

**REPORT NUMBER: NCAPSIDE-MGA-2010-001**

**NEW CAR ASSESSMENT PROGRAM  
SIDE IMPACT TEST**

**TOYOTA MOTOR CORPORATION  
2010 TOYOTA PRIUS IV  
NHTSA NUMBER: MA5107**

**PREPARED BY:  
MGA RESEARCH CORPORATION  
5000 WARREN ROAD  
BURLINGTON, WI 53105**



**Test Date: August 12, 2009**

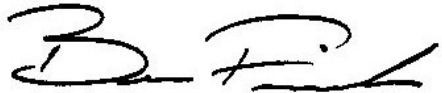
**Report Date: September 14, 2009**

**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
RULEMAKING  
OFFICE OF CRASHWORTHINESS STANDARDS  
1200 NEW JERSEY AVENUE, SE, ROOM W43-410  
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-09-D-00124.

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Prepared by:   
Ben Fischer, Project Engineer

Date: 9/14/2009

Reviewed by:   
David Winkelbauer, Director of Operations

Date: 9/14/2009

### Technical Report Documentation Page

| 1. Report No.<br>NCAPSIDE-MGA-2010-001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2. Government Accession No.                          | 3. Recipient's Catalog No.                                                                                                                                                                       |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
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| 4. Title and Subtitle<br>Final Report of New Car Assessment Program<br>Side Impact Testing of 2010 Toyota Prius IV<br>NHTSA No.: MA5107                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      | 5. Report Date<br>September 14, 2009                                                                                                                                                             |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
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| 7. Author(s)<br>Ben Fischer, Project Engineer<br>David Winkelbauer, Director of Operations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                      | 8. Performing Organization Report No.<br>NCAPSIDE-MGA-2010-001                                                                                                                                   |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| 9. Performing Organization Name and Address<br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                      | 10. Work Unit No.                                                                                                                                                                                |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
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| 15. Supplementary Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                      |                                                                                                                                                                                                  |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| 16. Abstract<br>A 55/28 km/h 90° Moving Deformable Barrier NCAP side impact was conducted on the subject 2010 Toyota Prius IV to obtain new car assessment and research data indicant of FMVSS No. 214D performance. The test was conducted at MGA Research Corporation, in Burlington, Wisconsin, on August 12, 2009. The impact velocity of the Moving Deformable Barrier (MDB) was 62.3 km/h, and the ambient temperature at the struck side (drivers) of the vehicle was 21°C. The target vehicle's maximum post test static crush was 244 mm at level 2. The test vehicle's occupant performance is as follows: <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th></th> <th style="text-align: center;"><u>DRIVER</u></th> <th style="text-align: center;"><u>PASS.</u></th> </tr> </thead> <tbody> <tr> <td>Left Upper Rib (LUR) Accel., g</td> <td style="text-align: center;">29.9</td> <td style="text-align: center;">57.1</td> </tr> <tr> <td>Left Lower Rib (LLR) Accel., g</td> <td style="text-align: center;">35.3</td> <td style="text-align: center;">62.3</td> </tr> <tr> <td>Lower Spine (T<sub>12</sub>) Accel., g</td> <td style="text-align: center;">31.3</td> <td style="text-align: center;">65.1</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">33</td> <td style="text-align: center;">64</td> </tr> <tr> <td>Pelvis (PEV) Accel., g</td> <td style="text-align: center;">56.1</td> <td style="text-align: center;">56.5</td> </tr> <tr> <td>HIC</td> <td style="text-align: center;">140</td> <td style="text-align: center;">166</td> </tr> </tbody> </table> <p>The door on the struck side of the vehicle did not separate from the body at the hinge or latch and the opposite door did not open during the side impact event.</p> |                                                      |                                                                                                                                                                                                  |           |  | <u>DRIVER</u> | <u>PASS.</u> | Left Upper Rib (LUR) Accel., g | 29.9 | 57.1 | Left Lower Rib (LLR) Accel., g | 35.3 | 62.3 | Lower Spine (T <sub>12</sub> ) Accel., g | 31.3 | 65.1 | Thoracic Trauma Index (TTI) | 33 | 64 | Pelvis (PEV) Accel., g | 56.1 | 56.5 | HIC | 140 | 166 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u>DRIVER</u>                                        | <u>PASS.</u>                                                                                                                                                                                     |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| Left Upper Rib (LUR) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 29.9                                                 | 57.1                                                                                                                                                                                             |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| Left Lower Rib (LLR) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 35.3                                                 | 62.3                                                                                                                                                                                             |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| Lower Spine (T <sub>12</sub> ) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 31.3                                                 | 65.1                                                                                                                                                                                             |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| Thoracic Trauma Index (TTI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 33                                                   | 64                                                                                                                                                                                               |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| Pelvis (PEV) Accel., g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 56.1                                                 | 56.5                                                                                                                                                                                             |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| HIC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 140                                                  | 166                                                                                                                                                                                              |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
| 17. Key Words<br>New Car Assessment Program (NCAP)<br>Side Impact<br>Side Impact Hybrid III Dummy (SID/HIII)<br>Occupant Side Impact Protection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                      | 18. Distribution Statement<br>Copies of this report are available from:<br>National Highway Traffic Safety Adm.<br>Technical Ref. Division,<br>1200 New Jersey Ave, SE<br>Washington, D.C. 20590 |           |  |               |              |                                |      |      |                                |      |      |                                          |      |      |                             |    |    |                        |      |      |     |     |     |
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## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

#### **PURPOSE**

This side impact test was conducted as part of the test program sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-09-D-00124. The purpose of this test was to evaluate side impact protection in a 2010 Toyota Prius IV manufactured by Toyota Motor Corporation.

#### **TEST PROCEDURE**

The side impact test was conducted in accordance with the Laboratory Test Procedure for New Car Assessment Program Side Impact Testing dated November 2002 and the corresponding MGA Research Corporation Test Procedure MGA-NHTSA5. The procedures for receiving, inspection, testing, and reporting of test results are described in the test procedures and are not repeated in this report.

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## **SECTION 2**

### **SUMMARY OF NCAP SIDE IMPACT TEST**

A model year 2010 Toyota Prius IV 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 62.3 km/h. The specified impact velocity range is from 61.1 to 62.7 km/h. The test (target) vehicle was stationary and positioned 63° to the line of forward motion. The weight of the vehicle as tested was 1596.2 kg and the test weight of the MDB was 1361.5 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on August 12, 2009.

One (1) real-time motion picture camera and nine (9) high-speed motion picture cameras were used to document the impact event. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera. Camera locations and pertinent camera information are documented in the data sheets. Pre- and post-test photographs of the vehicle and Side Impact Dummies (SID/HIIs) can be found in Appendix A. Two 50th percentile adult male SID/HIIs were placed in the driver and left rear passenger designated seating positions according to instructions specified in the Laboratory Test Procedure for New Car Assessment Program Side Impact Testing dated November 2002. Each SID/HII was instrumented in the following locations:

- Left Upper Rib (LUR) uni-axial accelerometer (Y-axis primary and redundant)
- Left Lower Rib (LLR) uni-axial accelerometer (Y-axis primary and redundant)
- Lower Thoracic Spine (T12) uni-axial accelerometer (Y-axis primary and redundant)
- Pelvic (PEV) section uni-axial accelerometer (Y-axis primary and redundant)
- Head Center of Gravity (CG) tri-axial accelerometers (X, Y and Z axes primary and redundant)
- Upper Neck load cell (Fx, Fy, Fz, Mx, My, Mz)

The test vehicle was instrumented with twenty (20) structural accelerometers and the MDB was instrumented with five (5) accelerometers and two (2) contact switches on the bumper to compare left side to right side bumper impact timing. All data channels were recorded with a fully self contained on-board DTS TDAS Pro Data Acquisition System. The data was digitally sampled at 10,000 samples per second and processed per Appendix V of the Test Procedure.

#### **2.2 GENERAL COMMENTS**

The test vehicle sustained a maximum static crush of 244 mm at level 2, 900 mm rearward of the vertical impact point. The driver and passenger SID/HIIs, Serial Nos. 271 and 272 respectively, were calibrated just prior to this test.

Appendix A contains the still photograph prints. Appendix B contains the SID/HII response data traces. Appendix C contains the dummy calibration data.

The occupant data is summarized below:

| ATD position | HIC | T <sup>1</sup> | T <sup>2</sup> | TTI (G's) | Peak Pelvis (G's) |
|--------------|-----|----------------|----------------|-----------|-------------------|
| Driver       | 140 | 42.3           | 72.1           | 33        | 56.1              |
| Passenger    | 166 | 35.2           | 71.2           | 64        | 56.5              |

#### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Information | Left Front (Driver) |          | Left Rear (Passenger) |          |
|-----------------------|---------------------|----------|-----------------------|----------|
|                       | Installed           | Deployed | Installed             | Deployed |
| Front Airbag          | Yes                 | No       | No                    |          |
| Side Torso Airbag     | Yes                 | Yes      | No                    |          |
| Curtain Airbag        | Yes                 | Yes      | Yes                   | Yes      |

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

#### TEST NOTES

There was no valid data collected for:

Passenger Lower Rib Y Redundant after 90 msec.

MDB CG X, Y, Z

MDB Rear X, Y

Left MDB Contact

Right MDB Contact

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# DATA SHEET NO. 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

### TEST VEHICLE INFORMATION

|                                                          |                      |
|----------------------------------------------------------|----------------------|
| Make                                                     | Toyota               |
| Model                                                    | Prius IV             |
| Body Style                                               | 5-Dr Hatchback       |
| NHTSA No.                                                | MA5107               |
| VIN                                                      | JTDKN3DU5A0004698    |
| Color                                                    | Blue Ribbon Metallic |
| Delivery Date                                            | 7/20/2009            |
| Odometer Reading (mile)                                  | 18                   |
| Dealer                                                   | West Herr Toyota     |
| Transmission                                             | Automatic            |
| Final Drive                                              | Front                |
| Number of Cylinders                                      | 4                    |
| Engine Displacement (L)                                  | 1.8                  |
| Engine Placement                                         | Lateral              |
| Automatic Door Locks (ADL)                               | Yes                  |
| Owner's Manual Details<br>Instructions on Disabling ADLs | Yes                  |

### TEST VEHICLE OPTIONS

|                                    |     |
|------------------------------------|-----|
| Driver Front Airbag                | Yes |
| Driver Side Curtain Airbag         | Yes |
| Driver Side Torso Airbag           | Yes |
| Rear Passenger Side Curtain Airbag | Yes |
| Rear Passenger Side Torso Airbag   | No  |
| Power Steering                     | Yes |
| Power Door Locks                   | Yes |
| Tilt Wheel                         | Yes |
| Anti-lock Brakes                   | Yes |
| Traction Control                   | Yes |
| All Wheel Drive                    | No  |
| Power Seats                        | No  |
| Pretensioners                      | Yes |
| Load Limiters                      | Yes |
| Bucket Seats                       | Yes |

### DATA FROM CERTIFICATION LABEL

|                     |                          |
|---------------------|--------------------------|
| Manufactured By     | Toyota Motor Corporation |
| Date of Manufacture | 05/09                    |

|                 |      |
|-----------------|------|
| GVWR (kg)       | 1805 |
| GAWR Front (kg) | 1030 |
| GAWR Rear (kg)  | 987  |

| Measured Parameter      | Front  | Rear  | Third | Total |
|-------------------------|--------|-------|-------|-------|
| Type of Seats           | Bucket | Bench |       |       |
| Number Of Occupants     | 2      | 3     |       | 5     |
| Capacity Wt. (VCW) (kg) |        |       |       | 370   |
| Cargo Wt. (RCLW) (kg)   |        |       |       | 30    |

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

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

**TEST VEHICLE WEIGHTS**

|        | Units | As Delivered (UVW) (Axle) |       |        | As Tested (ATW) (Axle) |       |        |
|--------|-------|---------------------------|-------|--------|------------------------|-------|--------|
|        |       | Front                     | Rear  | Total  | Front                  | Rear  | Total  |
| Left   | kg    | 425.5                     | 293.0 |        | 474.0                  | 368.8 |        |
| Right  | kg    | 415.0                     | 276.2 |        | 426.4                  | 327.0 |        |
| Ratio  | %     | 59.6                      | 40.4  |        | 56.4                   | 43.6  |        |
| Totals | kg    | 840.5                     | 569.2 | 1409.7 | 900.4                  | 695.8 | 1596.2 |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                      | Units | Value  |
|-----------------------------------------|-------|--------|
| Total Delivered Weight (UVW)            | kg    | 1409.7 |
| Weight of 2 P572M ATDs                  | kg    | 161.5  |
| Rated Cargo/Luggage Weight (RCLW)       | kg    | 30     |
| Calculated Vehicle Target Weight (TVTW) | kg    | 1601.2 |

\* Actual As Tested Weight (ATW) will be TVTW -5/-10 kg

Weight of Ballast in Trunk (kg): 4.5

**TEST VEHICLE ATTITUDES AND CG**

|              | Units | LF  | RF  | LR  | RR  | CG (aft of front axle) |
|--------------|-------|-----|-----|-----|-----|------------------------|
| As Delivered | mm    | 678 | 680 | 685 | 690 | 1089                   |
| As Tested    | mm    | 660 | 676 | 650 | 661 | 1175                   |
| Fully Loaded | mm    | 659 | 673 | 649 | 660 |                        |

**TEST VEHICLE VERTICAL IMPACT LINE DATA**

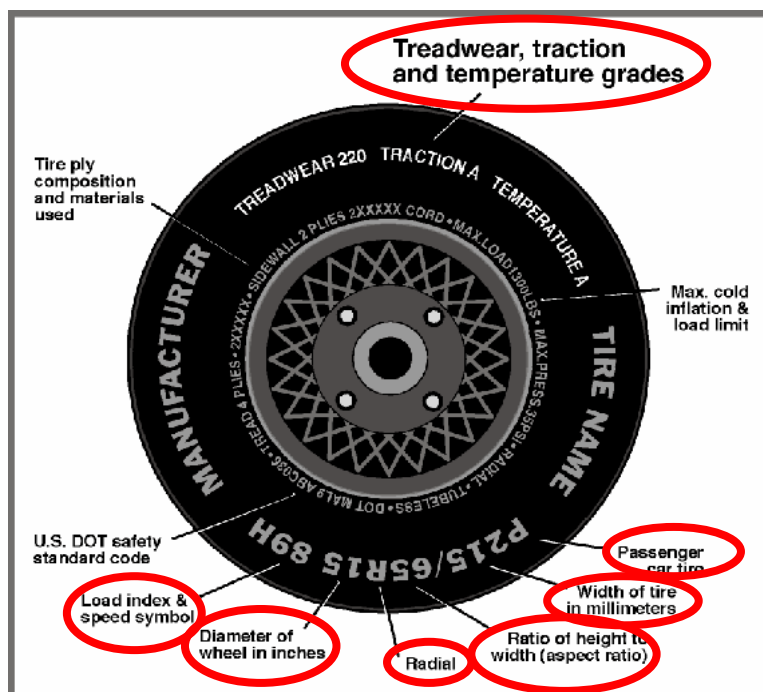
| Measurement Description               | Units | Value |
|---------------------------------------|-------|-------|
| Test Vehicle Wheel Base               | mm    | 2696  |
| Target Impact Point Aft of Front Axle | mm    | 408   |
| Actual Impact Point Aft of Front Axle | mm    | 404   |

## DATA SHEET NO. 2

### TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



### DATA FROM TIRE PLACARD

| Measured Parameter                      | Front       | Rear        |
|-----------------------------------------|-------------|-------------|
| Maximum Tire Pressure (kPa)             | 300         | 300         |
| Cold Test Pressure (kPa)                | 240         | 230         |
| Recommended Tire Size                   | P195/65R15  | P195/65R15  |
| Tire Size on Vehicle                    | P195/65R15  | P195/65R15  |
| Tire Manufacturer                       | Bridgestone | Bridgestone |
| Tire Name                               | Ecopia      | Ecopia      |
| Tire Type                               | Passenger   | Passenger   |
| Tire Width (mm)                         | 195         | 195         |
| Ratio of Height to Width (aspect ratio) | 65          | 65          |
| Radial                                  | R           | R           |
| Wheel Diameter                          | 15          | 15          |
| Load Index & Speed Symbol               | 89S         | 89S         |
| Treadwear                               | 380         | 380         |
| Traction Grade                          | B           | B           |
| Temperature Grade                       | B           | B           |

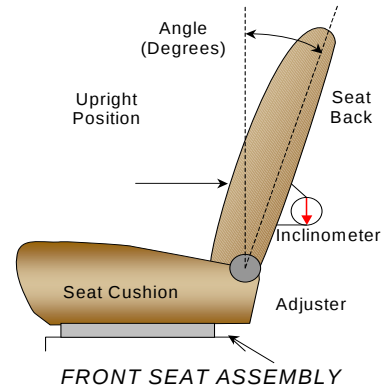
# **DATA SHEET NO. 3** **TEST VEHICLE INFORMATION**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

## **NORMAL DESIGN RIDING POSITION**

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: For the driver seat, set seat back in the 2<sup>nd</sup> detent (forward-most detent defined as 0). Seat back angle is 0.6 degrees measured at the headrest post. The second row seat backs are not adjustable.

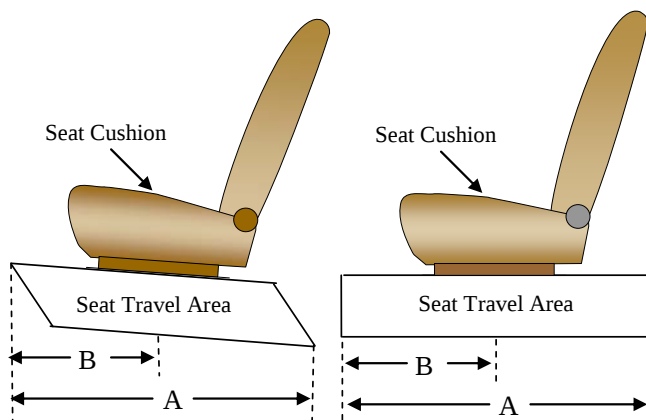


Driver seat back angle: 1.2 degrees at the headrest post

Passenger seat back angle: Fixed

## **SEAT FORE/AFT POSITIONS**

|             | Total Fore/Aft Travel | Placed in position #                           |
|-------------|-----------------------|------------------------------------------------|
| Driver Seat | 26 detents            | 11 <sup>th</sup> detent (1 <sup>st</sup> as 0) |
| Rear Seat   | Fixed                 | Fixed                                          |



## DATA SHEET NO. 3 (CONTINUED)

### TEST VEHICLE INFORMATION

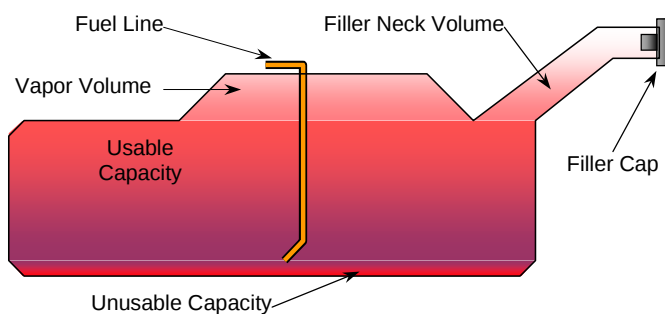
Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

#### FUEL TANK CAPACITY

|                                    | Liters       |
|------------------------------------|--------------|
| Usable Capacity of "Standard Tank" | 45.0         |
| Usable Capacity of "Optional" Tank |              |
| 92-94% of Usable Capacity          | 41.4 to 42.3 |
| Actual Amount of Solvent used      | 41.5         |
| 1/3 of Usable Capacity             | 15.0         |

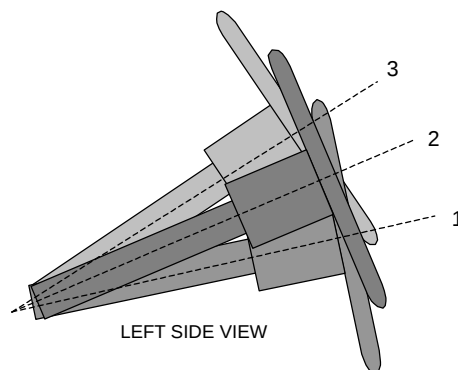
The test vehicle is equipped with an electric fuel pump. The condition under which the fuel pump will pump fuel is that ignition is on.



VEHICLE FUEL TANK ASSEMBLY

#### STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

#### STEERING COLUMN POSITION

|                                 | Fore/Aft (mm) | Degrees |
|---------------------------------|---------------|---------|
| Lowermost position No. 1        | 95            | 64.8    |
| Geometric center position No. 2 | 115           | 65.8    |
| Uppermost position No. 3        | 135           | 66.8    |

**DATA SHEET NO. 4**  
**MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

**MDB SPECIFICATIONS**

| Measurement Description                 | Length (mm) |
|-----------------------------------------|-------------|
| Overall Width of Framework Carriage     | 1252        |
| Overall Length Including Honeycomb Face | 4115        |
| Wheel base of Framework Carriage        | 2592        |
| C.G. Location aft of Front Axle         | 1129        |

**MDB WEIGHTS**

|        | Units | Front Axle | Rear Axle | Total  |
|--------|-------|------------|-----------|--------|
| Left   | kg    | 411.8      | 281.6     |        |
| Right  | kg    | 356.8      | 311.3     |        |
| Ratio  | %     | 56.5       | 43.5      |        |
| Totals | kg    | 768.6      | 592.9     | 1361.5 |

**SPEED AND IMPACT ANGLE DATA**

| Measured Parameter              | Units   | Requirement  | Value |
|---------------------------------|---------|--------------|-------|
| Trap No. 1 Velocity (Primary)   | km/h    | 61.1 to 62.7 | 62.3  |
| Trap No. 2 Velocity (Redundant) | km/h    | 61.1 to 62.7 | 62.6  |
| MDB CL to Target Vehicle CL     | degrees | 88.5 to 91.5 | 89.9  |

**POST TEST OBSERVATIONS**  
**MDB LEFT EDGE IMPACT POINT DATA**

| Measured Parameter | Units | Requirement | Value     |
|--------------------|-------|-------------|-----------|
| Horizontal Offset  | mm    | +/- 50      | 4 forward |
| Vertical Offset    | mm    | +/-20       | 1 down    |

**DATA SHEET NO. 5****POST TEST OBSERVATIONS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

**TEST DUMMY INFORMATION AND CONTACT POINTS**

| Description             | Front Seat SID/HIII           | Rear Seat SID/HIII       |
|-------------------------|-------------------------------|--------------------------|
| Dummy Type / Serial No. | SID HIII / 271                | SID HIII / 272           |
| Head Contact            | Airbag, Headrest, RF Seatback | Airbag, Mid Row Headrest |
| Upper Torso Contact     | Side Airbag                   | Door Panel               |
| Lower Torso Contact     | Door Panel                    | Door Panel               |
| Left Knee Contact       | Door Panel                    | Door Panel               |
| Right Knee Contact      | Left Knee                     | Left Knee                |

**POST TEST DOOR OPENING AND SEAT TRACK INFORMATION**

| Description             | Front                                                               | Rear                                                                |
|-------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|
| Locked/Unlocked Doors   | Struck side door was unlocked;<br>Non-struck side door was unlocked | Struck side door was unlocked;<br>Non-struck side door was unlocked |
| Left Side Door Opening  | Door remained closed and latched                                    | Door remained closed and latched                                    |
| Right Side Door Opening | Door remained closed and latched;<br>Door opened without tools      | Door remained closed and latched;<br>Door opened without tools      |
| Seat Movement           | 0                                                                   | 0                                                                   |
| Seat Back Failure       | None                                                                | None                                                                |

**POST TEST STRUCTURAL OBSERVATIONS**

| Critical Areas of Performance | Observations and Conclusions                  |
|-------------------------------|-----------------------------------------------|
| Pillar Performance            | No Separation                                 |
| Sill Separation               | None                                          |
| Windshield Damage             | None                                          |
| Window Damage                 | Left Front and Left Rear Windows were broken. |
| Other Notable Effects         | None                                          |

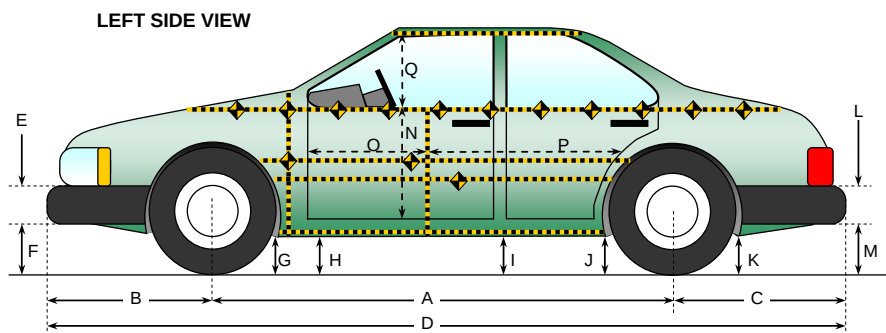
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Information | Left Front (Driver) |          | Left Rear (Passenger) |          |
|-----------------------|---------------------|----------|-----------------------|----------|
|                       | Installed           | Deployed | Installed             | Deployed |
| Front Airbag          | Yes                 | No       | No                    |          |
| Side Torso Airbag     | Yes                 | Yes      | No                    |          |
| Curtain Airbag        | Yes                 | Yes      | Yes                   | Yes      |

**DATA SHEET NO. 6**  
**VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



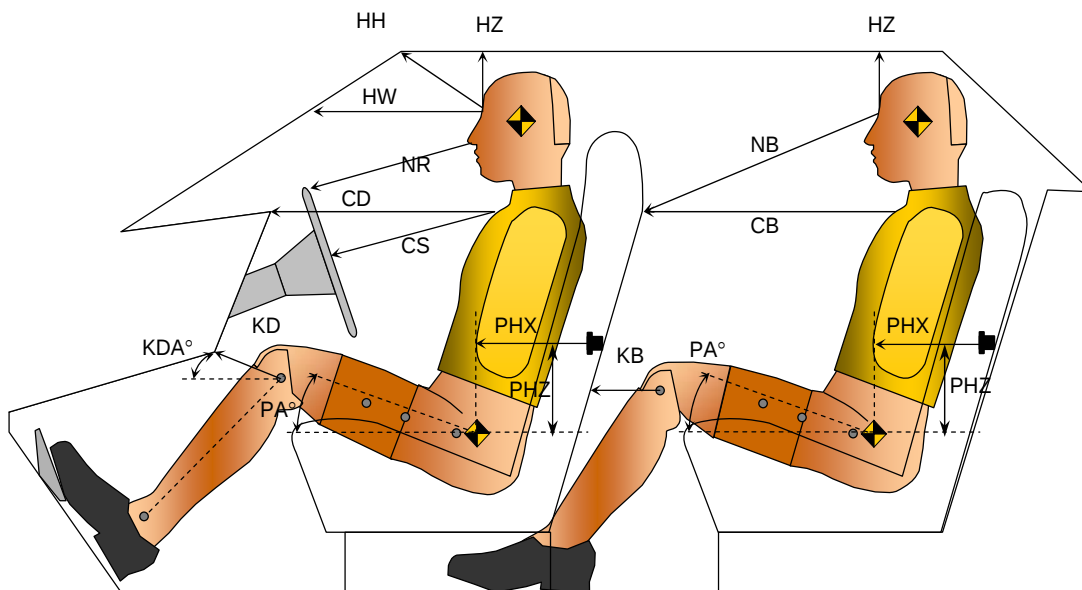
All Measurements in mm

| Code | Measurement Description                | Pre-Test | Post-Test | Difference |
|------|----------------------------------------|----------|-----------|------------|
| A    | Wheelbase                              | 2696     | 2686      | 10         |
| B    | Front Axle to FSOV                     | 905      | 909       | -4         |
| C    | Rear Axle to RSOV                      | 853      | 855       | -2         |
| D    | Total Length at Centerline             | 4454     | 4450      | 4          |
| E    | Front Bumper Thickness                 | 165      | 165       | 0          |
| F    | Front Bumper Bottom to Ground          | 405      | 432       | -27        |
| G    | Sill Height at Front Wheel Well        | 153      | 164       | -11        |
| H    | Sill Height at Front Door Leading Edge | 163      | 183       | -20        |
| I    | Sill Height at "B" Pillar              | 154      | 170       | -16        |
| J1   | Sill Height at Rear Wheel Well         | 133      | 141       | -8         |
| J2   | Pinch Weld Height at Rear Wheel Well   | 159      | 168       | -9         |
| K    | Sill Height Aft of Rear Wheel Well     | 190      | 183       | 7          |
| L    | Rear Bumper Thickness                  | 207      | 207       | 0          |
| M    | Rear Bumper Bottom to Ground           | 311      | 294       | 17         |
| N    | Sill Height to Window Bottom Sill      | 753      | 730       | 23         |
| O    | Front Door Leading Edge to Impact CL   | 804      | 800       | 4          |
| P    | Rear Door Trailing Edge to Impact CL   | 1170     | 1152      | 18         |
| Q    | Front Window Opening                   | 395      | 385       | 10         |
| R    | Right Side Length                      | 3754     | 3760      | -6         |
| S    | Left Side Length                       | 3754     | 3740      | 14         |
| T    | Vehicle Width at "B" Post              | 1746     | 1615      | 131        |

**DATA SHEET NO. 7**  
**SID/HII LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

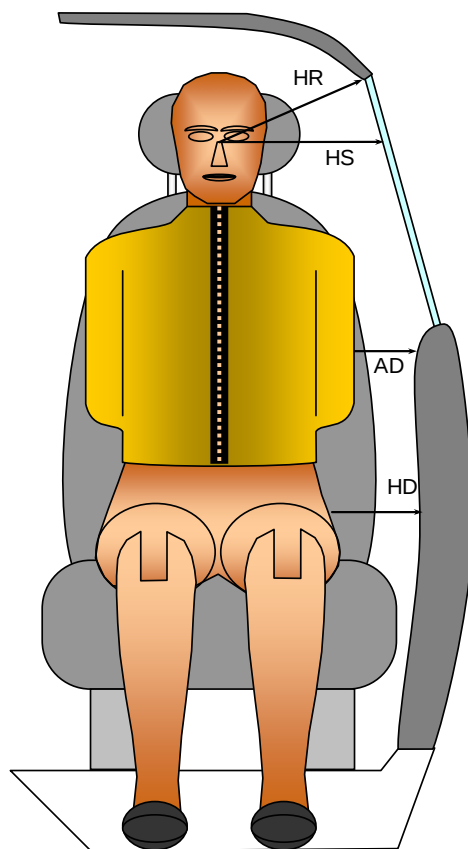


| Driver Code | Pass. Code | Measurement Description        | Driver S/N 271 |          | Passenger S/N 272 |          |
|-------------|------------|--------------------------------|----------------|----------|-------------------|----------|
|             |            |                                | Length(mm)     | Angle(°) | Length(mm)        | Angle(°) |
| HH          |            | Head to Header                 | 347            |          |                   |          |
| HW          |            | Head to Windshield             | 688            |          |                   |          |
| HZ          | HZ         | Head to Roof                   | 156            |          | 148               |          |
| NR          | NB         | Nose to Rim/Nose to Seatback   | 407            |          | 608               |          |
| CD          | CB         | Chest to Dash or Seatback      | 797            |          | 534               |          |
| CS          |            | Chest to Steering Wheel        | 324            |          |                   |          |
| KDL         | KBL        | Left Knee to Dash or Seatback  | 146            | 40.1     | 269               | 1.6      |
| KDR         | KBR        | Right Knee to Dash or Seatback | 161            | 42.9     | 265               | 2.8      |
| PA          | PA         | Pelvic Angle                   |                | 24.8     |                   | 24.7     |
| PHX         | PHX        | H-Point to Striker (X-Axis)    | 229            |          | 288               |          |
| PHZ         | PHZ        | H-Point to Striker (Z-Axis)    | 200            |          | 312               |          |

**DATA SHEET NO. 8**  
**SID/HIII LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



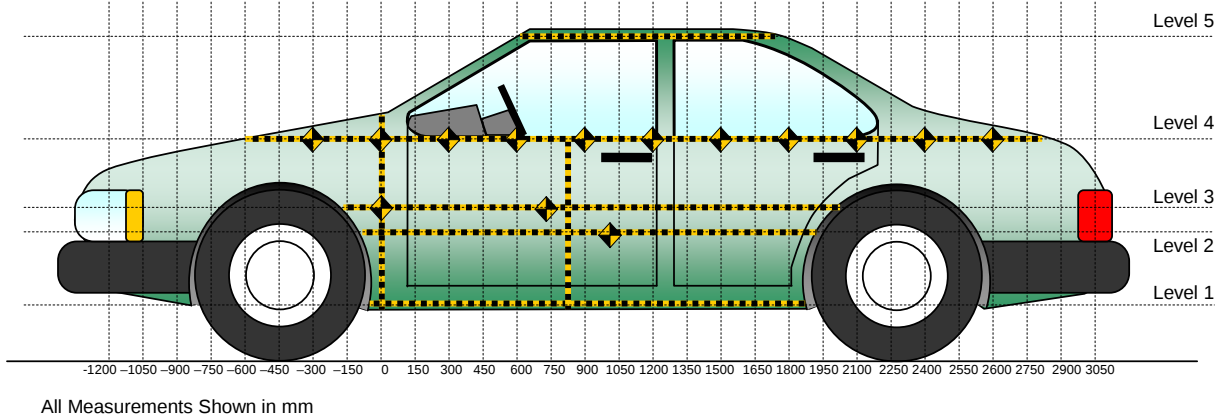
*FRONT VIEW OF DUMMY*

| Code | Measurement Description | Units | Driver<br>S/N 271 | Passenger<br>S/N 272 |
|------|-------------------------|-------|-------------------|----------------------|
| HR   | Head to Side Header     | mm    | 210               | 217                  |
| HS   | Head to Side Window     | mm    | 320               | 318                  |
| AD   | Arm to Door             | mm    | 103               | 94                   |
| HD   | H-Point to Door         | mm    | 149               | 141                  |

# **DATA SHEET NO. 9** **VEHICLE SIDE MEASUREMENTS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



**LEFT SIDE VIEW**

Measurements are taken with vehicle in the as tested condition.  
 Measurements along the vertical 800 mm.  
 All measurements below in mm.

| Level | Measurement Description | Maximum Exterior Static Crush | Distance From Impact | Height Above Ground |
|-------|-------------------------|-------------------------------|----------------------|---------------------|
| 5     | Window                  | 23                            | 1200                 | 1415                |
| 4     | Window Sill             | 174                           | 1350                 | 960                 |
| 3     | Mid Door                | 236                           | 600                  | 625                 |
| 2     | Occupant H-Point        | 244                           | 900                  | 510                 |
| 1     | Sill Top                | 92                            | 150                  | 260                 |
|       | Maximum Penetration     | 244                           |                      |                     |

**DATA SHEET NO. 10**  
**VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

|      | Pre-Test |     |     |     |     | Post-Test |     |     |     |     | Difference |     |     |     |    |
|------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|------------|-----|-----|-----|----|
|      | 1        | 2   | 3   | 4   | 5   | 1         | 2   | 3   | 4   | 5   | 1          | 2   | 3   | 4   | 5  |
| -600 |          |     |     | 330 |     |           |     |     | 330 |     |            |     |     | 0   |    |
| -450 |          |     |     | 318 |     |           |     |     | 327 |     |            |     |     | 9   |    |
| -300 |          |     |     | 309 |     |           |     |     | 328 |     |            |     |     | 19  |    |
| -150 |          |     | 224 | 303 |     |           |     | 265 | 322 |     |            |     | 41  | 19  |    |
| 0    | 253      | 227 | 229 | 303 |     | 317       | 285 | 280 | 324 |     | 64         | 58  | 51  | 21  |    |
| 150  | 257      | 229 | 230 | 305 |     | 349       | 426 | 408 | 331 |     | 92         | 197 | 178 | 26  |    |
| 300  | 259      | 229 | 229 | 298 |     | 349       | 451 | 432 | 345 |     | 90         | 222 | 203 | 47  |    |
| 450  | 259      | 229 | 229 | 296 |     | 347       | 455 | 445 | 368 |     | 88         | 226 | 216 | 72  |    |
| 600  | 259      | 228 | 229 | 297 |     | 345       | 467 | 465 | 371 |     | 86         | 239 | 236 | 74  |    |
| 750  | 258      | 228 | 228 | 300 | 511 | 342       | 471 | 444 | 377 | 512 | 84         | 243 | 216 | 77  | 1  |
| 900  | 258      | 228 | 228 | 301 | 502 | 340       | 472 | 440 | 384 | 508 | 82         | 244 | 212 | 83  | 6  |
| 1050 | 258      | 228 | 228 | 303 | 499 | 340       | 470 | 438 | 390 | 511 | 82         | 242 | 210 | 87  | 12 |
| 1200 | 257      | 228 | 229 | 306 | 499 | 342       | 467 | 435 | 424 | 522 | 85         | 239 | 206 | 118 | 23 |
| 1350 | 256      | 230 | 231 | 310 | 502 | 334       | 463 | 452 | 484 | 520 | 78         | 233 | 221 | 174 | 18 |
| 1500 | 257      | 231 | 232 | 312 | 506 | 314       | 440 | 420 | 465 | 521 | 57         | 209 | 188 | 153 | 15 |
| 1650 | 256      | 232 | 235 | 317 | 510 | 282       | 381 | 400 | 422 | 521 | 26         | 149 | 165 | 105 | 11 |
| 1800 | 245      | 233 | 236 | 320 | 518 | 252       | 326 | 378 | 370 | 525 | 7          | 93  | 142 | 50  | 7  |
| 1950 |          | 235 | 232 | 328 | 531 |           | 256 | 315 | 342 | 536 |            | 21  | 83  | 14  | 5  |
| 2100 |          |     | 223 | 336 | 543 |           |     | 242 | 333 | 550 |            |     | 19  | -3  | 7  |
| 2250 |          |     | 221 | 343 |     |           |     | 235 | 355 |     |            |     | 14  | 12  |    |
| 2400 |          |     |     | 354 |     |           |     |     | 362 |     |            |     |     | 8   |    |
| 2550 |          |     |     | 367 |     |           |     |     | 372 |     |            |     |     | 5   |    |
| 2700 |          |     |     | 381 |     |           |     |     | 381 |     |            |     |     | 0   |    |

Reference plane is parallel to test vehicle longitudinal centerline.

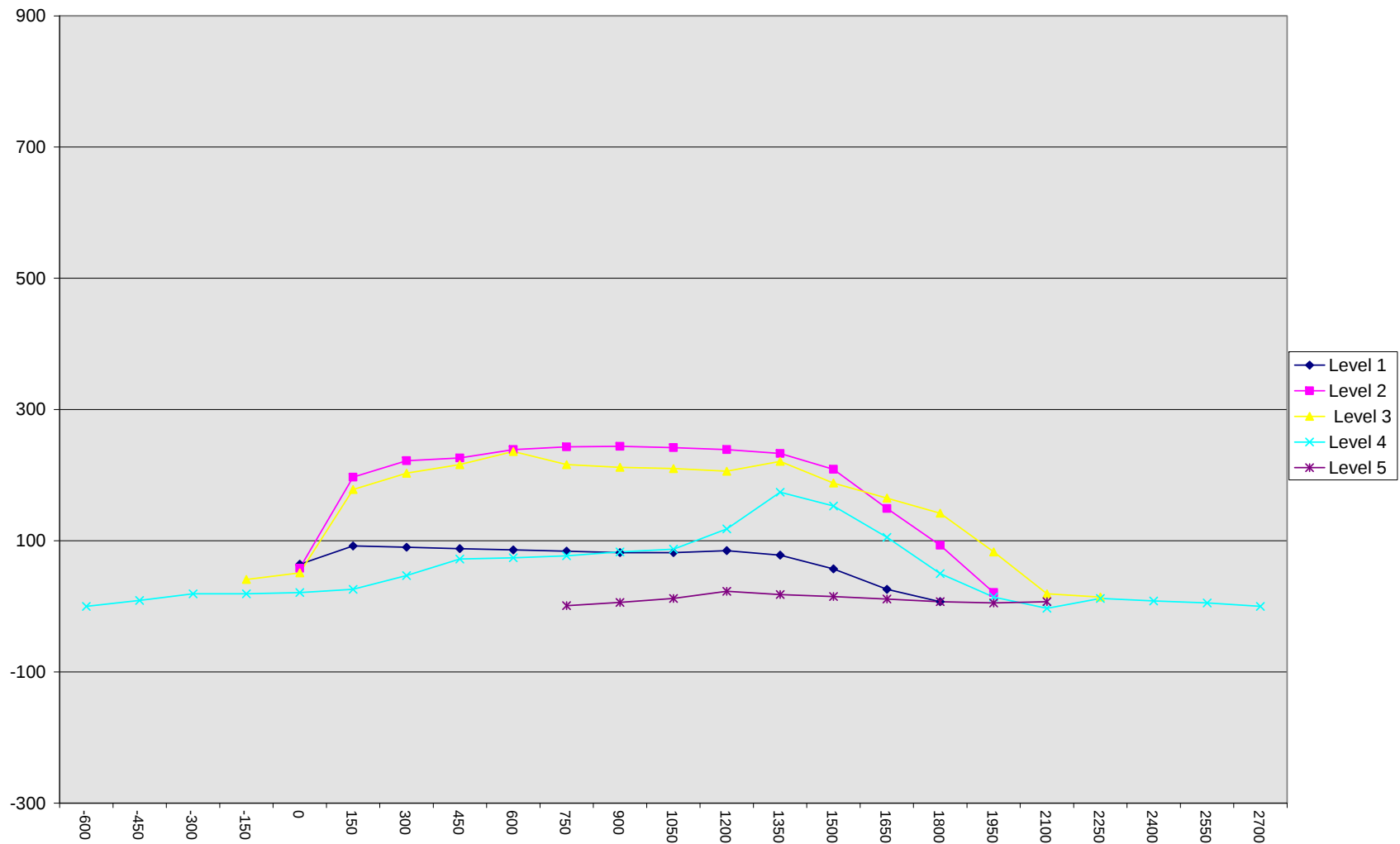
Given dimensions = Reference plane to car body

DATA SHEET NO. 10... (continued)  
VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2010 Toyota Prius IV  
Test Program: NCAP Side Impact

NHTSA No. MA5107  
Test Date: 8/12/2009

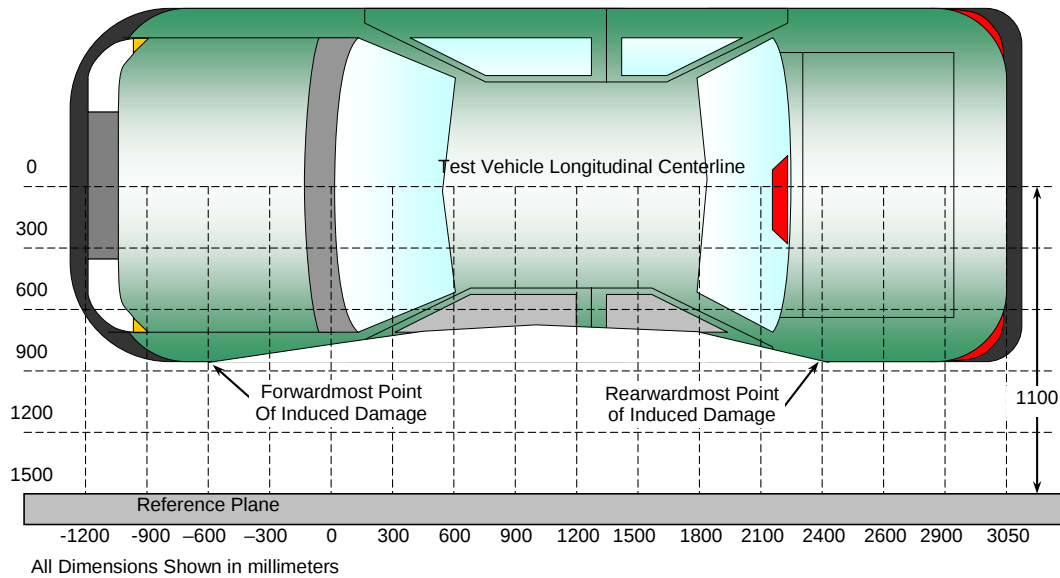
16



**DATA SHEET NO. 11**  
**VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



**TOP VIEW**

**DAMAGE PROFILE DISTANCES**

| DPD | Distance from Impact Point in mm | Level | Pre-Test (mm) | Post-Test (mm) | Max Static Crush (mm) |
|-----|----------------------------------|-------|---------------|----------------|-----------------------|
| 1   | 2700                             | 4     | 381           | 381            | 0                     |
| 2   | 2000                             | 3     | 230           | 305            | 75                    |
| 3   | 1350                             | 2     | 230           | 463            | 233                   |
| 4   | 690                              | 2     | 228           | 470            | 242                   |
| 5   | 50                               | 2     | 227           | 383            | 156                   |
| 6   | -600                             | 4     | 330           | 330            | 0                     |

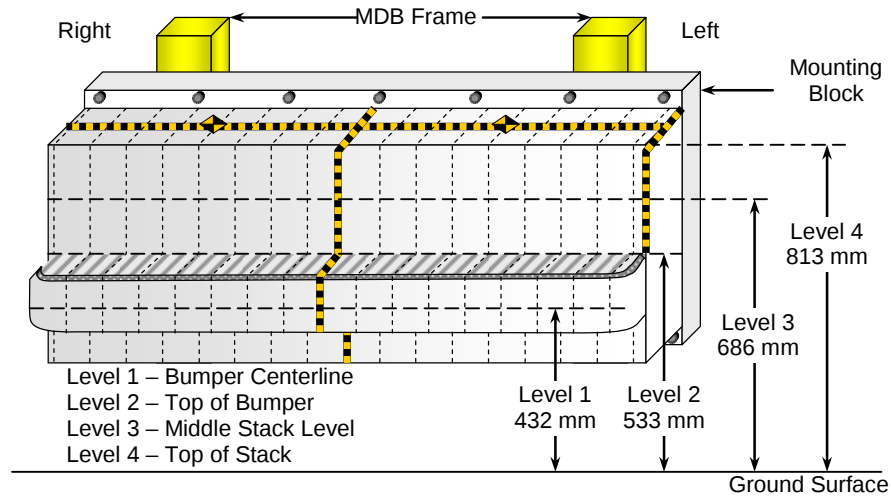
Reference plane is parallel to test vehicle longitudinal centerline.  
 Given dimensions = Reference plane to car body.

## DATA SHEET NO. 12

### DEFORMABLE BARRIER HONEYCOMB FACE STATIC CRUSH

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



### DEFORMABLE BARRIER STATIC CRUSH

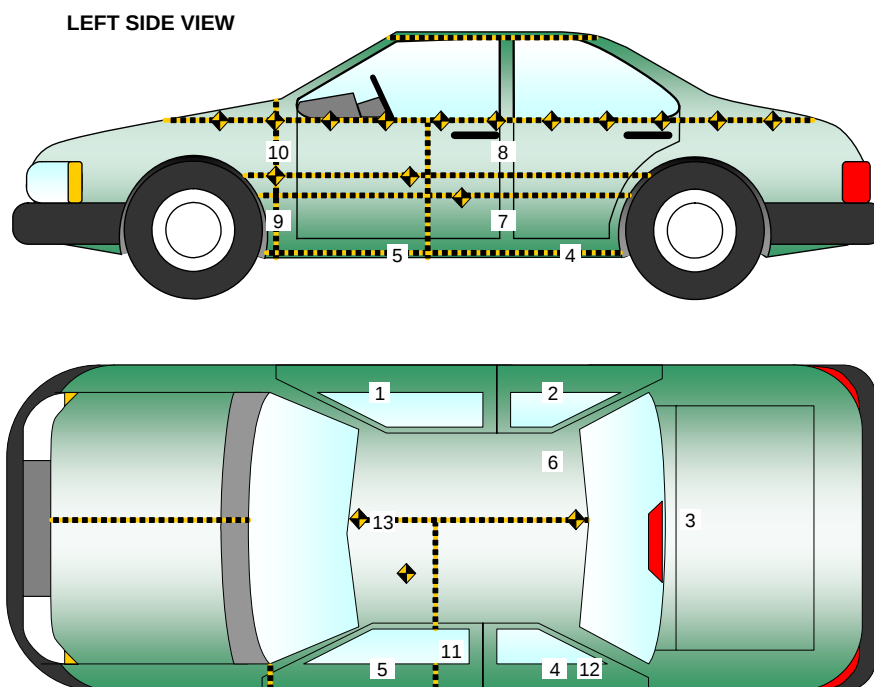
| Stack Level | Distance Right of Center |     |     |     |     |     |     |     | C <sub>L</sub> | Distance Left of Center |     |     |     |     |     |     |     |
|-------------|--------------------------|-----|-----|-----|-----|-----|-----|-----|----------------|-------------------------|-----|-----|-----|-----|-----|-----|-----|
|             | 800                      | 700 | 600 | 500 | 400 | 300 | 200 | 100 |                | 100                     | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 1           | 207                      | 193 | 169 | 153 | 144 | 145 | 139 | 135 | 132            | 127                     | 121 | 119 | 115 | 114 | 120 | 127 | 148 |
| 2           | 104                      | 78  | 63  | 56  | 53  | 55  | 65  | 67  | 52             | 56                      | 58  | 64  | 67  | 67  | 72  | 76  | 86  |
| 3           | 81                       | 55  | 32  | 23  | 20  | 20  | 31  | 43  | 32             | 20                      | 14  | 15  | 18  | 24  | 38  | 56  | 95  |
| 4           | 87                       | 43  | 10  | 5   | 17  | 38  | 74  | 76  | 54             | 38                      | 33  | 35  | 37  | 47  | 64  | 90  | 145 |

All Dimensions in mm

**DATA SHEET NO. 13**  
**VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



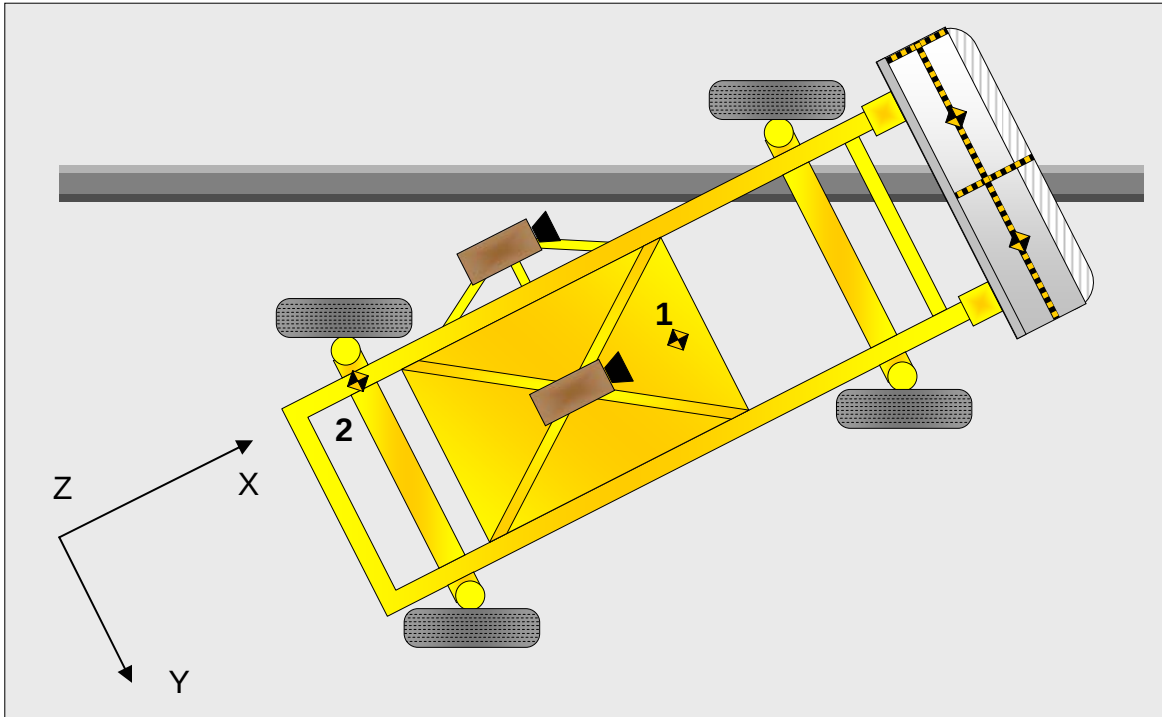
| Loc. No. | Accelerometer Location       | Measurements (mm) |      |      |
|----------|------------------------------|-------------------|------|------|
|          |                              | X                 | Y    | Z    |
| 1        | Right Sill at Front Seat     | 2544              | 727  | -197 |
| 2        | Right Sill at Rear Seat      | 1394              | 721  | -203 |
| 3        | Rear Floorpan Above Axle     | 706               | 0    | -301 |
| 4        | Left Sill at Rear Door       | 1409              | -721 | -203 |
| 5        | Left Sill at Front Door      | 2341              | -727 | -188 |
| 6        | Rear Occupant Compartment    | 1665              | 291  | -343 |
| 7        | Left Lower B-Post            | 1931              | -700 | -531 |
| 8        | Left Middle B-Post           | 1990              | -702 | -800 |
| 9        | Left Lower A-Post            | 3014              | -698 | -509 |
| 10       | Left Middle A-Post           | 3049              | -796 | -776 |
| 11       | Front Seat Track             | 2244              | -558 | -399 |
| 12       | Rear Seat Track or Structure |                   |      |      |
| 13       | Vehicle CG                   | 2331              | 0    | -361 |

Reference Points    X - Test Vehicle Rear Bumper (+ forward)  
                              Y - Test Vehicle Centerline (+ to right)  
                              Z - Ground Plane (+ down)

**DATA SHEET NO. 14**  
**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



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

Reference Points    X - MDB Front Axle (+ forward)  
                              Y - MDB Centerline (+ to right)  
                              Z - Ground Plane (+ down)

**DATA SHEET NO. 15**  
**VEHICLE STRUCTURAL MEASUREMENTS**

Test Vehicle: 2010 Toyota Prius IV  
Test Program: NCAP Side Impact

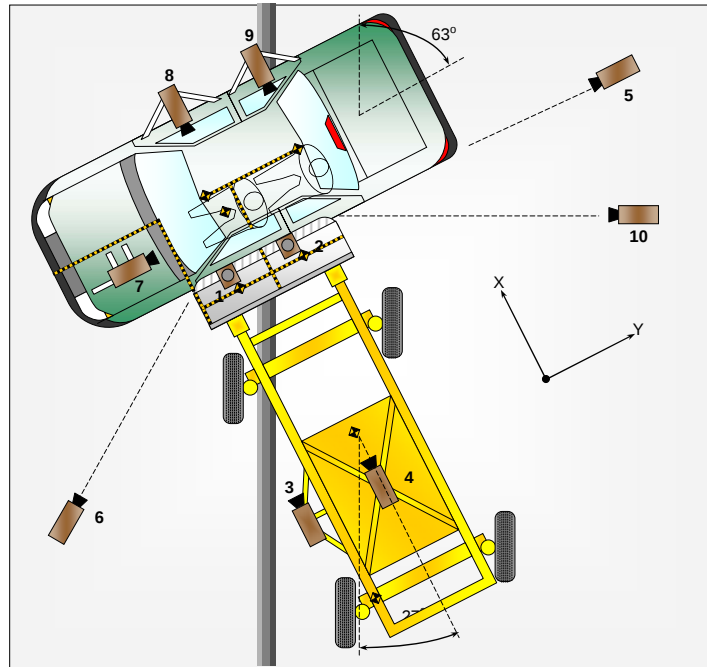
NHTSA No. MA5107  
Test Date: 8/12/2009

|    | Elements                              | Pre-Test (mm) |
|----|---------------------------------------|---------------|
| 1  | Total Length                          | 4454          |
| 2  | Total Width                           | 1746          |
| 3  | Bumper Top Height                     | 584           |
| 4  | Bumper Bottom Height                  | 421           |
| 5  | Longitudinal Member Top Height        | 539           |
| 6  | Distance between Longitudinal Members | 1066          |
| 7  | Longitudinal Member Width             | 57            |
| 8  | Engine Top Height                     | 877           |
| 9  | Engine Bottom Height                  | 171           |
| 10 | Engine and gearbox width              | 868           |
| 11 | Front bumper-engine distance          | 381           |
| 12 | Front shock absorber fixing height    | 865           |
| 13 | Bonnet leading edge height            | 790           |
| 14 | Front shock absorber fixing width     | 1158          |
| 15 | Front bumper – front axle distance    | 905           |
| 16 | Front axle – a pillar distance        | 435           |
| 17 | A-pillar – B-pillar distance          | 1115          |
| 18 | B-Pillar – rear axle distance         | 1146          |
| 19 | B-pillar – C-pillar distance          | 748           |
| 20 | Roof sill bottom height               | 1369          |
| 21 | Roof sill top height                  | 1490          |
| 22 | Floor sill bottom height              | 199           |
| 23 | Floor sill top height                 | 342           |

**DATA SHEET NO. 16**  
**HIGH SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009



| No. | Camera View                           | Location (mm) |       |       | Lens (mm) | Film Speed (fps) |
|-----|---------------------------------------|---------------|-------|-------|-----------|------------------|
|     |                                       | X             | Y     | Z     |           |                  |
| 1   | Overhead Close-up                     | -520          | -225  | -5055 | 50        | 1000             |
| 2   | Overhead Overall                      | 635           | 1260  | -5050 | 14        | 1000             |
| 3   | MDB Onboard, Impact Point Close-up    |               |       |       | 50        | 1000             |
| 4   | MDB Onboard, Centerline of Impact     |               |       |       | 16        | 1000             |
| 5   | Right Side, Ground Level, Overall     | 50            | 7280  | -1230 | 24        | 1000             |
| 6   | Left Side, Ground Level, Overall      | -3145         | -4790 | -1270 | 24        | 1000             |
| 7   | Vehicle Onboard Front SID/HIII, Front |               |       |       | 12.5      | 1000             |
| 8   | Vehicle Onboard Front SID/HIII, Side  |               |       |       | 8         | 1000             |
| 9   | Vehicle Onboard Rear SID/HIII, Side   |               |       |       | 8         | 1000             |
| 10  | Real Time Coverage                    |               |       |       | 13        | 24               |

Reference Points X - Impact Line  
 Y - MDB Left Edge Impact Point  
 Z - Ground Plane

**DATA SHEET NO. 17**  
**SUMMARY OF FMVSS 301 DATA**

Test Vehicle: 2010 Toyota Prius IV  
 Test Program: NCAP Side Impact

NHTSA No. MA5107  
 Test Date: 8/12/2009

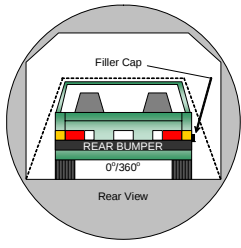
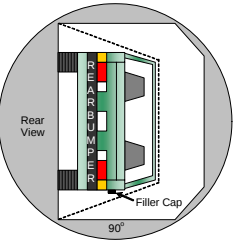
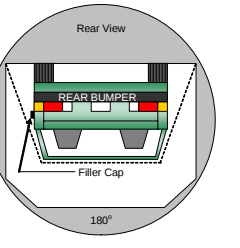
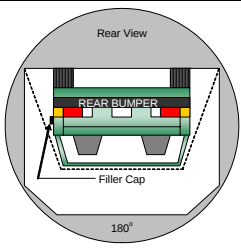
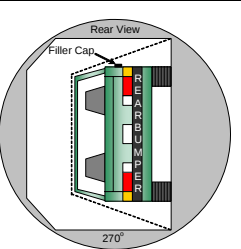
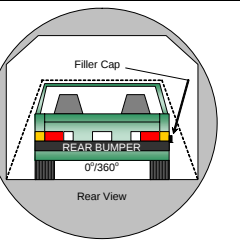
**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 21° C      Test Time: 12:11 pm

**Stoddard Solvent Spillage Measurements**

- A. From impact until vehicle motion ceases: 0 oz.  
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: None  
 (Maximum allowable = 5 ounces)
- C. For the following 25 minutes: None  
 (Maximum allowable = 1 oz./minute)
- D. Spillage Details: None

**FMVSS 301 STATIC ROLLOVER DATA**

|                                                                                     |                                                                                     |                                                                                      |                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  | <p>1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.</p> <p>2. The position hold time at each position is 300 seconds (minimum).</p> <p>3. Details of Stoddard Solvent spillage locations: <b>None</b></p> |
| 0° to 90°                                                                           |                                                                                     | 90° to 180°                                                                          |                                                                                                                                                                                                                                                |
|  |  |  |                                                                                                                                                                                                                                                |
| 180° to 270°                                                                        |                                                                                     | 270° to 360°                                                                         |                                                                                                                                                                                                                                                |

| Test Phase   | Rotation Time (sec.) | Hold Time (sec.) | Spillage Collection Time (min) | Spillage (oz.) |
|--------------|----------------------|------------------|--------------------------------|----------------|
| 0° to 90°    | 127                  | 300              | First 5                        | 0              |
| 90° to 180°  | 110                  | 300              | First 5                        | 0              |
| 180° to 270° | 109                  | 300              | First 5                        | 0              |
| 270° to 360° | 118                  | 300              | First 5                        | 0              |

**APPENDIX A**  
**PHOTOGRAPHS**

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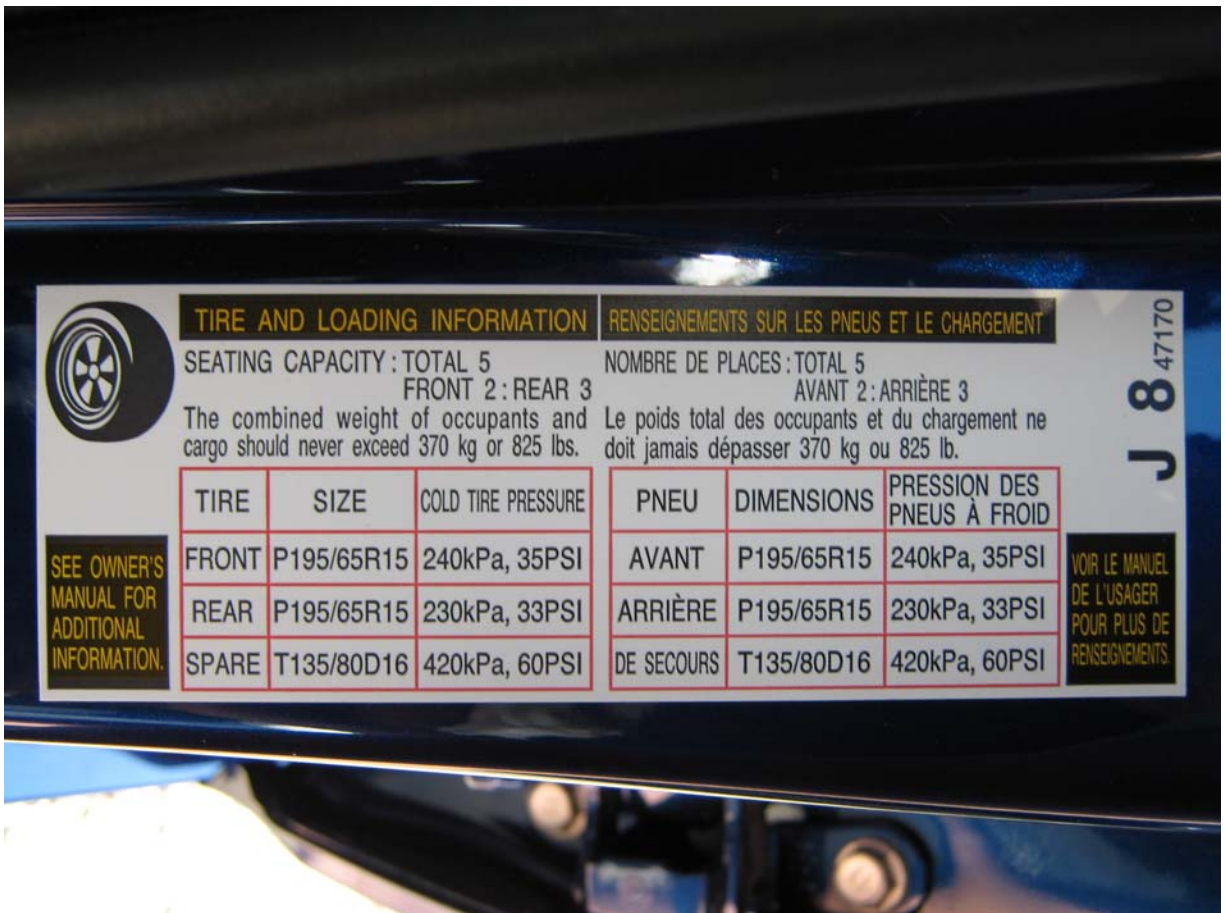
Right Front  $\frac{3}{4}$  View, As Received



Left Rear  $\frac{3}{4}$  View, As Received



Manufacturer's Label



Tire Placard



Pre-Test Front View



Post-Test Front View



Pre-Test Left Front  $\frac{3}{4}$  View



Post-Test Left Front  $\frac{3}{4}$  View



Pre-Test Left Side View



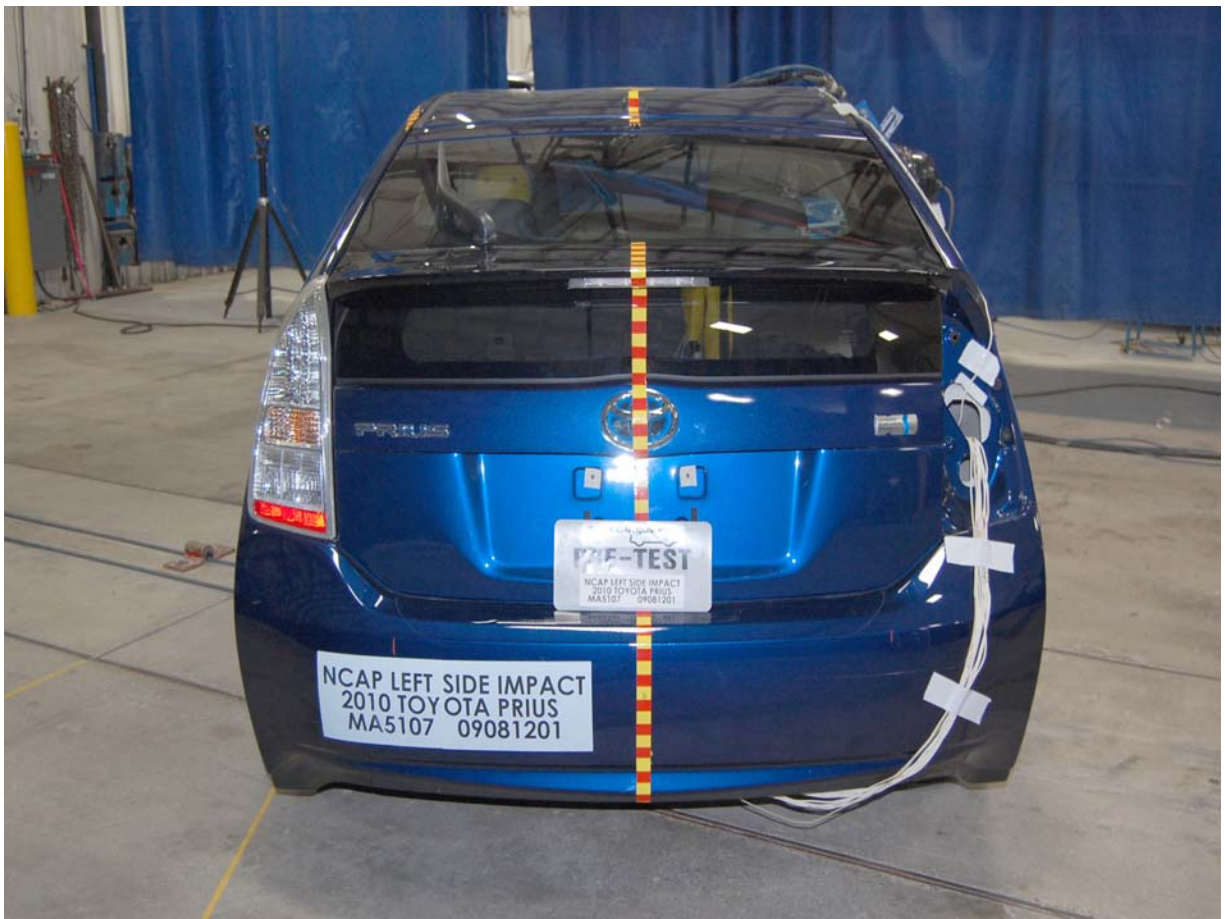
Post-Test Left Side View



Pre-Test Left Rear ¾ View



Post-Test Left Rear ¾ View



Pre-Test Rear View



Post-Test Rear View



Pre-Test Right Rear  $\frac{3}{4}$  View



Post-Test Right Rear  $\frac{3}{4}$  View



Pre-Test Right Side View



Post-Test Right Side View



Pre-Test Right Front  $\frac{3}{4}$  View



Post-Test Right Front  $\frac{3}{4}$  View



Pre-Test Left Impact Point



Post-Test Left Impact Point



Post-Test Front  $\frac{3}{4}$  View of Left Side Doors



Pre-Test Rear  $\frac{3}{4}$  View of Left Side Doors



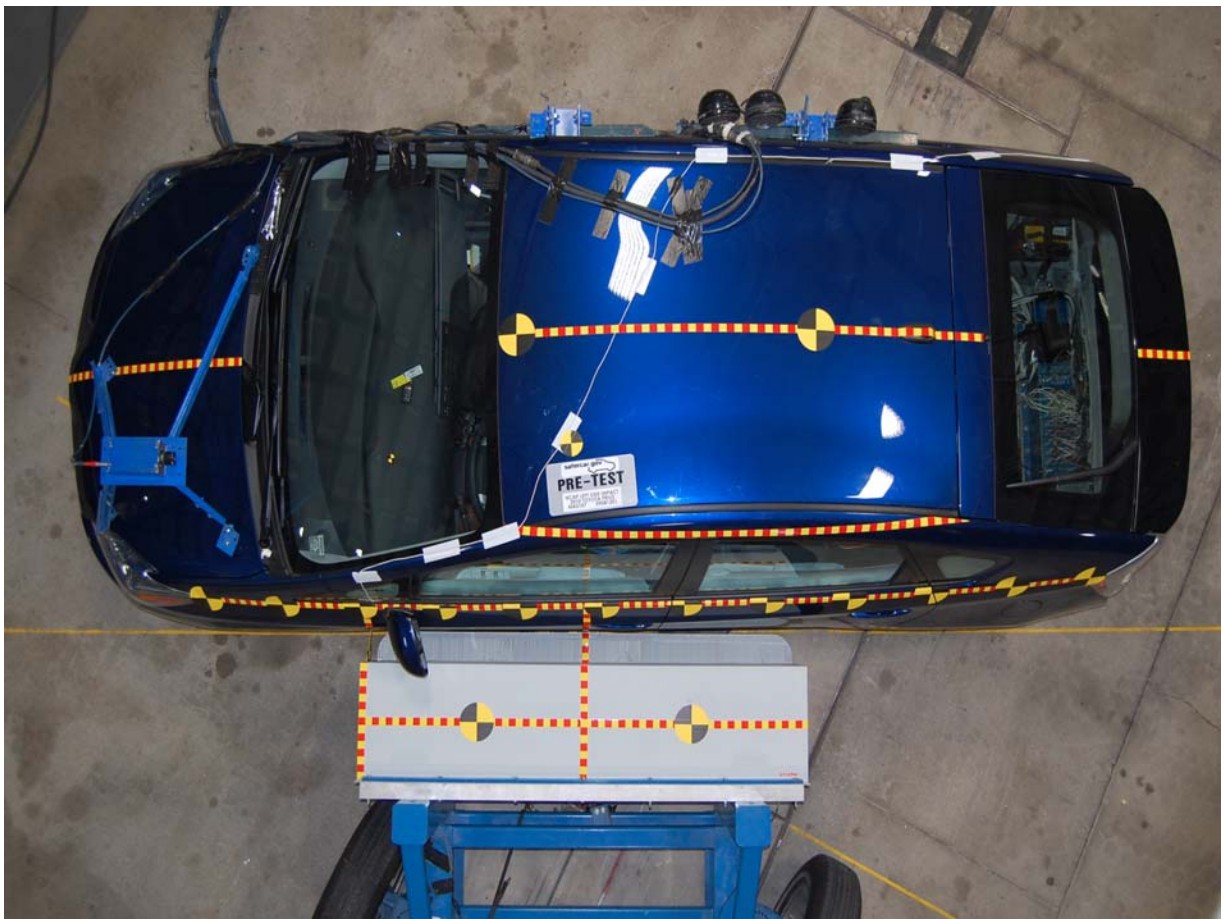
Post-Test Rear  $\frac{3}{4}$  View of Left Side Doors



Pre-Test Left Side Impact Close-up



Post-Test Left Side Impact Close-up



Pre-Test Overhead View



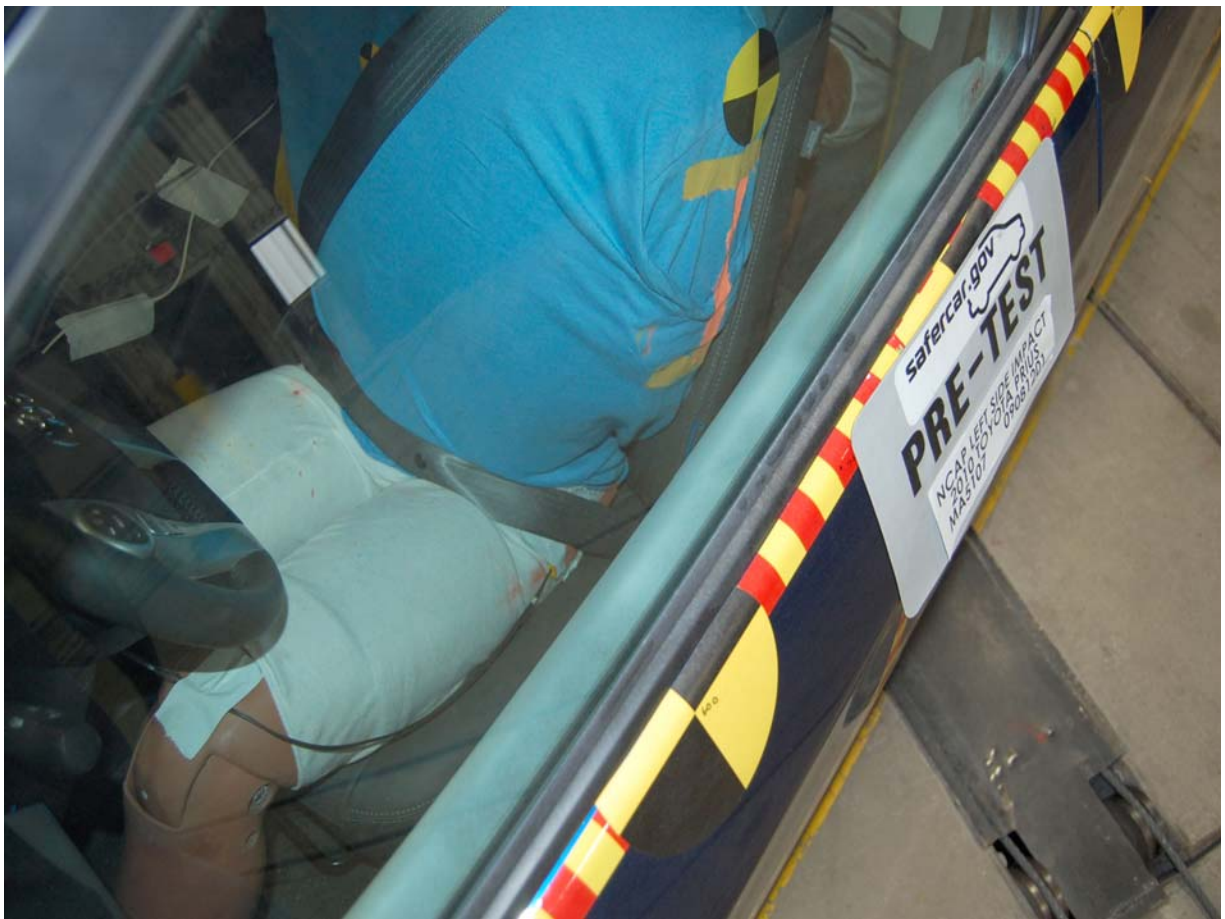
Post-Test Overhead View



Pre-Test Overhead Close-up View



Pre-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Clearance From Door



Post-Test Driver Dummy Clearance From Door



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy Right Side View



Post-Test Driver Dummy Right Side View



Pre-Test Passenger Dummy (Door Open)



Pre-Test Passenger Dummy Clearance From Door



Post-Test Passenger Dummy Clearance From Door



Pre-Test Passenger Dummy (Through Window)



Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy Right Side View



Post-Test Passenger Dummy Right Side View



Pre-Test Front View of Deformable Barrier



Post-Test Front View of Deformable Barrier



Pre-Test Right Side View of Deformable Barrier



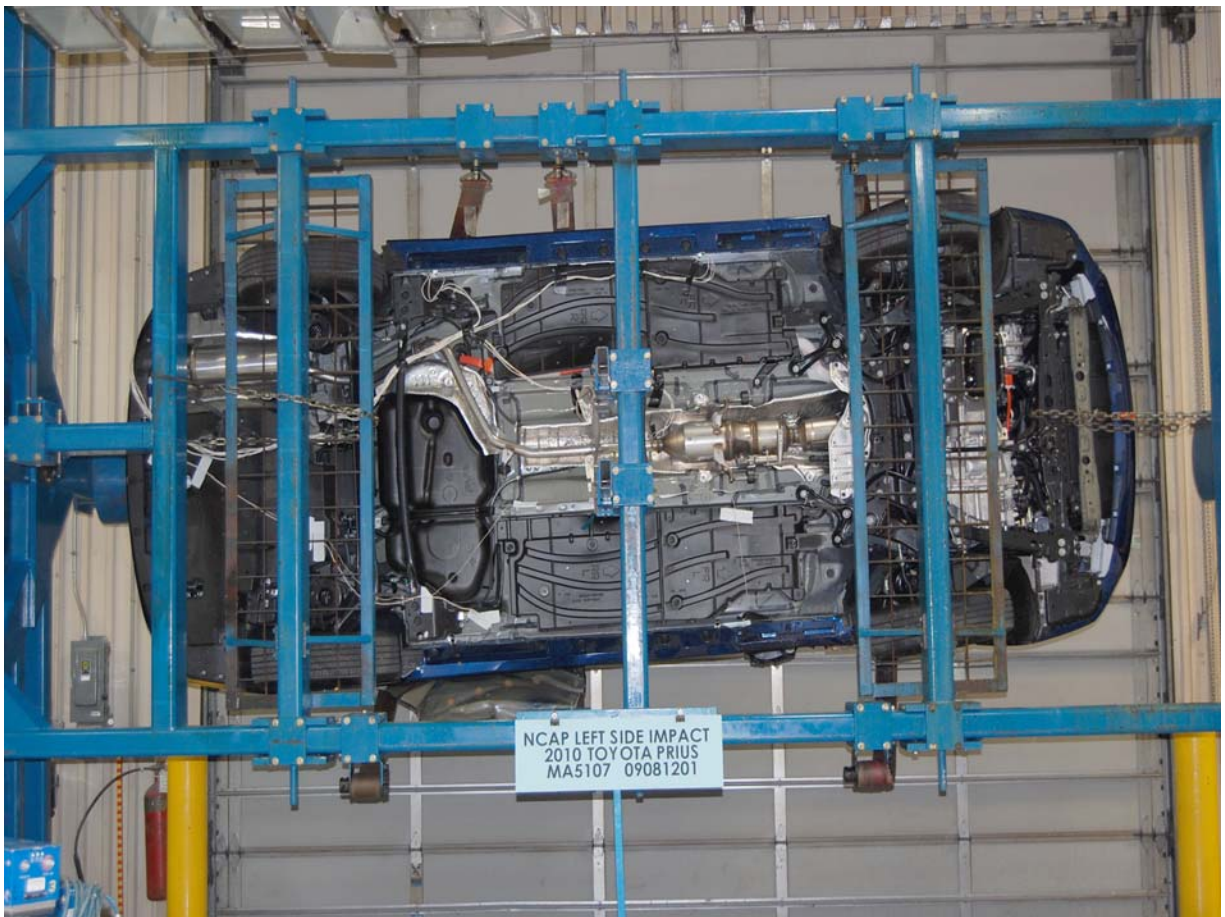
Post-Test Right Side View of Deformable Barrier



Pre-Test Left Side View of Deformable Barrier



Post-Test Left Side View of Deformable Barrier



Vehicle on Rollover Device (90 Degrees)



Vehicle on Rollover Device (180 Degrees)



Vehicle on Rollover Device (270 Degrees)



Vehicle on Rollover Device (360 Degrees)



Vehicle Impact



Post-Test Driver Dummy Head Contact View



Post-Test Driver Dummy Upper Torso Contact



Post-Test Driver Dummy Lower Torso Contact



Post-Test Driver Dummy Contact



Post-Test Passenger Dummy Head Contact View



Post-Test Passenger Dummy Torso Contact



Post-Test Passenger Dummy Contact

**APPENDIX B**  
**SID/HIII RESPONSE DATA TRACES**

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**The following dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.dot.gov](http://www.nhtsa.dot.gov)**

Driver Head X Primary

Driver Head Y Primary

Driver Head Z Primary

Driver Head X Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force X

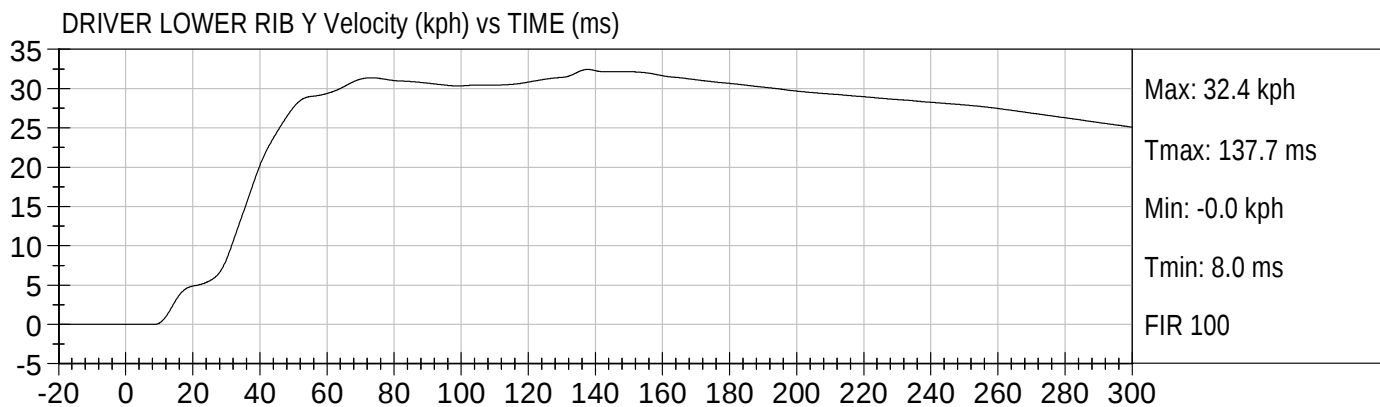
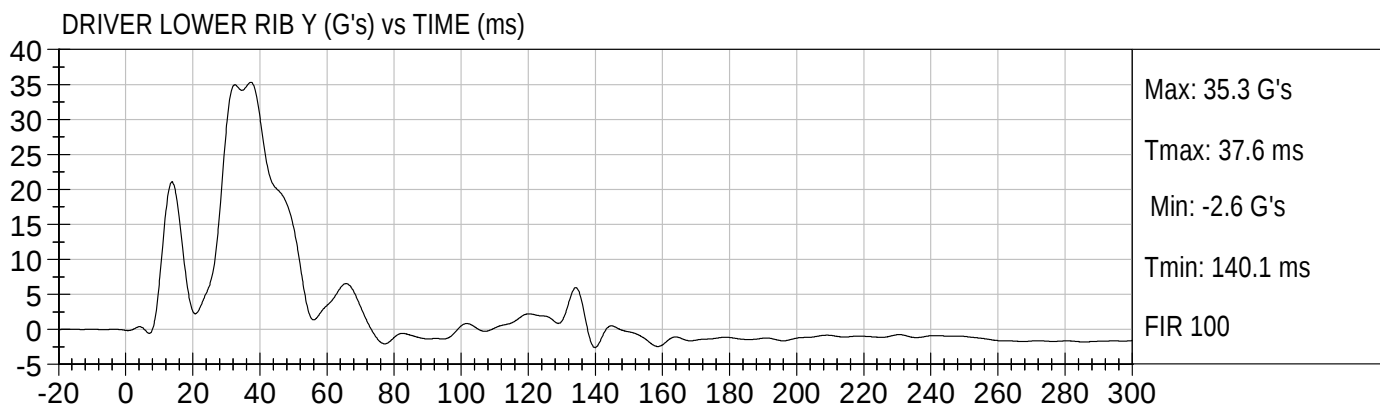
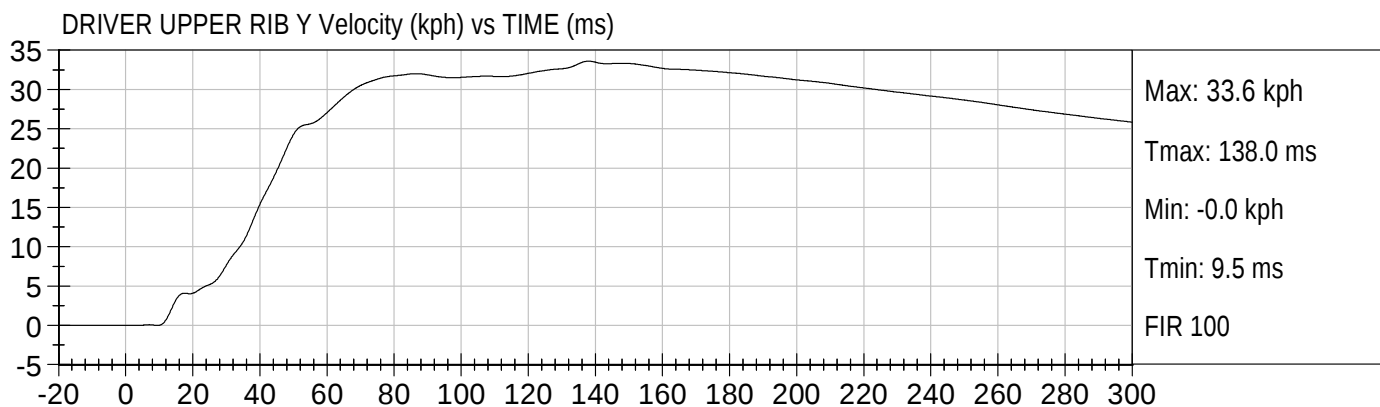
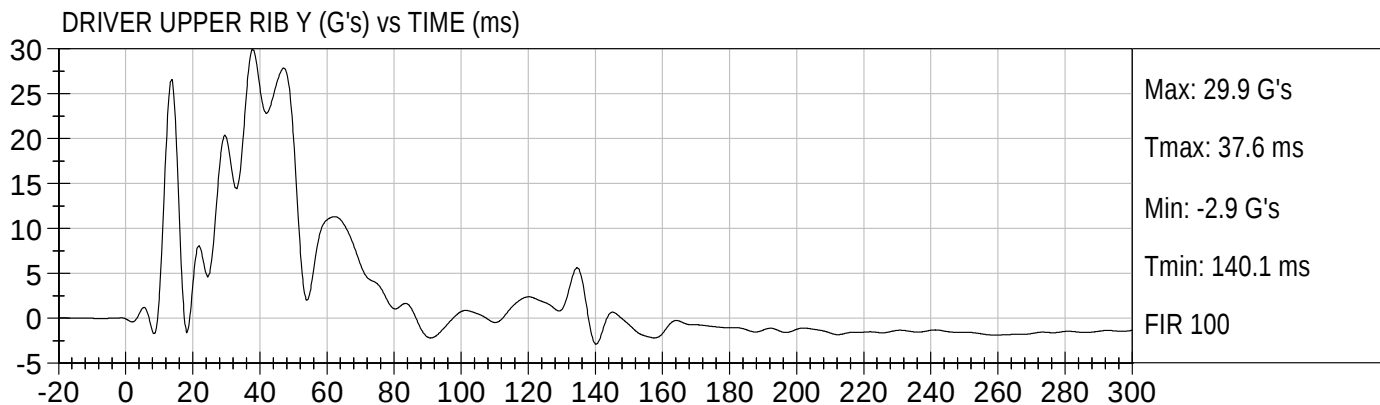
Driver Upper Neck Force Y

Driver Upper Neck Force Z

Driver Upper Neck Moment X

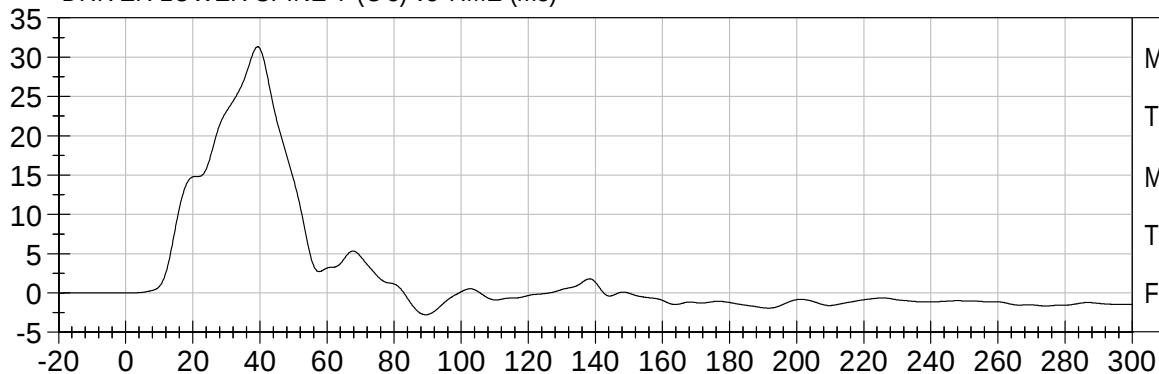
Driver Upper Neck Moment Y  
Driver Upper Neck Moment Z  
Driver Upper Rib Redundant Y  
Driver Lower Rib Redundant Y  
Driver Lower Spine Redundant Y  
Driver Pelvis Redundant Y  
Driver Thorax Contact  
Driver Pelvis Contact  
Passenger Head X Primary  
Passenger Head Y Primary  
Passenger Head Z Primary  
Passenger Head X Redundant  
Passenger Head Y Redundant  
Passenger Head Z Redundant  
Passenger Upper Neck Force X  
Passenger Upper Neck Force Y  
Passenger Upper Neck Force Z  
Passenger Upper Neck Moment X  
Passenger Upper Neck Moment Y  
Passenger Upper Neck Moment Z  
Passenger Upper Rib Redundant Y  
Passenger Lower Rib Redundant Y  
Passenger Lower Spine Redundant Y  
Passenger Pelvis Redundant Y  
Passenger Thorax Contact  
Passenger Pelvis Contact  
Vehicle Right Sill at Front Seat X  
Vehicle Right Sill at Front Seat Y  
Vehicle Right Sill at Front Seat Z  
Vehicle Right Sill at Rear Seat X  
Vehicle Right Sill at Rear Seat Y  
Vehicle Right Sill at Rear Seat Z

Vehicle Rear Floor Above Axle X  
Vehicle Rear Floor Above Axle Y  
Vehicle Rear Floor Above Axle Z  
Vehicle Left Sill at Rear Door Y  
Vehicle Left Sill at Front Door Y  
Vehicle Right Rear Occupant Compartment  
Vehicle B-Post Lower Y  
Vehicle B-Post Middle Y  
Vehicle A-Post Lower Y  
Vehicle A-Post Middle Y  
Vehicle Left Front Seat Track  
Vehicle CG X  
Vehicle CG Y  
Vehicle CG Z



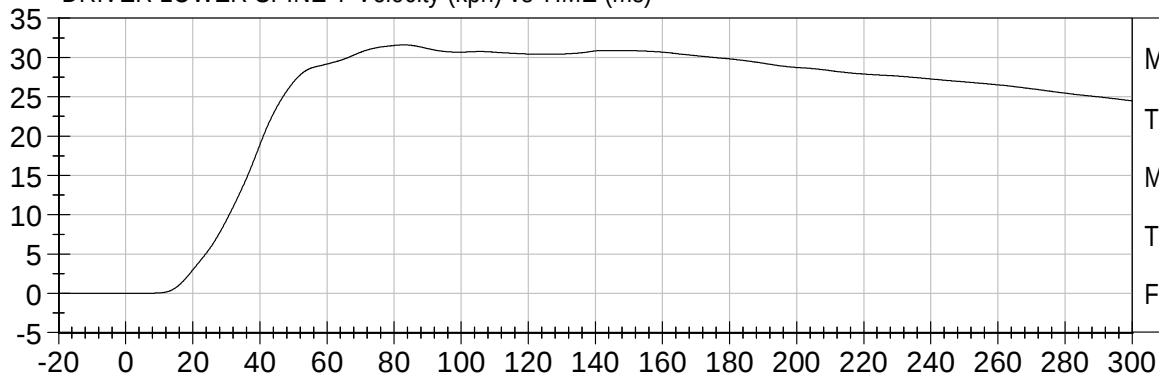


DRIVER LOWER SPINE Y (G's) vs TIME (ms)



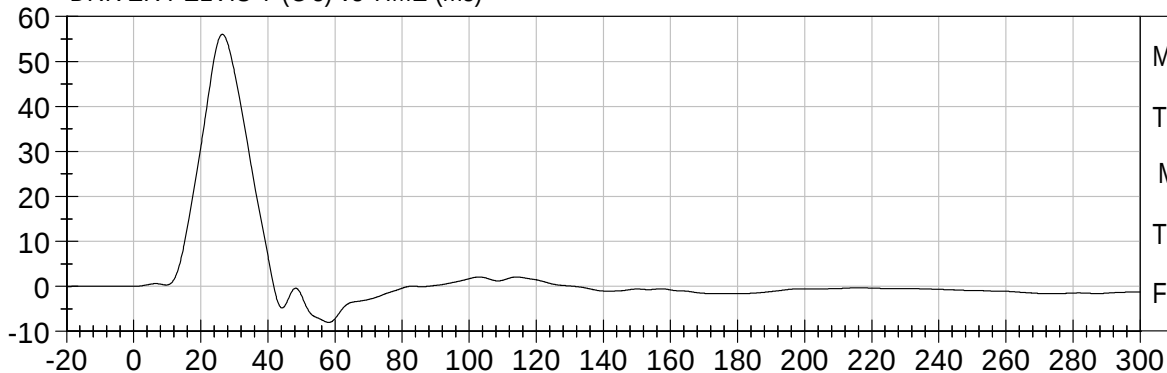
Max: 31.3 G's  
Tmax: 39.5 ms  
Min: -2.8 G's  
Tmin: 89.5 ms  
FIR 100

DRIVER LOWER SPINE Y Velocity (kph) vs TIME (ms)



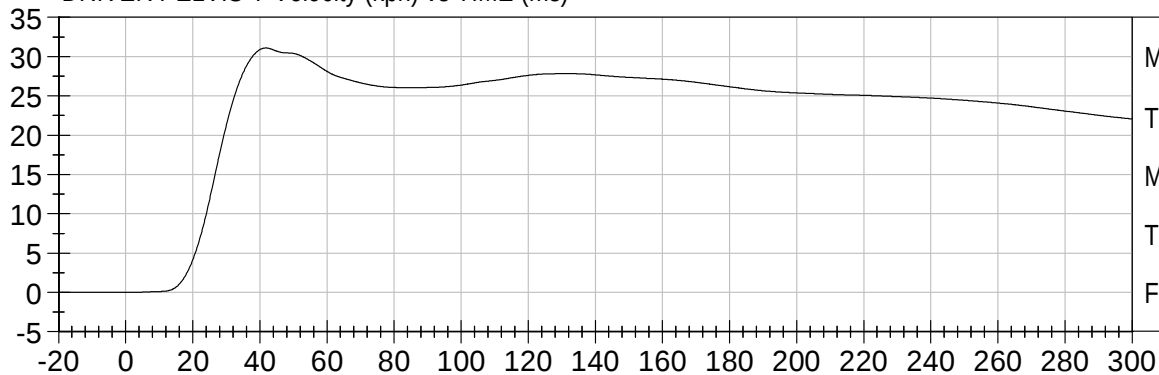
Max: 31.6 kph  
Tmax: 82.9 ms  
Min: -0.0 kph  
Tmin: 1.6 ms  
FIR 100

DRIVER PELVIS Y (G's) vs TIME (ms)

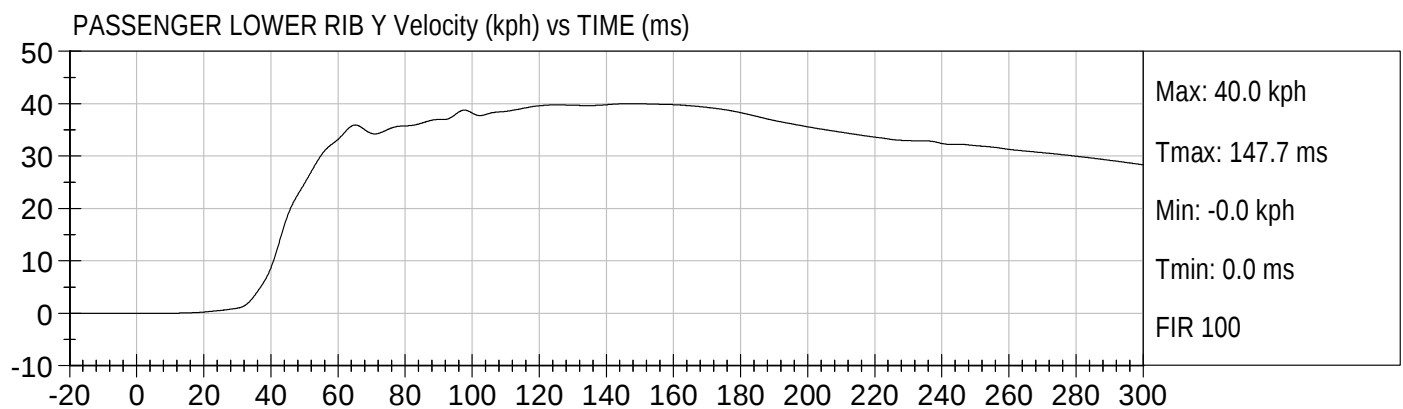
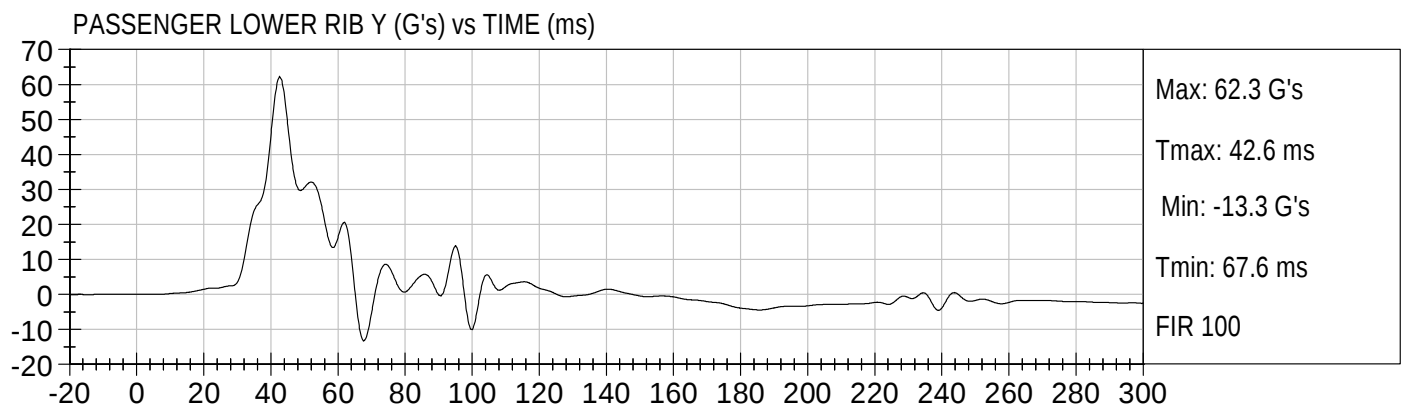
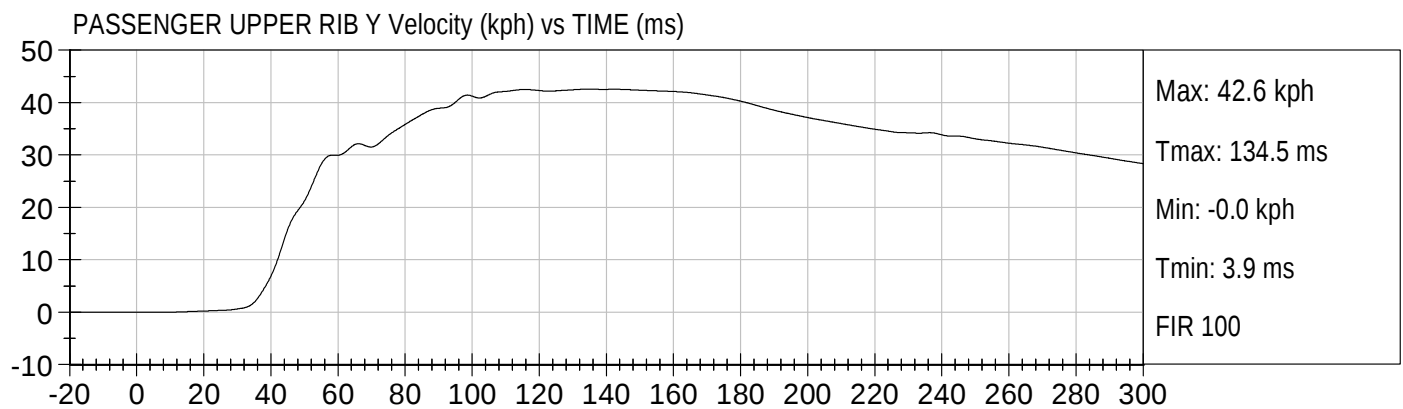
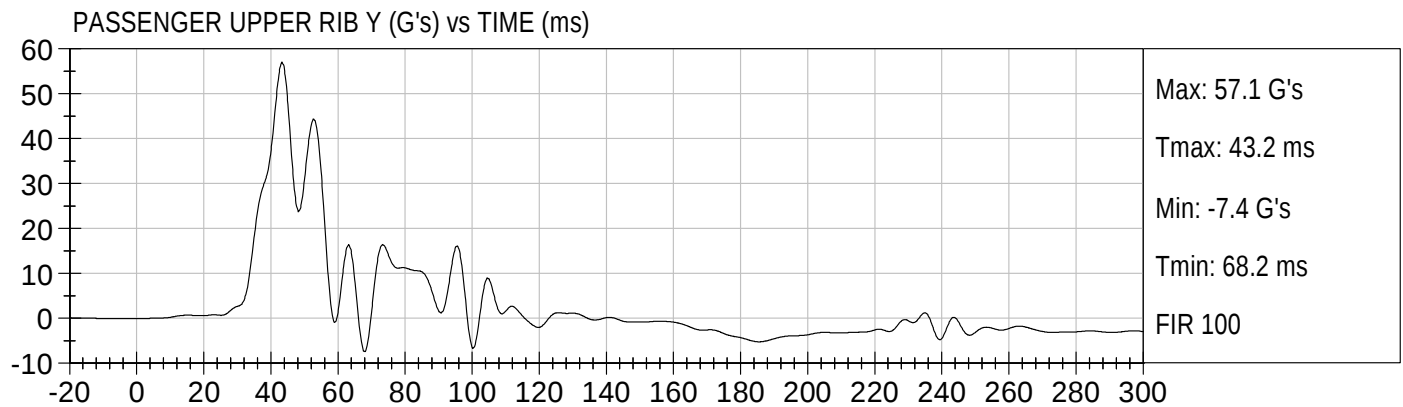


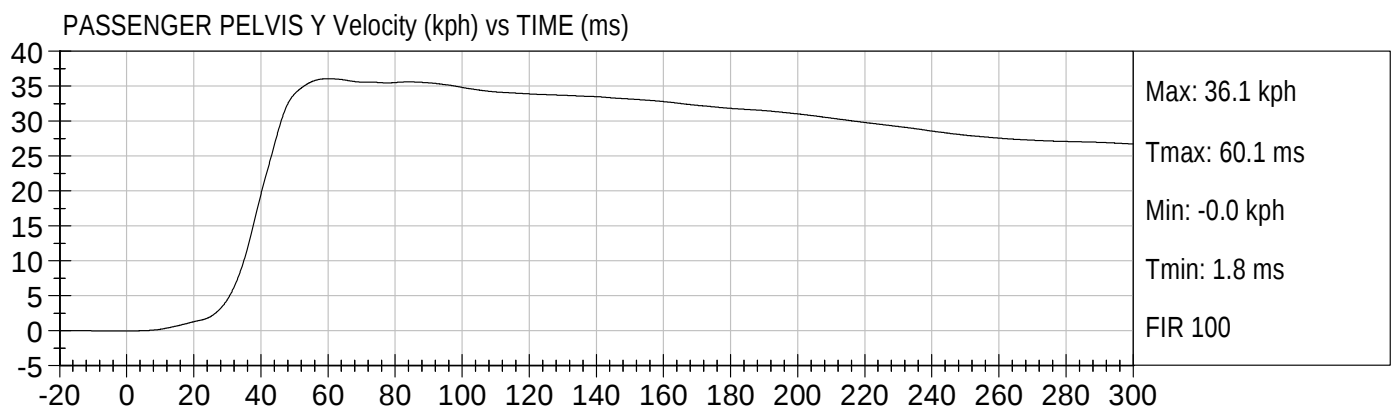
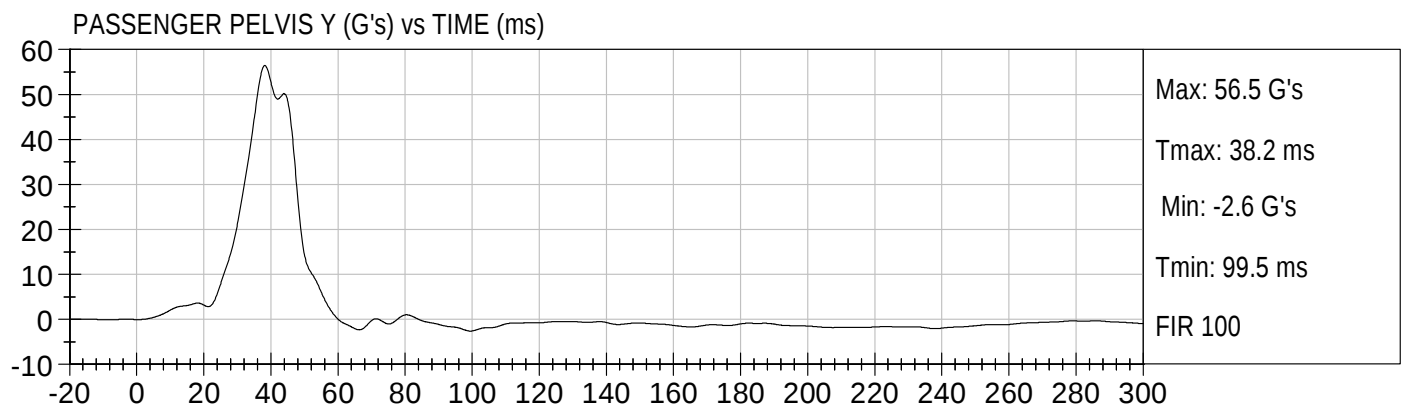
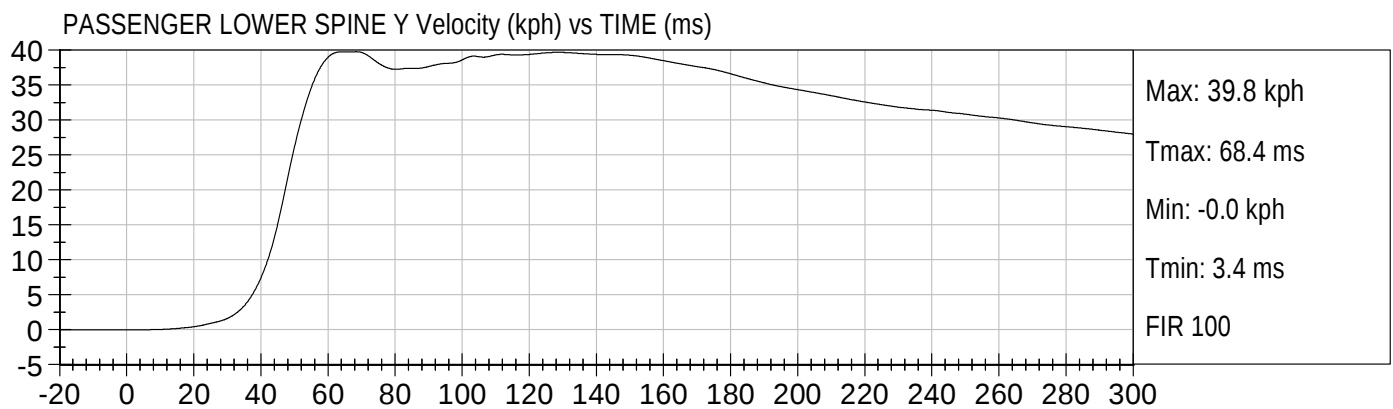
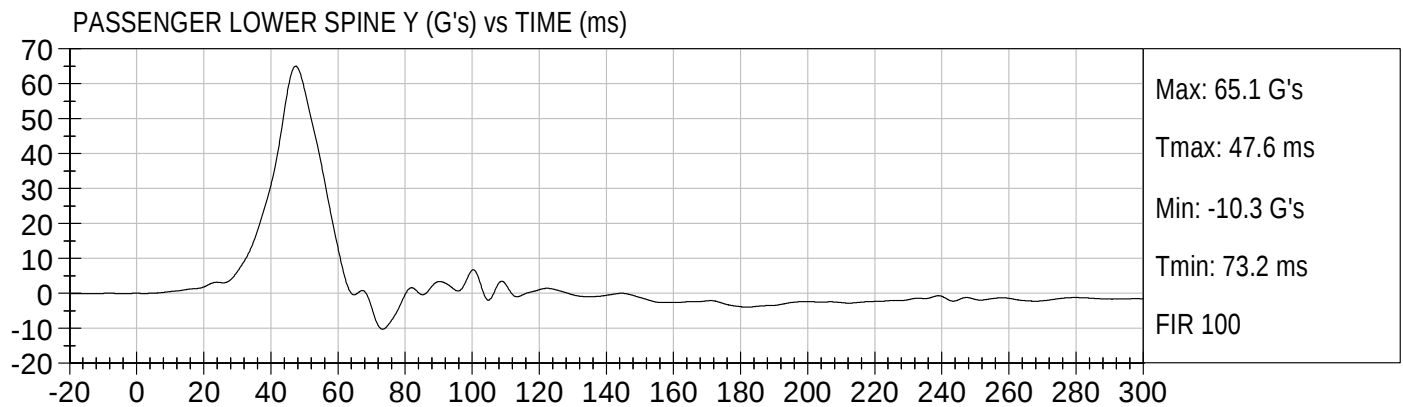
Max: 56.1 G's  
Tmax: 26.4 ms  
Min: -8.0 G's  
Tmin: 58.2 ms  
FIR 100

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)



Max: 31.1 kph  
Tmax: 41.8 ms  
Min: -0.0 kph  
Tmin: 0.0 ms  
FIR 100





**APPENDIX C**  
**DUMMY CALIBRATION DATA**

CERTIFICATION DATA

Dummy Serial Number: 271

## Calibration Test Results Summary

Dummy Serial Number: 271

### Pre-Test Calibration

|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| External Dimensions:        | The dummy passed all external dimension requirements. |
| Head Drop Test:             | The head passed all drop test requirements.           |
| Neck Pendulum Test:         | The neck passed all pendulum test requirements.       |
| Thorax Impact Test:         | The thorax passed all impact test requirements.       |
| Pelvic Impact Test:         | The pelvis passed all impact test requirements.       |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test:        | The lumbar passed all flexion test requirements.      |

**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**External Measurements**

**ATD Serial No:** 271

**Test I.D:** D09146

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| SH - Seated Height           | mm    | 889 - 909     | 905    | Pass      |
| RH - Rib Height              | mm    | 501 - 521     | 502    | Pass      |
| HP - Hip Pivot Height        | mm    | 99 ref.       | 99     | Pass      |
| RD - Rib from Back Line      | mm    | 229 - 241     | 239    | Pass      |
| KV - Knee Pivot to Back Line | mm    | 511 - 526     | 526    | Pass      |
| SW - Knee Pivot to Floor     | mm    | 490 - 505     | 497    | Pass      |
| HW - Hip Width               | mm    | 356 - 391     | 371    | Pass      |
| Overall Test Results         |       |               | Pass   |           |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

6/11/2009  
Test Date

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

**ATD Serial No:** 271

**Test I.D:** D091461

| Tested Parameter              | Units | Specification | Result | Pass/Fail |
|-------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature        | deg C | 18.9 to 25.5  | 21.9   | Pass      |
| Laboratory Relative Humidity  | %     | 10 to 70      | 44     | Pass      |
| Peak Resultant Acceleration   | G's   | 120 to 150    | 140    | Pass      |
| Is Resultant Curve Unimodal?  | N/A   | 15% of peak   | Yes    | Pass      |
| Peak Longitudnal Acceleration | G's   | +/- 15        | -6.4   | Pass      |
| Overall Test Results          |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

6/11/09  
Test Date



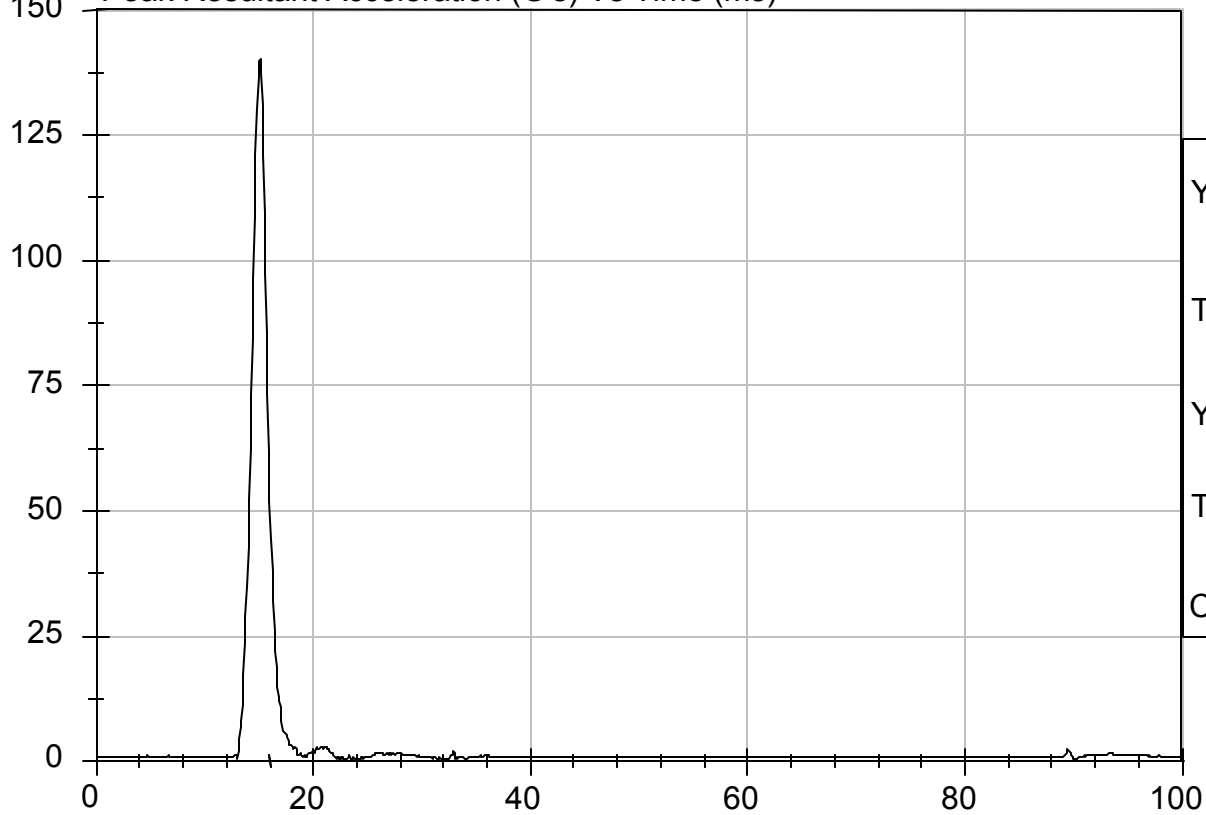
Test Description: Head Drop

Test Date: 6/11/09

Component: D091461

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (ms)



YMax: 140.3 G

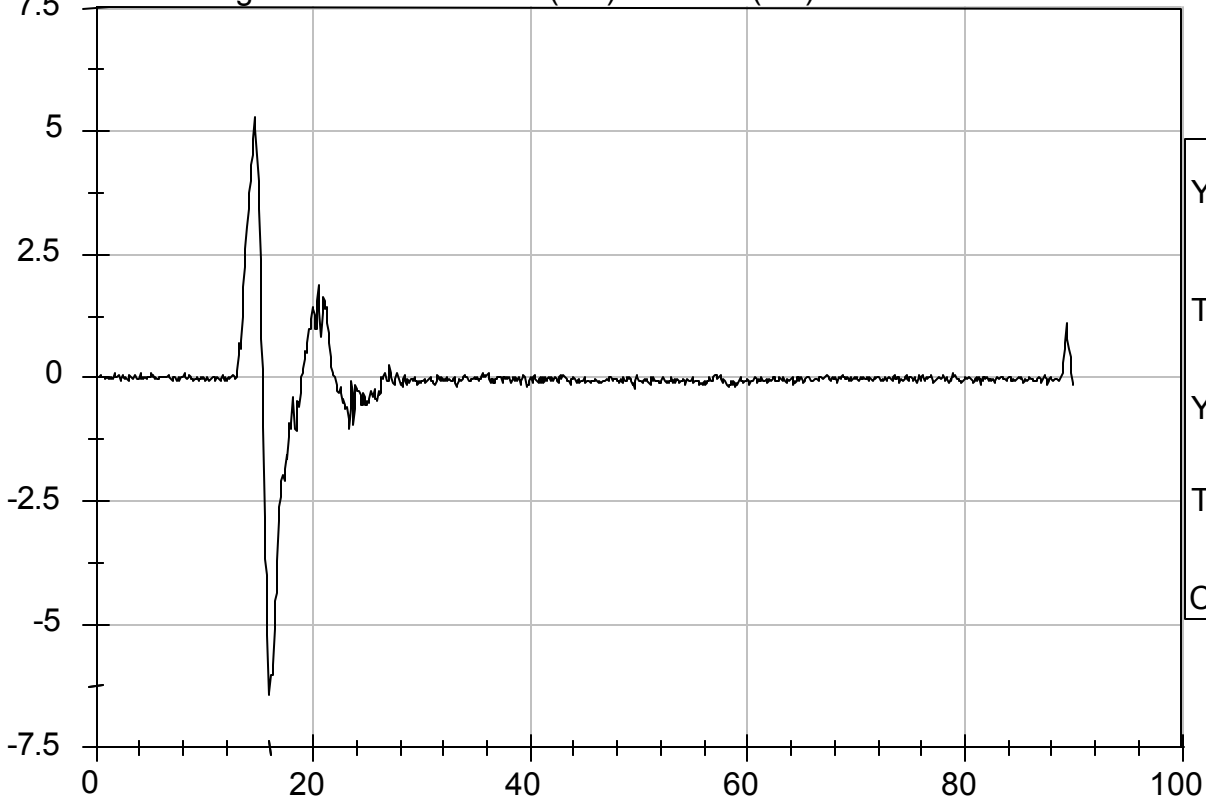
Tmax: 15.1 ms

YMin: 0.3 G

Tmin: 23.5 ms

CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (ms)



YMax: 5.3 G

Tmax: 14.6 ms

YMin: -6.4 G

Tmin: 15.9 ms

CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

ATD Serial No: 271

Test I.D: D091462

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.9   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 45     | Pass      |
| Probe Velocity               | m/s   | 4.22 - 4.31   | 4.30   | Pass      |
| Upper Rib                    | G's   | 37 - 46       | 39     | Pass      |
| Lower Rib                    | G's   | 37 - 46       | 38     | Pass      |
| Lower Spine                  | G's   | 15 - 22       | 18     | Pass      |
| Overall Test Results         |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

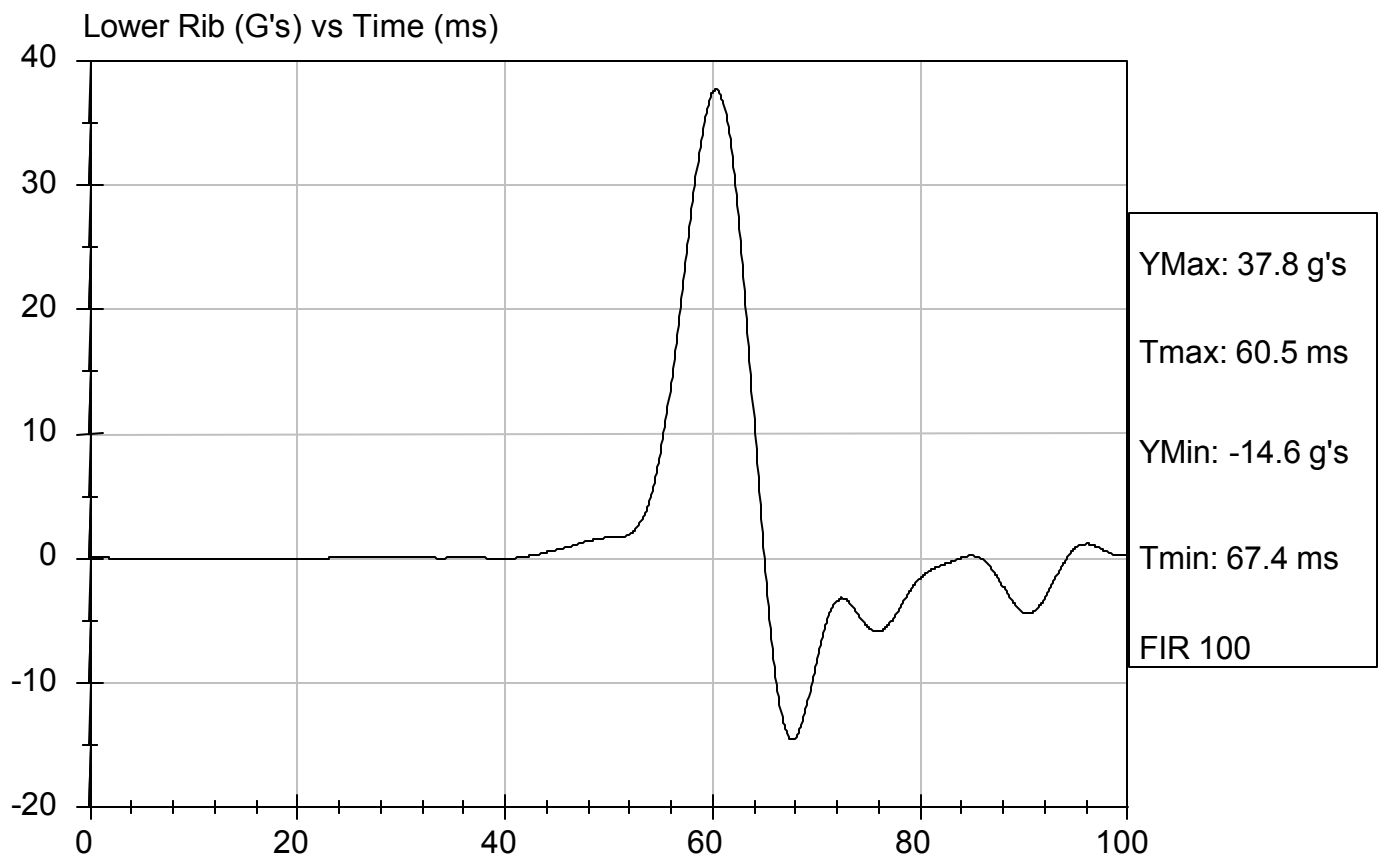
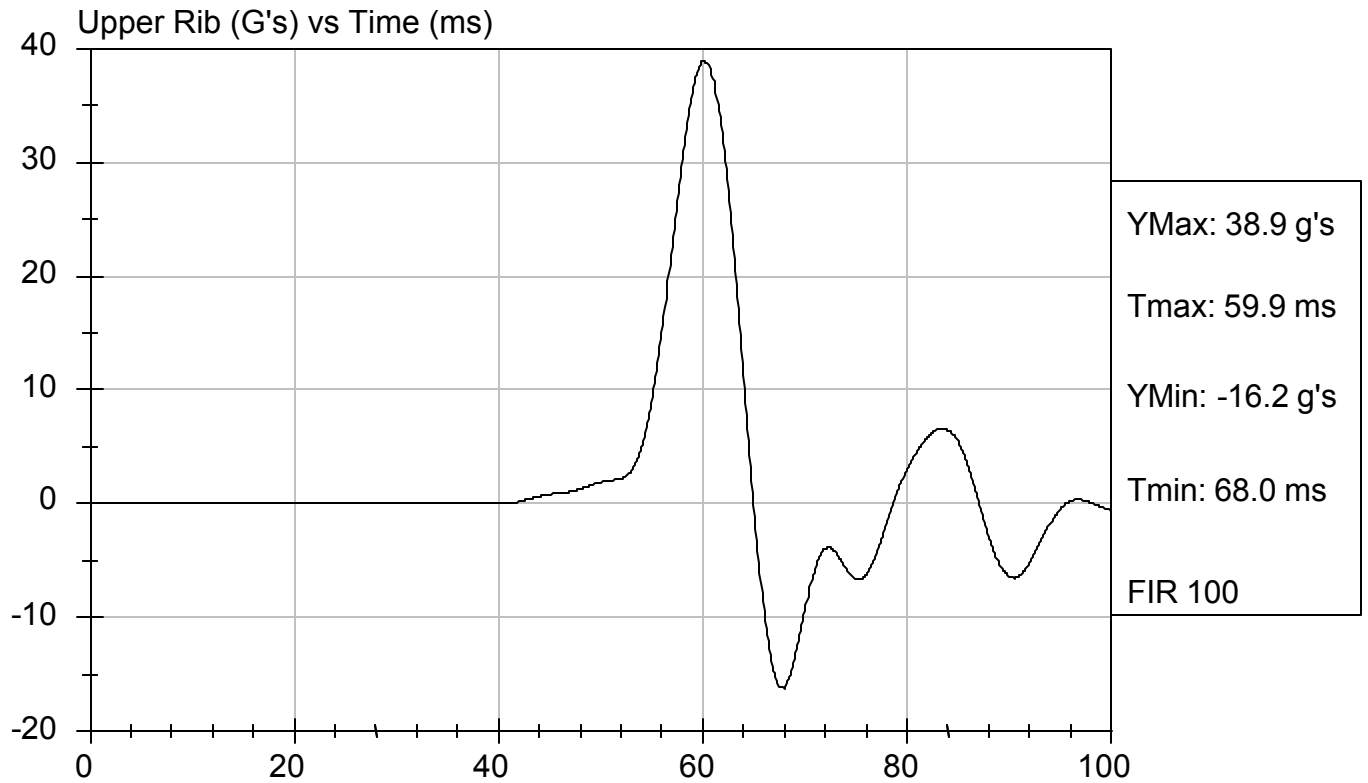
David Winkelbauer  
Approved By

6/11/09  
Test Date



Test Desc: Thorax Impact  
Component ID: D091462

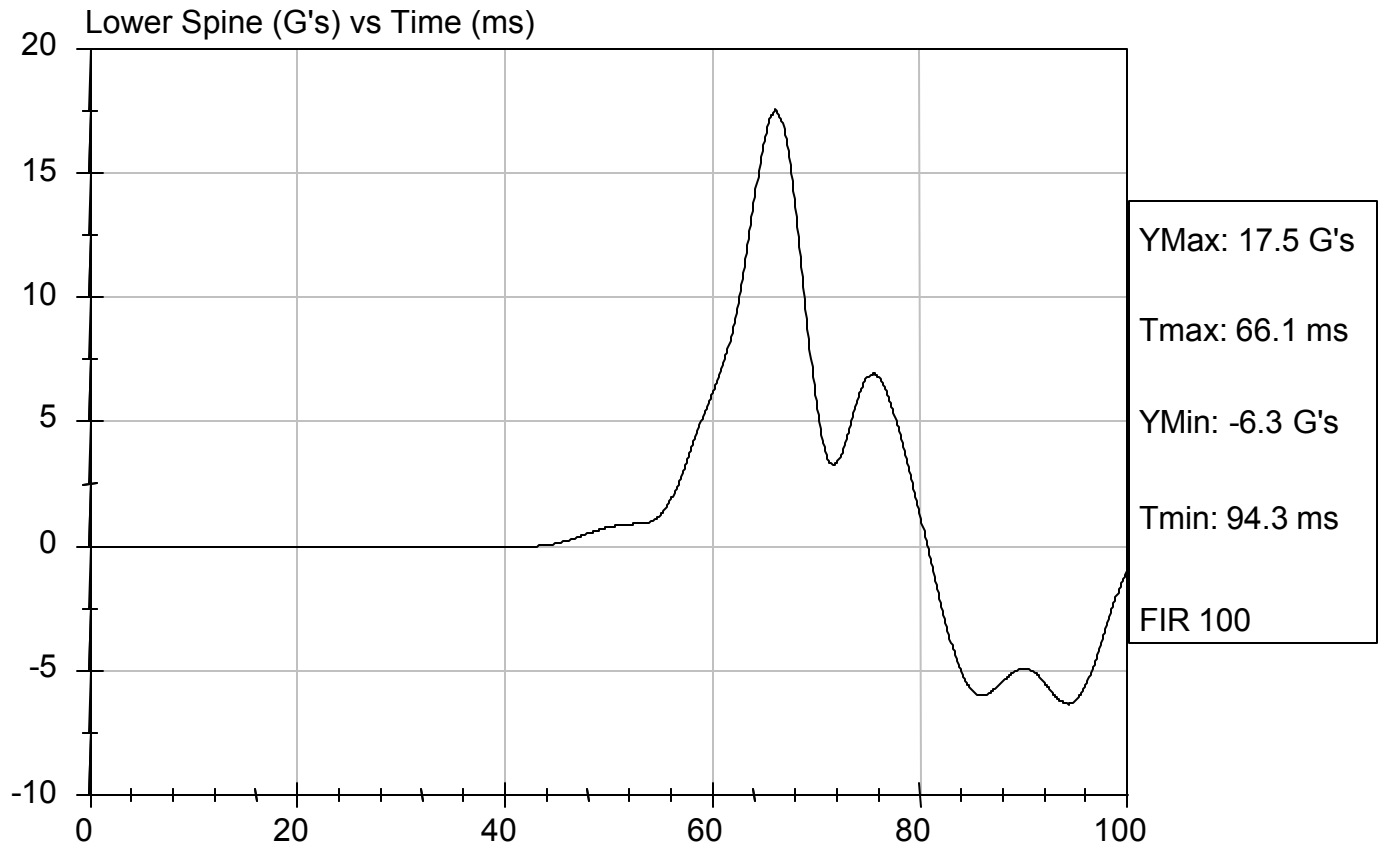
Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec





Test Desc: Thorax Impact  
Component ID: D091462

Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

ATD Serial No: 271

Test I.D: D091463

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 to 25.5  | 21.9   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 45     | Pass      |
| Probe Velocity               | m/s   | 4.27 - 4.33   | 4.30   | Pass      |
| Pelvis Acceleration          | G's   | 40 - 60       | 46     | Pass      |
| Overall Test Results         |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

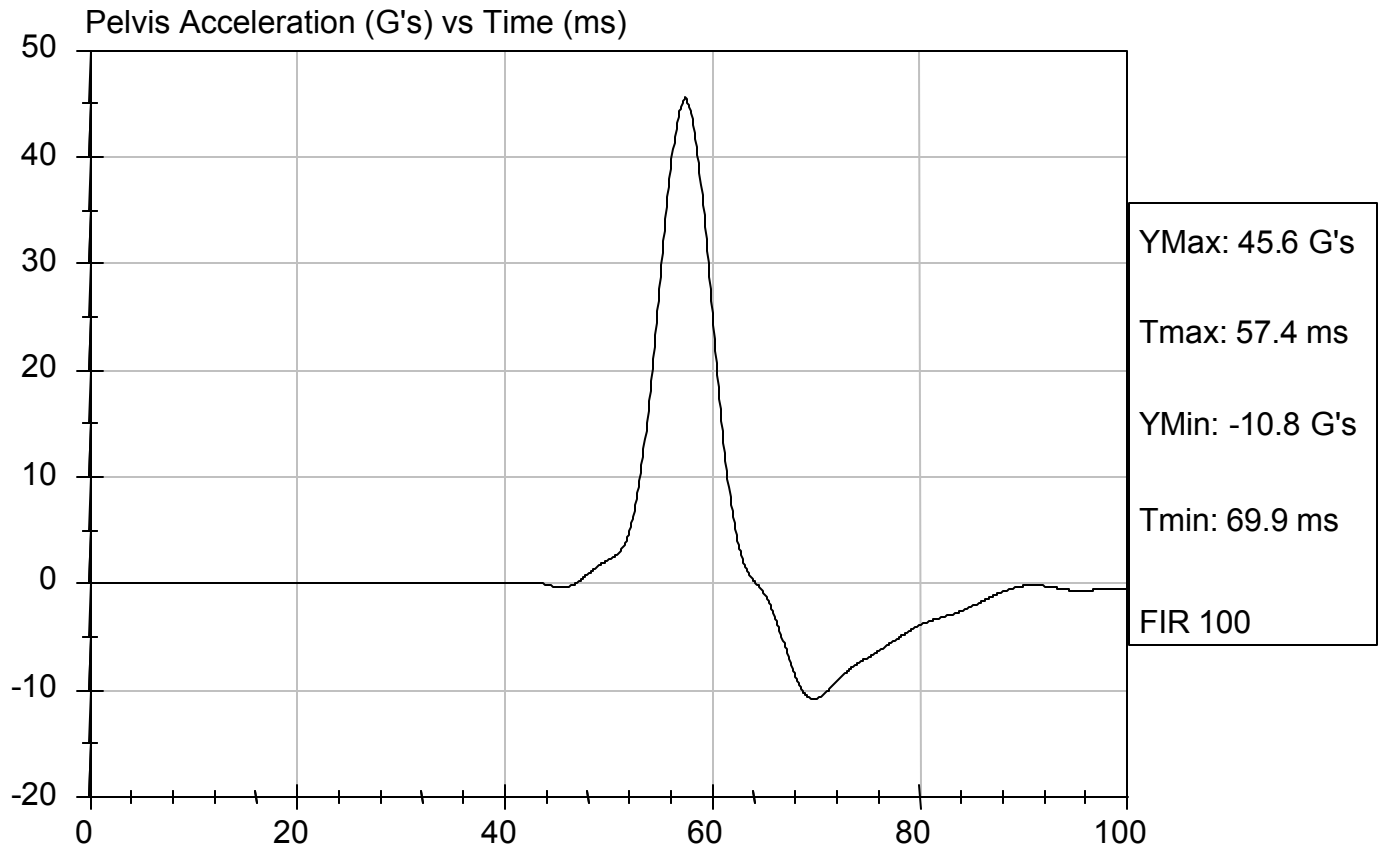
David Winkelbauer  
Approved By

6/11/09  
Test Date



Test Desc: Pelvis Impact  
Component ID: D091463

Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

ATD Serial No: 271

Test I.D: D091464

| Tested Parameter             | Units | Specification | Result               | Pass/Fail |
|------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.8                 | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44                   | Pass      |
| Force At 12.7 mm             | N     | 104 -162      | 142                  | Pass      |
| Force At 19 mm               | N     | 163 - 222     | 197                  | Pass      |
| Force At 25.4 mm             | N     | 222 - 280     | 266                  | Pass      |
| Force At 33 mm               | N     | 325 - 391     | 365                  | Pass      |
|                              |       |               | Overall Test Results | Pass      |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

6/11/09  
Test Date

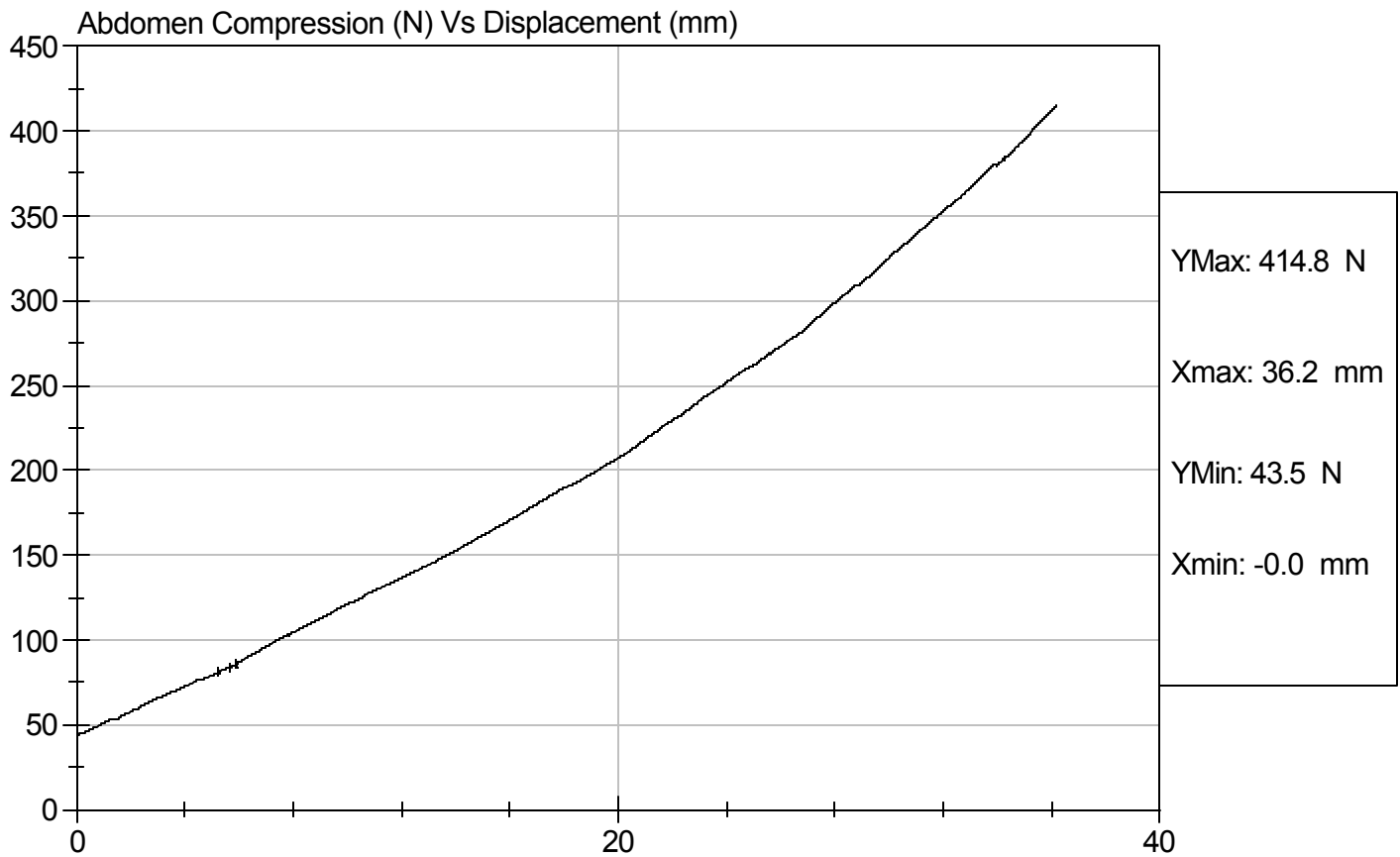


Test Description: Abdomen Compression

Test Date: 6/11/09

Component: D091464

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

ATD Serial No: 271

Test I.D: D091465

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.7   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Force At 0 deg               | N     | 0 - 26.7      | 0      | Pass      |
| Force At 20 deg              | N     | 97.9 - 151.2  | 115.2  | Pass      |
| Force At 30 deg              | N     | 151.2 - 204.6 | 174.8  | Pass      |
| Force At 40 deg              | N     | 204.6 - 258.0 | 235.0  | Pass      |
| Return Angle                 | Deg   | 12 Maximum    | 7      | Pass      |
| Overall Test Results         |       |               | Pass   |           |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

6/11/09  
Test Date

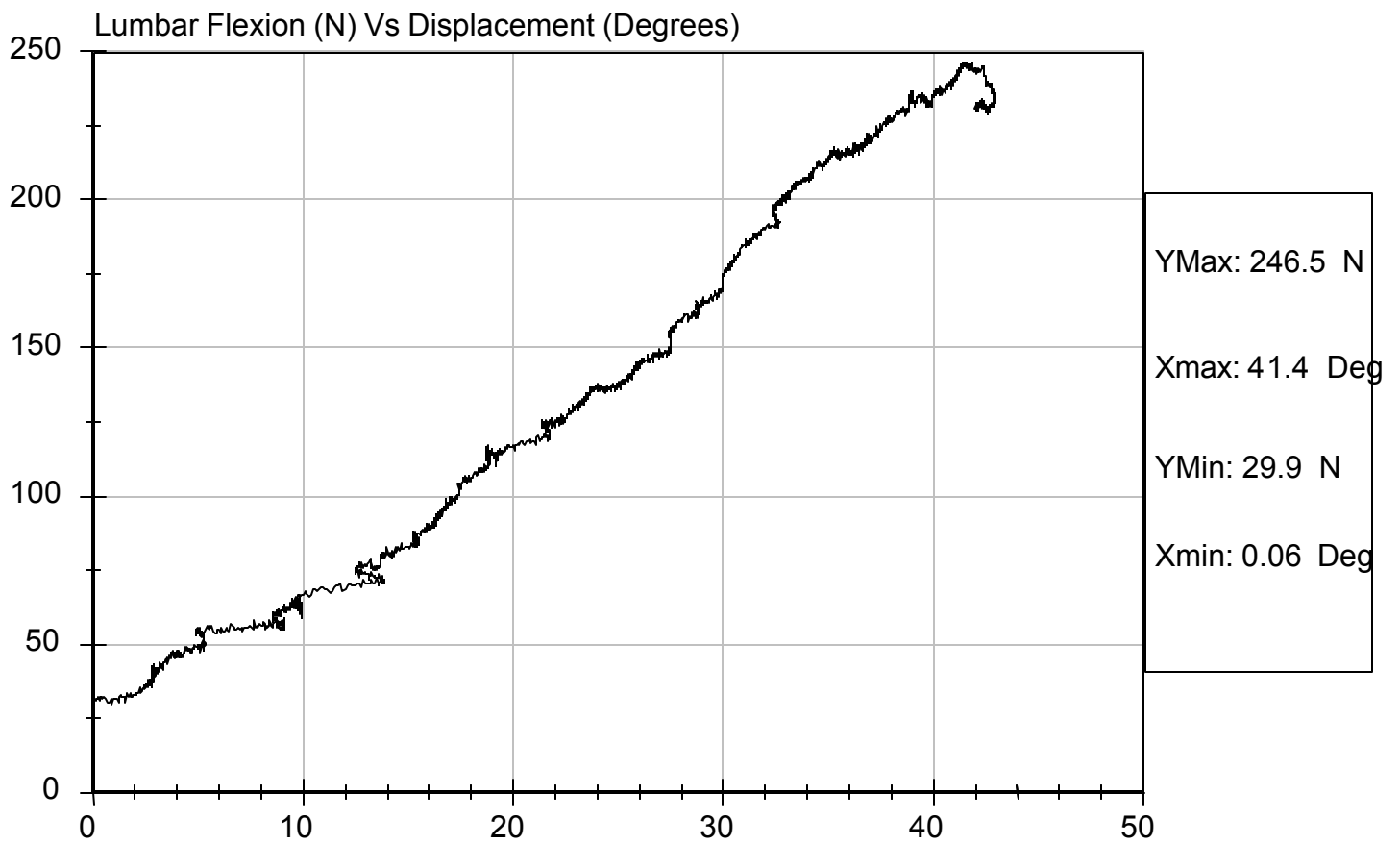


Test Description: Lumbar Flexion

Test Date: 6/11/09

Component: D091465

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 271

**Test I.D:** D091469

| Tested Parameter                        |             | Units | Specification | Result | Pass/Fail |
|-----------------------------------------|-------------|-------|---------------|--------|-----------|
| Laboratory Temperature                  |             | deg C | 20.6 to 22.2  | 21.8   | Pass      |
| Laboratory Relative Humidity            |             | %     | 10 to 70      | 44     | Pass      |
| Impact Velocity                         |             | m/s   | 6.89 to 7.13  | 7.06   | Pass      |
| Pendulum Deceleration                   | 10 ms       | m/s   | 1.96 to 2.55  | 2.38   | Pass      |
|                                         | 20 ms       | m/s   | 4.12 to 5.10  | 4.71   | Pass      |
|                                         | 30 ms       | m/s   | 5.73 to 7.01  | 6.50   | Pass      |
|                                         | 40 to 70 ms | m/s   | 6.27 to 7.64  | 6.75   | Pass      |
| Midsaggital Plane Max Rotation          |             | deg   | 66 to 82      | 71     | Pass      |
| Head Rotation Peak to Zero - Decay Time |             | ms    | 58 to 67      | 60     | Pass      |
| Max. Mx at Occipital Condyles           |             | Nm    | 73 to 88      | 73     | Pass      |
| Mx Peak To Zero - Decay Time            |             | ms    | 49 to 64      | 61     | Pass      |
| Mx Peak to Max. Head Rotation           |             | ms    | 2 to 16       | 13     | Pass      |

Jessica Hall  
Laboratory Technician

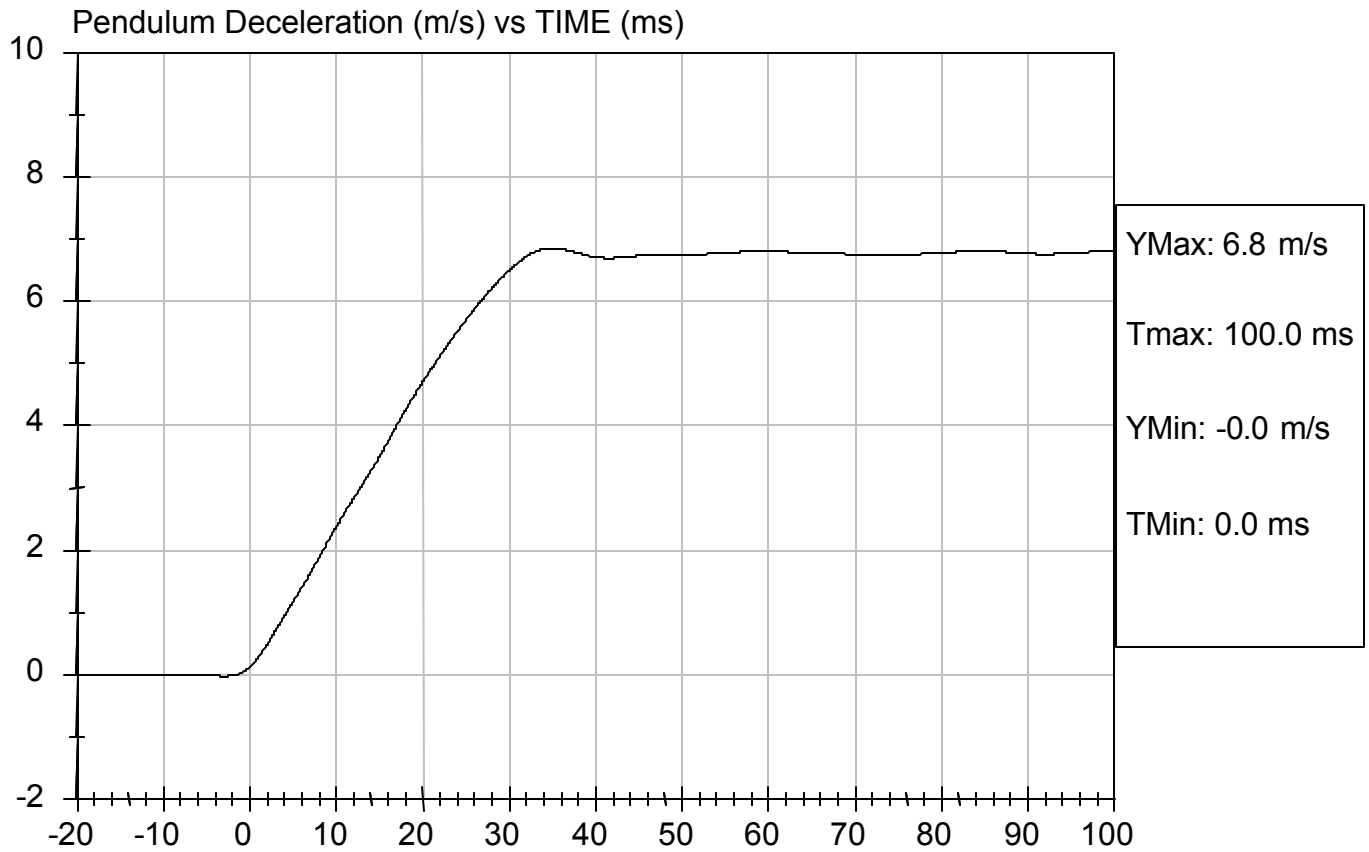
David Winkelbauer  
Approved By

6/11/09  
Test Date



Test Desc: Neck Bending  
Component ID: D091469

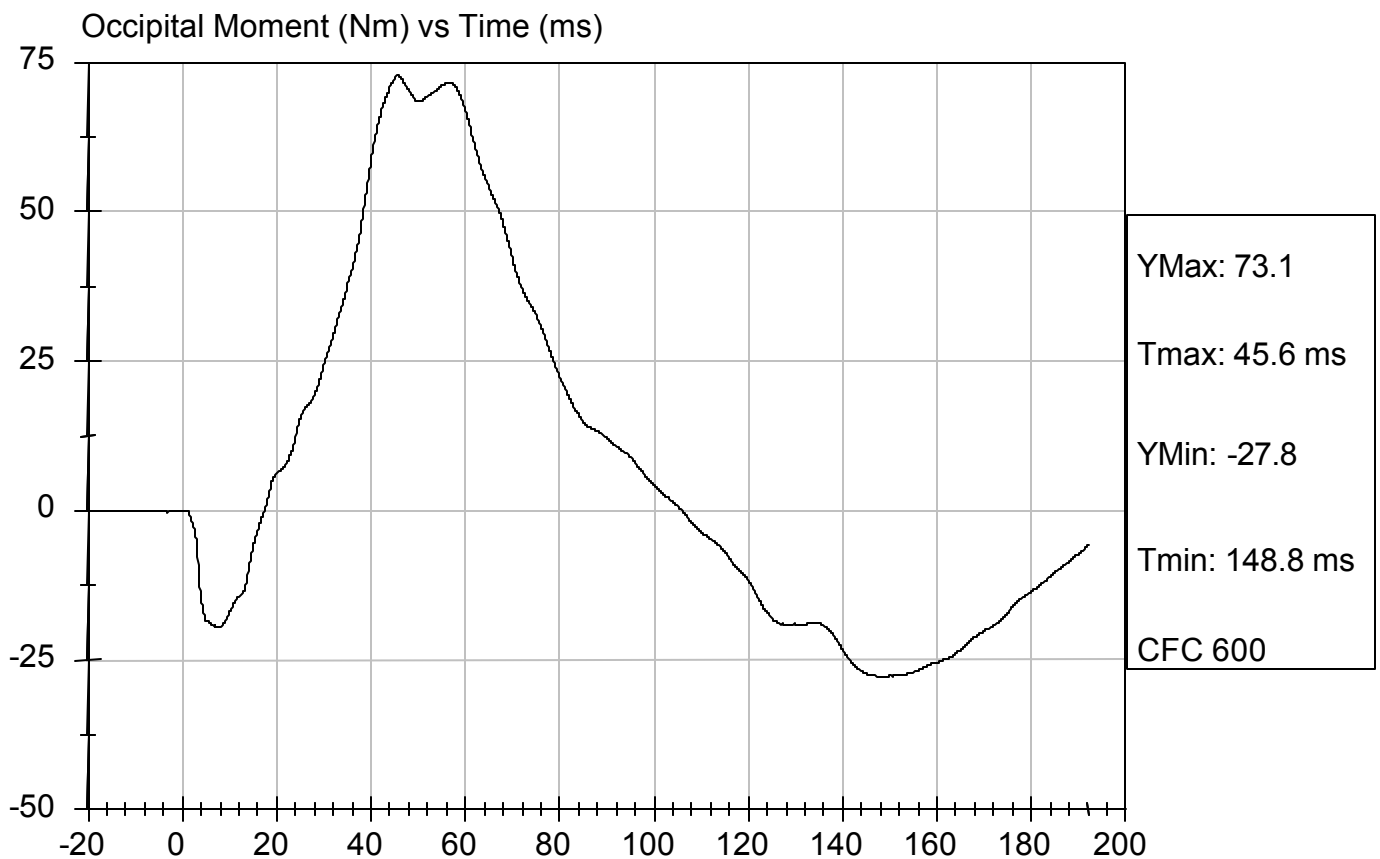
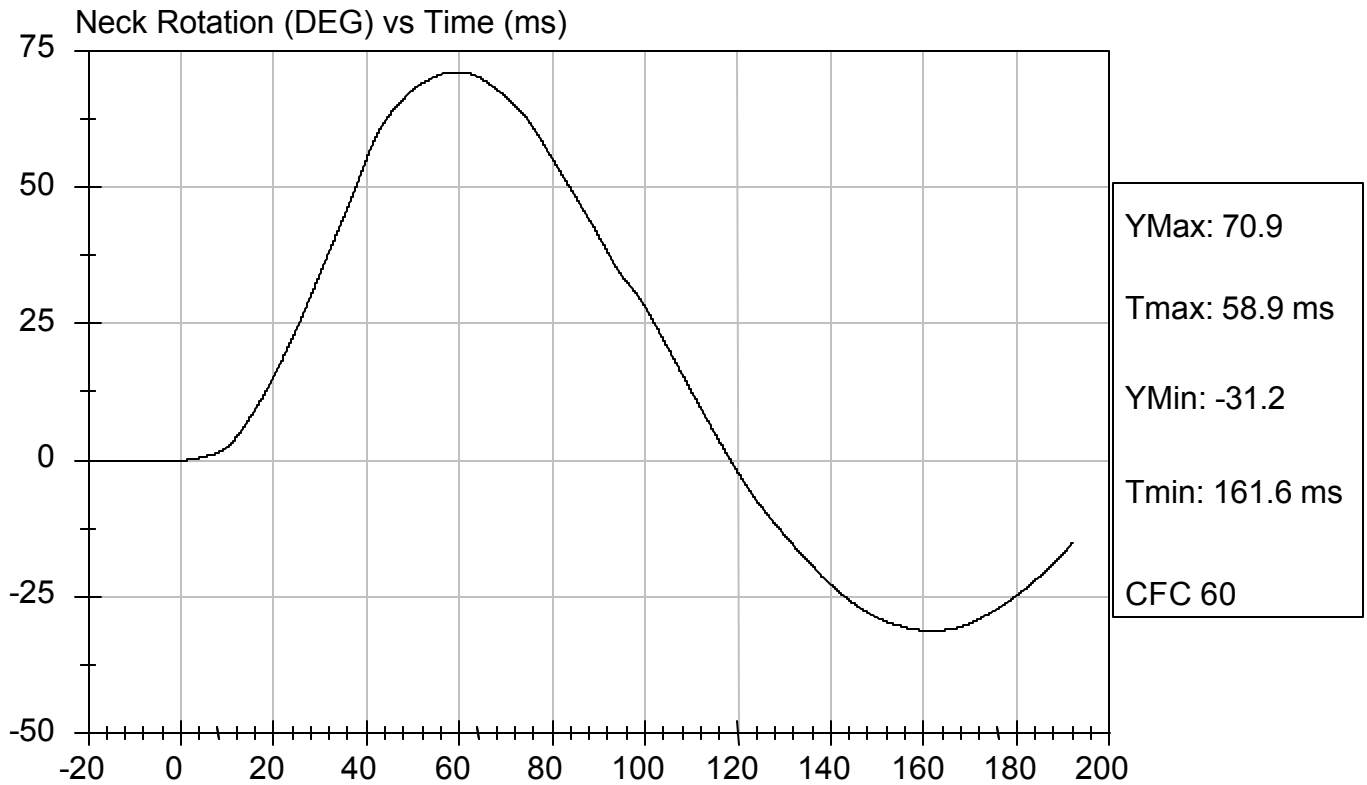
Test Date: 6/11/09  
Speed: 23.15 ft/sec, 7.06 m/sec





Test Desc: Neck Bending  
Component ID: D091469

Test Date: 6/11/09  
Speed: 23.15 ft/sec, 7.06 m/sec



## Calibration Test Results Summary

Dummy Serial Number: 271

### Post-Test Calibration

|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| External Dimensions:        | The dummy passed all external dimension requirements. |
| Head Drop Test:             | The head passed all drop test requirements.           |
| Neck Pendulum Test:         | The neck passed all pendulum test requirements.       |
| Thorax Impact Test:         | The thorax passed all impact test requirements.       |
| Pelvic Impact Test:         | The pelvis passed all impact test requirements.       |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test:        | The lumbar passed all flexion test requirements.      |

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

ATD Serial No: 271

Test I.D: D092101

| Tested Parameter              | Units | Specification | Result               | Pass/Fail |
|-------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature        | deg C | 18.9 to 25.5  | 20.7                 | Pass      |
| Laboratory Relative Humidity  | %     | 10 to 70      | 53                   | Pass      |
| Peak Resultant Acceleration   | G's   | 120 to 150    | 131                  | Pass      |
| Is Resultant Curve Unimodal?  | N/A   | 15% of peak   | Yes                  | Pass      |
| Peak Longitudnal Acceleration | G's   | +/- 15        | 6.4                  | Pass      |
|                               |       |               | Overall Test Results | Pass      |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

8/12/09  
Test Date



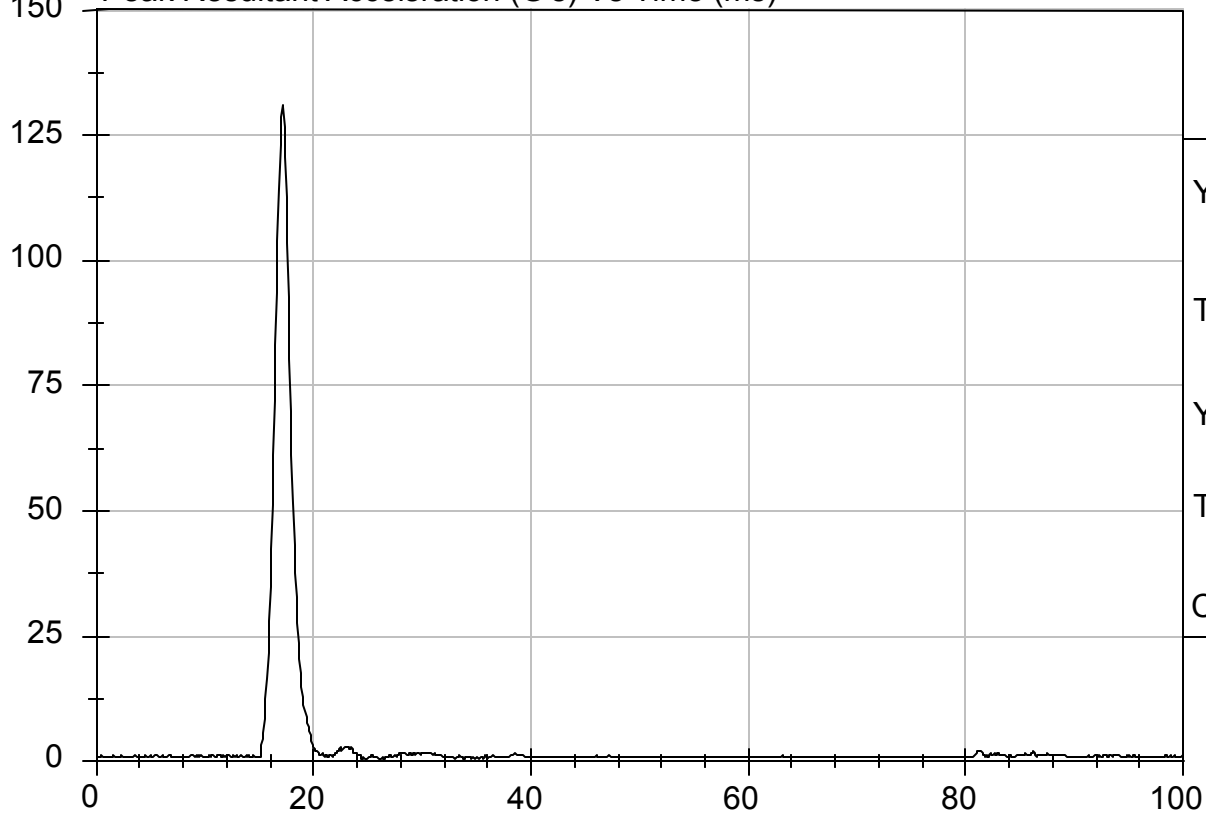
Test Description: Head Drop

Test Date: 8/12/09

Component: D092101

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (ms)



YMax: 131.1 G

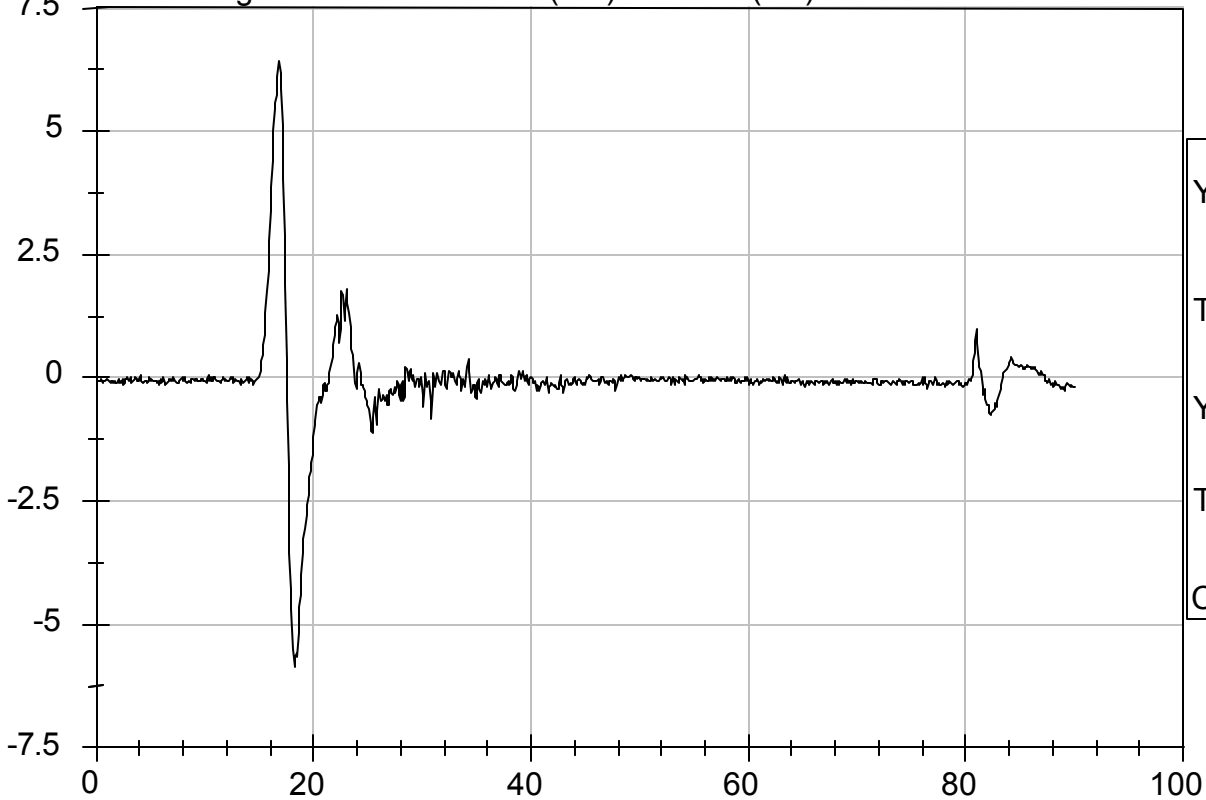
Tmax: 17.1 ms

YMin: 0.4 G

Tmin: 24.8 ms

CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (ms)



YMax: 6.4 G

Tmax: 16.8 ms

YMin: -5.9 G

Tmin: 18.2 ms

CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

ATD Serial No: 271

Test I.D: D092102

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 51     | Pass      |
| Probe Velocity               | m/s   | 4.22 - 4.31   | 4.27   | Pass      |
| Upper Rib                    | G's   | 37 - 46       | 38     | Pass      |
| Lower Rib                    | G's   | 37 - 46       | 37     | Pass      |
| Lower Spine                  | G's   | 15 - 22       | 18     | Pass      |
| Overall Test Results         |       |               |        | Pass      |

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Laboratory Technician

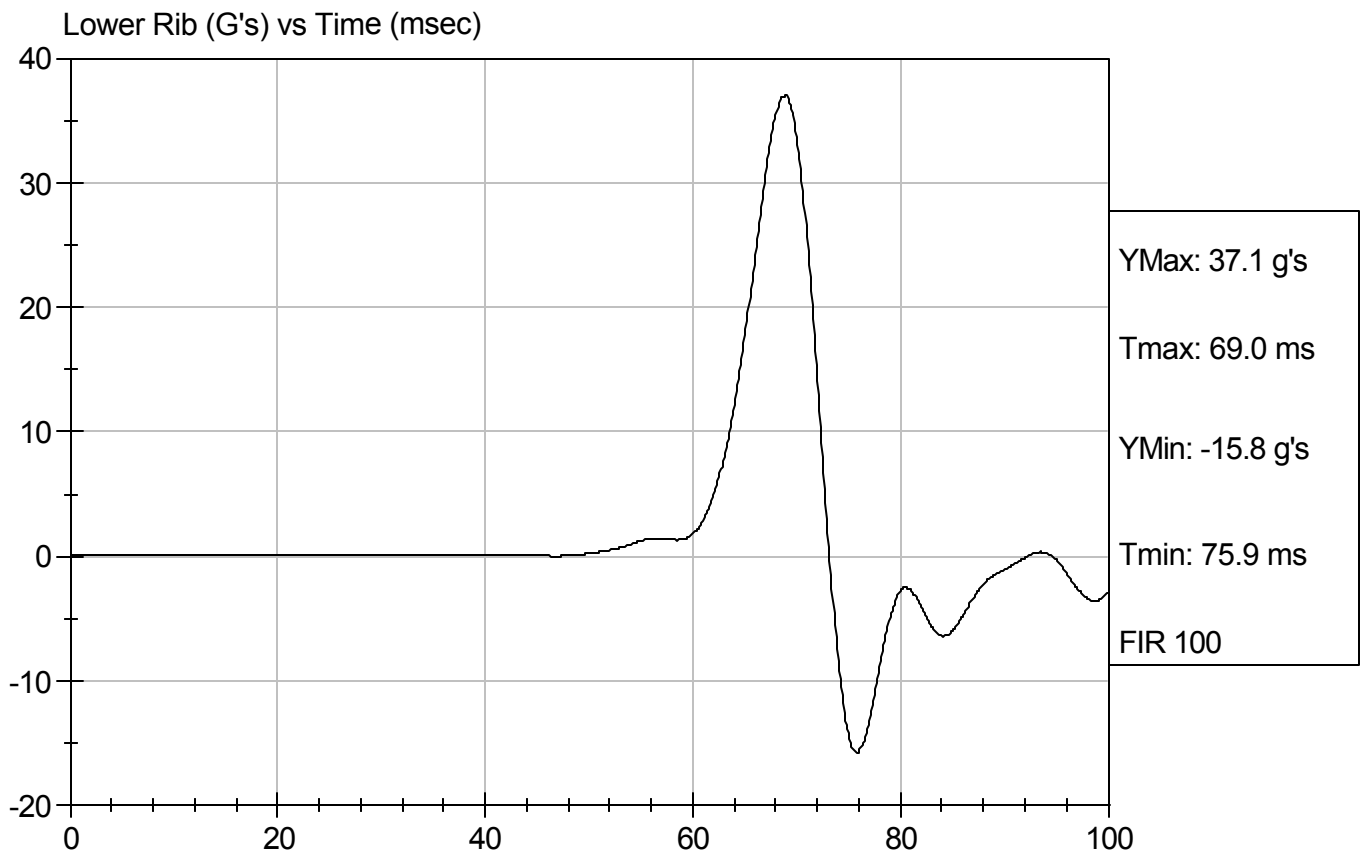
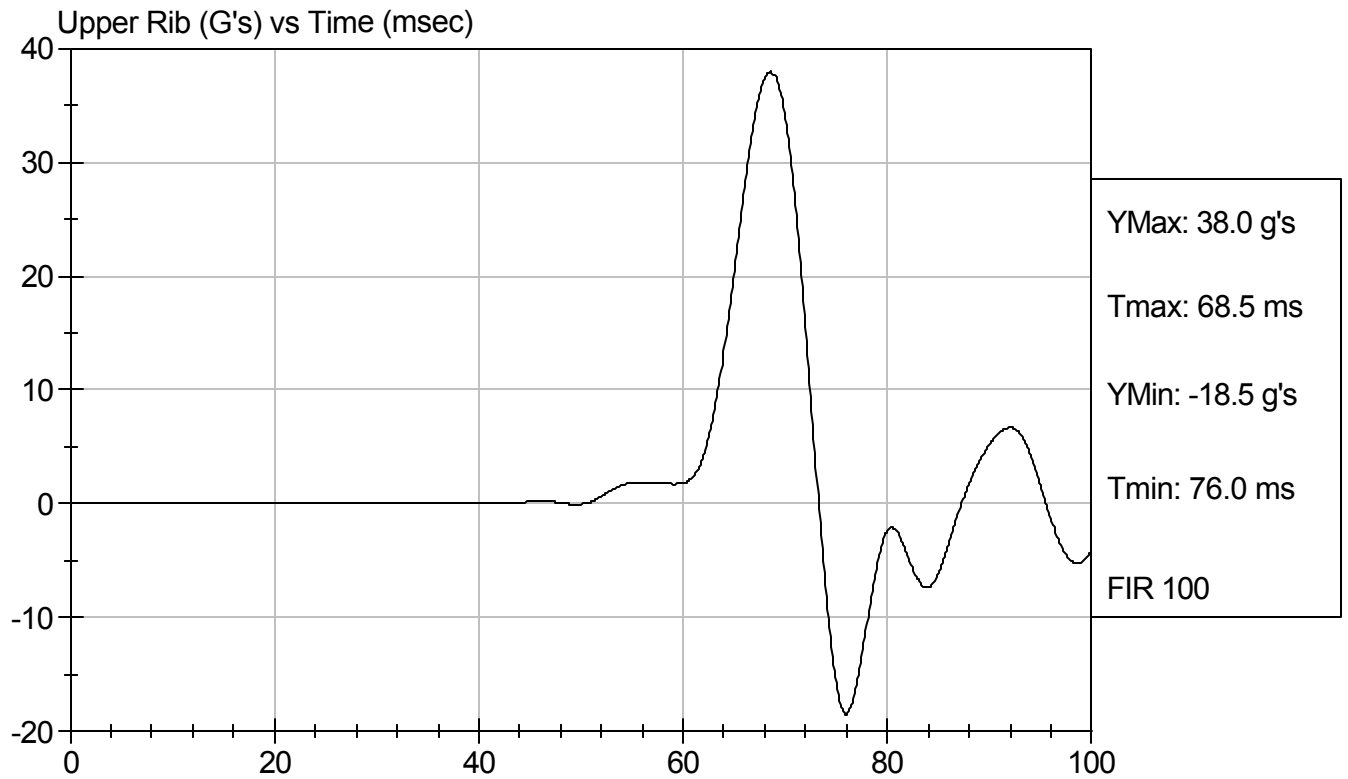
8/13/09  
Test Date

David Winkelbauer  
Approved By



Test Desc: Thorax Impact  
Component ID: D092102

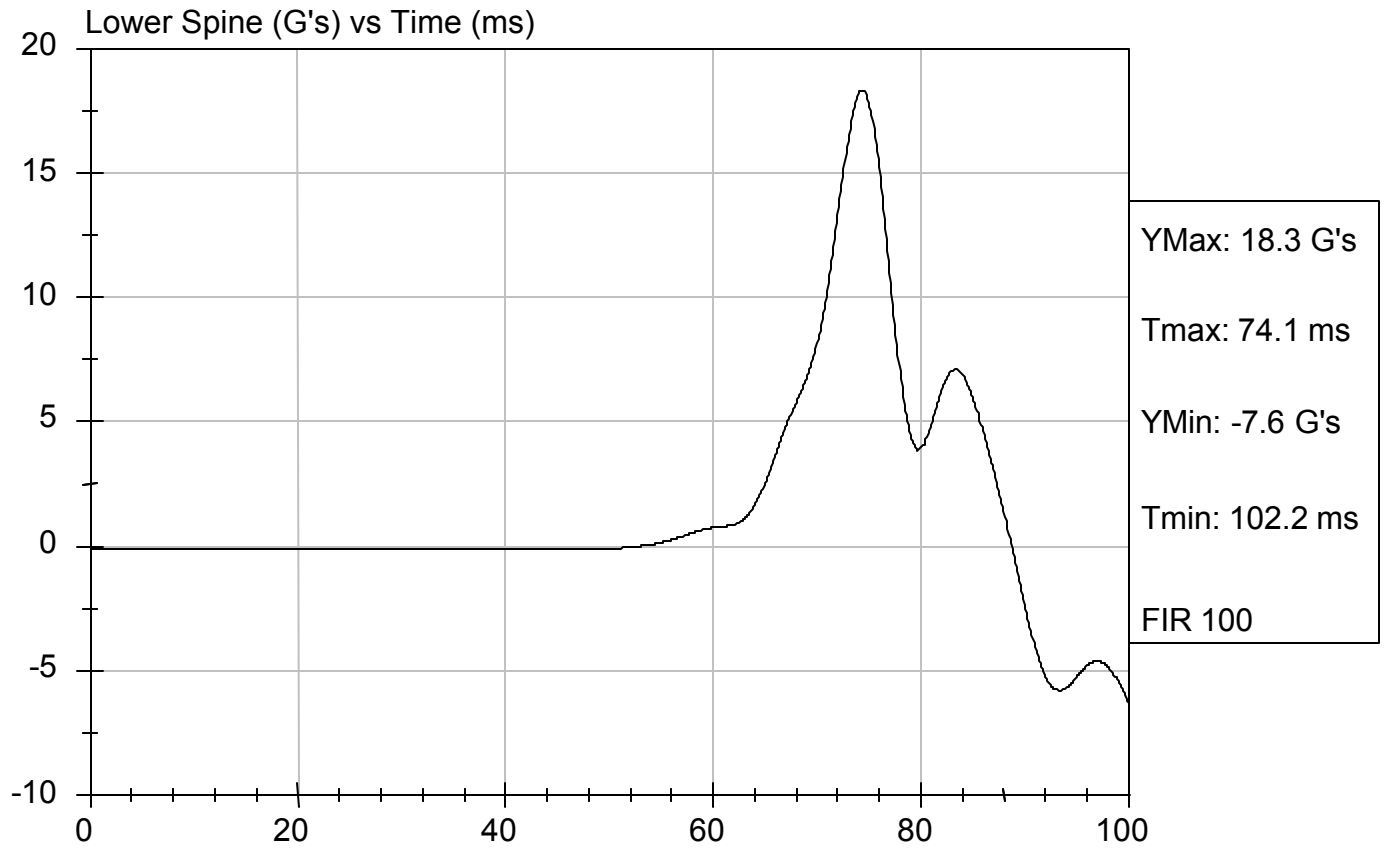
Test Date: 8/13/09  
Speed: 14.01 ft/sec, 4.27 m/sec





Test Desc: Thorax Impact  
Component ID: D092102

Test Date: 8/13/09  
Speed: 14.01 ft/sec, 4.27 m/sec



**SID/HIII Calibration Data Sheet**

**Side Impact Dummy**

**Pelvis Impact Test**

**ATD Serial No:** 271

**Test I.D:** D092103

| Tested Parameter             | Units | Specification | Result               | Pass/Fail |
|------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature       | deg C | 18.9 to 25.5  | 21.1                 | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 51                   | Pass      |
| Probe Velocity               | m/s   | 4.27 - 4.33   | 4.30                 | Pass      |
| Pelvis Acceleration          | G's   | 40 - 60       | 43                   | Pass      |
|                              |       |               | Overall Test Results | Pass      |

Jessica Hall  
Laboratory Technician

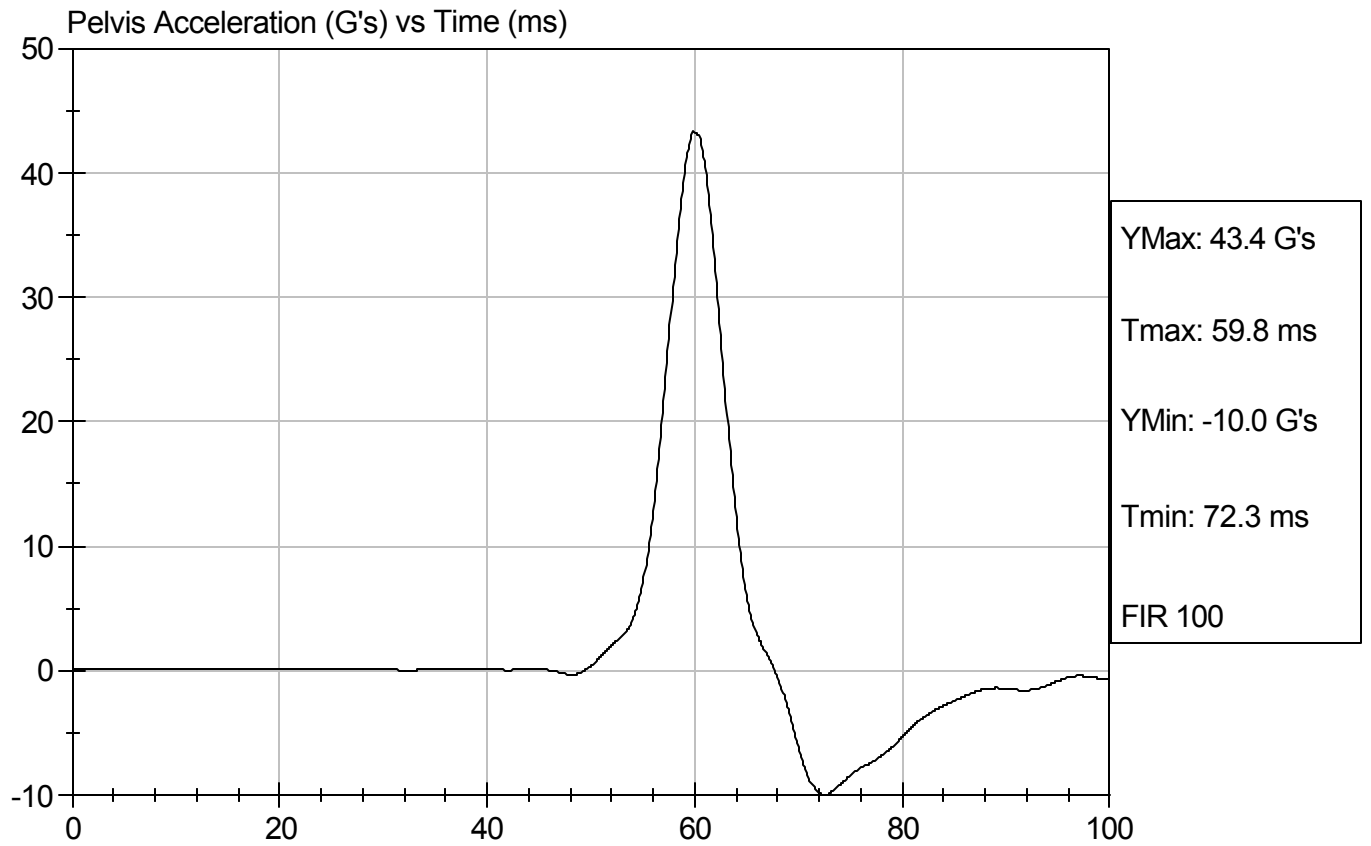
8/13/09  
Test Date

David Winkelbauer  
Approved By



Test Desc: Pelvis Impact  
Component ID: D092103

Test Date: 8/13/09  
Speed: 14.12 ft/sec, 4.30 m/sec



**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

**ATD Serial No:** 271

**Test I.D:** D092104

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.3   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 53     | Pass      |
| Force At 12.7 mm             | N     | 104 -162      | 129    | Pass      |
| Force At 19 mm               | N     | 163 - 222     | 188    | Pass      |
| Force At 25.4 mm             | N     | 222 - 280     | 276    | Pass      |
| Force At 33 mm               | N     | 325 - 391     | 389    | Pass      |
| Overall Test Results         |       |               | Pass   |           |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

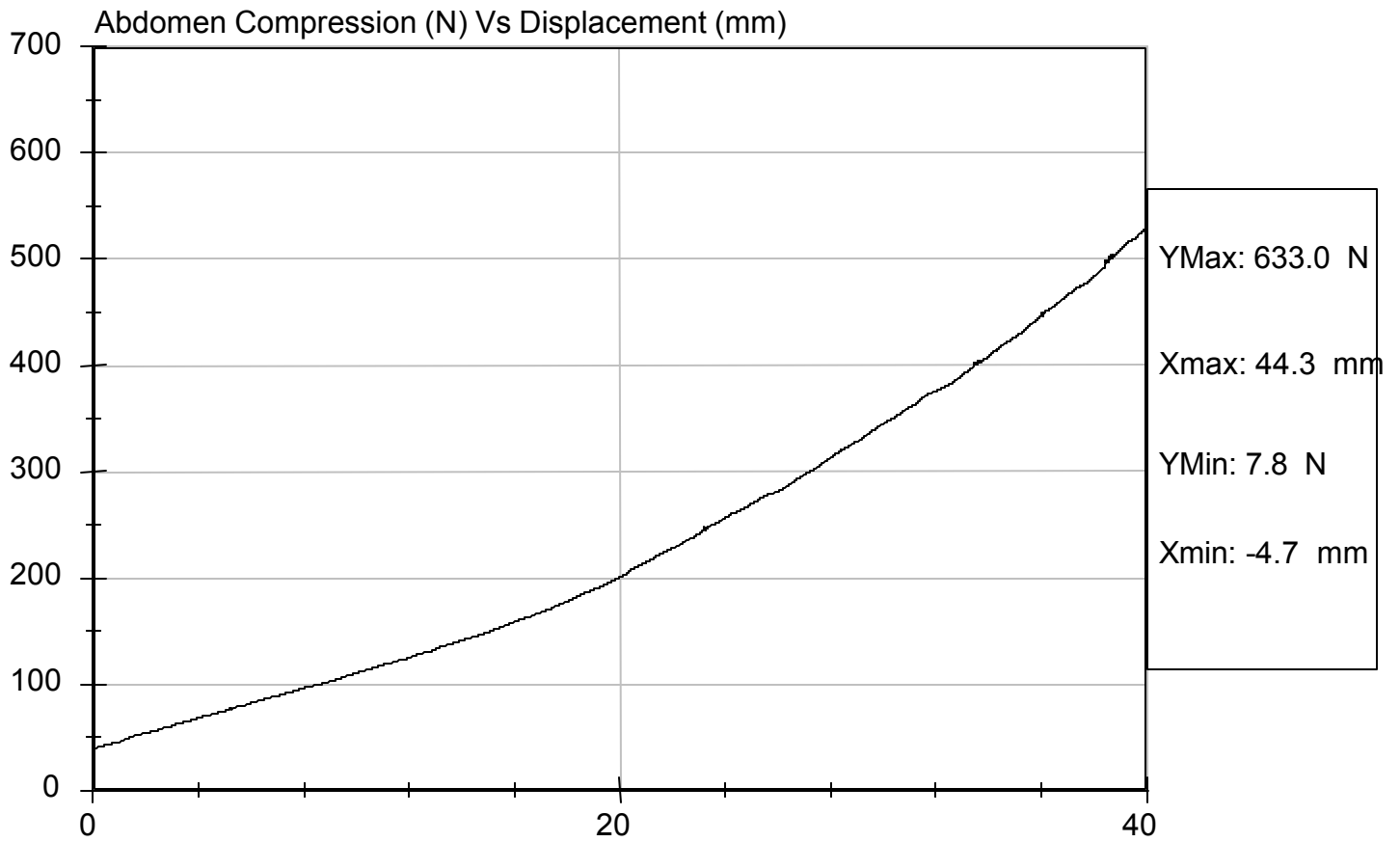
8/13/09  
Test Date



Test Description: Abdomen Compression Test Date: 8/13/09

Component: D092104

Speed: 0 ft/sec, 0 m/sec

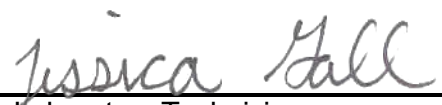


**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

**ATD Serial No:** 271

**Test I.D:** D092105

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 50     | Pass      |
| Force At 0 deg               | N     | 0 - 26.7      | 0      | Pass      |
| Force At 20 deg              | N     | 97.9 - 151.2  | 120.3  | Pass      |
| Force At 30 deg              | N     | 151.2 - 204.6 | 174.9  | Pass      |
| Force At 40 deg              | N     | 204.6 - 258.0 | 252.4  | Pass      |
| Return Angle                 | Deg   | 12 Maximum    | 5      | Pass      |
| Overall Test Results         |       |               | Pass   |           |

  
Laboratory Technician

  
Approved By

8/13/09  
Test Date

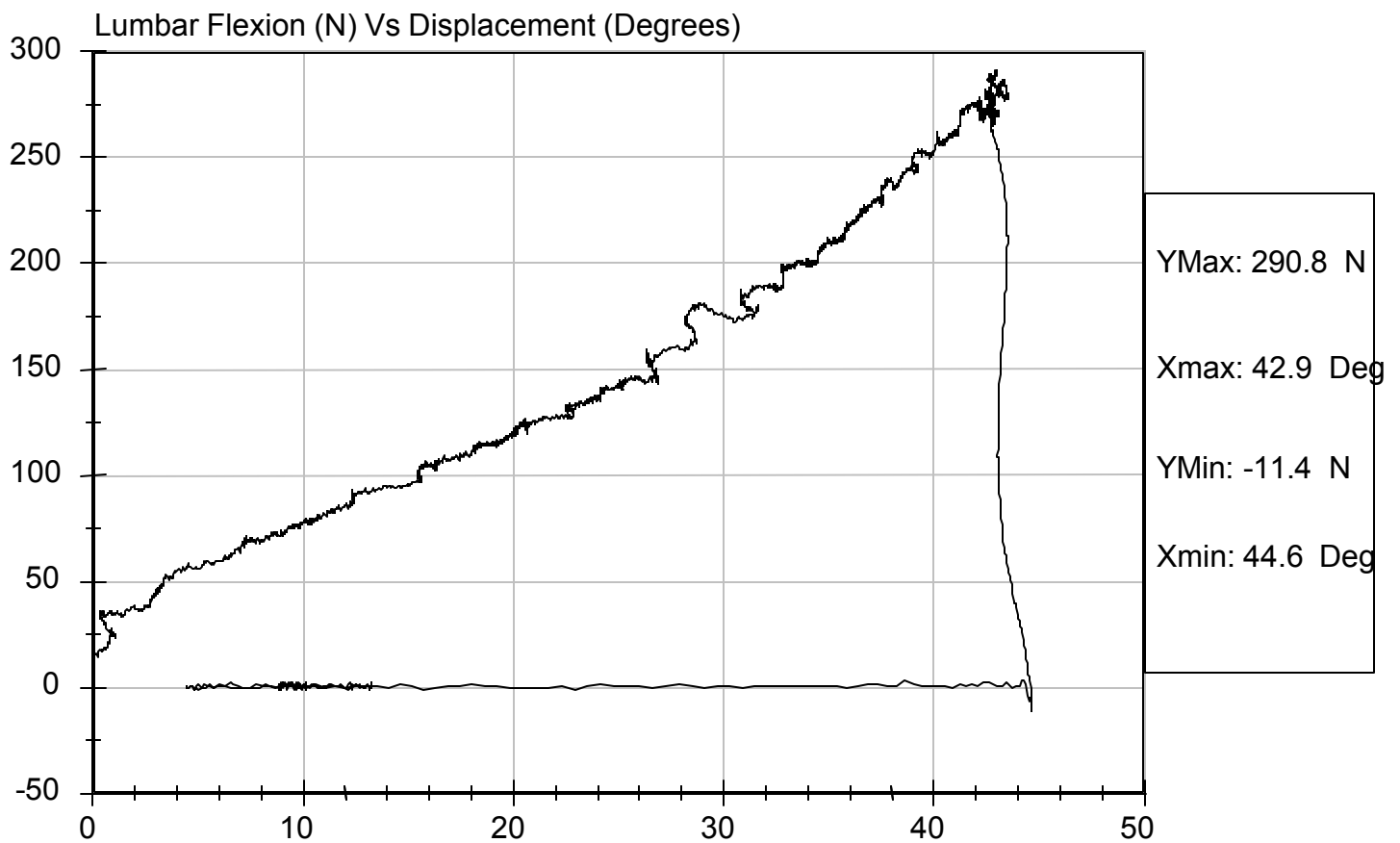


Test Description: Lumbar Flexion

Test Date: 8/13/09

Component: D092105

Speed: 0 ft/sec, 0 m/sec

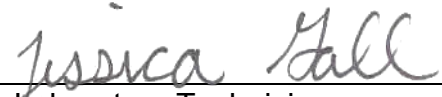


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 271

**Test I.D:** D092109

| Tested Parameter                        |             | Units | Specification | Result | Pass/Fail |
|-----------------------------------------|-------------|-------|---------------|--------|-----------|
| Laboratory Temperature                  |             | deg C | 20.6 to 22.2  | 20.7   | Pass      |
| Laboratory Relative Humidity            |             | %     | 10 to 70      | 53     | Pass      |
| Impact Velocity                         |             | m/s   | 6.89 to 7.13  | 7.06   | Pass      |
| Pendulum Deceleration                   | 10 ms       | m/s   | 1.96 to 2.55  | 2.28   | Pass      |
|                                         | 20 ms       | m/s   | 4.12 to 5.10  | 4.51   | Pass      |
|                                         | 30 ms       | m/s   | 5.73 to 7.01  | 6.41   | Pass      |
|                                         | 40 to 70 ms | m/s   | 6.27 to 7.64  | 6.79   | Pass      |
| Midsaggital Plane Max Rotation          |             | deg   | 66 to 82      | 76     | Pass      |
| Head Rotation Peak to Zero - Decay Time |             | ms    | 58 to 67      | 60     | Pass      |
| Max. Mx at Occipital Condyles           |             | Nm    | 73 to 88      | 78     | Pass      |
| Mx Peak To Zero - Decay Time            |             | ms    | 49 to 64      | 60     | Pass      |
| Mx Peak to Max. Head Rotation           |             | ms    | 2 to 16       | 15     | Pass      |

  
 Laboratory Technician

  
 Approved By

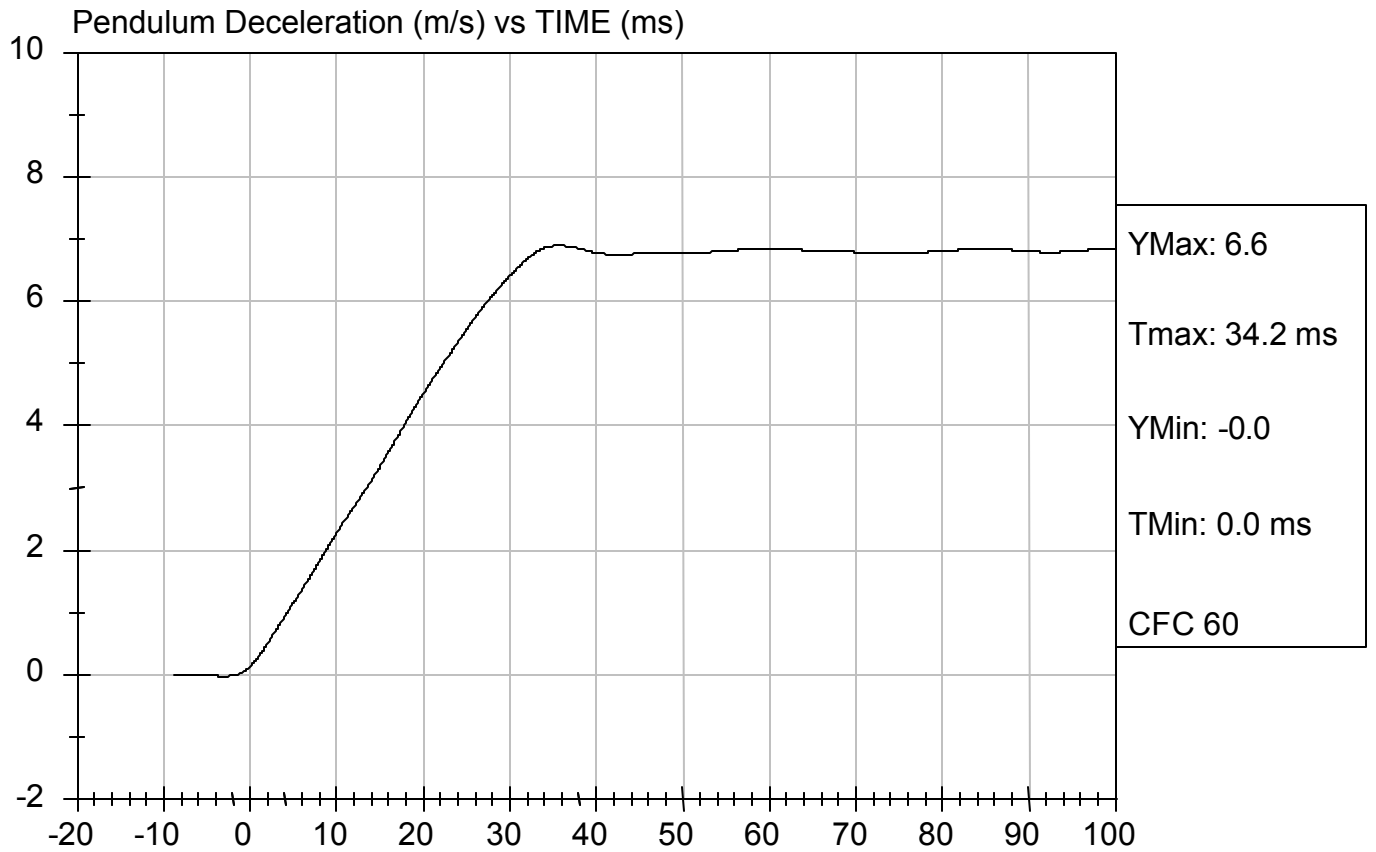
8/12/09

Test Date



Test Desc: Neck Bending  
Component ID: D092109

Test Date: 8/12/09  
Speed: 23.15 ft/sec, 7.06 m/sec

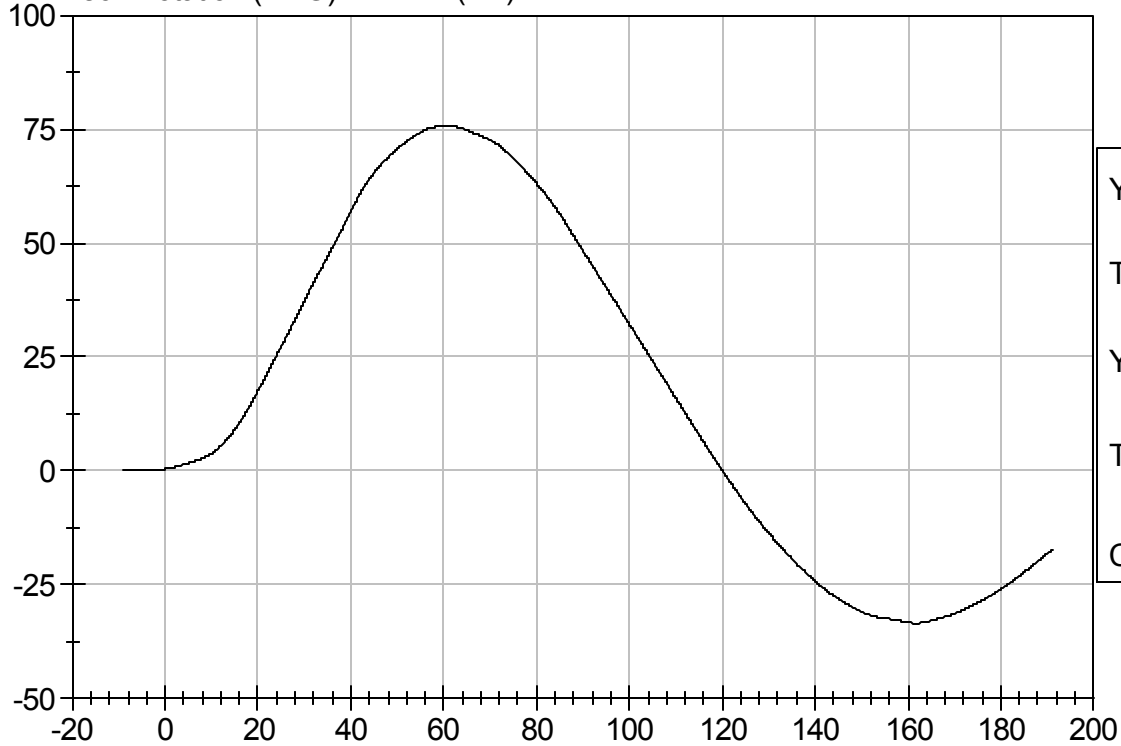




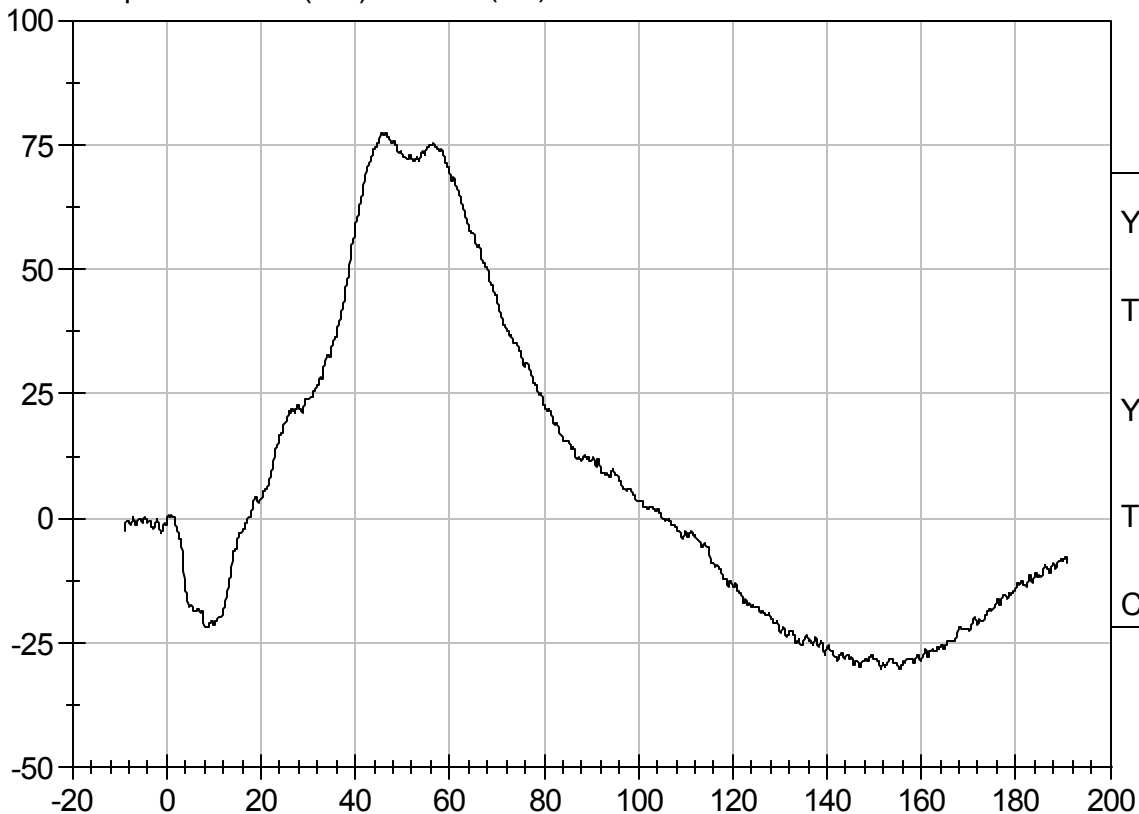
Test Desc: Neck Bending  
Component ID: D092109

Test Date: 8/12/09  
Speed: 23.15 ft/sec, 7.06 m/sec

Neck Rotation (DEG) vs Time (ms)



Occipital Moment (Nm) vs Time (ms)



**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Inspection Checklist**

**ATD Serial No:** 271

| Test Part    | Items Checked                        | Result |
|--------------|--------------------------------------|--------|
| Skin         | Visual inspection                    | Pass   |
| Head         | Visual, ballast, accelerometer mount | Pass   |
| Neck         | Visual                               | Pass   |
| Spine Box    | Visual, ballast, accelerometer mount | Pass   |
| Rib Cage     | Visual, measure                      | Pass   |
| Sternum      | Visual                               | Pass   |
| Lumbar Spine | Visual                               | Pass   |
| Abdomen      | Visual                               | Pass   |
| Pelvis       | Visual, palpate, accelerometer mount | Pass   |
| Upper Legs   | Visual                               | Pass   |
| Knees        | Visual                               | Pass   |
| Lower Legs   | Visual, range of motion              | Pass   |
| Ankles       | Visual, range of motion              | Pass   |
| Feet         | Visual, range of motion              | Pass   |
| Joints       | 1 to 2 g range                       | Pass   |
| Other        |                                      | Pass   |

Jessica Hall  
Laboratory Technician  
David Winkelbauer  
Approved By

08/13/2009  
Test Date

CERTIFICATION DATA

Dummy Serial Number: 272

## Calibration Test Results Summary

Dummy Serial Number: 272

### Pre-Test Calibration

|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| External Dimensions:        | The dummy passed all external dimension requirements. |
| Head Drop Test:             | The head passed all drop test requirements.           |
| Neck Pendulum Test:         | The neck passed all pendulum test requirements.       |
| Thorax Impact Test:         | The thorax passed all impact test requirements.       |
| Pelvic Impact Test:         | The pelvis passed all impact test requirements.       |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test:        | The lumbar passed all flexion test requirements.      |

**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**External Measurements**

**ATD Serial No:** 272

**Test I.D:** D09147

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| SH - Seated Height           | mm    | 889 - 909     | 907    | Pass      |
| RH - Rib Height              | mm    | 501 - 521     | 520    | Pass      |
| HP - Hip Pivot Height        | mm    | 99 ref.       | 99     | Pass      |
| RD - Rib from Back Line      | mm    | 229 - 241     | 230    | Pass      |
| KV - Knee Pivot to Back Line | mm    | 511 - 526     | 525    | Pass      |
| SW - Knee Pivot to Floor     | mm    | 490 - 505     | 495    | Pass      |
| HW - Hip Width               | mm    | 356 - 391     | 358    | Pass      |
| Overall Test Results         |       |               | Pass   |           |

Jessica Hall  
Laboratory Technician

David Winkelbauer  
Approved By

6/11/2009

Test Date

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

**ATD Serial No:** 272

**Test I.D:** D091471

| Tested Parameter              | Units | Specification | Result | Pass/Fail |
|-------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature        | deg C | 18.9 to 25.5  | 21.9   | Pass      |
| Laboratory Relative Humidity  | %     | 10 to 70      | 44     | Pass      |
| Peak Resultant Acceleration   | G's   | 120 to 150    | 145    | Pass      |
| Is Resultant Curve Unimodal?  | N/A   | 15% of peak   | Yes    | Pass      |
| Peak Longitudnal Acceleration | G's   | +/- 15        | -7.9   | Pass      |
| Overall Test Results          |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

6/11/09  
Test Date

David Winkelbauer  
Approved By



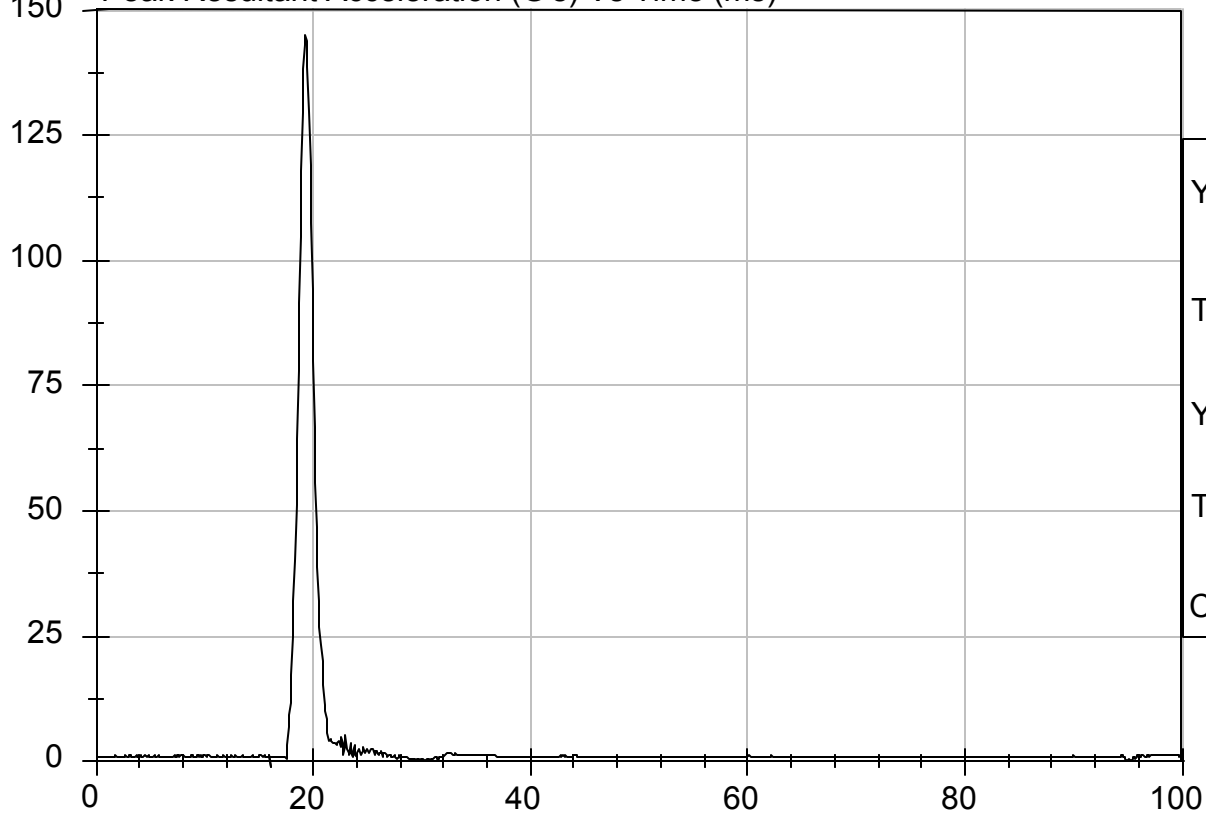
Test Description: Head Drop

Test Date: 6/11/09

Component: D091471

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (ms)



YMax: 144.9 G

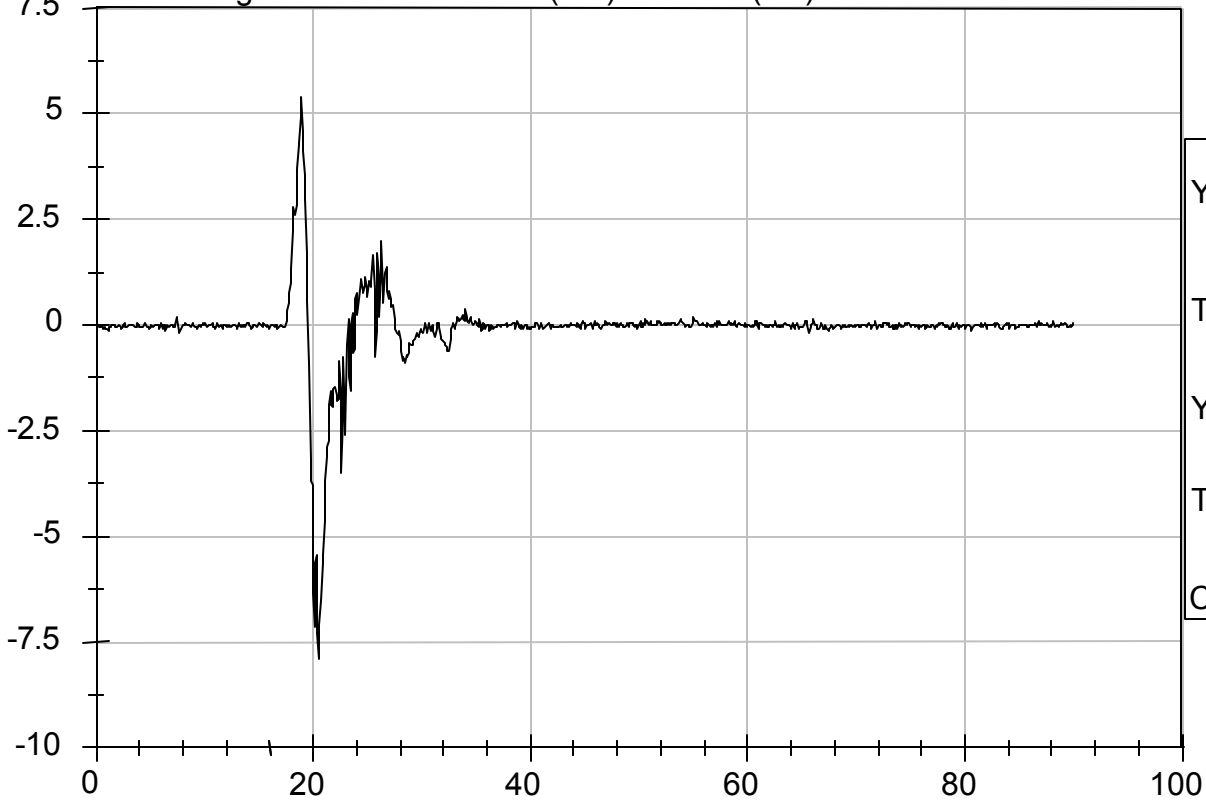
Tmax: 19.3 ms

YMin: 0.1 G

Tmin: 94.9 ms

CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (ms)



YMax: 5.4 G

Tmax: 18.9 ms

YMin: -7.9 G

Tmin: 20.5 ms

CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

**ATD Serial No:** 272

**Test I.D:** D091472

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.8   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 42     | Pass      |
| Probe Velocity               | m/s   | 4.22 - 4.31   | 4.30   | Pass      |
| Upper Rib                    | G's   | 37 - 46       | 39     | Pass      |
| Lower Rib                    | G's   | 37 - 46       | 38     | Pass      |
| Lower Spine                  | G's   | 15 - 22       | 19.0   | Pass      |
| Overall Test Results         |       |               |        | Pass      |

Jessica Hall  
Laboratory Technician

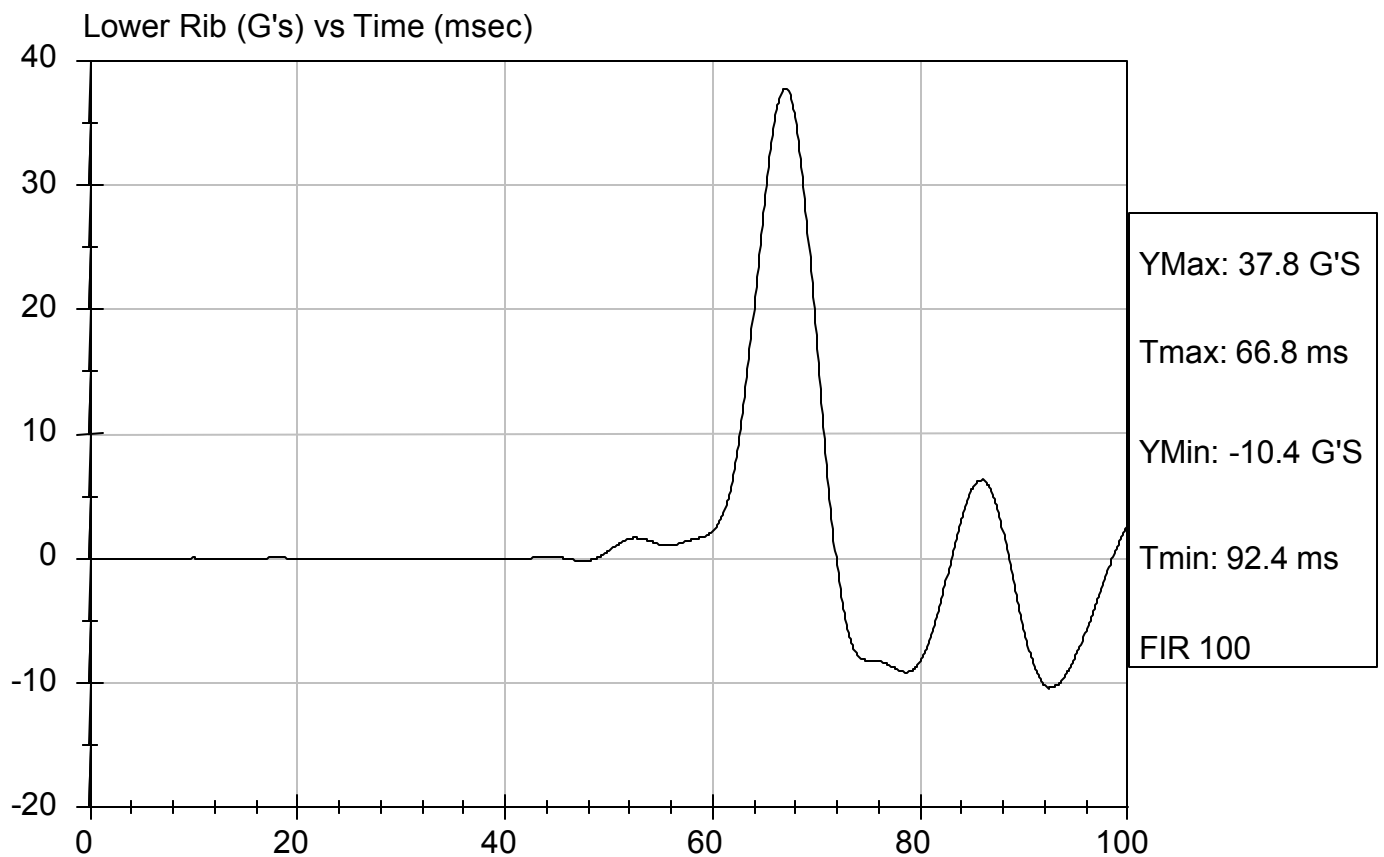
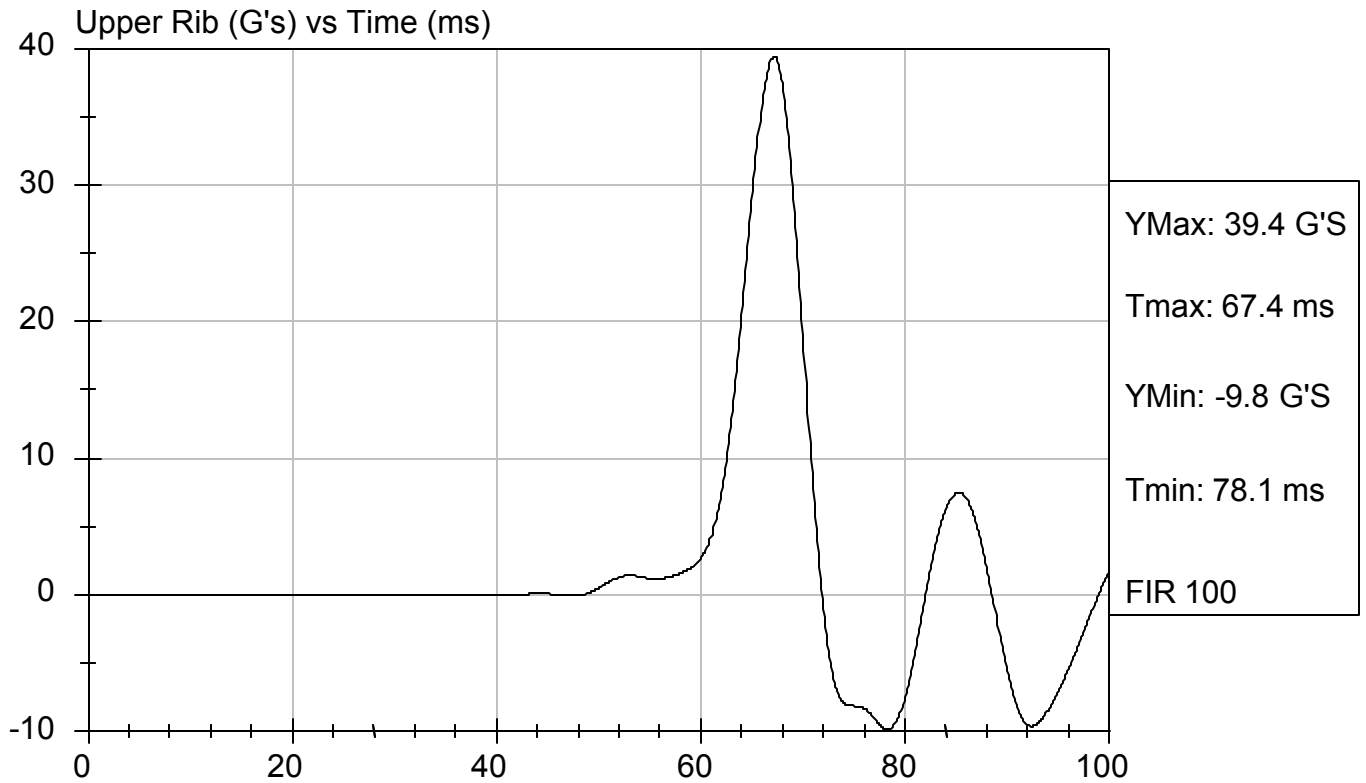
David Winkelbauer  
Approved By

6/11/09  
Test Date



Test Desc: Thorax Impact  
Component ID: D091472

Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec

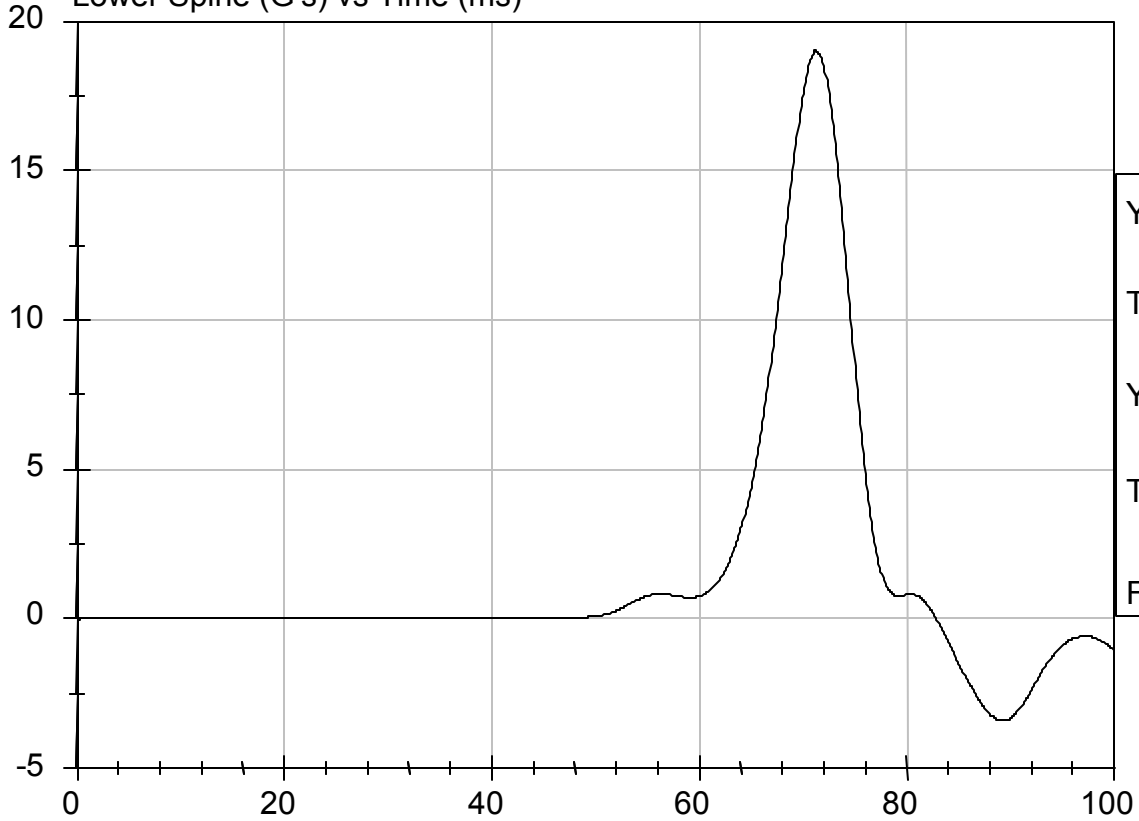




Test Desc: Thorax Impact  
Component ID: D091472

Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec

Lower Spine (G's) vs Time (ms)



YMax: 19.0 G'S

Tmax: 71.2 ms

YMin: -3.4 G'S

Tmin: 89.3 ms

FIR 100

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

**ATD Serial No:** 272

**Test I.D:** D091473

| Tested Parameter             | Units | Specification | Result               | Pass/Fail |
|------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature       | deg C | 18.9 to 25.5  | 21.8                 | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 42                   | Pass      |
| Probe Velocity               | m/s   | 4.27 - 4.33   | 4.30                 | Pass      |
| Pelvis Acceleration          | G's   | 40 - 60       | 42                   | Pass      |
|                              |       |               | Overall Test Results | Pass      |

Jessica Hall  
Laboratory Technician

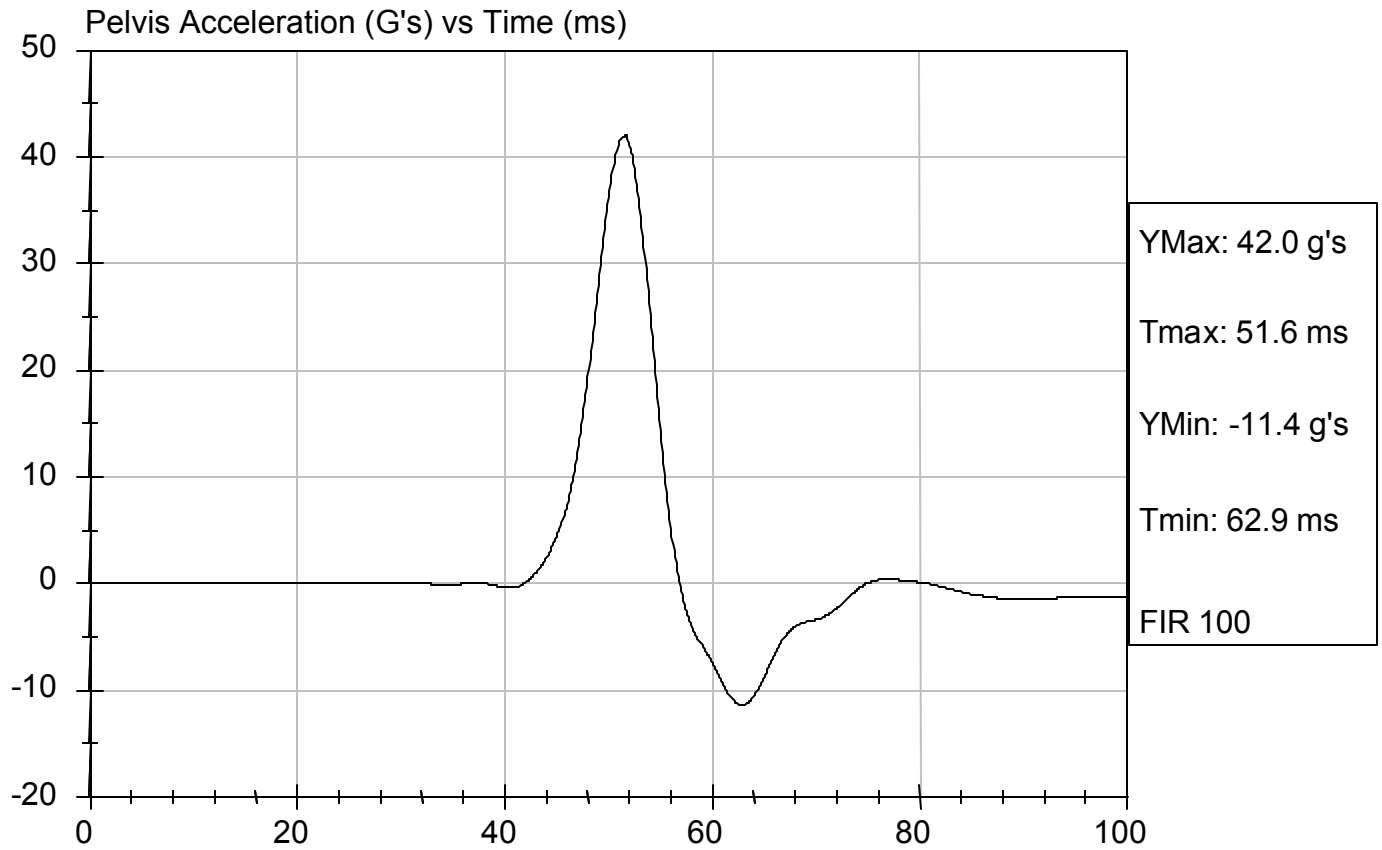
David Winkelbauer  
Approved By

6/11/09  
Test Date



Test Desc: Pelvis Impact  
Component ID: D091473

Test Date: 6/11/09  
Speed: 14.1 ft/sec, 4.30 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

**ATD Serial No:** 272

**Test I.D:** D091474

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.8   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 44     | Pass      |
| Force At 12.7 mm             | N     | 104 -162      | 136    | Pass      |
| Force At 19 mm               | N     | 163 - 222     | 190    | Pass      |
| Force At 25.4 mm             | N     | 222 - 280     | 256    | Pass      |
| Force At 33 mm               | N     | 325 - 391     | 353    | Pass      |
| Overall Test Results         |       |               |        | Pass      |

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Laboratory Technician

6/11/09  
Test Date

David Winkelbauer  
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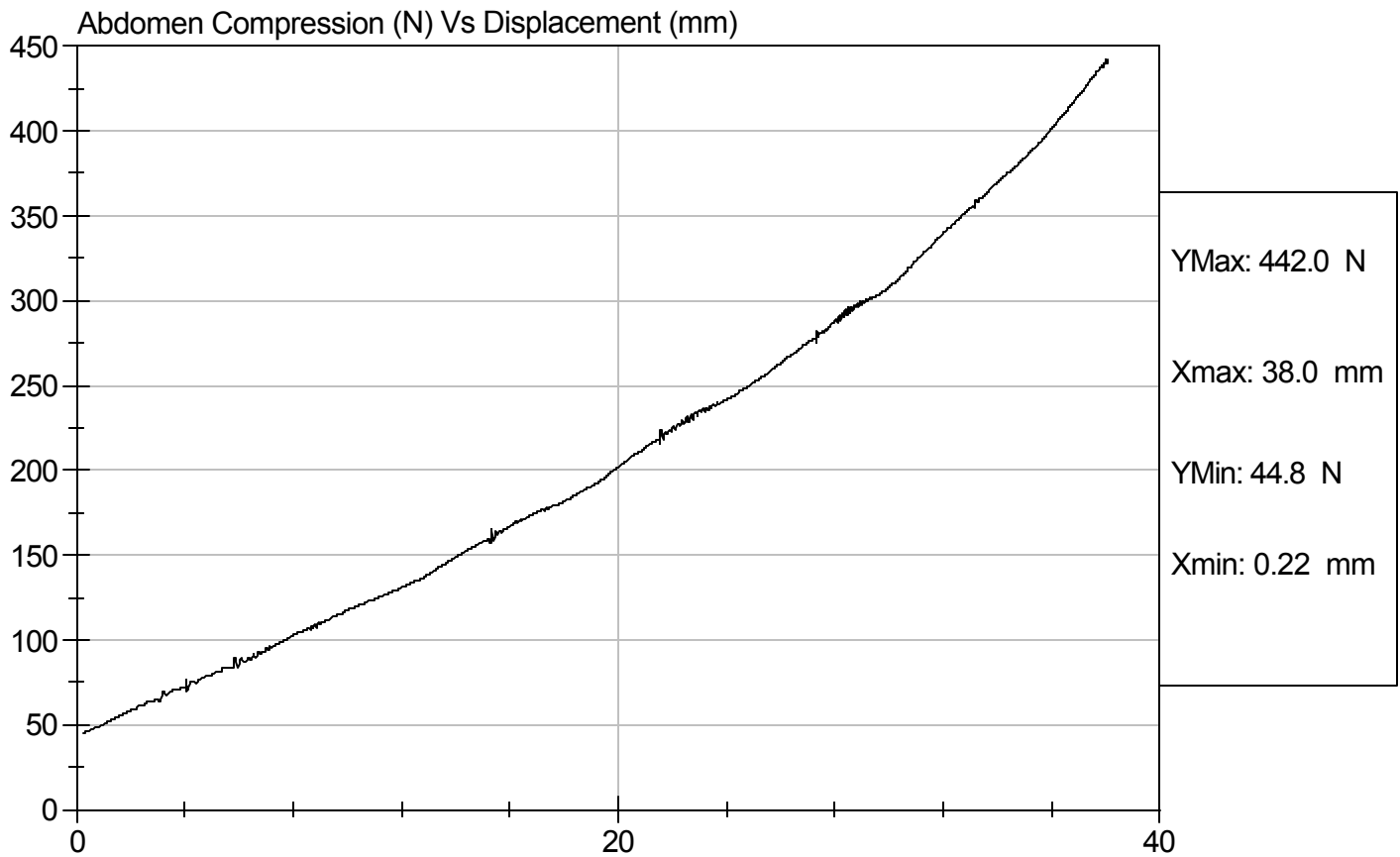


Test Description: Abdomen Compression

Test Date: 6/11/09

Component: D091474

Speed: 0 ft/sec, 0 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

ATD Serial No: 272

Test I.D: D091475

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.9   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 45     | Pass      |
| Force At 0 deg               | N     | 0 - 26.7      | 0      | Pass      |
| Force At 20 deg              | N     | 97.9 - 151.2  | 132.9  | Pass      |
| Force At 30 deg              | N     | 151.2 - 204.6 | 186.7  | Pass      |
| Force At 40 deg              | N     | 204.6 - 258.0 | 229.8  | Pass      |
| Return Angle                 | Deg   | 12 Maximum    | 0      | Pass      |
| Overall Test Results         |       |               | Pass   |           |

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Laboratory Technician

6/11/09  
Test Date

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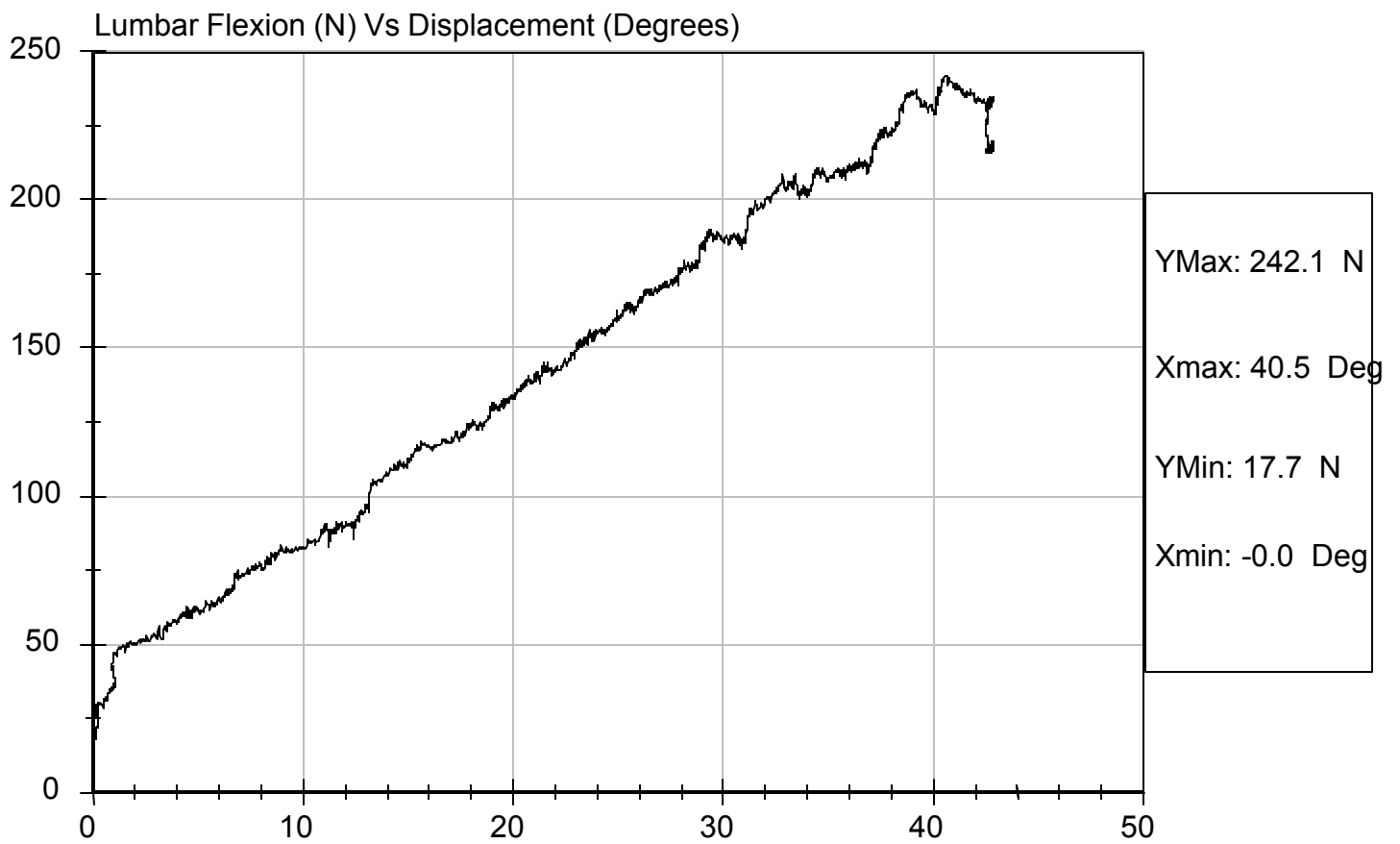


Test Description: Lumbar Flexion

Test Date: 6/11/09

Component: D091475

Speed: 0 ft/sec, 0 m/sec

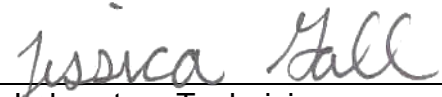


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 272

**Test I.D:** D091479

| Tested Parameter                        |             | Units | Specification | Result | Pass/Fail |
|-----------------------------------------|-------------|-------|---------------|--------|-----------|
| Laboratory Temperature                  |             | deg C | 20.6 to 22.2  | 21.8   | Pass      |
| Laboratory Relative Humidity            |             | %     | 10 to 70      | 44     | Pass      |
| Impact Velocity                         |             | m/s   | 6.89 to 7.13  | 7.06   | Pass      |
| Pendulum Deceleration                   | 10 ms       | m/s   | 1.96 to 2.55  | 2.42   | Pass      |
|                                         | 20 ms       | m/s   | 4.12 to 5.10  | 4.74   | Pass      |
|                                         | 30 ms       | m/s   | 5.73 to 7.01  | 6.60   | Pass      |
|                                         | 40 to 70 ms | m/s   | 6.27 to 7.64  | 6.67   | Pass      |
| Midsaggital Plane Max Rotation          |             | deg   | 66 to 82      | 71     | Pass      |
| Head Rotation Peak to Zero - Decay Time |             | ms    | 58 to 67      | 59     | Pass      |
| Max. Mx at Occipital Condyles           |             | Nm    | 73 to 88      | 75     | Pass      |
| Mx Peak To Zero - Decay Time            |             | ms    | 49 to 64      | 60     | Pass      |
| Mx Peak to Max. Head Rotation           |             | ms    | 2 to 16       | 14     | Pass      |

  
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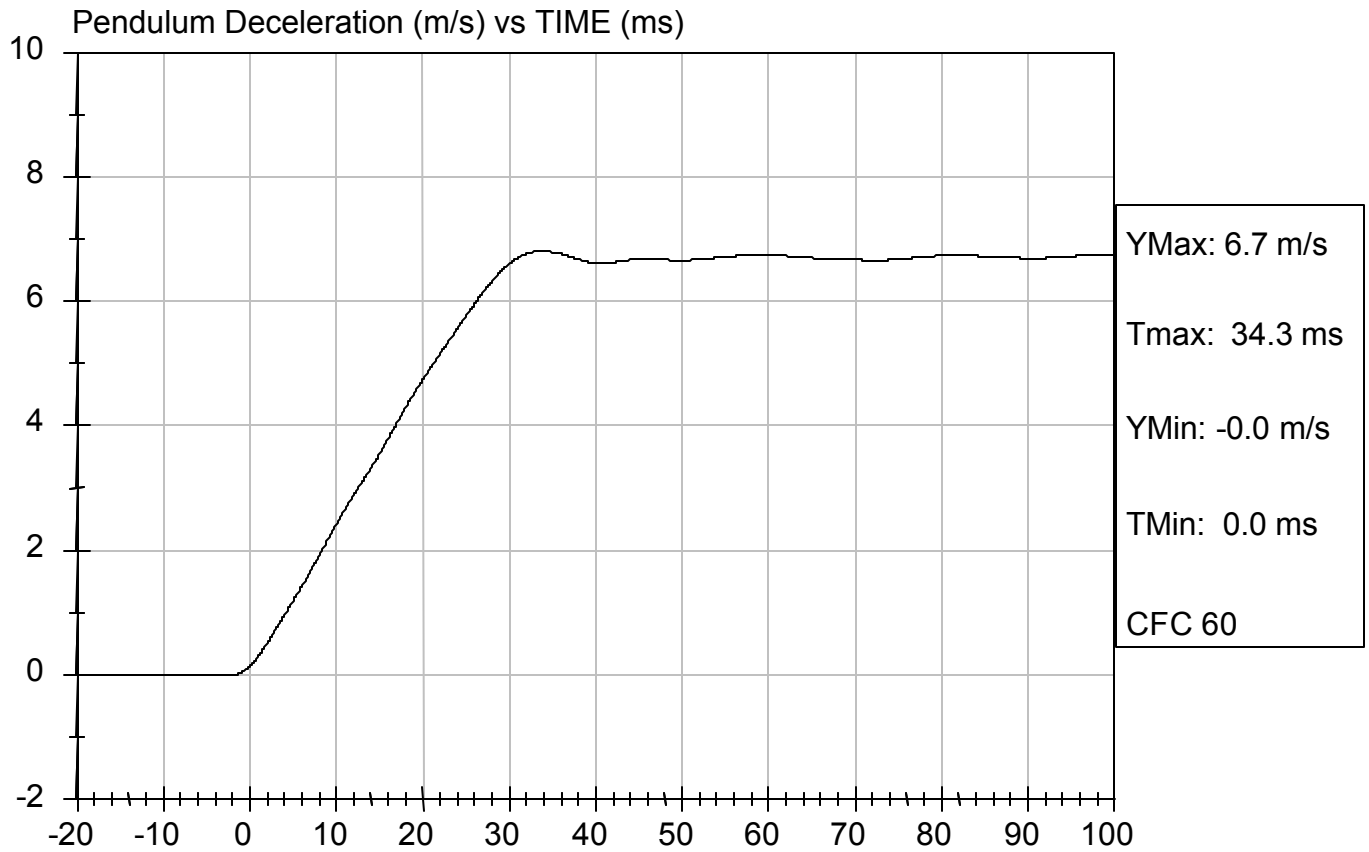
  
 Approved By

6/11/09  
 Test Date



Test Desc: Neck Bending  
Component ID: D091479

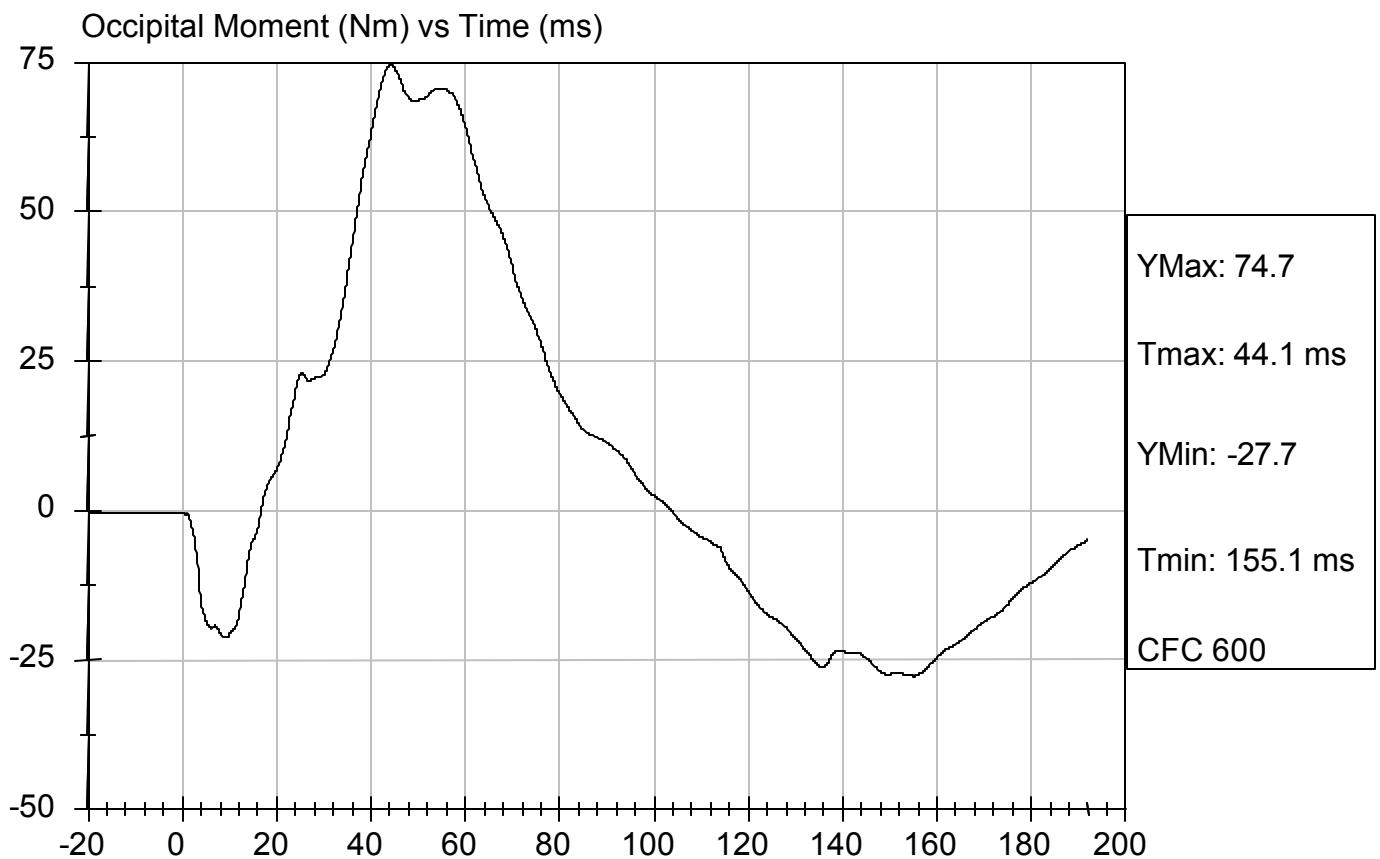
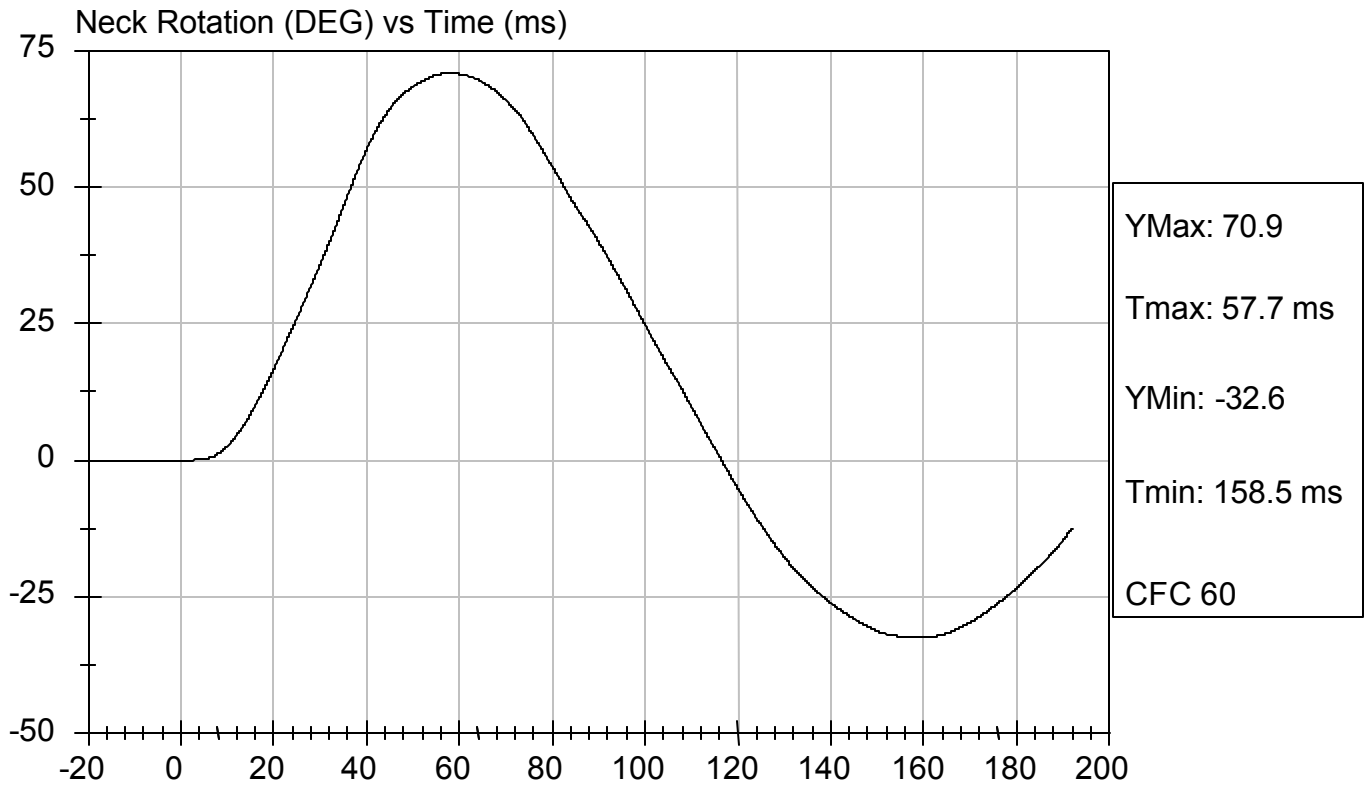
Test Date: 6/11/09  
Speed: 23.15 ft/sec, 7.06 m/sec





Test Desc: Neck Bending  
Component ID: D091479

Test Date: 6/11/09  
Speed: 23.15 ft/sec, 7.06 m/sec



## Calibration Test Results Summary

Dummy Serial Number: 272

### Post-Test Calibration

|                             |                                                       |
|-----------------------------|-------------------------------------------------------|
| External Dimensions:        | The dummy passed all external dimension requirements. |
| Head Drop Test:             | The head passed all drop test requirements.           |
| Neck Pendulum Test:         | The neck passed all pendulum test requirements.       |
| Thorax Impact Test:         | The thorax passed all impact test requirements.       |
| Pelvic Impact Test:         | The pelvis passed all impact test requirements.       |
| Abdominal Compression Test: | The abdomen passed all compression test requirements. |
| Lumbar Flexion Test:        | The lumbar passed all flexion test requirements.      |

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Head Drop Calibration (Lateral)**

**ATD Serial No:** 272

**Test I.D:** D092111

| Tested Parameter              | Units | Specification | Result | Pass/Fail |
|-------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature        | deg C | 18.9 to 25.5  | 20.7   | Pass      |
| Laboratory Relative Humidity  | %     | 10 to 70      | 52     | Pass      |
| Peak Resultant Acceleration   | G's   | 120 to 150    | 142    | Pass      |
| Is Resultant Curve Unimodal?  | N/A   | 15% of peak   | Yes    | Pass      |
| Peak Longitudnal Acceleration | G's   | +/- 15        | -8.5   | Pass      |
| Overall Test Results          |       |               |        | Pass      |

  
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8/12/09  
Test Date



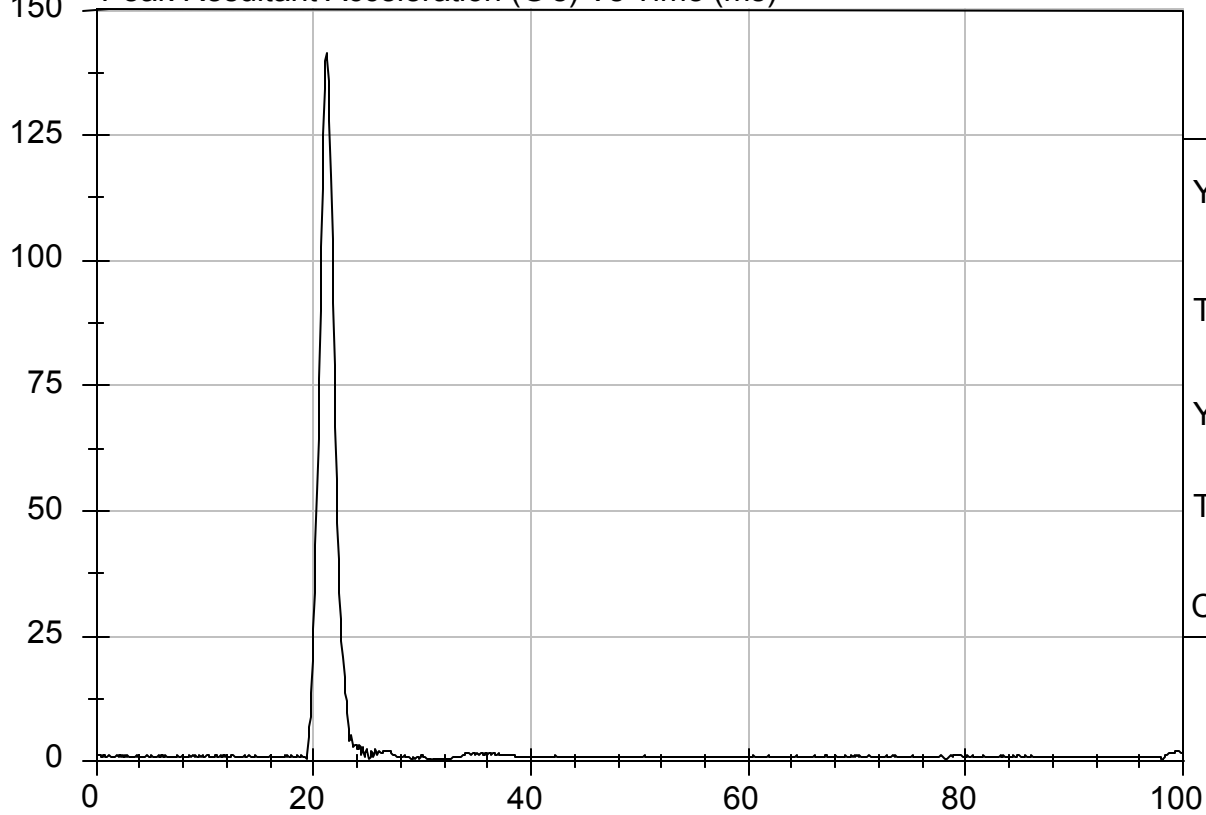
Test Description: Head Drop

Test Date: 8/12/09

Component: D092111

Speed: 0 ft/s, 0 m/s

Peak Resultant Acceleration (G's) Vs Time (ms)



YMax: 141.6 G

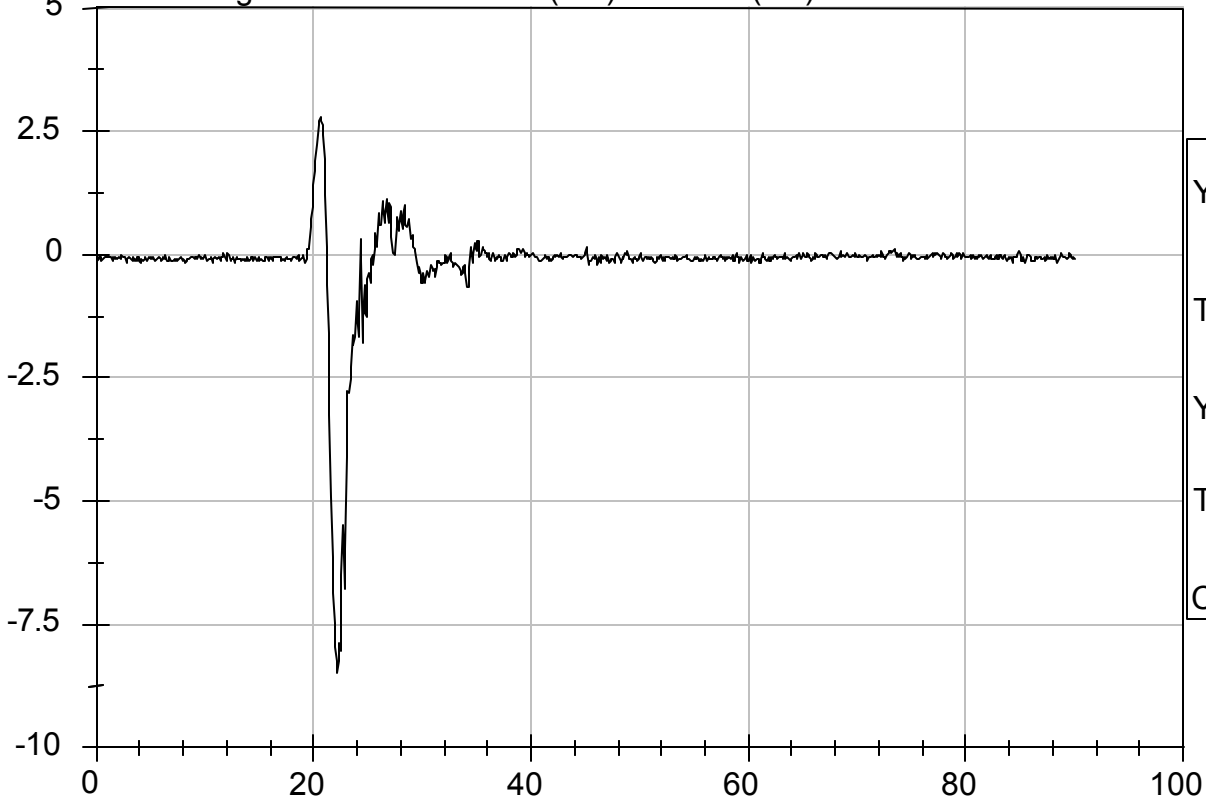
Tmax: 21.2 ms

YMin: 0.2 G

Tmin: 98.1 ms

CFC 1000

Peak Longitudinal Acceleration (G's) Vs Time (ms)



YMax: 2.8 G

Tmax: 20.6 ms

YMin: -8.5 G

Tmin: 22.2 ms

CFC 1000

**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Thorax Impact Test**

**ATD Serial No:** 272

**Test I.D:** D092112

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.0   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 50     | Pass      |
| Probe Velocity               | m/s   | 4.22 - 4.31   | 4.23   | Pass      |
| Upper Rib                    | G's   | 37 - 46       | 42     | Pass      |
| Lower Rib                    | G's   | 37 - 46       | 40     | Pass      |
| Lower Spine                  | G's   | 15 - 22       | 20     | Pass      |
| Overall Test Results         |       |               |        | Pass      |

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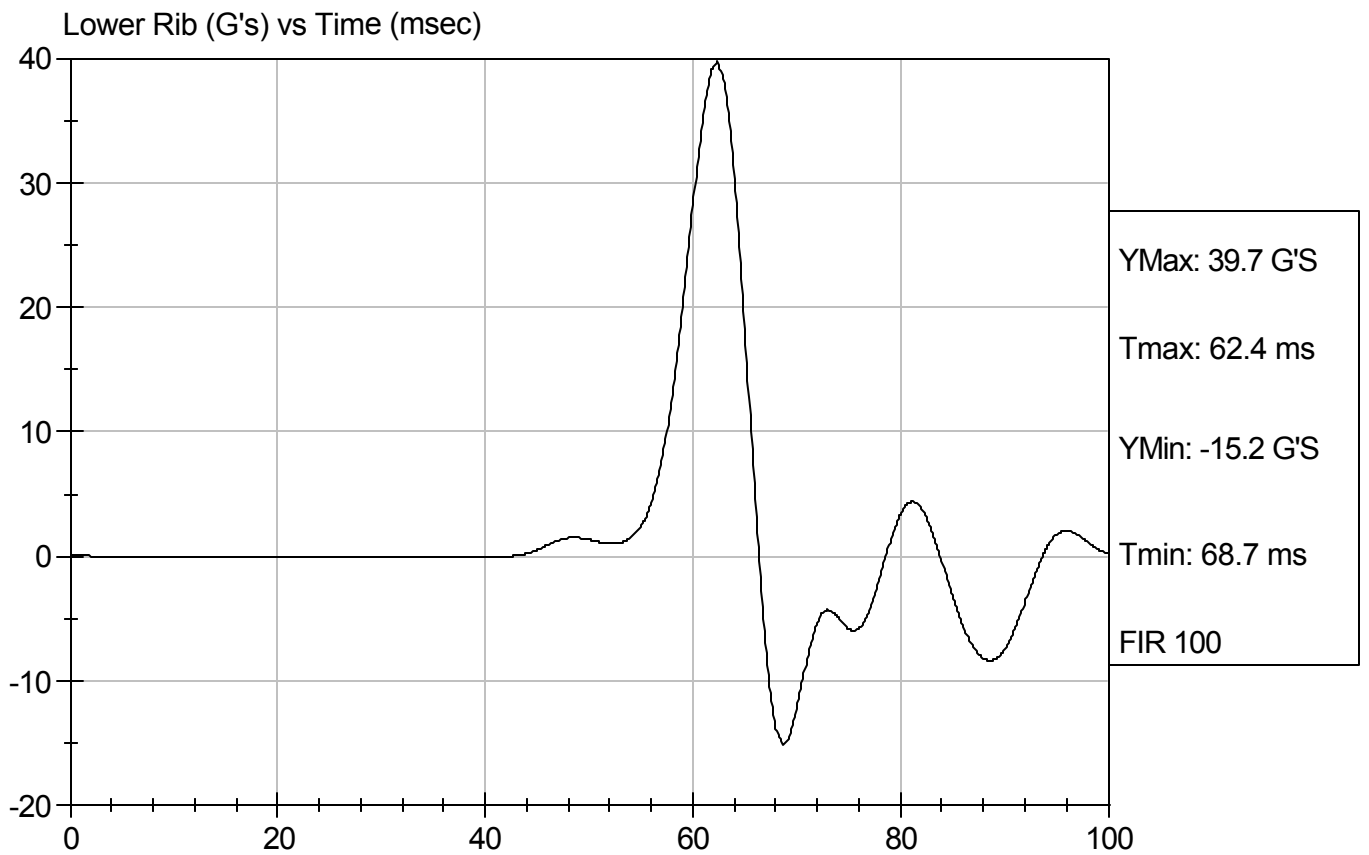
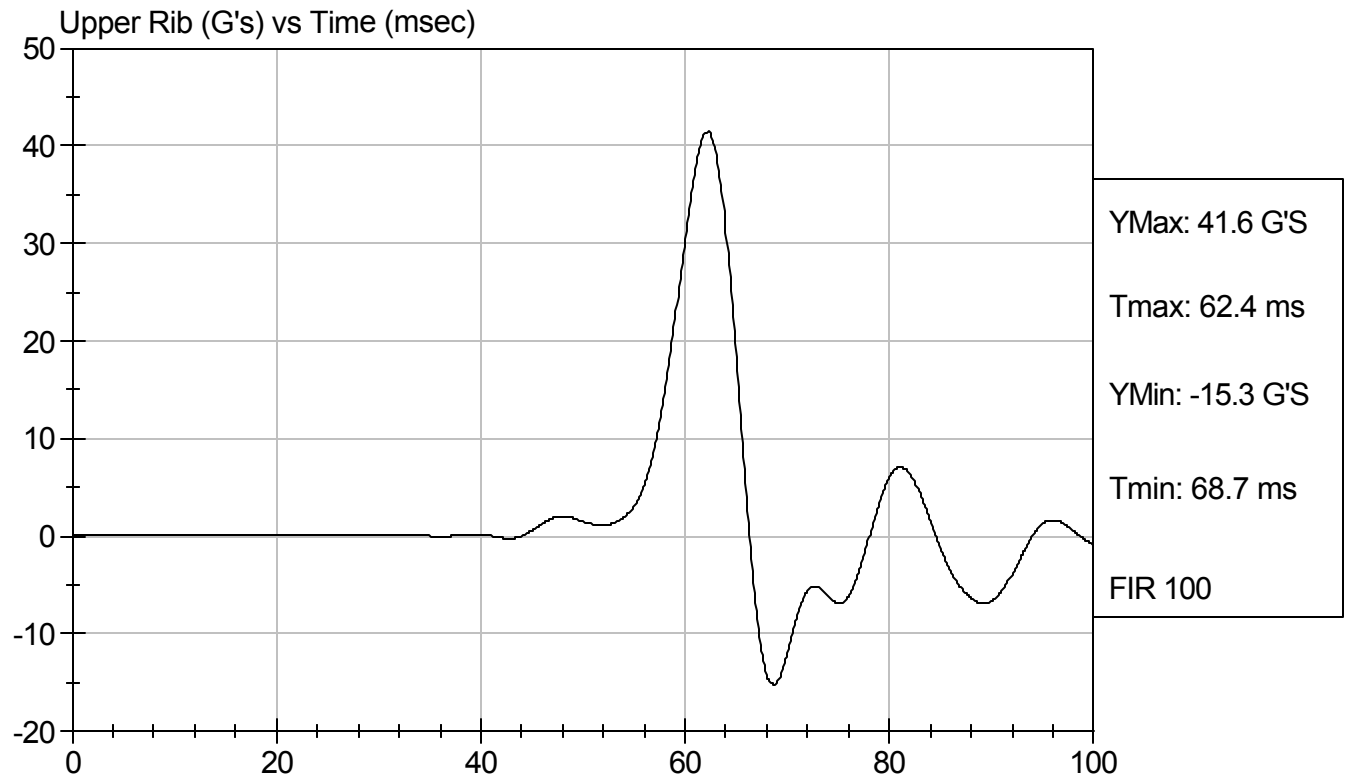
David Winkelbauer  
Approved By

8/13/09  
Test Date



Test Desc: Thorax Impact  
Component ID: D092112

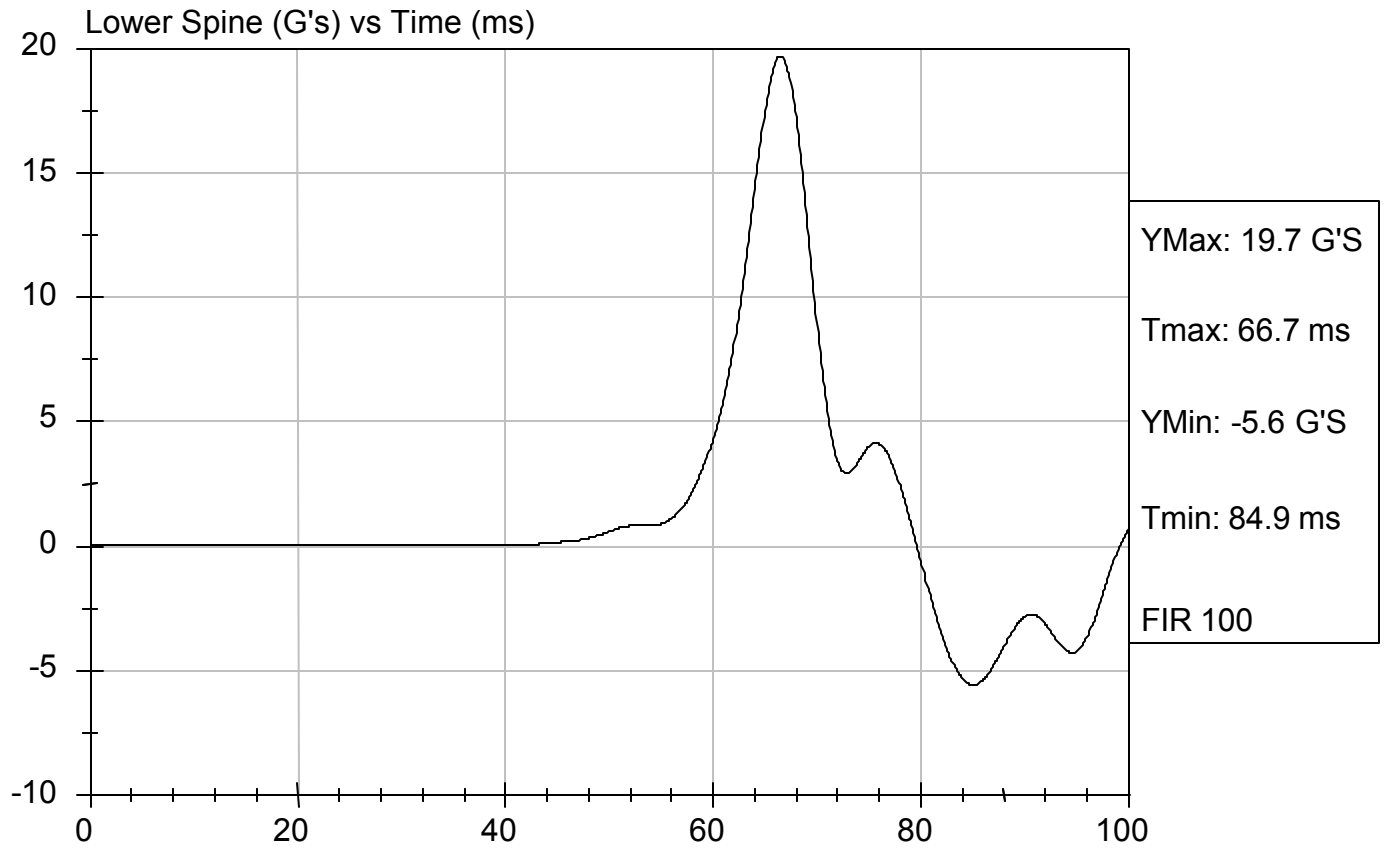
Test Date: 8/13/09  
Speed: 13.89 ft/sec, 4.23 m/sec





Test Desc: Thorax Impact  
Component ID: D092112

Test Date: 8/13/09  
Speed: 13.89 ft/sec, 4.23 m/sec



**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Pelvis Impact Test**

**ATD Serial No:** 272

**Test I.D:** D092113

| Tested Parameter             | Units | Specification | Result               | Pass/Fail |
|------------------------------|-------|---------------|----------------------|-----------|
| Laboratory Temperature       | deg C | 18.9 to 25.5  | 21.0                 | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 50                   | Pass      |
| Probe Velocity               | m/s   | 4.27 - 4.33   | 4.30                 | Pass      |
| Pelvis Acceleration          | G's   | 40 - 60       | 43                   | Pass      |
|                              |       |               | Overall Test Results | Pass      |

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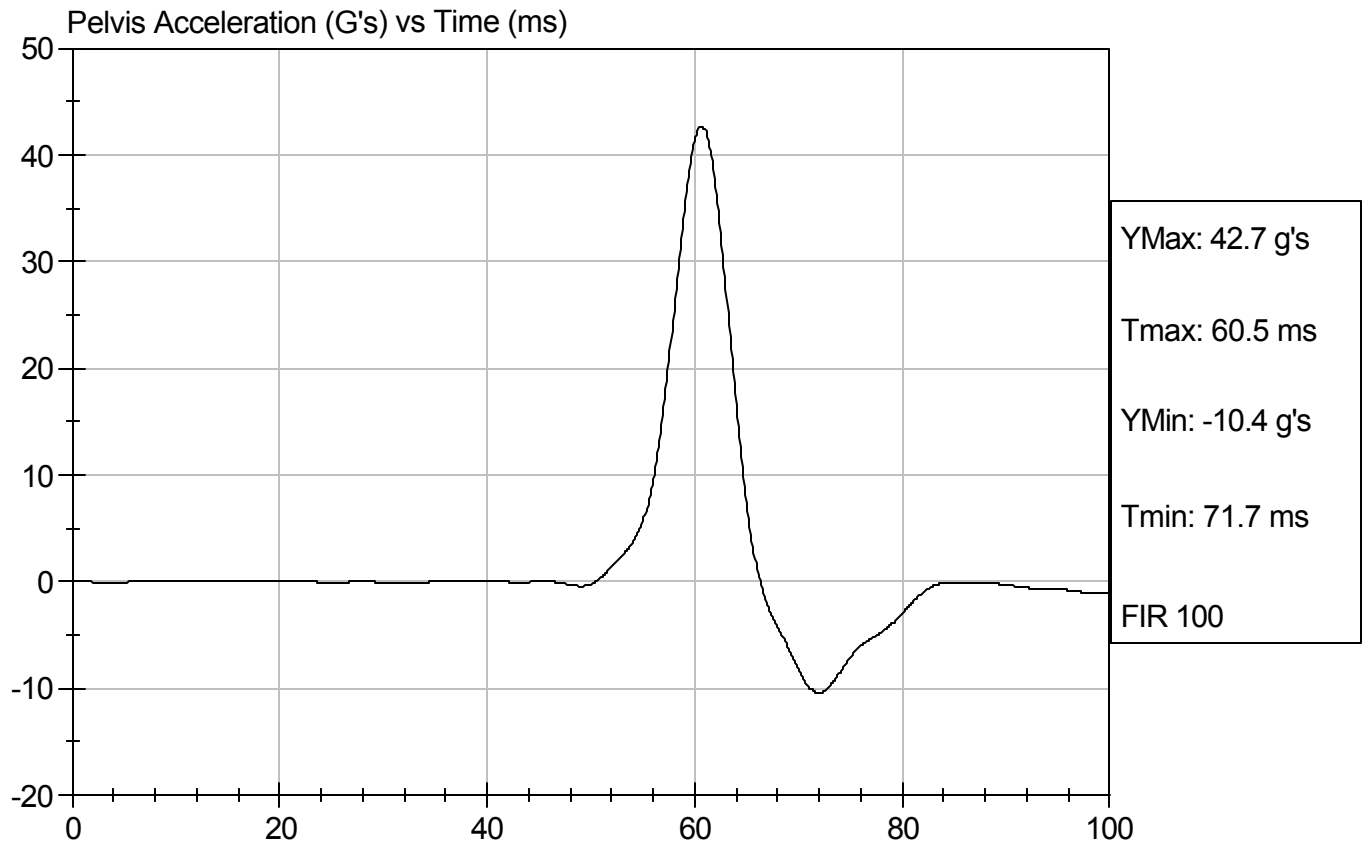
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8/13/09  
Test Date



Test Desc: Pelvis Impact  
Component ID: D092113

Test Date: 8/13/09  
Speed: 14.12 ft/sec, 4.30 m/sec



**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Abdominal Compression Calibration (Pre-Load = 10 lbs)**

**ATD Serial No:** 272

**Test I.D:** D092114

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.2   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 51     | Pass      |
| Force At 12.7 mm             | N     | 104 -162      | 132    | Pass      |
| Force At 19 mm               | N     | 163 - 222     | 181    | Pass      |
| Force At 25.4 mm             | N     | 222 - 280     | 241    | Pass      |
| Force At 33 mm               | N     | 325 - 391     | 330    | Pass      |
| Overall Test Results         |       |               | Pass   |           |

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Laboratory Technician

8/13/09  
Test Date

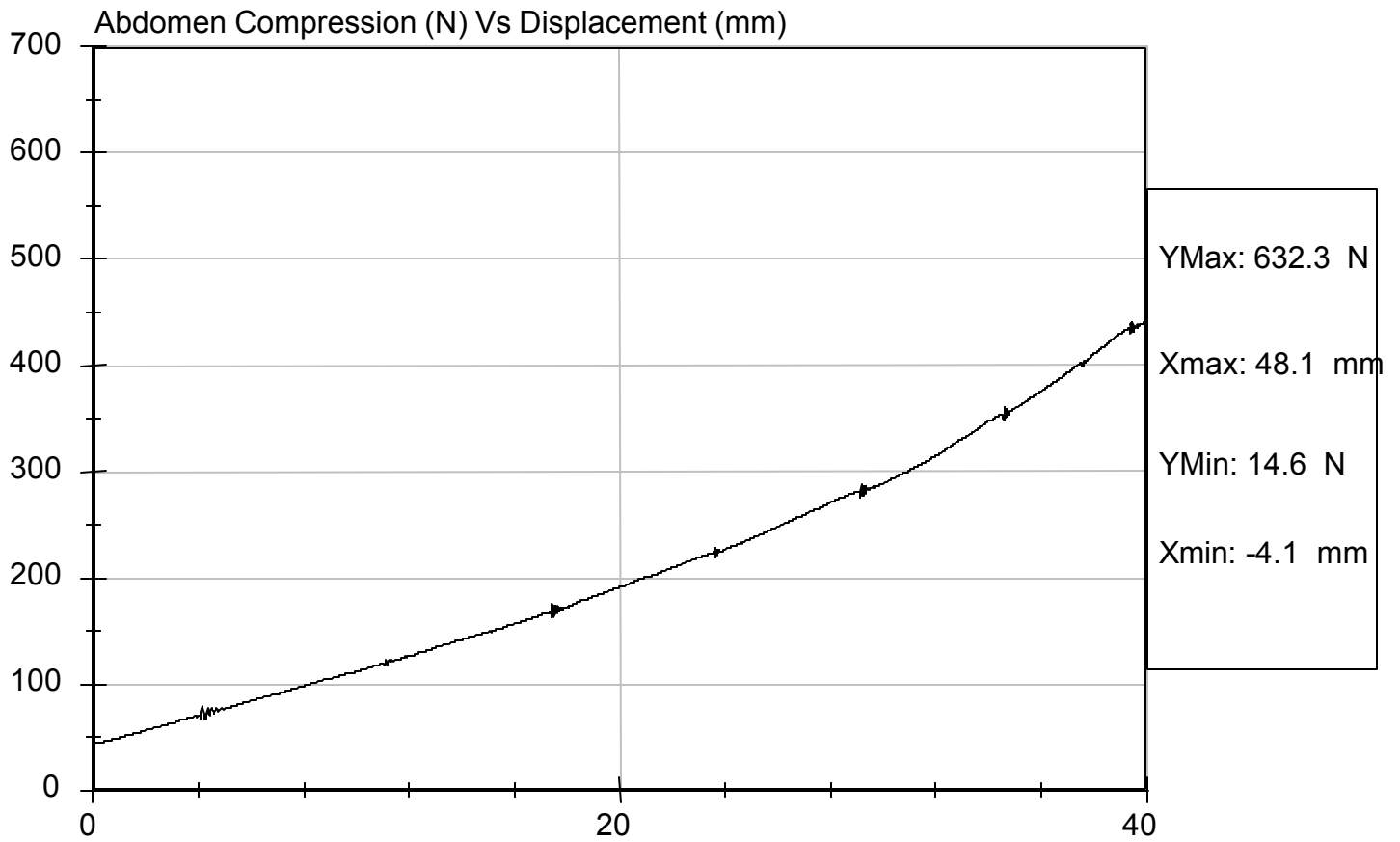
David Winkelbauer  
Approved By



Test Description: Abdomen Compression Test Date: 8/13/09

Component: D092114

Speed: 0 ft/sec, 0 m/sec



**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Lumbar Flexion Calibration**

**ATD Serial No:** 272

**Test I.D:** D092115

| Tested Parameter             | Units | Specification | Result | Pass/Fail |
|------------------------------|-------|---------------|--------|-----------|
| Laboratory Temperature       | deg C | 18.9 - 25.5   | 21.1   | Pass      |
| Laboratory Relative Humidity | %     | 10 to 70      | 50     | Pass      |
| Force At 0 deg               | N     | 0 - 26.7      | 0      | Pass      |
| Force At 20 deg              | N     | 97.9 - 151.2  | 135.6  | Pass      |
| Force At 30 deg              | N     | 151.2 - 204.6 | 181.3  | Pass      |
| Force At 40 deg              | N     | 204.6 - 258.0 | 245.7  | Pass      |
| Return Angle                 | Deg   | 12 Maximum    | 4      | Pass      |
| Overall Test Results         |       |               | Pass   |           |

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Laboratory Technician

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8/13/09  
Test Date

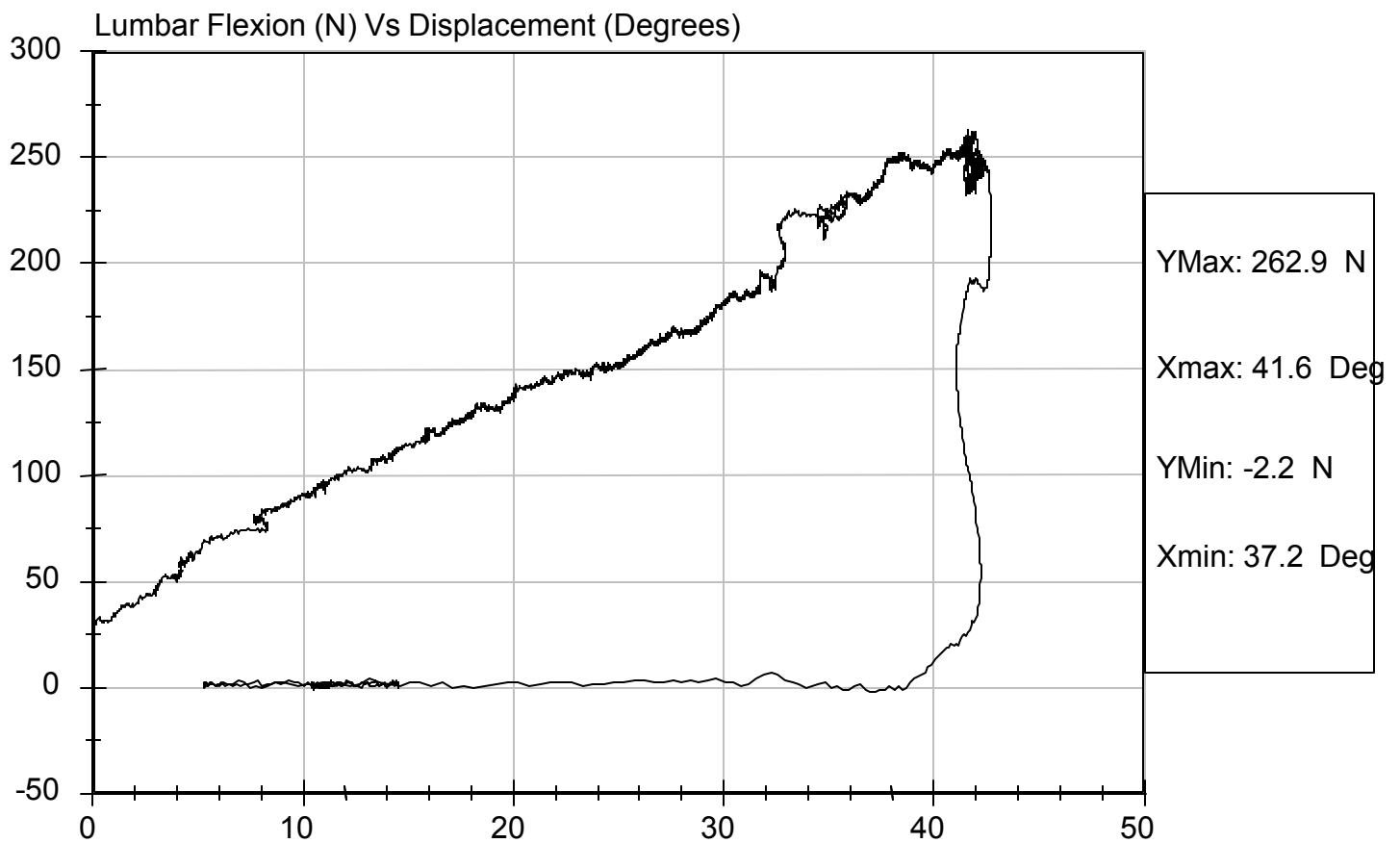


Test Description: Lumbar Flexion

Test Date: 8/13/09

Component: D092115

Speed: 0 ft/sec, 0 m/sec

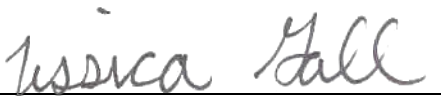


**SID/HIII Calibration Data Sheet**  
**Side Impact Dummy**  
**Neck Pendulum Test**

**ATD Serial No:** 272

**Test I.D:** D092119

| Tested Parameter                        |             | Units | Specification | Result | Pass/Fail |
|-----------------------------------------|-------------|-------|---------------|--------|-----------|
| Laboratory Temperature                  |             | deg C | 20.6 to 22.2  | 21.5   | Pass      |
| Laboratory Relative Humidity            |             | %     | 10 to 70      | 53     | Pass      |
| Impact Velocity                         |             | m/s   | 6.89 to 7.13  | 7.06   | Pass      |
| Pendulum Deceleration                   | 10 ms       | m/s   | 1.96 to 2.55  | 2.30   | Pass      |
|                                         | 20 ms       | m/s   | 4.12 to 5.10  | 4.51   | Pass      |
|                                         | 30 ms       | m/s   | 5.73 to 7.01  | 6.27   | Pass      |
|                                         | 40 to 70 ms | m/s   | 6.27 to 7.64  | 6.64   | Pass      |
| Midsaggital Plane Max Rotation          |             | deg   | 66 to 82      | 72     | Pass      |
| Head Rotation Peak to Zero - Decay Time |             | ms    | 58 to 67      | 58     | Pass      |
| Max. Mx at Occipital Condyles           |             | Nm    | 73 to 88      | 80     | Pass      |
| Mx Peak To Zero - Decay Time            |             | ms    | 49 to 64      | 61     | Pass      |
| Mx Peak to Max. Head Rotation           |             | ms    | 2 to 16       | 13     | Pass      |

  
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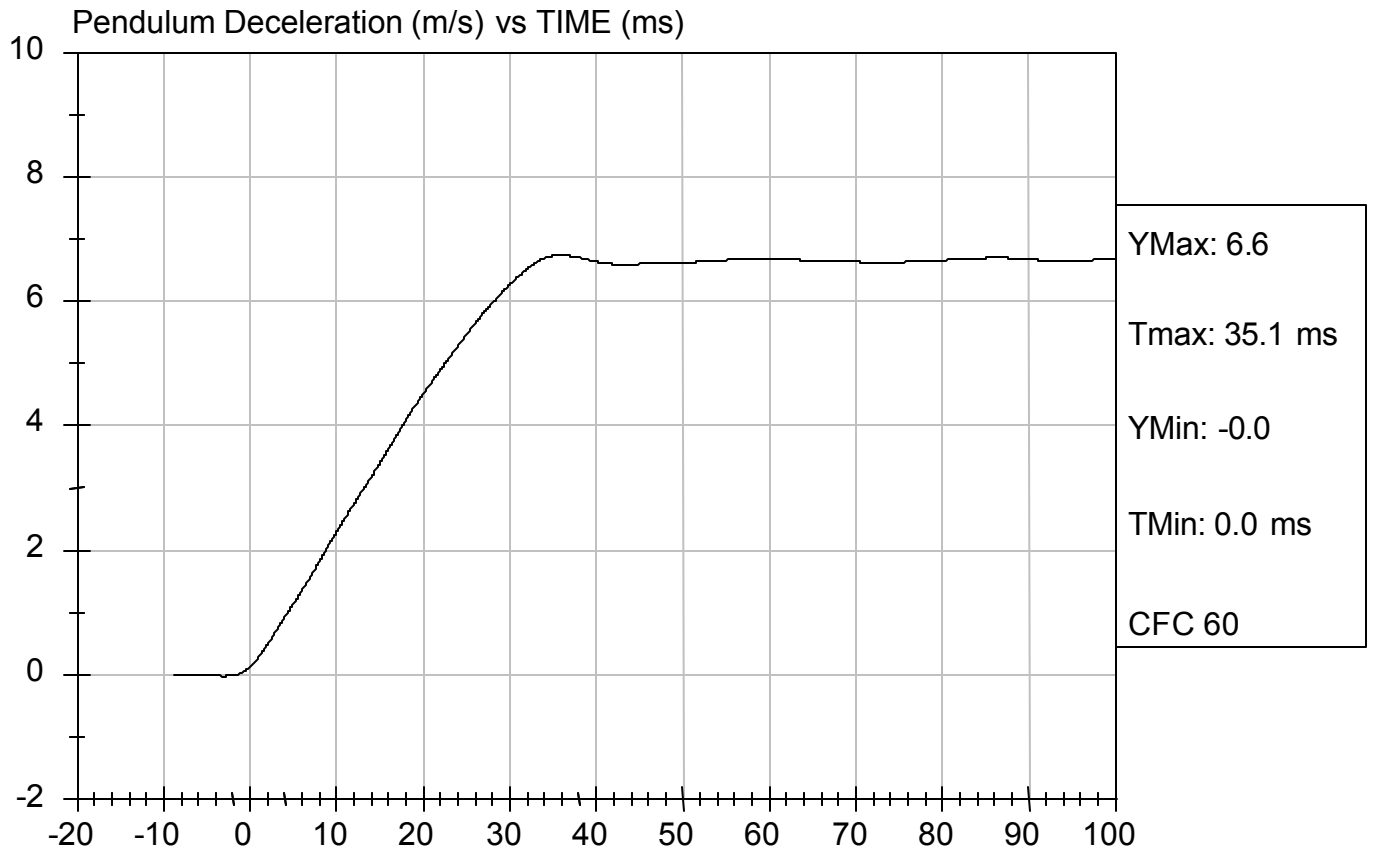
Test Date

  
 Approved By



Test Desc: Neck Bending  
Component ID: D092119

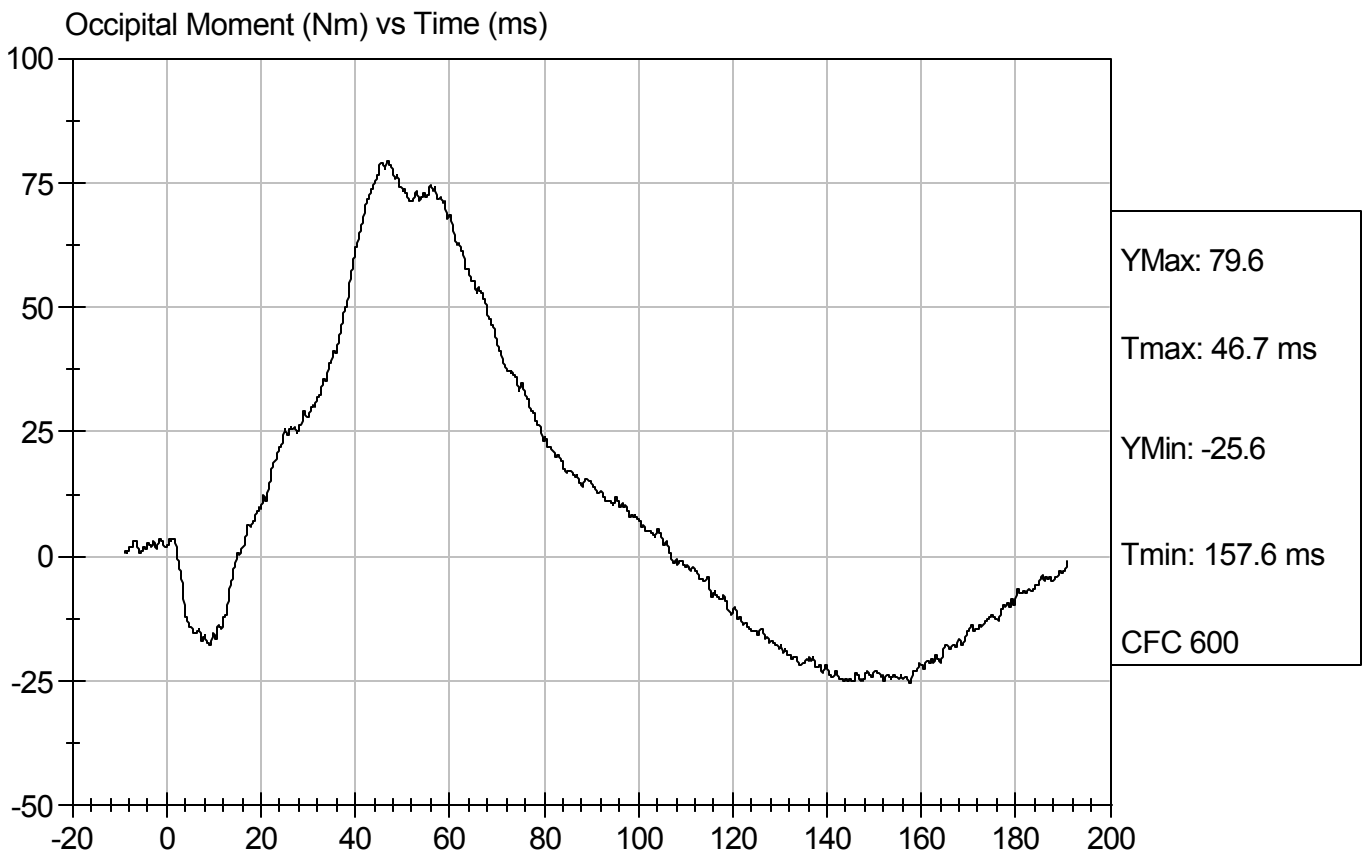
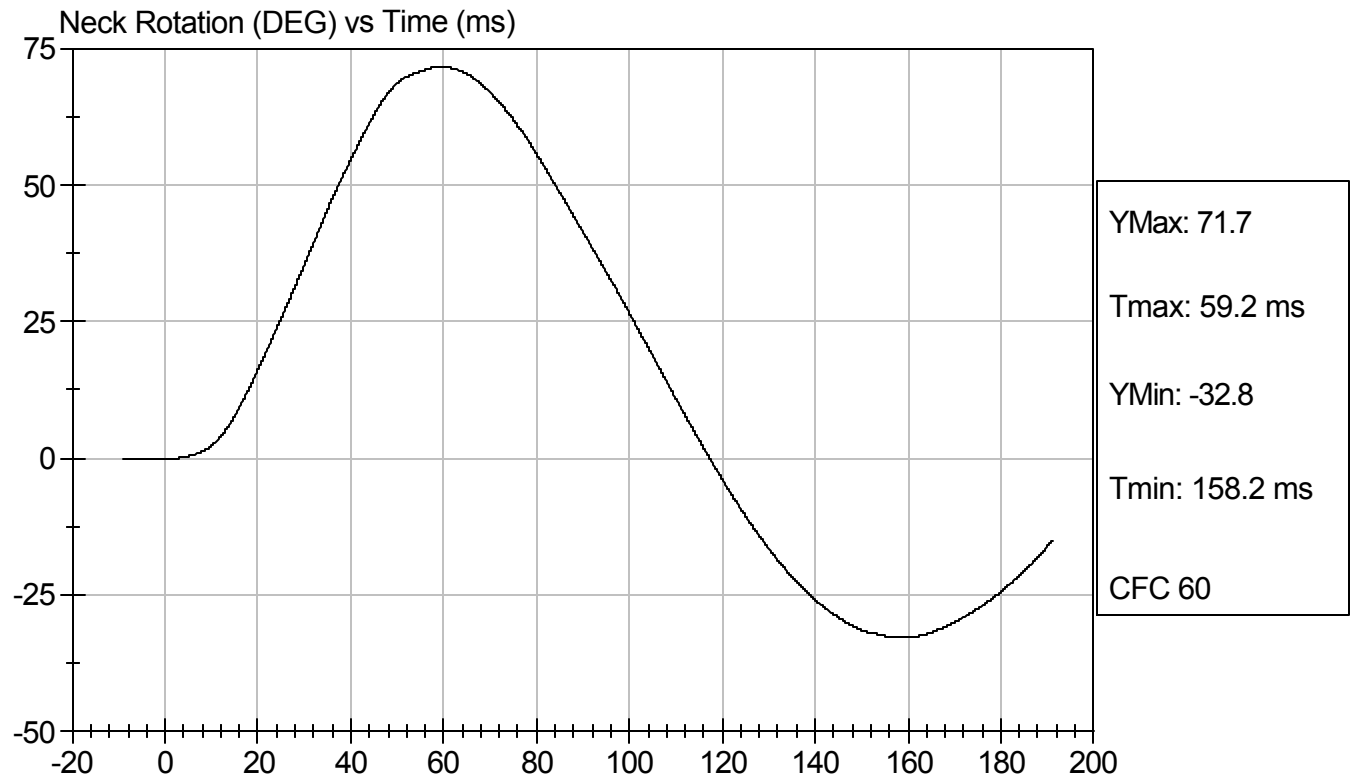
Test Date: 8/13/09  
Speed: 23.148 ft/sec, 7.06 m/sec





Test Desc: Neck Bending  
Component ID: D092119

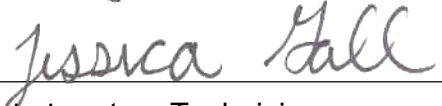
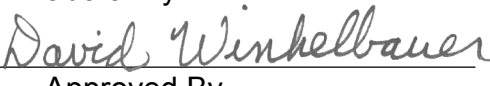
Test Date: 8/13/09  
Speed: 23.148 ft/sec, 7.06 m/sec



**SID Calibration Data Sheet**  
**Side Impact Dummy**  
**Inspection Checklist**

**ATD Serial No:** 272

| Test Part    | Items Checked                        | Result |
|--------------|--------------------------------------|--------|
| Skin         | Visual inspection                    | Pass   |
| Head         | Visual, ballast, accelerometer mount | Pass   |
| Neck         | Visual                               | Pass   |
| Spine Box    | Visual, ballast, accelerometer mount | Pass   |
| Rib Cage     | Visual, measure                      | Pass   |
| Sternum      | Visual                               | Pass   |
| Lumbar Spine | Visual                               | Pass   |
| Abdomen      | Visual                               | Pass   |
| Pelvis       | Visual, palpate, accelerometer mount | Pass   |
| Upper Legs   | Visual                               | Pass   |
| Knees        | Visual                               | Pass   |
| Lower Legs   | Visual, range of motion              | Pass   |
| Ankles       | Visual, range of motion              | Pass   |
| Feet         | Visual, range of motion              | Pass   |
| Joints       | 1 to 2 g range                       | Pass   |
| Other        |                                      | Pass   |

  
Laboratory Technician  
  
Approved By

8/13/2009  
Test Date