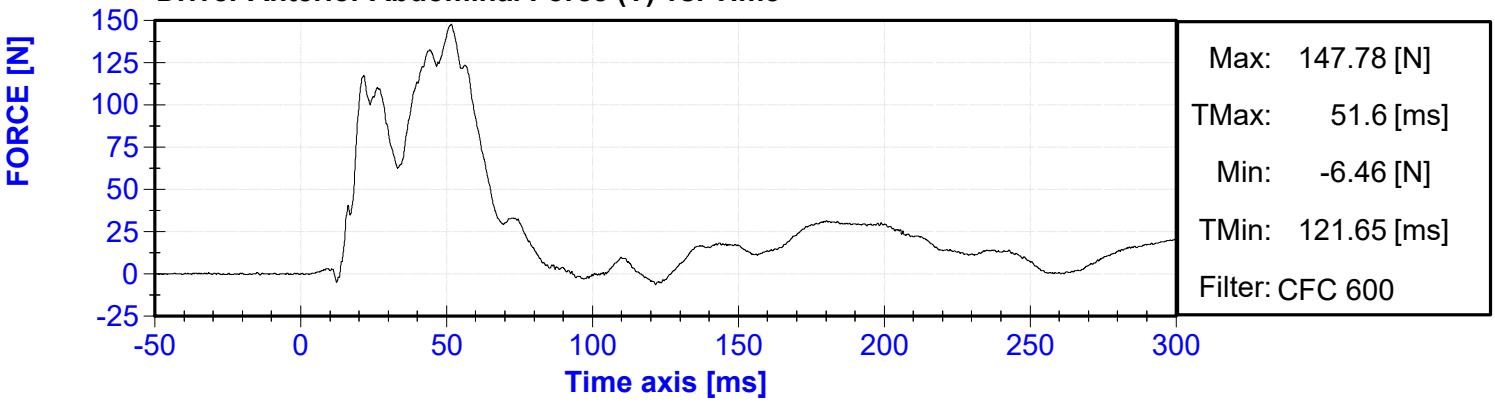

### Driver Lower Thorax Rib Deflection (Y) vs. Time



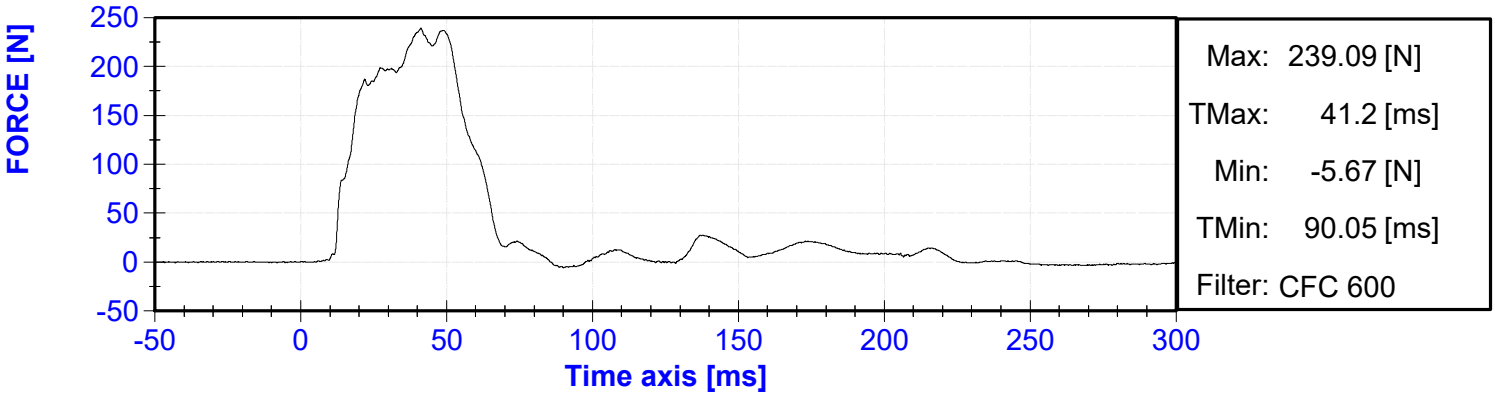

### Driver Thorax Rib Deflection Maximum vs. Time



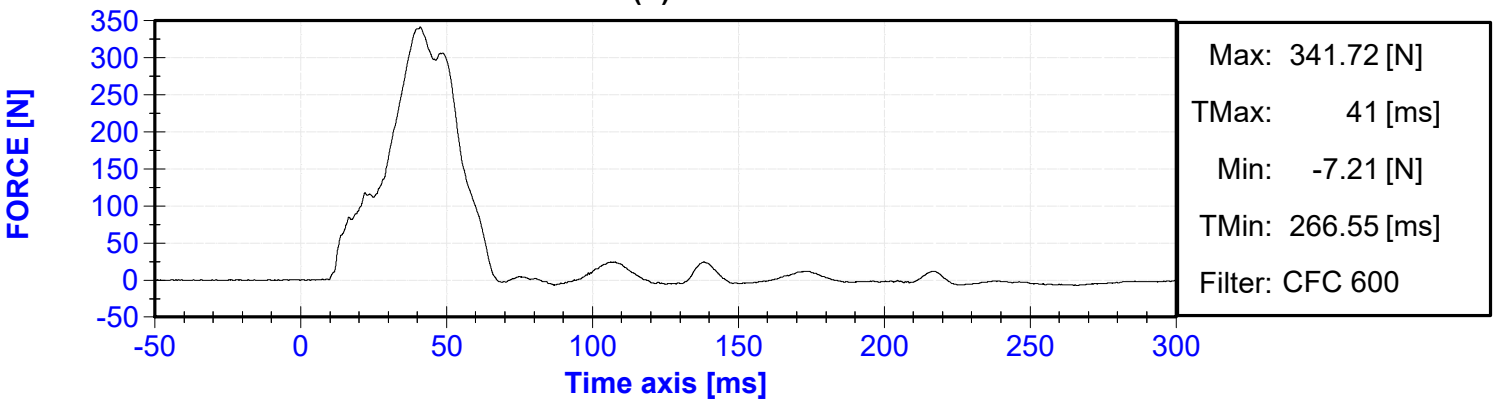
### Driver Anterior Abdominal Force (Y) vs. Time



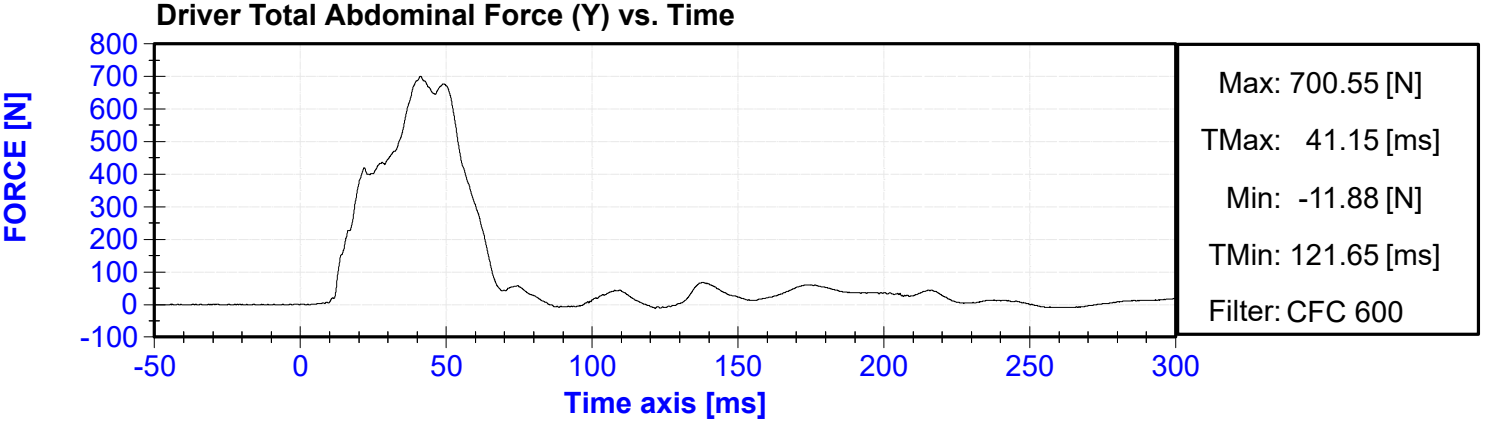

### Driver Middle Abdominal Force (Y) vs. Time



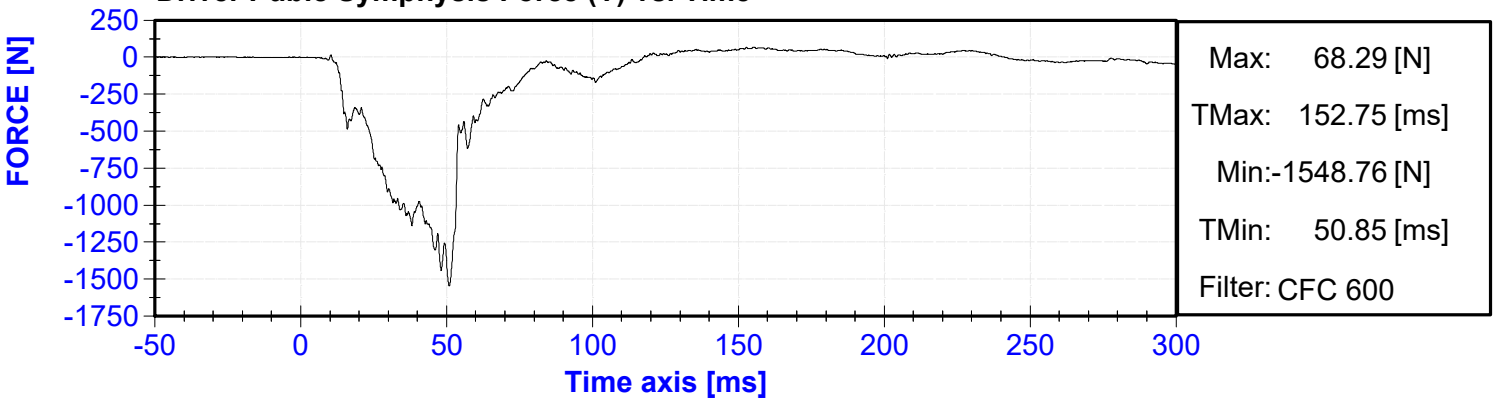

### Driver Posterior Abdominal Force (Y) vs. Time



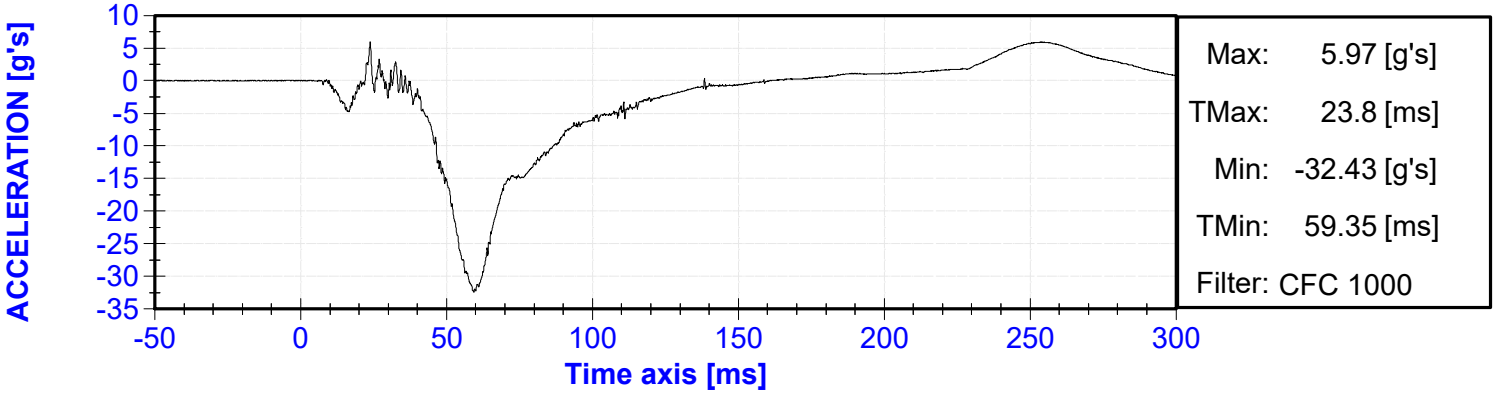

### Driver Total Abdominal Force (Y) vs. Time



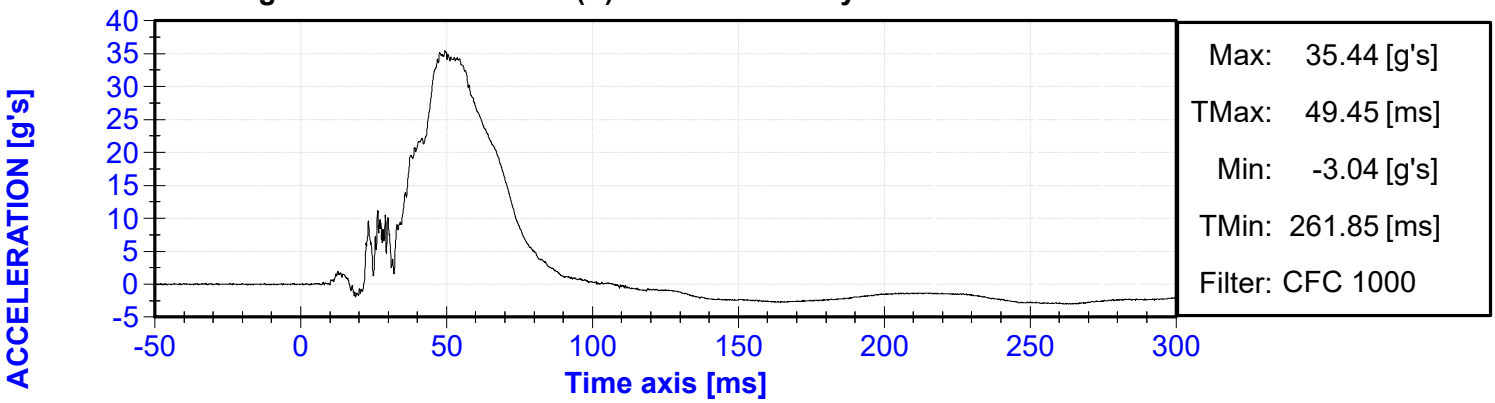
Driver Pubic Symphysis Force (Y) vs. Time



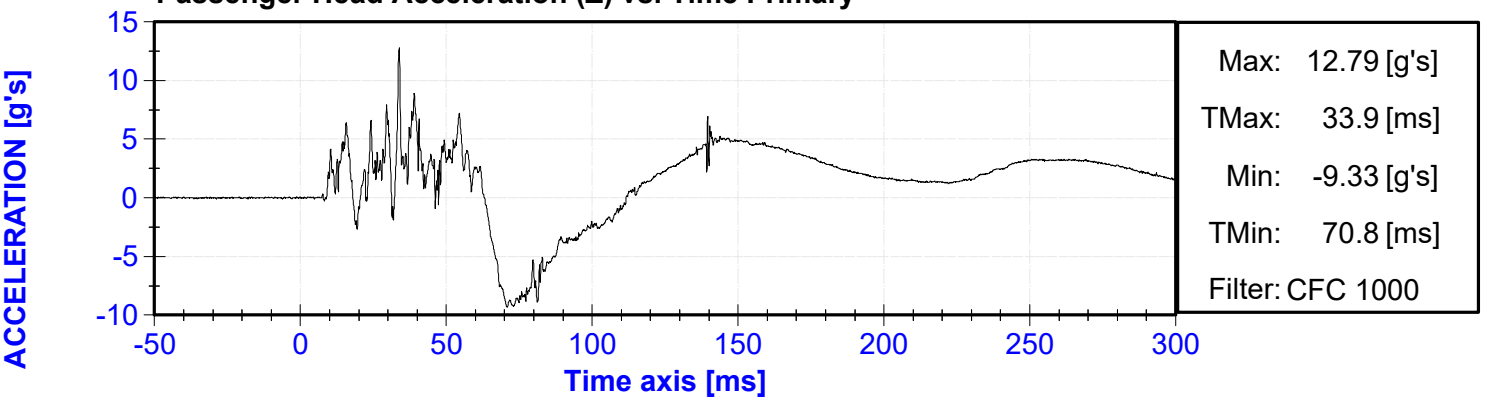

Passenger Head Acceleration (X) vs. Time Primary



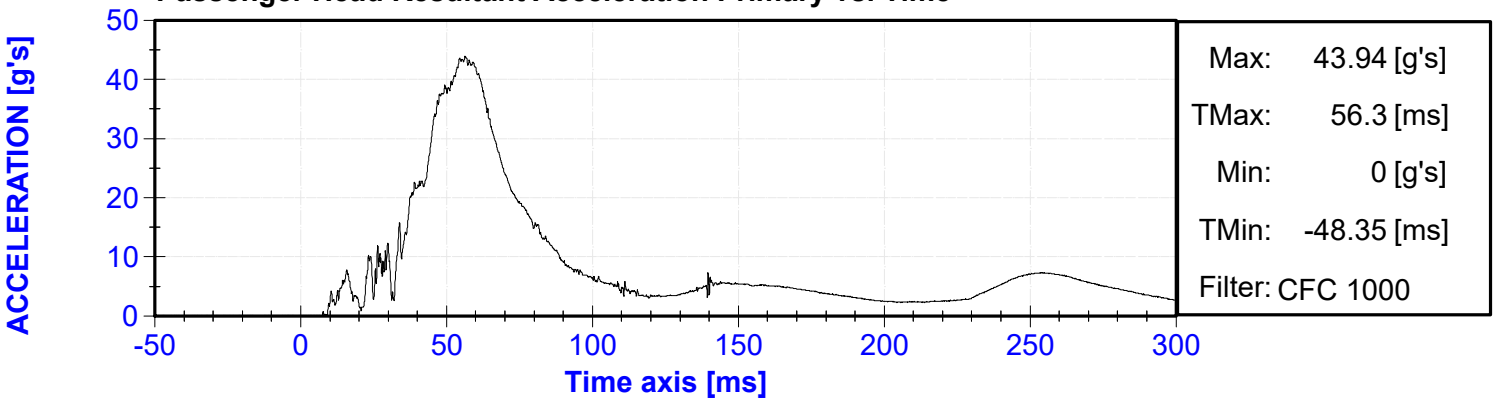

Passenger Head Acceleration (Y) vs. Time Primary



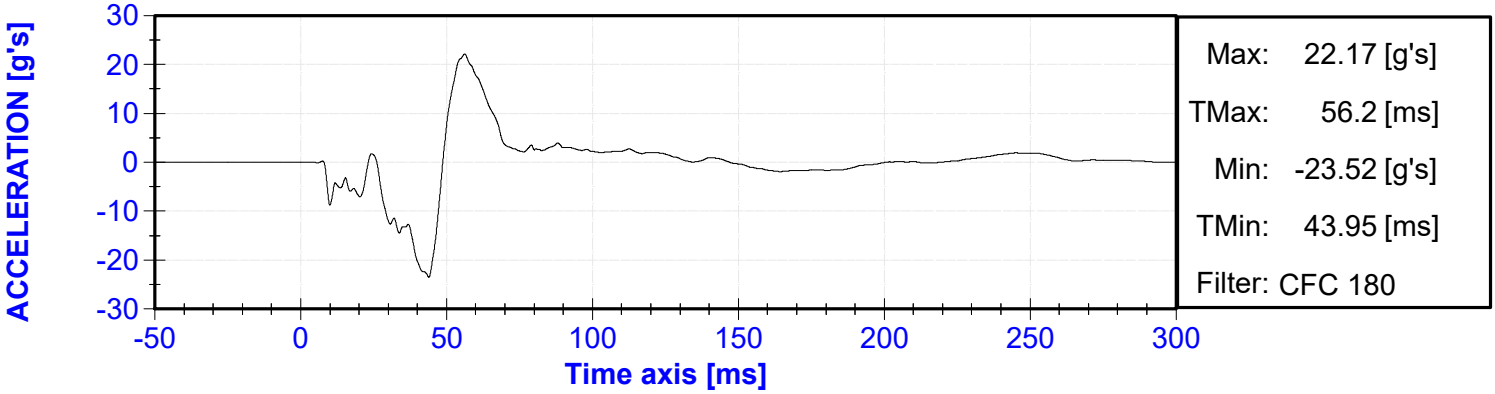

Passenger Head Acceleration (Z) vs. Time Primary



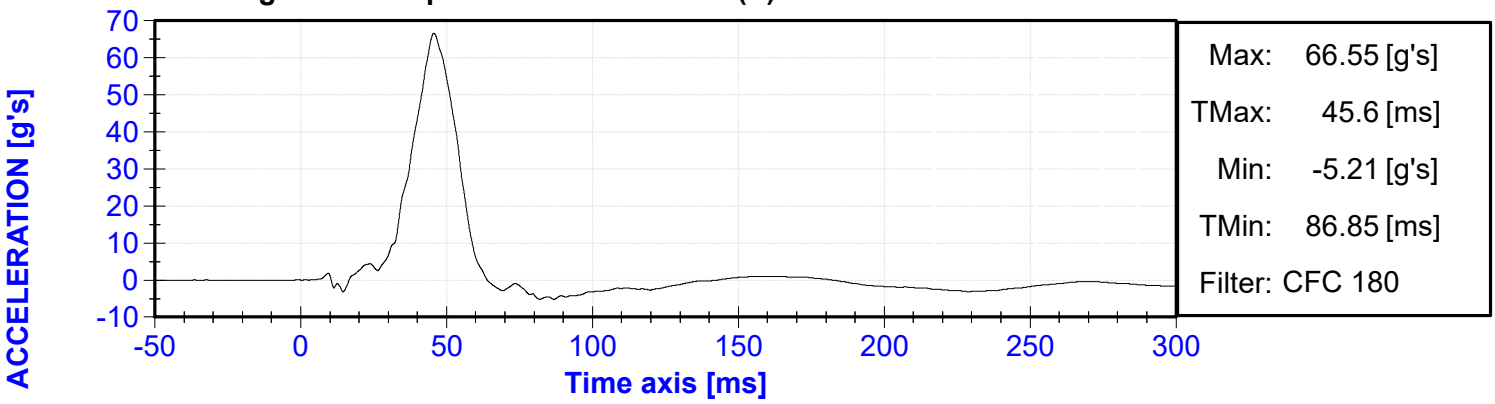
### Passenger Head Resultant Acceleration Primary vs. Time



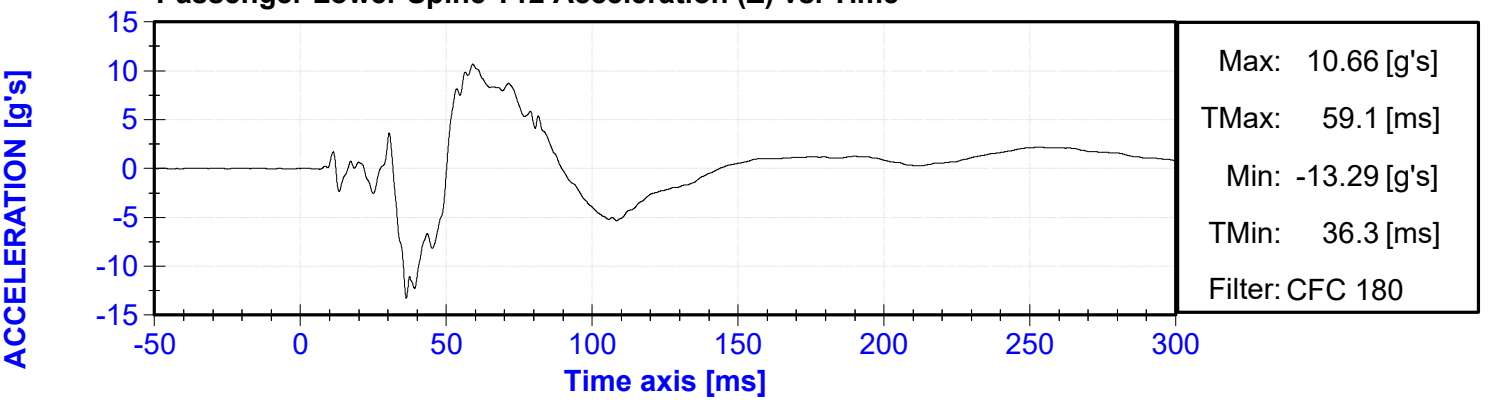

### Passenger Lower Spine T12 Acceleration (X) vs. Time



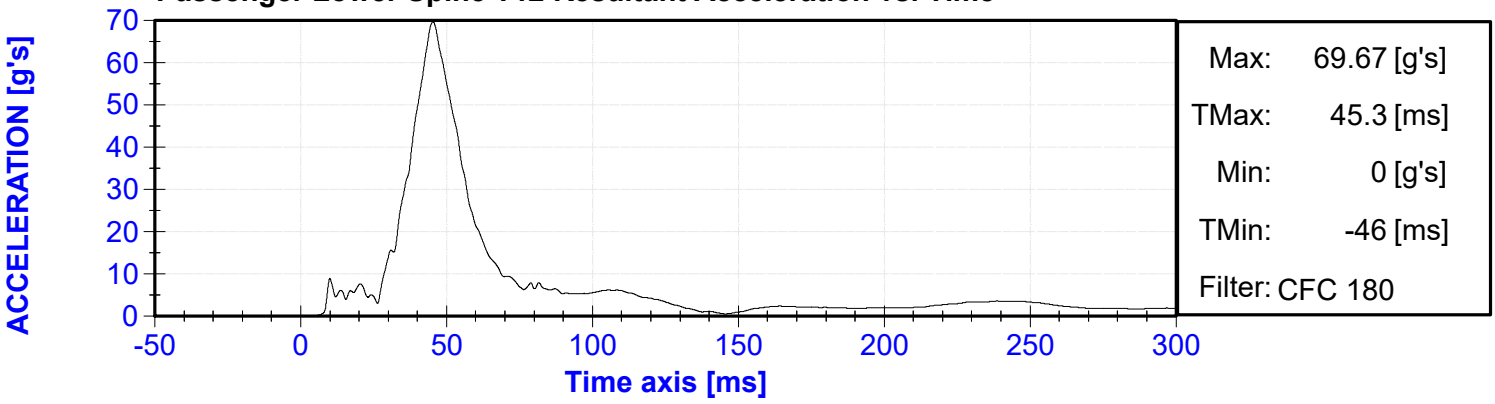

### Passenger Lower Spine T12 Acceleration (Y) vs. Time



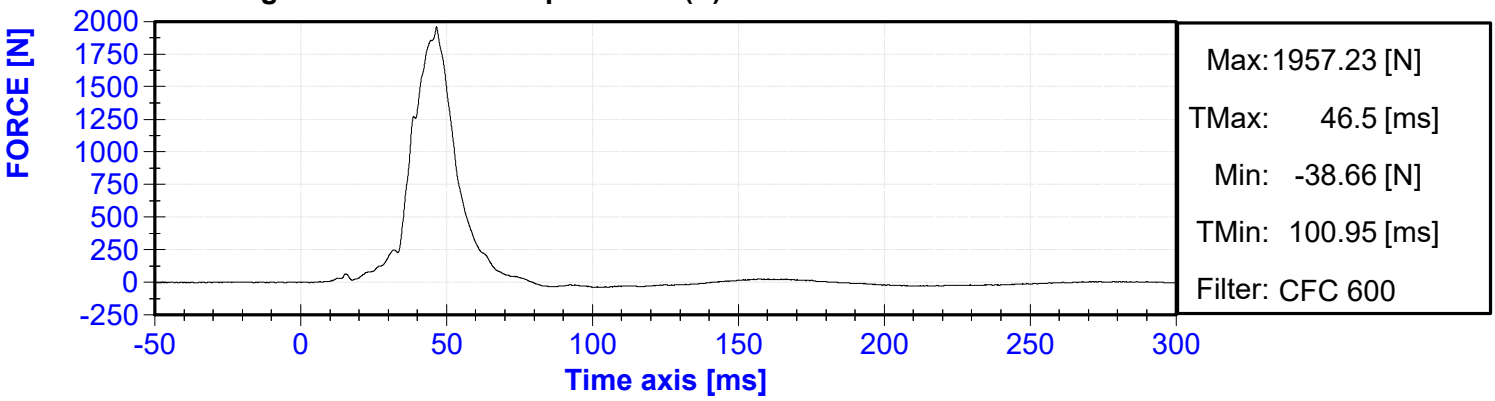

### Passenger Lower Spine T12 Acceleration (Z) vs. Time



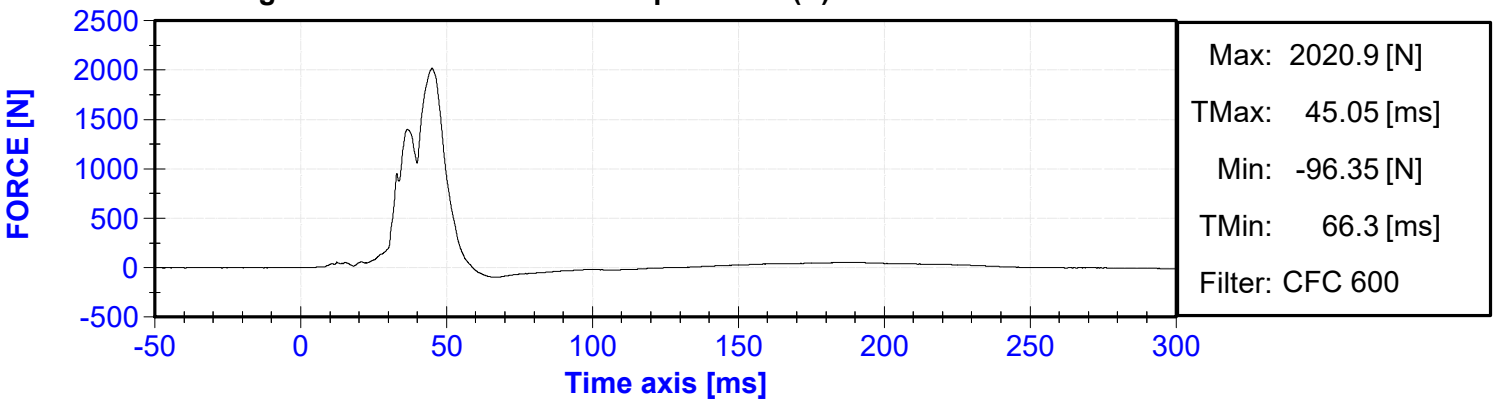
### Passenger Lower Spine T12 Resultant Acceleration vs. Time



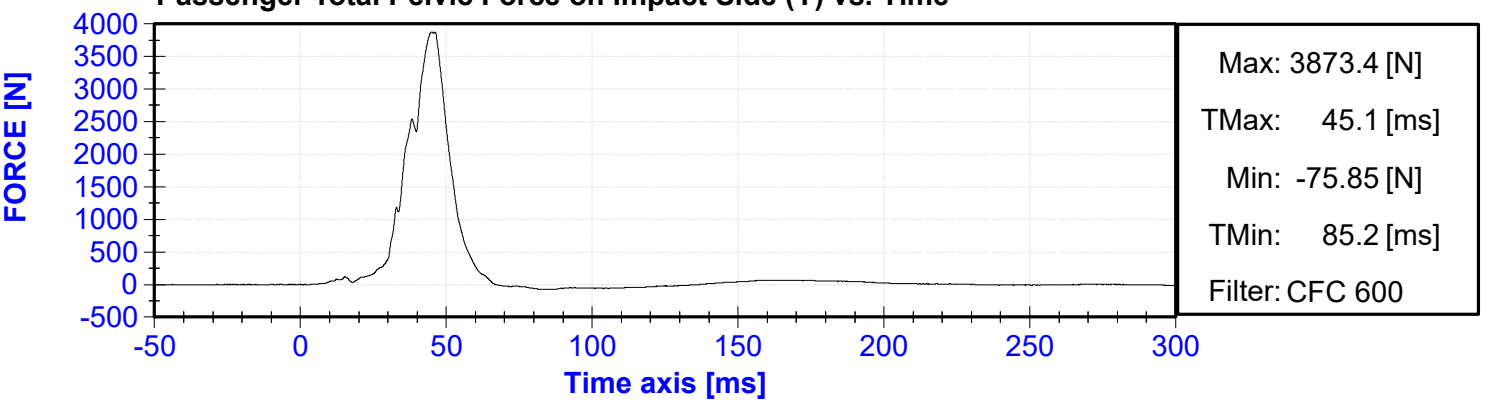

### Passenger Iliac Force on Impact Side (Y) vs. Time




### Passenger Acetabulum Force on Impact Side (Y) vs. Time




### Passenger Total Pelvic Force on Impact Side (Y) vs. Time



# APPENDIX C

# DUMMY CONFIGURATION AND PERFORMANCE VERFICATION DATA

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**EUROSID 2 (ES-2RE) MALE – DRIVER ATD**

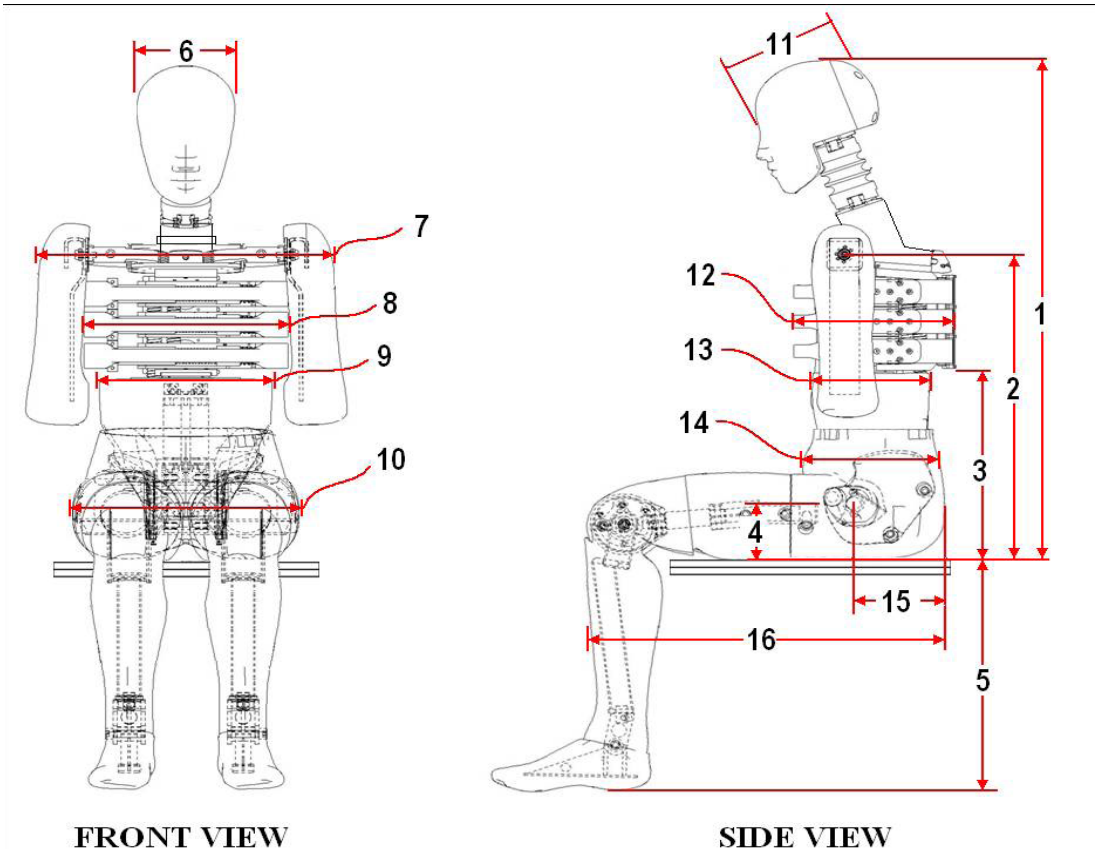
**SERIAL NO:F033**

**(CONFIGURED FOR LEFT SIDE IMPACT)**

External Measurements - EuroSID-2re

Technician: K. Brogan  Date: 05/17/2024

Dummy Serial Number: F033




FRONT VIEW  SIDE VIEW

| Dim. No. | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| 1 | Sitting Height | 900 | 918 | 915 | Pass |
| 2 | Seat to Shoulder Joint | 558 | 572 | 567 | Pass |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346 | 356 | 352 | Pass |
| 4 | Seat to Hip Joint (center of bolt) | 97 | 103 | 99 | Pass |
| 5 | Sole to Seat, Sitting | 333 | 451 | 429 | Pass |
| 6 | Head Width | 152 | 158 | 156 | Pass |
| 7 | Shoulder/Arm Width | 461 | 479 | 472 | Pass |
| 8 | Thorax Width | 322 | 332 | 330 | Pass |
| 9 | Abdomen Width | 273 | 287 | 282 | Pass |
| 10 | Pelvis Lap Width | 359 | 373 | 370 | Pass |
| 11 | Head Depth | 196 | 206 | 200 | Pass |
| 12 | Thorax Depth | 262 | 272 | 269 | Pass |
| 13 | Abdomen Depth | 194 | 204 | 201 | Pass |
| 14 | Pelvis Depth | 235 | 245 | 241 | Pass |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150 | 160 | 155 | Pass |
| 16 | Back of Buttocks to Front Knee | 597 | 615 | 611 | Pass |

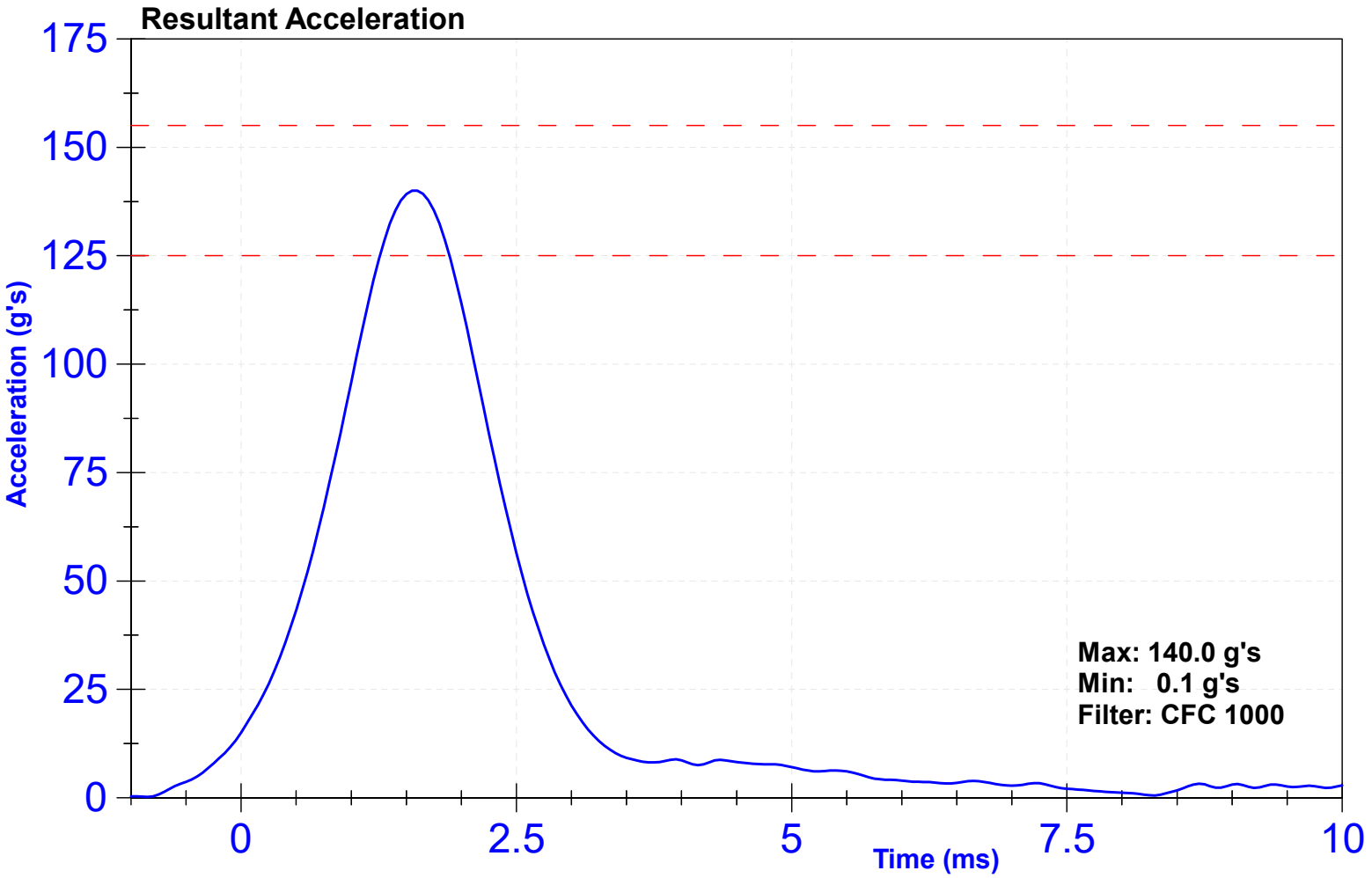
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

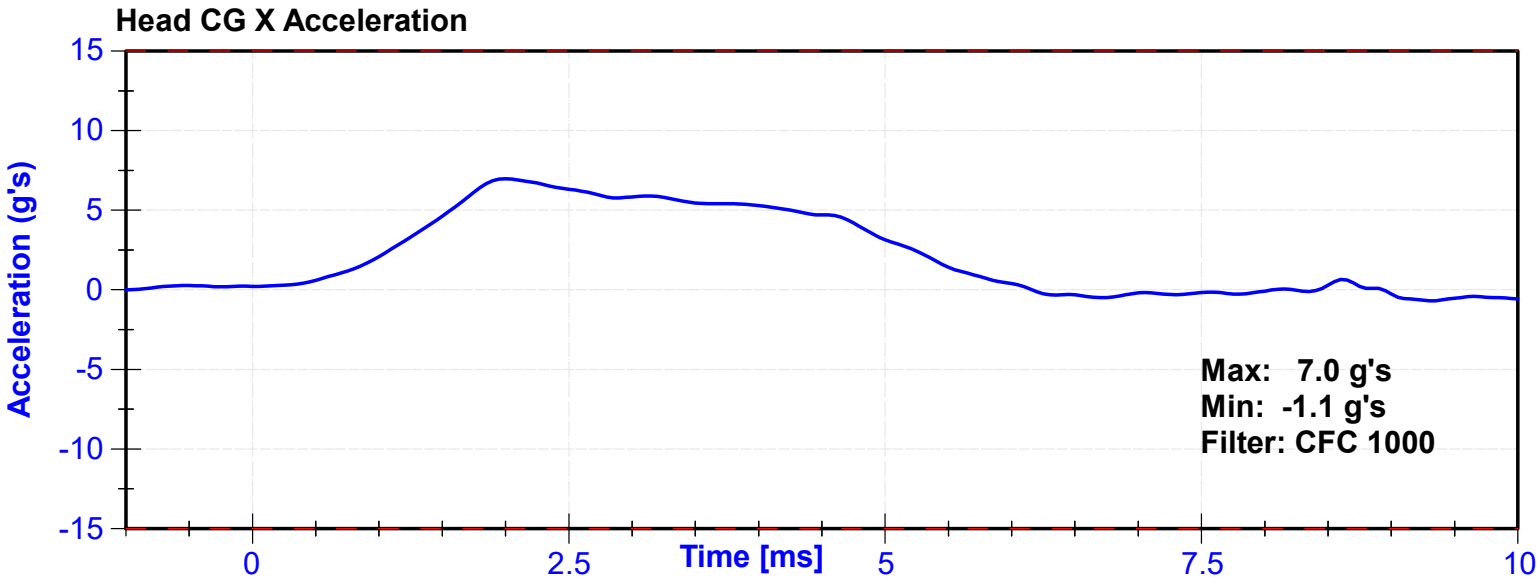
## Results

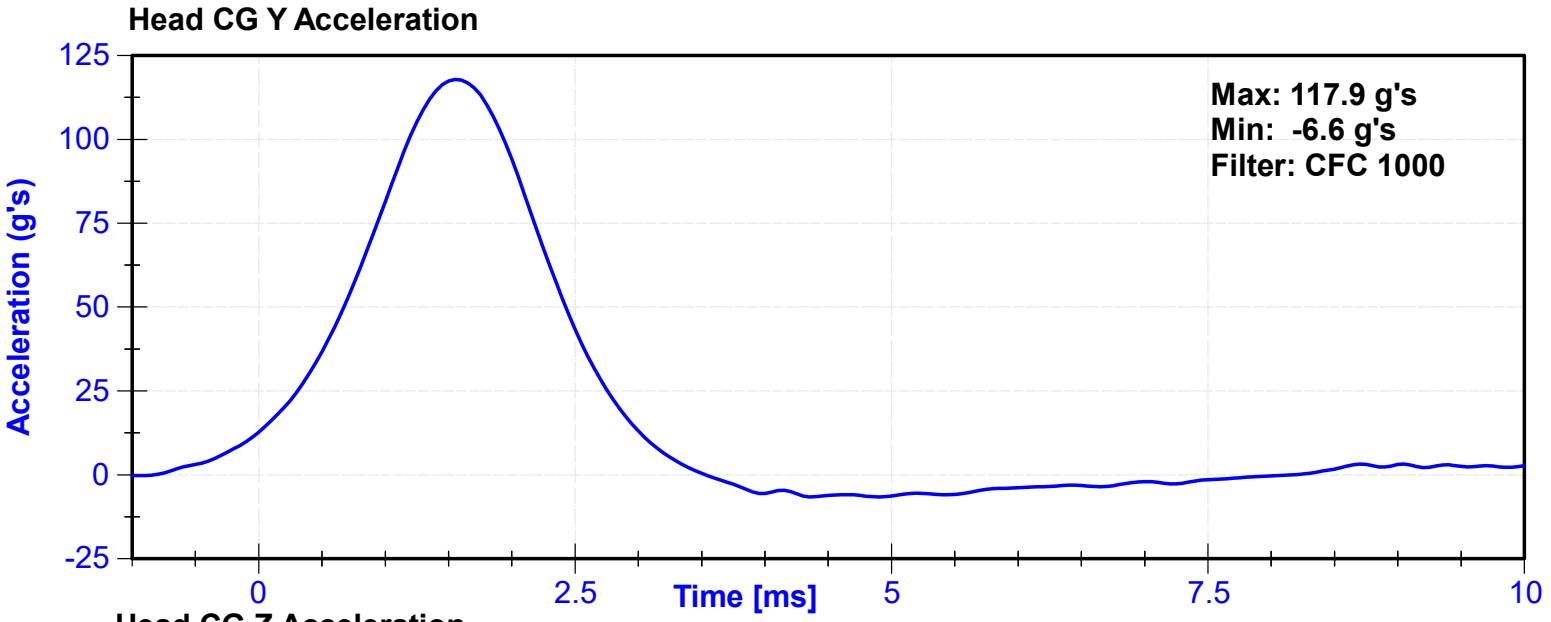
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Resultant Acceleration | 125 | 155 | g's | 140.0 | Pass |
| Oscillation | 0 | 15 | % | 6.32 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | 7.0 | Pass |

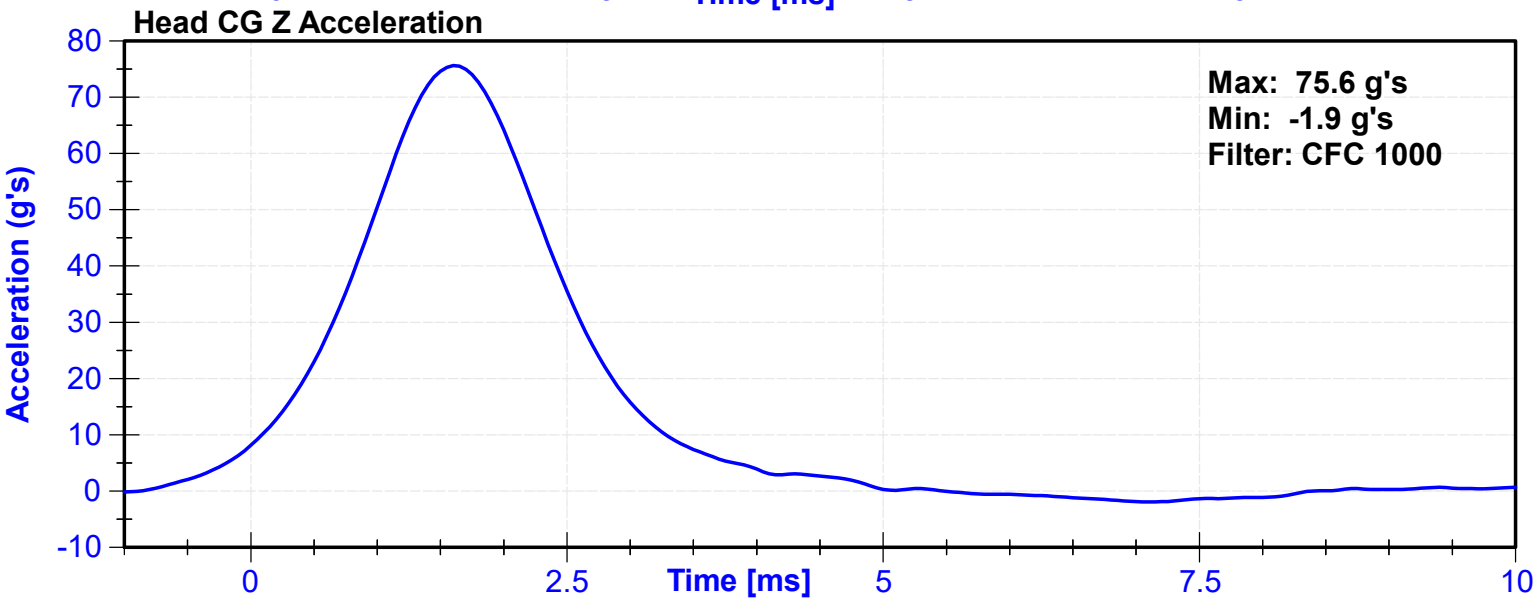
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P63861 | 5/6/2024 | 11/2/2024 |
| Y Accelerometer | Endevco | P49216 | 5/6/2024 | 11/2/2024 |
| Z Accelerometer | Endevco | P51303 | 5/6/2024 | 11/2/2024 |




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
Time [ms]
5
7.5
10
Max: 7.0 g's
Min: -1.1 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
Time [ms]
5
7.5
10
Max: 117.9 g's
Min: -6.6 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
Time [ms]
5
7.5
10
Max: 75.6 g's
Min: -1.9 g's
Filter: CFC 1000

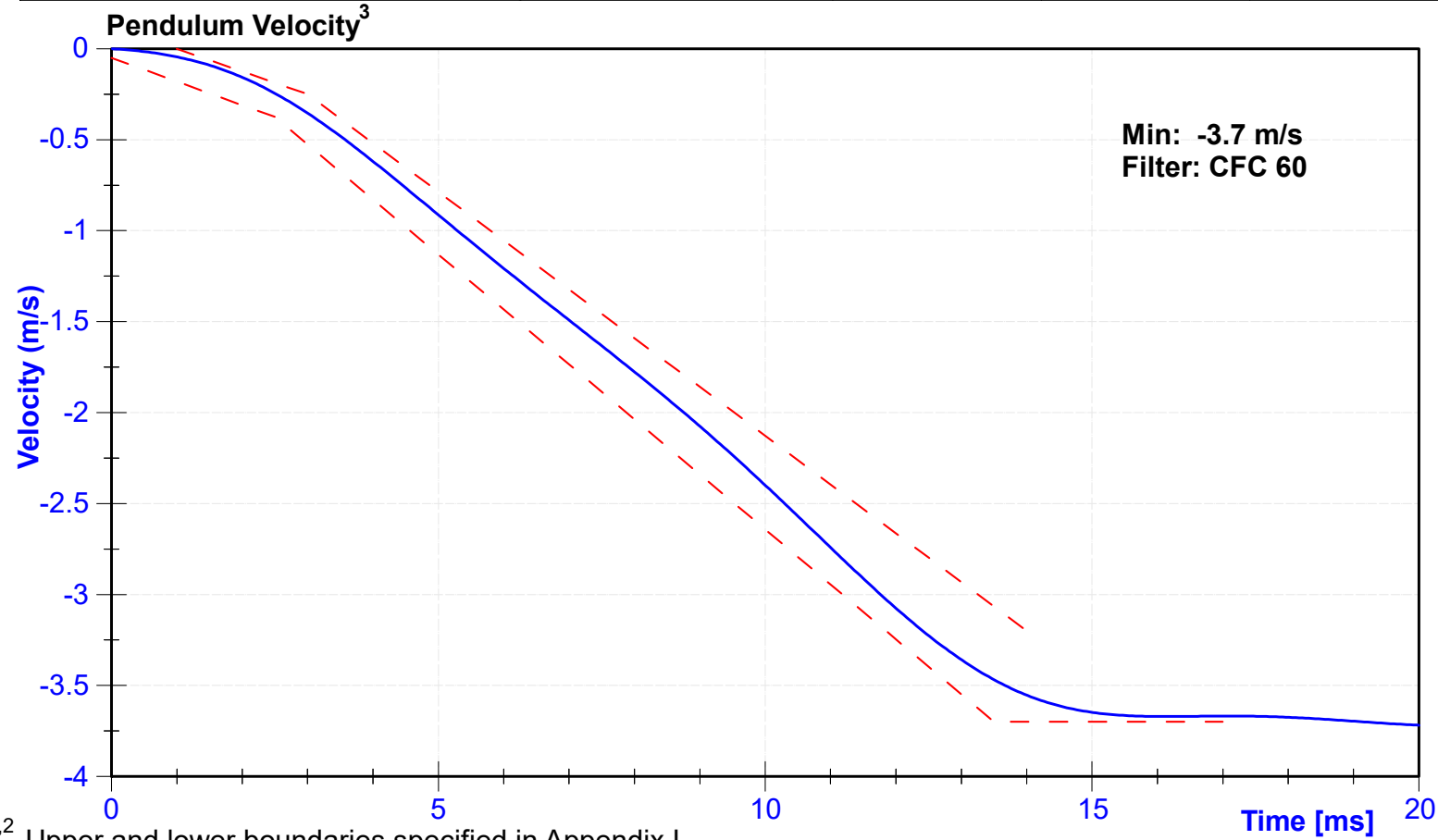
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

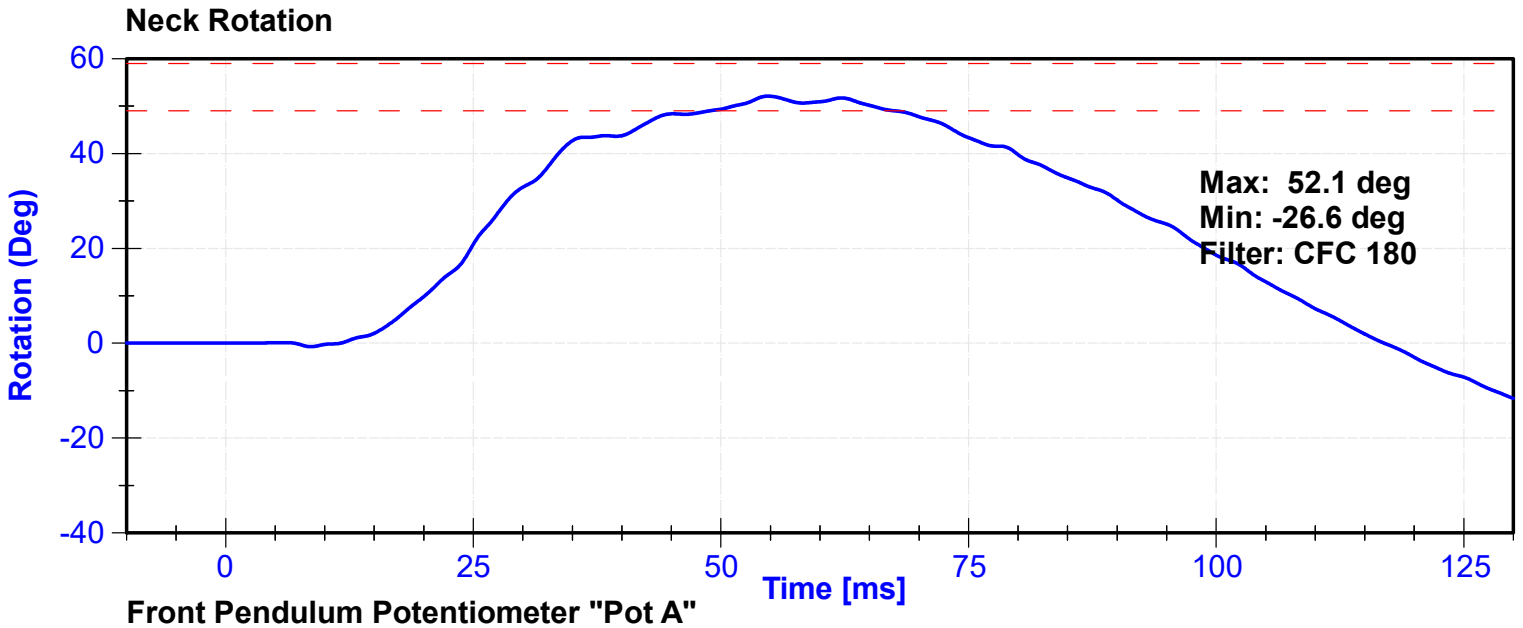
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 51 | Pass |
| Velocity | 3.3 | 3.5 | m/s | 3.45 | Pass |
| Lateral Neck Rotation | 49 | 59 | deg | 52.1 | Pass |
| Time at Maximum Rotation | 54 | 66 | ms | 54.8 | Pass |
| Time of Rotation Decay from Maximum | 53 | 88 | ms | 62.3 | Pass |
| Pendulum Velocity Overall Corridor | Lower Boundary[1] | Upper Boundary[2] | m/s | See Plot[3] | Pass |

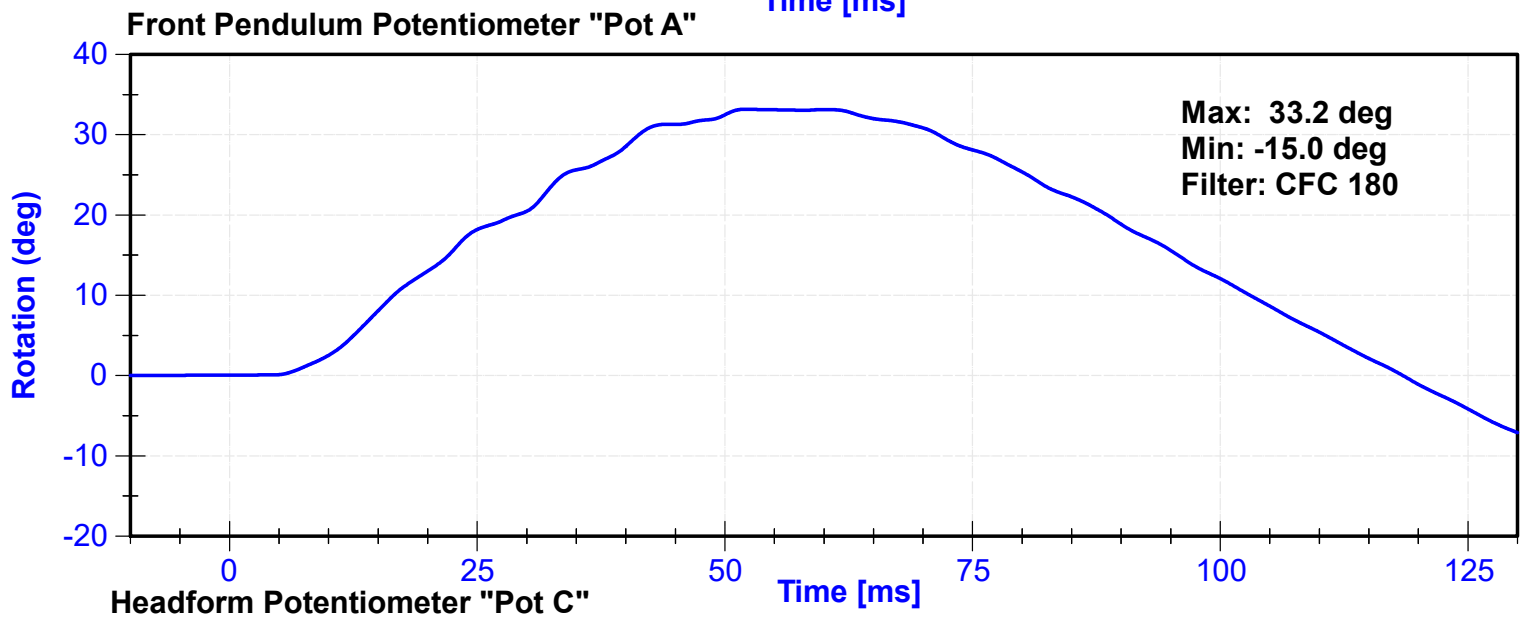
## Transducer Calibrations

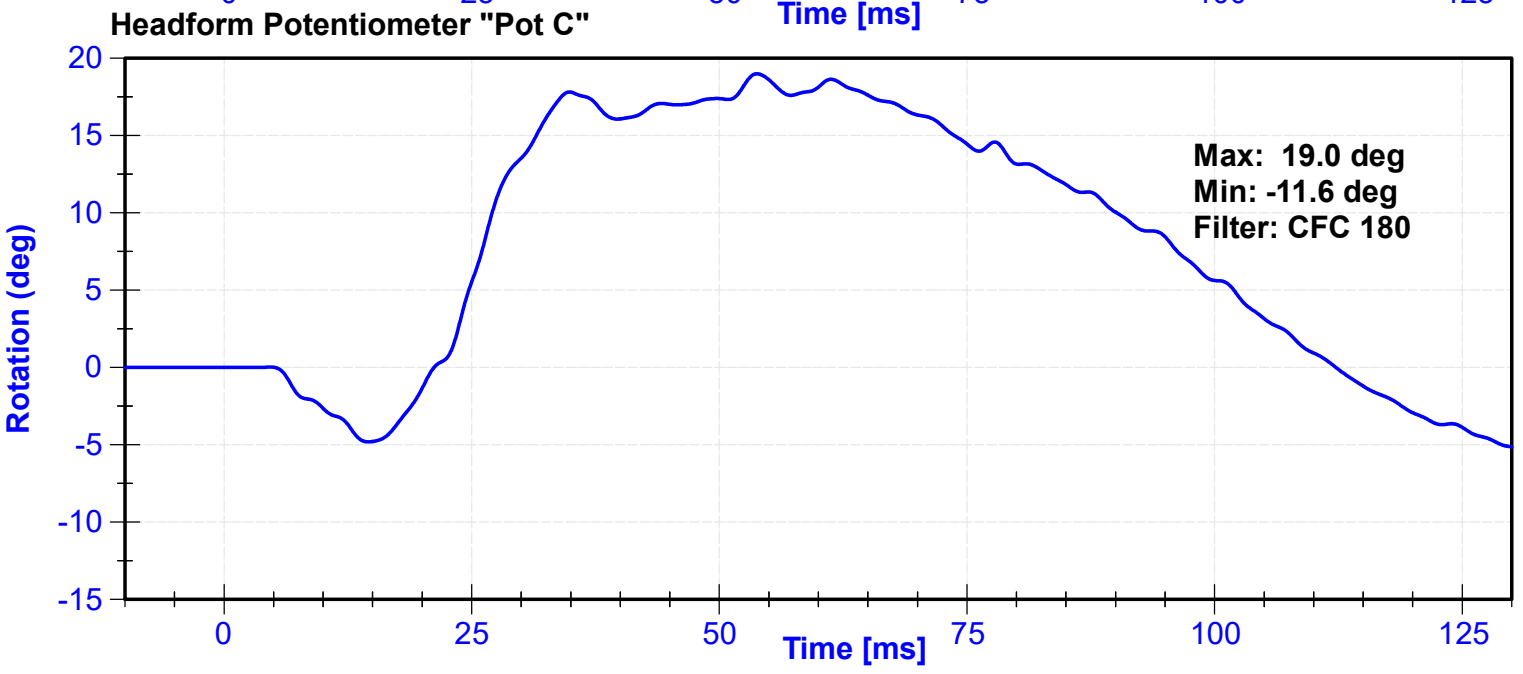
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | C16503 | 4/29/2024 | 10/26/2024 |
| Front Pendulum Potentiometer | Sfernice | 2247 | 12/5/2023 | 12/4/2024 |
| Headform Potentiometer | Sfernice | 095 | 9/29/2023 | 9/28/2024 |




[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]
Max: 52.1 deg
Min: -26.6 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]
Max: 33.2 deg
Min: -15.0 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]
Max: 19.0 deg
Min: -11.6 deg
Filter: CFC 180

# 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 |

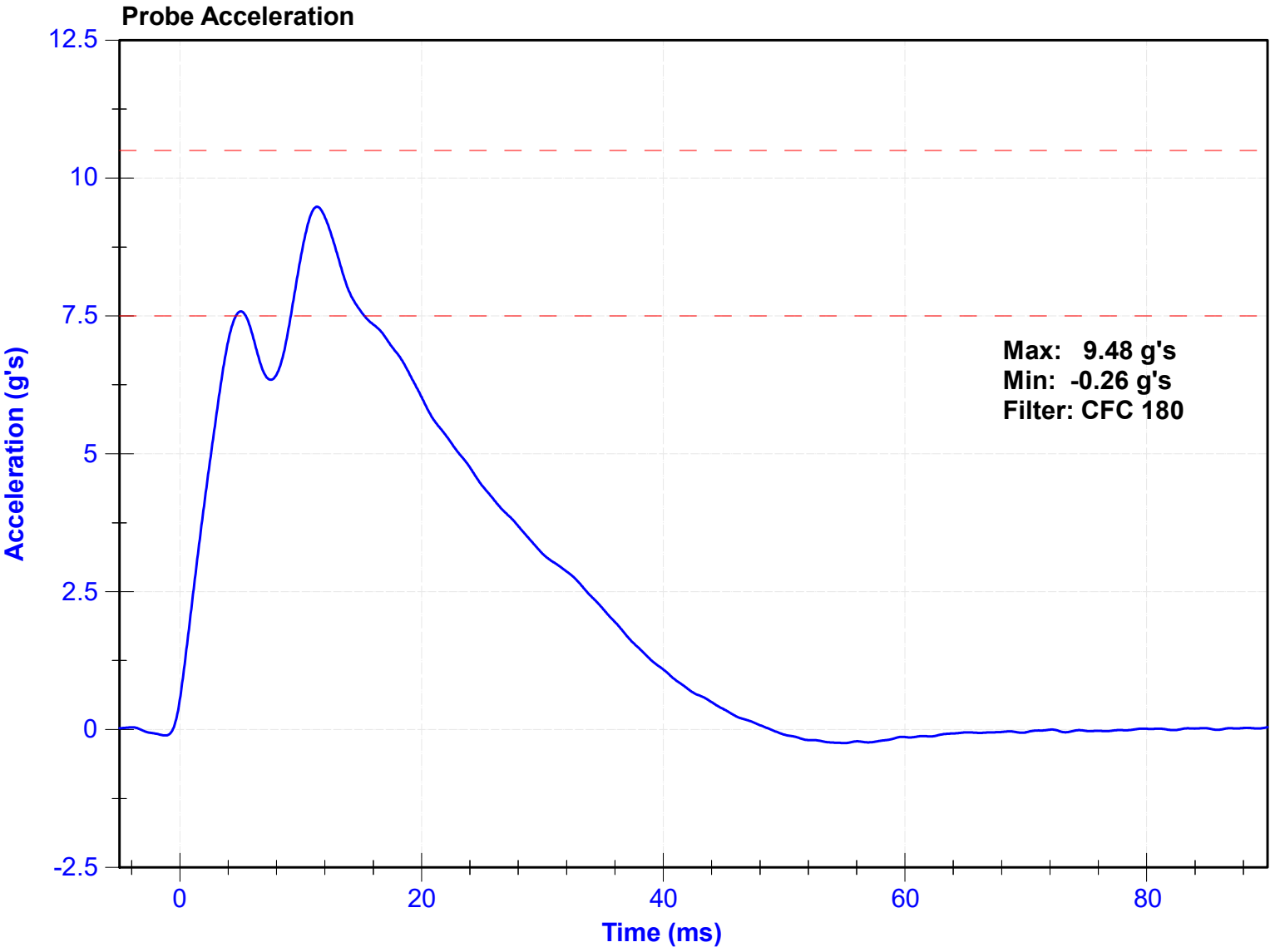
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.31 | Pass |
| Probe Acceleration | 7.5 | 10.5 | g's | 9.48 | Pass |

## Transducer Calibrations

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



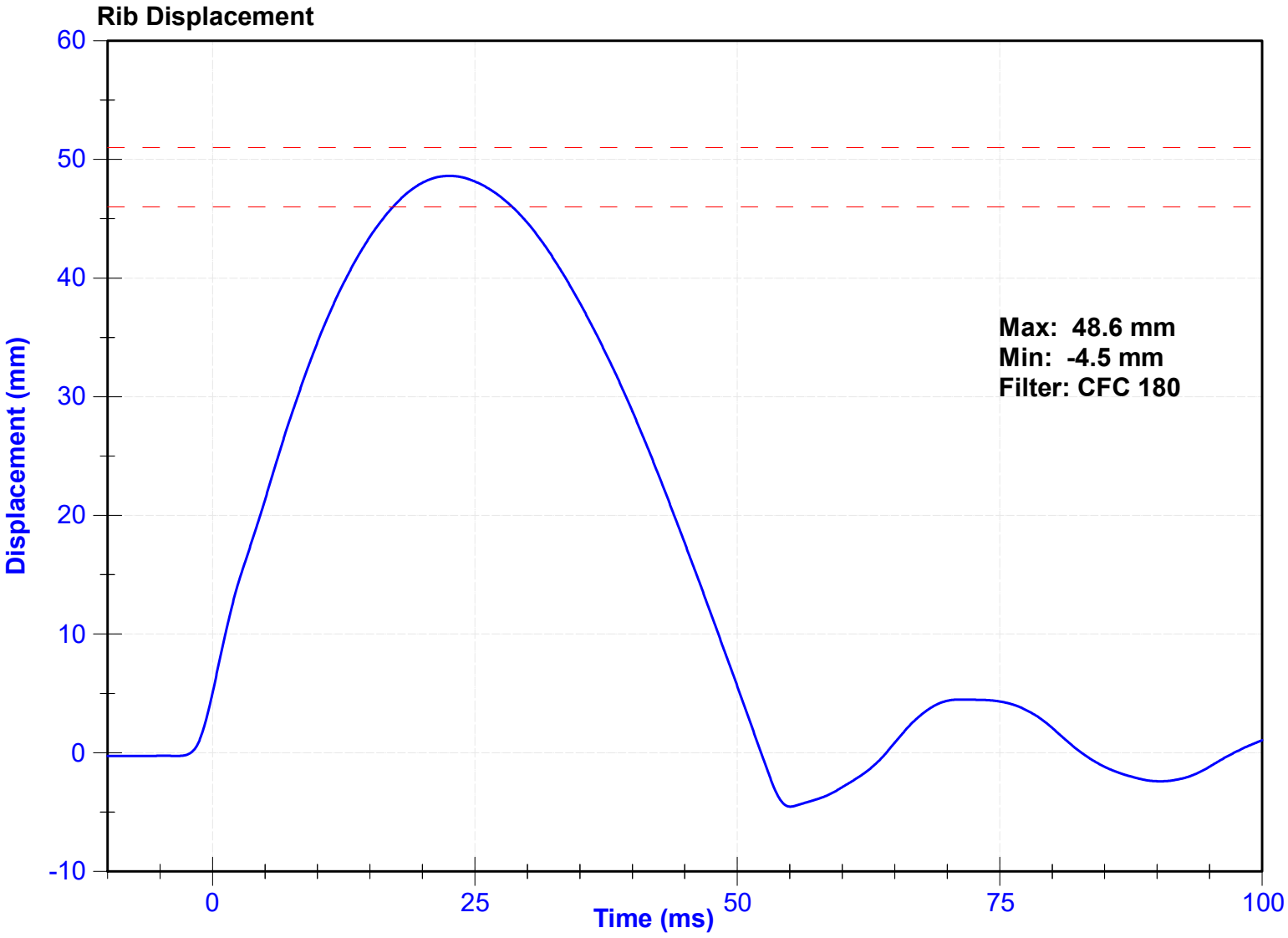
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 46 | 51 | mm | 48.6 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |



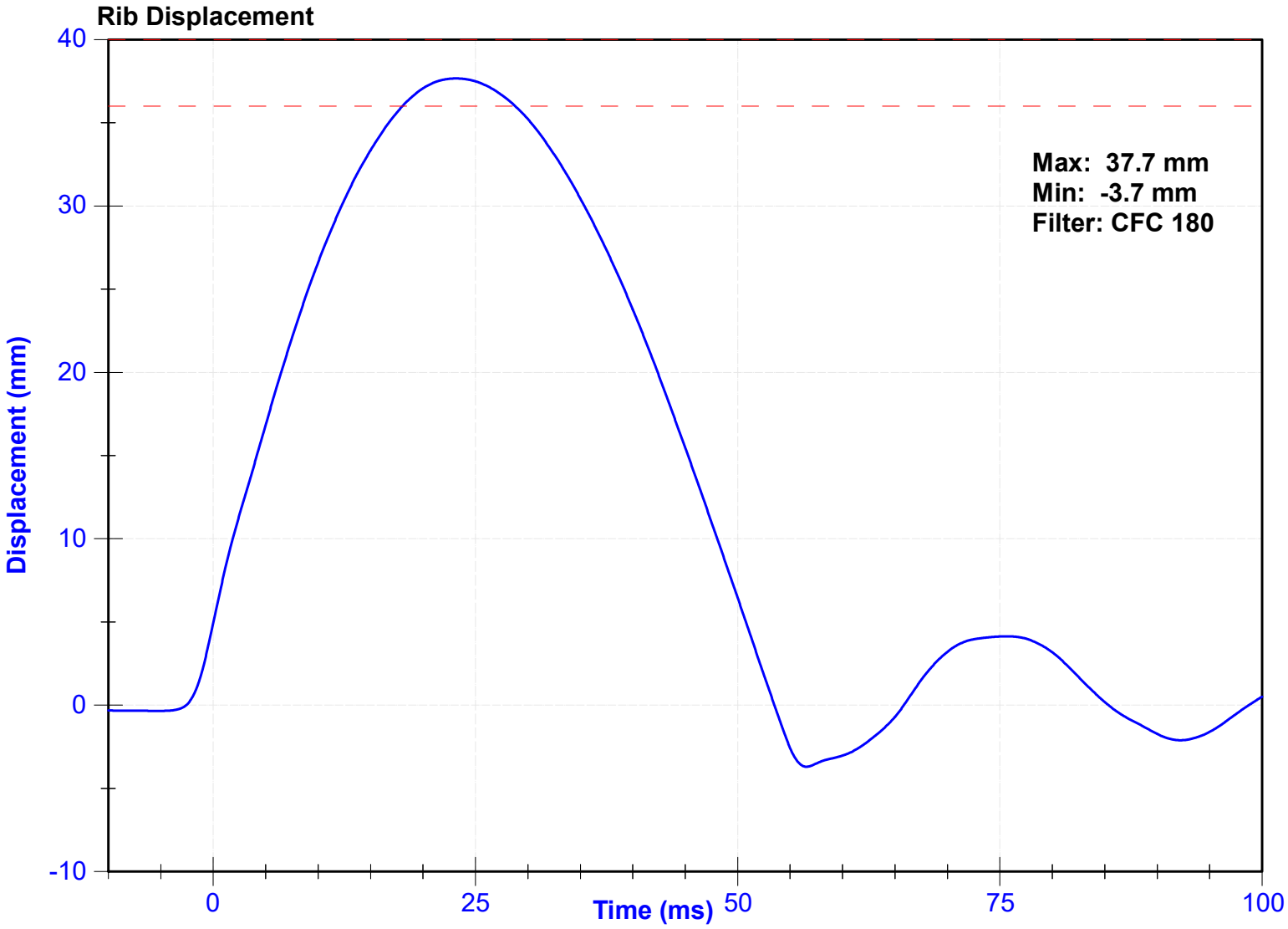
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 36 | 40 | mm | 37.7 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |



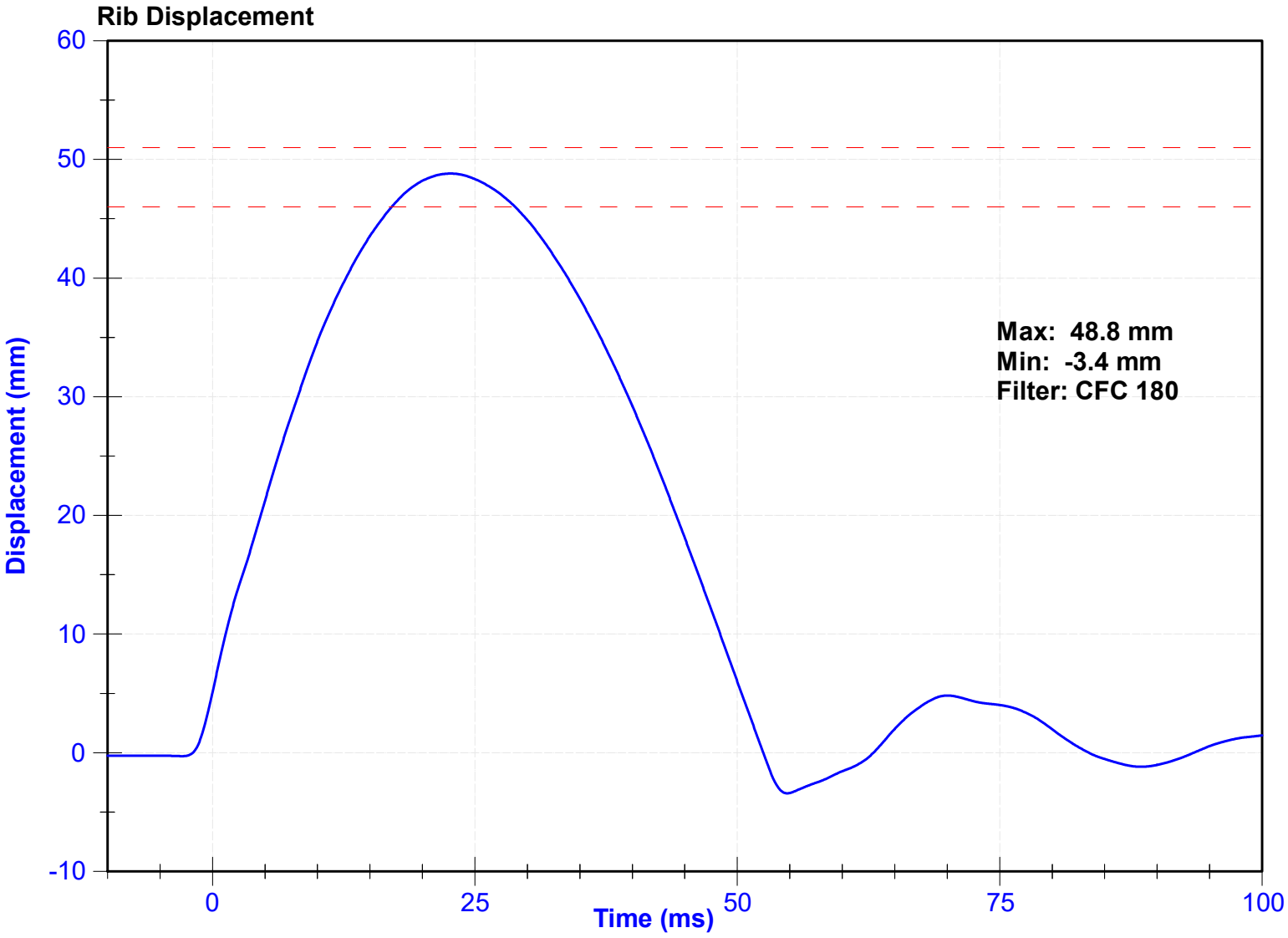
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 46 | 51 | mm | 48.8 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |



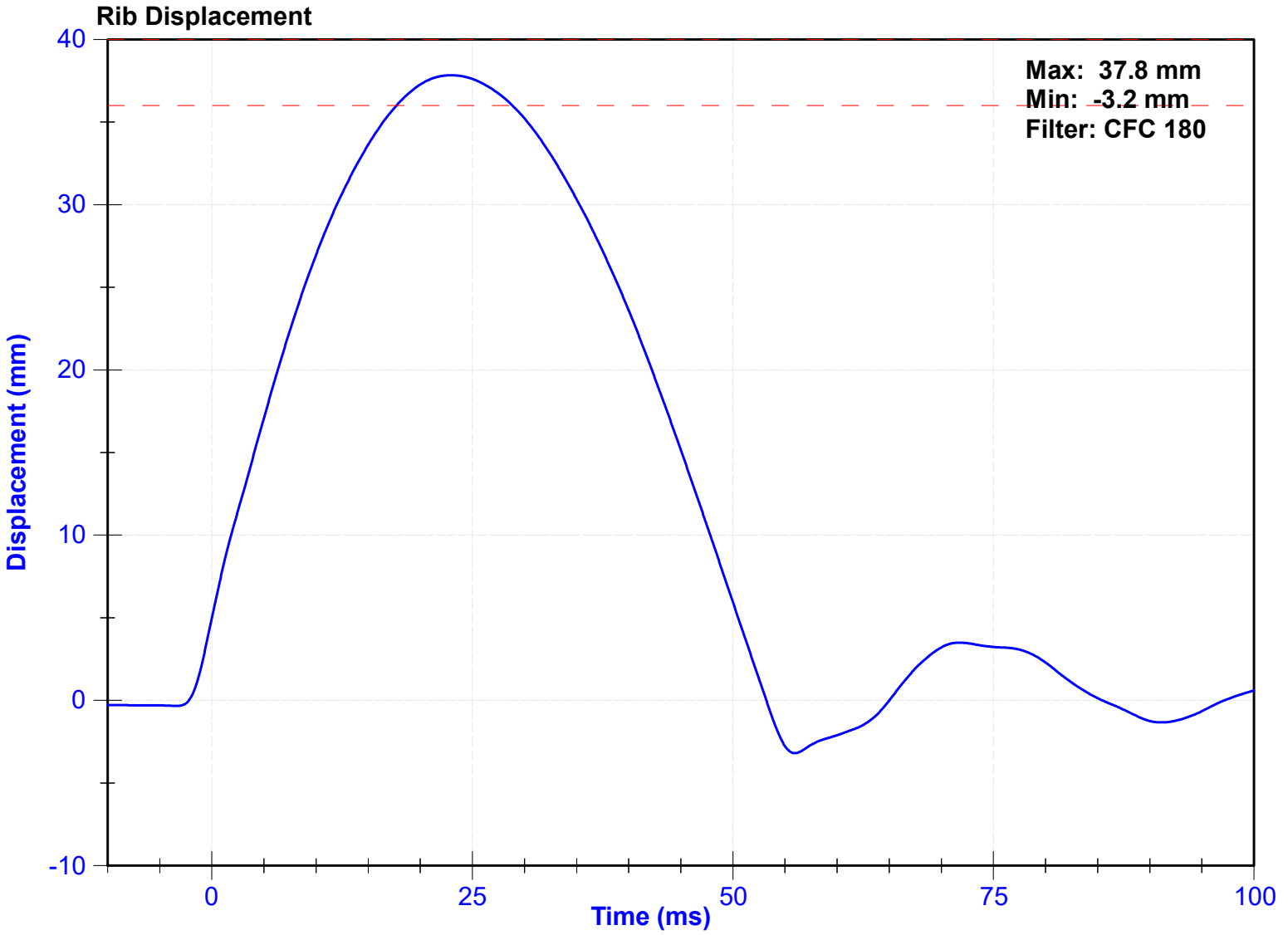
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 36 | 40 | mm | 37.8 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |



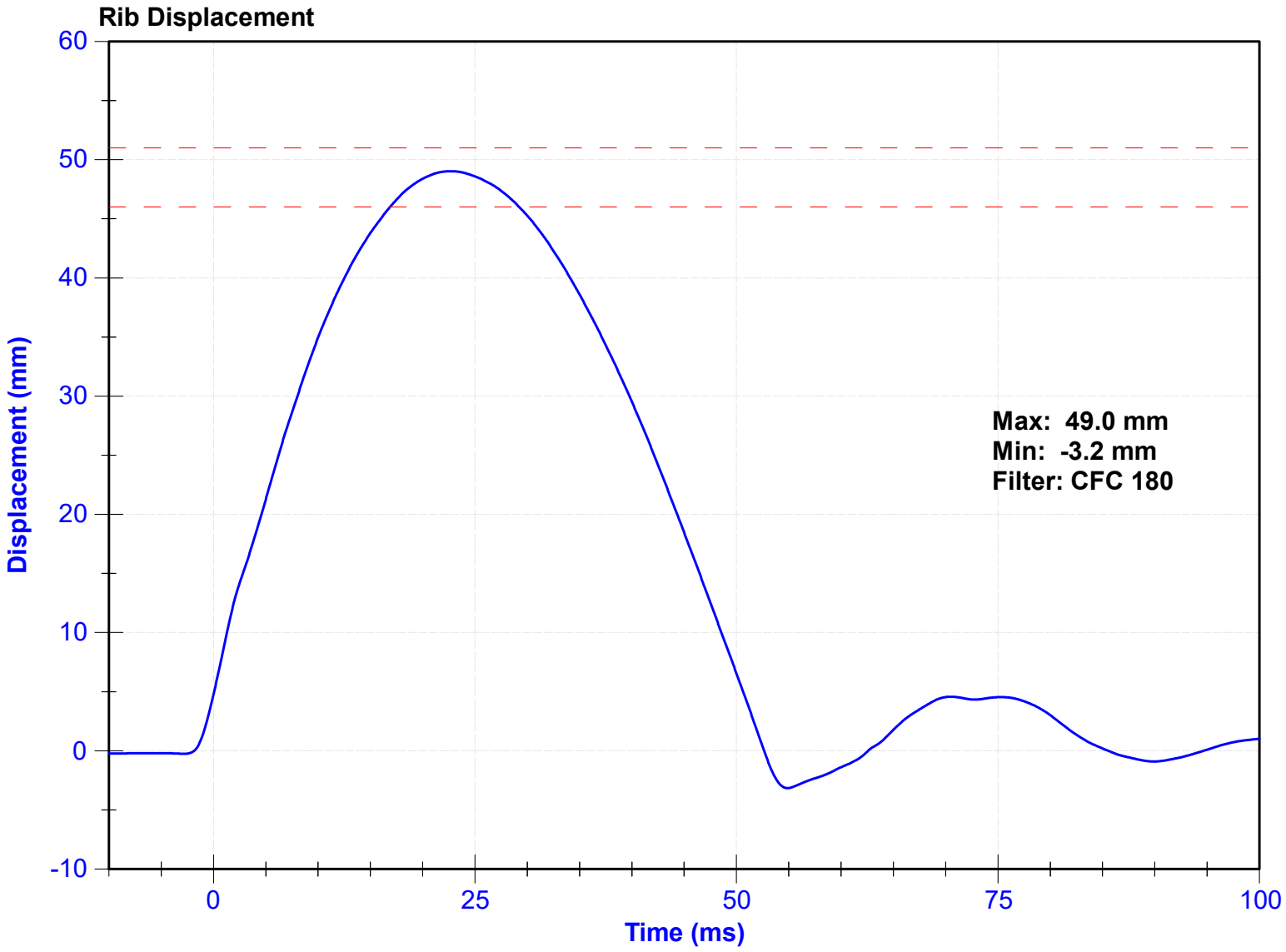
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 46 | 51 | mm | 49.0 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |



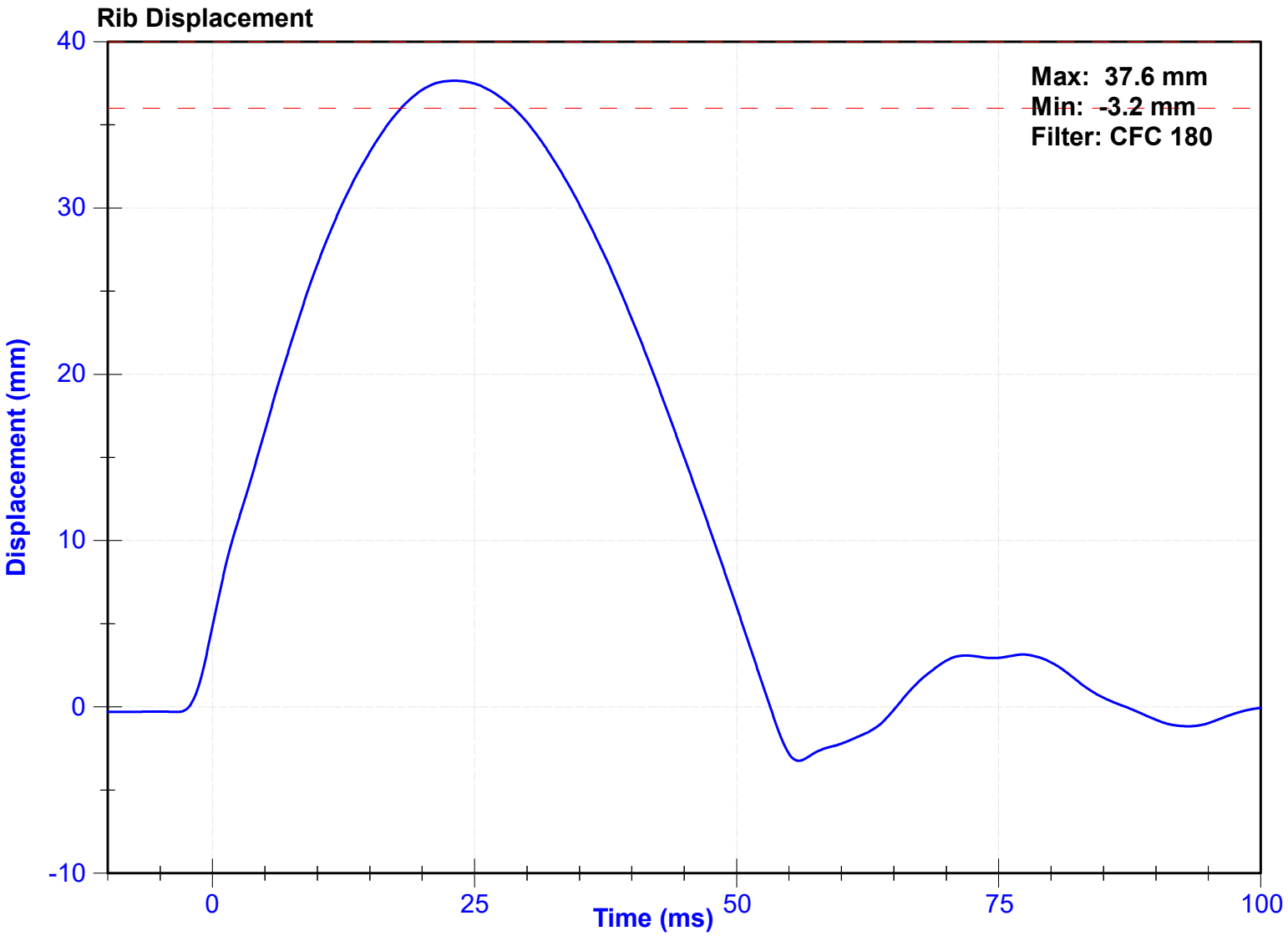
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Rib Displacement | 36 | 40 | mm | 37.6 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |



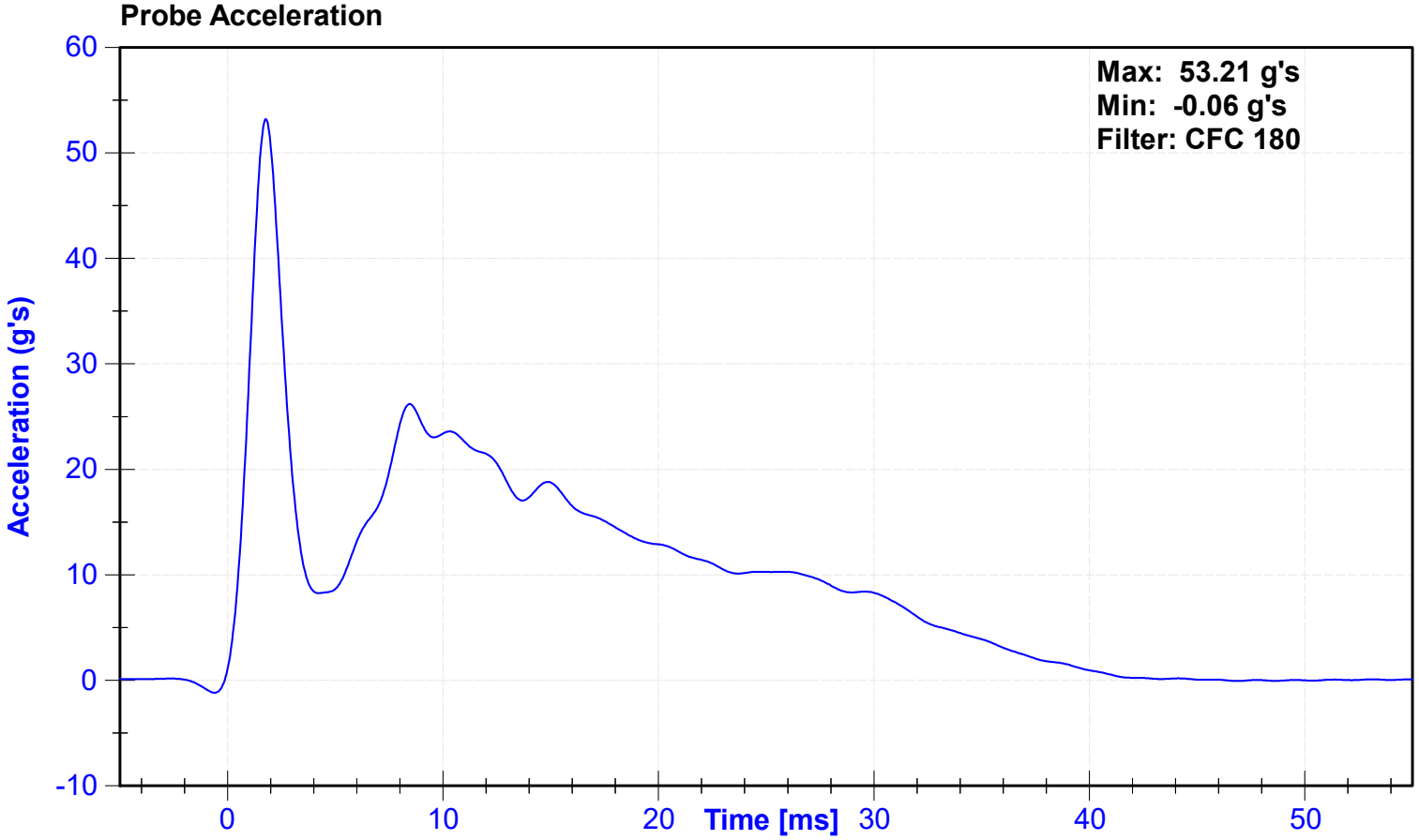
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

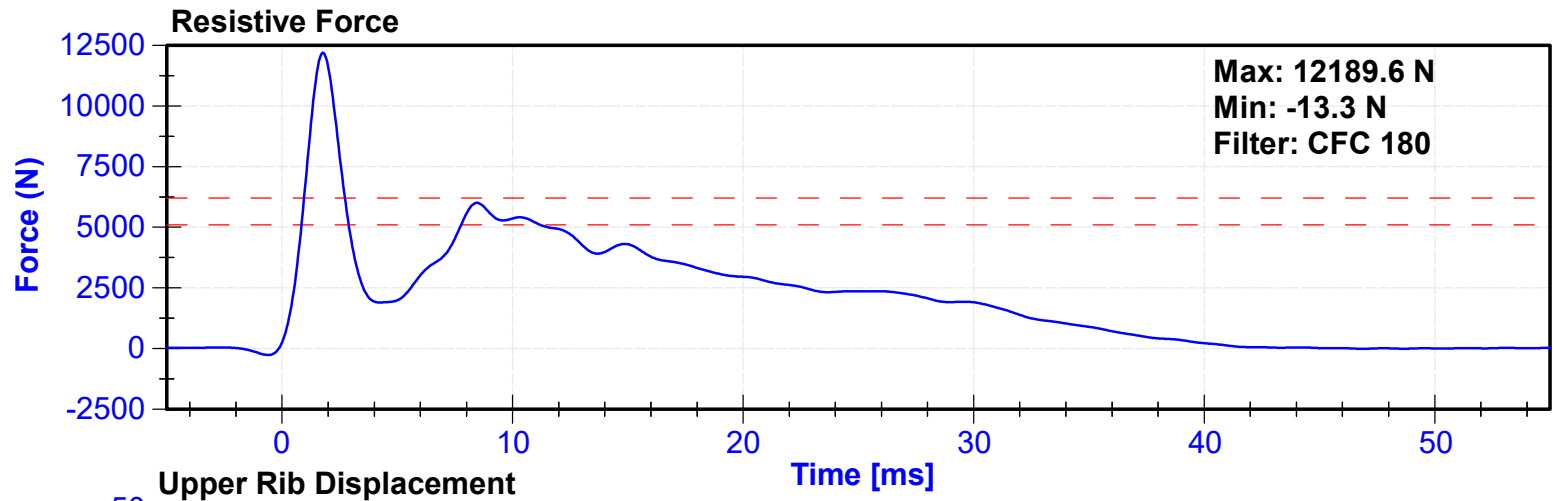
## Results

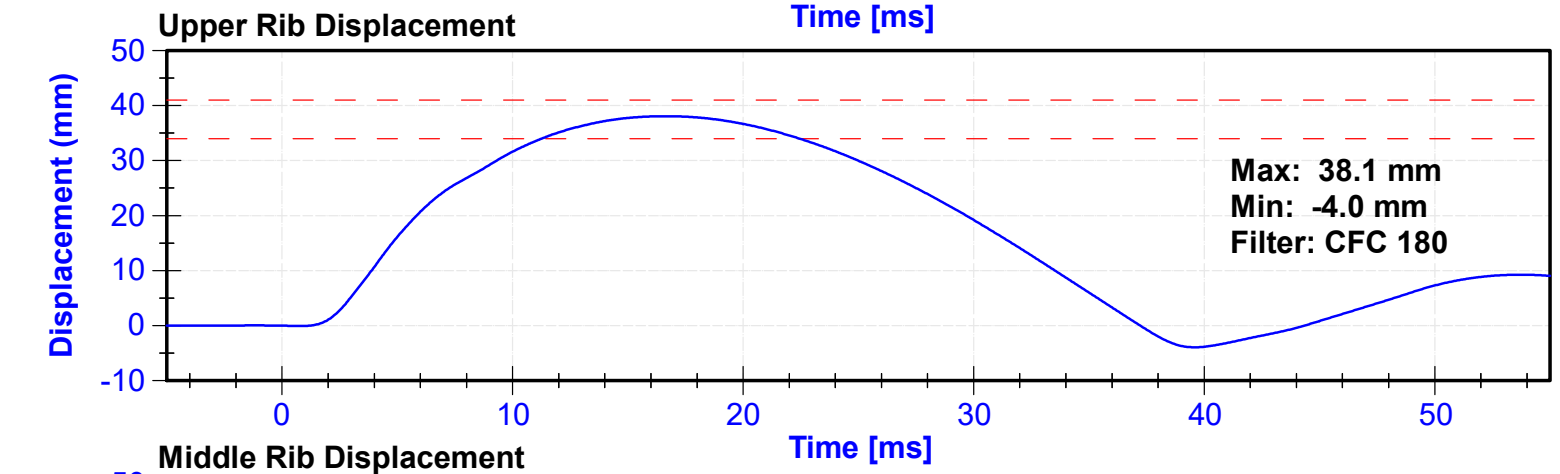
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 5.4 | 5.6 | m/s | 5.56 | Pass |
| Resistive Force after 6ms | 5100 | 6200 | N | 6003.4 | Pass |
| Upper Thorax Rib Deflection | 34 | 41 | mm | 38.1 | Pass |
| Mid Thorax Rib Deflection | 37 | 45 | mm | 41.3 | Pass |
| Lower Thorax Rib Deflection | 37 | 44 | mm | 42.2 | Pass |

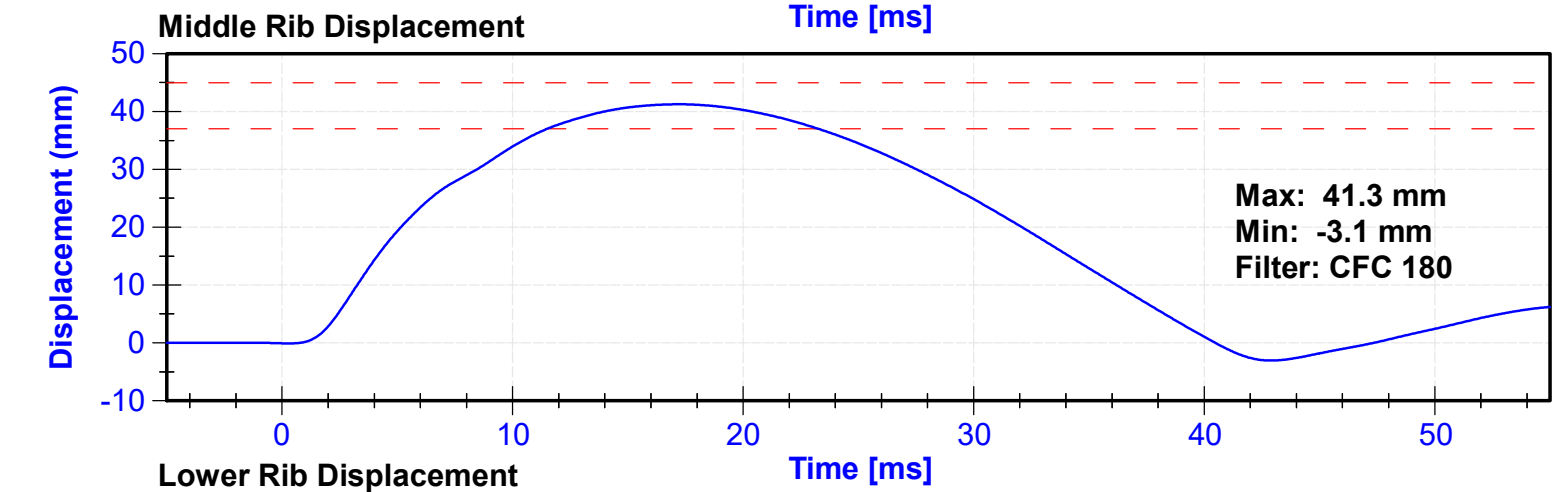
## Transducer Calibrations

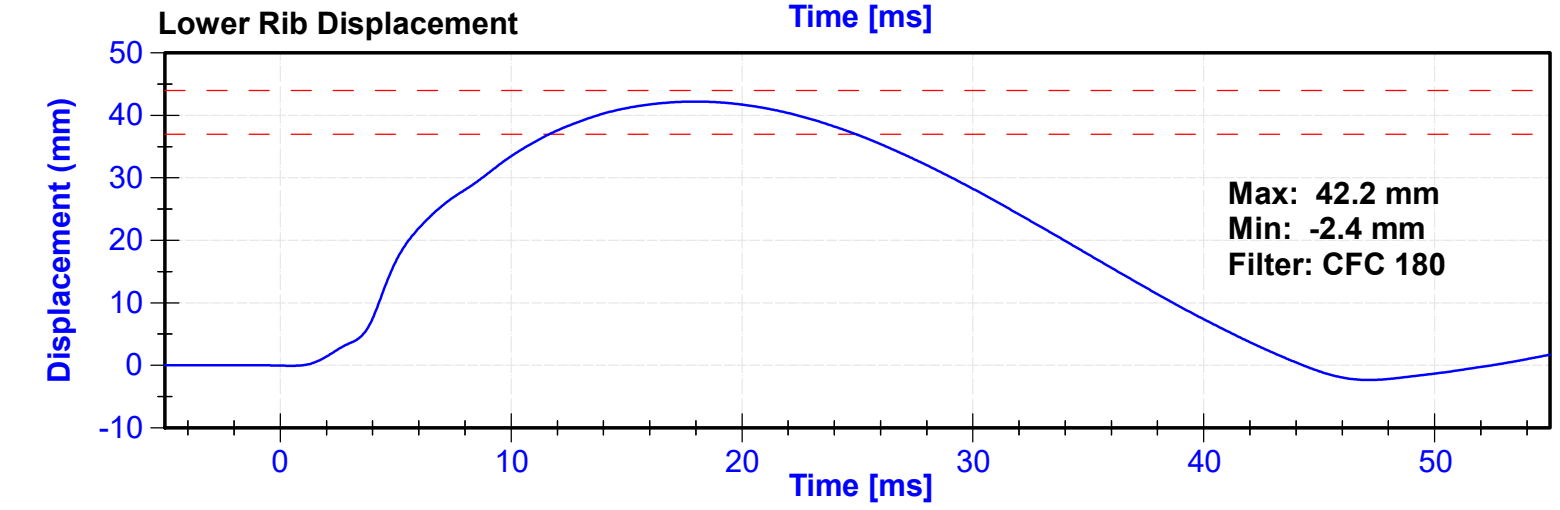
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Upper Thorax Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |
| Middle Thorax Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |
| Lower Thorax Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |




Resistive Force
Max: 12189.6 N
Min: -13.3 N
Filter: CFC 180
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 38.1 mm
Min: -4.0 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 41.3 mm
Min: -3.1 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 42.2 mm
Min: -2.4 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

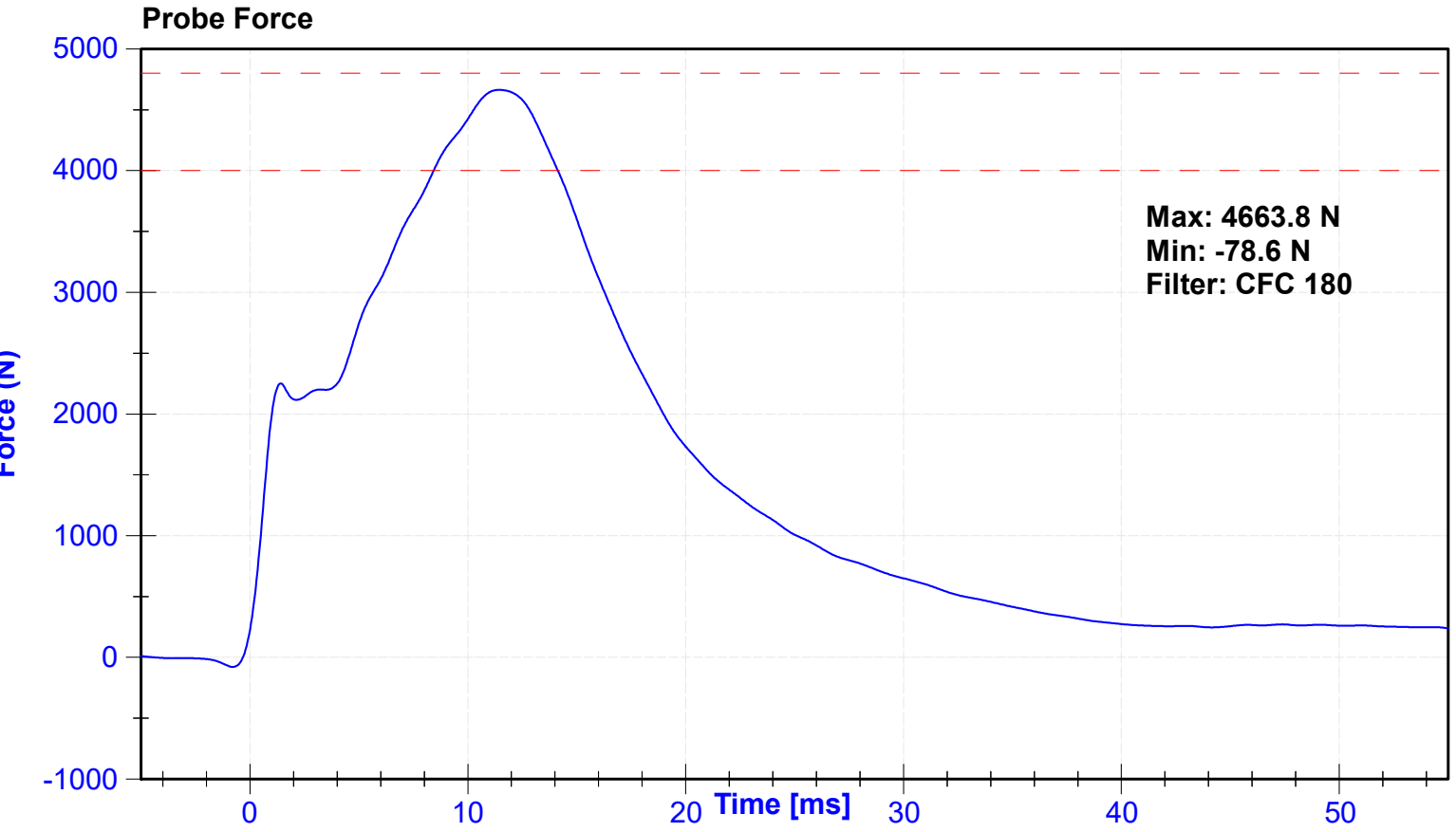
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

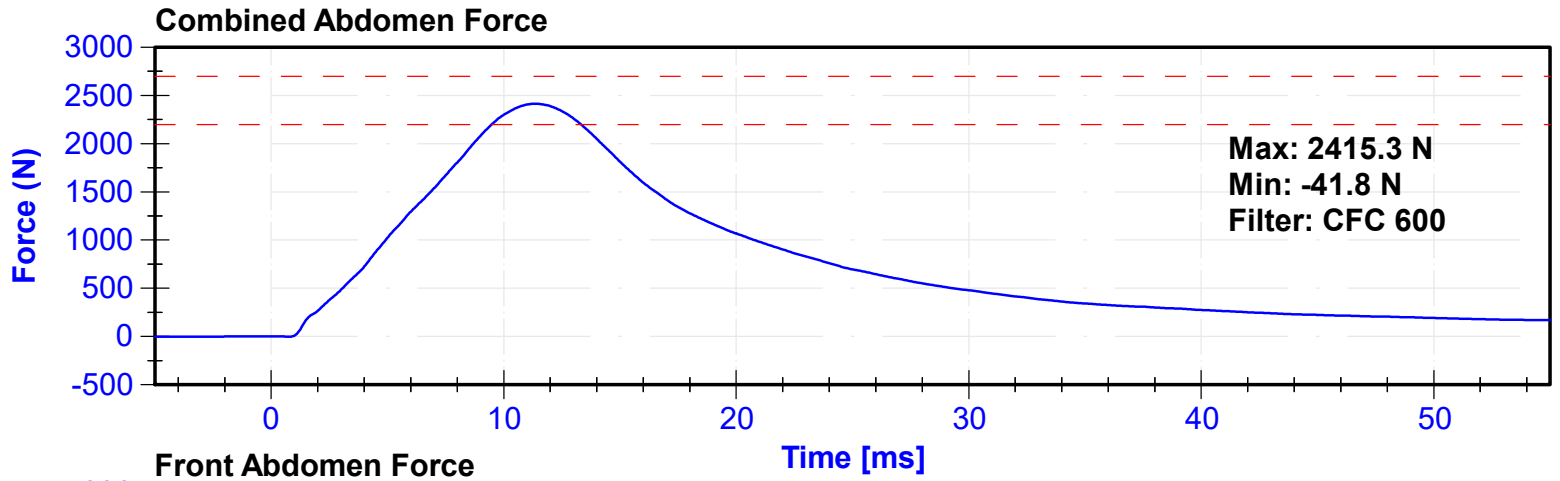
## Results

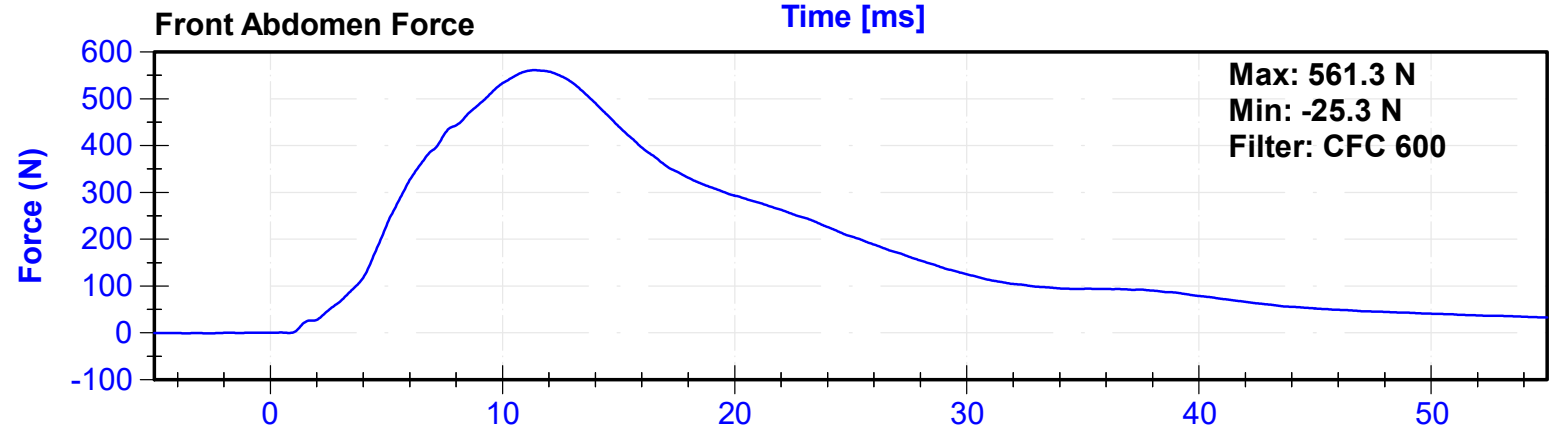
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 3.9 | 4.1 | m/s | 4.06 | Pass |
| Combined Abdomen Force | 2200 | 2700 | N | 2415.3 | Pass |
| Time at Peak Abdomen Force | 10.0 | 12.3 | ms | 11.35 | Pass |
| Resistive Probe Force | 4000 | 4800 | N | 4663.8 | Pass |
| Time at Peak Resistive Force | 10.6 | 13.0 | ms | 11.45 | Pass |

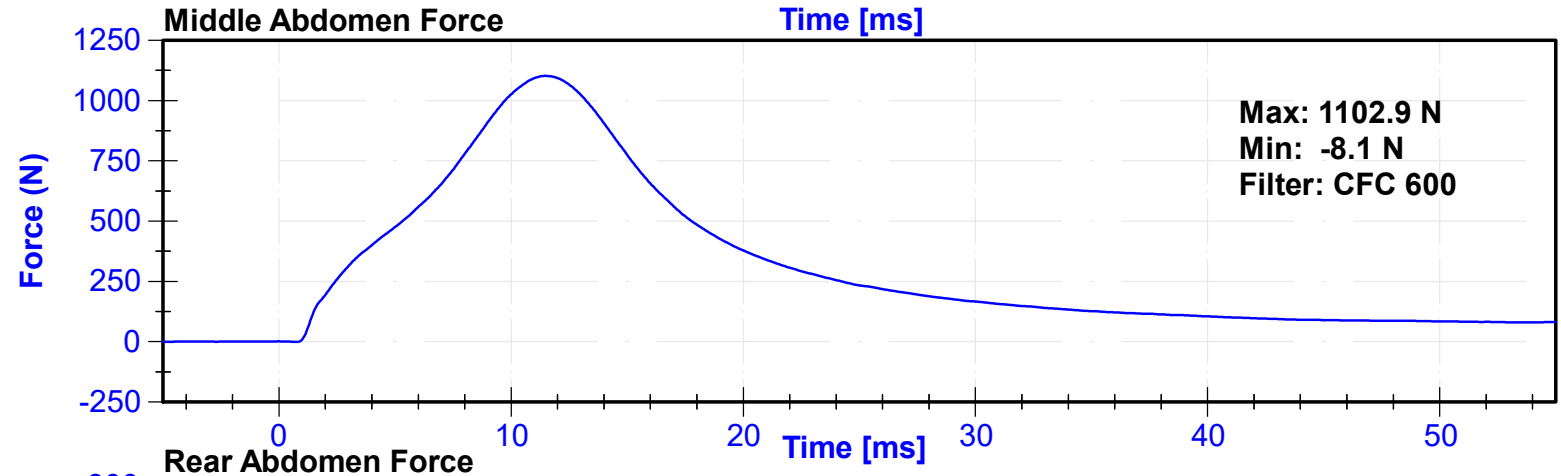
## Transducer Calibrations

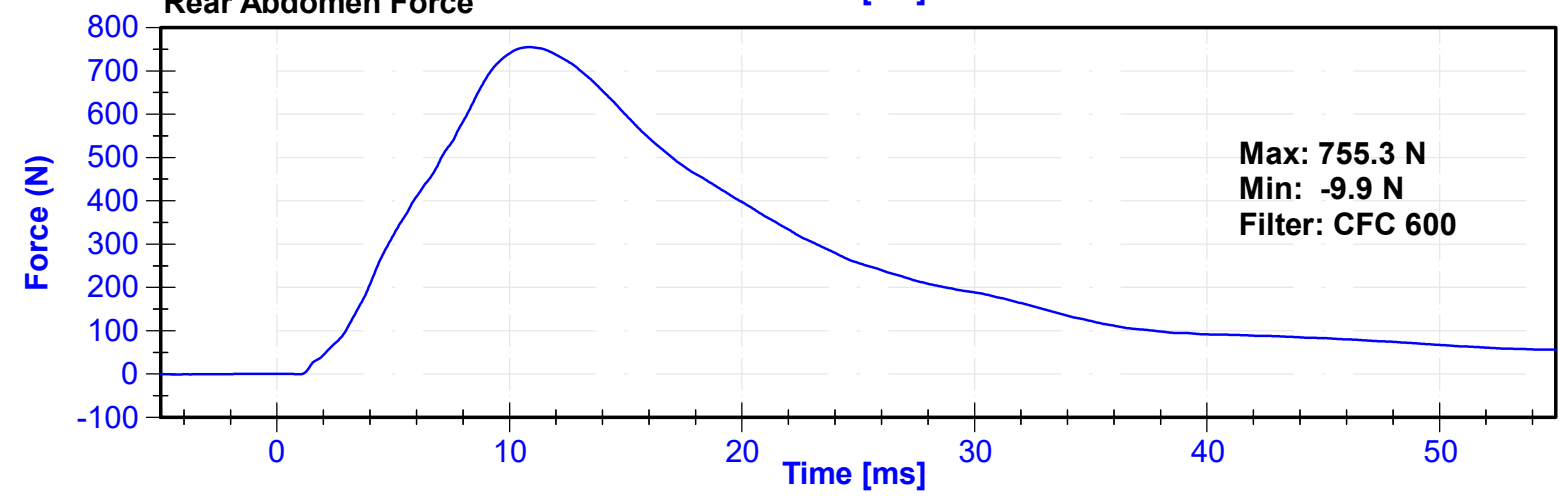
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Front Abdomen Load Cell | Denton | 1509 | 9/12/2023 | 9/11/2024 |
| Middle Abdomen Load Cell | Denton | 1508 | 9/12/2023 | 9/11/2024 |
| Rear Abdomen Load Cell | Denton | 1507 | 9/12/2023 | 9/11/2024 |




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2415.3 N
Min: -41.8 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 561.3 N
Min: -25.3 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1102.9 N
Min: -8.1 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 755.3 N
Min: -9.9 N
Filter: CFC 600

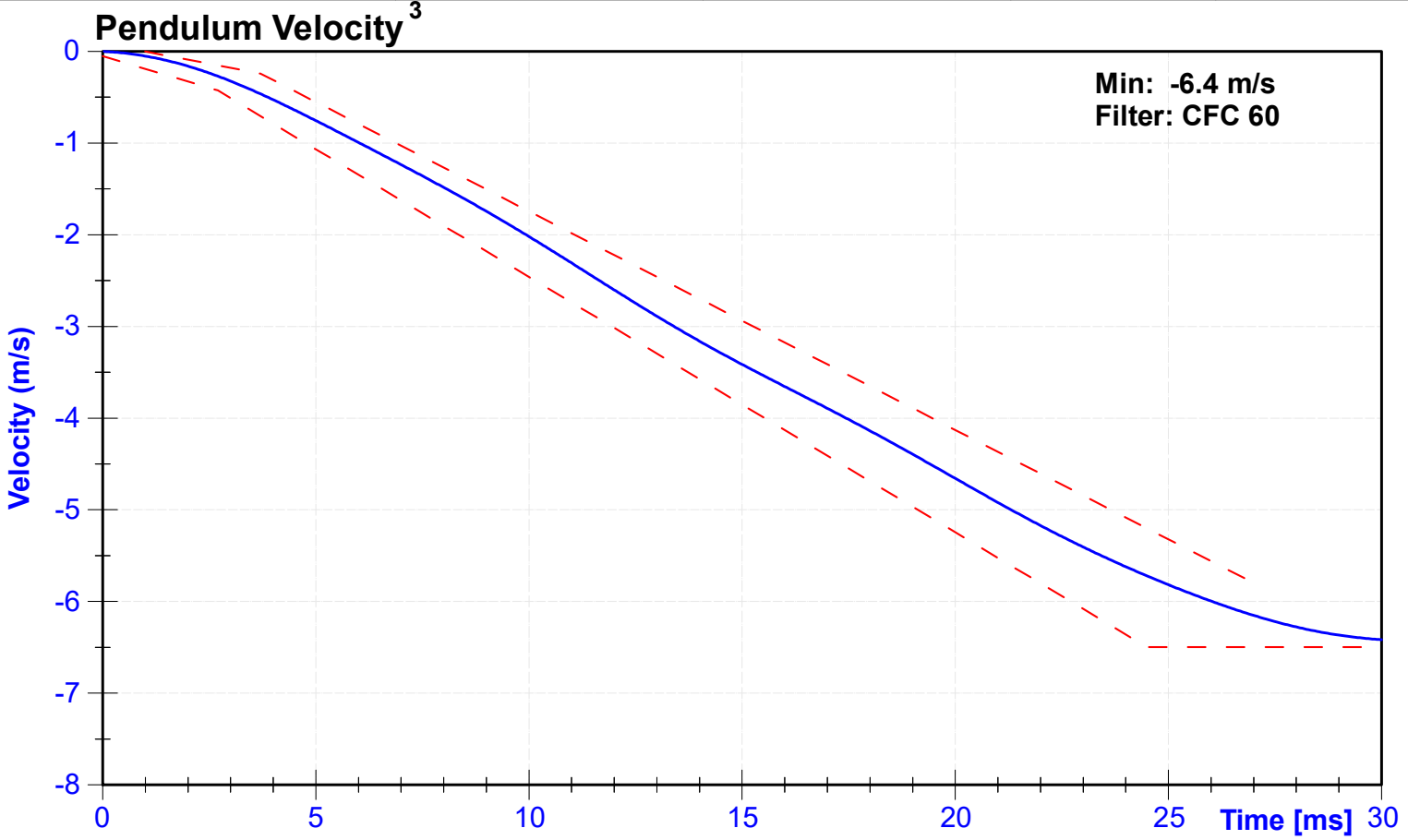
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

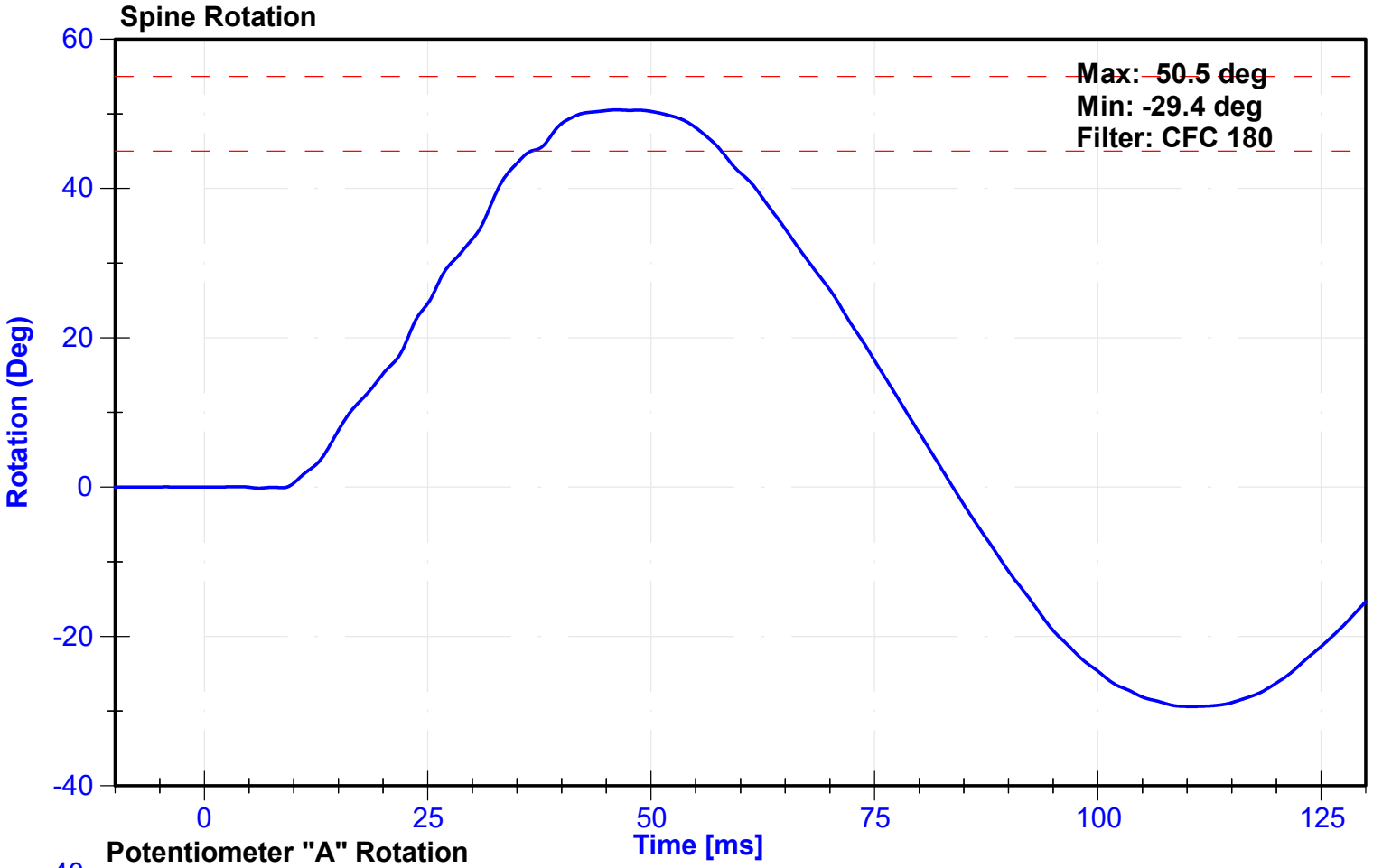
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 51 | Pass |
| Velocity | 5.95 | 6.15 | m/s | 6.094 | Pass |
| Lateral Spine Rotation | 45 | 55 | deg | 50.5 | Pass |
| Time at Maximum Rotation | 39 | 53 | ms | 46.1 | 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 |

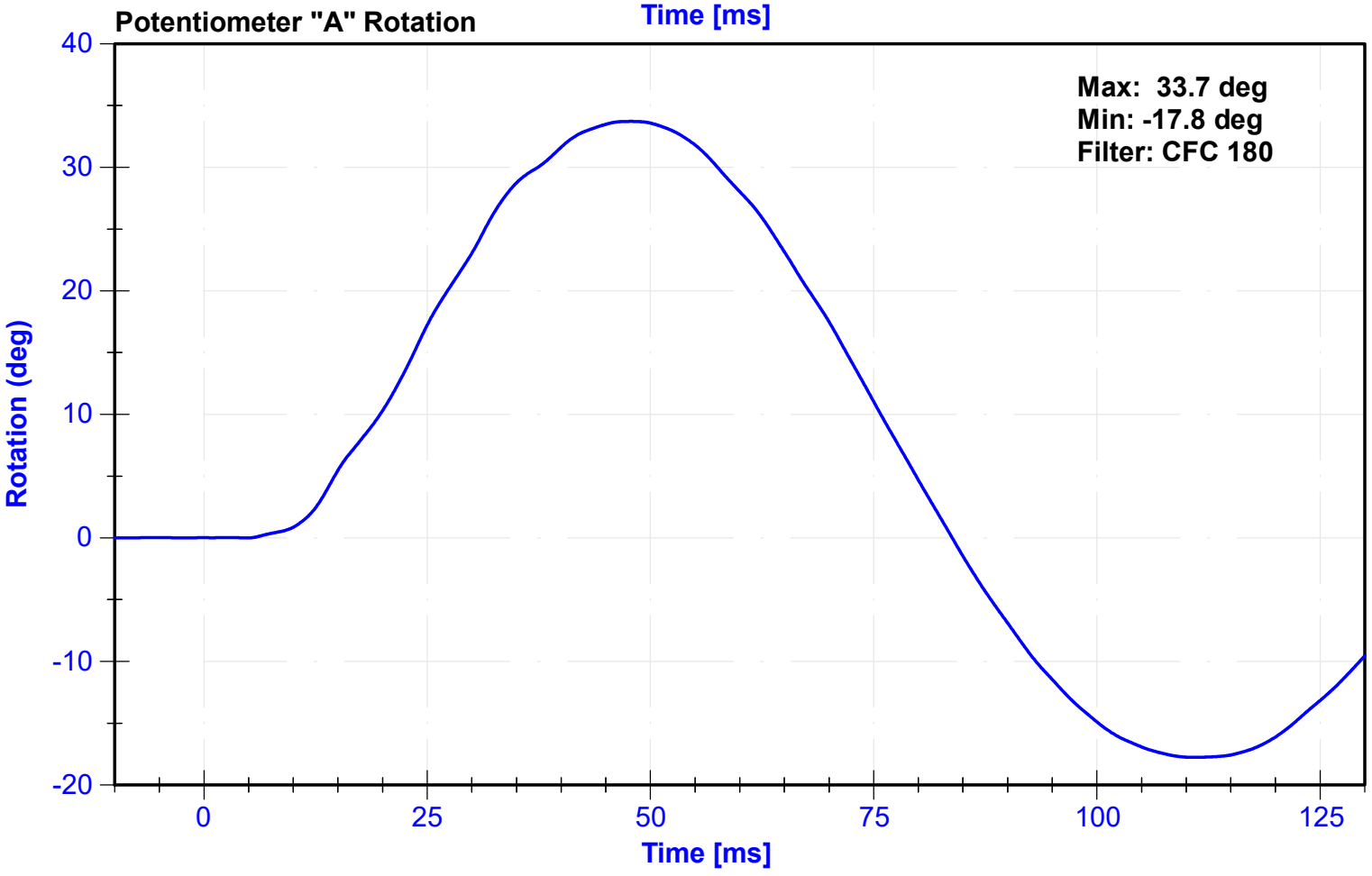
## Transducer Calibrations

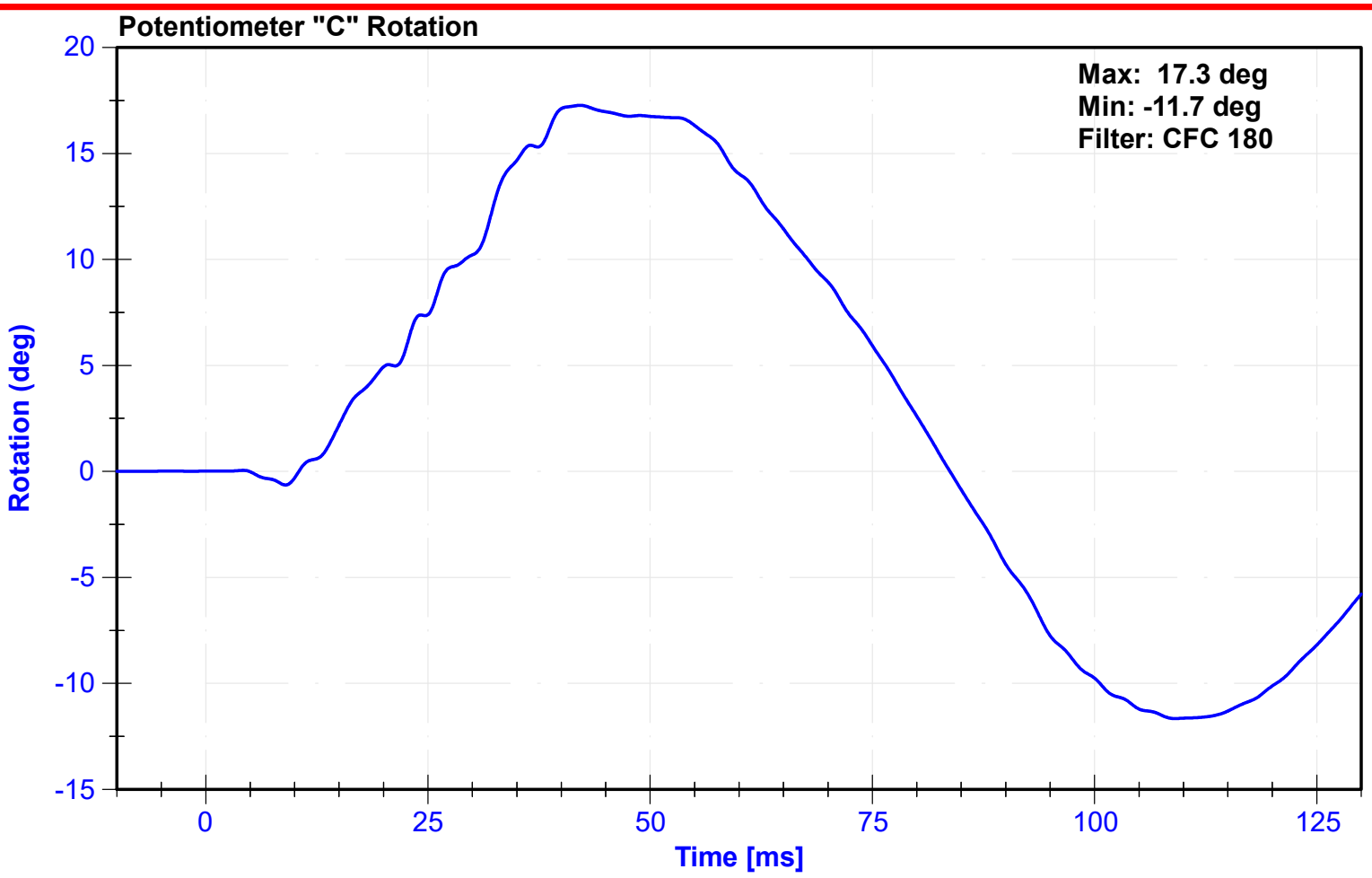
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | C16503 | 4/29/2024 | 10/26/2024 |
| Pendulum "A" Potentiometer | Sfernice | 2247 | 12/5/2023 | 12/4/2024 |
| Condyle "B" Potentiometer | Sfernice | 095 | 9/29/2023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




[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 50.5 deg
Min: -29.4 deg
Filter: CFC 180
Rotation (Deg)
60
40
20
0
-20
-40
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 33.7 deg
Min: -17.8 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]




# 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 |

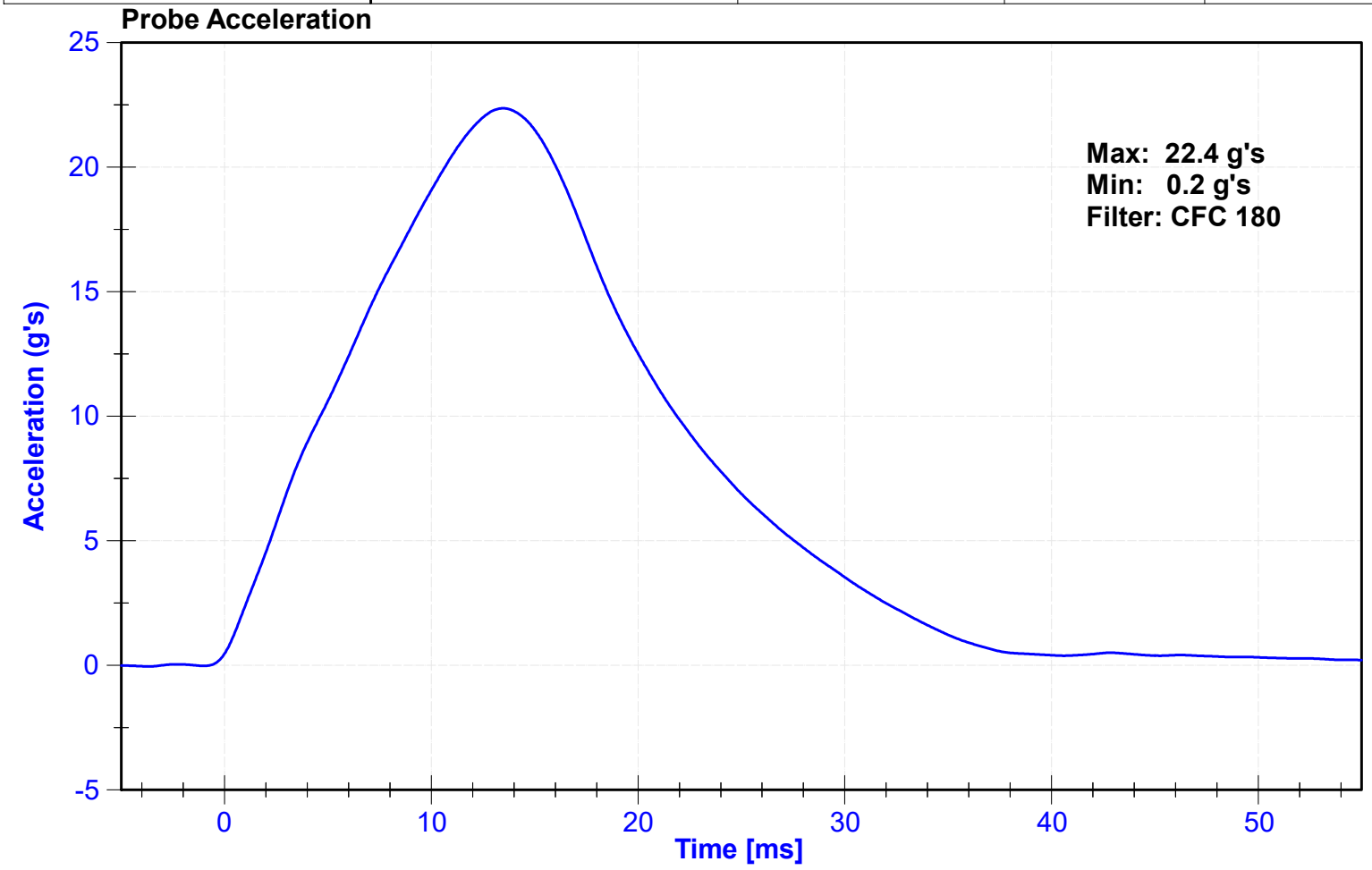
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

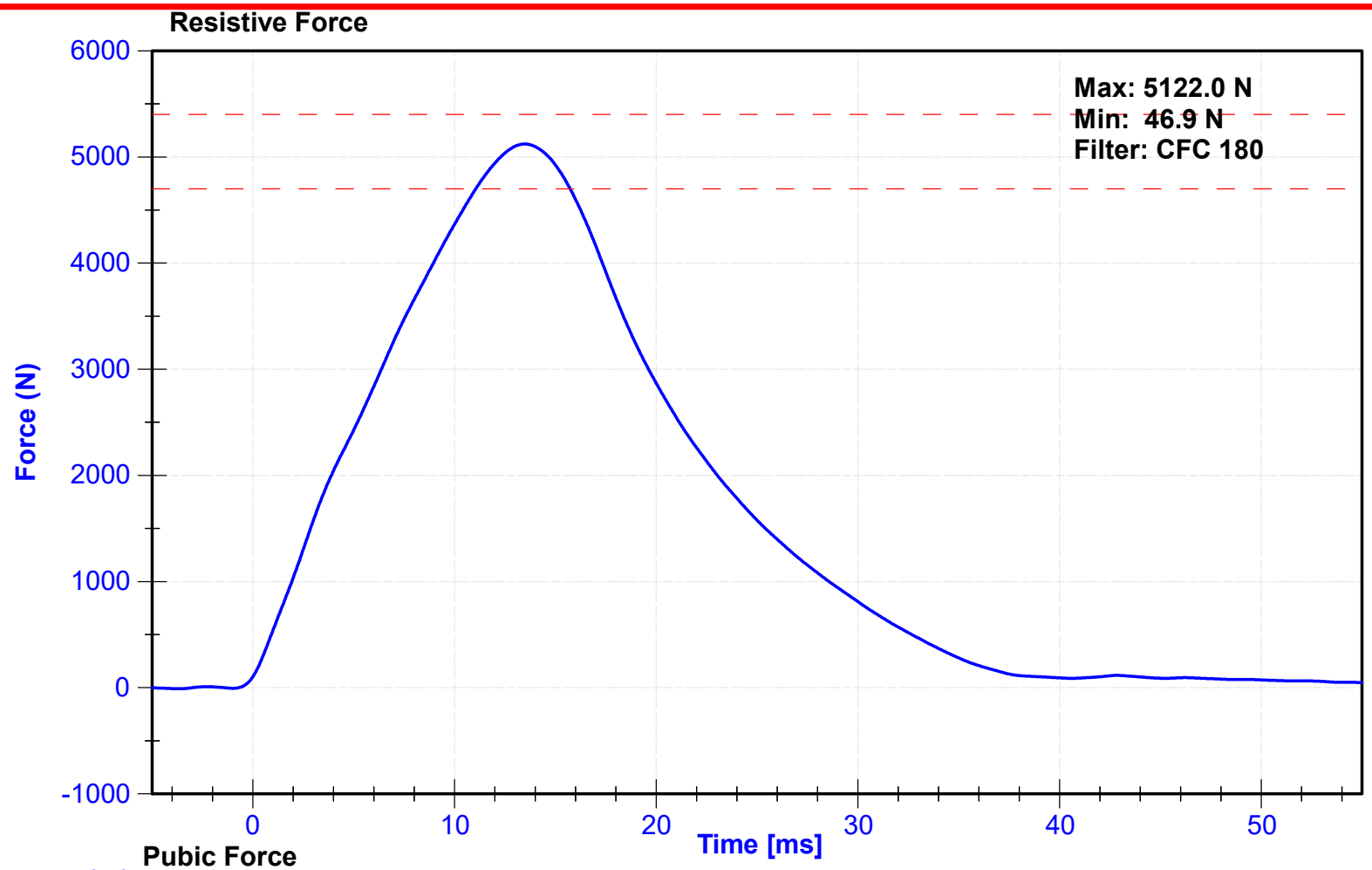
## Results

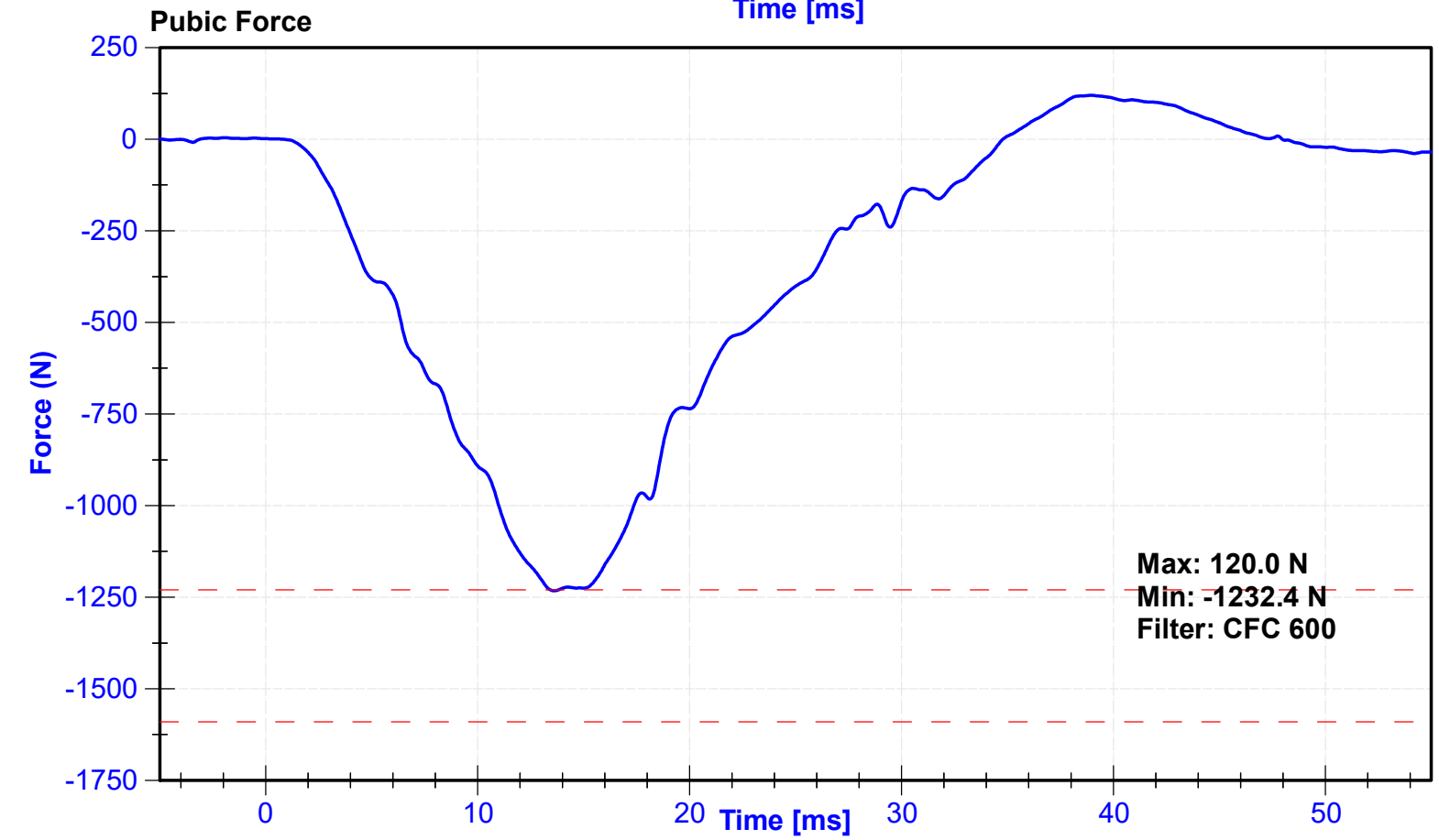
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.32 | Pass |
| Resistive Force | 4700 | 5400 | N | 5122.0 | Pass |
| Time at Peak Resistive Force | 11.8 | 16.1 | ms | 13.45 | Pass |
| Pubic Force | -1590 | -1230 | N | -1232.4 | Pass |
| Time at Peak Pubic Force | 12.2 | 17.0 | ms | 13.60 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Pubic Load Cell | Denton | 459-FY | 6/20/2023 | 6/19/2024 |




Resistive Force
Max: 5122.0 N
Min: 46.9 N
Filter: CFC 180
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Pubic Force
Max: 120.0 N
Min: -1232.4 N
Filter: CFC 600
Force (N)
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
0
10
20
30
40
50
Time [ms]

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD**

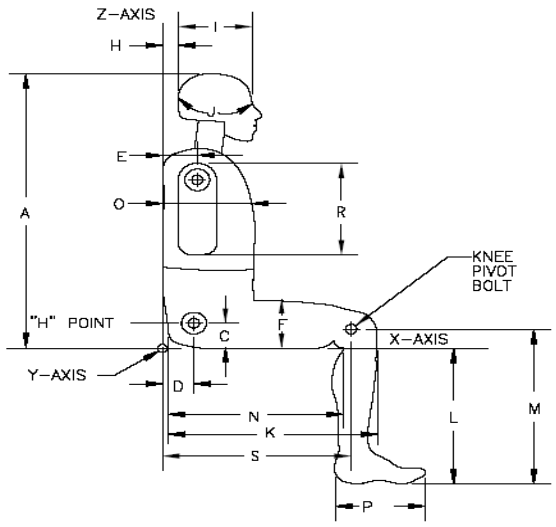
**SERIAL NO:300**

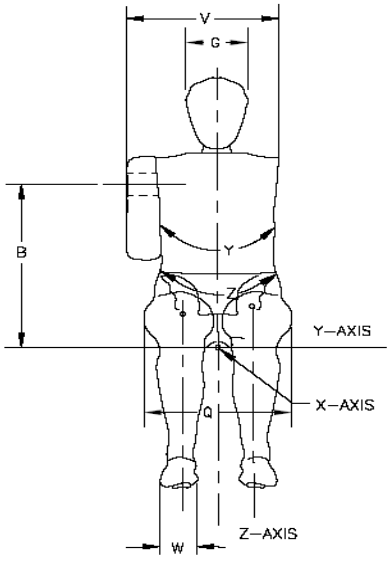
**(CONFIGURED FOR LEFT SIDE IMPACT)**

External Measurements - SID-IIs

Technician: K. Brogan  Date: 5/21/2024

Dummy Serial Number: 300




| Symbol | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| A | Sitting Height | 772 | 788 | 781 | Pass |
| B | Shoulder Pivot Height | 437 | 453 | 446 | Pass |
| C | H-point Height | 79 | 89 | 84 | Pass |
| D | H-point from seatback | 141 | 151 | 145 | Pass |
| E | Shoulder Pivot from Backline | 97 | 107 | 98 | Pass |
| F | Thigh Clearance | 119 | 135 | 127 | Pass |
| G | Head Breadth | 140 | 148 | 144 | Pass |
| H | Head Back from Backline | 40 | 46 | 43 | Pass |
| I | Head Depth | 178 | 188 | 181 | Pass |
| J | Head Circumference | 541 | 551 | 550 | Pass |
| K | Buttock to Knee Length | 514 | 540 | 530 | Pass |
| L | Popliteal Height | 343 | 369 | 357 | Pass |
| M | Knee Pivot to floor height | 392 | 409 | 401 | Pass |
| N | Buttock Popliteal Length | 416 | 442 | 435 | Pass |
| O | Chest Depth w/o jacket | 195 | 211 | 199 | Pass |
| P | Foot Length | 216 | 232 | 224 | Pass |
| Q | Hip Breadth (w/pelvic plugs) | 313 | 323 | 319 | Pass |
| R | Arm Length | 249 | 259 | 255 | Pass |
| S | Knee Joint to seatback | 477 | 493 | 488 | Pass |
| V | Shoulder Width | 341 | 357 | 351 | Pass |
| W | Foot Width | 78 | 94 | 85 | Pass |
| Y | Chest Circumference w/jacket | 851 | 881 | 877 | Pass |
| Z | Waist Circumference | 761 | 791 | 780 | Pass |

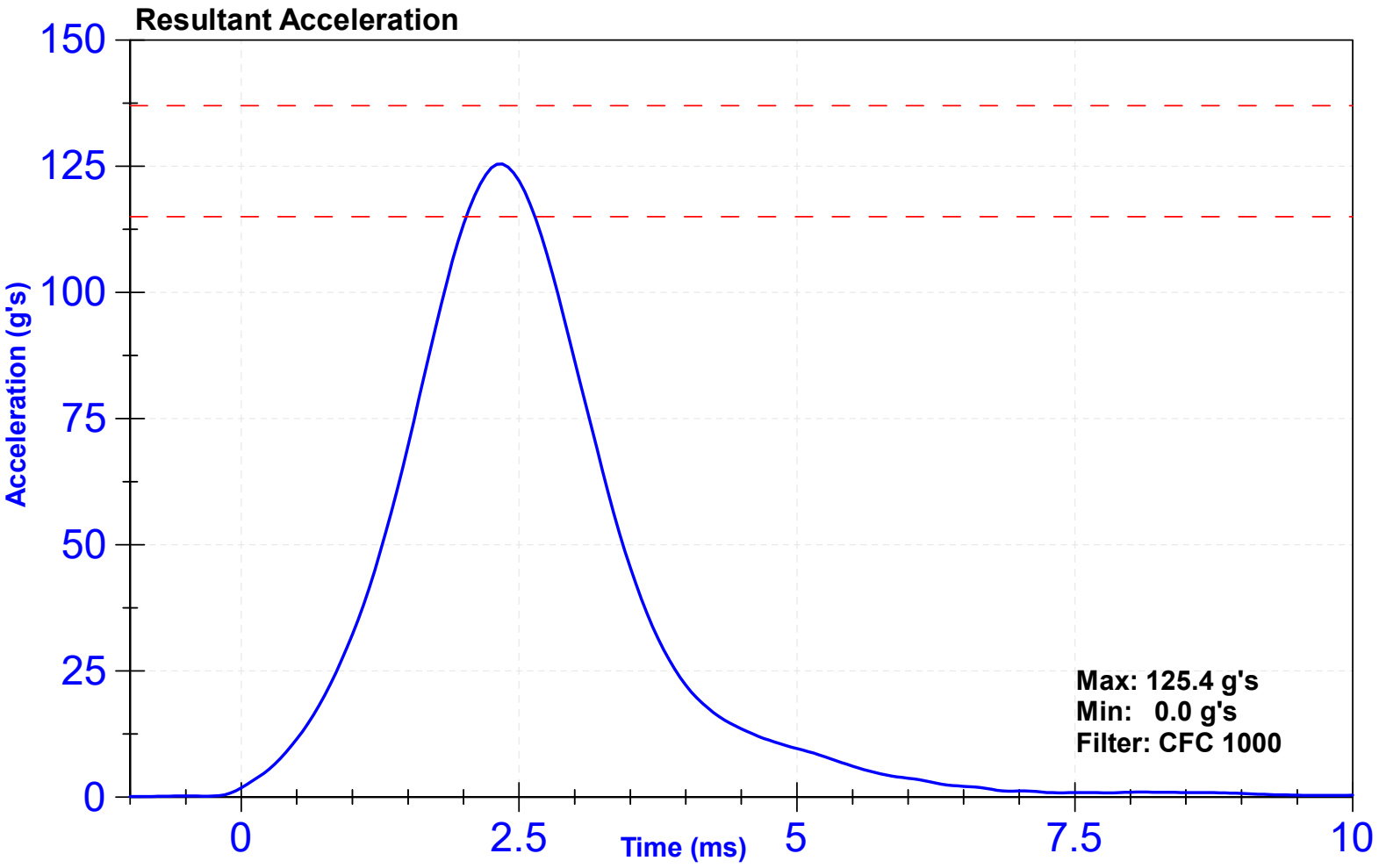
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

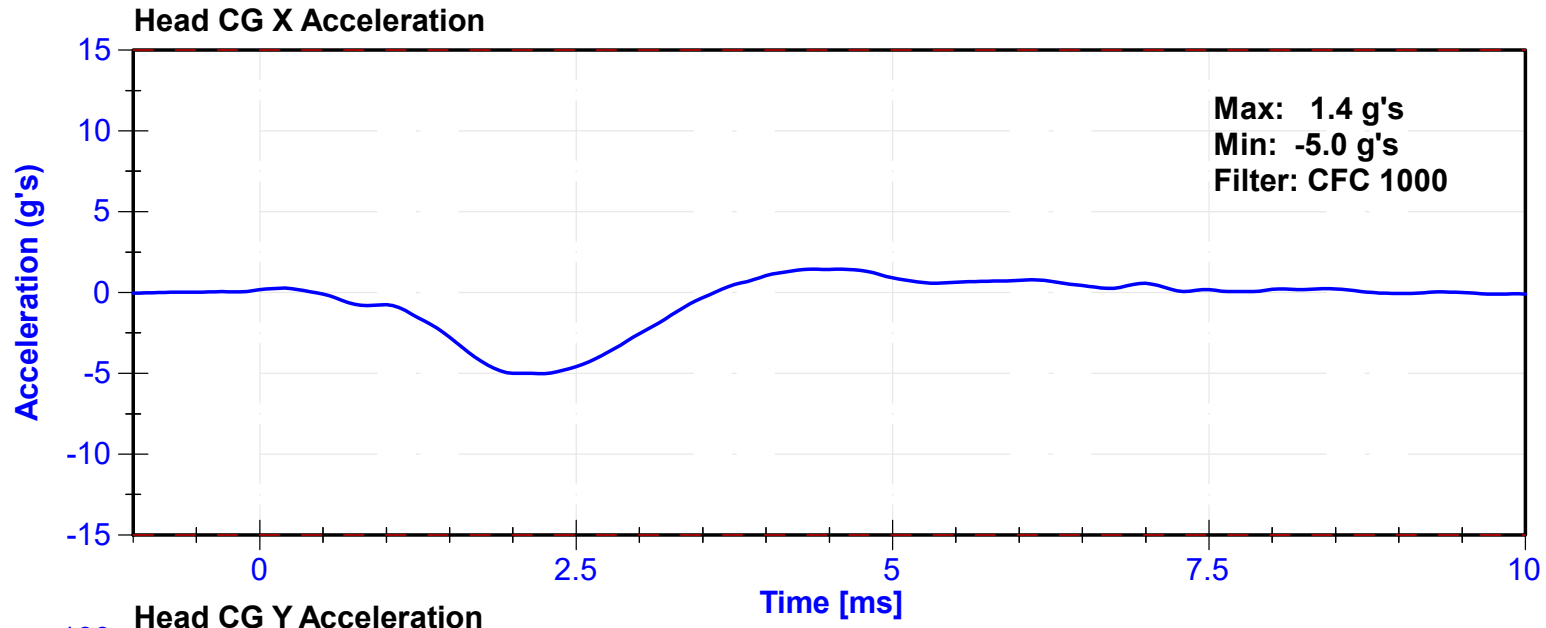
## Results

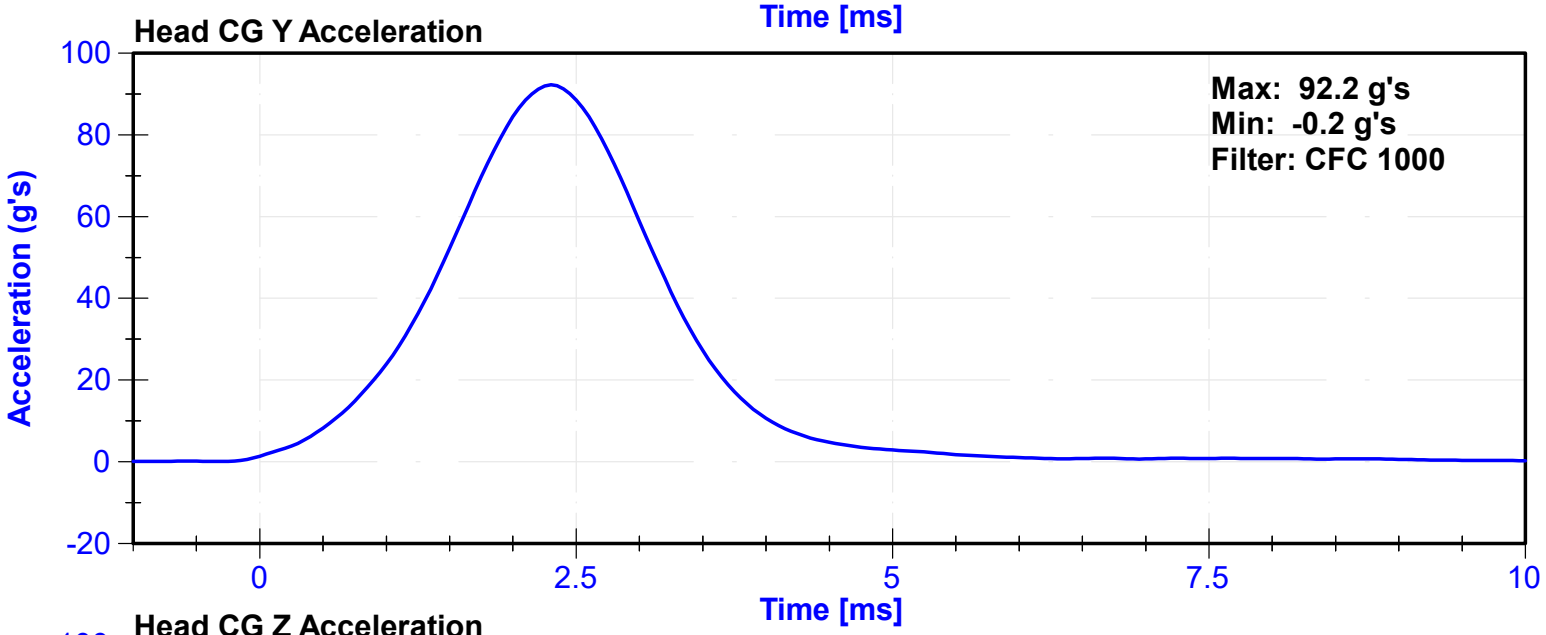
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Resultant Acceleration | 115 | 137 | g's | 125.4 | Pass |
| Oscillation | 0 | 15 | % | 0.9 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | -5.0 | Pass |

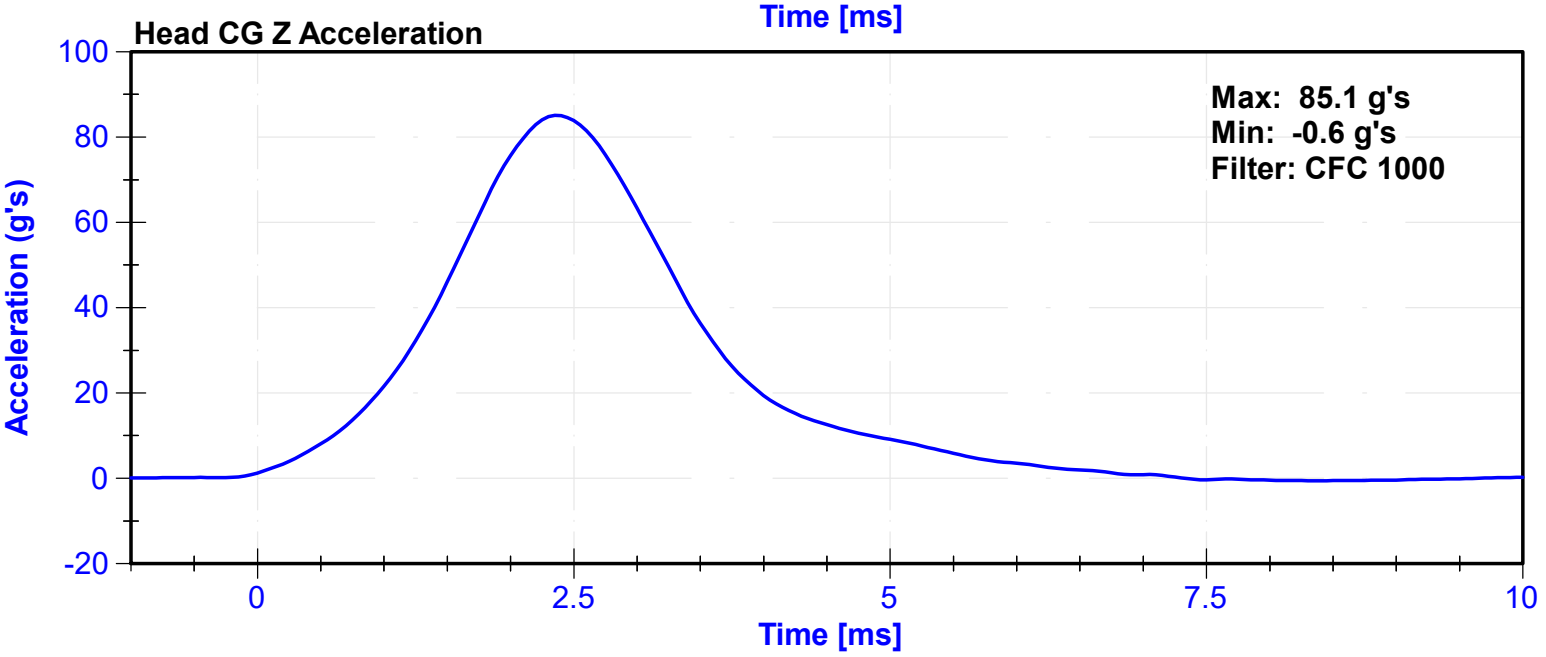
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibratio Date | Calibratio Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P59018 | 5/9/2024 | 11/5/2024 |
| Y Accelerometer | Endevco | P79189 | 5/9/2024 | 11/5/2024 |
| Z Accelerometer | Endevco | P79587 | 5/9/2024 | 11/5/2024 |




Head CG X Acceleration
Max: 1.4 g's
Min: -5.0 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 92.2 g's
Min: -0.2 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 85.1 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

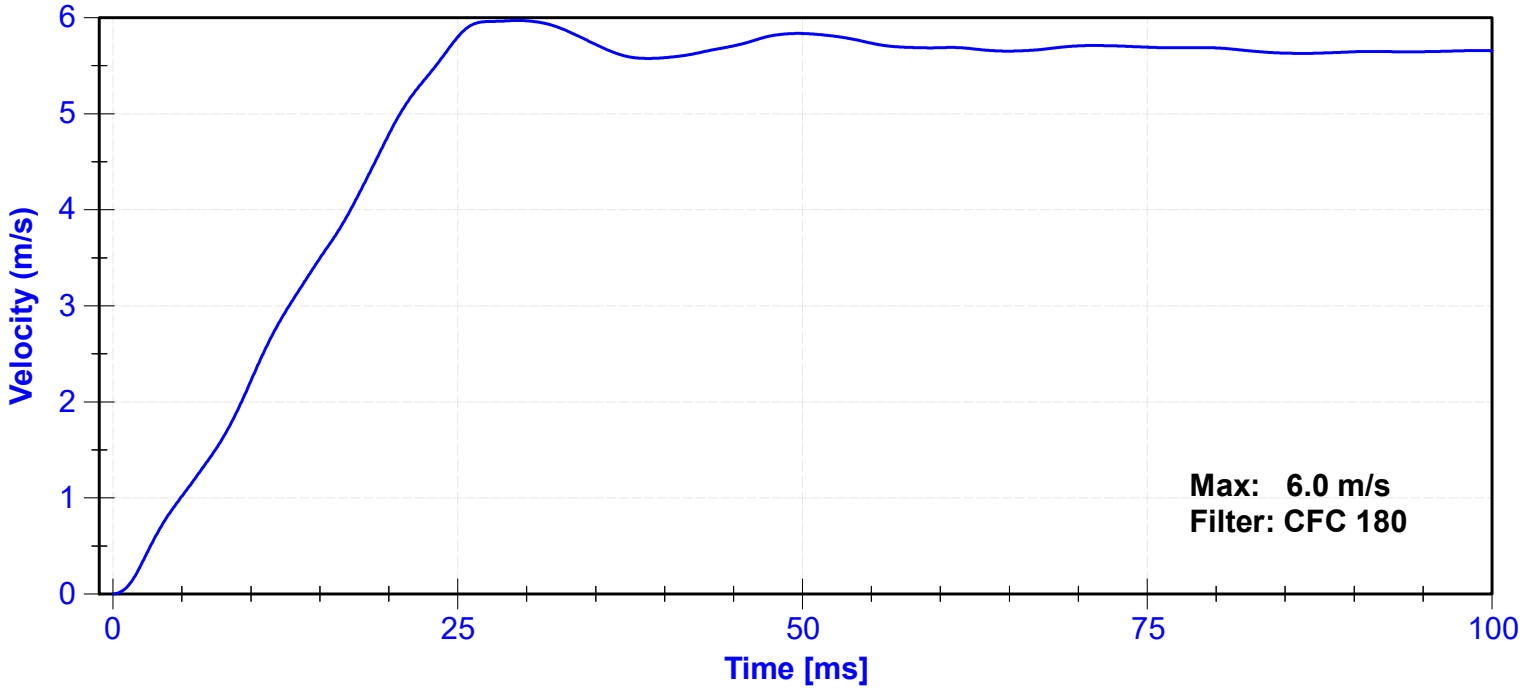
## Results

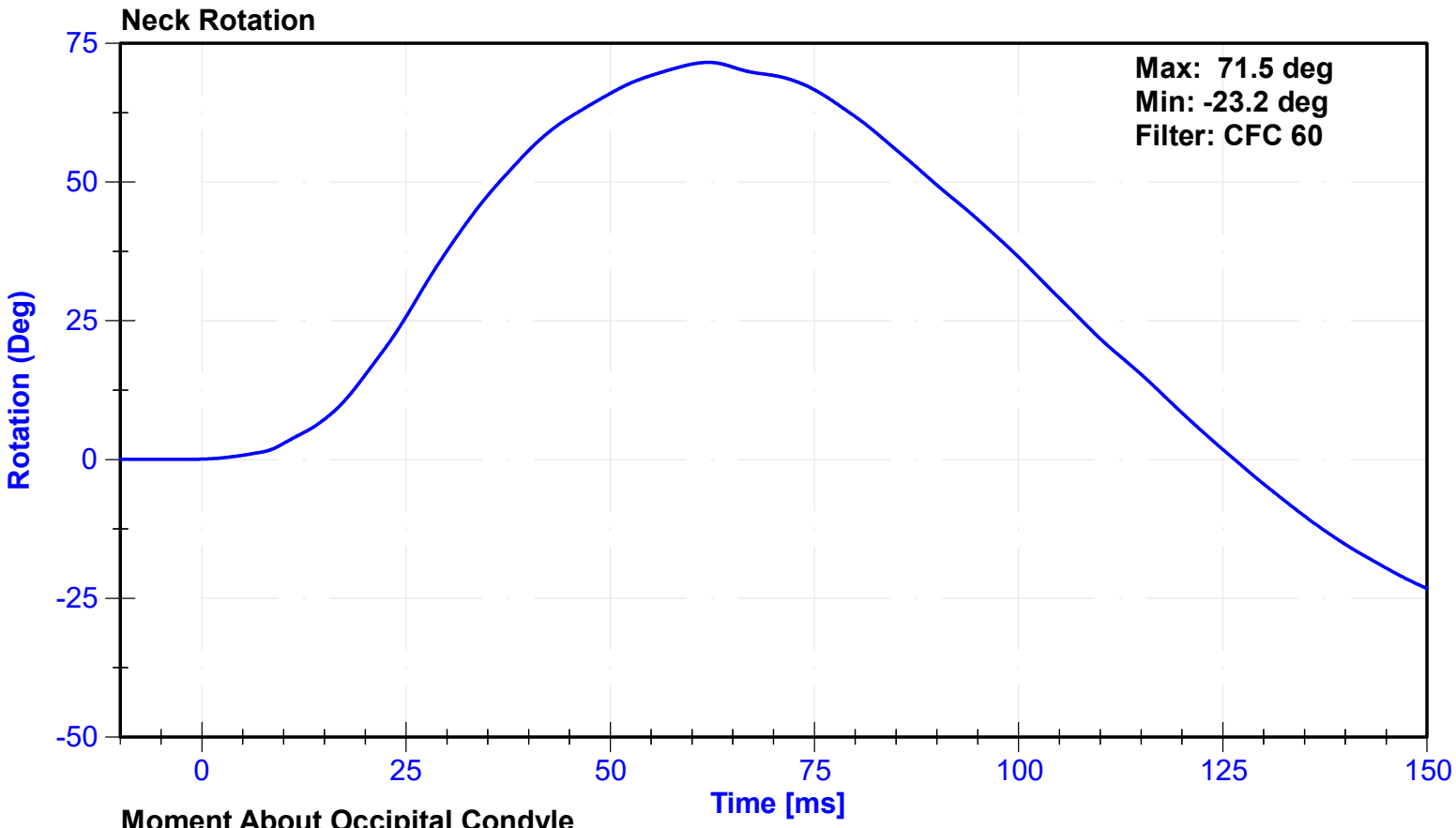
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 5.51 | 5.63 | m/s | 5.596 | Pass |
| Pendulum Impulse at 10ms | 2.2 | 2.8 | m/s | 2.22 | Pass |
| Pendulum Impulse at 15ms | 3.3 | 4.1 | m/s | 3.50 | Pass |
| Pendulum Impulse at 20ms | 4.4 | 5.4 | m/s | 4.78 | Pass |
| Pendulum Impulse at 25ms | 5.4 | 6.1 | m/s | 5.80 | Pass |
| Pendulum Impulse from 25 to 100ms | 5.5 | 6.2 | m/s | 5.97 | Pass |
| Neck Rotation | 71 | 81 | deg | 71.5 | Pass |
| Time at Maximum Rotation | 50 | 70 | ms | 62.0 | Pass |
| Moment about the OC | 36 | 44 | Nm | 43.1 | Pass |
| Moment Decay to 0 Nm | 102 | 126 | ms | 111.1 | Pass |

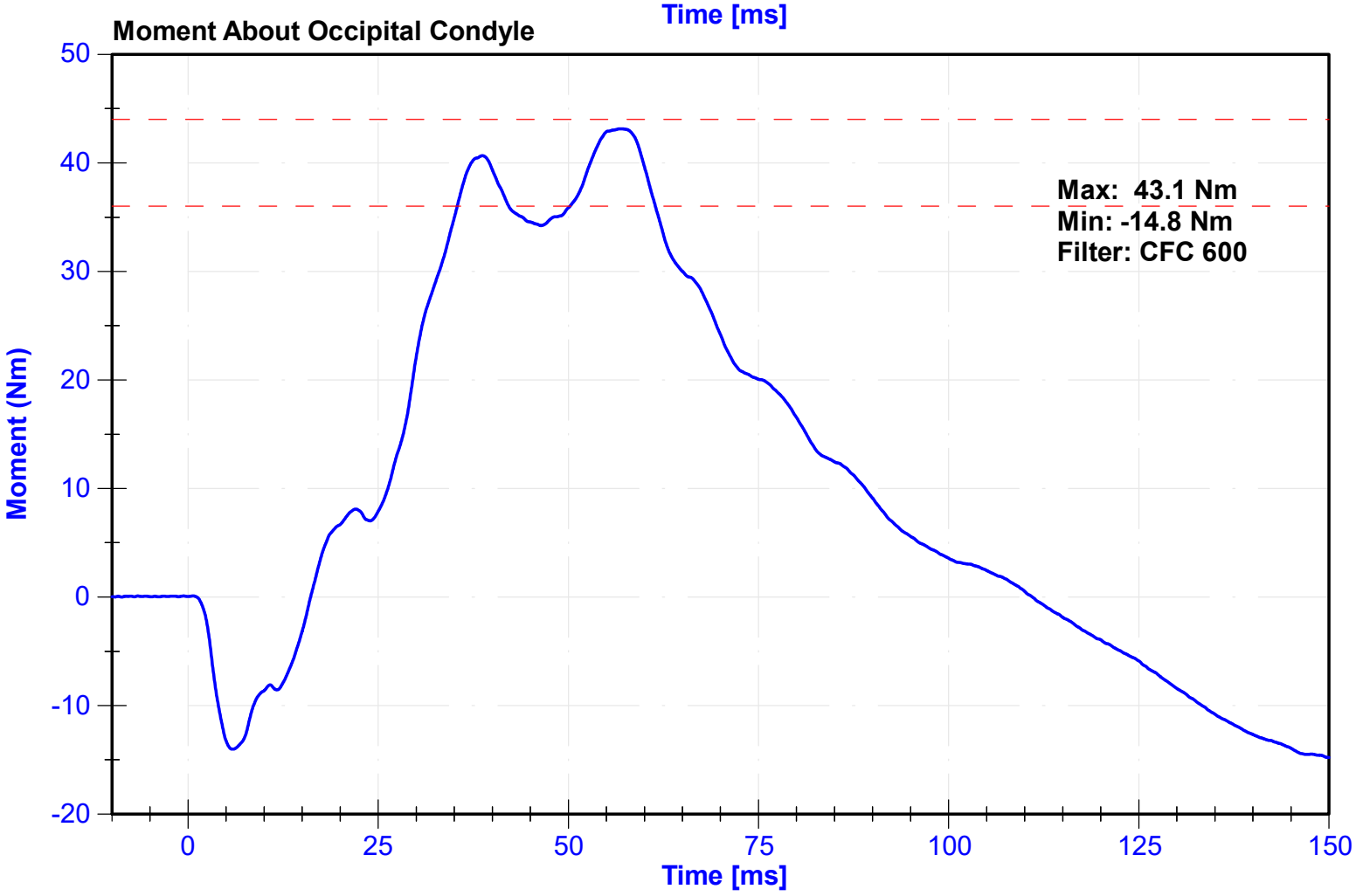
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 7231C-750 | 4/29/2024 | 10/26/2024 |
| Pendulum Potentiometer | Servo | 4961 | 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 |

**Pendulum Impulse**




Neck Rotation
Max: 71.5 deg
Min: -23.2 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.1 Nm
Min: -14.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

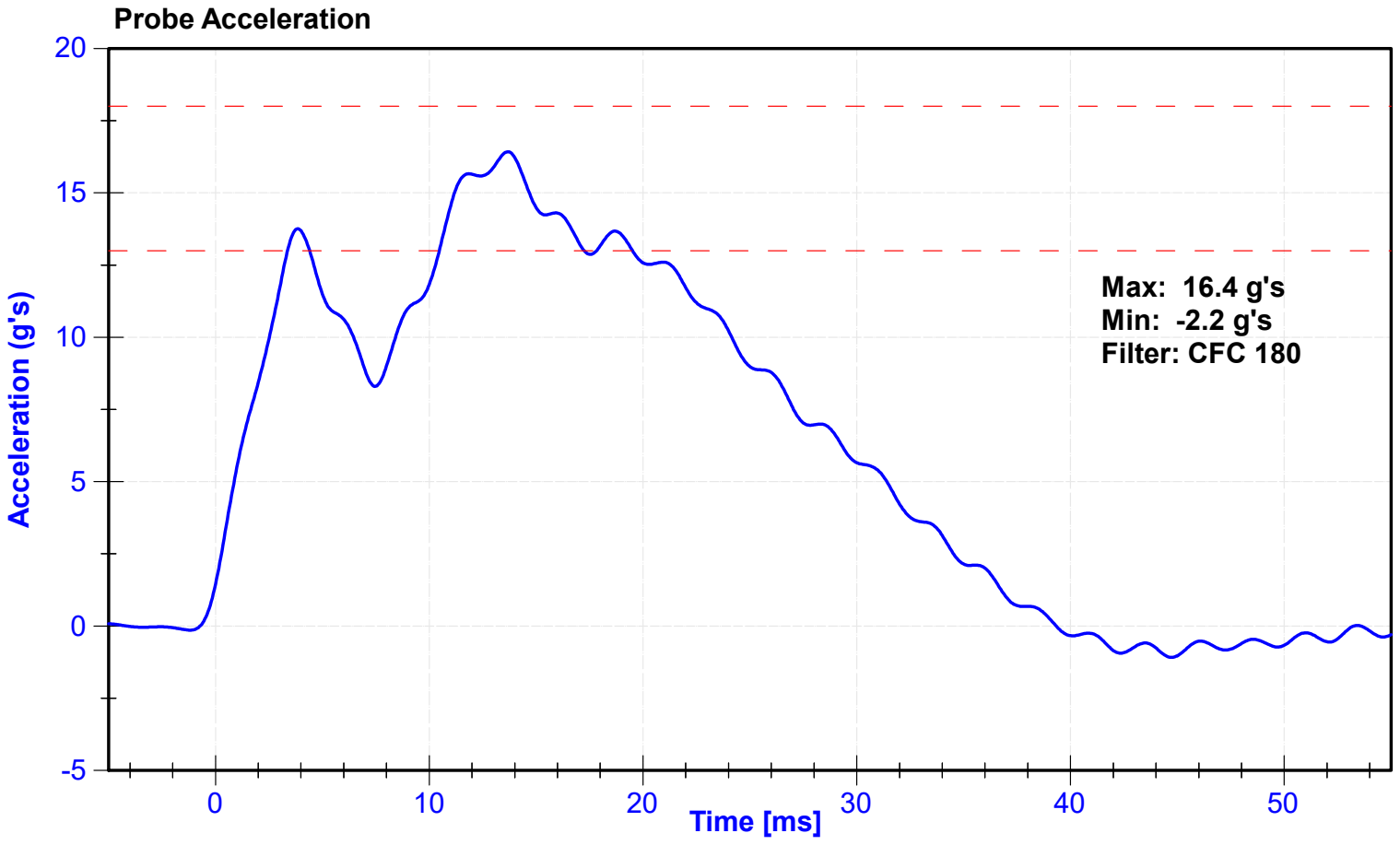
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

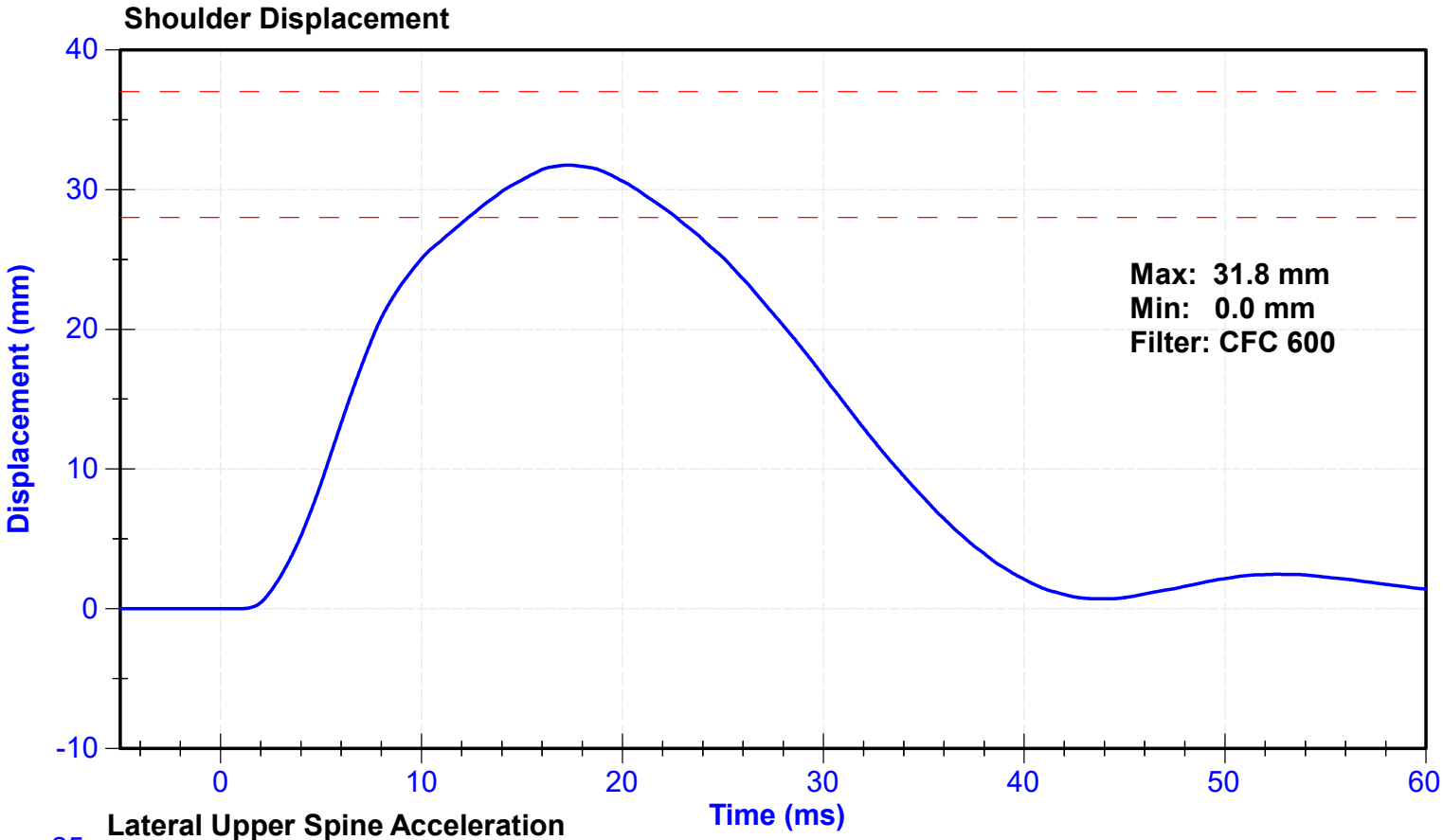
## Results

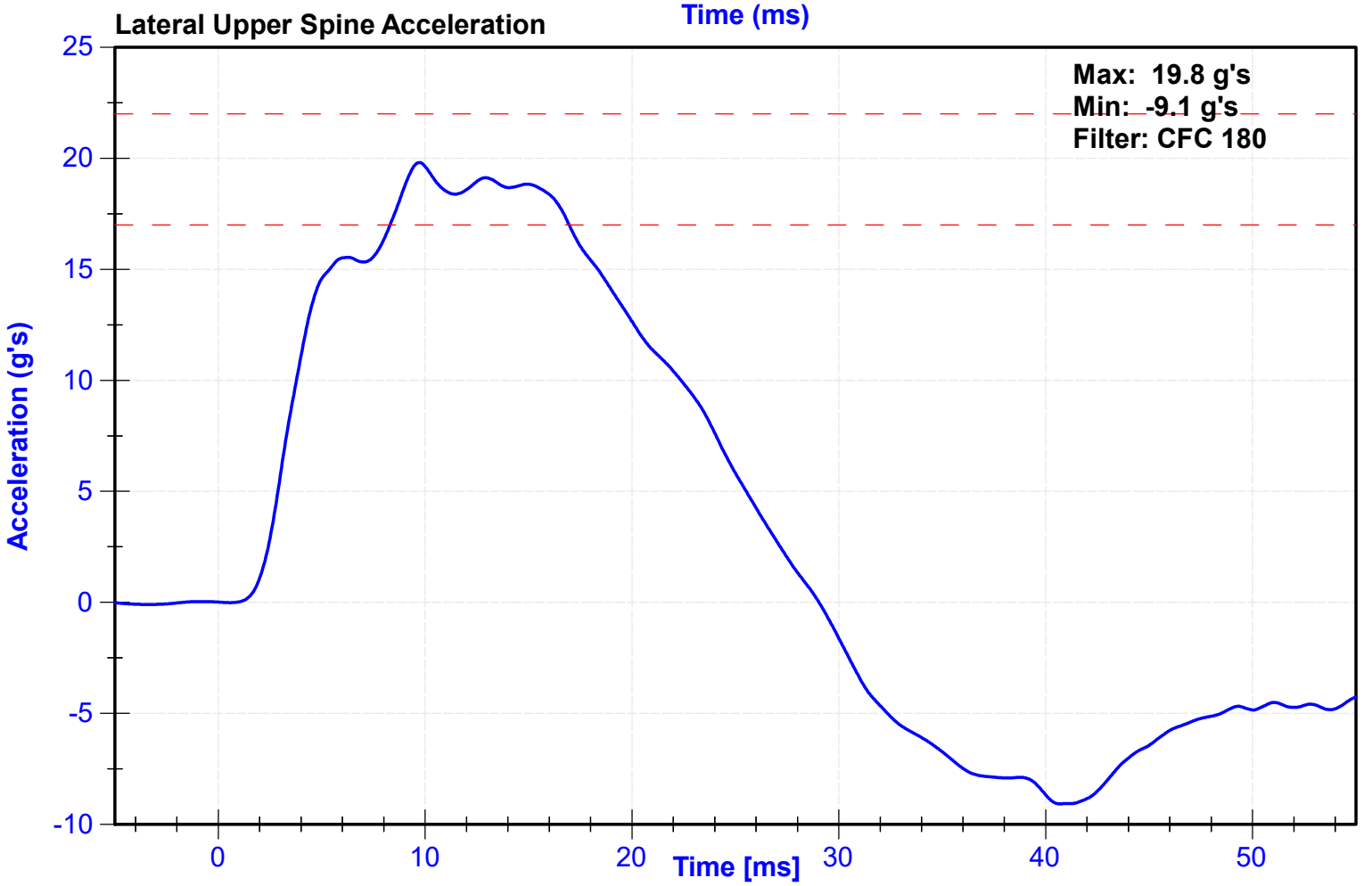
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.32 | Pass |
| Probe Acceleration | 13 | 18 | g's | 16.4 | Pass |
| Shoulder Deflection | 28 | 37 | mm | 31.8 | Pass |
| Lateral Upper Spine Acceleration | 17 | 22 | g's | 19.8 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Shoulder Potentiometer | Servo | 053GFE | 5/9/2024 | 11/7/2024 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 31.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.8 g's
Min: -9.1 g's
Filter: CFC 180

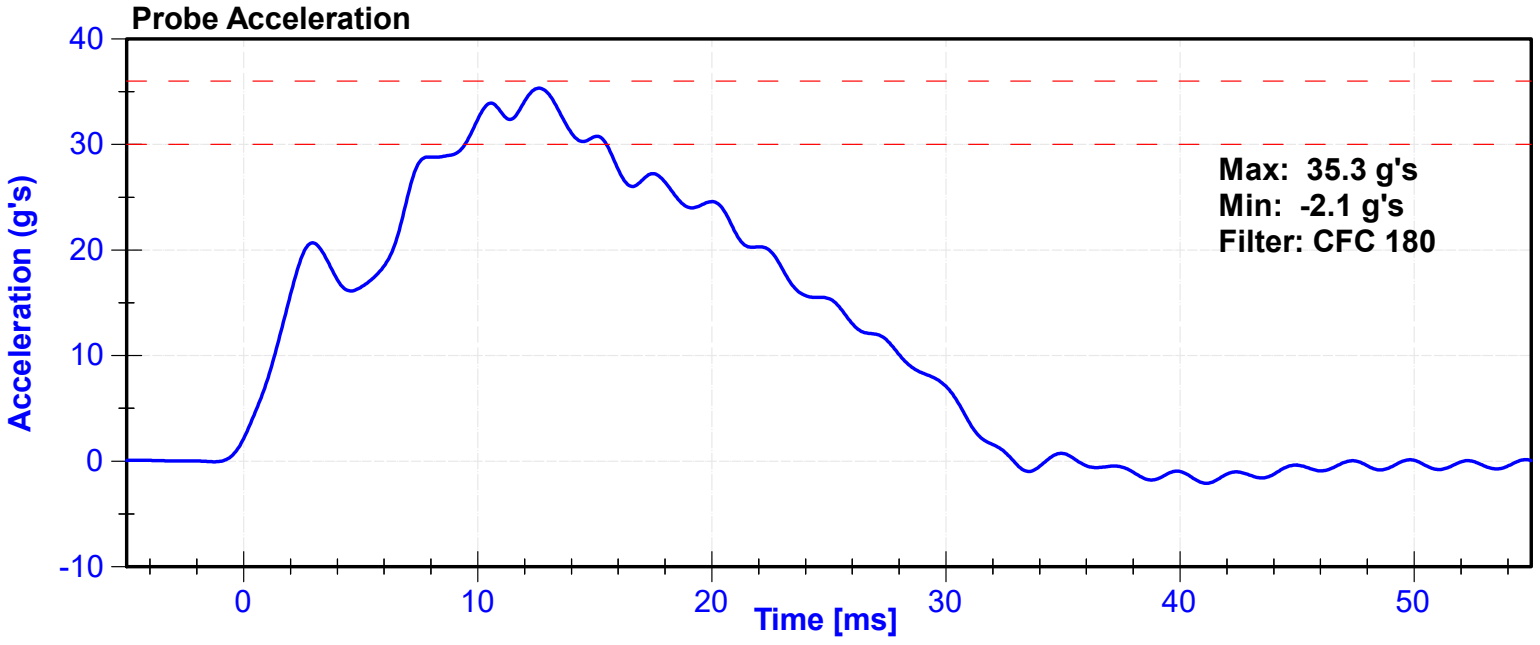
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

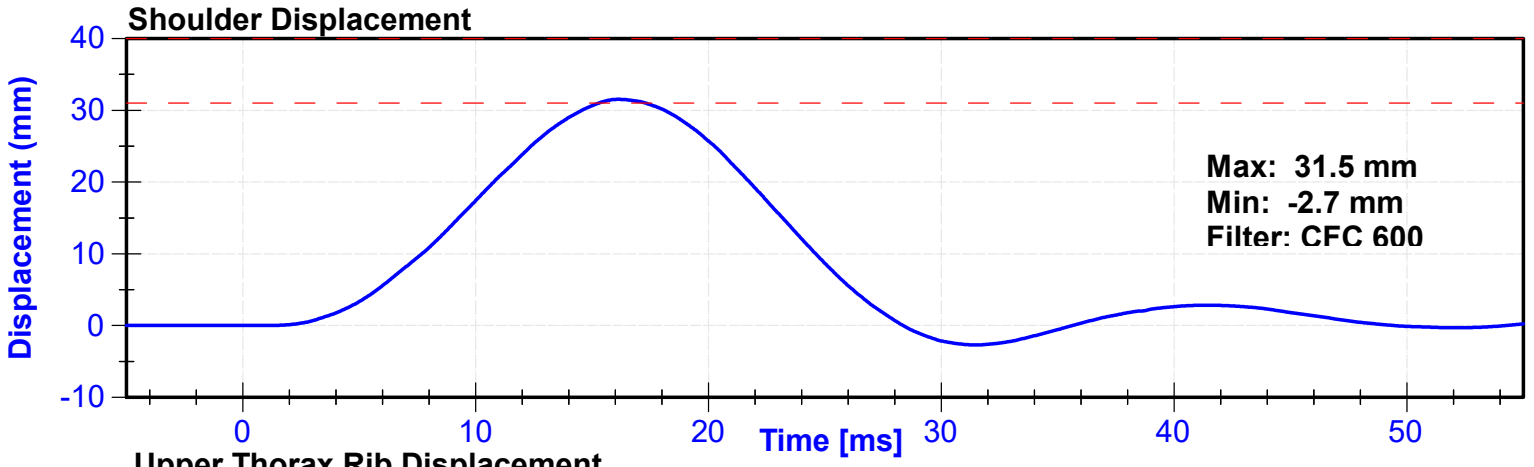
## Results

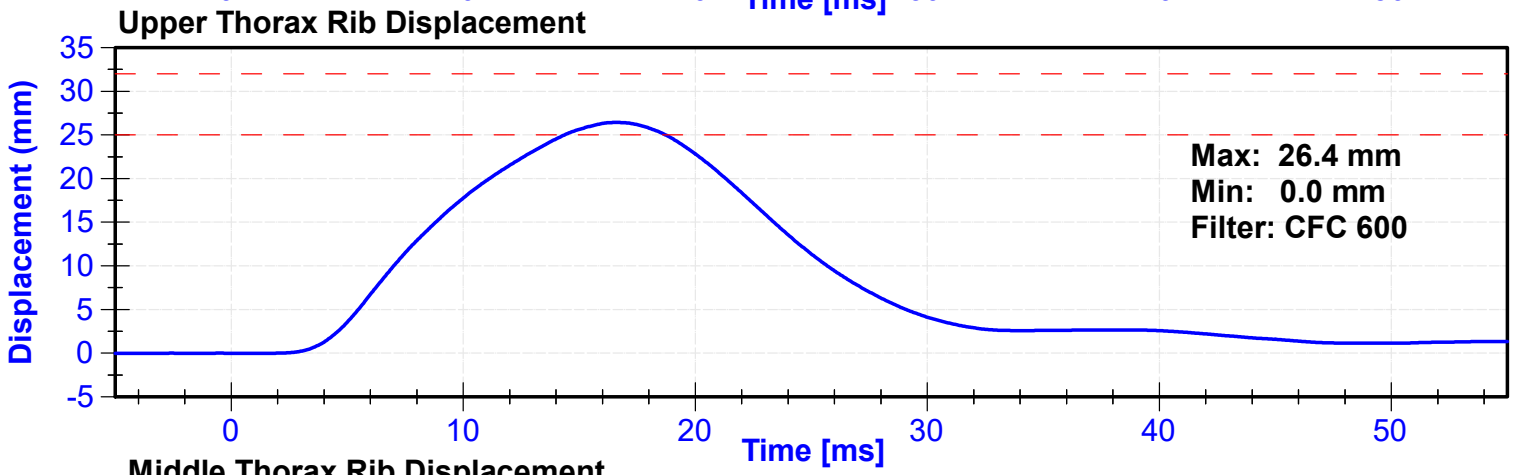
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.65 | Pass |
| Probe Acceleration after 5 ms | 30 | 36 | g's | 35.3 | Pass |
| Lateral Upper Spine Acceleration | 34 | 43 | g's | 35.9 | Pass |
| Lateral Lower Spine Acceleration | 29 | 37 | g's | 30.6 | Pass |
| Shoulder Deflection | 31 | 40 | mm | 31.5 | Pass |
| Upper Thorax Rib Deflection | 25 | 32 | mm | 26.4 | Pass |
| Mid Thorax Rib Deflection | 30 | 36 | mm | 32.6 | Pass |
| Lower Thorax Rib Deflection | 32 | 38 | mm | 35.0 | Pass |

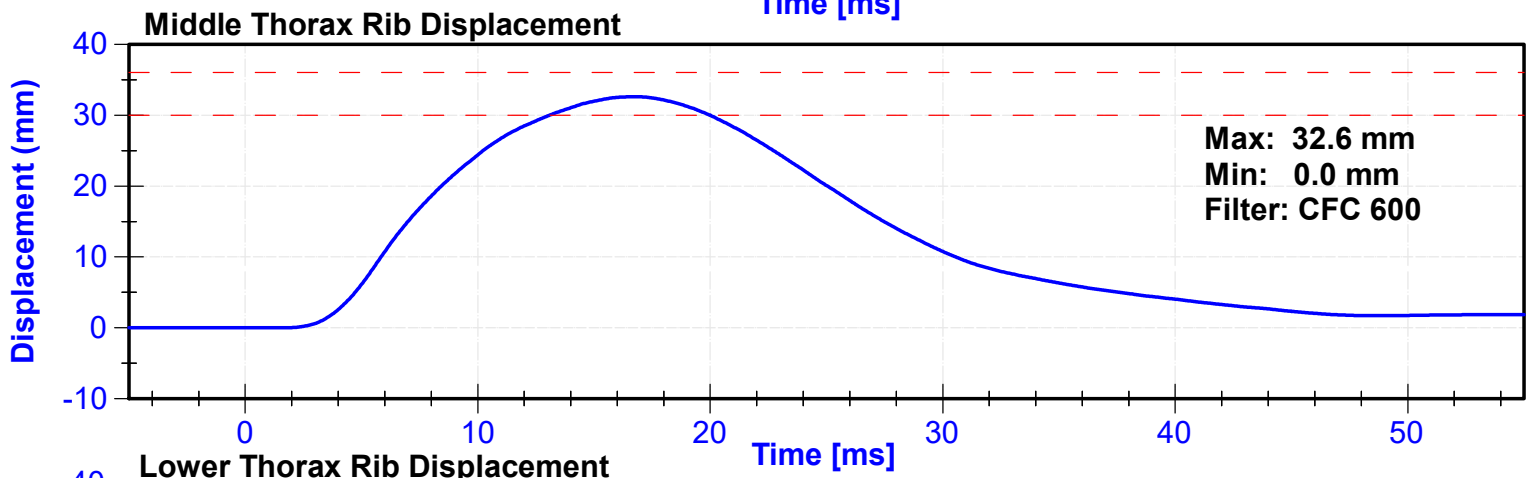
## Transducer Calibrations

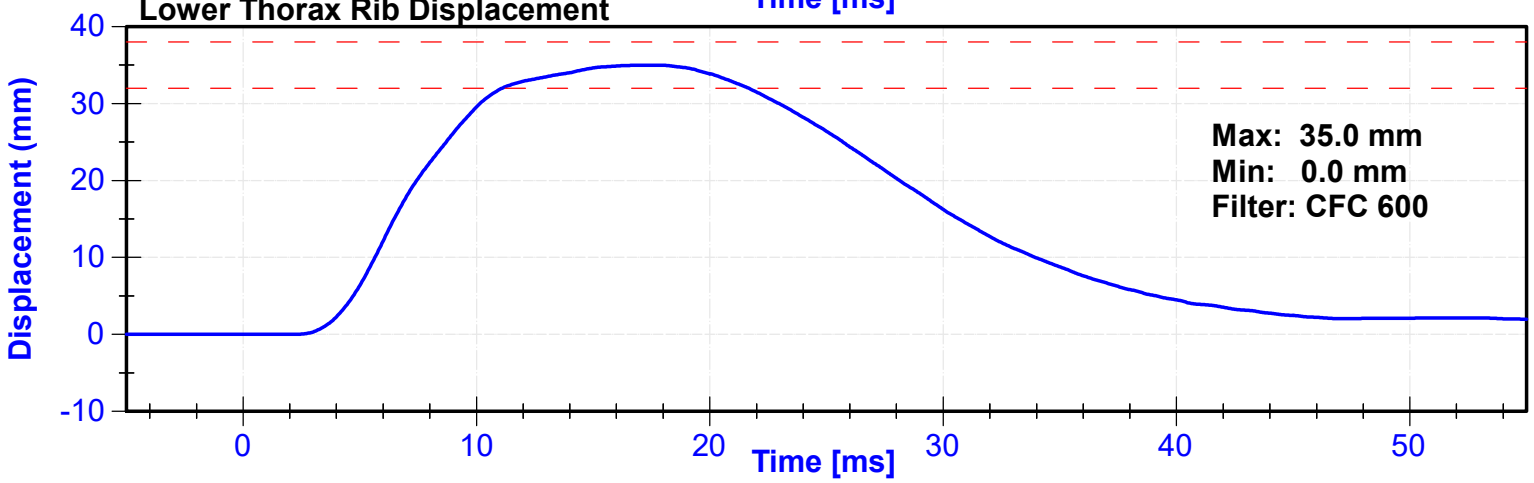
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Upper Spine T1 Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |
| Upper Spine T12 Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Shoulder Potentiometer | Servo | 053GFE | 5/9/2024 | 11/7/2024 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 5/9/2024 | 11/7/2024 |
| Middle Thorax Rib Potentiometer | Servo | 085GFE | 5/9/2024 | 11/7/2024 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 5/9/2024 | 11/7/2024 |

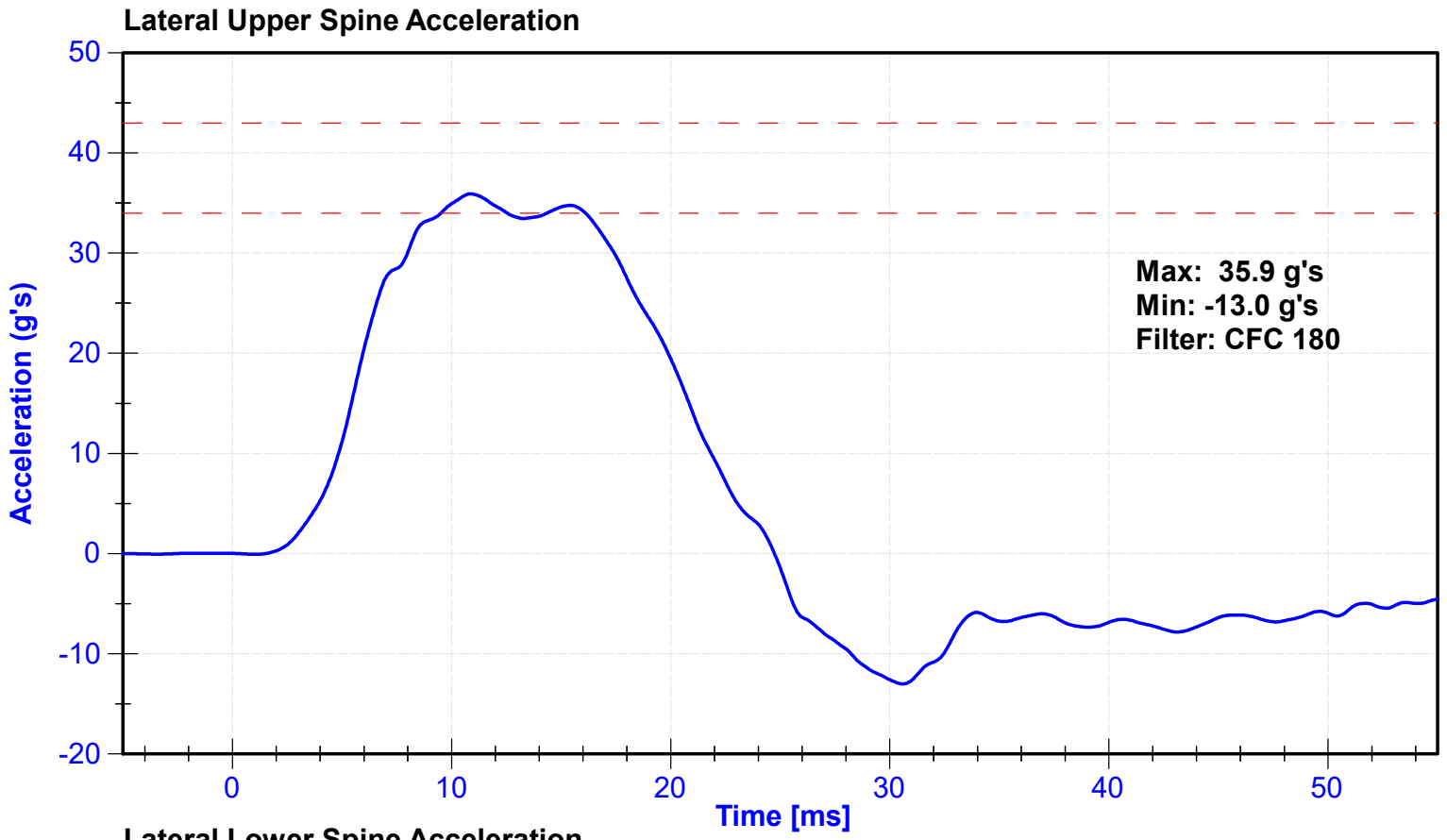


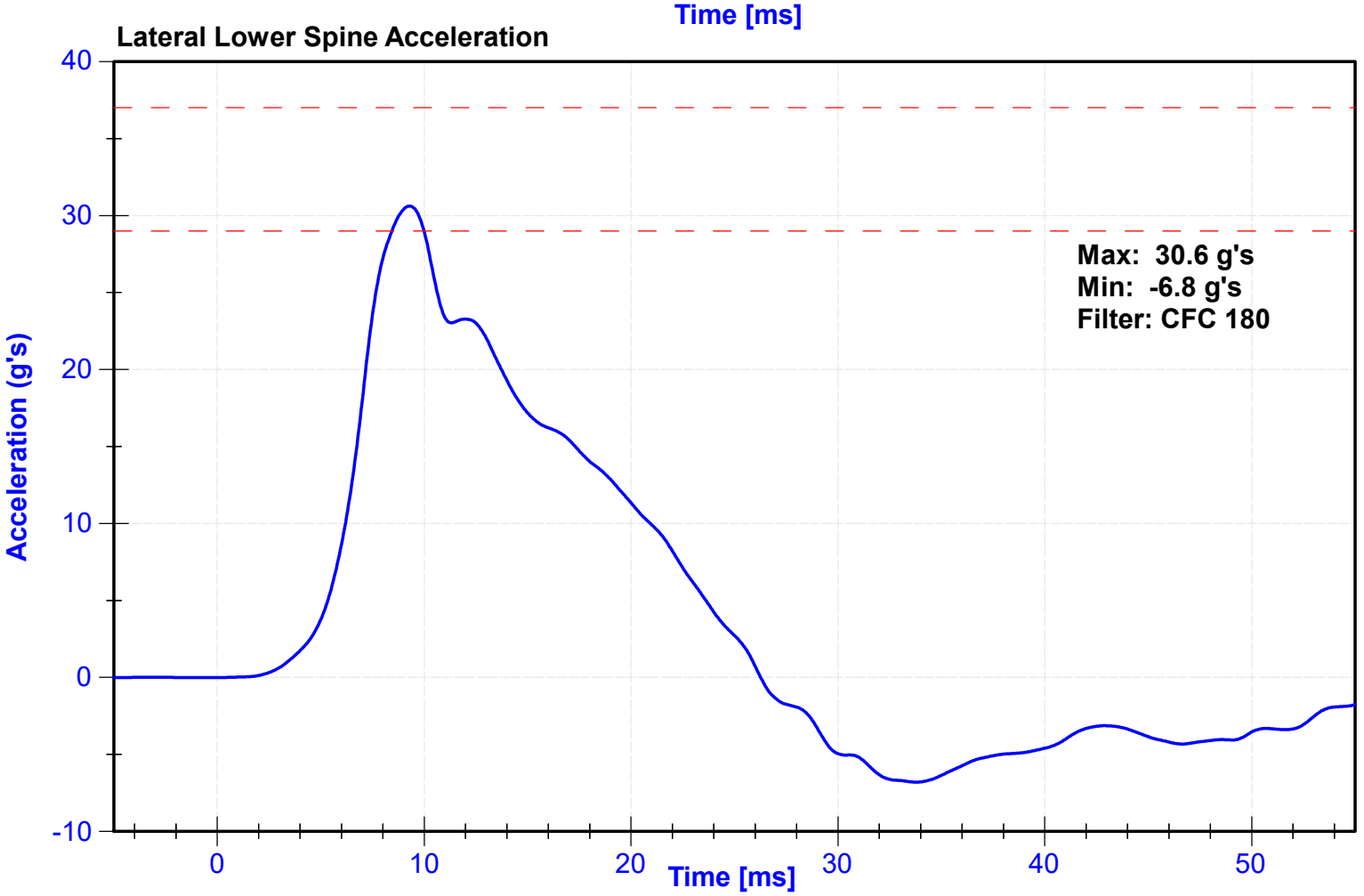

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 31.5 mm
Min: -2.7 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.6 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.0 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 35.9 g's
Min: -13.0 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 30.6 g's
Min: -6.8 g's
Filter: CFC 180

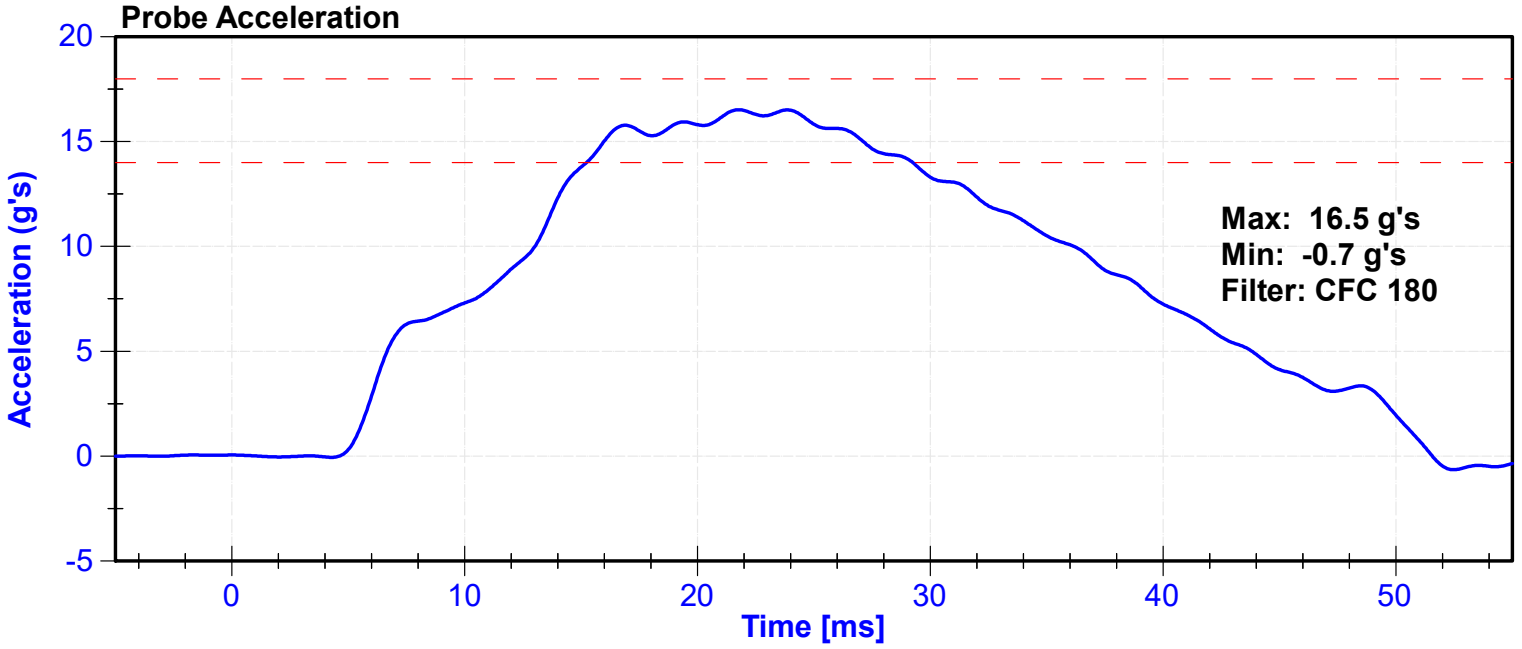
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

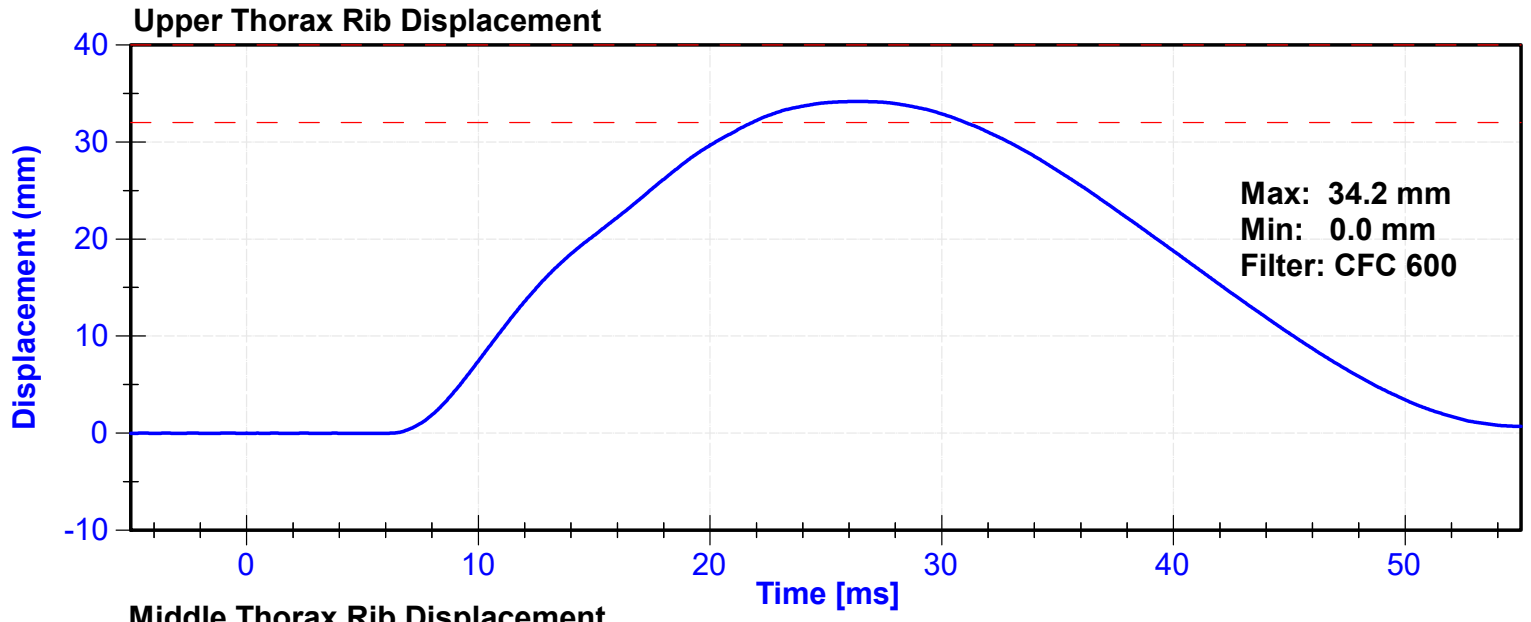
## Results

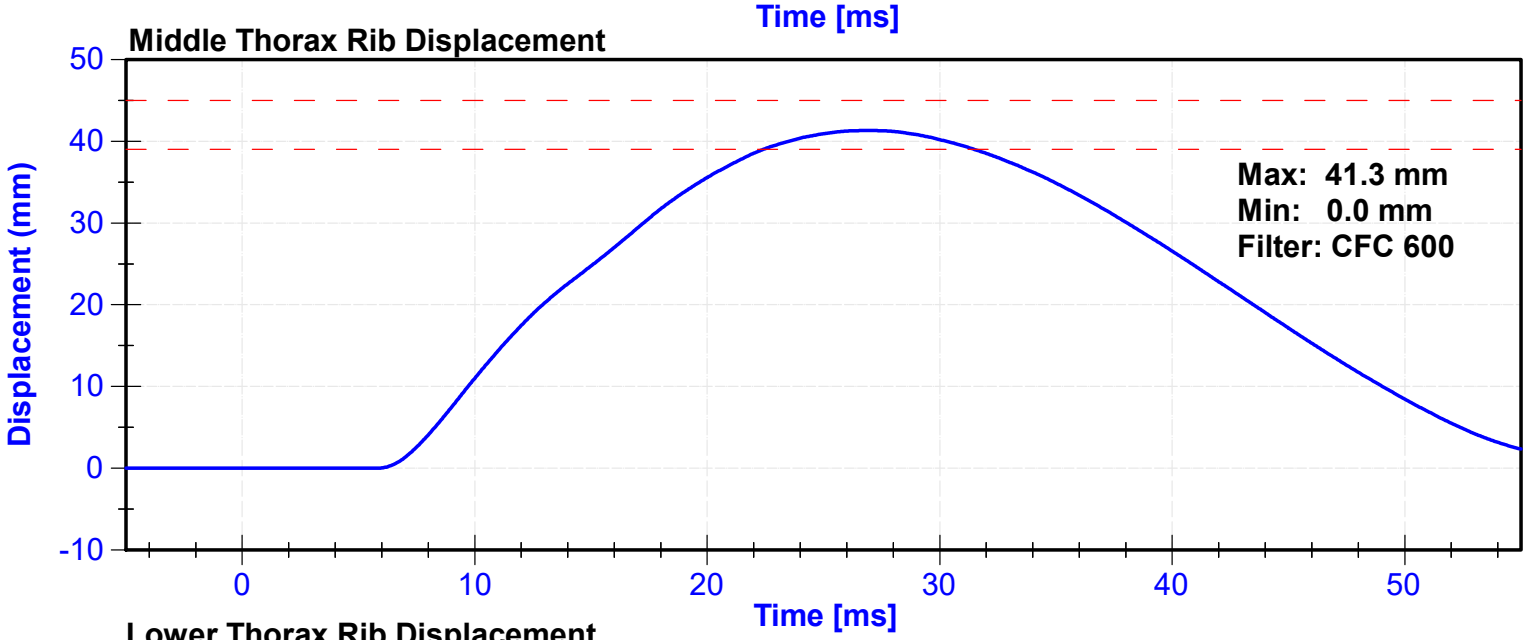
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.31 | Pass |
| Probe Acceleration | 14 | 18 | g's | 16.5 | Pass |
| Lateral Upper Spine Acceleration | 13 | 17 | g's | 14.2 | Pass |
| Lateral Lower Spine Acceleration | 7 | 11 | g's | 9.7 | Pass |
| Upper Thorax Rib Deflection | 32 | 40 | mm | 34.2 | Pass |
| Middle Thorax Rib Deflection | 39 | 45 | mm | 41.3 | Pass |
| Lower Thorax Rib Deflection | 35 | 43 | mm | 38.5 | Pass |

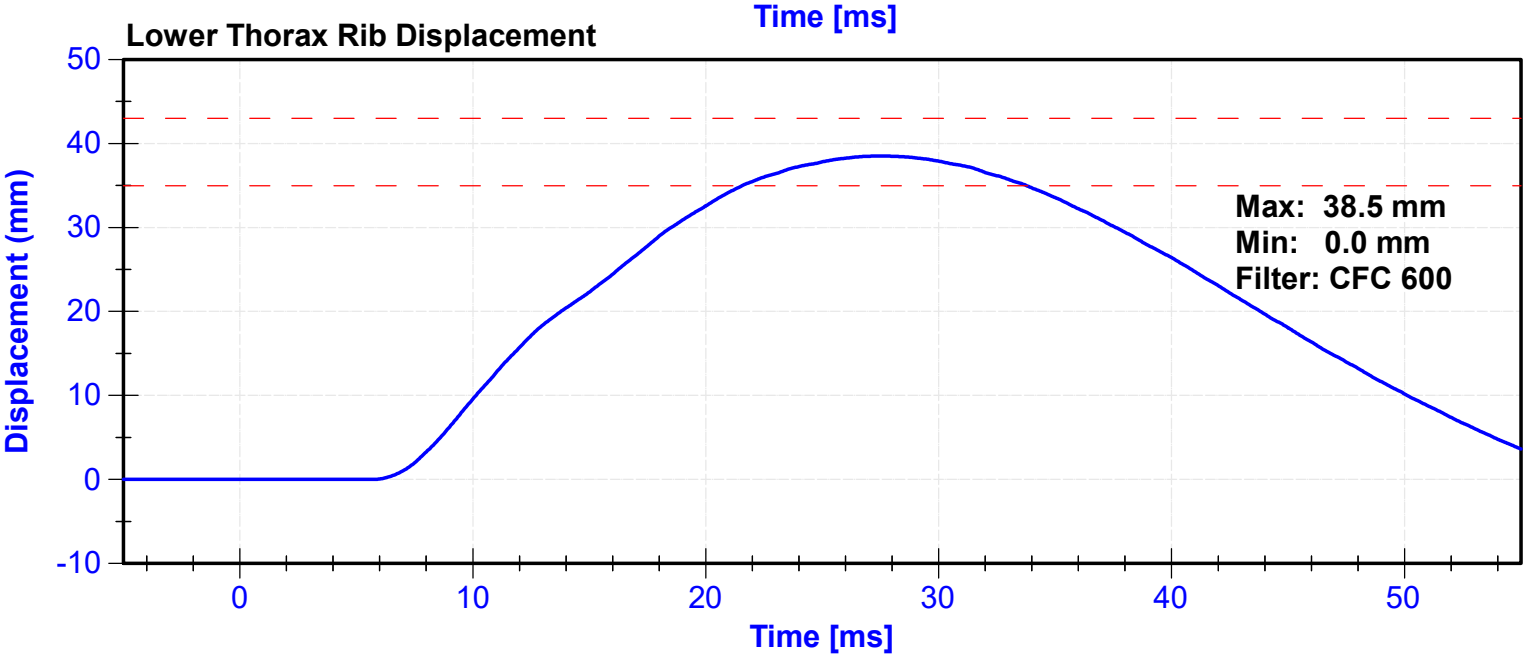
## Transducer Calibrations

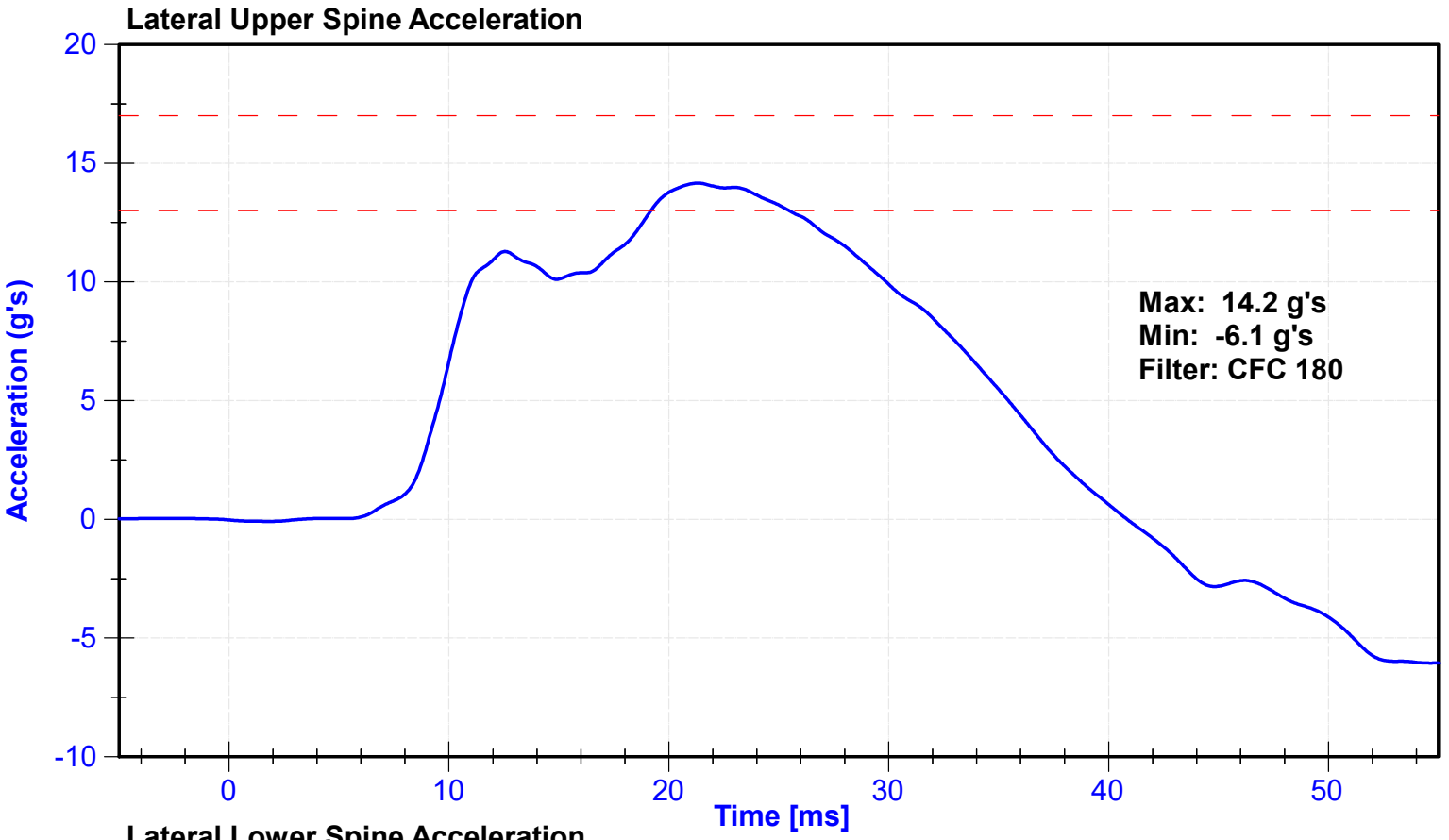
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 5/9/2024 | 11/7/2024 |
| Middle Thorax Rib Potentiometer | Servo | 085GFE | 5/9/2024 | 11/7/2024 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 5/9/2024 | 11/7/2024 |

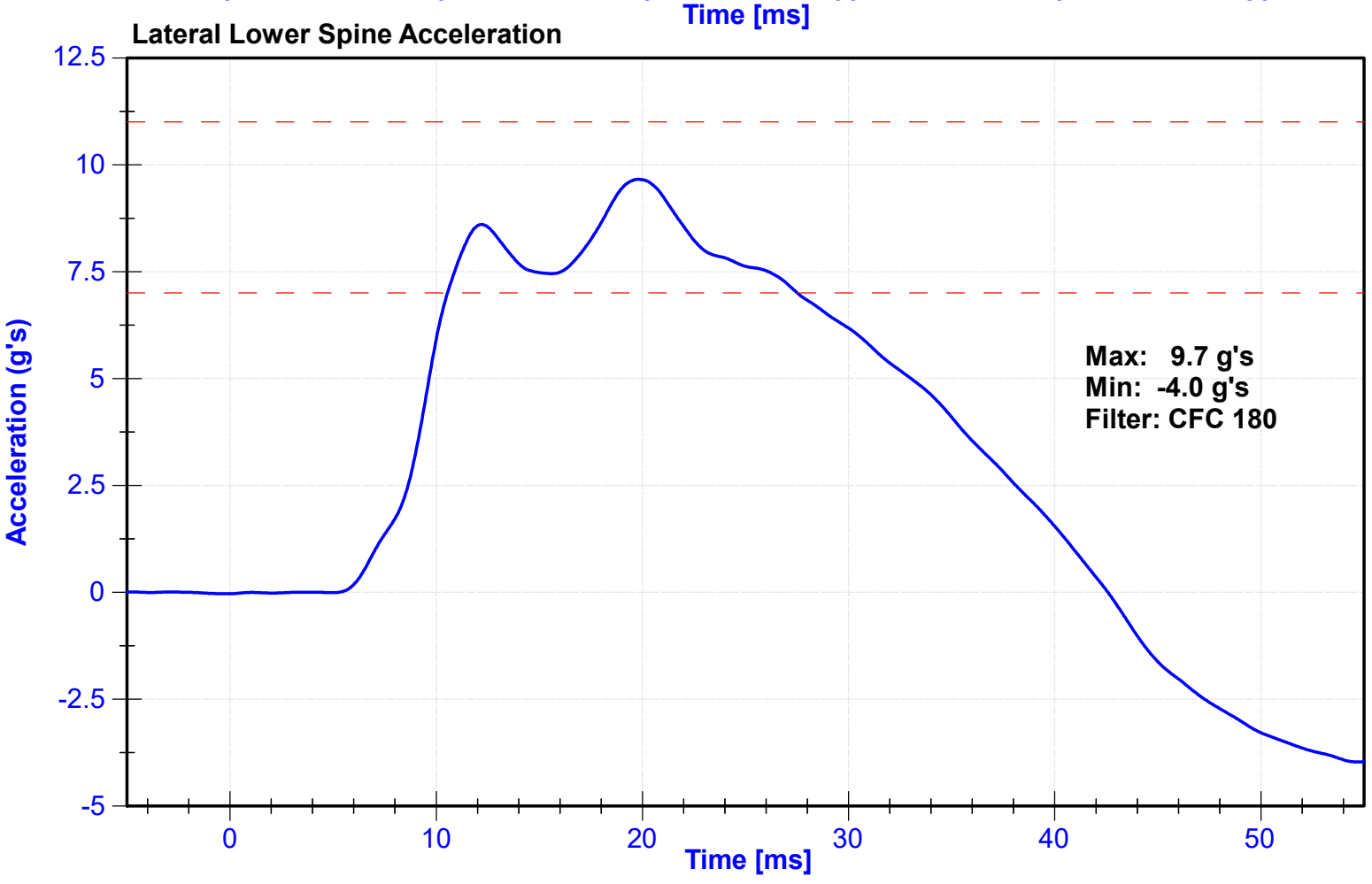



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.2 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
20
15
10
5
0
-5
-10
0
10
20
30
40
50
Time [ms]
Max: 14.2 g's
Min: -6.1 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50
Time [ms]
Max: 9.7 g's
Min: -4.0 g's
Filter: CFC 180

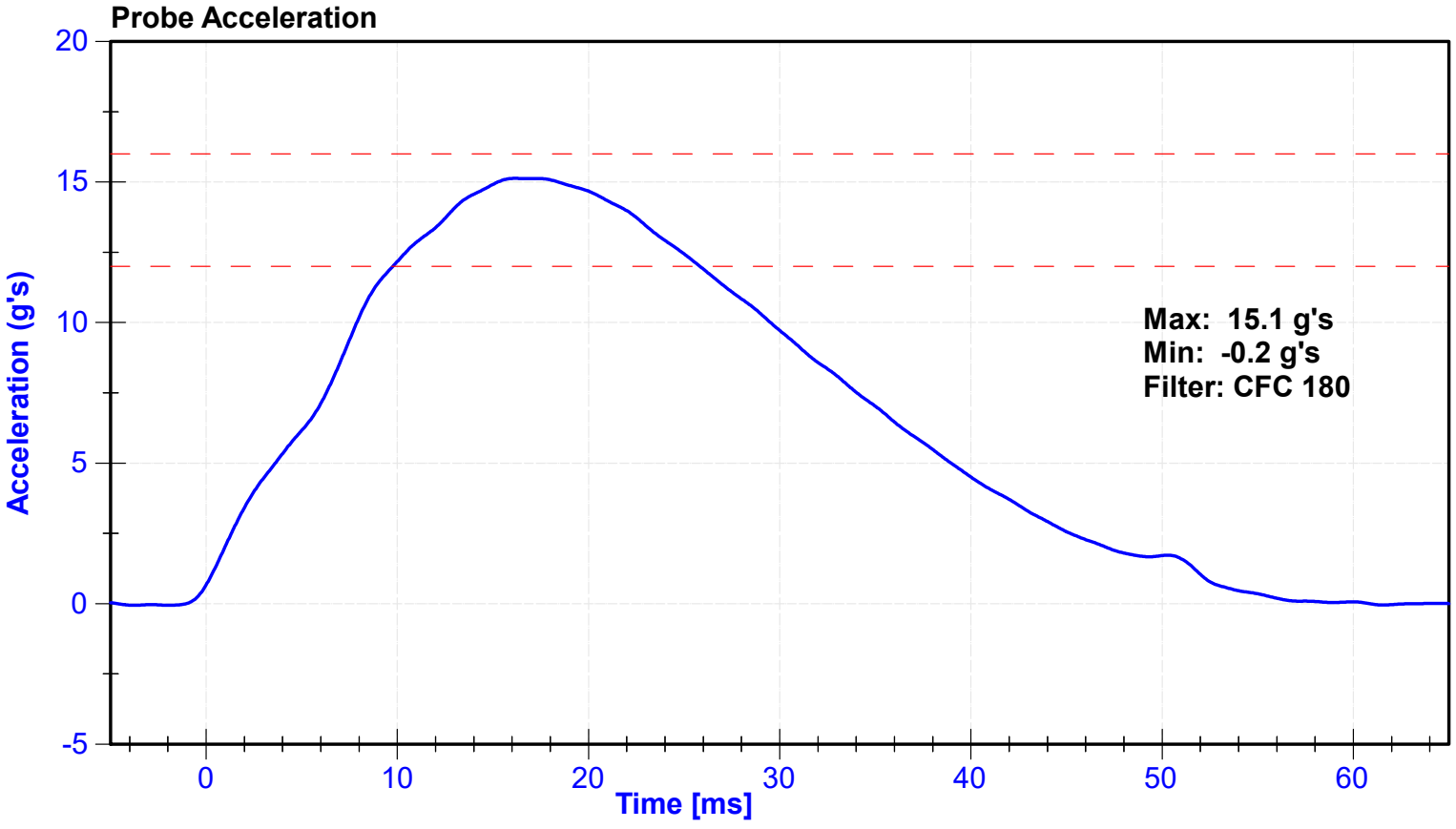
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

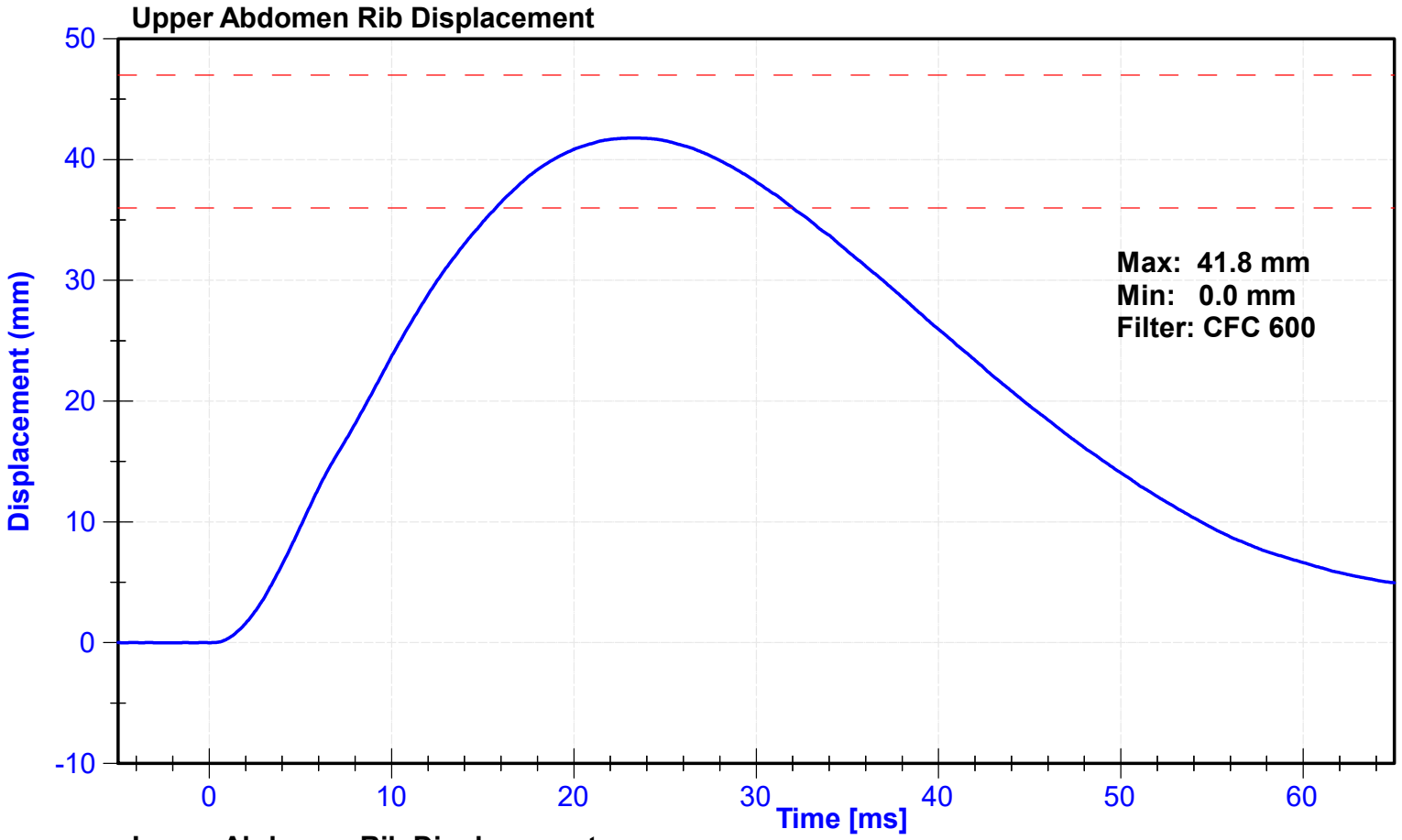
## Results

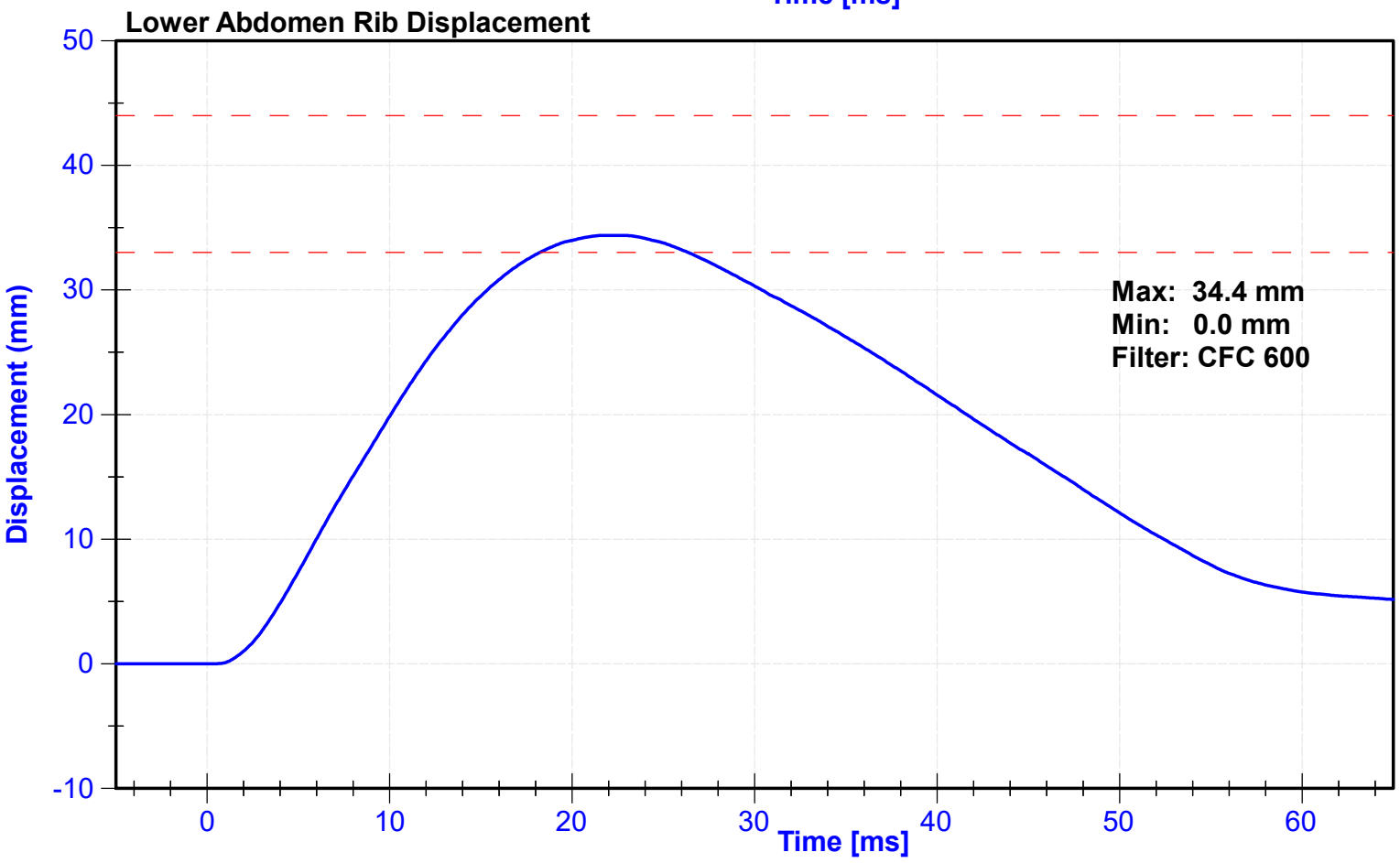
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.30 | Pass |
| Probe Acceleration | 12 | 16 | g's | 15.1 | Pass |
| Lateral Lower Spine Acceleration | 9 | 14 | g's | 11.2 | Pass |
| Upper Abdomen Rib Deflection | 36 | 47 | mm | 41.8 | Pass |
| Lower Abdomen Rib Deflection | 33 | 44 | mm | 34.4 | Pass |

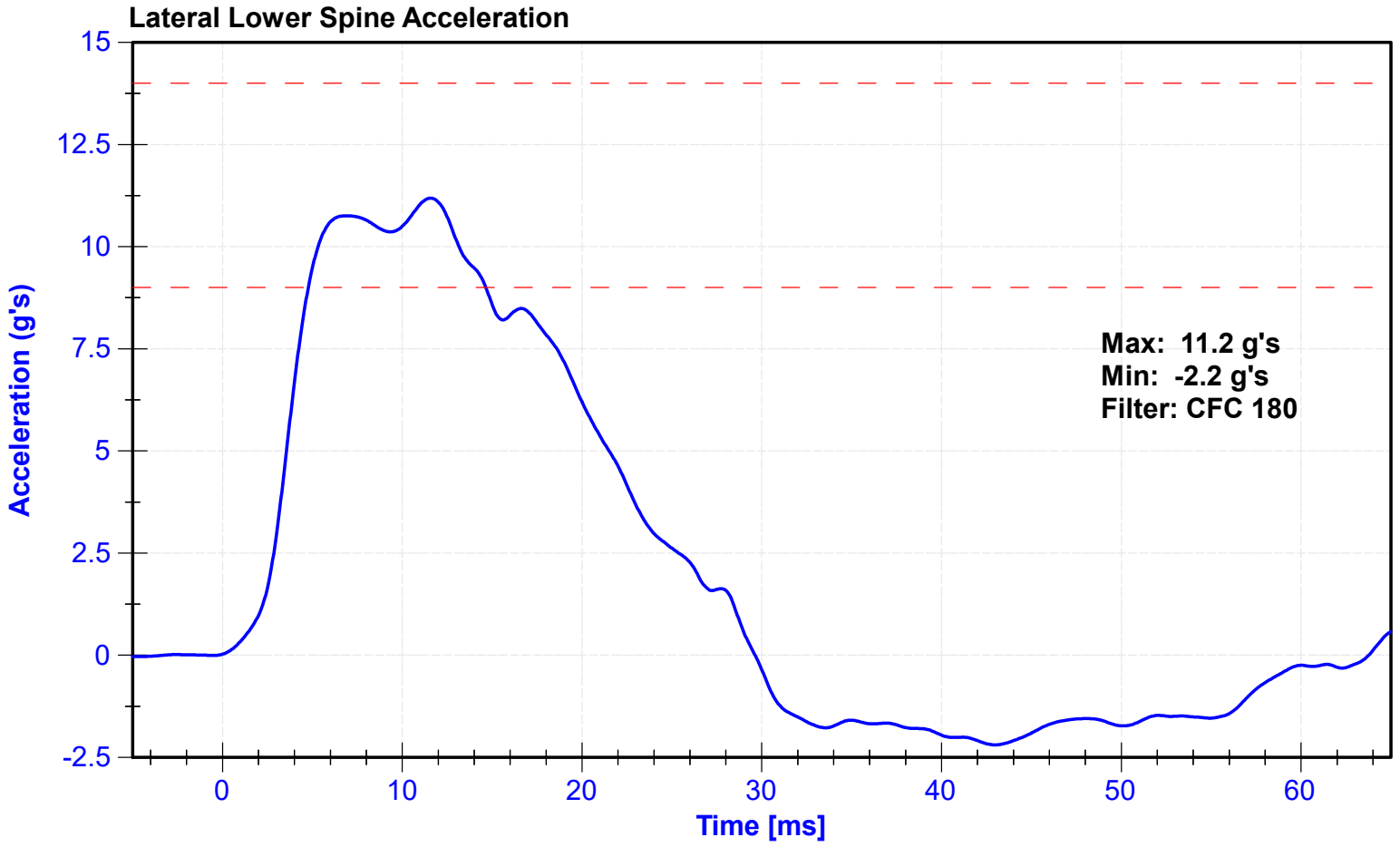
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Upper Abdomen Rib Potentiometer | Servo | 060GFE | 5/9/2024 | 11/7/2024 |
| Lower Abdomen Rib Potentiometer | Servo | 075GFE | 5/9/2024 | 11/7/2024 |




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 41.8 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 34.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 11.2 g's
Min: -2.2 g's
Filter: CFC 180

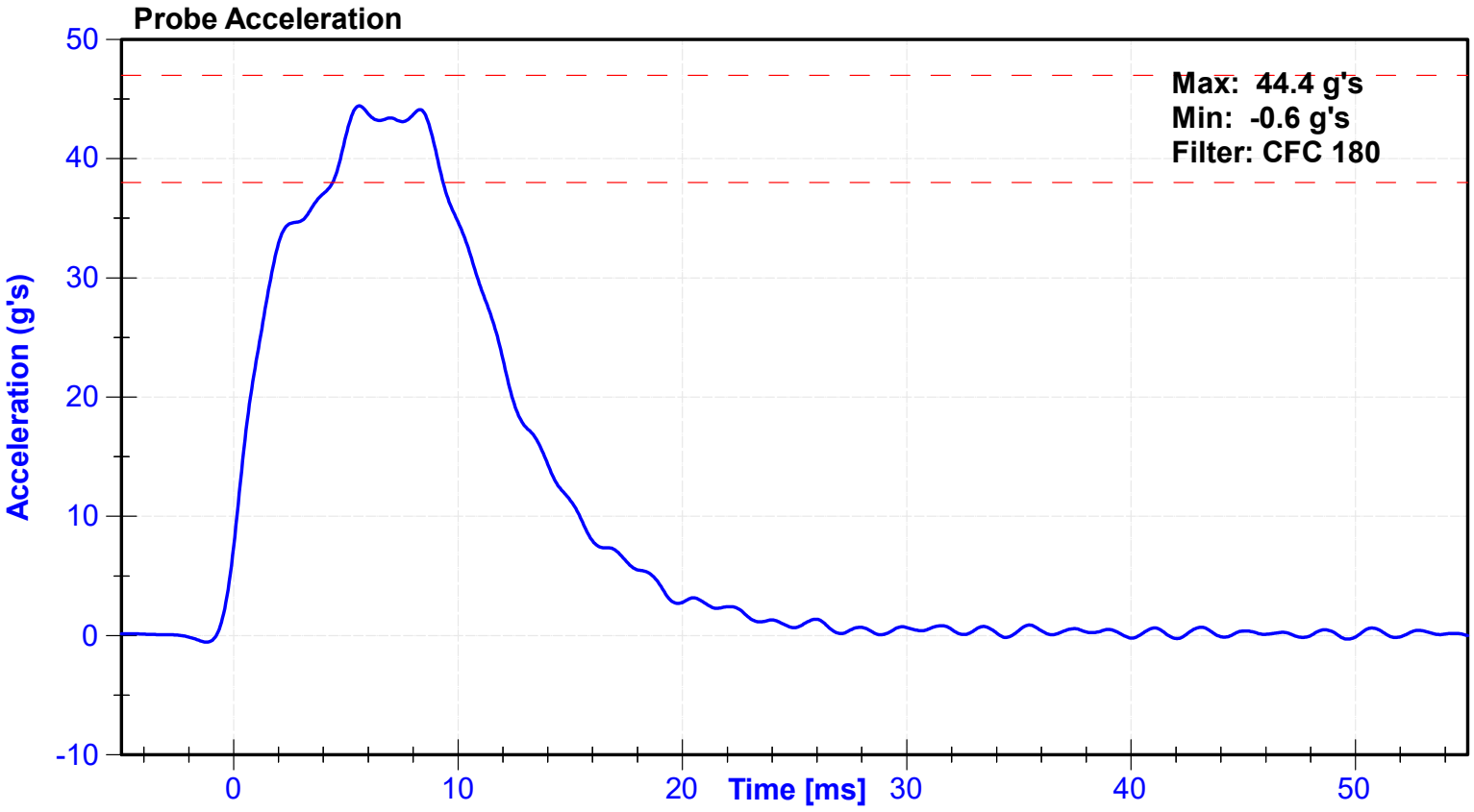
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

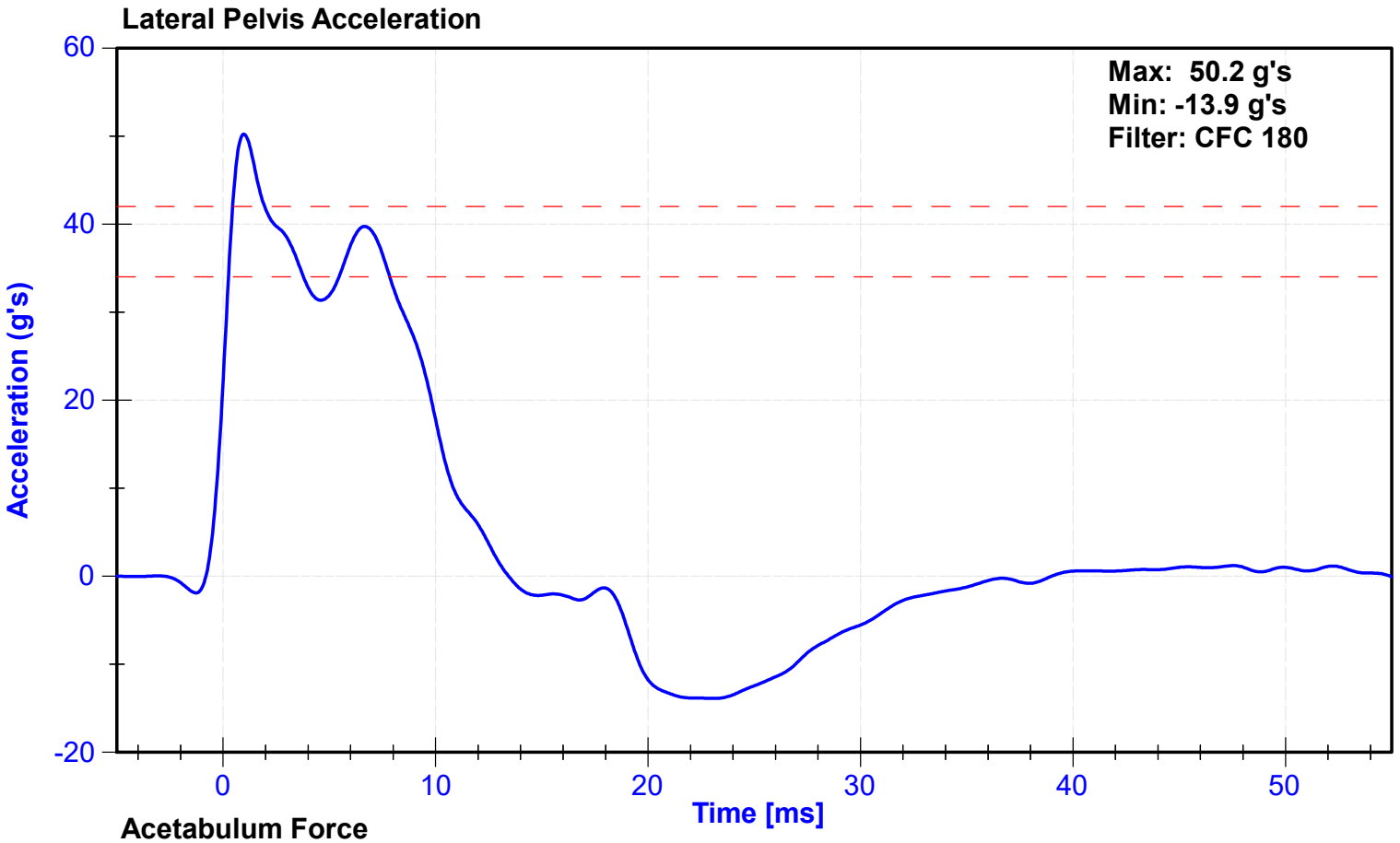
## Results

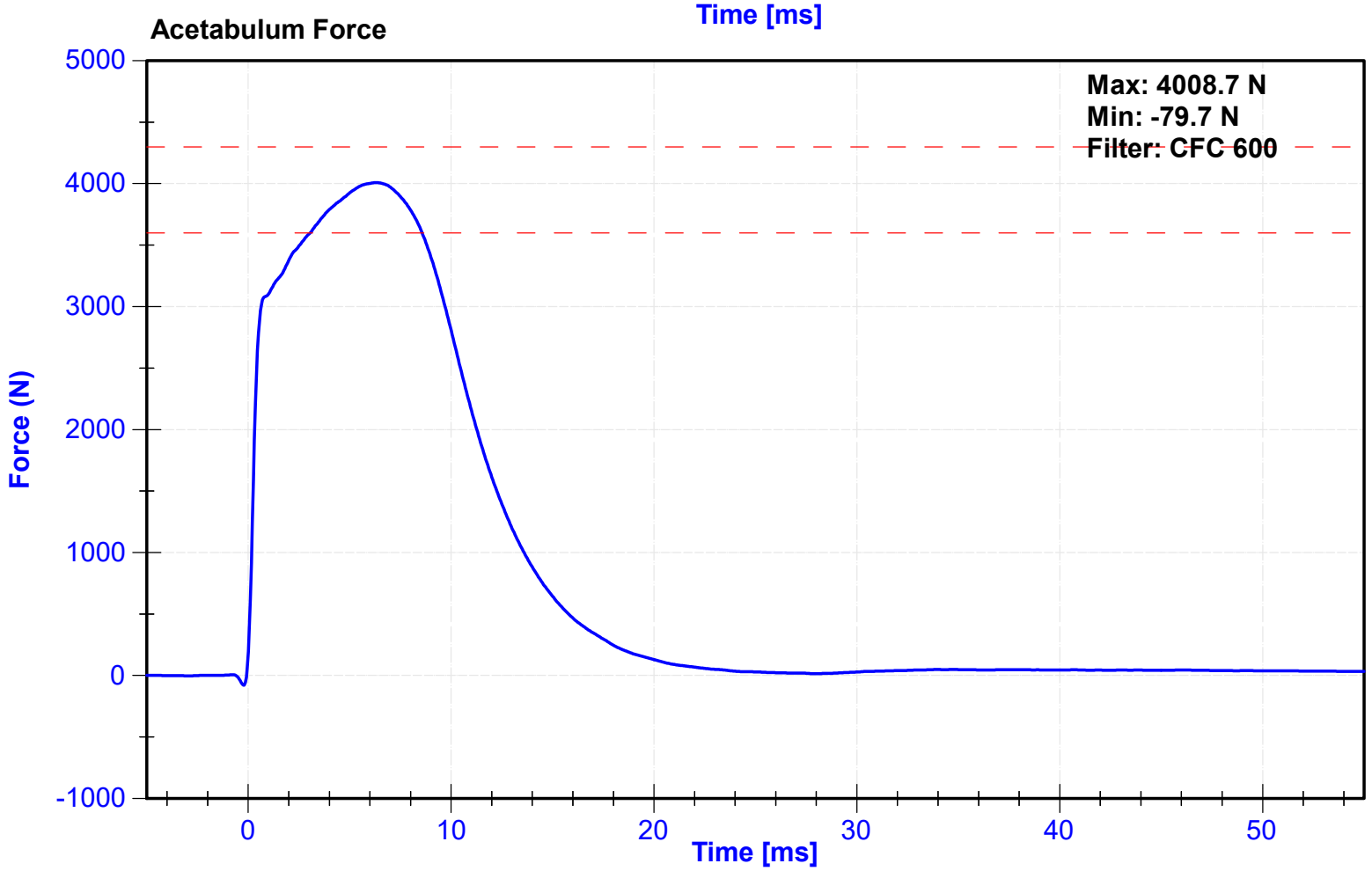
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.65 | Pass |
| Probe Acceleration | 38 | 47 | g's | 44.4 | Pass |
| Lateral Pelvis Acceleration after 6ms | 34 | 42 | g's | 39.7 | Pass |
| Acetabulum Force | 3600 | 4300 | N | 4008.7 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Pelvis Y Accelerometer | Endevco | P51731 | 5/9/2024 | 11/5/2024 |
| Acetabulum Load Cell | Denton | 267-FY | 9/11/2023 | 9/10/2024 |
| Certification Plug | SACO | | | N/A |
| Crash Test Plug | SACO | | | N/A |




Lateral Pelvis Acceleration
Max: 50.2 g's
Min: -13.9 g's
Filter: CFC 180
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 4008.7 N
Min: -79.7 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

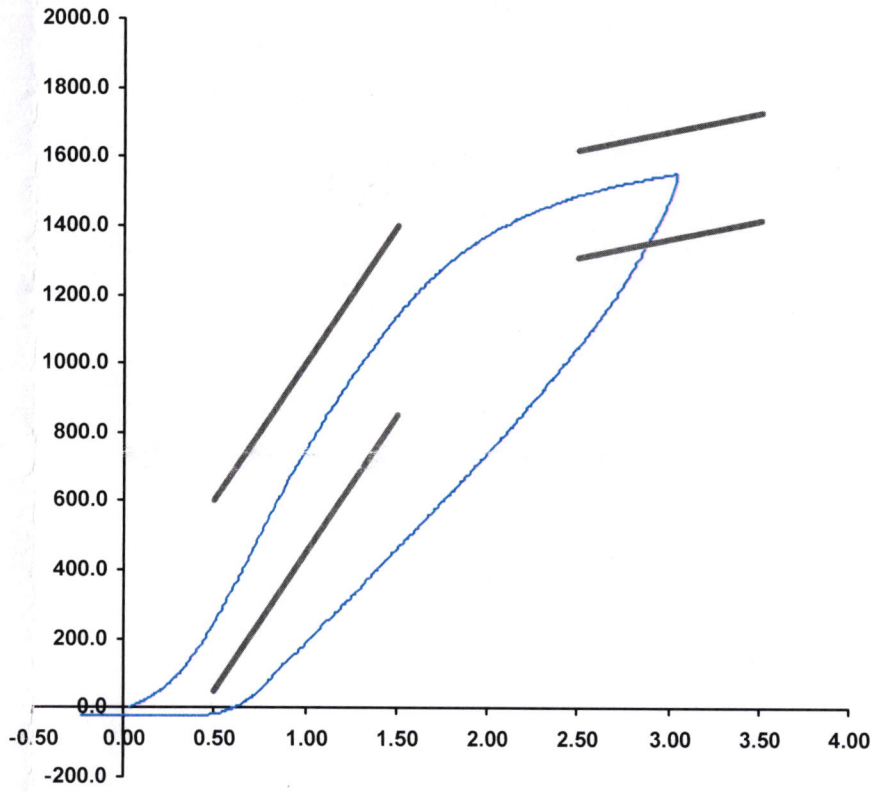
SACO RESEARCH

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15768
Test Number 20668
Report Number 20722
Test Date 10/15/2021 7:51:31 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 257 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,147 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,491 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,552 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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: 05-20-2024 Cert Plug

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

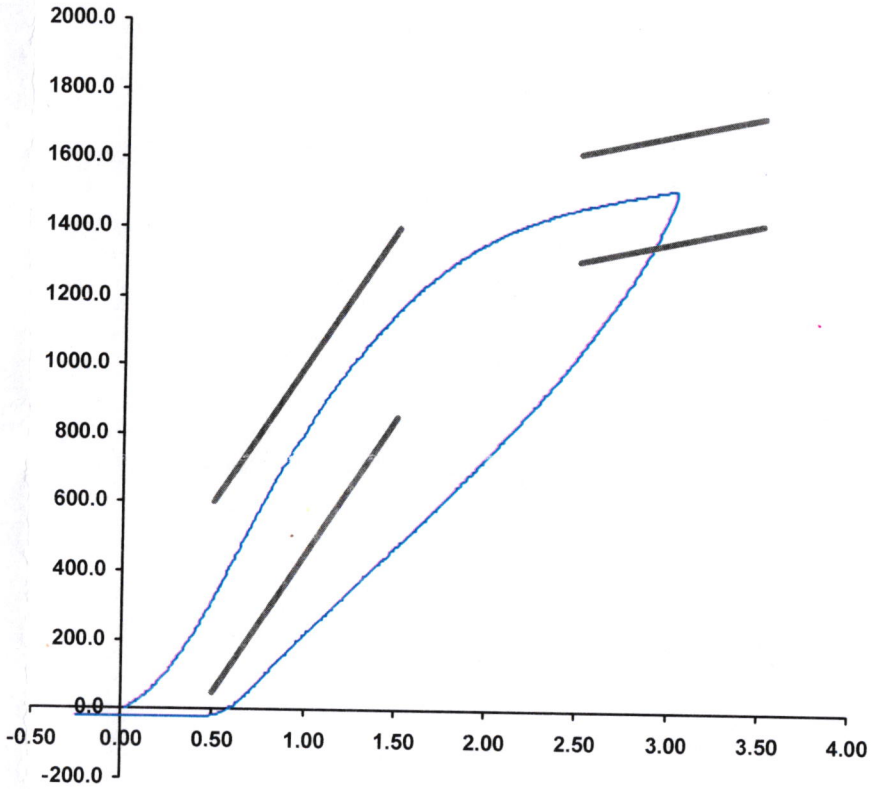
SACO RESEARCH

## SID-IIs Pelvis Plug Certification Test

Plug S/N 16620
Test Number 23386
Report Number 23443
Test Date 7/20/2022 11:42:52 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 319 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,156 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,461 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,515 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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: Impact Plug Cal 6172
05-22-24

Operator

Part Number 180-4450

Template No 107 20-Jul-22
SACO Research

By : DC Date : 7/20/22

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

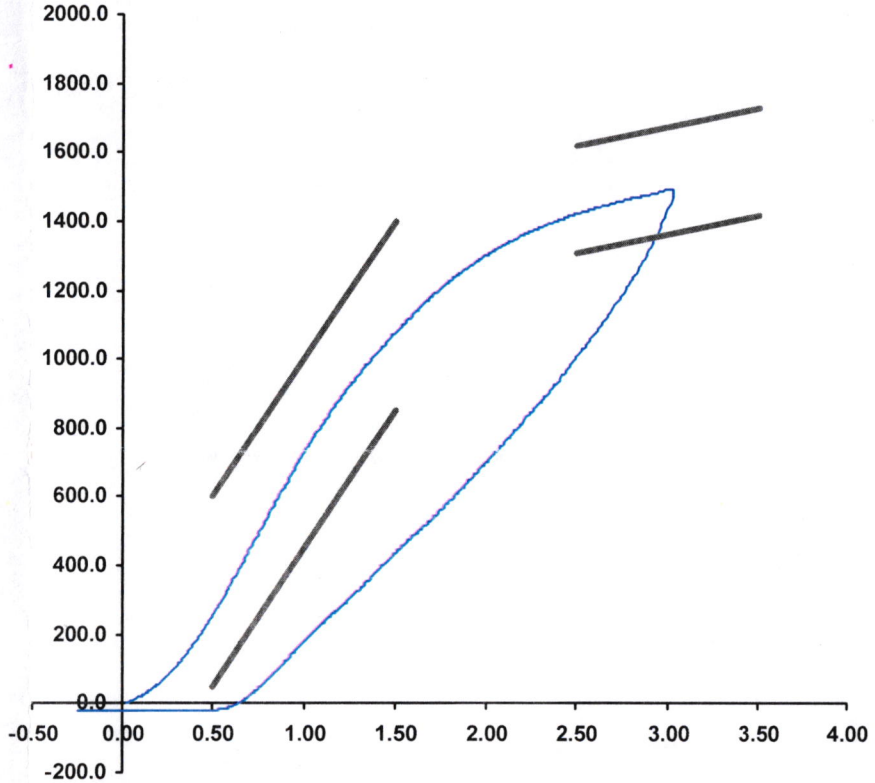
SACO RESEARCH

## SID-IIs Pelvis Plug Certification Test

**Plug S/N** 16540
**Test Number** 23324
**Report Number** 23381
**Test Date** 7/15/2022 9:04:41 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 264 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,081 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,422 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,491 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




**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:
Non-Impact Plug Cal 6172
05-22-24

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

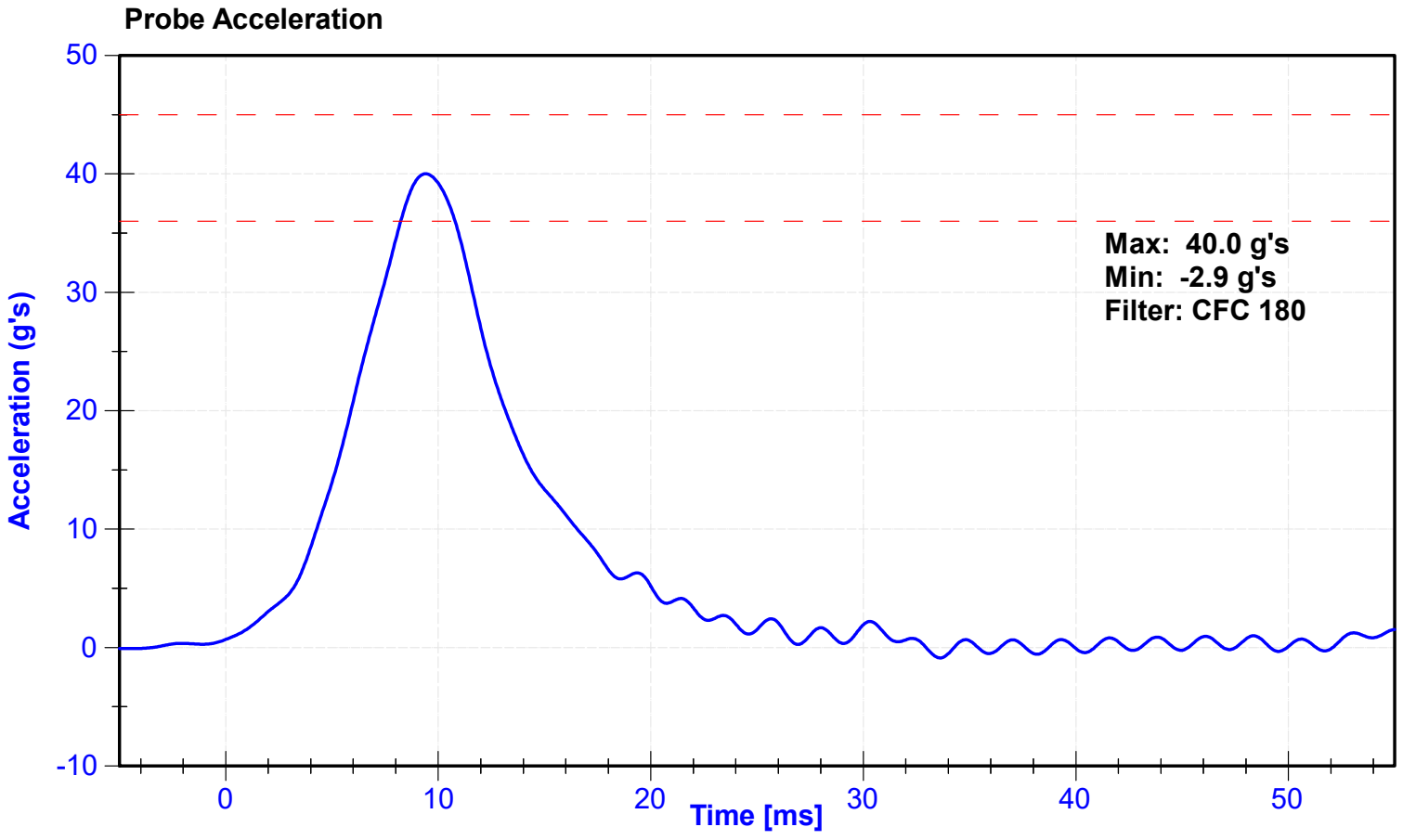
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | J. Rios |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

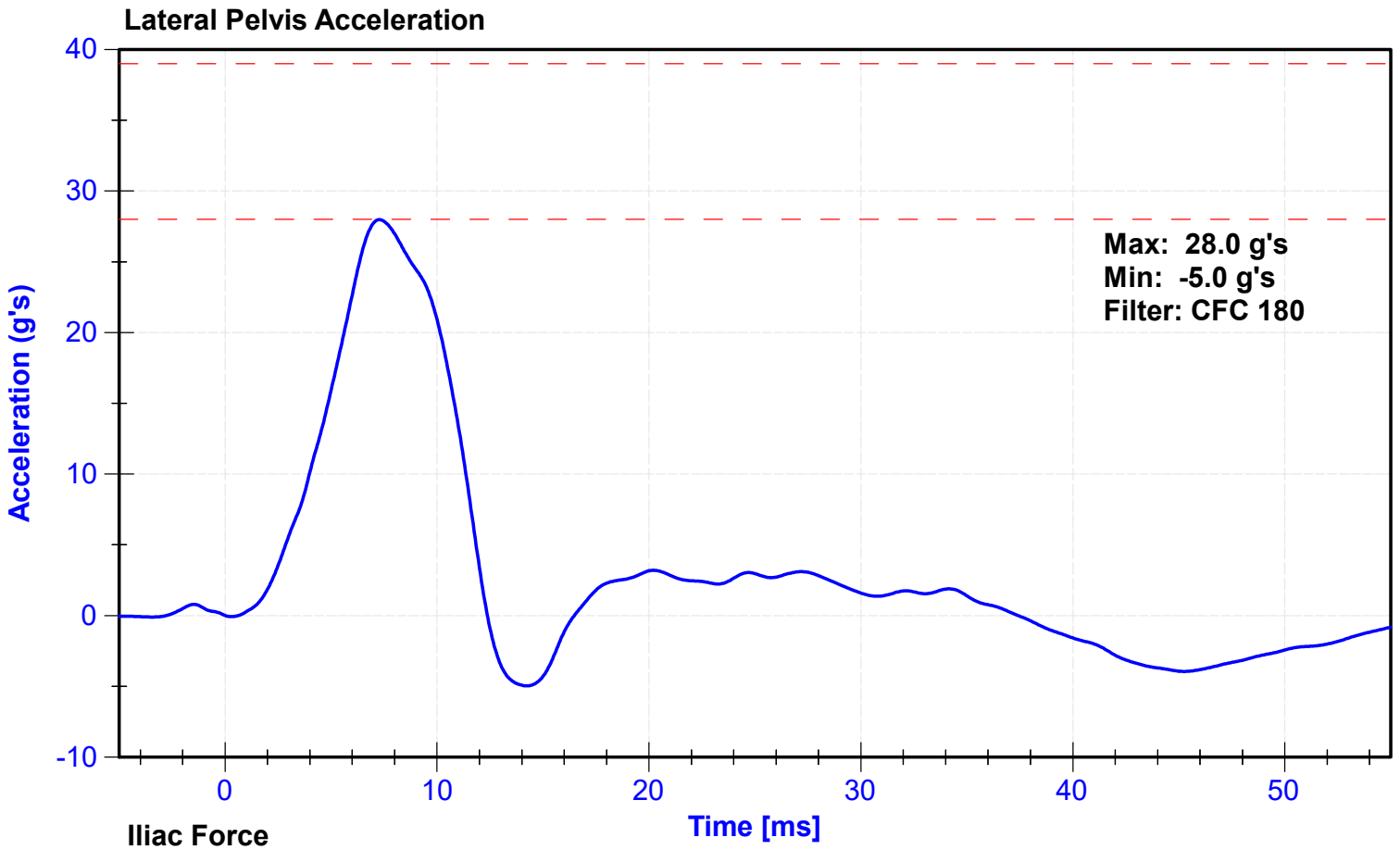
## Results

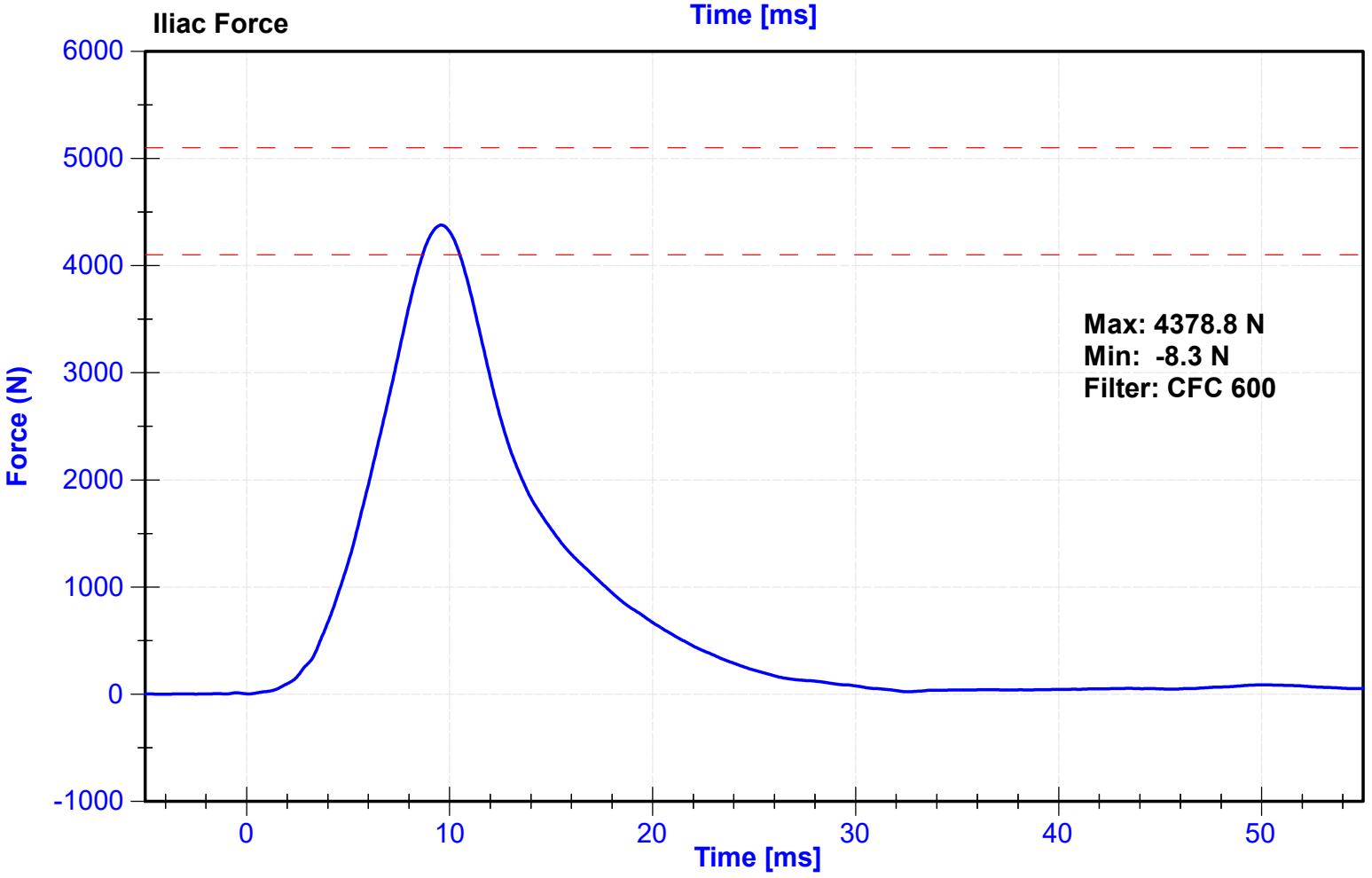
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 44 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.26 | Pass |
| Probe Acceleration | 36 | 45 | g's | 40.0 | Pass |
| Lateral Pelvis Acceleration | 28 | 39 | g's | 28.0 | Pass |
| Iliac Force | 4100 | 5100 | N | 4378.8 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Pelvis Y Accelerometer | Endevco | P51731 | 5/9/2024 | 11/5/2024 |
| Iliac Load Cell | Denton | 321 | 9/11/2023 | 9/10/2024 |




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 28.0 g's
Min: -5.0 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4378.8 N
Min: -8.3 N
Filter: CFC 600

**CALIBRATION TEST RESULTS**

**POST-TEST**

**EUROSID 2 (ES-2RE) MALE – DRIVER ATD**

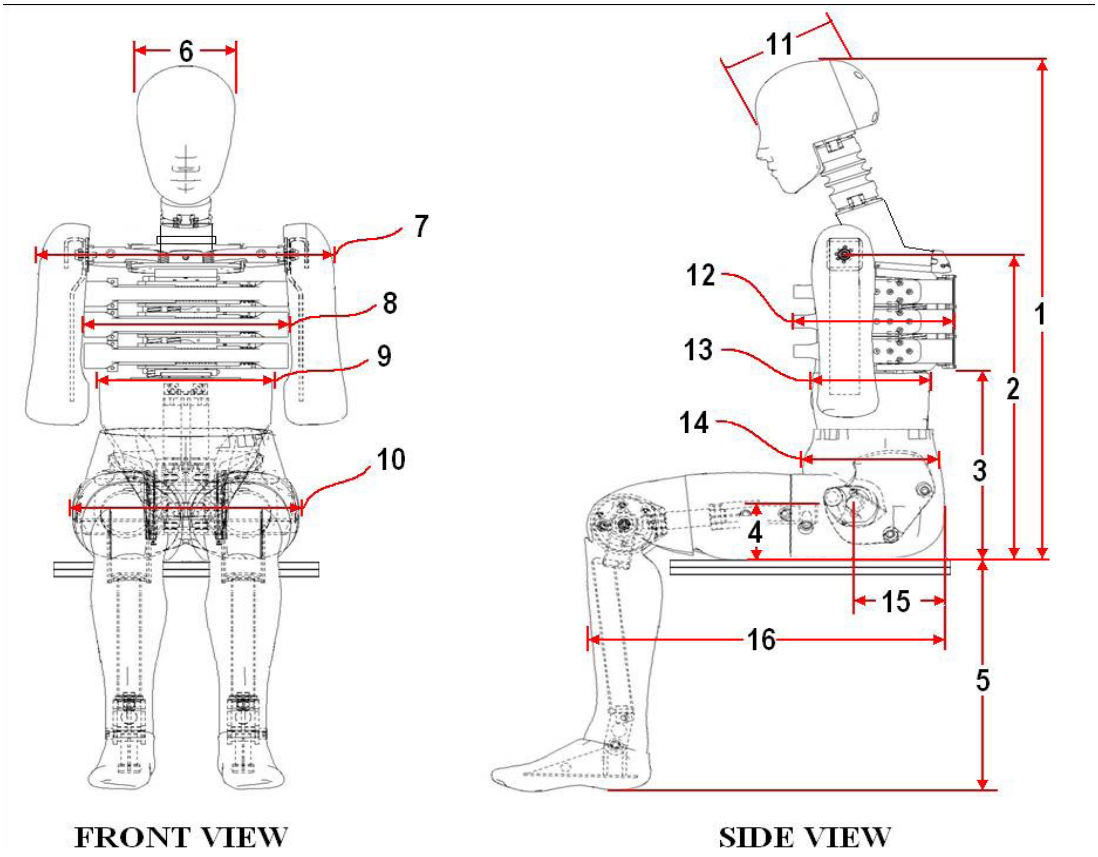
**SERIAL NO:F033**

**(CONFIGURED FOR LEFT SIDE IMPACT)**

External Measurements - EuroSID-2re

Technician: K. Brogan  Date: 5/23/2024

Dummy Serial Number: F033




FRONT VIEW  SIDE VIEW

| Dim. No. | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| 1 | Sitting Height | 900 | 918 | 914 | Pass |
| 2 | Seat to Shoulder Joint | 558 | 572 | 567 | Pass |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346 | 356 | 354 | Pass |
| 4 | Seat to Hip Joint (center of bolt) | 97 | 103 | 99 | Pass |
| 5 | Sole to Seat, Sitting | 333 | 451 | 429 | 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 | 370 | Pass |
| 11 | Head Depth | 196 | 206 | 201 | Pass |
| 12 | Thorax Depth | 262 | 272 | 269 | Pass |
| 13 | Abdomen Depth | 194 | 204 | 199 | Pass |
| 14 | Pelvis Depth | 235 | 245 | 241 | Pass |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150 | 160 | 154 | Pass |
| 16 | Back of Buttocks to Front Knee | 597 | 615 | 611 | Pass |

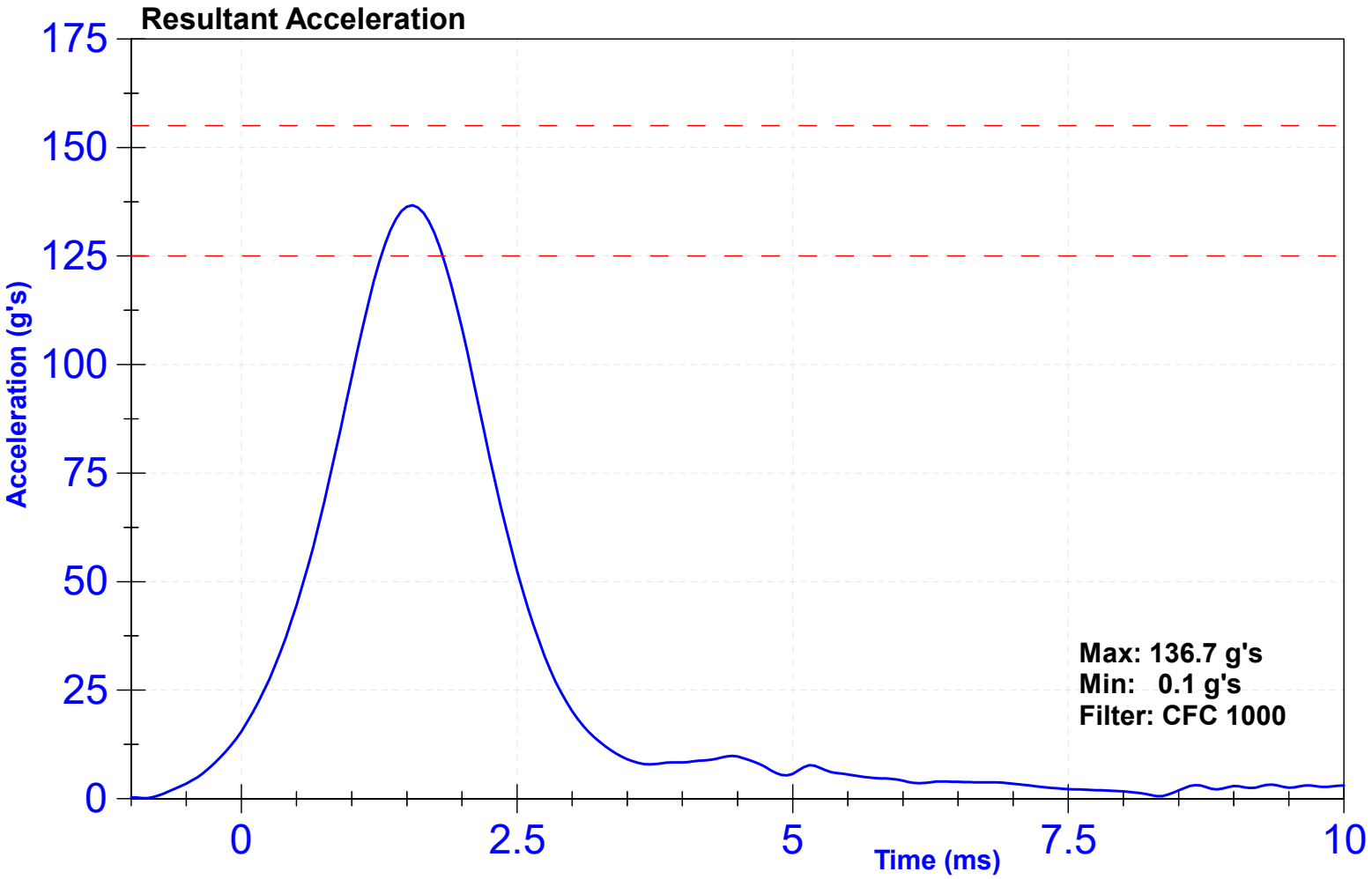
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

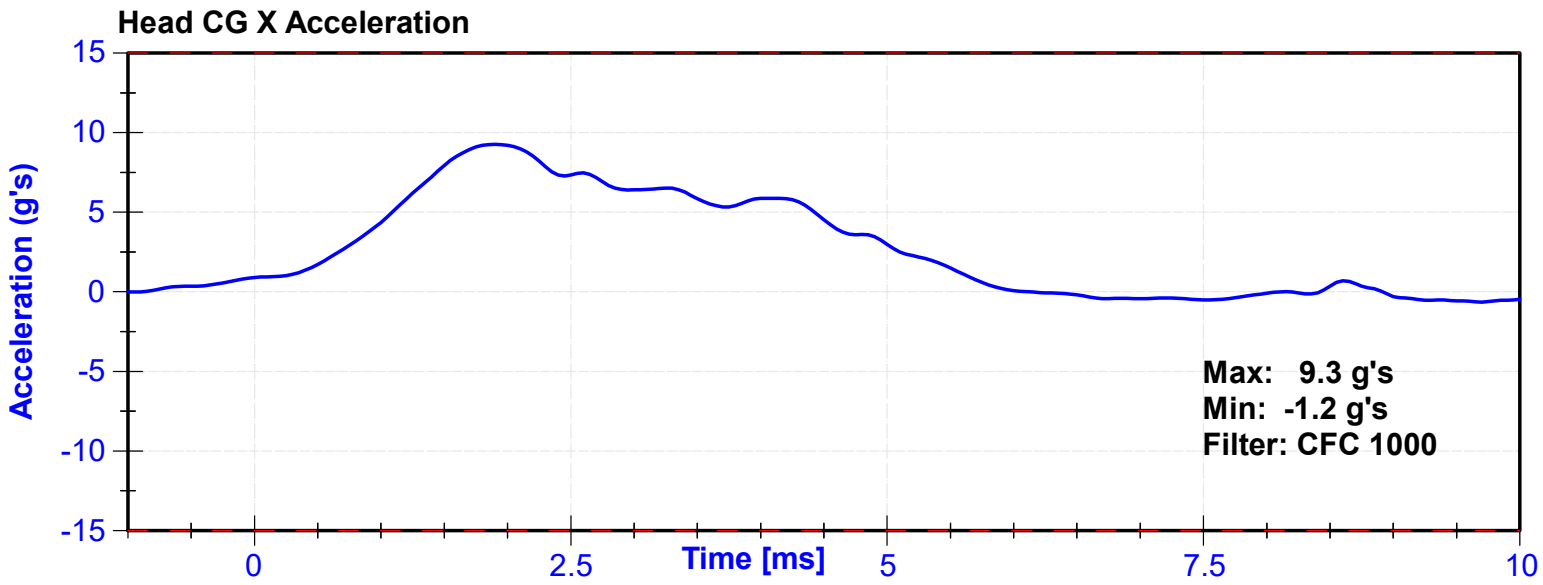
## Results

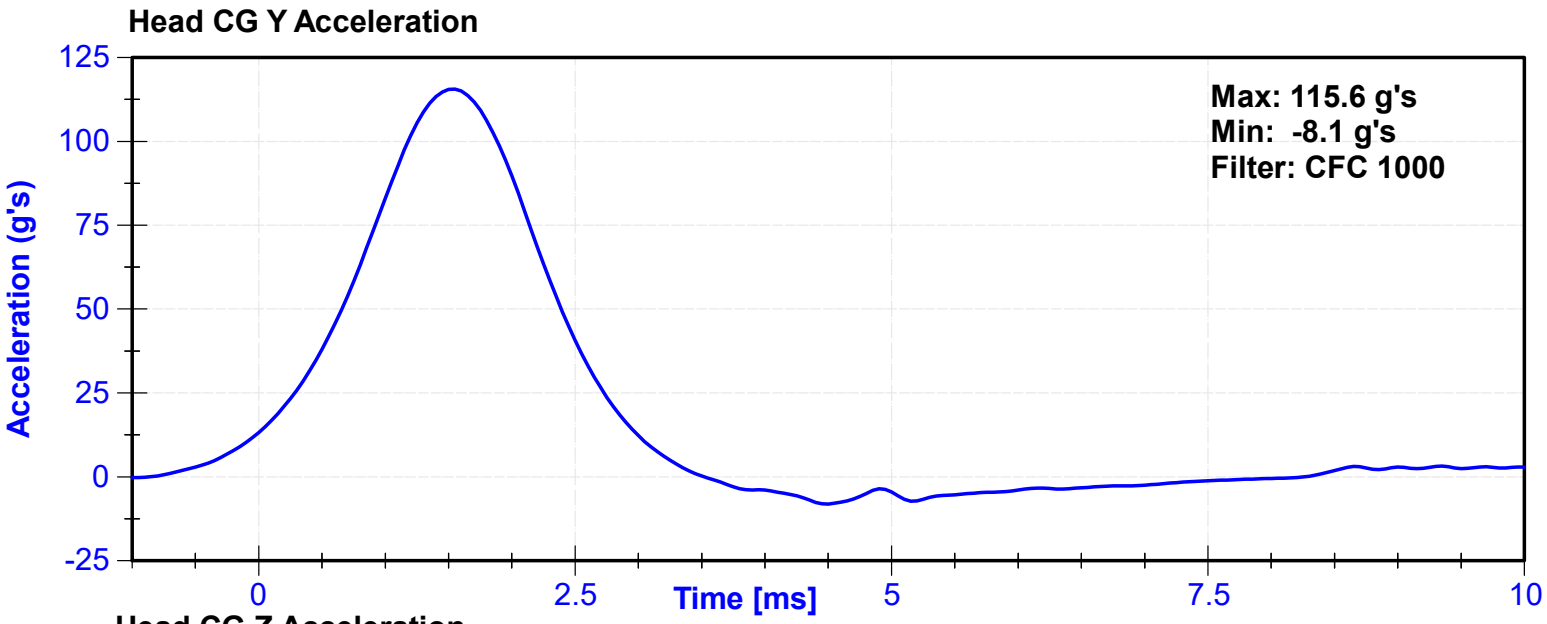
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Resultant Acceleration | 125 | 155 | g's | 136.7 | Pass |
| Oscillation | 0 | 15 | % | 7.20 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | 9.3 | Pass |

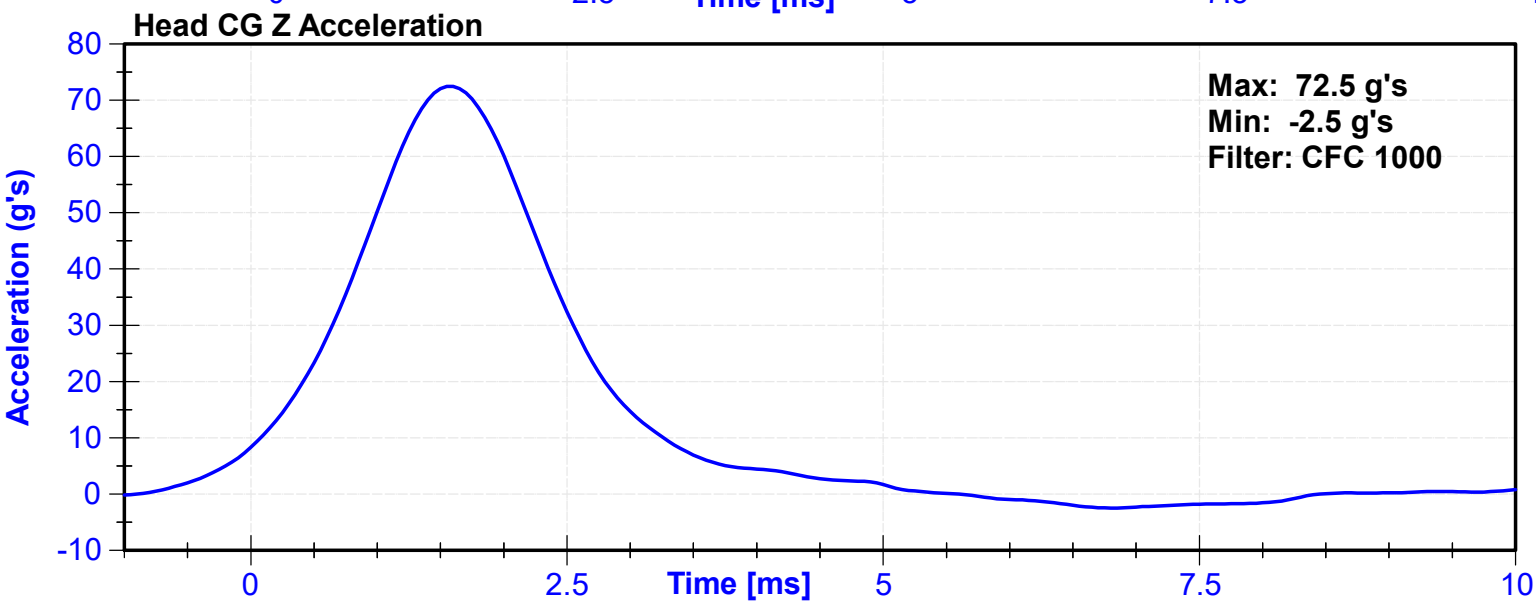
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P63861 | 5/6/2024 | 11/2/2024 |
| Y Accelerometer | Endevco | P49216 | 5/6/2024 | 11/2/2024 |
| Z Accelerometer | Endevco | P51303 | 5/6/2024 | 11/2/2024 |




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 9.3 g's
Min: -1.2 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 115.6 g's
Min: -8.1 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 72.5 g's
Min: -2.5 g's
Filter: CFC 1000

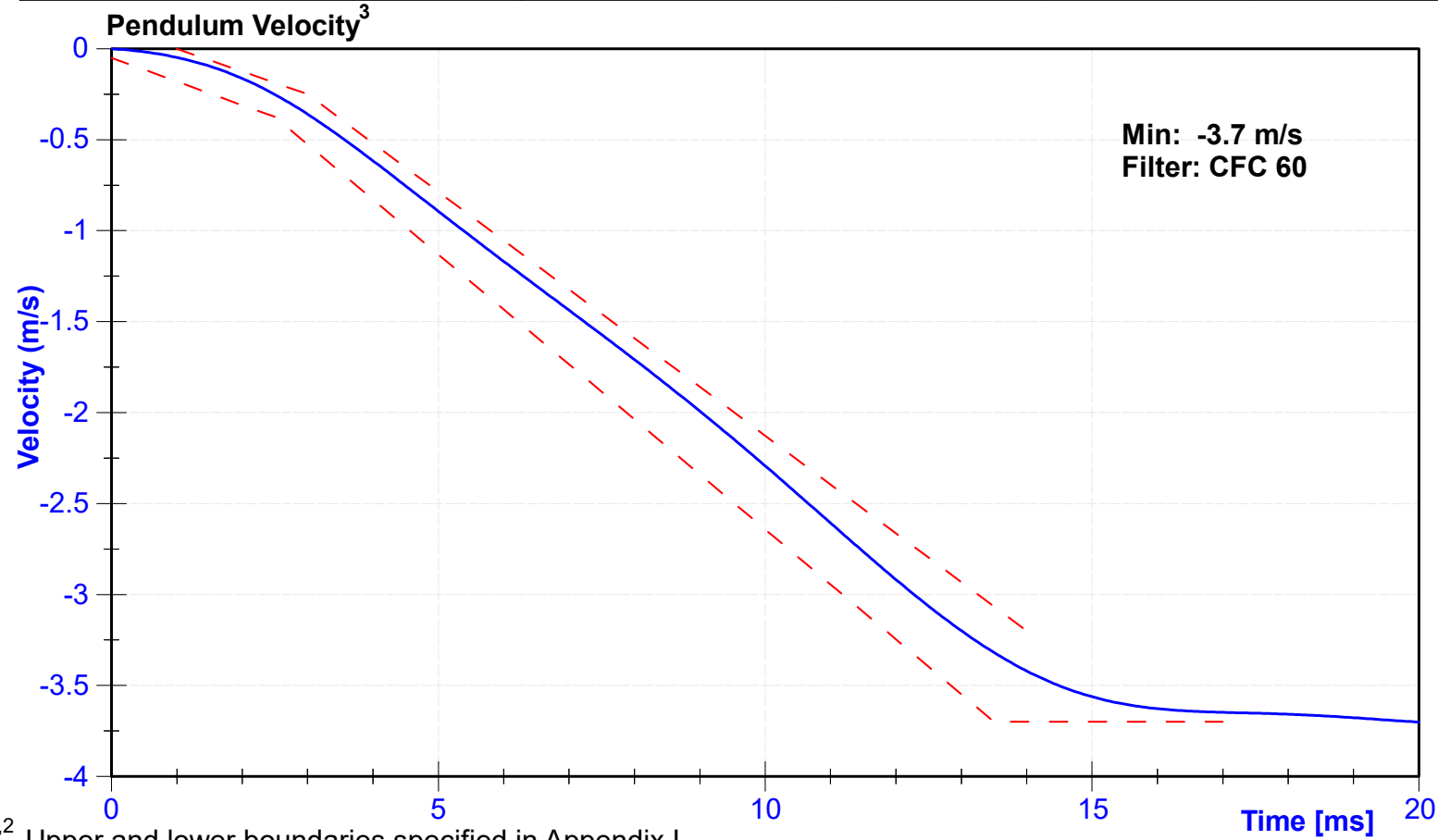
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

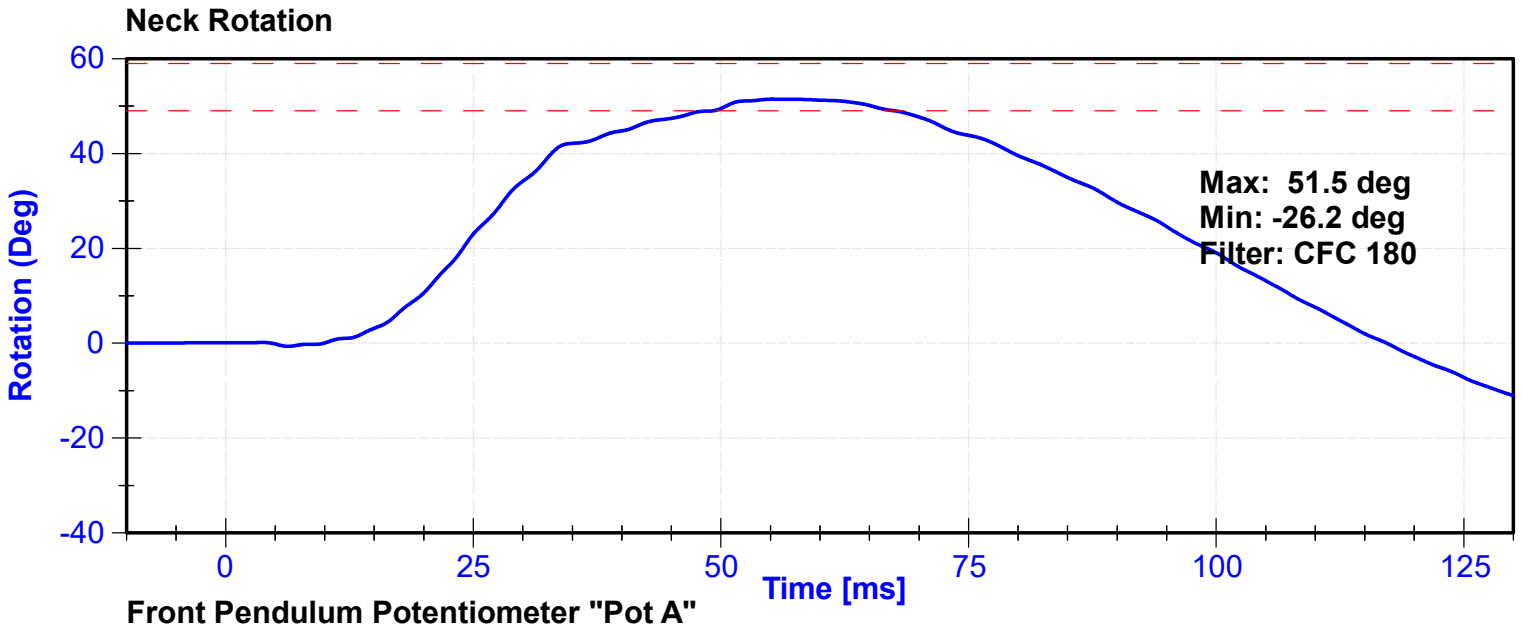
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 49 | Pass |
| Velocity | 3.3 | 3.5 | m/s | 3.45 | Pass |
| Lateral Neck Rotation | 49 | 59 | deg | 51.5 | Pass |
| Time at Maximum Rotation | 54 | 66 | ms | 55.2 | Pass |
| Time of Rotation Decay from Maximum | 53 | 88 | ms | 62.1 | Pass |
| Pendulum Velocity Overall Corridor | Lower Boundary[1] | Upper Boundary[2] | m/s | See Plot[3] | Pass |

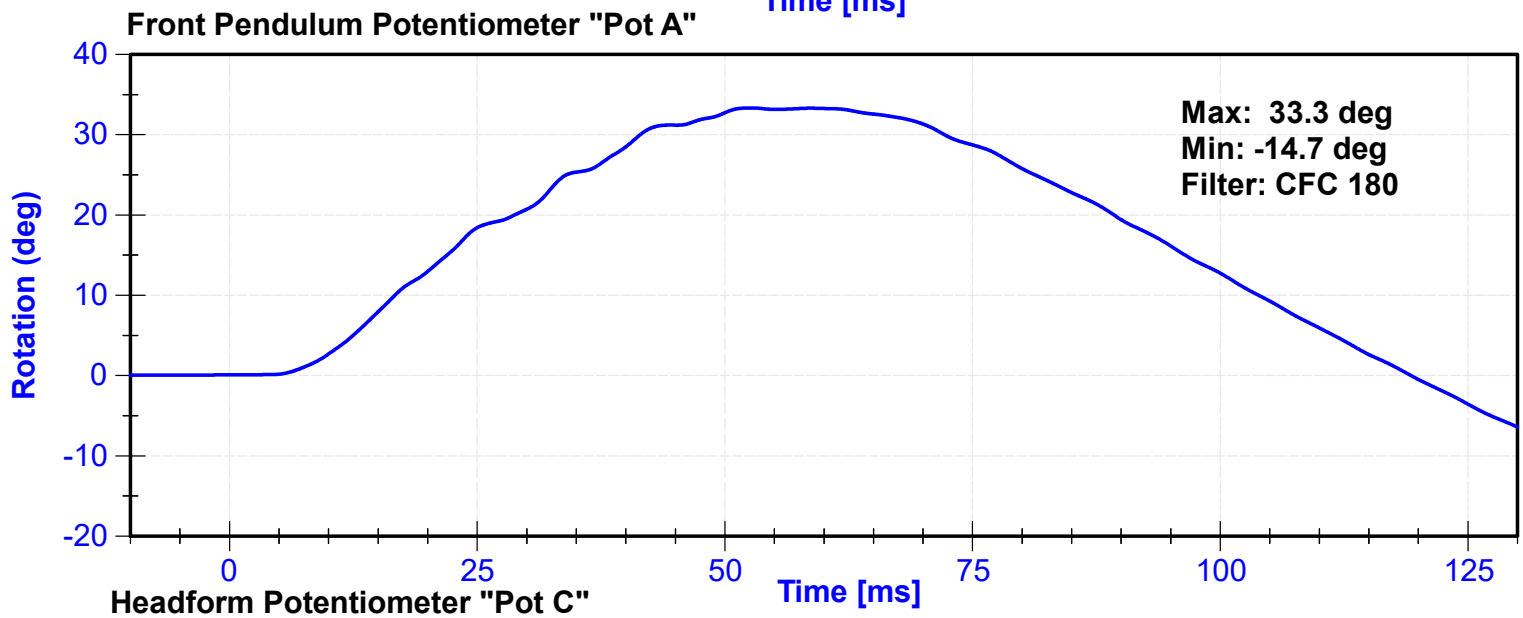
## Transducer Calibrations

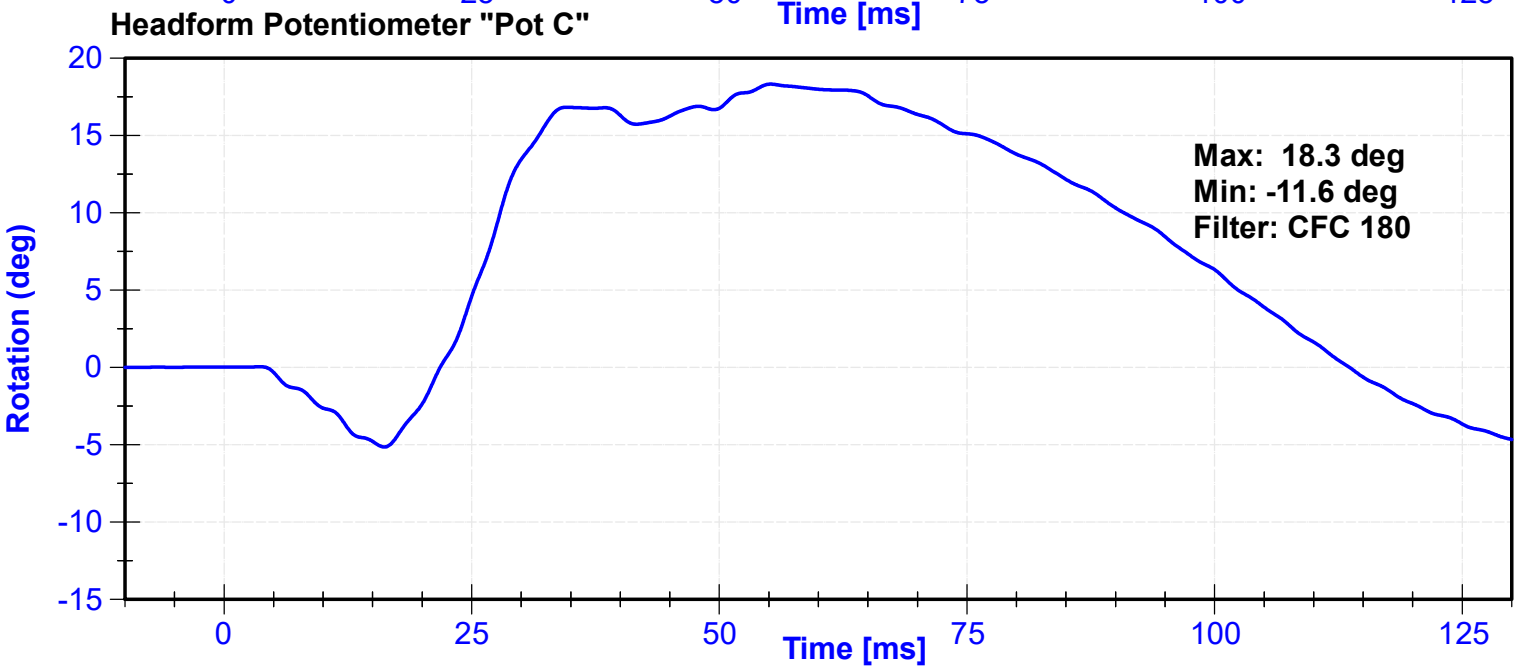
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | C16503 | 4/29/2024 | 10/26/2024 |
| Front Pendulum Potentiometer | Sfernice | 2247 | 12/5/2023 | 12/4/2024 |
| Headform Potentiometer | Sfernice | 095 | 9/29/2023 | 9/28/2024 |




[1,2] Upper and lower boundaries specified in Appendix I


Neck Rotation
Rotation (Deg)
Time [ms]
Max: 51.5 deg
Min: -26.2 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 33.3 deg
Min: -14.7 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.3 deg
Min: -11.6 deg
Filter: CFC 180

# 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 |

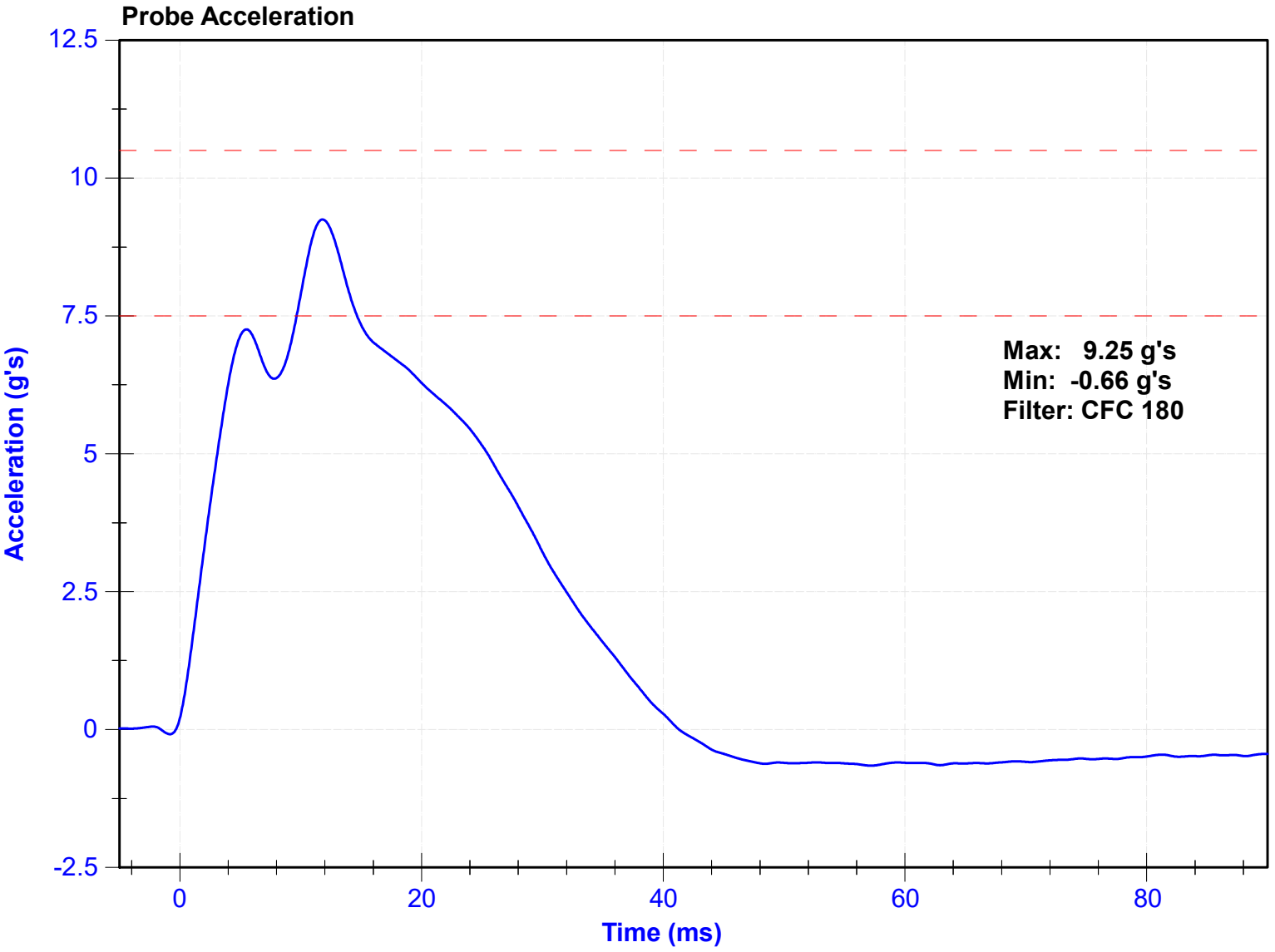
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 49 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.29 | Pass |
| Probe Acceleration | 7.5 | 10.5 | g's | 9.25 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |



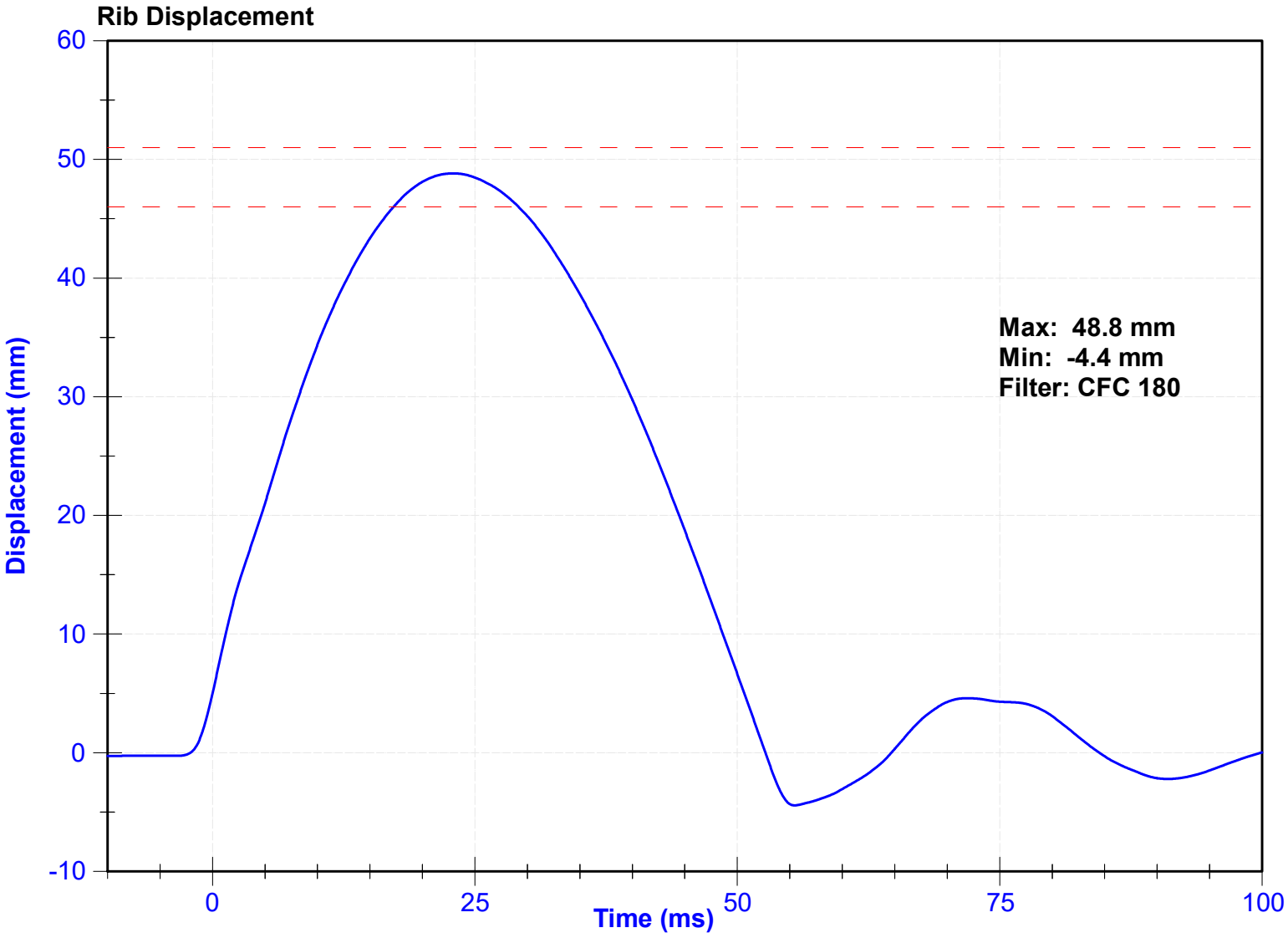
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 46 | 51 | mm | 48.8 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |



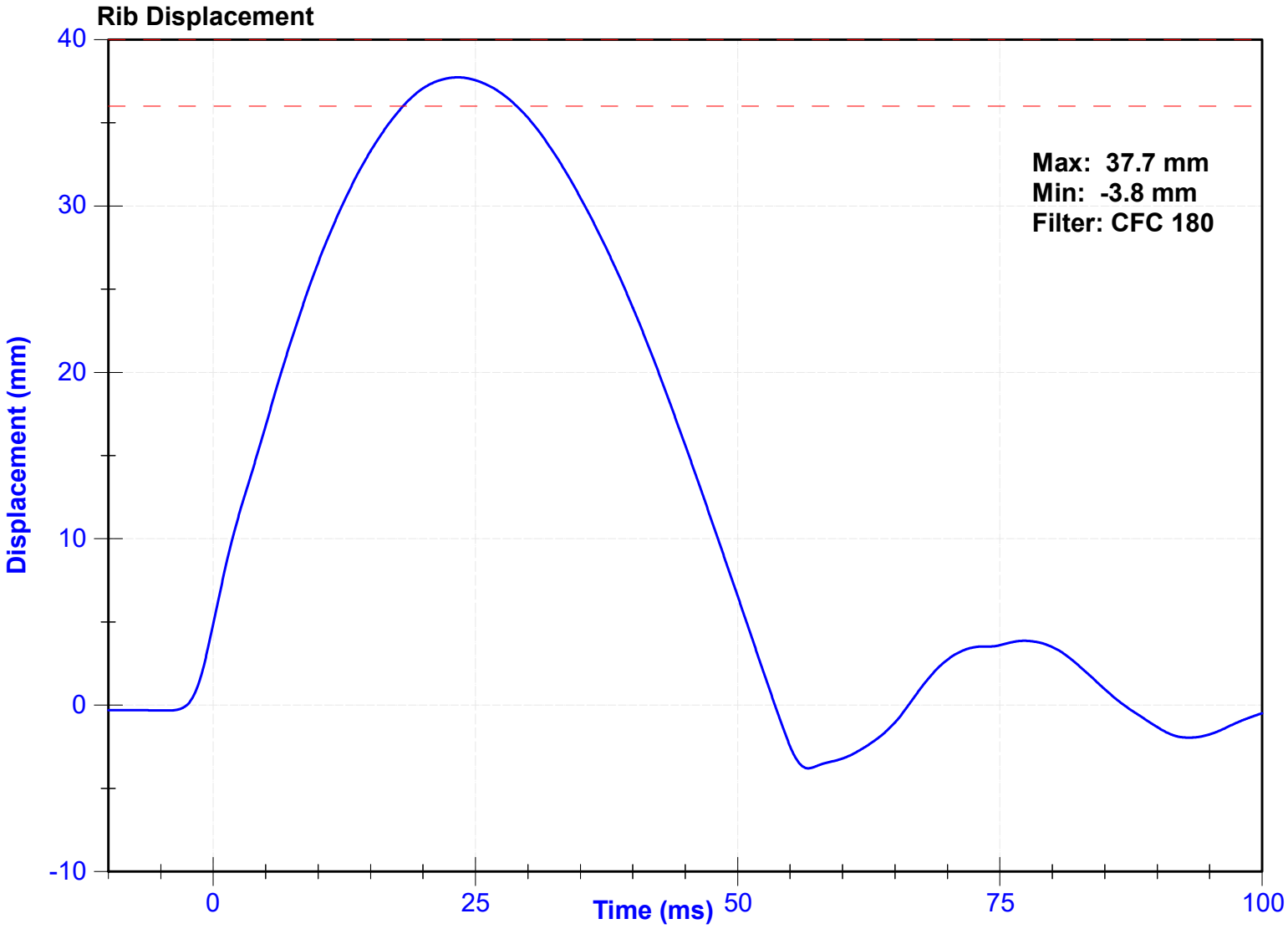
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 36 | 40 | mm | 37.7 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |



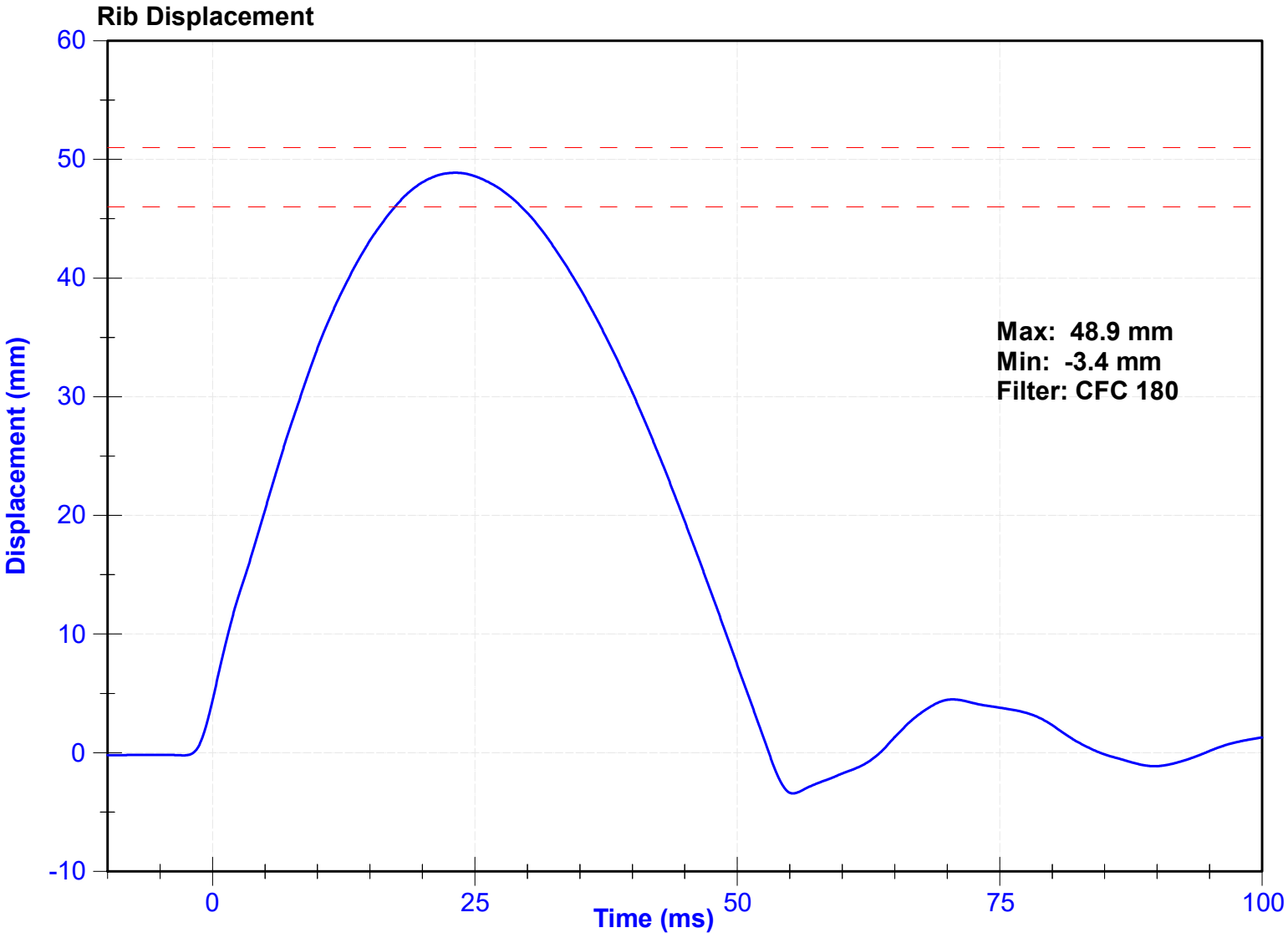
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 46 | 51 | mm | 48.9 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |



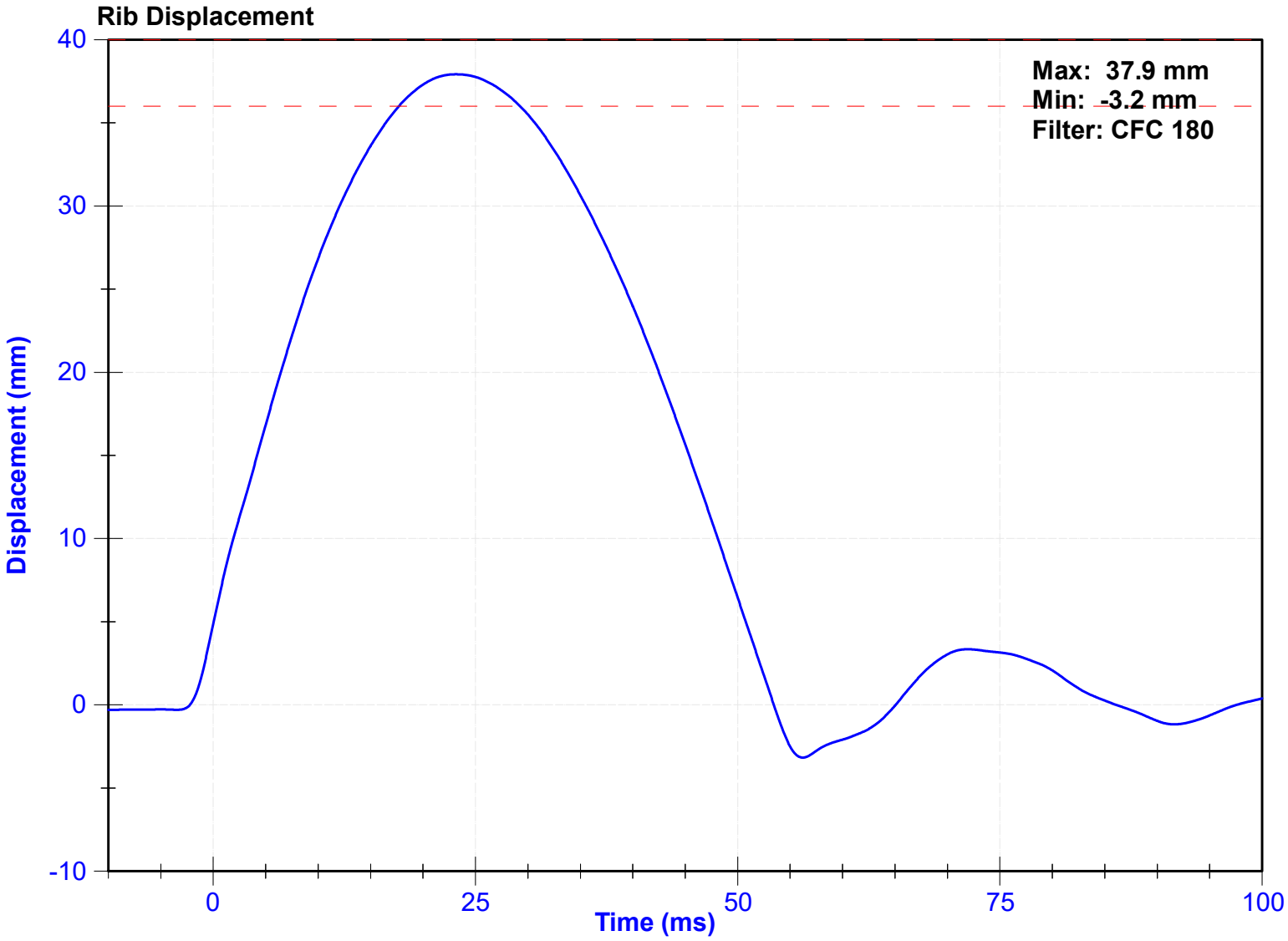
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 36 | 40 | mm | 37.9 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |



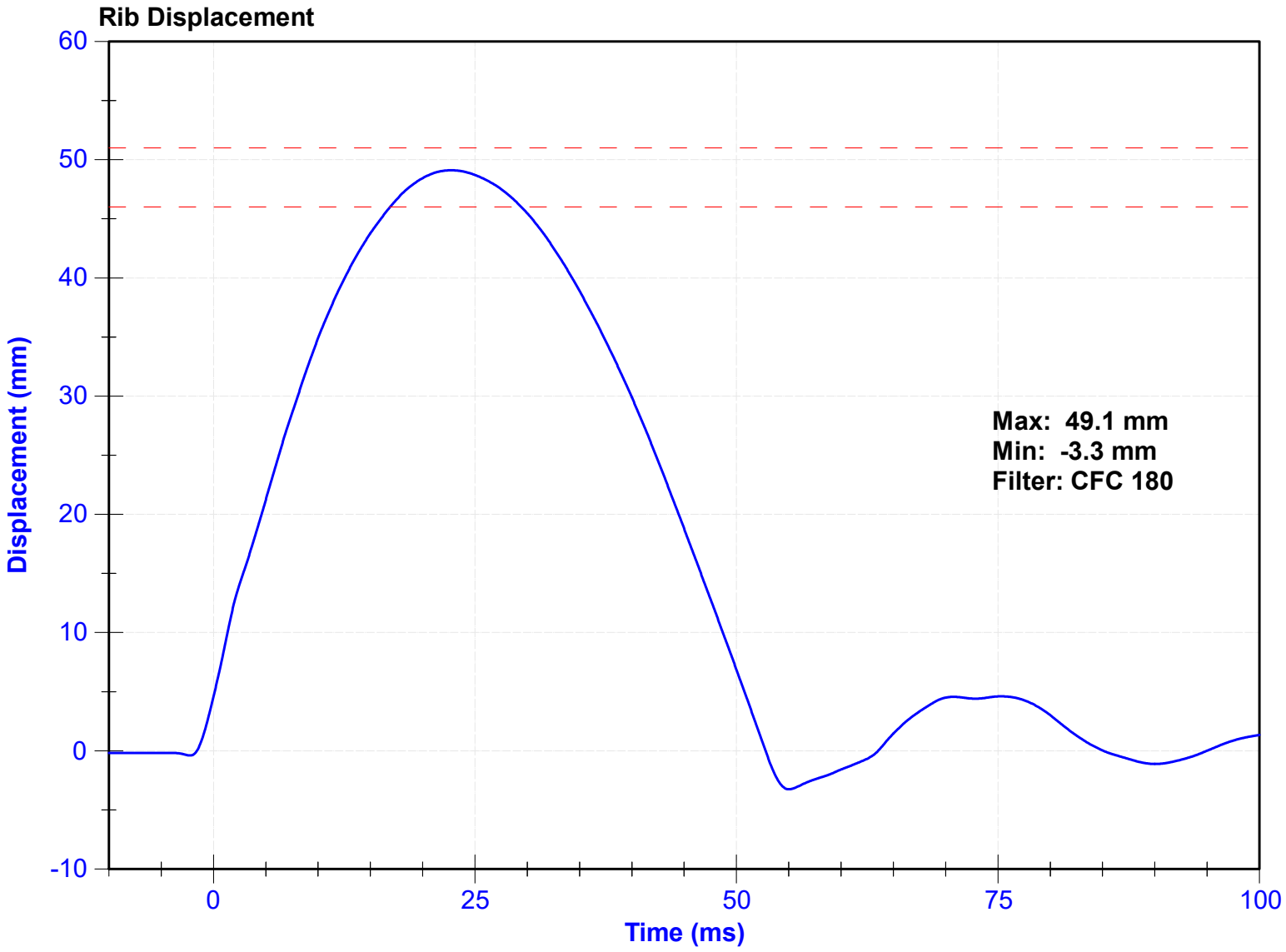
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 46 | 51 | mm | 49.1 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |



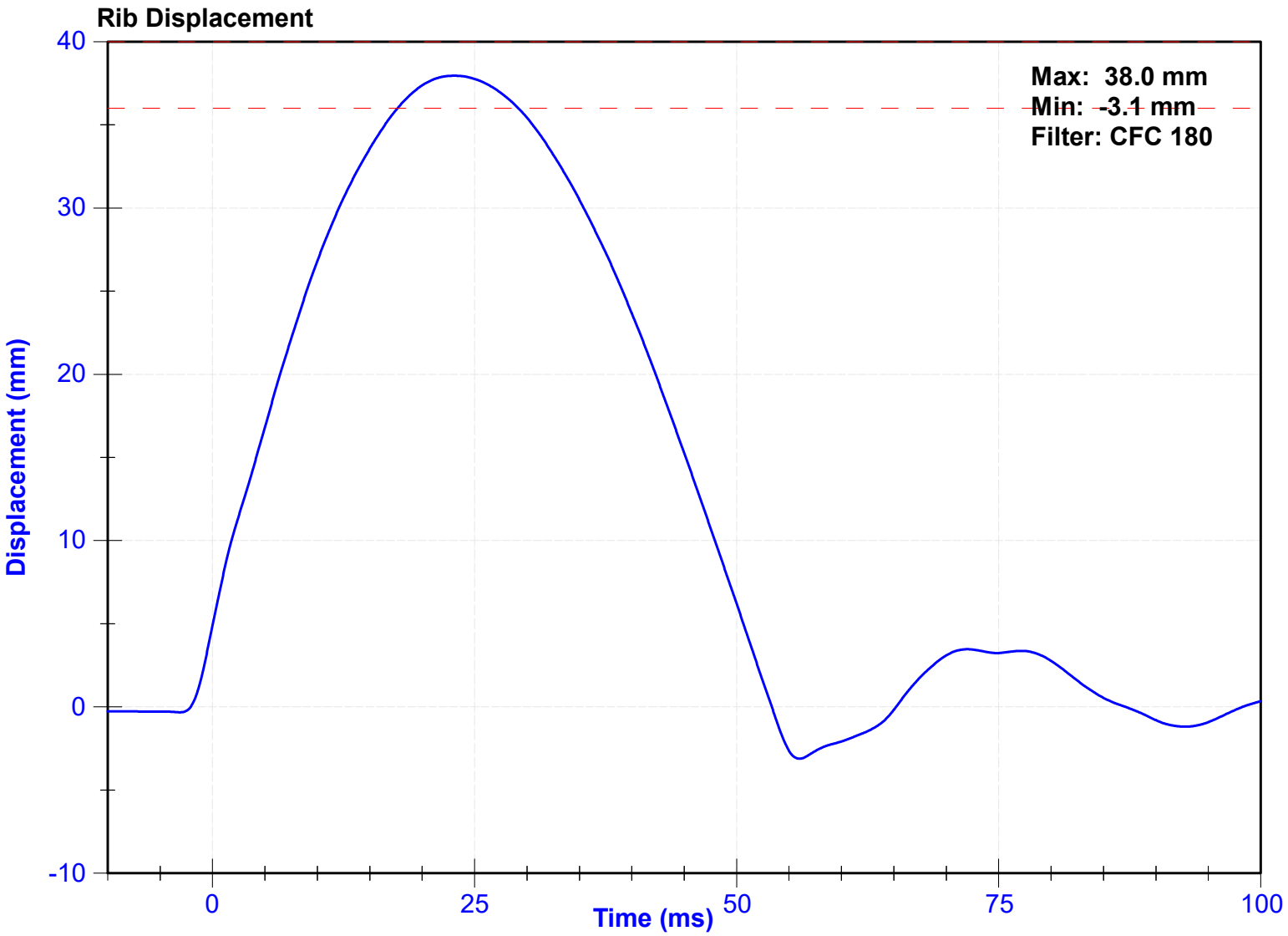
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C.Mantel |

## Results

| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 56 | Pass |
| Rib Displacement | 36 | 40 | mm | 38.0 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |



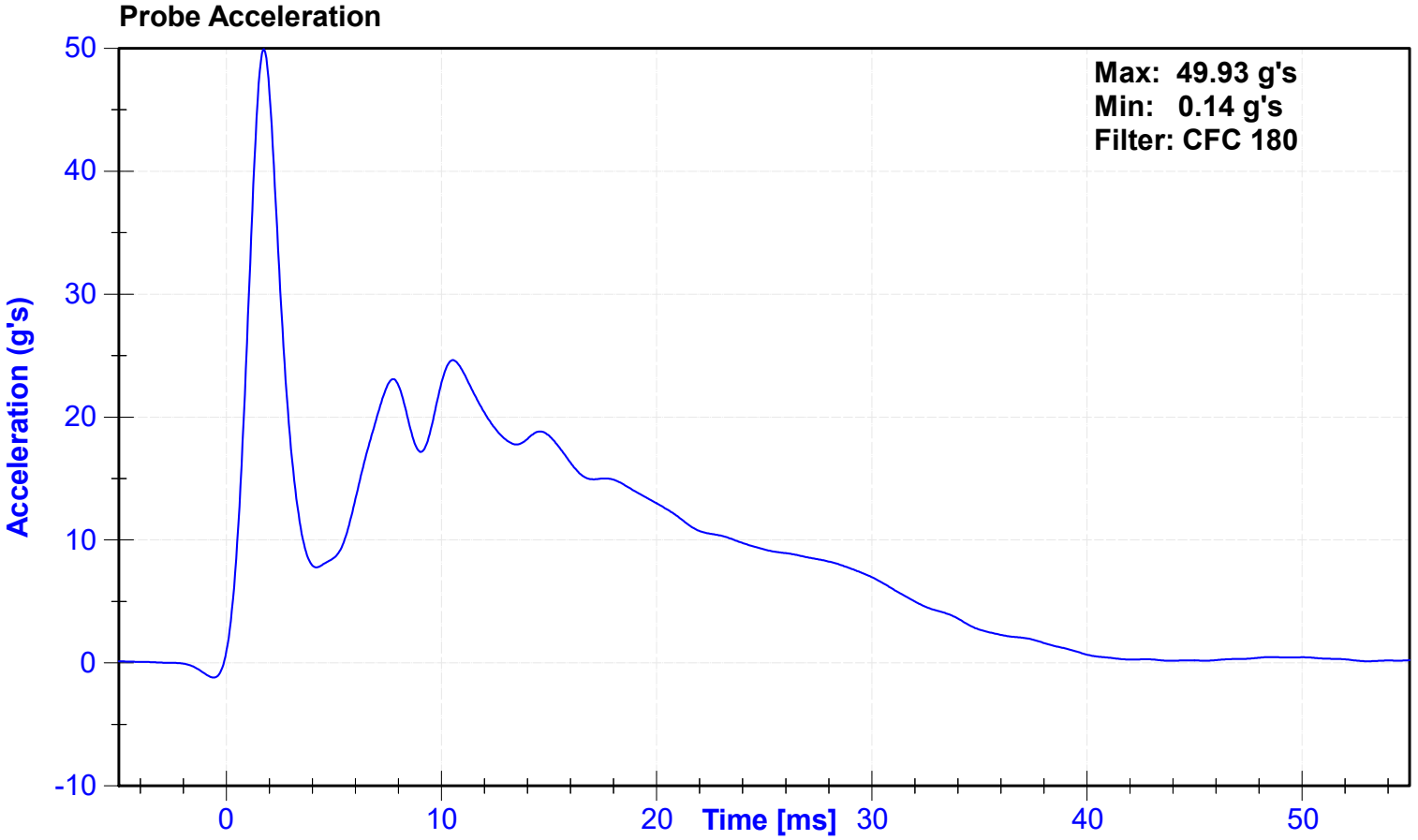
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

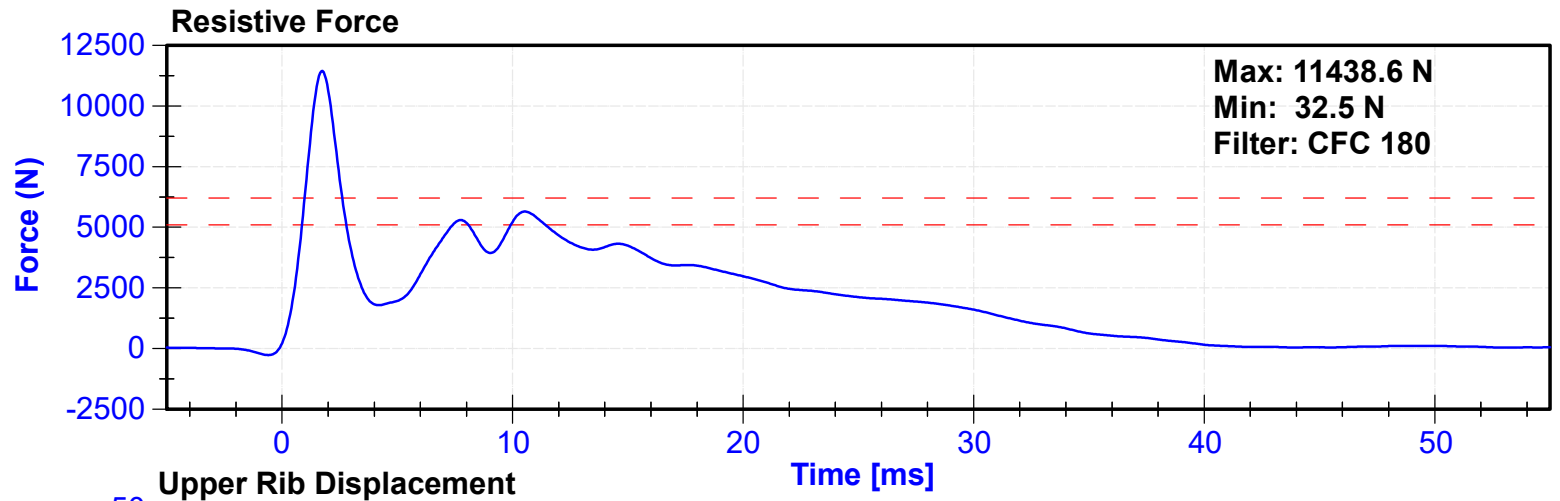
## Results

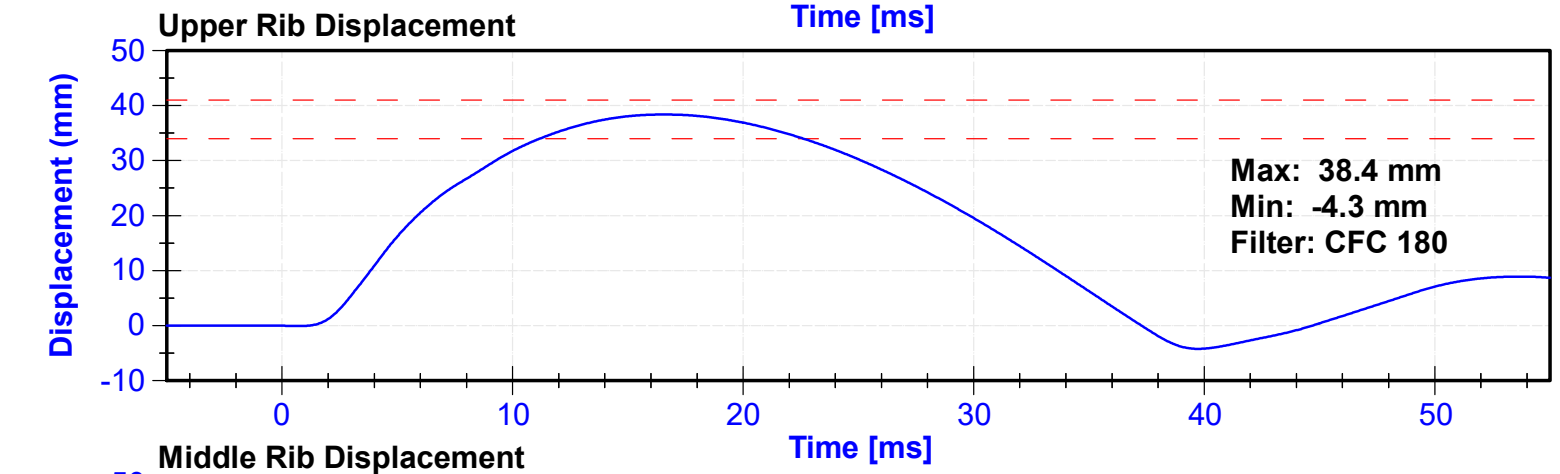
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 49 | Pass |
| Velocity | 5.4 | 5.6 | m/s | 5.52 | Pass |
| Resistive Force after 6ms | 5100 | 6200 | N | 5643.9 | Pass |
| Upper Thorax Rib Deflection | 34 | 41 | mm | 38.4 | Pass |
| Mid Thorax Rib Deflection | 37 | 45 | mm | 42.2 | Pass |
| Lower Thorax Rib Deflection | 37 | 44 | mm | 41.2 | Pass |

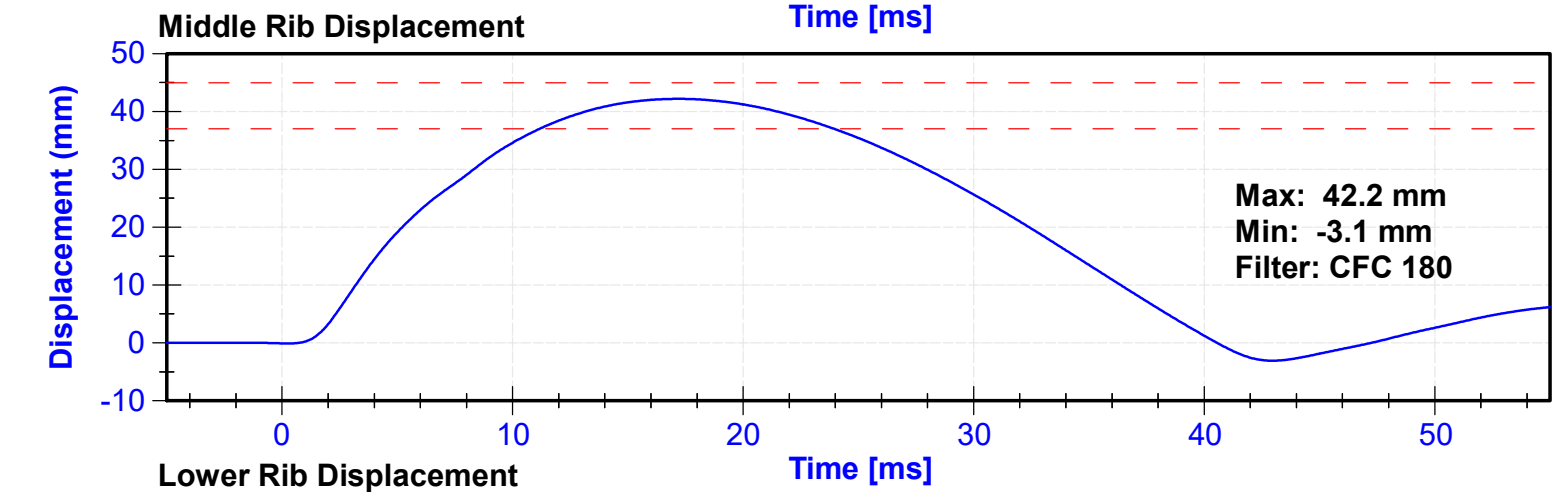
## Transducer Calibrations

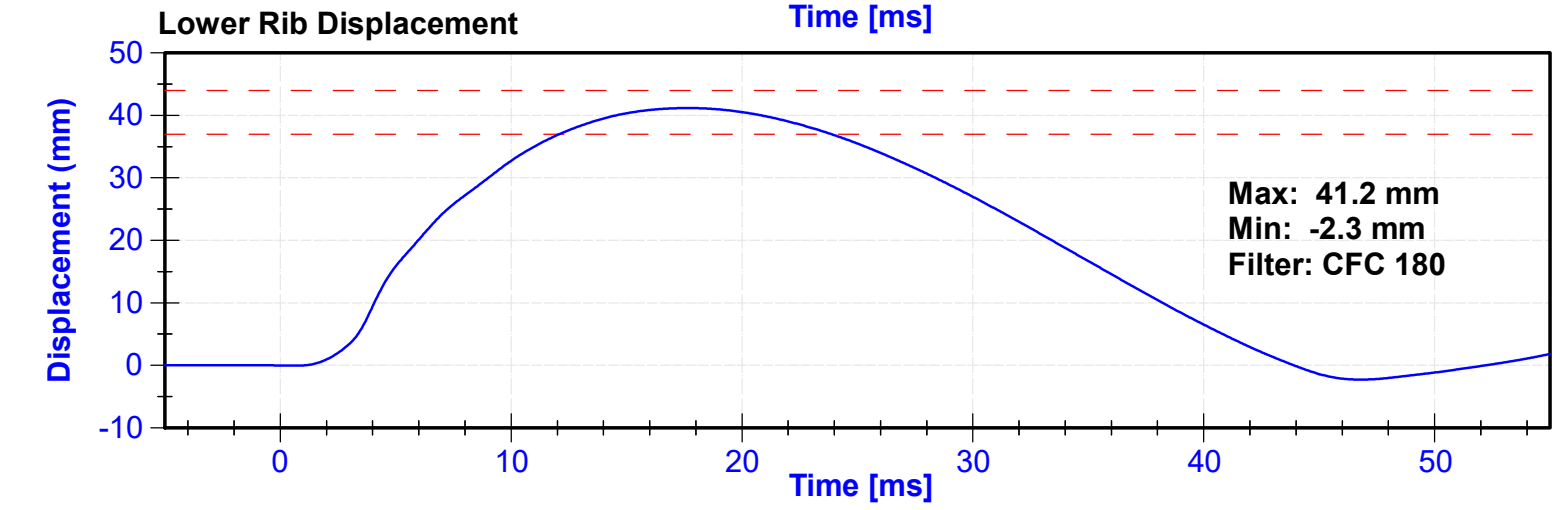
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | 18619 | 3/29/2024 | 9/25/2024 |
| Upper Thorax Rib Potentiometer | Honeywell | 179GFE | 5/6/2024 | 11/4/2024 |
| Middle Thorax Rib Potentiometer | Honeywell | 185GFE | 5/6/2024 | 11/4/2024 |
| Lower Thorax Rib Potentiometer | Honeywell | 178GFE | 5/6/2024 | 11/4/2024 |




Resistive Force
Max: 11438.6 N
Min: 32.5 N
Filter: CFC 180
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 38.4 mm
Min: -4.3 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 42.2 mm
Min: -3.1 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 41.2 mm
Min: -2.3 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

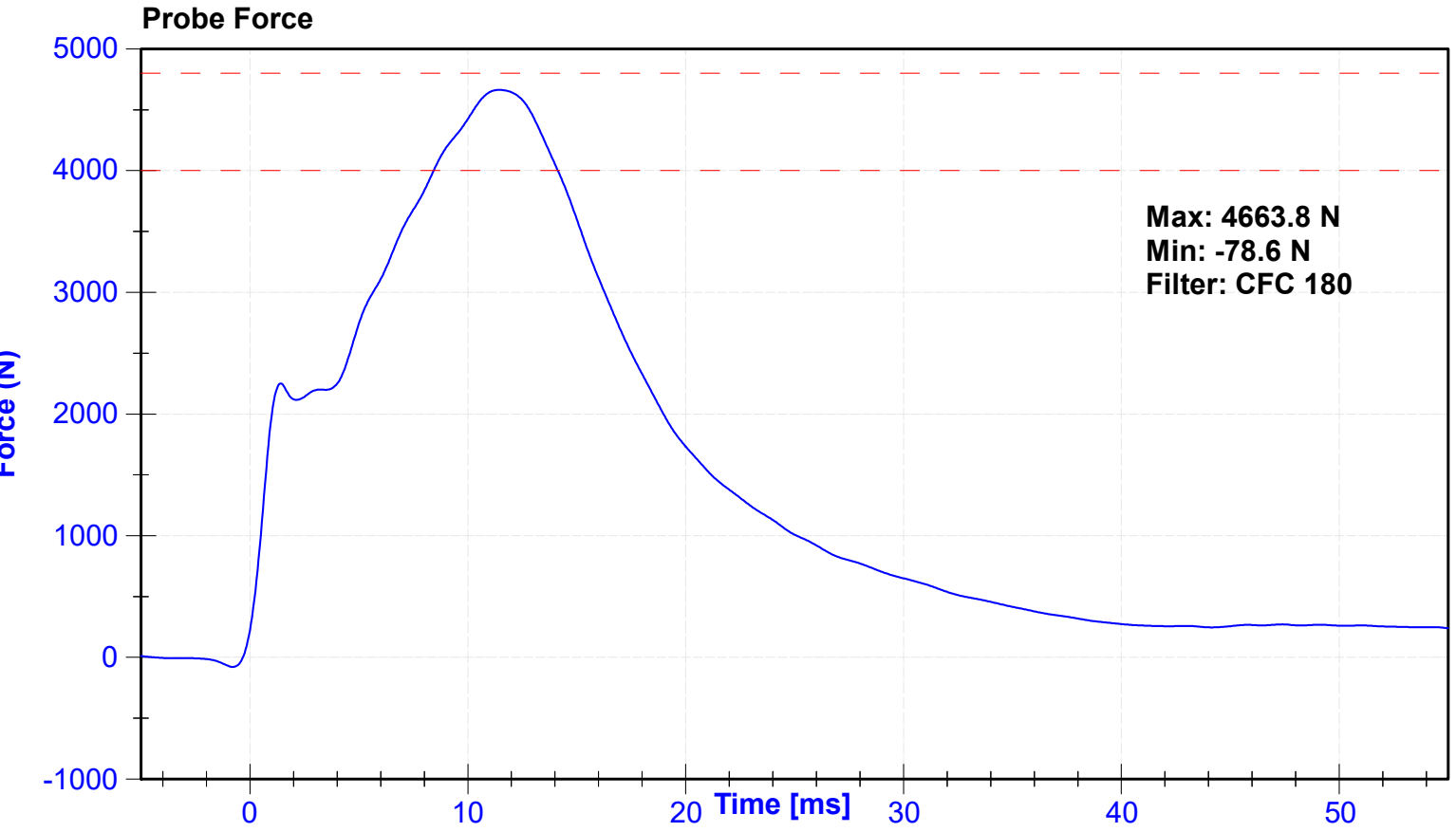
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

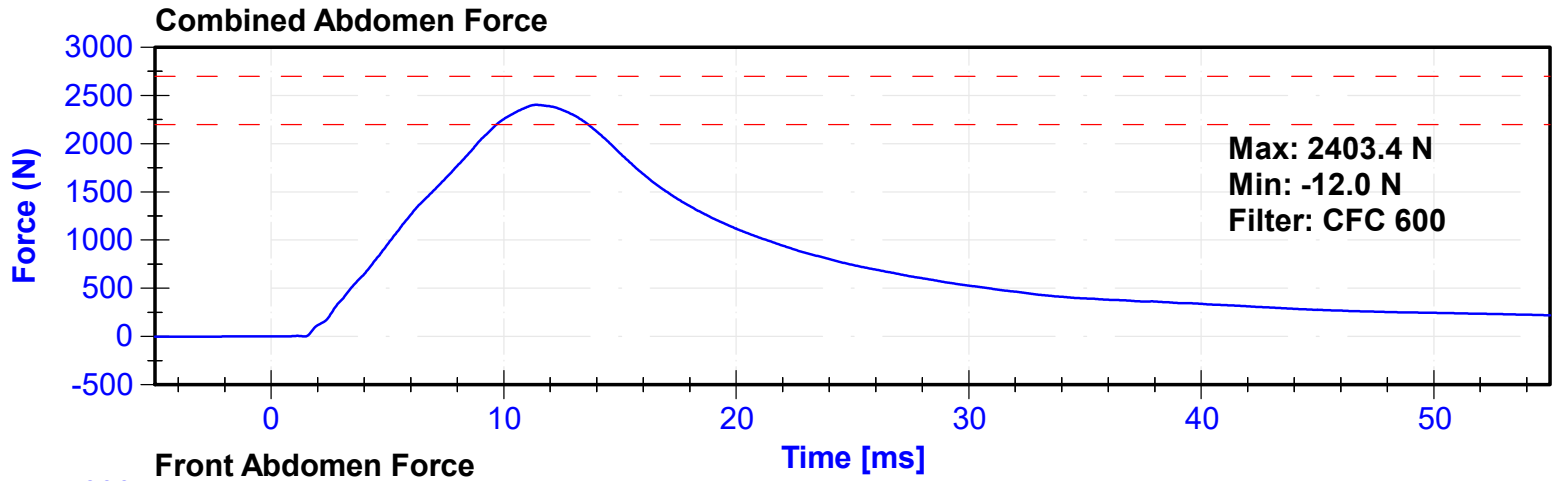
## Results

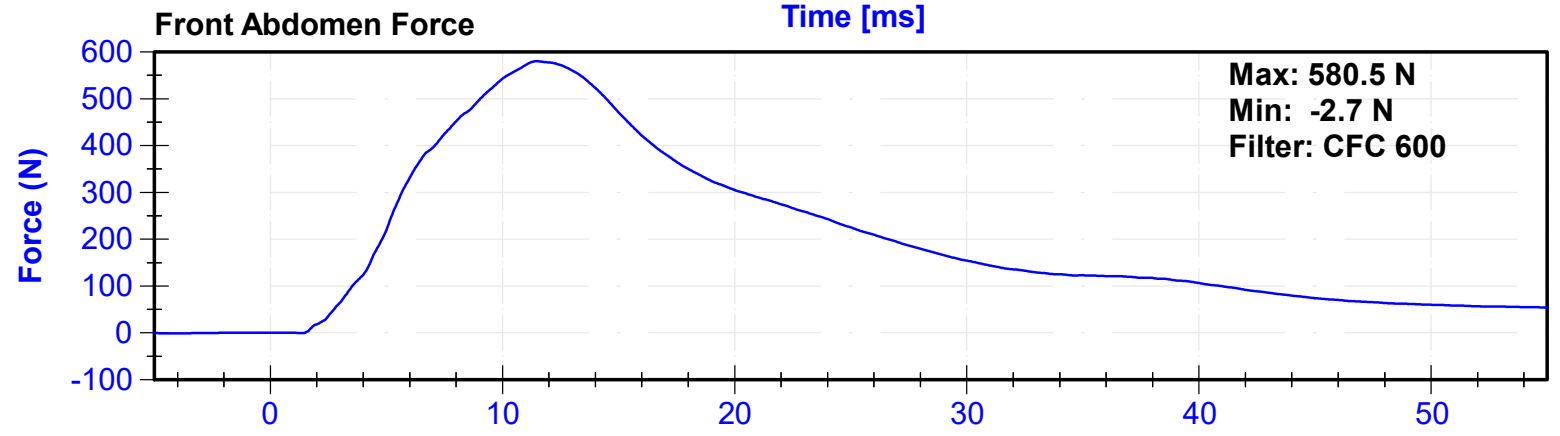
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 49 | Pass |
| Velocity | 3.9 | 4.1 | m/s | 4.03 | Pass |
| Combined Abdomen Force | 2200 | 2700 | N | 2403.4 | Pass |
| Time at Peak Abdomen Force | 10.0 | 12.3 | ms | 11.40 | Pass |
| Resistive Probe Force | 4000 | 4800 | N | 4663.8 | Pass |
| Time at Peak Resistive Force | 10.6 | 13.0 | ms | 11.45 | Pass |

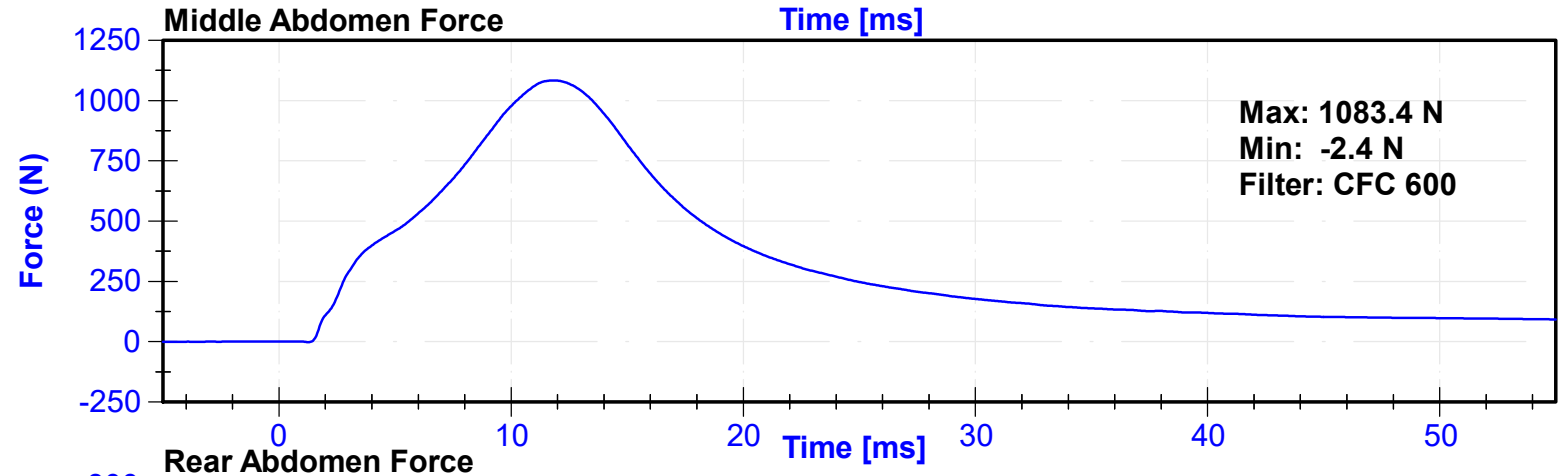
## Transducer Calibrations

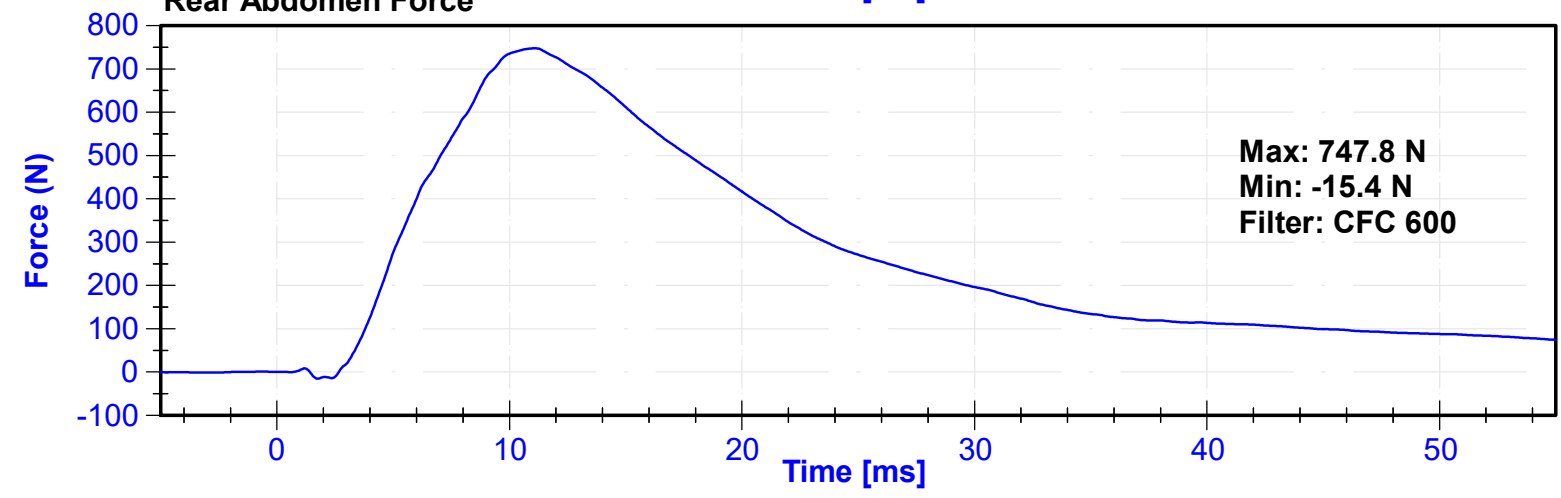
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Front Abdomen Load Cell | Denton | 1509 | 9/12/2023 | 9/11/2024 |
| Middle Abdomen Load Cell | Denton | 1508 | 9/12/2023 | 9/11/2024 |
| Rear Abdomen Load Cell | Denton | 1507 | 9/12/2023 | 9/11/2024 |




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2403.4 N
Min: -12.0 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 580.5 N
Min: -2.7 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 1083.4 N
Min: -2.4 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 747.8 N
Min: -15.4 N
Filter: CFC 600

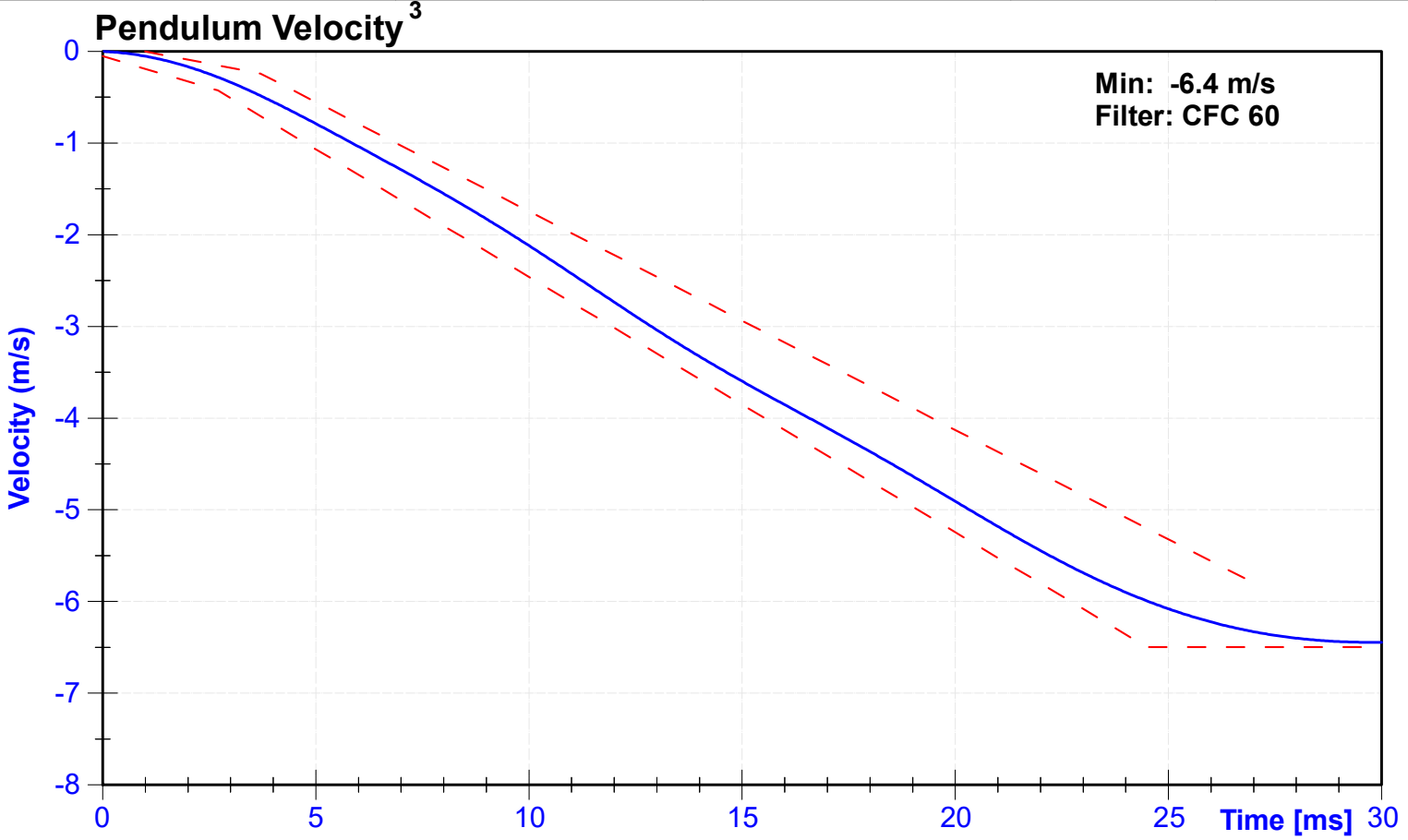
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

## Results

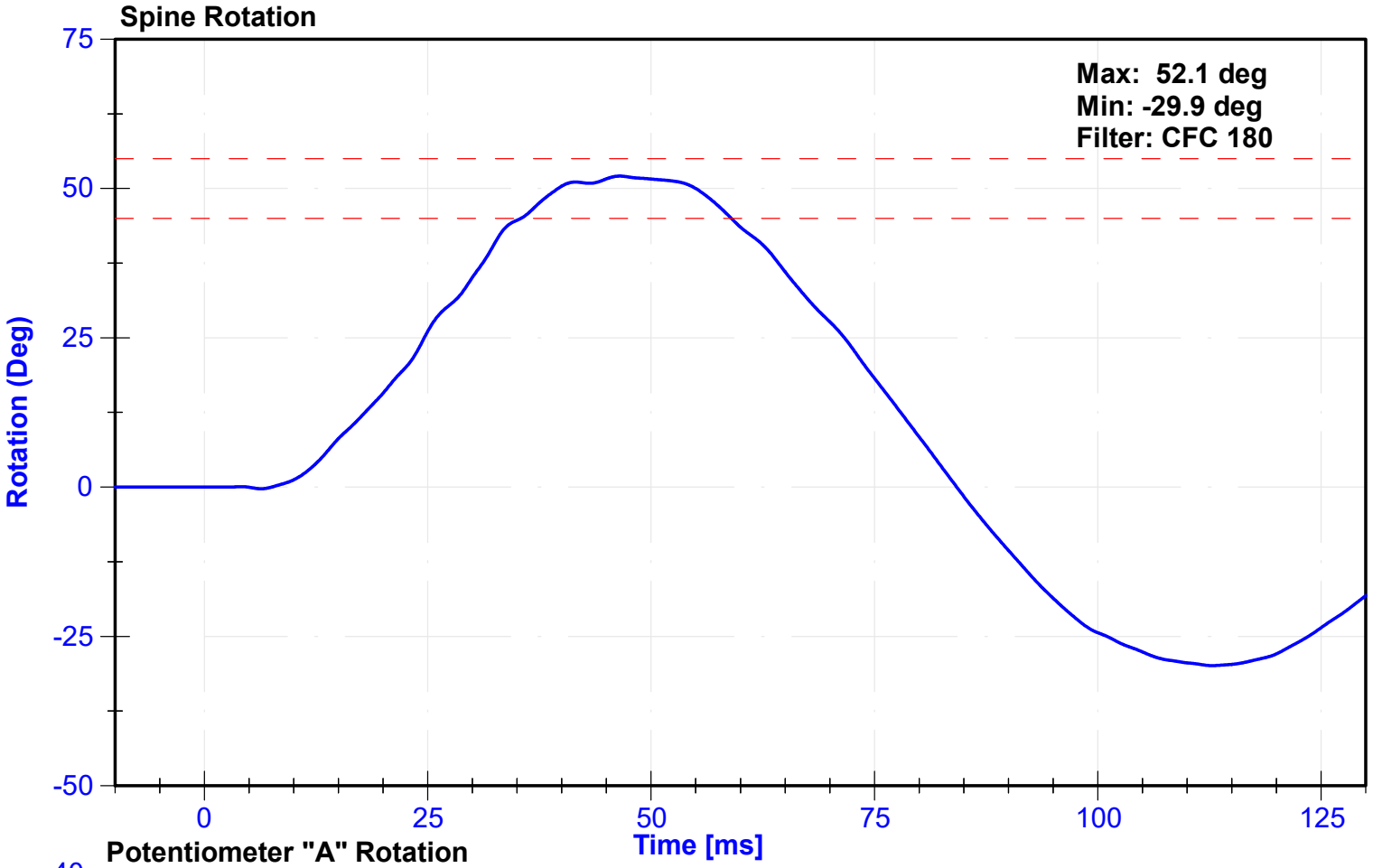
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 49 | Pass |
| Velocity | 5.95 | 6.15 | m/s | 6.086 | Pass |
| Lateral Spine Rotation | 45 | 55 | deg | 52.1 | Pass |
| Time at Maximum Rotation | 39 | 53 | ms | 46.5 | Pass |
| Time of Decay to Zero Degrees | 37 | 57 | ms | 37.8 | Pass |
| Pendulum Velocity Overall Corridor | Lower Boundary[1] | Upper Boundary[2] | m/s | See Plot[3] | Pass |

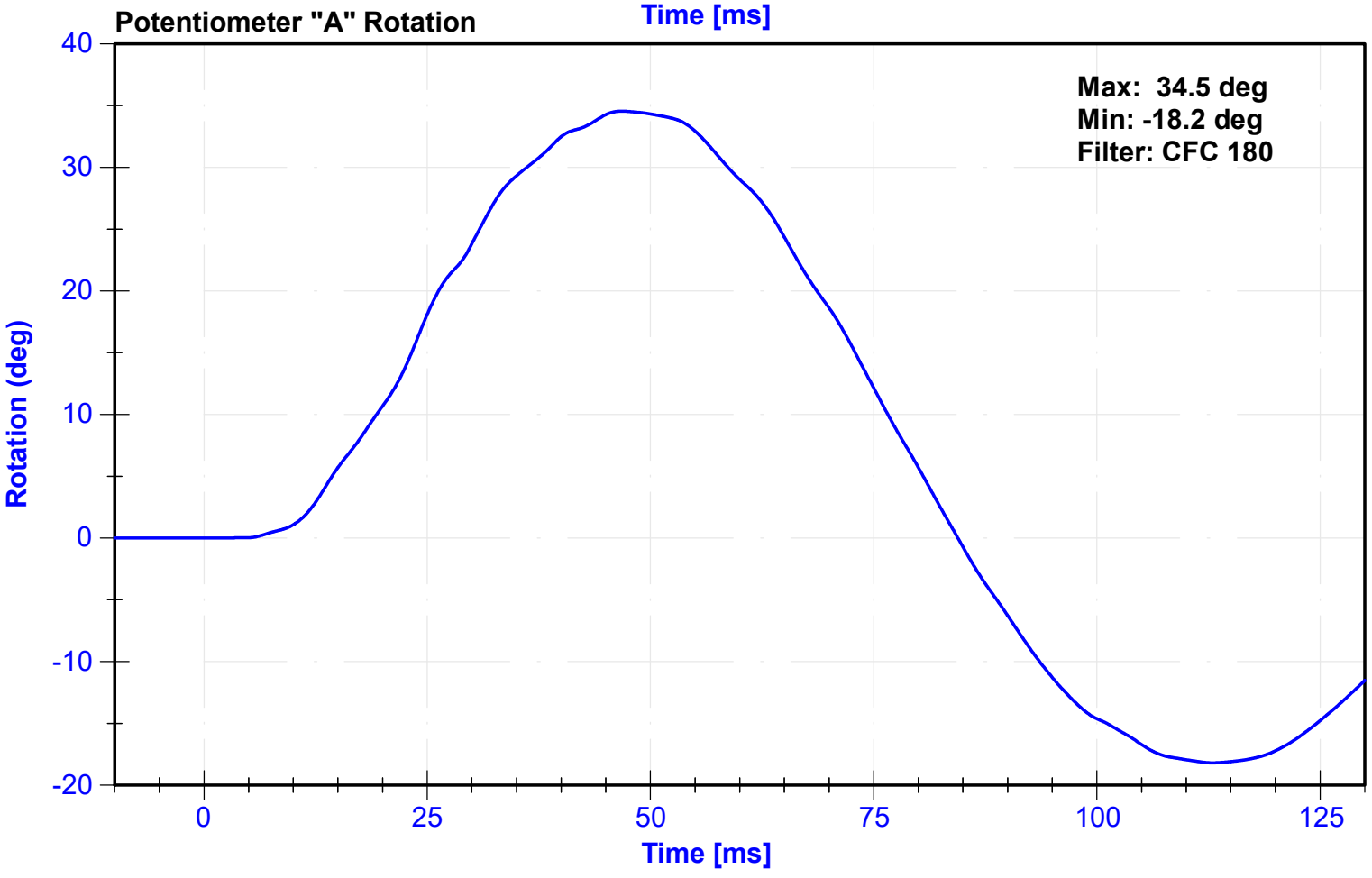
## Transducer Calibrations

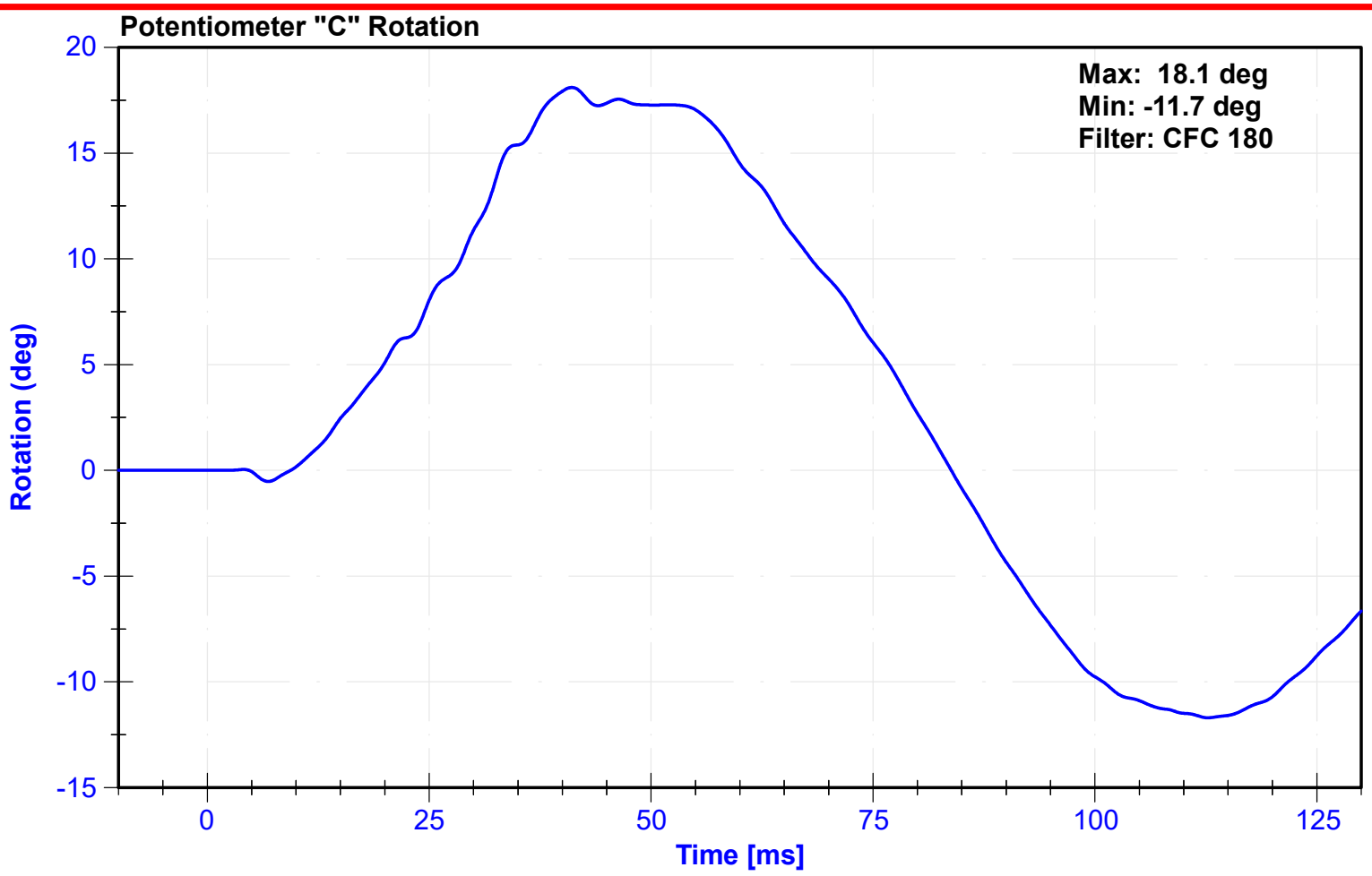
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | C16503 | 4/29/2024 | 10/26/2024 |
| Pendulum "A" Potentiometer | Sfernice | 2247 | 12/5/2023 | 12/4/2024 |
| Condyle "B" Potentiometer | Sfernice | 095 | 9/29/2023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




[1,2] Upper and lower boundaries specified in Appendix I


Spine Rotation
Max: 52.1 deg
Min: -29.9 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 34.5 deg
Min: -18.2 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]




# 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 |

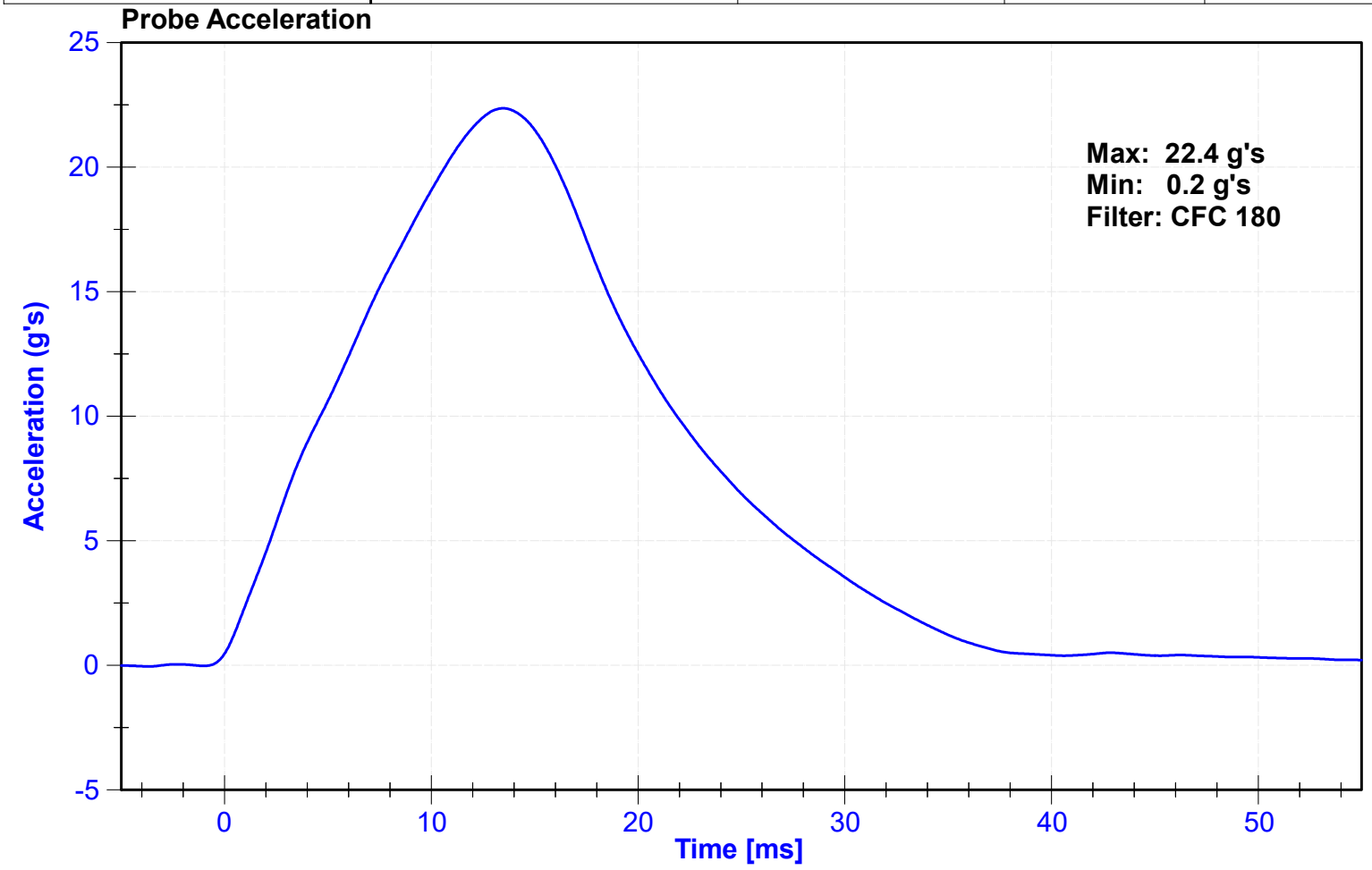
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | F033 | Laboratory Supervisor | C. Mantell |

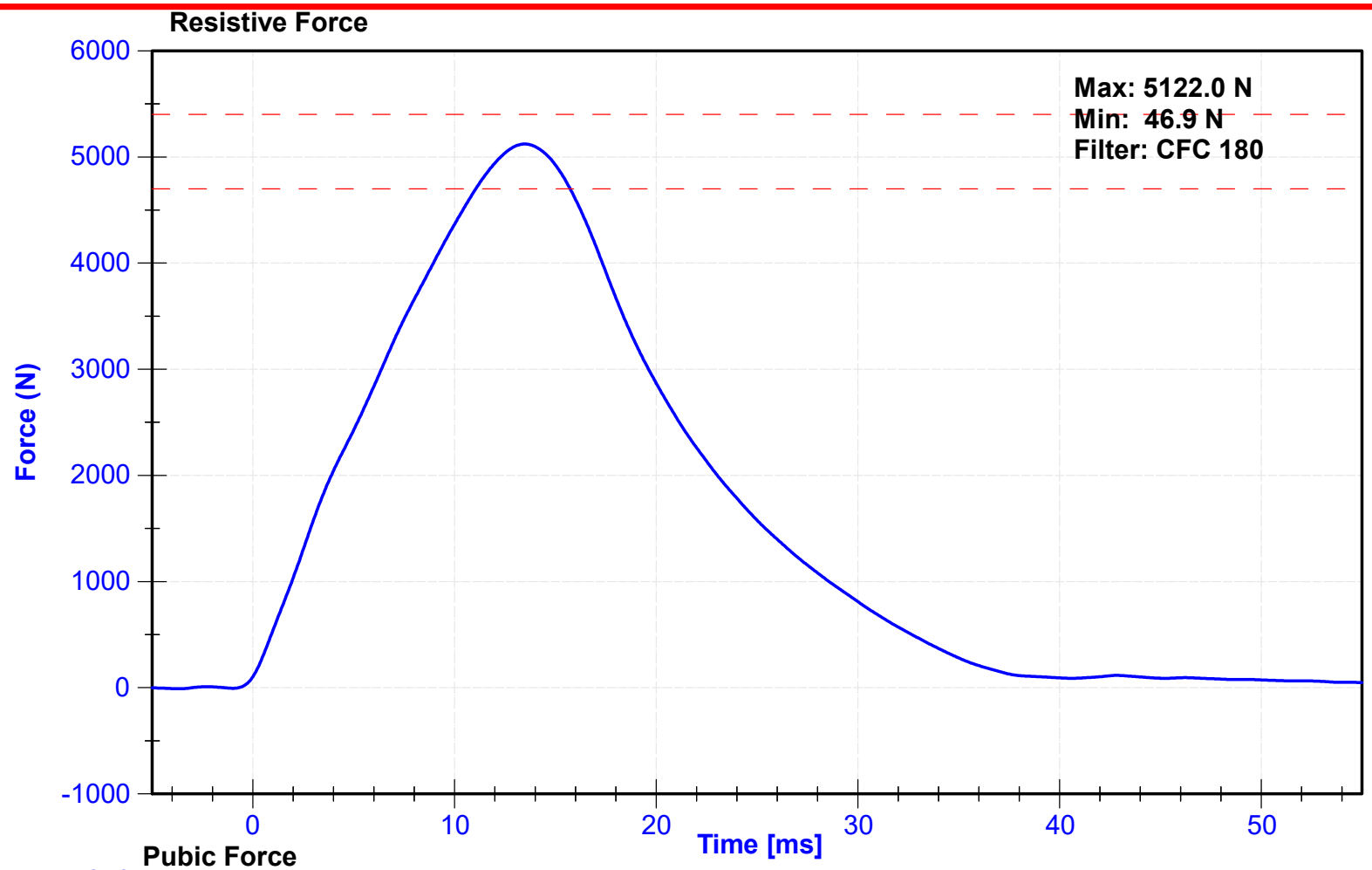
## Results

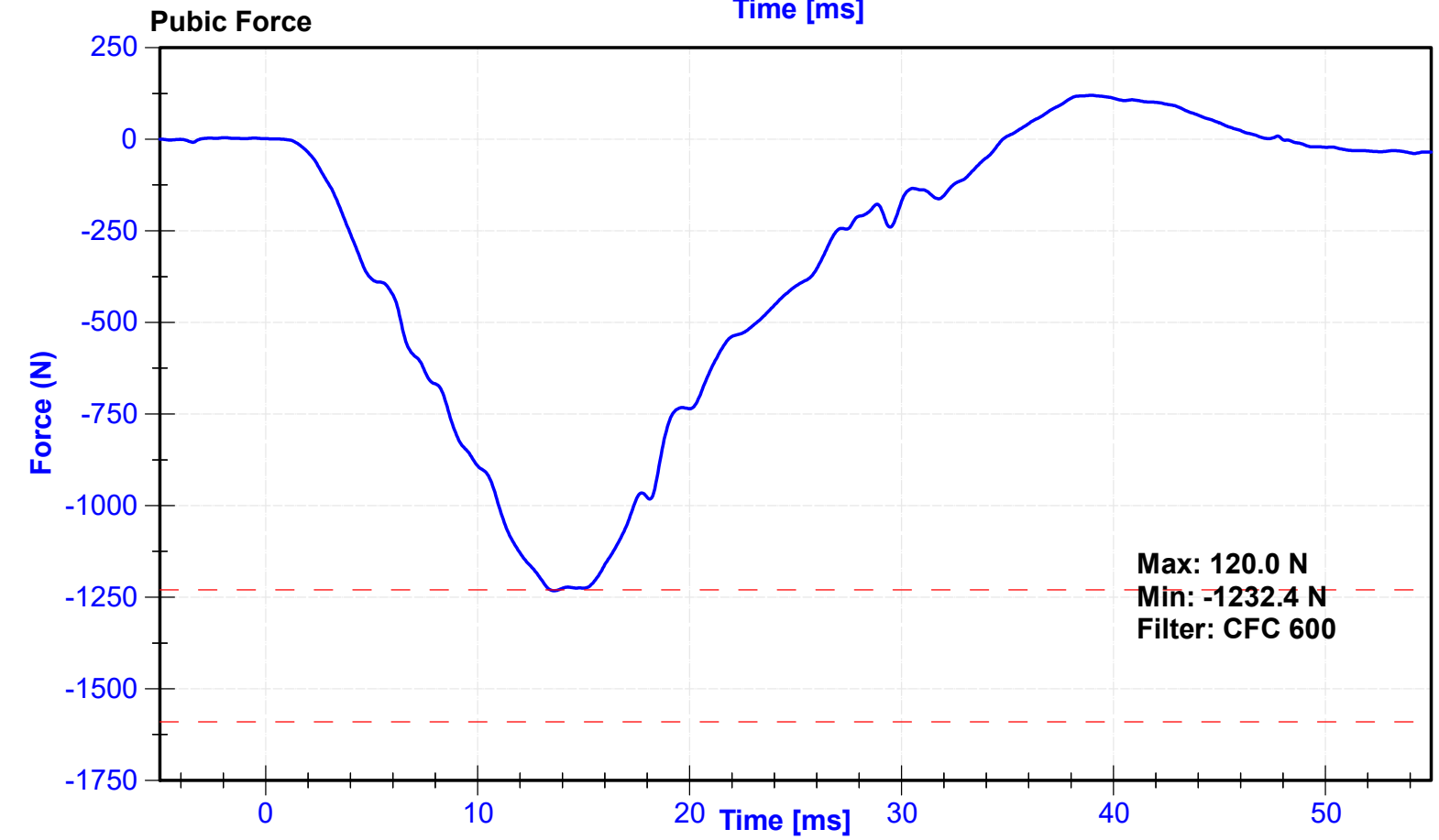
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.8 | Pass |
| Humidity | 10 | 70 | % | 48 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.32 | Pass |
| Resistive Force | 4700 | 5400 | N | 5122.0 | Pass |
| Time at Peak Resistive Force | 11.8 | 16.1 | ms | 13.45 | Pass |
| Pubic Force | -1590 | -1230 | N | -1232.4 | Pass |
| Time at Peak Pubic Force | 12.2 | 17.0 | ms | 13.60 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Pubic Load Cell | Denton | 459-FY | 6/20/2023 | 6/19/2024 |




Resistive Force
Max: 5122.0 N
Min: 46.9 N
Filter: CFC 180
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]


Pubic Force
Max: 120.0 N
Min: -1232.4 N
Filter: CFC 600
Force (N)
250
0
-250
-500
-750
-1000
-1250
-1500
-1750
0
10
20
30
40
50
Time [ms]

**CALIBRATION TEST RESULTS**

**POST-TEST**

**SID-IIS 5TH PERCENTILE FEMALE – PASSENGER ATD**

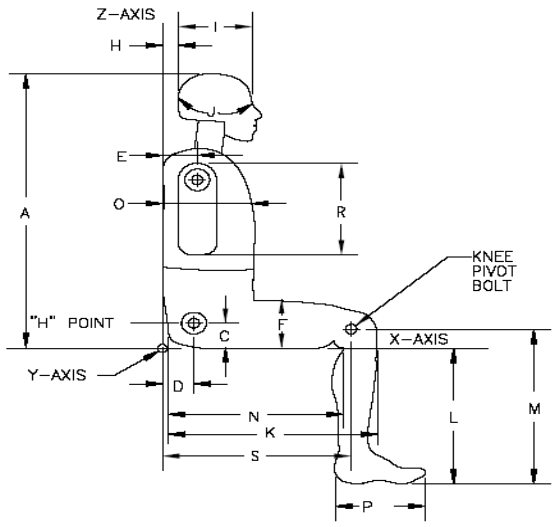
**SERIAL NO:300**

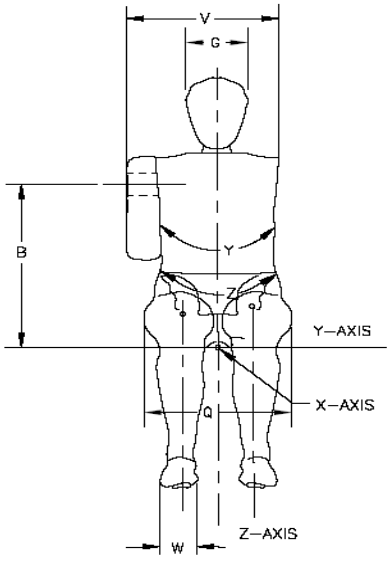
**(CONFIGURED FOR LEFT SIDE IMPACT)**

External Measurements - SID-IIs

Technician: K. Brogan  Date: 5/28/2024

Dummy Serial Number: 300




| Symbol | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| A | Sitting Height | 772 | 788 | 782 | Pass |
| B | Shoulder Pivot Height | 437 | 453 | 446 | Pass |
| C | H-point Height | 79 | 89 | 84 | Pass |
| D | H-point from seatback | 141 | 151 | 146 | Pass |
| E | Shoulder Pivot from Backline | 97 | 107 | 98 | Pass |
| F | Thigh Clearance | 119 | 135 | 127 | Pass |
| G | Head Breadth | 140 | 148 | 145 | Pass |
| H | Head Back from Backline | 40 | 46 | 43 | Pass |
| I | Head Depth | 178 | 188 | 181 | Pass |
| J | Head Circumference | 541 | 551 | 548 | Pass |
| K | Buttock to Knee Length | 514 | 540 | 530 | Pass |
| L | Popliteal Height | 343 | 369 | 357 | Pass |
| M | Knee Pivot to floor height | 392 | 409 | 402 | Pass |
| N | Buttock Popliteal Length | 416 | 442 | 435 | Pass |
| O | Chest Depth w/o jacket | 195 | 211 | 199 | Pass |
| P | Foot Length | 216 | 232 | 225 | Pass |
| Q | Hip Breadth (w/pelvic plugs) | 313 | 323 | 319 | Pass |
| R | Arm Length | 249 | 259 | 255 | Pass |
| S | Knee Joint to seatback | 477 | 493 | 489 | Pass |
| V | Shoulder Width | 341 | 357 | 351 | Pass |
| W | Foot Width | 78 | 94 | 85 | Pass |
| Y | Chest Circumference w/jacket | 851 | 881 | 878 | Pass |
| Z | Waist Circumference | 761 | 791 | 780 | Pass |

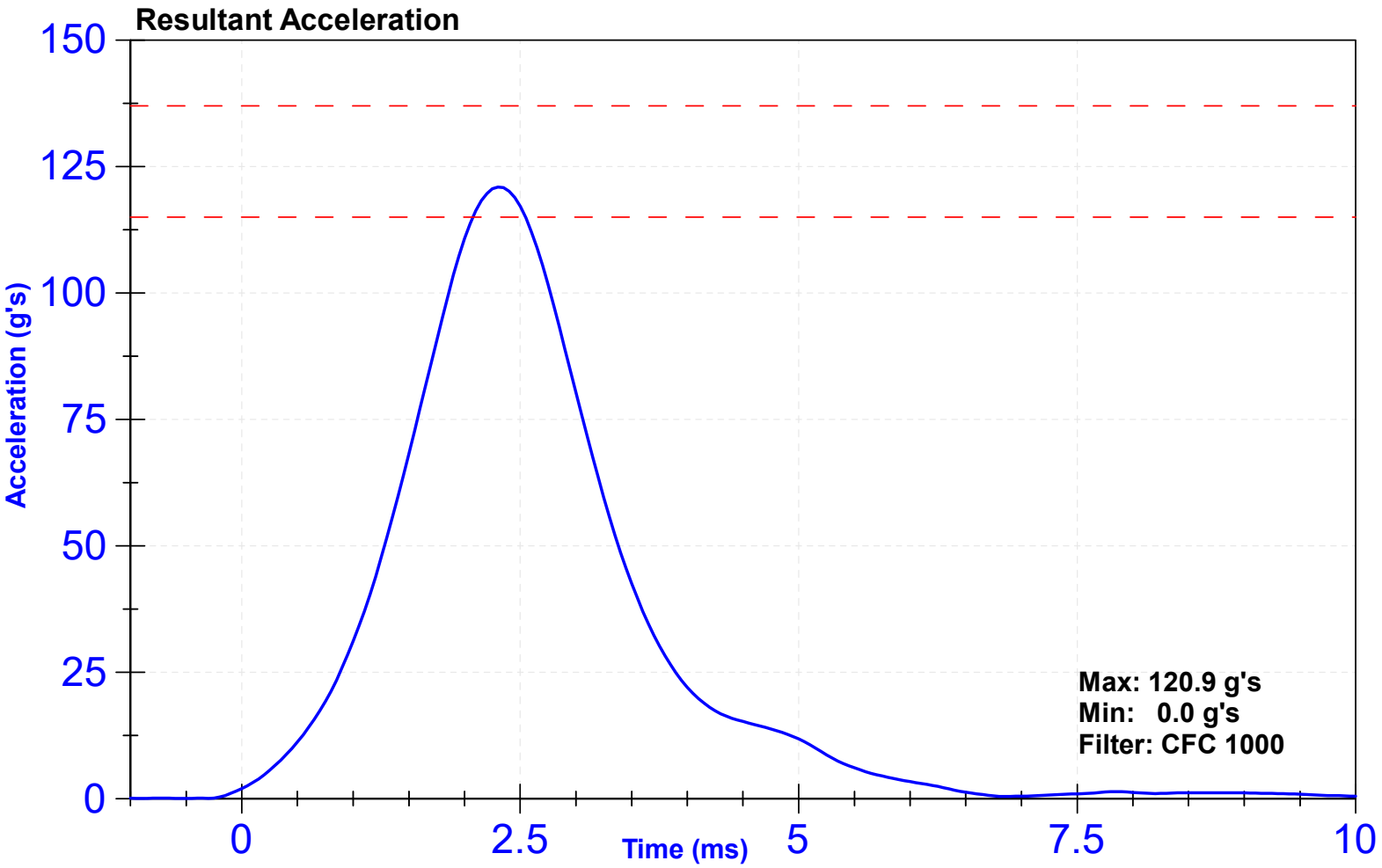
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

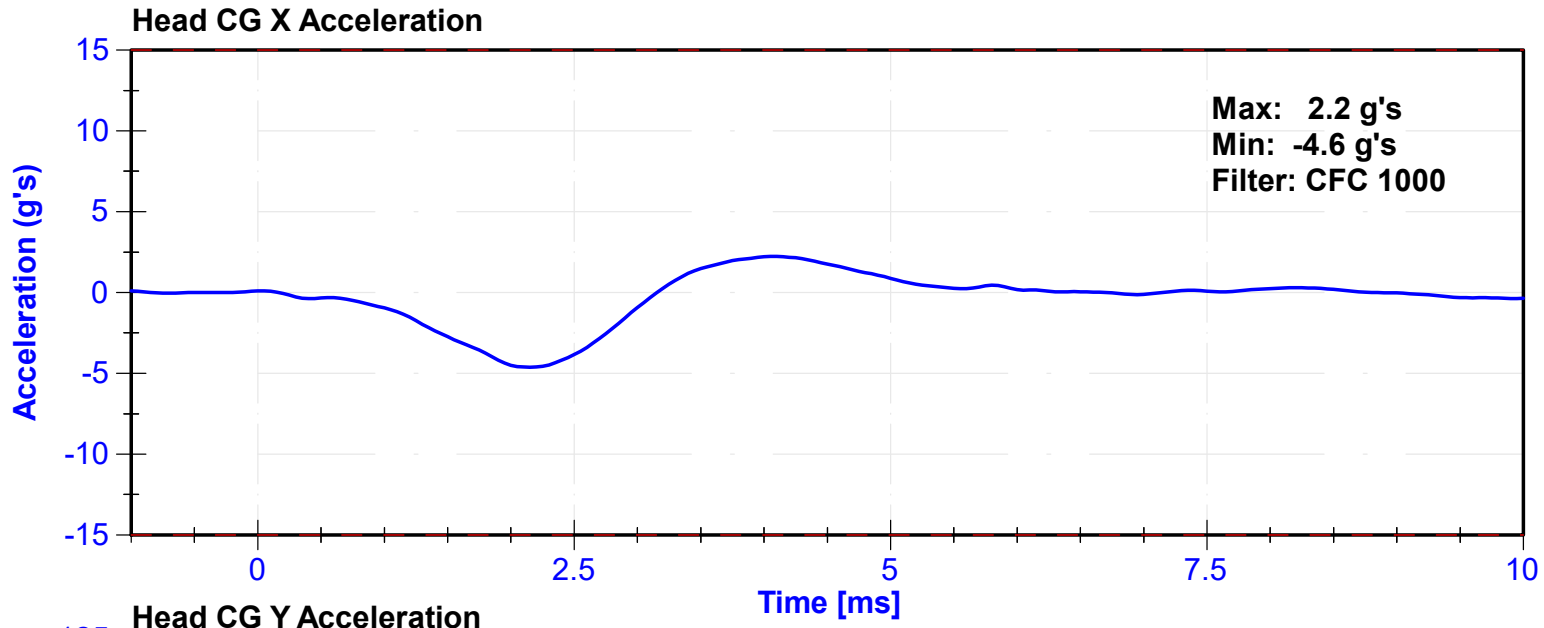
## Results

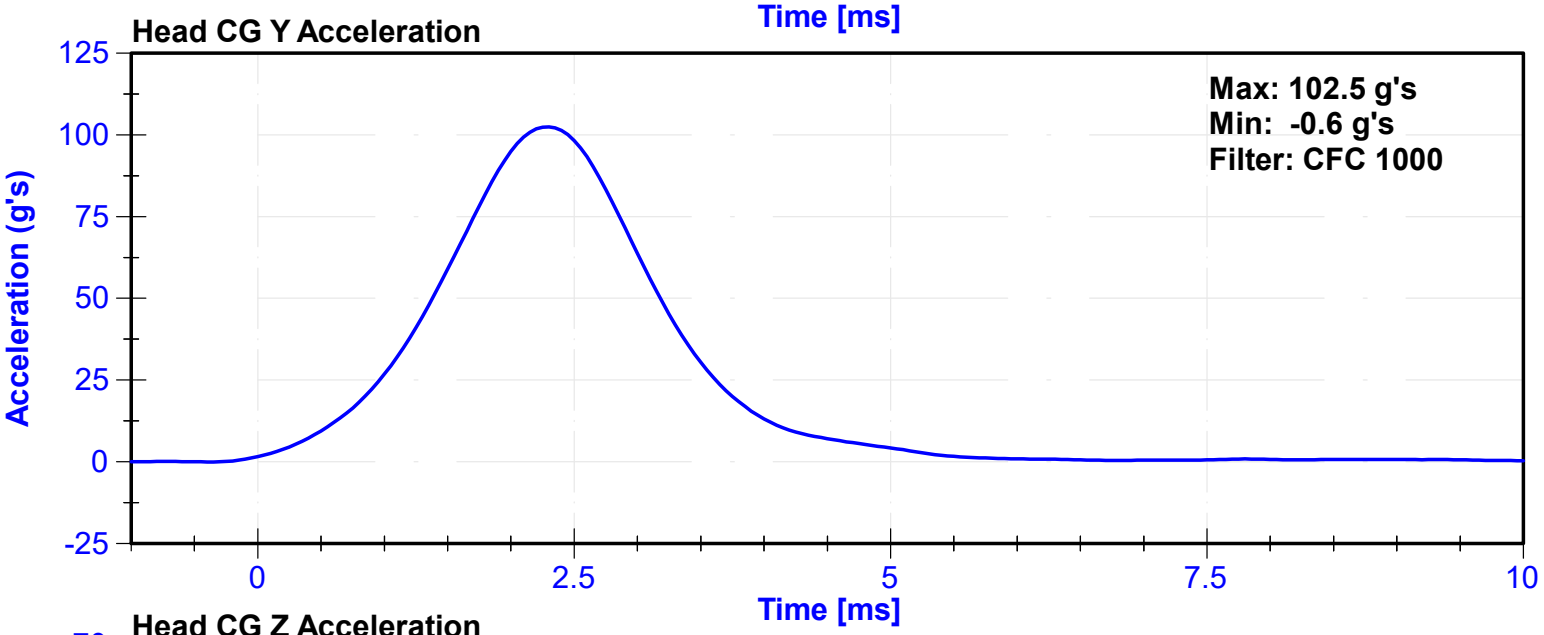
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.4 | Pass |
| Humidity | 10 | 70 | % | 51 | Pass |
| Resultant Acceleration | 115 | 137 | g's | 120.9 | Pass |
| Oscillation | 0 | 15 | % | 1.1 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | -4.6 | Pass |

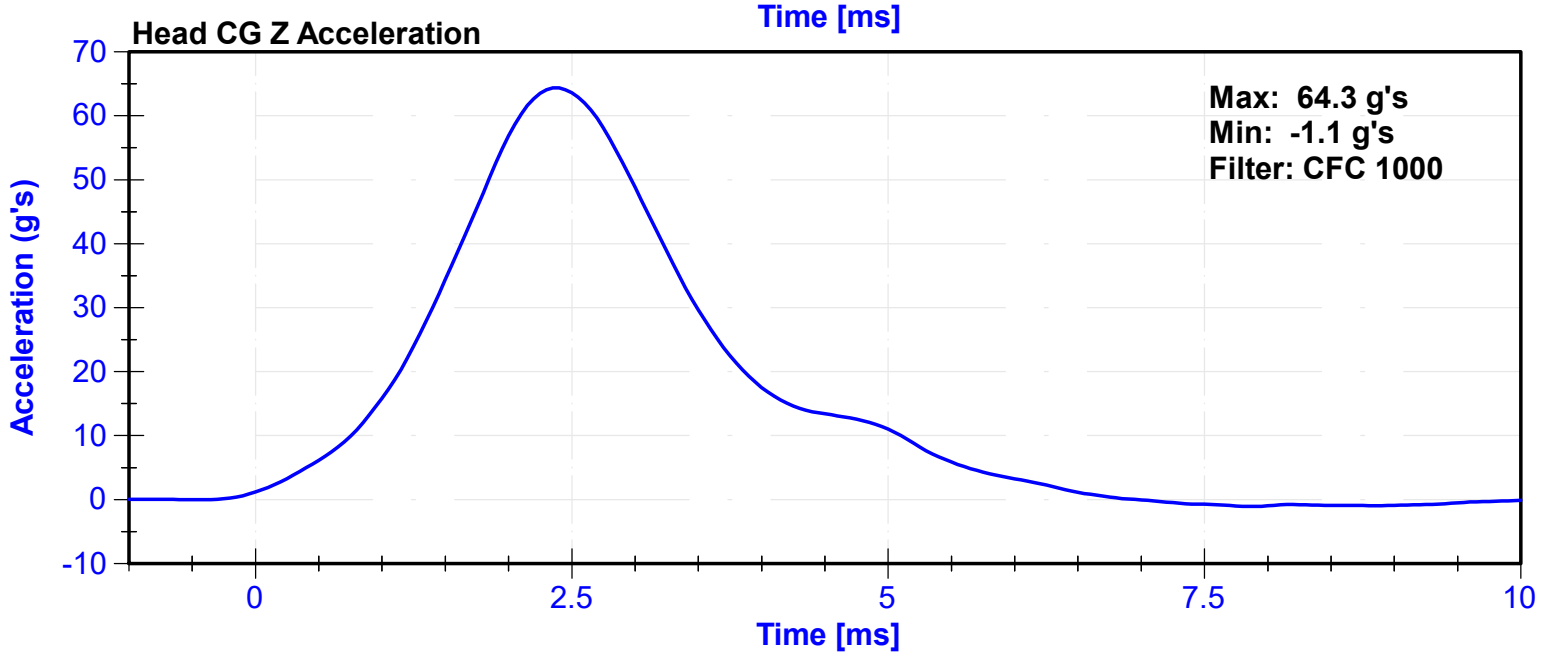
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibratio Date | Calibratio Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P59018 | 5/9/2024 | 11/5/2024 |
| Y Accelerometer | Endevco | P79189 | 5/9/2024 | 11/5/2024 |
| Z Accelerometer | Endevco | P79587 | 5/9/2024 | 11/5/2024 |




Head CG X Acceleration
Max: 2.2 g's
Min: -4.6 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 102.5 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 64.3 g's
Min: -1.1 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

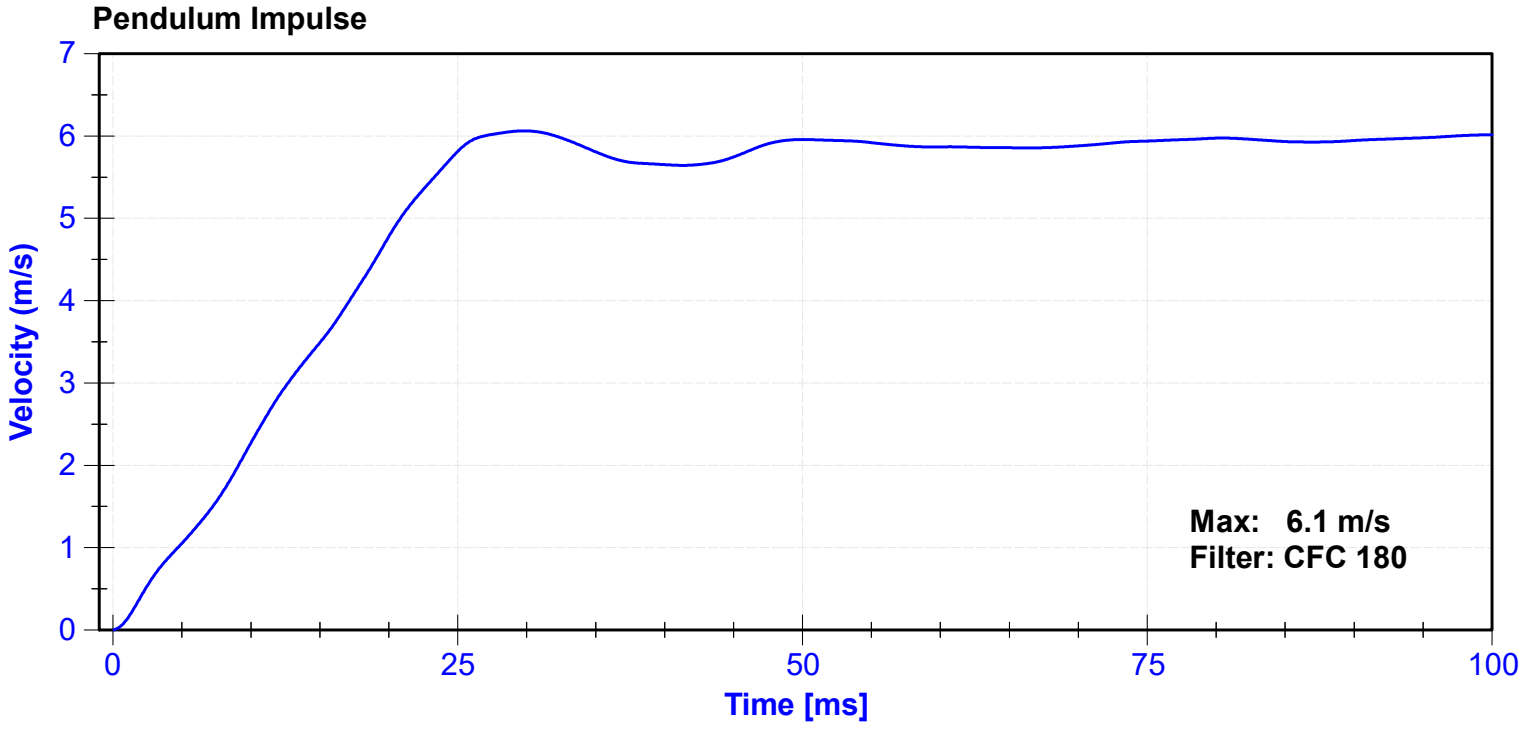
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

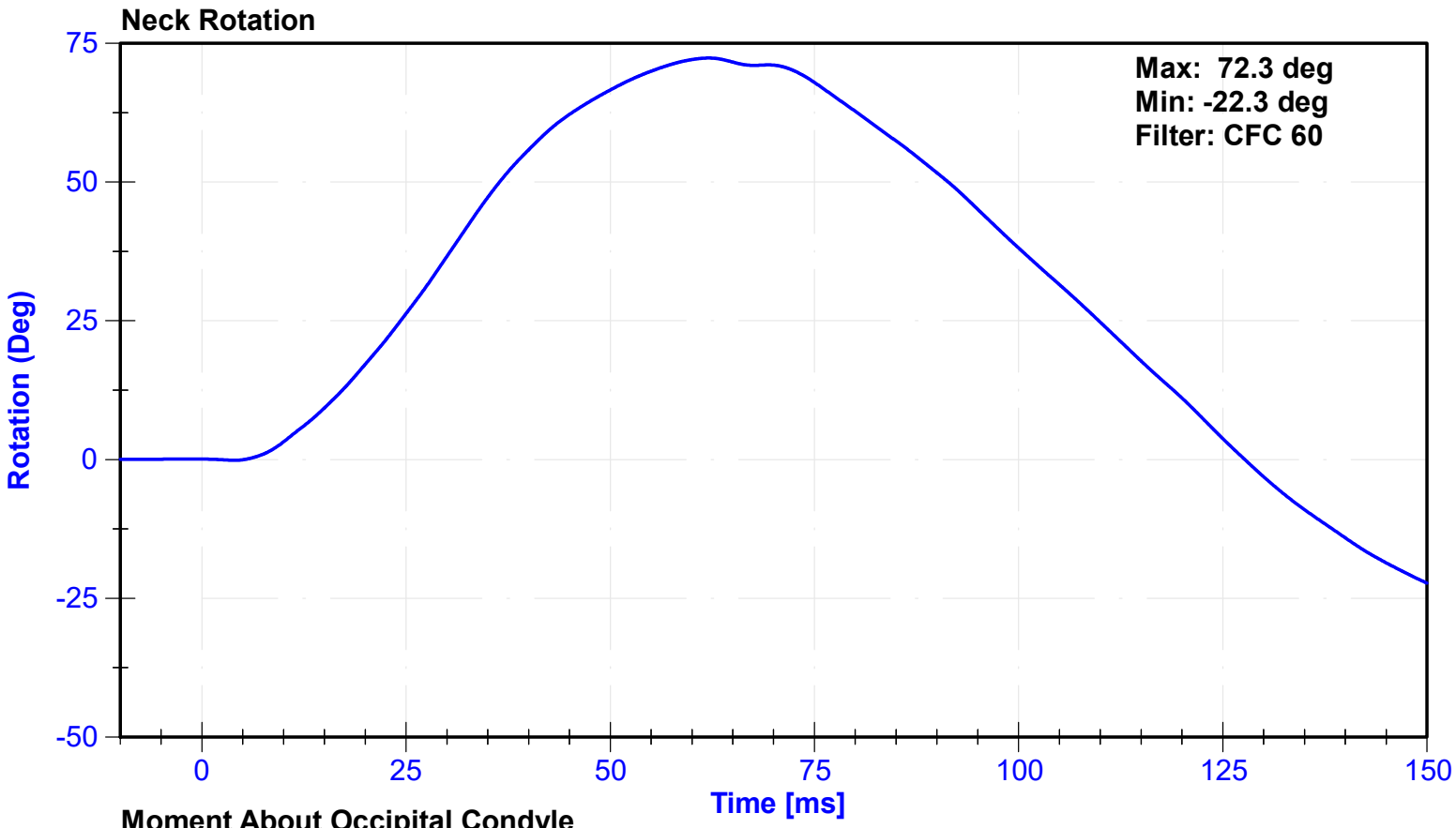
## Results

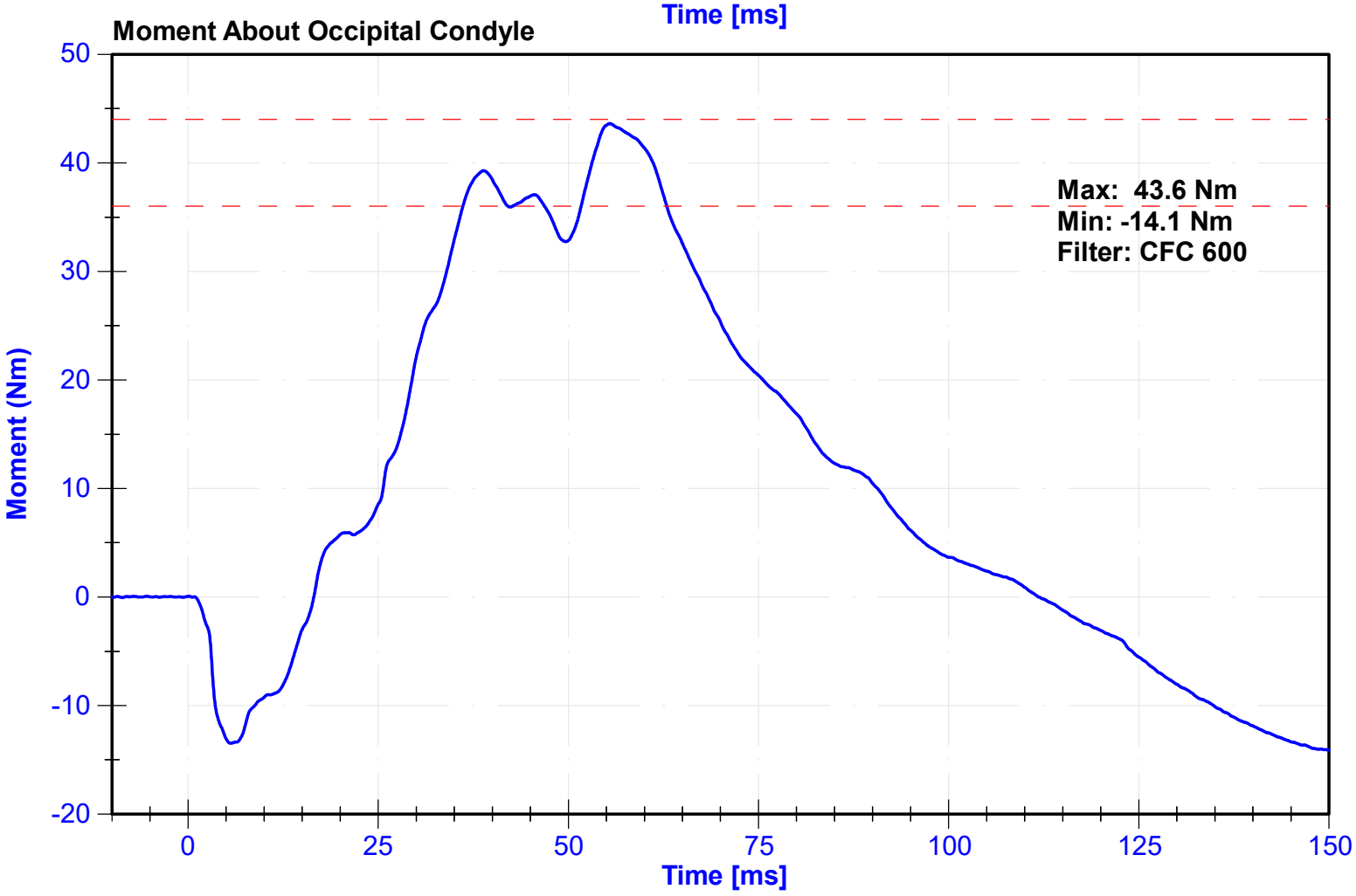
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.8 | Pass |
| Humidity | 10 | 70 | % | 52 | Pass |
| Velocity | 5.51 | 5.63 | m/s | 5.597 | Pass |
| Pendulum Impulse at 10ms | 2.2 | 2.8 | m/s | 2.27 | Pass |
| Pendulum Impulse at 15ms | 3.3 | 4.1 | m/s | 3.49 | Pass |
| Pendulum Impulse at 20ms | 4.4 | 5.4 | m/s | 4.78 | Pass |
| Pendulum Impulse at 25ms | 5.4 | 6.1 | m/s | 5.81 | Pass |
| Pendulum Impulse from 25 to 100ms | 5.5 | 6.2 | m/s | 6.06 | Pass |
| Neck Rotation | 71 | 81 | deg | 72.3 | Pass |
| Time at Maximum Rotation | 50 | 70 | ms | 62.1 | Pass |
| Moment about the OC | 36 | 44 | Nm | 43.6 | Pass |
| Moment Decay to 0 Nm | 102 | 126 | ms | 111.9 | 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 |




Neck Rotation
Max: 72.3 deg
Min: -22.3 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.6 Nm
Min: -14.1 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

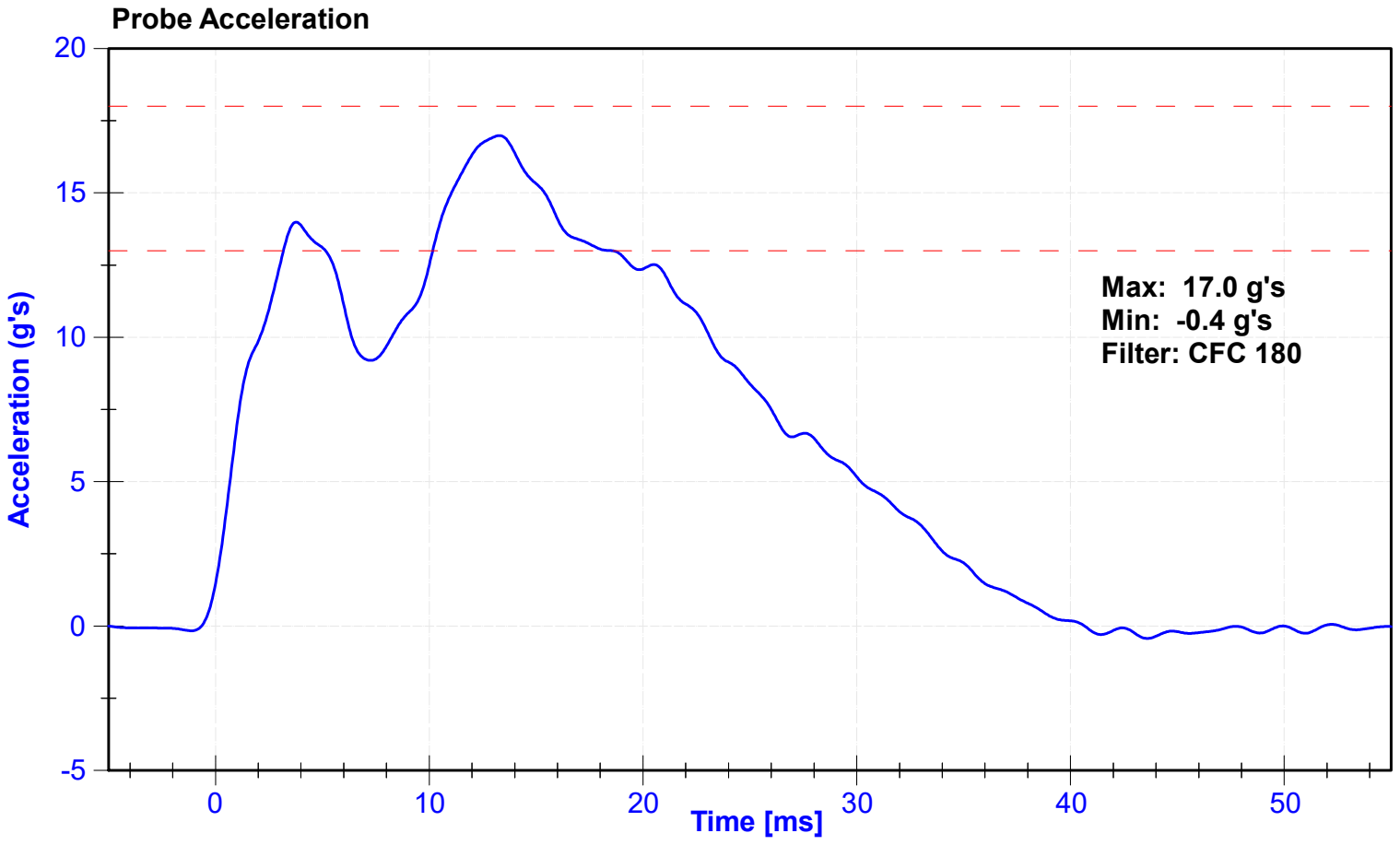
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

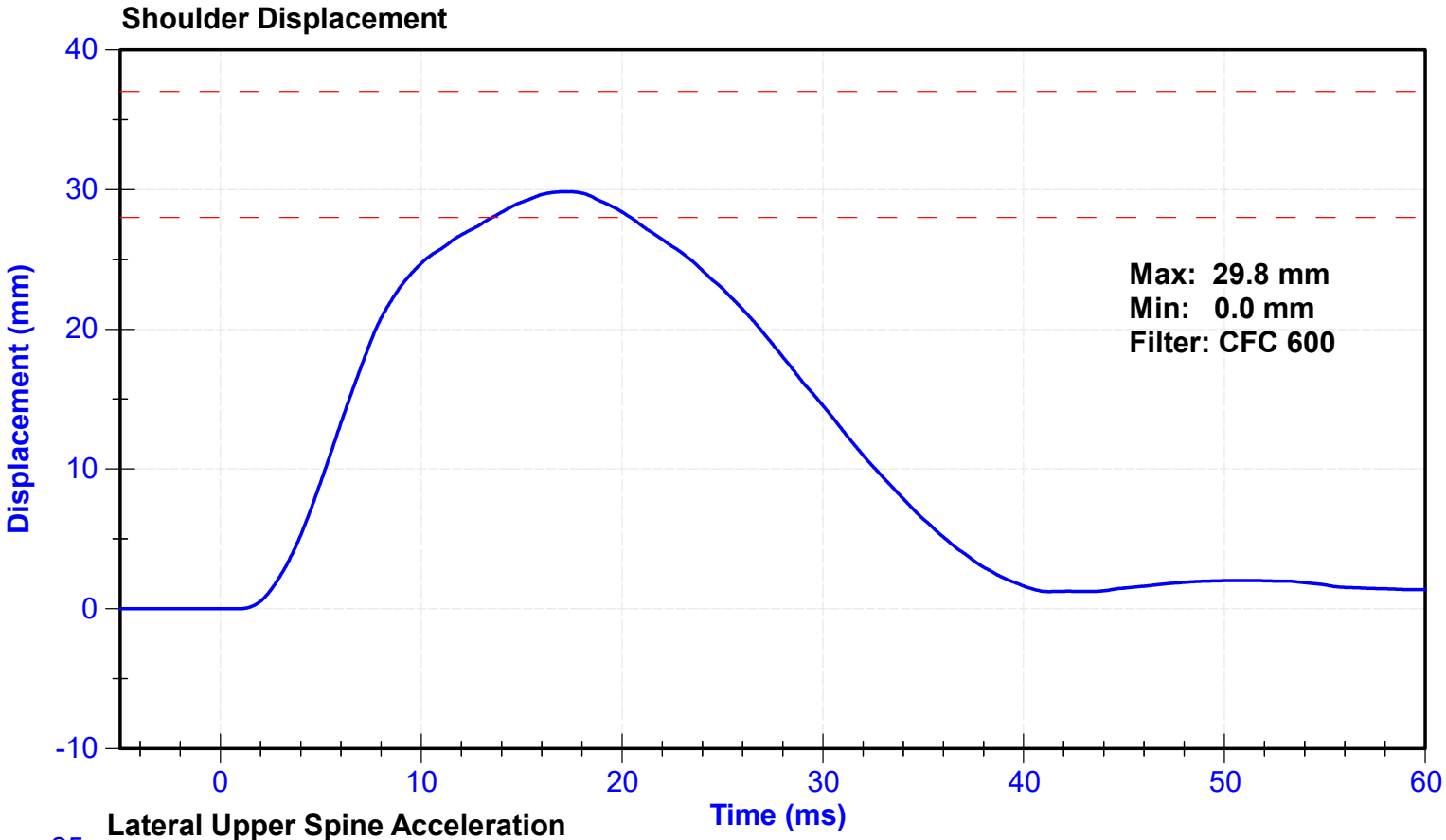
## Results

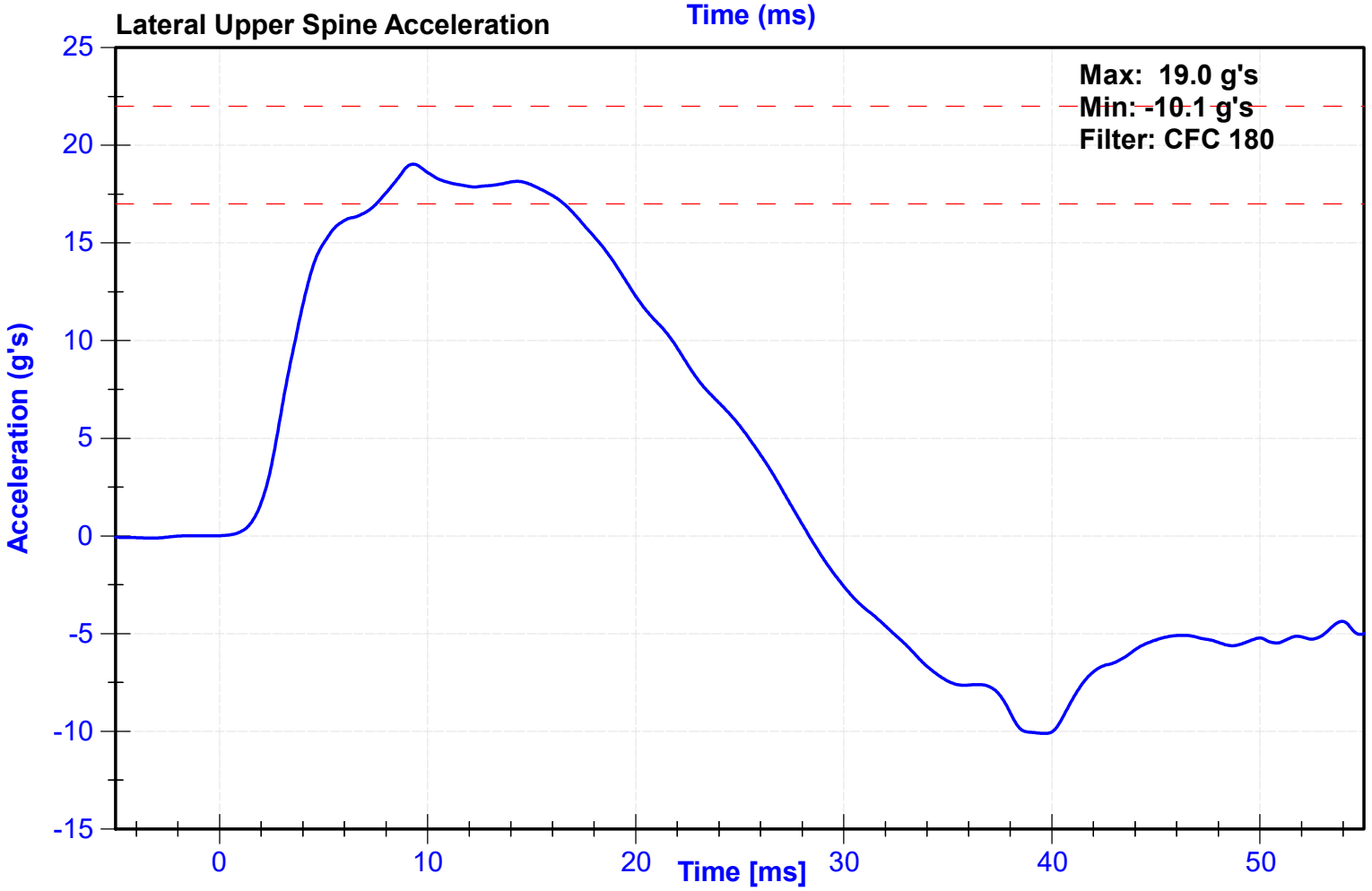
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.28 | Pass |
| Probe Acceleration | 13 | 18 | g's | 17.0 | Pass |
| Shoulder Deflection | 28 | 37 | mm | 29.8 | Pass |
| Lateral Upper Spine Acceleration | 17 | 22 | g's | 19.0 | 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 | 053GFE | 5/9/2024 | 11/7/2024 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.0 g's
Min: -10.1 g's
Filter: CFC 180

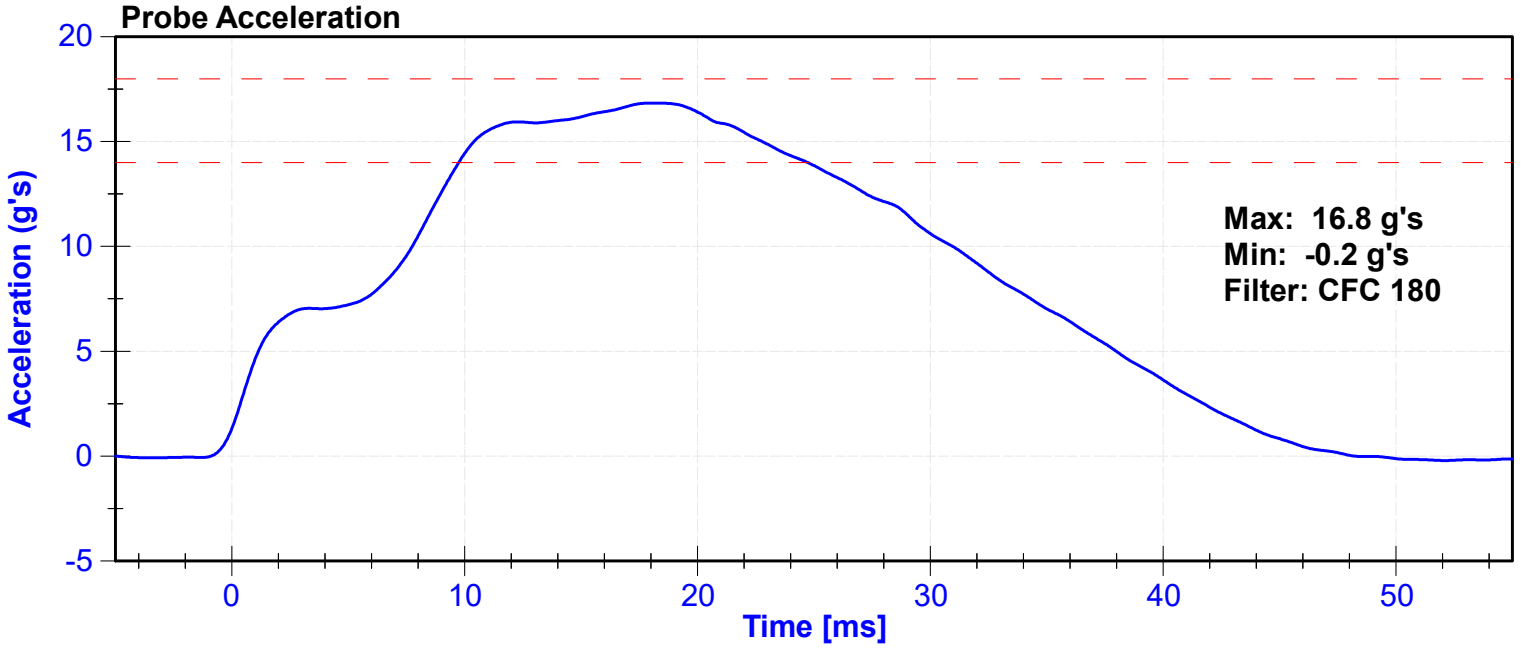
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

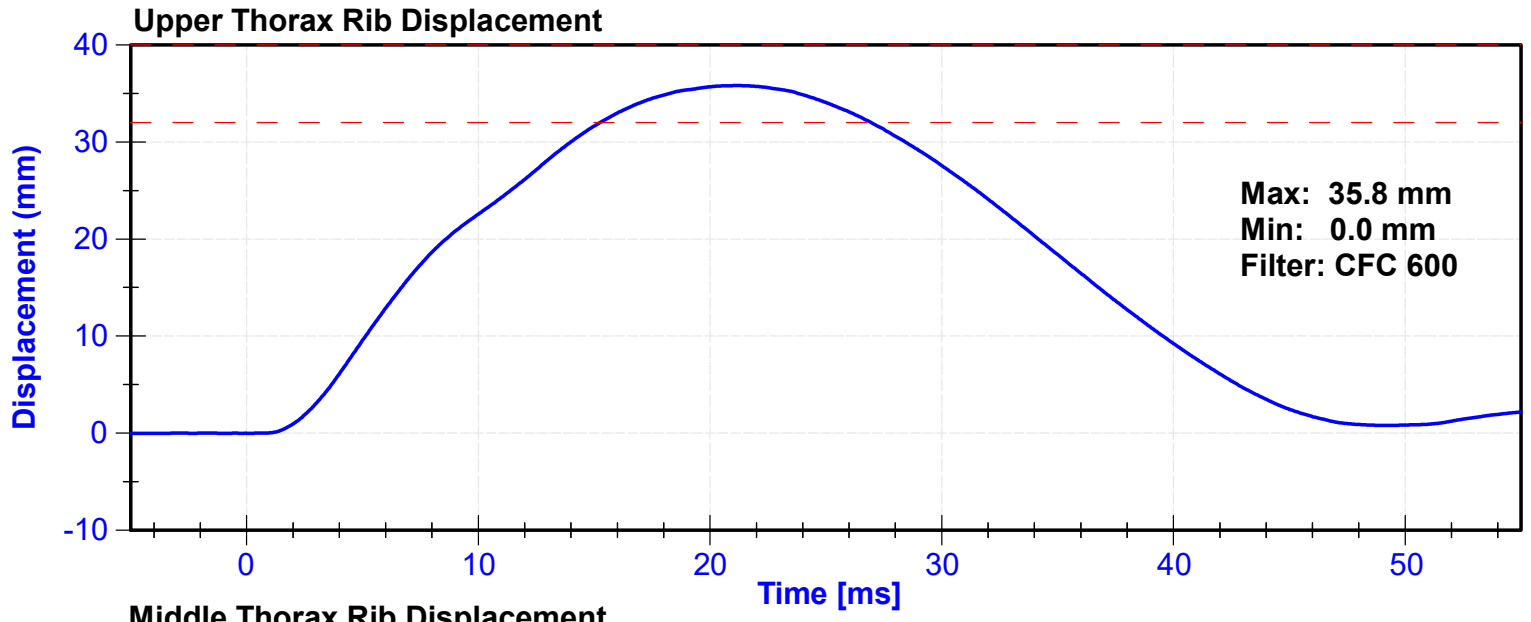
## Results

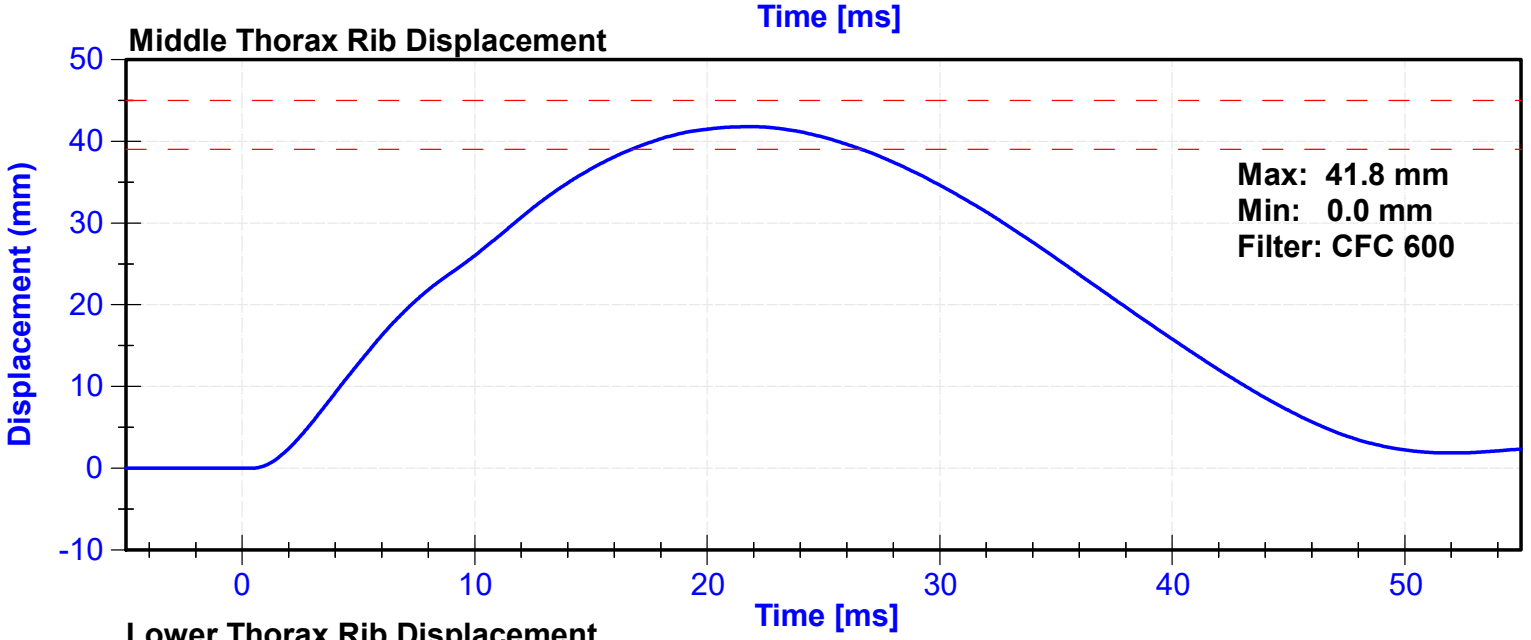
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.28 | Pass |
| Probe Acceleration | 14 | 18 | g's | 16.8 | Pass |
| Lateral Upper Spine Acceleration | 13 | 17 | g's | 15.1 | Pass |
| Lateral Lower Spine Acceleration | 7 | 11 | g's | 9.5 | Pass |
| Upper Thorax Rib Deflection | 32 | 40 | mm | 35.8 | Pass |
| Middle Thorax Rib Deflection | 39 | 45 | mm | 41.8 | Pass |
| Lower Thorax Rib Deflection | 35 | 43 | mm | 38.6 | Pass |

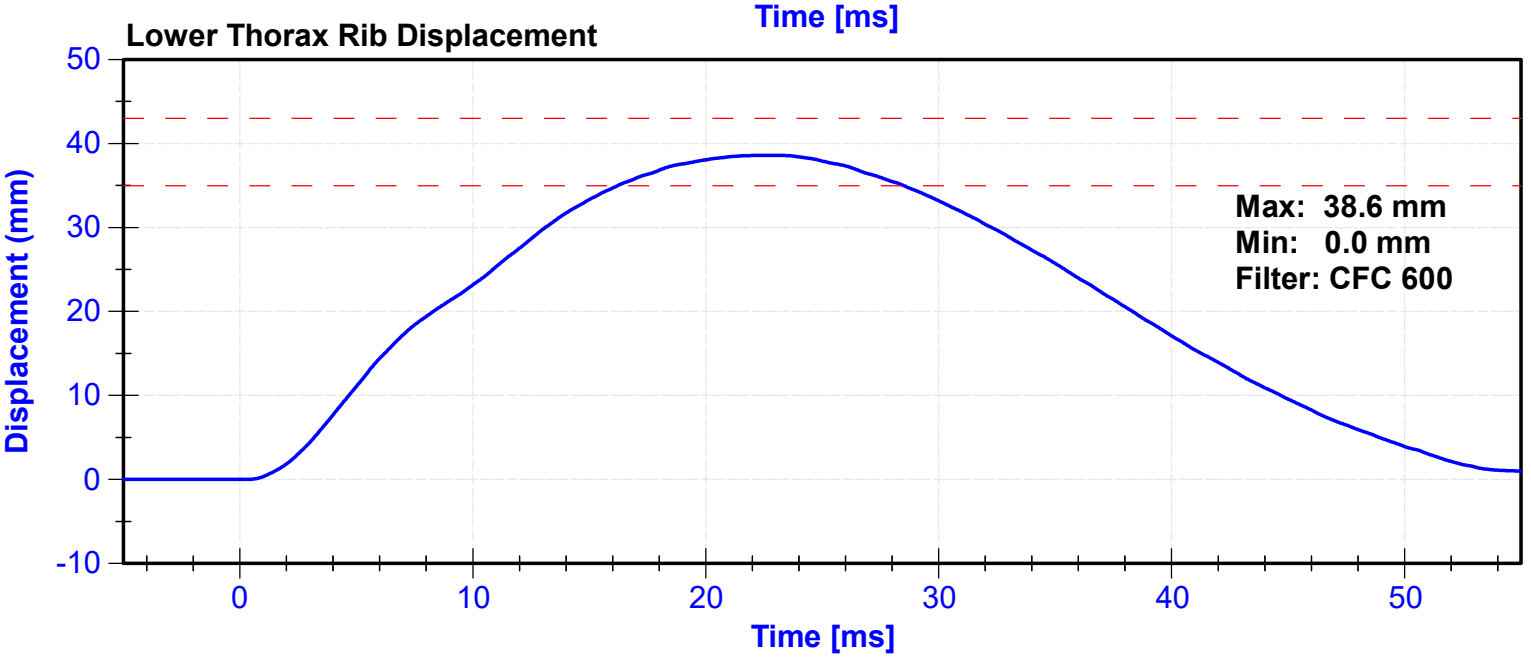
## Transducer Calibrations

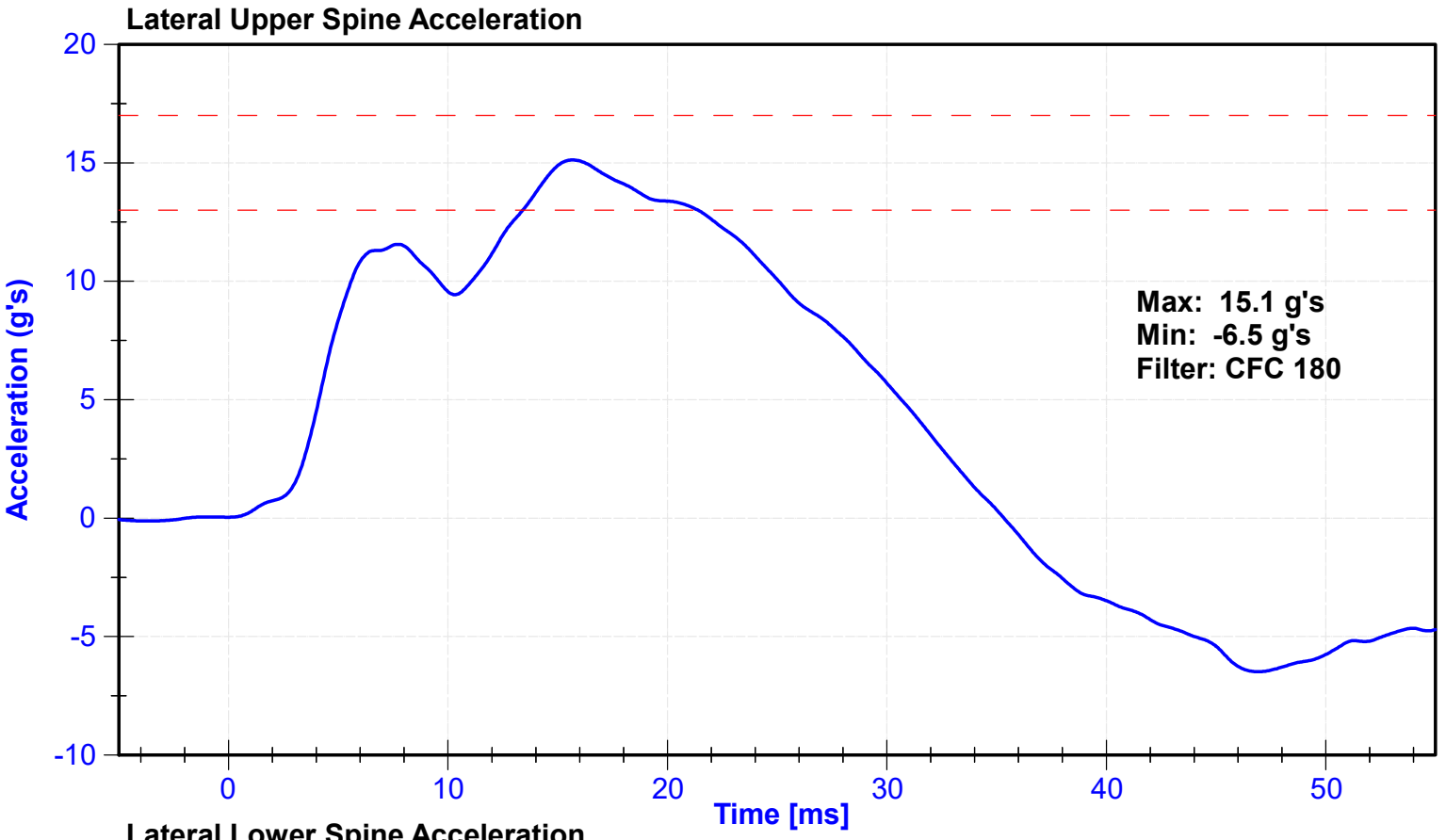
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 5/9/2024 | 11/7/2024 |
| Middle Thorax Rib Potentiometer | Servo | 085GFE | 5/9/2024 | 11/7/2024 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 5/9/2024 | 11/7/2024 |

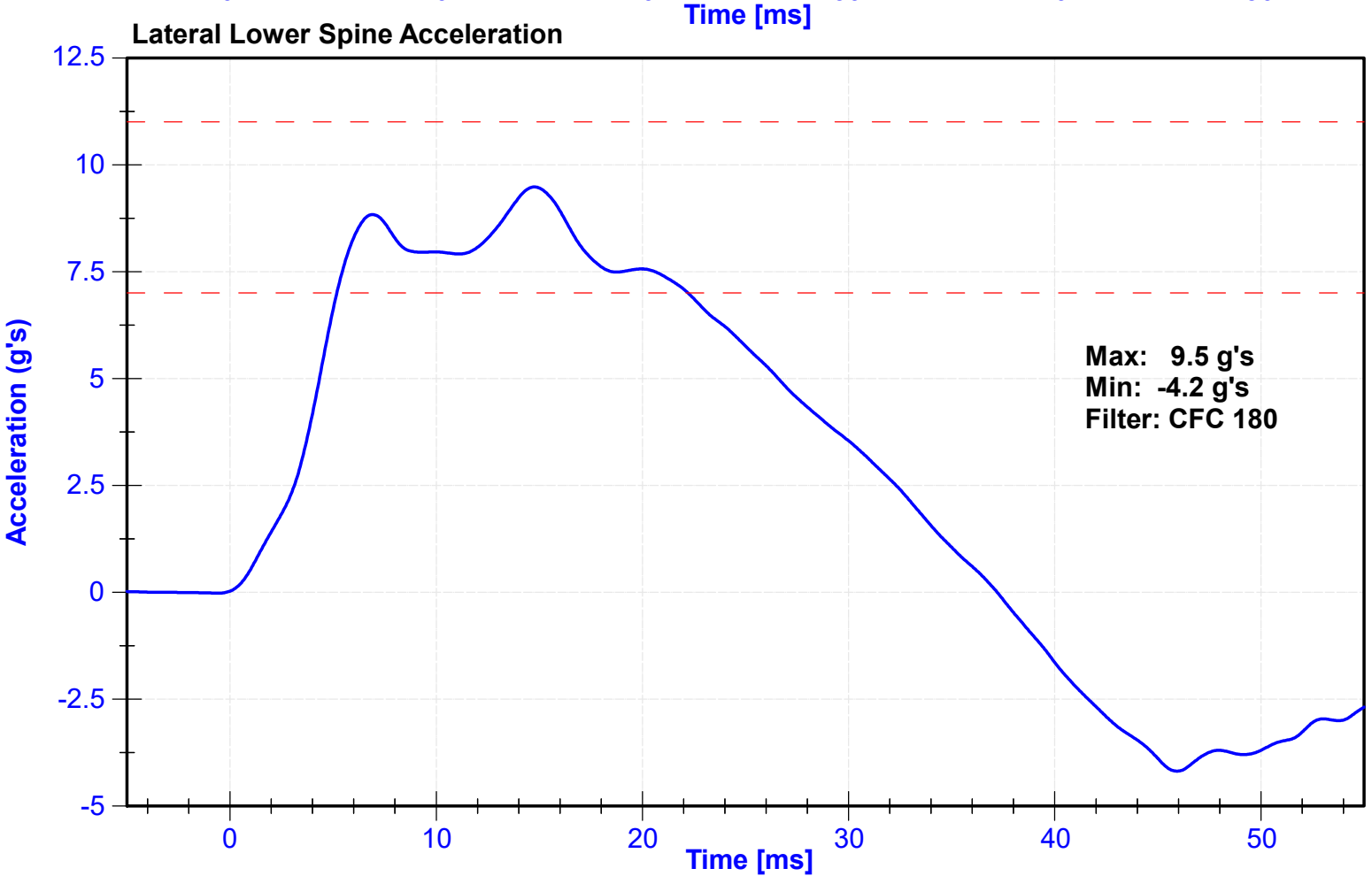



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.8 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.8 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.6 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 15.1 g's
Min: -6.5 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 9.5 g's
Min: -4.2 g's
Filter: CFC 180

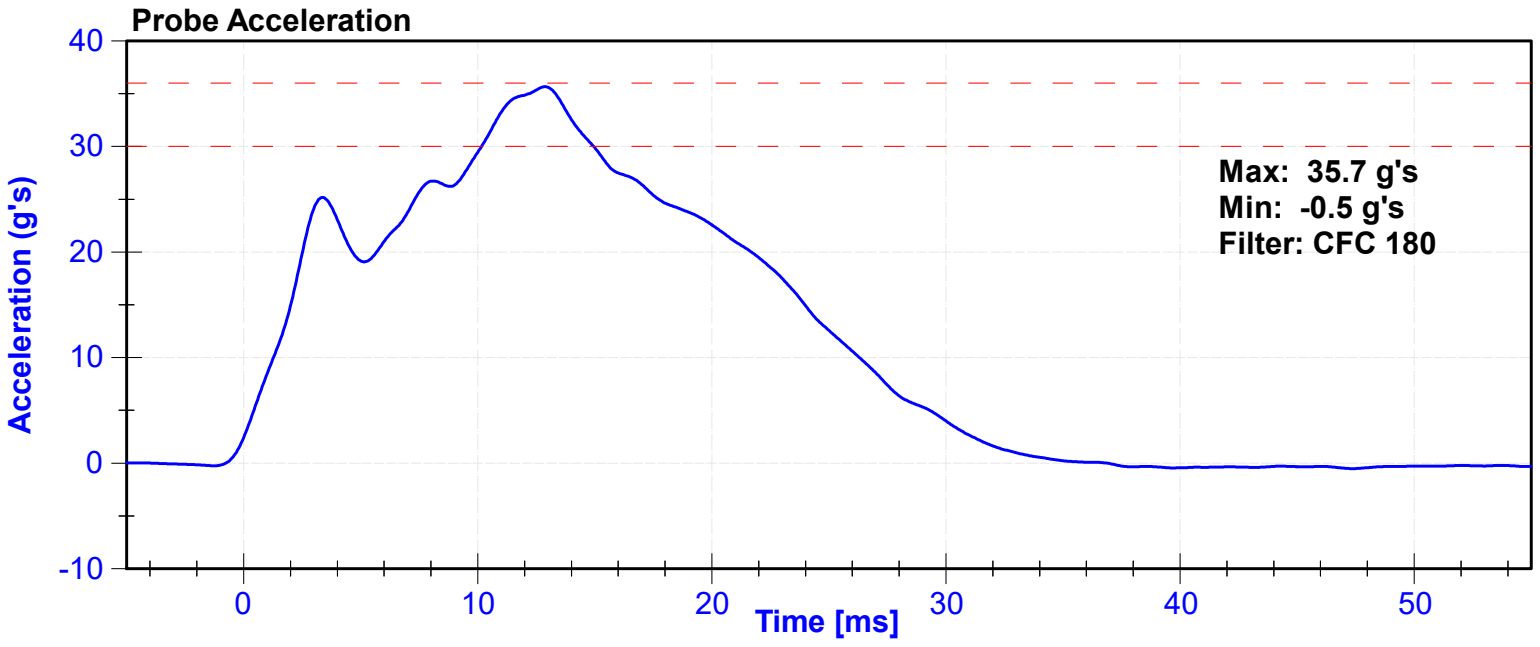
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

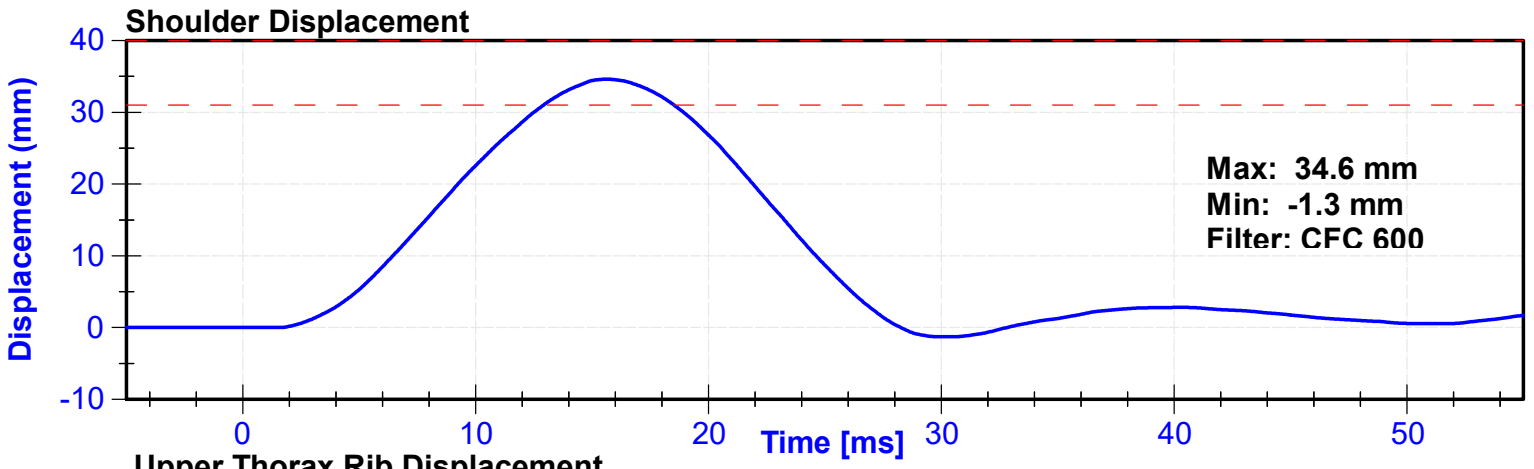
## Results

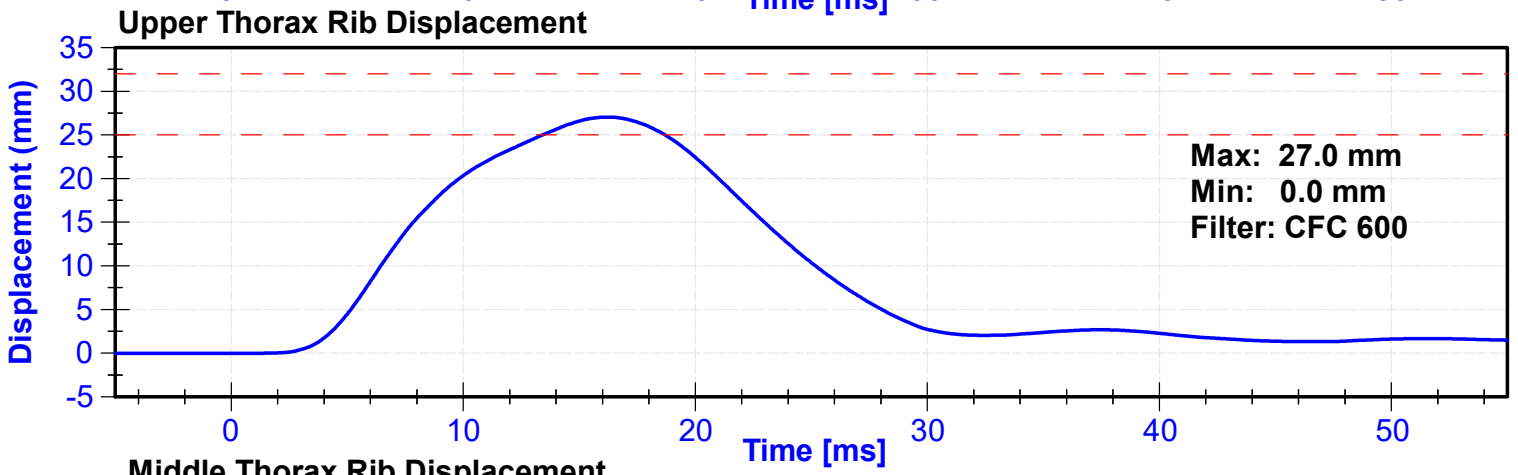
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.64 | Pass |
| Probe Acceleration after 5 ms | 30 | 36 | g's | 35.7 | Pass |
| Lateral Upper Spine Acceleration | 34 | 43 | g's | 36.2 | Pass |
| Lateral Lower Spine Acceleration | 29 | 37 | g's | 34.8 | Pass |
| Shoulder Deflection | 31 | 40 | mm | 34.6 | Pass |
| Upper Thorax Rib Deflection | 25 | 32 | mm | 27.0 | Pass |
| Mid Thorax Rib Deflection | 30 | 36 | mm | 30.6 | Pass |
| Lower Thorax Rib Deflection | 32 | 38 | mm | 32.6 | Pass |

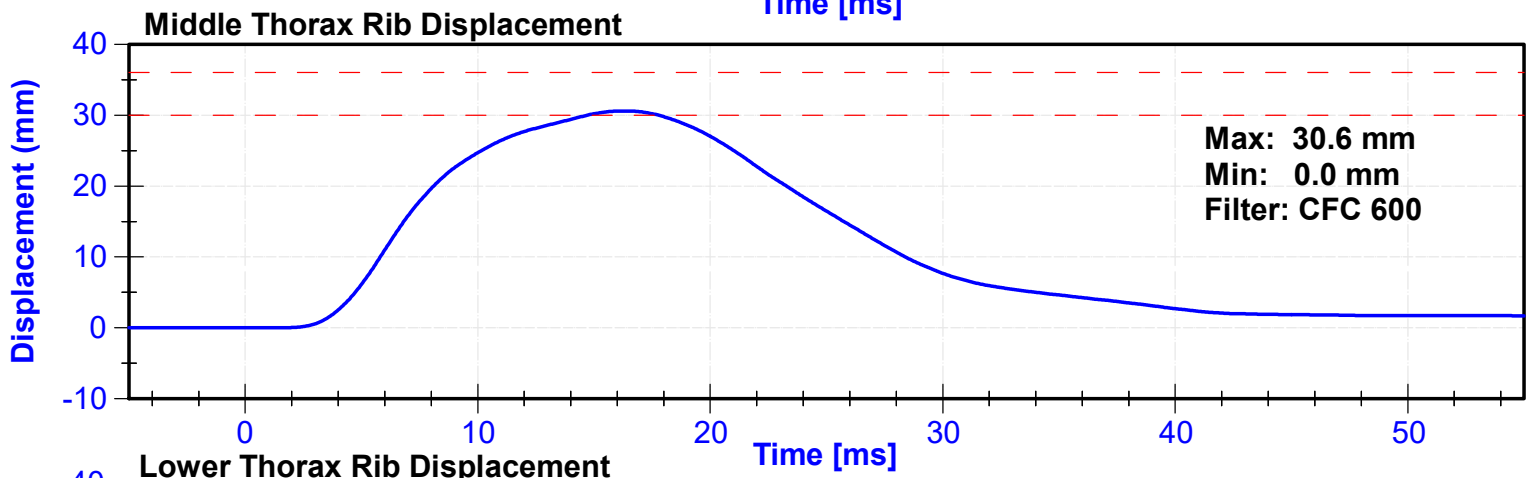
## Transducer Calibrations

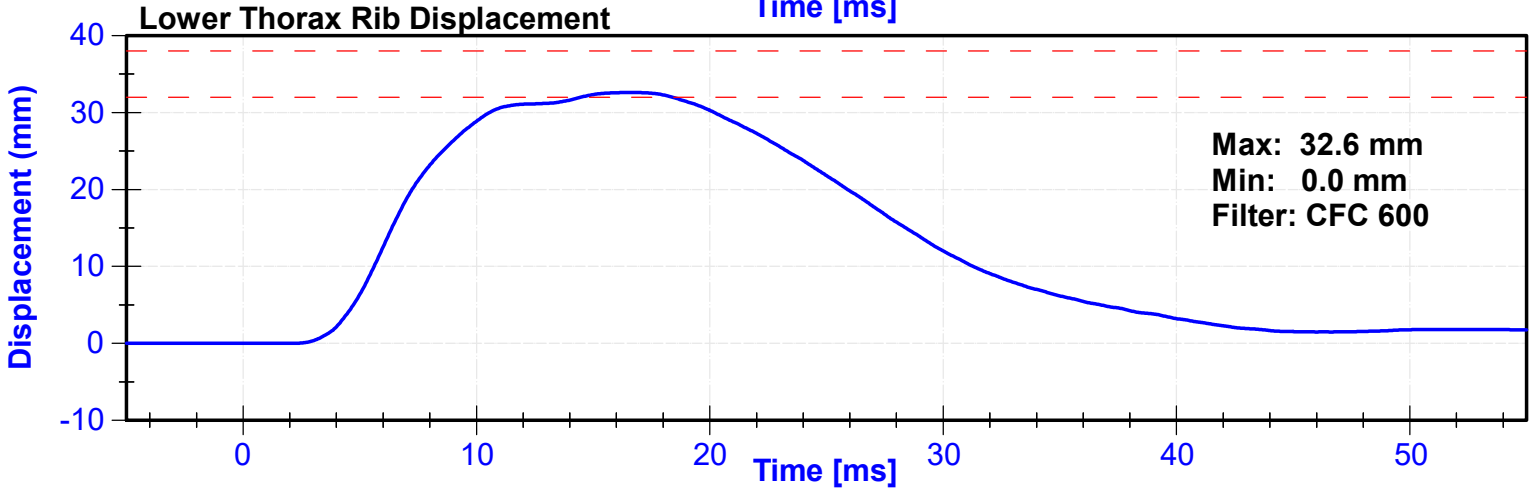
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Upper Spine T1 Y Accelerometer | Endevco | T20880 | 5/9/2024 | 11/5/2024 |
| Upper Spine T12 Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Shoulder Potentiometer | Servo | 053GFE | 5/9/2024 | 11/7/2024 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 5/9/2024 | 11/7/2024 |
| Middle Thorax Rib Potentiometer | Servo | 085GFE | 5/9/2024 | 11/7/2024 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 5/9/2024 | 11/7/2024 |

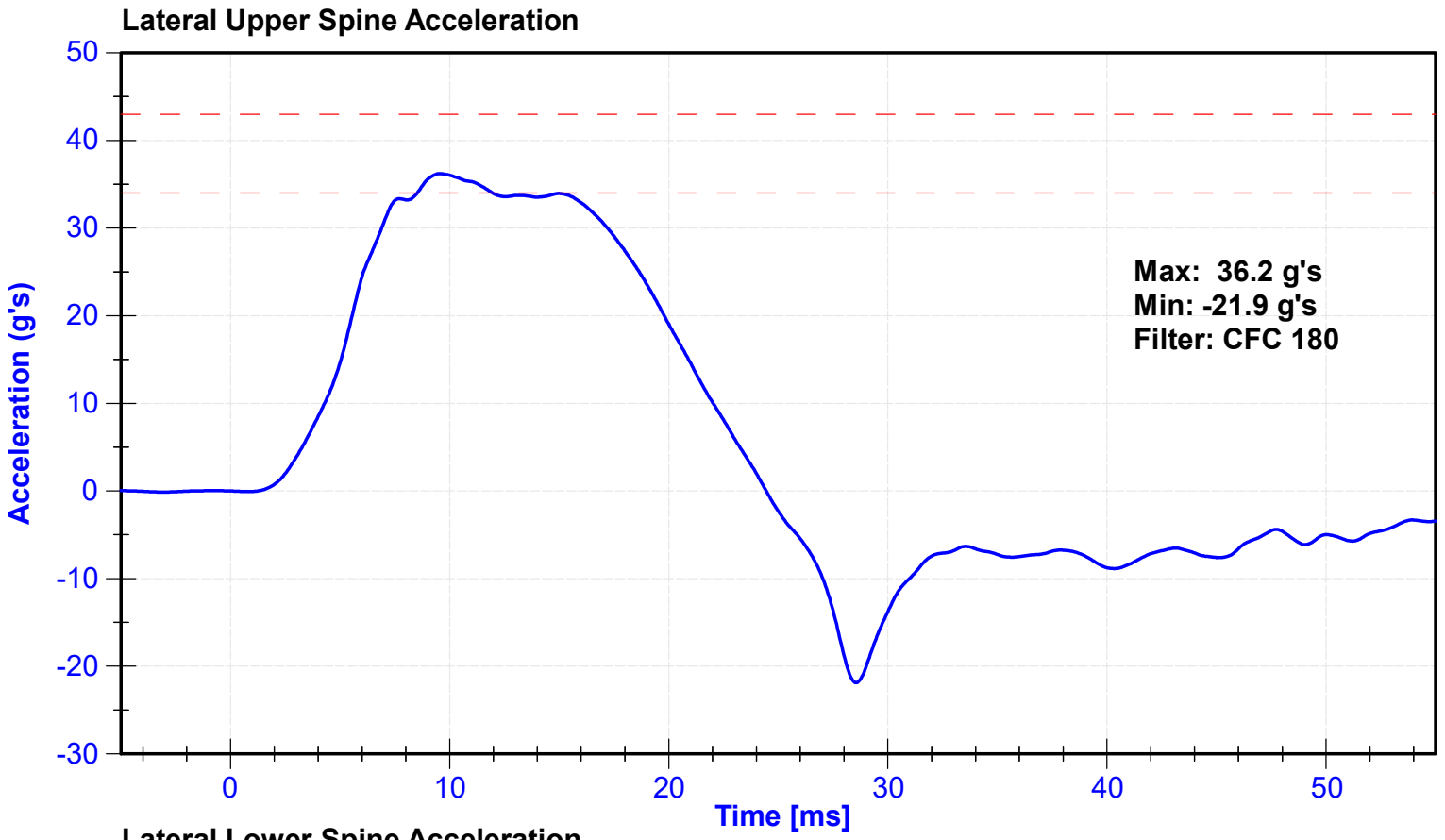


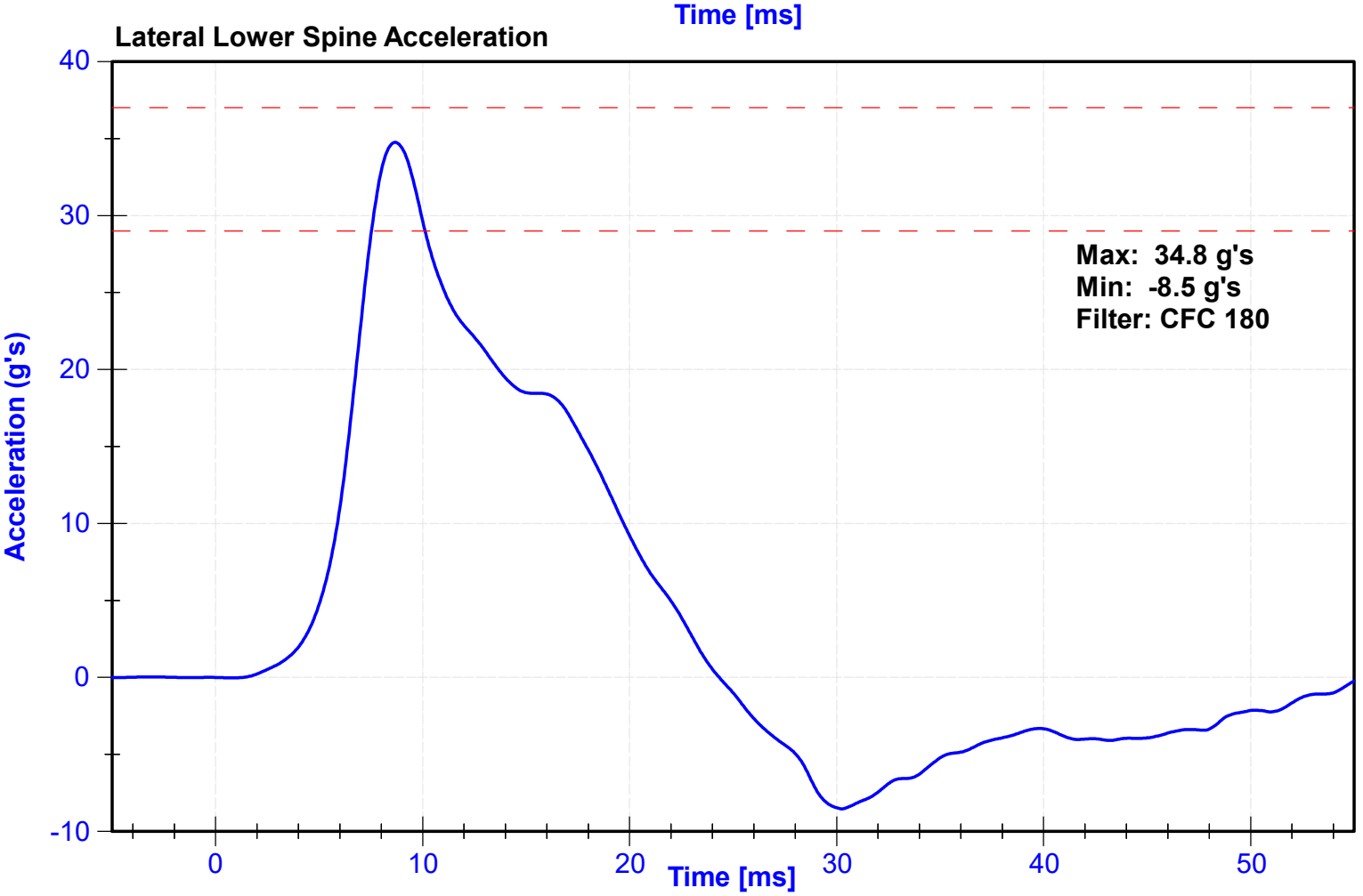

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.6 mm
Min: -1.3 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.0 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 30.6 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.6 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
-30
0
10
20
30
40
50
Time [ms]
Max: 36.2 g's
Min: -21.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 34.8 g's
Min: -8.5 g's
Filter: CFC 180

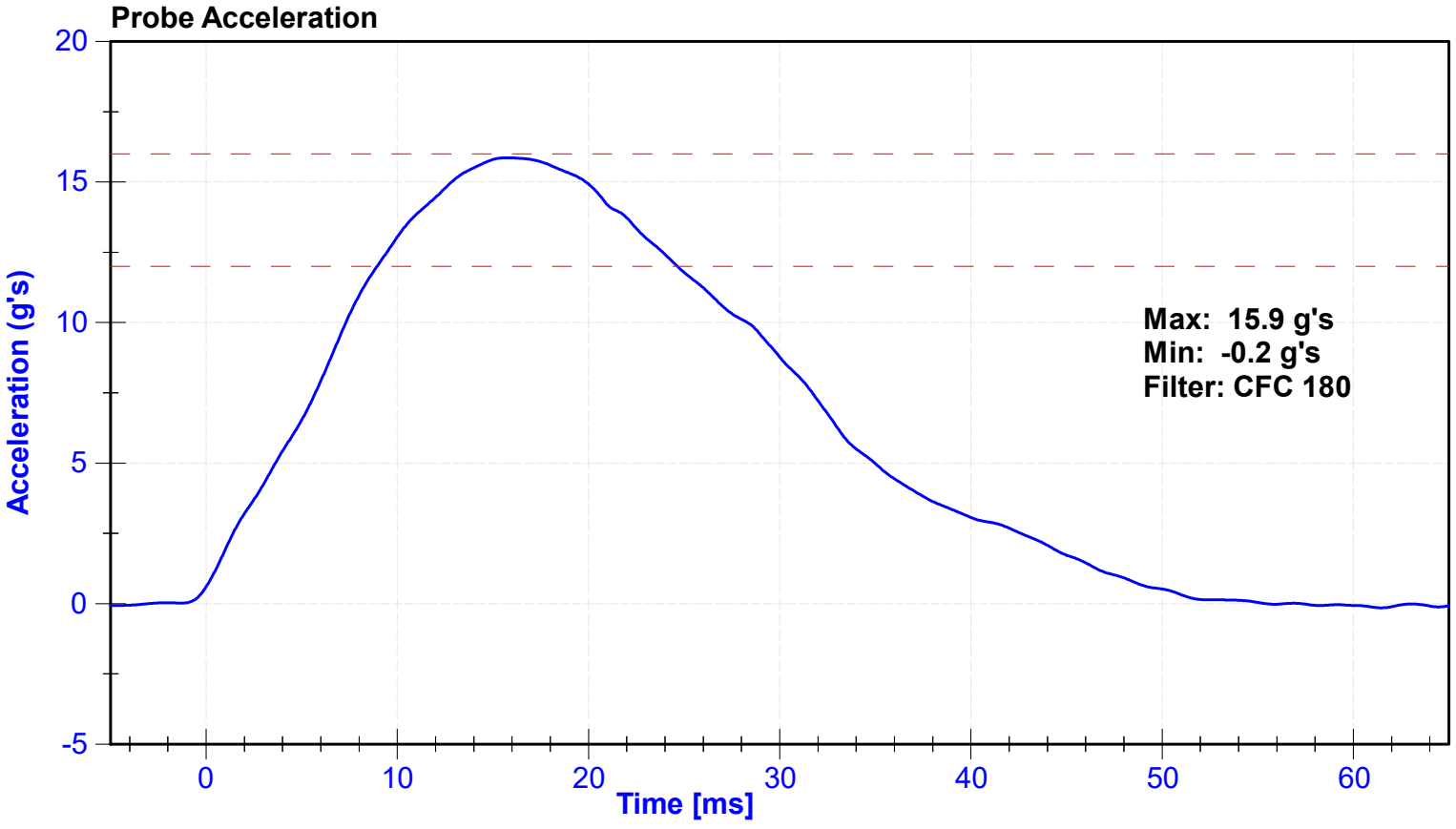
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

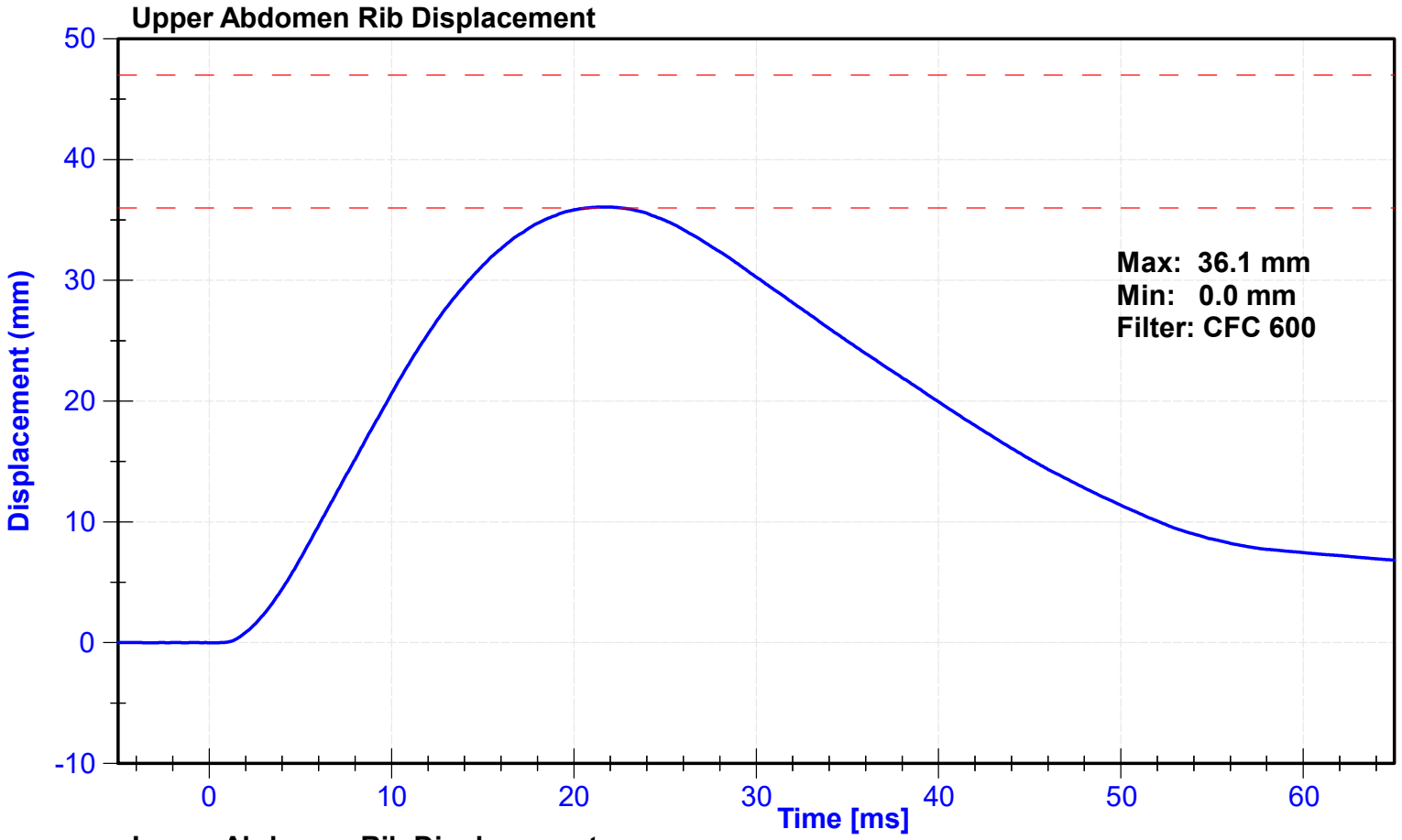
## Results

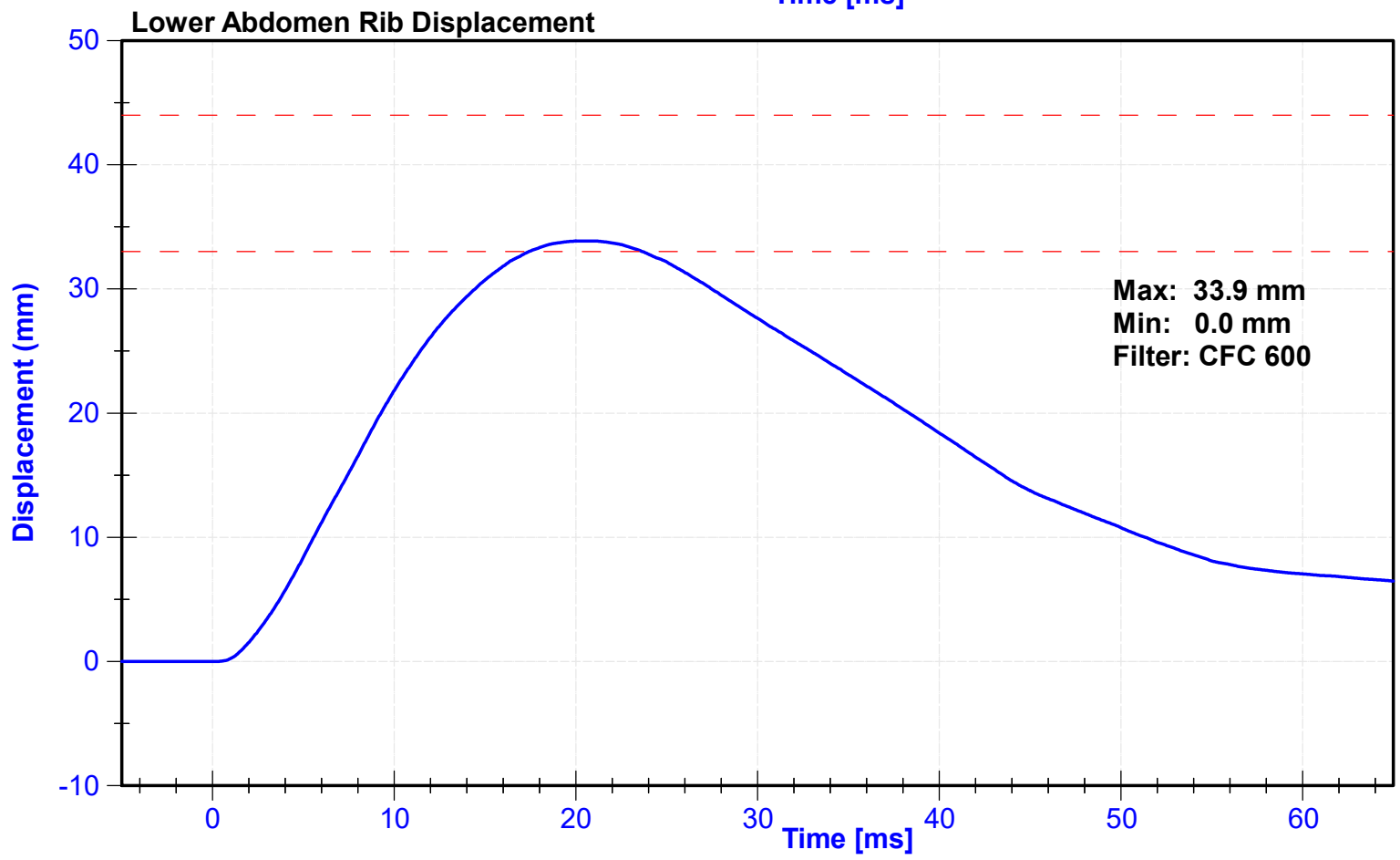
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.28 | Pass |
| Probe Acceleration | 12 | 16 | g's | 15.9 | Pass |
| Lateral Lower Spine Acceleration | 9 | 14 | g's | 12.5 | Pass |
| Upper Abdomen Rib Deflection | 36 | 47 | mm | 36.1 | Pass |
| Lower Abdomen Rib Deflection | 33 | 44 | mm | 33.9 | Pass |

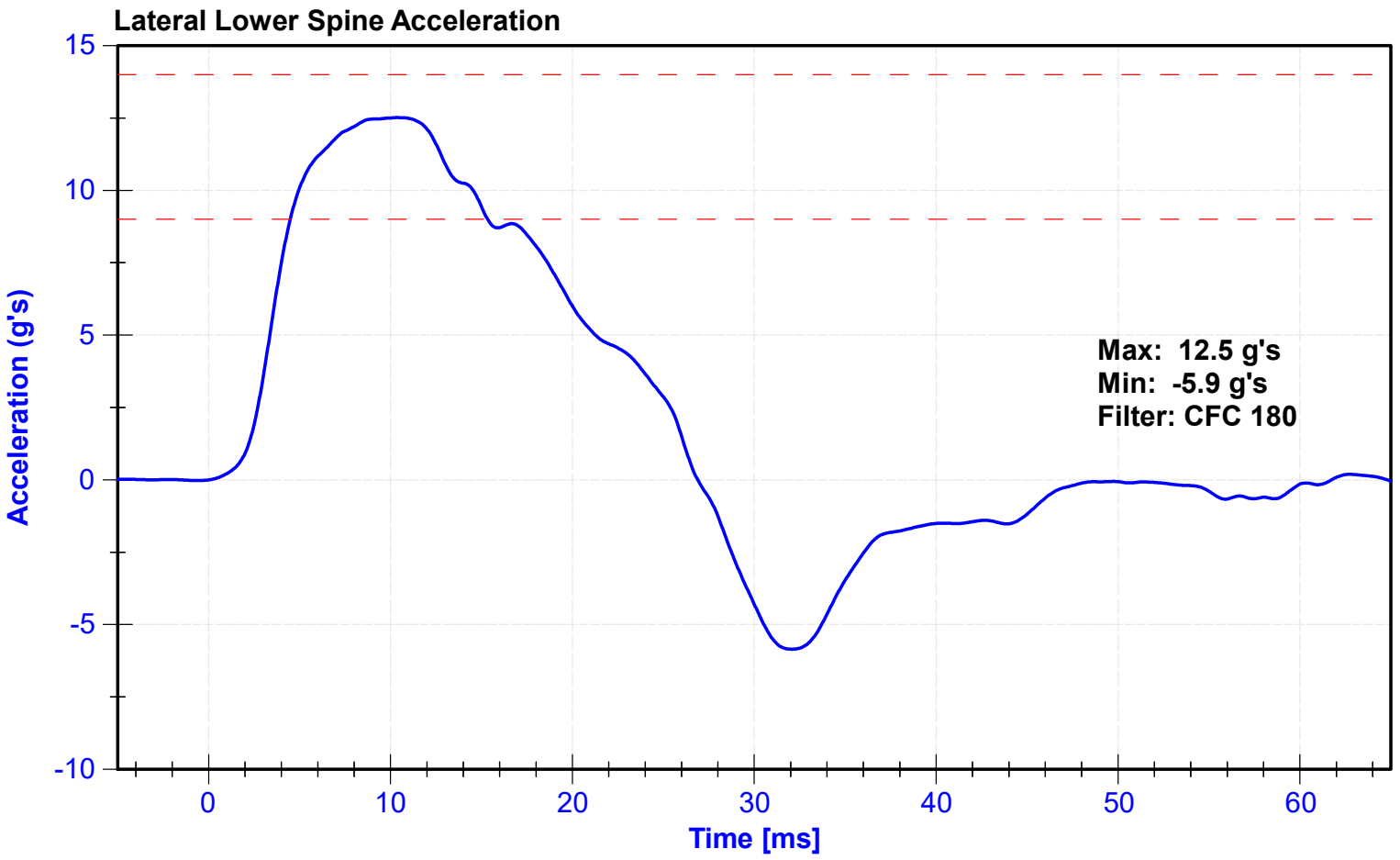
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | 18587 | 11/20/2023 | 11/19/2024 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 5/9/2024 | 11/5/2024 |
| Upper Abdomen Rib Potentiometer | Endevco | 074GFE | 5/28/2024 | 11/26/2024 |
| Lower Abdomen Rib Potentiometer | Endevco | 075GFE | 5/9/2024 | 11/7/2024 |




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 36.1 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 33.9 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
0
10
20
30
40
50
60
Time [ms]
Max: 12.5 g's
Min: -5.9 g's
Filter: CFC 180

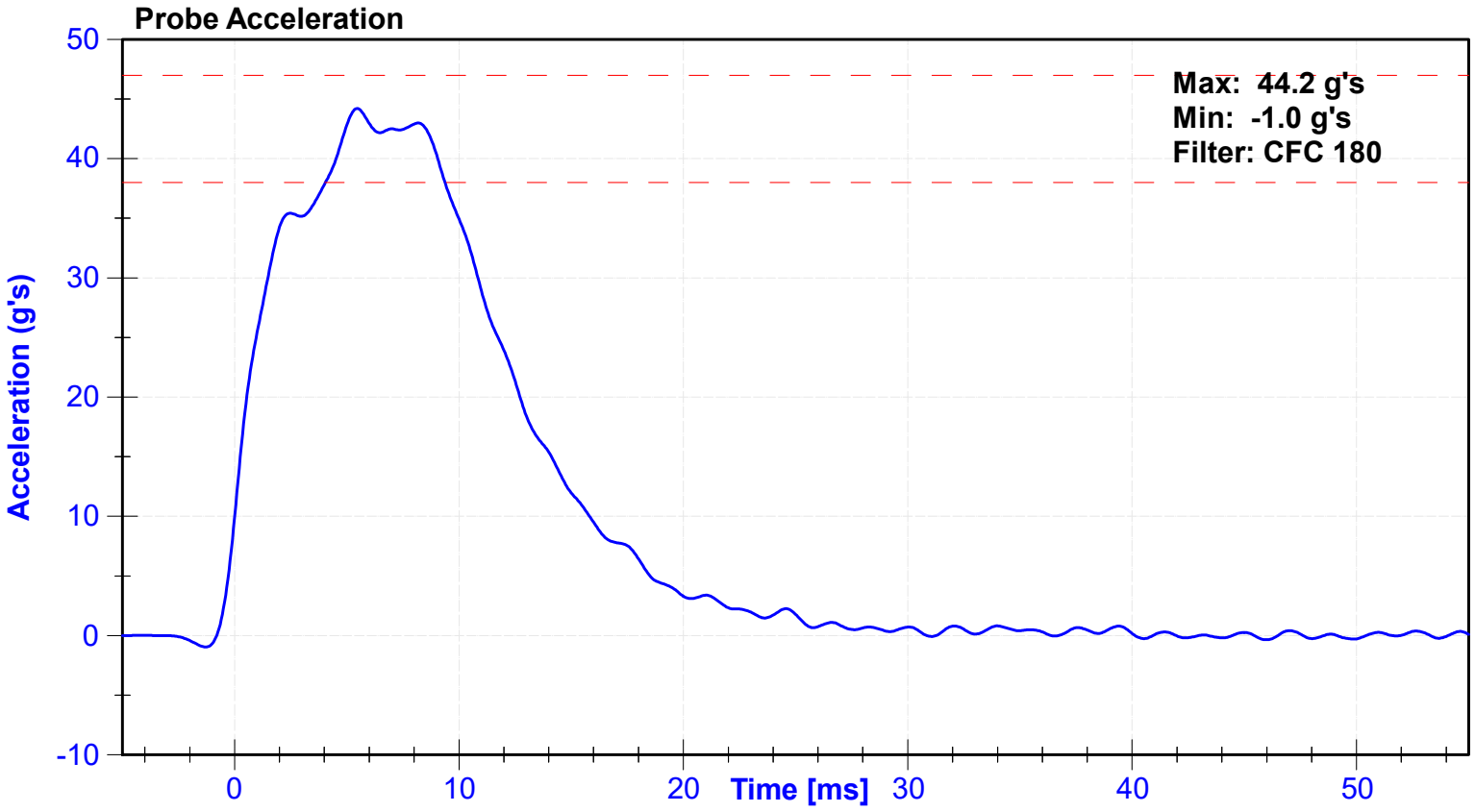
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

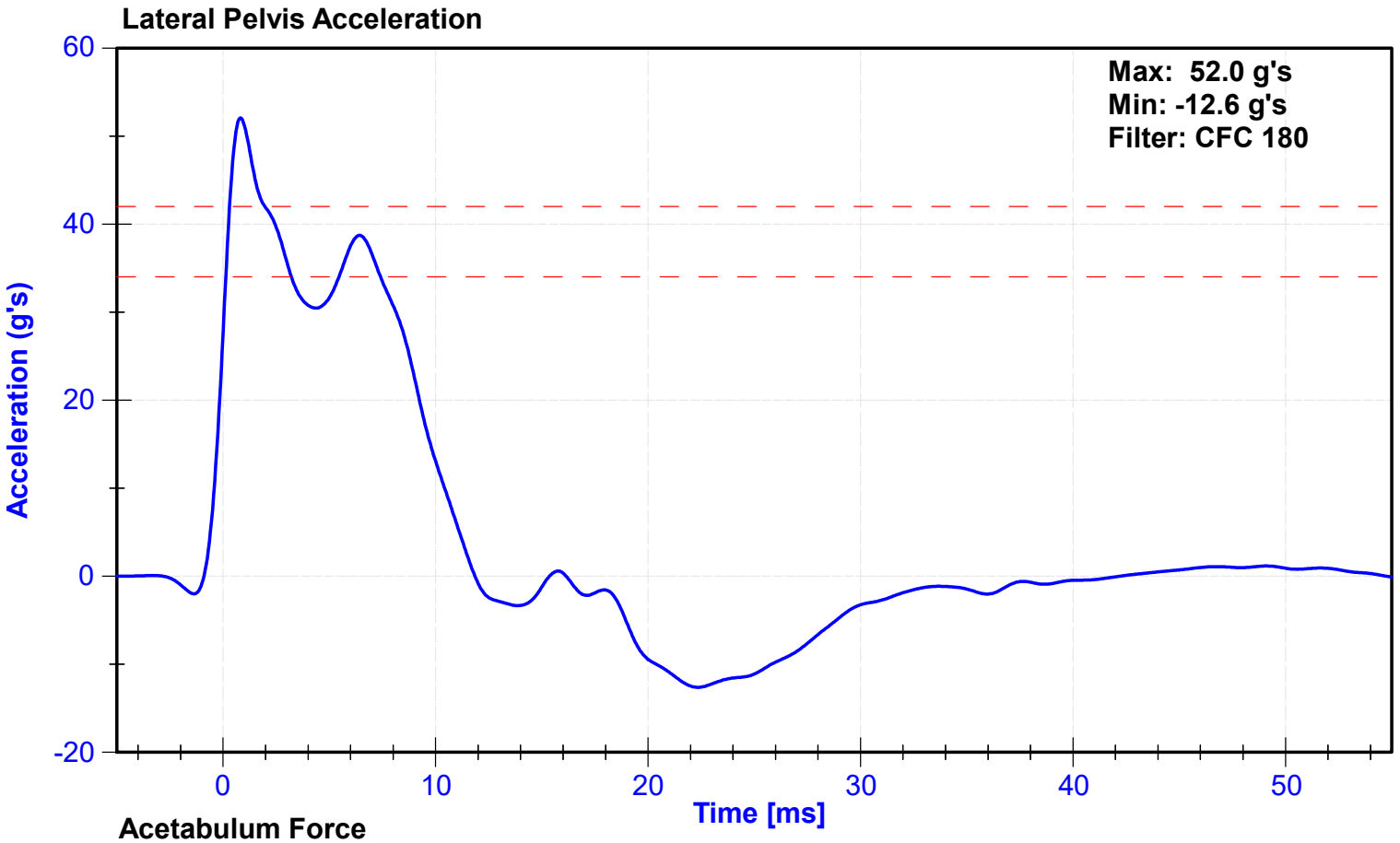
## Results

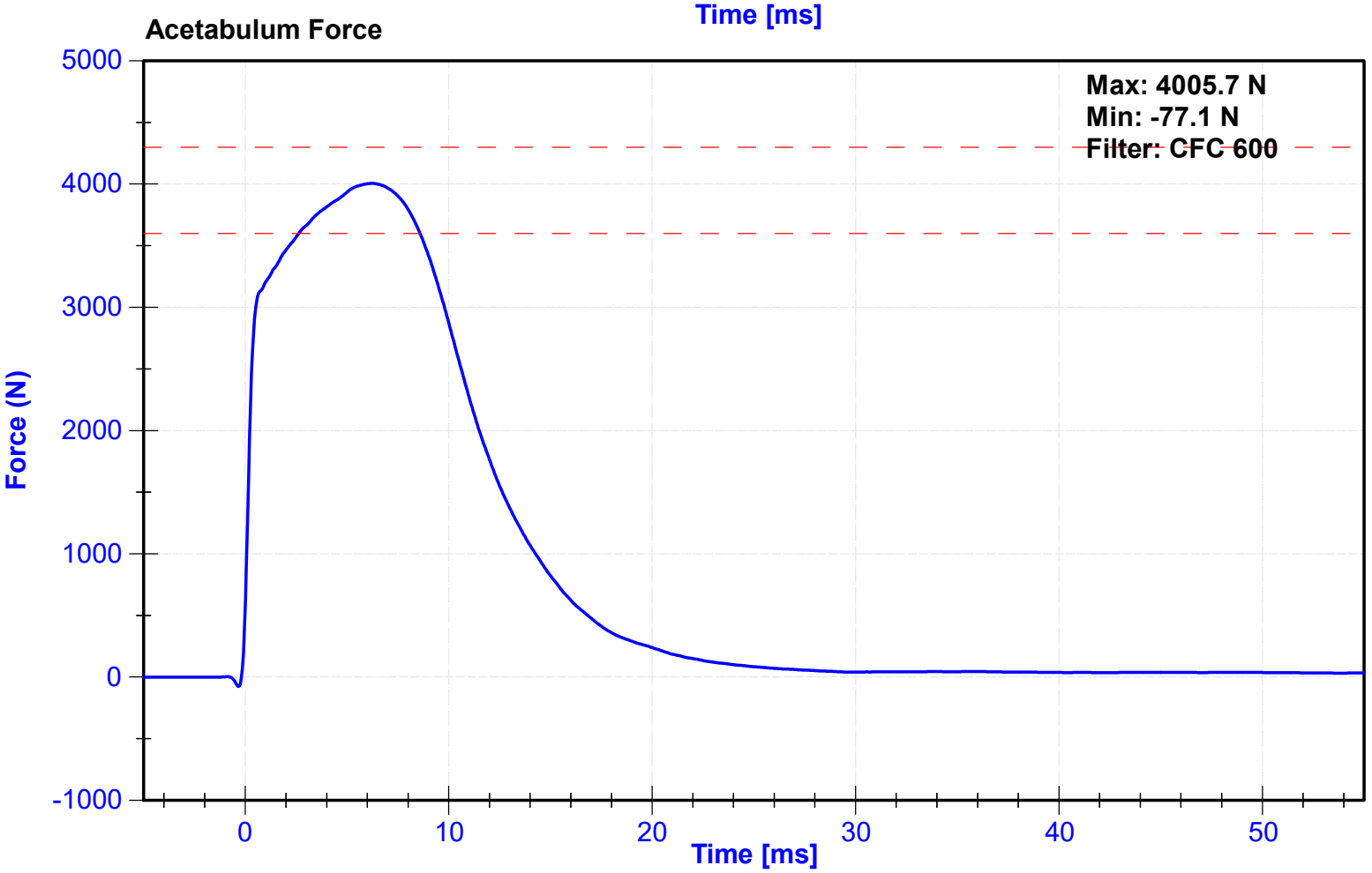
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.65 | Pass |
| Probe Acceleration | 38 | 47 | g's | 44.2 | Pass |
| Lateral Pelvis Acceleration after 6ms | 34 | 42 | g's | 38.7 | Pass |
| Acetabulum Force | 3600 | 4300 | N | 4005.7 | 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 | P51731 | 5/9/2024 | 11/5/2024 |
| Acetabulum Load Cell | Denton | 267-FY | 9/11/2023 | 9/10/2024 |
| Certification Plug | SACO | | | N/A |
| Crash Test Plug | SACO | | | N/A |




Lateral Pelvis Acceleration
Max: 52.0 g's
Min: -12.6 g's
Filter: CFC 180
Acceleration (g's)
60
40
20
0
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 4005.7 N
Min: -77.1 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

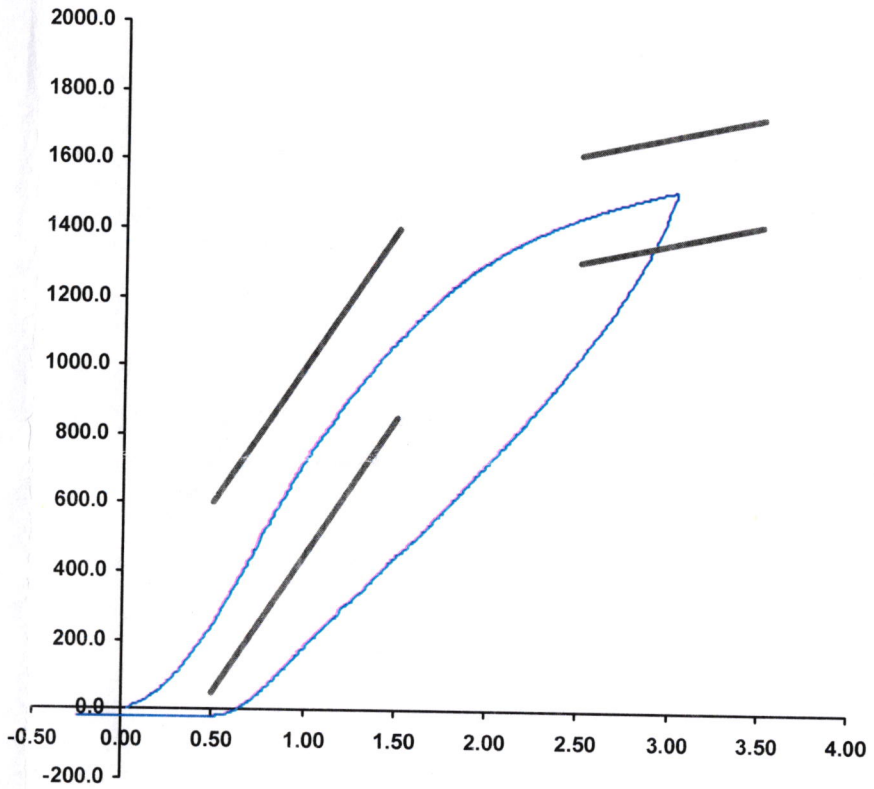
Cert 5/29/24

## SID-IIs Pelvis Plug Certification Test

Plug S/N 16546
Test Number 23330
Report Number 23387
Test Date 7/15/2022 9:16:46 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 253 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,074 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,435 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,512 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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 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

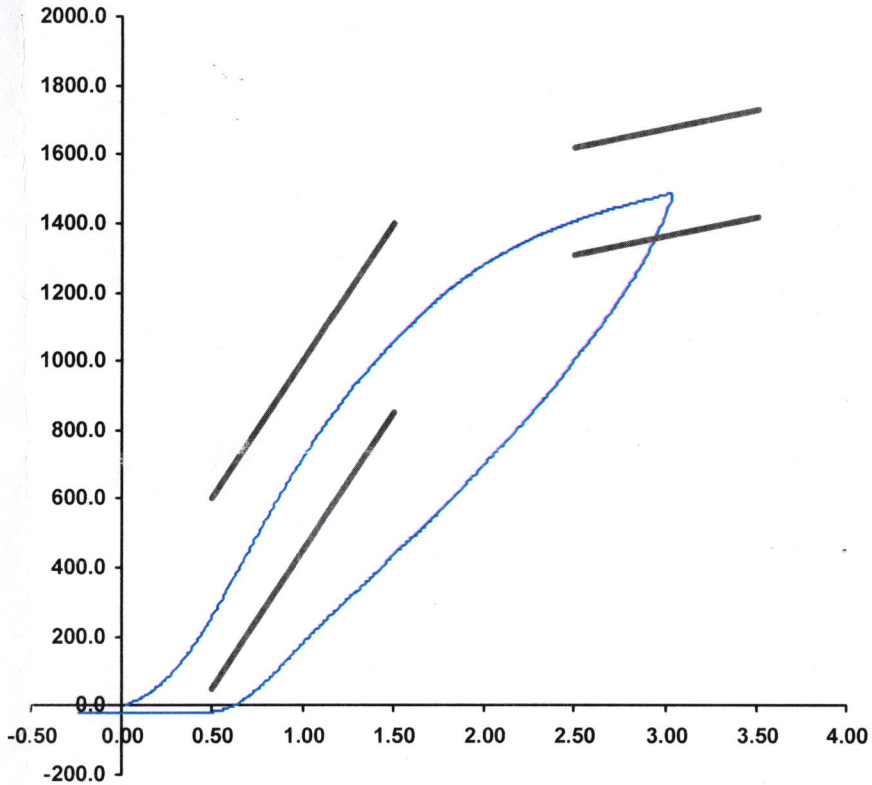
Crash 5/29/24

## SID-IIs Pelvis Plug Certification Test

Plug S/N 16536
Test Number 23320
Report Number 23377
Test Date 7/15/2022 8:55:45 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 260 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,060 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,408 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,483 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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 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

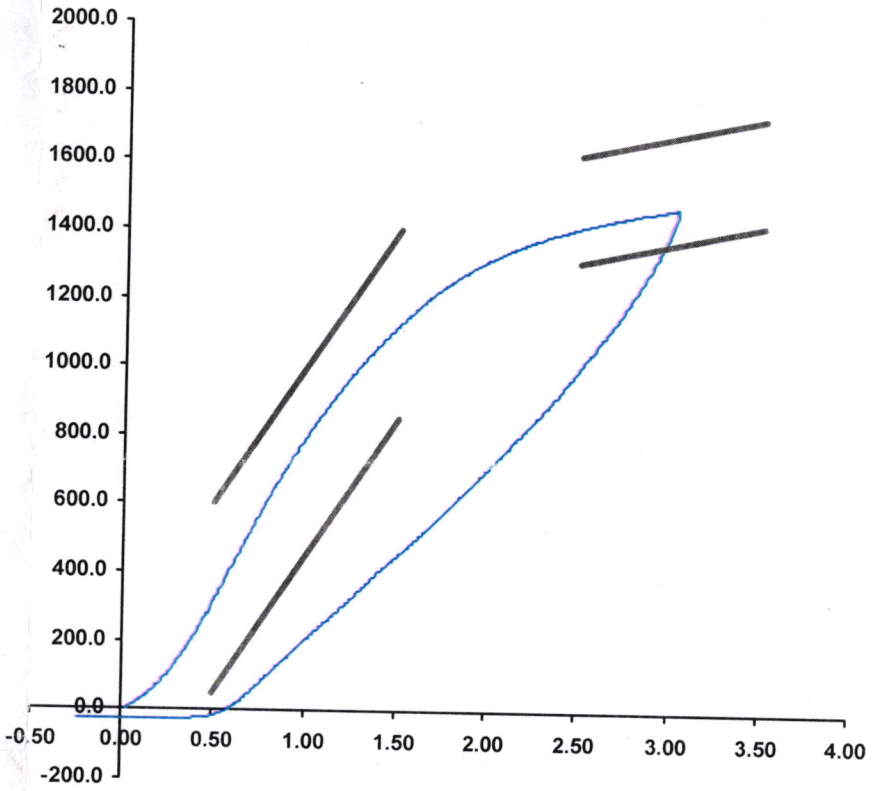
Non Impact
5/29/24

## SID-IIs Pelvis Plug Certification Test

Plug S/N 16616
Test Number 23381
Report Number 23438
Test Date 7/20/2022 11:30:16 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 320 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,122 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,410 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,465 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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 20-Jul-22
SACO Research

By : DC Date : 7/20/21

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

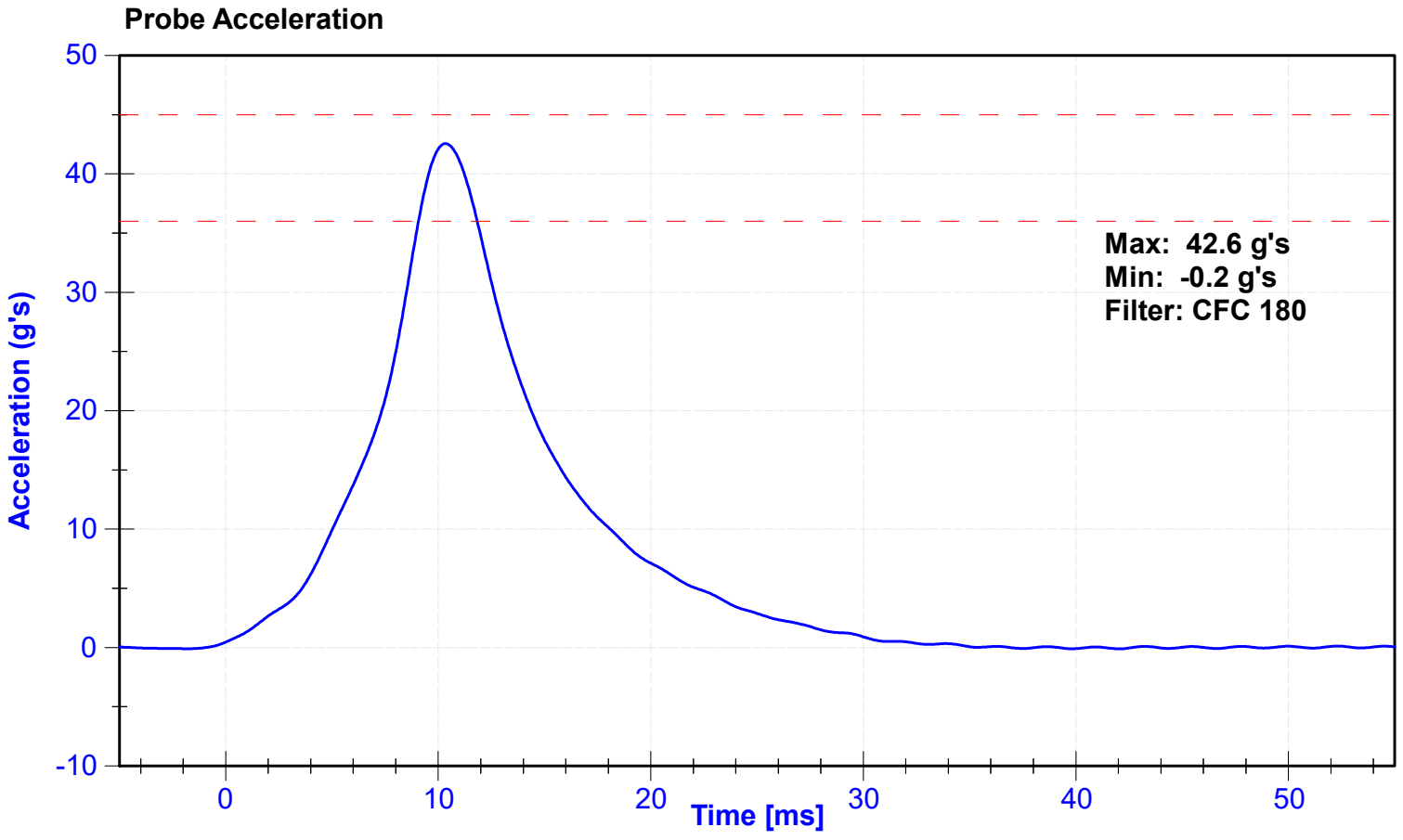
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

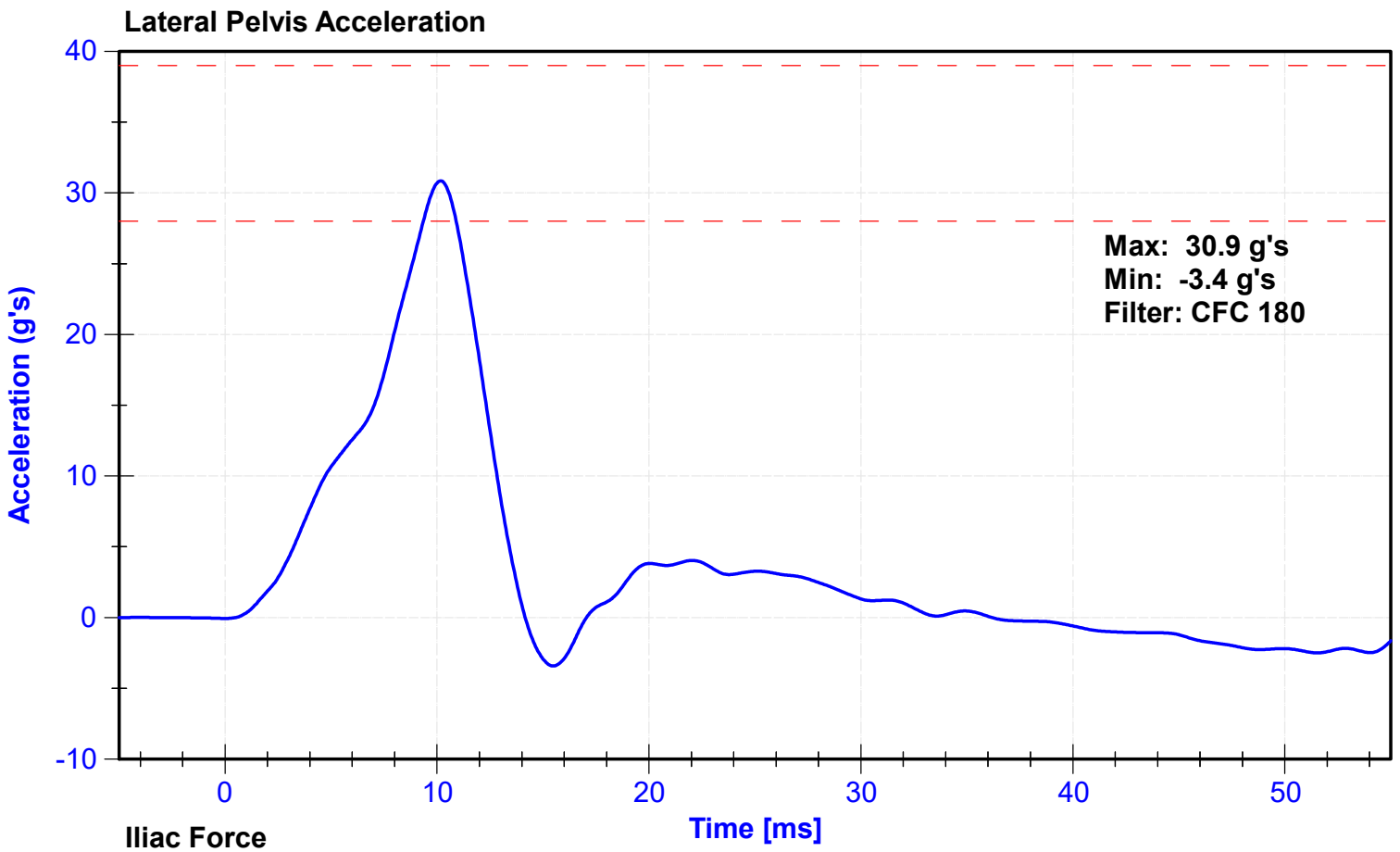
## Results

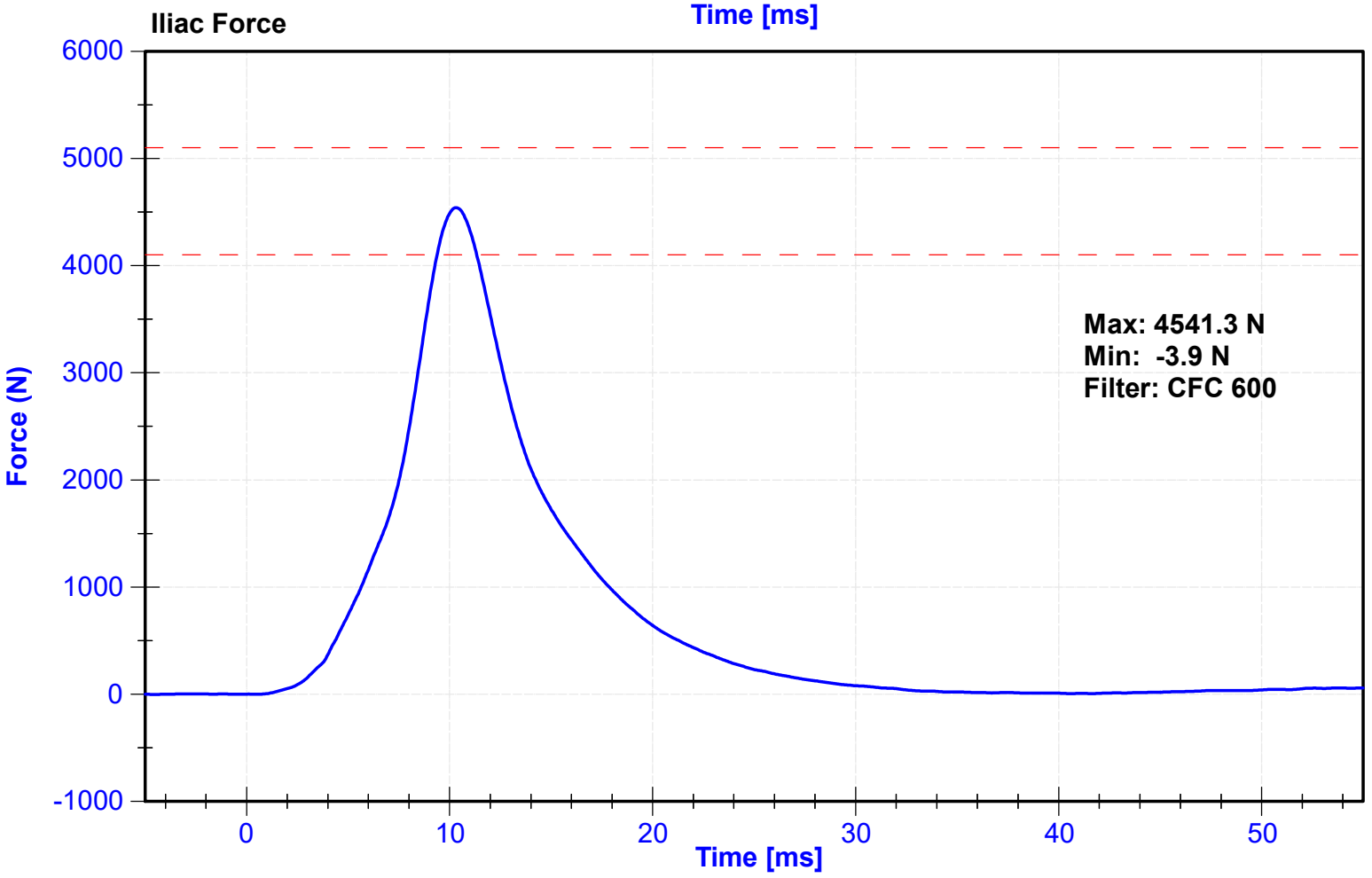
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 46 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.26 | Pass |
| Probe Acceleration | 36 | 45 | g's | 42.6 | Pass |
| Lateral Pelvis Acceleration | 28 | 39 | g's | 30.9 | Pass |
| Iliac Force | 4100 | 5100 | N | 4541.3 | 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 | P51731 | 5/9/2024 | 11/5/2024 |
| Iliac Load Cell | Denton | 321 | 9/11/2023 | 9/10/2024 |




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 30.9 g's
Min: -3.4 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4541.3 N
Min: -3.9 N
Filter: CFC 600

# APPENDIX D

# TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

**TABLE 1 – Dummy Instrumentation (ES-2re)**

| | | | ES-2re S/N _F033__ | | |
|---|---|---|---|---|---|
| | | | **Serial Number** | **Manufacturer** | **Calibration Date** |
| Head Accelerometers | Primary | X | P63861 | Endevco | 05/06/2024 |
| | | Y | P49216 | Endevco | 05/06/2024 |
| | | Z | P51303 | Endevco | 05/06/2024 |
| | Redundant | X | P58868 | Endevco | 05/06/2024 |
| | | Y | P59020 | Endevco | 05/06/2024 |
| | | Z | P52132 | Endevco | 05/06/2024 |
| Thorax Rib Displacement Potentiometers | Upper | Y | 179GFE | Honeywell | 05/06/2024 |
| | Middle | Y | 185GFE | Honeywell | 05/06/2024 |
| | Lower | Y | 178GFE | Honeywell | 05/06/2024 |
| Abdomen Load Cells | Forward | Y | 1509 | Denton | 09/12/2023 |
| | Middle | Y | 1508 | Denton | 09/12/2023 |
| | Rear | Y | 1507 | Denton | 09/12/2023 |
| Lower Spine Accelerometers (T12) | | X | P35790 | Endevco | 05/06/2024 |
| | | Y | T31029 | Endevco | 05/06/2024 |
| | | Z | P52033 | Endevco | 05/06/2024 |
| Pubic Symphysis Load Cell | | Y | 459-FY | Denton | 06/20/2023 |

**TABLE 2 – Dummy Instrumentation (SID-IIs)**

| | | | | SID-IIs S/N __300__ | | |
|---|---|---|---|---|---|---|
| | | | | **Serial Number** | **Manufacturer** | **Calibration Date** |
| Head Accelerometers | | Primary | X | P59018 | Endevco | 05/09/2024 |
| | | | Y | P79189 | Endevco | 05/09/2024 |
| | | | Z | P79587 | Endevco | 05/09/2024 |
| | | Redundant | X | P68057 | Endevco | 05/09/2024 |
| | | | Y | P58986 | Endevco | 05/09/2024 |
| | | | Z | P52025 | Endevco | 05/09/2024 |
| Displacement Potentiometers | Thoracic Rib | Upper | Y | 2316GFE | Servo | 05/09/2024 |
| | | Middle | Y | 085GFE | Servo | 05/09/2024 |
| | | Lower | Y | 1156GFE | Servo | 05/09/2024 |
| | Abdominal Rib | Upper | Y | 060GFE | Servo | 05/09/2024 |
| | | Lower | Y | 075GFE | Servo | 05/09/2024 |
| Lower Spine Accelerometers (T12) | | | X | P64003 | Endevco | 05/09/2024 |
| | | | Y | P52071 | Endevco | 05/09/2024 |
| | | | Z | P17283 | Endevco | 05/09/2024 |
| Acetabulum Load Cell | | | Y | 267-FY | Denton | 09/11/2023 |
| Iliac Wing Load Cell | | | Y | 321 | Denton | 09/11/2023 |
| Pelvis Plug (struck side) | | | | 16620 | SACO | 07/20/2022 |
| Pelvis Plug (non-struck side) | | | | 15768 | SACO | 10/15/2021 |

**TABLE 3 – Vehicle Instrumentation**

| Vehicle Instrumentation | | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|---|
| 1 | Vehicle Center of Gravity | X | A398667 | Measurement Specialties | 03/21/2024 |
| | Vehicle Center of Gravity | Y | A405567 | Measurement Specialties | 03/21/2024 |
| | Vehicle Center of Gravity | Z | A413596 | Measurement Specialties | 03/21/2024 |
| 2 | Right Sill at Front Seat | X | A280968 | Measurement Specialties | 03/21/2024 |
| | Right Sill at Front Seat | Y | A282683 | Measurement Specialties | 03/21/2024 |
| | Right Sill at Front Seat | Z | G22423 | Endevco | 03/21/2024 |
| 3 | Right Sill at Rear Seat | X | A405546 | Measurement Specialties | 03/21/2024 |
| | Right Sill at Rear Seat | Y | A413593 | Measurement Specialties | 03/21/2024 |
| | Right Sill at Rear Seat | Z | A413602 | Measurement Specialties | 03/21/2024 |
| 4 | Left Sill at Front Door | Y | G23679 | Endevco | 04/22/2024 |
| 5 | Left Sill at Rear Door | Y | A413618 | Measurement Specialties | 02/16/2024 |
| 6 | Left A-Post Lower | Y | A413599 | Measurement Specialties | 02/19/2024 |
| 7 | Left A-Post Middle | Y | A372874 | Measurement Specialties | 02/16/2024 |
| 8 | Left B-Post Lower | Y | G22661 | Endevco | 02/19/2024 |
| 9 | Left B-Post Middle | Y | G22610 | Endevco | 04/04/2024 |
| 10 | Front Seat Track | Y | G24311 | Endevco | 04/22/2024 |
| 11 | Rear Seat Track or Structure | Y | A373215 | Measurement Specialties | 02/16/2024 |
| 12 | Right Rear Occ. Compartment | Y | A370928 | Measurement Specialties | 02/15/2024 |
| 13 | Engine Block | X | A300134 | Measurement Specialties | 03/27/2024 |
| | Engine Block | Y | A335474 | Measurement Specialties | 03/27/2024 |
| 14 | Rear Floorpan Above Axle | X | A374251 | Measurement Specialties | 03/08/2024 |
| | Rear Floorpan Above Axle | Y | A374252 | Measurement Specialties | 03/08/2024 |
| | Rear Floorpan Above Axle | Z | A374286 | Measurement Specialties | 03/08/2024 |

**TABLE 4 – MDB Instrumentation**

| MDB Instrumentation | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|
| MDB Center of Gravity | X | A315905 | Measurement Specialties | 02/16/2024 |
| MDB Center of Gravity | Y | A315970 | Measurement Specialties | 02/16/2024 |
| MDB Center of Gravity | Z | A335459 | Measurement Specialties | 02/16/2024 |
| Left Frame at Rear Axle Centerline | X | G23642 | Endevco | 02/05/2024 |
| Left Frame at Rear Axle Centerline | Y | G23646 | Endevco | 02/05/2024 |