**REPORT NUMBER: SINCAP-KAR-19-024**

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

## KIA MOTORS CORPORATION
## 2019 KIA NIRO HYBRID LX 5-DOOR MPV

**NHTSA No: M20194211**


**PREPARED BY:**

**APPLUS IDIADA KARCO ENGINEERING, LLC.**

**9270 HOLLY ROAD**

**ADELANTO, CA 92301**


**JUNE 8, 2019**

**FINAL REPORT**

**PREPARED FOR:**

**U.S. DEPARTMENT OF TRANSPORTATION**

**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

**OFFICE OF CRASHWORTHINESS STANDARDS**

**MAIL CODE: NRM-110**

**1200 NEW JERSEY AVE, SE, ROOM W43-410**

**WASHINGTON, D.C. 20590**

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Approval Date: June 8, 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

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| Final Report of New Car Assessment Program<br>Side Impact MDB Testing of a 2019 Kia Niro Hybrid LX 5-Door MPV<br>NHTSA No. M20194211 | June 8, 2019 |
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**15. Supplementary Notes**

**16. Abstract**

A 55 / 28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2019 Kia Niro Hybrid LX 5-Door MPV in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on May 21, 2019.

The impact velocity of the Moving Deformable Barrier was 62.17 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 19.4°C. The target vehicle's maximum post-test static crush was 201 mm located at level 3. The test vehicle's occupant performance data is as follows:

| Measurement Description | Driver ATD (ES-2re) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 138.1 |
| Maximum Thoracic Rib Deflection | mm | 44 | 23 |
| Total Abdominal Force | N | 2500 | 873 |
| Pubic Symphysis Force | N | 6000 | 1523 |

| Measurement Description | Passenger ATD (SID-IIs) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 170.3 |
| Resultant Lower Spine Acceleration | g | 82 | 77 |
| Total Pelvic Force (Sum of Acetubular and Iliac Forces) | N | 5525 | 4415 |
| Maximum Thoracic Rib Deflection | mm | 38* | 41 |
| Maximum Abdominal Rib Deflection | mm | 45* | 41 |

Both the left front driver and left rear passenger doors were jammed shut. The doors on the struck side of the vehicle did not separate from the body at the hinges or latches. The opposite side doors did not open during the side impact event.

** Proposed IARV*

| 17. Key Words | | 18. Distribution Statement | |
|---|---|---|---|
| New Car Assessment Program (NCAP)<br>Side Impact<br>Moving Deformable Barrier (MDB)<br>ES-2re<br>SID-IIs | | Copies of this report are available from:<br>National Highway Traffic Safety Administration<br>Technical Information Services Division, NPO-411<br>1200 New Jersey Ave., SE<br>Washington, DC 20590 | |
| **19. Security Classification of this report** | **20. Security Classification of this page** | **21. No. of Pages** | **22. Price** |
| UNCLASSIFIED | UNCLASSIFIED | 155 | |

## TABLE OF CONTENTS

## 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 number DTNH22-14-D-00355L. The purpose of this test is to generate comparative side impact performance in a 2019 Kia Niro Hybrid LX 5-Door MPV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

## SECTION 2
## SUMMARY OF TEST RESULTS

A 2019 Kia Niro Hybrid LX 5-door MPV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.17 km/h (38.63 mph). 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 Applus IDIADA KARCO Engineering, LLC. in Adelanto, California, on May 21, 2019. Pre- and post-test photographs of the test vehicle, the MDB and the dummy (ES-2re and SID-IIs) are included in Appendix A of this report.

The dummies were placed in the driver and left rear designated seating position according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (12) tri-axial accelerometers
Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

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

Dummy injury readings were recorded as follows:

| Measurement Description | Units | Driver ATD (ES-2re) | |
|---|---|---|---|
| | | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 138.1 |
| Maximum Thoracic Rib Deflection | mm | 44 | 23 |
| Combined Abdominal Force | N | 2500 | 873 |
| Pubic Symphysis Force | N | 6000 | 1523 |

| Measurement Description | Units | Passenger ATD (SID-IIs) | |
|---|---|---|---|
| | | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 170.3 |
| Lower Spine (T12) Resultant Acceleration | g | 82 | 77 |
| Total Pelvic Force (sum of acetabular and iliac forces | N | 5525 | 4415 |
| Maximum Thoracic Rib Deflection | mm | 38* | 41 |
| Maximum Abdominal Rib Deflection | mm | 45* | 41 |

**Proposed IARV*

Supplemental restraint information is given below:

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

**GENERAL COMMENTS**

The doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. The doors on the non-struck side remained closed and latched. There was no ATD value that exceeded its limit. The Passenger Lower Thorax Rib Deflection Y exceeded the proposed IARV threshold. Left Front Sill Y channel failed at 46.9 ms, Left Rear Sill Y channel failed at 28.7 ms, Left Lower A-Post Y channel failed at 22.5 ms, Left Lower B-Post Y channel failed at 20.7 ms, and Left Mid B-Post Y channel failed at 20.5 ms. Left Mid A-Post Y channel failed and no data was collected.

## SECTION 3

## OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### CONVERSION FACTORS

| Quantity | Typical Application | Std Units | Metric Unit | Multiply By |
|---|---|---|---|---|
| Mass | Vehicle Weight | lb | kg | 0.4536 |
| Linear Velocity | Impact Velocity | miles/hr | km/hr | 1.609344 |
| Length or Distance | Measurements | in | mm | 25.4 |
| Volume | Fuel Systems | gal | liter | 3.785 |
| Volume | Small Fluids | oz | mL | 29.574 |
| Pressure | Tire Pressures | $lbf/in^2$ | kPa | 6.895 |
| Temperature | General Use | $^oF$ | $^oC$ | =(Tf -32)/1.8 |
| Force | Dynamic Forces | lbf | N | 4.448 |
| Moment | Torque | lbf-ft | N•m | 1.355 |

## DATA SHEET NO. 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### TEST VEHICLE INFORMATION AND OPTIONS

| | |
|---|---|
| NHTSA Number | M20194211 |
| Model Year | 2019 |
| Make | Kia |
| Model | Niro Hybrid LX |
| Body Style | 5-Door MPV |
| VIN | KNDCB3LC3K5240812 |
| Body Color | Silver |
| Odometer Reading (km / mi) | 29 / 18 |
| Engine Displacement (L) | 1.6 |
| Type / No. of Cylinders | Inline 4 |
| Engine Placement | Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | 6 |
| Overdrive | Yes |
| Final Drive | FWD |
| Roof Rack | Yes |
| Sunroof / T-Top | No |
| Running Boards | No |
| Tilt Steering Wheel | Yes |
| Power Seats | No |
| Anti-Lock Brakes (ABS) | Yes |

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

| | |
|---|---|
| Does Owner's Manual provide instructions to turn off automatic door locks? | No |

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | Kia Motors Corporation |
| Date of Manufacture | Oct-18 |
| Vehicle Type | MPV |

| | |
|---|---|
| GVWR (kg) | 1900 |
| GAWR Front (kg) | 1052 |
| GAWR Rear (kg) | 908 |

### VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total | |
|---|---|---|---|---|---|
| Designated Seating Capacity | 2 | 3 | | 5 | |
| Capacity Weight (VCW) (kg) | | | | 385.0 | *A* |
| DSC x 68.04 (kg) | | | | 340.2 | *B* |
| Cargo Weight (RCLW) (kg) | | | | 44.8 | *A-B* |

### VEHICLE SEAT TYPE

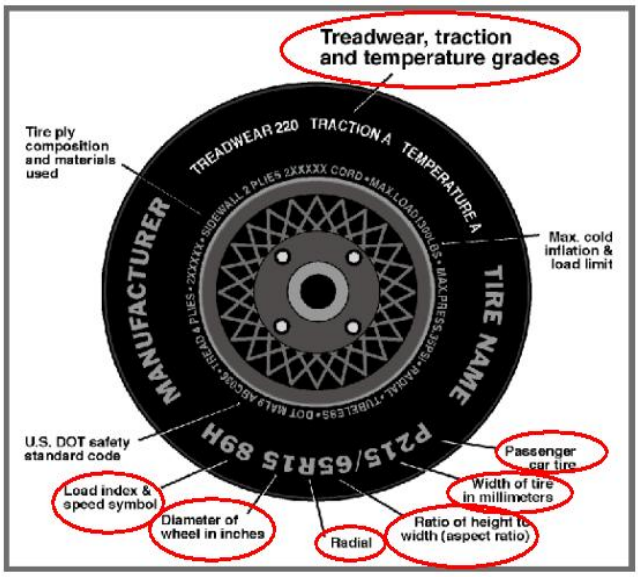
| Seating Location | Type of Seat Pan | | | | Type of Seat Back | | |
|---|---|---|---|---|---|---|---|
| | Bucket | Bench | Split Bench | Contoured | Fixed | Adjustable w/ Lever | Adjustable w/ Knob |
| Front Seat | Yes | | | | | Yes | |
| Rear or Second Row Seat | | | Yes | | Yes | | |
| Third Row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

**DATA SHEET NO. 1 … (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




| Measured Parameter | Front | Rear |
|---|---|---|
| Max. Tire Pressure (kpa) | 300 | 300 |
| Cold Pressure (kPa) | 250 | 250 |
| Recommended Tire Size | P205/60R16 | P205/60R16 |
| Tire Size on Vehicle | P205/60R16 | P205/60R16 |
| Tire Manufacturer | Michelin | Michelin |
| Tire Model | Energy Saver A/S | Energy Saver A/S |
| Treadware | 480 | 480 |
| Traction Grade | A | A |
| Temperature Grade | A | A |
| Tire Plies Sidewall | 1 Polyester | 1 Polyester |
| Tire Plies Body | 1 Polyester, 1 Polyamide, 2 Steel | 1 Polyester, 1 Polyamide, 2 Steel |
| Load Index/Speed Symbol | 92H | 92H |
| Tire Material | Polyester, Polyamide, Steel | Polyester, Polyamide, Steel |
| DOT Safety Code Left | B37R 04MX 0118 | B37R 04MX 0118 |
| DOT Safety Code Right | B37R 04MX 0118 | B37R 04MX 0118 |

## DATA SHEET NO. 1 … (CONTINUED)

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### TIRE PRESSURES

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

### MDB TIRE SPECIFICATIONS

| | Units | Requirement | LF | RF | LR | RR |
|---|---|---|---|---|---|---|
| Tire Size | | P205/60R16 | P205/60R16 | P205/60R16 | P205/60R16 | P205/60R16 |
| Tire Pressure | kPa | 230 ± 21 | 230 | 230 | 230 | 230 |

### TEST VEHICLE AXLE WEIGHTS

| | | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Units | Front | Rear | Total | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 438.5 | 287.5 | | 460.5 | 384.0 | | 479.5 | 358.0 | |
| Right | kg | 428.5 | 271.0 | | 445.5 | 297.0 | | 439.0 | 317.5 | |
| Ratio | % | 60.8% | 39.2% | 100.0% | 57.1% | 42.9% | 100.0% | 57.6% | 42.4% | 100.0% |
| Total | kg | 867.0 | 558.5 | 1425.5 | 906.0 | 681.0 | 1587.0 | 918.5 | 675.5 | 1594.0 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|---|---|---|
| Total Delivered Weight (UVW) | kg | 1425.5 | A |
| Actual Weight of 2 P572 ATD Used | kg | 125.0 | B |
| Rated Cargo/Luggage Wt (RCLW) | kg | 44.8 | C |
| Calculated Vehicle Target Wt (TVTW) | kg | 1595.3 | 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 -9.0 kg)?** ☒ **Yes** ☐ **No**

### TEST VEHICLE ATTITUDE AND CG

| Measurement Description | Units | Fully Loaded | As Tested | Meets Requirement*** |
|---|---|---|---|---|
| LF | mm | 720 | 714 | Yes |
| RF | mm | 730 | 723 | Yes |
| LR | mm | 713 | 703 | Yes |
| RR | mm | 725 | 715 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1144 | 1158 | |
| Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline) | mm | 40 | 50 | |

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

**DATA SHEET NO. 1 … (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

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

| Component Description | Weight (kg) |
|---|---|
| Trunk Trim | 6.0 |
| | |
| Ballast / Equipment Added | 42.5 |

| Test Height Adjustable Setting (If Applicable) | |
|---|---|

## DATA SHEET NO. 2

## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### 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 rearmost, lowest, mid-angle position.

### SCRL ANGLE RANGE

| Seat | SCRL (°) | | |
|---|---|---|---|
| | Max | Min | Mid |
| Driver Seat | 3.0 | 0.0 | 1.5 |
| Front Passenger Seat | 3.1 | 0.0 | 1.6 |
| Front Center Seat | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed |

### SEAT HEIGHT AND ANGLE

| Seat | As Tested SCRL Angle (Mid) (°) | As Tested SCRP Height (mm) | SCRP Height Position | SCRP Height (mm) | | |
|---|---|---|---|---|---|---|
| | | | | Rearmost | Mid Fore/Aft | Forwardmost |
| Driver Seat | 1.5 | 192 | Max | | | |
| | | | Mid | 184 | 192 | 198 |
| | | | Min | | | |
| Front Passenger Seat | 1.6 | 580 | Max | | | |
| | | | Mid | 570 | 580 | 590 |
| | | | Min | | | |
| 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 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

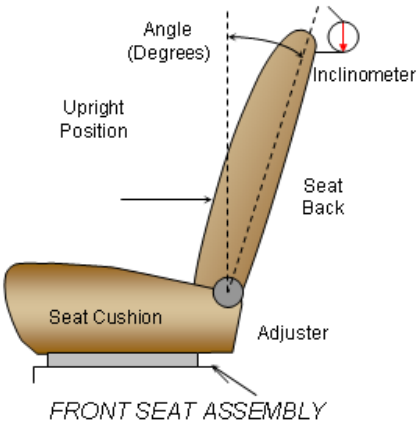
### SEAT FORE/AFT POSITION

| Seat | Total Fore/Aft Travel | | Test Position From Forwardmost Position | |
|---|---|---|---|---|
| | mm | Detents* | mm | Detent* |
| Driver Seat | 255 | 64 | 128 | 33 |
| Front Passenger Seat | 254 | 64 | 128 | 33 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed | Fixed |

*Detent zero (0) is the forward most detent

### SEAT BACK ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured using the outboard head restraint post.




### SEAT BACK POSITION

| Seat | Total Seat Back Angle Range | | Test Position from Most Upright | |
|---|---|---|---|---|
| | Degrees | Detents* | Degree | Detent* |
| Driver Seat w/ Seated Dummy | 59.3 | 19 | 1.2 | 4 |
| Front Passenger Seat | 60.1 | 19 | 1.0 | 4 |
| Front Center Seat | | | | |
| Struck Side Rear Seat w/Seated Dummy | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed | Fixed |

*Detent zero (0) is the forward most detent

## DATA SHEET NO. 2 … (CONTINUED)

## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. The positions are marked H, M3, M2, M1, L from top to bottom.

| | Total No. of Positions | Placed in Position |
|---|---|---|
| Driver Seat | 4 | H |
| Rear Seat | Fixed | Fixed |

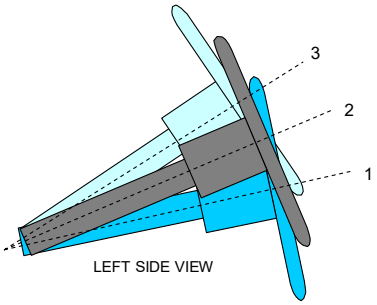
### HEAD RESTRAINT ADJUSTMENT

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

| | Total No. of Positions | Placed in Position |
|---|---|---|
| Driver Seat | 6 | H |
| Rear Seat | 1 | L |

### STEERING COLUMN ADJUSTMENT

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




*STEERING COLUMN ASSEMBLY*

| | Degrees | Fore-Aft Position (mm) |
|---|---|---|
| Lowermost - Position 1 | 22.4 | 88 |
| Geometric Center - Position 2 | 25.1 | 112 |
| Uppermost - Position 3 | 27.7 | 136 |
| Telescoping Steering Wheel Travel | | 48 |
| Test Position | 25.1 | 112 |

## DATA SHEET NO. 2 … (CONTINUED)

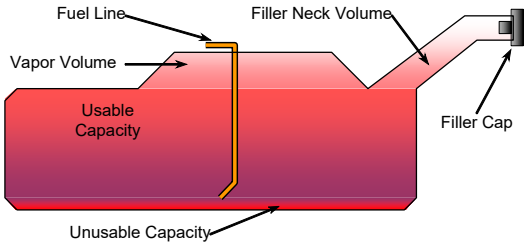
## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump operates when the engine system is normally operating.




*VEHICLE FUEL TANK ASSEMBLY*

### FUEL TANK CAPACITY

| Description | Liters |
|---|---|
| Usable Capacity of "Standard Tank" (see Form No. 1) | 45.00 |
| Usable Capacity of "Optional Tank" (see Form No. 1) | |
| Usable Capacity of "Standard Tank" (see Owner's Manual) | 45.00 |
| Usable Capacity of "Optional Tank" (see Owner's Manual) | |
| 93% of Usable Capacity | 41.85 |
| Actual amount of Solvent Used in Test | 41.86 |
| 1/3 of Usable Capacity | 15.00 |

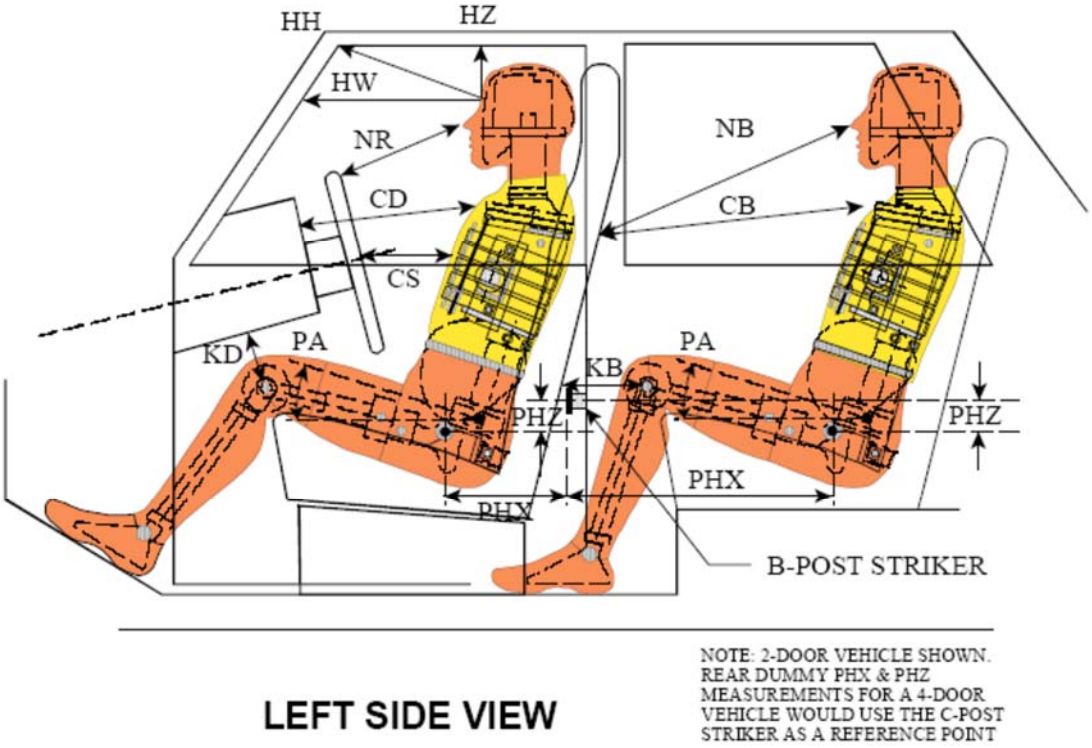
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? ☒ **Yes** ☐ **No**

**DATA SHEET NO. 3**

**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




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

**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

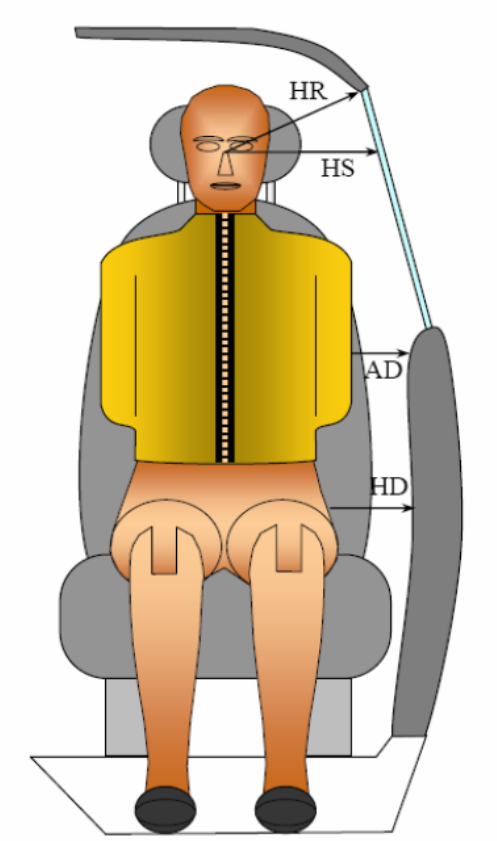
| Driver Code | Pass. Code | Description | Driver | | Passenger | |
|---|---|---|---|---|---|---|
| | | | Length (mm) | Angle (º) | Length (mm) | Angle (º) |
| HH | | Head to Header | 351 | | | |
| HW | | Head to Windshield | 638 | | | |
| HZ | HZ | Head to Roof | 169 | | 292 | |
| NR | NB | Nose to Rim/Seat Back | 410 | | 574 | |
| CD | CB | Chest to Dash/Seat Back | 577 | | 548 | |
| CS | | Chest to Steering Wheel | 368 | | | |
| KD(L)/KDA(L)° | KB(L)/KBA(L)° | Left Knee to Dash/Seat Back | 211 | 22.6 | 283 | 16.5 |
| KD(R)/KDA(R)° | KB(R)/KBA(R)° | Right Knee to Dash/Seat Back | 185 | 24.5 | 286 | 20.8 |
| PAX° | PAX° | Pelvic Tilt Angle X | | 9.1 | | 20.3 |
| | PAY° | Pelvic Tilt Angle Y | | 0.2 | | 0.1 |
| PHX | PHX | Hip Point to Striker (x-axis) | 190 | | 256 | |
| PHZ | PHZ | Hip Point to Striker (z-axis) | 250 | | 257 | |

**DATA SHEET NO. 4**

**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




**DUMMY LATERAL CLEARANCE DIMENSION INFORMATION**

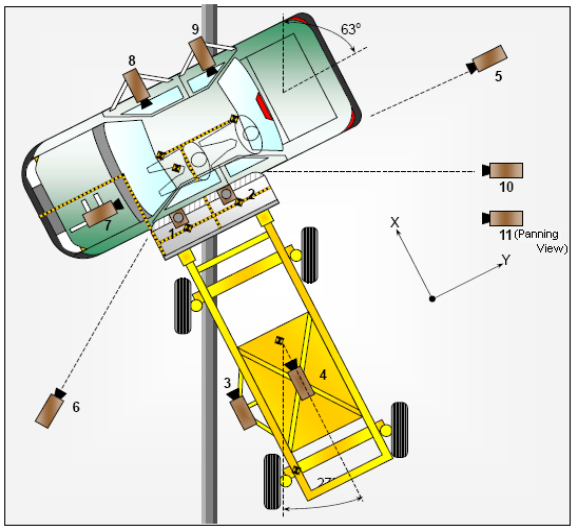
| Code | Measurement Description | Units | Driver | Passenger |
|---|---|---|---|---|
| HR | Head to Side Header | mm | 204 | 268 |
| HS | Head to Side Window | mm | 355 | 352 |
| AD | Arm to Door | mm | 105 | 164 |
| HD | H-Point to Door | mm | 165 | 202 |

## DATA SHEET NO. 5

## CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




### CAMERA LOCATIONS AND DATA

| No. | View | Coordinates (mm) | | | Lens Length (mm) | Operating Frame Rate (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Overhead Overall | 1220 | 2287 | -5486 | 14 | 1000 |
| 2 | Overhead Close-Up | 609 | 2287 | -5102 | 35 | 1000 |
| 3 | Left Impact Point (MDB) | -2134 | 0 | -1143 | 25 | 1000 |
| 4 | Side Overall (MDB) | -3912 | 838 | -1829 | 12.5 | 1000 |
| 5 | Rear | -64 | 2485 | -1348 | 85 | 1000 |
| 6 | Left Front | -2266 | -3564 | -1475 | 24 | 1000 |
| 7 | Driver Front (On-Board) | 520 | -523 | 686 | 8.5 | 1000 |
| 8 | Driver Side (On-Board) | 1667 | 771 | 370 | 8.5 | 1000 |
| 9 | Passenger Side (On-Board) | 1646 | 1519 | 462 | 8.5 | 1000 |
| 10 | Real Time Overall | | | | Zoom | 30 |
| 11 | Real Time Inrun | | | | Zoom | 30 |

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

*All measurements accurate to ±6 mm

### INSTRUMENTATION

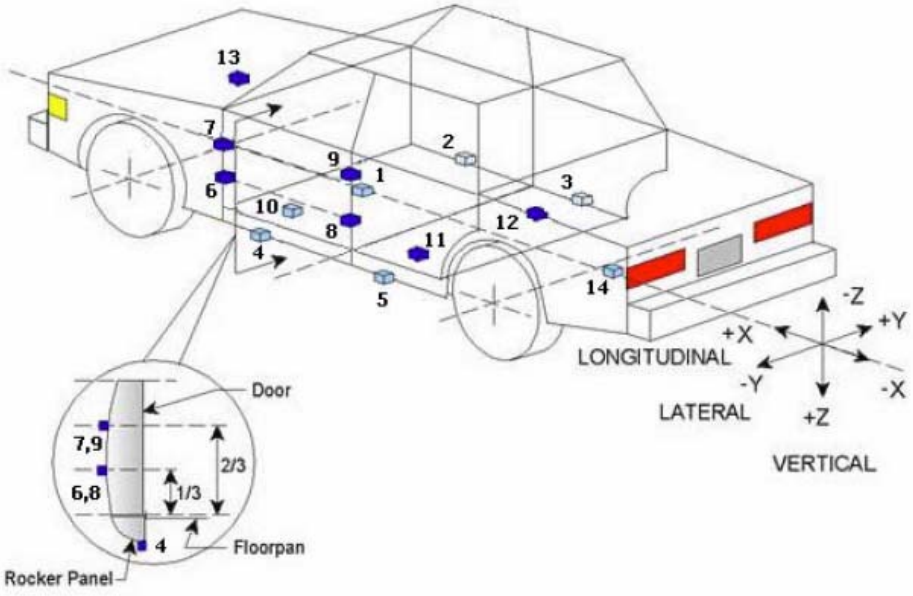
| | |
|---|---|
| Driver Dummy Channels | 16 |
| Passenger Dummy Channels | 19 |
| Vehicle Structure Accelerometers | 23 |
| MDB Channels | 7 |
| Total | 65 |

**DATA SHEET NO. 6**

**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

| Loc. No. | Sensor Description | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Vehicle CG | 1980 | 0 | -350 |
| 2 | Right Sill at Front Seat | 2500 | 700 | -390 |
| 3 | Right Sill at Rear Seat | 1540 | 690 | -390 |
| 4 | Left Sill at Front Door | 2570 | -735 | -200 |
| 5 | Left Sill at Rear Door | 1500 | -735 | -200 |
| 6 | A-Pillar Lower | 2980 | -800 | -420 |
| 7 | A-Pillar Middle | 2980 | -800 | -680 |
| 8 | B-Pillar Lower | 1940 | -690 | -520 |
| 9 | B-Pillar Middle | 1940 | -690 | -800 |
| 10 | Front Seat Track | 2100 | -610 | -450 |
| 11 | Rear Seat Structure | 1630 | -400 | -500 |
| 12 | Right Rear Occupant Compartment | 1630 | 400 | -500 |
| 13 | Engine Block | 3600 | 410 | -500 |
| 14 | Rear Floorpan Above Axle | 900 | 0 | -560 |

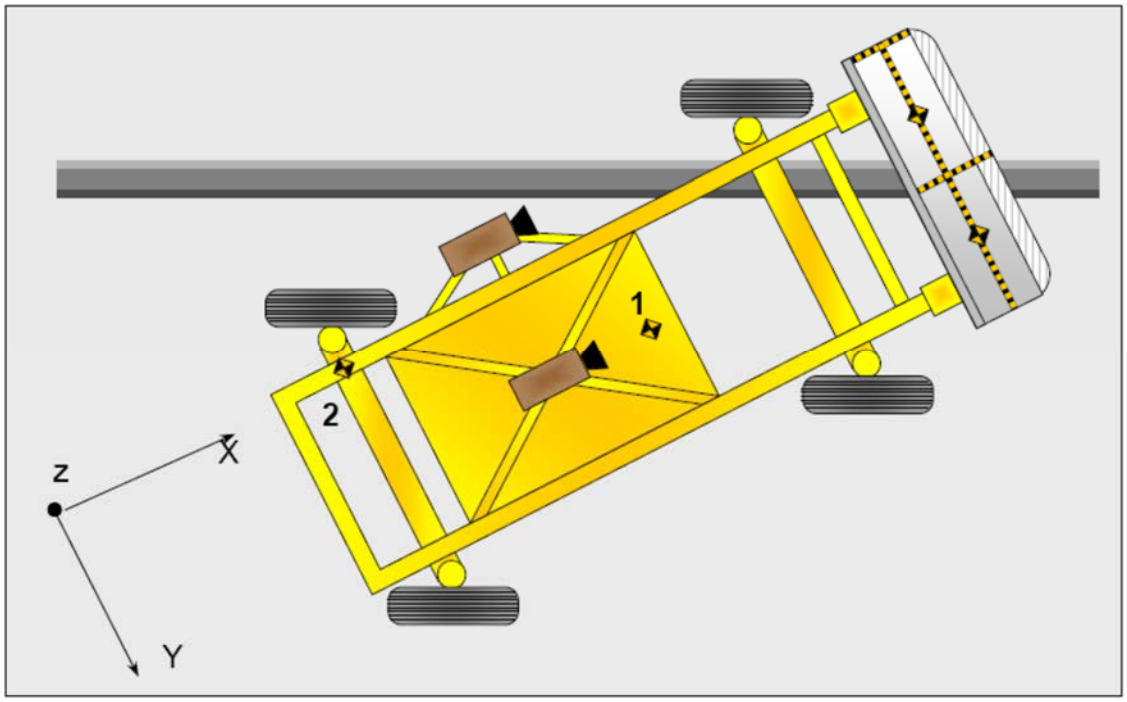
Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

**DATA SHEET NO. 7**

**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




**MDB ACCELEROMETER LOCATIONS**

| Loc. No. | Accelerometer Location | Measurement | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | MDB CG | -1195 | 0 | -430 |
| 2 | MDB Rear | -2642 | -593 | -608 |

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

**DATA SHEET NO. 8**

**POST-TEST OBSERVATIONS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

**TEST DUMMY INFORMATION AND CONTACT POINTS**

| Dummy Body Part | Front Seat Dummy (ES-2re) | Rear Seat Dummy (SID-IIs) |
|---|---|---|
| Face | Curtain Airbag | Curtain Airbag |
| Top of Head | Side Header | Curtain Airbag, Center Headrest |
| Left Side of Head | Curtain Airbag, Side Header | Curtain Airbag |
| Back of Head | Curtain Airbag, Side Header, Headrest | Curtain Airbag, Headrest, Seatback |
| Left Shoulder | Curtain Airbag, Side Airbag, Door Panel | Curtain Airbag, Door Panel |
| Upper Torso | Side Airbag, Seat | Door Panel |
| Lower Torso | Side Airbag, Seat | Door Panel |
| Left Hip | Side Airbag, Door Panel | Door Panel, Seat |
| Left Knee | Door Panel, Knee Airbag | Door Panel |

**POST-TEST DOOR PERFORMANCE**

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

## DATA SHEET NO. 8 … (CONTINUED)

## POST-TEST OBSERVATIONS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### POST-TEST SEAT PERFORMANCE

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

### POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|---|---|
| Pillar Performance | No separation |
| Sill Separation | No separation |
| Windshield Damage | None |
| Side Window Damage | None |
| Other Notable Effects | None |

## DATA SHEET NO. 8 … (CONTINUED)

## POST-TEST OBSERVATIONS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Type | Struck Side Driver | | Struck Side Rear Passenger | |
|---|---|---|---|---|
| | Mounted | Deployed | Mounted | Deployed |
| Frontal Airbag | Yes | Yes | No | |
| Knee Airbag | Yes | Yes | No | |
| Side Airbag 1 (Curtain) | Yes | Yes | Yes | Yes |
| Side Airbag 2 (Torso/Pelvis) | Yes | Yes | No | |
| Seat Belt Pretensioner | Yes | Yes | No | |
| Seat Belt Load Limiter | Yes | Yes | No | |

### IMPACT POINT LOCATION DATA

| Measured Parameter | Units | Tolerance | Value |
|---|---|---|---|
| Vehicle Wheel Base | mm | | 2699 |
| Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point) | mm | | 407 |
| Actual Impact Point (Aft of Front Axle) | mm | | 408 |
| Horizontal Offset (+ forward / - rearward) | mm | ± 50 of Intended Impact Point | -1 |
| Vertical Offset (+ down / - up) | mm | ± 20 of Intended Impact Point | -1 |

## DATA SHEET NO. 9

## MDB SUMMARY OF RESULTS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### MDB SPECIFICATIONS

| Measurement Description | Length (mm) |
|---|---|
| Overall Width of Framework Carriage | 1251 |
| Overall Length including Honeycomb Face | 4115 |
| Wheel Base of Framework Carriage | 2595 |
| CG location aft of Front Axle | 1118 |

### MDB WEIGHTS

| | Units | Front Axle | Rear Axle | Total |
|---|---|---|---|---|
| Left | kg | 402.0 | 297.5 | 699.5 |
| Right | kg | 377.0 | 290.0 | 667.0 |
| Ratio | % | 57.0% | 43.0% | 100.0% |
| Totals | kg | 779.0 | 587.5 | 1366.5 |

### SPEED AND IMPACT DATA

| Measured Parameter | Units | Requirement | Value |
|---|---|---|---|
| Trap No. 1 Velocity (Primary) | km/h | 61.1 to 62.7 | 62.17 |
| Trap No. 2 Velocity (Redundant) | km/h | 61.1 to 62.7 | 62.16 |
| MDB CL to Target Vehicle CL | degrees | 88.5 to 91.5 | 90.3 |
| MDB Forward Line of Motion to Target Vehicle CL | degrees | 62.5 to 63.5 | 63.0 |
| MDB Crabbed Angle to MDB Forward Line of Motion | degrees | 26.0 to 28.0 | 27.3 |

### MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

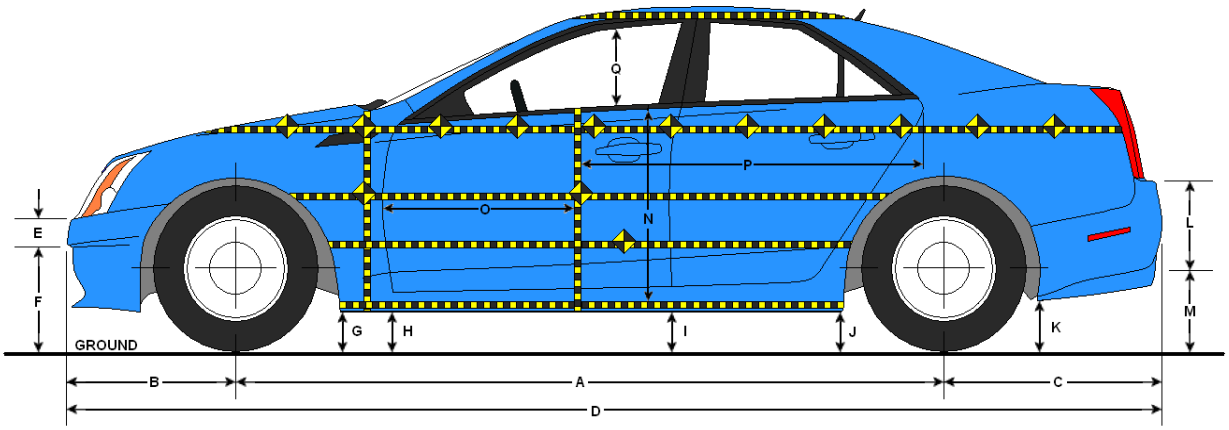
| Vertical Location | | | From Centerline | | Max. Crush (mm) |
|---|---|---|---|---|---|
| Row | Description | Height (mm) | Distance (mm) | Direction | |
| A | Center of Bumper | 432 | 800 | Right | 225 |
| B | Top of Bumper | 533 | 800 | Right | 137 |
| C | Mid Level | 686 | 800 | Right | 149 |
| D | Top of Stack | 813 | 800 | Right | 147 |

## DATA SHEET NO. 10

## TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




**LEFT SIDE VIEW**

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

| Code | Description | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|
| A | Wheelbase | 2699 | 2718 | 19 |
| B | Front Axle to FSOV | 869 | 843 | -26 |
| C | Rear Axle to RSOV | 782 | 786 | 4 |
| D | Total Length at Centerline | 4350 | 4346 | -4 |
| E | Front Bumper Thickness | 131 | 131 | 0 |
| F | Fromt Bumper Bottom to Ground | 462 | 460 | -2 |
| G | Sill Height at Front Wheel Well | 302 | 304 | 2 |
| H | Sill Height at Front Door Leading Edge | 288 | 294 | 6 |
| I | Sill Height at B-Pillar | 301 | 322 | 21 |
| J1 | Sill Height at Rear Wheel Well | 247 | 267 | 20 |
| J2 | Pinch Weld Height at Rear Wheel Well | 207 | 211 | 4 |
| K | Sill Height Aft of Rear Wheel Well | 324 | 321 | -3 |
| L | Rear Bumper Thickness | 208 | 208 | 0 |
| M | Rear Bumper Bottom to Ground | 391 | 392 | 1 |
| N | Sill Height to Bottom of Front Window Sill | 694 | 657 | -37 |
| O | Front Door Leading Edge to Impact CL | 795 | 743 | -52 |
| P | Rear Door Trailing Edge to Impact CL | 1354 | 1327 | -27 |
| Q | Front Window Opening | 434 | 443 | 9 |
| R | Right Side Length | 3153 | 3154 | 1 |
| S | Left Side Length | 3149 | 3144 | -5 |
| T | Vehicle Width at B-Pillar | 1797 | 1696 | -101 |

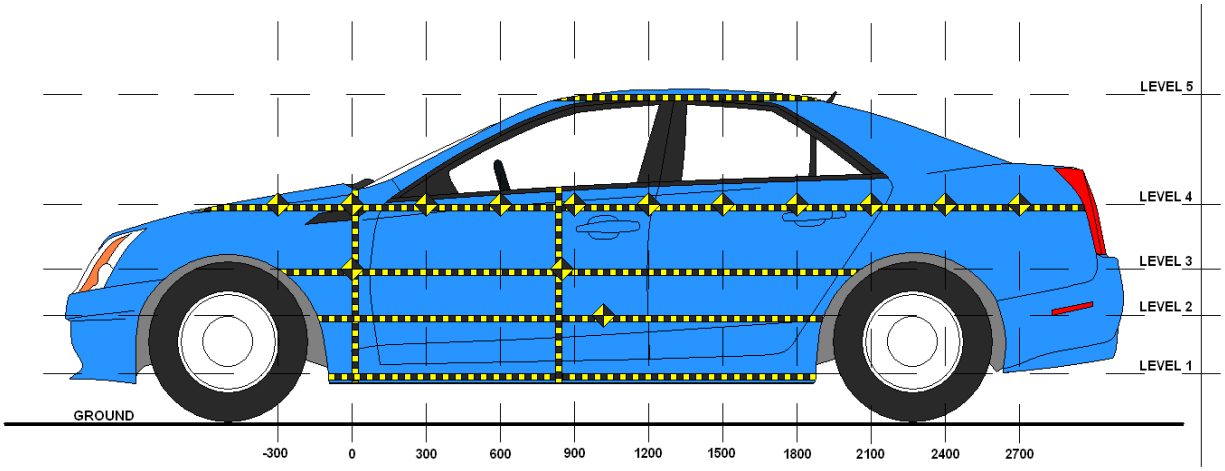
All measurements in mm with tolerance of ± 3mm

**DATA SHEET NO. 11**

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




**LEFT SIDE VIEW**

| Level | Description | Height Above Ground (mm) | Maximum Exterior Static Crush | Distance from Impact |
|---|---|---|---|---|
| 1 | Sill Top | 277 | 19 | 1050 |
| 2 | Occupant H-Point | 568 | 187 | 1800 |
| 3 | Mid-Door | 692 | 201 | 900 |
| 4 | Window Sill | 984 | 87 | 1500 |
| 5 | Window Top | 1489 | 3 | 750 |

## DATA SHEET NO. 11 … (CONTINUED)

## TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

### EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

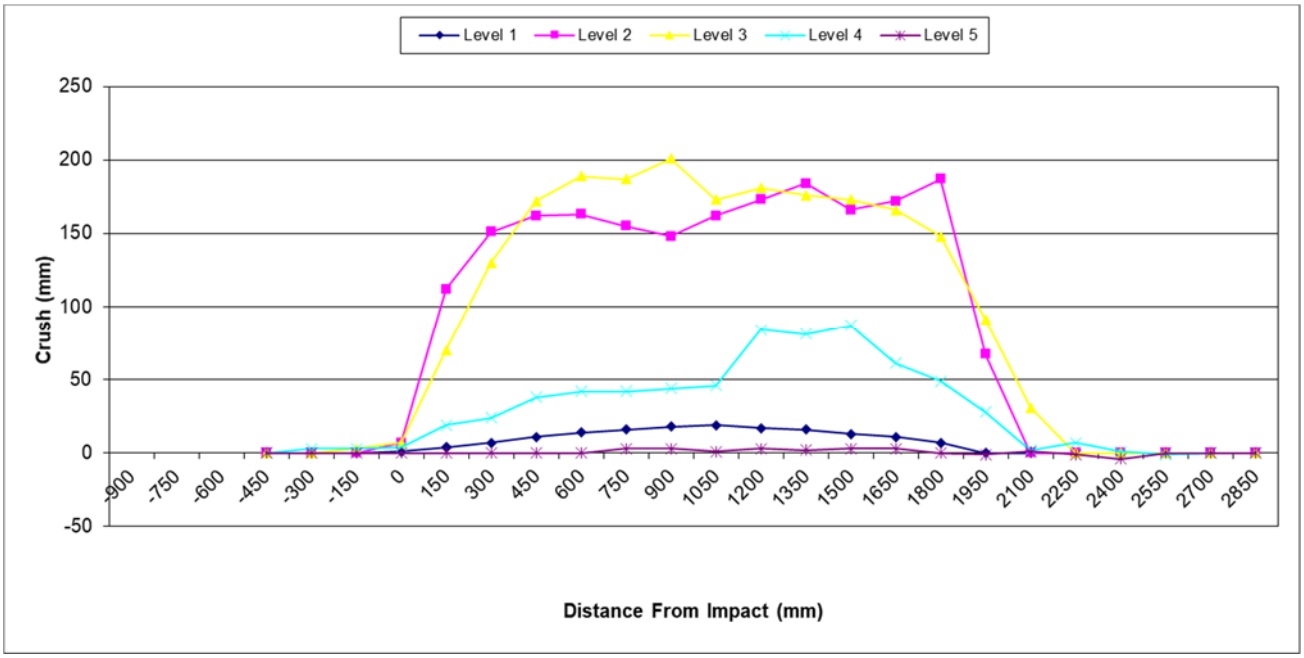
| | Pre-Test (mm) | | | | | Post-Test (mm) | | | | | Difference (mm) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -900 | | | | | | | | | | | | | | | |
| -750 | | | | | | | | | | | | | | | |
| -600 | | | | | | | | | | | | | | | |
| -450 | | | | | | | | | | | | | | | |
| -300 | | | | 703 | | | | | 706 | | | | | 3 | |
| -150 | | | 600 | 697 | | | | 603 | 700 | | | | 3 | 3 | |
| 0 | 624 | 601 | 601 | 695 | | 625 | 608 | 608 | 699 | | 1 | 7 | 7 | 4 | |
| 150 | 639 | 611 | 608 | 693 | | 643 | 723 | 678 | 712 | | 4 | 112 | 70 | 19 | |
| 300 | 647 | 616 | 610 | 686 | | 654 | 767 | 740 | 710 | | 7 | 151 | 130 | 24 | |
| 450 | 647 | 617 | 611 | 674 | | 658 | 779 | 783 | 712 | | 11 | 162 | 172 | 38 | |
| 600 | 646 | 620 | 611 | 666 | | 660 | 783 | 800 | 708 | | 14 | 163 | 189 | 42 | |
| 750 | 644 | 621 | 611 | 659 | 900 | 660 | 776 | 798 | 701 | 903 | 16 | 155 | 187 | 42 | 3 |
| 900 | 642 | 621 | 610 | 651 | 899 | 660 | 769 | 811 | 695 | 902 | 18 | 148 | 201 | 44 | 3 |
| 1050 | 643 | 622 | 609 | 648 | 903 | 662 | 784 | 782 | 694 | 904 | 19 | 162 | 173 | 46 | 1 |
| 1200 | 644 | 623 | 609 | 644 | 902 | 661 | 796 | 790 | 728 | 905 | 17 | 173 | 181 | 84 | 3 |
| 1350 | 645 | 623 | 610 | 643 | 901 | 661 | 807 | 786 | 724 | 903 | 16 | 184 | 176 | 81 | 2 |
| 1500 | 646 | 623 | 612 | 643 | 899 | 659 | 789 | 785 | 730 | 902 | 13 | 166 | 173 | 87 | 3 |
| 1650 | 641 | 619 | 614 | 644 | 899 | 652 | 791 | 780 | 705 | 902 | 11 | 172 | 166 | 61 | 3 |
| 1800 | 633 | 608 | 612 | 644 | 901 | 640 | 795 | 760 | 693 | 901 | 7 | 187 | 148 | 49 | 0 |
| 1950 | | 601 | 602 | 622 | 902 | | 668 | 693 | 650 | 901 | | 67 | 91 | 28 | -1 |
| 2100 | | | 597 | 623 | 903 | | | 628 | 625 | 904 | | | 31 | 2 | 1 |
| 2250 | | | | 653 | 909 | | | | 660 | 908 | | | | 7 | -1 |
| 2400 | | | | 660 | 914 | | | | 661 | 910 | | | | 1 | -4 |
| 2550 | | | | 667 | | | | | 666 | | | | | -1 | |
| 2700 | | | | | | | | | | | | | | | |
| 2850 | | | | | | | | | | | | | | | |

**DATA SHEET NO. 11 … (CONTINUED)**

**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

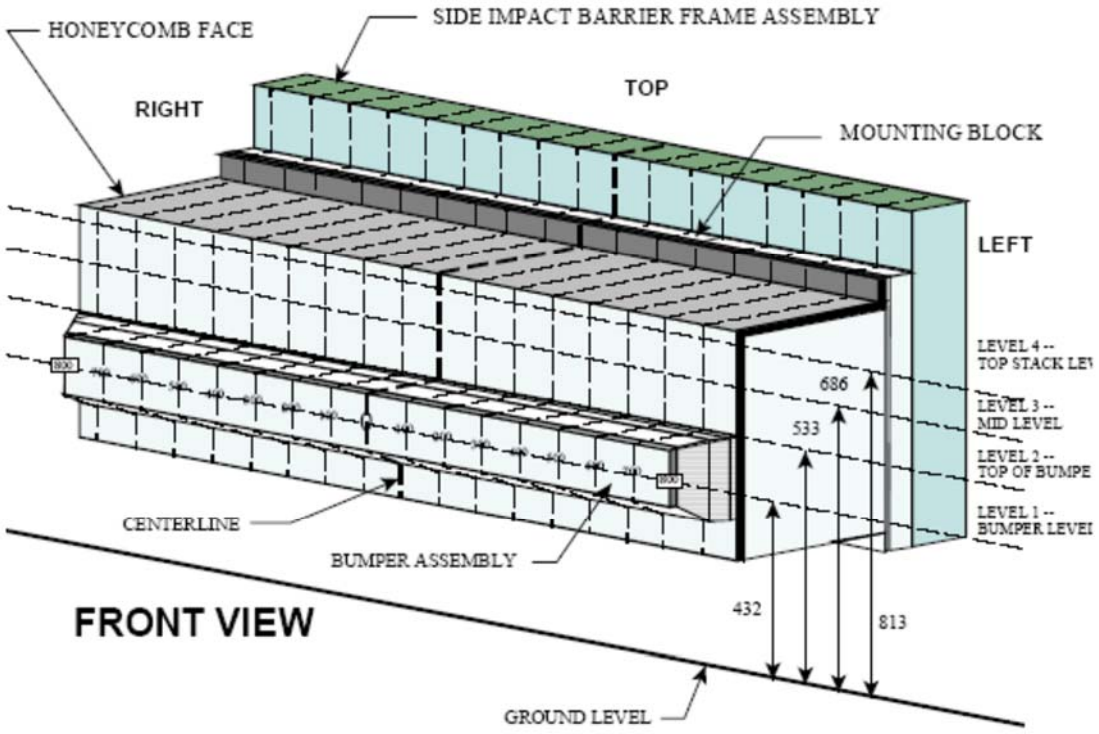


**DATA SHEET NO. 12**

**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




NOTE: Dimensions are shown in millimeters, mm

**DEFORMABLE BARRIER STATIC CRUSH**

| Stack Level | Distance Right of Center | | | | | | | | C/L | Distance Left of Center | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 800 | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 1 | 219 | 194 | 187 | 199 | 193 | 195 | 191 | 193 | 192 | 189 | 189 | 187 | 184 | 179 | 177 | 199 | 225 |
| 2 | 104 | 101 | 92 | 91 | 87 | 82 | 77 | 84 | 85 | 82 | 82 | 82 | 85 | 89 | 87 | 109 | 137 |
| 3 | 75 | 52 | 35 | 40 | 39 | 51 | 56 | 73 | 50 | 37 | 36 | 33 | 38 | 51 | 68 | 101 | 149 |
| 4 | 85 | 61 | 38 | 26 | 55 | 82 | 87 | 83 | 67 | 61 | 66 | 57 | 62 | 72 | 83 | 109 | 147 |

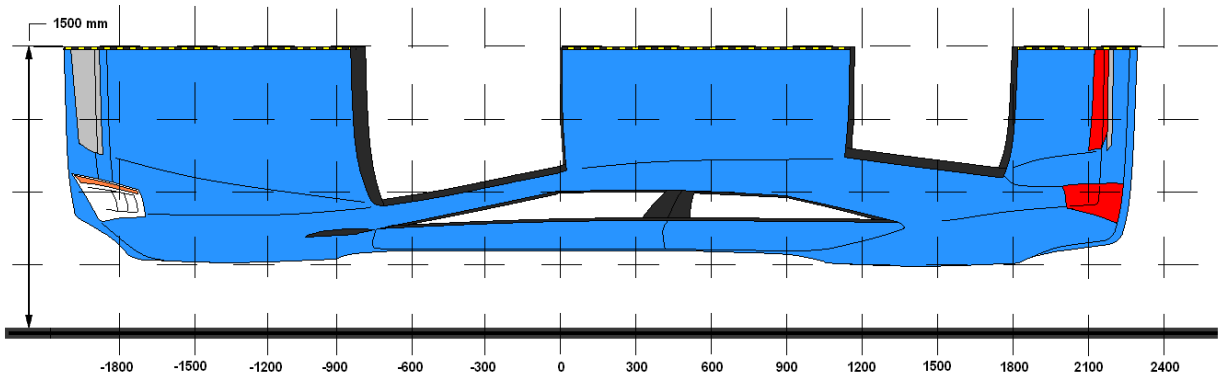
All dimensions in millimeters.

## DATA SHEET NO. 13

## VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19




### VEHICLE DAMAGE PROFILE DISTANCES

| DPD | Distance From Impact Point (mm) | Level | Pre-Test (mm) | Post-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | 2550 | 4 | 667 | 666 | -1 |
| 2 | 1950 | 3 | 602 | 693 | 91 |
| 3 | 1350 | 2 | 623 | 807 | 184 |
| 4 | 900 | 3 | 610 | 811 | 201 |
| 5 | 300 | 3 | 616 | 767 | 151 |
| 6 | -300 | 4 | 703 | 706 | 3 |

### MDB DAMAGE PROFILE DISTANCES

| DPD | From MDB Centerline | | Level | Crush (mm) |
|---|---|---|---|---|
| | Distance (mm) | Direction | | |
| 1 | 800 | Left | 1 | 225 |
| 2 | 500 | Left | 1 | 179 |
| 3 | 200 | Left | 1 | 189 |
| 4 | 200 | Right | 1 | 191 |
| 5 | 500 | Right | 1 | 199 |
| 6 | 800 | Right | 1 | 219 |

**DATA SHEET NO. 14**

**FMVSS NO. 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19

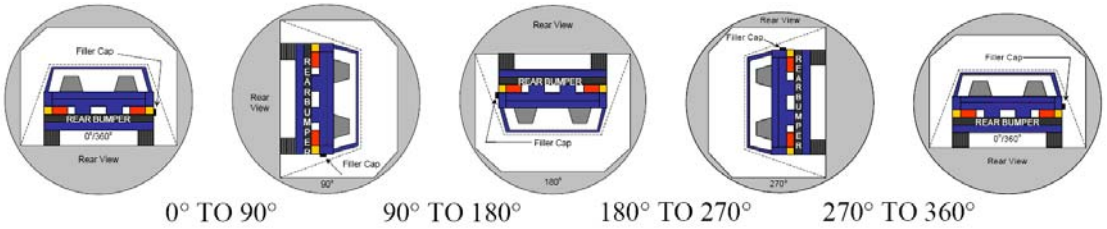
Temperature at Time of Impact: 19.4 °C Test Time: 1:14 PM

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)

D. Spillage Details: There was no Stoddard solvent spillage.




**SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase | Rotation Time | Hold Time | Total Time |
|---|---|---|---|
| 0° To 90° | 79 | 300 | 379 |
| 90° To 180° | 80 | 300 | 380 |
| 180° To 270° | 80 | 300 | 380 |
| 270° To 360° | 78 | 300 | 378 |

**FMVSS 301 SPILLAGE TABLE**

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

**SOLVENT SPILLAGE LOCATION TABLE**

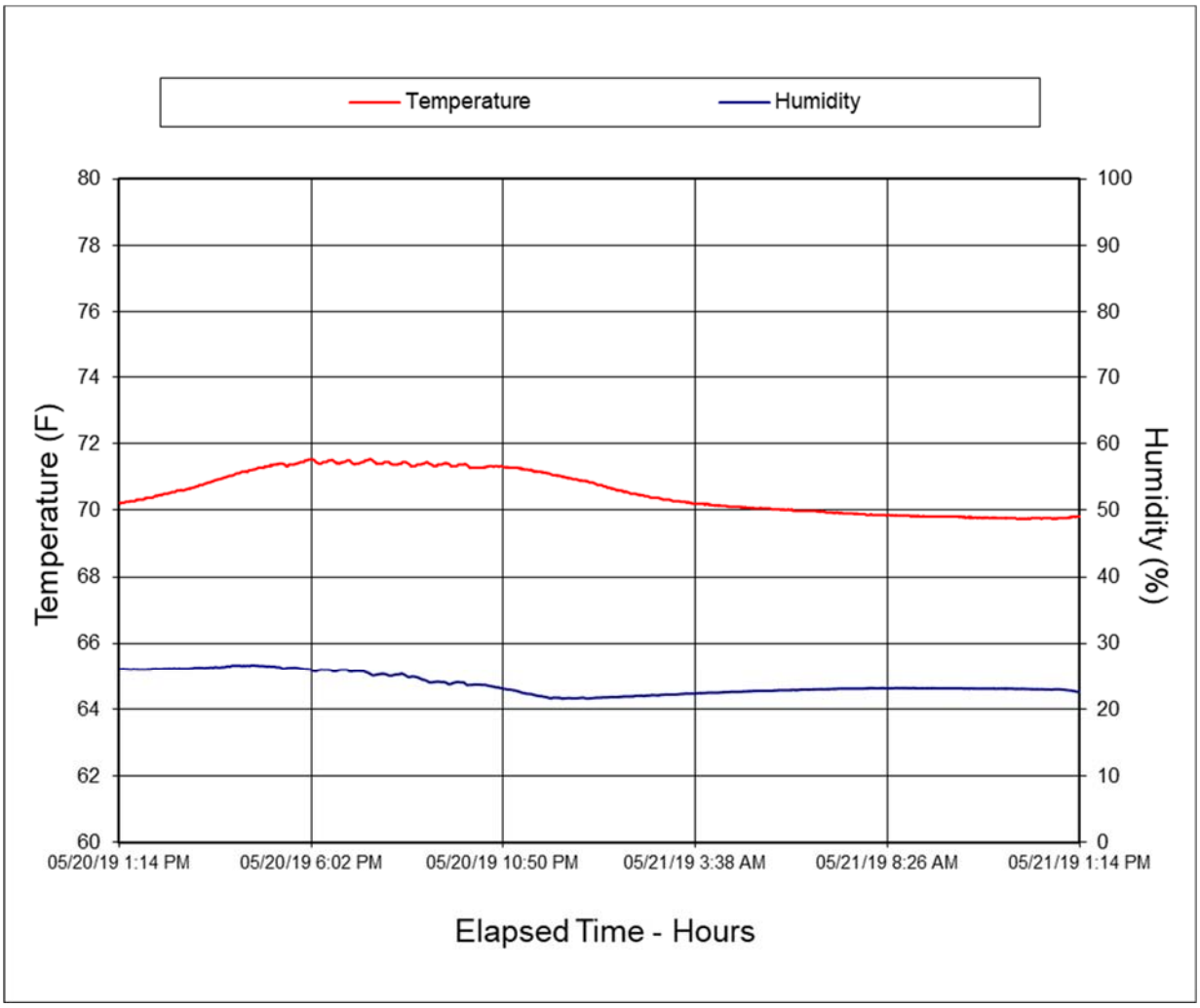
| Test Phase | Spillage Location |
|---|---|
| 0° To 90° | N/A |
| 90° To 180° | N/A |
| 180° To 270° | N/A |
| 270° To 360° | N/A |

**DATA SHEET NO. 15**

**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION**

Test Vehicle: 2019 Kia Niro Hybrid LX 5-Door MPV NHTSA No. M20194211

Test Program: NCAP MDB Side Impact Test Test Date: 05/21/19



**APPENDIX A**

**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS … (CONTINUED)

## TABLE OF PHOTOGRAPHS … (CONTINUED)


FIGURE 1. As-Delivered Right Front ¾ View of Test Vehicle


FIGURE 2. As-Delivered Left Rear ¾ View of Test Vehicle

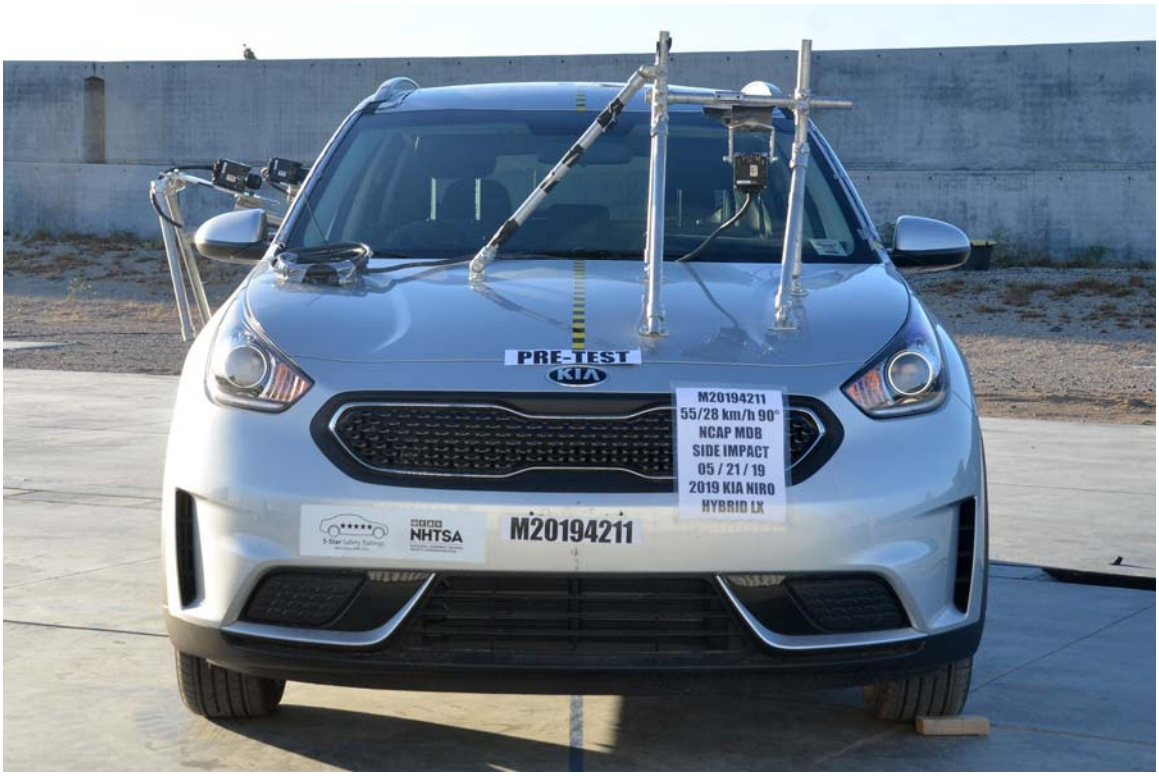



FIGURE 3. Pre-Test Frontal View of Test Vehicle


FIGURE 4. Post-Test Frontal View of Test Vehicle


FIGURE 5. Pre-Test Left Front ¾ View of Test Vehicle


FIGURE 6. Post-Test Left Front ¾ View of Test Vehicle


FIGURE 7. Pre-Test Left Side View of Test Vehicle


FIGURE 8. Post-Test Left Side View of Test Vehicle


FIGURE 9. Pre-Test Left Rear ¾ View of Test Vehicle


FIGURE 10. Post-Test Left Rear ¾ View of Test Vehicle


FIGURE 11. Pre-Test Rear View of Test Vehicle


FIGURE 12. Post-Test Rear View of Test Vehicle


FIGURE 13. Pre-Test Right Side View of Test Vehicle


FIGURE 14. Post-Test Right Side View of Test Vehicle


FIGURE 15. Pre-Test Overhead View of Test Area

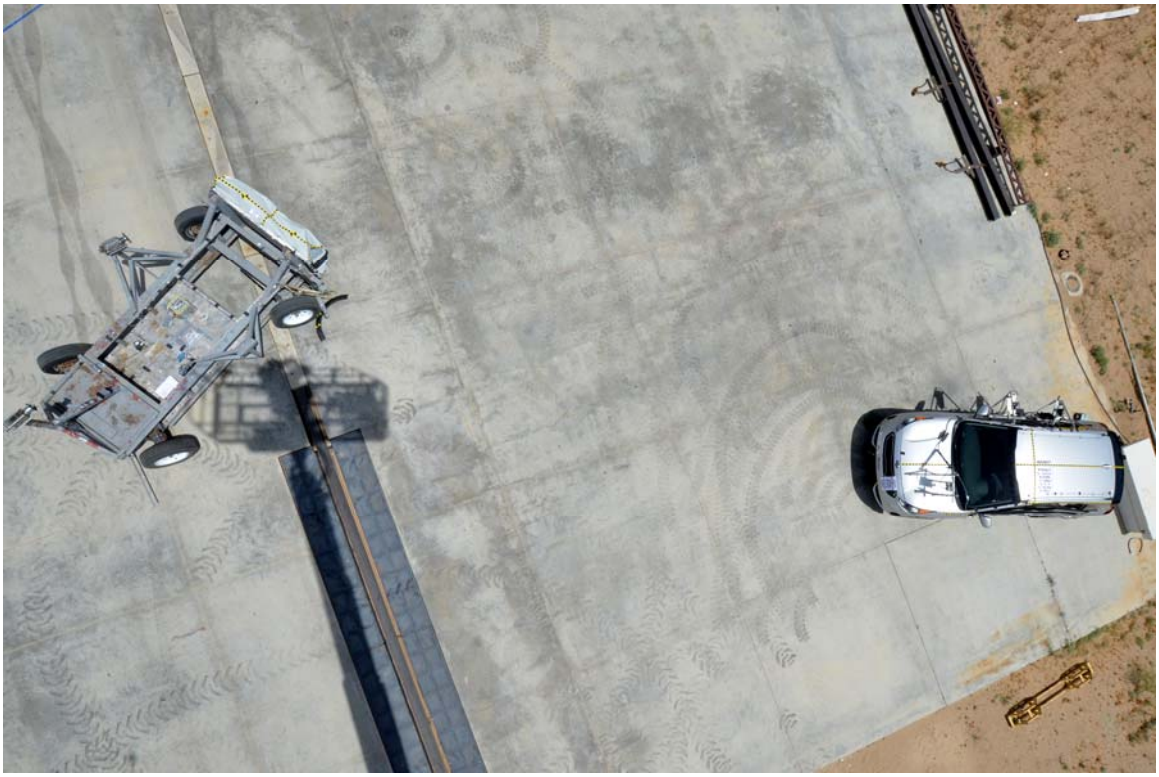


FIGURE 16. Post-Test Overhead View of Test Area


FIGURE 17. Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle


FIGURE 18. Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle

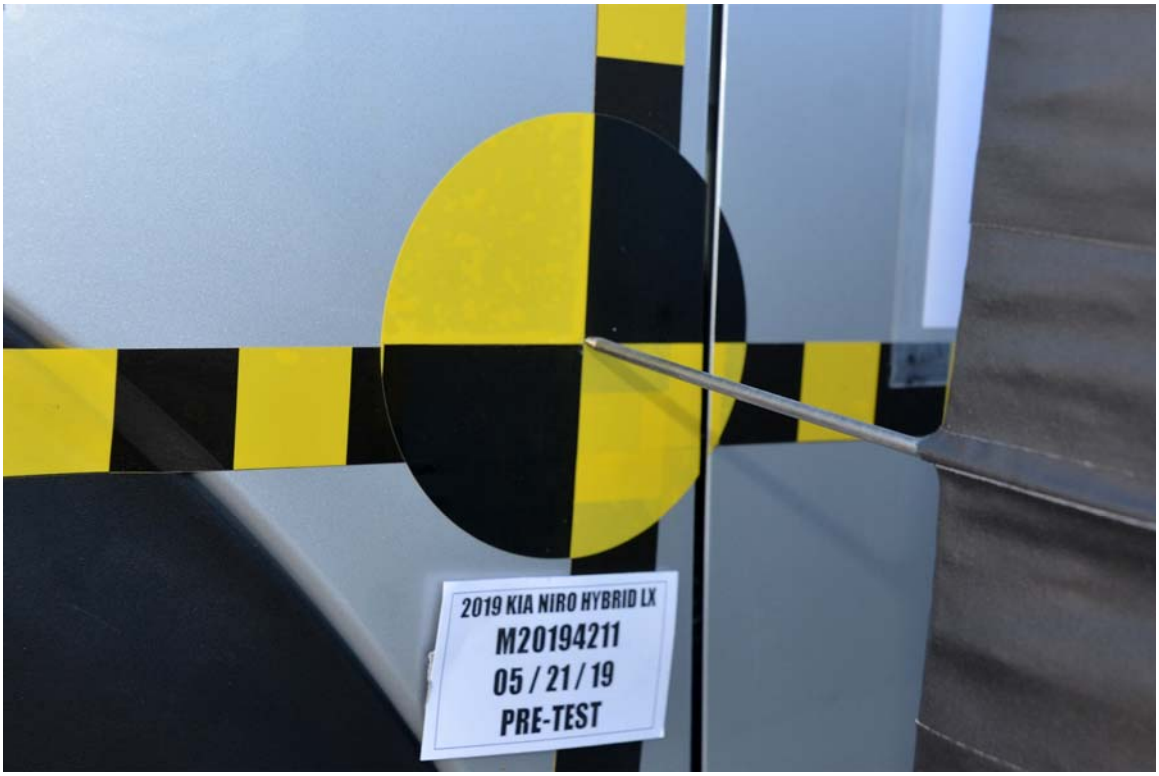



FIGURE 19. Pre-Test Close-Up View of Impact Point Target


FIGURE 20. Post-Test Close-Up View of Impact Point Target


FIGURE 21. Pre-Test Left Front Door Latch Close-Up


FIGURE 22. Post-Test Left Front Door Latch Close-Up

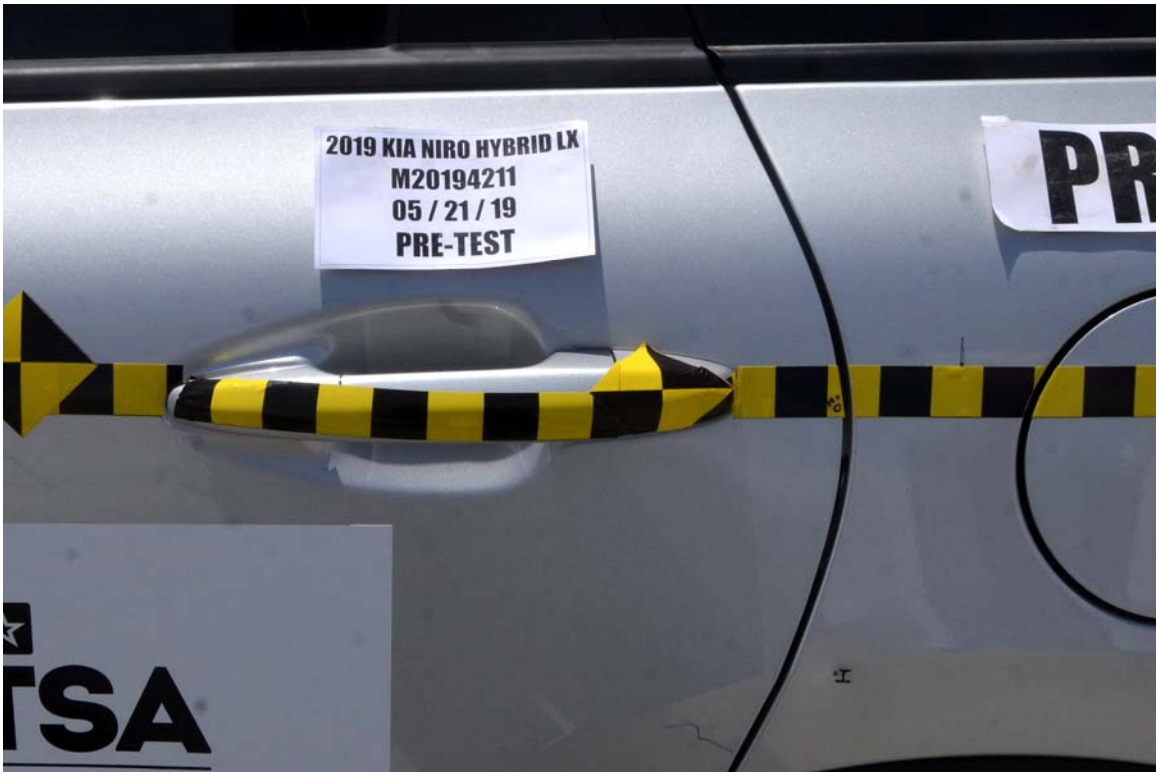



FIGURE 23. Pre-Test Left Rear Door Latch Close-Up

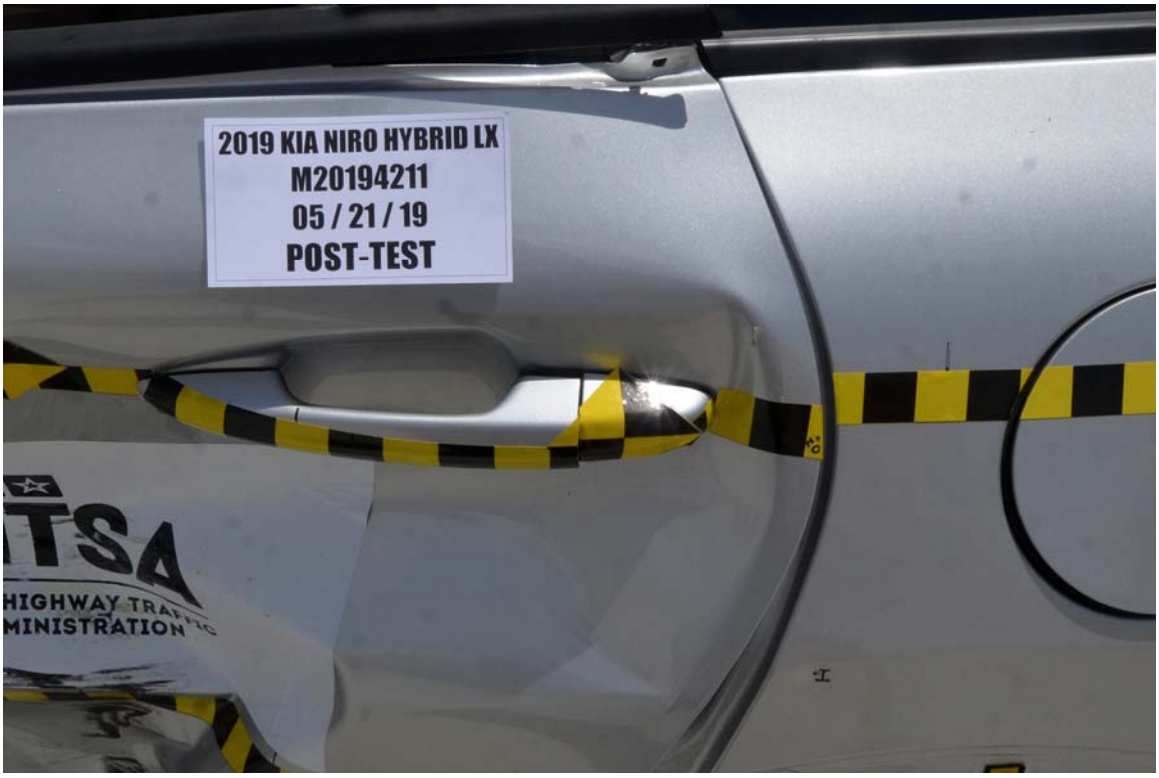



FIGURE 24. Post-Test Left Rear Door Latch Close-Up


FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy


FIGURE 26. Post-Test Front Close-Up View of Driver Dummy

FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt and Chalking


FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning


FIGURE 31. Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint


FIGURE 32. Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning


FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan


FIGURE 34. Pre-Test Placement of Driver Dummy's Feet


FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy


FIGURE 36. Pre-Test Left Side View of Steering Wheel


FIGURE 37. View of Disengaged Parking Brake


FIGURE 38. Pre-Test View of Parking Brake


FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track


FIGURE 40. Pre-Test Close-Up Left Side View of Driver Seat Back


FIGURE 41. Pre-Test Close-Up View of Driver Seat Back or Head Restraint


FIGURE 42. Pre-Test Driver Dummy and Door Clearance View


FIGURE 43. Post-Test Driver Dummy and Door Clearance View


FIGURE 44. Pre-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment


FIGURE 45. Post-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment


FIGURE 46. Pre-Test Driver Inner Door Panel View


FIGURE 47. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations

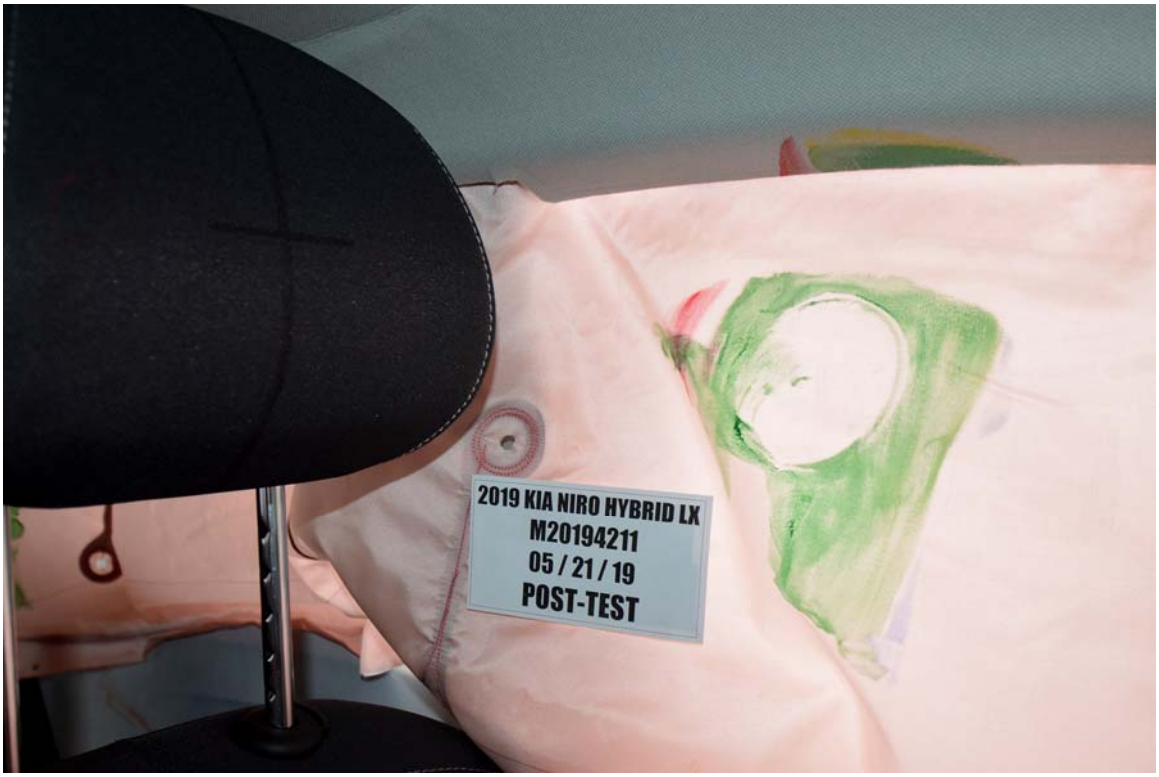



FIGURE 48. Post-Test Driver Dummy Close-Up Head Contact
with Vehicle Interior View


FIGURE 49. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View


FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View


FIGURE 51. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View


FIGURE 52. Post-Test Driver Dummy Close-Up Pelvis Contact with Vehicle Interior View

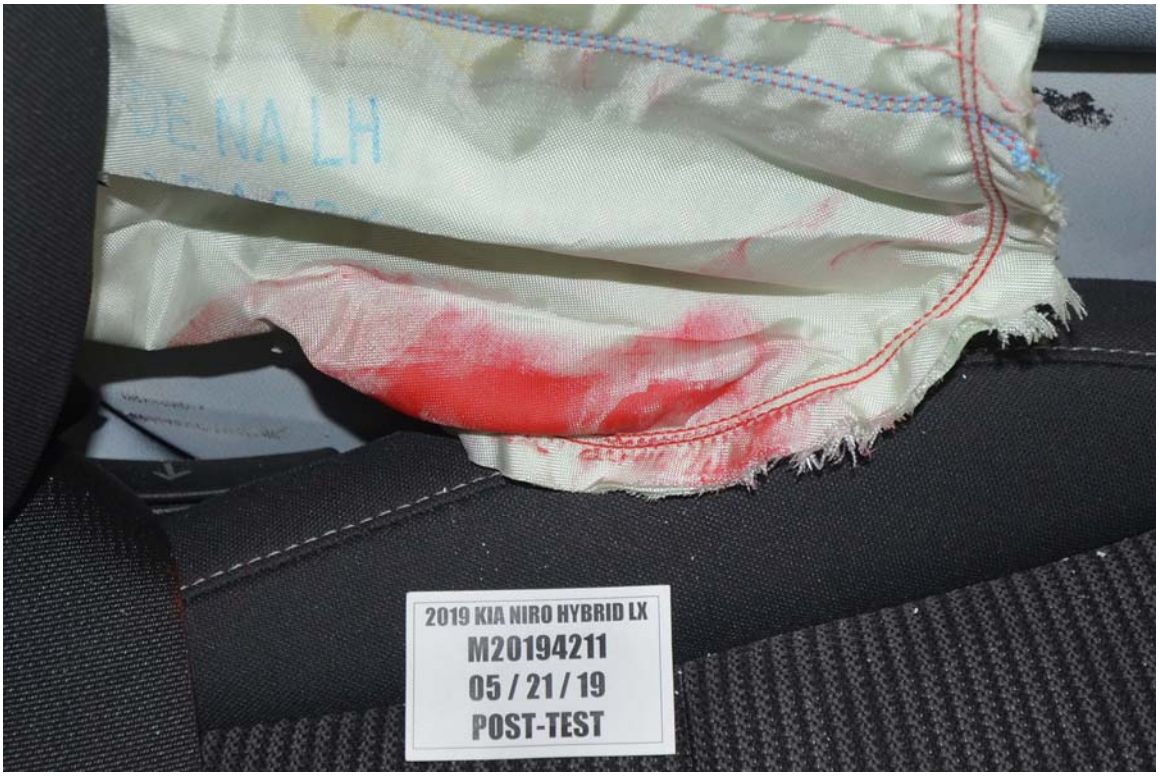



FIGURE 53. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View


FIGURE 54. Post-Test Driver Dummy Close-Up Knee Contact View


FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking


FIGURE 56. Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View


FIGURE 57. Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View


FIGURE 58. Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning


FIGURE 59. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint


FIGURE 60. Pre-Test Overhead View of Rear Passenger
Seat Pan Prior to Dummy Positioning

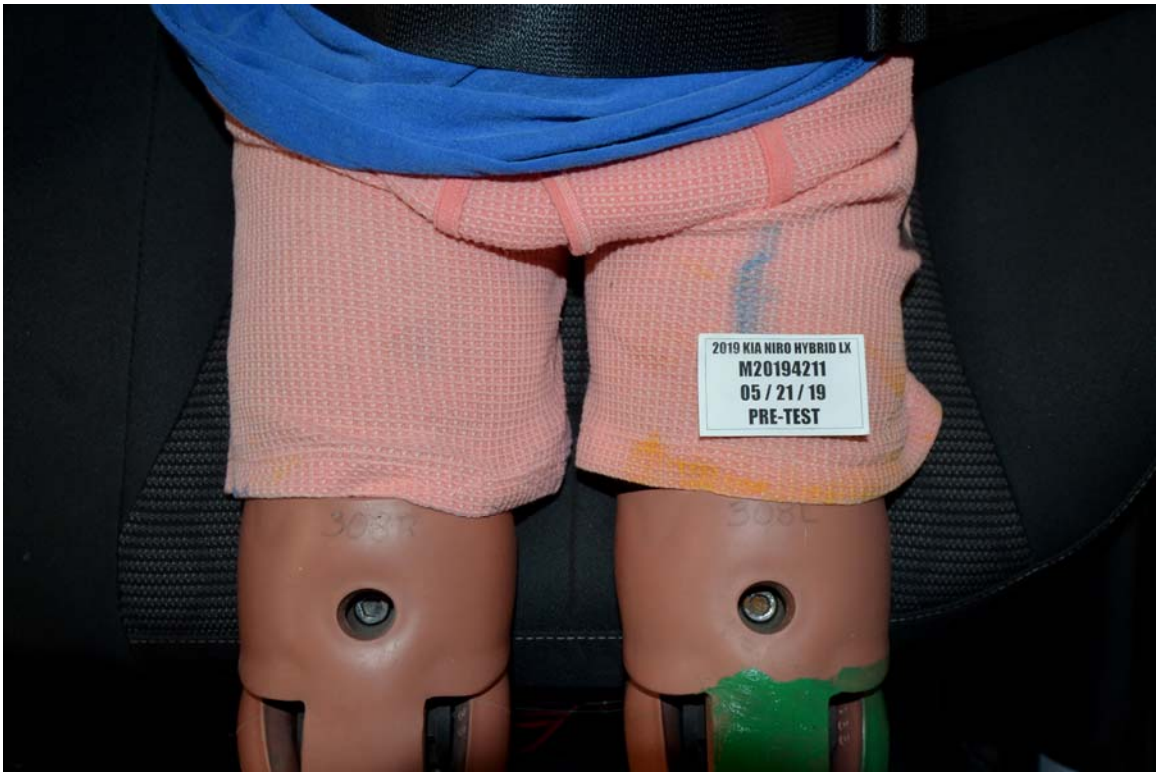



FIGURE 61. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

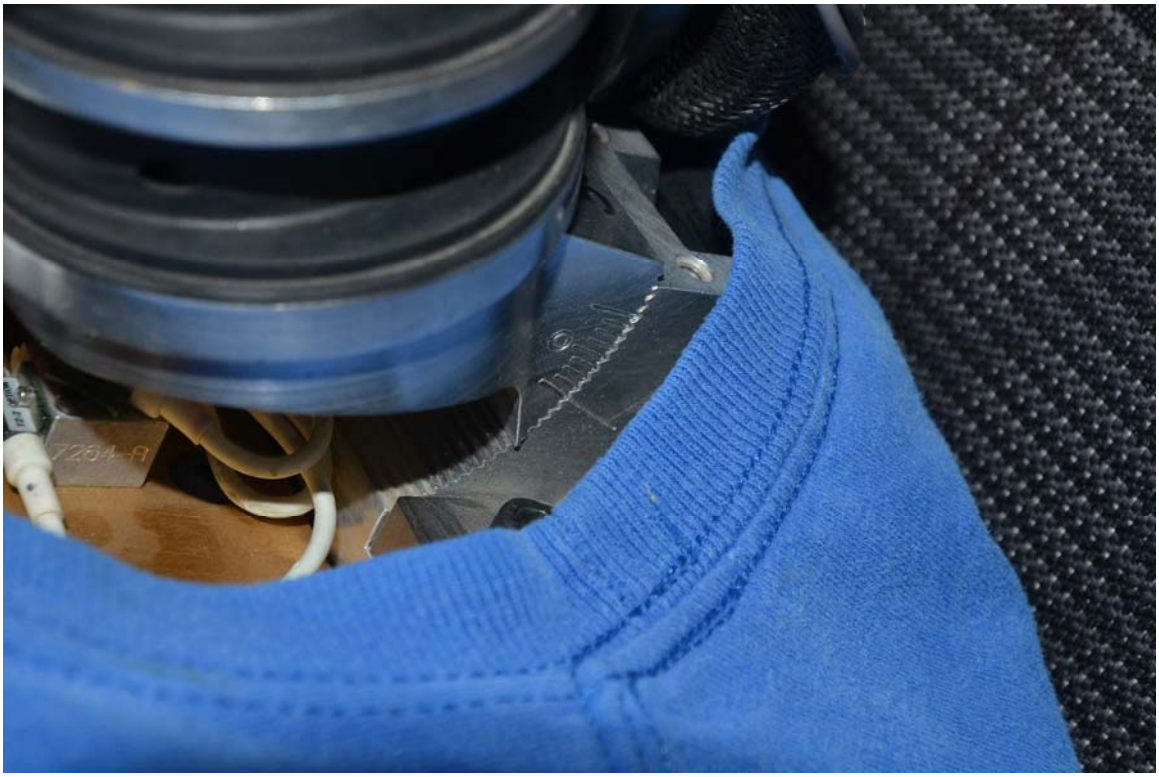


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket


FIGURE 63. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy’s Head is Level


FIGURE 64. Pre-Test Placement of Rear Passenger Dummy's Feet


FIGURE 65. Pre-Test View of Belt Anchorage for Rear Passenger Dummy


FIGURE 66. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track


FIGURE 67. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back


FIGURE 68. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint


FIGURE 69. Pre-Test Rear Passenger Dummy and Door Clearance View


FIGURE 70. Post-Test Rear Passenger Dummy and Door Clearance View

FIGURE 71. Pre-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment

FIGURE 72. Post-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment


FIGURE 73. Pre-Test Rear Passenger Inner Door Panel View

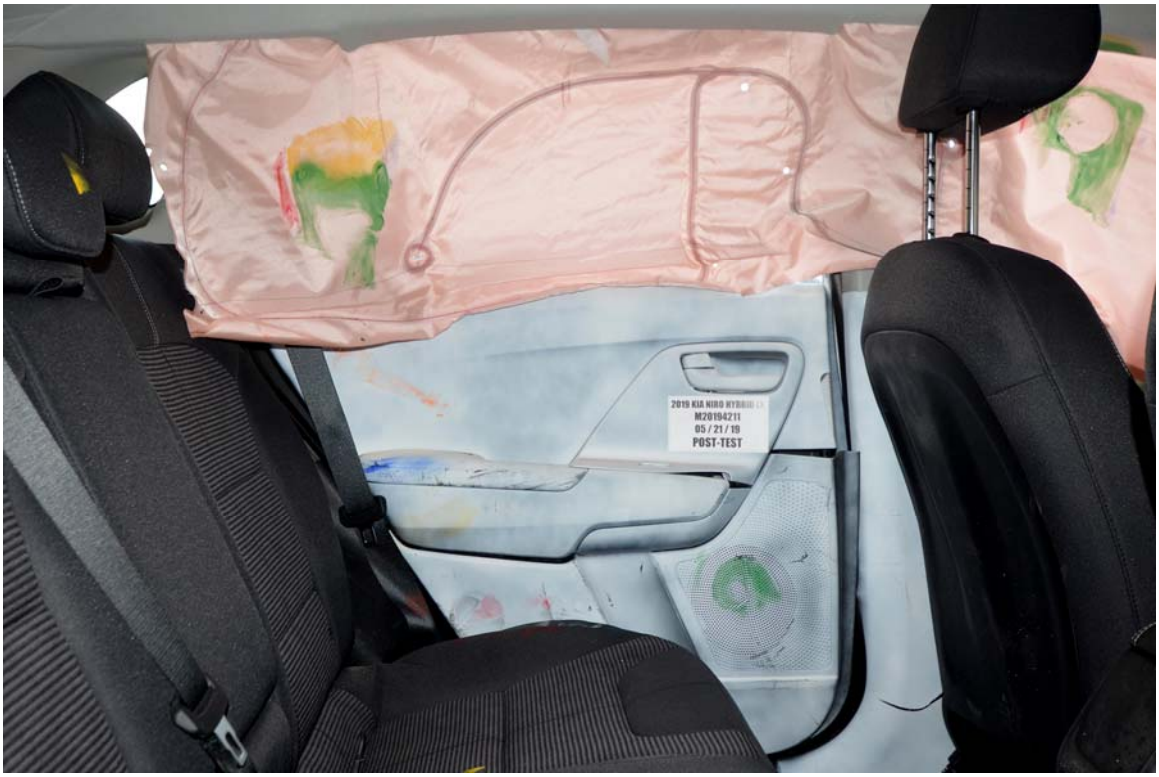



FIGURE 74. Post-Test Rear Passenger Inner Door Panel View
Showing Rear Passenger Dummy Contact Locations


FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View


FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View


FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View


FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

FIGURE 80. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View


FIGURE 81. Post-Test Rear Passenger Dummy Close-Up Knee Contact View


FIGURE 82. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck


FIGURE 83. Post-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 84. Pre-Test Front View of MDB Impactor Face


FIGURE 85. Post-Test Front View of MDB Impactor Face

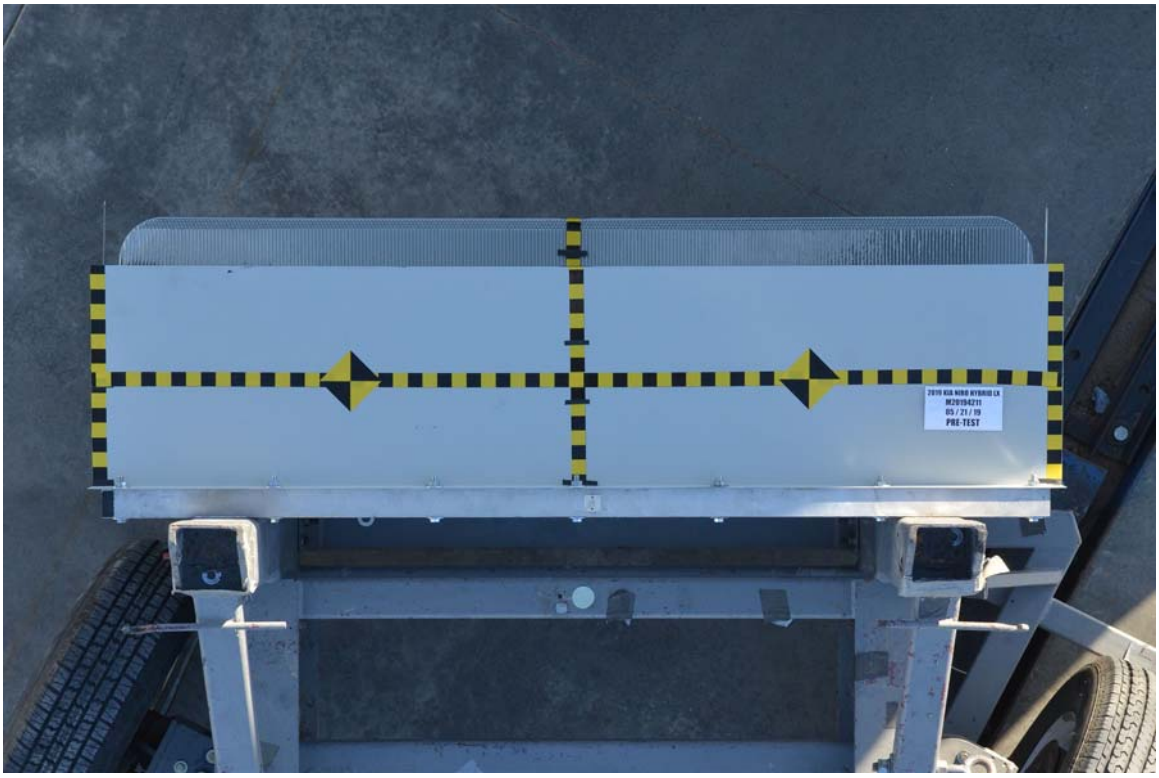



FIGURE 86. Pre-Test Top View of MDB Impactor Face


FIGURE 87. Post-Test Top View of MDB Impactor Face


FIGURE 88. Pre-Test Left Side View of MDB Impactor Face


FIGURE 89. Post-Test Left Side View of MDB Impactor Face


FIGURE 90. Pre-Test Right Side View of MDB Impactor Face


FIGURE 91. Post-Test Right Side View of MDB Impactor Face


FIGURE 92. Close-Up View of Vehicle's Certification Label


FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

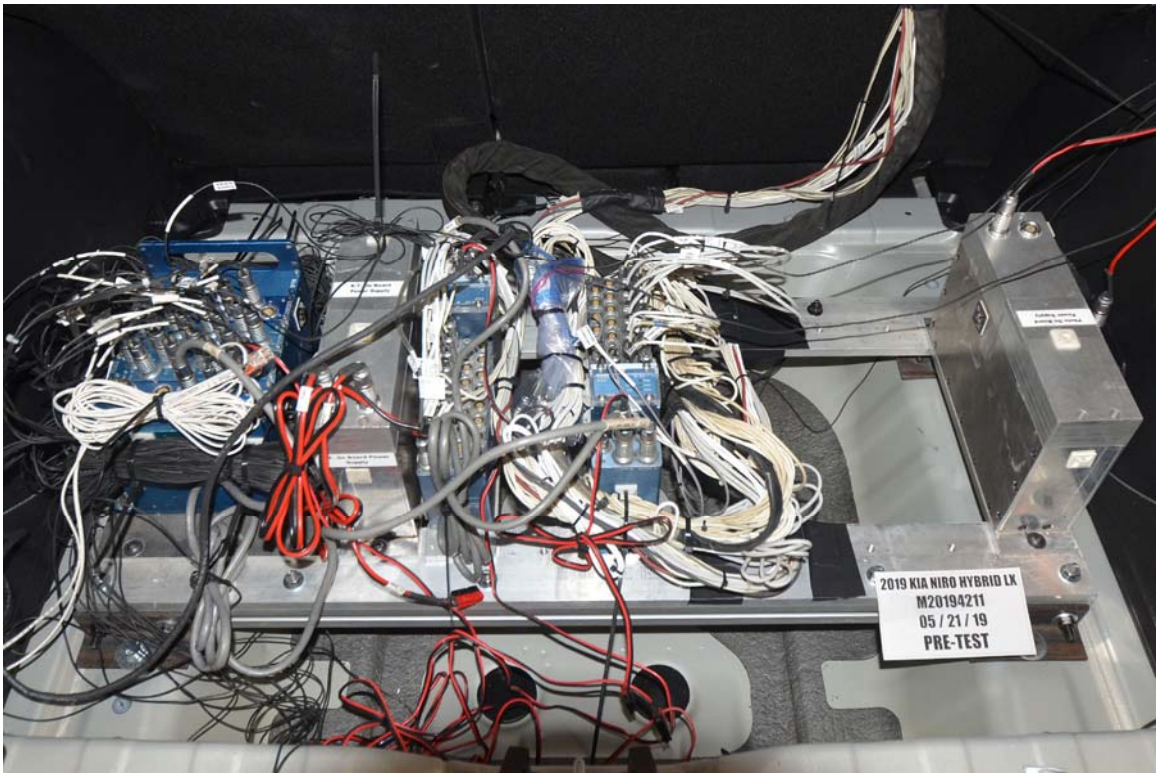



FIGURE 94. Pre-Test Ballast View


FIGURE 95. Post-Test Primary and Redundant Speed Trap Read-Out

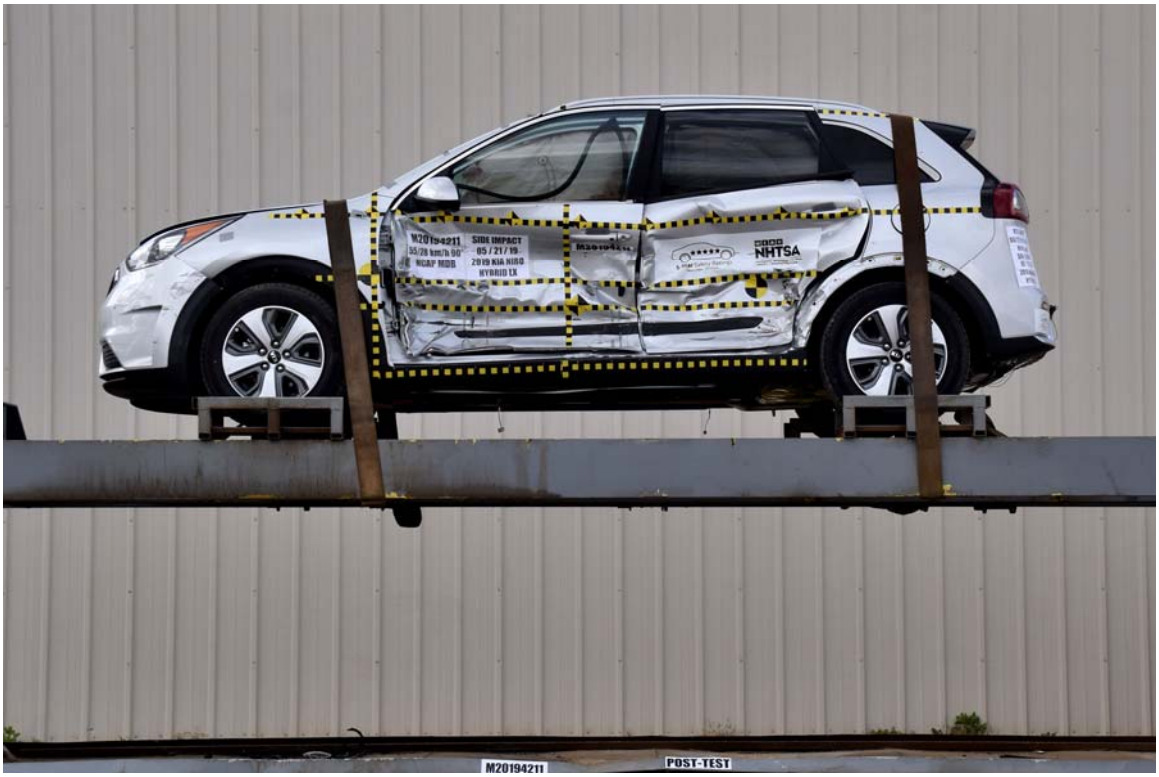



FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees


FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees


FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees

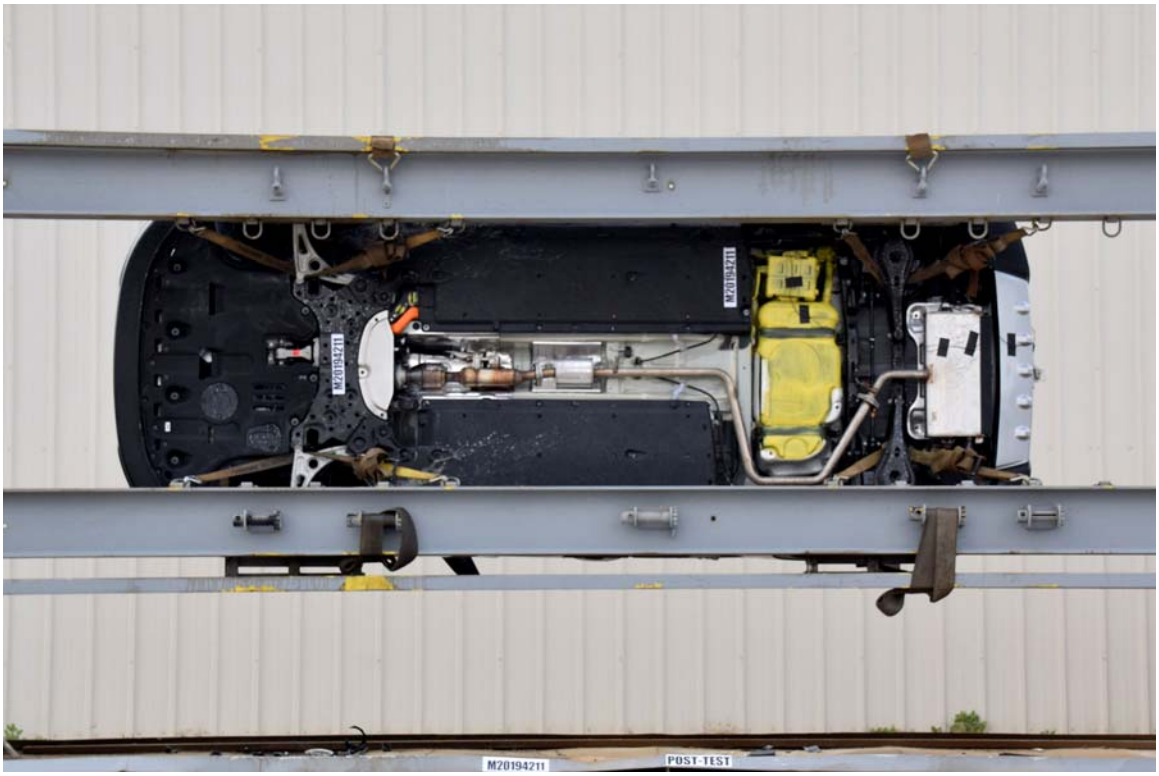



FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees

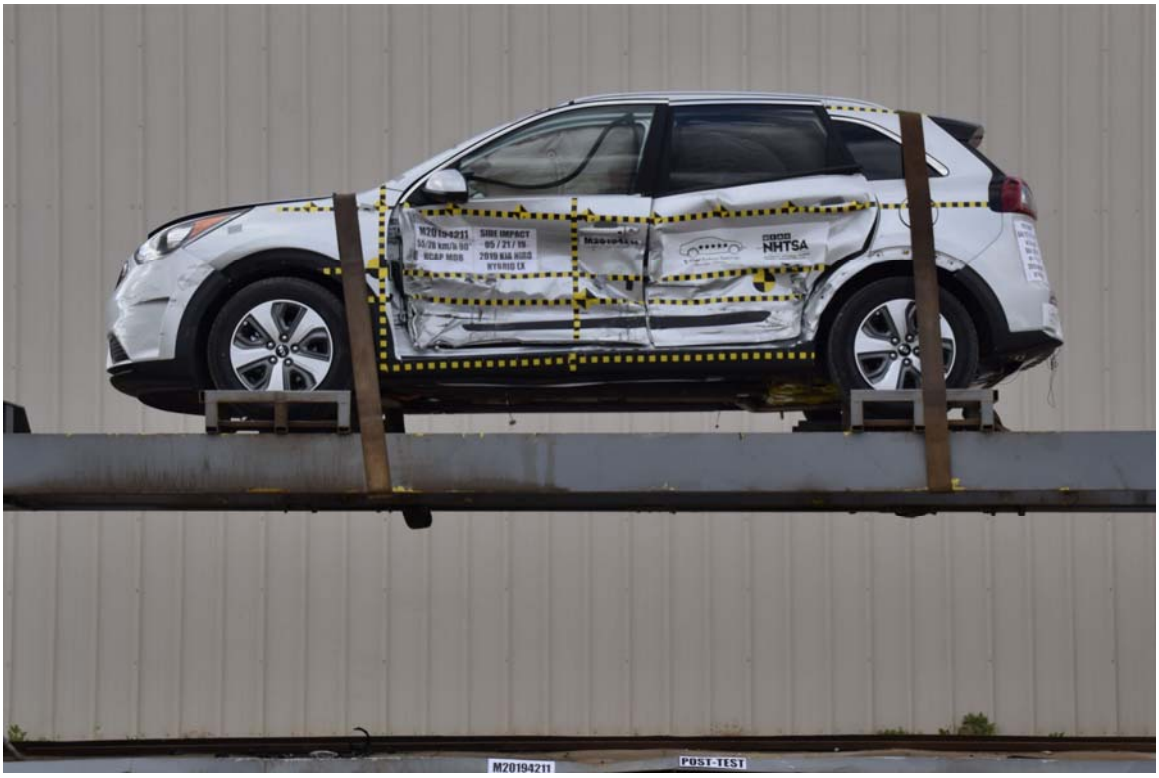
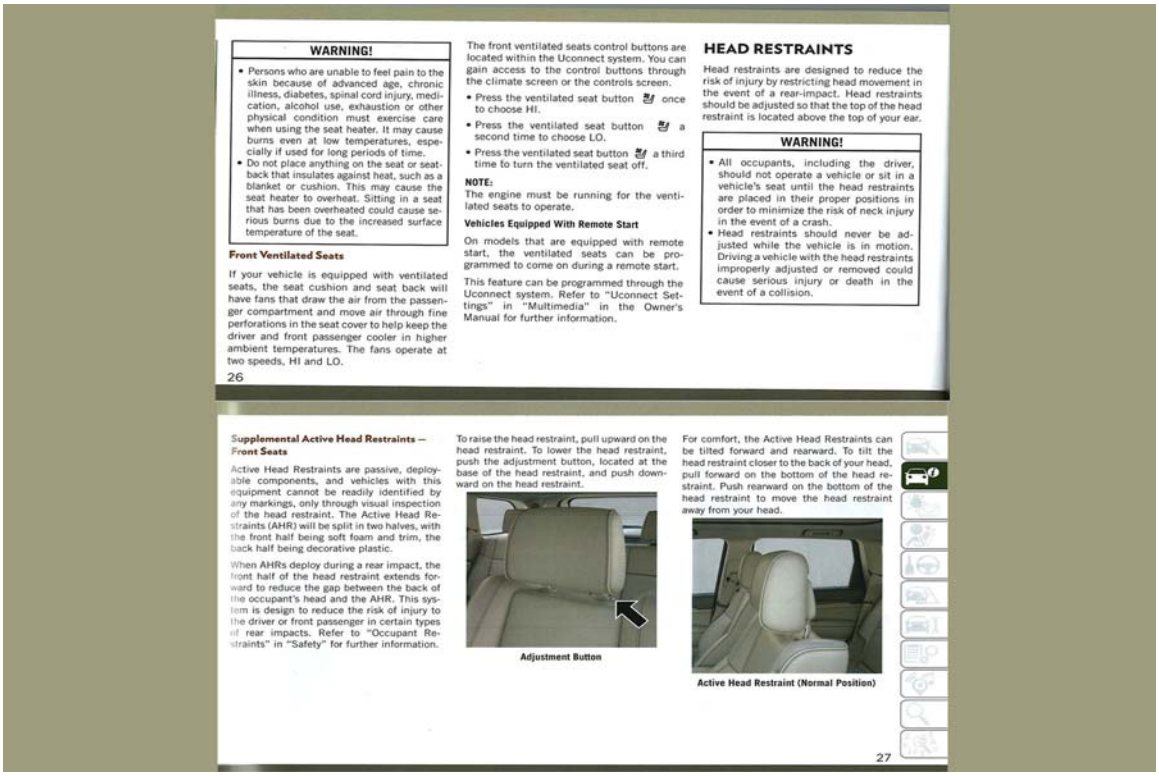



FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees


FIGURE 101. Impact Event

Photograph Not Available

FIGURE 102. Monroney Label



**WARNING!**

- Persons who are unable to feel pain to the skin because of advanced age, chronic illness, diabetes, spinal cord injury, medication, alcohol use, exhaustion or other physical condition must exercise care when using the seat heater. It may cause burns even at low temperatures, especially if used for long periods of time.
- Do not place anything on the seat or seatback that insulates against heat, such as a blanket or cushion. This may cause the seat heater to overheat. Sitting in a seat that has been overheated could cause serious burns due to the increased surface temperature of the seat.

**Front Ventilated Seats**

If your vehicle is equipped with ventilated seats, the seat cushion and seat back will have fans that draw the air from the passenger compartment and move air through fine perforations in the seat cover to help keep the driver and front passenger cooler in higher ambient temperatures. The fans operate at two speeds, HI and LO.

The front ventilated seats control buttons are located within the Uconnect system. You can gain access to the control buttons through the climate screen or the controls screen.

- Press the ventilated seat button once to choose HI.
- Press the ventilated seat button a second time to choose LO.
- Press the ventilated seat button a third time to turn the ventilated seat off.

**NOTE:**
The engine must be running for the ventilated seats to operate.

**Vehicles Equipped With Remote Start**

On models that are equipped with remote start, the ventilated seats can be programmed to come on during a remote start.

This feature can be programmed through the Uconnect system. Refer to "Uconnect Settings" in "Multimedia" in the Owner's Manual for further information.

## HEAD RESTRAINTS

Head restraints are designed to reduce the risk of injury by restricting head movement in the event of a rear-impact. Head restraints should be adjusted so that the top of the head restraint is located above the top of your ear.

**WARNING!**

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

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**Supplemental Active Head Restraints — Front Seats**

Active Head Restraints are passive, deployable components, and vehicles with this equipment cannot be readily identified by any markings, only through visual inspection of the head restraint. The Active Head Restraints (AHR) will be split in two halves, with the front half being soft foam and trim, the back half being decorative plastic.

When AHRs deploy during a rear impact, the front half of the head restraint extends forward to reduce the gap between the back of the occupant's head and the AHR. This system is design to reduce the risk of injury to the driver or front passenger in certain types of rear impacts. Refer to "Occupant Restraints" in "Safety" for further information.

To raise the head restraint, pull upward on the head restraint. To lower the head restraint, push the adjustment button, located at the base of the head restraint, and push downward on the head restraint.



Adjustment Button

For comfort, the Active Head Restraints can be tilted forward and rearward. To tilt the head restraint closer to the back of your head, pull forward on the bottom of the head restraint. Push rearward on the bottom of the head restraint to move the head restraint away from your head.



Active Head Restraint (Normal Position)

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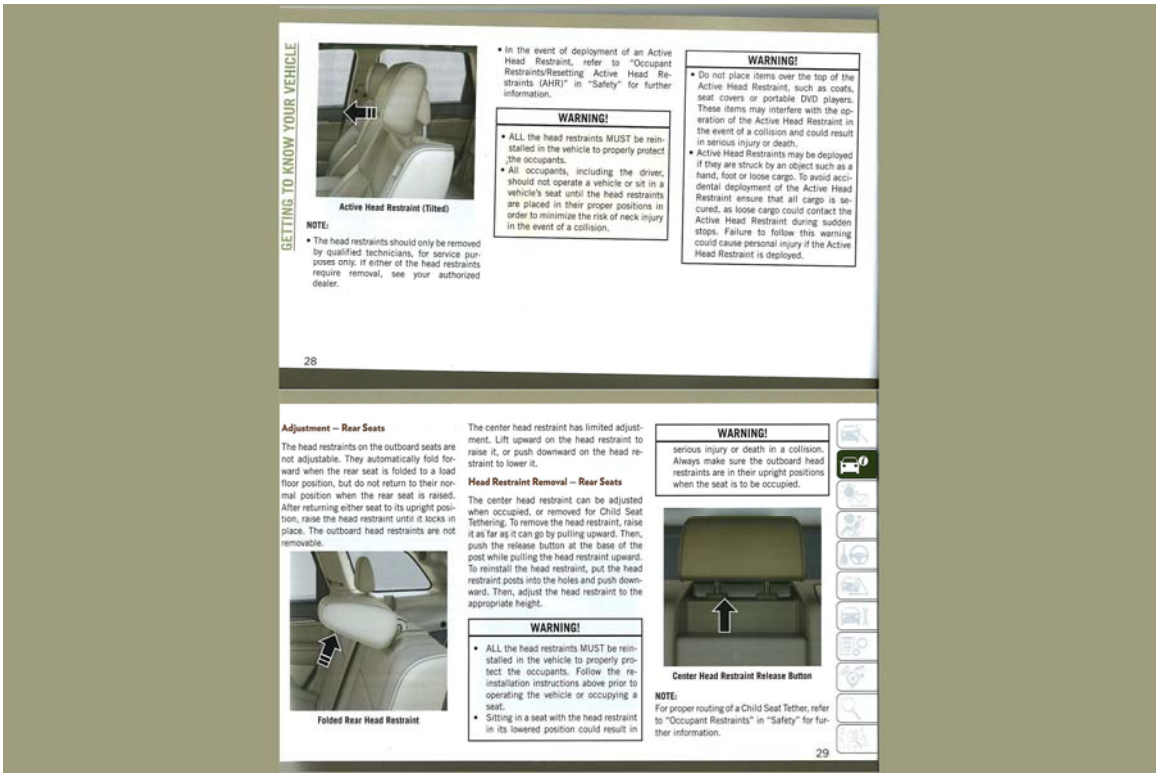
FIGURE 103. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



GETTING TO KNOW YOUR VEHICLE



Active Head Restraint (Tilted)

**NOTE:**

- The head restraints should only be removed by qualified technicians, for service purposes only. If either of the head restraints require removal, see your authorized dealer.

- In the event of deployment of an Active Head Restraint, refer to "Occupant Restraints/Resetting Active Head Restraints (AHR)" in "Safety" for further information.

**WARNING!**

- ALL the head restraints MUST be reinstalled in the vehicle to properly protect the occupants.
- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a collision.

**WARNING!**

- Do not place items over the top of the Active Head Restraint, such as coats, seat covers or portable DVD players. These items may interfere with the operation of the Active Head Restraint in the event of a collision and could result in serious injury or death.
- Active Head Restraints may be deployed if they are struck by an object such as a hand, foot or loose cargo. To avoid accidental deployment of the Active Head Restraint ensure that all cargo is secured, as loose cargo could contact the Active Head Restraint during sudden stops. Failure to follow this warning could cause personal injury if the Active Head Restraint is deployed.

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**Adjustment — Rear Seats**

The head restraints on the outboard seats are not adjustable. They automatically fold forward when the rear seat is folded to a load floor position, but do not return to their normal position when the rear seat is raised. After returning either seat to its upright position, raise the head restraint until it locks in place. The outboard head restraints are not removable.



Folded Rear Head Restraint

The center head restraint has limited adjustment. Lift upward on the head restraint to raise it, or push downward on the head restraint to lower it.

**Head Restraint Removal — Rear Seats**

The center head restraint can be adjusted when occupied, or removed for Child Seat Tethering. To remove the head restraint, raise it as far as it can go by pulling upward. Then, push the release button at the base of the post while pulling the head restraint upward. To reinstall the head restraint, put the head restraint posts into the holes and push downward. Then, adjust the head restraint to the appropriate height.

**WARNING!**

- ALL the head restraints MUST be reinstalled in the vehicle to properly protect the occupants. Follow the reinstallation instructions above prior to operating the vehicle or occupying a seat.
- Sitting in a seat with the head restraint in its lowered position could result in

**WARNING!**

serious injury or death in a collision. Always make sure the outboard head restraints are in their upright positions when the seat is to be occupied.



Center Head Restraint Release Button

**NOTE:**
For proper routing of a Child Seat Tether, refer to "Occupant Restraints" in "Safety" for further information.

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FIGURE 104. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

# APPENDIX B
# DUMMY RESPONSE DATA

## TABLE OF DATA PLOTS

**The following additional data for this test can be obtained from the Research and Development section of the NHTSA website (www.NHTSA.gov)**

**Additional Driver & Passenger Dummy Instrumentation Data**

Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

**Vehicle Instrumentation Data**

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

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

**MDB Instrumentation Data**

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

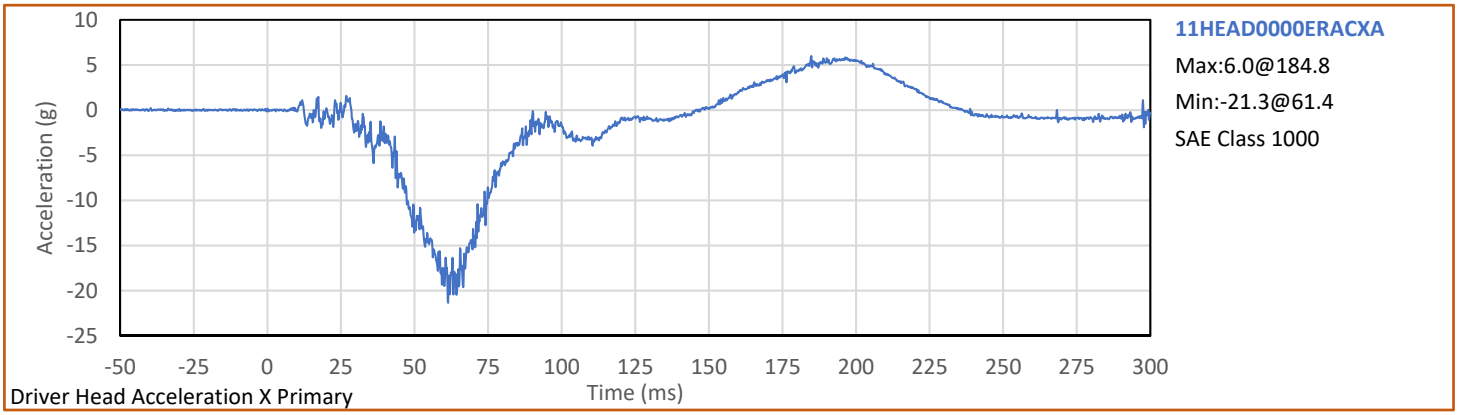
MDB Rear Acceleration (X)

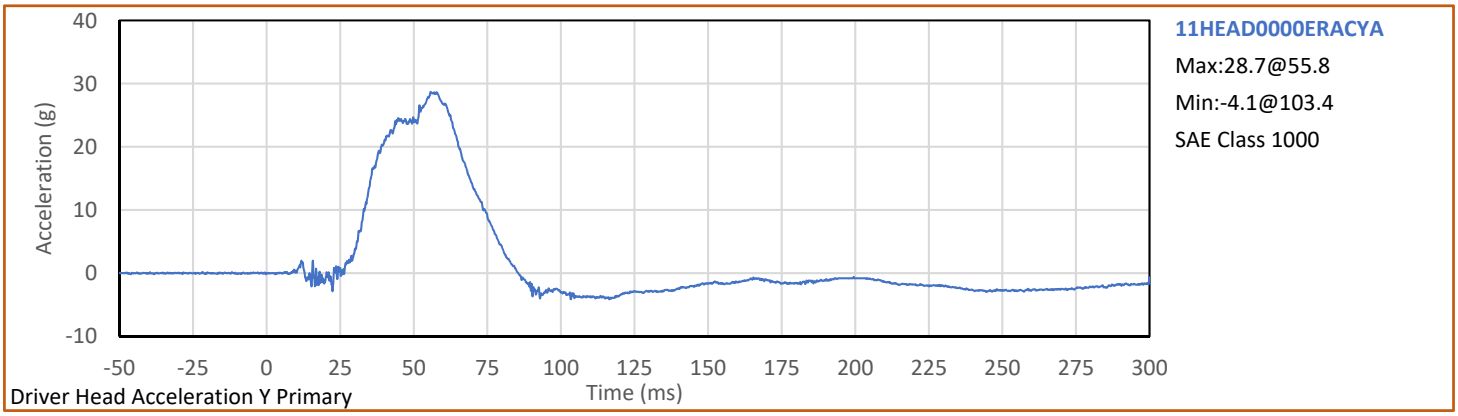
MDB Rear Acceleration (Y)

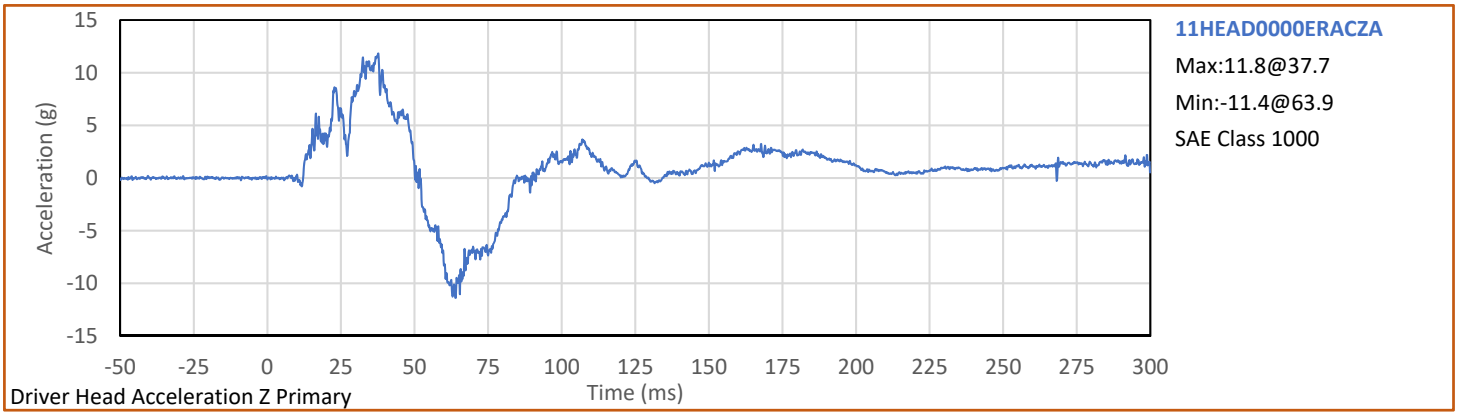
Left MDB Contact Switch

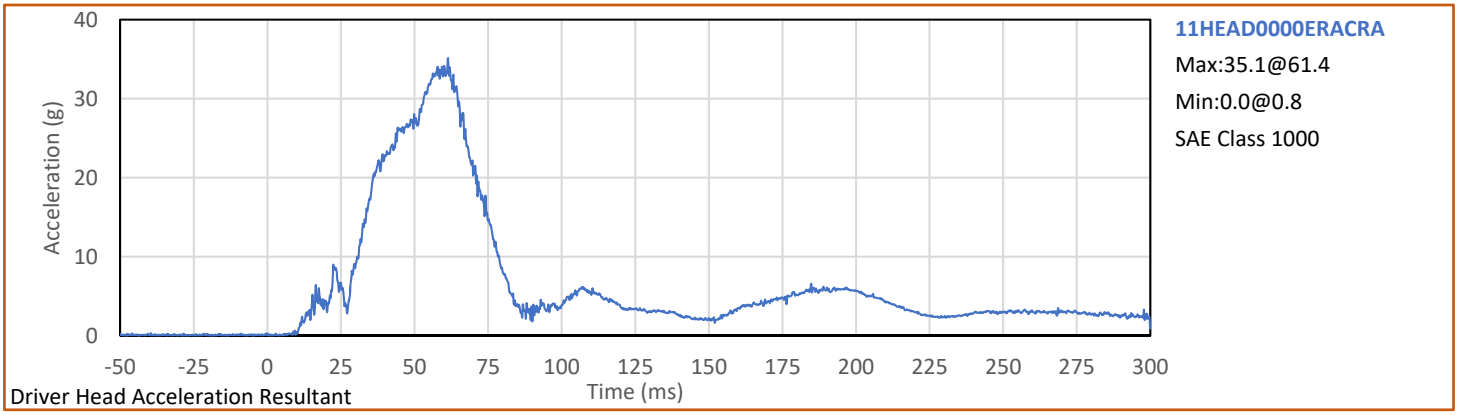
Right MDB Contact Switch

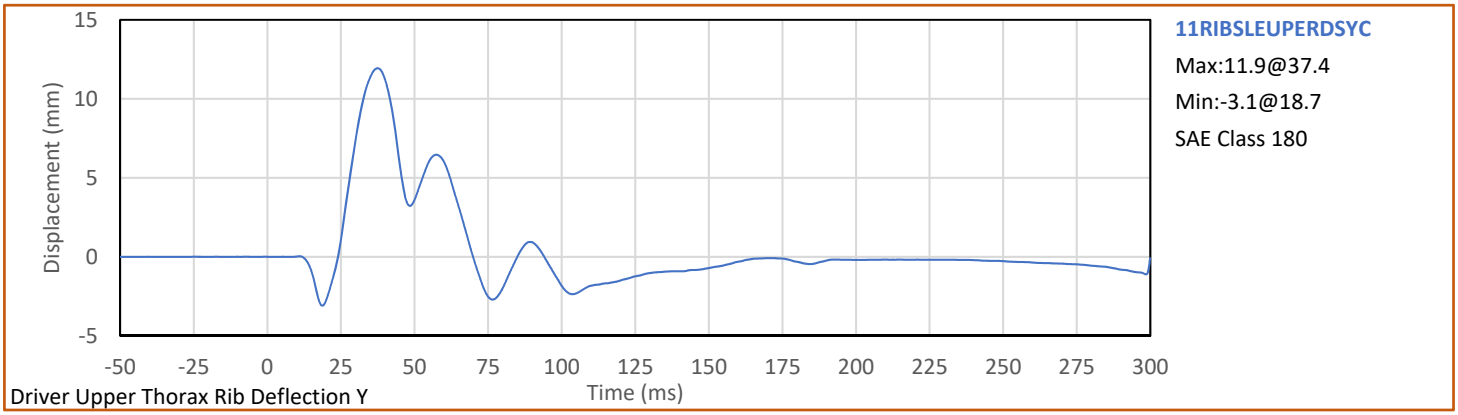
| | | | |
|---|---|---|---|
| Test Vehicle: | 2019 Kia Niro Hybrid LX 5-Door MPV | NHTSA No.: | M20194211 |
| Test Program: | NCAP MDB Side Impact Test | Test Date: | 5/21/2019 |



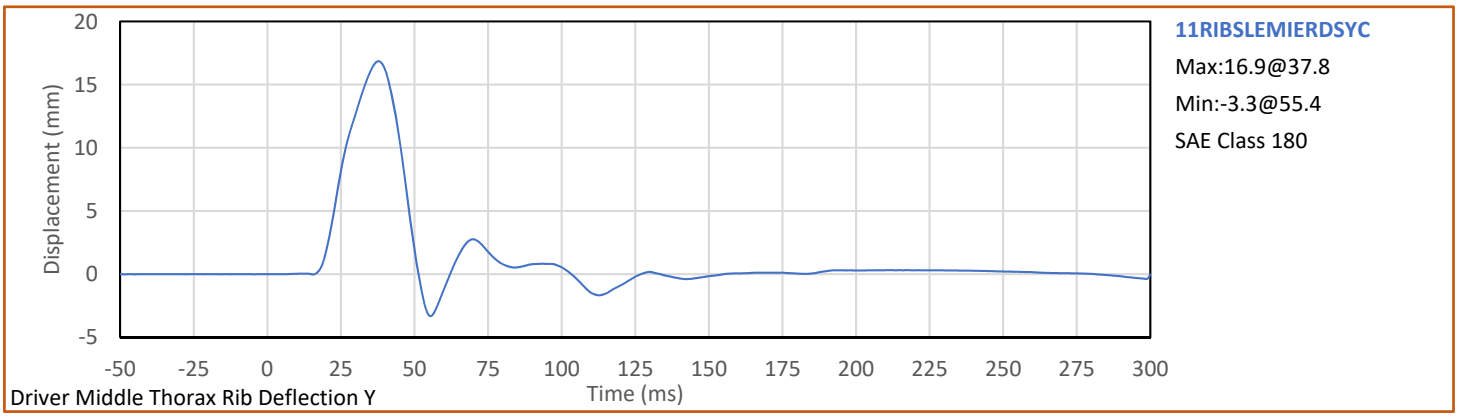



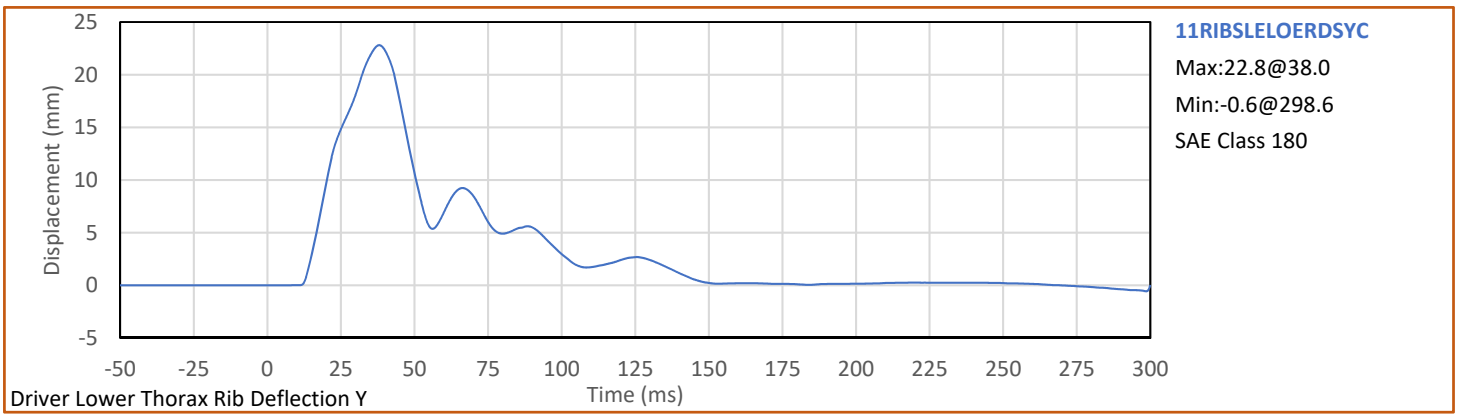





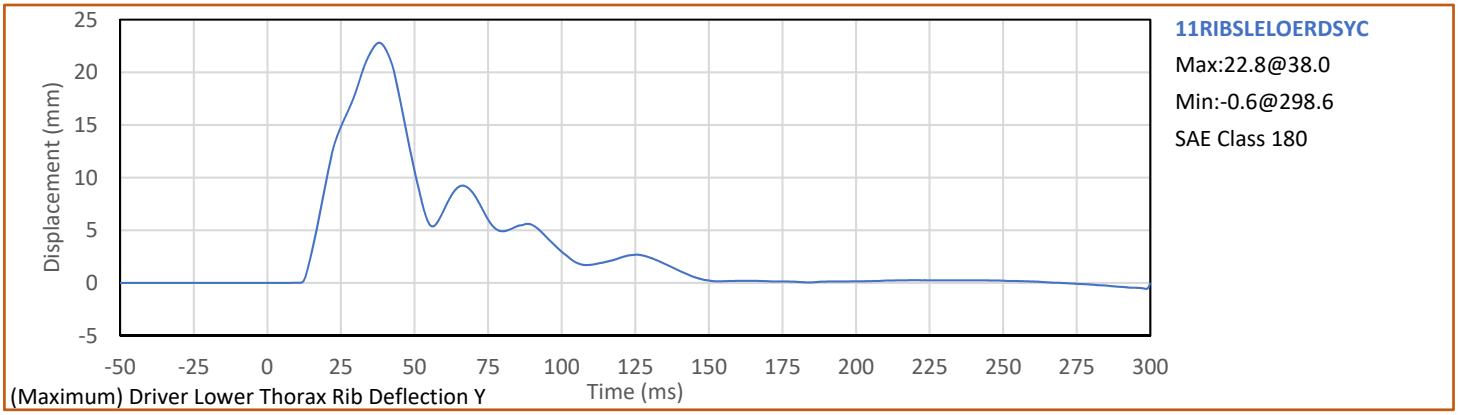
Driver Upper Thorax Rib Deflection Y



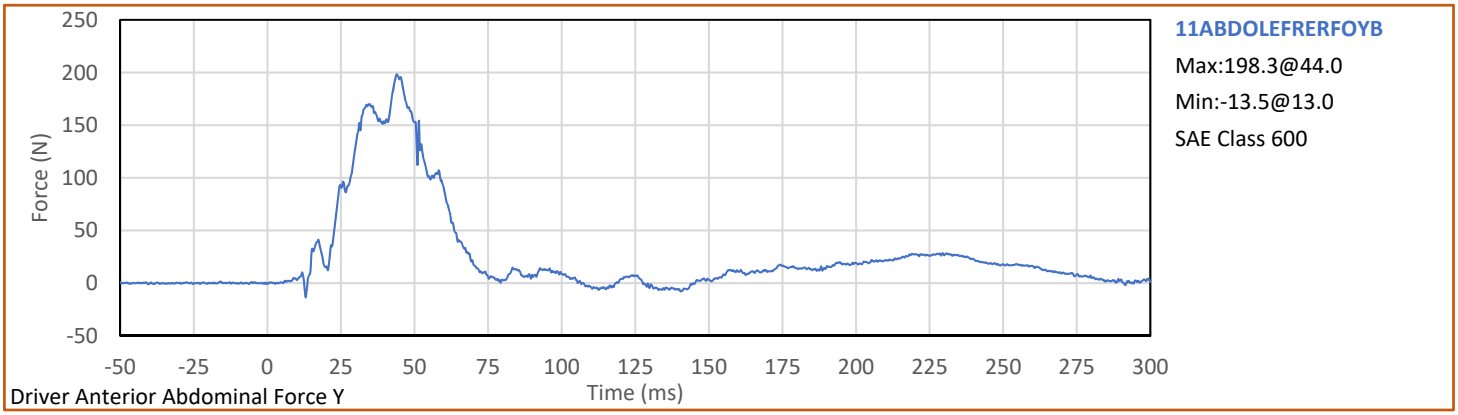
Driver Middle Thorax Rib Deflection Y

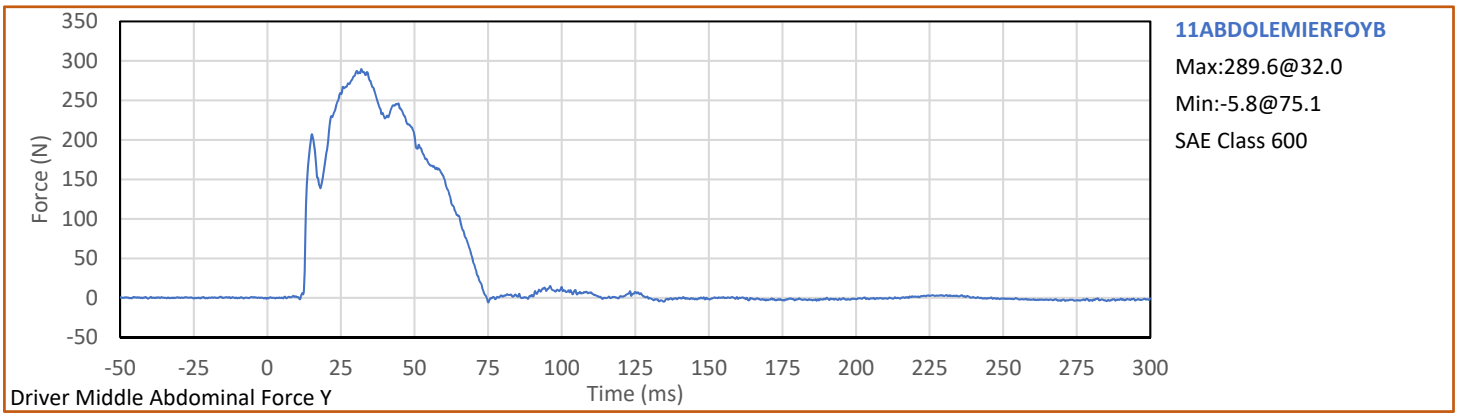


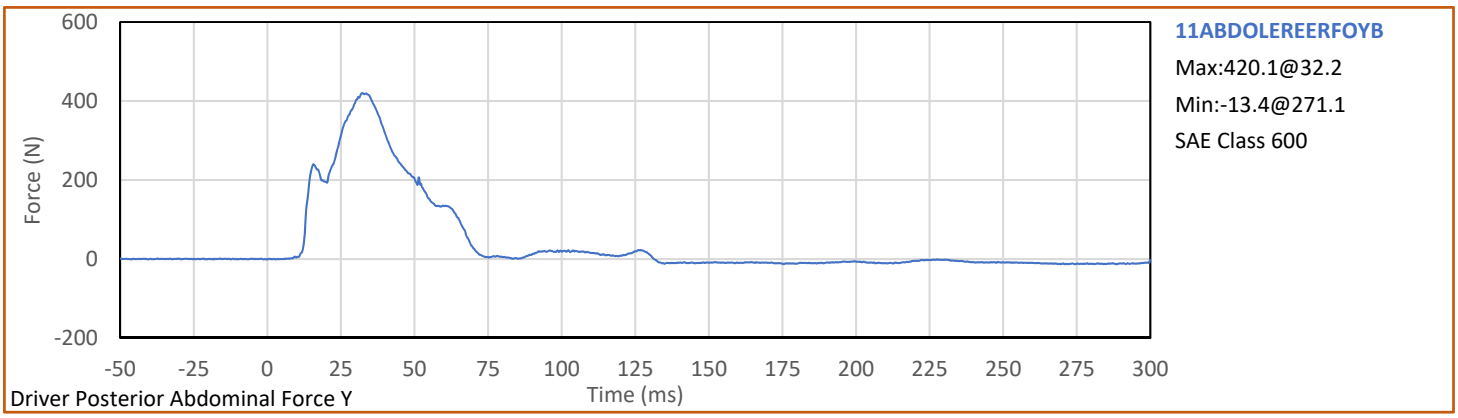
Driver Lower Thorax Rib Deflection Y

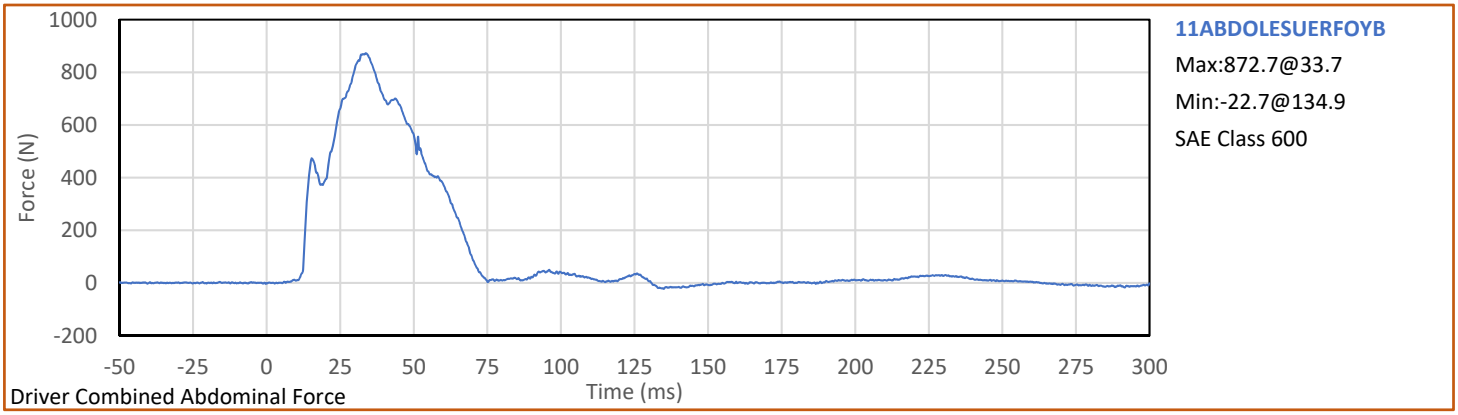


(Maximum) Driver Lower Thorax Rib Deflection Y

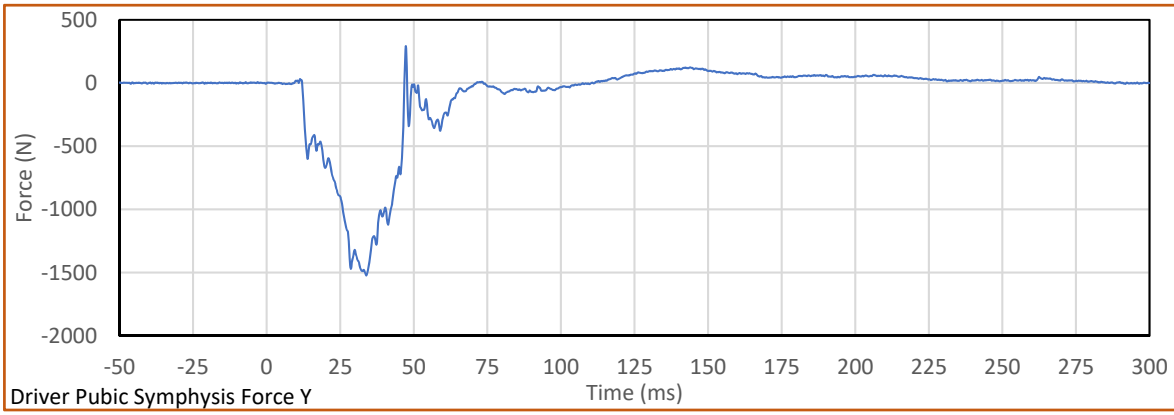

Force (N)
Time (ms)
Driver Anterior Abdominal Force Y
11ABDOLEFRERFOYB
Max:198.3@44.0
Min:-13.5@13.0
SAE Class 600

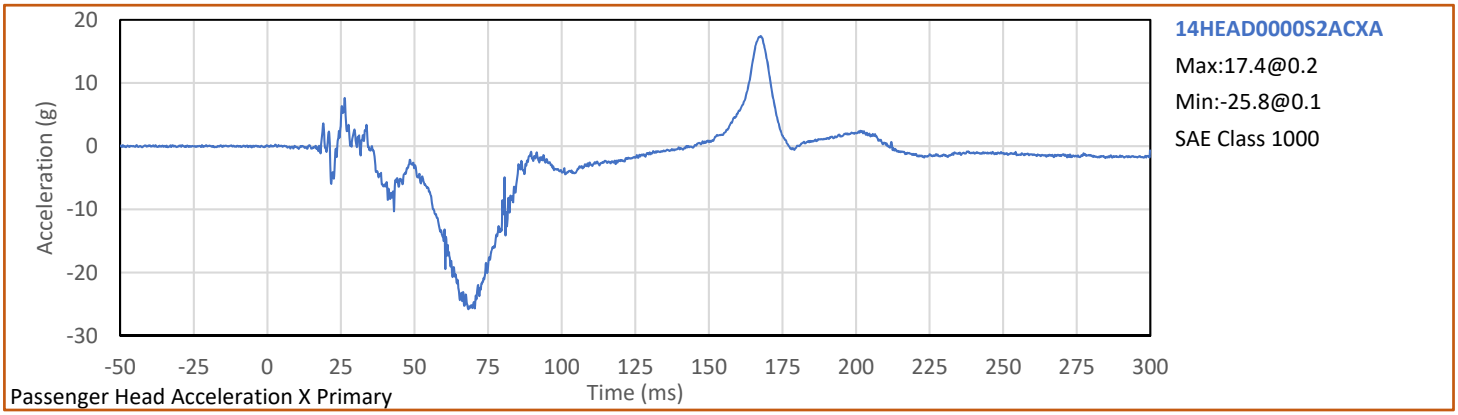

Force (N)
Time (ms)
Driver Middle Abdominal Force Y
11ABDOLEMIERFOYB
Max:289.6@32.0
Min:-5.8@75.1
SAE Class 600


Force (N)
Time (ms)
Driver Posterior Abdominal Force Y
11ABDOLEREERFOYB
Max:420.1@32.2
Min:-13.4@271.1
SAE Class 600

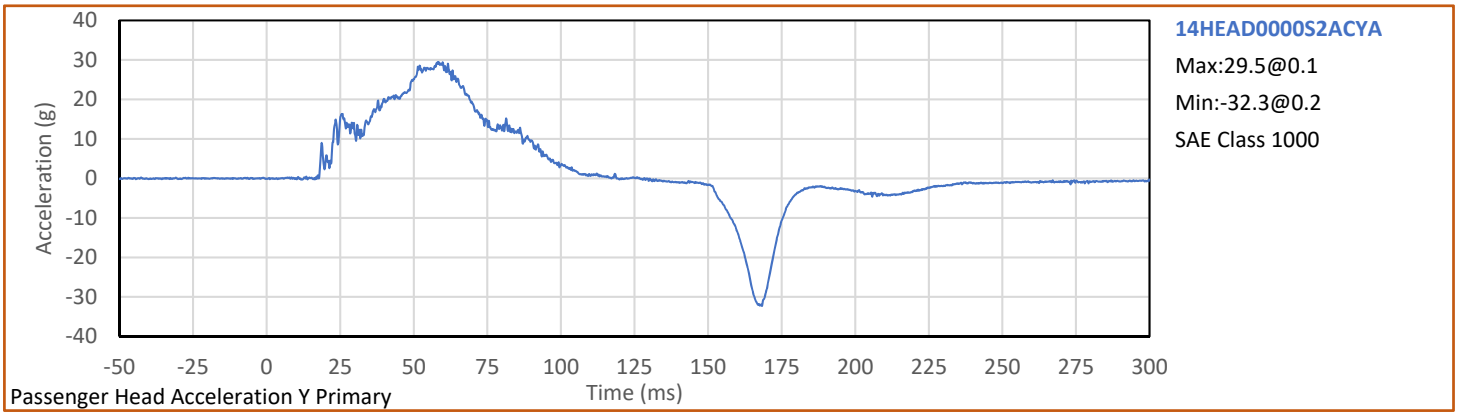

Force (N)
Time (ms)
Driver Combined Abdominal Force
11ABDOLESUERFOYB
Max:872.7@33.7
Min:-22.7@134.9
SAE Class 600

| | | | |
|---|---|---|---|
| Test Vehicle: | 2019 Kia Niro Hybrid LX 5-Door MPV | NHTSA No.: | M20194211 |
| Test Program: | NCAP MDB Side Impact Test | Test Date: | 5/21/2019 |

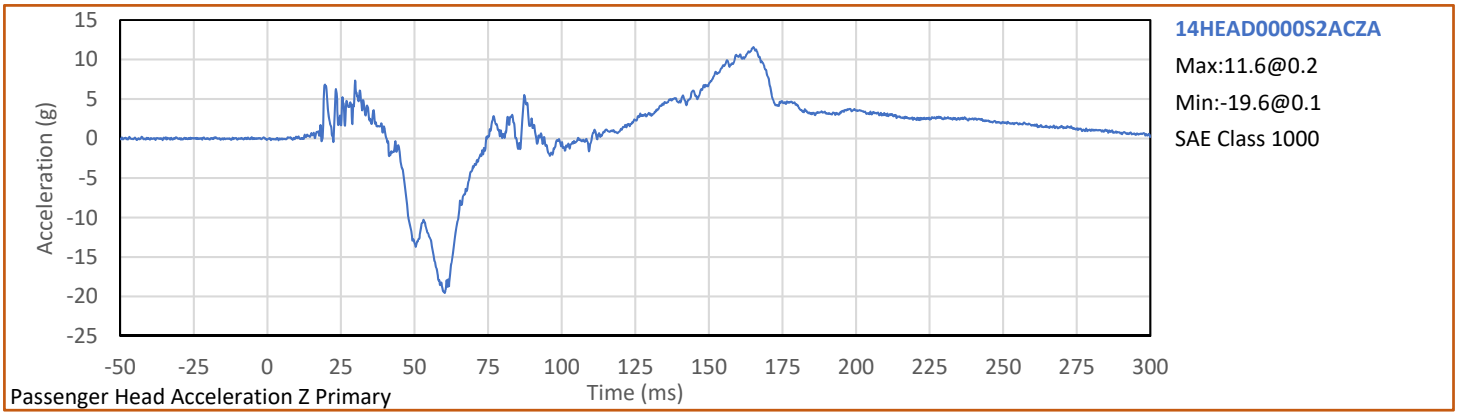




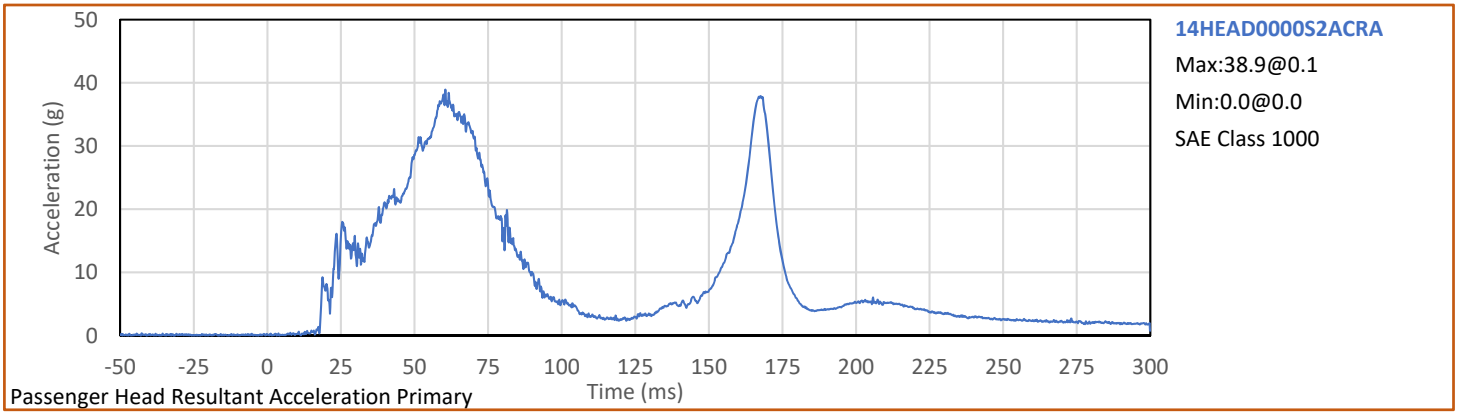
Passenger Head Acceleration X Primary



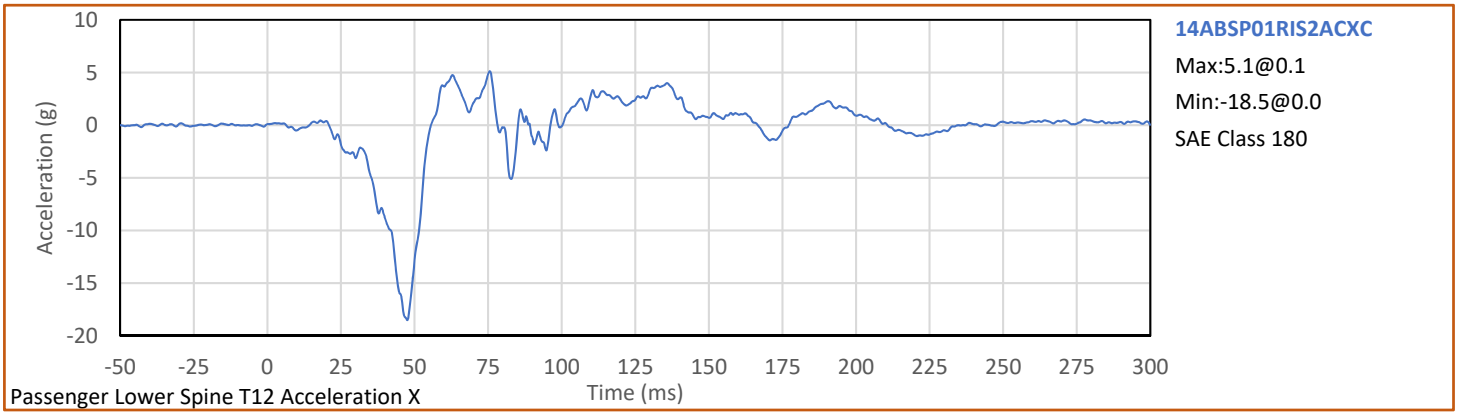
Passenger Head Acceleration Y Primary



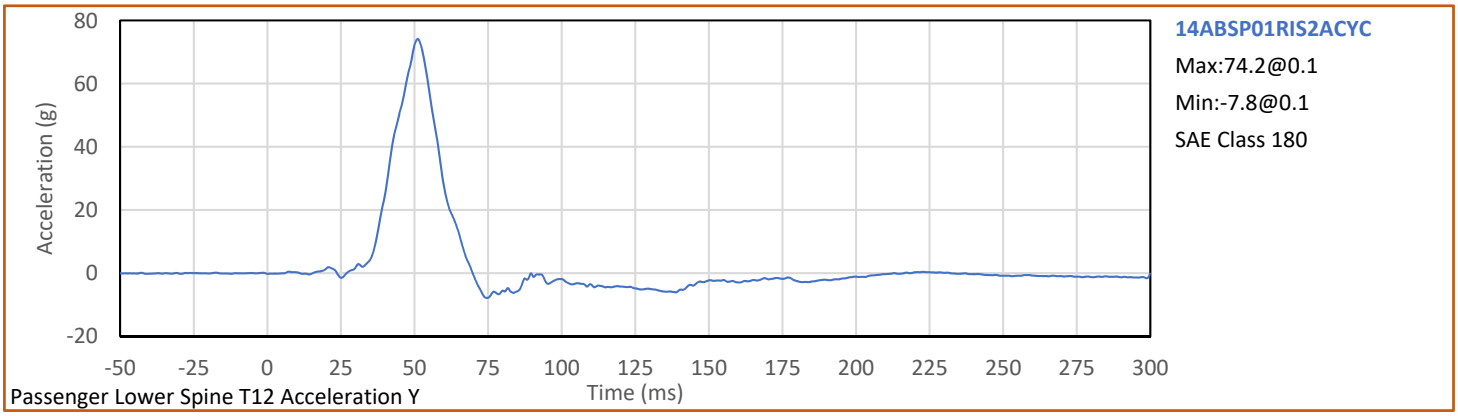
Passenger Head Acceleration Z Primary



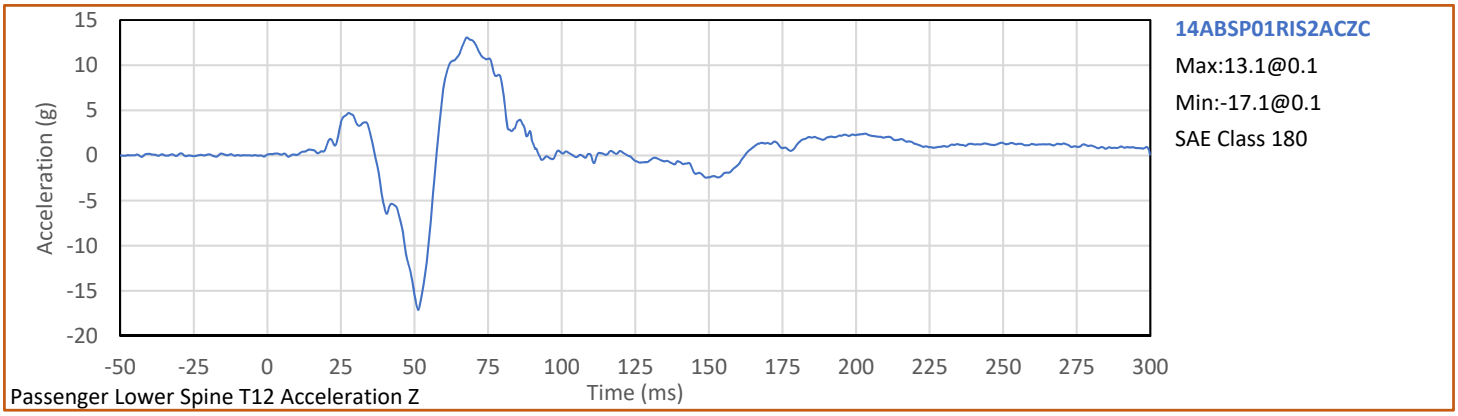
Passenger Head Resultant Acceleration Primary



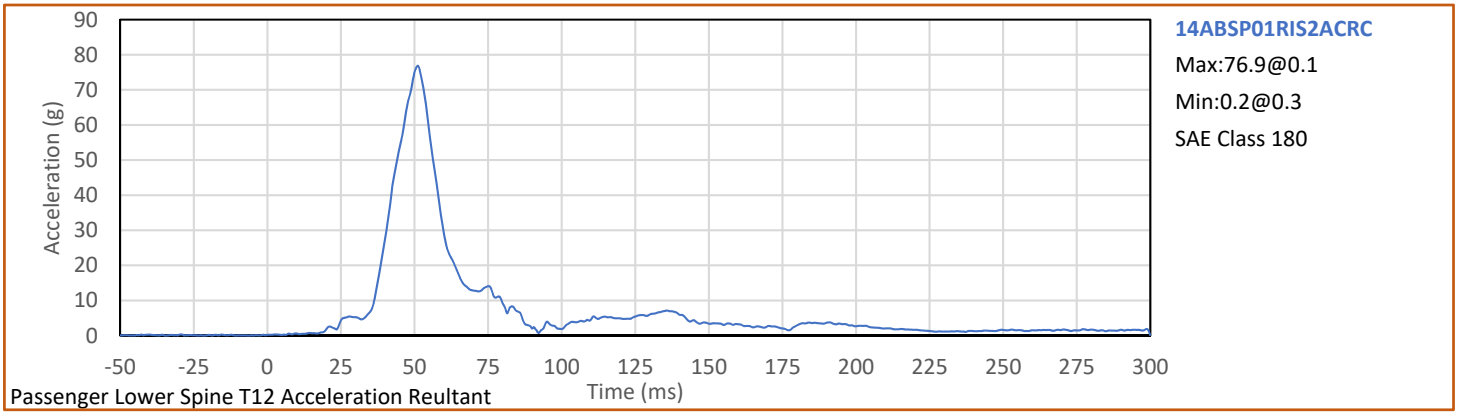
Passenger Lower Spine T12 Acceleration X



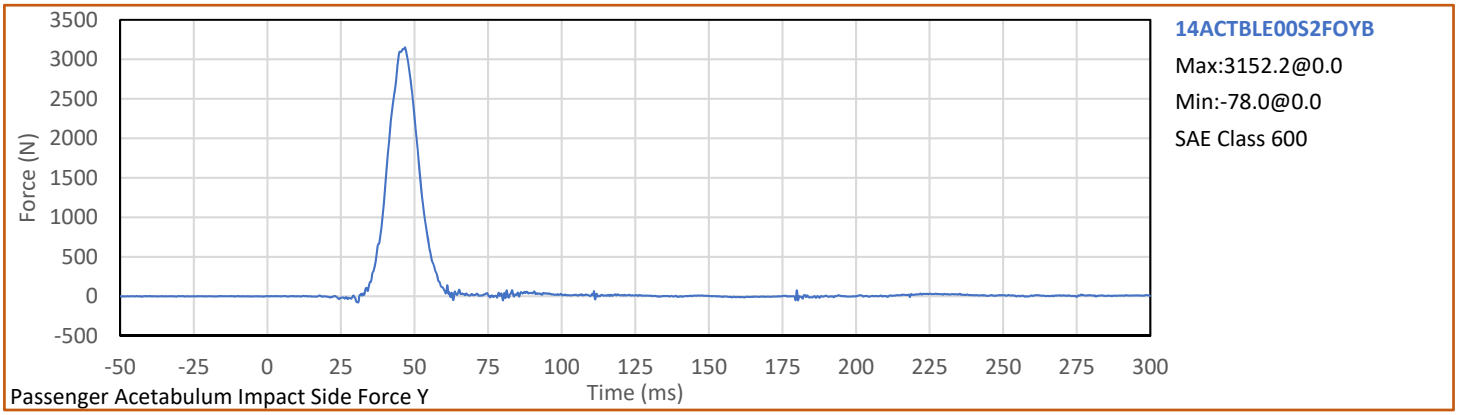
Passenger Lower Spine T12 Acceleration Y



Passenger Lower Spine T12 Acceleration Z

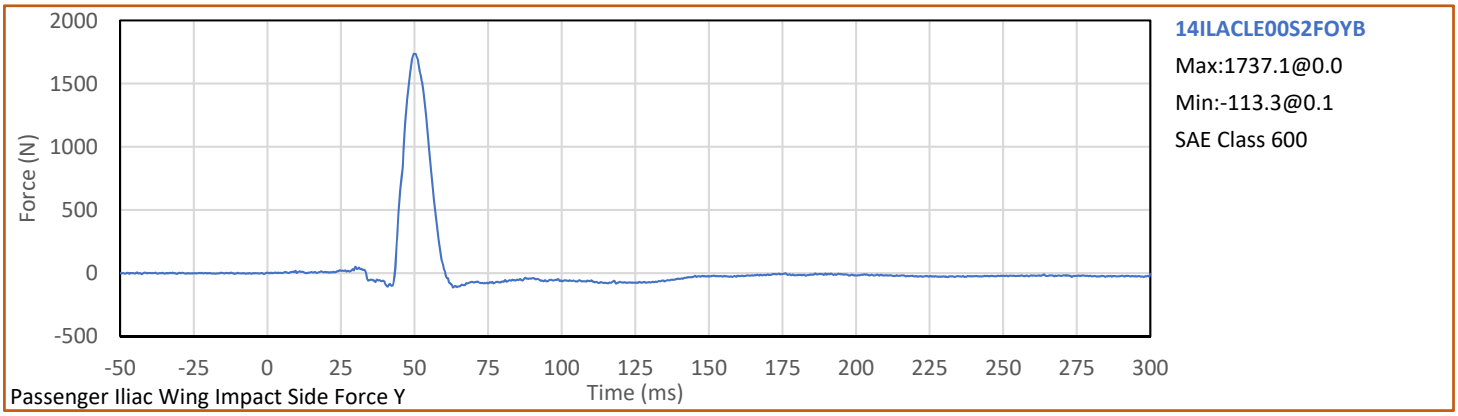


Passenger Lower Spine T12 Acceleration Reultant



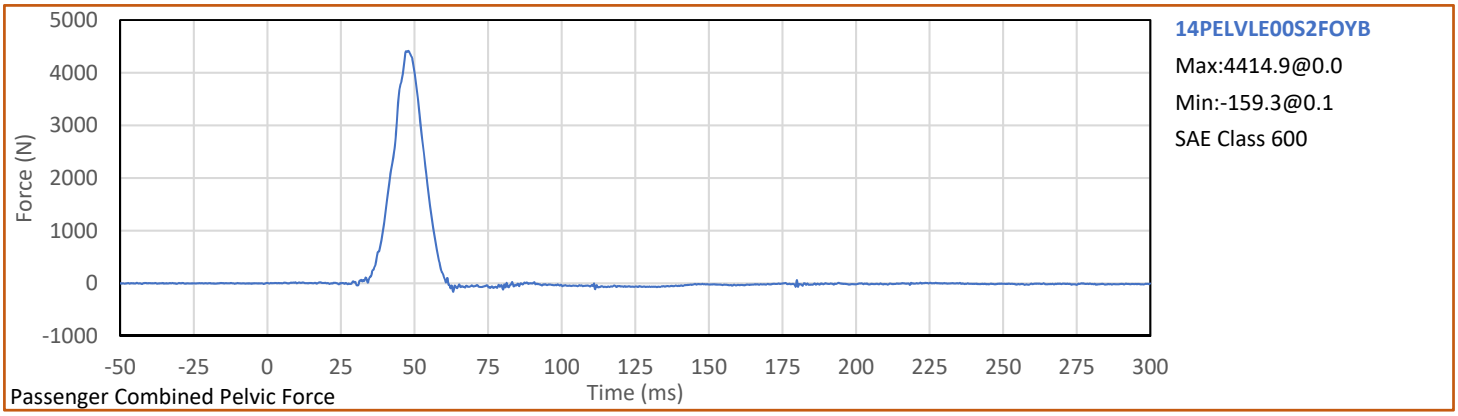

Passenger Acetabulum Impact Side Force Y

14ACTBLE00S2FOYB
Max:3152.2@0.0
Min:-78.0@0.0
SAE Class 600



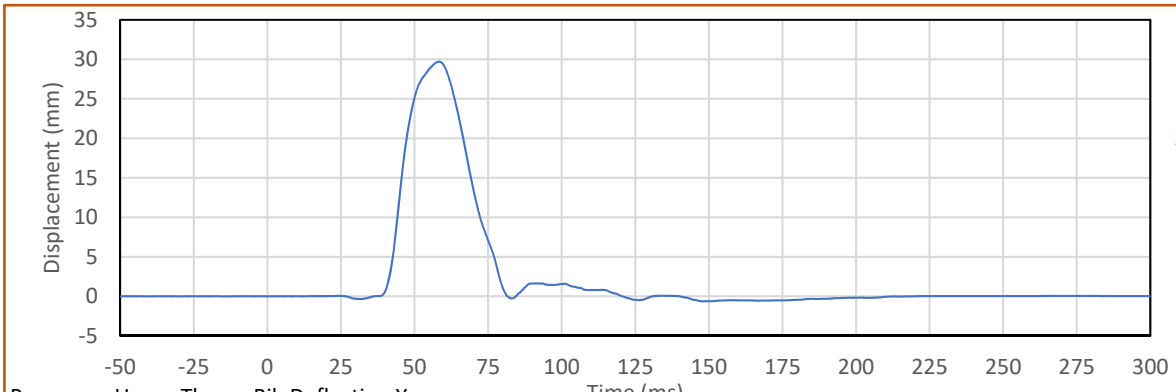

Passenger Iliac Wing Impact Side Force Y

14ILACLE00S2FOYB
Max:1737.1@0.0
Min:-113.3@0.1
SAE Class 600

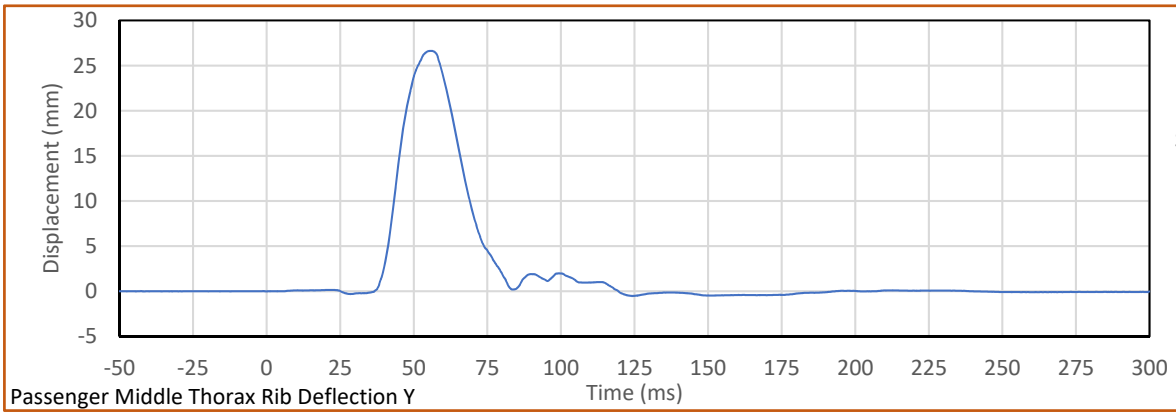



Passenger Combined Pelvic Force

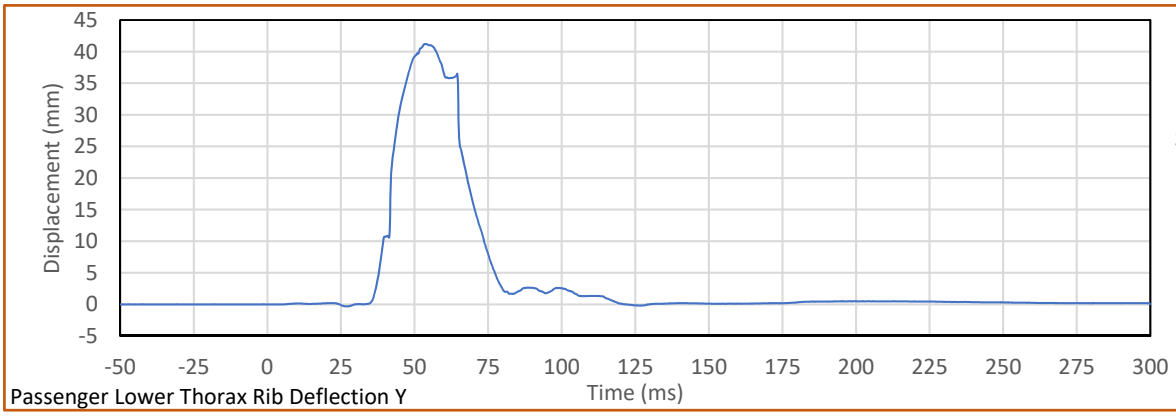
14PELVLE00S2FOYB
Max:4414.9@0.0
Min:-159.3@0.1
SAE Class 600



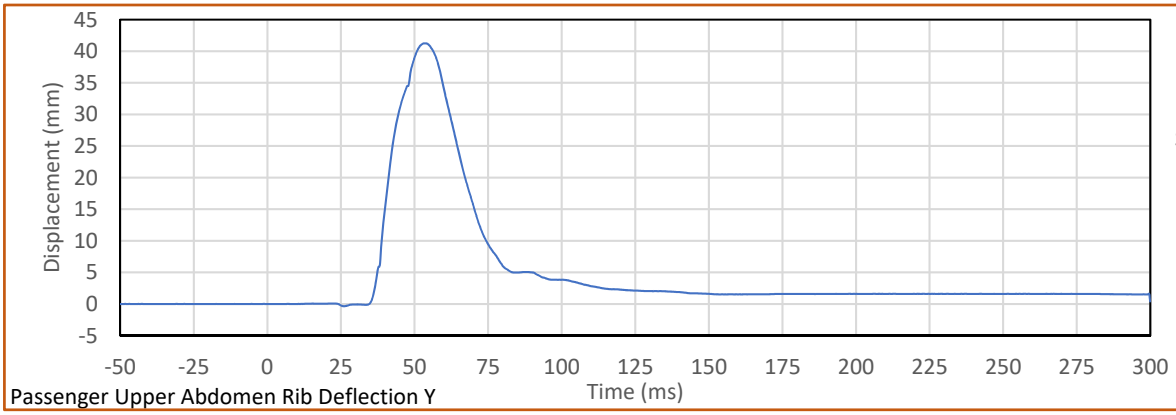

14TRRI01LES2DSYB
Max:29.7@0.1
Min:-0.6@0.1
SAE Class 600



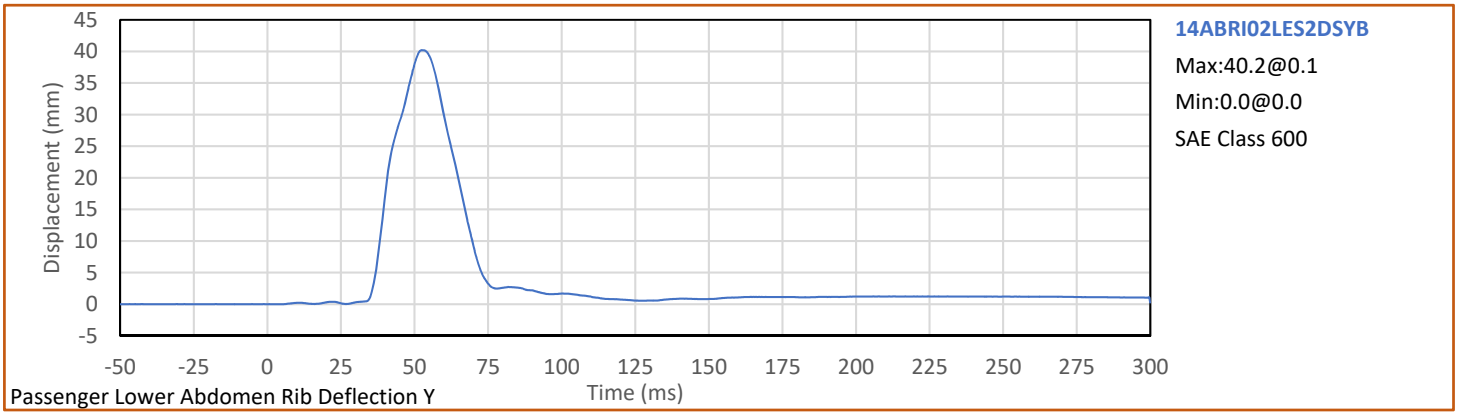

14TRRI02LES2DSYB
Max:26.6@55.7
Min:-0.5@124.3
SAE Class 600




14TRRI03LES2DSYB
Max:41.2@0.1
Min:-0.3@0.0
SAE Class 600




14ABRI01LES2DSYB
Max:41.2@0.1
Min:-0.4@0.0
SAE Class 600




Passenger Lower Abdomen Rib Deflection Y

# APPENDIX C
# ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

**APPENDIX C**
**Pre-Test ATD Configuration And Performance Verification Data**
**ES-2re 50th Male Side Impact ATD**
**S/N: F035**

Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## External Measurements

ATD Serial No.: F035 Test Date: 2019-05-06

| Tested Parameter | Units | Spec Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 | 70 | 30 | Pass |
| 1 - Sitting Height | mm | 900 | 918 | 904 | Pass |
| 2 - Seat to Shoulder Joint | mm | 558 | 572 | 564 | Pass |
| 3 - Seat to Lower Face of Thoracic Spine Box | mm | 346 | 356 | 350 | Pass |
| 4 - Seat to Hip Joint (bolt center) | mm | 97 | 103 | 100 | Pass |
| 5 - Sole to Seat, Sitting | mm | 433 | 451 | 441 | Pass |
| 6 - Head Width | mm | 152 | 158 | 155 | Pass |
| 7 - Shoulder/Arm Width | mm | 461 | 479 | 471 | Pass |
| 8 - Thorax Width | mm | 322 | 332 | 327 | Pass |
| 9 - Abdomen Width | mm | 273 | 287 | 278 | Pass |
| 10 - Pelvis Lap Width | mm | 359 | 373 | 368 | Pass |
| 11 - Head Depth | mm | 196 | 206 | 200 | Pass |
| 12 - Thorax Depth | mm | 262 | 272 | 268 | Pass |
| 13 - Abdomen Depth | mm | 194 | 204 | 201 | Pass |
| 14 - Pelvis Depth | mm | 235 | 245 | 243 | Pass |
| 15 - Back of Buttocks to Hip Joint (bolt Center) | mm | 150 | 160 | 157 | Pass |
| 16 - Back of Buttocks to Front Knee | mm | 597 | 615 | 611 | Pass |
| | | | Overall Test Results | | Pass |

Technician: J. Hernandez

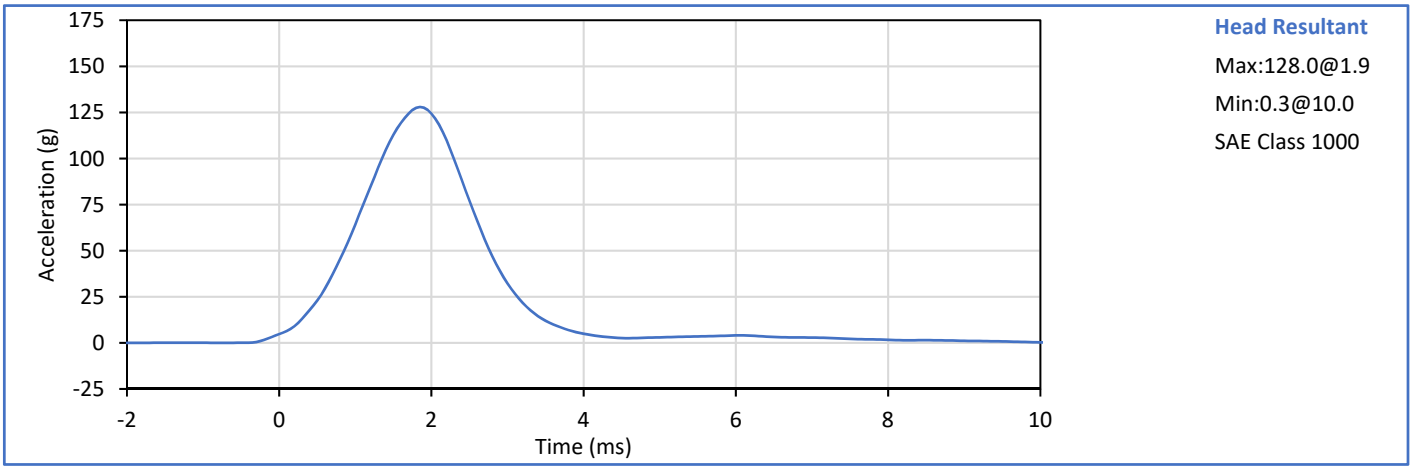
Approved By: P. Puzzuto

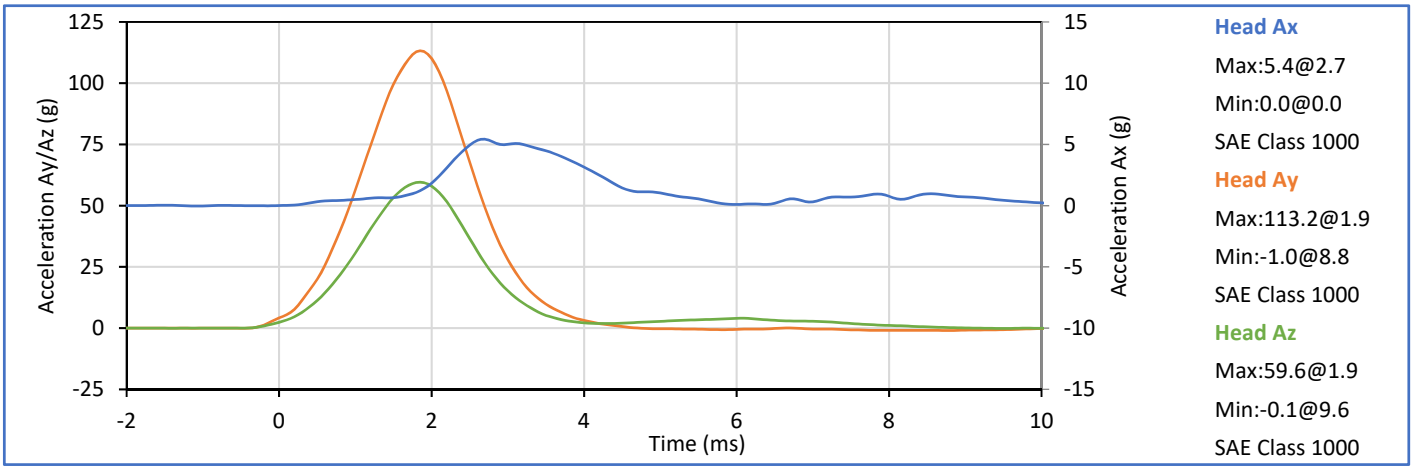
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Head Drop

ATD Serial No.: F035 Test Date: 2019-05-06

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 18.9 | 25.6 | 21.4 | Pass |
| Laboratory Humidity | % | 10 | 70 | 35 | Pass |
| Peak Resultant Acceleration | g | 125.0 | 155.0 | 128.0 | Pass |
| Peak Head Ax | g | -15.0 | 15.0 | 5.4 | Pass |
| Oscillations After Main Pulse | % | 0.0 | 15.0 | 3.2 | Pass |
| Is Acceleration Unimodal? | Yes/No | Yes | | Yes | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

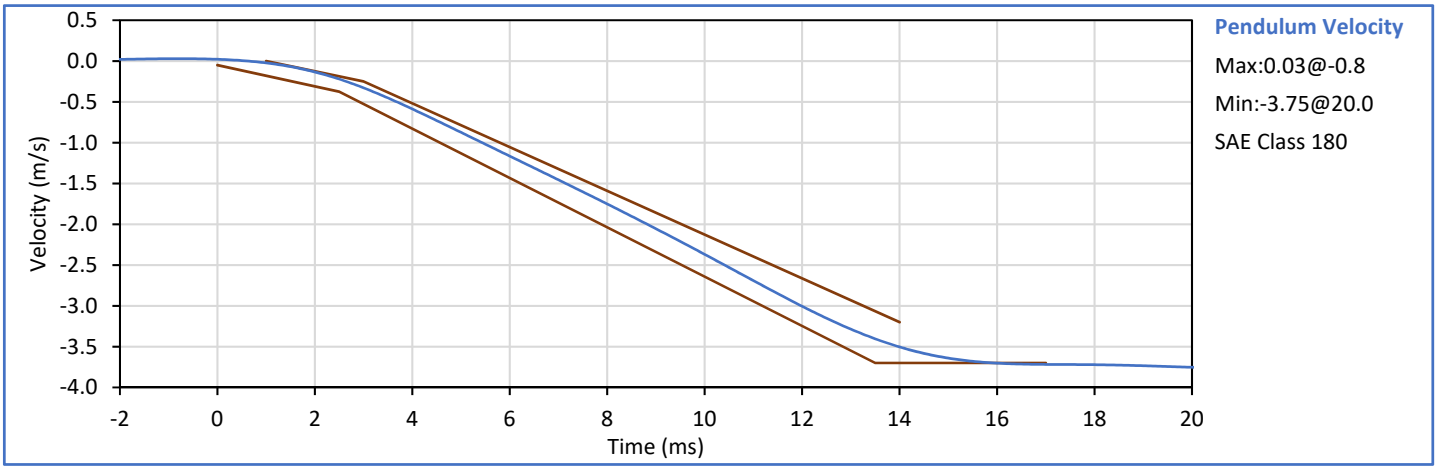
Approved By: P. Puzzuto

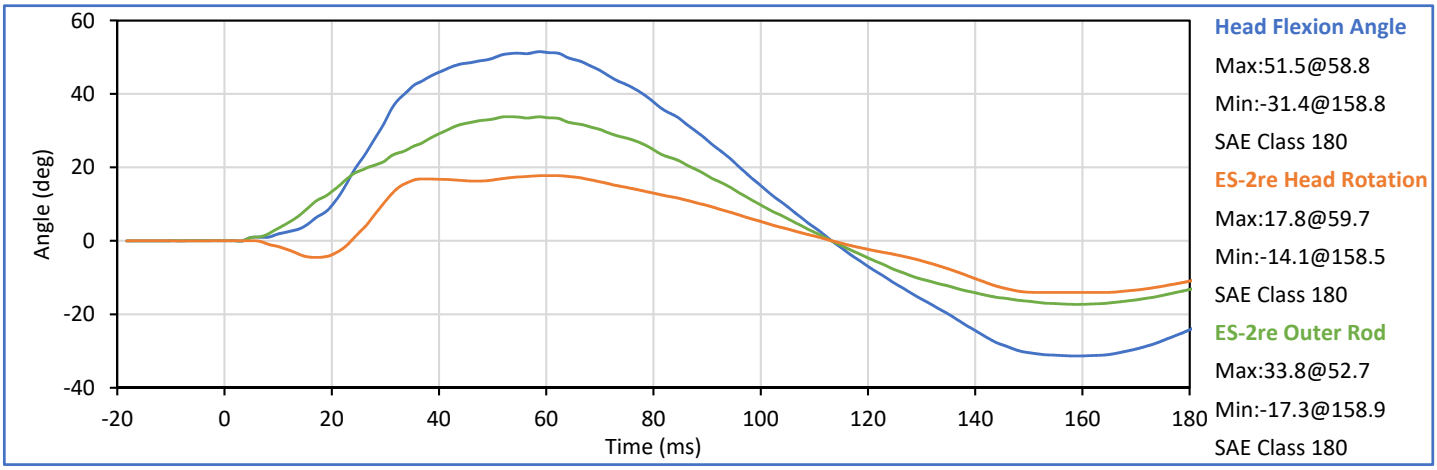
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Neck Flexion

ATD Serial No.: F035 Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 20.9 | Pass |
| Laboratory Humidity | % | 10 | 70 | 32 | Pass |
| Pendulum Velocity | m/s | 3.30 | 3.50 | 3.47 | Pass |
| Peak Headform Flexion | deg | 49.0 | 59.0 | 51.5 | Pass |
| Time of Peak Headform Flexion | ms | 54.0 | 66.0 | 58.8 | Pass |
| Flexion Decay (Peak to zero) | ms | 53.0 | 88.0 | 54.5 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

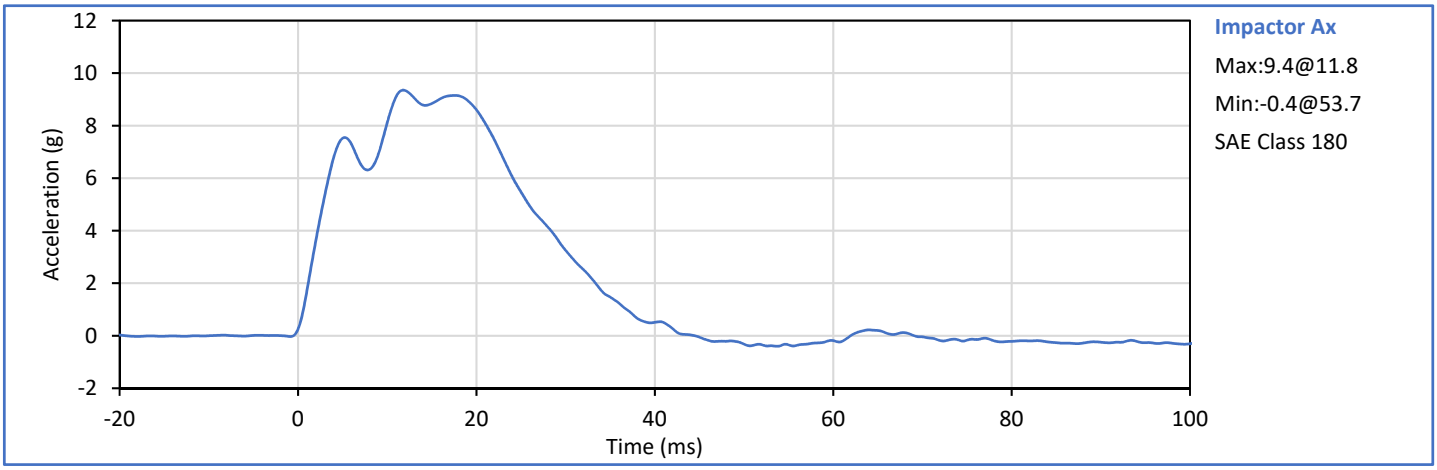
Applus IDIADA
KARCO

**ES-2re 50th Male Side Impact ATD**
**Shoulder Impact Test**

ATD Serial No.: F035

Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.0 | Pass |
| Laboratory Humidity | % | 10 | 70 | 36 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.31 | Pass |
| Peak Impactor Ax | g | 7.5 | 10.5 | 9.4 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

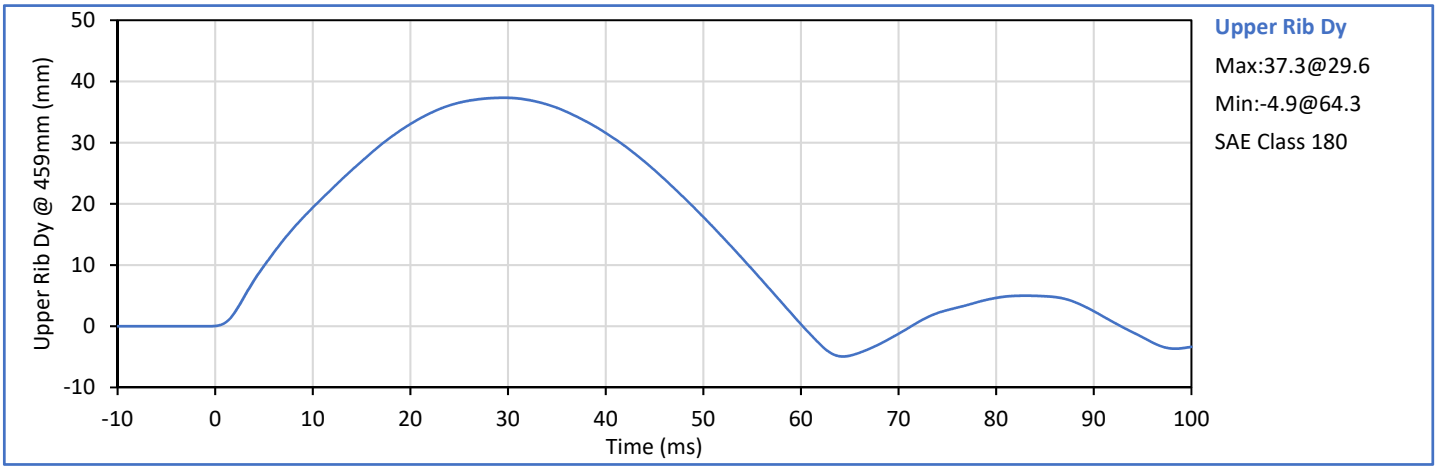
Applus IDIADA
KARCO

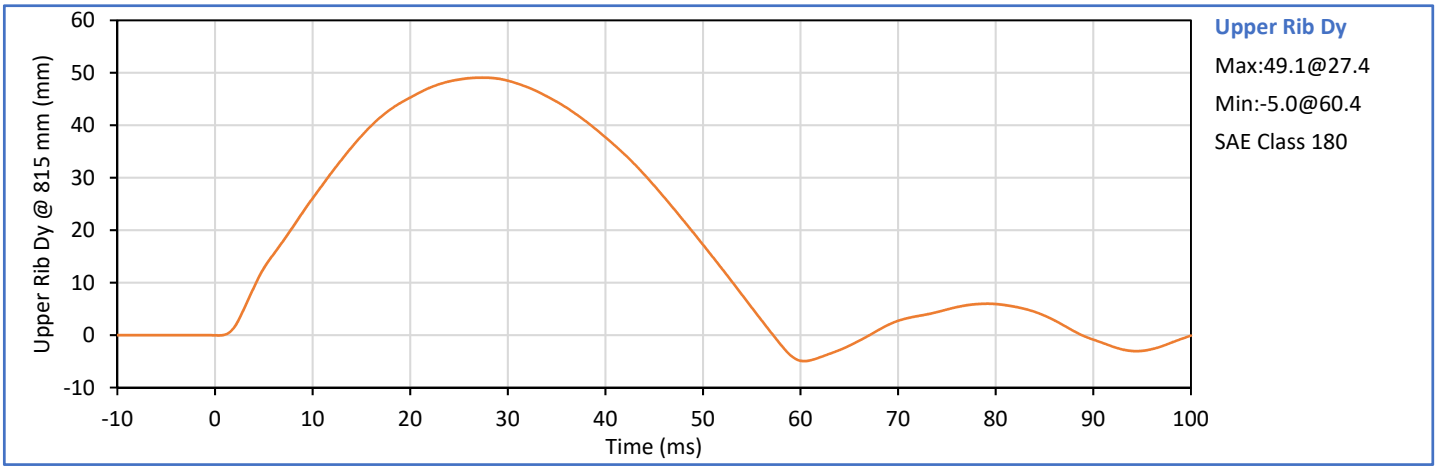
# ES-2re 50th Male Side Impact ATD
## Upper Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.4 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Upper Rib Dy @ 459mm | mm | 36.0 | 40.0 | 37.3 | Pass |
| Upper Rib Dy @ 815mm | mm | 46.0 | 51.0 | 49.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

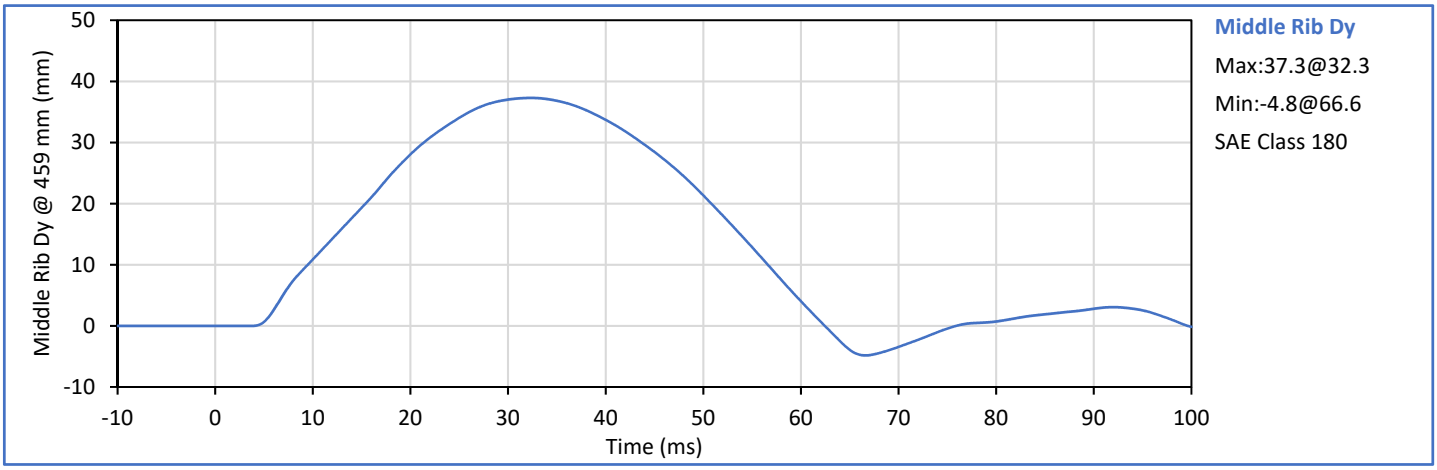
Applus IDIADA KARCO

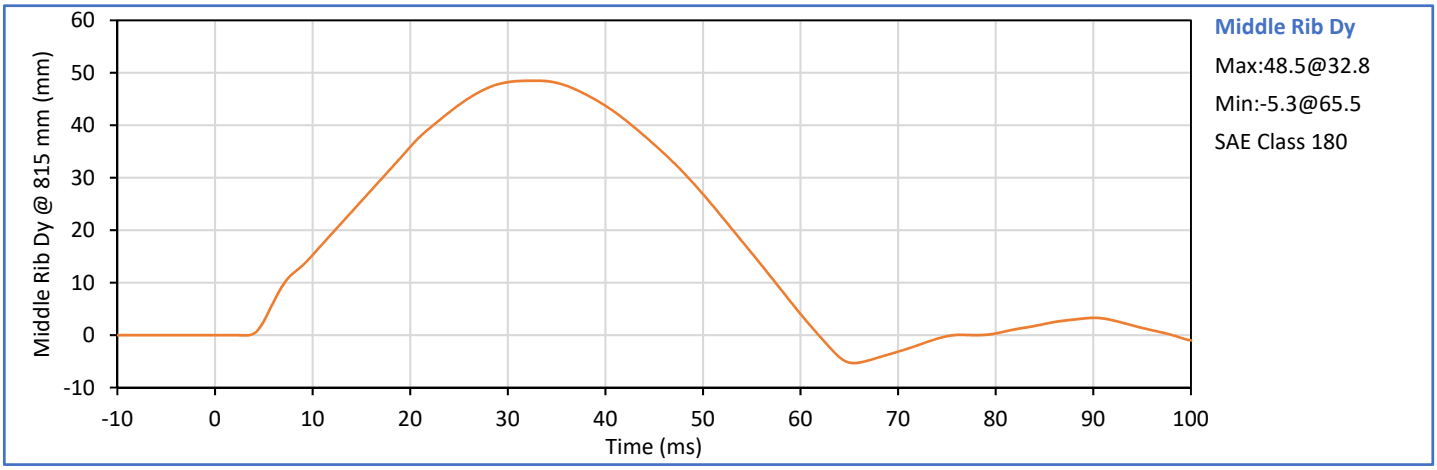
## ES-2re 50th Male Side Impact ATD
## Middle Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Middle Rib Dy @ 459mm | mm | 36.0 | 40.0 | 37.3 | Pass |
| Middle Rib Dy @ 815mm | mm | 46.0 | 51.0 | 48.5 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

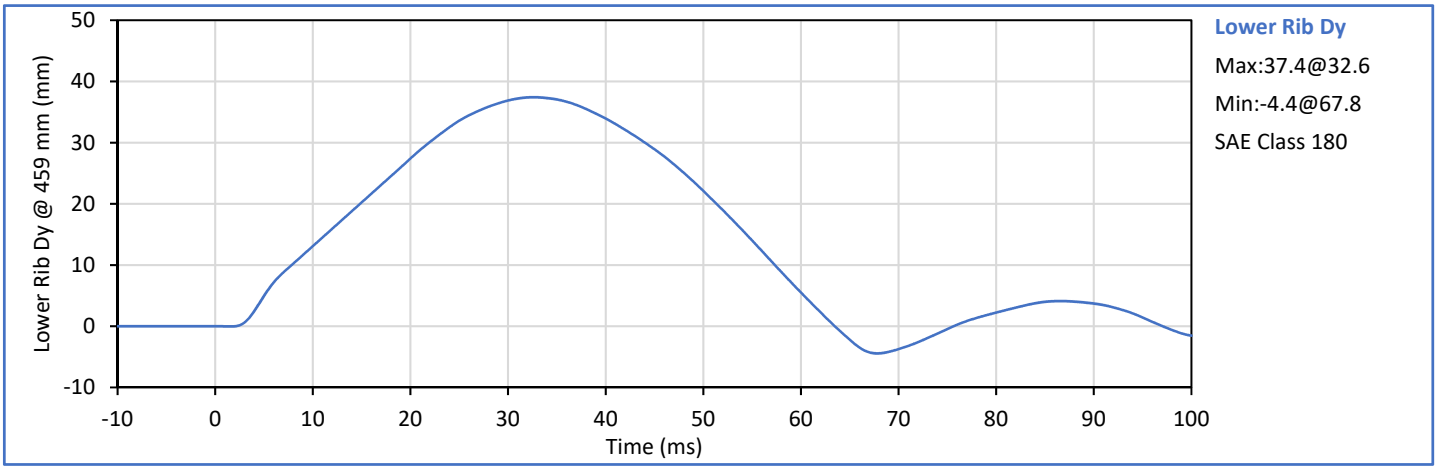
Applus IDIADA KARCO

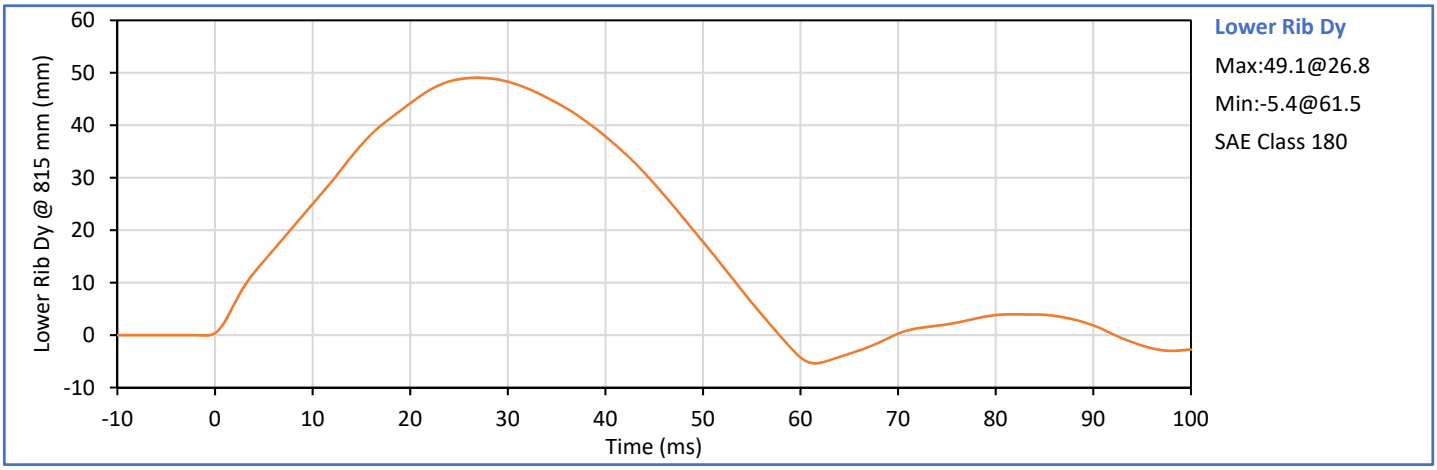
## ES-2re 50th Male Side Impact ATD
## Lower Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Lower Rib Dy @ 459mm | mm | 36.0 | 40.0 | 37.4 | Pass |
| Lower Rib Dy @ 815mm | mm | 46.0 | 51.0 | 49.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

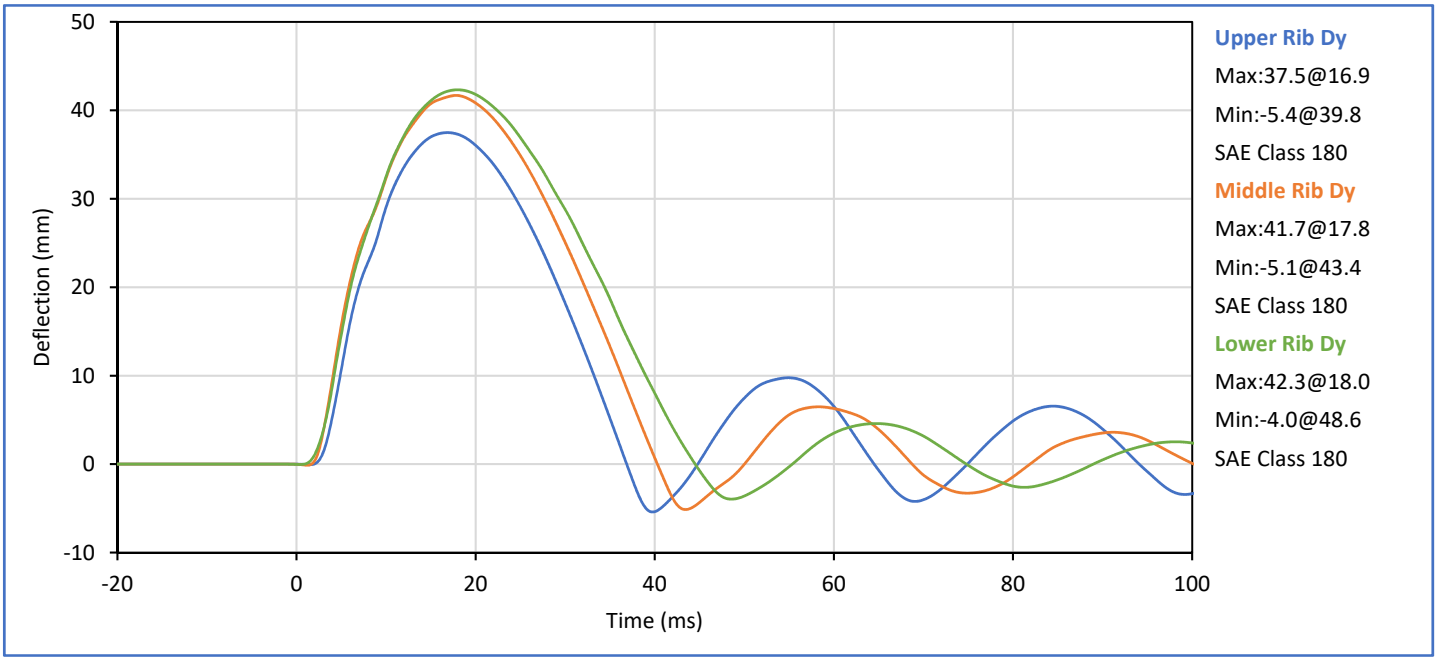
Applus IDIADA
KARCO

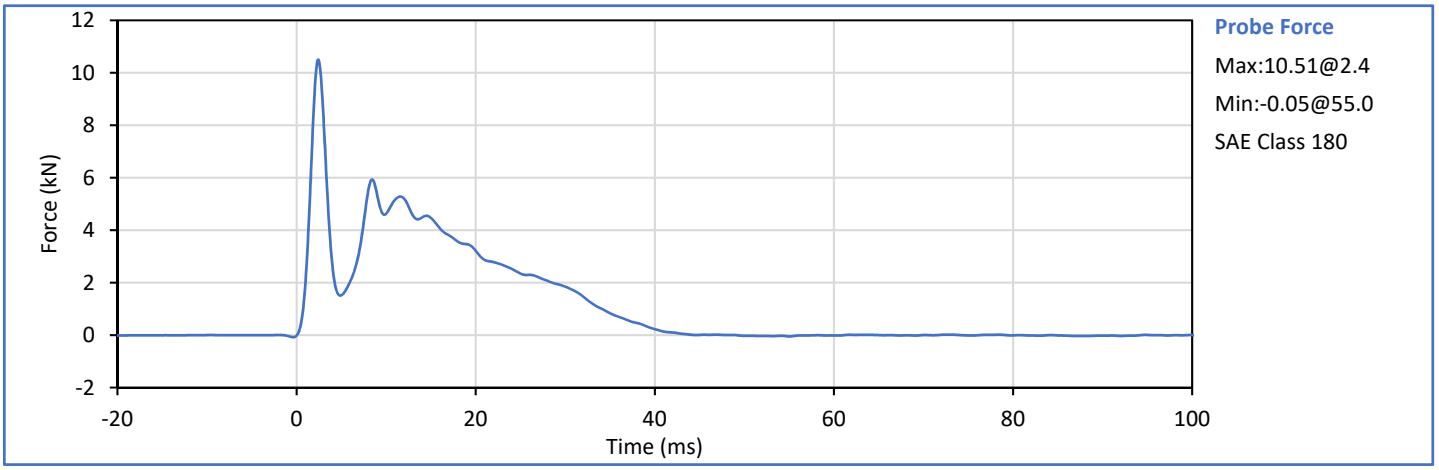
# ES-2re 50th Male Side Impact ATD
## Thorax Impact (Full Body)

ATD Serial No.: F035

Test Date: 2019-05-08

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 5.40 | 5.60 | 5.44 | Pass |
| Peak Upper Rib Dy | mm | 34.0 | 41.0 | 37.5 | Pass |
| Peak Middle Rib Dy | mm | 37.0 | 45.0 | 41.7 | Pass |
| Peak Lower Rib Dy | mm | 37.0 | 44.0 | 42.3 | Pass |
| Peak Impactor Force After 6 ms | kN | 5.10 | 6.20 | 5.93 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

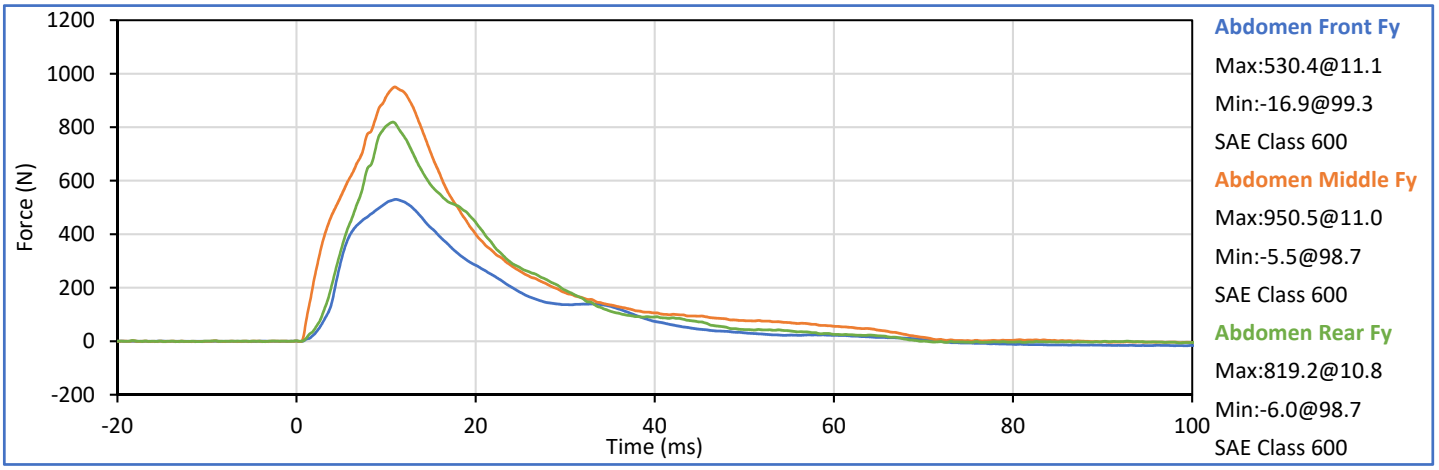
Approved By: P. Puzzuto

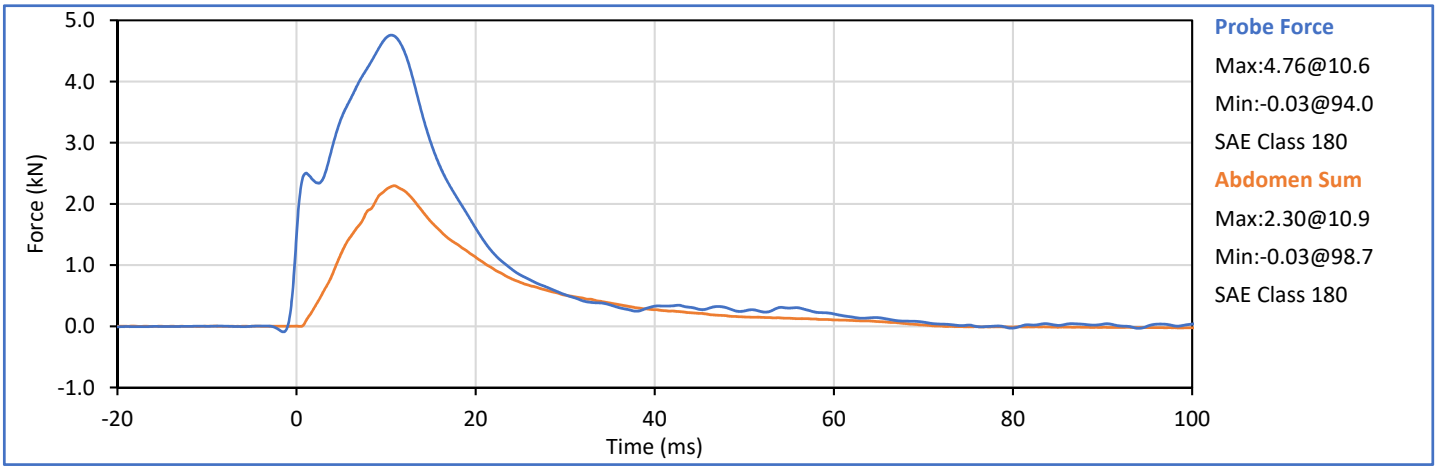
Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## Abdomen Impact

ATD Serial No.: F035 Test Date: 2019-05-08

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 3.90 | 4.10 | 4.02 | Pass |
| Peak Impactor Force | kN | 4.00 | 4.80 | 4.76 | Pass |
| Time of Peak Impactor Force | ms | 10.6 | 13.0 | 10.6 | Pass |
| Sum of Abdomen Forces | kN | 2.20 | 2.70 | 2.30 | Pass |
| Time of Peak Sum Abdomen Force | ms | 10.0 | 12.3 | 10.9 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

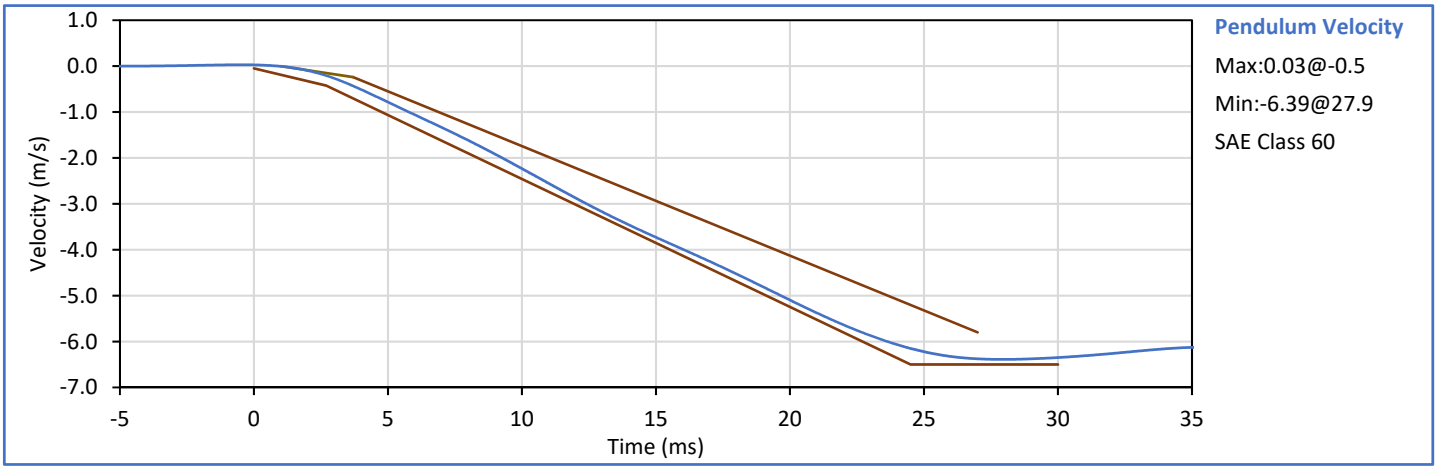
Approved By: P. Puzzuto

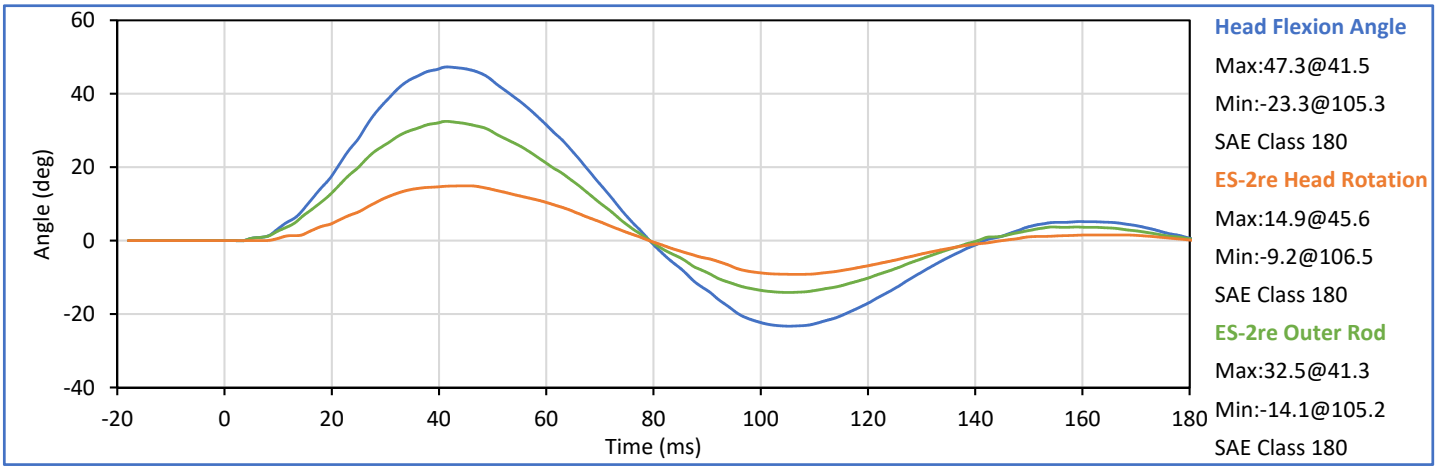
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Lumbar Spine Flexion

ATD Serial No.: F035 Test Date: 2019-05-07

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 32 | Pass |
| Pendulum Velocity | m/s | 5.95 | 6.15 | 6.08 | Pass |
| Peak Headform Flexion | deg | 45.0 | 55.0 | 47.3 | Pass |
| Time of Peak Headform Flexion | ms | 39.0 | 53.0 | 41.5 | Pass |
| Flexion Decay (Peak to zero) | ms | 37.0 | 57.0 | 37.8 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

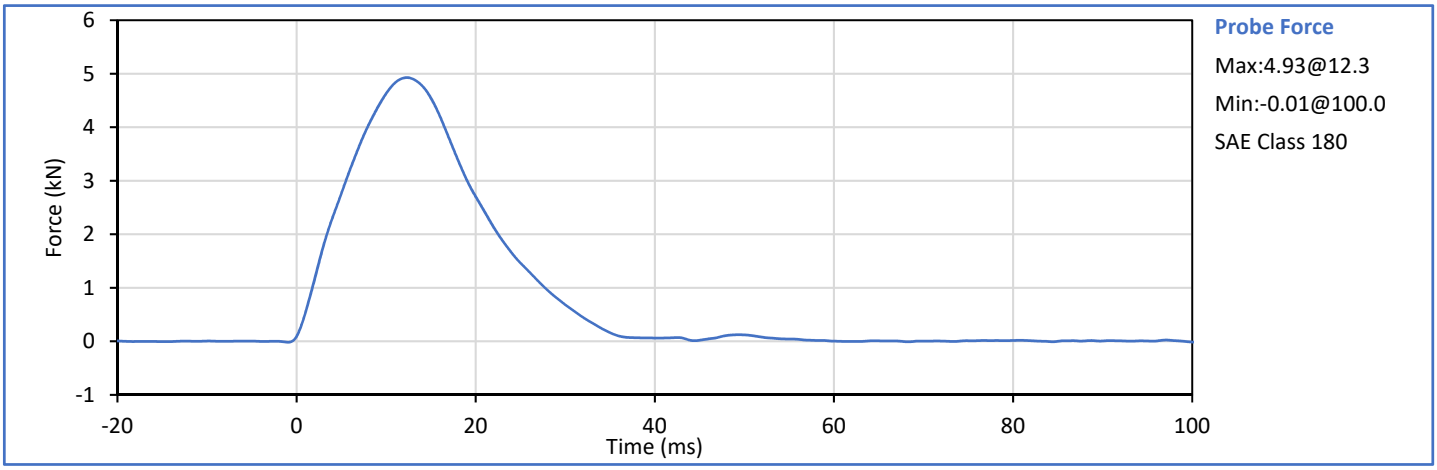
Approved By: P. Puzzuto

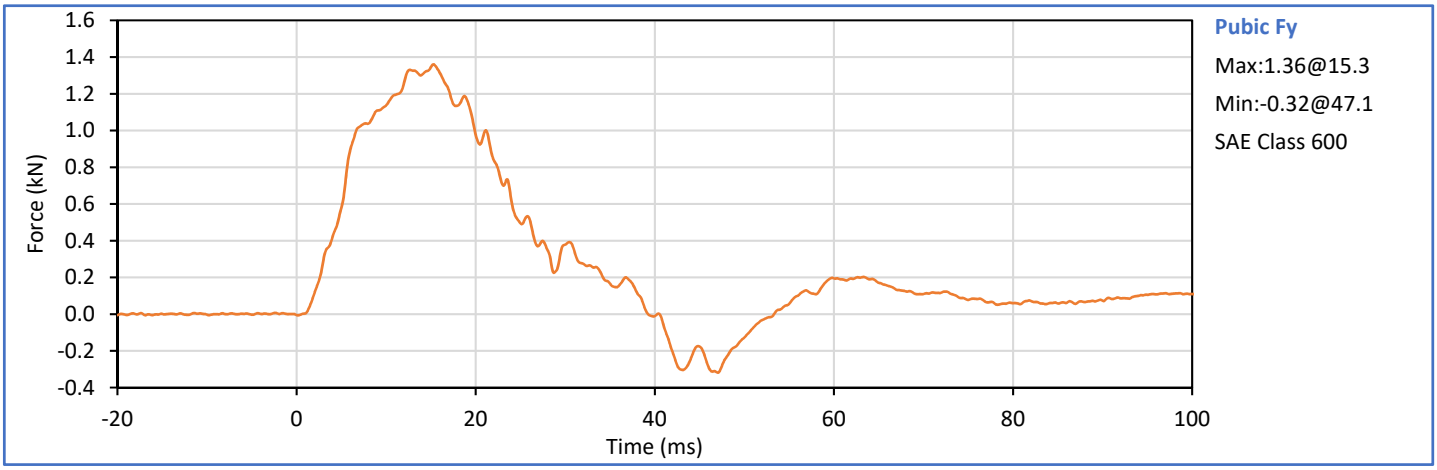
Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## Pelvis Impact

ATD Serial No.: F035 Test Date: 2019-05-08

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.31 | Pass |
| Peak Impactor Force | kN | 4.70 | 5.40 | 4.93 | Pass |
| Time of Peak Impactor Force | ms | 11.8 | 16.1 | 12.3 | Pass |
| Pubic Symphysis Fy | kN | 1.23 | 1.59 | 1.36 | Pass |
| Time of Peak Pubic Symphysis Fy | ms | 12.2 | 17.0 | 15.3 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

**APPENDIX C**
**Pre-Test ATD Configuration And Performance Verification Data**
**SID-IIs Small Side Impact ATD**
**S/N: 308**

Applus IDIADA
KARCO

## SID-IIs Small Side Impact ATD
## External Measurements

ATD Serial No.: 308 Test Date: 2019-04-30

| Tested Parameter | Units | Spec Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Relative Humidity | % | 10 | 70 | 44 | Pass |
| A - Sitting Height | mm | 772 | 788 | 778 | Pass |
| B - Shoulder Pivot Height | mm | 437 | 453 | 450 | Pass |
| C - Hpoint Height | mm | 79 | 89 | 83 | Pass |
| D - H Point From Seatback | mm | 141 | 151 | 146 | Pass |
| E - Shoulder Pivot From Backline | mm | 97 | 107 | 103 | Pass |
| F - Thigh Clearance | mm | 119 | 135 | 126 | Pass |
| G - Head Breadth | mm | 140 | 148 | 142 | Pass |
| H - Head Back From Backline | mm | 40 | 46 | 43 | Pass |
| I - Head Depth | mm | 178 | 188 | 185 | Pass |
| J - Head Circumference | mm | 541 | 551 | 549 | Pass |
| K - Buttock To Knee Length | mm | 514 | 540 | 524 | Pass |
| L - Popliteal Height | mm | 343 | 369 | 356 | Pass |
| K - Knee Pivot To Floor Height | mm | 392 | 409 | 396 | Pass |
| N - Buttock Popliteal Length | mm | 416 | 442 | 427 | Pass |
| O - Chest Depth W/O Jacket | mm | 195 | 211 | 206 | Pass |
| P - Foot Length | mm | 216 | 232 | 223 | Pass |
| Q - Hip Breadth (W/Pelvic Plugs) | mm | 313 | 323 | 319 | Pass |
| R - Arm Length | mm | 249 | 259 | 256 | Pass |
| S - Knee Joint To Seatback | mm | 477 | 493 | 485 | Pass |
| V - Shoulder Width | mm | 341 | 357 | 344 | Pass |
| W - Foot Width | mm | 78 | 94 | 83 | Pass |
| Y - Chest Circumference W/Jacket | mm | 851 | 881 | 862 | Pass |
| Z - Waist Circumference | mm | 761 | 791 | 783 | Pass |
| | | | Overall Test Results | | Pass |

Technician: J. Hernandez

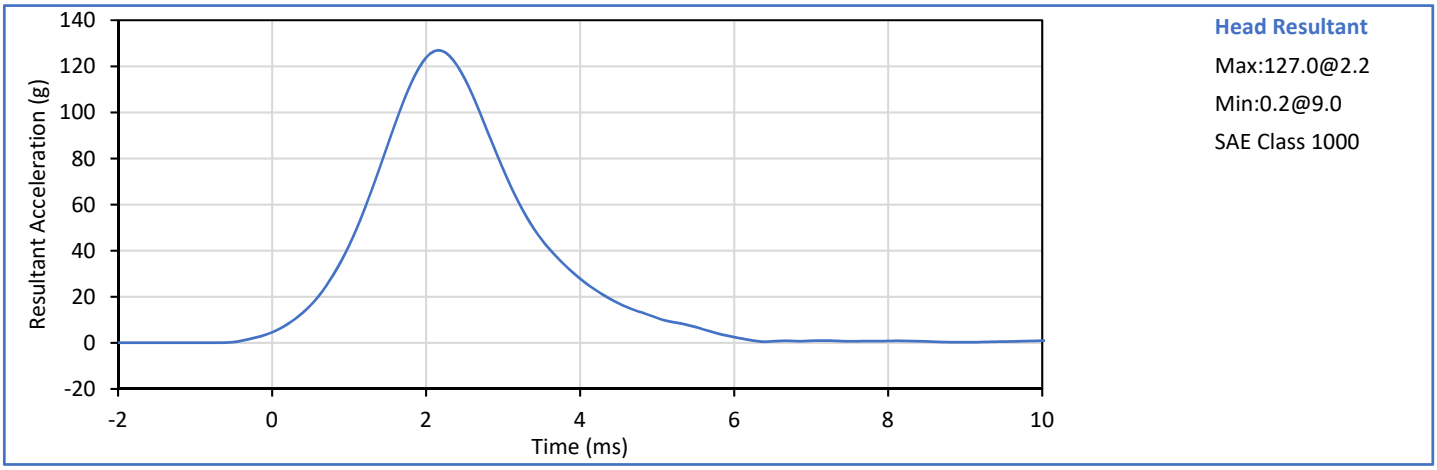
Approved By: P. Puzzuto

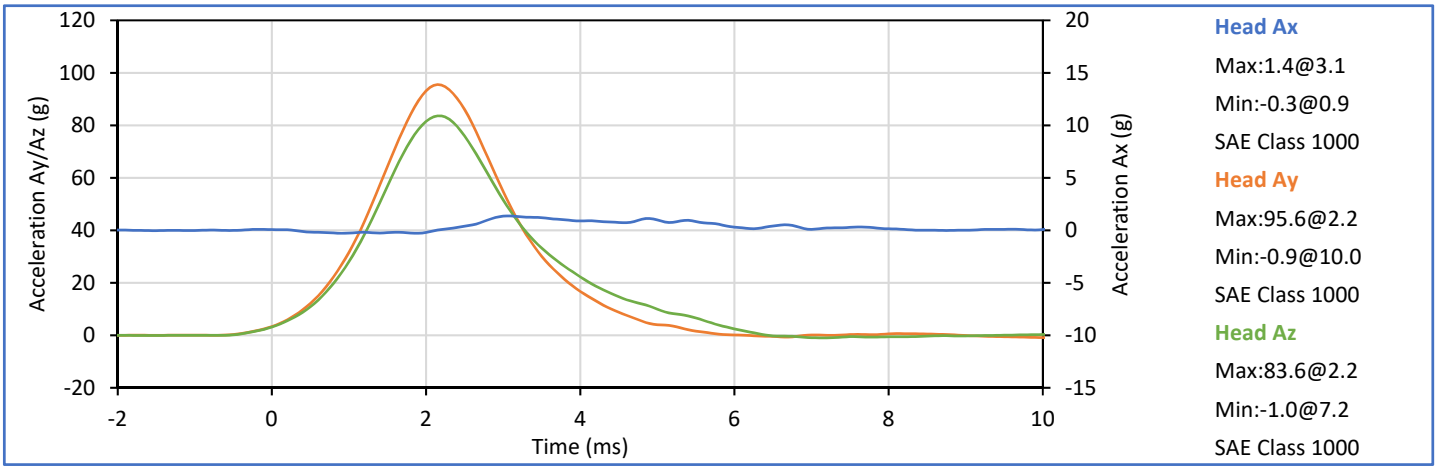
Applus IDIADA
KARCO

**SID-IIs Small Side Impact ATD**
**Head Drop**

ATD Serial No.: 308 Test Date: 2019-04-30

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 18.9 | 25.6 | 21.7 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Peak Resultant Acceleration | g | 115.0 | 137.0 | 127.0 | Pass |
| Peak Head Ax | g | -15.0 | 15.0 | -0.3 | Pass |
| Oscillations After Main Pulse | % | 0.0 | 15.0 | 1.2 | Pass |
| Is Acceleration Unimodal? | Yes/No | Yes | | Yes | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

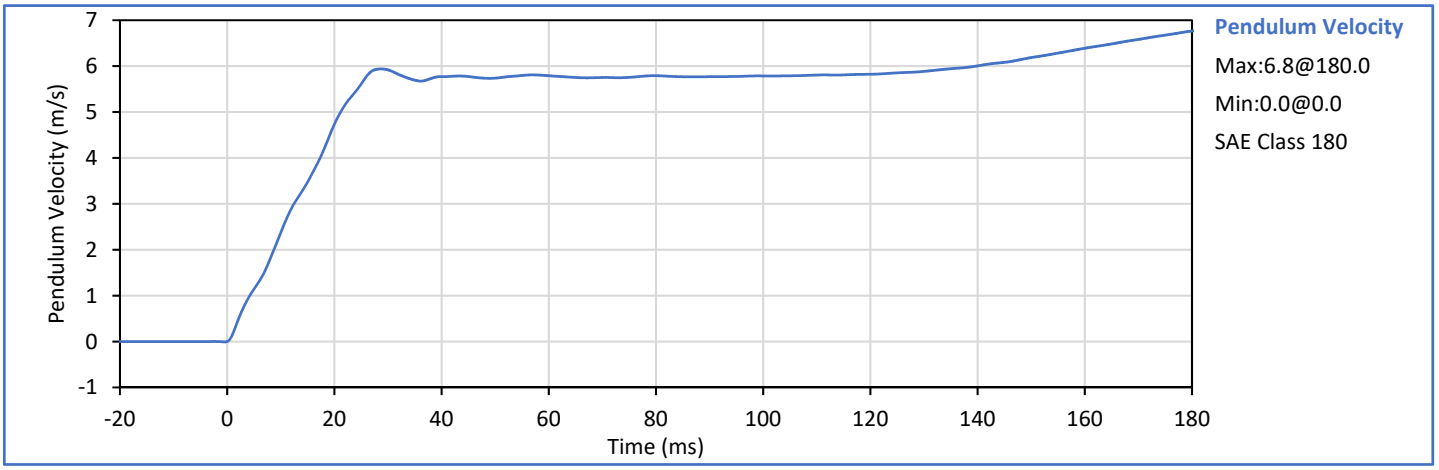
Approved By: P. Puzzuto

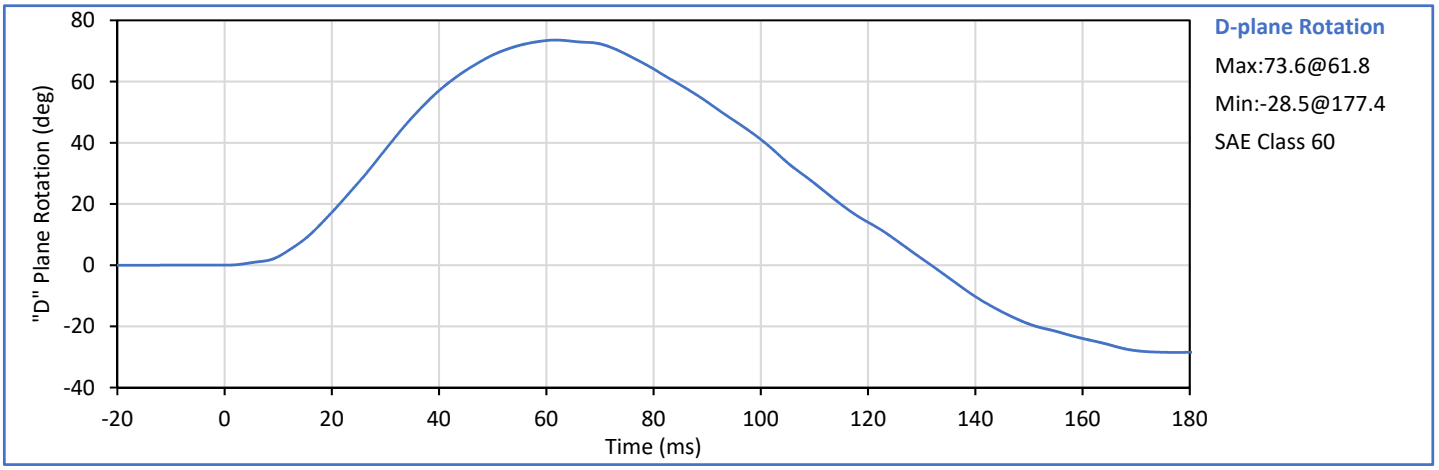
Applus IDIADA
KARCO

# SID-IIs Small Side Impact ATD
## Neck Flexion

ATD Serial No.: 308 Test Date: 2019-04-30

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Pendulum Velocity | m/s | 5.51 | 5.63 | 5.56 | Pass |
| Pendulum Decel at 10 ms | m/s | 2.20 | 2.80 | 2.37 | Pass |
| Pendulum Decel at 15 ms | m/s | 3.30 | 4.10 | 3.47 | Pass |
| Pendulum Decel at 20 ms | m/s | 4.40 | 5.40 | 4.73 | Pass |
| Pendulum Decel at 25 ms | m/s | 5.40 | 6.10 | 5.61 | Pass |
| Pendulum Decel from 25-100 ms | m/s | 5.50 | 6.20 | 5.94 | Pass |
| Peak "D" Plane Rotation | deg | 71.0 | 81.0 | 73.6 | Pass |
| Time of Peak "D" Plane Rotation | ms | 50.0 | 70.0 | 61.8 | Pass |
| Peak Occ. Condyle Moment | Nm | -44.0 | -36.0 | -40.1 | Pass |
| Time of Moment Decay to 0 Nm | ms | 102.0 | 126.0 | 111.3 | Pass |
| | | | Overall Test Results | | Pass |



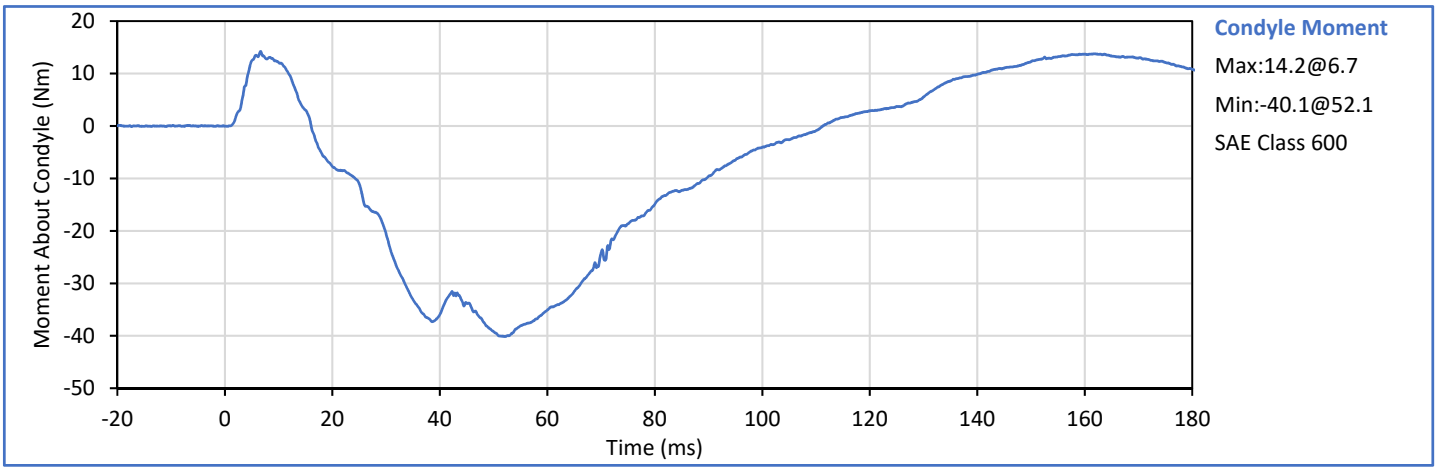



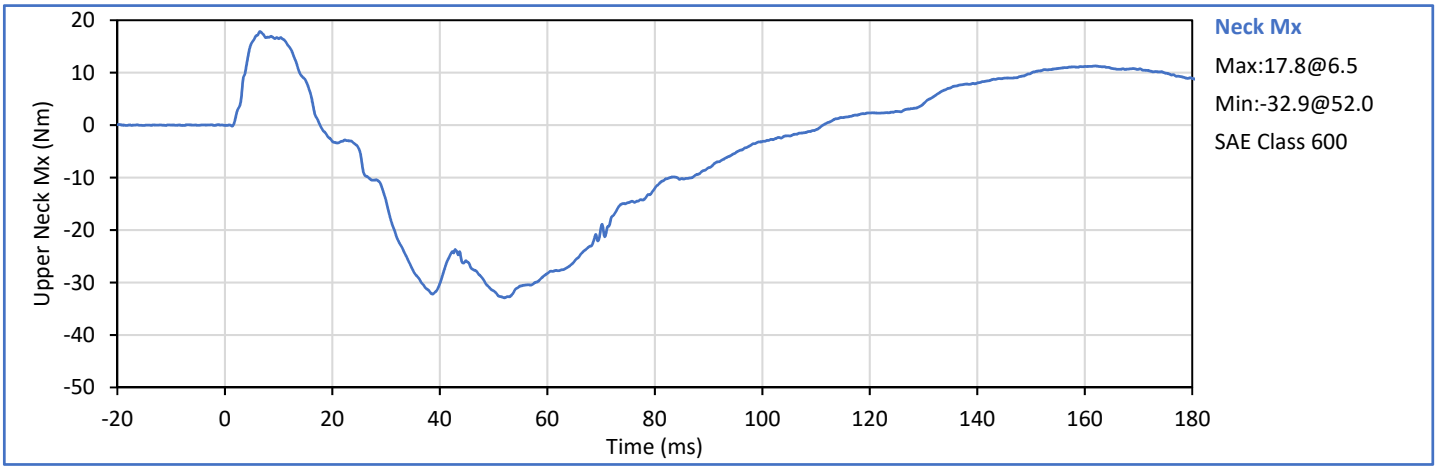

Technician: J. Hernandez

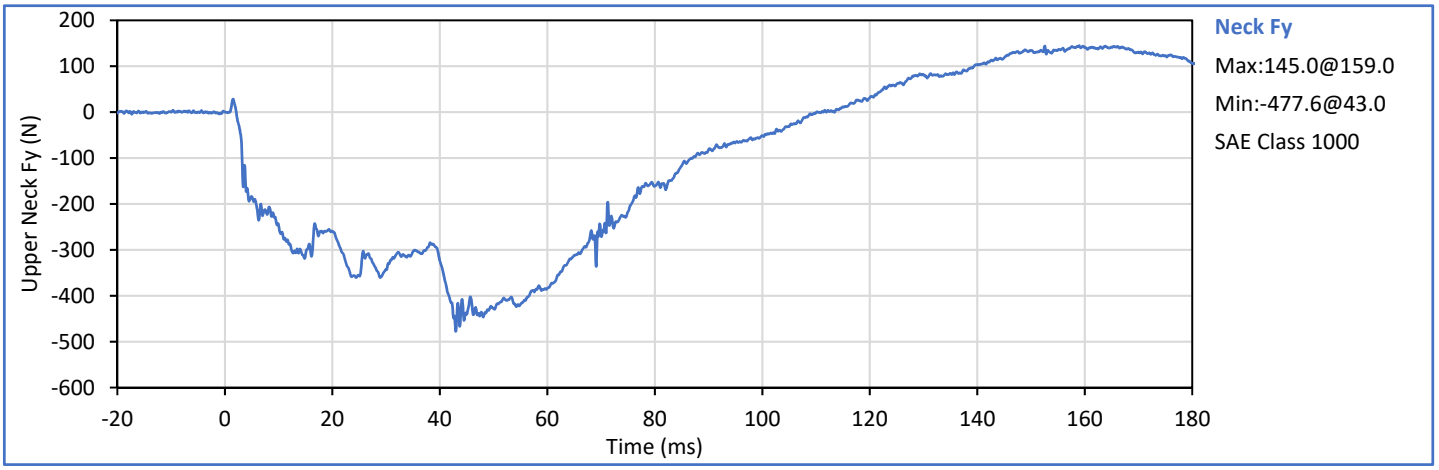
Approved By: P. Puzzuto

**SID-IIs Small Side Impact ATD**
**Neck Flexion**

ATD Serial No.: 308 Test Date: 2019-04-30



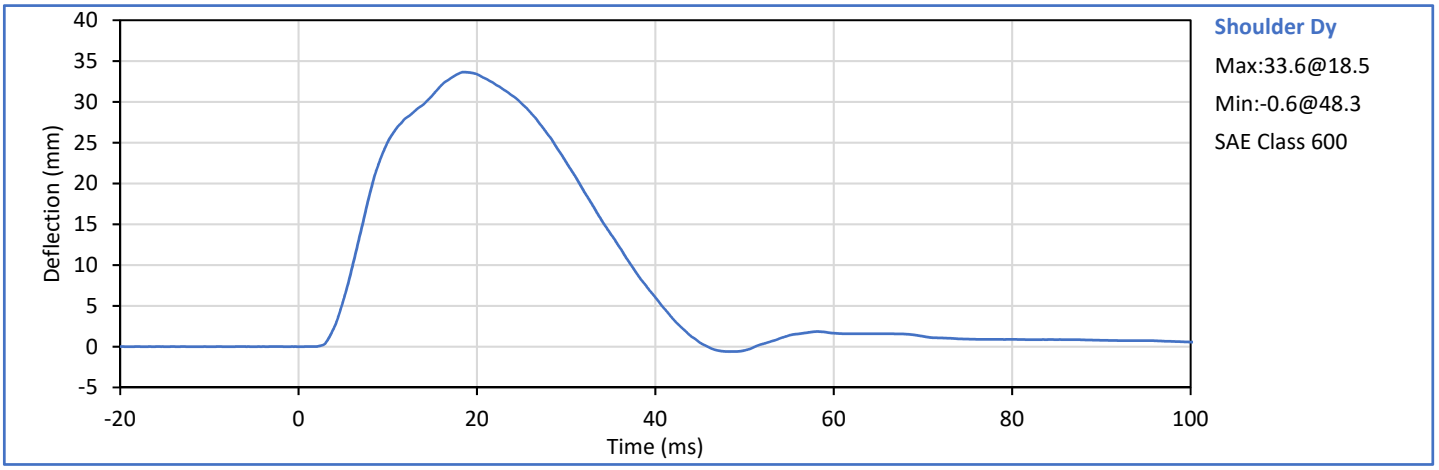



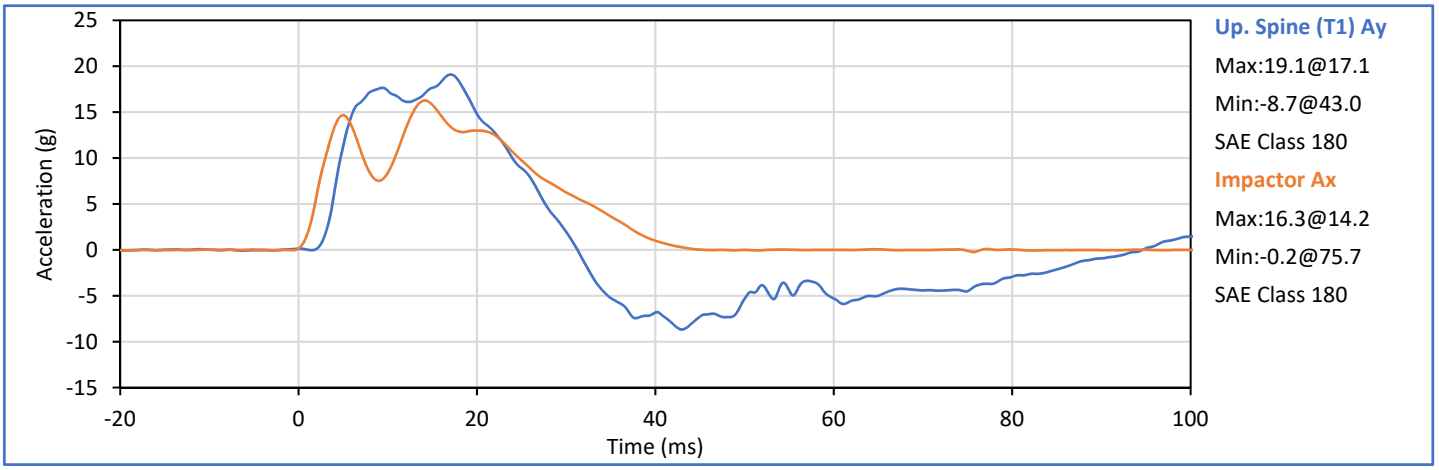
Applus IDIADA
KARCO

**SID-IIs Small Side Impact ATD**
**Shoulder Impact Test**

ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 32 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.31 | Pass |
| Peak Shoulder Dy | mm | 28.0 | 37.0 | 33.6 | Pass |
| Peak Upper Spine (T1) Ay | g | 17.0 | 22.0 | 19.1 | Pass |
| Peak Impactor Ax | g | 13.0 | 18.0 | 16.3 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

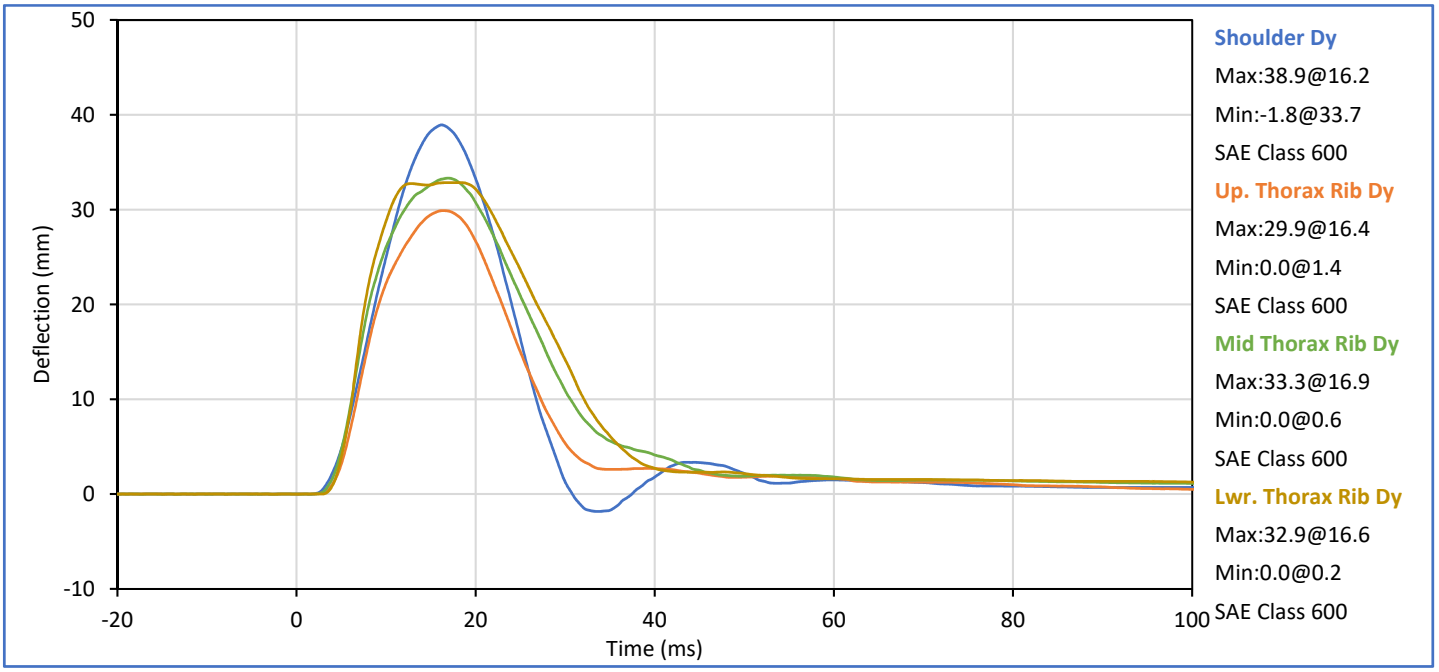
Approved By: P. Puzzuto

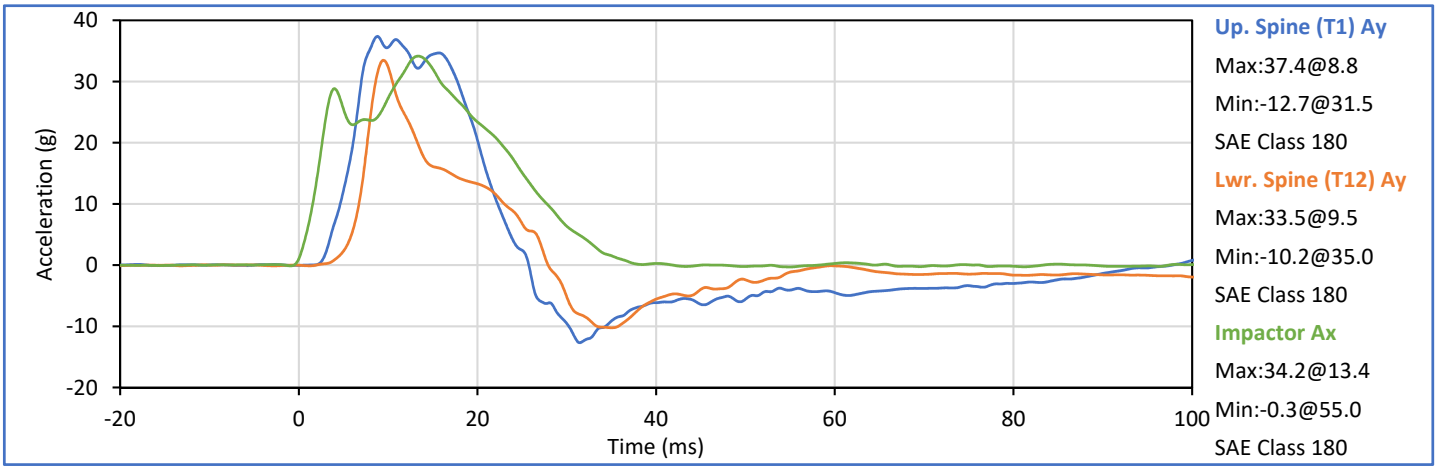
Applus IDIADA
KARCO

# SID-IIs Small Side Impact ATD
## Thorax (With Arm)

ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.4 | Pass |
| Laboratory Humidity | % | 10 | 70 | 32 | Pass |
| Impactor Velocity | m/s | 6.60 | 6.80 | 6.73 | Pass |
| Peak Shoulder Dy | mm | 31.0 | 40.0 | 38.9 | Pass |
| Peak Upper Rib Dy | mm | 25.0 | 32.0 | 29.9 | Pass |
| Peak Middle Rib Dy | mm | 30.0 | 36.0 | 33.3 | Pass |
| Peak Lower Rib Dy | mm | 32.0 | 38.0 | 32.9 | Pass |
| Peak Upper Spine (T1) Ay | g | 34.0 | 43.0 | 37.4 | Pass |
| Peak Lower Spine (T12) Ay | g | 29.0 | 37.0 | 33.5 | Pass |
| Peak Impactor Ax | g | 30.0 | 36.0 | 34.2 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

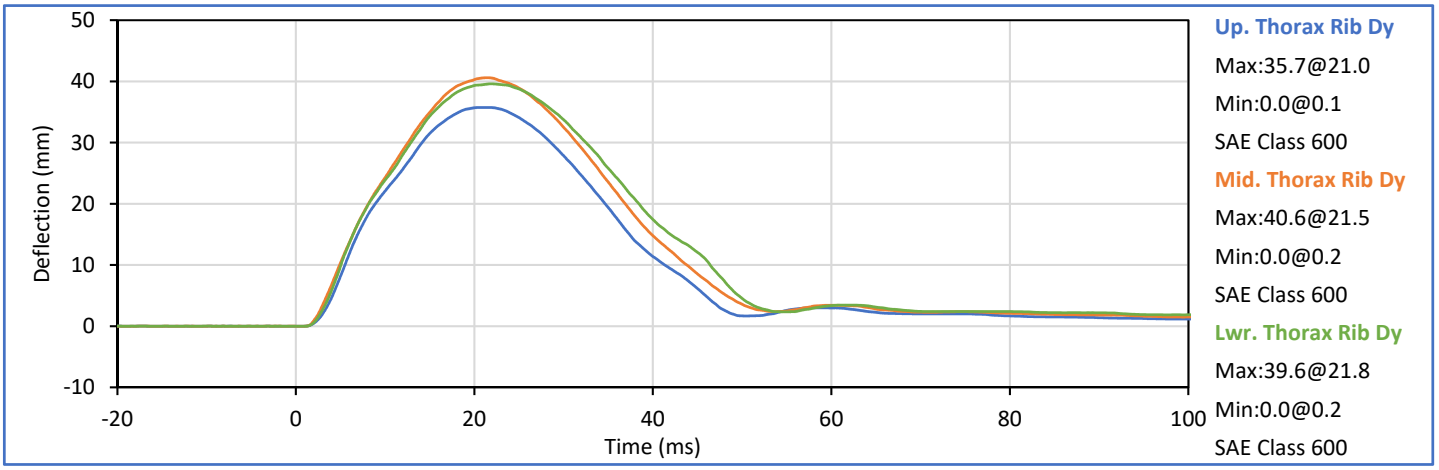
Approved By: P. Puzzuto

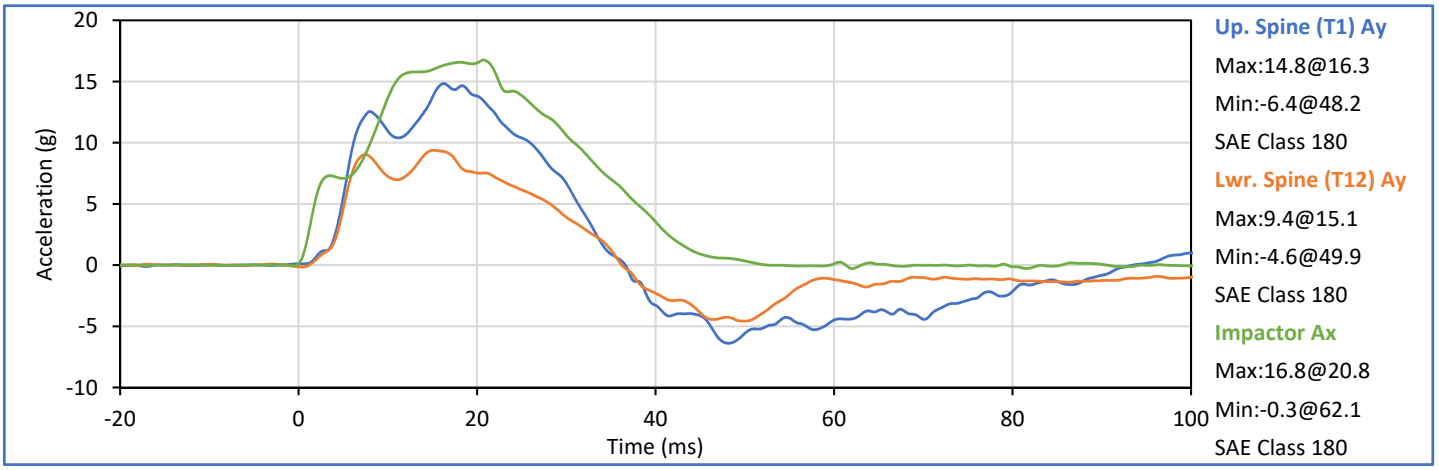
Applus IDIADA
KARCO

**SID-IIs Small Side Impact ATD**
**Thorax (No Arm)**

ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 40 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.23 | Pass |
| Peak Upper Rib Dy | mm | 32.0 | 40.0 | 35.7 | Pass |
| Peak Middle Rib Dy | mm | 39.0 | 45.0 | 40.6 | Pass |
| Peak Lower Rib Dy | mm | 35.0 | 43.0 | 39.6 | Pass |
| Peak Upper Spine (T1) Ay | g | 13.0 | 17.0 | 14.8 | Pass |
| Peak Lower Spine (T12) Ay | g | 7.0 | 11.0 | 9.4 | Pass |
| Peak Impactor Ax | g | 14.0 | 18.0 | 16.8 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

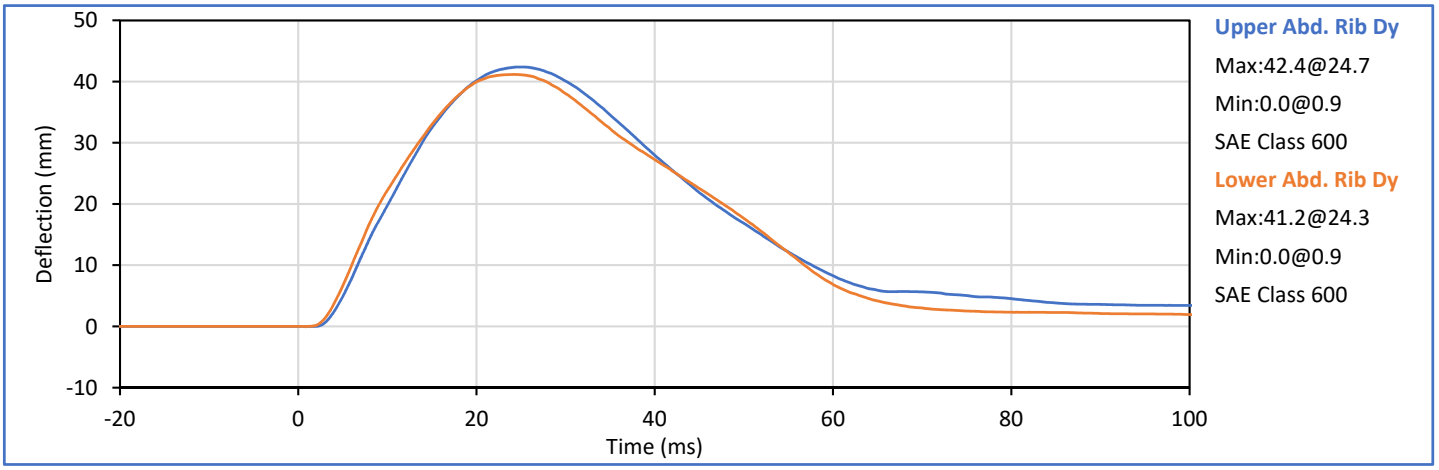
Approved By: P. Puzzuto

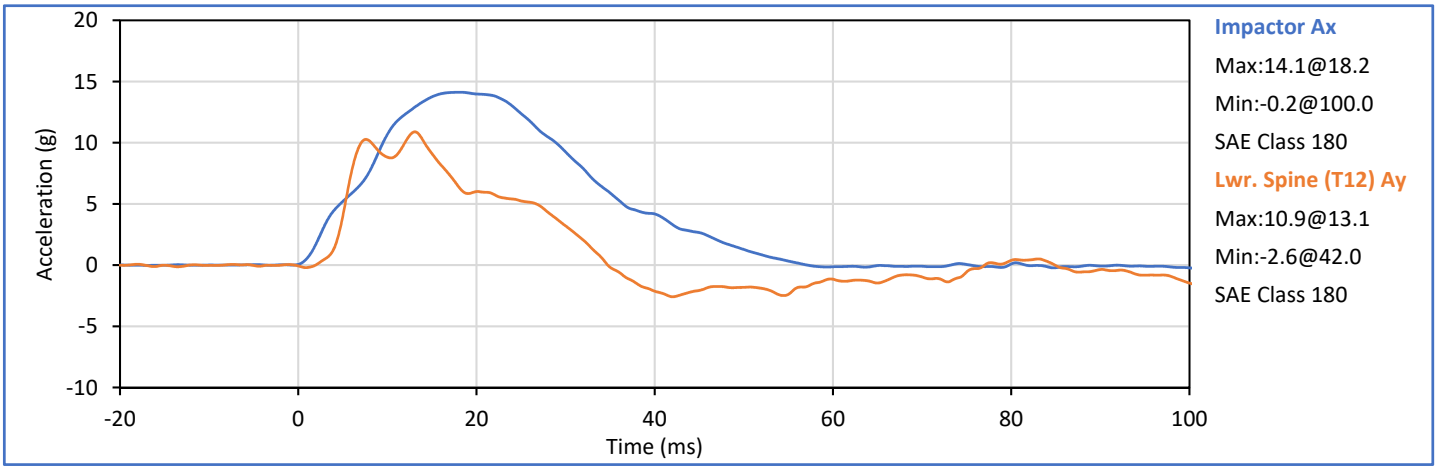
Applus IDIADA
KARCO

## SID-IIs Small Side Impact ATD
## Abdomen Impact

ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 40 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.31 | Pass |
| Peak Upper Abdomen Rib Dy | mm | 36.0 | 47.0 | 42.4 | Pass |
| Peak Lower Abdomen Rib Dy | mm | 33.0 | 44.0 | 41.2 | Pass |
| Peak Lower Spine T12 Ay | mm | 9.0 | 14.0 | 10.9 | Pass |
| Peak Impactor Ax | g | 12.0 | 16.0 | 14.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

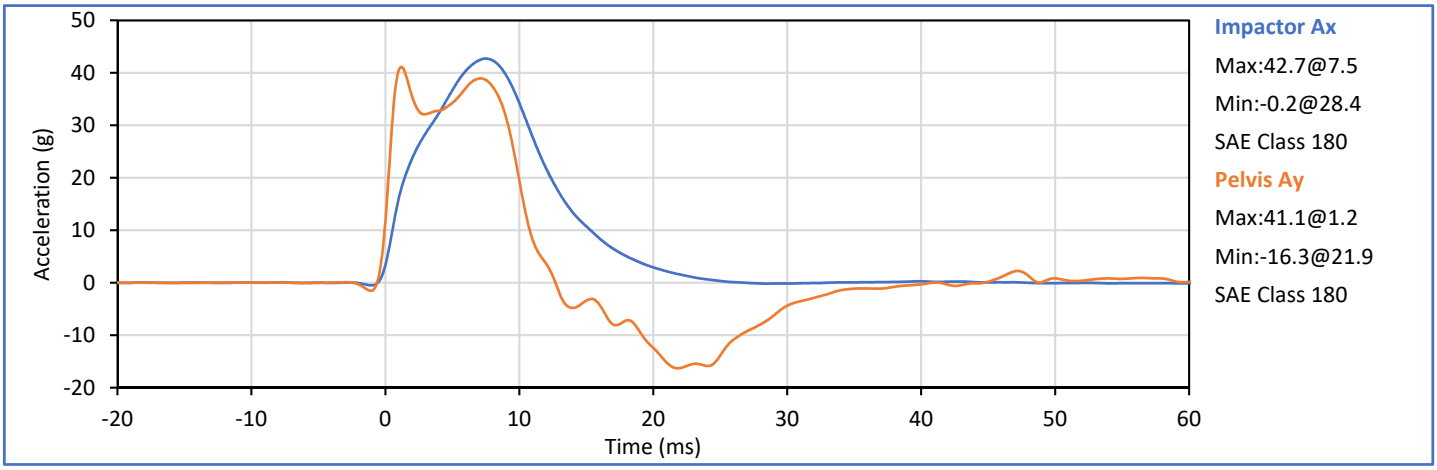
Applus IDIADA KARCO

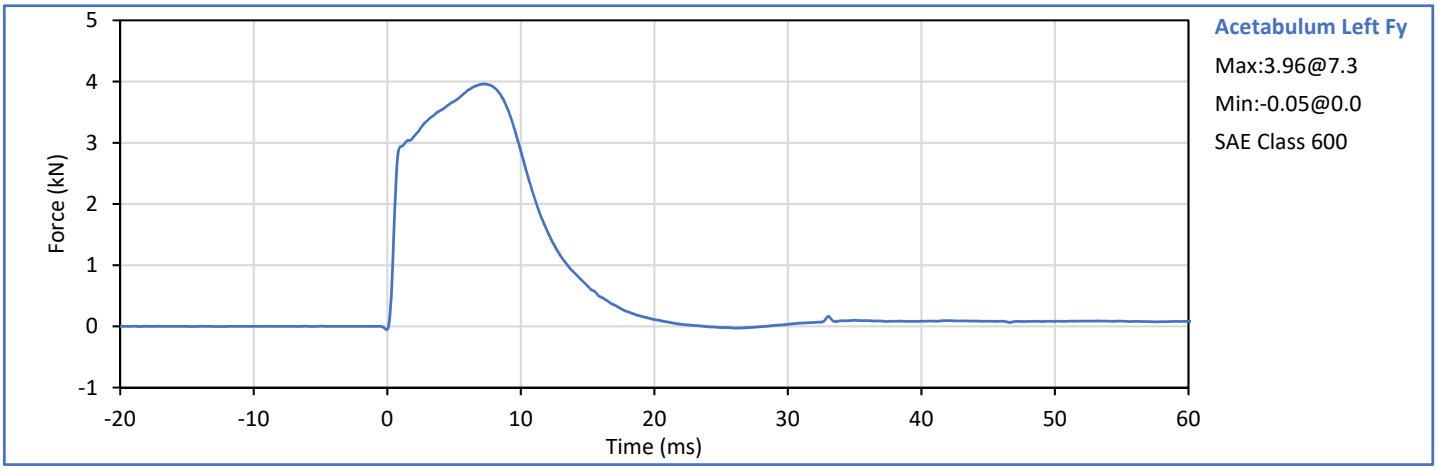
**SID-IIs Small Side Impact ATD**
**Pelvis Acetabulum Impact**

ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 42 | Pass |
| Impactor Velocity | m/s | 6.60 | 6.80 | 6.72 | Pass |
| Peak Acetabulum Fy | kN | 3.60 | 4.30 | 3.96 | Pass |
| Pelvis Ay after 6ms | g | 34.0 | 42.0 | 38.9 | Pass |
| Peak Impactor Ax | g | 38.0 | 47.0 | 42.7 | Pass |
| | | | Overall Test Results | | Pass |

Pelvis Plug S/N: 11514 (SACO)




Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: 308 Test Date: 2019-05-03

Pelvis Plug S/N: 11514 (SACO)

SACO RESEARCH

**SID-IIs Pelvis Plug Certification Test**

Plug S/N 11514
Test Number 3018
Report Number 3015
Test Date 8/31/2016 11:01:26 AM

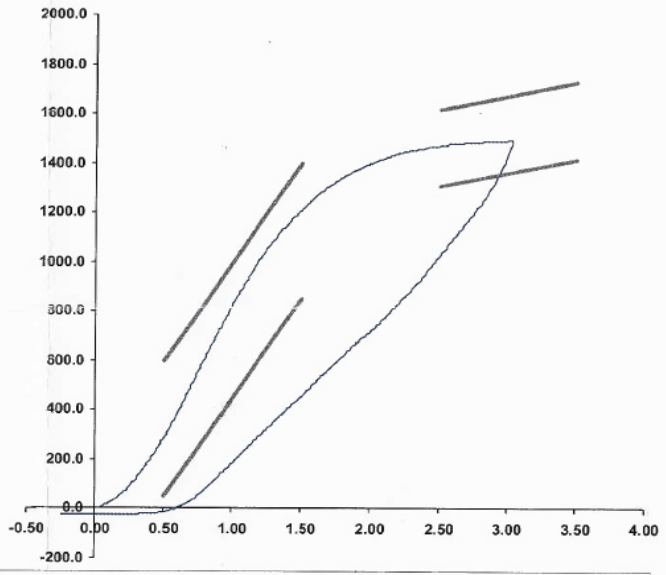
| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 293.86 | 50.00 | 600.00 |
| Force @ 1.5 mm (N) | 1,211.55 | 850.00 | 1,400.00 |
| Force @ 2.5 mm (N) | 1,470.48 | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,491.62 | 1,361.00 | 1,673.00 |

Testing Machine STM-20 5965542
Load Cell S/N (TI240813), 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 31-Aug-16
SACO Research

By : DC Date : 8/31/16

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

Applus IDIADA
KARCO

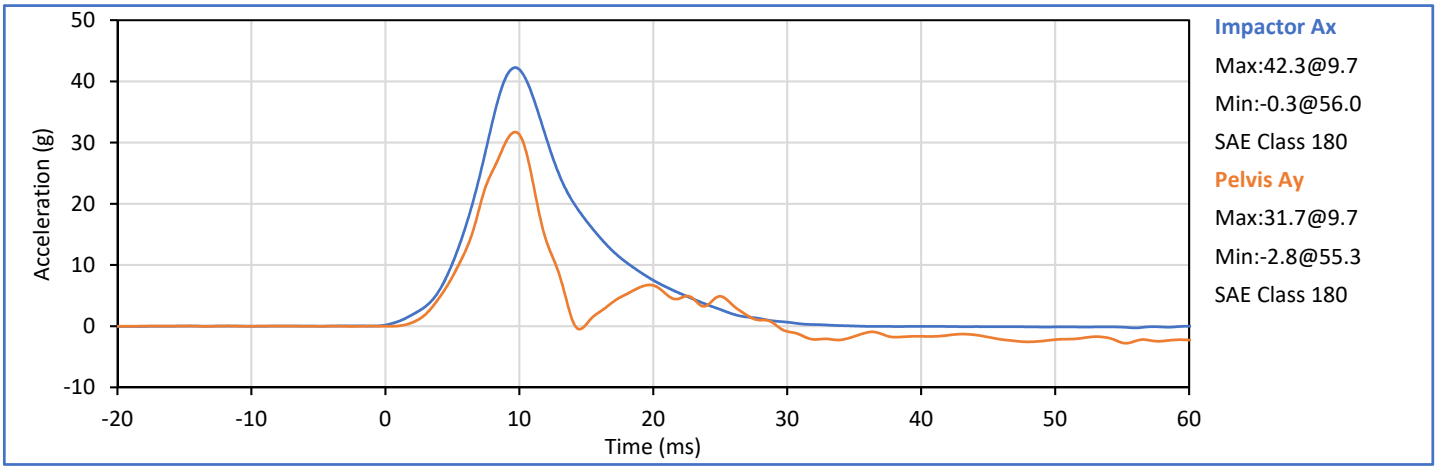
**SID-IIs Small Side Impact ATD**
**Pelvis Iliac Impact**

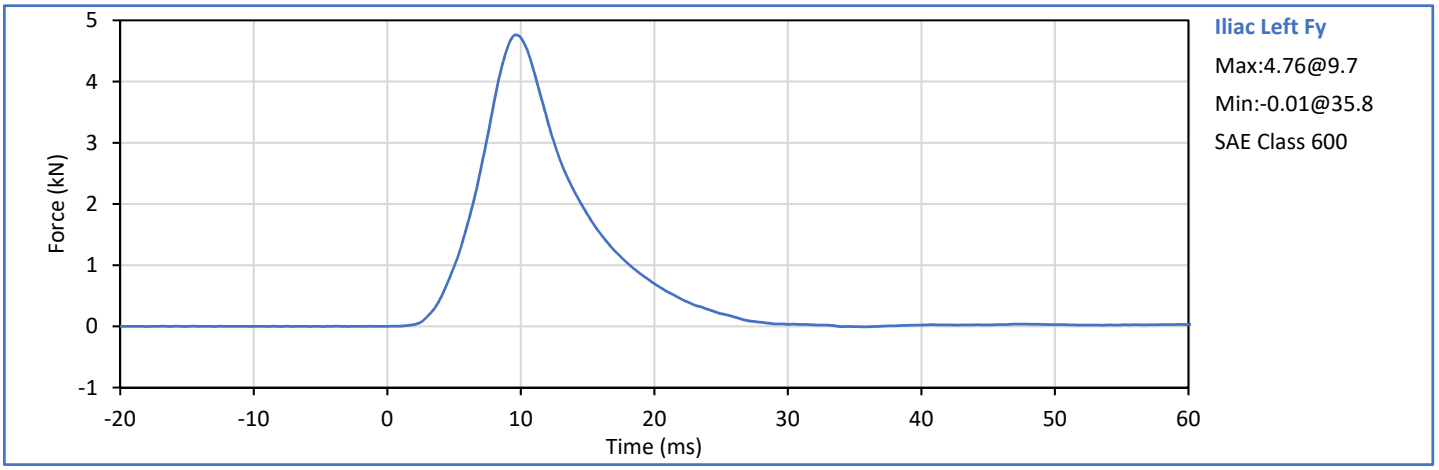
ATD Serial No.: 308 Test Date: 2019-05-03

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.32 | Pass |
| Peak Iliac Fy | kN | 4.10 | 5.10 | 4.76 | Pass |
| Pelvis Ay after 6ms | g | 28.0 | 39.0 | 31.7 | Pass |
| Peak Impactor Ax | g | 36.0 | 45.0 | 42.3 | Pass |
| | | | Overall Test Results | | Pass |

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified




Technician: J. Hernandez

Approved By: P. Puzzuto

**APPENDIX C**
**Post-Test ATD Configuration And Performance Verification Data**
**ES-2re 50th Male Side Impact ATD**
**S/N: F035**

Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## External Measurements

ATD Serial No.: F035 Test Date: 2019-05-24

| Tested Parameter | Units | Spec Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.4 | Pass |
| Laboratory Relative Humidity | % | 10 | 70 | 30 | Pass |
| 1 - Sitting Height | mm | 900 | 918 | 904 | Pass |
| 2 - Seat to Shoulder Joint | mm | 558 | 572 | 564 | Pass |
| 3 - Seat to Lower Face of Thoracic Spine Box | mm | 346 | 356 | 350 | Pass |
| 4 - Seat to Hip Joint (bolt center) | mm | 97 | 103 | 100 | Pass |
| 5 - Sole to Seat, Sitting | mm | 433 | 451 | 441 | Pass |
| 6 - Head Width | mm | 152 | 158 | 155 | Pass |
| 7 - Shoulder/Arm Width | mm | 461 | 479 | 471 | Pass |
| 8 - Thorax Width | mm | 322 | 332 | 327 | Pass |
| 9 - Abdomen Width | mm | 273 | 287 | 278 | Pass |
| 10 - Pelvis Lap Width | mm | 359 | 373 | 368 | Pass |
| 11 - Head Depth | mm | 196 | 206 | 200 | Pass |
| 12 - Thorax Depth | mm | 262 | 272 | 268 | Pass |
| 13 - Abdomen Depth | mm | 194 | 204 | 201 | Pass |
| 14 - Pelvis Depth | mm | 235 | 245 | 243 | Pass |
| 15 - Back of Buttocks to Hip Joint (bolt Center) | mm | 150 | 160 | 157 | Pass |
| 16 - Back of Buttocks to Front Knee | mm | 597 | 615 | 611 | Pass |
| | | | Overall Test Results | | Pass |

Technician: J. Hernandez

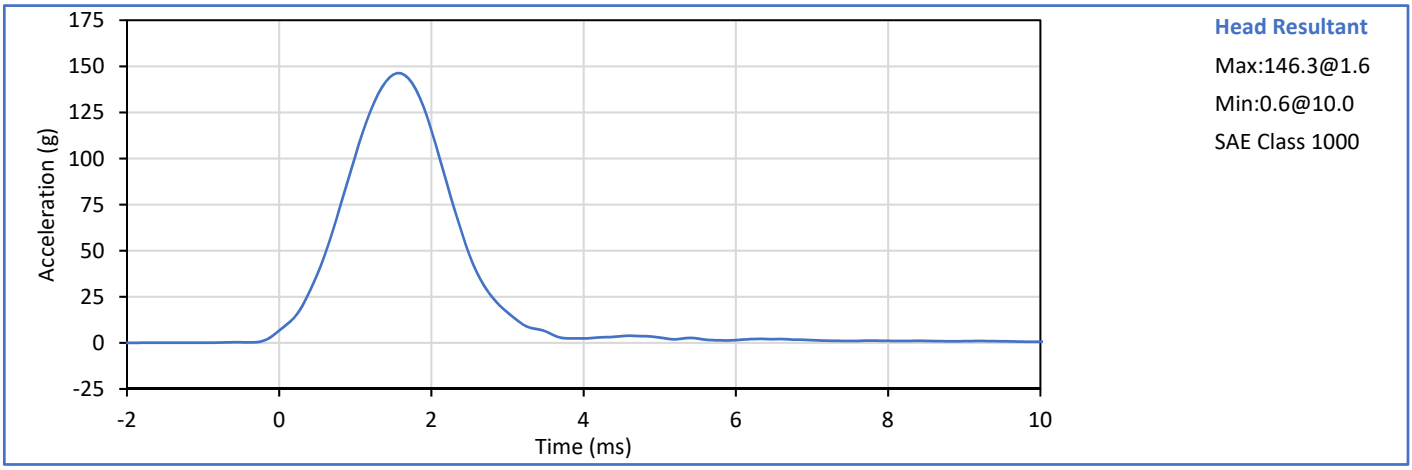
Approved By: P. Puzzuto

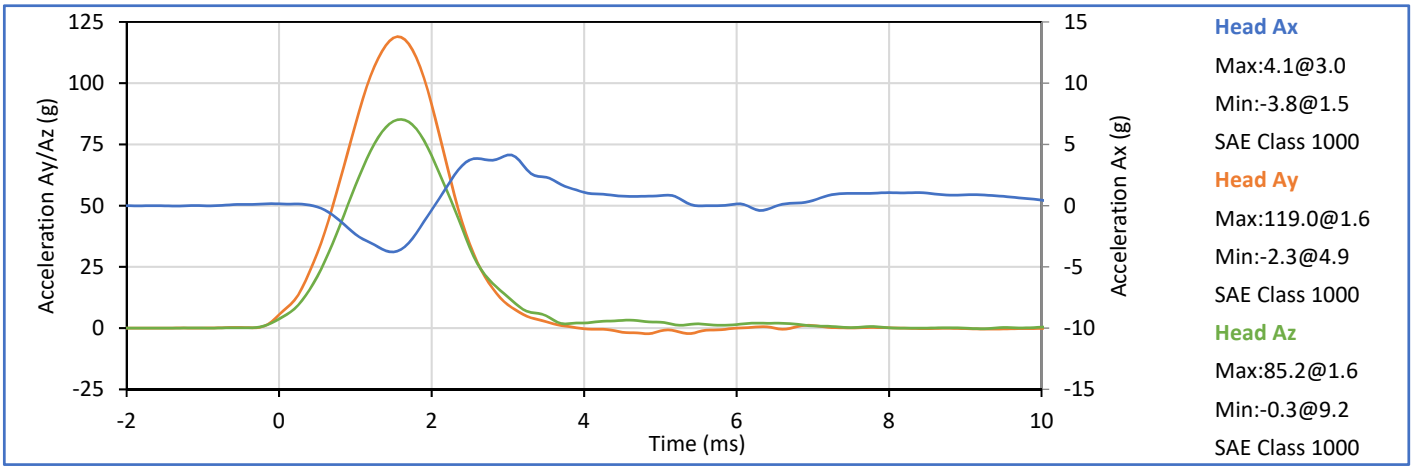
Applus IDIADA KARCO

# ES-2re 50th Male Side Impact ATD
## Head Drop

ATD Serial No.: F035 Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 18.9 | 25.6 | 21.4 | Pass |
| Laboratory Humidity | % | 10 | 70 | 35 | Pass |
| Peak Resultant Acceleration | g | 125.0 | 155.0 | 146.3 | Pass |
| Peak Head Ax | g | -15.0 | 15.0 | 4.1 | Pass |
| Oscillations After Main Pulse | % | 0.0 | 15.0 | 1.5 | Pass |
| Is Acceleration Unimodal? | Yes/No | Yes | | Yes | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

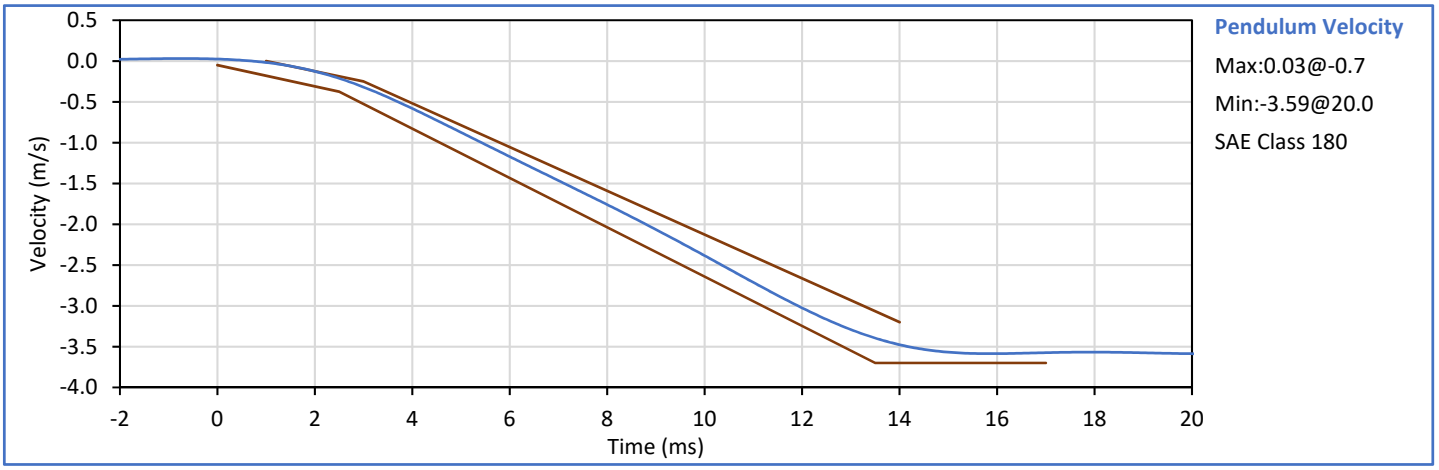
Approved By: P. Puzzuto

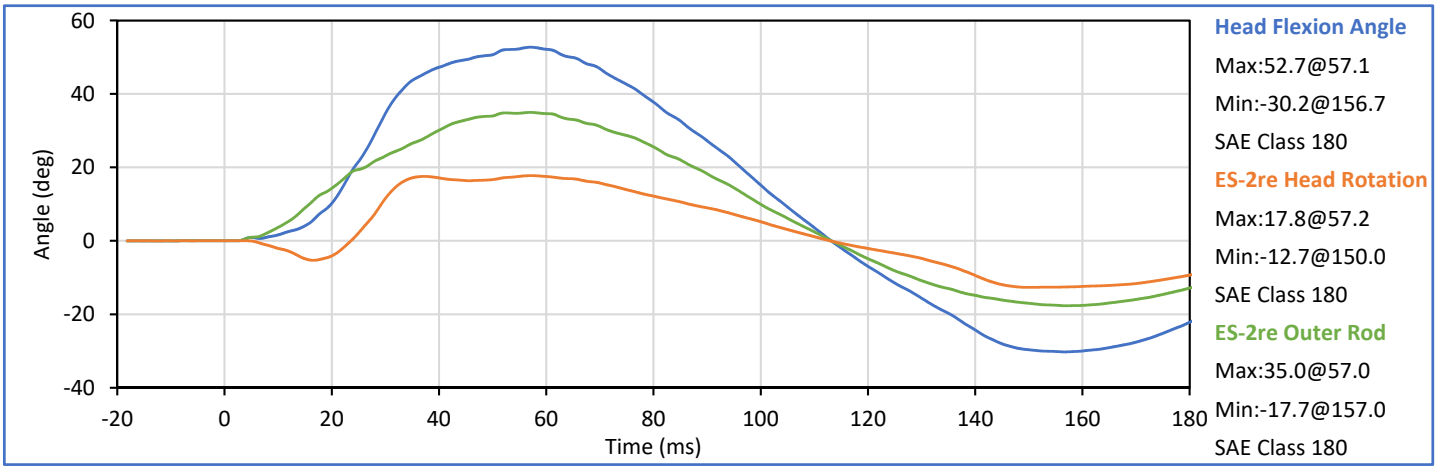
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Neck Flexion

ATD Serial No.: F035 Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 25 | Pass |
| Pendulum Velocity | m/s | 3.30 | 3.50 | 3.48 | Pass |
| Peak Headform Flexion | deg | 49.0 | 59.0 | 52.7 | Pass |
| Time of Peak Headform Flexion | ms | 54.0 | 66.0 | 57.1 | Pass |
| Flexion Decay (Peak to zero) | ms | 53.0 | 88.0 | 56.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

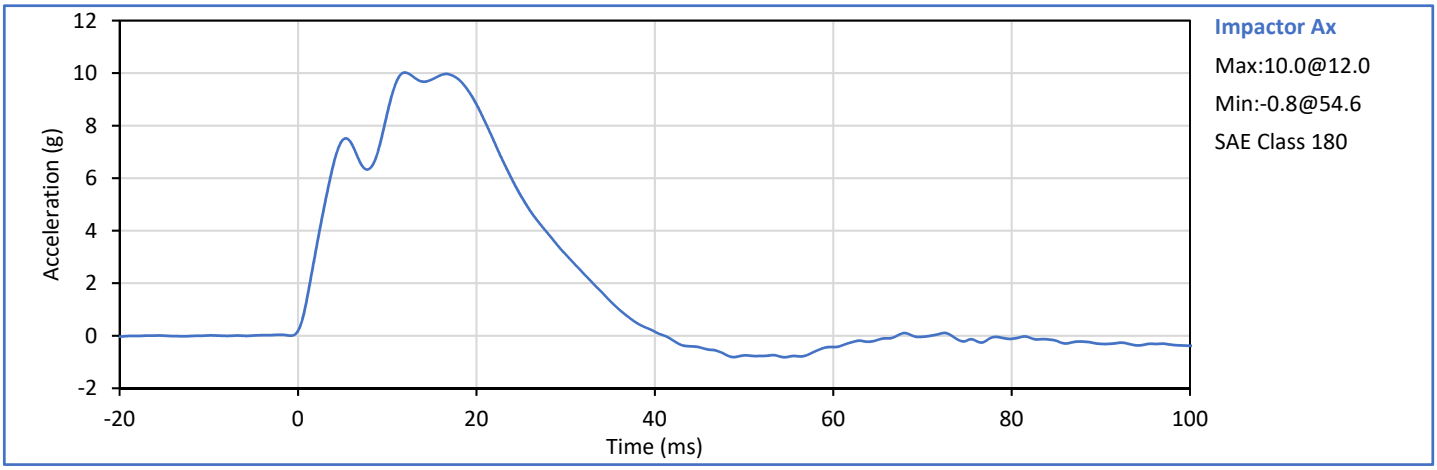
Applus IDIADA
KARCO

**ES-2re 50th Male Side Impact ATD**
**Shoulder Impact Test**

ATD Serial No.: F035

Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 33 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.37 | Pass |
| Peak Impactor Ax | g | 7.5 | 10.5 | 10.0 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

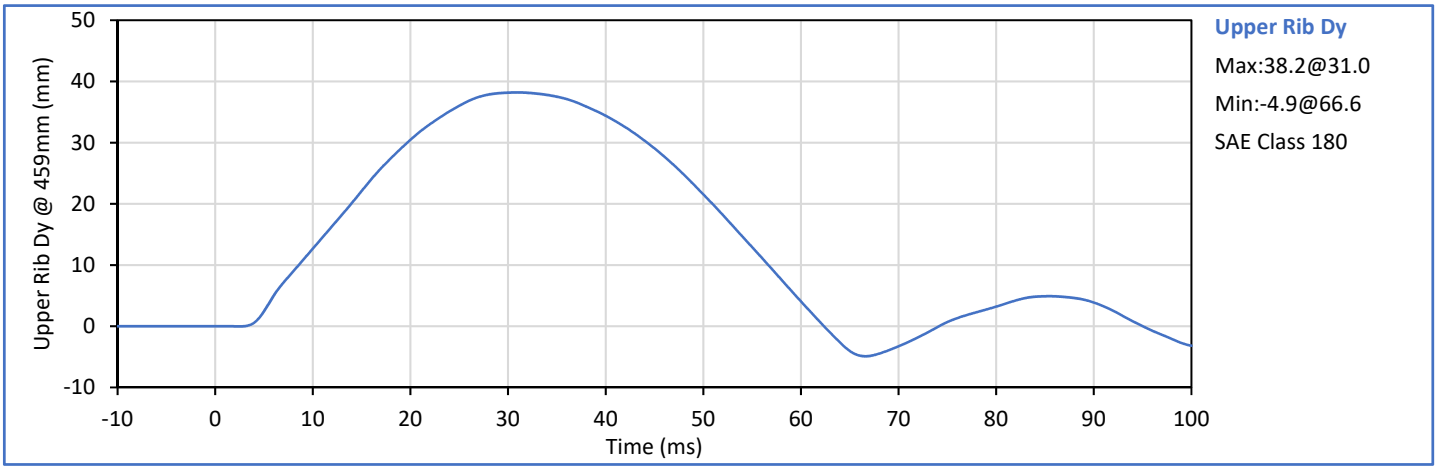
Applus IDIADA
KARCO

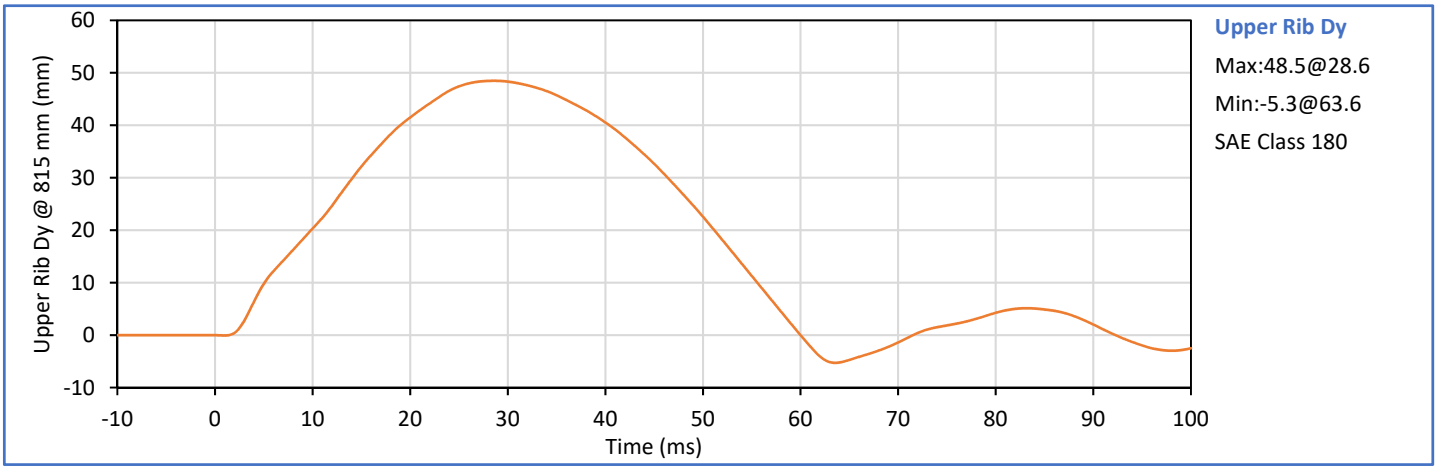
## ES-2re 50th Male Side Impact ATD
## Upper Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 24 | Pass |
| Upper Rib Dy @ 459mm | mm | 36.0 | 40.0 | 38.2 | Pass |
| Upper Rib Dy @ 815mm | mm | 46.0 | 51.0 | 48.5 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

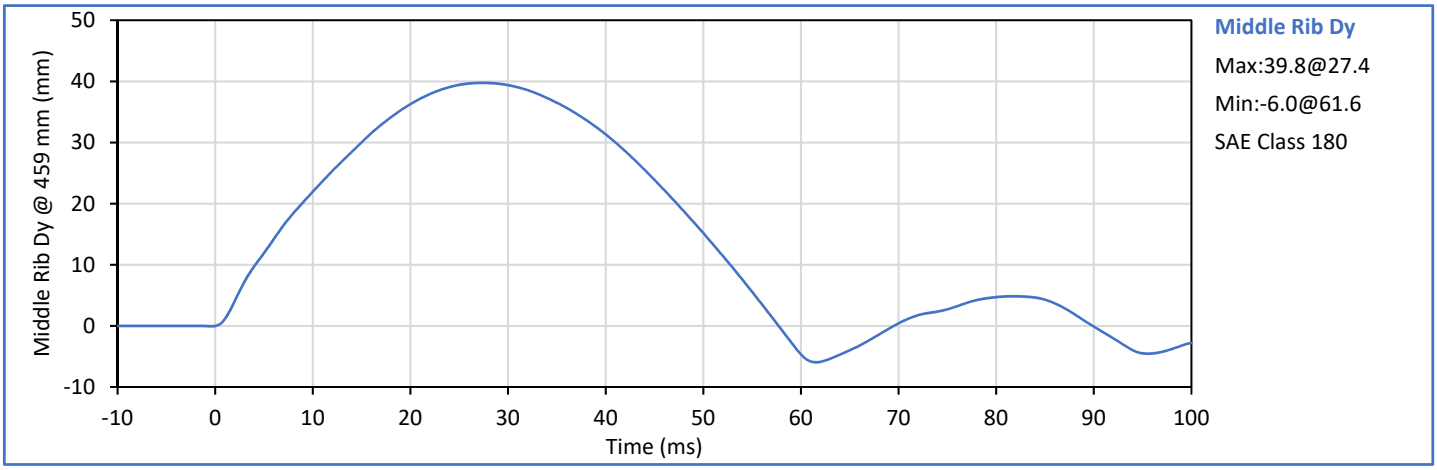
Approved By: P. Puzzuto

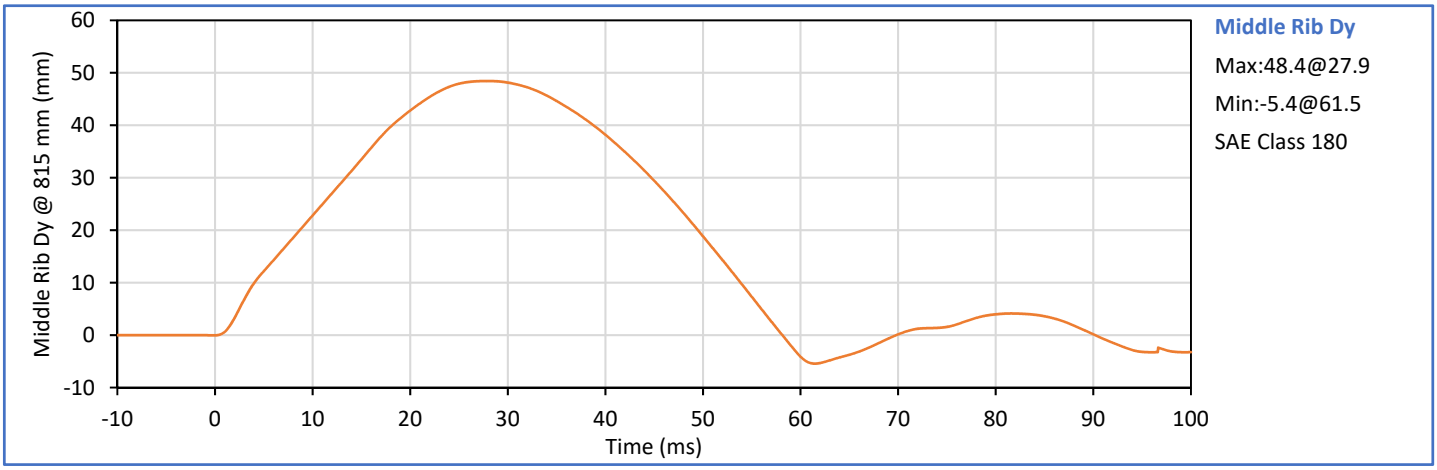
Applus IDIADA KARCO

**ES-2re 50th Male Side Impact ATD**
**Middle Rib Drop Test**

ATD Serial No.: F035 Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 24 | Pass |
| Middle Rib Dy @ 459mm | mm | 36.0 | 40.0 | 39.8 | Pass |
| Middle Rib Dy @ 815mm | mm | 46.0 | 51.0 | 48.4 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

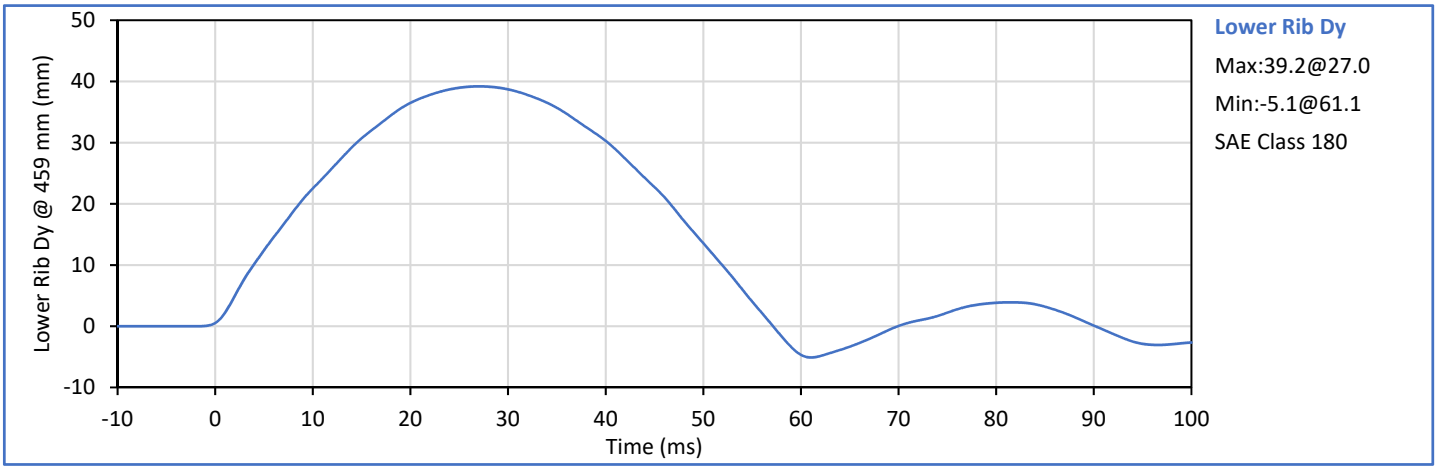
Applus IDIADA KARCO

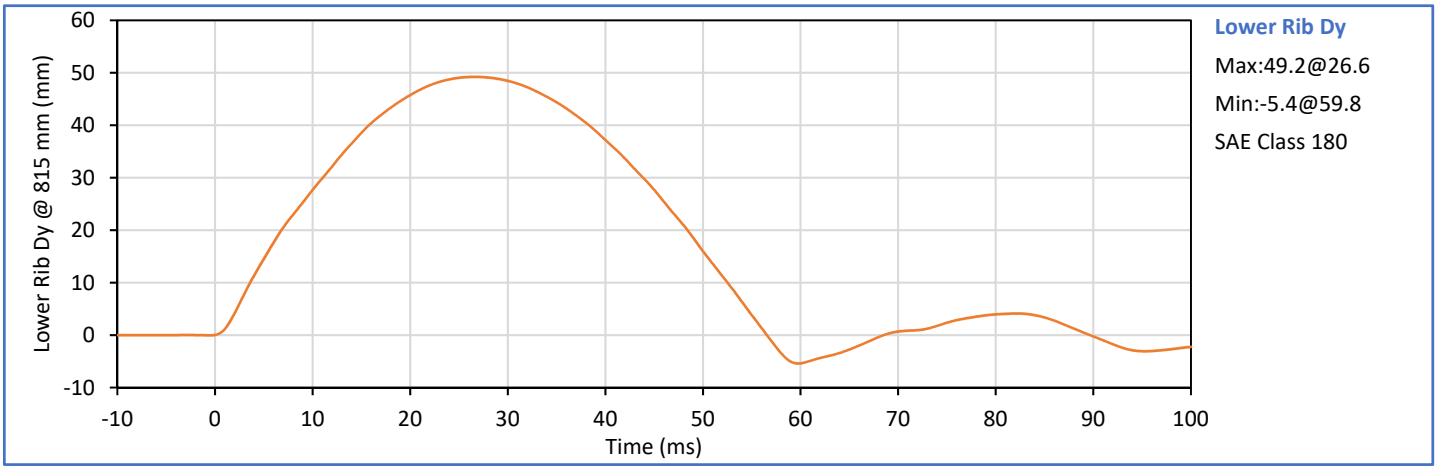
## ES-2re 50th Male Side Impact ATD
## Lower Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 24 | Pass |
| Lower Rib Dy @ 459mm | mm | 36.0 | 40.0 | 39.2 | Pass |
| Lower Rib Dy @ 815mm | mm | 46.0 | 51.0 | 49.2 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

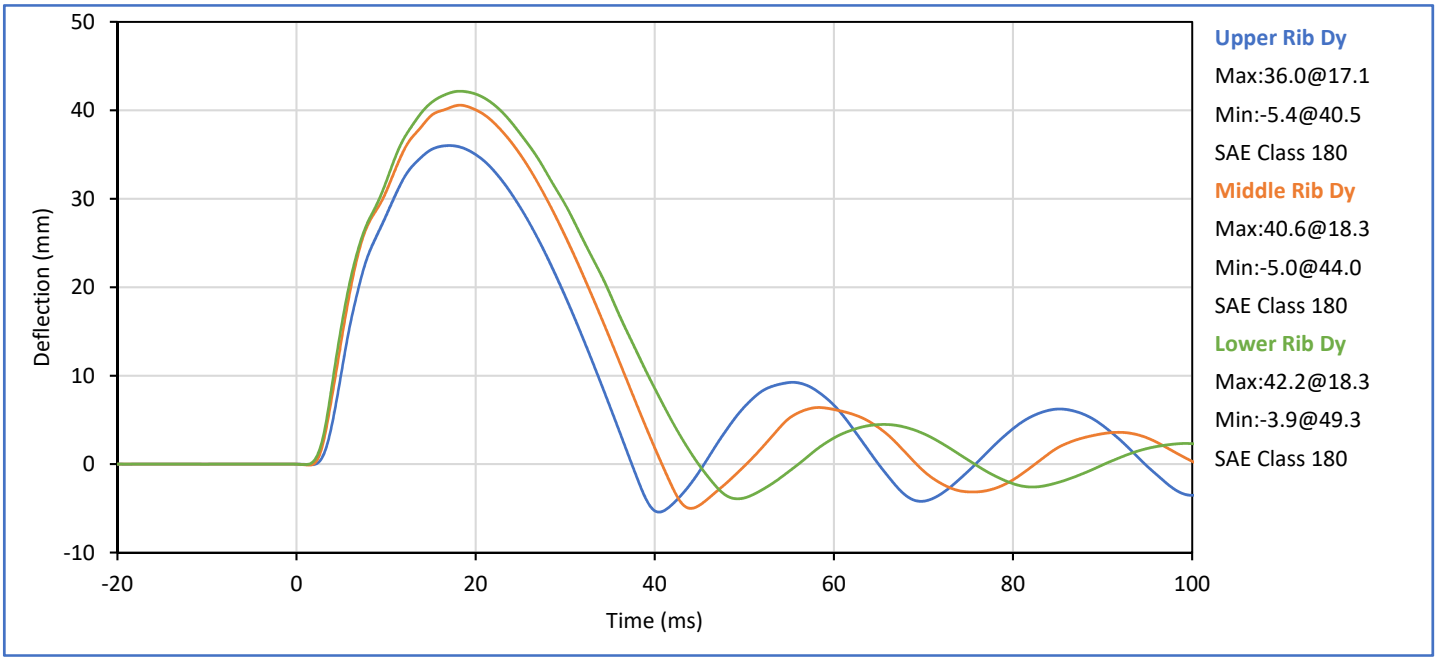
Approved By: P. Puzzuto

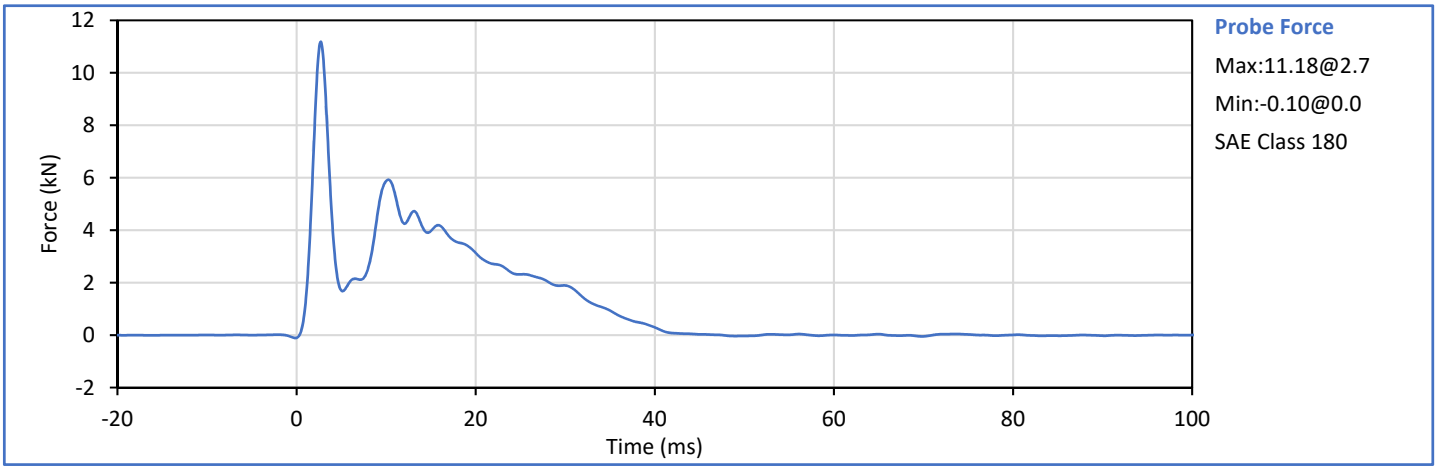
Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## Thorax Impact (Full Body)

ATD Serial No.: F035 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 5.40 | 5.60 | 5.41 | Pass |
| Peak Upper Rib Dy | mm | 34.0 | 41.0 | 36.0 | Pass |
| Peak Middle Rib Dy | mm | 37.0 | 45.0 | 40.6 | Pass |
| Peak Lower Rib Dy | mm | 37.0 | 44.0 | 42.2 | Pass |
| Peak Impactor Force After 6 ms | kN | 5.10 | 6.20 | 5.92 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

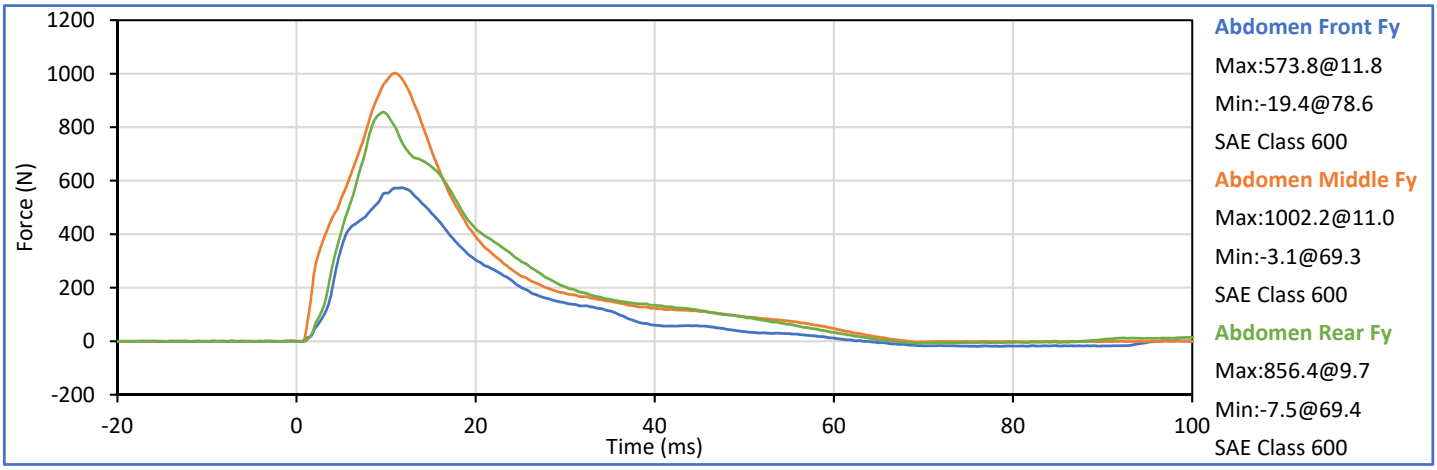
Approved By: P. Puzzuto

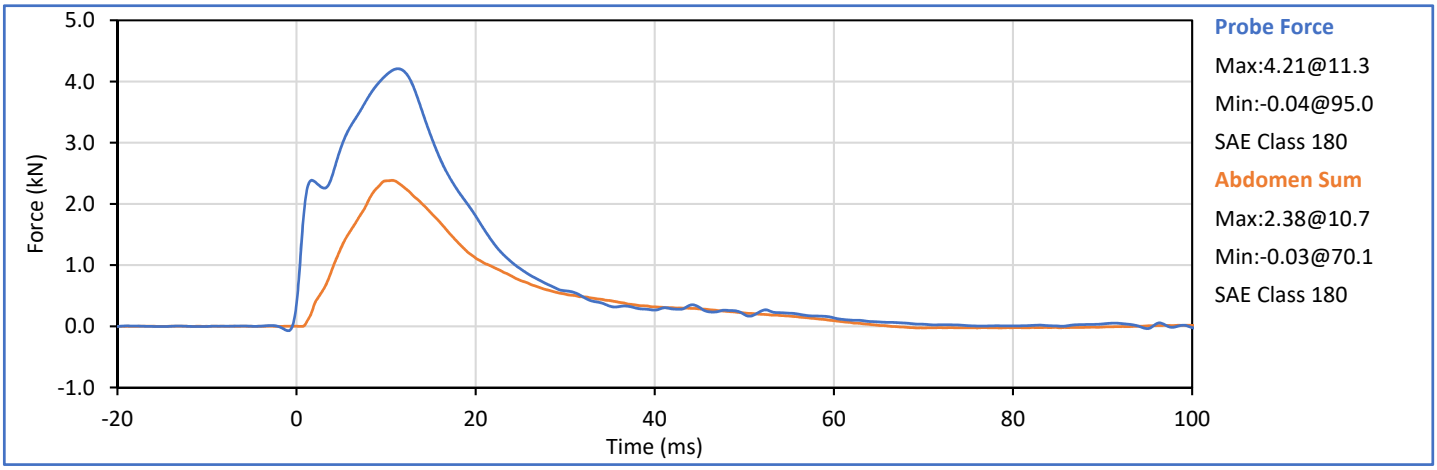
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Abdomen Impact

ATD Serial No.: F035 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 33 | Pass |
| Impactor Velocity | m/s | 3.90 | 4.10 | 4.02 | Pass |
| Peak Impactor Force | kN | 4.00 | 4.80 | 4.21 | Pass |
| Time of Peak Impactor Force | ms | 10.6 | 13.0 | 11.3 | Pass |
| Sum of Abdomen Forces | kN | 2.20 | 2.70 | 2.38 | Pass |
| Time of Peak Sum Abdomen Force | ms | 10.0 | 12.3 | 10.7 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

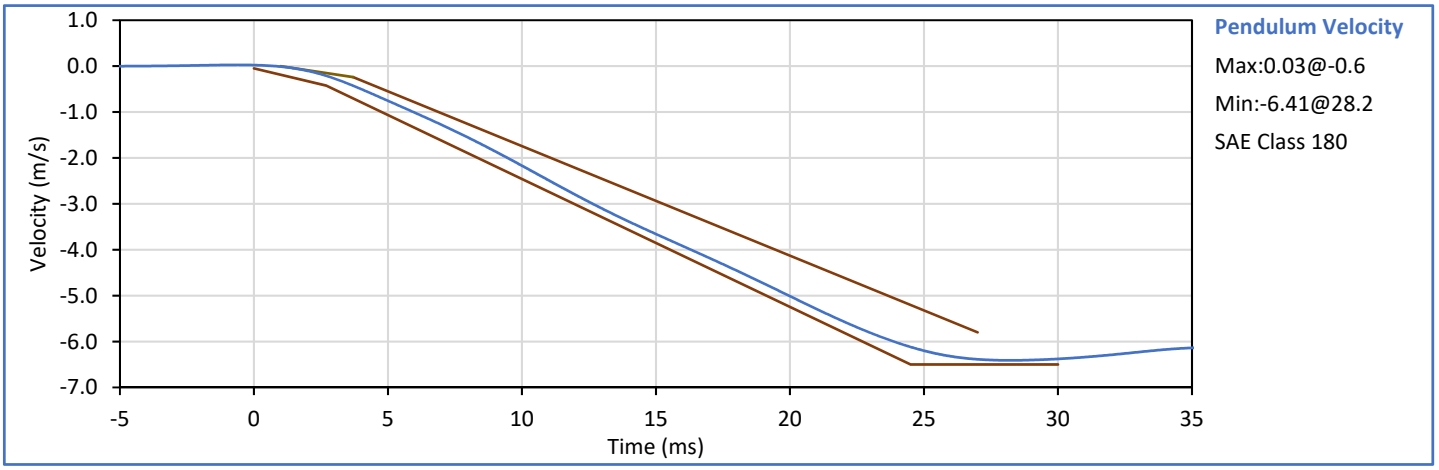
Approved By: P. Puzzuto

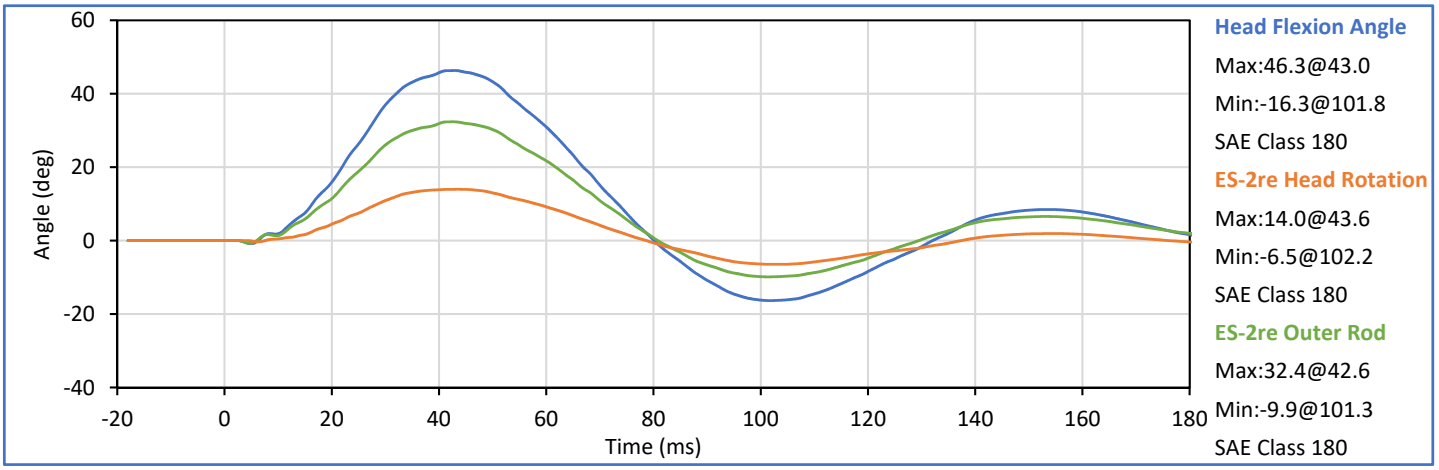
Applus IDIADA
KARCO

# ES-2re 50th Male Side Impact ATD
## Lumbar Spine Flexion

ATD Serial No.: F035 Test Date: 2019-05-28

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 35 | Pass |
| Pendulum Velocity | m/s | 5.95 | 6.15 | 6.08 | Pass |
| Peak Headform Flexion | deg | 45.0 | 55.0 | 46.3 | Pass |
| Time of Peak Headform Flexion | ms | 39.0 | 53.0 | 43.0 | Pass |
| Flexion Decay (Peak to zero) | ms | 37.0 | 57.0 | 37.2 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

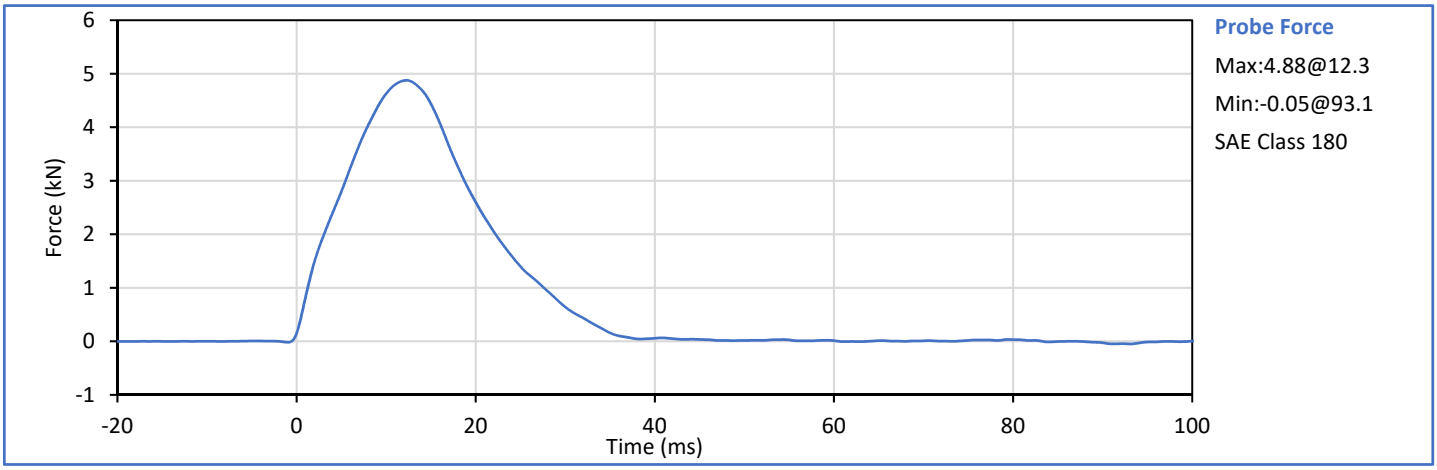
Approved By: P. Puzzuto

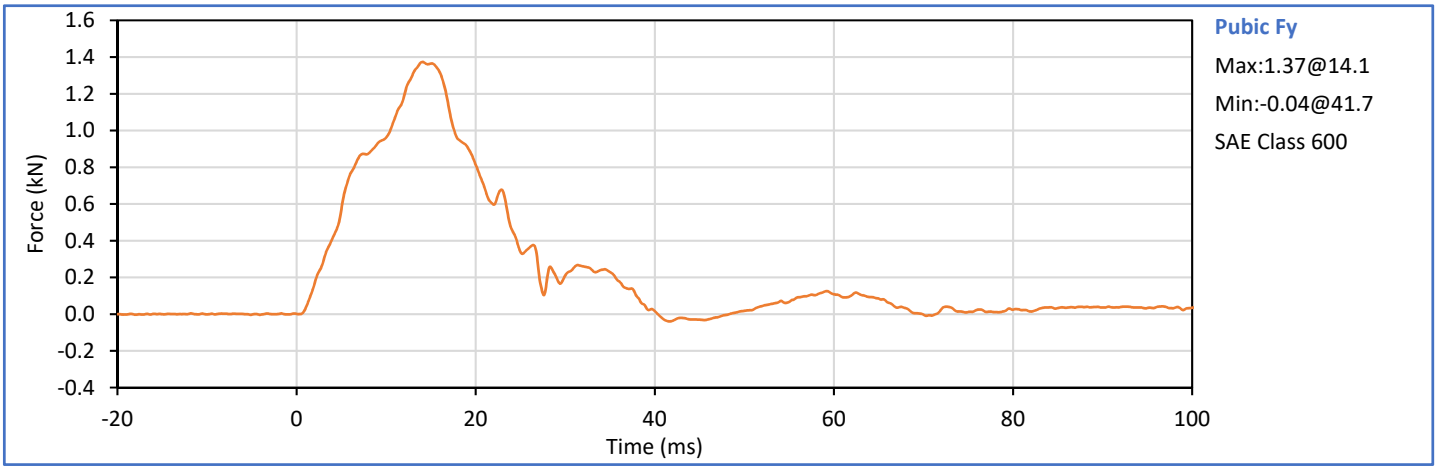
Applus IDIADA
KARCO

## ES-2re 50th Male Side Impact ATD
## Pelvis Impact

ATD Serial No.: F035 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.31 | Pass |
| Peak Impactor Force | kN | 4.70 | 5.40 | 4.88 | Pass |
| Time of Peak Impactor Force | ms | 11.8 | 16.1 | 12.3 | Pass |
| Pubic Symphysis Fy | kN | 1.23 | 1.59 | 1.37 | Pass |
| Time of Peak Pubic Symphysis Fy | ms | 12.2 | 17.0 | 14.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

**APPENDIX C**
**Post-Test ATD Configuration And Performance Verification Data**
**SID-IIs Small Side Impact ATD**
**S/N: 308**

Applus IDIADA
KARCO

## SID-IIs Small Side Impact ATD
## External Measurements

ATD Serial No.: 308 Test Date: 2019-05-23

| Tested Parameter | Units | Spec Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Relative Humidity | % | 10 | 70 | 33 | Pass |
| A - Sitting Height | mm | 772 | 788 | 778 | Pass |
| B - Shoulder Pivot Height | mm | 437 | 453 | 450 | Pass |
| C - Hpoint Height | mm | 79 | 89 | 85 | Pass |
| D - H Point From Seatback | mm | 141 | 151 | 147 | Pass |
| E - Shoulder Pivot From Backline | mm | 97 | 107 | 104 | Pass |
| F - Thigh Clearance | mm | 119 | 135 | 127 | Pass |
| G - Head Breadth | mm | 140 | 148 | 142 | Pass |
| H - Head Back From Backline | mm | 40 | 46 | 42 | Pass |
| I - Head Depth | mm | 178 | 188 | 183 | Pass |
| J - Head Circumference | mm | 541 | 551 | 547 | Pass |
| K - Buttock To Knee Length | mm | 514 | 540 | 520 | Pass |
| L - Popliteal Height | mm | 343 | 369 | 350 | Pass |
| K - Knee Pivot To Floor Height | mm | 392 | 409 | 399 | Pass |
| N - Buttock Popliteal Length | mm | 416 | 442 | 430 | Pass |
| O - Chest Depth W/O Jacket | mm | 195 | 211 | 202 | Pass |
| P - Foot Length | mm | 216 | 232 | 227 | Pass |
| Q - Hip Breadth (W/Pelvic Plugs) | mm | 313 | 323 | 316 | Pass |
| R - Arm Length | mm | 249 | 259 | 255 | Pass |
| S - Knee Joint To Seatback | mm | 477 | 493 | 484 | Pass |
| V - Shoulder Width | mm | 341 | 357 | 347 | Pass |
| W - Foot Width | mm | 78 | 94 | 84 | Pass |
| Y - Chest Circumference W/Jacket | mm | 851 | 881 | 867 | Pass |
| Z - Waist Circumference | mm | 761 | 791 | 784 | Pass |
| | | | Overall Test Results | | Pass |

Technician: J. Hernandez

Approved By: P. Puzzuto

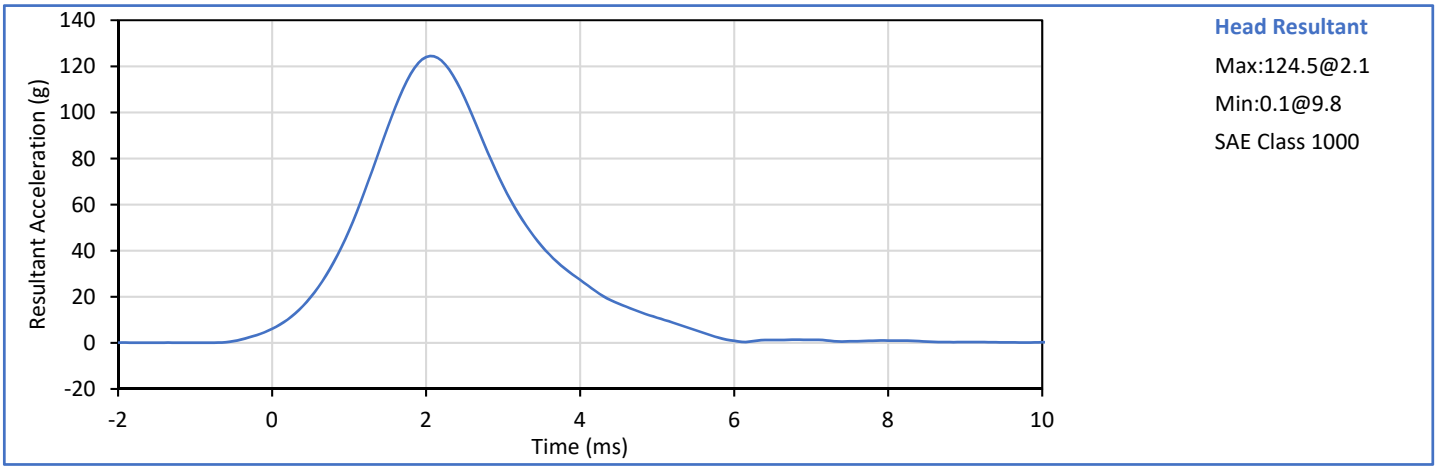
Applus IDIADA
KARCO

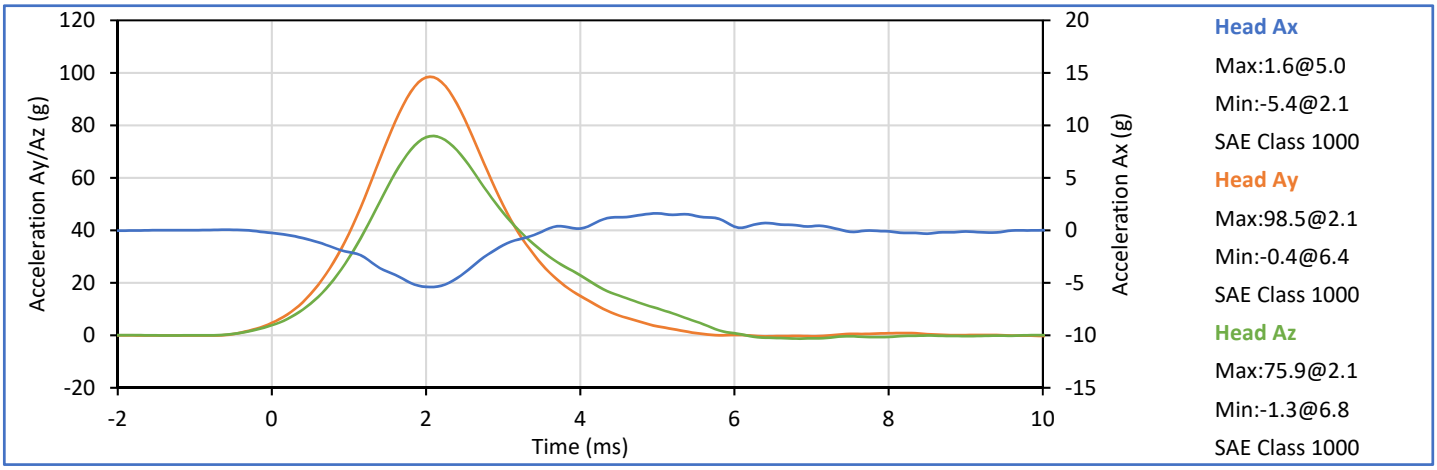
**SID-IIs Small Side Impact ATD**
**Head Drop**

ATD Serial No.: 308

Test Date: 2019-05-23

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 18.9 | 25.6 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 40 | Pass |
| Peak Resultant Acceleration | g | 115.0 | 137.0 | 124.5 | Pass |
| Peak Head Ax | g | -15.0 | 15.0 | -5.4 | Pass |
| Oscillations After Main Pulse | % | 0.0 | 15.0 | 1.1 | Pass |
| Is Acceleration Unimodal? | Yes/No | Yes | | Yes | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

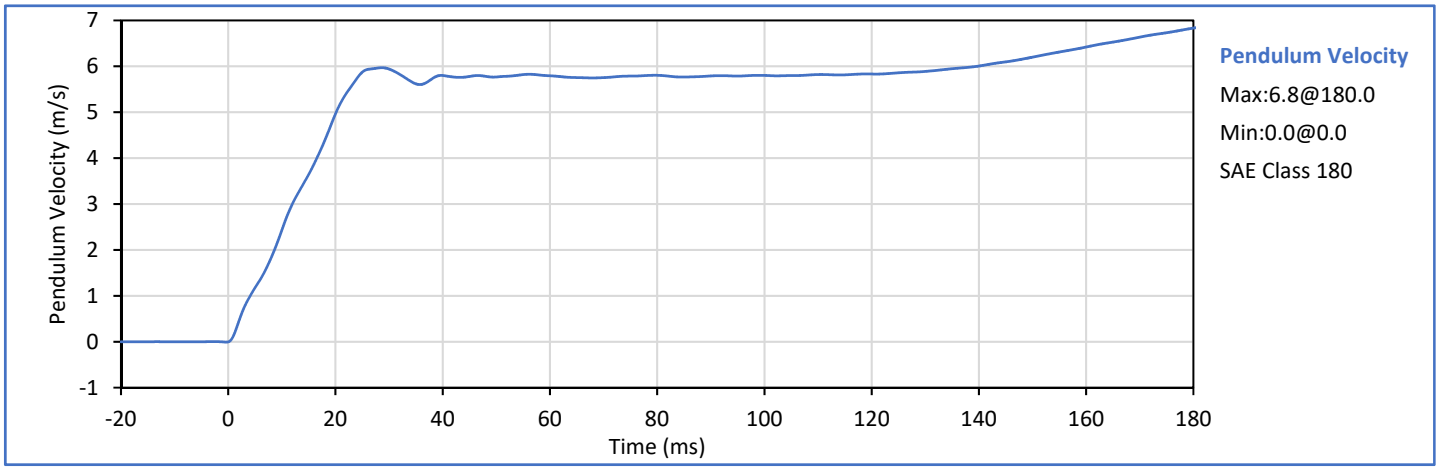
Approved By: P. Puzzuto

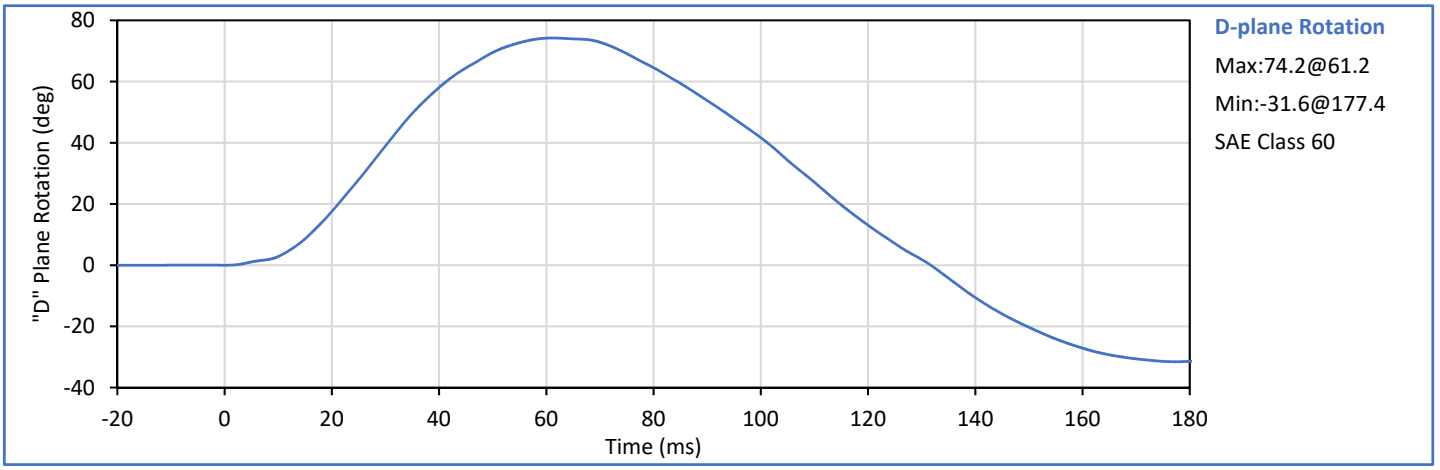
Applus IDIADA KARCO

## SID-IIs Small Side Impact ATD
## Neck Flexion

ATD Serial No.: 308 Test Date: 2019-05-23

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.4 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Pendulum Velocity | m/s | 5.51 | 5.63 | 5.53 | Pass |
| Pendulum Decel at 10 ms | m/s | 2.20 | 2.80 | 2.43 | Pass |
| Pendulum Decel at 15 ms | m/s | 3.30 | 4.10 | 3.64 | Pass |
| Pendulum Decel at 20 ms | m/s | 4.40 | 5.40 | 4.96 | Pass |
| Pendulum Decel at 25 ms | m/s | 5.40 | 6.10 | 5.87 | Pass |
| Pendulum Decel from 25-100 ms | m/s | 5.50 | 6.20 | 5.97 | Pass |
| Peak "D" Plane Rotation | deg | 71.0 | 81.0 | 74.2 | Pass |
| Time of Peak "D" Plane Rotation | ms | 50.0 | 70.0 | 61.2 | Pass |
| Peak Occ. Condyle Moment | Nm | -44.0 | -36.0 | -39.8 | Pass |
| Time of Moment Decay to 0 Nm | ms | 102.0 | 126.0 | 111.7 | Pass |
| | | | Overall Test Results | | Pass |



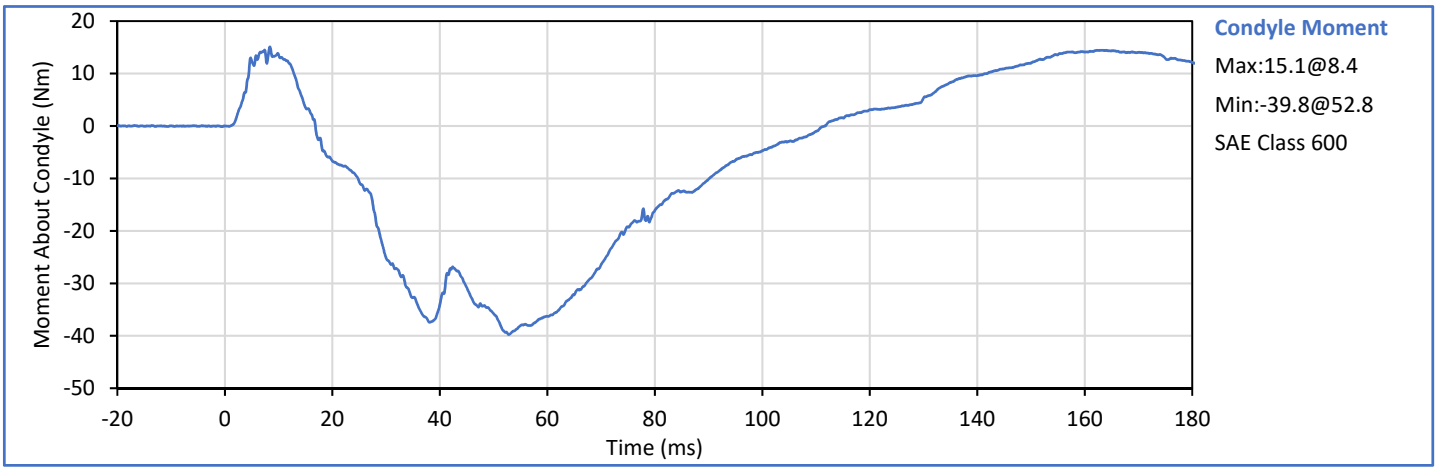



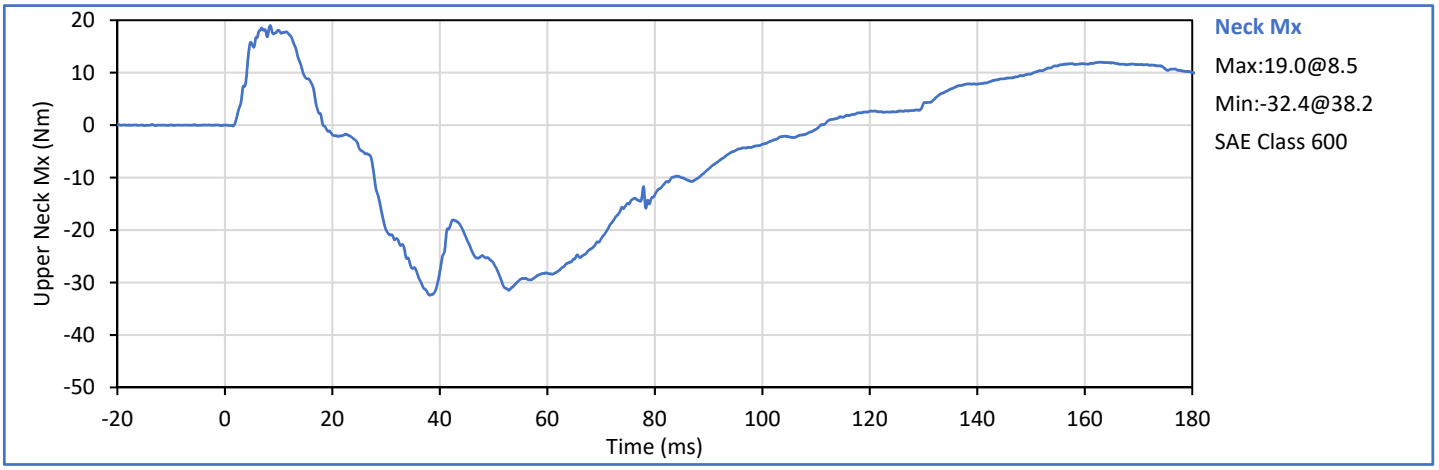

Technician: J. Hernandez

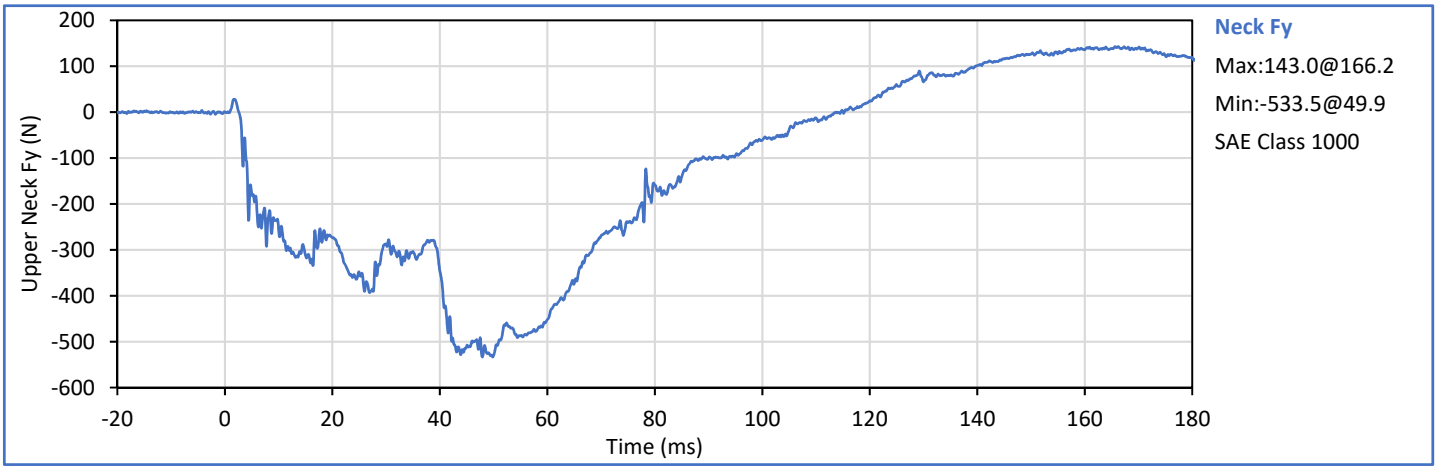
Approved By: P. Puzzuto

**SID-IIs Small Side Impact ATD**
**Neck Flexion**

ATD Serial No.: 308 Test Date: 2019-05-23



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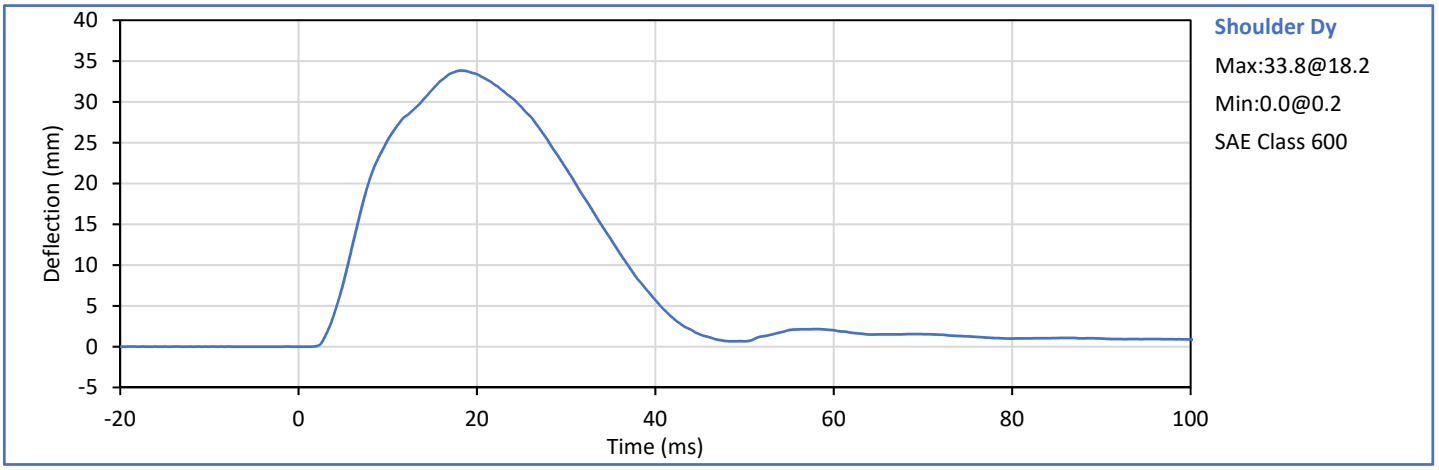
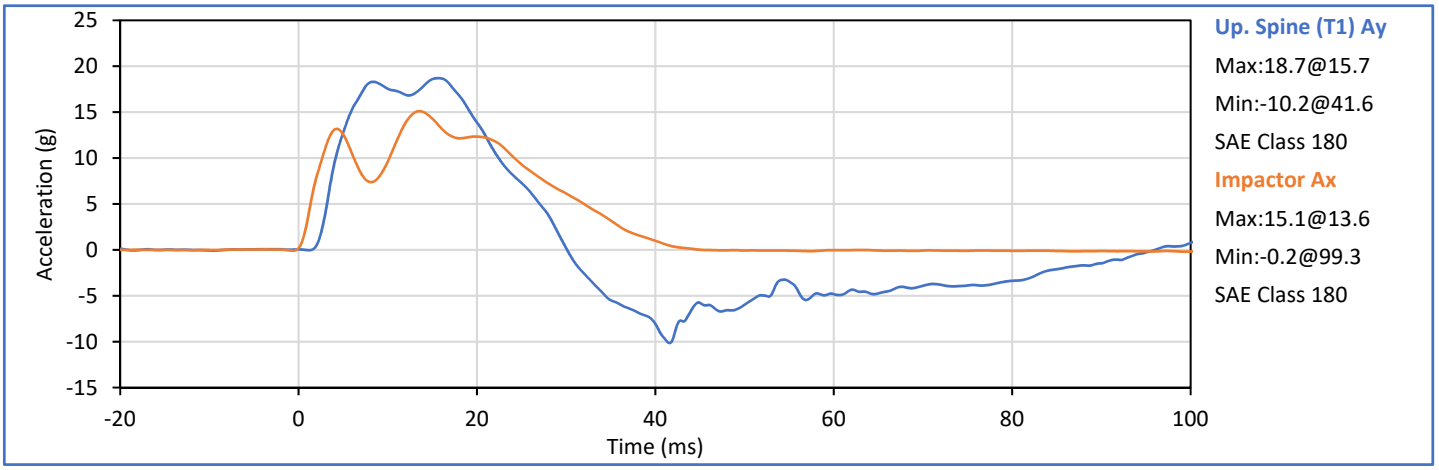
## SID-IIs Small Side Impact ATD
## Shoulder Impact Test

ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 33 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.32 | Pass |
| Peak Shoulder Dy | mm | 28.0 | 37.0 | 33.8 | Pass |
| Peak Upper Spine (T1) Ay | g | 17.0 | 22.0 | 18.7 | Pass |
| Peak Impactor Ax | g | 13.0 | 18.0 | 15.1 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

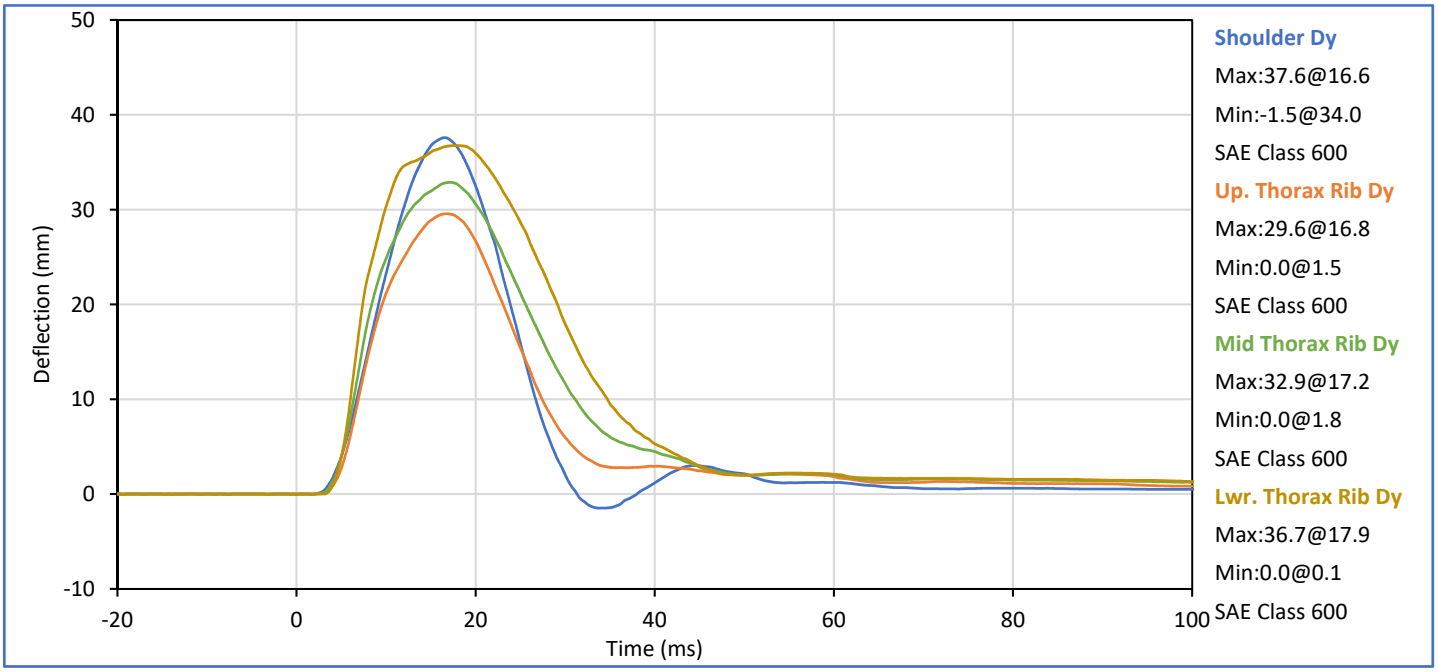
Approved By: P. Puzzuto

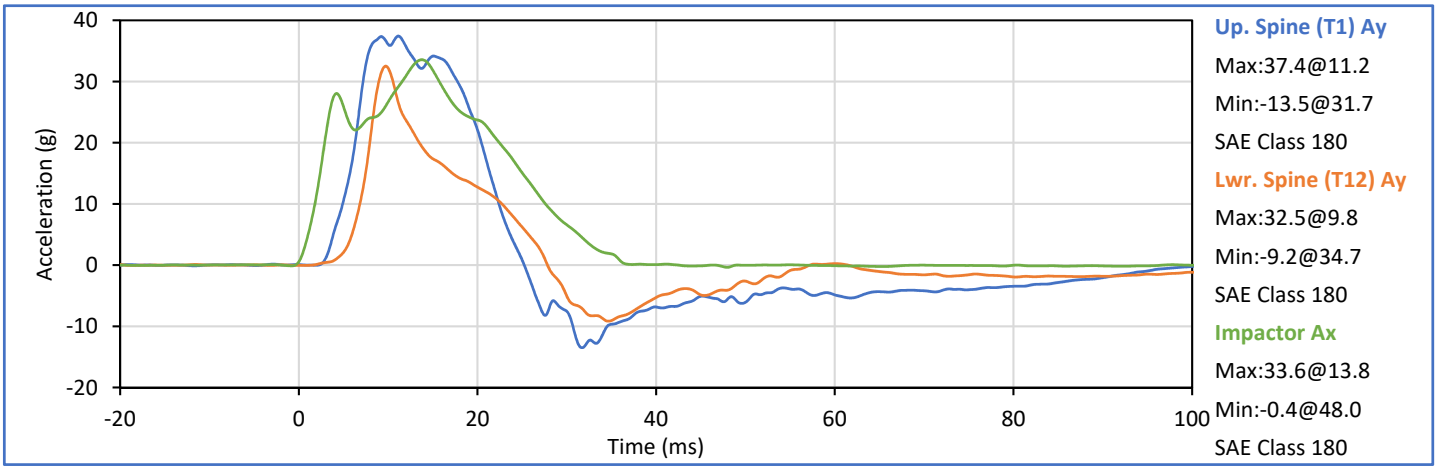
Applus IDIADA
KARCO

# SID-IIs Small Side Impact ATD
## Thorax (With Arm)

ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 6.60 | 6.80 | 6.67 | Pass |
| Peak Shoulder Dy | mm | 31.0 | 40.0 | 37.6 | Pass |
| Peak Upper Rib Dy | mm | 25.0 | 32.0 | 29.6 | Pass |
| Peak Middle Rib Dy | mm | 30.0 | 36.0 | 32.9 | Pass |
| Peak Lower Rib Dy | mm | 32.0 | 38.0 | 36.7 | Pass |
| Peak Upper Spine (T1) Ay | g | 34.0 | 43.0 | 37.4 | Pass |
| Peak Lower Spine (T12) Ay | g | 29.0 | 37.0 | 32.5 | Pass |
| Peak Impactor Ax | g | 30.0 | 36.0 | 33.6 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

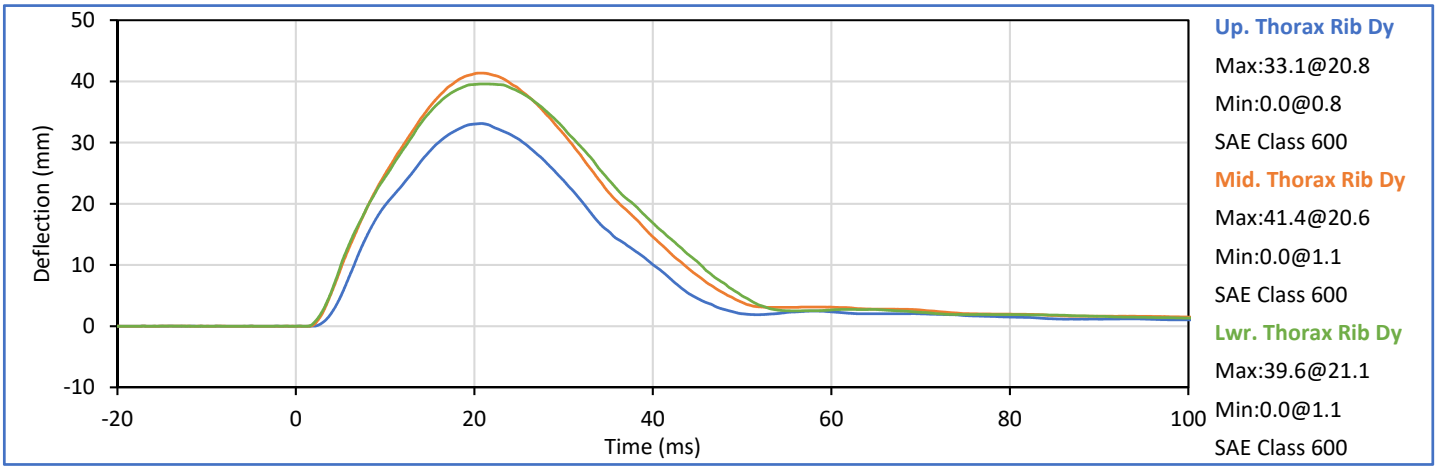
Approved By: P. Puzzuto

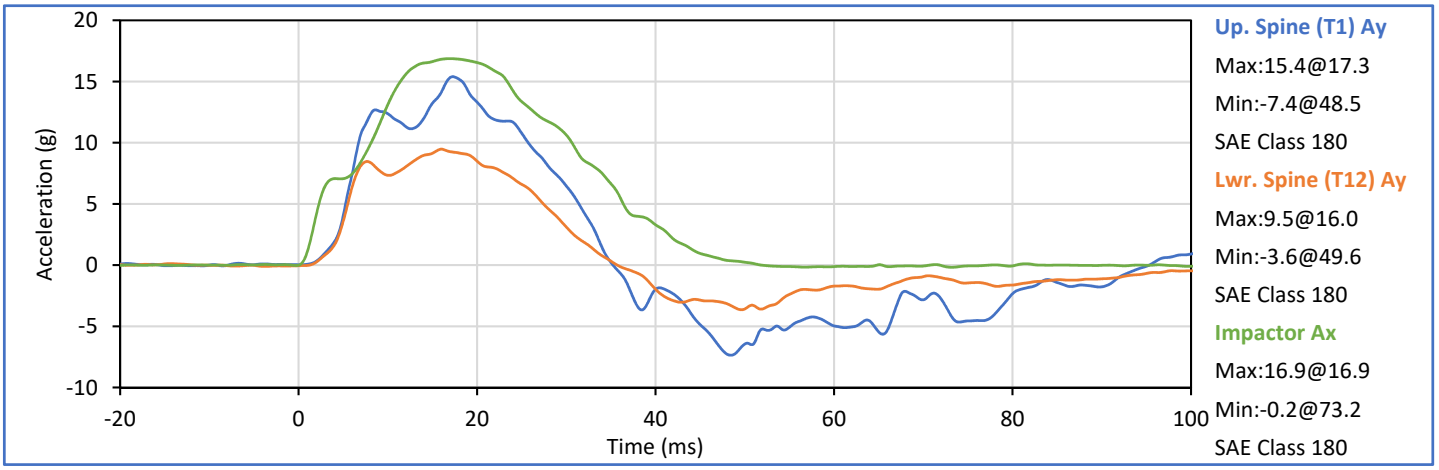
Applus IDIADA
KARCO

**SID-IIs Small Side Impact ATD**
**Thorax (No Arm)**

ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.28 | Pass |
| Peak Upper Rib Dy | mm | 32.0 | 40.0 | 33.1 | Pass |
| Peak Middle Rib Dy | mm | 39.0 | 45.0 | 41.4 | Pass |
| Peak Lower Rib Dy | mm | 35.0 | 43.0 | 39.6 | Pass |
| Peak Upper Spine (T1) Ay | g | 13.0 | 17.0 | 15.4 | Pass |
| Peak Lower Spine (T12) Ay | g | 7.0 | 11.0 | 9.5 | Pass |
| Peak Impactor Ax | g | 14.0 | 18.0 | 16.9 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

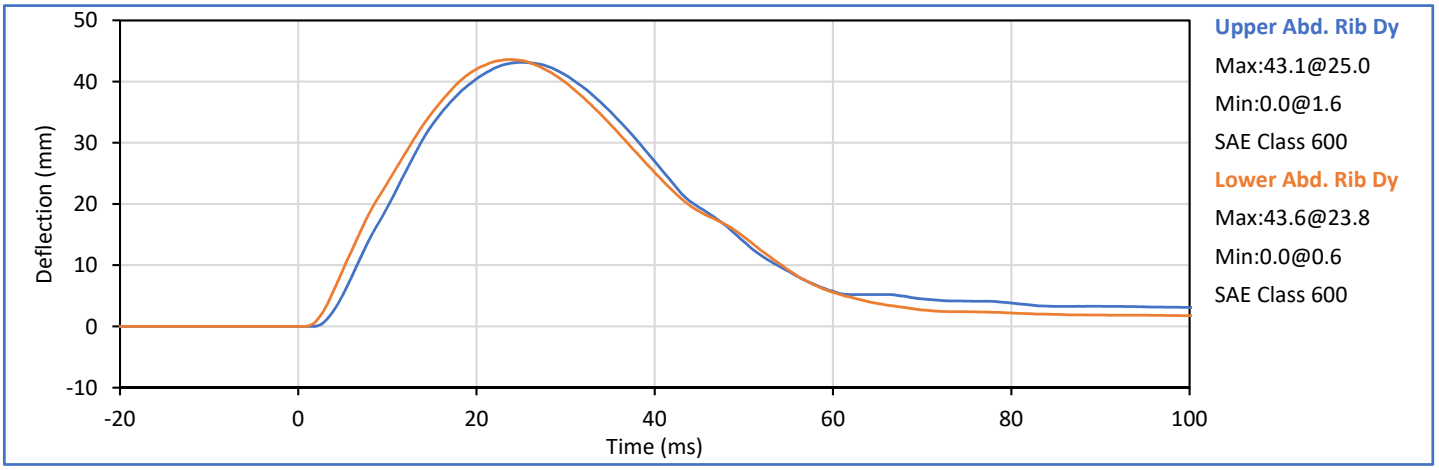
Approved By: P. Puzzuto

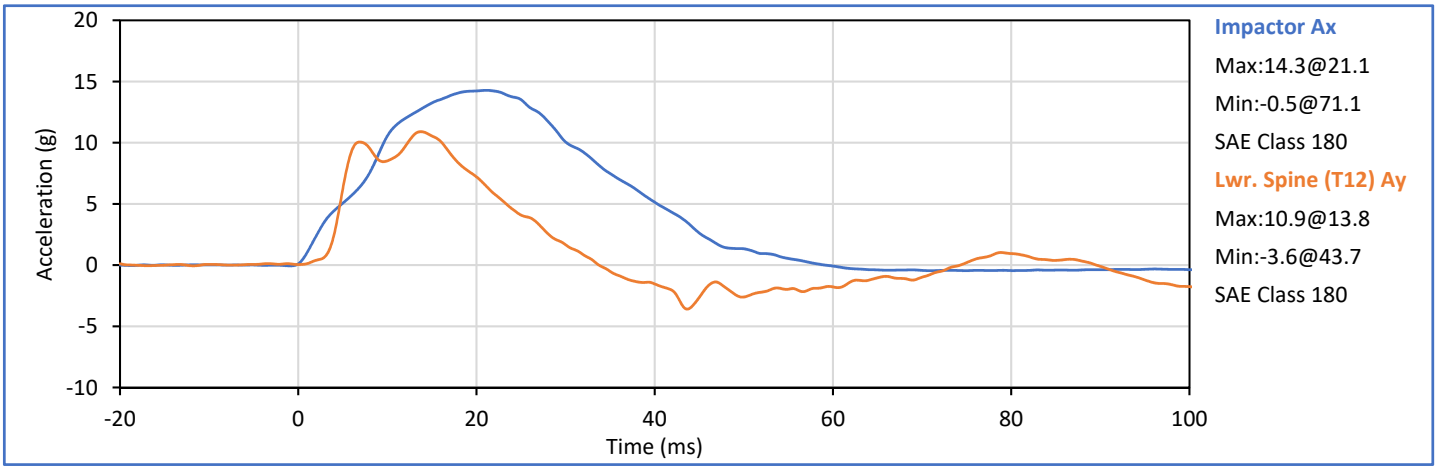
Applus IDIADA
KARCO

## SID-IIs Small Side Impact ATD
## Abdomen Impact

ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 33 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.38 | Pass |
| Peak Upper Abdomen Rib Dy | mm | 36.0 | 47.0 | 43.1 | Pass |
| Peak Lower Abdomen Rib Dy | mm | 33.0 | 44.0 | 43.6 | Pass |
| Peak Lower Spine T12 Ay | mm | 9.0 | 14.0 | 10.9 | Pass |
| Peak Impactor Ax | g | 12.0 | 16.0 | 14.3 | Pass |
| | | | Overall Test Results | | Pass |




Technician: J. Hernandez

Approved By: P. Puzzuto

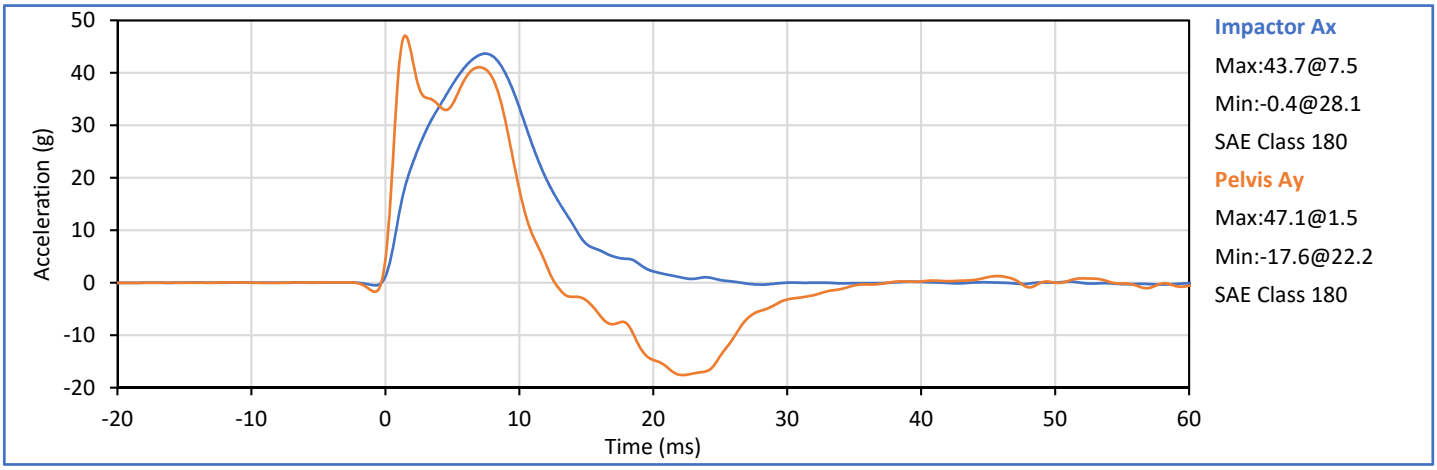
Applus IDIADA
KARCO

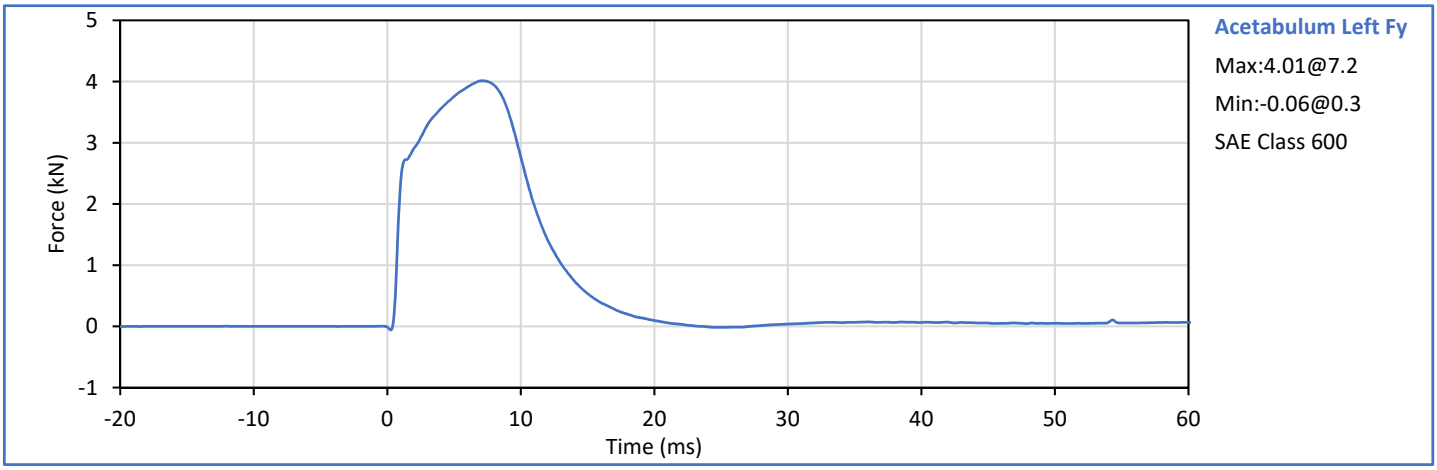
**SID-IIs Small Side Impact ATD**
**Pelvis Acetabulum Impact**

ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.2 | Pass |
| Laboratory Humidity | % | 10 | 70 | 42 | Pass |
| Impactor Velocity | m/s | 6.60 | 6.80 | 6.74 | Pass |
| Peak Acetabulum Fy | kN | 3.60 | 4.30 | 4.01 | Pass |
| Pelvis Ay after 6ms | g | 34.0 | 42.0 | 41.1 | Pass |
| Peak Impactor Ax | g | 38.0 | 47.0 | 43.7 | Pass |
| | | | Overall Test Results | | Pass |

Pelvis Plug S/N: 12027 (SACO)




Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: 308 Test Date: 2019-05-24

Pelvis Plug S/N: 12027 (SACO)

SACO RESEARCH

**SID-IIs Pelvis Plug Certification Test**

Plug S/N 12027
Test Number 6378
Report Number 6393
Test Date 2/26/2018 12:03:24 PM

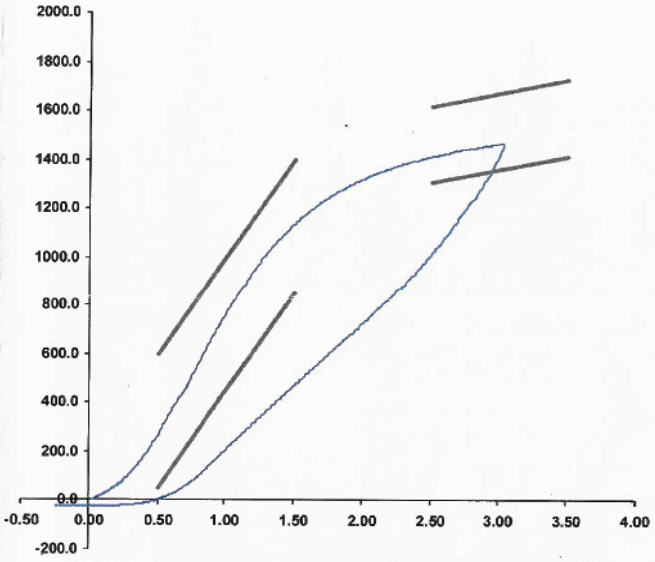
| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 264.98 | 50.00 | 600.00 |
| Force @ 1.5 mm (N) | 1,137.51 | 850.00 | 1,400.00 |
| Force @ 2.5 mm (N) | 1,411.83 | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,466.76 | 1,361.00 | 1,673.00 |

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 26-Feb-18
SACO Research

By : DC Date : 2/26/18

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

Applus IDIADA
KARCO

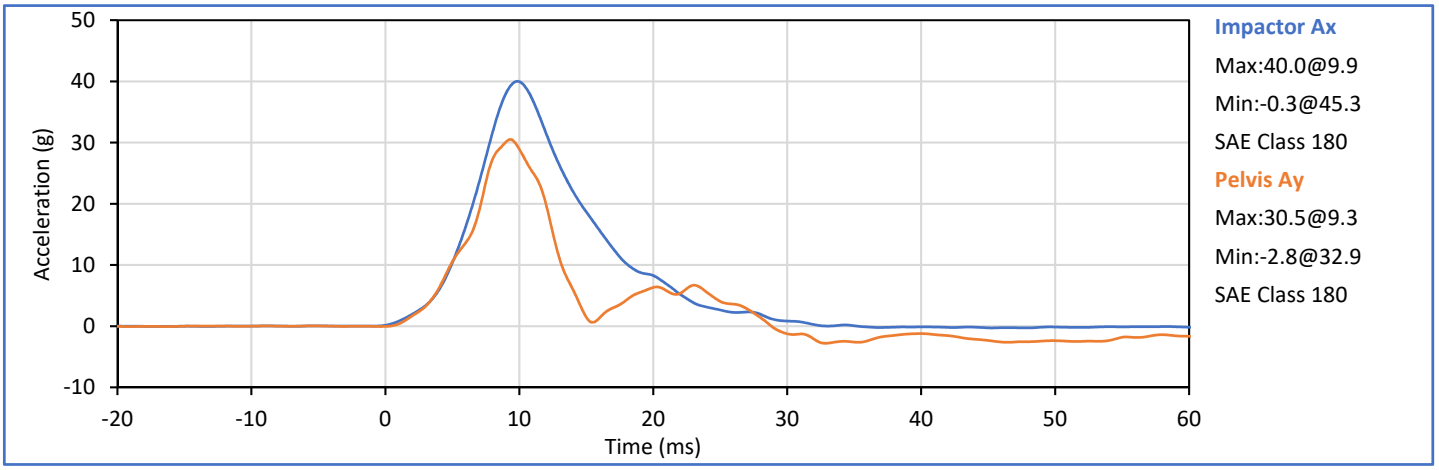
## SID-IIs Small Side Impact ATD
## Pelvis Iliac Impact

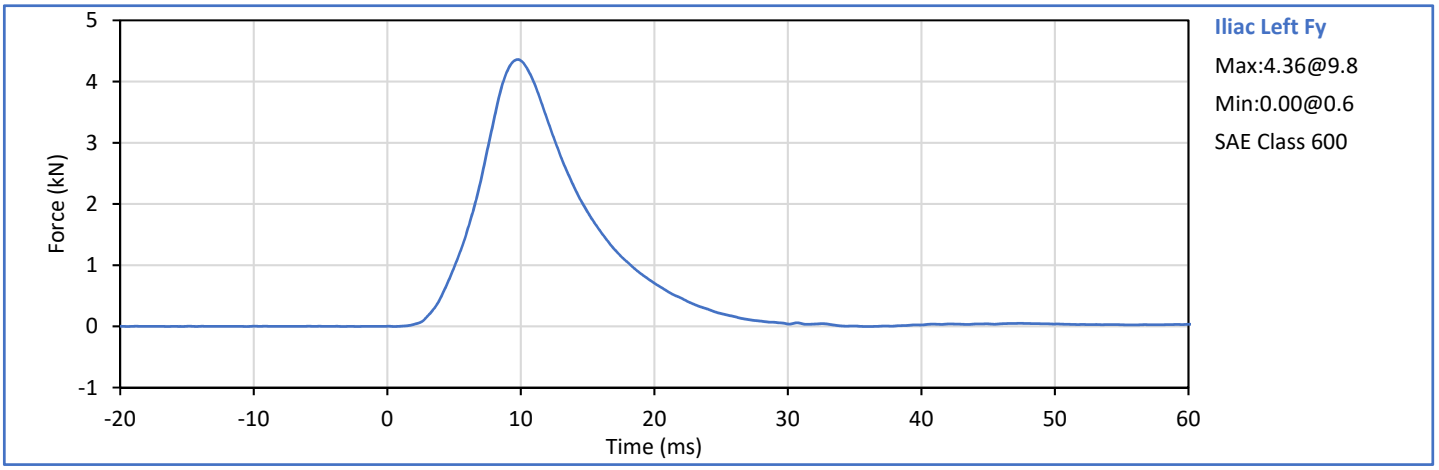
ATD Serial No.: 308 Test Date: 2019-05-24

| Tested Parameter | Units | Spec. Low | Spec. High | Result | Pass/Fail |
|---|---|---|---|---|---|
| Laboratory Temperature | °C | 20.6 | 22.2 | 21.1 | Pass |
| Laboratory Humidity | % | 10 | 70 | 30 | Pass |
| Impactor Velocity | m/s | 4.20 | 4.40 | 4.32 | Pass |
| Peak Iliac Fy | kN | 4.10 | 5.10 | 4.36 | Pass |
| Pelvis Ay after 6ms | g | 28.0 | 39.0 | 30.5 | Pass |
| Peak Impactor Ax | g | 36.0 | 45.0 | 40.0 | Pass |
| | | | Overall Test Results | | Pass |

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified




Technician: J. Hernandez

Approved By: P. Puzzuto

# APPENDIX D
# TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Position: Driver
ATD Type: ES-2re
ATD S\N: F035

**Table 1 - Driver ATD Instrumentation**

| Sensor Location | Sensor S\N | Mfr | Model | Cal Due |
|---|---|---|---|---|
| Head Acceleration X Primary | P58760 | Endevco | 7264C-2k | 2020-03-24 |
| Head Acceleration Y Primary | P58763 | Endevco | 7264C-2k | 2020-03-24 |
| Head Acceleration Z Primary | P52093 | Endevco | 7264C-2k | 2020-03-24 |
| Head Acceleration X Redundant | P52072 | Endevco | 7264C-2k | 2020-03-24 |
| Head Acceleration Y Redundant | P58768 | Endevco | 7264C-2k | 2020-03-24 |
| Head Acceleration Z Redundant | P52074 | Endevco | 7264C-2k | 2020-03-24 |
| Upper Thorax Rib Deflection Y | 180 (ES-2 Rib) | Honeywell | F38000203 | 2019-07-24 |
| Middle Thorax Rib Deflection Y | 177 (ES-2 Rib) | Honeywell | F38000203 | 2019-07-24 |
| Lower Thorax Rib Deflection Y | 186 (ES-2 Rib) | Honeywell | F38000203 | 2019-07-24 |
| Anterior Abdominal Force Y | 1504 Fy | R.A. Denton | 2631J | 2019-10-11 |
| Middle Abdominal Force Y | 1505 Fy | R.A. Denton | 2631J | 2019-10-11 |
| Posterior Abdominal Force Y | 1506 Fy | R.A. Denton | 2631J | 2019-10-11 |
| Lower Spine T12 Acceleration X | P45011 | Endevco | 7264C-2k | 2020-03-24 |
| Lower Spine T12 Acceleration Y | P58992 | Endevco | 7264C-2k | 2020-03-24 |
| Lower Spine T12 Acceleration Z | P51700 | Endevco | 7264C-2k | 2020-03-24 |
| Pubic Symphysis Force Y | DG6784 Fy | FTSS | IF-556 | 2019-10-11 |

Position: Rear Pass.
ATD Type: SID-IIs
ATD S\N: 308

**Table 2a - Passenger ATD Instrumentation**

| Sensor Location | Sensor S\N | Mfr | Model | Cal Due |
|---|---|---|---|---|
| Head Acceleration X Primary | P63980 | Endevco | 7264C-2k | 2019-09-14 |
| Head Acceleration Y Primary | P58861 | Endevco | 7264C-2k | 2019-09-14 |
| Head Acceleration Z Primary | P51261 | Endevco | 7264C-2k | 2019-09-14 |
| Head Acceleration X Redundant | P58808 | Endevco | 7264C-2k | 2019-09-14 |
| Head Acceleration Y Redundant | P63310 | Endevco | 7264C-2k | 2019-09-14 |
| Head Acceleration Z Redundant | P49189 | Endevco | 7264C-2k | 2019-09-14 |
| Upper Thorax Rib Deflection Y | 1172 | Servo | 08TCI-3725 | 2019-09-13 |
| Middle Thorax Rib Deflection Y | 1219 | Servo | 08TCI-3725 | 2019-09-13 |
| Lower Thorax Rib Deflection Y | 1221 | Servo | 08TCI-3725 | 2019-09-13 |
| Upper Abdomen Rib Deflection Y | 1252 | Servo | 08TCI-3725 | 2019-09-13 |
| Lower Abdomen Rib Deflection Y | 1283 | Servo | 08TCI-3725 | 2019-09-13 |
| Lower Spine T12 Acceleration X | P52108 | Endevco | 7264C-2k | 2019-09-14 |
| Lower Spine T12 Acceleration Y | P63970 | Endevco | 7264C-2k | 2019-09-14 |
| Lower Spine T12 Acceleration Z | P51712 | Endevco | 7264C-2k | 2019-09-14 |
| Iliac Wing Impact Side Force Y | 284 Fy (Iliac) | R.A. Denton | 3228J | 2019-06-21 |
| Acetabulum Impact Side Force Y | 272 Fy (Acetabulum) | R.A. Denton | 3249J | 2019-06-21 |

**Table 2b - Passenger ATD Optional Instrumentation (Research Data Only)**

| Sensor Location | Sensor S\N | Mfr | Model | Cal Due |
|---|---|---|---|---|
| Head Rotation Rate X | ARS15066 | DTS | ARS PRO-8k (2000Hz) | 2019-07-25 |
| Head Rotation Rate Y | ARS15067 | DTS | ARS PRO-8k (2000Hz) | 2019-07-25 |
| Head Rotation Rate Z | ARS15068 | DTS | ARS PRO-8k (2000Hz) | 2019-07-25 |

**Table 3 - Vehicle Instrumentation**

| Sensor Location | Sensor S\N | Mfr | Model | Cal Due |
|---|---|---|---|---|
| Vehicle CG Ax | A265901 | MSI | 52F-2000 | 2019-07-05 |
| Vehicle CG Ay | A265910 | MSI | 52F-2000 | 2019-07-05 |
| Vehicle CG Az | A265924 | MSI | 52F-2000 | 2019-07-05 |
| Right Side Sill at Front Seat Ax | A265849 | MSI | 52F-2000 | 2019-07-05 |
| Right Side Sill at Front Seat Ay | A265871 | MSI | 52F-2000 | 2019-07-05 |
| Right Side Sill at Front Seat Az | A265852 | MSI | 52F-2000 | 2019-07-05 |
| Right Side Sill at Rear Seat Ax | A247326 | MSI | 52F-2000 | 2019-06-21 |
| Right Side Sill at Rear Seat Ay | A265884 | MSI | 52F-2000 | 2019-07-11 |
| Right Side Sill at Rear Seat Az | A265900 | MSI | 52F-2000 | 2019-07-11 |
| Left Side Sill at Front Seat Ay | A227260 | MSI | 52F-2000 | 2019-09-17 |
| Left Side Sill at Rear Seat Ay | A185568 | MSI | 52F-2000 | 2019-09-25 |
| Left Lower A-Pillar Ay | A254854 | MSI | 52F-2000 | 2019-06-18 |
| Left Middle A-Pillar Ay | A226930 | MSI | 52F-2000 | 2020-11-27 |
| Left Lower B-Pillar Ay | A248837 | MSI | 52F-2000 | 2019-09-17 |
| Left Middle B-Pillar Ay | A267286 | MSI | 52F-2000 | 2019-08-02 |
| Driver Seat Track at H-Point Ay | A273415 | MSI | 52F-2000 | 2019-09-17 |
| Rear Seat Structure Ay | A273421 | MSI | 52F-2000 | 2019-09-17 |
| Right Rear Occupant Comp. Ay | A273021 | MSI | 52F-2000 | 2019-09-12 |
| Engine Block Top Ax | A254918 | MSI | 52F-2000 | 2019-11-28 |
| Engine Block Top Ay | A265846 | MSI | 52F-2000 | 2019-07-05 |
| Rear Floopan Above Axle Ax | A265950 | MSI | 52F-2000 | 2019-07-05 |
| Rear Floopan Above Axle Ay | A265947 | MSI | 52F-2000 | 2019-07-05 |
| Rear Floopan Above Axle Az | A266323 | MSI | 52F-2000 | 2019-07-05 |

**Table 4 - Moving Deformable Barrier (MDB) Instrumentation**

| Sensor Location | Sensor S\N | Mfr | Model | Cal Due |
|---|---|---|---|---|
| MDB CG Ax | 10390 | Endevco | 757F-2k | 2019-09-04 |
| MDB CG Ay | 10405 | Endevco | 757F-2k | 2019-09-04 |
| MDB CG Az | 10421 | Endevco | 757F-2k | 2019-09-05 |
| MDB Left Side at Rear Axle Ax | A224516 | MSI | 52F-2000 | 2019-09-21 |
| MDB Left Side at Rear Axle Ay | A160734 | MSI | 52F-2000 | 2019-11-28 |