

REPORT NUMBER: 214MDB-CAL-10-3

**SAFETY COMPLIANCE TESTING FOR FMVSS 214
DYNAMIC SIDE IMPACT PROTECTION
MOVING DEFORMABLE BARRIER**

**BAYERISCHE MOTORENWERKE
2010 BMW 128i
2-DOOR CONVERTIBLE**

NHTSA NUMBER: CA0512

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



Test Date: June 14, 2010

FINAL REPORT

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

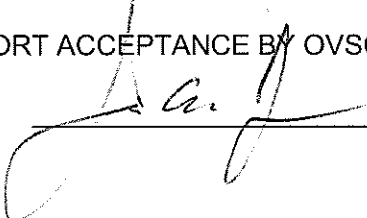
This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-07-D-00064.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by:  Date: August 31, 2010
Vincent M. Paolini, Project Engineer

Approved by:  Date: August 31, 2010
David J. Travale, Program Manager
Transportation Research Group

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by  Date: 9/7/2010

Technical Report Documentation Page

1. Report No. 214MDB-CAL-10-3	2. Government Accession No.	3. Recipient's Catalog No.																						
4. Title and Subtitle Final Report of FMVSS 214 Compliance Side Impact Testing of a 2010 BMW 128i 2-Door Convertible NHTSA No. CA0512		5. Report Date June 14, 2010																						
		6. Performing Organization Code CAL																						
7. Author(s) Vincent M. Paolini, Project Engineer David J. Travale, Program Manager		8. Performing Organization Report No. tr2445																						
9. Performing Organization Name and Address Calspan Corporation Transportation Sciences Group P.O. Box 400 Buffalo, New York 14225		10. Work Unit No.																						
		11. Contract or Grant No. DTNH22-07-D-00064																						
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance- Enforcement 1200 New Jersey Avenue, SE Room W43-503 Washington, DC 20590		13. Type of Report and Period Covered: <i>Final Report</i> June 2010																						
		14. Sponsoring Agency Code NVS-220																						
15. Supplementary Notes																								
16. Abstract <p>A 48/24 km/h 90° (Moving Deformable Barrier) Compliance Test was conducted on the subject 2010 BMW 128i 2-Door Convertible in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP- 214D-09 for the determination of FMVSS 214 Side Impact Protection compliance. The test was conducted at the Calspan Corporation Transportation Research Group in Buffalo, New York, on June 14, 2010.</p> <p>The impact velocity of the Moving Deformable Barrier (MDB) was 52.8 km/h, and the ambient temperature at the struck side (driver side) of the vehicle was 21.7°C. The target vehicle's maximum post test static crush was 122 mm at level 2. The test vehicle's occupant performance is as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #d9ead3;"> <th style="width: 40%;"></th> <th style="width: 30%; text-align: center;">DRIVER</th> <th style="width: 30%; text-align: center;">PASS.</th> </tr> </thead> <tbody> <tr> <td>HIC</td> <td style="text-align: center;">46.6</td> <td style="text-align: center;">226.5</td> </tr> <tr style="background-color: #d9d9d9;"> <td>Max. Rib Deflection (mm)</td> <td style="text-align: center;">32</td> <td></td> </tr> <tr style="background-color: #d9d9d9;"> <td>Sum of Abdomen Forces (N)</td> <td style="text-align: center;">638.8</td> <td></td> </tr> <tr style="background-color: #d9d9d9;"> <td>Pubic Symphysis (N)</td> <td style="text-align: center;">-1867.7</td> <td></td> </tr> <tr> <td>Spine (g's)</td> <td></td> <td style="text-align: center;">37.5</td> </tr> <tr style="background-color: #d9d9d9;"> <td>Sum of Acetabular and Iliac</td> <td></td> <td style="text-align: center;">1798.8</td> </tr> </tbody> </table> <p>The door on the struck side of the vehicle did not separate from the body at the hinge or latch and the opposite door did not open during the side impact event.</p>					DRIVER	PASS.	HIC	46.6	226.5	Max. Rib Deflection (mm)	32		Sum of Abdomen Forces (N)	638.8		Pubic Symphysis (N)	-1867.7		Spine (g's)		37.5	Sum of Acetabular and Iliac		1798.8
	DRIVER	PASS.																						
HIC	46.6	226.5																						
Max. Rib Deflection (mm)	32																							
Sum of Abdomen Forces (N)	638.8																							
Pubic Symphysis (N)	-1867.7																							
Spine (g's)		37.5																						
Sum of Acetabular and Iliac		1798.8																						
17. Key Words Compliance Testing Side Impact Protection MDB ES-2re SID-IIs		18. Distribution Statement <u>Copies of this report are available from:</u> NHTSA Technical Information Services National Highway Traffic Safety Admin. 1200 New Jersey Avenue, SE Washington, DC 20590																						
19. Security Class. (of this report) Unclassified	20. Security Class. (of this page) Unclassified	21. No. of Pages 336	22. Price																					

Form DOT F1700.7 (8-72)

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	2-4
3	Test Vehicle Tire Information	2-5
4	Seat and Seat Belt Adjustment Data	2-6
5	Fuel Systems and Steering Wheel Position Data	2-7
6	Dummy Longitudinal Clearance Dimensions	2-8
7	Dummy Lateral Clearance Dimensions	2-11
8	High Speed Camera Locations	2-12
9	Test Vehicle Accelerometer Locations	2-13
10	Test Vehicle Accelerometer Data Summary	2-14
11	MDB Accelerometer Locations and Data Summary	2-15
12	Moving Deformable Barrier (MDB) Summary of Results	2-16
13	Dummy Injury Response Data for ES-2re	2-17
14	Dummy Injury Response Data for SID-IIs	2-18
15	Post Test Observations	2-19
16	Vehicle Pre-Test and Post-Test Measurements	2-20
17	Exterior Crush Measurements	2-21
18	Vehicle Exterior Crush Profiles	2-22
19	Exterior Static Crush for Impactor Face	2-23
20	Summary of FMVSS 301 Fuel System Data	2-24
21	Temperature and Humidity Trace	2-25
<u>Appendix</u>		<u>Page No</u>
A	Photographs	A-1
B	ES-2re Dummy Response Data	B-1
C	SID-IIs Dummy Response Data	C-1
D	Vehicle and MDB Accelerometer Response Data	D-1
E	ES-2re Performance Calibration Test Data	E-1
F	SID-IIs Performance Calibration Test Data	F-1
G	Test Equipment and Instrumentation Calibration	G-1

SECTION 1

PURPOSE AND TEST PROCEDURE

PURPOSE

This moving deformable barrier 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 BMW 128i 2-Door Convertible. The side impact test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-214D-09, dated July 2009).

SUMMARY

A model year 2010 BMW 128i 2-Door Convertible was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 52.8 km/h. The test (target) vehicle was stationary and positioned 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation Transportation Sciences Group in Buffalo, New York on June 14, 2010. Pre-test and post-test photographs of the test vehicle, the MDB, and test dummies are included in this report.

Test dummies were placed in both the driver and left rear designated seating positions according to instructions specified in the OVSC Test Procedure dated July 2009. The side impact event was documented by 1 real-time and 9 high-speed cameras. Camera locations and other pertinent camera information are included in this report.

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 SID-IIs female dummy was instrumented with tri-axial accelerometer packs located in the head and spine. Load cells were located in the pubic symphysis and acetabulum. A summary of each dummies configuration and performance verification test data has been included in this report along with the dummy response traces.

The occupant data is summarized below:

Driver ES-2re Male Dummy		
HIC	46.6	
UPPER RIB DEFLECTION	32	mm
MIDDLE RIB DEFLECTION	29	mm
LOWER RIB DEFLECTION	27	mm
ABDOMEN (FRONT)	69.6	N
ABDOMEN (MID)	218.2	N
ABDOMEN (REAR)	370.4	N
SUM OF ABDOMEN FORCES	638.8	N
PUBIC SYMPHYSIS	-1867.7	N

Passenger SID-IIs Female Dummy		
HIC	226.5	
MAX. SPINE ACCELERATION	35.6	g
SPINE X	-8.5	g
SPINE Y	35.6	g
SPINE Z	-11.3	g
SPINE RESULTANT	37.5	g
ACETABULAR	1614.4	N
ILIAC	201.4	N
SUM	1801.1 N @ 55.6 ms	

SECTION 2

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

Vehicle Information		Options	
Make	BMW	ESC	Yes
Model	128i	All-Wheel Drive	No
Body Style	2-Door Convertible	Power Steering	Yes
VIN	WBAUN1C50AVH77833	Tilt Steering Wheel	Yes
Body Color	White	Driver Side Curtain Airbag	No
Engine Disp (liters)	3.0	Driver Side Torso Airbag	No
# of Cylinders	6	Driver Combo (Head/Torso) Airbag	Yes
Engine Placement	Longitudinal	Driver Seat Belt Pretensioners	Yes
Transmission Type	Manual	Driver Seat Belt Load Limiters	Yes
Transmission Speeds	6	Driver Power Seats	No
Overdrive	Yes	Rear Pass. Curtain Airbag	No
Final Drive	Front	Rear Pass. Side Torso Airbag	No
Odometer Reading	12 mi	Rear Pass. Seat Belt Pretensioners	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?	Yes
		Anti-Lock Brakes	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Bayerische Motorenwerke	GVWR (kg)	1995
		GAWR Front (kg)	930
Date of Manufacture	10/09	GAWR Rear (kg)	1119

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	2		4
Capacity Wt. (VCW) (kg)				340.0
Cargo Wt. (RCLW) (kg)				67.8

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

TIRE PRESSURES

	Units	LF	RF	RR	LR
As Delivered	kpa	220	220	240	240
As Tested	Kpa	220	220	240	240

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	381.0	394.0		416.0	488.0		416.0	387.0	
Right	kg	381.0	407.0		380.0	474.0		490.0	462.0	
Ratio	%	48.8	51.2		45.3	54.7		51.6	48.4	
Totals	kg	762.0	801.0	1563.0	796.0	962.0	1758.0	906.0	849.0	1755.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1563.0
Weight of one P572U and one P572V ATD	kg	129.3
Rated Cargo/Luggage Weight (RCLW)	kg	67.8
Calculated Vehicle Target Weight (TVTW)	kg	1760.1

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

Weight of Ballast (including instrumentation package and cameras): 62.7 kg

WEIGHT of BALLAST and VEHICLE COMPONENTS REMOVED TO MEET TVTW

Description of Component	Weight (kg)
Ballast (if any)	22.6

TEST VEHICLE ATTITUDES

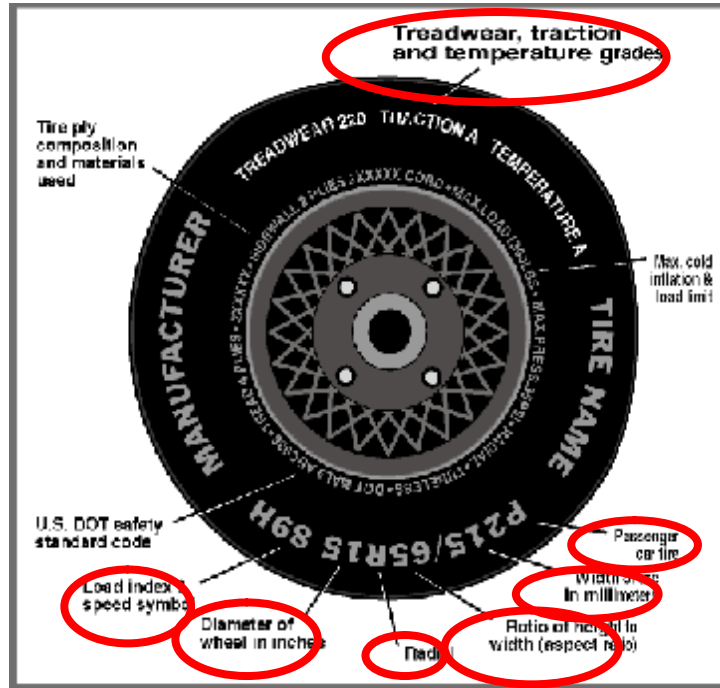
	Units	LF	RF	LR	RR
Fully Loaded	mm	673	683	675	674
As Tested	mm	672	683	648	659
DIFF Δ	mm	1	0	27	15

TEST VEHICLE VERTICAL IMPACT LINE AND CG

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2662
Target Vertical Impact Reference Line Aft of Front Axle	mm	391
Actual Vertical Impact Reference Line Aft of Front Axle	mm	396

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



DATA FROM TIRE PLACARD

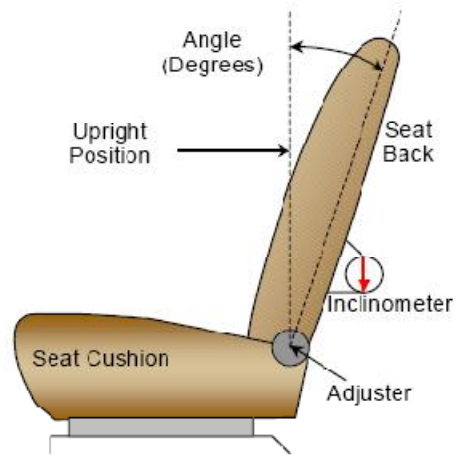
Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold / Test Pressure (kPa)	220	220
Recommended Tire Size	P205/55R16	P205/55R16
Tire Size on Vehicle	P205/55R16	P205/55R16
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Turanza EL42	Turanza EL42
Tire Type	Passenger	Passenger
Tire Width (mm)	205	205
Ratio of Height to Width (aspect ratio)	55	55
Radial	Yes	Yes
Wheel Diameter	16	16
Load Index & Speed Symbol	91H	91H
Treadwear	300	300
Traction Grade	A	A
Temperature Grade	A	A

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

NORMAL DESIGN RIDING POSITION

Driver seat:
 An inclinometer was placed on a straight edge that was placed along the outboard seat back.



FRONT SEAT ASSEMBLY

SEAT BACK ANGLES

	Degrees
Driver w/ Seated Dummy	21.3
Passenger w/Seated Dummy	NA

SEAT FORE/AFT POSITIONS

The front outboard seat was placed in the mid-travel position while maintaining the seat cushion mid-angle position. The rear outboard seat did not have a fore/aft or cushion angle adjustment.

SEAT FORE/AFT POSITION

	Driver Seat	Rear Seat
Total Fore/Aft Travel (mm)	250	NA
Test Position (mm)	125	NA
Test Detent (forward-most detent defined as 0)	28	NA
Total Number of Detents (including 0)	57	NA

SEAT BELT UPPER ANCHORAGES

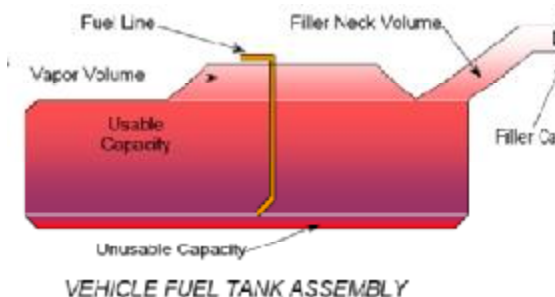
	Total # of Positions	Placed in Position #
Driver Seat	NA	NA
Rear Seat	NA	NA

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

FUEL SYSTEM INFORMATION

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

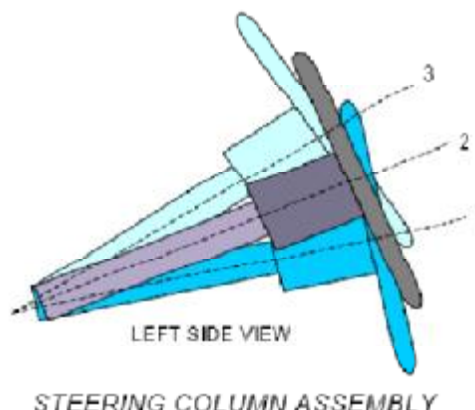


FUEL TANK CAPACITY

	Liters
Usable Capacity (Form 1)	53.0
Usable Capacity (Owner's Manual)	53.0
92%-94% of Fuel Tank Usable Capacity	NA
Actual Amount of Stoddard Used	49.2

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.

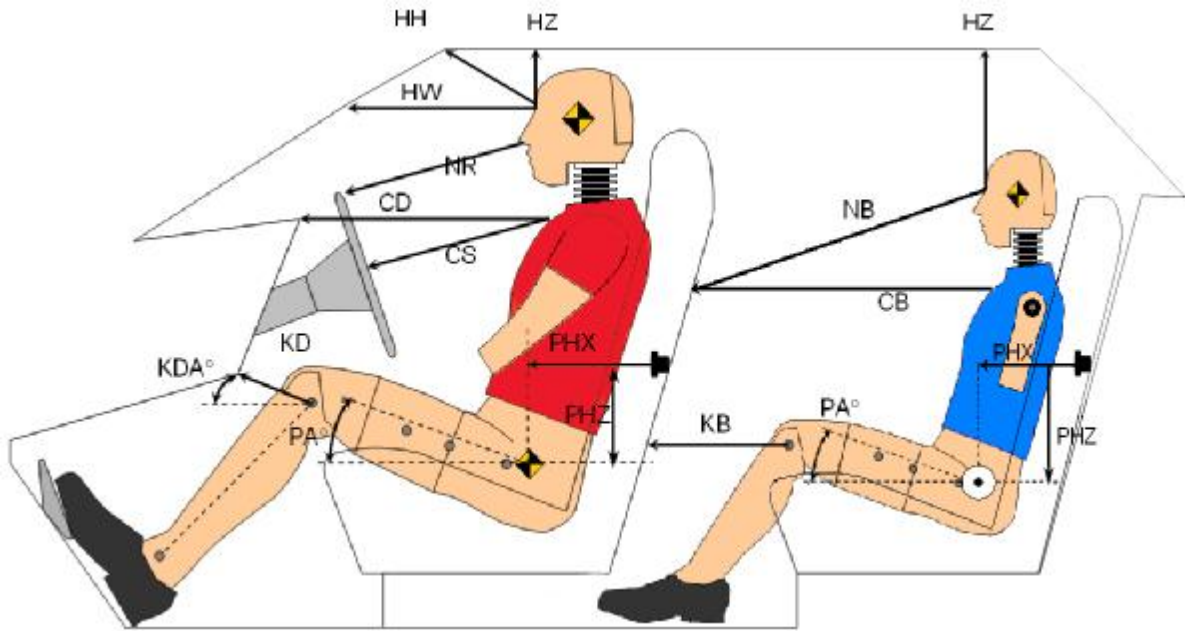


STEERING COLUMN POSITIONING

	Degrees	Fore/Aft Position (mm)
Lowermost - Position 1	17.3	
Geometric Center - Position 2	19.3	
Uppermost - Position 3	21.3	
Telescoping Steering Wheel Travel		40
Test Position	19.3	20

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

Test Vehicle:	2010 BMW 128i	NHTSA No.	CA0512
Test Program:	FMVSS 214 Side Impact	Test Date:	June 14, 2010

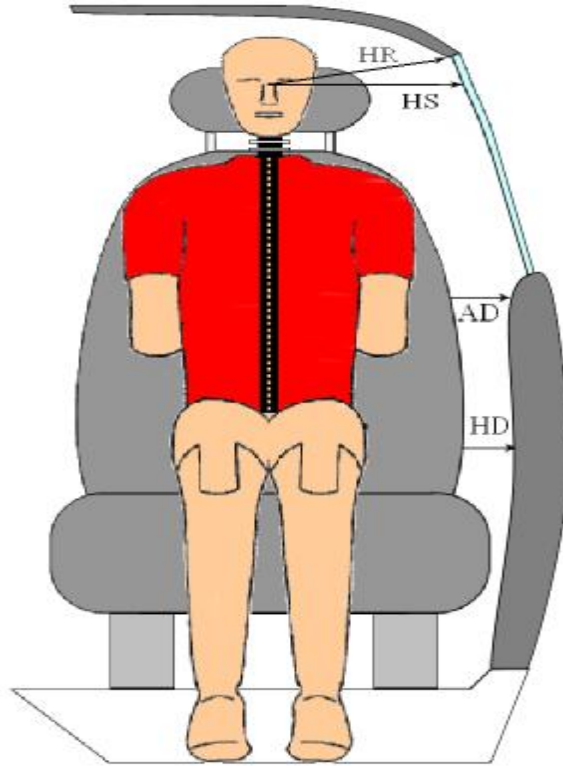


NOTE: 4-door vehicle shown. Rear dummy PHX and PHZ measurements for a 2-door vehicle would use the B-post striker as a reference point.

Frt. Occupant Code	Rear Occupant Code	Measurement Description	037 ES-2re		224 SID-IIs	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	370			
HW		Header to Windshield	579			
HZ	HZ	Head to Roof	150		242	
NR	NB	Nose to Rim/Seat Back	454		350	
CD	CB	Chest to Dash/Seat Back	555		380	
CS		Chest to Steering Wheel	365			
KDL	KBL	Left Knee to Dash/Seat Back	185	29	165	12
KDR	KBR	Right Knee to Dash/Seat Back	155	25	145	12
PA	PA	Pelvic Angle		24.0		20.4
PHX	PHX	H-Point to Striker (X-Axis)	371		413	
PHZ	PHZ	H-Point to Striker (Z-Axis)	241		235	

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

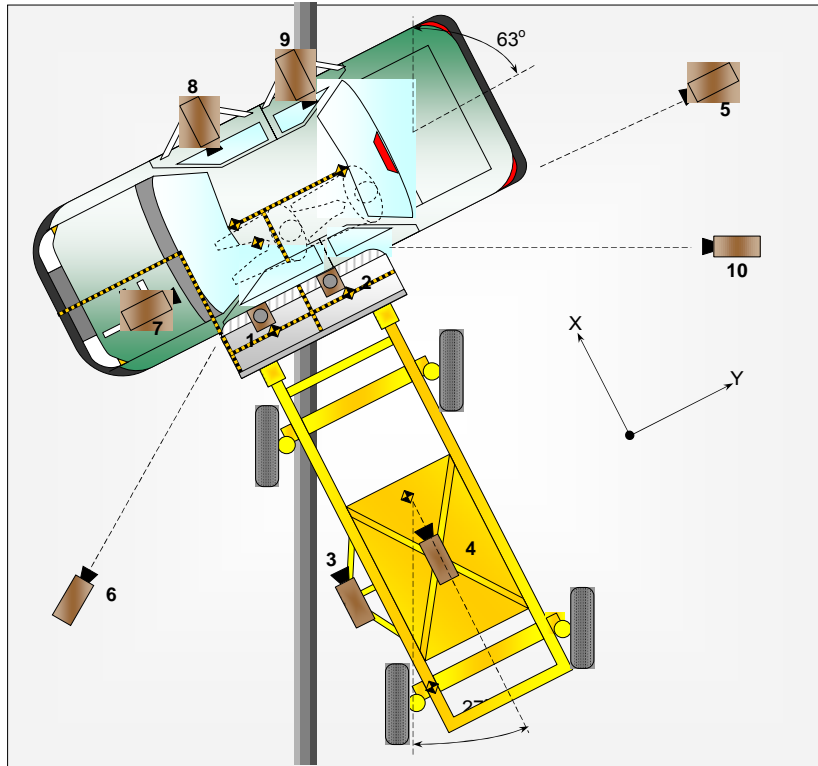
Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



Code		Units	Front Occupant	Rear Occupant
HR	Head to Side Header	mm	212	295
HS	Head to Side Window	mm	284	410
AD	Arm to Door	mm	61	32
HD	H-point to Door	mm	146	71

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

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

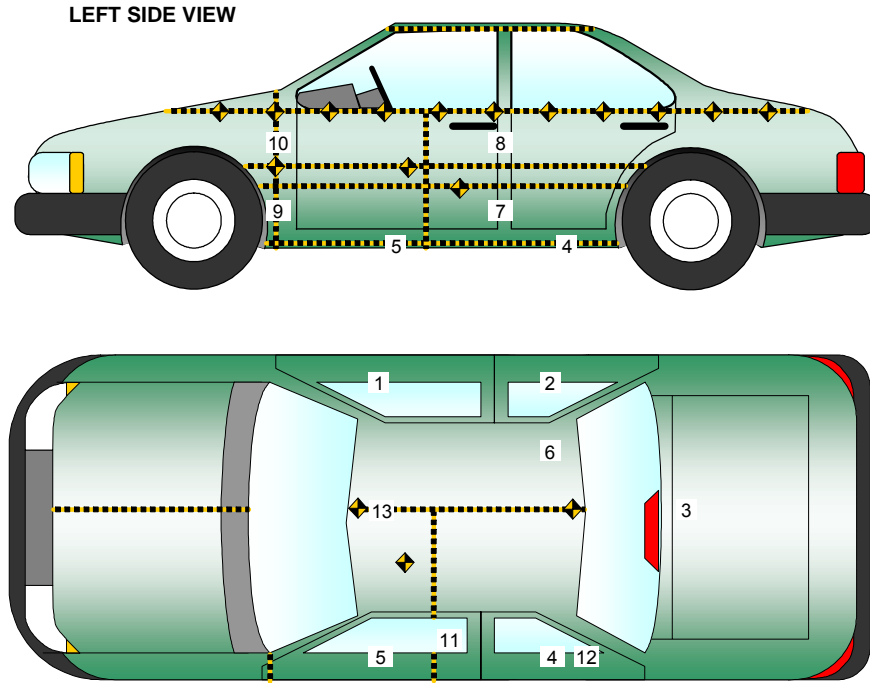


No.	Camera View	Location			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	72	812	-4880	8	1000
2	Overhead Close-up	195	855	-4880	28	1000
3	Impact Point Close-up (MDB)				13	500
4	Centerline of Impact (MDB)				7.5	500
5	Right Side View	125	10925	875	50	1000
6	Left Side View	1780	980	970	24	1000
7	Front Seat Occupant - Frontal View (OB)				25	500
8	Front Seat Occupant - Side View (OB)				12.5	500
9	Rear Passenger - Side View (OB)				12.5	500
10	Real Time Coverage				-	30

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

DATA SHEET NO. 9
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2642	711	316
2	Right Sill at Rear Seat	1989	711	313
3	Rear Floorpan Above Axle	910	-27	506
4	Left Sill at Rear Door	1976	-709	315
5	Left Sill at Front Door	2638	-708	315
6	Left Rear Occ. Compartment	1978	401	193
7	Left B-Post Lower	1823	-710	398
8	Left B-Post Middle	1718	-638	928
9	Left A-Post Lower	2965	-674	424
10	Left A-Post Middle	2799	-624	954
11	Front Seat Track	2058	-582	295
12	Rear Seat Track or Structure	884	-474	580
13	Vehicle CG	2283	29	474

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

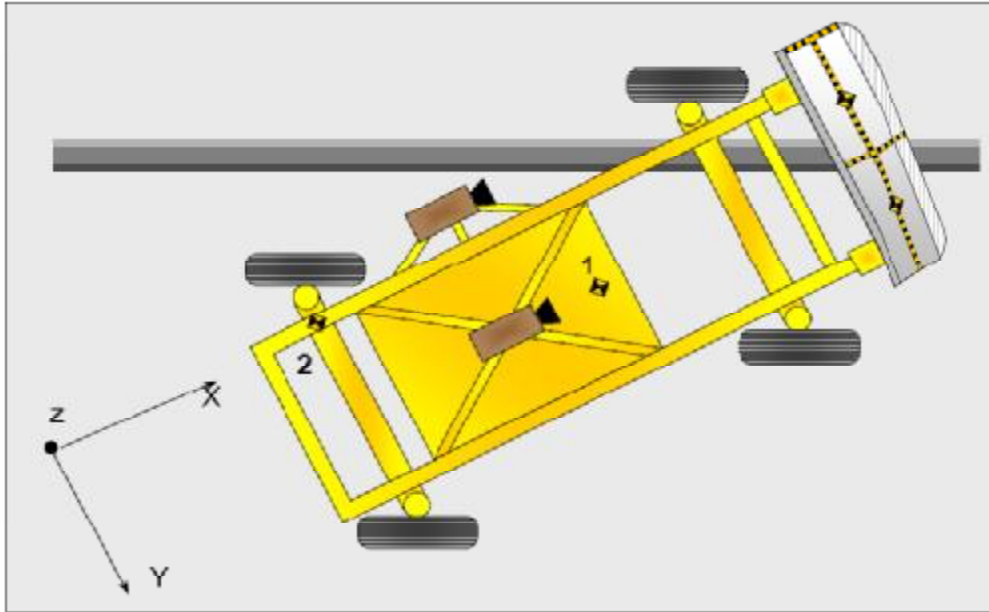
DATA SHEET NO. 10
TEST VEHICLE ACCELEROMETER DATA SUMMARY

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

Loc. No	Description	Peak Values (g's)			
		Max	Time (ms)	Min	Time (ms)
1	Right Sill at Front Seat (X)	2.4	66.4	-7.3	28.6
	Right Sill at Front Seat (Y)	23.8	8.8	-2.1	69.4
	Right Sill at Front Seat (Z)	7.5	17.7	-7.6	9.8
	Right Sill at Front Seat Resultant	25.8	8.9	0.0	-85.9
2	Right Sill at Rear Seat (X)	2.2	66.6	-6.9	27.5
	Right Sill at Rear Seat (Y)	20.8	5.9	-1.9	69.0
	Right Sill at Rear Seat (Z)	6.8	34.4	-7.6	12.6
	Right Sill at Rear Seat Resultant	21.1	6.0	0.0	-15.7
3	Rear Floor Pan Above Axle (X)	8.8	102.7	-6.8	27.2
	Rear Floor Pan Above Axle (Y)	20.7	19.6	-2.5	72.7
	Rear Floor Pan Above Axle (Z)	6.8	4.9	-4.7	8.5
	Rear Floor Pan Above Axle Resultant	20.8	19.6	0.0	-57.6
4	Left Sill at Rear Door (Y)	70.7	2.5	-24.2	7.6
5	Left Sill at Front Door (Y)	78.2	3.2	-45.2	7.7
6	Left Rear Occ. Compartment(Y)	20.9	6.8	-1.9	69.3
7	Left B-Post Lower (Y)	48.7	2.1	-19.2	7.5
8	Left B-Post Middle (Y)	88.9	3.8	-54.0	19.6
9	Left A-Post Lower (Y)	187.8	3.4	-158.2	8.0
10	Left A-Post Middle (Y)	31.8	14.6	-2.3	98.1
11	Front Seat Track (Y)	149.1	60.3	-4.6	52.7
12	Rear Seat Track or Structure (Y)	55.7	48.1	-28.6	36.7
13	Vehicle CG (X)	16.7	13.1	-21.1	6.9
	Vehicle CG (Y)	40.6	7.5	-16.3	12.3
	Vehicle CG (Z)	43.0	12.9	-22.4	18.3
	Vehicle CG Resultant	50.1	7.4	0.0	-37.5

DATA SHEET NO. 11
MDB ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



No.	Accelerometer Location	Coordinates (mm)			Peak Values (G's)				
		X	Y	Z	Axis	Max	Time	Min	Time
1	MDB CG	1859	0	-330	X	1.1	123.9	-20.3	38.6
					Y	3.5	58.1	-8.9	26.1
					Z	11.0	56.4	-11.3	26.9
					RES	23.8	26.8	0.1	-36.1
2	MDB Rear	386	-660	-660	X	2.3	101.5	-23.3	24.3
					Y	3.5	56.6	-3.5	27.8

Reference: +X = Rearward +Y = To Right +Z = Up

**DATA SHEET NO. 12
MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

MDB SPECIFICATIONS

Measurement Description	Requirement	Value
Overall Width of the Framework Carriage (mm)	1241 – 1261	1250
Overall length including honeycomb face (mm)	4140 – 3990	4120
Wheelbase of Framework Carriage	2566 – 2616	2590
Center of gravity location aft of front axle		1104
MDB Front Axle Weight		782.0
MDB Rear Axle Weight		580.5
MDB Total Weight	1356.5 – 1365.5	1362.5

SPEED AND IMPACT ANGLE DATA

	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	52.9 ± 0.8	52.8
Trap No. 2 Velocity (Redundant)	km/h	52.9 ± 0.8	52.9
MDB C/L to Target Vehicle C/L	Degrees	88.5 to 91.5	89.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Row	Description	Height	From Centerline		Maximum Crush
			Distance	Direction	
1	Center of Bumper	432	800	Right	255
2	Top of Bumper	533	700	Right	205
3	Mid-Level	686	800	Right	104
4	Top of Stack	813	800	Left	115

MDB IMPACT POINT DATA

Measured Parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	-5
Vertical Offset	mm	+/- 20	-3

DATA SHEET NO. 13
DUMMY INJURY RESPONSE DATA FOR ES-2re

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

DUMMY Serial # 037				
	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)				
Longitudinal (X)	4.1	186.9	-8.2	64.5
Lateral (Y)	13.8	76.3	-5.1	199.0
Vertical (Z)	19.8	59.8	-0.7	23.2
Resultant (R)	22.1	60.1	0.0	0.0
HIC36 (t1, t2)	46.6		t1 = 50.6	t2 = 86.6
THORAX DEFLECTION (mm)				
Upper Rib	31.8	47.6	-2.1	299.9
Middle Rib	29.2	45.8	-3.3	77.2
Lower Rib	27.4	45.1	-4.3	76.7
ABDOMINAL FORCES (N)				
Front	69.6	48.7	-15.0	26.7
Middle	218.2	44.8	-20.6	11.5
Rear	370.4	43.1	-5.2	72.9
SUM	638.3	44.8	-25.7	21.1
PELVIS FORCE (N)				
Pubic Symphysis (Y)	340.7	130.6	-1867.7	44.0

Reference:

Positive direction:

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

**DATA SHEET NO. 14
DUMMY INJURY RESPONSE DATA FOR SID-IIs**

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

DUMMY Serial No. 224				
	Positive		Negative	
	MAX	TIME (ms)	MAX	TIME (ms)
HEAD ACCELERATION (g)				
Longitudinal (X)	6.6	286.6	-24.4	69.8
Lateral (Y)	49.3	72.8	-23.2	268.8
Vertical (Z)	26.6	60.9	-0.5	12.6
Resultant (R)	54.1	72.0	0.0	0.0
HIC36 (t1, t2)	226.5		t1 = 49.9	t2 = 80.1
LOWER SPINE (g)				
Longitudinal (X)	4.8	57.7	-8.5	75.8
Lateral (Y)	35.6	54.1	-6.8	84.5
Vertical (Z)	3.5	34.9	-11.3	55.9
Resultant (R)	37.5	54.4	0.0	0.0
PELVIS FORCE (N)				
Acetabular	1614.4	55.7		
Iliac	201.4	54.6		
Pelvic Summation	1801.1	55.6		

Reference:

Positive direction:

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

**DATA SHEET NO. 15
POST TEST OBSERVATIONS**

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

TEST DUMMY INFORMATION AND CONTACT

Description	Front Occupant	Rear Occupant
Head Contact	Side of head – Head/Torso Combo Airbag	Side of Head – B-pillar & top of window sill
Upper Torso Contact	Head/Torso Combo Airbag	Upper Shoulder –Side Panel
Lower Torso Contact	Head/Torso Combo Airbag	Side Panel
Left Knee Contact	Side Door	Side Panel
Right Knee Contact	No Contact	No Contact

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Left Side Doors	Door was Jammed shut	Not Applicable
Right Side Doors	Door remained closed and latched	Not Applicable
Hatch and Other Doors	Door remained closed and latched; Door opened without tools	
Seat Movement	0	Not Applicable
Seat Back Failure	None	Not Applicable

POST TEST STRUCTURAL OBSERVATIONS

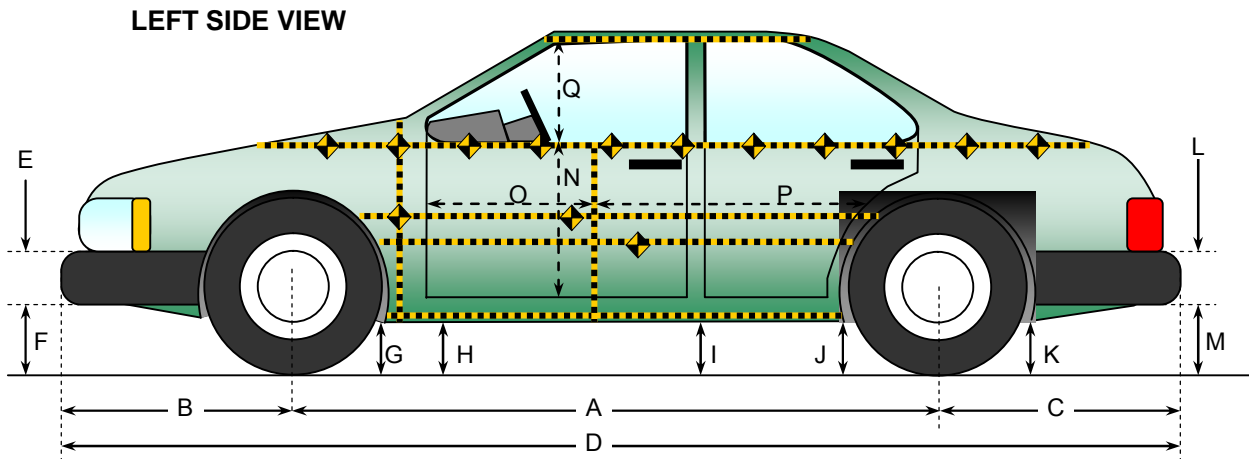
Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No Separation
Sill Separation	None
Windshield Damage	Both front and rear windows shattered
Window Damage	No apparent damage
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 16
VEHICLE PRETEST AND POST TEST MEASUREMENTS

Test Vehicle:	2010 BMW 128i	NHTSA No.	CA0512
Test Program:	FMVSS 214 Side Impact	Test Date:	June 14, 2010

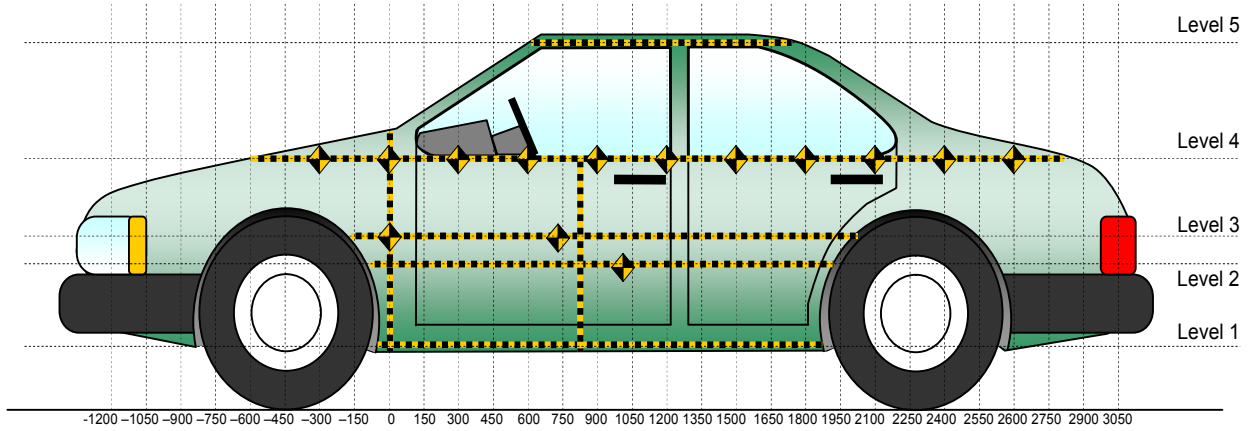


Code	Description	Pre-Test	Post-Test	Diff Δ
A	Wheelbase	2662	2658	4
B	Front Axle to FSOV	751	750	1
C	Rear Axle to RSOV	949	951	-2
D	Total Length at Centerline	4362	4360	2
E	Front Bumper Thickness	120	120	0
F	Front Bumper Bottom to Ground	395	424	-29
G	Sill Height at Front Wheel Well	159	188	-29
H	Sill Height at Front Door Leading Edge	159	186	-27
I	Sill Height at B Pillar	157	182	-25
J1	Sill Height at Rear Wheel Well	144	175	-31
J2	Pinch Weld Height at Rear Wheel Well	154	168	-14
K	Sill Height Aft of Rear Wheel Well	199	222	-23
L	Rear Bumper Thickness	135	135	0
M	Rear Bumper Bottom to Ground	488	473	15
N	Sill Height to Window Bottom Sill	636	643	-7
O	Front Door Leading Edge to Impact CL	605	603	2
P	Rear Door Trailing Edge to Impact CL	680	675	5
Q	Front Window Opening	361	349	12
R*	Right Side Length	4224	4226	-2
S*	Left Side Length	4223	4217	6
T*	Vehicle Width at B Post	1711	1631	80

* - not shown in schematic above

**DATA SHEET NO. 17
EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



All Measurements Shown in mm

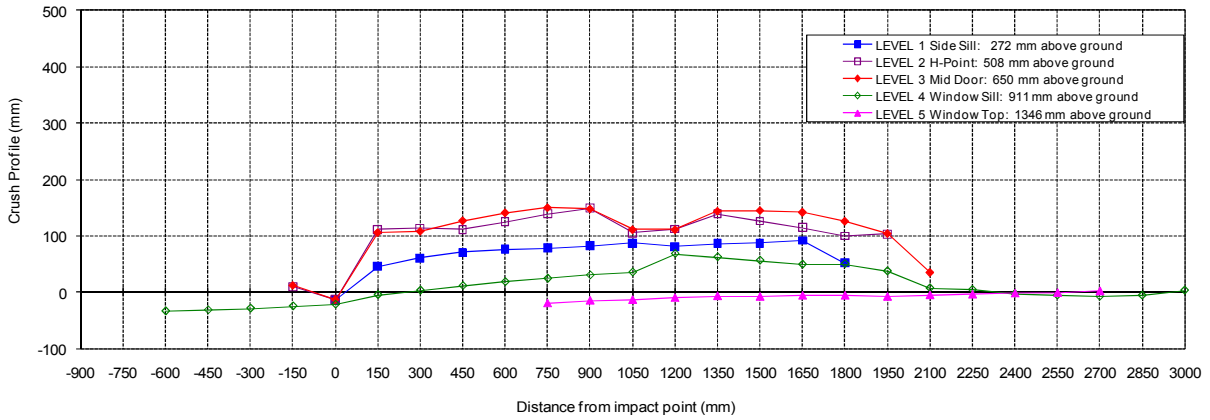
LEFT SIDE VIEW

Maximum Exterior Crush Measurements

Level	Measurement Description	Maximum Exterior Static Crush	Distance from Impact	Height Above Ground
1	Sill Top	16	300	272
2	Occupant H-Point	122	750	508
3	Mid-Door	120	1050	650
4	Window Sill	87	1500	911
5	Window Top	0	900	1346

**DATA SHEET NO. 18
VEHICLE EXTERIOR CRUSH PROFILES**

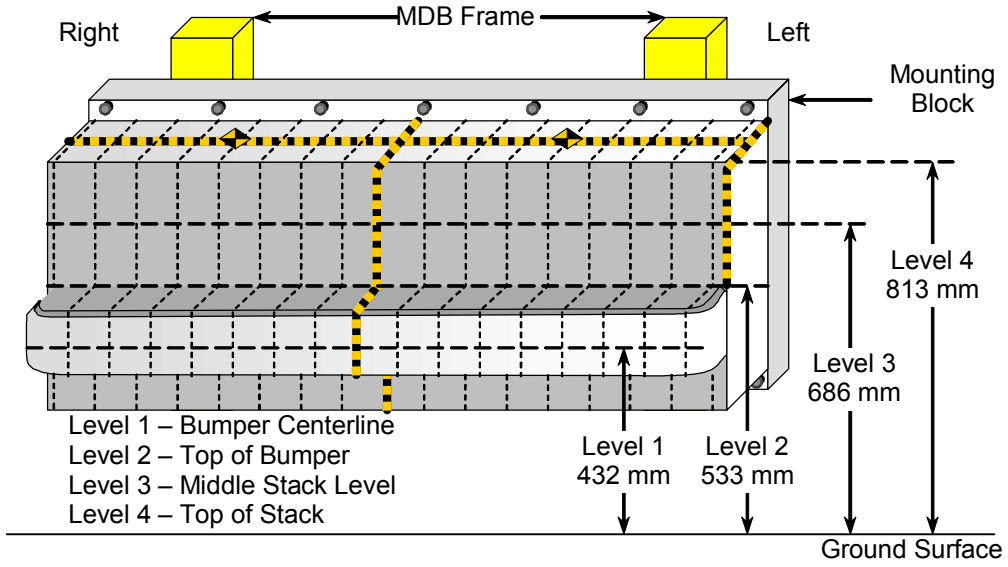
Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



	Pre-Test					Post-Test					Diff Δ				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-750	--	822	781	--	--	--	832	794	--	--	--	-10	-13	--	--
-600	--	--	842	--	--	--	--	850	--	--	--	--	-8	--	--
-450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-300	--	--	--	503	--	--	--	--	510	--	--	--	--	-7	--
-150	--	--	860	601	--	--	--	852	605	--	--	--	8	-4	--
0	822	854	854	674	--	821	810	798	677	--	1	44	56	-3	--
150	830	837	839	739	--	818	749	758	741	--	12	88	81	-2	--
300	838	839	845	775	--	822	757	784	775	--	16	82	61	0	--
450	843	842	850	792	--	828	738	773	783	--	15	104	77	9	--
600	847	845	853	803	--	832	729	758	783	--	15	116	95	20	--
750	848	847	856	812	--	833	725	754	784	--	15	122	102	28	--
900	849	849	858	820	418	835	727	753	780	418	14	122	105	40	0
1050	849	850	859	827	539	834	729	739	774	540	15	121	120	53	-1
1200	849	851	859	831	588	834	741	746	769	591	15	110	113	62	-3
1350	848	850	858	835	592	833	763	748	760	594	15	87	110	75	-2
1500	844	848	856	837	589	830	803	784	750	592	14	45	72	87	-3
1650	840	847	853	833	564	832	799	768	758	568	8	48	85	75	-4
1800	835	849	850	832	512	831	815	776	783	516	4	34	74	49	-4
1950	--	864	858	827	401	--	862	822	803	405	--	2	36	24	-4
2100	--	--	875	819	259	--	--	861	810	263	--	--	14	9	-4
2250	--	--	877	807	--	--	--	870	806	--	--	--	7	1	--
2400	--	--	874	794	--	--	--	868	796	--	--	--	6	-2	--
2550	--	--	848	776	--	--	--	846	778	--	--	--	2	-2	--
2700	--	827	796	754	--	--	825	797	756	--	--	2	-1	-2	--
2850	--	788	762	724	--	--	786	763	726	--	--	2	-1	-2	--
3000	--	744	707	666	--	--	743	706	662	--	--	1	1	4	--

**DATA SHEET NO. 19
EXTERIOR STATIC CRUSH FOR IMPACTOR FACE**

Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010



Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
Level 1	246	251	255	235	205	181	165	155	151	148	144	142	143	152	173	158	145
Level 2	200	205	194	167	141	124	110	106	103	102	99	95	93	98	106	106	101
Level 3	102	94	104	86	52	38	31	26	26	24	26	32	45	63	88	89	75
Level 4	97	61	65	63	52	30	17	17	23	32	42	54	68	84	104	115	111

Reference: + X = Forward + Y = To Right + Z = Down

**DATA SHEET NO. 20
SUMMARY OF FMVSS 301 FUEL SYSTEM DATA**

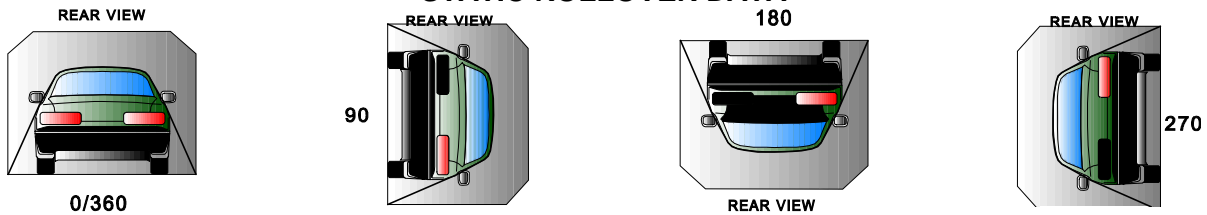
Test Vehicle: 2010 BMW 128i NHTSA No. CA0512
 Test Program: FMVSS 214 Side Impact Test Date: June 14, 2010

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

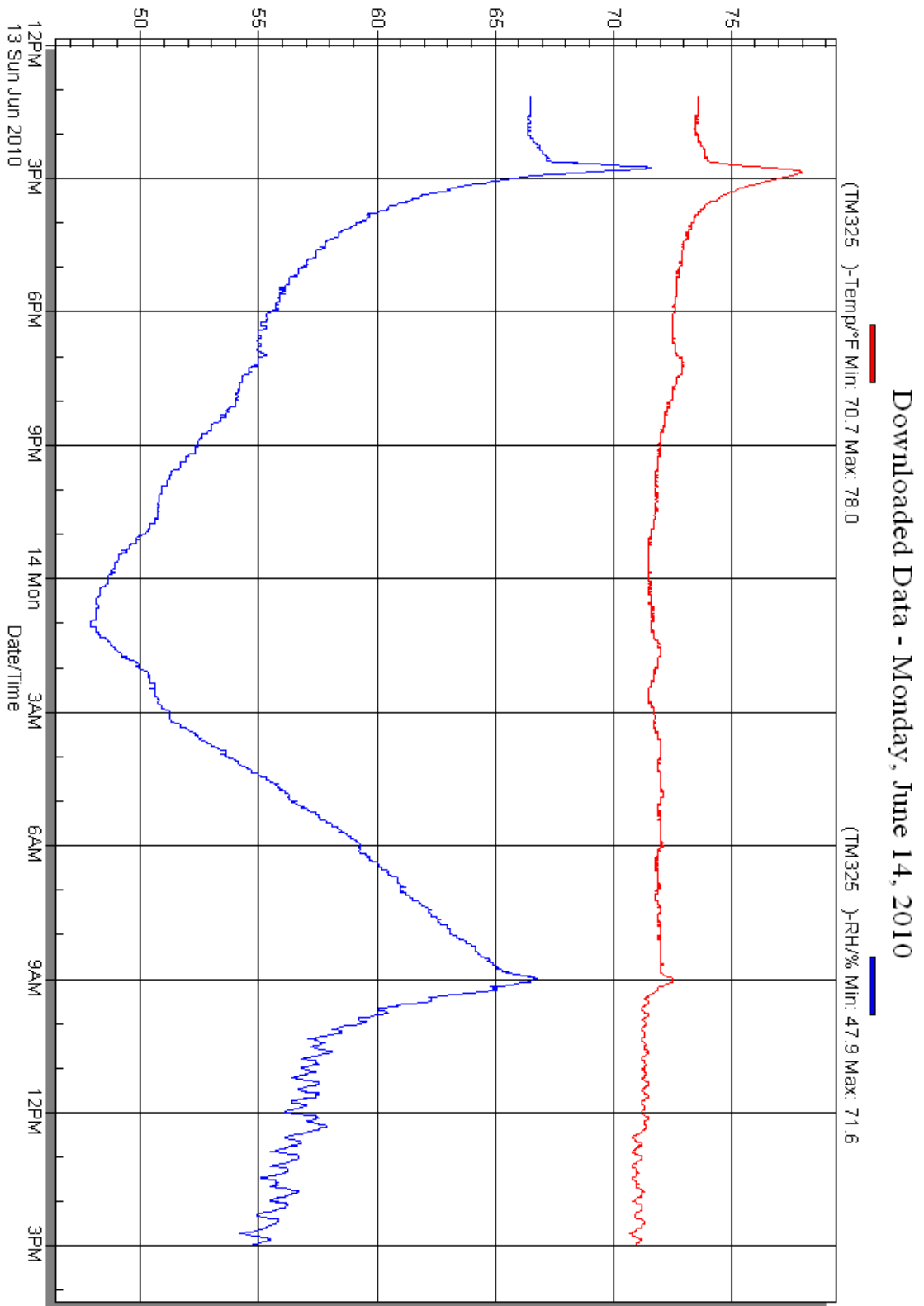


Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds
0° - 90°	1	09	5	00	6	09	7	09	7	09	7	09
90° - 180°	1	06	5	00	6	06	7	06	7	06	7	06
180°-270°	1	00	5	00	6	00	7	00	7	00	7	00
270°-360°	1	12	5	00	6	12	7	12	7	12	7	12

Rollover Stage	Spillage (g)			
	First 5 min. from onset of rotation	6 th min.	7 th min.	8 th 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. 21
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 Frontal View of MDB Impactor Face	A-9
A-8	Post-Test Frontal View of MDB Impactor Face	A-10
A-9	Pre-Test Left Side View of MDB Impactor Face	A-11
A-10	Post-Test Left Side View of MDB Impactor Face	A-12
A-11	Pre-Test Right Side View of MDB Impactor Face	A-13
A-12	Post-Test Right Side View of MDB Impactor Face	A-14
A-13	Pre-Test Top View of MDB Impactor Face	A-15
A-14	Post-Test Top View of MDB Impactor Face	A-16
A-15	Pre-Test Overhead View of Aligned MDB and Vehicle at Impact Location	A-17
A-16	Pre-Test Occupant Compartment View Showing Both SIDS	A-18
A-17	Post-Test Occupant Compartment View Showing Both SIDS	A-19
A-18	Pre-Test Left Front Door Interior Trim	A-20
A-19	Post-Test Left Front Door Interior Trim Showing SID Impact Locations	A-21
A-20	Pre-Test Left Rear Interior Trim	A-22
A-21	Post-Test Left Rear Door Interior Trim Showing SID Impact Locations	A-23
A-22	Pre-Test Left Side View of Aligned MDB and Vehicle	A-24
A-23	Pre-Test Right Side View of Aligned MDB and Vehicle	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	Post-Test Overhead View of MDB and Target Vehicle	A-29
A-28	Rollover 90 Degrees	A-30
A-29	Rollover 180 Degrees	A-31
A-30	Rollover 270 Degrees	A-32
A-31	Rollover 360 Degrees	A-33



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 Frontal View of MDB Impactor Face



Figure A-8 Post-Test Frontal View of MDB Impactor Face



Figure A-9 Pre-Test Left Side View of MDB Impactor Face



Figure A-10 Post-Test Left Side View of MDB Impactor Face



Figure A-11 Pre-Test Right Side View of MDB Impactor Face



Figure A-12 Post-Test Right Side View of MDB Impactor Face



Figure A-13 Pre-Test Top View of MDB Impactor Face



Figure A-14 Post-Test Top View of MDB Impactor Face



Figure A-15 Pre-Test Overhead View of Aligned MDB and Vehicle at Impact Location



Figure A-16 Pre-Test Occupant Compartment View Showing Both SIDS



Figure A-17 Post-Test Occupant Compartment View Showing Both SIDS



Figure A-18 Pre-Test Left Front Door Interior Trim



Figure A-19 Post-Test Left Front Door Interior Trim Showing SID Impact Locations



Figure A-20 Pre-Test Left Rear Interior Trim



Figure A-21 Post-Test Left Rear Door Interior Trim Showing SID Impact Locations



Figure A-22 Pre-Test Left Side View of Aligned MDB and Vehicle



Figure A-23 Pre-Test Right Side View of Aligned MDB and Vehicle



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

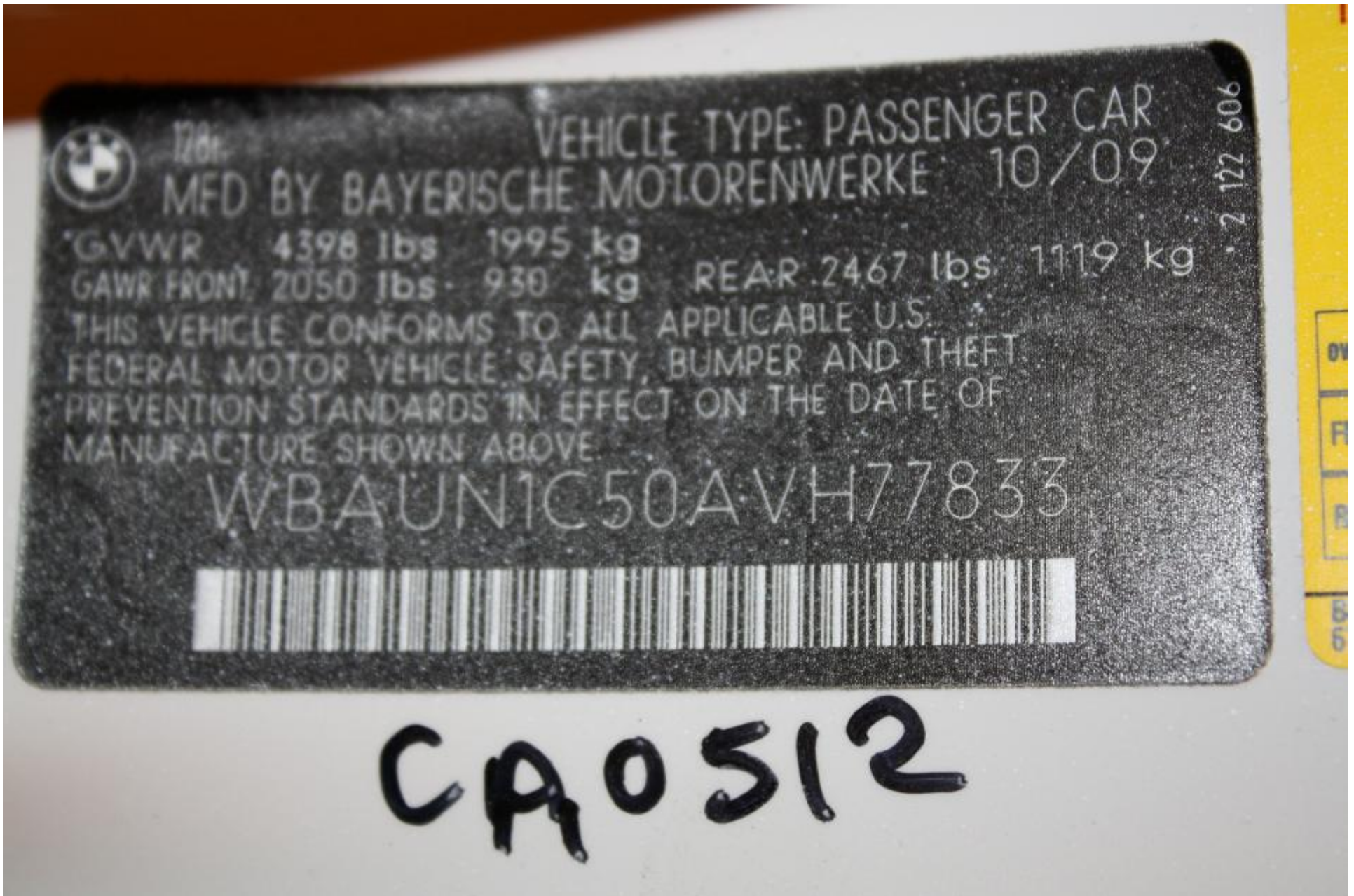


Figure A-25 Close-up View of Vehicle's Certification Label



TIRE AND LOADING INFORMATION
RENSEIGNEMENTS SUR LES PNEUS ET LE CHARGEMENT

SEATING CAPACITY
 NOMBRE DE PLACES

TOTAL 4

FRONT
 AVANT 2

REAR
 ARRIÈRE 2

The combined weight of occupants and cargo should never exceed 340 kg or 750 lbs.
 Le poids total des occupants et du chargement ne doit jamais dépasser 340 kg ou 750 lb.

TIRE / PNEU	SIZE DIMENSIONS	COLD TIRE PRESSURE PRESSION DES PNEUS A FROID
FRONT / AVANT	205/55 R 16	220 KPA, 32 PSI
REAR / ARRIÈRE	205/55 R 16	240 KPA, 35 PSI
SPARE DE SECOURS	NONE	NONE KPA, NONE PSI

**SEE OWNER'S MANUAL
 FOR ADDITIONAL
 INFORMATION**
**VOIR LE MANUEL DE
 L'USAGER POUR PLUS
 DE RENSEIGNEMENTS**

BMW
 6796045



CA0512

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

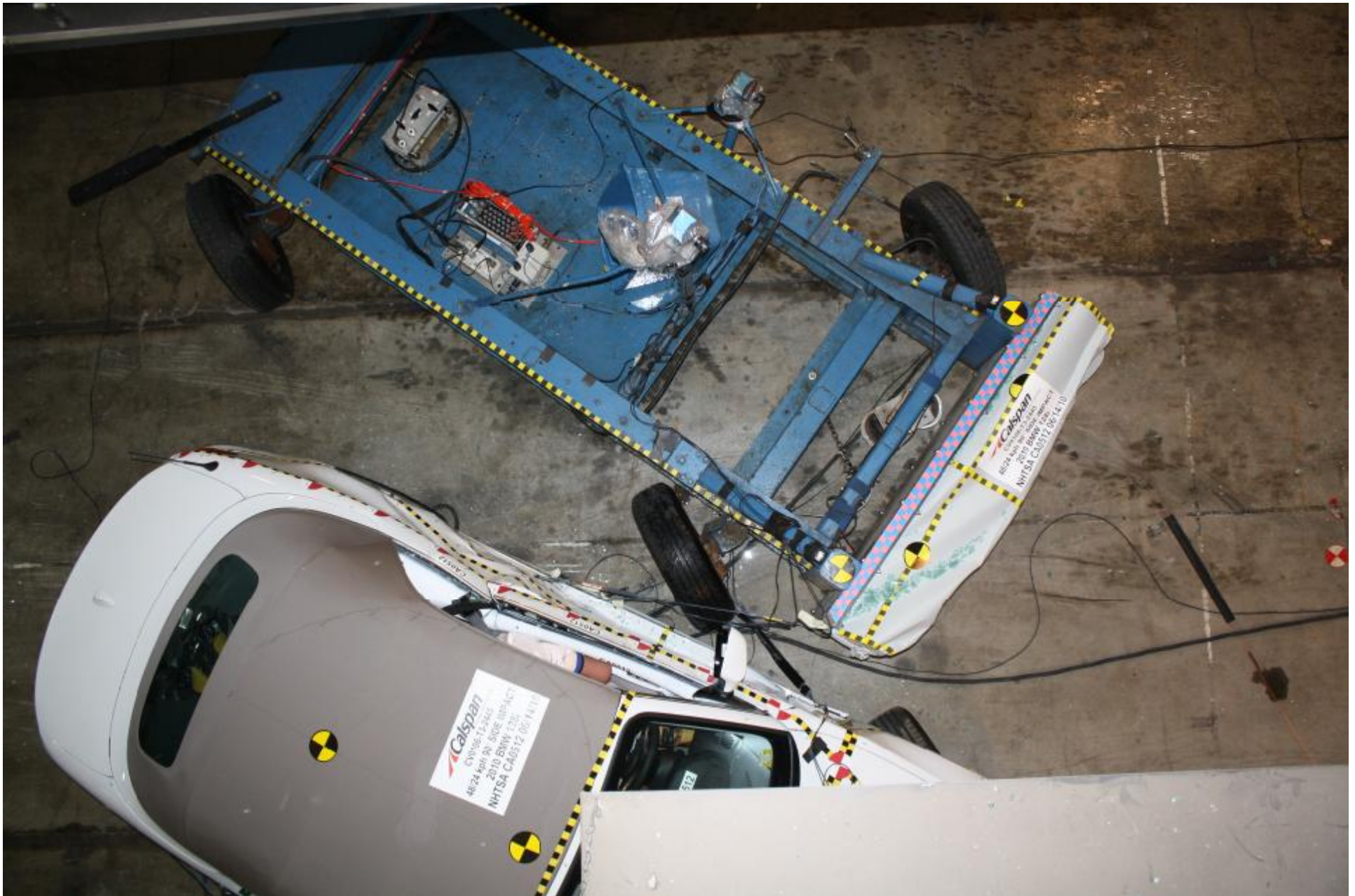


Figure A-27 Post-Test Overhead View of MDB and Target Vehicle



Figure A-28 Rollover 90 Degrees



Figure A-29 Rollover 180 Degrees



Figure A-30 Rollover 270 Degrees



Figure A-31 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
Abdomen Force	600	1000
Pubic Force	600	1000

DATA CHANNEL TITLE KEY

Prefix	Suffix
V1 = Vehicle 1 (Test Vehicle)	Ax = Acceleration, X-direction
V2 = Vehicle 2 (Test Vehicle)	Ay = Acceleration, Y-direction
P1 = Left Front Seating Position (Driver)	Az = Acceleration, Z-direction
P4 = Left Second Row Seating Position (Passenger)	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

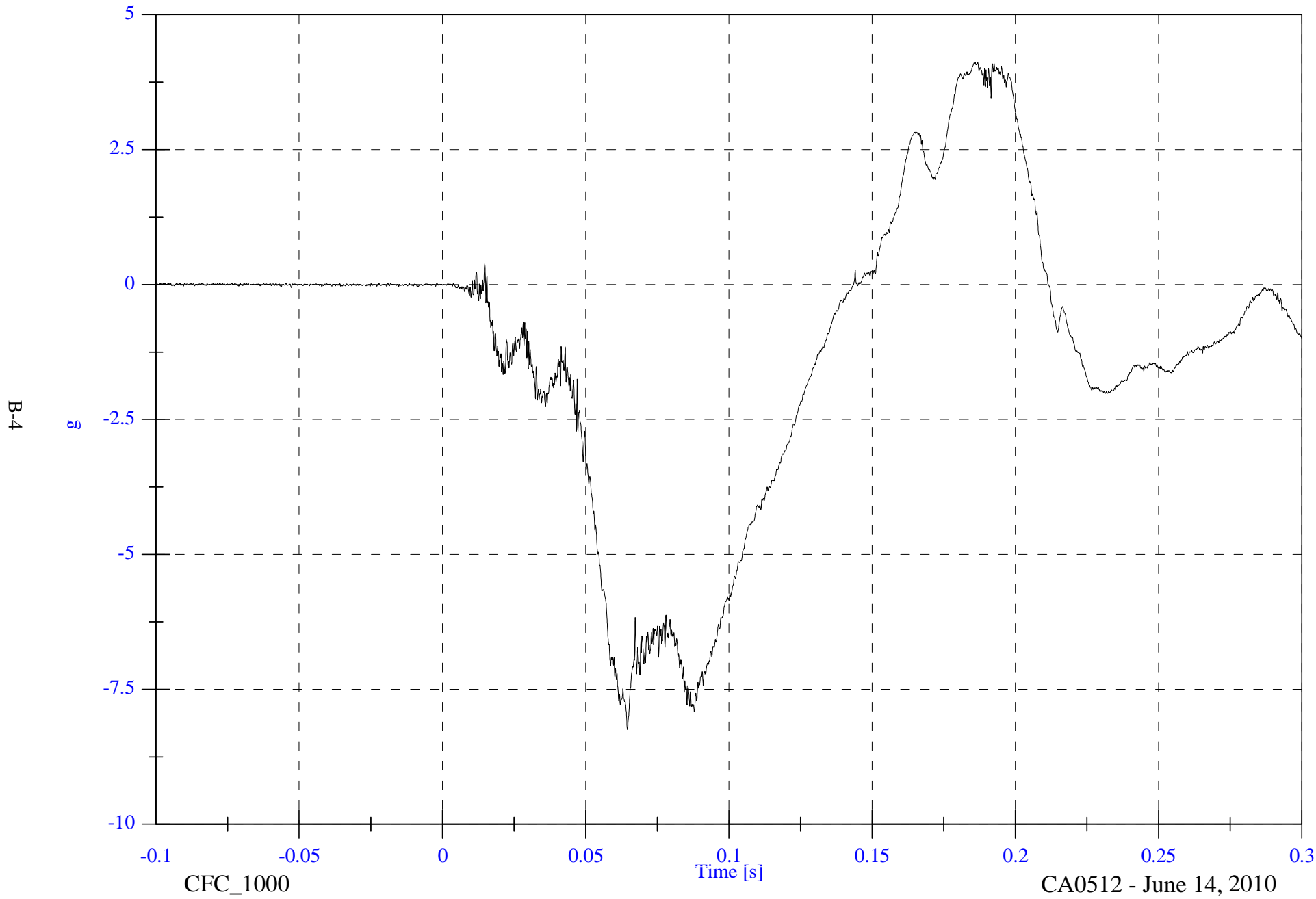
PLOT	PLOT NAME [UNITS, CHANNEL FILTER CLASS]	PAGE
1	ES-2re Head Ax [g, CFC_1000]	B-4
2	ES-2re Head Ay [g, CFC_1000]	B-5
3	ES-2re Head Az [g, CFC_1000]	B-6
4	ES-2re Head Resultant [g, CFC_1000]	B-7
5	ES-2re Head Ax Velocity vs. Time	B-8
6	ES-2re Head Ay Velocity vs. Time	B-9
7	ES-2re Head Az Velocity 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 MDB - 2010 BMW 128i

V2P1 Head x

Max: 4.1 [g] at 0.187 [s]

Min: -8.2 [g] at 0.065 [s]

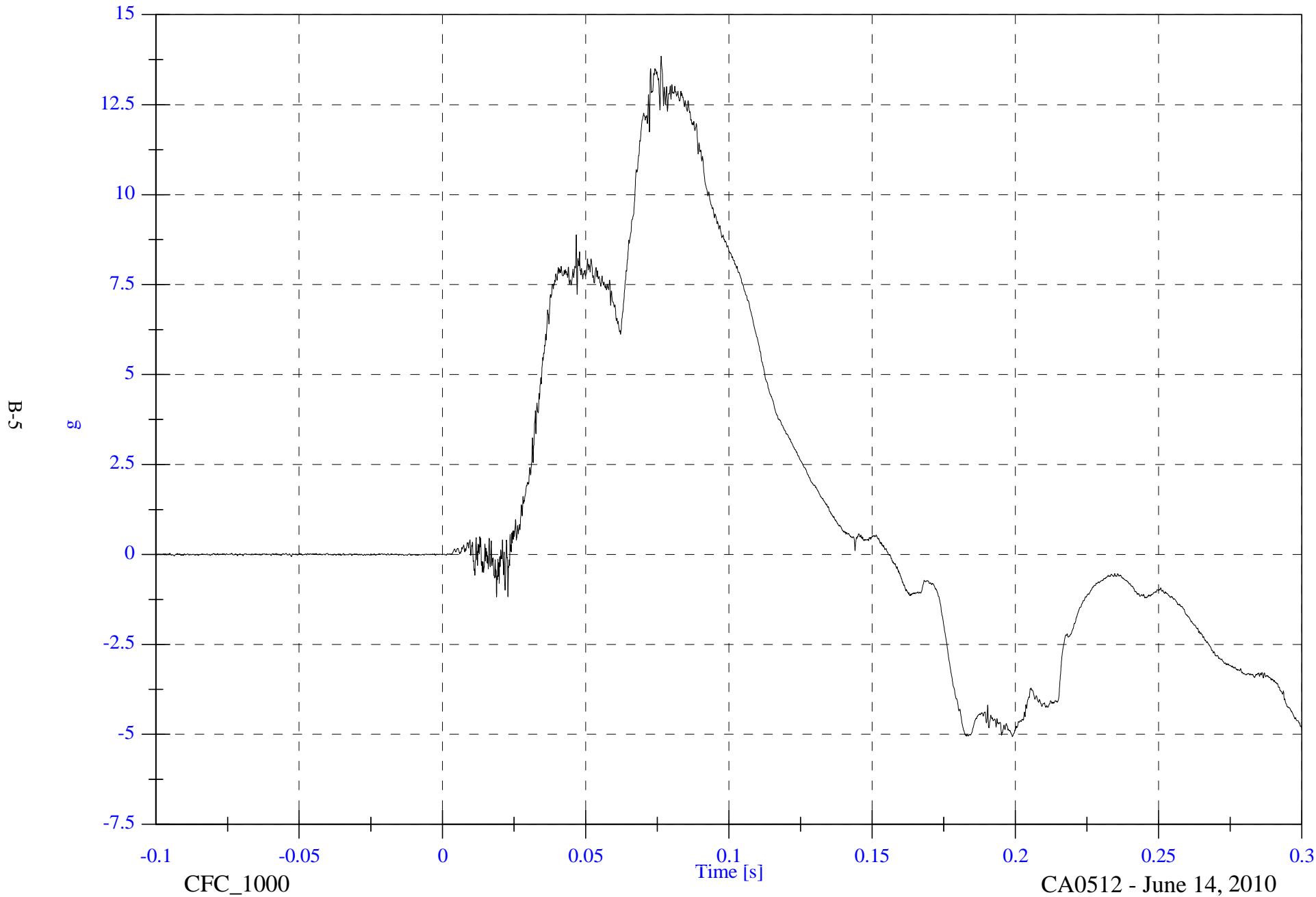


FMVSS 214 MDB - 2010 BMW 128i

V2P1 Head Redundant y

Max: 13.8 [g] at 0.076 [s]

Min: -5.1 [g] at 0.199 [s]



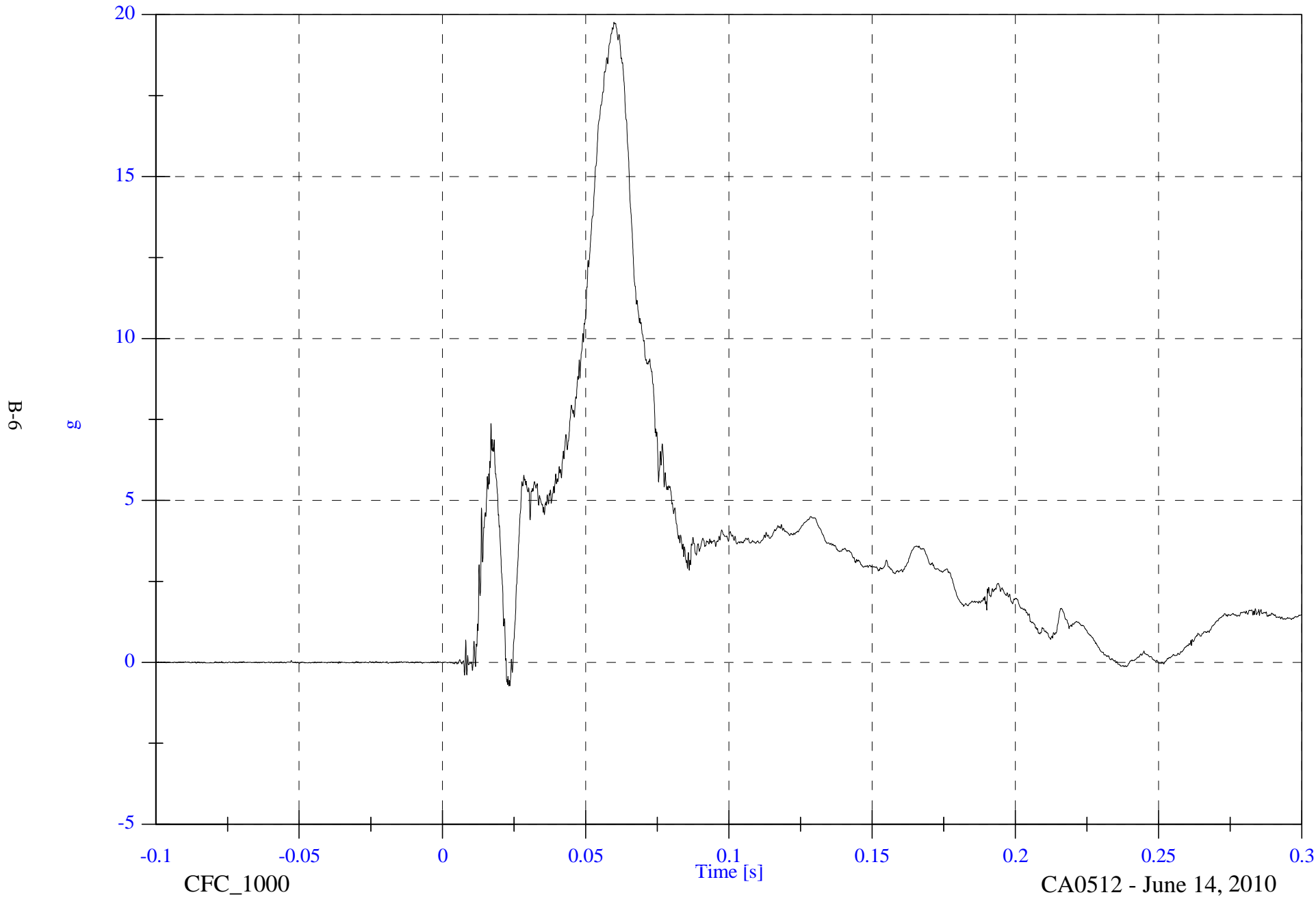
CFC_1000

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 19.8 [g] at 0.060 [s]
Min: -0.7 [g] at 0.023 [s]

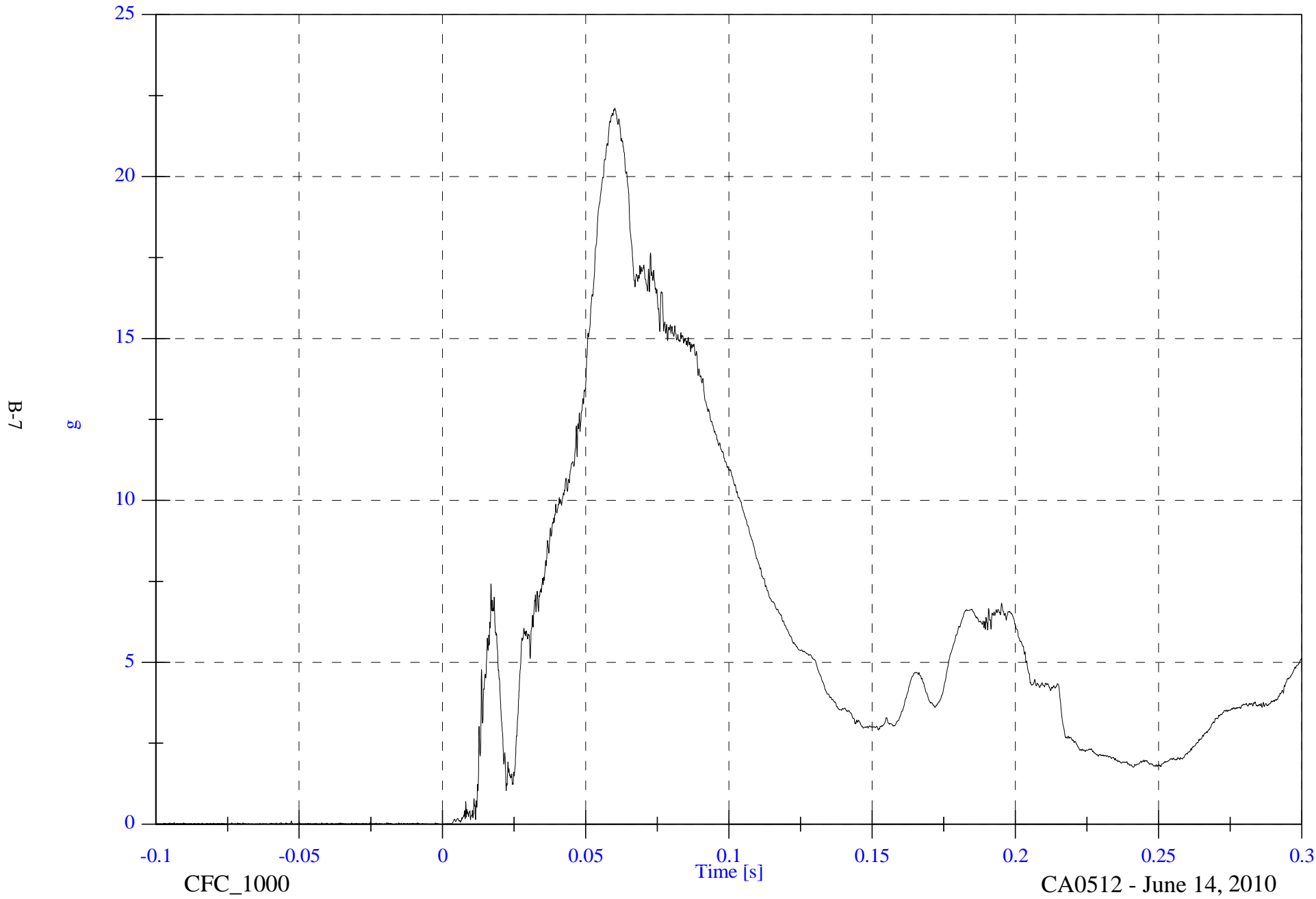
V2P1 Head z



FMVSS 214 MDB - 2010 BMW 128i

V2P1 Head Resultant

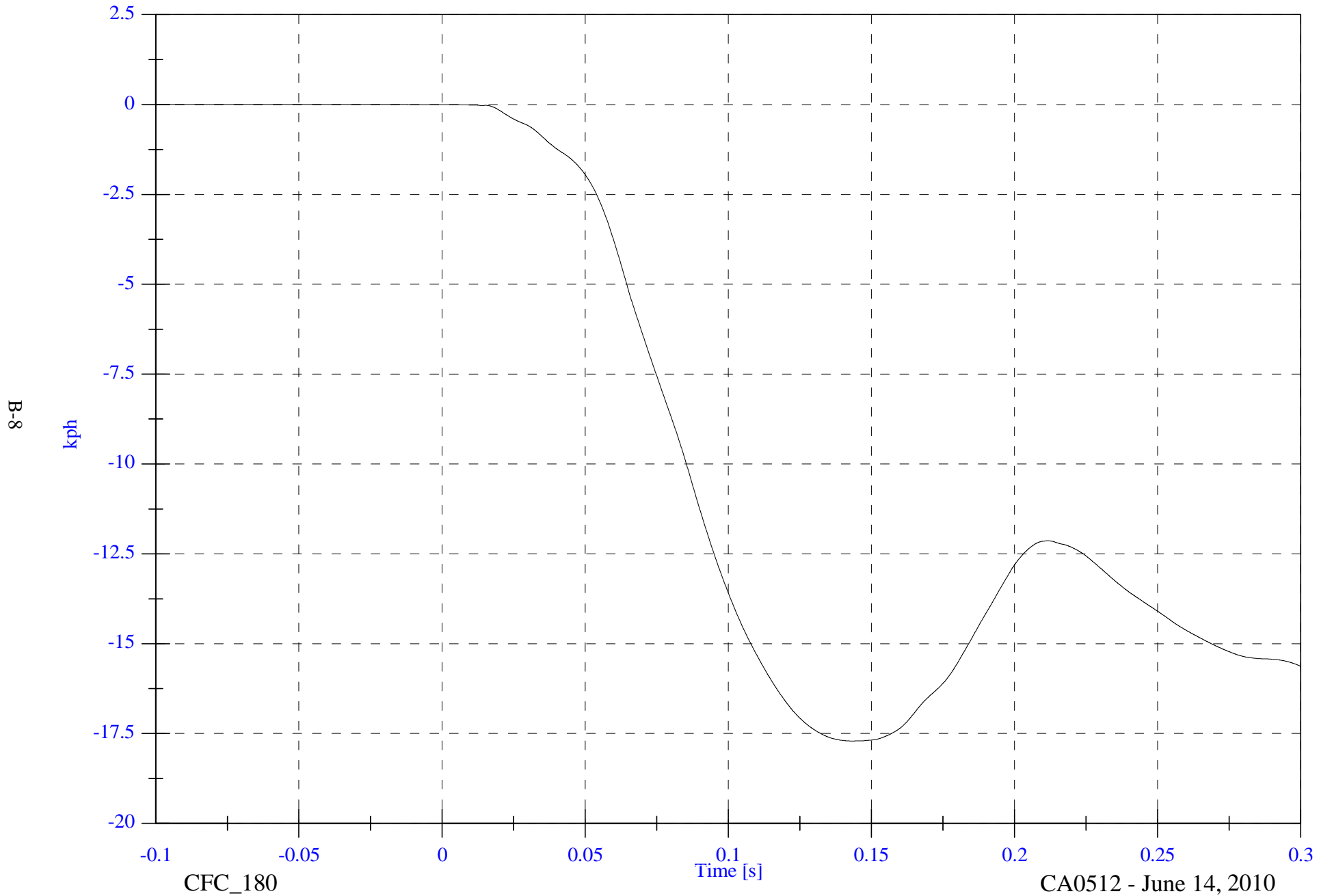
Max: 22.1 [g] at 0.060 [s]
Min: 0.0 [g] at -0.003 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2P1 Head x Velocity

Max: 0.0 [kph] at -0.057 [s]
Min: -17.7 [kph] at 0.143 [s]



B-8

kph

Time [s]

CFC_180

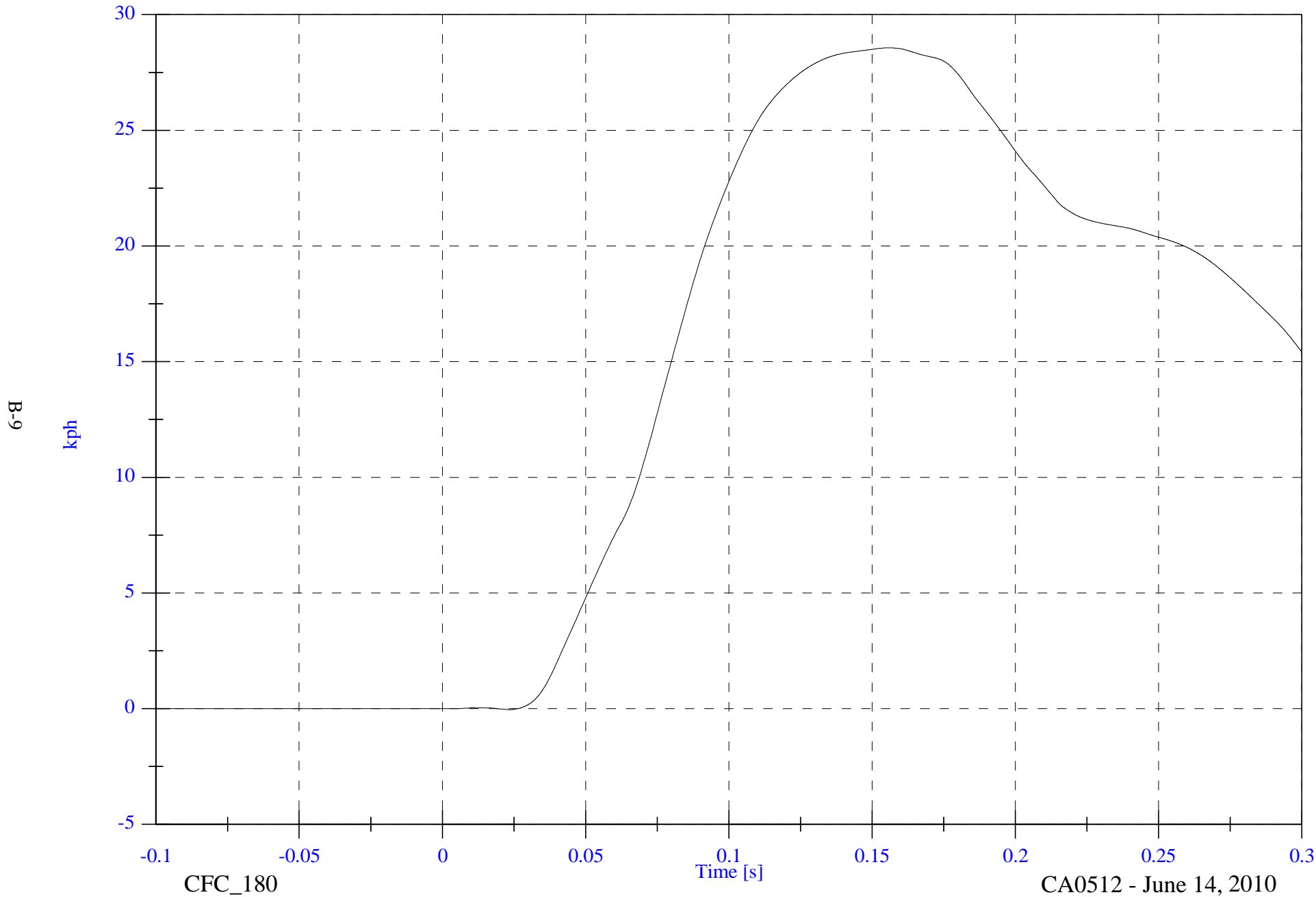
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Head Ry Velocity

Max: 28.6 [kph] at 0.156 [s]

Min: -0.0 [kph] at 0.024 [s]



B-9

kph

CFC_180

Time [s]

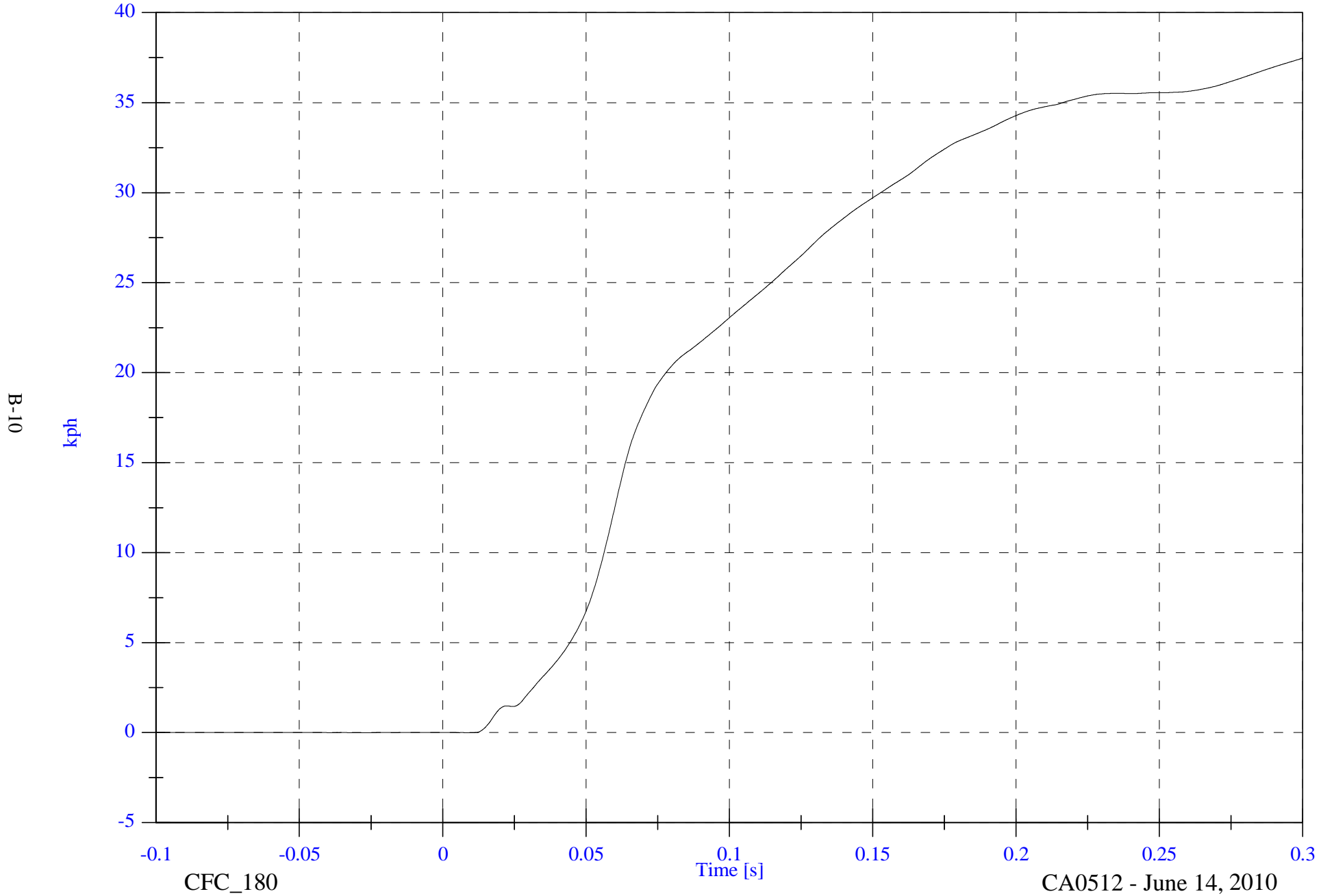
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Head z Velocity

Max: 37.5 [kph] at 0.300 [s]

Min: -0.0 [kph] at 0.010 [s]



CFC_180

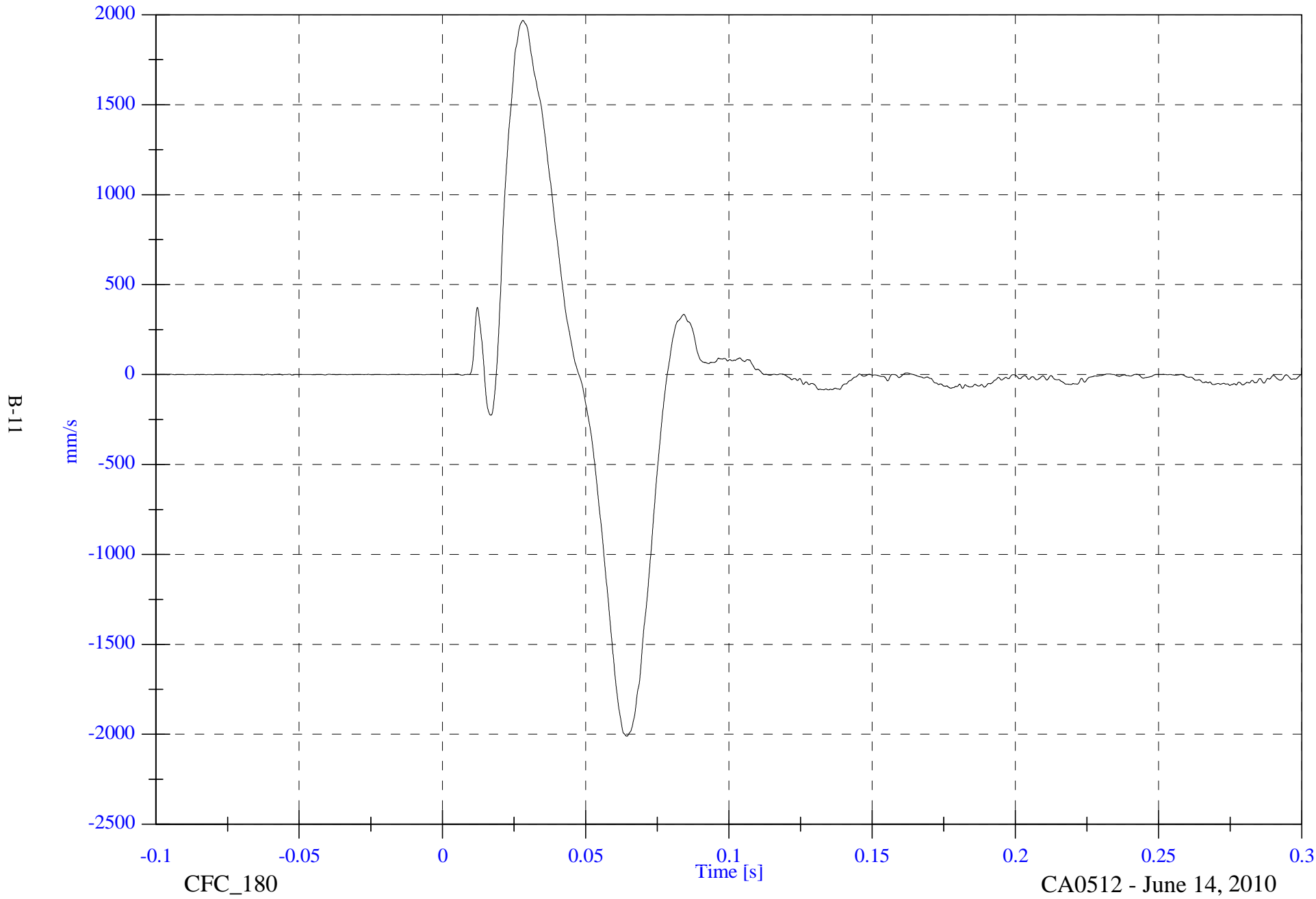
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Upper Thorax Rib Dy Rate

Max: 1968.3 [mm/s] at 0.028 [s]

Min: -2010.4 [mm/s] at 0.064 [s]



B-11

mm/s

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

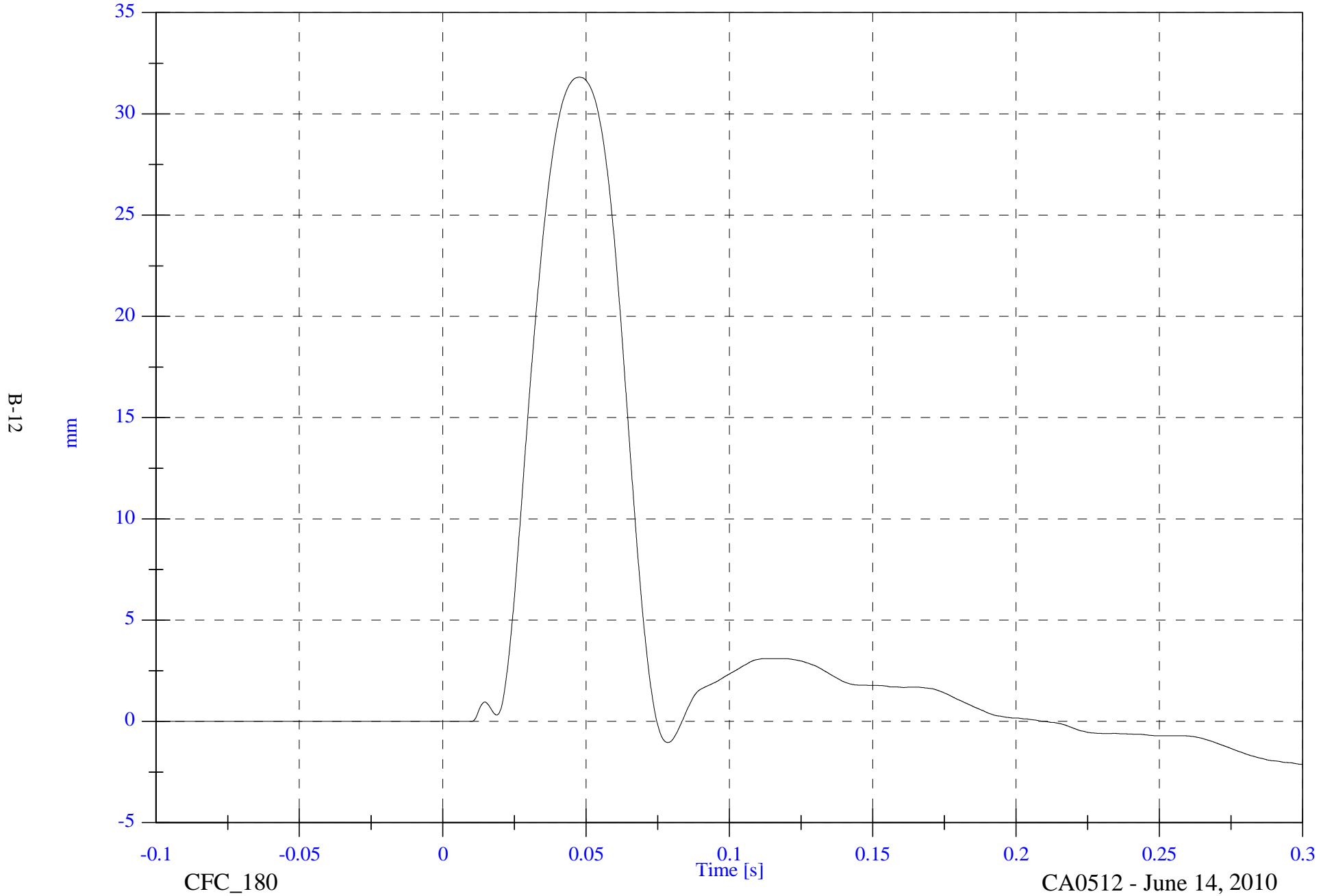
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Upper Thorax Rib Dy

Max: 31.8 [mm] at 0.048 [s]

Min: -2.1 [mm] at 0.300 [s]



CFC_180

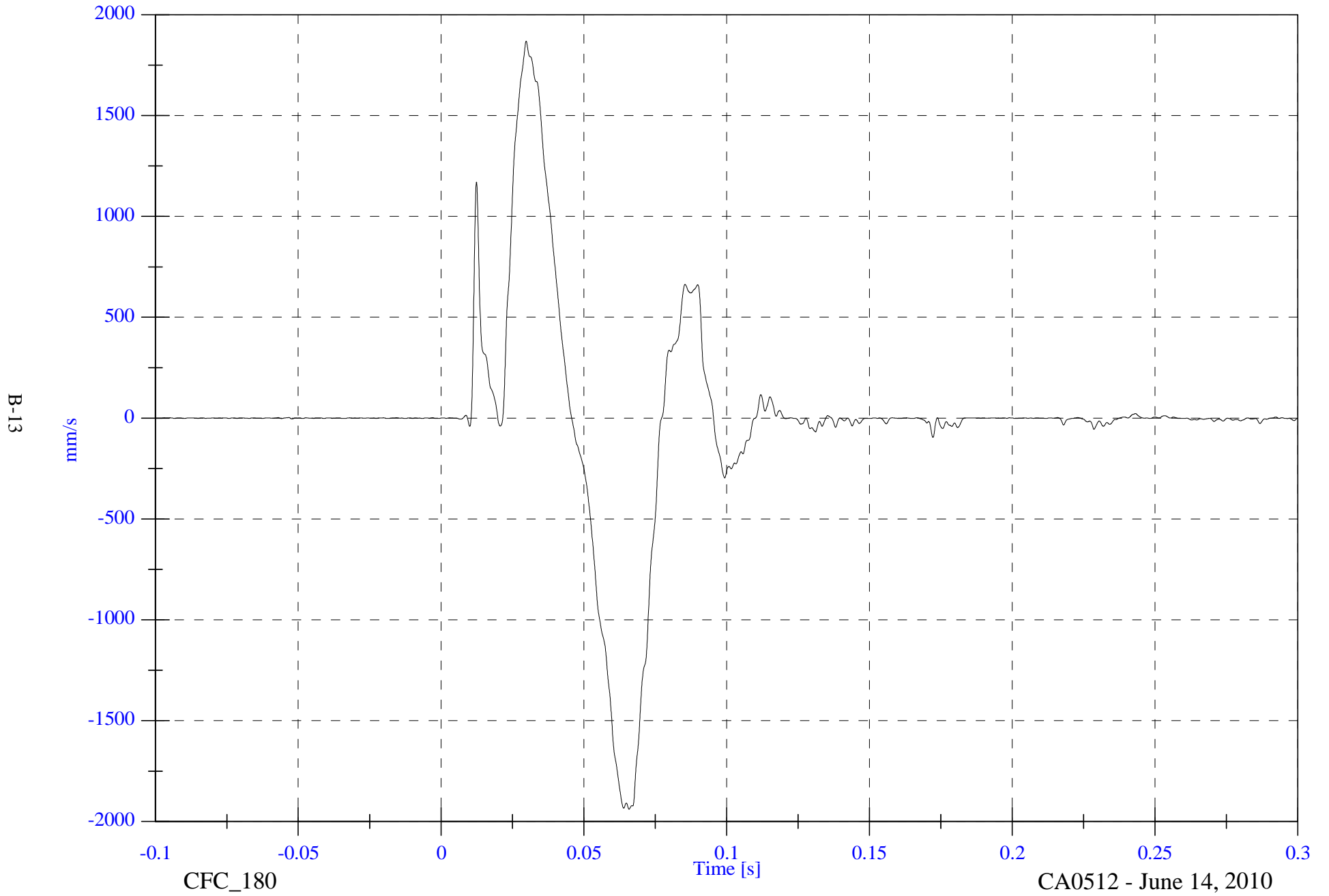
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Middle Thorax Rib Dy Rate

Max: 1869.1 [mm/s] at 0.030 [s]

Min: -1939.2 [mm/s] at 0.066 [s]



B-13

mm/s

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

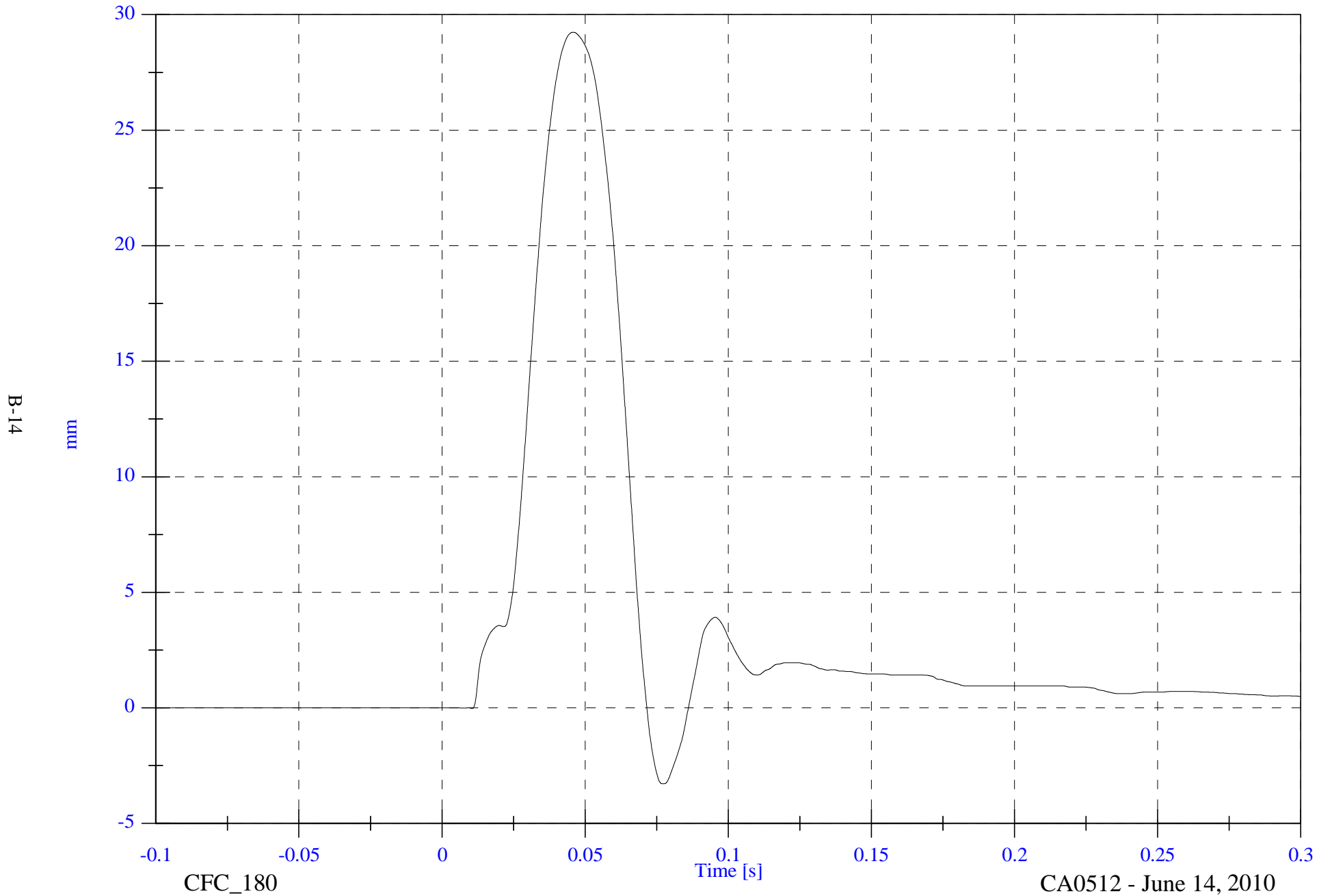
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Middle Thorax Rib Dy

Max: 29.2 [mm] at 0.046 [s]

Min: -3.3 [mm] at 0.077 [s]



CFC_180

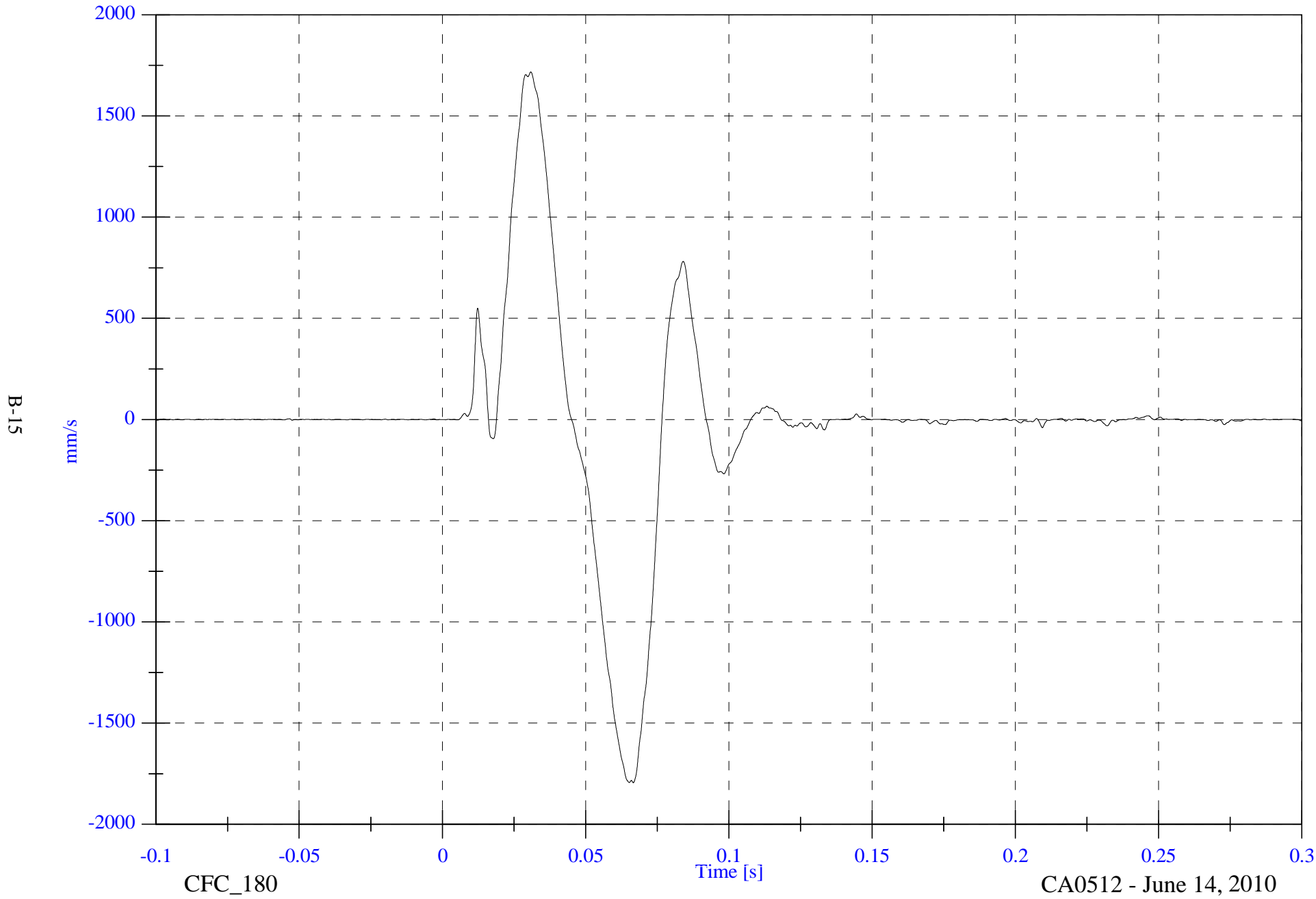
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Lower Thorax Rib Dy Rate

Max: 1717.7 [mm/s] at 0.031 [s]

Min: -1794.5 [mm/s] at 0.067 [s]



B-15

CFC_180

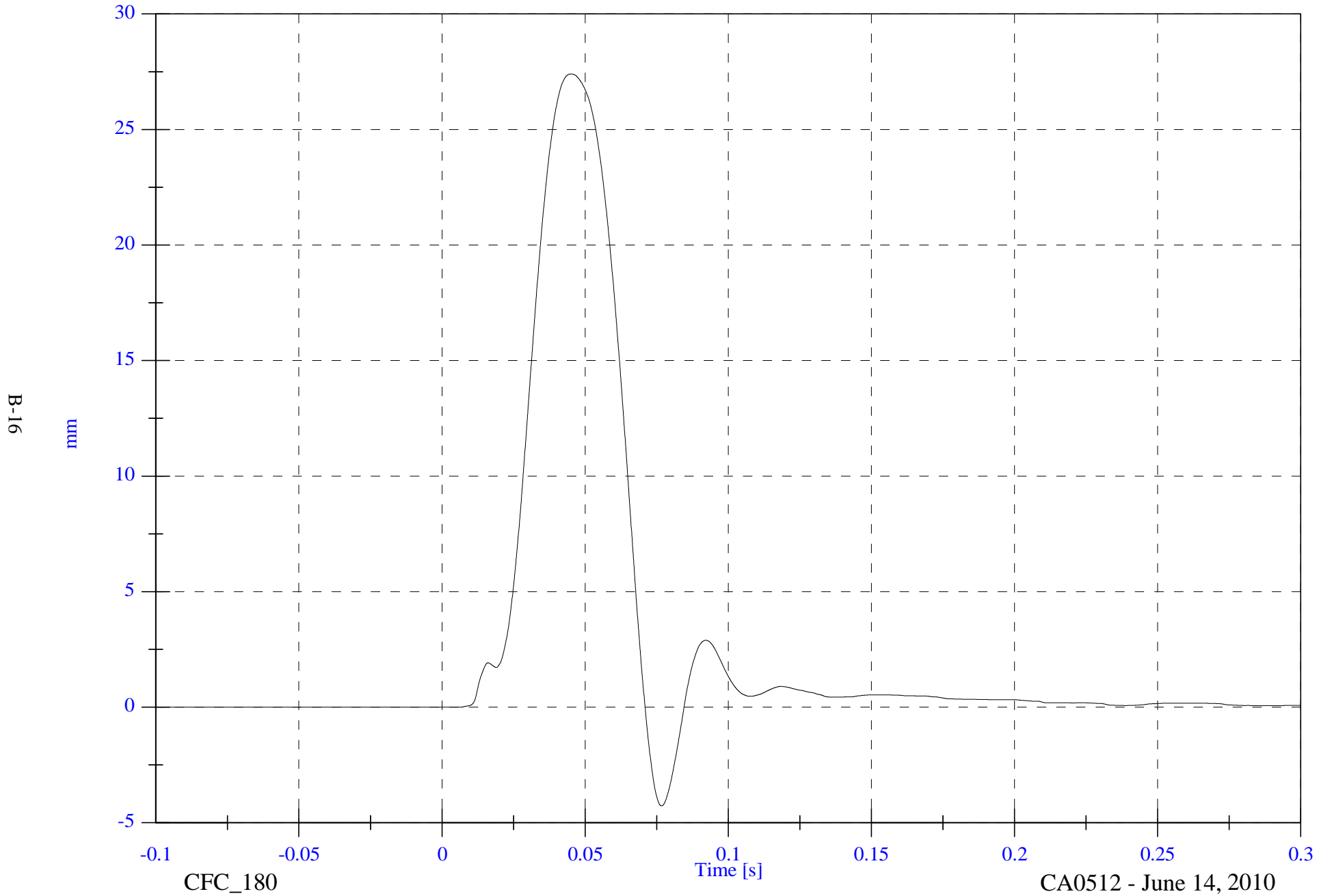
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Lower Thorax Rib Dy

Max: 27.4 [mm] at 0.045 [s]

Min: -4.3 [mm] at 0.077 [s]



CFC_180

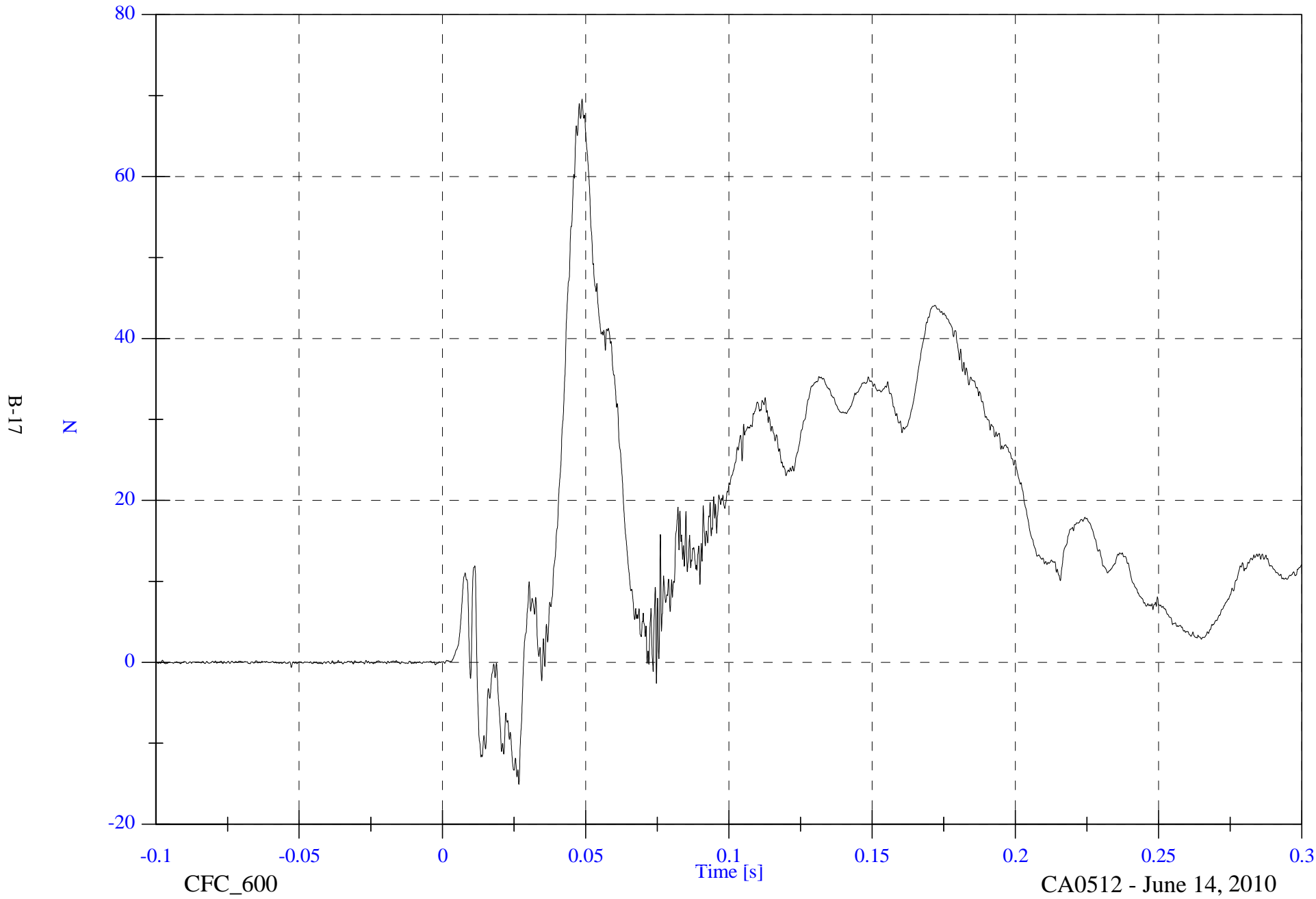
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Front Abdominal Fy

Max: 69.6 [N] at 0.049 [s]

Min: -15.0 [N] at 0.027 [s]



CFC_600

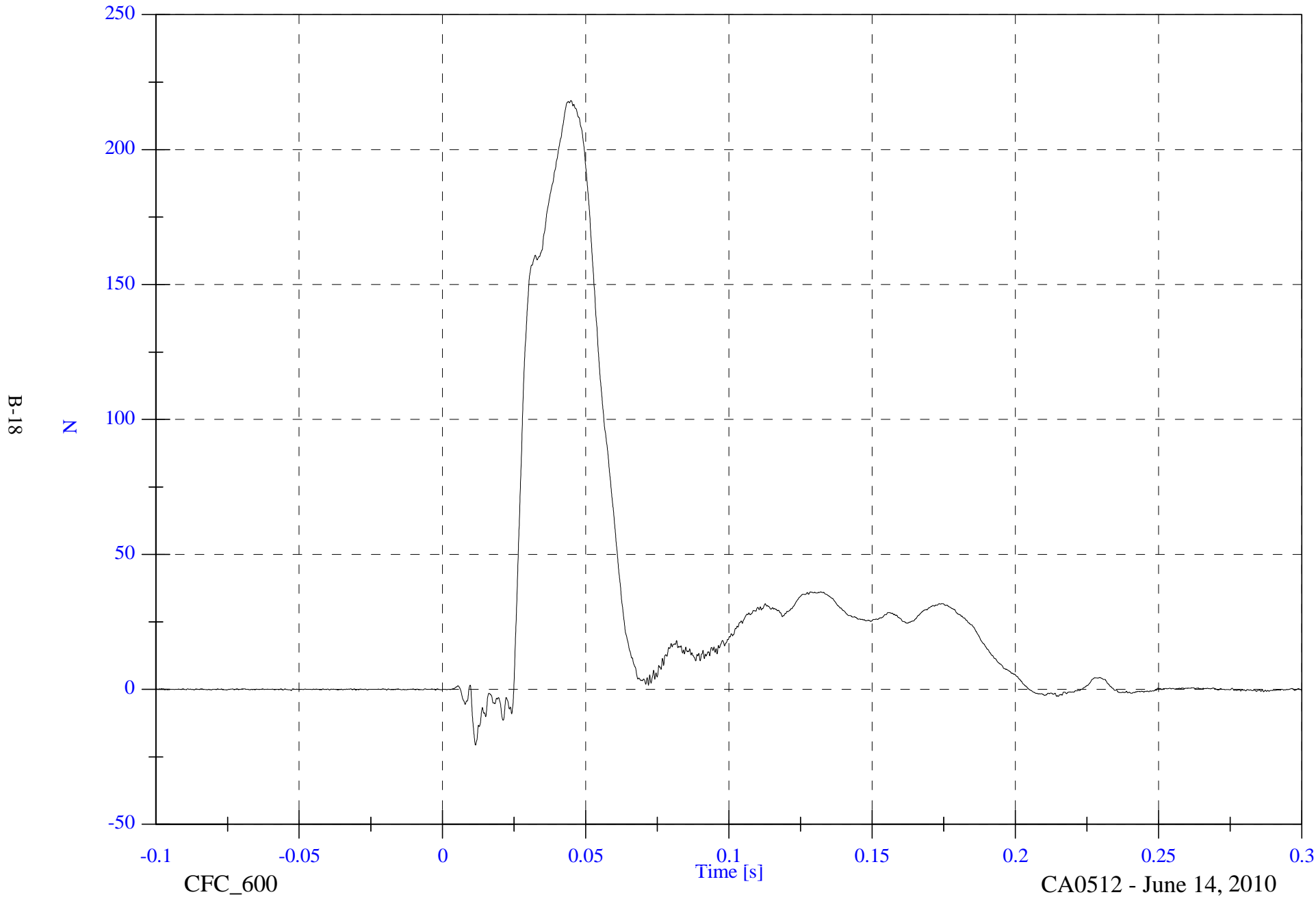
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Middle Abdominal Fy

Max: 218.2 [N] at 0.045 [s]

Min: -20.6 [N] at 0.012 [s]



CFC_600

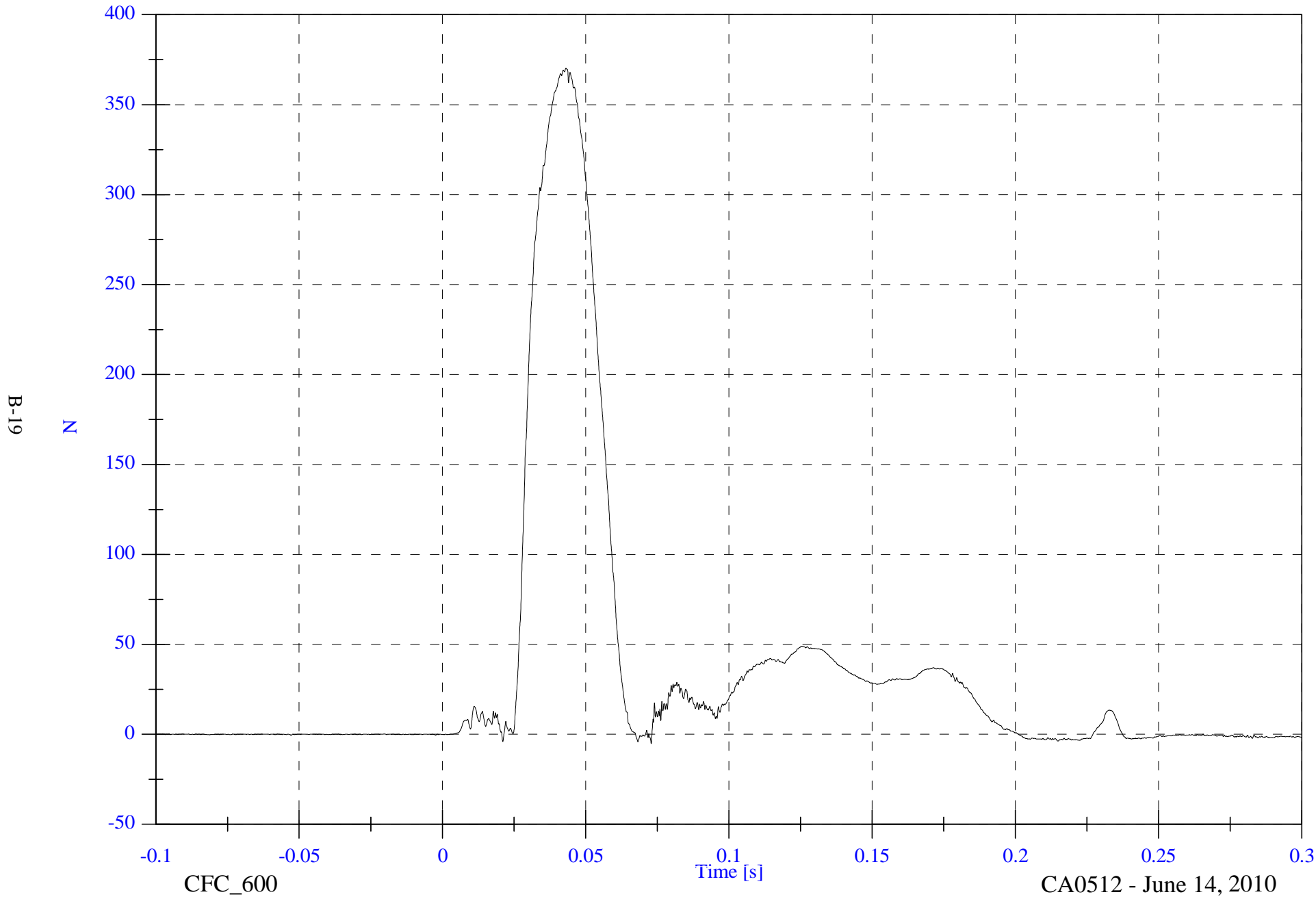
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 370.4 [N] at 0.043 [s]

V2P1 Rear Abdominal Fy

Min: -5.2 [N] at 0.073 [s]



B-19

N

CFC_600

Time [s]

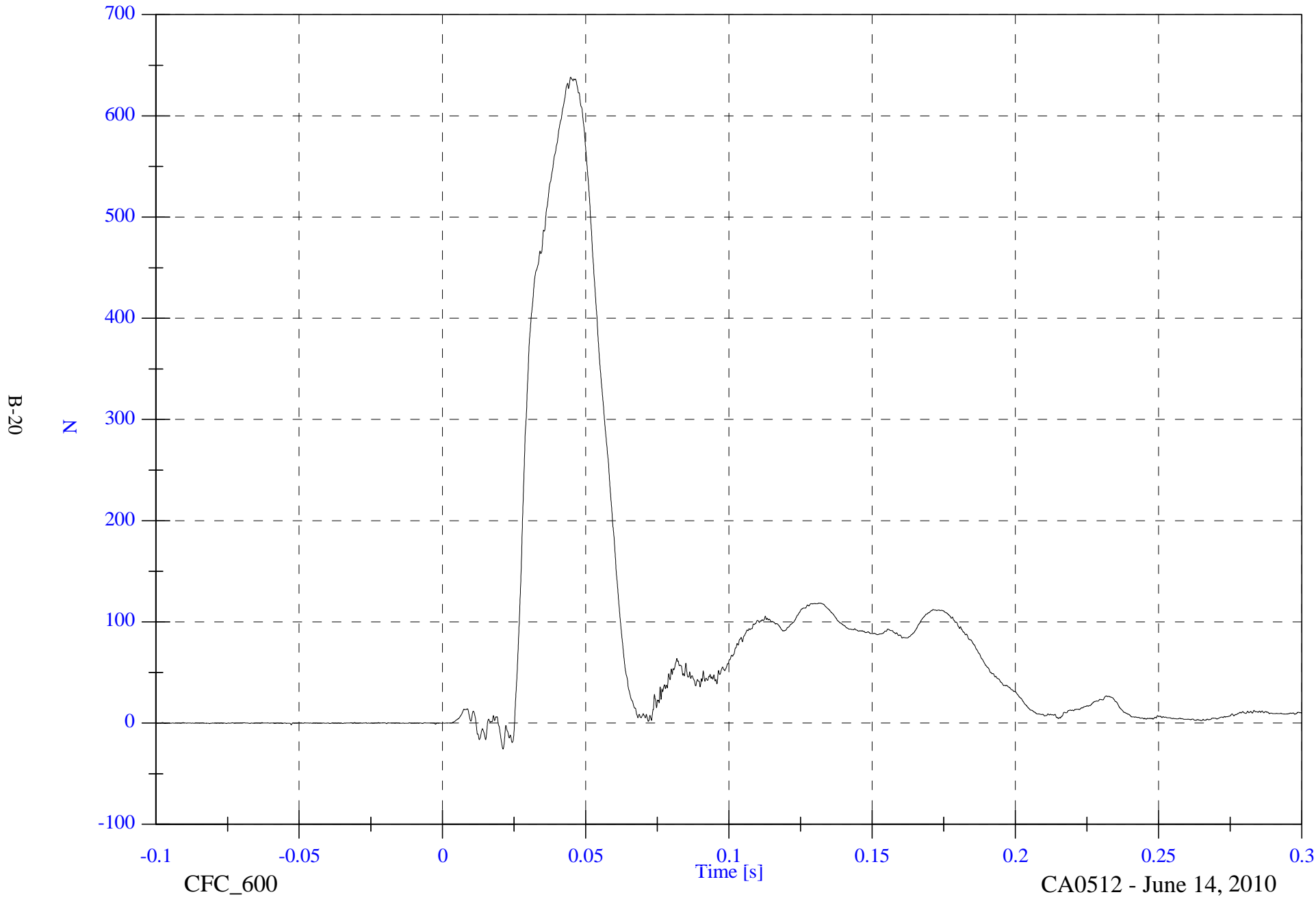
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P1 Abdominal Summation Fy

Max: 638.3 [N] at 0.045 [s]

Min: -25.7 [N] at 0.021 [s]

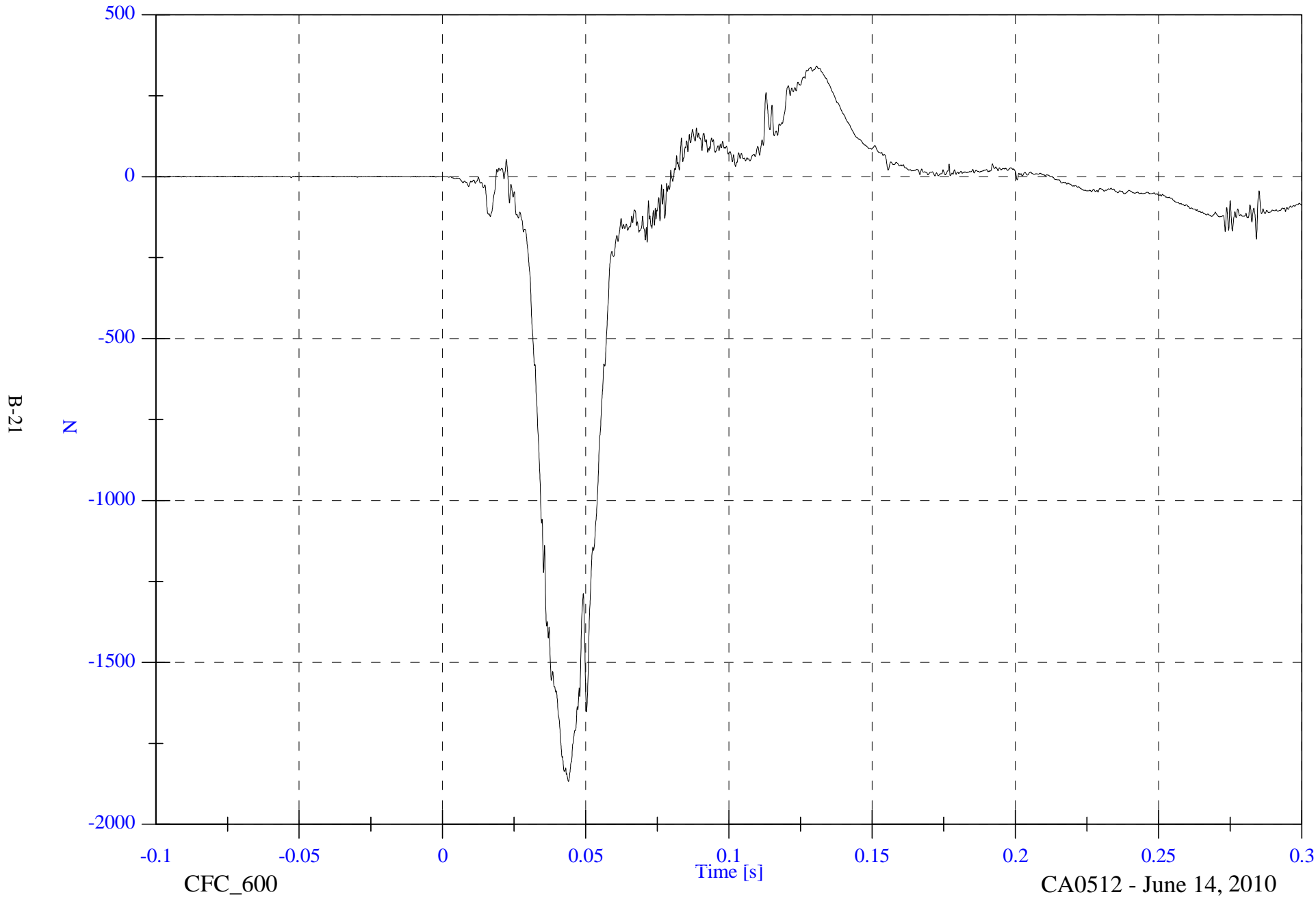


FMVSS 214 MDB - 2010 BMW 128i

V2P1 Pubic Symphysis Fy

Max: 340.7 [N] at 0.131 [s]

Min: -1867.7 [N] at 0.044 [s]



CFC_600

CA0512 - June 14, 2010

APPENDIX C
SID-IIs DUMMY RESPONSE DATA
(SAE sign convention)

SID-IIs DATA CHANNEL FILTER CLASS SUMMARY

Data Type	SAE Filter Class	Cut-off Frequency
Dummy Head Acceleration	1000	1650
Lower Spine T12 Acceleration	180	300
Acetabulum Force	600	1000
Iliac Force	600	1000

DATA CHANNEL TITLE KEY

Prefix	Suffix
V1 = Vehicle 1 (Test Vehicle)	Ax = Acceleration, X-direction
V2 = Vehicle 2 (Test Vehicle)	Ay = Acceleration, Y-direction
P1 = Left Front Seating Position (Driver)	Az = Acceleration, Z-direction
P4 = Left Second Row Seating Position (Passenger)	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

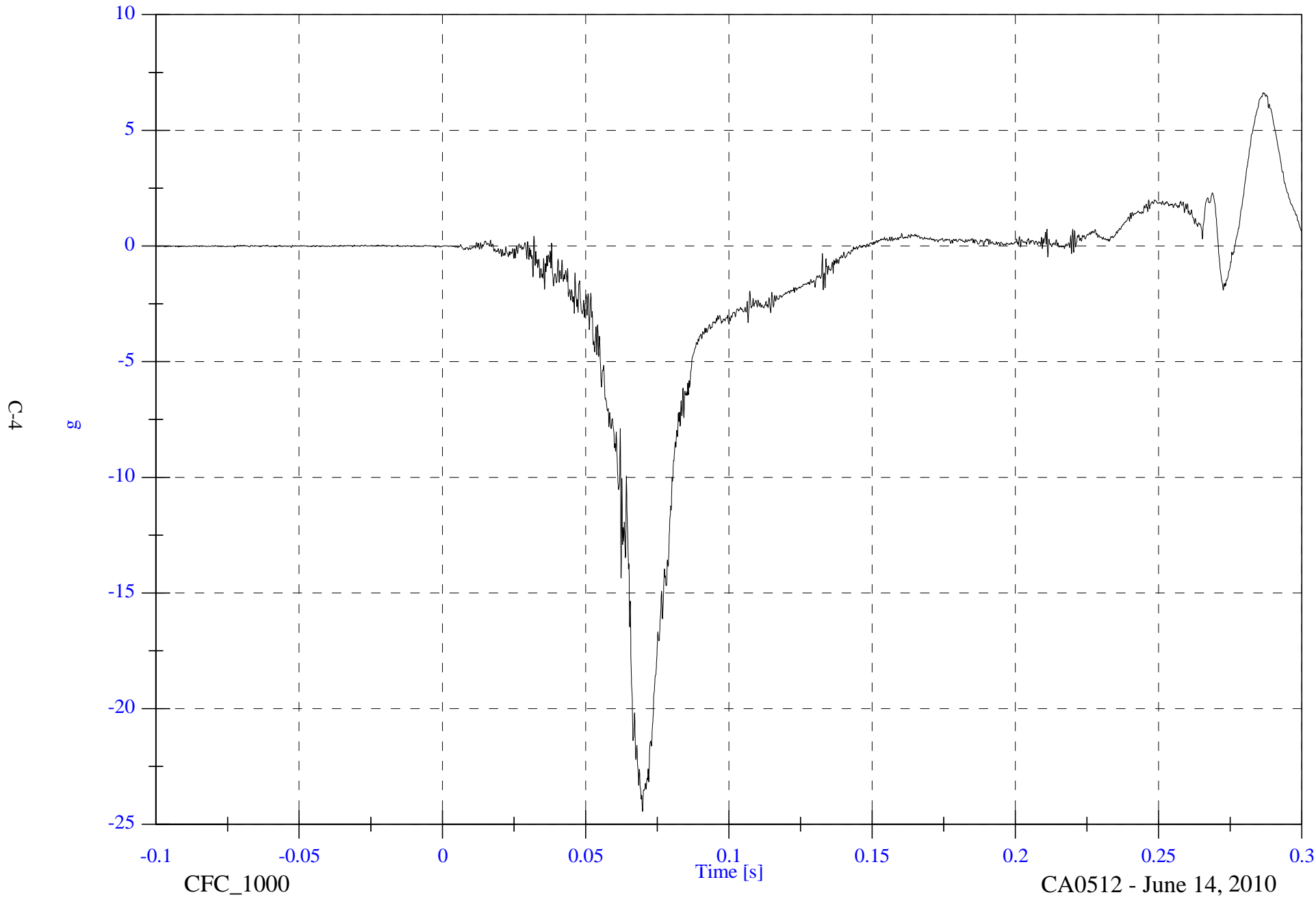
TABLE OF DATA PLOTS for SID-IIs

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
1	SID-IIs Head Ax [g, CFC_1000]	C-4
2	SID-IIs Head Ay [g, CFC_1000]	C-5
3	SID-IIs Head Az [g, CFC_1000]	C-6
4	SID-IIs Head Resultant [g, CFC_1000]	C-7
5	SID-IIs Head Ax Velocity vs. Time	C-8
6	SID-IIs Head Ay Velocity vs. Time	C-9
7	SID-IIs Head Az Velocity vs. Time	C-10
8	SID-IIs Lower Spine X Acceleration vs. Time	C-11
9	SID-IIs Lower Spine Y Acceleration vs. Time	C-12
10	SID-IIs Lower Spine Z Acceleration vs. Time	C-13
11	SID-IIs Lower Spine Resultant Acceleration vs. Time	C-14
12	SID-IIs Lower Spine X Velocity vs. Time	C-15
13	SID-IIs Lower Spine Y Velocity vs. Time	C-16
14	SID-IIs Lower Spine Z Velocity vs. Time	C-17
15	SID-IIs Acetabulum Force vs. Time	C-18
16	SID-IIs Iliac Force (Y) vs. Time	C-19
17	SID-IIs Sum of Iliac and Acetabulum Force vs. Time	C-20

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head x

Max: 6.6 [g] at 0.287 [s]
Min: -24.4 [g] at 0.070 [s]



CFC_1000

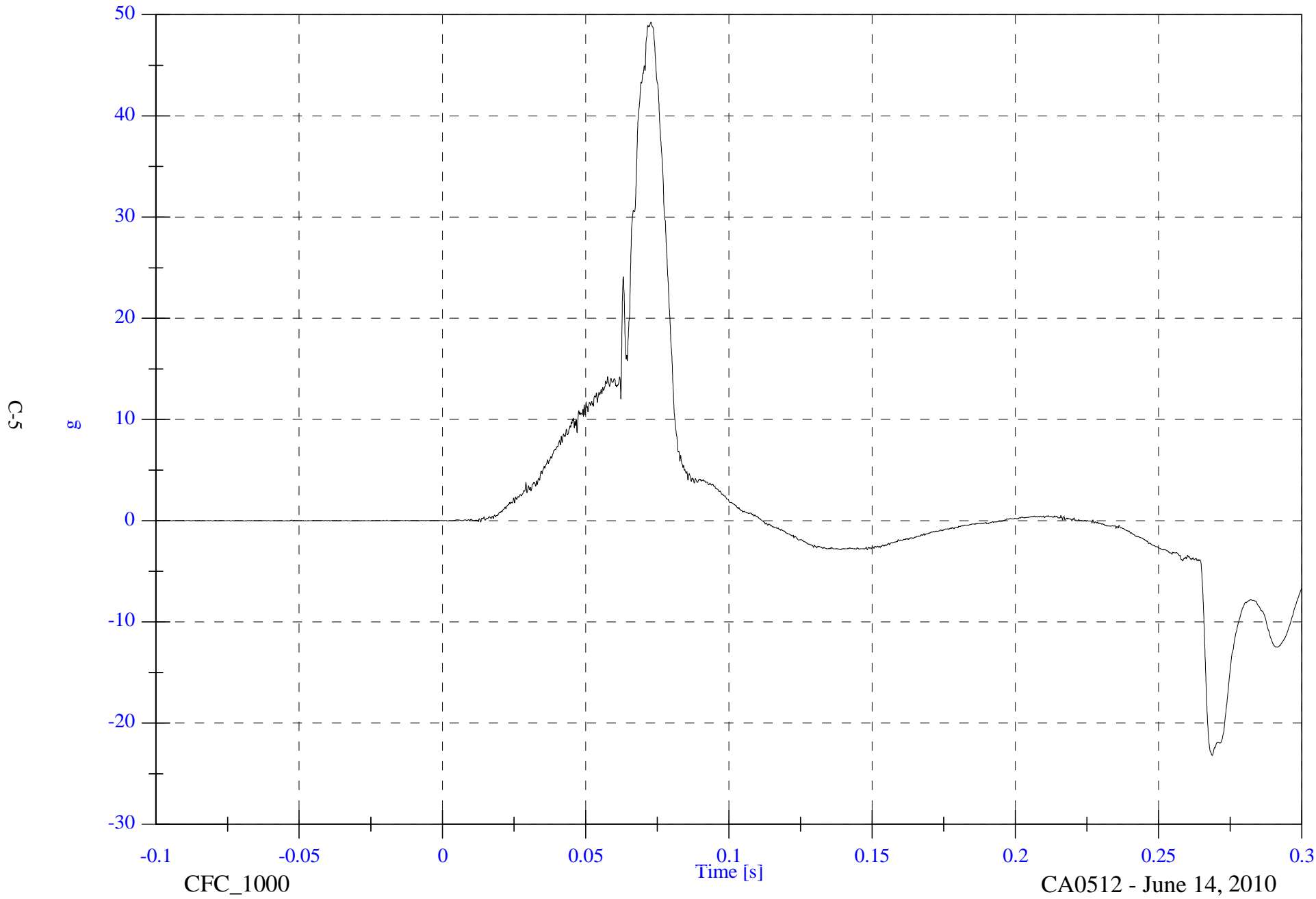
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 49.3 [g] at 0.073 [s]

Min: -23.2 [g] at 0.269 [s]

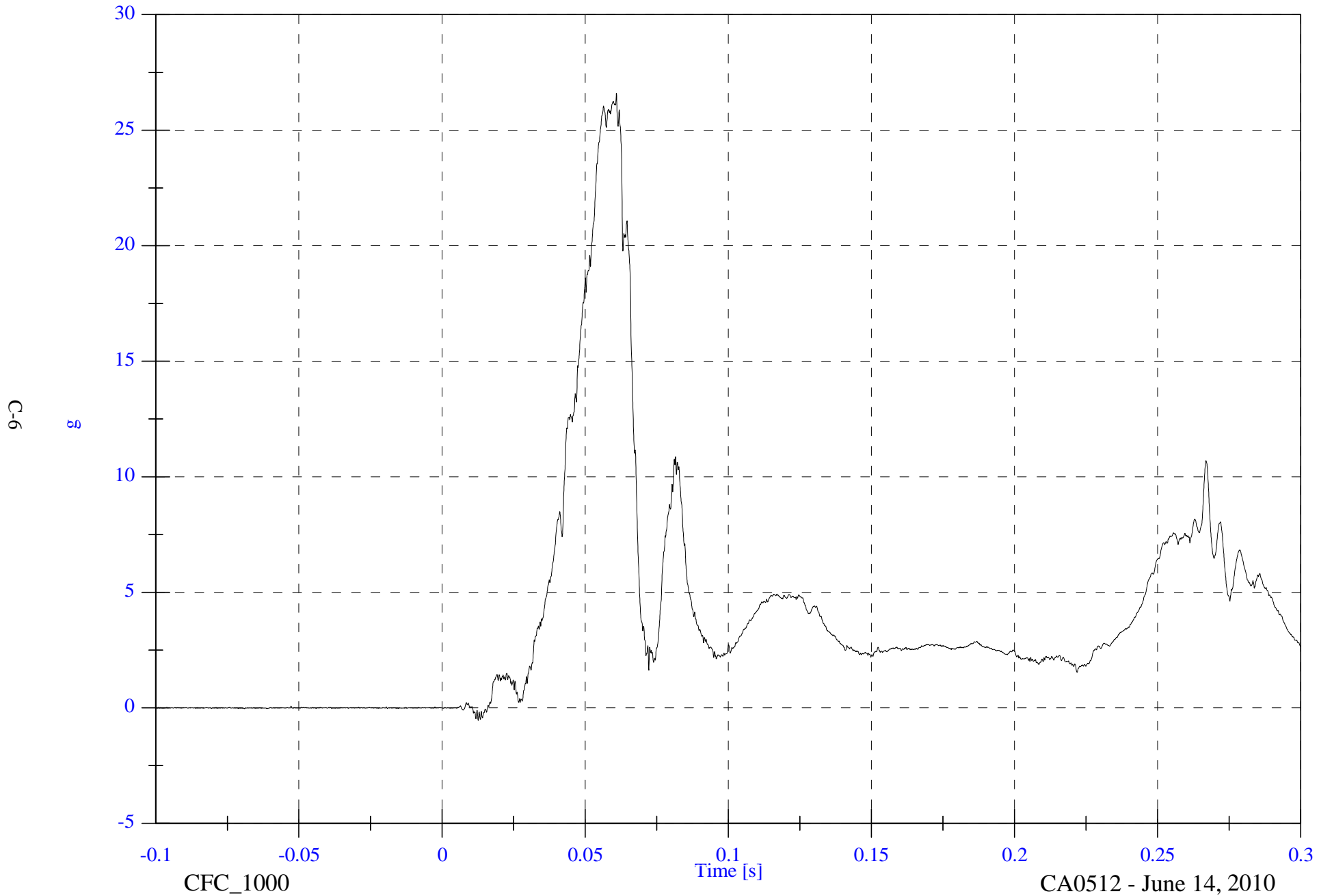
V2P4 Head y



FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head z

Max: 26.6 [g] at 0.061 [s]
Min: -0.5 [g] at 0.013 [s]

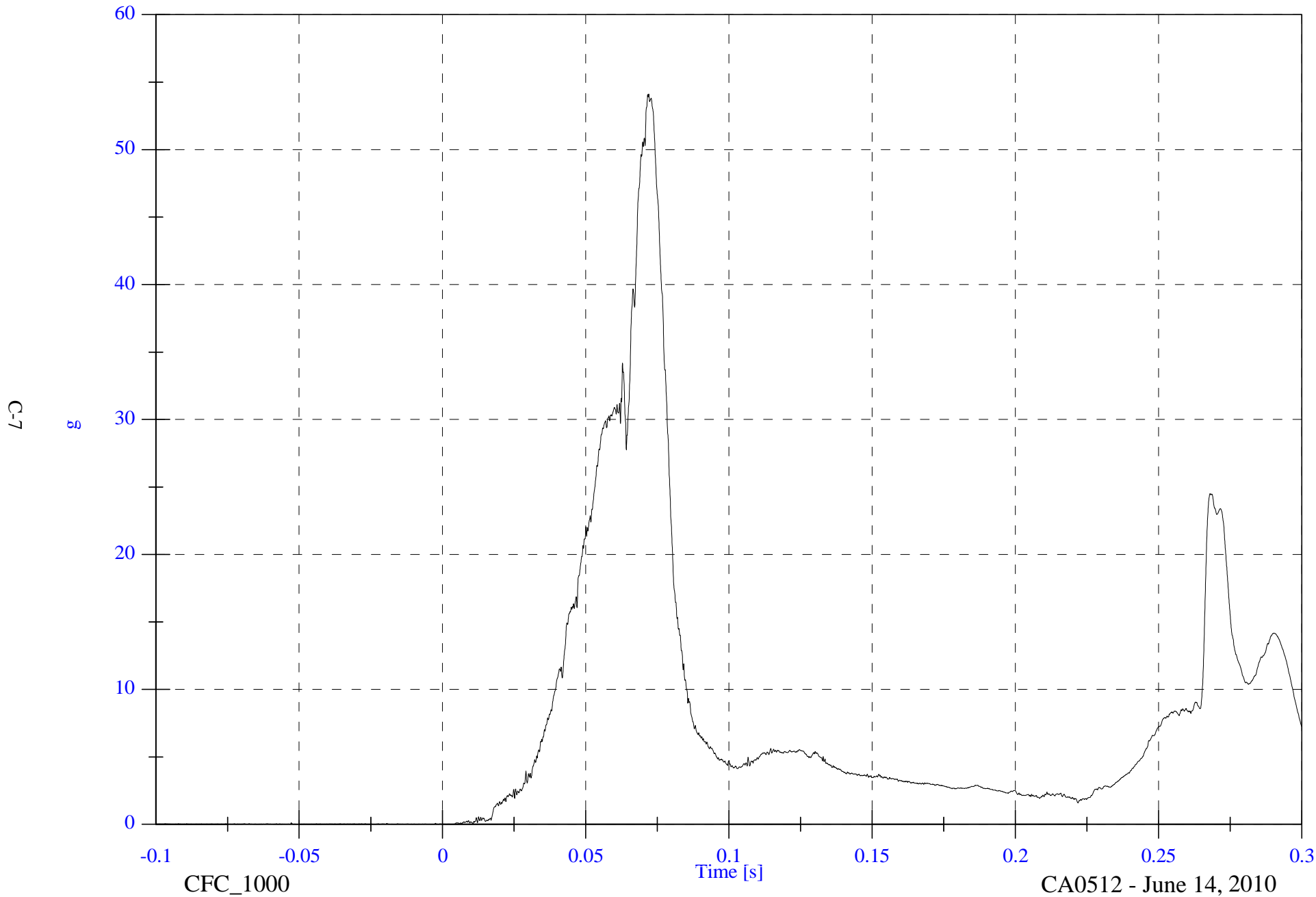


FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head Resultant

Max: 54.1 [g] at 0.072 [s]

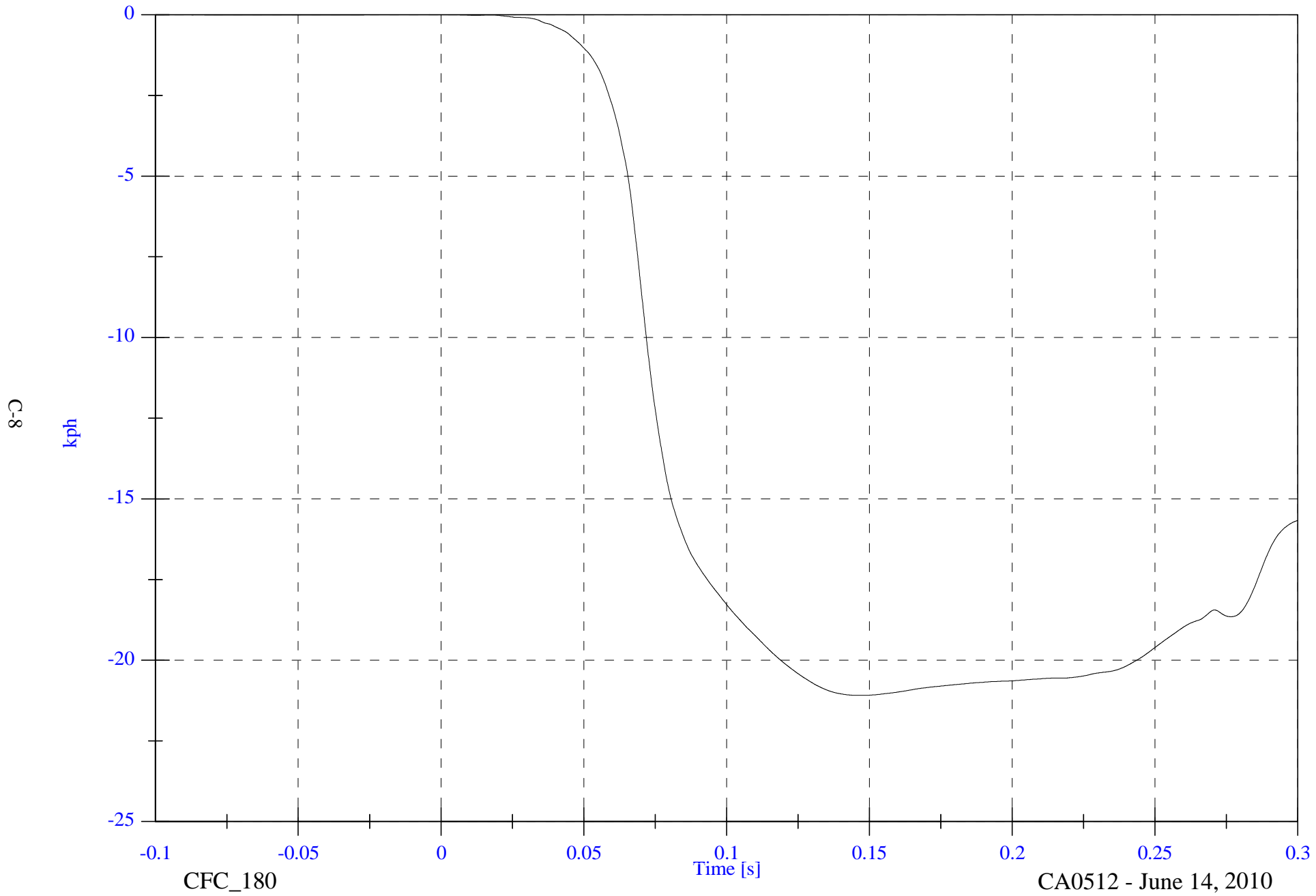
Min: 0.0 [g] at -0.087 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head x Velocity

Max: 0.0 [kph] at -0.004 [s]
Min: -21.1 [kph] at 0.147 [s]



8-C

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

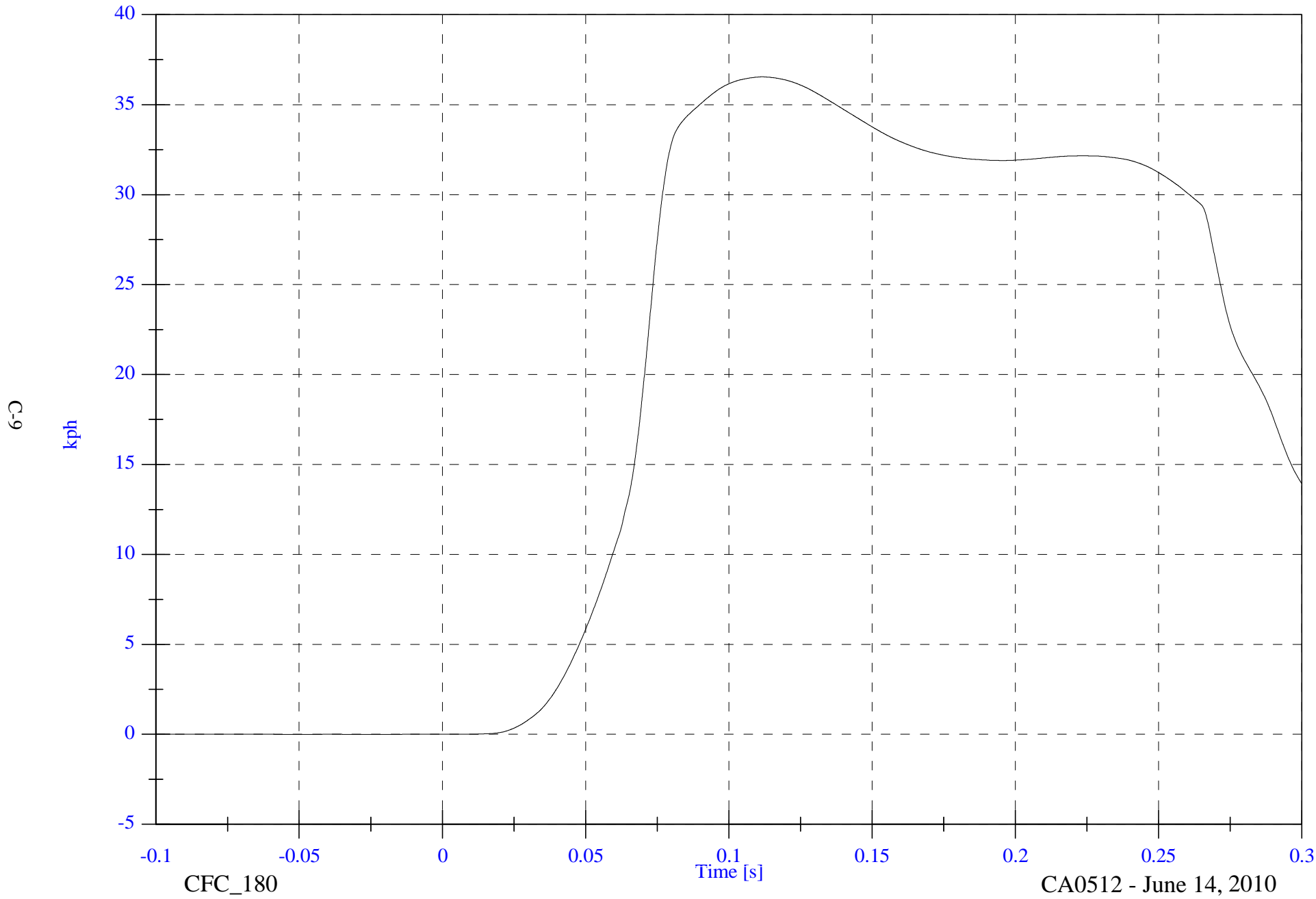
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head y Velocity

Max: 36.5 [kph] at 0.112 [s]

Min: -0.0 [kph] at -0.025 [s]



6-9

kph

Time [s]

CFC_180

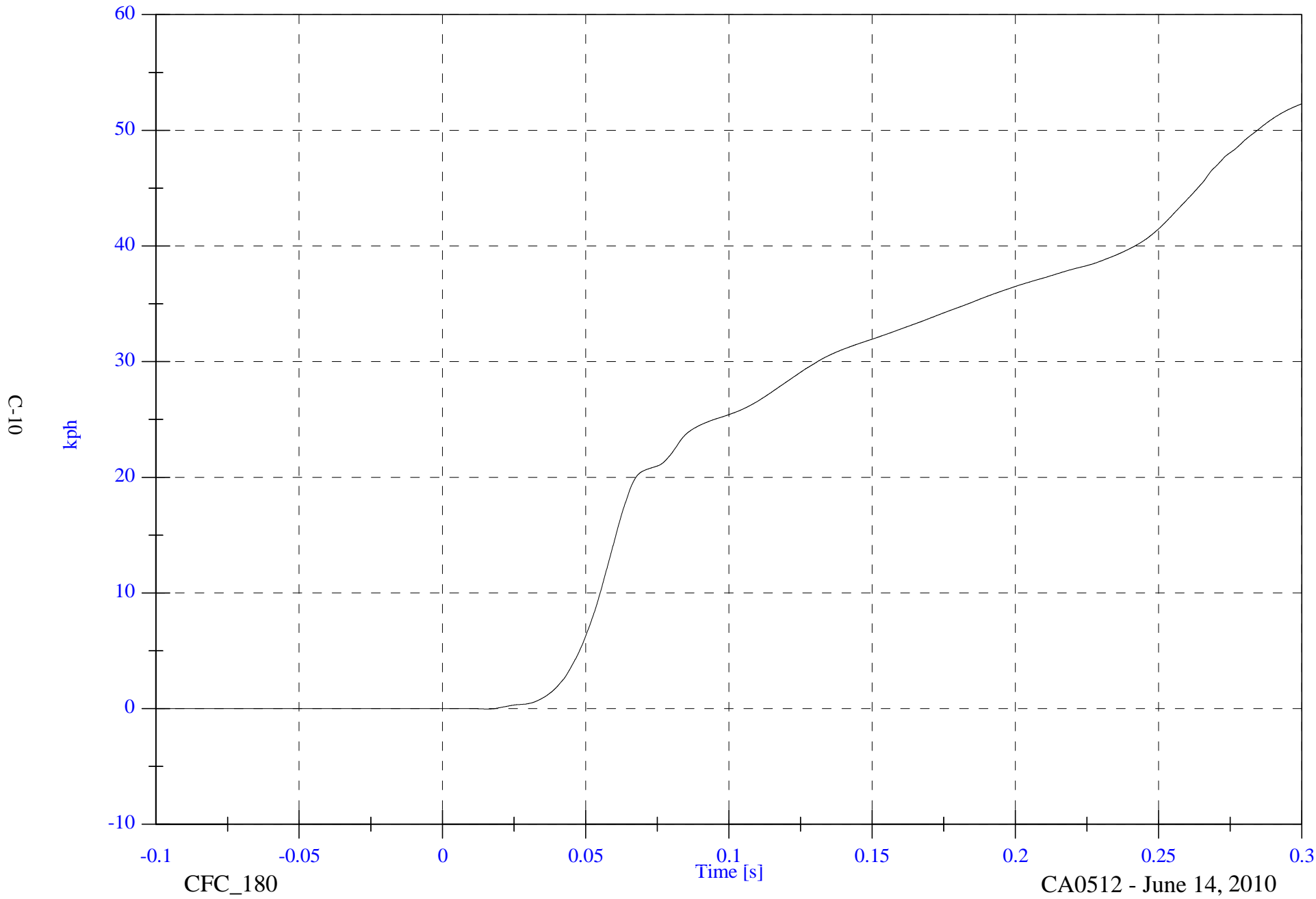
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Head z Velocity

Max: 52.3 [kph] at 0.300 [s]

Min: -0.0 [kph] at 0.016 [s]



C-10

kph

CFC_180

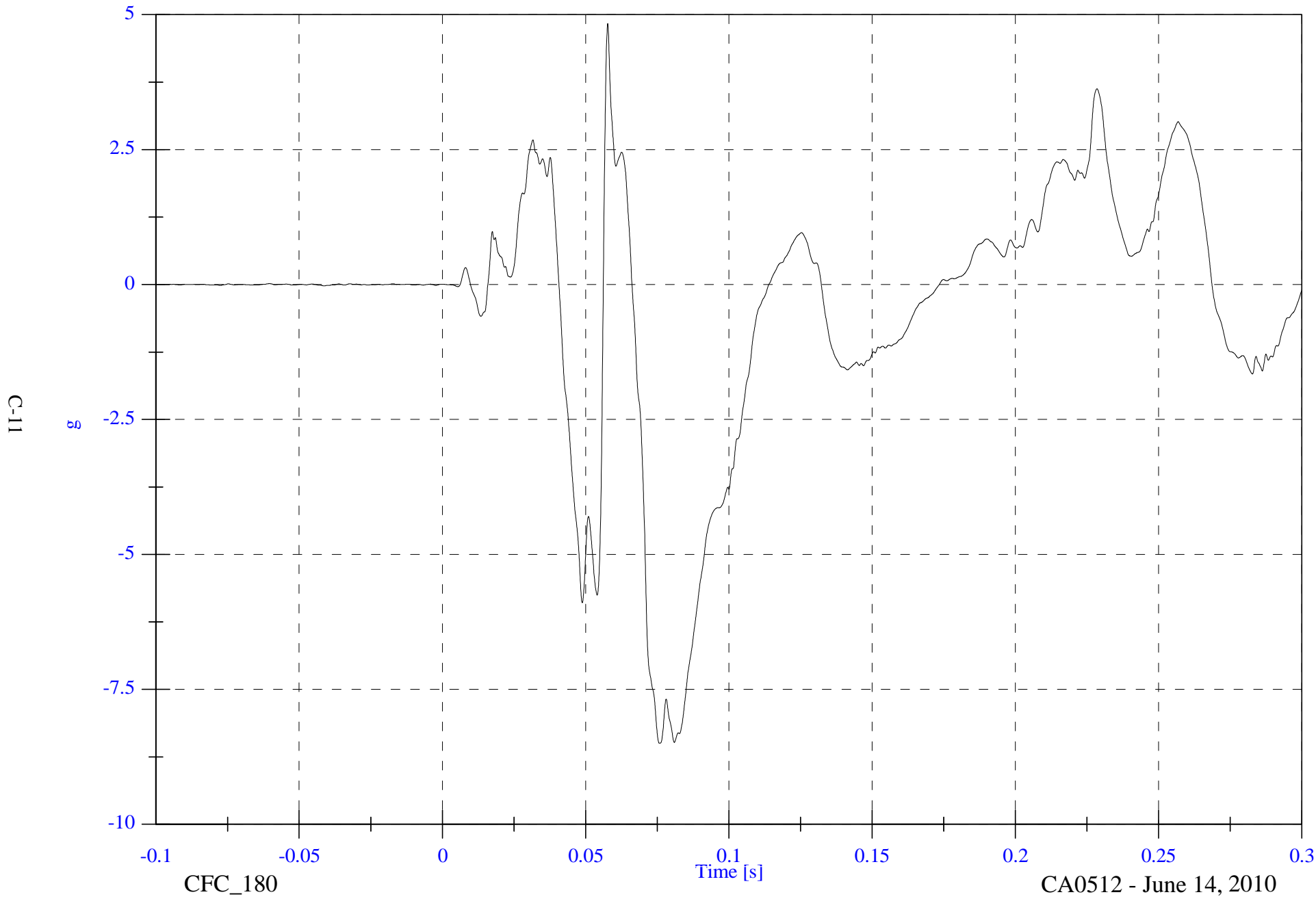
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine x

Max: 4.8 [g] at 0.058 [s]
Min: -8.5 [g] at 0.076 [s]



C-111

g

CFC_180

Time [s]

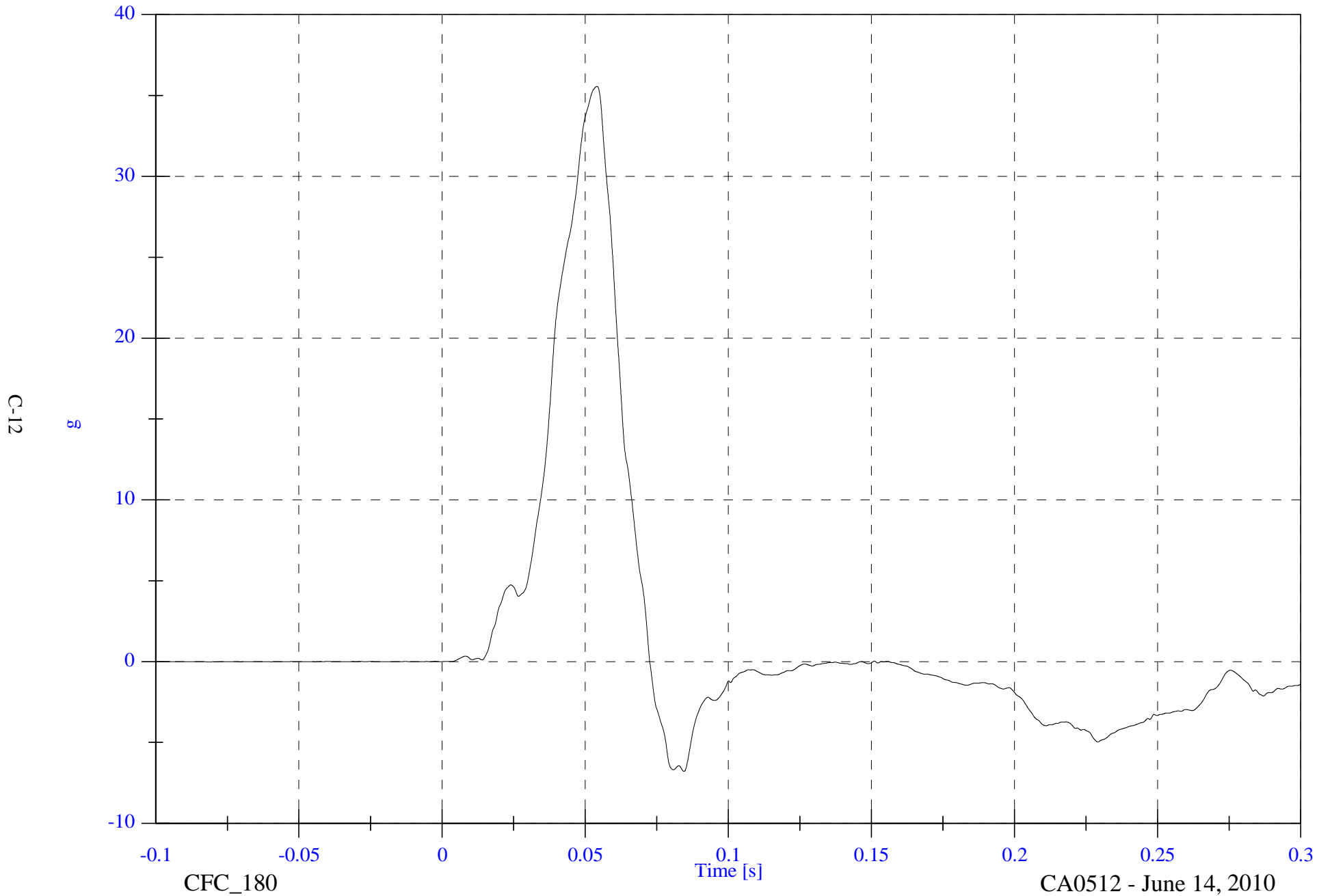
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine y

Max: 35.6 [g] at 0.054 [s]

Min: -6.8 [g] at 0.085 [s]



C-12

g

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

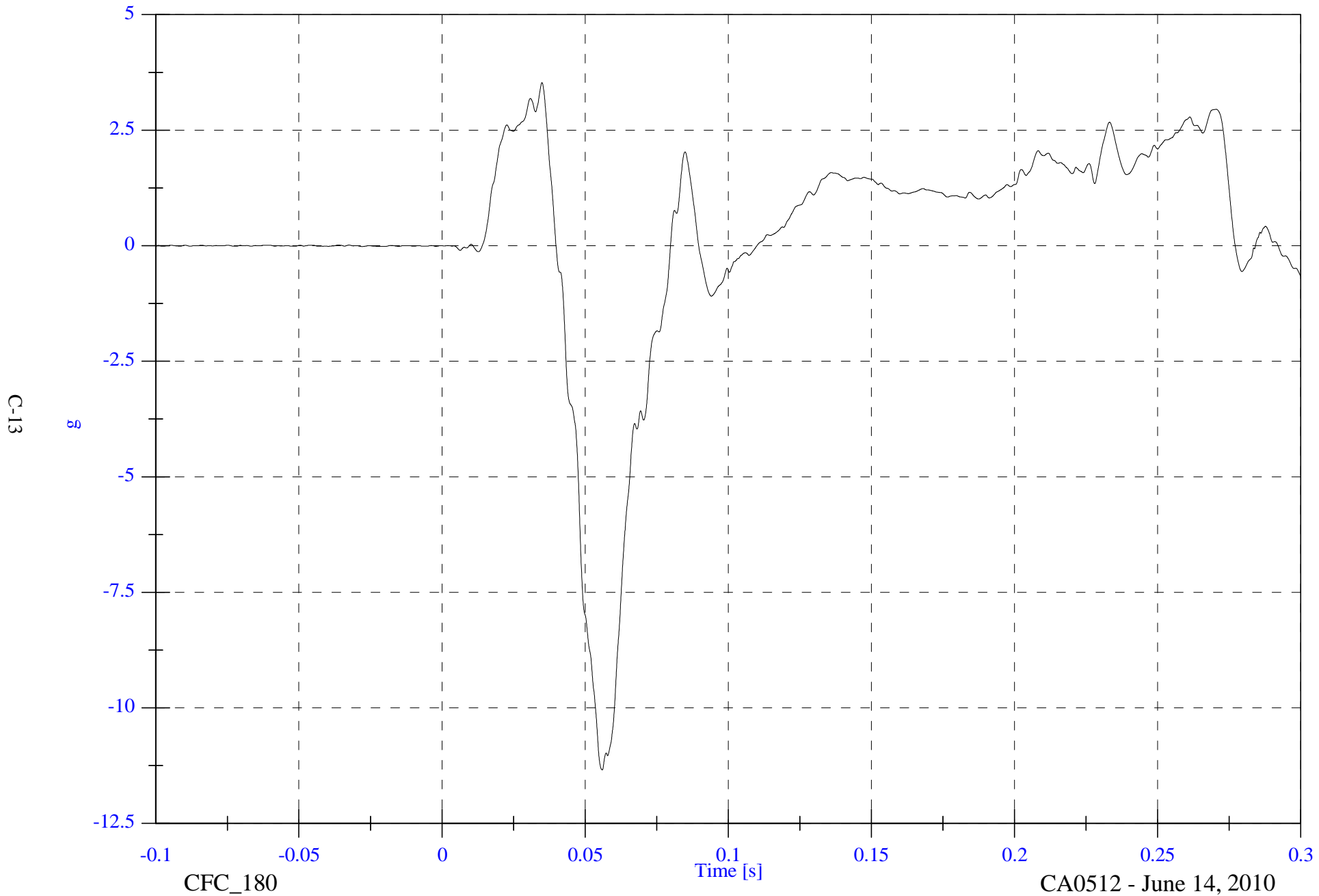
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine z

Max: 3.5 [g] at 0.035 [s]
Min: -11.3 [g] at 0.056 [s]



C-13

g

CFC_180

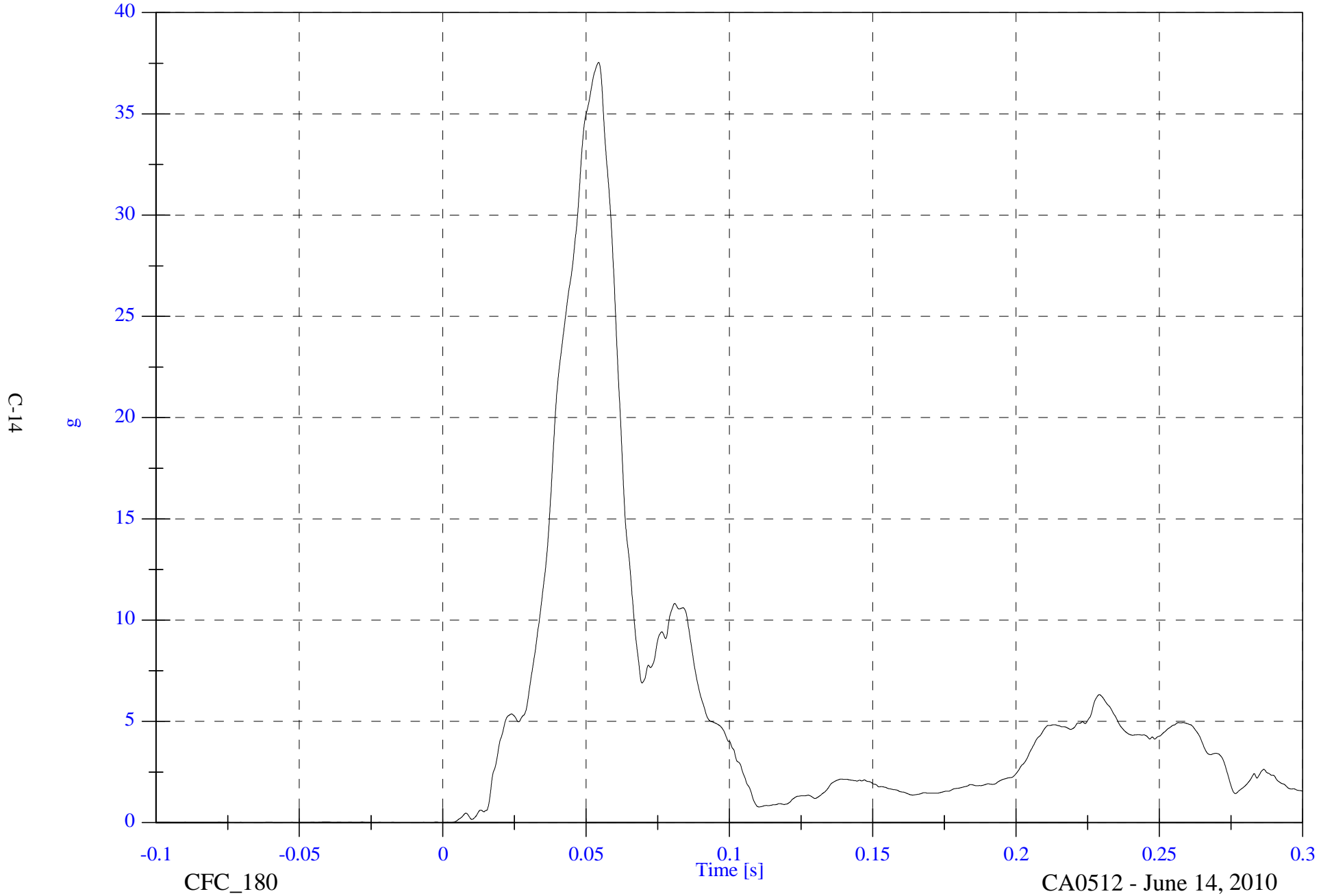
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine Resultant

Max: 37.5 [g] at 0.054 [s]

Min: 0.0 [g] at -0.011 [s]

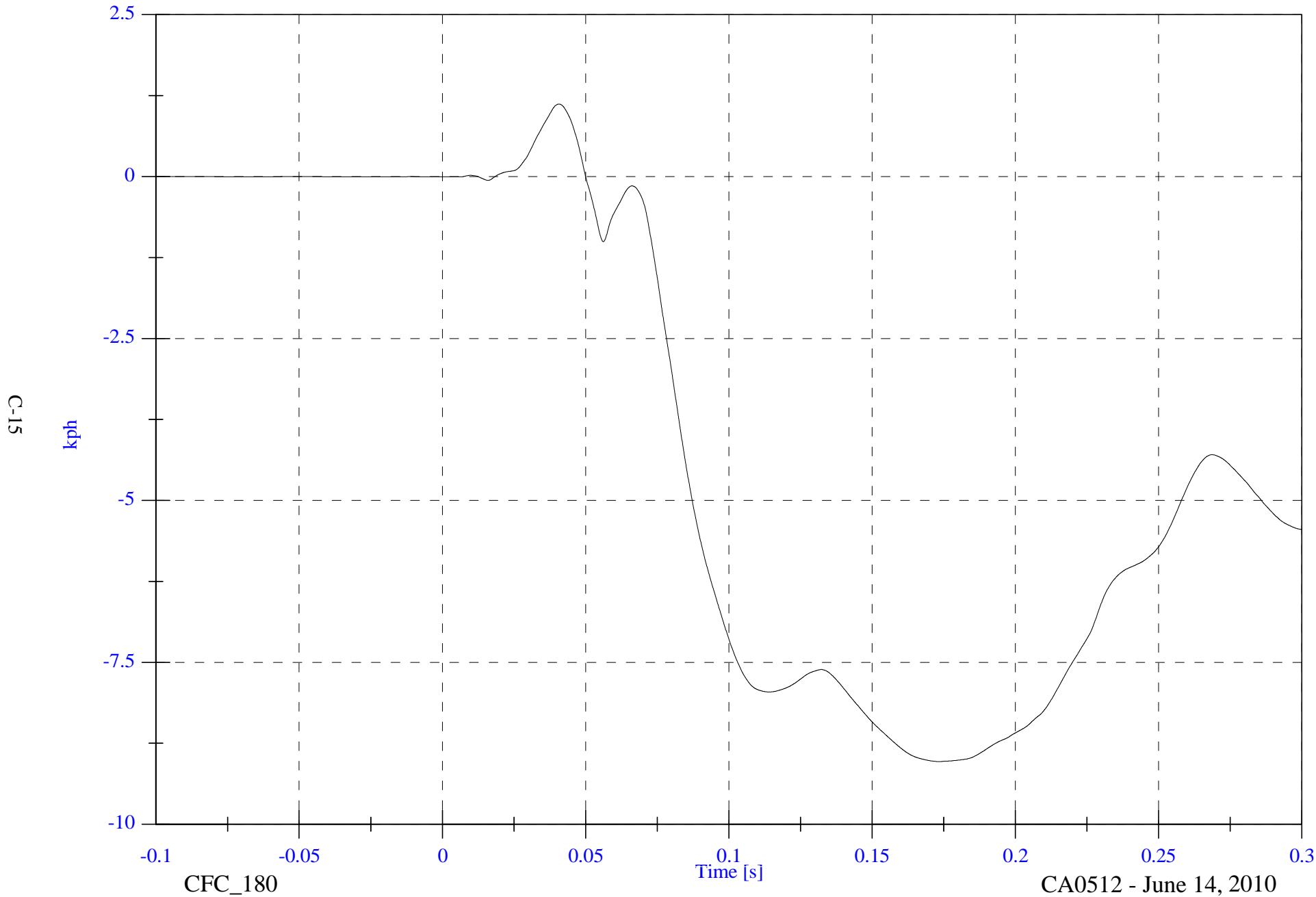


FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine x Velocity

Max: 1.1 [kph] at 0.041 [s]

Min: -9.0 [kph] at 0.173 [s]



C-15

CFC_180

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

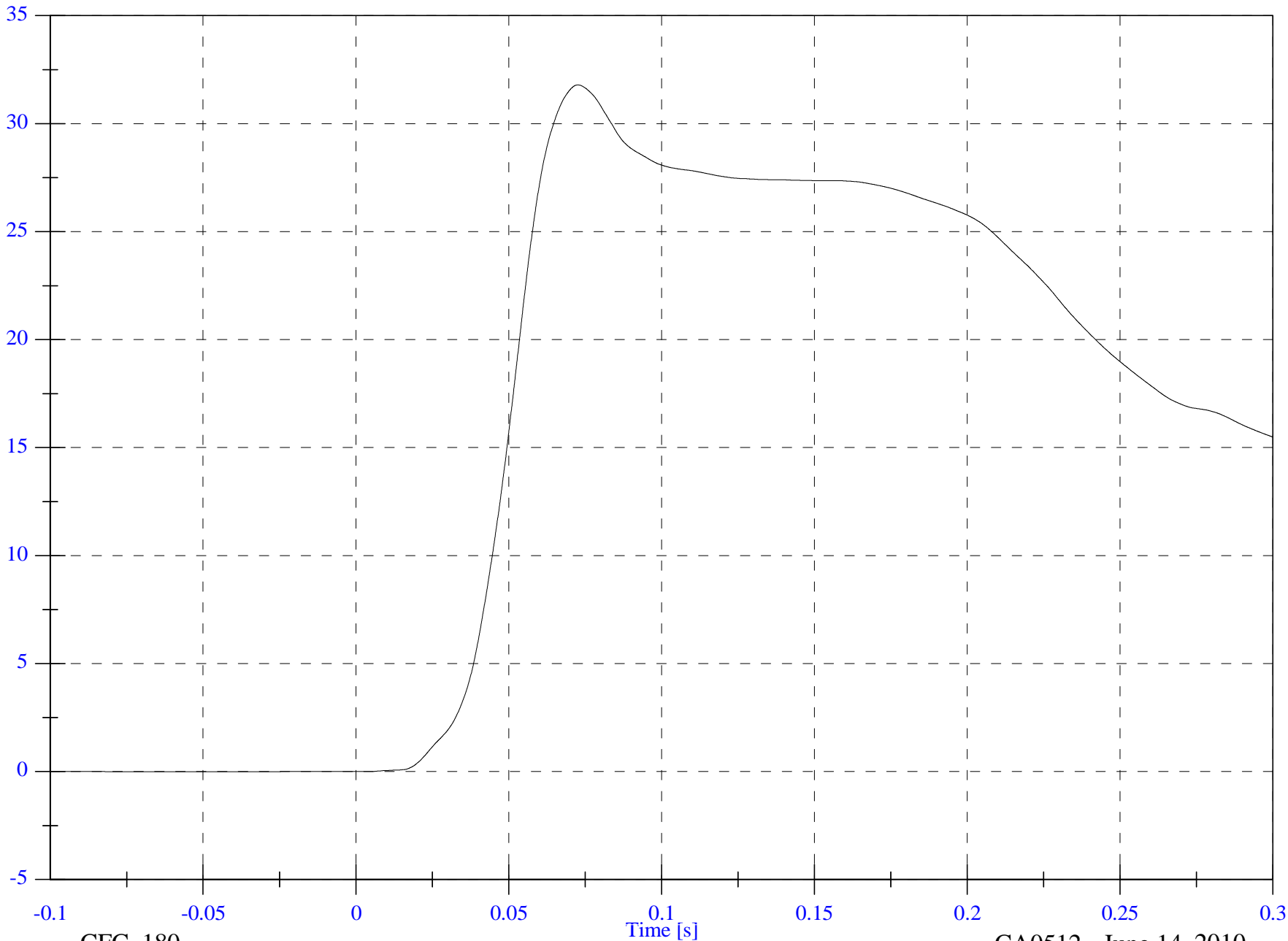
V2P4 Lower Spine y Velocity

Max: 31.8 [kph] at 0.073 [s]

Min: -0.0 [kph] at -0.043 [s]

C-16

kph



CFC_180

Time [s]

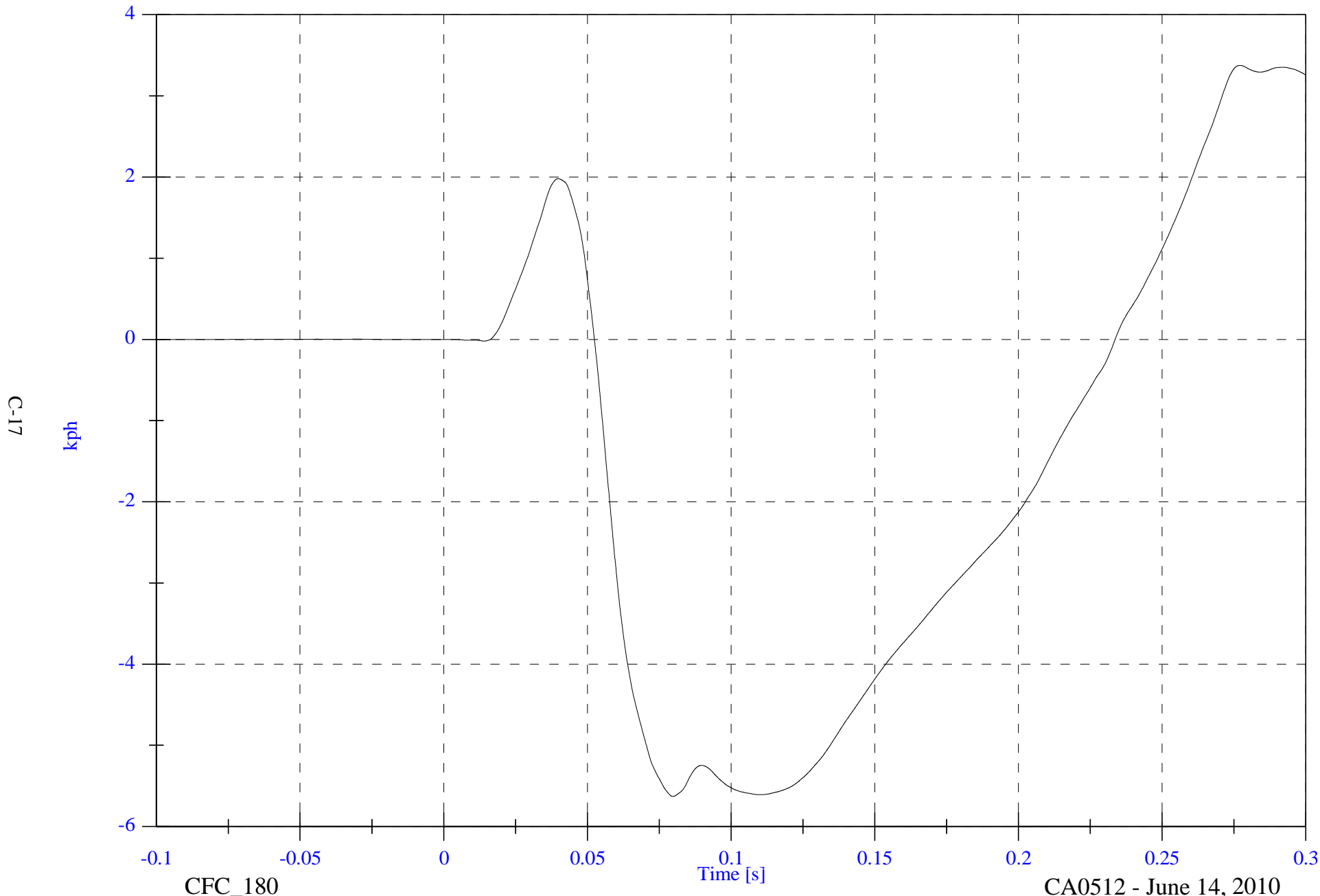
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Lower Spine z Velocity

Max: 3.4 [kph] at 0.277 [s]

Min: -5.6 [kph] at 0.080 [s]



C-17

kph

-0.1

-0.05

0

0.05

0.1
Time [s]

0.15

0.2

0.25

0.3

CFC_180

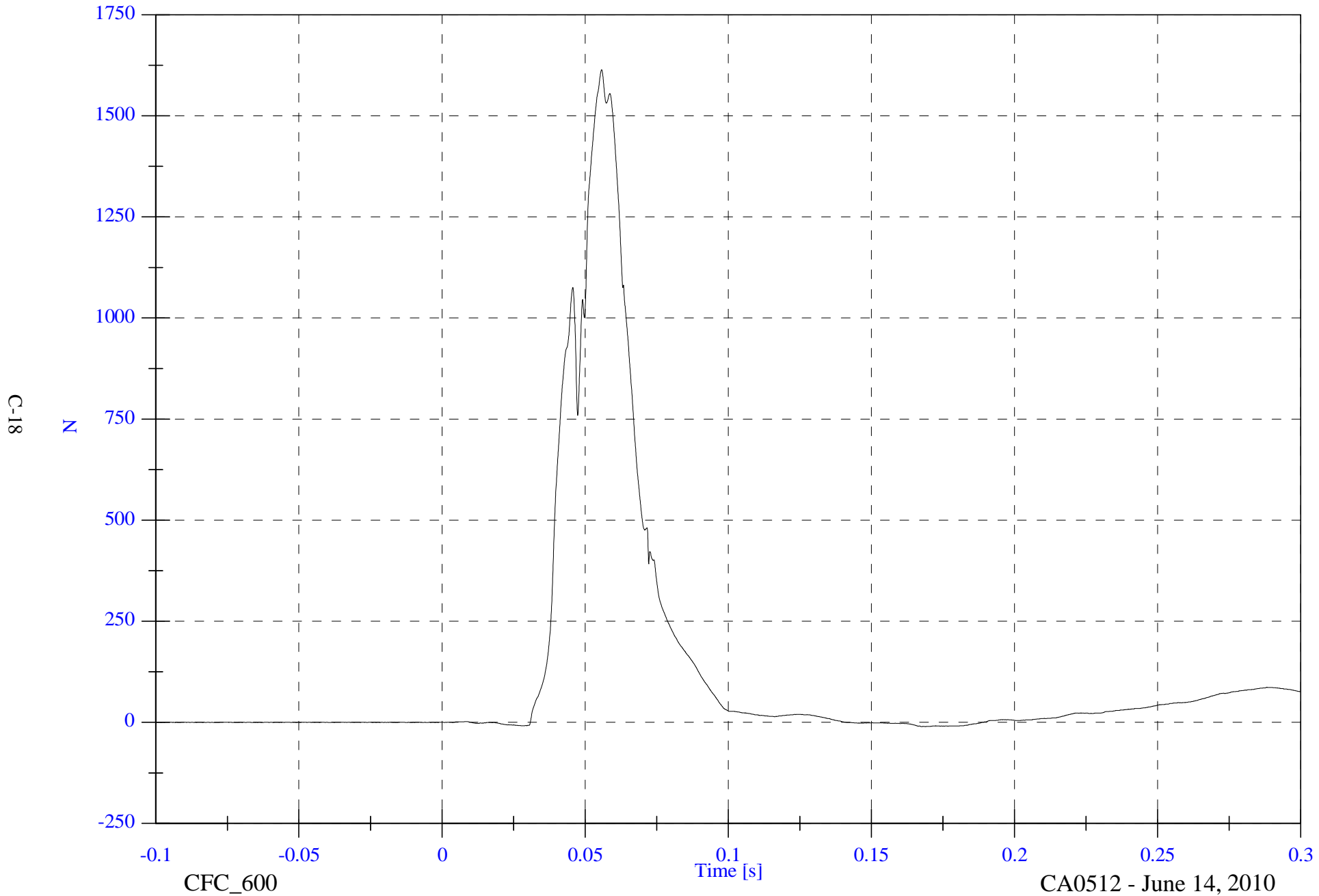
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2P4 Left Acetabulum Fy

Max: 1614.4 [N] at 0.056 [s]

Min: -10.7 [N] at 0.169 [s]

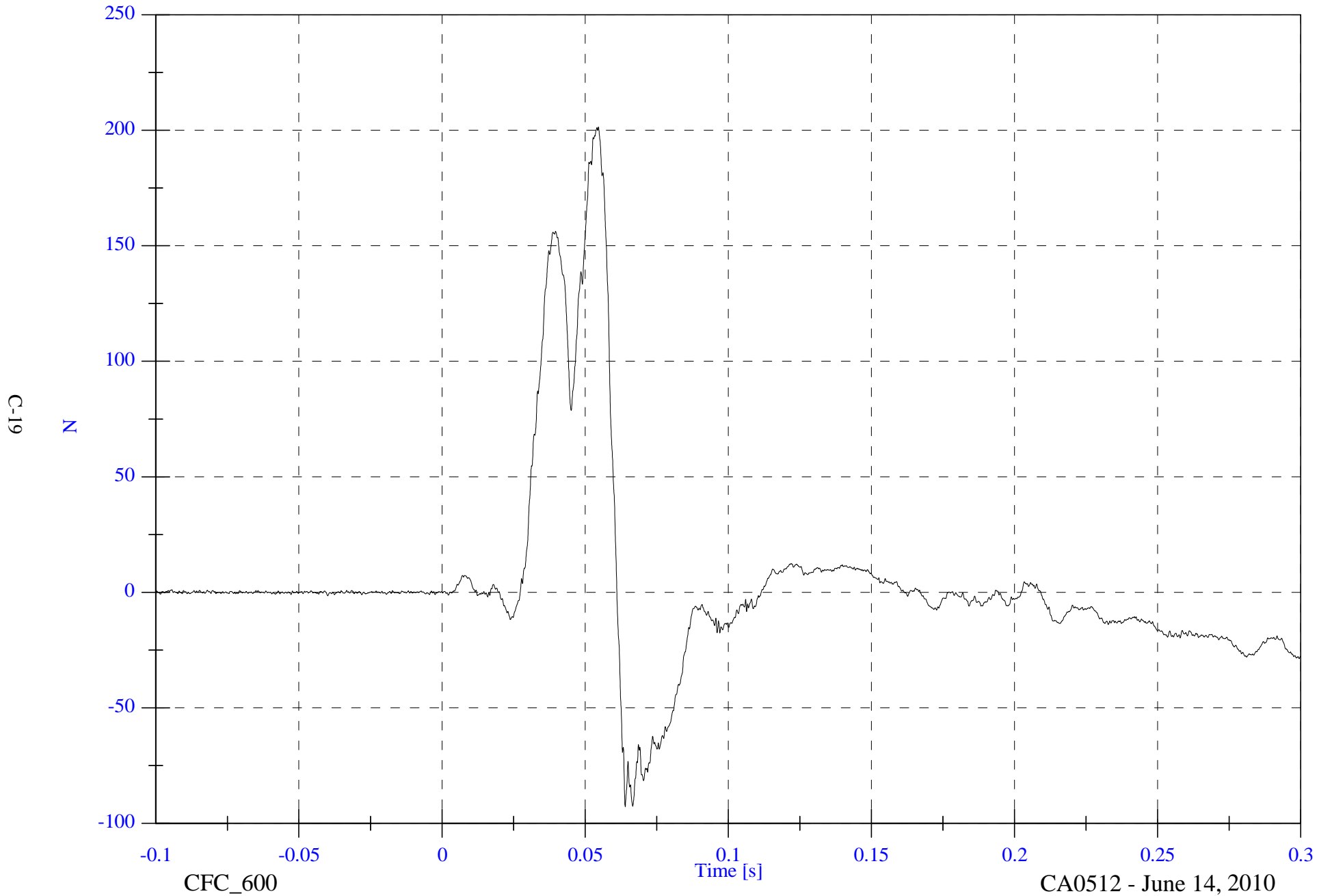


FMVSS 214 MDB - 2010 BMW 128i

Max: 201.4 [N] at 0.055 [s]

V2P4 Left Illiac Wing Fy

Min: -92.8 [N] at 0.064 [s]



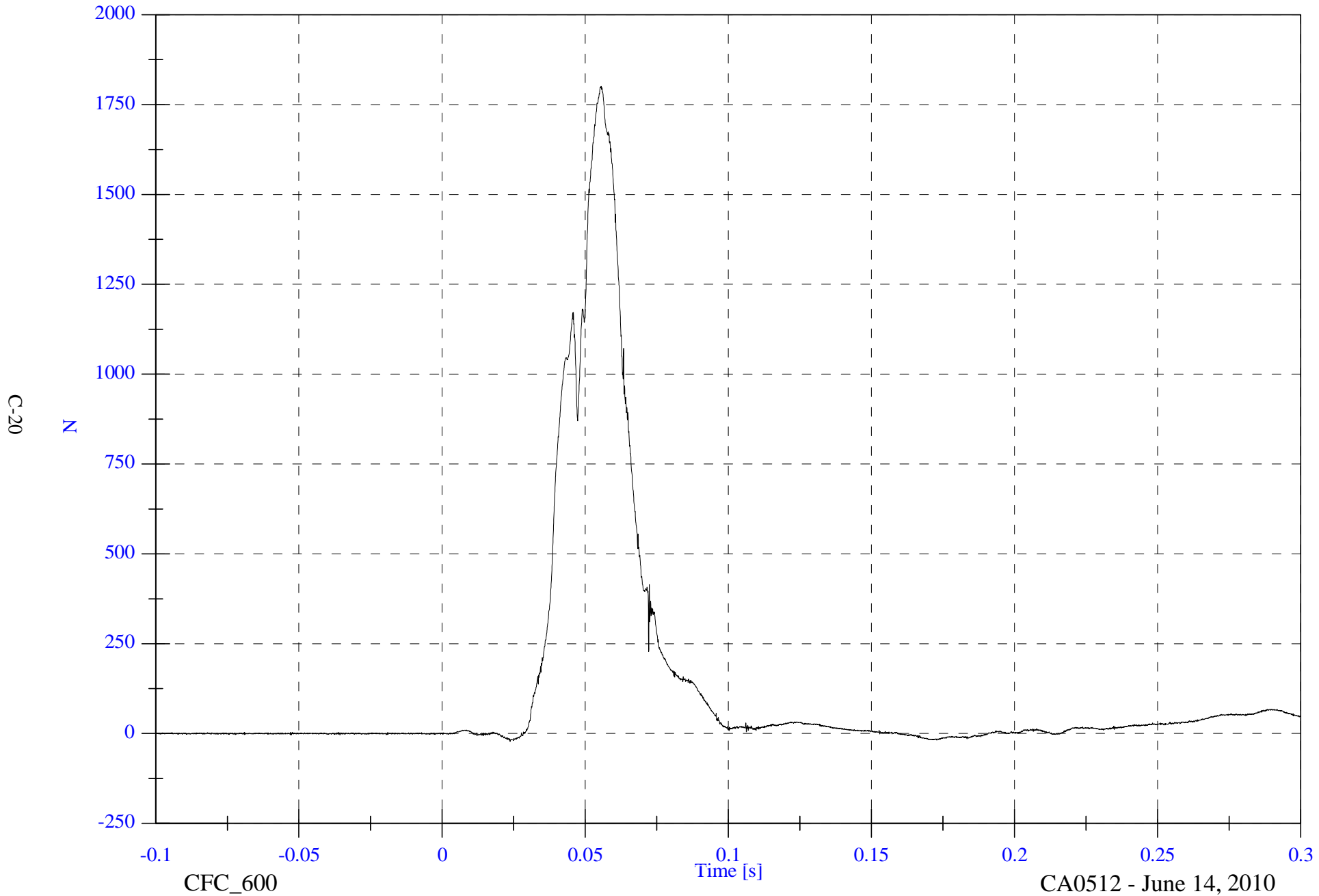
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 1801.1 [N] at 0.056 [s]

V2P4 Pelvis Summation

Min: -22.0 [N] at 0.024 [s]



CA0512 - June 14, 2010

APPENDIX D
VEHICLE AND MDB ACCELEROMETER RESPONSE DATA
(SAE sign convention)

DATA CHANNEL TITLE KEY

Prefix	Suffix
V1 = Vehicle 1 (Test Vehicle)	Ax = Acceleration, X-direction
V2 = Vehicle 2 (Test Vehicle)	Ay = Acceleration, Y-direction
A1-A13 = Accelerometer Location Number	Az = Acceleration, Z-direction

TABLE OF DATA PLOTS for VEHICLE

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
1	Right Sill at Front Seat (X) Acceleration vs. Time	D-4
2	Right Sill at Front Seat (X) Velocity vs. Time	D-5
3	Right Sill at Front Seat (Y) Acceleration vs. Time	D-6
4	Right Sill at Front Seat (Y) Velocity vs. Time	D-7
5	Right Sill at Front Seat (Z) Acceleration vs. Time	D-8
6	Right Sill at Front Seat (Z) Velocity vs. Time	D-9
7	Right Sill at Front Seat Resultant Acceleration vs. Time	D-10
8	Right Sill at Rear Seat (X) Acceleration vs. Time	D-11
9	Right Sill at Rear Seat (X) Velocity vs. Time	D-12
10	Right Sill at Rear Seat (Y) Acceleration vs. Time	D-13
11	Right Sill at Rear Seat (Y) Velocity vs. Time	D-14
12	Right Sill at Rear Seat (Z) Acceleration vs. Time	D-15
13	Right Sill at Rear Seat (Z) Velocity vs. Time	D-16
14	Right Sill at Rear Seat Resultant Acceleration vs. Time	D-17
15	Rear Floorpan Above Axle (X) Acceleration vs. Time	D-18
16	Rear Floorpan Above Axle (X) Velocity vs. Time	D-19
17	Rear Floorpan Above Axle (Y) Acceleration vs. Time	D-20
18	Rear Floorpan Above Axle (Y) Velocity vs. Time	D-21
19	Rear Floorpan Above Axle (Z) Acceleration vs. Time	D-22
20	Rear Floorpan Above Axle (Z) Velocity vs. Time	D-23
21	Rear Floorpan Above Axle Resultant Acceleration vs. Time	D-24
22	Left Sill at Rear Door (Y) Acceleration vs. Time	D-25
23	Left Sill at Rear Door (Y) Velocity vs. Time	D-26
24	Left Sill at Front Door (Y) Acceleration vs. Time	D-27
25	Left Sill at Front Door (Y) Velocity vs. Time	D-28
26	Left Rear Occupant Compartment (Y) Acceleration vs. Time	D-29
27	Left Rear Occupant Compartment (Y) Velocity vs. Time	D-30
28	Left Lower B-Pillar (Y) Acceleration vs. Time	D-31
29	Left Lower B-Pillar (Y) Velocity vs. Time	D-32
30	Left Mid B-Pillar (Y) Acceleration vs. Time	D-33
31	Left Mid B-Pillar (Y) Velocity vs. Time	D-34

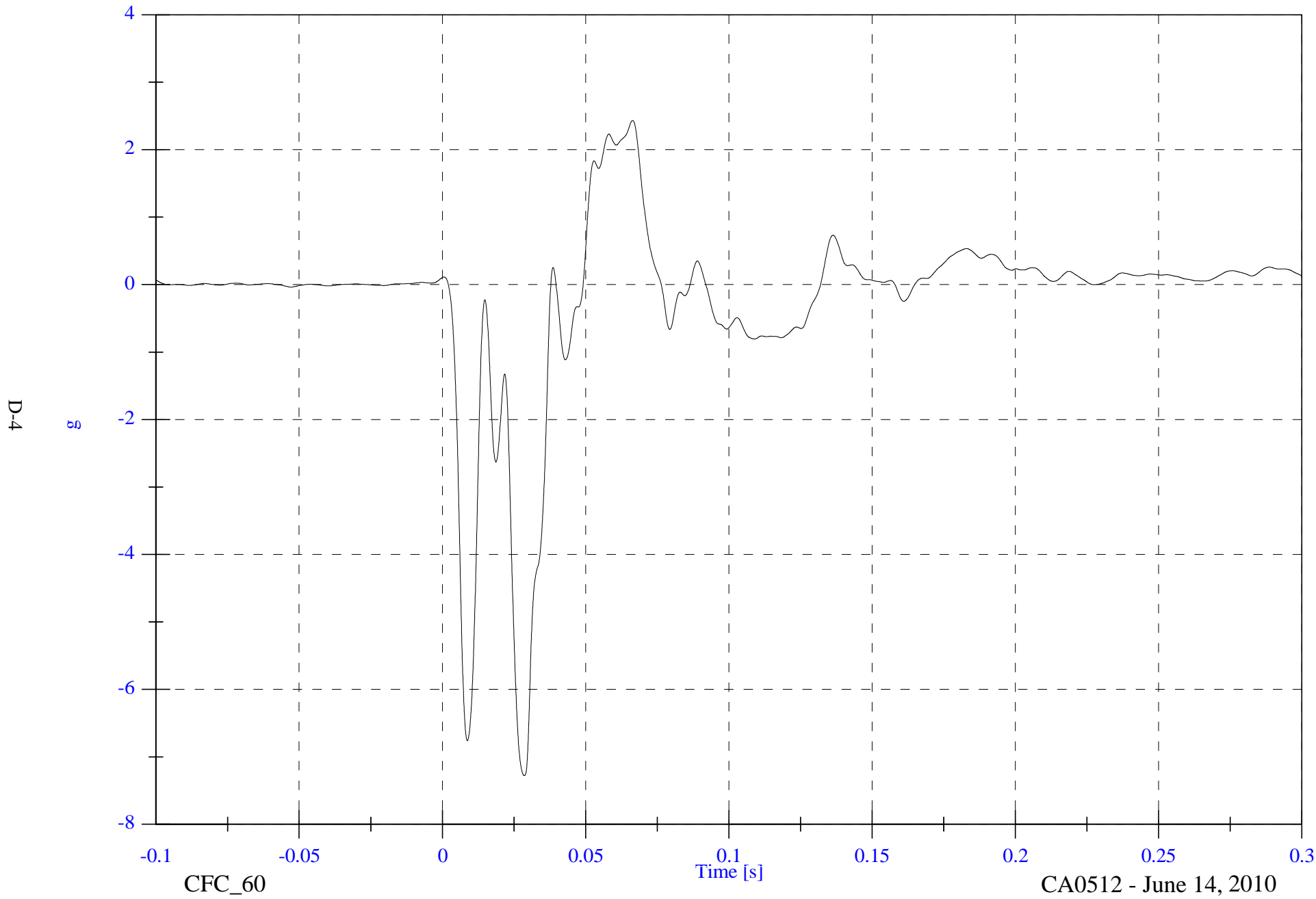
TABLE OF DATA PLOTS for VEHICLE (cont'd)

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
32	Left Lower A-Pillar (Y) Acceleration vs. Time	D-35
33	Left Lower A-Pillar (Y) Velocity vs. Time	D-36
34	Left Middle A-Pillar (Y) Acceleration vs. Time	D-37
35	Left Middle A-Pillar (Y) Velocity vs. Time	D-38
36	Driver Seat Track (Y) Acceleration vs. Time	D-39
37	Driver Seat Track (Y) Velocity vs. Time	D-40
38	Rear Seat Track (Y) Acceleration vs. Time	D-41
39	Rear Seat Track (Y) Velocity vs. Time	D-42
40	Vehicle Center of Gravity (X) Acceleration vs. Time	D-43
41	Vehicle Center of Gravity (X) Velocity vs. Time	D-44
42	Vehicle Center of Gravity (Y) Acceleration vs. Time	D-45
43	Vehicle Center of Gravity (Y) Velocity vs. Time	D-46
44	Vehicle Center of Gravity (Z) Acceleration vs. Time	D-47
45	Vehicle Center of Gravity (Z) Velocity vs. Time	D-48
46	Vehicle Center of Gravity Resultant Acceleration vs. Time	D-49
47	MDB Center of Gravity (X) Acceleration vs. Time	D-50
48	MDB Center of Gravity (X) Velocity vs. Time	D-51
49	MDB Center of Gravity (Y) Acceleration vs. Time	D-52
50	MDB Center of Gravity (Y) Velocity vs. Time	D-53
51	MDB Center of Gravity (Z) Acceleration vs. Time	D-54
52	MDB Center of Gravity (Z) Velocity vs. Time	D-55
53	MDB Center of Gravity Resultant Acceleration vs. Time	D-56
54	MDB Rear (X) Acceleration vs. Time	D-57
55	MDB Rear (X) Velocity vs. Time	D-58
56	MDB Rear (Y) Acceleration vs. Time	D-59
57	MDB Rear (Y) Velocity vs. Time	D-60

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill X

Max: 2.4 [g] at 0.066 [s]
Min: -7.3 [g] at 0.029 [s]



CFC_60

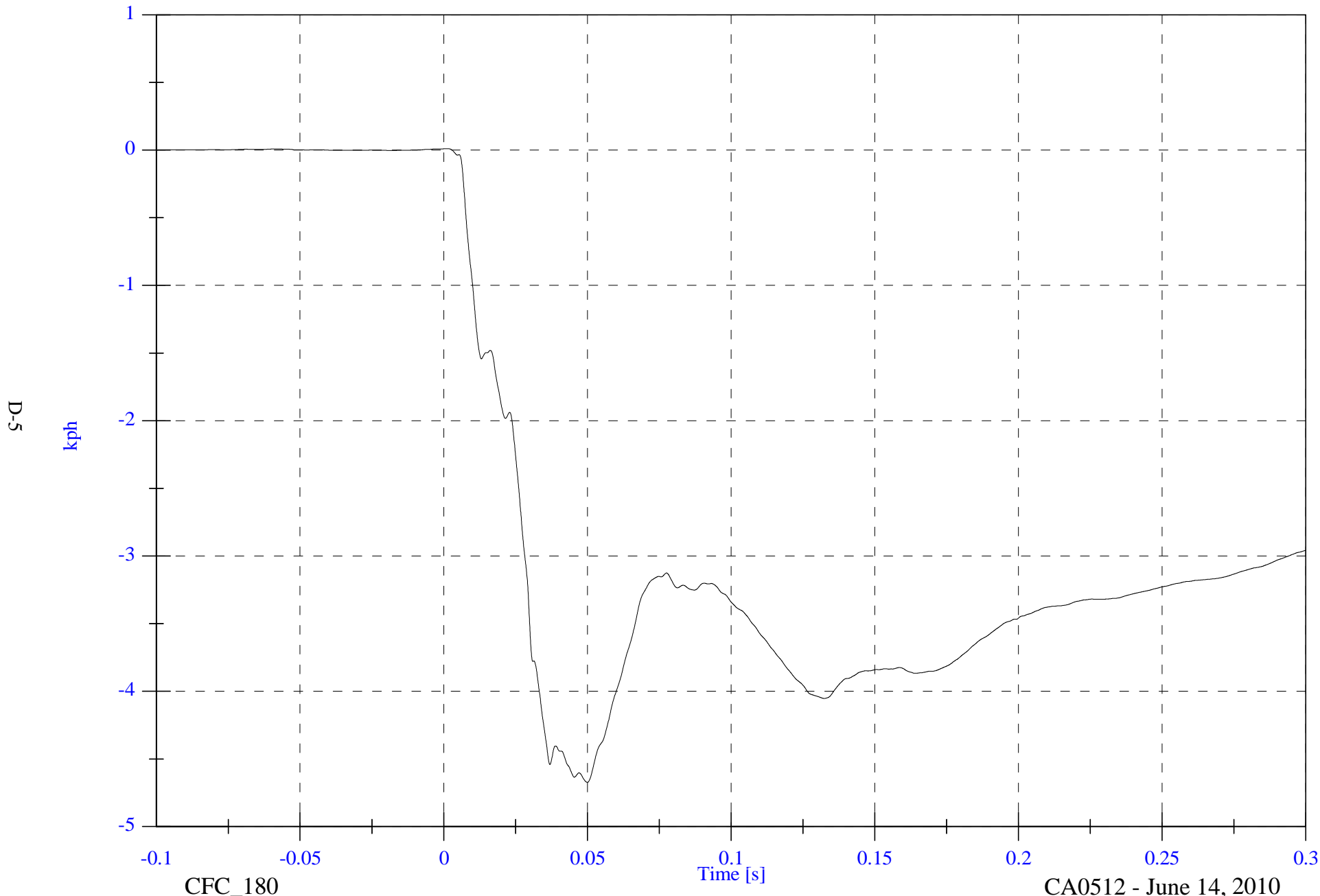
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill X Velocity

Max: 0.0 [kph] at 0.001 [s]

Min: -4.7 [kph] at 0.050 [s]



D-5

kph

-0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25 0.3

CFC_180

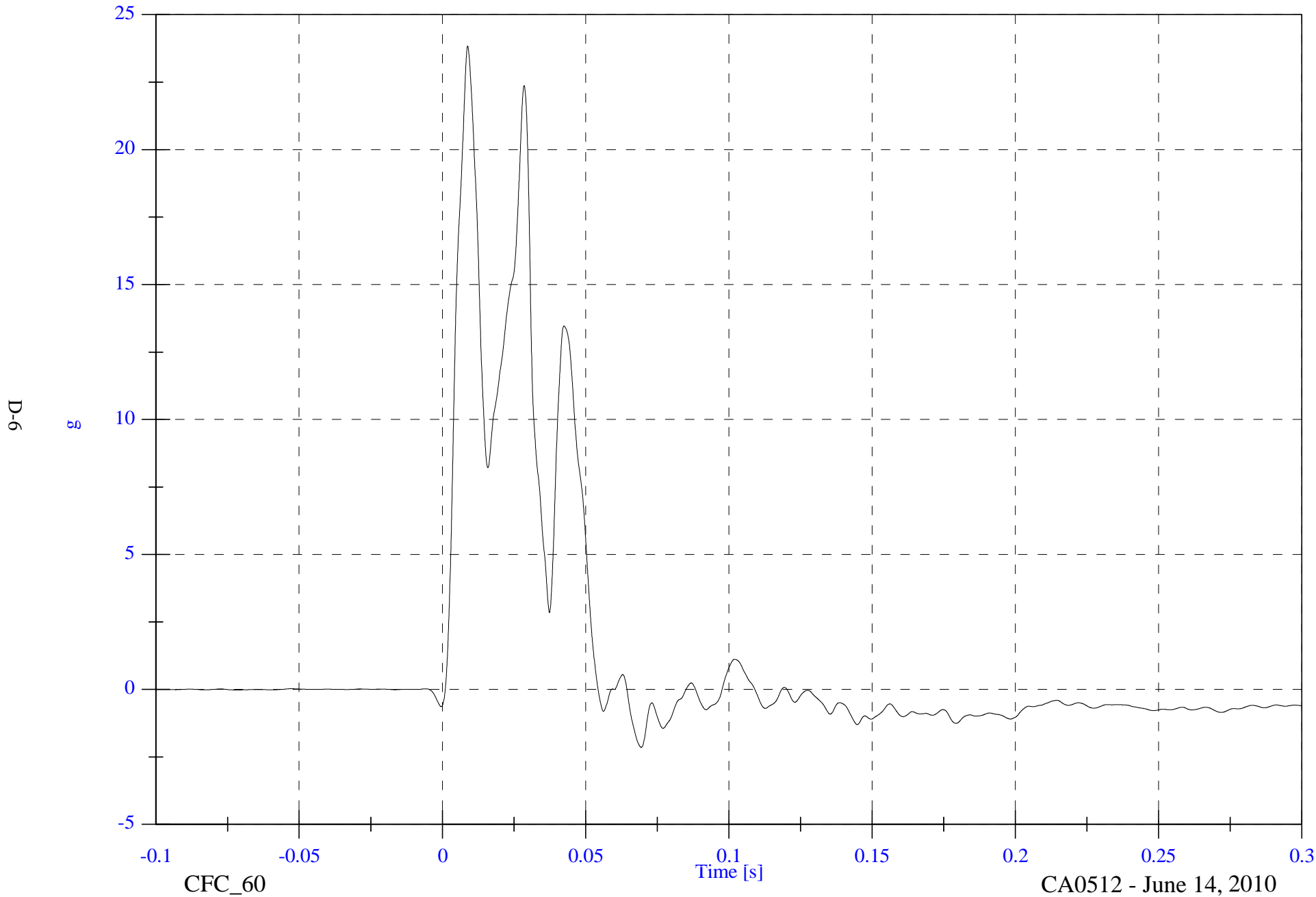
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill Y

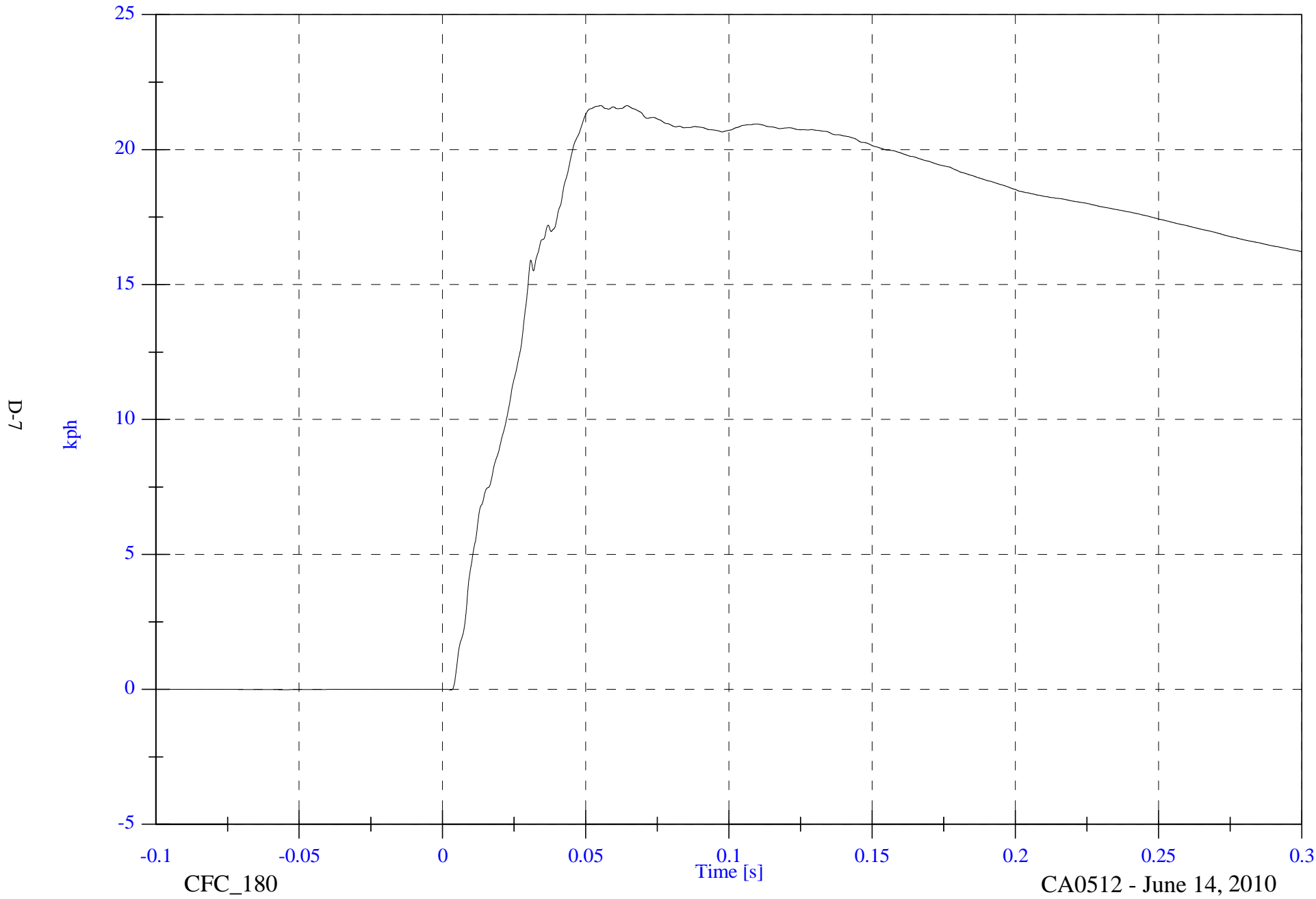
Max: 23.8 [g] at 0.009 [s]
Min: -2.1 [g] at 0.069 [s]



FMVSS 214 MDB - 2010 BMW 128i

Max: 21.6 [kph] at 0.055 [s]
Min: -0.0 [kph] at 0.003 [s]

V2 A1 Right Front Sill Y Velocity



D-7

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

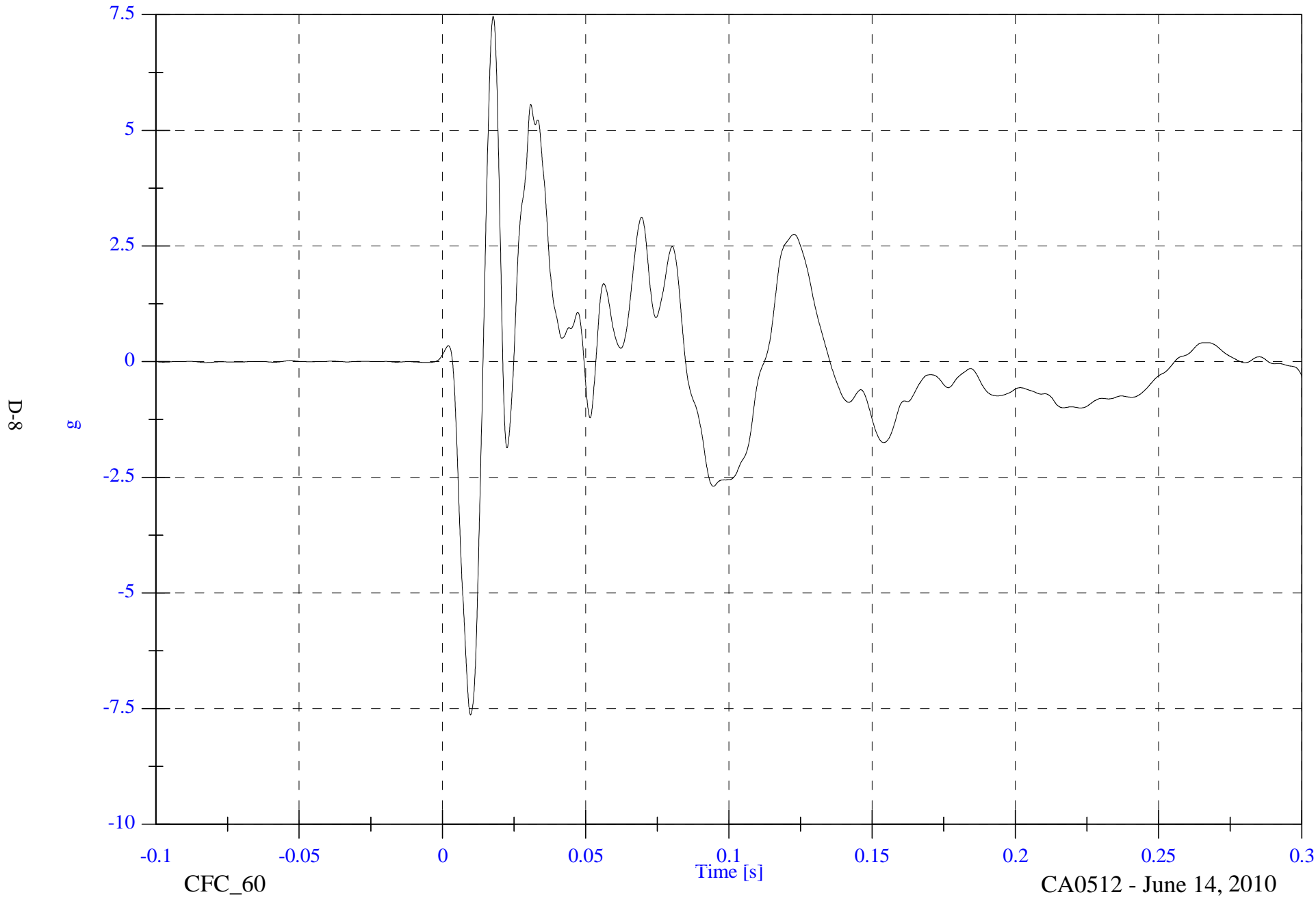
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill Z

Max: 7.5 [g] at 0.018 [s]

Min: -7.6 [g] at 0.010 [s]



D-8
g

Time [s]

CFC_60

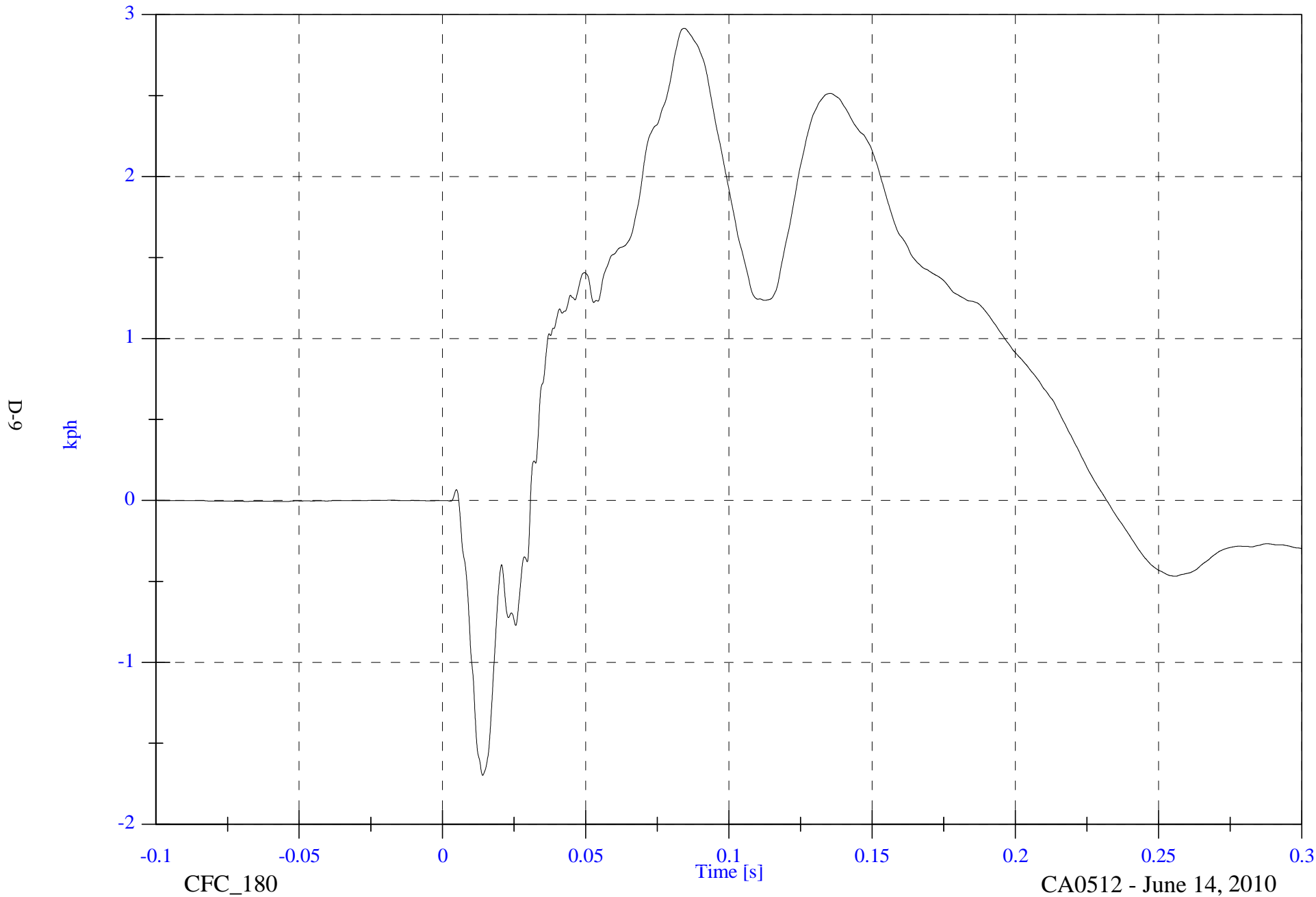
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill Z Velocity

Max: 2.9 [kph] at 0.084 [s]

Min: -1.7 [kph] at 0.014 [s]



CFC_180

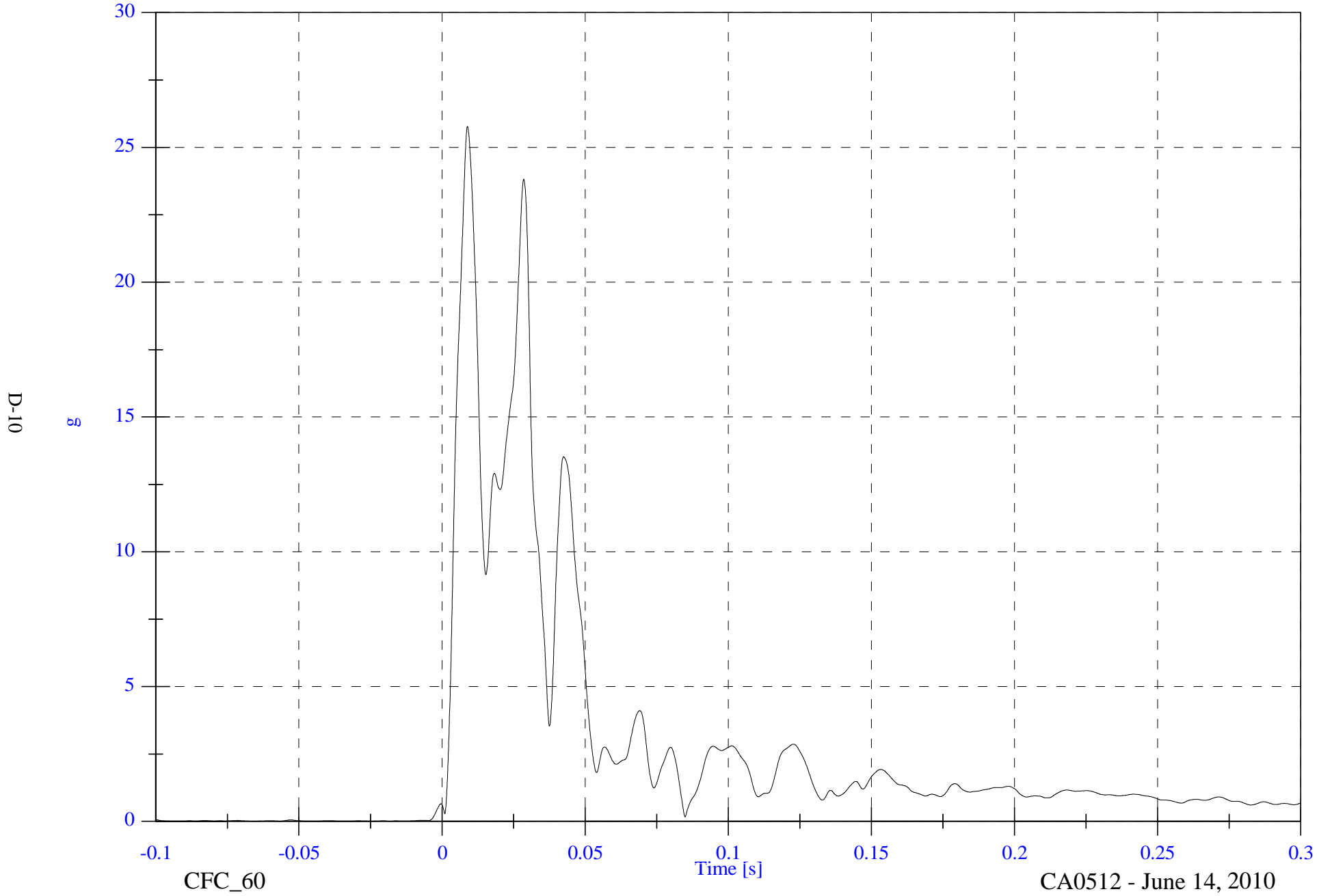
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A1 Right Front Sill Resultant

Max: 25.8 [g] at 0.009 [s]

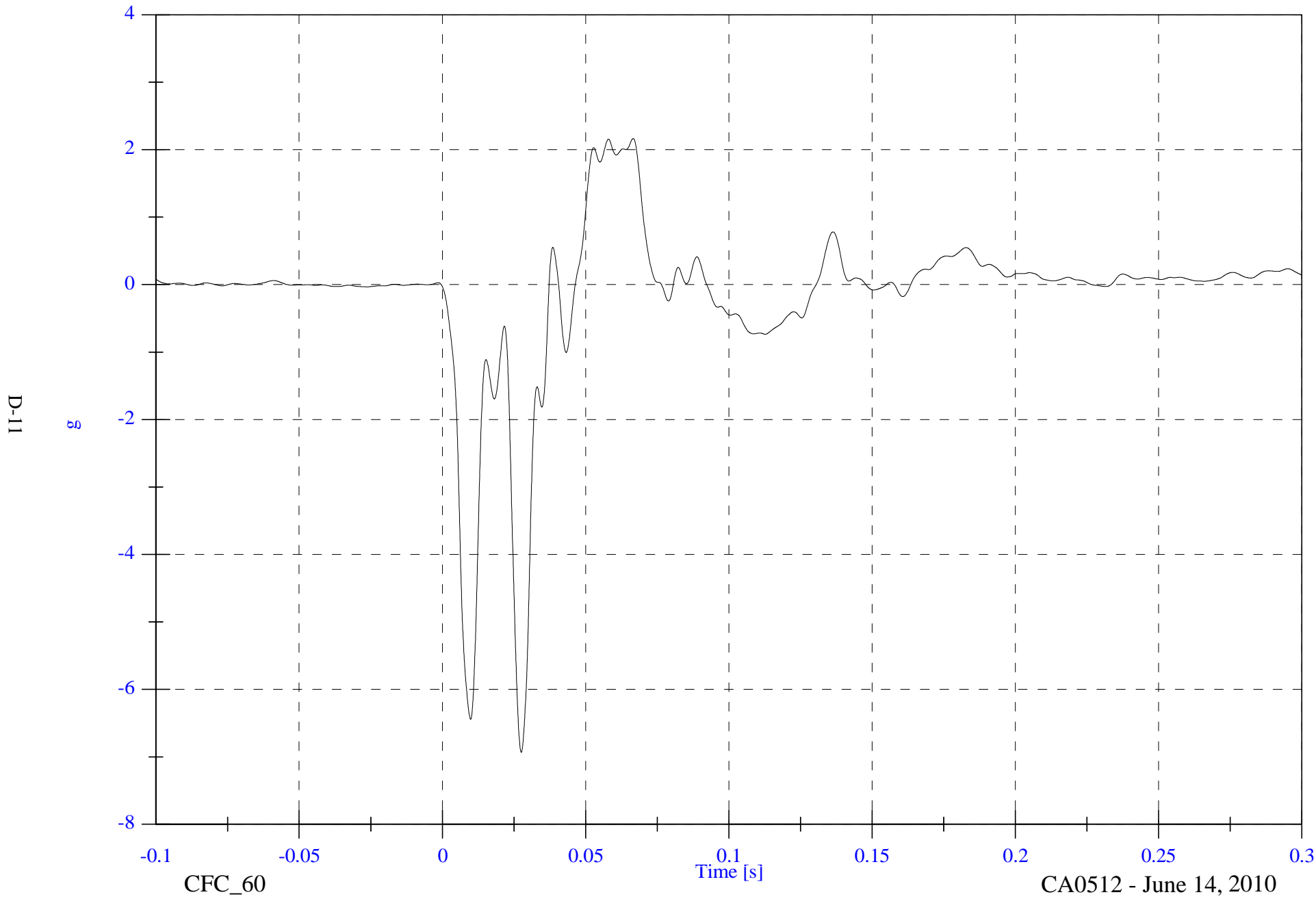
Min: 0.0 [g] at -0.086 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill X

Max: 2.2 [g] at 0.067 [s]
Min: -6.9 [g] at 0.027 [s]

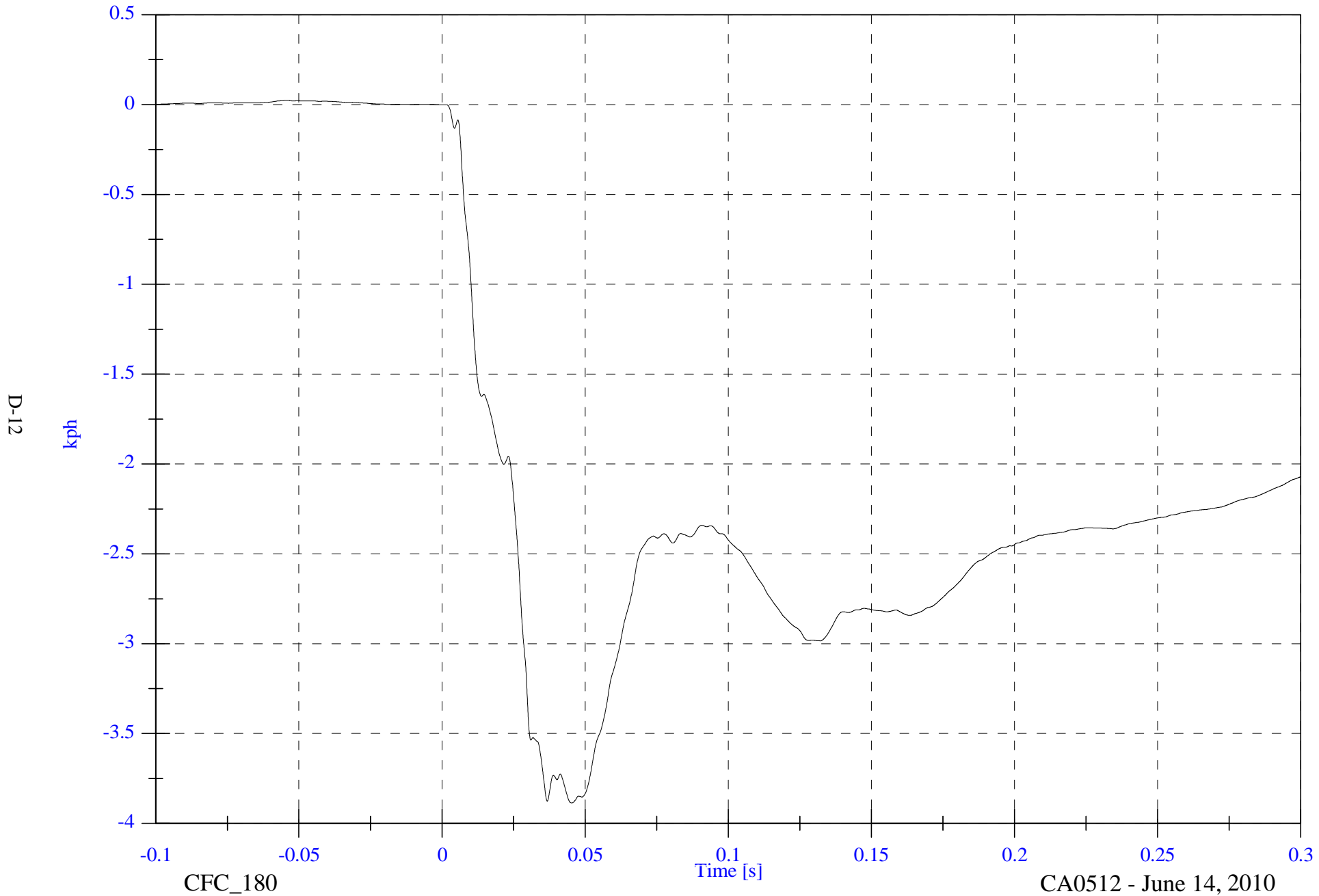


FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill X Velocity

Max: 0.0 [kph] at -0.054 [s]

Min: -3.9 [kph] at 0.045 [s]



D-12

kph

CFC_180

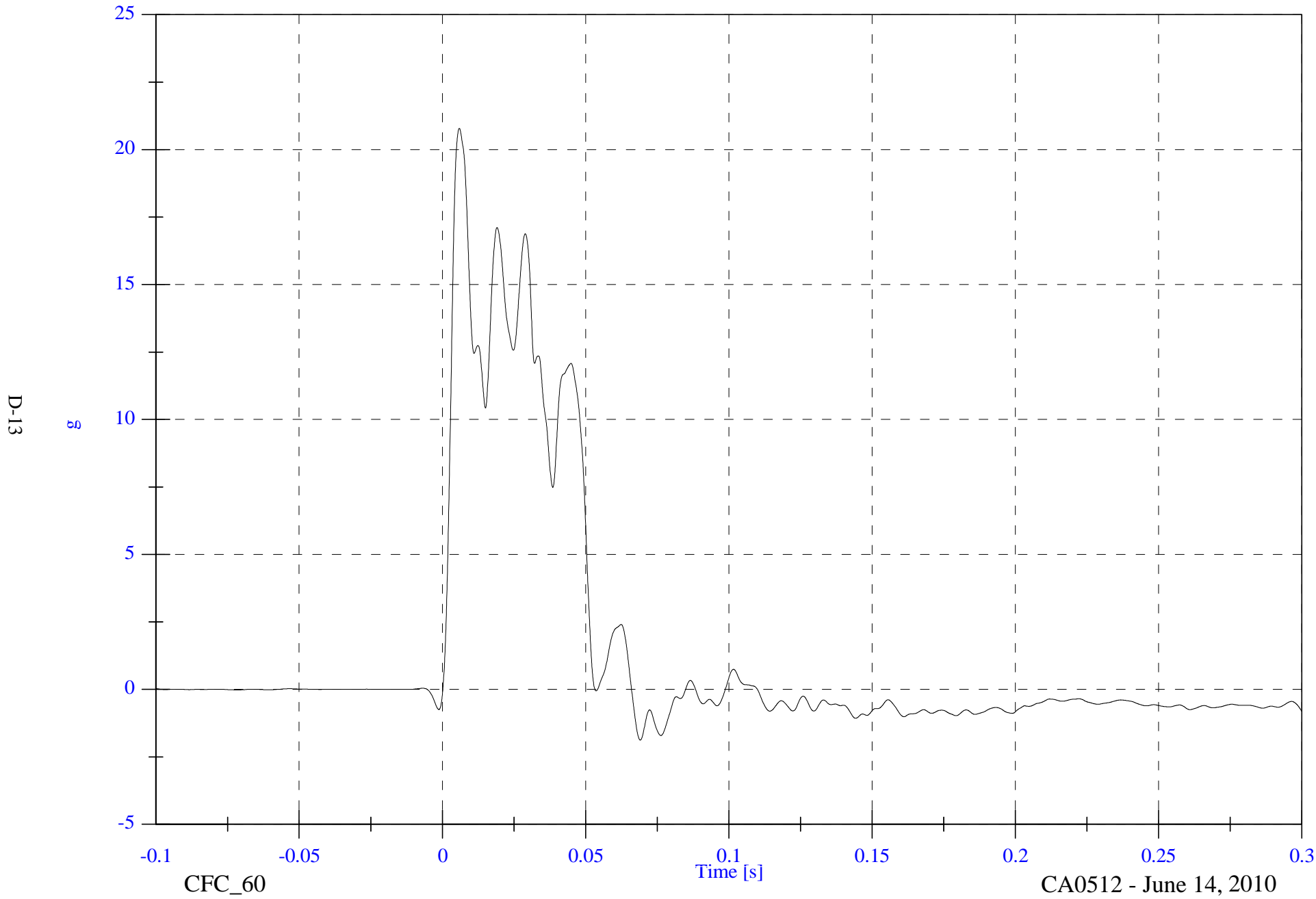
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill Y

Max: 20.8 [g] at 0.006 [s]
Min: -1.9 [g] at 0.069 [s]

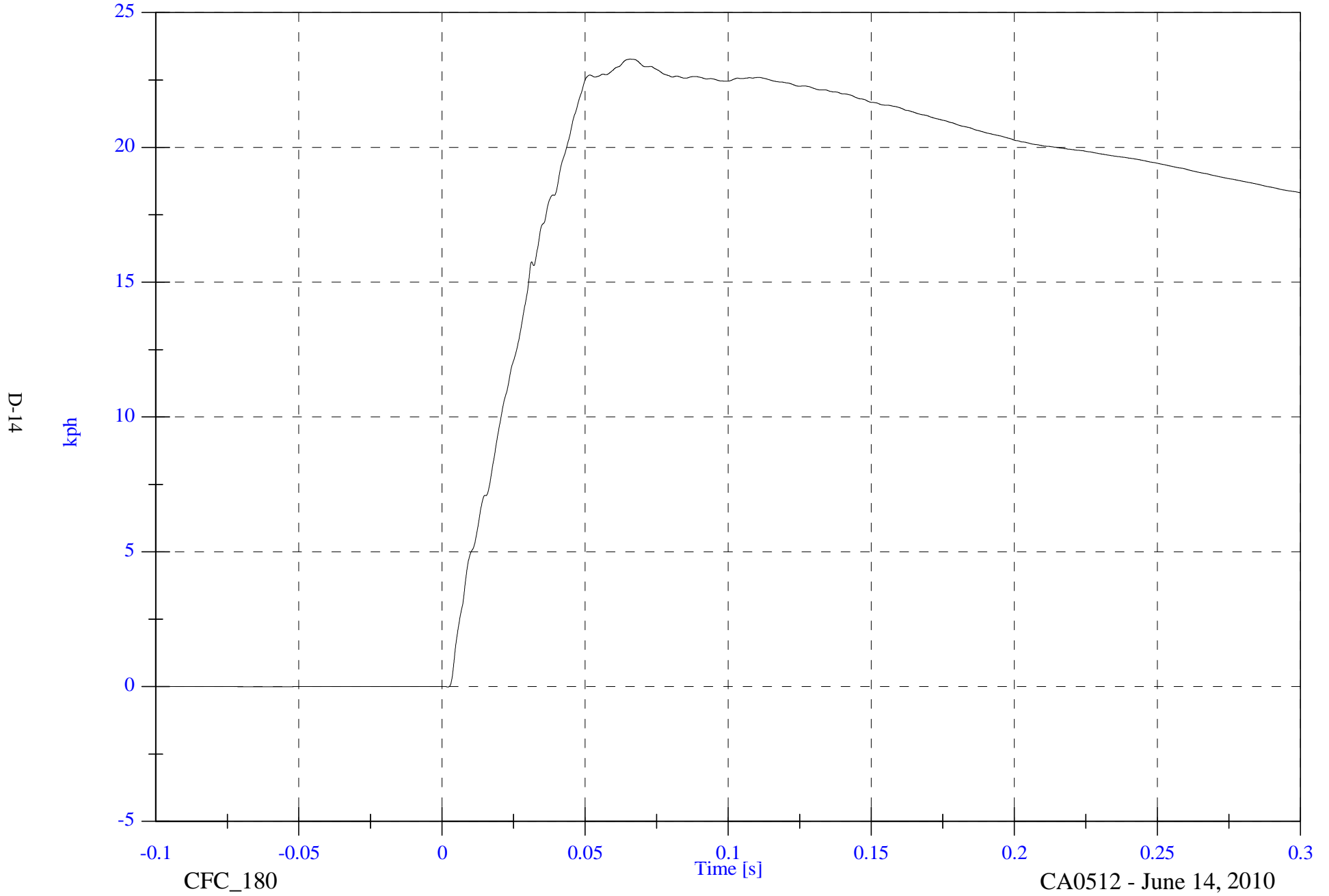


FMVSS 214 MDB - 2010 BMW 128i

Max: 23.3 [kph] at 0.066 [s]

V2 A2 Right Rear Sill Y Velocity

Min: -0.0 [kph] at 0.002 [s]



D-14

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

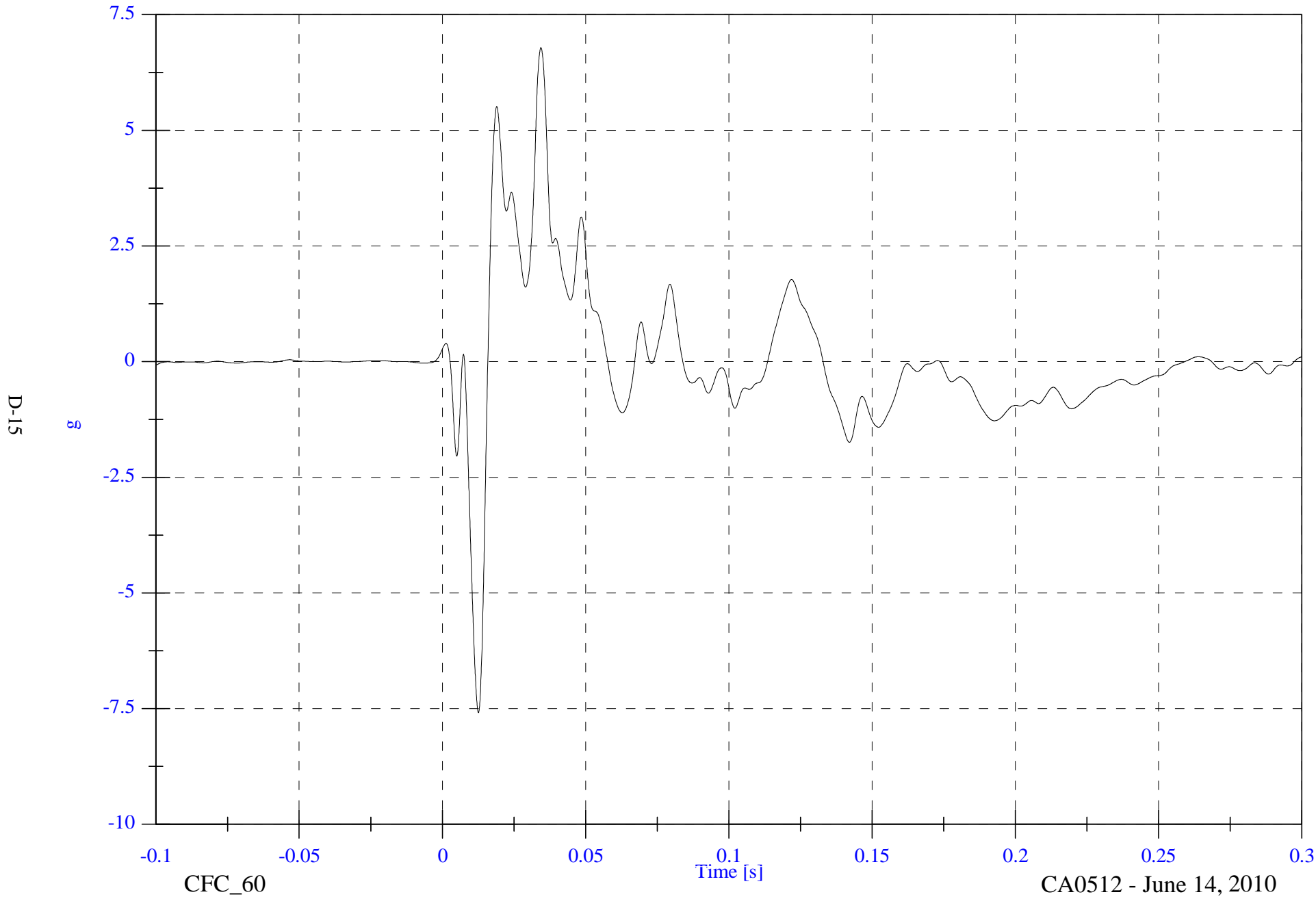
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill Z

Max: 6.8 [g] at 0.034 [s]

Min: -7.6 [g] at 0.013 [s]



D-15

g

CFC_60

Time [s]

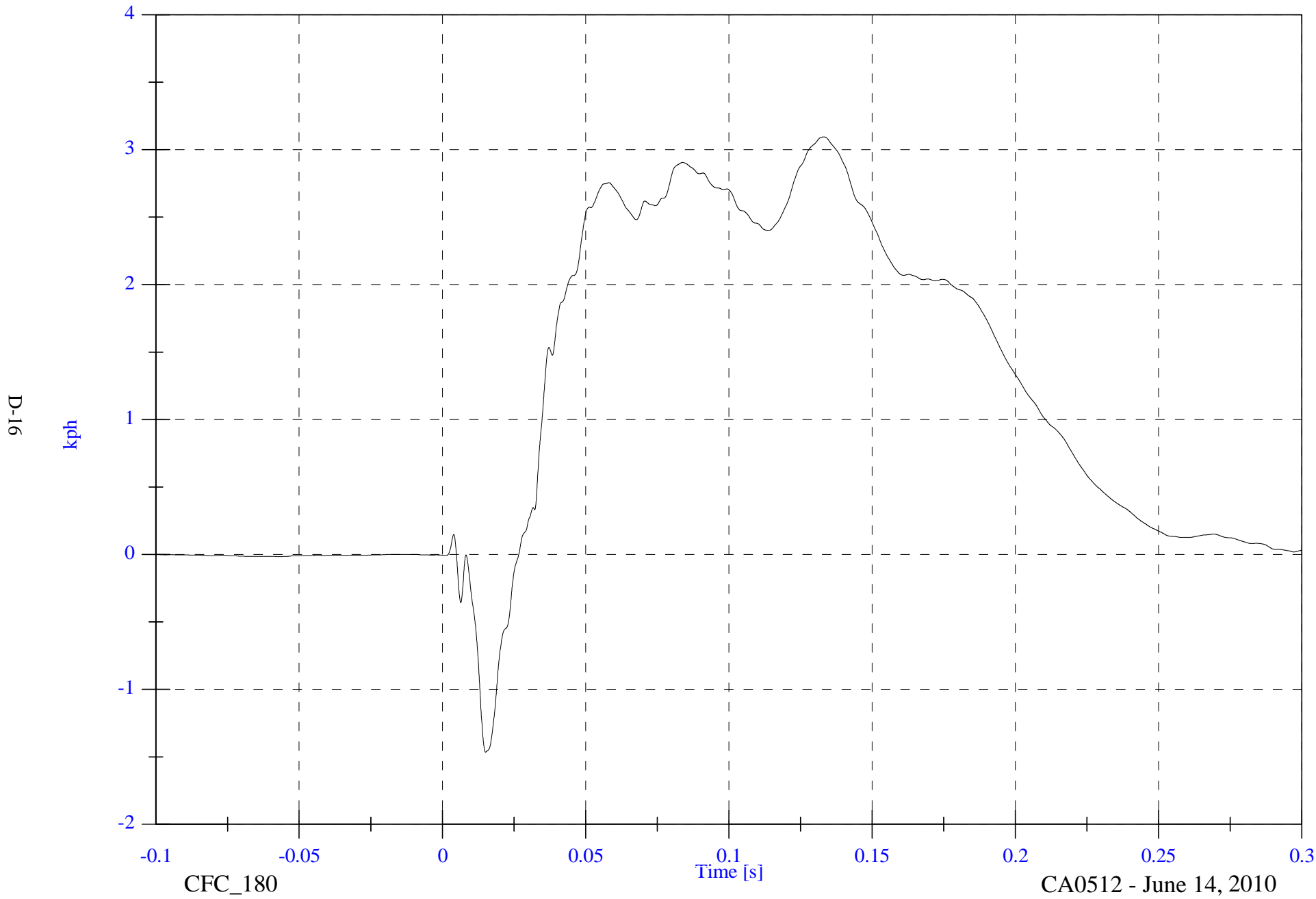
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill Z Velocity

Max: 3.1 [kph] at 0.133 [s]

Min: -1.5 [kph] at 0.015 [s]



D-16

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

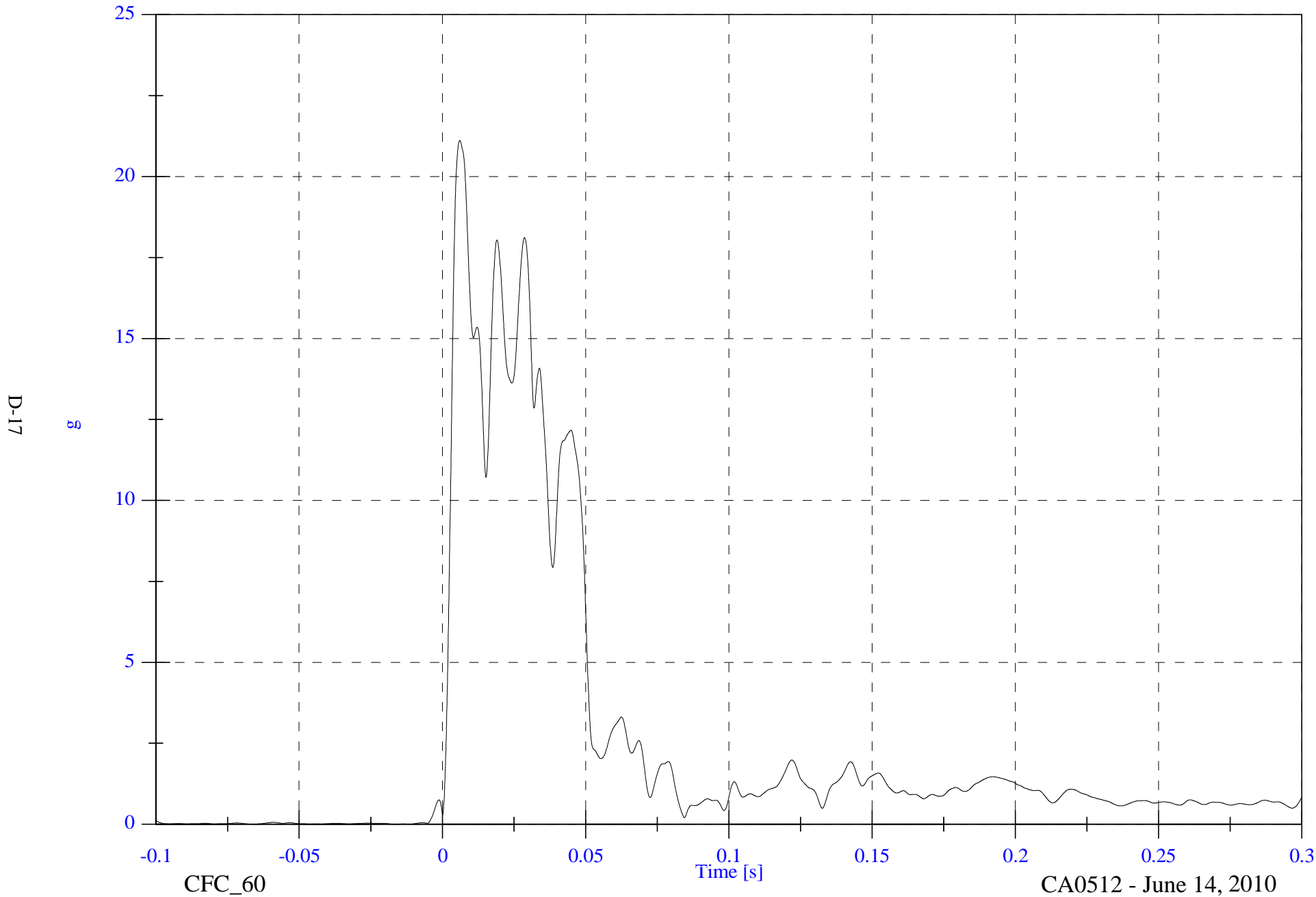
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A2 Right Rear Sill Resultant

Max: 21.1 [g] at 0.006 [s]
Min: 0.0 [g] at -0.016 [s]

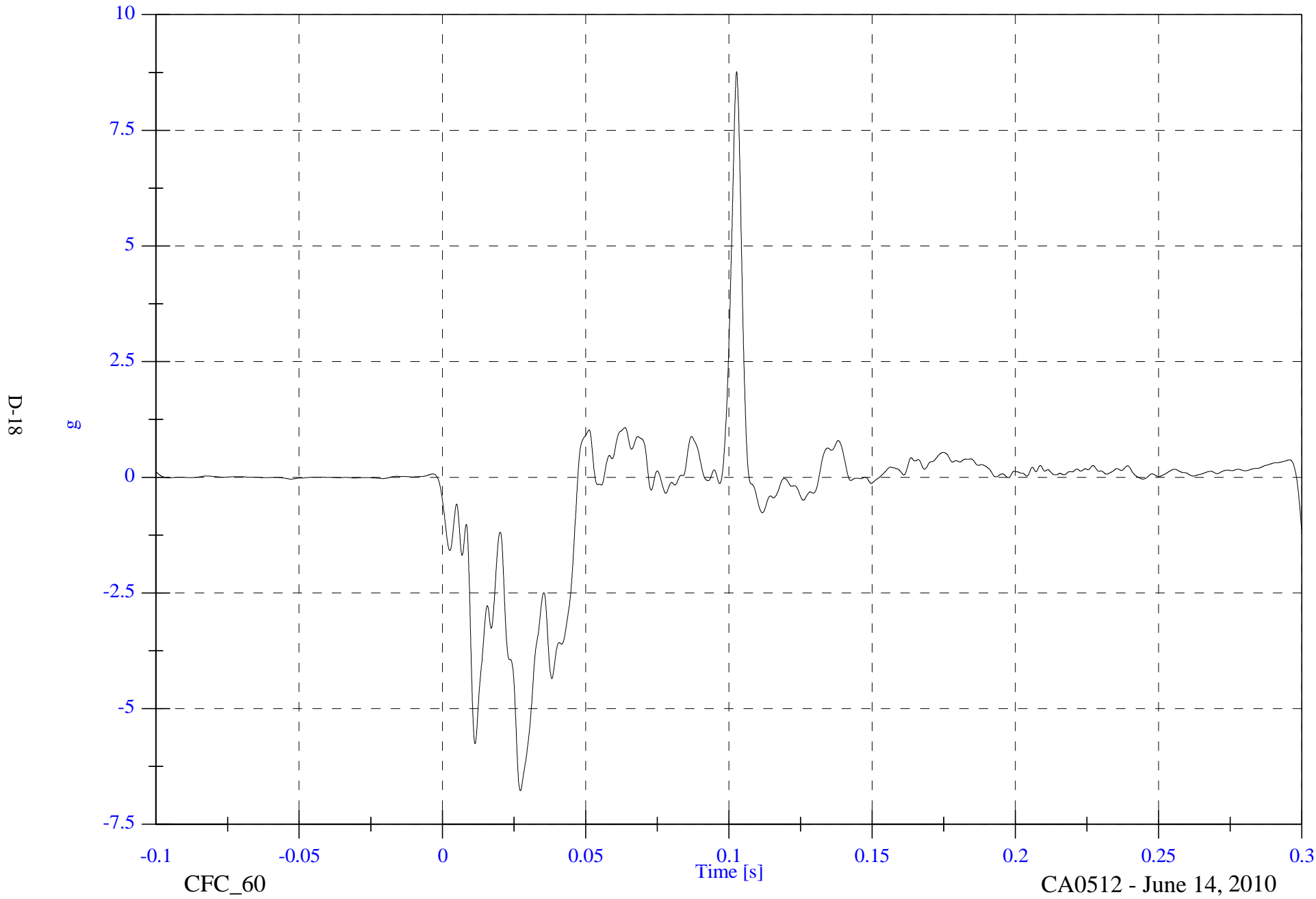


FMVSS 214 MDB - 2010 BMW 128i

V2 A3 Rear Floorpan X

Max: 8.8 [g] at 0.103 [s]

Min: -6.8 [g] at 0.027 [s]



D-18

g

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_60

Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 0.0 [kph] at -0.063 [s]
Min: -5.4 [kph] at 0.047 [s]

V2 A3 Rear Floorpan X Velocity



CFC_180

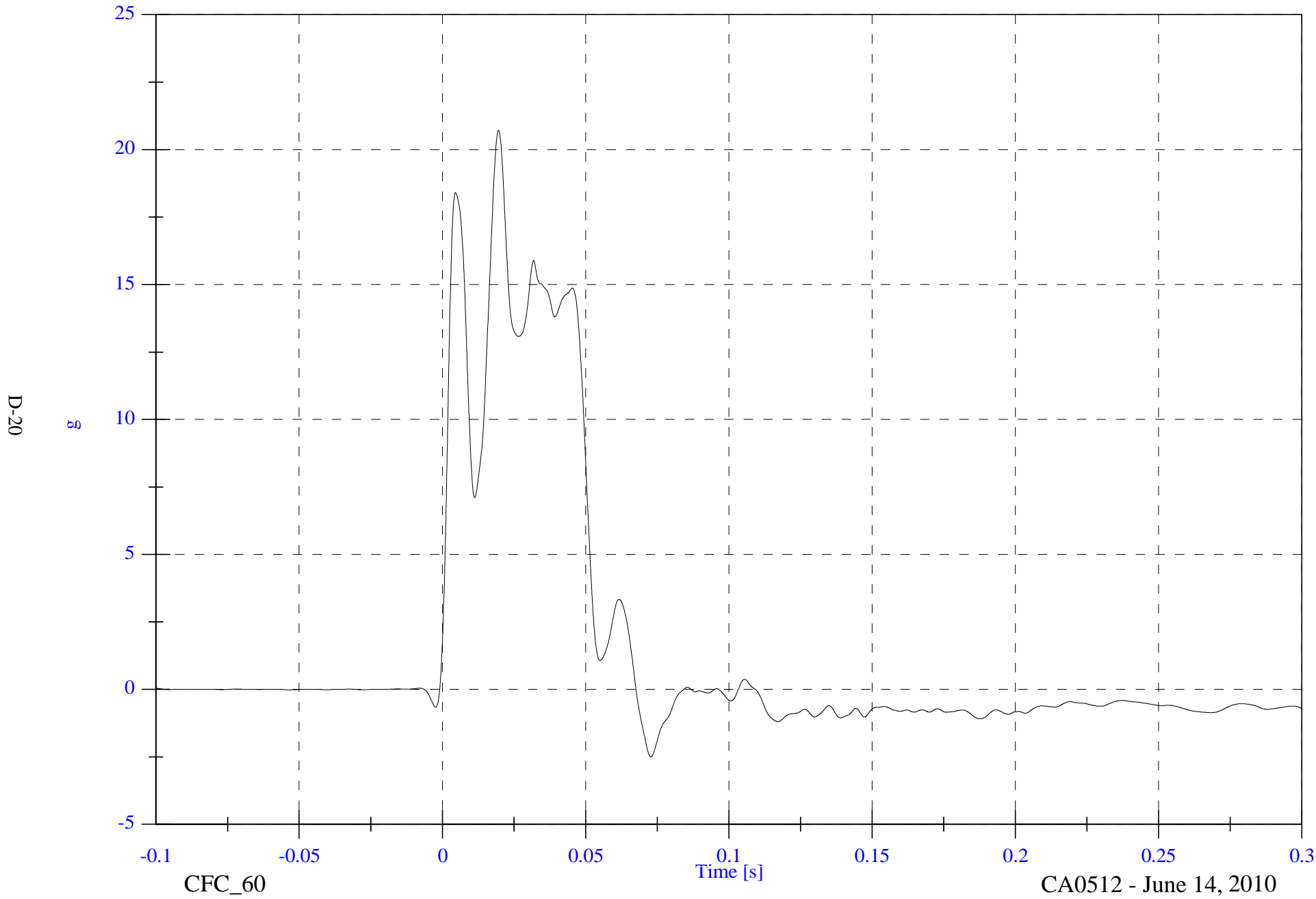
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A3 Rear Floorpan Y

Max: 20.7 [g] at 0.020 [s]

Min: -2.5 [g] at 0.073 [s]



D-20

g

Time [s]

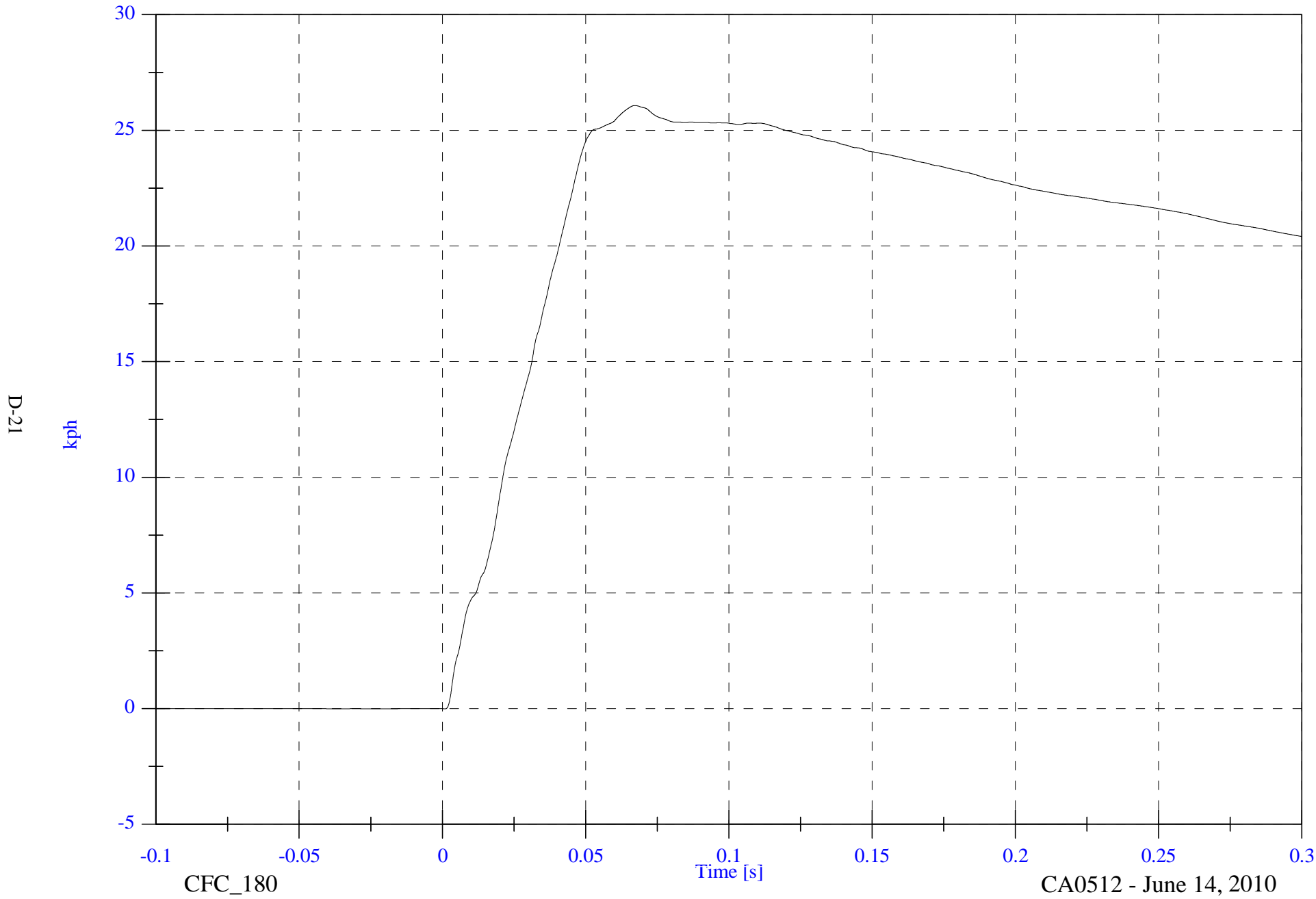
CFC_60

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 26.1 [kph] at 0.067 [s]
Min: -0.0 [kph] at 0.001 [s]

V2 A3 Rear Floorpan Y Velocity



D-21

kph

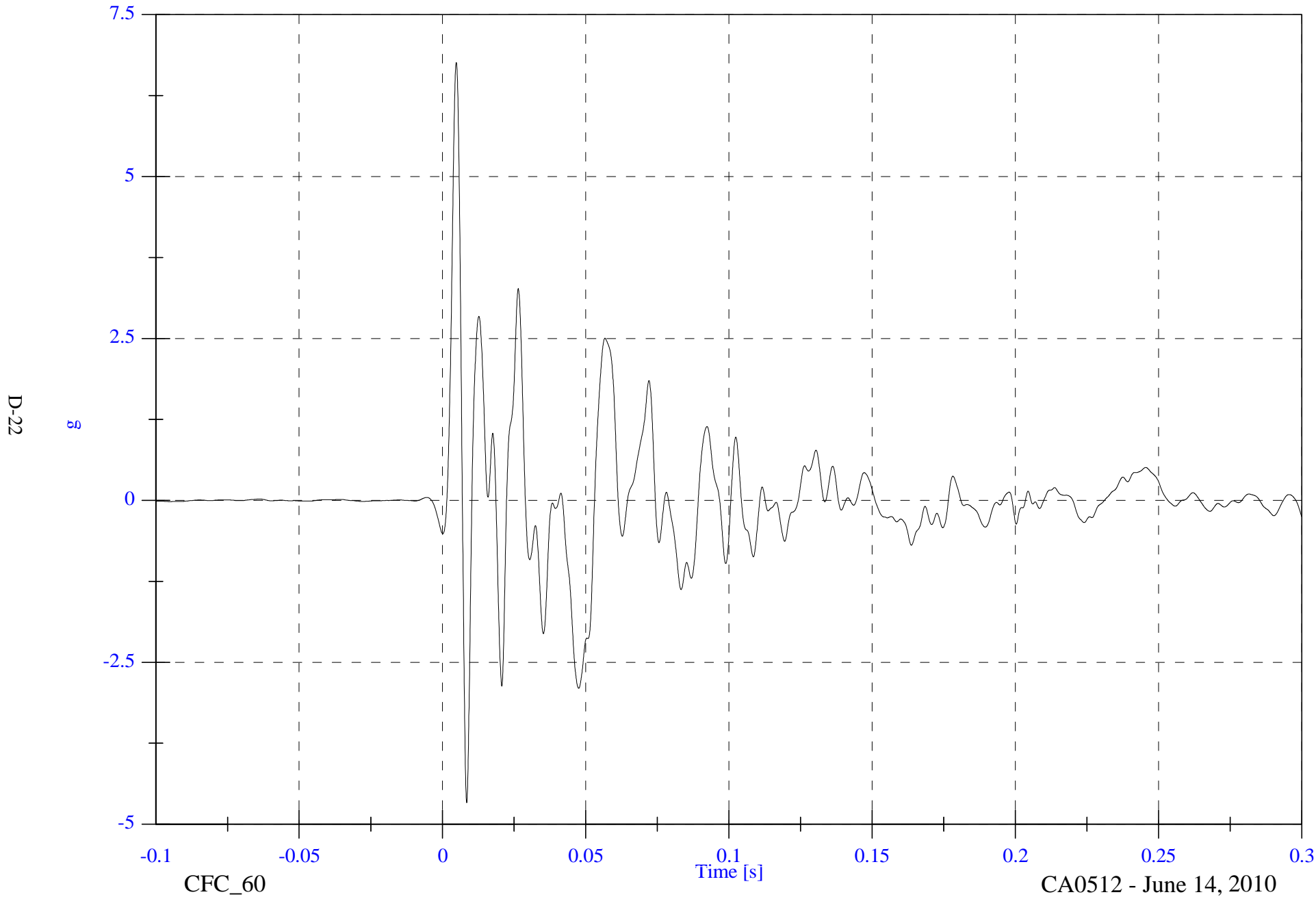
CFC_180 Time [s] CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A3 Rear Floorpan Z

Max: 6.8 [g] at 0.005 [s]

Min: -4.7 [g] at 0.009 [s]



D-22

g

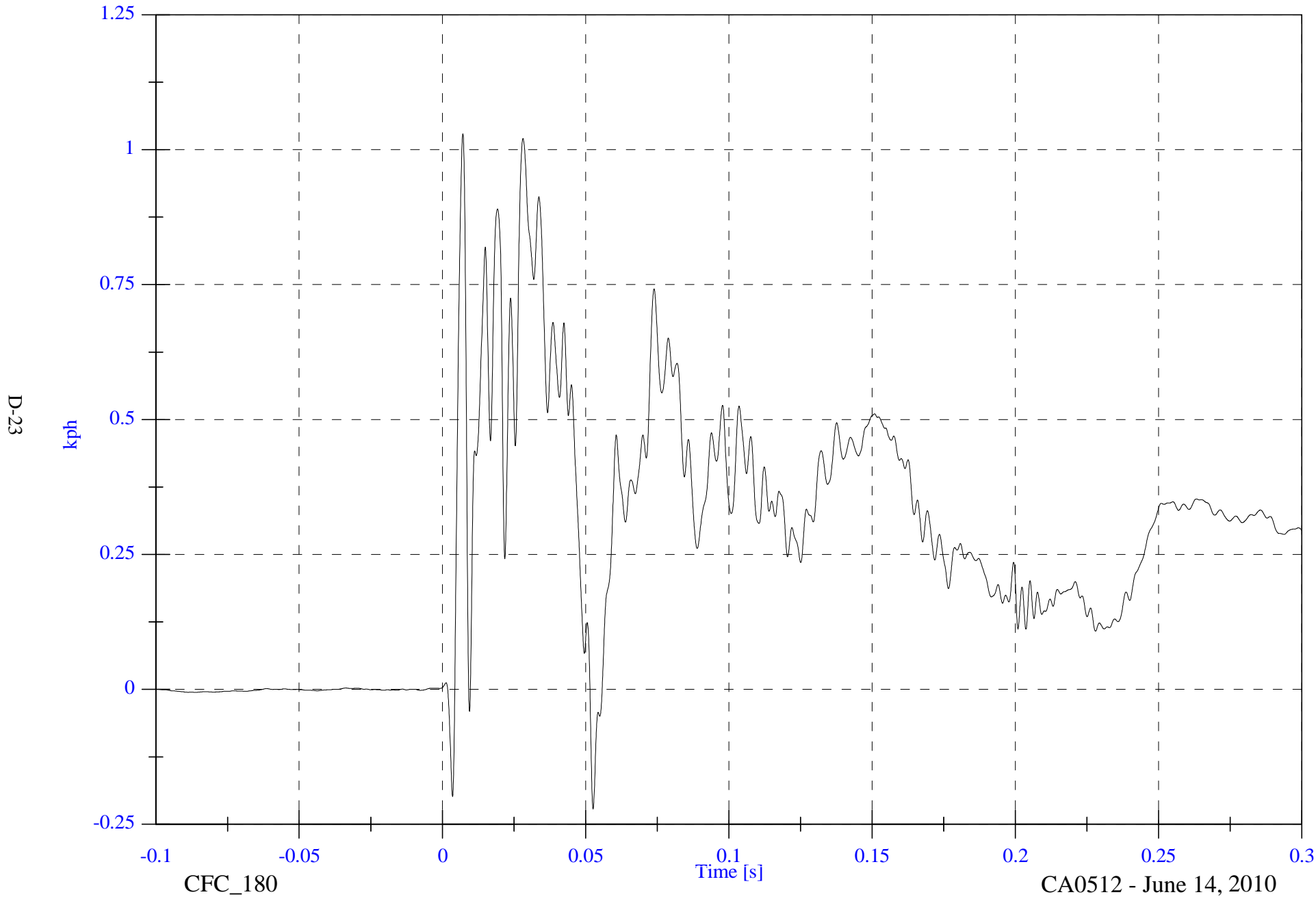
-0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25 0.3
CFC_60 Time [s] CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A3 Rear Floorpan Z Velocity

Max: 1.0 [kph] at 0.007 [s]

Min: -0.2 [kph] at 0.053 [s]

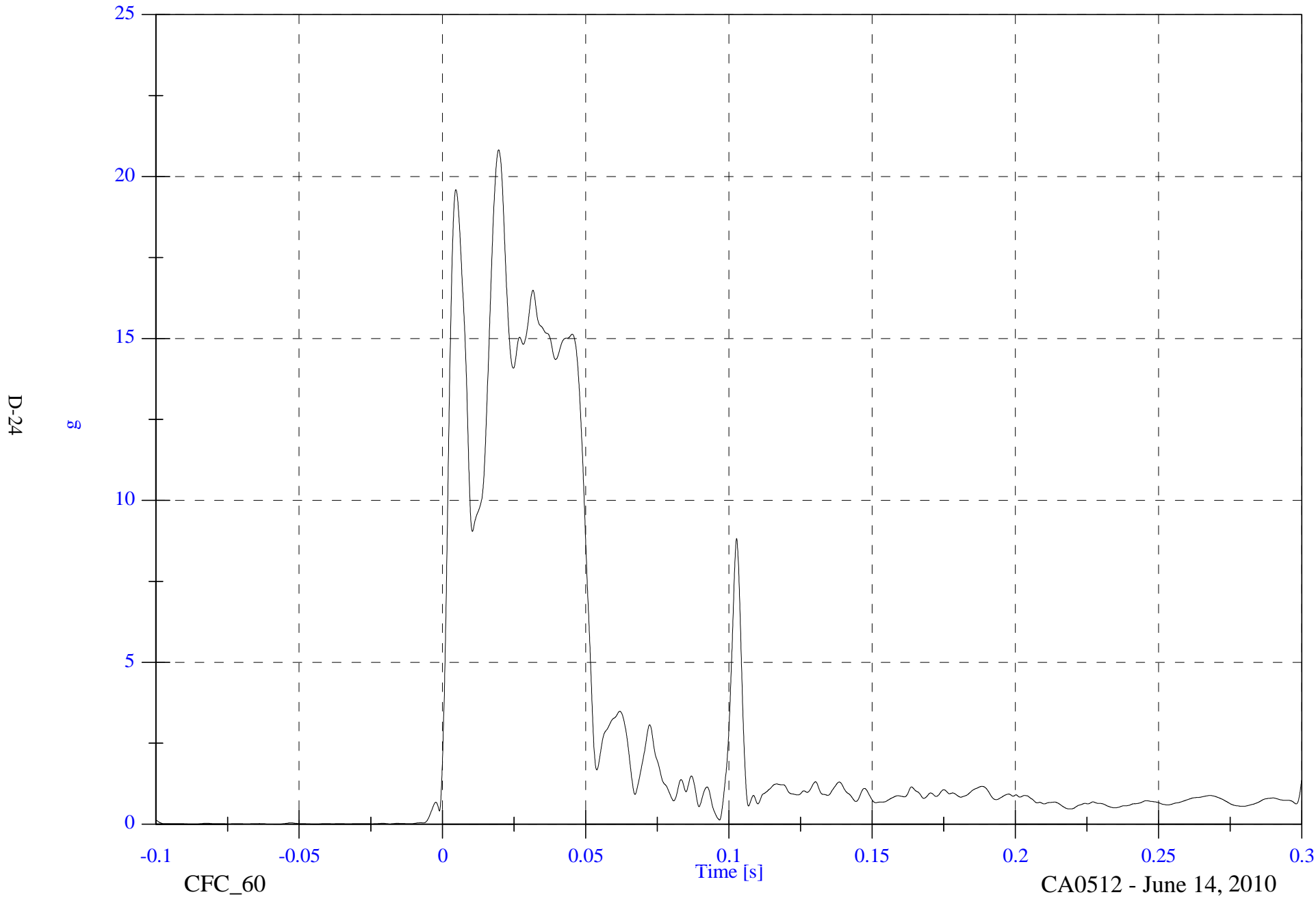


FMVSS 214 MDB - 2010 BMW 128i

V2 A3 Rear Floorpan Resultant

Max: 20.8 [g] at 0.020 [s]

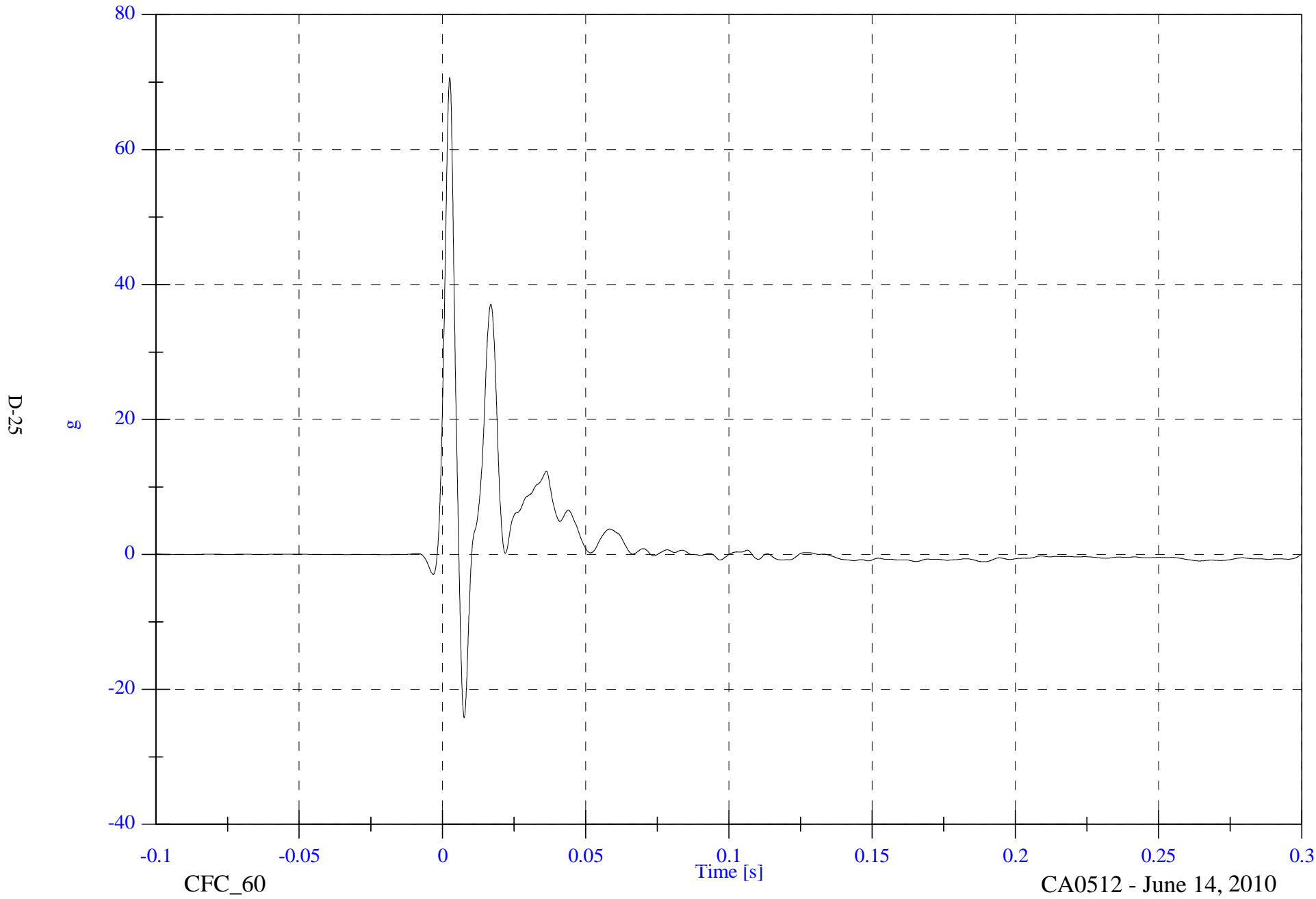
Min: 0.0 [g] at -0.058 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2 A4 Left Rear Sill Y

Max: 70.7 [g] at 0.003 [s]
Min: -24.2 [g] at 0.008 [s]



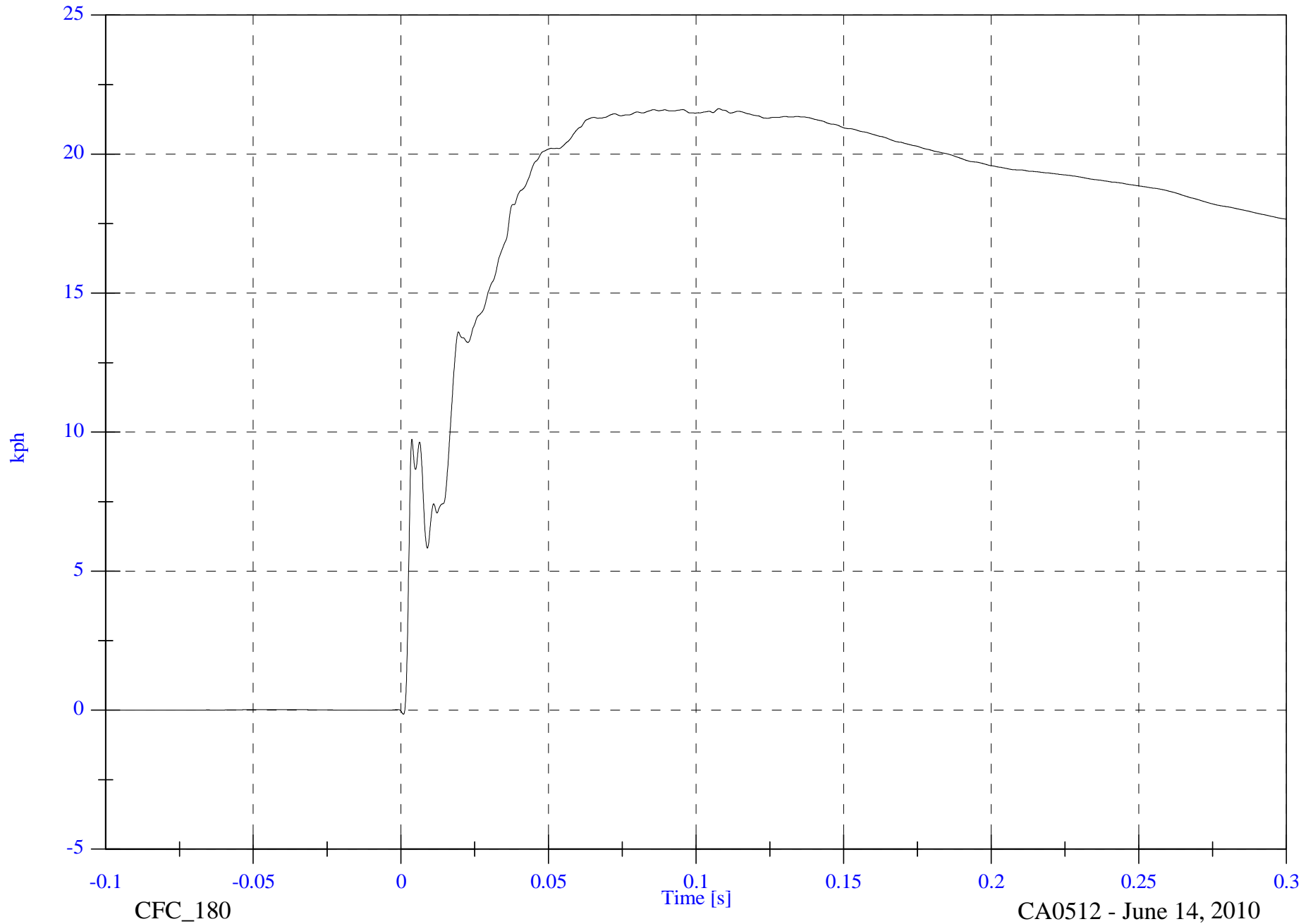
FMVSS 214 MDB - 2010 BMW 128i

V2 A4 Left Rear Sill Y Velocity

Max: 21.6 [kph] at 0.108 [s]

Min: -0.1 [kph] at 0.001 [s]

D-26



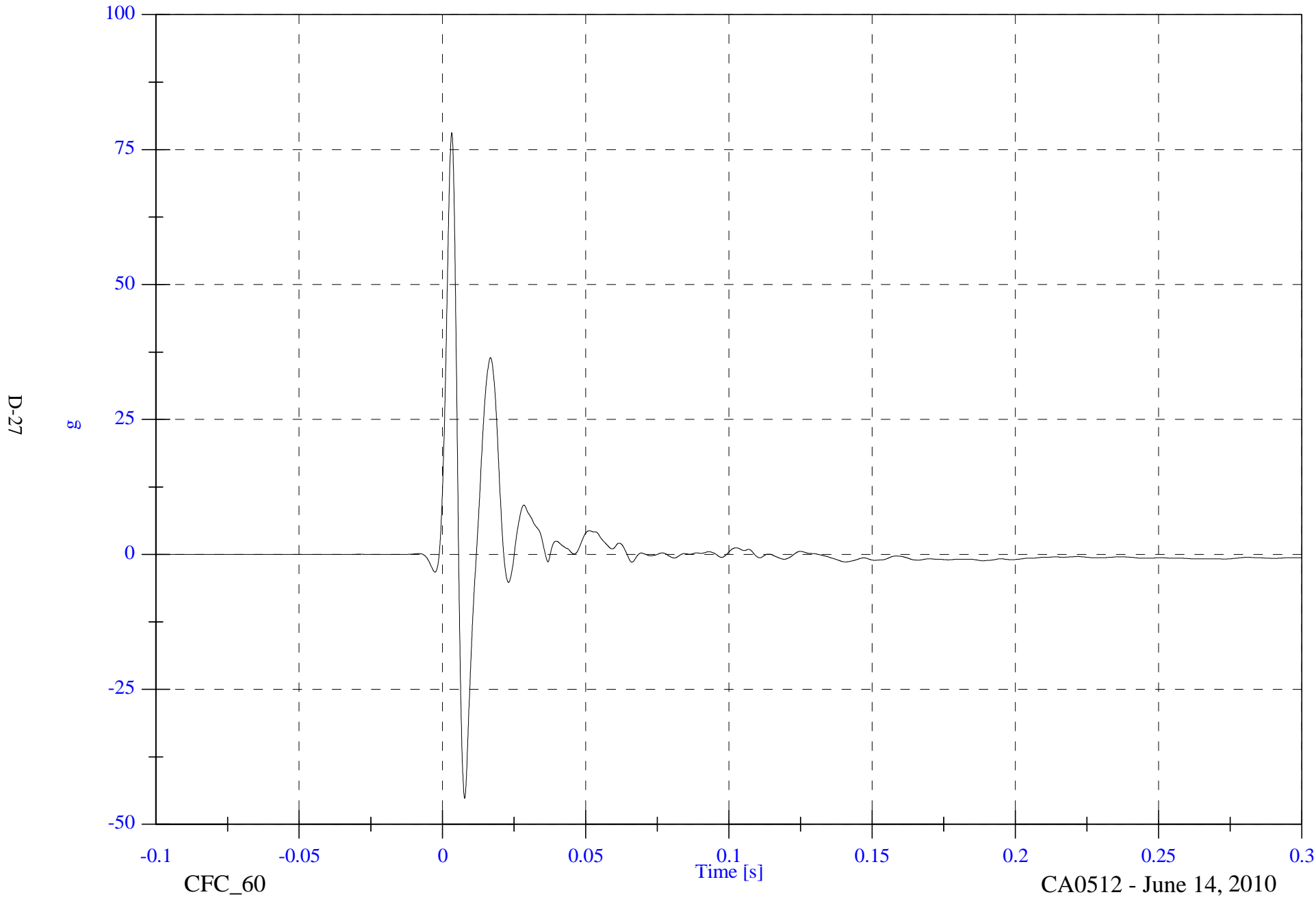
CFC_180

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A5 Left Front Sill Y

Max: 78.2 [g] at 0.003 [s]
Min: -45.2 [g] at 0.008 [s]



D-27

g

-0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25 0.3
CFC_60 Time [s] CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 15.0 [kph] at 0.108 [s]

V2 A5 Left Front Sill Y Velocity

Min: -0.1 [kph] at 0.001 [s]

D-28



CFC_180

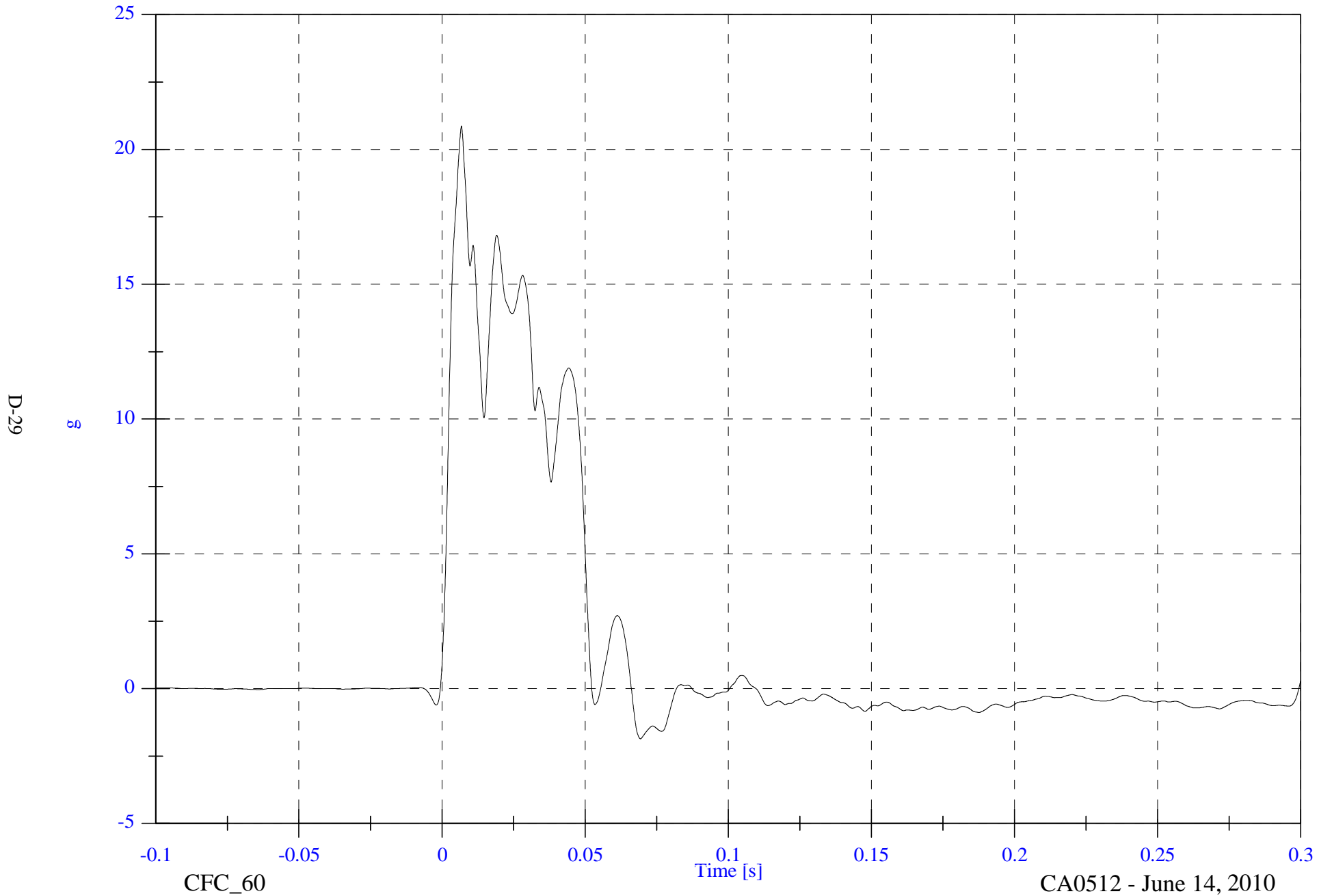
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A6 Right Rear Compartment Y

Max: 20.9 [g] at 0.007 [s]

Min: -1.9 [g] at 0.069 [s]



D-29

CFC_60

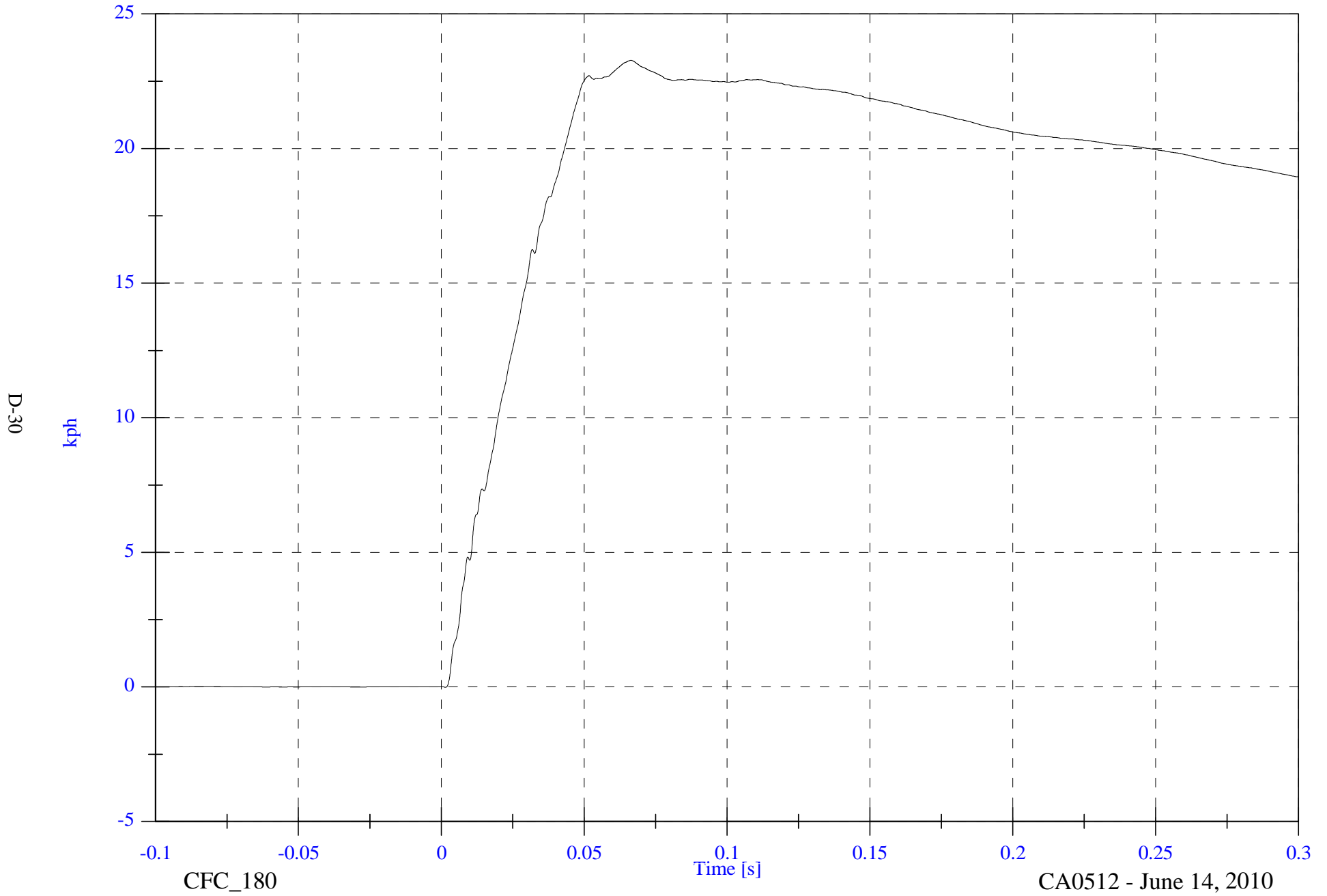
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A6 Right Rear Compartment Y Velocity

Max: 23.3 [kph] at 0.066 [s]

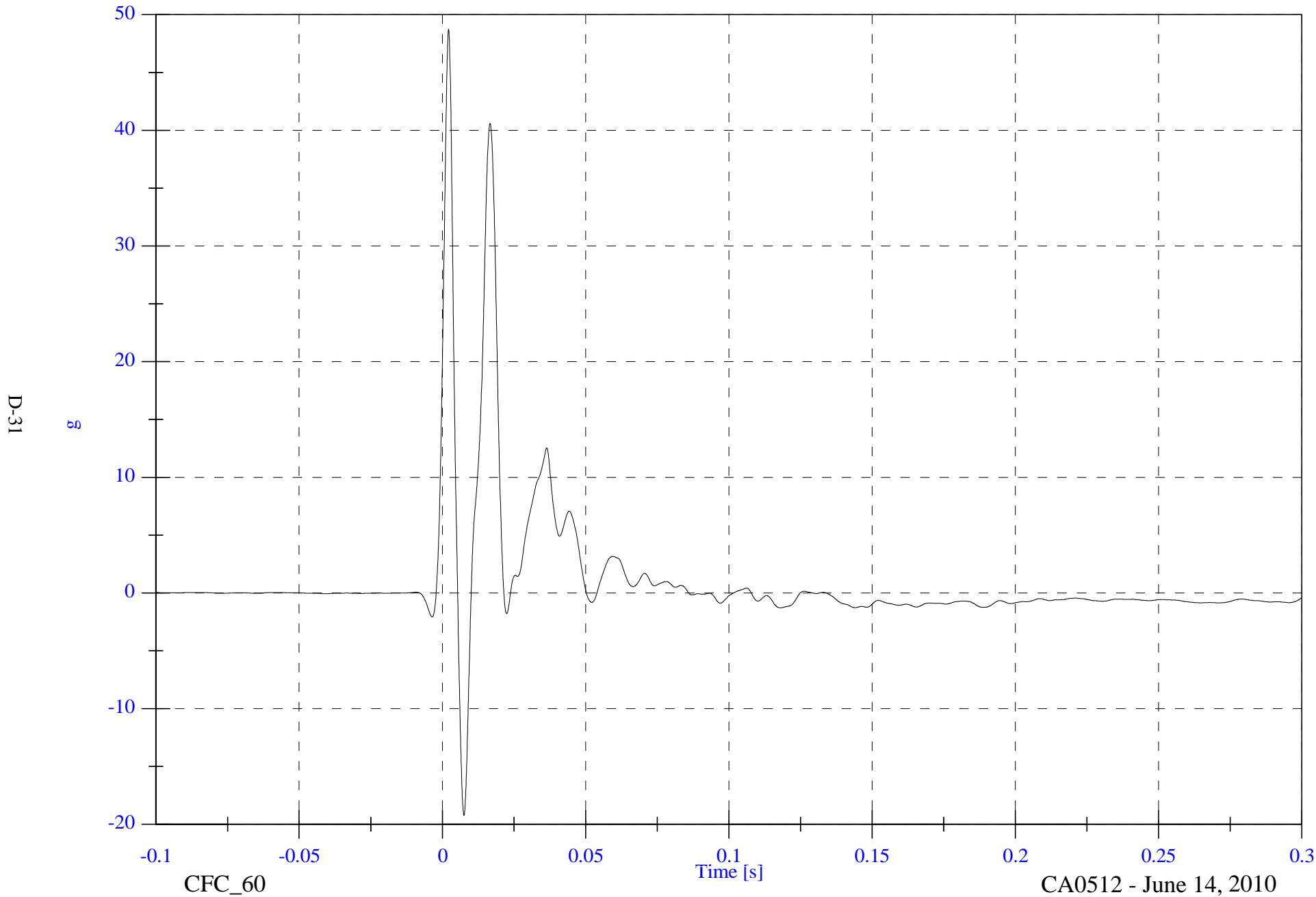
Min: -0.0 [kph] at 0.001 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2 A7 Left Lower B Post Y

Max: 48.7 [g] at 0.002 [s]
Min: -19.2 [g] at 0.007 [s]

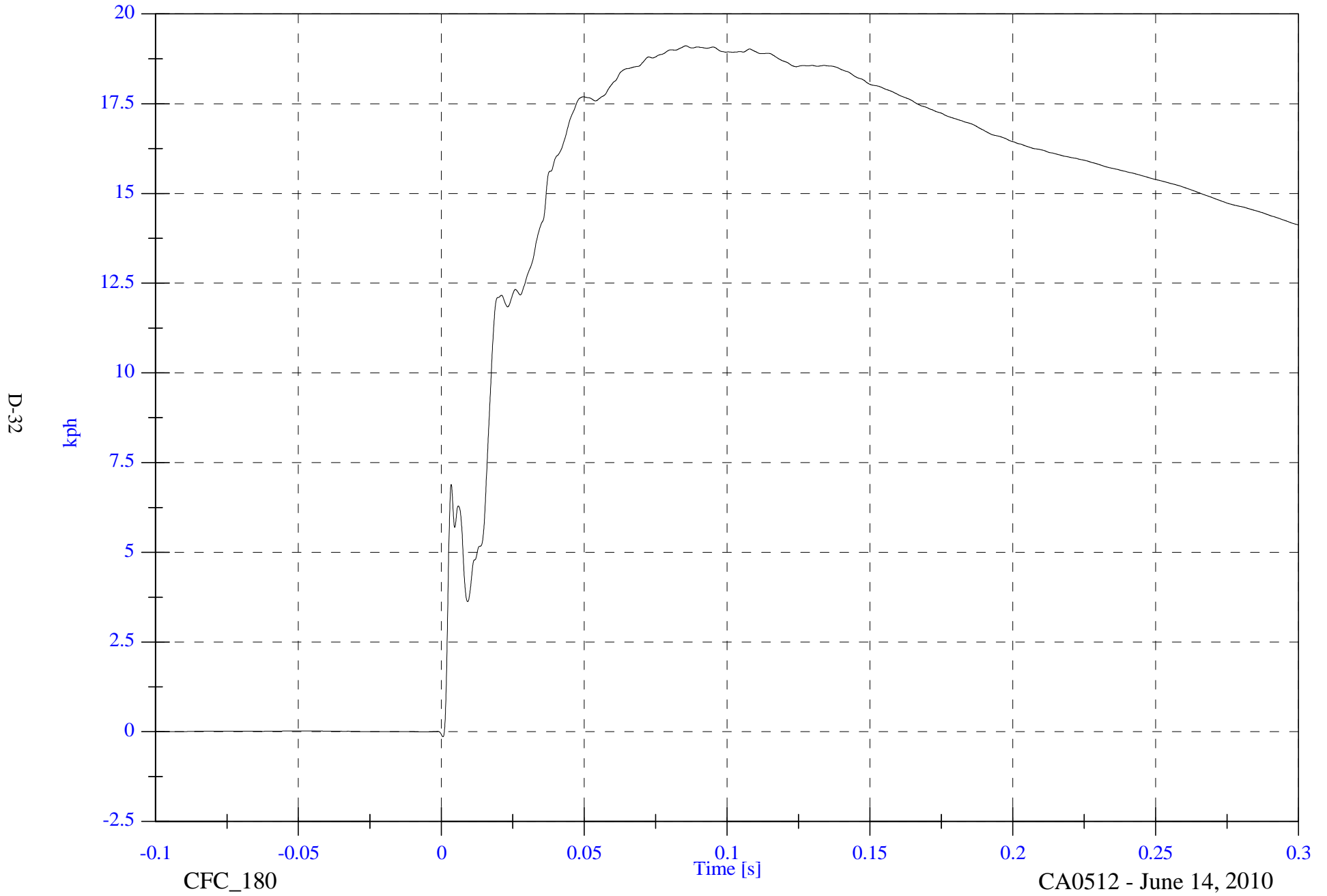


FMVSS 214 MDB - 2010 BMW 128i

Max: 19.1 [kph] at 0.086 [s]

V2 A7 Left Lower B Post Y Velocity

Min: -0.1 [kph] at 0.001 [s]



D-32

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

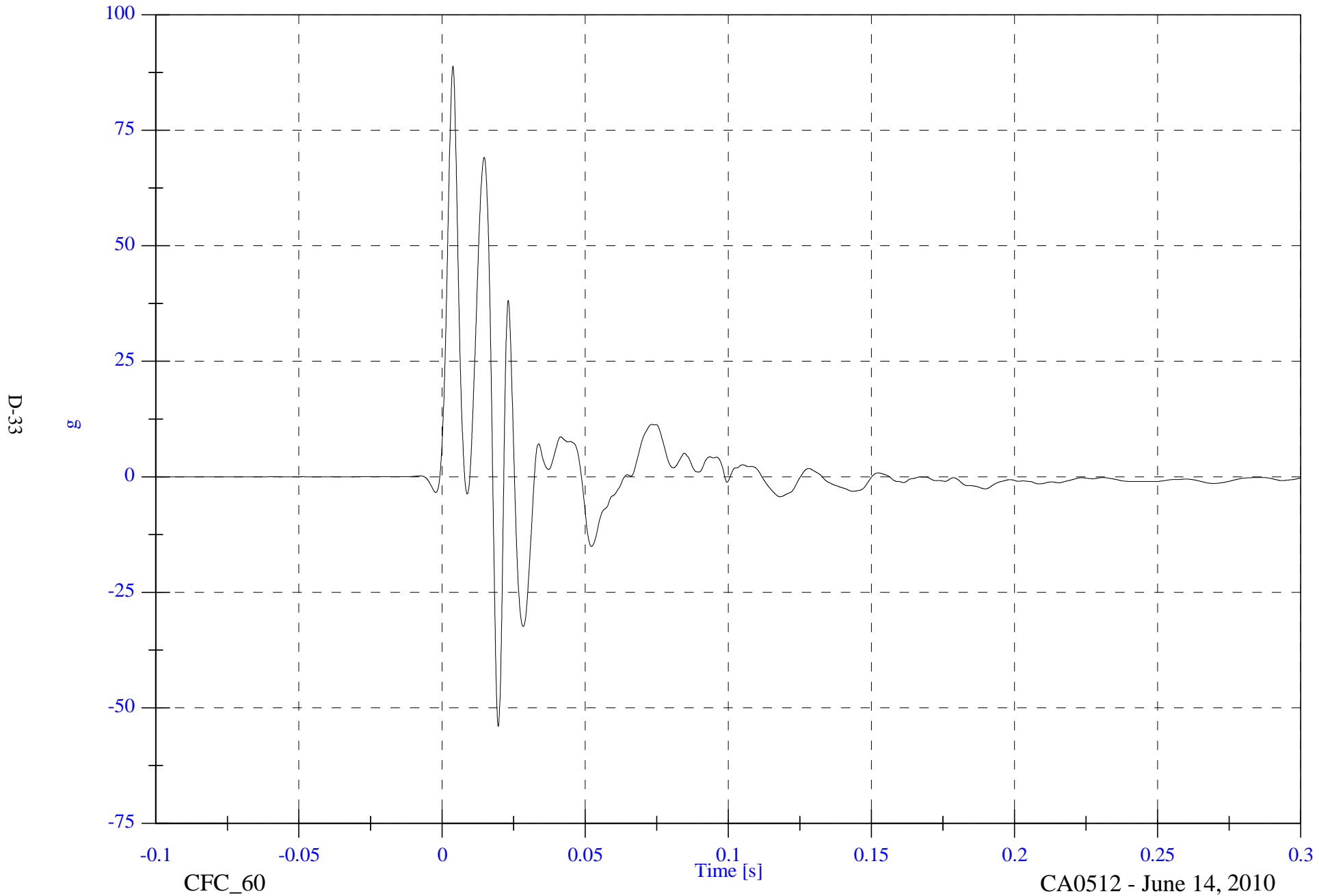
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A8 Left Middle B Post Y

Max: 88.9 [g] at 0.004 [s]
Min: -54.0 [g] at 0.020 [s]

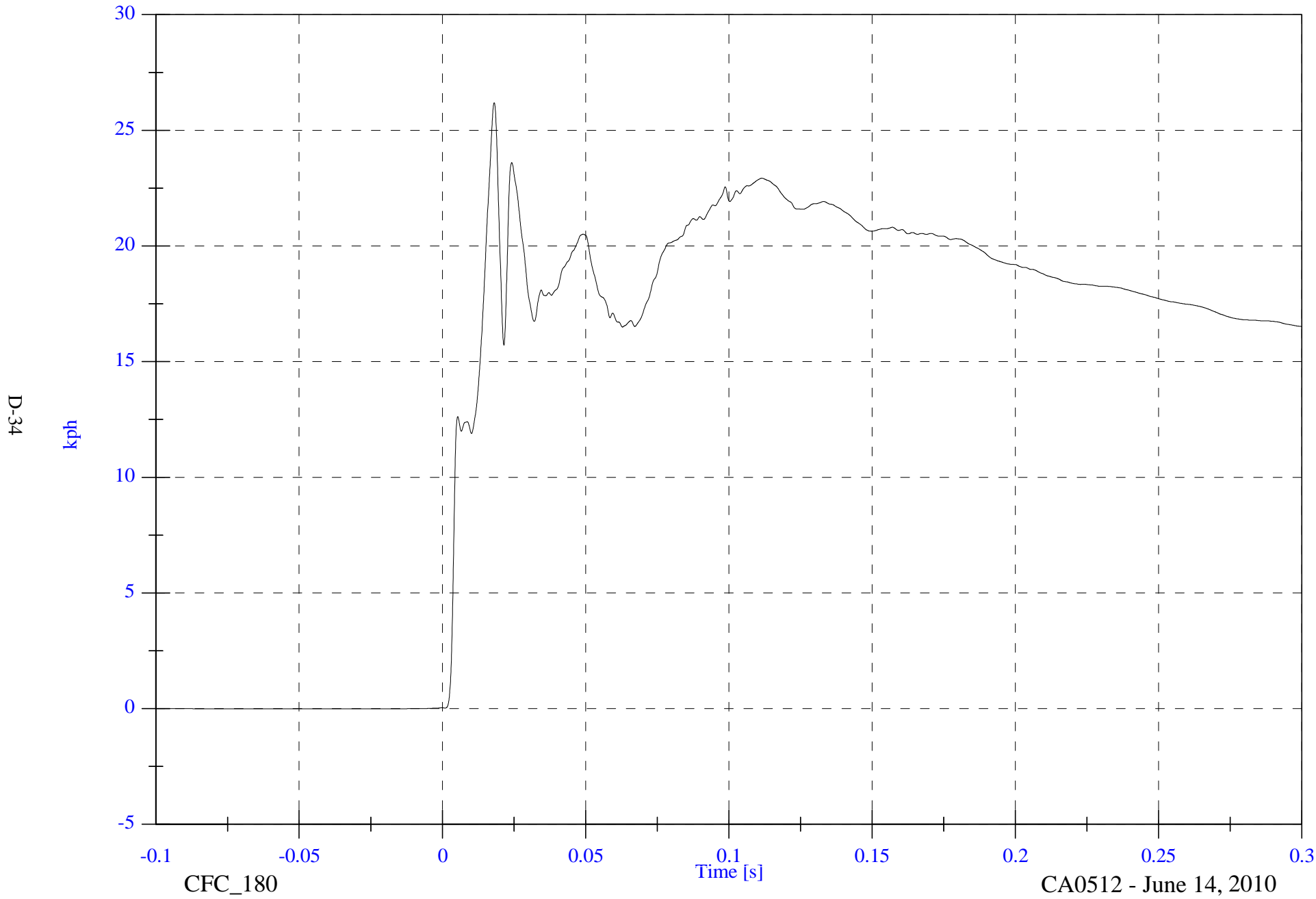


FMVSS 214 MDB - 2010 BMW 128i

Max: 26.2 [kph] at 0.018 [s]

V2 A8 Left Middle B Post Y Velocity

Min: -0.0 [kph] at -0.061 [s]



D-34

kph

CFC_180

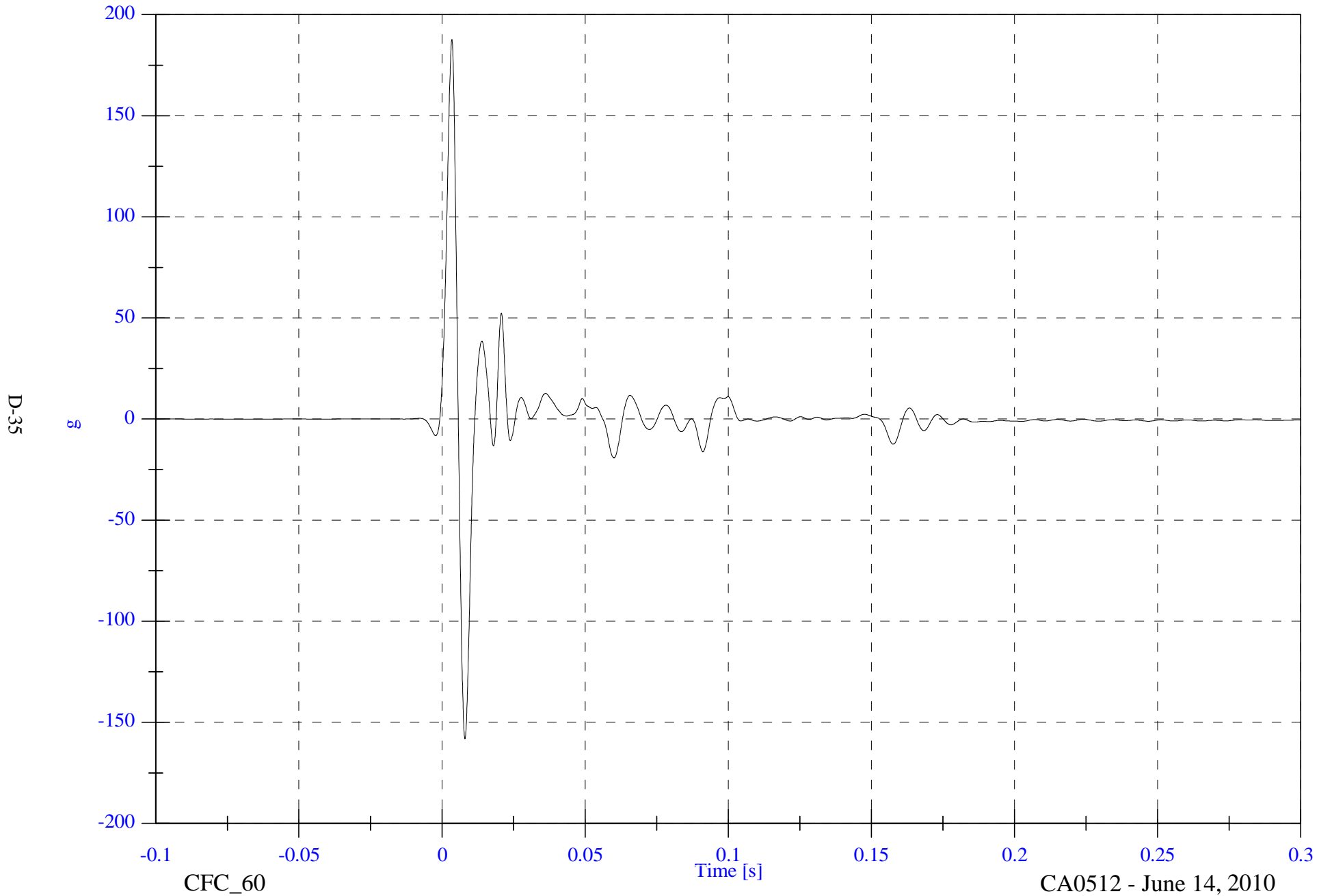
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A9 Left Lower A Post Y

Max: 187.8 [g] at 0.003 [s]
Min: -158.2 [g] at 0.008 [s]



D-35

CFC_60

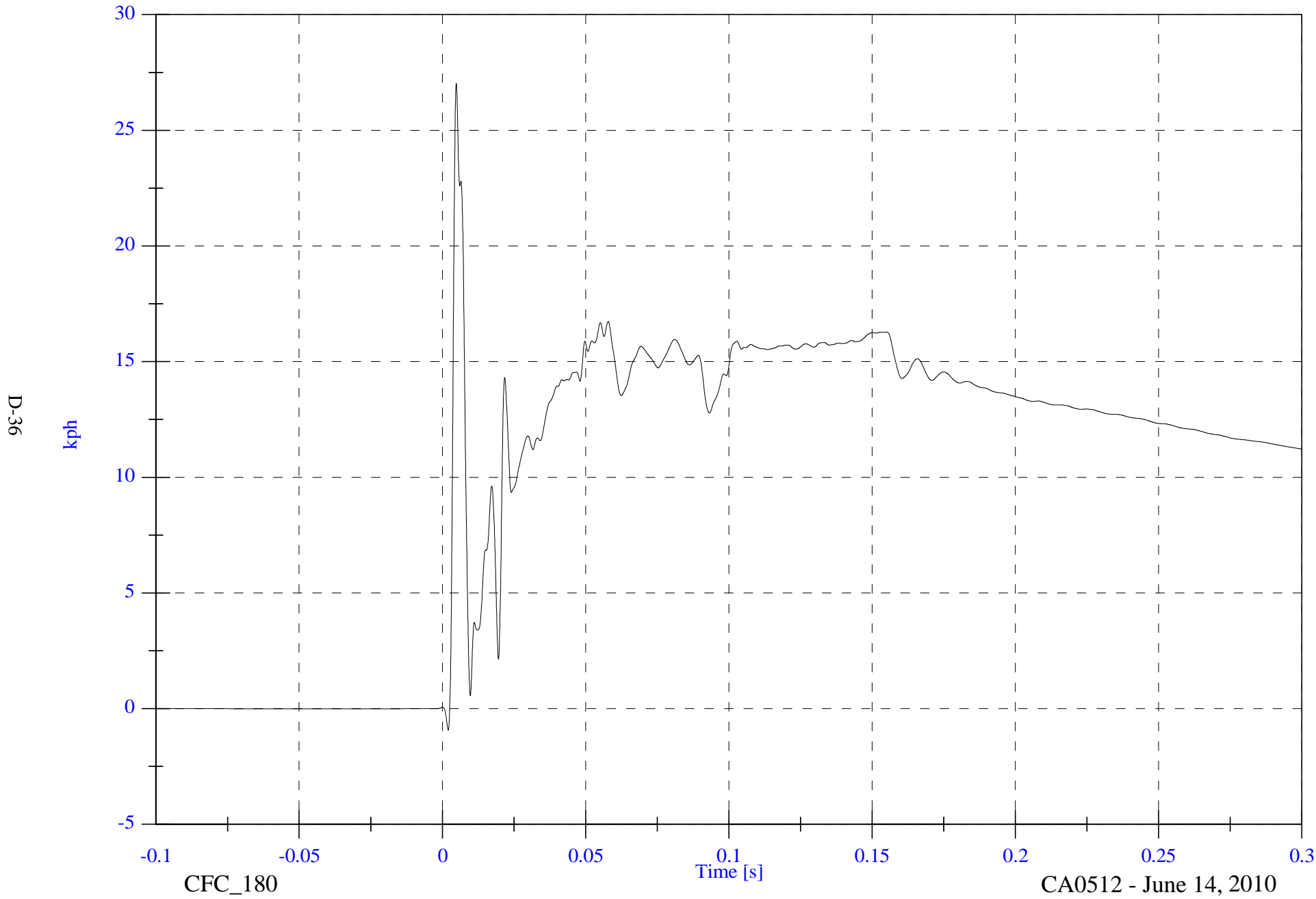
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 27.0 [kph] at 0.005 [s]

V2 A9 Left Lower A Post Y Velocity

Min: -0.9 [kph] at 0.002 [s]



D-36

kph

CFC_180

Time [s]

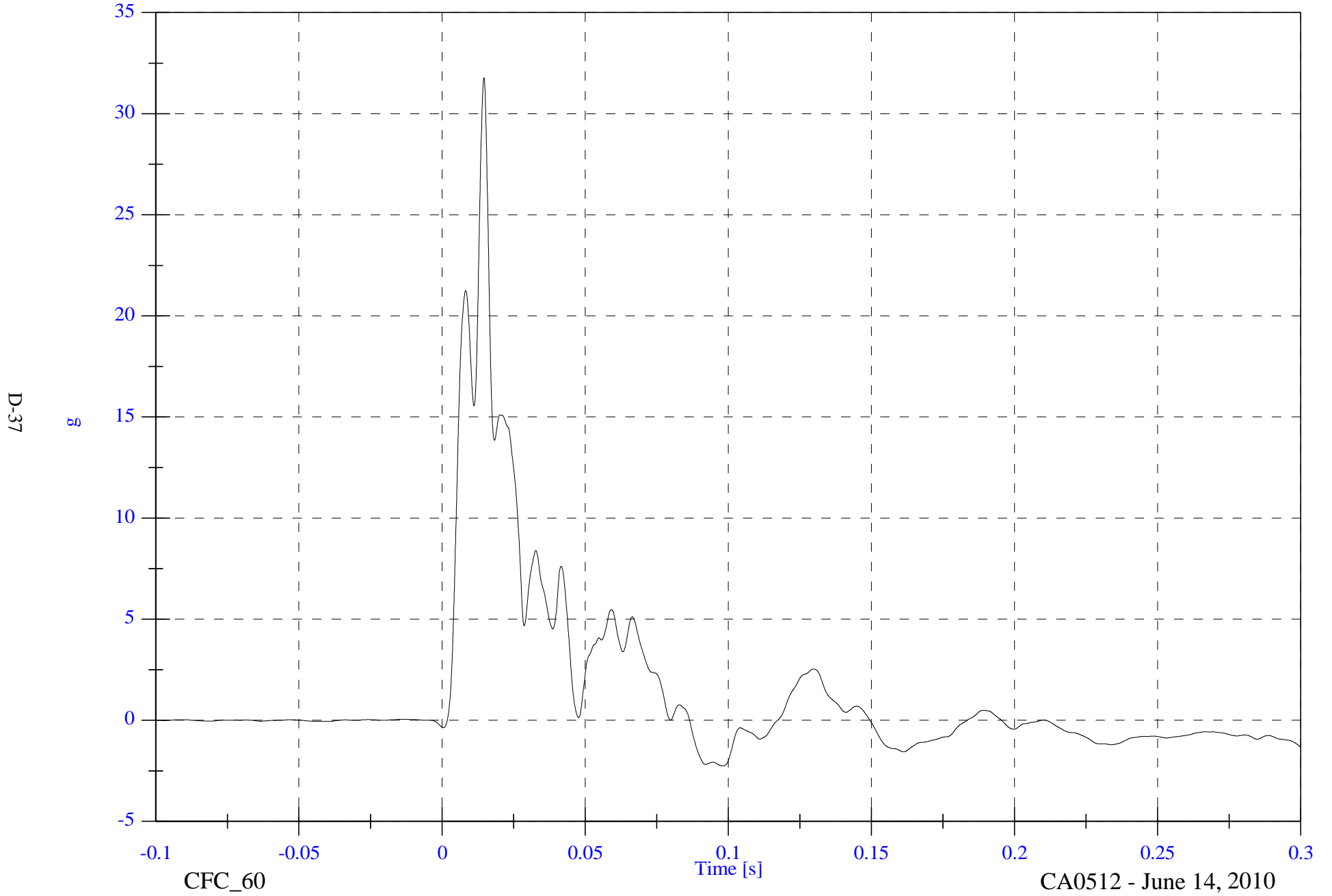
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A10 Left Mid A Post Y

Max: 31.8 [g] at 0.015 [s]

Min: -2.3 [g] at 0.098 [s]

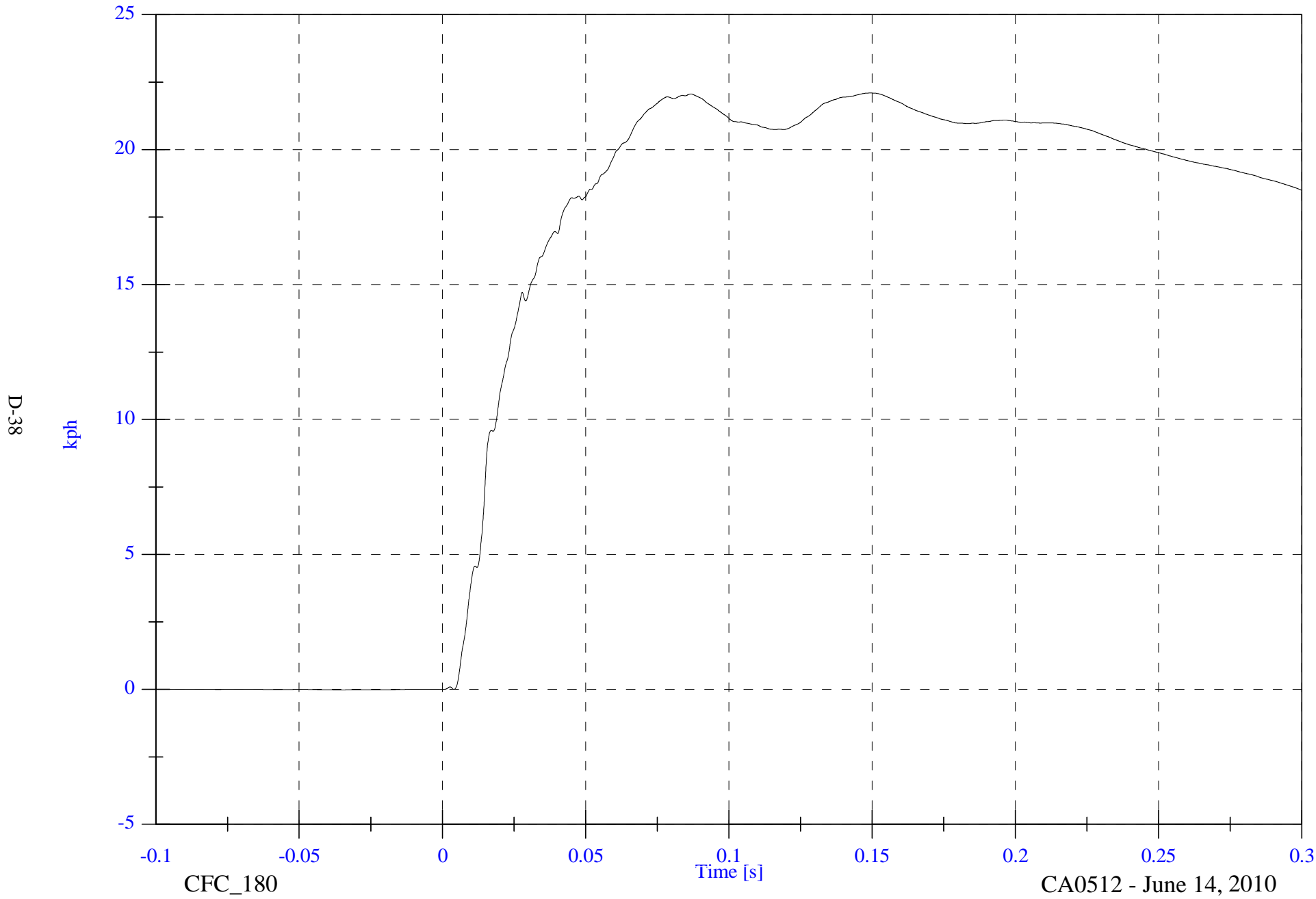


FMVSS 214 MDB - 2010 BMW 128i

V2 A10 Left Mid A Post Y Velocity

Max: 22.1 [kph] at 0.149 [s]

Min: -0.0 [kph] at -0.036 [s]



D-38

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

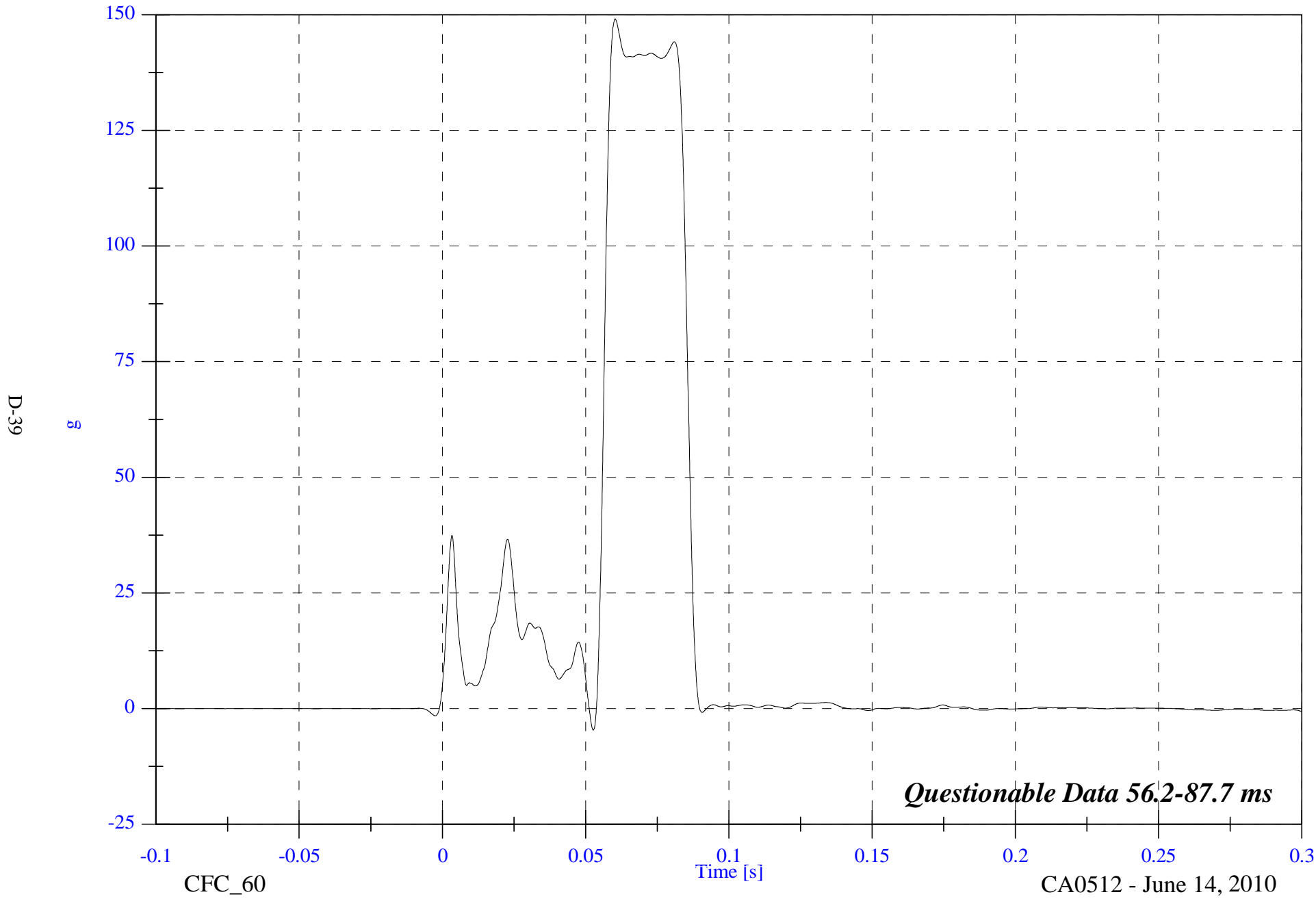
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 149.1 [g] at 0.060 [s]
Min: -4.6 [g] at 0.053 [s]

V2 A11 Front Seat Track Y

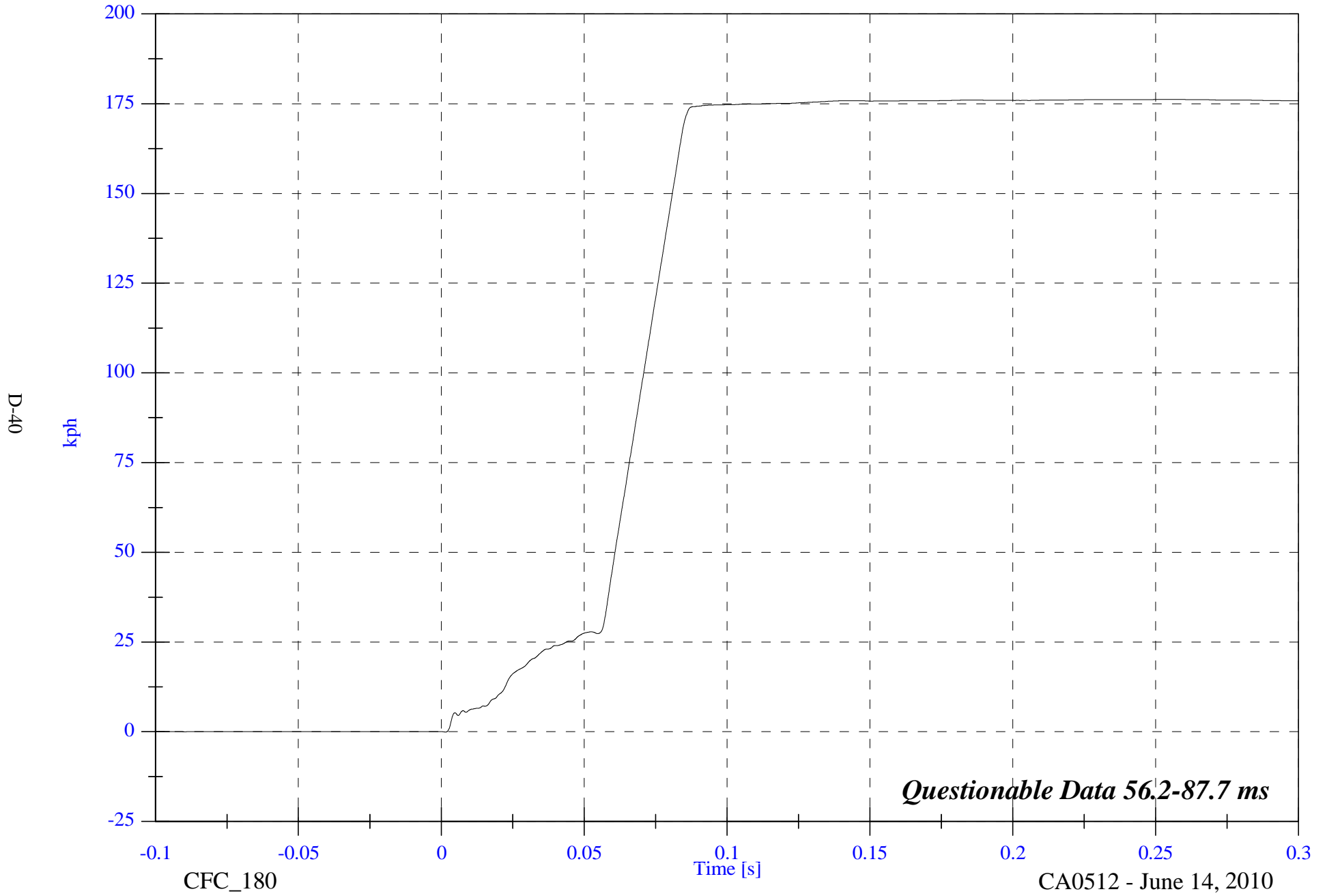


FMVSS 214 MDB - 2010 BMW 128i

Max: 176.2 [kph] at 0.255 [s]

V2 A11 Front Seat Track Y Velocity

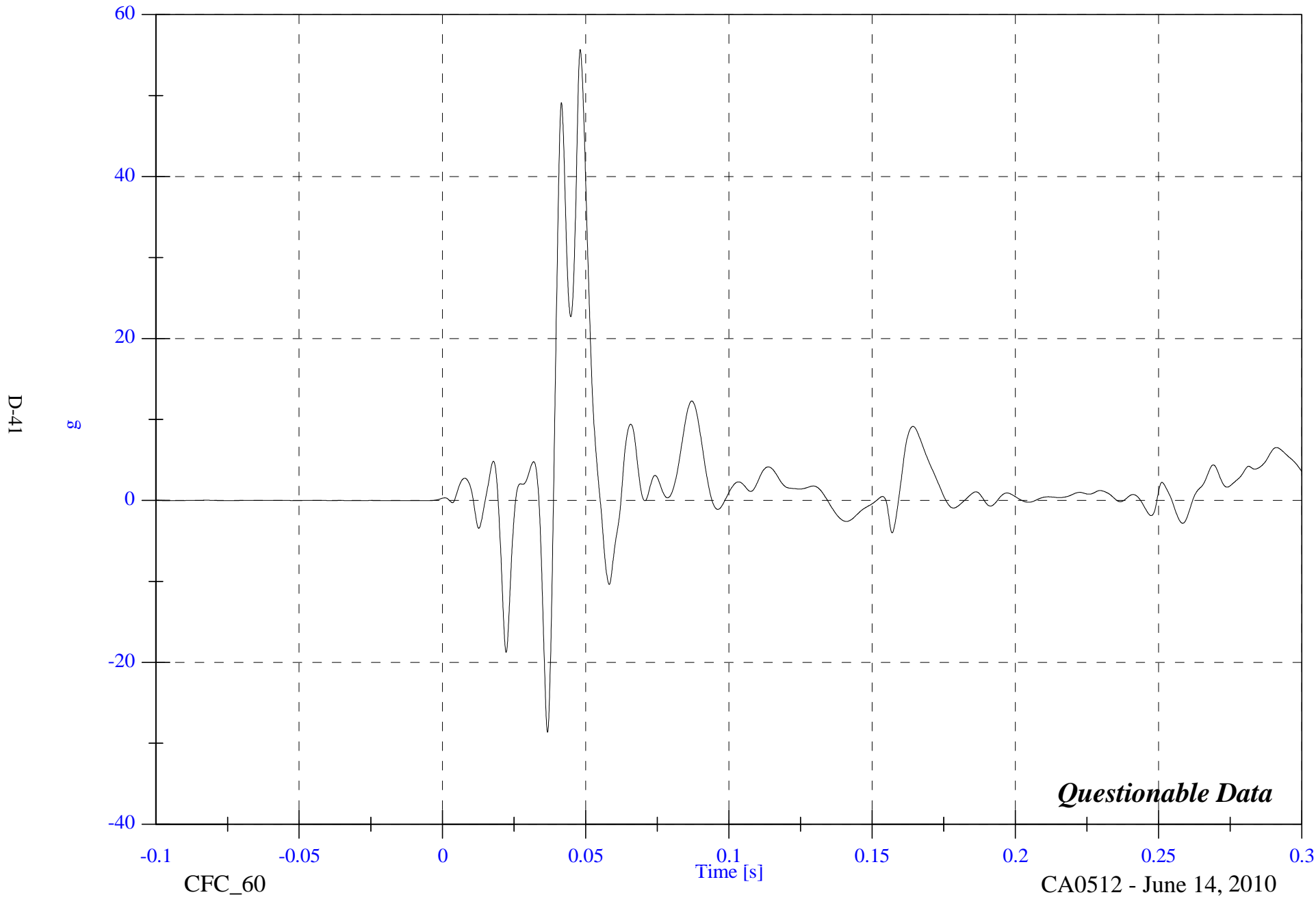
Min: -0.1 [kph] at 0.001 [s]



FMVSS 214 MDB - 2010 BMW 128i

V2 A12 Rear Seat Track Y

Max: 55.7 [g] at 0.048 [s]
Min: -28.6 [g] at 0.037 [s]



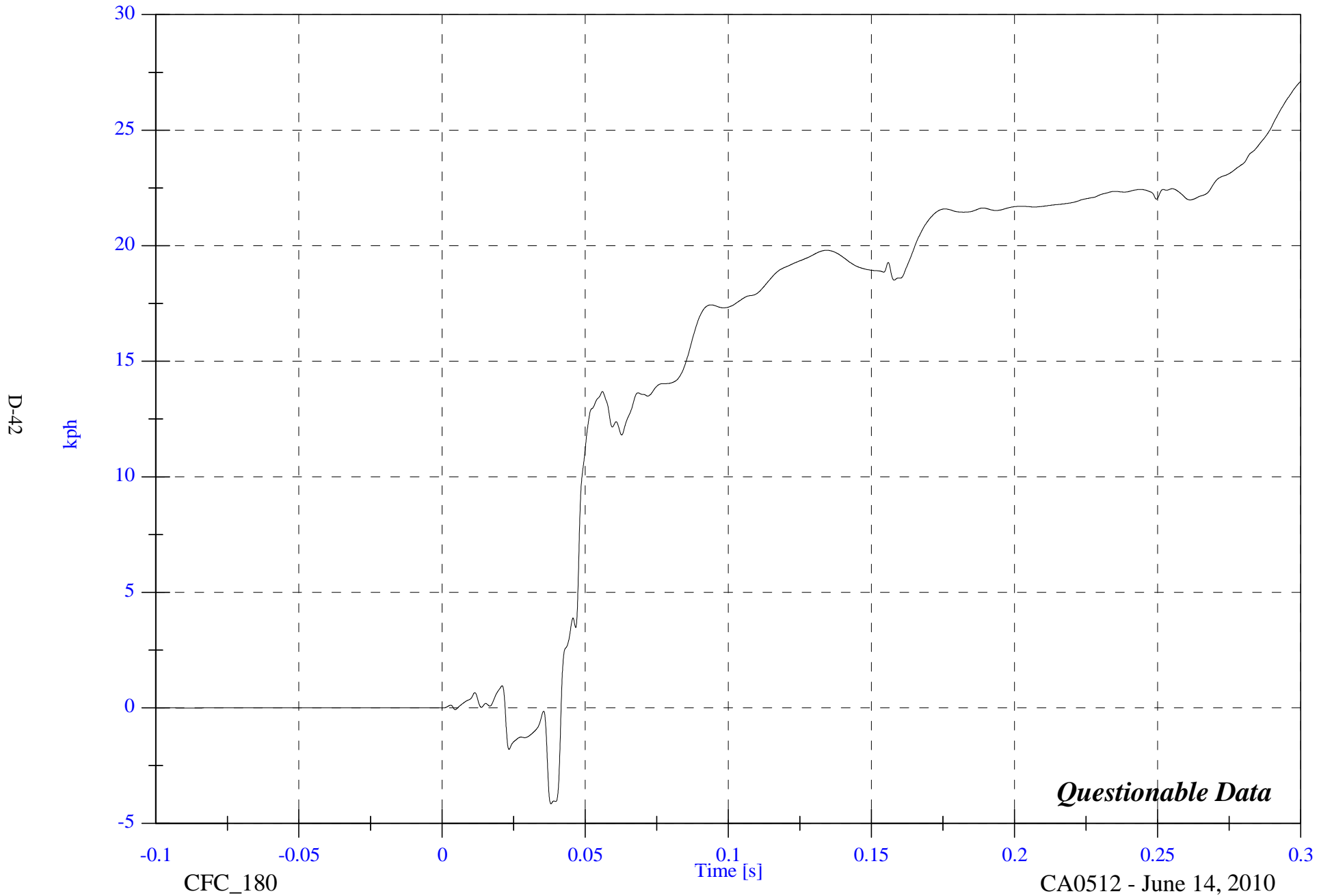
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A12 Rear Seat Track Y Velocity

Max: 27.1 [kph] at 0.300 [s]

Min: -4.2 [kph] at 0.038 [s]



Questionable Data

D-42

kph

Time [s]

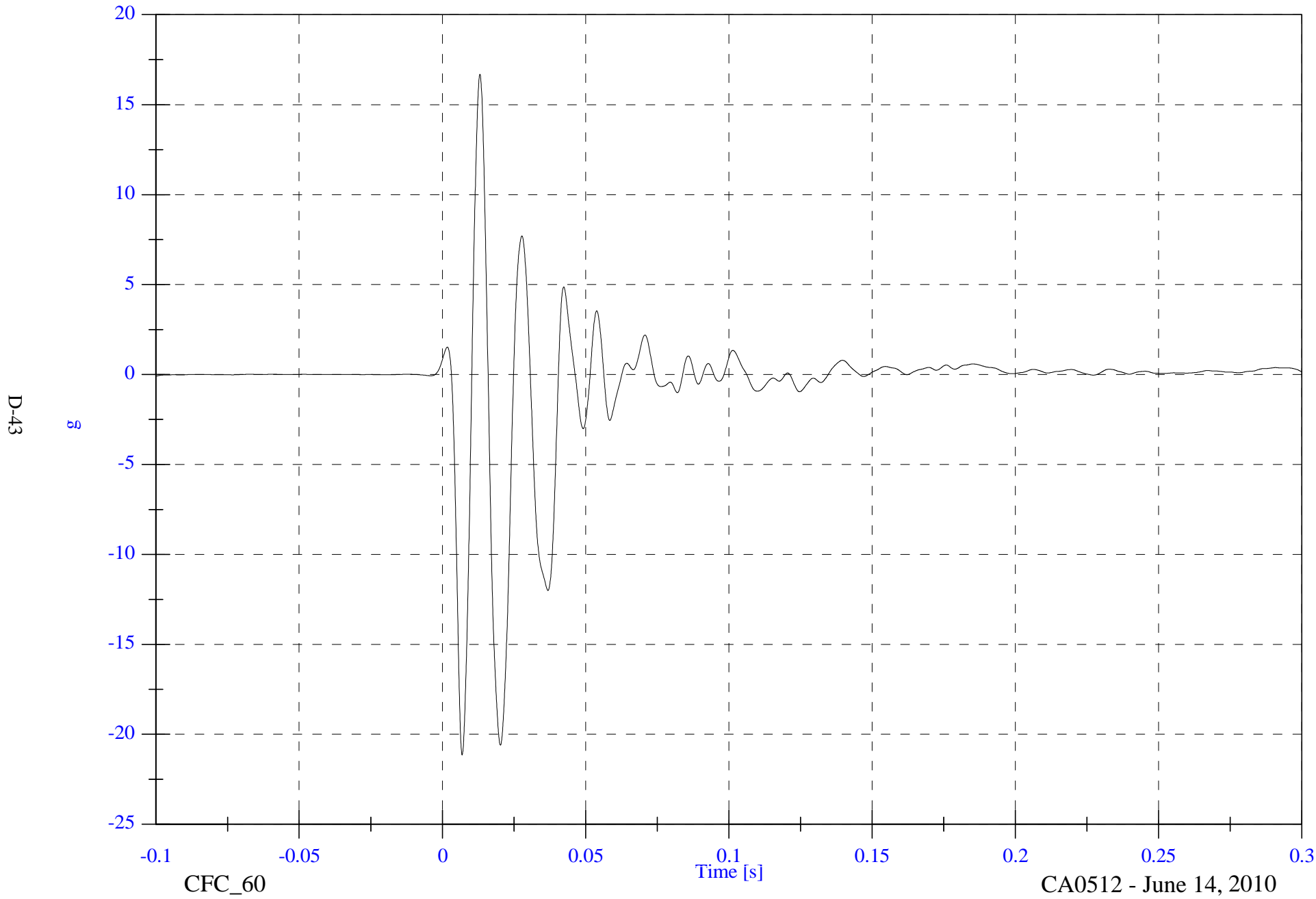
CFC_180

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A13 Target CG X

Max: 16.7 [g] at 0.013 [s]
Min: -21.1 [g] at 0.007 [s]



D-43

CFC_60

CA0512 - June 14, 2010

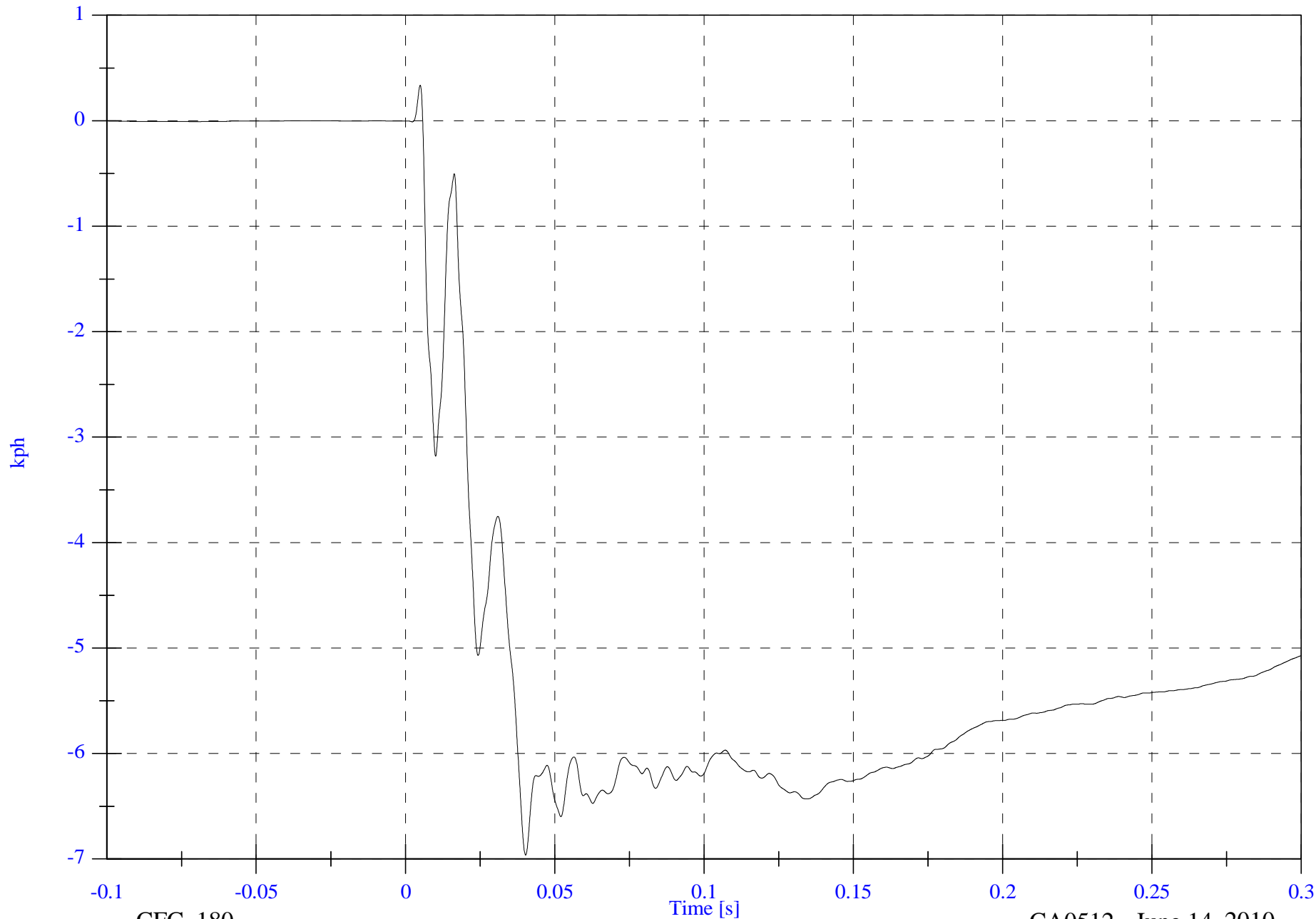
FMVSS 214 MDB - 2010 BMW 128i

V2 A13 Target CG X Velocity

Max: 0.3 [kph] at 0.005 [s]

Min: -7.0 [kph] at 0.040 [s]

D-44



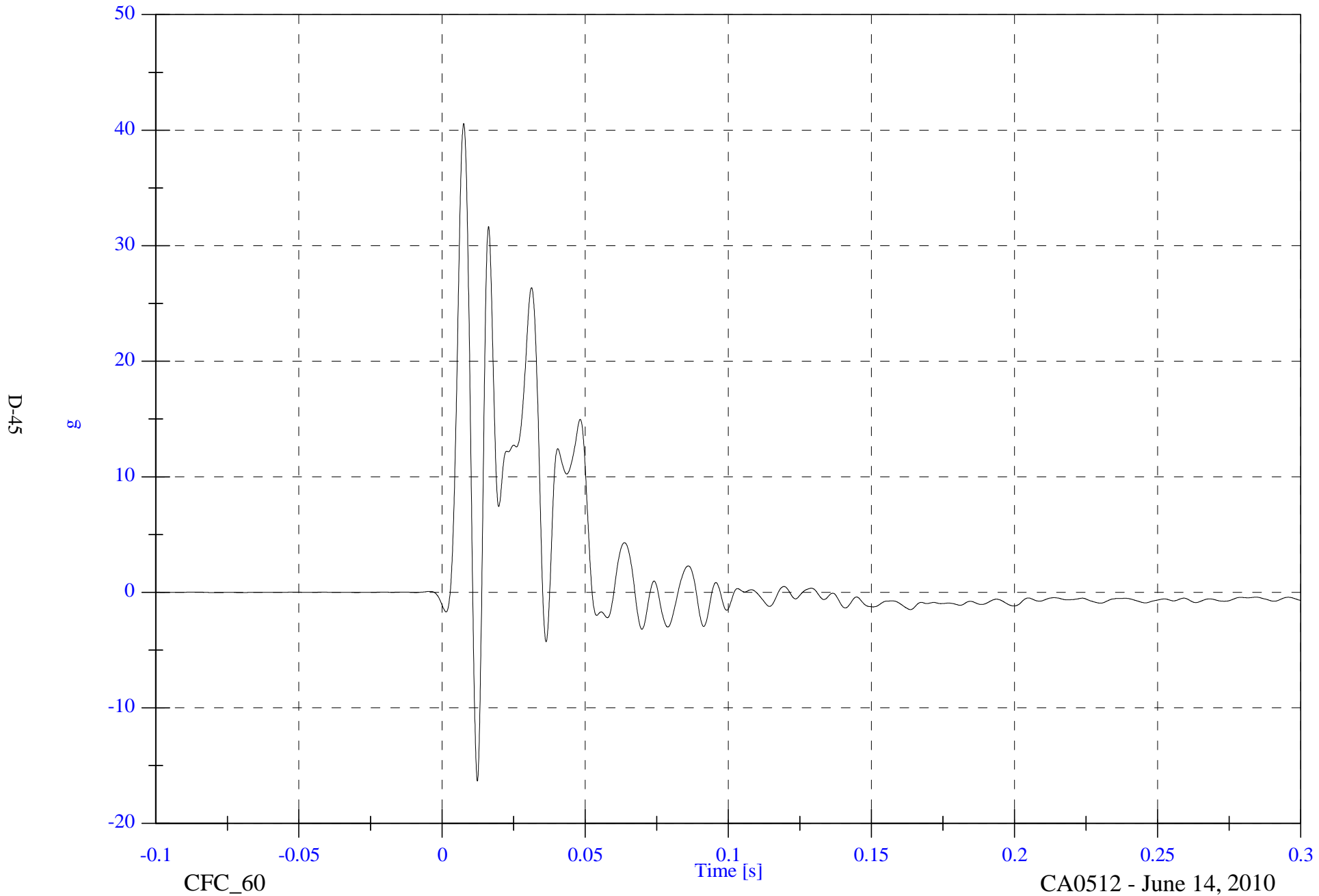
CFC_180

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A13 Target CG Y

Max: 40.6 [g] at 0.008 [s]
Min: -16.3 [g] at 0.012 [s]



D-45

g

CFC_60

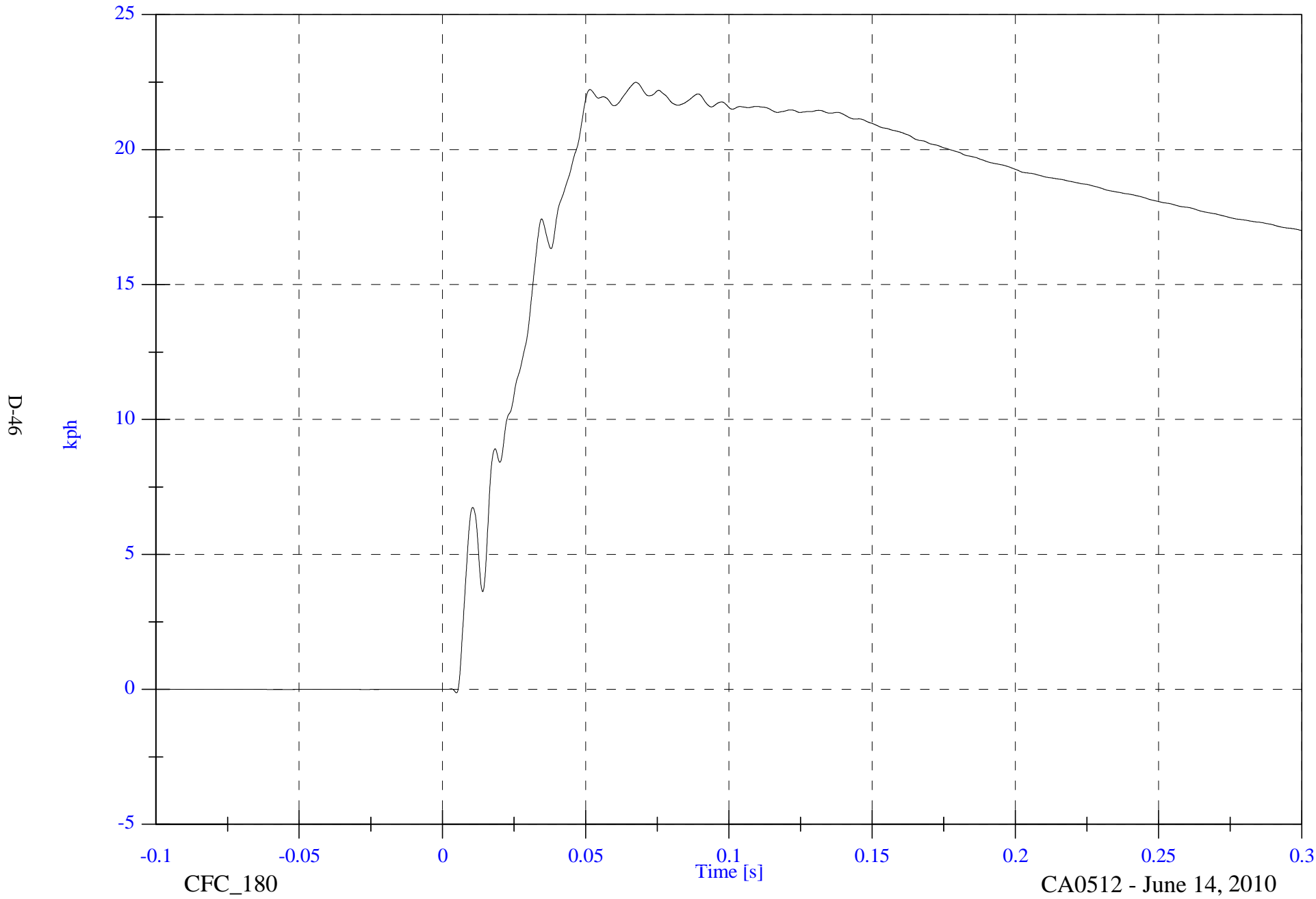
Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 22.5 [kph] at 0.068 [s]
Min: -0.1 [kph] at 0.005 [s]

V2 A13 Target CG Y Velocity



D-46

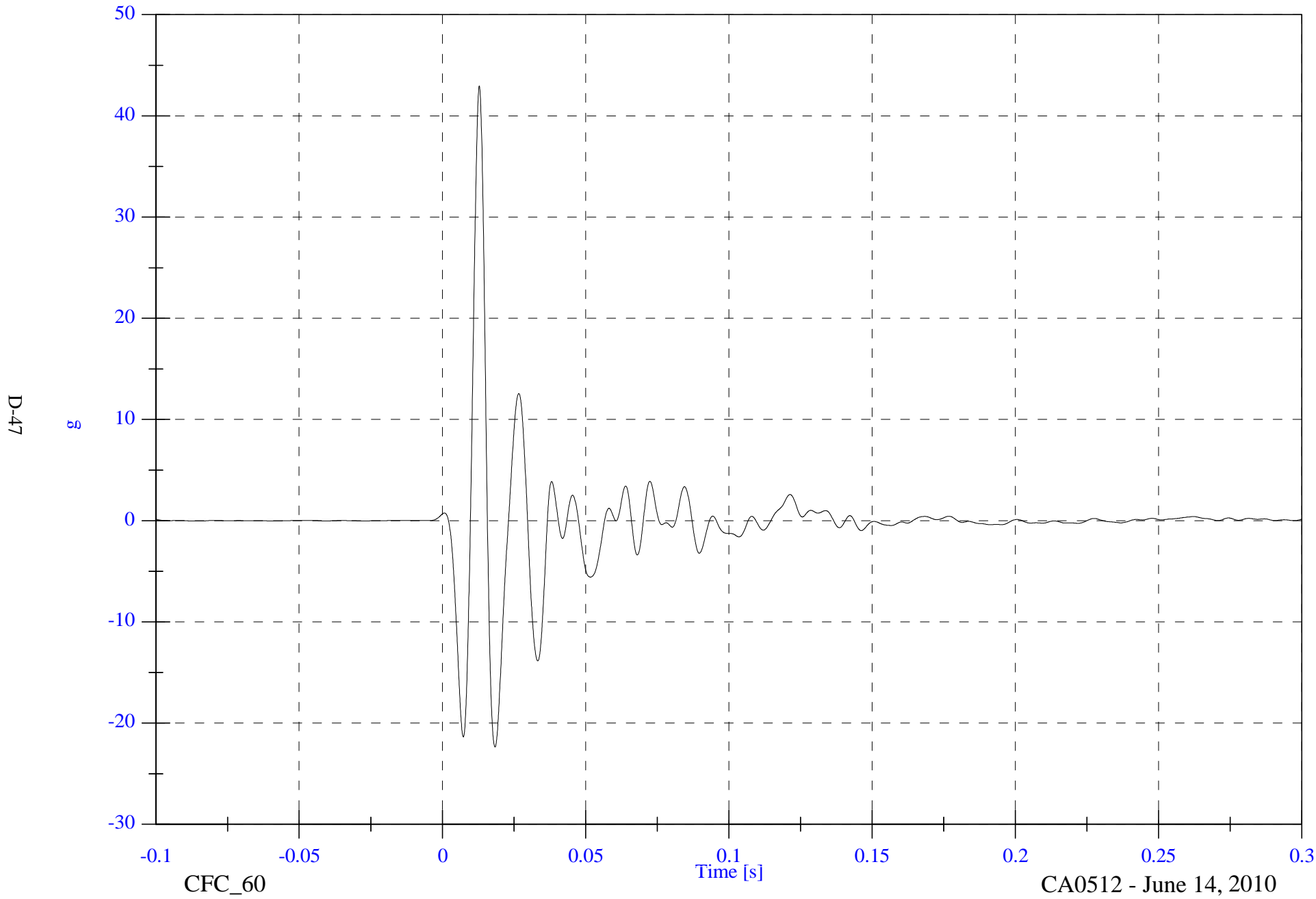
kph

-0.1 -0.05 0 0.05 0.1 0.15 0.2 0.25 0.3
Time [s]
CFC_180 CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A13 Target CG Z

Max: 43.0 [g] at 0.013 [s]
Min: -22.4 [g] at 0.018 [s]



FMVSS 214 MDB - 2010 BMW 128i

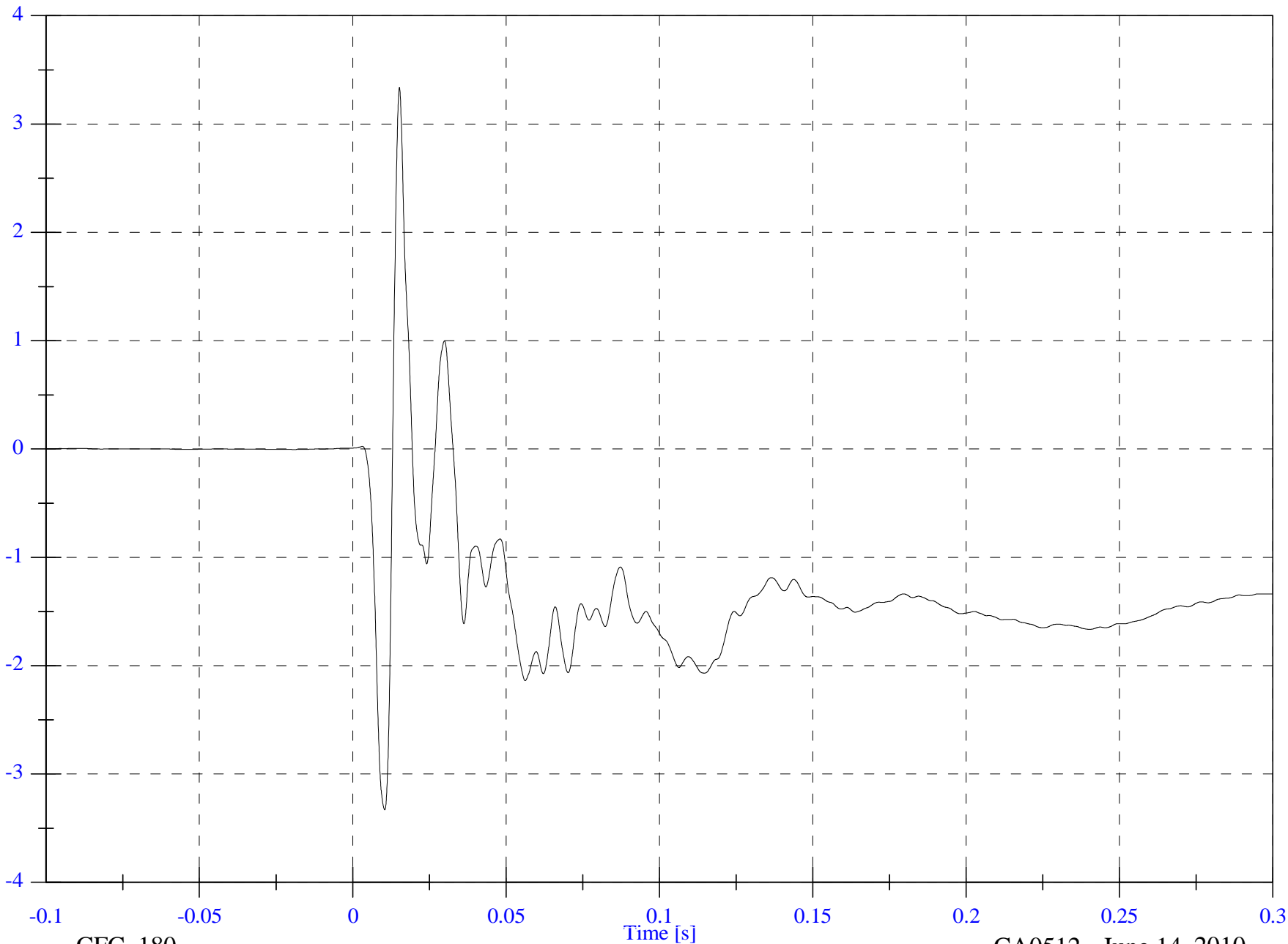
V2 A13 Target CG Z Velocity

Max: 3.3 [kph] at 0.015 [s]

Min: -3.3 [kph] at 0.010 [s]

D-48

kph



CFC_180

Time [s]

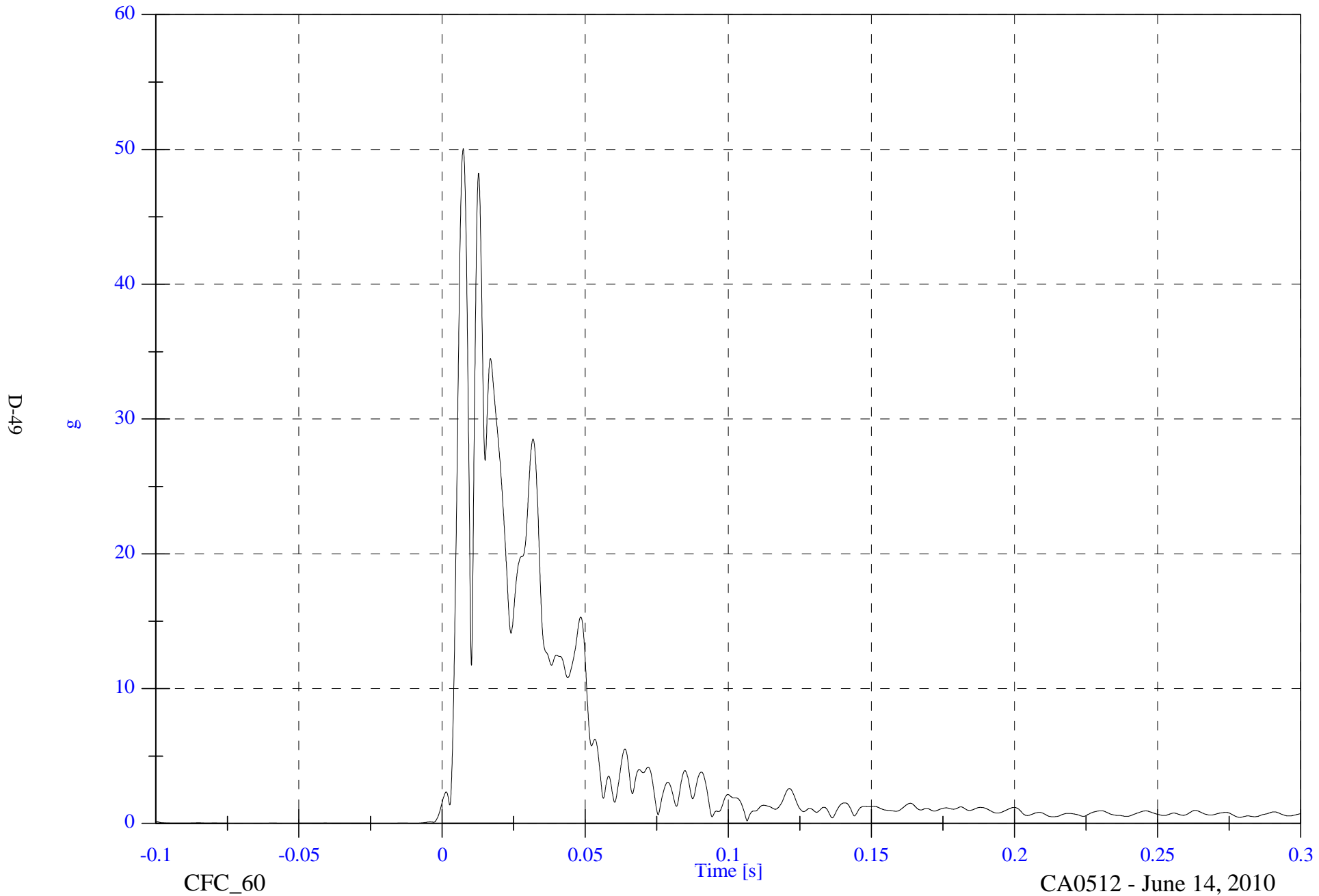
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V2 A13 Target CG Resultant

Max: 50.1 [g] at 0.007 [s]

Min: 0.0 [g] at -0.037 [s]

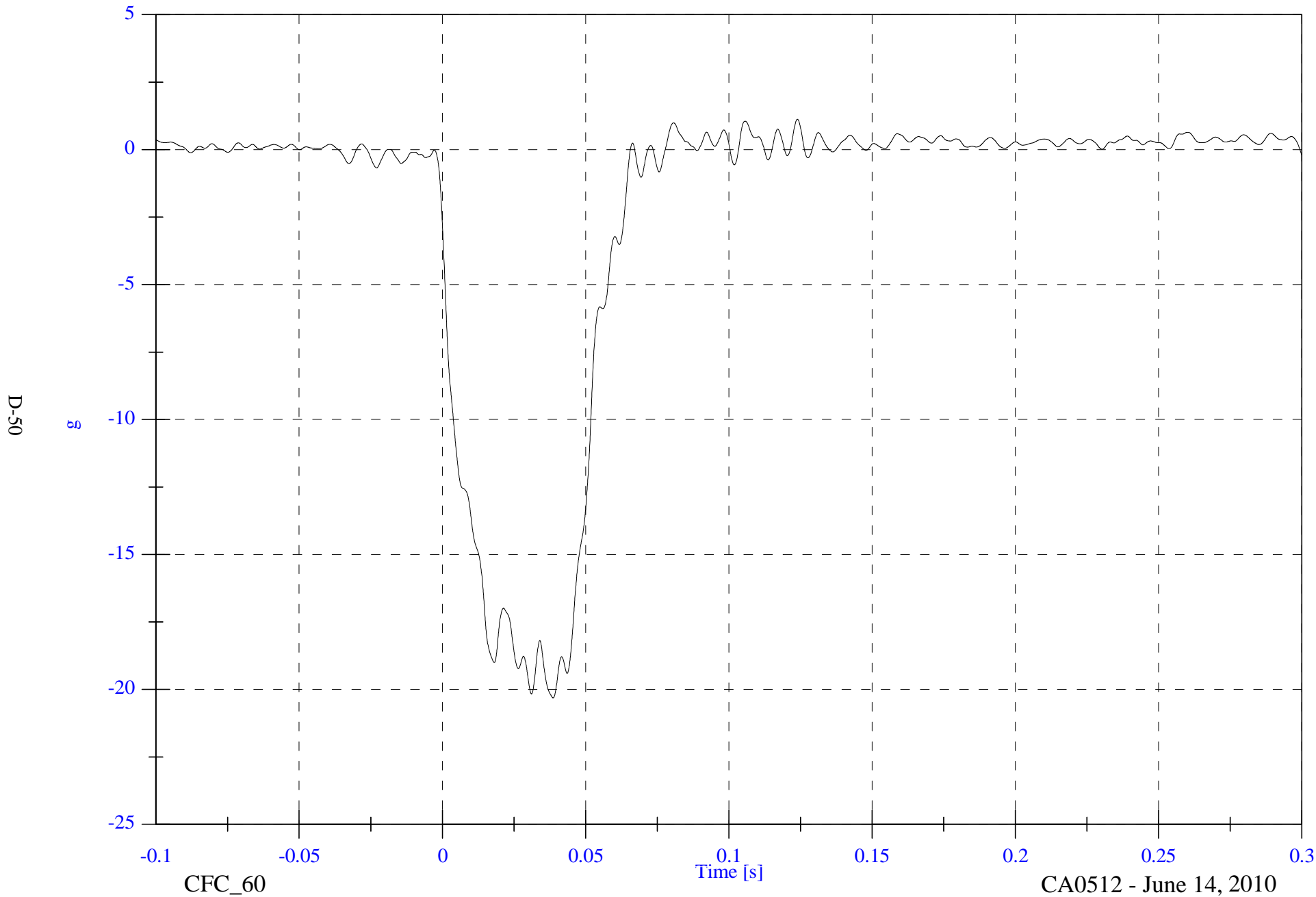


FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier CG X

Max: 1.1 [g] at 0.124 [s]

Min: -20.3 [g] at 0.039 [s]



CFC_60

Time [s]

CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

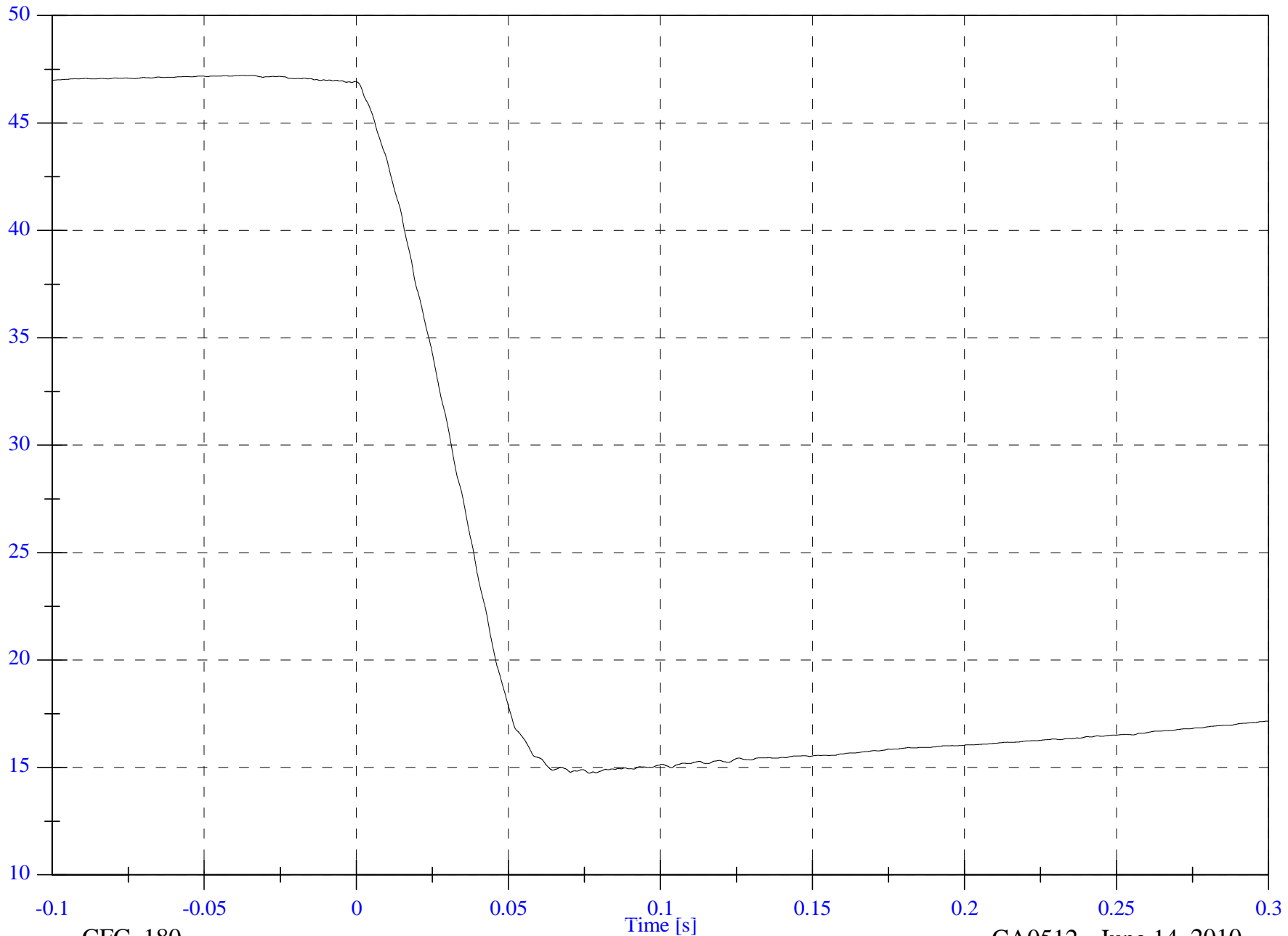
Max: 47.2 [kph] at -0.034 [s]

V1 Moving Barrier CG X Velocity

Min: 14.7 [kph] at 0.077 [s]

D-51

kph



CFC_180

Time [s]

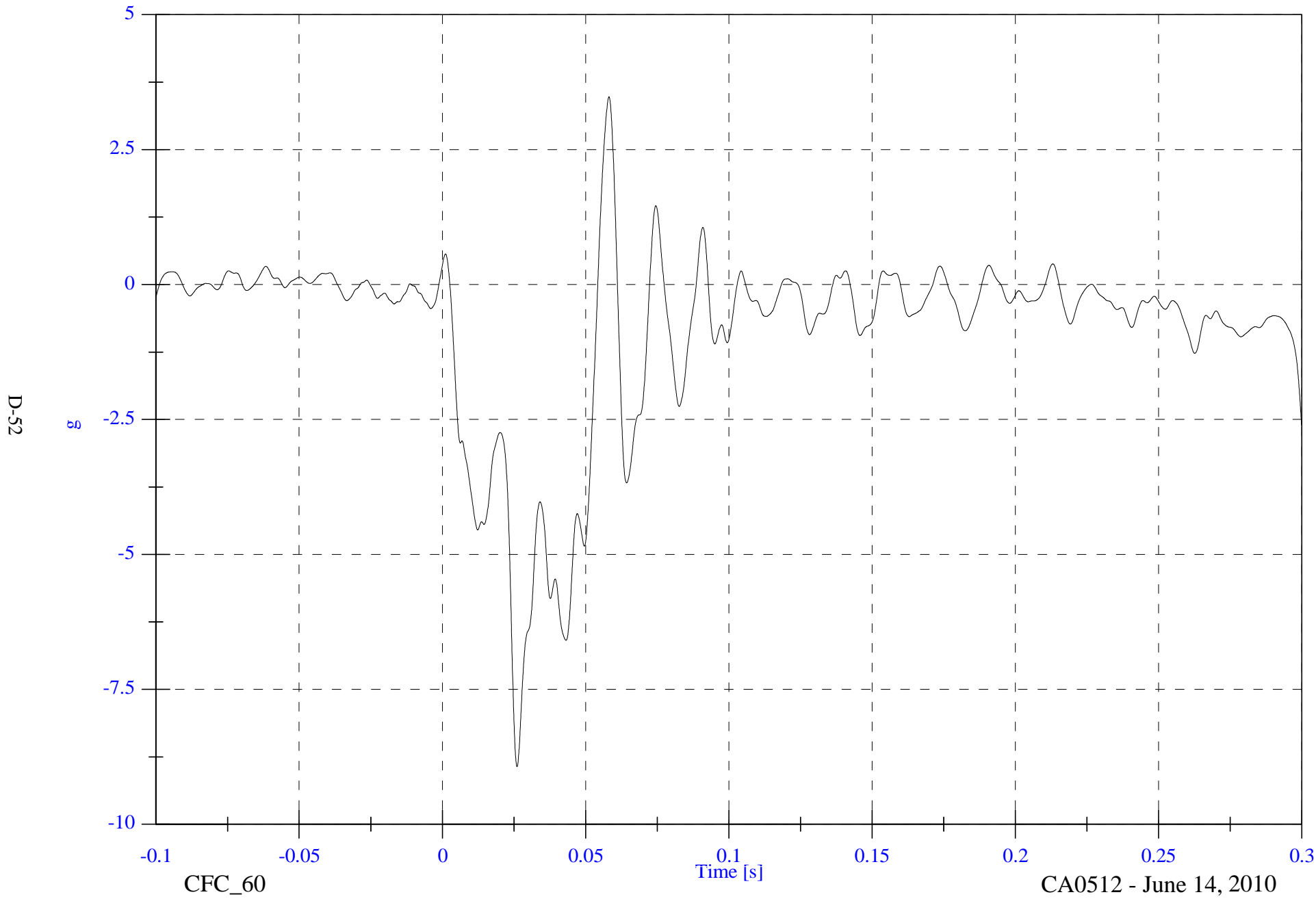
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier CG Y

Max: 3.5 [g] at 0.058 [s]

Min: -8.9 [g] at 0.026 [s]



D-52

CFC_60

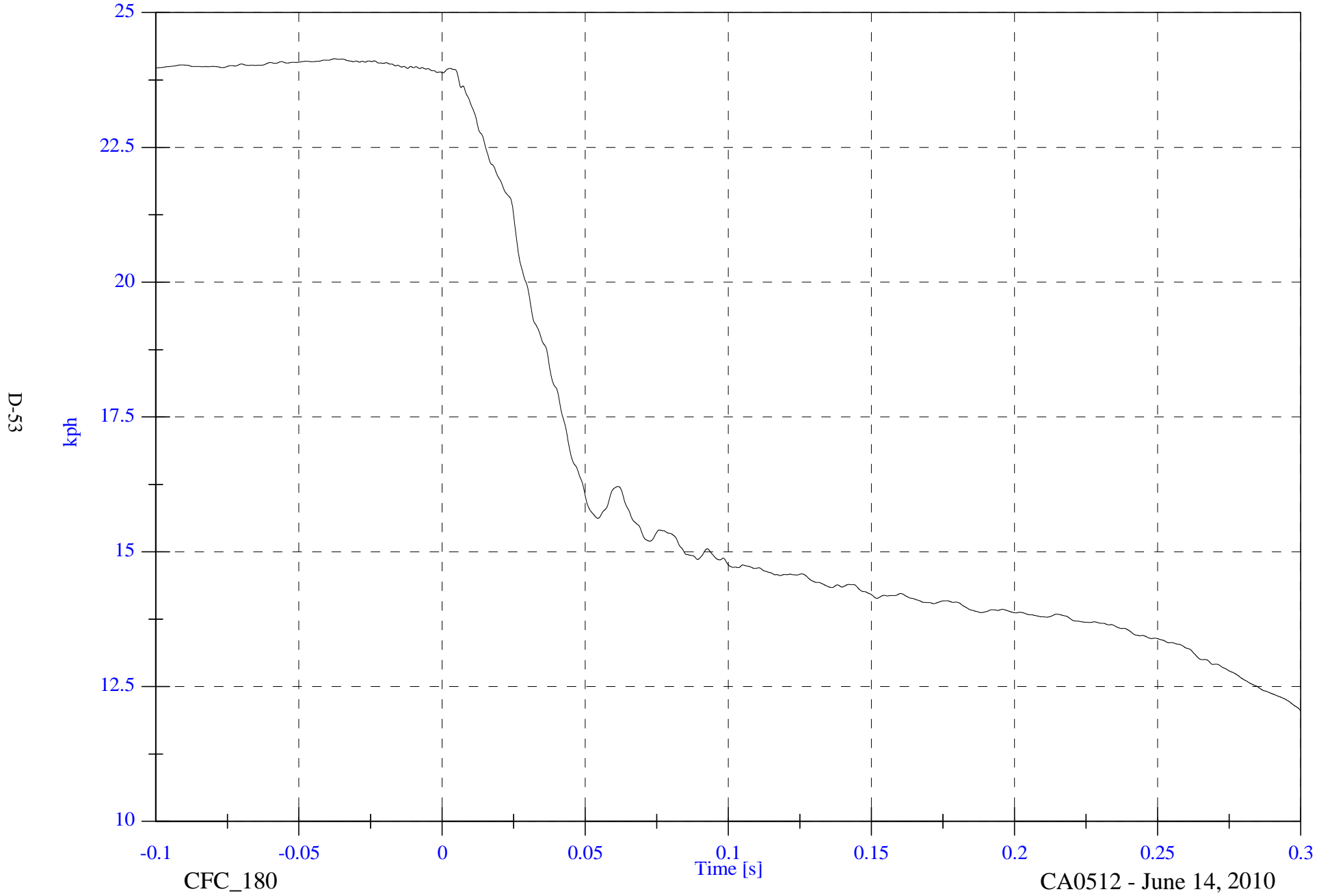
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 24.1 [kph] at -0.038 [s]

V1 Moving Barrier CG Y Velocity

Min: 12.0 [kph] at 0.300 [s]



D-53

kph

-0.1

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

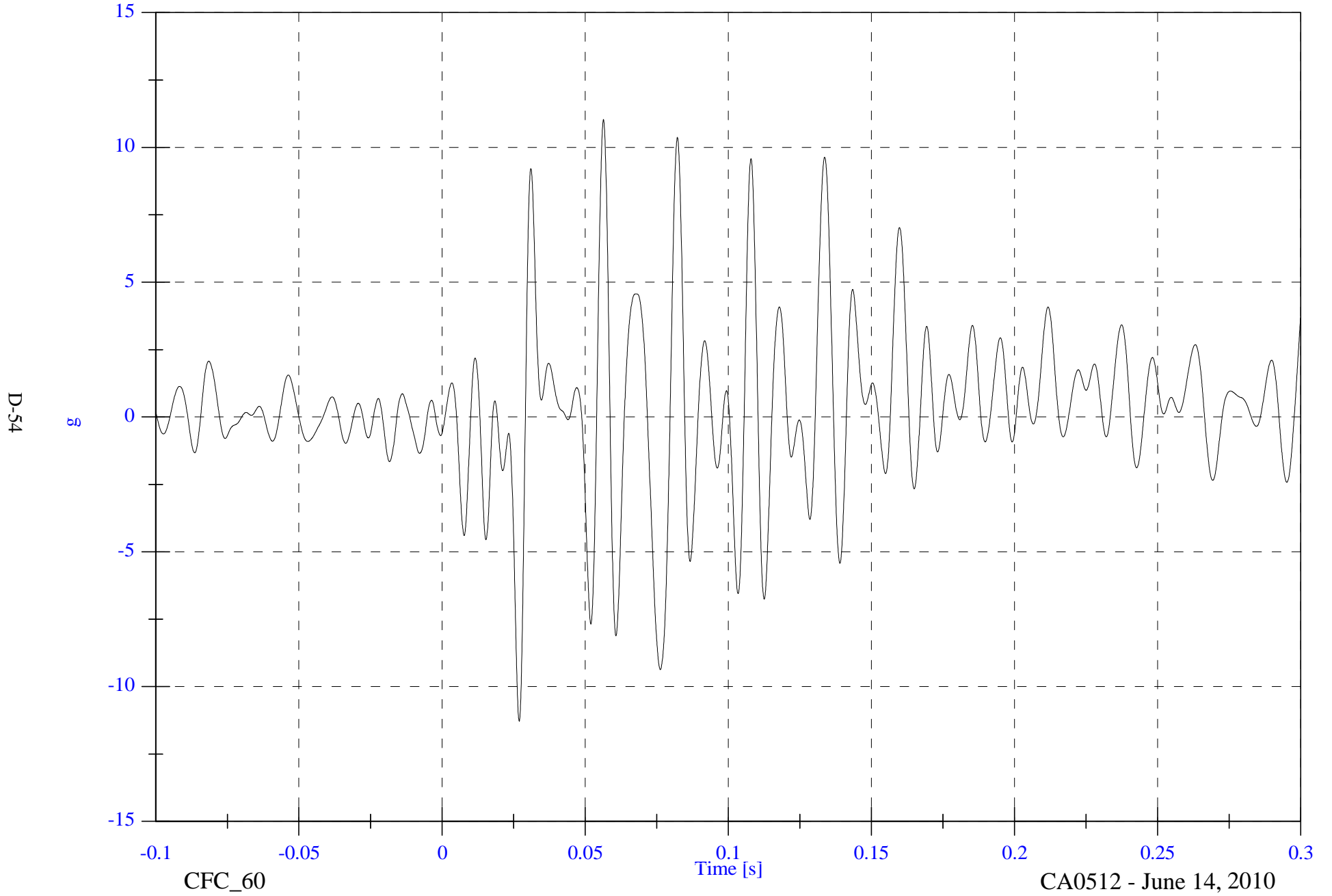
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier CG Z

Max: 11.0 [g] at 0.056 [s]

Min: -11.3 [g] at 0.027 [s]



FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier CG Z Velocity

Max: 4.2 [kph] at 0.292 [s]

Min: -2.7 [kph] at 0.029 [s]

D-55

kph



CFC_180

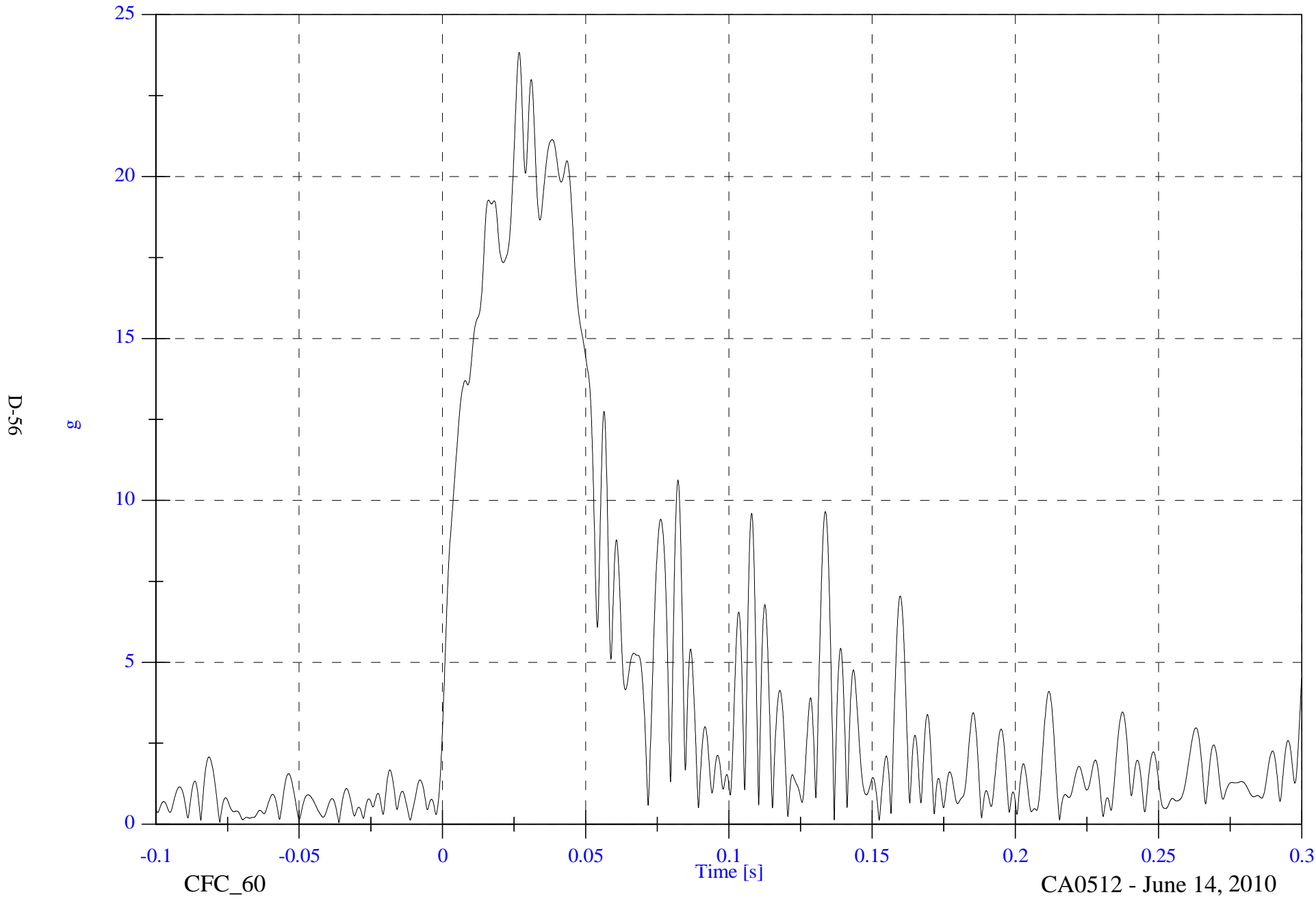
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier CG Resultant

Max: 23.8 [g] at 0.027 [s]

Min: 0.1 [g] at -0.036 [s]

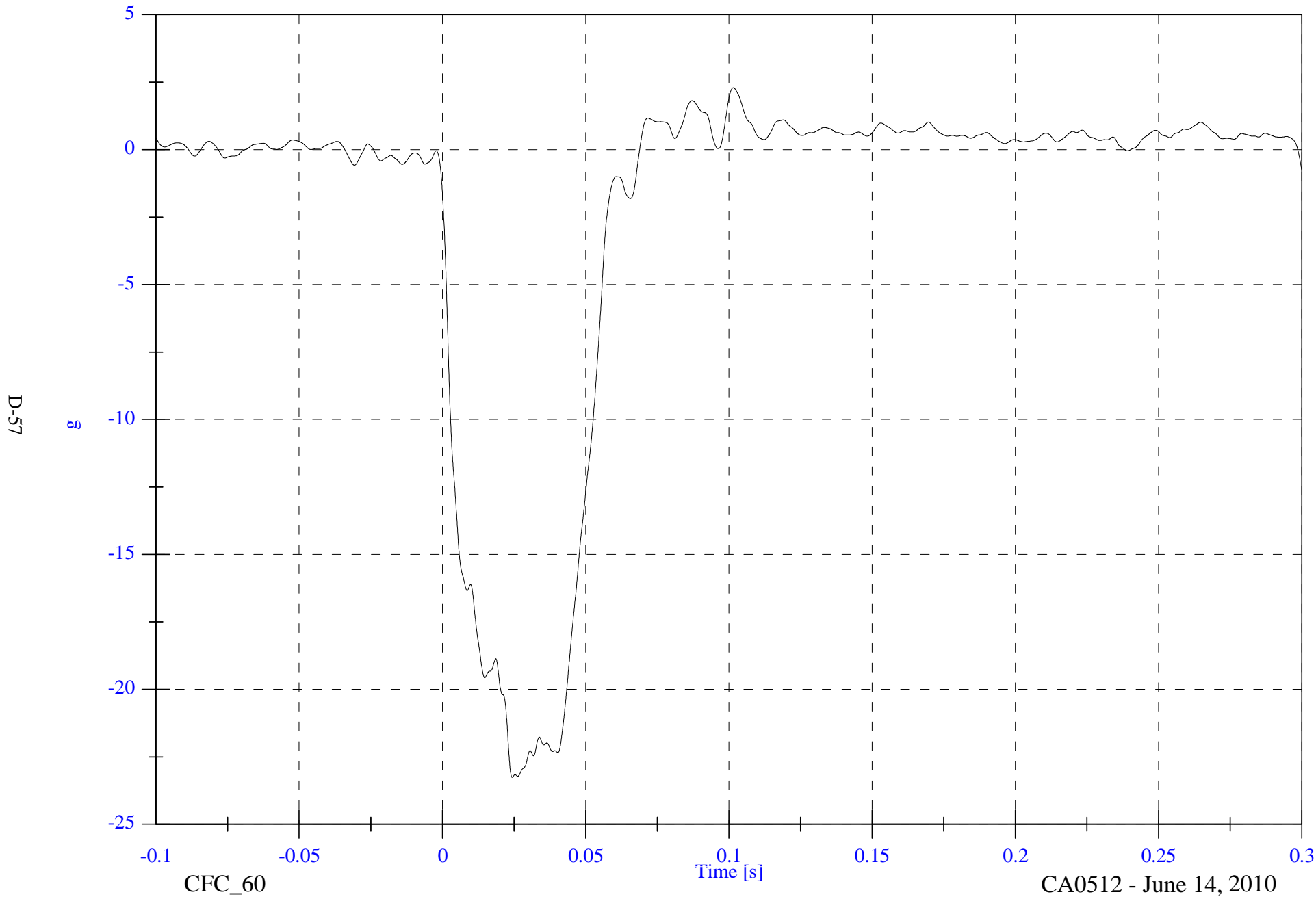


FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier Left Rail X

Max: 2.3 [g] at 0.102 [s]

Min: -23.3 [g] at 0.024 [s]



D-57

g

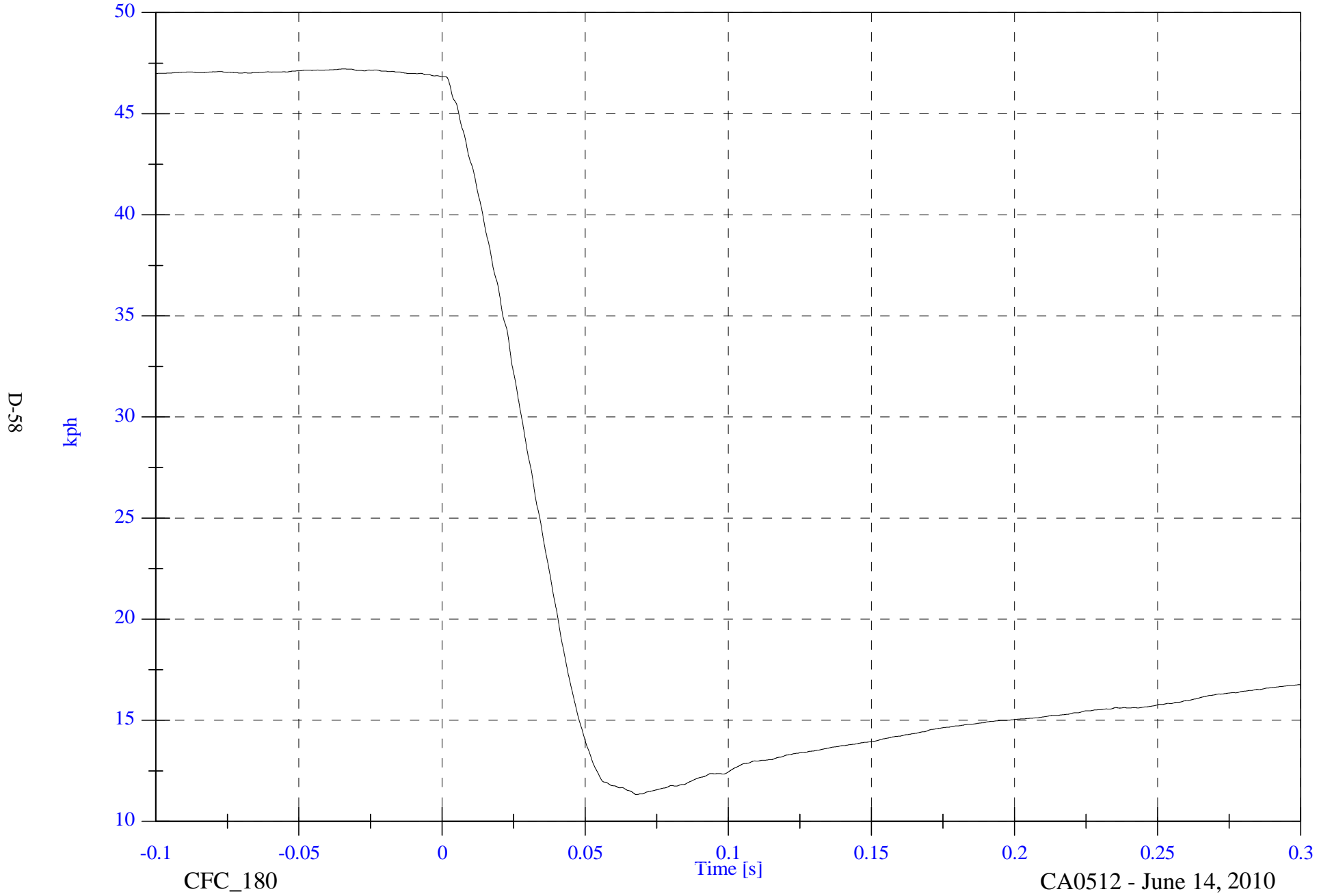
CFC_60 Time [s] CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

Max: 47.2 [kph] at -0.035 [s]

V1 Moving Barrier Left Rail X Velocity

Min: 11.3 [kph] at 0.068 [s]



D-58

kph

CFC_180

Time [s]

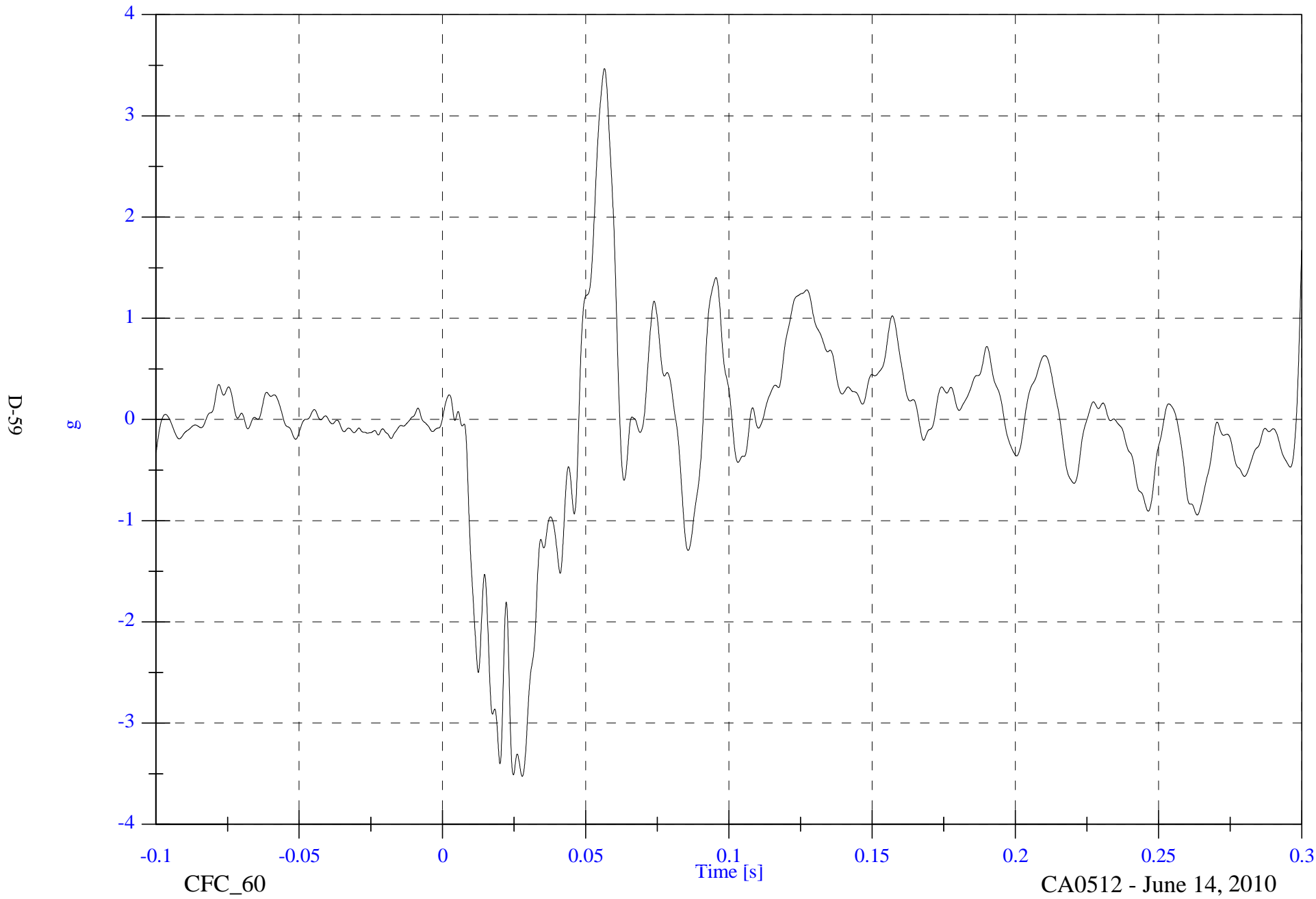
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier Left Rail Y

Max: 3.5 [g] at 0.057 [s]

Min: -3.5 [g] at 0.028 [s]



D-59

CFC_60

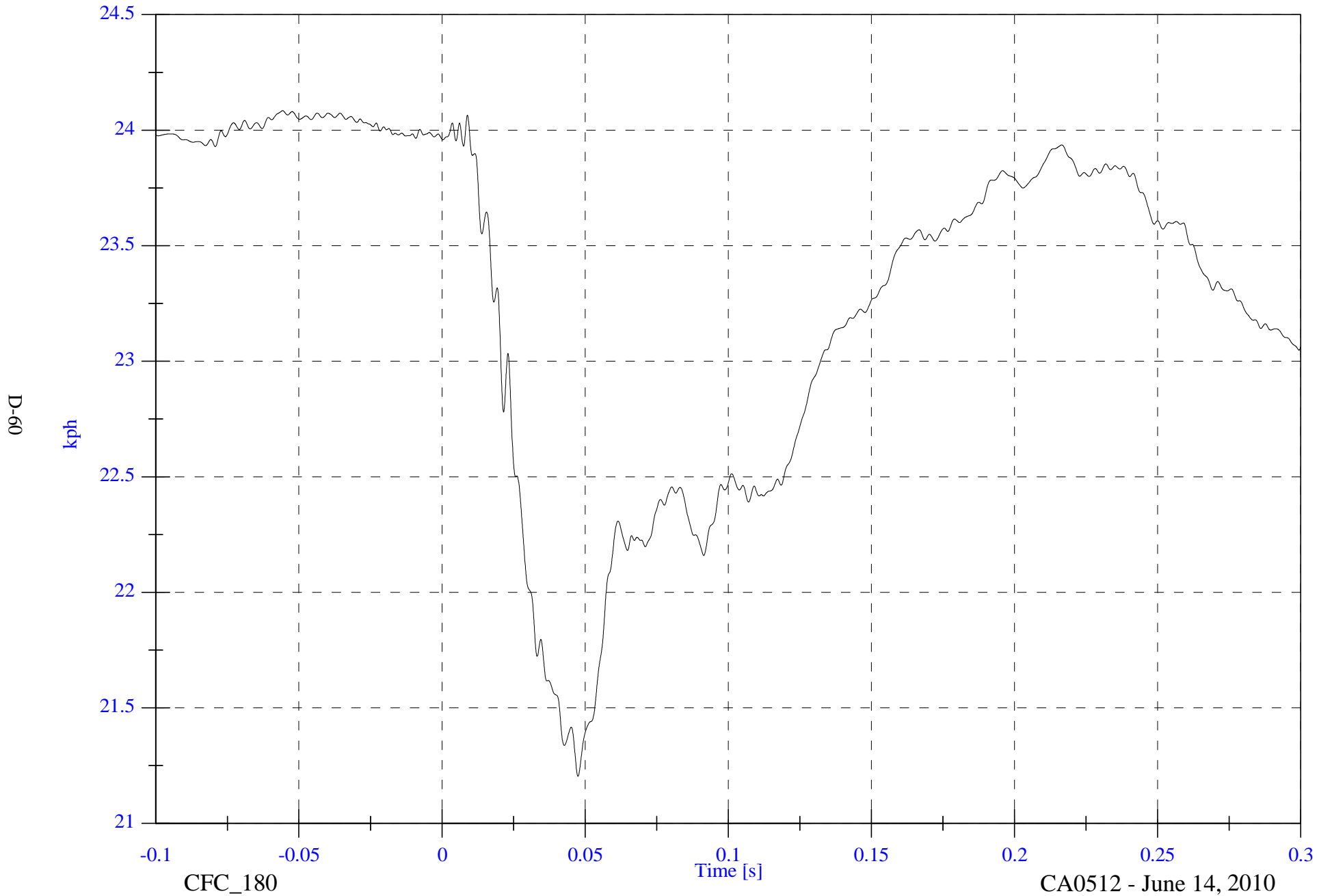
CA0512 - June 14, 2010

FMVSS 214 MDB - 2010 BMW 128i

V1 Moving Barrier Left Rail Y Velocity

Max: 24.1 [kph] at -0.056 [s]

Min: 21.2 [kph] at 0.047 [s]



CFC_180

CA0512 - June 14, 2010

APPENDIX E

ES-2re PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

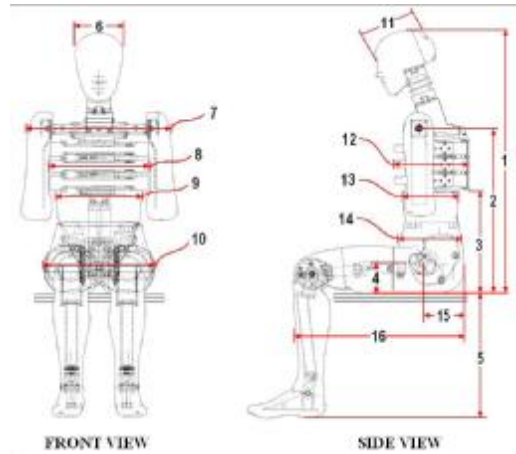
PRE-TEST

ES-2re NO.: 037

CONFIGURED FOR LEFT SIDE IMPACT

ES-2re External Measurements

S/N D037



Dim. No.	Description	Specification (mm)	Result	Pass/Fail
1	Sitting Height	900-918	912	Pass
2	Seat to Shoulder Joint	558-572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346-356	352	Pass
4	Seat to Hip Joint (center of bolt)	97-103	101	Pass
5	Sole to Seat, Sitting	333-451	441	Pass
6	Head Width	152-158	155	Pass
7	Shoulder/Arm Width	461-479	473	Pass
8	Thorax Width	322-332	326	Pass
9	Abdomen Width	273-287	283	Pass
10	Pelvis Lap Width	359-373	369	Pass
11	Head Depth	196-206	199	Pass
12	Thorax Depth	262-272	266	Pass
13	Abdomen Depth	194-204	198	Pass
14	Pelvis Depth	235-245	242	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150-160	157	Pass
16	Back of Buttocks to Front Knee	597-615	605	Pass

Technician: A. Rudniski

Date: 06/2/2010



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Head Drop	Test Date:	6/3/2010
Test Number:	1	Test Time:	11:05:48 AM

Component Part Number	Component Serial Number
455-1007	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	65 %RH P
Resultant Acceleration	125 -- 155	144 g P
Oscillation	0.0 -- 15.0	4.2 % P
Fore-Aft Acceleration	-15.00 -- 15.00	5.92 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Head Drop**

Test Time: **11:05:48 AM**

Test Date: **6/3/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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**

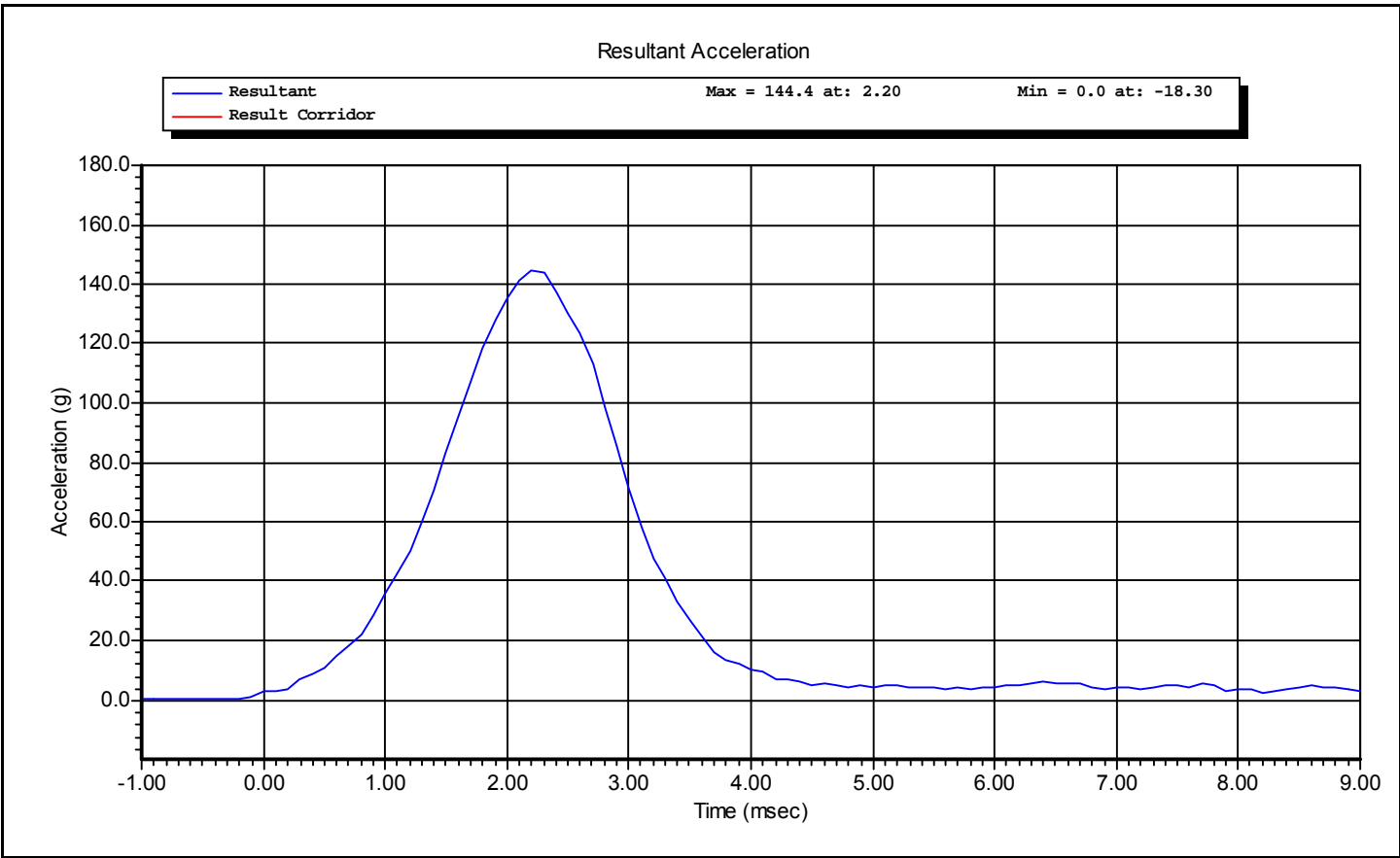
Test Time: **11:05:48 AM**

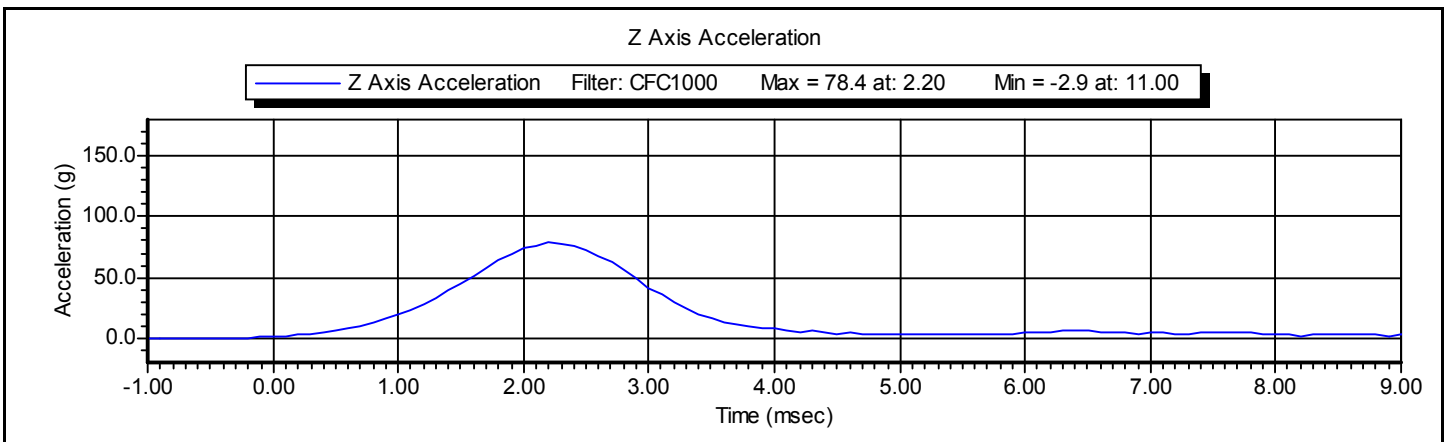
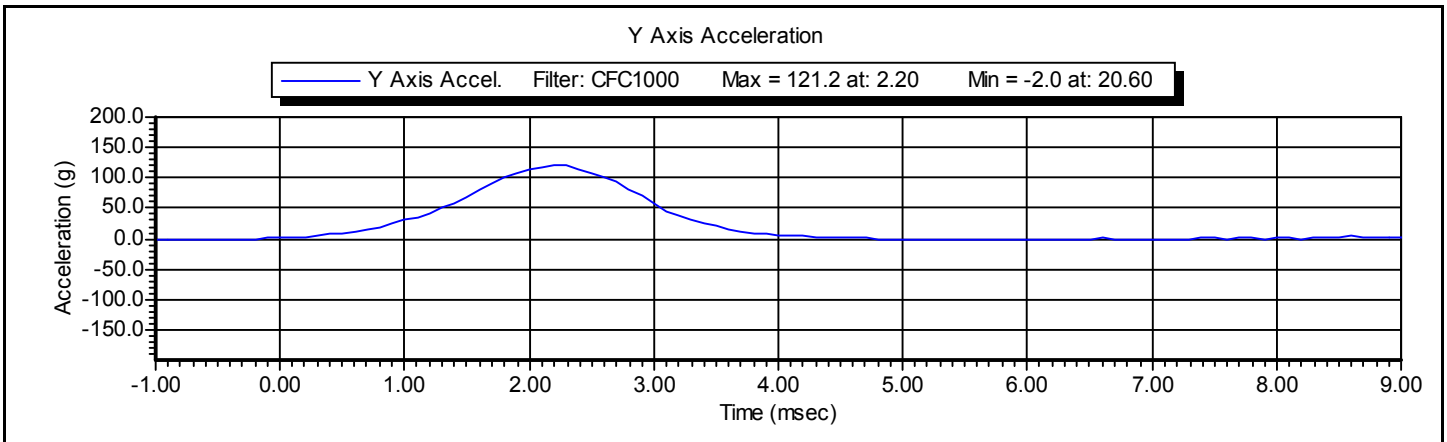
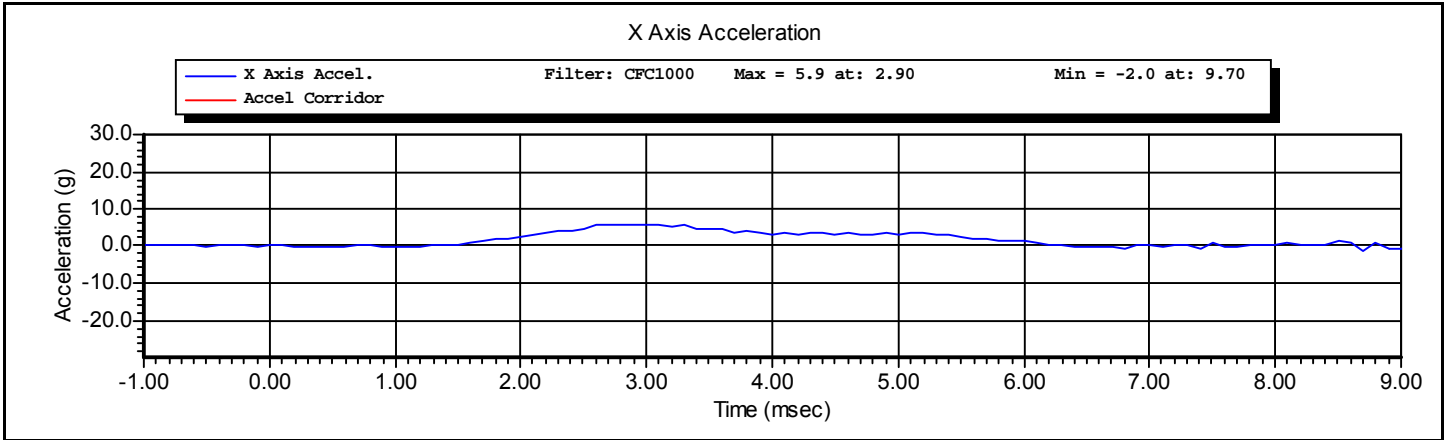
Test Date: **6/3/2010**



Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Head Drop	Test Date:	6/3/2010
Test Number:	1	Test Time:	11:05:48 AM

Component Part Number	Component Serial Number
455-1007	







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Neck Flexion	Test Date:	6/2/2010
Test Number:	1	Test Time:	3:27:59 PM

Component Part Number	Component Serial Number
455-2002	19-020118A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	51 %RH P
Velocity	3.30 -- 3.50	3.43 m/s P
Maximum Neck Flexion Angle	49.0 -- 59.0	53.5 degrees P
Time At Maximum Neck Flexion	54.0 -- 66.0	60.9 ms P
Decay to Zero Degrees	53.0 -- 88.0	59.5 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: **3:27:59 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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	4/27/2010
DentonATD	7000428	095	4/27/2010
DentonATD	7000428	093	4/27/2010

Test ID: **Neck Flexion**

Test Time: **3:27:59 PM**

Test Date: **6/2/2010**



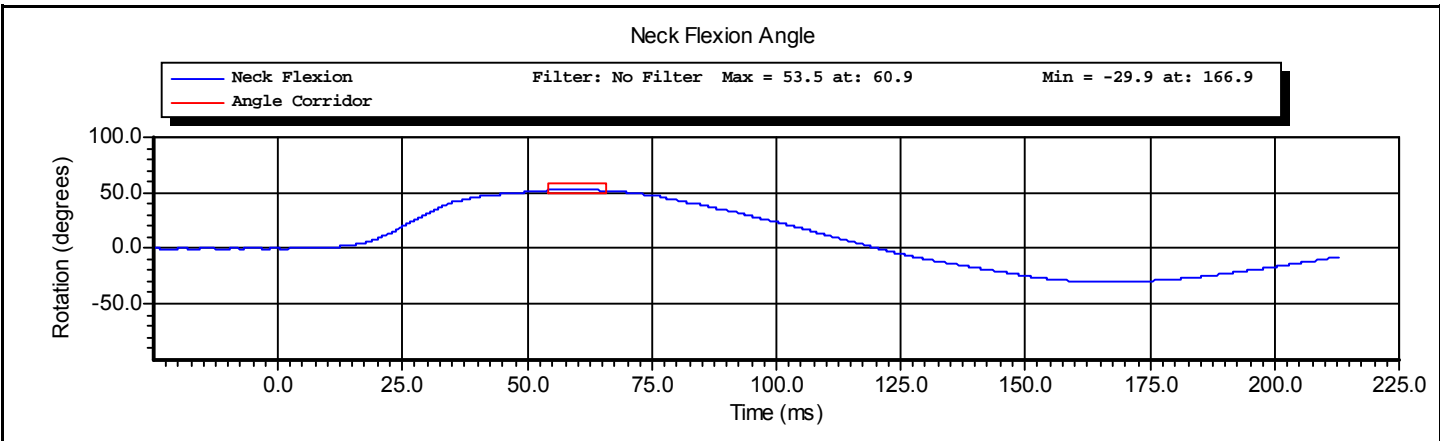
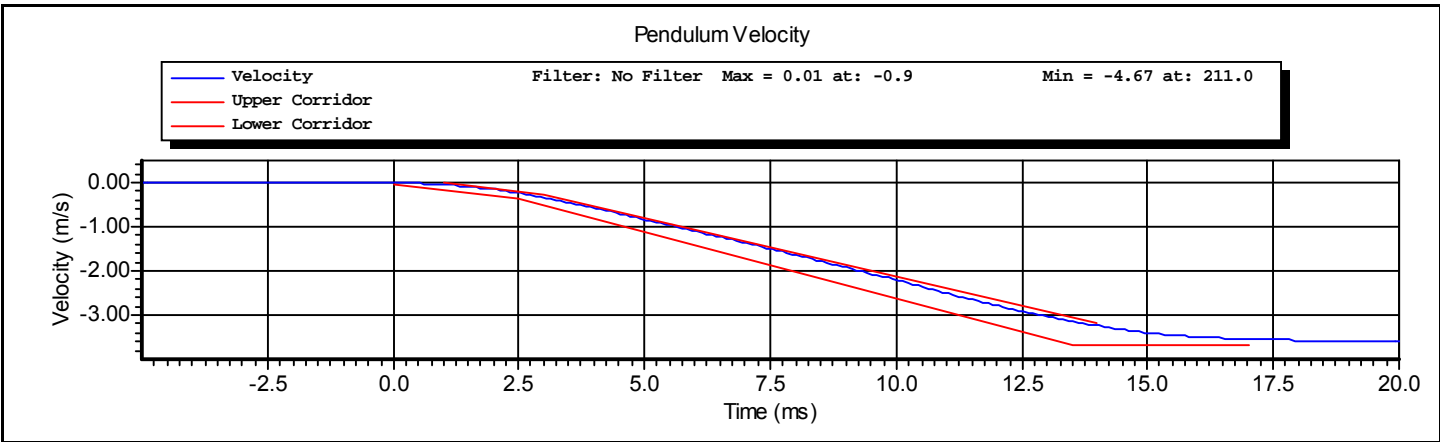
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Neck Flexion	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Neck Flexion	Test Date:	6/2/2010
Test Number:	1	Test Time:	3:27:59 PM

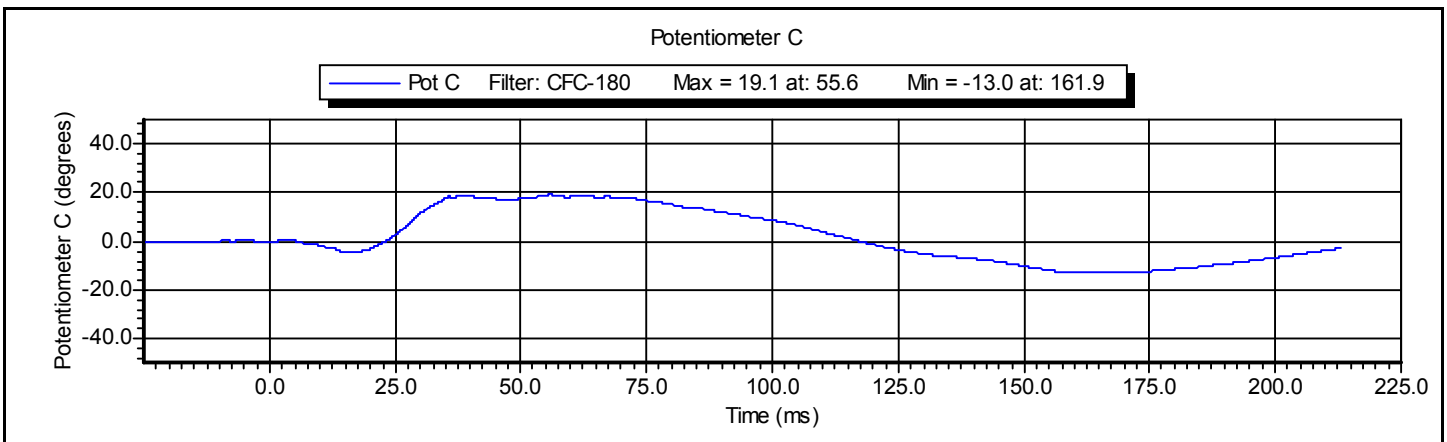
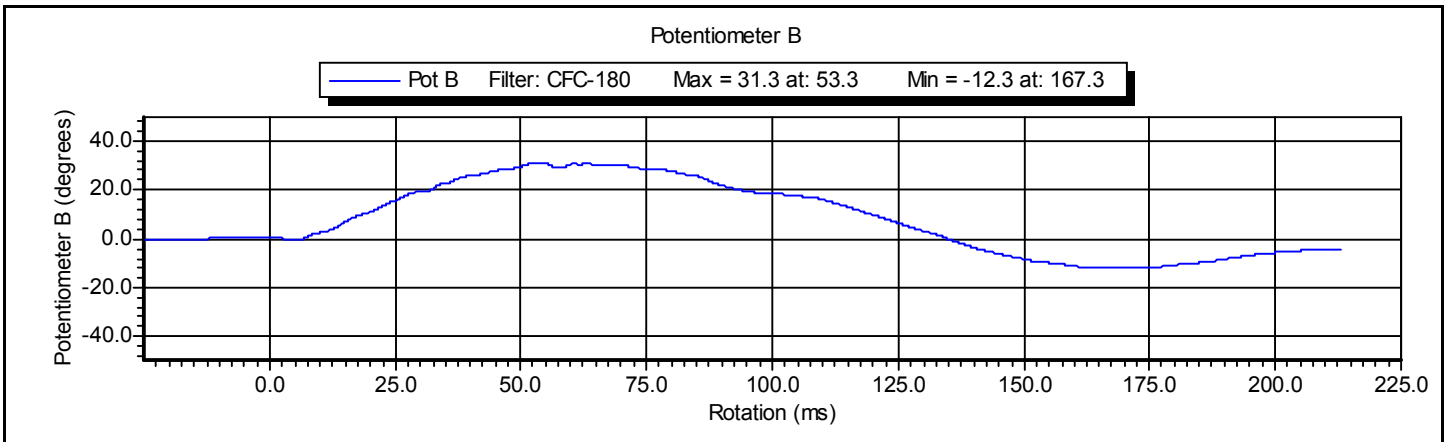
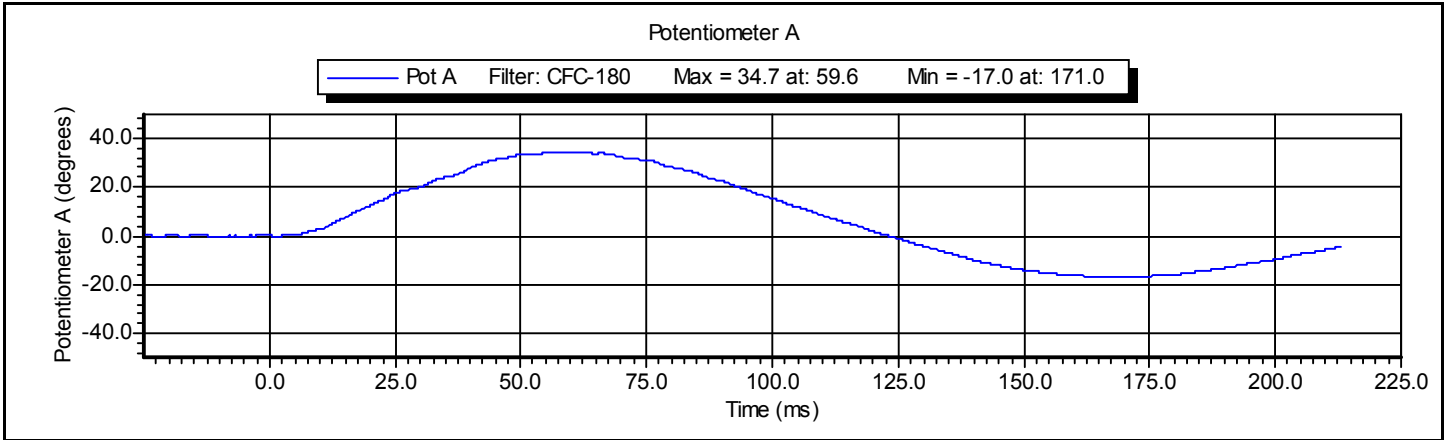
Component Part Number	Component Serial Number
455-2002	19-020118A



Test ID: **Neck Flexion**

Test Time: **3:27:59 PM**

Test Date: **6/2/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Shoulder Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Shoulder	Test Date:	6/2/2010
Test Number:	1	Test Time:	9:51:49 AM

Component Part Number	Component Serial Number
960715-313	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	53.0 %RH P
Velocity	4.20 -- 4.40	4.32 m/s P
Pendulum Acceleration	-10.50 -- -7.50	-9.12 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
Supervisor: **D. Travale** Signature: _____

Test ID: **Shoulder**

Test Time: **9:51:49 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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**

Test Time: **9:51:49 AM**

Test Date: **6/2/2010**



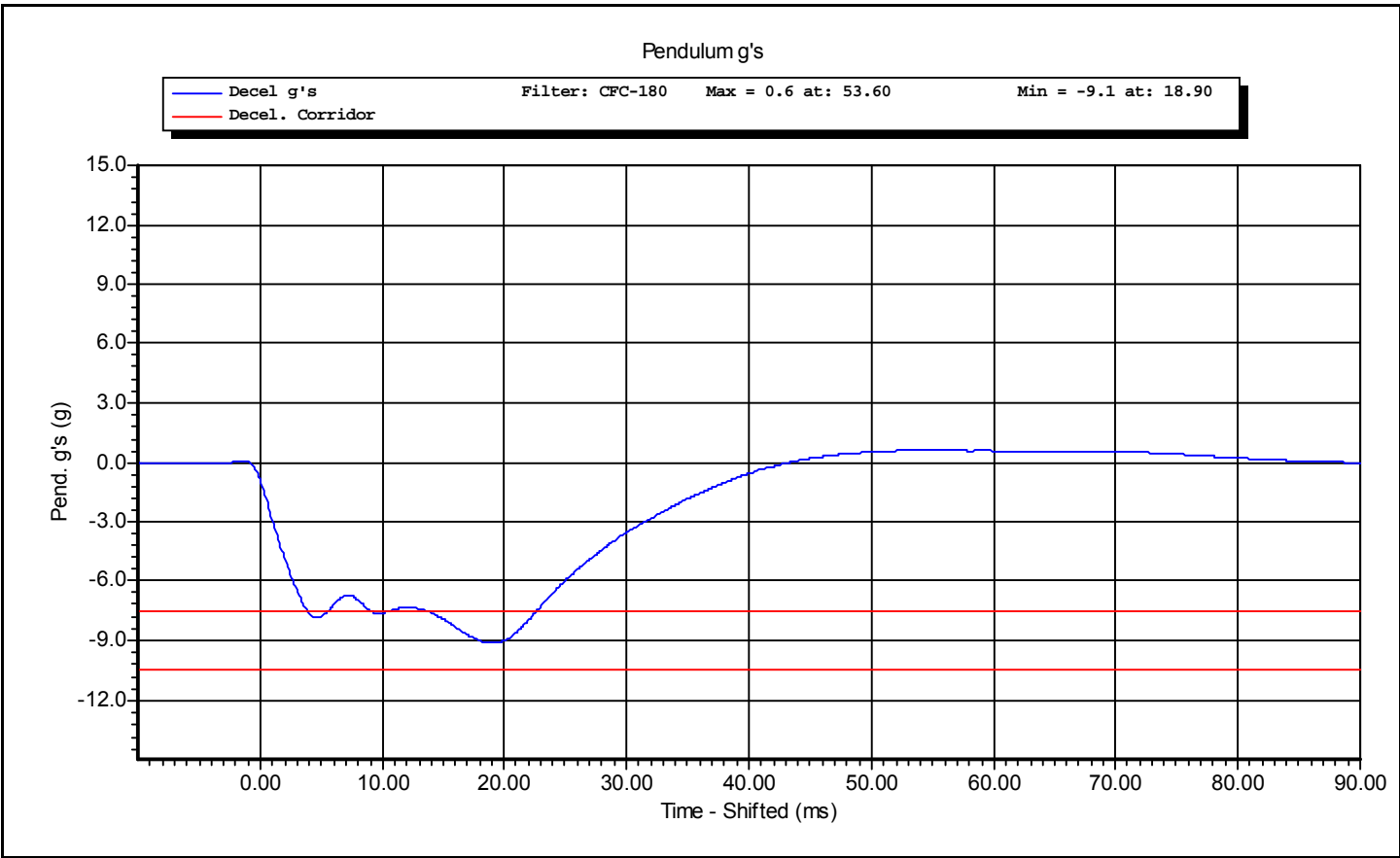
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Shoulder Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Shoulder	Test Date:	6/2/2010
Test Number:	1	Test Time:	9:51:49 AM

Component Part Number	Component Serial Number
960715-313	



Test ID: **Shoulder**

Test Time: **9:51:49 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Lower 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	12:51:13 PM

Component Part Number	Component Serial Number
455-3100	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	52.0 %RH P
Velocity	3.90 -- 4.10	4.00 m/s P
Rib Displacement	-51.00 -- -46.00	-47.87 mm P
Drop Height	807.0 -- 823.0	815.0 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **12:51:13 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Lower 4 m/s**

Test Time: **12:51:13 PM**

Test Date: **6/2/2010**



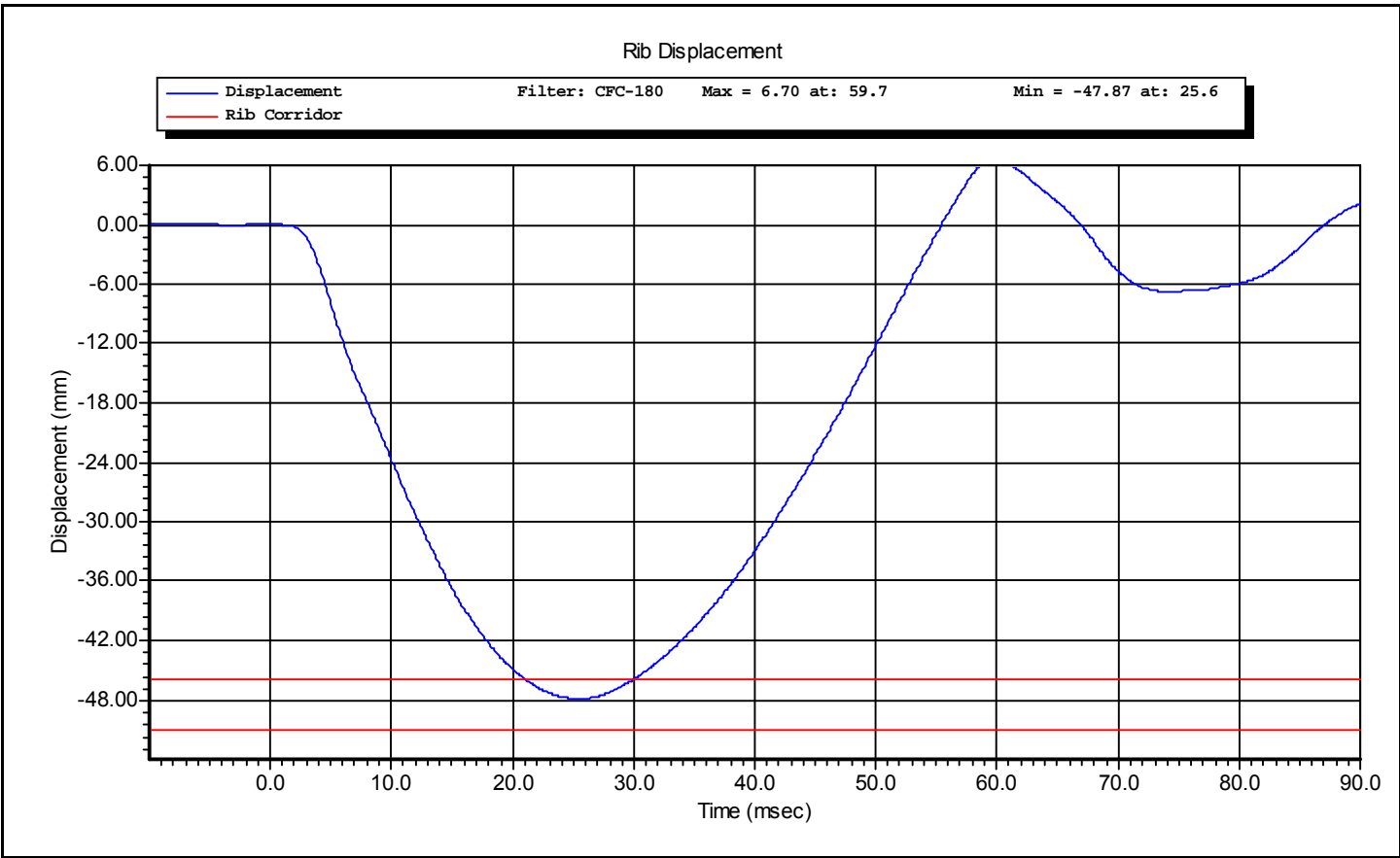
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Lower 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	12:51:13 PM

Component Part Number	Component Serial Number
455-3100	1954-0126A



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

Test Time: **12:51:13 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Lower 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	1:00:40 PM

Component Part Number	Component Serial Number
455-3100	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	52.0 %RH P
Velocity	2.90 -- 3.10	2.98 m/s P
Rib Displacement	-40.00 -- -36.00	-38.23 mm P
Drop Height	454 -- 464	459 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **1:00:40 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Lower 3 m/s**

Test Time: **1:00:40 PM**

Test Date: **6/2/2010**



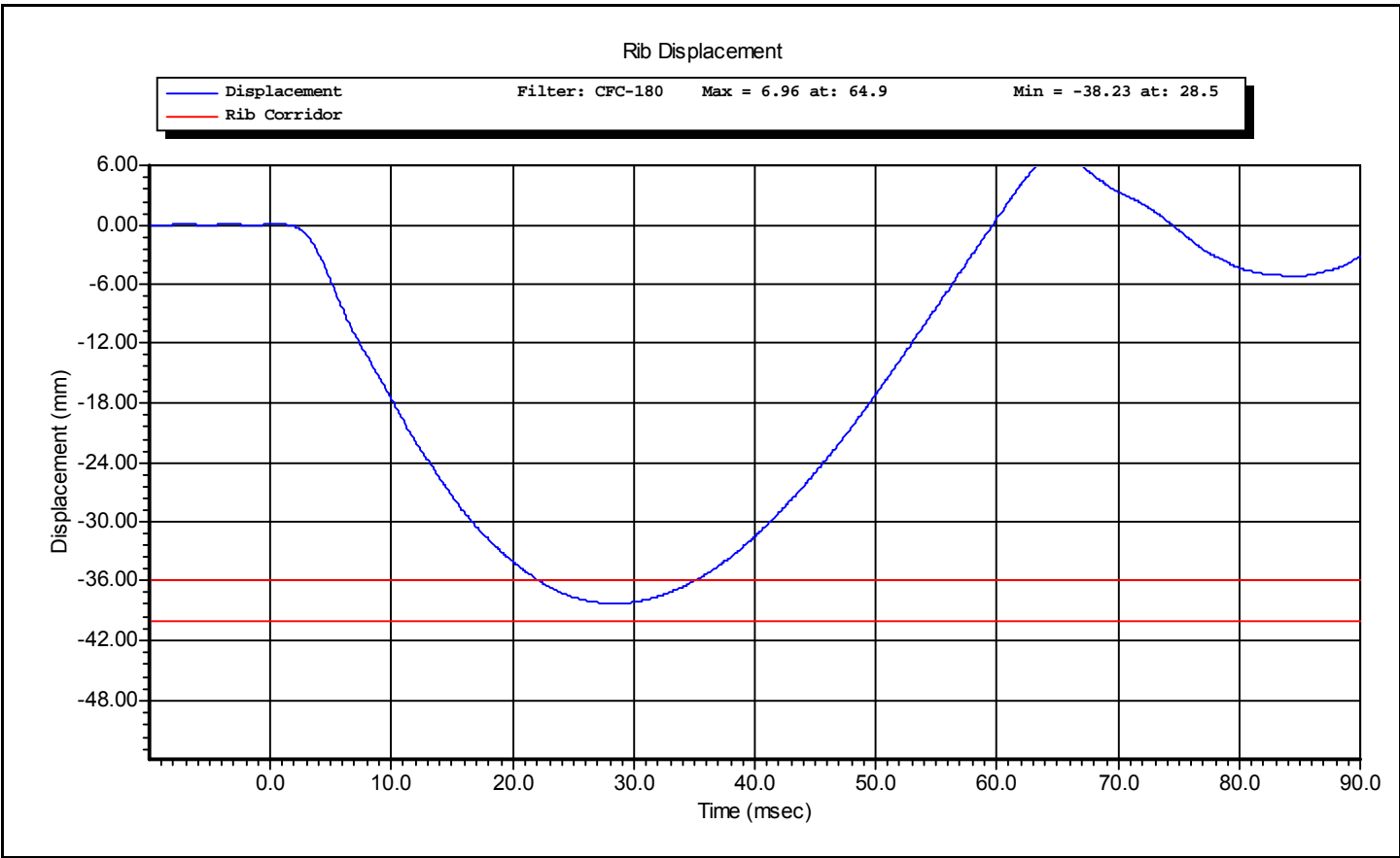
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Lower 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	1:00:40 PM

Component Part Number	Component Serial Number
455-3100	1954-0126A



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

Test Time: **1:00:40 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Middle 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:48:56 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	53.0 %RH P
Velocity	3.90 -- 4.10	3.99 m/s P
Rib Displacement	-51.00 -- -46.00	-48.16 mm P
Drop Height	807.0 -- 823.0	815.0 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **10:48:56 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Middle 4 m/s**

Test Time: **10:48:56 AM**

Test Date: **6/2/2010**



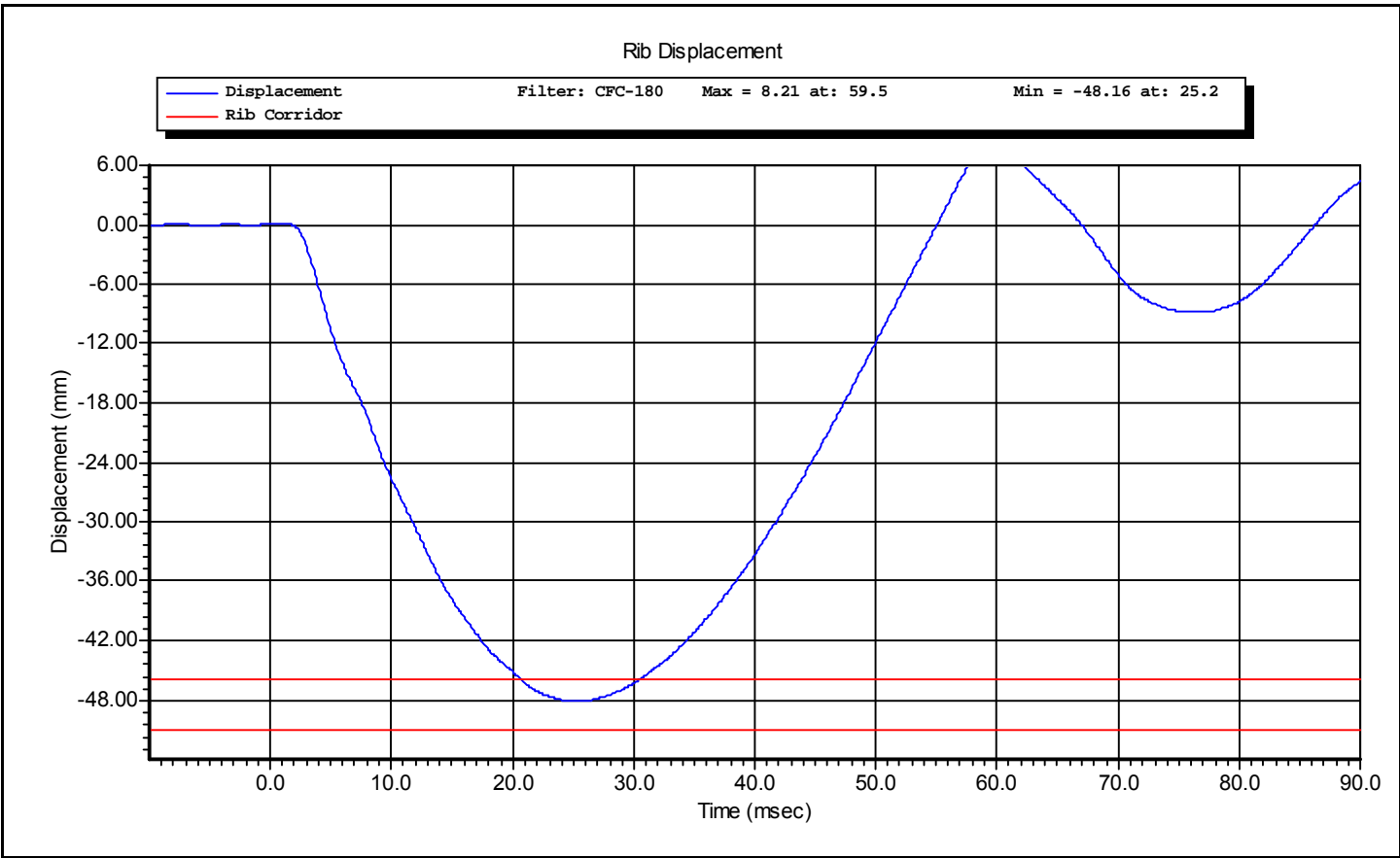
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Middle 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:48:56 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Middle 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	11:03:32 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	53.0 %RH P
Velocity	2.90 -- 3.10	2.99 m/s P
Rib Displacement	-40.00 -- -36.00	-37.64 mm P
Drop Height	454 -- 464	459 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **11:03:32 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Middle 3 m/s**

Test Time: **11:03:32 AM**

Test Date: **6/2/2010**



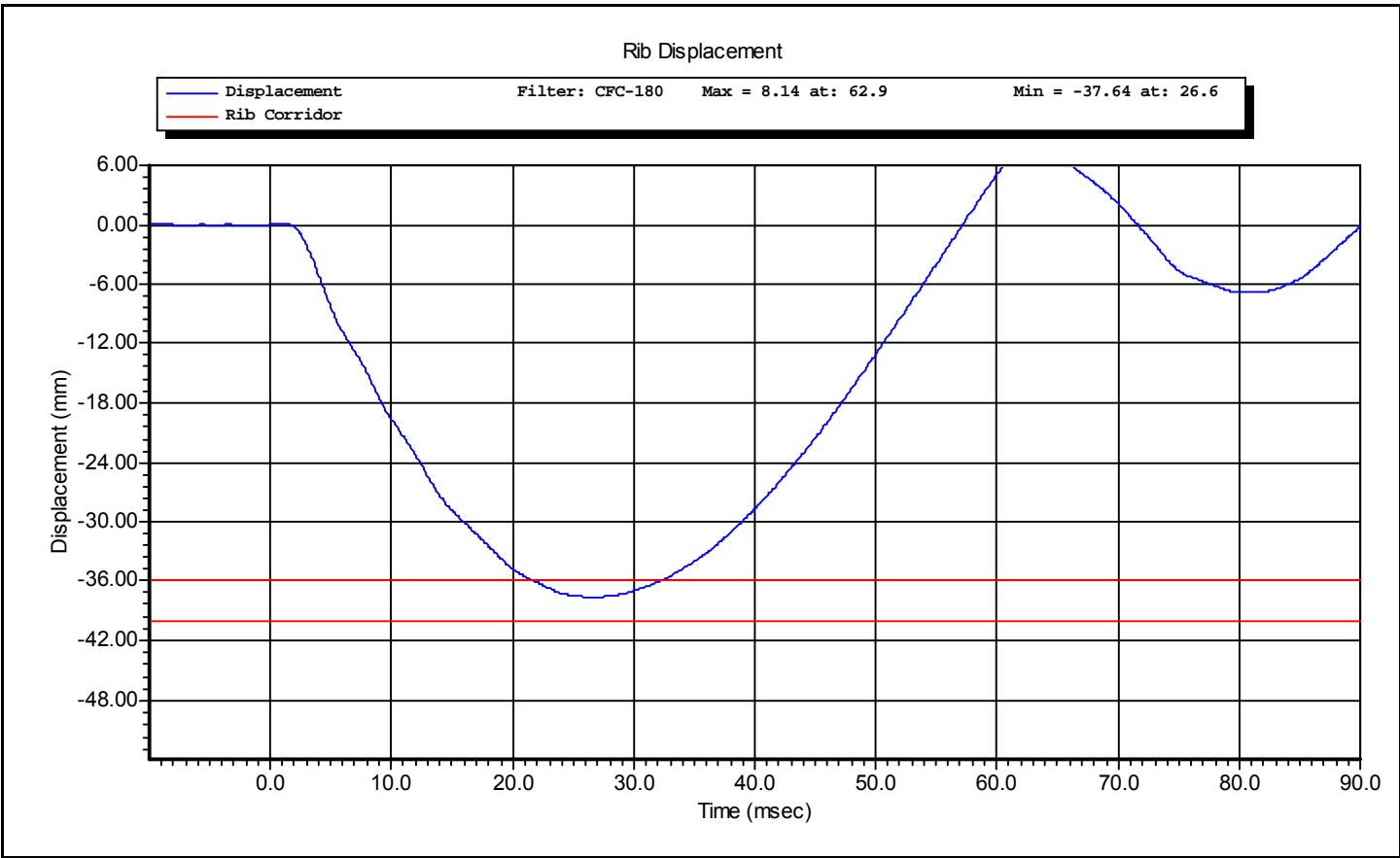
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Middle 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	11:03:32 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Upper 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:16:09 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	53.0 %RH P
Velocity	3.90 -- 4.10	3.97 m/s P
Rib Displacement	-51.00 -- -46.00	-49.51 mm P
Drop Height	807.0 -- 823.0	815.0 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **10:16:09 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Upper 4 m/s**

Test Time: **10:16:09 AM**

Test Date: **6/2/2010**



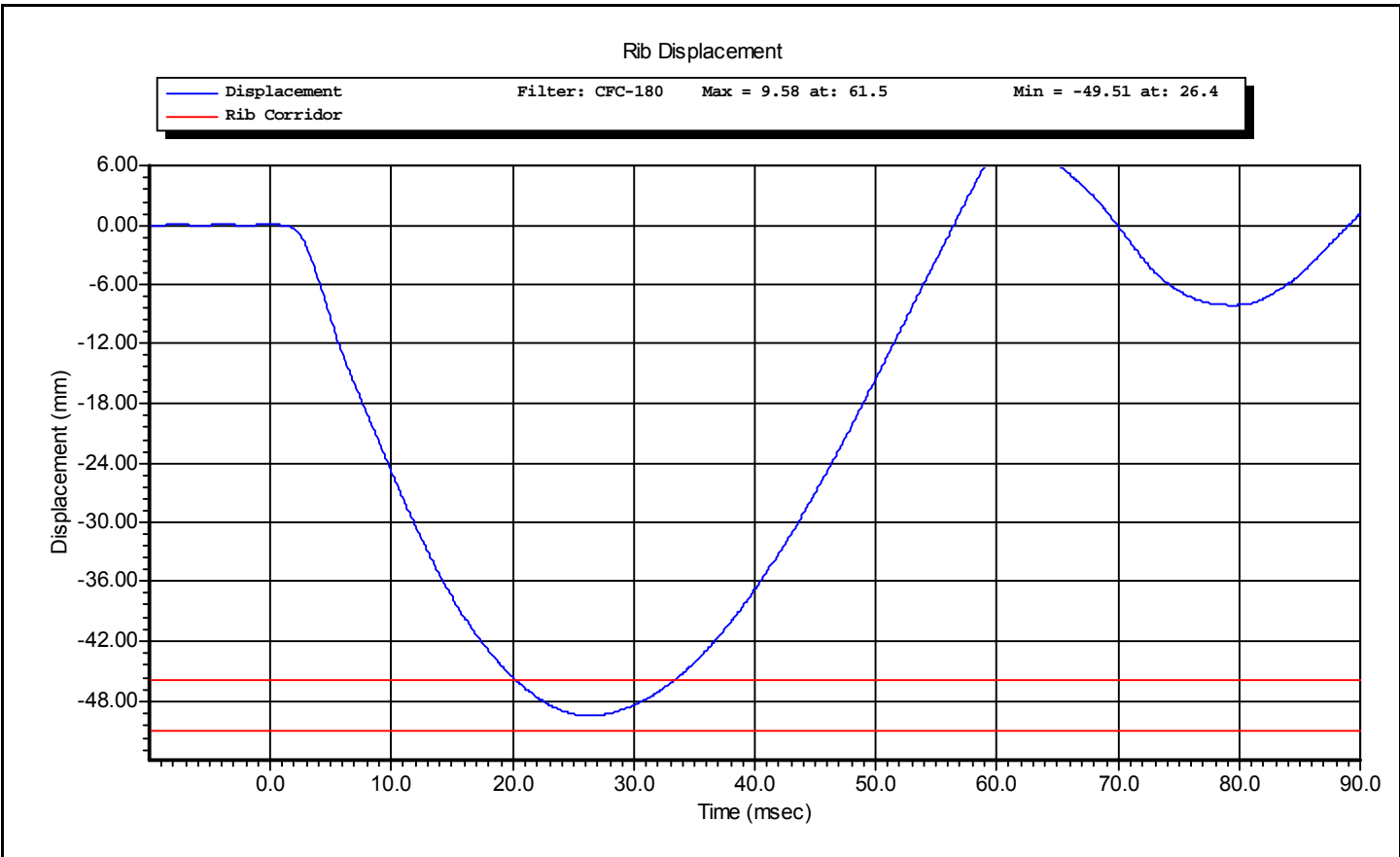
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Upper 4 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:16:09 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A



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

Test Time: **10:16:09 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Upper 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:41:37 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10.0 -- 70.0	53.0 %RH P
Velocity	2.90 -- 3.10	2.96 m/s P
Rib Displacement	-40.00 -- -36.00	-38.06 mm P
Drop Height	454 -- 464	459 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

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

Test Time: **10:41:37 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Rib Upper 3 m/s**

Test Time: **10:41:37 AM**

Test Date: **6/2/2010**



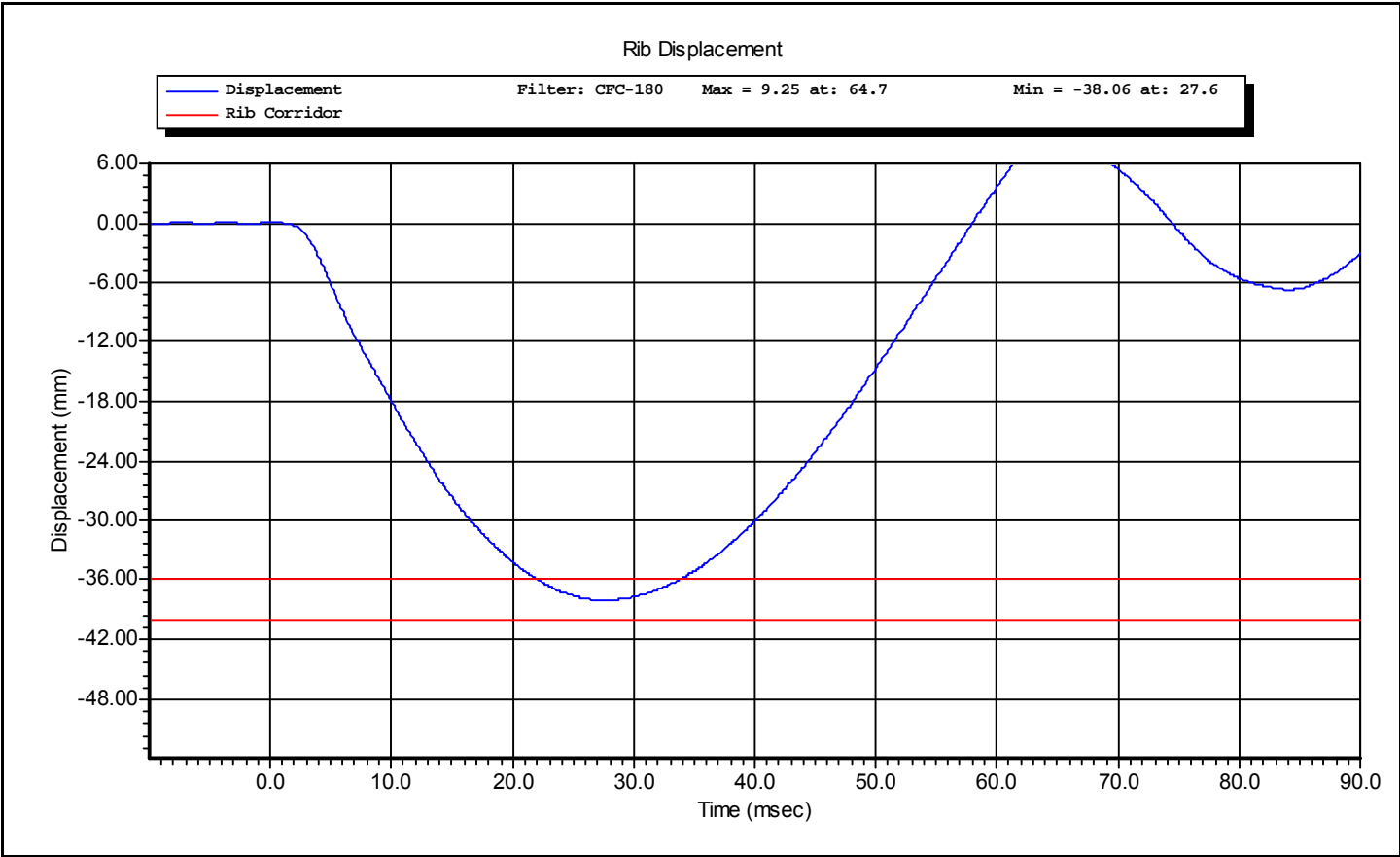
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Rib Upper 3 m/s	Test Date:	6/2/2010
Test Number:	1	Test Time:	10:41:37 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A



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

Test Time: **10:41:37 AM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	8/15/2008
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Thorax Impact	Test Date:	6/2/2010
Test Number:	1	Test Time:	1:22:14 PM

Component Part Number	Component Serial Number
Upper Rib - 175-4002	1954-0124A
Middle Rib - 175-4002	1954-0125A
Lower Rib - 175-4002	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	52.0 %RH P
Velocity	5.40 -- 5.60	5.50 m/s P
Upper Rib Displacement	34.0 -- 41.0	37.0 mm P
Middle Rib Displacement	37.0 -- 45.0	40.5 mm P
Lower Rib Displacement	37.0 -- 44.0	41.7 mm P
Impactor Force	5100 -- 6200	6100 N P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax Impact**

Test Time: **1:22:14 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
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: **1:22:14 PM**

Test Date: **6/2/2010**



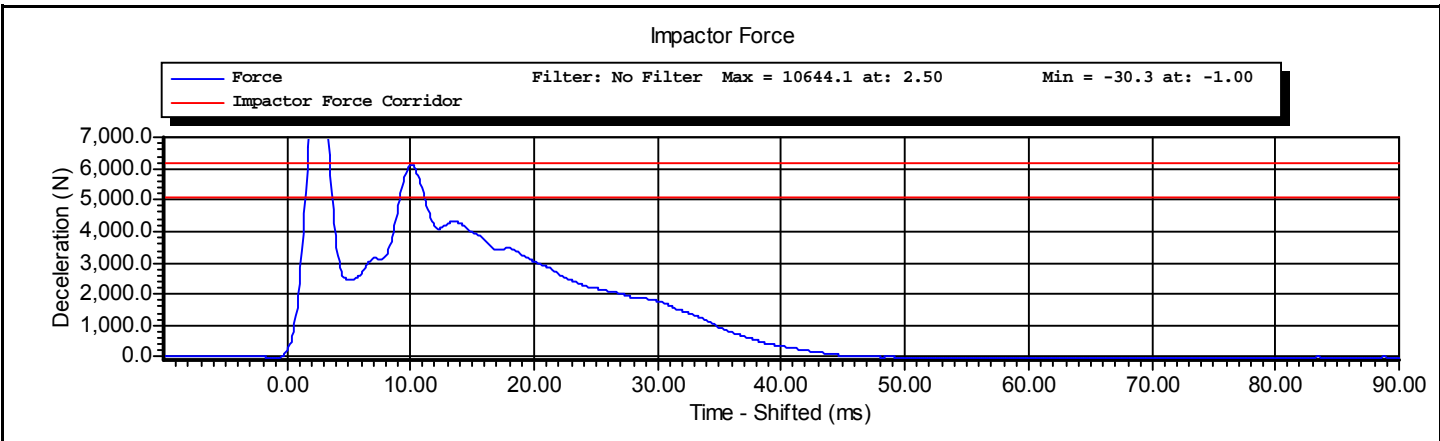
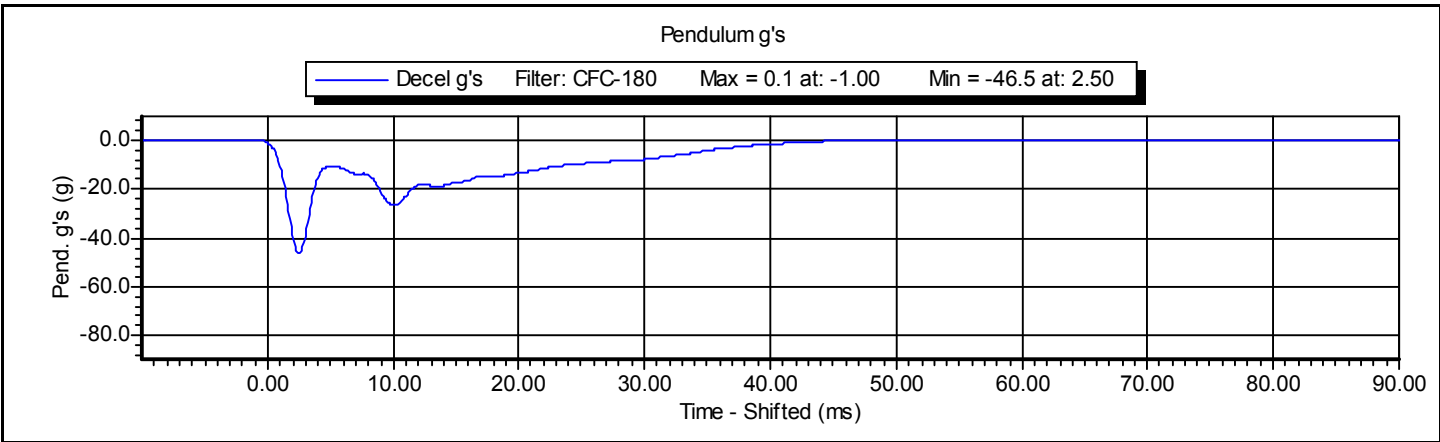
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Thorax Impact	Revision:	8/15/2008
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Thorax Impact	Test Date:	6/2/2010
Test Number:	1	Test Time:	1:22:14 PM

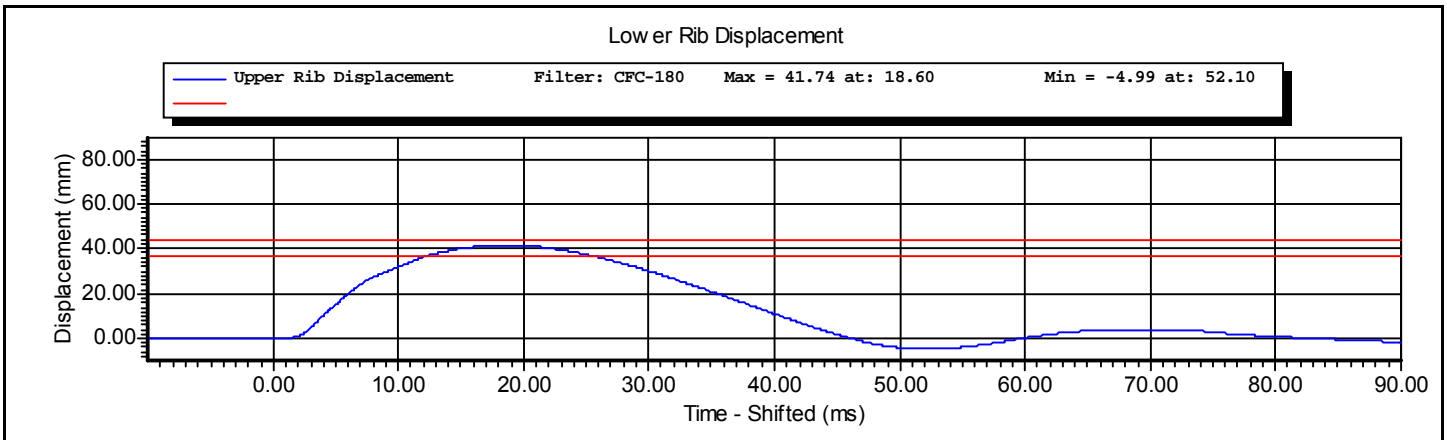
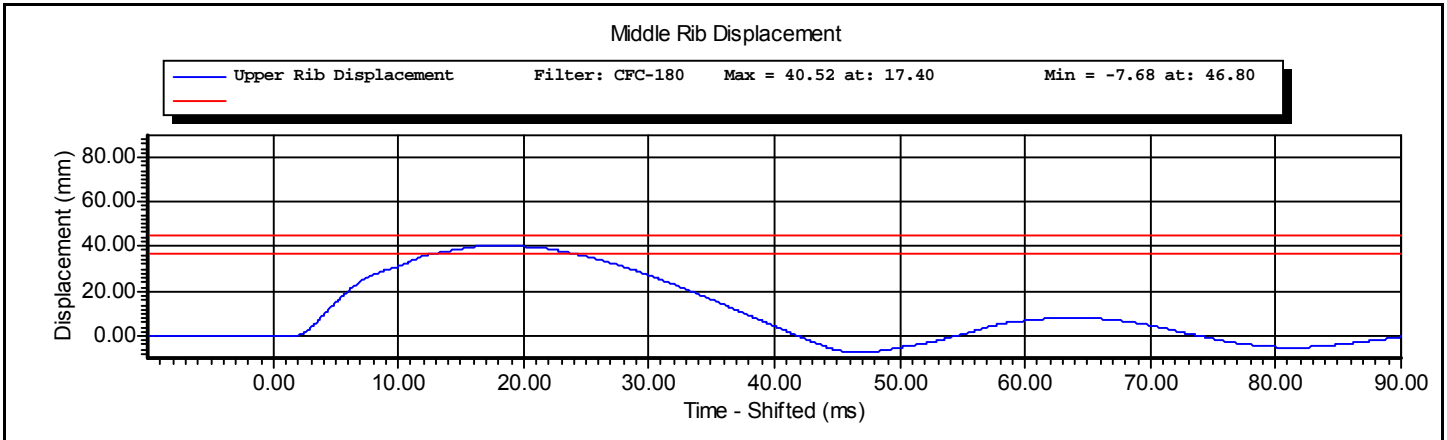
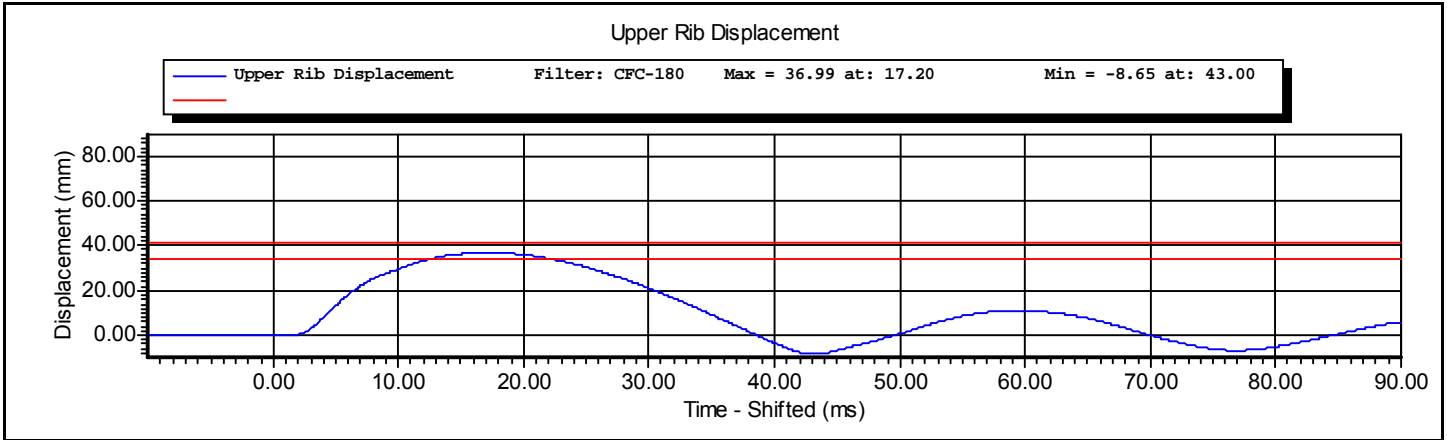
Component Part Number	Component Serial Number
Upper Rib - 175-4002	1954-0124A



Test ID: **Thorax Impact**

Test Time: **1:22:14 PM**

Test Date: **6/2/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Abdominal Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Abdominal Impact	Test Date:	6/1/2010
Test Number:	1	Test Time:	3:51:04 PM

Component Part Number	Component Serial Number
FTSS-0004	07/118

Comments:
 FTSS Abdomen
 Model - FTSS-0004
 Serial - 07/118

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	53 %RH P
Velocity	3.90 -- 4.10	4.02 m/s P
Peak Abdominal Force	-2.70 -- -2.20	-2.39 kN P
Time At Peak Abdominal Force	10.0 -- 12.3	11.5 ms P
Maximum Pendulum Force	-4.80 -- -4.00	-4.21 kN P
Time at Peak Pendulum Force	10.6 -- 13.0	12.3 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Abdominal Impact** Test Time: **3:51:04 PM**

Test Date: **6/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **3:51:04 PM**

Test Date: **6/1/2010**



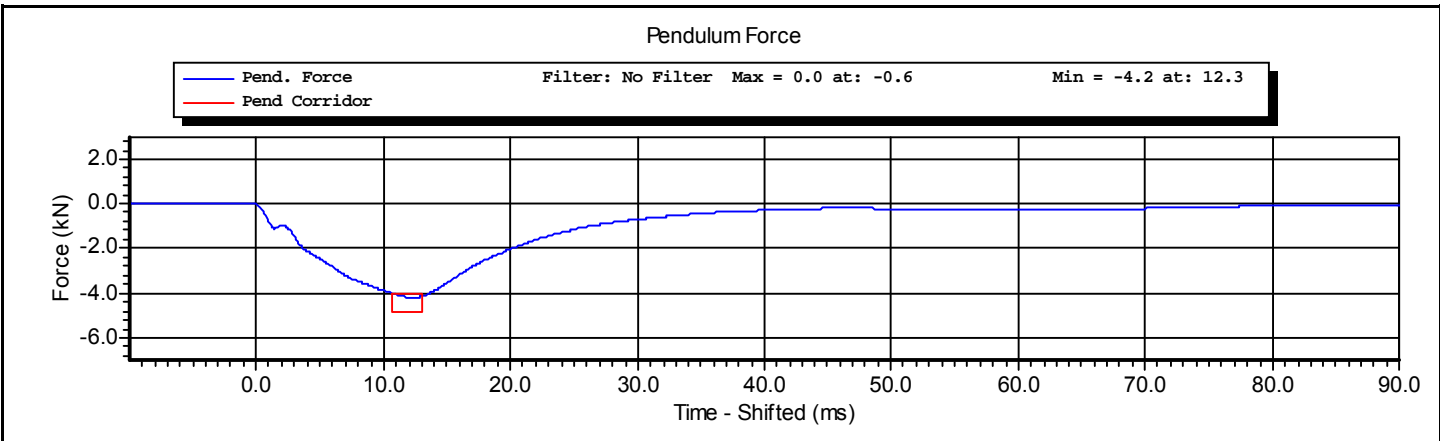
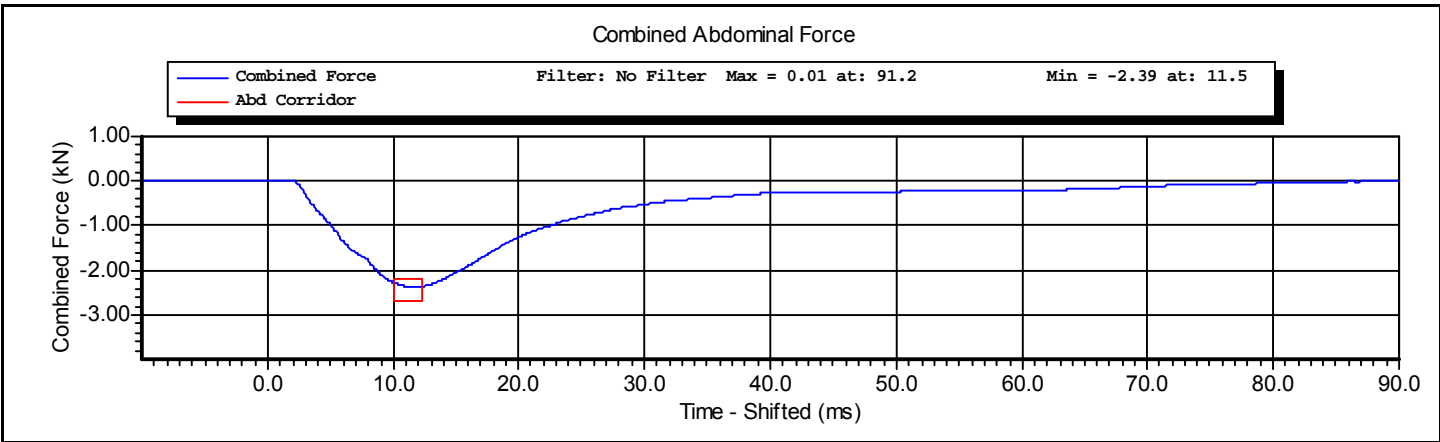
www.calspan.com

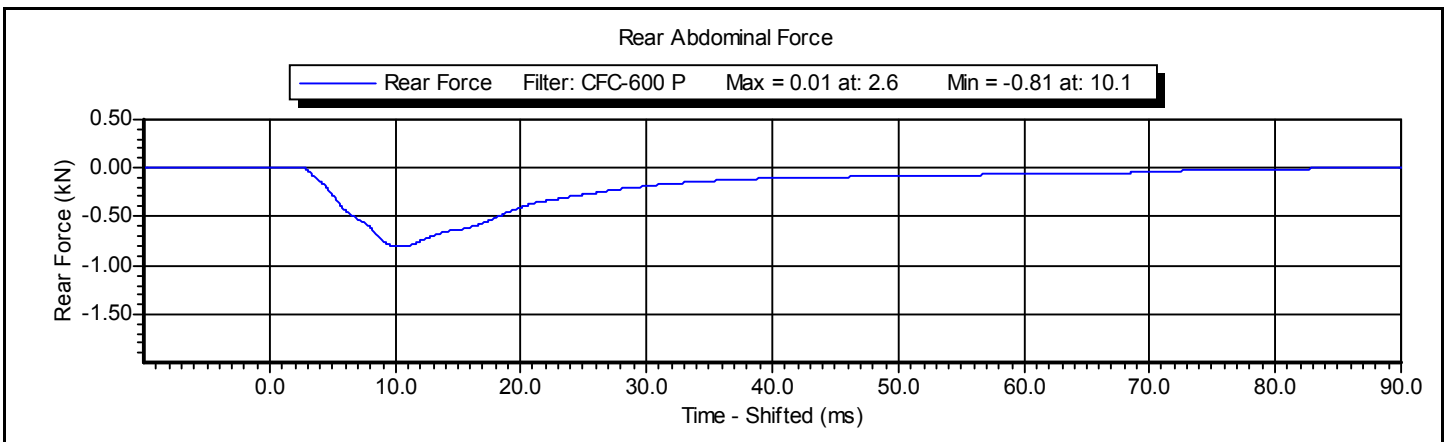
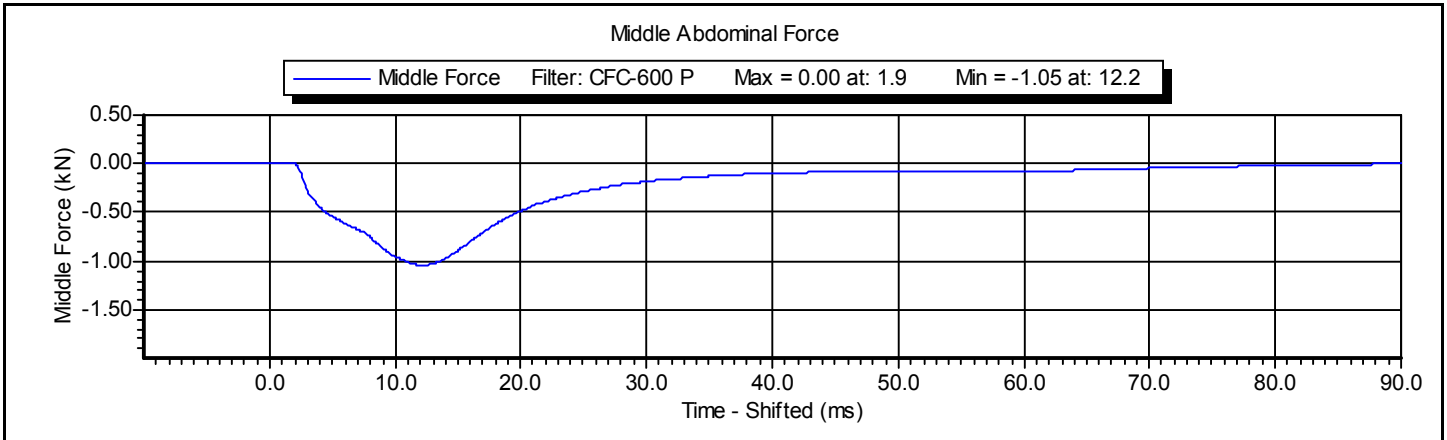
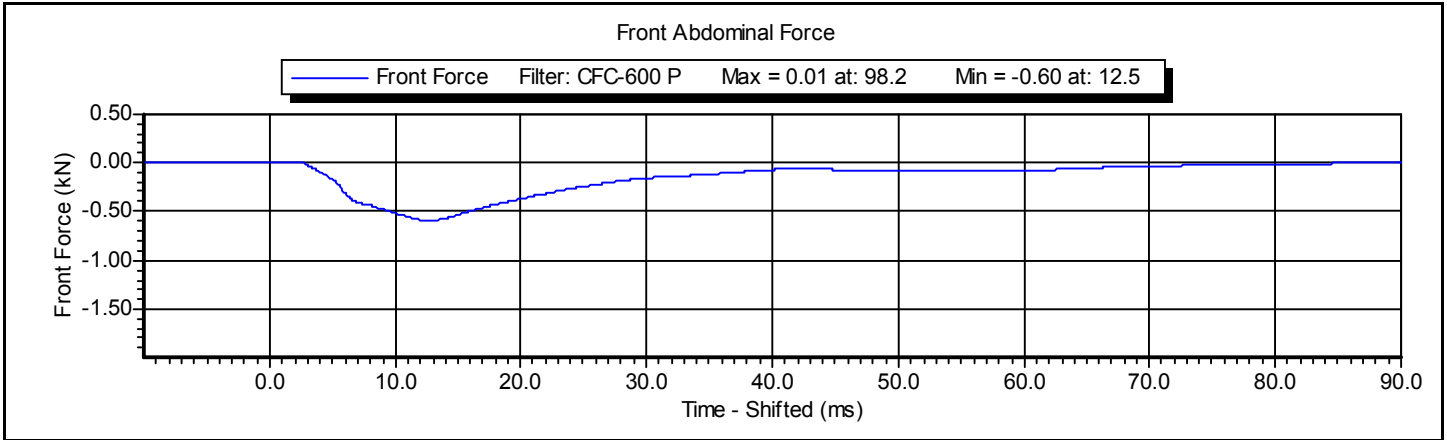
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Abdominal Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Abdominal Impact	Test Date:	6/1/2010
Test Number:	1	Test Time:	3:51:04 PM

Component Part Number	Component Serial Number
FTSS-0004	07/118







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Lumbar Spine	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lumbar Spine	Test Date:	6/2/2010
Test Number:	1	Test Time:	4:21:28 PM

Component Part Number	Component Serial Number
175-5501	15-0376

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	51 %RH P
Velocity	5.95 -- 6.15	6.12 m/s P
Maximum Headform Flexion Angle	45.0 -- 55.0	45.7 degrees P
Time at Maximum Headform Flexion Angle	39.0 -- 53.0	42.1 ms P
Decay to Zero Degrees	37.0 -- 57.0	37.5 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: **4:21:28 PM**

Test Date: **6/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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	C16510	5/10/2010
DentonATD	7000428	094	4/27/2010
DentonATD	7000428	095	4/27/2010
DentonATD	7000428	093	4/27/2010

Test ID: **Lumbar Spine**

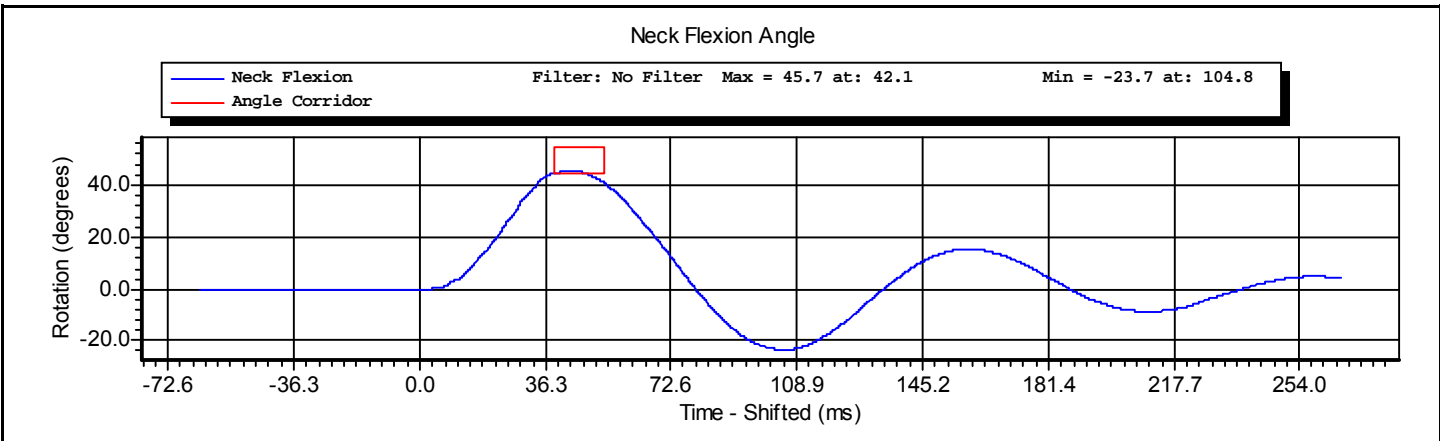
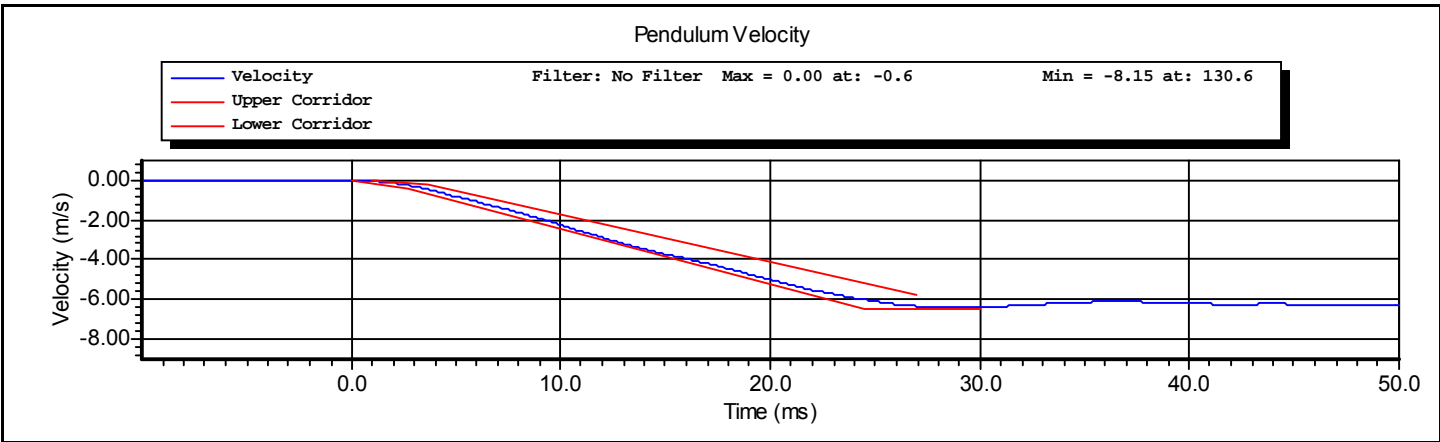
Test Time: **4:21:28 PM**

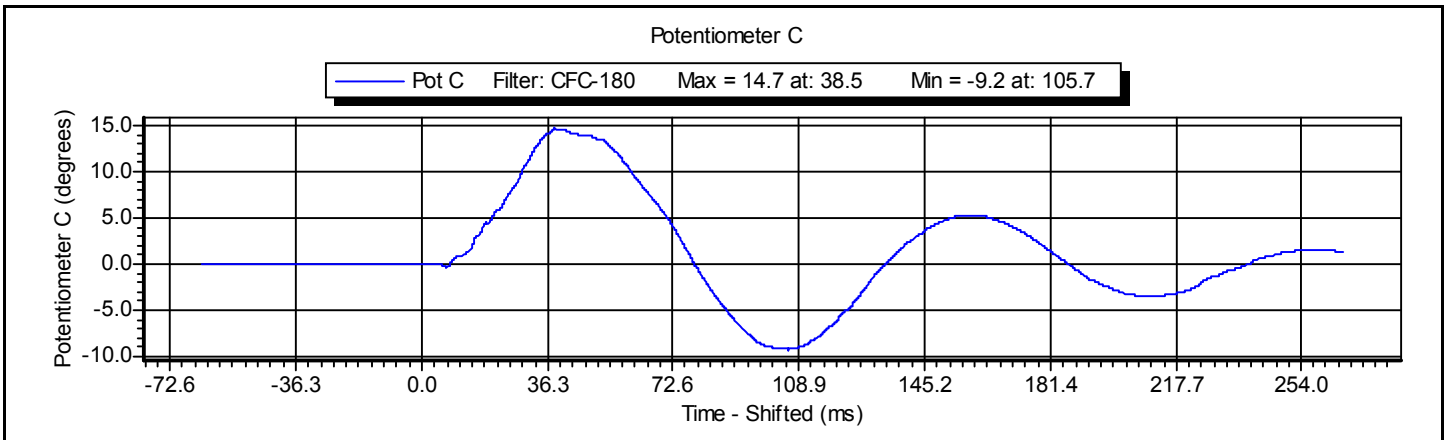
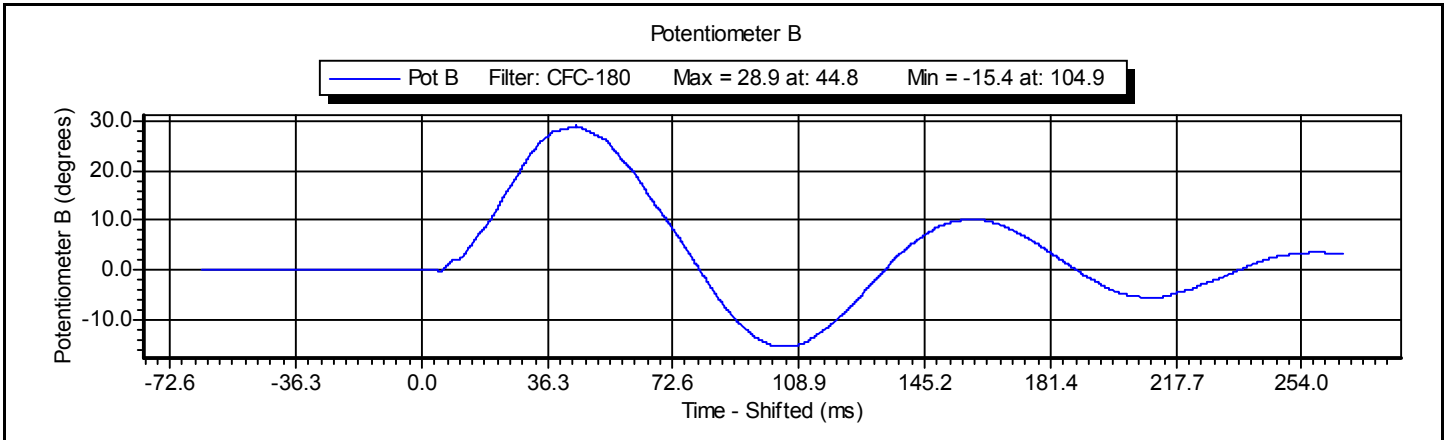
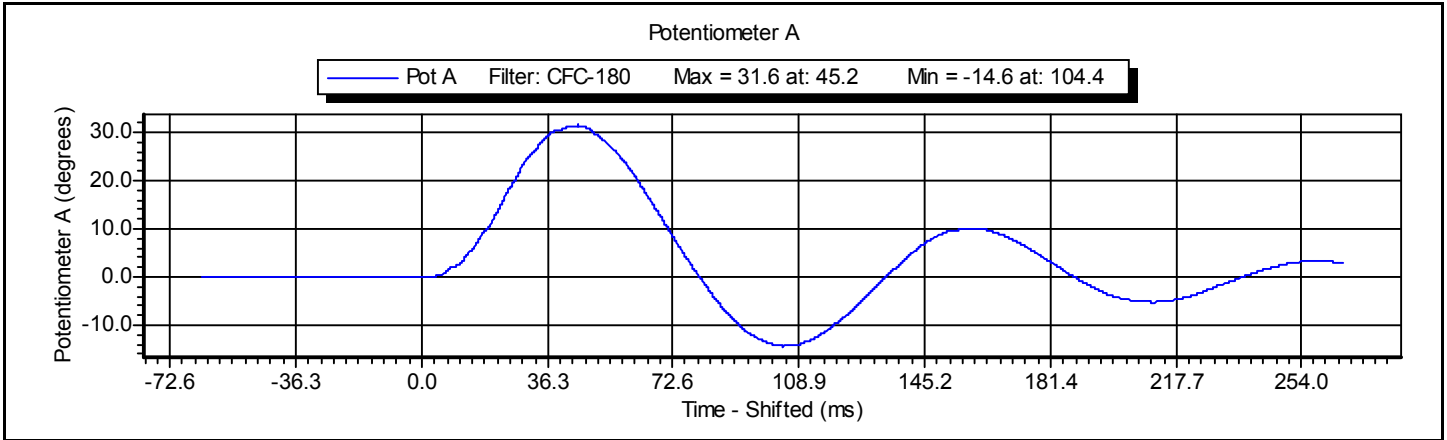
Test Date: **6/2/2010**



Test Name:	Lumbar Spine	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lumbar Spine	Test Date:	6/2/2010
Test Number:	1	Test Time:	4:21:28 PM

Component Part Number	Component Serial Number
175-5501	15-0376







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis Impact New	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Pelvis	Test Date:	6/3/2010
Test Number:	2	Test Time:	4:00:28 PM

Component Part Number	Component Serial Number
455-4003	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	56 %RH P
Velocity	4.20 -- 4.40	4.23 m/s P
Peak Pendulum Force	-5.40 -- -4.70	-5.13 kN P
Time at Peak Pendulum Force	11.80 -- 16.10	15.99 ms P
Peak Pubic Symphysis Force	-1.59 -- -1.23	-1.53 kN P
Time at Peak Pubic Symphysis Force	12.20 -- 17.00	15.59 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Pelvis**

Test Time: **4:00:28 PM**

Test Date: **6/3/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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**

Test Time: **4:00:28 PM**

Test Date: **6/3/2010**



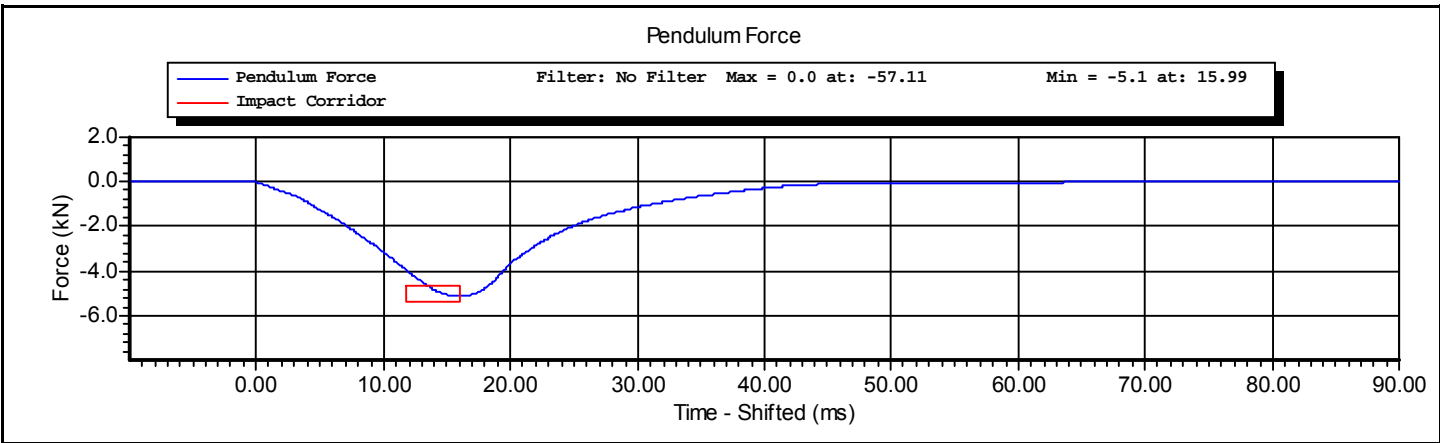
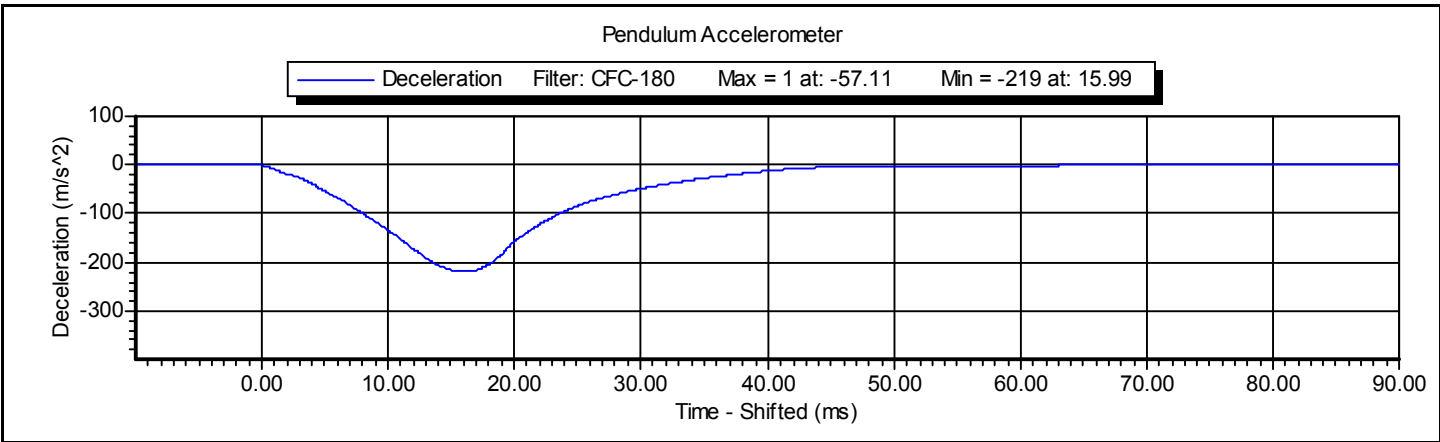
www.calspan.com

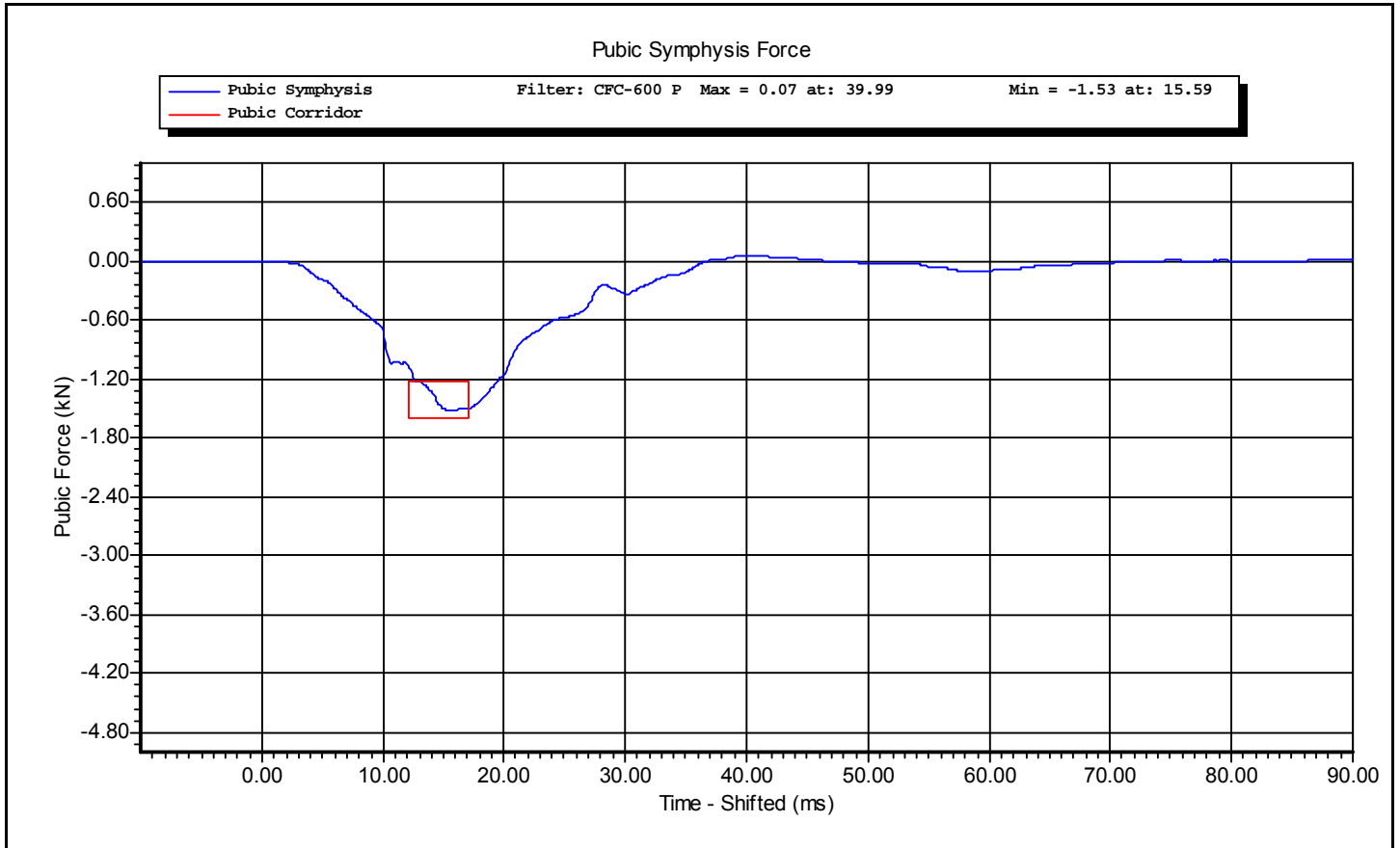
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Pelvis Impact New	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Pelvis	Test Date:	6/3/2010
Test Number:	2	Test Time:	4:00:28 PM

Component Part Number	Component Serial Number
455-4003	





CALIBRATION TEST RESULTS

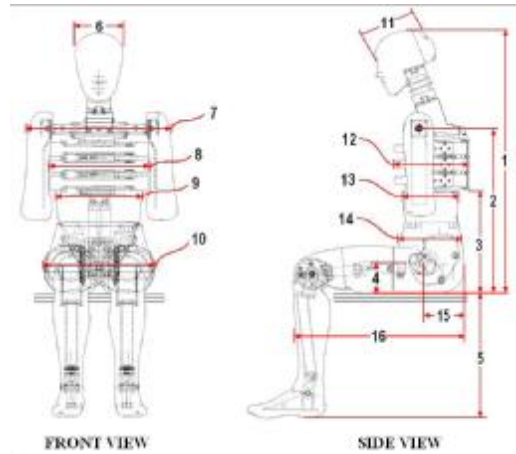
POST-TEST

ES2-re NO.: 037

CONFIGURED FOR LEFT SIDE IMPACT

ES-2re External Measurements

S/N D037



Dim. No.	Description	Specification (mm)	Result	Pass/Fail
1	Sitting Height	900-918	912	Pass
2	Seat to Shoulder Joint	558-572	565	Pass
3	Seat to Lower Face of Thoracic Spine Box	346-356	352	Pass
4	Seat to Hip Joint (center of bolt)	97-103	101	Pass
5	Sole to Seat, Sitting	333-451	441	Pass
6	Head Width	152-158	155	Pass
7	Shoulder/Arm Width	461-479	473	Pass
8	Thorax Width	322-332	326	Pass
9	Abdomen Width	273-287	283	Pass
10	Pelvis Lap Width	359-373	369	Pass
11	Head Depth	196-206	199	Pass
12	Thorax Depth	262-272	266	Pass
13	Abdomen Depth	194-204	198	Pass
14	Pelvis Depth	235-245	242	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150-160	157	Pass
16	Back of Buttocks to Front Knee	597-615	605	Pass

Technician : A. Rudniski

Date: 06/28/2010



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Head Drop	Test Date:	6/25/2010
Test Number:	1	Test Time:	2:16:39 PM

Component Part Number	Component Serial Number
455-1007	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	55 %RH P
Resultant Acceleration	125 -- 155	141 g P
Oscillation	0.0 -- 15.0	4.0 % P
Fore-Aft Acceleration	-15.00 -- 15.00	5.16 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Head Drop**

Test Time: **2:16:39 PM**

Test Date: **6/25/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	J45479	1/25/2010
Endevco	7264-2000	P32453	1/25/2010
Endevco	7264-2000	P22639	1/25/2010

Test ID: **Head Drop**

Test Time: **2:16:39 PM**

Test Date: **6/25/2010**



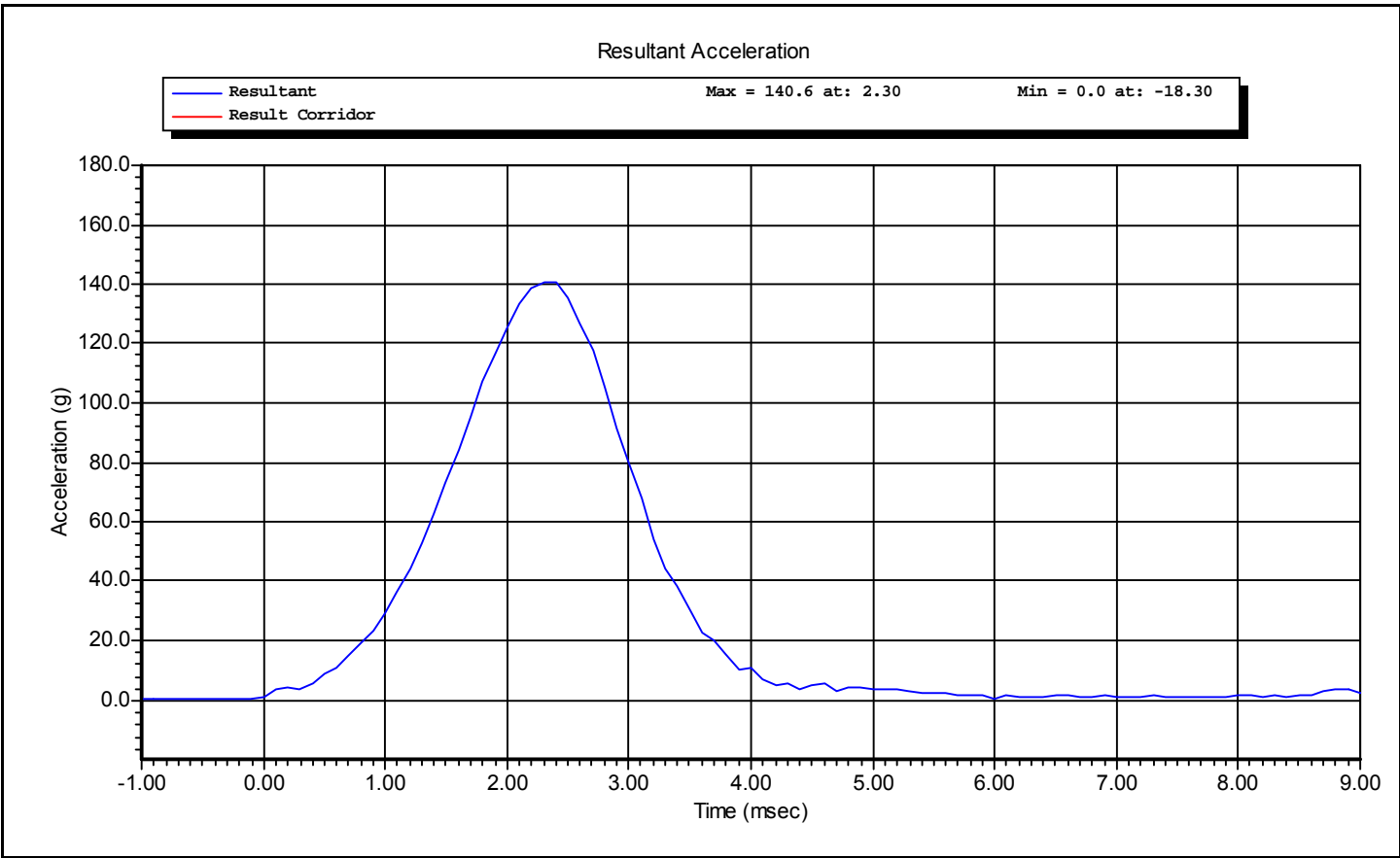
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Head Drop	Test Date:	6/25/2010
Test Number:	1	Test Time:	2:16:39 PM

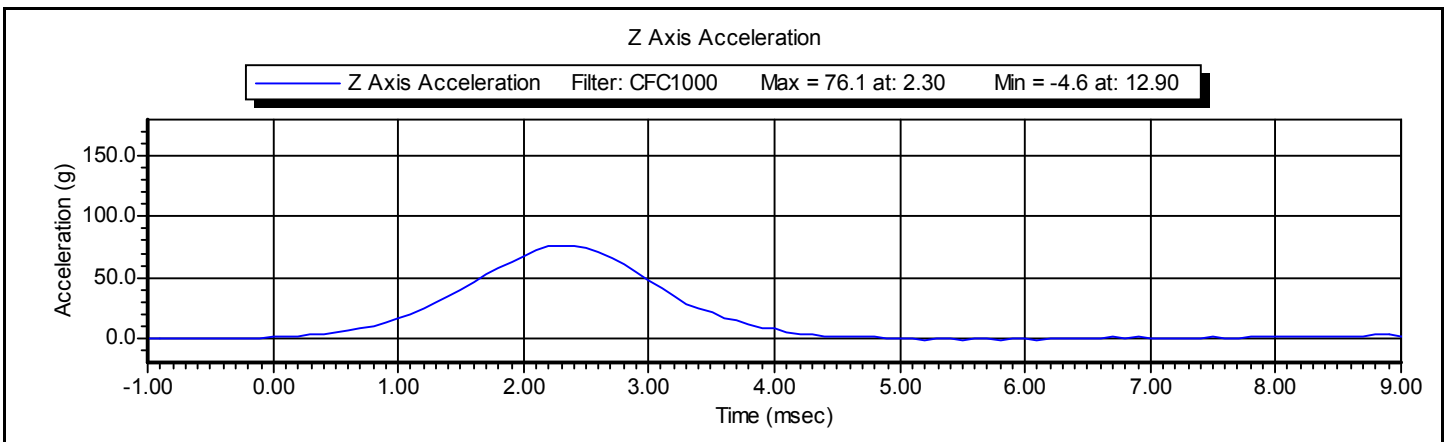
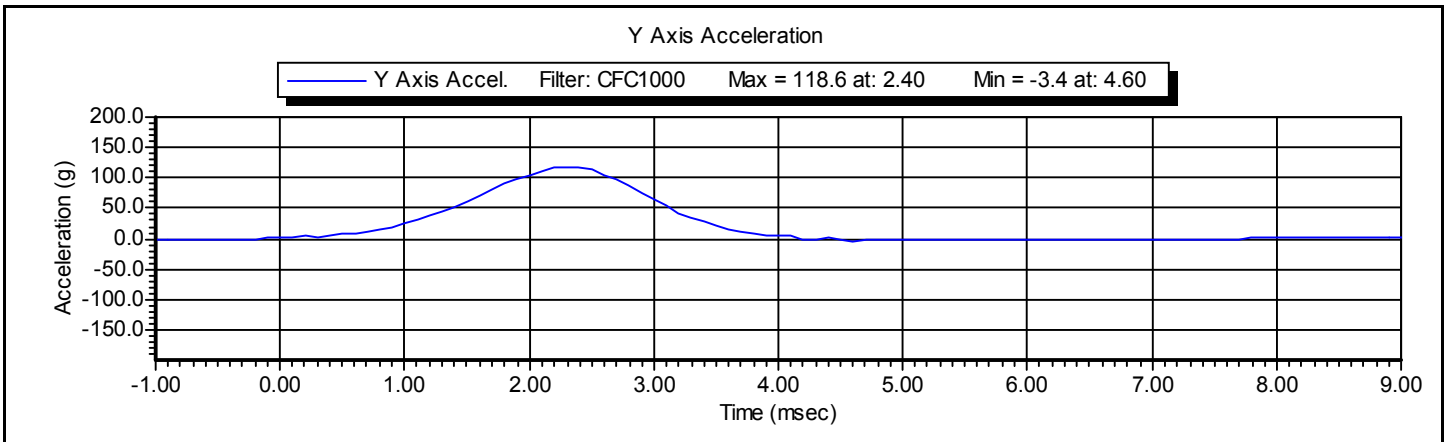
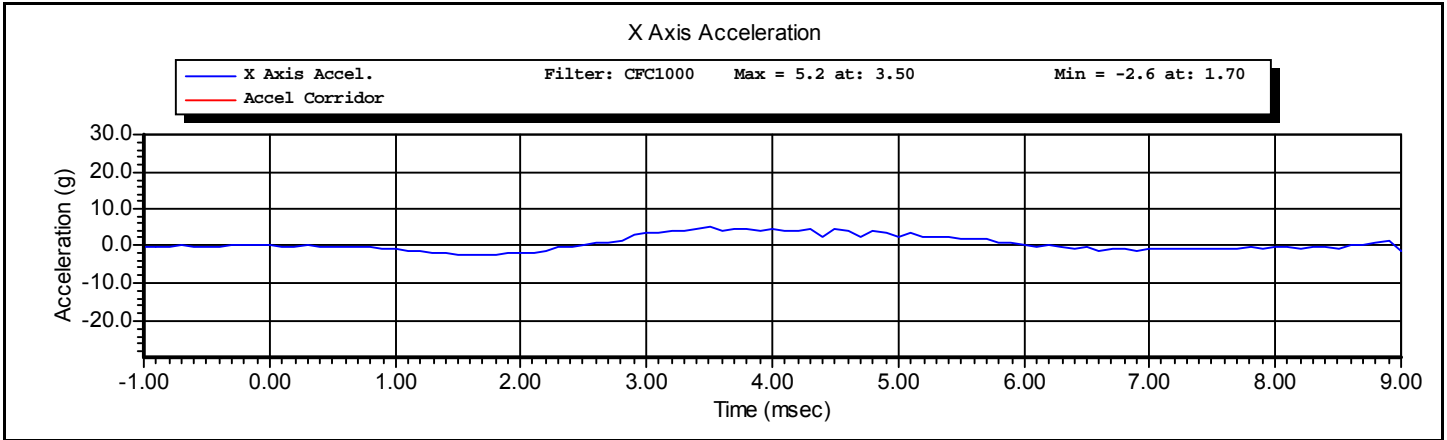
Component Part Number	Component Serial Number
455-1007	



Test ID: **Head Drop**

Test Time: **2:16:39 PM**

Test Date: **6/25/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Neck Flexion	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Neck Flexion	Test Date:	6/25/2010
Test Number:	1	Test Time:	3:28:19 PM

Component Part Number	Component Serial Number
455-2002	19-020118A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	55 %RH P
Velocity	3.30 -- 3.50	3.43 m/s P
Maximum Neck Flexion Angle	49.0 -- 59.0	52.7 degrees P
Time At Maximum Neck Flexion	54.0 -- 66.0	61.8 ms P
Decay to Zero Degrees	53.0 -- 88.0	58.4 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: **3:28:19 PM**

Test Date: **6/25/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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	C16510	5/10/2010
DentonATD	7000428	094	4/27/2010
DentonATD	7000428	095	4/27/2010
DentonATD	7000428	093	4/27/2010

Test ID: **Neck Flexion**

Test Time: **3:28:19 PM**

Test Date: **6/25/2010**



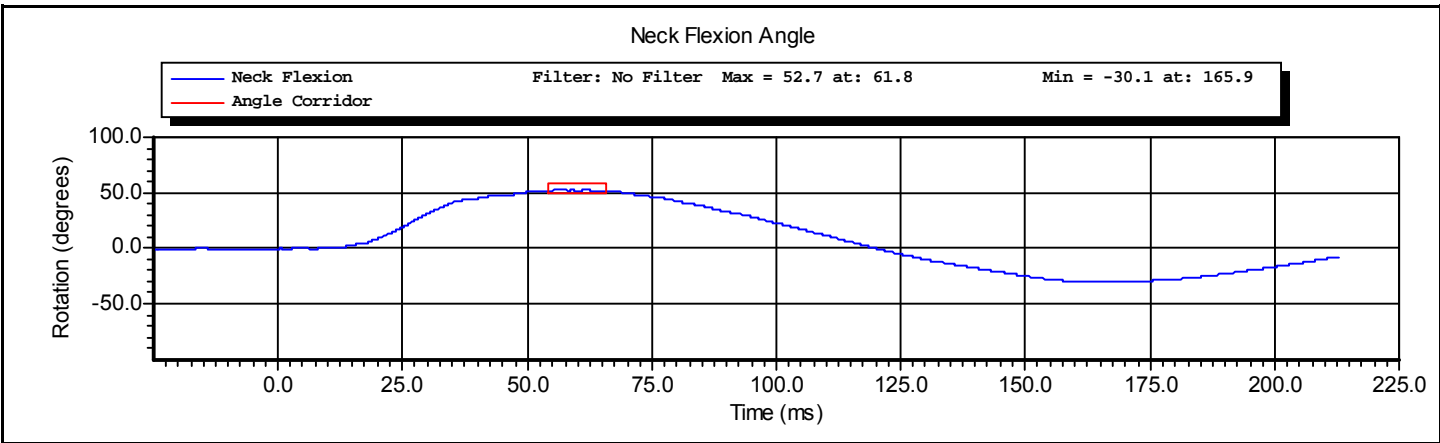
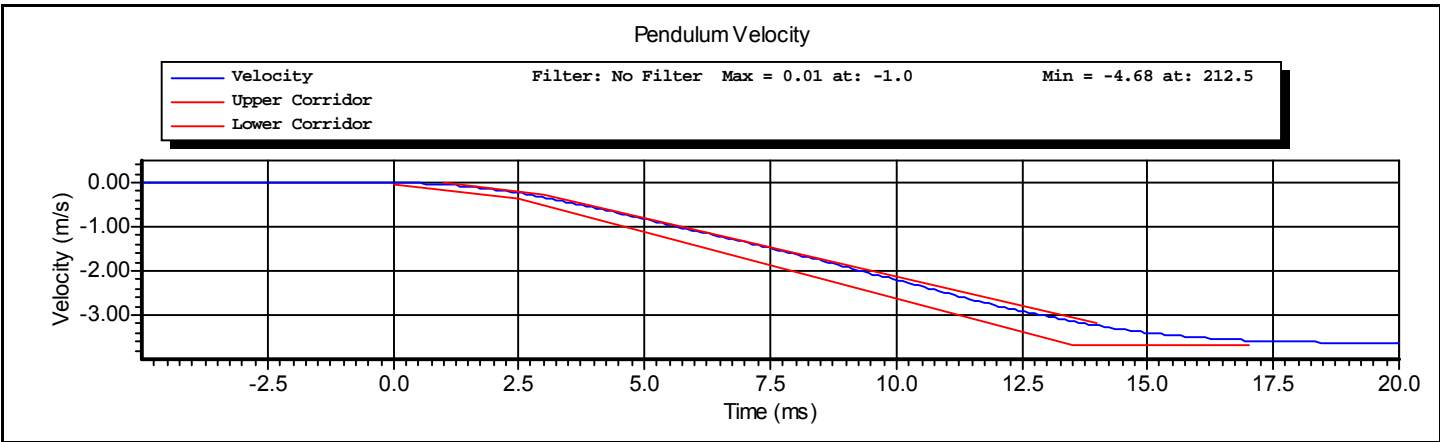
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Neck Flexion	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Neck Flexion	Test Date:	6/25/2010
Test Number:	1	Test Time:	3:28:19 PM

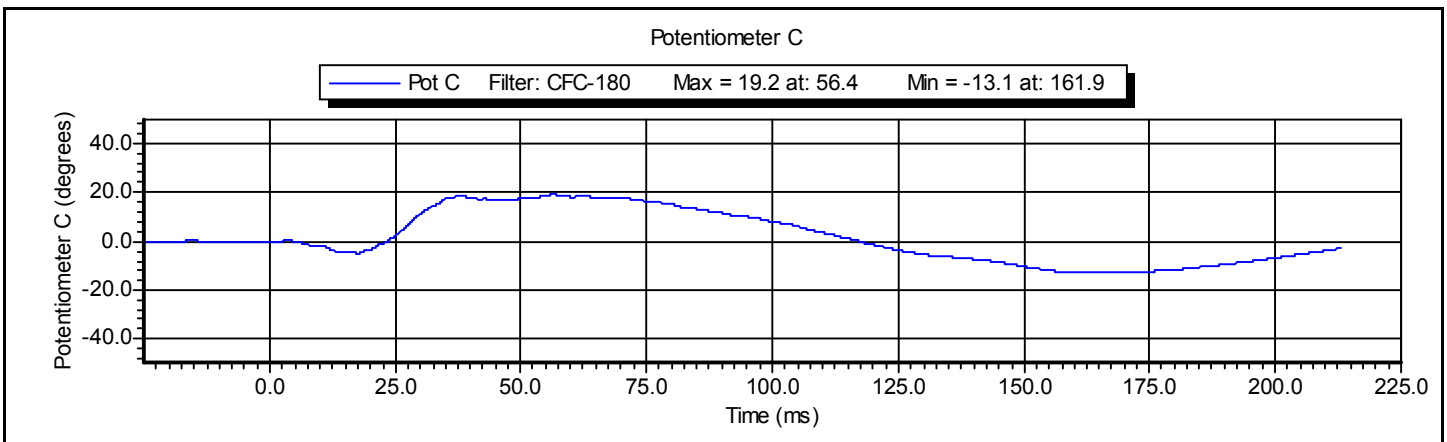
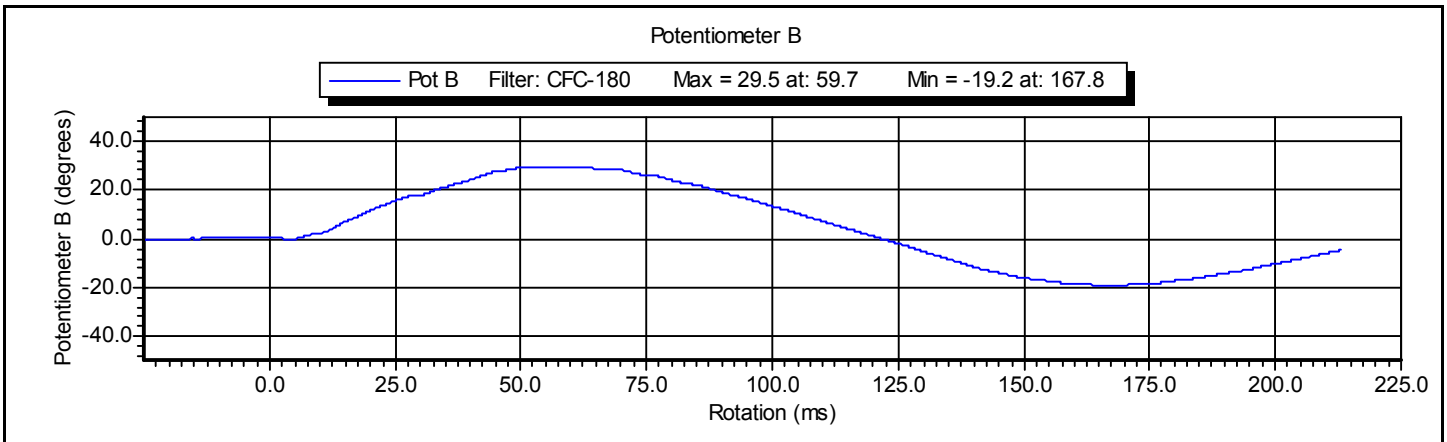
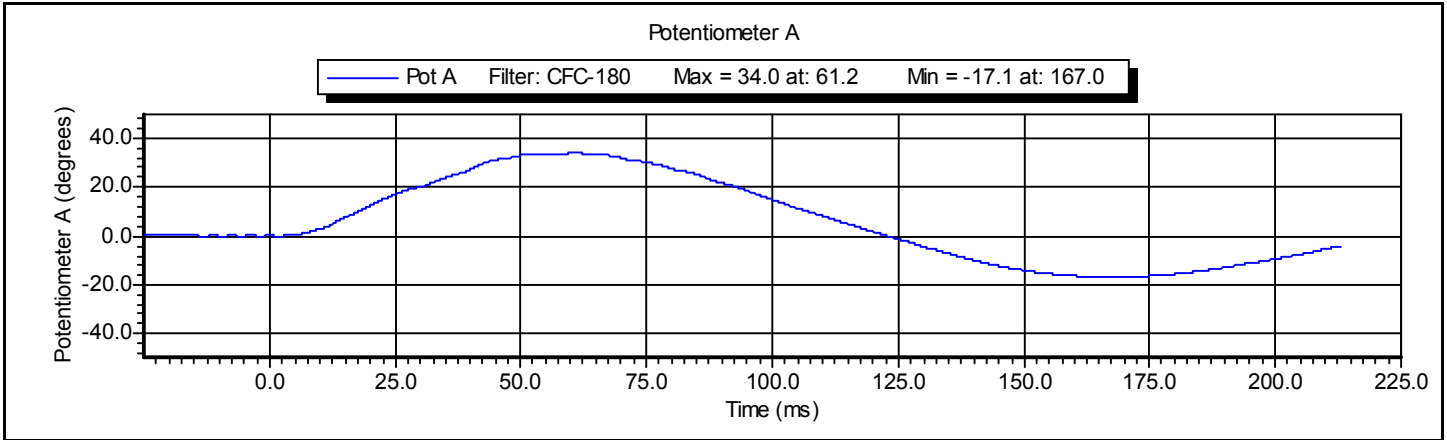
Component Part Number	Component Serial Number
455-2002	19-020118A



Test ID: **Neck Flexion**

Test Time: **3:28:19 PM**

Test Date: **6/25/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Shoulder Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Shoulder	Test Date:	6/28/2010
Test Number:	1	Test Time:	10:56:02 AM

Component Part Number	Component Serial Number
960715-313	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	65.0 %RH P
Velocity	4.20 -- 4.40	4.32 m/s P
Pendulum Acceleration	-10.50 -- -7.50	-7.94 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
Supervisor: **D. Travale** Signature: _____

Test ID: **Shoulder**

Test Time: **10:56:02 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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**

Test Time: **10:56:02 AM**

Test Date: **6/28/2010**



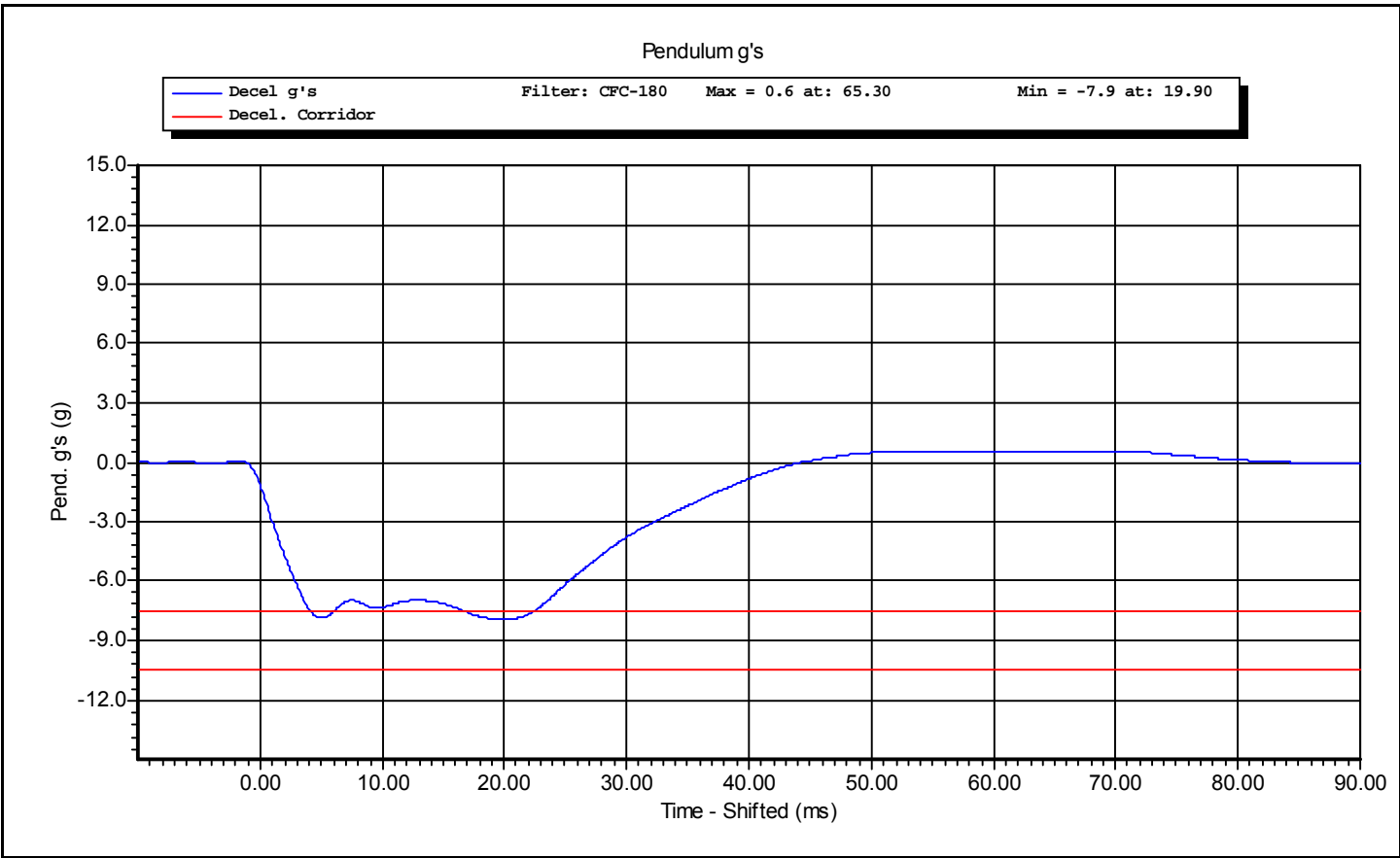
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Shoulder Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Shoulder	Test Date:	6/28/2010
Test Number:	1	Test Time:	10:56:02 AM

Component Part Number	Component Serial Number
960715-313	



Test ID: **Shoulder**

Test Time: **10:56:02 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lower Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:41:56 AM

Component Part Number	Component Serial Number
455-3100	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	64.0 %RH P
Velocity	3.90 -- 4.10	3.98 m/s P
Rib Displacement	-51.00 -- -46.00	-48.61 mm P
Drop Height	807.0 -- 823.0	815.0 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: **9:41:56 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:41:56 AM**

Test Date: **6/28/2010**



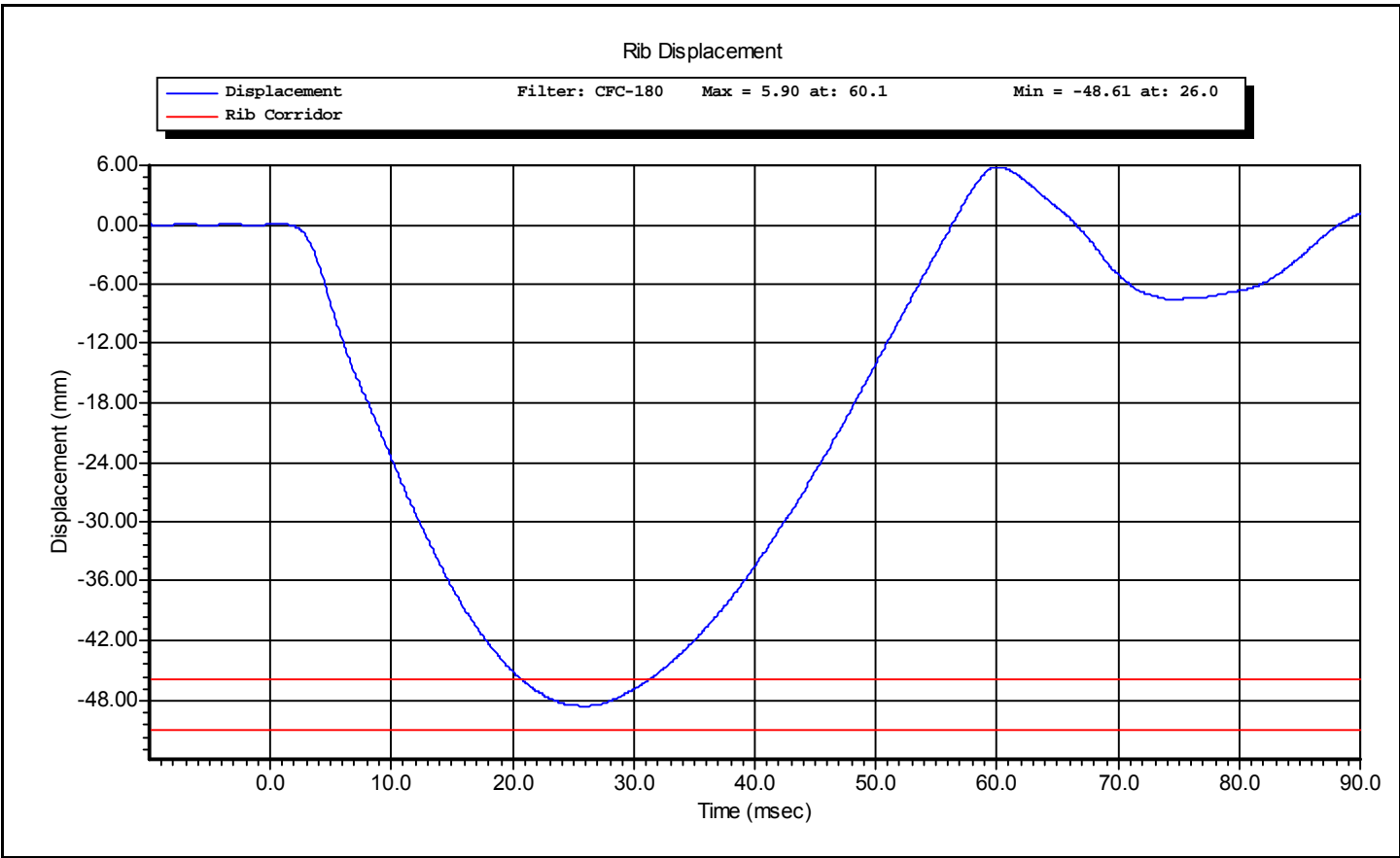
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lower Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:41:56 AM

Component Part Number	Component Serial Number
455-3100	1954-0126A



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

Test Time: **9:41:56 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lower Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:50:57 AM

Component Part Number	Component Serial Number
455-3100	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	64.0 %RH P
Velocity	2.90 -- 3.10	2.97 m/s P
Rib Displacement	-40.00 -- -36.00	-38.49 mm P
Drop Height	454 -- 464	459 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: **9:50:57 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:50:57 AM**

Test Date: **6/28/2010**



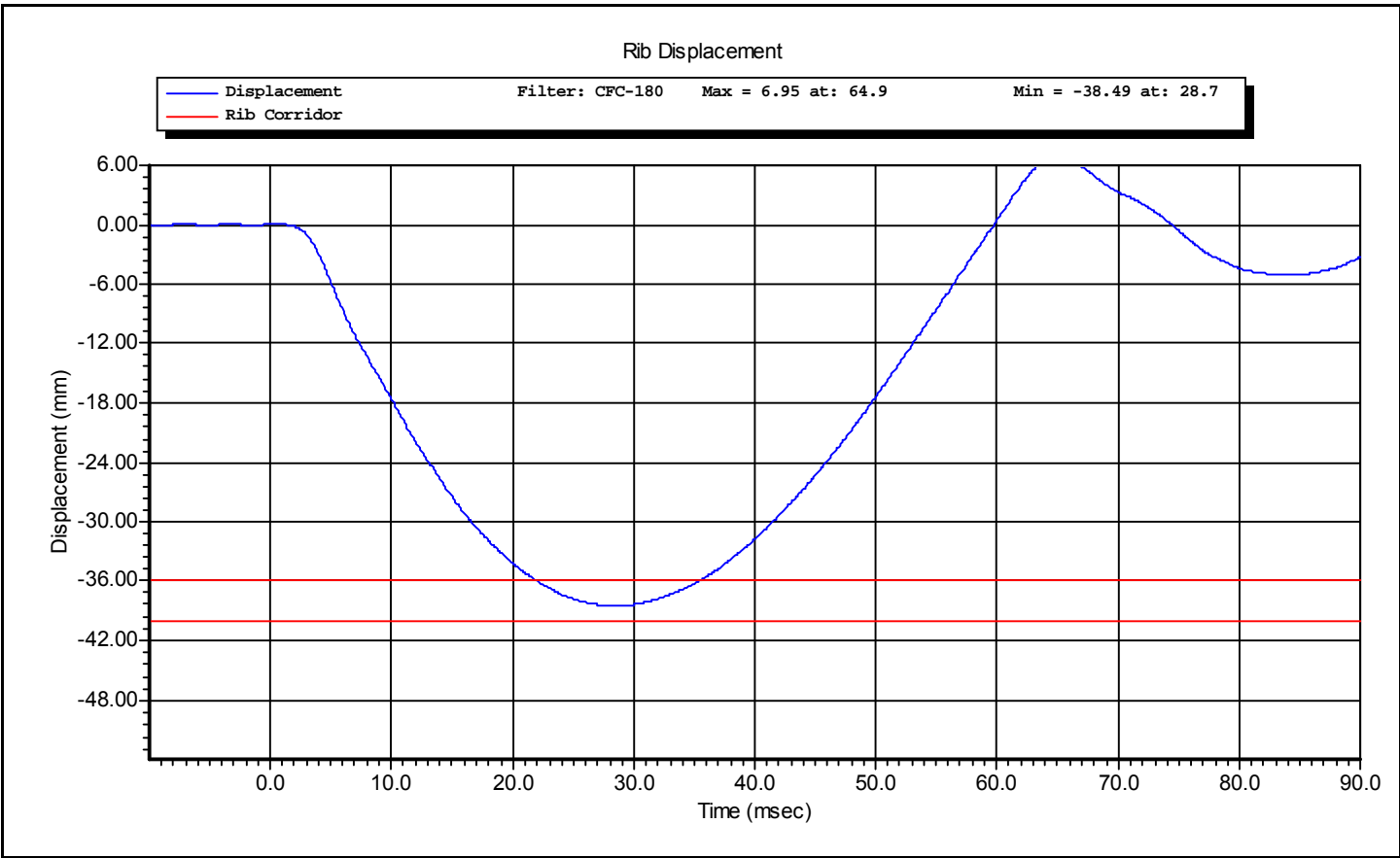
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lower Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:50:57 AM

Component Part Number	Component Serial Number
455-3100	1954-0126A



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

Test Time: **9:50:57 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Middle Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:25:51 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	68.0 %RH P
Velocity	3.90 -- 4.10	3.98 m/s P
Rib Displacement	-51.00 -- -46.00	-48.43 mm P
Drop Height	807.0 -- 823.0	815.0 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: **9:25:51 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:25:51 AM**

Test Date: **6/28/2010**



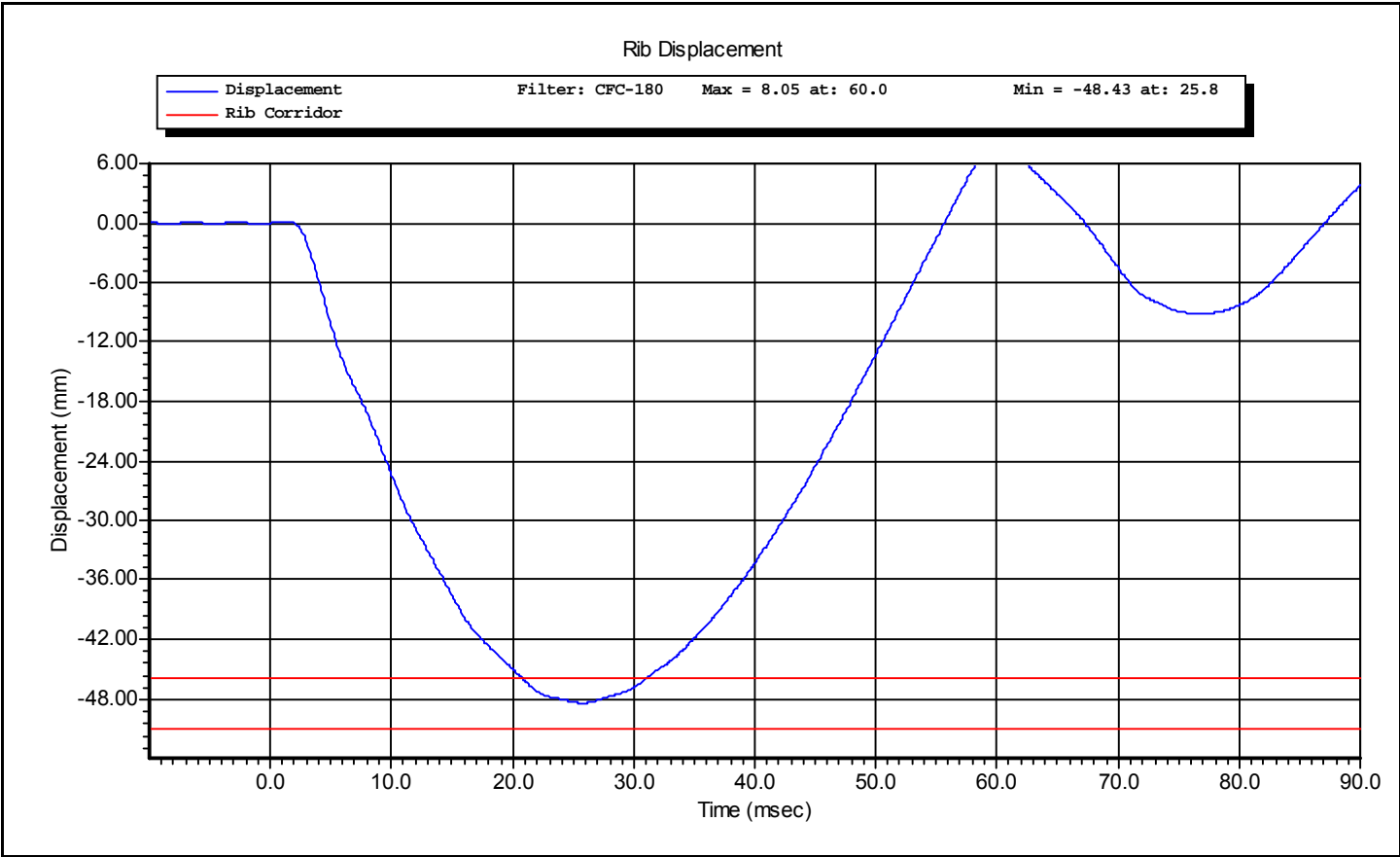
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Middle Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:25:51 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A



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

Test Time: **9:25:51 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Middle Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:32:41 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	68.0 %RH P
Velocity	2.90 -- 3.10	2.96 m/s P
Rib Displacement	-40.00 -- -36.00	-38.07 mm P
Drop Height	454 -- 464	459 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: **9:32:41 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:32:41 AM**

Test Date: **6/28/2010**



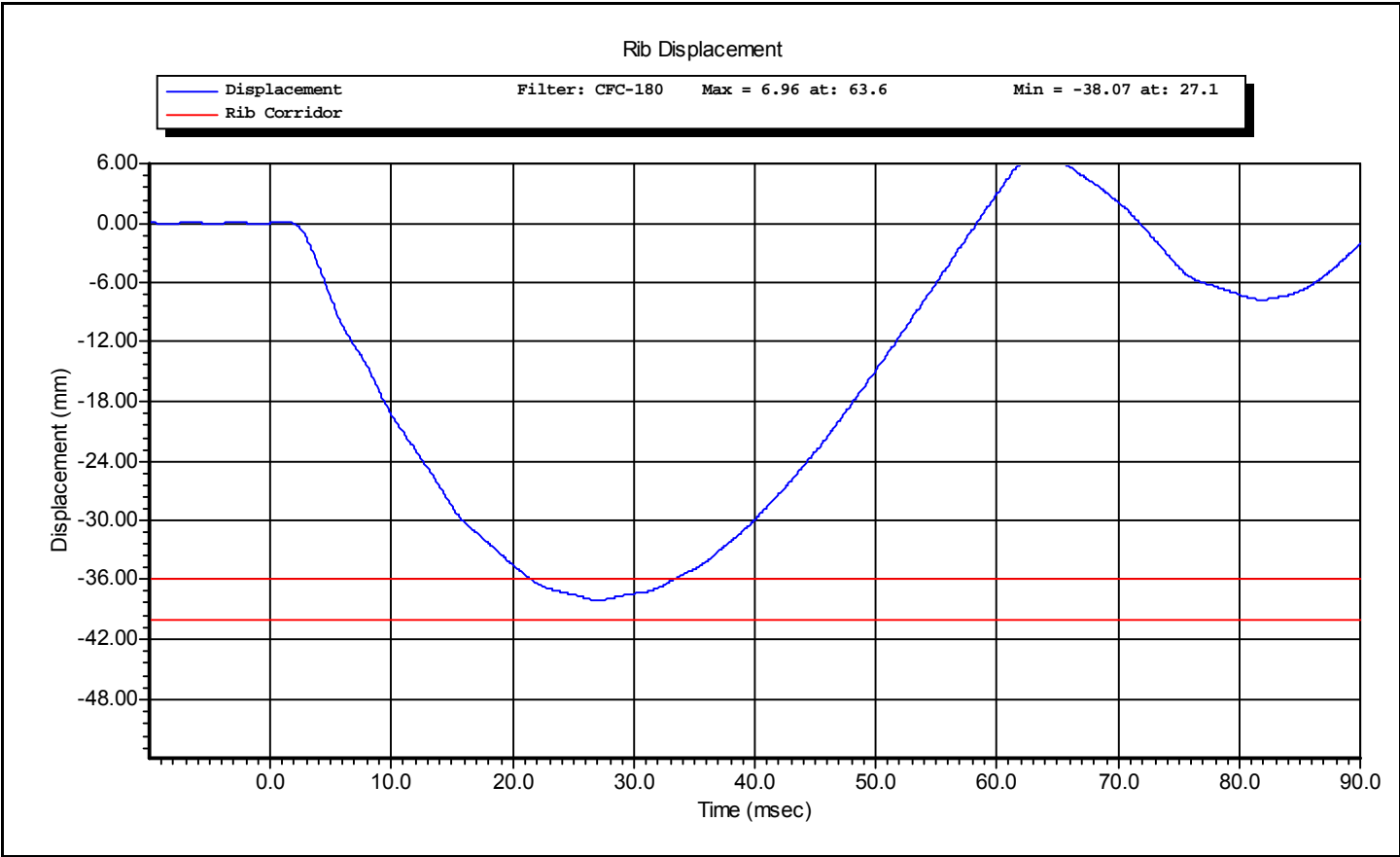
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Middle Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:32:41 AM

Component Part Number	Component Serial Number
455-3100	1954-0125A



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

Test Time: **9:32:41 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Upper Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:11:33 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	67.0 %RH P
Velocity	3.90 -- 4.10	3.99 m/s P
Rib Displacement	-51.00 -- -46.00	-49.74 mm P
Drop Height	807.0 -- 823.0	815.0 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: **9:11:33 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:11:33 AM**

Test Date: **6/28/2010**



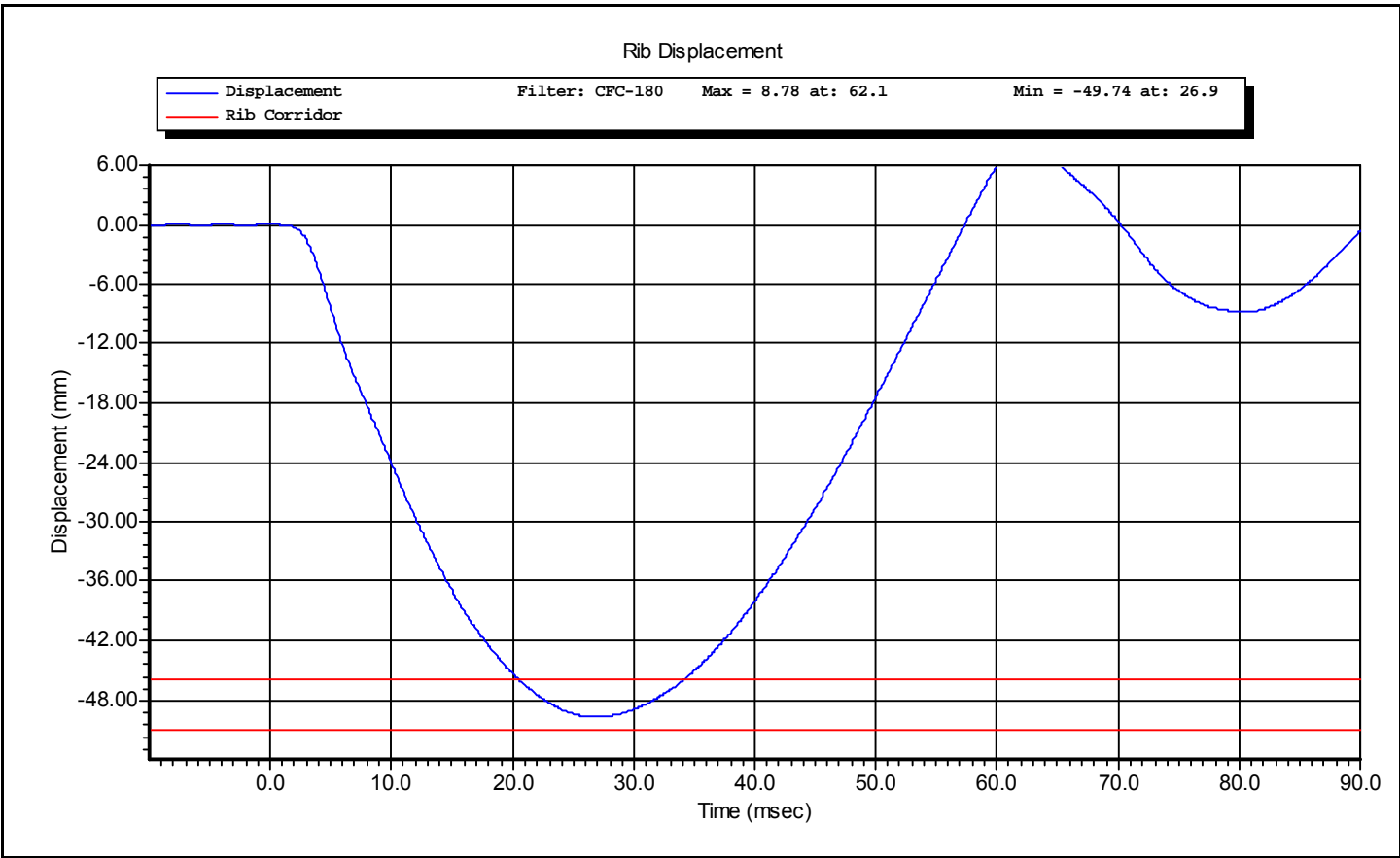
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	4.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Upper Rib 4 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:11:33 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A



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

Test Time: **9:11:33 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Upper Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:17:49 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	68.0 %RH P
Velocity	2.90 -- 3.10	2.97 m/s P
Rib Displacement	-40.00 -- -36.00	-38.10 mm P
Drop Height	454 -- 464	459 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: **9:17:49 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **9:17:49 AM**

Test Date: **6/28/2010**



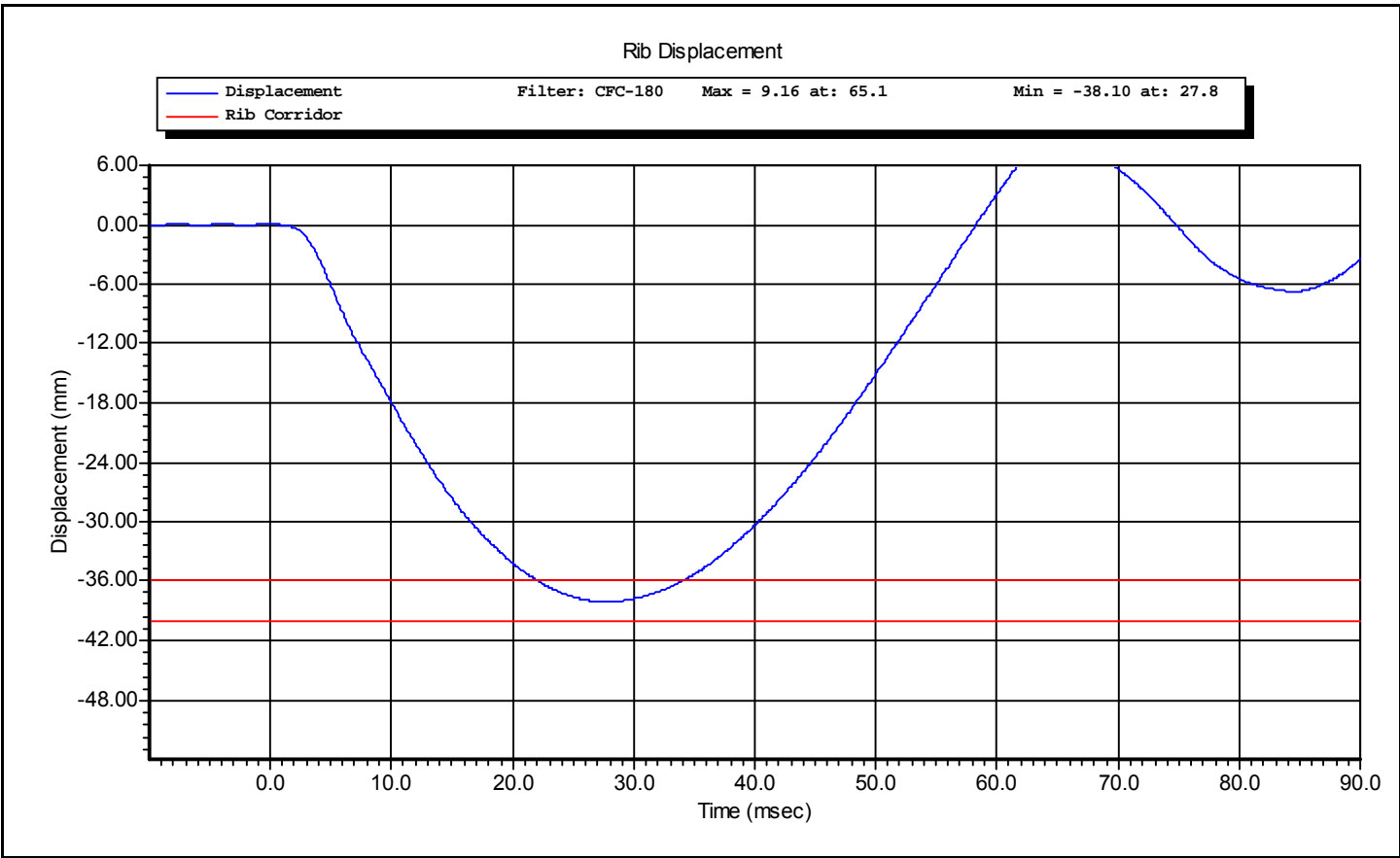
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Full Rib Module Impact	Revision:	12/14/2006
Sub Test Name:	3.0 Meters/Second	Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Upper Rib 3 m/s	Test Date:	6/28/2010
Test Number:	1	Test Time:	9:17:49 AM

Component Part Number	Component Serial Number
455-3100	1954-0124A



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

Test Time: **9:17:49 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact	Revision:	8/15/2008
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Thorax	Test Date:	6/28/2010
Test Number:	1	Test Time:	10:38:12 AM

Component Part Number	Component Serial Number
Upper Rib - 175-4002	1954-0124A
Middle Rib - 175-4002	1954-0125A
Lower Rib - 175-4002	1954-0126A

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10.0 -- 70.0	64.0 %RH P
Velocity	5.40 -- 5.60	5.49 m/s P
Upper Rib Displacement	34.0 -- 41.0	37.3 mm P
Middle Rib Displacement	37.0 -- 45.0	41.4 mm P
Lower Rib Displacement	37.0 -- 44.0	42.8 mm P
Impactor Force	5100 -- 6200	5468 N P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax**

Test Time: **10:38:12 AM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
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**

Test Time: **10:38:12 AM**

Test Date: **6/28/2010**



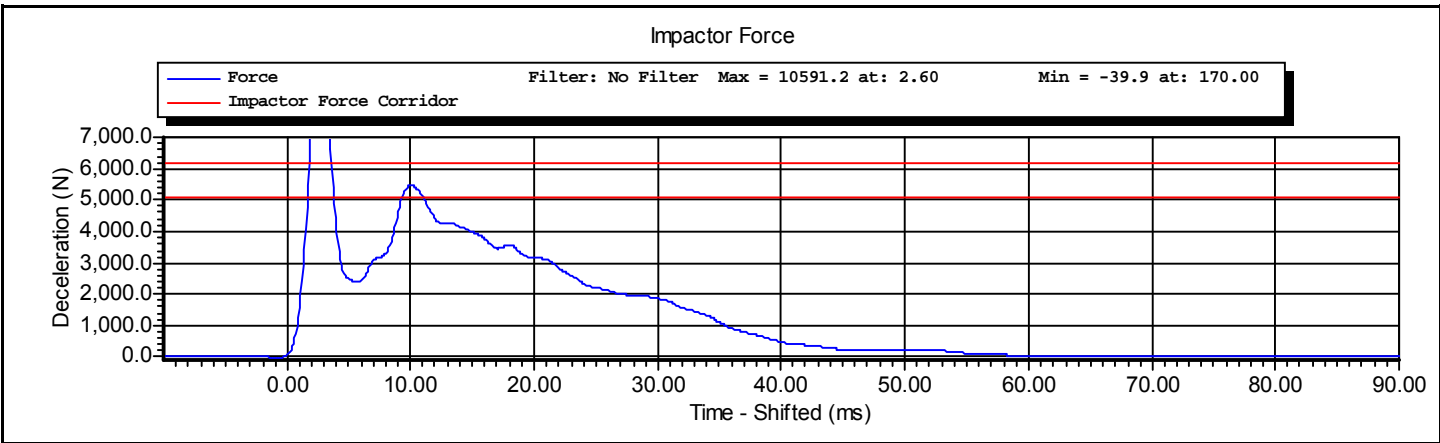
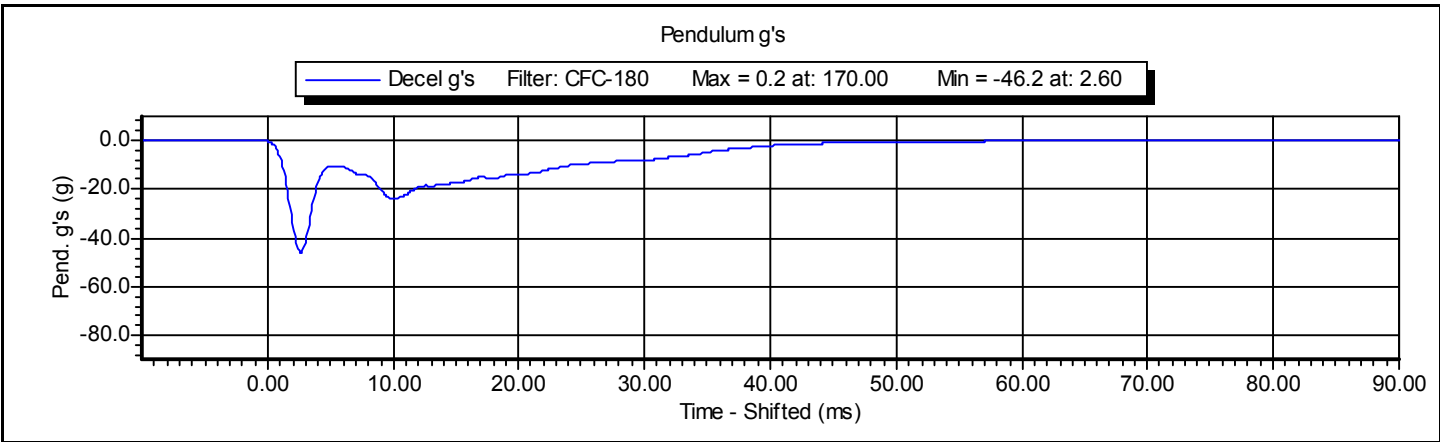
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Thorax Impact	Revision:	8/15/2008
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Thorax	Test Date:	6/28/2010
Test Number:	1	Test Time:	10:38:12 AM

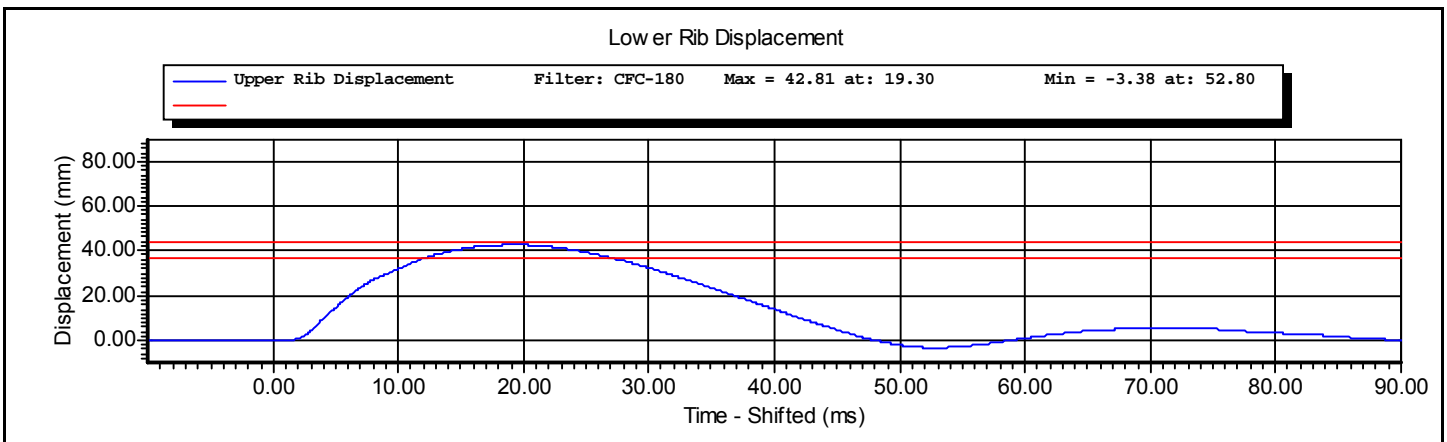
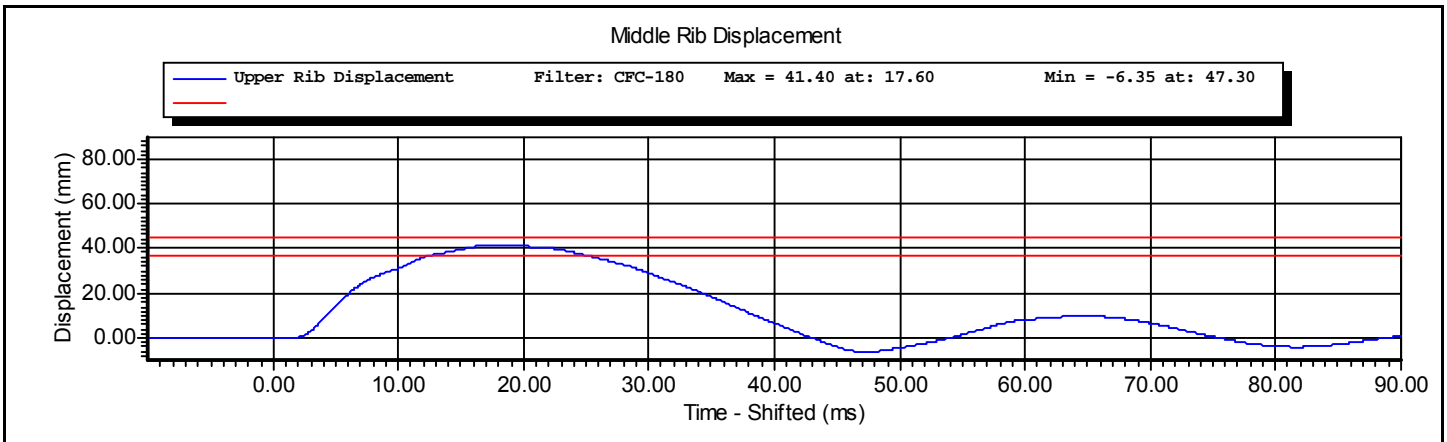
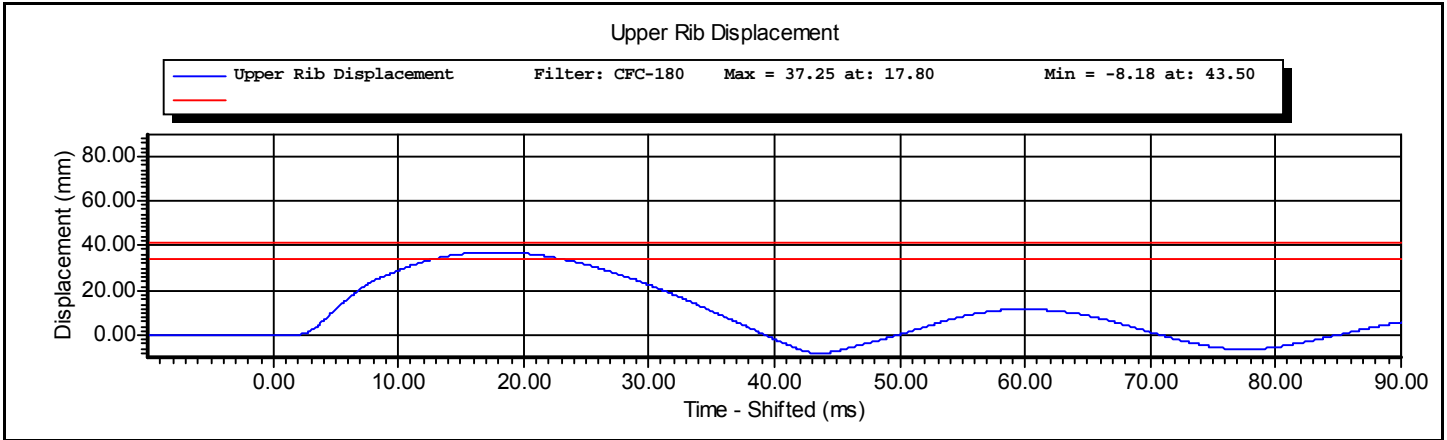
Component Part Number	Component Serial Number
Upper Rib - 175-4002	1954-0124A



Test ID: **Thorax**

Test Time: **10:38:12 AM**

Test Date: **6/28/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Abdominal Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Abdomen	Test Date:	6/28/2010
Test Number:	1	Test Time:	1:28:10 PM

Component Part Number	Component Serial Number
455-4001	07/118

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	65 %RH P
Velocity	3.90 -- 4.10	4.01 m/s P
Peak Abdominal Force	-2.70 -- -2.20	-2.49 kN P
Time At Peak Abdominal Force	10.0 -- 12.3	11.6 ms P
Maximum Pendulum Force	-4.80 -- -4.00	-4.25 kN P
Time at Peak Pendulum Force	10.6 -- 13.0	12.2 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Abdomen**

Test Time: **1:28:10 PM**

Test Date: **6/28/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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: **Abdomen**

Test Time: **1:28:10 PM**

Test Date: **6/28/2010**



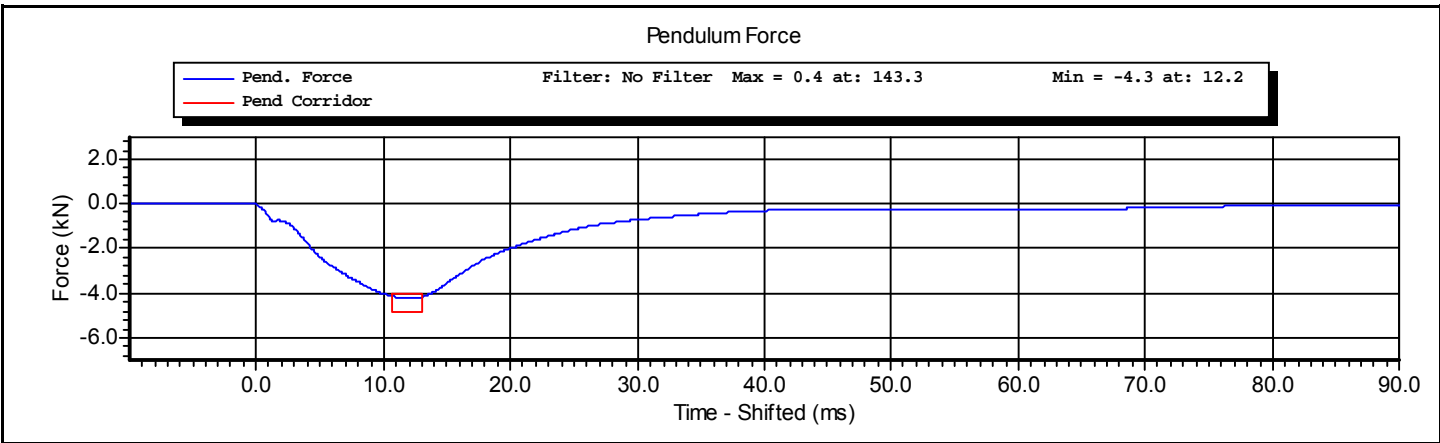
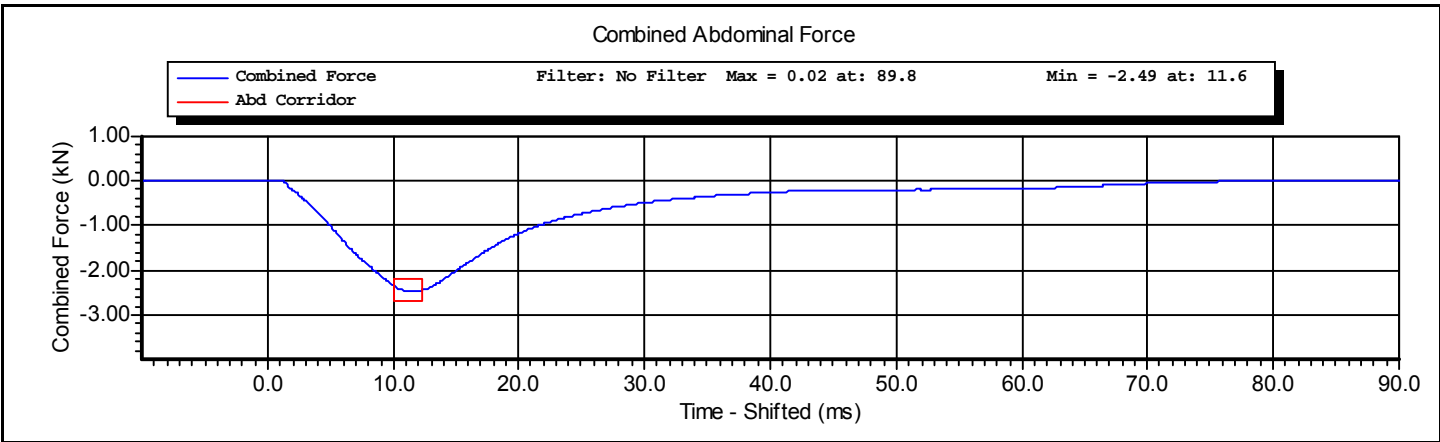
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Abdominal Impact	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Abdomen	Test Date:	6/28/2010
Test Number:	1	Test Time:	1:28:10 PM

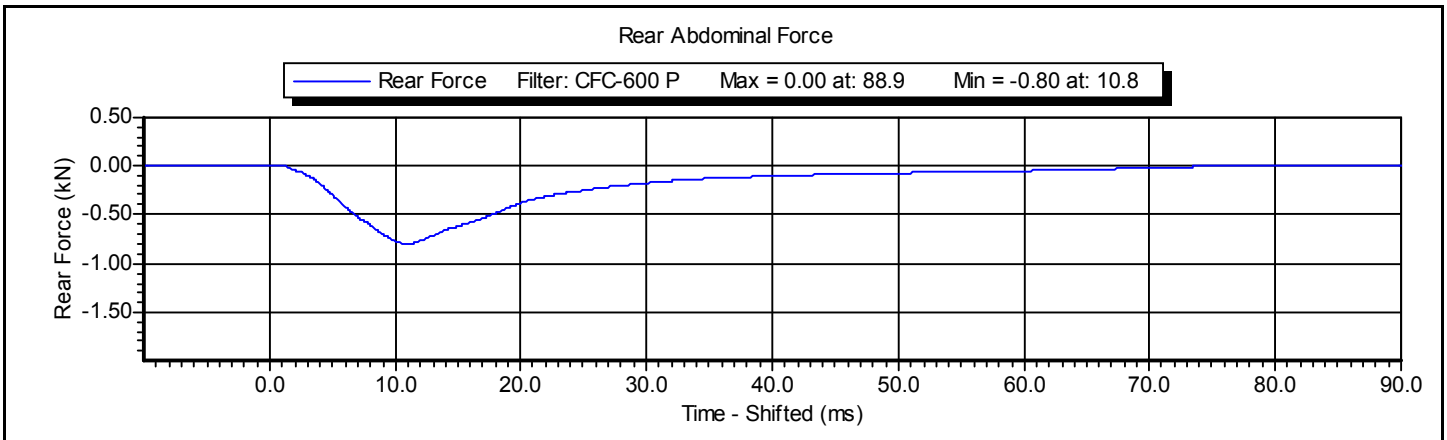
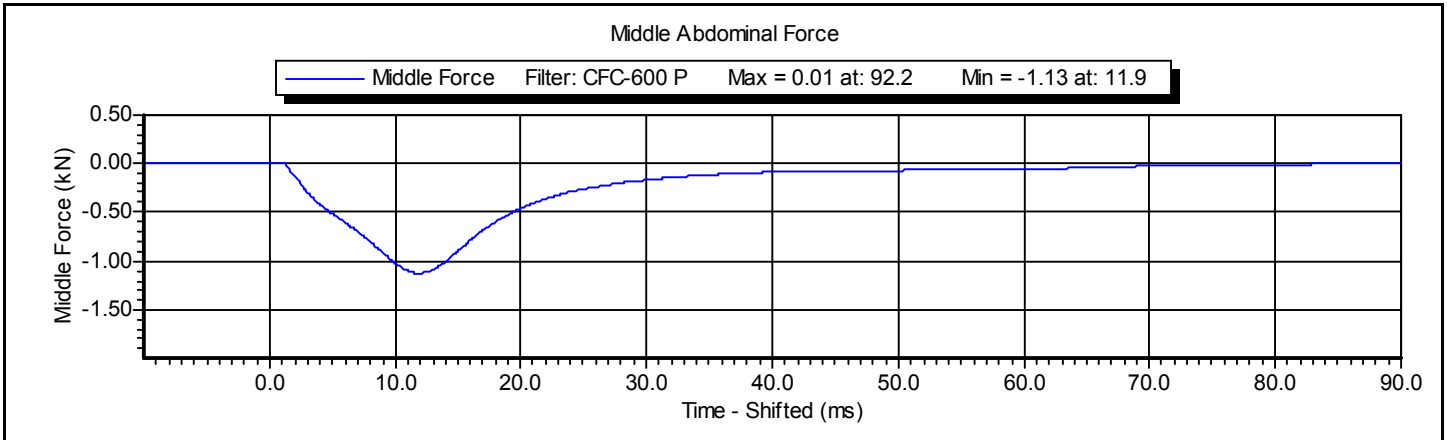
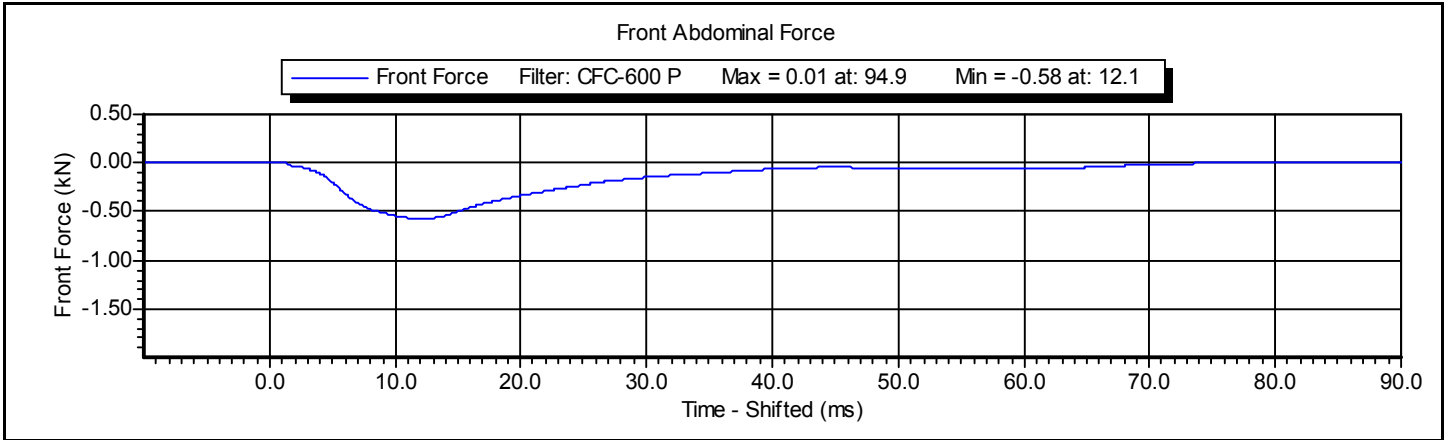
Component Part Number	Component Serial Number
455-4001	07/118



Test ID: **Abdomen**

Test Time: **1:28:10 PM**

Test Date: **6/28/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Lumbar Spine	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lumbar Spine	Test Date:	6/26/2010
Test Number:	2	Test Time:	9:07:21 AM

Component Part Number	Component Serial Number
175-5501	15-0376

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.1 deg C P
Humidity	10 -- 70	58 %RH P
Velocity	5.95 -- 6.15	6.12 m/s P
Maximum Headform Flexion Angle	45.0 -- 55.0	48.2 degrees P
Time at Maximum Headform Flexion Angle	39.0 -- 53.0	42.5 ms P
Decay to Zero Degrees	37.0 -- 57.0	37.2 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: **9:07:21 AM**

Test Date: **6/26/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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	C16510	5/10/2010
DentonATD	7000428	094	4/27/2010
DentonATD	7000428	095	4/27/2010
DentonATD	7000428	093	4/27/2010

Test ID: **Lumbar Spine**

Test Time: **9:07:21 AM**

Test Date: **6/26/2010**



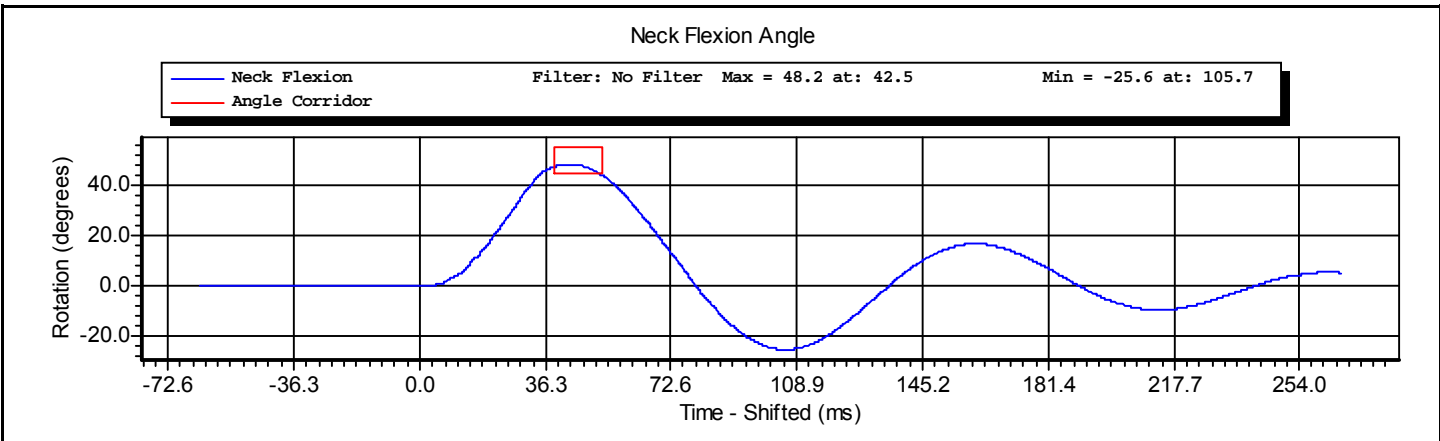
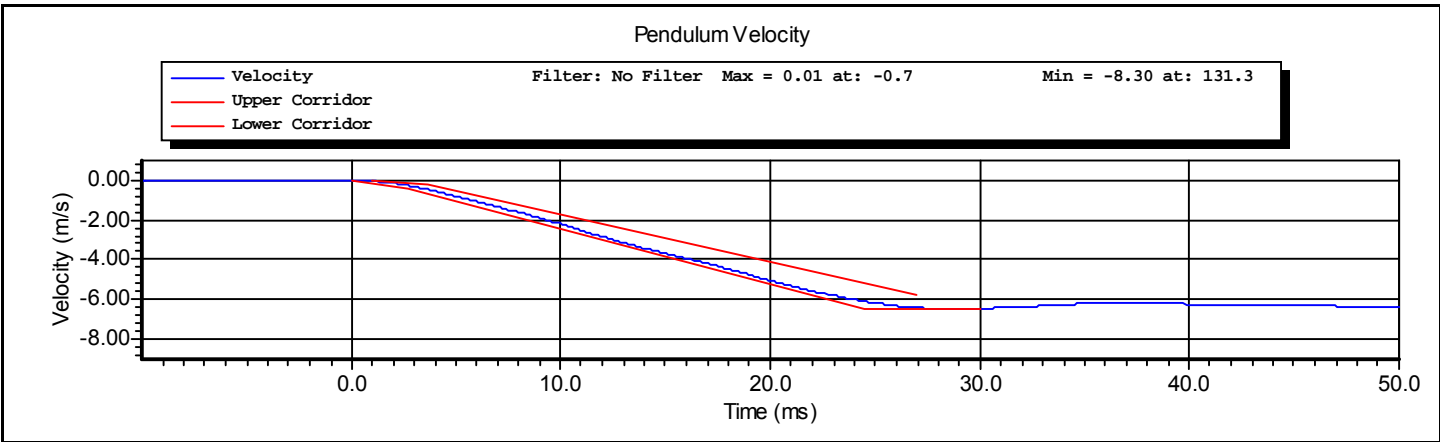
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Lumbar Spine	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Lumbar Spine	Test Date:	6/26/2010
Test Number:	2	Test Time:	9:07:21 AM

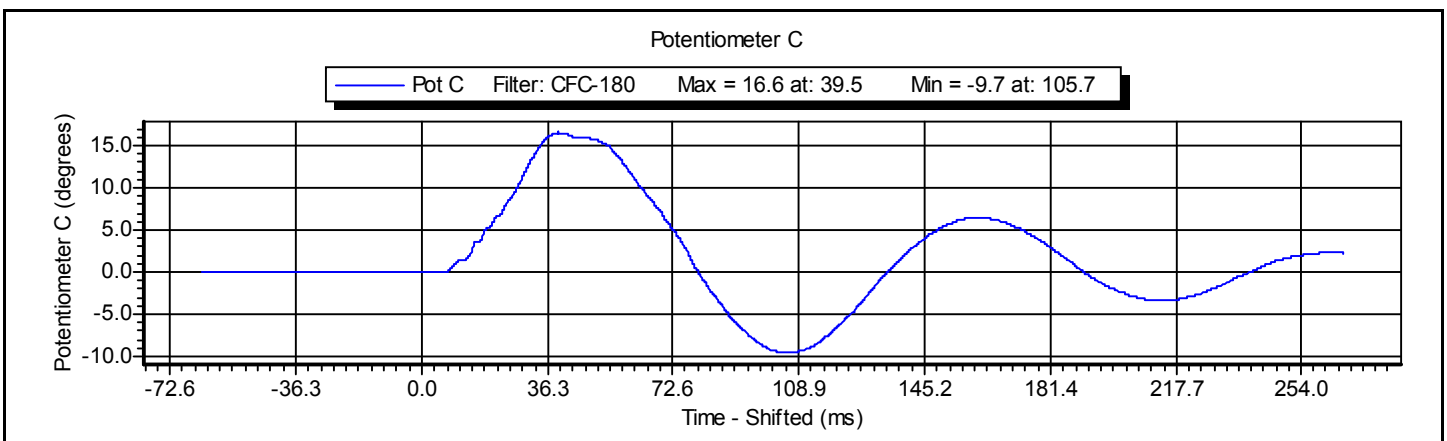
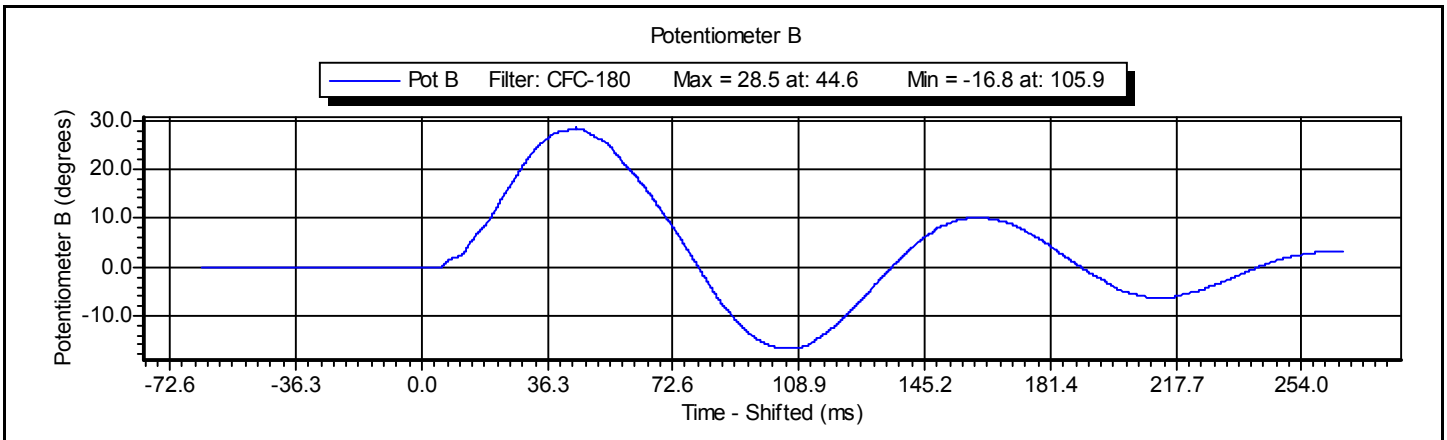
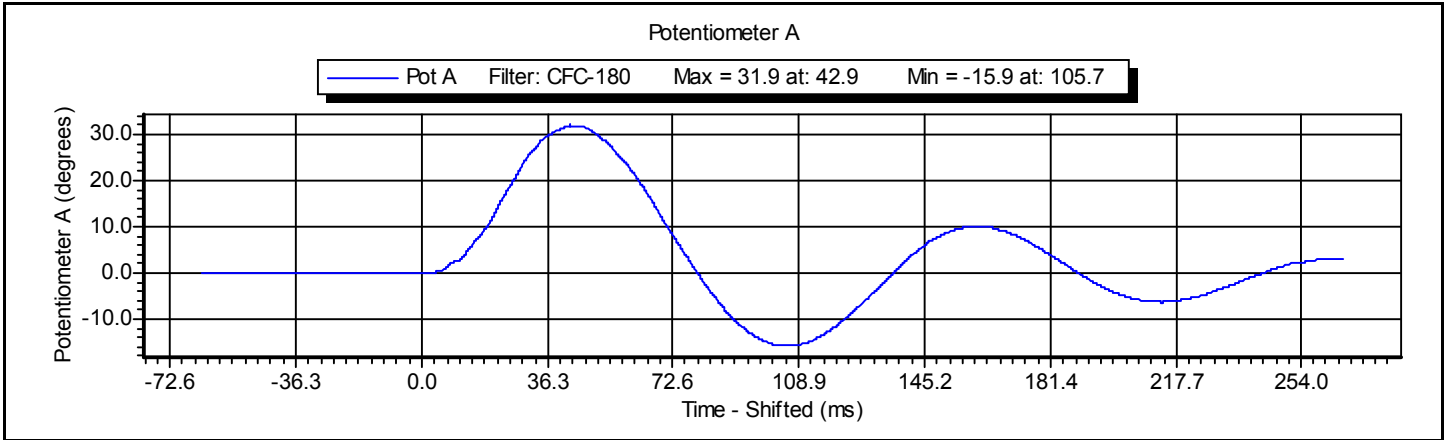
Component Part Number	Component Serial Number
175-5501	15-0376



Test ID: **Lumbar Spine**

Test Time: **9:07:21 AM**

Test Date: **6/26/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis Impact New	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Pelvis	Test Date:	6/26/2010
Test Number:	1	Test Time:	11:08:38 AM

Component Part Number	Component Serial Number
455-4003	

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	53 %RH P
Velocity	4.20 -- 4.40	4.32 m/s P
Peak Pendulum Force	-5.40 -- -4.70	-4.87 kN P
Time at Peak Pendulum Force	11.80 -- 16.10	15.02 ms P
Peak Pubic Symphysis Force	-1.59 -- -1.23	-1.48 kN P
Time at Peak Pubic Symphysis Force	12.20 -- 17.00	16.22 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Pelvis**

Test Time: **11:08:38 AM**

Test Date: **6/26/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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**

Test Time: **11:08:38 AM**

Test Date: **6/26/2010**



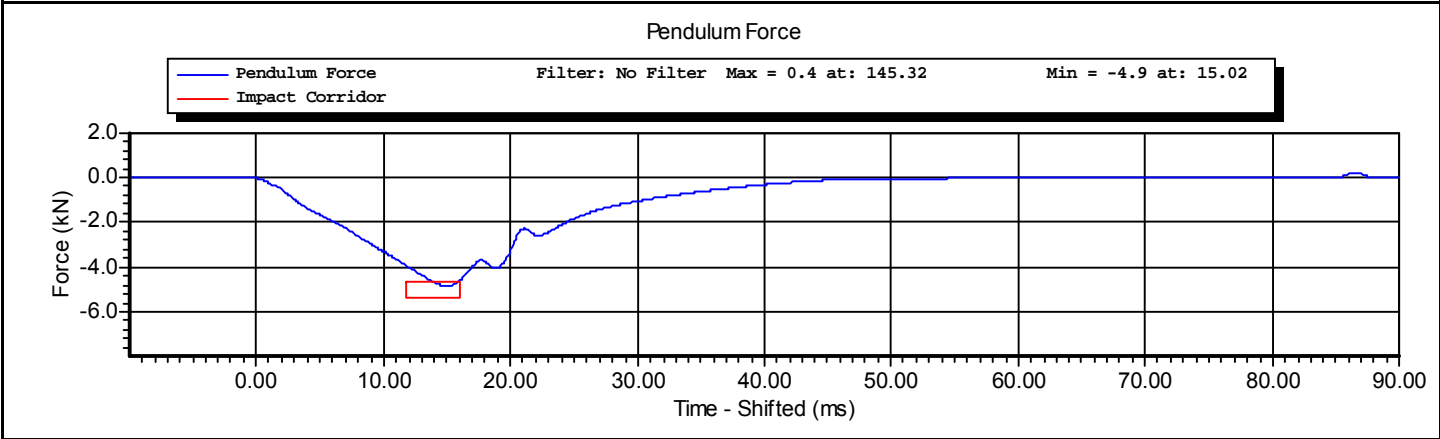
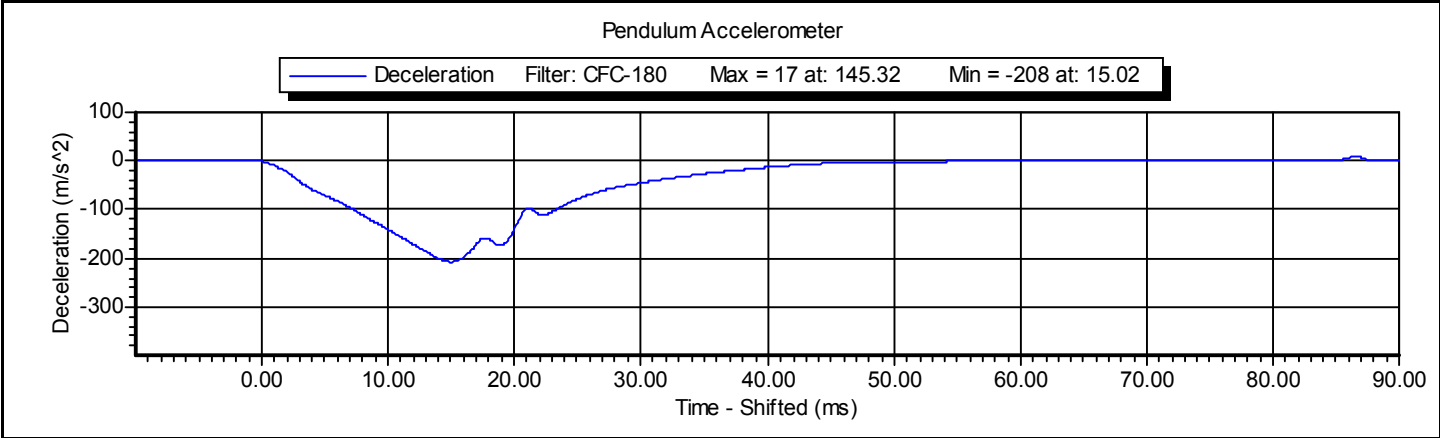
www.calspan.com

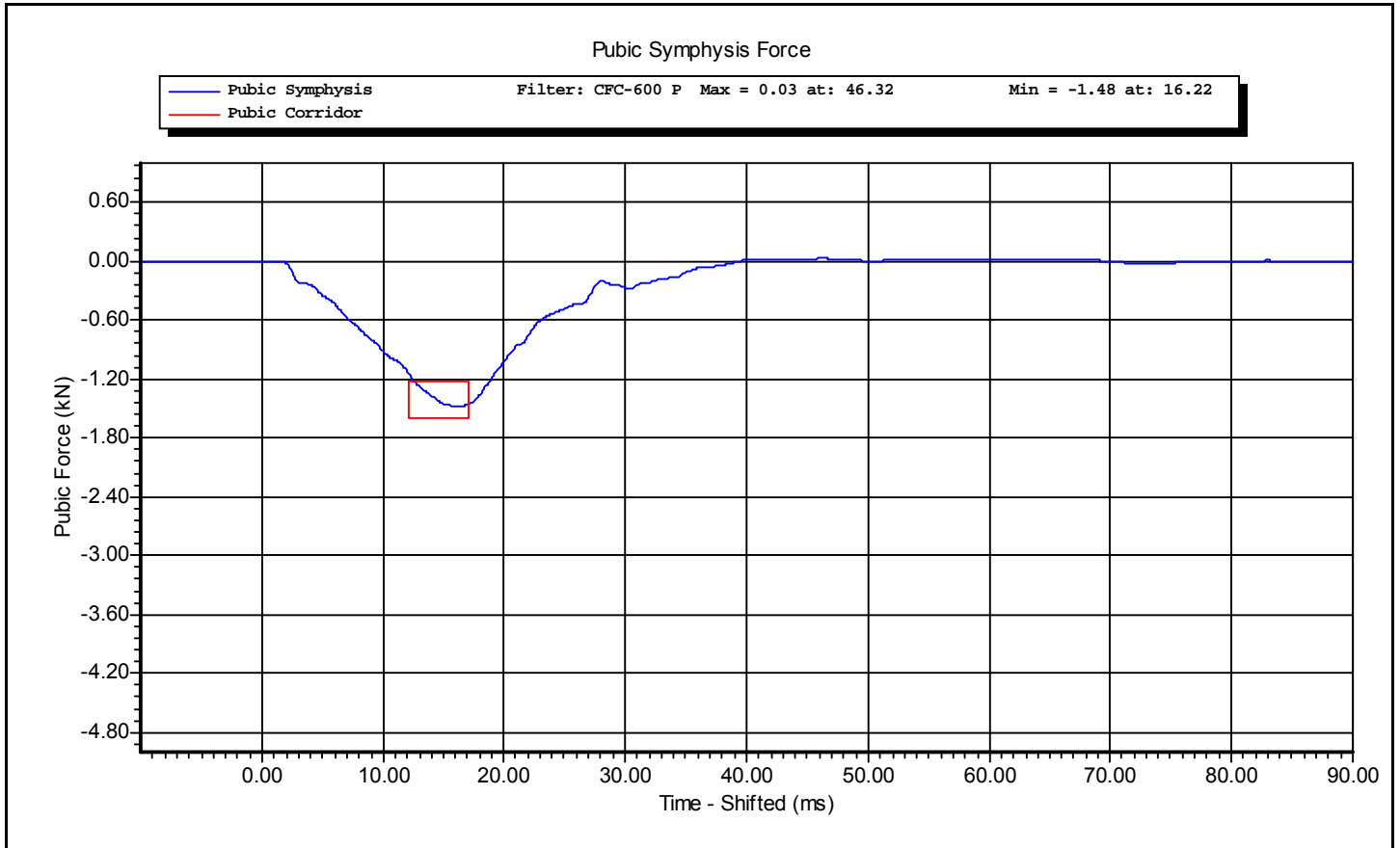
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Pelvis Impact New	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	ES-2re		
ATD Serial Number:	D037		
Test ID:	Pelvis	Test Date:	6/26/2010
Test Number:	1	Test Time:	11:08:38 AM

Component Part Number	Component Serial Number
455-4003	





APPENDIX F
SID-IIs PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIs NO.: 224

CONFIGURED FOR LEFT SIDE IMPACT



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

SID-IIsD External Measurements

S/N 224

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	782	Yes
B	Shoulder Pivot Height	437.0 - 453.0	440	Yes
C	H-Point Height	79.0 - 89.0	80	Yes
D	H-Point from Seat Back	141.0 - 151.0	143	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	104	Yes
F	Thigh Clearance	119.0 - 135.0	125	Yes
G	Head Breadth	140.0 - 148.0	144	Yes
H	Head Back from Backline	40.0 - 46.0	43	Yes
I	Head Depth	178.0 - 188.0	182	Yes
J	Head Circumference	541.0 - 551.0	546	Yes
K	Buttock to Knee Length	514.0 - 540.0	523	Yes
L	Popliteal Height	343.0 - 369.0	349	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	398	Yes
N	Buttock Popliteal Length	416.0 - 442.0	423	Yes
O	Chest Depth without Jacket	195.0 - 211.0	201	Yes
P	Foot Length (right)	216.0 - 232.0	221	Yes
P	Foot Length (left)	216.0 - 232.0	221	Yes
Q	Hip Breadth	313.0 - 323.0	318	Yes
R	Arm Length	249.0 - 259.0	252	Yes
S	Knee Joint to Seat back	478.0 - 493.0	484	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	353	Yes
W	Foot Width (right)	78.0 - 94.0	80	Yes
W	Foot Width (left)	78.0 - 94.0	80	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	865	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

Technician : A. Rudniski

Date: 5/26/2010



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Head Drop	Test Date:	6/1/2010
Test Number:	1	Test Time:	1:58:24 PM

Component Part Number	Component Serial Number
FTSS 880105-106	1105

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	64 %RH P
Resultant Acceleration	115.0 -- 137.0	134.3 g P
Oscillation	0.0 -- 15.0	1.3 % P
Fore-Aft Acceleration	-15.0 -- 15.0	-5.1 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Head Drop**

Test Time: **1:58:24 PM**

Test Date: **6/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P23142	2/12/2010
Endevco	7264-2000	P16593	2/12/2010
Endevco	7264-2000	P32219	2/12/2010

Test ID: **Head Drop**

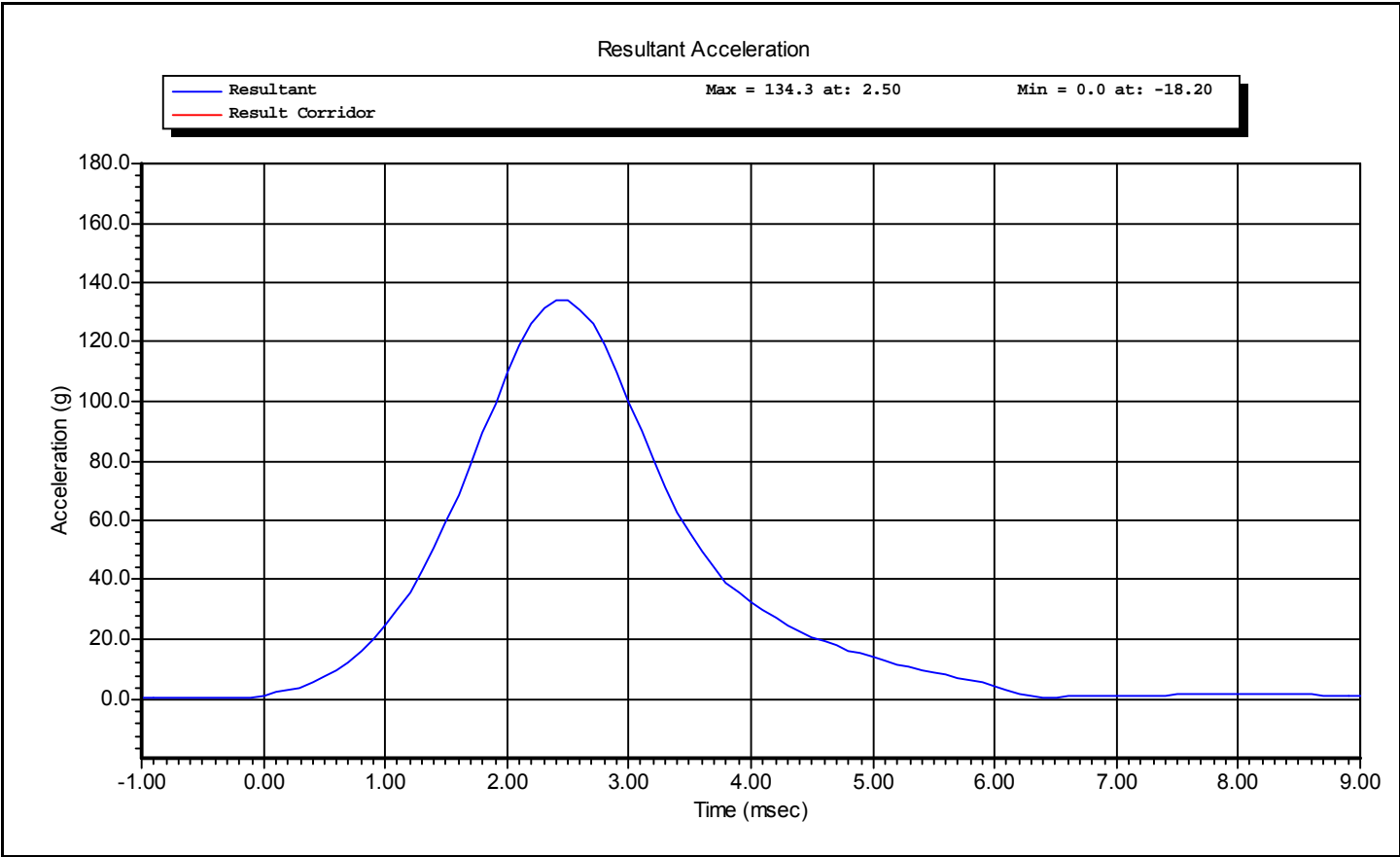
Test Time: **1:58:24 PM**

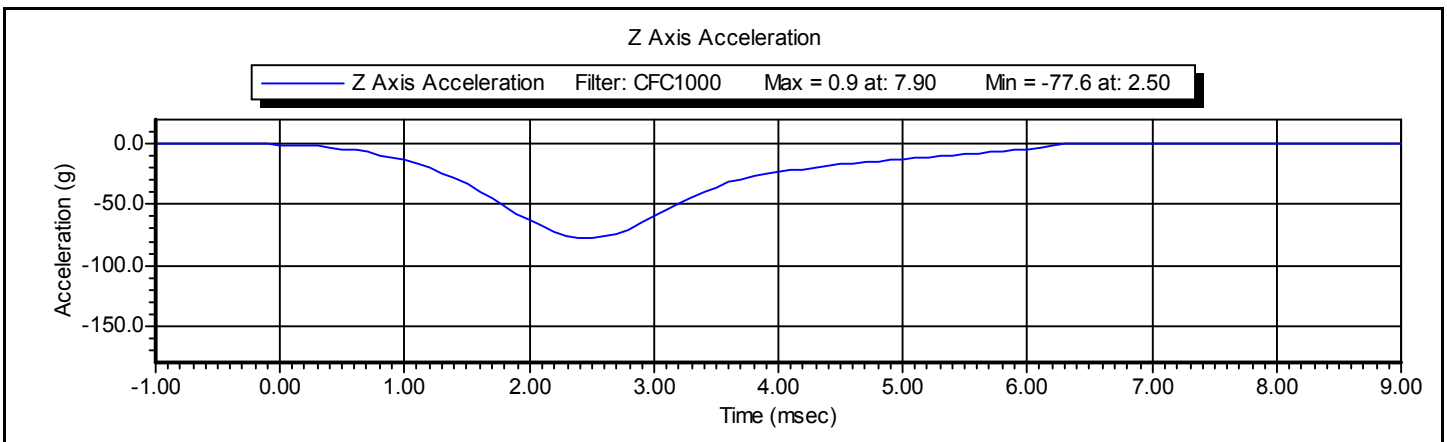
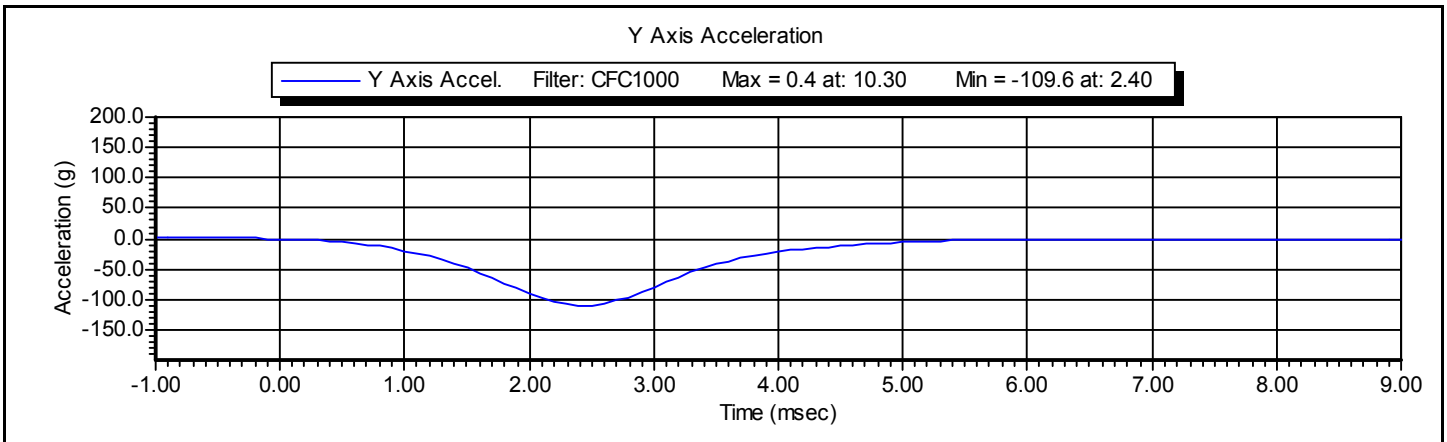
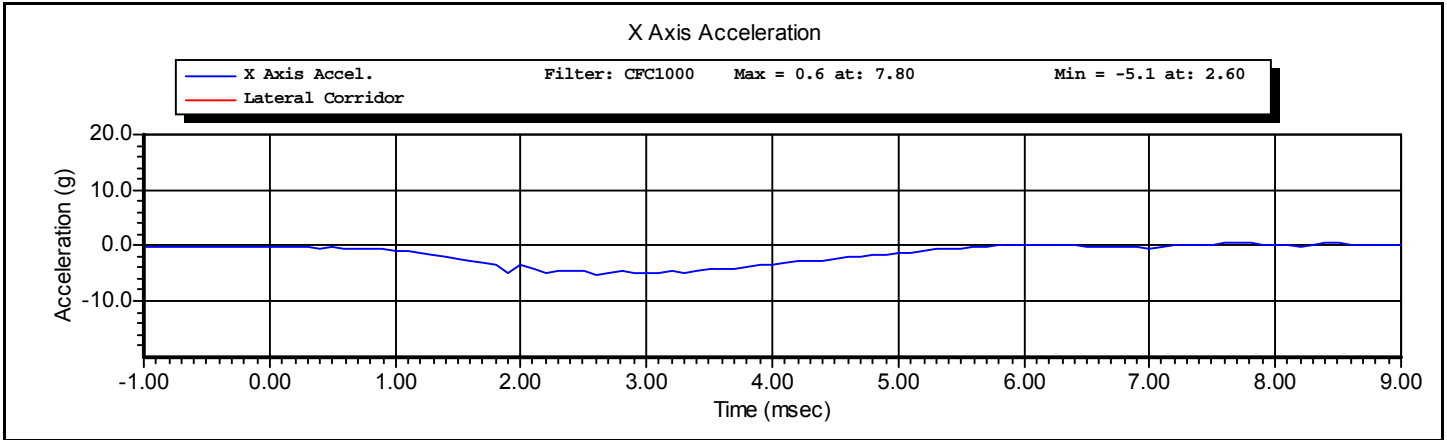
Test Date: **6/1/2010**



Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Head Drop	Test Date:	6/1/2010
Test Number:	1	Test Time:	1:58:24 PM

Component Part Number	Component Serial Number
FTSS 880105-106	1105







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Neck Pendulum	Revision:	8/24/2009
Sub Test Name:	Left Side	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Neck Flexion	Test Date:	6/1/2010
Test Number:	1	Test Time:	1:26:20 PM

Component Part Number	Component Serial Number
Neck - 180-2001	AB8236

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	61 %RH P
Velocity	5.51 -- 5.63	5.58 m/s P
Pendulum Impulse at 10 ms	2.20 -- 2.80	2.44 m/s P
Pendulum Impulse at 15 ms	3.30 -- 4.10	3.58 m/s P
Pendulum Impulse at 20 ms	4.40 -- 5.40	4.91 m/s P
Pendulum Impulse at 25 ms	5.40 -- 6.10	5.74 m/s P
Pendulum Impulse between 25 and 100 ms	5.50 -- 6.20	5.77 m/s P
Max D Plane Rotation	71.0 -- 81.0	74.2 degrees P
Time at Max Rotation	50.0 -- 70.0	61.1 ms P
Moment about OC	-44.0 -- -36.0	-43.1 Nm P
Moment Decay to Zero	102.0 -- 126.0	120.6 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Neck Flexion**

Test Time: **1:26:20 PM**

Test Date: **6/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Denton	1716A	LC-576 Fy	1/12/2010
Denton	1716A	LC-576 Mx	1/12/2010
DentonATD	78051-342	184	4/30/2010
DentonATD	78051-342	174	4/30/2010
DentonATD	78051-342	185	4/30/2010

Test ID: **Neck Flexion**

Test Time: **1:26:20 PM**

Test Date: **6/1/2010**



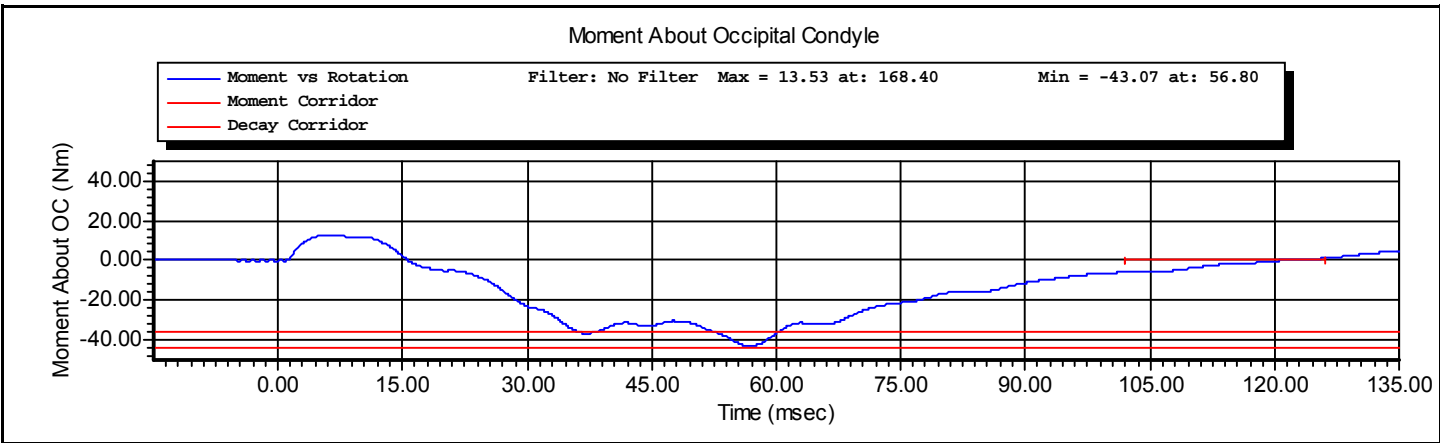
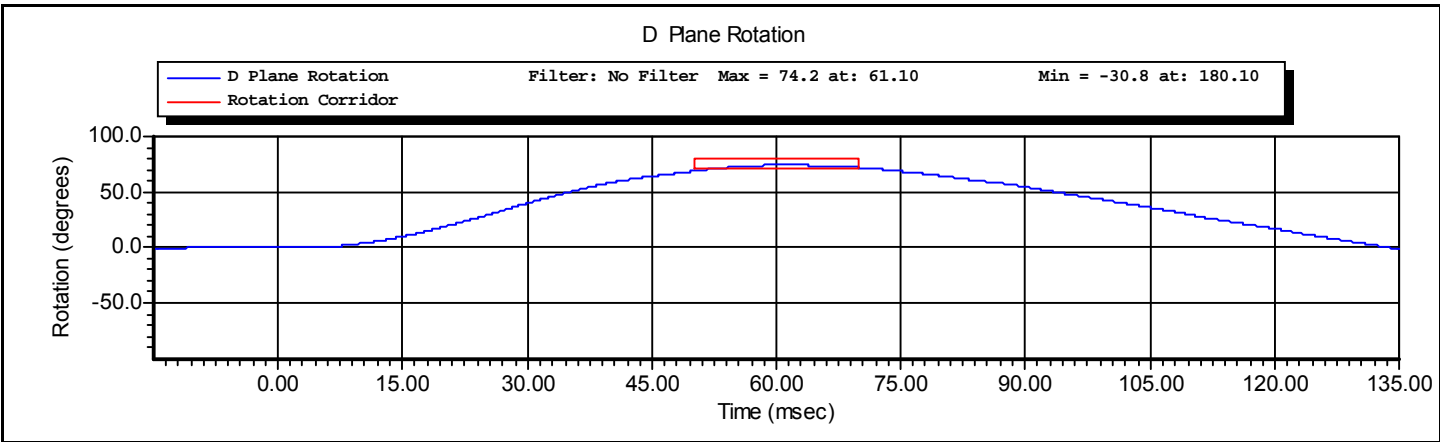
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Neck Pendulum	Revision:	8/24/2009
Sub Test Name:	Left Side	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Neck Flexion	Test Date:	6/1/2010
Test Number:	1	Test Time:	1:26:20 PM

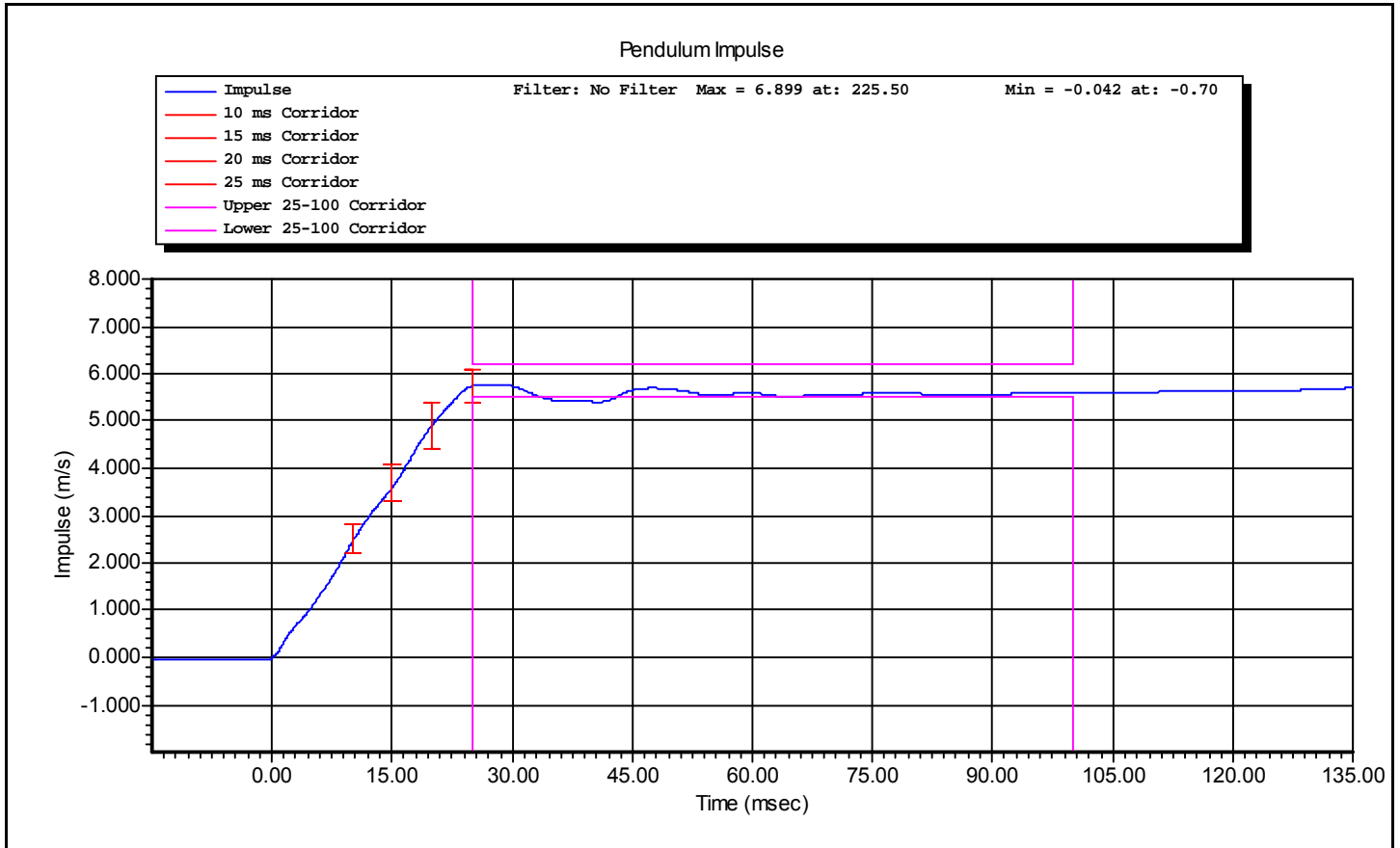
Component Part Number	Component Serial Number
Neck - 180-2001	AB8236



Test ID: **Neck Flexion**

Test Time: **1:26:20 PM**

Test Date: **6/1/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Shoulder Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Shoulder	Test Date:	5/27/2010
Test Number:	1	Test Time:	9:41:40 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.70 deg C P
Humidity	10.0 -- 70.0	66.0 %RH P
Velocity	4.20 -- 4.40	4.34 m/s P
Probe Acceleration	13.0 -- 18.0	16.3 g P
Shoulder Deflection	28.0 -- 37.0	32.5 mm P
T1 Acceleration	17.0 -- 22.0	19.9 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Shoulder**

Test Time: **9:41:40 AM**

Test Date: **5/27/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Servo	180-3885	DS-125	4/26/2010
Endevco	7264-2000	P16862	3/29/2010

Test ID: **Shoulder**

Test Time: **9:41:40 AM**

Test Date: **5/27/2010**



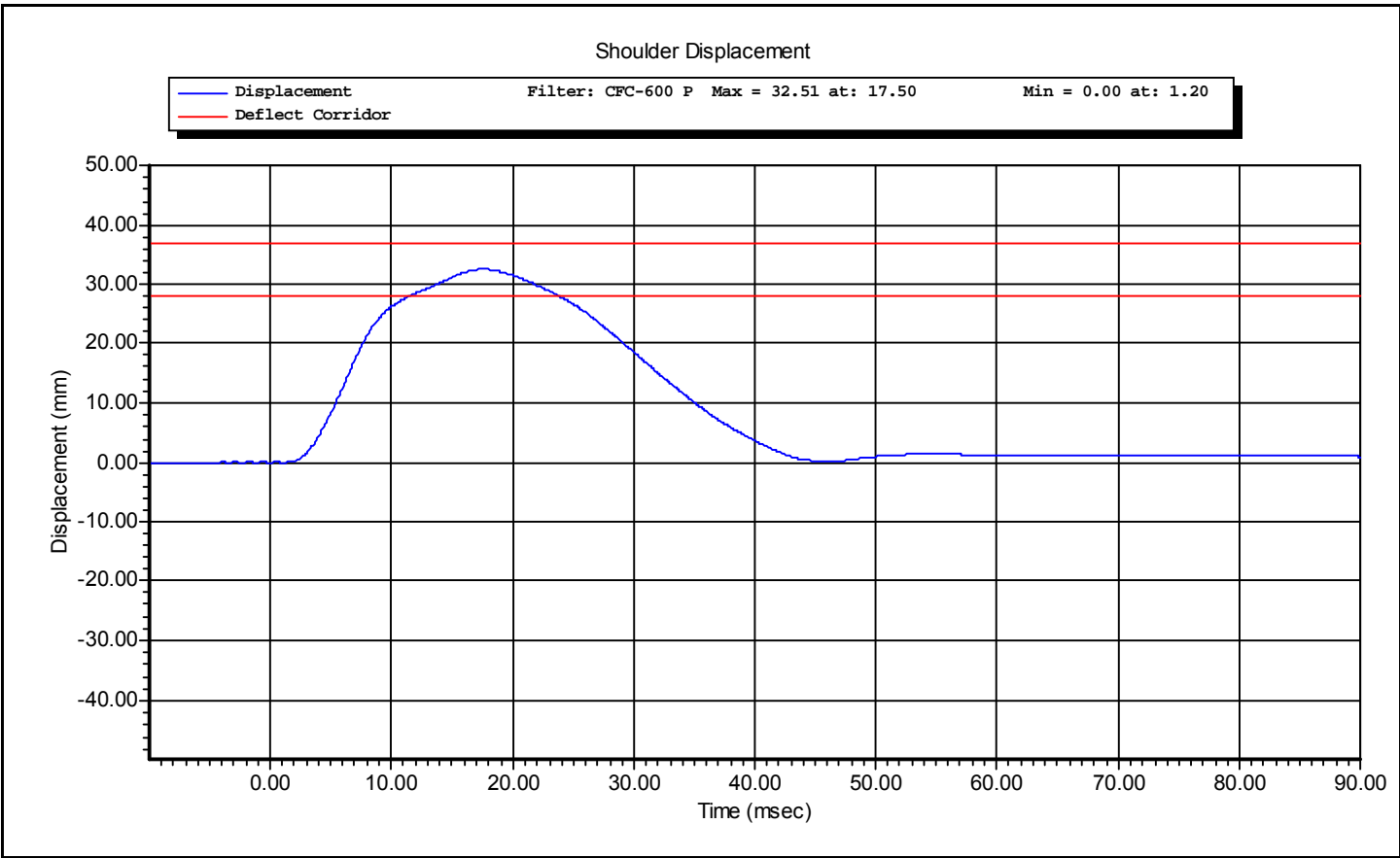
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Shoulder Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Shoulder	Test Date:	5/27/2010
Test Number:	1	Test Time:	9:41:40 AM

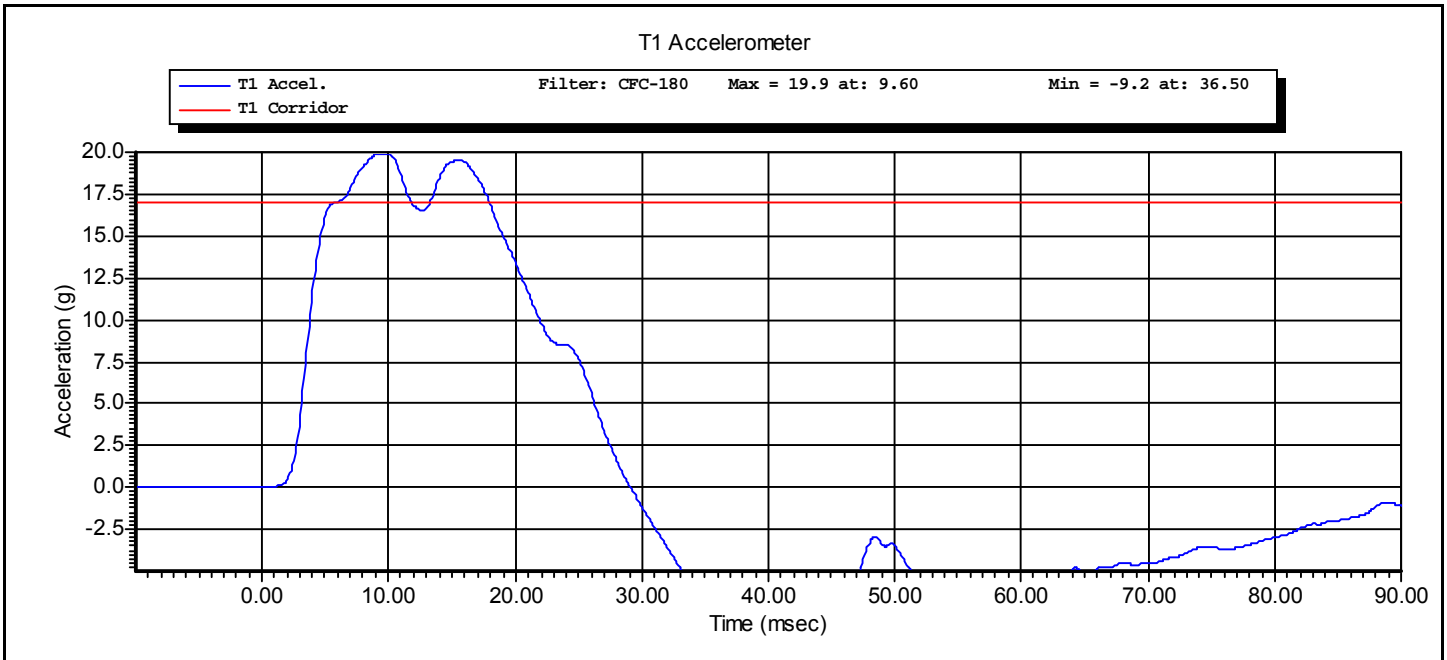
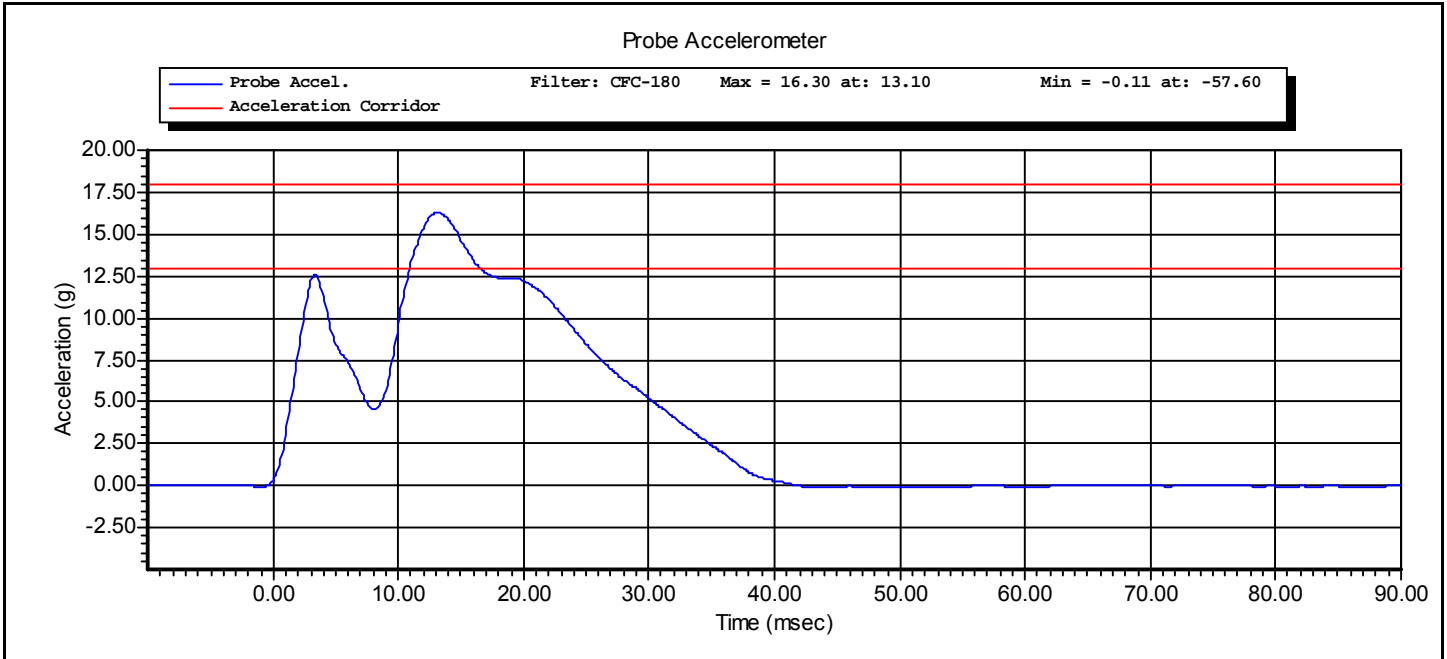
Component Part Number	Component Serial Number
-----------------------	-------------------------



Test ID: **Shoulder**

Test Time: **9:41:40 AM**

Test Date: **5/27/2010**





www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact with Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax With Arm	Test Date:	6/1/2010
Test Number:	1	Test Time:	10:12:47 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	66 %RH P
Velocity	6.60 -- 6.80	6.67 m/s P
Probe Acceleration after 5ms	30.0 -- 36.0	32.9 g P
Upper Thorax Rib Deflection	25.0 -- 32.0	26.7 mm P
Mid Thorax Rib Deflection	30.0 -- 36.0	30.6 mm P
Lower Thorax Rib Deflection	32.0 -- 38.0	34.1 mm P
Upper Spine Acceleration ("y")	34.0 -- 43.0	39.9 g P
Lower Spine Acceleration ("y")	29.0 -- 37.0	33.8 g P
Shoulder Deflection	31.0 -- 40.0	36.9 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax With Arm**

Test Time: **10:12:47 AM**

Test Date: **6/1/2010**



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
Servo	180-3885	DS-145	4/26/2010
Servo	180-3885	DS-222	4/26/2010
Servo	180-3885	DS-224	4/26/2010
Endevco	7264-2000	P16862	3/29/2010
Endevco	7264-2000	P23939	4/13/2010
Servo	180-3885	DS-125	4/26/2010

Test ID: **Thorax With Arm**

Test Time: **10:12:47 AM**

Test Date: **6/1/2010**



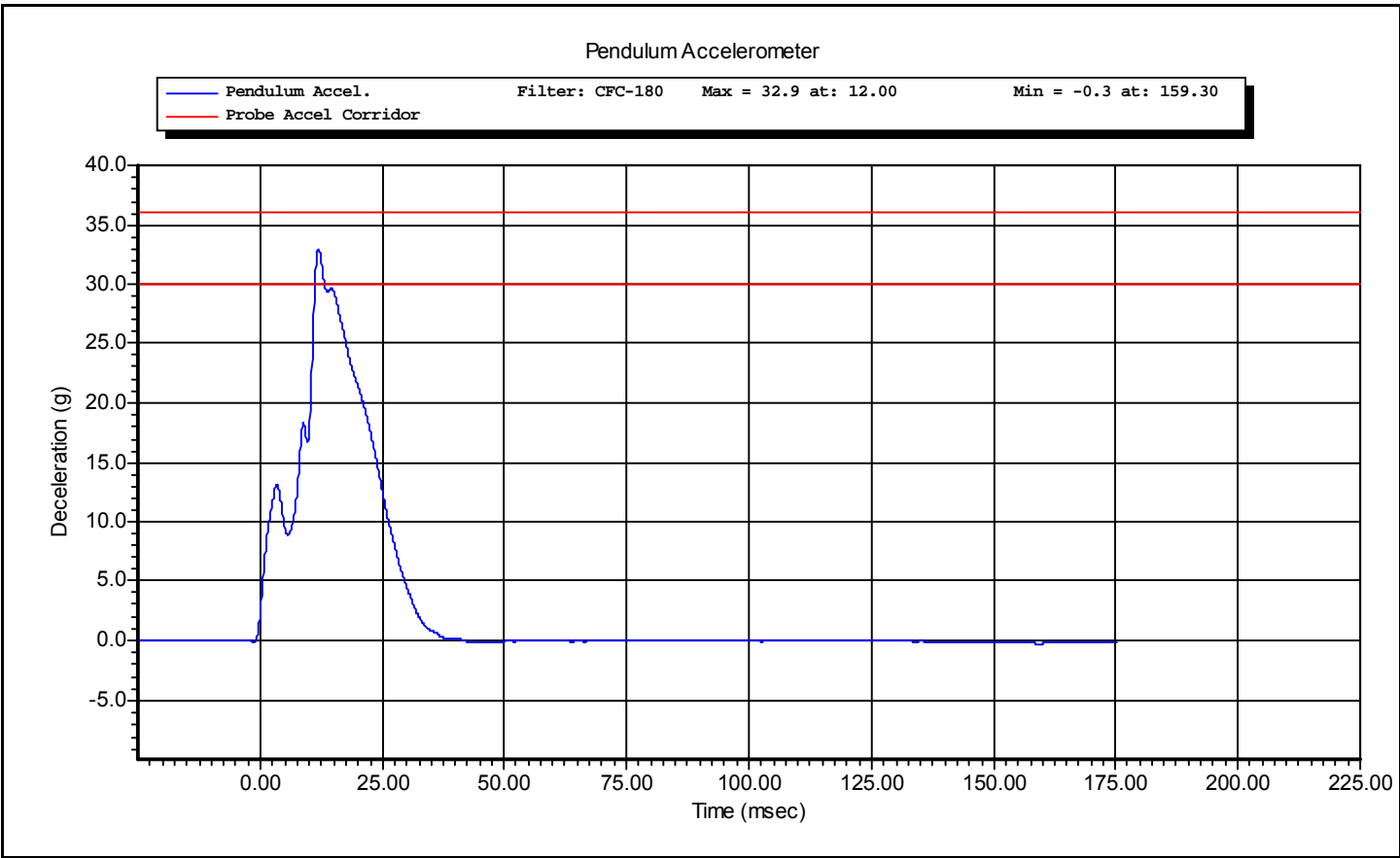
www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

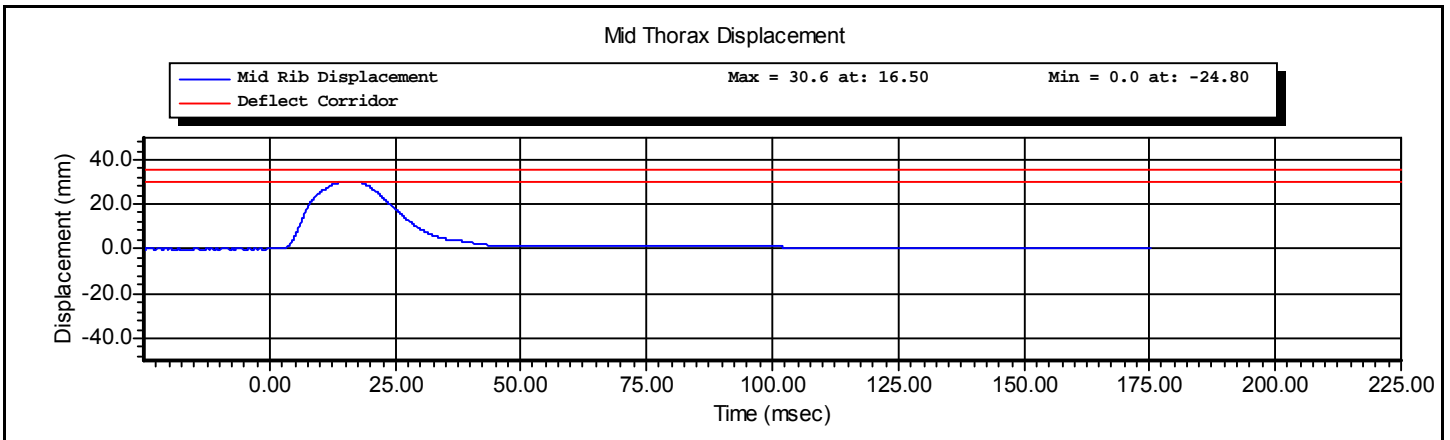
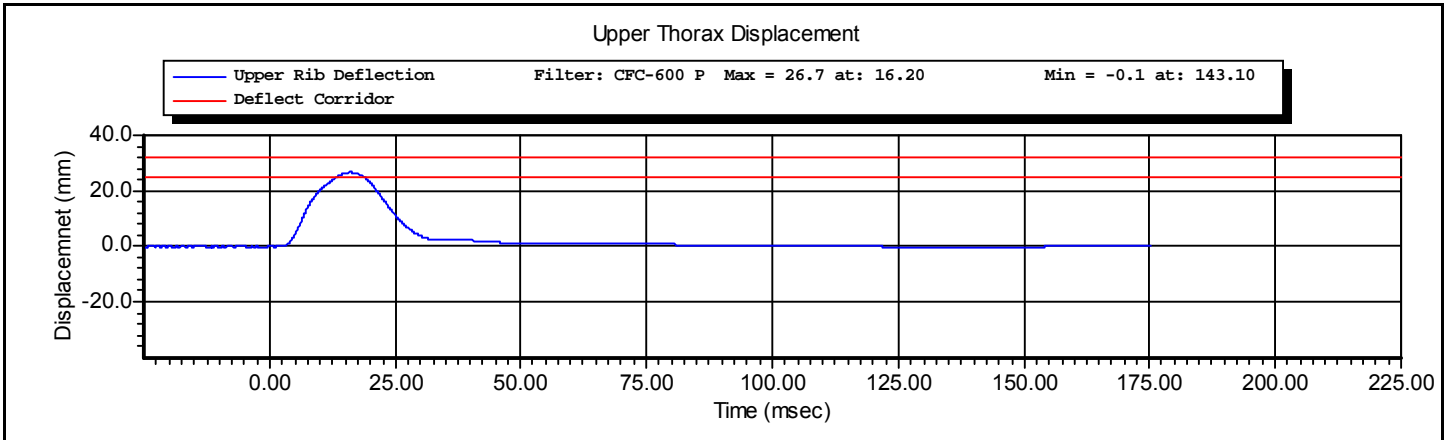
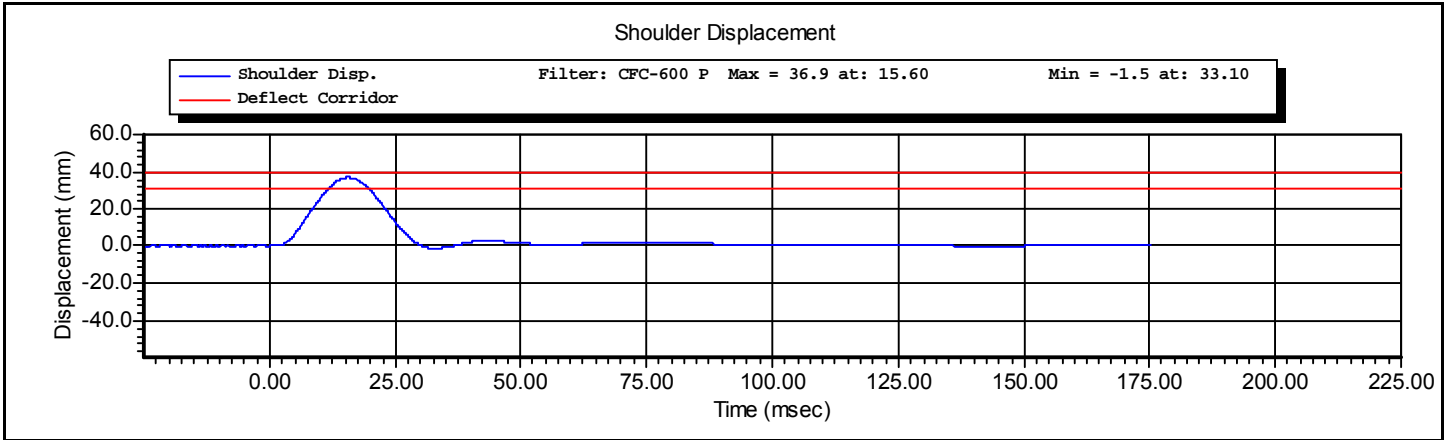
Test Name:	Thorax Impact with Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax With Arm	Test Date:	6/1/2010
Test Number:	1	Test Time:	10:12:47 AM

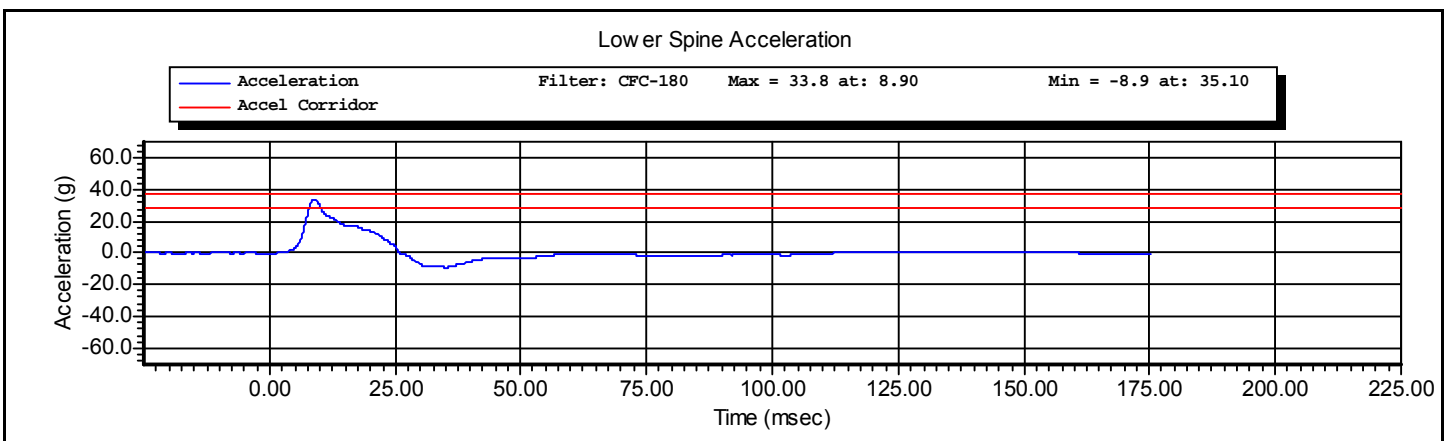
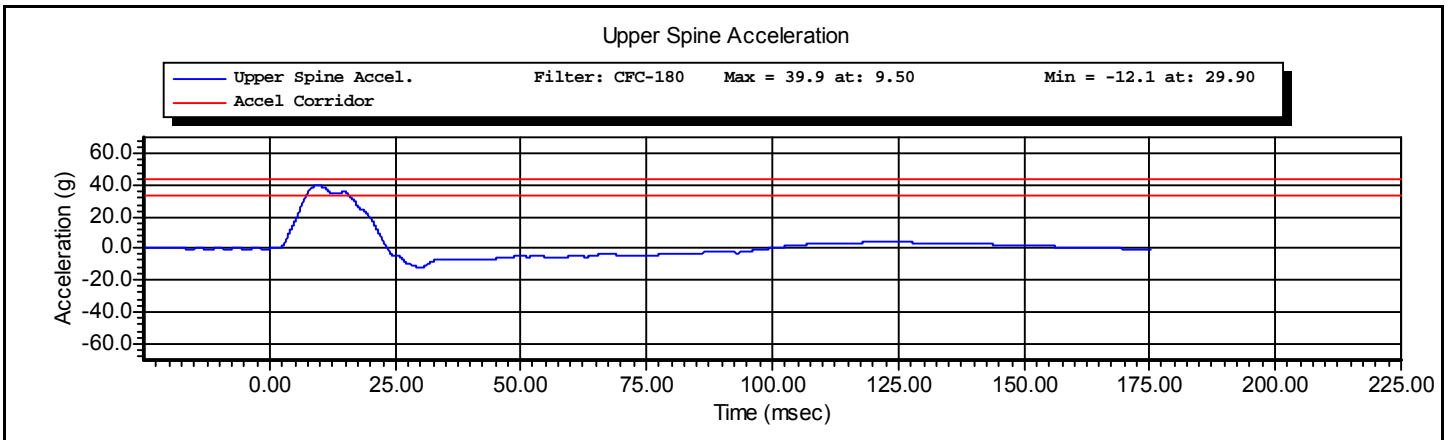
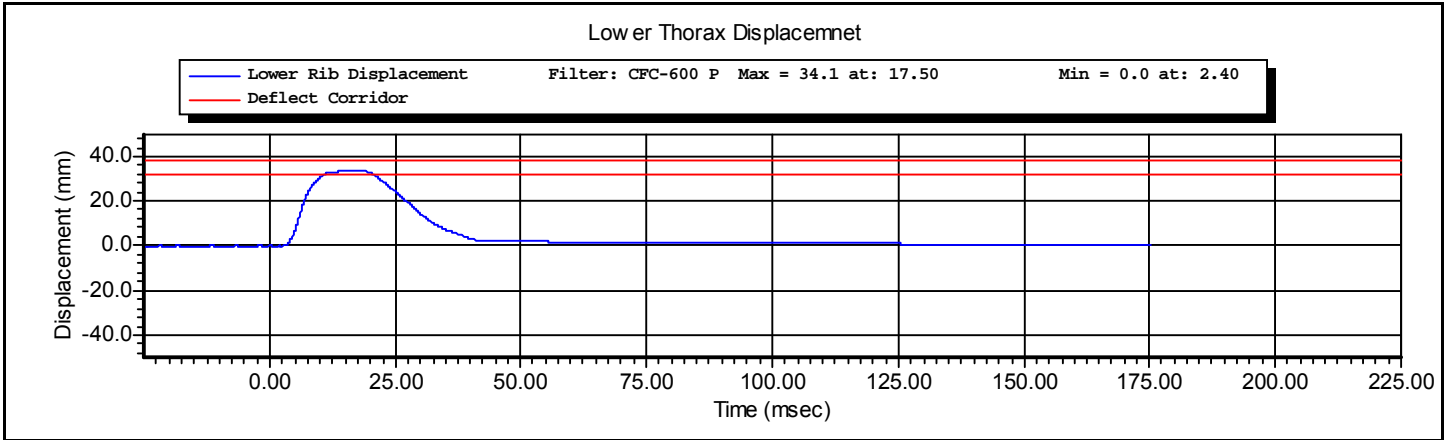
Component Part Number	Component Serial Number
-----------------------	-------------------------



Test ID: **Thorax With Arm** Test Time: **10:12:47 AM**

Test Date: **6/1/2010**







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact without Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax Without Arm	Test Date:	6/1/2010
Test Number:	1	Test Time:	9:37:55 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	66 %RH P
Velocity	4.20 -- 4.40	4.39 m/s P
Probe Acceleration	14.0 -- 18.0	16.7 g P
Upper Thorax Rib Deflection	32.0 -- 40.0	35.7 mm P
Mid Thorax Rib Deflection	39.0 -- 45.0	41.0 mm P
Lower Thorax Rib Deflection	35.0 -- 43.0	39.7 mm P
Upper Spine Acceleration T1	13.0 -- 17.0	16.0 g P
Lower Spine Acceleration T12	7.0 -- 11.0	10.2 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax Without Arm** Test Time: **9:37:55 AM**

Test Date: **6/1/2010**



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
Servo	180-3885	DS-145	4/26/2010
Servo	180-3885	DS-222	4/26/2010
Servo	180-3885	DS-224	4/26/2010
Endevco	7264-2000	P16862	3/29/2010
Endevco	7264-2000	P23939	4/13/2010

Test ID: **Thorax Without Arm** Test Time: **9:37:55 AM**

Test Date: **6/1/2010**



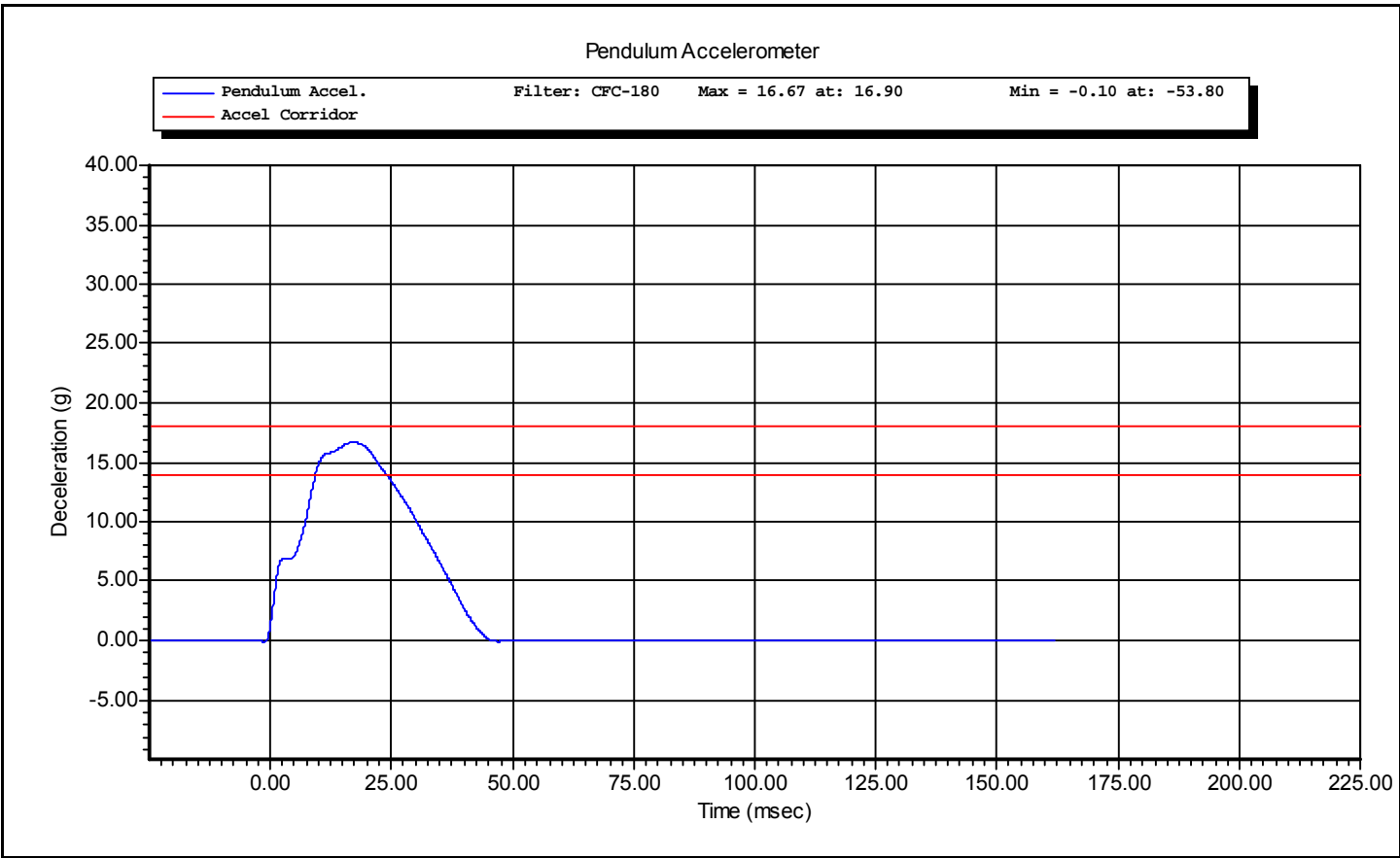
www.calspan.com

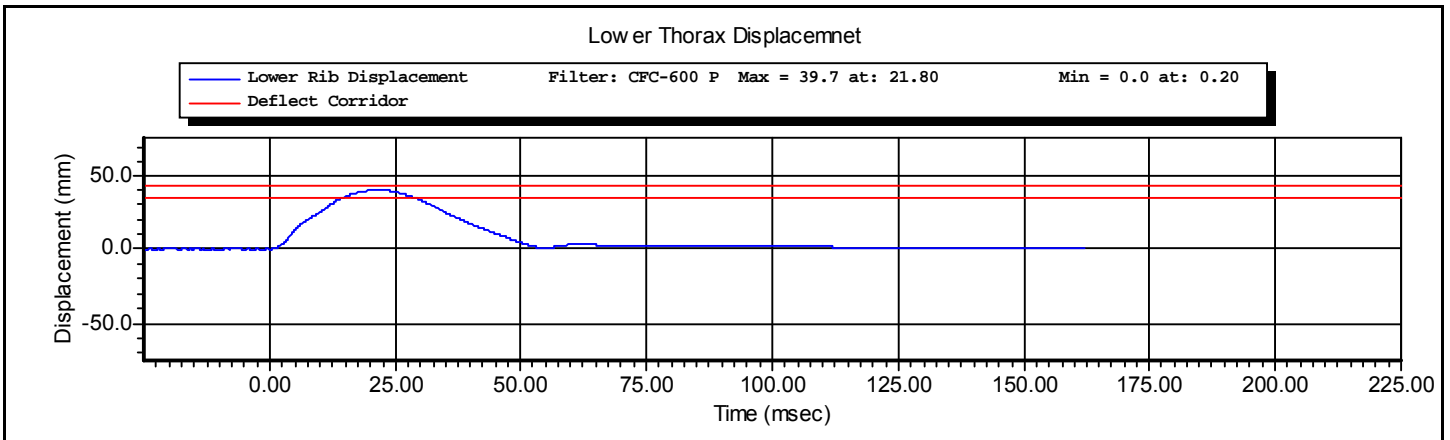
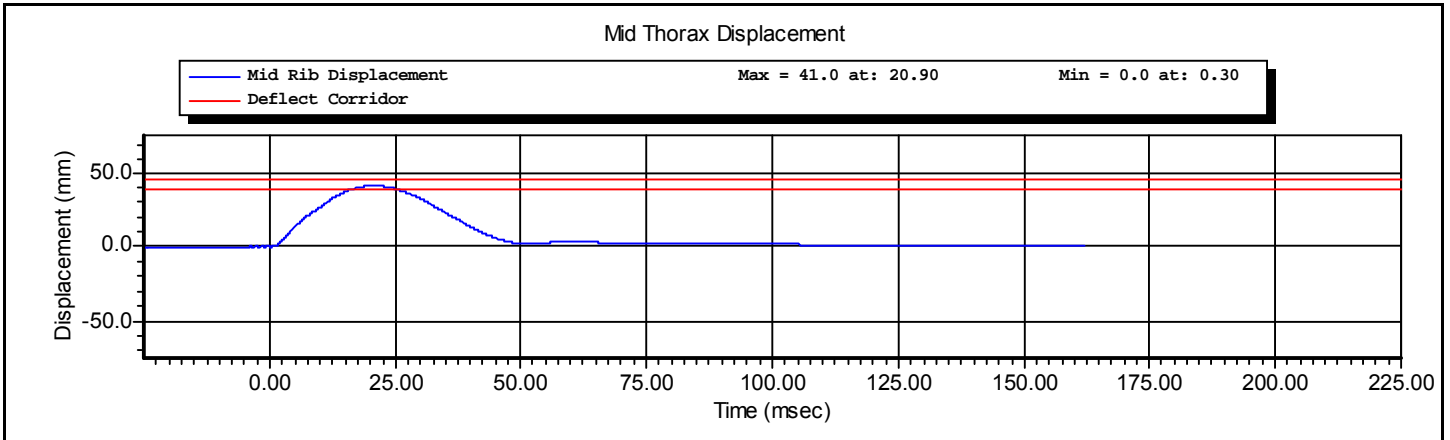
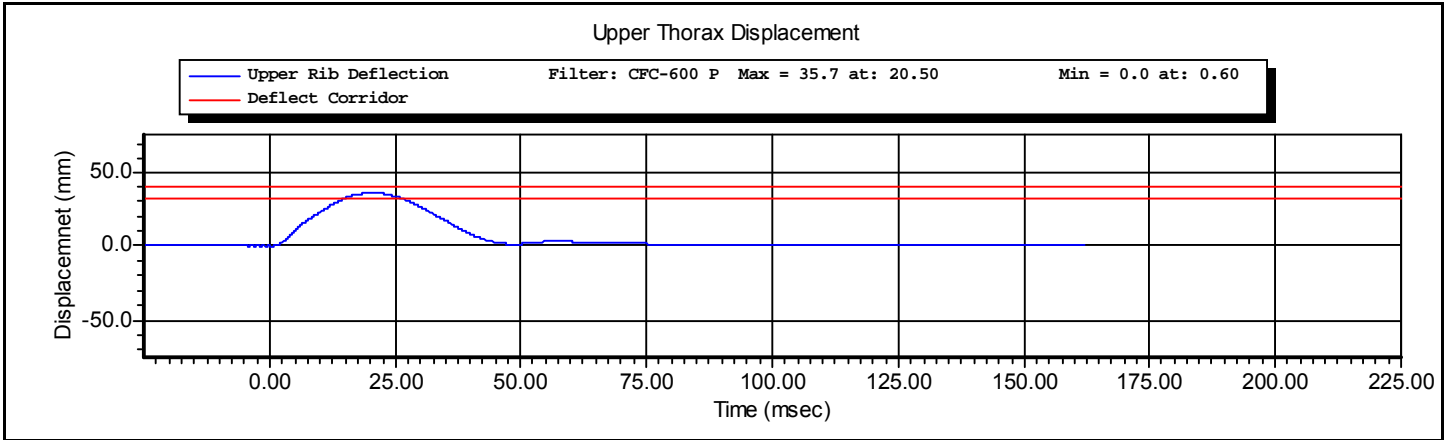
Calspan - Transportation Research Group

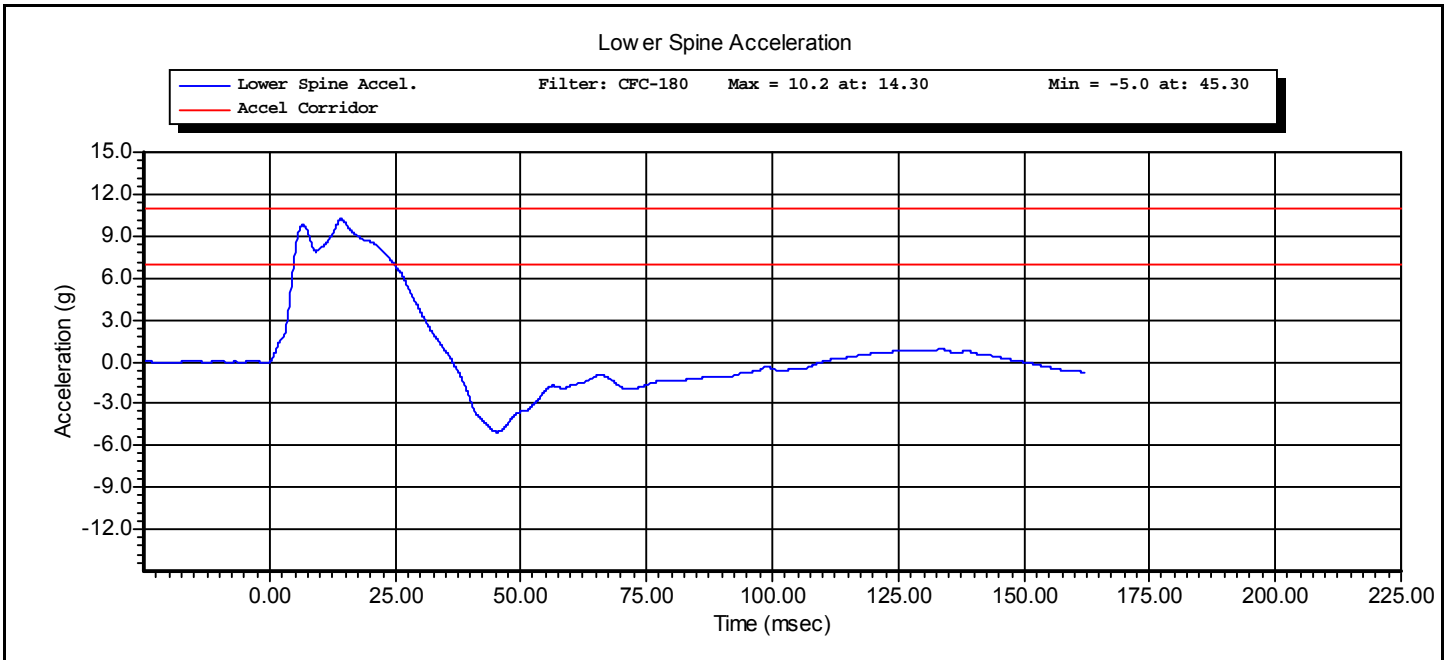
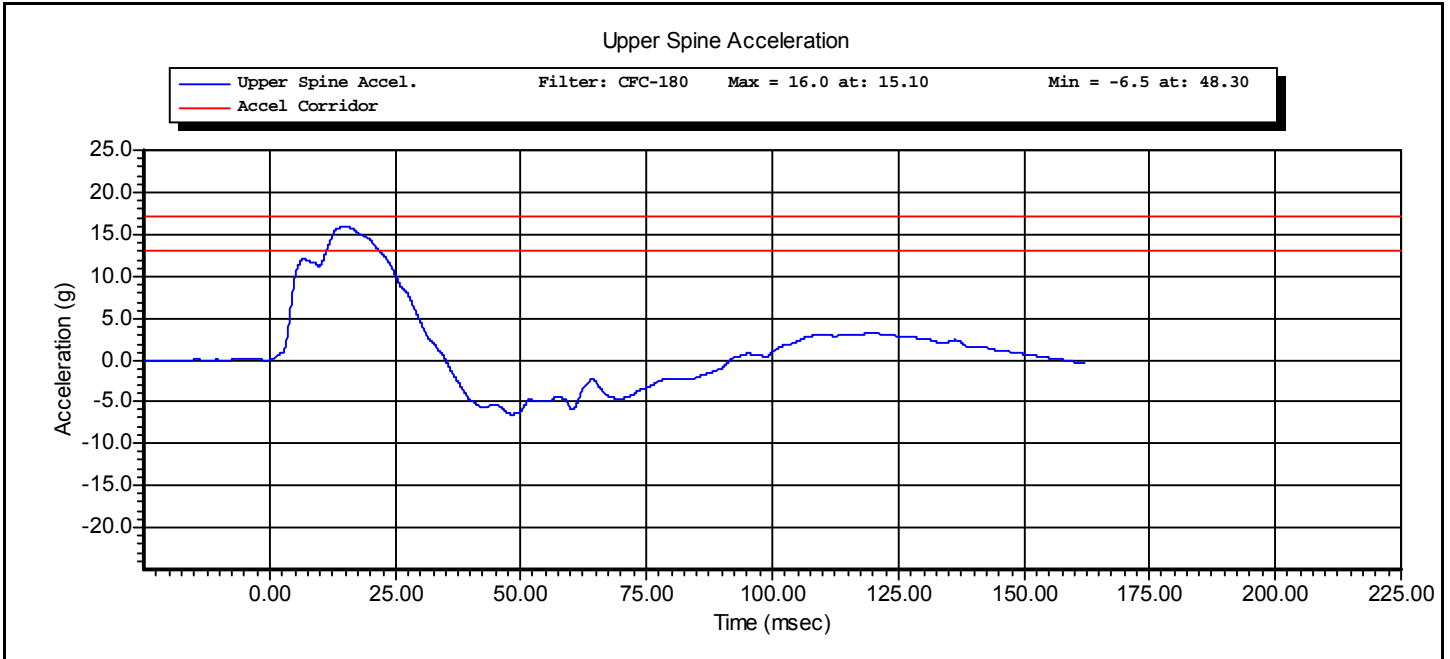
4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Thorax Impact without Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax Without Arm	Test Date:	6/1/2010
Test Number:	1	Test Time:	9:37:55 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------









www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Abdominal Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Abdominal Impact	Test Date:	6/1/2010
Test Number:	2	Test Time:	11:34:16 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	66 %RH P
Velocity	4.20 -- 4.40	4.40 m/s P
Probe Acceleration	12.0 -- 16.0	14.3 g P
Upper Abdominal Rib Deflection	36.0 -- 47.0	43.1 mm P
Lower Abdominal Rib Deflection	33.0 -- 44.0	39.9 mm P
Lower Spine Acceleration - T12	9.0 -- 14.0	11.6 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Abdominal Impact** Test Time: **11:34:16 AM** Test Date: **6/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Servo	180-3885	DS-225	4/26/2010
Servo	180-3885	DS-230	4/26/2010
Endevco	7264-2000	P23939	4/13/2010

Test ID: **Abdominal Impact** Test Time: **11:34:16 AM**

Test Date: **6/1/2010**



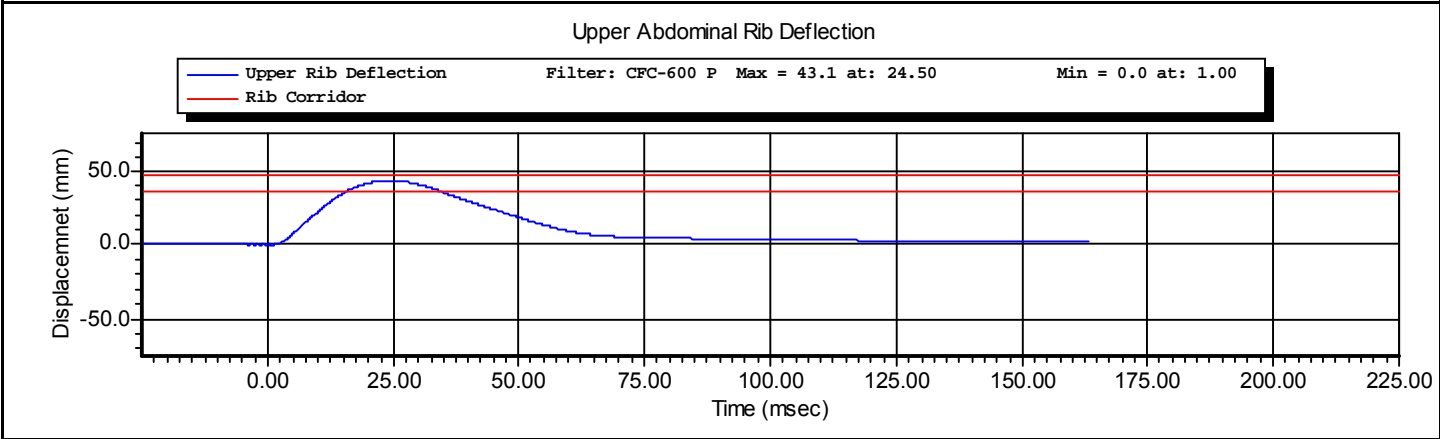
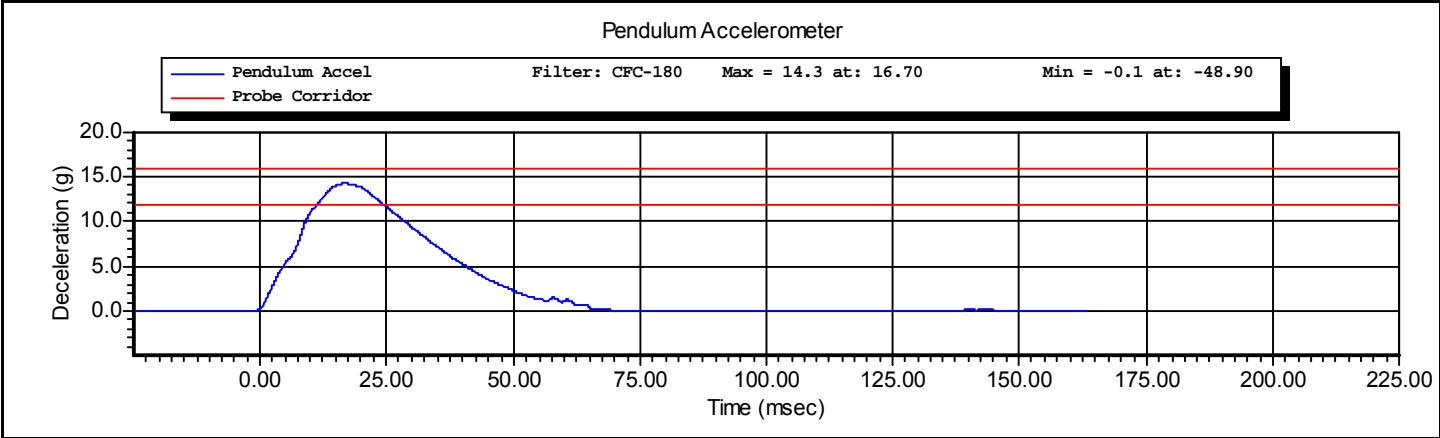
www.calspan.com

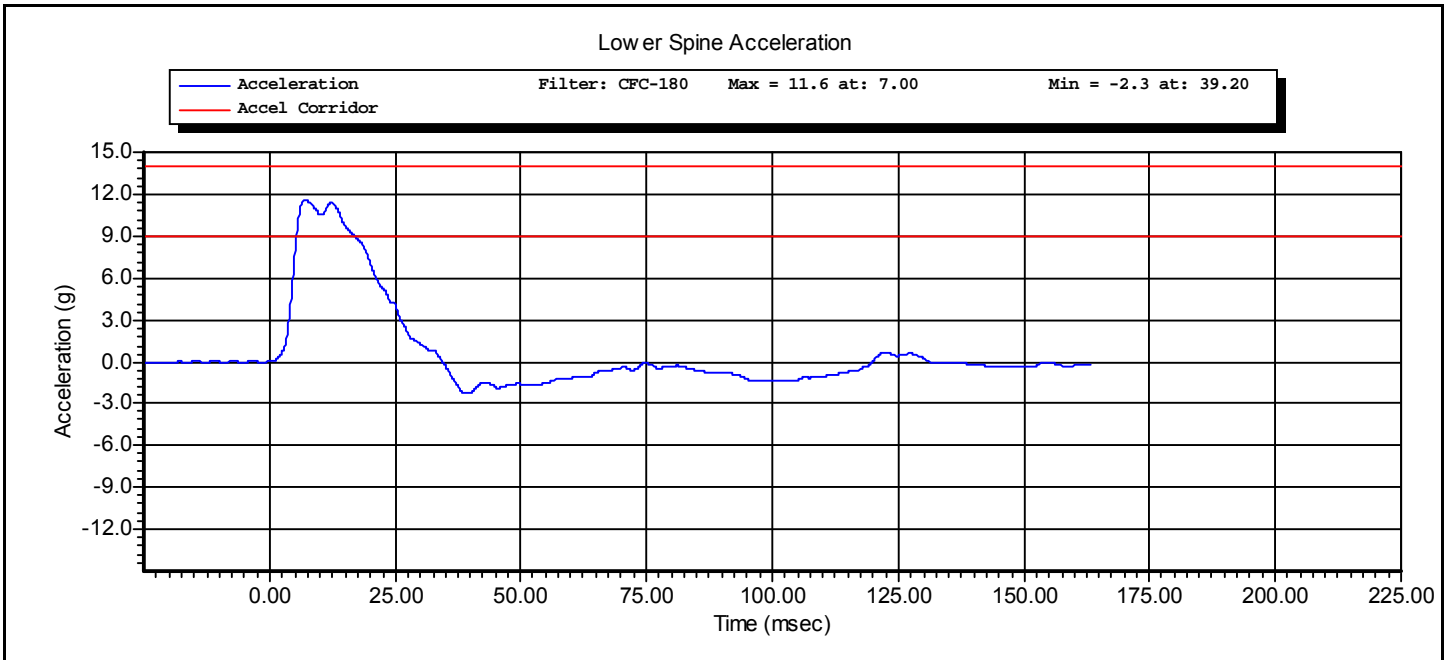
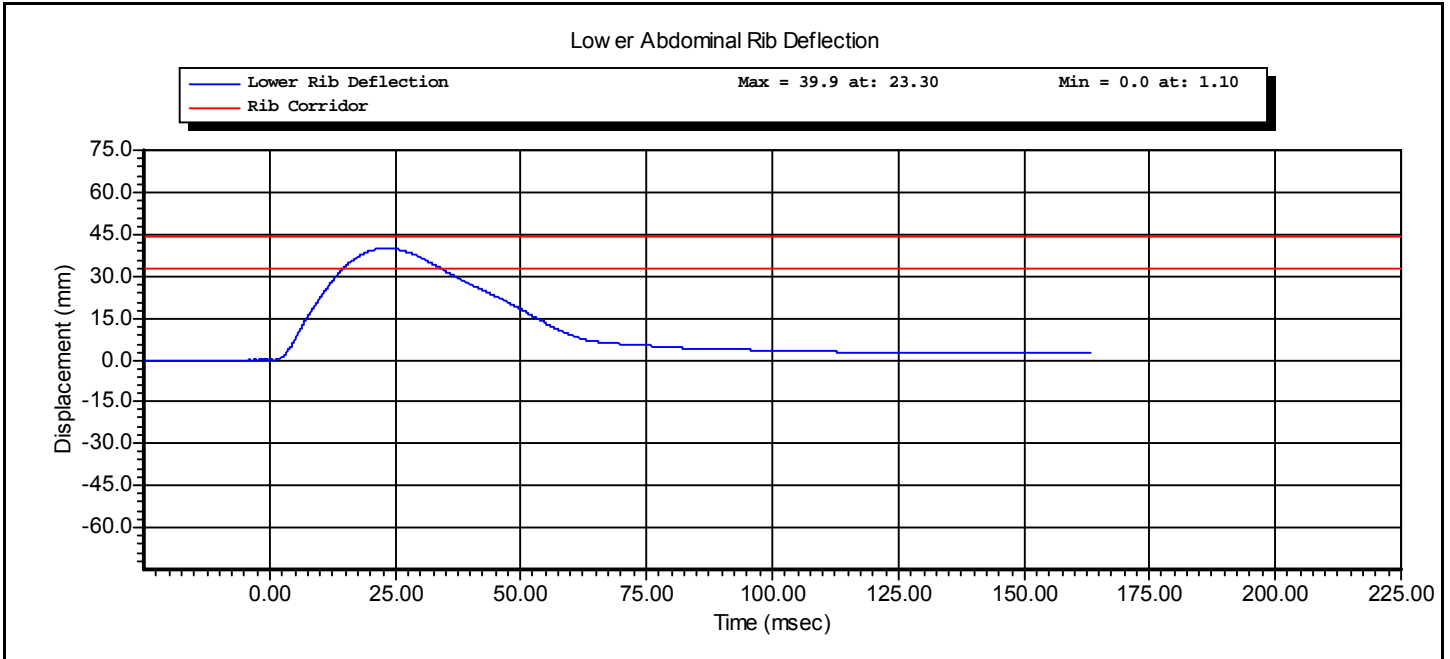
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Abdominal Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Abdominal Impact	Test Date:	6/1/2010
Test Number:	2	Test Time:	11:34:16 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Acetabulum Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Acetabulum Pelvis	Test Date:	5/27/2010
Test Number:	1	Test Time:	9:10:18 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Pelvis Plug Used for Certification:
 FTSS S/N 12804
 Force @ 3mm = 1535N

Pelvis Plug Used for Full Scale Test:
 FTSS S/N 12817
 Force @ 3mm = 1527N

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	66 %RH P
Velocity	6.60 -- 6.80	6.68 m/s P
Peak Probe Acceleration	38.0 -- 47.0	41.9 g P
Peak Pelvis Acceleration	34.0 -- 42.0	36.1 g P
Peak Acetabulum Force	3.60 -- 4.30	4.03 kN P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Acetabulum Pelvis** Test Time: **9:10:18 AM**

Test Date: **5/27/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Endevco	7264-2000	P35793	2/24/2010
DentonATD	IF-520	LC-115 Fy	4/26/2010

Test ID: **Acetabulum Pelvis** Test Time: **9:10:18 AM**

Test Date: **5/27/2010**



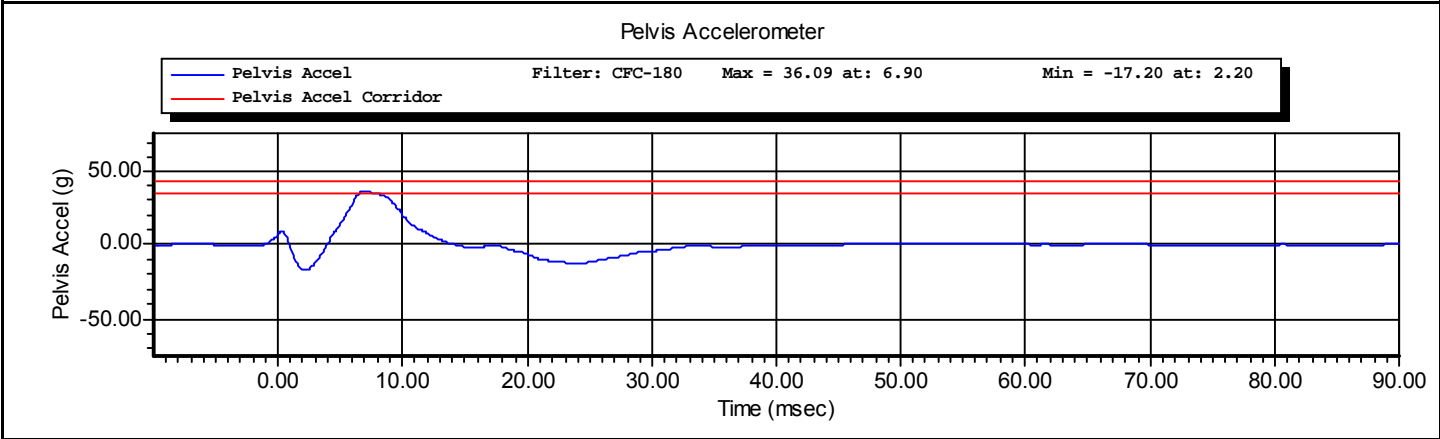
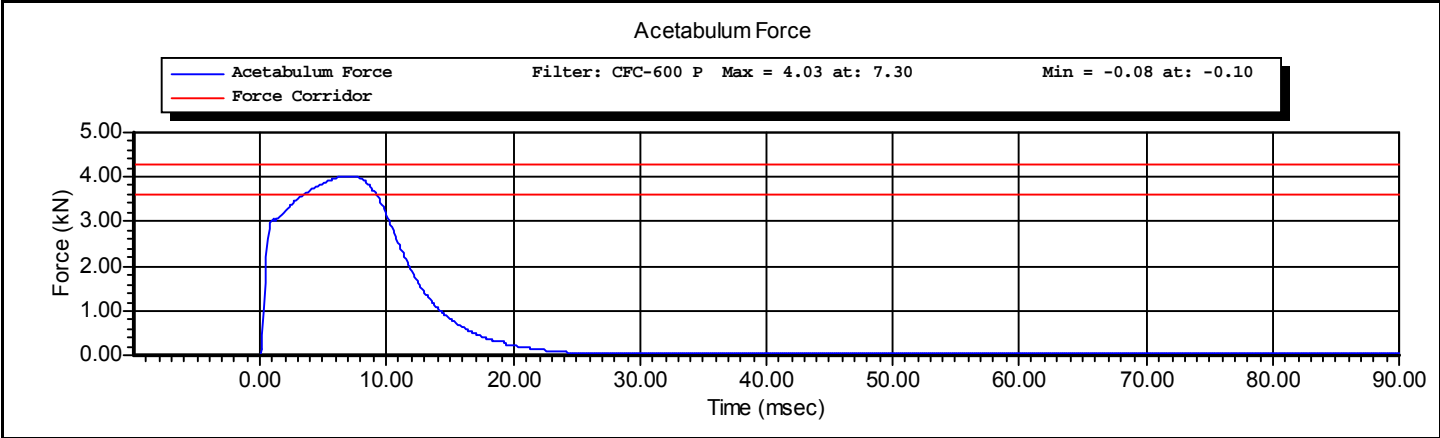
www.calspan.com

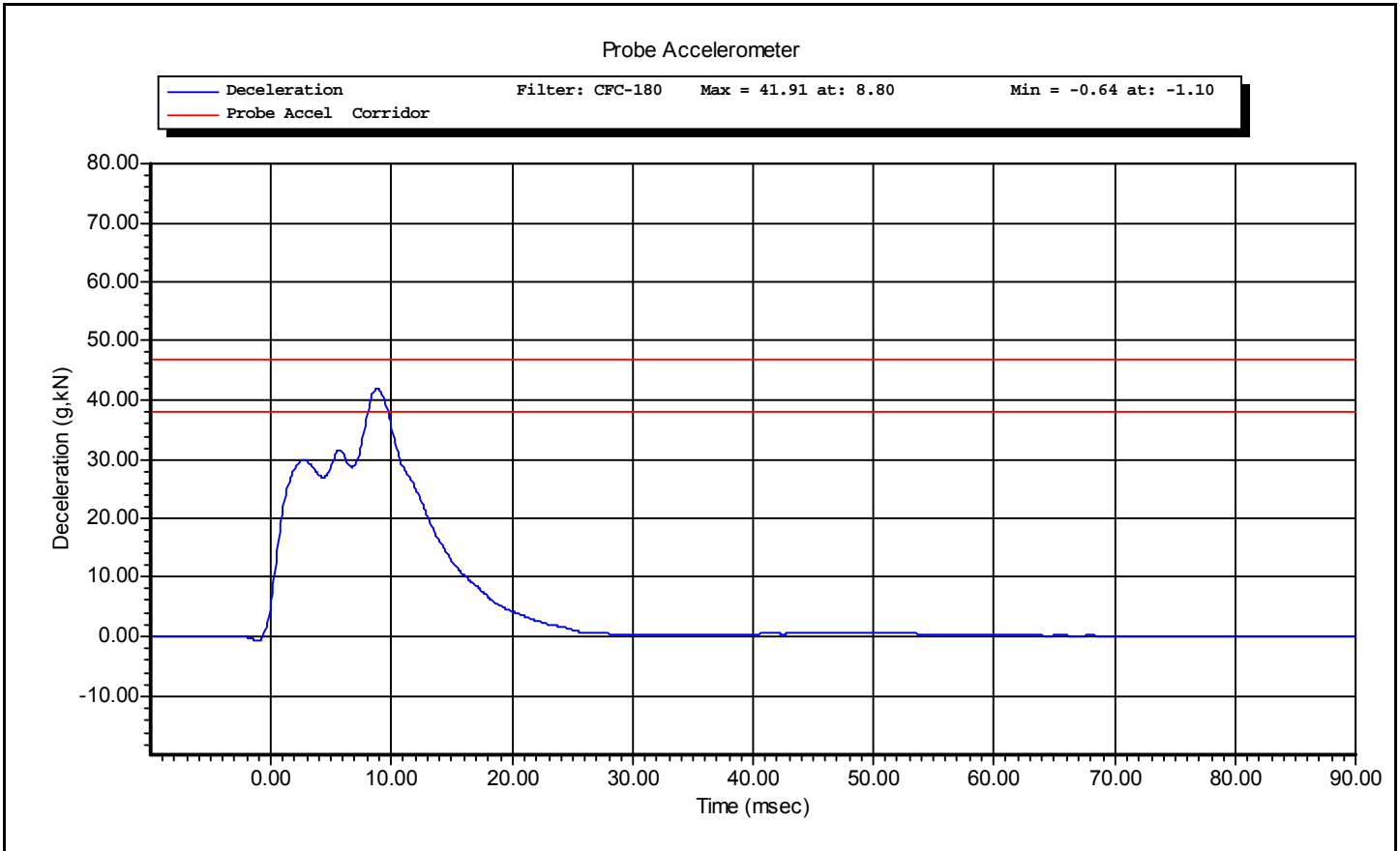
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Acetabulum Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Acetabulum Pelvis	Test Date:	5/27/2010
Test Number:	1	Test Time:	9:10:18 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Iliac Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Iliac Pelvis	Test Date:	5/27/2010
Test Number:	1	Test Time:	8:29:59 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.1 deg C P
Humidity	10 -- 70	66 %RH P
Velocity	4.20 -- 4.40	4.22 m/s P
Peak Probe Acceleration	36.0 -- 45.0	40.4 g P
Peak Pelvis Acceleration	28.0 -- 39.0	37.4 g P
Peak Iliac Force	4.10 -- 5.10	4.55 kN P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D Travale** Signature: _____

Test ID: **Iliac Pelvis** Test Time: **8:29:59 AM** Test Date: **5/27/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Endevco	7264-2000	P35793	2/24/2010
DentonATD	3228J	LC-290 Fy	4/26/2010

Test ID: **Illiac Pelvis**

Test Time: **8:29:59 AM**

Test Date: **5/27/2010**



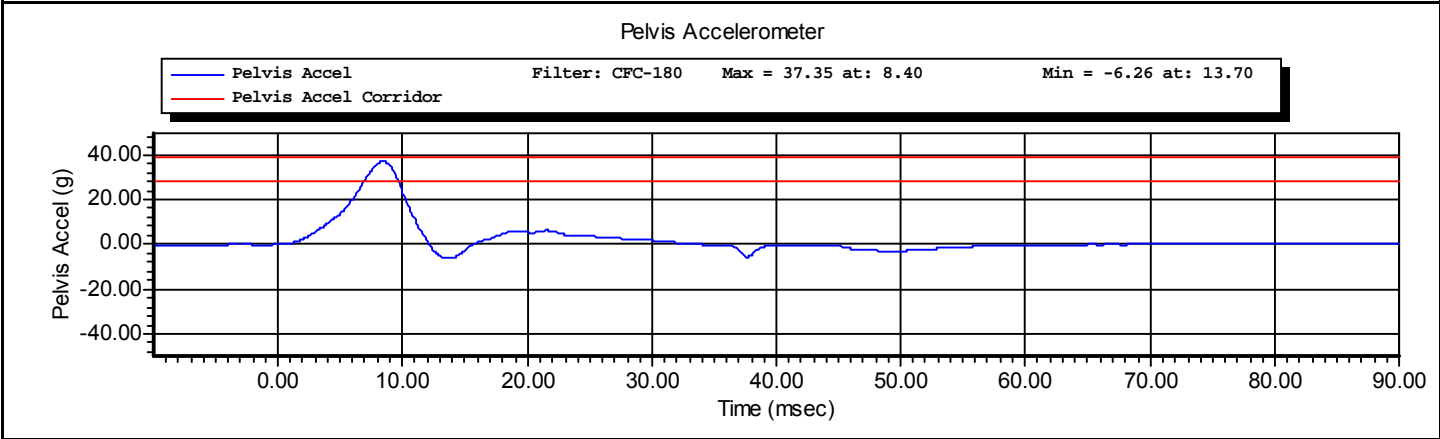
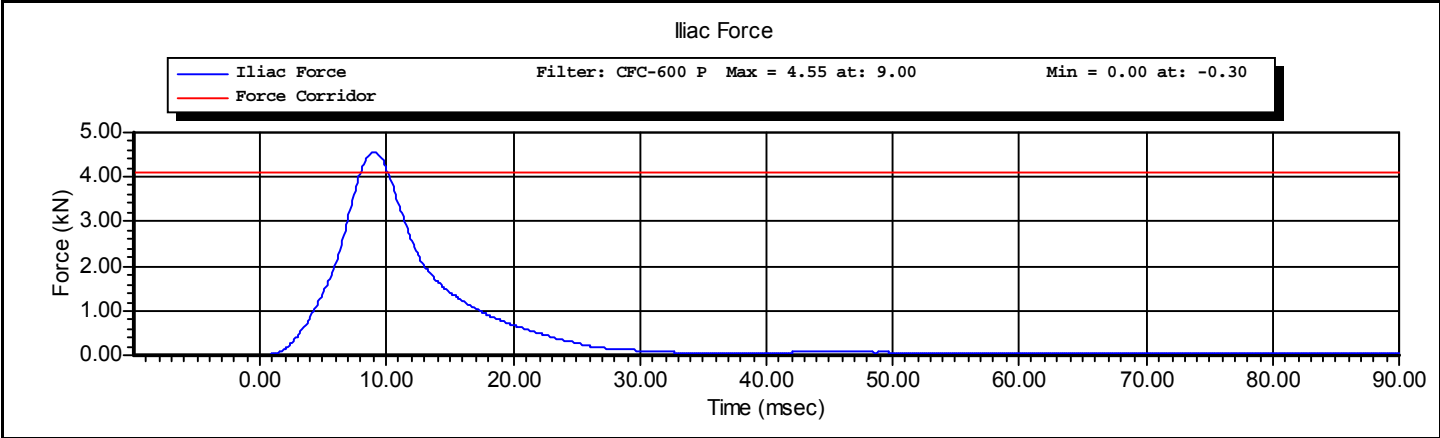
www.calspan.com

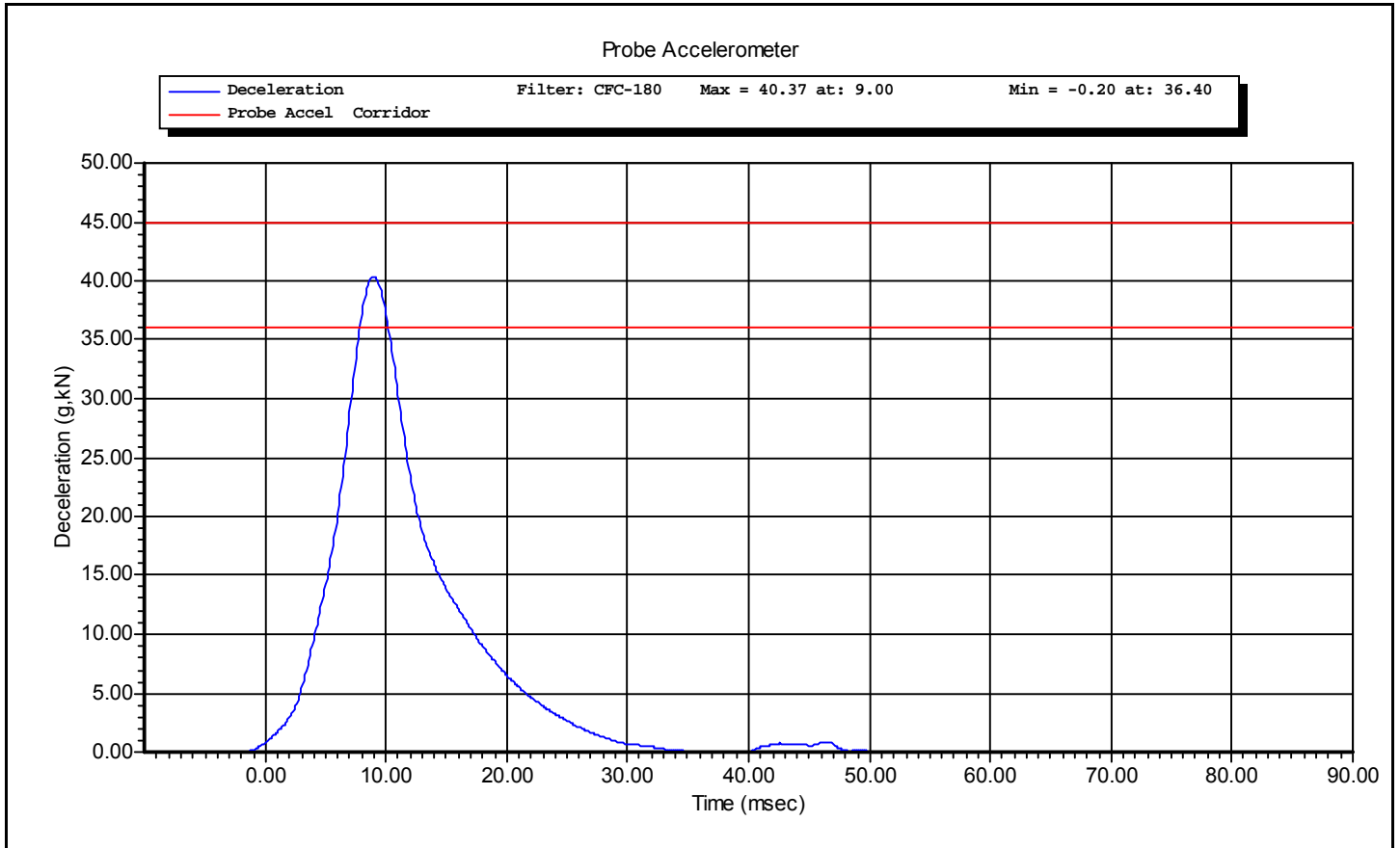
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Iliac Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Illiic Pelvis	Test Date:	5/27/2010
Test Number:	1	Test Time:	8:29:59 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------





CALIBRATION TEST RESULTS

POST-TEST

SID-IIs NO.: 224

CONFIGURED FOR LEFT SIDE IMPACT



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

SID-IIsD External Measurements

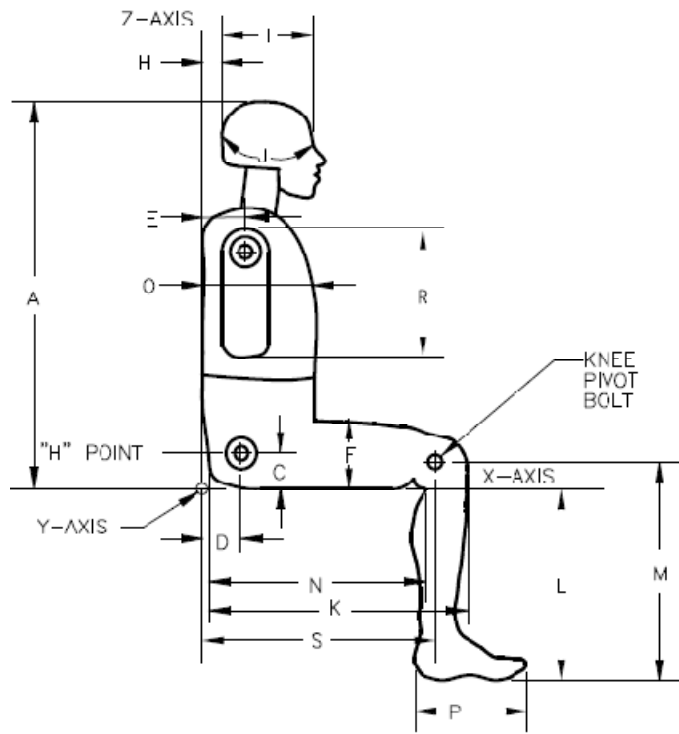
NHTSA ATD S/N 224

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	782	Yes
B	Shoulder Pivot Height	437.0 - 453.0	440	Yes
C	H-Point Height	79.0 - 89.0	80	Yes
D	H-Point from Seat Back	141.0 - 151.0	143	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	104	Yes
F	Thigh Clearance	119.0 - 135.0	125	Yes
G	Head Breadth	140.0 - 148.0	144	Yes
H	Head Back from Backline	40.0 - 46.0	43	Yes
I	Head Depth	178.0 - 188.0	182	Yes
J	Head Circumference	541.0 - 551.0	546	Yes
K	Buttock to Knee Length	514.0 - 540.0	523	Yes
L	Popliteal Height	343.0 - 369.0	349	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	398	Yes
N	Buttock Popliteal Length	416.0 - 442.0	423	Yes
O	Chest Depth without Jacket	195.0 - 211.0	201	Yes
P	Foot Length (right)	216.0 - 232.0	221	Yes
P	Foot Length (left)	216.0 - 232.0	221	Yes
Q	Hip Breadth	313.0 - 323.0	318	Yes
R	Arm Length	249.0 - 259.0	252	Yes
S	Knee Joint to Seat back	478.0 - 493.0	484	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	353	Yes
W	Foot Width (right)	78.0 - 94.0	80	Yes
W	Foot Width (left)	78.0 - 94.0	80	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	865	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

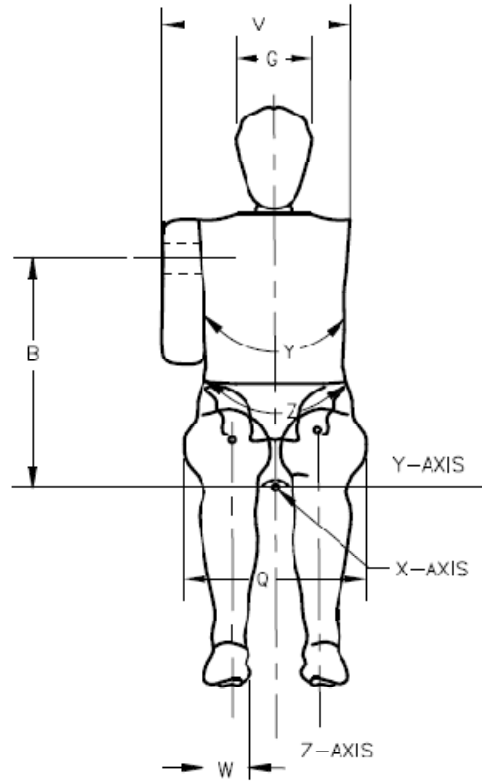
Technician : A. Rudniski

Date: 6/30/2010

SID-IIsD External Dimension Reference Diagram



SIDE VIEW



FRONT VIEW



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Head Drop	Test Date:	7/1/2010
Test Number:	1	Test Time:	9:21:02 AM

Component Part Number	Component Serial Number
Head Skin - 180-1002	1105

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	47 %RH P
Resultant Acceleration	115.0 -- 137.0	119.9 g P
Oscillation	0.0 -- 15.0	0.0 % P
Fore-Aft Acceleration	-15.0 -- 15.0	7.0 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Head Drop**

Test Time: **9:21:02 AM**

Test Date: **7/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

REFERENCE EQUIPMENT

<u>Manufacturer</u>	<u>Model</u>	<u>Serial Number</u>	<u>Calibration Date</u>
Endevco	7264-2000	P23142	2/12/2010
Endevco	7264-2000	P16593	2/12/2010
Endevco	7264-2000	P32219	2/12/2010

Test ID: **Head Drop**

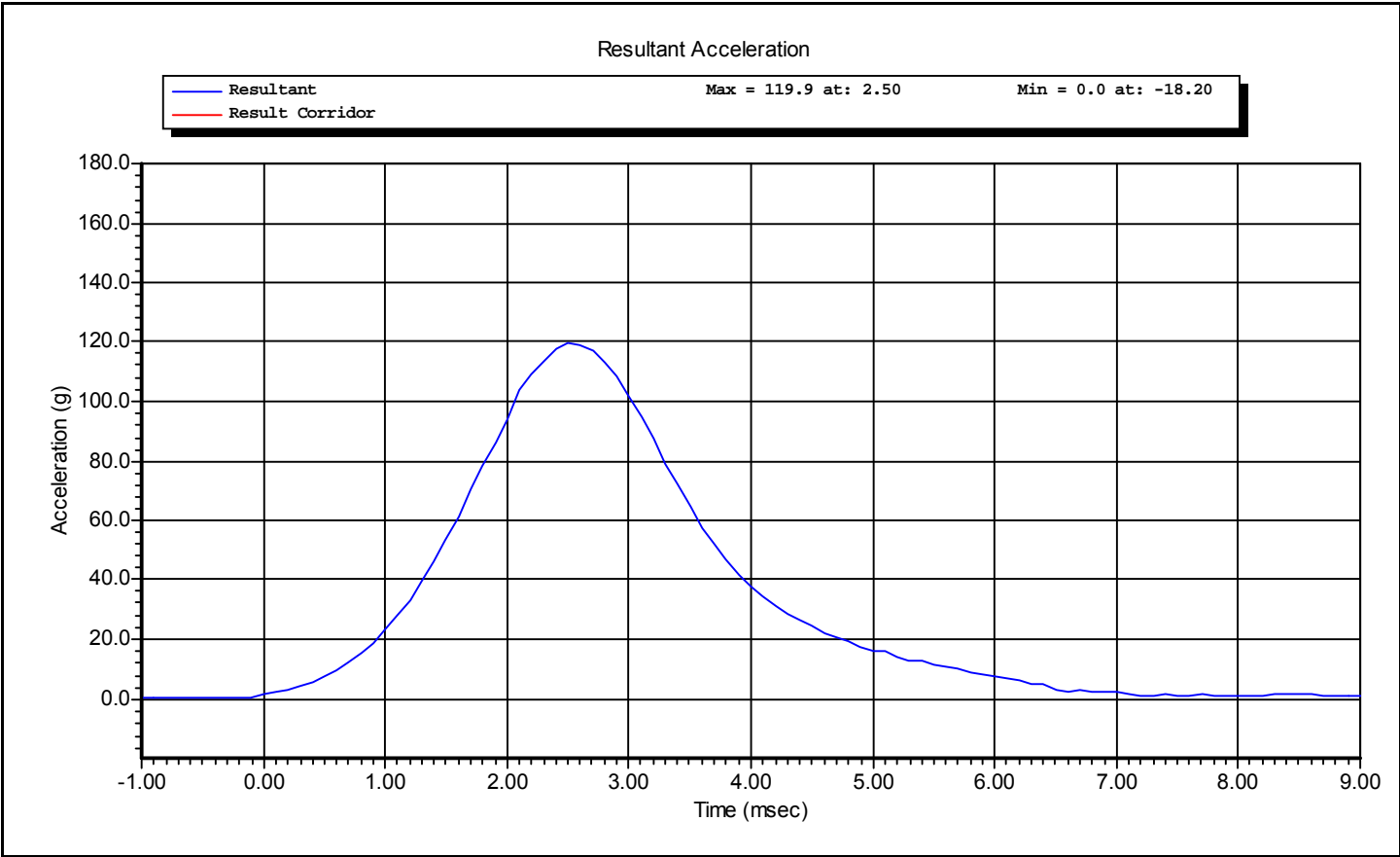
Test Time: **9:21:02 AM**

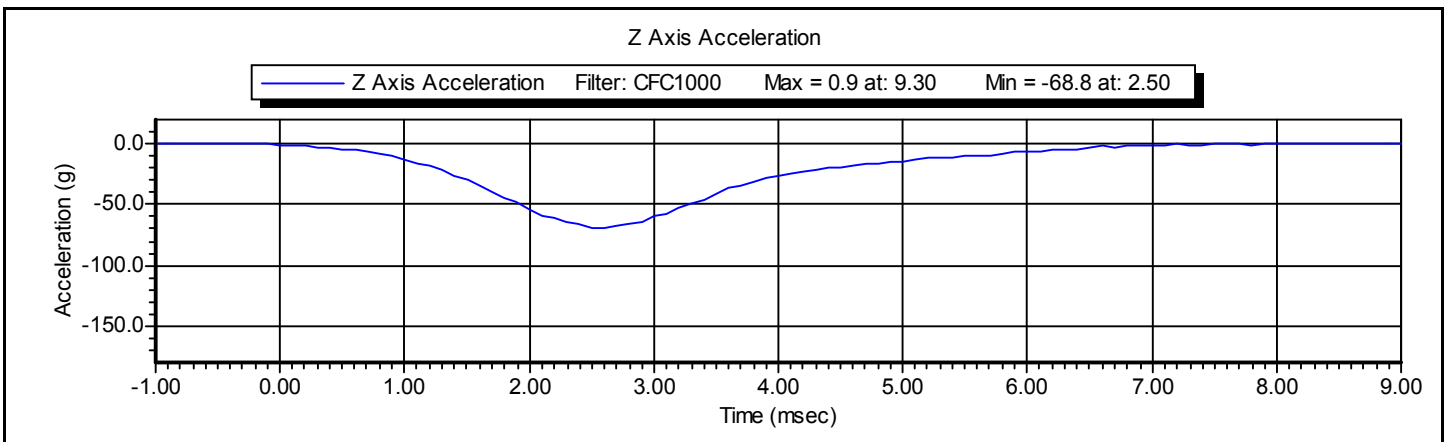
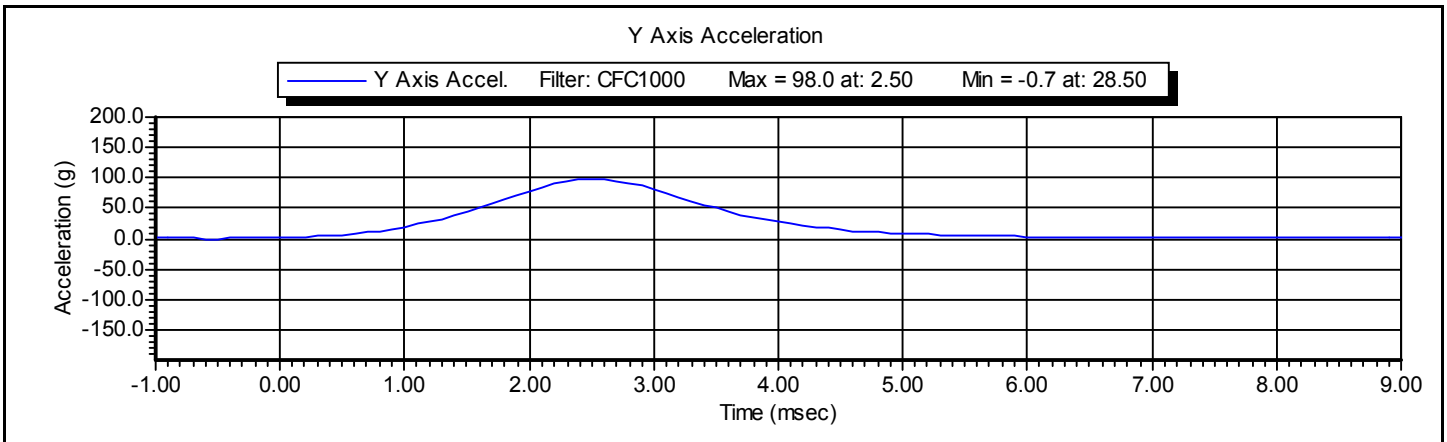
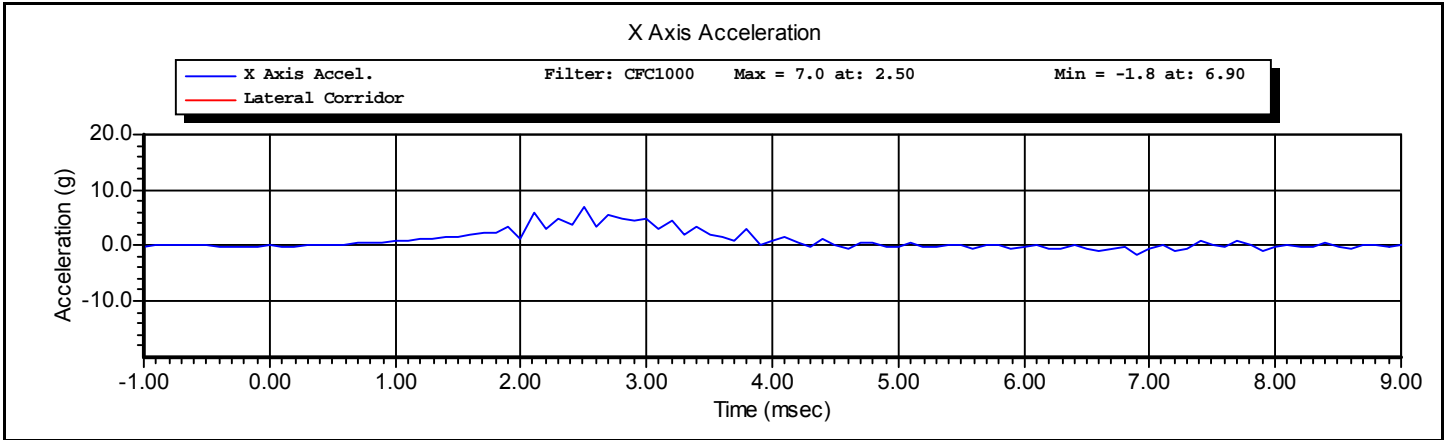
Test Date: **7/1/2010**



Test Name:	Head Drop	Revision:	12/14/2006
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Head Drop	Test Date:	7/1/2010
Test Number:	1	Test Time:	9:21:02 AM

Component Part Number	Component Serial Number
Head Skin - 180-1002	1105







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Neck Pendulum	Revision:	8/24/2009
Sub Test Name:	Left Side	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Neck Flexion	Test Date:	6/30/2010
Test Number:	1	Test Time:	3:25:47 PM

Component Part Number	Component Serial Number
Neck - 180-2000	AB8236

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	44 %RH P
Velocity	5.51 -- 5.63	5.57 m/s P
Pendulum Impulse at 10 ms	2.20 -- 2.80	2.56 m/s P
Pendulum Impulse at 15 ms	3.30 -- 4.10	3.81 m/s P
Pendulum Impulse at 20 ms	4.40 -- 5.40	5.16 m/s P
Pendulum Impulse at 25 ms	5.40 -- 6.10	5.87 m/s P
Pendulum Impulse between 25 and 100 ms	5.50 -- 6.20	5.91 m/s P
Max D Plane Rotation	71.0 -- 81.0	74.8 degrees P
Time at Max Rotation	50.0 -- 70.0	61.5 ms P
Moment about OC	-44.0 -- -36.0	-40.5 Nm P
Moment Decay to Zero	102.0 -- 126.0	115.7 ms P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
Supervisor: **D. Travale** Signature: _____

Test ID: **Neck Flexion**

Test Time: **3:25:47 PM**

Test Date: **6/30/2010**



www.calspan.com

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	C16510	5/10/2010
Denton	1716A	LC-576 Fy	1/12/2010
Denton	1716A	LC-576 Mx	1/12/2010
DentonATD	78051-342	184	4/30/2010
DentonATD	78051-342	174	4/30/2010
DentonATD	78051-342	185	4/30/2010

Test ID: **Neck Flexion**

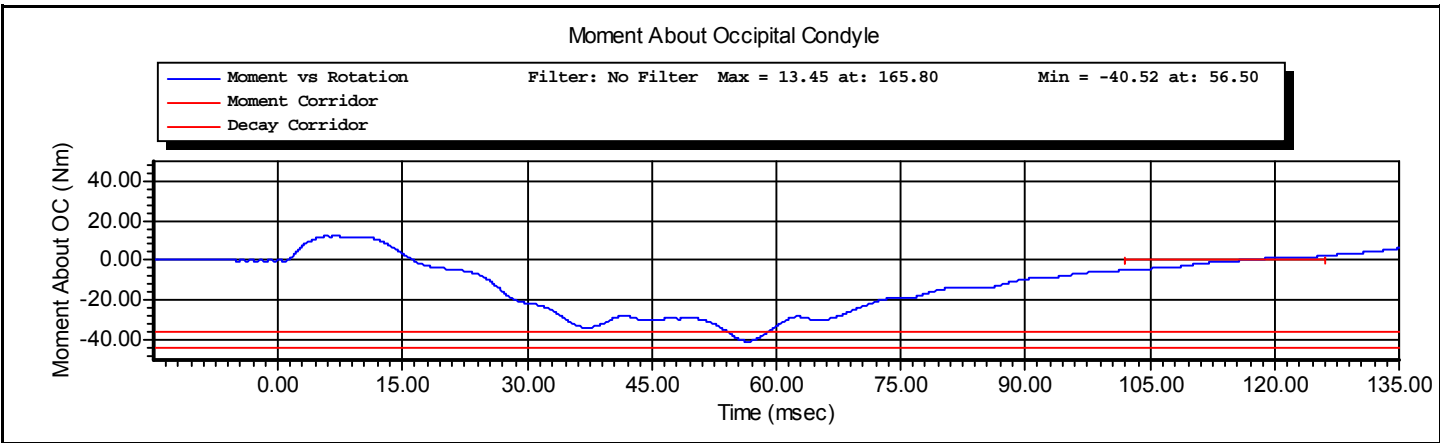
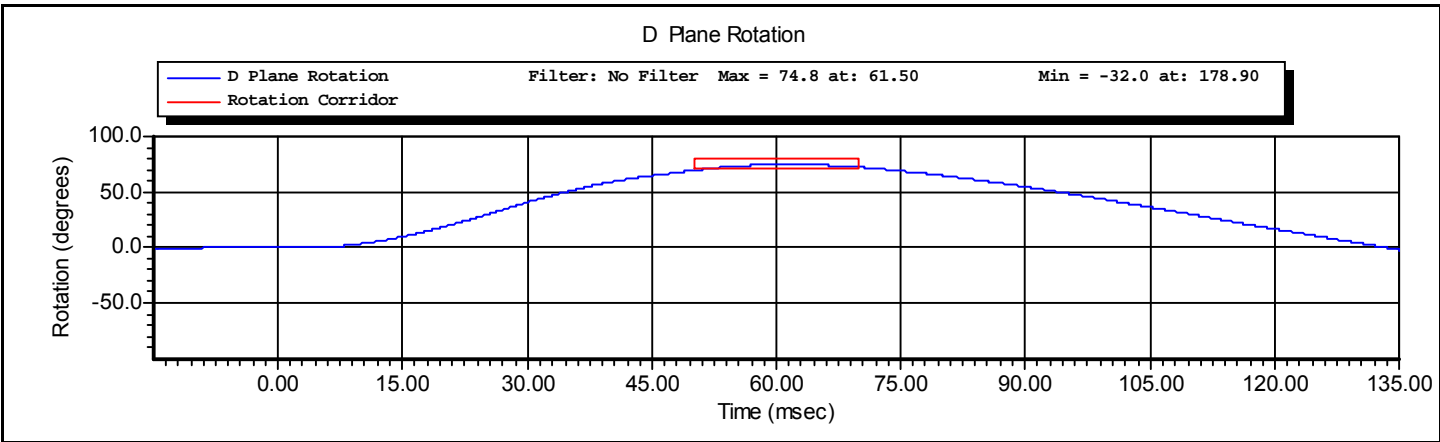
Test Time: **3:25:47 PM**

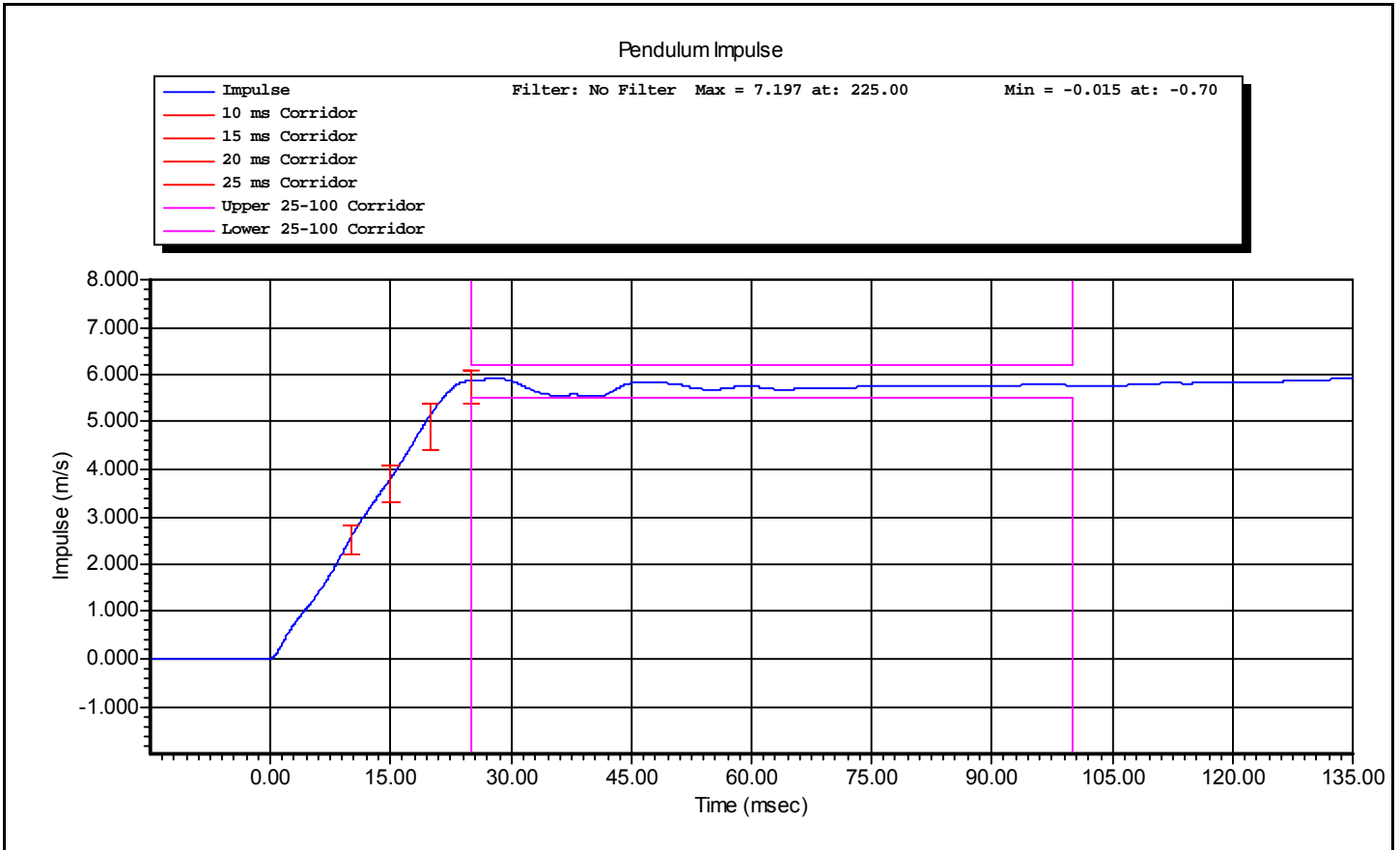
Test Date: **6/30/2010**



Test Name:	Neck Pendulum	Revision:	8/24/2009
Sub Test Name:	Left Side	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Neck Flexion	Test Date:	6/30/2010
Test Number:	1	Test Time:	3:25:47 PM

Component Part Number	Component Serial Number
Neck - 180-2000	AB8236







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Shoulder Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Shoulder	Test Date:	7/2/2010
Test Number:	1	Test Time:	2:19:03 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.20 deg C P
Humidity	10.0 -- 70.0	42.0 %RH P
Velocity	4.20 -- 4.40	4.33 m/s P
Probe Acceleration	13.0 -- 18.0	16.1 g P
Shoulder Deflection	28.0 -- 37.0	33.97 mm P
T1 Acceleration	17.0 -- 22.0	19.4 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Shoulder**

Test Time: **2:19:03 PM**

Test Date: **7/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Servo	180-3885	DS-125	4/26/2010
Endevco	7264-2000	P16862	3/29/2010

Test ID: **Shoulder**

Test Time: **2:19:03 PM**

Test Date: **7/2/2010**



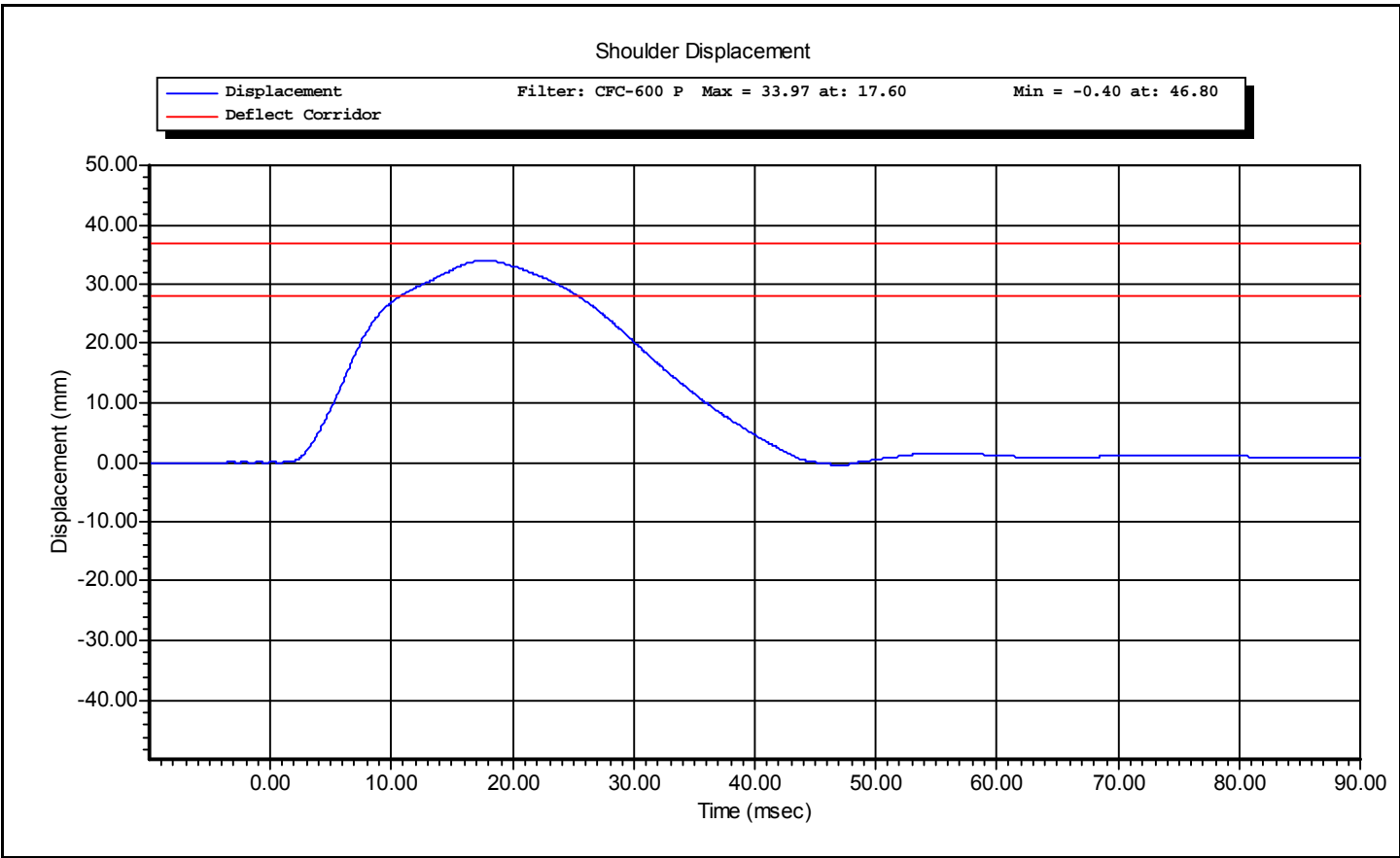
www.calspan.com

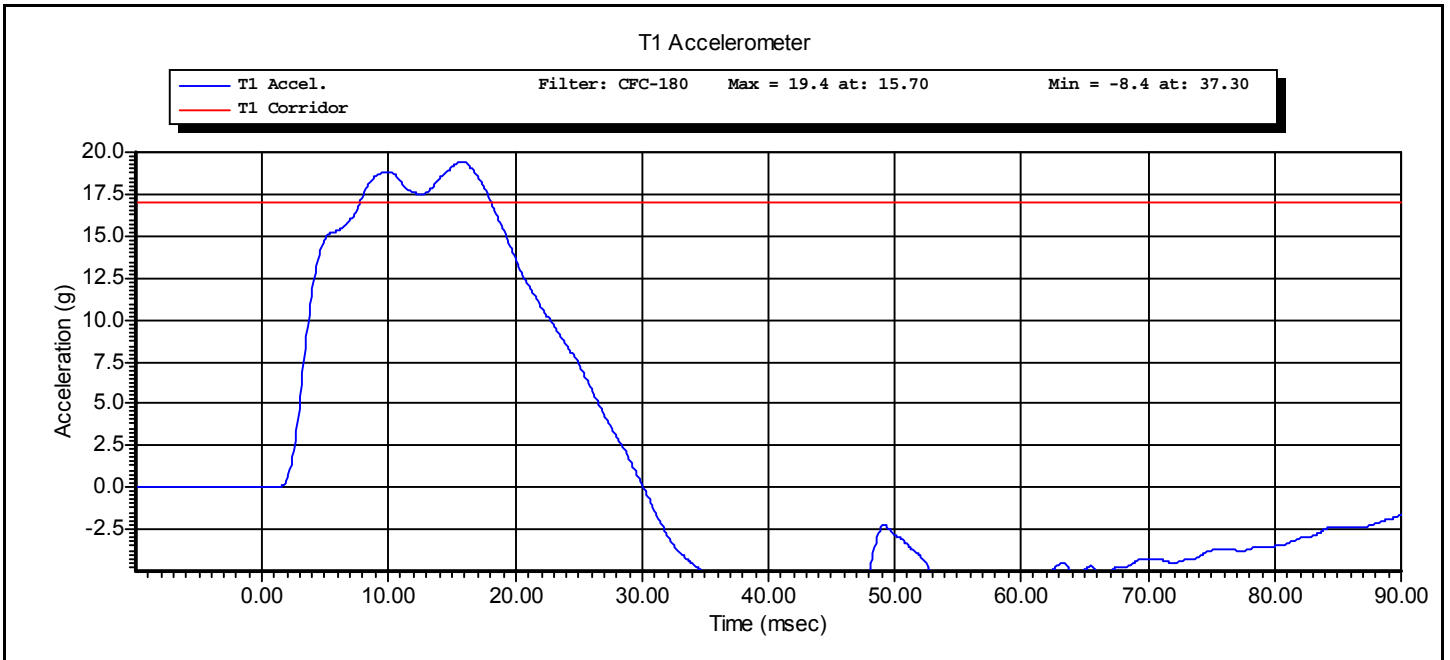
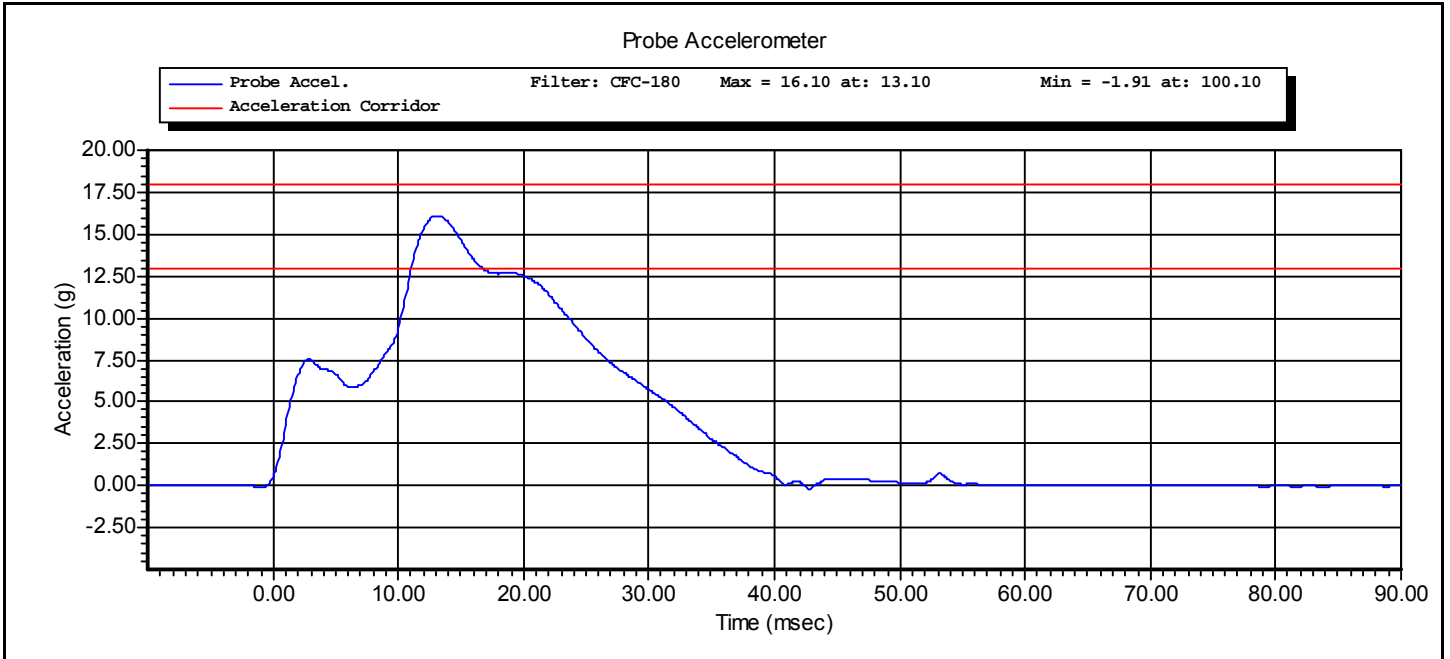
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Shoulder Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Shoulder	Test Date:	7/2/2010
Test Number:	1	Test Time:	2:19:03 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact with Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax With Arm	Test Date:	7/2/2010
Test Number:	1	Test Time:	2:48:36 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	42 %RH P
Velocity	6.60 -- 6.80	6.68 m/s P
Probe Acceleration after 5ms	30.0 -- 36.0	32.5 g P
Upper Thorax Rib Deflection	25.0 -- 32.0	27.8 mm P
Mid Thorax Rib Deflection	30.0 -- 36.0	31.3 mm P
Lower Thorax Rib Deflection	32.0 -- 38.0	34.3 mm P
Upper Spine Acceleration ("y")	34.0 -- 43.0	39.8 g P
Lower Spine Acceleration ("y")	29.0 -- 37.0	30.0 g P
Shoulder Deflection	31.0 -- 40.0	37.7 mm P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax With Arm** Test Time: **2:48:36 PM** Test Date: **7/2/2010**



www.calspan.com

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
Servo	180-3885	DS-145	4/26/2010
Servo	180-3885	DS-222	4/26/2010
Servo	180-3885	DS-224	4/26/2010
Endevco	7264-2000	P16862	3/29/2010
Endevco	7264-2000	P23939	4/13/2010
Servo	180-3885	DS-125	4/26/2010

Test ID: **Thorax With Arm**

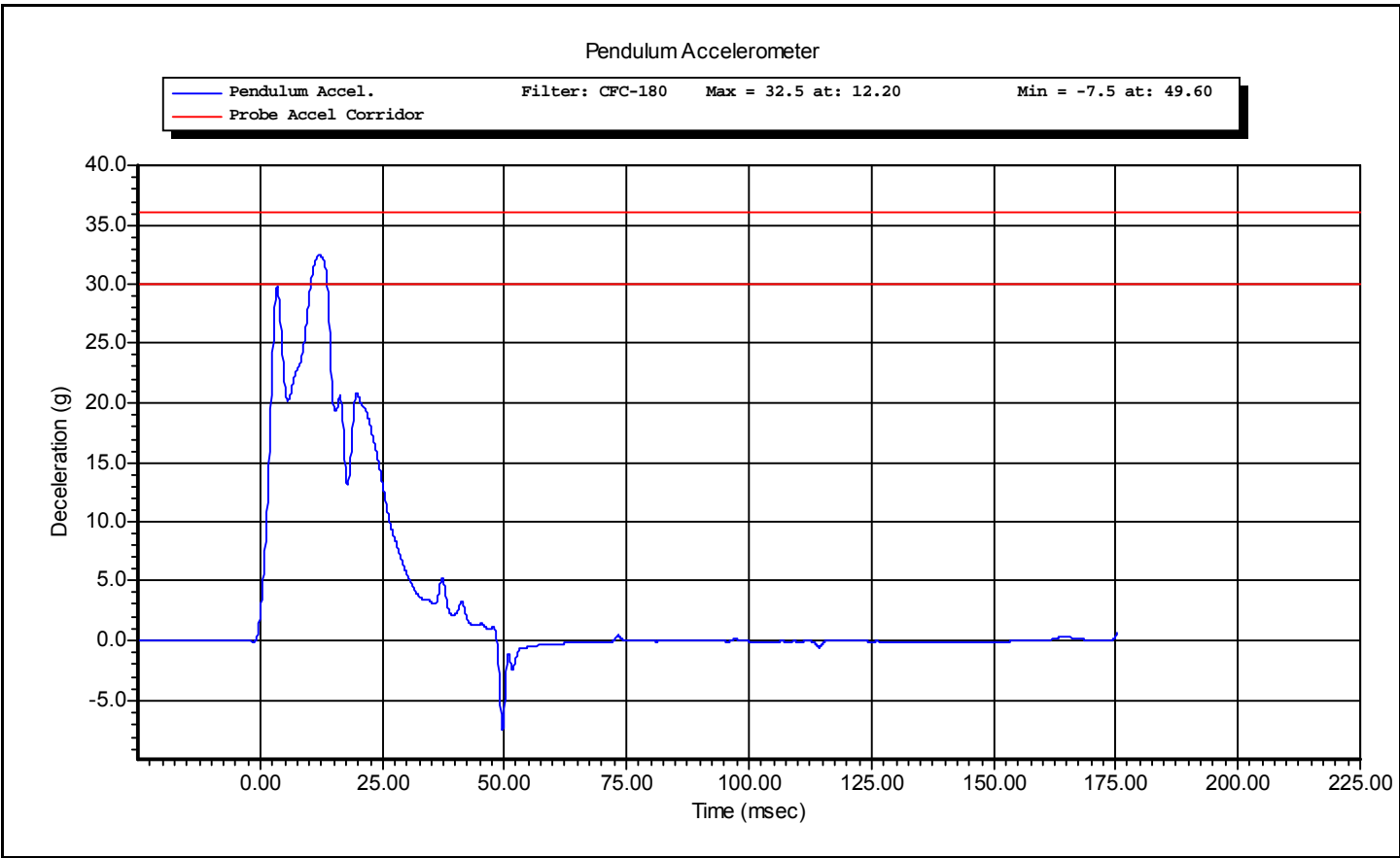
Test Time: **2:48:36 PM**

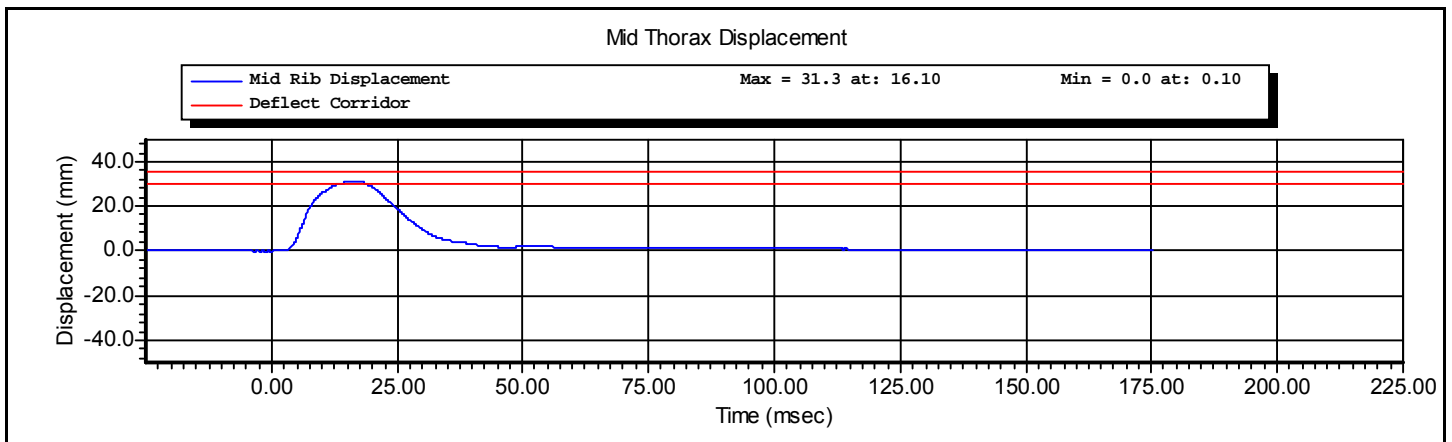
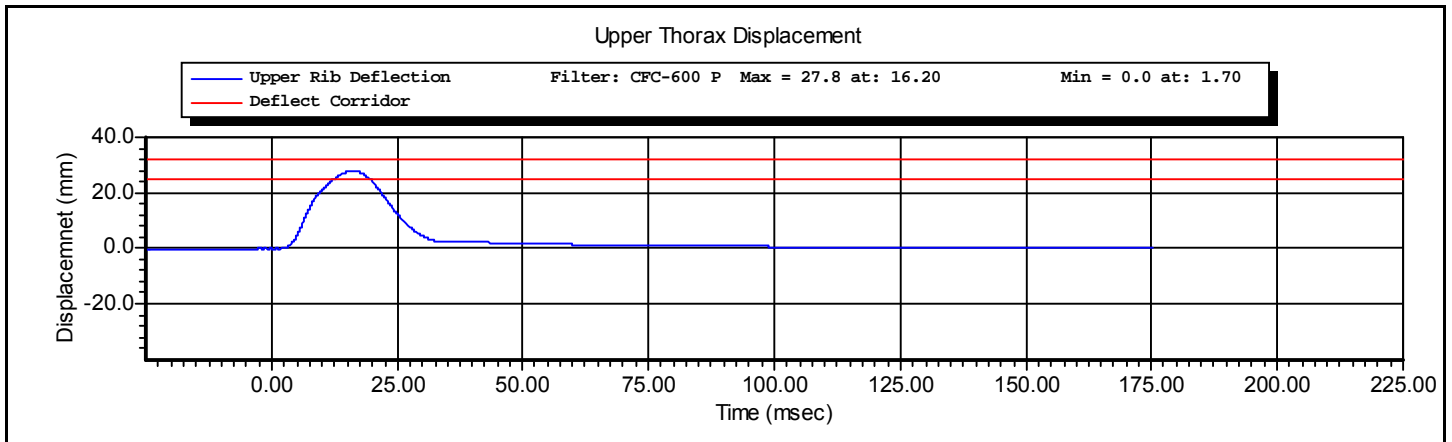
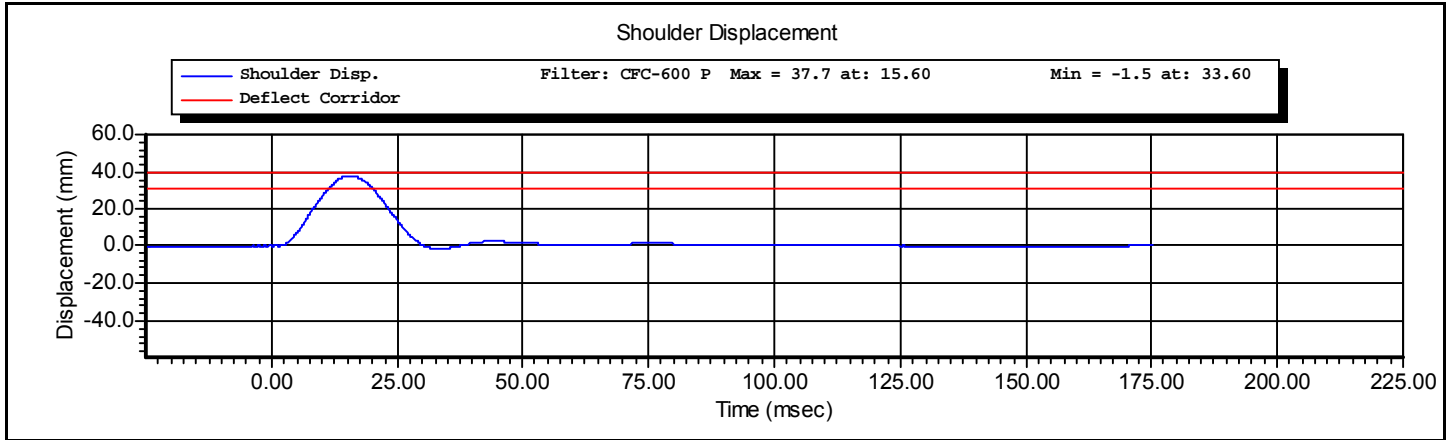
Test Date: **7/2/2010**

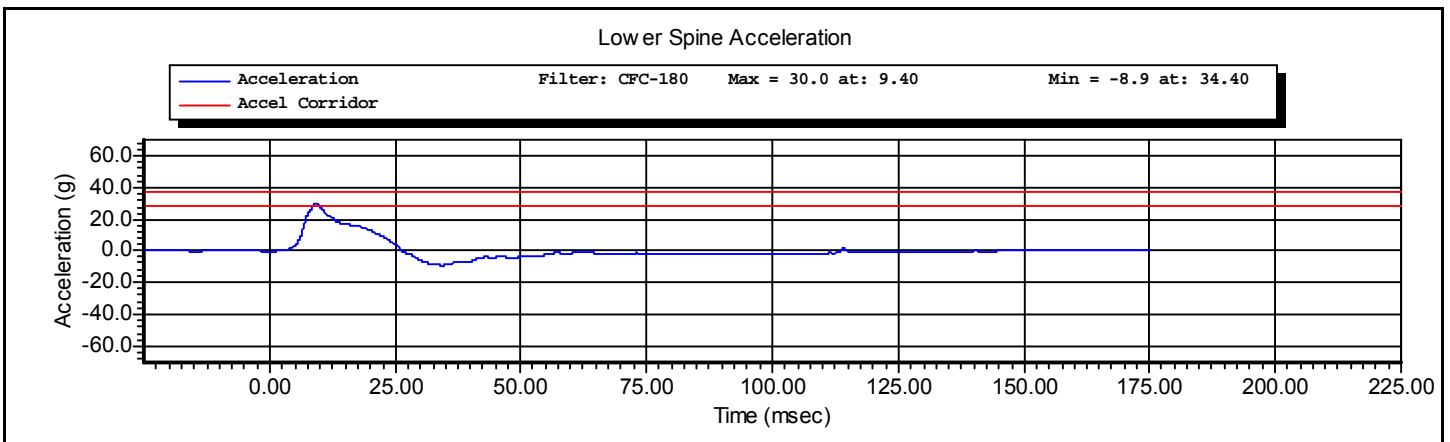
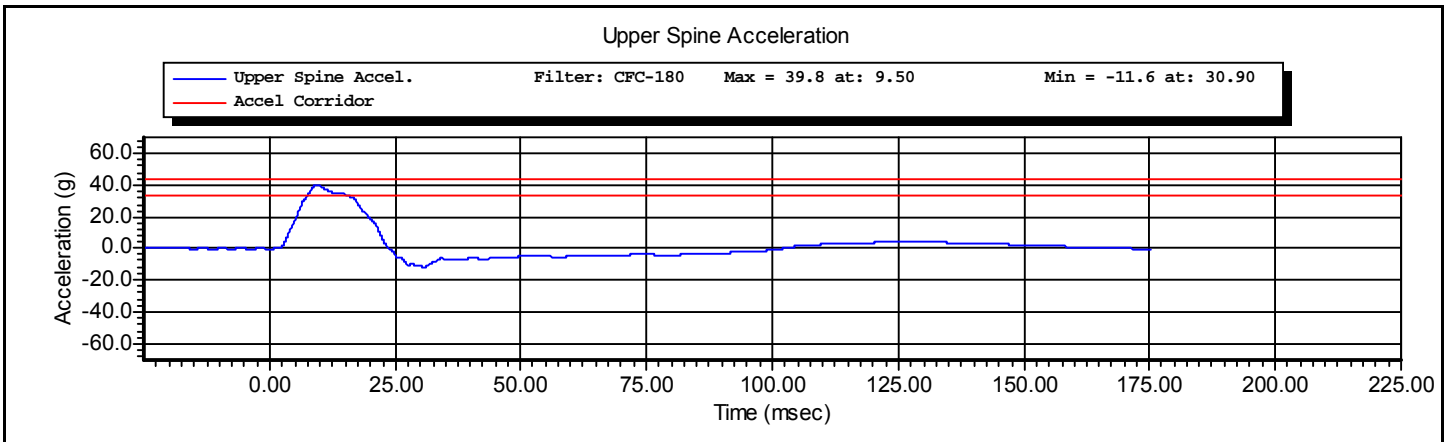
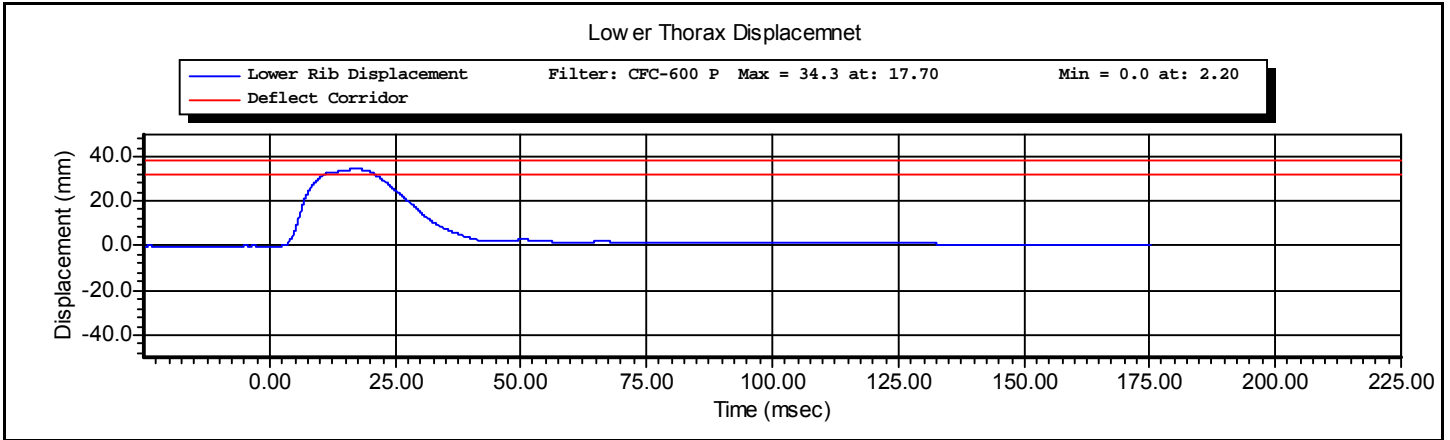


Test Name:	Thorax Impact with Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax With Arm	Test Date:	7/2/2010
Test Number:	1	Test Time:	2:48:36 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------









www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Thorax Impact without Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax Without Arm	Test Date:	7/2/2010
Test Number:	1	Test Time:	1:40:29 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	42 %RH P
Velocity	4.20 -- 4.40	4.39 m/s P
Probe Acceleration	14.0 -- 18.0	16.5 g P
Upper Thorax Rib Deflection	32.0 -- 40.0	36.5 mm P
Mid Thorax Rib Deflection	39.0 -- 45.0	41.8 mm P
Lower Thorax Rib Deflection	35.0 -- 43.0	40.4 mm P
Upper Spine Acceleration T1	13.0 -- 17.0	16.3 g P
Lower Spine Acceleration T12	7.0 -- 11.0	9.8 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Thorax Without Arm** Test Time: **1:40:29 PM**

Test Date: **7/2/2010**



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
Servo	180-3885	DS-145	4/26/2010
Servo	180-3885	DS-222	4/26/2010
Servo	180-3885	DS-224	4/26/2010
Endevco	7264-2000	P16862	3/29/2010
Endevco	7264-2000	P23939	4/13/2010

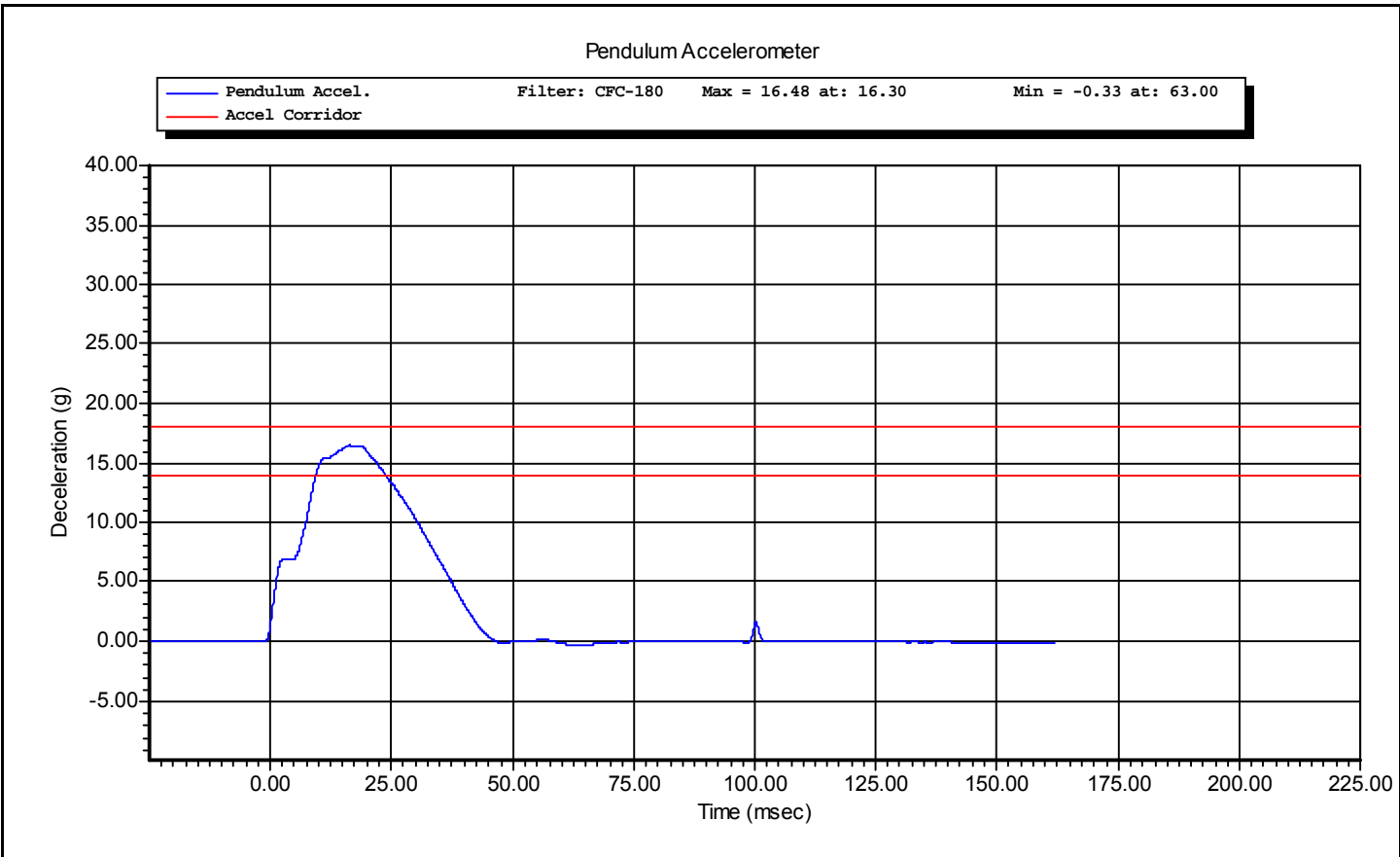
Test ID: **Thorax Without Arm** Test Time: **1:40:29 PM**

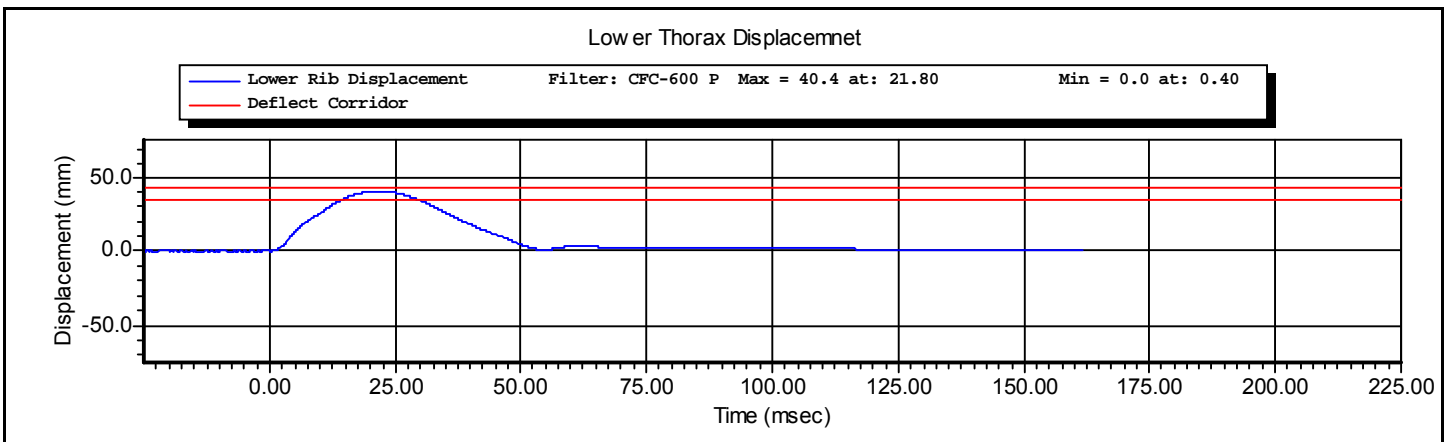
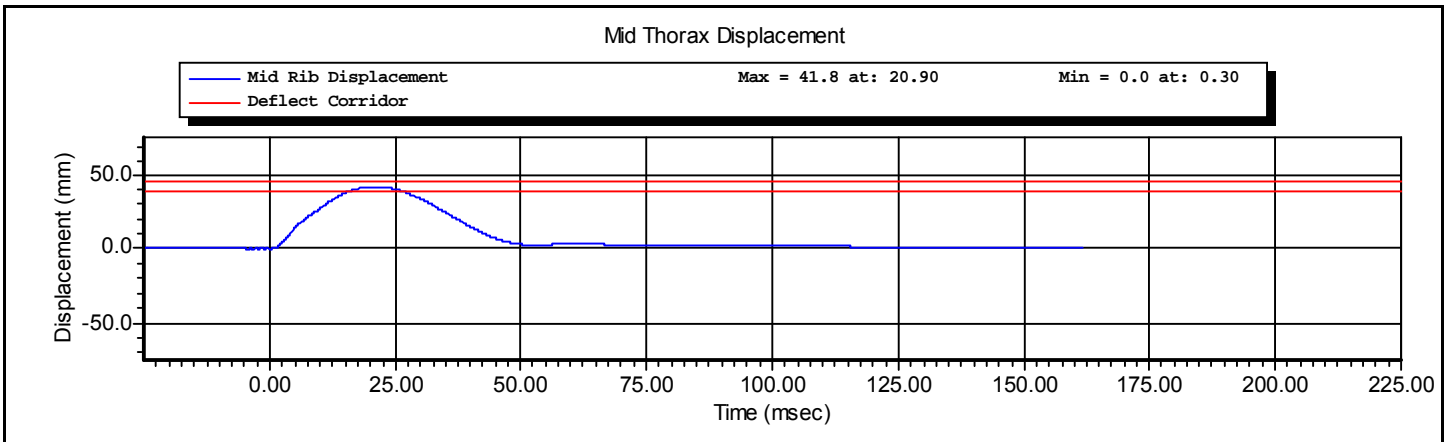
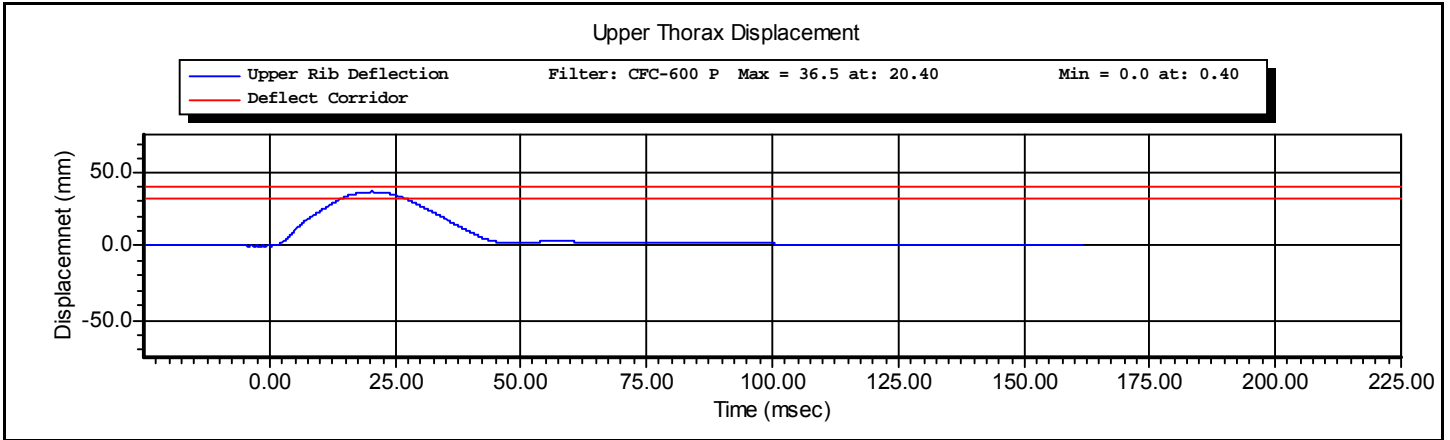
Test Date: **7/2/2010**

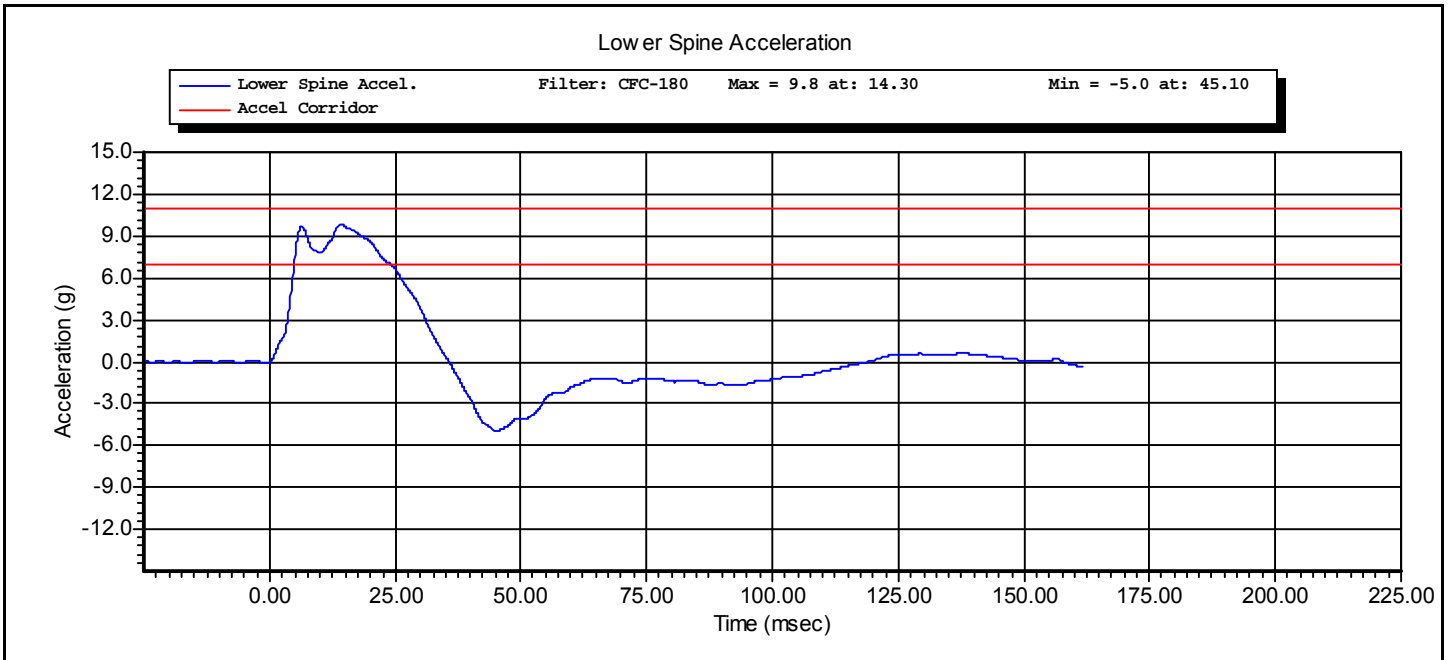
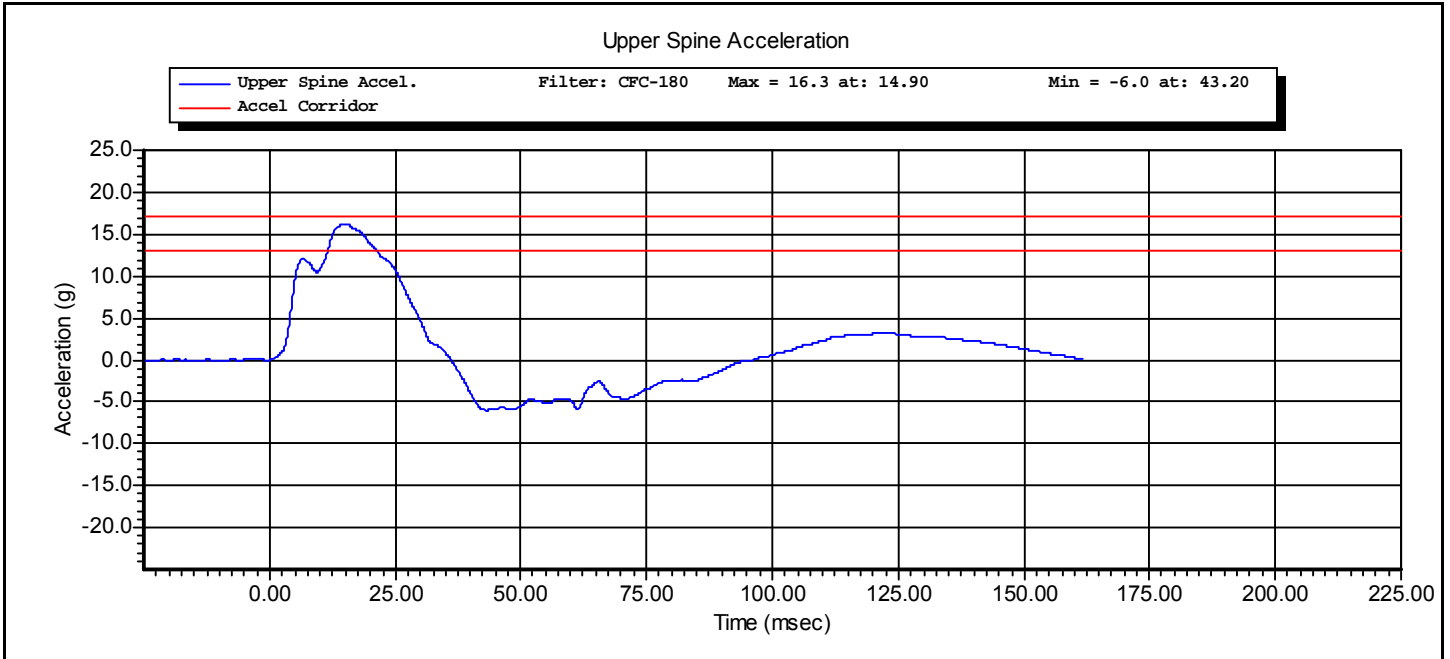


Test Name:	Thorax Impact without Arm	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Thorax Without Arm	Test Date:	7/2/2010
Test Number:	1	Test Time:	1:40:29 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------









www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Abdominal Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Abdomen	Test Date:	7/2/2010
Test Number:	2	Test Time:	1:10:59 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	42 %RH P
Velocity	4.20 -- 4.40	4.38 m/s P
Probe Acceleration	12.0 -- 16.0	14.4 g P
Upper Abdominal Rib Deflection	36.0 -- 47.0	43.6 mm P
Lower Abdominal Rib Deflection	33.0 -- 44.0	39.4 mm P
Lower Spine Acceleration - T12	9.0 -- 14.0	12.1 g P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Abdomen**

Test Time: **1:10:59 PM**

Test Date: **7/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Servo	180-3885	DS-225	4/26/2010
Servo	180-3885	DS-230	4/26/2010
Endevco	7264-2000	P23939	4/13/2010

Test ID: **Abdomen**

Test Time: **1:10:59 PM**

Test Date: **7/2/2010**



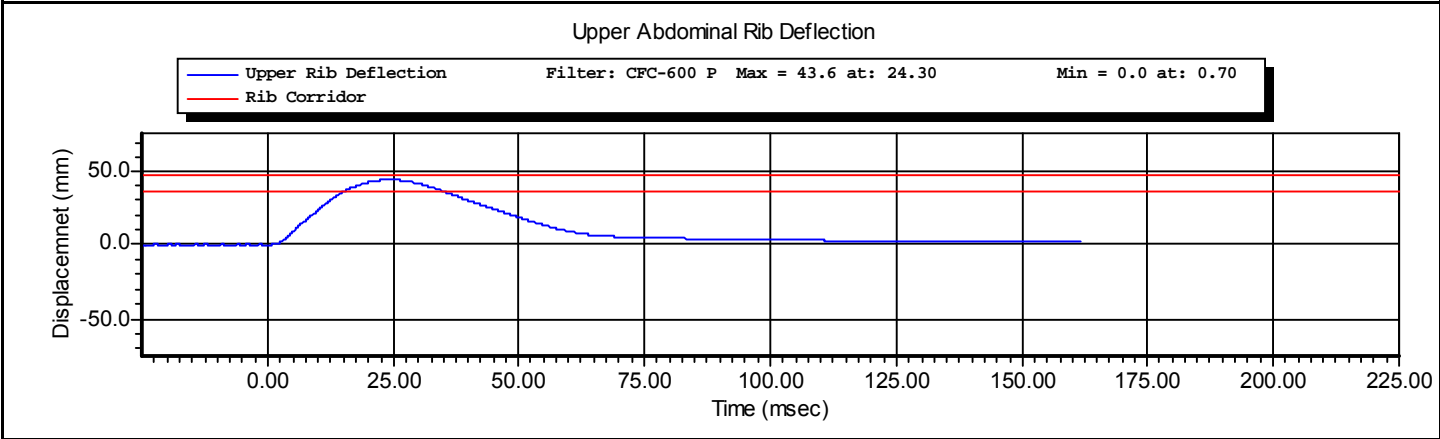
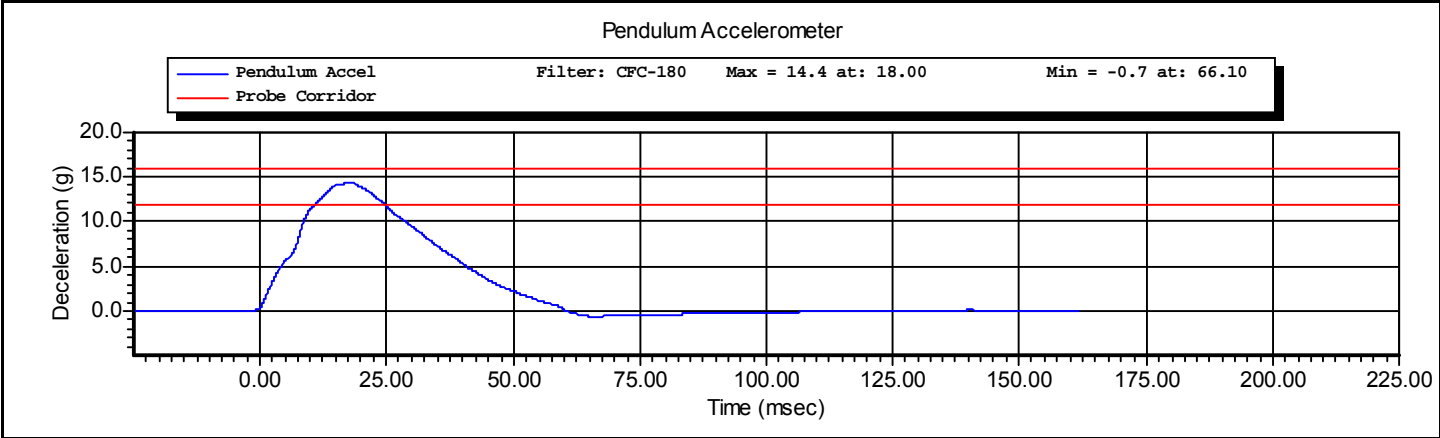
www.calspan.com

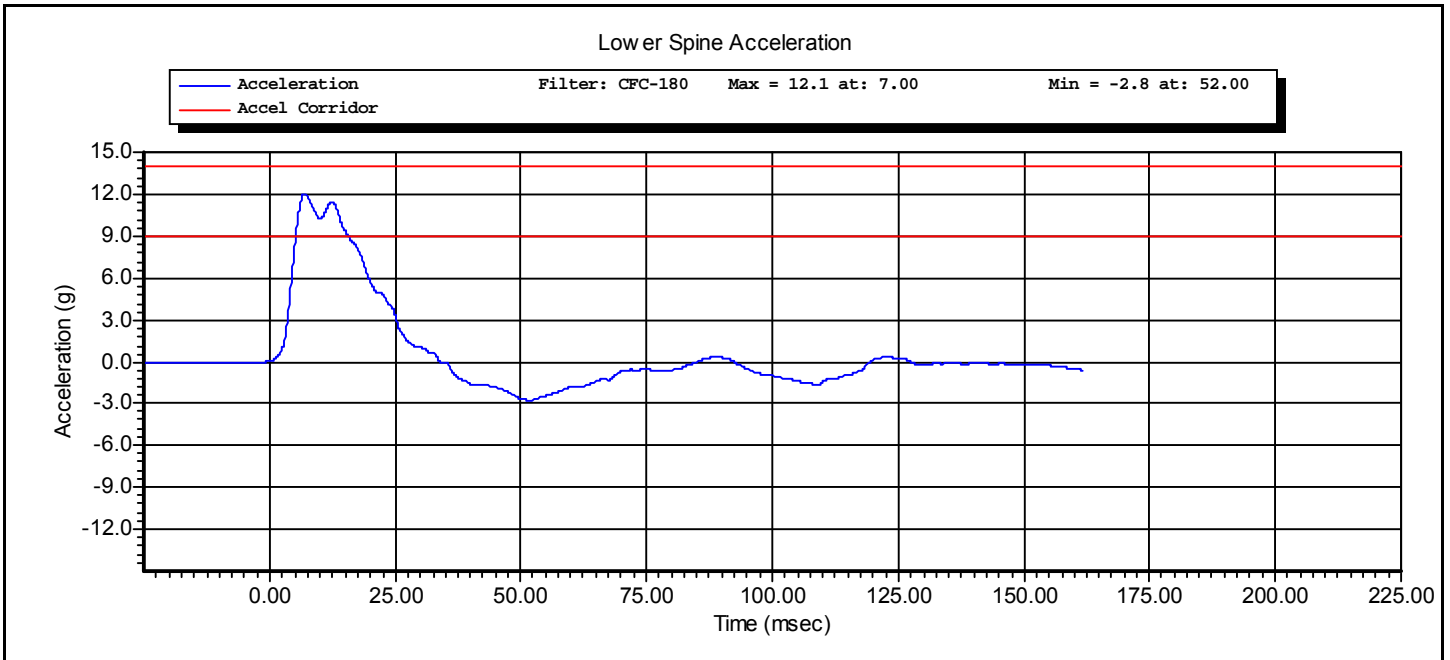
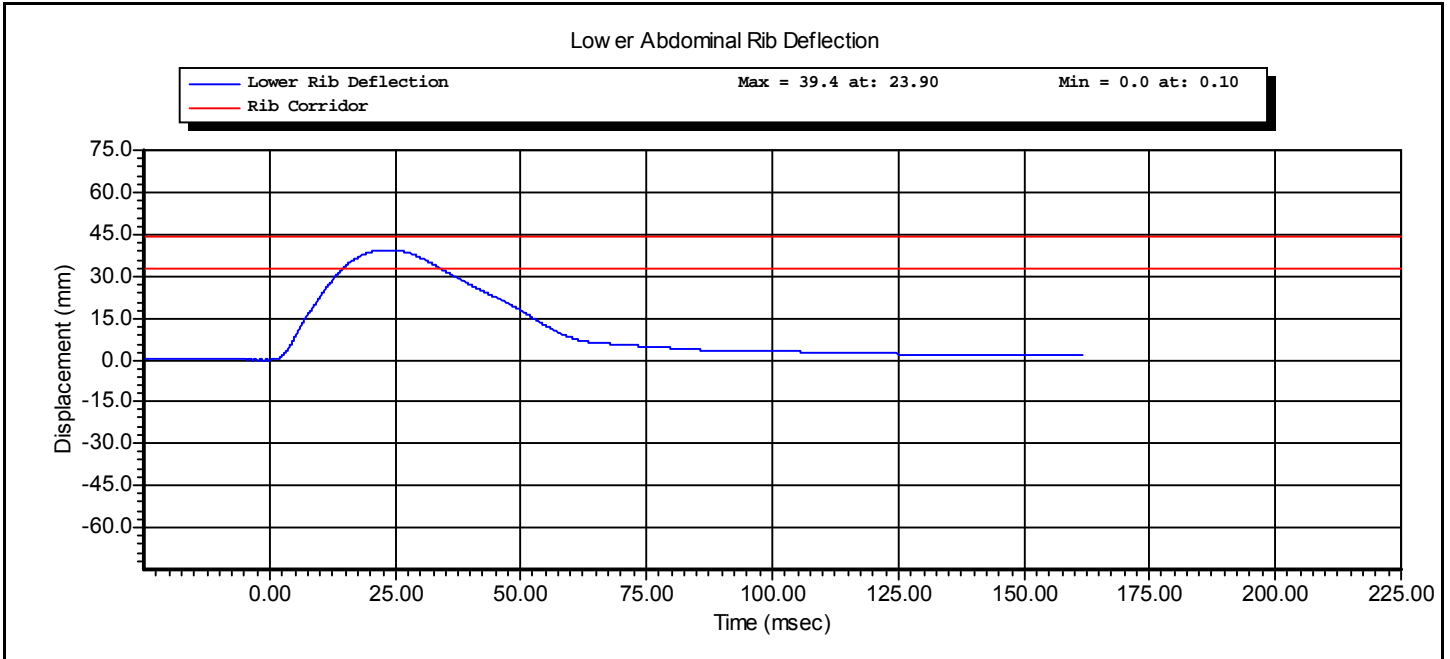
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Abdominal Impact	Revision:	8/24/2009
Sub Test Name:		Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Abdomen	Test Date:	7/2/2010
Test Number:	2	Test Time:	1:10:59 PM

Component Part Number	Component Serial Number
-----------------------	-------------------------







www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Acetabulum Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Acetabulum Pelvis	Test Date:	7/2/2010
Test Number:	1	Test Time:	10:13:47 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Comments:

Pelvis Plug Used for Certification:
 FTSS S/N 12470
 Force @ 3mm = 1529N

Pelvis Plug Used for Full Scale Test:
 FTSS S/N 12469
 Force @ 3mm = 1503N

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	21.7 deg C P
Humidity	10 -- 70	44 %RH P
Velocity	6.60 -- 6.80	6.67 m/s P
Peak Probe Acceleration	38.0 -- 47.0	43.1 g P
Peak Pelvis Acceleration	34.0 -- 42.0	38.7 g P
Peak Acetabulum Force	3.60 -- 4.30	4.19 kN P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____

Supervisor: **D. Travale** Signature: _____

Test ID: **Acetabulum Pelvis** Test Time: **10:13:47 AM**

Test Date: **7/2/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Endevco	7264-2000	P35793	2/24/2010
DentonATD	IF-520	LC-115 Fy	4/26/2010

Test ID: **Acetabulum Pelvis** Test Time: **10:13:47 AM**

Test Date: **7/2/2010**



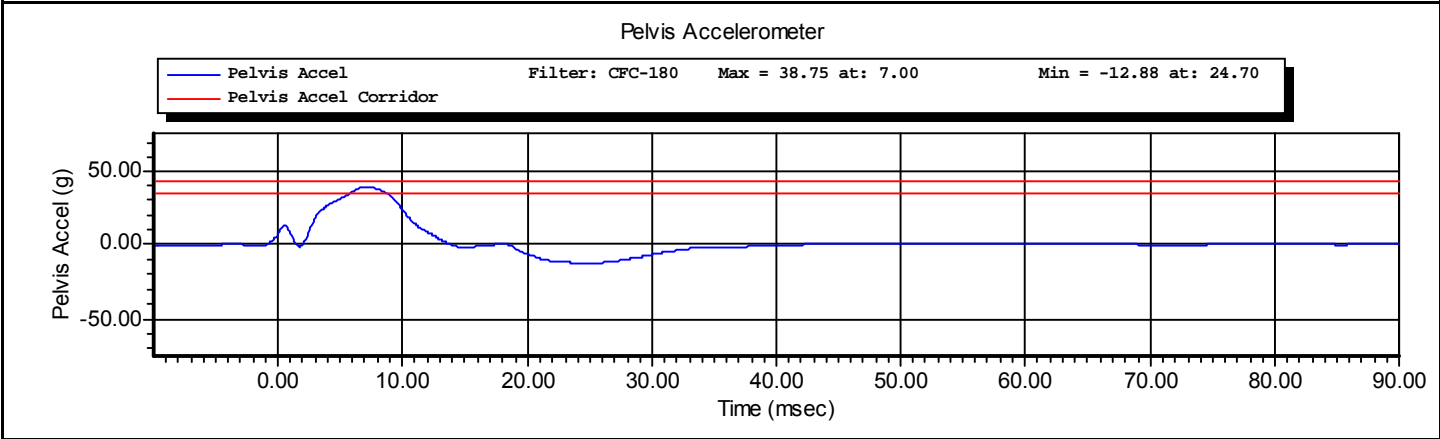
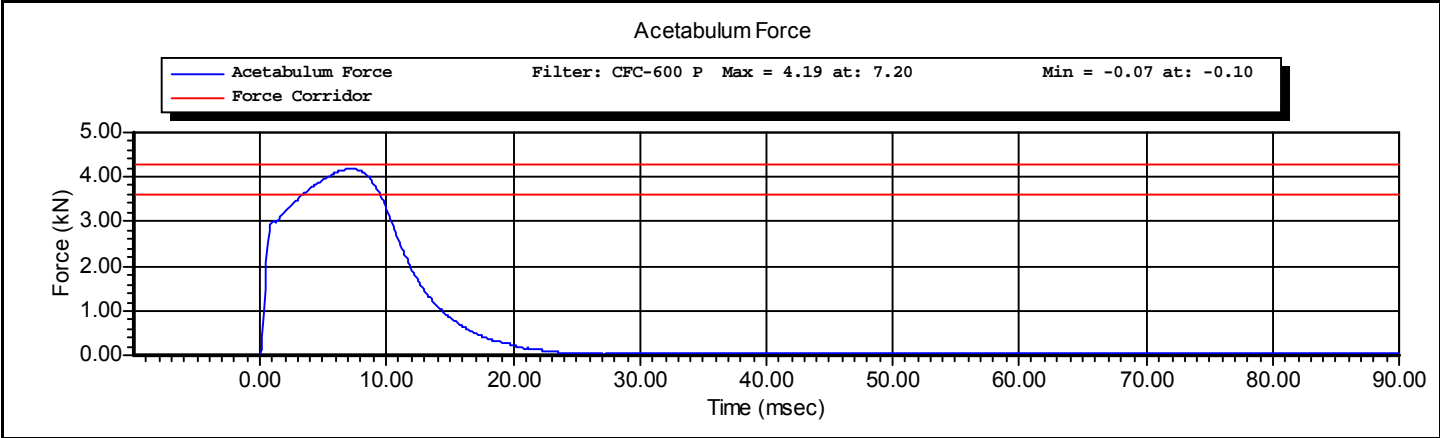
www.calspan.com

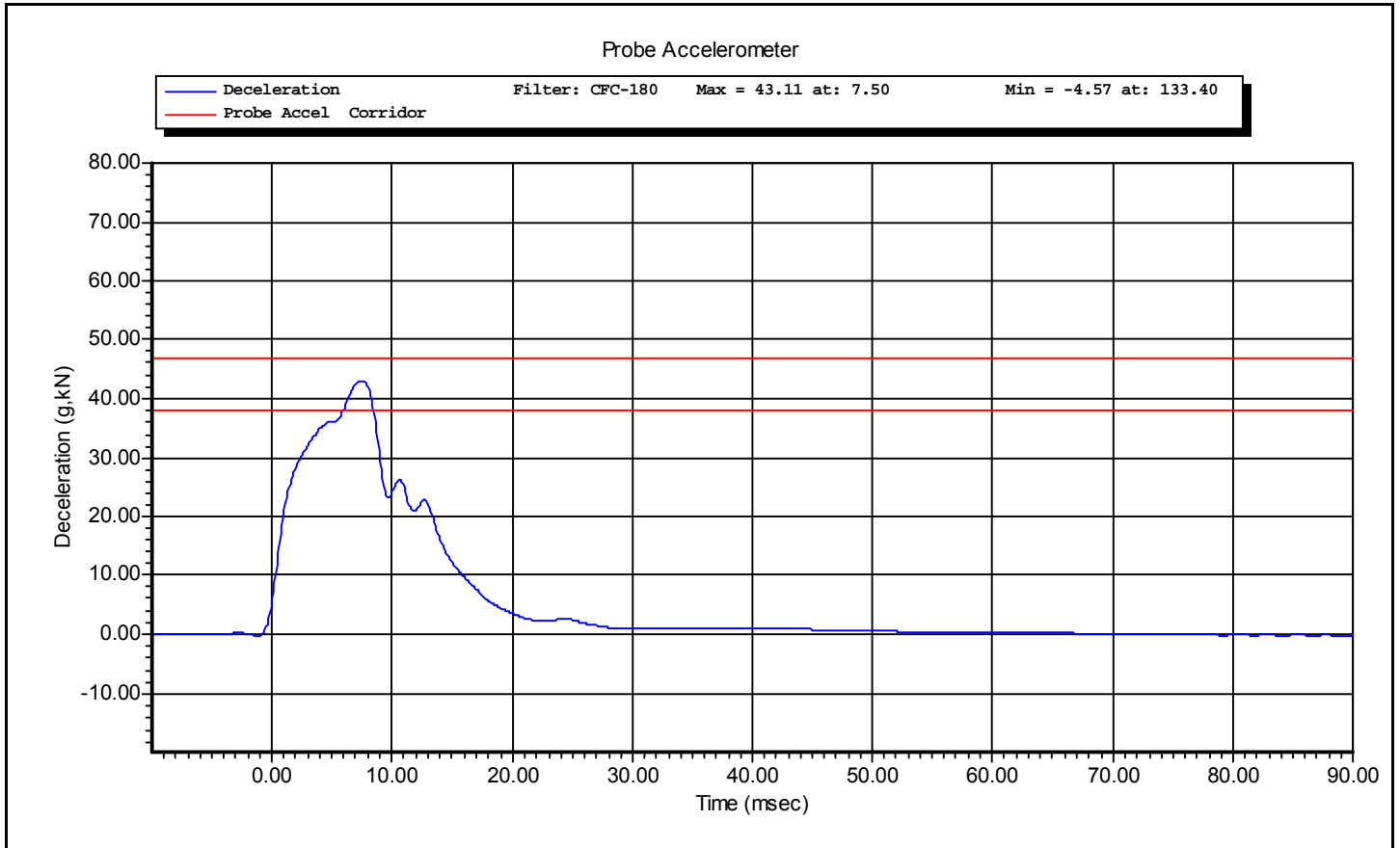
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

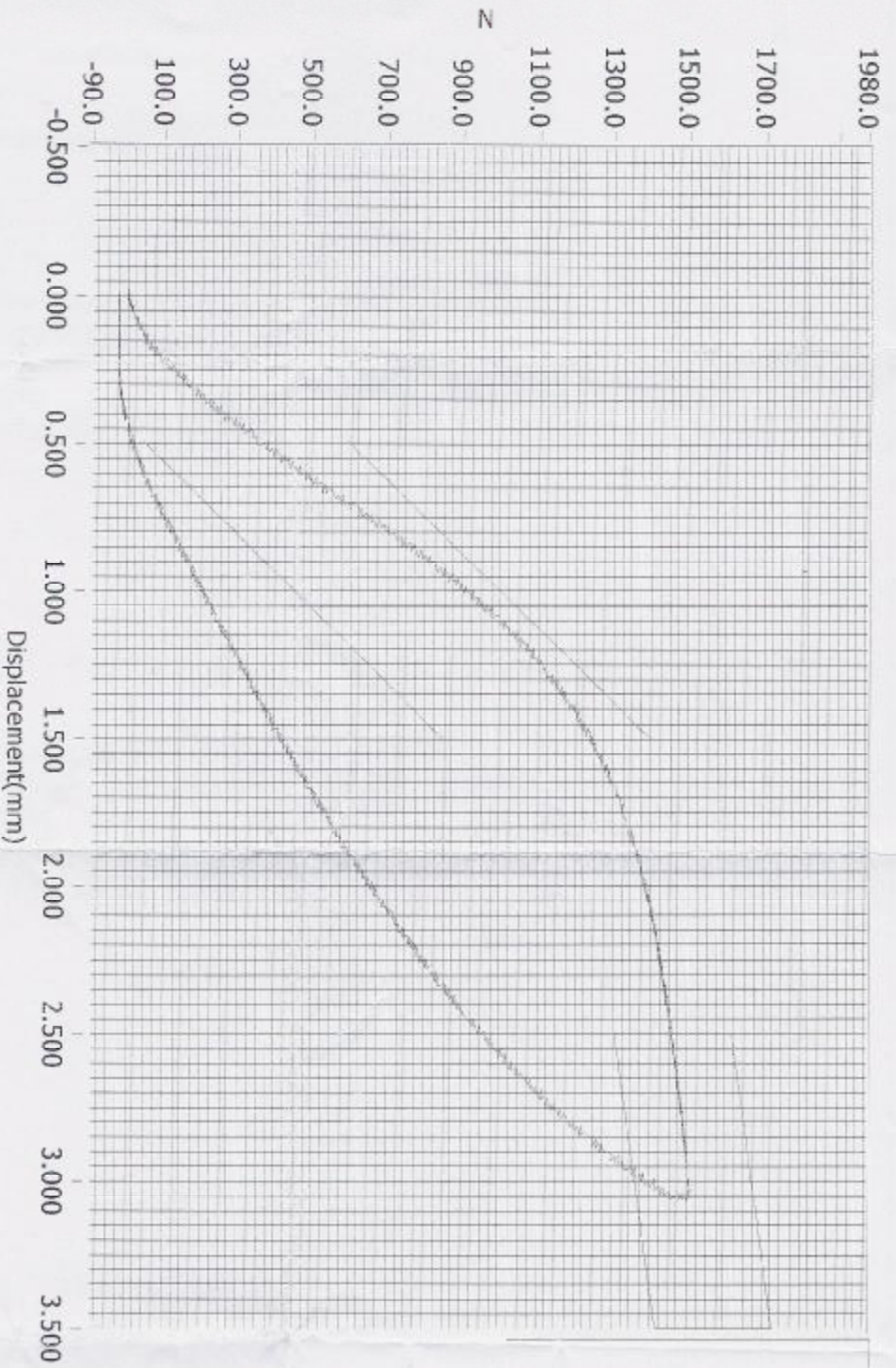
Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Acetabulum Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Acetabulum Pelvis	Test Date:	7/2/2010
Test Number:	1	Test Time:	10:13:47 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------





Resultant Data - SIDIIS Plug Compression



- <> Loading Curve
- <> Boundary Limit Upper
- <> Boundary Limit Lower
- <> Peak Load Upper
- <> Peak Load Lower
- <> Peak Defl Upper
- <> Peak Defl Lower

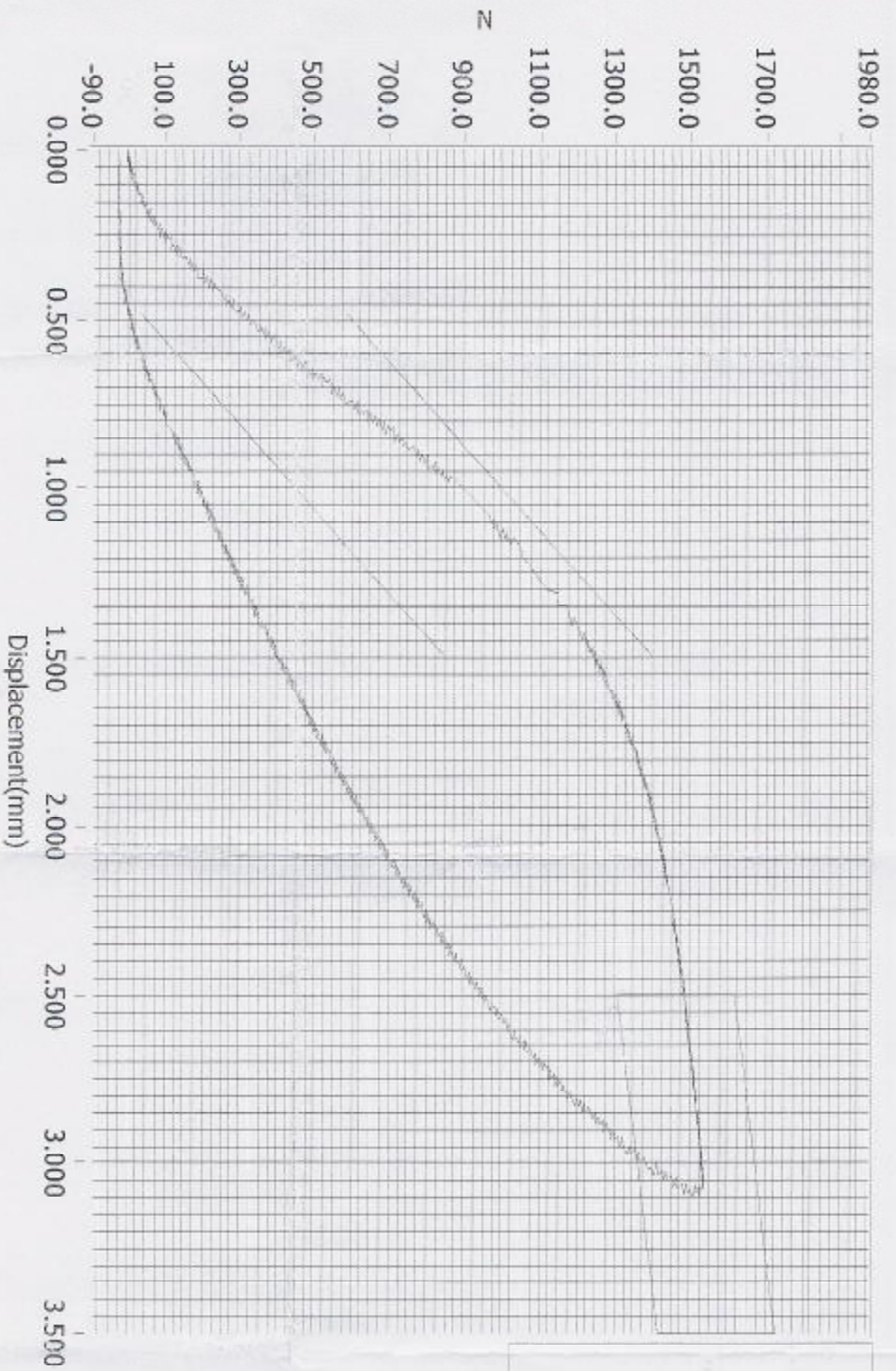
ATD Calibration Lab

<u>Test ID</u>	<u>Part Serial Number</u>	<u>Test Date</u>	<u>Test Time</u>
<u>Cert ID</u>	<u>ATD Serial Number</u>	<u>ATD Type</u>	
	12469	SIDIIS	

Current Date : 7/9/2007

Current Time : 09:49:40

Resultant Data - SIDIIs Plug Compression



- <> Loading Curve
- <> Boundary Limit Upper
- <> Boundary Limit Lower
- <> Peak Load Upper
- <> Peak Load Lower
- <> Peak Defl Upper
- <> Peak Defl Lower

ATD Calibration Lab

Test ID

Part Serial Number

Test Date

Test Time

Cert ID

ATD Serial Number

ATD Type

12470

SIDIIs

7/9/2007

9:50 AM

Current Date : 7/9/2007

Current Time : 09:51:47



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

VERIFICATION REPORT

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Iliac Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Iliac Pelvis	Test Date:	7/1/2010
Test Number:	1	Test Time:	11:34:17 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------

Test Parameters	Test Specifications	Test Results
Temperature	20.6 -- 22.2	22.2 deg C P
Humidity	10 -- 70	44 %RH P
Velocity	4.20 -- 4.40	4.25 m/s P
Peak Probe Acceleration	36.0 -- 45.0	41.4 g P
Peak Pelvis Acceleration	28.0 -- 39.0	38.5 g P
Peak Iliac Force	4.10 -- 5.10	4.69 kN P

All test parameters are within specifications

Technician: **A. Rudniski** Signature: _____
 Supervisor: **D. Travale** Signature: _____

Test ID: **Iliac Pelvis**

Test Time: **11:34:17 AM**

Test Date: **7/1/2010**



www.calspan.com

Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

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
Endevco	7264-2000	P35793	2/24/2010
DentonATD	3228J	LC-290 Fy	4/26/2010

Test ID: **Iliac Pelvis**

Test Time: **11:34:17 AM**

Test Date: **7/1/2010**



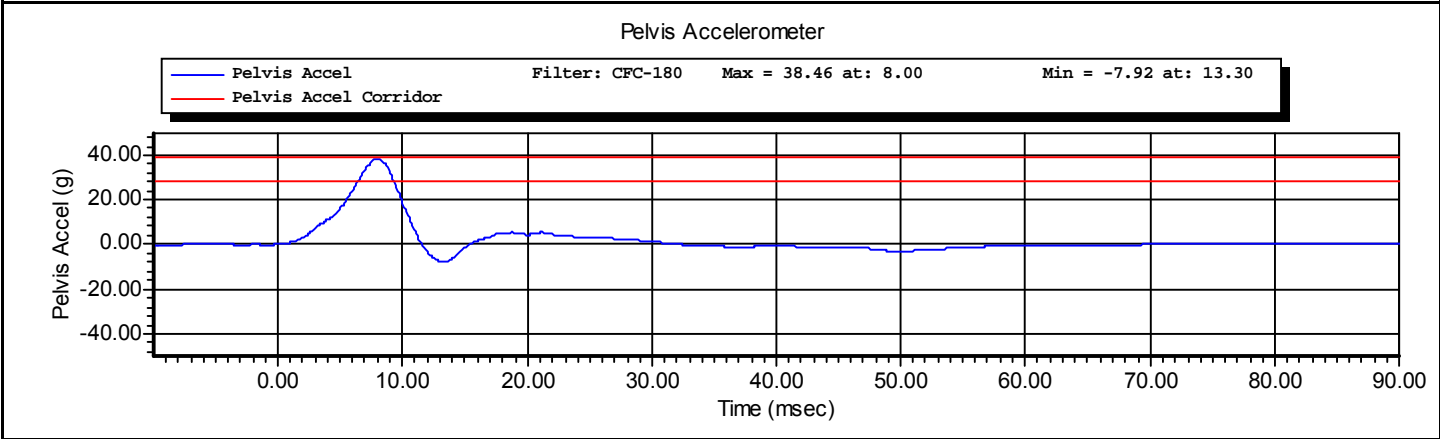
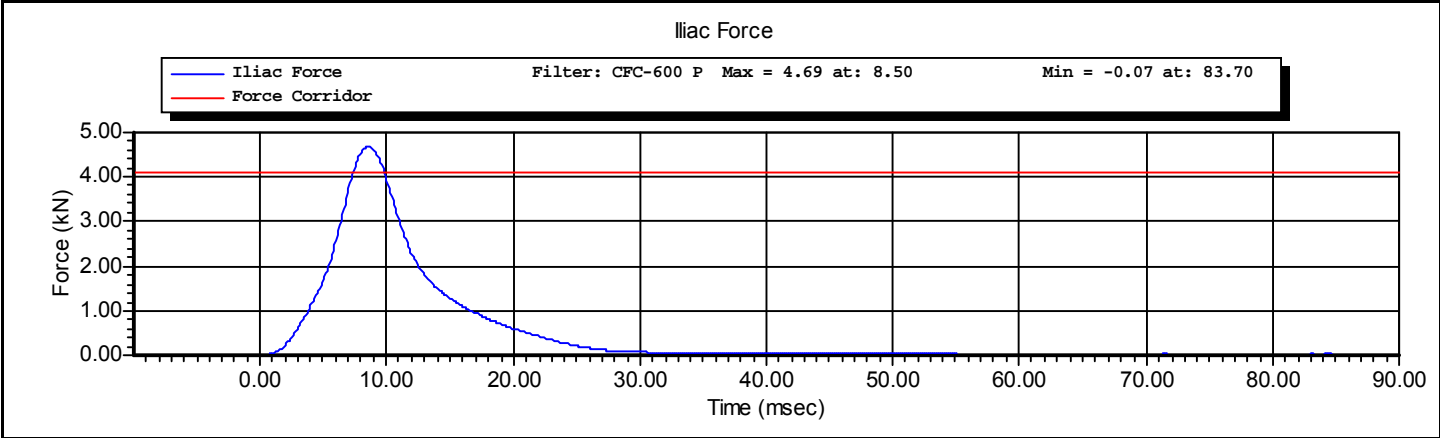
www.calspan.com

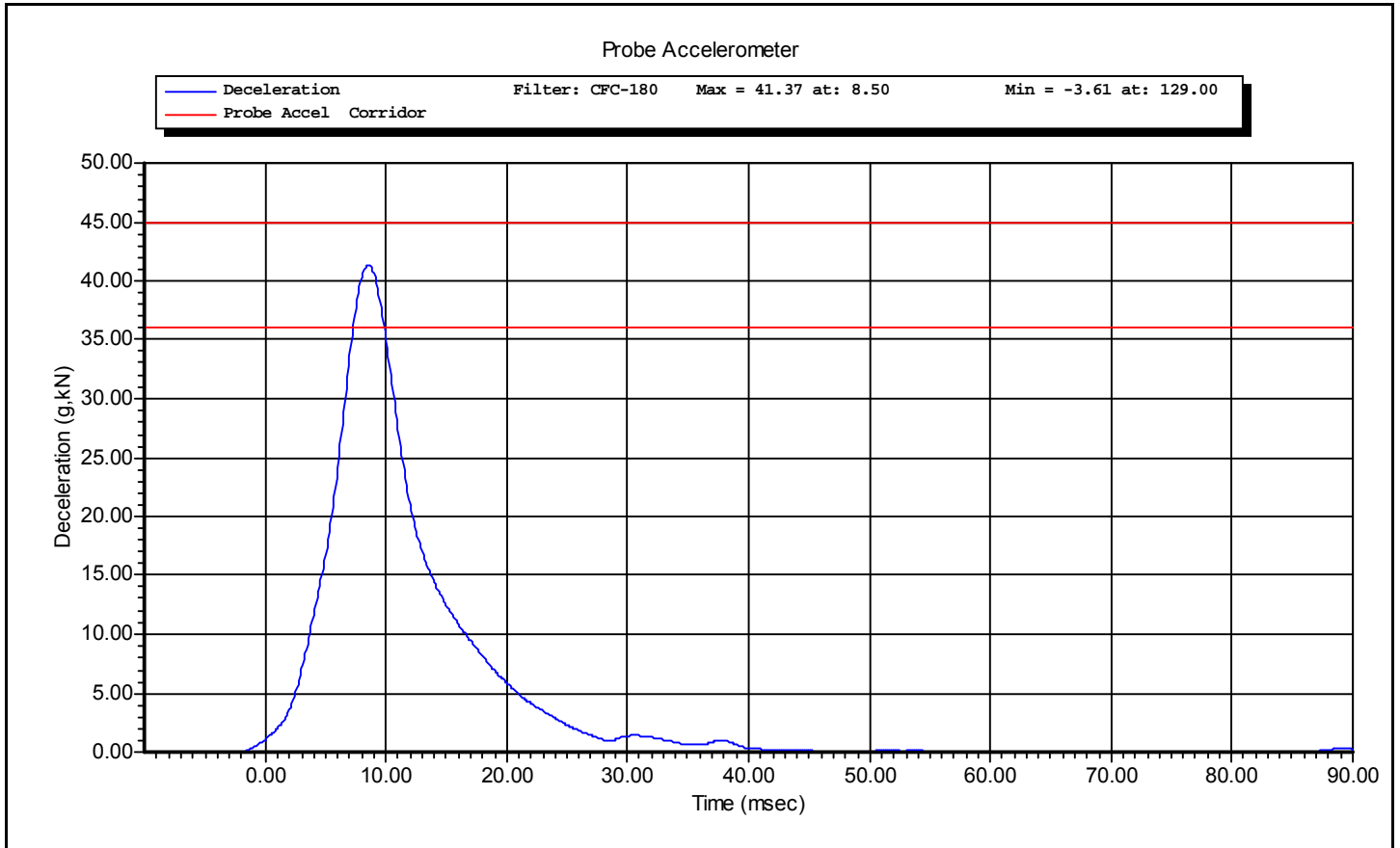
Calspan - Transportation Research Group

4455 Genesee Street, Buffalo, New York 14225 - Phone (716)632-7500

Test Name:	Pelvis	Revision:	8/24/2009
Sub Test Name:	Iliac Impact	Spec Type:	NHTSA
ATD Type:	SID-IIs		
ATD Serial Number:	SID 224		
Test ID:	Iliac Pelvis	Test Date:	7/1/2010
Test Number:	1	Test Time:	11:34:17 AM

Component Part Number	Component Serial Number
-----------------------	-------------------------





APPENDIX G
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY INSTRUMENTATION

		FRONT ES-2re NO.: 037		
		SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
Head Accelerometers	X	AC-P18639	ENDEVCO	25-Jan-10
	Y	AC-P23128	ENDEVCO	25-Jan-10
	Z	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

		REAR SID-IIs NO.: 224		
		SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
Head Accelerometers	X	AC-P23142	ENDEVCO	12-Feb-10
	Y	AC-P16593	ENDEVCO	12-Feb-10
	Z	AC-P32219	ENDEVCO	12-Feb-10
Head Accelerometers	X (Redundant)	AC-P16289	ENDEVCO	12-Feb-10
	Y (Redundant)	AC-P15736	ENDEVCO	12-Feb-10
	Z (Redundant)	AC-P35786	ENDEVCO	22-Jan-10
Lower Spine Accelerometers (T12)	X	AC-P23993	ENDEVCO	13-Apr-10
	Y	AC-P23939	ENDEVCO	13-Apr-10
	Z	AC-P17283	ENDEVCO	13-Apr-10
Acetabulum Load Cell (Y)		LC-115Fy	Denton	26-Apr-10
Iliac Wing Load Cell (Y)		LC-290Fy	DENTON	26-Apr-10

REMARKS: None

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

VEHICLE AND MDB INSTRUMENTATION

VEHICLE INSTRUMENTATION	VEHICLE AND MDB INSTRUMENTS		
	SERIAL NUMBER	MANUFACTURER	CALIBRATION DATE
RIGHT SILL at FRONT SEAT(X)	P35811	ENDEVCO	3/29/2010
RIGHT SILL at FRONT SEAT (Y)	P35789	ENDEVCO	3/29/2010
RIGHT SILL at FRONT SEAT (Z)	P35803	ENDEVCO	3/29/2010
RIGHT SILL at REAR SEAT (X)	P19363	ENDEVCO	1/26/2010
RIGHT SILL at REAR SEAT (Y)	P23176	ENDEVCO	1/26/2010
RIGHT SILL at REAR SEAT (Z)	P17457	ENDEVCO	1/26/2010
REAR FLOORPAN ABOVE AXLE (X)	P23885	ENDEVCO	6/2/2010
REAR FLOORPAN ABOVE AXLE (Y)	P16671	ENDEVCO	6/2/2010
REAR FLOORPAN ABOVE AXLE (Z)	P32288	ENDEVCO	6/2/2010
LEFT SILL at REAR DOOR (Y)	J38127	ENDEVCO	6/2/2010
LEFT SILL at FRONT DOOR (Y)	P26269	ENDEVCO	4/6/2010
RIGHT REAR OCCUPANT COMP. (Y)	P23926	ENDEVCO	3/29/2010
LOWER LEFT B- PILLAR (Y)	P16841	ENDEVCO	2/24/2010
MIDDLE LEFT B-PILLAR (Y)	P24145	ENDEVCO	2/11/2010
LOWER LEFT A-PILLAR (Y)	P15526	ENDEVCO	1/22/2010
MIDDLE LEFT A-PILLAR (Y)	J32838	ENDEVCO	6/2/2010
FRONT SEAT TRACK (Y)	P35798	ENDEVCO	1/25/2010
REAR SEAT TRACK or STRUCTURE (Y)	P18528	ENDEVCO	1/22/2010
VEHICLE CG (X)	P26262	ENDEVCO	2/2/2010
VEHICLE CG (Y)	P21373	ENDEVCO	2/2/2010
VEHICLE CG (Z)	P23957	ENDEVCO	2/2/2010
MDB INSTRUMENTATION			
MDB CG (X)	AC-C16680	ENDEVCO	09-Dec-09
MDB CG (Y)	AC-C14948	ENDEVCO	09-Dec-09
MDB CG (Z)	AC-CP30	ENDEVCO	09-Dec-09
MDB REAR (X)	AC-C15007	ENDEVCO	09-Dec-09
MDB REAR (Y)	AC-C16499	ENDEVCO	09-Dec-09

REMARKS: None