

**REPORT NUMBER: 214P-CAL-10-4**

**SAFETY COMPLIANCE TESTING FOR FMVSS 214  
DYNAMIC SIDE IMPACT PROTECTION  
RIGID POLE SIDE IMPACT**

**GENERAL MOTORS LLC  
2010 BUICK LACROSSE CX  
4-DOOR SEDAN**

**NHTSA NUMBER: CA0104**

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



**Test Date: April 5, 2010**

**FINAL REPORT**

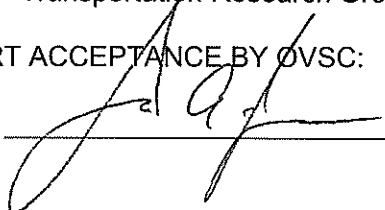
**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
ENFORCEMENT  
OFFICE OF VEHICLE SAFETY COMPLIANCE  
1200 NEW JERSEY AVENUE, SE  
NVS-220, WEST BUILDING 4<sup>TH</sup> FLOOR  
WASHINGTON, DC 20590**

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**Technical Report Documentation Page**

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| 4. Title and Subtitle<br>Final Report of FMVSS 214P Compliance Side Impact Testing of a 2010 Buick LaCrosse CX 4-Door Sedan<br>NHTSA No.: CA0104  |               |  |  | 5. Report Date<br>April 5, 2010   |           |  |               |     |       |                          |      |                           |        |                     |        |
|   |               |  |  | 6. Performing Organization Code<br>CAL  |           |  |               |     |       |                          |      |                           |        |                     |        |
| 7. Author(s)<br>Vincent M. Paolini, Project Engineer<br>David J. Travale, Program Manager   |               |  |  | 8. Performing Organization Report No.<br>tr2434   |           |  |               |     |       |                          |      |                           |        |                     |        |
| 9. Performing Organization Name and Address<br>Calspan Corporation<br>Transportation Research Group<br>P.O. Box 400<br>Buffalo, New York 14225  |               |  |  | 10. Work Unit No.   |           |  |               |     |       |                          |      |                           |        |                     |        |
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| 15. Supplementary Notes   |               |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| 16. Abstract<br>A 32 km/h (20 mph) 75° oblique impact compliance test was conducted on the subject 2010 Buick LaCrosse CX 4-Door Sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP- 214P-01 for the determination of FMVSS 214 Side Impact Protection compliance. The test was conducted by the Calspan Corporation Transportation Research Group in Buffalo, New York, on April 5, 2010.<br>The impact velocity was 31.5 km/h, and the ambient temperature at the struck side (driver side) of the test vehicle was 21.7°C. The test vehicle's maximum post test static crush was 294 mm at level 3. The test vehicle's occupant performance is as follows: |               |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| <table border="1"> <thead> <tr> <th></th> <th align="center"><u>DRIVER</u></th> </tr> </thead> <tbody> <tr> <td>HIC</td> <td align="center">401.7</td> </tr> <tr> <td>Max. Rib Deflection (mm)</td> <td align="center">23.4</td> </tr> <tr> <td>Sum of Abdomen Forces (N)</td> <td align="center">1051.2</td> </tr> <tr> <td>Pubic Symphysis (N)</td> <td align="center">2751.9</td> </tr> </tbody> </table>  |               |  |  |   |           |  | <u>DRIVER</u> | HIC | 401.7 | Max. Rib Deflection (mm) | 23.4 | Sum of Abdomen Forces (N) | 1051.2 | Pubic Symphysis (N) | 2751.9 |
|   | <u>DRIVER</u> |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| HIC   | 401.7         |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| Max. Rib Deflection (mm)  | 23.4          |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| Sum of Abdomen Forces (N)   | 1051.2        |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| Pubic Symphysis (N)   | 2751.9        |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.   |               |  |  |   |           |  |               |     |       |                          |      |                           |        |                     |        |
| 17. Key Words<br>Compliance Testing<br>Side Impact Protection<br>Pole Test<br>ES-2re  |               |  |  | 18. Distribution Statement<br><u>Copies of this report are available from:</u><br>National Highway Traffic Safety Admin.<br>Technical Information Services<br>Room E12-100 East Bldg.<br>1200 New Jersey Avenue, SE<br>Washington, DC 20590<br>Phone : (202) 366-2588 |           |  |               |     |       |                          |      |                           |        |                     |        |
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## TABLE OF CONTENTS

| <u>Section</u>        |  | <u>Page No.</u> |
|-----------------------|--|-----------------|
| 1                     | Purpose and Summary of the Test                | 1-1             |
| 2                     | Occupant and Vehicle Information               | 2-1             |
| <u>Data Sheet No.</u> |  |                 |
| 1                     | Test Vehicle Information and Options           | 2-2             |
| 2                     | General Test and Vehicle Parameter Data        | 2-3             |
| 3                     | Vehicle Tire Information                       | 2-4             |
| 4                     | Seat and Seat Belt Adjustment Data             | 2-5             |
| 5                     | Fuel Systems and Steering Wheel Position Data  | 2-6             |
| 6                     | Dummy Longitudinal Clearance Dimensions        | 2-7             |
| 7                     | Dummy Lateral Clearance Dimensions             | 2-8             |
| 8                     | High Speed Camera Locations                    | 2-9             |
| 9                     | Test Vehicle Accelerometer Locations           | 2-10            |
| 10                    | Test Vehicle Accelerometer Data Summary        | 2-11            |
| 11                    | Dummy Injury Response Data for ES-2re          | 2-12            |
| 12                    | Post Test Observations                         | 2-13            |
| 13                    | Vehicle Pre-Test and Post-Test Measurements    | 2-14            |
| 14                    | Exterior Crush Measurements                    | 2-15            |
| 15                    | Vehicle Exterior Crush Profiles                | 2-16            |
| 16                    | Summary of FMVSS 301 Fuel System Data          | 2-17            |
| 17                    | Temperature and Humidity Trace                 | 2-18            |
| <u>Appendix</u>       |  | <u>Page No</u>  |
| A                     | Photographs                                    | A-1             |
| B                     | ES-2re Dummy Response Data                     | B-1             |
| C                     | Vehicle Accelerometer Response Data            | C-1             |
| D                     | Dummy ES-2re Performance Calibration Test Data | D-1             |
| E                     | Test Equipment and Instrumentation Calibration | E-1             |

**SECTION 1**  
**PURPOSE AND TEST PROCEDURE**

**PURPOSE**

This side impact test is part of the FY 2010 FMVSS 214 Side Impact Protection Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-07-D-00064. The purpose of this test was to evaluate side impact protection in a 2010 Buick LaCrosse CX 4-Door Sedan. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-214P-01, dated January 2010).

**SUMMARY**

A rigid pole impact test was conducted on a 2010 Buick LaCrosse CX 4-Door Sedan. The test was towed into a rigid pole at an angle of 75° and a velocity of 31.5 km/h. The test was conducted by the Calspan Corporation Transportation Sciences Group in Buffalo, New York on April 5, 2010. Pre-test and post-test photographs of the test vehicle and side impact dummy are included in Appendix A of this report.

One Part 572U dummy was placed in the left front outboard designated seating position according to instructions specified in TP-214P-01 dated July 2009. The side impact event was documented by 1 real-time and 9 high-speed cameras.

The ES2-re male dummy was instrumented with a tri-axial accelerometer pack located in the head, 3 rib displacement transducers located in the chest, 3 load cells located in the abdomen and a load cell in the pubic symphysis.

The summary of the test results follows:

| Driver ES-2re Male Dummy |        |    |
|--------------------------|--------|----|
| HIC                      | 401.7  |    |
| UPPER RIB DEFLECTION     | 23.4   | mm |
| MIDDLE RIB DEFLECTION    | 22.5   | mm |
| LOWER RIB DEFLECTION     | 21.1   | mm |
| ABDOMEN (FRONT)          | 257.7  | N  |
| ABDOMEN (MID)            | 273.6  | N  |
| ABDOMEN (REAR)           | 616.6  | N  |
| SUM OF ABDOMEN FORCES    | 1051.2 | N  |
| PUBIC SYMPHYSIS          | 2751.9 | N  |

## SECTION 2

**DATA SHEET NO. 1  
TEST VEHICLE INFORMATION AND OPTIONS**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214P Side Impact Test Date: April 5, 2010

| Vehicle Information  |                    | Options   |     |
|----------------------|--------------------|---|-----|
| Make                 | General Motors LLC | ESC   | Yes |
| Model                | LaCrosse CX        | All-Wheel Drive   | No  |
| Body Style           | 4-Door Sedan       | Power Steering  | Yes |
| VIN                  | 1G4GB5GG7AF160766  | Tilt Steering Wheel                                       | Yes |
| Body Color           | White              | Driver Side Curtain Airbag                                | Yes |
| Engine Disp (liters) | 3.0                | Driver Side Torso Airbag                                  | Yes |
| # of Cylinders       | V6                 | Driver Combo Bag  | No  |
| Engine Placement     | Lateral            | Driver Seat Belt Pretentioners                            | Yes |
| Transmission Type    | Automatic          | Driver Seat Belt Load Limiters                            | Yes |
| Transmission Speeds  | 6 Speed            | Driver Power Seats  | Yes |
| Overdrive            | Yes                | Rear Pass. Curtain Airbag                                 | Yes |
| Final Drive          | Front              | Rear Pass. Side Torso Airbag                              | Yes |
| Odometer Reading     | 22 Miles           | Rear Pass. Seat Belt Pretentioners                        | No  |
|                      |                    | Rear Pass. Seat Belt Load Limiters                        | No  |
|                      |                    | Rear Pass. Power Seats                                    | No  |
|                      |                    | Power Windows   | Yes |
|                      |                    | Air Conditioning  | Yes |
|                      |                    | AM/FM CD  | Yes |
|                      |                    | Automatic Door Locks (ADL)                                | Yes |
|                      |                    | Does owner's manual provide instructions to disable ADLs? | No  |
|                      |                    | Anti-Lock Brakes  | Yes |

**DATA FROM CERTIFICATION LABEL**

|                     |                    |                 |      |
|---------------------|--------------------|-----------------|------|
| Manufactured By     | General Motors LLC | GVWR (kg)       | 2219 |
|                     |                    | GAWR Front (kg) | 1155 |
| Date of Manufacture | 11/09              | GAWR Rear (kg)  | 1064 |

**VEHICLE CAPACITY DATA**

| Measured Parameter      | Front  | Rear  | Third | Total |
|-------------------------|--------|-------|-------|-------|
| Type of Seats           | Bucket | Bench |       |       |
| Number Of Occupants     | 2      | 3     |       | 5     |
| Capacity Wt. (VCW) (kg) |        |       |       | 420   |
| Cargo Wt. (RCLW) (kg)   |        |       |       | 79.8  |

**DATA SHEET NO. 2  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214P Side Impact Test Date: April 5, 2010

**TIRE PRESSURES**

|              | Units | LF  | RF  | RR  | LR  |
|--------------|-------|-----|-----|-----|-----|
| As Delivered | kpa   | 230 | 230 | 230 | 230 |
| As Tested    | kpa   | 230 | 230 | 230 | 230 |

**TEST VEHICLE WEIGHTS**

|        | Units | As Delivered (UVW) (Axle) |       |        | Fully Loaded (Axle) |       |        | As Tested (ATW) (Axle) |       |        |
|--------|-------|---------------------------|-------|--------|---------------------|-------|--------|------------------------|-------|--------|
|        |       | Front                     | Rear  | Total  | Front               | Rear  | Total  | Front                  | Rear  | Total  |
| Left   | kg    | 534.5                     | 364.0 |        | 549.5               | 444.5 |        | 568.5                  | 417.0 |        |
| Right  | kg    | 519.0                     | 349.0 |        | 531.5               | 396.0 |        | 530.0                  | 401.0 |        |
| Ratio  | %     | 59.6                      | 40.4  |        | 56.3                | 43.7  |        | 57.3                   | 42.7  |        |
| Totals | kg    | 1053.5                    | 713.0 | 1766.5 | 1081.0              | 840.5 | 1921.5 | 1098.5                 | 818.0 | 1916.5 |

**TARGET TEST WEIGHT CALCULATION**

| Measured Parameter                      | Units | Value  |
|---|-------|--------|
| Total Delivered Weight (UVW)            | kg    | 1766.5 |
| Weight of 1 P572U ATD (78.0 kg each)    | kg    | 78.0   |
| Rated Cargo/Luggage Weight (RCLW)       | kg    | 79.8   |
| Calculated Vehicle Target Weight (TVTW) | kg    | 1924.3 |

\* Actual As Tested Weight (ATW) will be TVTW -4.5/-9.1 kg

Weight of Ballast (including instrumentation package and cameras): 72.0 kg

**WEIGHT of BALLAST and VEHICLE COMPONENTS REMOVED TO MEET TVTW**

| Description of Component | Weight (kg) |
|--------------------------|-------------|
| Ballast (if any)         | 34          |
|                          |             |
|                          |             |
|                          |             |

**TEST VEHICLE ATTITUDES**

|              | Units | LF  | RF  | LR  | RR  |
|--------------|-------|-----|-----|-----|-----|
| Fully Loaded | mm    | 737 | 743 | 736 | 731 |
| As Tested    | mm    | 743 | 743 | 747 | 737 |
| DIFF Δ       | mm    | -6  | 0   | -11 | -6  |

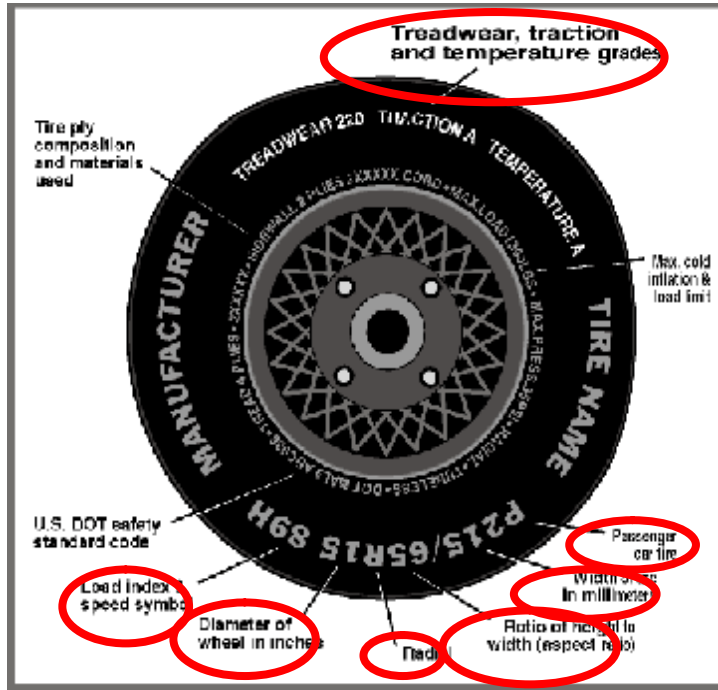
**CALCULATION OF THE VERTICAL IMPACT REFERENCE LINE**

| Measurement Description                          | Units | Value |
|--|-------|-------|
| Test Vehicle Wheel Base                          | mm    | 2841  |
| Vertical Impact Reference Line Aft of Front Axle | mm    | 1364  |



**DATA SHEET NO. 3  
VEHICLE TIRE INFORMATION**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010



**DATA FROM TIRE PLACARD**

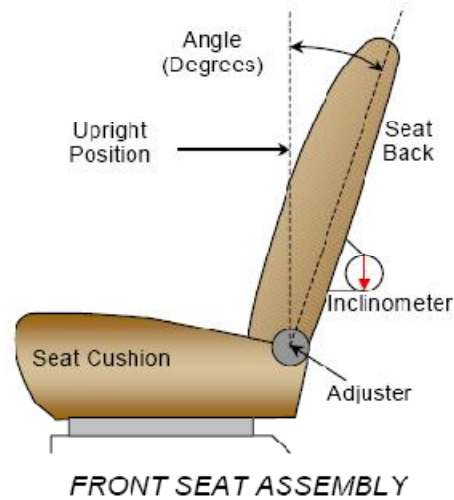
| Measured Parameter                      | Front        | Rear         |
|---|--------------|--------------|
| Maximum Tire Pressure (kPa)             | 300          | 300          |
| Cold / Test Pressure (kPa)              | 230          | 230          |
| Recommended Tire Size                   | P245/50R17   | P245/50R17   |
| Tire Size on Vehicle                    | P245/50R17   | P245/50R17   |
| Tire Manufacturer                       | Michelin     | Michelin     |
| Tire Name                               | Primacy MXM4 | Primacy MXM4 |
| Tire Type                               | Passenger    | Passenger    |
| Tire Width (mm)                         | 245          | 245          |
| Ratio of Height to Width (aspect ratio) | 50           | 50           |
| Radial                                  | Yes          | Yes          |
| Wheel Diameter                          | 17           | 17           |
| Load Index & Speed Symbol               | 98H          | 98H          |
| Treadwear                               | 500          | 500          |
| Traction Grade                          | A            | A            |
| Temperature Grade                       | A            | A            |

**DATA SHEET NO. 4  
SEAT AND SEAT BELT ADJUSTMENT DATA**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010

**NORMAL DESIGN RIDING POSITION**

An inclinometer was placed on the head restraint post and it measured a vertical angle of -13.9 degrees with the ATD in seat. The sill pitch angle was 0.0 degrees (pitched down). In addition the measurement from the front edge of head restraint post to the front edge of left front door striker was 263 mm (measurement was taken with ATD in seat).



**SEAT BACK ANGLES**

|                        | Degrees |
|------------------------|---------|
| Driver w/ Seated Dummy | -13.9   |

**SEAT FORE/AFT POSITIONS**

The seat was placed in the mid-travel position while maintaining the seat cushion mid-angle position.

**SEAT FORE/AFT POSITION**

|                                    | Driver Seat |
|------------------------------------|-------------|
| Total Fore/Aft Travel (mm)         | 268         |
| Test Position (mm)                 | 134         |
| Test Detent (forward-most detent)  | NA          |
| Total Number of Detents (including | NA          |

**SEAT BELT UPPER ANCHORAGES**

|             | Total # of Positions | Placed in Position # |
|-------------|----------------------|----------------------|
| Driver Seat | 5                    | 1 (uppermost)        |

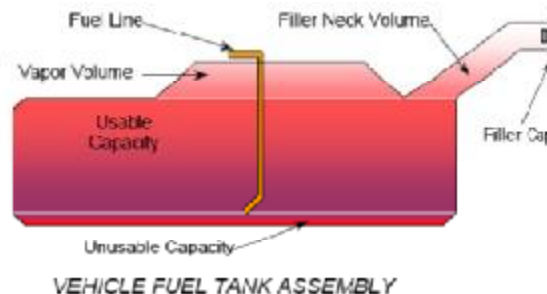
**DATA SHEET NO. 5  
FUEL SYSTEMS AND STEERING WHEEL POSITION DATA**

Test Vehicle: 2010 Buick LaCrosse CX  
 Test Program: FMVSS 214 Side Impact

NHTSA No. CA0104  
 Test Date: April 5, 2010

**FUEL SYSTEM INFORMATION**

The test vehicle is equipped with an electric fuel pump. The fuel pump operates continuously while the engine is running

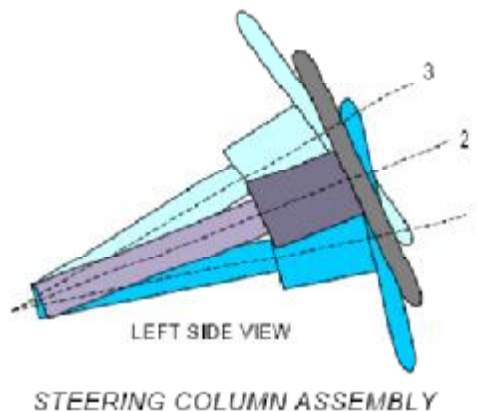


**FUEL TANK CAPACITY**

|   | Liters     |
|---|------------|
| Usable Capacity (Form 1)                      | 70.4       |
| Usable Capacity (Owner's Manual)              | 70.4 (FWD) |
| Usable Capacity of "Optional" Fuel Tank       | -          |
| Stoddard Used for Test (92%-94% of Fuel) Tank | 65.5       |

**STEERING COLUMN ADJUSTMENT**

A flat plate was placed on the top and bottom of steering wheel. The inclinometer was placed on the flat plate to measure the angle.

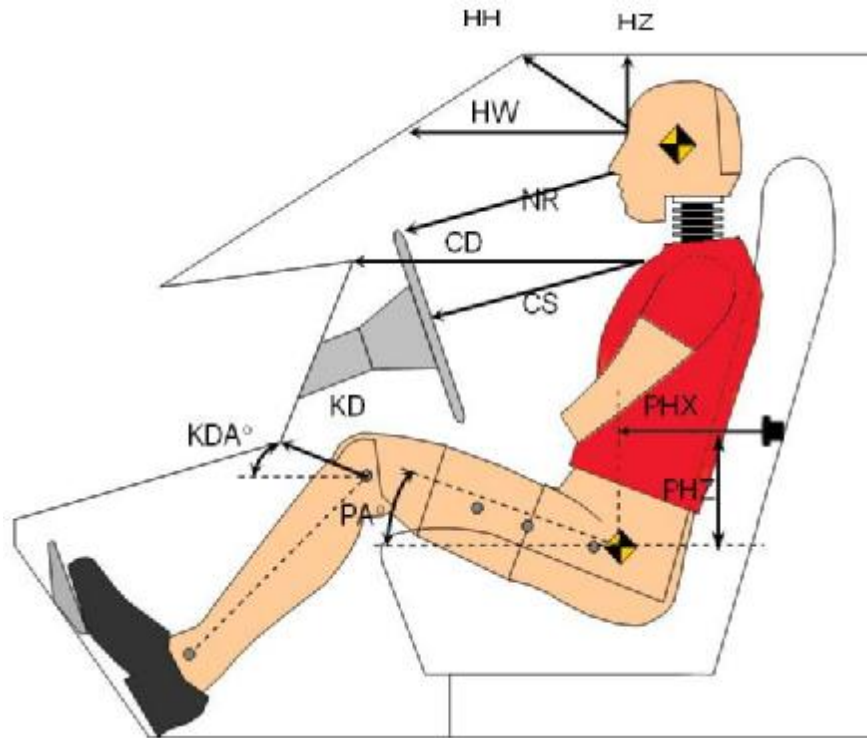


**STEERING COLUMN POSITIONING**

|                                   | Degrees | Fore/Aft Position (mm) |
|-----------------------------------|---------|------------------------|
| Lowermost - Position 1            | 20.8    | NA                     |
| Geometric Center - Position 2     | 23.0    | NA                     |
| Uppermost - Position 3            | 25.2    | NA                     |
| Telescoping Steering Wheel Travel | NA      | 56                     |
| Test Position                     | 23.0    | 28                     |

**DATA SHEET NO. 6  
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

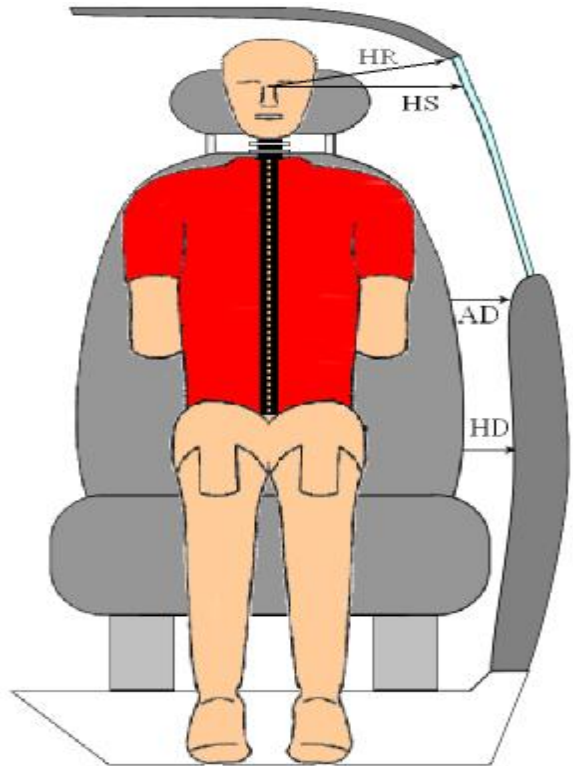
|               |                        |            |               |
|---------------|------------------------|------------|---------------|
| Test Vehicle: | 2010 Buick LaCrosse CX | NHTSA No.  | CA0104        |
| Test Program: | FMVSS 214 Side Impact  | Test Date: | April 5, 2010 |



| Frt.<br>Occupant<br>Code | Measurement Description      | ES2-re         |       |
|--------------------------|------------------------------|----------------|-------|
|                          |                              | Length<br>(mm) | Angle |
| HH                       | Header to Header             | 481            |       |
| HW                       | Header to Windshield         | 717            |       |
| HZ                       | Head to Roof                 | 165            |       |
| NR                       | Nose to Rim/Seat Back        | 499            |       |
| CD                       | Chest to Dash/Seat Back      | 624            |       |
| CS                       | Chest to Steering Wheel      | 369            |       |
| KDL                      | Left Knee to Dash/Seat Back  | 205            | 27.3  |
| KDR                      | Right Knee to Dash/Seat Back | 195            | 26.0  |
| PA                       | Pelvic Angle                 |                | 22.5  |
| PHX                      | H-Point to Striker (X-Axis)  | 142            |       |
| PHZ                      | H-Point to Striker (Z-Axis)  | 146            |       |

**DATA SHEET NO. 7  
DUMMY LATERAL CLEARANCE DIMENSIONS**

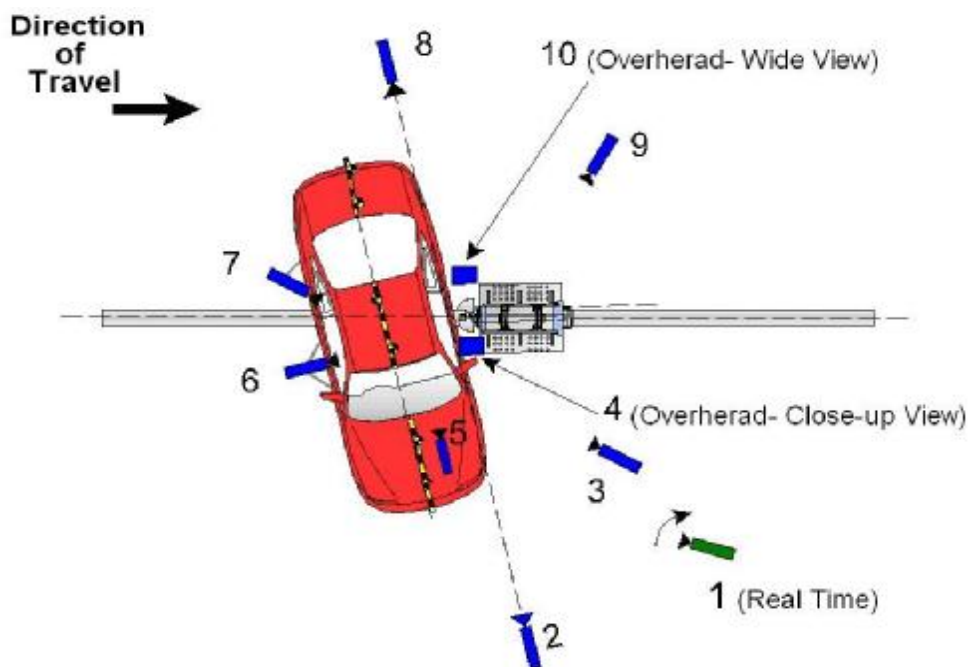
Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010



| Code |                     | Units | Front Occupant |
|------|---------------------|-------|----------------|
| HR   | Head to Side Header | mm    | 187            |
| HS   | Head to Side Window | mm    | 320            |
| AD   | Arm to Door         | mm    | 105            |
| HD   | H-point to Door     | mm    | 159            |

**DATA SHEET NO. 8  
HIGH SPEED CAMERA LOCATIONS AND DATA**

|               |                        |            |               |
|---------------|------------------------|------------|---------------|
| Test Vehicle: | 2010 Buick LaCrosse CX | NHTSA No.  | CA0104        |
| Test Program: | FMVSS 214P Side Impact | Test Date: | April 5, 2010 |

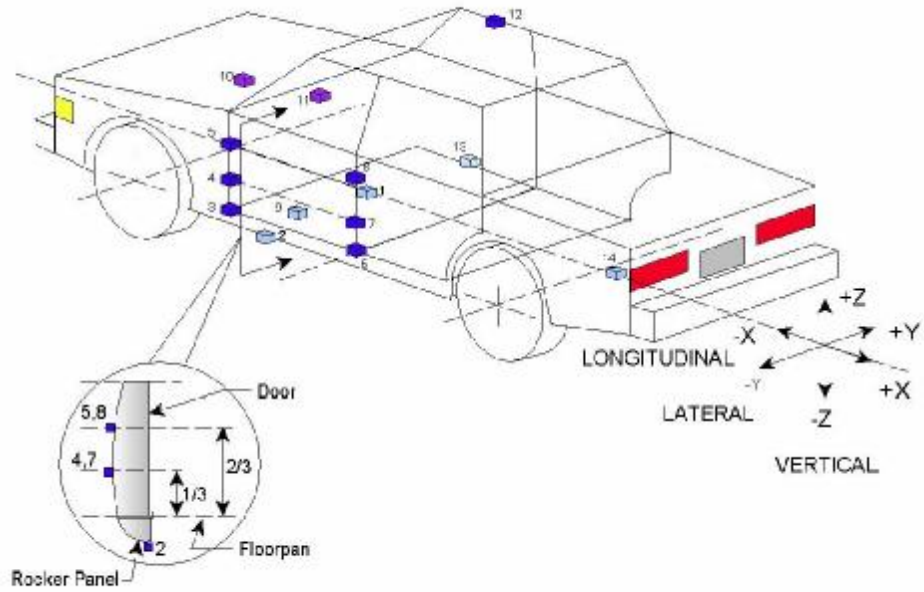


| No. | CAMERA VIEW                          | Location |       |      | LEN S (mm) | FILM SPEED (fps) |
|-----|--------------------------------------|----------|-------|------|------------|------------------|
|     |                                      | X        | Y     | Z    |            |                  |
| 1   | Real time (24 fps) film coverage     | -        | -     | -    | -          | 24               |
| 2   | Front ground level - impact view     | -1890    | -4290 | 1035 | 28         | 1000             |
| 3   | Impact side 45° - forward pole view  | -1670    | -1245 | 2270 | 24         | 1000             |
| 4   | Overhead Close-up view of impact     | -40      | -210  | 4375 | 28         | 1000             |
| 5   | Onboard – dummy front view           |          |       |      | 25         | 500              |
| 6   | Onboard – dummy side view            |          |       |      | 12.5       | 500              |
| 7   | Onboard – dummy rear view            |          |       |      | 12.5       | 500              |
| 8   | Rear ground level – impact view      | 1560     | 6480  | 1020 | 24         | 1000             |
| 9   | Impact side 45° - rearward pole view | -2950    | 2640  | 1510 | 24         | 1000             |
| 10  | Overhead wide-view of impact         | 310      | -160  | 4375 | 14         | 1000             |

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

**DATA SHEET NO. 9**  
**TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2010 Buick LaCrosse CX                      NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact                      Test Date: April 5, 2010



| Loc. No. | Accelerometer Location | Coordinates (mm) |      |      |
|----------|------------------------|------------------|------|------|
|          |                        | X                | Y    | Z    |
| 1        | Vehicle C.G.           | 2747             | -5   | 530  |
| 2        | Left Floor Sill        | 3119             | -659 | 351  |
| 3        | Left A-Pillar Sill     | 3462             | -584 | 381  |
| 4        | Left A-Pillar Low      | 3485             | -601 | 500  |
| 5        | Left A-Pillar Mid      | 3454             | -657 | 1029 |
| 6        | Left B-Pillar Sill     | 2437             | -656 | 348  |
| 7        | Left B-Pillar Low      | 2438             | -701 | 606  |
| 8        | Left B-Pillar Mid      | 2376             | -695 | 937  |
| 9        | Left Seat Track        | 2490             | -565 | 307  |
| 10       | Engine Top             | 4371             | -118 | 745  |
| 11       | Firewall               | 3920             | -57  | 914  |
| 12       | Right Roof             | 2474             | 629  | 1424 |
| 13       | Right Floor Sill       | 3107             | 668  | 356  |
| 14       | Rear Deck              | 1213             | 88   | 552  |

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

**DATA SHEET NO. 10  
TEST VEHICLE ACCELEROMETER DATA SUMMARY**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010

| Loc. No | Description            | Peak Values (g's) |           |        |           |
|---------|------------------------|-------------------|-----------|--------|-----------|
|         |                        | Max               | Time (ms) | Min    | Time (ms) |
| 1       | Vehicle CG (X)         | 12.6              | 98.0      | -18.4  | 30.6      |
|         | Vehicle CG (Y)         | 38.4              | 50.9      | -8.5   | 103.7     |
|         | Vehicle CG (Z)         | 13.5              | 22.9      | -14.2  | 98.0      |
|         | Vehicle CG Resultant   | 82.8              | 18.6      | -98.5  | 14.6      |
| 2       | Left Floor Sill (Y)    | 45.7              | 24.8      | -72.1  | 34.1      |
| 3       | Left A-Pillar Sill (Y) | 42.9              | 50.9      | -55.3  | 37.0      |
| 4       | Left A-Pillar Low (Y)  | 65.7              | 19.6      | -26.7  | 23.7      |
| 5       | Left A-Pillar Mid (Y)  | 160.7             | 22.3      | -0.7   | 1.1       |
| 6       | Left B-Pillar Sill (Y) | 246.4             | 14.0      | -50.7  | 20.2      |
| 7       | Left B-Pillar Low (Y)  | 127.7             | 14.2      | -115.8 | 19.2      |
| 8       | Left B-Pillar Mid (Y)  | 60.2              | 20.7      | -11.6  | 35.1      |
| 9       | Seat Track (Y)         | 4.6               | 92.5      | -10.7  | 28.7      |
| 10      | Engine Top (X)         | 15.4              | 49.0      | -3.1   | 174.8     |
|         | Engine Top (Y)         | 14.7              | 40.0      | -1.0   | 139.5     |
| 11      | Firewall (Y)           | 24.3              | 17.0      | -13.8  | 12.8      |
| 12      | Right Roof (Y)         | 26.9              | 15.7      | -9.9   | 20.3      |
| 13      | Right Floor Sill (Y)   | 2.4               | 136.1     | -7.6   | 58.1      |
| 14      | Rear Deck (X)          | 19.3              | 49.9      | -2.7   | 125.6     |
|         | Rear Deck (Y)          | 12.6              | 98.0      | -18.4  | 30.6      |



**DATA SHEET NO. 11**  
**DUMMY INJURY RESPONSE DATA FOR ES-2re**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010

|                               | Positive |           | Negative     |              |
|-------------------------------|----------|-----------|--------------|--------------|
|                               | MAX      | TIME (ms) | MAX          | TIME (ms)    |
| <b>HEAD ACCELERATION (g)</b>  |          |           |              |              |
| Longitudinal (X)              | 5.8      | 170.3     | -33.3        | 47.9         |
| Lateral (Y)                   | 60.3     | 49.9      | -17.0        | 92.0         |
| Vertical (Z)                  | 17.3     | 45.6      | -10.1        | 84.7         |
| Resultant (R)                 | 66.8     | 49.5      | 0.1          | 0            |
| HIC36 (t1, t2)                | 401.7    |           | t1 = 37.9 ms | t2 = 59.7 ms |
| <b>THORAX DEFLECTION (mm)</b> |          |           |              |              |
| Upper Rib                     | 23.4     | 40.4      | -2.7         | 22.7         |
| Middle Rib                    | 22.5     | 39.9      | -4.9         | 72.8         |
| Lower Rib                     | 21.1     | 39.8      | -1.6         | 68.9         |
| <b>ABDOMINAL FORCES (N)</b>   |          |           |              |              |
| Front                         | 257.7    | 39.4      | -39.9        | 88.9         |
| Middle                        | 273.6    | 37.2      | -12.3        | 15.0         |
| Rear                          | 616.6    | 36.8      | -17.4        | 84.9         |
| SUM                           | 1051.2   | 37.3      | -47.1        | 90.2         |
| <b>PELVIS FORCE (N)</b>       |          |           |              |              |
| Pubic Symphysis (Y)           | 163.2    | 20.9      | -2751.9      | 53.8         |

Reference:

Positive direction:

Longitudinal (x) = forward  
 Lateral (y) = to right  
 Vertical (z) = down

**DATA SHEET NO. 12  
POST TEST OBSERVATIONS**

Test Vehicle: 2010 Buick LaCrosse CX NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact Test Date: April 5, 2010

**TEST DUMMY INFORMATION AND CONTACT**

| Description         | Front Occupant                     |
|---------------------|------------------------------------|
| Head Contact        | Side of Head – Side curtain airbag |
| Upper Torso Contact | Side Torso airbag                  |
| Lower Torso Contact | Side Torso airbag                  |
| Hip                 | Door                               |
| Left Knee Contact   | No Contact                         |
| Right Knee Contact  | No contact                         |

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

| Description           | Front                  | Rear                   |
|-----------------------|------------------------|------------------------|
| Left Side Doors       | Jammed Shut            | Jammed Shut            |
| Right Side Doors      | Closed and operational | Closed and operational |
| Hatch and Other Doors | NA                     | Closed and operational |
| Seat Movement         | None                   | None                   |
| Seat Back Failure     | None                   | None                   |

**POST TEST STRUCTURAL OBSERVATIONS**

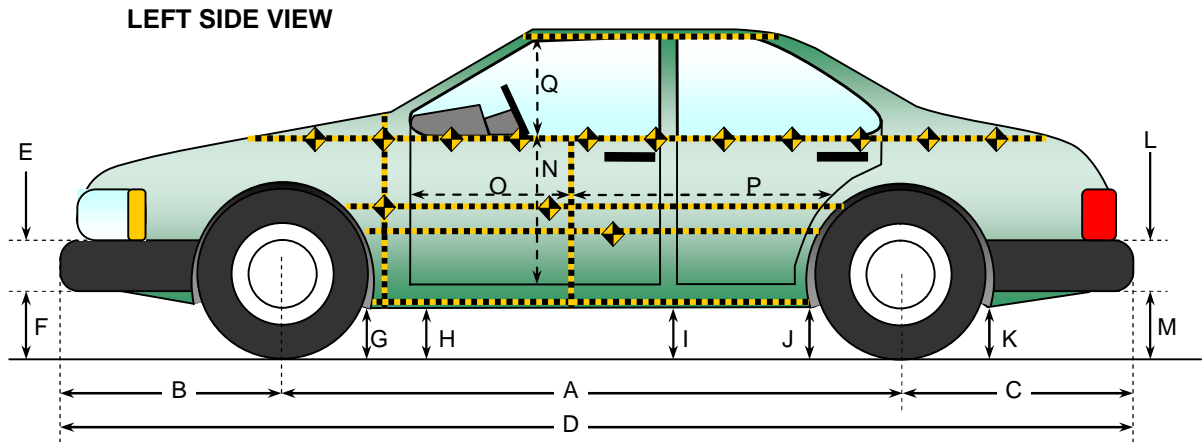
| Critical Areas of Performance | Observations and Conclusions               |
|-------------------------------|--|
| Pillar Performance            | B-Pillar Intrusion caused by pole impact   |
| Sill Separation               | No separation                              |
| Windshield Damage             | Severe cracking on left side of windshield |
| Window Damage                 | Sever cracking on left front window        |
| Other Notable Effects         | None                                       |

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

| Restraint Type         | Front Occupant |          |
|------------------------|----------------|----------|
|                        | Installed      | Operated |
| Front Airbag           | Yes            | No       |
| Side Torso Airbag      | Yes            | Yes      |
| Head Airbag            | No             | NA       |
| Curtain Airbag         | Yes            | Yes      |
| Seat Belt Pretensioner | Yes            | Yes      |
| Seat Belt Load Limiter | Yes            | Yes      |

**DATA SHEET NO. 13**  
**VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS**

|               |                        |            |               |
|---------------|------------------------|------------|---------------|
| Test Vehicle: | 2010 Buick LaCrosse CX | NHTSA No.  | CA0104        |
| Test Program: | FMVSS 214 Side Impact  | Test Date: | April 5, 2010 |

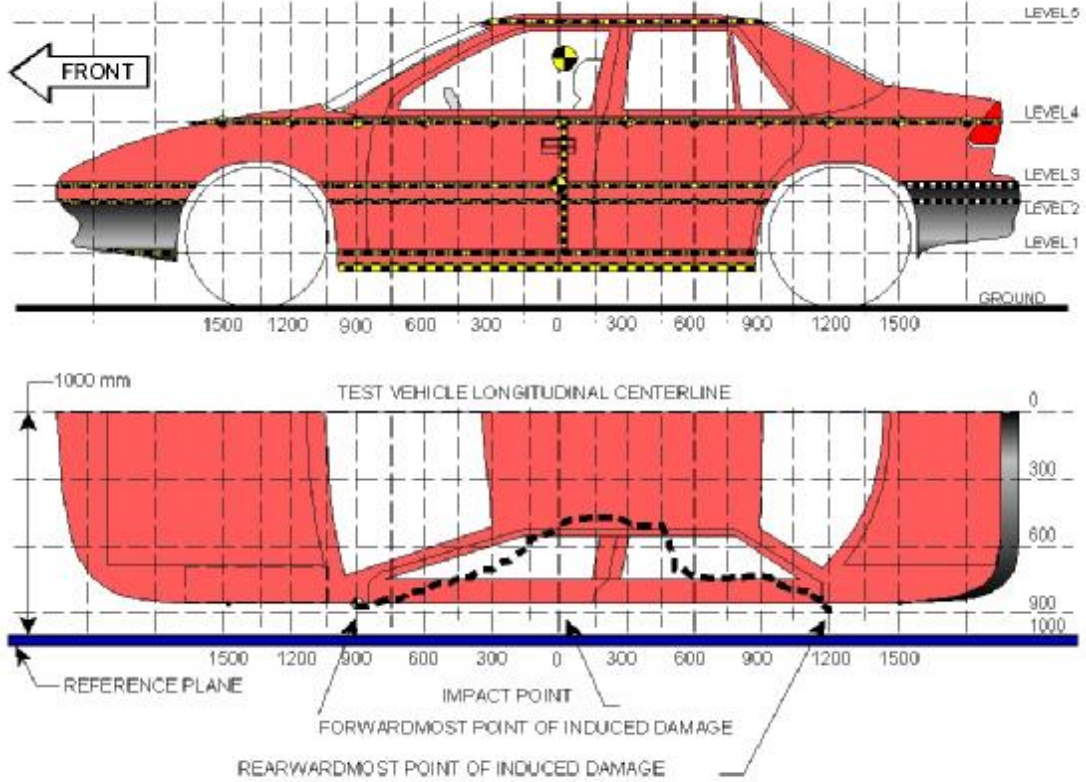


| Code | Description                            | Pre-Test | Post-Test | Diff Δ |
|------|--|----------|-----------|--------|
| A    | Wheelbase                              | 2841     | 2801      | 40     |
| B    | Front Axle to FSOV                     | 1024     | 1051      | -27    |
| C    | Rear Axle to RSOV                      | 1138     | 1134      | 4      |
| D    | Total Length at Centerline             | 5003     | 4986      | 17     |
| E    | Front Bumper Thickness                 | 157      | 157       | 0      |
| F    | Front Bumper Bottom to Ground          | 417      | 440       | -23    |
| G    | Sill Height at Front Wheel Well        | 180      | 191       | -11    |
| H    | Sill Height at Front Door Leading Edge | 181      | 185       | -4     |
| I    | Sill Height at B Pillar                | 186      | 187       | -1     |
| J1   | Sill Height at Rear Wheel Well         | 183      | 190       | -7     |
| J2   | Pinch Weld Height at Rear Wheel Well   | 181      | 185       | -4     |
| K    | Sill Height Aft of Rear Wheel Well     | 238      | 240       | -2     |
| L    | Rear Bumper Thickness                  | 185      | 185       | 0      |
| M    | Rear Bumper Bottom to Ground           | 453      | 440       | 13     |
| N    | Sill Height to Window Bottom Sill      | 772      | 775       | -3     |
| O    | Front Door Leading Edge to Impact CL   | 901      | 898       | 3      |
| P    | Rear Door Trailing Edge to Impact CL   | 1139     | 1118      | 21     |
| Q    | Front Window Opening                   | 410      | 377       | 33     |
| R*   | Right Side Length                      | 4815     | 4816      | -1     |
| S*   | Left Side Length                       | 4815     | 4787      | 28     |
| T*   | Vehicle Width at B Post                | 1818     | 1632      | 186    |

\* - not shown in schematic above

**DATA SHEET NO. 14  
EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2010 Buick LaCrosse CX                      NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact                      Test Date: April 5, 2010



NOTE: All measurements are in millimeters (mm)

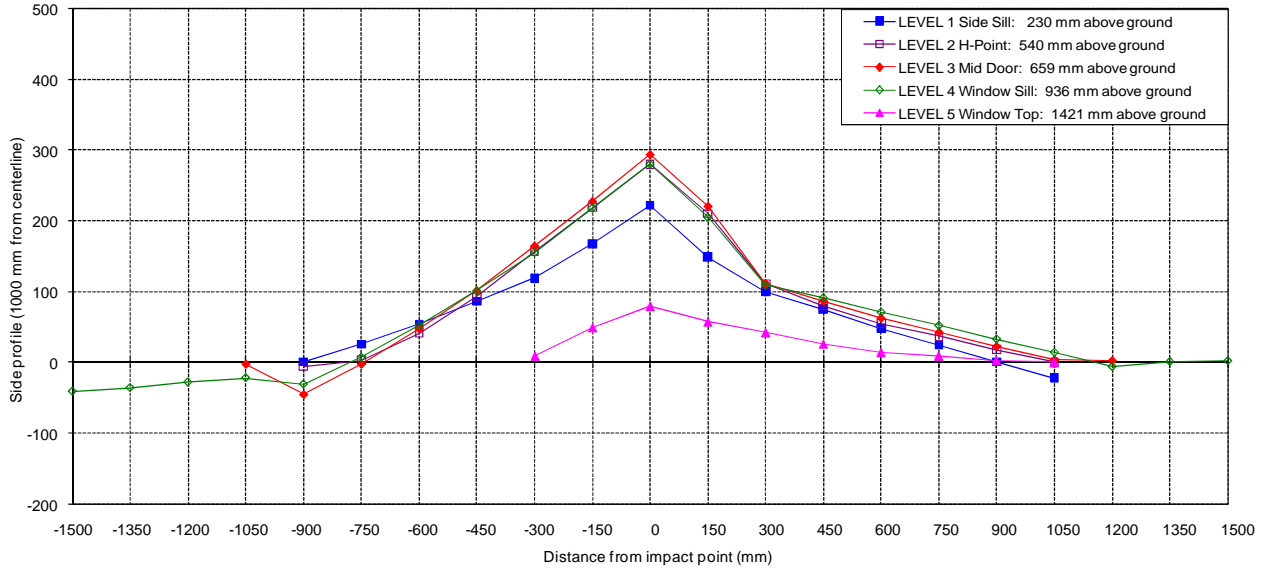
**Maximum Exterior Crush Measurements**

| Level | Measurement Description | Maximum Exterior Static Crush | Distance from Impact | Height Above Ground |
|-------|-------------------------|-------------------------------|----------------------|---------------------|
| 1     | Sill Top                | 222                           | 230                  | 0                   |
| 2     | Occupant H-Point        | 280                           | 540                  | 0                   |
| 3     | Mid-Door                | 294                           | 659                  | 0                   |
| 4     | Window Sill             | 280                           | 936                  | 0                   |
| 5     | Window Top              | 79                            | 1421                 | 0                   |

**DATA SHEET NO. 15  
VEHICLE EXTERIOR CRUSH PROFILES**

Test Vehicle: 2010 Buick LaCrosse CX  
Test Program: FMVSS 214 Side Impact

NHTSA No. CA0104  
Test Date: April 5, 2010



|       | Pre-Test |     |     |     |     | Post-Test |     |     |     |     | Diff Δ |     |     |     |    |
|-------|----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|--------|-----|-----|-----|----|
|       | 1        | 2   | 3   | 4   | 5   | 1         | 2   | 3   | 4   | 5   | 1      | 2   | 3   | 4   | 5  |
| -1500 | --       | --  | --  | 758 | --  | --        | --  | --  | 799 | --  | --     | --  | --  | -41 | -- |
| -1350 | --       | --  | --  | 795 | --  | --        | --  | --  | 831 | --  | --     | --  | --  | -36 | -- |
| -1200 | --       | --  | --  | 820 | --  | --        | --  | --  | 848 | --  | --     | --  | --  | -28 | -- |
| -1050 | --       | --  | 923 | 839 | --  | --        | --  | 925 | 861 | --  | --     | --  | -2  | -22 | -- |
| -900  | 868      | 907 | 904 | 852 | --  | 867       | 913 | 949 | 883 | --  | 1      | -6  | -45 | -31 | -- |
| -750  | 867      | 895 | 899 | 859 | --  | 841       | 892 | 901 | 852 | --  | 26     | 3   | -2  | 7   | -- |
| -600  | 866      | 894 | 900 | 865 | --  | 812       | 853 | 852 | 813 | --  | 54     | 41  | 48  | 52  | -- |
| -450  | 865      | 895 | 902 | 870 | --  | 779       | 802 | 801 | 769 | --  | 86     | 93  | 101 | 101 | -- |
| -300  | 864      | 896 | 904 | 874 | 565 | 745       | 739 | 739 | 719 | 556 | 119    | 157 | 165 | 155 | 9  |
| -150  | 860      | 897 | 905 | 876 | 616 | 692       | 678 | 677 | 658 | 567 | 168    | 219 | 228 | 218 | 49 |
| 0     | 858      | 897 | 906 | 877 | 622 | 636       | 617 | 612 | 597 | 543 | 222    | 280 | 294 | 280 | 79 |
| 150   | 855      | 898 | 907 | 880 | 624 | 706       | 688 | 686 | 675 | 567 | 149    | 210 | 221 | 205 | 57 |
| 300   | 850      | 897 | 906 | 879 | 625 | 750       | 786 | 794 | 770 | 583 | 100    | 111 | 112 | 109 | 42 |
| 450   | 849      | 897 | 906 | 879 | 626 | 774       | 817 | 819 | 788 | 600 | 75     | 80  | 87  | 91  | 26 |
| 600   | 849      | 895 | 905 | 877 | 624 | 801       | 840 | 842 | 806 | 610 | 48     | 55  | 63  | 71  | 14 |
| 750   | 852      | 894 | 904 | 876 | 619 | 828       | 857 | 861 | 824 | 610 | 24     | 37  | 43  | 52  | 9  |
| 900   | 854      | 899 | 905 | 877 | 604 | 853       | 881 | 882 | 844 | 601 | 1      | 18  | 23  | 33  | 3  |
| 1050  | 856      | 915 | 913 | 887 | 570 | 878       | 915 | 909 | 873 | 570 | -22    | 0   | 4   | 14  | 0  |
| 1200  | --       | --  | 926 | 887 | --  | --        | --  | 923 | 893 | --  | --     | --  | 3   | -6  | -- |
| 1350  | --       | --  | --  | 887 | --  | --        | --  | --  | 886 | --  | --     | --  | --  | 1   | -- |
| 1500  | --       | --  | --  | 883 | --  | --        | --  | --  | 881 | --  | --     | --  | --  | 2   | -- |

**DATA SHEET NO. 16  
SUMMARY OF FMVSS 301 FUEL SYSTEM DATA**

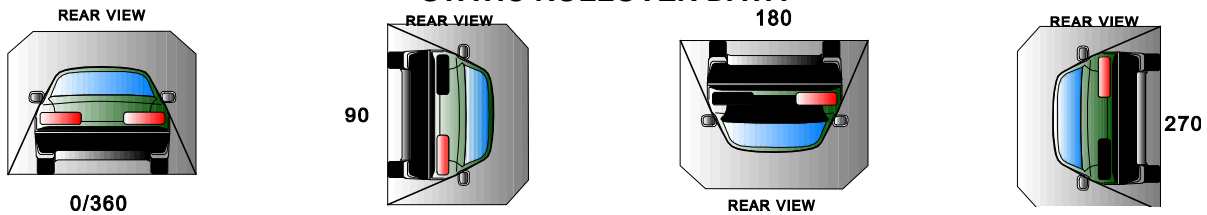
Test Vehicle: 2010 Buick LaCrosse CX      NHTSA No. CA0104  
 Test Program: FMVSS 214 Side Impact      Test Date: April 5, 2010

**FUEL SYSTEM INTEGRITY POST IMPACT DATA**

| Time Interval                       | FMVSS 301 Maximum Allowable Spillage | Spillage (g) |
|-------------------------------------|--------------------------------------|--------------|
| Impact Until Motion Ceases          | 28 g                                 | 0            |
| First Five Minutes Following Impact | 142 g                                | 0            |
| Next 25 Minutes                     | 28 g / 1 minute                      | 0            |

|                      |      |
|----------------------|------|
| Spillage Location(s) | None |
|----------------------|------|

**STATIC ROLLOVER DATA**

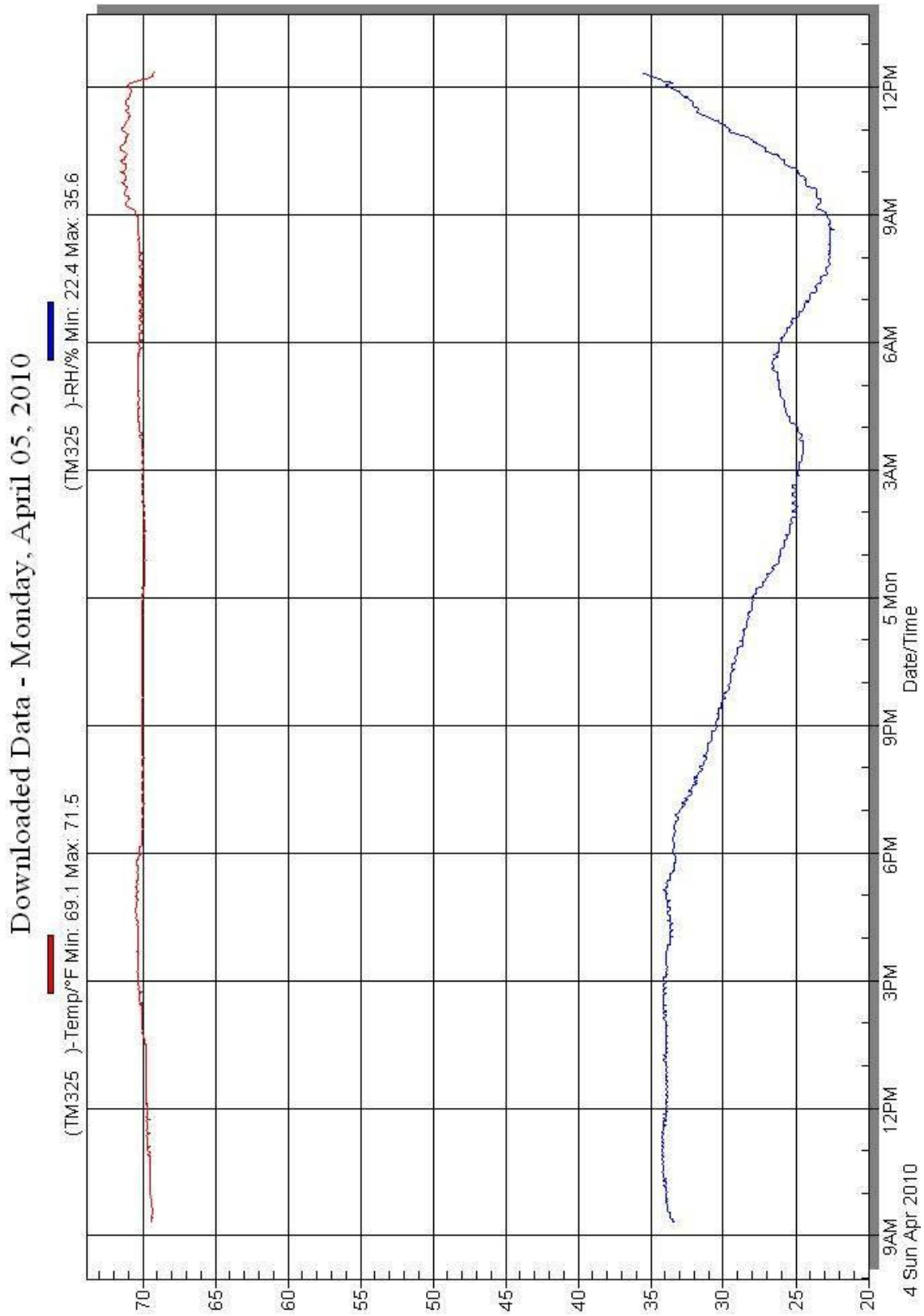


| Rollover Stage | Rotation Time (spec. 1 -3 min) |         |    |         | FMVSS 301 Hold Time |         | Total Time |         |    |         | Next Whole Minute Interval |         |
|----------------|--------------------------------|---------|----|---------|---------------------|---------|------------|---------|----|---------|----------------------------|---------|
|                | 1                              | minutes | 12 | seconds | 5                   | minutes | 6          | minutes | 12 | seconds | 7                          | minutes |
| 0° - 90°       | 1                              | minutes | 12 | seconds | 5                   | minutes | 6          | minutes | 12 | seconds | 7                          | minutes |
| 90° - 180°     | 1                              | minutes | 01 | seconds | 5                   | minutes | 6          | minutes | 1  | seconds | 7                          | minutes |
| 180°-270°      | 1                              | minutes | 04 | seconds | 5                   | minutes | 6          | minutes | 4  | seconds | 7                          | minutes |
| 270°-360°      | 1                              | minutes | 12 | seconds | 5                   | minutes | 6          | minutes | 12 | seconds | 7                          | minutes |

| Rollover Stage                                   | Spillage (g)                        |                      |                      |                                    |
|--|-------------------------------------|----------------------|----------------------|------------------------------------|
|  | First 5 min. from onset of rotation | 6 <sup>th</sup> min. | 7 <sup>th</sup> min. | 8 <sup>th</sup> min. (if required) |
| 0° - 90°   | 0                                   | 0                    | 0                    | 0                                  |
| 90° - 180°                                       | 0                                   | 0                    | 0                    | 0                                  |
| 180°-270°  | 0                                   | 0                    | 0                    | 0                                  |
| 270°-360°  | 0                                   | 0                    | 0                    | 0                                  |
| FMVSS 301 Maximum Allowable (for each 90° stage) | 142                                 | 28                   | 28                   | 28                                 |

| Rollover Stage | Spillage Location(s) |
|----------------|----------------------|
| 0° - 90°       | None                 |
| 90° - 180°     | None                 |
| 180°-270°      | None                 |
| 270°-360°      | None                 |

DATA SHEET NO. 17  
TEMPERATURE AND HUMIDITY TRACE



**APPENDIX A**  
**PHOTOGRAPHS**



**TABLE OF PHOTOGRAPHS**

| FIGURE | TITLE   | PAGE |
|--------|---|------|
| A-1    | Pre-Test Front View of Test Vehicle                             | A-3  |
| A-2    | Post-Test Front View of Test Vehicle                            | A-4  |
| A-3    | Pre-Test Rear View of Test Vehicle                              | A-5  |
| A-4    | Post-Test Rear View of Test Vehicle                             | A-6  |
| A-5    | Pre-Test Impacted Side View of Test Vehicle                     | A-7  |
| A-6    | Post-Test Impacted Side View of Test Vehicle                    | A-8  |
| A-7    | Pre-Test Left $\frac{3}{4}$ Front View of Vehicle and Pole      | A-9  |
| A-8    | Pre-Test Left $\frac{3}{4}$ Rear View of Vehicle and Pole       | A-10 |
| A-9    | Pre-Test Overhead View of Aligned Vehicle and Pole              | A-11 |
| A-10   | Post-Test Overhead View of Aligned Vehicle and Pole             | A-12 |
| A-11   | Pre-Test Dummy Thru Opposite Window                             | A-13 |
| A-12   | Post-Test Dummy Thru Opposite Window                            | A-14 |
| A-13   | Pre-Test Close-up of Dummy w/Door Closed (Impact Side)          | A-15 |
| A-14   | Post-Test Dummy w/Door Closed (Impact Side)                     | A-16 |
| A-15   | Pre-Test Dummy Door Open  | A-17 |
| A-16   | Pre-Test Dummy Shoulder and Door Top View                       | A-18 |
| A-17   | Post-Test Dummy Shoulder and Door Top View                      | A-19 |
| A-18   | Pre-Test Interior of Front Door Closed (thru opposite door)     | A-20 |
| A-19   | Post-Test Interior of Front Door Showing Dummy Impact Locations | A-21 |
| A-20   | Impact Event  | A-22 |
| A-21   | Post-Test Impact Zone Close-up View                             | A-23 |
| A-22   | Post-Test $\frac{3}{4}$ Front View of Impact Zone               | A-24 |
| A-23   | Post-Test $\frac{3}{4}$ Rear View of Impact Zone                | A-25 |
| A-24   | Post-Test Close-Up View of Impact Point Target                  | A-26 |
| A-25   | Close-up View of Vehicle's Certification Label                  | A-27 |
| A-26   | Close-up View of Vehicle's Tire Placard Label                   | A-28 |
| A-27   | Rollover 90 Degrees   | A-29 |
| A-28   | Rollover 180 Degrees  | A-30 |
| A-29   | Rollover 270 Degrees  | A-31 |
| A-30   | Rollover 360 Degrees  | A-32 |



FIGURE A-1 : Pre-Test Front View of Test Vehicle

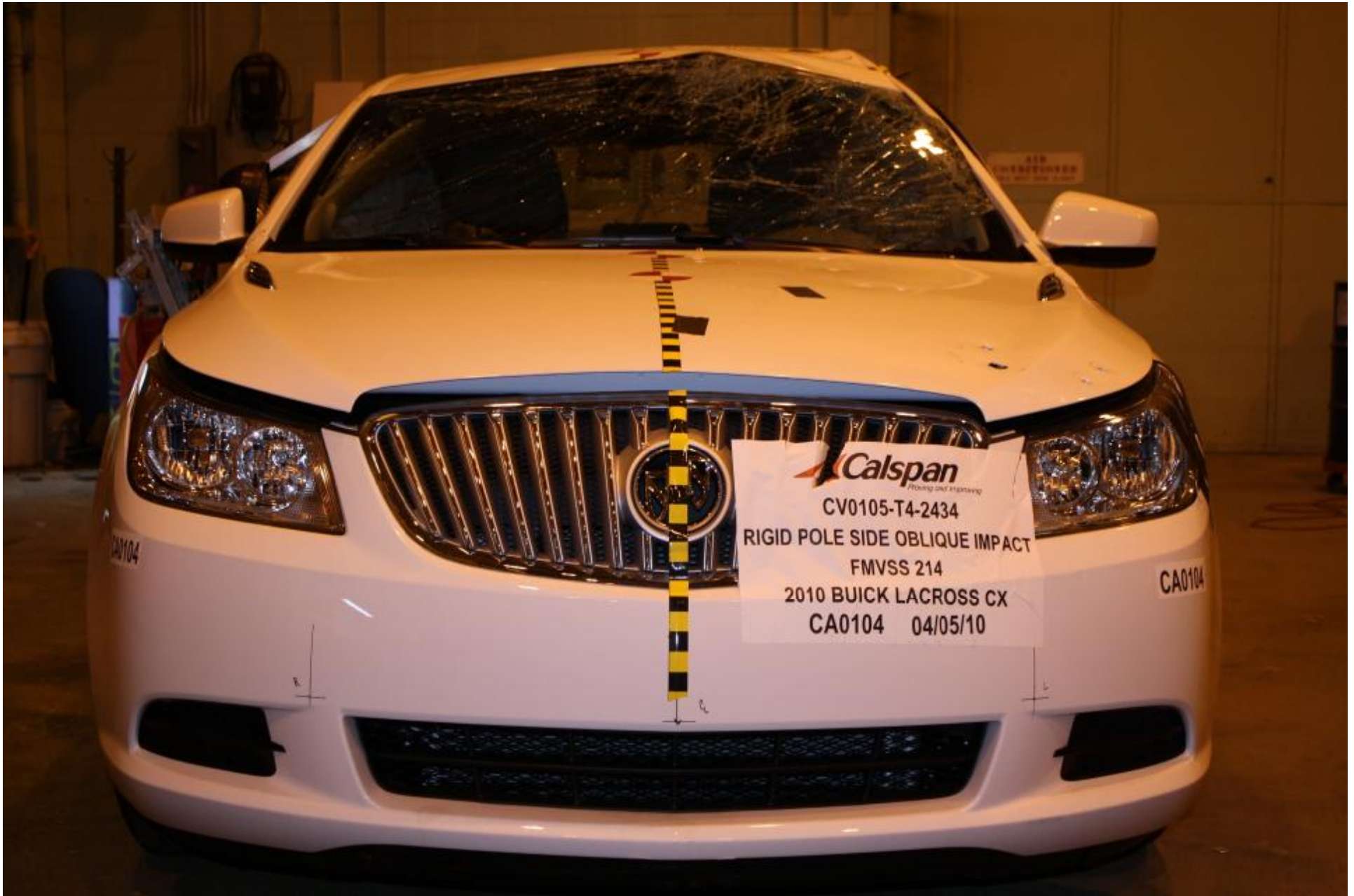


FIGURE A-2 : Post-Test Front View of Test Vehicle





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



FIGURE A-4 : Post-Test Rear View of Test Vehicle





FIGURE A-5 : Pre-Test Impacted Side View of Test Vehicle



FIGURE A-6 : Post-Test Impacted Side View of Test Vehicle





FIGURE A-7 : Pre-Test Left  $\frac{3}{4}$  Front View of Vehicle and Pole





FIGURE A-8 : Pre-Test Left  $\frac{3}{4}$  Rear View of Vehicle and Pole



FIGURE A-9 : Pre-Test Overhead View of Aligned Vehicle and Pole





FIGURE A-10 : Post-Test Overhead View of Aligned Vehicle and Pole



FIGURE A-11 : Pre-Test Dummy Thru Opposite Window





FIGURE A-12 : Post-Test Dummy Thru Opposite Window



FIGURE A-13 : Pre-Test Close-up of Dummy w/Door Closed (Impact Side)





FIGURE A-14 : Post-Test Dummy w/Door Closed (Impact Side)



FIGURE A-15 : Pre-Test Dummy Door Open





FIGURE A-16 : Pre-Test Dummy Shoulder and Door Top View

Photograph Not Available

FIGURE A-17 : Post-Test Dummy Shoulder and Door Top View



FIGURE A-18 : Pre-Test Interior of Front Door Closed (thru opposite door)





FIGURE A-19 : Post-Test Interior of Front Door Showing Dummy Impact Locations

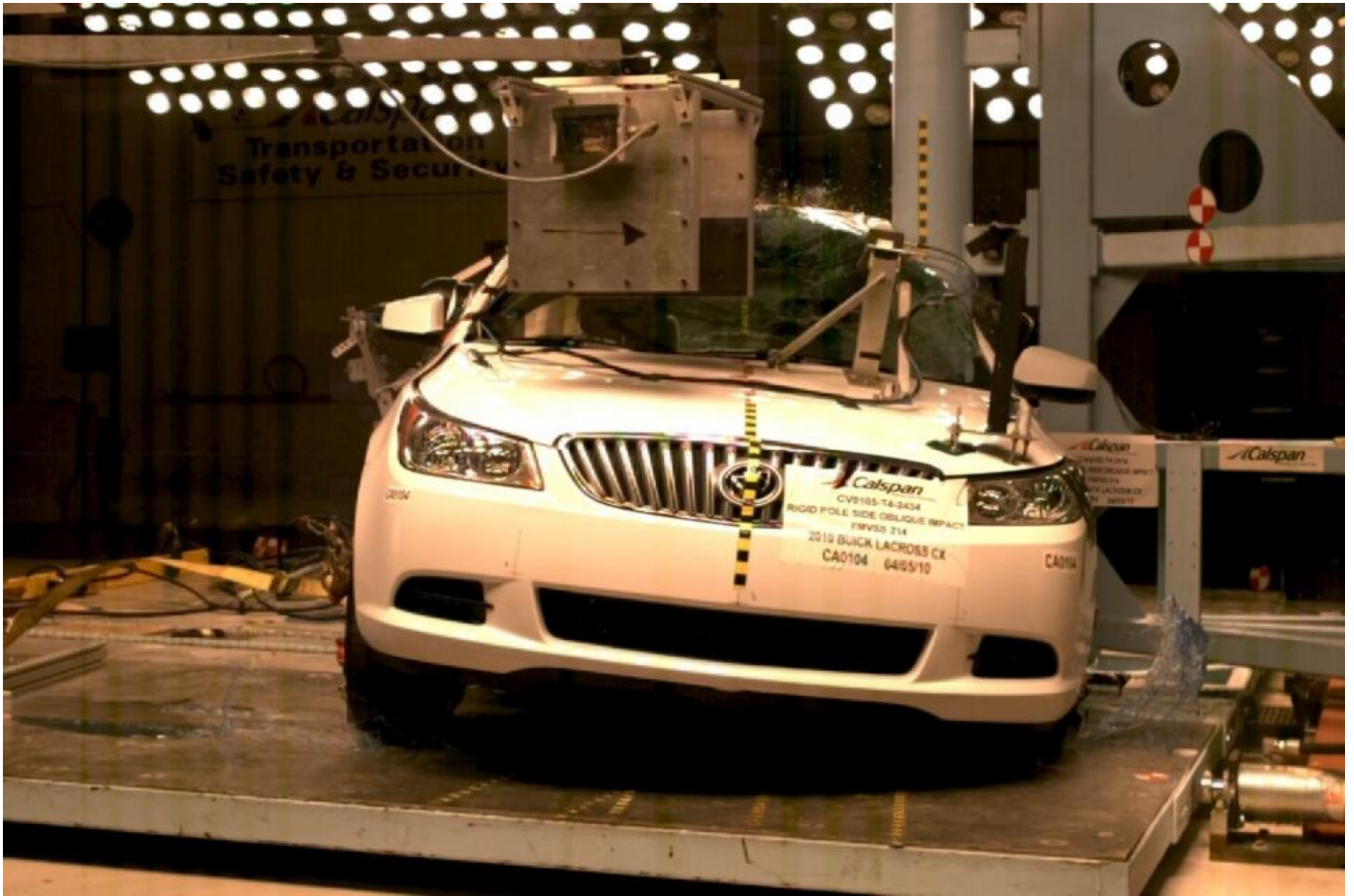


FIGURE A-20 : Impact Event





FIGURE A-21 : Post-Test Impact Zone Close-up View





FIGURE A-22 : Post-Test ¾ Front View of Impact Zone



FIGURE A-23 : Post-Test  $\frac{3}{4}$  Rear View of Impact Zone





FIGURE A-24 : Post-Test Close-Up View of Impact Point Target

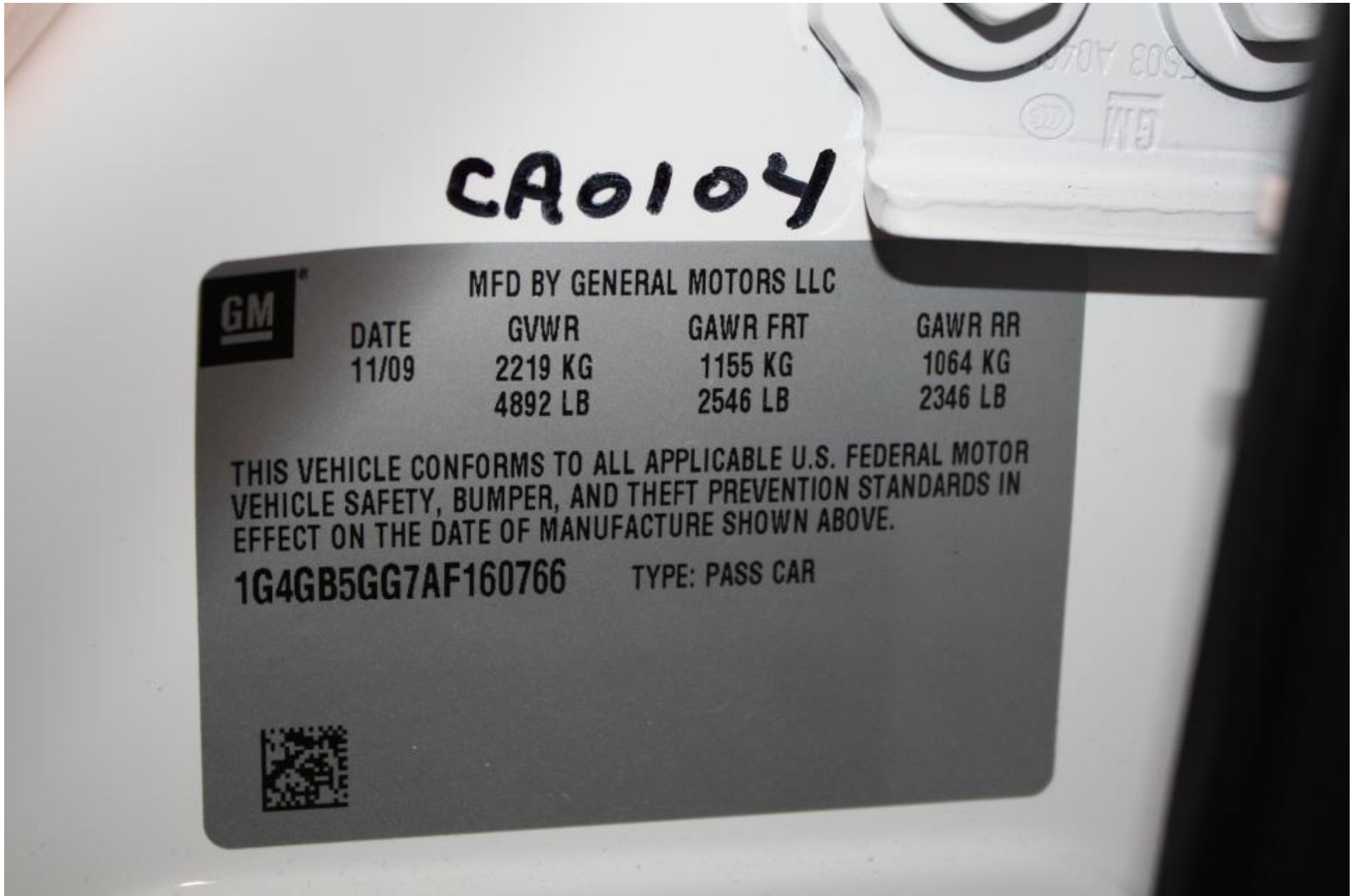


FIGURE A-25 : Close-up View of Vehicle's Certification Label

CA 2104



## TIRE AND LOADING INFORMATION

SEATING CAPACITY | TOTAL 5 | FRONT 2 | REAR 3

The combined weight of occupants and cargo should never exceed 420 kg or 926 lbs.

| TIRE  | ORIGINAL SIZE | COLD TIRE PRESSURE |
|-------|---------------|--------------------|
| FRONT | P245/50R17 H  | 230 kPa, 33 PSI    |
| REAR  | P245/50R17 H  | 230 kPa, 33 PSI    |
| SPARE | T125/70R17 M  | 420 kPa, 60 PSI    |

SEE OWNER'S  
MANUAL FOR  
ADDITIONAL  
INFORMATION

1G4GB5GG7AF160766

FIGURE A-26 : Close-up View of Vehicle's Tire Placard Label





FIGURE A-27 : Rollover 90 Degrees





FIGURE A-28 : Rollover 180 Degrees



FIGURE A-29 : Rollover 270 Degrees





FIGURE A-30 : Rollover 360 Degrees

**APPENDIX B**

**ES-2re DUMMY RESPONSE DATA**

**(SAE sign convention)**



### ES-2re DATA CHANNEL FILTER CLASS SUMMARY

| Data Type               | SAE Filter Class | Cut-off Frequency |
|-------------------------|------------------|-------------------|
| Dummy Head Acceleration | 1000             | 1650              |
| Chest Deflection        | 180              | 300               |
| Spine Acceleration      | 60               | 100               |
| Abdomen Force           | 600              | 1000              |
| Pubic Force             | 600              | 1000              |

### DATA CHANNEL TITLE KEY

| Prefix                                    | Suffix                         |
|---|--------------------------------|
| V1 = Vehicle 1 (Test Vehicle)             | Ax = Acceleration, X-direction |
|   | Ay = Acceleration, Y-direction |
| P1 = Left Front Seating Position (Driver) | Az = Acceleration, Z-direction |
|   | Fx = Force, X-direction        |
| A1-A18 = Accelerometer Location Number    | Fy = Force, Y-direction        |
|   | Fz = Force, Z-direction        |
|   | Dx = Deflection, X-direction   |
|   | Dy = Deflection, Y-direction   |
|   | Dz = Deflection, Z-direction   |

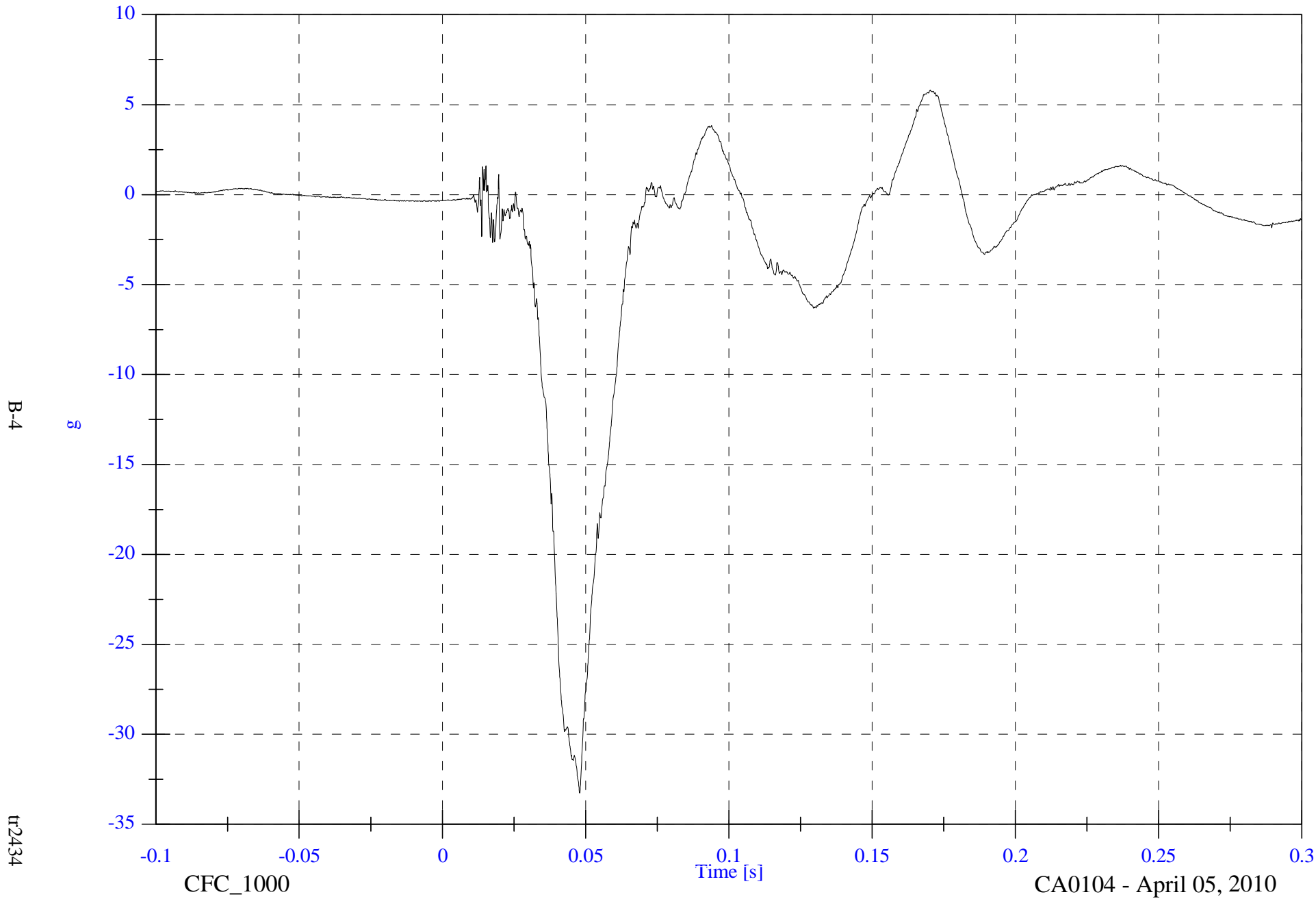
**TABLE OF DATA PLOTS for ES-2RE**

| PLOT | PLOT NAME [UNITS, CHANNEL FILTER CLASS]           | PAGE |
|------|---|------|
| 1    | ES-2re Head Ax [g, CFC_1000]                      | B-4  |
| 2    | ES-2re Head Ay [g, CFC_1000]                      | B-5  |
| 3    | ES-2re Head Az [g, CFC_1000]                      | B-6  |
| 4    | ES-2re Head Resultant [g, CFC_1000]               | B-7  |
| 5    | ES-2re Head Ax Velocity vs. Time                  | B-8  |
| 6    | ES-2re Head Ay Velocity vs. Time                  | B-9  |
| 7    | ES-2re Head Az Velocity vs. Time                  | B-10 |
| 8    | ES-2re Upper Thorax Rib Deflection Rate vs. Time  | B-11 |
| 9    | ES-2re Upper Thorax Rib Deflection (Y) vs. Time   | B-12 |
| 10   | ES-2re Middle Thorax Rib Deflection Rate vs. Time | B-13 |
| 11   | ES-2re Middle Thorax Rib Deflection (Y) vs. Time  | B-14 |
| 12   | ES-2re Lower Thorax Rib Deflection Rate vs. Time  | B-15 |
| 13   | ES-2re Lower Thorax Rib Deflection (Y) vs. Time   | B-16 |
| 14   | ES-2re Front Abdomen Force (Y) vs. Time           | B-17 |
| 15   | ES-2re Middle Abdomen Force (Y) vs. Time          | B-18 |
| 16   | ES-2re Rear Abdomen Force (Y) vs. Time            | B-19 |
| 17   | ES-2re Sum of the Abdominal Forces vs. Time       | B-20 |
| 18   | ES-2re Pubic Symphysis Force (Y)vs. Time          | B-21 |

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 5.8 [g] at 0.170 [s]  
Min: -33.3 [g] at 0.048 [s]

V1P1 Head x



B-4

g

tr2434

CFC\_1000

Time [s]

CA0104 - April 05, 2010



FMVSS 214 Oblique Pole 2010 Buick LaCrosse

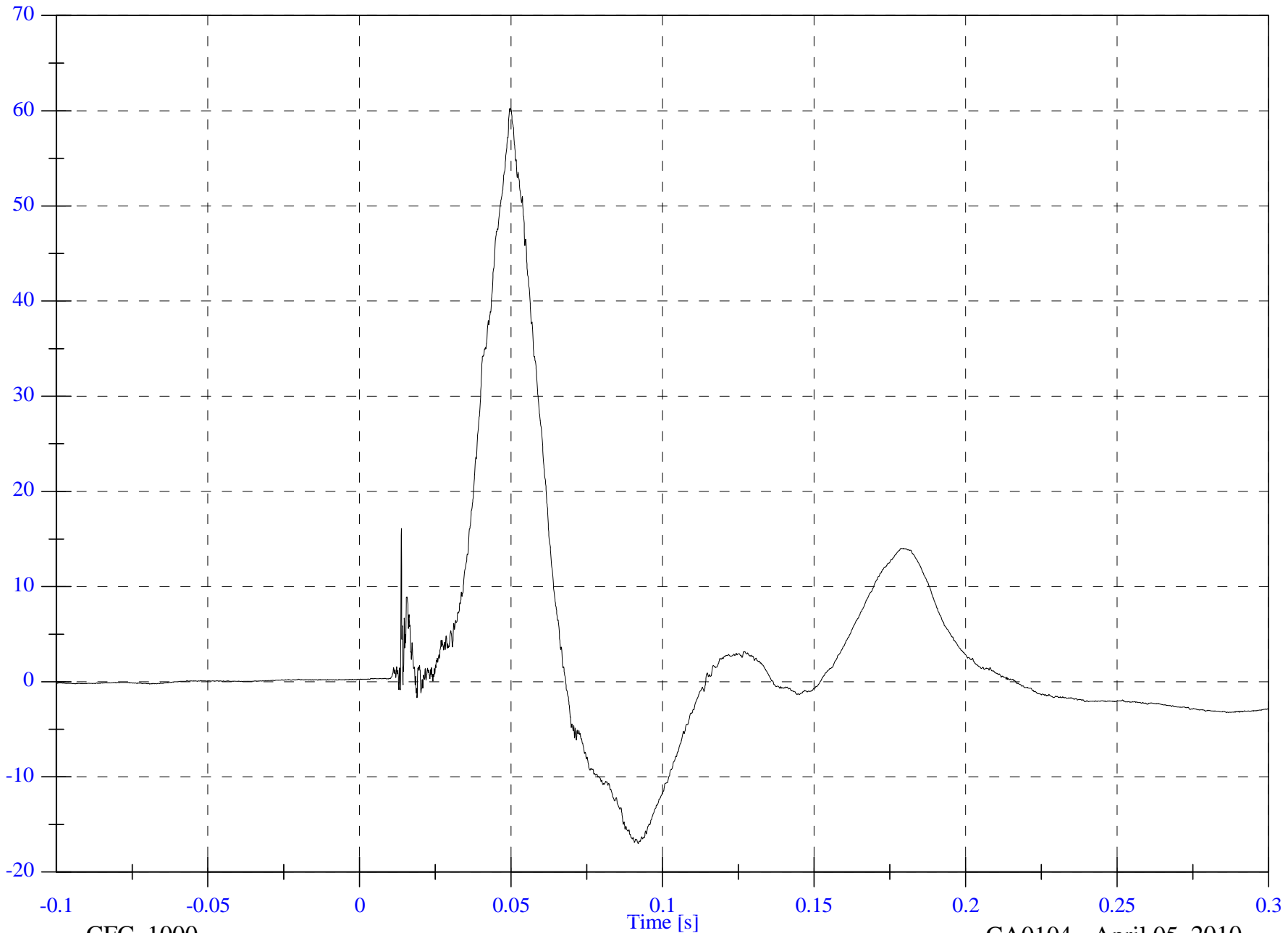
V1P1 Head y

Max: 60.3 [g] at 0.050 [s]

Min: -17.0 [g] at 0.092 [s]

B-5

g



CFC\_1000

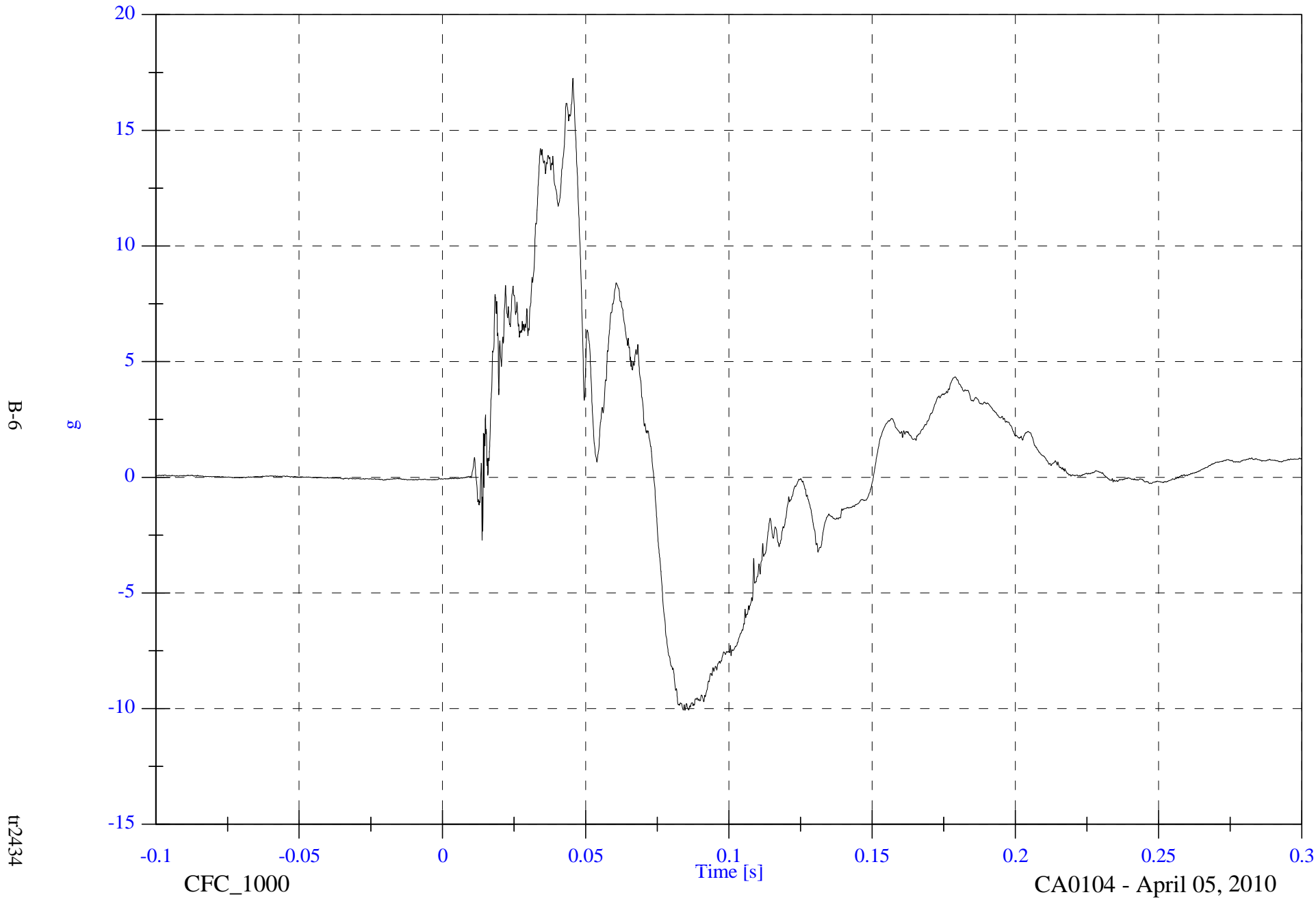
CA0104 - April 05, 2010

tt2434

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 17.3 [g] at 0.046 [s]  
Min: -10.1 [g] at 0.085 [s]

V1P1 Head z



B-6

g

tr2434

CFC\_1000

Time [s]

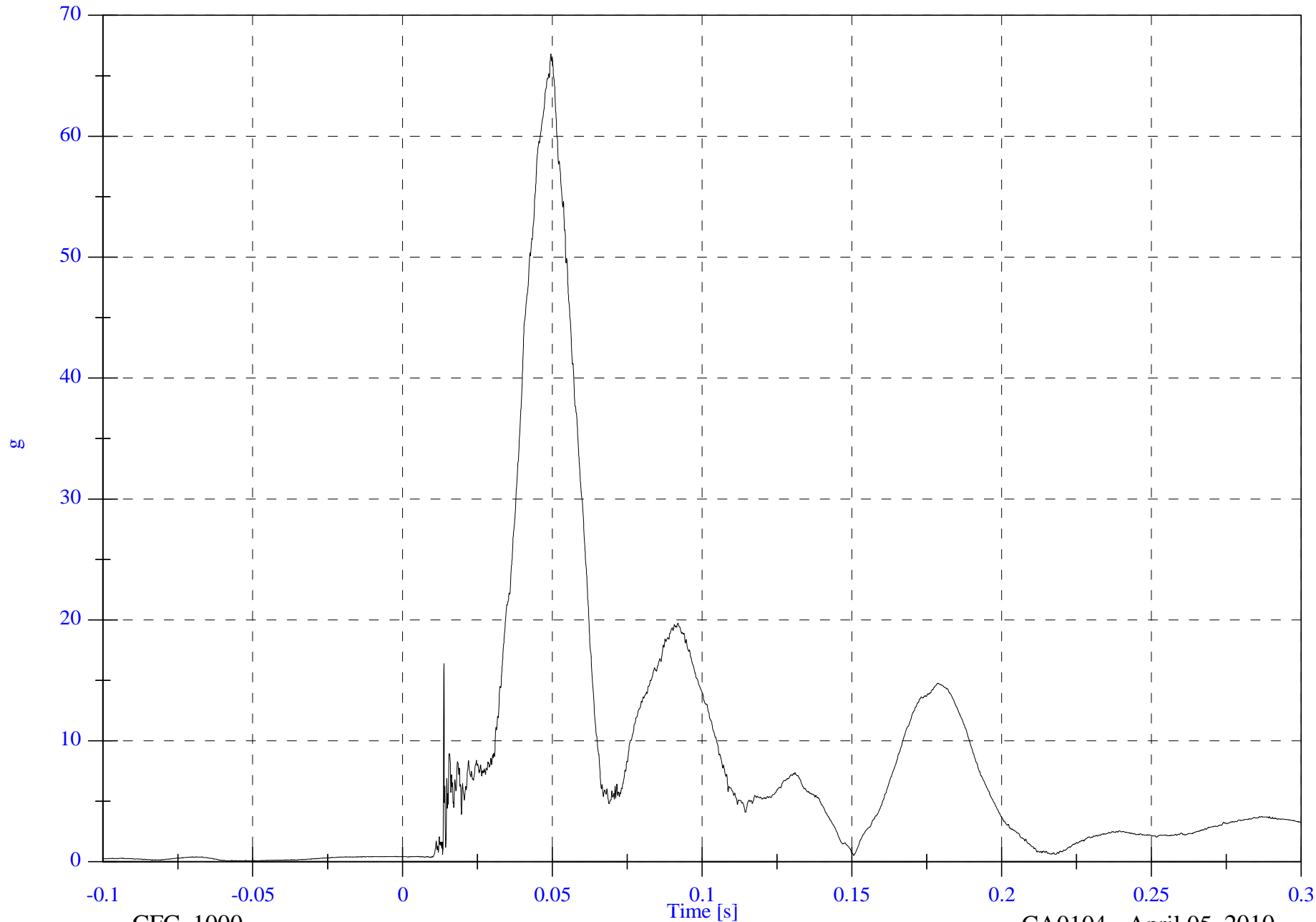
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 66.8 [g] at 0.050 [s]

V1P1 Head Resultant

Min: 0.1 [g] at -0.054 [s]



B-7

g

tt2434

CFC\_1000

Time [s]

CA0104 - April 05, 2010

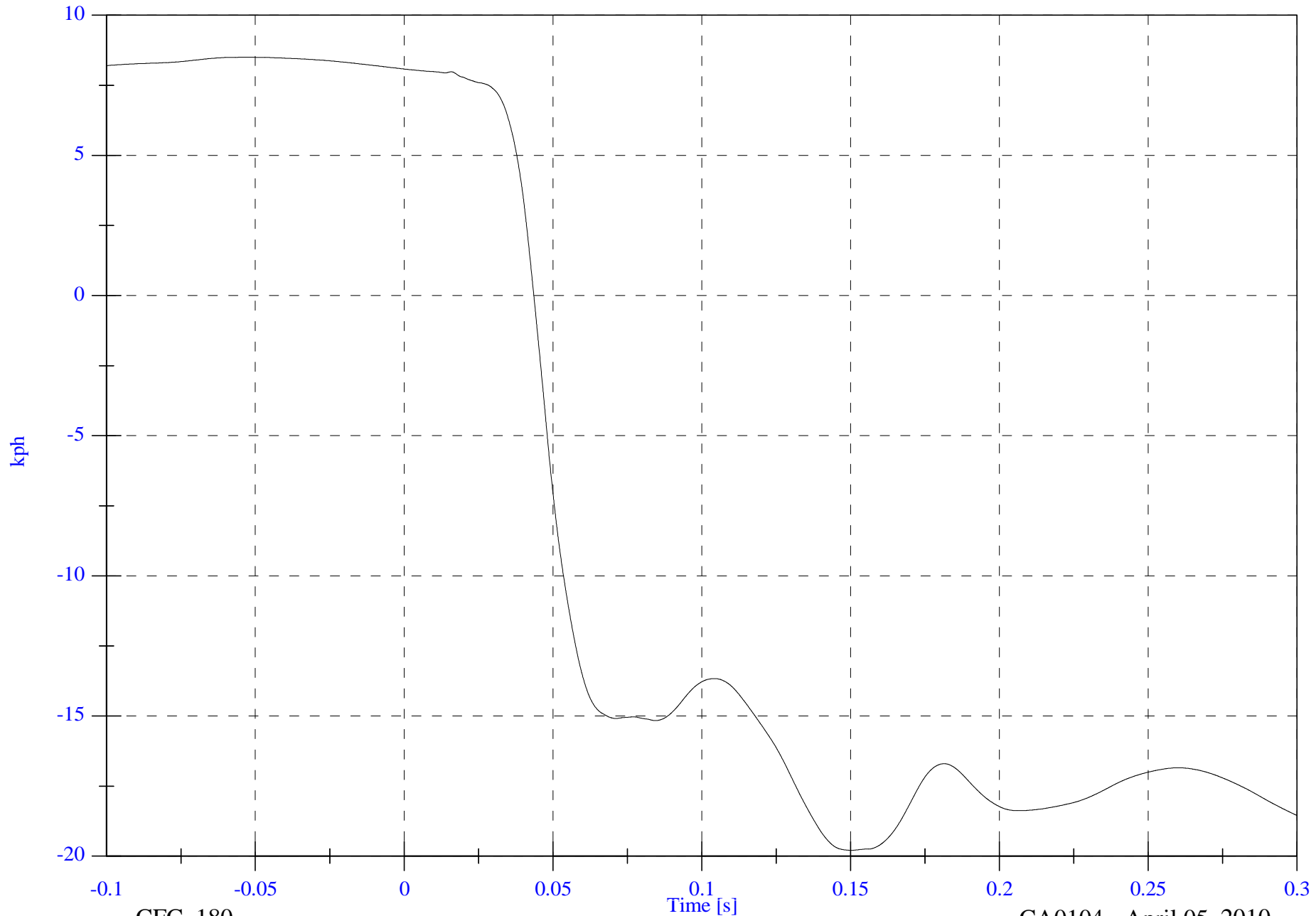


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 8.5 [kph] at -0.052 [s]

V1P1 Head x Velocity

Min: -19.8 [kph] at 0.150 [s]



B-8

kph

tr2434

CFC\_180

Time [s]

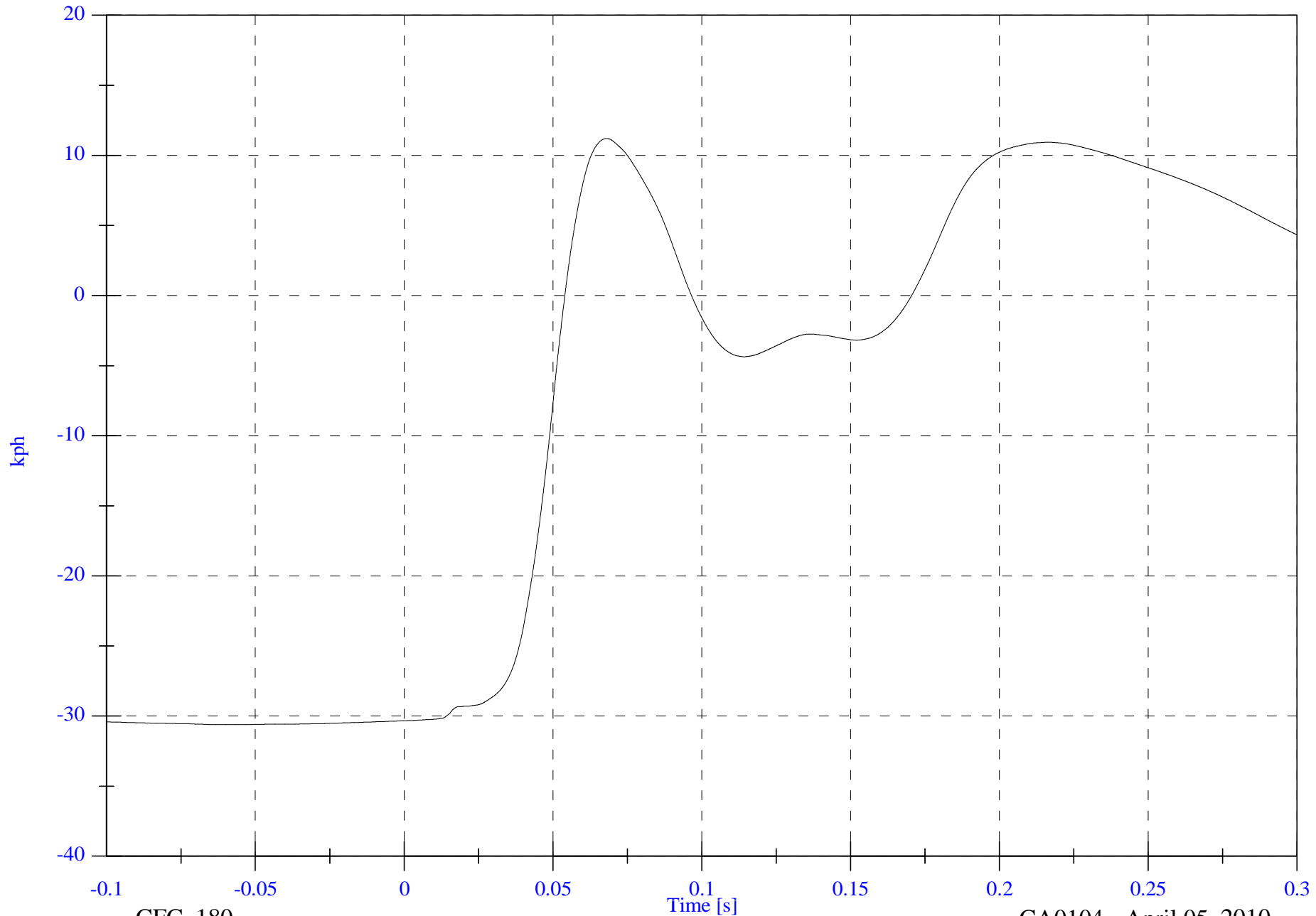
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 11.2 [kph] at 0.068 [s]

V1P1 Head y Velocity

Min: -30.6 [kph] at -0.060 [s]



B-9

kph

tr2434

CFC\_180

Time [s]

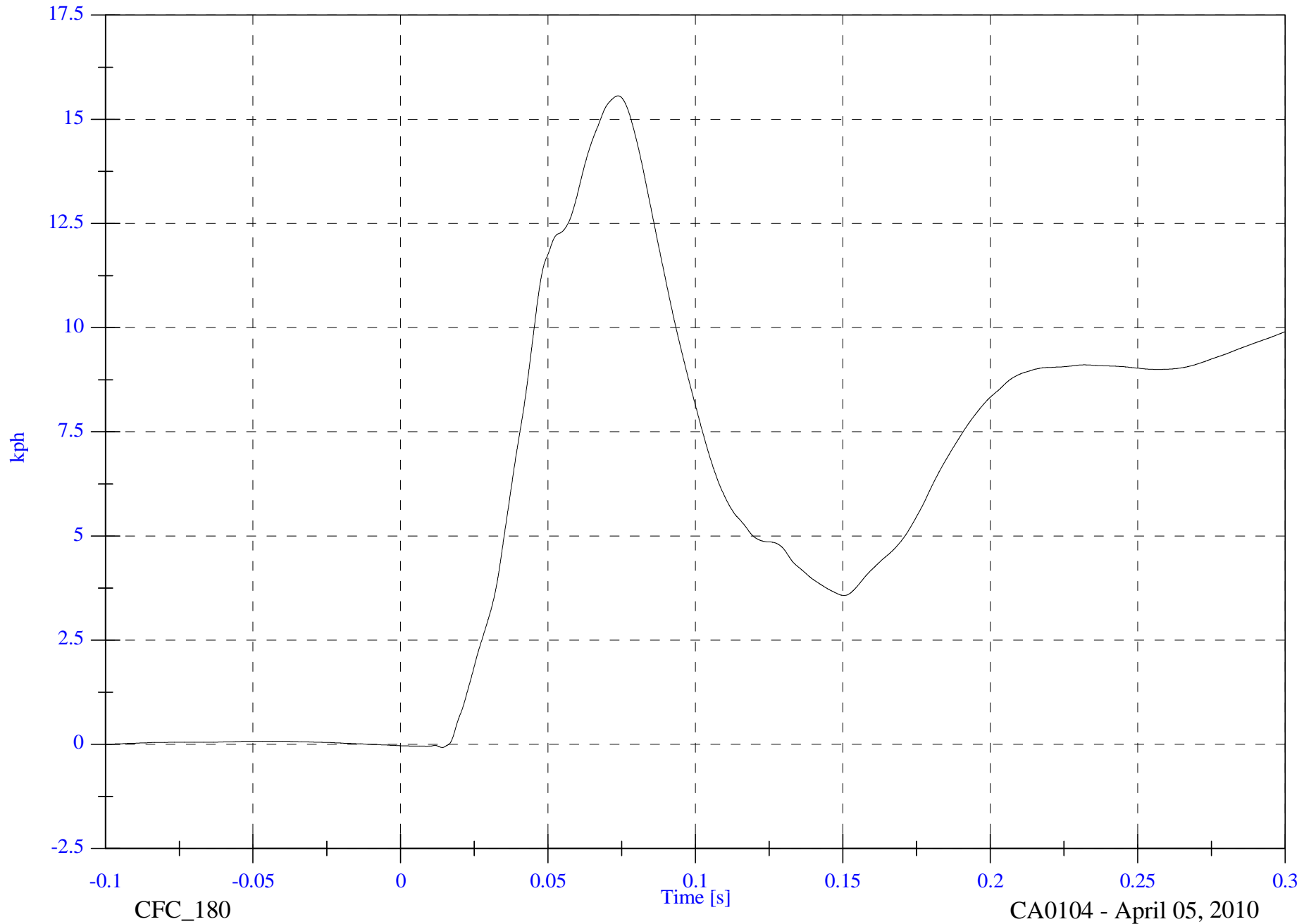
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 15.6 [kph] at 0.074 [s]

V1P1 Head z Velocity

Min: -0.1 [kph] at 0.014 [s]



B-10

tr2434

CFC\_180

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

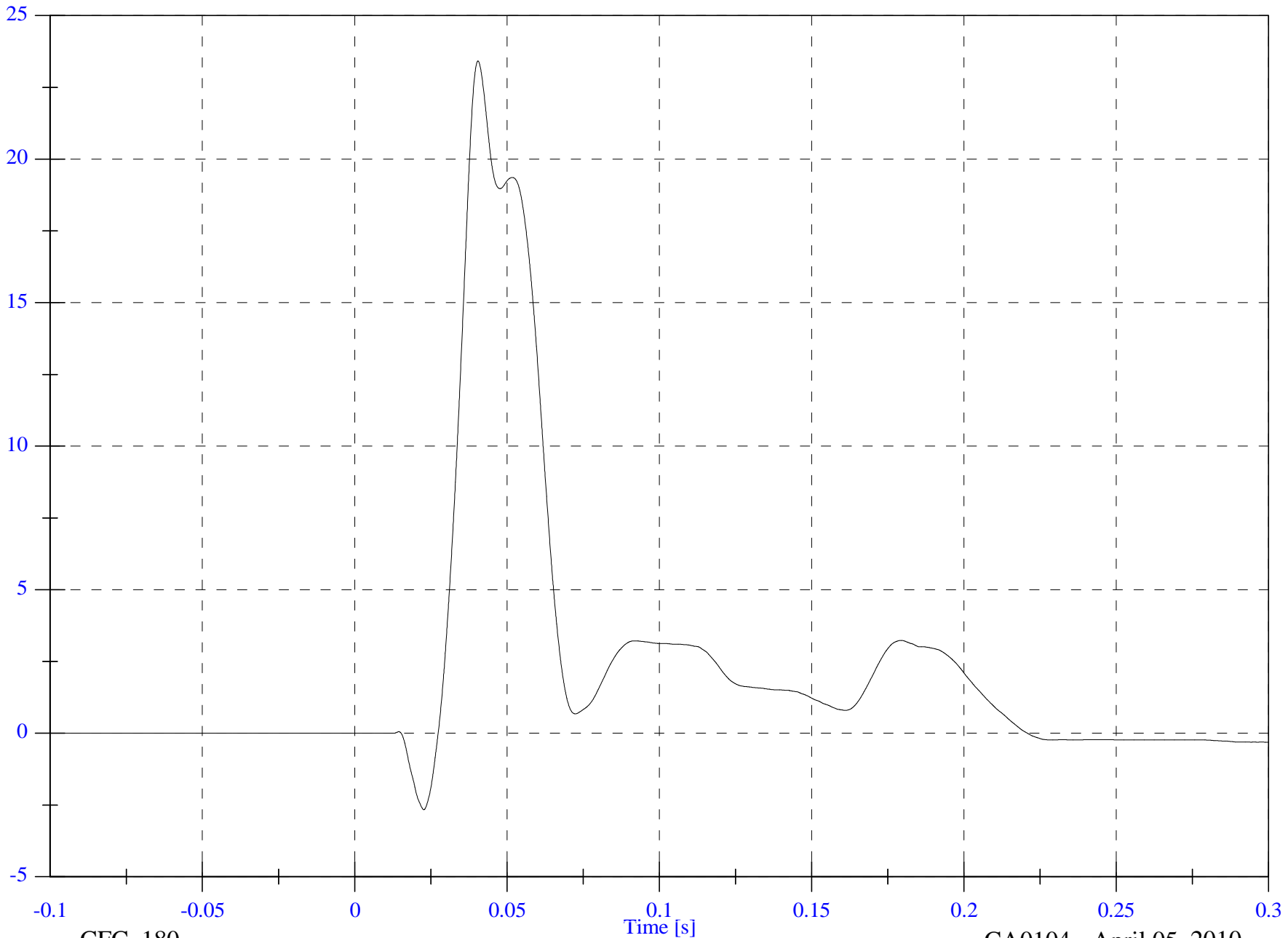
VIP1 Upper Thorax Rib Dy

Max: 23.4 [mm] at 0.040 [s]

Min: -2.7 [mm] at 0.023 [s]

B-11

mm



CFC\_180

CA0104 - April 05, 2010

tr2434

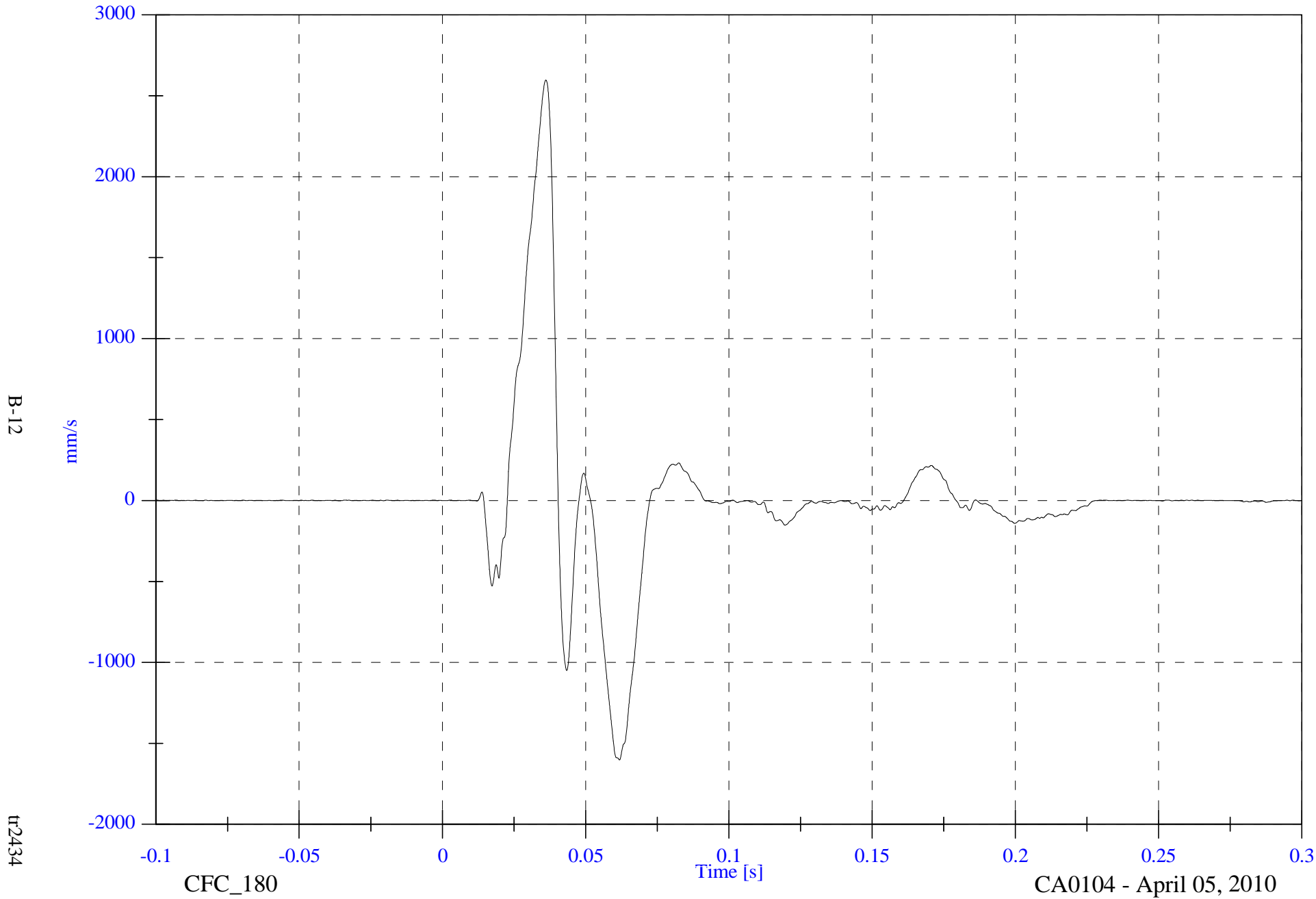


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1P1 Upper Thorax Rib Dy Rate

Max: 2596.7 [mm/s] at 0.036 [s]

Min: -1602.6 [mm/s] at 0.062 [s]



B-12

tr2434

CFC\_180

Time [s]

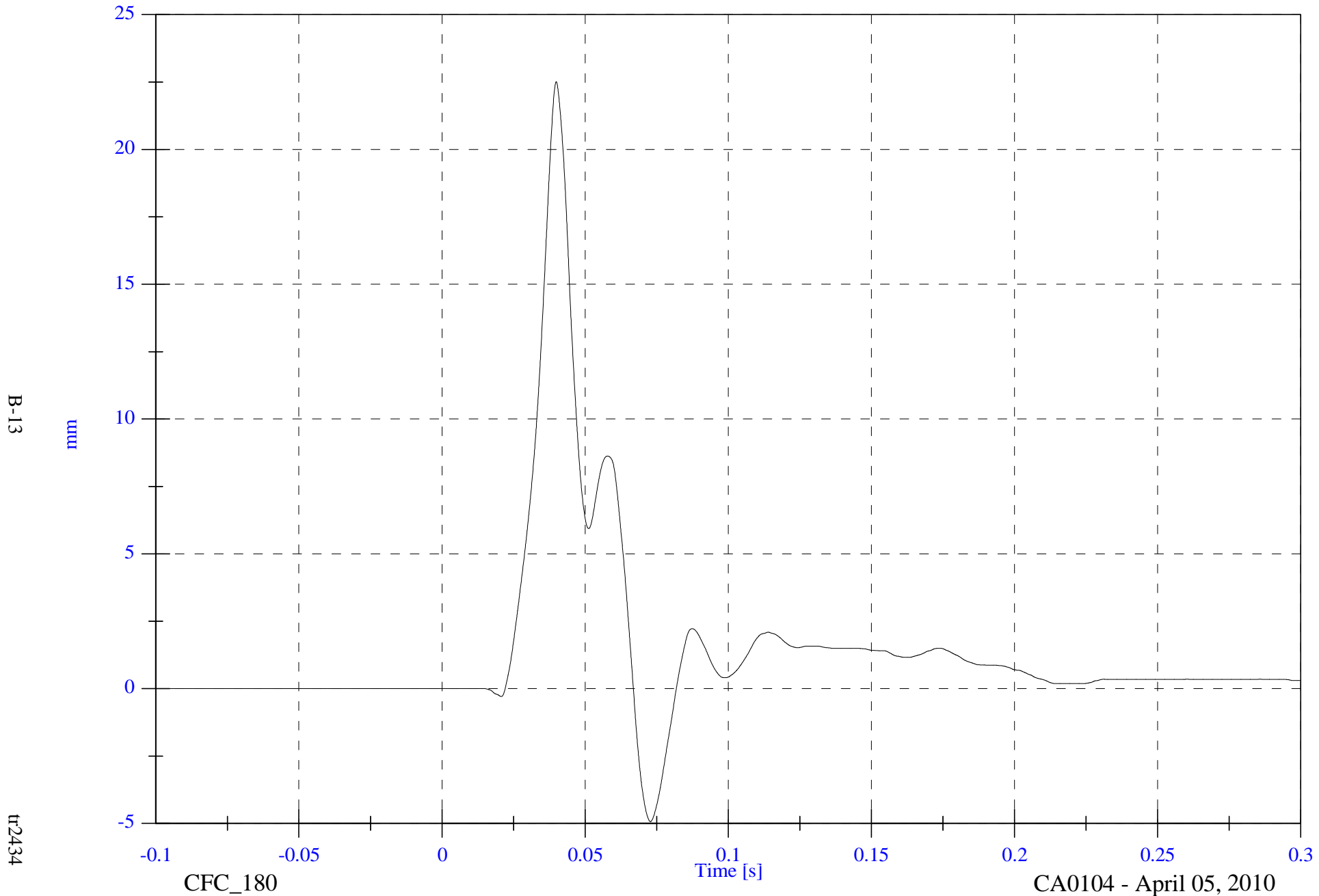
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1P1 Middle Thorax Rib Dy

Max: 22.5 [mm] at 0.040 [s]

Min: -4.9 [mm] at 0.073 [s]



B-13

tr2434

CFC\_180

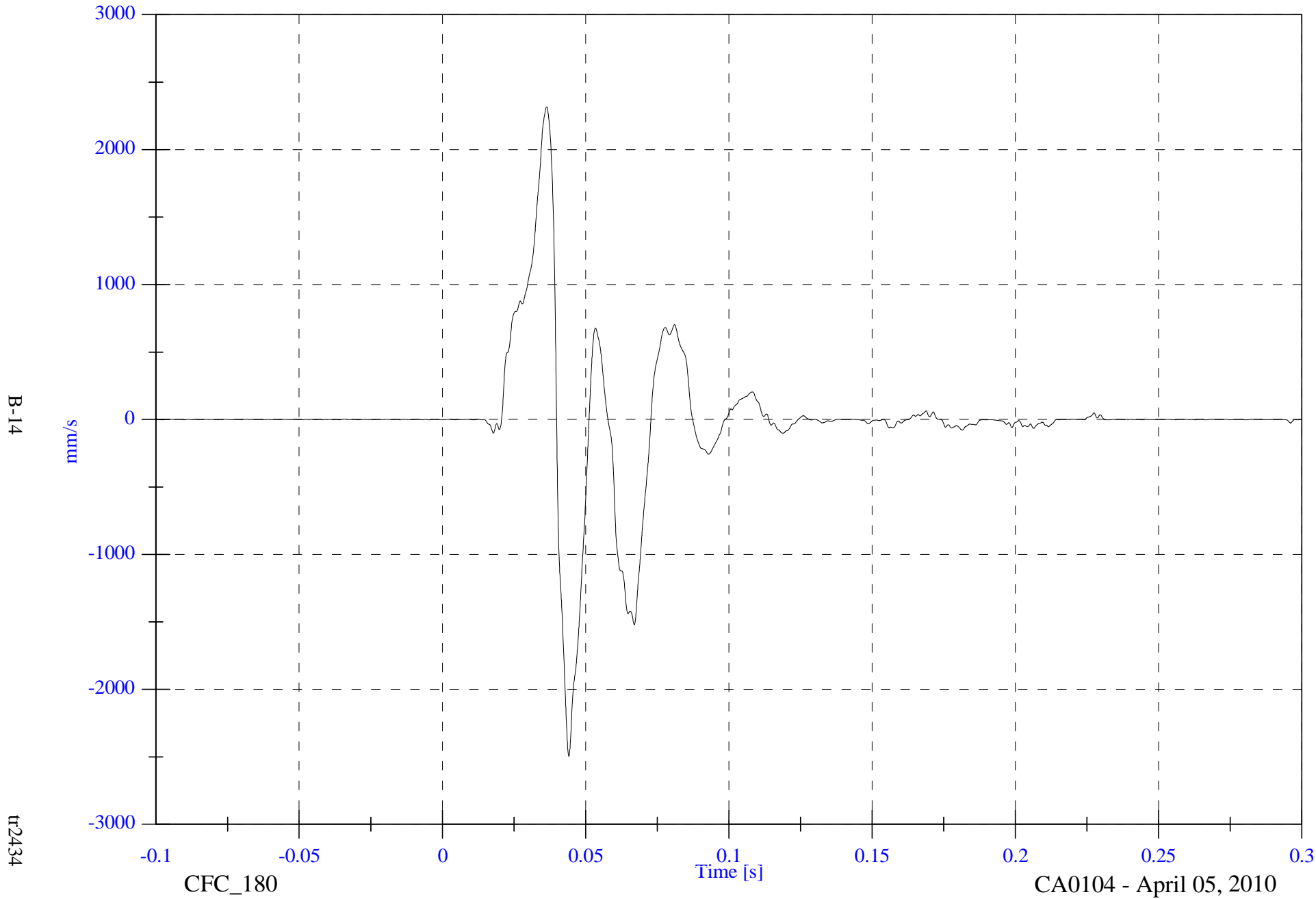
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 2317.7 [mm/s] at 0.036 [s]

V1P1 Middle Thorax Rib Dy Rate

Min: -2496.1 [mm/s] at 0.044 [s]



B-14

tr2434

CFC\_180

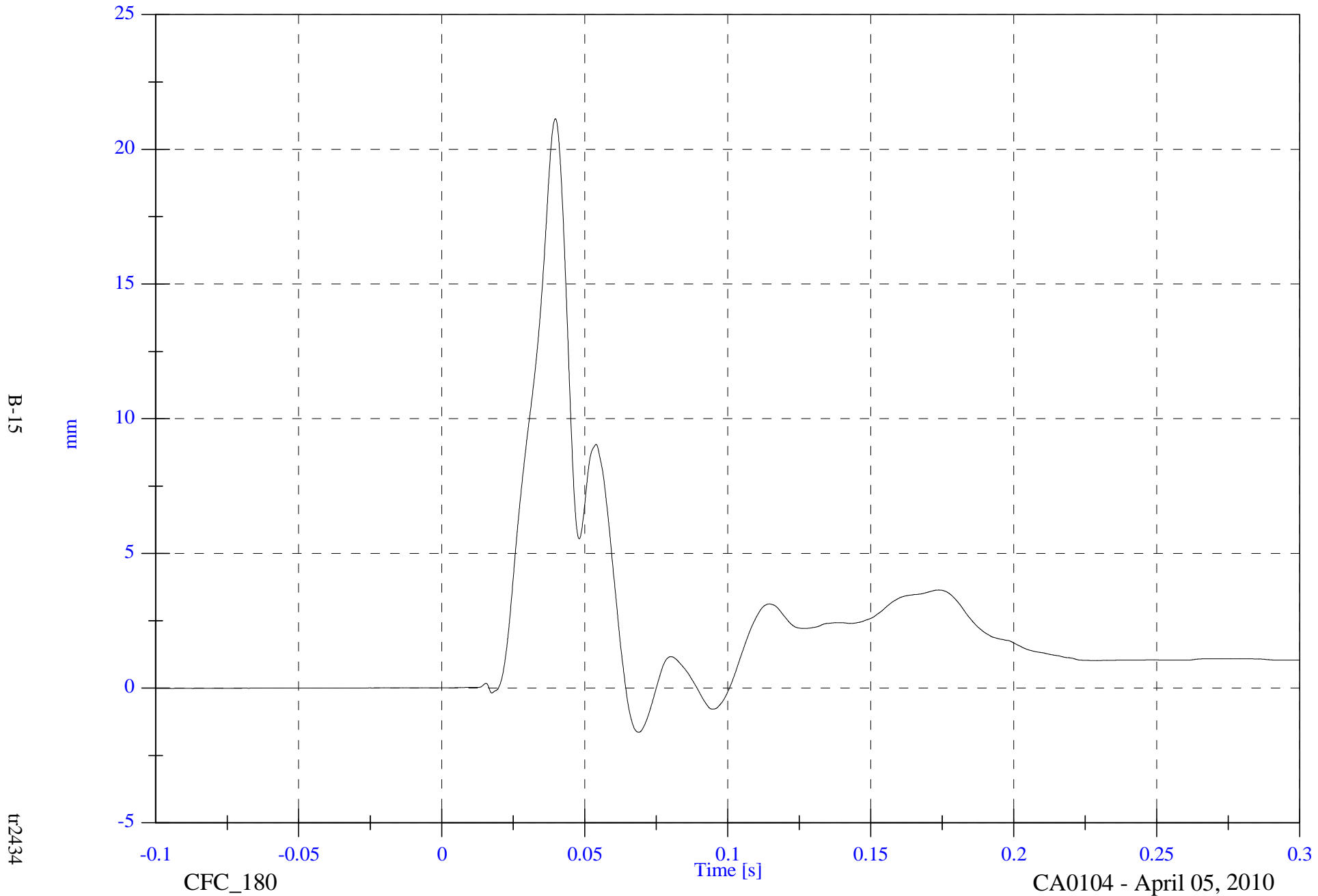
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1P1 Lower Thorax Rib Dy

Max: 21.1 [mm] at 0.040 [s]

Min: -1.6 [mm] at 0.069 [s]



B-15

tr2434

CFC\_180

CA0104 - April 05, 2010

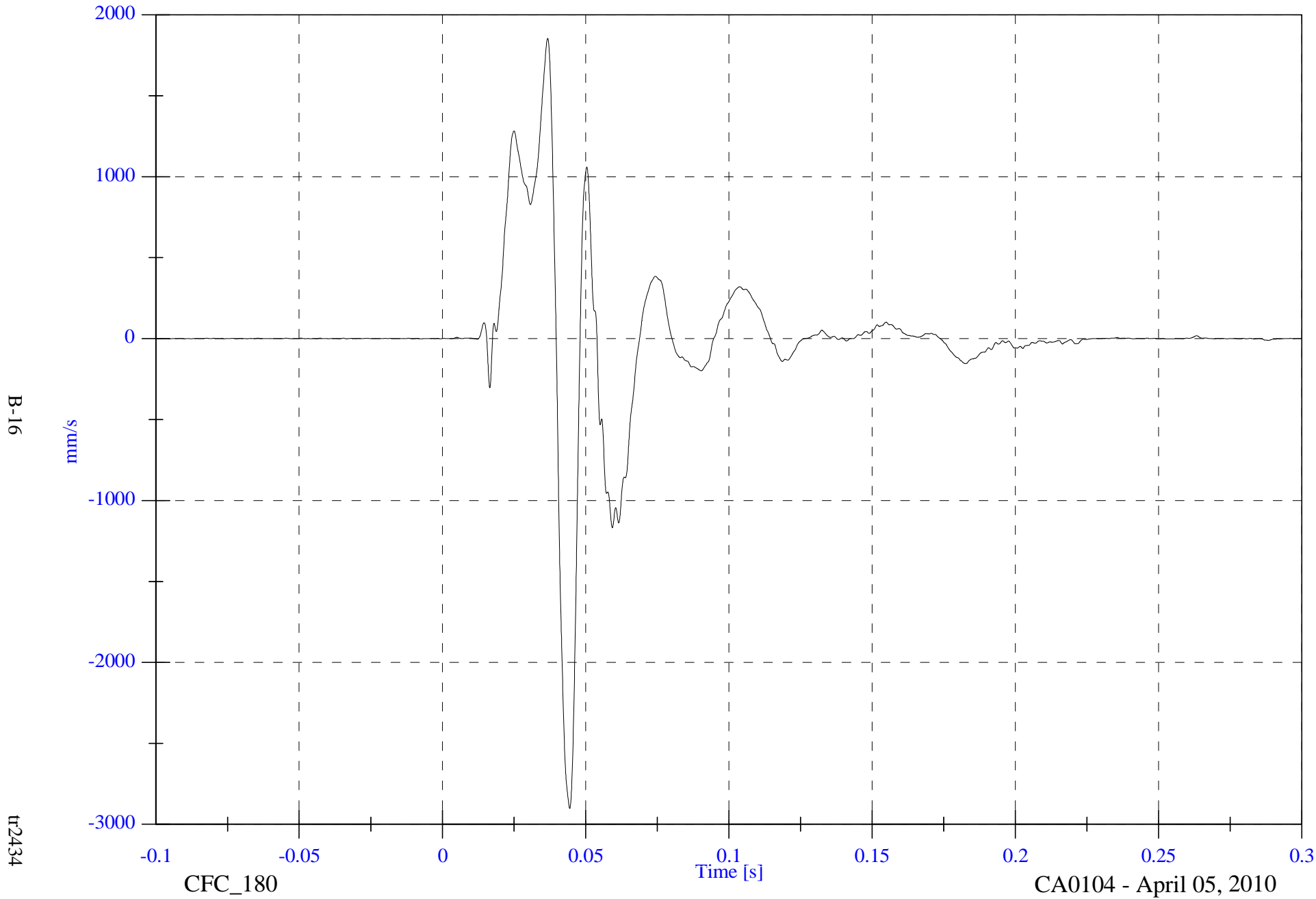


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 1854.0 [mm/s] at 0.037 [s]

V1P1 Lower Thorax Rib Dy Rate

Min: -2902.2 [mm/s] at 0.044 [s]



B-16

tr2434

CFC\_180

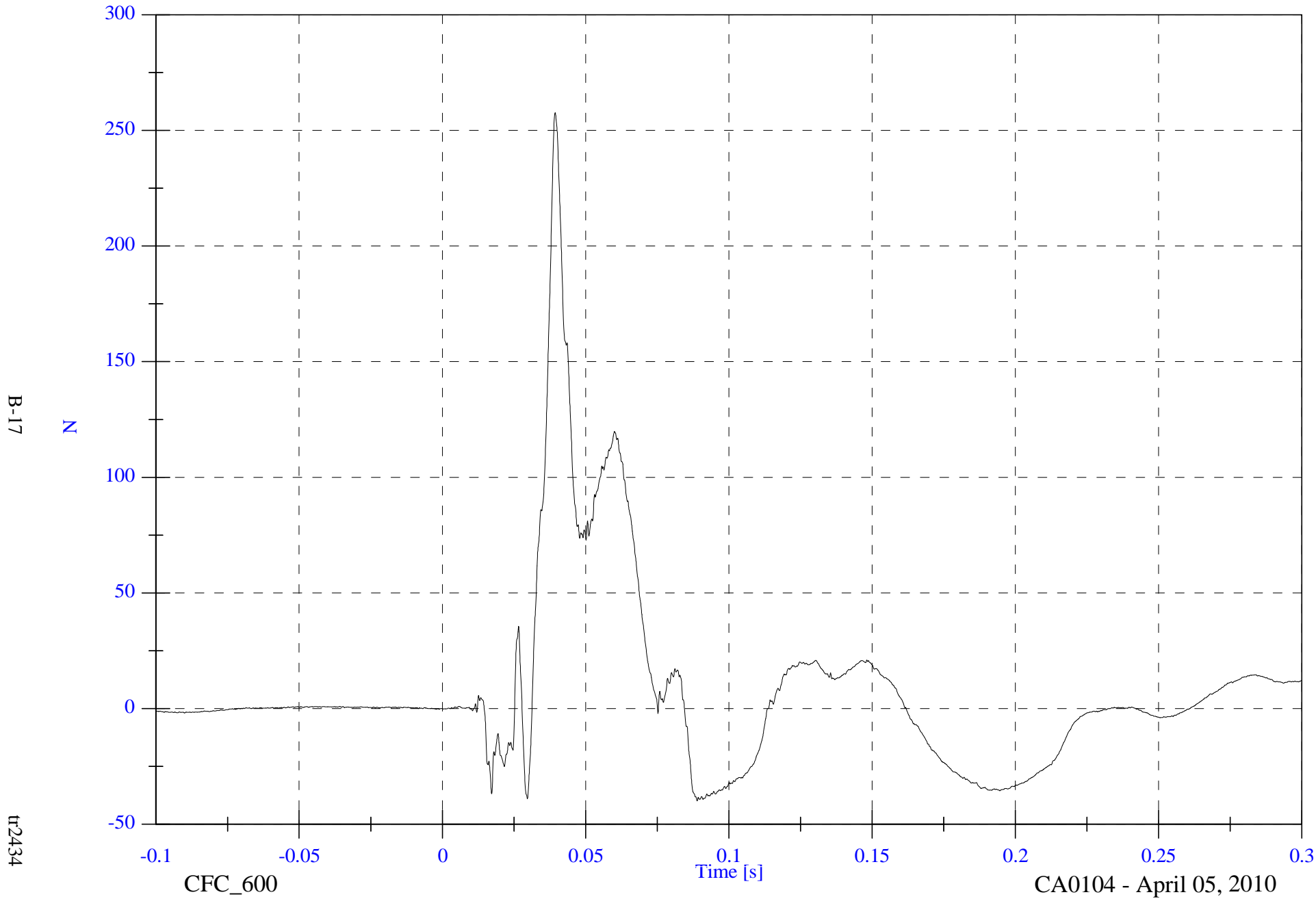
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 257.7 [N] at 0.039 [s]

V1P1 Front Abdominal Fy

Min: -39.9 [N] at 0.089 [s]



B-17

N

tr2434

CFC\_600

Time [s]

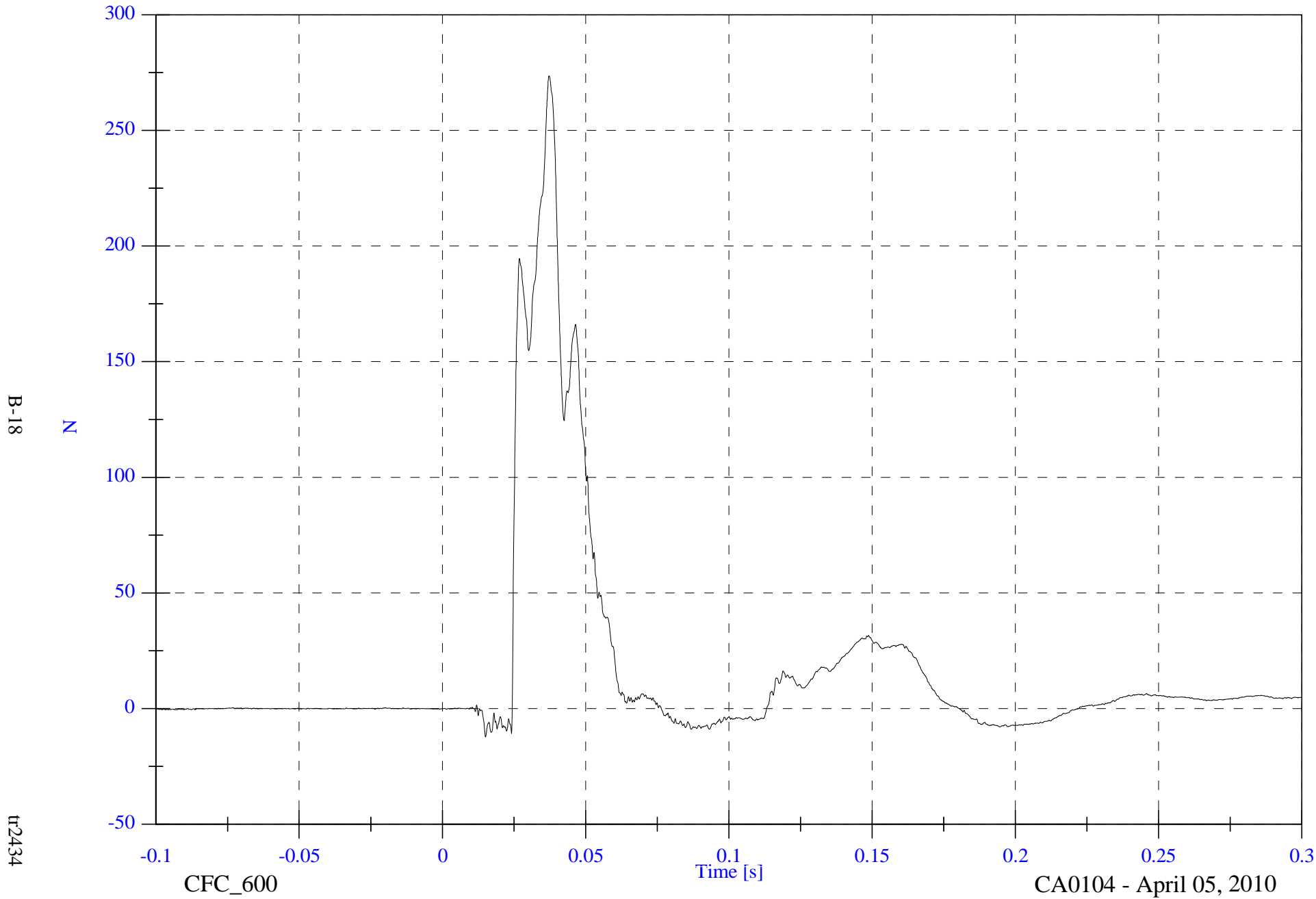
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 273.6 [N] at 0.037 [s]

V1P1 Middle Abdominal Fy

Min: -12.3 [N] at 0.015 [s]



B-18

N

tr2434

CFC\_600

Time [s]

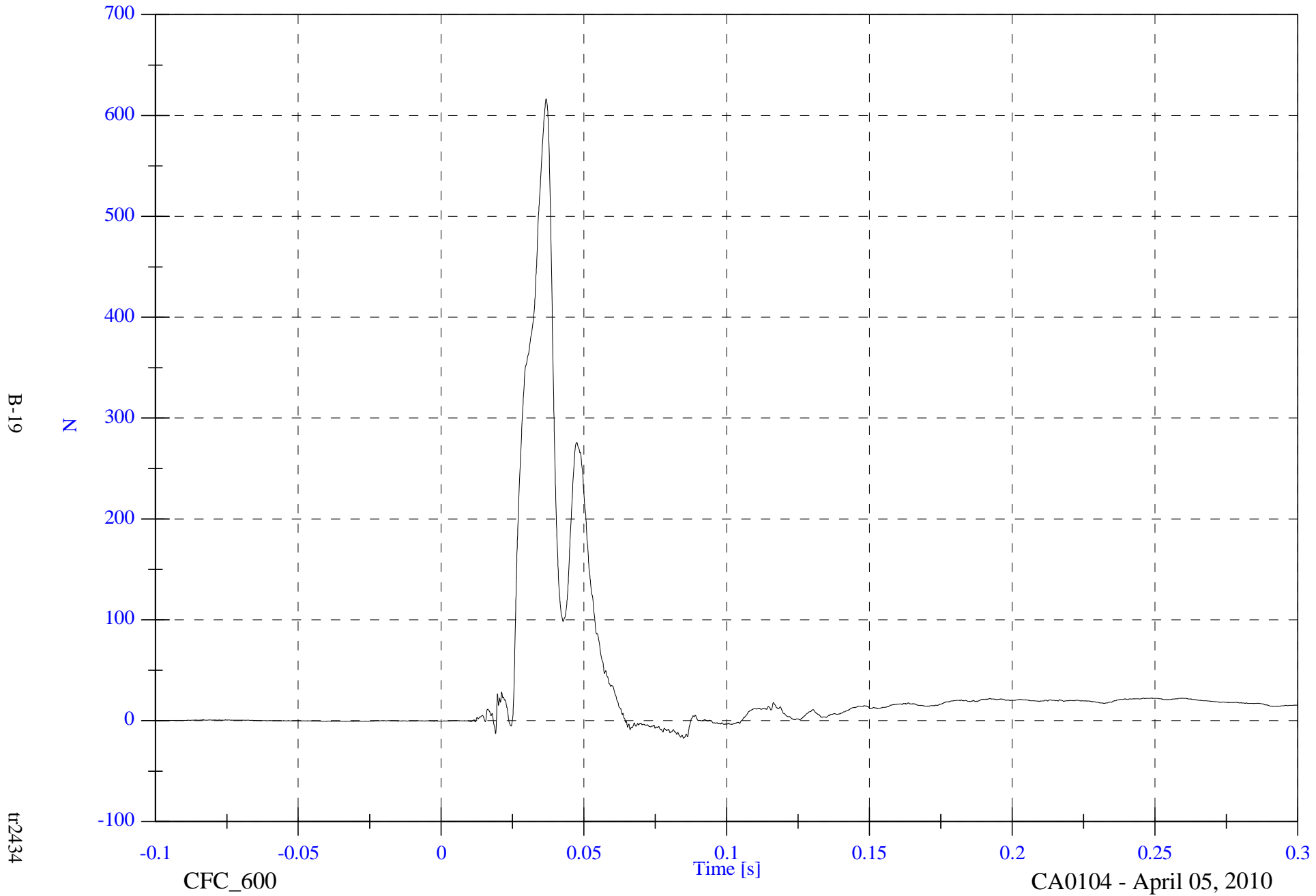
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 616.6 [N] at 0.037 [s]

VIP1 Rear Abdominal Fy

Min: -17.4 [N] at 0.085 [s]



B-19

N

tr2434

CFC\_600

Time [s]

CA0104 - April 05, 2010

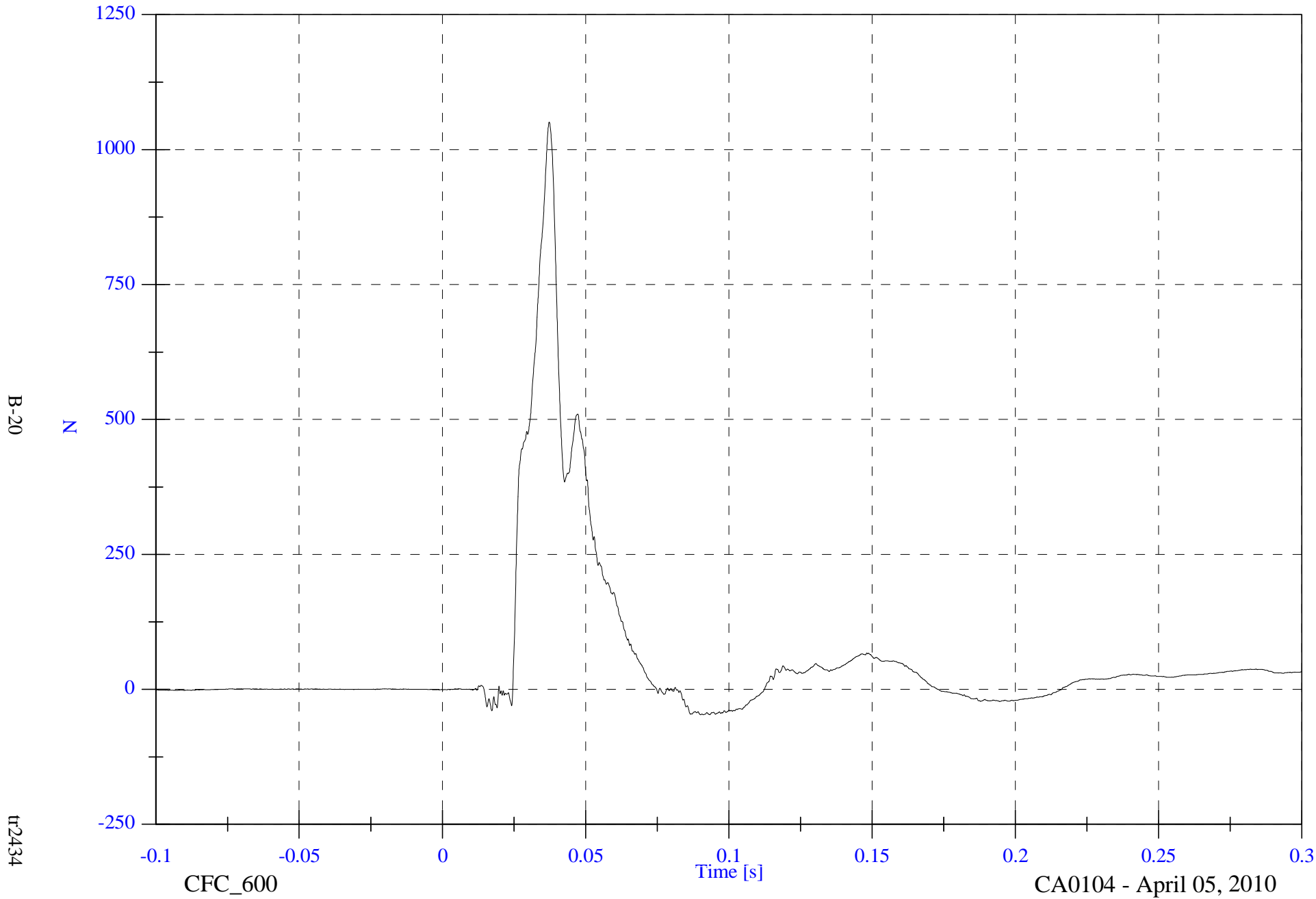


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 1051.2 [N] at 0.037 [s]

V1P1 Abdominal Summation Fy

Min: -47.1 [N] at 0.090 [s]



B-20

N

tr2434

CFC\_600

Time [s]

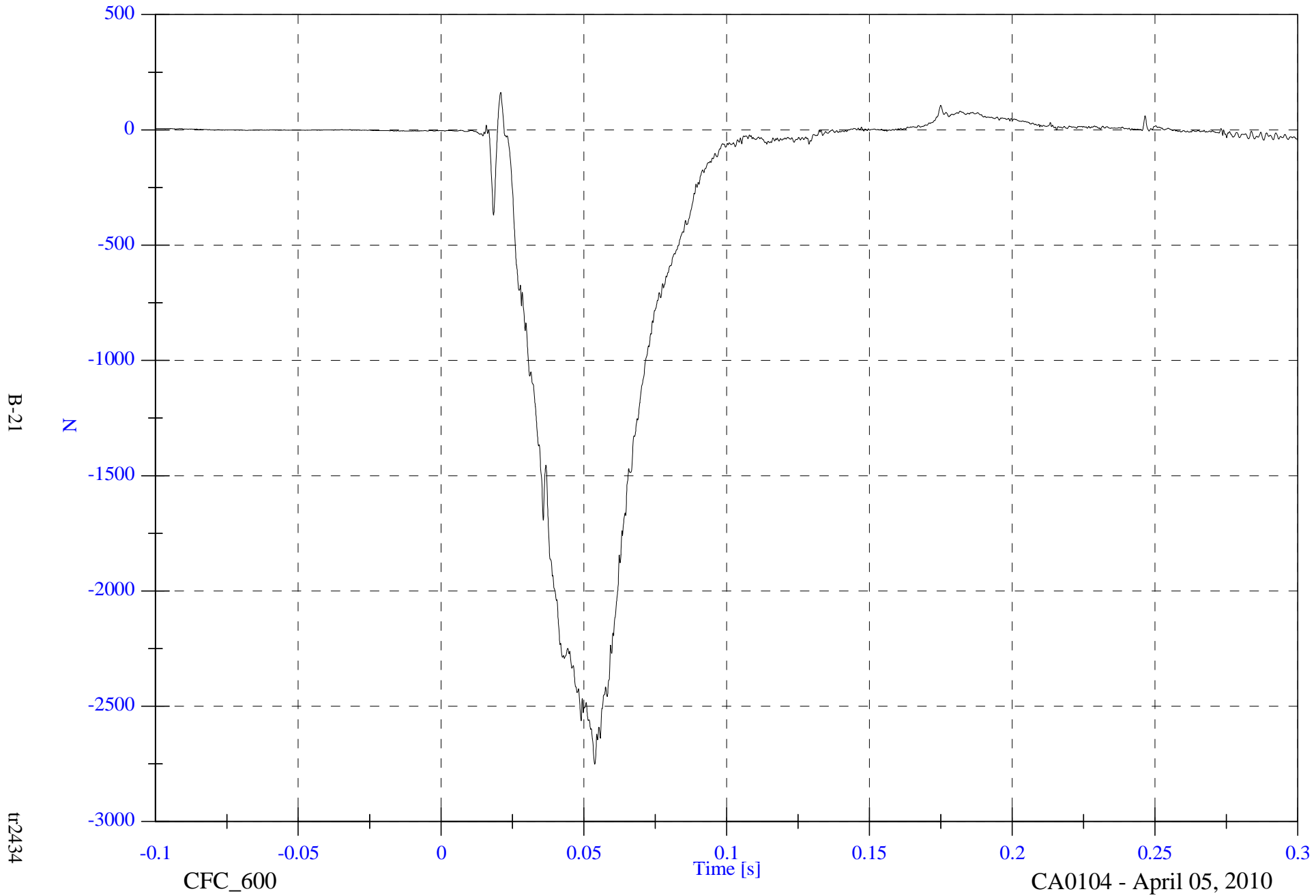
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 163.2 [N] at 0.021 [s]

V1P1 Pubic Symphysis Fy

Min: -2751.9 [N] at 0.054 [s]



B-21

N

tr2434

CFC\_600

Time [s]

CA0104 - April 05, 2010

**APPENDIX C**  
**VEHICLE ACCELEROMETER RESPONSE DATA**  
**(SAE sign convention)**

### DATA CHANNEL TITLE KEY

| Prefix                                    | Suffix                         |
|---|--------------------------------|
| V1 = Vehicle 1 (Test Vehicle)             | Ax = Acceleration, X-direction |
|   | Ay = Acceleration, Y-direction |
| P1 = Left Front Seating Position (Driver) | Az = Acceleration, Z-direction |
|   | Fx = Force, X-direction        |
| A1-A18 = Accelerometer Location Number    | Fy = Force, Y-direction        |
|   | Fz = Force, Z-direction        |
|   | Dx = Deflection, X-direction   |
|   | Dy = Deflection, Y-direction   |
|   | Dz = Deflection, Z-direction   |

**TABLE OF DATA PLOTS for VEHICLE**

| PLOT | PLOT NAME[UNITS, CHANNEL FILTER CLASS]                    | PAGE |
|------|---|------|
| 1    | Vehicle Center of Gravity (X) Acceleration vs. Time       | C-5  |
| 2    | Vehicle Center of Gravity (X) Velocity vs. Time           | C-6  |
| 3    | Vehicle Center of Gravity (Y) Acceleration vs. Time       | C-7  |
| 4    | Vehicle Center of Gravity (Y) Velocity vs. Time           | C-8  |
| 5    | Vehicle Center of Gravity (Z) Acceleration vs. Time       | C-9  |
| 6    | Vehicle Center of Gravity (Z) Velocity vs. Time           | C-10 |
| 7    | Vehicle Center of Gravity Resultant Acceleration vs. Time | C-11 |
| 8    | Left Floor Sill (Y) Acceleration vs. Time                 | C-12 |
| 9    | Left Floor Sill (Y) Velocity vs. Time                     | C-13 |
| 10   | Left Floor Sill (Y) Displacement vs. Time                 | C-14 |
| 11   | Left A-Pillar Sill (Y) Acceleration vs. Time              | C-15 |
| 12   | Left A-Pillar Sill (Y) Velocity vs. Time                  | C-16 |
| 13   | Left A-Pillar Sill (Y) Displacement vs. Time              | C-17 |
| 14   | Left Lower A-Pillar (Y) Acceleration vs. Time             | C-18 |
| 15   | Left Lower A-Pillar (Y) Velocity vs. Time                 | C-19 |
| 16   | Left Lower A-Pillar (Y) Displacement vs. Time             | C-20 |
| 17   | Left Mid A-Pillar (Y) Acceleration vs. Time               | C-21 |
| 18   | Left Mid A-Pillar (Y) Velocity vs. Time                   | C-22 |
| 19   | Left Mid A-Pillar (Y) Displacement vs. Time               | C-23 |
| 20   | Left B-Pillar Sill (Y) Acceleration vs. Time              | C-24 |
| 21   | Left B-Pillar Sill (Y) Velocity vs. Time                  | C-25 |
| 22   | Left B-Pillar Sill (Y) Displacement vs. Time              | C-26 |
| 23   | Left Lower B-Pillar (Y) Acceleration vs. Time             | C-27 |
| 24   | Left Lower B-Pillar (Y) Velocity vs. Time                 | C-28 |
| 25   | Left Lower B-Pillar (Y) Displacement vs. Time             | C-29 |
| 26   | Left Mid B-Pillar (Y) Acceleration vs. Time               | C-30 |
| 27   | Left Mid B-Pillar (Y) Velocity vs. Time                   | C-31 |
| 28   | Left Mid B-Pillar (Y) Displacement vs. Time               | C-32 |



**TABLE OF DATA PLOTS for VEHICLE**

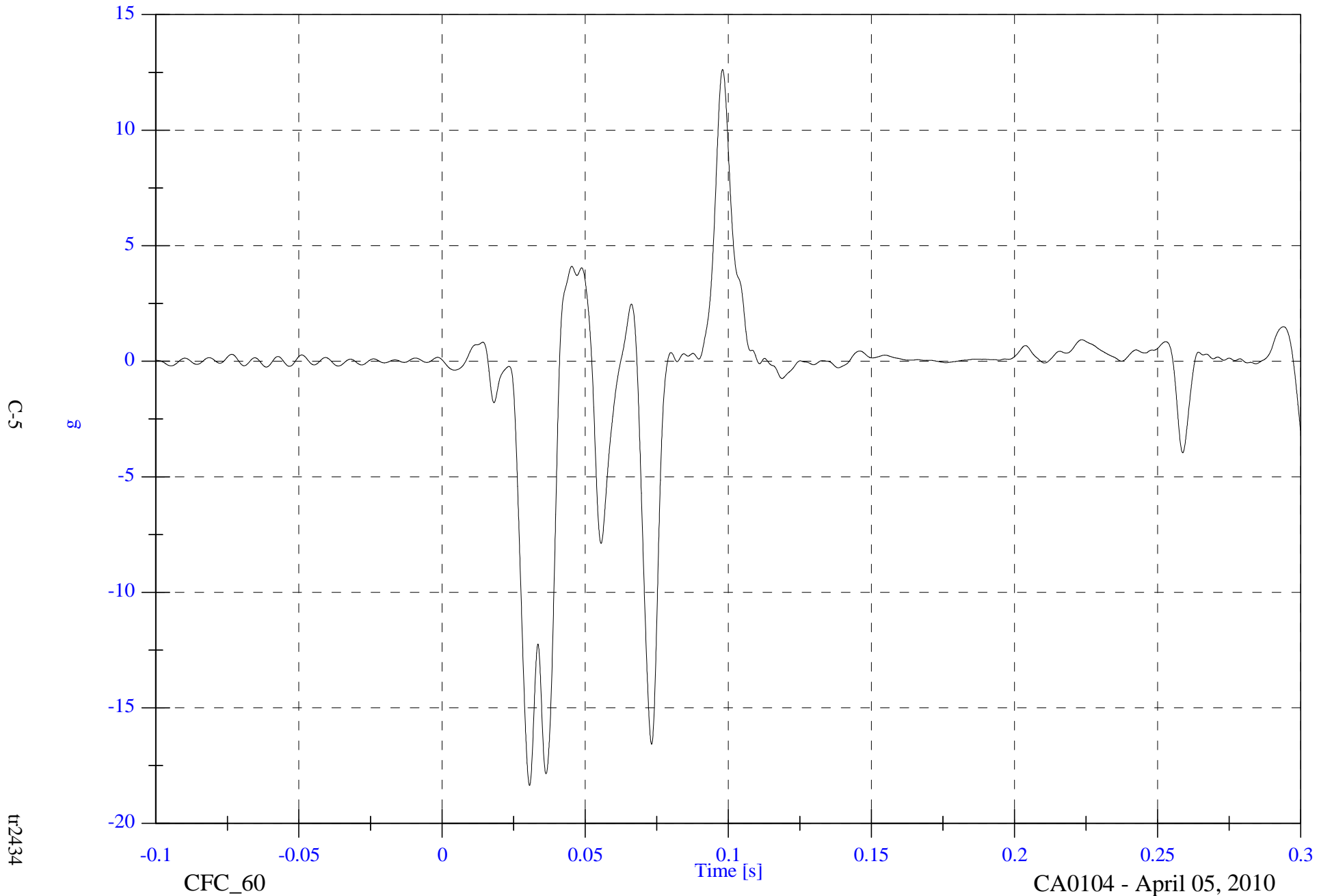
| PLOT | PLOT NAME[UNITS, CHANNEL FILTER CLASS]                                 | PAGE |
|------|--|------|
| 29   | Driver Seat Track at Dummy H-Point (Y) Acceleration vs. Time           | C-33 |
| 30   | Driver Seat Track at Dummy H-Point (Y) Velocity vs. Time               | C-34 |
| 31   | Driver Seat Track at Dummy H-Point (Y) Displacement vs. Time           | C-35 |
| 32   | Engine Top (X) Acceleration vs. Time                                   | C-36 |
| 33   | Engine Top (X) Velocity vs. Time                                       | C-37 |
| 34   | Engine Top (Y) Acceleration vs. Time                                   | C-38 |
| 35   | Engine Top (Y) Velocity vs. Time                                       | C-39 |
| 36   | Firewall Center (Y) Acceleration vs. Time                              | C-40 |
| 37   | Firewall Center (Y) Velocity vs. Time                                  | C-41 |
| 38   | Right Roof at Vertical Impact Reference Line (Y) Acceleration vs. Time | C-42 |
| 39   | Right Roof at Vertical Impact Reference Line (Y) Velocity vs. Time     | C-43 |
| 40   | Right Sill at Vertical Impact Reference Line (Y) Acceleration vs. Time | C-44 |
| 41   | Right Sill at Vertical Impact Reference Line (Y) Velocity vs. Time     | C-45 |
| 42   | Rear Floorpan Behind Rear Axle at C/L (X) Acceleration vs. Time        | C-46 |
| 43   | Rear Floorpan Behind Rear Axle at C/L (X) Velocity vs. Time            | C-47 |
| 44   | Rear Floorpan Behind Rear Axle at C/L (Y) Acceleration vs. Time        | C-48 |
| 45   | Rear Floorpan Behind Rear Axle at C/L (Y) Velocity vs. Time            | C-49 |

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 12.6 [g] at 0.098 [s]

V1 Vehicle CG x

Min: -18.4 [g] at 0.031 [s]



C-5

g

tr2434

CFC\_60

Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

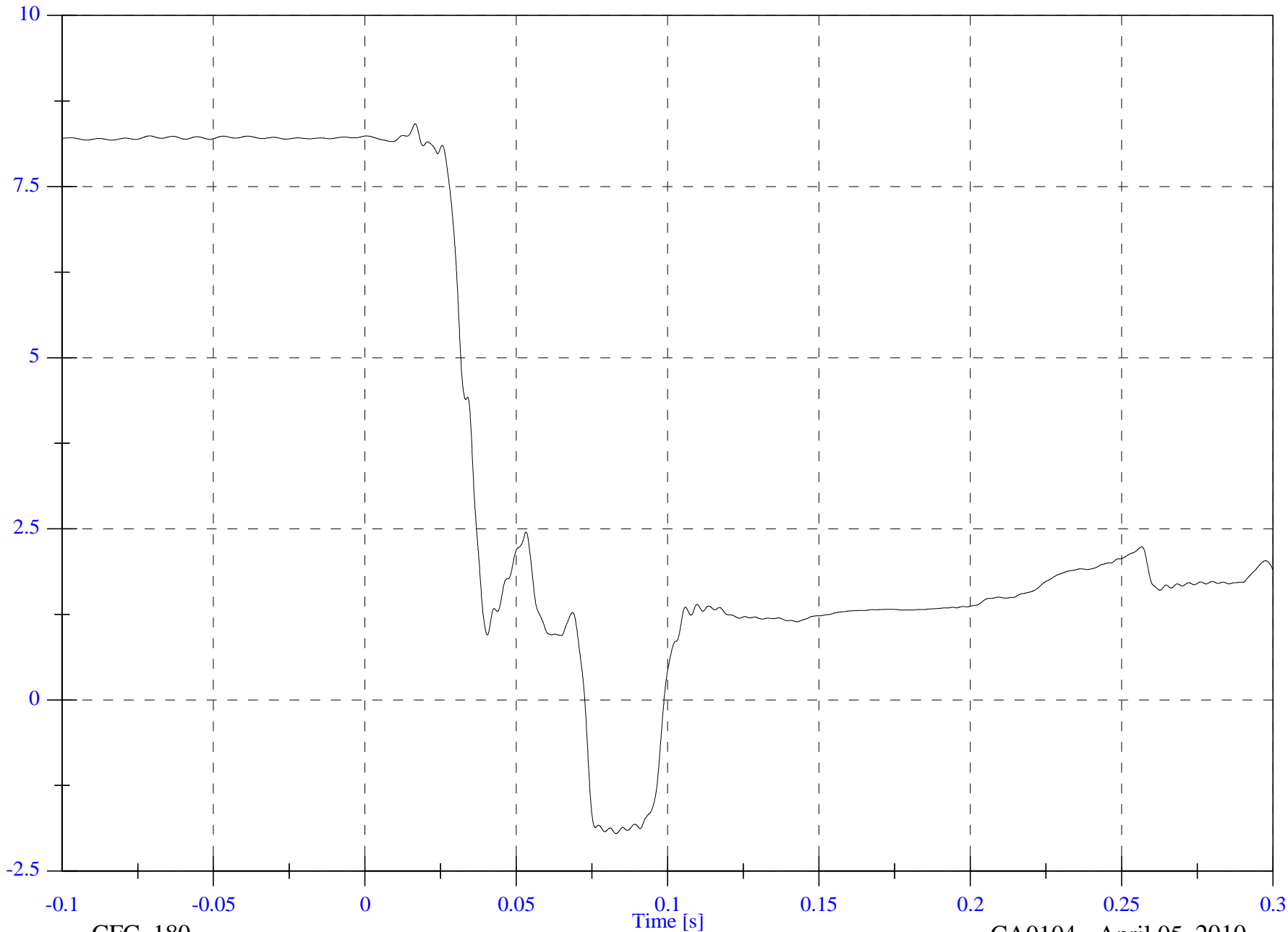
Max: 8.4 [kph] at 0.017 [s]

V1 Vehicle CG x Velocity

Min: -2.0 [kph] at 0.083 [s]

C-6

kph



tt2434

CFC\_180

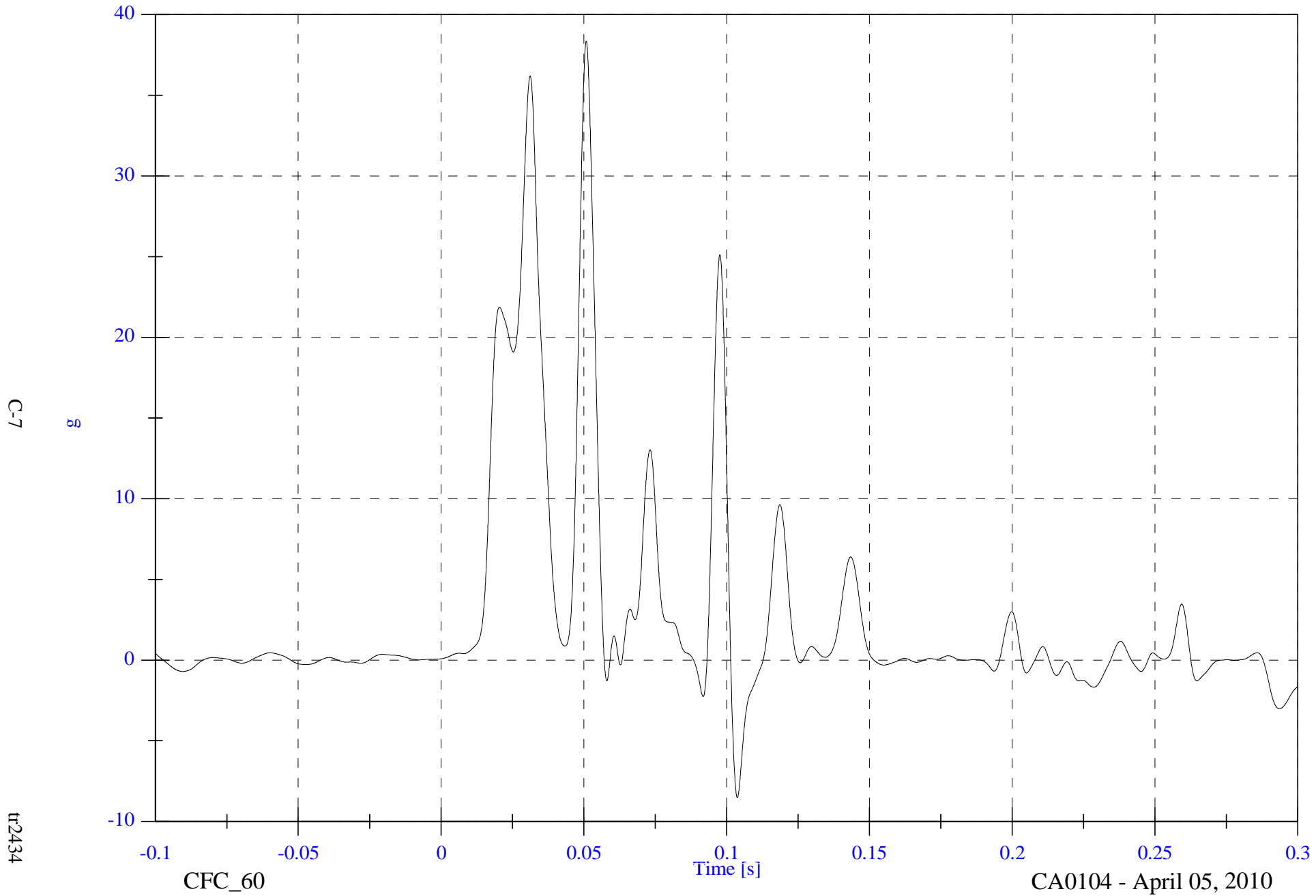
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Vehicle CG y

Max: 38.4 [g] at 0.051 [s]

Min: -8.5 [g] at 0.104 [s]



C-7

g

tt2434

CFC\_60

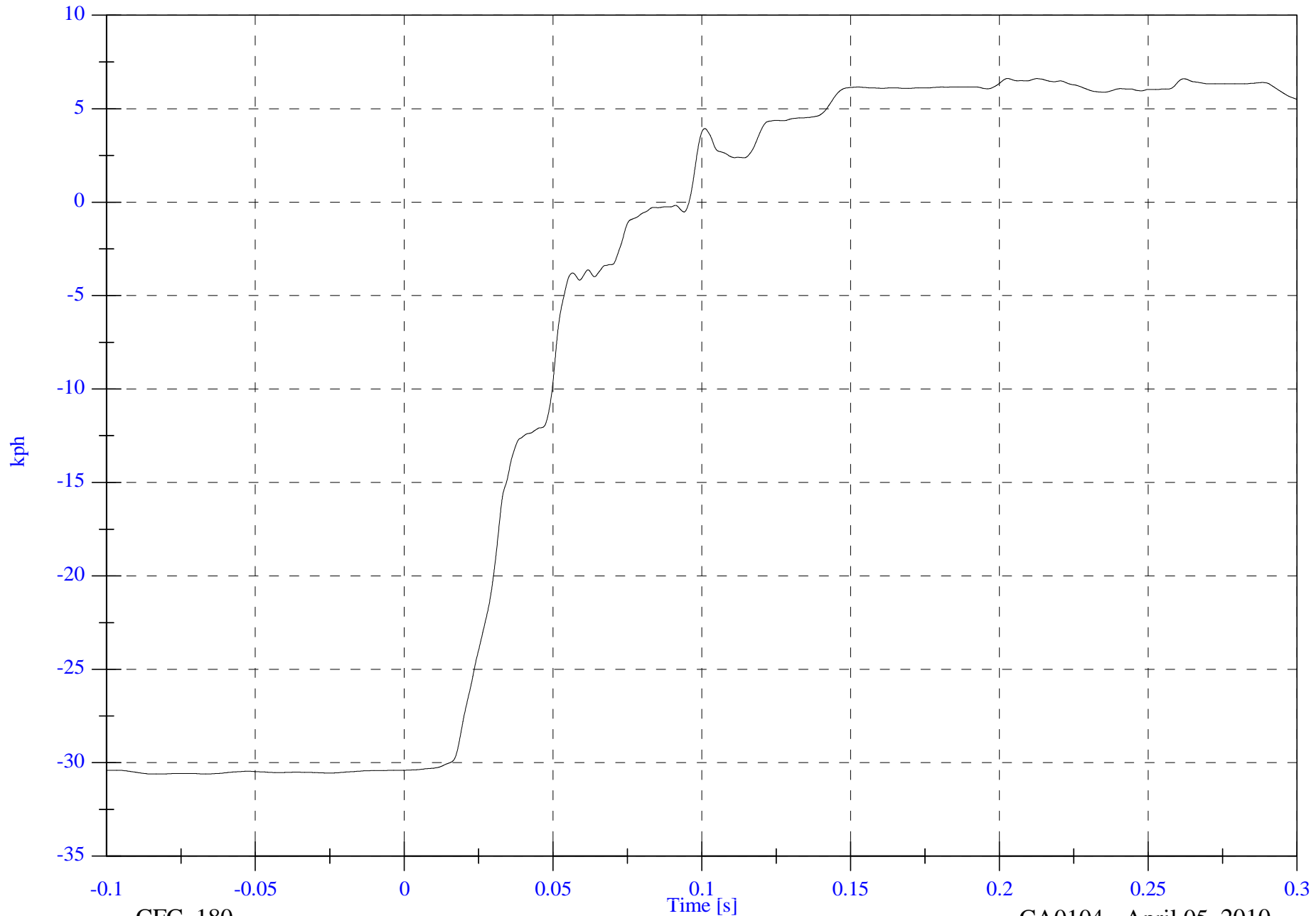
Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 6.6 [kph] at 0.203 [s]  
Min: -30.6 [kph] at -0.084 [s]

V1 Vehicle CG y Velocity



C-8

tr2434

CFC\_180

CA0104 - April 05, 2010

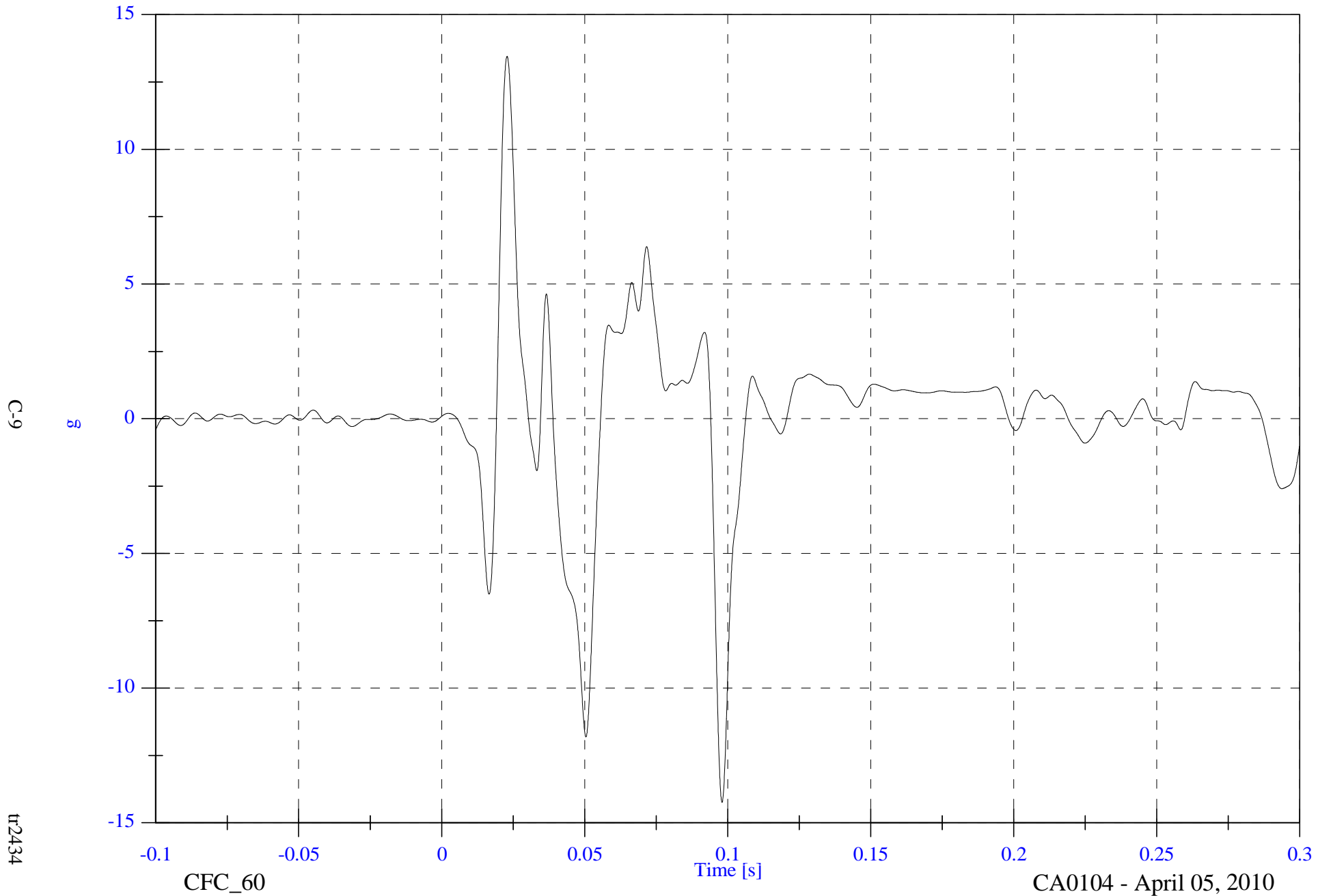


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Vehicle CG z

Max: 13.5 [g] at 0.023 [s]

Min: -14.2 [g] at 0.098 [s]



C-9

g

tr2434

CFC\_60

Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

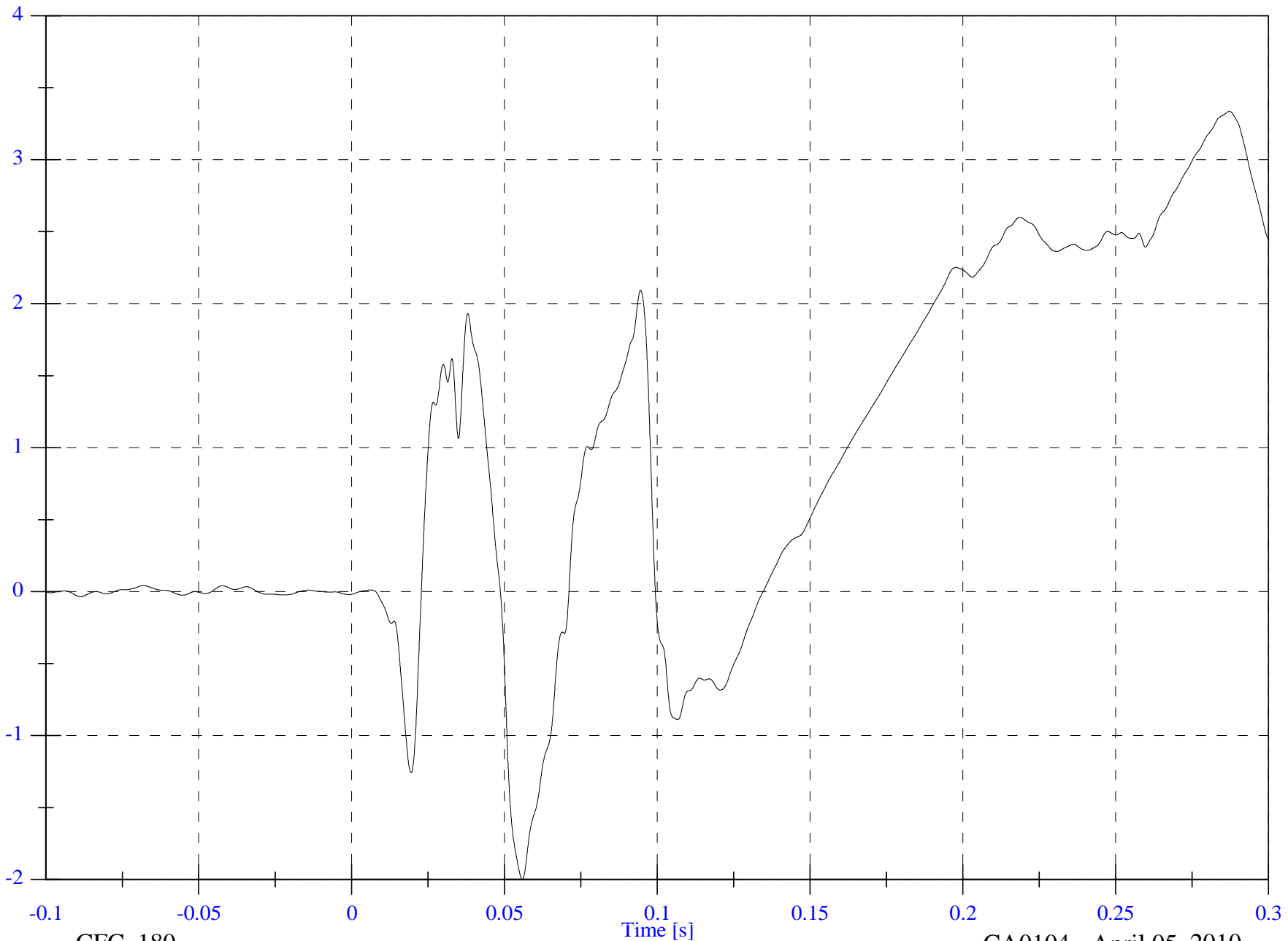
V1 Vehicle CG z Velocity

Max: 3.3 [kph] at 0.287 [s]

Min: -2.0 [kph] at 0.056 [s]

C-10

kph



CFC\_180

Time [s]

CA0104 - April 05, 2010

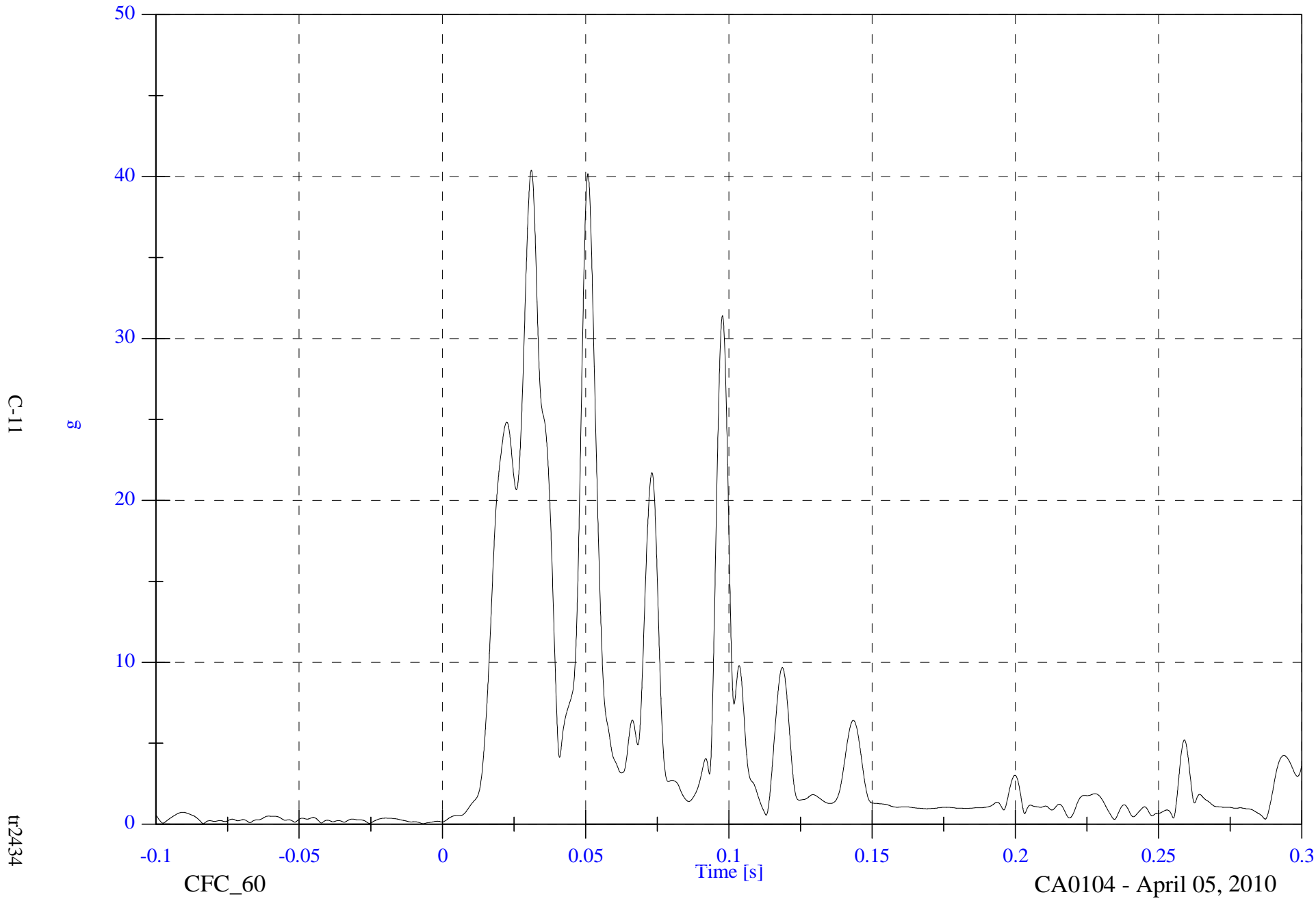
tr2434

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Vehicle CG Resultant

Max: 40.4 [g] at 0.031 [s]

Min: 0.0 [g] at -0.083 [s]



C-11

tr2434

CFC\_60

CA0104 - April 05, 2010

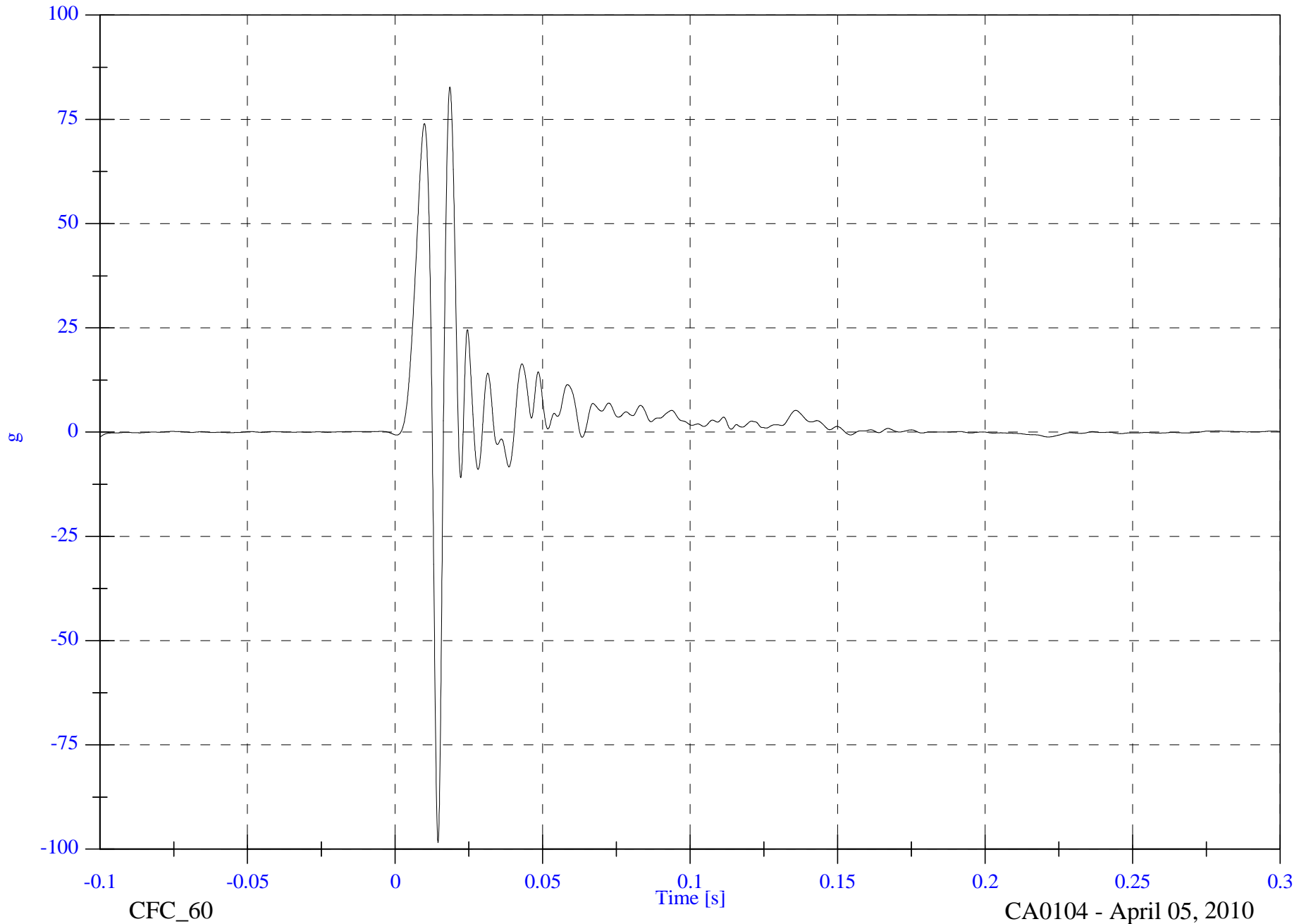
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 82.8 [g] at 0.019 [s]

V1 Left Front Sill y

Min: -98.5 [g] at 0.015 [s]

C-12



tr2434

CFC\_60

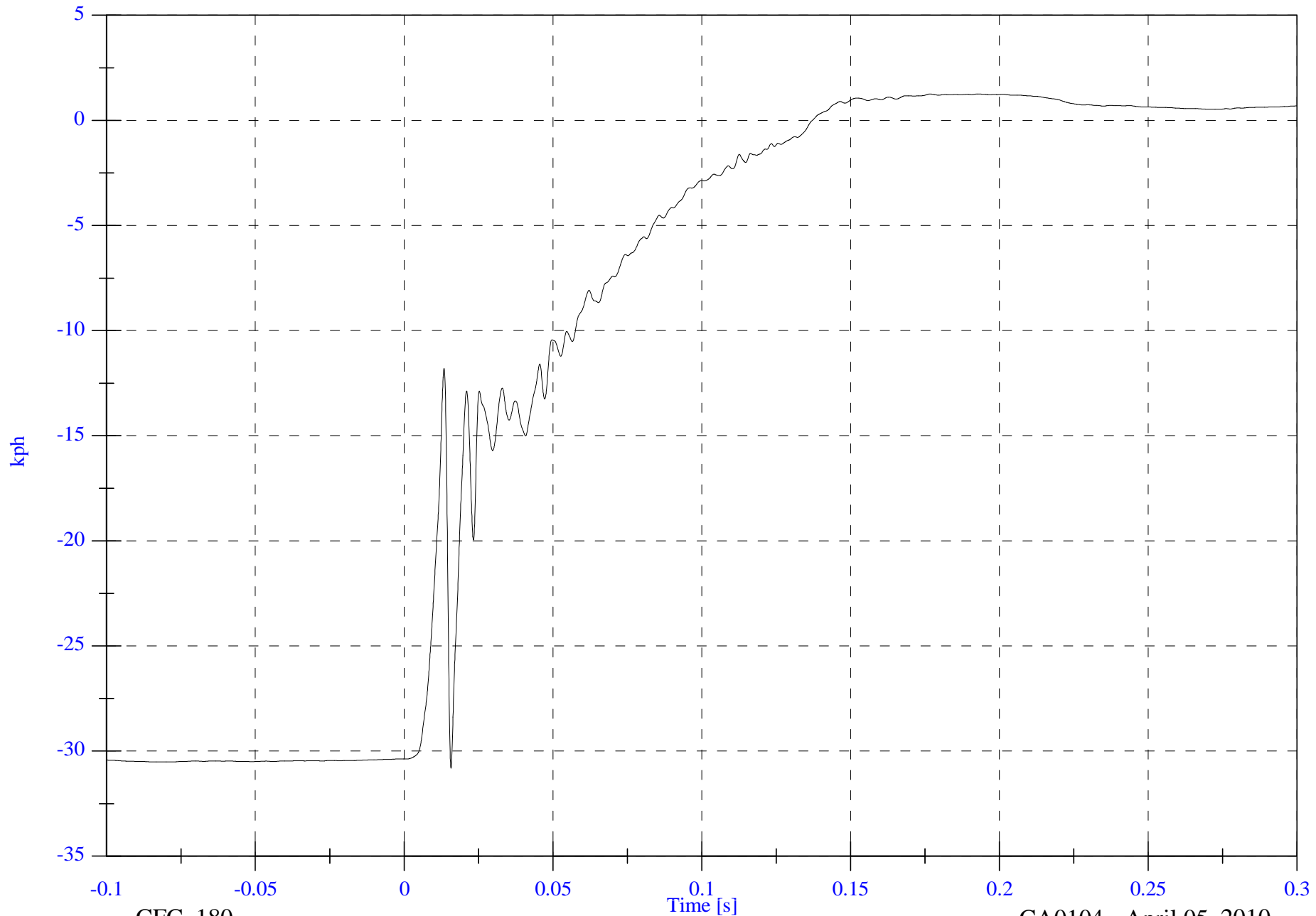
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 1.3 [kph] at 0.193 [s]

V1 Left Front Sill y Velocity

Min: -30.8 [kph] at 0.016 [s]



C-13

tr2434

CFC\_180

CA0104 - April 05, 2010

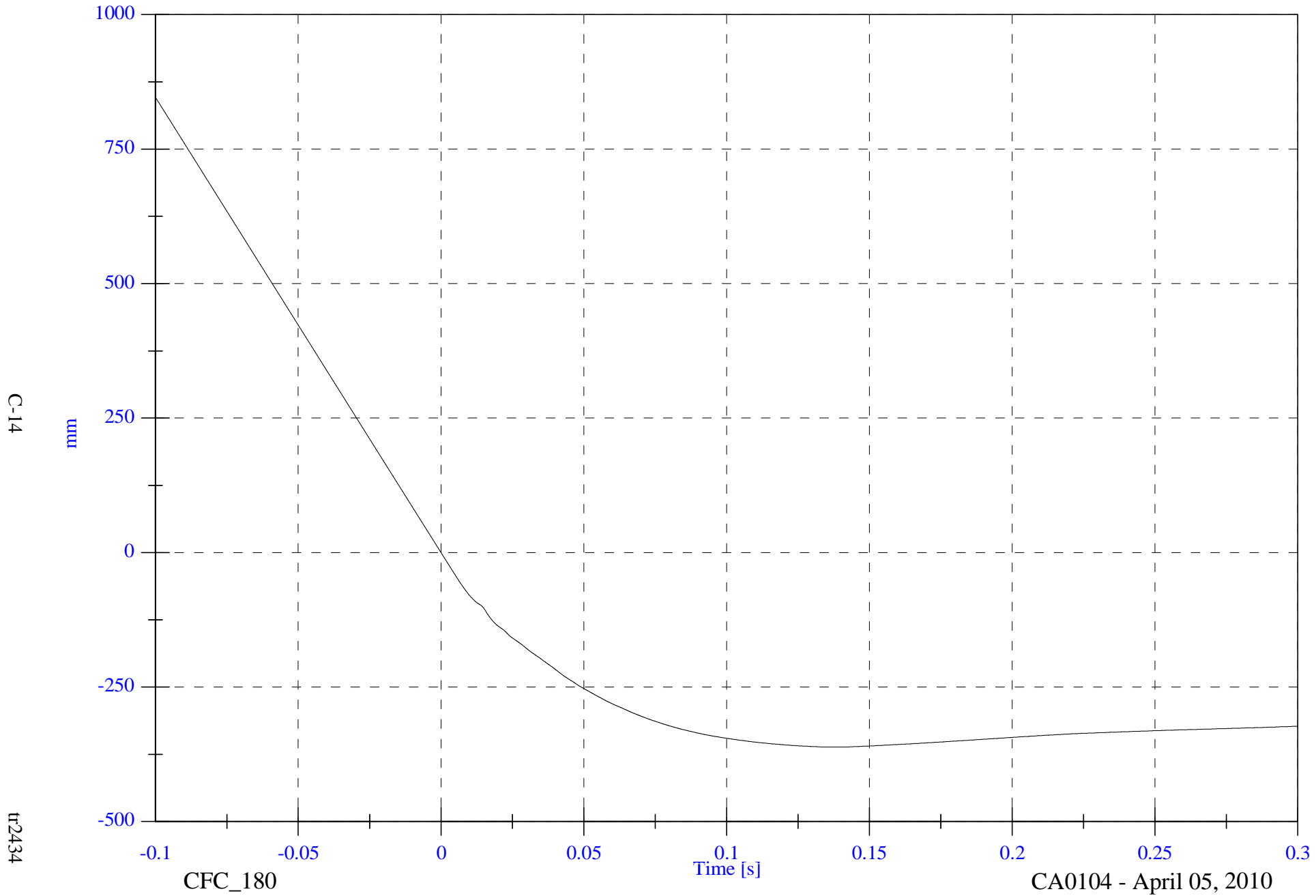


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 845.9 [mm] at -0.100 [s]

V1 Left Front Sill y Displacement

Min: -361.7 [mm] at 0.137 [s]



C-14

mm

tr2434

CFC\_180

Time [s]

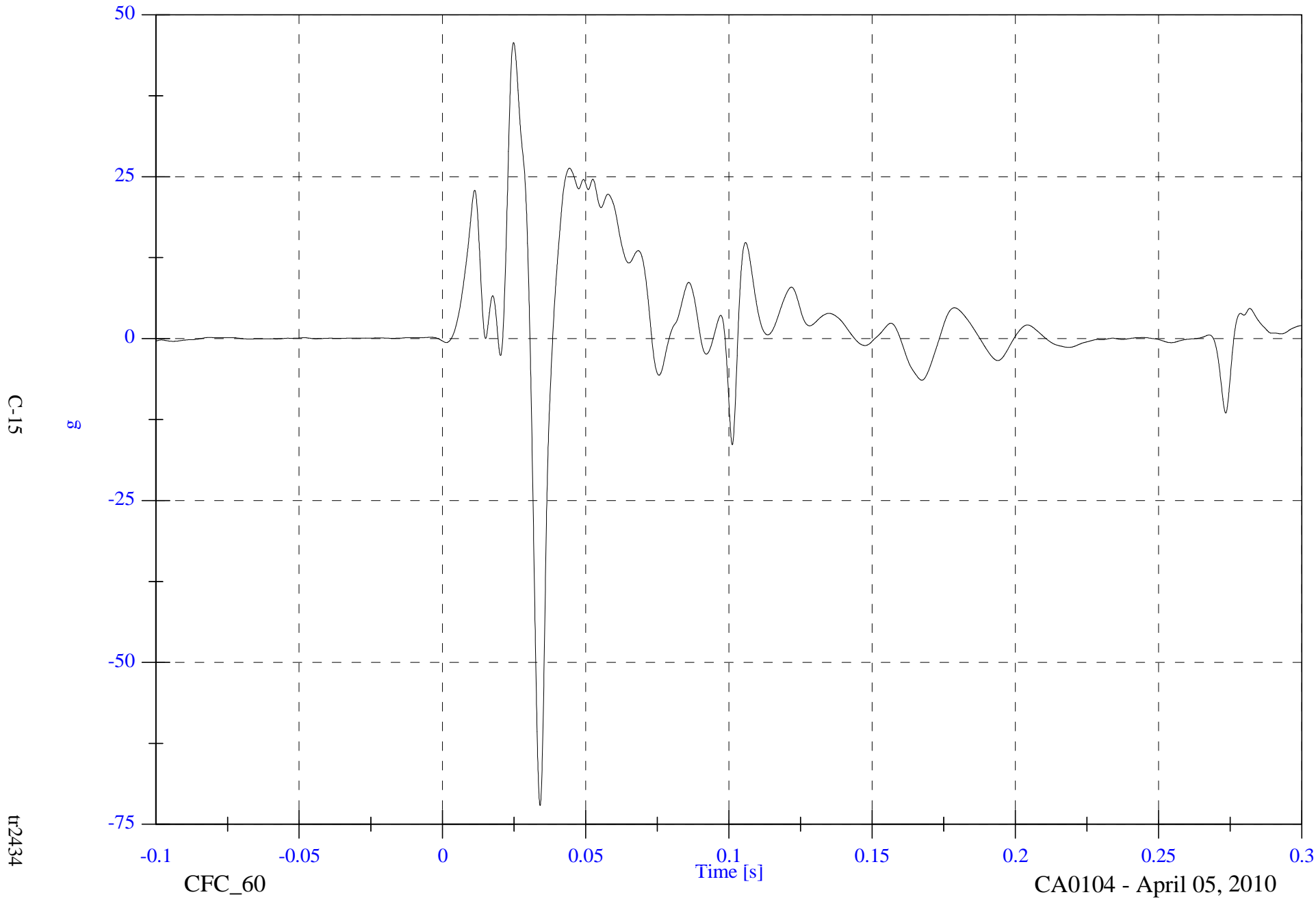
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left Lower A-Pillar Sill

Max: 45.7 [g] at 0.025 [s]

Min: -72.1 [g] at 0.034 [s]



C-15

g

Time [s]

CFC\_60

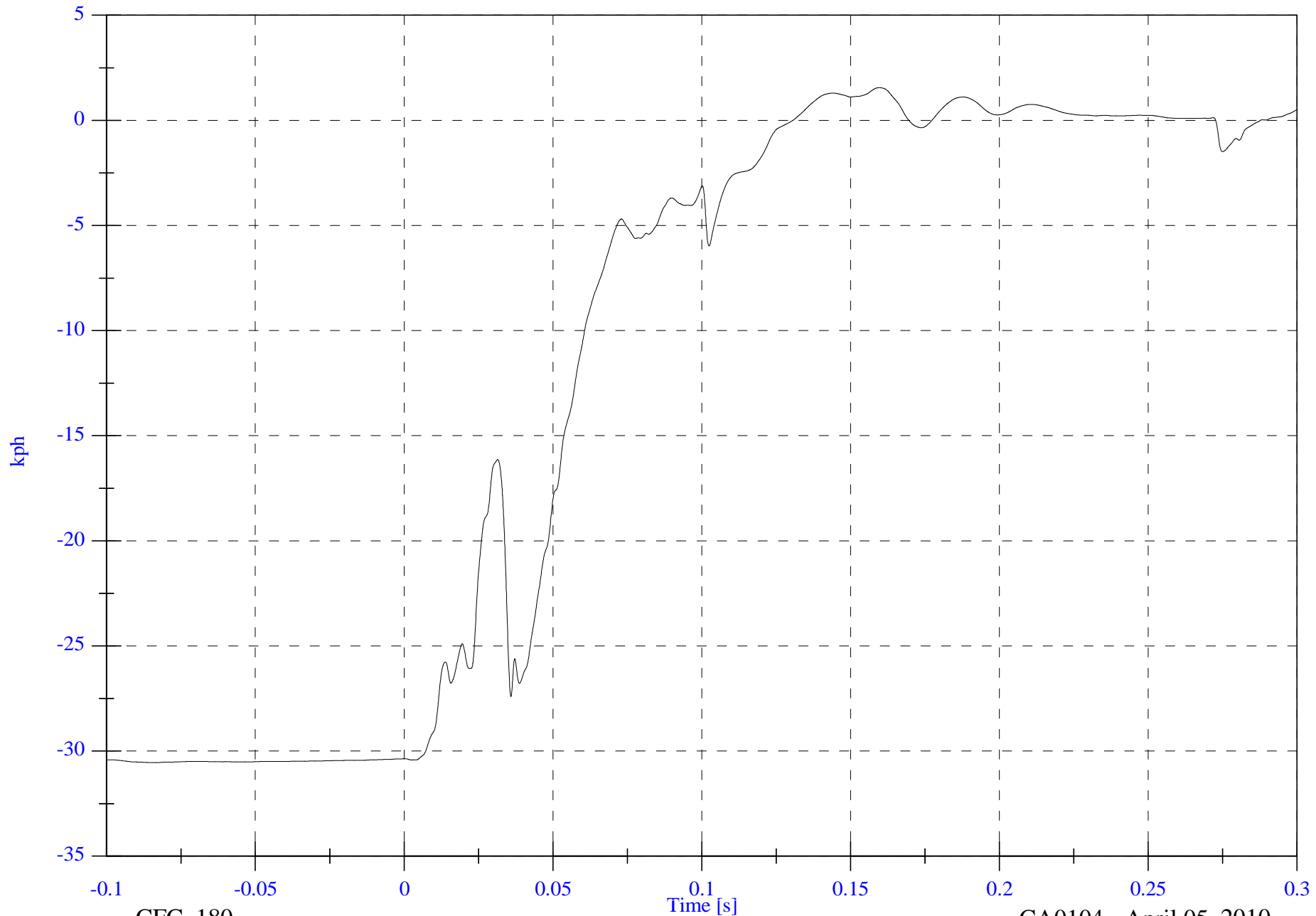
CA0104 - April 05, 2010

tt2434

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left Lower A-Pillar Sill Velocity

Max: 1.6 [kph] at 0.160 [s]  
Min: -30.6 [kph] at -0.084 [s]



C-16

tr2434

CFC\_180

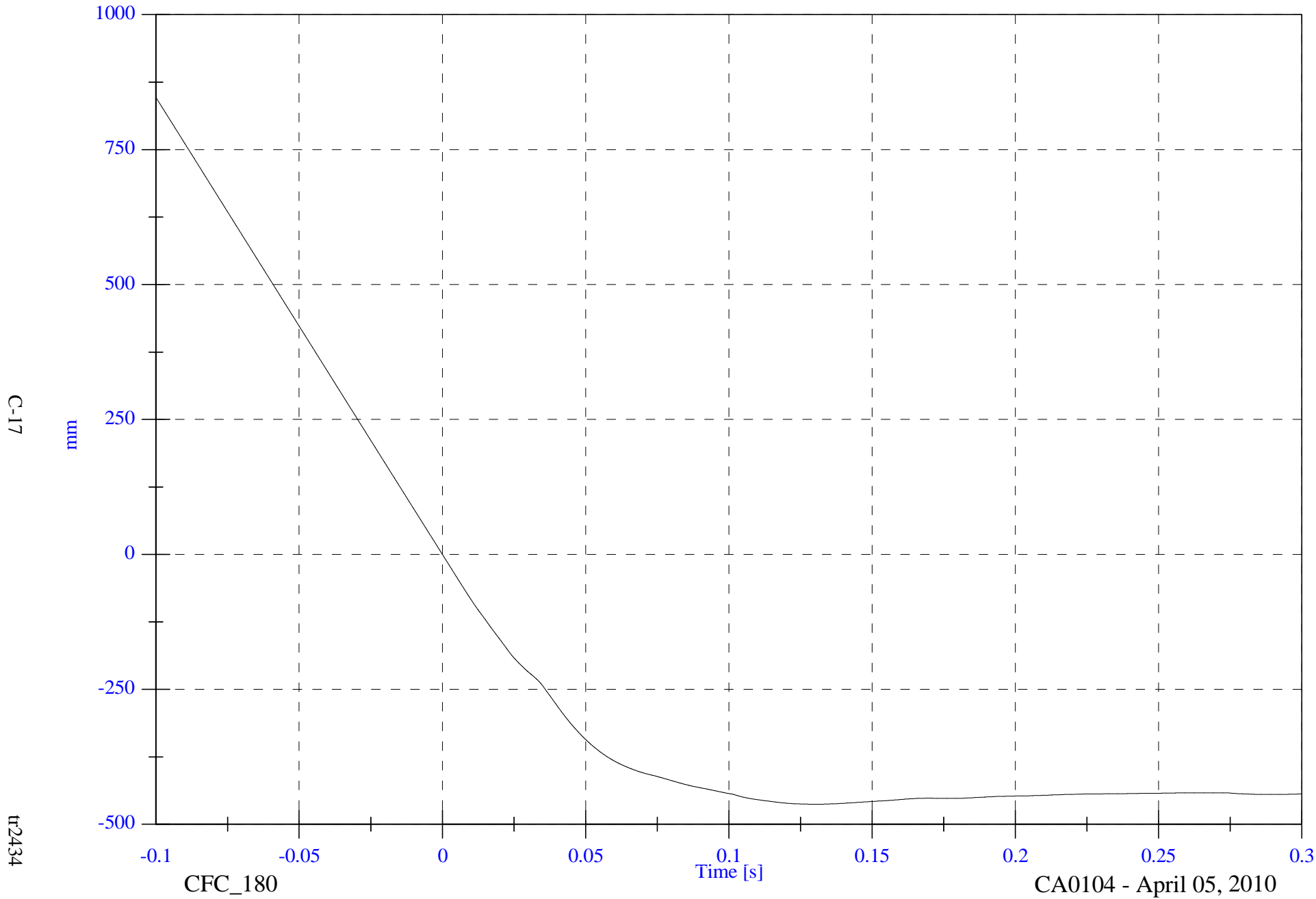
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left Lower A-Pillar Sill Displacement

Max: 846.2 [mm] at -0.100 [s]

Min: -462.7 [mm] at 0.131 [s]



C-17

tr2434

CFC\_180

Time [s]

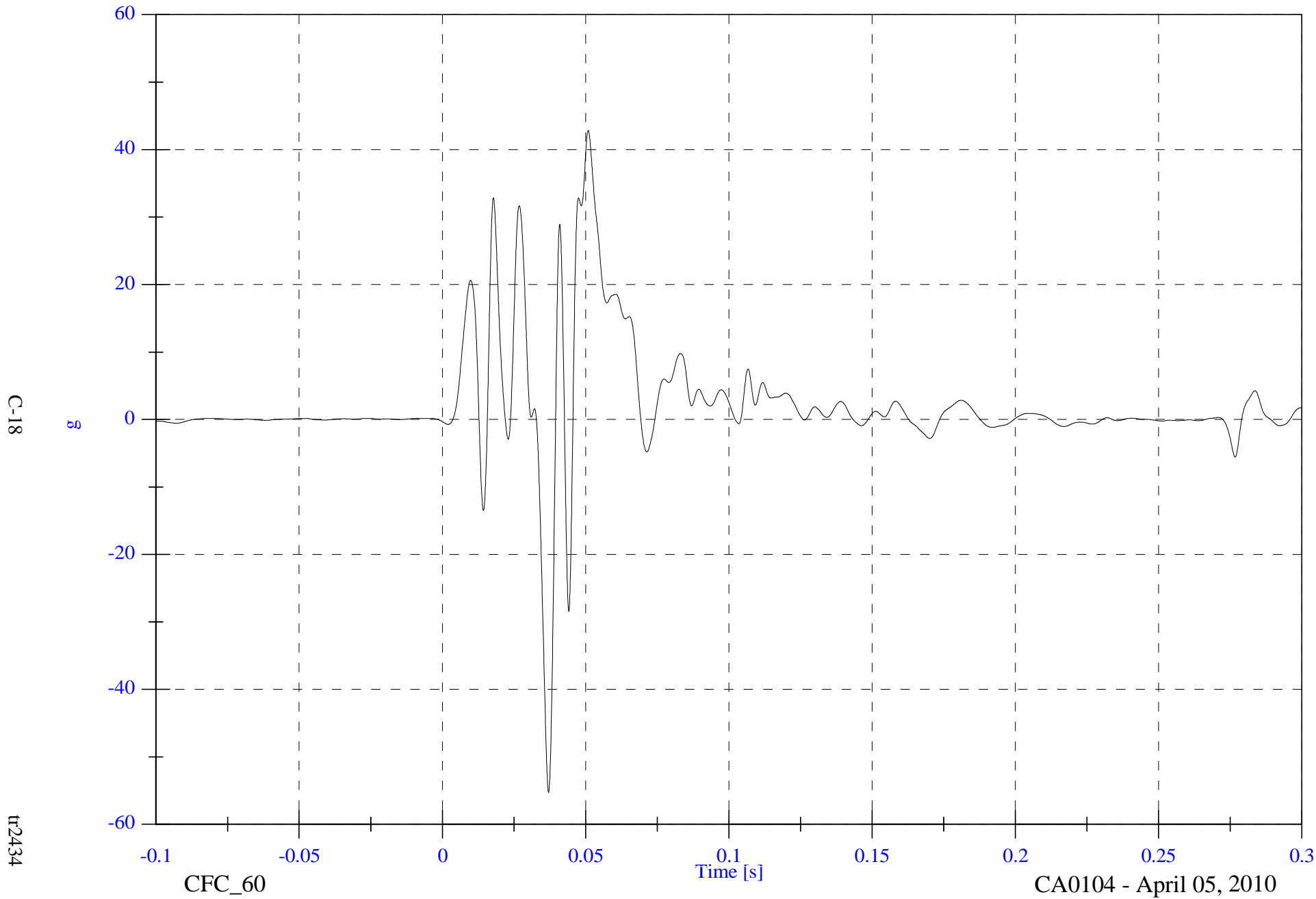
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 42.9 [g] at 0.051 [s]

V1 Left A-Pillar Mid y

Min: -55.3 [g] at 0.037 [s]



C-18

tr2434

CFC\_60

CA0104 - April 05, 2010



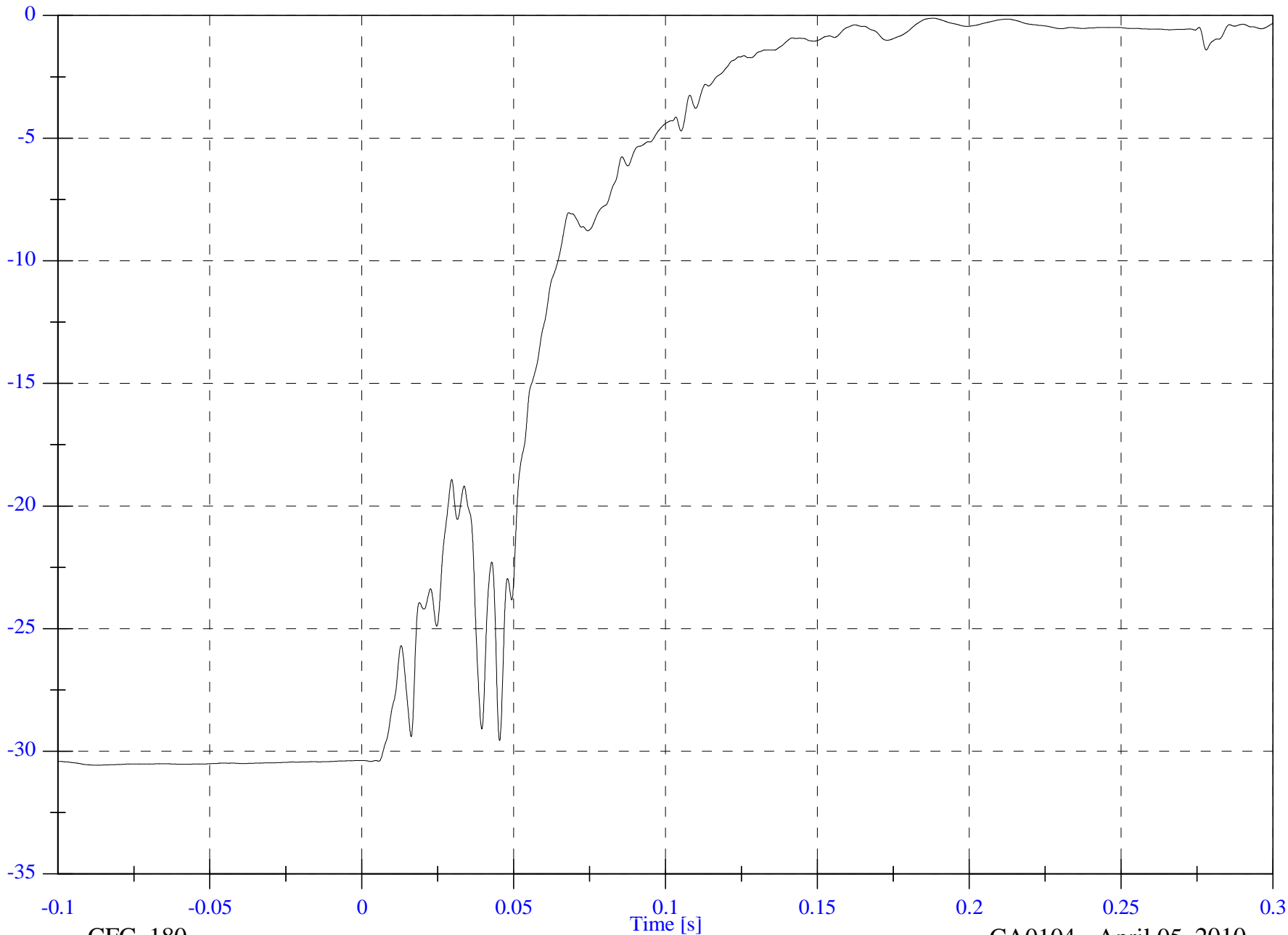
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left A-Pillar Mid y Velocity

Max: -0.1 [kph] at 0.188 [s]  
Min: -30.6 [kph] at -0.088 [s]

C-19

kph



CFC\_180

Time [s]

CA0104 - April 05, 2010

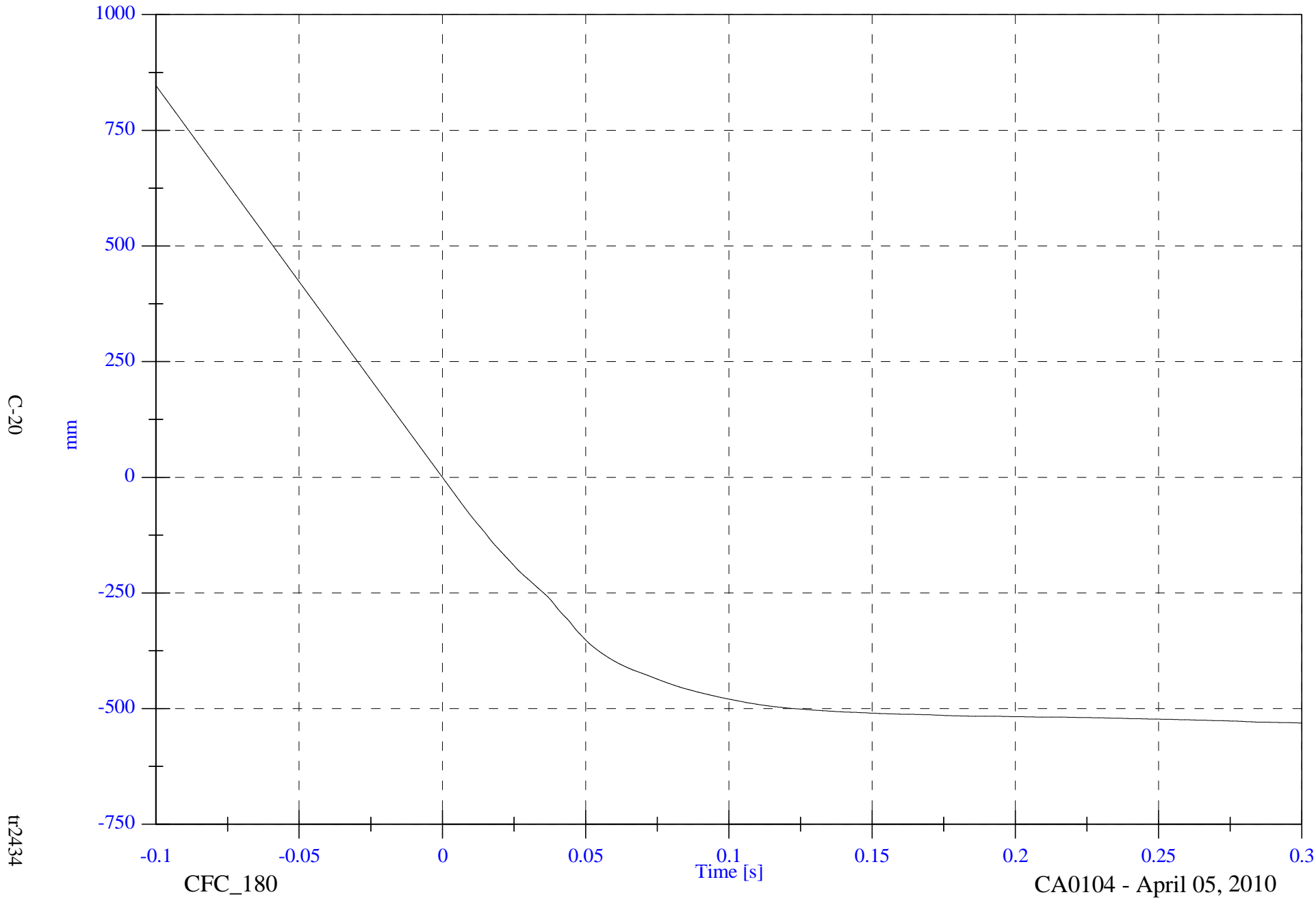
tr2434

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 846.3 [mm] at -0.100 [s]

V1 Left A-Pillar Mid y Displacement

Min: -530.9 [mm] at 0.300 [s]



C-20

mm

tr2434

CFC\_180

Time [s]

CA0104 - April 05, 2010

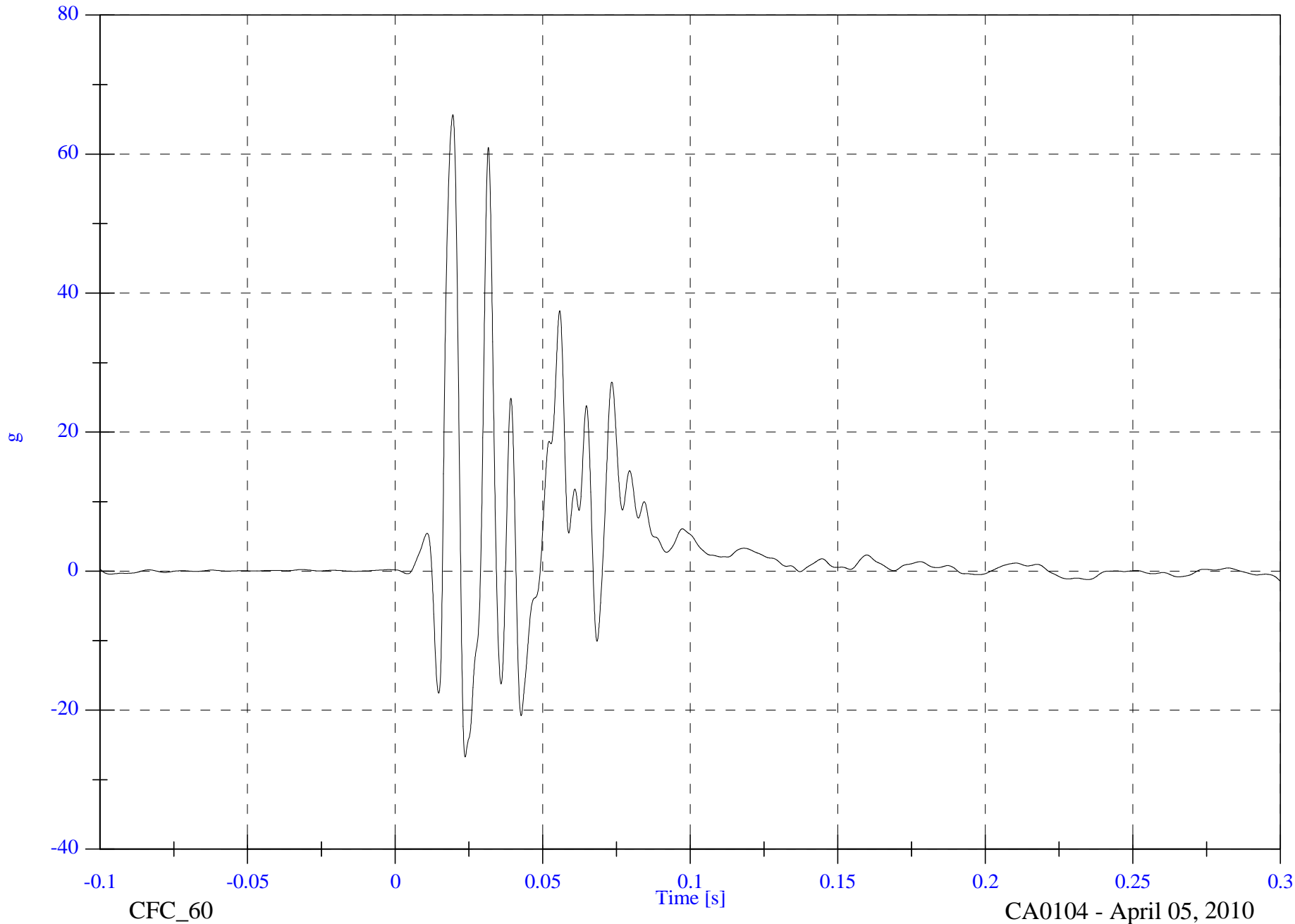
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 65.7 [g] at 0.020 [s]

V1 Left A-Pillar Top y

Min: -26.7 [g] at 0.024 [s]

C-21



tr2434

CFC\_60

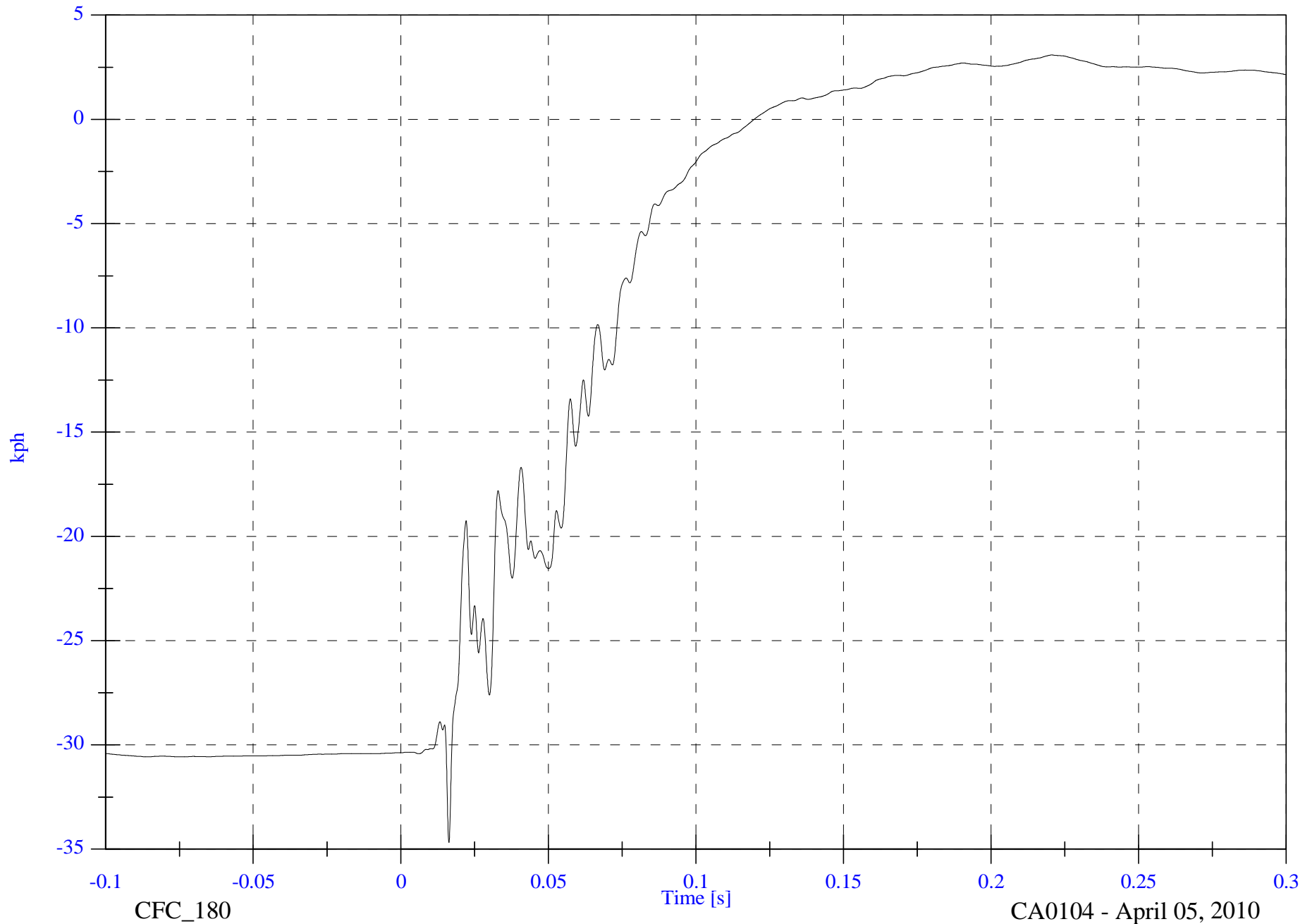
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 3.1 [kph] at 0.221 [s]

V1 Left A-Pillar Top y Velocity

Min: -34.7 [kph] at 0.016 [s]



C-22

tr2434

CFC\_180

CA0104 - April 05, 2010

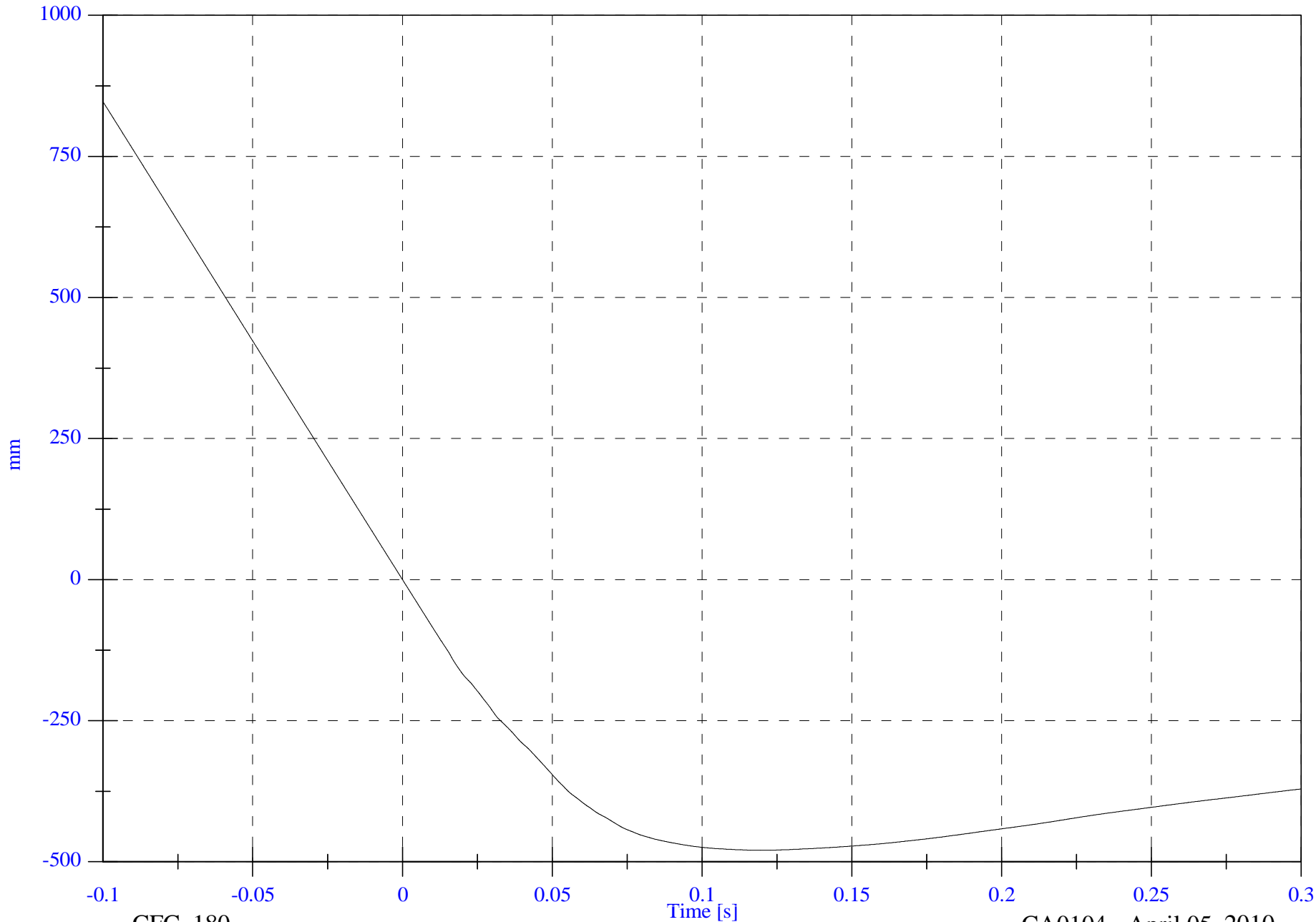
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 846.7 [mm] at -0.100 [s]

V1 Left A-Pillar Top y Displacement

Min: -479.6 [mm] at 0.120 [s]

C-23



mm

Time [s]

CFC\_180

CA0104 - April 05, 2010

tr2434

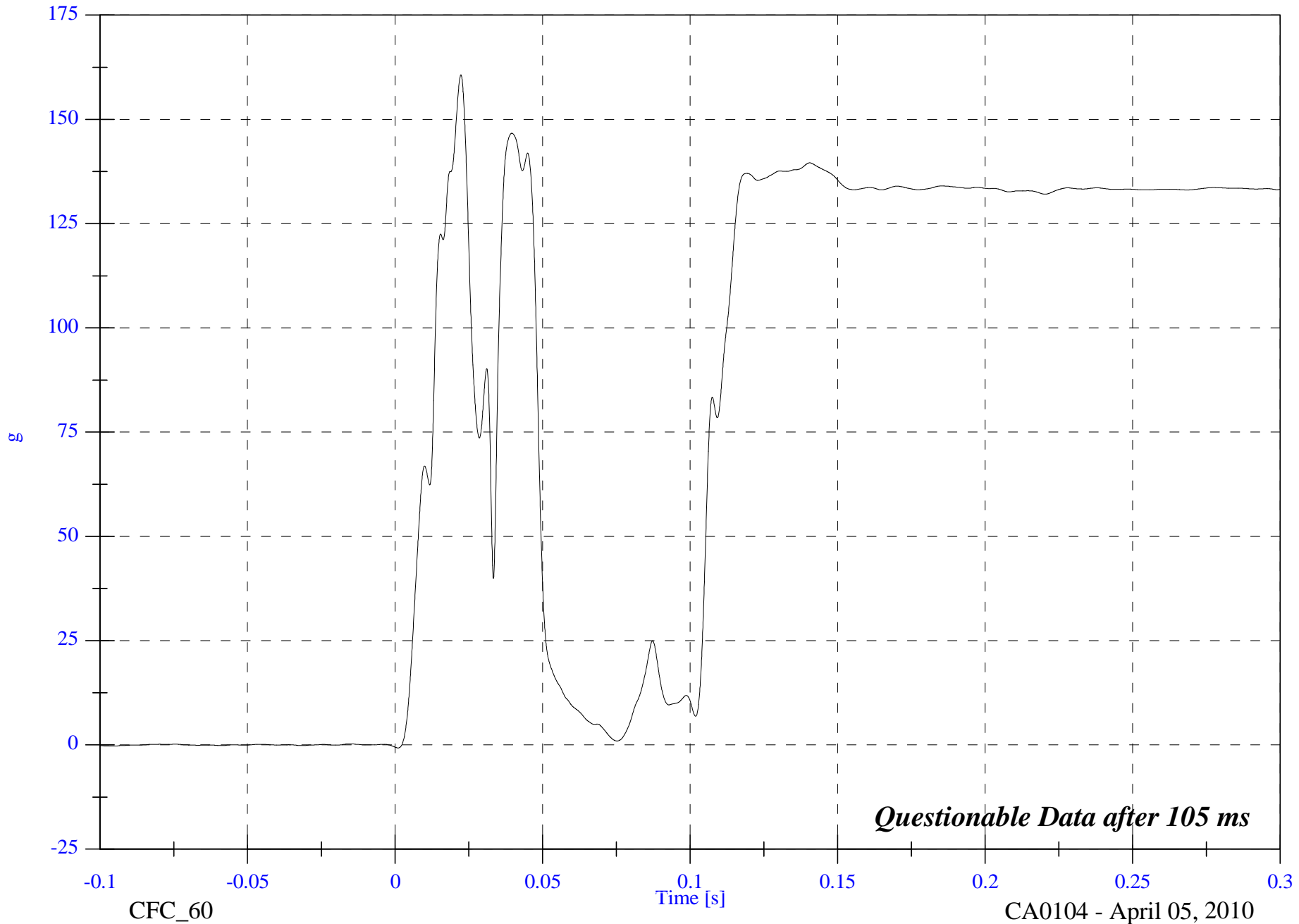
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 160.7 [g] at 0.022 [s]

V1 Left B-Pillar Sill y

Min: -0.7 [g] at 0.001 [s]

C-24



*Questionable Data after 105 ms*

tt2434

CFC\_60

CA0104 - April 05, 2010



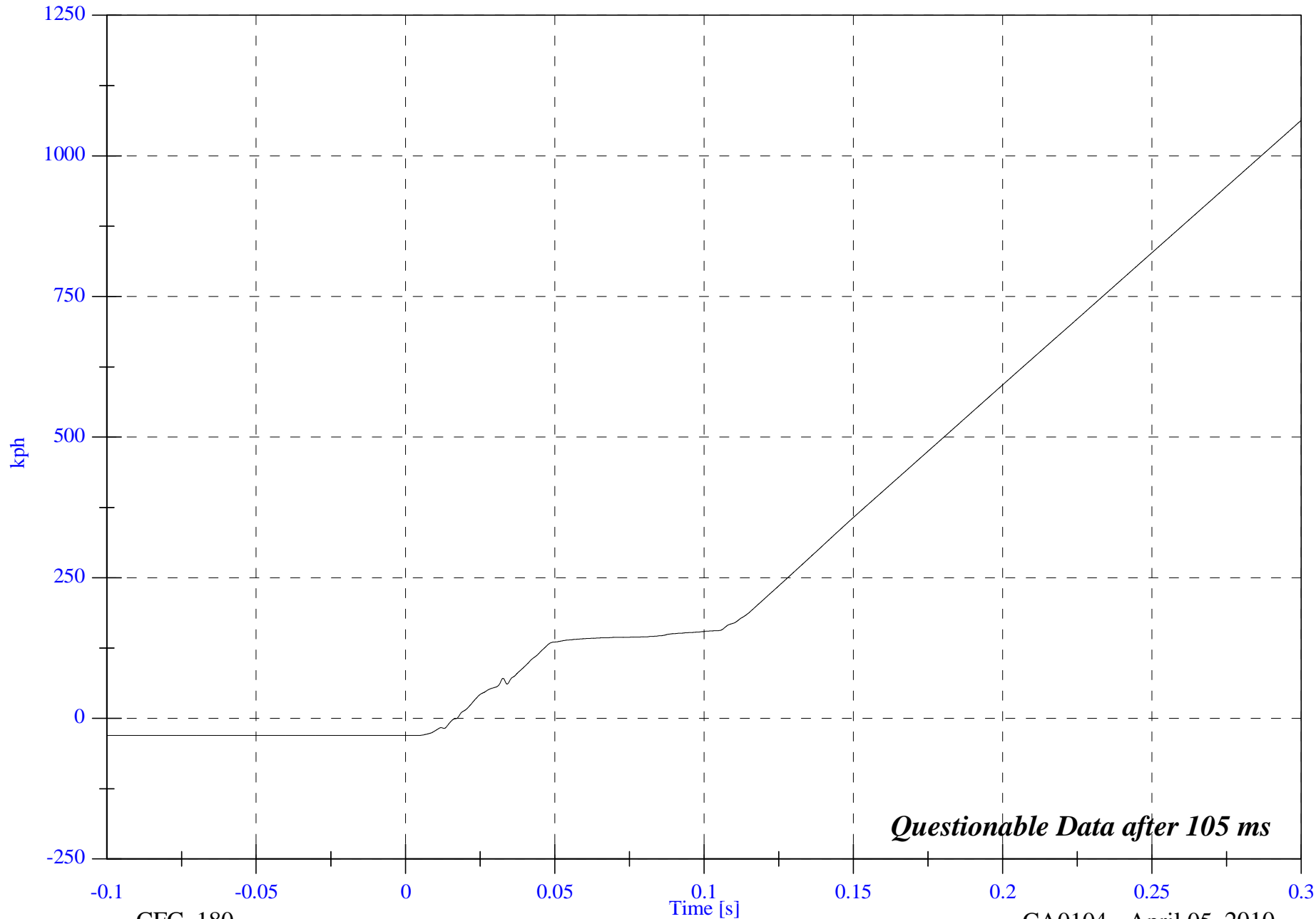
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 1062.9 [kph] at 0.300 [s]

V1 Left B-Pillar Sill y Velocity

Min: -30.5 [kph] at -0.085 [s]

C-25



*Questionable Data after 105 ms*

tr2434

CFC\_180

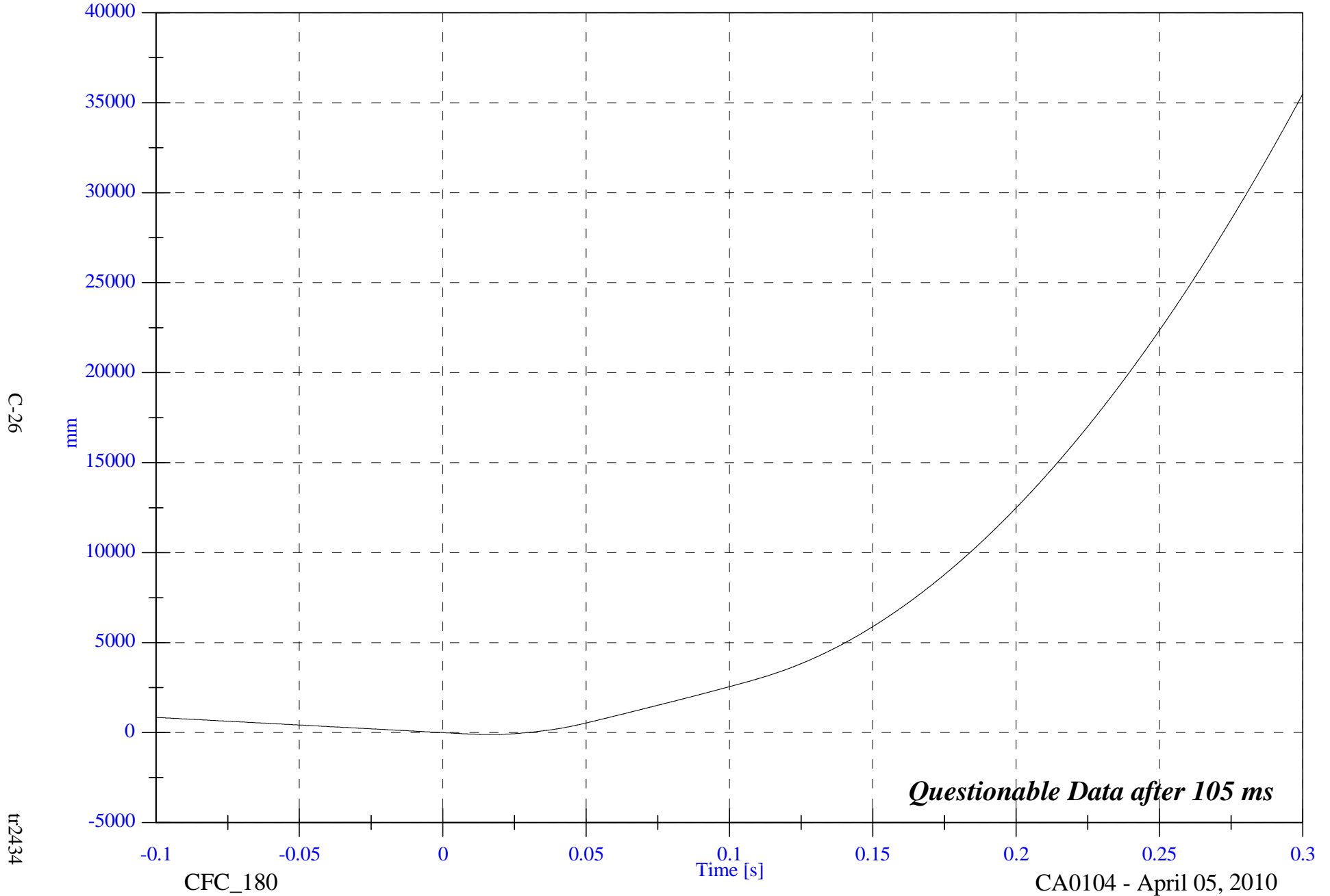
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left B-Pillar Sill y Displacement

Max: 35461.4 [mm] at 0.300 [s]

Min: -103.5 [mm] at 0.017 [s]



C-26

tr2434

CFC\_180

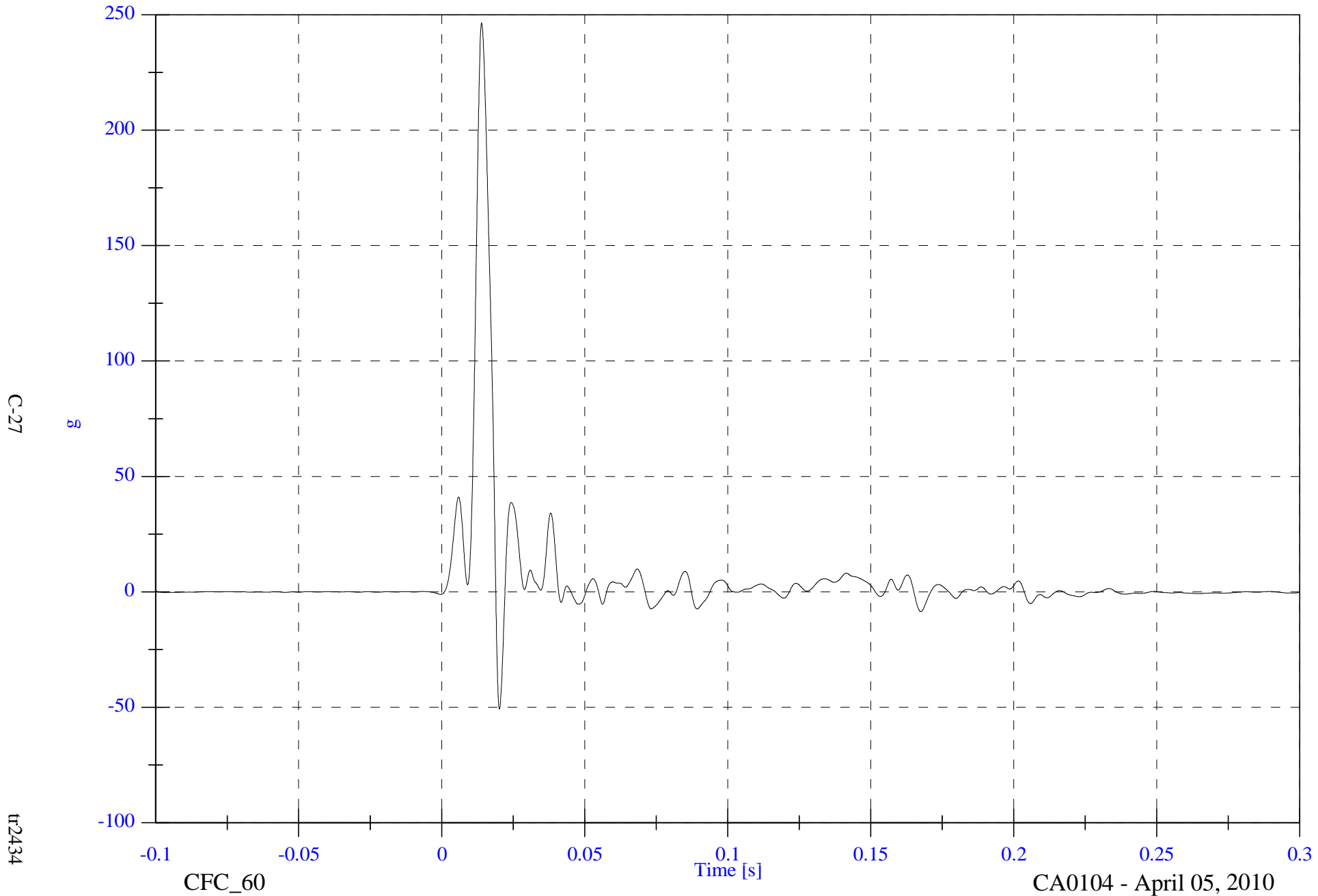
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left B-Pillar Mid y

Max: 246.4 [g] at 0.014 [s]

Min: -50.7 [g] at 0.020 [s]

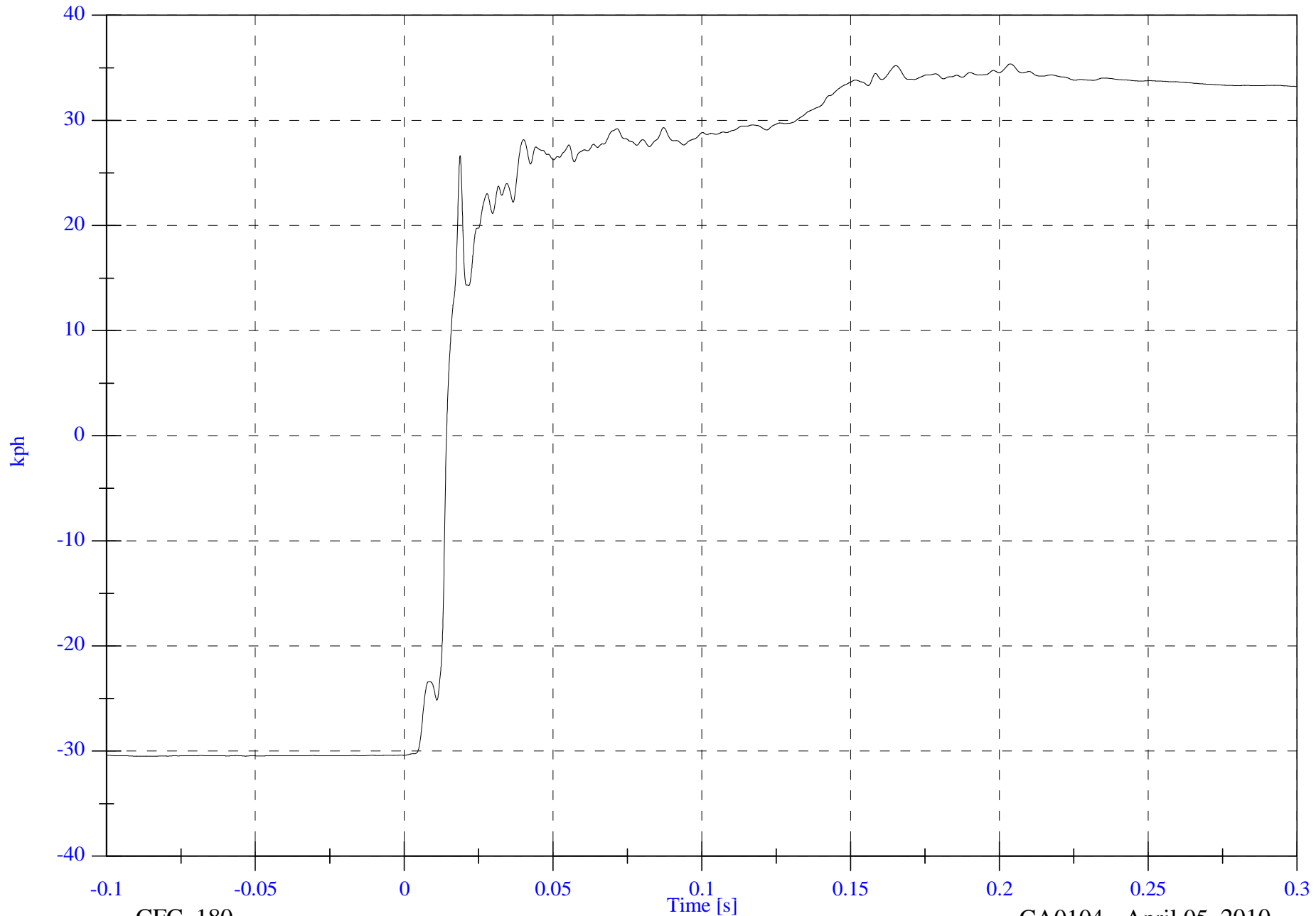


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 35.4 [kph] at 0.204 [s]

V1 Left B-Pillar Mid y Velocity

Min: -30.5 [kph] at -0.085 [s]



C-28

tr2434

CFC\_180

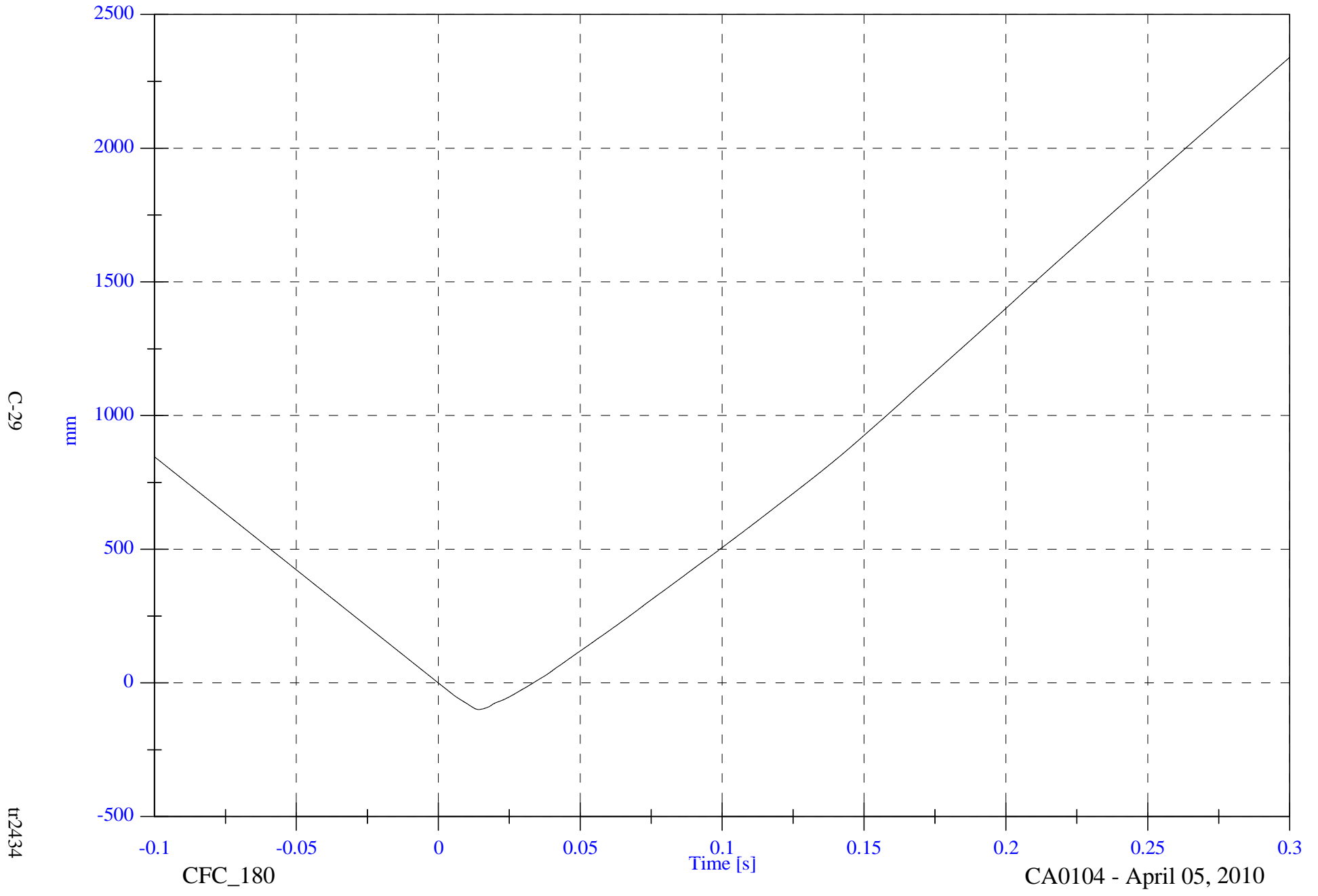
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 2339.4 [mm] at 0.300 [s]

V1 Left B-Pillar Mid y Displacement

Min: -99.5 [mm] at 0.014 [s]



C-29

tr2434

CFC\_180

Time [s]

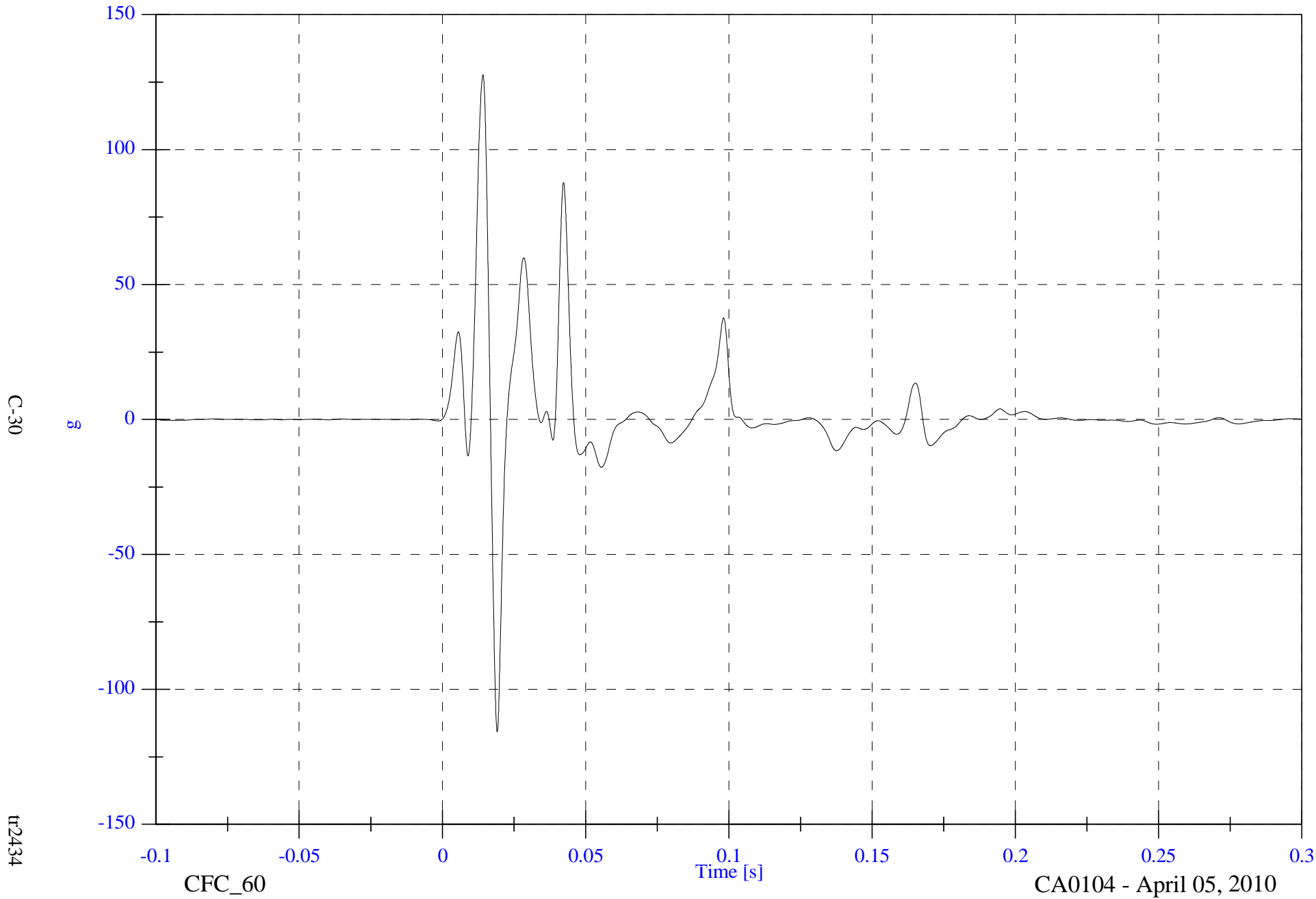
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 127.7 [g] at 0.014 [s]

V1 Left B-Pillar Top y

Min: -115.8 [g] at 0.019 [s]



C-30

tr2434

CFC\_60

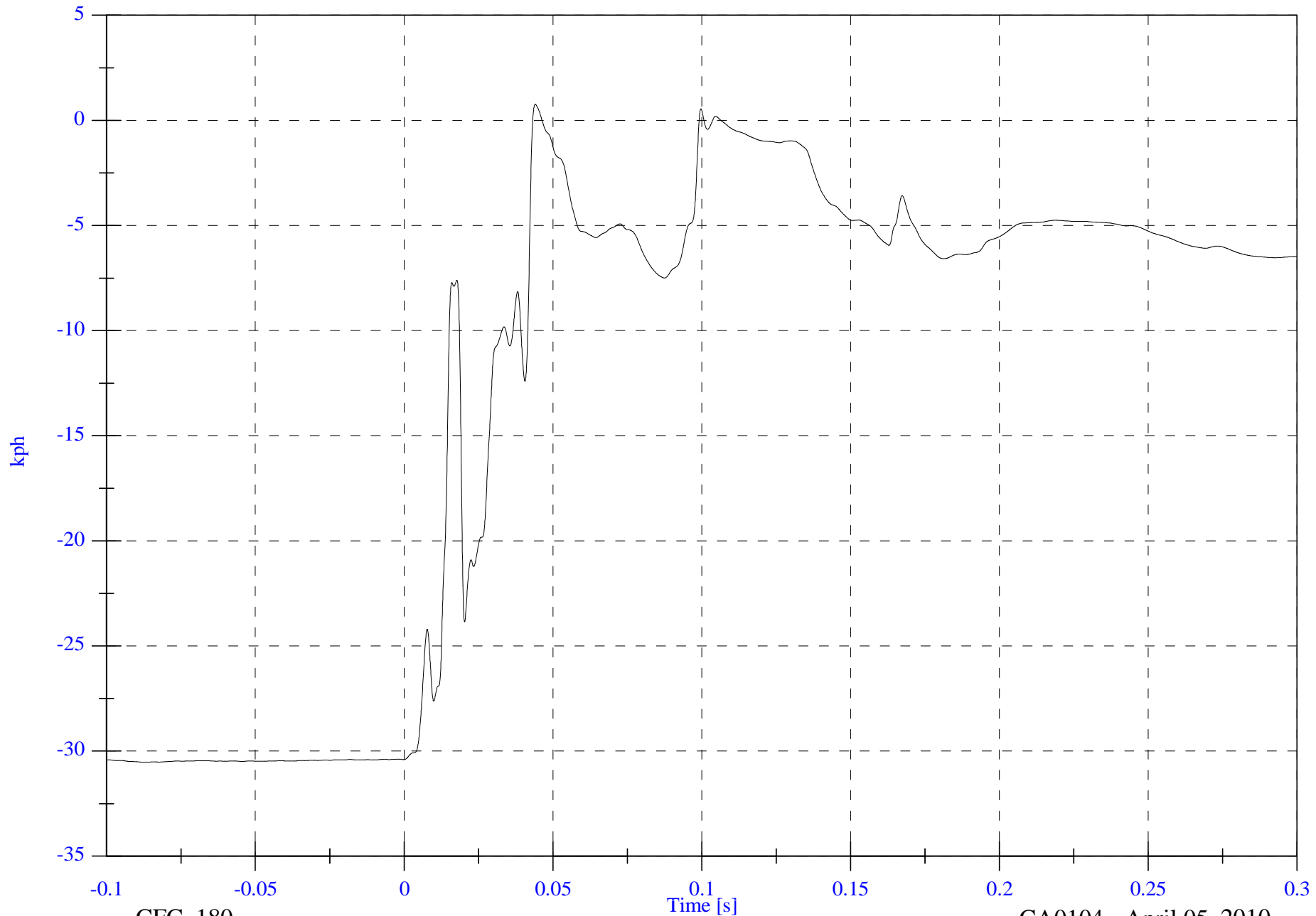
CA0104 - April 05, 2010



FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Left B-Pillar Top y Velocity

Max: 0.8 [kph] at 0.044 [s]  
Min: -30.5 [kph] at -0.088 [s]



C-31

tr2434

CFC\_180

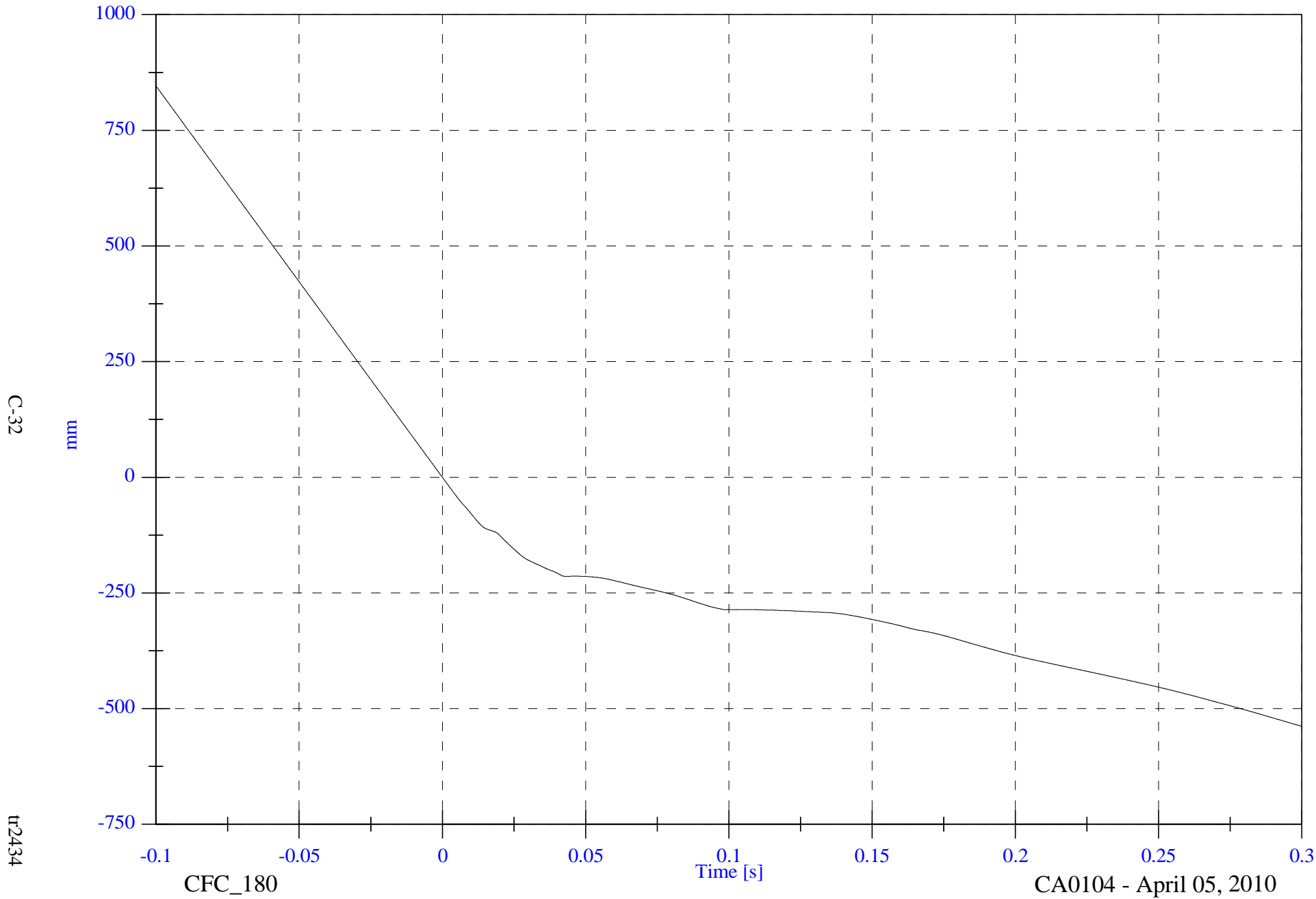
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 845.7 [mm] at -0.100 [s]

V1 Left B-Pillar Top y Displacement

Min: -538.1 [mm] at 0.300 [s]



C-32

tr2434

CFC\_180

Time [s]

CA0104 - April 05, 2010

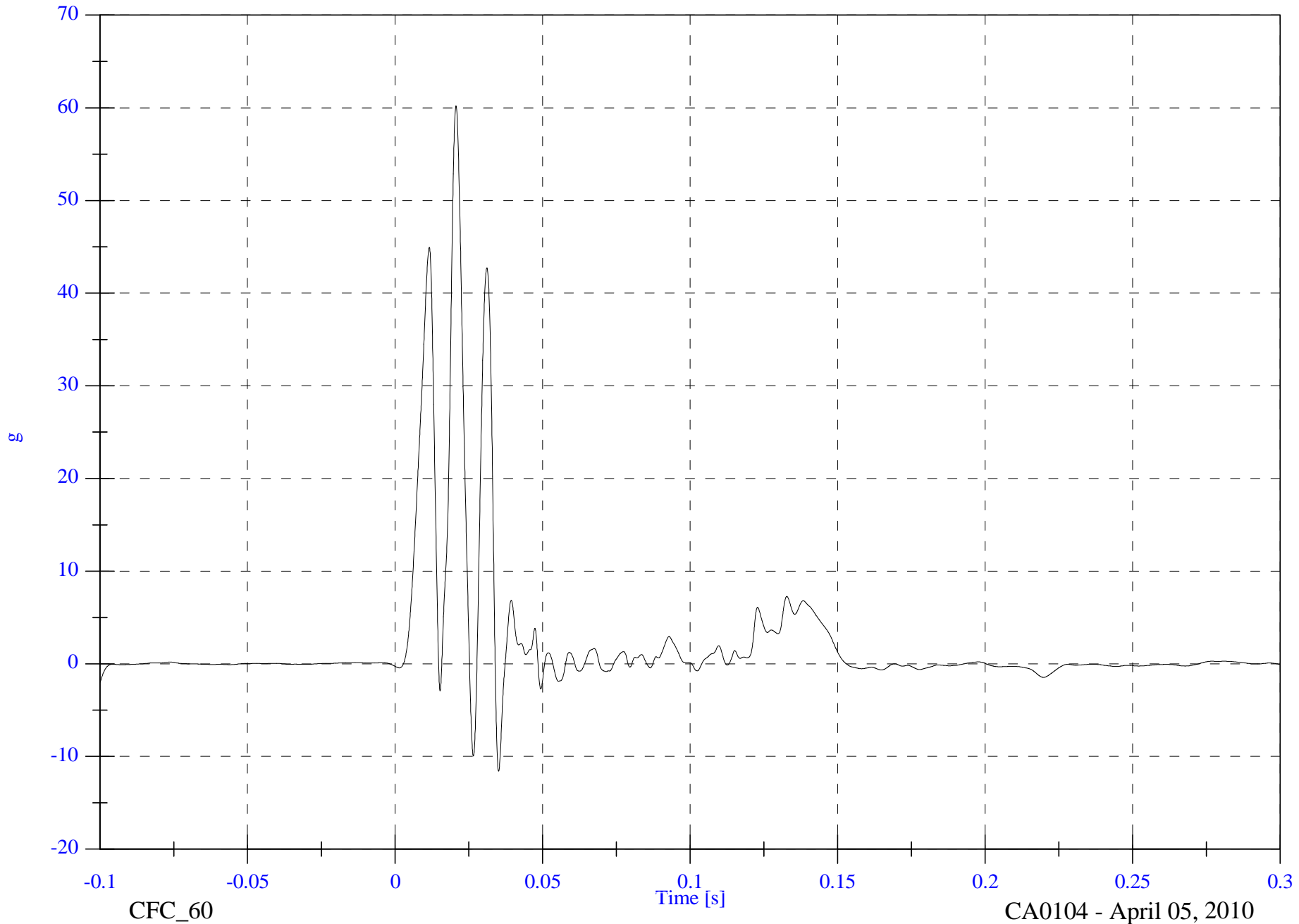
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 60.2 [g] at 0.021 [s]

V1 Seat Track y

Min: -11.6 [g] at 0.035 [s]

C-33



tr2434

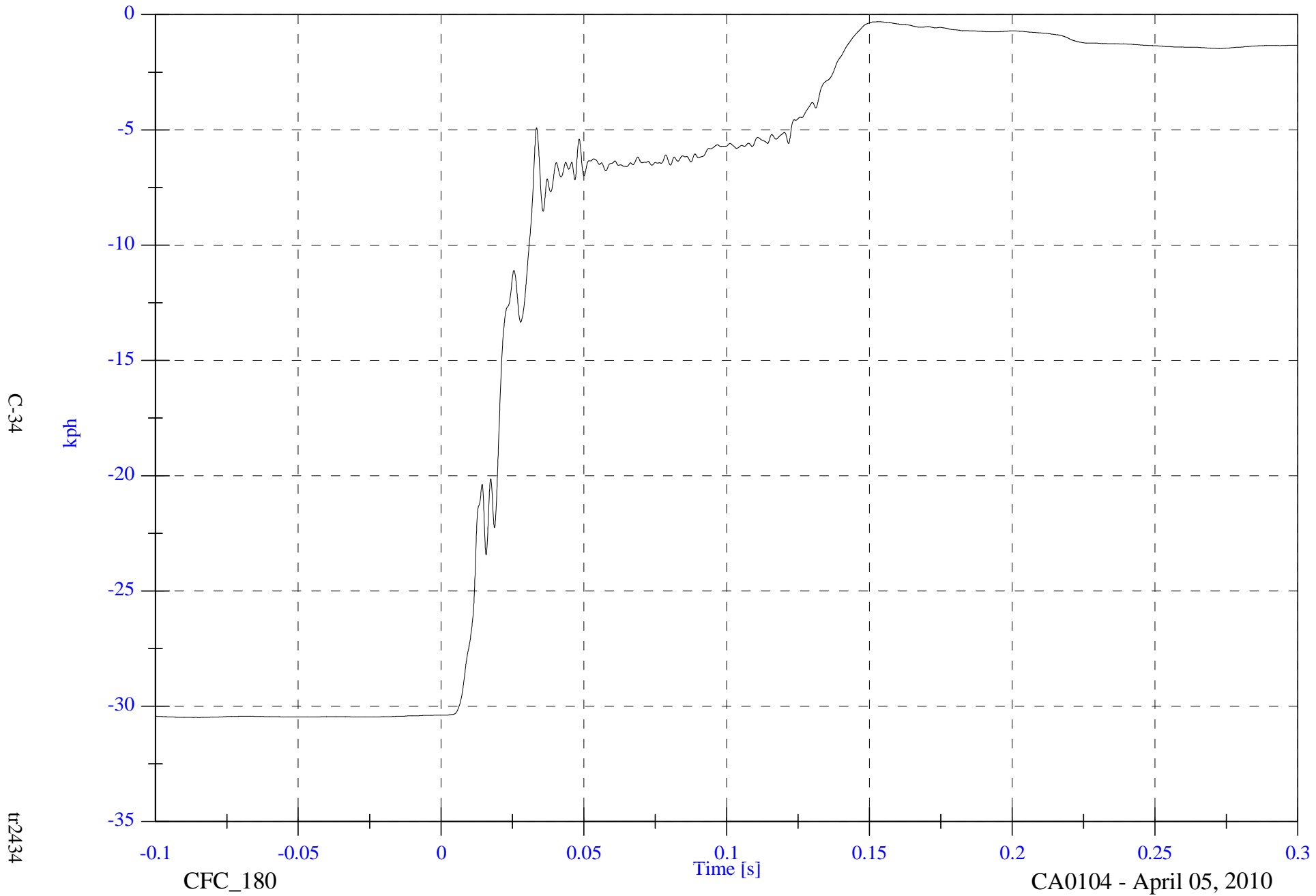
CFC\_60

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: -0.3 [kph] at 0.153 [s]  
Min: -30.5 [kph] at -0.085 [s]

V1 Seat Track y Velocity



C-34

kph

tr2434

CFC\_180

Time [s]

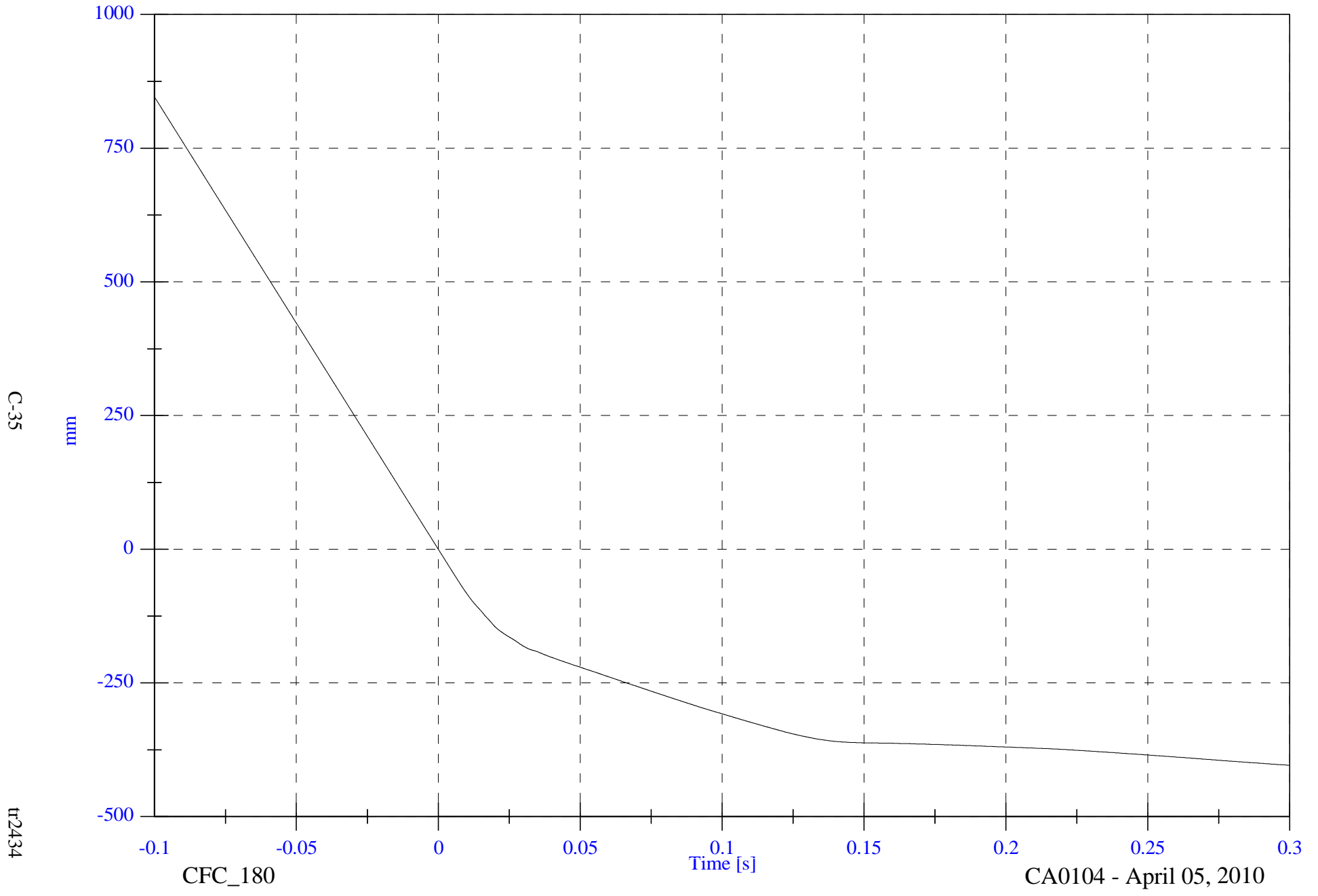
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 845.5 [mm] at -0.100 [s]

V1 Seat Track y Displacement

Min: -404.1 [mm] at 0.300 [s]



C-35

mm

tr2434

CFC\_180

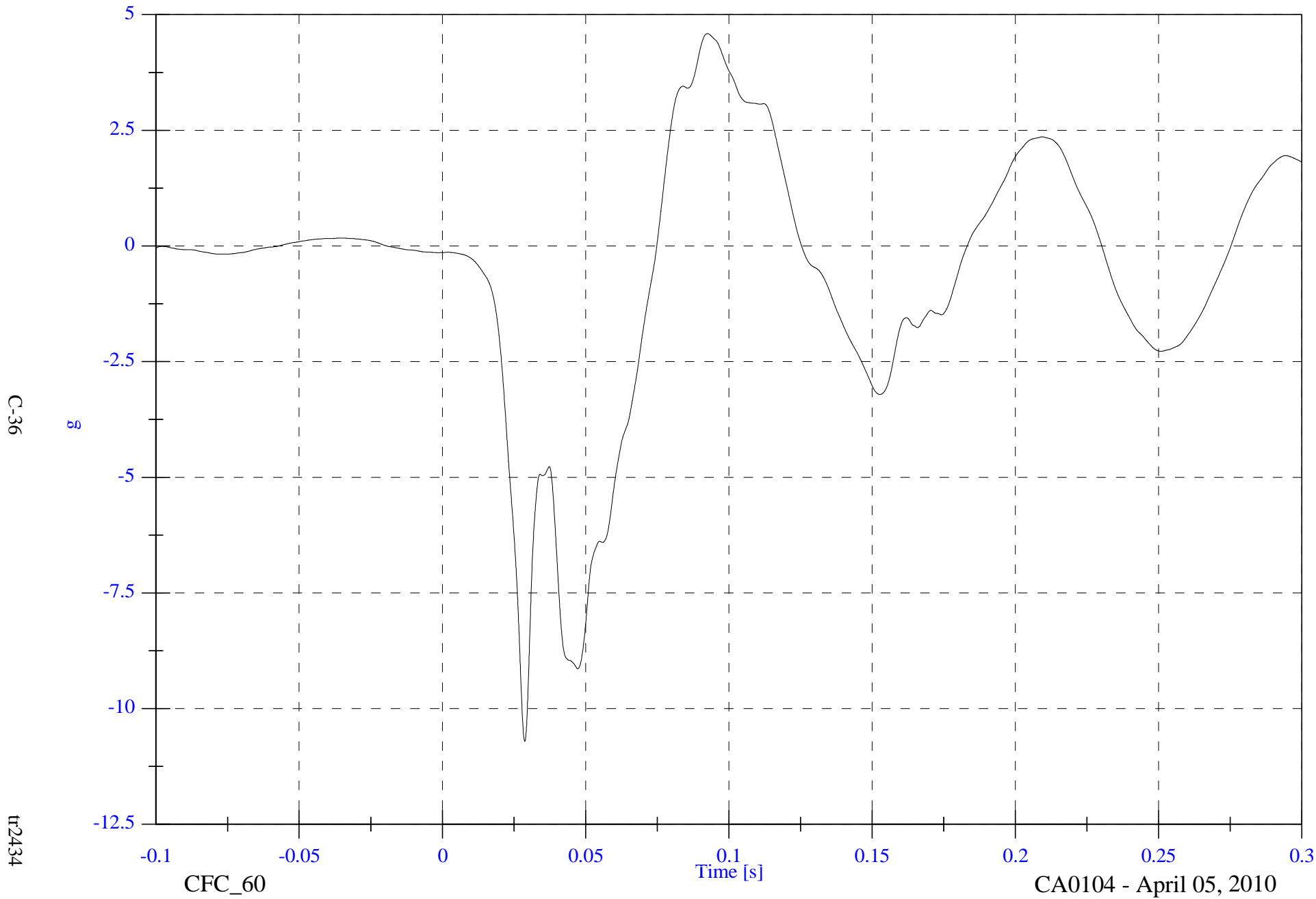
Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 4.6 [g] at 0.093 [s]  
Min: -10.7 [g] at 0.029 [s]

V1 Engine Top x



C-36

tr2434

CFC\_60

CA0104 - April 05, 2010

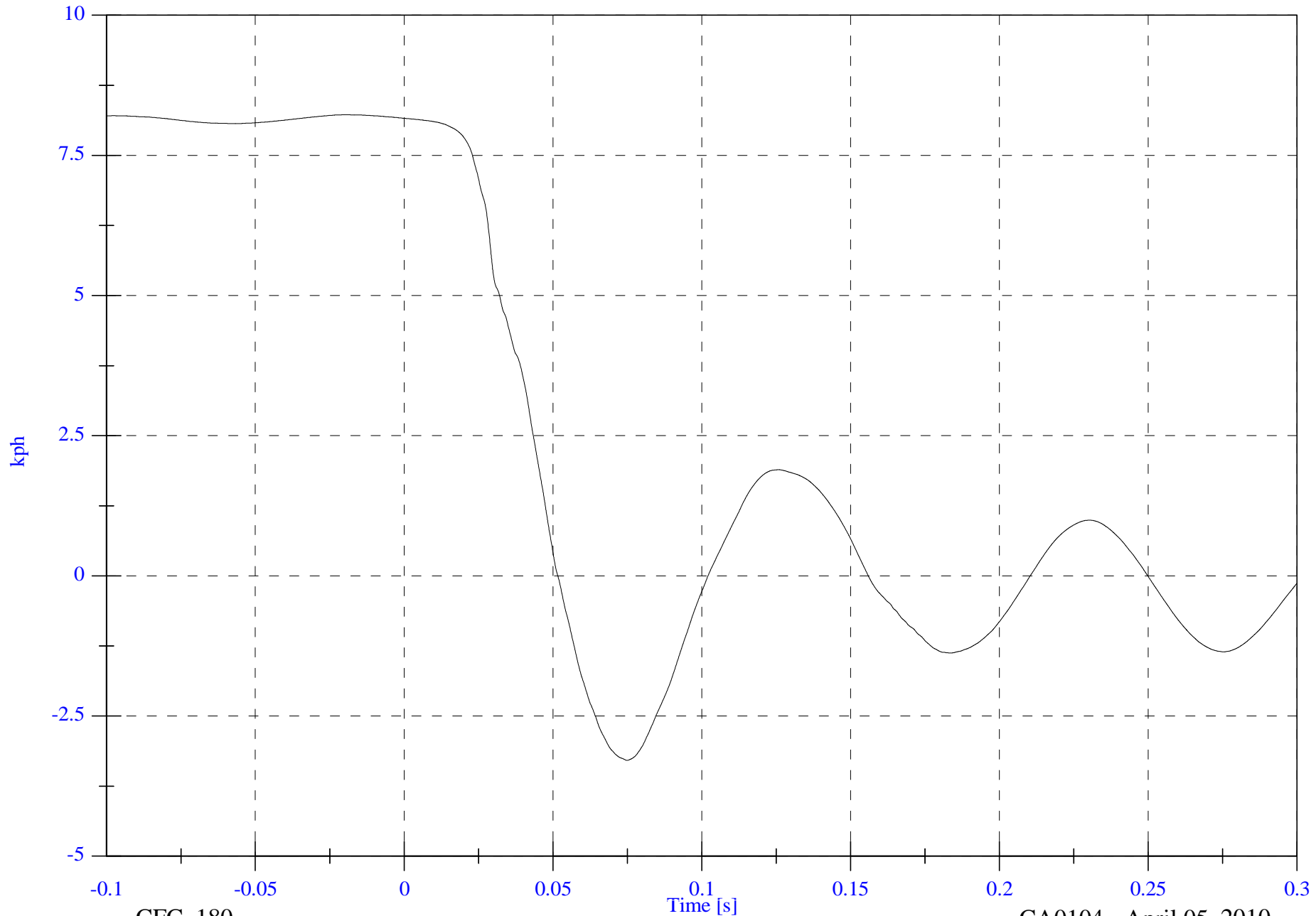


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 8.2 [kph] at -0.020 [s]

V1 Engine Top x Velocity

Min: -3.3 [kph] at 0.075 [s]



C-37

tr2434

CFC\_180

Time [s]

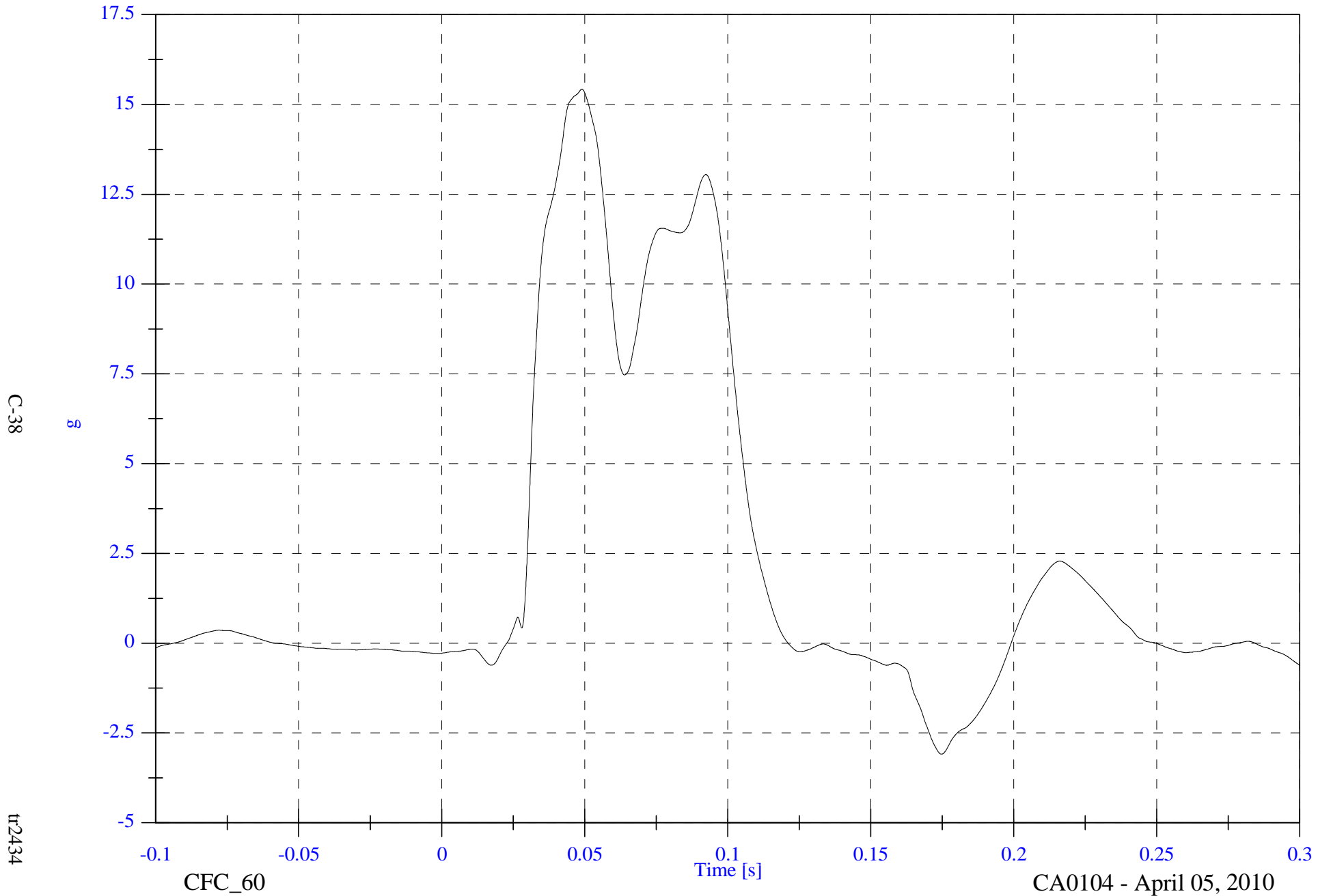
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Engine Top y

Max: 15.4 [g] at 0.049 [s]

Min: -3.1 [g] at 0.175 [s]



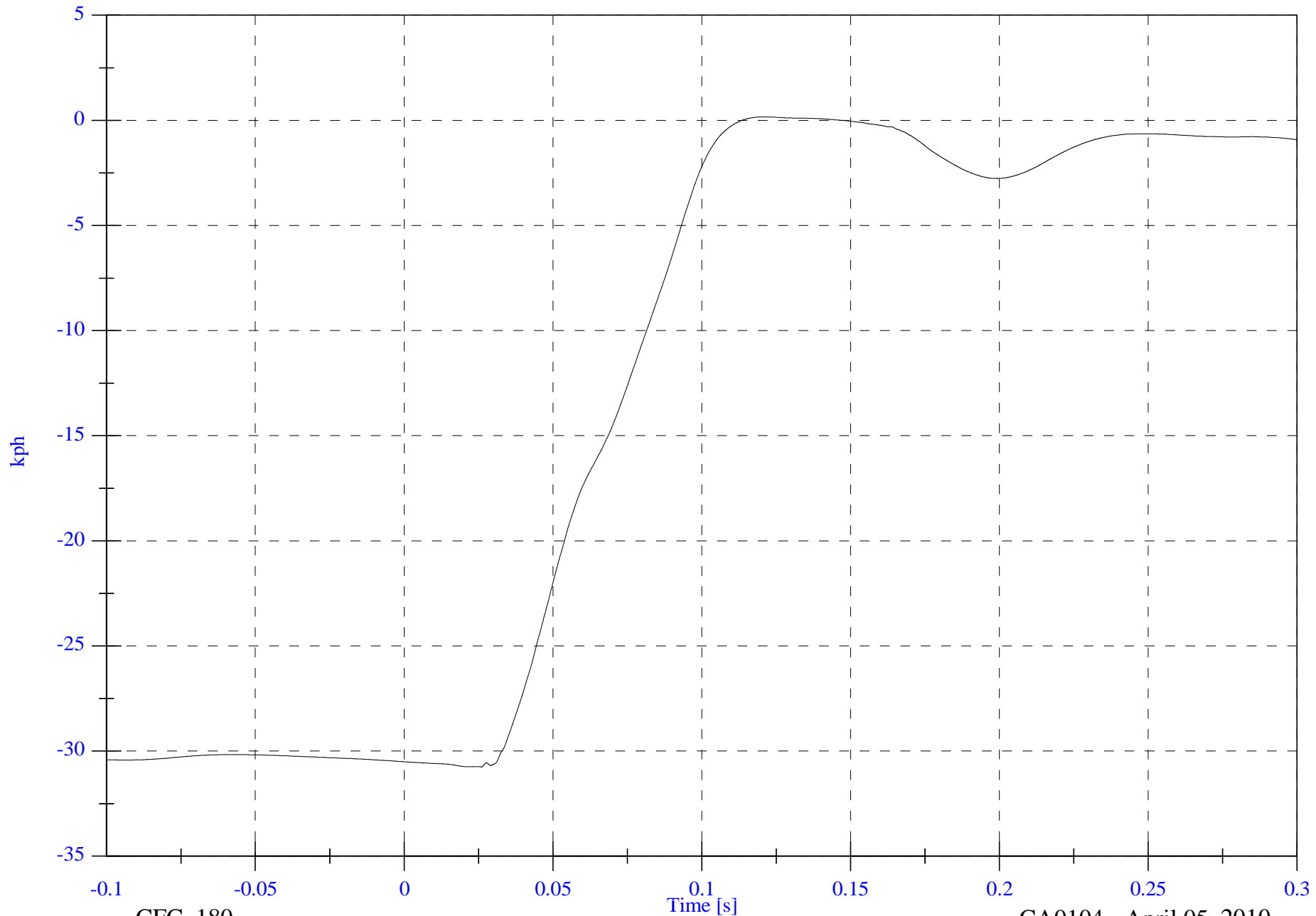
C-38

tt2434

CFC\_60

CA0104 - April 05, 2010

V1 Engine Top y Velocity



C-39

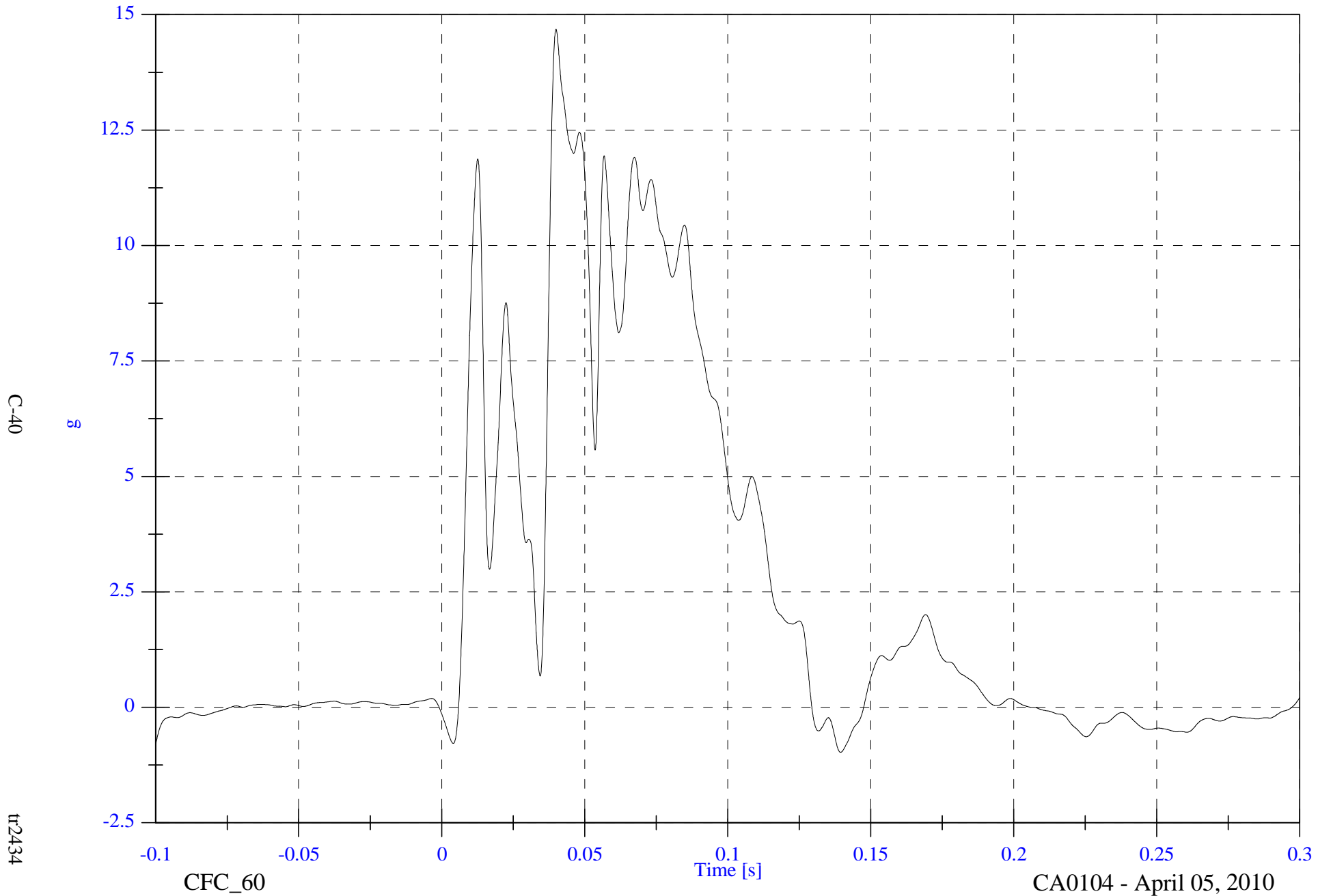
tr2434

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Firewall y

Max: 14.7 [g] at 0.040 [s]

Min: -1.0 [g] at 0.139 [s]



C-40

g

tt2434

CFC\_60

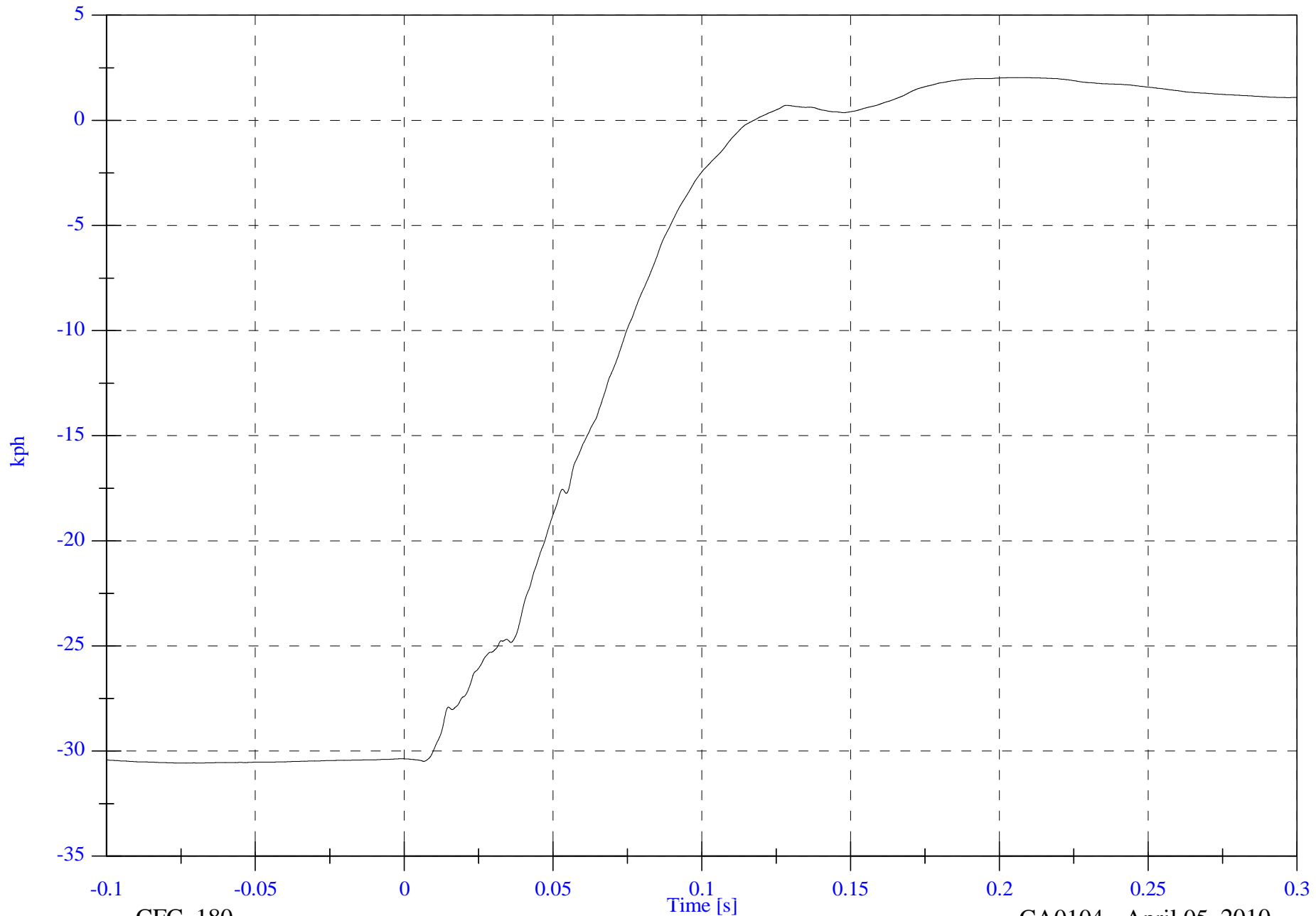
Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 2.0 [kph] at 0.208 [s]  
Min: -30.6 [kph] at -0.073 [s]

V1 Firewall y Velocity



C-41

tr2434

CFC\_180

CA0104 - April 05, 2010

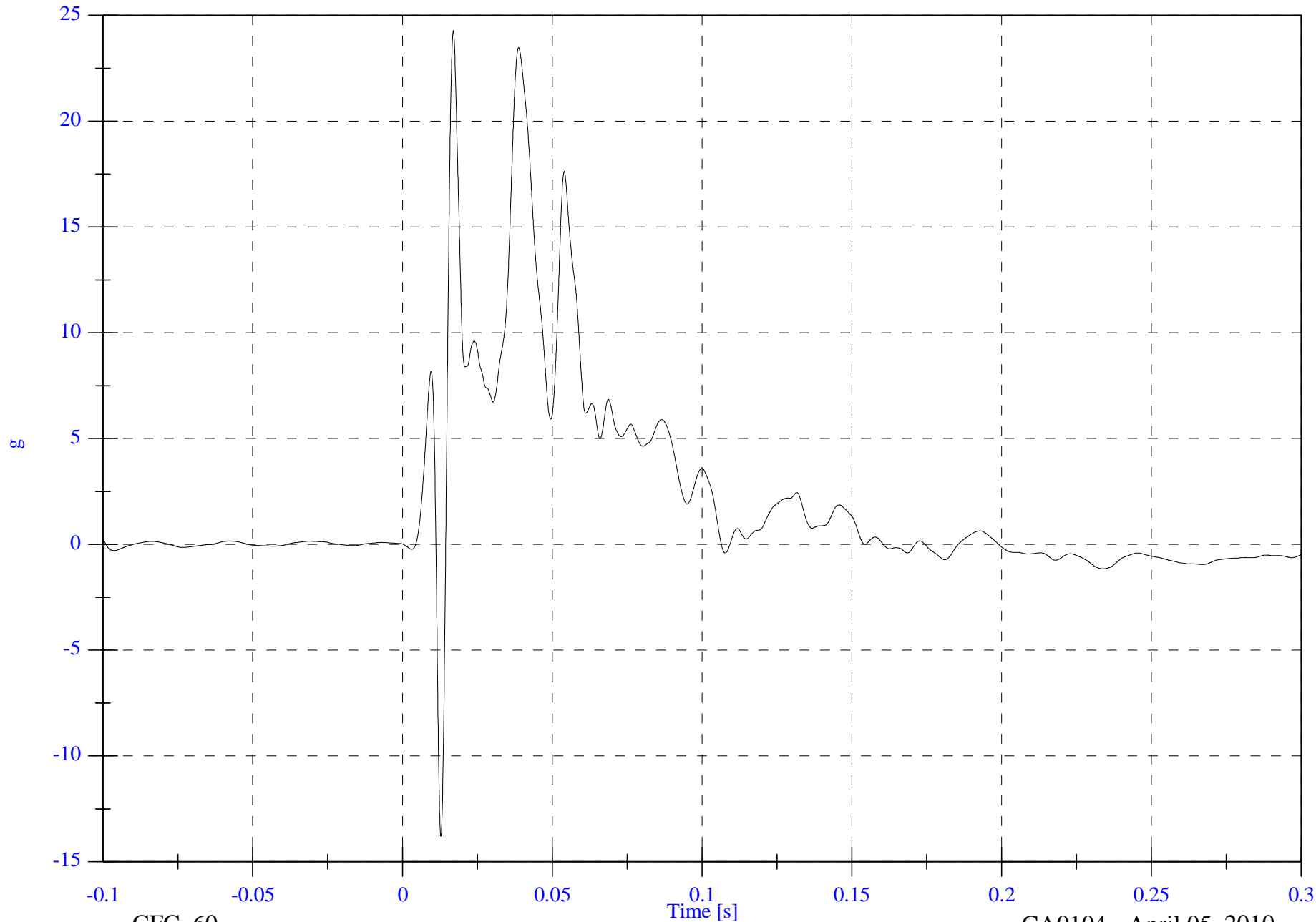
FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 24.3 [g] at 0.017 [s]

V1 Roof Rail y

Min: -13.8 [g] at 0.013 [s]

C-42



tt2434

CFC\_60

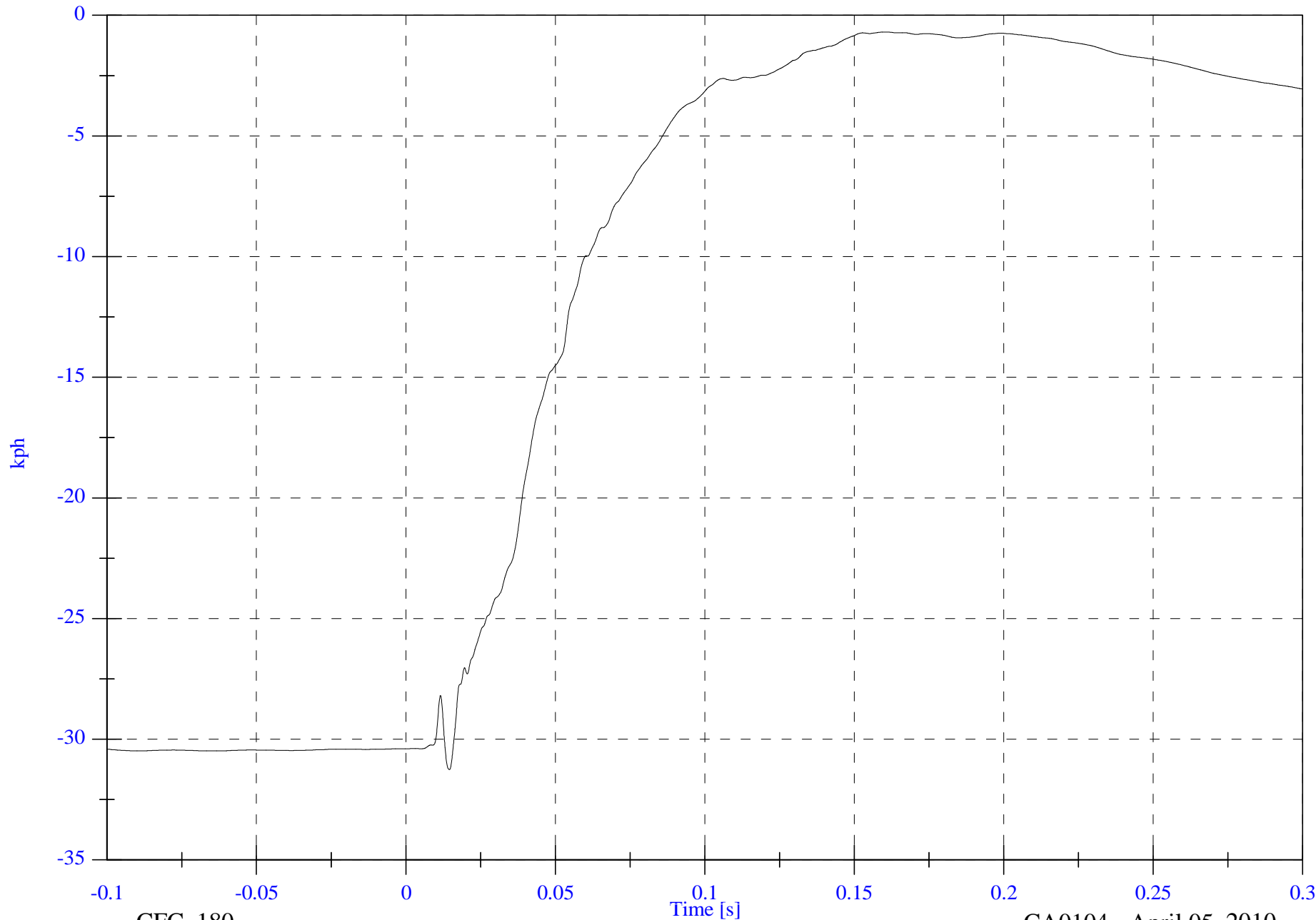
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: -0.7 [kph] at 0.160 [s]

V1 Roof Rail y Velocity

Min: -31.3 [kph] at 0.015 [s]



C-43

tr2434

CFC\_180

CA0104 - April 05, 2010

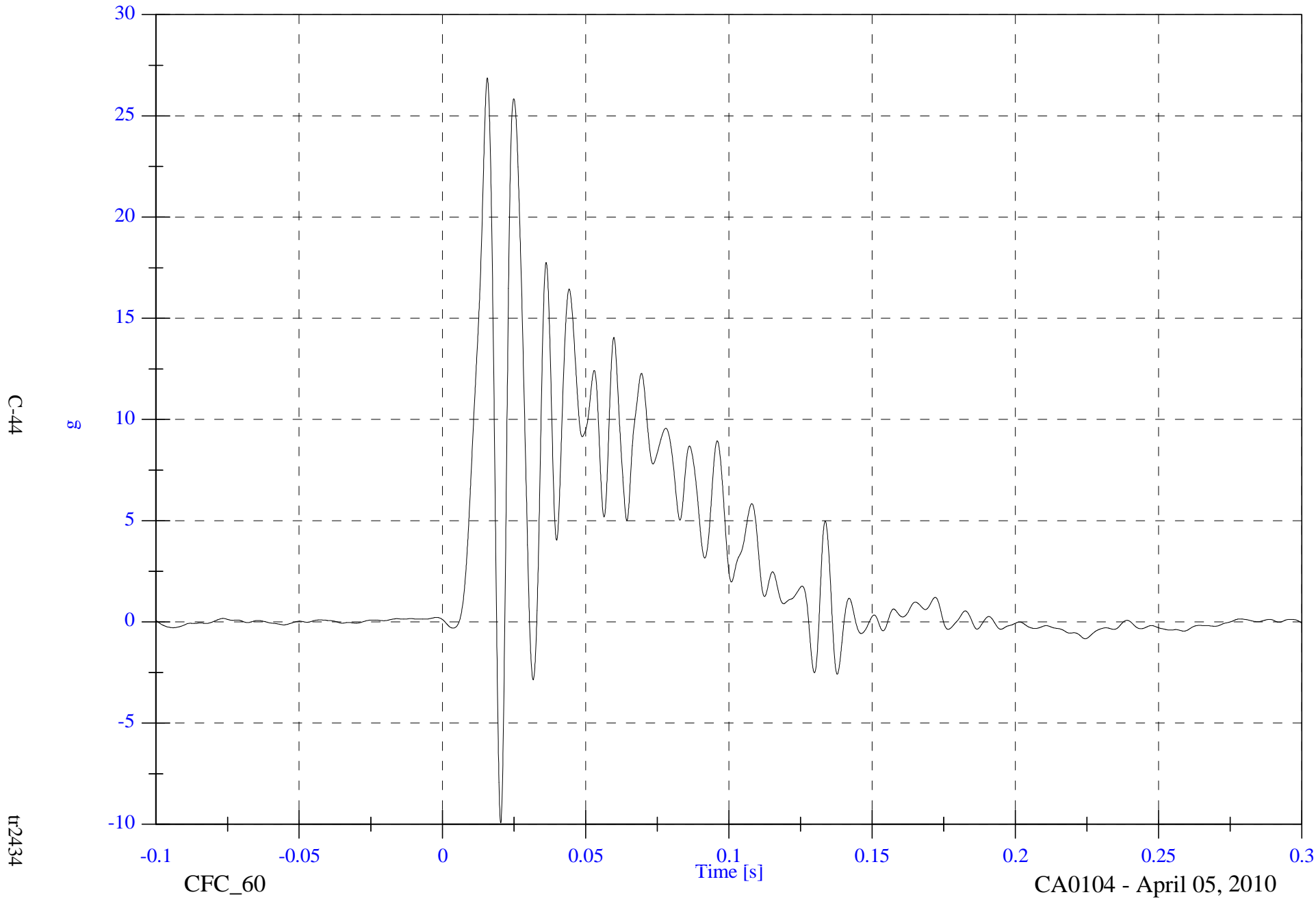


FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 26.9 [g] at 0.016 [s]

V1 Front Right Side Rail y

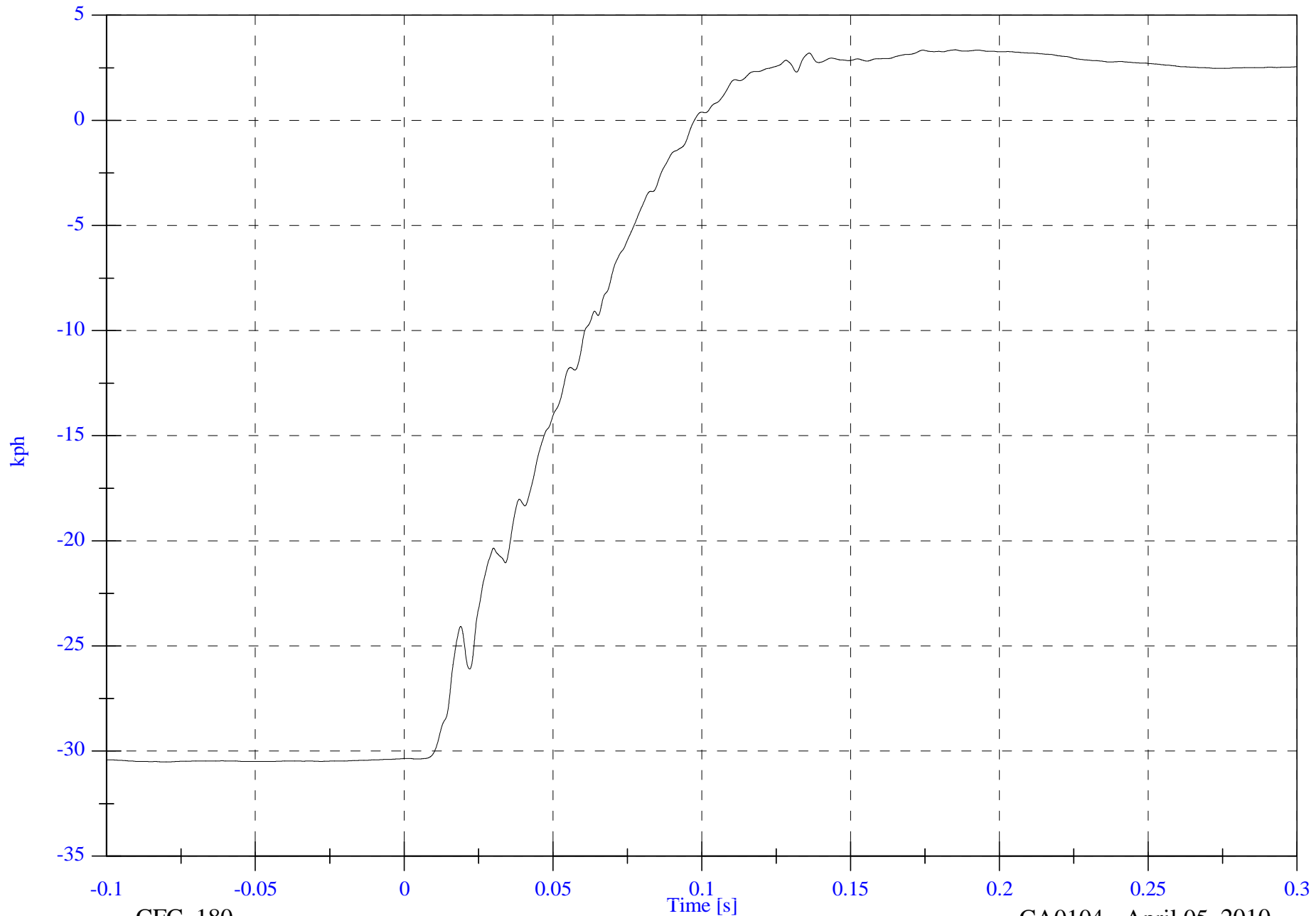
Min: -9.9 [g] at 0.020 [s]



FMVSS 214 Oblique Pole 2010 Buick LaCrosse

V1 Front Right Side Rail y Velocity

Max: 3.4 [kph] at 0.185 [s]  
Min: -30.5 [kph] at -0.080 [s]



C-45

tr2434

CFC\_180

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

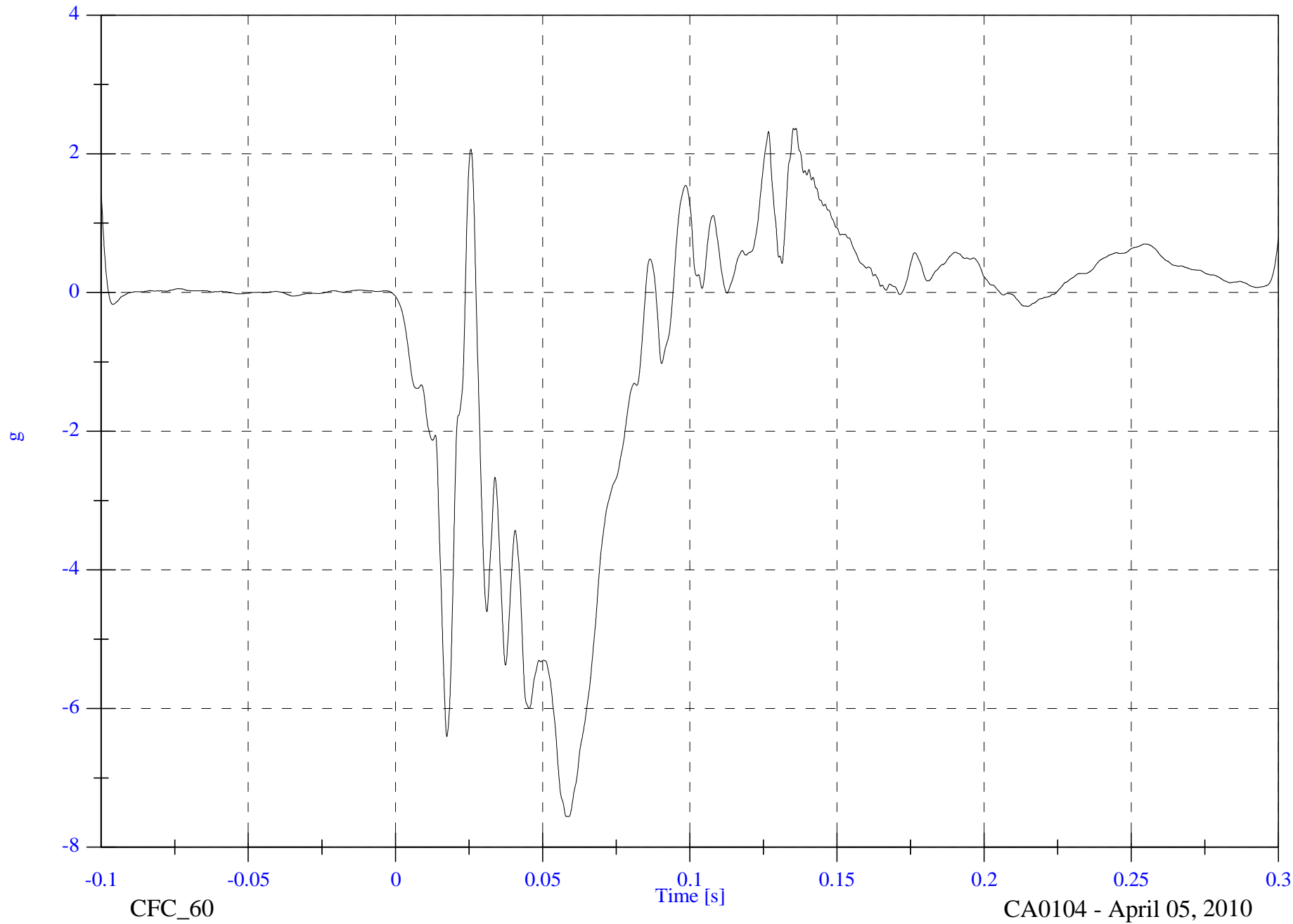
V1 Rear Floorpan x

Max: 2.4 [g] at 0.136 [s]

Min: -7.6 [g] at 0.058 [s]

C-46

tr2434



CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

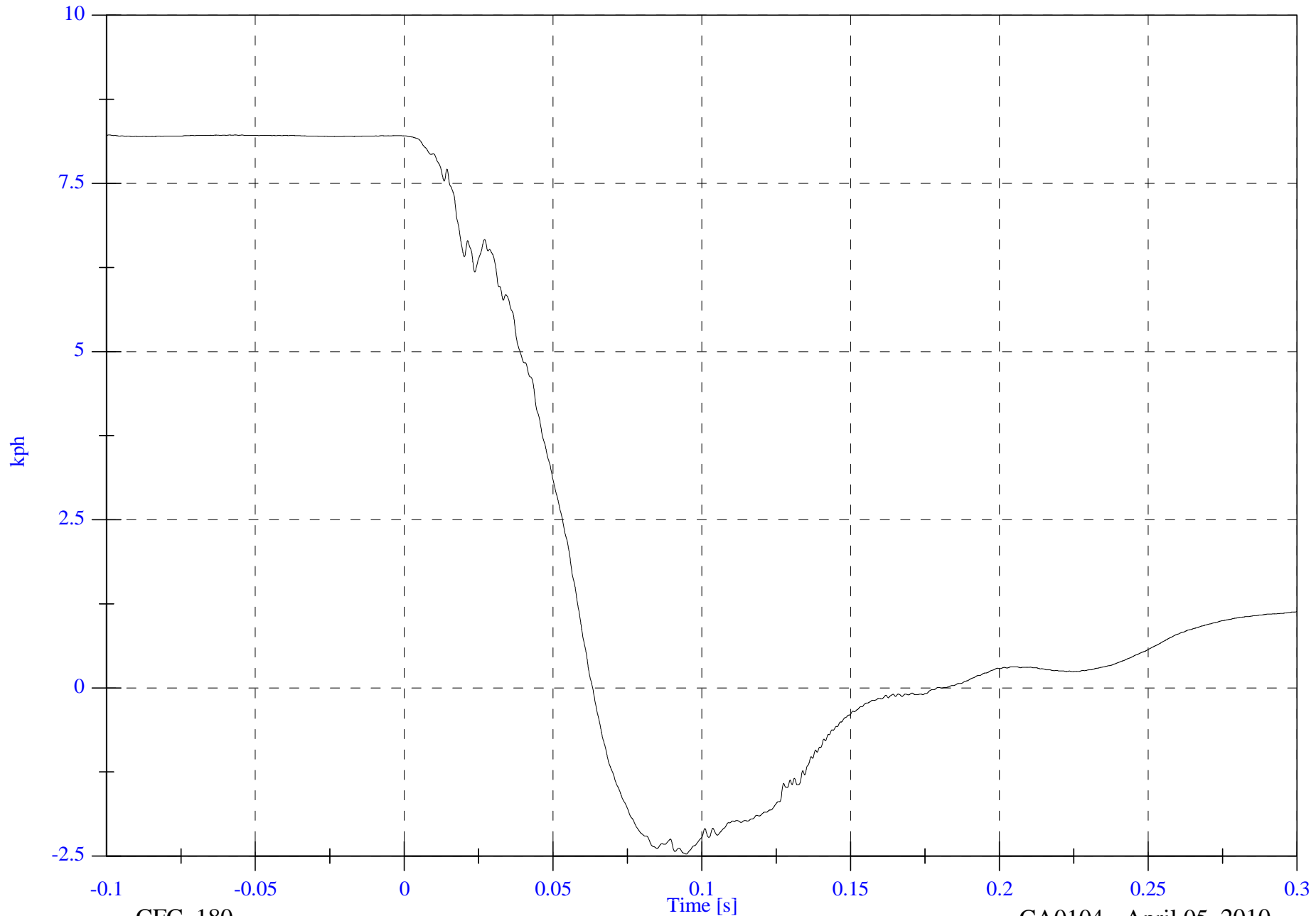
V1 Rear Floorpan x Velocity

Max: 8.2 [kph] at -0.057 [s]

Min: -2.5 [kph] at 0.095 [s]

C-47

tr2434



CFC\_180

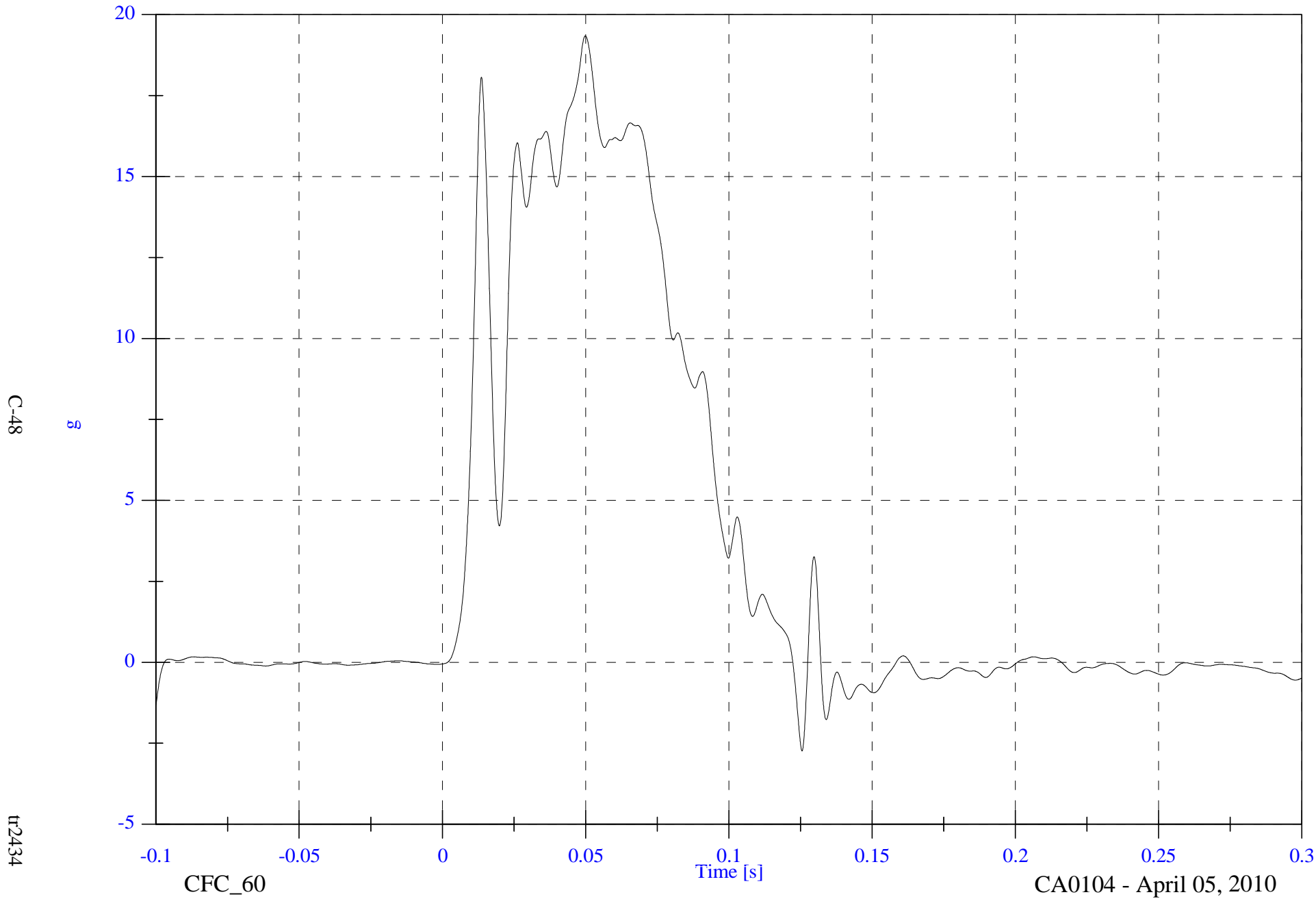
CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

Max: 19.3 [g] at 0.050 [s]

V1 Rear Floorpan y

Min: -2.7 [g] at 0.126 [s]



C-48

g

tt2434

CFC\_60

Time [s]

CA0104 - April 05, 2010

FMVSS 214 Oblique Pole 2010 Buick LaCrosse

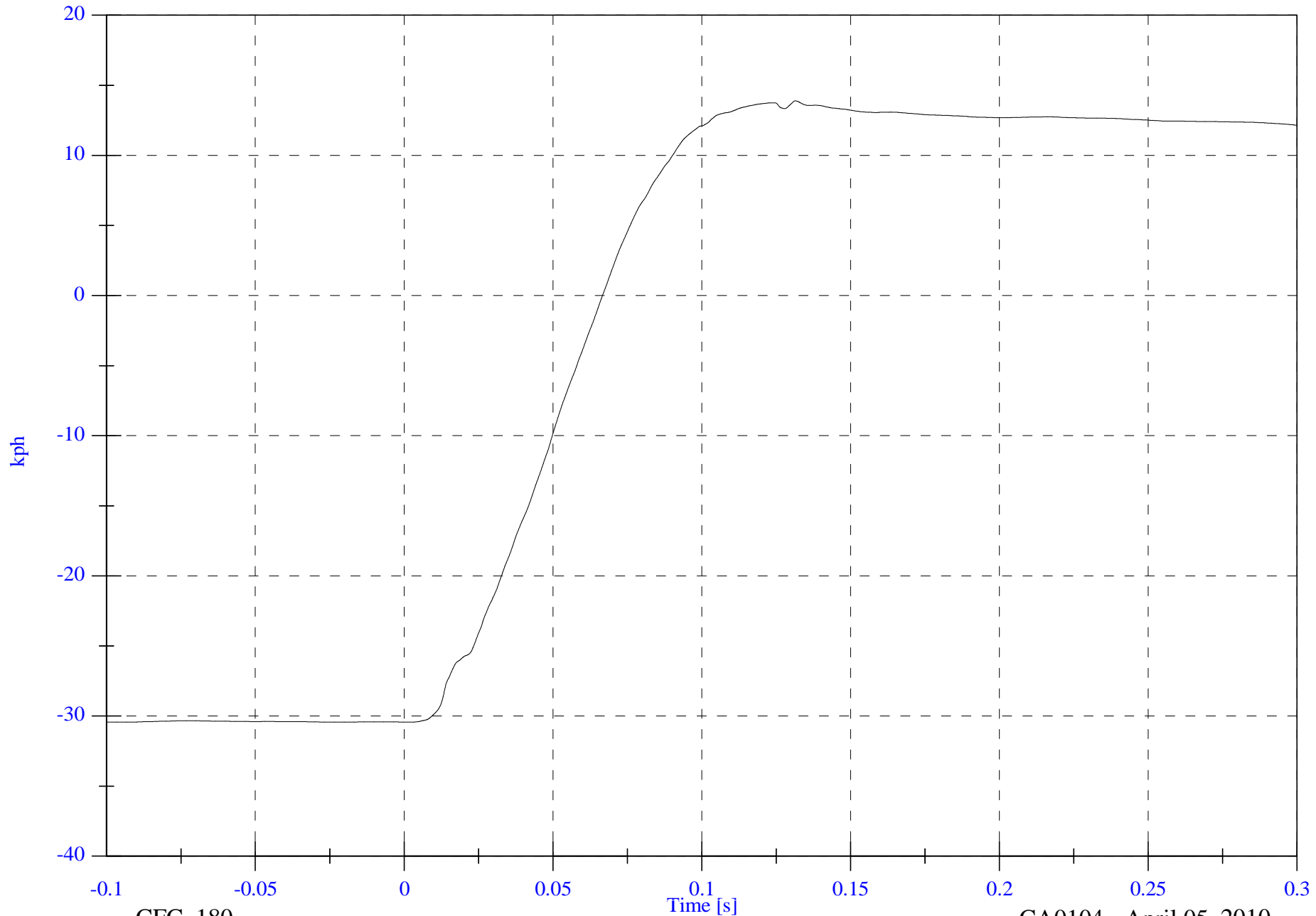
V1 Rear Floorpan y Velocity

Max: 13.9 [kph] at 0.131 [s]

Min: -30.4 [kph] at -0.099 [s]

C-49

tr2434



CFC\_180

Time [s]

CA0104 - April 05, 2010

**APPENDIX D**  
**DUMMY ES2-re PERFORMANCE CALIBRATION TEST DATA**



**PRE-TEST**  
**ES2-re S/N: 037**



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## VERIFICATION REPORT

|                    |                  |            |                   |
|--------------------|------------------|------------|-------------------|
| Test Name:         | <b>Head Drop</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                  | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>    |            |                   |
| ATD Serial Number: | <b>D037</b>      |            |                   |
| Test ID:           | <b>Head Drop</b> | Test Date: | <b>3/30/2010</b>  |
| Test Number:       | <b>3</b>         | Test Time: | <b>4:04:37 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-1007</b>       |                         |

| Test Parameters        | Test Specifications | Test Results        |
|------------------------|---------------------|---------------------|
| Temperature            | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity               | 10 -- 70            | <b>35</b> %RH P     |
| Resultant Acceleration | 125 -- 155          | <b>145</b> g P      |
| Oscillation            | 0.0 -- 15.0         | <b>5.3</b> % P      |
| Fore-Aft Acceleration  | -15.00 -- 15.00     | <b>5.93</b> g P     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Head Drop**

Test Time: **4:04:37 PM**

Test Date: **3/30/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u> | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|--------------|----------------------|-------------------------|
| Endevco             | 7264-2000    | AC-P18639            | 1/25/2010               |
| Endevco             | 7264-2000    | AC-P23128            | 1/25/2010               |
| Endevco             | 7264-2000    | AC-P16591            | 1/25/2010               |

Test ID: **Head Drop**

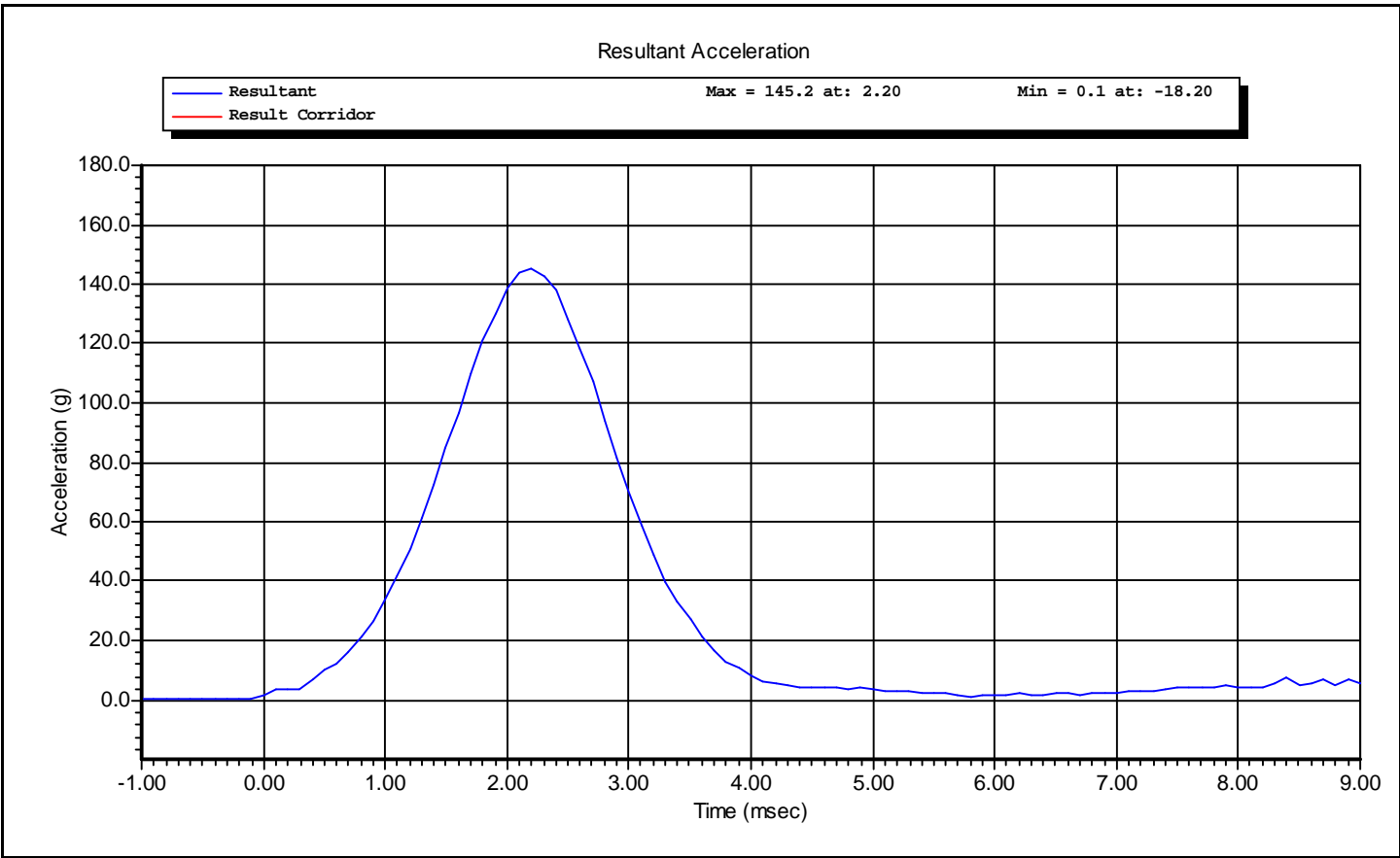
Test Time: **4:04:37 PM**

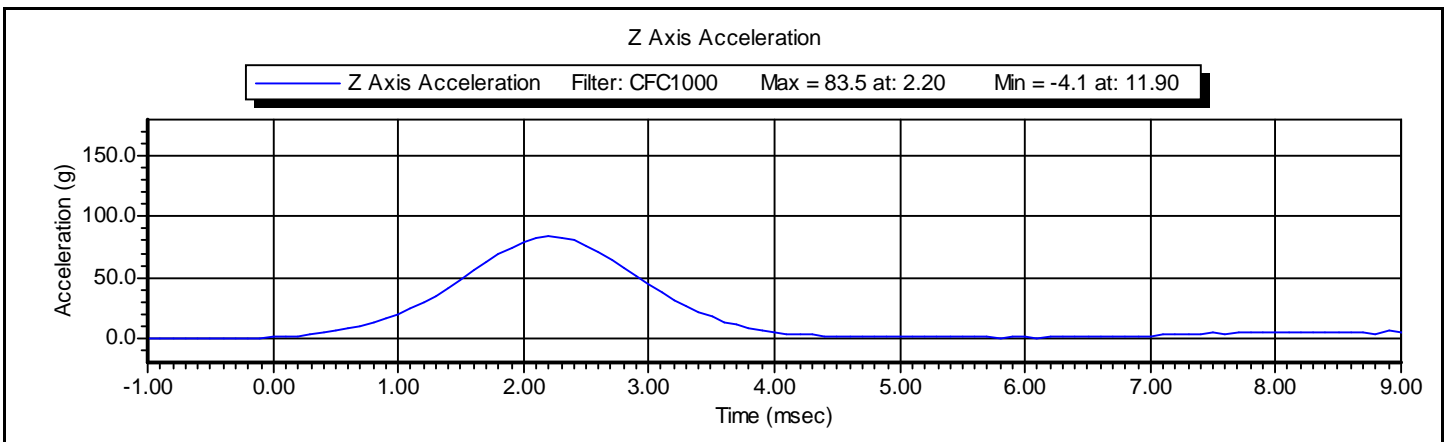
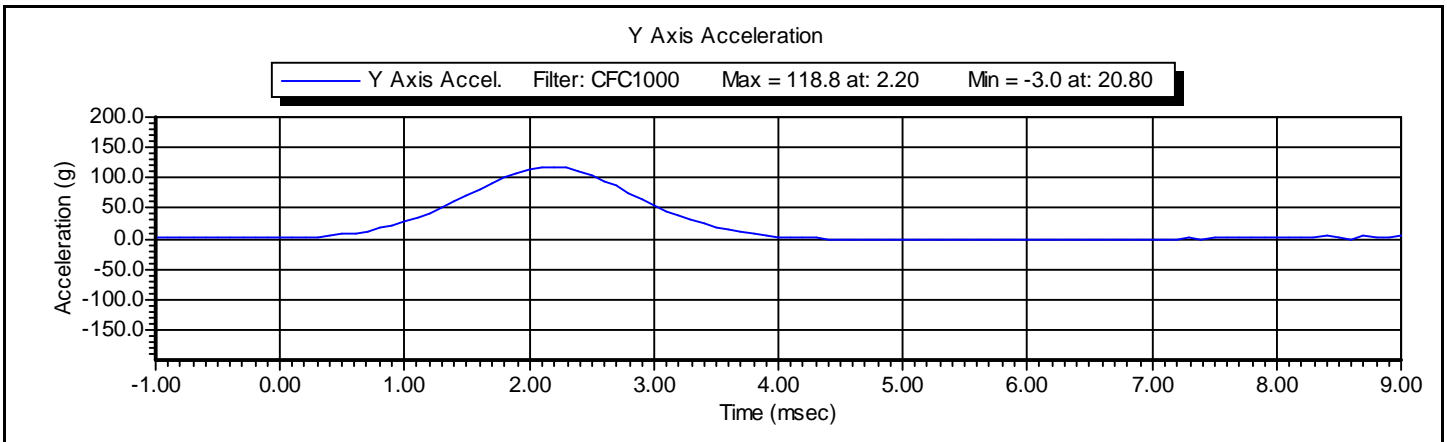
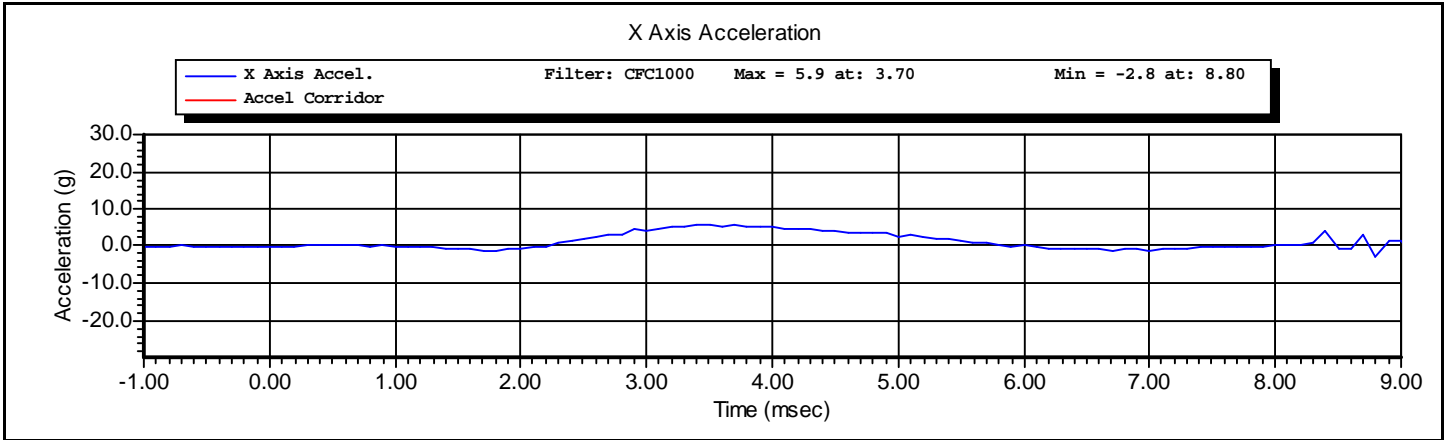
Test Date: **3/30/2010**



|                    |                  |            |                   |
|--------------------|------------------|------------|-------------------|
| Test Name:         | <b>Head Drop</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                  | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>    |            |                   |
| ATD Serial Number: | <b>D037</b>      |            |                   |
| Test ID:           | <b>Head Drop</b> | Test Date: | <b>3/30/2010</b>  |
| Test Number:       | <b>3</b>         | Test Time: | <b>4:04:37 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-1007</b>       |                         |







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## VERIFICATION REPORT

|                    |                     |            |                    |
|--------------------|---------------------|------------|--------------------|
| Test Name:         | <b>Neck Flexion</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>       |            |                    |
| ATD Serial Number: | <b>D037</b>         |            |                    |
| Test ID:           | <b>Neck Flexion</b> | Test Date: | <b>3/29/2010</b>   |
| Test Number:       | <b>2</b>            | Test Time: | <b>11:47:30 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-2002</b>       | <b>19-020118A</b>       |

| Test Parameters              | Test Specifications | Test Results          |
|------------------------------|---------------------|-----------------------|
| Temperature                  | 20.6 -- 22.2        | <b>22.2</b> deg C P   |
| Humidity                     | 10 -- 70            | <b>38</b> %RH P       |
| Velocity                     | 3.30 -- 3.50        | <b>3.42</b> m/s P     |
| Maximum Neck Flexion Angle   | 49.0 -- 59.0        | <b>54.0</b> degrees P |
| Time At Maximum Neck Flexion | 54.0 -- 66.0        | <b>55.8</b> ms P      |
| Decay to Zero Degrees        | 53.0 -- 88.0        | <b>63.3</b> ms P      |
| Velocity Corridor            | --                  | P                     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Neck Flexion**

Test Time: **11:47:30 AM**

Test Date: **3/29/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7231CT        | AF5B3                | 2/24/2010               |
| DentonATD           | 7000428       | 094                  | 10/23/2009              |
| DentonATD           | 7000428       | 095                  | 10/23/2009              |
| DentonATD           | 7000428       | 093                  | 10/23/2009              |

Test ID: **Neck Flexion**

Test Time: **11:47:30 AM**

Test Date: **3/29/2010**





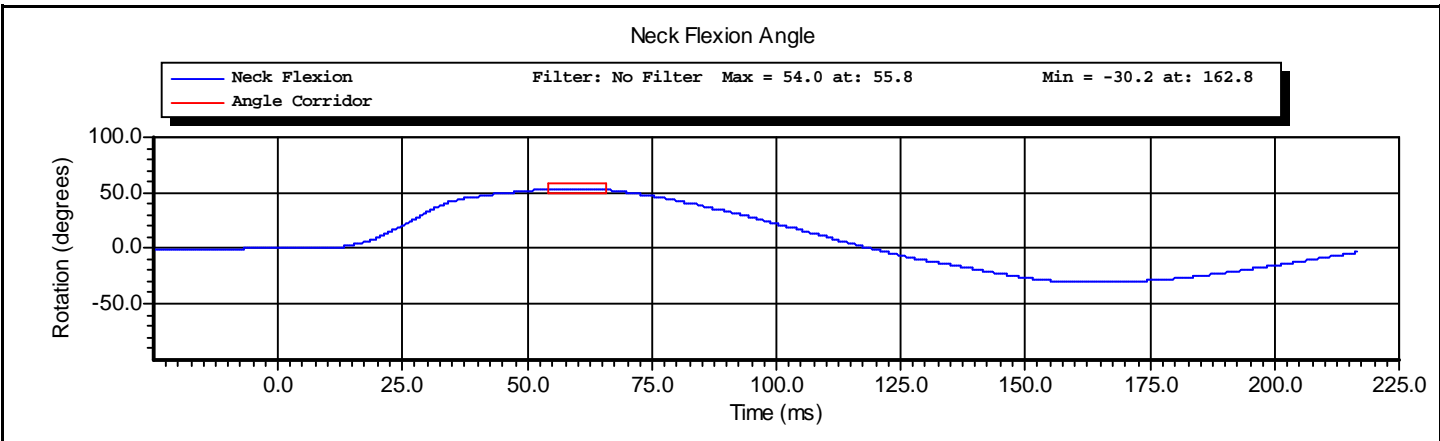
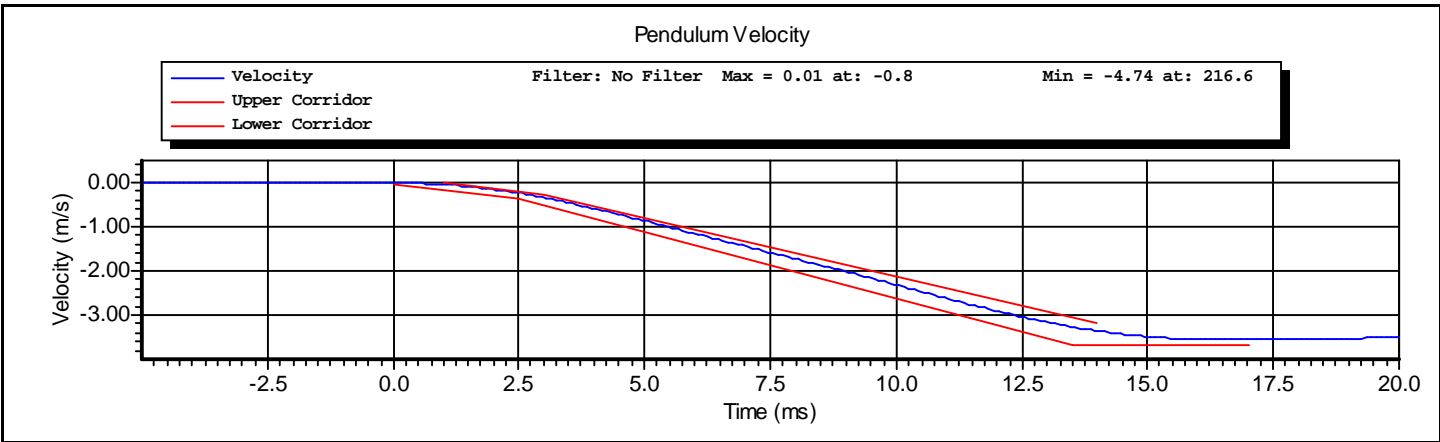
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|                    |                     |            |                    |
|--------------------|---------------------|------------|--------------------|
| Test Name:         | <b>Neck Flexion</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>       |            |                    |
| ATD Serial Number: | <b>D037</b>         |            |                    |
| Test ID:           | <b>Neck Flexion</b> | Test Date: | <b>3/29/2010</b>   |
| Test Number:       | <b>2</b>            | Test Time: | <b>11:47:30 AM</b> |

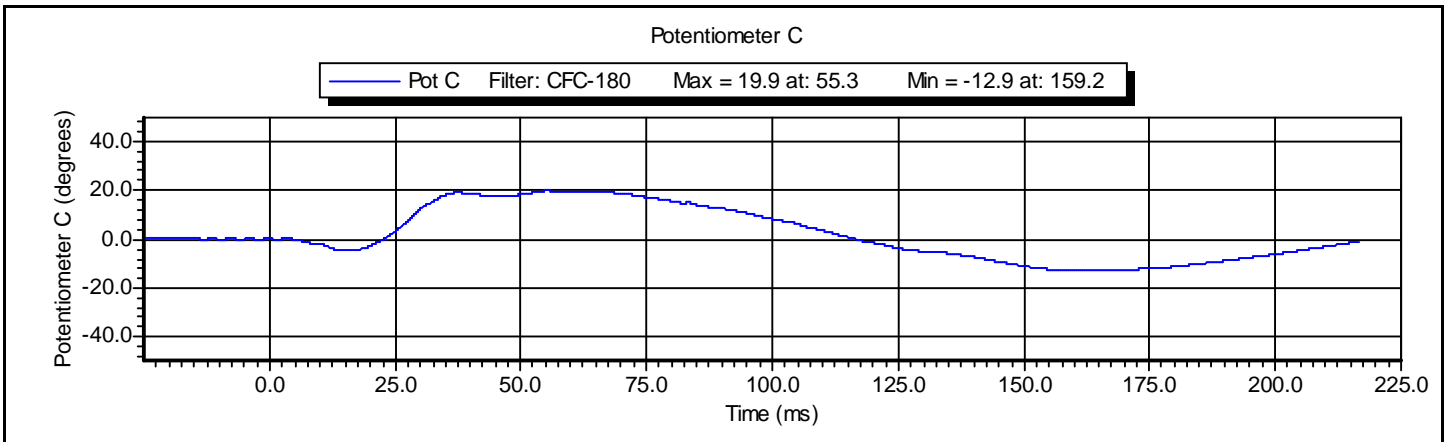
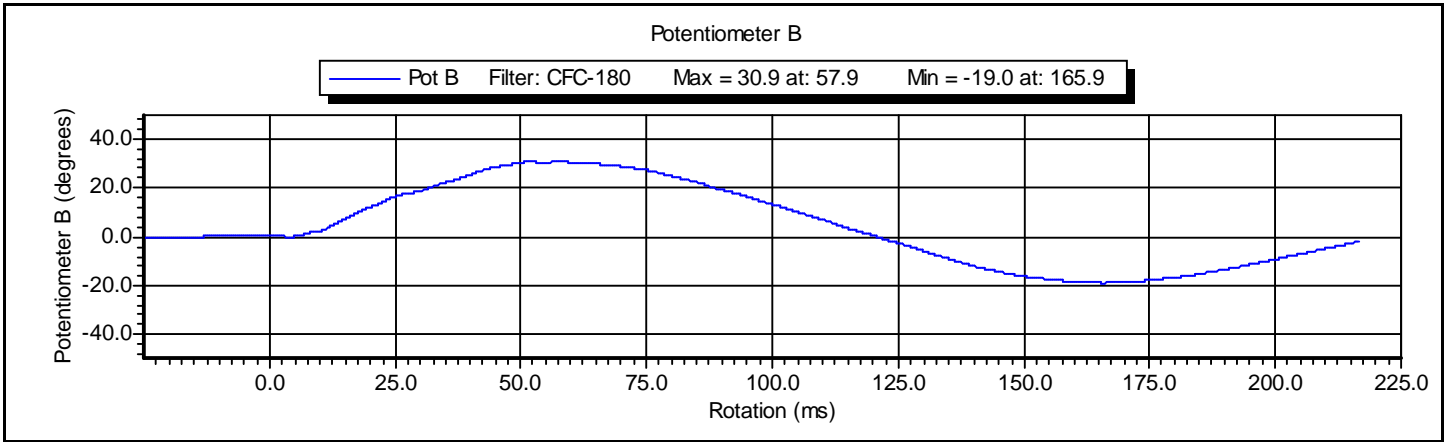
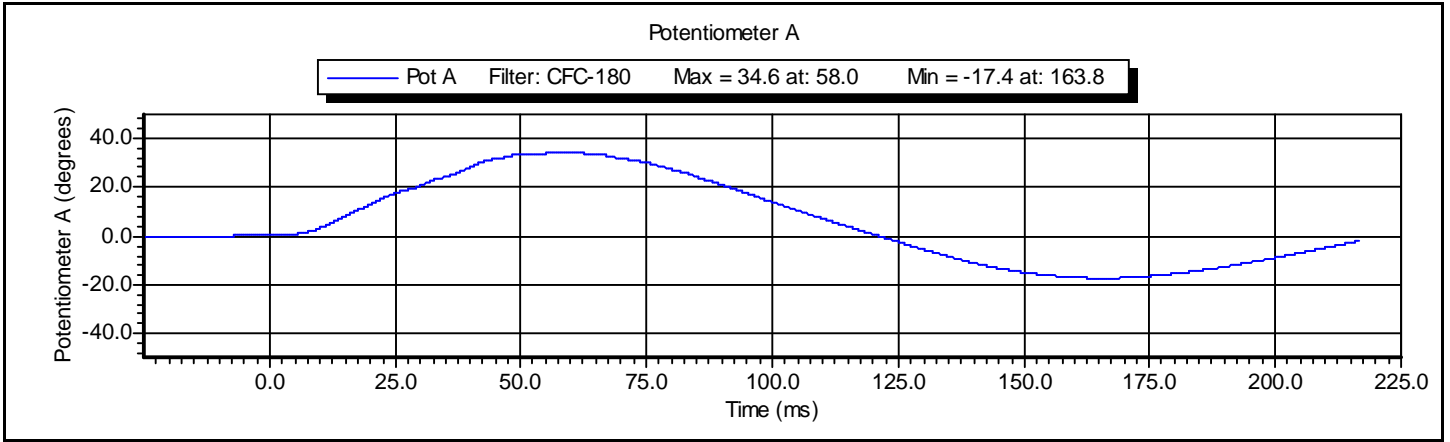
|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-2002</b>       | <b>19-020118A</b>       |



Test ID: **Neck Flexion**

Test Time: **11:47:30 AM**

Test Date: **3/29/2010**





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### VERIFICATION REPORT

|                    |                        |            |                   |
|--------------------|------------------------|------------|-------------------|
| Test Name:         | <b>Shoulder Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                        | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>          |            |                   |
| ATD Serial Number: | <b>D037</b>            |            |                   |
| Test ID:           | <b>Shoulder Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>               | Test Time: | <b>1:42:31 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>960715-313</b>     |                         |

| Test Parameters       | Test Specifications | Test Results        |
|-----------------------|---------------------|---------------------|
| Temperature           | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity              | 10.0 -- 70.0        | <b>22.0</b> %RH P   |
| Velocity              | 4.20 -- 4.40        | <b>4.29</b> m/s P   |
| Pendulum Acceleration | -10.50 -- -7.50     | <b>-8.04</b> g P    |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Shoulder Impact**      Test Time: **1:42:31 PM**      Test Date: **3/26/2010**



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## Calspan - Transportation Research Group

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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 11/4/2009               |

Test ID: **Shoulder Impact**

Test Time: **1:42:31 PM**

Test Date: **3/26/2010**



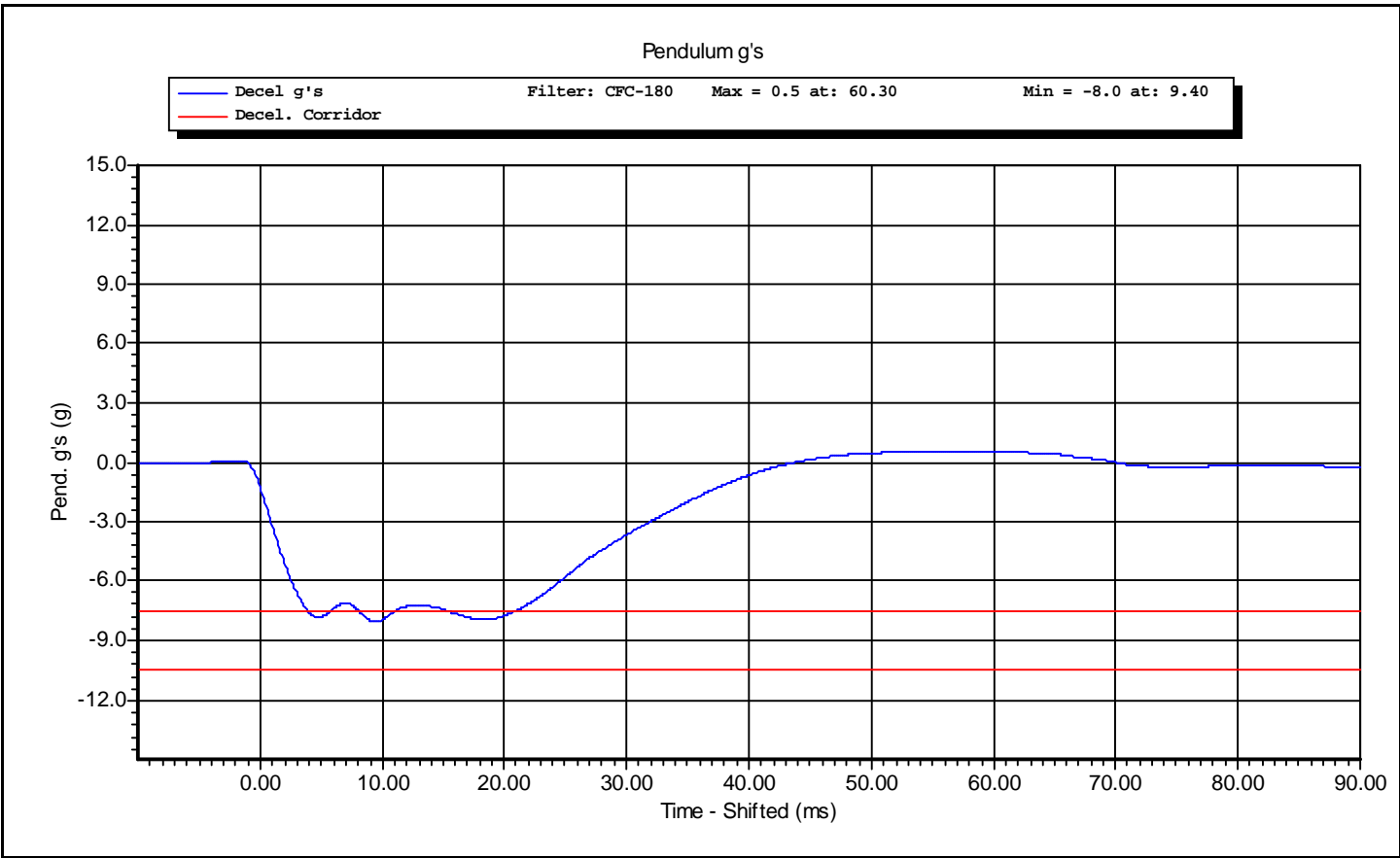
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|                    |                        |            |                   |
|--------------------|------------------------|------------|-------------------|
| Test Name:         | <b>Shoulder Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                        | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>          |            |                   |
| ATD Serial Number: | <b>D037</b>            |            |                   |
| Test ID:           | <b>Shoulder Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>               | Test Time: | <b>1:42:31 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>960715-313</b>     |                         |



Test ID: **Shoulder Impact**

Test Time: **1:42:31 PM**

Test Date: **3/26/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 3 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:07:43 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.98</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-38.21</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Lower Rib 3 m/s**

Test Time: **3:07:43 PM**

Test Date: **3/26/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Lower Rib 3 m/s**

Test Time: **3:07:43 PM**

Test Date: **3/26/2010**





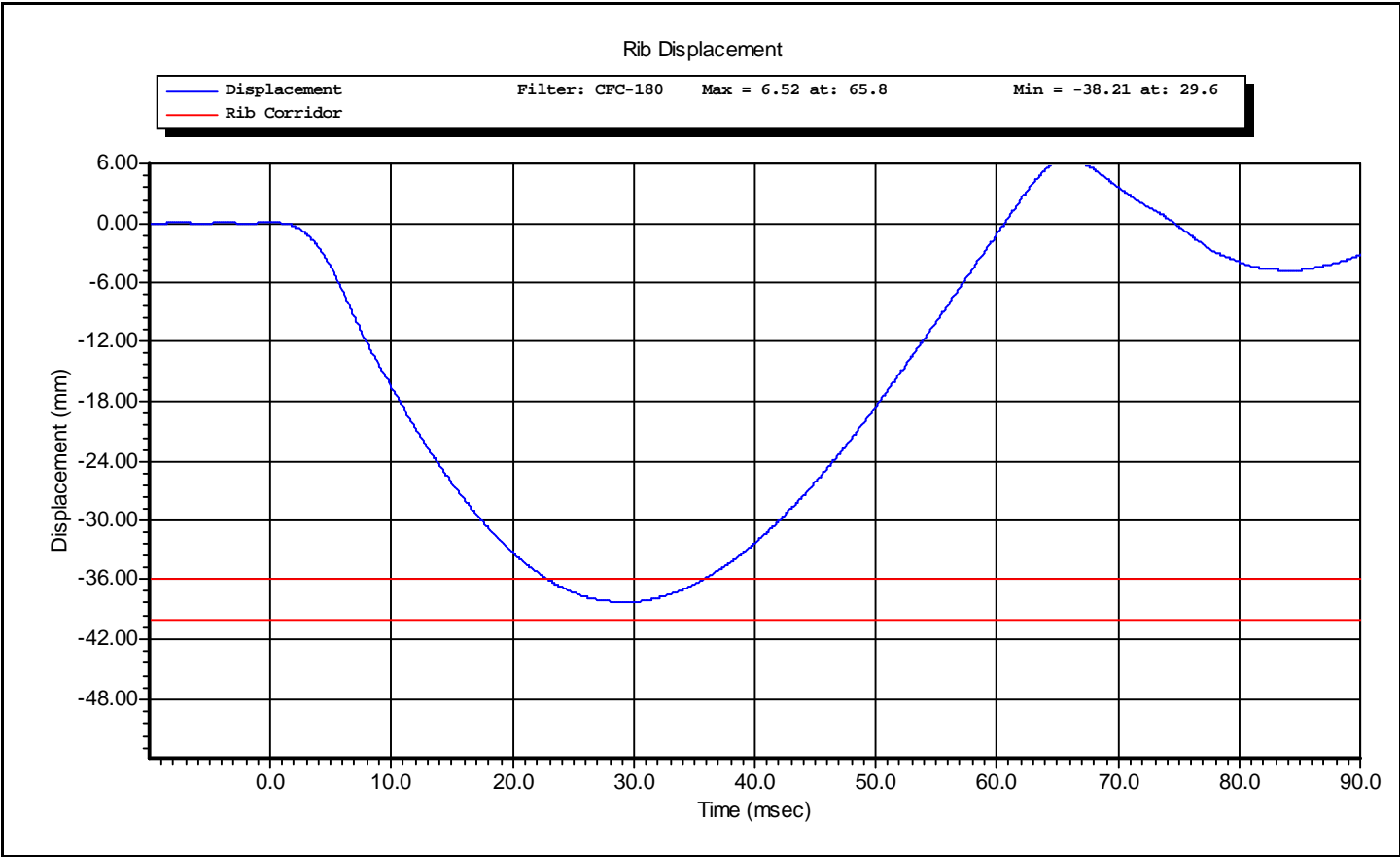
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 3 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:07:43 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |



Test ID: **Lower Rib 3 m/s**

Test Time: **3:07:43 PM**

Test Date: **3/26/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 4 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:14:46 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>3.98</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-47.29</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Lower Rib 4 m/s**

Test Time: **3:14:46 PM**

Test Date: **3/26/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Lower Rib 4 m/s**

Test Time: **3:14:46 PM**

Test Date: **3/26/2010**



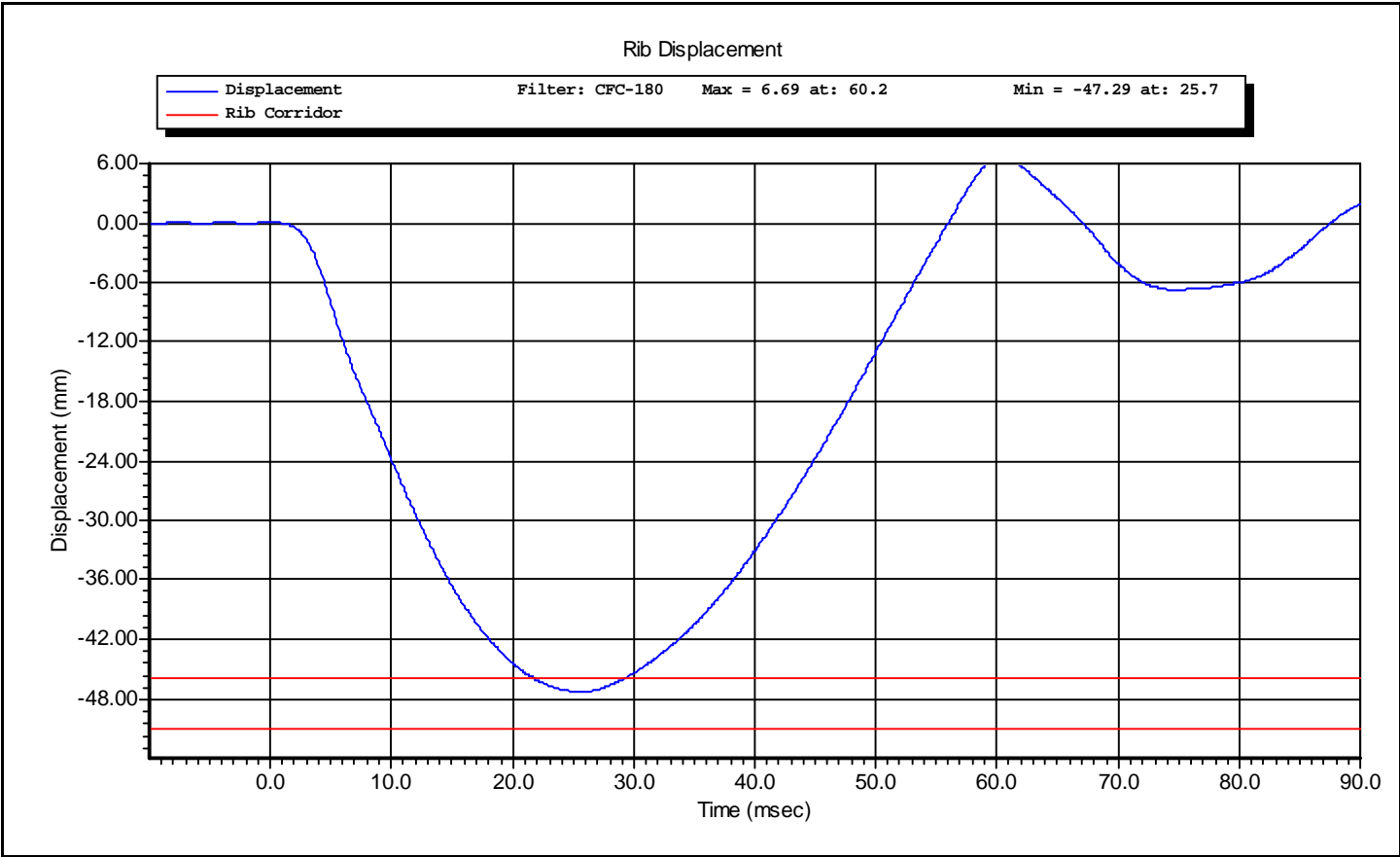
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 4 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:14:46 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |



Test ID: **Lower Rib 4 m/s**

Test Time: **3:14:46 PM**

Test Date: **3/26/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 3 m/s</b>       | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:47:09 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.97</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-37.75</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Middle Rib 3 m/s**

Test Time: **2:47:09 PM**

Test Date: **3/26/2010**



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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Middle Rib 3 m/s**

Test Time: **2:47:09 PM**

Test Date: **3/26/2010**



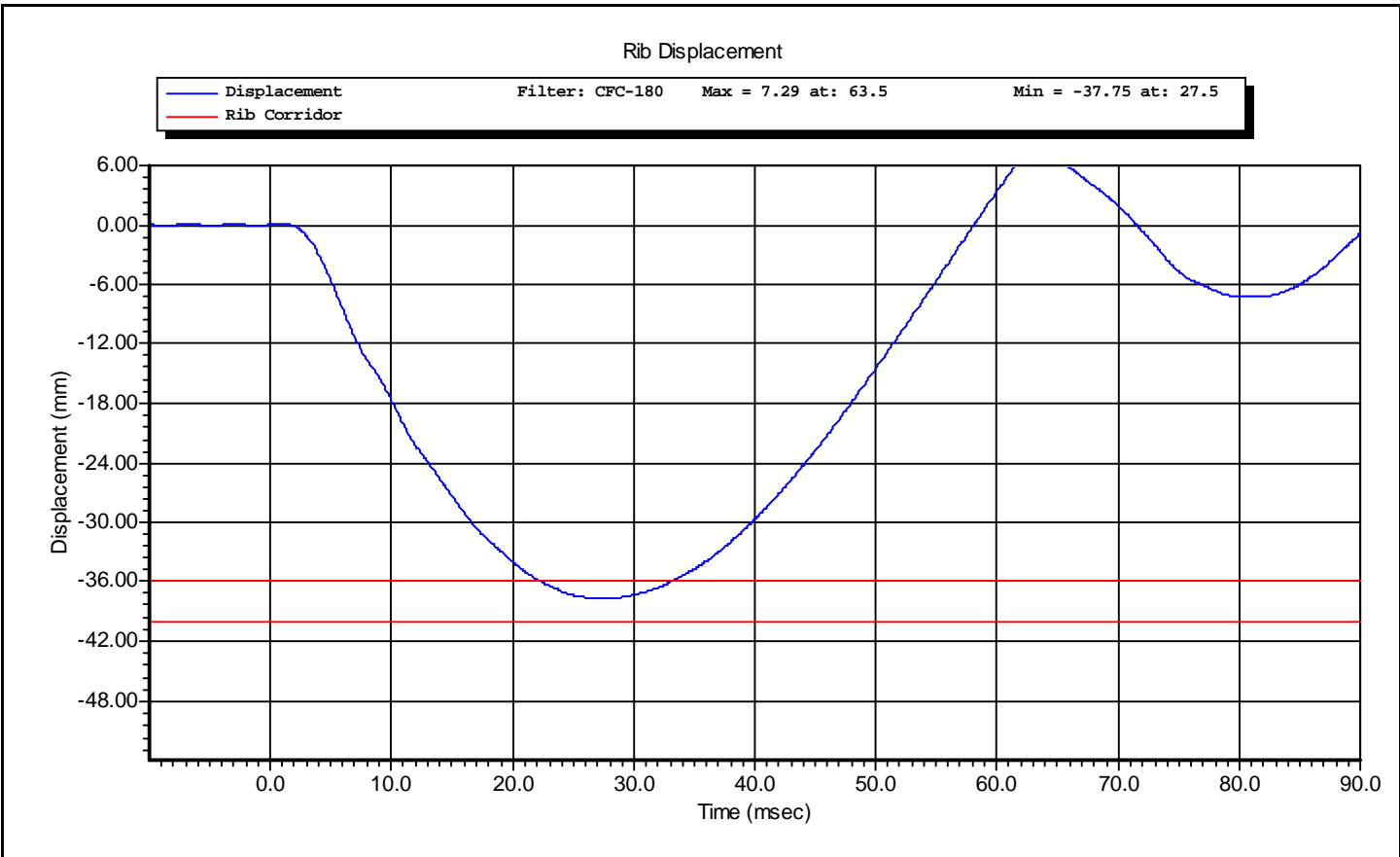
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 3 m/s</b>       | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:47:09 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |



Test ID: **Middle Rib 3 m/s**

Test Time: **2:47:09 PM**

Test Date: **3/26/2010**



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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 4 m/s</b>       | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:56:00 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>3.99</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-47.45</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Middle Rib 4 m/s**

Test Time: **2:56:00 PM**

Test Date: **3/26/2010**





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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Middle Rib 4 m/s**

Test Time: **2:56:00 PM**

Test Date: **3/26/2010**



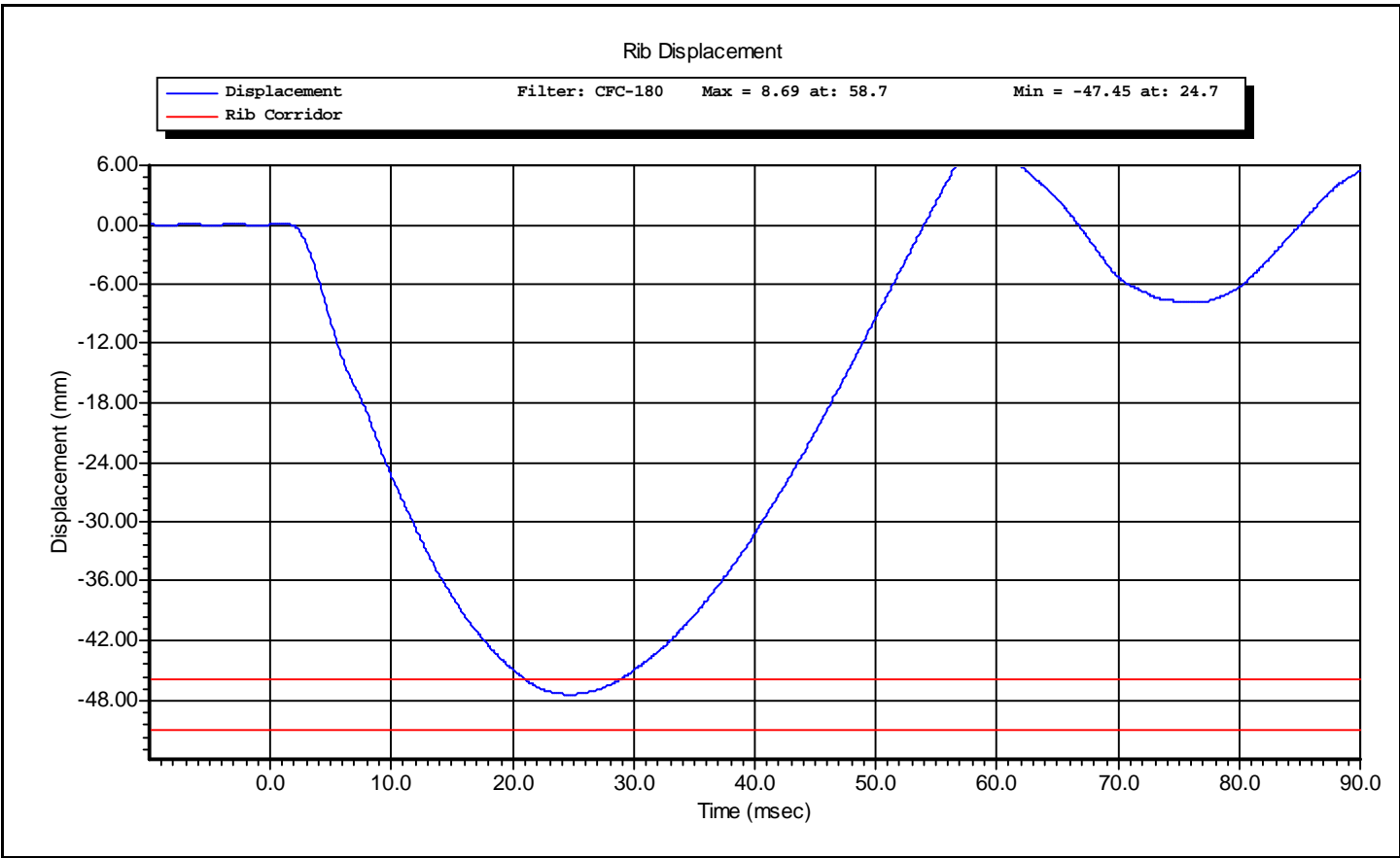
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 4 m/s</b>       | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:56:00 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |



Test ID: **Middle Rib 4 m/s**

Test Time: **2:56:00 PM**

Test Date: **3/26/2010**



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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 3 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:25:49 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.98</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-38.65</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Upper Rib 3 m/s**

Test Time: **2:25:49 PM**

Test Date: **3/26/2010**



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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Upper Rib 3 m/s**

Test Time: **2:25:49 PM**

Test Date: **3/26/2010**



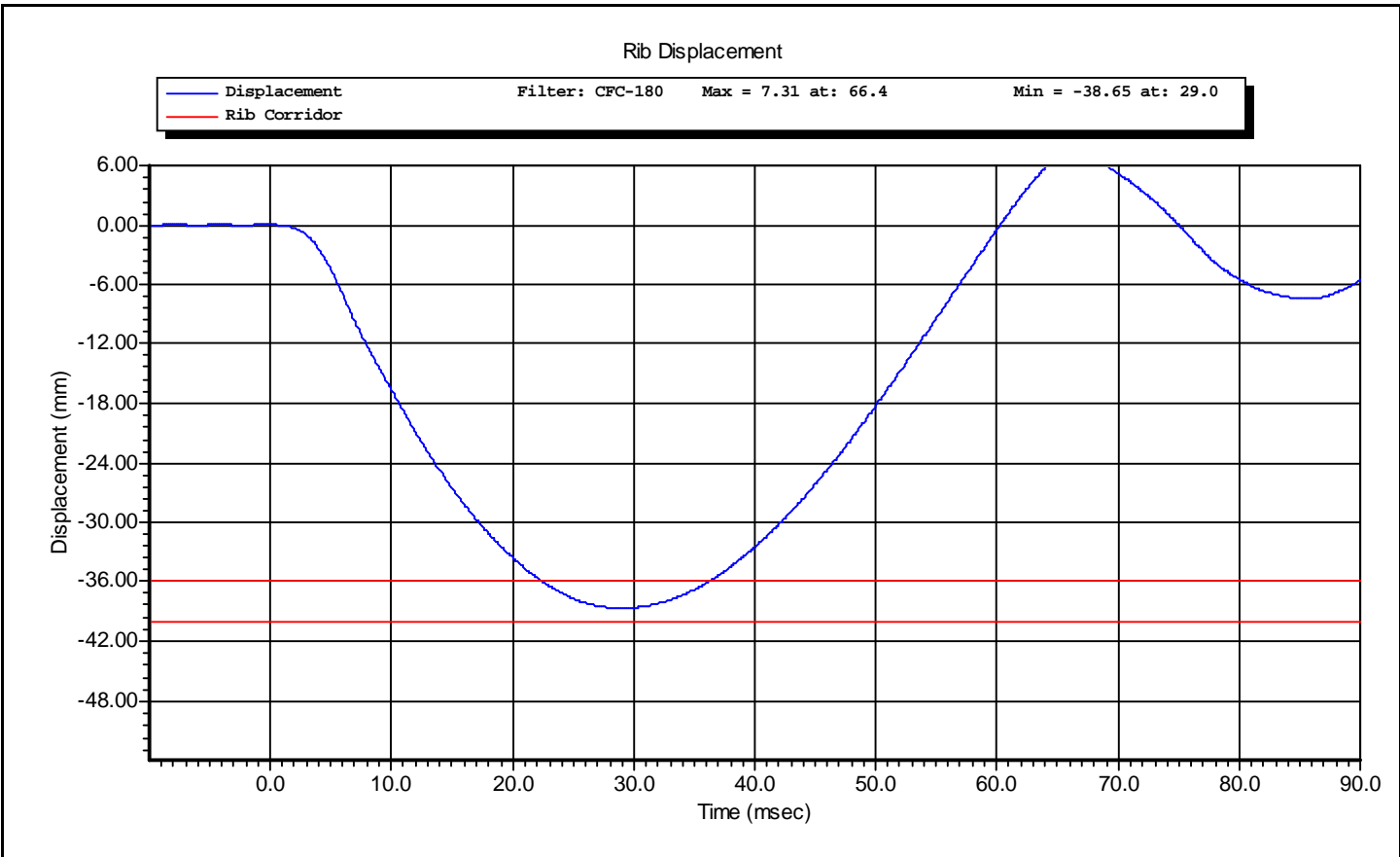
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 3 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:25:49 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |



Test ID: **Upper Rib 3 m/s**

Test Time: **2:25:49 PM**

Test Date: **3/26/2010**



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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 4 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:33:28 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>26.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>3.99</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-49.29</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Upper Rib 4 m/s**

Test Time: **2:33:28 PM**

Test Date: **3/26/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Upper Rib 4 m/s**

Test Time: **2:33:28 PM**

Test Date: **3/26/2010**



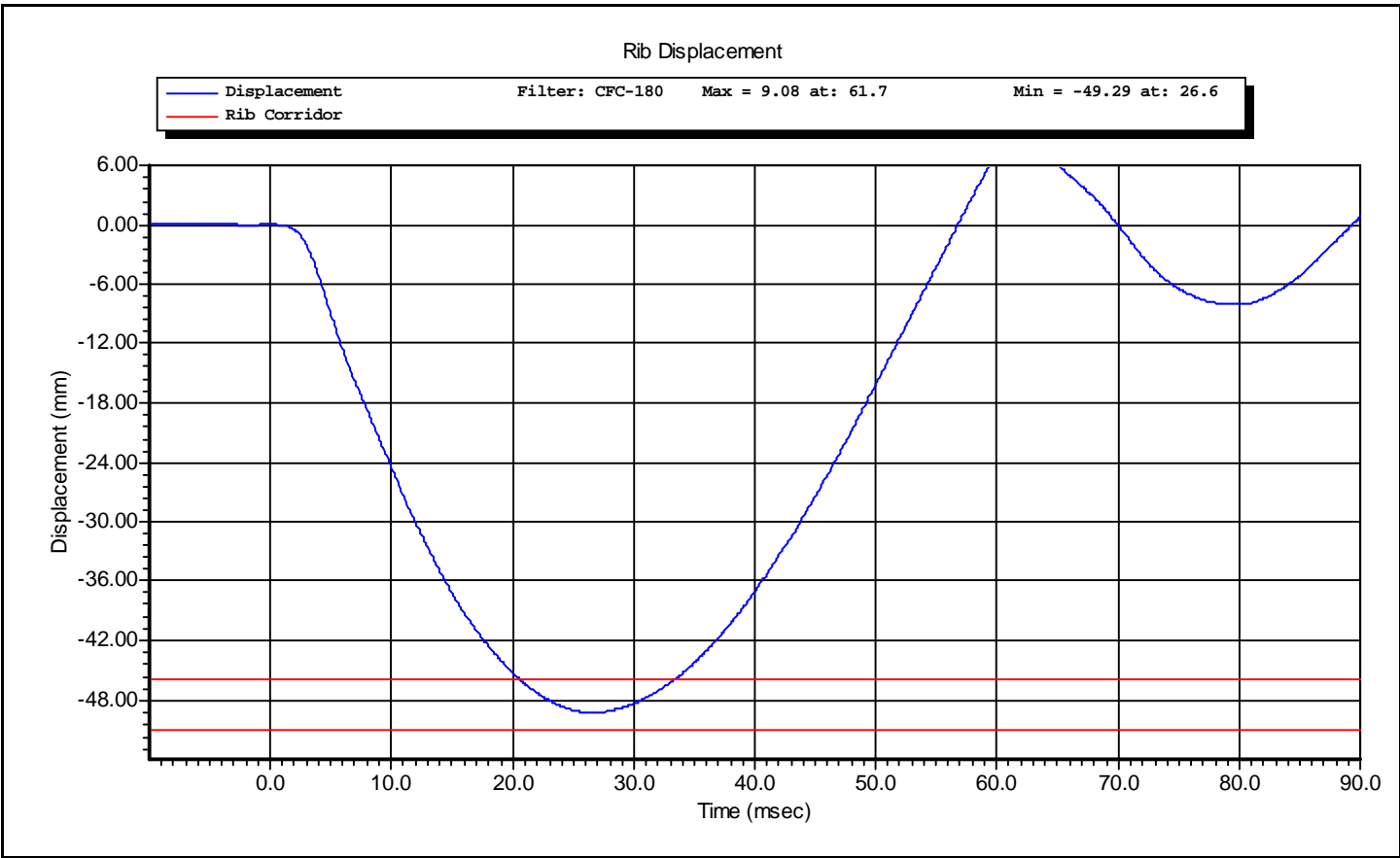
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 4 m/s</b>        | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>                      | Test Time: | <b>2:33:28 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |



Test ID: **Upper Rib 4 m/s**

Test Time: **2:33:28 PM**

Test Date: **3/26/2010**





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## VERIFICATION REPORT

|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Thorax Impact</b> | Revision:  | <b>8/15/2008</b>  |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Thorax Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>             | Test Time: | <b>3:51:07 PM</b> |

|                              |                         |
|------------------------------|-------------------------|
| Component Part Number        | Component Serial Number |
| <b>Upper Rib - 175-4002</b>  | <b>1954-0124A</b>       |
| <b>Middle Rib - 175-4002</b> | <b>1954-0125A</b>       |
| <b>Lower Rib - 175-4002</b>  | <b>1954-0126A</b>       |

| Test Parameters         | Test Specifications | Test Results        |
|-------------------------|---------------------|---------------------|
| Temperature             | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity                | 10.0 -- 70.0        | <b>27.0</b> %RH P   |
| Velocity                | 5.40 -- 5.60        | <b>5.50</b> m/s P   |
| Upper Rib Displacement  | 34.0 -- 41.0        | <b>36.6</b> mm P    |
| Middle Rib Displacement | 37.0 -- 45.0        | <b>41.1</b> mm P    |
| Lower Rib Displacement  | 37.0 -- 44.0        | <b>42.3</b> mm P    |
| Impactor Force          | 5100 -- 6200        | <b>5720</b> N P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Thorax Impact**

Test Time: **3:51:07 PM**

Test Date: **3/26/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 11/4/2009               |
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |

Test ID: **Thorax Impact**

Test Time: **3:51:07 PM**

Test Date: **3/26/2010**



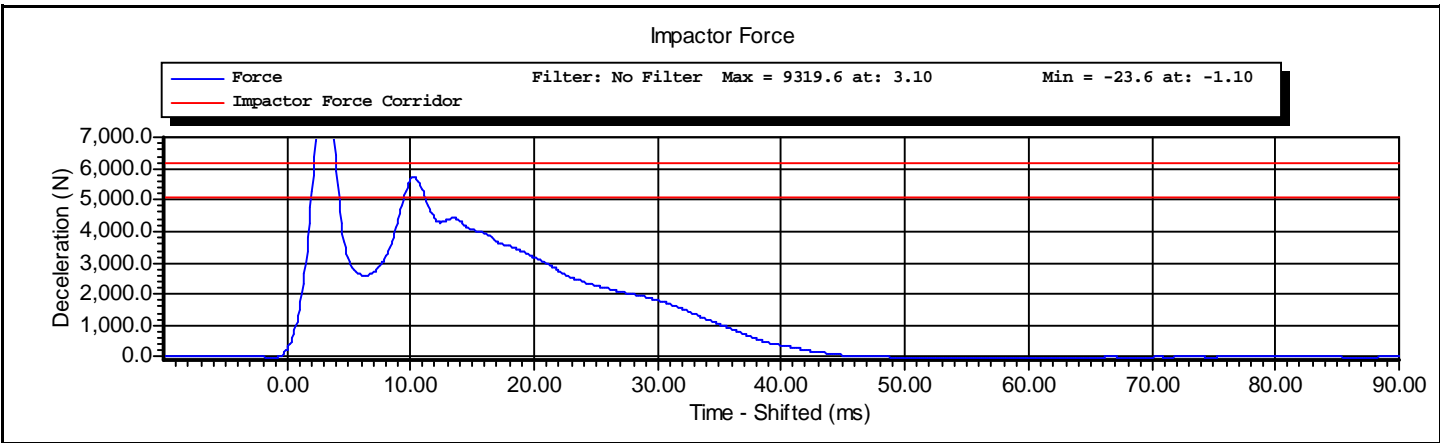
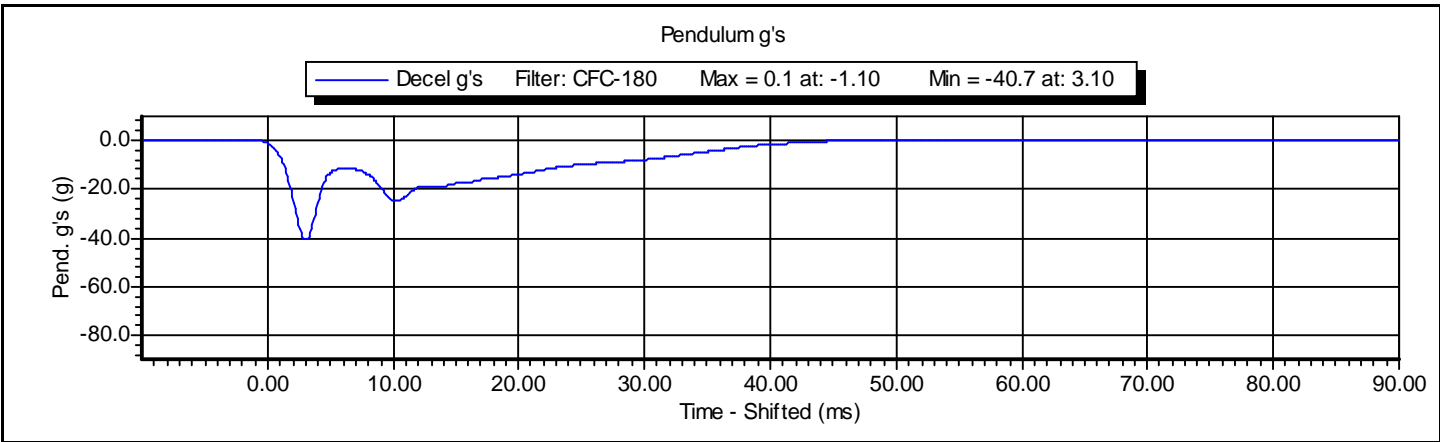
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|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Thorax Impact</b> | Revision:  | <b>8/15/2008</b>  |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Thorax Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>             | Test Time: | <b>3:51:07 PM</b> |

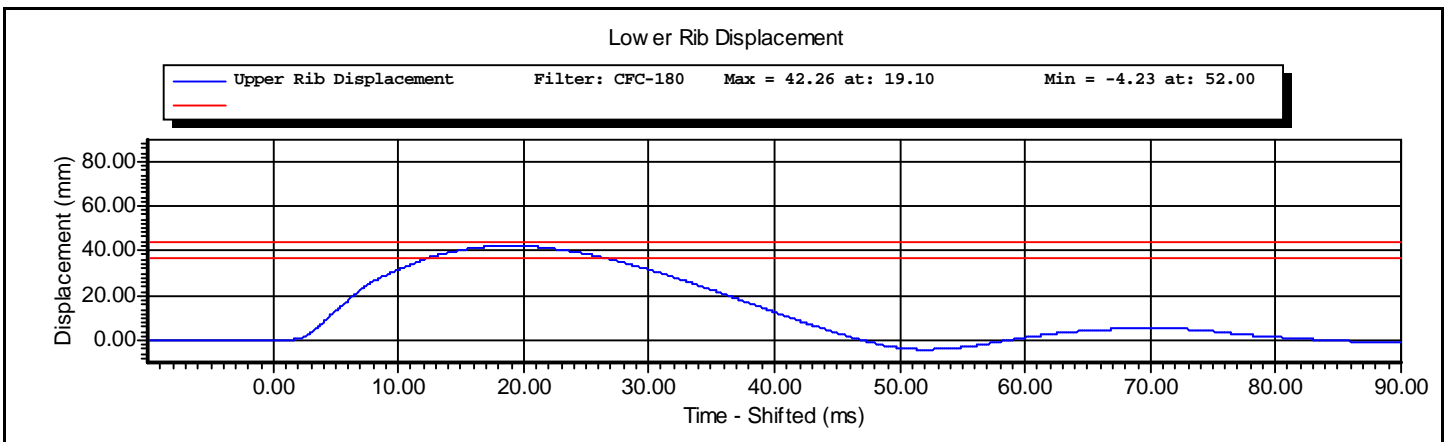
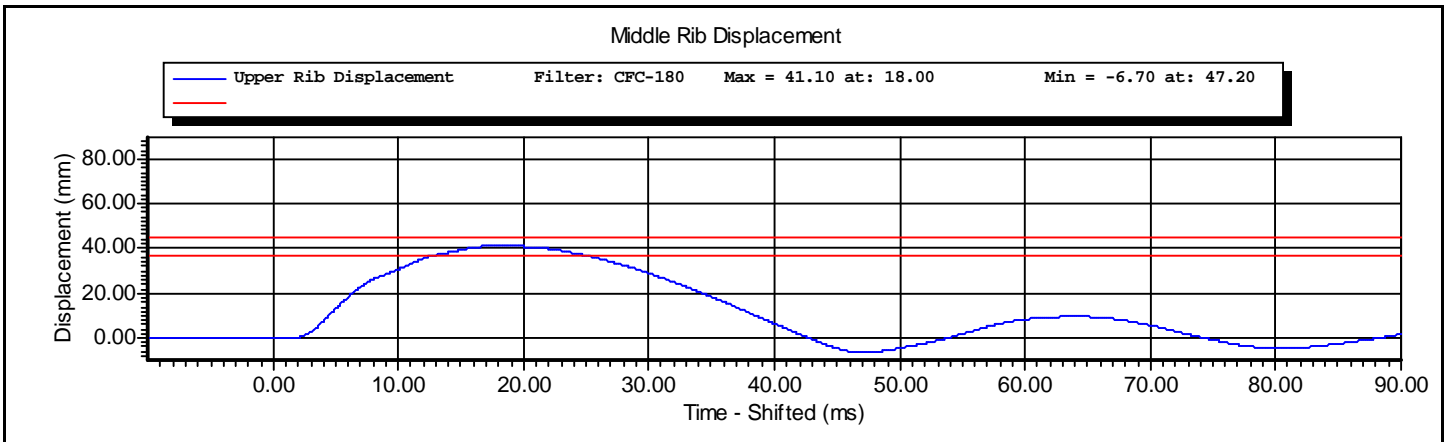
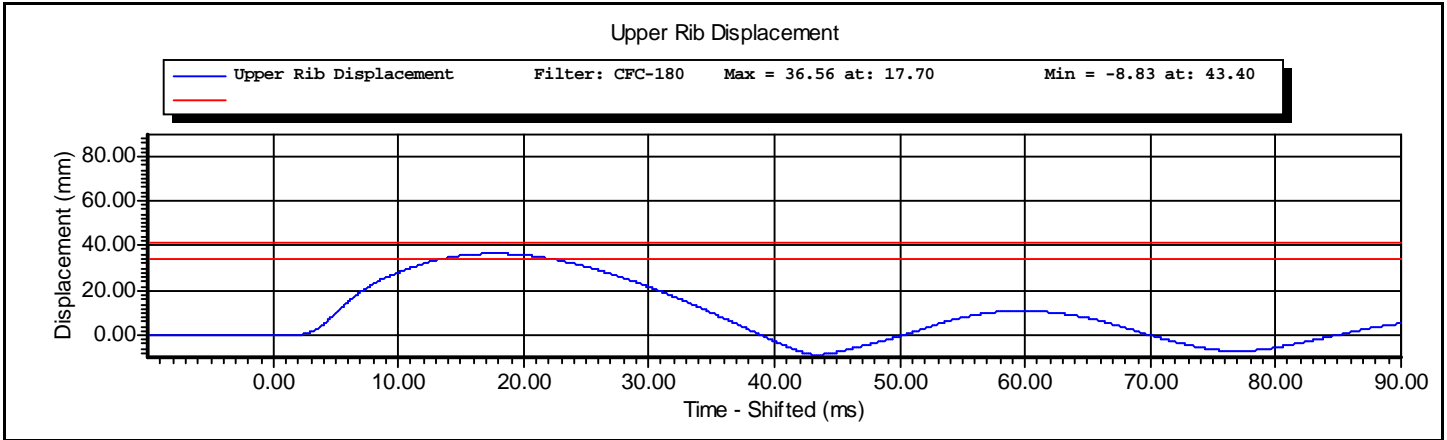
|                             |                         |
|-----------------------------|-------------------------|
| Component Part Number       | Component Serial Number |
| <b>Upper Rib - 175-4002</b> | <b>1954-0124A</b>       |



Test ID: **Thorax Impact**

Test Time: **3:51:07 PM**

Test Date: **3/26/2010**





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## VERIFICATION REPORT

|                    |                         |            |                    |
|--------------------|-------------------------|------------|--------------------|
| Test Name:         | <b>Abdominal Impact</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                         | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>           |            |                    |
| ATD Serial Number: | <b>D037</b>             |            |                    |
| Test ID:           | <b>Abdominal Test</b>   | Test Date: | <b>3/26/2010</b>   |
| Test Number:       | <b>2</b>                | Test Time: | <b>11:58:29 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4001</b>       | <b>19-179</b>           |

| Test Parameters              | Test Specifications | Test Results        |
|------------------------------|---------------------|---------------------|
| Temperature                  | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity                     | 10 -- 70            | <b>21</b> %RH P     |
| Velocity                     | 3.90 -- 4.10        | <b>3.92</b> m/s P   |
| Peak Abdominal Force         | -2.70 -- -2.20      | <b>-2.49</b> kN P   |
| Time At Peak Abdominal Force | 10.0 -- 12.3        | <b>11.1</b> ms P    |
| Maximum Pendulum Force       | -4.80 -- -4.00      | <b>-4.80</b> kN P   |
| Time at Peak Pendulum Force  | 10.6 -- 13.0        | <b>10.7</b> ms P    |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Abdominal Test**

Test Time: **11:58:29 AM**

Test Date: **3/26/2010**



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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 11/4/2009               |
| Denton              | 2631          | LC-1507Fy            | 1/7/2010                |
| Denton              | 2631          | LC-1508Fy            | 1/7/2010                |
| Denton              | 2631          | LC-1509Fy            | 1/7/2010                |

Test ID: **Abdominal Test**

Test Time: **11:58:29 AM**

Test Date: **3/26/2010**



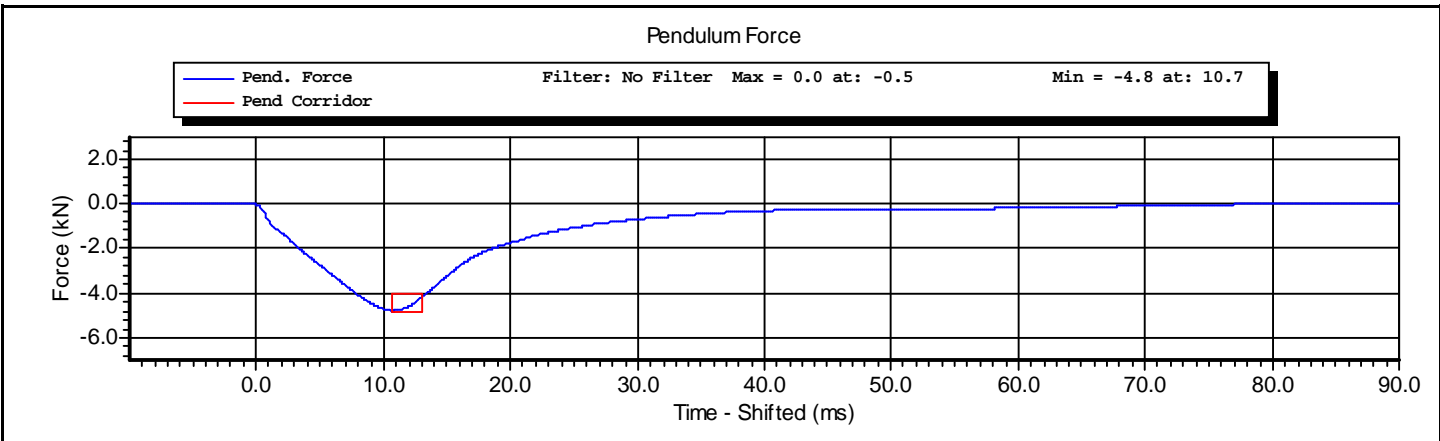
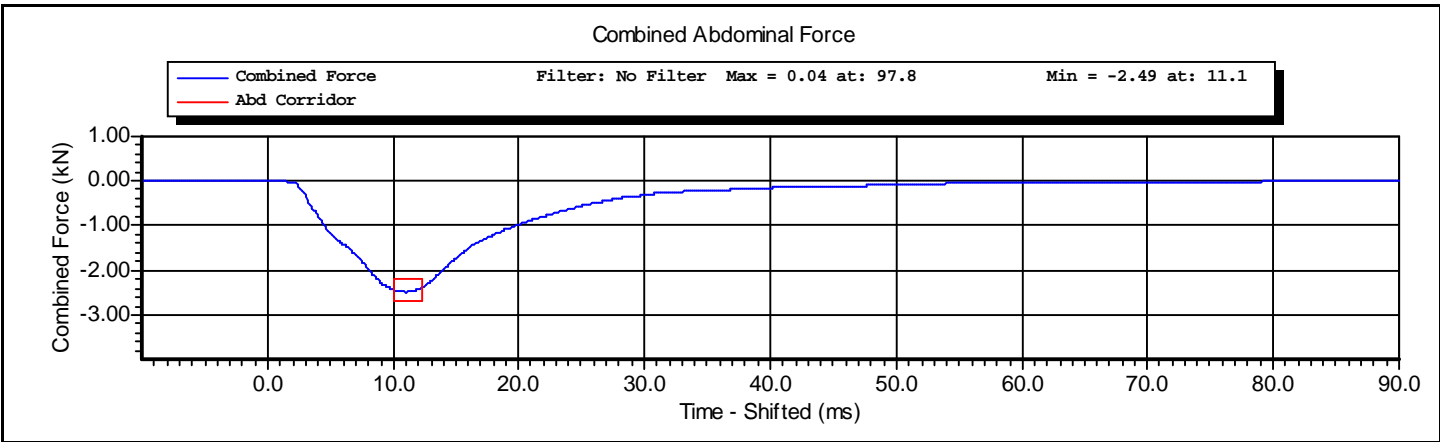
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|                    |                         |            |                    |
|--------------------|-------------------------|------------|--------------------|
| Test Name:         | <b>Abdominal Impact</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                         | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>           |            |                    |
| ATD Serial Number: | <b>D037</b>             |            |                    |
| Test ID:           | <b>Abdominal Test</b>   | Test Date: | <b>3/26/2010</b>   |
| Test Number:       | <b>2</b>                | Test Time: | <b>11:58:29 AM</b> |

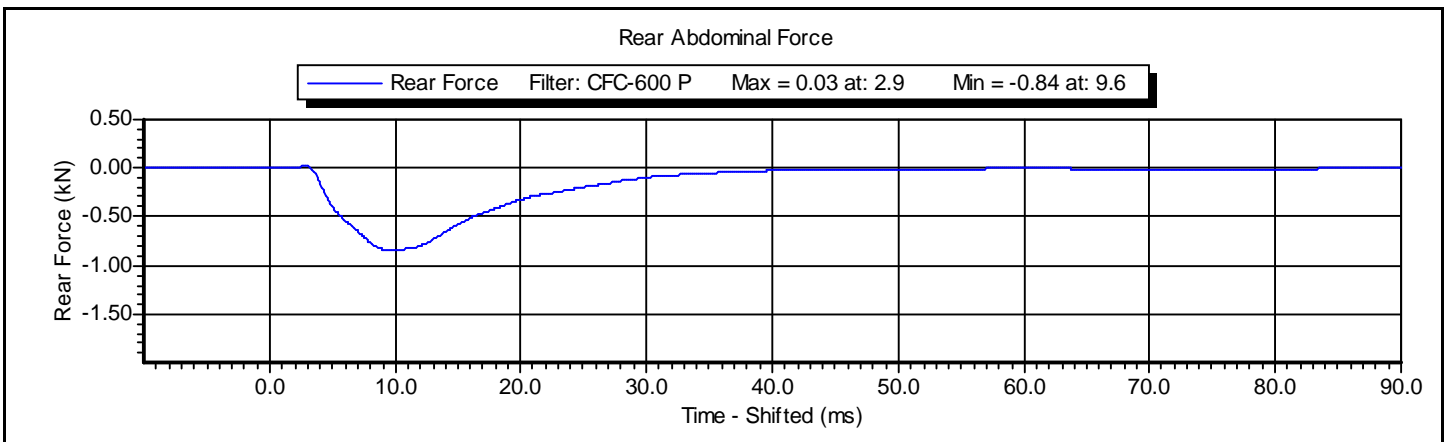
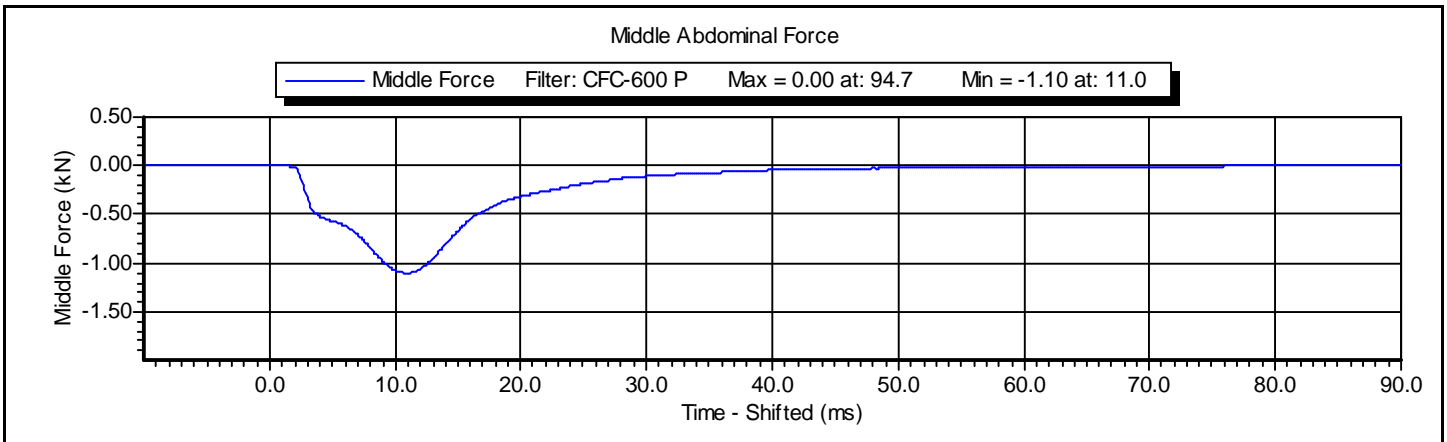
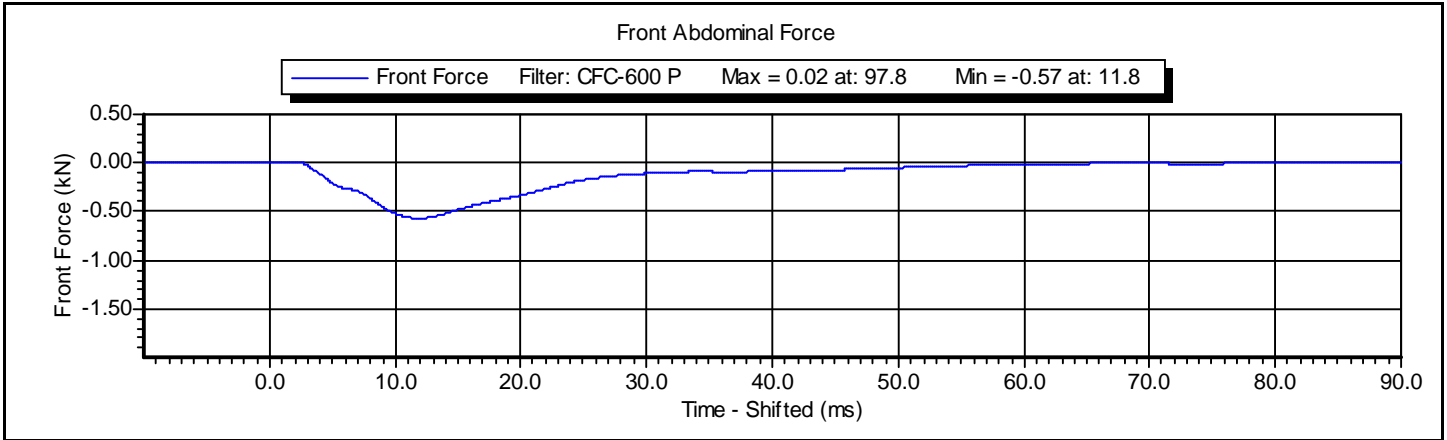
|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4001</b>       | <b>19-179</b>           |



Test ID: **Abdominal Test**

Test Time: **11:58:29 AM**

Test Date: **3/26/2010**







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## VERIFICATION REPORT

|                    |                     |            |                   |
|--------------------|---------------------|------------|-------------------|
| Test Name:         | <b>Lumbar Spine</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>       |            |                   |
| ATD Serial Number: | <b>D037</b>         |            |                   |
| Test ID:           | <b>Lumbar Spine</b> | Test Date: | <b>3/30/2010</b>  |
| Test Number:       | <b>4</b>            | Test Time: | <b>9:53:31 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>175-5501</b>       | <b>15-0376</b>          |

| Test Parameters                        | Test Specifications | Test Results          |
|--|---------------------|-----------------------|
| Temperature                            | 20.6 -- 22.2        | <b>21.7</b> deg C P   |
| Humidity                               | 10 -- 70            | <b>36</b> %RH P       |
| Velocity                               | 5.95 -- 6.15        | <b>6.05</b> m/s P     |
| Maximum Headform Flexion Angle         | 45.0 -- 55.0        | <b>48.0</b> degrees P |
| Time at Maximum Headform Flexion Angle | 39.0 -- 53.0        | <b>43.3</b> ms P      |
| Decay to Zero Degrees                  | 37.0 -- 57.0        | <b>38.1</b> ms P      |
| Velocity Corridor                      | --                  | P                     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Lumbar Spine**

Test Time: **9:53:31 AM**

Test Date: **3/30/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7231CT        | AF5B3                | 2/24/2010               |
| DentonATD           | 7000428       | 094                  | 10/23/2009              |
| DentonATD           | 7000428       | 095                  | 10/23/2009              |
| DentonATD           | 7000428       | 093                  | 10/23/2009              |

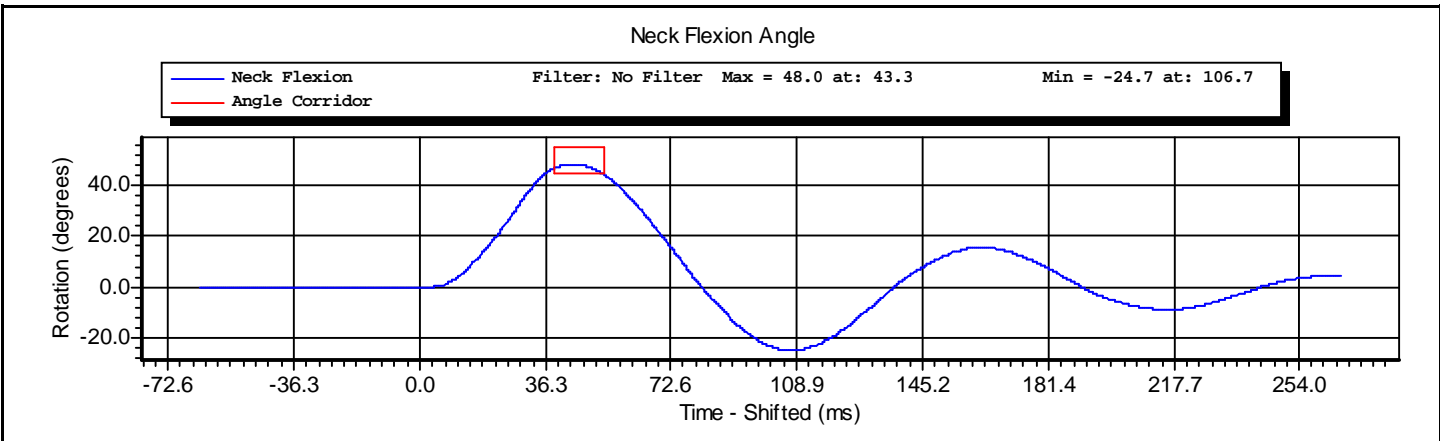
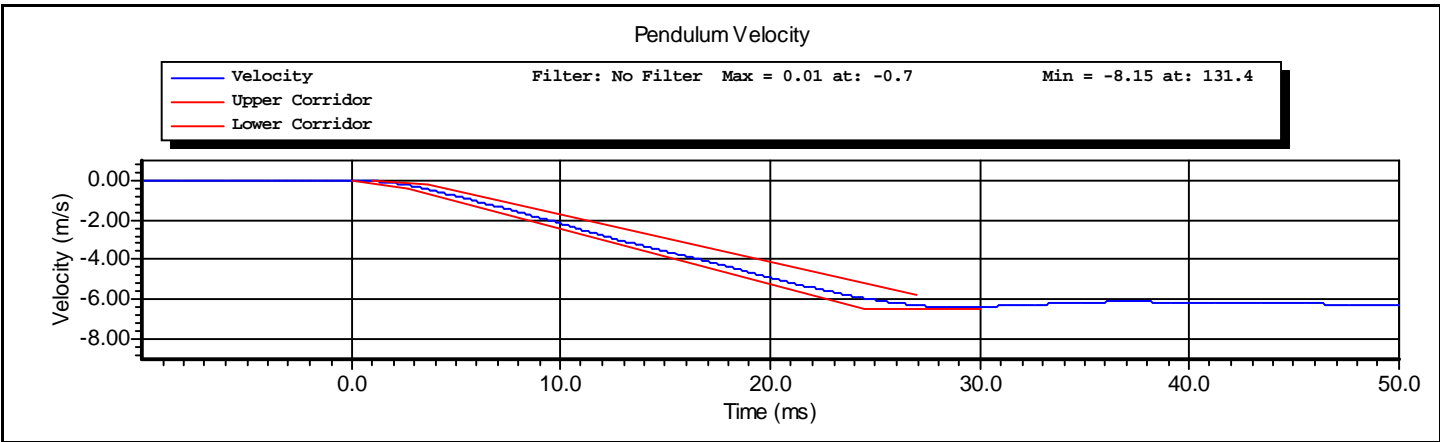
Test ID: **Lumbar Spine**

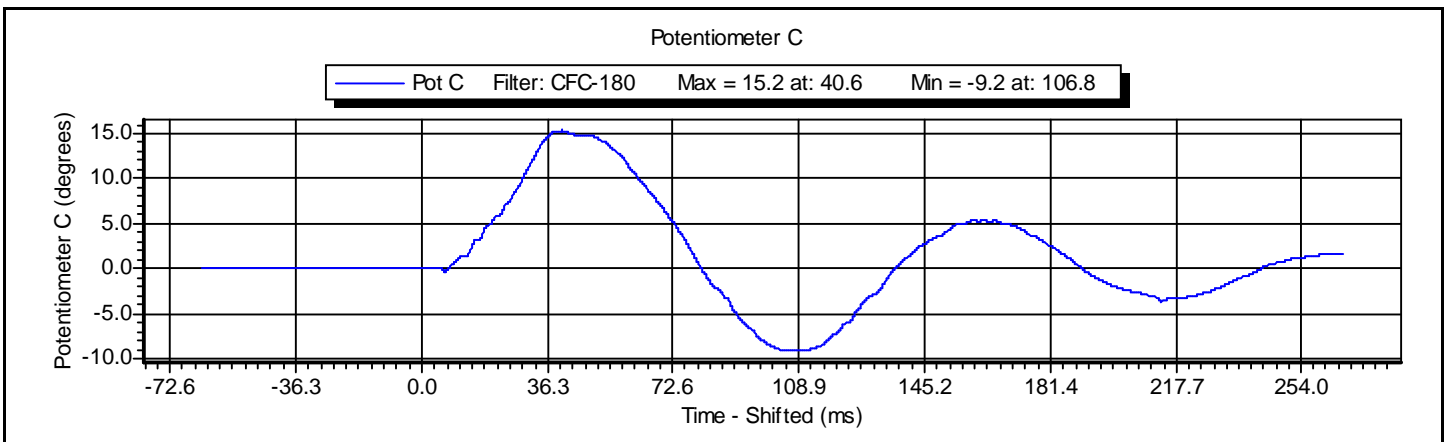
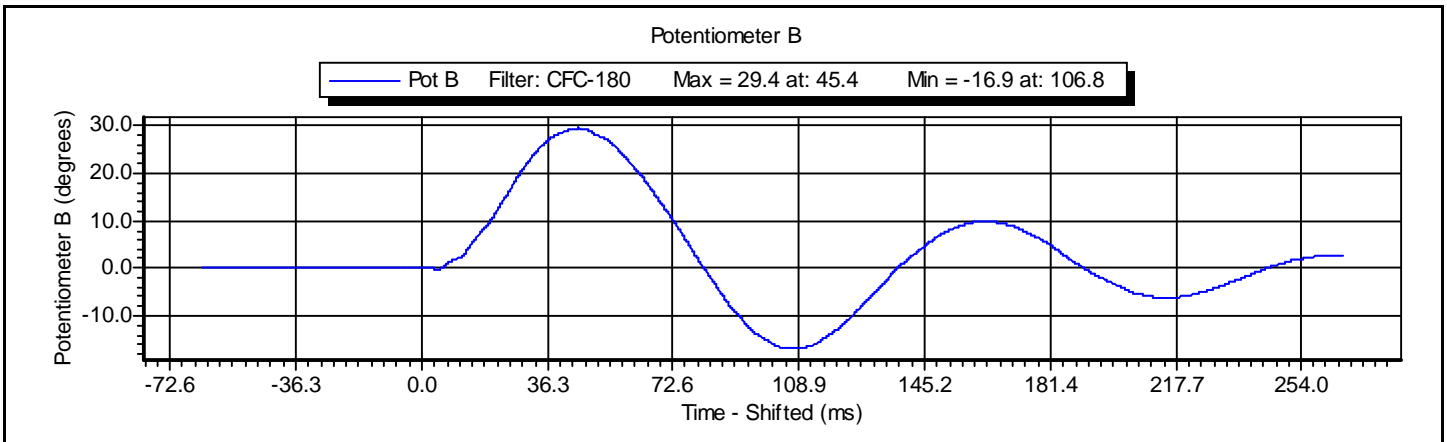
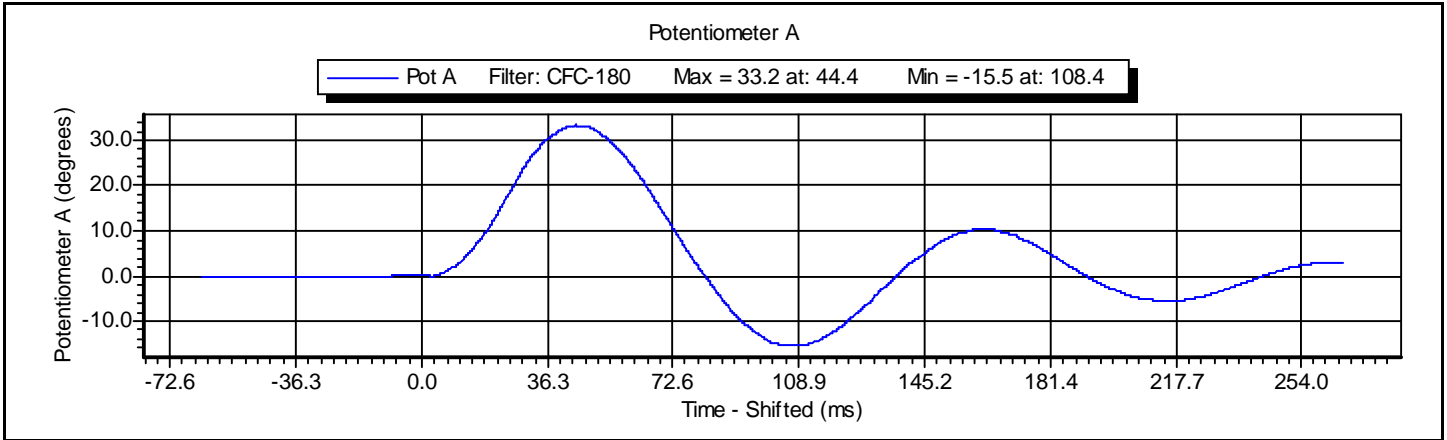
Test Time: **9:53:31 AM**

Test Date: **3/30/2010**

|                    |                     |            |                   |
|--------------------|---------------------|------------|-------------------|
| Test Name:         | <b>Lumbar Spine</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>       |            |                   |
| ATD Serial Number: | <b>D037</b>         |            |                   |
| Test ID:           | <b>Lumbar Spine</b> | Test Date: | <b>3/30/2010</b>  |
| Test Number:       | <b>4</b>            | Test Time: | <b>9:53:31 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>175-5501</b>       | <b>15-0376</b>          |







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## VERIFICATION REPORT

|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Pelvis Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Pelvis Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>             | Test Time: | <b>1:09:48 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4003</b>       |                         |

| Test Parameters                    | Test Specifications | Test Results        |
|------------------------------------|---------------------|---------------------|
| Temperature                        | 20.6 -- 22.2        | <b>21.7</b> deg C P |
| Humidity                           | 10 -- 70            | <b>22</b> %RH P     |
| Velocity                           | 4.20 -- 4.40        | <b>4.29</b> m/s P   |
| Peak Pendulum Force                | -5.40 -- -4.70      | <b>-5.27</b> kN P   |
| Time at Peak Pendulum Force        | 11.80 -- 16.10      | <b>13.90</b> ms P   |
| Peak Pubic Symphysis Force         | -1.59 -- -1.23      | <b>-1.59</b> kN P   |
| Time at Peak Pubic Symphysis Force | 12.20 -- 17.00      | <b>14.40</b> ms P   |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Pelvis Impact**

Test Time: **1:09:48 PM**

Test Date: **3/26/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 11/4/2009               |
| Denton              | 3096          | LC-458Fy             | 1/7/2010                |

Test ID: **Pelvis Impact**

Test Time: **1:09:48 PM**

Test Date: **3/26/2010**



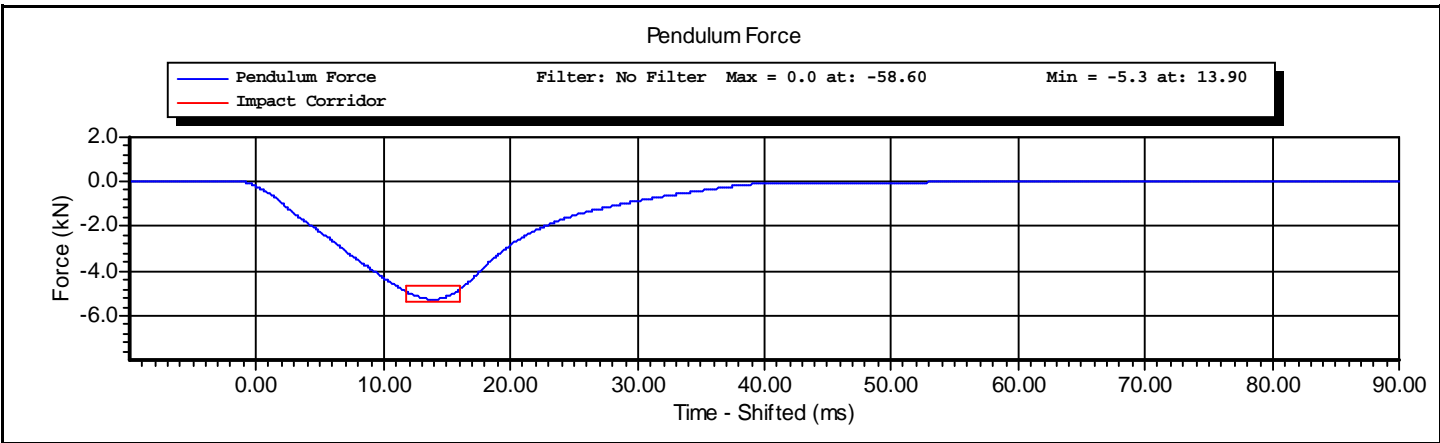
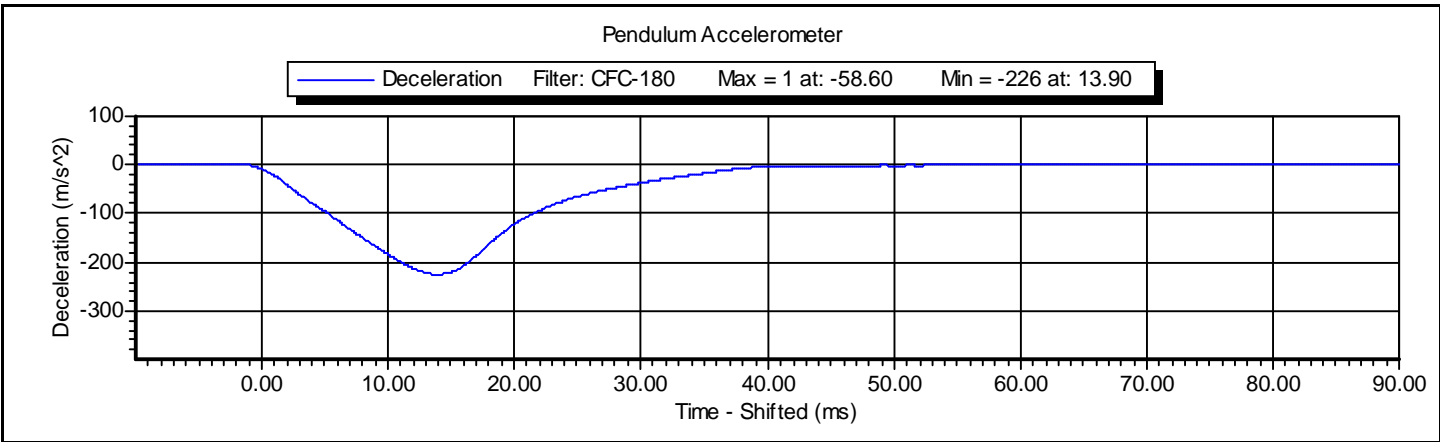
www.calspan.com

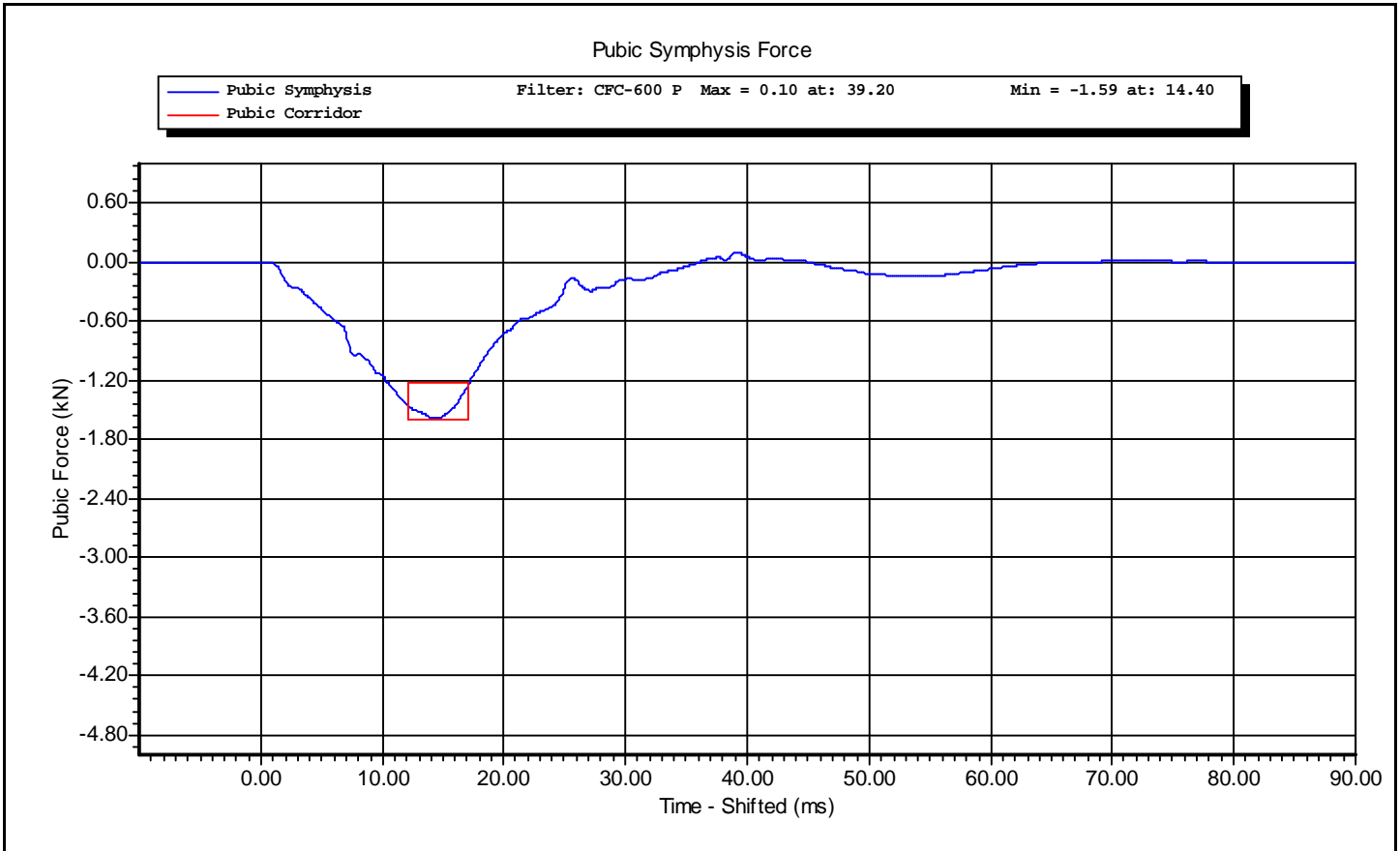
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|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Pelvis Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Pelvis Impact</b> | Test Date: | <b>3/26/2010</b>  |
| Test Number:       | <b>1</b>             | Test Time: | <b>1:09:48 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4003</b>       |                         |







**POST-TEST**  
**ES2-re S/N: 037**



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### VERIFICATION REPORT

|                    |                  |            |                   |
|--------------------|------------------|------------|-------------------|
| Test Name:         | <b>Head Drop</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                  | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>    |            |                   |
| ATD Serial Number: | <b>D037</b>      |            |                   |
| Test ID:           | <b>Head Drop</b> | Test Date: | <b>4/8/2010</b>   |
| Test Number:       | <b>2</b>         | Test Time: | <b>8:53:04 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-1007</b>       |                         |

| Test Parameters        | Test Specifications | Test Results        |
|------------------------|---------------------|---------------------|
| Temperature            | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity               | 10 -- 70            | <b>45</b> %RH P     |
| Resultant Acceleration | 125 -- 155          | <b>141</b> g P      |
| Oscillation            | 0.0 -- 15.0         | <b>3.8</b> % P      |
| Fore-Aft Acceleration  | -15.00 -- 15.00     | <b>6.47</b> g P     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Head Drop**

Test Time: **8:53:04 AM**

Test Date: **4/8/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u> | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|--------------|----------------------|-------------------------|
| Endevco             | 7264-2000    | AC-P18639            | 1/25/2010               |
| Endevco             | 7264-2000    | AC-P23128            | 1/25/2010               |
| Endevco             | 7264-2000    | AC-P16591            | 1/25/2010               |

Test ID: **Head Drop**

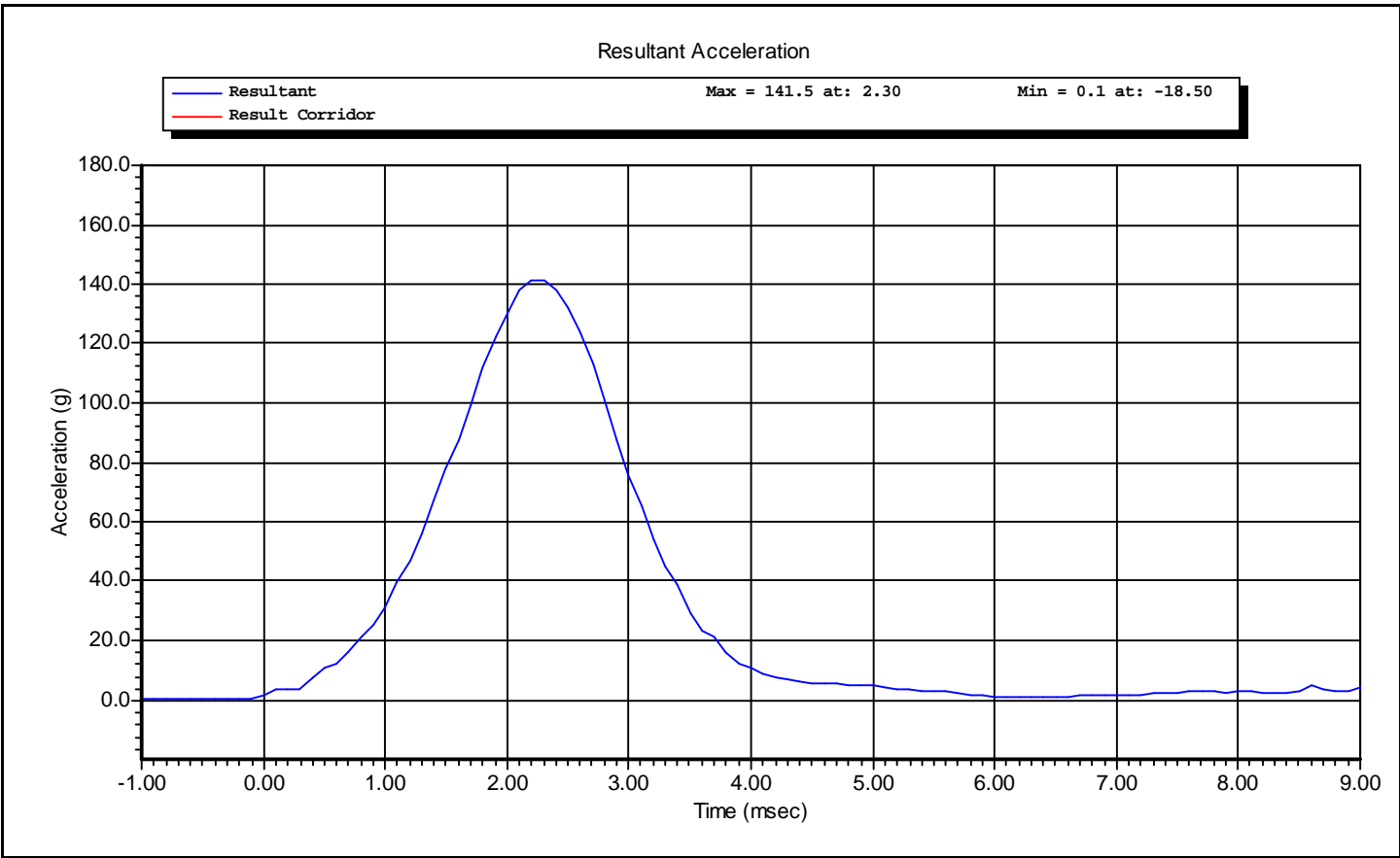
Test Time: **8:53:04 AM**

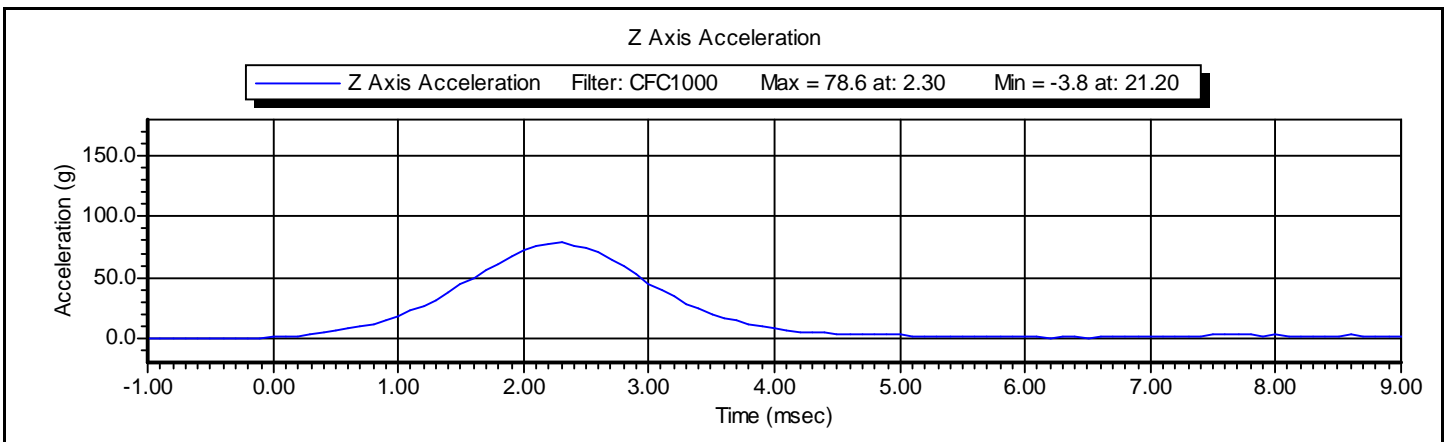
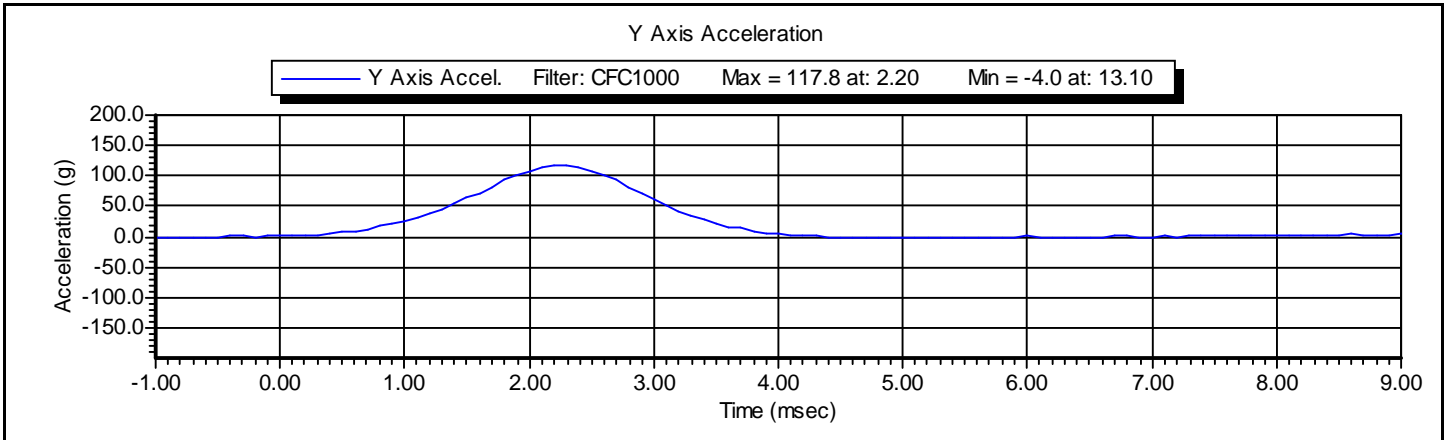
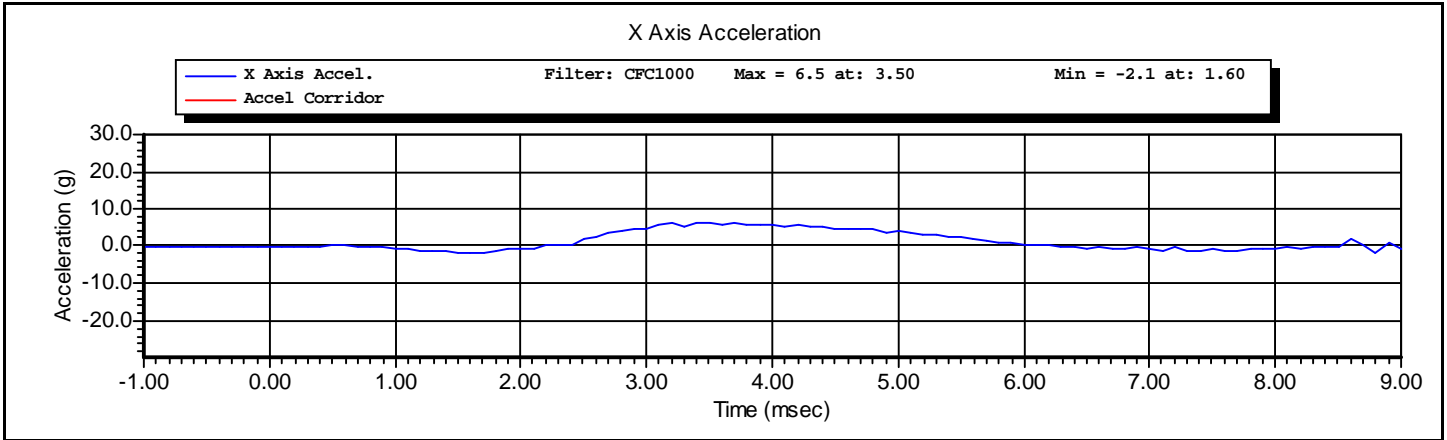
Test Date: **4/8/2010**



|                    |                  |            |                   |
|--------------------|------------------|------------|-------------------|
| Test Name:         | <b>Head Drop</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                  | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>    |            |                   |
| ATD Serial Number: | <b>D037</b>      |            |                   |
| Test ID:           | <b>Head Drop</b> | Test Date: | <b>4/8/2010</b>   |
| Test Number:       | <b>2</b>         | Test Time: | <b>8:53:04 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-1007</b>       |                         |







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## VERIFICATION REPORT

|                    |                     |            |                    |
|--------------------|---------------------|------------|--------------------|
| Test Name:         | <b>Neck Flexion</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>       |            |                    |
| ATD Serial Number: | <b>D037</b>         |            |                    |
| Test ID:           | <b>Neck Flexion</b> | Test Date: | <b>4/7/2010</b>    |
| Test Number:       | <b>1</b>            | Test Time: | <b>11:22:05 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-2002</b>       | <b>19-020118A</b>       |

| Test Parameters              | Test Specifications | Test Results          |
|------------------------------|---------------------|-----------------------|
| Temperature                  | 20.6 -- 22.2        | <b>22.2</b> deg C P   |
| Humidity                     | 10 -- 70            | <b>39</b> %RH P       |
| Velocity                     | 3.30 -- 3.50        | <b>3.38</b> m/s P     |
| Maximum Neck Flexion Angle   | 49.0 -- 59.0        | <b>53.5</b> degrees P |
| Time At Maximum Neck Flexion | 54.0 -- 66.0        | <b>58.8</b> ms P      |
| Decay to Zero Degrees        | 53.0 -- 88.0        | <b>61.0</b> ms P      |
| Velocity Corridor            | --                  | P                     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Neck Flexion**

Test Time: **11:22:05 AM**

Test Date: **4/7/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7231CT        | AF5B3                | 2/24/2010               |
| DentonATD           | 7000428       | 094                  | 10/23/2009              |
| DentonATD           | 7000428       | 095                  | 10/23/2009              |
| DentonATD           | 7000428       | 093                  | 10/23/2009              |

Test ID: **Neck Flexion**

Test Time: **11:22:05 AM**

Test Date: **4/7/2010**



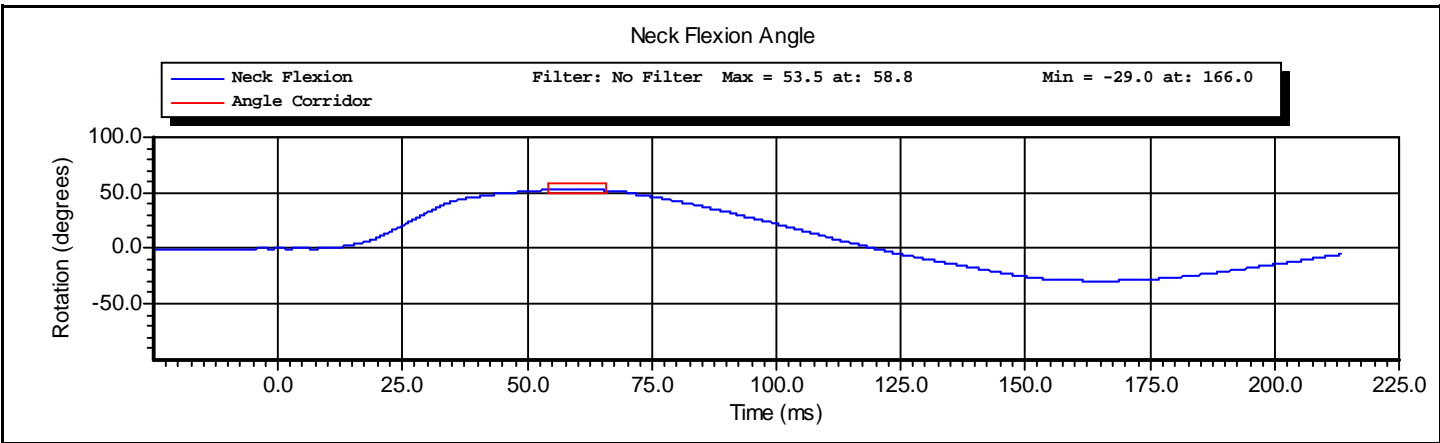
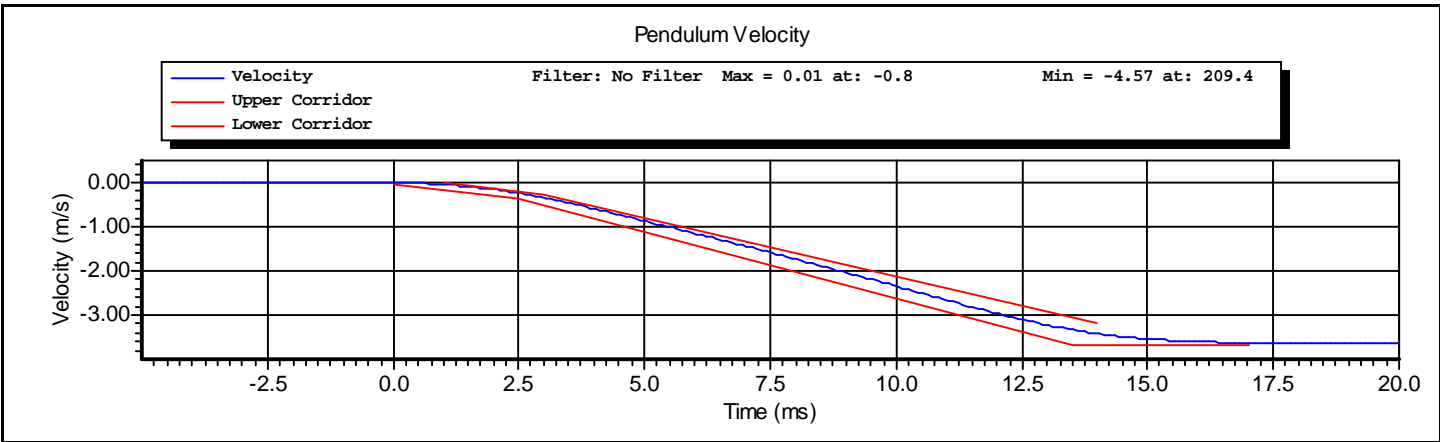
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|                    |                     |            |                    |
|--------------------|---------------------|------------|--------------------|
| Test Name:         | <b>Neck Flexion</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>       |            |                    |
| ATD Serial Number: | <b>D037</b>         |            |                    |
| Test ID:           | <b>Neck Flexion</b> | Test Date: | <b>4/7/2010</b>    |
| Test Number:       | <b>1</b>            | Test Time: | <b>11:22:05 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-2002</b>       | <b>19-020118A</b>       |

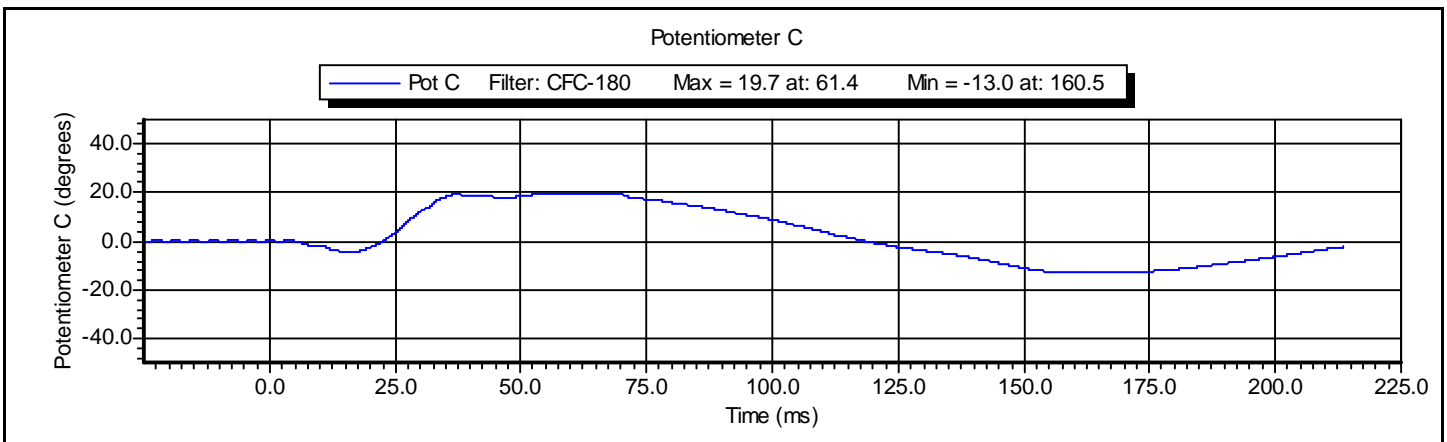
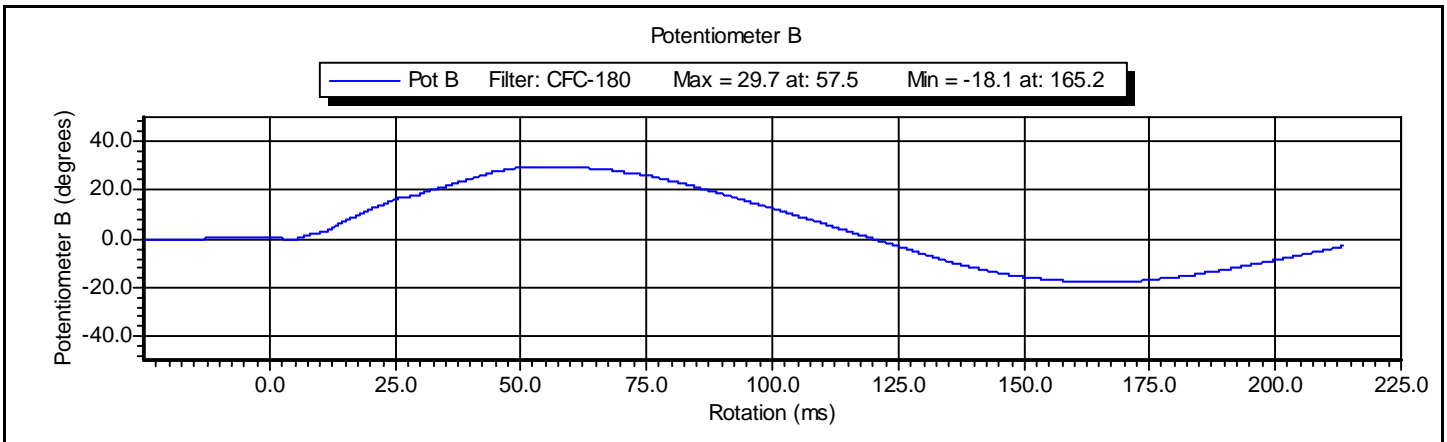
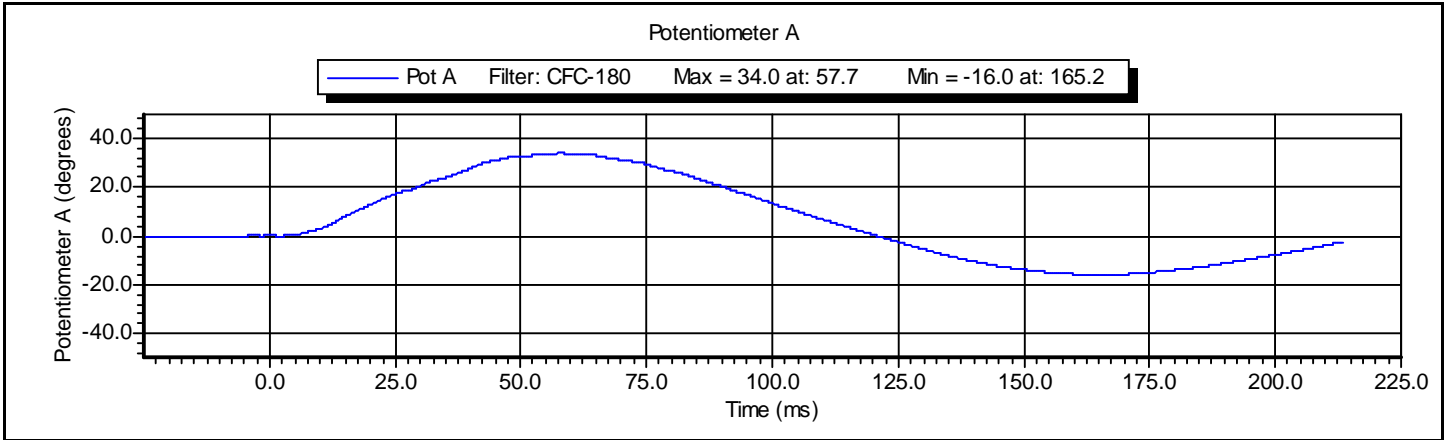


Test ID: **Neck Flexion**

Test Time: **11:22:05 AM**

Test Date: **4/7/2010**







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## VERIFICATION REPORT

|                    |                        |            |                   |
|--------------------|------------------------|------------|-------------------|
| Test Name:         | <b>Shoulder Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                        | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>          |            |                   |
| ATD Serial Number: | <b>D037</b>            |            |                   |
| Test ID:           | <b>Shoulder Impact</b> | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>               | Test Time: | <b>3:40:30 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>960715-313</b>     |                         |

| Test Parameters       | Test Specifications | Test Results        |
|-----------------------|---------------------|---------------------|
| Temperature           | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity              | 10.0 -- 70.0        | <b>39.0</b> %RH P   |
| Velocity              | 4.20 -- 4.40        | <b>4.29</b> m/s P   |
| Pendulum Acceleration | -10.50 -- -7.50     | <b>-7.90</b> g P    |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Shoulder Impact**      Test Time: **3:40:30 PM**      Test Date: **4/6/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 4/6/2010                |

Test ID: **Shoulder Impact**

Test Time: **3:40:30 PM**

Test Date: **4/6/2010**



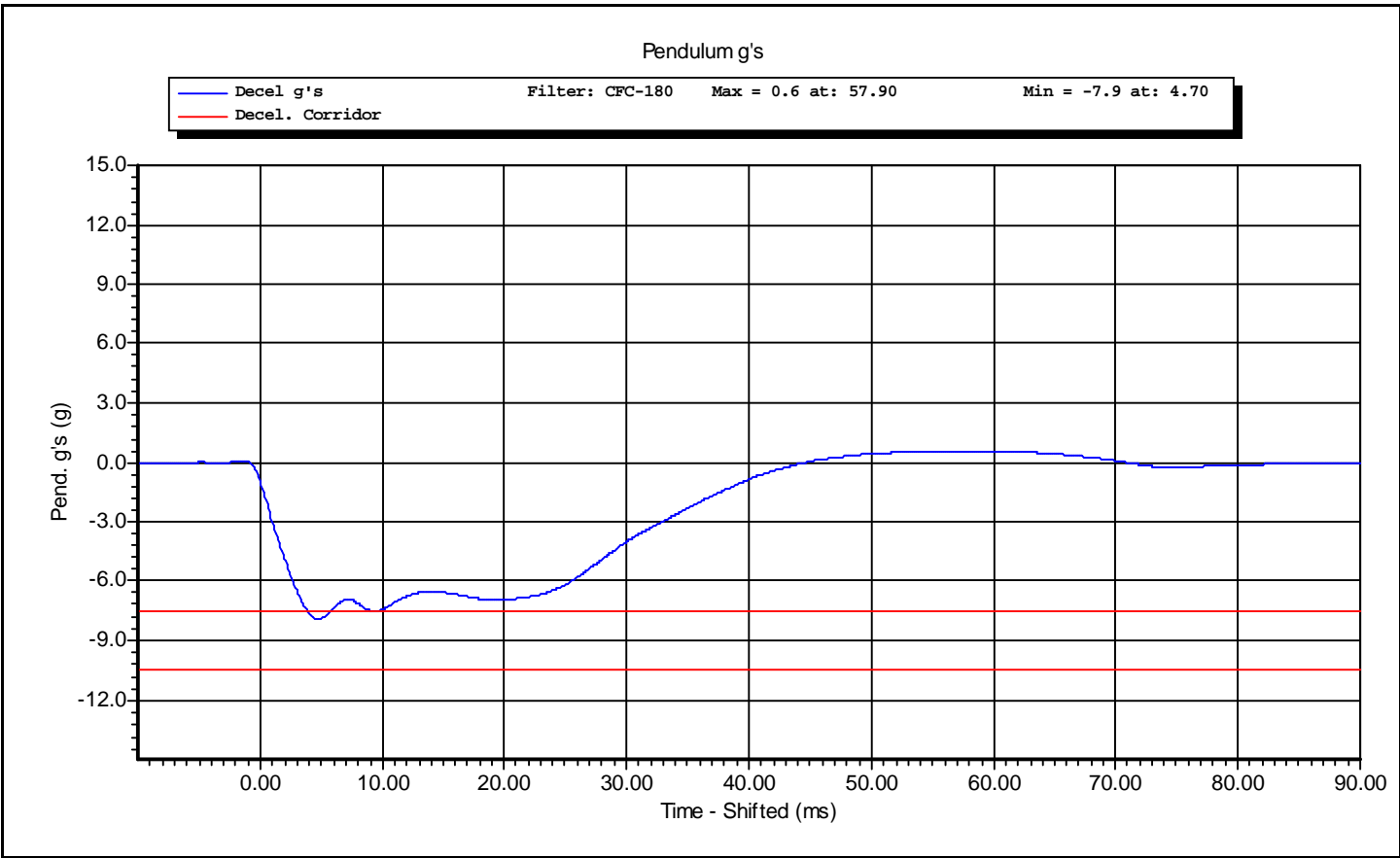
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|                    |                        |            |                   |
|--------------------|------------------------|------------|-------------------|
| Test Name:         | <b>Shoulder Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                        | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>          |            |                   |
| ATD Serial Number: | <b>D037</b>            |            |                   |
| Test ID:           | <b>Shoulder Impact</b> | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>               | Test Time: | <b>3:40:30 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>960715-313</b>     |                         |



Test ID: **Shoulder Impact**

Test Time: **3:40:30 PM**

Test Date: **4/6/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 4 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:12:15 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>40.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>3.99</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-47.99</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Lower Rib 4 m/s**

Test Time: **4:12:15 PM**

Test Date: **4/6/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Lower Rib 4 m/s**

Test Time: **4:12:15 PM**

Test Date: **4/6/2010**



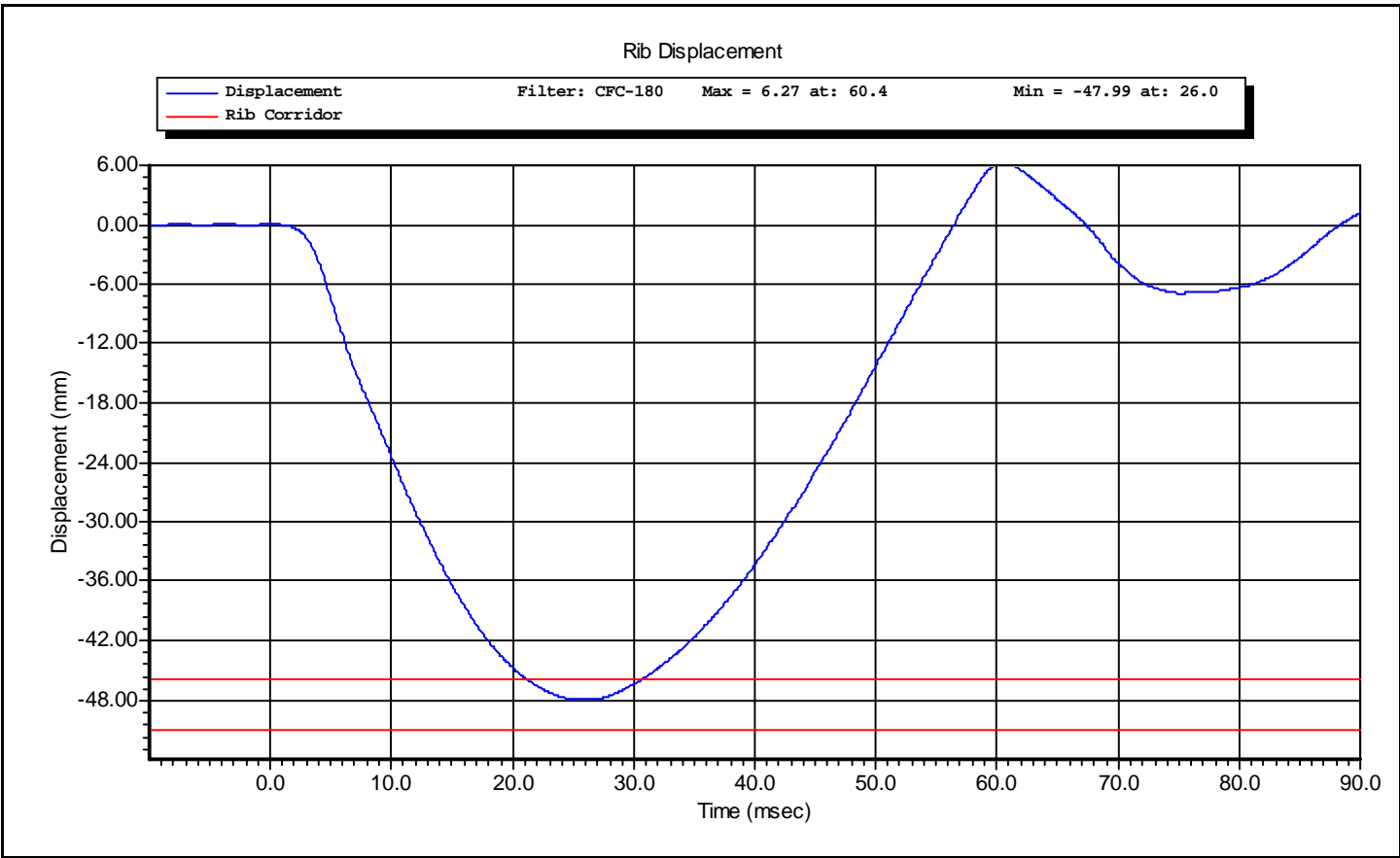
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 4 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:12:15 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |



Test ID: **Lower Rib 4 m/s**

Test Time: **4:12:15 PM**

Test Date: **4/6/2010**



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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 3 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:17:53 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>40.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.98</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-38.34</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Lower Rib 3 m/s**

Test Time: **4:17:53 PM**

Test Date: **4/6/2010**





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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Lower Rib 3 m/s**

Test Time: **4:17:53 PM**

Test Date: **4/6/2010**



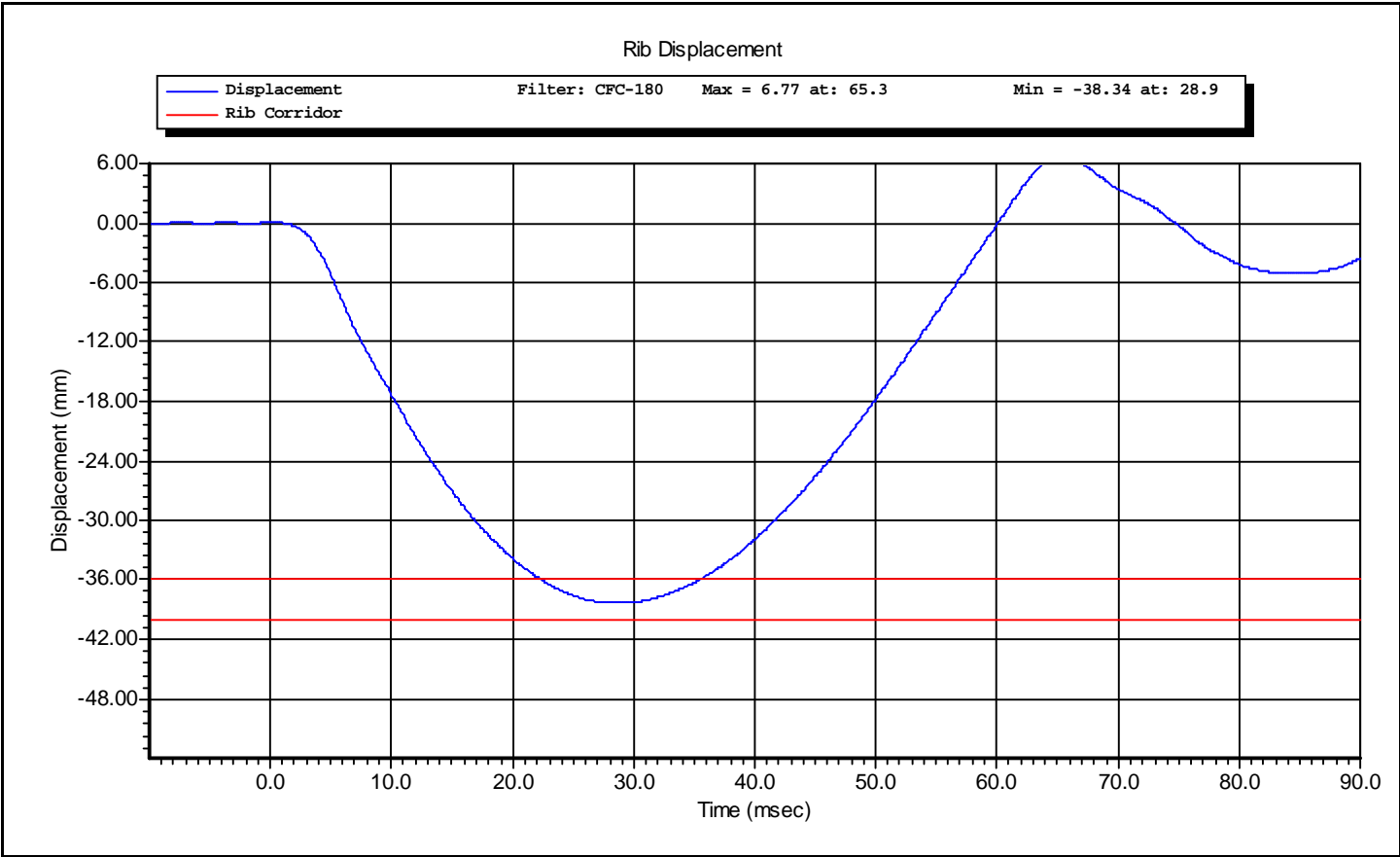
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Lower Rib 3 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:17:53 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0126A</b>       |



Test ID: **Lower Rib 3 m/s**

Test Time: **4:17:53 PM**

Test Date: **4/6/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 4 m/s</b>       | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>8:18:12 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>39.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>4.01</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-48.33</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Middle Rib 4 m/s**

Test Time: **8:18:12 AM**

Test Date: **4/7/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Middle Rib 4 m/s**

Test Time: **8:18:12 AM**

Test Date: **4/7/2010**



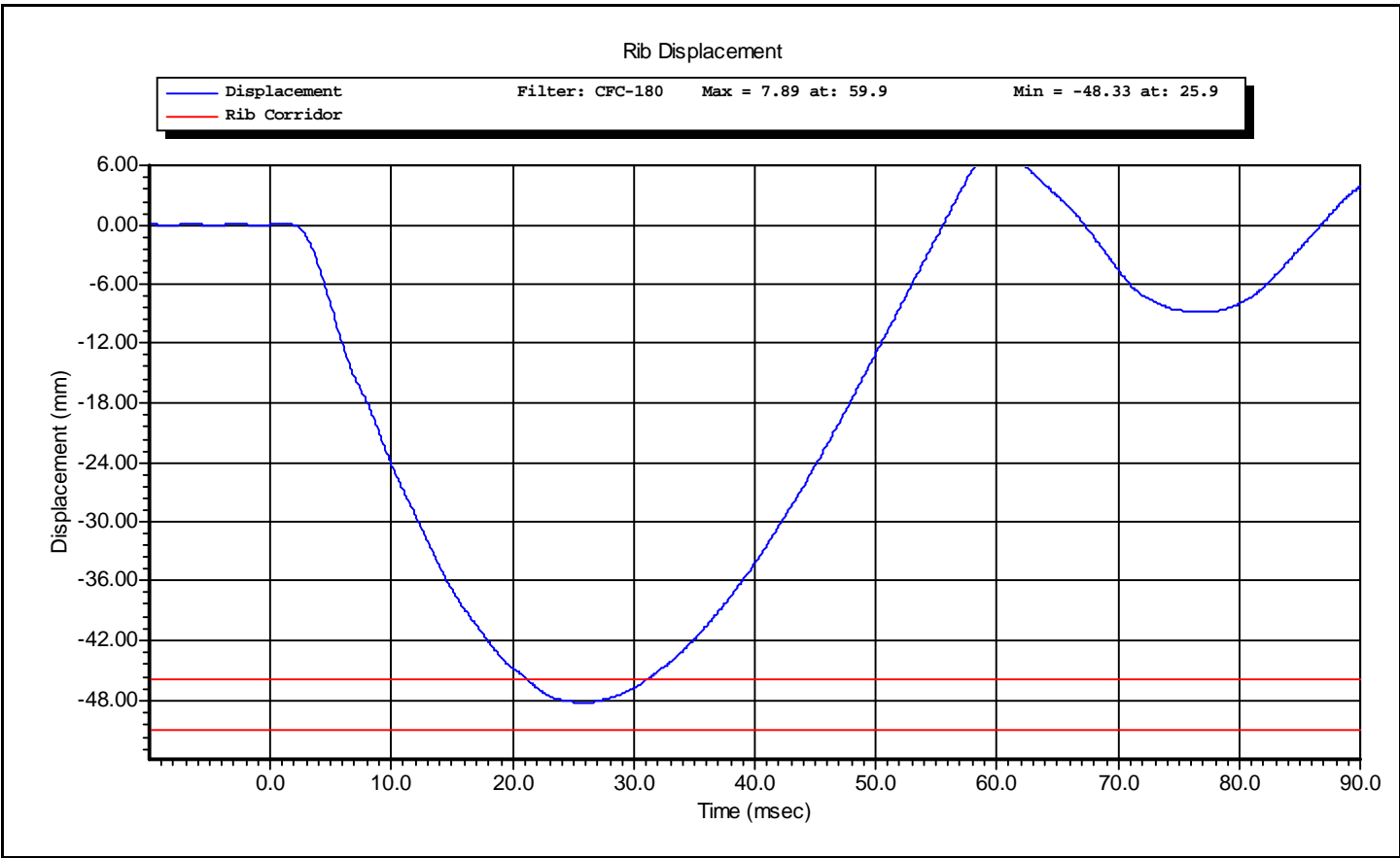
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 4 m/s</b>       | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>8:18:12 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0125A</b>       |



Test ID: **Middle Rib 4 m/s**

Test Time: **8:18:12 AM**

Test Date: **4/7/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 3 m/s</b>       | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>8:25:01 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-1025A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>39.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.99</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-37.57</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Middle Rib 3 m/s**

Test Time: **8:25:01 AM**

Test Date: **4/7/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Middle Rib 3 m/s**

Test Time: **8:25:01 AM**

Test Date: **4/7/2010**



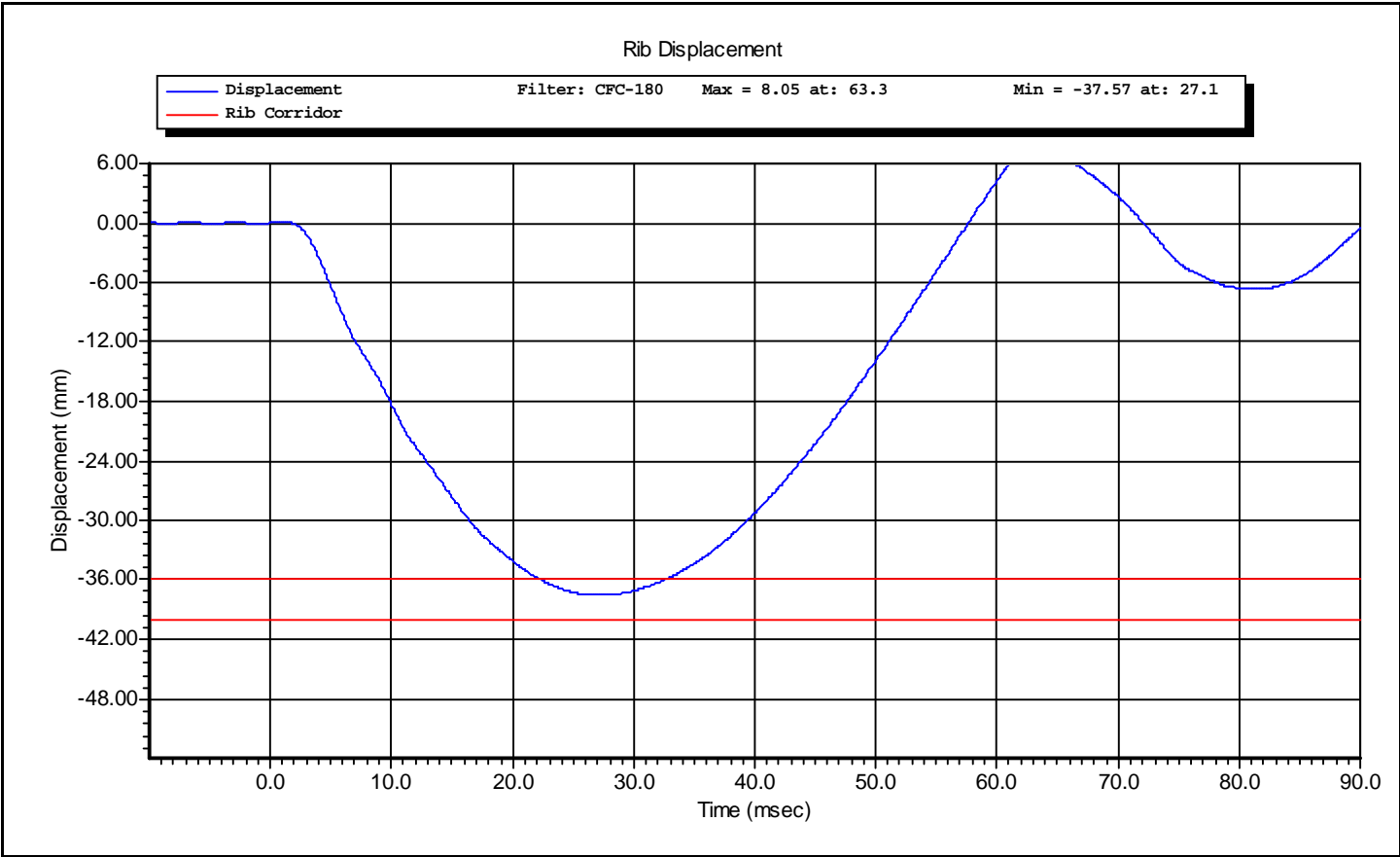
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Middle Rib 3 m/s</b>       | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>8:25:01 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-1025A</b>       |



Test ID: **Middle Rib 3 m/s**

Test Time: **8:25:01 AM**

Test Date: **4/7/2010**





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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 4 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:59:07 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>40.0</b> %RH P   |
| Velocity         | 3.90 -- 4.10        | <b>4.00</b> m/s P   |
| Rib Displacement | -51.00 -- -46.00    | <b>-49.35</b> mm P  |
| Drop Height      | 807.0 -- 823.0      | <b>815.0</b> mm P   |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Upper Rib 4 m/s**

Test Time: **3:59:07 PM**

Test Date: **4/6/2010**



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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Upper Rib 4 m/s**

Test Time: **3:59:07 PM**

Test Date: **4/6/2010**



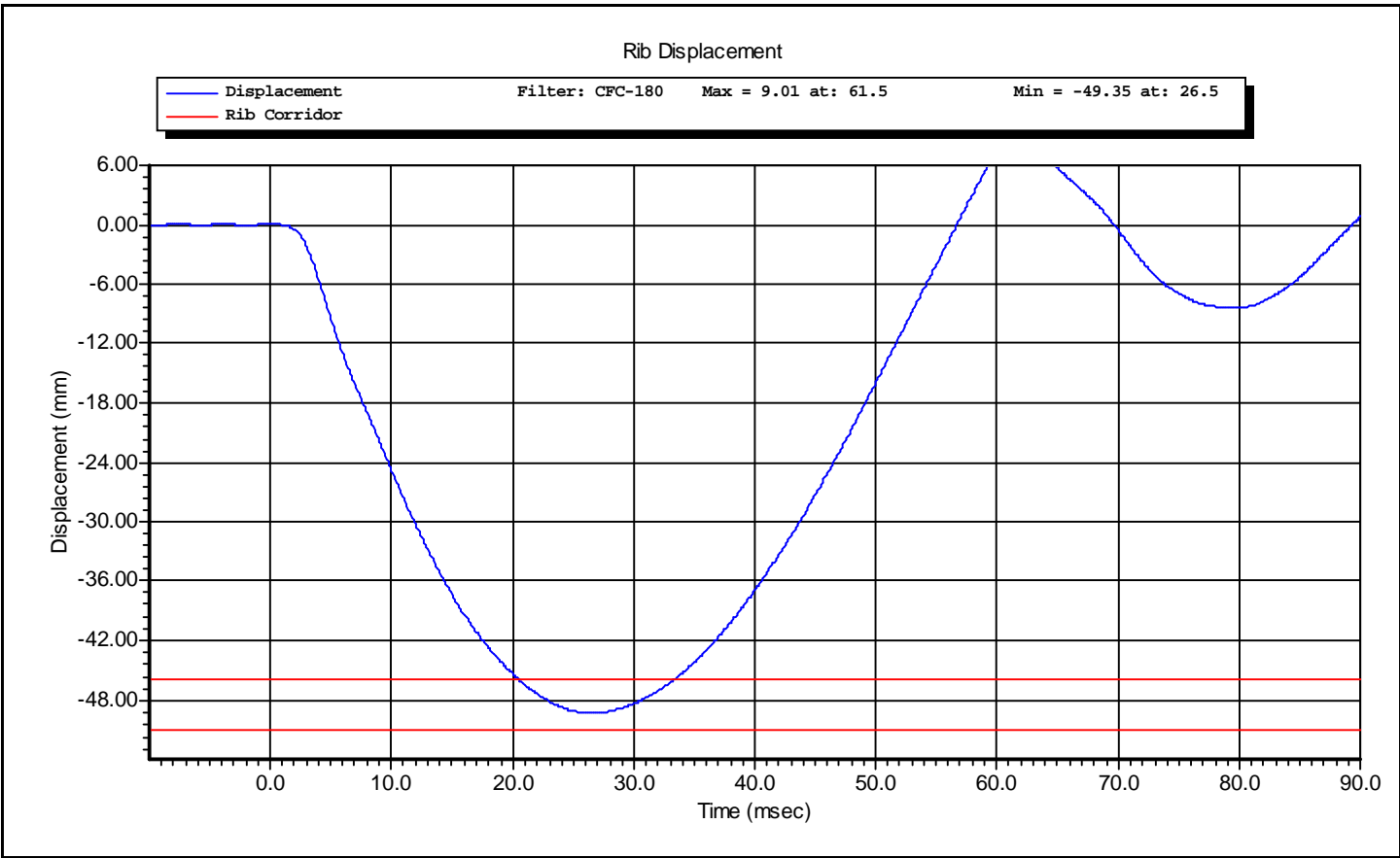
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>4.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 4 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>3:59:07 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |



Test ID: **Upper Rib 4 m/s**

Test Time: **3:59:07 PM**

Test Date: **4/6/2010**



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## VERIFICATION REPORT

|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 3 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:06:41 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |

| Test Parameters  | Test Specifications | Test Results        |
|------------------|---------------------|---------------------|
| Temperature      | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity         | 10.0 -- 70.0        | <b>40.0</b> %RH P   |
| Velocity         | 2.90 -- 3.10        | <b>2.95</b> m/s P   |
| Rib Displacement | -40.00 -- -36.00    | <b>-38.03</b> mm P  |
| Drop Height      | 454 -- 464          | <b>459</b> mm P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_

Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Upper Rib 3 m/s**

Test Time: **4:06:41 PM**

Test Date: **4/6/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P23137               | 1/22/2010               |

Test ID: **Upper Rib 3 m/s**

Test Time: **4:06:41 PM**

Test Date: **4/6/2010**



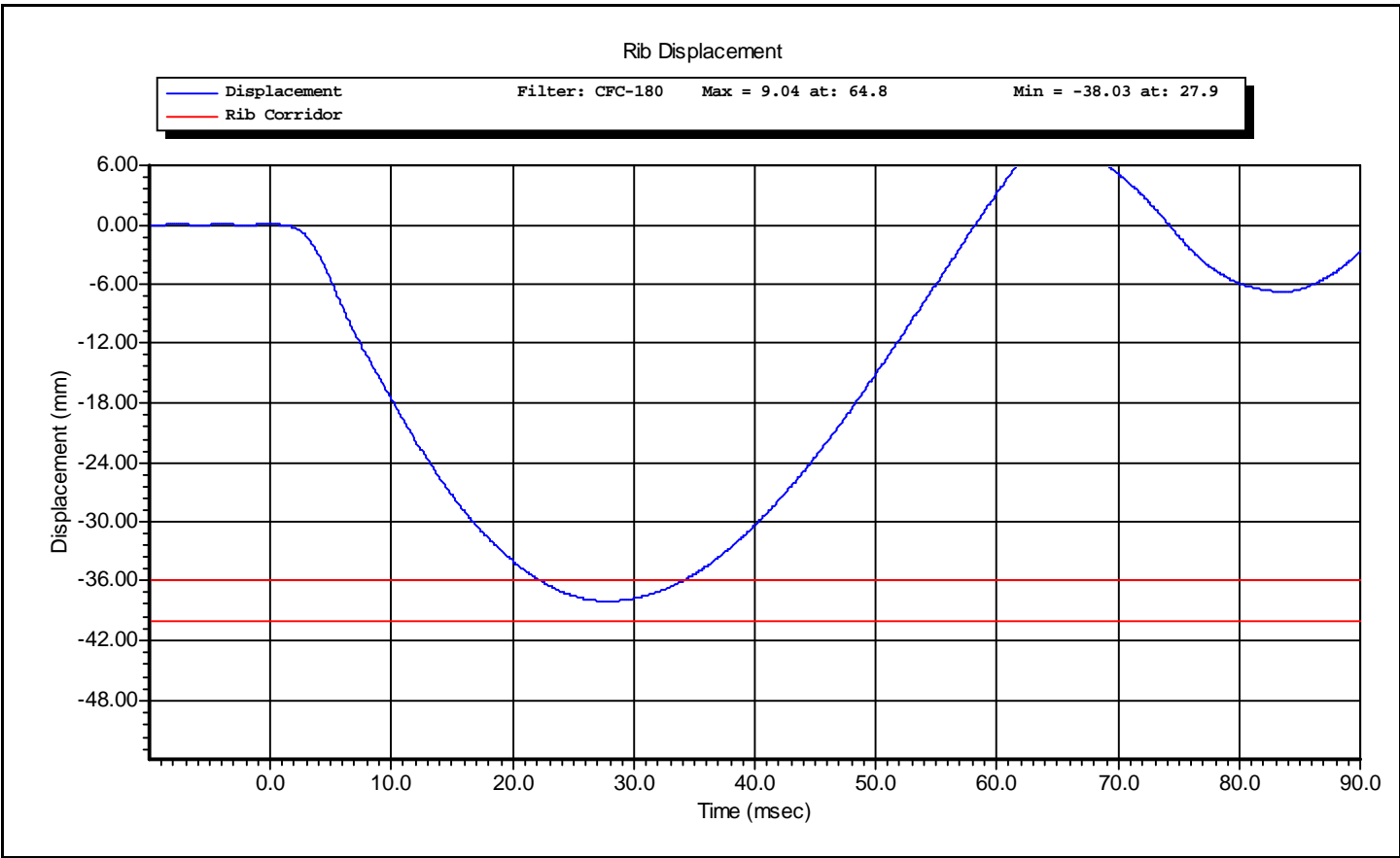
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|                    |                               |            |                   |
|--------------------|-------------------------------|------------|-------------------|
| Test Name:         | <b>Full Rib Module Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     | <b>3.0 Meters/Second</b>      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>                 |            |                   |
| ATD Serial Number: | <b>D037</b>                   |            |                   |
| Test ID:           | <b>Upper Rib 3 m/s</b>        | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>                      | Test Time: | <b>4:06:41 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-3100</b>       | <b>1954-0124A</b>       |



Test ID: **Upper Rib 3 m/s**

Test Time: **4:06:41 PM**

Test Date: **4/6/2010**



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## VERIFICATION REPORT

|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Thorax Impact</b> | Revision:  | <b>8/15/2008</b>  |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Thorax Impact</b> | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>             | Test Time: | <b>9:43:38 AM</b> |

|                              |                         |
|------------------------------|-------------------------|
| Component Part Number        | Component Serial Number |
| <b>Upper Rib - 175-4002</b>  | <b>1954-0124A</b>       |
| <b>Middle Rib - 175-4002</b> | <b>1954-0125A</b>       |
| <b>Lower Rib - 175-4002</b>  | <b>1954-0126A</b>       |

| Test Parameters         | Test Specifications | Test Results        |
|-------------------------|---------------------|---------------------|
| Temperature             | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity                | 10.0 -- 70.0        | <b>40.0</b> %RH P   |
| Velocity                | 5.40 -- 5.60        | <b>5.50</b> m/s P   |
| Upper Rib Displacement  | 34.0 -- 41.0        | <b>36.0</b> mm P    |
| Middle Rib Displacement | 37.0 -- 45.0        | <b>40.8</b> mm P    |
| Lower Rib Displacement  | 37.0 -- 44.0        | <b>43.1</b> mm P    |
| Impactor Force          | 5100 -- 6200        | <b>5789</b> N P     |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_  
Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Thorax Impact**

Test Time: **9:43:38 AM**

Test Date: **4/7/2010**



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#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 4/6/2010                |
| Honeywell           | MLT-38000     | DS-0552-01           | 1/11/2010               |
| Honeywell           | MLT-38000     | DS-0807              | 1/11/2010               |
| Honeywell           | MLT-38000     | DS-0552-3            | 1/11/2010               |

Test ID: **Thorax Impact**

Test Time: **9:43:38 AM**

Test Date: **4/7/2010**





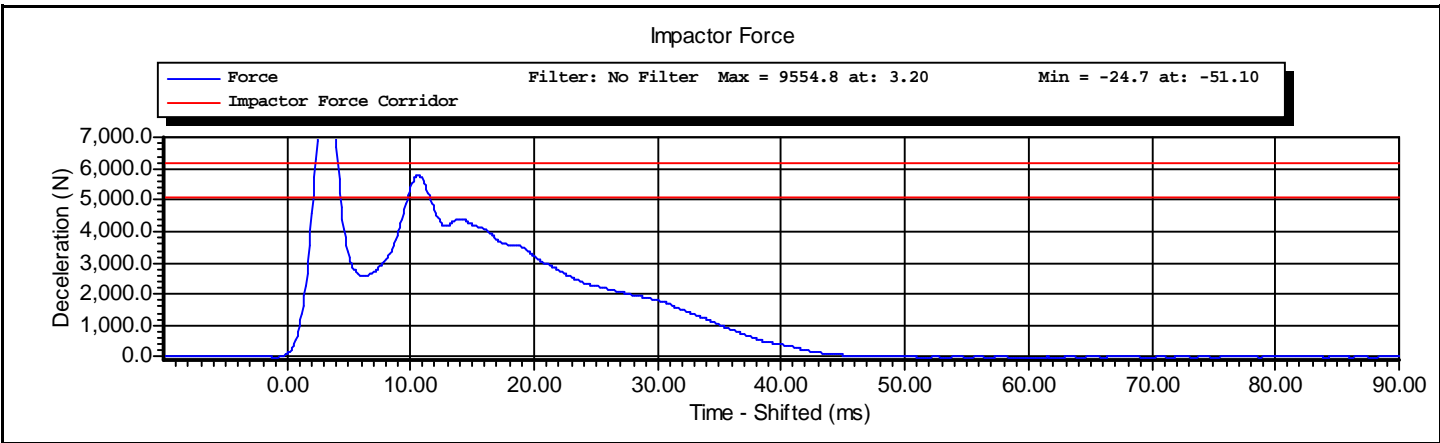
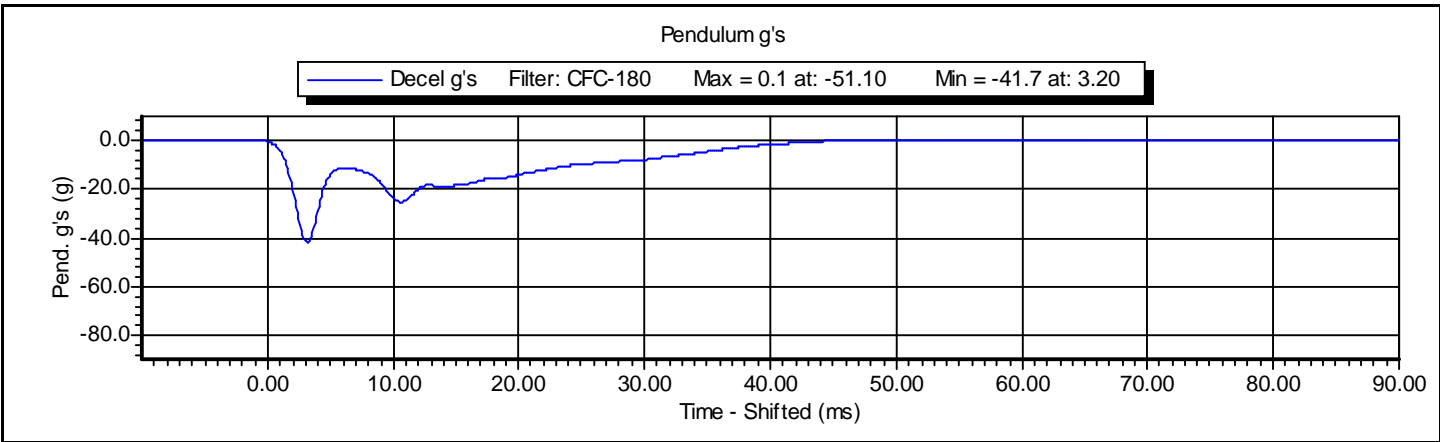
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|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Thorax Impact</b> | Revision:  | <b>8/15/2008</b>  |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Thorax Impact</b> | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>1</b>             | Test Time: | <b>9:43:38 AM</b> |

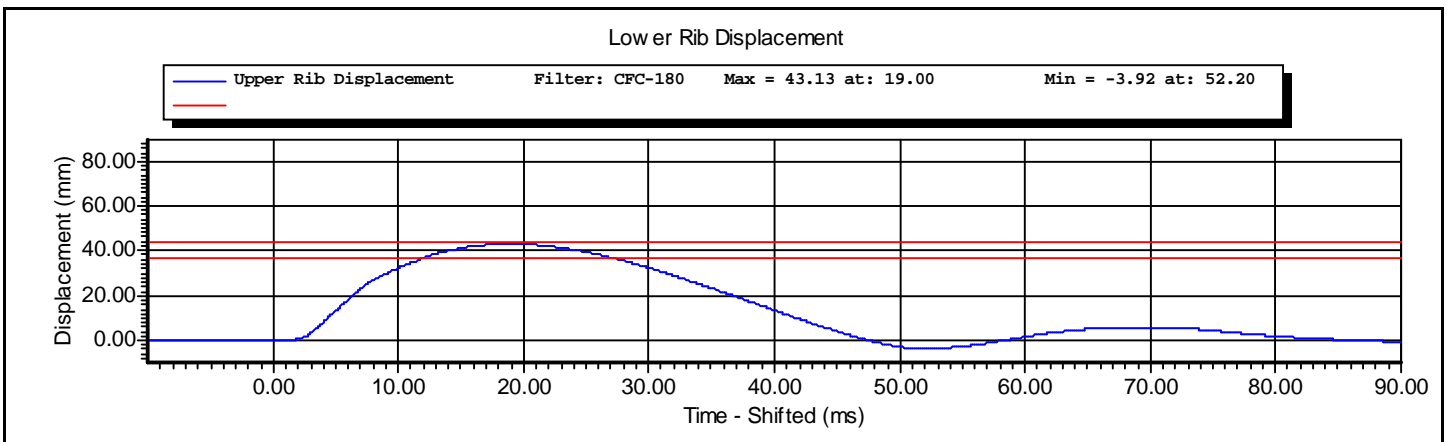
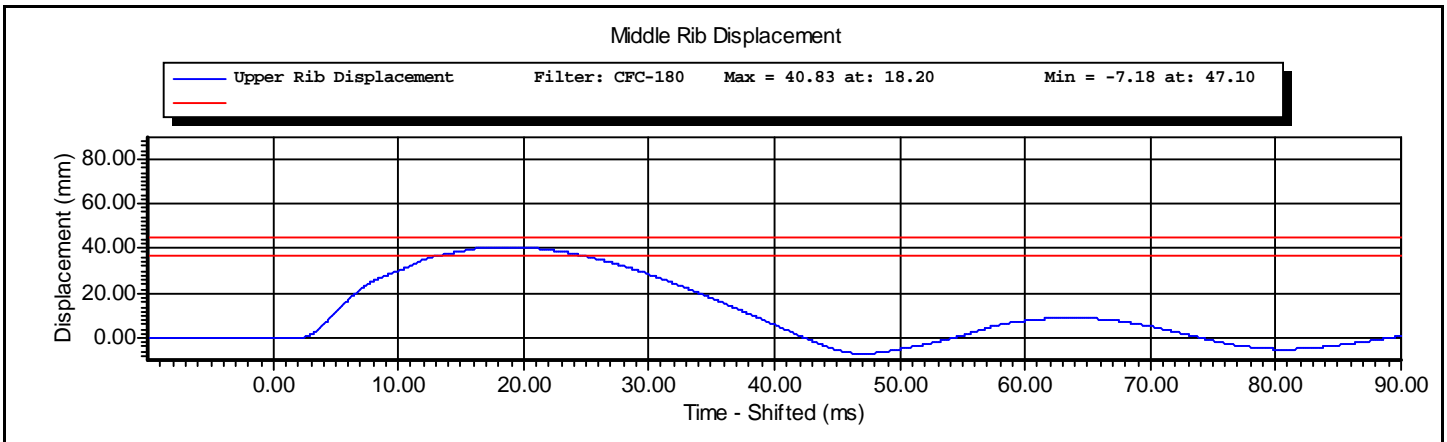
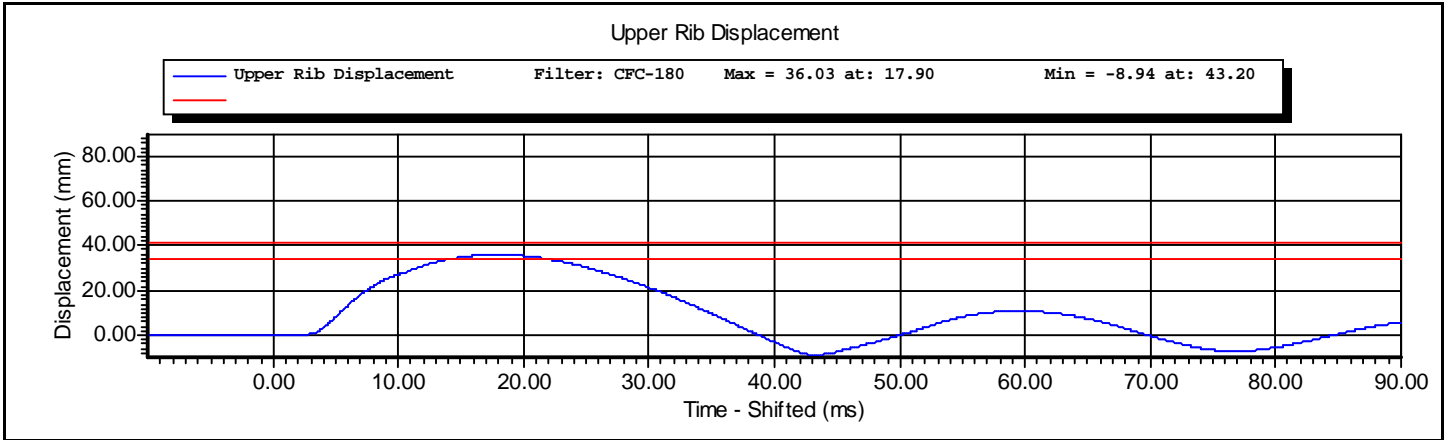
|                             |                         |
|-----------------------------|-------------------------|
| Component Part Number       | Component Serial Number |
| <b>Upper Rib - 175-4002</b> | <b>1954-0124A</b>       |



Test ID: **Thorax Impact**

Test Time: **9:43:38 AM**

Test Date: **4/7/2010**





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## VERIFICATION REPORT

|                    |                         |            |                    |
|--------------------|-------------------------|------------|--------------------|
| Test Name:         | <b>Abdominal Impact</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                         | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>           |            |                    |
| ATD Serial Number: | <b>D037</b>             |            |                    |
| Test ID:           | <b>Abdominal Impact</b> | Test Date: | <b>4/8/2010</b>    |
| Test Number:       | <b>1</b>                | Test Time: | <b>10:13:08 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4001</b>       | <b>1804-00882</b>       |

Comments:  
Denton abdomen S/N 1804-00882; previous abdomen Denton S/N 19-179

| Test Parameters              | Test Specifications | Test Results        |
|------------------------------|---------------------|---------------------|
| Temperature                  | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity                     | 10 -- 70            | <b>45</b> %RH P     |
| Velocity                     | 3.90 -- 4.10        | <b>3.93</b> m/s P   |
| Peak Abdominal Force         | -2.70 -- -2.20      | <b>-2.70</b> kN P   |
| Time At Peak Abdominal Force | 10.0 -- 12.3        | <b>11.0</b> ms P    |
| Maximum Pendulum Force       | -4.80 -- -4.00      | <b>-4.40</b> kN P   |
| Time at Peak Pendulum Force  | 10.6 -- 13.0        | <b>11.4</b> ms P    |

All test parameters are within specifications

Technician:     **A. Rudniski**     Signature: \_\_\_\_\_  
Supervisor:     **D. Travale**     Signature: \_\_\_\_\_

Test ID: **Abdominal Impact**      Test Time: **10:13:08 AM**      Test Date: **4/8/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 4/6/2010                |
| Denton              | 2631          | LC-1507Fy            | 1/7/2010                |
| Denton              | 2631          | LC-1508Fy            | 1/7/2010                |
| Denton              | 2631          | LC-1509Fy            | 1/7/2010                |

Test ID: **Abdominal Impact** Test Time: **10:13:08 AM**

Test Date: **4/8/2010**



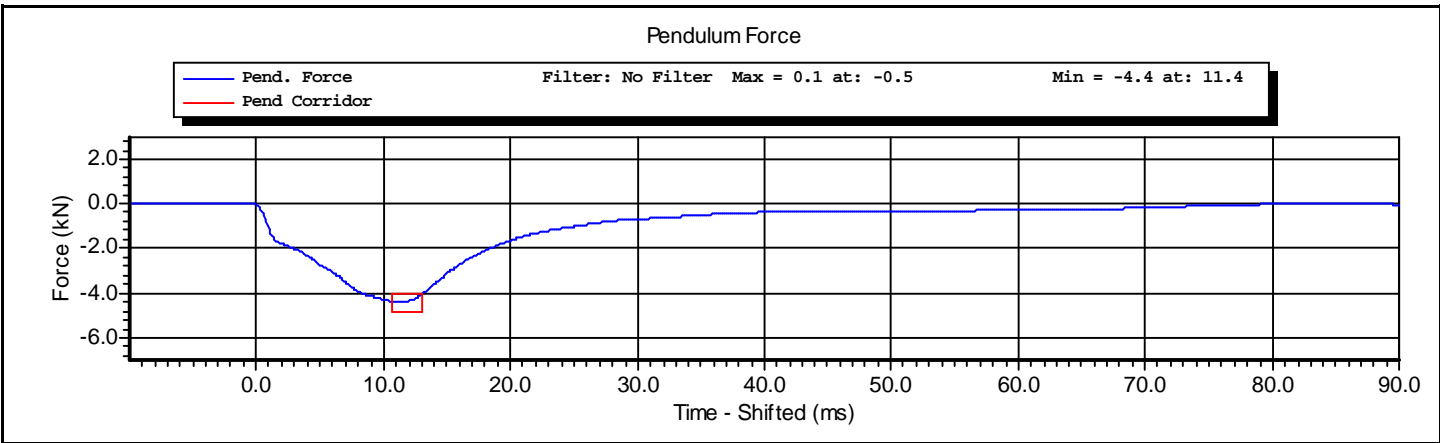
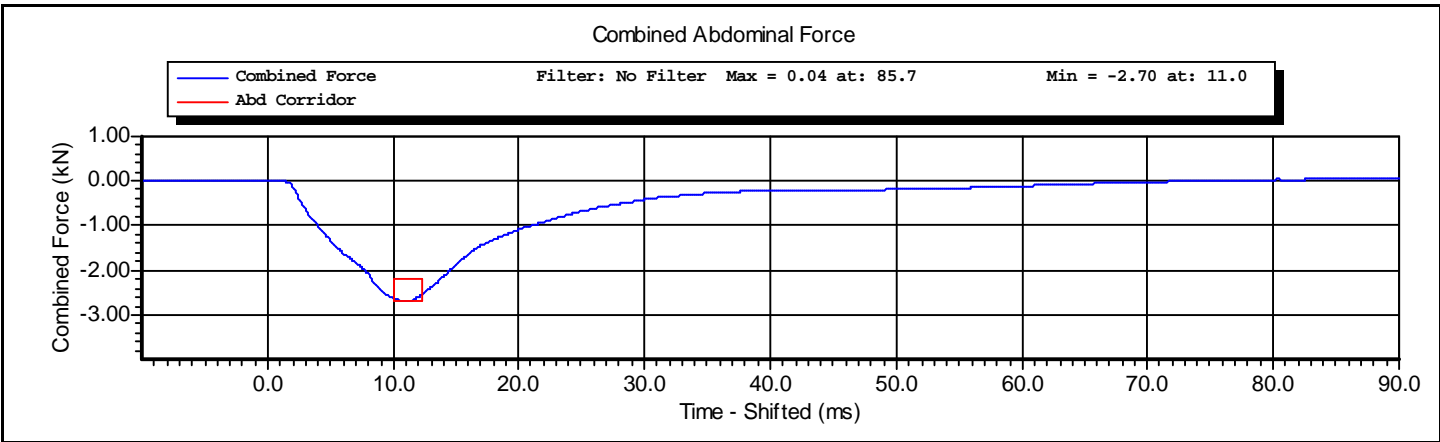
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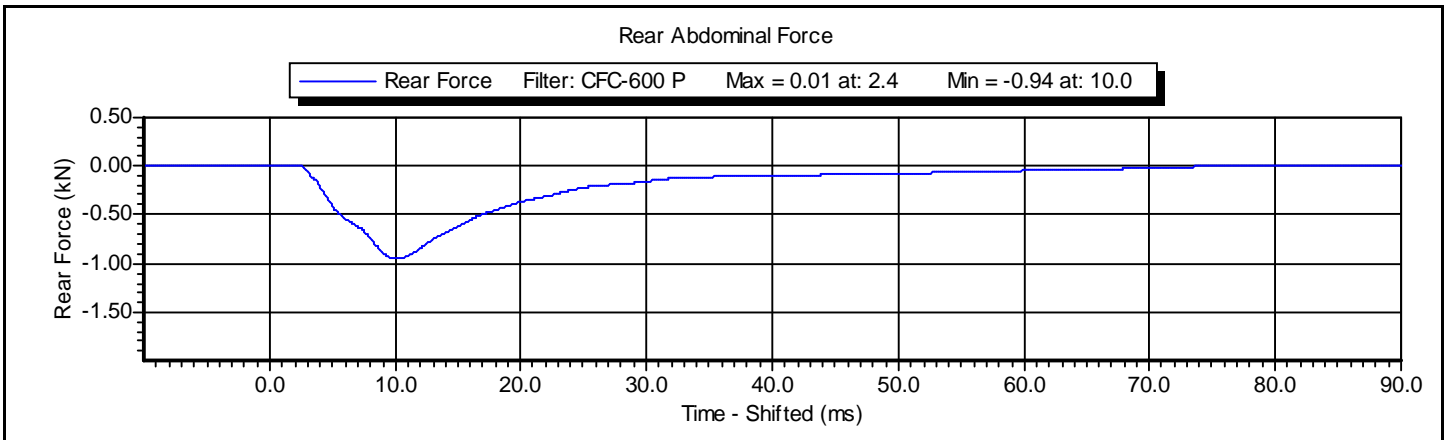
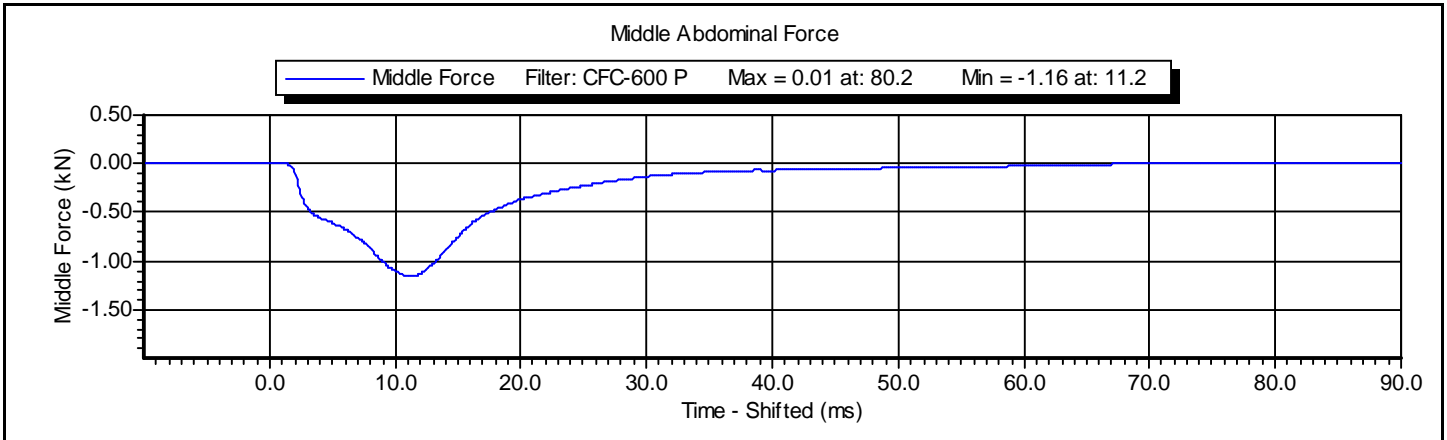
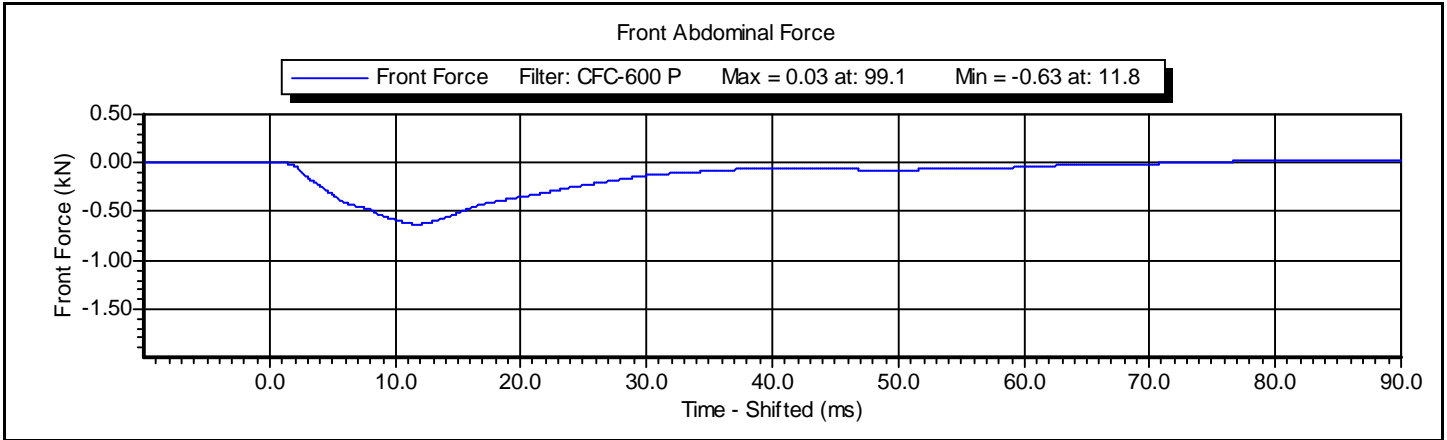
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|                    |                         |            |                    |
|--------------------|-------------------------|------------|--------------------|
| Test Name:         | <b>Abdominal Impact</b> | Revision:  | <b>12/14/2006</b>  |
| Sub Test Name:     |                         | Spec Type: | <b>NHTSA</b>       |
| ATD Type:          | <b>ES-2re</b>           |            |                    |
| ATD Serial Number: | <b>D037</b>             |            |                    |
| Test ID:           | <b>Abdominal Impact</b> | Test Date: | <b>4/8/2010</b>    |
| Test Number:       | <b>1</b>                | Test Time: | <b>10:13:08 AM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4001</b>       | <b>1804-00882</b>       |







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## VERIFICATION REPORT

|                    |                     |            |                   |
|--------------------|---------------------|------------|-------------------|
| Test Name:         | <b>Lumbar Spine</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>       |            |                   |
| ATD Serial Number: | <b>D037</b>         |            |                   |
| Test ID:           | <b>Lumbar Spine</b> | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>4</b>            | Test Time: | <b>3:52:49 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>175-5501</b>       | <b>15-0376</b>          |

| Test Parameters                        | Test Specifications | Test Results          |
|--|---------------------|-----------------------|
| Temperature                            | 20.6 -- 22.2        | <b>22.2</b> deg C P   |
| Humidity                               | 10 -- 70            | <b>40</b> %RH P       |
| Velocity                               | 5.95 -- 6.15        | <b>6.01</b> m/s P     |
| Maximum Headform Flexion Angle         | 45.0 -- 55.0        | <b>48.3</b> degrees P |
| Time at Maximum Headform Flexion Angle | 39.0 -- 53.0        | <b>44.0</b> ms P      |
| Decay to Zero Degrees                  | 37.0 -- 57.0        | <b>37.6</b> ms P      |
| Velocity Corridor                      | --                  | P                     |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Ttravale** Signature: \_\_\_\_\_

Test ID: **Lumbar Spine**

Test Time: **3:52:49 PM**

Test Date: **4/7/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7231CT        | AF5B3                | 2/24/2010               |
| DentonATD           | 7000428       | 094                  | 10/23/2009              |
| DentonATD           | 7000428       | 095                  | 10/23/2009              |
| DentonATD           | 7000428       | 093                  | 10/23/2009              |

Test ID: **Lumbar Spine**

Test Time: **3:52:49 PM**

Test Date: **4/7/2010**





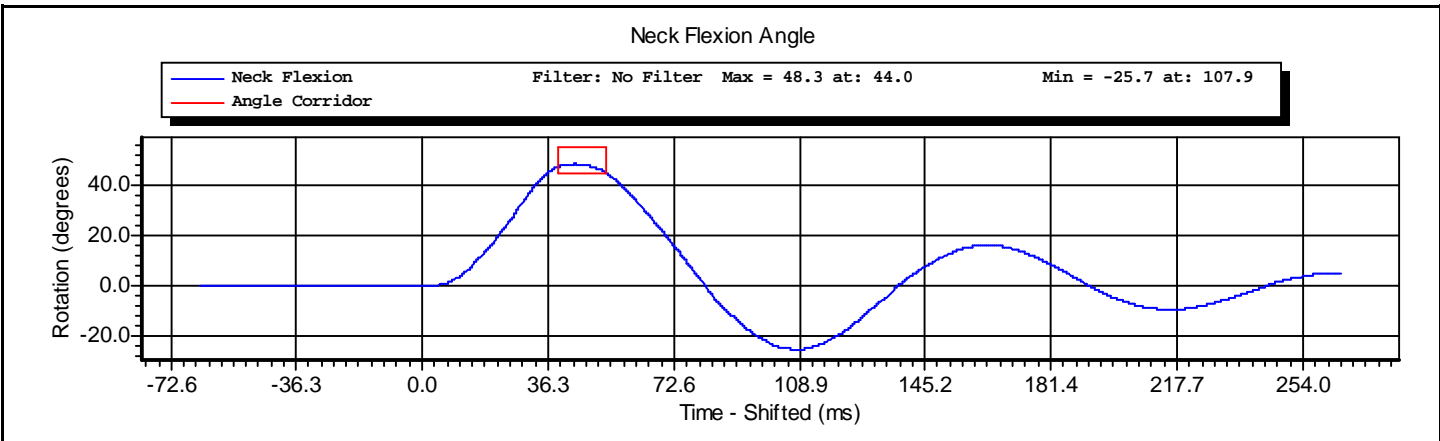
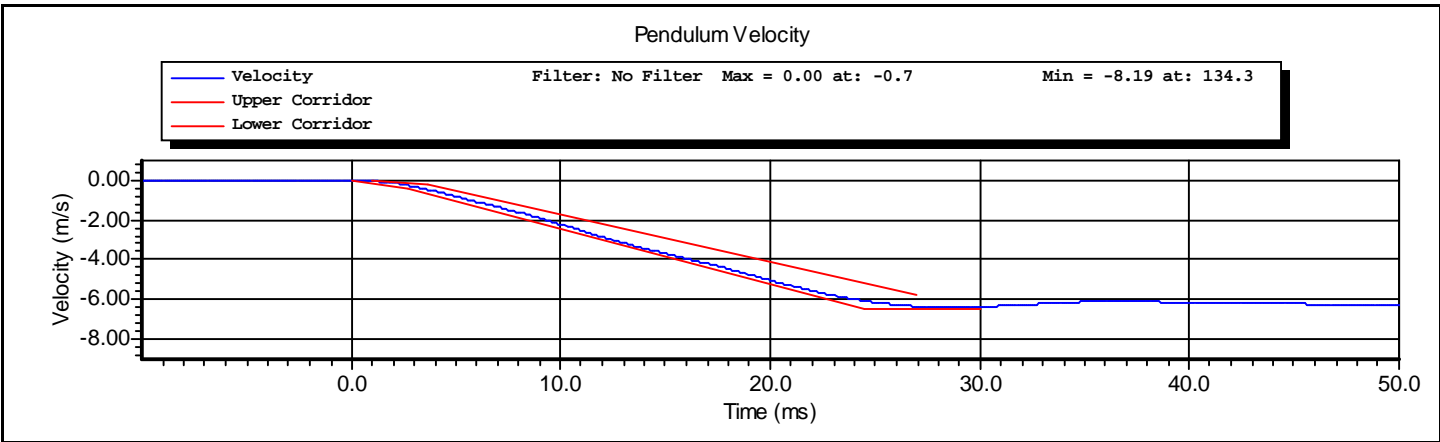
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|                    |                     |            |                   |
|--------------------|---------------------|------------|-------------------|
| Test Name:         | <b>Lumbar Spine</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                     | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>       |            |                   |
| ATD Serial Number: | <b>D037</b>         |            |                   |
| Test ID:           | <b>Lumbar Spine</b> | Test Date: | <b>4/7/2010</b>   |
| Test Number:       | <b>4</b>            | Test Time: | <b>3:52:49 PM</b> |

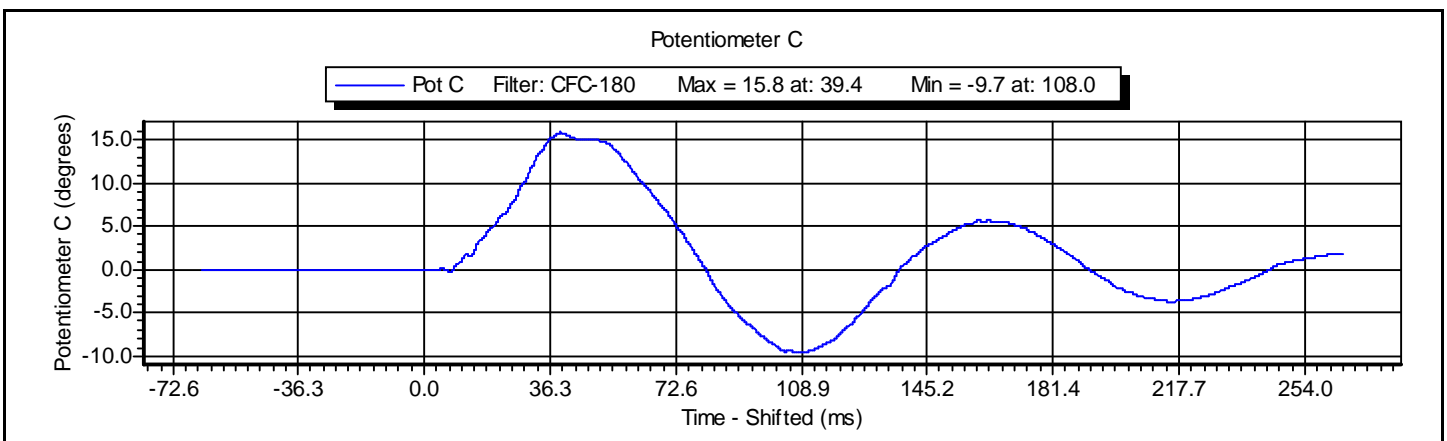
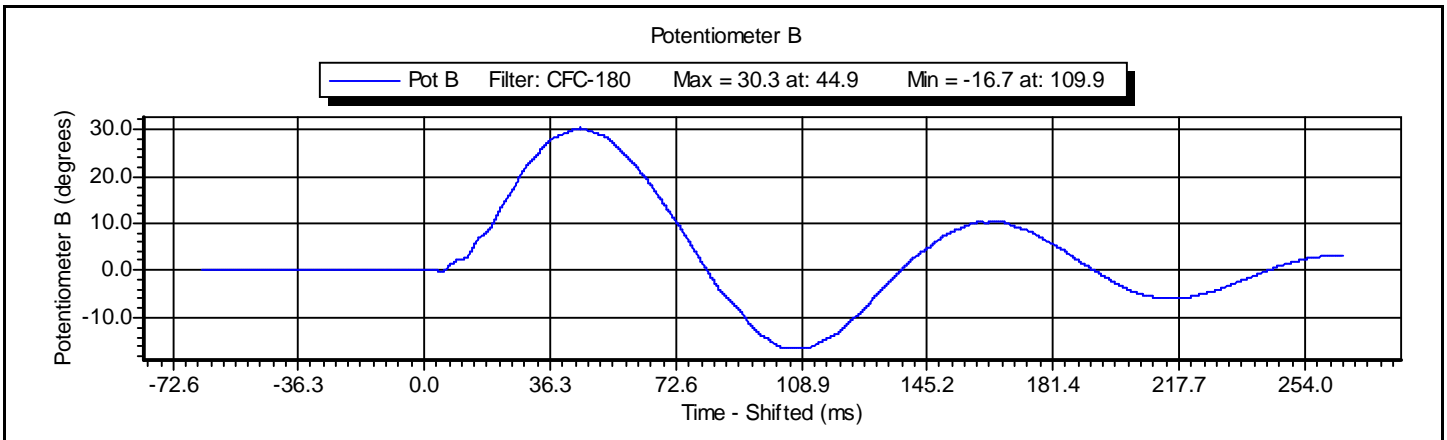
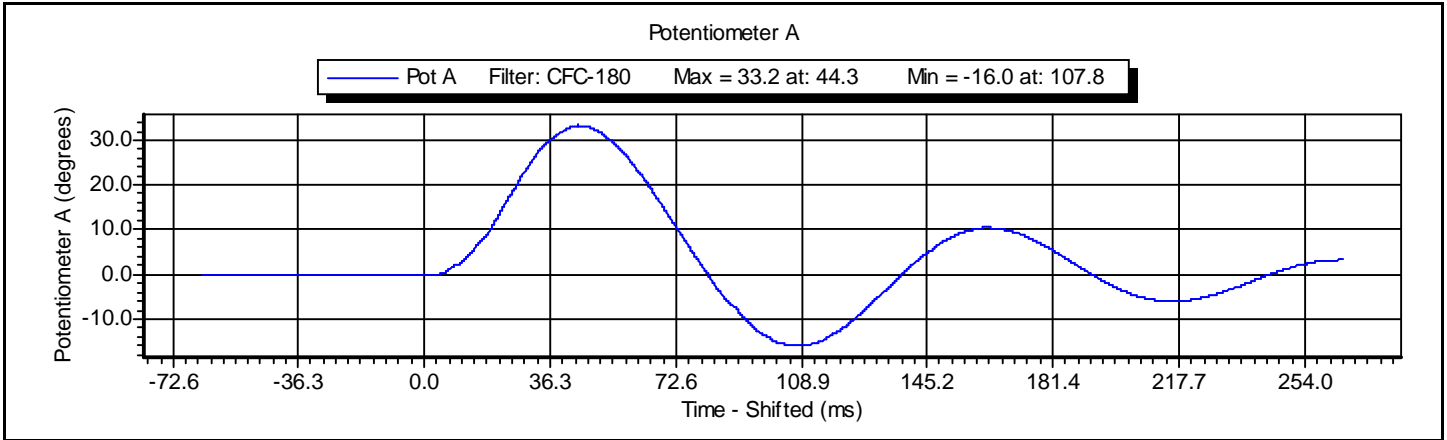
|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>175-5501</b>       | <b>15-0376</b>          |



Test ID: **Lumbar Spine**

Test Time: **3:52:49 PM**

Test Date: **4/7/2010**





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## VERIFICATION REPORT

|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Pelvis Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Pelvis Impact</b> | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>             | Test Time: | <b>3:22:16 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4003</b>       |                         |

| Test Parameters                    | Test Specifications | Test Results        |
|------------------------------------|---------------------|---------------------|
| Temperature                        | 20.6 -- 22.2        | <b>22.2</b> deg C P |
| Humidity                           | 10 -- 70            | <b>40</b> %RH P     |
| Velocity                           | 4.20 -- 4.40        | <b>4.27</b> m/s P   |
| Peak Pendulum Force                | -5.40 -- -4.70      | <b>-5.14</b> kN P   |
| Time at Peak Pendulum Force        | 11.80 -- 16.10      | <b>14.70</b> ms P   |
| Peak Pubic Symphysis Force         | -1.59 -- -1.23      | <b>-1.52</b> kN P   |
| Time at Peak Pubic Symphysis Force | 12.20 -- 17.00      | <b>15.20</b> ms P   |

All test parameters are within specifications

Technician: **A. Rudniski** Signature: \_\_\_\_\_

Supervisor: **D. Travale** Signature: \_\_\_\_\_

Test ID: **Pelvis Impact**

Test Time: **3:22:16 PM**

Test Date: **4/6/2010**



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### VERIFICATION REPORT

#### REFERENCE EQUIPMENT

| <u>Manufacturer</u> | <u>Model</u>  | <u>Serial Number</u> | <u>Calibration Date</u> |
|---------------------|---------------|----------------------|-------------------------|
| DentonATD           | Velocity Trap | 1                    | 1/11/2010               |
| Endevco             | 7264-2000     | P16576               | 4/6/2010                |
| Denton              | 3096          | LC-458Fy             | 1/7/2010                |

Test ID: **Pelvis Impact**

Test Time: **3:22:16 PM**

Test Date: **4/6/2010**



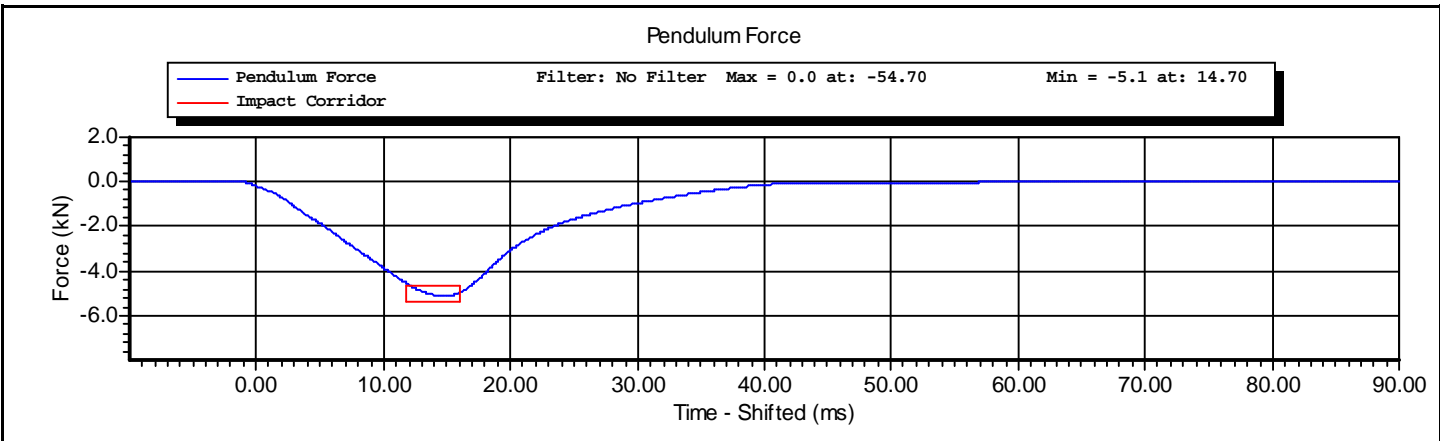
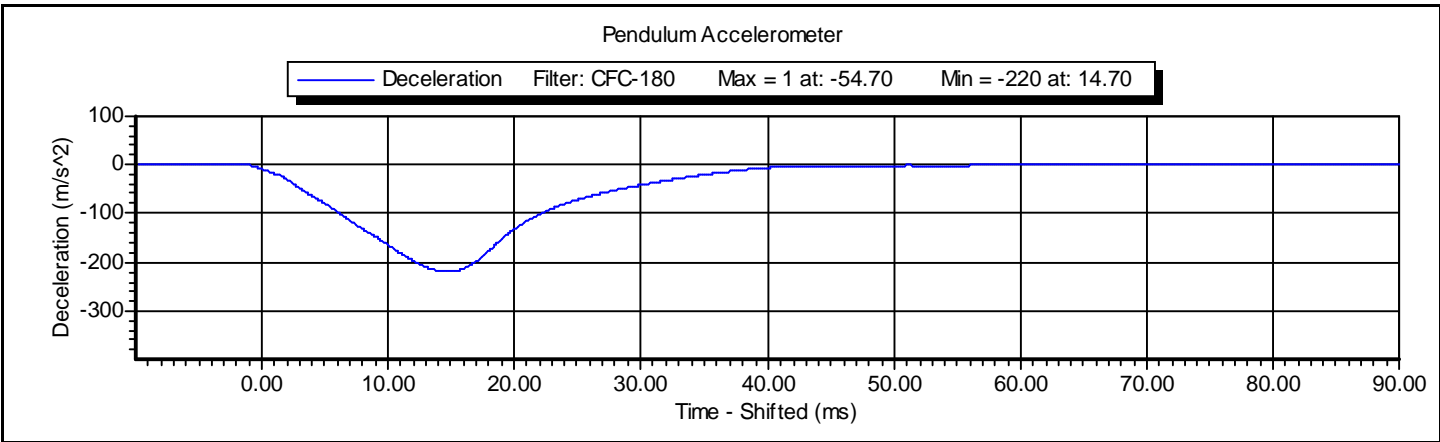
www.calspan.com

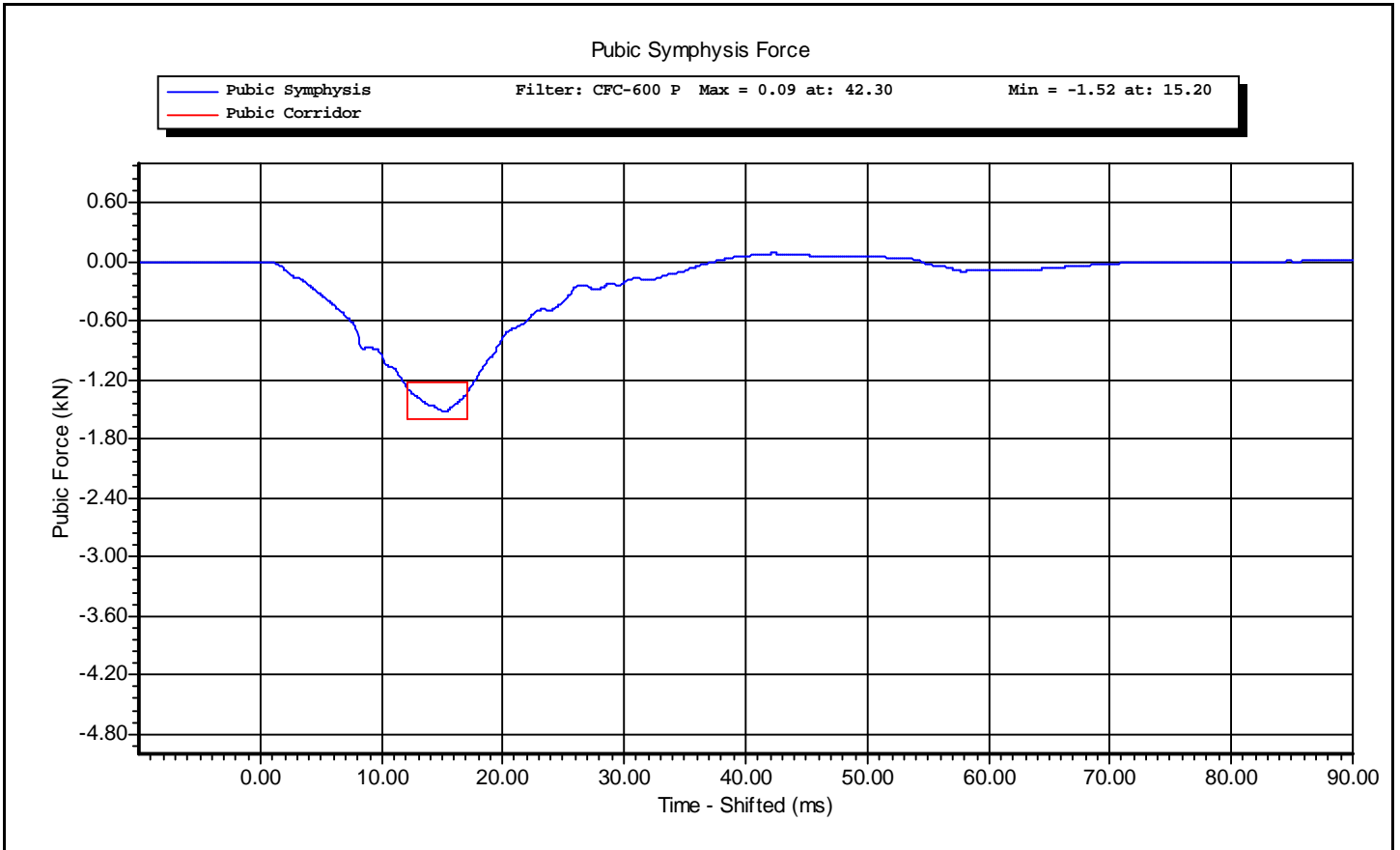
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|                    |                      |            |                   |
|--------------------|----------------------|------------|-------------------|
| Test Name:         | <b>Pelvis Impact</b> | Revision:  | <b>12/14/2006</b> |
| Sub Test Name:     |                      | Spec Type: | <b>NHTSA</b>      |
| ATD Type:          | <b>ES-2re</b>        |            |                   |
| ATD Serial Number: | <b>D037</b>          |            |                   |
| Test ID:           | <b>Pelvis Impact</b> | Test Date: | <b>4/6/2010</b>   |
| Test Number:       | <b>1</b>             | Test Time: | <b>3:22:16 PM</b> |

|                       |                         |
|-----------------------|-------------------------|
| Component Part Number | Component Serial Number |
| <b>455-4003</b>       |                         |





**APPENDIX E**

**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION**

**TEST EQUIPMENT LIST AND CALIBRATION INFORMATION**

**DUMMY INSTRUMENTATION**

|                               |                | FRONT ES2-re NO.: |              |                  |
|-------------------------------|----------------|-------------------|--------------|------------------|
|                               |                | SERIAL NUMBER     | MANUFACTURER | CALIBRATION DATE |
| Head Accelerometers           | X              | AC-P18639         | Endevco      | 25-Jan-10        |
|                               | Y              | AC-P23128         | Endevco      | 25-Jan-10        |
|                               | Y              | AC-P16591         | Endevco      | 25-Jan-10        |
| Head Accelerometers           | X (Redundant)  | AC-J45479         | Endevco      | 22-Jan-10        |
|                               | Y (Redundant)  | AC-P32453         | Endevco      | 25-Jan-10        |
|                               | Z (Redundant)  | AC-P22639         | Endevco      | 25-Jan-10        |
| Thorax Potentiometers         | Upper Rib (Y)  | DS-0552-01        | Honeywell    | 11-Jan-10        |
|                               | Middle Rib (Y) | DS-0807           | Honeywell    | 11-Jan-10        |
|                               | Lower Rib (Y)  | DS-0552-3         | Honeywell    | 11-Jan-10        |
| Abdomen Load Cells            | Forward (Y)    | LC-1507Fy         | Denton       | 07-Jan-10        |
|                               | Middle (Y)     | LC-1508Fy         | Denton       | 07-Jan-10        |
|                               | Rear (Y)       | LC-1509Fy         | Denton       | 07-Jan-10        |
| Pubic Symphysis Load Cell (Y) |                | LC-458Fy          | Denton       | 07-Jan-10        |

**REMARKS:** None



**TEST EQUIPMENT LIST AND CALIBRATION INFORMATION**

**VEHICLE AND MDB INSTRUMENTATION**

| VEHICLE INSTRUMENTATION                     | VEHICLE AND MDB INSTRUMENTS |              |                  |
|---|-----------------------------|--------------|------------------|
|   | SERIAL NUMBER               | MANUFACTURER | CALIBRATION DATE |
| VEHICLE CG (X)                              | AC-P26263                   | Endevco      | 02-Feb-10        |
| VEHICLE CG (Y)                              | AC-P47300                   | Endevco      | 02-Feb-10        |
| VEHICLE CG (Z)                              | AC-P32146                   | Endevco      | 02-Feb-10        |
| LEFT FLOOR SILL (Y)                         | AC-APF89                    | Endevco      | 04-Nov-09        |
| A-PILLAR LEFT SILL (Y)                      | AC-P38132                   | Endevco      | 25-Oct-09        |
| LOWER LEFT A-PILLAR (Y)                     | AC-P23960                   | Endevco      | 25-Oct-09        |
| MIDDLE LEFT A-PILLAR (Y)                    | AC-P23788                   | Endevco      | 22-Jan-10        |
| B-PILLAR LEFT SILL (Y)                      | AC-P35798                   | Endevco      | 25-Jan-10        |
| LOWER LEFT B- PILLAR (Y)                    | AC-P26269                   | Endevco      | 25-Oct-09        |
| MIDDLE LEFT B-PILLAR (Y)                    | AC-P23873                   | Endevco      | 25-Oct-09        |
| DRIVER SEAT TRACK (Y)                       | AC-P24145                   | Endevco      | 11-Feb-10        |
| ENGINE TOP (X)                              | AC-P35803                   | Endevco      | 29-Mar-10        |
| ENGINE TOP (Y)                              | AC-P35811                   | Endevco      | 29-Mar-10        |
| FIREWAELL CENTER (Y)                        | AC-P23926                   | Endevco      | 29-Mar-10        |
| RIGHT ROOF at VERTICAL IMPACT REFERENCE (Y) | AC-P21516                   | Endevco      | 04-Nov-09        |
| RIGHT SILL at VERTICAL IMPACT REFERENCE (Y) | AC-J38127                   | Endevco      | 04-Nov-09        |
| REAR FLOORPAN BEHIND REAR AXLE at C/L (X)   | AC-P26262                   | Endevco      | 02-Feb-10        |
| REAR FLOORPAN BEHIND REAR AXLE at C/L (Y)   | AC-P21373                   | Endevco      | 02-Feb-10        |

**REMARKS:** None