

**REPORT NUMBER: SINCAP-MGA-19-056**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
Moving Deformable Barrier Side Impact Test**

**AUDI AG  
2019 Audi e-tron quattro 5-Door SUV  
NHTSA No.: O20195805**

**MGA RESEARCH CORPORATION  
5000 Warren Road  
Burlington, WI 53105**



**Test Date: October 17, 2019**

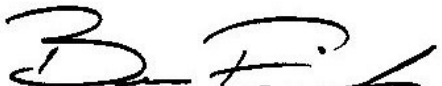
**Final Report Date: December 6, 2019**

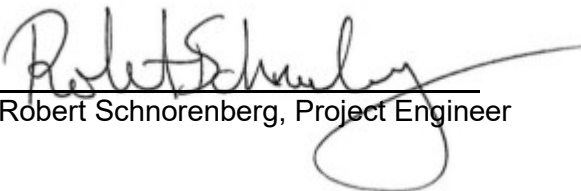
**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Office of Crashworthiness Standards  
Mail Code: NRM-110  
1200 New Jersey Ave, SE  
Room W43-410  
Washington, DC 20590**

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Approval Date: December 6, 2019

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**

|                                                                                                                                                                                                                                                          |                                    |                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>1. Report No.</b><br>SINCAP-MGA-19-056                                                                                                                                                                                                                | <b>2. Government Accession No.</b> | <b>3. Recipient's Catalog No.</b>                                                                          |
| <b>4. Title and Subtitle</b><br>Final Report of New Car Assessment Program<br>Side Impact MDB Testing of 2019 Audi e-tron quattro 5-Door SUV,<br>NHTSA No.: O20195805                                                                                    |                                    | <b>5. Report Date</b><br>December 6, 2019                                                                  |
| <b>7. Author(s)</b><br>Ben Fischer, Project Engineer                                                                                                                                                                                                     |                                    | <b>6. Performing Organization Code</b><br>MGA                                                              |
| <b>9. Performing Organization Name and Address</b><br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105                                                                                                                               |                                    | <b>8. Performing Organization Report No.</b><br>SINCAP-MGA-19-056                                          |
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|                                                                                                                                                                                                                                                          |                                    | <b>14. Sponsoring Agency Code</b><br>NRM-110                                                               |

## **15. Supplementary Notes**

### **16. Abstract**

A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the 2019 Audi e-tron quattro 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards NCAP Side Laboratory Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at MGA Research Corporation in Burlington, Wisconsin on October 17, 2019.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.68 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.9°C. The target vehicle post-test maximum crush was 194 mm at level 1. The test vehicle's performance was as follows:

| Measurement Description                   | Units | Driver ATD (ES-2re) |        |
|-------------------------------------------|-------|---------------------|--------|
|                                           |       | Threshold           | Result |
| Head Injury Criteria (HIC <sub>36</sub> ) |       | 1000                | 44     |
| Maximum Thorax Rib Deflection             | mm    | 44                  | 18     |
| Total Abdominal Force                     | N     | 2500                | 521    |
| Pubic Symphysis Force                     | N     | 6000                | 1049   |
| Resultant Lower Spine Acceleration        | g     | 82*                 | 19     |

| Measurement Description                                 | Units | Passenger ATD (SID-IIs) |        |
|---------------------------------------------------------|-------|-------------------------|--------|
|                                                         |       | Threshold               | Result |
| Head Injury Criteria (HIC <sub>36</sub> )               |       | 1000                    | 123    |
| Resultant Lower Spine Acceleration                      | g     | 82                      | 44     |
| Total Pelvic Force (sum of acetabular and iliac forces) | N     | 5525                    | 2574   |
| Maximum Thoracic Rib Deflection                         | mm    | 38*                     | 8      |
| Maximum Abdomen Rib Deflection                          | mm    | 45*                     | 3      |

\*Proposed IARV

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

### **17. Key Words**

New Car Assessment Program (NCAP)  
Side Impact  
MDB  
ES-2re  
SID-IIs

### **18. Distribution Statement**

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## **SECTION 1**

### **TEST PURPOSE AND PROCEDURE**

This moving deformable barrier side impact test is part of the MY 2019 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00353. The purpose of this test is to generate comparative side impact performance in a 2019 Audi e-tron quattro 5-Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated October 2015.

## SECTION 2 SUMMARY OF TEST RESULTS

A 2019 Audi e-tron quattro 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 61.68 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 MGA Research Corporation in Burlington, Wisconsin on October 17, 2019. 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 NCAP Side Laboratory Test Procedure dated October 2015. The side impact event was documented by eleven (11) 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 Triaxial 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) Triaxial Accelerometers  
Pubic Symphysis Y-Axis Load Cell

### PASSENGER ATD (SID-IIs)

Primary and Redundant Head CG Triaxial Accelerometers  
Primary Head CG Angular Rate Sensors  
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) Triaxial Accelerometers  
Acetabulum and Iliac Wing Y-Axis Load Cells

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D contains the test equipment and instrumentation calibration data. Dummy Injury readings were recorded as follows:

### DUMMY INJURY VALUES

| Measurement Description                   | Units | Driver ATD (ES-2re) |        |
|-------------------------------------------|-------|---------------------|--------|
|                                           |       | Threshold           | Result |
| Head Injury Criteria (HIC <sub>36</sub> ) |       | 1000                | 44     |
| Maximum Thorax Rib Deflection             | mm    | 44                  | 18     |
| Total Abdominal Force                     | N     | 2500                | 521    |
| Pubic Symphysis Force                     | N     | 6000                | 1049   |
| Resultant Lower Spine Acceleration        | g     | 82*                 | 19     |

| Measurement Description                                 | Units | Passenger ATD (SID-IIs) |        |
|---------------------------------------------------------|-------|-------------------------|--------|
|                                                         |       | Threshold               | Result |
| Head Injury Criteria (HIC <sub>36</sub> )               |       | 1000                    | 123    |
| Resultant Lower Spine Acceleration                      | g     | 82                      | 44     |
| Total Pelvic Force (sum of acetabular and iliac forces) | N     | 5525                    | 2574   |
| Maximum Thoracic Rib Deflection                         | mm    | 38*                     | 8      |
| Maximum Abdomen Rib Deflection                          | mm    | 45*                     | 3      |

\*Proposed IARV

Supplemental restraint information is given below:

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type           | Struck Side Driver |          | Struck Side Left Rear Passenger |          |
|--------------------------|--------------------|----------|---------------------------------|----------|
|                          | Mounted            | Deployed | Mounted                         | Deployed |
| Frontal Airbag           | Yes                | No       |                                 |          |
| Knee Airbag              | Yes                | No       |                                 |          |
| Side Curtain Airbag      | Yes                | Yes      | Yes                             | Yes      |
| Side Torso/Pelvis Airbag | Yes                | Yes      | No                              |          |
| Seat Belt Pretensioner   | Yes                | Yes      | Yes                             | Yes      |
| Seat Belt Load Limiter   | Yes                |          | Yes                             |          |
| Other:                   | No                 |          | No                              |          |

The test data can be found on the NHTSA website at [www.nhtsa.gov](http://www.nhtsa.gov)

**GENERAL COMMENTS**

None.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

**SECTION 3**  
**OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019

**TEST VEHICLE INFORMATION AND OPTIONS**

|                          |                      |                                   |     |
|--------------------------|----------------------|-----------------------------------|-----|
| NHTSA No.                | O20195805            | Traction Control System (TCS)     | Yes |
| Model Year               | 2019                 | Auto-Leveling System              | Yes |
| Make                     | Audi                 | Automatic Door Locks (ADL)        | Yes |
| Model                    | e-tron quattro       | Power Window Auto-Reverse         | Yes |
| Body Style               | 5-Door SUV           | Other Optional Feature            | No  |
| VIN                      | WA1LAAGEXKB014815    | Driver Front Airbag               | Yes |
| Body Color               | Galaxy Blue Metallic | Driver Curtain Airbag             | Yes |
| Odometer Reading (km/mi) | 108 km / 67 mi       | Driver Head/Torso Airbag          | No  |
| Engine Displacement (L)  |                      | Driver Torso Airbag               | No  |
| Type/No. Cylinders       | Electric             | Driver Torso/Pelvis Airbag        | Yes |
| Engine Placement         |                      | Driver Pelvis Airbag              | No  |
| Transmission Type        | Automatic            | Driver Knee Airbag                | Yes |
| Transmission Speeds      | 1                    | Rear Pass. Curtain Airbag         | Yes |
| Overdrive                | No                   | Rear Pass. Head/Torso Airbag      | No  |
| Final Drive              | AWD                  | Rear Pass. Torso Airbag           | No  |
| Roof Rack                | No                   | Rear Pass. Torso/Pelvis Airbag    | No  |
| Sunroof/T-Top            | Yes                  | Rear Pass. Pelvis Airbag          | No  |
| Running Boards           | No                   | Driver Seat Belt Pretensioner     | Yes |
| Tilt Steering Wheel      | Yes                  | Rear Pass. Seat Belt Pretensioner | Yes |
| Power Seats              | Yes                  | Driver Load Limiter               | Yes |
| Anti-Lock Brakes (ABS)   | Yes                  | Rear Pass. Load Limiter           | Yes |
|                          |                      | Other Restraint Feature           | N/A |

|                                                                           |    |
|---------------------------------------------------------------------------|----|
| Does owner's manual provide instruction to turn off automatic door locks? | No |
|---------------------------------------------------------------------------|----|

**DATA FROM CERTIFICATION LABEL**

|                     |         |                 |      |
|---------------------|---------|-----------------|------|
| Manufactured By     | AUDI AG | GVWR (kg)       | 3165 |
| Date of Manufacture | 05/19   | GAWR Front (kg) | 1600 |
|                     |         | GAWR Rear (kg)  | 1850 |

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

| Measured Parameter                         | Front | Rear | Third | Total |       |
|--------------------------------------------|-------|------|-------|-------|-------|
| Designated Seating Capacity (DSC)          | 2     | 3    |       | 5     |       |
| Capacity Weight (VCW) (kg)                 |       |      |       | 480   | (A)   |
| DSC x 68.04 kg                             |       |      |       | 340   | (B)   |
| Rated Cargo and Luggage Weight (RCLW) (kg) |       |      |       | 136*  | (A-B) |

\* Rated Cargo and Luggage Weight (RCLW) limited to maximum of 300 lbs (136 kg).

**VEHICLE SEAT TYPE**

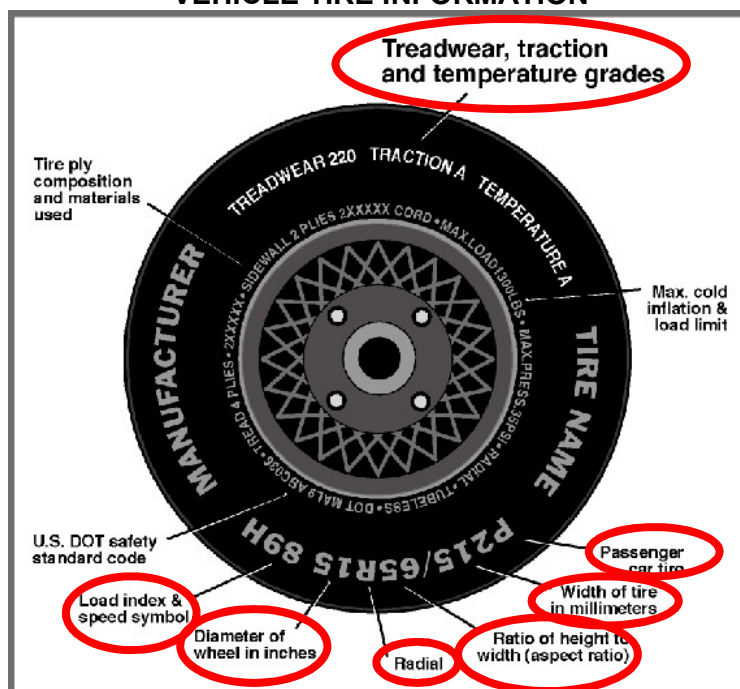
| Seating Location   | Type of Seat Pan |       |             |           | Type of Seat Back |            |       |
|--------------------|------------------|-------|-------------|-----------|-------------------|------------|-------|
|                    | Bucket           | Bench | Split Bench | Contoured | Fixed             | Adjustable |       |
|                    |                  |       |             |           |                   | Manual     | Power |
| Front Seat         | X                |       |             |           |                   |            | X     |
| Rear or Second Row |                  |       |             | X         | X                 |            |       |
| Third Row Seat     |                  |       |             |           |                   |            |       |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

## VEHICLE TIRE INFORMATION



| Measured Parameter       | Front                             | Rear                              |
|--------------------------|-----------------------------------|-----------------------------------|
| Max. Tire Pressure (kPa) | 340                               | 340                               |
| Cold Pressure (kPa)      | 260                               | 280                               |
| Recommended Tire Size    | 255/50 R20 109H                   | 255/50 R20 109H                   |
| Tire Size on Vehicle     | 255/50 R20                        | 255/50 R20                        |
| Tire Manufacturer        | Goodyear                          | Goodyear                          |
| Tire Model               | Eagle Sport                       | Eagle Sport                       |
| Treadwear                | 560                               | 560                               |
| Traction                 | A                                 | A                                 |
| Temperature Grade        | A                                 | A                                 |
| Tire Plies Sidewall      | 2 Polyester                       | 2 Polyester                       |
| Tire Plies Body          | 2 Polyester, 2 Steel, 1 Polyamide | 2 Polyester, 2 Steel, 1 Polyamide |
| Load Index/Speed Symbol  | 109H                              | 109H                              |
| Tire Material            | Rubber                            | Rubber                            |
| DOT Safety Code Left     | K5N4 JK1R 0319                    | K5N4 JK1R 0319                    |
| DOT Safety Code Right    | K5N4 JK1R 0319                    | K5N4 JK1R 0319                    |



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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019

**TEST VEHICLE TIRE PRESSURES**

|                | Units | LF  | RF  | LR  | RR  |
|----------------|-------|-----|-----|-----|-----|
| As Delivered   | kPa   | 250 | 250 | 240 | 250 |
| Tire Placard   | kPa   | 260 | 260 | 280 | 280 |
| Owner's Manual | kPa   | 260 | 260 | 280 | 280 |
| As Tested      | kPa   | 260 | 260 | 280 | 280 |

**MDB TIRE SPECIFICATIONS**

|               | Requirement | Units | LF         | RF         | LR         | RR         |
|---------------|-------------|-------|------------|------------|------------|------------|
| Tire Size     | P205/75R15  | N/A   | P205/75R15 | P205/75R15 | P205/75R15 | P205/75R15 |
| Tire Pressure | 200 ± 21    | kPa   | 200        | 200        | 200        | 200        |

**TEST VEHICLE AXLE WEIGHTS**

|        | Units | As Delivered (UVW) |        |        | As Tested (ATW) |        |        | Fully Loaded |        |        |
|--------|-------|--------------------|--------|--------|-----------------|--------|--------|--------------|--------|--------|
|        |       | Front              | Rear   | Total  | Front           | Rear   | Total  | Front        | Rear   | Total  |
| Left   | kg    | 643.5              | 664.5  |        | 691.5           | 783.0  |        | 686.5        | 789.5  |        |
| Right  | kg    | 661.5              | 646.5  |        | 664.0           | 735.5  |        | 658.0        | 751.0  |        |
| Ratio  | %     | 49.9%              | 50.1%  |        | 47.2%           | 52.8%  |        | 46.6%        | 53.4%  |        |
| Totals | kg    | 1305.0             | 1311.0 | 2616.0 | 1355.5          | 1518.5 | 2874.0 | 1344.5       | 1540.5 | 2885.0 |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                           | Units | Value  |         |
|----------------------------------------------|-------|--------|---------|
| Total Delivered Weight (UVW)                 | kg    | 2616.0 | (A)     |
| Sum of Actual Weight of 2 P572 ATDs Used     | kg    | 129    | (B)     |
| Rated Cargo/Luggage Weight (RCLW)            | kg    | 136    | (C)     |
| Calculated Test Vehicle Target Weight (TVTW) | kg    | 2881.0 | (A+B+C) |

Does the measured As Tested Vehicle Weight lie within the required weight range  
 (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? **YES**

**TEST VEHICLE ATTITUDES AND CG**

|                                                                | Units | Fully Loaded | As Tested | Meets Requirement* |
|----------------------------------------------------------------|-------|--------------|-----------|--------------------|
| Left Front                                                     | mm    | 810          | 819       | Yes                |
| Right Front                                                    | mm    | 815          | 817       | Yes                |
| Right Rear                                                     | mm    | 825          | 831       | Yes                |
| Left Rear                                                      | mm    | 815          | 818       | Yes                |
| Vehicle CG (Aft of Front Axle)                                 | mm    | 1565         | 1549      |                    |
| Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline) | mm    | 19           | 21        |                    |

\* ND=Nose Down (-), NU=Nose Up (+)    \*\* LD=Left Down (-), LU=Left Up (+)

\*\*\* The "As Tested" vehicle attitude measurements must be equal to or within ± 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well.

|                                                           |      |
|-----------------------------------------------------------|------|
| Test height adjustable suspension setting, if applicable: | Auto |
|-----------------------------------------------------------|------|

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

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

| Component Description    | Units | Weight |
|--------------------------|-------|--------|
| Weight of Ballast Added  | kg    | 124    |
| Components Removed: none | kg    |        |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

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**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               | 24.1     | 12.9  | 18.5  |
| Front Passenger Seat      | 24.5     | 13.7  | 19.1  |
| 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<br>SCRL Angle<br>(Mid)<br>(°) | As-Tested<br>SCR Height<br>(mm) | SCR<br>Height<br>Position | SCR Height (mm) |       |              |
|---------------------------|-----------------------------------------|---------------------------------|---------------------------|-----------------|-------|--------------|
|                           |                                         |                                 |                           | Rear-Most       | Mid   | Forward-Most |
| Driver Seat               | 18.5                                    | 0                               | Max                       | 66              | 66    | 66           |
|                           |                                         |                                 | Mid                       | 33              | 33    | 33           |
|                           |                                         |                                 | Min                       | 0               | 0     | 0            |
| Front Passenger Seat      | 19.1                                    | 0                               | Max                       | 66              | 66    | 66           |
|                           |                                         |                                 | Mid                       | 33              | 33    | 33           |
|                           |                                         |                                 | Min                       | 0               | 0     | 0            |
| Front Center Seat         |                                         |                                 | Max                       |                 |       |              |
|                           |                                         |                                 | Mid                       |                 |       |              |
|                           |                                         |                                 | Min                       |                 |       |              |
| Struck Side Rear Seat     | Fixed                                   | Fixed                           | Max                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Mid                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Min                       | Fixed           | Fixed | Fixed        |
| Non-Struck Side Rear Seat | Fixed                                   | Fixed                           | Max                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Mid                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Min                       | Fixed           | Fixed | Fixed        |
| Rear Center Seat          | Fixed                                   | Fixed                           | Max                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Mid                       | Fixed           | Fixed | Fixed        |
|                           |                                         |                                 | Min                       | Fixed           | Fixed | Fixed        |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

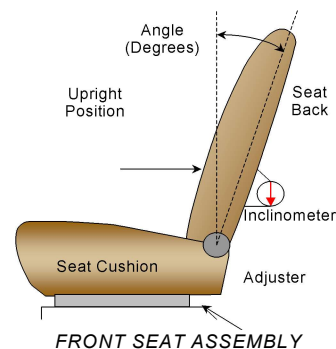
NHTSA No.: O20195805  
 Test Date: 10/17/2019

**SEAT FORE/AFT POSITIONS**

| Seat                      | Total Fore/Aft Travel |                                | Test Position from Forward-Most Position |                               |
|---------------------------|-----------------------|--------------------------------|------------------------------------------|-------------------------------|
|                           | mm                    | Detents (1 <sup>st</sup> as 1) | mm                                       | Detent (1 <sup>st</sup> as 0) |
| Driver Seat               | 246                   |                                | 123                                      |                               |
| Front Passenger Seat      | 246                   |                                | 123                                      |                               |
| Front Center Seat         |                       |                                |                                          |                               |
| Struck Side Rear Seat     | Fixed                 |                                | Fixed                                    |                               |
| Non-Struck Side Rear Seat | Fixed                 |                                | Fixed                                    |                               |
| Rear Center Seat          | Fixed                 |                                | Fixed                                    |                               |

**SEAT BACK ANGLE ADJUSTMENT**

The driver's seat back is positioned to the manufacturer's designated design angle. The front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is adjusted following Appendix C, "Positioning Dummies in the Test Vehicle" in the NCAP Laboratory Test Procedure dated October 2015. The rear center and non-struck side rear outboard seat backs are positioned to match the struck side rear seat back.



| Seat                      | Total Seat Back Angle Range |                                | Test Position from Vertical |                               |
|---------------------------|-----------------------------|--------------------------------|-----------------------------|-------------------------------|
|                           | Degrees                     | Detents (1 <sup>st</sup> as 1) | Degrees                     | Detent (1 <sup>st</sup> as 0) |
| Driver Seat               | 66.4                        |                                | 17.5                        |                               |
| Front Passenger Seat      | 67.0                        |                                | 18.0                        |                               |
| Front Center Seat         |                             |                                |                             |                               |
| Struck Side Rear Seat     | Fixed                       |                                | 25.8                        |                               |
| Non-Struck Side Rear Seat | Fixed                       |                                | 25.8                        |                               |
| Rear Center Seat          | Fixed                       |                                | 25.8                        |                               |

Seat back angles measured on seat back centerline.

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019

**SEAT BELT ANCHORAGE ADJUSTMENT**

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

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

**HEAD RESTRAINT ADJUSTMENT**

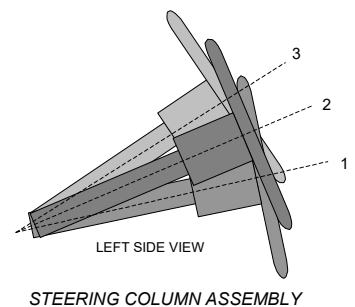
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

|             | Total # of Positions | Placed in Position #             |
|-------------|----------------------|----------------------------------|
| Driver Seat | 5                    | 4 (Lowest as 0) / Forward        |
| Rear Seat   | 2                    | 0 (Lowest as 0) / Fixed Fore-Aft |

**STEERING COLUMN ADJUSTMENT**

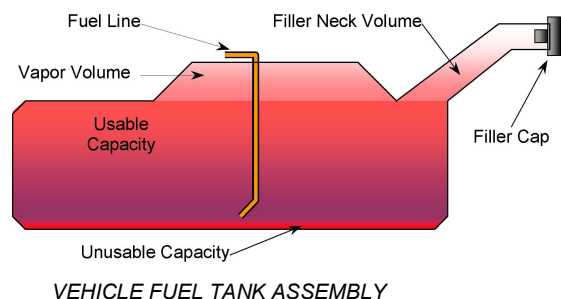
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

|                                   | Wheel Angle (°) | Fore/Aft Position (mm) |
|-----------------------------------|-----------------|------------------------|
| Lowermost, Position 1             | 67.8            |                        |
| Geometric Center, Position 2      | 65.8            |                        |
| Uppermost, Position 3             | 63.8            |                        |
| Telescoping Steering Wheel Travel |                 | 65                     |
| Test Position                     | 65.8            | 33                     |



**FUEL PUMP**

The vehicle propulsion system is fully electric and does not contain a fuel pump.



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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

**FUEL TANK CAPACITY DATA**

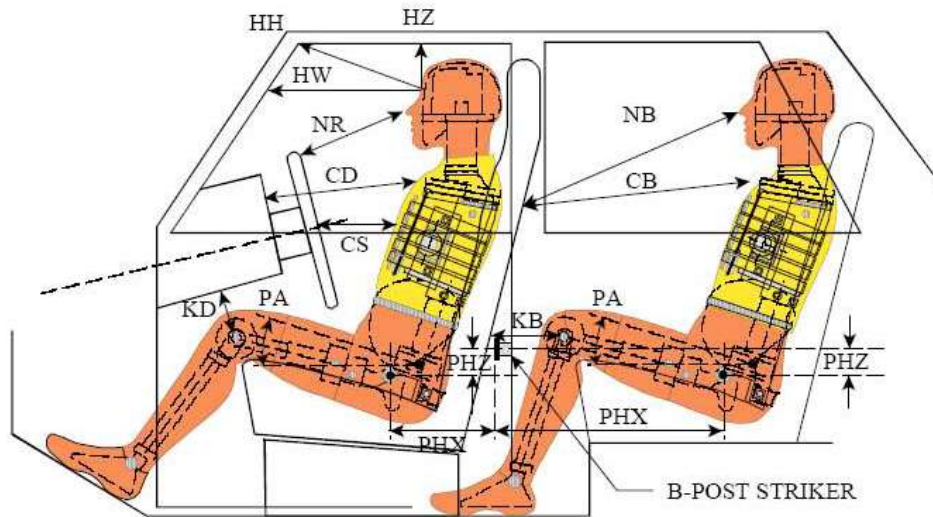
|                                                                 | Liters |
|-----------------------------------------------------------------|--------|
| Usable Capacity of Standard Tank (see Form No. 1)               |        |
| Usable Capacity of Optional Tank (see Form No. 1)               |        |
| Usable Capacity of Standard Tank as Specified in Owner's Manual |        |
| Usable Capacity of Optional Tank as Specified in Owner's Manual |        |
| 93% of Usable Capacity                                          |        |
| Actual Amount of Solvent Used                                   |        |
| 1/3 of Usable Capacity                                          |        |

Is the actual amount of solvent used in the test equal to 93%  $\pm$  1%  
of the Usable Capacity stated in Form No. 1? **N/A**

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



**LEFT SIDE VIEW**

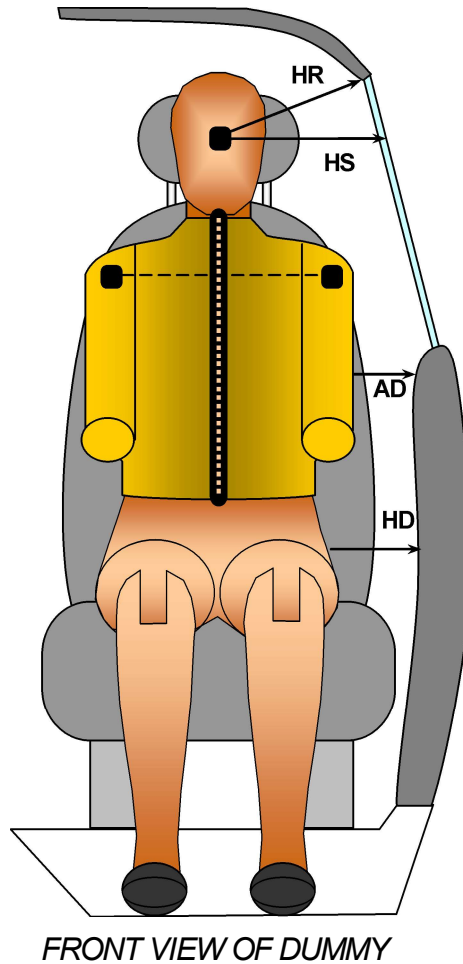
NOTE: 2-DOOR VEHICLE SHOWN.  
 REAR DUMMY PHX & PHZ  
 MEASUREMENTS FOR A 4-DOOR  
 VEHICLE WOULD USE THE C-POST  
 STRIKER AS A REFERENCE POINT

| Driver Code | Pass. Code | Measurement Description       | Driver      |           | Passenger   |           |
|-------------|------------|-------------------------------|-------------|-----------|-------------|-----------|
|             |            |                               | Length (mm) | Angle (°) | Length (mm) | Angle (°) |
| HH          |            | Head to Header                | 375         | 23.9      |             |           |
| HW          |            | Head to Windshield            | 633         | 0         |             |           |
| HZ          | HZ         | Head to Roof Liner            | 176         | 90        | 288         | 90        |
| NR          | NB         | Nose to Rim/Seat Back         | 428         | 14.2      | 612         | 9.5       |
| CD          | CB         | Chest to Dashboard/Seat Back  | 551         | 16.1      | 579         | 5.5       |
| CS          |            | Chest to Steering Wheel       | 352         | 0.8       |             |           |
| KDL         | KBL        | Left Knee to Dash/Seat Back   | 235         | 44.8      | 290         | 4.4       |
| KDR         | KBR        | Right Knee to Dash/Seat Back  | 220         | 41.4      | 295         | 5.2       |
| PAX         | PAX        | Pelvic Tilt Angle X           |             | 20.9      |             | 29.6      |
| PAY         | PAY        | Pelvic Tilt Angle Y           |             | -1.1      |             | 0.3       |
| PHX         | PHX        | Hip Point to Striker (X-Axis) | 145         |           | 205         |           |
| PHZ         | PHZ        | Hip Point to Striker (Z-Axis) | 165         |           | 160         |           |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



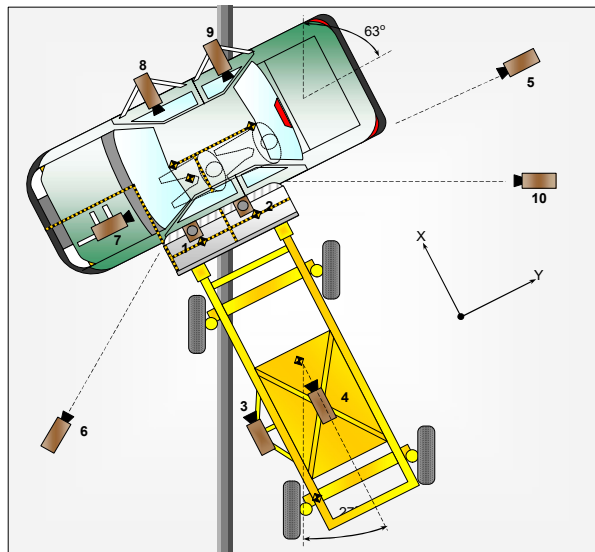
| Code | Measurement Description | Driver      | Passenger |
|------|-------------------------|-------------|-----------|
|      |                         | Length (mm) |           |
| HR   | Head to Side Header     | 224         | 280       |
| HS   | Head to Side Window     | 367         | 405       |
| AD   | Arm to Door             | 122         | 192       |
| HD   | Hip Point to Door       | 157         | 173       |



## DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019



### CAMERA LOCATIONS AND DATA

| No. | Camera View             | Coordinates* (mm) |       |       | Lens (mm) | Frame Rate (fps) |
|-----|-------------------------|-------------------|-------|-------|-----------|------------------|
|     |                         | X                 | Y     | Z     |           |                  |
| 1   | Overhead Overall        | 1060              | 820   | -4995 | 8.5       | 1000             |
| 2   | Overhead Close-Up       | 470               | 0     | -4895 | 20        | 1000             |
| 3   | Left Impact Point (MDB) |                   |       |       | 75        | 1000             |
| 4   | Side Overall (MDB)      |                   |       |       | 16        | 1000             |
| 5   | Rear                    | -40               | 6580  | -1490 | 20        | 1000             |
| 6   | Left Front              | -2470             | -6790 | -1470 | 24        | 1000             |
| 7   | Driver Front (OB)       |                   |       |       | 16        | 1000             |
| 8   | Driver Side (OB)        |                   |       |       | 8.5       | 1000             |
| 9   | Passenger Side (OB)     |                   |       |       | 8.5       | 1000             |
| 10  | Real Time Left Rear     |                   |       |       |           | 30               |
| 11  | Real Time Inrun         |                   |       |       |           | 30               |

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

\*All measurements accurate to  $\pm 6$  mm

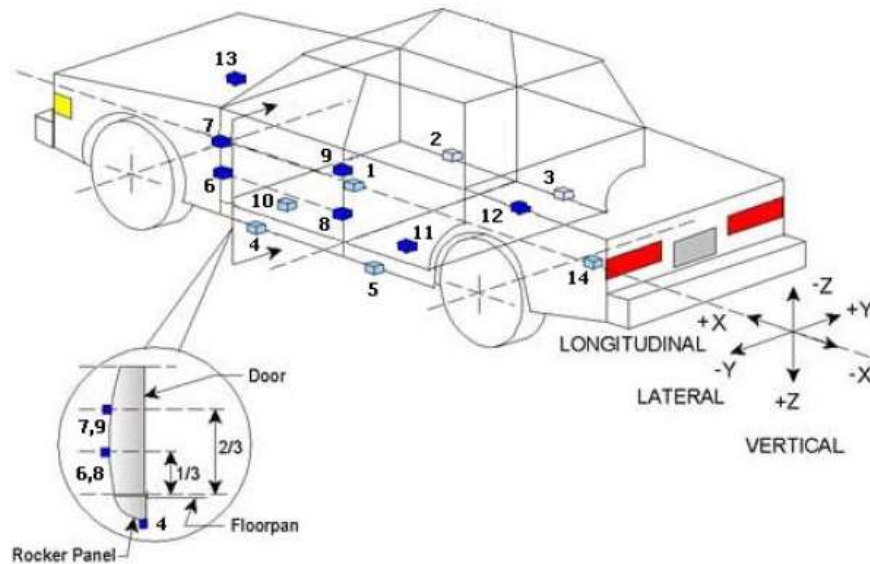
### INSTRUMENTATION

|                    | Number of Channels |
|--------------------|--------------------|
| Driver Dummy       | 16                 |
| Passenger Dummy    | 19                 |
| Vehicle Structure  | 23                 |
| MDB Accelerometers | 5                  |
| MDB Contacts       | 2                  |
| Total              | 65                 |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019



**TEST VEHICLE ACCELEROMETER LOCATIONS**

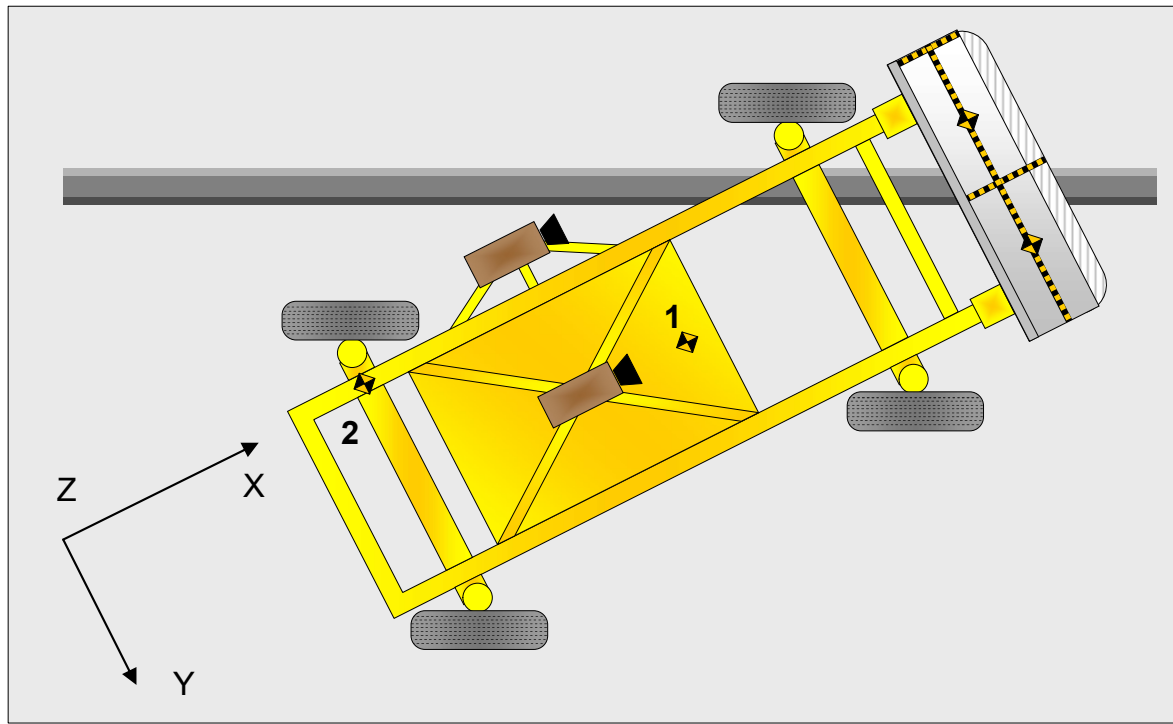
| No. | ID                        | Coordinates (mm) |      |      |
|-----|---------------------------|------------------|------|------|
|     |                           | X                | Y    | Z    |
| 1   | Vehicle CG                | 2469             | -25  | -178 |
| 2   | Right Sill at Front Seat  | 2802             | 785  | -210 |
| 3   | Right Sill at Rear Seat   | 1504             | 860  | -250 |
| 4   | Left Sill at Front Door   | 2826             | -785 | -218 |
| 5   | Left Sill at Rear Door    | 1908             | -783 | -219 |
| 6   | Left Lower A-Post         | 3340             | -852 | -640 |
| 7   | Left Middle A-Post        | 3336             | -845 | -840 |
| 8   | Left Lower B-Post         | 2203             | -753 | -663 |
| 9   | Left Middle B-Post        | 2209             | -760 | -862 |
| 10  | Front Seat Track          | 2407             | -379 | -376 |
| 11  | Rear Seat Structure       | 1952             | -353 | -355 |
| 12  | Rt. Rear Occ. Compartment | 1961             | 394  | -329 |
| 13  | Engine Block              | 4041             | 65   | -999 |
| 14  | Rear Above Axle           | 1092             | -5   | -572 |

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: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



**MDB ACCELEROMETER LOCATIONS**

| No. | Accelerometer Location | Coordinates (mm) |      |      |
|-----|------------------------|------------------|------|------|
|     |                        | X                | Y    | Z    |
| 1   | MDB CG                 | -1105            | 0    | -330 |
| 2   | MDB Rear               | -2580            | -650 | -625 |

Reference: X – MDB Face (+ forward)  
 Y – MDB Centerline (+ to right)  
 Z – Ground Plane (+ down)

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

**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       | Headliner                           | Curtain Airbag, Center Headrest |
| Left Side of Head | Curtain Airbag                      | Curtain Airbag                  |
| Back of Head      | Curtain Airbag, Headliner, Headrest | Seat Back                       |
| Left Shoulder     | None                                | Door Panel                      |
| Upper Torso       | Side Torso/Pelvis Airbag            | None                            |
| Lower Torso       | Side Torso/Pelvis Airbag, Seat Back | Seat Back, Door Panel           |
| Left Hip          | Seat Cushion                        | Seat Cushion, Door Panel        |
| Left Knee         | None                                | Door Panel                      |

**POST-TEST DOOR PERFORMANCE**

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

**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            | No Separation                                    |
| Sill Separation               | None                                             |
| Windshield Damage             | None                                             |
| Side Window Damage            | None                                             |
| Other Notable Effects         | Struck-side windows opened slightly after impact |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type           | Struck Side<br>Driver |          | Struck Side<br>Left Rear Passenger |          |
|--------------------------|-----------------------|----------|------------------------------------|----------|
|                          | Mounted               | Deployed | Mounted                            | Deployed |
| Frontal Airbag           | Yes                   | No       |                                    |          |
| Knee Airbag              | Yes                   | No       |                                    |          |
| Side Curtain Airbag      | Yes                   | Yes      | Yes                                | Yes      |
| Side Torso/Pelvis Airbag | Yes                   | Yes      | No                                 |          |
| Seat Belt Pretensioner   | Yes                   | Yes      | Yes                                | Yes      |
| Seat Belt Load Limiter   | Yes                   |          | Yes                                |          |
| Other:                   | No                    |          | No                                 |          |

**IMPACT POINT LOCATION DATA**

| Measured Parameter                                                            | Units | Tolerance                       | Value |
|-------------------------------------------------------------------------------|-------|---------------------------------|-------|
| Vehicle Wheel Base                                                            | mm    |                                 | 2931  |
| Vertical Impact Reference Line (Aft of Front Axle)<br>(Intended Impact Point) | mm    |                                 | 508   |
| Actual Impact Point (Aft of Front Axle)                                       | mm    |                                 | 505   |
| Horizontal Offset (+forward / -rearward)                                      | mm    | +/- 50 of intended impact point | 3     |
| Vertical Offset (+down / -up)                                                 | mm    | +/- 20 of intended impact point | -2    |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019

**MDB SPECIFICATIONS**

| Measurement Description                 | Length (mm) |
|-----------------------------------------|-------------|
| Overall Width of Framework Carriage     | 1250        |
| Overall Length Including Honeycomb Face | 4119        |
| Wheelbase of Framework Carriage         | 2584        |
| CG Location aft of Front Axle           | 1128        |

**MDB WEIGHTS**

|        | Units | Front Axle | Rear Axle | Total  |
|--------|-------|------------|-----------|--------|
| Left   | kg    | 427.9      | 264.0     |        |
| Right  | kg    | 340.6      | 331.2     |        |
| Ratio  | %     | 56.4       | 43.6      |        |
| Totals | kg    | 768.5      | 595.2     | 1363.7 |

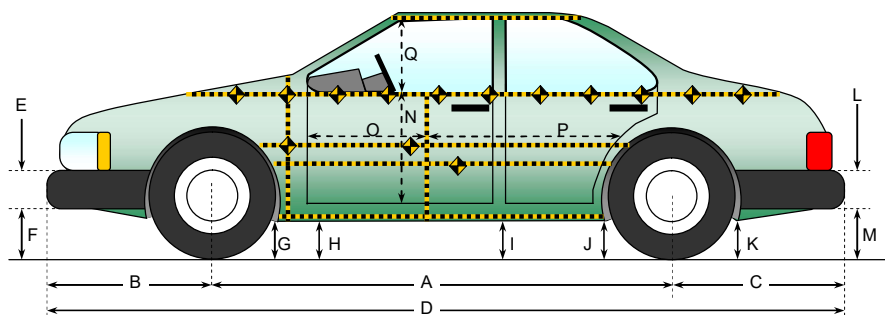
**SPEED AND ANGLE AT IMPACT DATA**

| Measured Parameter                              | Units   | Requirement  | Value |
|-------------------------------------------------|---------|--------------|-------|
| Trap No. 1 Velocity (Primary)                   | km/h    | 61.1 to 62.7 | 61.68 |
| Trap No. 2 Velocity (Redundant)                 | km/h    | 61.1 to 62.7 | 61.83 |
| MDB CL to Target Vehicle CL                     | degrees | 88.5 to 91.5 | 90.9  |
| 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 to 28     | 26.8  |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
Test Date: 10/17/2019



All measurements in (mm) with tolerance of  $\pm 3$  mm

## **LEFT SIDE VIEW**

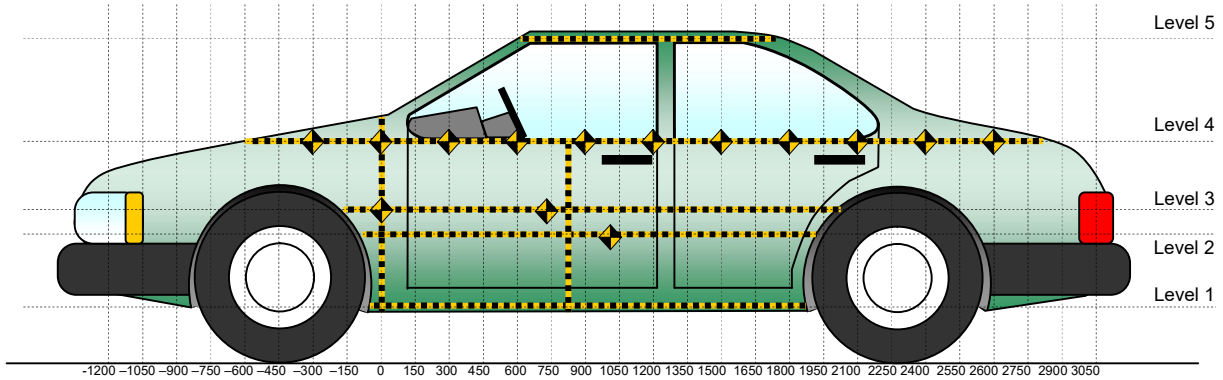
### **VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

| Code | Measurement Description                | Pre-Test | Post-Test | Difference |
|------|----------------------------------------|----------|-----------|------------|
| A    | Wheelbase                              | 2931     | 2931      | 0          |
| B    | Front Axle to FSOV                     | 927      | 933       | -6         |
| C    | Rear Axle to RSOV                      | 1049     | 1041      | 8          |
| D    | Total Length at Centerline             | 4907     | 4905      | 2          |
| E    | Front Bumper Thickness                 | 120      | 120       | 0          |
| F    | Front Bumper Bottom to Ground          | 212      | 220       | -8         |
| G    | Sill Height at Front Wheel Well        | 220      | 226       | -6         |
| H    | Sill Height at Front Door Leading Edge | 220      | 225       | -5         |
| I    | Sill Height at B Pillar                | 182      | 190       | -8         |
| J1   | Sill Height at Rear Wheel Well         | 216      | 223       | -7         |
| J2   | Pinch Weld Height at Rear Wheel Well   | 216      | 223       | -7         |
| K    | Sill Height Aft of Rear Wheel Well     | 276      | 269       | 7          |
| L    | Rear Bumper Thickness                  | 140      | 140       | 0          |
| M    | Rear Bumper Bottom to Ground           | 308      | 314       | -6         |
| N    | Sill Height to Window Bottom Sill      | 915      | 861       | 54         |
| O    | Front Door Leading Edge to Impact CL   | 790      | 767       | 23         |
| P    | Rear Door Trailing Edge to Impact CL   | 1148     | 1098      | 50         |
| Q    | Front Window Opening                   | 432      | 423       | 9          |
| R    | Right Side Length                      | 4137     | 4135      | 2          |
| S    | Left Side Length                       | 4137     | 4130      | 7          |
| T    | Vehicle Width at B Post                | 1938     | 1865      | 73         |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



All Measurements Shown in mm

**LEFT SIDE VIEW**

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

| Level | Measurement Description | Height Above Ground | Maximum Exterior Static Crush | Distance from Impact |
|-------|-------------------------|---------------------|-------------------------------|----------------------|
| 1     | Sill Top                | 555                 | 194                           | 1500                 |
| 2     | Mid Door                | 581                 | 186                           | 1500                 |
| 3     | Occupant H-Point        | 685                 | 174                           | 1650                 |
| 4     | Window Sill             | 1062                | 50                            | 1350                 |
| 5     | Window Top              | 1563                | 9                             | 1350                 |

Note: The measurements are 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: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019

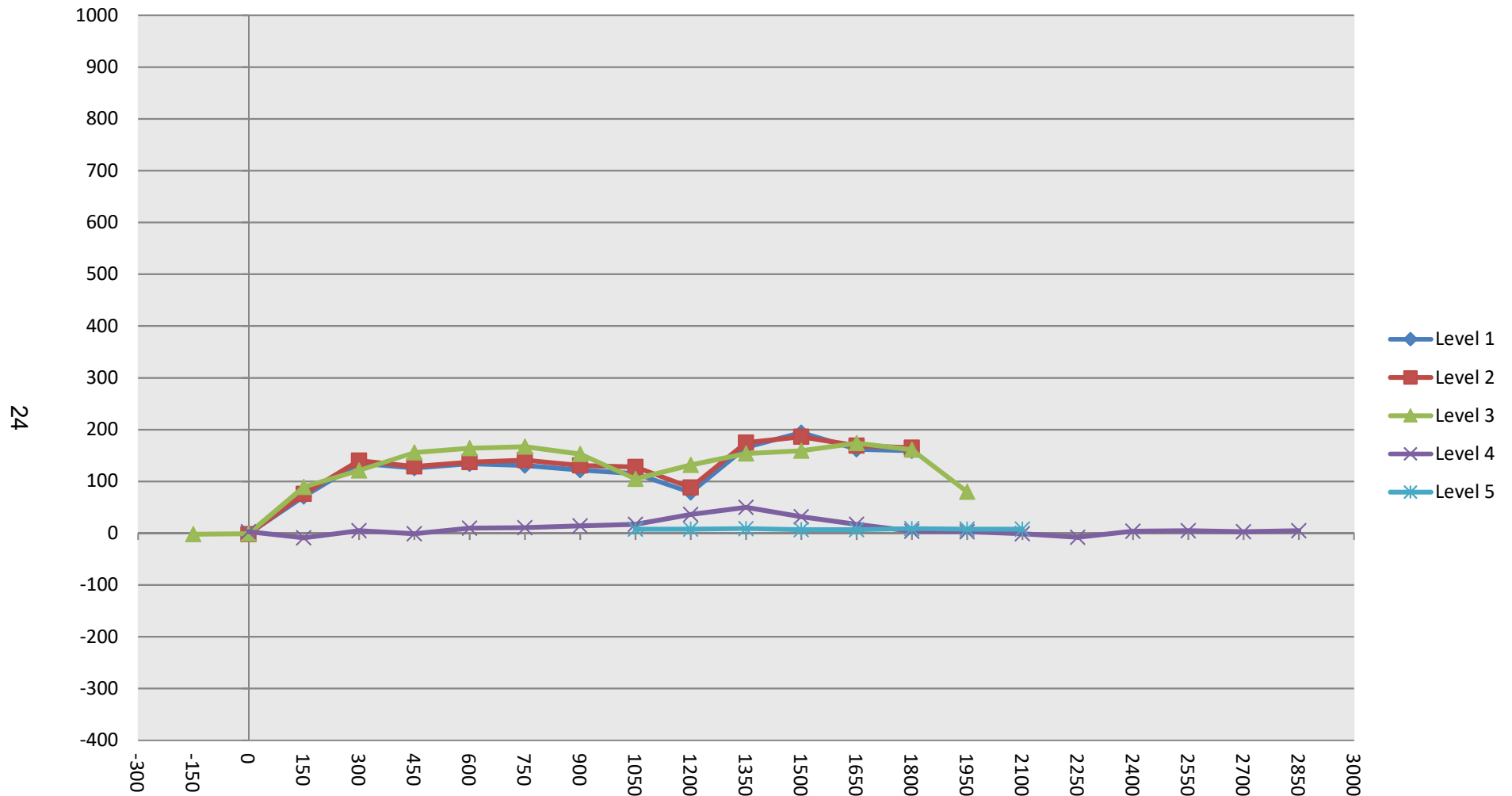
|       | Pre-Test |     |     |     |     | Post-Test |     |     |     |     | Difference |     |     |    |   |
|-------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|------------|-----|-----|----|---|
|       | 1        | 2   | 3   | 4   | 5   | 1         | 2   | 3   | 4   | 5   | 1          | 2   | 3   | 4  | 5 |
| -2100 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1950 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1800 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1650 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1500 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1350 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1200 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -1050 |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -900  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -750  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -600  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -450  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -300  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| -150  |          |     | 135 |     |     |           |     | 133 |     |     |            |     | -2  |    |   |
| 0     | 142      | 142 | 142 | 261 |     | 141       | 140 | 141 | 264 |     | -1         | -2  | -1  | 3  |   |
| 150   | 150      | 149 | 146 | 255 |     | 221       | 225 | 235 | 246 |     | 71         | 76  | 89  | -9 |   |
| 300   | 160      | 157 | 152 | 241 |     | 295       | 297 | 273 | 246 |     | 135        | 140 | 121 | 5  |   |
| 450   | 163      | 163 | 157 | 238 |     | 289       | 292 | 313 | 237 |     | 126        | 129 | 156 | -1 |   |
| 600   | 159      | 161 | 157 | 231 |     | 293       | 298 | 321 | 241 |     | 134        | 137 | 164 | 10 |   |
| 750   | 152      | 157 | 154 | 225 |     | 283       | 298 | 321 | 236 |     | 131        | 141 | 167 | 11 |   |
| 900   | 145      | 152 | 154 | 219 |     | 267       | 283 | 307 | 233 |     | 122        | 131 | 153 | 14 |   |
| 1050  | 140      | 149 | 153 | 214 | 472 | 255       | 277 | 258 | 231 | 480 | 115        | 128 | 105 | 17 | 8 |
| 1200  | 136      | 145 | 153 | 212 | 467 | 215       | 233 | 285 | 248 | 475 | 79         | 88  | 132 | 36 | 8 |
| 1350  | 135      | 143 | 155 | 210 | 466 | 301       | 318 | 309 | 260 | 475 | 166        | 175 | 154 | 50 | 9 |
| 1500  | 132      | 141 | 157 | 210 | 468 | 326       | 327 | 316 | 242 | 475 | 194        | 186 | 159 | 32 | 7 |
| 1650  | 134      | 139 | 157 | 211 | 473 | 296       | 308 | 331 | 228 | 480 | 162        | 169 | 174 | 17 | 7 |
| 1800  | 136      | 137 | 148 | 212 | 476 | 295       | 302 | 309 | 216 | 485 | 159        | 165 | 161 | 4  | 9 |
| 1950  |          |     | 135 | 202 | 486 |           |     | 215 | 205 | 494 |            |     | 80  | 3  | 8 |
| 2100  |          |     |     | 194 | 504 |           |     |     | 193 | 512 |            |     |     | -1 | 8 |
| 2250  |          |     |     | 191 |     |           |     |     | 183 |     |            |     |     | -8 |   |
| 2400  |          |     |     | 192 |     |           |     |     | 196 |     |            |     |     | 4  |   |
| 2550  |          |     |     | 196 |     |           |     |     | 201 |     |            |     |     | 5  |   |
| 2700  |          |     |     | 208 |     |           |     |     | 211 |     |            |     |     | 3  |   |
| 2850  |          |     |     | 222 |     |           |     |     | 227 |     |            |     |     | 5  |   |
| 3000  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3150  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3300  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3450  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3600  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3750  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |
| 3900  |          |     |     |     |     |           |     |     |     |     |            |     |     |    |   |

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.

**DATA SHEET NO. 11 (CONTINUED)**  
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
Test Program: NCAP Side MDB Impact Test

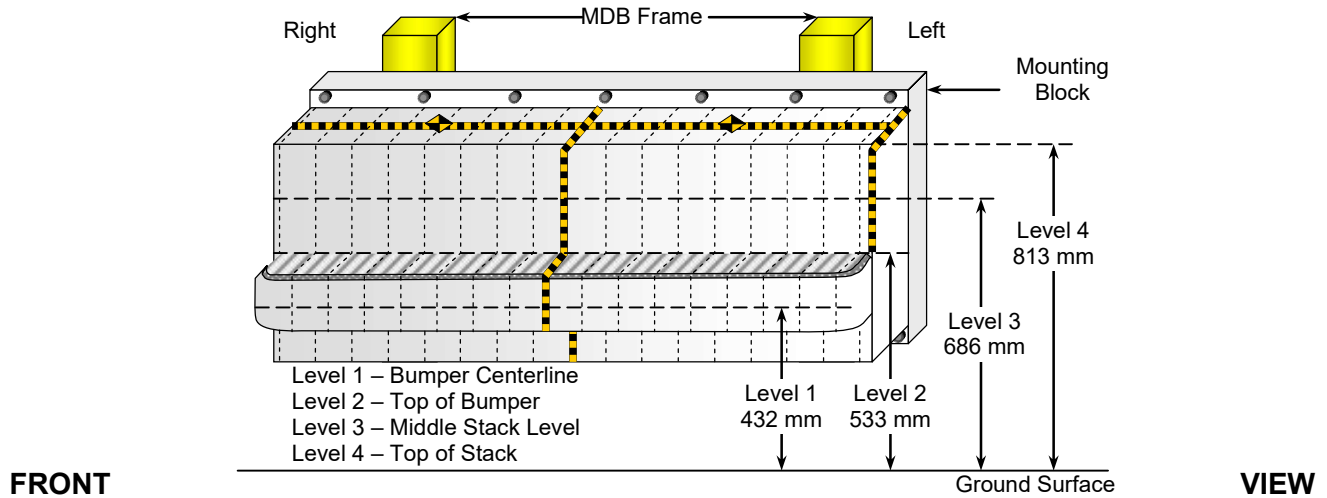
NHTSA No.: O20195805  
Test Date: 10/17/2019



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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

| Vertical Location |                  |             | From Centerline |           | Maximum Crush (mm) |
|-------------------|------------------|-------------|-----------------|-----------|--------------------|
| Row               | Description      | Height (mm) | Distance (mm)   | Direction |                    |
| A                 | Center of Bumper | 432         | 800             | Right     | 324                |
| B                 | Top of Bumper    | 533         | 800             | Right     | 215                |
| C                 | Mid-Level        | 686         | 800             | Left      | 196                |
| D                 | Top of Stack     | 813         | 800             | Left      | 223                |

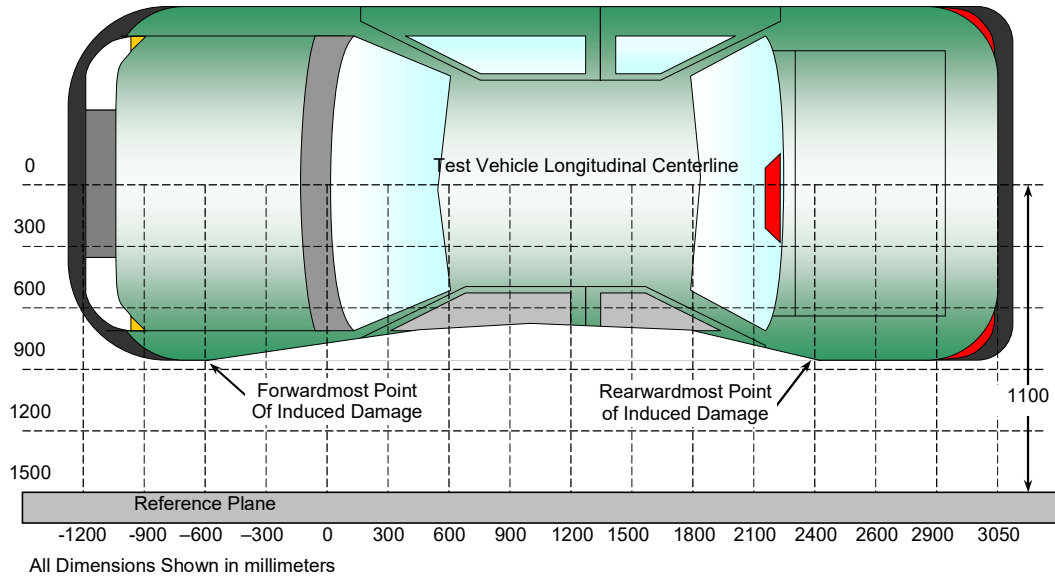
**DEFORMABLE BARRIER STATIC CRUSH**

| Stack Level | Distance Right of Center (mm) |     |     |     |     |     |     |     | C <sub>L</sub> | Distance Left of Center (mm) |     |     |     |     |     |     |     |
|-------------|-------------------------------|-----|-----|-----|-----|-----|-----|-----|----------------|------------------------------|-----|-----|-----|-----|-----|-----|-----|
|             | 800                           | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0              | 100                          | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 4           | 145                           | 138 | 138 | 138 | 173 | 210 | 208 | 195 | 138            | 133                          | 126 | 114 | 128 | 138 | 162 | 187 | 223 |
| 3           | 134                           | 122 | 123 | 122 | 120 | 129 | 153 | 159 | 125            | 101                          | 92  | 90  | 92  | 100 | 126 | 161 | 196 |
| 2           | 215                           | 210 | 200 | 197 | 195 | 203 | 190 | 189 | 190            | 183                          | 173 | 165 | 164 | 166 | 170 | 174 | 198 |
| 1           | 324                           | 319 | 309 | 306 | 307 | 307 | 302 | 289 | 287            | 282                          | 277 | 273 | 275 | 276 | 277 | 280 | 296 |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



**TOP VIEW**

**VEHICLE DAMAGE PROFILE DISTANCES**

| DPD | Distance from Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Max. Static Crush (mm) |
|-----|---------------------------------|-------|----------------|---------------|------------------------|
| 1   | 2000                            | 3     | 180            | 153           | 27                     |
| 2   | 1610                            | 3     | 328            | 157           | 171                    |
| 3   | 1220                            | 3     | 285            | 153           | 132                    |
| 4   | 830                             | 3     | 316            | 154           | 162                    |
| 5   | 440                             | 3     | 311            | 157           | 154                    |
| 6   | 50                              | 3     | 182            | 143           | 39                     |

**MDB DAMAGE PROFILE DISTANCES**

| DPD | Distance from Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Max. Static Crush (mm) |
|-----|---------------------------------|-------|----------------|---------------|------------------------|
| 1   | 800 mm right of center          | 1     | 800            | 476           | 324                    |
| 2   | 480 mm right of center          | 1     | 774            | 463           | 311                    |
| 3   | 160 mm right of center          | 1     | 758            | 463           | 295                    |
| 4   | 160 mm left of center           | 1     | 737            | 463           | 274                    |
| 5   | 480 mm left of center           | 1     | 745            | 463           | 282                    |
| 6   | 800 mm left of center           | 1     | 772            | 476           | 296                    |

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

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

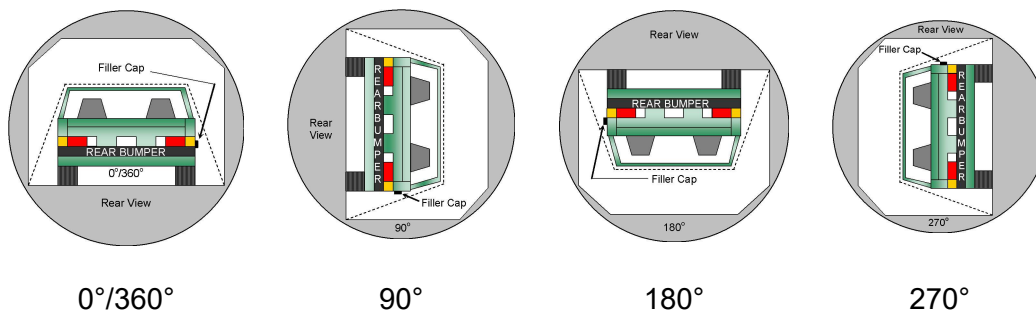
NHTSA No.: O20195805  
 Test Date: 10/17/2019

Test Time: 1:49 pm

Temperature: 21.9°C

- A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) N/A oz.  
 B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) N/a oz.  
 C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) N/A  
 D. Spillage Details: N/A

**FMVSS 301 STATIC ROLLOVER DATA**



**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase   | Rotation Time | Hold Time | Total Time |
|--------------|---------------|-----------|------------|
| 0° to 90°    |               |           |            |
| 90° to 180°  |               |           |            |
| 180° to 270° |               |           |            |
| 270° to 360° |               |           |            |

**FMVSS 301 ROLLOVER SPILLAGE TABLE (UNITS IN OUNCES)**

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

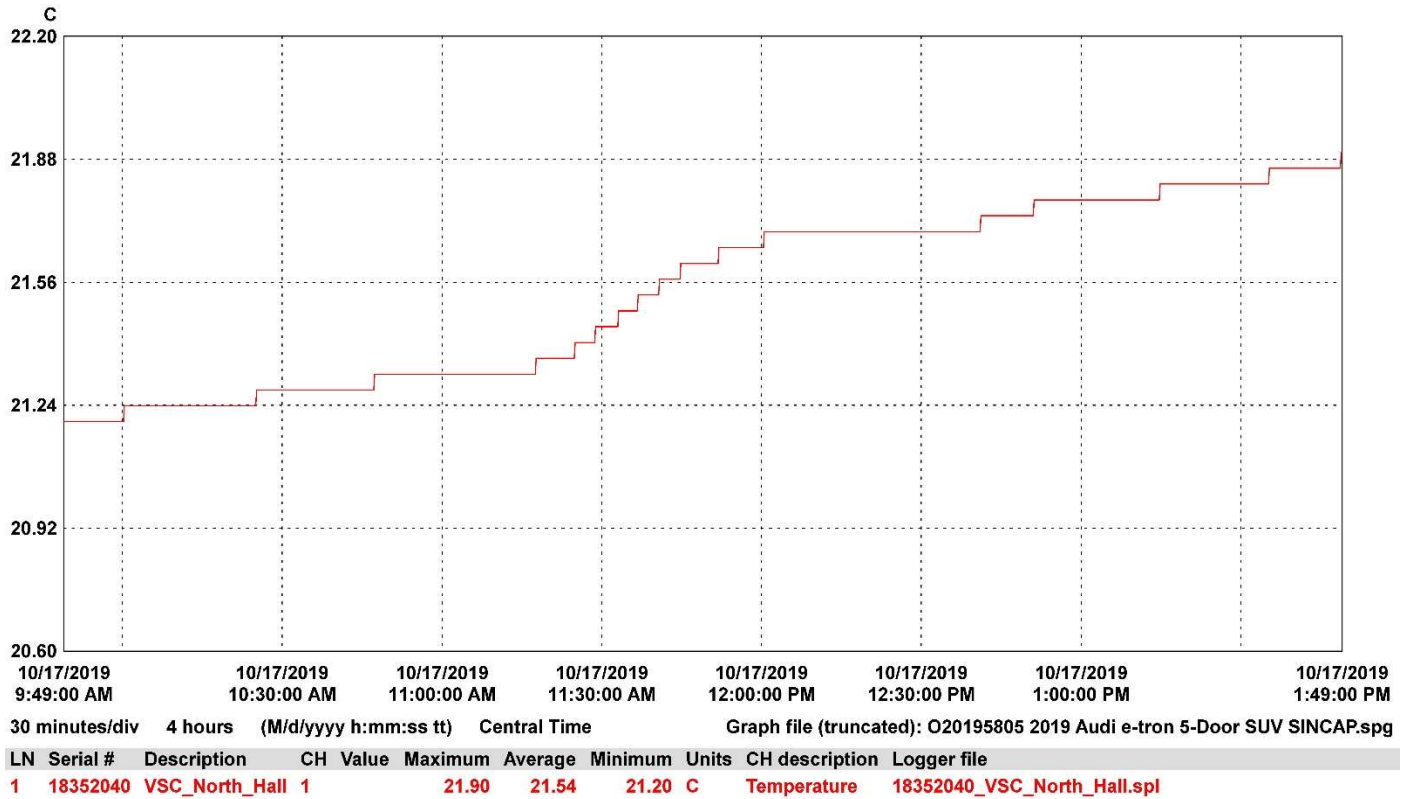
**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

| Test Phase   | Spillage Location |
|--------------|-------------------|
| 0° to 90°    |                   |
| 90° to 180°  |                   |
| 180° to 270° |                   |
| 270° to 360° |                   |

# **DATA SHEET NO. 15** **DUMMY/VEHICLE TEMPERATURE STABILIZATION DATA**

Test Vehicle: 2019 Audi e-tron quattro 5-Door SUV  
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20195805  
 Test Date: 10/17/2019



**APPENDIX A**  
**PHOTOGRAPHS**

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Photo No. 001 - As Delivered Right Front Three-Quarter View of Test Vehicle



Photo No. 002 - As Delivered Left Rear Three-Quarter View of Test Vehicle





Photo No. 003 - Pre-Test Frontal View of Test Vehicle



Photo No. 004 - Post-Test Frontal View of Test Vehicle





Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle





Photo No. 007 - Pre-Test Left Side View of Test Vehicle



Photo No. 008 - Post-Test Left Side View of Test Vehicle





Photo No. 009 - Pre-Test Left Three-Quarter Rear View of Test Vehicle



Photo No. 010 - Post-Test Left Three-Quarter Rear View of Test Vehicle



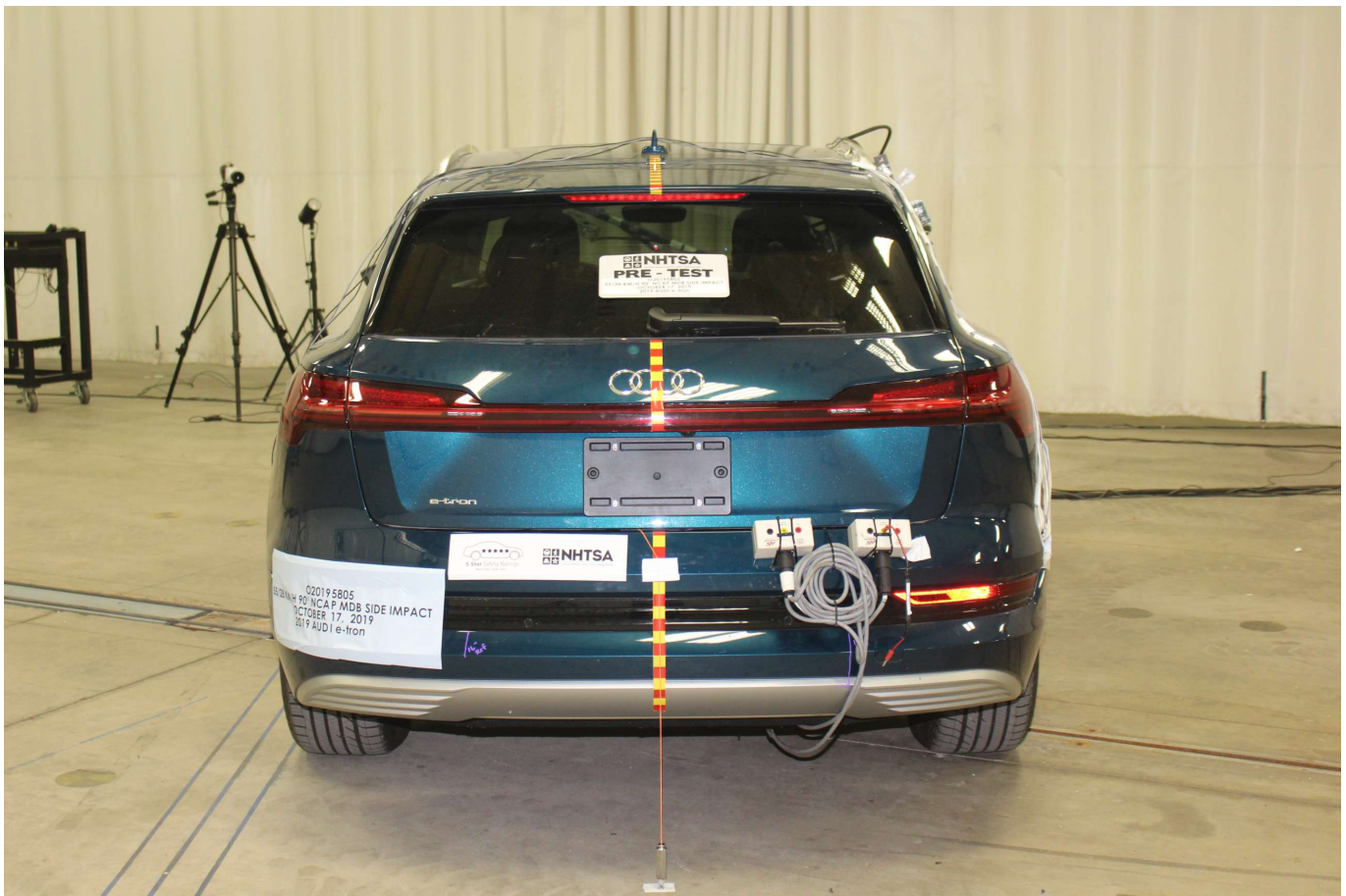


Photo No. 011 - Pre-Test Rear View of Test Vehicle



Photo No. 012 - Post-Test Rear View of Test Vehicle





Photo No. 013 - Pre-Test Right Side View of Test Vehicle



Photo No. 014 - Post-Test Right Side View of Test Vehicle



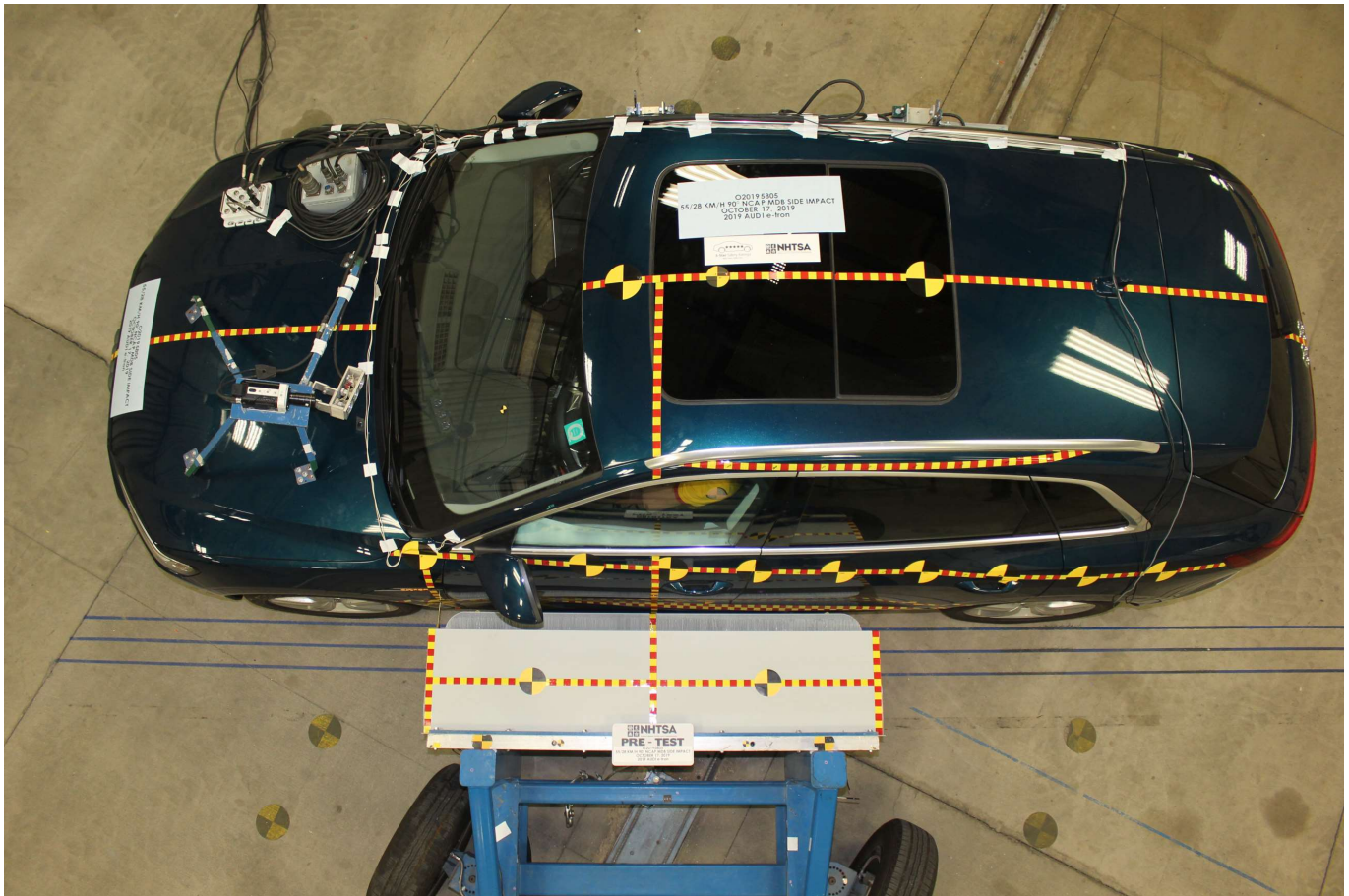


Photo No. 015 - Pre-Test Overhead View of Test Area

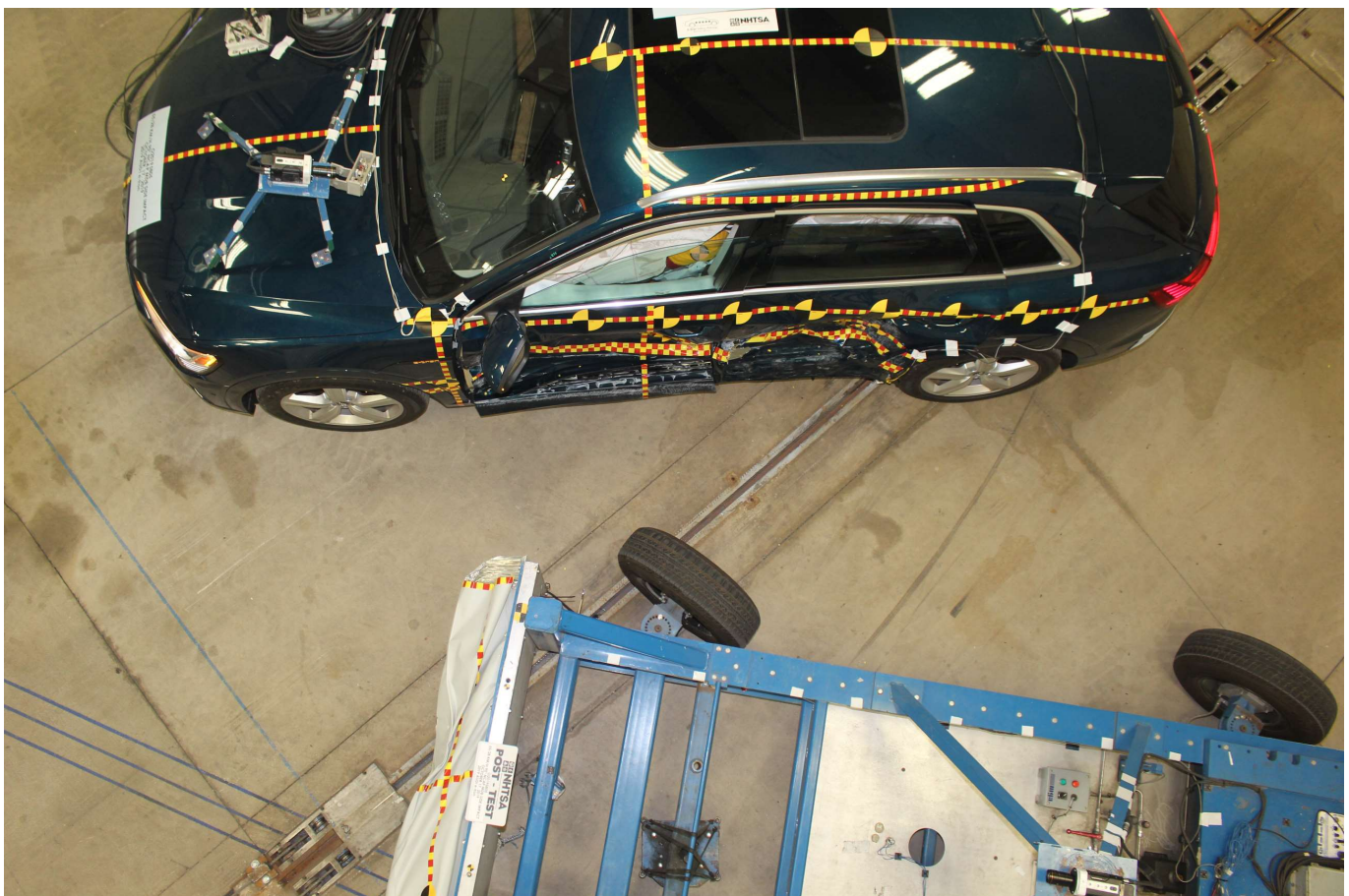


Photo No. 016 - Post-Test Overhead View of Test Area





Photo No. 017 - Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 018 - Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle





Photo No. 019 - Pre-Test Close-Up View of Impact Point Target



Photo No. 020 - Post-Test Close-Up View of Impact Point Target





Photo No. 021 - Pre-Test Left Front Door Latch Close-Up



Photo No. 022 - Post-Test Left Front Door Latch Close-Up





Photo No. 023 - Pre-Test Left Rear Door Latch Close-Up



Photo No. 024 - Post-Test Left Rear Door Latch Close-Up





Photo No. 025 - Pre-Test Front Close-Up View of Driver Dummy



Photo No. 026 - Post-Test Front Close-Up View of Driver Dummy





Photo No. 027 - Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Photo No. 028 - Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View





Photo No. 029 - Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 030 - Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



**PHOTOGRAPH NOT AVAILABLE**

Photo No. 031 - Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 032 - Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Photo No. 033 - Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Photo No. 034 - Pre-Test Placement of Driver Dummy Feet





Photo No. 035 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 036 - Pre-Test Left Side View of Steering Wheel





Photo No. 037 - Pre-Test View of Disengaged Parking Brake



Photo No. 038 - Pre-Test View of Parking Brake





Photo No. 039 - Pre-Test Close-Up Left Side View of Driver Seat Track



Photo No. 040 - Pre-Test Close-Up Left Side View of Driver Seat Back





Photo No. 041 - Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Photo No. 042 - Pre-Test Driver Dummy and Door Clearance View





Photo No. 043 - Post-Test Driver Dummy and Door Clearance View



Photo No. 044 - Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment





Photo No. 045 - Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Photo No. 046 - Pre-Test Driver Inner Door Panel View





Photo No. 047 - Post-Test Driver Inner Door Panel View



Photo No. 048 - Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View





Photo No. 049 - Post-Test Driver Dummy Close-up Head Contact with Side Airbag View



Photo No. 050 - Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View





Photo No. 051 - Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View



Photo No. 052 - Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 053 - Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 054 - Post-Test Driver Dummy Close-up Knee Contact View





Photo No. 055 - Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Photo No. 056 - Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View





Photo No. 057 - Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 058 - Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning





Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 060 - Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning





Photo No. 061 - Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



Photo No. 062 - Pre-Test View of Rear Passenger Dummy Neck Showing Position of Adjustable Neck Bracket





Photo No. 063 - Pre-Test View of Rear Passenger Dummy Head Showing Dummy Head is Level



Photo No. 064 - Pre-Test Placement of Rear Passenger Dummy Feet





Photo No. 065 - Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Photo No. 066 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Track





Photo No. 067 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Photo No. 068 - Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint





Photo No. 069 - Pre-Test Rear Passenger Dummy and Door Clearance View



Photo No. 070 - Post-Test Rear Passenger Dummy and Door Clearance View





Photo No. 071 - Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 072 - Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment





Photo No. 073 - Pre-Test Rear Passenger Inner Door Panel View



Photo No. 074 - Post-Test Rear Passenger Inner Door Panel View





Photo No. 075 - Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View



Photo No. 076 - Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View





Photo No. 077 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 078 - Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View



Photo No. 079 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 080 - Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View



# PHOTOGRAPH NOT APPLICABLE

Photo No. 081 - Post-Test Rear Passenger Dummy Close-up Knee Contact View



Photo No. 082 - Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 083 - Post-Test View of Fuel Filler Cap or Fuel Filler Neck

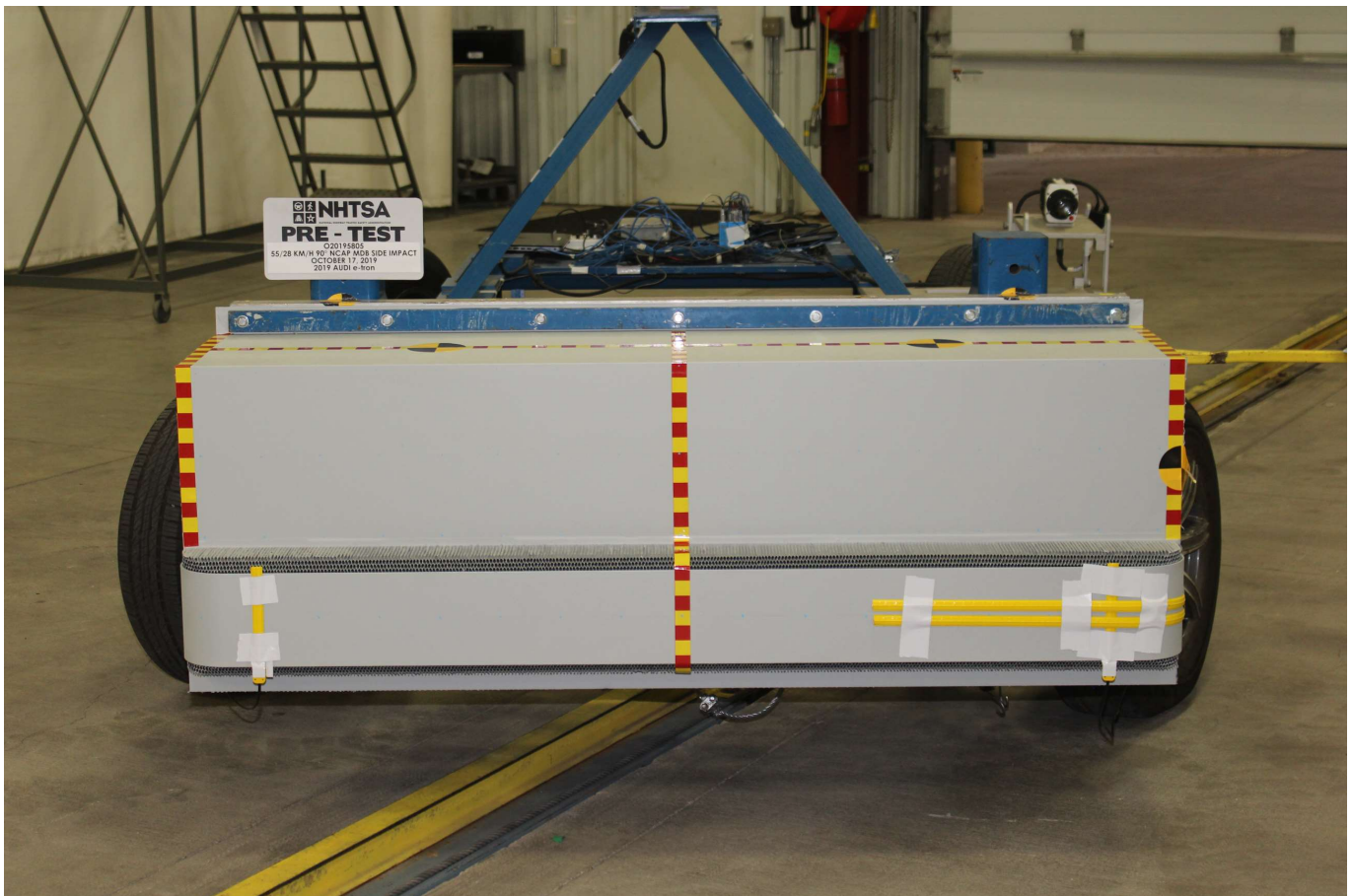


Photo No. 084 - Pre-Test Front View of MDB Impactor Face



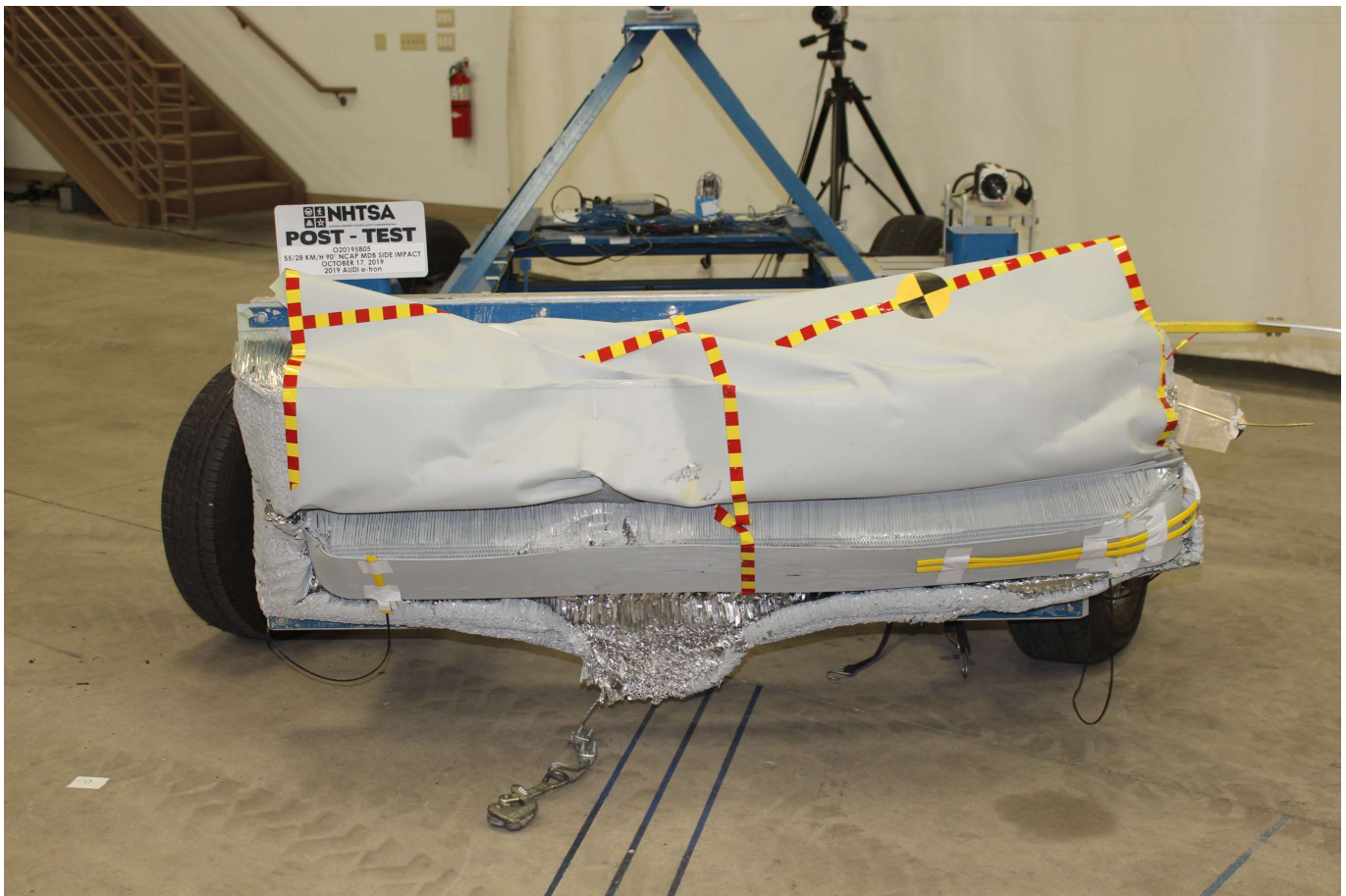


Photo No. 085 - Post-Test Front View of MDB Impactor Face

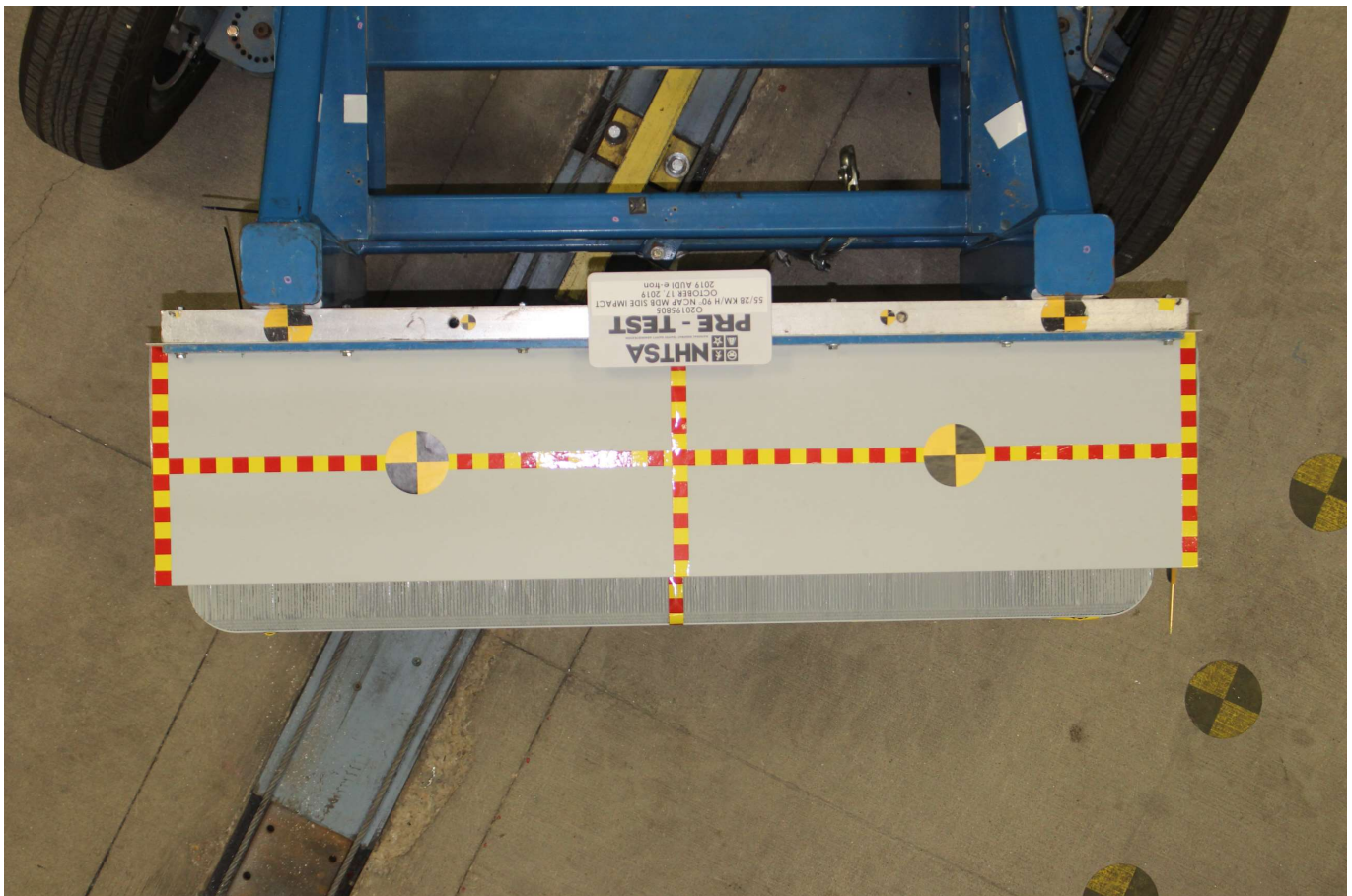


Photo No. 086 - Pre-Test Top View of MDB Impactor Face





Photo No. 087 - Post-Test Top View of MDB Impactor Face



Photo No. 088 - Pre-Test Left Side View of MDB Impactor Face





Photo No. 089 - Post-Test Left Side View of MDB Impactor Face



Photo No. 090 - Pre-Test Right Side View of MDB Impactor Face





Photo No. 091 - Post-Test Right Side View of MDB Impactor Face

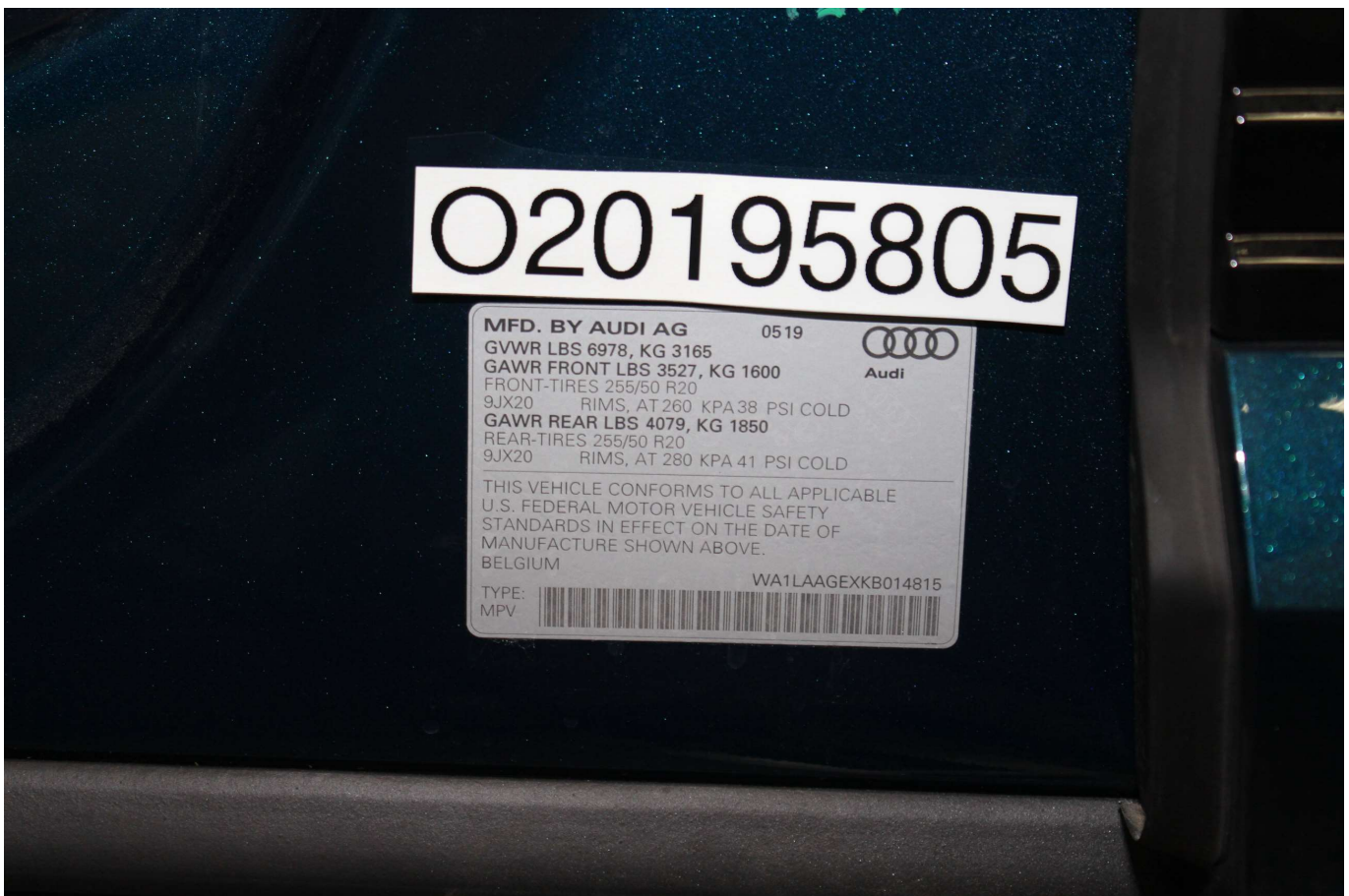


Photo No. 092 - Close-Up View of Vehicle Certification Label



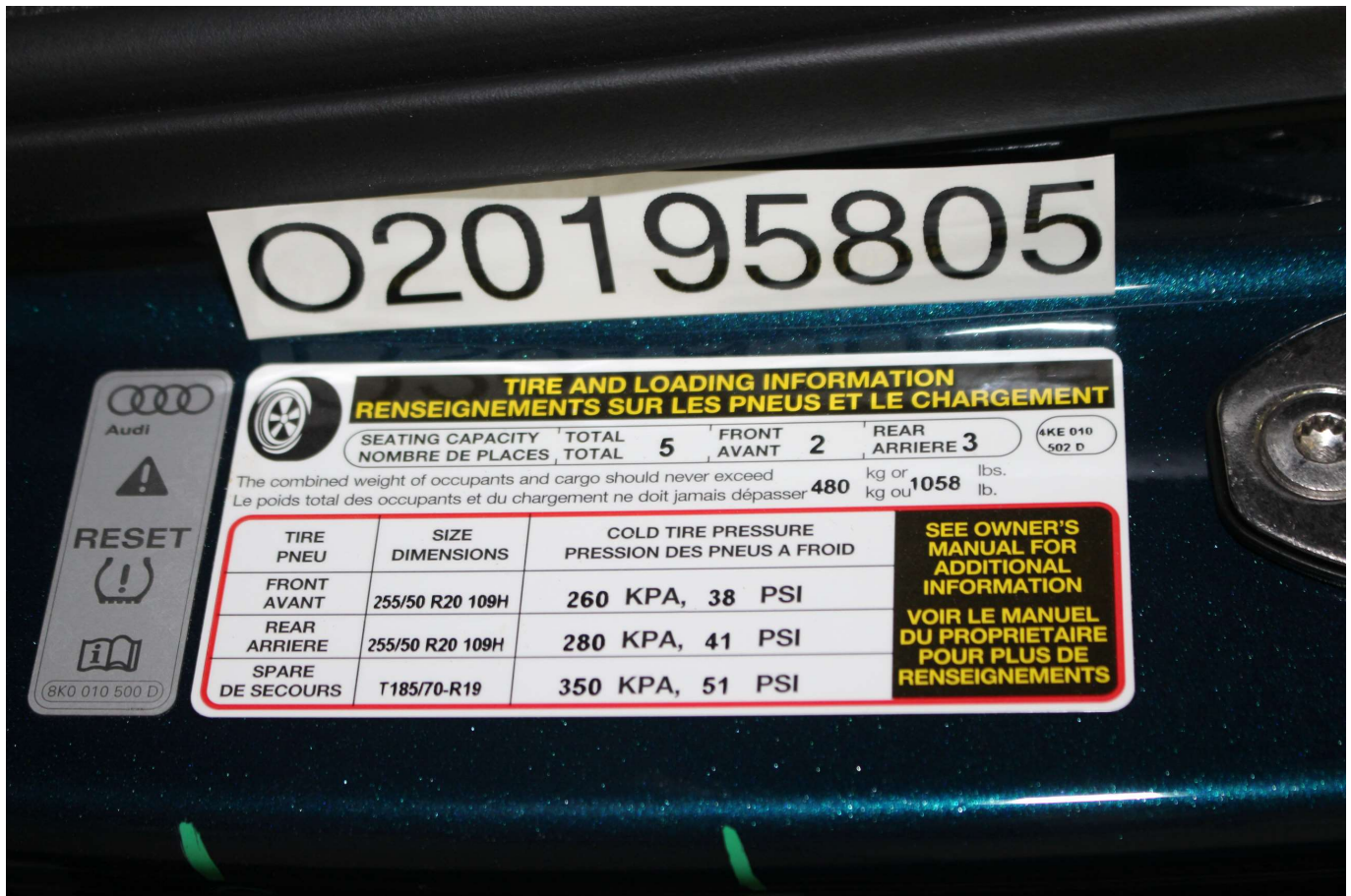


Photo No. 093 - Close-Up View of Vehicle Tire Information Placard or Label



Photo No. 094 - Pre-Test Ballast View





Photo No. 095 - Post-Test Primary and Redundant Speed Trap Read-Out

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 096 - FMVSS Photo No. 301 Static Rollover 0 Degrees

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 097 - FMVSS Photo No. 301 Static Rollover 90 Degrees

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 098 - FMVSS Photo No. 301 Static Rollover 180 Degrees



**PHOTOGRAPH NOT APPLICABLE**

Photo No. 099 - FMVSS Photo No. 301 Static Rollover 270 Degrees

**PHOTOGRAPH NOT APPLICABLE**

Photo No. 100 - FMVSS Photo No. 301 Static Rollover 360 Degrees



Photo No. 101 - Impact Event

## 2019 Audi e-tron quattro



### STANDARD EQUIPMENT\* (unless replaced by options)

#### TECHNICAL

- 95 kWh battery w/ active liquid cooling
- Dual asynchronous electric motors w/ adjustable regenerative braking system
- quattro® all-wheel-drive
- 20-inch 5-Arm-design wheels w/ all-season tires
- Space-saving spare tire

#### COMFORT/TECHNOLOGY

- Audi advanced key and power tailgate w/ handsfree release
- Audi connect (CARE, PRIME, PLUS) w/ e-tron online services (with six-month complimentary trial)
- Audi Navigation plus w/ MMI® touch response
- Audi smartphone interface
- Audi virtual cockpit plus w/ e-tron display option
- Adaptive air suspension
- Auto-dimming interior mirror w/ compass, and Integrated Toll Module (ITM)
- Bang & Olufsen® sound system w/ 3D sound
- FM / HD FM / SIRIUS Satellite Radio (with three-month complimentary subscription)
- Four-zone automatic climate control w/ heat pump and comfort pre-conditioning
- Garage door opener (HomeLink®)
- Heated, auto-dimming, and power-folding exterior mirrors, with memory
- Leather seating surfaces w/ extended interior elements in mono.pur
- Matrix-design LED headlights w/ animation
- Natural Burl Walnut Wood inlays
- Panoramic sunroof (two-piece w/ electric sunshade)
- Power adjustable tilting & telescoping steering column
- Twelve-way power front seats, heated and ventilated, with driver memory
- Trailer hitch preparation (includes brake controller wiring)
- 4-spoke multifunction steering wheel, w/ regenerative braking paddles

#### SAFETY/CONVENIENCE

- Advanced Airbag Protection System with 8 airbags
- Anti-lock Braking System (ABS) w/ Brake Assist
- Audi pre sense basic (preventative occupant protection)
- Audi pre sense front
- Audi pre sense rear
- Child safety locks in rear doors, power
- Electronic Stabilization Control (ESC) w/ Offroad mode
- Electronic vehicle immobilization w/ anti-theft alarm & interior motion sensor
- LED headlights with LED Daytime Running Lights (DRLs)
- LED taillights with animation w/ dynamic turn signals
- Lower Anchors and Tethers for Children (LATCH)
- Rearview camera
- Tire Pressure Monitoring System (TPMS)

#### WARRANTY/MAINTENANCE

- 4 Year/50,000 mile (whichever occurs first) New Vehicle Limited Warranty\*
- 8 Year/100,000 mile (whichever occurs first) High-Voltage Battery Coverage\*
- 12 Year Limited Warranty Against Corrosion Perforation
- 1 Year/10,000 mile (whichever occurs first) First Scheduled Maintenance Service FREE OF CHARGE
- 4 Year Roadside Assistance coverage provided by a third party supplier

\*Please refer to the 2019 Audi Warranty and Maintenance Booklet for complete coverage information.

### MANUFACTURER'S SUGGESTED RETAIL PRICE

2019 Audi e-tron quattro \$74,800.00

#### PACKAGES / OPTIONS

Galaxy Blue metallic \$595.00  
Black interior Included

Destination Charge \$995.00

Total Price: \$76,390.00

Fuel, license, title fees, taxes and dealer-installed accessories are not included.

MODEL: GENBAE

VIN: WA1LAAGEXKB014815

DEALER: 402F21  
AUDI NORTH SHORE  
4400 W BROWN DEER RD  
MILWAUKEE, WI 53223  
Port of Entry: HOUSTON

SHIP TO: 402F21  
AUDI NORTH SHORE  
4400 W BROWN DEER RD  
MILWAUKEE, WI 53223  
COMM NUM: VX6261  
Transportation Method: TRUCK

### GOVERNMENT 5-STAR SAFETY RATINGS

**Overall Vehicle Score** Not Rated

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

**Frontal Crash** Driver Passenger Not Rated Not Rated

Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.

**Side Crash** Front Seat Rear Seat Not Rated Not Rated

Based on the risk of injury in a side impact.

**Rollover** Not Rated

Based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.

Source: National Highway Traffic Safety Administration (NHTSA).

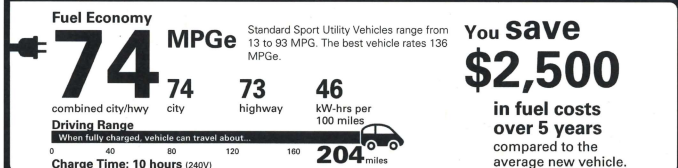
www.safercar.gov or 1-888-327-4236



### Fuel Economy and Environment



Electric Vehicle



**Annual fuel cost \$900**

### Fuel Economy & Greenhouse Gas Rating (tailpipe only)

**1** **10** Best

This vehicle emits 0 grams of CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Does not include emissions from generating electricity; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$0.13 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

**fueleconomy.gov**

Calculate personalized estimates and compare vehicles



Smartphone QR Code



### PARTS CONTENT INFORMATION

For Vehicles In This Carline

U.S./Canadian Parts Content: 0%

Major Sources Of Foreign

Parts Content: **POLAND: 32%**

**GERMANY: 27%**

For This Vehicle:

Final Assembly Point: **BRUSSELS, BELGIUM**

Country Of Origin:

**ENGINE (MOTOR): HUNGARY**

**TRANSMISSION: HUNGARY**

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION OR OTHER NON-PARTS COSTS.

Photo No. 102 - Monroney Label



- You are always holding the steering wheel with both hands on the outer edge at the sides (9:00 and 3:00 position) when driving

#### WARNING

- If you are too close to the steering wheel, the driver's airbag cannot provide optimal protection, which increases the risk of injury or death.
- Never hold the steering wheel in the 12:00 position or in any other way, such as holding the center of the steering wheel. Otherwise, your arms, hands, and head could be injured in the event that the driver's airbag deploys.

#### Power steering wheel position adjustment

Applies to: vehicles with power steering wheel adjustment

The steering wheel position can be adjusted electrically up/down and forward/back.



Fig. 53 Steering column: switch for adjusting the steering wheel position

- To move the steering wheel upward or downward, press the switch upward or downward.
- To move the steering wheel forward or backward, press the switch forward or backward.

The steering wheel can also be adjusted when the ignition is switched off.

In vehicles with memory function\*, the steering column settings are stored together with the seat position.

#### Tips

The entry assistance makes entering and exiting the vehicle easier, because the steering column moves upward into the park position when the ignition is switched off. After enter-

ing the vehicle, the steering column returns to the stored position once the ignition is switched on. To use entry assistance, select on the home screen: **VEHICLE > Seats > Additional seat settings > Driver seat entry assistance**.

### Head restraints

#### General information

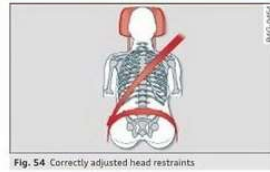


Fig. 54 Correctly adjusted head restraints

Make sure that:

- The upper edge of the head restraint is as even as possible with the top of your head
- The head restraint is as close as possible to the back of your head
- The head restraints on the occupied rear seats are positioned all the way up

#### WARNING

- There is one head restraint for each seat. All vehicle occupants must adjust the head restraint correctly before every trip. Having head restraints that are not adjusted correctly or not installed in the vehicle increases the risk of a neck injury during sudden or unexpected driving or braking maneuvers or in a collision.

- Only remove the rear seat head restraints if it is necessary to install a child safety seat → page 69. Stow the removed head restraints securely, for example in the luggage compartment. Reinstall the head restraints immediately once the child safety seat has been removed. Driving without head restraints increases the risk of serious neck injuries.

#### Front head restraints

Applies to: vehicles with adjustable head restraints

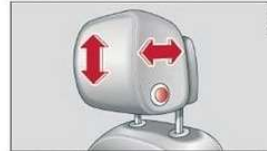


Fig. 55 Front seat: adjusting the head restraint (example)

#### Adjusting the head restraints

- To adjust the head restraint upward or forward\*, slide it until it locks into place.
- To adjust the head restraint downward or backward\*, press the side button and slide the head restraint in the desired direction until it locks into place.

#### Rear head restraints

Applies to: vehicles with adjustable head restraints

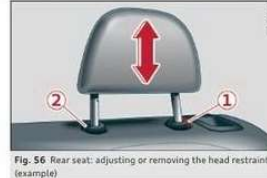


Fig. 56 Rear seat: adjusting or removing the head restraint (example)

#### Adjusting the head restraints

- Upward: slide the head restraint upward until it latches into place.
- Downward: press the button on the head restraint base ① → fig. 56 and slide the head restraint downward. Release the button and slide the head restraint farther until it locks into place.

#### Removing the head restraints

Applies to: vehicles with removable head restraints

- Move the head restraint upward all the way.

- Press the release point on the head restraint base ② → fig. 56 using the mechanical key → page 33, Key set and press the button ③. Pull the head restraint out of the backrest at the same time → ⚠ in General information on page 59.

#### Installing the head restraints

Applies to: vehicles with removable head restraints

- Slide the posts on the head restraint down into the guides until the posts click into place.
- Press the button ① and slide the head restraint all the way down. It should not be possible to remove the head restraint from the backrest without pressing the button.

### Safety belts

#### General information

Each seat is equipped with a three-point safety belt. Safety belts that are worn correctly are the most effective way to reduce the risk of serious or fatal injuries in a collision. Therefore, wear your safety belt correctly and make sure that all vehicle occupants also wear their safety belts correctly when the vehicle is moving.

Even though your vehicle is equipped with an airbag system, all vehicle occupants must still always wear their safety belts. In addition to their normal protective function, safety belts also hold vehicle occupants in the correct seating position in the event of a collision so that the airbags can deploy correctly and provide additional protection. Safety belts provide protection during collisions when the airbags do not deploy or if they have already deployed.

#### WARNING

The risk of serious or fatal injury increases if the safety belt is not fastened, if it is worn incorrectly, or if it is damaged.

- All vehicle occupants, including the driver, must fasten their safety belts correctly before every trip and must always keep their safety belts fastened during the trip, regardless of whether the seat is equipped with an airbag or not. This also applies to children

**APPENDIX B**  
**DUMMY RESPONSE DATA PLOTS**



**TABLE OF DATA PLOTS**  
**Driver Dummy Instrumentation Plots**

| <b><u>No.</u></b> | <b><u>Description</u></b>                                 | <b><u>Page No.</u></b> |
|-------------------|-----------------------------------------------------------|------------------------|
| Figure No. 1.     | Driver Head Acceleration (X) Primary vs. Time             | B-1                    |
| Figure No. 2.     | Driver Head Acceleration (Y) Primary vs. Time             | B-1                    |
| Figure No. 3.     | Driver Head Acceleration (Z) Primary vs. Time             | B-1                    |
| Figure No. 4.     | Driver Head Resultant Acceleration Primary vs. Time       | B-1                    |
| Figure No. 5.     | Driver Upper Thorax Rib Deflection (Y) vs. Time           | B-2                    |
| Figure No. 6.     | Driver Middle Thorax Rib Deflection (Y) vs. Time          | B-2                    |
| Figure No. 7.     | Driver Lower Thorax Rib Deflection (Y) vs. Time           | B-2                    |
| Figure No. 8.     | Driver Thorax Rib Deflection Maximum vs. Time             | B-2                    |
| Figure No. 9.     | Driver Anterior Abdomen Force (Y) vs. Time                | B-3                    |
| Figure No. 10.    | Driver Middle Abdomen Force (Y) vs. Time                  | B-3                    |
| Figure No. 11.    | Driver Posterior Abdomen Force (Y) vs. Time               | B-3                    |
| Figure No. 12.    | Driver Total Abdominal Force (Y) vs. Time                 | B-3                    |
| Figure No. 13.    | Driver Pubic Symphysis Force (Y) vs. Time                 | B-4                    |
| Figure No. 14.    | Passenger Head Acceleration (X) Primary vs. Time          | B-5                    |
| Figure No. 15.    | Passenger Head Acceleration (Y) Primary vs. Time          | B-5                    |
| Figure No. 16.    | Passenger Head Acceleration (Z) Primary vs. Time          | B-5                    |
| Figure No. 17.    | Passenger Head Resultant Acceleration Primary vs. Time    | B-5                    |
| Figure No. 18.    | Passenger Lower Spine T12 Acceleration (X) vs. Time       | B-6                    |
| Figure No. 19.    | Passenger Lower Spine T12 Acceleration (Y) vs. Time       | B-6                    |
| Figure No. 20.    | Passenger Lower Spine T12 Acceleration (Z) vs. Time       | B-6                    |
| Figure No. 21.    | Passenger Lower Spine T12 Resultant Acceleration vs. Time | B-6                    |
| Figure No. 22.    | Passenger Iliac Force on Impact Side (Y) vs. Time         | B-7                    |
| Figure No. 23.    | Passenger Acetabulum Force on Impact Side (Y) vs. Time    | B-7                    |
| Figure No. 24.    | Passenger Total Pelvic Force on Impact Side (Y) vs. Time  | B-7                    |

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at [www.nhtsa.gov](http://www.nhtsa.gov)

**Additional Driver & Passenger Dummy Instrumentation Data**

Passenger Head Angular Velocity (X)  
Passenger Head Angular Velocity (Y)  
Passenger Head Angular Velocity (Z)  
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 Track 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)

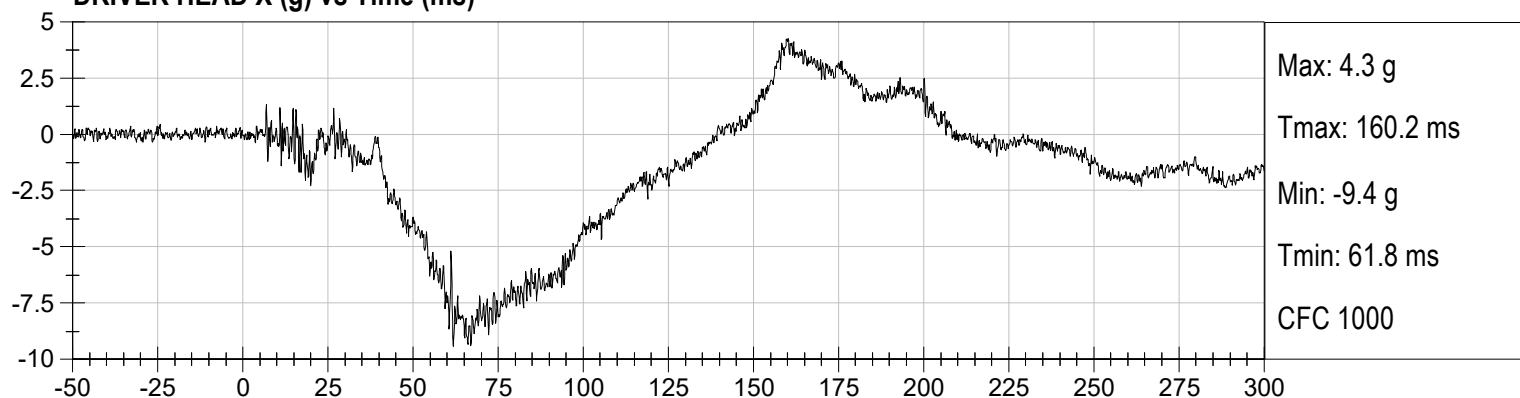
MDB Rear Acceleration (Y)

Left MDB Contact Switch

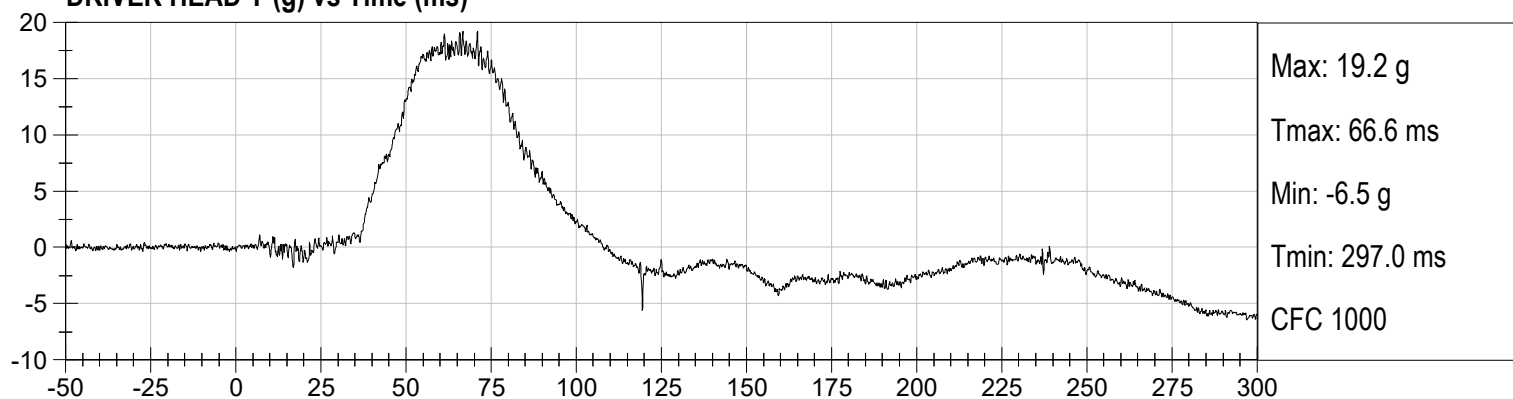
Right MDB Contact Switch



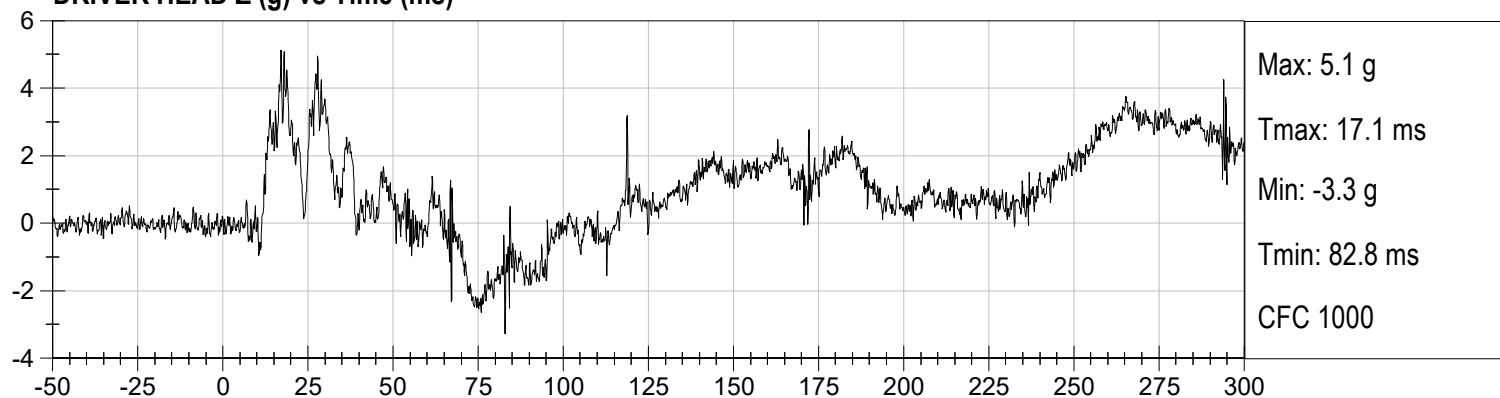
**DRIVER HEAD X (g) vs Time (ms)**



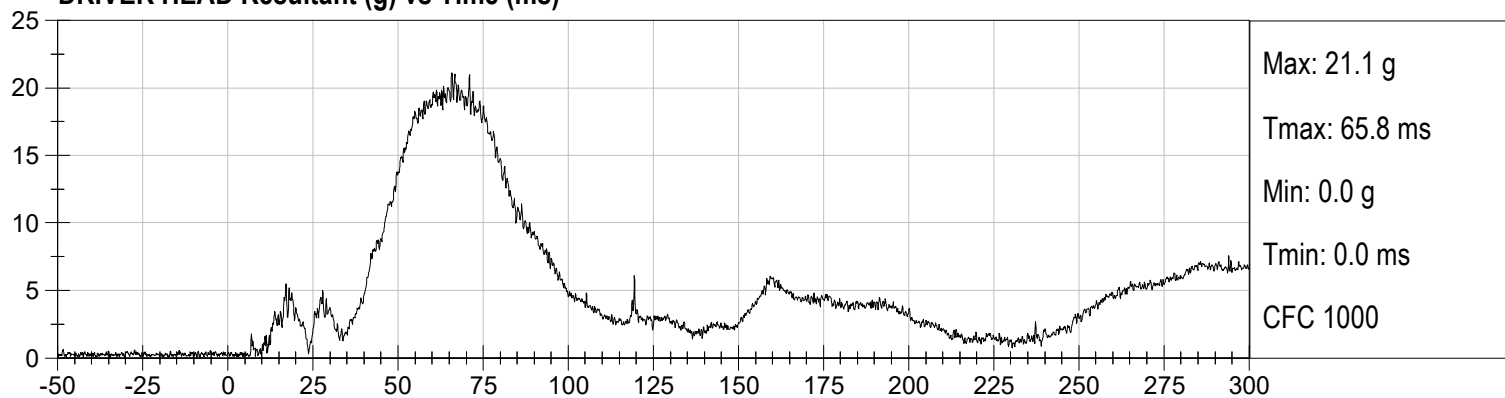
**DRIVER HEAD Y (g) vs Time (ms)**



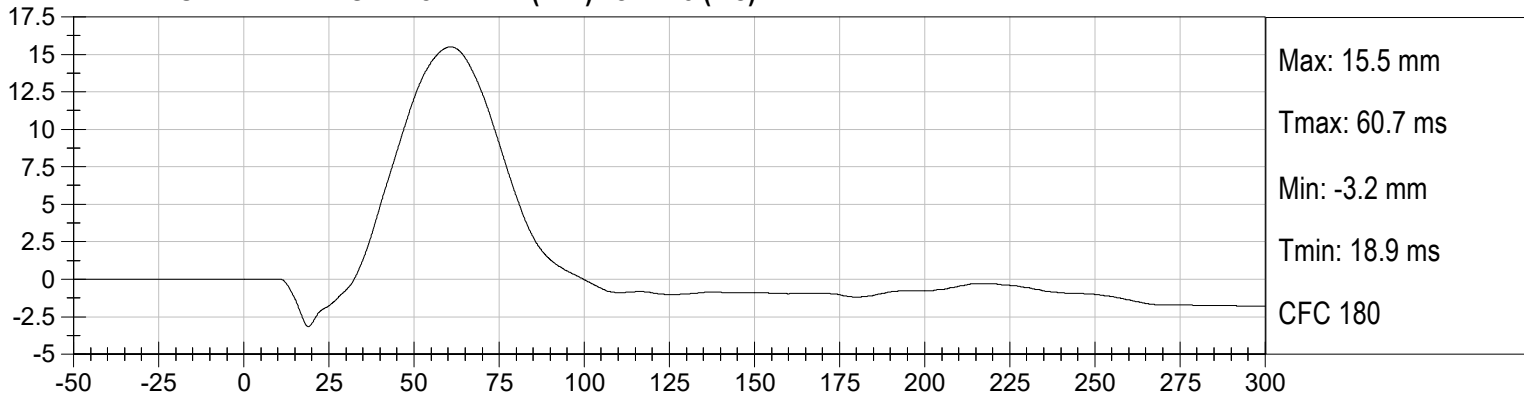
**DRIVER HEAD Z (g) vs Time (ms)**



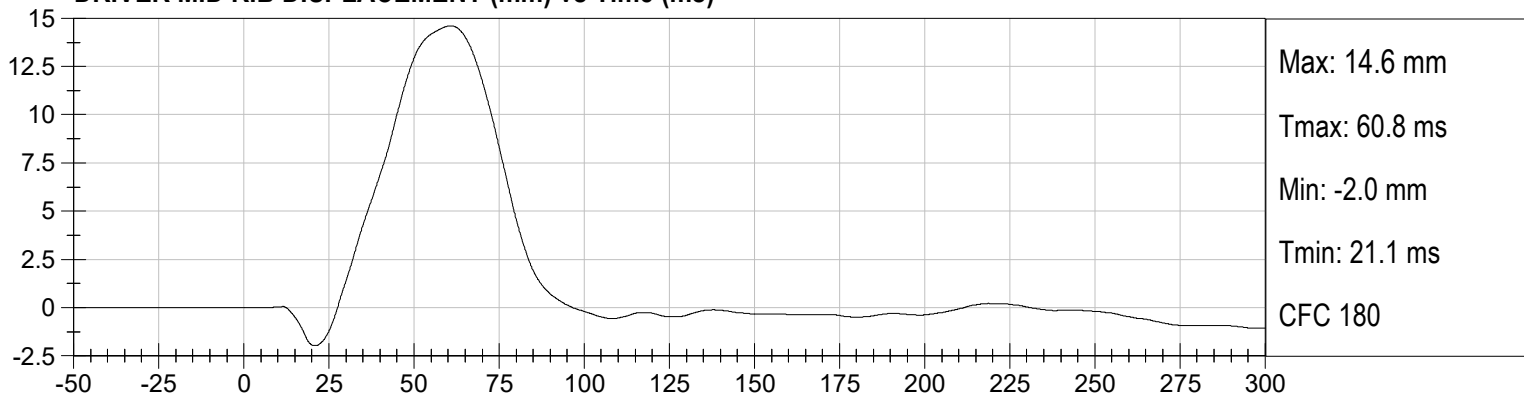
**DRIVER HEAD Resultant (g) vs Time (ms)**



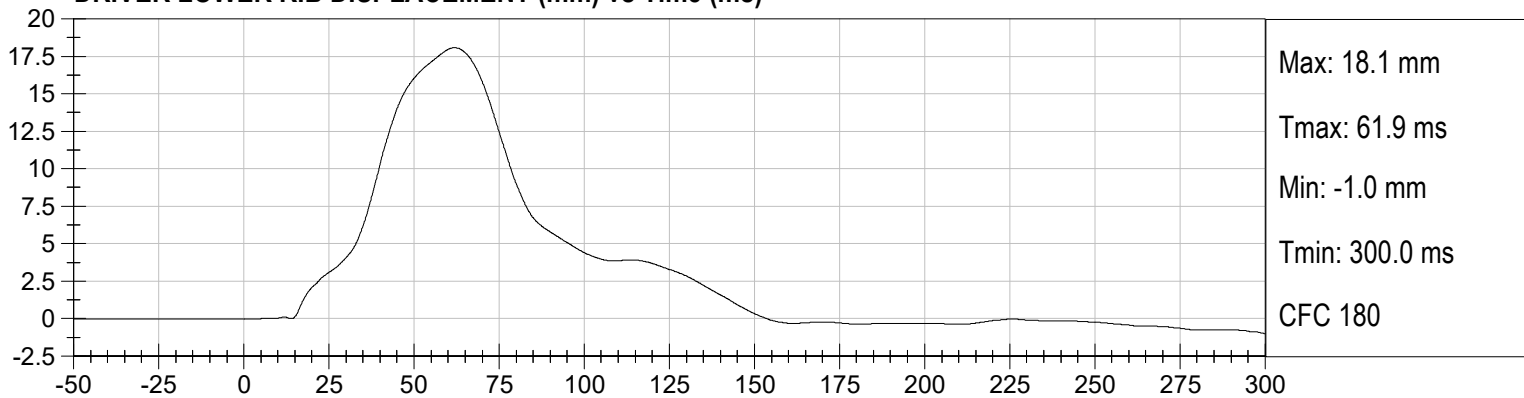
**DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)**



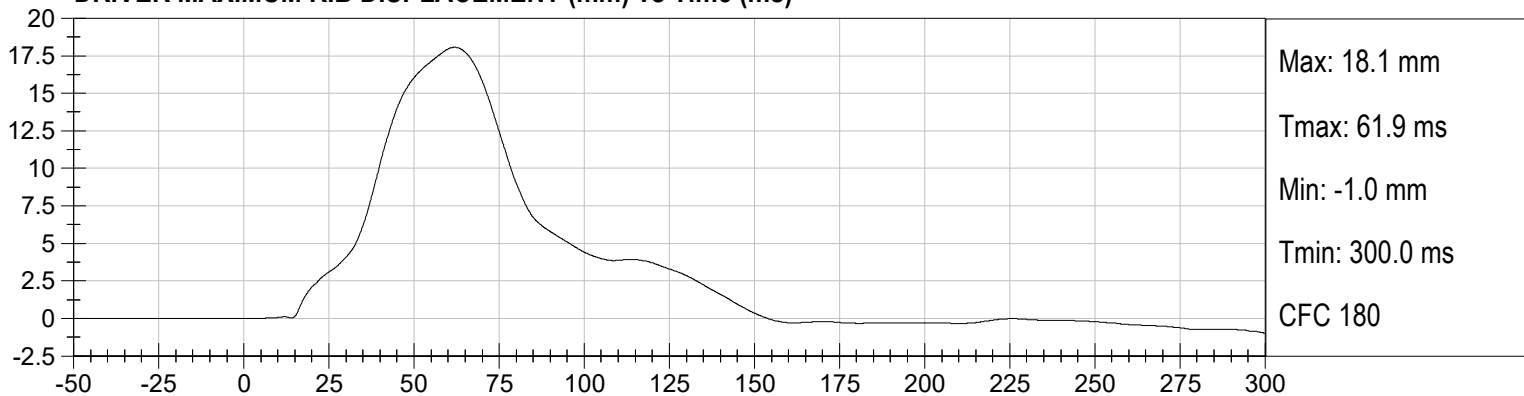
**DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)**



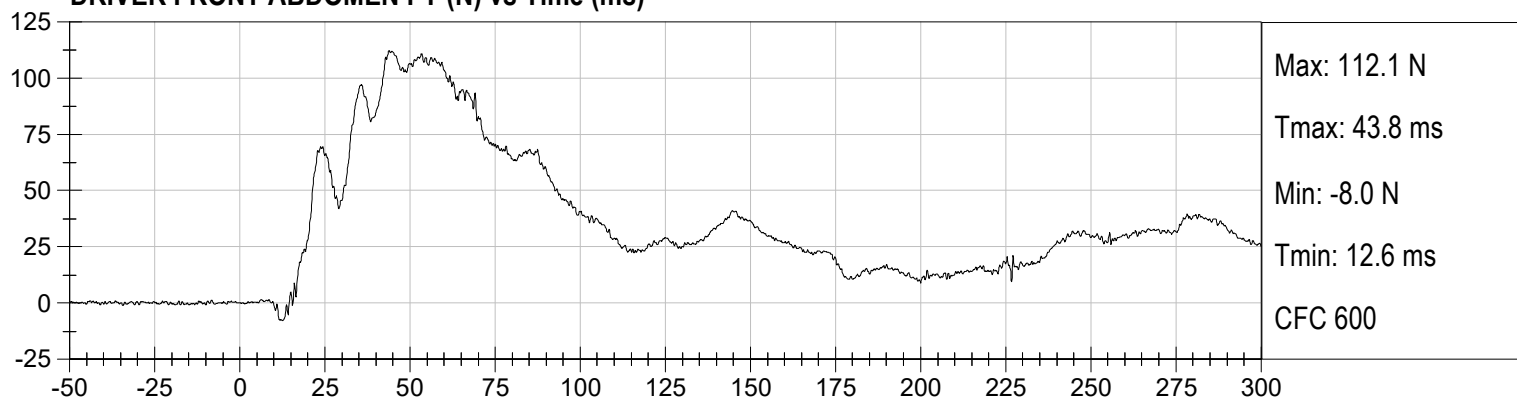
**DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)**



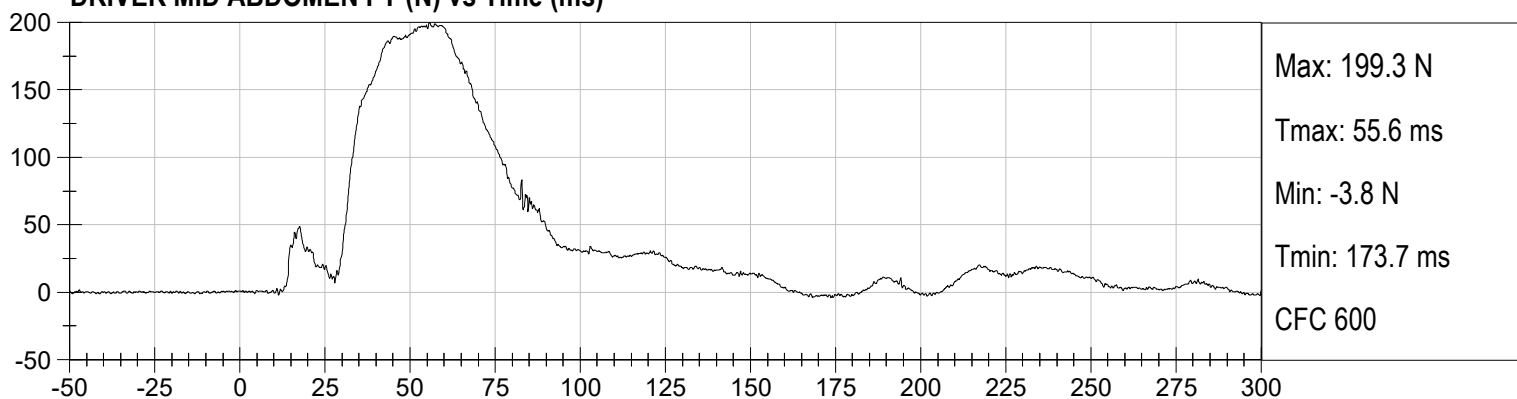
**DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)**



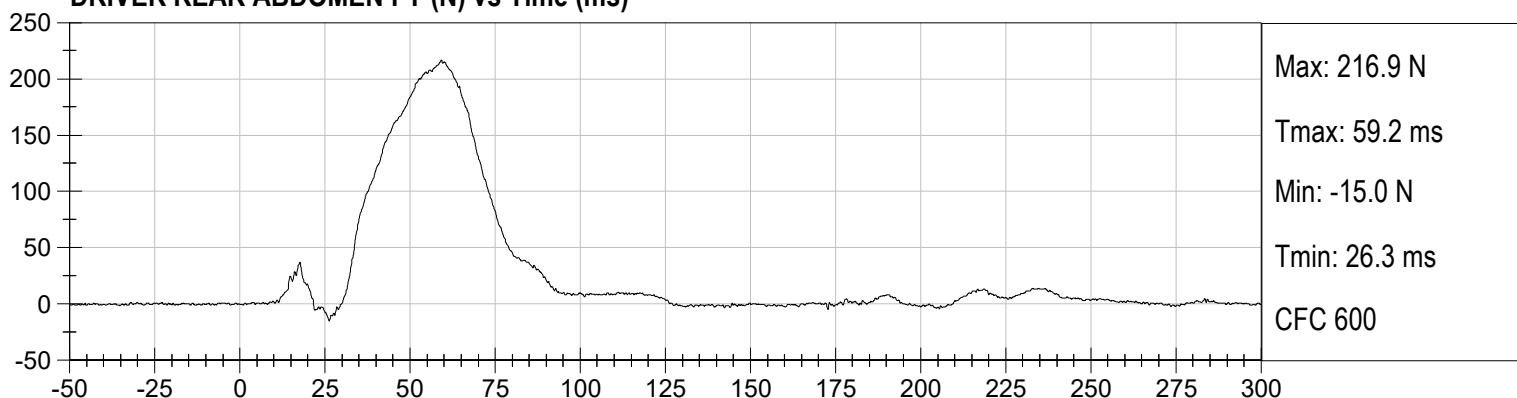
**DRIVER FRONT ABDOMEN FY (N) vs Time (ms)**



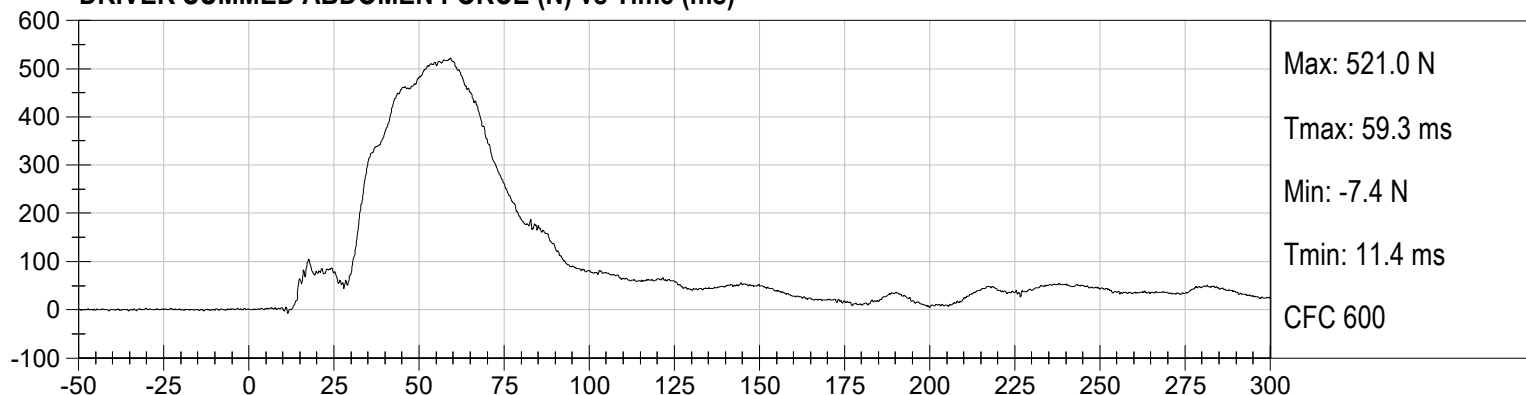
**DRIVER MID ABDOMEN FY (N) vs Time (ms)**



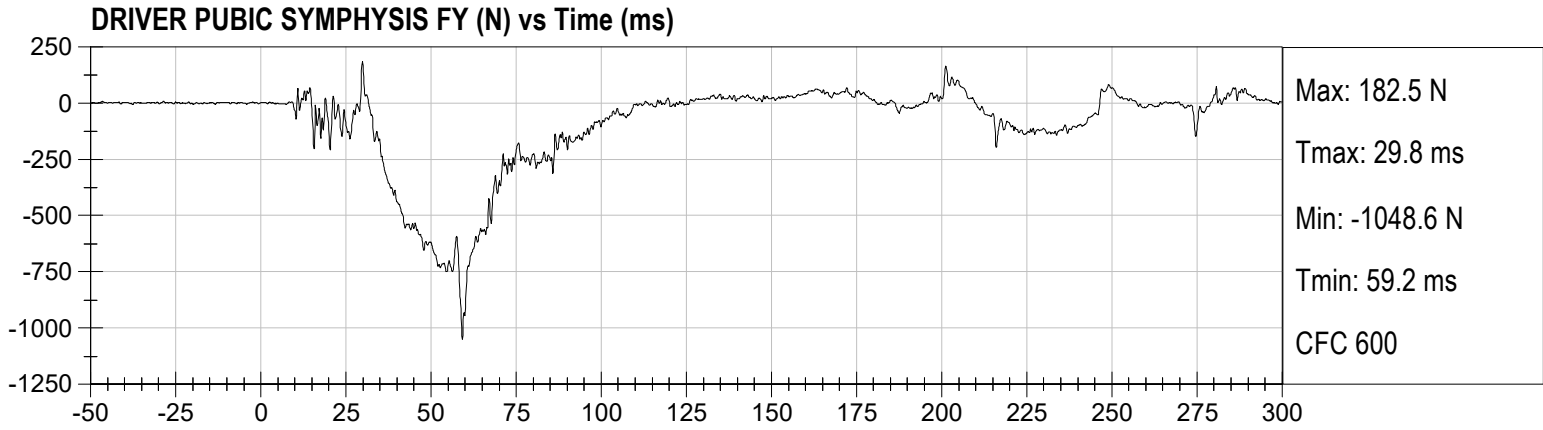
**DRIVER REAR ABDOMEN FY (N) vs Time (ms)**



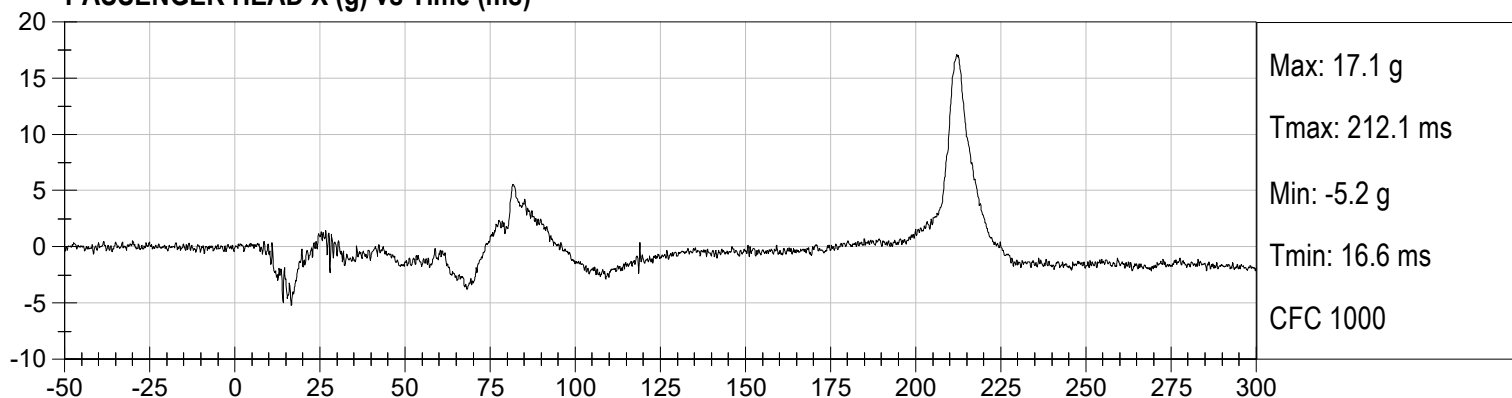
**DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)**



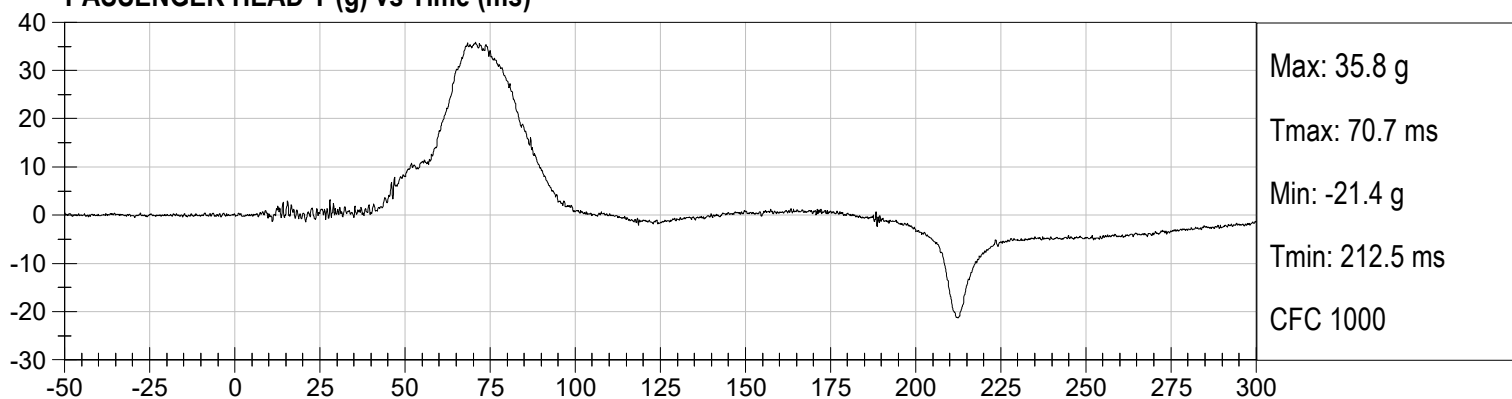




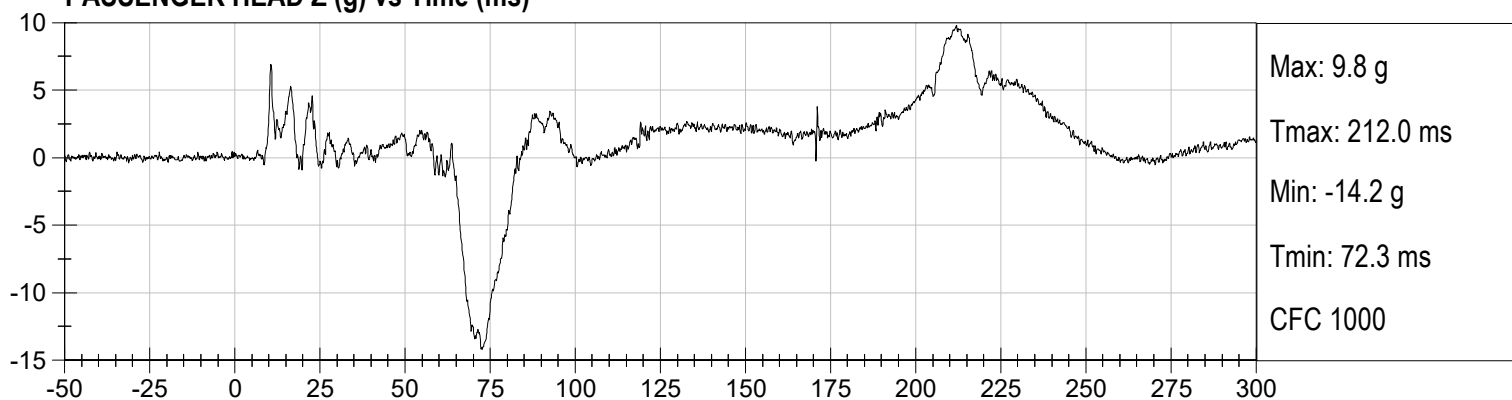
**PASSENGER HEAD X (g) vs Time (ms)**



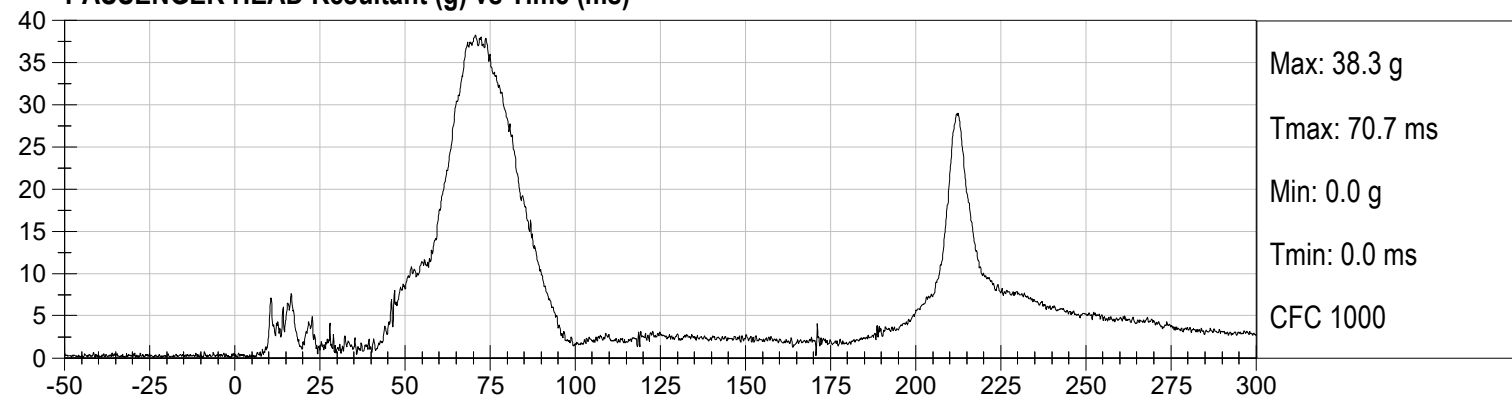
**PASSENGER HEAD Y (g) vs Time (ms)**



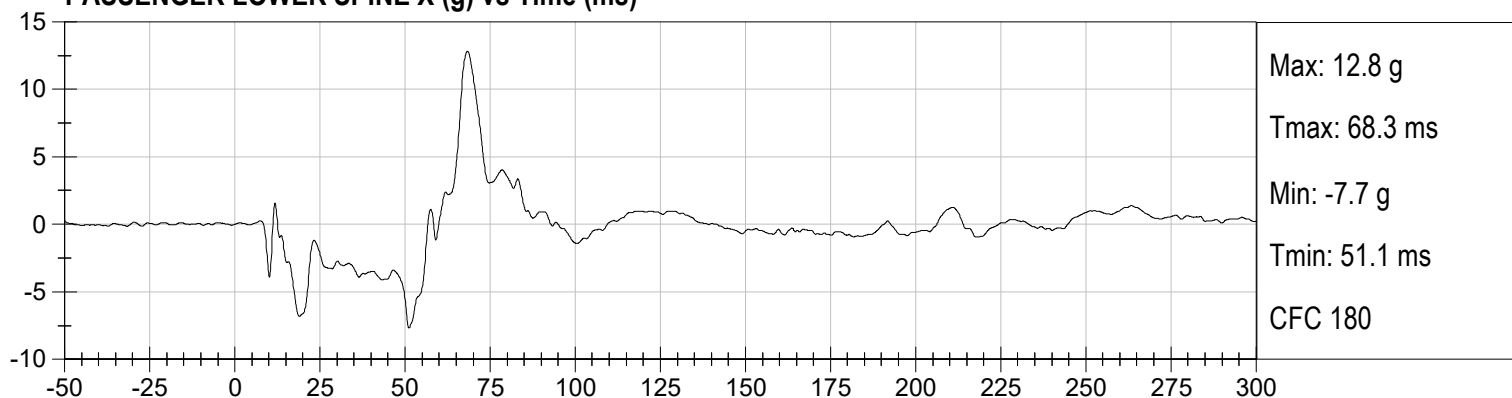
**PASSENGER HEAD Z (g) vs Time (ms)**



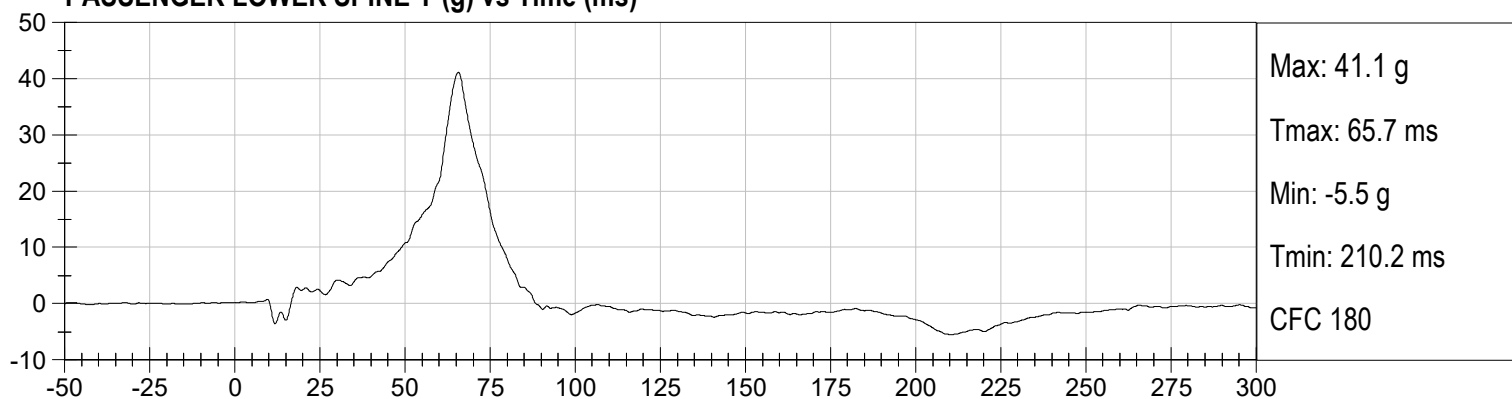
**PASSENGER HEAD Resultant (g) vs Time (ms)**



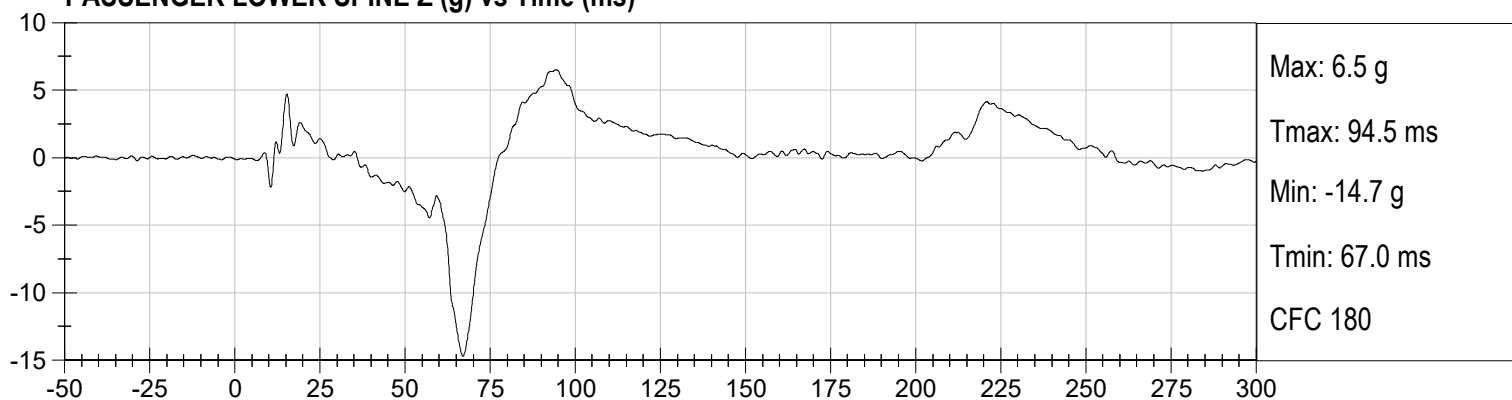
**PASSENGER LOWER SPINE X (g) vs Time (ms)**



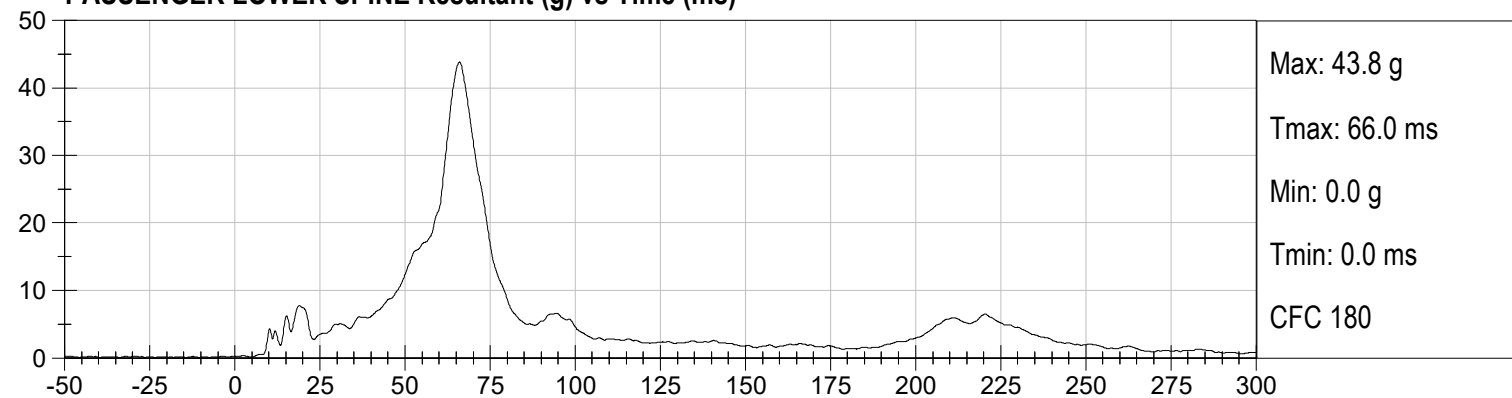
**PASSENGER LOWER SPINE Y (g) vs Time (ms)**



**PASSENGER LOWER SPINE Z (g) vs Time (ms)**

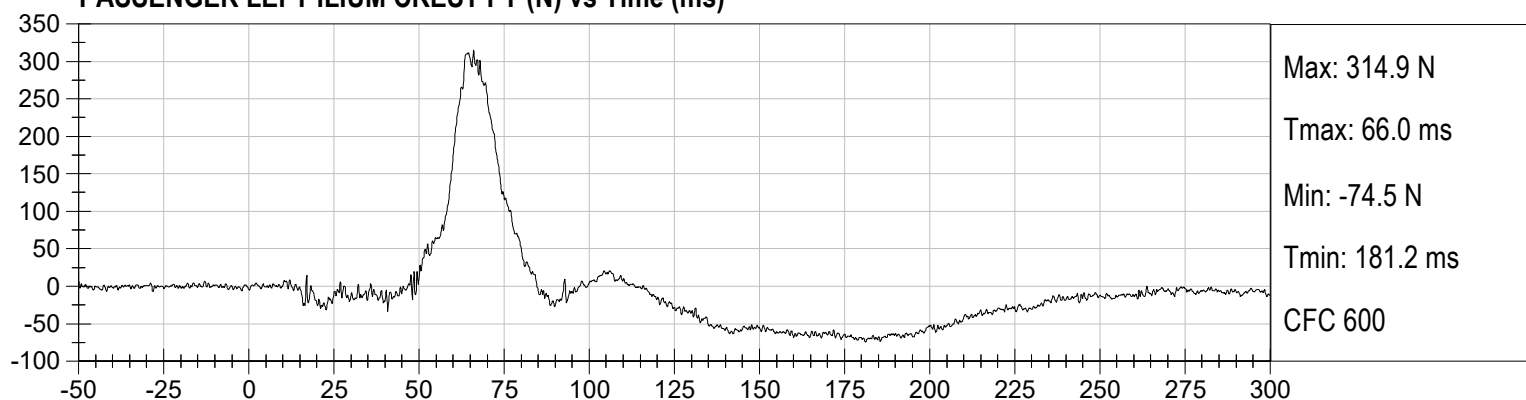


**PASSENGER LOWER SPINE Resultant (g) vs Time (ms)**

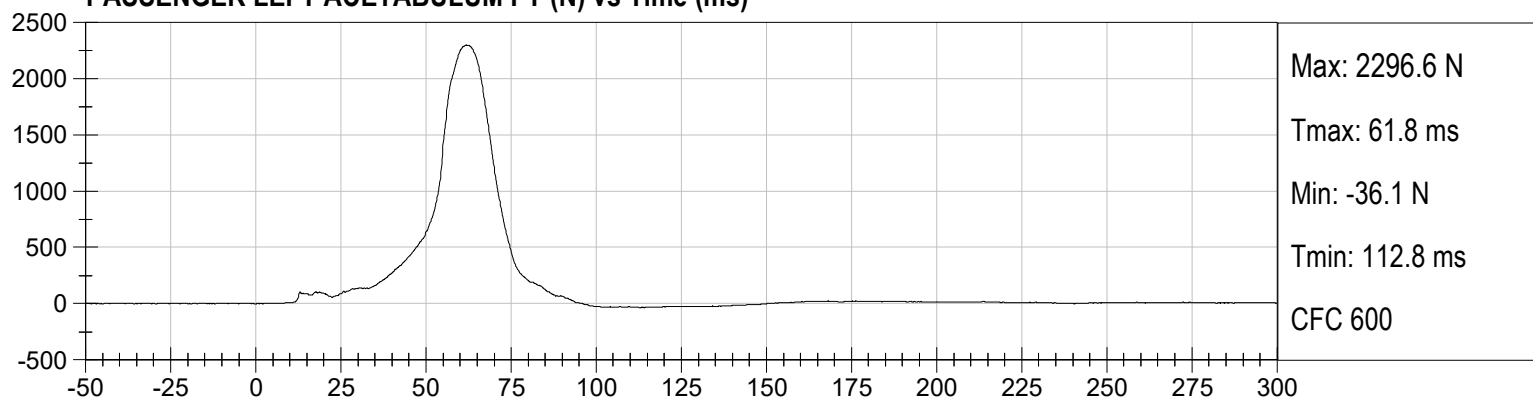




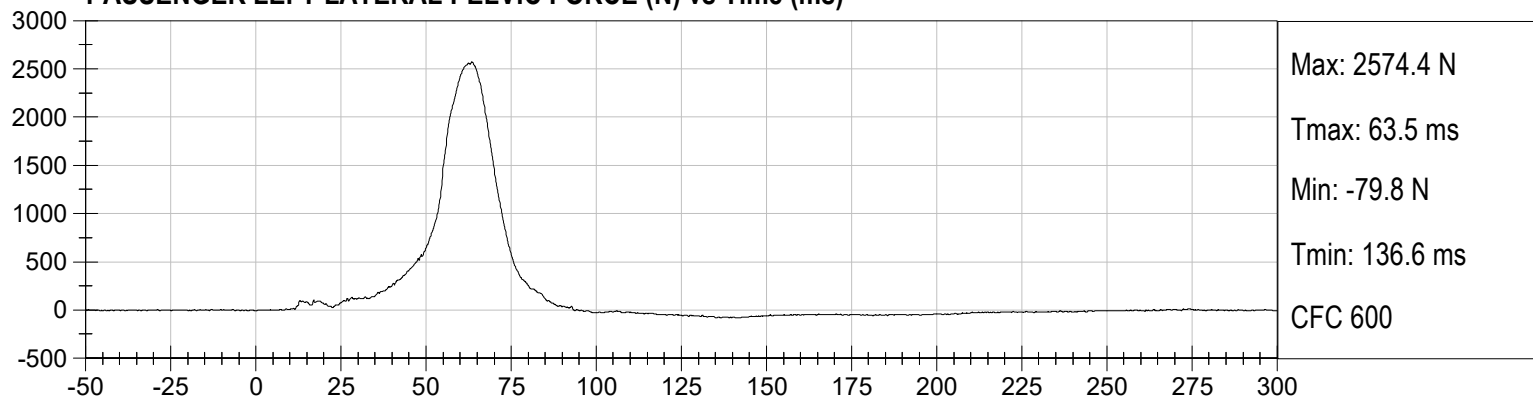
**PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)**



**PASSENGER LEFT ACETABULUM FY (N) vs Time (ms)**



**PASSENGER LEFT LATERAL PELVIC FORCE (N) vs Time (ms)**



**APPENDIX C**  
**DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA**

## **CALIBRATION TEST RESULTS**

### **PRE-TEST**

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



**ES-2re External Measurements**  
**SN: 032**

| <b>No.</b> | <b>Name</b>                                    | <b>Spec. (mm)</b> | <b>Result</b> | <b>Pass/Fail</b> |
|------------|------------------------------------------------|-------------------|---------------|------------------|
| <b>1</b>   | Sitting Height                                 | 900 - 918         | 915           | Pass             |
| <b>2</b>   | Seat to Shoulder Joint                         | 558 - 572         | 568           | Pass             |
| <b>3</b>   | Seat to Lower Face of Thoracic Spine Box       | 346 - 356         | 355           | Pass             |
| <b>4</b>   | Seat to Hip Joint (center of bolt)             | 97 - 103          | 98            | Pass             |
| <b>5</b>   | Sole to Seat, Sitting                          | 333 - 451         | 440           | Pass             |
| <b>6</b>   | Head Width                                     | 152 - 158         | 157           | Pass             |
| <b>7</b>   | Shoulder/Arm Width                             | 461 - 479         | 464           | Pass             |
| <b>8</b>   | Thorax Width                                   | 322 - 332         | 323           | Pass             |
| <b>9</b>   | Abdomen Width                                  | 273 - 287         | 281           | Pass             |
| <b>10</b>  | Pelvis Lap Width                               | 359 - 373         | 370           | Pass             |
| <b>11</b>  | Head Depth                                     | 196 - 206         | 203           | Pass             |
| <b>12</b>  | Thorax Depth                                   | 262 - 272         | 264           | Pass             |
| <b>13</b>  | Abdomen Depth                                  | 194 - 204         | 196           | Pass             |
| <b>14</b>  | Pelvis Depth                                   | 235 - 245         | 236           | Pass             |
| <b>15</b>  | Back of Buttocks to Hip Joint (center of bolt) | 150 - 160         | 151           | Pass             |
| <b>16</b>  | Back of Buttocks to Front Knee                 | 597 - 615         | 607           | Pass             |

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

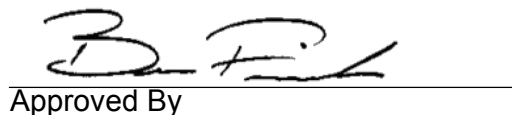
**ATD Serial No:** 032

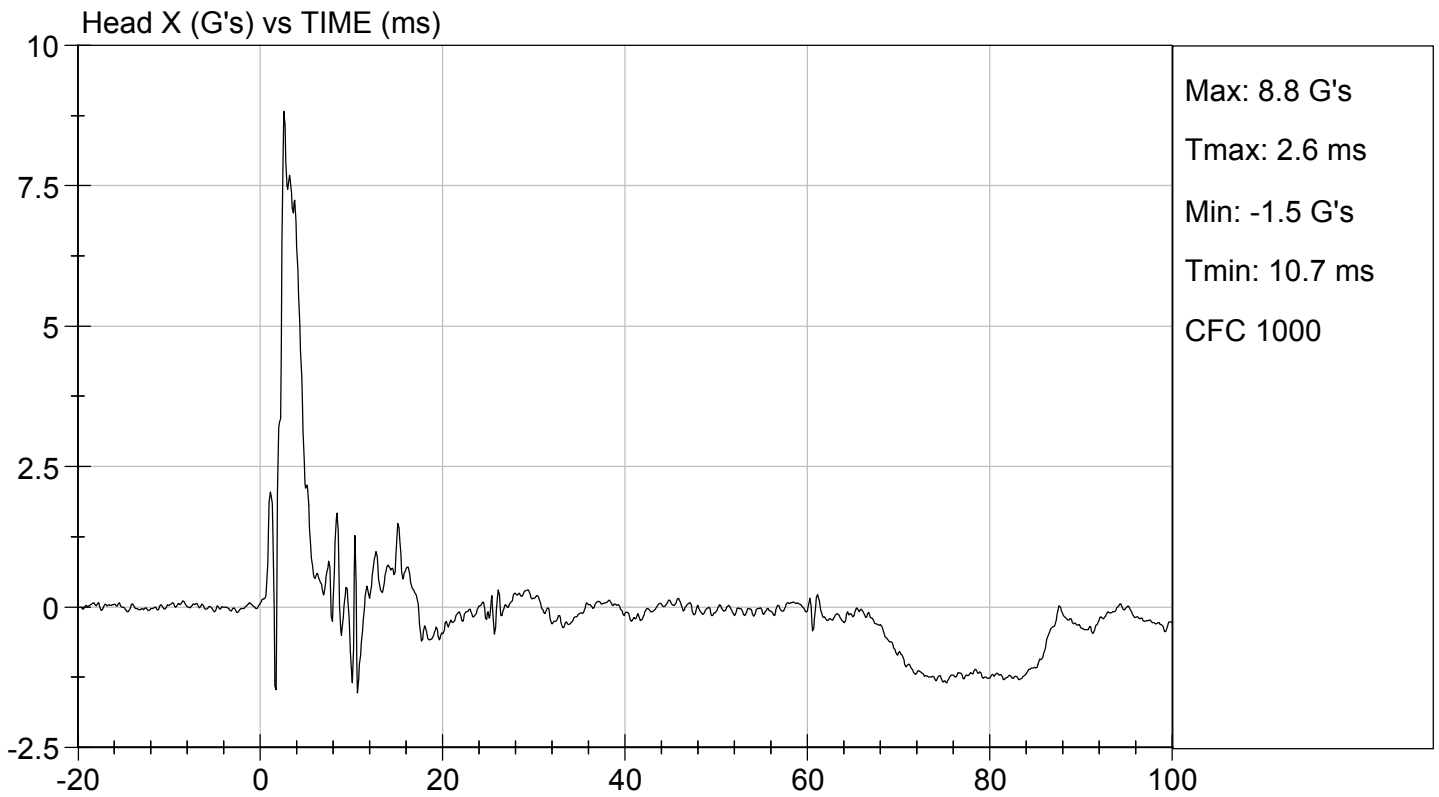
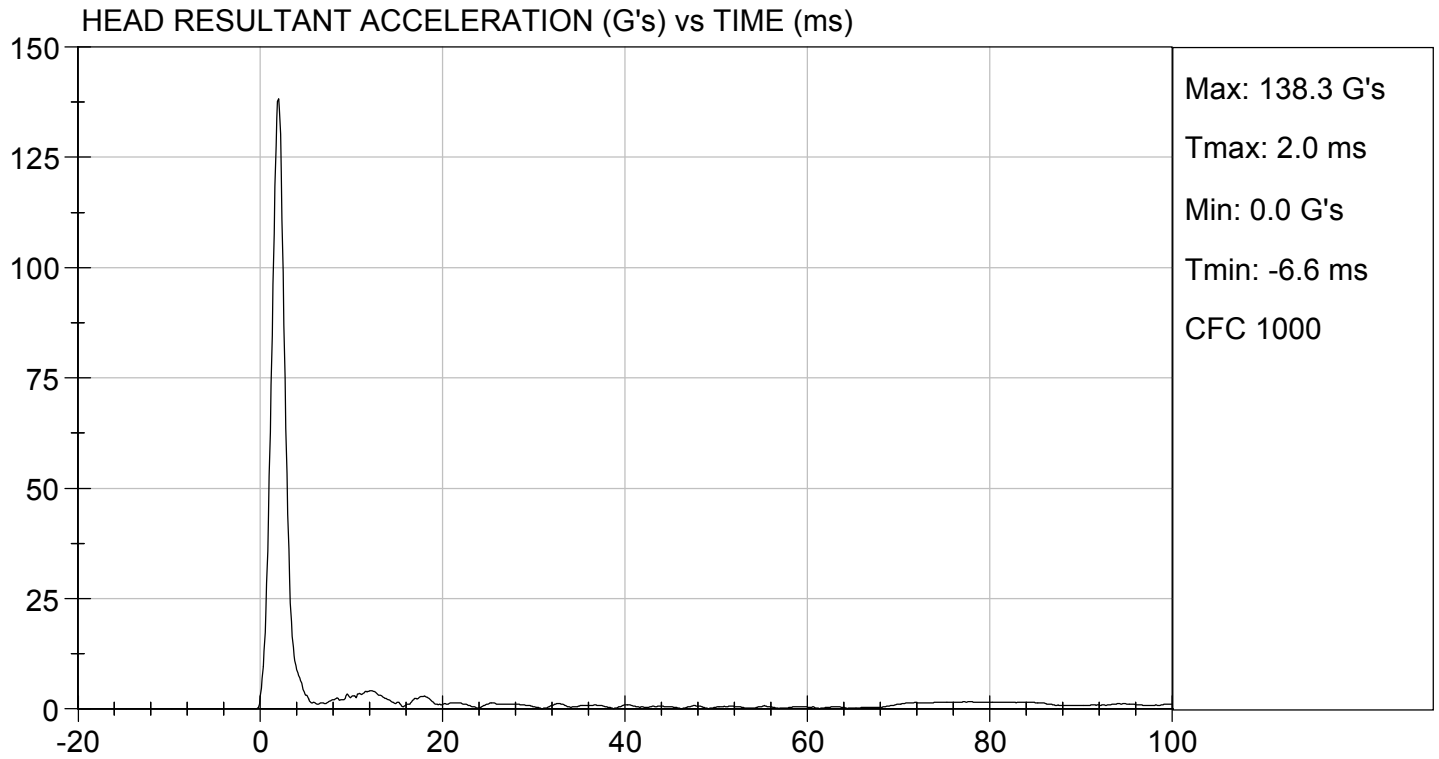
**Test ID:** D193021

| Tested Parameter               | Units | Specification      | Result | Pass/Fail |
|--------------------------------|-------|--------------------|--------|-----------|
| Laboratory Temperature         | deg C | 18.9 to 25.6       | 21.2   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70           | 44     | Pass      |
| Peak Resultant Acceleration    | G's   | 125 to 155         | 138    | Pass      |
| Peak Longitudinal Acceleration | G's   | <= +/- 15.0        | 8.8    | Pass      |
| Unimodal                       | N/A   | Yes                | Yes    | Pass      |
| Oscillations                   | N/A   | within 15% of peak | Yes    | Pass      |
| Overall Test Results           |       |                    |        | Pass      |

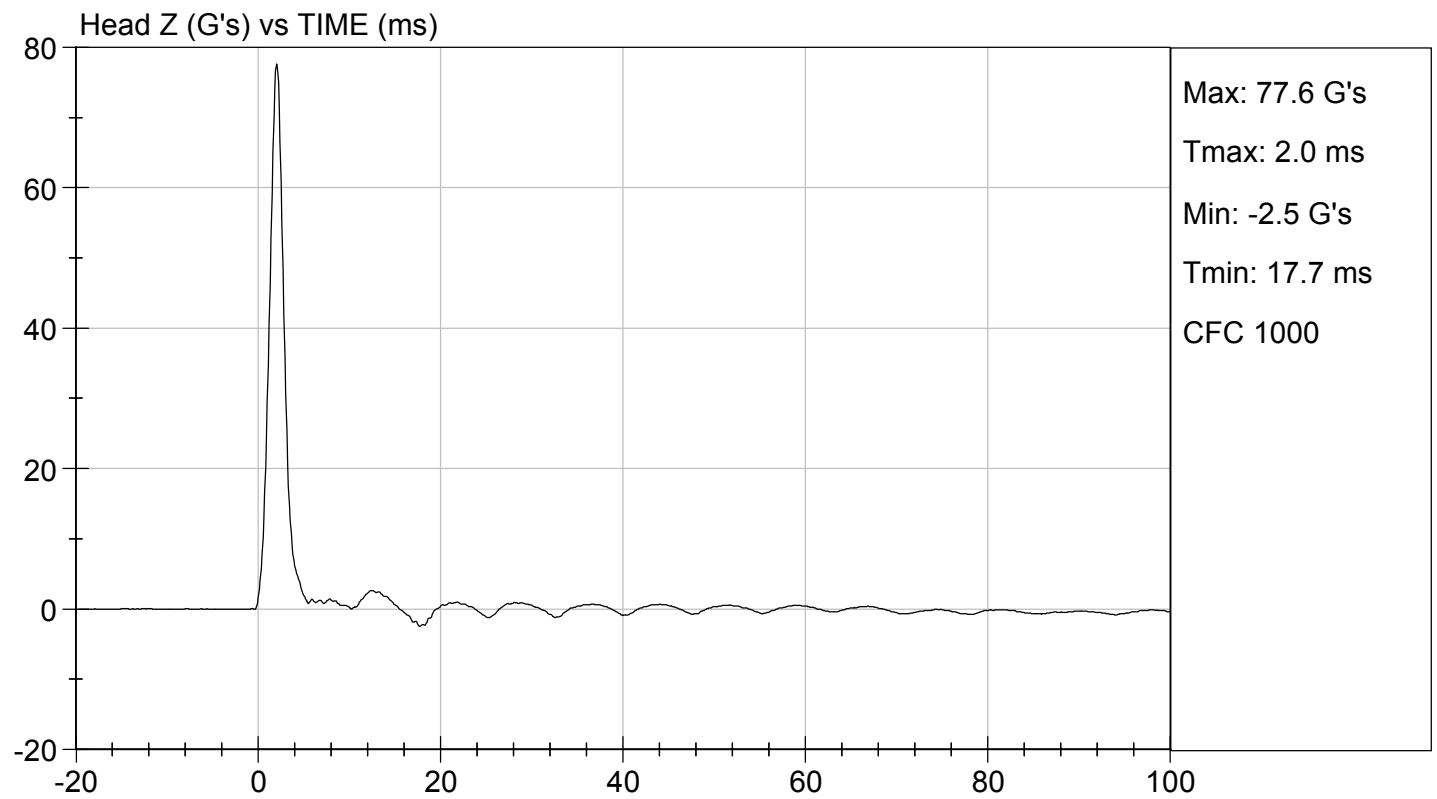
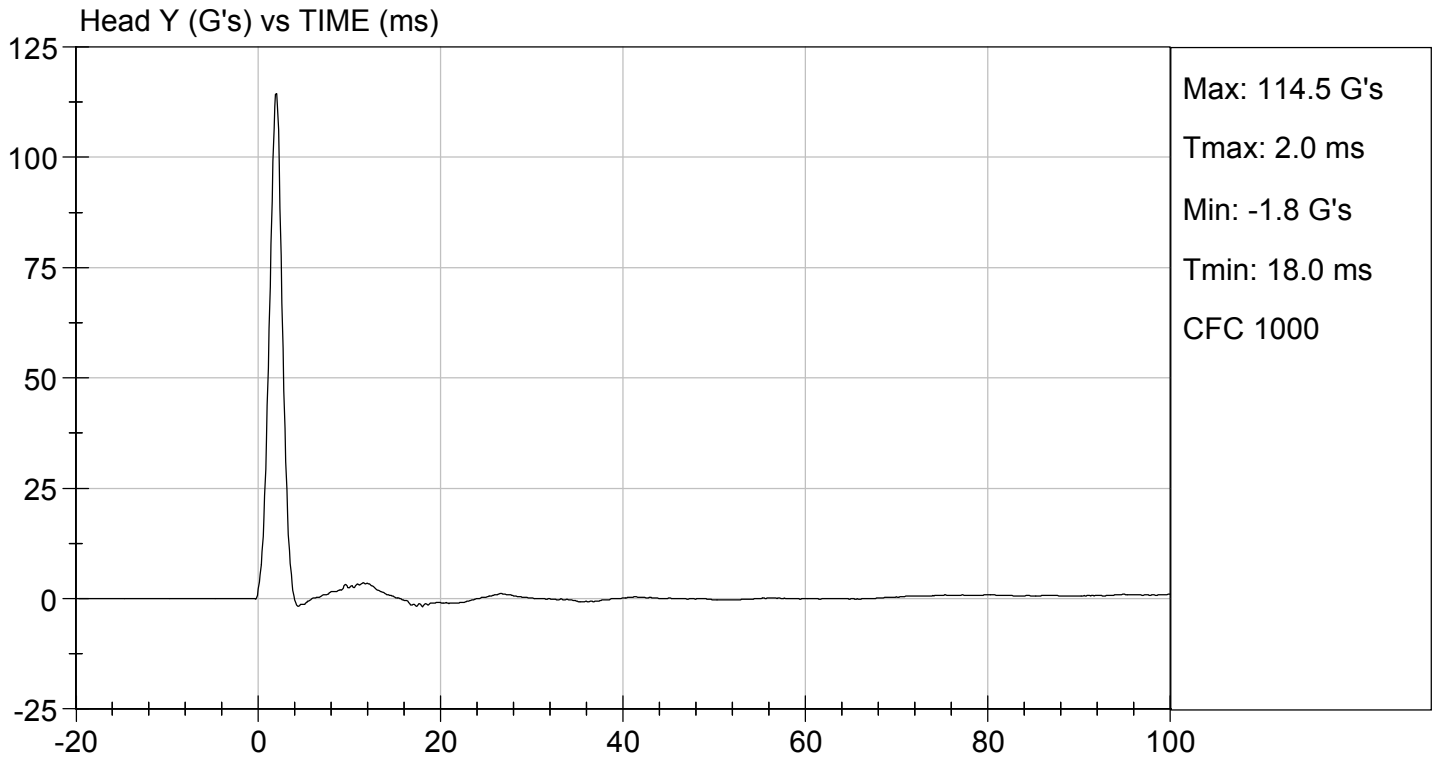
  
Laboratory Technician

09/25/2019  
Test Date

  
Approved By





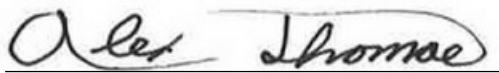


**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

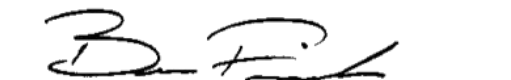
**ATD Serial No:** 032

**Test I.D:** D193022

| Tested Parameter                     |       | Units | Specification   | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature               |       | deg C | 20.6 to 22.2    | 21.3   | Pass      |
| Laboratory Relative Humidity         |       | %     | 10 to 70        | 45     | Pass      |
| Pendulum Speed                       |       | m/s   | 3.30 to 3.50    | 3.48   | Pass      |
| Pendulum Velocity                    | 1 ms  | m/s   | -0.05 to 0.00   | -0.00  | Pass      |
|                                      | 3 ms  | m/s   | -0.25 to -0.375 | -0.35  | Pass      |
|                                      | 14 ms | m/s   | -3.20 to -3.70  | -3.56  | Pass      |
|                                      | 17 ms | m/s   | >= -3.70        | -3.41  | Pass      |
| Maximum Flexion Angle                |       | deg   | 49.0 to 59.0    | 49.3   | Pass      |
| Time of Maximum Flexion Angle        |       | ms    | 54.0 to 66.0    | 54.8   | Pass      |
| Head Rotation Decay Time to 0 Degree |       | ms    | 53.0 to 88.0    | 58.1   | Pass      |
| Overall Results                      |       |       |                 |        | Pass      |

  
 Laboratory Technician

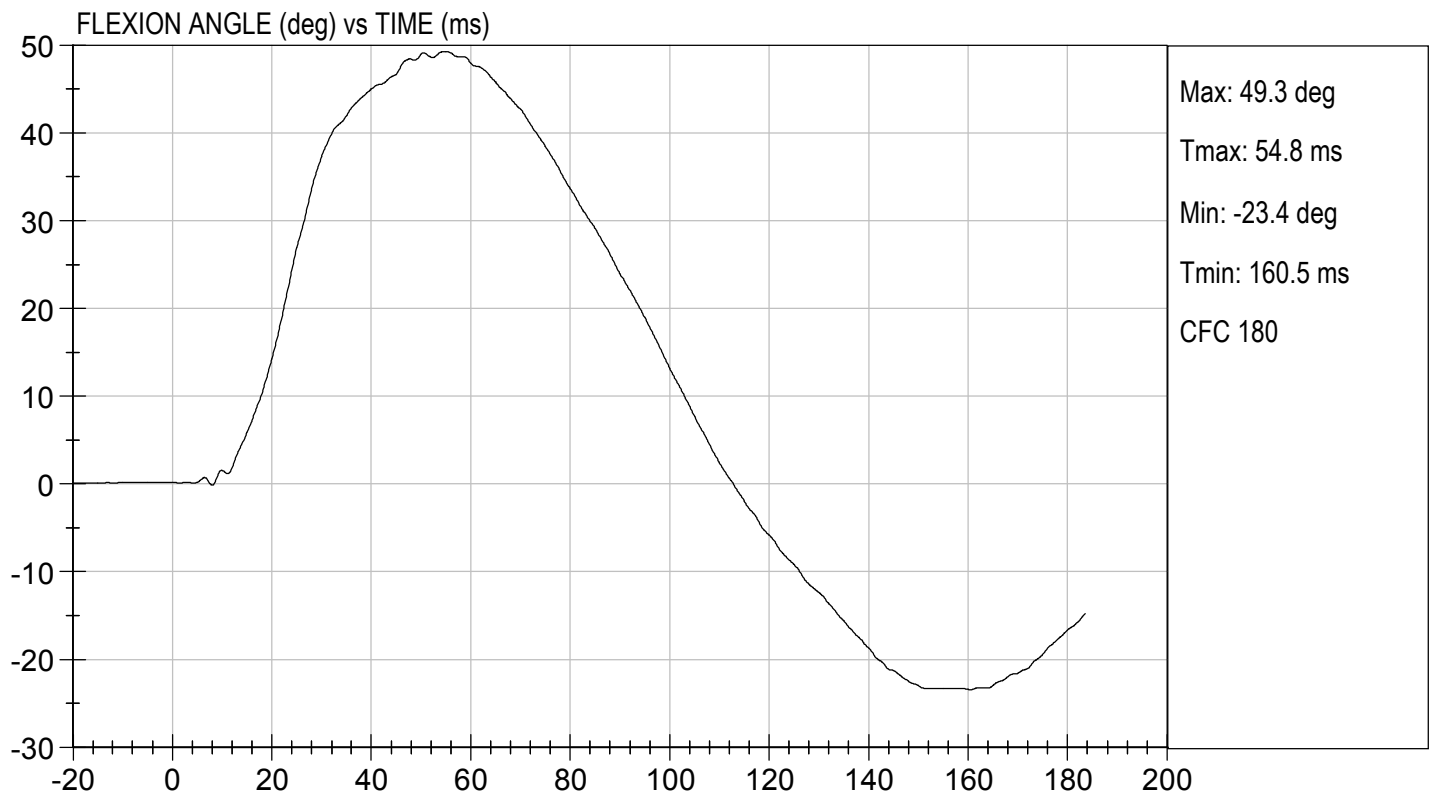
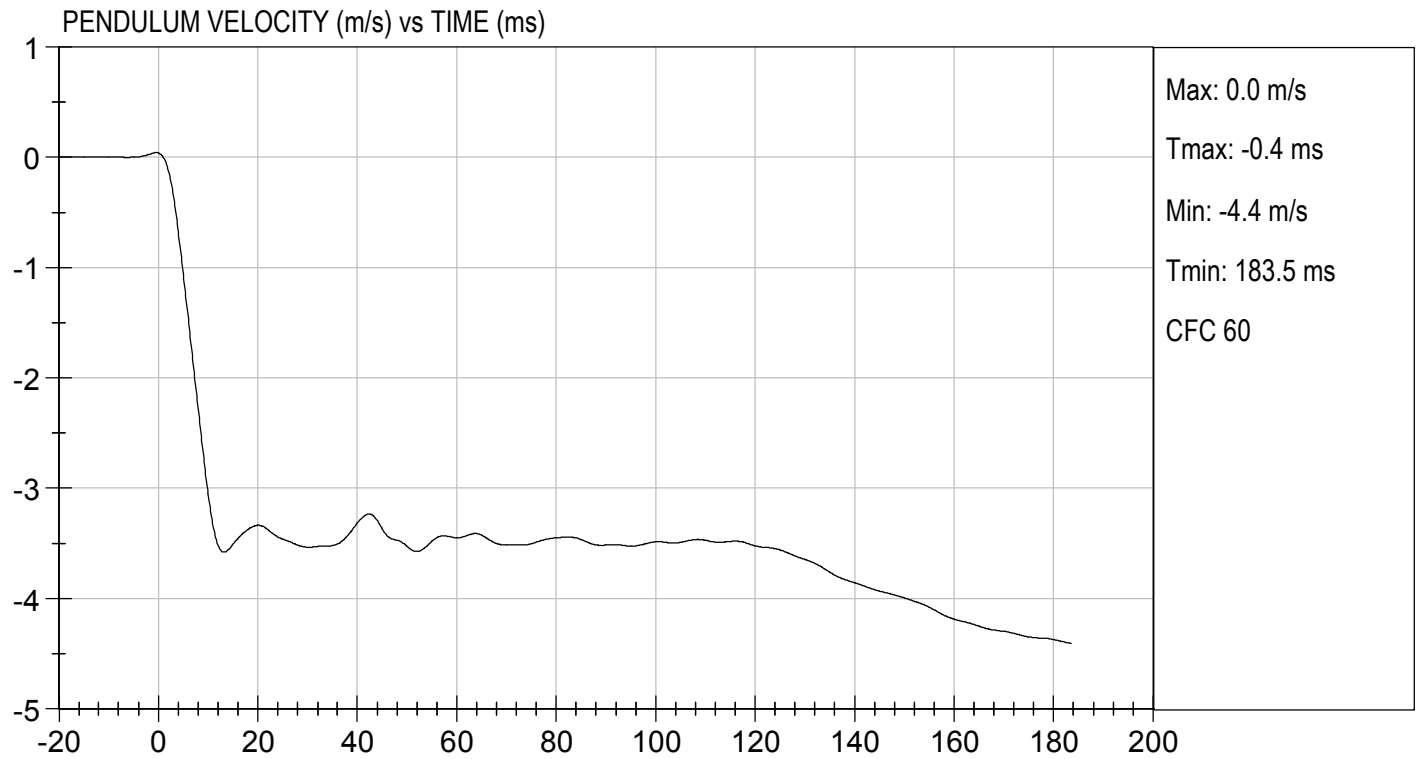
09/25/2019  
 Test Date

  
 Approved By



TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 09/25/2019  
TEST #: D193022

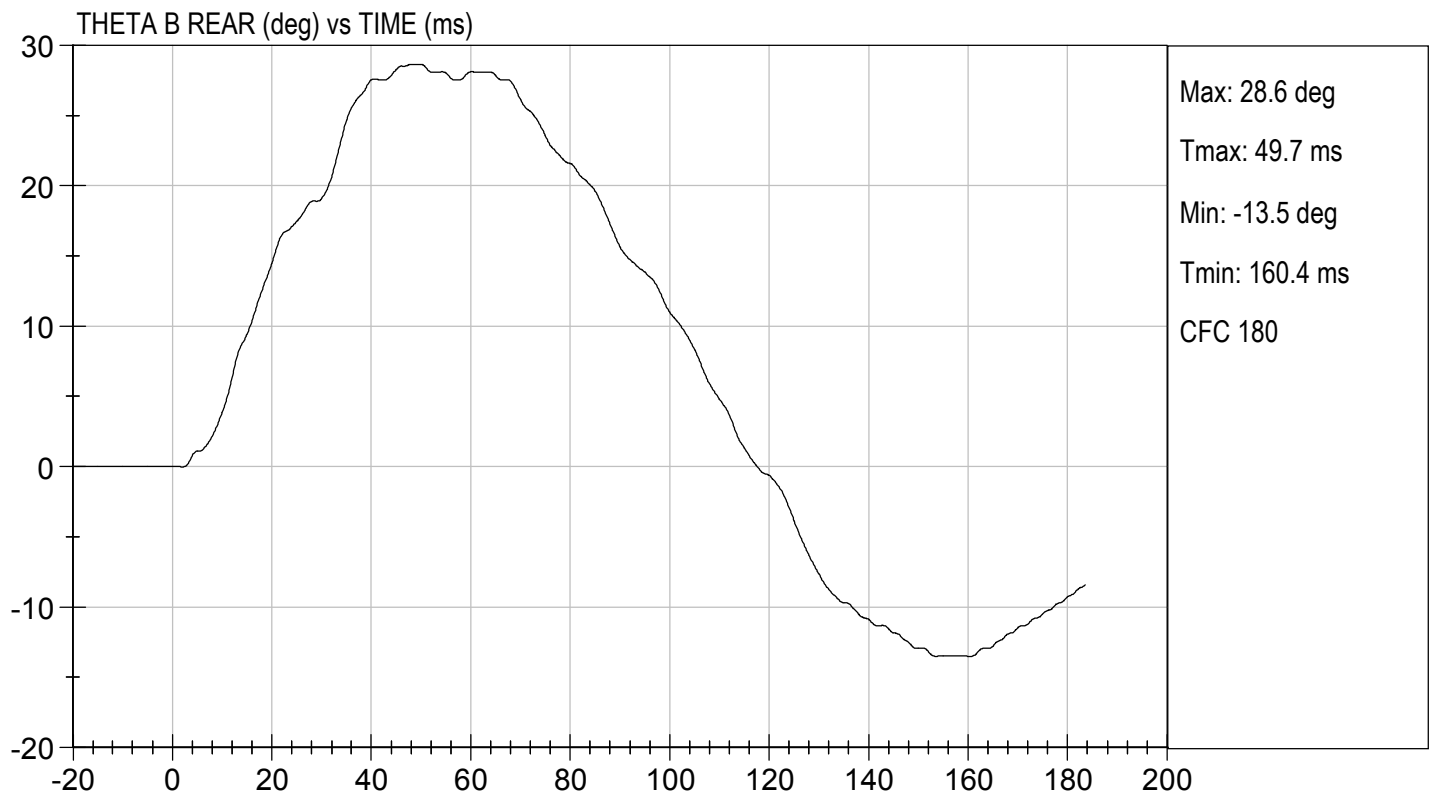
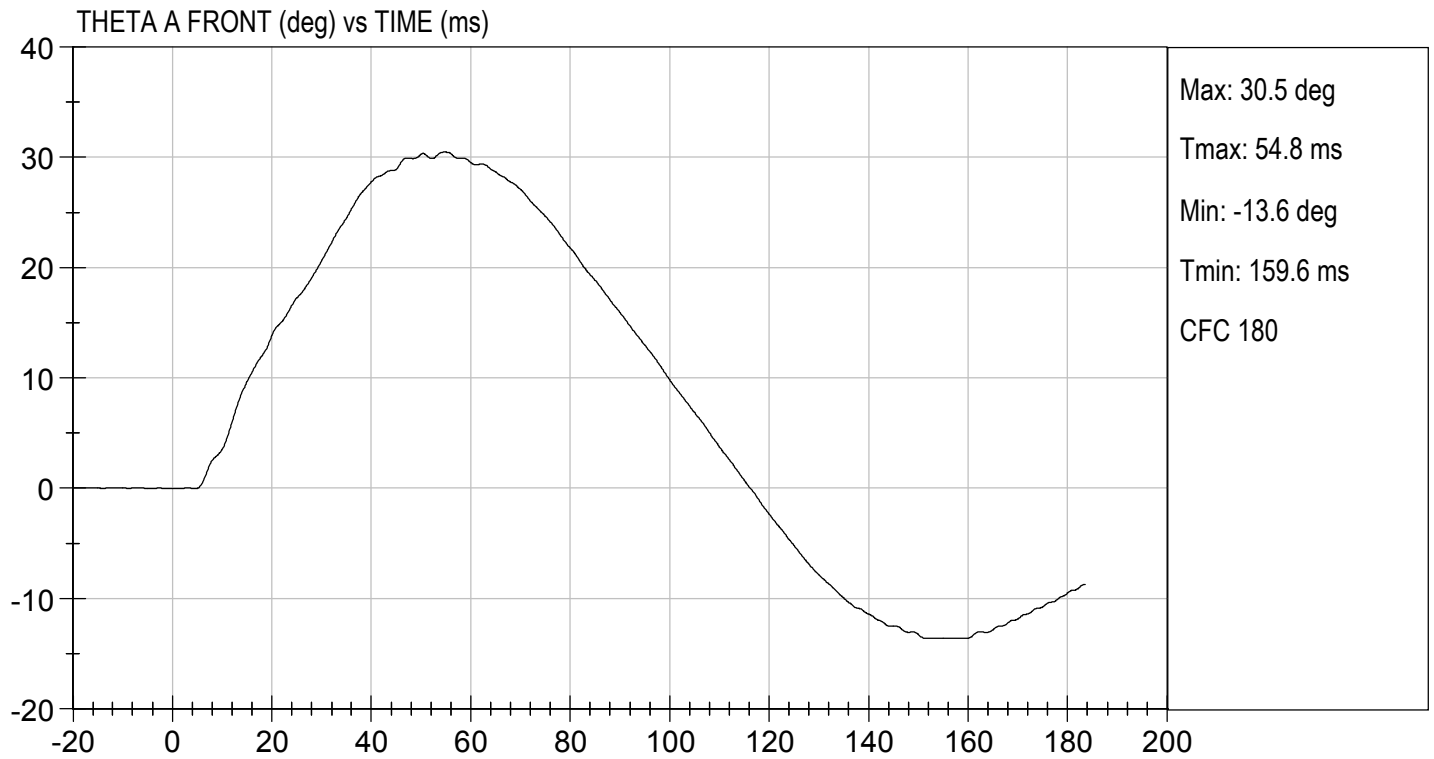






TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

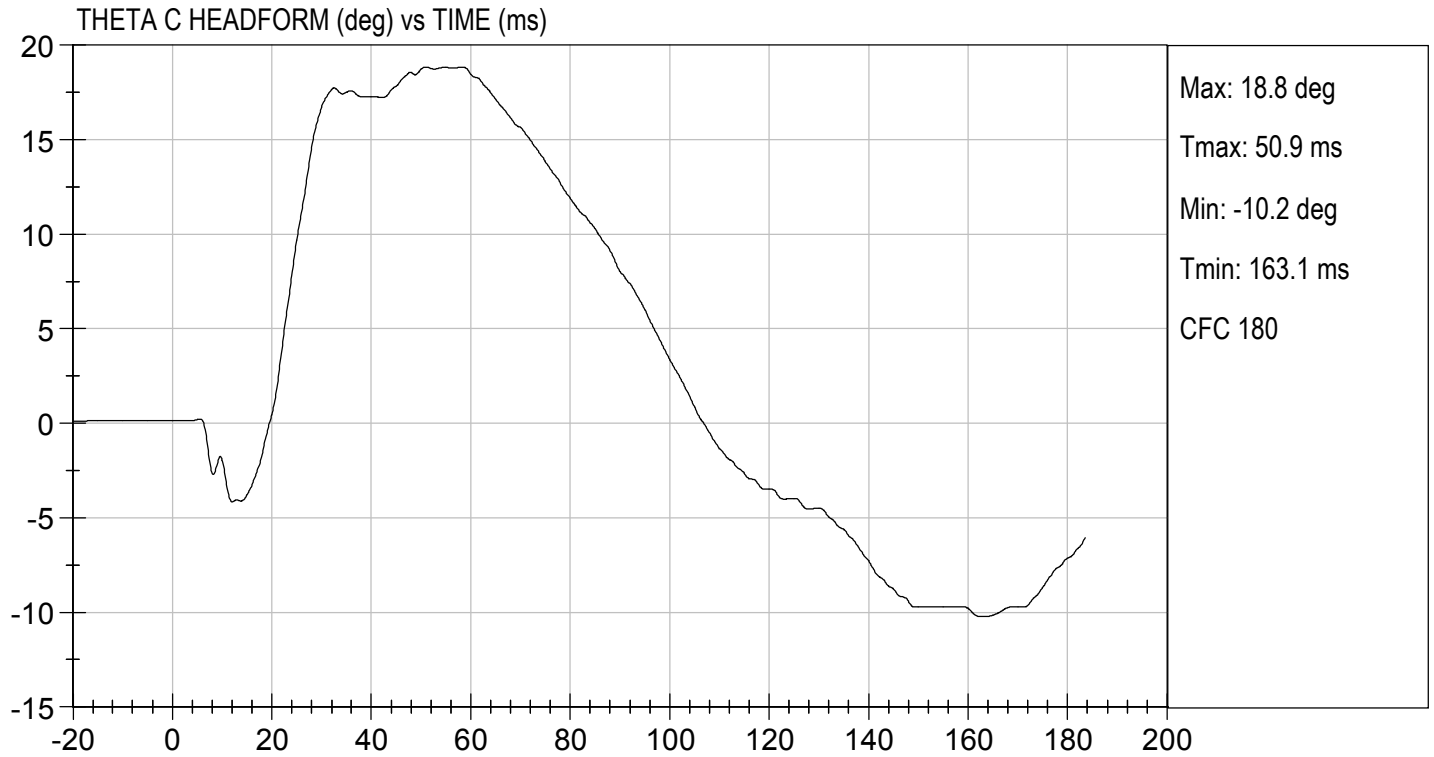
TEST DATE: 09/25/2019  
TEST #: D193022





TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 09/25/2019  
TEST #: D193022



**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

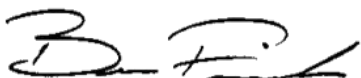
**ATD Serial No:** F032

**Test I.D:** D193023

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Pendulum Speed               | m/s   | 4.20 to 4.40  | 4.2    | Pass      |
| Peak Impactor Acceleration   | G's   | 7.5 to 10.5   | 8.8    | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
\_\_\_\_\_  
Laboratory Technician

09/25/2019  
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Test Date

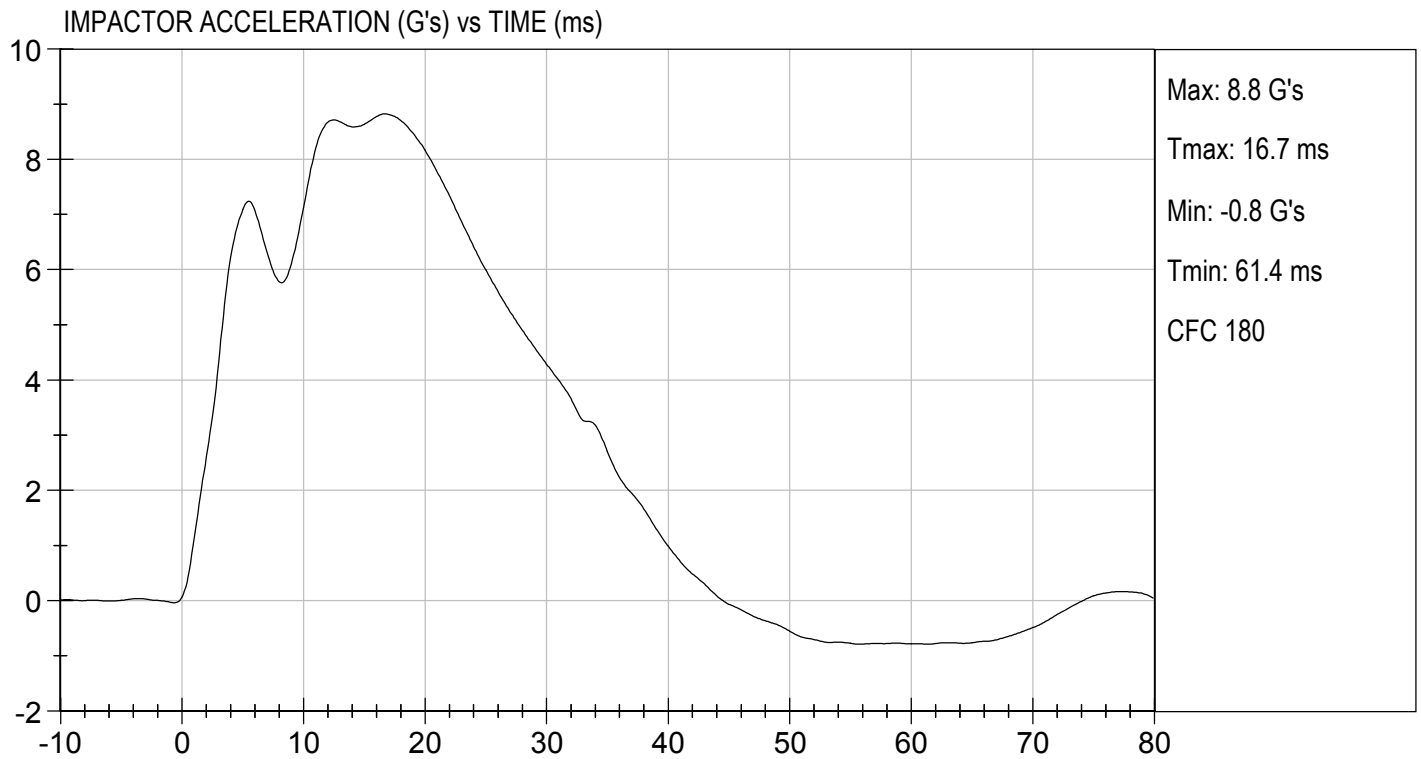
  
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Approved By





TEST DESC: SHOULDER IMPACT  
VELOCITY: 13.77 ft/s, 4.2 m/s

TEST DATE: 09/25/2019  
TEST #: D193023



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

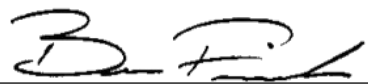
**ATD Serial No:** F032

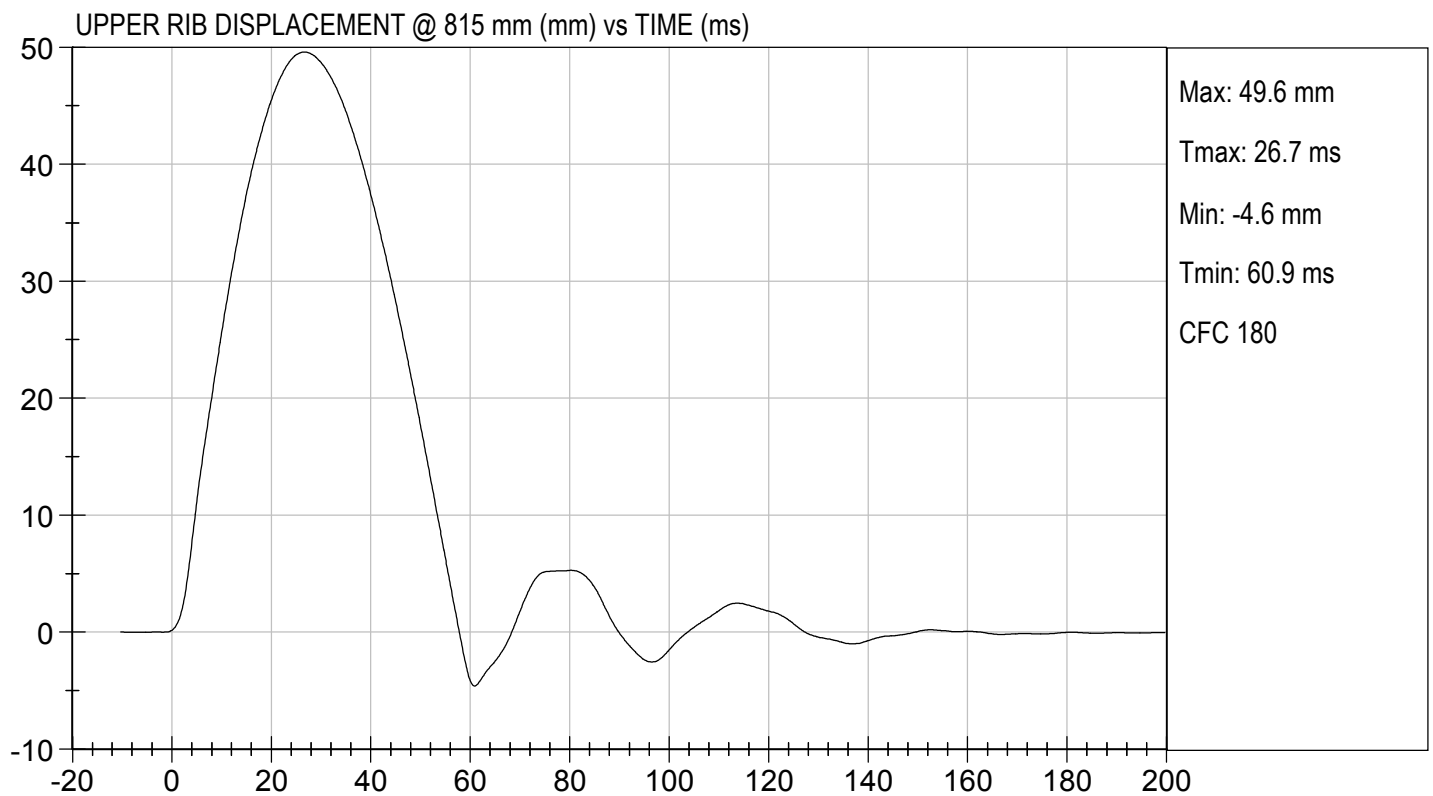
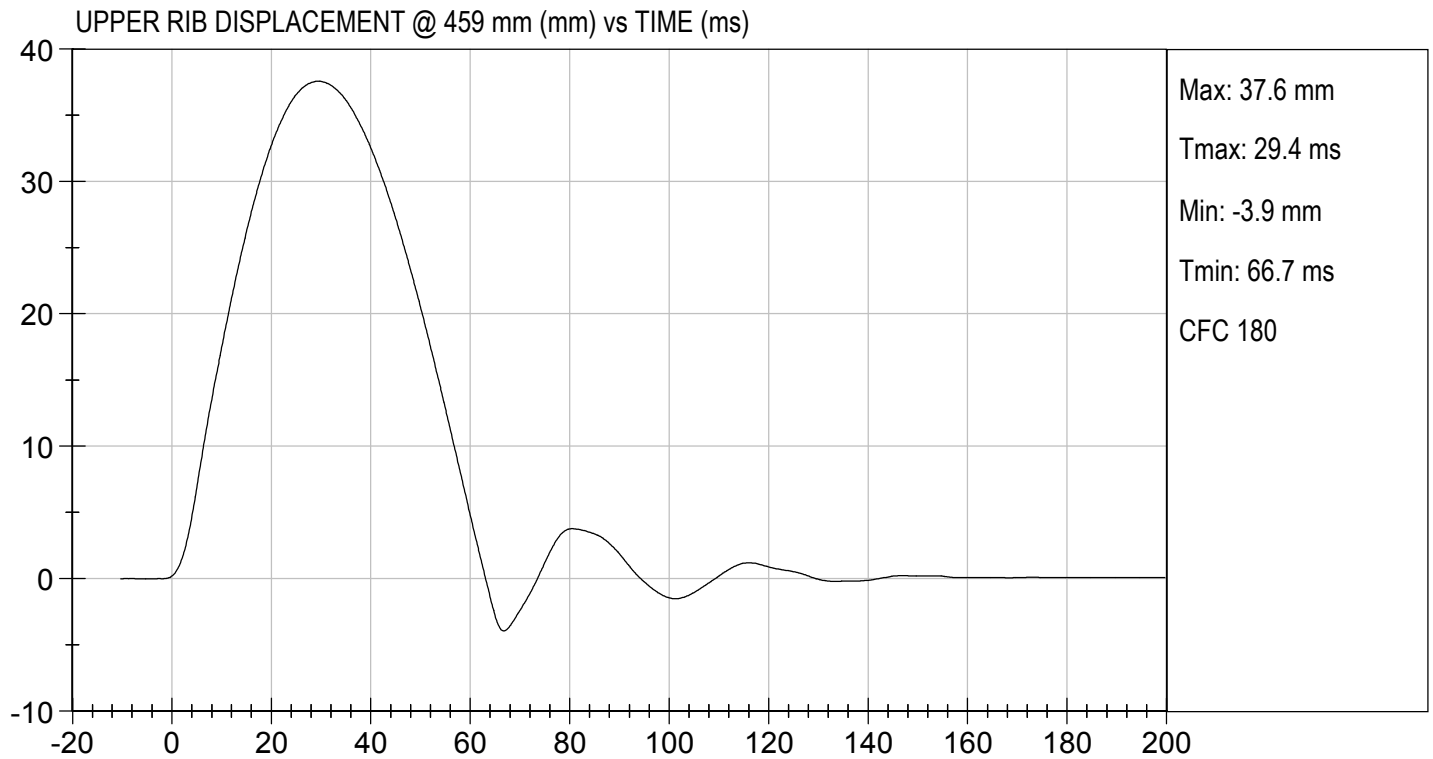
**Test I.D:** D193024

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 37.6   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 49.6   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
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Laboratory Technician

09/25/2019  
\_\_\_\_\_  
Test Date

  
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Approved By





**MGA RESEARCH CORPORATION**

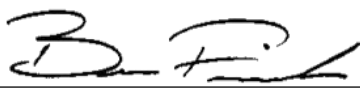
**MID RIB TEST  
ES-2re DUMMY**

**ATD Serial No:** F032

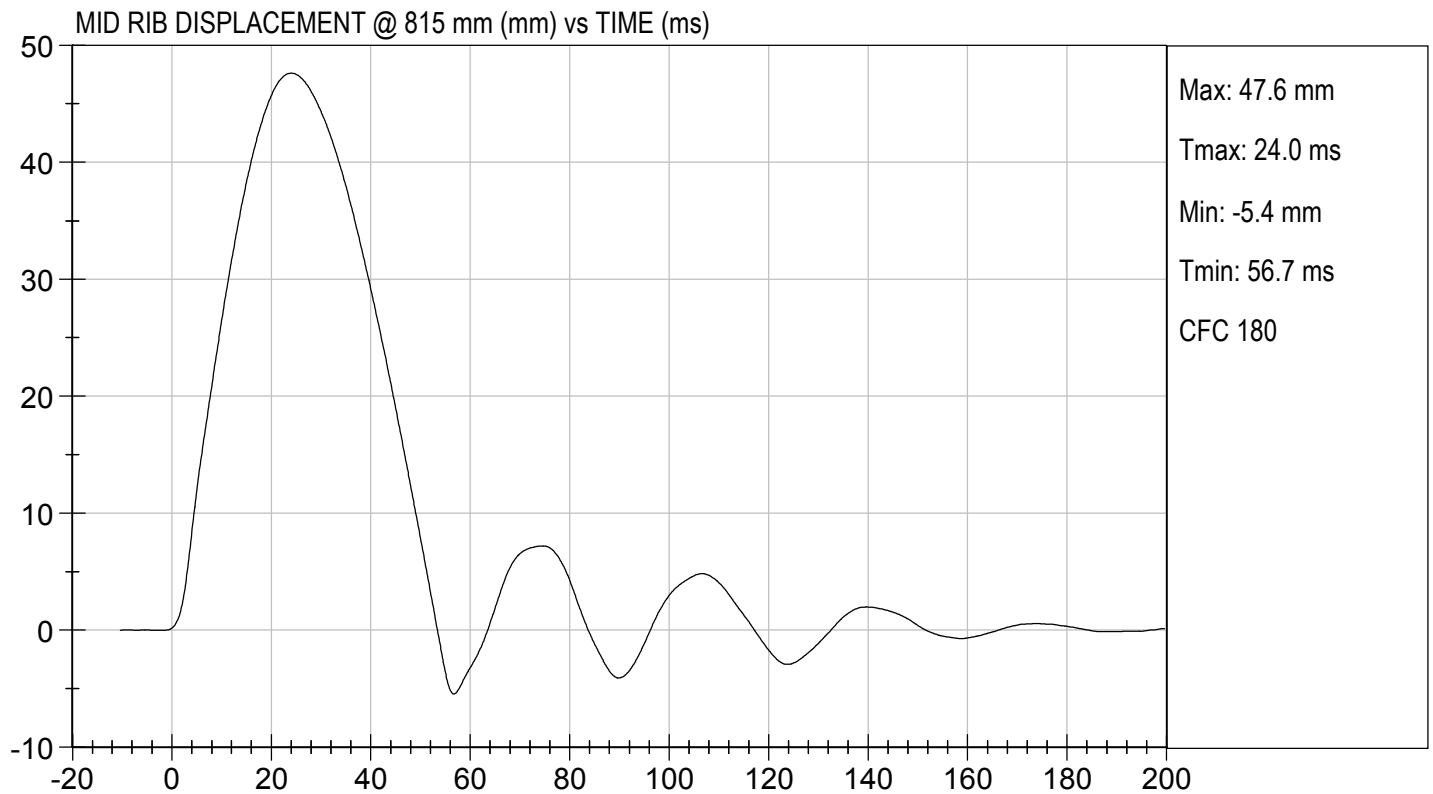
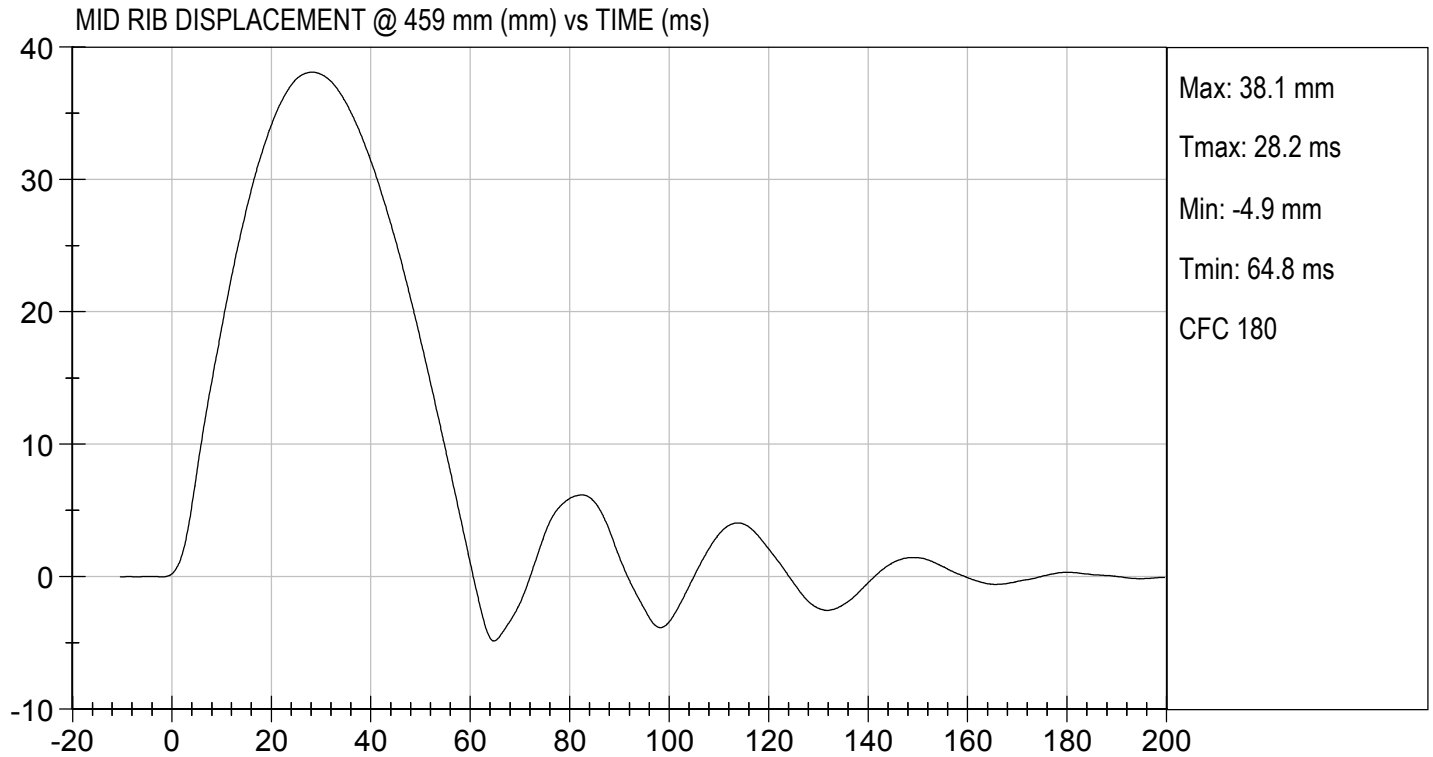
**Test I.D:** D193025

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 38.1   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 47.6   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

  
Approved By

09/25/2019  
Test Date



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

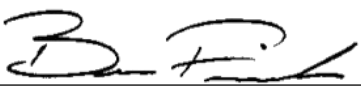
**ATD Serial No:** F032

**Test I.D:** D193026

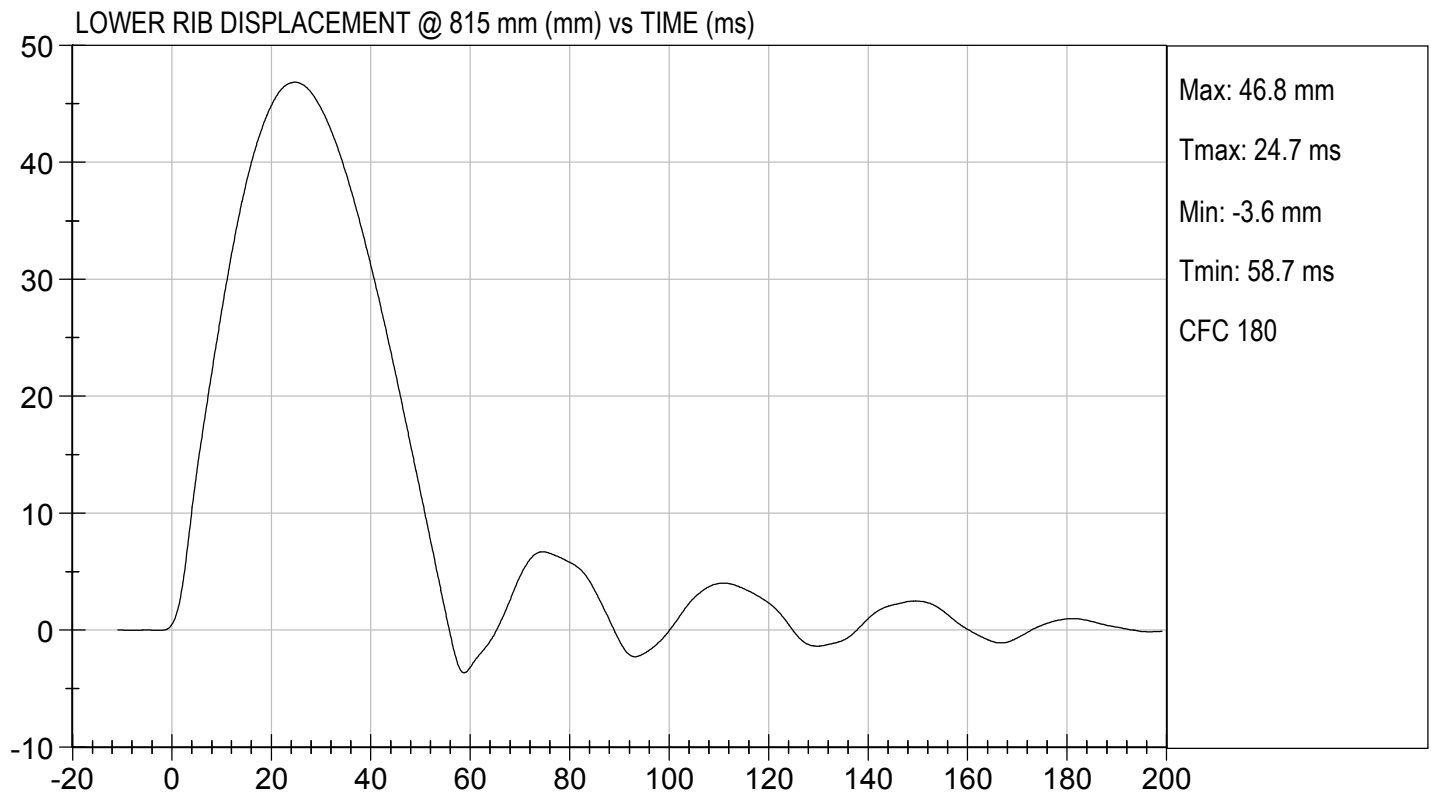
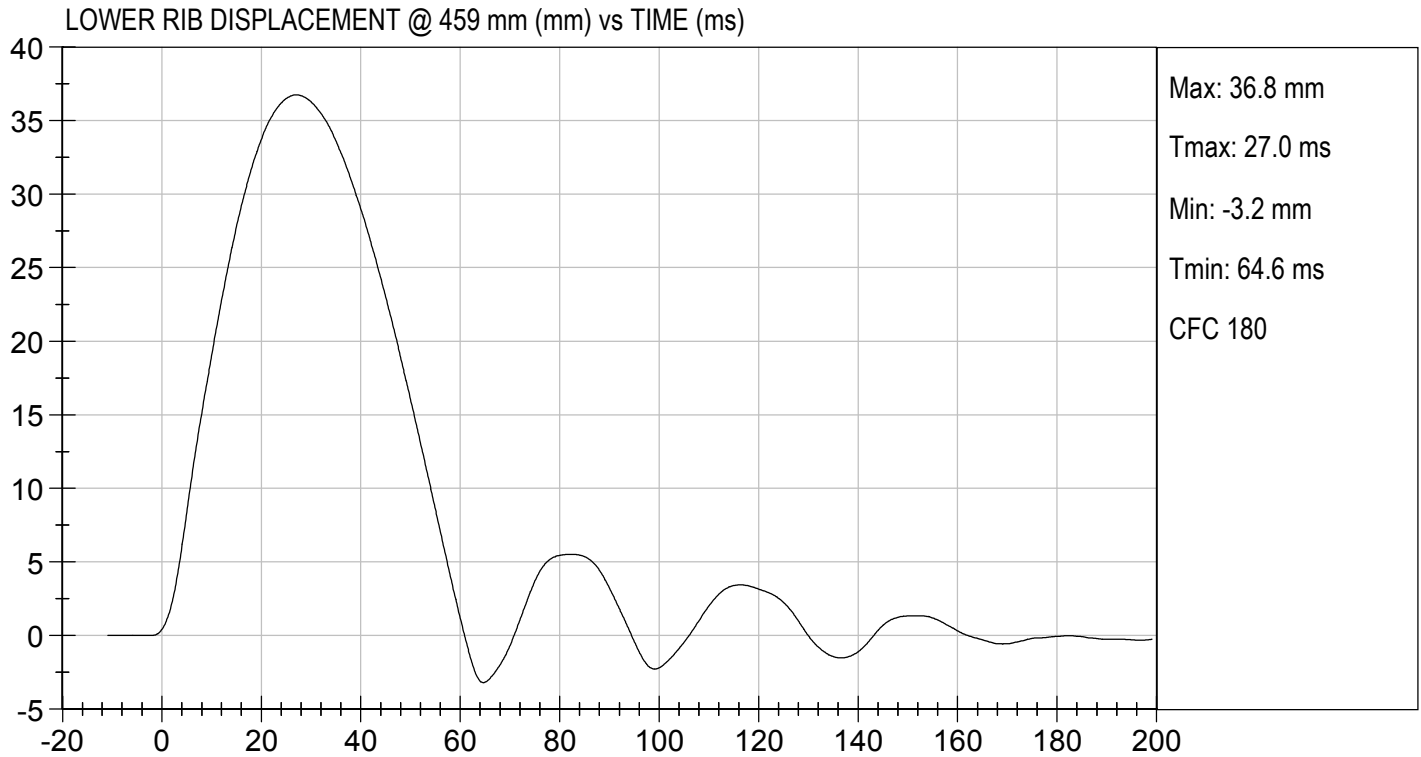
| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 36.8   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 46.8   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
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09/25/2019  
\_\_\_\_\_  
Test Date

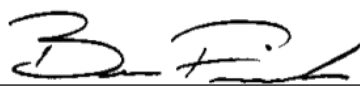
  
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Approved By





**MGA RESEARCH CORPORATION****ABDOMEN TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193027

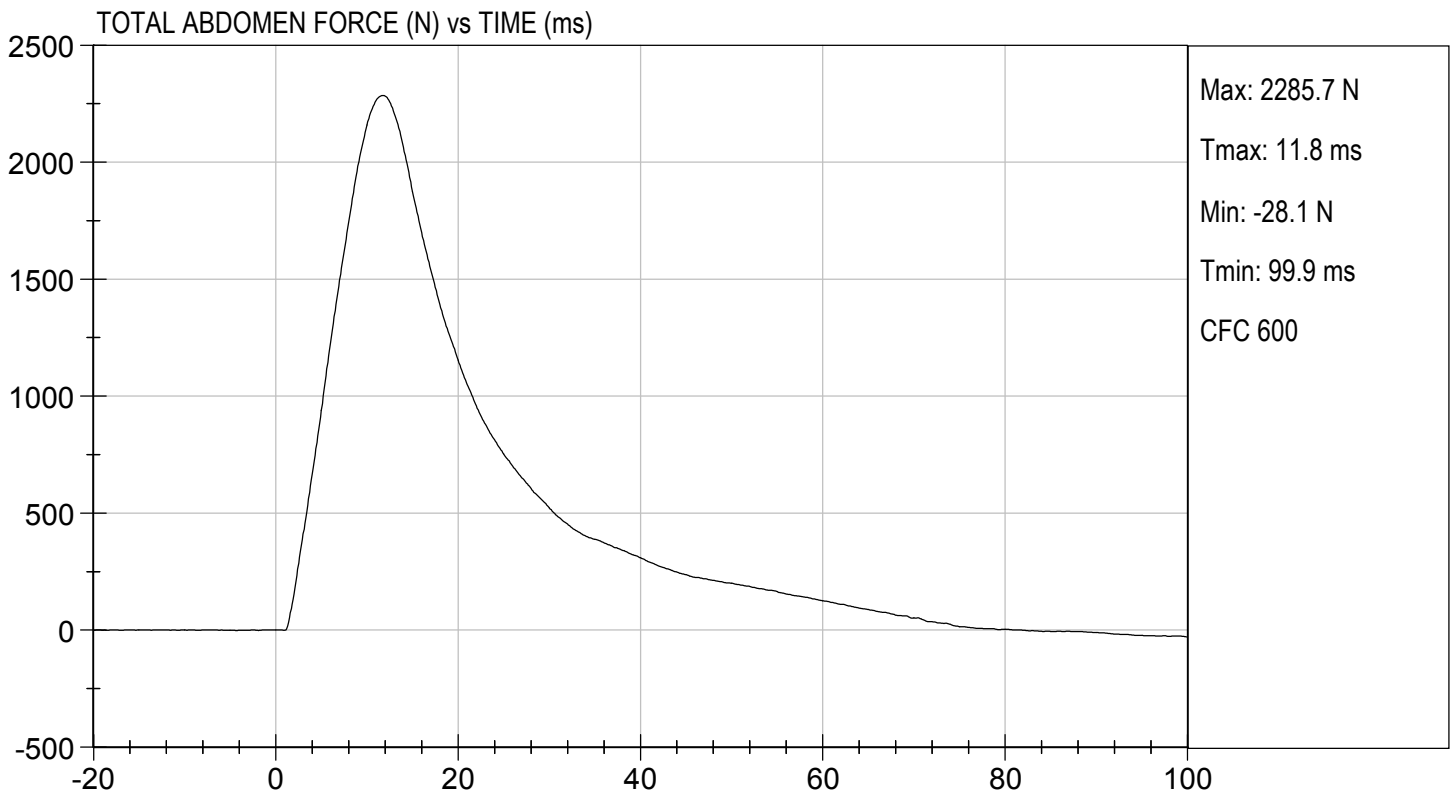
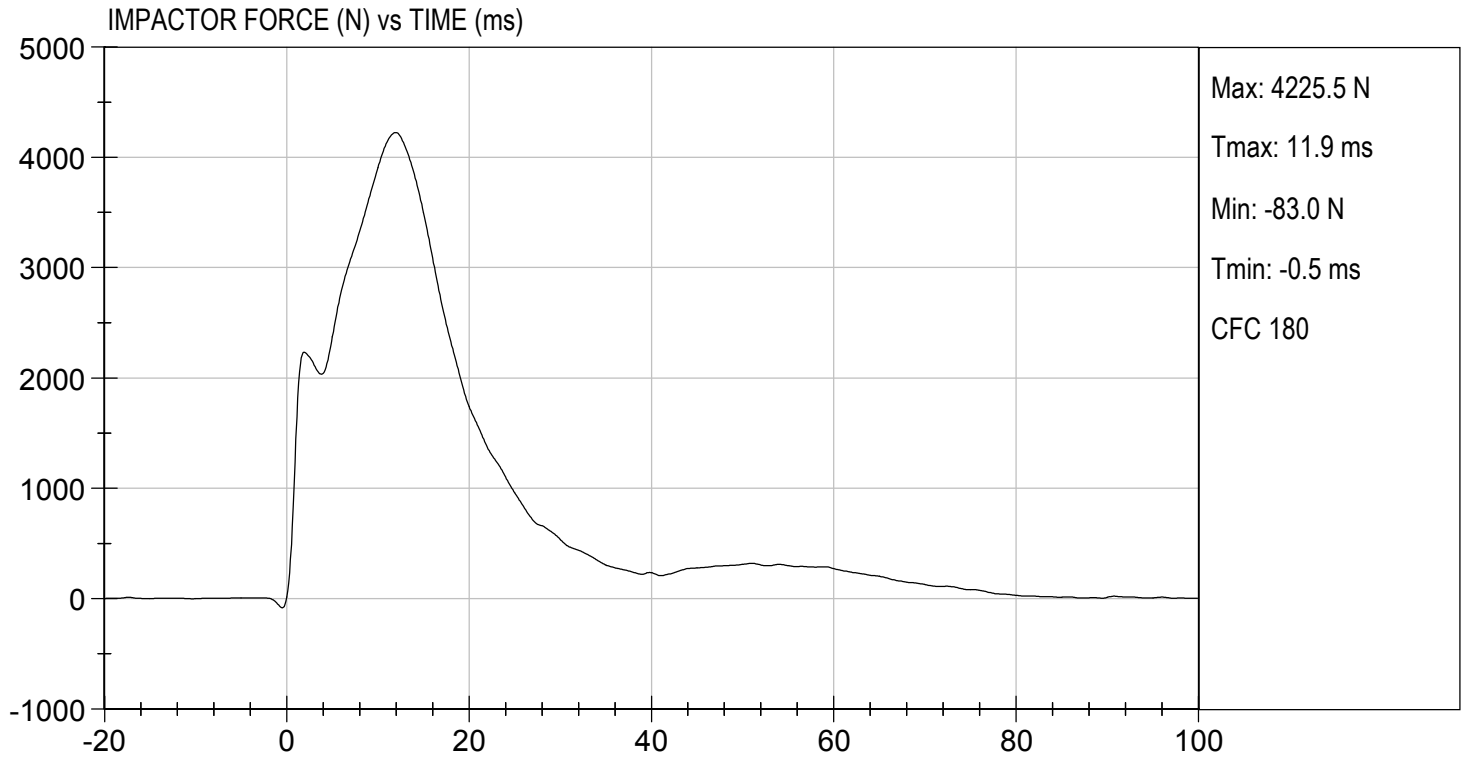
| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 44     | Pass      |
| Probe Speed                    | m/s   | 3.90 to 4.10  | 4.03   | Pass      |
| Maximum Impactor Force         | N     | 4000 to 4800  | 4226   | Pass      |
| Time of Maximum Impactor Force | ms    | 10.6 to 13.0  | 11.9   | Pass      |
| Maximum Total Abdomen Force    | N     | 2200 to 2700  | 2286   | Pass      |
| Time of Maximum Abdomen Force  | ms    | 10.0 to 12.3  | 11.8   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
\_\_\_\_\_  
Laboratory Technician09/25/2019  
Test Date  
\_\_\_\_\_  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

TEST DATE: 09/25/2019  
TEST #: D193027

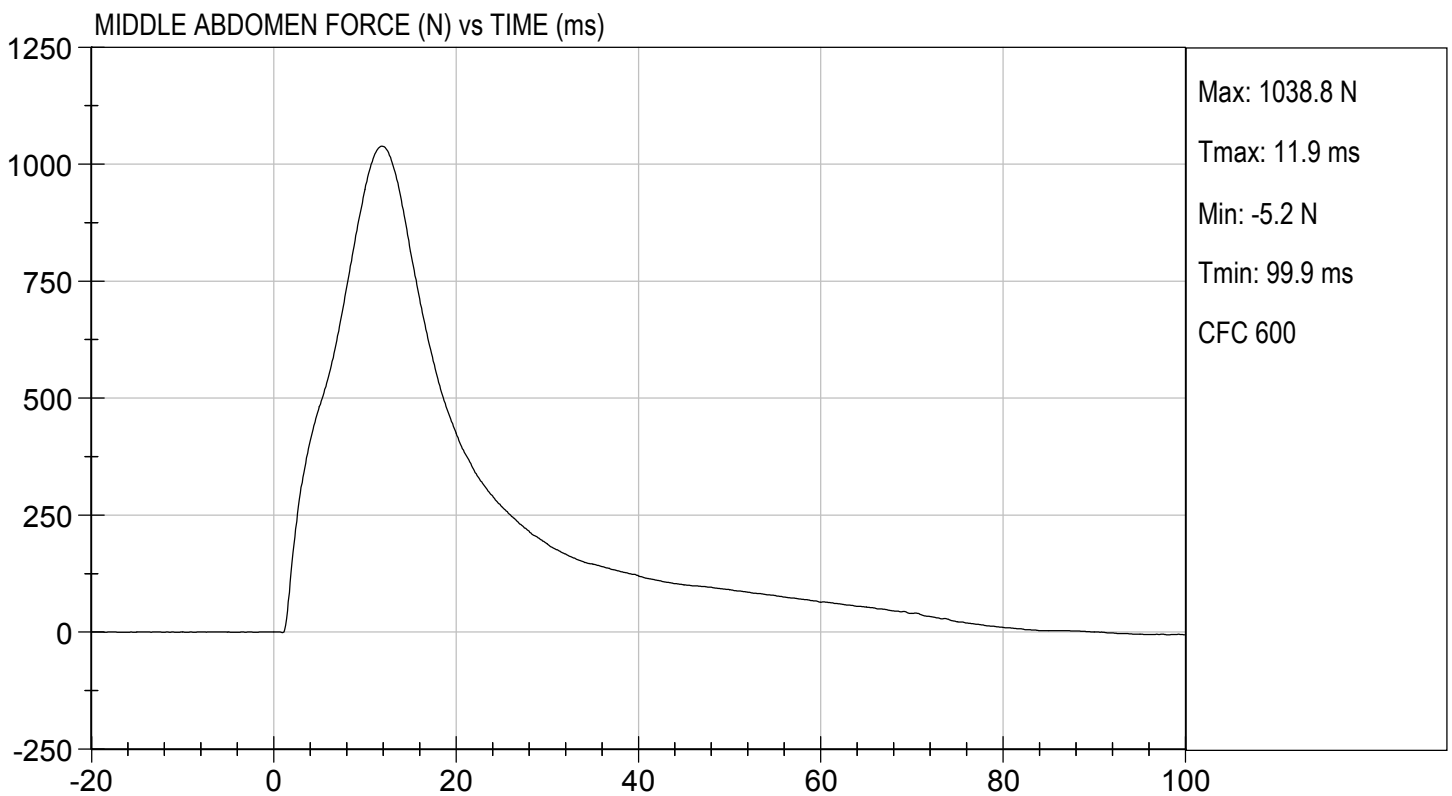
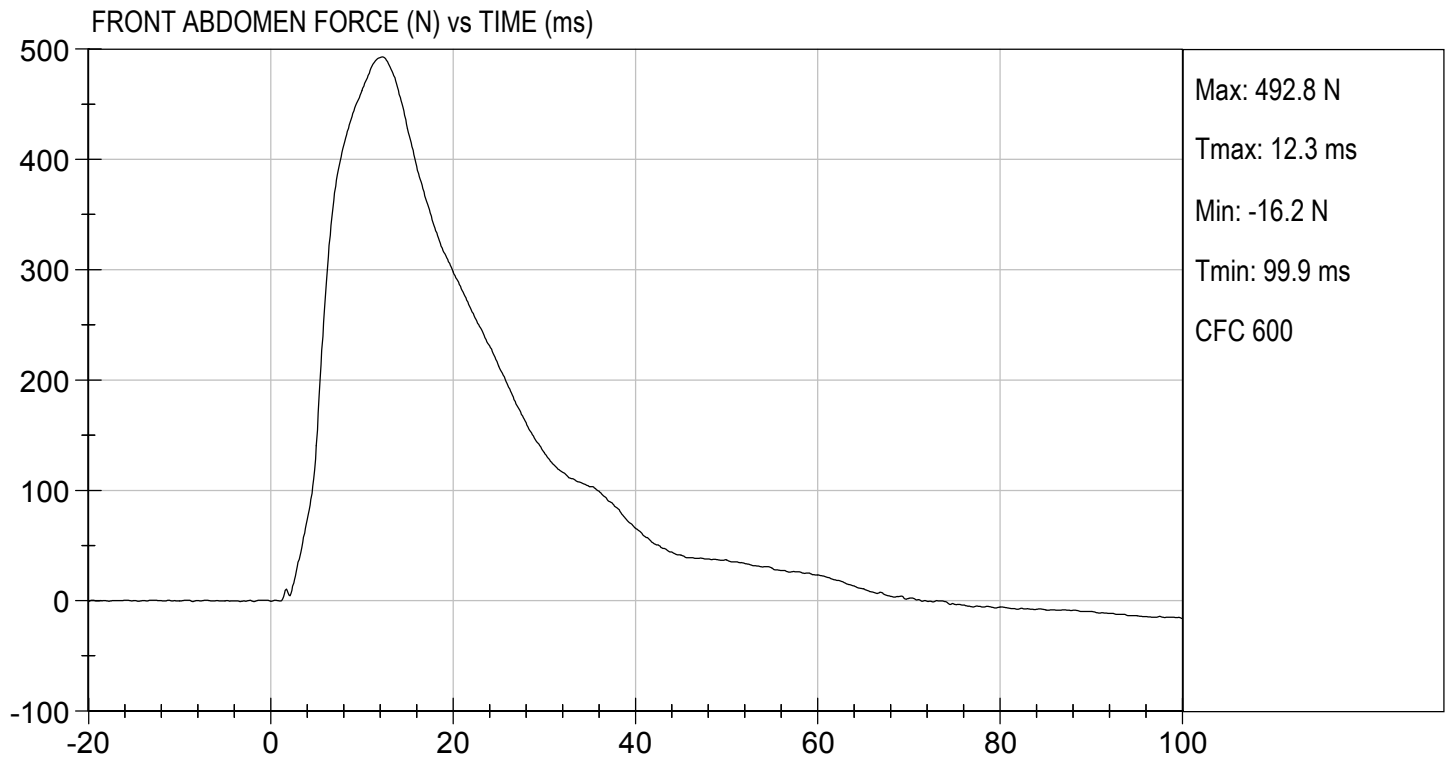






TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

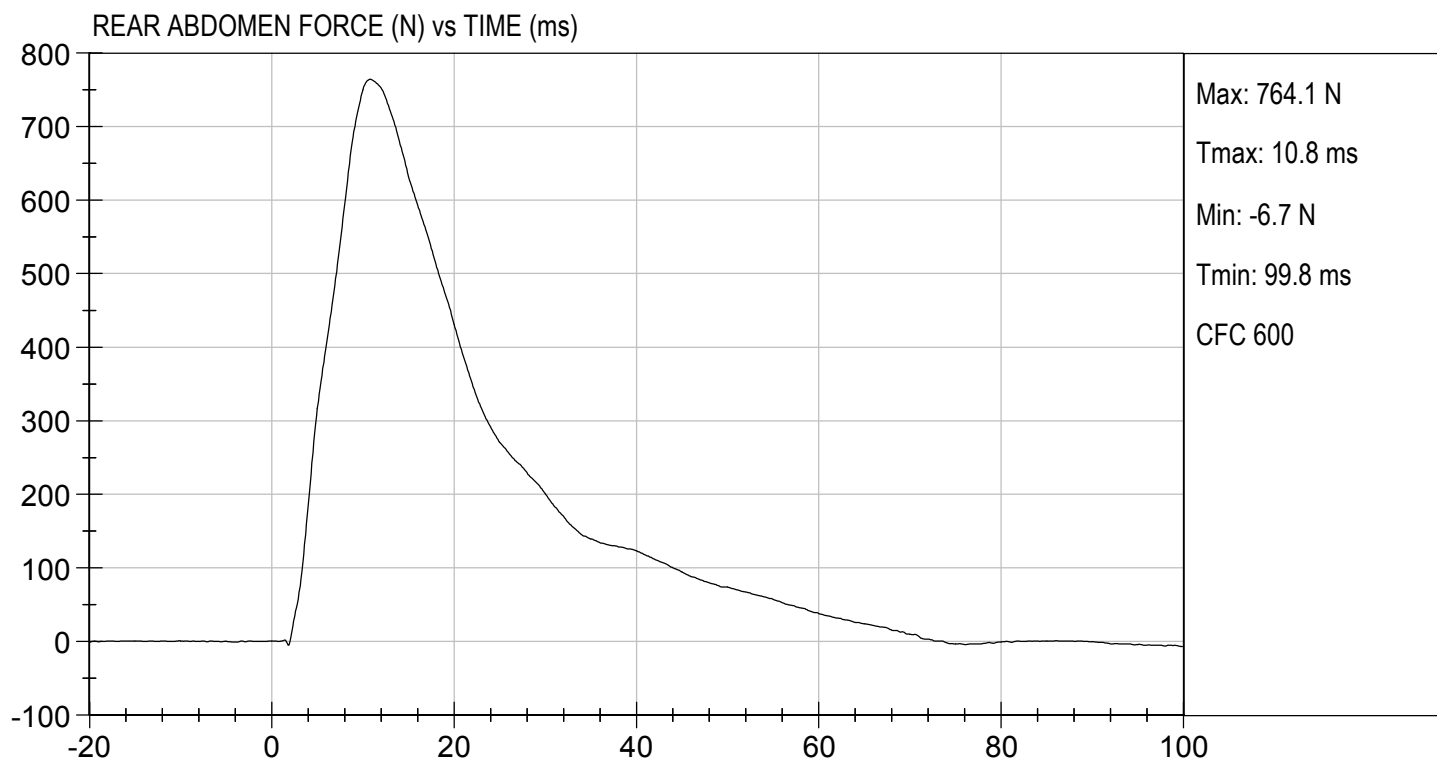
TEST DATE: 09/25/2019  
TEST #: D193027





TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

TEST DATE: 09/25/2019  
TEST #: D193027



**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

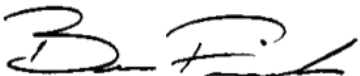
**ATD Serial No:** 032

**Test I.D:** D193028

| Tested Parameter                            |        | Units | Specification   | Result | Pass/Fail |
|---------------------------------------------|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature                      |        | deg C | 20.6 to 22.2    | 21.3   | Pass      |
| Laboratory Relative Humidity                |        | %     | 10 to 70        | 45     | Pass      |
| Pendulum Speed                              |        | m/s   | 5.95 to 6.15    | 6.05   | Pass      |
| Pendulum Velocity                           | 1 ms   | m/s   | -0.05 to 0.00   | -0.01  | Pass      |
|                                             | 3.7 ms | m/s   | -0.425 to -0.24 | -0.424 | Pass      |
|                                             | 27 ms  | m/s   | -6.50 to -5.80  | -6.04  | Pass      |
|                                             | 30 ms  | m/s   | >= -6.50        | -5.88  | Pass      |
| Maximum Flexion Angle                       |        | deg   | 45.0 to 55.0    | 45.5   | Pass      |
| Time of Maximum Flexion Angle               |        | ms    | 39.0 to 53.0    | 43.5   | Pass      |
| Headform Rotation Decay to Initial Position |        | ms    | 37 to 57        | 38     | Pass      |
| Overall Results                             |        |       |                 |        | Pass      |

  
 Laboratory Technician

09/25/2019  
 Test Date

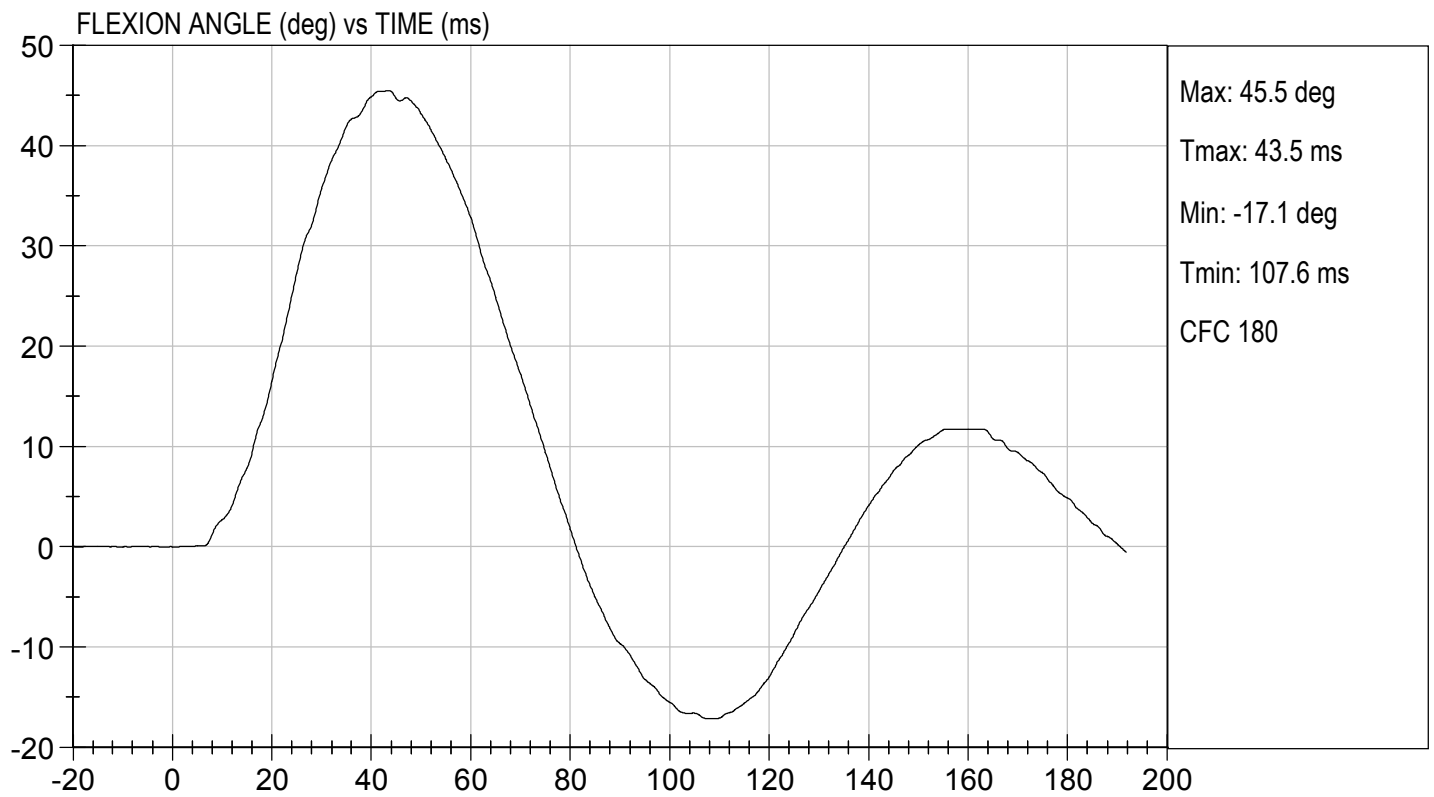
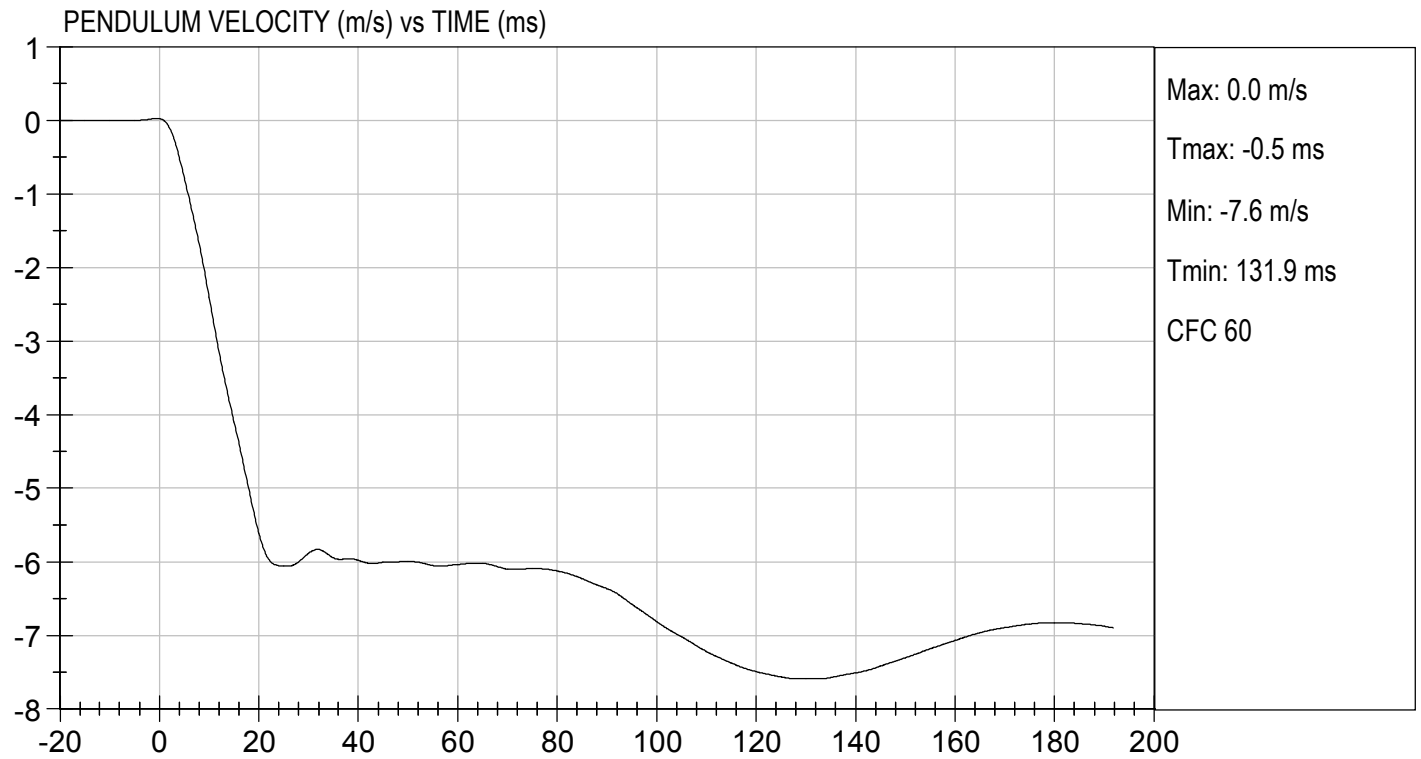
  
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TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

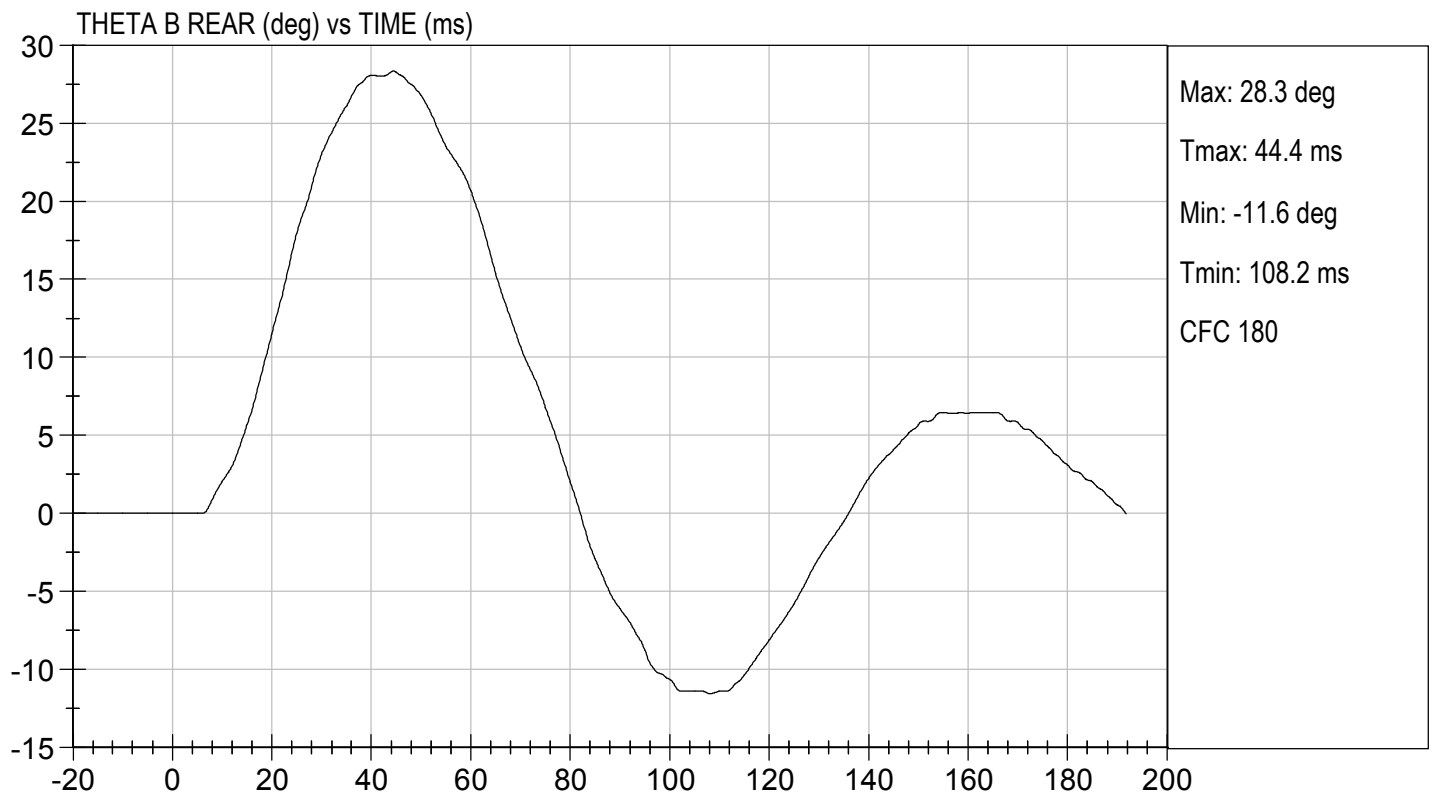
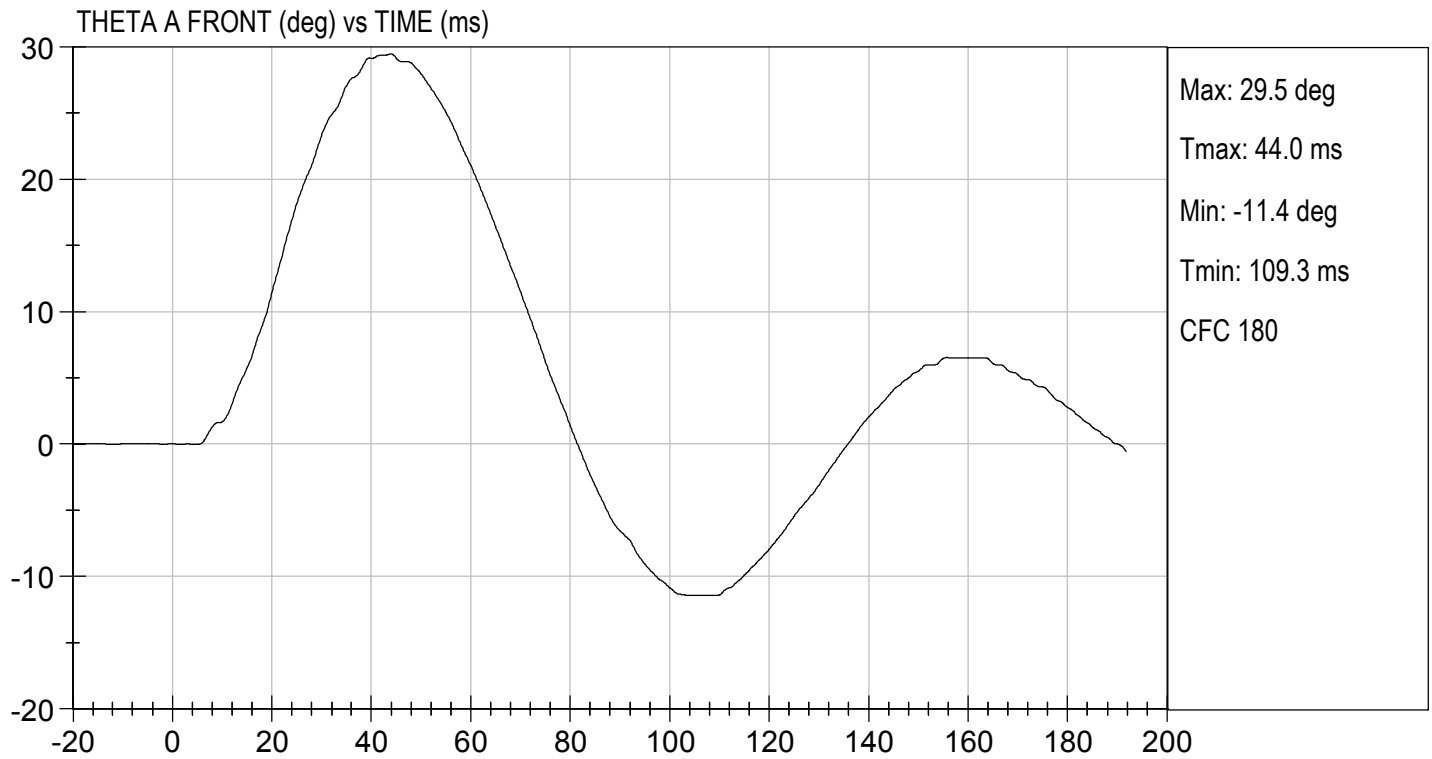
TEST DATE: 09/25/2019  
TEST #: D193028





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

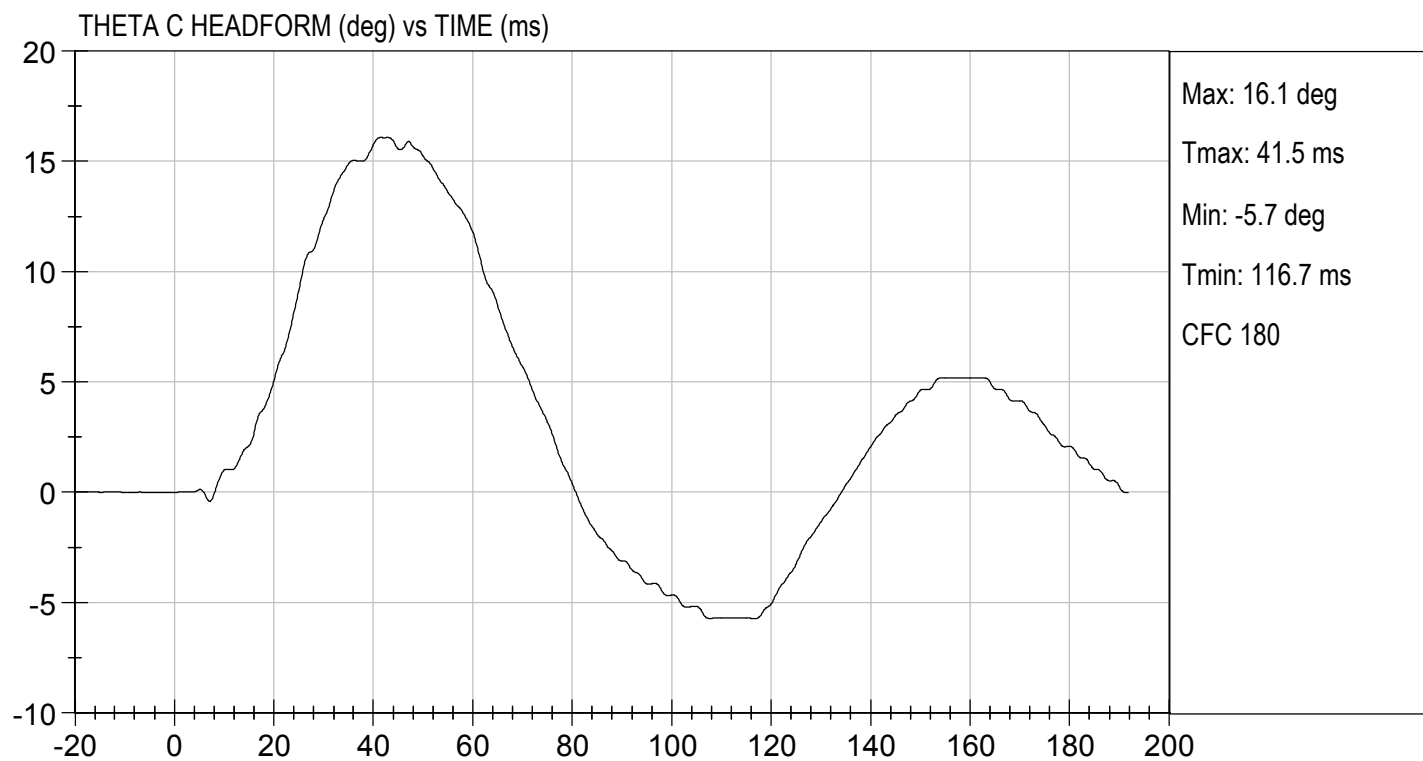
TEST DATE: 09/25/2019  
TEST #: D193028





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 09/25/2019  
TEST #: D193028





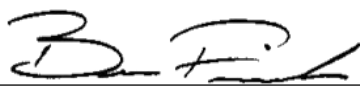
**MGA RESEARCH CORPORATION****PELVIS TEST  
ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193029

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 44     | Pass      |
| Probe Speed                    | m/s   | 4.20 to 4.40  | 4.38   | Pass      |
| Maximum Impactor Force         | N     | 4700 to 5400  | 4954   | Pass      |
| Time of Maximum Impactor Force | ms    | 11.8 to 16.1  | 13.4   | Pass      |
| Maximum Pubic Force            | N     | 1230 to 1590  | 1362   | Pass      |
| Time of Maximum Pubic Force    | ms    | 12.2 to 17.0  | 14.3   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

09/25/2019

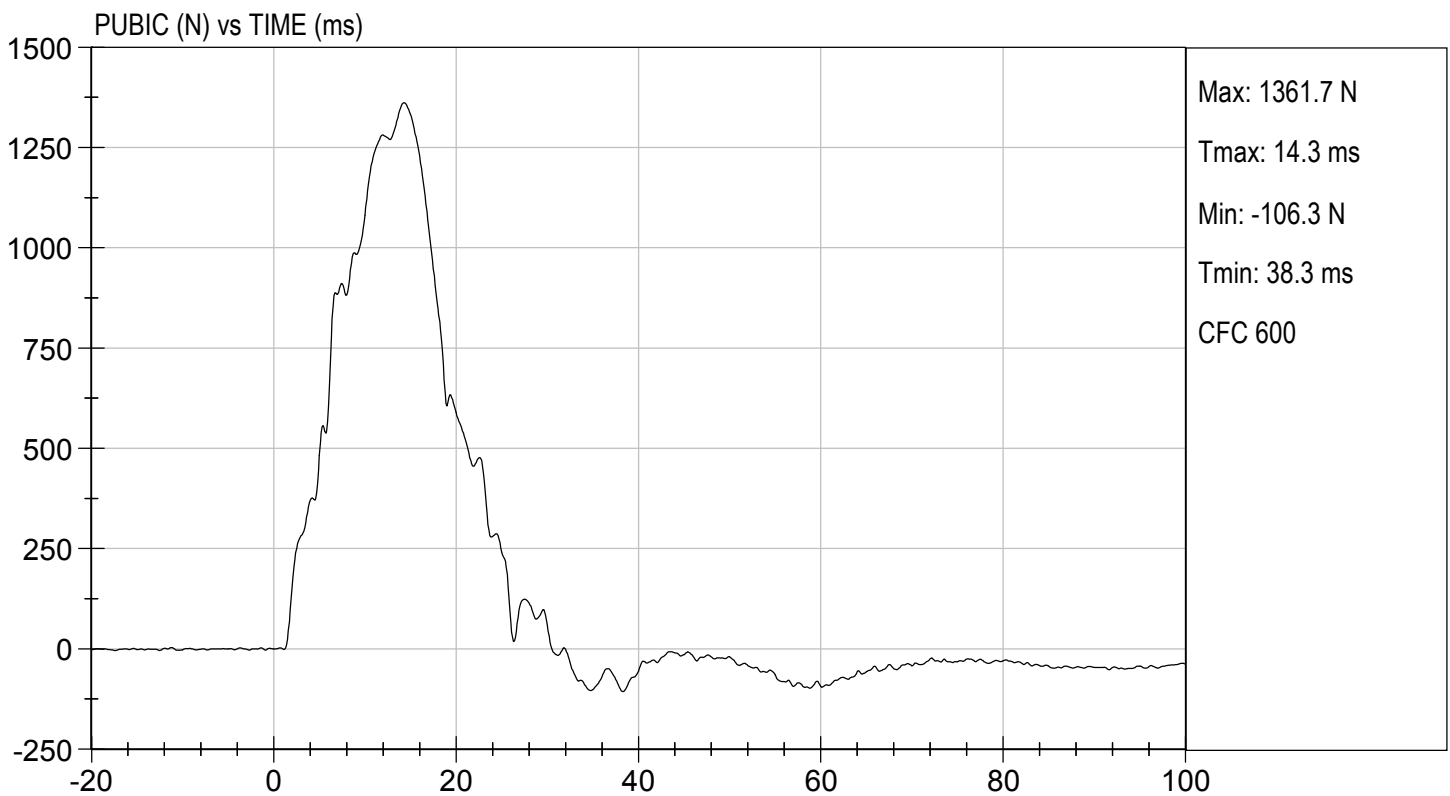
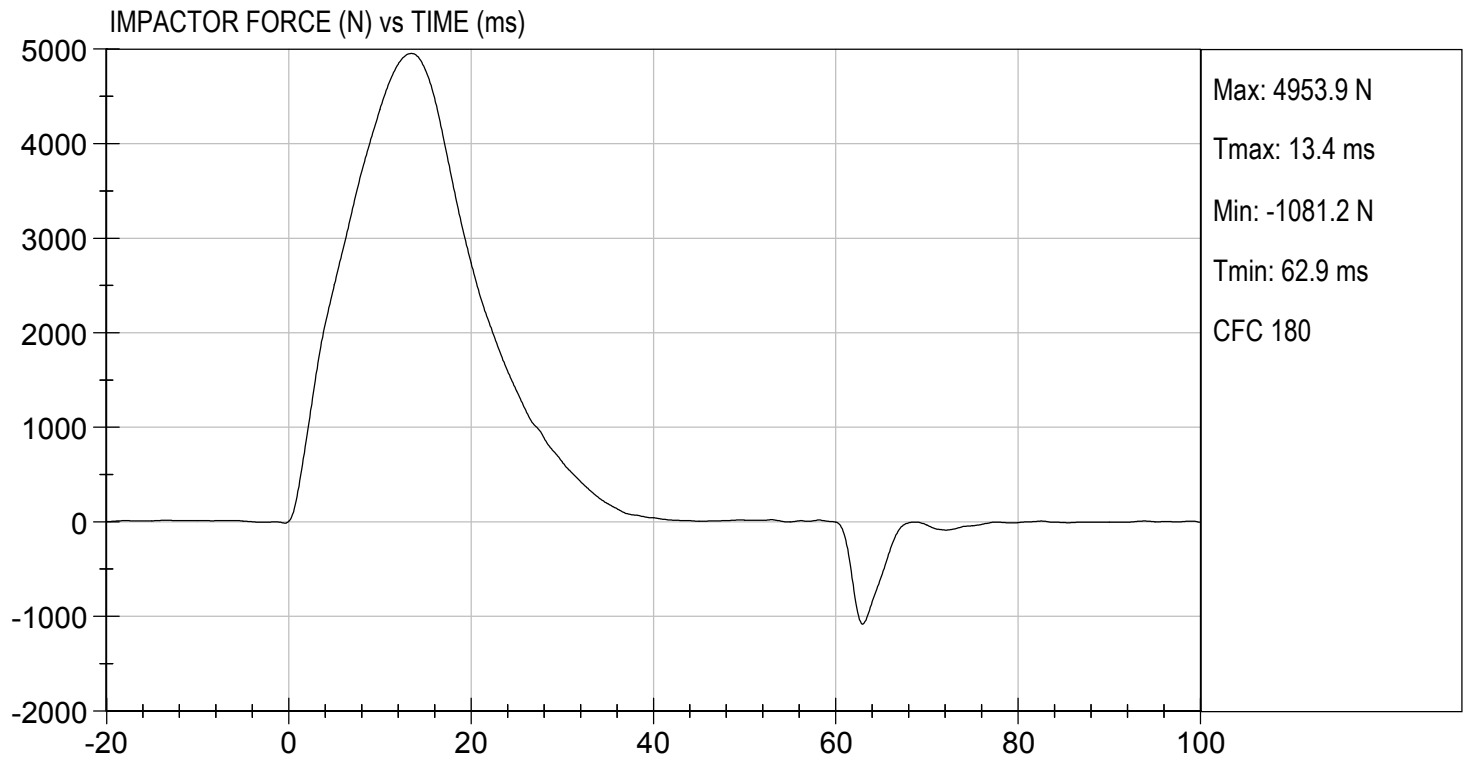
Test Date

  
Approved By



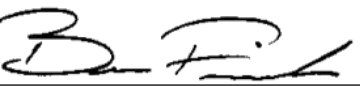
TEST DESC: PELVIS IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 09/25/2019  
TEST #: D193029



**MGA RESEARCH CORPORATION****THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193020

| Tested Parameter                    | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature                         | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Humidity                            | %     | 10 to 70      | 44     | Pass      |
| Probe Speed                         | m/s   | 5.40 to 5.60  | 5.52   | Pass      |
| Maximum Impactor Force (after 6 ms) | N     | 5100 to 6200  | 5378   | Pass      |
| Upper Rib Displacement              | mm    | 34.0 to 41.0  | 39.2   | Pass      |
| Middle Rib Displacement             | mm    | 37.0 to 45.0  | 40.2   | Pass      |
| Lower Rib Displacement              | mm    | 37.0 to 44.0  | 41.2   | Pass      |
| Overall Test Results                |       |               |        | Pass      |

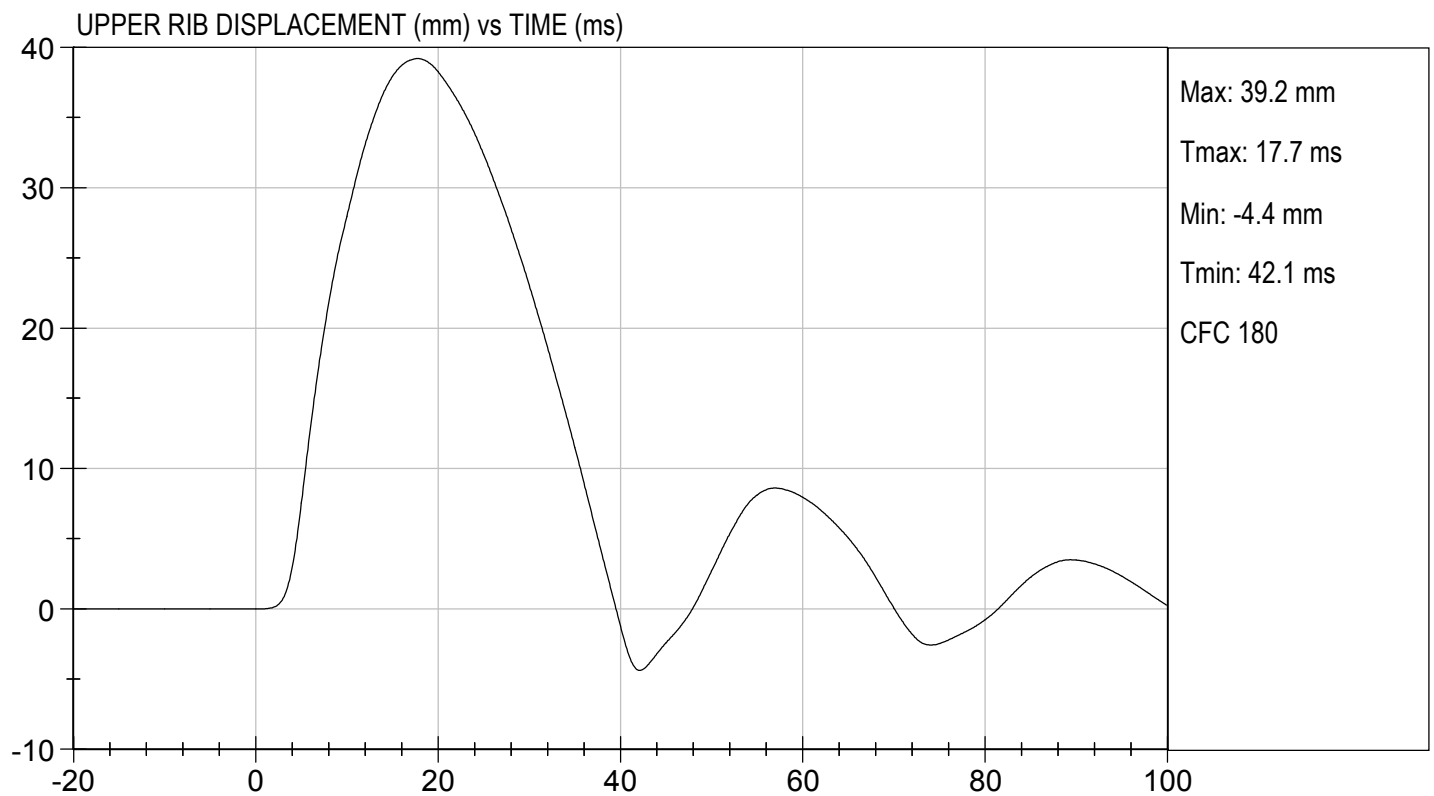
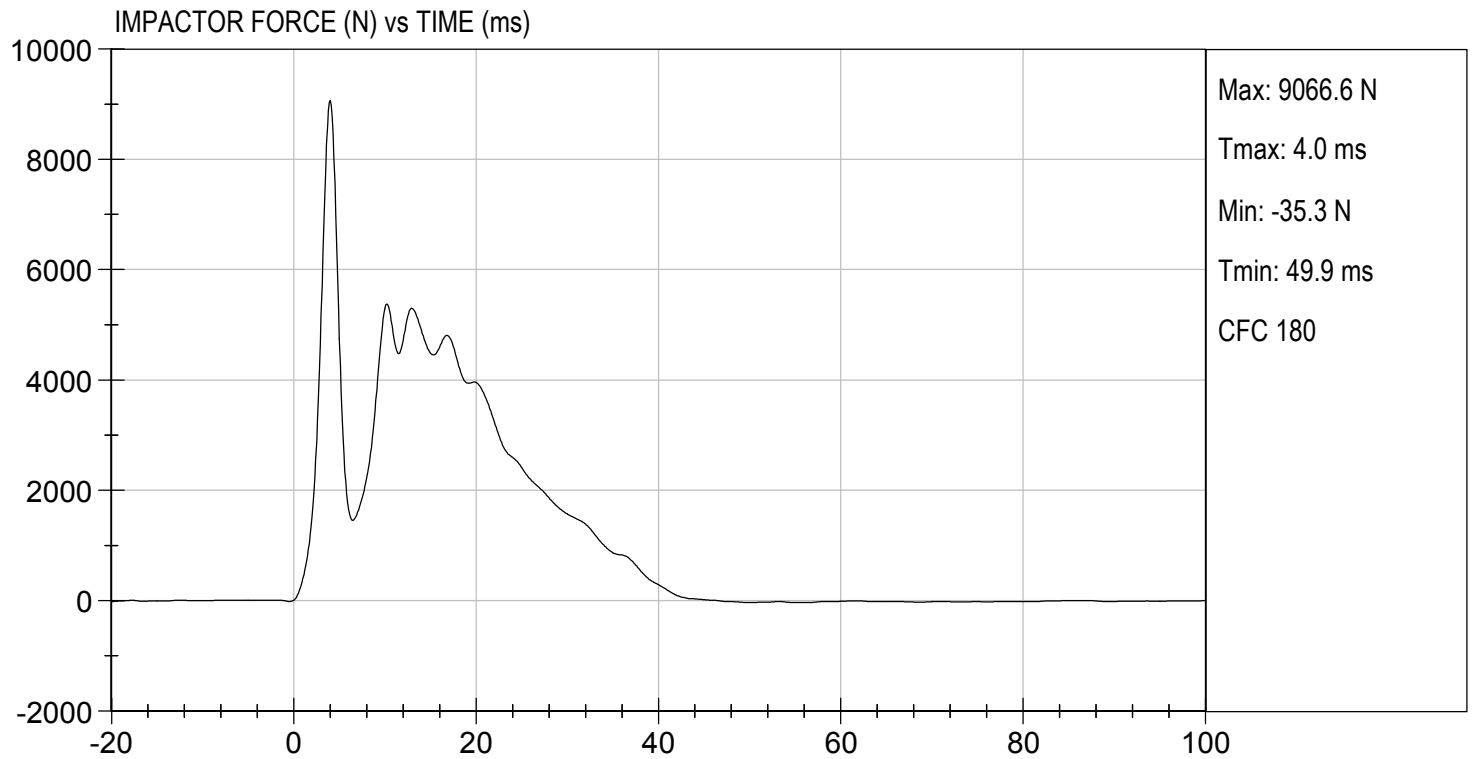
  
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Laboratory Technician09/25/2019  
\_\_\_\_\_  
Test Date  
\_\_\_\_\_  
Approved By





TEST DESC: THORAX IMPACT  
VELOCITY: 18.12 ft/s, 5.52 m/s

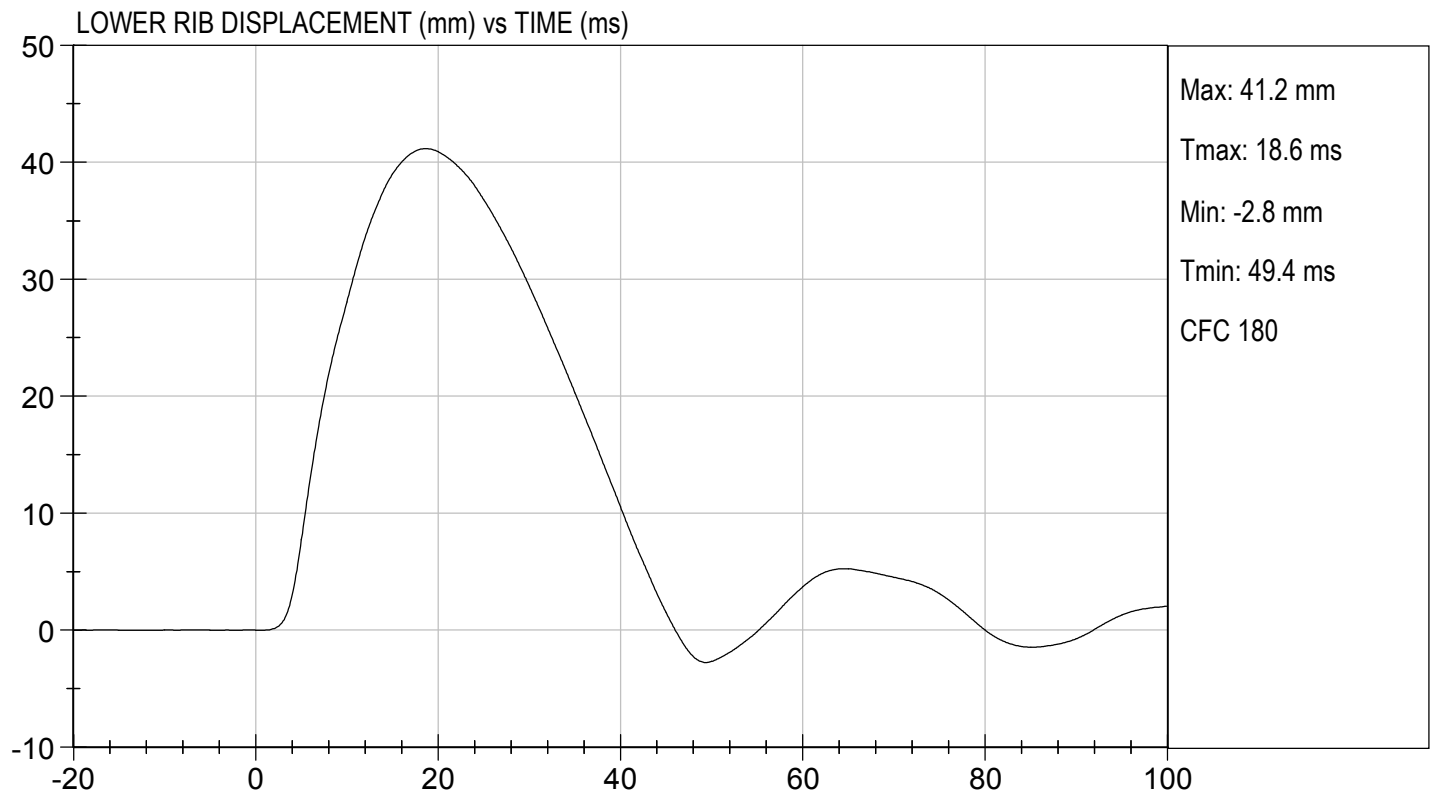
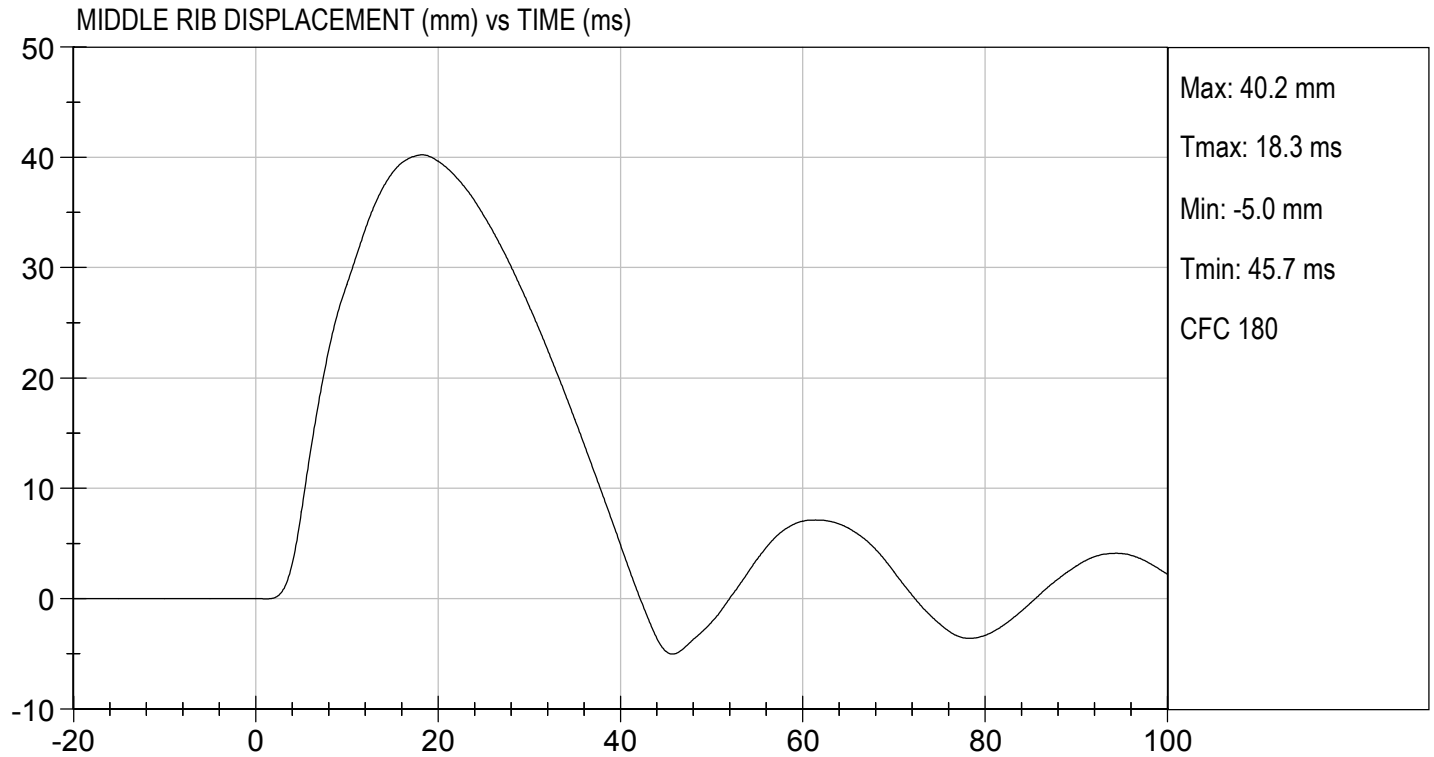
TEST DATE: 09/25/2019  
TEST #: D193020





TEST DESC: THORAX IMPACT  
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 09/25/2019  
TEST #: D193020



**CALIBRATION TEST RESULTS**

**POST-TEST**

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



**ES-2re External Measurements**  
**SN: 032**

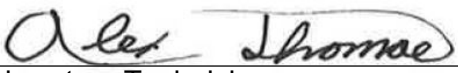
| <b>No.</b> | <b>Name</b>                                    | <b>Spec. (mm)</b> | <b>Result</b> | <b>Pass/Fail</b> |
|------------|------------------------------------------------|-------------------|---------------|------------------|
| <b>1</b>   | Sitting Height                                 | 900 - 918         | 915           | Pass             |
| <b>2</b>   | Seat to Shoulder Joint                         | 558 - 572         | 568           | Pass             |
| <b>3</b>   | Seat to Lower Face of Thoracic Spine Box       | 346 - 356         | 355           | Pass             |
| <b>4</b>   | Seat to Hip Joint (center of bolt)             | 97 - 103          | 98            | Pass             |
| <b>5</b>   | Sole to Seat, Sitting                          | 333 - 451         | 440           | Pass             |
| <b>6</b>   | Head Width                                     | 152 - 158         | 157           | Pass             |
| <b>7</b>   | Shoulder/Arm Width                             | 461 - 479         | 464           | Pass             |
| <b>8</b>   | Thorax Width                                   | 322 - 332         | 323           | Pass             |
| <b>9</b>   | Abdomen Width                                  | 273 - 287         | 281           | Pass             |
| <b>10</b>  | Pelvis Lap Width                               | 359 - 373         | 370           | Pass             |
| <b>11</b>  | Head Depth                                     | 196 - 206         | 203           | Pass             |
| <b>12</b>  | Thorax Depth                                   | 262 - 272         | 264           | Pass             |
| <b>13</b>  | Abdomen Depth                                  | 194 - 204         | 196           | Pass             |
| <b>14</b>  | Pelvis Depth                                   | 235 - 245         | 236           | Pass             |
| <b>15</b>  | Back of Buttocks to Hip Joint (center of bolt) | 150 - 160         | 151           | Pass             |
| <b>16</b>  | Back of Buttocks to Front Knee                 | 597 - 615         | 607           | Pass             |

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**ES-2re DUMMY**

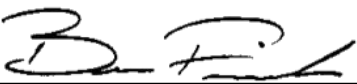
**ATD Serial No:** F032

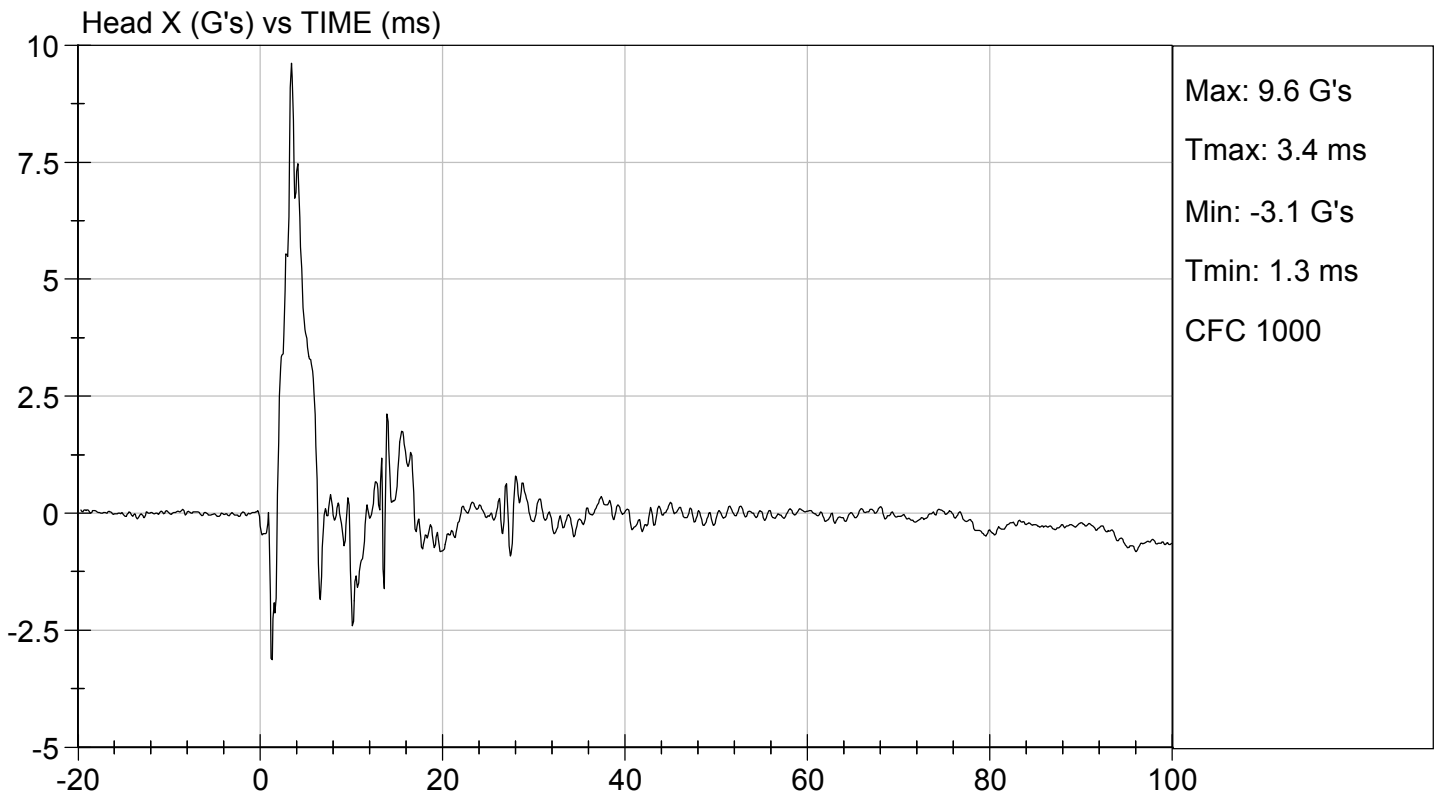
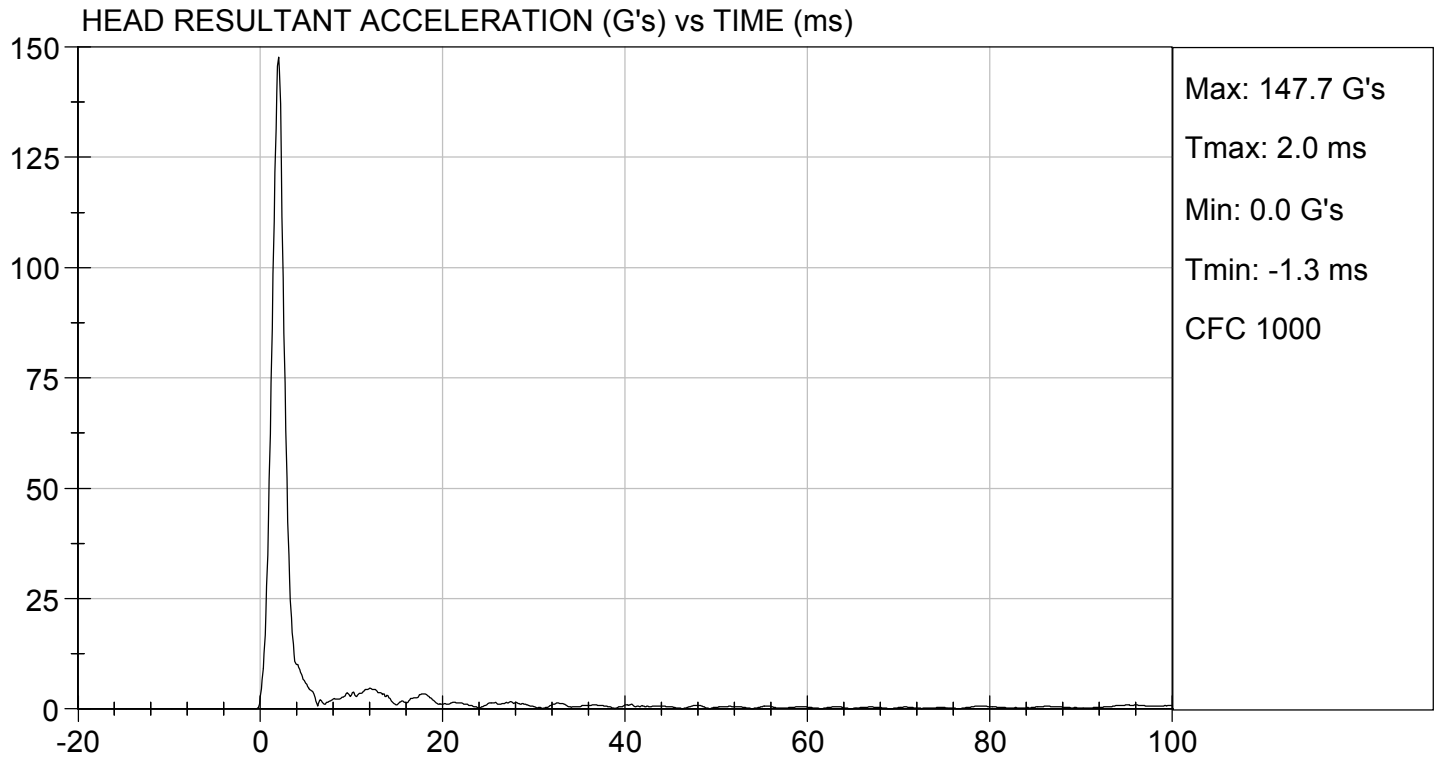
**Test ID:** D193271

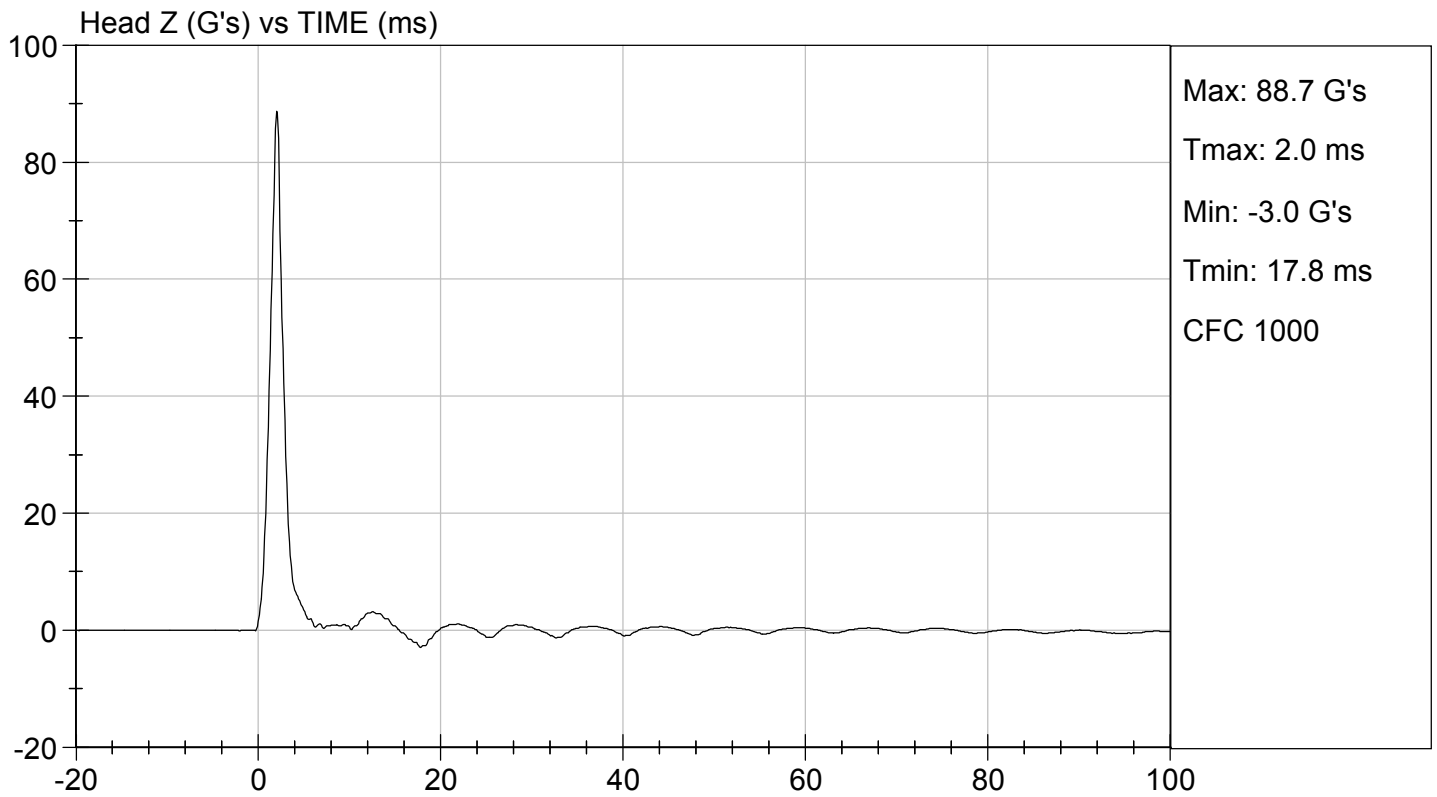
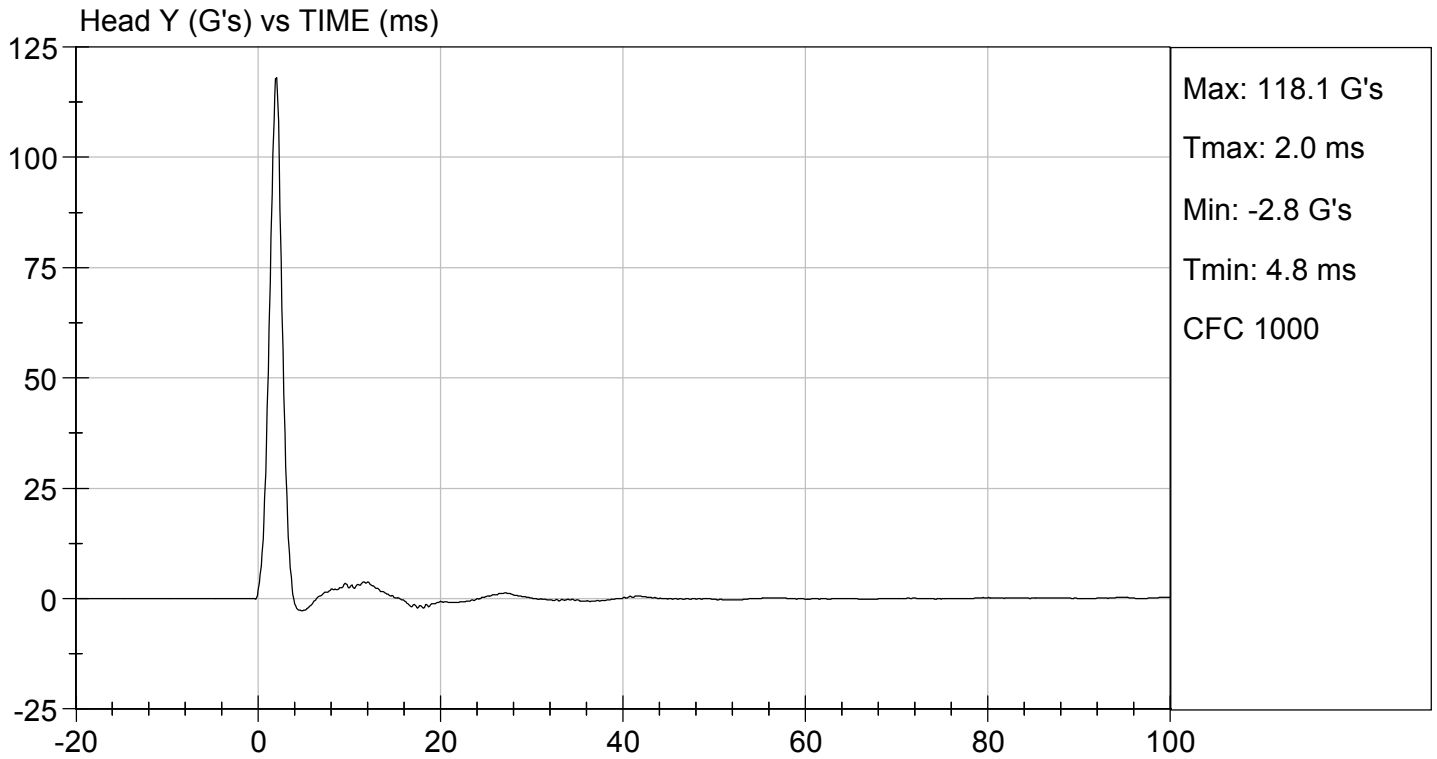
| Tested Parameter               | Units | Specification      | Result               | Pass/Fail |
|--------------------------------|-------|--------------------|----------------------|-----------|
| Laboratory Temperature         | deg C | 18.9 to 25.6       | 20.9                 | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70           | 43                   | Pass      |
| Peak Resultant Acceleration    | G's   | 125 to 155         | 148                  | Pass      |
| Peak Longitudinal Acceleration | G's   | <= +/- 15.0        | 9.6                  | Pass      |
| Unimodal                       | N/A   | Yes                | Yes                  | Pass      |
| Oscillations                   | N/A   | within 15% of peak | Yes                  | Pass      |
|                                |       |                    | Overall Test Results | Pass      |

  
Laboratory Technician

10/21/2019  
Test Date

  
Approved By







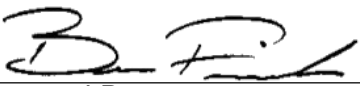
**MGA RESEARCH CORPORATION**  
**NECK PENDULUM TEST**  
**ES-2re DUMMY**

**ATD Serial No:** F032

**Test I.D:** D193272

| Tested Parameter                     |       | Units | Specification   | Result | Pass/Fail |
|--------------------------------------|-------|-------|-----------------|--------|-----------|
| Laboratory Temperature               |       | deg C | 20.6 to 22.2    | 20.9   | Pass      |
| Laboratory Relative Humidity         |       | %     | 10 to 70        | 43     | Pass      |
| Pendulum Speed                       |       | m/s   | 3.30 to 3.50    | 3.48   | Pass      |
| Pendulum Velocity                    | 1 ms  | m/s   | -0.05 to 0.00   | 0.00   | Pass      |
|                                      | 3 ms  | m/s   | -0.25 to -0.375 | -0.35  | Pass      |
|                                      | 14 ms | m/s   | -3.20 to -3.70  | -3.58  | Pass      |
|                                      | 17 ms | m/s   | >= -3.70        | -3.43  | Pass      |
| Maximum Flexion Angle                |       | deg   | 49.0 to 59.0    | 49.2   | Pass      |
| Time of Maximum Flexion Angle        |       | ms    | 54.0 to 66.0    | 56.4   | Pass      |
| Head Rotation Decay Time to 0 Degree |       | ms    | 53.0 to 88.0    | 58.0   | Pass      |
| Overall Results                      |       |       |                 |        | Pass      |

  
 Laboratory Technician

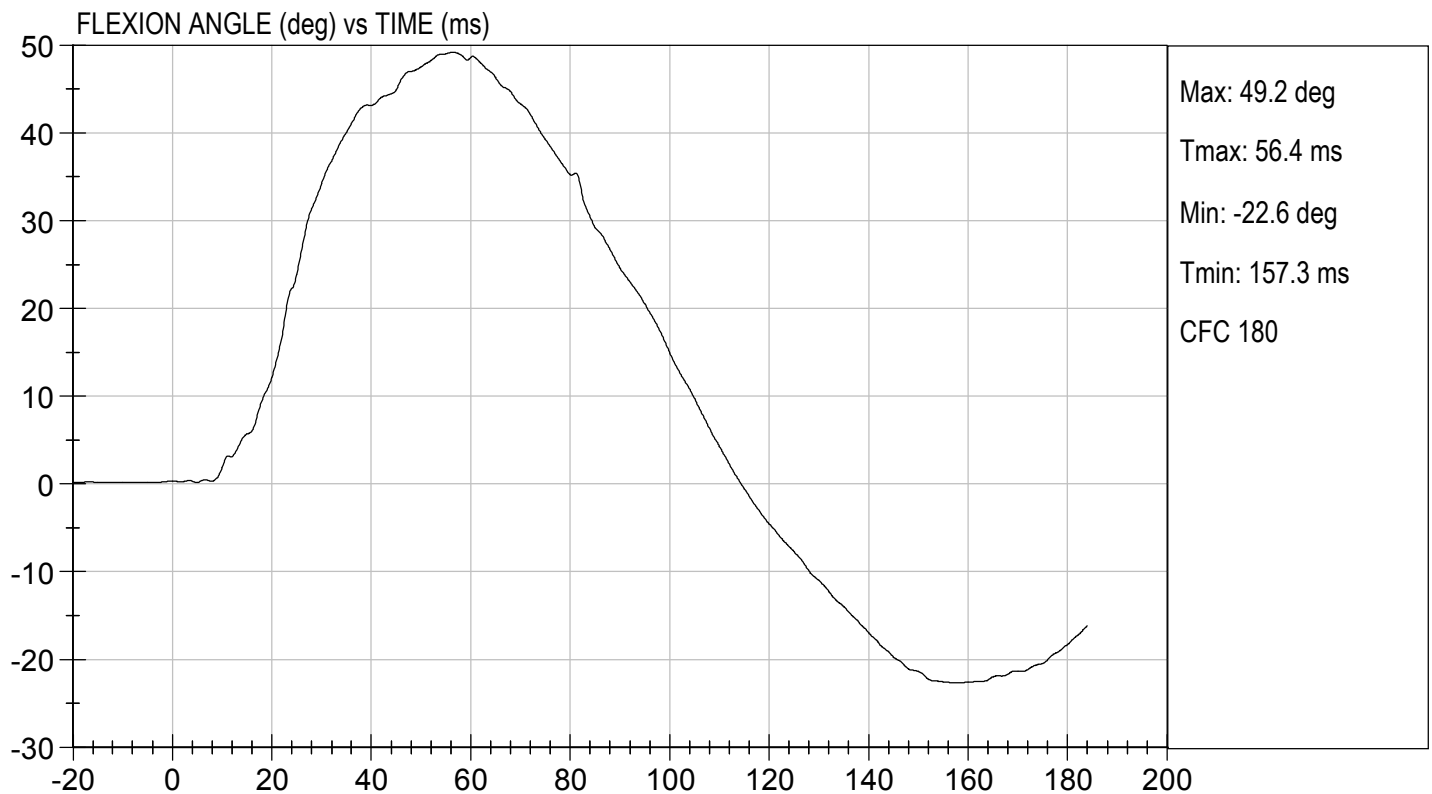
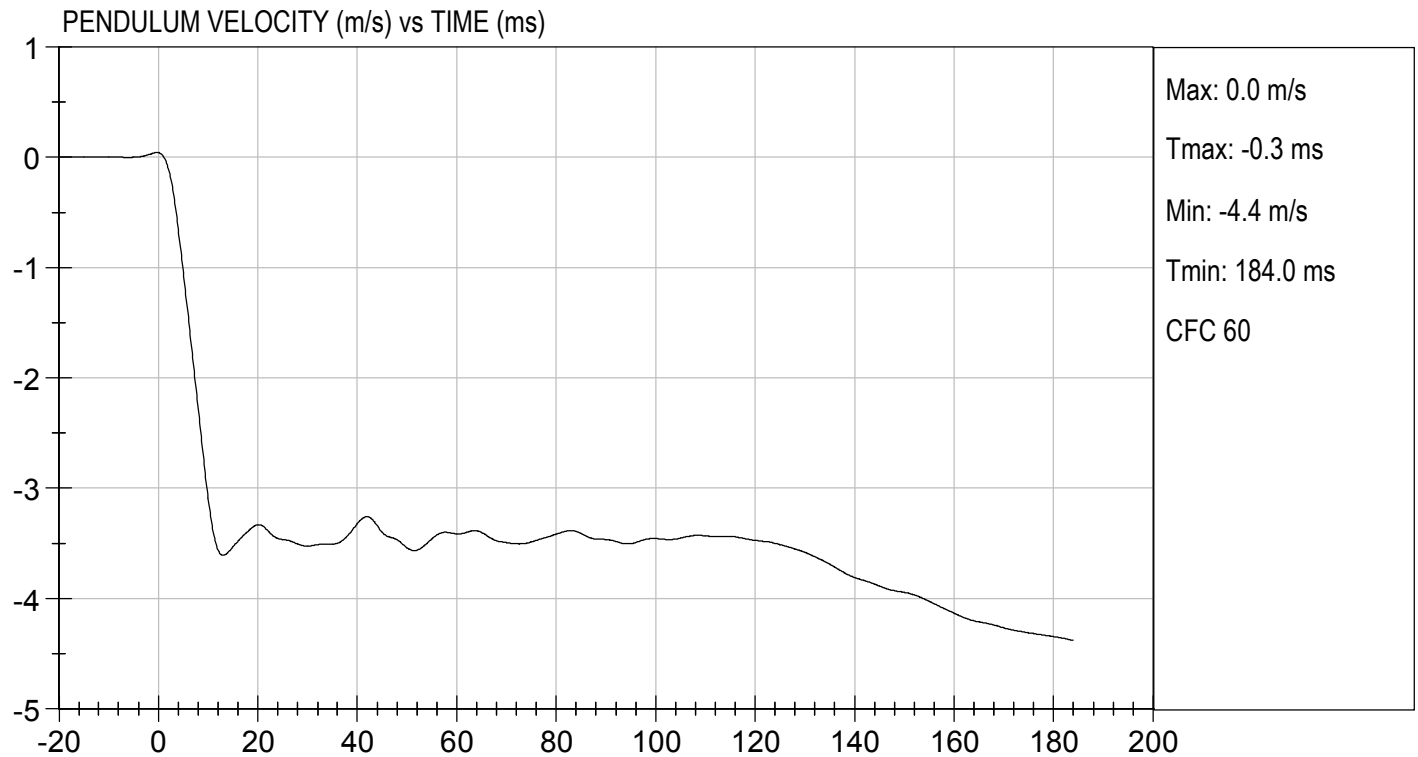
  
 Approved By

10/21/2019  
 Test Date



TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

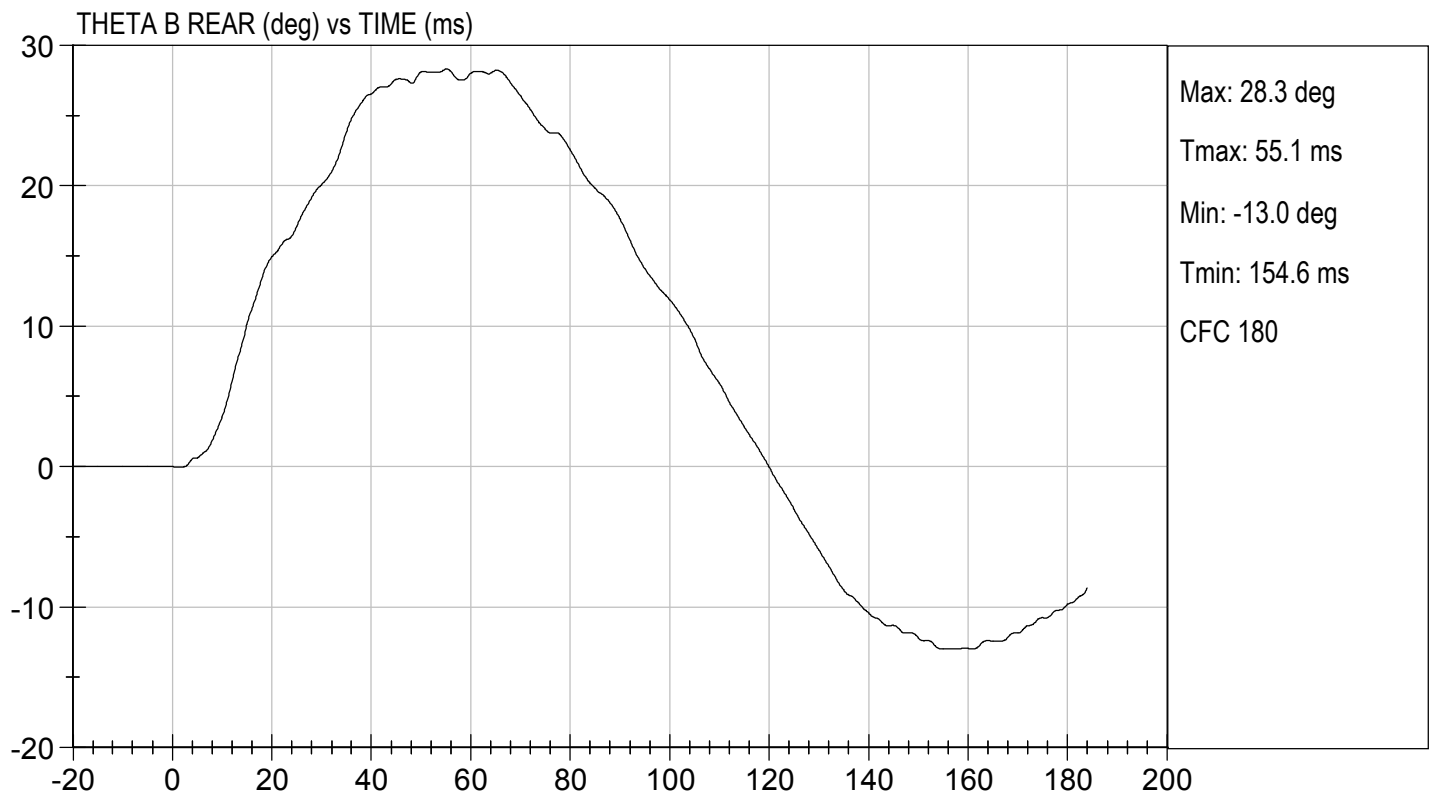
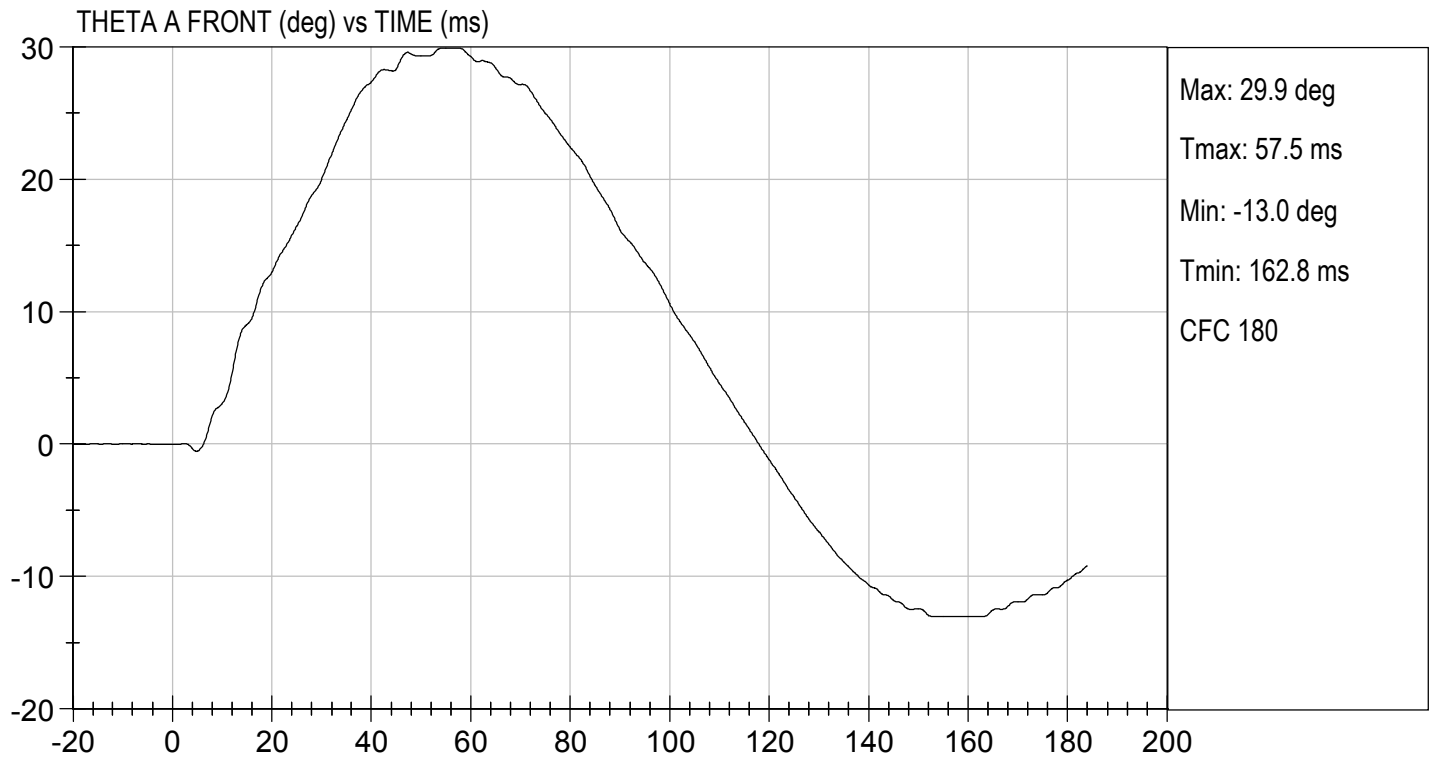
TEST DATE: 10/21/2019  
TEST #: D193272





TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

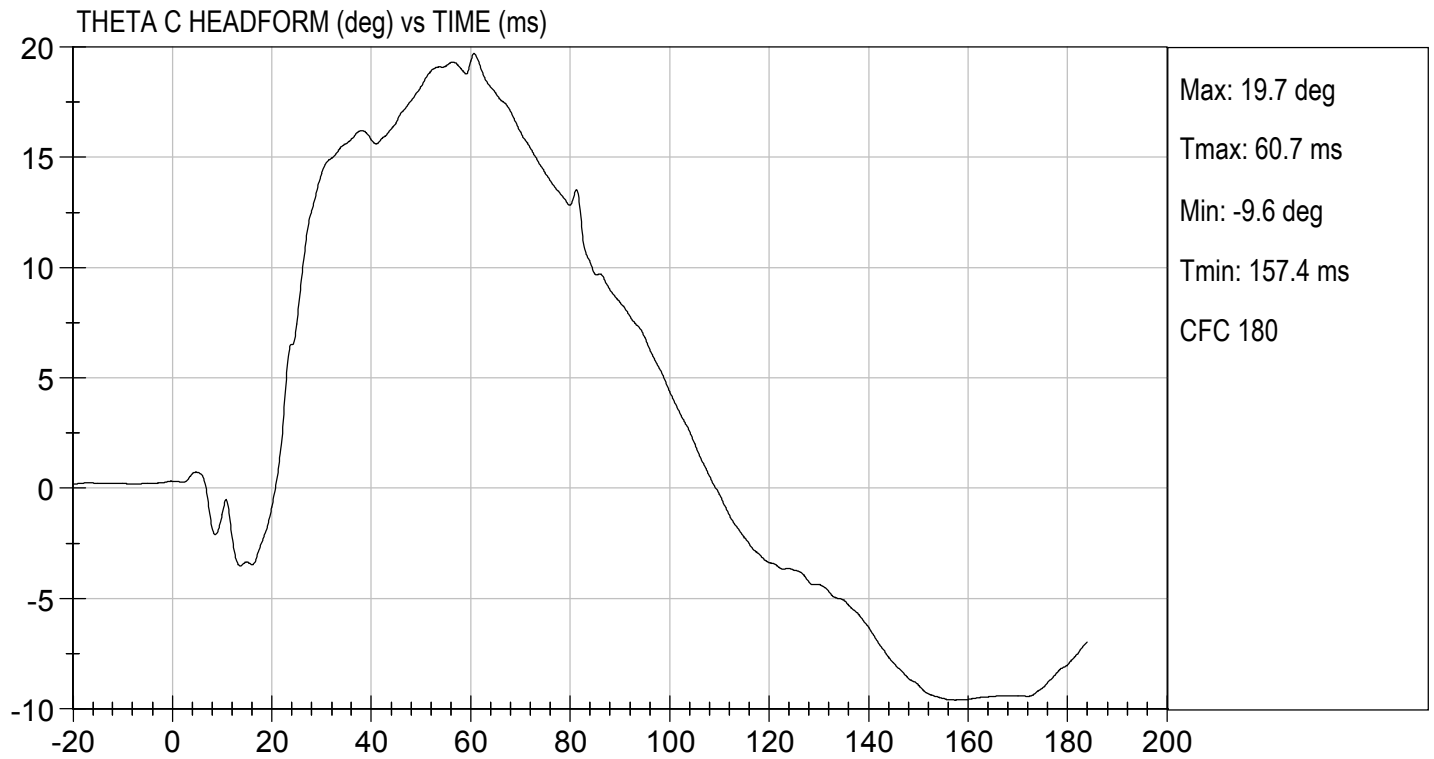
TEST DATE: 10/21/2019  
TEST #: D193272





TEST DESC: NECK BENDING  
VELOCITY: 11.42 ft/s, 3.48 m/s

TEST DATE: 10/21/2019  
TEST #: D193272



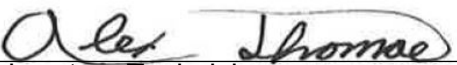


**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**ES-2re DUMMY**

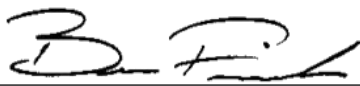
**ATD Serial No:** F032

**Test I.D:** D193273

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 38     | Pass      |
| Pendulum Speed               | m/s   | 4.20 to 4.40  | 4.2    | Pass      |
| Peak Impactor Acceleration   | G's   | 7.5 to 10.5   | 7.9    | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

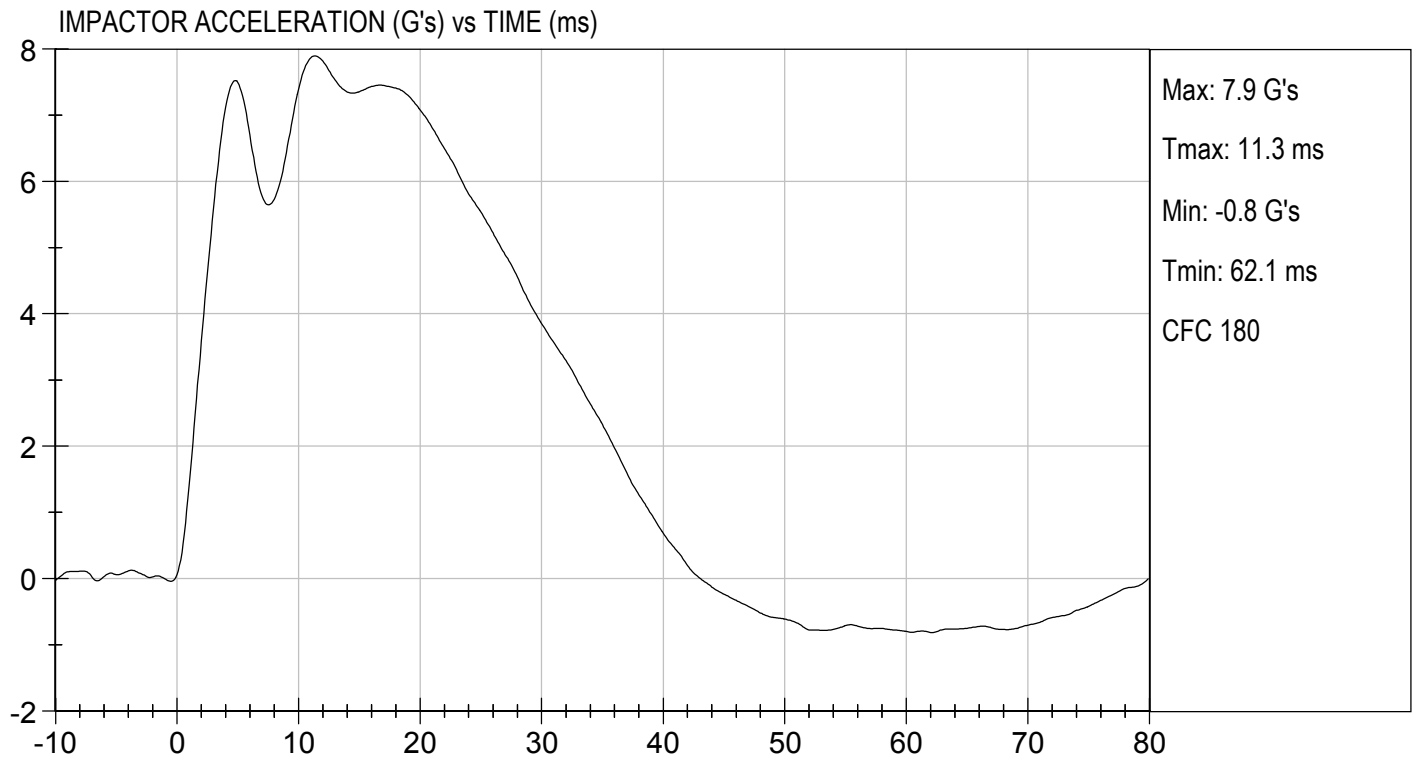
10/22/2019  
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 13.77 ft/s, 4.2 m/s

TEST DATE: 10/22/2019  
TEST #: D193273



**MGA RESEARCH CORPORATION**

**UPPER RIB TEST**

**ES-2re DUMMY**

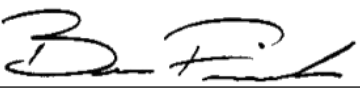
**ATD Serial No:** F032

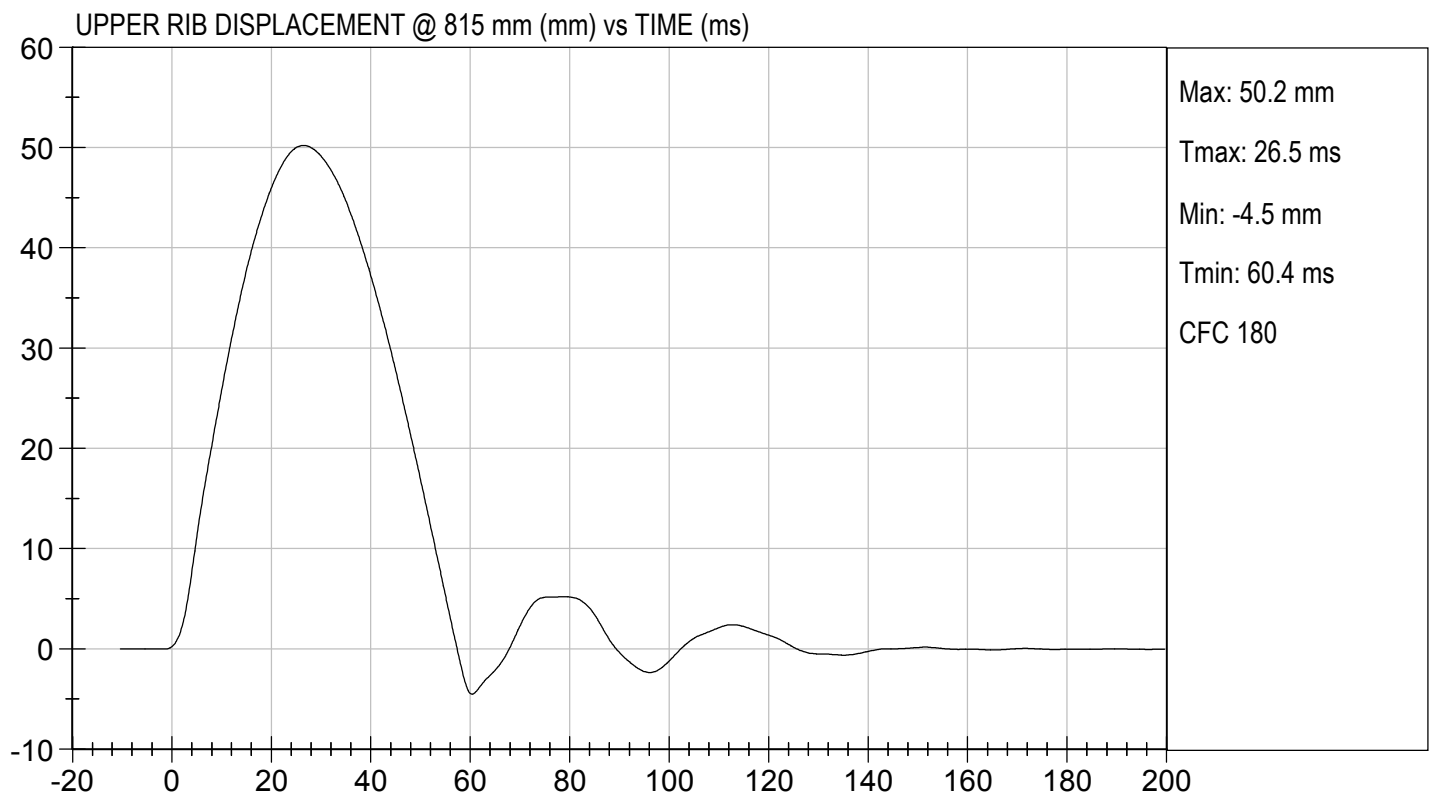
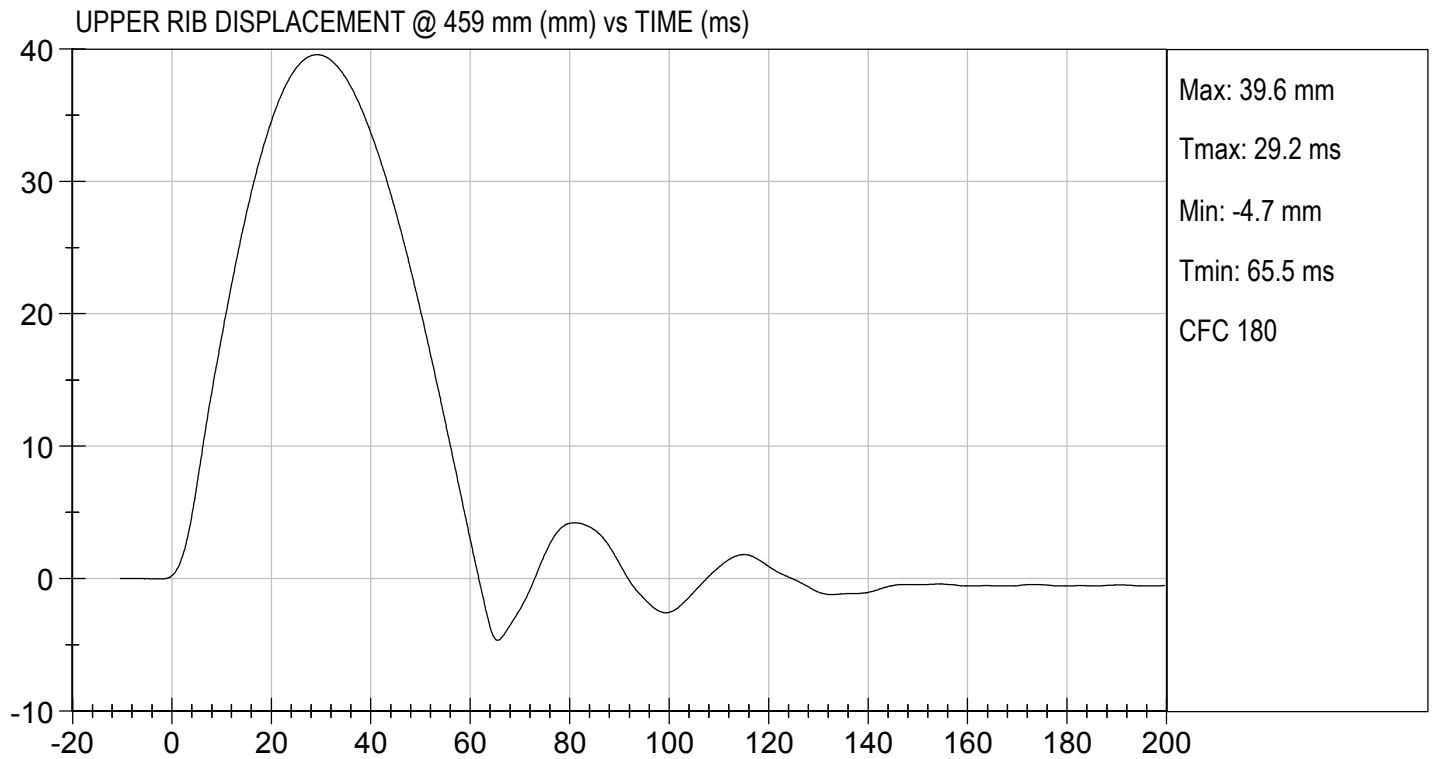
**Test I.D:** D193274

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 38     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 39.6   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 50.2   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019  
Test Date

  
Approved By





**MGA RESEARCH CORPORATION**

**MID RIB TEST**

**ES-2re DUMMY**

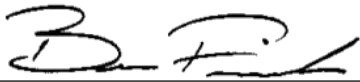
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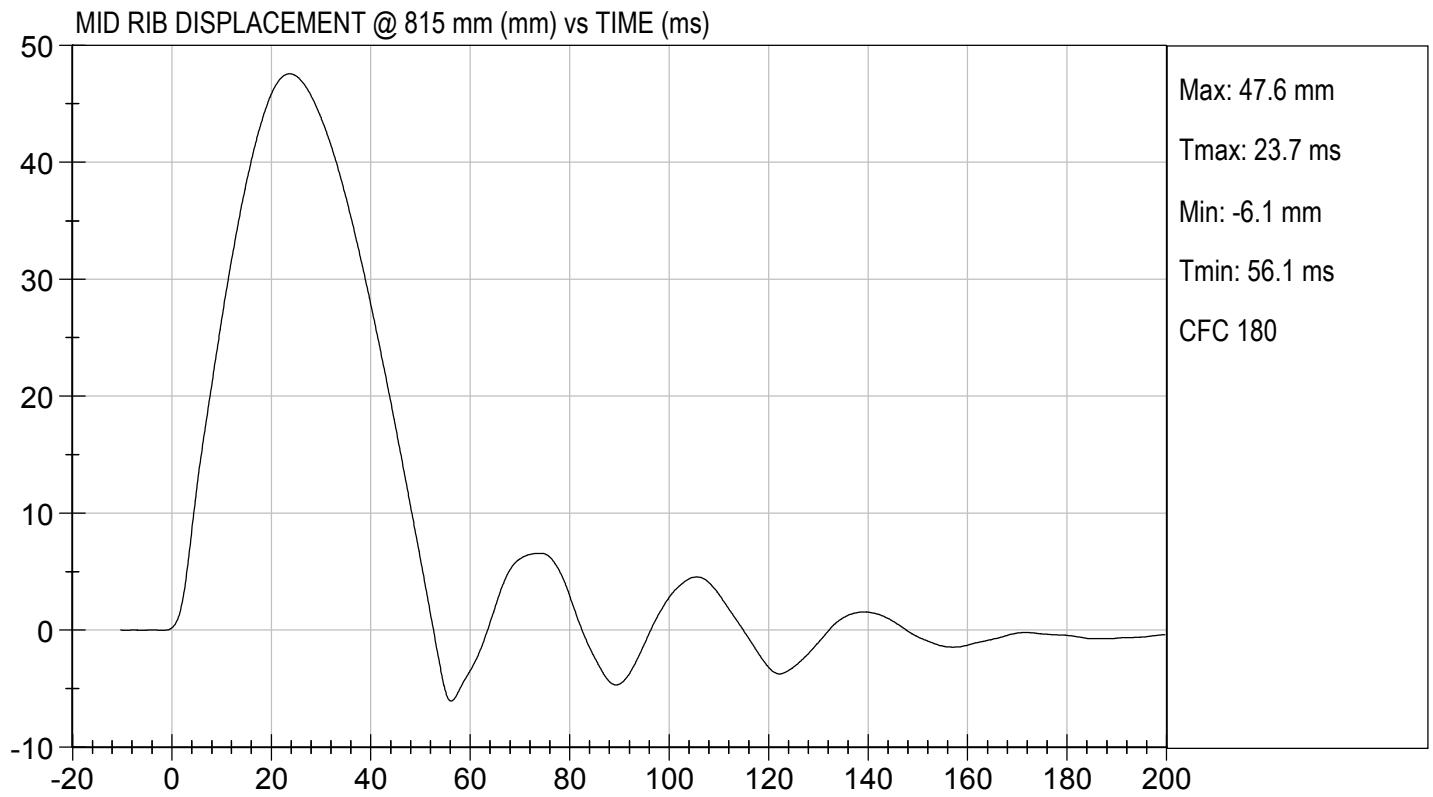
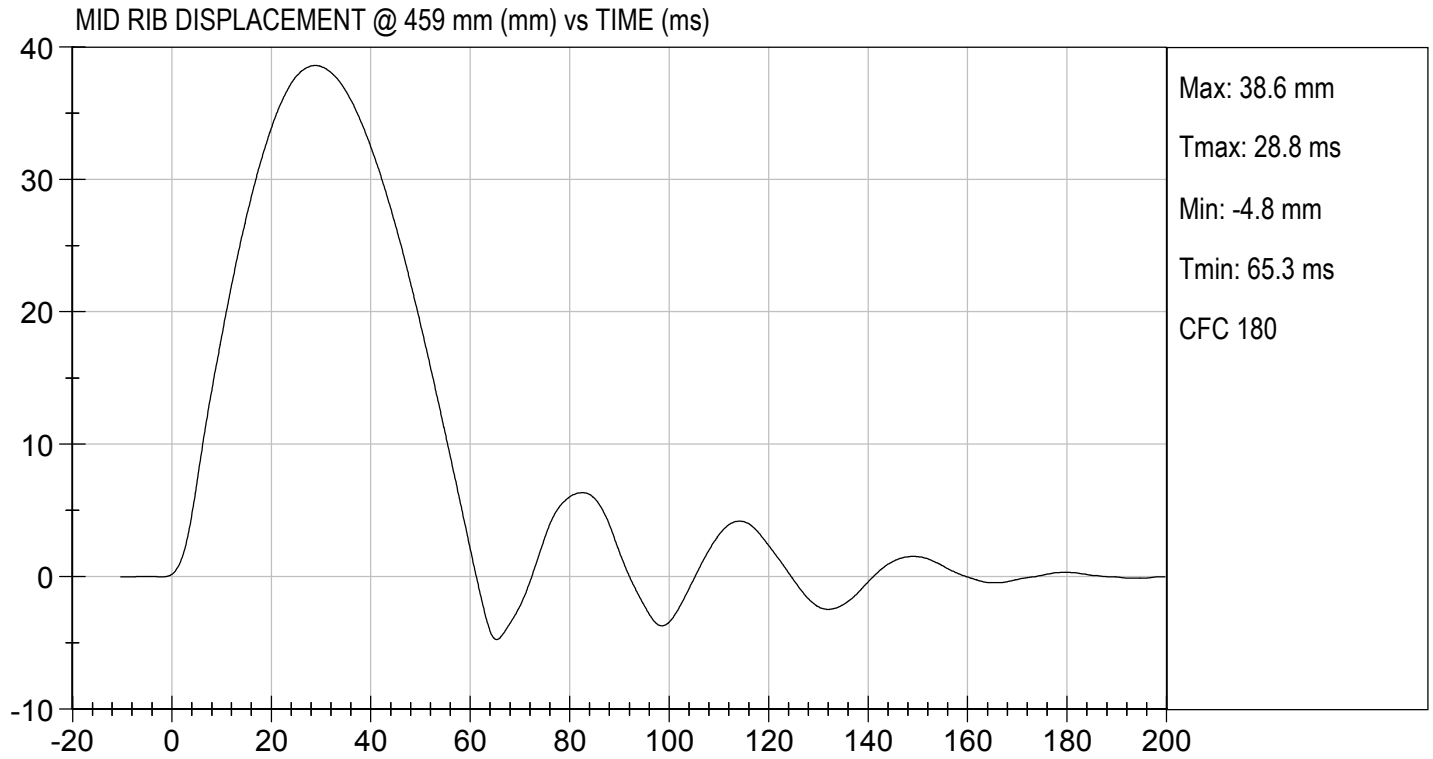
**Test I.D:** D193275

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 38     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 38.6   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 47.6   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019  
Test Date

  
Approved By



**MGA RESEARCH CORPORATION**

**LOWER RIB TEST**

**ES-2re DUMMY**

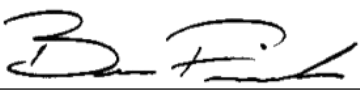
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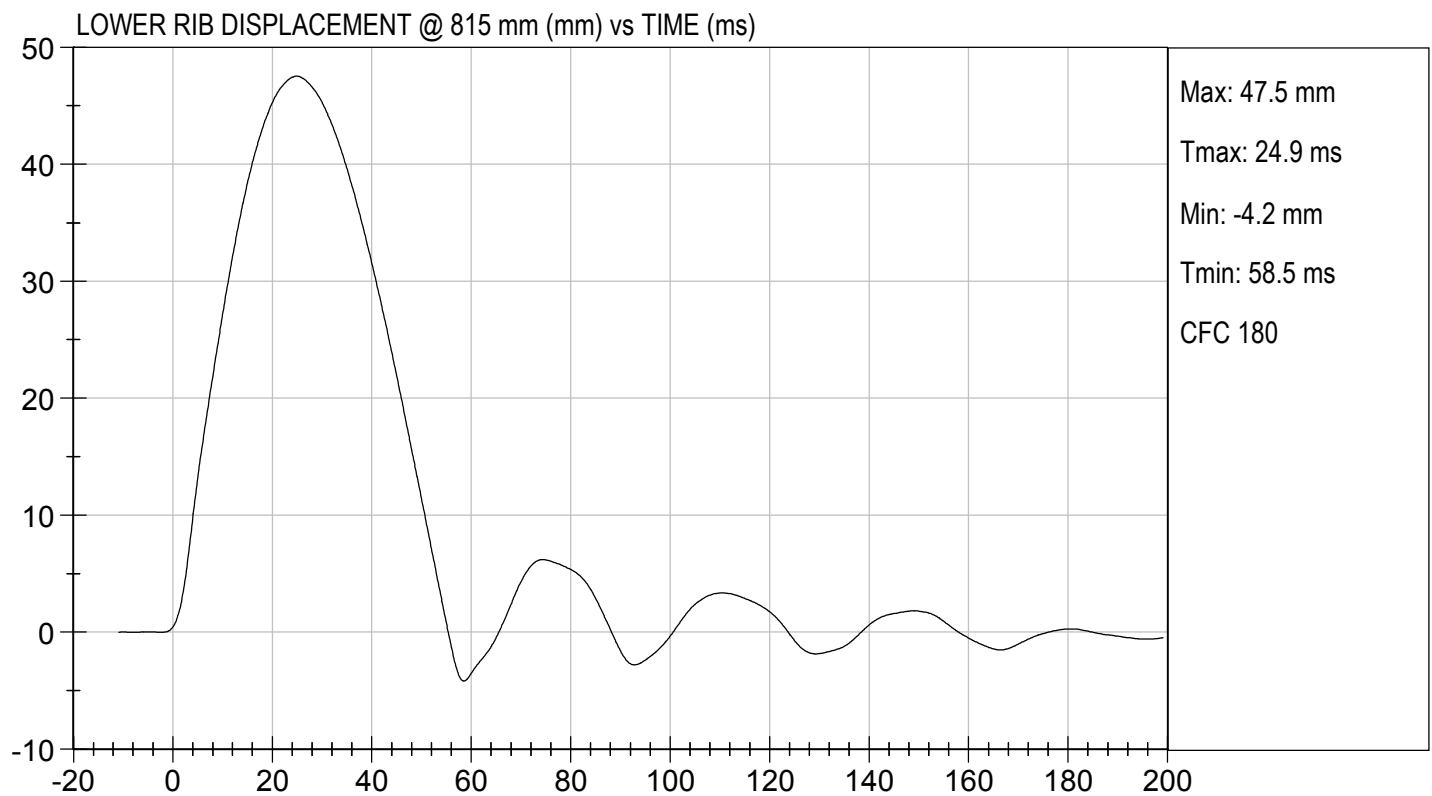
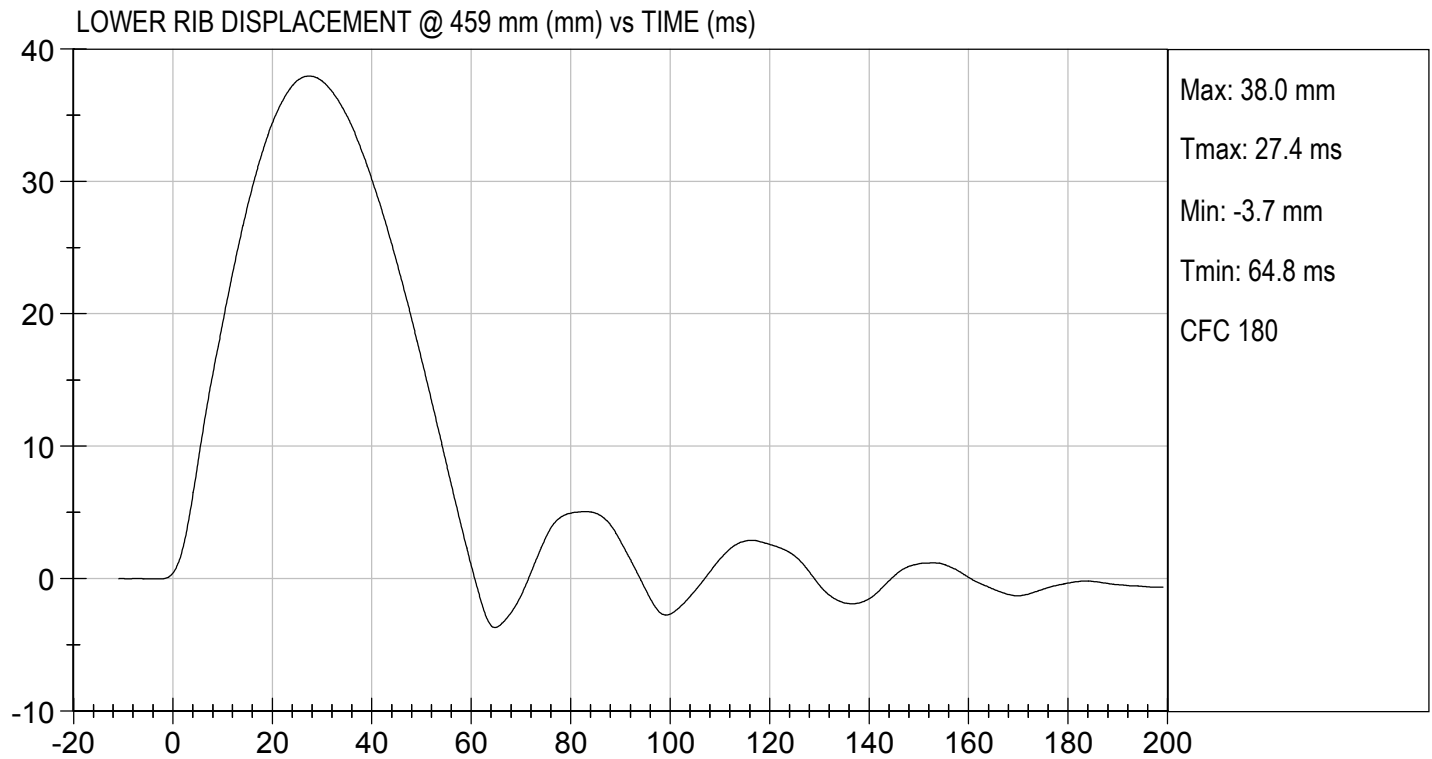
**Test I.D:** D193276

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 38     | Pass      |
| Displacement at 459 mm       | mm    | 36.0 to 40.0  | 38.0   | Pass      |
| Displacement at 815 mm       | mm    | 46.0 to 51.0  | 47.6   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019  
Test Date

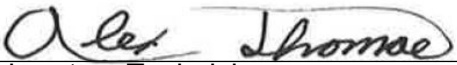
  
Approved By





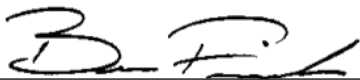
**MGA RESEARCH CORPORATION****ABDOMEN TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193277

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 38     | Pass      |
| Probe Speed                    | m/s   | 3.90 to 4.10  | 4.03   | Pass      |
| Maximum Impactor Force         | N     | 4000 to 4800  | 4275   | Pass      |
| Time of Maximum Impactor Force | ms    | 10.6 to 13.0  | 11.8   | Pass      |
| Maximum Total Abdomen Force    | N     | 2200 to 2700  | 2299   | Pass      |
| Time of Maximum Abdomen Force  | ms    | 10.0 to 12.3  | 11.8   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

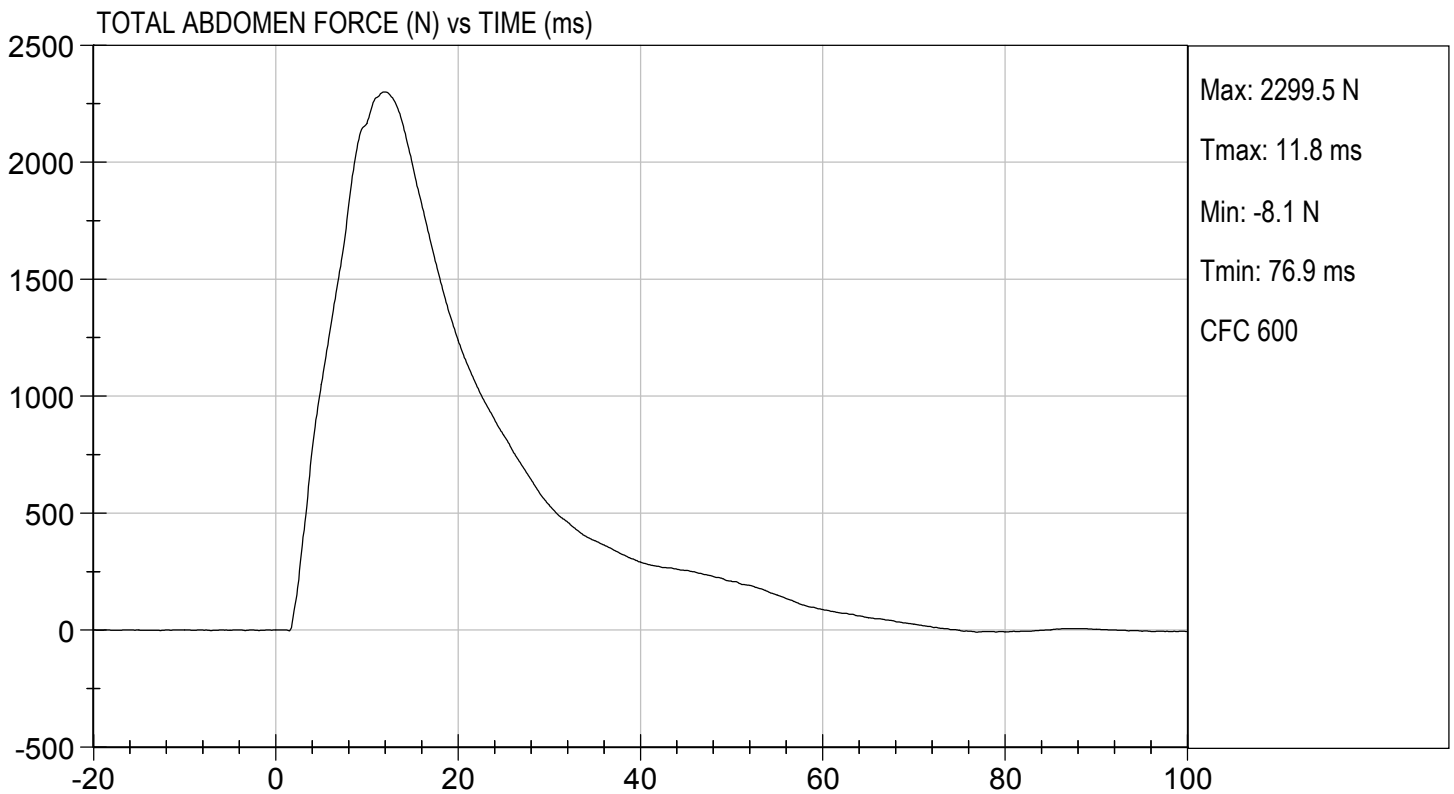
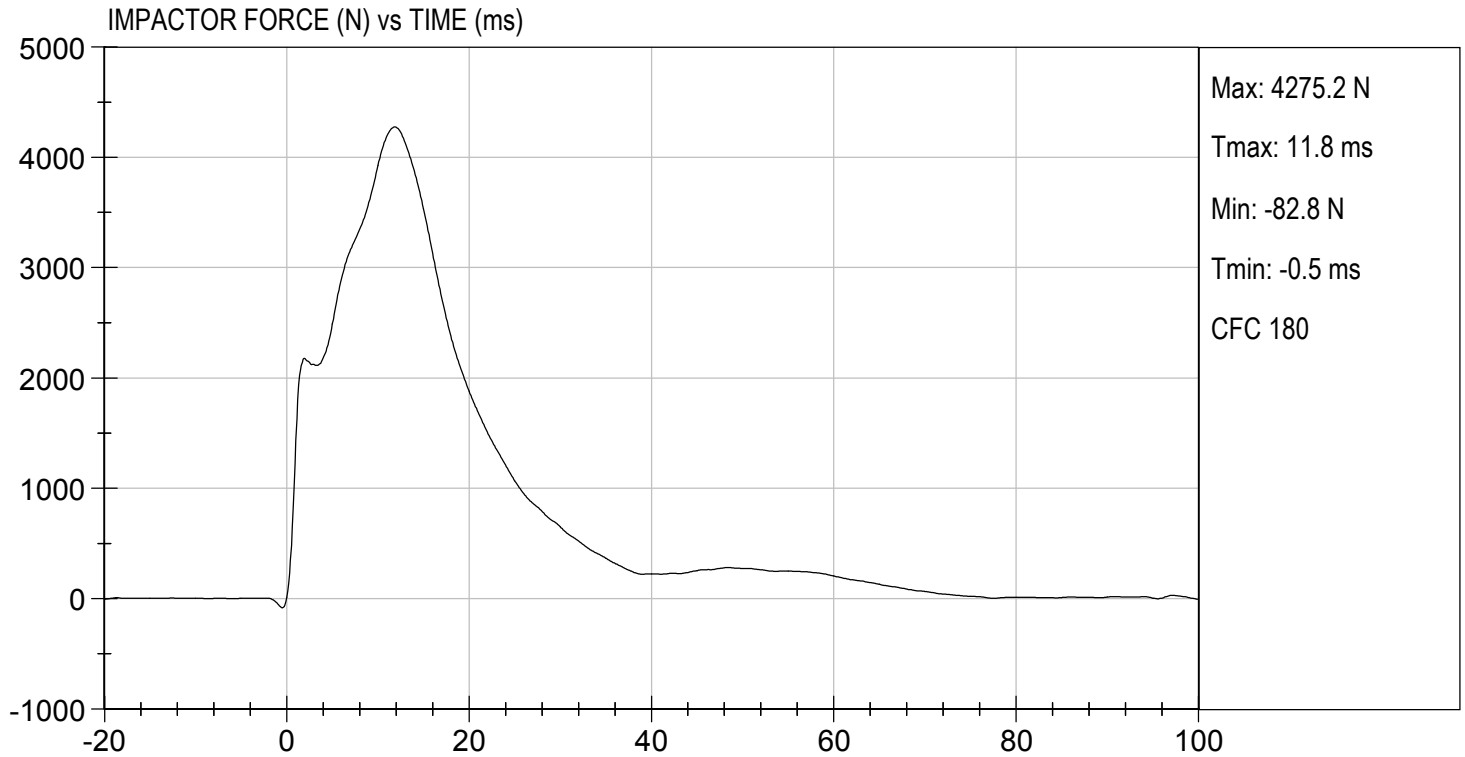
Test Date

  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

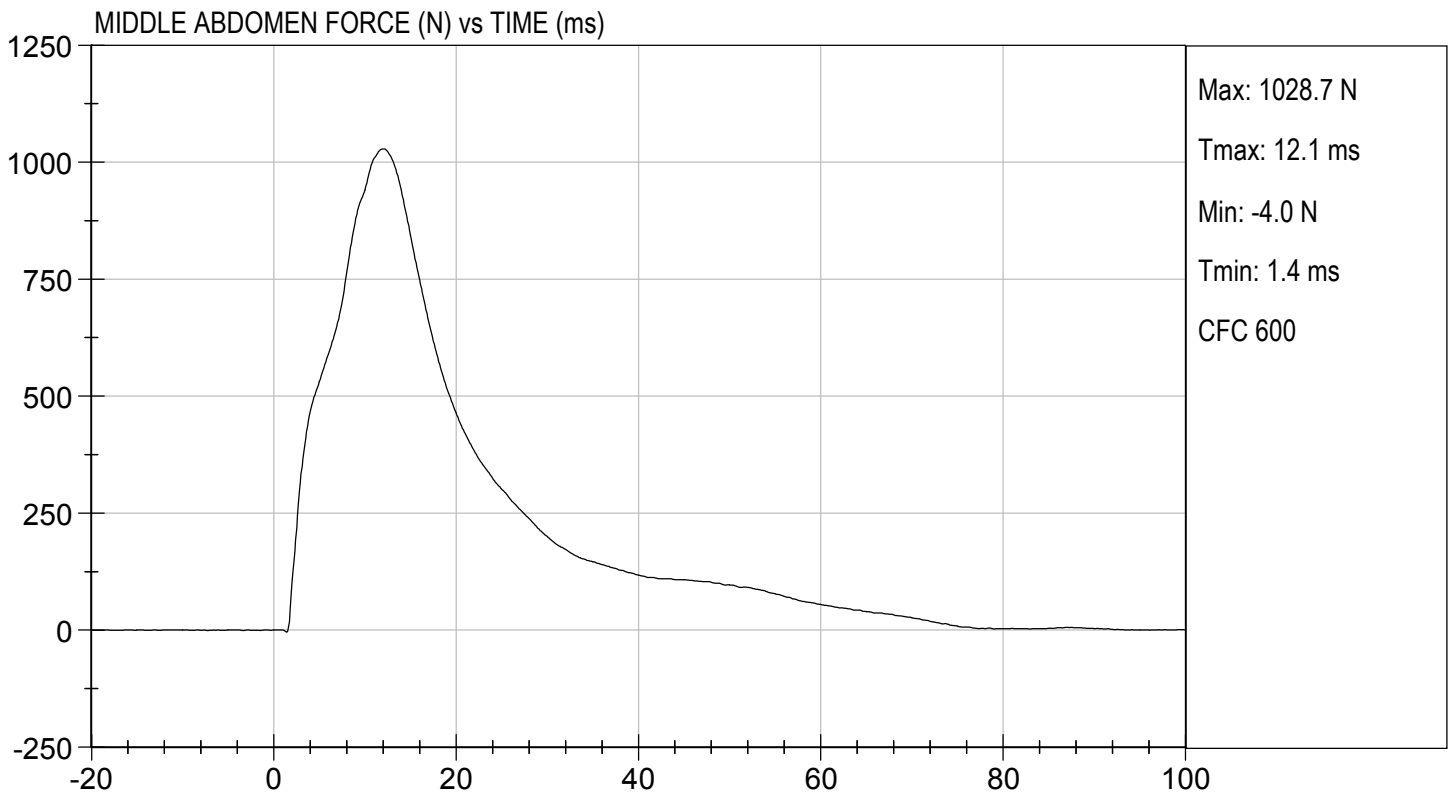
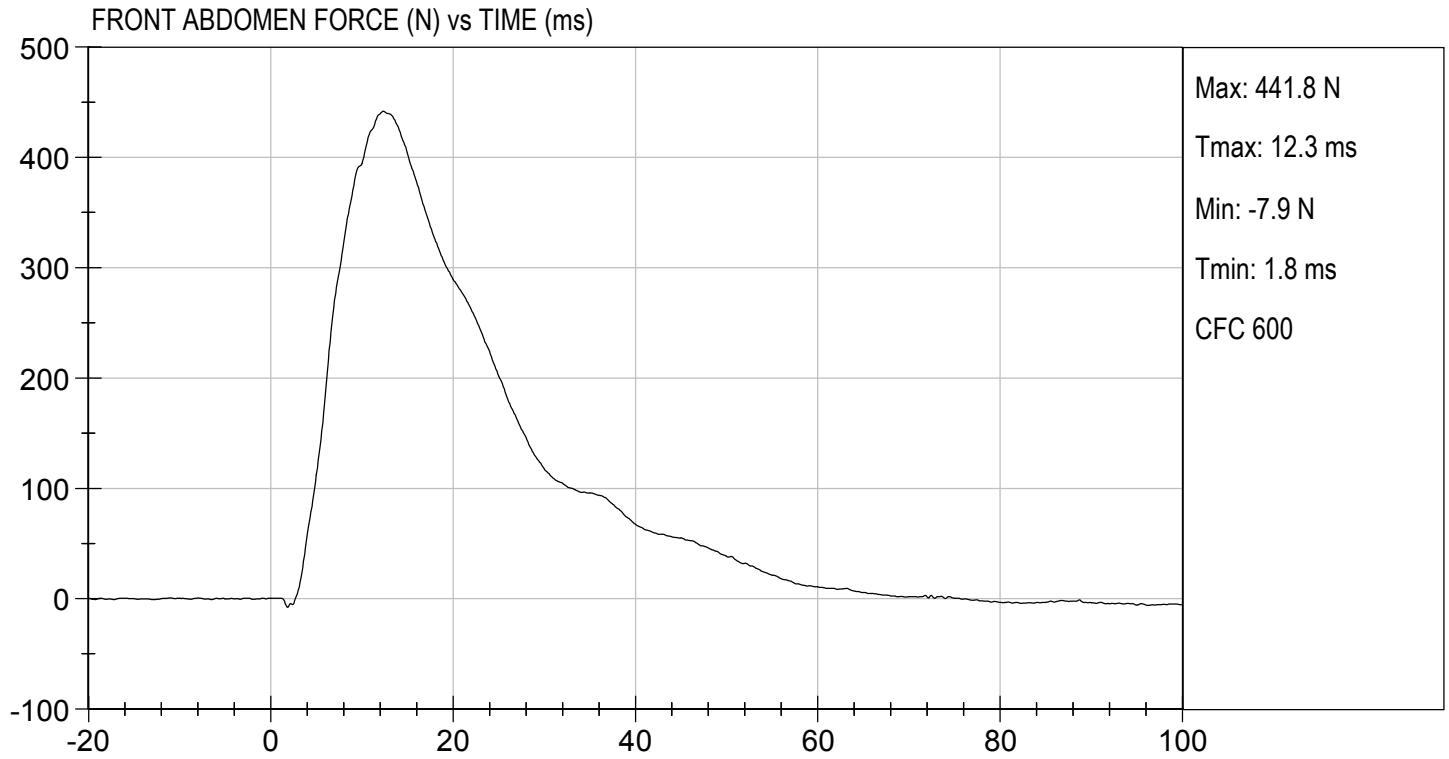
TEST DATE: 10/22/2019  
TEST #: D193277





TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

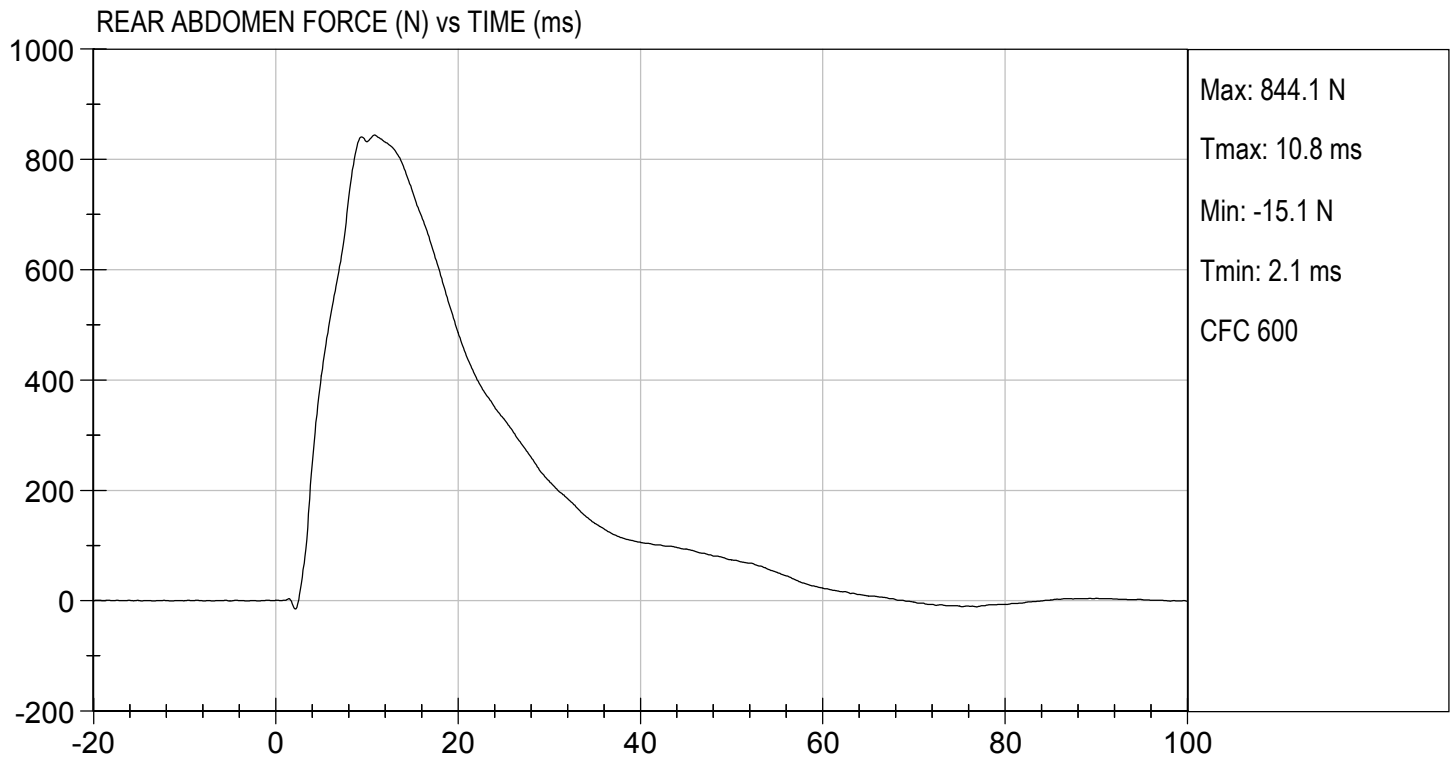
TEST DATE: 10/22/2019  
TEST #: D193277





TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.23 ft/s, 4.03 m/s

TEST DATE: 10/22/2019  
TEST #: D193277





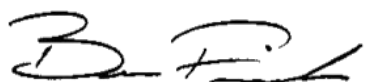
**MGA RESEARCH CORPORATION**  
**LUMBAR SPINE TEST**  
**ES-2re DUMMY**

**ATD Serial No:** F032

**Test I.D:** D193278

| Tested Parameter                            |        | Units | Specification   | Result | Pass/Fail |
|---------------------------------------------|--------|-------|-----------------|--------|-----------|
| Laboratory Temperature                      |        | deg C | 20.6 to 22.2    | 20.9   | Pass      |
| Laboratory Relative Humidity                |        | %     | 10 to 70        | 43     | Pass      |
| Pendulum Speed                              |        | m/s   | 5.95 to 6.15    | 6.05   | Pass      |
| Pendulum Velocity                           | 1 ms   | m/s   | -0.05 to 0.00   | -0.01  | Pass      |
|                                             | 3.7 ms | m/s   | -0.425 to -0.24 | -0.417 | Pass      |
|                                             | 27 ms  | m/s   | -6.50 to -5.80  | -6.03  | Pass      |
|                                             | 30 ms  | m/s   | >= -6.50        | -5.84  | Pass      |
| Maximum Flexion Angle                       |        | deg   | 45.0 to 55.0    | 46.1   | Pass      |
| Time of Maximum Flexion Angle               |        | ms    | 39.0 to 53.0    | 43.5   | Pass      |
| Headform Rotation Decay to Initial Position |        | ms    | 37 to 57        | 38     | Pass      |
| Overall Results                             |        |       |                 |        | Pass      |

  
Laboratory Technician

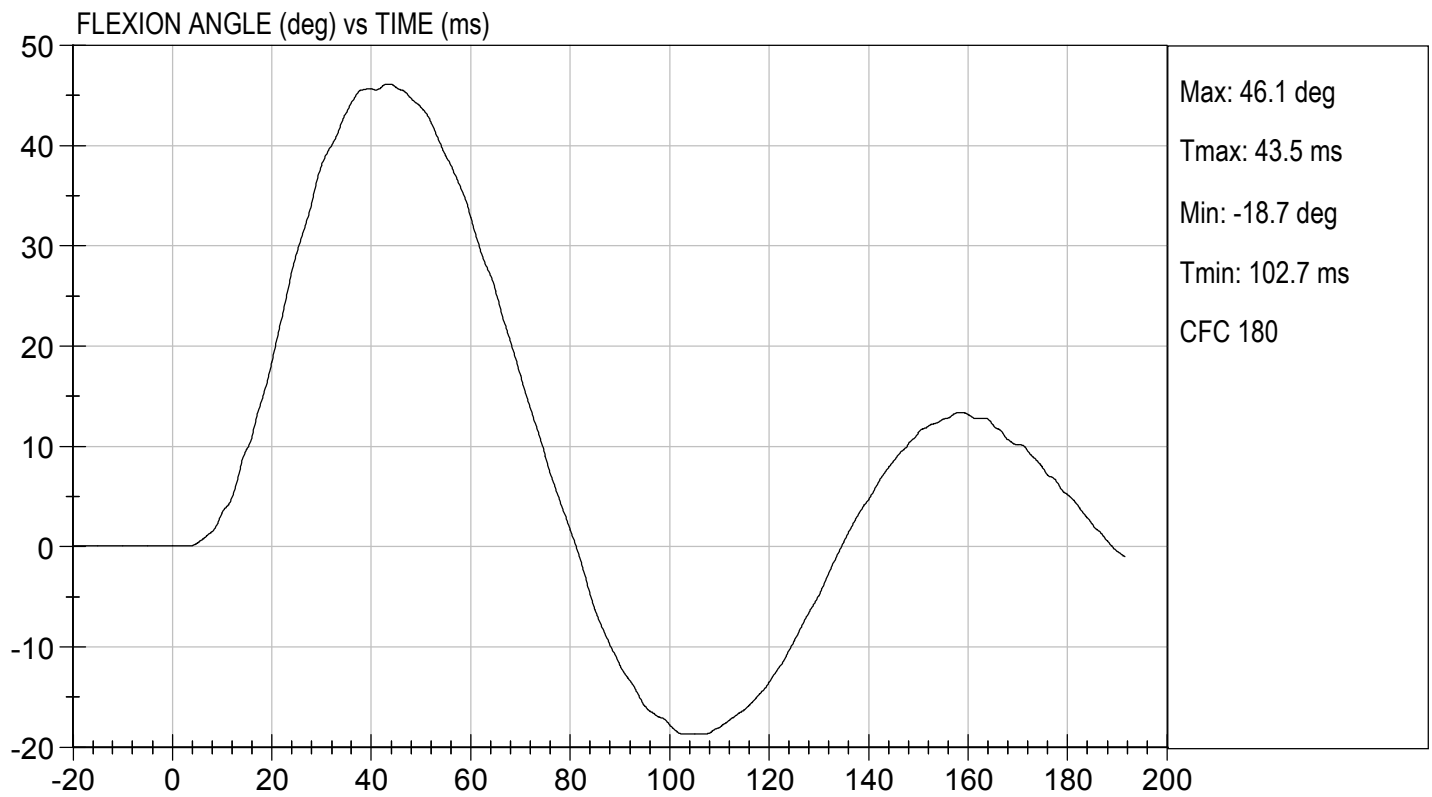
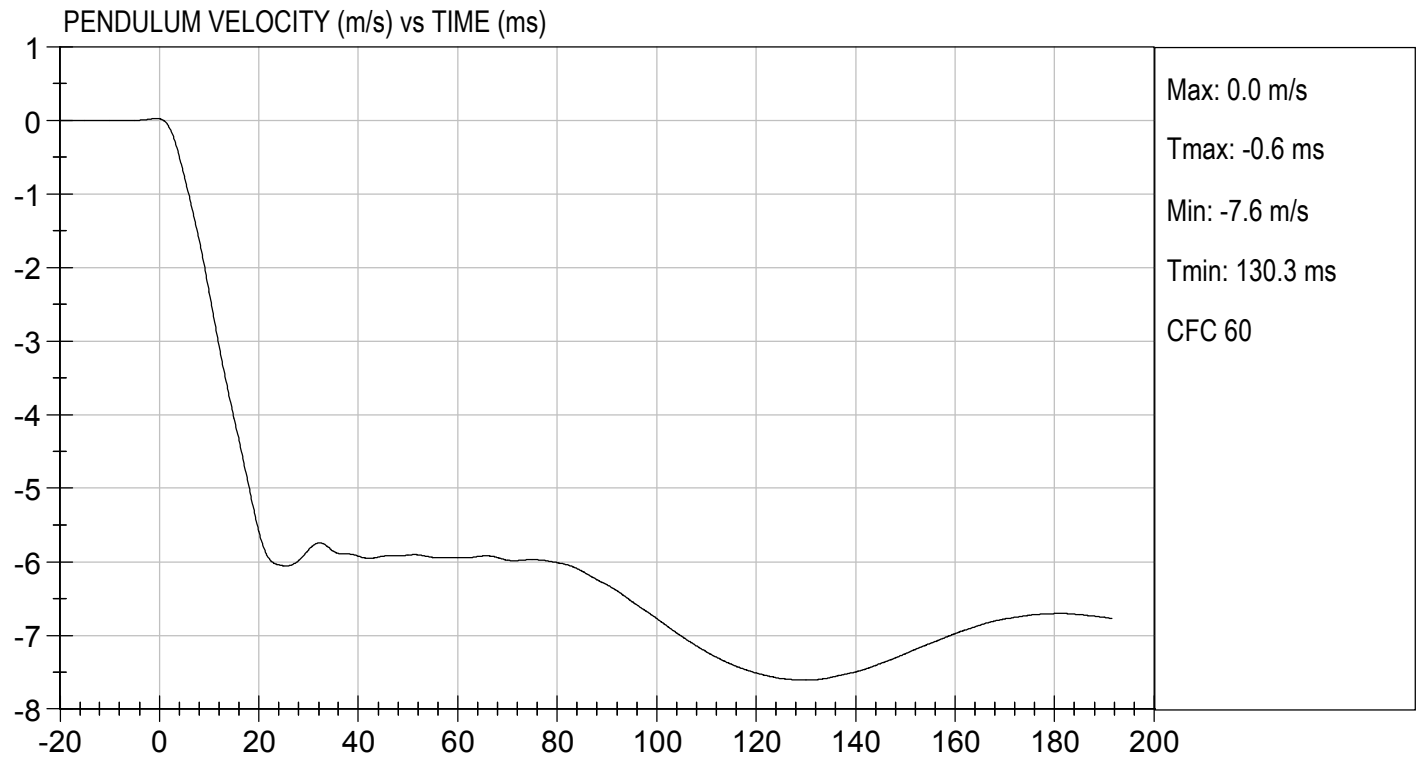
  
Approved By

10/21/2019  
Test Date



TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

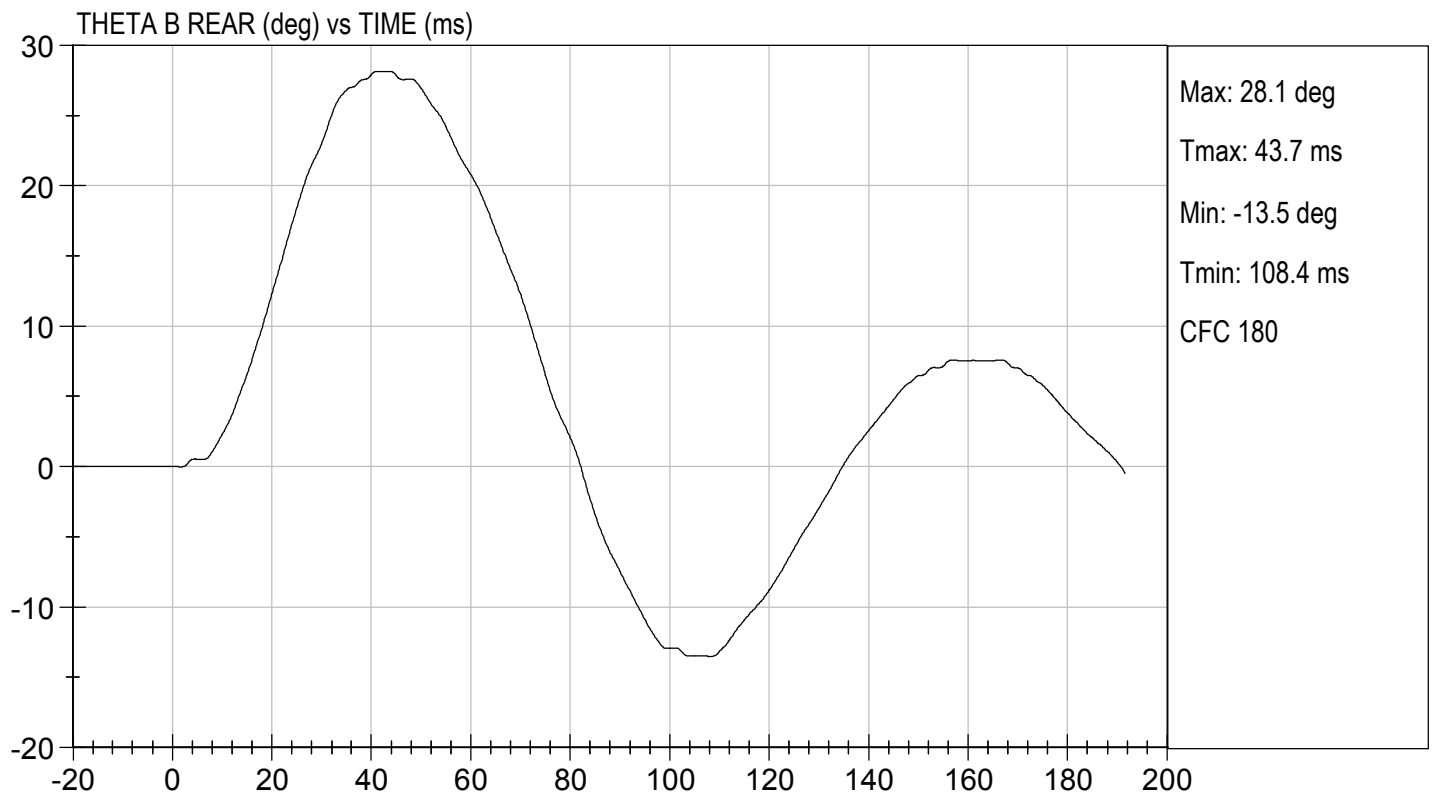
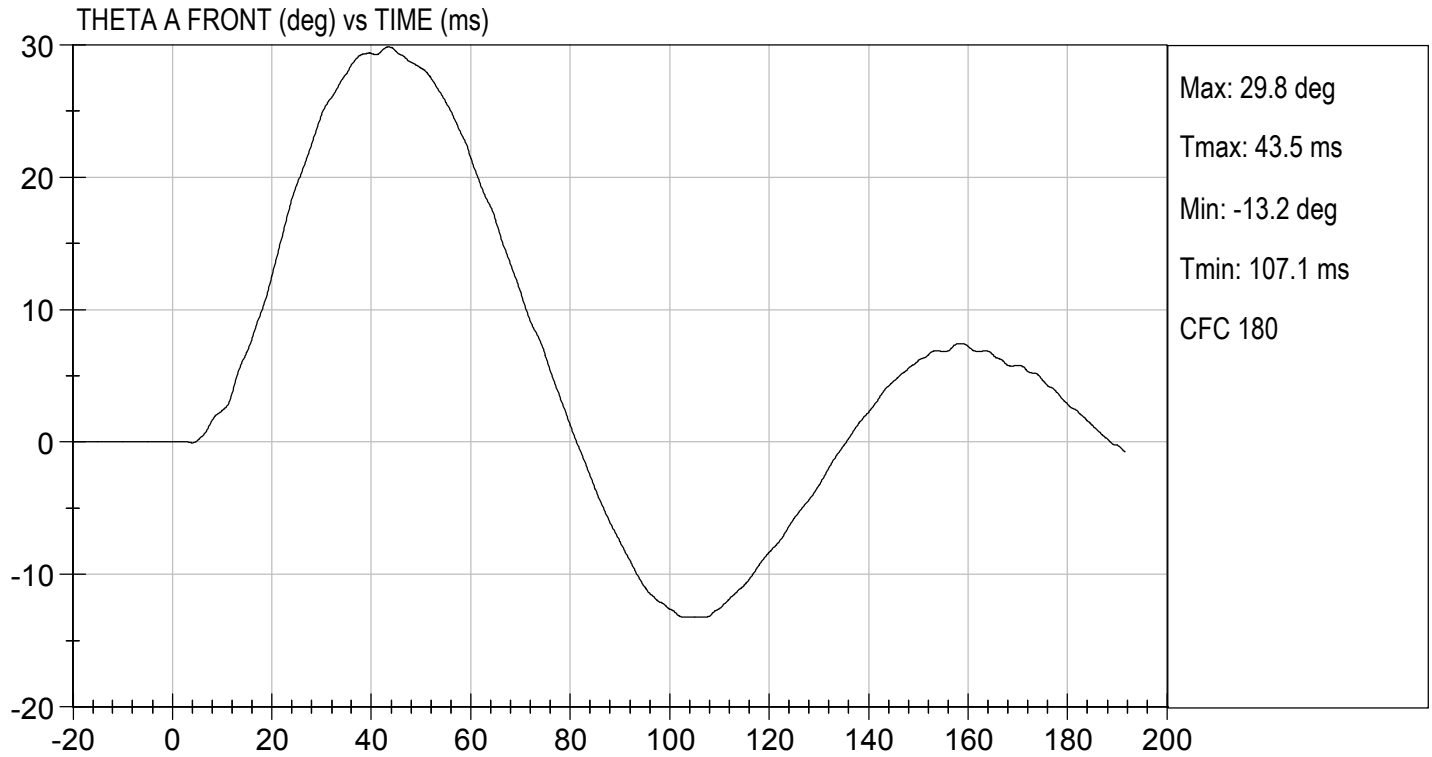
TEST DATE: 10/21/2019  
TEST #: D193278





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

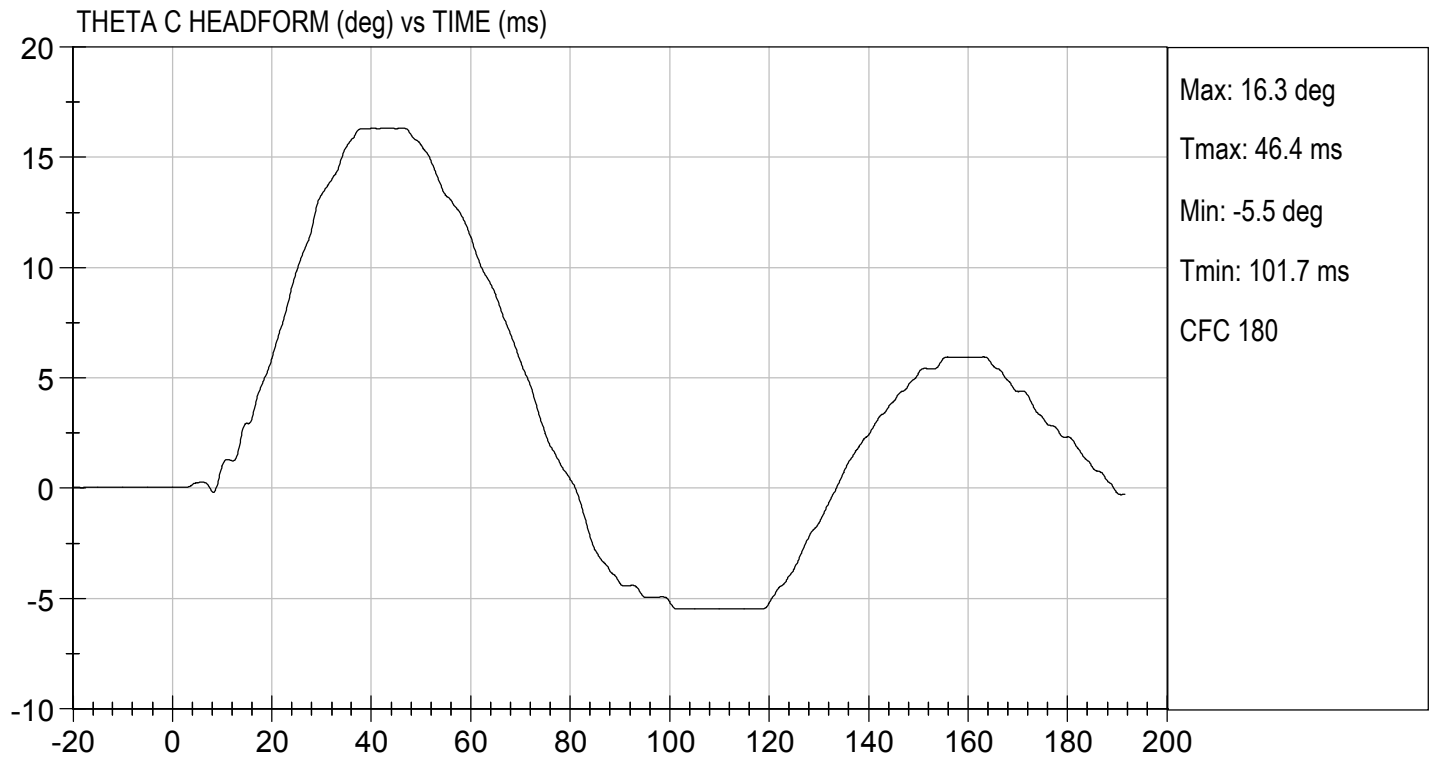
TEST DATE: 10/21/2019  
TEST #: D193278





TEST DESC: LUMBAR BENDING  
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 10/21/2019  
TEST #: D193278



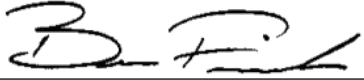


**MGA RESEARCH CORPORATION****PELVIS TEST  
ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193279

| Tested Parameter               | Units | Specification | Result | Pass/Fail |
|--------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 38     | Pass      |
| Probe Speed                    | m/s   | 4.20 to 4.40  | 4.38   | Pass      |
| Maximum Impactor Force         | N     | 4700 to 5400  | 5047   | Pass      |
| Time of Maximum Impactor Force | ms    | 11.8 to 16.1  | 12.6   | Pass      |
| Maximum Pubic Force            | N     | 1230 to 1590  | 1406   | Pass      |
| Time of Maximum Pubic Force    | ms    | 12.2 to 17.0  | 13.0   | Pass      |
| Overall Test Results           |       |               |        | Pass      |

  
Laboratory Technician

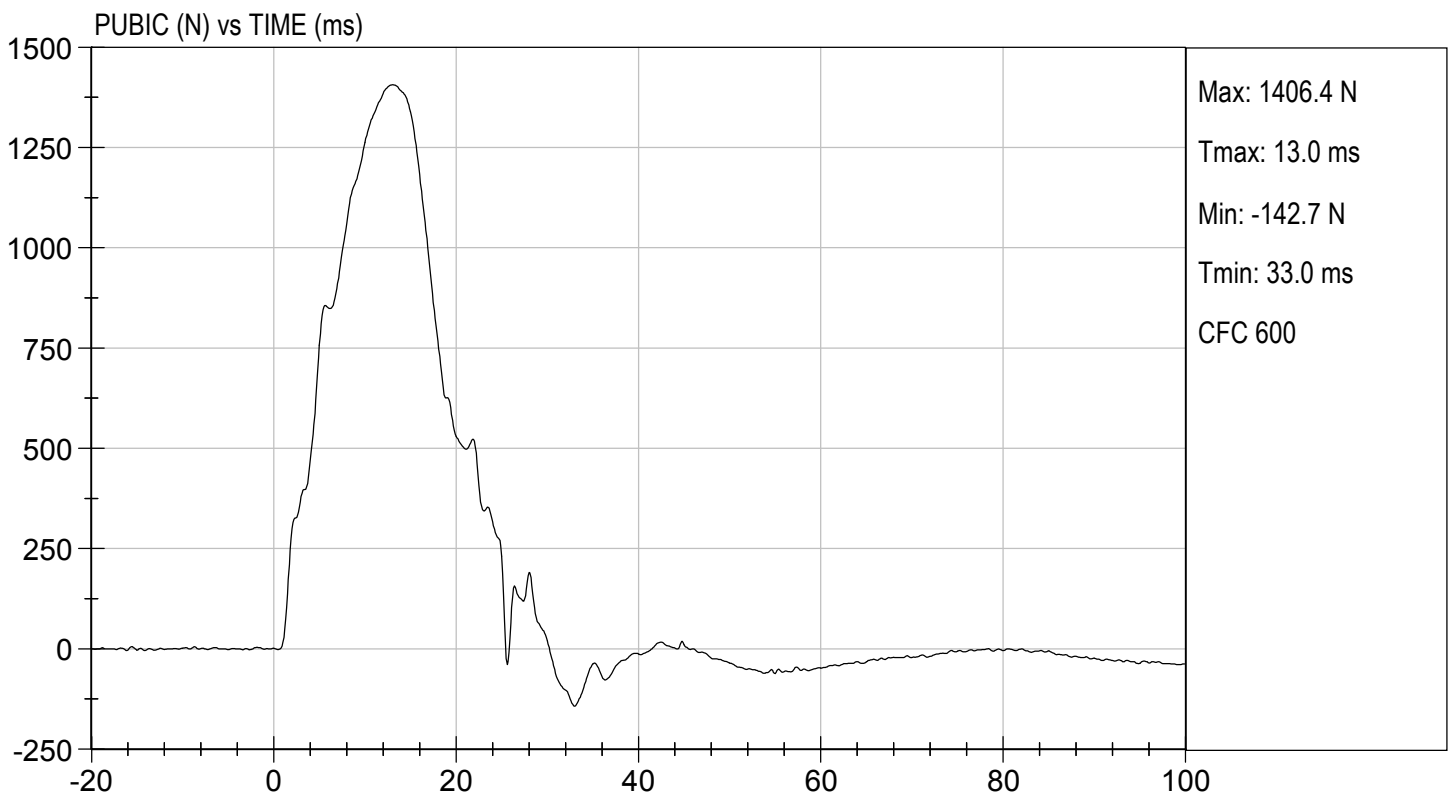
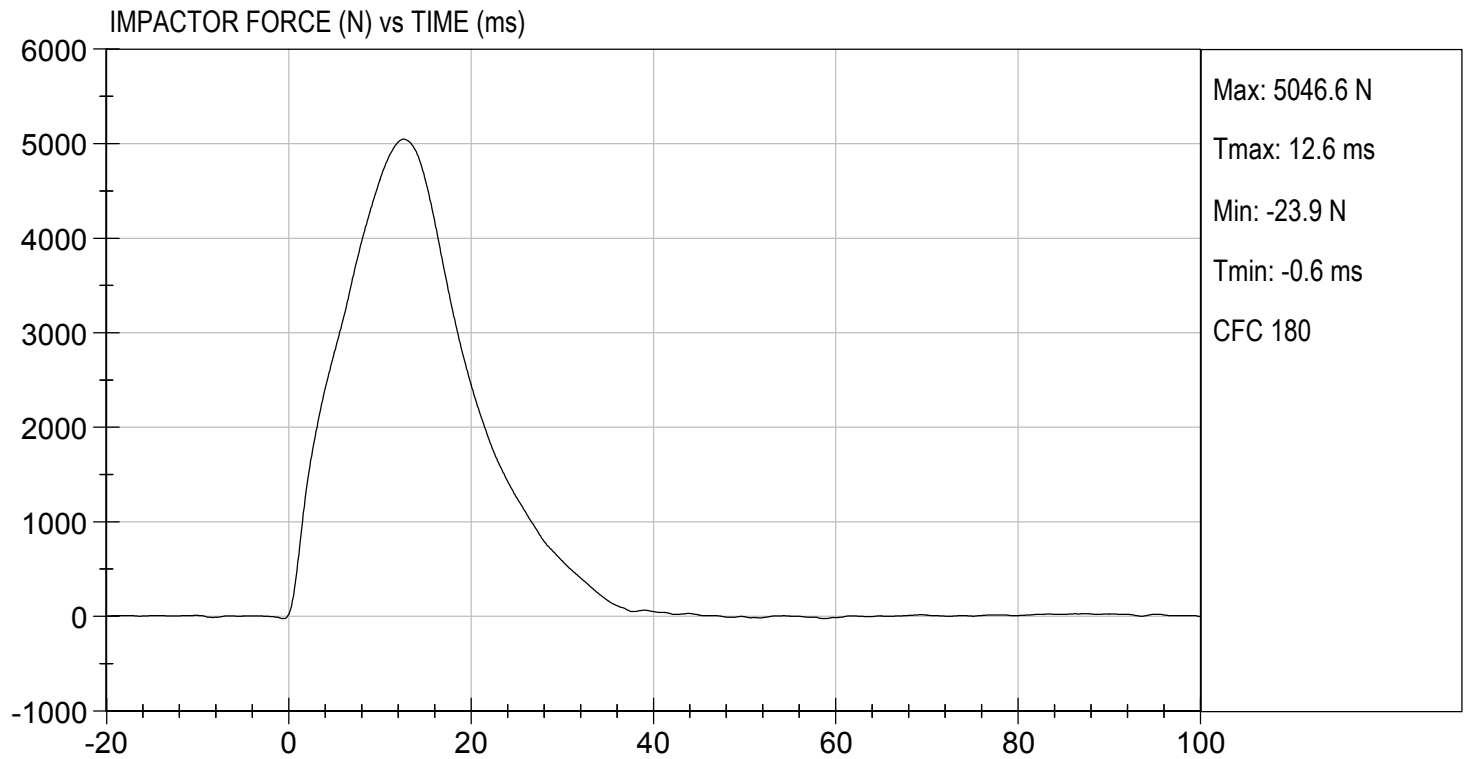
10/22/2019  
Test Date

  
Approved By



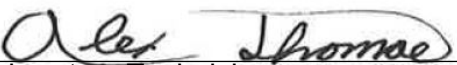
TEST DESC: PELVIS IMPACT  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 10/22/2019  
TEST #: D193279



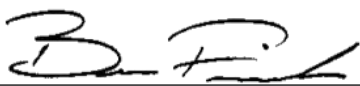
**MGA RESEARCH CORPORATION****THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D193270

| Tested Parameter                    | Units | Specification | Result | Pass/Fail |
|-------------------------------------|-------|---------------|--------|-----------|
| Temperature                         | deg C | 20.6 to 22.2  | 20.6   | Pass      |
| Humidity                            | %     | 10 to 70      | 38     | Pass      |
| Probe Speed                         | m/s   | 5.40 to 5.60  | 5.46   | Pass      |
| Maximum Impactor Force (after 6 ms) | N     | 5100 to 6200  | 5894   | Pass      |
| Upper Rib Displacement              | mm    | 34.0 to 41.0  | 37.7   | Pass      |
| Middle Rib Displacement             | mm    | 37.0 to 45.0  | 39.7   | Pass      |
| Lower Rib Displacement              | mm    | 37.0 to 44.0  | 40.5   | Pass      |
| Overall Test Results                |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

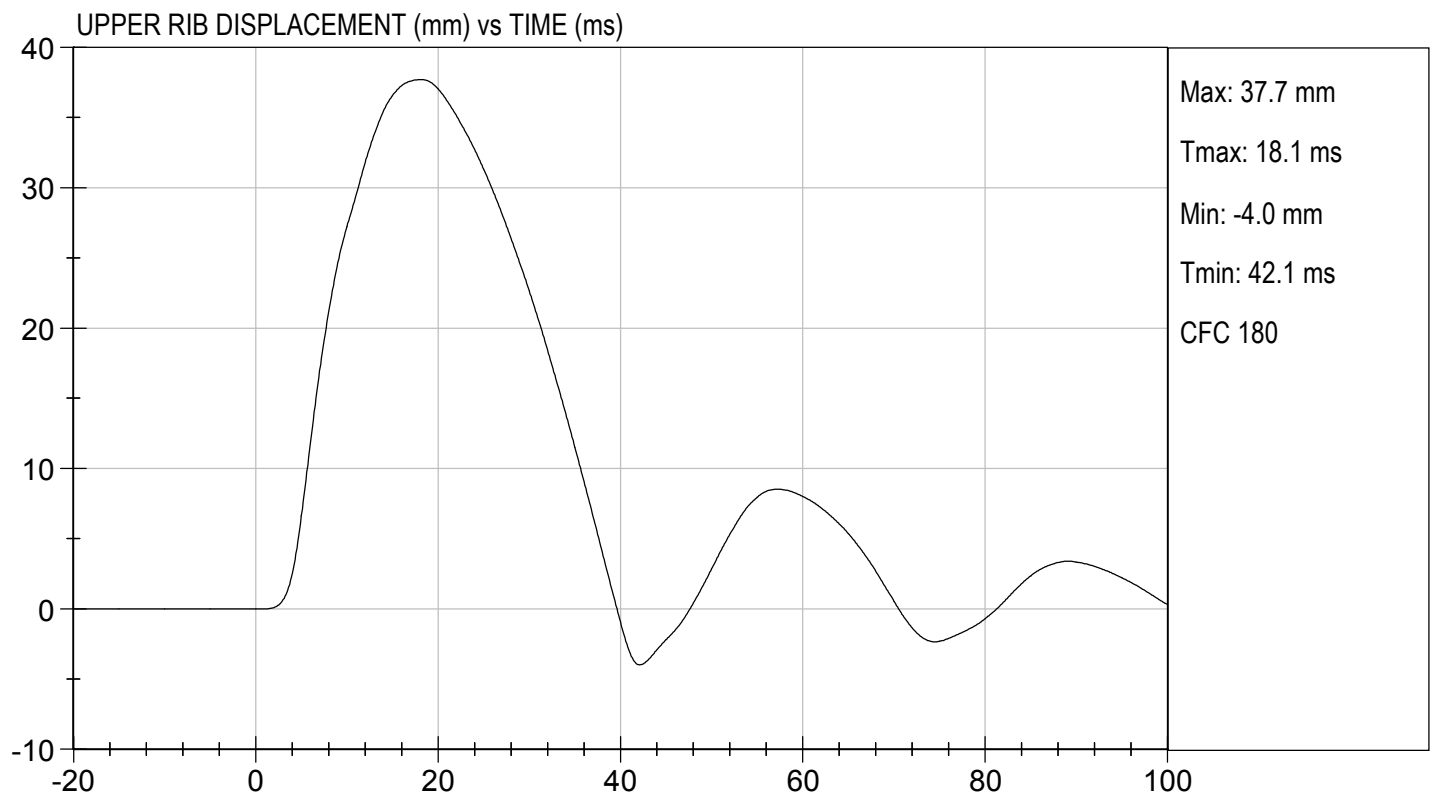
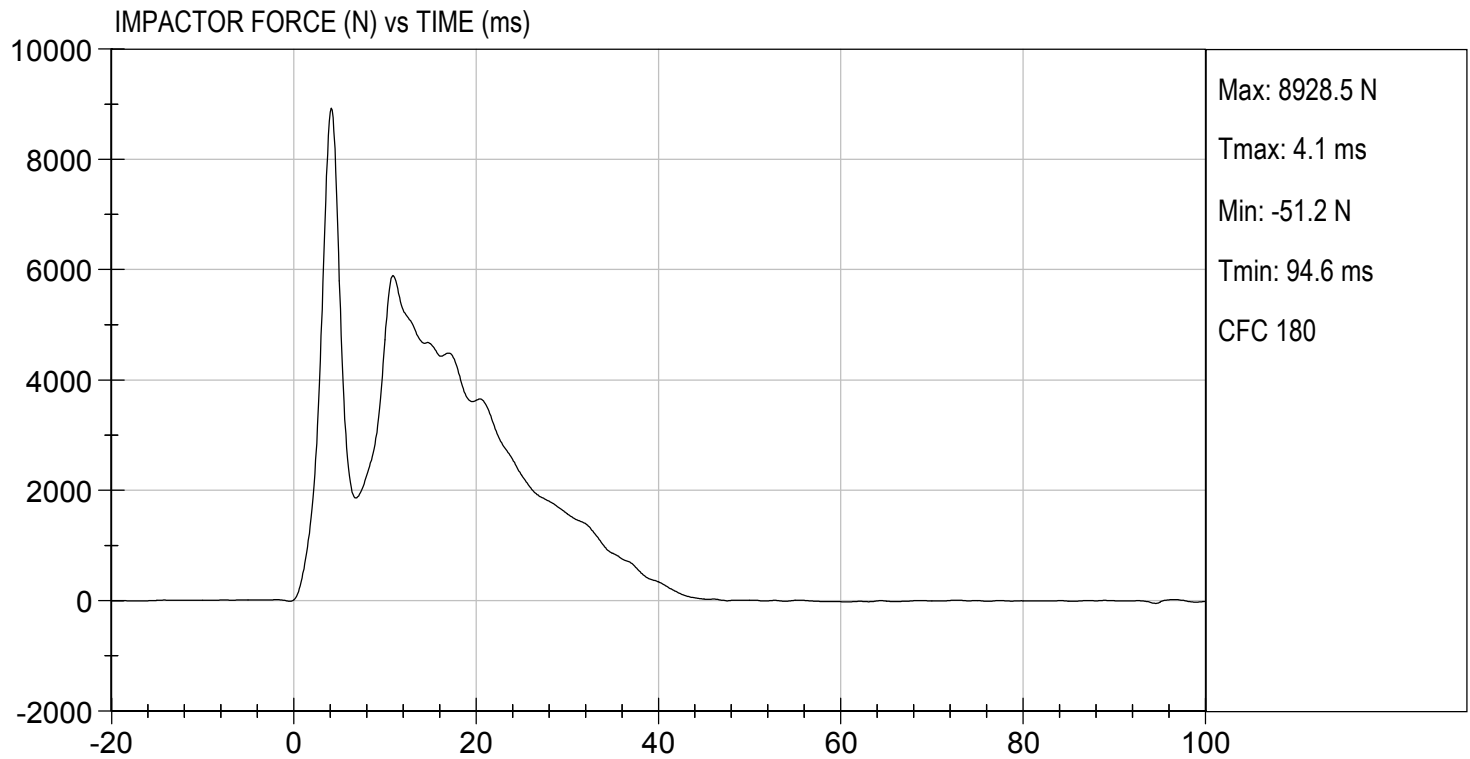
Test Date

  
Approved By



TEST DESC: THORAX IMPACT  
VELOCITY: 17.92 ft/s, 5.46 m/s

TEST DATE: 10/22/2019  
TEST #: D193270

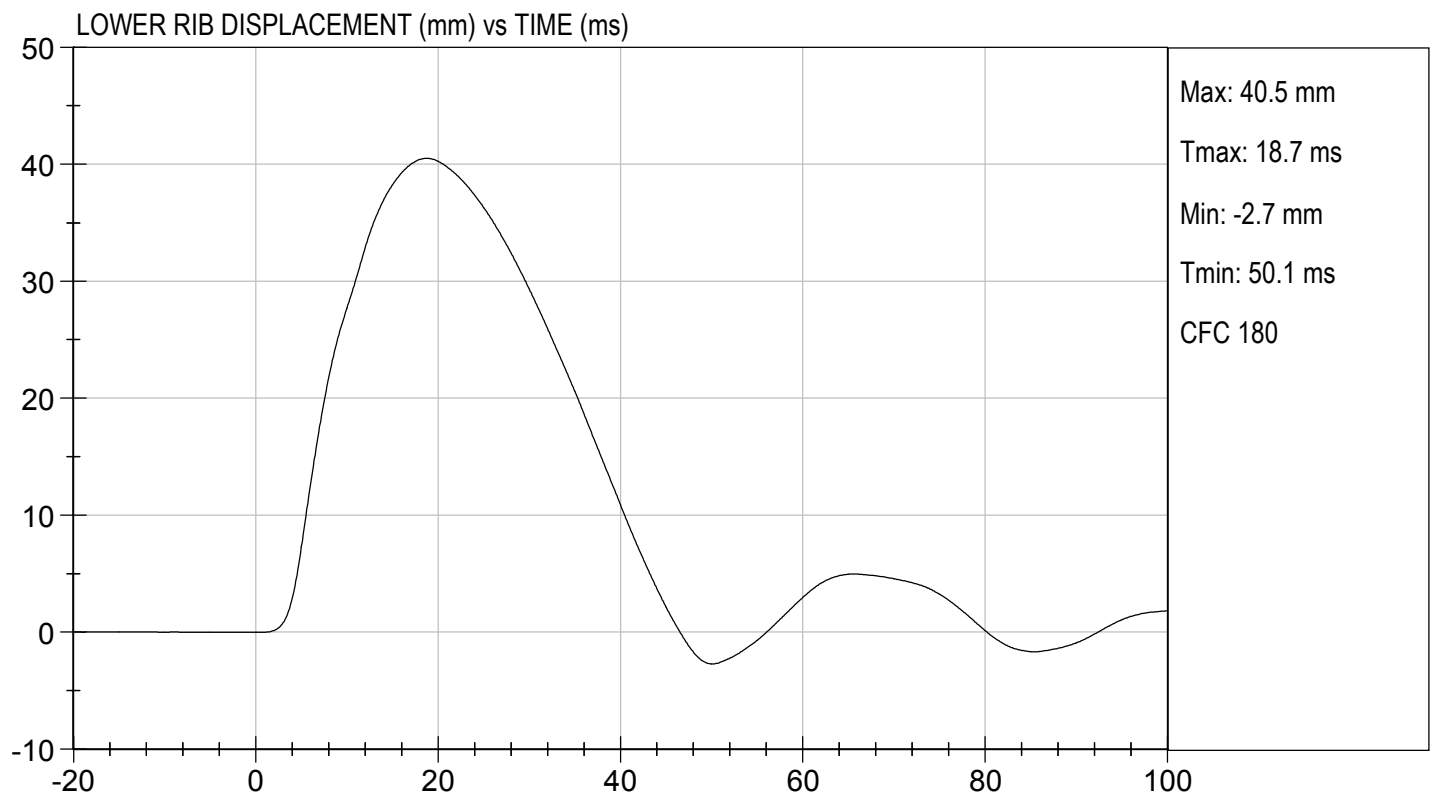
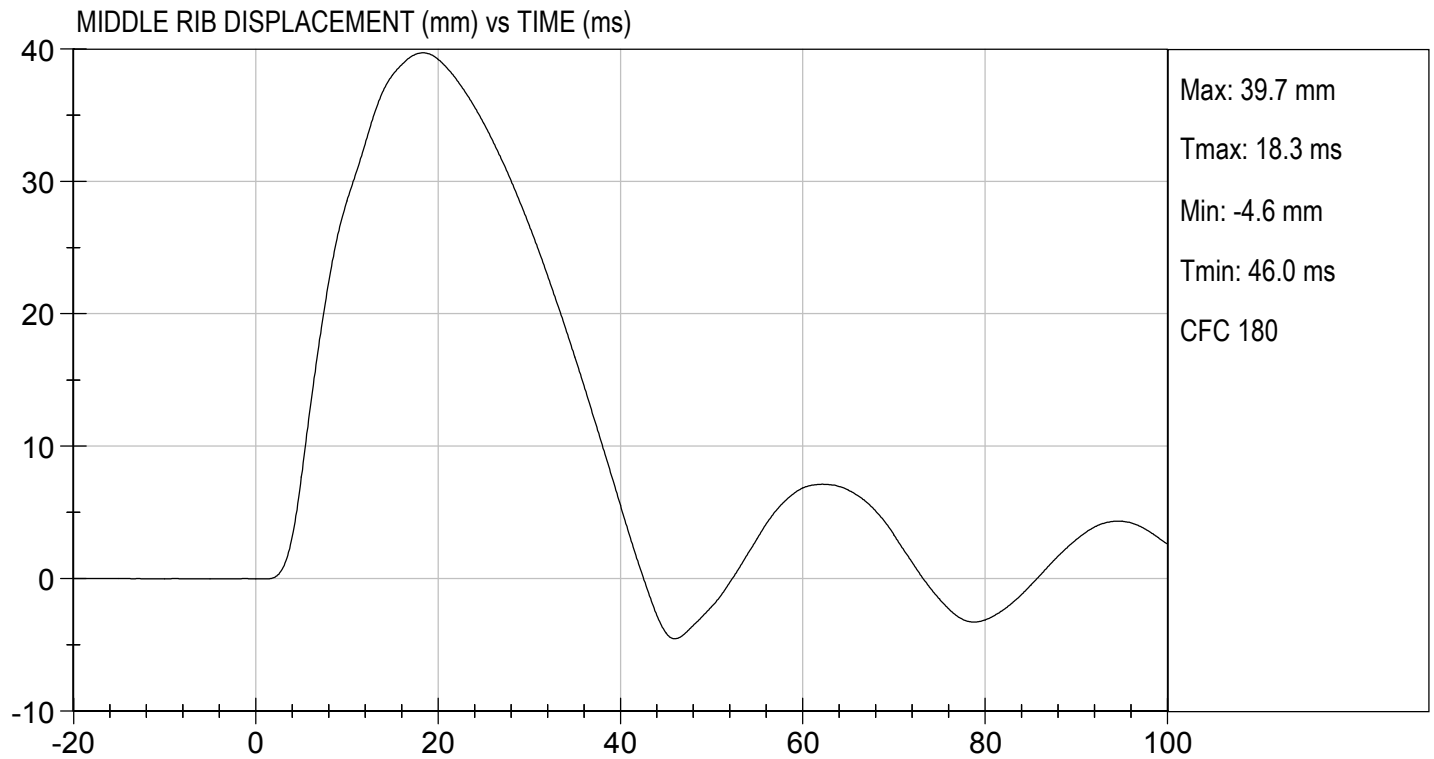






TEST DESC: THORAX IMPACT  
VELOCITY: 17.92 ft/s, 5.46 m/s

TEST DATE: 10/22/2019  
TEST #: D193270



## **CALIBRATION TEST RESULTS**

### **PRE-TEST**

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

**SID-IIsD External Measurements**  
**SN: 306**

| <b>No.</b> | <b>Name</b>                   | <b>Spec. (mm)</b> | <b>Result</b> | <b>Pass/Fail</b> |
|------------|-------------------------------|-------------------|---------------|------------------|
| <b>A</b>   | Sitting Height                | 772 - 788         | 785           | Pass             |
| <b>B</b>   | Shoulder Pivot Height         | 437 - 453         | 449           | Pass             |
| <b>C</b>   | H-point Height                | 79 - 89           | 86            | Pass             |
| <b>D</b>   | H-point from Seatback         | 141 - 151         | 147           | Pass             |
| <b>E</b>   | Shoulder Pivot from Backline  | 97 - 107          | 99            | Pass             |
| <b>F</b>   | Thigh Clearance               | 119 -135          | 120           | Pass             |
| <b>G</b>   | Head Breadth                  | 140 - 148         | 141           | Pass             |
| <b>H</b>   | Head Back from Backline       | 40 - 46           | 45            | Pass             |
| <b>I</b>   | Head Depth                    | 178 - 188         | 182           | Pass             |
| <b>J</b>   | Head Circumference            | 541 - 551         | 550           | Pass             |
| <b>K</b>   | Buttock to Knee Length        | 514 - 540         | 538           | Pass             |
| <b>L</b>   | Popliteal Height              | 343 - 369         | 349           | Pass             |
| <b>M</b>   | Knee Pivot to Floor Height    | 392 - 409         | 394           | Pass             |
| <b>N</b>   | Buttock Popliteal Length      | 416 - 442         | 435           | Pass             |
| <b>O</b>   | Chest Depth w/o Jacket        | 195 - 211         | 198           | Pass             |
| <b>P</b>   | Foot Length                   | 216 - 232         | 222           | Pass             |
| <b>Q</b>   | Hip Breadth (w/ pelvic plugs) | 313 - 323         | 317           | Pass             |
| <b>R</b>   | Arm Length                    | 249 - 259         | 250           | Pass             |
| <b>S</b>   | Knee Joint to Seatback        | 477 - 493         | 483           | Pass             |
| <b>V</b>   | Shoulder Width                | 341 - 357         | 351           | Pass             |
| <b>W</b>   | Foot Width                    | 78 - 94           | 82            | Pass             |
| <b>Y</b>   | Chest Circumference w/ jacket | 851 - 881         | 863           | Pass             |
| <b>Z</b>   | Waist Circumference           | 761 - 791         | 782           | Pass             |

**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

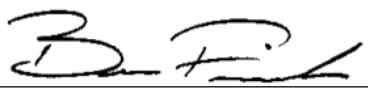
**Test ID:** D193041

| Tested Parameter               | Units | Specification | Result               | Pass/Fail |
|--------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21.2                 | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 44                   | Pass      |
| Peak Resultant Acceleration    | G's   | 115 to 137    | 133                  | Pass      |
| Peak Longitudinal Acceleration | G's   | +/- 15        | 3.6                  | Pass      |
| Unimodal                       | N/A   | Yes           | Yes                  | Pass      |
| Oscillations                   | N/A   | <15%          | Yes                  | Pass      |
|                                |       |               | Overall Test Results | Pass      |

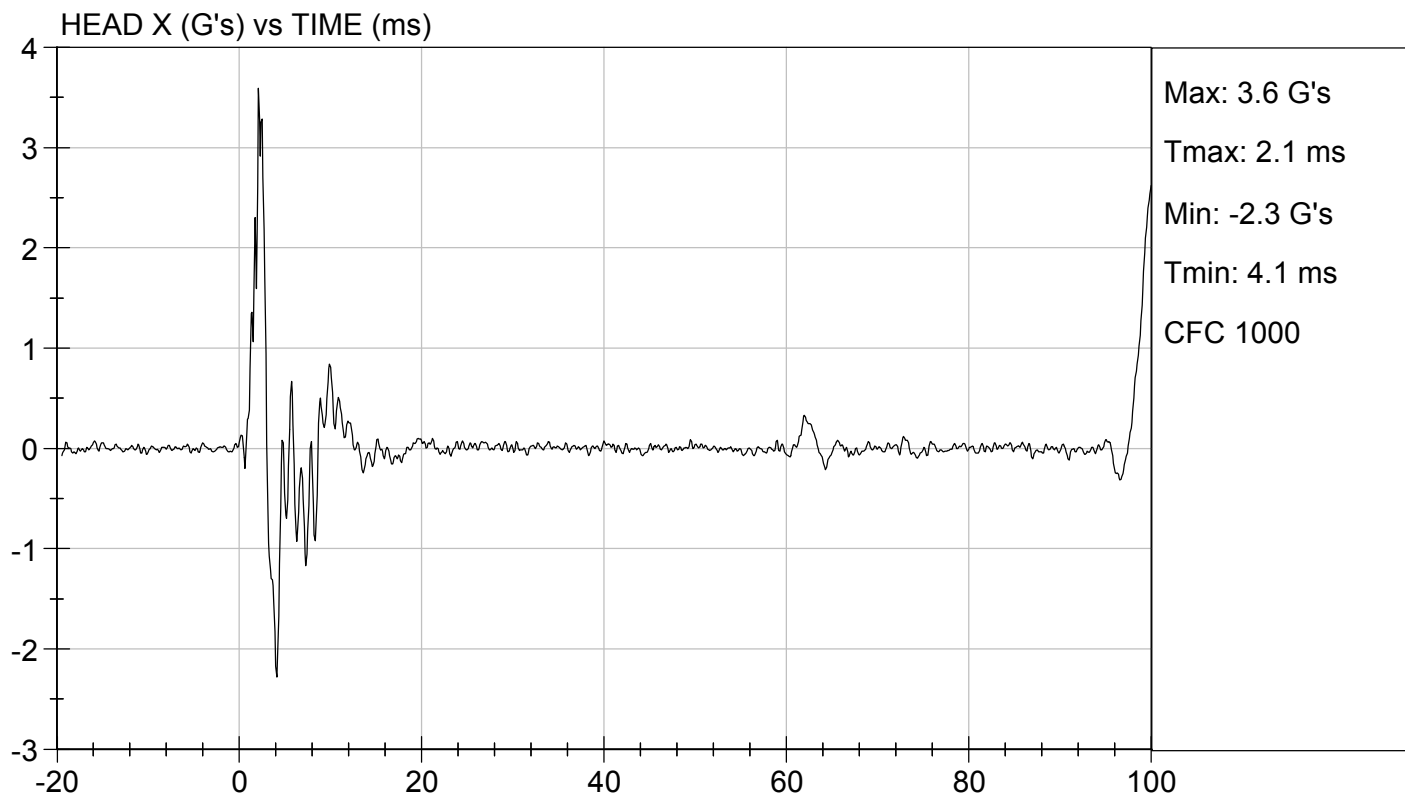
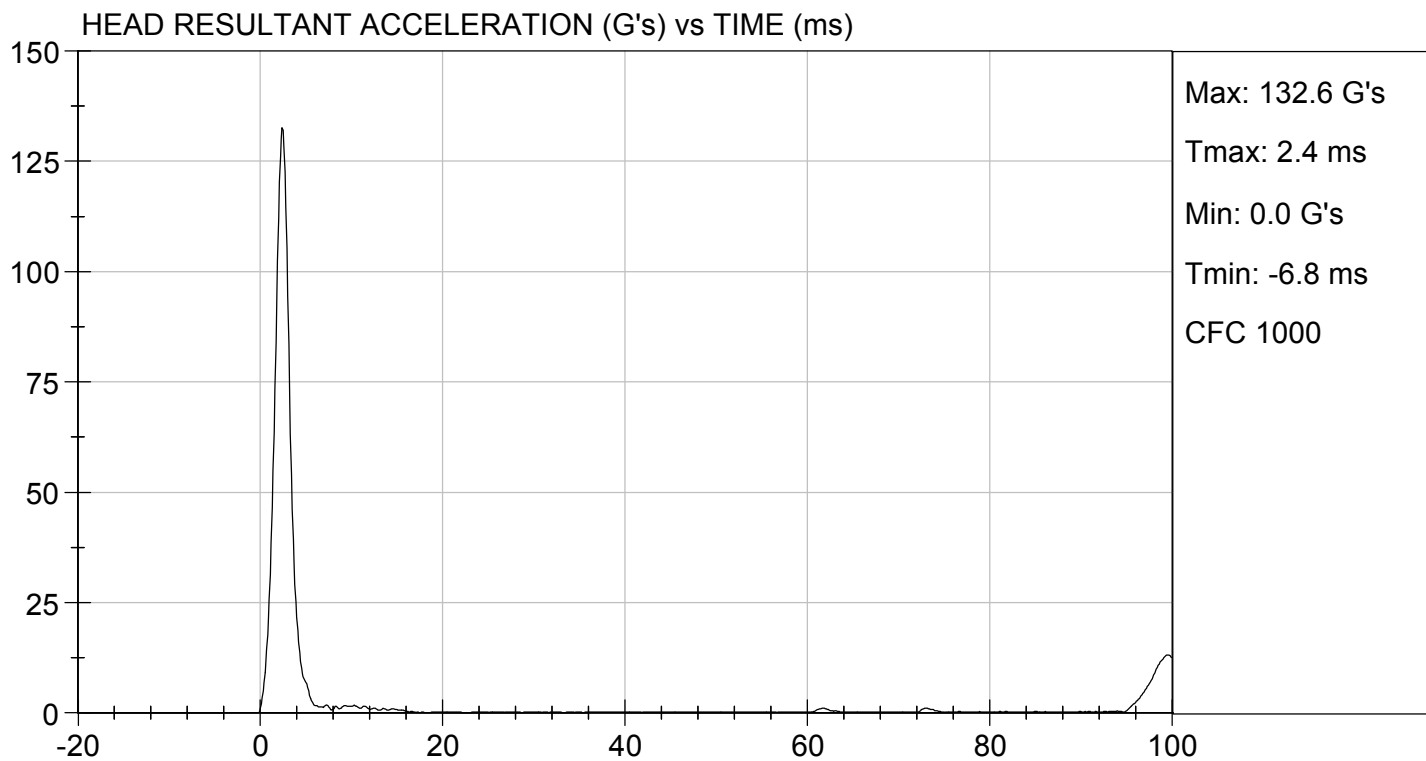
  
\_\_\_\_\_  
Laboratory Technician

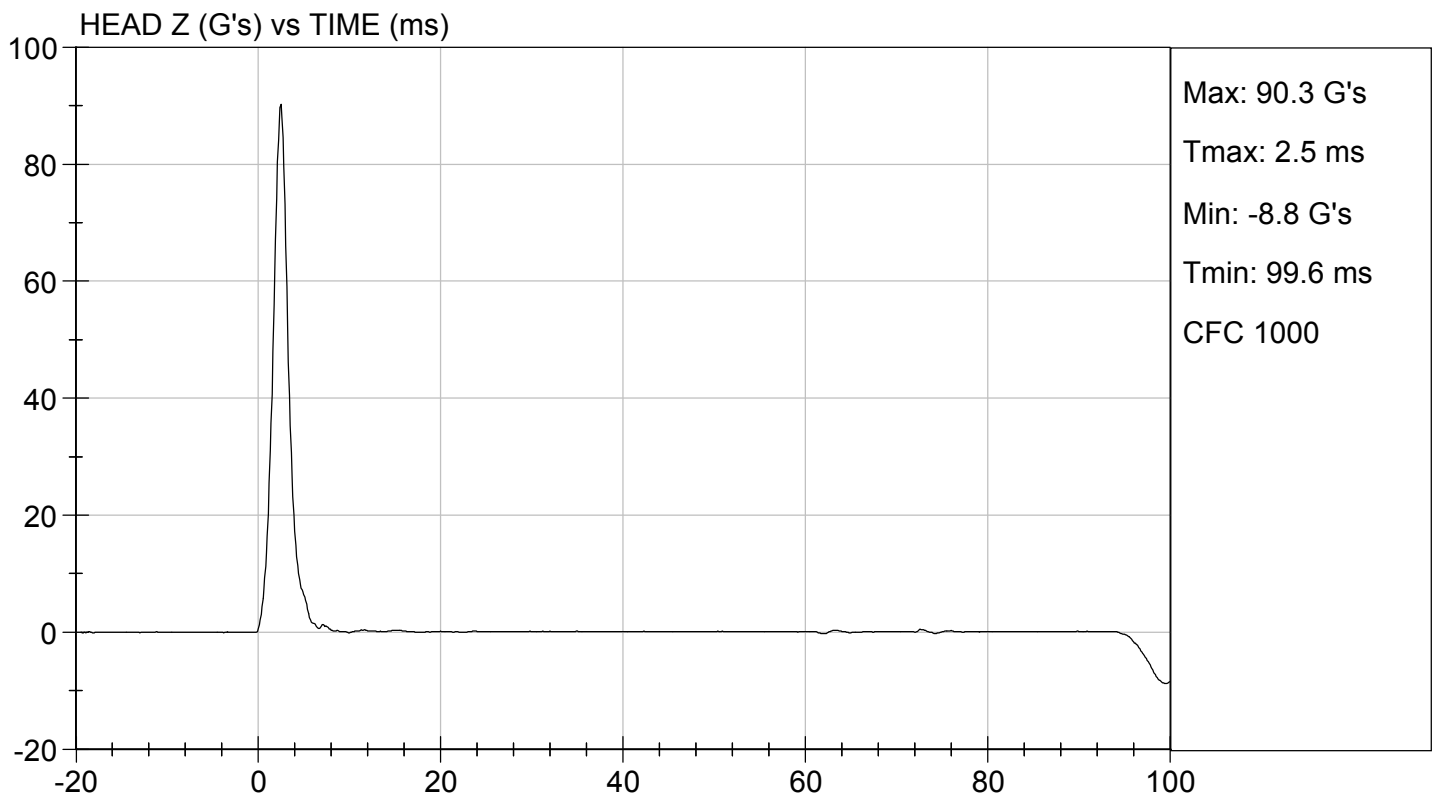
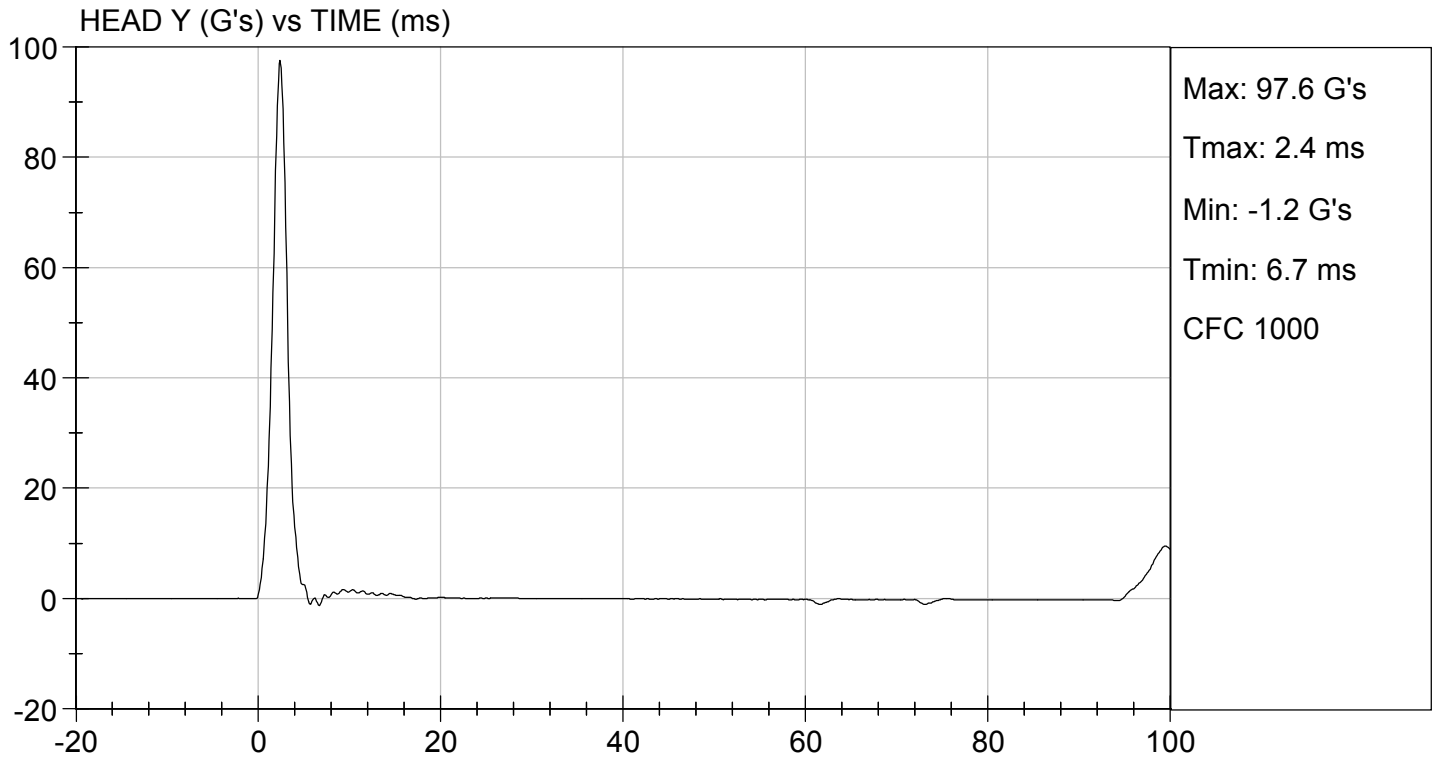
09/25/2019

Test Date

  
\_\_\_\_\_  
Approved By







**MGA RESEARCH CORPORATION**  
**LATERAL NECK PENDULUM TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

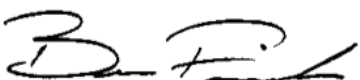
**Test I.D:** D193042

| Tested Parameter                 |           | Units | Specification | Result | Pass/Fail |
|----------------------------------|-----------|-------|---------------|--------|-----------|
| Temperature                      |           | deg C | 20.6 to 22.2  | 21.4   | Pass      |
| Humidity                         |           | %     | 10 to 70      | 44     | Pass      |
| Impact Velocity                  |           | m/s   | 5.51 to 5.63  | 5.58   | Pass      |
| Pendulum Velocity                | 10 ms     | m/s   | 2.20 to 2.80  | 2.31   | Pass      |
|                                  | 15 ms     | m/s   | 3.30 to 4.10  | 3.47   | Pass      |
|                                  | 20 ms     | m/s   | 4.40 to 5.40  | 4.86   | Pass      |
|                                  | 25 ms     | m/s   | 5.40 to 6.10  | 5.66   | Pass      |
|                                  | 25-100 ms | m/s   | 5.50 to 6.20  | 5.66   | Pass      |
| Maximum D-Plane Rotation         |           | deg   | 71 to 81      | 73     | Pass      |
| Time of Maximum D-Plane Rotation |           | ms    | 50 to 70      | 61     | Pass      |
| Maximum Occipital Condyle Moment |           | Nm    | -44 to -36    | -36    | Pass      |
| Time of Moment Decay to 0 Nm     |           | ms    | 102 to 126    | 115    | Pass      |
| Overall Test Results             |           |       |               |        | Pass      |

  
 Laboratory Technician

09/25/2019

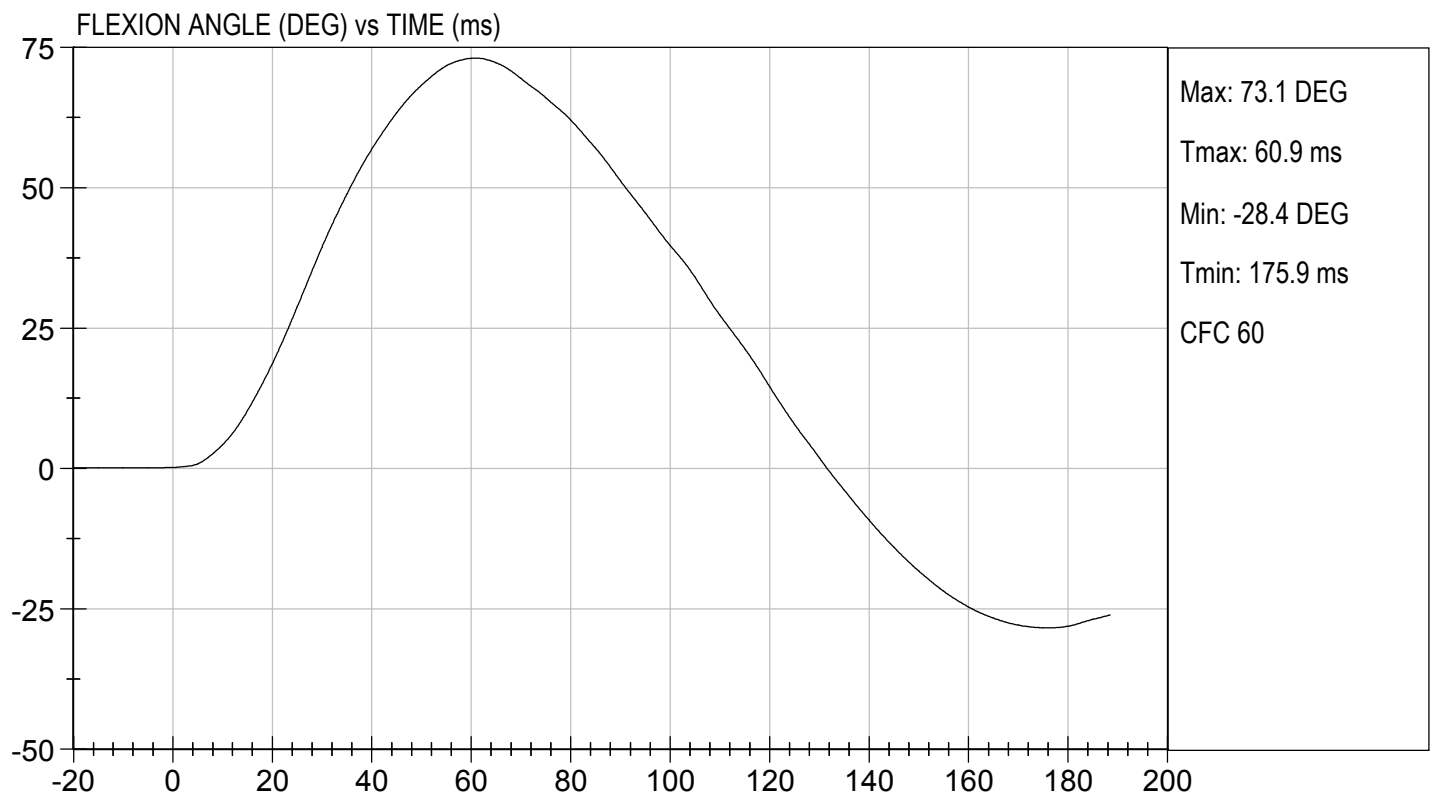
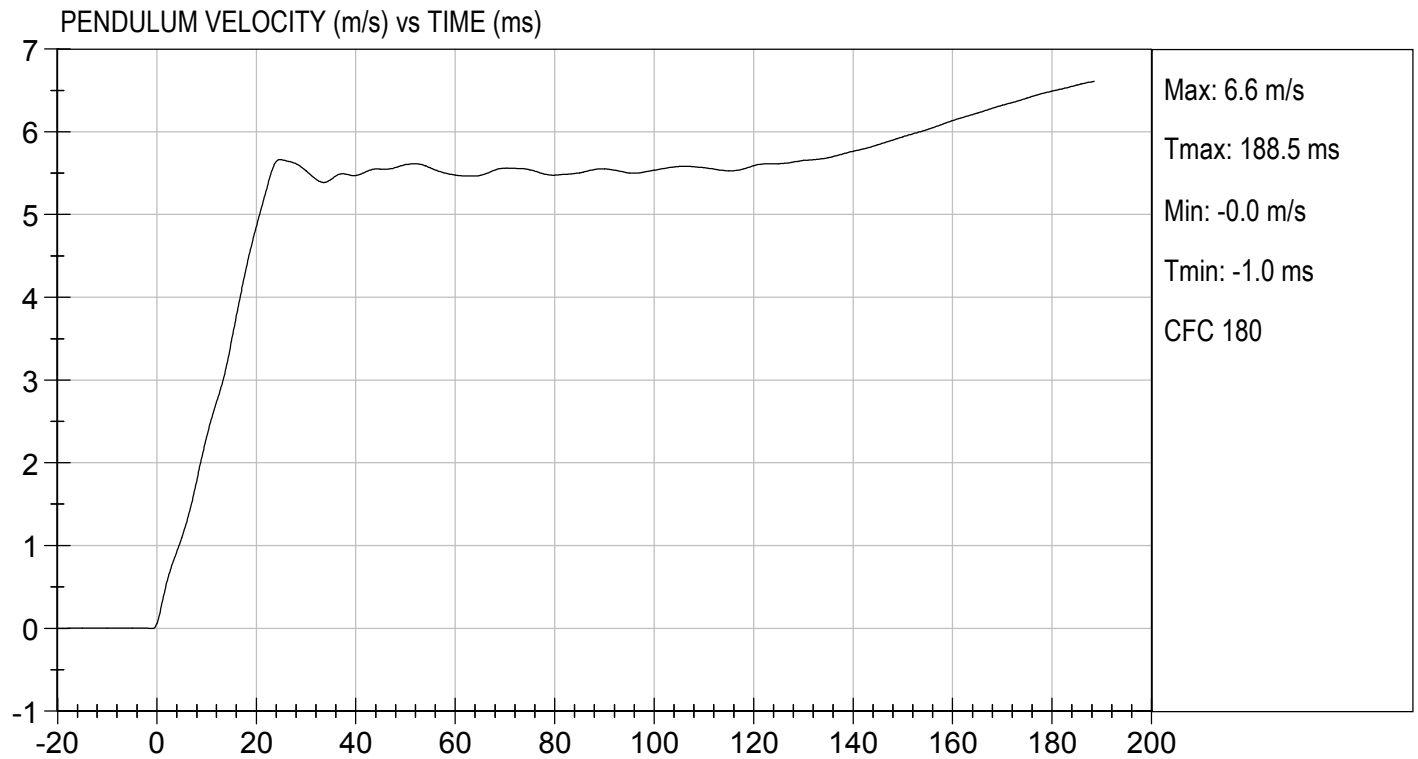
Test Date

  
 Approved By



TEST DESC: NECK BENDING  
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 09/25/2019  
TEST #: D193042

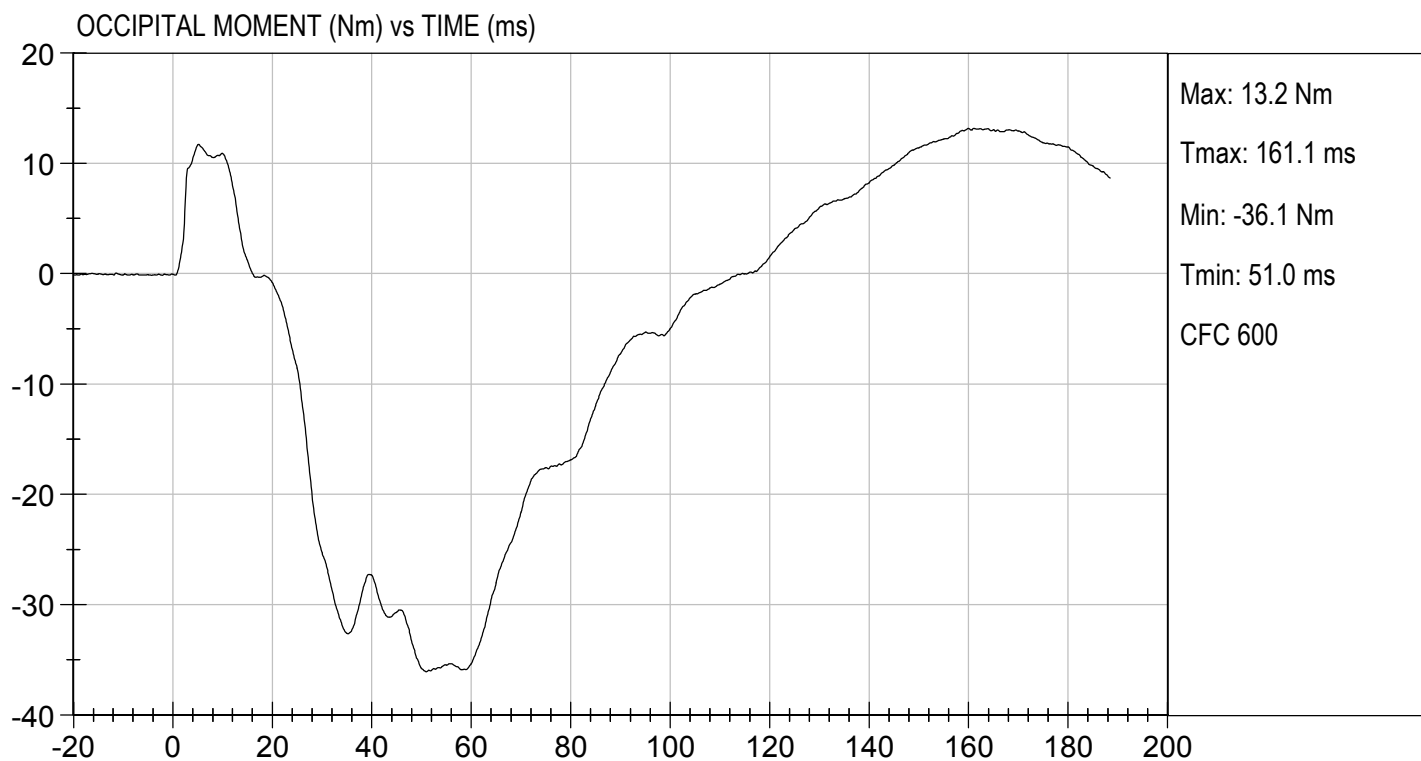






TEST DESC: NECK BENDING  
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 09/25/2019  
TEST #: D193042

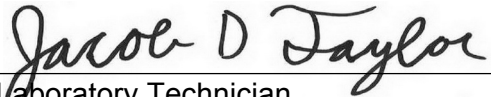


**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

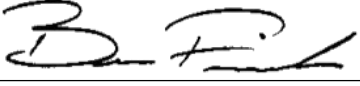
**Test ID:** D193043

| Tested Parameter                | Units | Specification | Result | Pass/Fail |
|---------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature          | deg C | 20.6 to 22.2  | 21.6   | Pass      |
| Laboratory Relative Humidity    | %     | 10 to 70      | 38     | Pass      |
| Impact Velocity                 | m/s   | 4.20 to 4.40  | 4.27   | Pass      |
| Maximum Probe Acceleration      | G's   | 13 to 18      | 15     | Pass      |
| Shoulder Displacement           | mm    | 28 to 37      | 28     | Pass      |
| Upper Spine (T1) Y Acceleration | G's   | 17 to 22      | 20     | Pass      |
| Overall Test Results            |       |               |        | Pass      |

  
Laboratory Technician

09/26/2019

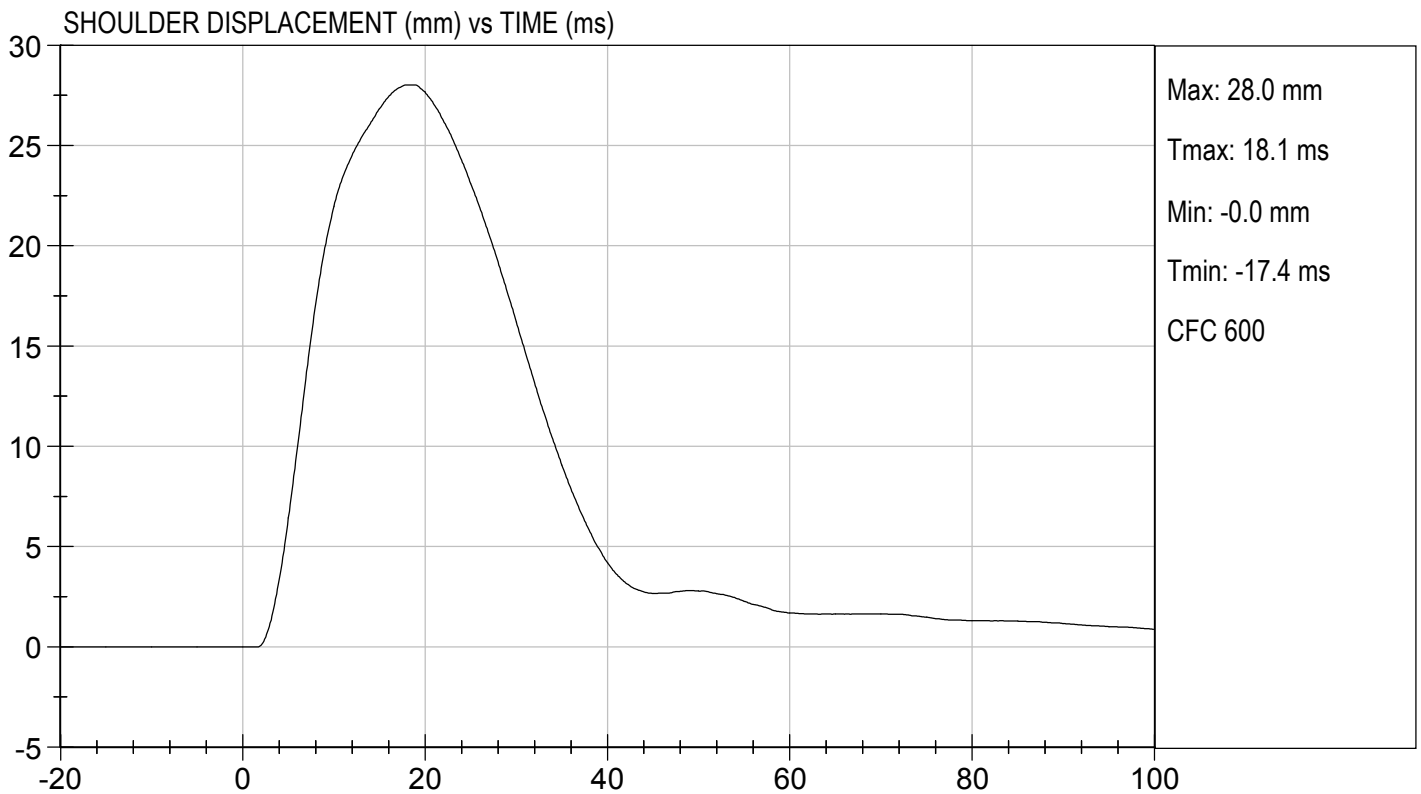
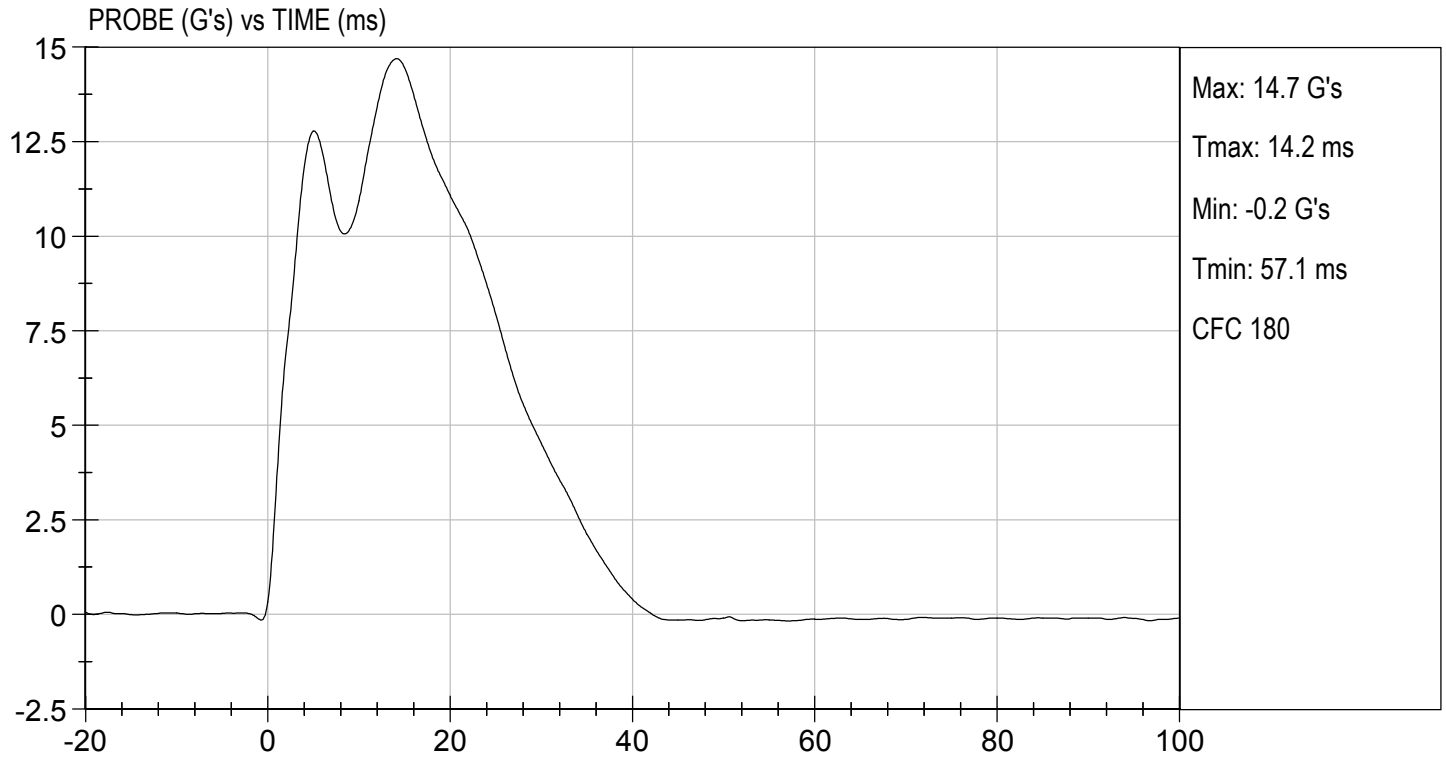
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.01 ft/s, 4.27 m/s

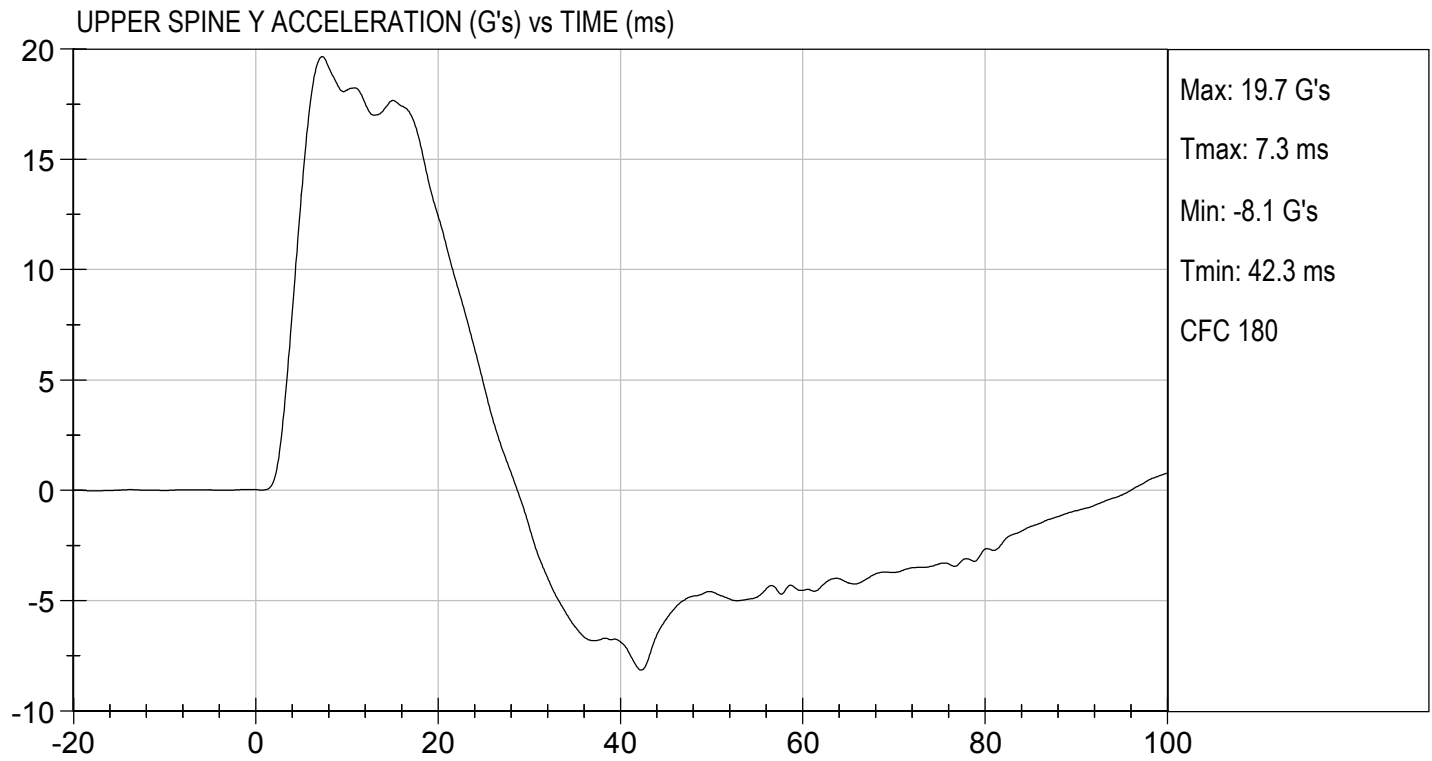
TEST DATE: 09/26/2019  
TEST #: D193043





TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 09/26/2019  
TEST #: D193043



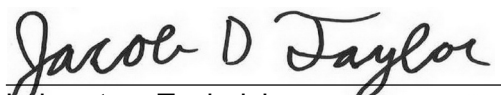


**MGA RESEARCH CORPORATION**  
**THORAX (WITH ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

**Test I.D:** D193044

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.6   | Pass      |
| Humidity                         | %     | 10 to 70      | 38     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.77   | Pass      |
| Maximum Probe Acceleration       | G's   | 30 to 36      | 32     | Pass      |
| Shoulder Displacement            | mm    | 31 to 40      | 33     | Pass      |
| Upper Rib Displacement           | mm    | 25 to 32      | 27     | Pass      |
| Middle Rib Displacement          | mm    | 30 to 36      | 31     | Pass      |
| Lower Rib Displacement           | mm    | 32 to 38      | 32     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 34 to 43      | 41     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 29 to 37      | 33     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

09/26/2019

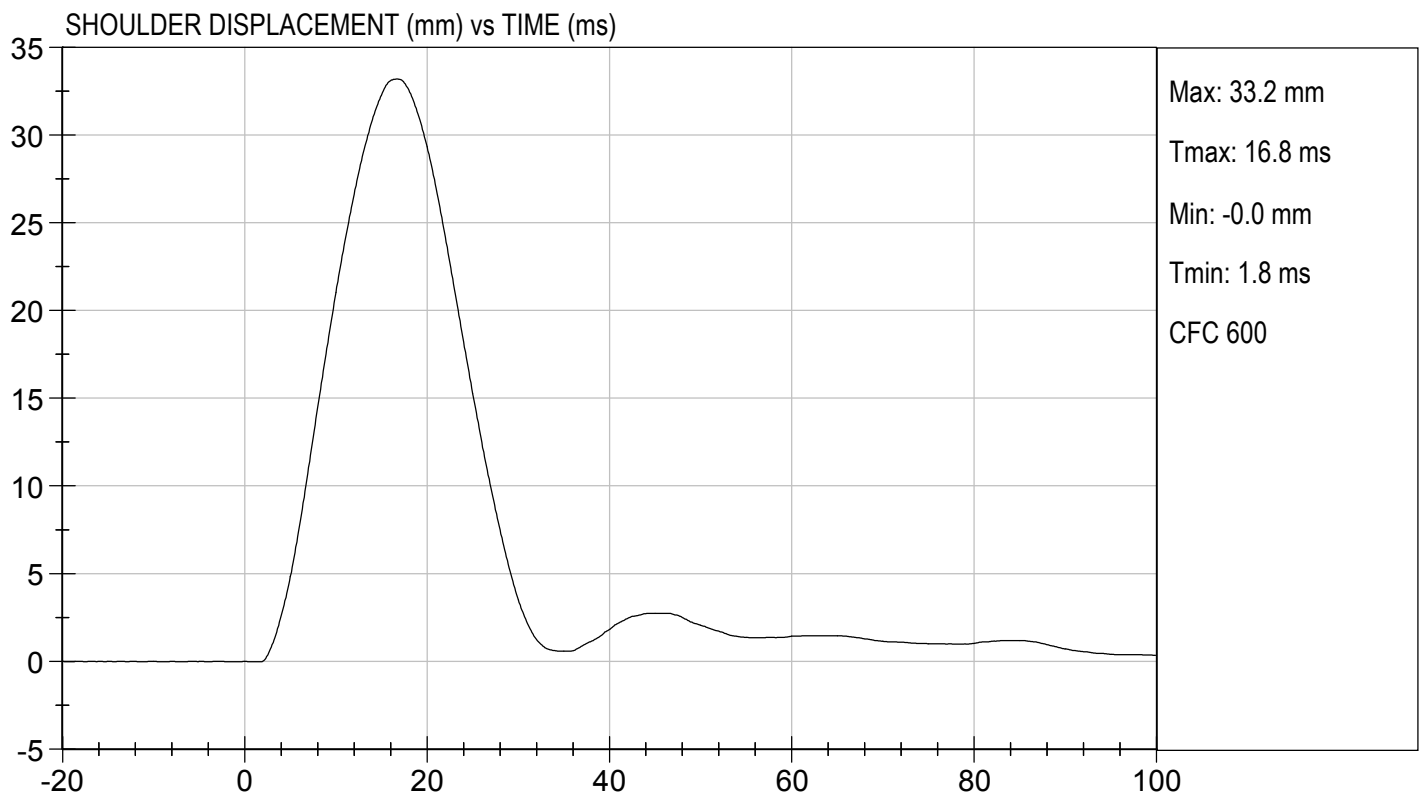
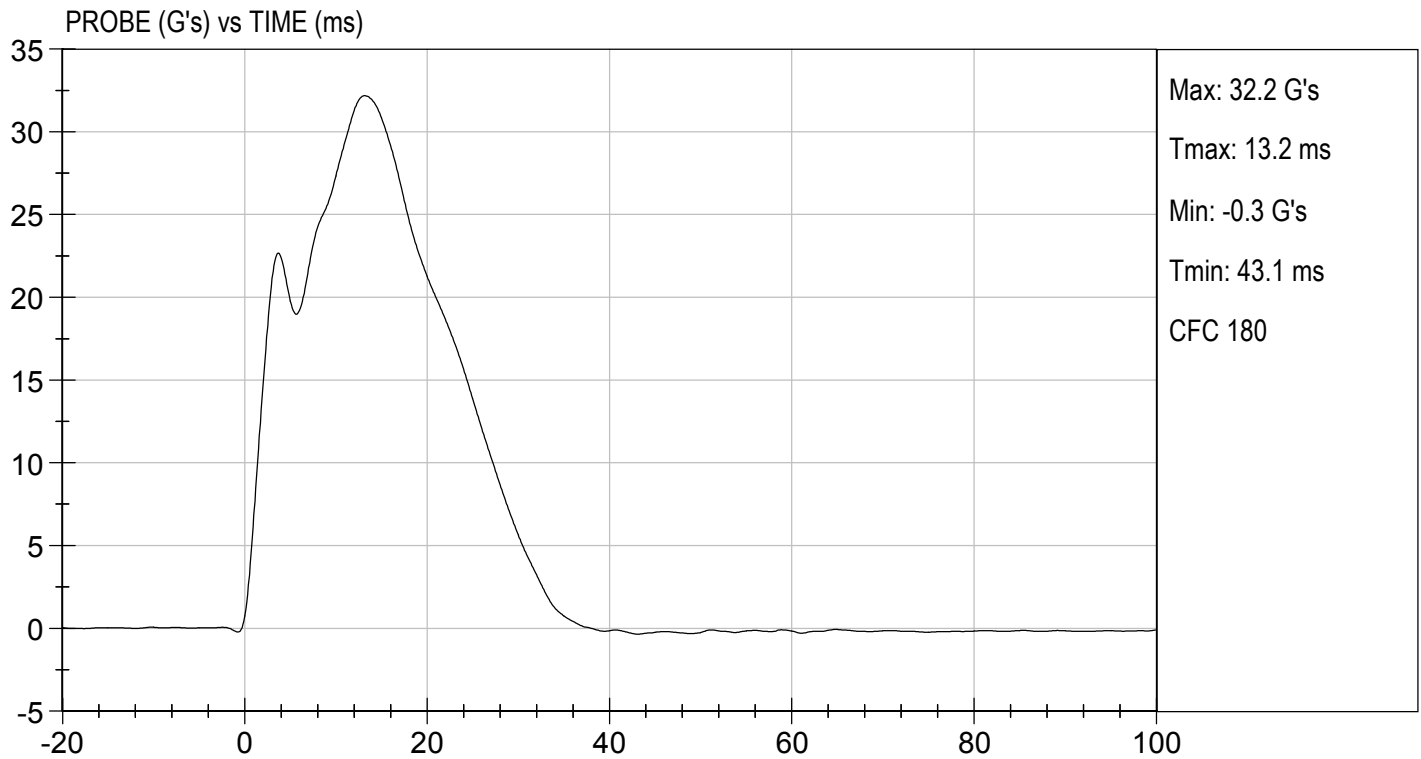
Test Date

  
Approved By



TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

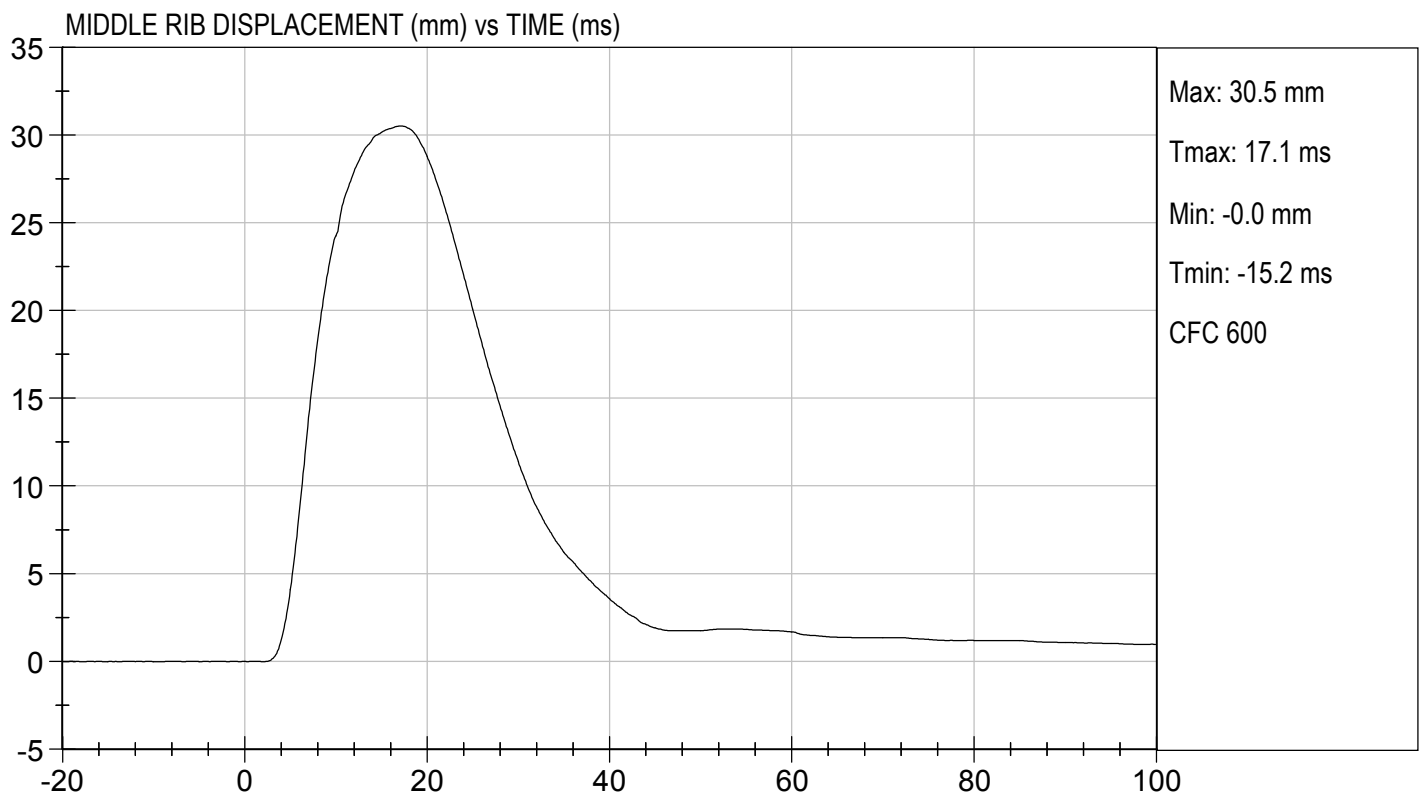
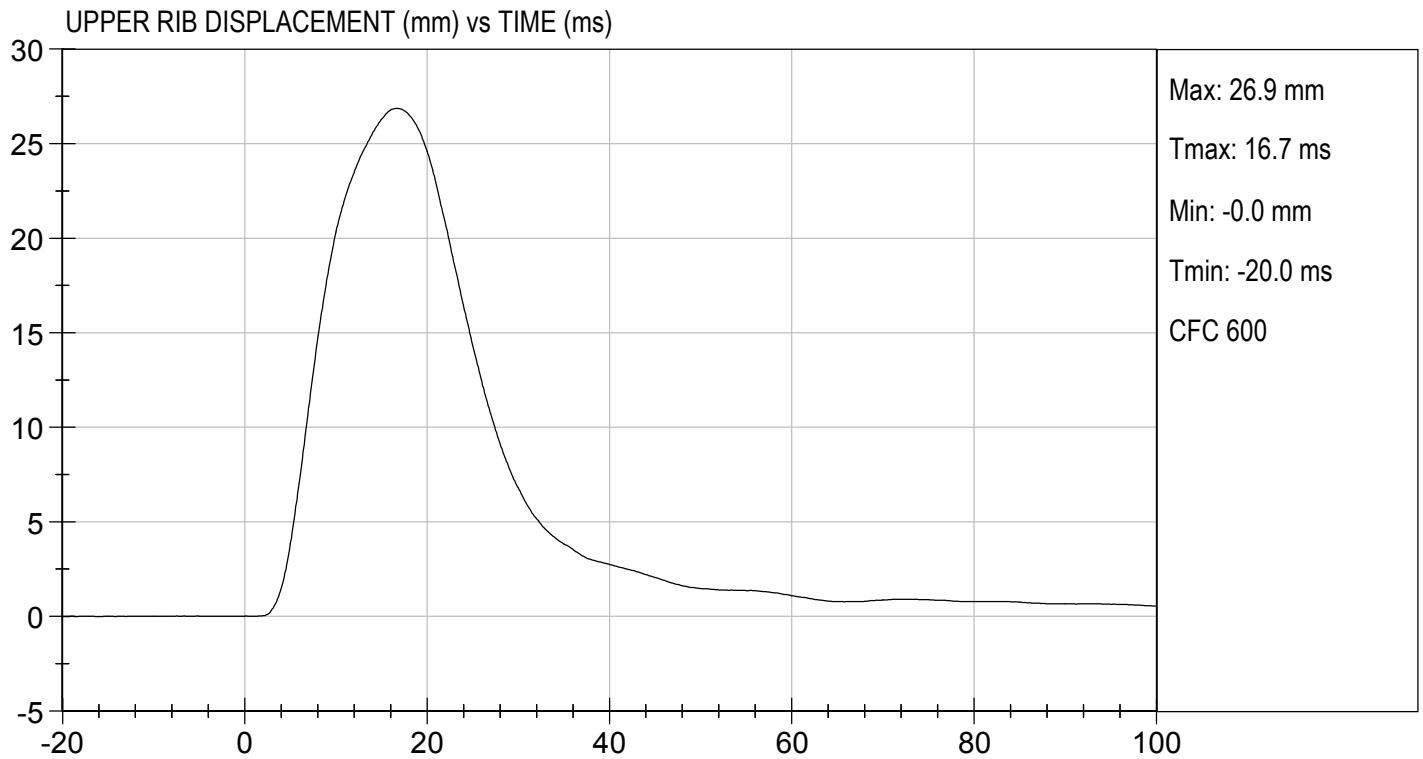
TEST DATE: 09/26/2019  
TEST #: D193044





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

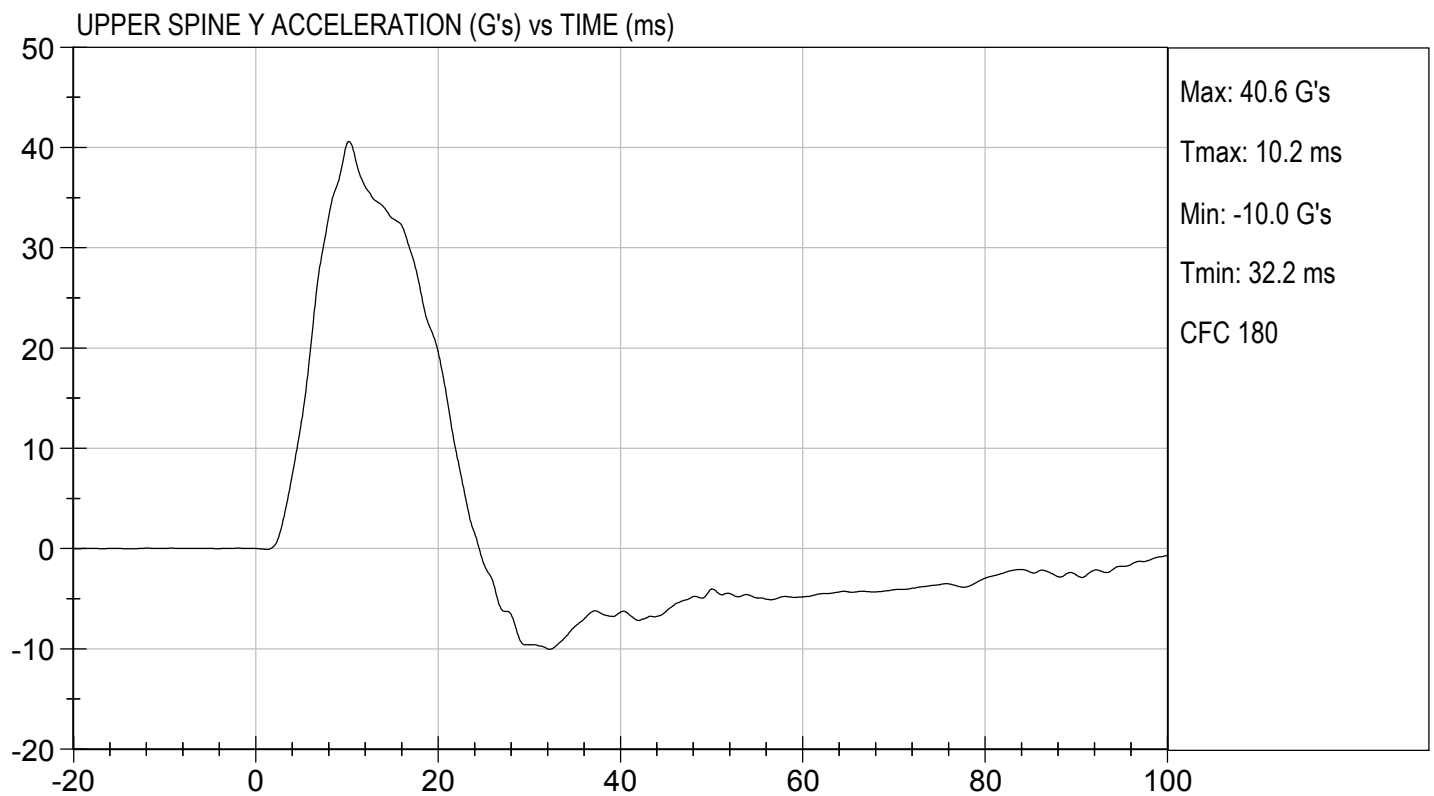
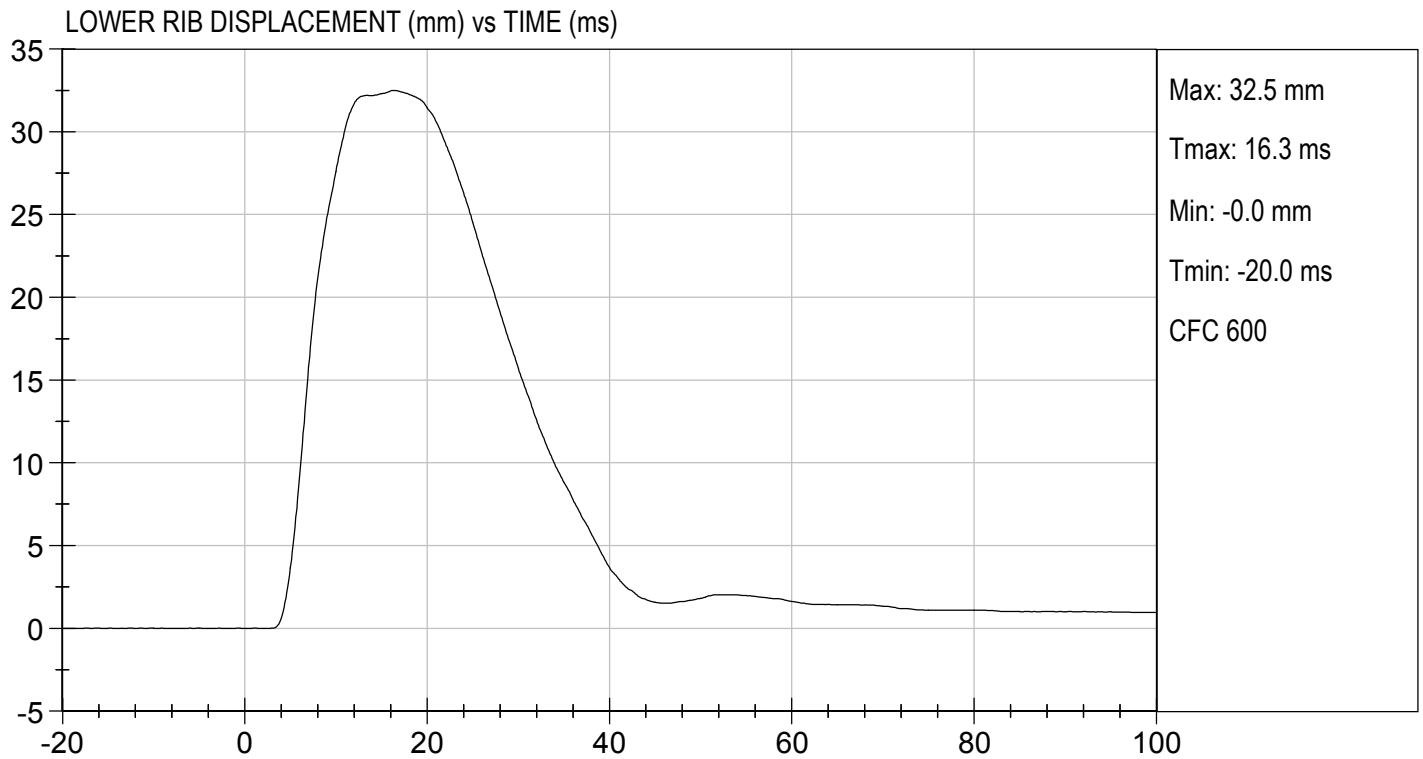
TEST DATE: 09/26/2019  
TEST #: D193044





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

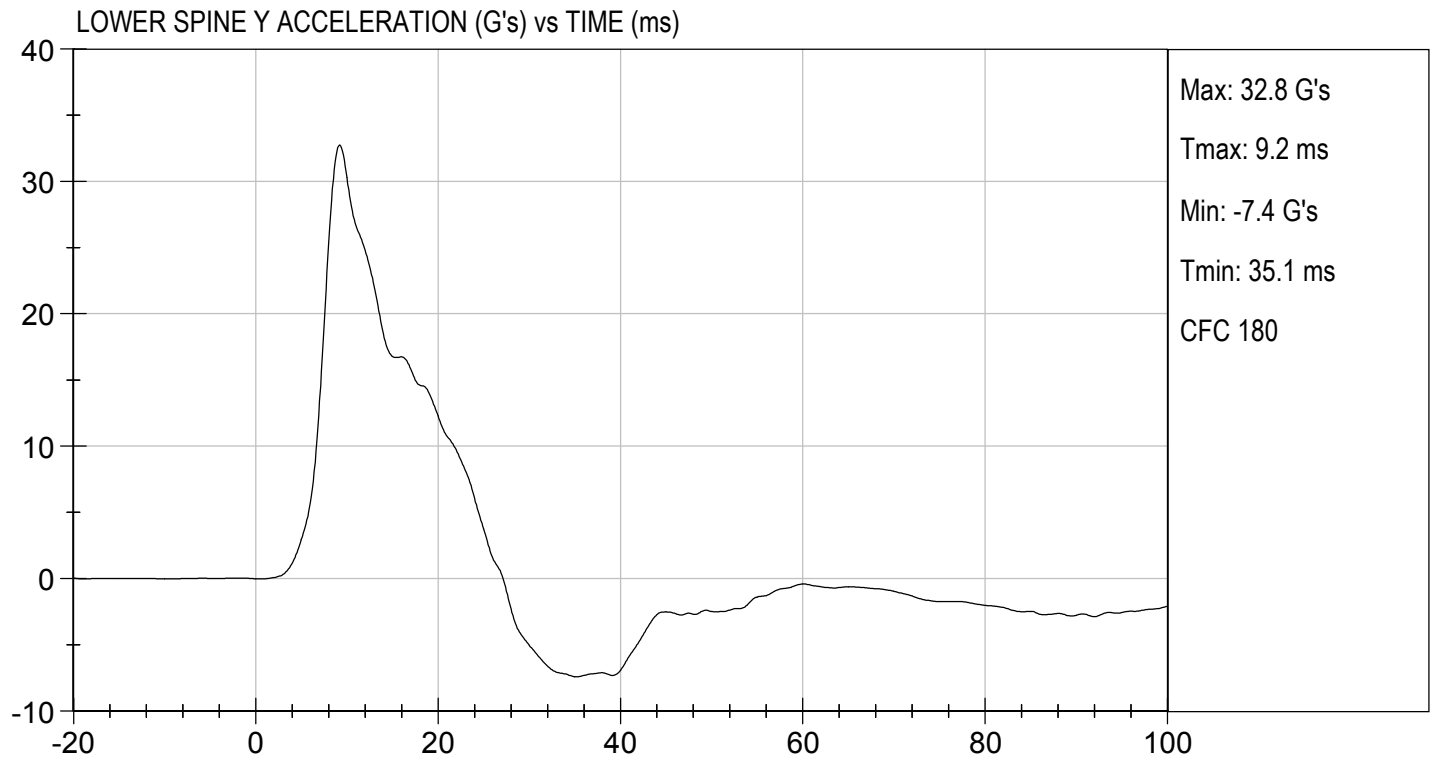
TEST DATE: 09/26/2019  
TEST #: D193044





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 09/26/2019  
TEST #: D193044



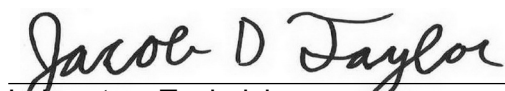


**MGA RESEARCH CORPORATION**  
**THORAX (WITHOUT ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

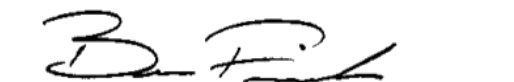
**Test I.D:** D193045

| Tested Parameter                 | Units | Specification | Result               | Pass/Fail |
|----------------------------------|-------|---------------|----------------------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.6                 | Pass      |
| Humidity                         | %     | 10 to 70      | 38                   | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.27                 | Pass      |
| Maximum Probe Acceleration       | G's   | 14 to 18      | 15                   | Pass      |
| Upper Rib Displacement           | mm    | 32 to 40      | 38                   | Pass      |
| Middle Rib Displacement          | mm    | 39 to 45      | 41                   | Pass      |
| Lower Rib Displacement           | mm    | 35 to 43      | 37                   | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 13 to 17      | 15                   | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 7 to 11       | 9                    | Pass      |
|                                  |       |               | Overall Test Results | Pass      |

  
Laboratory Technician

09/26/2019

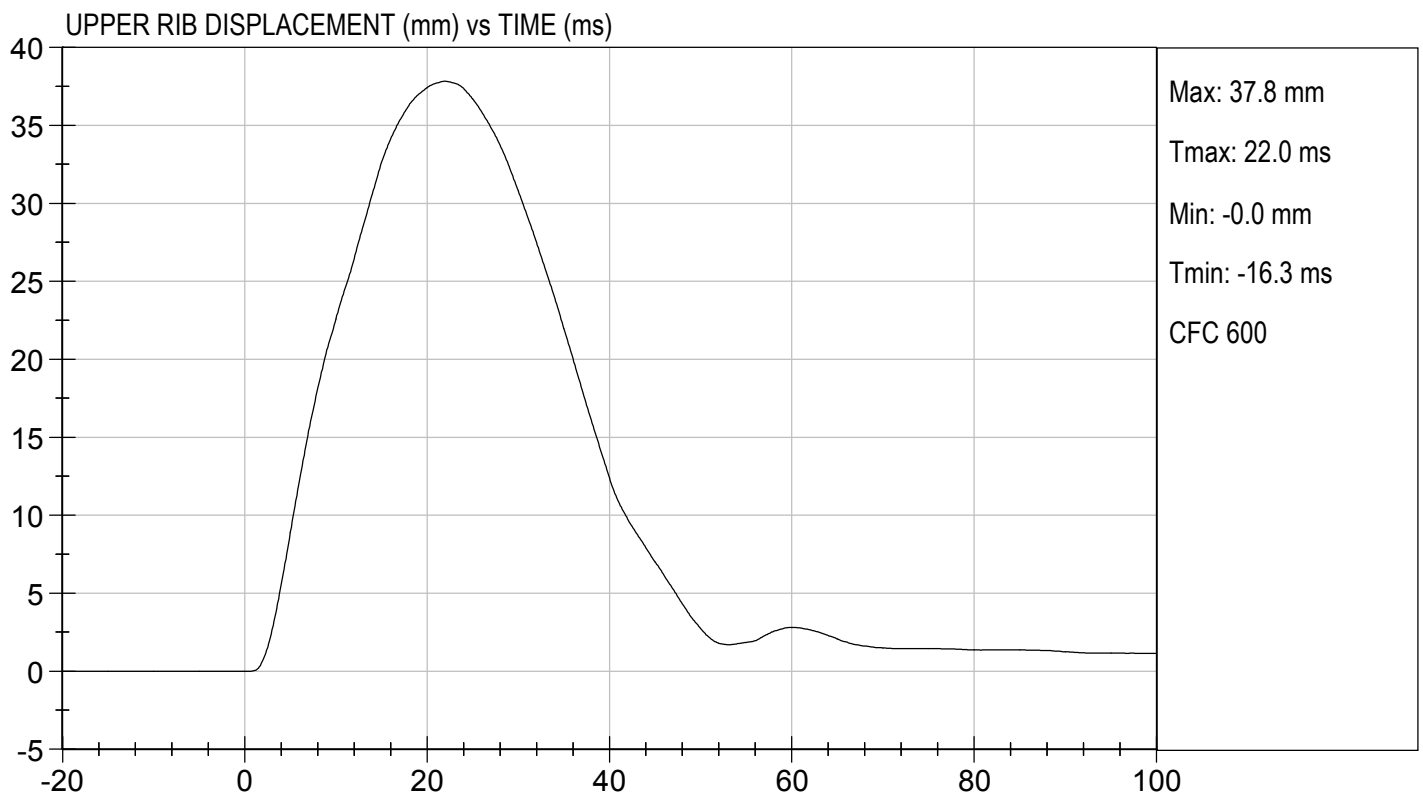
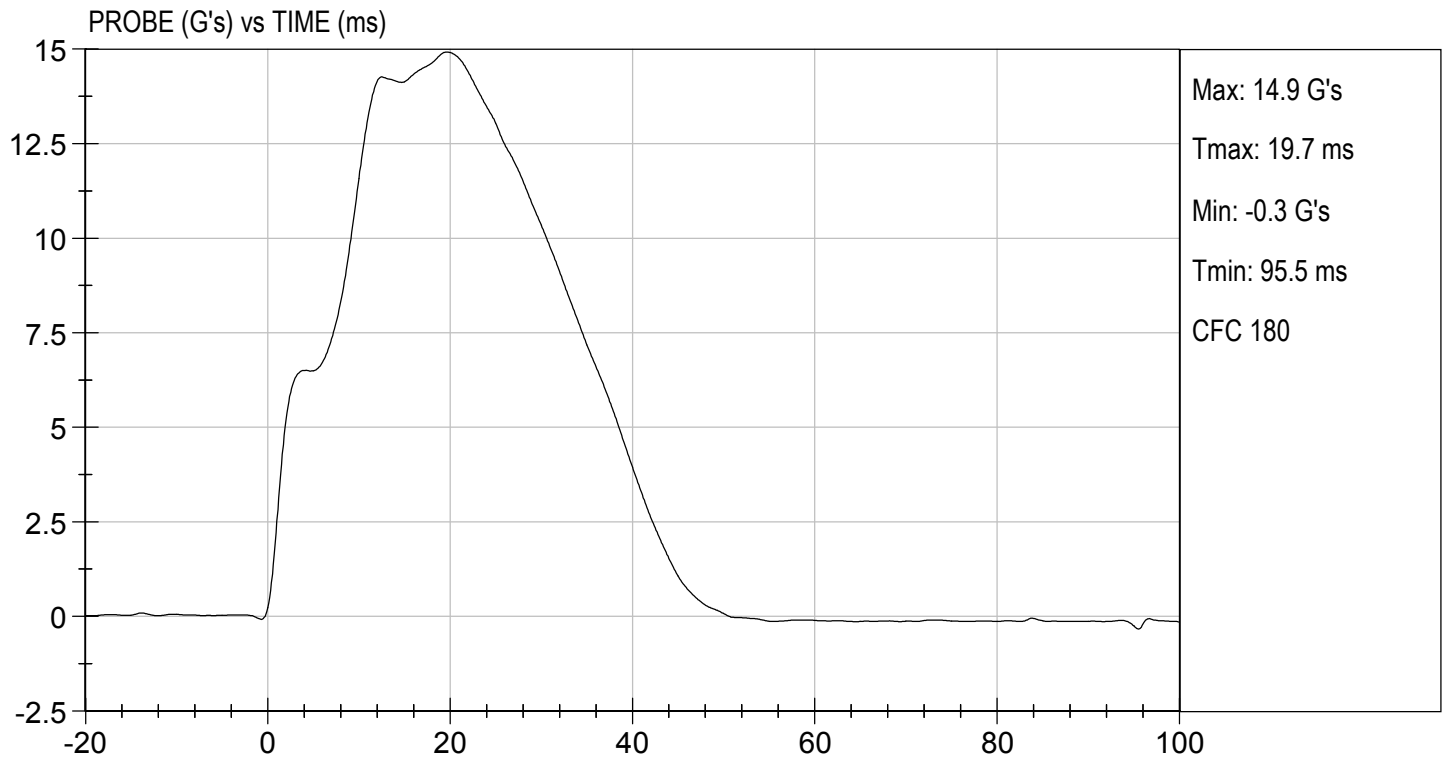
Test Date

  
Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

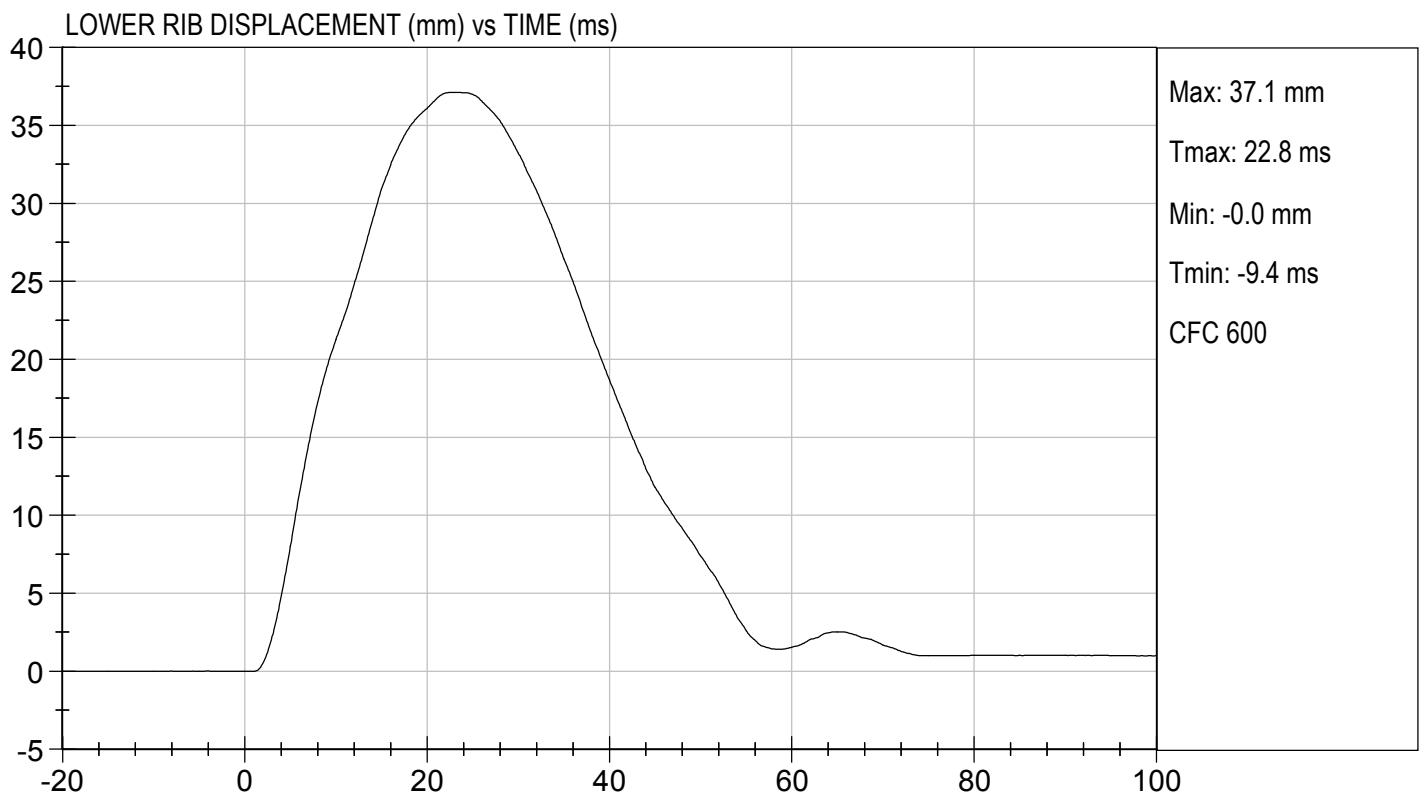
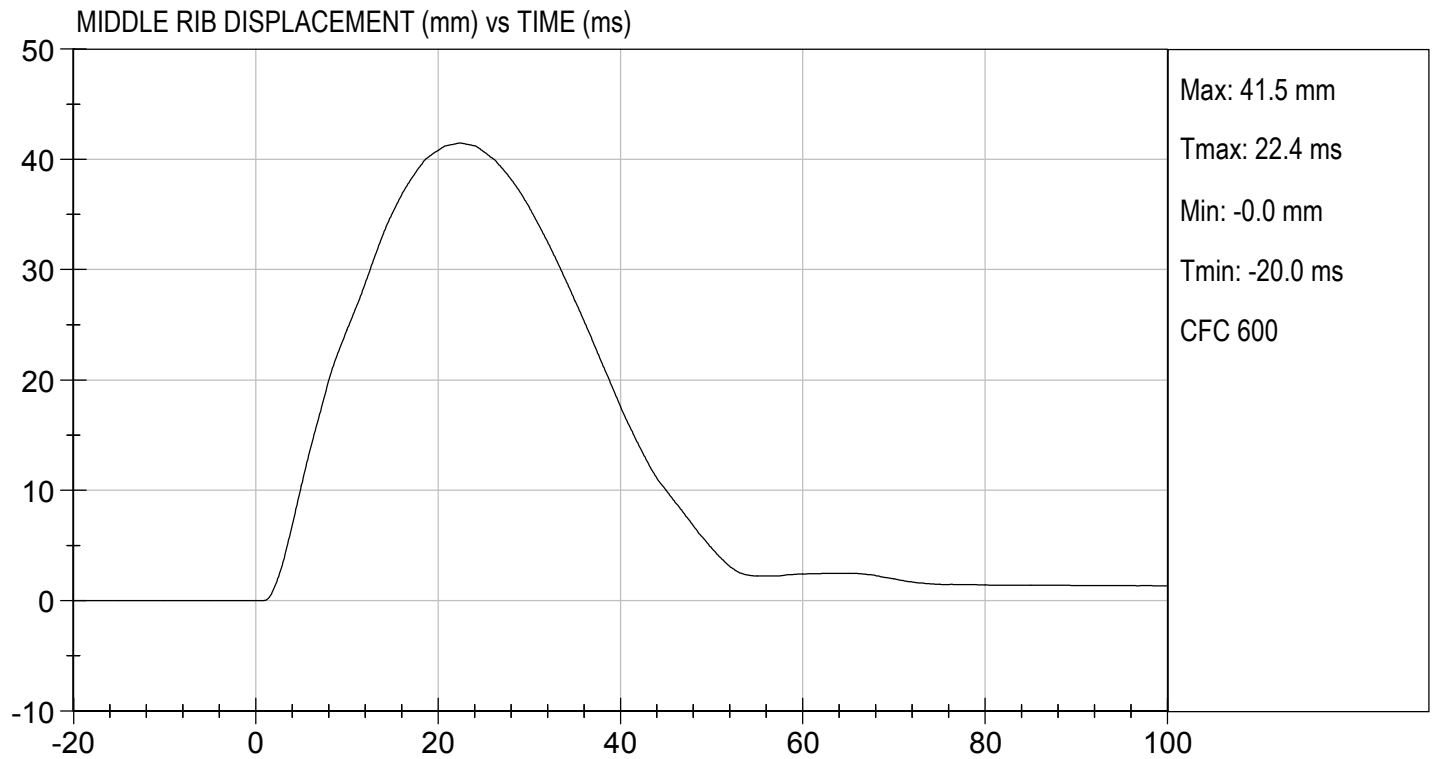
TEST DATE: 09/26/2019  
TEST #: D193045





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

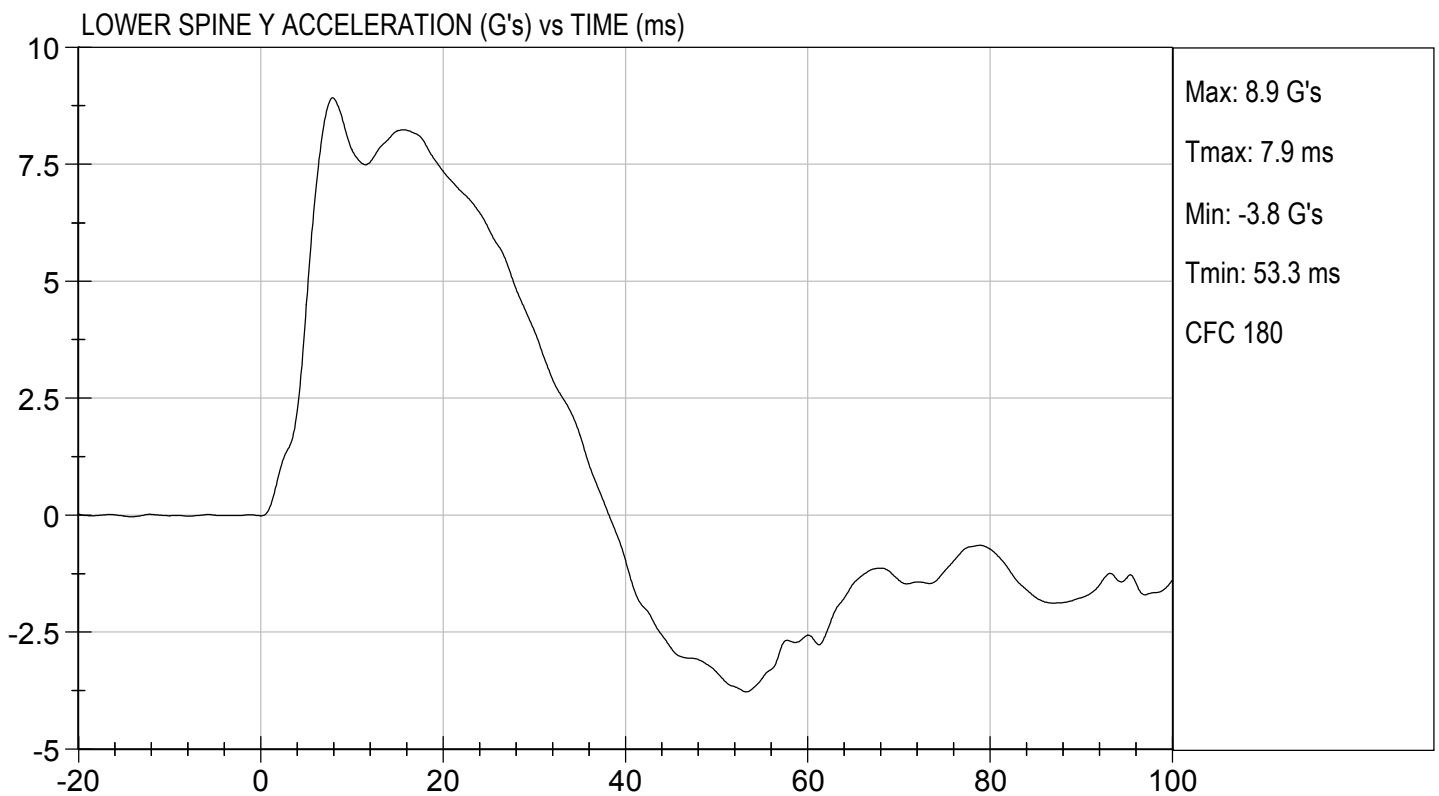
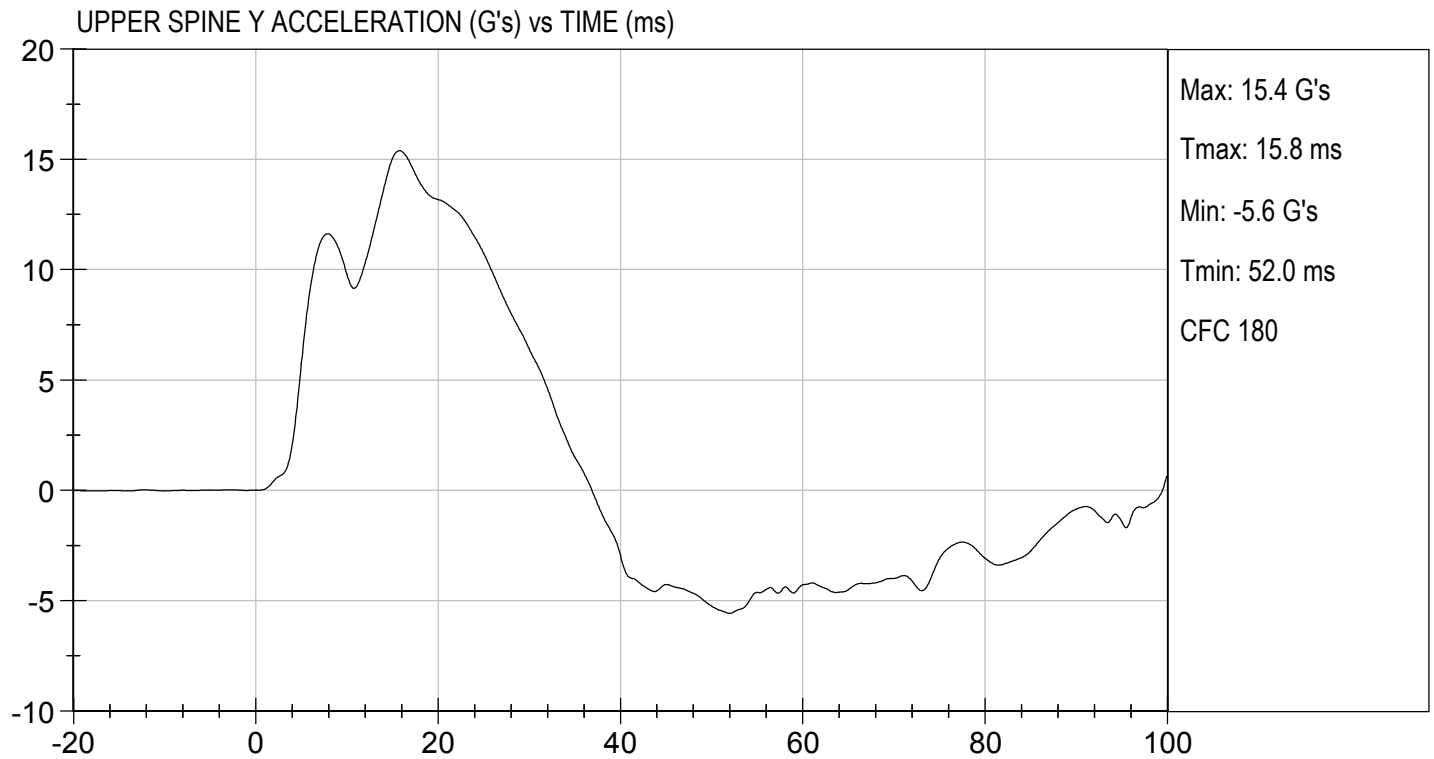
TEST DATE: 09/26/2019  
TEST #: D193045





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 09/26/2019  
TEST #: D193045



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

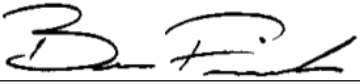
**Test I.D:** D193046

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.6   | Pass      |
| Humidity                         | %     | 10 to 70      | 38     | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.27   | Pass      |
| Maximum Probe Acceleration       | G's   | 12 to 16      | 15     | Pass      |
| Upper Abdomen Rib Displacement   | mm    | 36 to 47      | 37     | Pass      |
| Lower Abdomen Rib Displacement   | mm    | 33 to 44      | 40     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 9 to 14       | 11     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

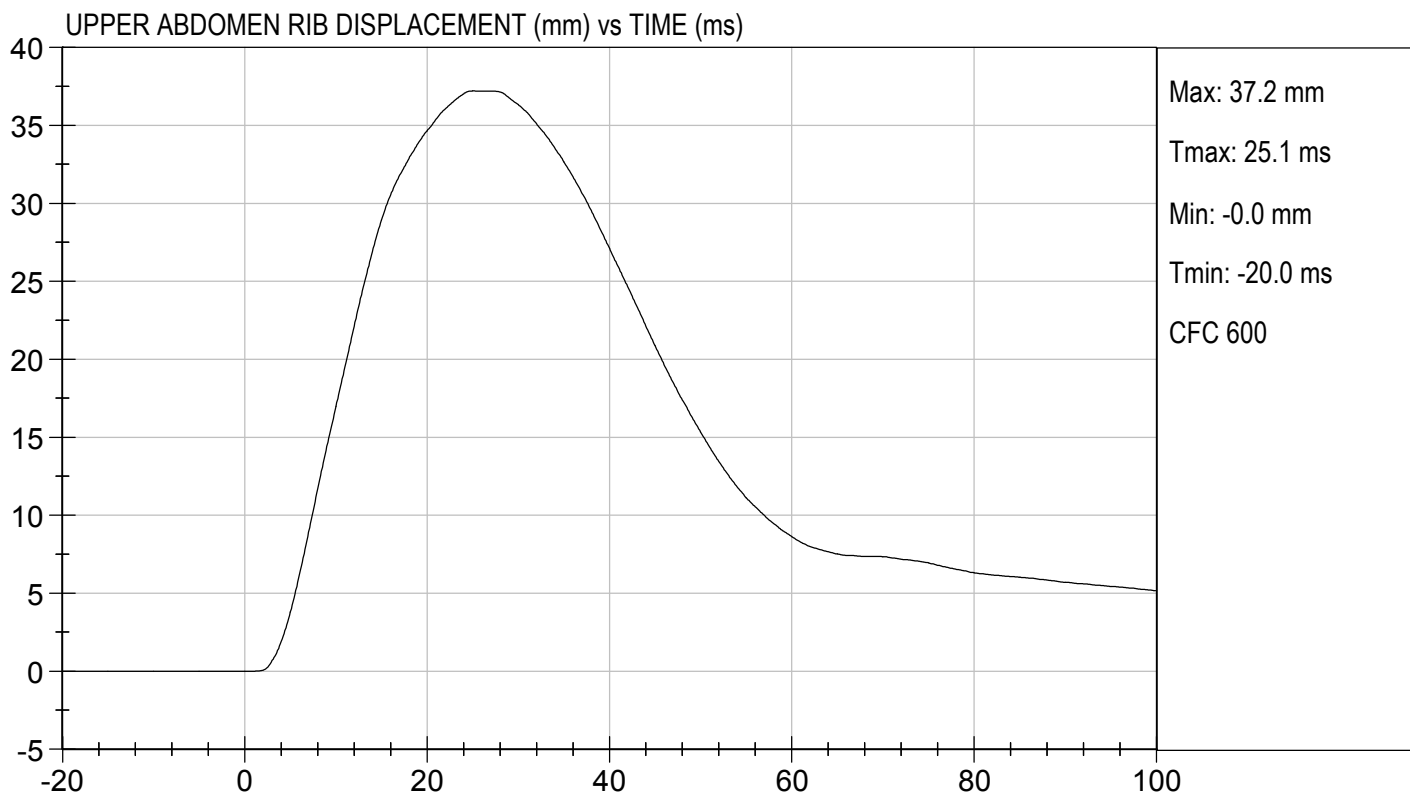
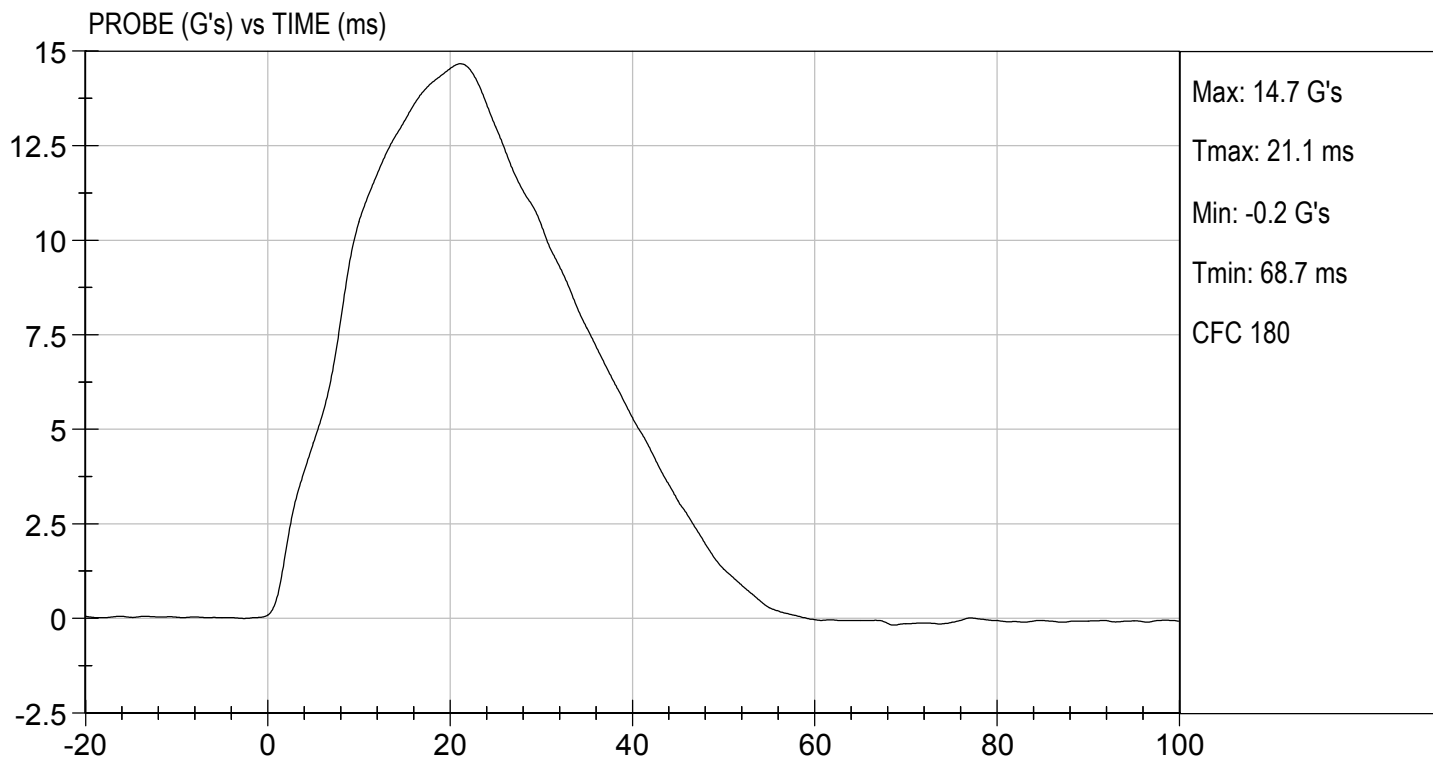
  
Laboratory Technician

09/26/2019

Test Date

  
Approved By

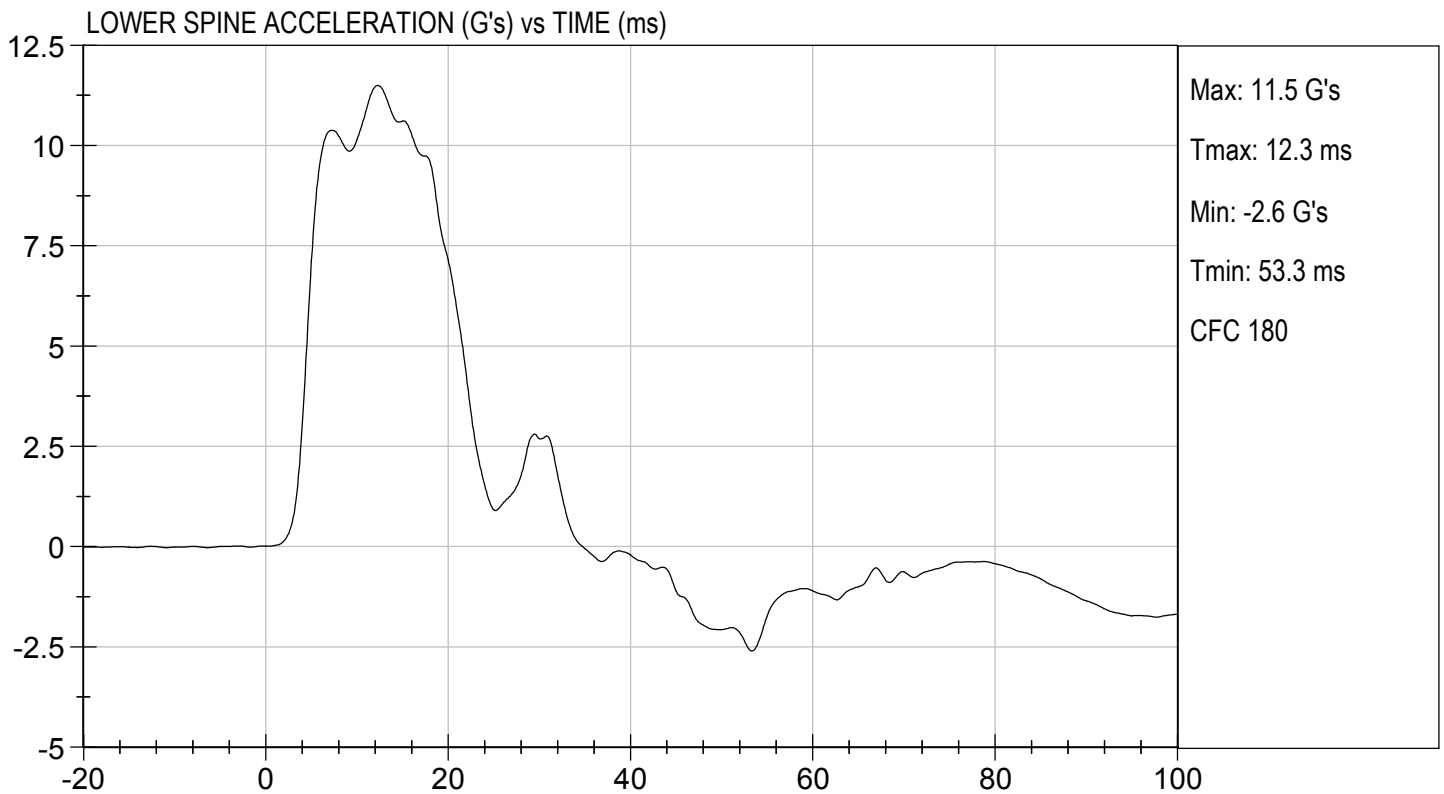
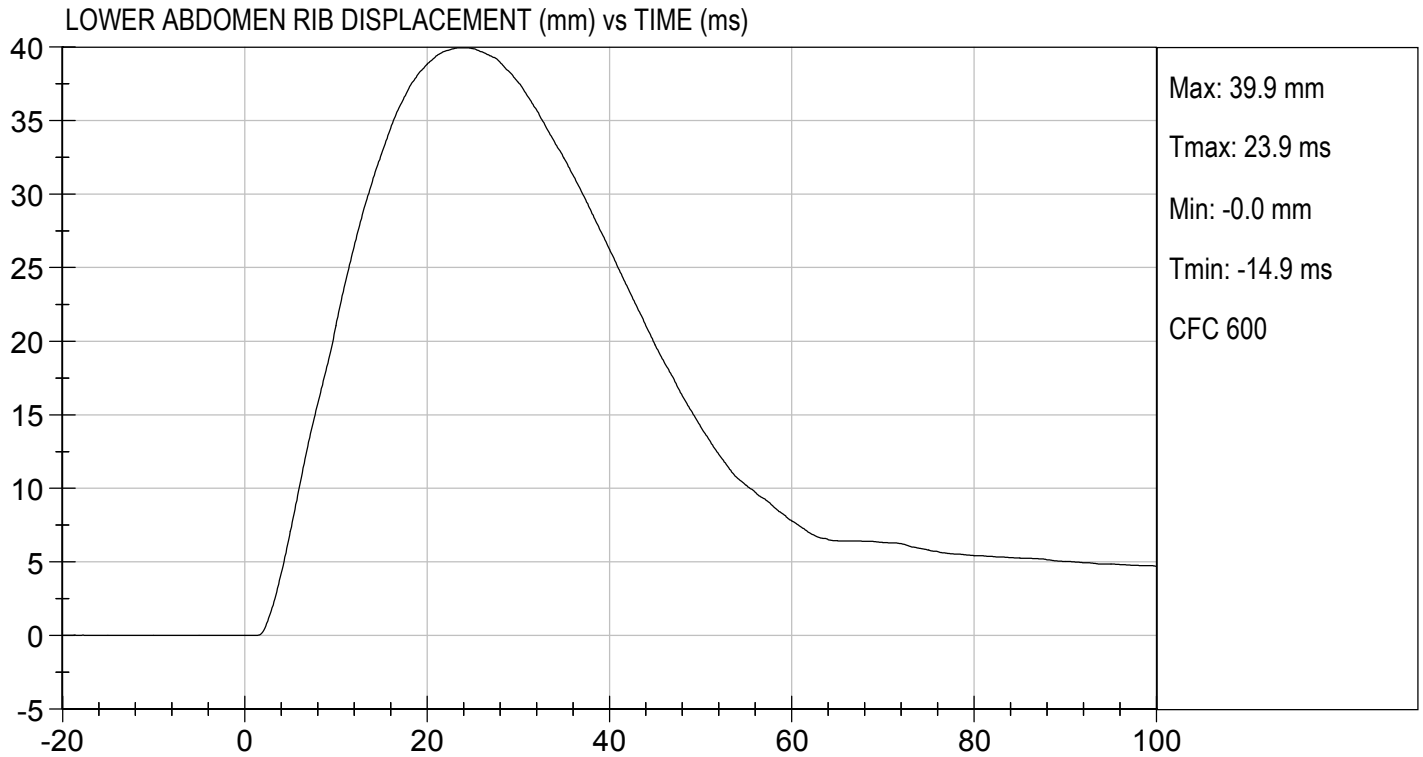






TEST DESC: ABDOMEN IMPACT  
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 09/26/2019  
TEST #: D193046



**MGA RESEARCH CORPORATION**

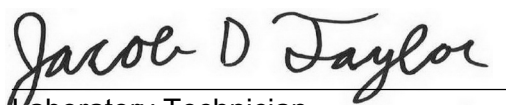
**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

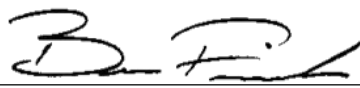
**Test I.D:** D193047

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.6   | Pass      |
| Humidity                         | %     | 10 to 70      | 38     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.60   | Pass      |
| Maximum Probe Acceleration       | G's   | 38 to 47      | 45     | Pass      |
| Pelvis Y Acceleration After 6 ms | G's   | 34 to 42      | 34     | Pass      |
| Peak Acetabulum Force            | N     | 3600 to 4300  | 4,082  | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

09/26/2019

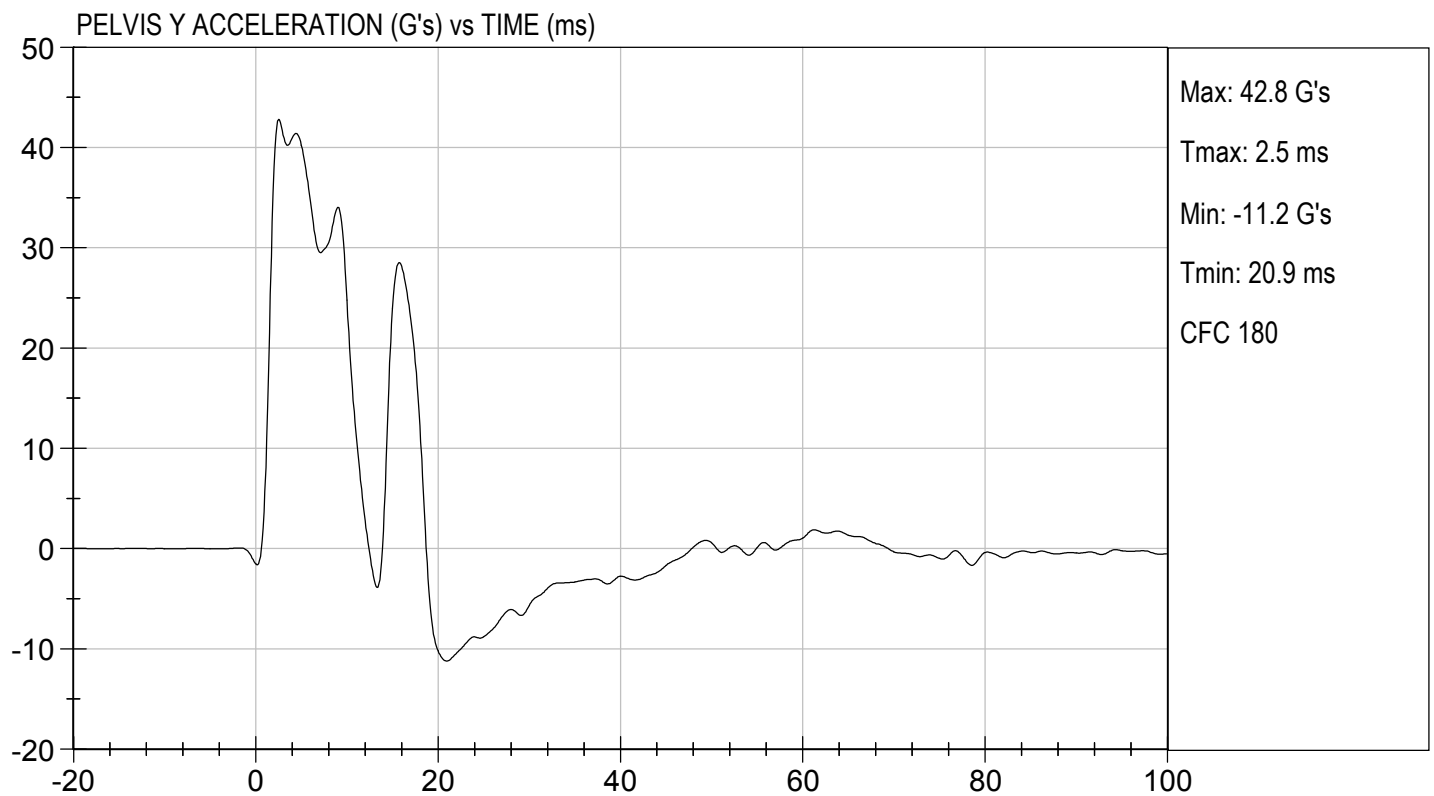
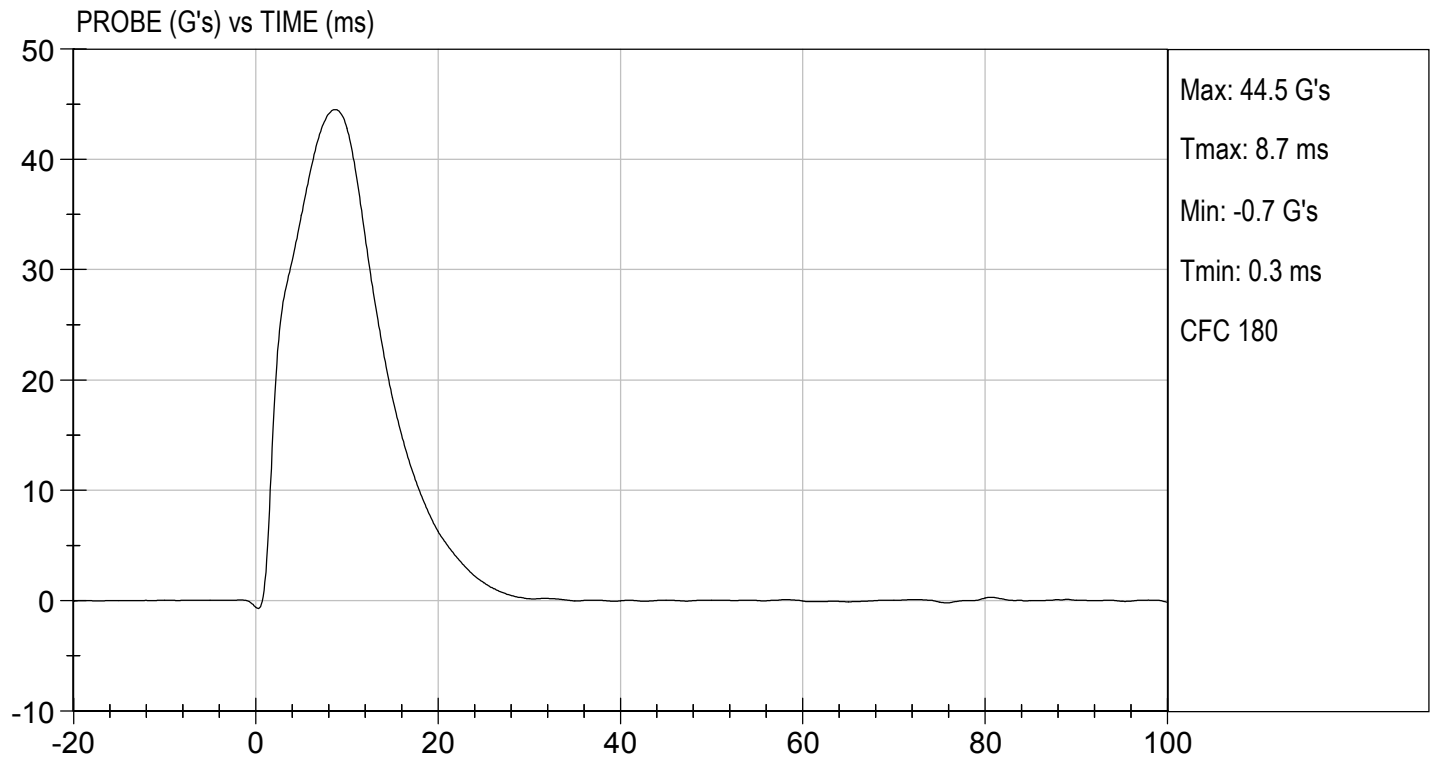
Test Date

  
Approved By



TEST DESC: PELVIS IMPACT  
VELOCITY: 21.65 ft/s, 6.60 m/s

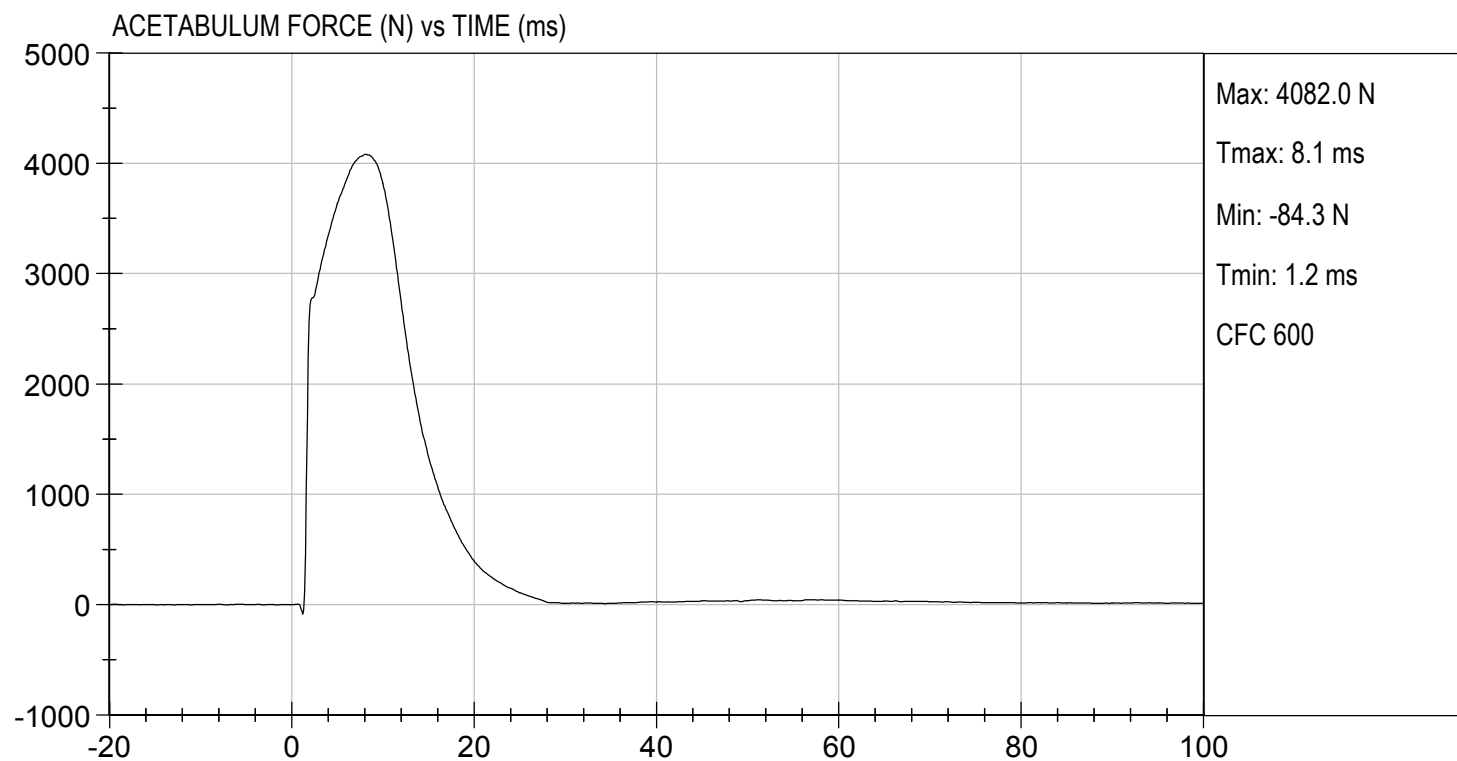
TEST DATE: 09/26/2019  
TEST #: D193047





TEST DESC: PELVIS IMPACT  
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 09/26/2019  
TEST #: D193047





**MGA RESEARCH CORPORATION**

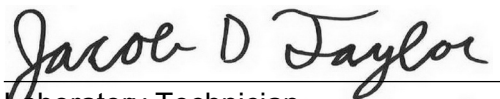
**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

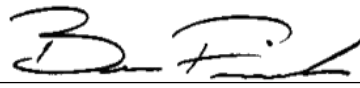
**Test I.D:** D193048

| Tested Parameter           | Units | Specification | Result | Pass/Fail |
|----------------------------|-------|---------------|--------|-----------|
| Temperature                | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Humidity                   | %     | 10 to 70      | 44     | Pass      |
| Impact Velocity            | m/s   | 4.20 to 4.40  | 4.38   | Pass      |
| Maximum Probe Acceleration | G's   | 36 to 45      | 40     | Pass      |
| Pelvis Y Acceleration      | G's   | 28 to 39      | 32     | Pass      |
| Peak Pelvis Iliac Force    | N     | 4100 to 5100  | 4,431  | Pass      |
| Overall Test Results       |       |               |        | Pass      |

  
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09/25/2019

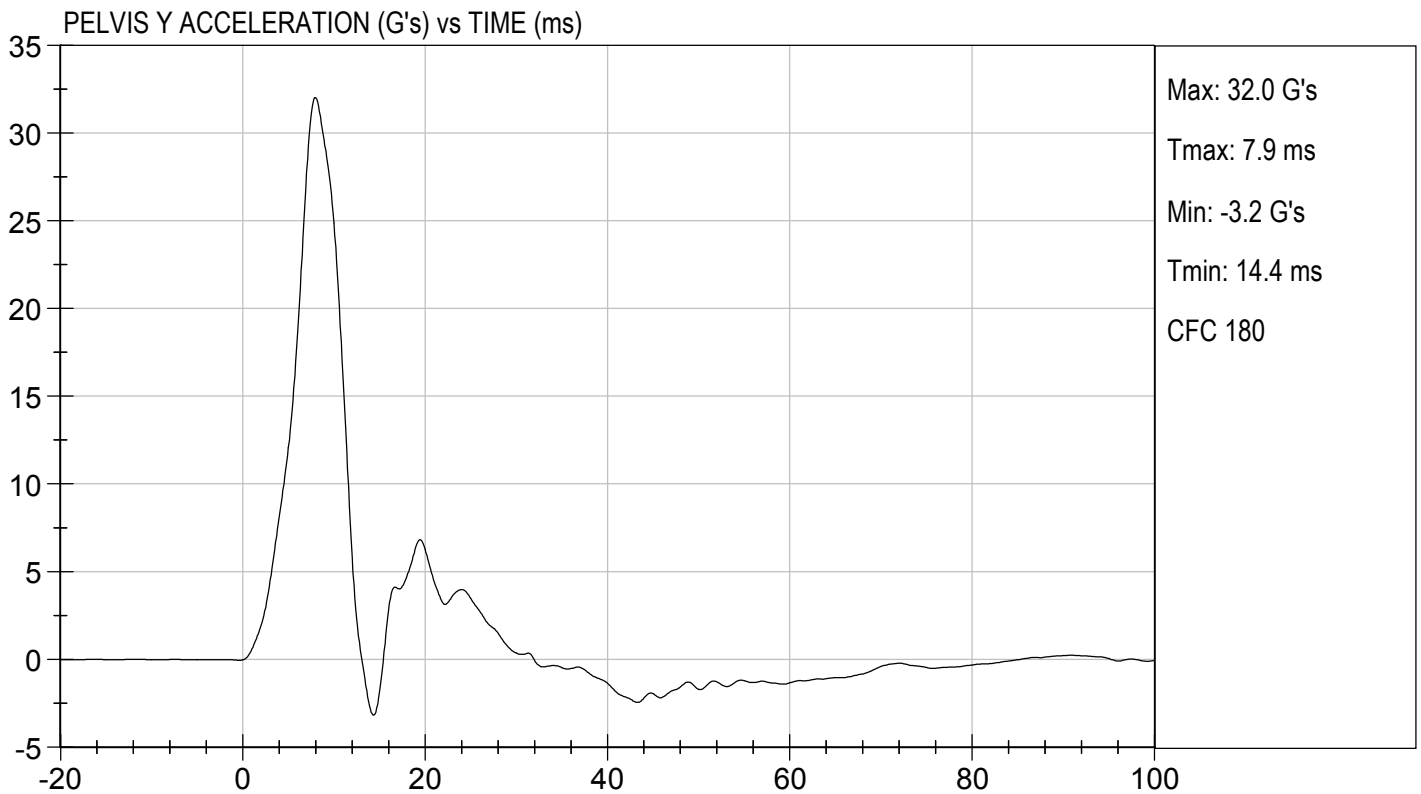
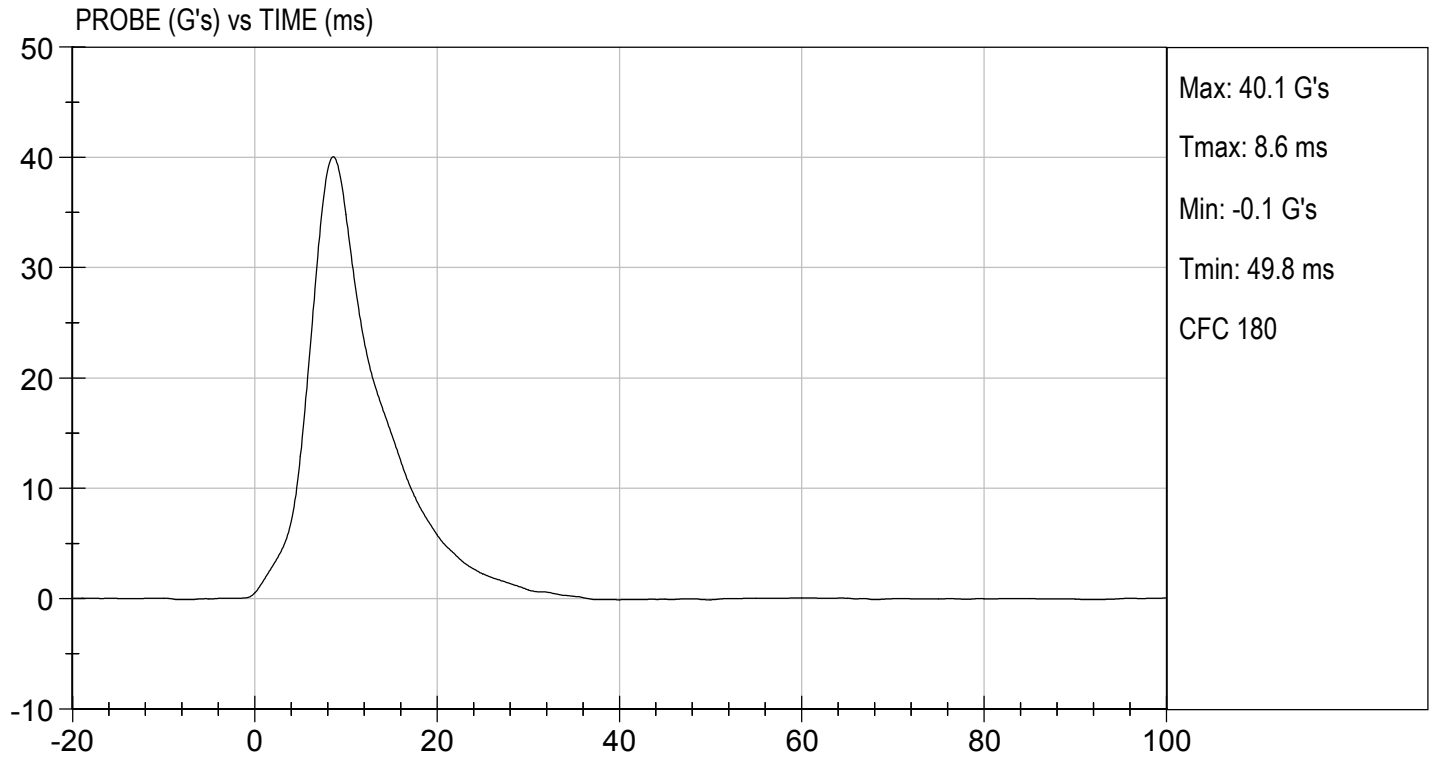
Test Date

  
Approved By



TEST DESC: ILLIAC  
VELOCITY: 14.37 ft/s, 4.38 m/s

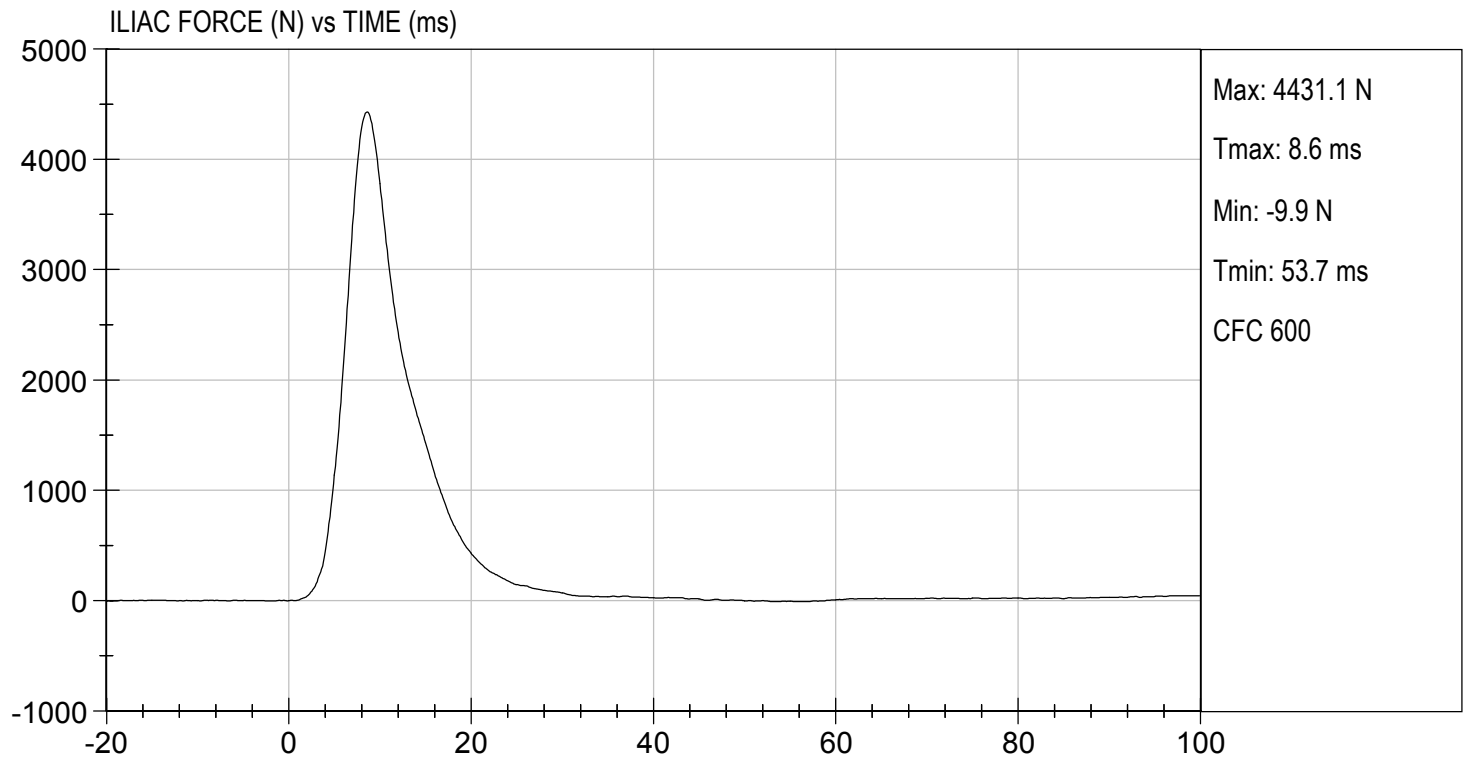
TEST DATE: 09/25/2019  
TEST #: D193048





TEST DESC: ILLIAC  
VELOCITY: 14.37 ft/s, 4.38 m/s

TEST DATE: 09/25/2019  
TEST #: D193048



## **CALIBRATION TEST RESULTS**

### **POST-TEST**

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

**SID-IIsD External Measurements**  
**SN: 306**

| No.      | Name                          | Spec. (mm) | Result | Pass/Fail |
|----------|-------------------------------|------------|--------|-----------|
| <b>A</b> | Sitting Height                | 772 - 788  | 785    | Pass      |
| <b>B</b> | Shoulder Pivot Height         | 437 - 453  | 449    | Pass      |
| <b>C</b> | H-point Height                | 79 - 89    | 86     | Pass      |
| <b>D</b> | H-point from Seatback         | 141 - 151  | 147    | Pass      |
| <b>E</b> | Shoulder Pivot from Backline  | 97 - 107   | 99     | Pass      |
| <b>F</b> | Thigh Clearance               | 119 -135   | 120    | Pass      |
| <b>G</b> | Head Breadth                  | 140 - 148  | 141    | Pass      |
| <b>H</b> | Head Back from Backline       | 40 - 46    | 45     | Pass      |
| <b>I</b> | Head Depth                    | 178 - 188  | 182    | Pass      |
| <b>J</b> | Head Circumference            | 541 - 551  | 550    | Pass      |
| <b>K</b> | Buttock to Knee Length        | 514 - 540  | 538    | Pass      |
| <b>L</b> | Popliteal Height              | 343 - 369  | 349    | Pass      |
| <b>M</b> | Knee Pivot to Floor Height    | 392 - 409  | 394    | Pass      |
| <b>N</b> | Buttock Popliteal Length      | 416 - 442  | 435    | Pass      |
| <b>O</b> | Chest Depth w/o Jacket        | 195 - 211  | 198    | Pass      |
| <b>P</b> | Foot Length                   | 216 - 232  | 222    | Pass      |
| <b>Q</b> | Hip Breadth (w/ pelvic plugs) | 313 - 323  | 317    | Pass      |
| <b>R</b> | Arm Length                    | 249 - 259  | 250    | Pass      |
| <b>S</b> | Knee Joint to Seatback        | 477 - 493  | 483    | Pass      |
| <b>V</b> | Shoulder Width                | 341 - 357  | 351    | Pass      |
| <b>W</b> | Foot Width                    | 78 - 94    | 82     | Pass      |
| <b>Y</b> | Chest Circumference w/ jacket | 851 - 881  | 863    | Pass      |
| <b>Z</b> | Waist Circumference           | 761 - 791  | 782    | Pass      |

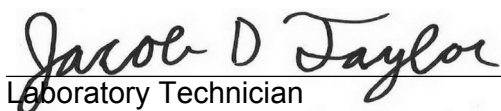


**MGA RESEARCH CORPORATION**  
**HEAD DROP TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

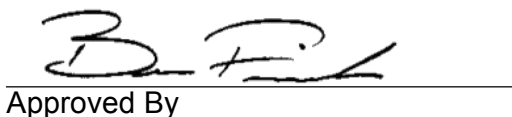
**Test ID:** D193281

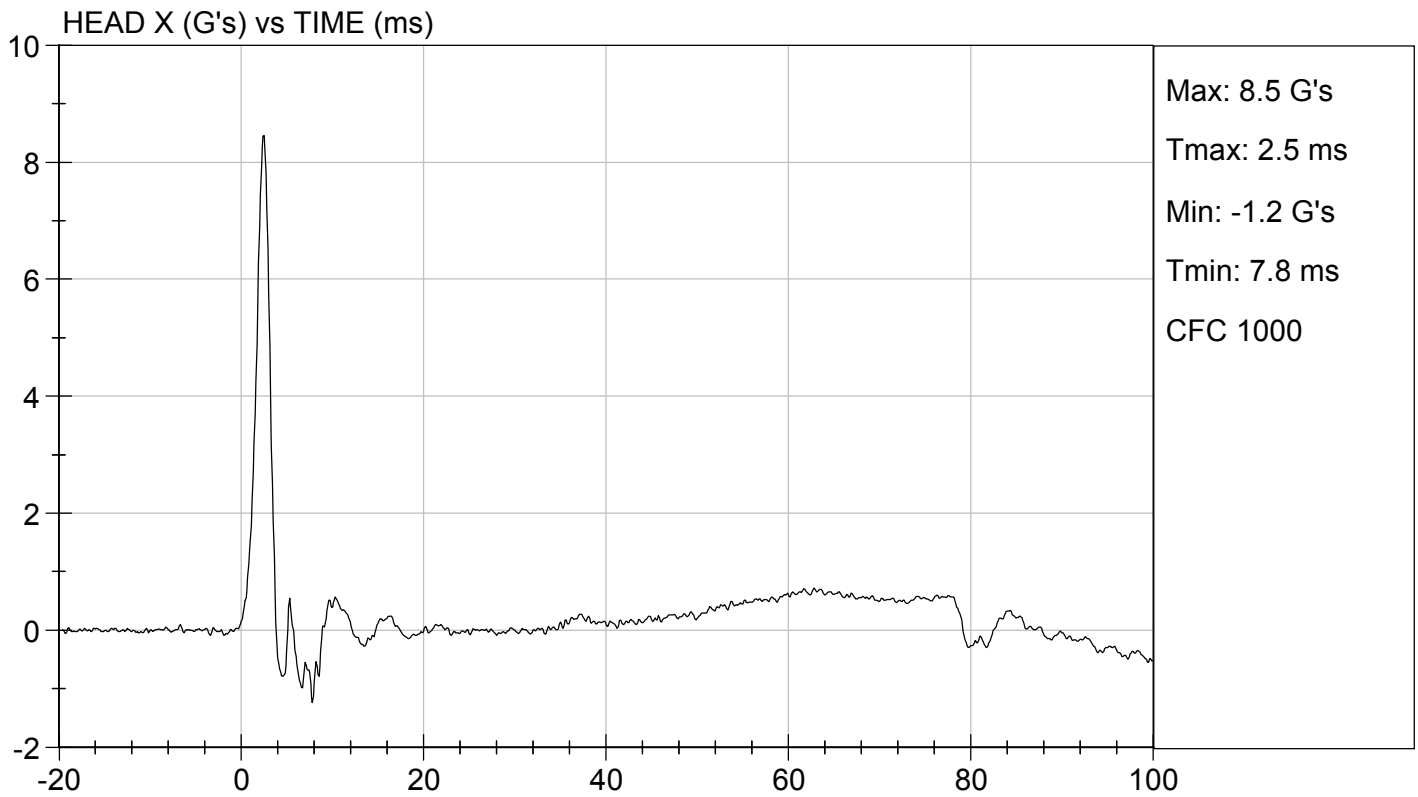
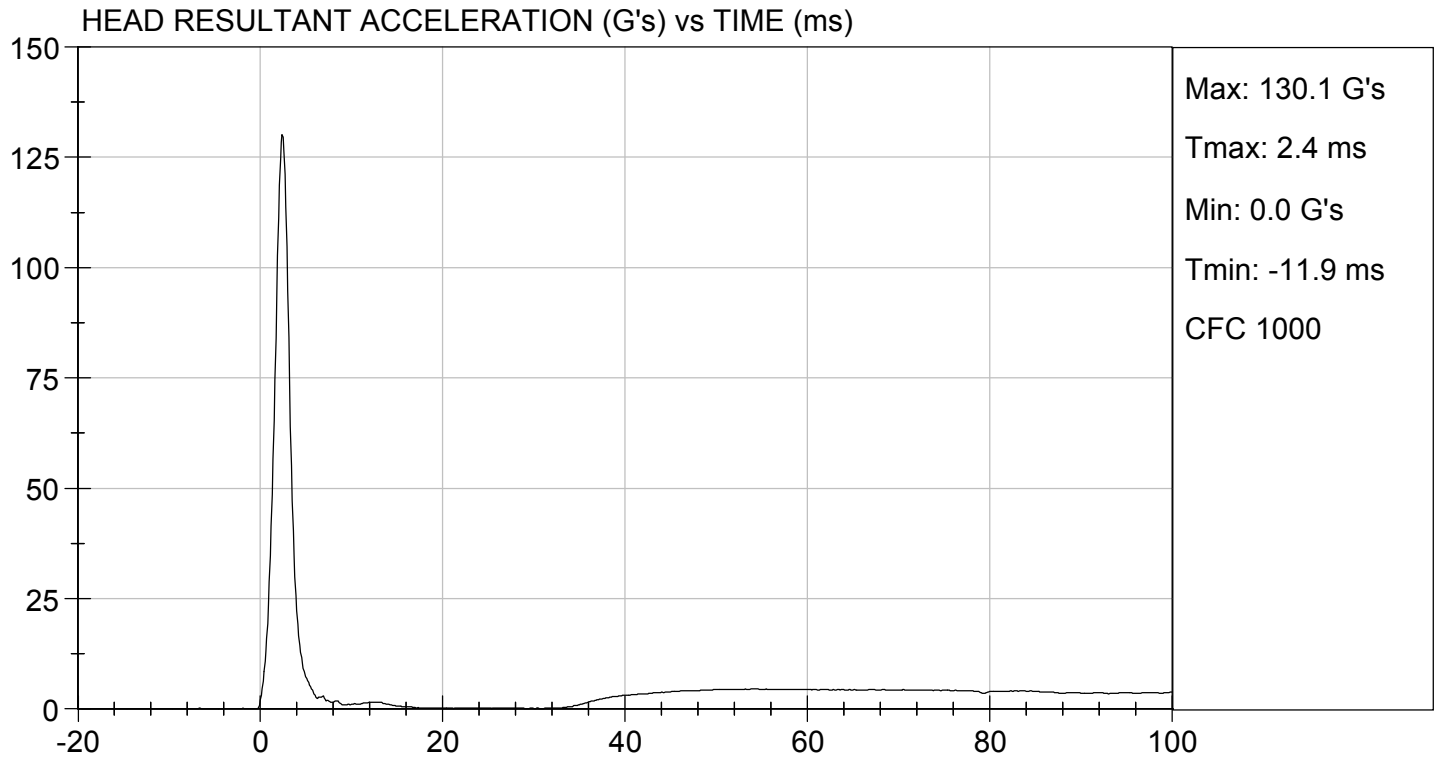
| Tested Parameter               | Units | Specification | Result               | Pass/Fail |
|--------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature         | deg C | 20.6 to 22.2  | 21                   | Pass      |
| Laboratory Relative Humidity   | %     | 10 to 70      | 33                   | Pass      |
| Peak Resultant Acceleration    | G's   | 115 to 137    | 130                  | Pass      |
| Peak Longitudinal Acceleration | G's   | +/- 15        | 8.5                  | Pass      |
| Unimodal                       | N/A   | Yes           | Yes                  | Pass      |
| Oscillations                   | N/A   | <15%          | Yes                  | Pass      |
|                                |       |               | Overall Test Results | Pass      |

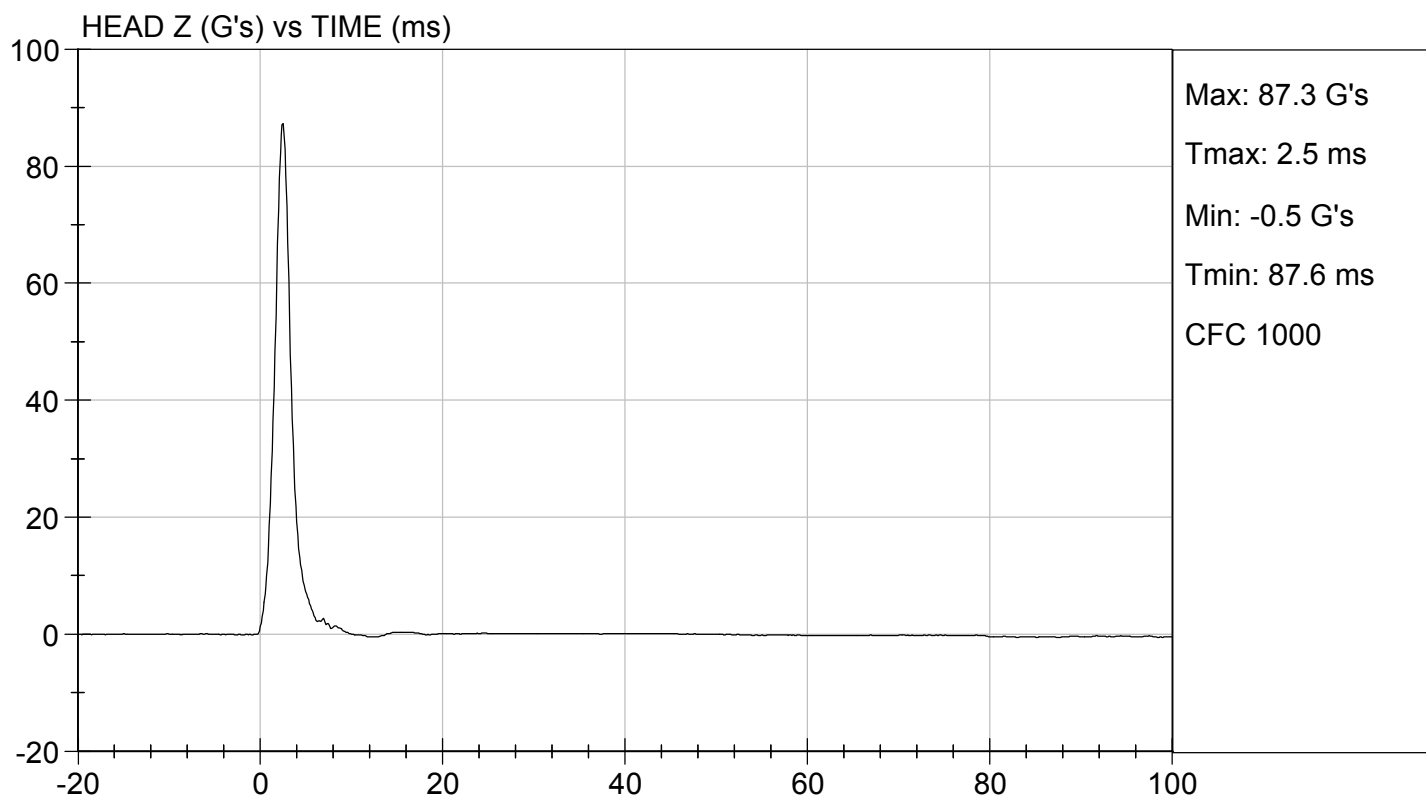
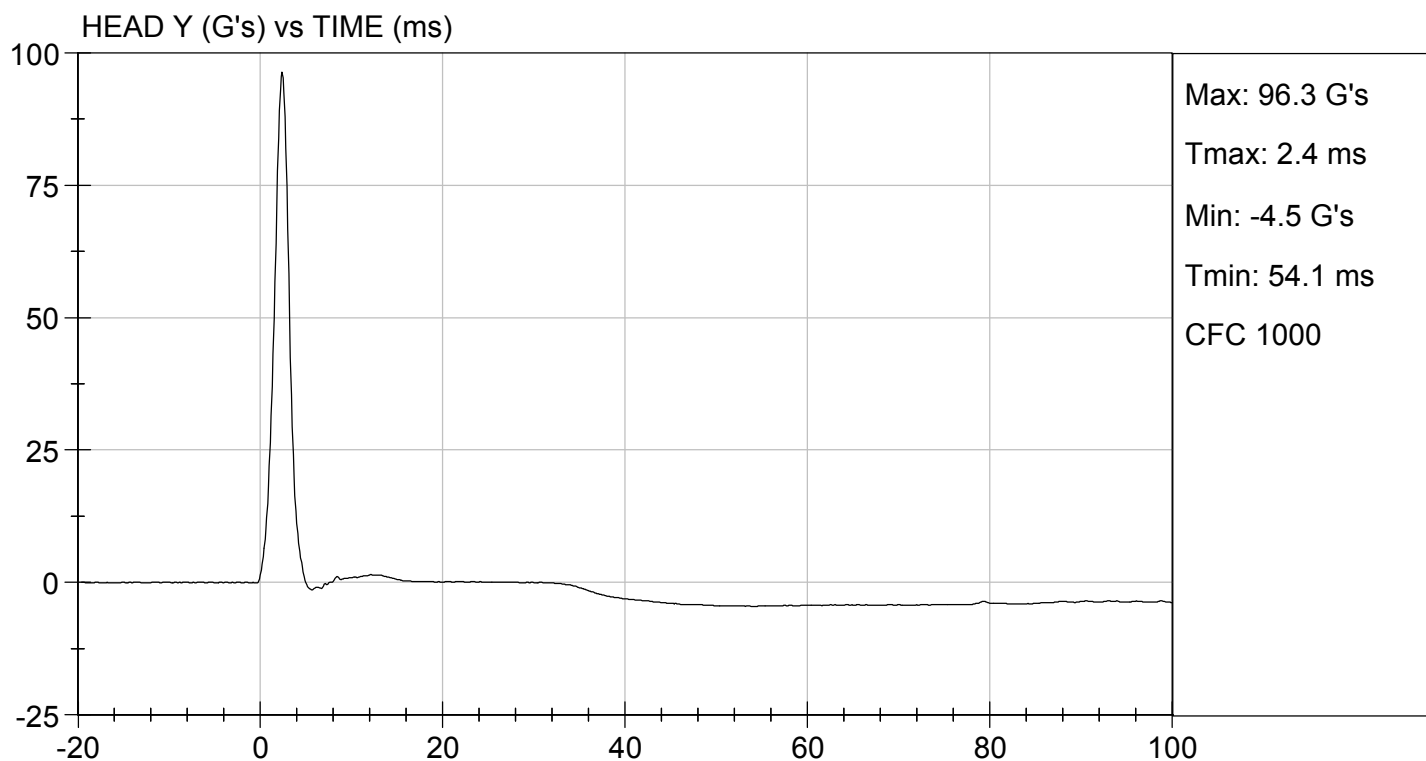
  
Laboratory Technician

10/18/2019

Test Date

  
Approved By



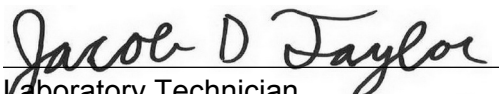


**MGA RESEARCH CORPORATION**  
**LATERAL NECK PENDULUM TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

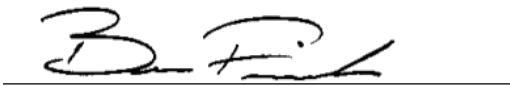
**Test I.D:** D193282

| Tested Parameter                 |           | Units | Specification | Result | Pass/Fail |
|----------------------------------|-----------|-------|---------------|--------|-----------|
| Temperature                      |           | deg C | 20.6 to 22.2  | 21.1   | Pass      |
| Humidity                         |           | %     | 10 to 70      | 33     | Pass      |
| Impact Velocity                  |           | m/s   | 5.51 to 5.63  | 5.62   | Pass      |
| Pendulum Velocity                | 10 ms     | m/s   | 2.20 to 2.80  | 2.41   | Pass      |
|                                  | 15 ms     | m/s   | 3.30 to 4.10  | 3.63   | Pass      |
|                                  | 20 ms     | m/s   | 4.40 to 5.40  | 4.93   | Pass      |
|                                  | 25 ms     | m/s   | 5.40 to 6.10  | 5.68   | Pass      |
|                                  | 25-100 ms | m/s   | 5.50 to 6.20  | 5.68   | Pass      |
| Maximum D-Plane Rotation         |           | deg   | 71 to 81      | 72     | Pass      |
| Time of Maximum D-Plane Rotation |           | ms    | 50 to 70      | 60     | Pass      |
| Maximum Occipital Condyle Moment |           | Nm    | -44 to -36    | -37    | Pass      |
| Time of Moment Decay to 0 Nm     |           | ms    | 102 to 126    | 117    | Pass      |
| Overall Test Results             |           |       |               |        | Pass      |

  
 Laboratory Technician

10/18/2019

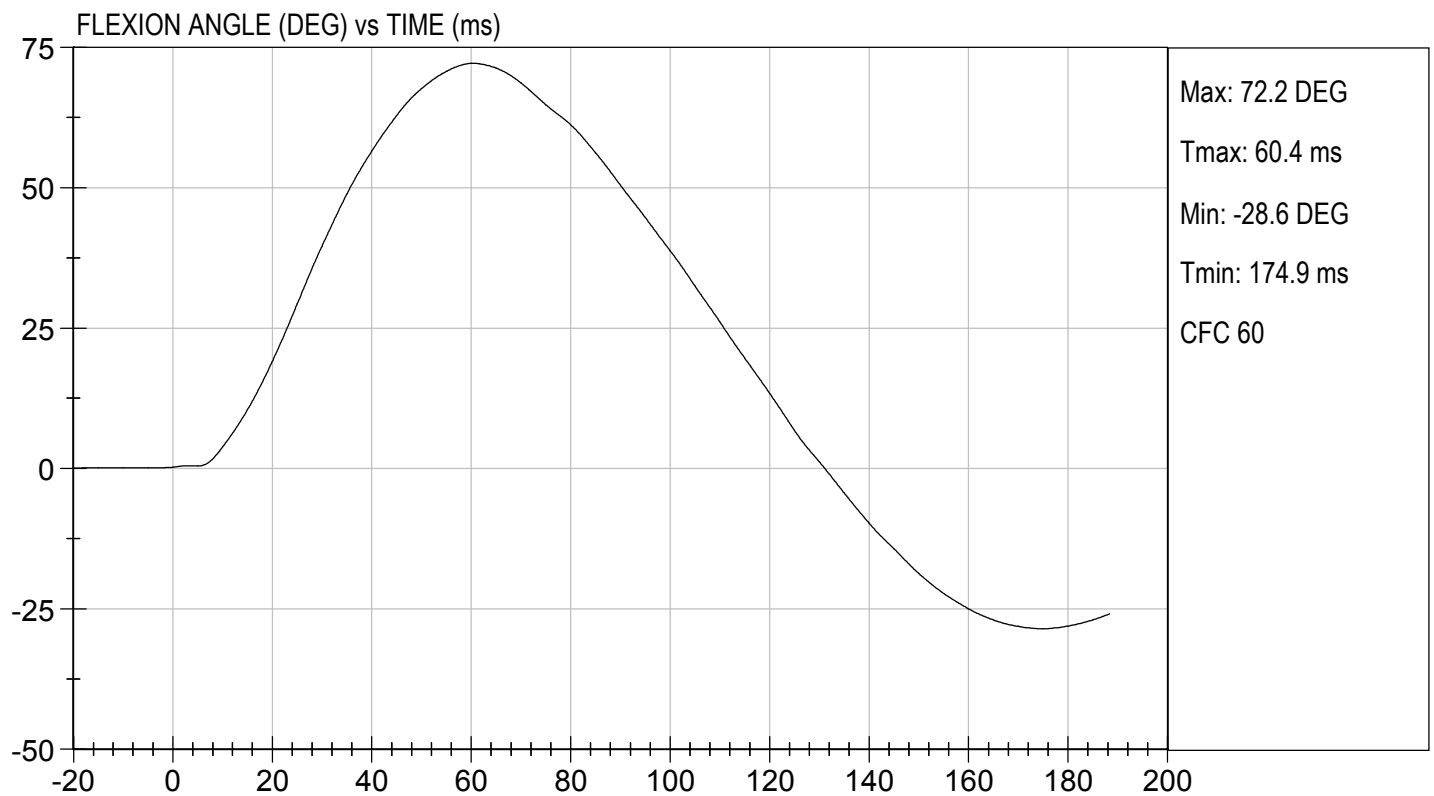
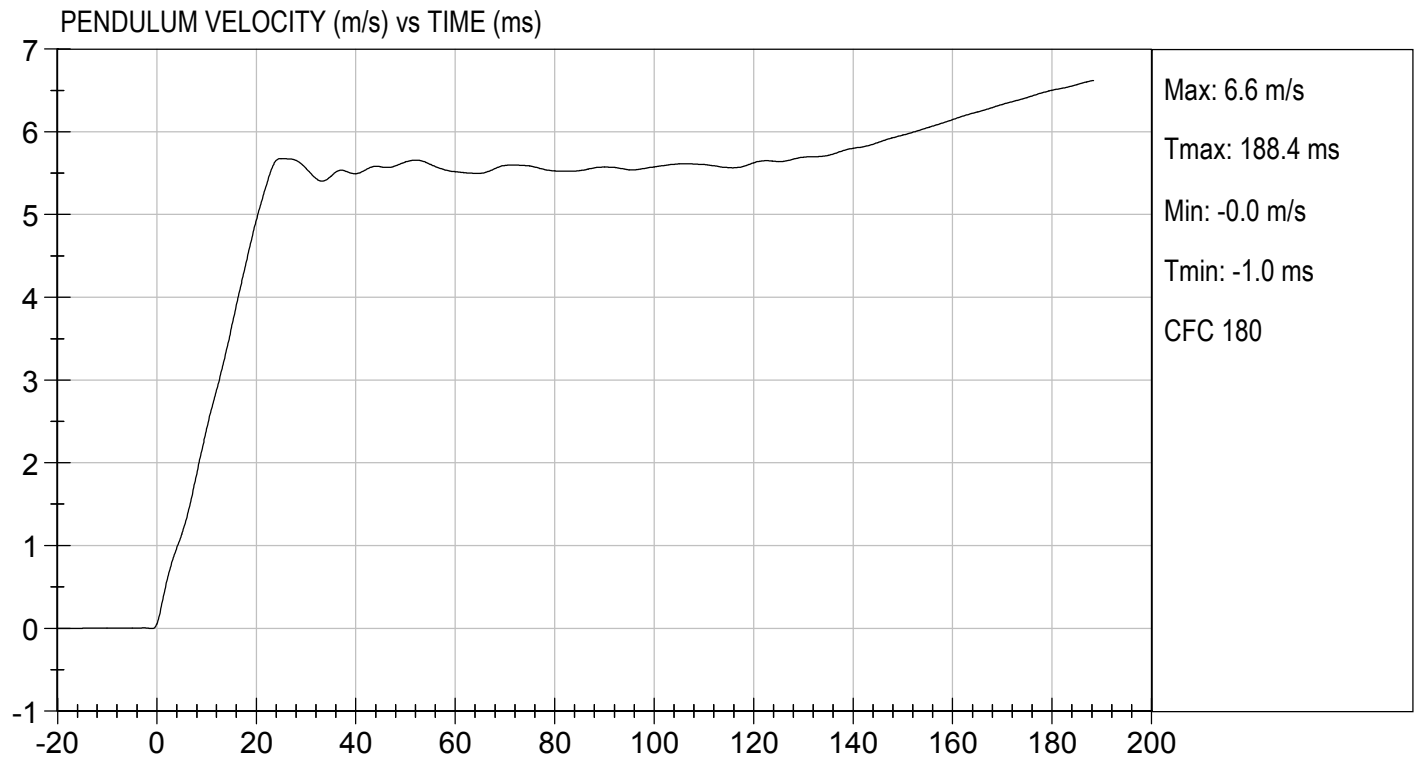
Test Date

  
 Approved By



TEST DESC: NECK BENDING  
VELOCITY: 18.45 ft/s, 5.62 m/s

TEST DATE: 10/18/2019  
TEST #: D193282

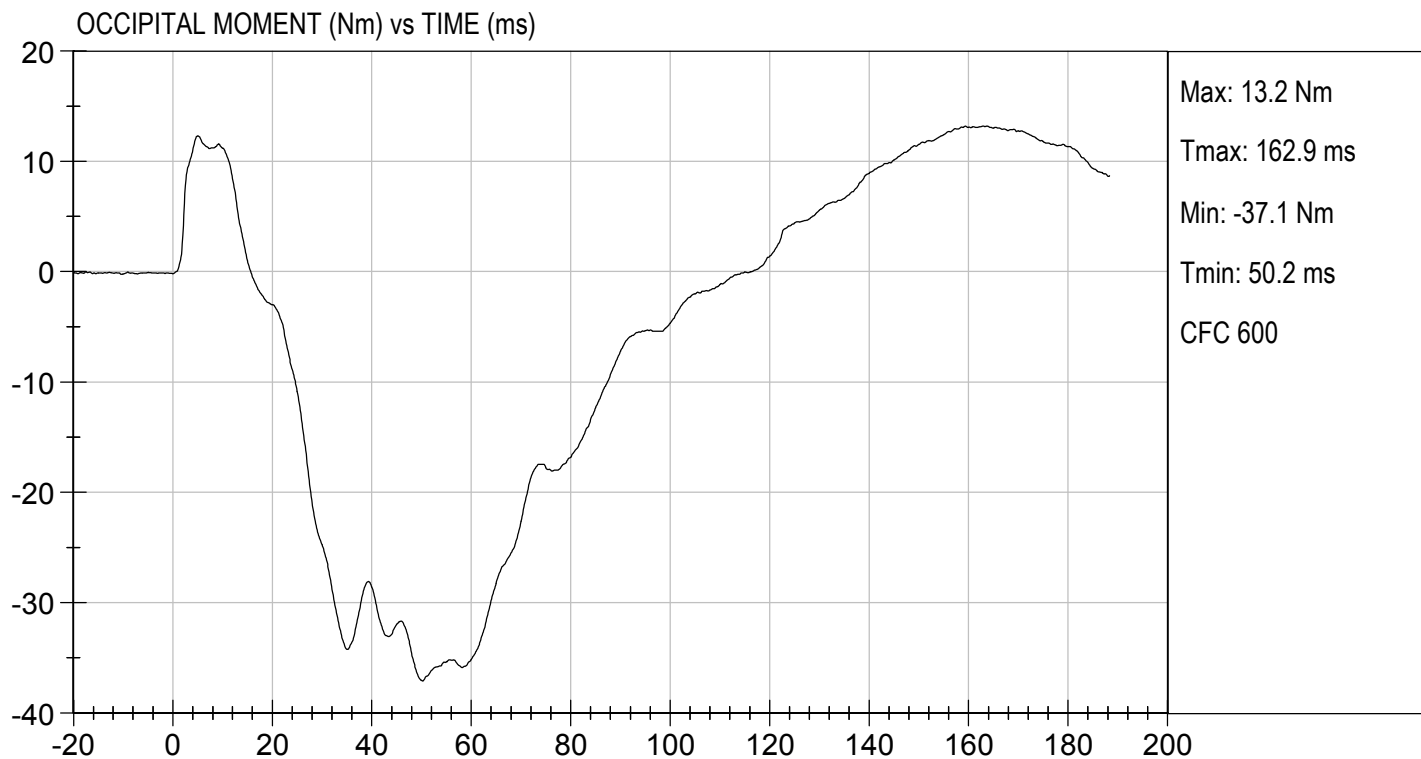






TEST DESC: NECK BENDING  
VELOCITY: 18.45 ft/s, 5.62 m/s

TEST DATE: 10/18/2019  
TEST #: D193282

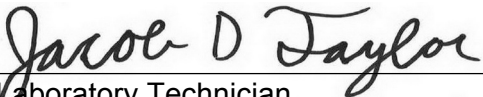


**MGA RESEARCH CORPORATION**  
**SHOULDER IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

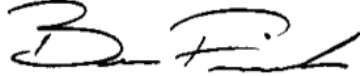
**Test ID:** D193283

| Tested Parameter                | Units | Specification | Result | Pass/Fail |
|---------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature          | deg C | 20.6 to 22.2  | 21.3   | Pass      |
| Laboratory Relative Humidity    | %     | 10 to 70      | 39     | Pass      |
| Impact Velocity                 | m/s   | 4.20 to 4.40  | 4.39   | Pass      |
| Maximum Probe Acceleration      | G's   | 13 to 18      | 15     | Pass      |
| Shoulder Displacement           | mm    | 28 to 37      | 29     | Pass      |
| Upper Spine (T1) Y Acceleration | G's   | 17 to 22      | 21     | Pass      |
| Overall Test Results            |       |               | Pass   |           |

  
Laboratory Technician

10/22/2019

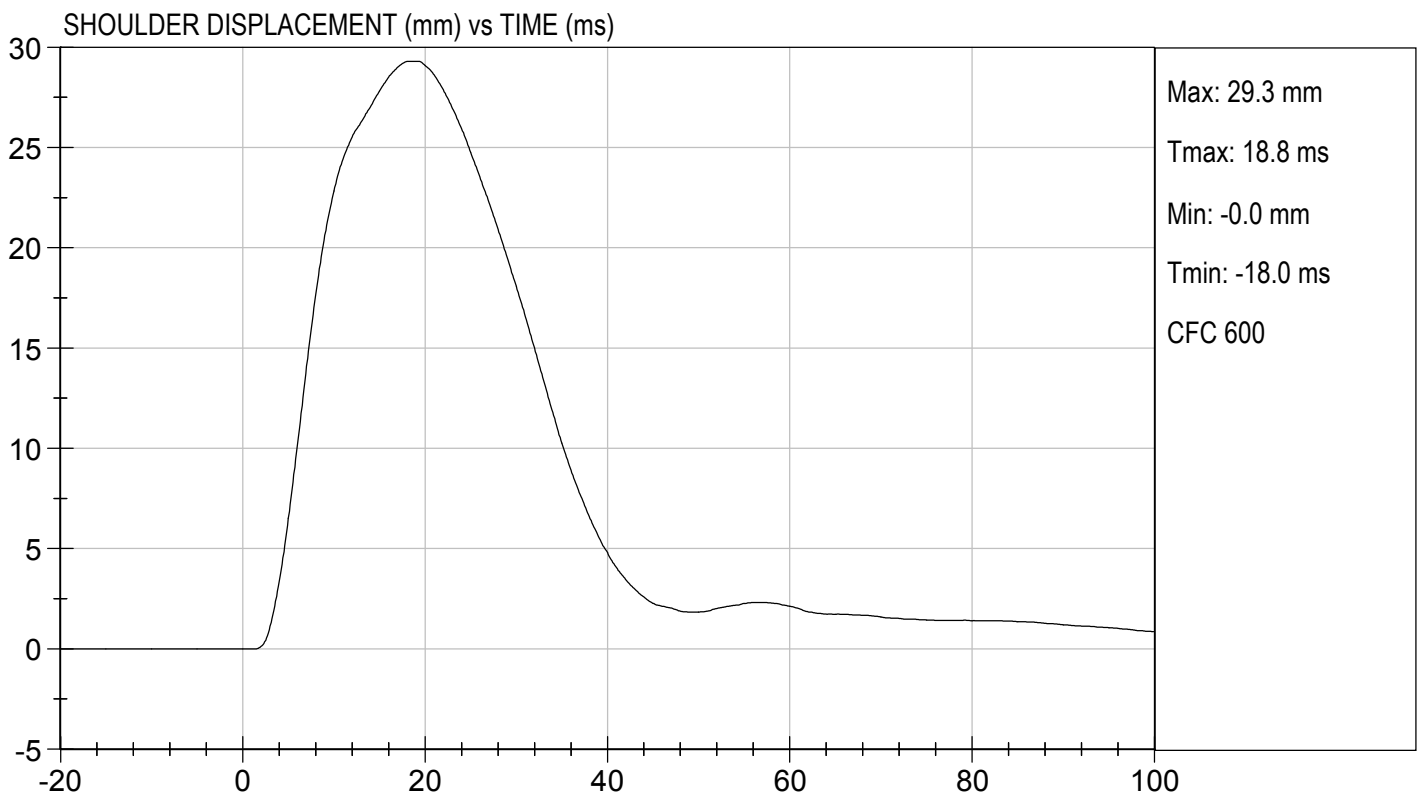
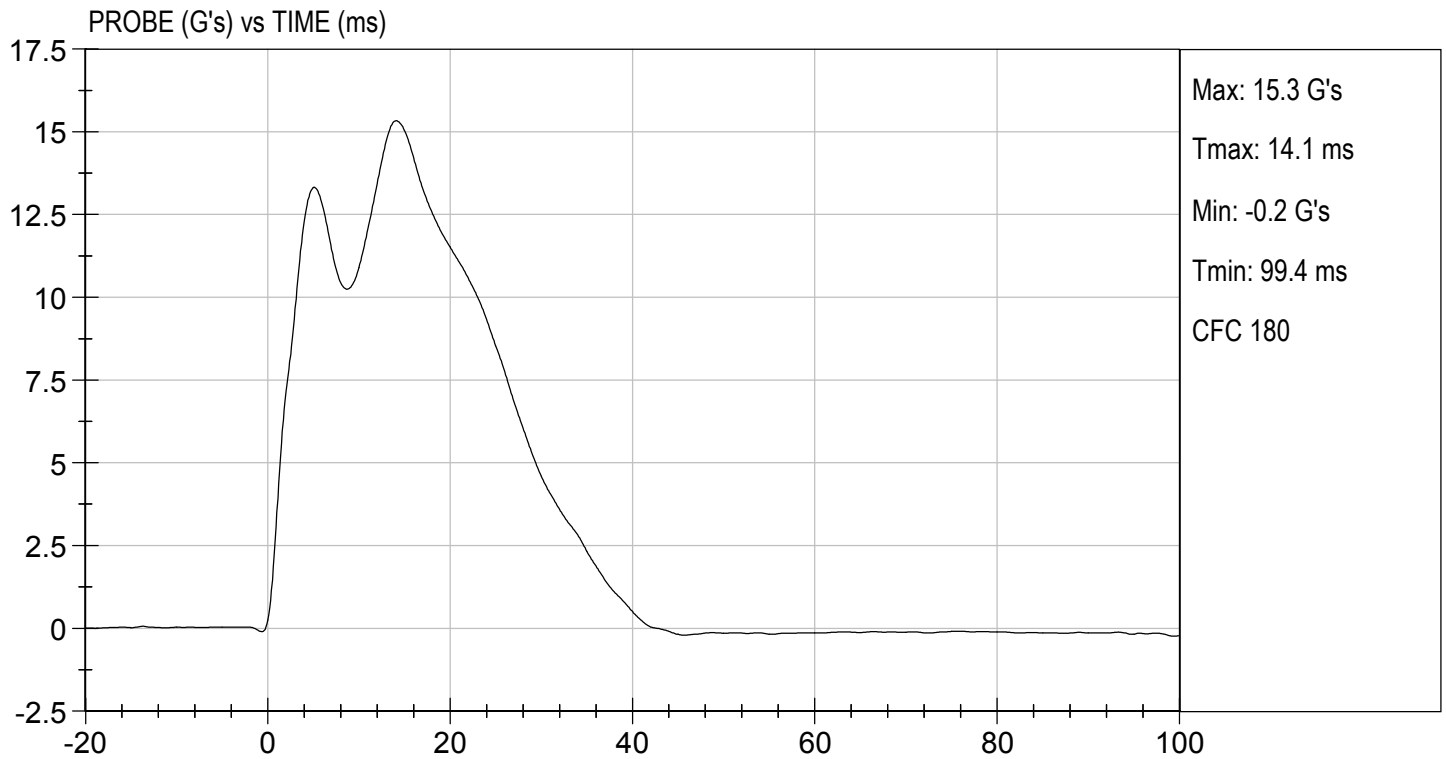
Test Date

  
Approved By



TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.40 ft/s, 4.39 m/s

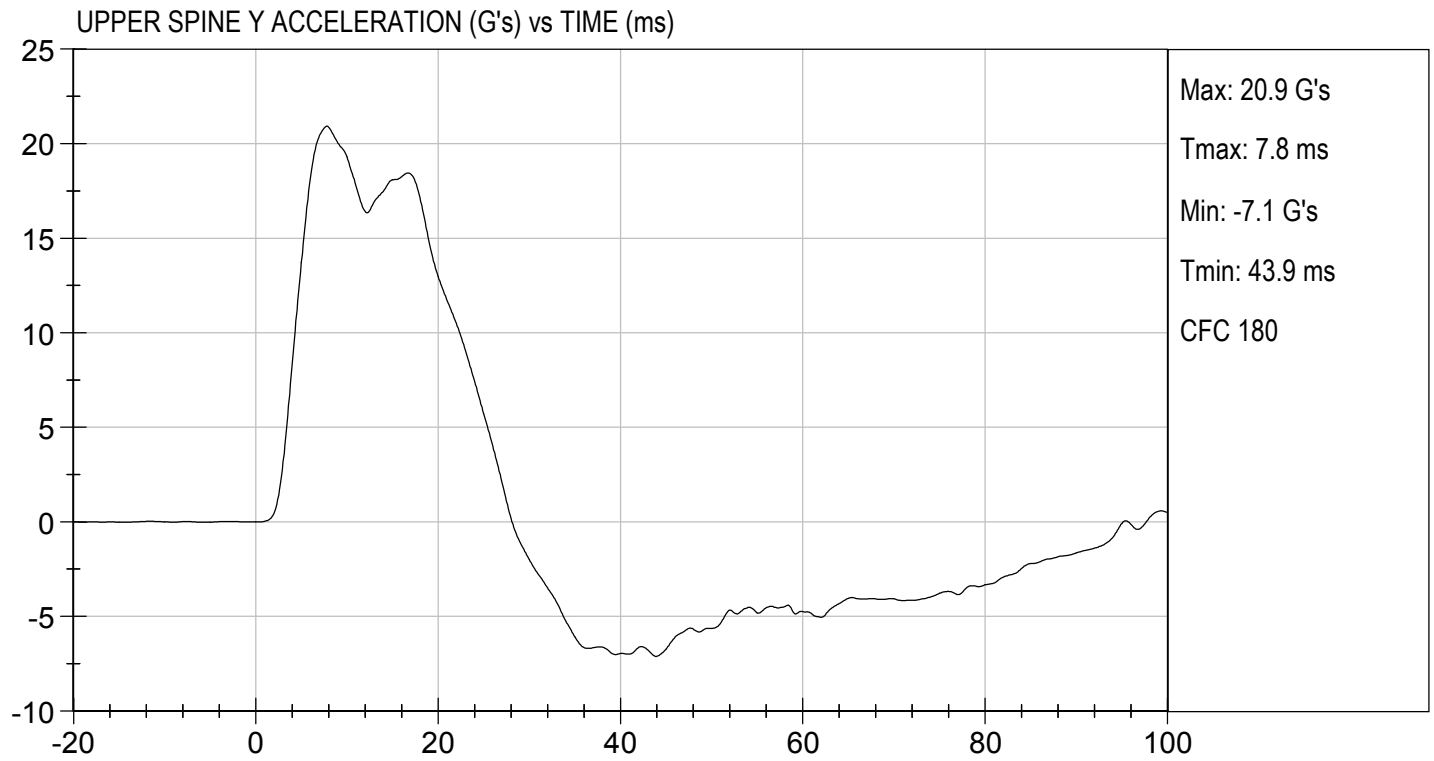
TEST DATE: 10/22/2019  
TEST #: D193283





TEST DESC: SHOULDER IMPACT  
VELOCITY: 14.40 ft/s, 4.39 m/s

TEST DATE: 10/22/2019  
TEST #: D193283

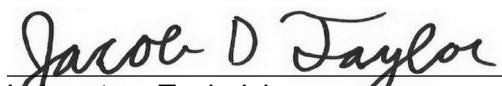


**MGA RESEARCH CORPORATION**  
**THORAX (WITH ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

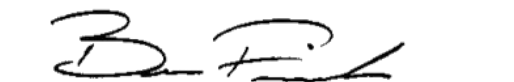
**Test I.D:** D193284

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.3   | Pass      |
| Humidity                         | %     | 10 to 70      | 39     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.68   | Pass      |
| Maximum Probe Acceleration       | G's   | 30 to 36      | 32     | Pass      |
| Shoulder Displacement            | mm    | 31 to 40      | 35     | Pass      |
| Upper Rib Displacement           | mm    | 25 to 32      | 27     | Pass      |
| Middle Rib Displacement          | mm    | 30 to 36      | 30     | Pass      |
| Lower Rib Displacement           | mm    | 32 to 38      | 32     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 34 to 43      | 39     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 29 to 37      | 34     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

Test Date

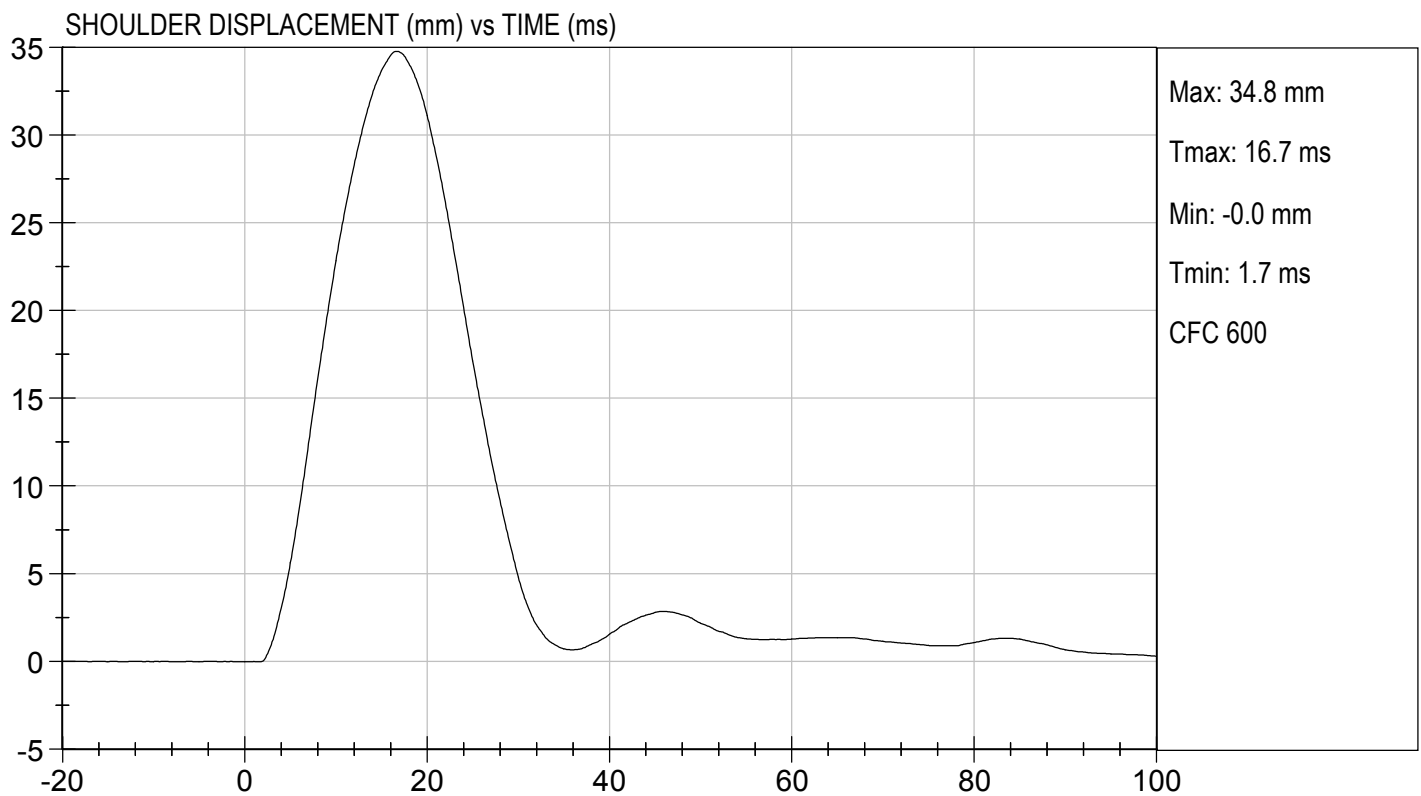
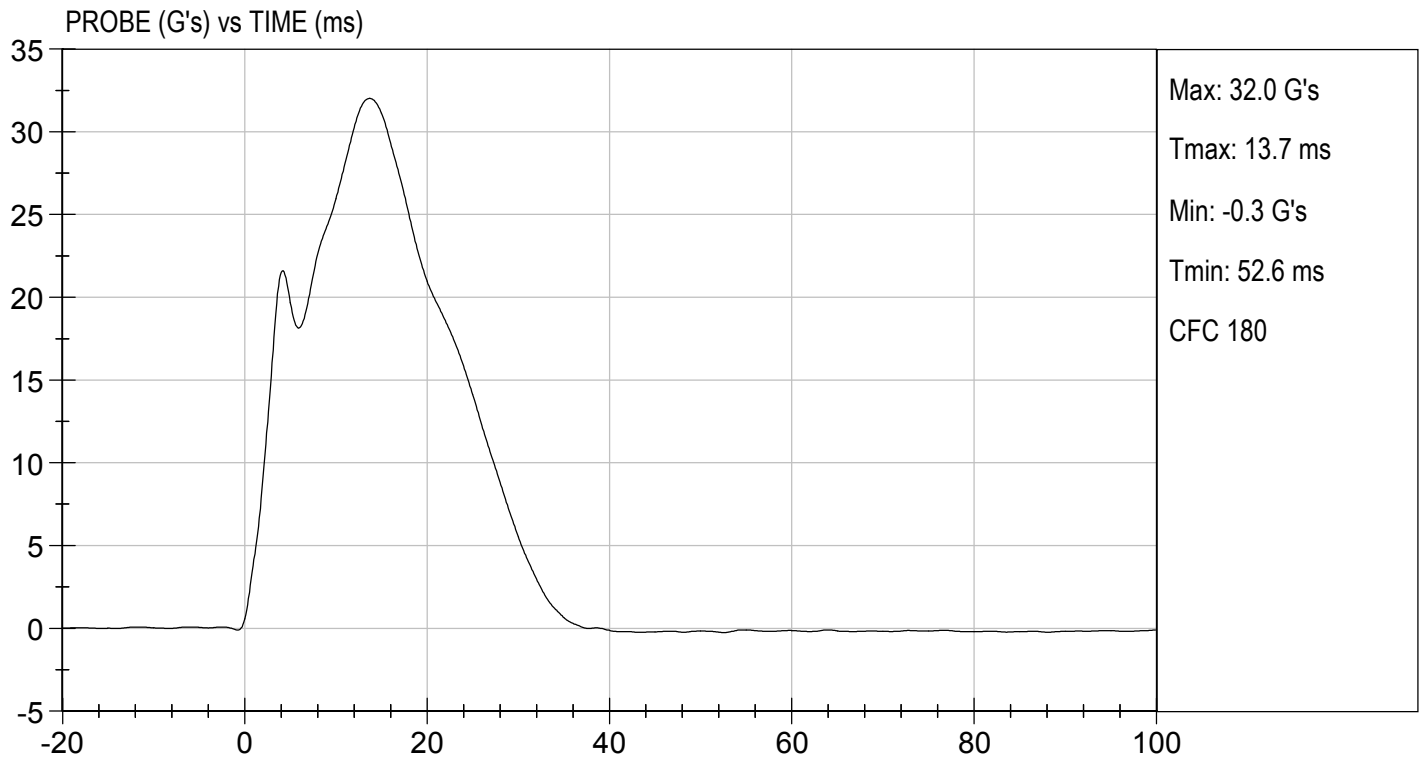
  
Approved By

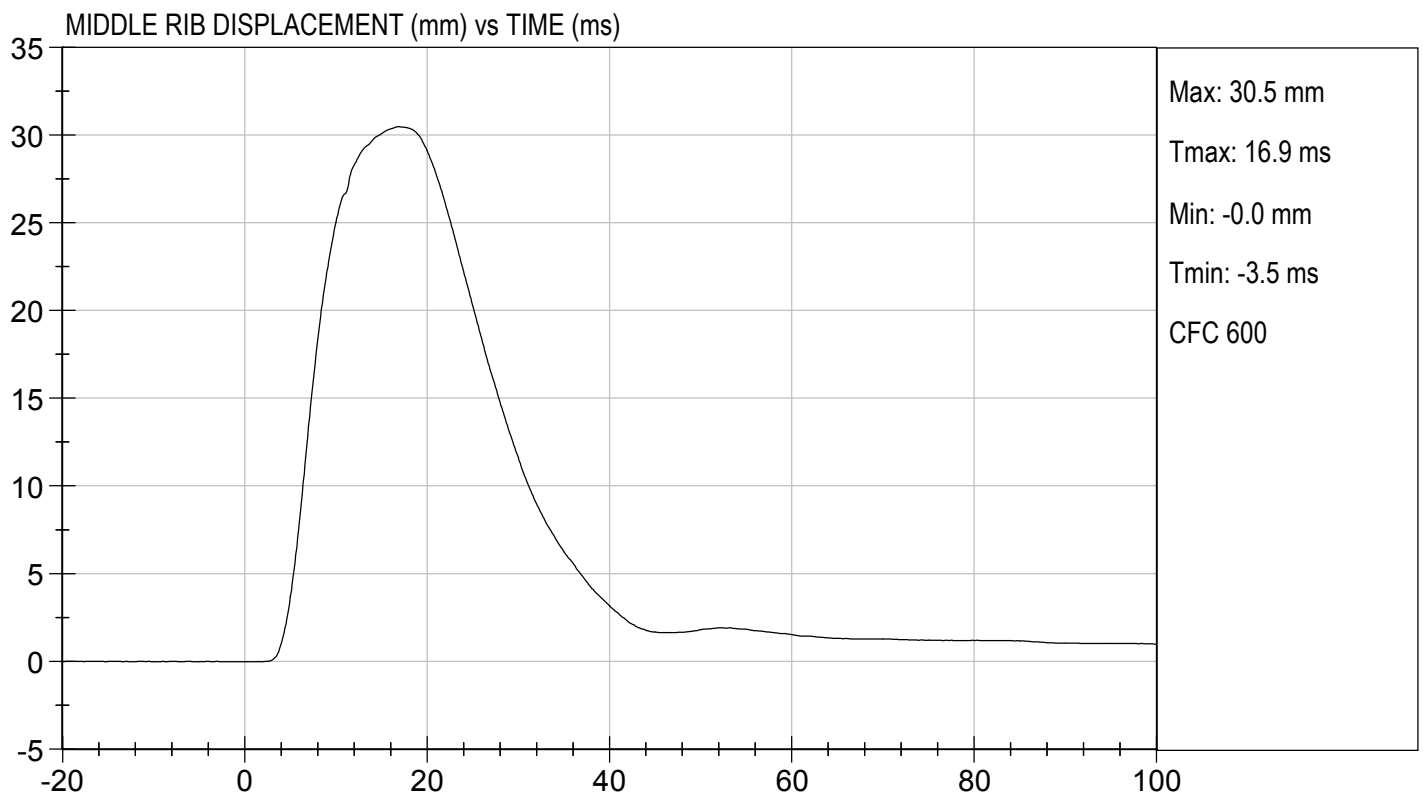
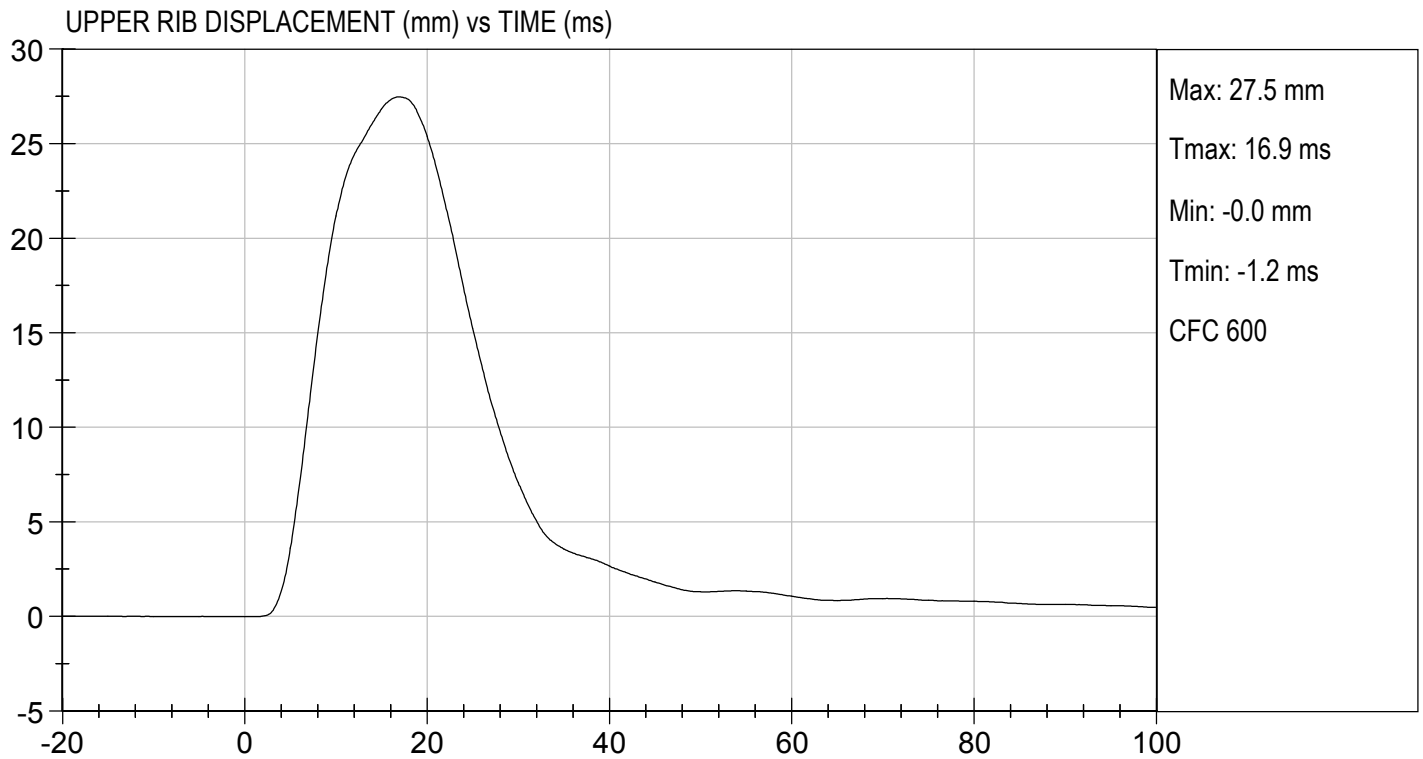




TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 10/22/2019  
TEST #: D193284

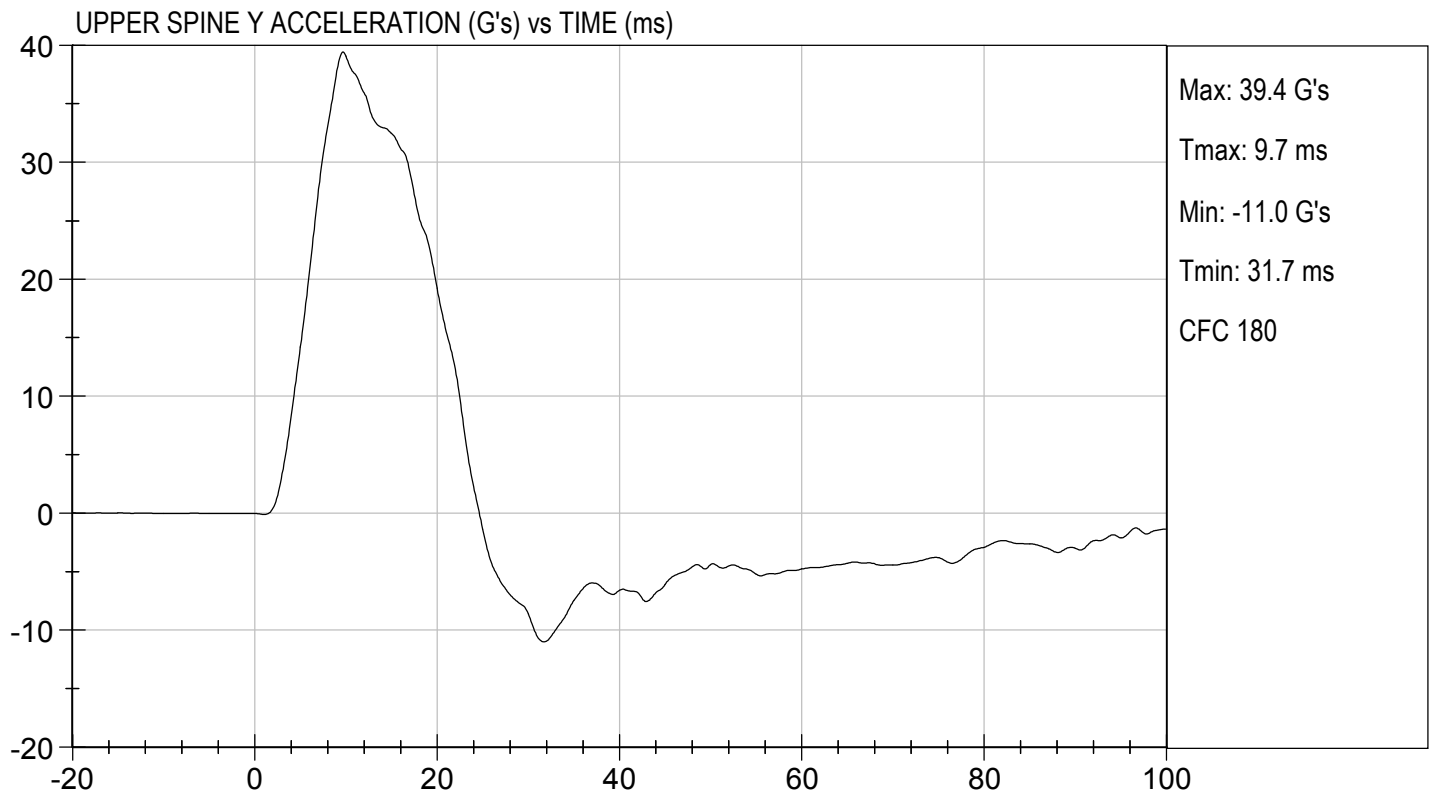
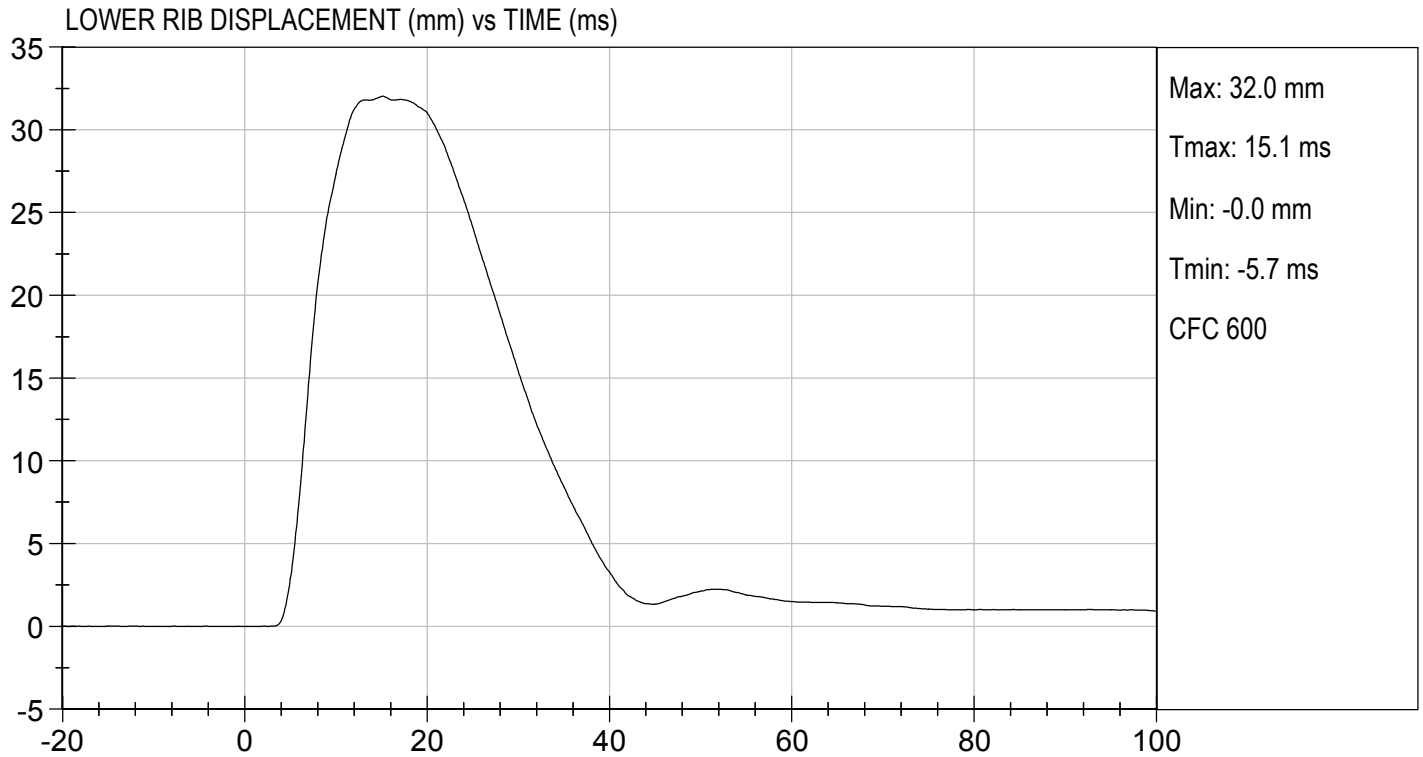






TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 21.93 ft/s, 6.68 m/s

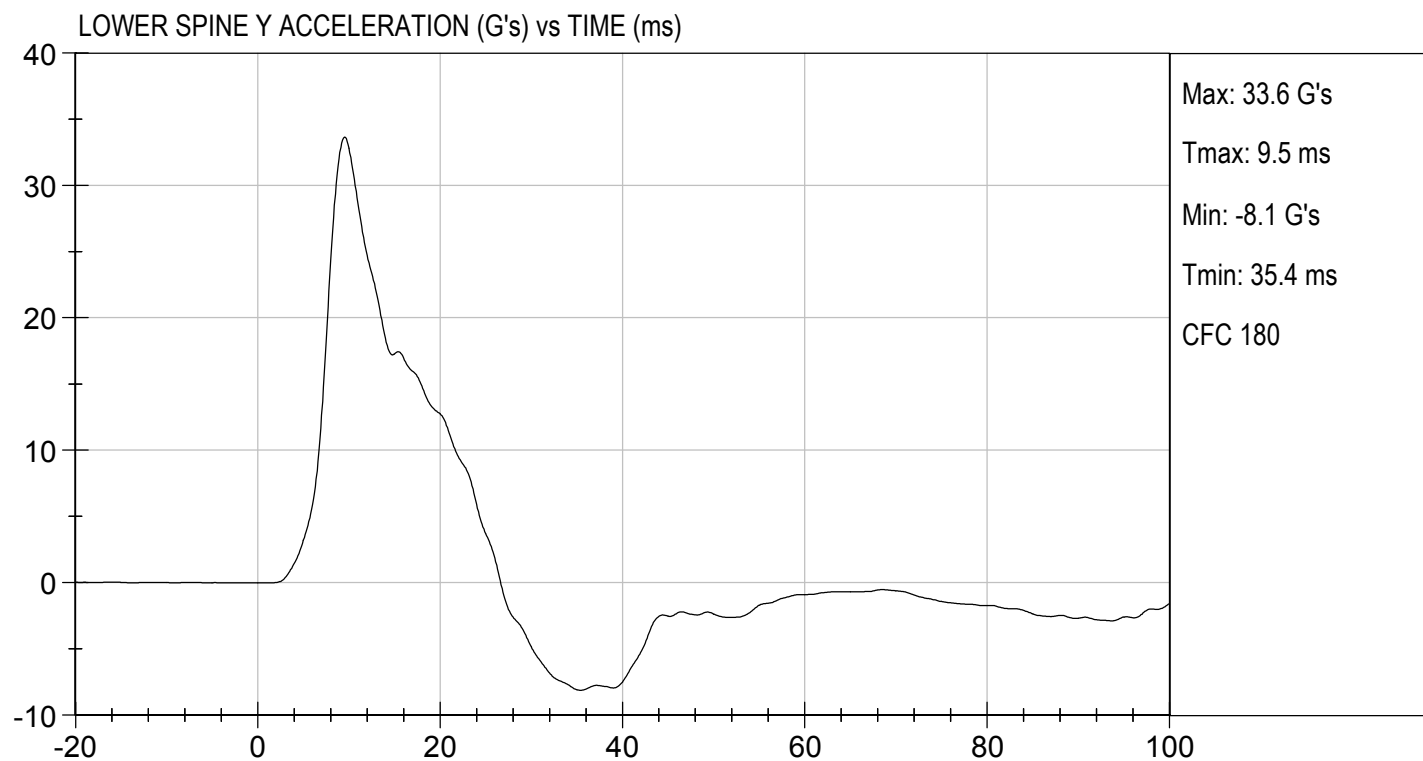
TEST DATE: 10/22/2019  
TEST #: D193284





TEST DESC: THORAX IMPACT WITH ARM  
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 10/22/2019  
TEST #: D193284

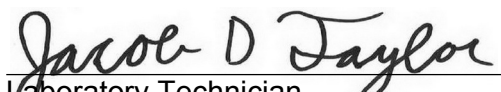


**MGA RESEARCH CORPORATION**  
**THORAX (WITHOUT ARM) IMPACT TEST**  
**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

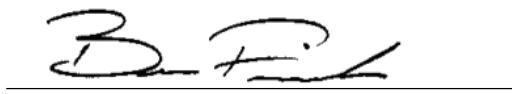
**Test I.D:** D193285

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.3   | Pass      |
| Humidity                         | %     | 10 to 70      | 39     | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.27   | Pass      |
| Maximum Probe Acceleration       | G's   | 14 to 18      | 15     | Pass      |
| Upper Rib Displacement           | mm    | 32 to 40      | 36     | Pass      |
| Middle Rib Displacement          | mm    | 39 to 45      | 40     | Pass      |
| Lower Rib Displacement           | mm    | 35 to 43      | 37     | Pass      |
| Upper Spine (T1) Y Acceleration  | G's   | 13 to 17      | 14     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 7 to 11       | 9      | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

Test Date

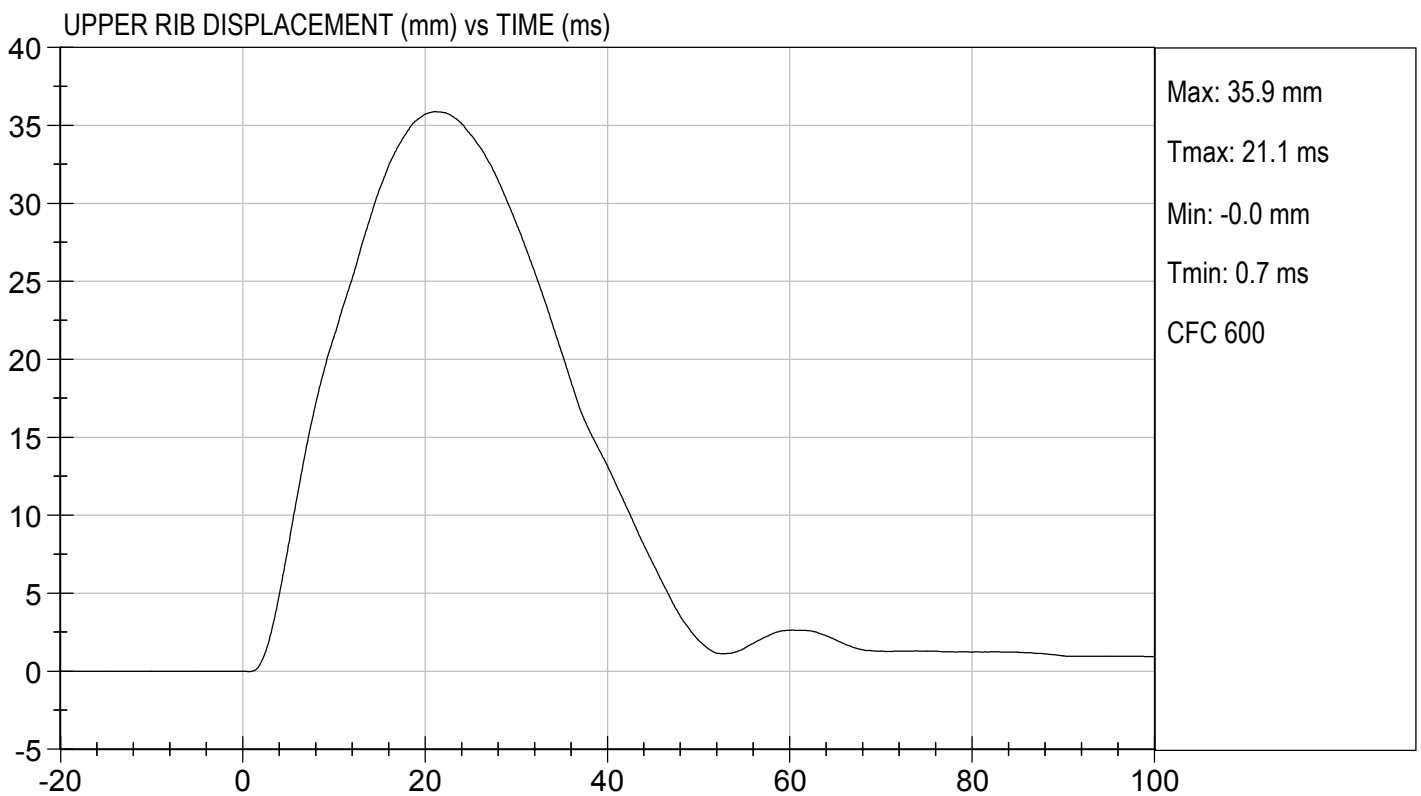
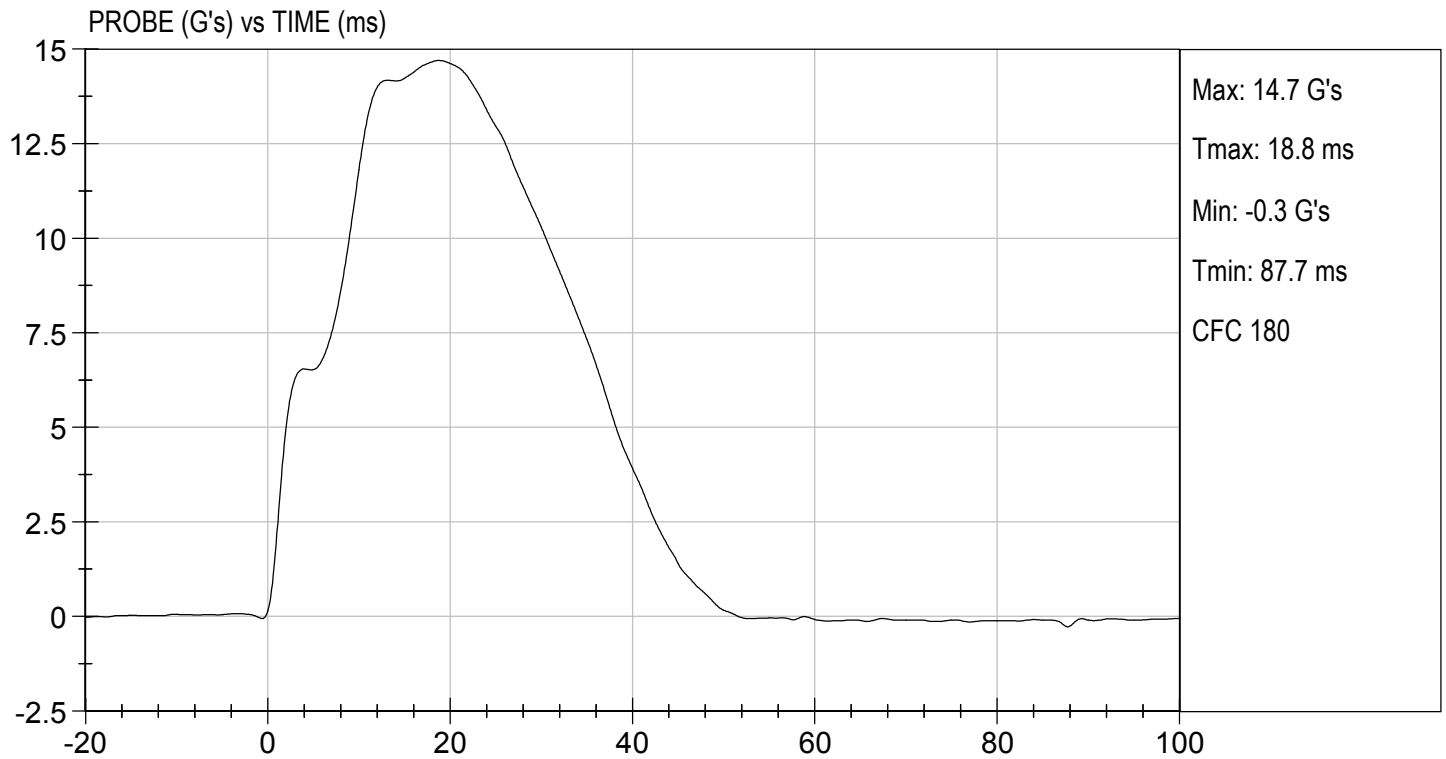
  
Approved By





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

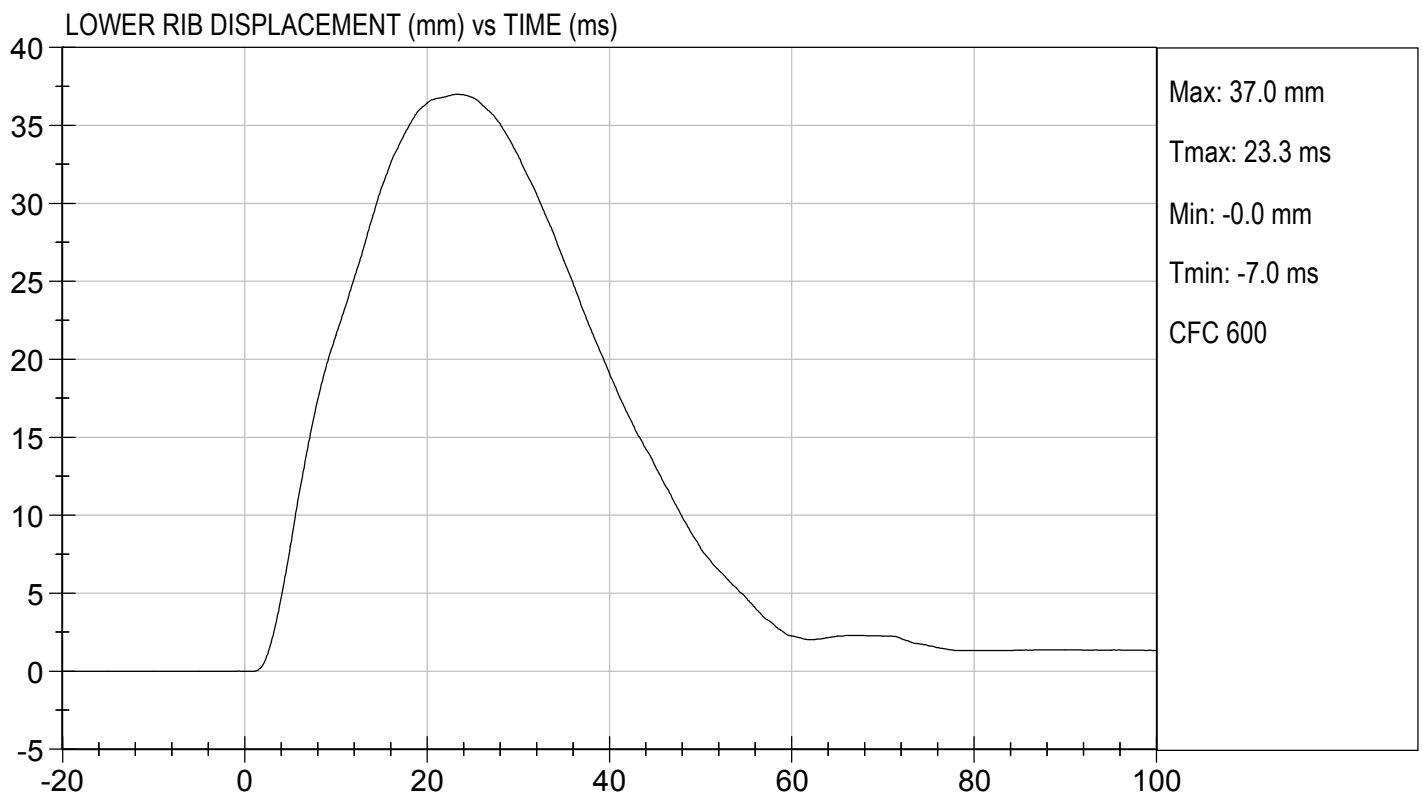
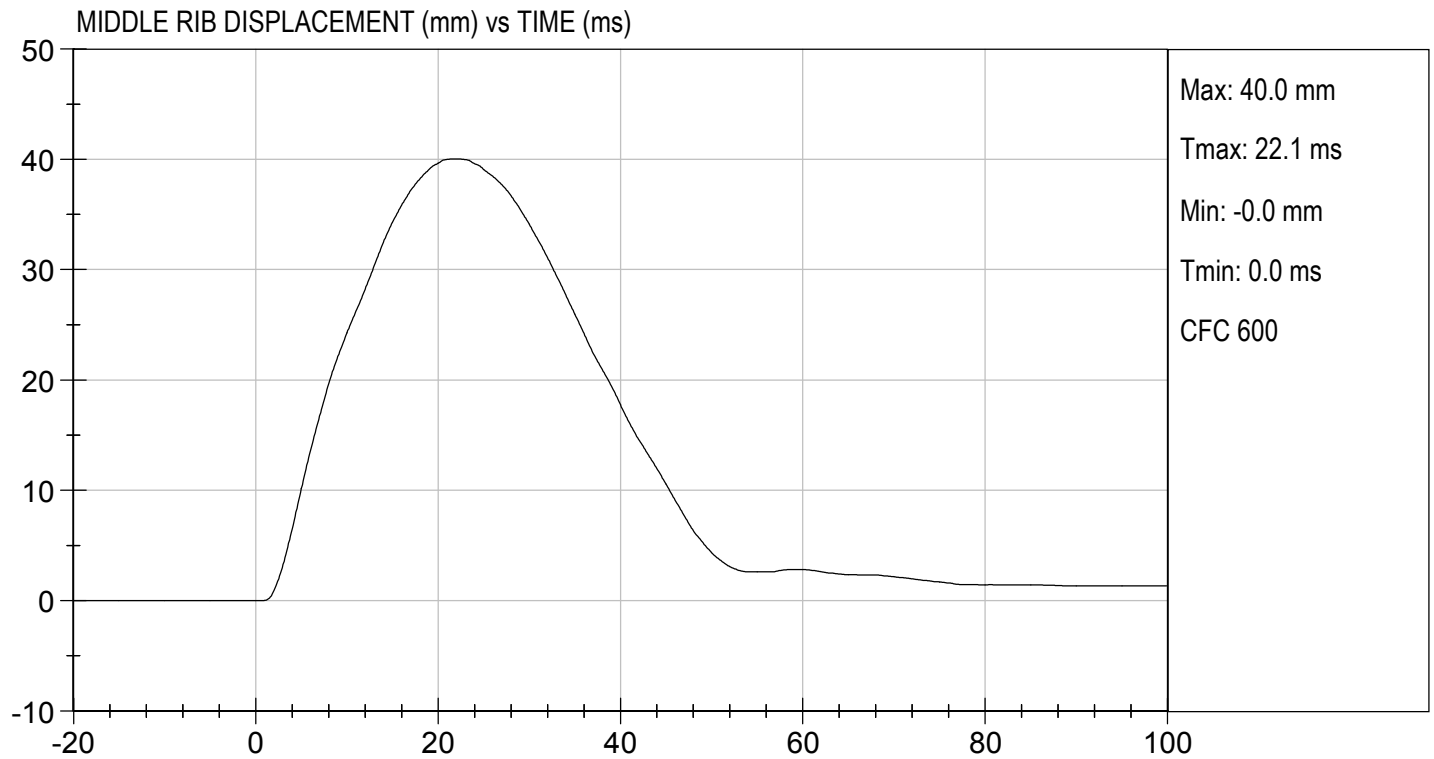
TEST DATE: 10/22/2019  
TEST #: D193285





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

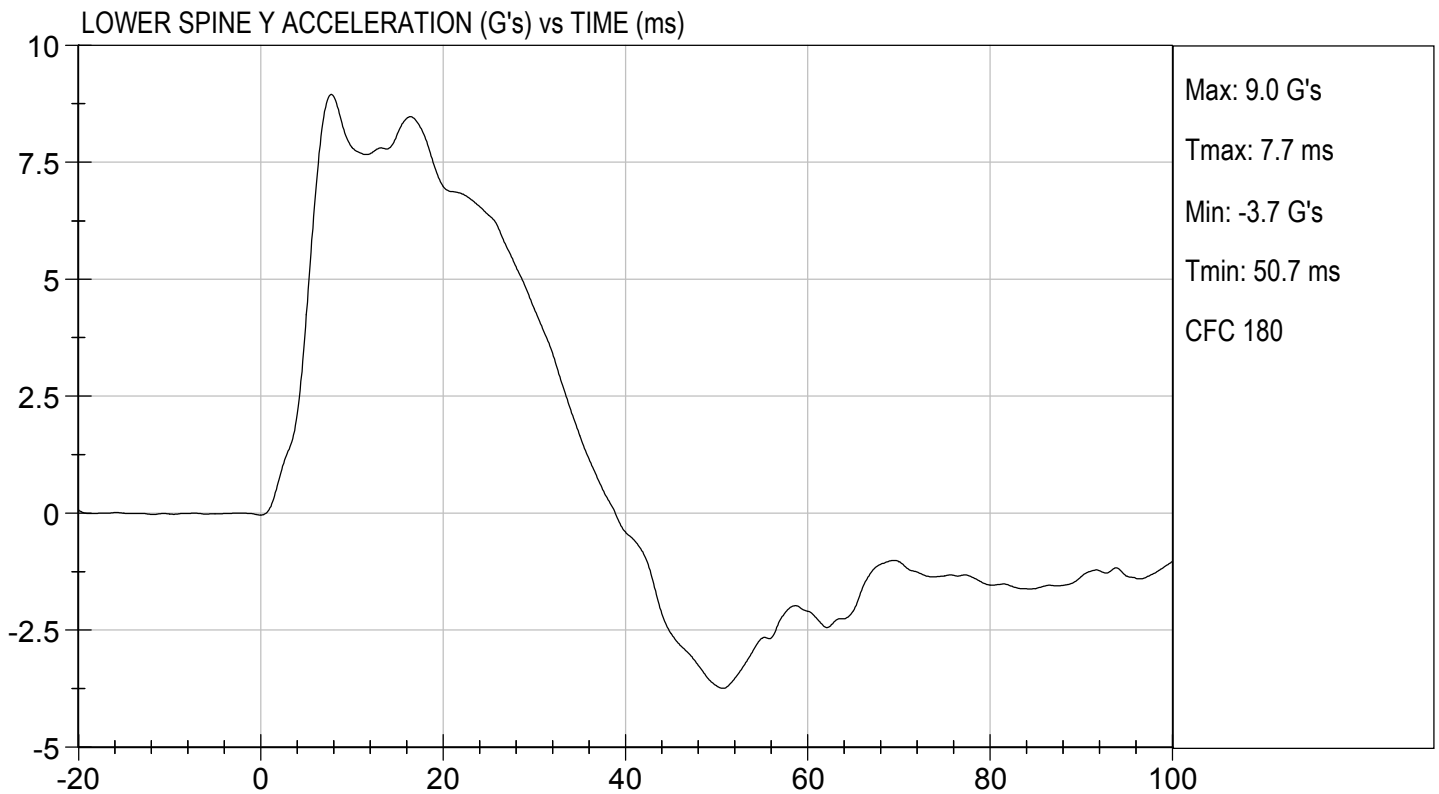
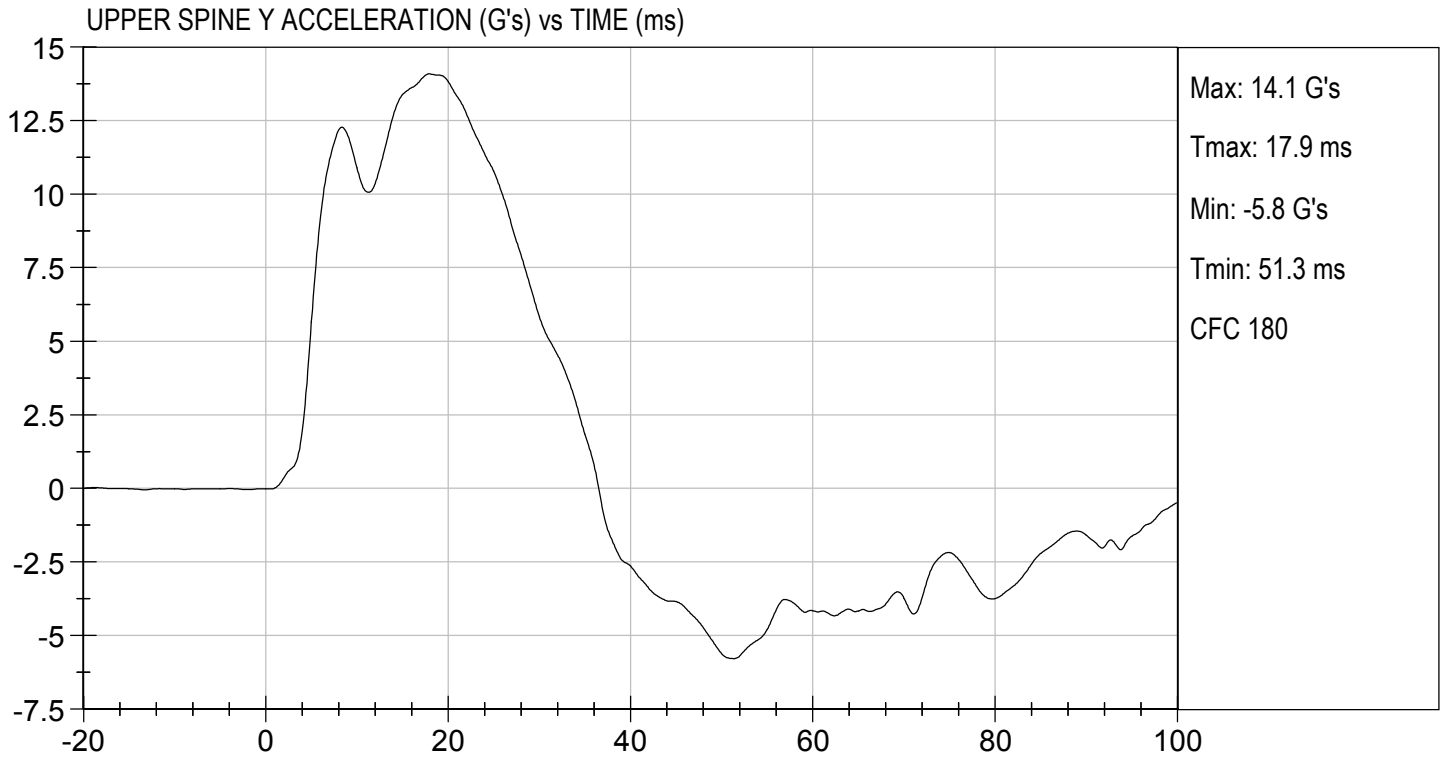
TEST DATE: 10/22/2019  
TEST #: D193285





TEST DESC: THORAX IMPACT WITHOUT ARM  
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 10/22/2019  
TEST #: D193285



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

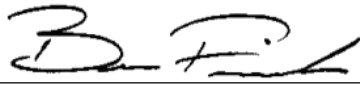
**Test I.D:** D193286

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.3   | Pass      |
| Humidity                         | %     | 10 to 70      | 39     | Pass      |
| Impact Velocity                  | m/s   | 4.20 to 4.40  | 4.21   | Pass      |
| Maximum Probe Acceleration       | G's   | 12 to 16      | 14     | Pass      |
| Upper Abdomen Rib Displacement   | mm    | 36 to 47      | 39     | Pass      |
| Lower Abdomen Rib Displacement   | mm    | 33 to 44      | 37     | Pass      |
| Lower Spine (T12) Y Acceleration | G's   | 9 to 14       | 11     | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

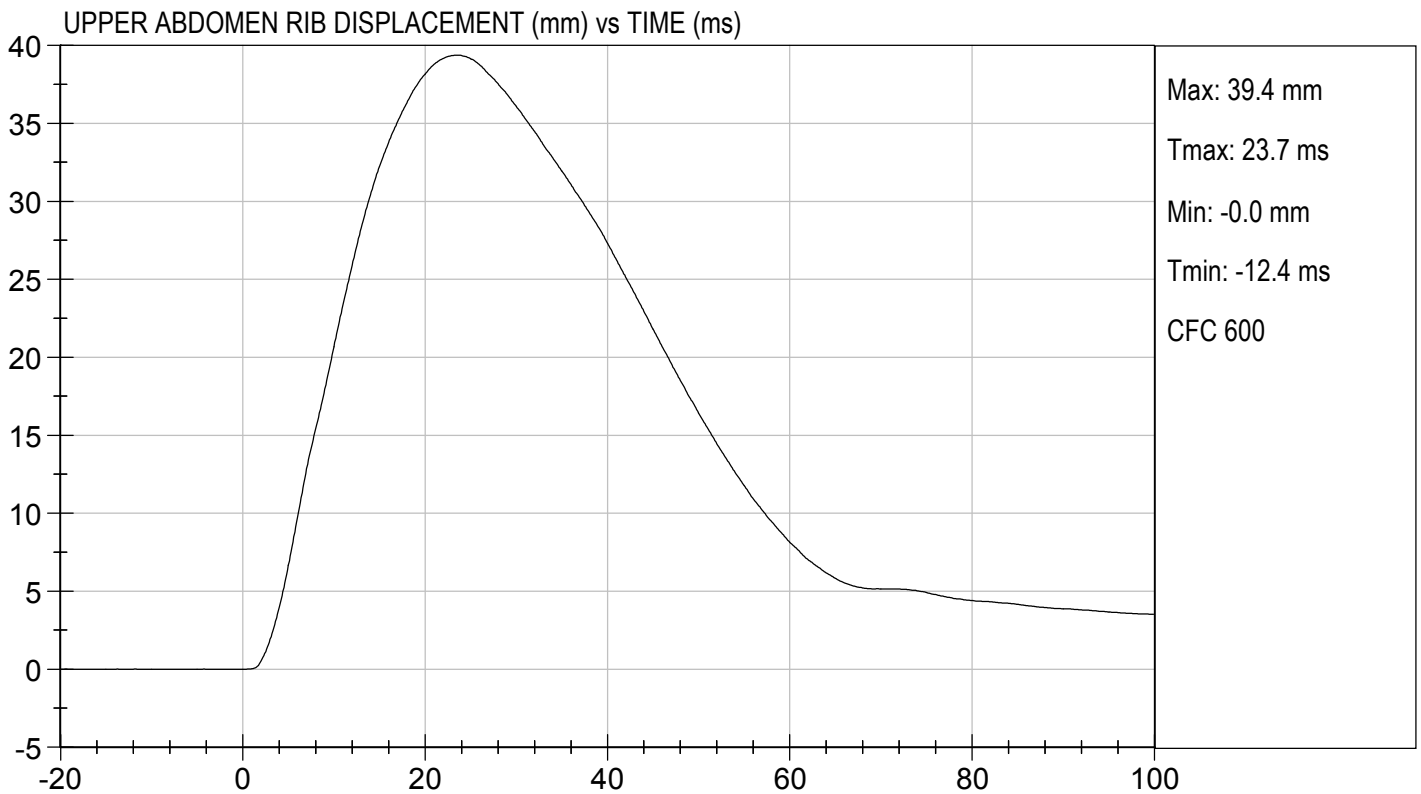
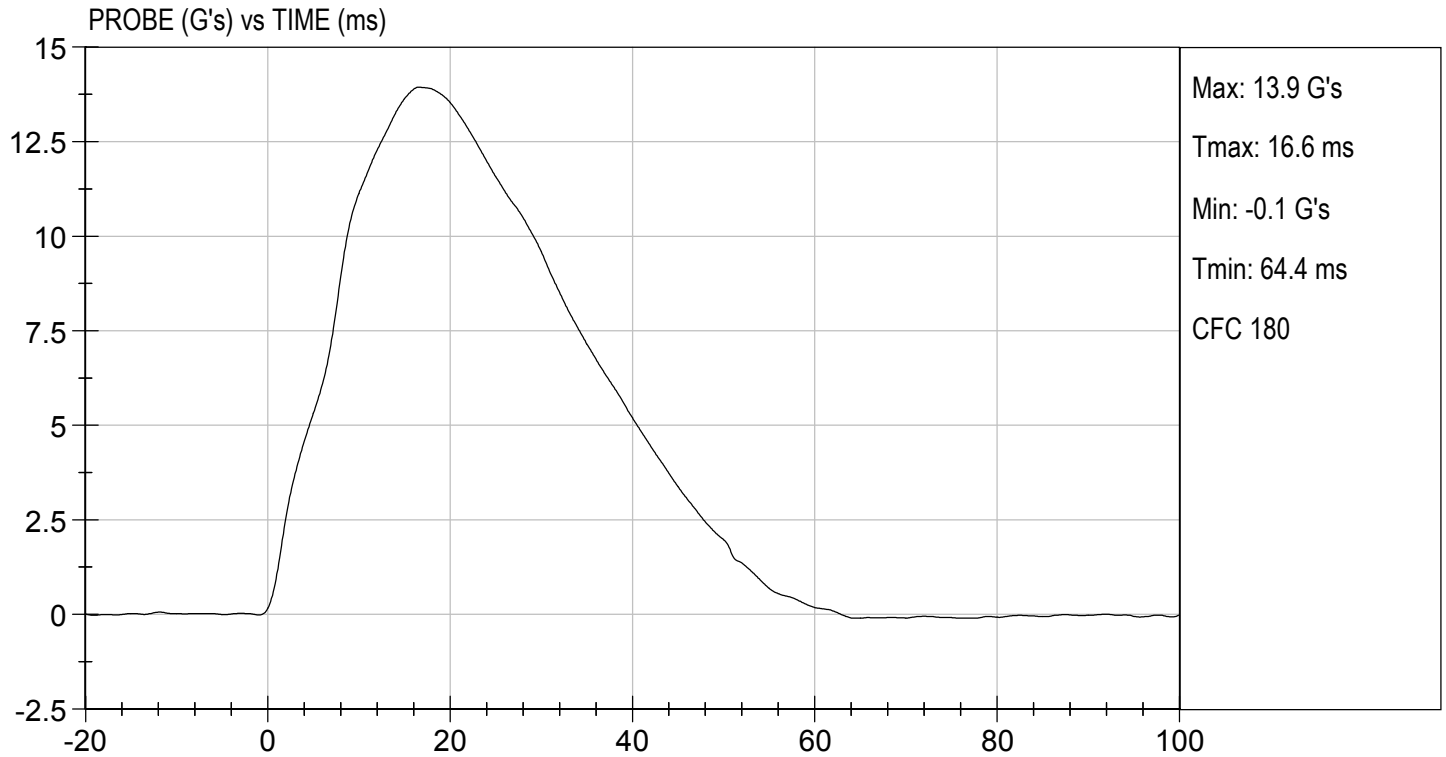
Test Date

  
Approved By



TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.80 ft/s, 4.21 m/s

TEST DATE: 10/22/2019  
TEST #: D193286

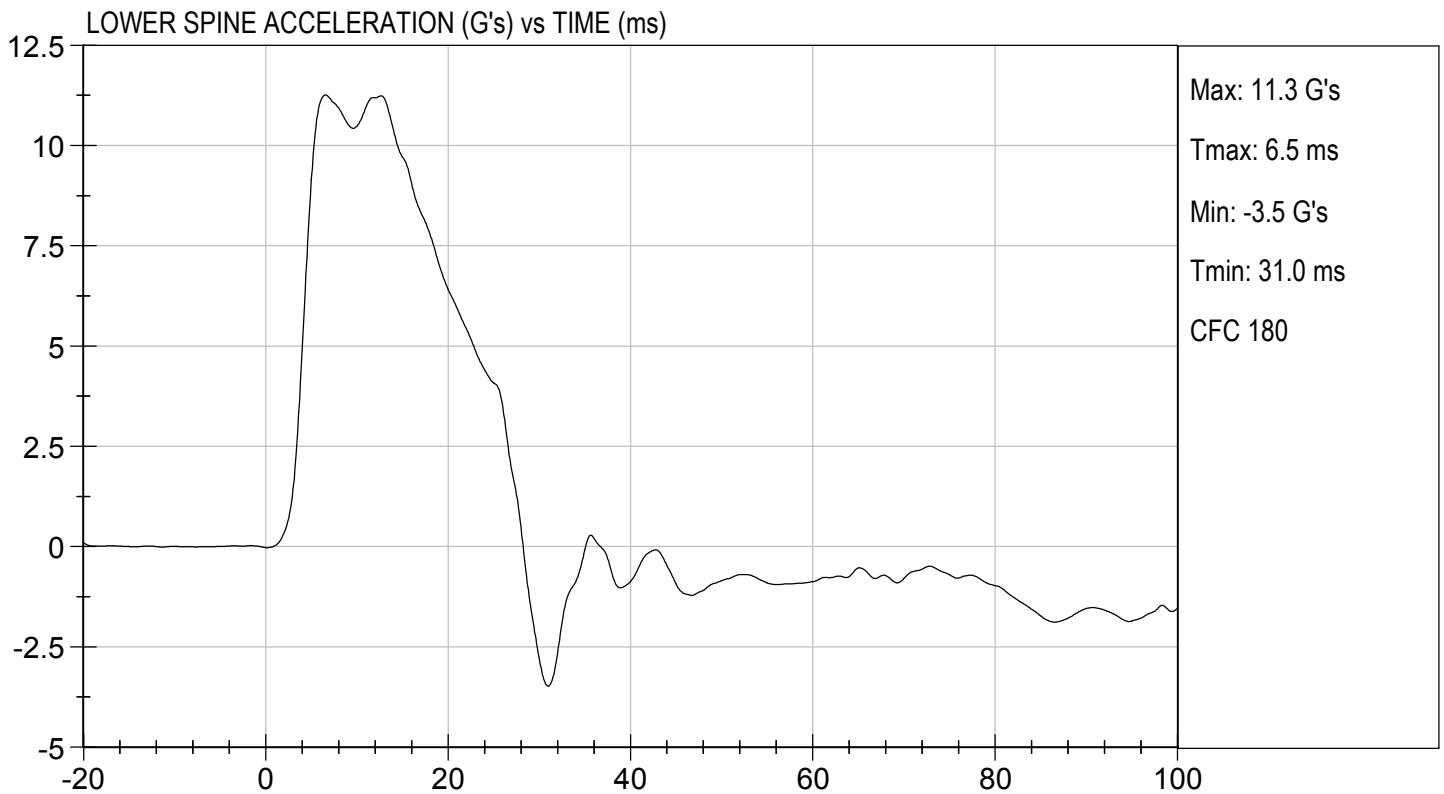
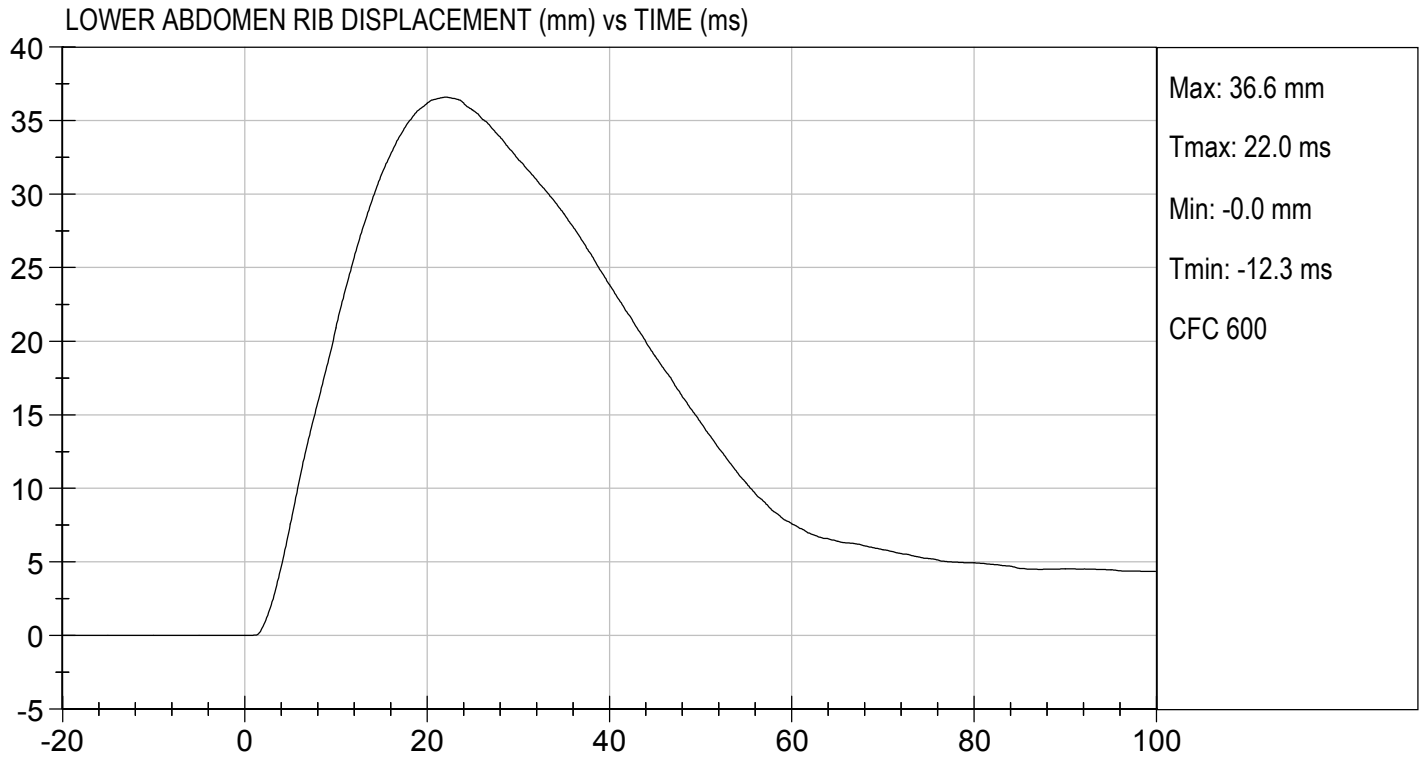






TEST DESC: ABDOMEN IMPACT  
VELOCITY: 13.80 ft/s, 4.21 m/s

TEST DATE: 10/22/2019  
TEST #: D193286



**MGA RESEARCH CORPORATION**

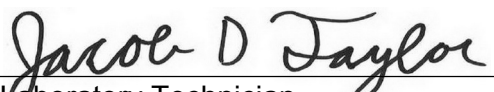
**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

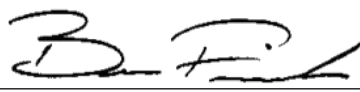
**Test I.D:** D193287

| Tested Parameter                 | Units | Specification | Result | Pass/Fail |
|----------------------------------|-------|---------------|--------|-----------|
| Temperature                      | deg C | 20.6 to 22.2  | 21.3   | Pass      |
| Humidity                         | %     | 10 to 70      | 39     | Pass      |
| Impact Velocity                  | m/s   | 6.60 to 6.80  | 6.60   | Pass      |
| Maximum Probe Acceleration       | G's   | 38 to 47      | 44     | Pass      |
| Pelvis Y Acceleration After 6 ms | G's   | 34 to 42      | 38     | Pass      |
| Peak Acetabulum Force            | N     | 3600 to 4300  | 4,197  | Pass      |
| Overall Test Results             |       |               |        | Pass      |

  
Laboratory Technician

10/22/2019

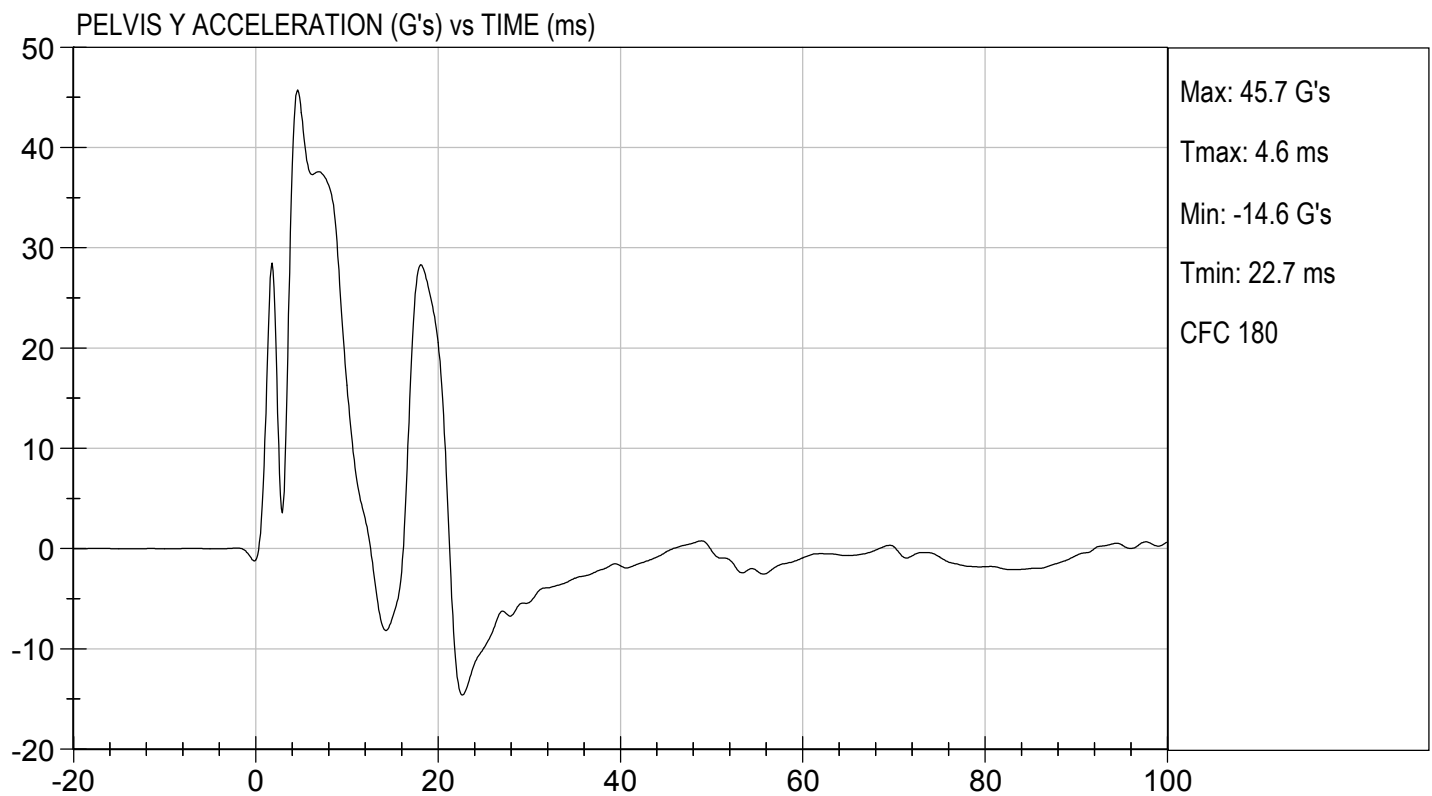
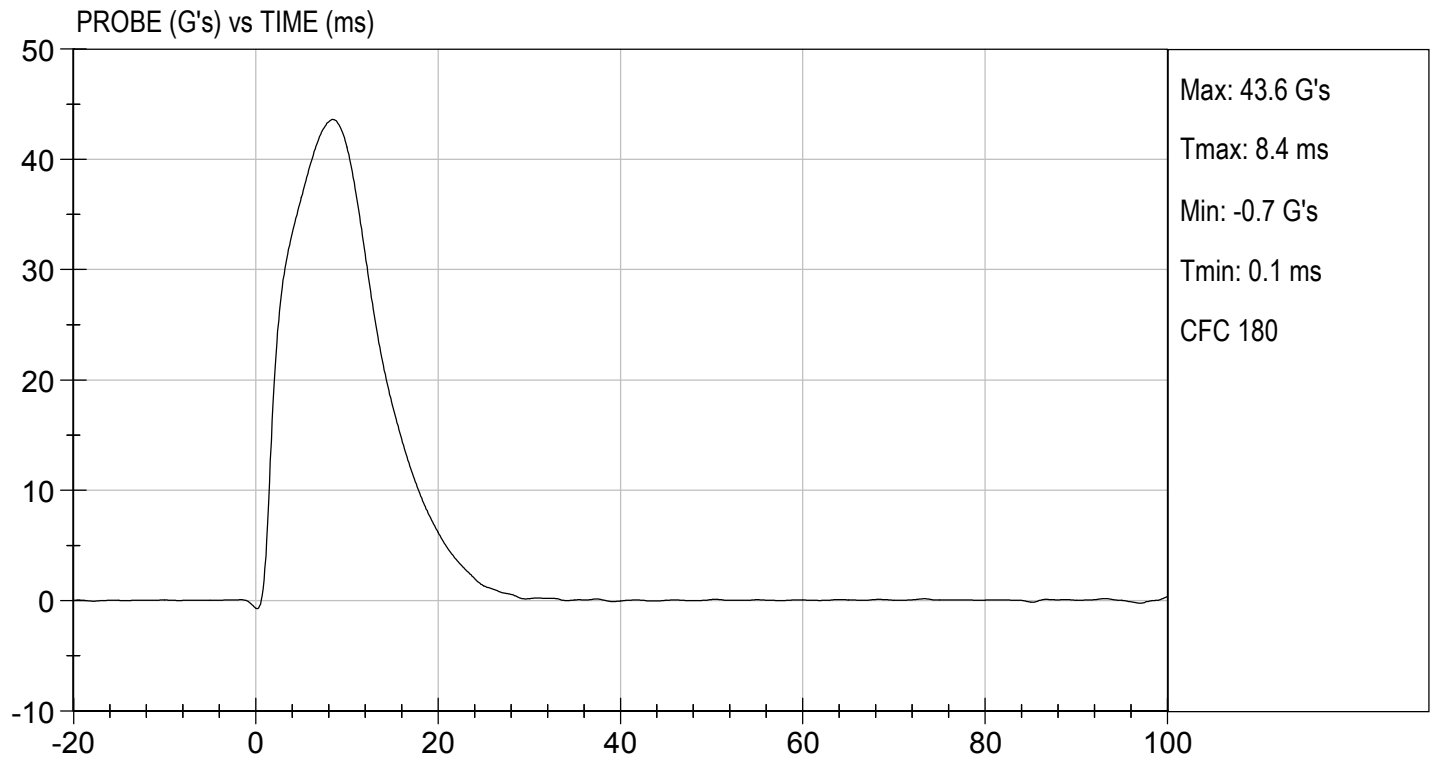
Test Date

  
Approved By



TEST DESC: PELVIS IMPACT  
VELOCITY: 21.65 ft/s, 6.60 m/s

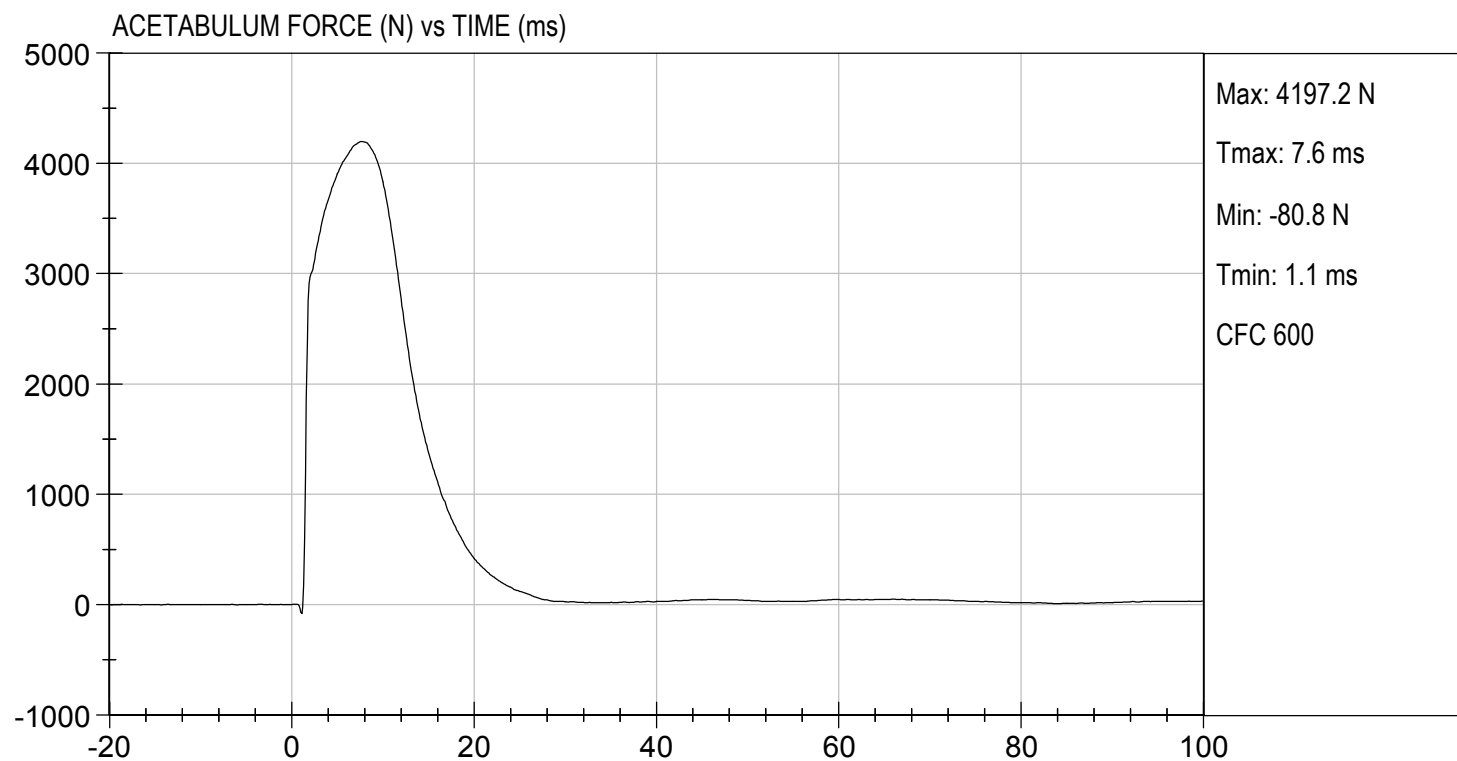
TEST DATE: 10/22/2019  
TEST #: D193287





TEST DESC: PELVIS IMPACT  
VELOCITY: 21.65 ft/s, 6.60 m/s

TEST DATE: 10/22/2019  
TEST #: D193287



**MGA RESEARCH CORPORATION**

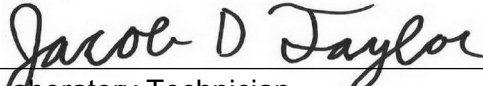
**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 306

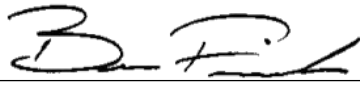
**Test I.D:** D193288

| Tested Parameter           | Units | Specification | Result | Pass/Fail |
|----------------------------|-------|---------------|--------|-----------|
| Temperature                | deg C | 20.6 to 22.2  | 20.9   | Pass      |
| Humidity                   | %     | 10 to 70      | 43     | Pass      |
| Impact Velocity            | m/s   | 4.20 to 4.40  | 4.20   | Pass      |
| Maximum Probe Acceleration | G's   | 36 to 45      | 42     | Pass      |
| Pelvis Y Acceleration      | G's   | 28 to 39      | 37     | Pass      |
| Peak Pelvis Iliac Force    | N     | 4100 to 5100  | 4,762  | Pass      |
| Overall Test Results       |       |               |        | Pass      |

  
Laboratory Technician

10/21/2019

Test Date

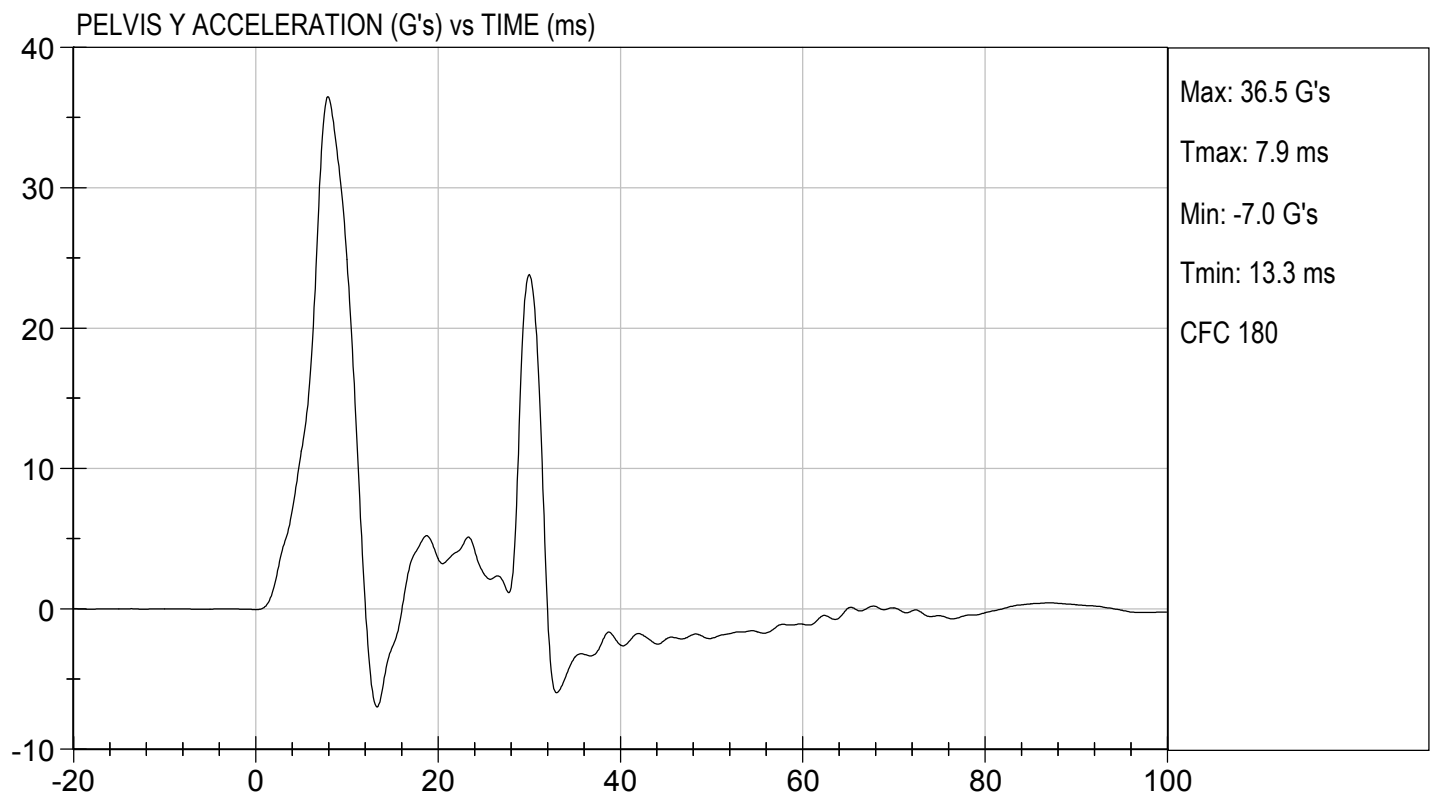
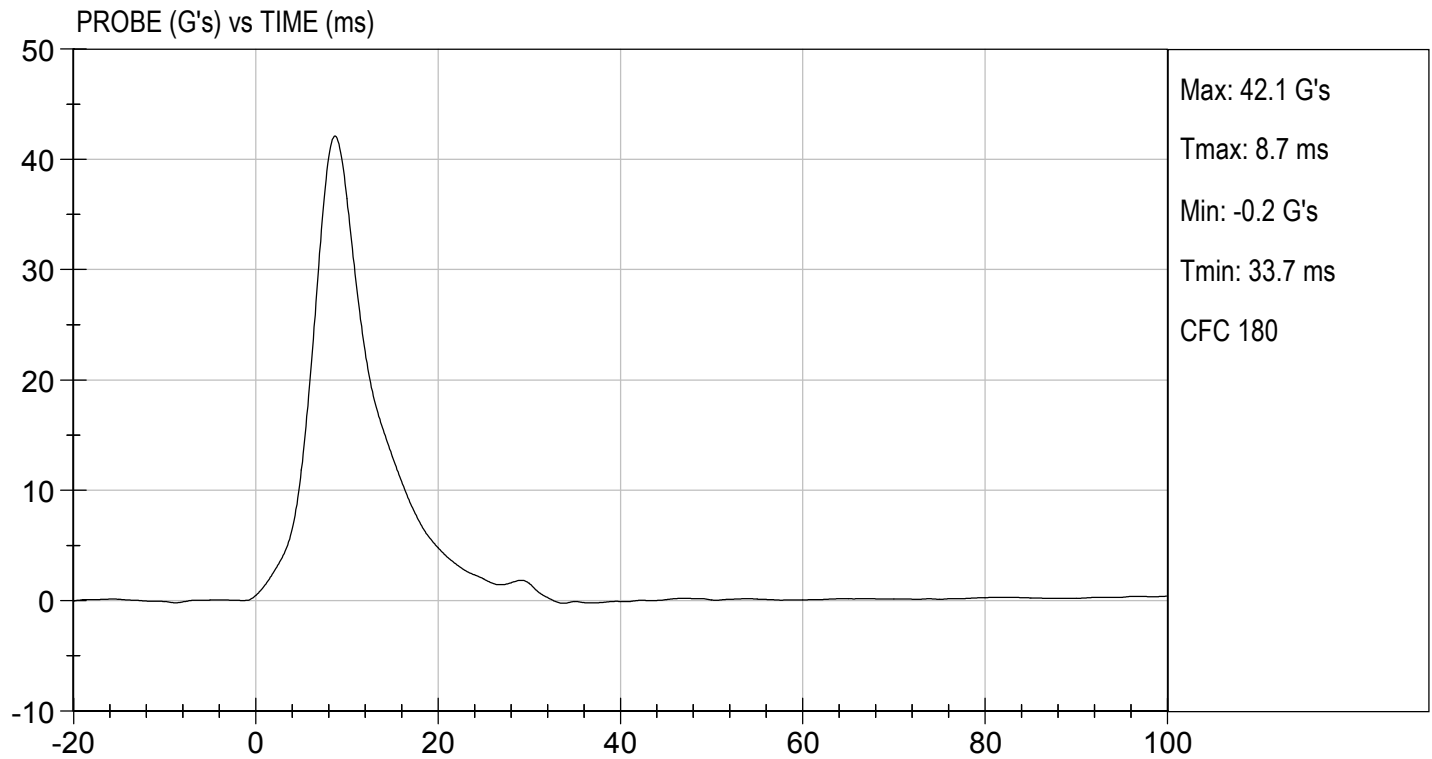
  
Approved By





TEST DESC: ILLIAC  
VELOCITY: 13.79 ft/s, 4.20 m/s

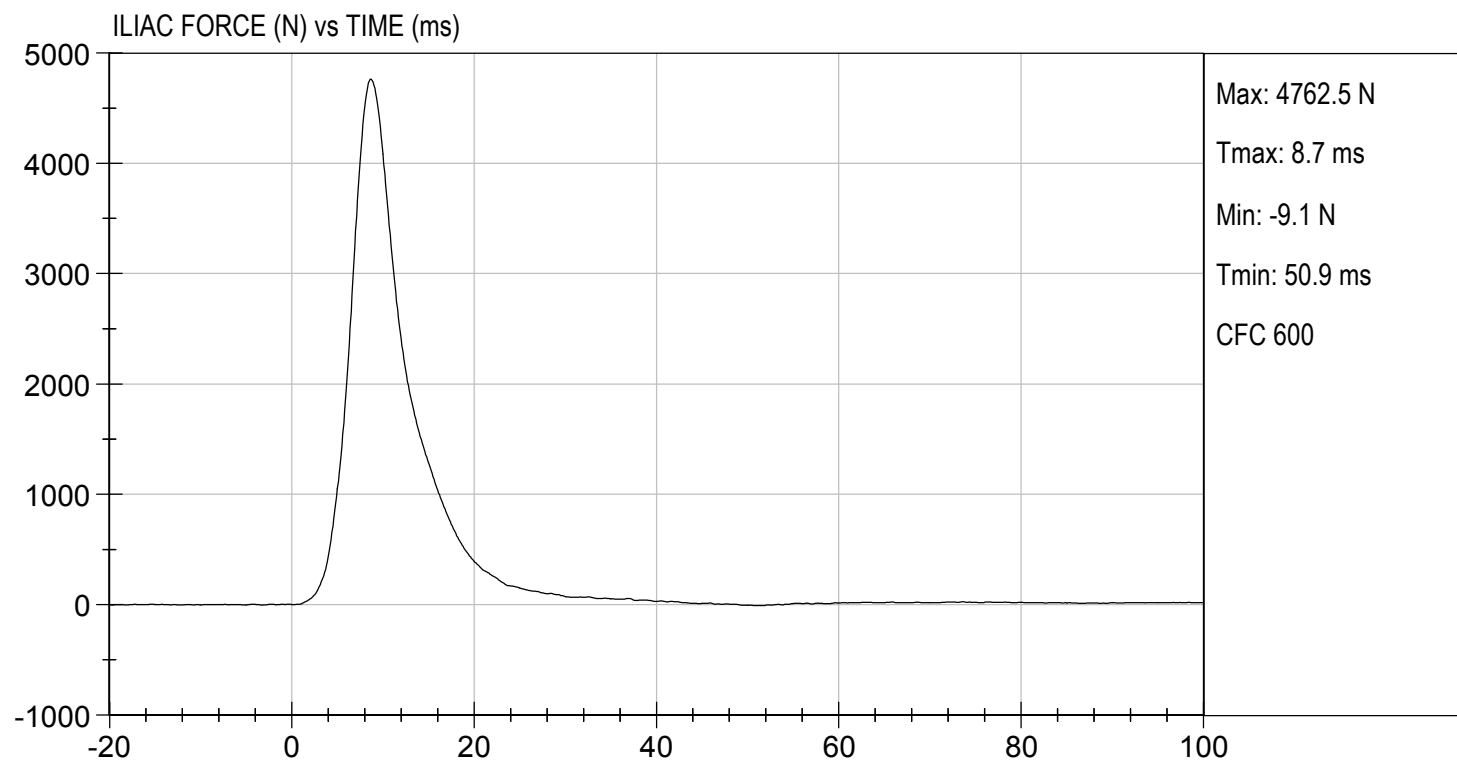
TEST DATE: 10/21/2019  
TEST #: D193288





TEST DESC: ILLIAC  
VELOCITY: 13.79 ft/s, 4.20 m/s

TEST DATE: 10/21/2019  
TEST #: D193288





# **SID-IIs Pelvis Plug Certification Test**

Plug S/N 12390

Test Number 6778

Report Number 6793

Test Date 3/23/2018 10:12:28 AM

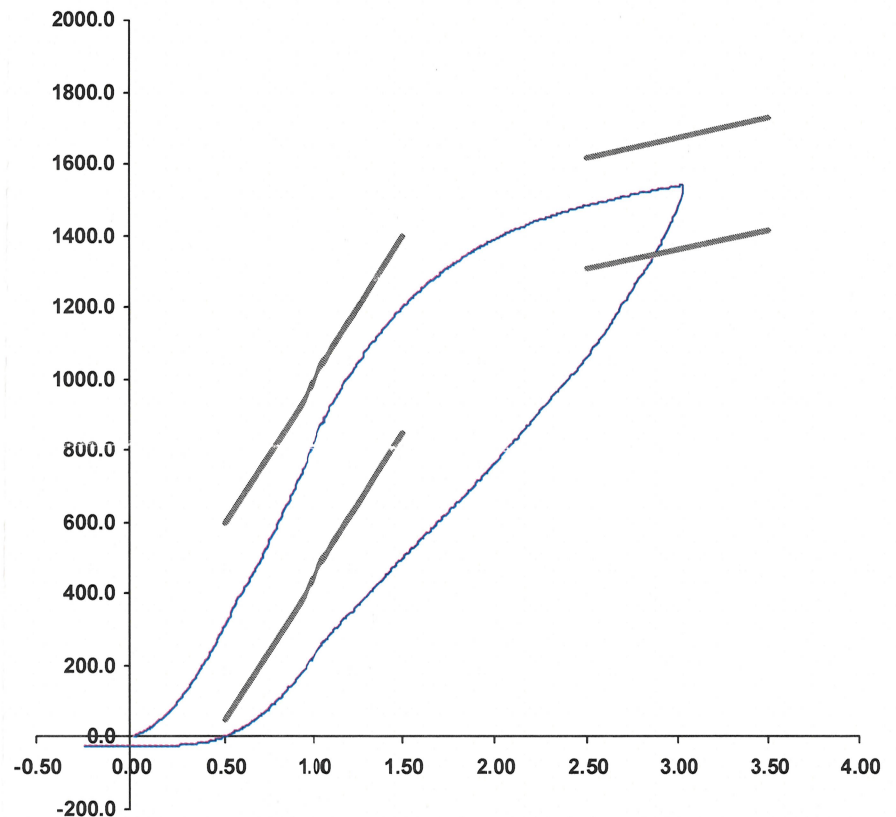
|                    | Test Results | Spec Min | Spec Max |
|--------------------|--------------|----------|----------|
| Force @ 0.5 mm (N) | 313.82       | 50.00    | 600.00   |
| Force @ 1.5 mm (N) | 1,200.17     | 850.00   | 1,400.00 |
| Force @ 2.5 mm (N) | 1,482.83     | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,539.15     | 1,361.00 | 1,673.00 |

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:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 23-Mar-18  
SACO Research

By : DC Date : 3/23/18

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



# **SID-IIs Pelvis Plug Certification Test**

Plug S/N 12238

Test Number 6624

Report Number 6639

Test Date 3/14/2018 1:00:50 PM

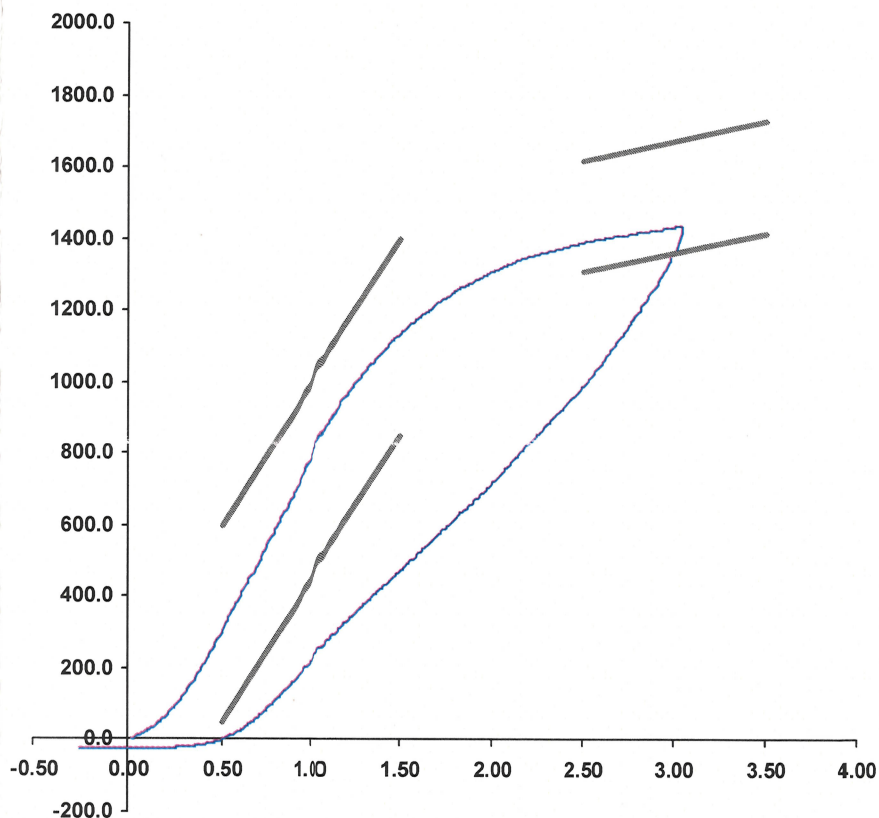
|                    | Test Results | Spec Min | Spec Max |
|--------------------|--------------|----------|----------|
| Force @ 0.5 mm (N) | 307.17       | 50.00    | 600.00   |
| Force @ 1.5 mm (N) | 1,135.93     | 850.00   | 1,400.00 |
| Force @ 2.5 mm (N) | 1,388.18     | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,433.79     | 1,361.00 | 1,673.00 |

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:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 14-Mar-18

SACO Research

By : DC

Date : 3/14/18

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

**APPENDIX D**  
**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA**

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

|                                        |         |    | ES-2re S/N 032 |              |                  |
|----------------------------------------|---------|----|----------------|--------------|------------------|
|                                        |         |    | Serial Number  | Manufacturer | Calibration Date |
| Head CG Accelerometers                 |         | X  | P79711         | Endevco      | 7/19/2019        |
|                                        |         | Y  | P79712         | Endevco      | 7/19/2019        |
|                                        |         | Z  | P79750         | Endevco      | 7/19/2019        |
|                                        |         | Xr | P79751         | Endevco      | 7/19/2019        |
|                                        |         | Yr | P79753         | Endevco      | 7/19/2019        |
|                                        |         | Zr | P88170         | Endevco      | 7/19/2019        |
| Thorax Rib Displacement Potentiometers | Upper   | Y  | G176           | Honeywell    | 7/19/2019        |
|                                        | Middle  | Y  | G169           | Honeywell    | 7/19/2019        |
|                                        | Lower   | Y  | G164           | Honeywell    | 7/19/2019        |
| Abdomen Load Cells                     | Forward | Y  | ABG1532        | Denton       | 8/13/2019        |
|                                        | Middle  | Y  | ABG1534        | Denton       | 8/13/2019        |
|                                        | Rear    | Y  | ABG1535        | Denton       | 8/13/2019        |
| Lower Spine Accelerometers (T12)       |         | X  | P79574         | Endevco      | 7/19/2019        |
|                                        |         | Y  | P82097         | Endevco      | 7/19/2019        |
|                                        |         | Z  | P82603         | Endevco      | 7/19/2019        |
| Public Symphysis Load Cell             |         | Y  | PG461          | Denton       | 8/13/2019        |



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

|                                  |               |        |   | SID-IIs S/N 306 |              |                  |           |
|----------------------------------|---------------|--------|---|-----------------|--------------|------------------|-----------|
|                                  |               |        |   | Serial Number   | Manufacturer | Calibration Date |           |
| Head CG Accelerometers           |               |        |   | X               | P79445       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Y               | P79721       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Z               | P79724       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Xr              | P84999       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Yr              | P85000       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Zr              | P85001       | Endevco          | 7/12/2019 |
| Head Angular Rate Sensors        |               |        |   | X               | ARS7416      | DTS              | 7/8/2019  |
|                                  |               |        |   | Y               | ARS7442      | DTS              | 7/8/2019  |
|                                  |               |        |   | Z               | ARS7475      | DTS              | 7/8/2019  |
| Displacement Potentiometers      | Thoracic Rib  | Upper  | Y | G033            | FTSS         | 7/12/2019        |           |
|                                  |               | Middle | Y | G1261           | FTSS         | 7/12/2019        |           |
|                                  |               | Lower  | Y | G1270           | FTSS         | 7/12/2019        |           |
|                                  | Abdominal Rib | Upper  | Y | G032            | FTSS         | 7/12/2019        |           |
|                                  |               | Lower  | Y | G1304           | FTSS         | 7/12/2019        |           |
| Lower Spine Accelerometers (T12) |               |        |   | X               | P96332       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Y               | P96335       | Endevco          | 7/12/2019 |
|                                  |               |        |   | Z               | P96341       | Endevco          | 7/12/2019 |
| Acetabulum Load Cell             |               |        |   | Y               | ACG268       | Denton           | 12/4/2018 |
| Iliac Wing Load Cell             |               |        |   | Y               | IWG273       | Denton           | 12/4/2018 |
| Pelvis Plug (struck side)        |               |        |   |                 | 12390        | SACO             | 3/23/2018 |
| Pelvis Plug (non-struck side)    |               |        |   |                 | 12238        | SACO             | 3/14/2018 |

**Table 3 – Vehicle Instrumentation**

|    |                              |   | Serial Number | Manufacturer | Calibration Date |
|----|------------------------------|---|---------------|--------------|------------------|
| 1  | Vehicle Center of Gravity    | X | T12206        | Endevco      | 9/27/2019        |
|    | Vehicle Center of Gravity    | Y | T21447        | Endevco      | 7/26/2019        |
|    | Vehicle Center of Gravity    | Z | T19327        | Endevco      | 9/27/2019        |
| 2  | Right Sill at Front Seat     | X | PCB1377       | PCB          | 9/18/2019        |
|    | Right Sill at Front Seat     | Y | PCB1371       | PCB          | 9/18/2019        |
|    | Right Sill at Front Seat     | Z | PCB1165       | PCB          | 7/17/2019        |
| 3  | Right Sill at Rear Seat      | X | T20401        | Endevco      | 9/26/2019        |
|    | Right Sill at Rear Seat      | Y | T21457        | Endevco      | 7/26/2019        |
|    | Right Sill at Rear Seat      | Z | T18990        | Endevco      | 9/27/2019        |
| 4  | Left Sill at Front Door      | Y | T19009        | Endevco      | 9/27/2019        |
| 5  | Left Sill at Rear Door       | Y | T16894        | Endevco      | 6/12/2019        |
| 6  | Left A-Post Lower            | Y | T21421        | Endevco      | 7/25/2019        |
| 7  | Left A-Post Middle           | Y | T19004        | Endevco      | 7/19/2019        |
| 8  | Left B-Post Lower            | Y | PCB1126       | PCB          | 9/18/2019        |
| 9  | Left B-Post Middle           | Y | PCB1263       | PCB          | 9/18/2019        |
| 10 | Front Seat Track             | Y | PCB1134       | PCB          | 7/17/2019        |
| 11 | Rear Seat Track or Structure | Y | T18351        | Endevco      | 7/19/2019        |
| 12 | Right Rear Occ. Compartment  | Y | T19344        | Endevco      | 5/3/2019         |
| 13 | Engine Block                 | X | T20410        | Endevco      | 7/25/2019        |
|    | Engine Block                 | Y | T20339        | Endevco      | 7/25/2019        |
| 14 | Rear Floorpan Above Axle     | X | PCB1125       | PCB          | 7/17/2019        |
|    | Rear Floorpan Above Axle     | Y | PCB1329       | PCB          | 7/12/2019        |
|    | Rear Floorpan Above Axle     | Z | PCB1145       | PCB          | 7/22/2019        |

**Table 4 – MDB Instrumentation**

|                                    |   | Serial Number | Manufacturer | Calibration Date |
|------------------------------------|---|---------------|--------------|------------------|
| MDB Center of Gravity              | X | PCB660D       | PCB          | 9/23/2019        |
| MDB Center of Gravity              | Y | PCB659D       | PCB          | 9/23/2019        |
| MDB Center of Gravity              | Z | PCB661D       | PCB          | 9/23/2019        |
| Left Frame at Rear Axle Centerline | X | PCB557D       | PCB          | 9/23/2019        |
| Left Frame at Rear Axle Centerline | Y | PCB753D       | PCB          | 9/23/2019        |