

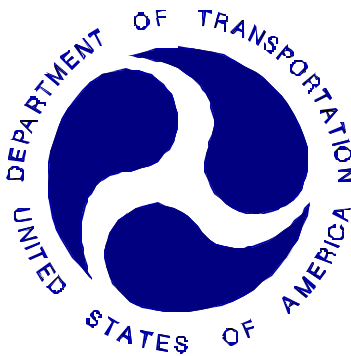
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

VOLVO GOTHENBURG SWEDEN
2004 VOLVO XC90
MPV

NHTSA NUMBER: VO45900

VERIDIAN TEST NUMBER: 8714-01

VERIDIAN ENGINEERING
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



July 15, 2003

FINAL REPORT

PREPARED FOR:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
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16. Abstract					
<p>A frontal load cell barrier test of a 2004 Volvo XC90 MPV was performed at Veridian Engineering crash test facility in Buffalo, New York, on July 15, 2003.</p> <p>The impact velocity was 56.3 kph and the temperature at the barrier face was 21°C. The maximum post-test vehicle crush was 404 mm. The test vehicle was equipped with 3-point restraint systems, knee bolsters, and airbags with shoulder belt pretensioners and force limiters at both the driver and right outboard passenger seating positions.</p> <p>With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appeared to comply with head, chest, and femur requirements.</p>					
ATD Position	HIC	Clip (g's)	Chest Disp (mm)	Left Femur (N)	Right Femur (N)
Driver (150)	431.2	41.7	40.1	5819.1	7848.6
Passenger (245)	348.2	48.3	§	2617.4	4298.6
§Data is questionable after 120 ms					
17. Key Words 56 kph Frontal Barrier Impact test New Car Assessment Program (NCAP)				18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, DC 20590	
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SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.3 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA). The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 48.3 kph requirements.

The 56.3 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.3 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated December 1999. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion (Partial)"; and FMVSS 301 "Fuel System Integrity" performance. Procedures for receiving, inspection testing and reporting of test results are described in the test procedures and are not repeated in this report.

One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with nine accelerometer array head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, , and lower leg instrumentation. The driver (position 1) ATD (Serial No. 150) and the right-front passenger (position 2) ATD (Serial No.245) were used in two tests previous to this test (M30108 and DC0301) where they did not exceed FMVSS 208 head, chest or femur requirements. Certification details, along with instrumentation calibration data, are found in Appendix C.

The vehicle, occupant, camera and measurement data are presented in Section 2. Appendix A contains the still photograph prints. The 193 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Appendix C contains the dummy calibration data and Appendix D contains the transducer calibration dates.

1.3 SUMMARY OF FRONTAL BARRIER IMPACT TEST

A load cell barrier consisting of 36 load cells was impacted by a 2004 Volvo XC90 MPV at a velocity of 56.3 kph. The test was performed at Veridian Engineering on July 15, 2003. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The occupant data is summarized below.

	HIC	Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)	Belt Stretch (mm/50 mm)
Driver ATD	431.2	41.7	40.1	5819.1	7848.6	*	*
Passenger ATD	348.2	48.3	§	2617.4	4298.6	*	*

§ - Data is questionable after 120 ms.

* Not used

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum vehicle static crush was 404 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The face to the center of the airbag, the top of the head to the visor, the chest to the airbag and the left and right knee to the knee bolster. The passenger's visible contact points were as follows: The face to the right of the center of the airbag, the top and back of the head to the right outboard side of the head restraint, the chest to the airbag and the left and right knee to the knee bolster.

The 2004 Volvo XC90 MPV did not exceed the requirements of FMVSS 208, FMVSS 212, FMVSS 219, and FMVSS 301. Data pertaining to these standards are presented in the data sheets.

SECTION 2

GENERAL TEST AND VEHICLE PARAMETER DATA

DATA SHEET NO. 1 CRASH TEST SUMMARY

Vehicle NHTSA No.: VO45900 Test Mode: 56.3 kph Frontal Barrier
 Test Date: July 15, 2003 Time: 18:45 Temperature: 21 °C
 Vehicle Make/Model/Body Style: 2004 Volvo XC90 MPV
 Vehicle Test Weight: 2401.0 kg
 Vehicle/Barrier Impact Angle: 0 °
 Impact Velocity: 56.3 kph
 Maximum Static Crush: 404 mm
 Vehicle Rebound: 384 mm

<u>DUMMIES:</u>	<u>DRIVER</u>	<u>PASSENGER</u>
Type:	<u>572E</u>	<u>572E</u>
Restraint System:	Seatbelt with torso belt pretensioner and load limiter, Airbag, Knee Bolster, Whiplash protection system	Seatbelt with torso belt pretensioner and load limiter, Airbag, Knee Bolster, Whiplash protection system

Number of Data Channels: 193
 Number of Cameras: 1 Real Time
16 High Speed

DOOR OPENING DATA: Closed, latched and operable without tools - Left Front
Closed, latched and operable without tools - Right Front

Front Seat(s) Data:	<u>DRIVER</u>	<u>PASSENGER</u>
Seat Track Failure: (mm of shift)	<u>10 mm forward</u>	<u>10 mm forward</u>
Seat Back Failure:	<u>None</u>	<u>None</u>

<u>VISIBLE DUMMY CONTACT POINTS:</u>	<u>DRIVER</u>	<u>PASSENGER</u>
Head:	The face to the center of the airbag, the top of the head to the visor.	The face to the right of the center of the airbag, the top and back of the head to the right outboard side of the head restraint.
Abdomen:	<u>-</u>	<u>-</u>
Chest:	<u>Airbag</u>	<u>Airbag</u>
Knees:	<u>Knee bolster</u>	<u>Knee bolster</u>

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2004 Volvo XC90 MPV

NHTSA No. : VO45900 ; VIN: YV1CZ91H441045447 ; Color: Black

Engine Data: 6 cylinders; - CID; 2.9 Liters; - cc

Placement: X Longitudinal or In-Line; - Transverse or Lateral

Transmission Data: 5 speeds; - Manual; X Automatic; X Overdrive

Final Drive: - Rear Wheel Drive; - Front Wheel Drive; X Four Wheel Drive

Safety Belt Features – Driver X Pretensioner (Shoulder); X Load Limiter; X Adj. Anchorage

Safety Belt Features - Passenger X Pretensioner (Shoulder); X Load Limiter; X Adj. Anchorage

Major Options: X A/C; X Pwr.Strg.; X Pwr. Brakes

X Pwr. Windows; X Pwr. Door Locks; X Tilt Wheel

Date Received: June 30, 2003 ; Odometer Reading 32 km

Selling Dealer: Jim Culligan, Inc.

& Address: 8129 Main Street Williamsville, NY 14221

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Volvo Gothenburg Sweden

Date of Manufacture 05/03

GVWR: 2760 kg; GAWR: 1310 kg FRONT; 1470 kg REAR

DATA FROM TIRE PLACARD:

Recommended Tire Size: P235/60R18

* Recommended Cold Tire Pressure: 250 kpa FRONT; 270 kpa REAR

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P235/60R18 102V ; Manufacturer: Michelin

Tire Pressure with Maximum Capacity Vehicle Load: Front: 300 kPa; Rear: 300 kPa

Treadwear: 300 ; Traction: A ; Temperature: A

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; X Bucket; - Split Bench

Number of Occupants: 2 Front; 5 Rear; 7 Total

Vehicle Capacity Weight (VCW) = 550 kg

No. of Occupants x 68.04 kg = 476.28 kg

Rated Cargo/Luggage Weight (RCLW) = 73.72 kg

*Tire pressure used for test

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

Right Front =	<u>574.0</u>	kg	Right Rear =	<u>516.0</u>	kg
Left Front =	<u>575.0</u>	kg	Left Rear =	<u>515.0</u>	kg
TOTAL FRONT =	<u>1149.0</u>	kg	TOTAL REAR =	<u>1031.0</u>	kg
TOTAL DELIVERED WEIGHT =	<u>2180.0</u>	kg			
% of Total Front of Vehicle Weight =	<u>52.7%</u>		% of Total Rear Weight =	<u>47.3%</u>	%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	<u>2180.0</u>	kg
Rated Cargo/Luggage Weight (RCLW) =	<u>73.72</u>	kg
Weight of 2 p.572 Dummies @ 76 each =	<u>152</u>	kg
TARGET TEST WEIGHT =	<u>2405.7</u>	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND

69.0

KG OF CARGO WEIGHT:

Right Front =	<u>614.0</u>	kg	Right Rear =	<u>581.5</u>	kg
Left Front =	<u>612.0</u>	kg	Left Rear =	<u>593.5</u>	kg
TOTAL FRONT =	<u>1226.0</u>	kg	TOTAL REAR =	<u>1175.0</u>	kg
TOTAL TEST WEIGHT =	<u>2401.0</u>	kg			
% of Total Front Weight =	<u>51.1%</u>	%	% of Total Rear Weight =	<u>48.9%</u>	%
Weight of Ballast Secured in Vehicle Trunk Area =	<u>11</u>	kg			
Vehicle Components Removed for Weight Reduction:	<u>Tail lights, rear door trim, side mirrors, rear cargo trim, rear wiper.</u>				

VEHICLE ATTITUDE (all dimension in millimeters):

AS DELIVERED:	RF	<u>805</u>	LF	<u>806</u>	RR	<u>827</u>	LR	<u>831</u>
FULLY LOADED:	RF	<u>798</u>	LF	<u>799</u>	RR	<u>797</u>	LR	<u>802</u>
AS TESTED:	RF	<u>800</u>	LF	<u>803</u>	RR	<u>809</u>	LR	<u>913</u>
Vehicle's Wheel Base:	<u>2854</u> mm							
Location of Vehicle's C.G.:	<u>1397</u> mm rearward of front wheel center.							

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual =	<u>72.0</u>	liters
Usable Capacity Figure Furnished by COTR =	<u>72.0</u>	liters
Test Volume Range (92 to 94% of Usable Capacity) =	<u>66.24</u>	to <u>67.68</u> liters
ACTUAL TEST VOLUME=	<u>66.5</u>	liters (with entire fuel system filled)
Test Fluid Type:	<u>Stoddard Solution</u>	; Spec. Grav. = <u>0.764</u>
Kinematic Viscosity =	<u>0.96</u>	centistokes; Color = <u>Orange</u>
Type of Fuel Pump: Electric-	<u>X</u>	; Mechanical- <u>-</u>
Does Electric Pump operate with ignition switch "ON" & engine "OFF"	Yes- <u>X</u>	No- <u>-</u>
<u>Details of Fuel System: Fuel tank – centered ahead of rear axle; Fuel lines – along right frame stiffener;</u>		
<u>Fuel Filler – right side behind rear axle.</u>		

DATA SHEET NO. 3 POST IMPACT DATA

TYPE OF TEST:

Type of Test: Frontal Barrier Impact Angle: 0°
Test Date: July 15, 2003 Time: 18:45 Temperature: 21 °C
Vehicle NHTSA No.: VO45900
Required Impact Velocity Range: 55.5 to 57.1 kph

BARRIER IMPACT VELOCITY: (Speed traps within 5 feet of impact plane.)

Trap No. 1 = 56.3 kph; Trap No. 2 = 56.3 kph
Distance from vehicle to barrier: (1) entering trap = 813 mm
(2) exiting trap = 305 mm

VEHICLE STATIC CRUSH: (mm) (For frontal and rear impacts only.)

Vehicle Length:
Pre-Test Left = 4773 ; C/L = 4810 ; Right = 4771
Post-Test Left = 4404 ; C/L = 4410 ; Right = 4422
Crush Left = 369 ; C/L = 400 ; Right = 349
AVERAGE = 372.67 mm

VEHICLE REBOUND: (From rigid barrier only.)

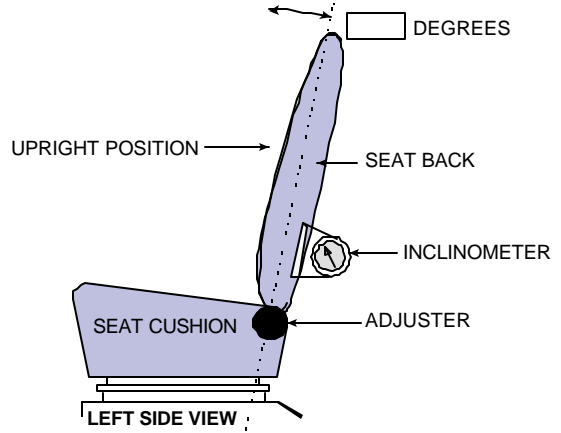
Distance from front of test vehicle to impact point:
Left = 458 ; C/L = 340 ; Right = 355
AVERAGE = 384 mm

DATA SHEET NO. 4 TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2004 Vehicle Model: Volvo XC90 Body Style : MPV

1. Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



FRONT SEAT ASSEMBLY

Seat back angle for driver's seat: 19°

Measurement instructions: Measure angle along seatback centerline using a straight edge. Angle should be measured from vertical adjusted for a level sill.

Seat back angle for passenger's seat: 19°

Measurement instructions: Same as the driver's seat.

2. Seat Fore and Aft Positioning

Positioning of the driver's seat: Seat tracks should be placed in mid-position (116 mm of 232 mm)

Positioning of the passenger's seat: Same as the driver's seat.

3. Fuel Tank Capacity Data

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 72 liters

B. "Usable Capacity" of the optional equipment fuel tank is - liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 72 liters

3.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 66.6 liters

3.3 Is vehicle equipped with electric fuel pump? Yes- X ; No- -

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

When the ignition is turned to the 'ON' position, the pump will pressurize the fuel system. The pump runs continuously only while the engine is running.

DATA SHEET NO. 4 TEST VEHICLE INFORMATION (cont.)

4. STEERING COLUMN ADJUSTMENTS:

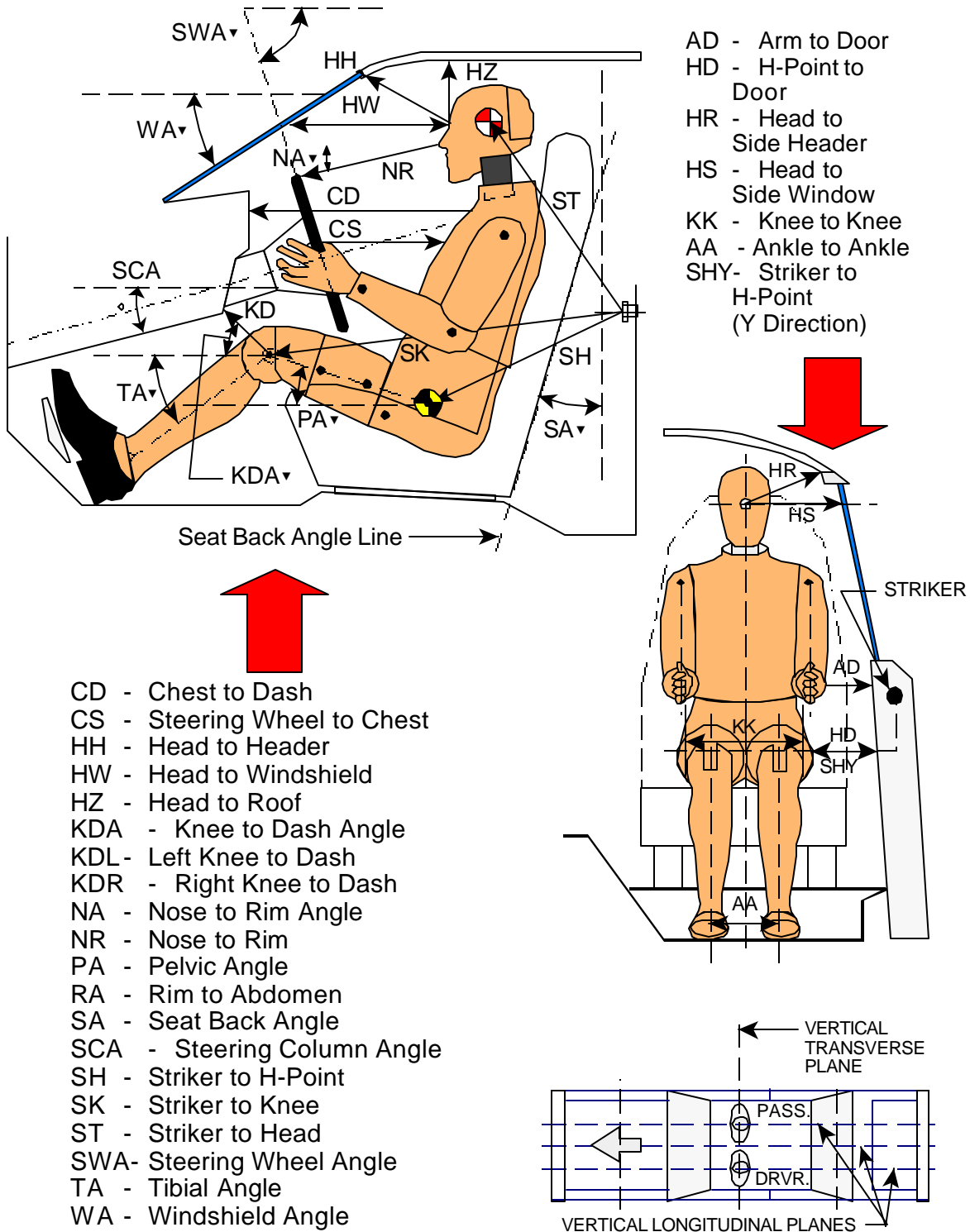
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: Place steering column in mid tilt and telescope position (angle should
measure 27° adjusted to level sill. The adjustable travel is 55 mm, column should be located at 27.5 mm.

5. SEAT BELT UPPER ANCHORAGE

Nominal design riding position: Test position is mid-position of the panel slot.

DATA SHEET NO. 5 FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

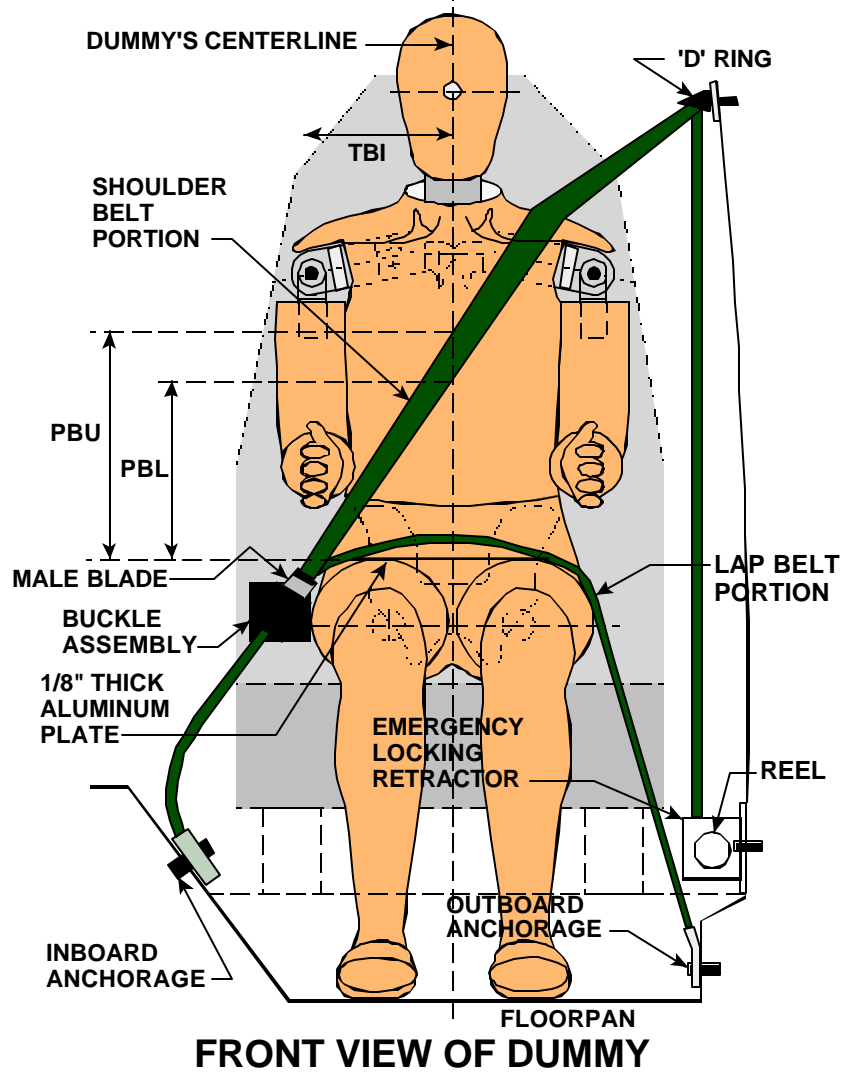


DATA SHEET NO. 5 FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #150)			PASS. (Serial #245)		
WA ^o	28 deg.			N/A		
SWA ^o	63 deg.			N/A		
SCA ^o	27 deg.			N/A		
SA ^o	19 deg.			19 deg.		
HZ	196			200		
HH	337			336		
HW	659			658		
HR	214			213		
NR	408	Angle	-10 deg.	N/A		
CD	558			532		
CS	304			N/A		
RA	192			N/A		
KDL	197	Angle (KDA)	36 deg.	170		
KDR	195			174	Angle (KDA)	30 deg.
PA ^o	20.5 deg.			24.2 deg.		
TA ^o	47.3deg.			47.8 deg.		
KK	320			275		
AA	280			215		
ST	552	Angle	12 deg.	550	Angle	10 deg.
SK	605	Angle	97 deg.	602	Angle	96 deg.
SH	240	Angle	131 deg.	244	Angle	127 deg.
SHY	240			244		
HS	308			306		
HD	129			133		
AD	112			110		

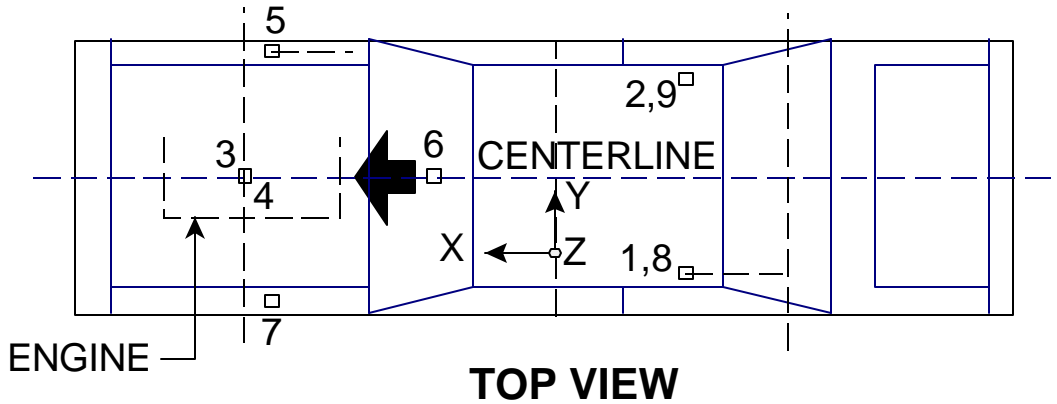
Dimensions in millimeters

SEAT BELT POSITIONING DATA

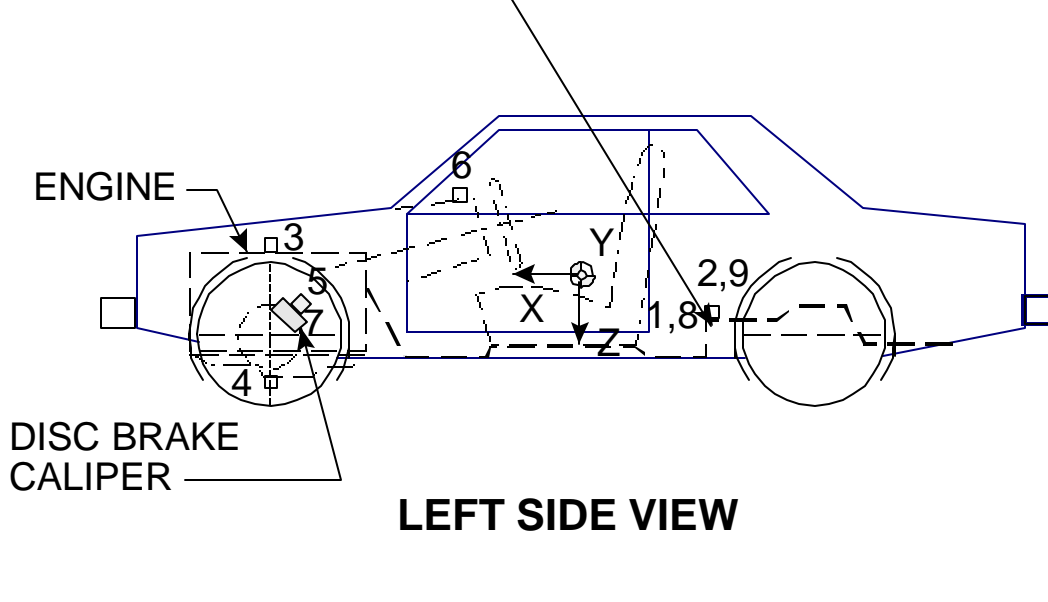


	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	385	385
PBL-- Top surface of alum. plate to belt lower edge	300	300
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



REAR SEAT CUSHION
ASSY. FRONT ATTACHMENT
BRACKET SUPPORT



Note: Vehicle accelerometer location and data summary shown in DATA SHEET NO. 7

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY (cont.)

LOCATION		PRE-TEST LENGTH (mm)		
		X	Y	Z
1	Left Rear Seat Cross Member X	1151	-450	-687
2	Right Rear Seat Cross Member X	1151	455	-684
3	Top of Engine Block	4201	-197	-859
4	Bottom of Engine	3852	13	-290
5	Disc Brake Caliper @ Right Side	4028	894	-275
6	Instrument Panel	3128	45	-980
7	Disc Brake Caliper @Left Side	3963	-871	-472
8	Left Rear Seat Cross Member Z	1151	-450	-687
9	Right Rear Seat Cross Member Z	1151	455	-684

LOCATION NUMBER	DESCRIPTION	MAXIMUM VALUE (g's)			
		Pos.	msec.	Neg.	msec.
1	Left Rear Seat Cross Member X	1.7	119.4	-37.8	41.8
2	Right Rear Seat Cross Member X	8.1	231.6	-37.7	42.6
3	Top of Engine Block	9.7	34.9	-135.9	23.0
4	Bottom of Engine	14.6	36.9	-147.2	30.0
5	Disc Brake Caliper @ Right Side	26.9	37.0	-93.2	28.5
6	Instrument Panel	19.7	59.6	-43.9	29.5
7	Disc Brake Caliper @Left Side	15.6	71.1	-73.5	26.8
8	Left Rear Seat Cross Member Z	7.6	73.6	-13.0	51.5
9	Right Rear Seat Cross Member Z	6.0	56.4	-8.0	10.0

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES

Vehicle Year/Make/Model/Body Style: 2004 Volvo XC90 MPV

NHTSA Test No.: VO45900 Test Date: July 15, 2003

DESCRIPTION	Unit	MAXIMUM VALUE							
		Driver				Passenger			
		Pos	msec	Neg	msec	Pos	msec	Neg	msec
Head 9 Array X Arm Y	g	6.1	79.6	-6.1	43.4	21.4	31.0	-12.6	60.1
Head 9 Array X Arm Z	g	34.1	41.9	-23.4	57.0	30.1	49.6	-9.3	61.6
Head 9 Array Y Arm X	g	31.8	193.1	-52.0	76.3	5.5	211.3	-44.9	67.5
Head 9 Array Y Arm Z	g	21.1	38.5	-24.6	81.1	28.2	47.7	-2.5	84.2
Head 9 Array Z Arm X	g	49.2	191.1	-63.0	56.6	8.5	212.1	-54.2	61.6
Head 9 Array Z Arm Y	g	6.7	70.2	-6.2	50.9	6.9	51.6	-8.9	105.8
Head X	g	30.6	192.7	-53.6	75.5	5.1	211.2	-42.9	70.0
Head Y	g	4.2	68.5	-4.7	43.3	10.9	30.9	-8.7	78.9
Head Z	g	21.0	62.6	-24.7	82.2	24.6	48.4	-2.2	124.7
Head Resultant	g	55.1	77.5	0.1	10.5	43.7	70.0	0.1	-45.3
Redundant Head X	g	31.1	192.7	-53.4	76.2	5.5	210.9	-41.9	70.0
Redundant Head Y	g	3.3	80.0	-5.5	42.9	10.3	30.9	-9.6	78.2
Redundant Head Z	g	21.6	64.6	-24.5	81.8	25.4	48.3	-2.2	124.2
Redundant Head Resultant	g	55.4	76.9	0.1	-49.9	42.9	70.0	0.1	-44.7
Upper Neck Fx	N	1387.2	78.3	-436.0	210.2	762.5	61.7	-421.1	121.0
Upper Neck Fy	N	133.4	224.3	-136.4	90.4	183.6	45.1	-177.5	114.7
Upper Neck Fz	N	1413.2	64.4	-1102.0	197.5	1702.1	47.9	-192.8	68.4
Upper Neck F Resultant	N	1663.7	64.4	2.6	-49.1	1744.0	47.9	2.8	-23.6
Upper Neck Mx	N-m	13.2	200.4	-7.6	52.6	28.9	78.4	-15.0	121.7
Upper Neck My	N-m	94.7	56.0	-16.7	112.3	63.7	61.1	-15.1	225.9
Upper Neck Mz	N-m	6.3	160.1	-11.2	103.8	16.7	86.3	-7.6	134.5
Upper Neck M Resultant	N-m	94.9	56.0	0.1	-4.9	66.1	60.9	0.1	-12.5
Chest X	g	2.8	254.2	-42.1	77.6	2.6	123.4	-50.2	66.0
Chest Y	g	5.7	55.8	-5.5	45.5	4.7	36.8	-7.5	58.1
Chest Z	g	10.1	38.6	-5.1	95.0	11.3	37.5	-11.1	66.7
Chest Resultant	g	42.1	77.6	0.0	-49.8	51.3	66.4	0.0	-43.5

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)

Vehicle Year/Make/Model/Body Style: 2004 Volvo XC90 MPV

NHTSA Test No.: VO45900 Test Date: July 15, 2003

DESCRIPTION	Unit	MAXIMUM VALUE							
		Driver				Passenger			
		Pos	msec	Neg	msec	Pos	msec	Neg	msec
Redundant Chest X	g	2.8	254.3	-41.4	44.9	2.7	273.4	-50.3	65.9
Redundant Chest Y	g	5.6	54.7	-5.8	45.5	4.6	35.2	-7.5	58.0
Redundant Chest Z	g	9.8	38.9	-5.1	94.7	11.0	37.3	-11.2	66.7
Redundant Chest Resultant	g	41.8	45.0	0.0	-49.1	51.4	66.4	0.0	-47.2
Chest Displacement	mm	0.0	5.8	-40.1	46.7	§	§	§	§
Pelvic X	g	3.3	272.3	-89.2	44.2	5.8	79.9	-67.3	49.1
Pelvic Y	g	7.4	60.6	-9.7	46.4	5.8	35.5	-7.6	68.4
Pelvic Z	g	4.3	197.8	-35.7	63.3	3.8	25.8	-39.2	64.8
Pelvic Resultant	g	90.7	44.2	0.0	-41.2	72.8	49.1	0.0	-50.0
Left Femur	N	650.4	37.6	-5819.1	49.0	393.9	17.6	-2617.4	43.5
Right Femur	N	546.8	30.3	-7848.6	47.5	369.9	18.5	-4298.6	44.1
Left Upper Tibia Mx	N-m	34.4	46.8	-20.2	74.5	21.8	69.2	-40.0	41.1
Left Upper Tibia My	N-m	14.8	97.6	-135.0	46.7	8.3	155.1	-193.4	44.3
Left Lower Tibia Fz	N	186.6	107.8	-2368.3	26.1	136.0	222.6	-3863.1	42.9
Left Lower Tibia Mx	N-m	54.0	39.9	-5.0	30.6	61.8	44.2	-15.1	38.9
Left Lower Tibia My	N-m	20.0	81.9	-30.6	46.9	39.1	76.1	-42.2	43.8
Right Upper Tibia Mx	N-m	12.2	150.7	-51.0	43.9	5.9	14.4	-43.4	54.4
Right Upper Tibia My	N-m	22.0	194.8	-186.2	40.6	23.3	214.4	-161.0	44.7
Right Lower Tibia Fz	N	65.0	23.3	-3823.7	43.3	285.7	15.0	-3487.8	43.1
Right Lower Tibia Mx	N-m	3.5	29.6	-22.8	39.9	73.3	43.6	-11.1	226.9
Right Lower Tibia My	N-m	23.9	29.5	-145.9	39.9	57.9	72.6	-25.1	27.3
Left Foot Aft Ax	g	10.1	83.3	-57.6	41.6	80.7	39.4	-13.4	48.8
Left Foot Aft Az	g	11.1	46.9	-49.2	28.5	108.8	40.7	-12.7	61.4
Left Foot Fore Az	g	43.4	37.9	-75.2	28.4	29.4	23.8	-119.6	38.6
Right Foot Aft Ax	g	36.9	47.4	-289.3	38.9	11.7	75.0	-65.1	29.8
Right Foot Aft Az	g	8.6	29.0	-183.9	38.1	7.5	54.8	-48.5	41.1
Right Foot Fore Az	g	104.5	42.1	-621.6	38.0	54.8	42.6	-56.2	29.2

§ Data is questionable after 120 ms.

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)

Vehicle Year/Make/Model/Body Style: 2004 Volvo XC90 MPV

NHTSA Test No.: VO45900 Test Date: July 15, 2003

HEAD INJURY CRITERIA (HIC)				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	431.2	57.7	90.3	44.5 g
Position #2 - Passenger	348.2	46.9	82.9	39.3 g

** HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

CLIP SUMMARY*				
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	41.7	76.2	79.2	461.2
Position #2 - Passenger	48.3	64.8	67.8	481.6

* The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
REDUNDANT DATA

Vehicle Year/Make/Model/Body Style: 2004 Volvo XC90 MPV
 NHTSA Test No.: VO45900 Test Date: July 15, 2003

HEAD INJURY CRITERIA (HIC) REDUNDANT				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	429.7	58.0	90.0	44.8 g
Position #2 - Passenger	319.9	46.9	82.9	38.0 g

** HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

CLIP SUMMARY* REDUNDANT				
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	40.9	76.9	79.9	438.1
Position #2 - Passenger	48.6	64.7	67.7	481.9

* The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

DATA SHEET NO. 9 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

Belt length from trim panel exit
to bolt hole anchor point for
continuous webbing systems.

Driver

Passenger

1560

1560

Shoulder belt length as measured
on Part 572 Dummy.

890

890

Lap belt length as measured
on Part 572 Dummy.

670

670

Dimensions in millimeters

DATA SHEET NO.10 SUMMARY OF FMVSS 212 DATA

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

Windshield is bonded in place and covered with a 0.0 mm molding.

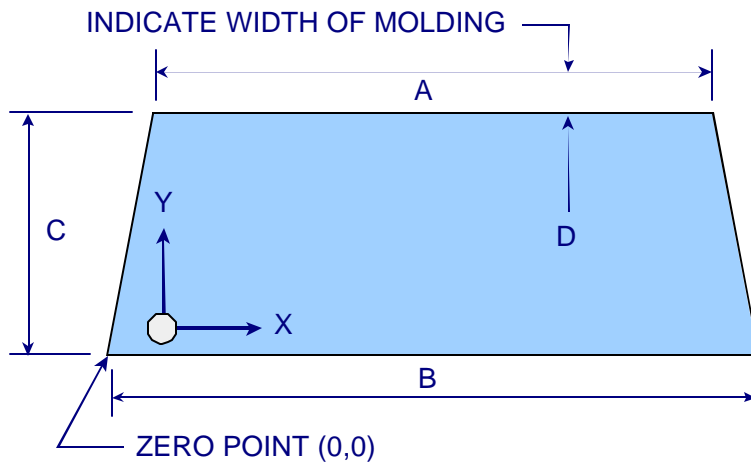
FMVSS 212 REQUIREMENTS:

The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of the windshield for vehicles equipped with automatic restraint systems for front occupants,

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST (mm)	
RIGHT SIDE	2209	2209	100.0%
LEFT SIDE	2209	2209	100.0%
TOTAL	4418	4418	100.0%

AREA OF RETENTION FAILURE: None



DIMENSIONS (mm)	
A	1218
B	1520
C	840
D	0

FRONT VIEW OF WINDSHIELD

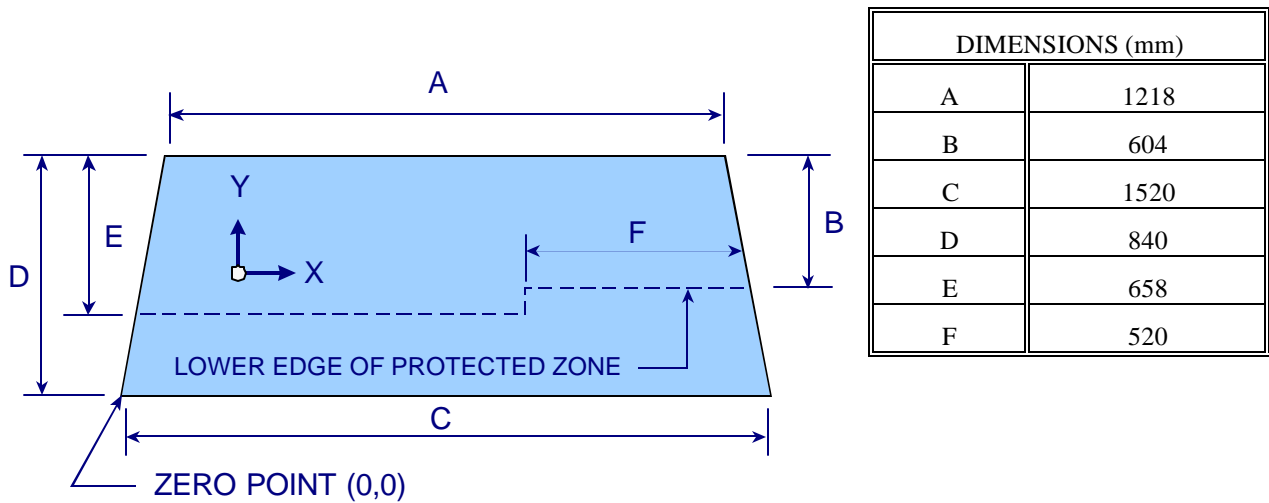
FAILURE DETAILS: None

DATA SHEET NO. 11 FMVSS NO. 219 (PARTIAL) - "WINDSHIELD ZONE INTRUSION" DATA

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 165 mm diameter rigid sphere weighing 6.8 kg in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points extend the locus line horizontally to the edges of the windshield, then draw a line on the inner surface of the windshield below and 13 mm distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA:



FRONT VIEW OF WINDSHIELD

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

(Show location of penetration on the above sketch)

	COORDINATES	
	X	Y
1.	-	-
2.	-	-
3.	-	-
4.	-	-

DATA SHEET NO. 12 FMVSS NO. 301-75 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATA

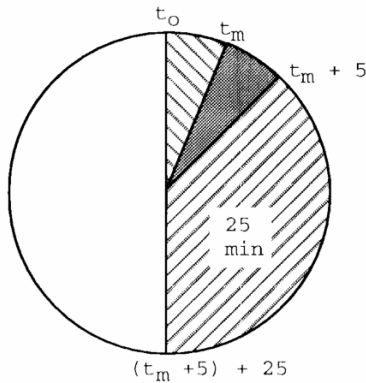
NHTSA TEST No.: VO45900 TEST DATE: July 15, 2003
VEHICLE MAKE/MODEL: 2004 Volvo XC90 MPV

The test vehicle was filled from 92% to 94% of the manufacturer's "usable" capacity. The electric fuel pump was operating if it will operate without engine operation. Two Part 572 anthropomorphic test devices were located at each of the front designated seating positions.

=====

TEST VEHICLE IMPACT TYPE: X Frontal (56 kph)
- Oblique (48 kph) with _____ deg. barrier face first contacting _____
- (driver/passenger) side
- Rear Moving Barrier (48 kph)
- Lateral Moving Barrier (32 kph)

FUEL SPILLAGE MEASUREMENT:



1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

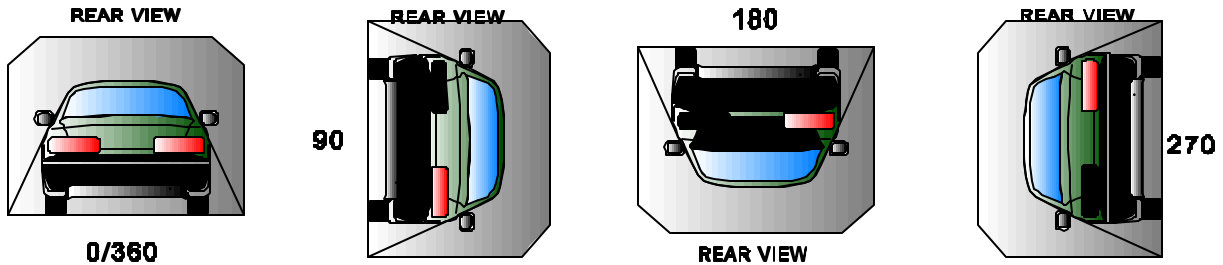
ACTUAL	MAX ALLOWED
0	28 g
0	141 g
0	28 g/min.

SOLVENT SPILLAGE DETAILS: None

DATA SHEET NO. 13 - ROLLOVER DATA

Vehicle: 2004 Volvo XC90 MPV

NHTSA No.: VO45900



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	1	minutes	14	seconds	5	minutes	6	minutes	14	seconds	7	minutes
0° - 90°	1	minutes	08	seconds	5	minutes	6	minutes	8	seconds	7	minutes
90° - 180°	1	minutes	04	seconds	5	minutes	6	minutes	4	seconds	7	minutes
180° -270°	1	minutes	11	seconds	5	minutes	6	minutes	11	seconds	7	minutes
270° -360°	1	minutes										

II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

First 5 minutes from onset of rotation	6th min.	7th min.	8th min. (if required)
142 g	28 g	28 g	28 g

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

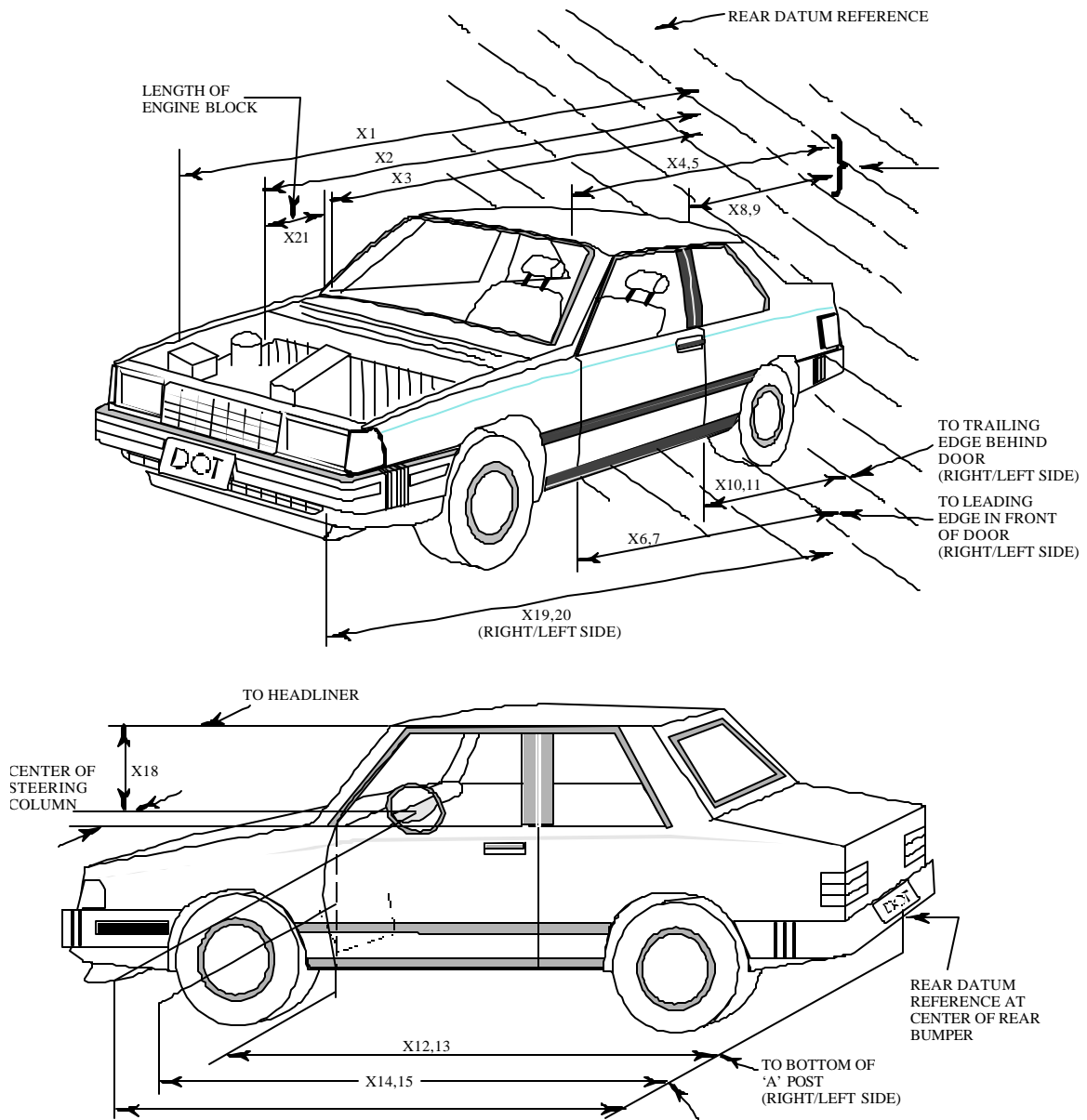
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180° -270°	0	0	0	N/A
270° -360°	0	0	0	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover Stage	Spillage Location
0° - 90°	None
90° - 180°	None
180° -270°	None
270° -360°	None

DATA SHEET NO. 14 TEST VEHICLE MEASUREMENTS

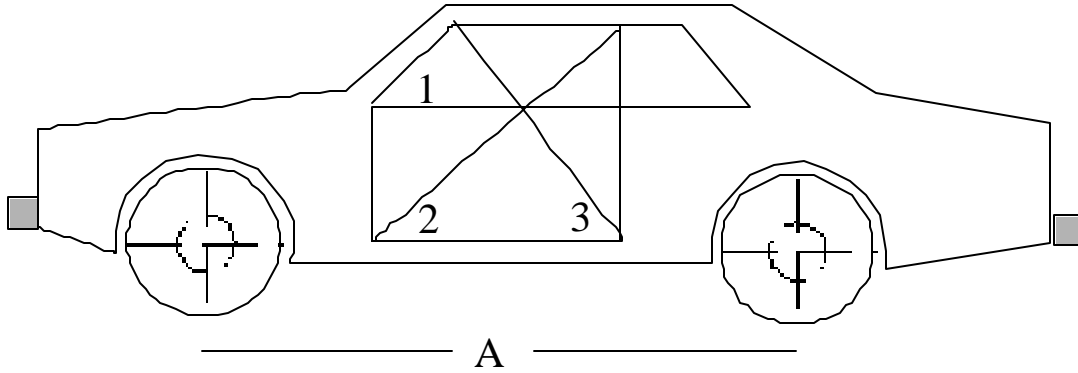


DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	4810	4410	400
X2	Rear Surface of Vehicle to Front of Engine	4391	4173	218
X3	Rear Surface of Vehicle to Firewall	3821	3777	44
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3336	3330	6
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3337	3335	2
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3323	3322	1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3323	3320	3
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2284	2280	4
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2285	2285	0
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2326	2316	10
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2325	2323	2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3438	3432	6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3437	3432	5
X14	Rear Surface of Vehicle to Firewall, Right Side	3741	3678	63
X15	Rear Surface of Vehicle to Firewall, Left Side	3739	3694	45
X16	Rear Surface of Vehicle to Steering Column	2889	2927	-38
X17	Center of Steering Column to "A" Post	347	342	5
X18	Center of Steering Column to Headliner	426	455	-29
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4771	4422	349
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4773	4404	369
X21	Length of Engine Block	450	450	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3112	3104	8
CD	Rear Surface of Vehicle to Center of Dash Panel	3208	3205	3
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3113	3111	2

All Dimensions in mm

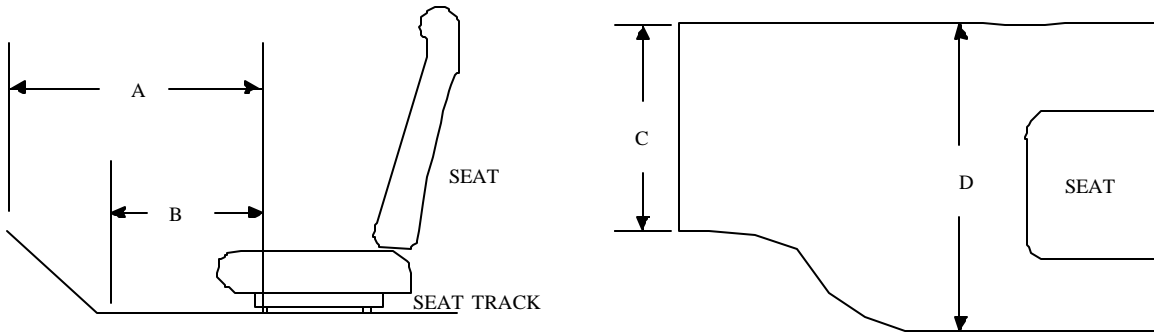
DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 VEHICLE INTRUSION MEASUREMENTS
 DOOR OPENING WIDTH



UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	947	1512	1062	944	1518	1055
AFTER TEST	941	1513	1051	934	1520	1050
DIFFERENCE	6	-1	11	10	-2	5

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2854	2854
AFTER TEST	2814	2769
DIFFERENCE	40	85

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 VEHICLE INTRUSION MEASUREMENTS
 STATIC FOOTWELL DEFORMATION



DRIVER

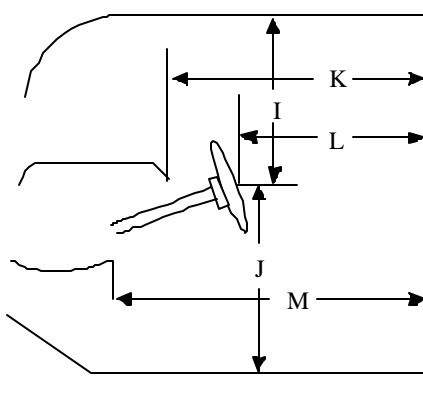
Measurement	Pre-Test	Post-Test	Difference
A	819	751	68
B	601	584	17
C	438	436	2
D	411	410	1

PASSENGER

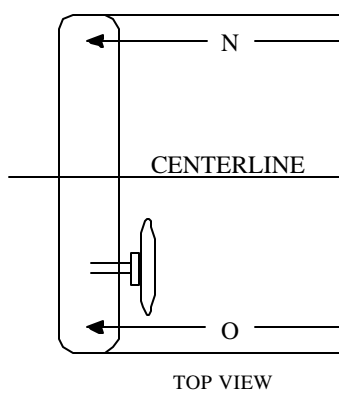
Measurement	Pre-Test	Post-Test	Difference
A	687	657	30
B	525	514	11
C	457	425	32
D	400	394	6

Units = mm

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 VEHICLE INTRUSION MEASUREMENTS
 STATIC PASSENGER COMPARTMENT INTRUSION

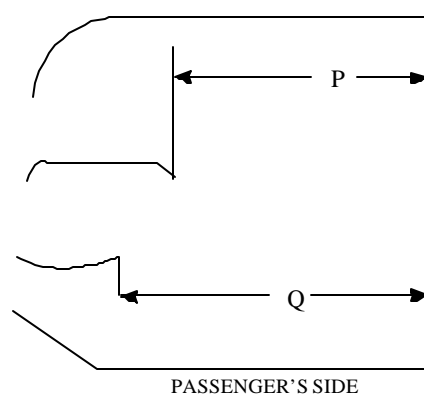


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
 FROM C-PILLAR
 BELT ANCHORAGE

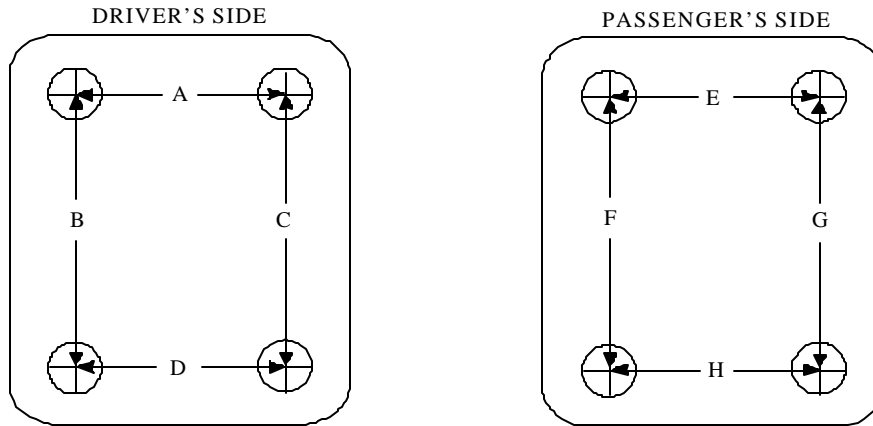


PASSENGER'S SIDE

Measurement	Pre-Test	Post-Test	Difference
I	426	455	-29
J	713	708	5
K	1834	1829	5
L	1568	1606	-38
M	1868	1869	-1
N	1797	1791	6
O	1803	1790	13
P = K (PASS.)	1824	1833	-9
Q = M (PASS.)	1861	1867	-6

Units = mm

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 FLOORBOARD DEFORMATION

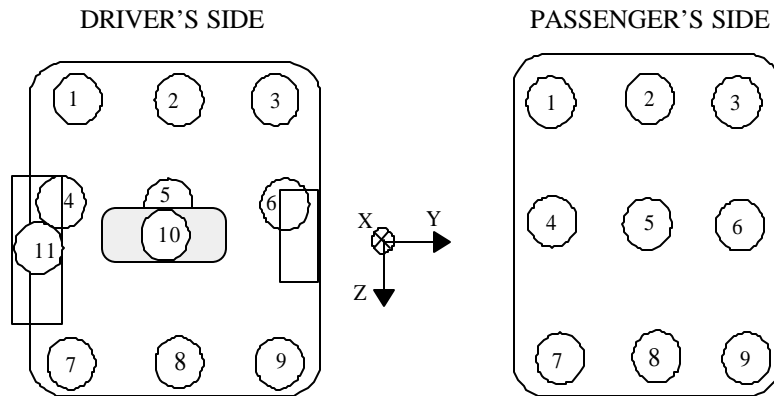


TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	438	436	2
B	349	346	4
C	362	363	-1
D	411	410	1
E	457	425	33
F	403	412	-10
G	401	431	-30
H	400	394	6

Units = mm

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
TOE-PAN INTRUSION



Driver Side Toe-pan Measurements

Toe-pan Location	X Deformation (mm)			Z Deformation (mm)		
	Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	3540	3539	1	-649	-702	53
2	3679	3628	51	-620	-675	55
3	3634	3563	71	-608	-659	51
4	3505	3495	10	-553	-585	32
5	3581	3556	25	-519	-572	53
6	3595	3546	49	-510	-566	56
7	3478	3489	-11	-435	-460	25
8	3461	3461	0	-416	-440	24
9	3460	3466	-6	-424	-452	28
10	3391	3489	-98	-561	-544	-17
11	3466	3464	2	-576	-601	25

Passenger Side Toe-pan Measurements

Toe-pan Location	X Deformation (mm)			Z Deformation (mm)		
	Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	3529	3498	31	-538	-551	13
2	3546	3519	27	-539	-576	37
3	3544	3530	14	-550	-591	41
4	3384	3437	-53	-443	-441	-2
5	3425	3439	-14	-460	-461	1
6	3471	3446	25	-474	-471	-3
7	3350	3395	-45	-398	-377	-21
8	3383	3376	7	-385	-361	-24
9	3393	3391	2	-393	-383	-10

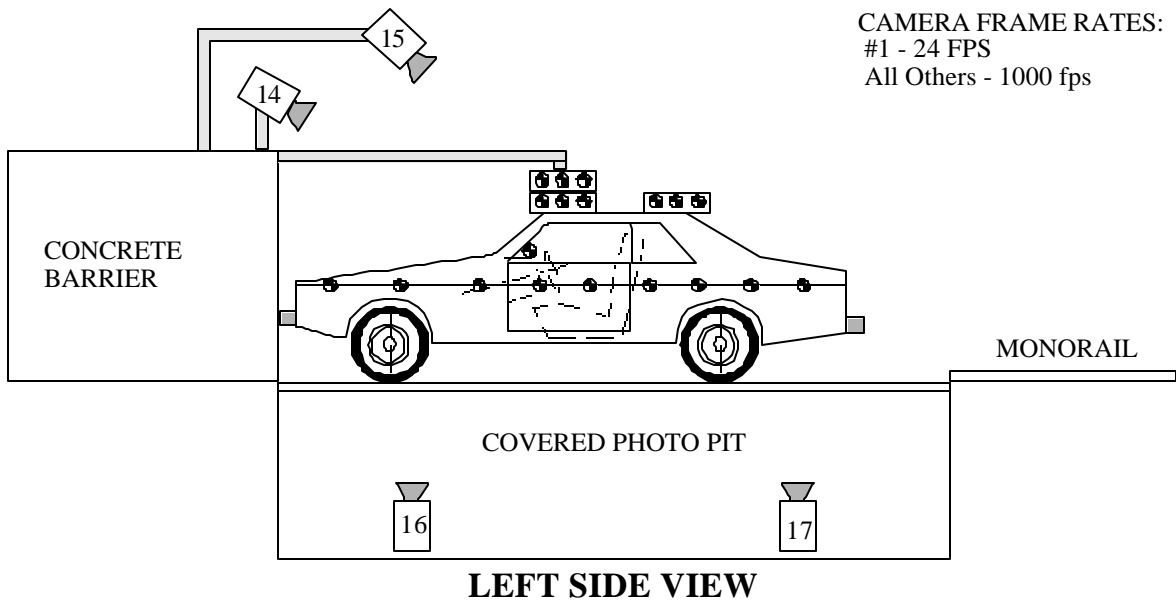
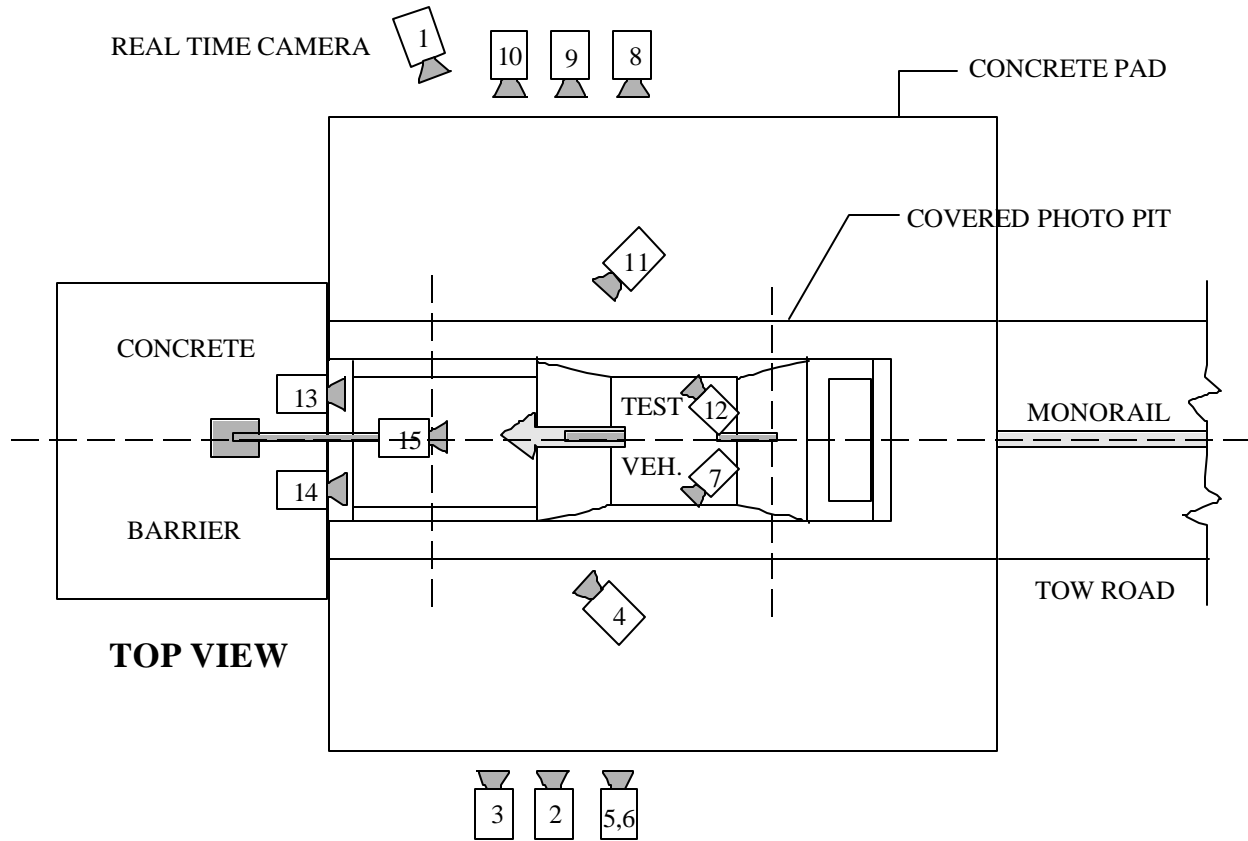
Reference: SAE: X = Rear Bumper (Positive: forward); Z = Ground (Positive: down)

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
TARGET VEHICLE STRUCTURAL MEASUREMENTS

	Elements	Pre-Test (mm)
1	Total length	4810
2	Total Width	1898
3	Bumper Top Height	718
4	Bumper Bottom Height	491
5	Longitudinal Member Top Height	244
6	Distance Between Longitudinal Members	976
7	Longitudinal Member Width	69
8	Engine top height	890
9	Engine bottom height	316
10	Engine and gearbox width	795
11	Front bumper-engine distance	408
12	Front shock absorber fixing height	1005
13	Bonnet leading edge height	931
14	Front shock absorber fixing width	1220
15	Front bumper – front axle distance	899
16	Front axle – a pillar distance	535
17	A-pillar – B pillar distance	1046
18	B-pillar – rear axle distance	1284
19	B-pillar – C Pillar distance	1004
20	Roof sill bottom height	1587
21	Roof sill top height	1687
22	Floor sill bottom height	356
23	Floor sill top height	464

DATA SHEET NO.15 HIGH-SPEED CAMERA LOCATIONS

NOTE: Camera information shown in DATA SHEET NO. 15.



CAMERA FRAME RATES:
 #1 - 24 FPS
 All Others - 1000 fps

DATA SHEET NO.15 HIGH-SPEED CAMERA LOCATIONS (cont.)

NHTSA Test No.: VO45900 Vehicle: 2004 Volvo XC90 MPV

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)*			ANGLE (deg)**	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	6837	1700	1073	-2	6532	12.5	1000
3	Left Side View	8320	705	1050	-4	8015	25	1005
4	Driver and Interior View	7620	2581	2000	-18	-	25	1050
5	Steering Column (Bottom)	8024	1861	1177	-2	7719	25	1010
6	Steering Column (Top)	8024	1861	1777	-7	7719	25	1000
7	Left Belt	-	-	-	-	-	13	-
8	Overall Right Side	8435	1327	1115	0	8754	12.5	1000
9	Right Side View	6921	2130	1100	-1	7240	25	1000
10	Right Passenger View	8435	1727	1456	-2	8754	35	1000
11	Passenger and Interior View	7620	2687	1993	-10	-	25	1000
12	Right Belt	-	-	-	-	-	13	-
13	Passenger Front View	620	-92	1987	-35	-	13	990
14	Driver Front View	620	-92	1987	-32	-	13	1000
15	Windshield View	0	-530	3374	-52	-	13	1000
16	Pit View of Engine	0	615	-3048	90	-	13	1000
17	Pit View of Fuel Tank	0	2186	-3048	90	-	13	1035

*X = film plane to monorail centerline ** = referenced to horizontal plane

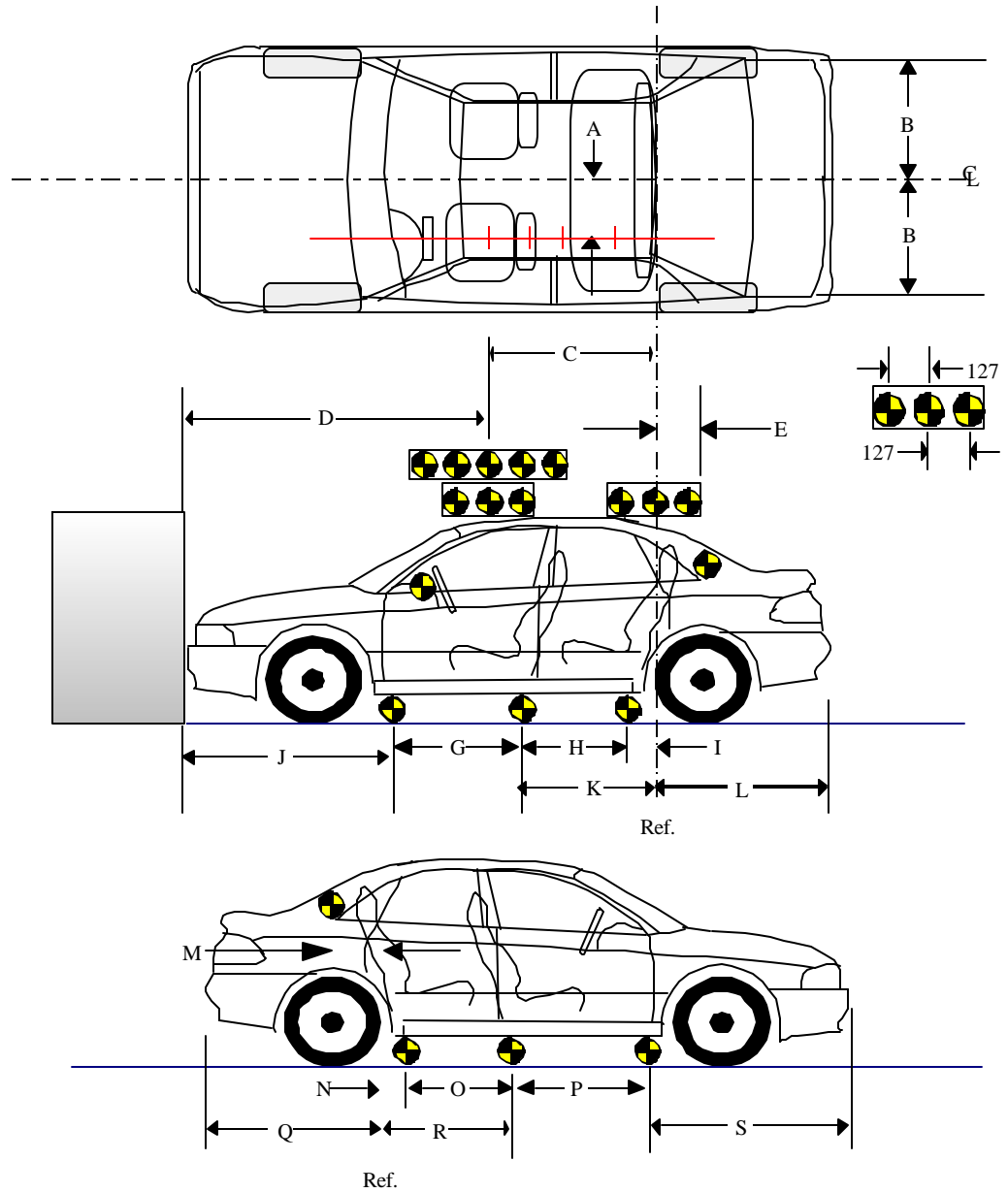
Y = film plane to impact location N.T. indicates No Timing

Z = film plane to ground

DATA SHEET NO. 16 VEHICLE REFERENCE PHOTO TARGET LOCATIONS

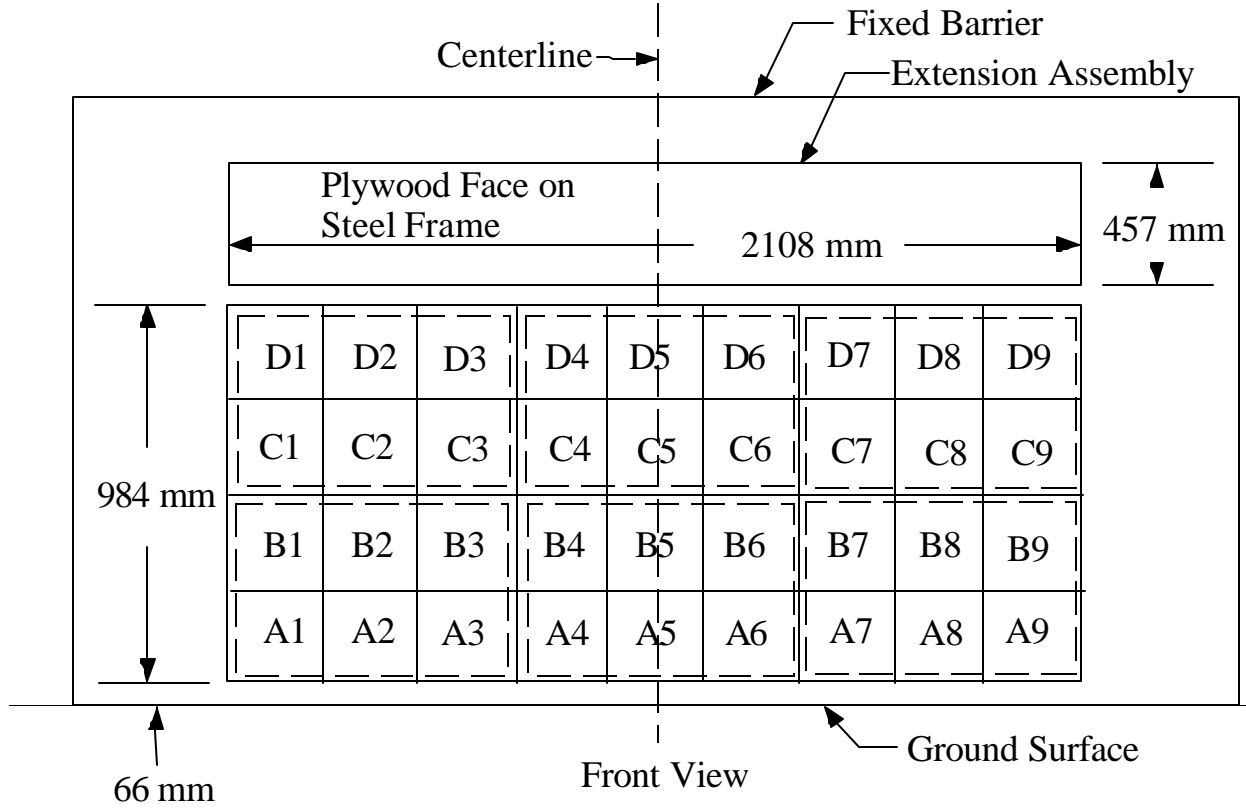
(Dimensions in millimeters)

A	395
B	624
C	1222
D	2138
E	130
F	1634
G	948
H	939
I	106
J	1395
K	1045
L	1423
M	136
N	485
O	944
P	935
Q	1043
R	1429
S	1402



DATA SHEET NO. 17 LOAD CELL LOCATIONS ON FIXED BARRIER

- 36 Load Cells
- 4 Rows
- 9 Columns
- 6 Groupings (6 cells/group)



6 GROUPS OF 6 LOAD CELLS EACH

Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

The following data is presented in Appendix B:

- (1) Data from 36 individual load cells
- (2) Total or Sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)

DATA SHEET NO. 18 POST TEST AIR BAG DATA

NHTSA No.: VO45900; Test Date: July 15, 2003; Technician: P. MacDiarmid

Vehicle Model Year/Make/Model: 2004 Volvo XC90 MPV

A. No. of vent holes: 2 -Driver 2 -Passenger

B. Size of vent holes: (mm²) 707 -Driver 1964 -Passenger

C. Total vent area: (mm²) 1414 -Driver 3928 -Passenger

D. Deflated air bag length and width dimensions or, if round, diameter. (mm)

Driver: 560 -Height; 550 -Width; 350 -Depth

Passenger: 430 -Height; 500 -Width; 530 -Depth

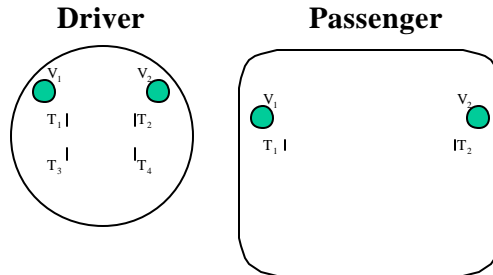
E. Is the air bag tethered?

Driver: X -Yes; - -No; If yes, record length of tether- 250

Passenger: - -Yes; X -No; If yes, record length of tether- -

Sketch the air bag showing the location of the vent holes, how the bag is tethered, and where the bag is tethered. Also describe how the tethers are attached to the bag and the steering wheel.

(Note: Not to scale; V_n = Vent hole_n, T_n = Tether_n).



F. Record part numbers and manufacturer name of the air bag and gas generator.

Driver: Air bag: None

Generator: Not Available

Passenger: Air bag: 196

Generator: Not Available

DATA SHEET NO. 19 ACCIDENT INVESTIGATION DIVISION DATA

FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Volvo XC90 MPV

NHTSA Test No.: VO45900 VIN: YV1CZ91H441045447

Model Year: 2004 Build Date: 05/03 Test Date: July 15, 2003

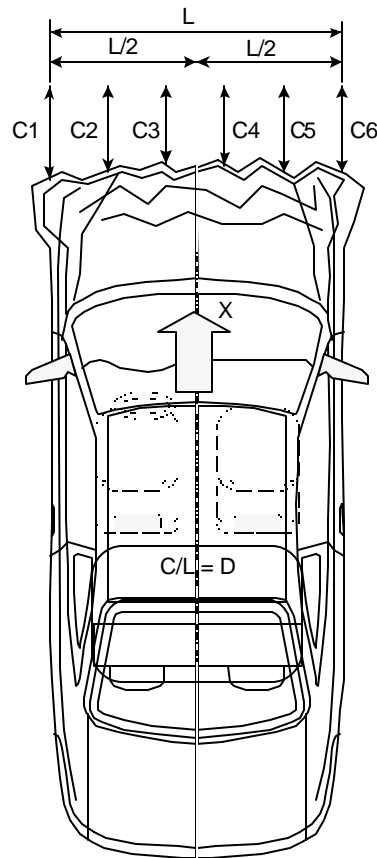
Vehicle Size Category: MPV Test Weight: 2401.0 kg

Vehicle Wheelbase: 2854 mm; Front Overhang: 906 mm; Overall Width: 1898 mm

Collision Deformation Classification (CDC) Code: 12FDEW 3

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	4609	4399	210
C2 =	4775	4407	368
C3 =	4802	4398	404
C4 =	4803	4408	395
C5 =	4776	4417	359
C6 =	4613	4420	193



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

Length of Damaged Region: L1= 1536 mm

L2= 768.0 mm

L5= 307.2 mm

APPENDIX A
PHOTOGRAPHS

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* The vehicle NHTSA number was changed post-test to reflect the 2004 model year, as a result, the photos show the NHTSA number originally assigned to the vehicle.

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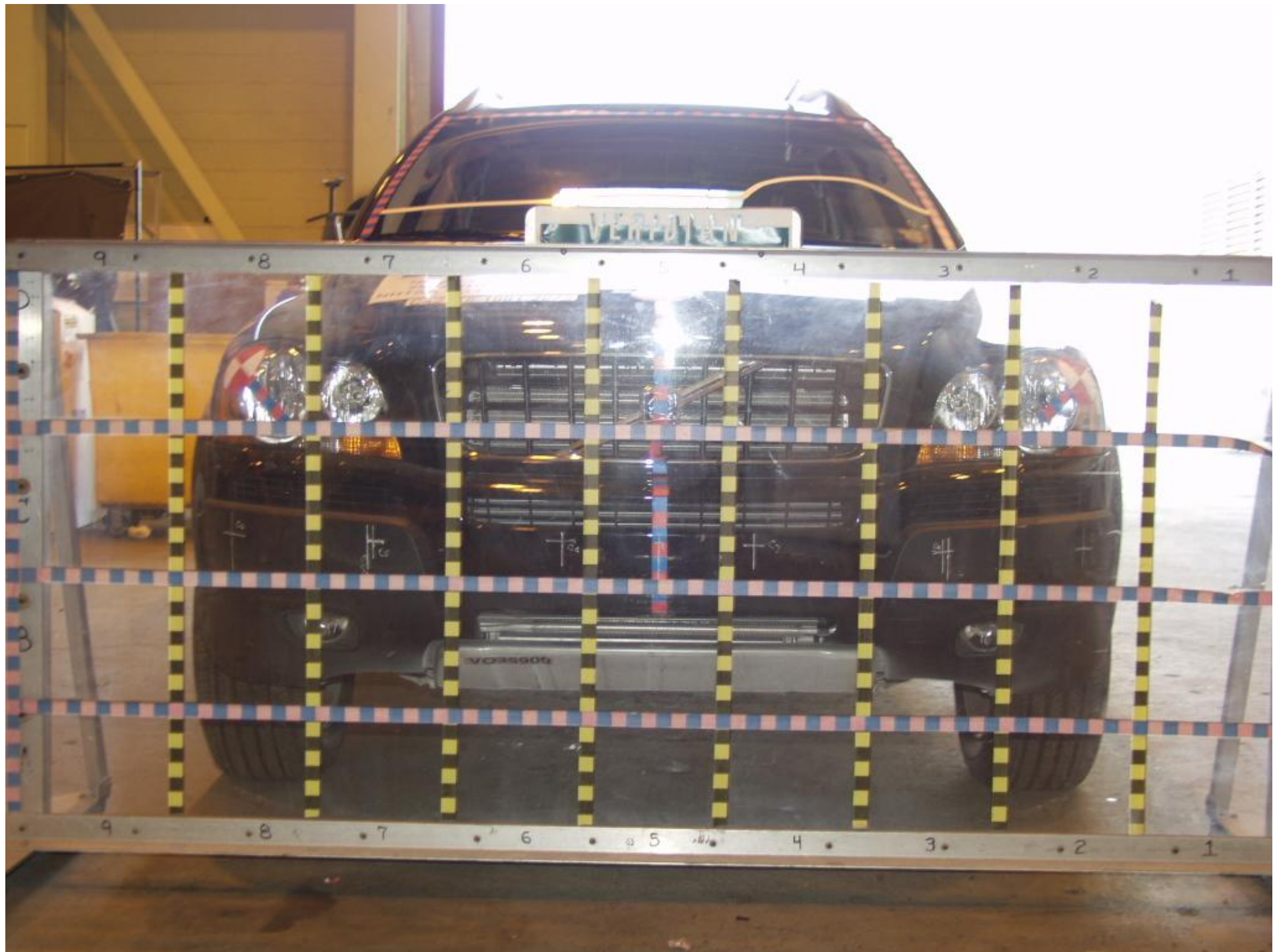


Figure A-1 LOAD CELL LOCATIONS

MFD. BY VOLVO GOTHENBURG SWEDEN

DATE:	GVWR	GAWR FRONT	GAWR REAR
05/03	6080 LB	2880 LB	3240 LB
	2760 KG	1310 KG	1470 KG
TIRES		235/60R18	235/60R18
RIMS		7Jx18x49	7Jx18x49
AT (COLD)		36 PSI	39 PSI
		250 KPa	270 KPa

VIN YV1CZ91H441045447 TYPE:MPV



VOLVO

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

9454363

Figure A-2 VEHICLE CERTIFICATION PLACARD



Figure A-3 VEHICLE TIRE PLACARD



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Figure A-4 RIGHT FRONT, AS RECEIVED

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Figure A-5 LEFT REAR, AS RECEIVED



Figure A-6 PRE-TEST FRONT VIEW

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Figure A-7 POST-TEST FRONT VIEW

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Figure A-8 PRE-TEST LEFT SIDE VIEW



Figure A-9 POST-TEST LEFT SIDE VIEW



Figure A-10 PRE-TEST RIGHT SIDE VIEW



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Figure A-11 POST-TEST RIGHT SIDE VIEW

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Figure A-12 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-13 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-14 PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-15 POST-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-16 LEFT REAR THREE-QUARTER VIEW OF DOORS AFTER IMPACT



Figure A-17 RIGHT REAR THREE-QUARTER VIEW OF DOORS AFTER IMPACT



Figure A-18 PRE-TEST WINDSHIELD VIEW

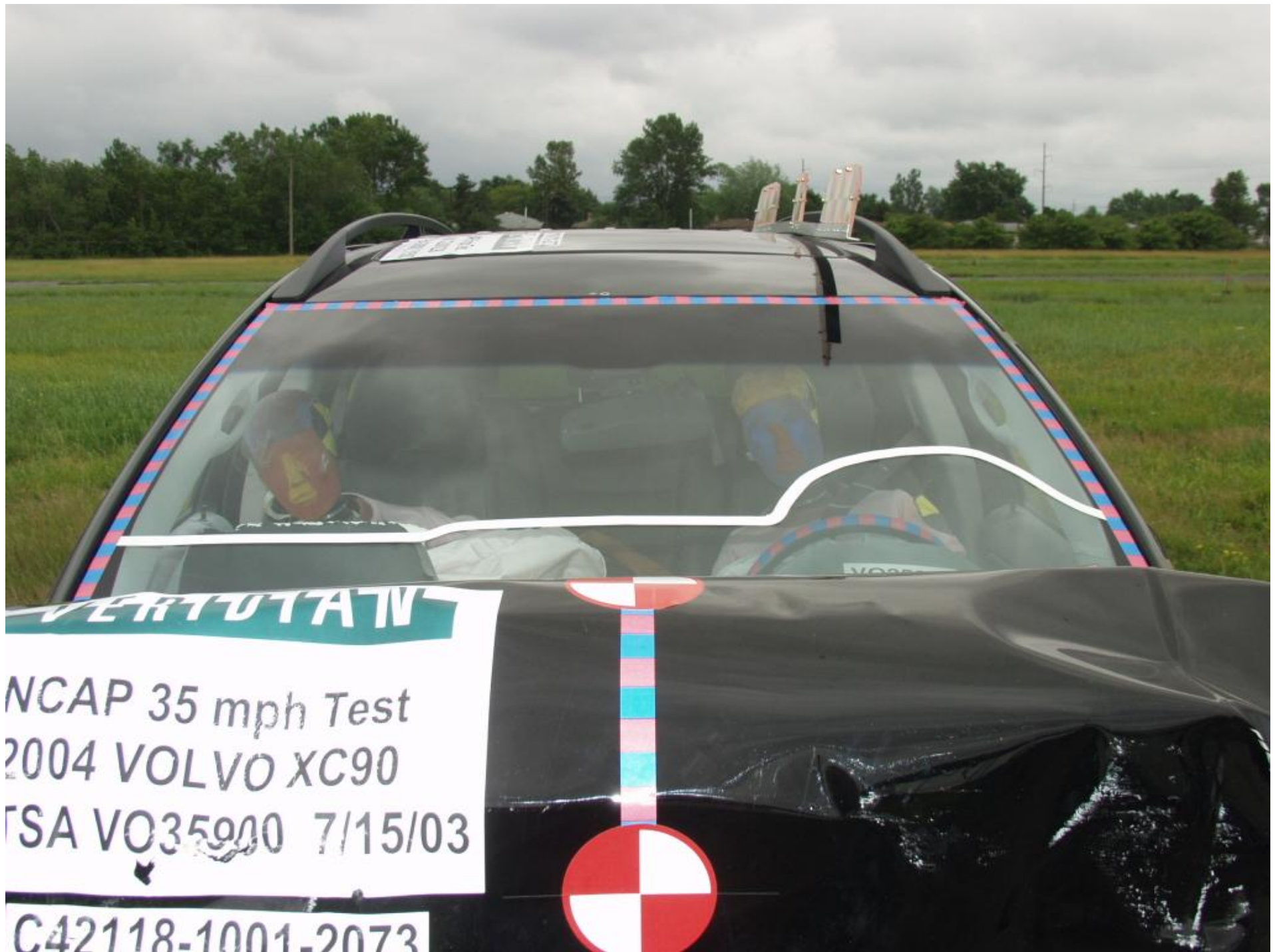


Figure A-19 POST-TEST WINDSHIELDVIEW



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Figure A-20 PRE-TEST ENGINE COMPARTMENT VIEW



Figure A-21 POST-TEST ENGINE COMPARTMENT VIEW

C42118-1001-2073

VO35900



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Figure A-22 PRE-TEST FUEL CAP VIEW



Figure A-23 POST-TEST FUEL CAP VIEW



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Figure A-24 PRE-TEST FRONT UNDERBODY VIEW



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Figure A-25 POST-TEST FRONT UNDERBODY VIEW



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Figure A-26 PRE-TEST MID UNDERBODY VIEW

VO35900



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Figure A-28 PRE-TEST REAR UNDERBODY VIEW

C42118-1001-2073

VO35900



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Figure A-29 POST-TEST REAR UNDERBODY VIEW

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Figure A-30 PRE-TEST DRIVER HEAD LOCATION



Figure A-31 POST-TEST DRIVER HEAD LOCATION

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Figure A-32 PRE-TEST DRIVER POSITION VIEW



Figure A-33 POST-TEST DRIVER POSITION VIEW



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Figure A-34 PRE-TEST DRIVER AND INTERIOR VIEW



Figure A-35 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-36 PRE-TEST DRIVER FEET VIEW



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Figure A-37 POST-TEST DRIVER FEET VIEW



Figure A-38 PRE-TEST DRIVER KNEE BOLSTER VIEW



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Figure A-39 POST-TEST DRIVER KNEE BOLSTER VIEW



Figure A-40 PRE-TEST DRIVER FLOOR PAN VIEW



Figure A-41 POST-TEST DRIVER FLOOR PAN VIEW



Figure A-42 POST-TEST DRIVER HEAD VIEW



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Figure A-43 POST-TEST DRIVER CONTACT TO AIRBAG



Figure A-44 PRE-TEST PASSENGER HEAD LOCATION



Figure A-45 POST-TEST PASSENGER HEAD LOCATION



Figure A-46 PRE-TEST PASSENGER POSITION VIEW

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Figure A-47 POST-TEST PASSENGER POSITION VIEW



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Figure A-48 PRE-TEST PASSENGER AND INTERIOR VIEW



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Figure A-49 POST-TEST PASSENGER AND INTERIOR VIEW



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Figure A-50 PRE- TEST PASSENGER FEET VIEW



Figure A-51 POST-TEST PASSENGER FEET VIEW



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Figure A-52 PRE-TEST PASSENGER KNEE BOLSTER VIEW

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Figure A-53 POST-TEST PASSENGER KNEE BOLSTER VIEW

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Figure A-54 PRE-TEST PASSENGER FLOOR PAN VIEW

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Figure A-55 POST-TEST PASSENGER FLOOR PAN VIEW



Figure A-56 POST-TEST PASSENGER HEAD VIEW



Figure A-57 POST-TEST PASSENGER CONTACT TO AIRBAG

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Figure A-58 ROLLOVER VIEW*

* All doors were closed, latched and operable without tools after the event. The passenger door was not properly closed after the post-test analysis and opened during the static rollover



Figure A-59 IMPACT VIEW

APPENDIX B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

**Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers**

Transducer	SAE Sign Convention (positive unless noted)
Upper Neck Load Cell	Fx Head rearward Fy Head left Fz Neck in tension Mx Left ear to left shoulder My Chin to chest (flexion) Mz Chin to left shoulder (look left)
Chest Displacement Potentiometer	Compression is negative
Pelvic Load Cell (Lower Lumbar)	Fx Chest rearward Fy Chest left Fz Spine in tension
Femur Load Cell	Compression is negative
Upper Tibia Load Cell (right and left leg)	Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center
Lower Tibia Load Cell (right and left leg)	Fz Tibia in tension Mx Support tibia at ends, load left side center My Support tibia at ends, load front (shin) center

DATA CHANNEL FILTER CLASS SUMMARY

NHTSA TEST NO.

DATA TYPE	SAE FILTER CLASS (Hz)
Dummy Head Accelerations	1000
Dummy Chest Accelerations	180
Dummy Chest Displacements	600
Dummy Femur Forces	600
Dummy Belt Loads	60
Dummy Belt Displacements	180
Dummy Neck Forces	1000
Dummy Neck Moments	600
Vehicle Accelerations	60
Vehicle Velocity Integrations	180
Vehicle Displacement Integrations	180
Load Cell Barrier Forces	60

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2	V1P1 Head 9 Array X Arm Az [g, CFC_1000]	B-9
3	V1P1 Head 9 Array Y Arm Ax [g, CFC_1000]	B-10
4	V1P1 Head 9 Array Y Arm Az [g, CFC_1000]	B-11
5	V1P1 Head 9 Array Z Arm Ax [g, CFC_1000]	B-12
6	V1P1 Head 9 Array Z Arm Ay [g, CFC_1000]	B-13
7	V1P1 Head CG x [g, CFC_1000]	B-14
8	V1P1 Head CG y [g, CFC_1000]	B-15
9	V1P1 Head CG z [g, CFC_1000]	B-16
10	V1P1 Head CG Resultant [g, CFC_1000]	B-17
11	V1P1 Head CG Red x [g, CFC_1000]	B-18
12	V1P1 Head CG Red y [g, CFC_1000]	B-19
13	V1P1 Head CG Red z [g, CFC_1000]	B-20
14	V1P1 Head CG Red Resultant [g, CFC_1000]	B-21
15	V1P1 Upper Neck Fx [N, CFC_1000]	B-22
16	V1P1 Upper Neck Fy [N, CFC_1000]	B-23
17	V1P1 Upper Neck Fz [N, CFC_1000]	B-24
18	V1P1 Upper Neck F Resultant [N, CFC_1000]	B-25
19	V1P1 Upper Neck Mx [N-m, CFC_600]	B-26
20	V1P1 Upper Neck My [N-m, CFC_600]	B-27
21	V1P1 Upper Neck Mz [N-m, CFC_600]	B-28
22	V1P1 Upper Neck M Resultant [N-m, CFC_600]	B-29
23	V1P1 Chest x [g, CFC_180]	B-30
24	V1P1 Chest y [g, CFC_180]	B-31
25	V1P1 Chest z [g, CFC_180]	B-32
26	V1P1 Chest Resultant [g, CFC_180]	B-33
27	V1P1 Chest Red x [g, CFC_180]	B-34
28	V1P1 Chest Red y [g, CFC_180]	B-35
29	V1P1 Chest Red z [g, CFC_180]	B-36
30	V1P1 Chest Red Resultant [g, CFC_180]	B-37
31	V1P1 Chest Compression [mm, CFC_600]	B-38
32	V1P1 Pelvic x [g, CFC_1000]	B-39
33	V1P1 Pelvic y [g, CFC_1000]	B-40
34	V1P1 Pelvic z [g, CFC_1000]	B-41
35	V1P1 Pelvic Resultant [g, CFC_1000]	B-42
36	V1P1 Left Femur [N, CFC_600]	B-43
37	V1P1 Right Femur [N, CFC_600]	B-44
38	V1P1 Left Upper Tibia Mx [N-m, CFC_600]	B-45
39	V1P1 Left Upper Tibia My [N-m, CFC_600]	B-46
40	V1P1 Left Lower Tibia Fz [N, CFC_600]	B-47
41	V1P1 Left Lower Tibia Mx [N-m, CFC_600]	B-48
42	V1P1 Left Lower Tibia My [N-m, CFC_600]	B-49
43	V1P1 Right Upper Tibia Mx [N-m, CFC_600]	B-50
44	V1P1 Right Upper Tibia My [N-m, CFC_600]	B-51
45	V1P1 Right Lower Tibia Fz [N, CFC_600]	B-52
46	V1P1 Right Lower Tibia Mx [N-m, CFC_600]	B-53
47	V1P1 Right Lower Tibia My [N-m, CFC_600]	B-54

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49	V1P1 Left Foot Aft Az [g, CFC_600]	B-56
50	V1P1 Left Foot Fore Az [g, CFC_600]	B-57
51	V1P1 Right Foot Aft x [g, CFC_600]	B-58
52	V1P1 Right Foot Aft z [g, CFC_600]	B-59
53	V1P1 Right Foot Fore z [g, CFC_600]	B-60
54	V1P2 Head 9 Array X Arm y [g, CFC_1000]	B-61
55	V1P2 Head 9 Array X Arm z [g, CFC_1000]	B-62
56	V1P2 Head 9 Array Y Arm x [g, CFC_1000]	B-63
57	V1P2 Head 9 Array Y Arm z [g, CFC_1000]	B-64
58	V1P2 Head 9 Array Z Arm x [g, CFC_1000]	B-65
59	V1P2 Head 9 Array Z Arm y [g, CFC_1000]	B-66
60	V1P2 Head CG x [g, CFC_1000]	B-67
61	V1P2 Head CG y [g, CFC_1000]	B-68
62	V1P2 Head CG z [g, CFC_1000]	B-69
63	V1P2 Head CG Resultant [g, CFC_1000]	B-70
64	V1P2 Head CG Red x [g, CFC_1000]	B-71
65	V1P2 Head CG Red y [g, CFC_1000]	B-72
66	V1P2 Head CG Red z [g, CFC_1000]	B-73
67	V1P2 Head CG Red Resultant [g, CFC_1000]	B-74
68	V1P2 Upper Neck Fx [N, CFC_1000]	B-75
69	V1P2 Upper Neck Fy [N, CFC_1000]	B-76
70	V1P2 Upper Neck Fz [N, CFC_1000]	B-77
71	V1P2 Upper Neck F Resultant [N, CFC_1000]	B-78
72	V1P2 Upper Neck Mx [N-m, CFC_600]	B-79
73	V1P2 Upper Neck My [N-m, CFC_600]	B-80
74	V1P2 Upper Neck Mz [N-m, CFC_600]	B-81
75	V1P2 Upper Neck M Resultant [N-m, CFC_600]	B-82
76	V1P2 Chest x [g, CFC_180]	B-83
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78	V1P2 Chest z [g, CFC_180]	B-85
79	V1P2 Chest Resultant [g, CFC_180]	B-86
80	V1P2 Chest Red x [g, CFC_180]	B-87
81	V1P2 Chest Red y [g, CFC_180]	B-88
82	V1P2 Chest Red z [g, CFC_180]	B-89
83	V1P2 Chest Red Resultant [g, CFC_180]	B-90
84	V1P2 Chest Compression [mm, CFC_600]	B-91
85	V1P2 Pelvic x [g, CFC_1000]	B-92
86	V1P2 Pelvic y [g, CFC_1000]	B-93
87	V1P2 Pelvic z [g, CFC_1000]	B-94
88	V1P2 Pelvic Resultant [g, CFC_1000]	B-95
89	V1P2 Left Femur [N, CFC_600]	B-96
90	V1P2 Right Femur [N, CFC_600]	B-97
91	V1P2 Left Upper Tibia Mx [N-m, CFC_600]	B-98
92	V1P2 Left Upper Tibia My [N-m, CFC_600]	B-99
93	V1P2 Left Lower Tibia Fz [N, CFC_600]	B-100
94	V1P2 Left Lower Tibia Mx [N-m, CFC_600]	B-101

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PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
95	V1P2 Left Lower Tibia My [N-m, CFC_600]	B-102
96	V1P2 Right Upper Tibia Mx [N-m, CFC_600]	B-103
97	V1P2 Right Upper Tibia My [N-m, CFC_600]	B-104
98	V1P2 Right Lower Tibia Fz [N, CFC_600]	B-105
99	V1P2 Right Lower Tibia Mx [N-m, CFC_600]	B-106
100	V1P2 Right Lower Tibia My [N-m, CFC_600]	B-107
101	V1P2 Left Foot Aft x [g, CFC_600]	B-108
102	V1P2 Left Foot Aft z [g, CFC_600]	B-109
103	V1P2 Left Foot Fore z [g, CFC_600]	B-110
104	V1P2 Right Foot Aft x [g, CFC_600]	B-111
105	V1P2 Right Foot Aft z [g, CFC_600]	B-112
106	V1P2 Right Foot Fore z [g, CFC_600]	B-113
107	V1 Left Rear #1x [g, CFC_60]	B-114
108	V1 Left Rear #1x Velocity [kph, CFC_180]	B-115
109	V1 Left Rear #1x Displacement [mm, CFC_180]	B-116
110	V1 Right Rear #2x [g, CFC_60]	B-117
111	V1 Right Rear #2x Velocity [kph, CFC_180]	B-118
112	V1 Right Rear #2x Displacement [mm, CFC_180]	B-119
113	V1 Engine Top #3x [g, CFC_60]	B-120
114	V1 Engine Top #3x Velocity [kph, CFC_180]	B-121
115	V1 Engine Top #3x Displacement [mm, CFC_180]	B-122
116	V1 Engine Bottom #4x [g, CFC_60]	B-123
117	V1 Engine Bottom #4x Velocity [kph, CFC_180]	B-124
118	V1 Engine Bottom #4x Displacement [mm, CFC_180]	B-125
119	V1 Right Caliper #5x [g, CFC_60]	B-126
120	V1 Right Caliper #5x Velocity [kph, CFC_180]	B-127
121	V1 Right Caliper #5x Displacement [mm, CFC_180]	B-128
122	V1 Instrument Panel #6x [g, CFC_60]	B-129
123	V1 Instrument Panel #6x Velocity [kph, CFC_180]	B-130
124	V1 Instrument Panel #6x Displacement [mm, CFC_180]	B-131
125	V1 Left Caliper #7x [g, CFC_60]	B-132
126	V1 Left Caliper #7x Velocity [kph, CFC_180]	B-133
127	V1 Left Caliper #7x Displacement [mm, CFC_180]	B-134
128	V1 Left Rear #8z [g, CFC_60]	B-135
129	V1 Left Rear #8z Velocity [kph, CFC_180]	B-136
130	V1 Left Rear #8z Displacement [mm, CFC_180]	B-137
131	V1 Right Rear #9z [g, CFC_60]	B-138
132	V1 Right Rear #9z Velocity [kph, CFC_180]	B-139
133	V1 Right Rear #9z Displacement [mm, CFC_180]	B-140
134	Barrier Load Cell A1 Fx [N, CFC_60]	B-141
135	Barrier Load Cell A2 Fx [N, CFC_60]	B-142
136	Barrier Load Cell A3 Fx [N, CFC_60]	B-143
137	Barrier Load Cell A4 Fx [N, CFC_60]	B-144
138	Barrier Load Cell A5 Fx [N, CFC_60]	B-145
139	Barrier Load Cell A6 Fx [N, CFC_60]	B-146
140	Barrier Load Cell A7 Fx [N, CFC_60]	B-147
141	Barrier Load Cell A8 Fx [N, CFC_60]	B-148

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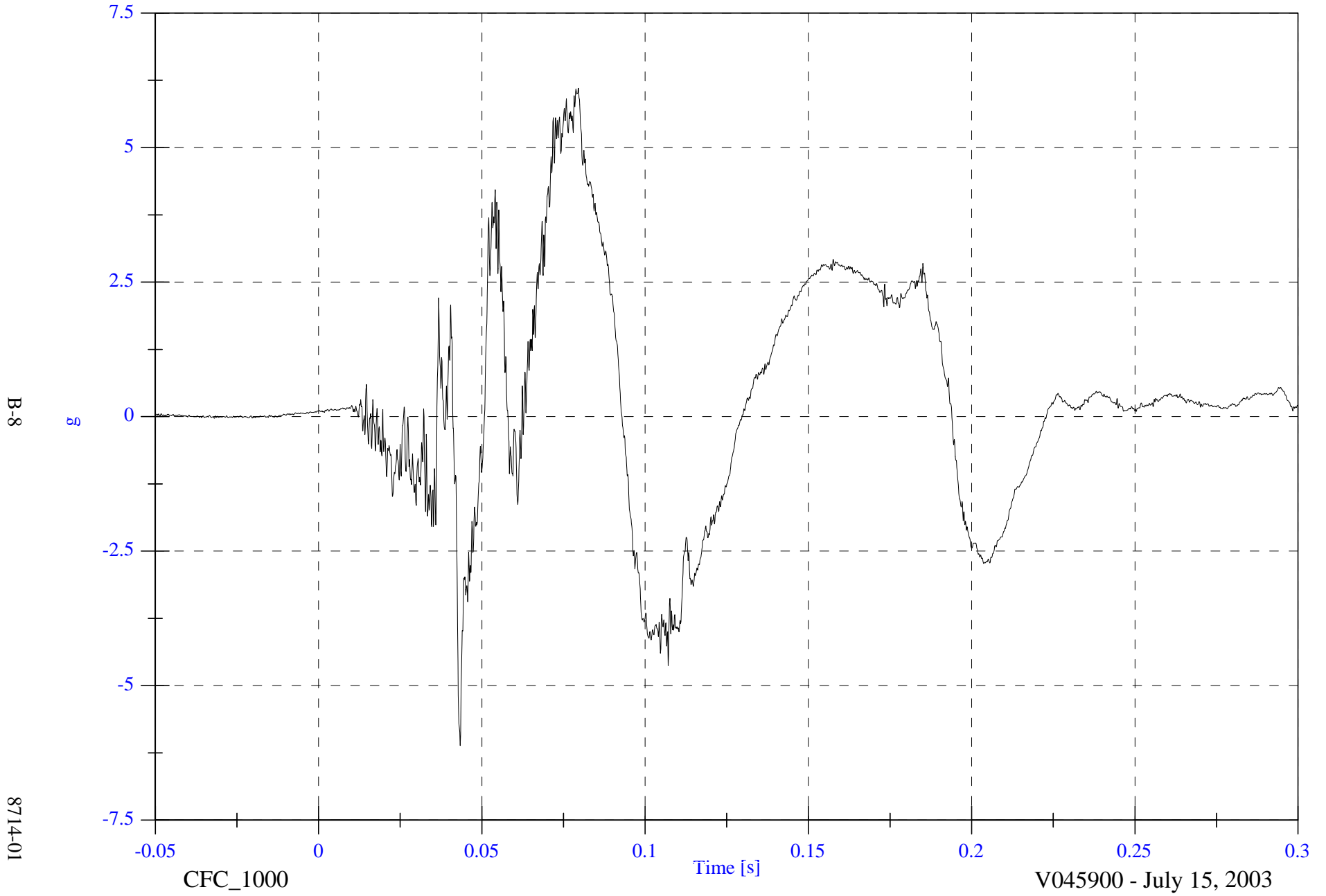
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2004 Volvo XC90 NCAP

V1P1 Head 9 Array X Arm Ay

Max: 6.1 [g] at 0.080 [s]

Min: -6.1 [g] at 0.043 [s]



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8714-01

CFC_1000

Time [s]

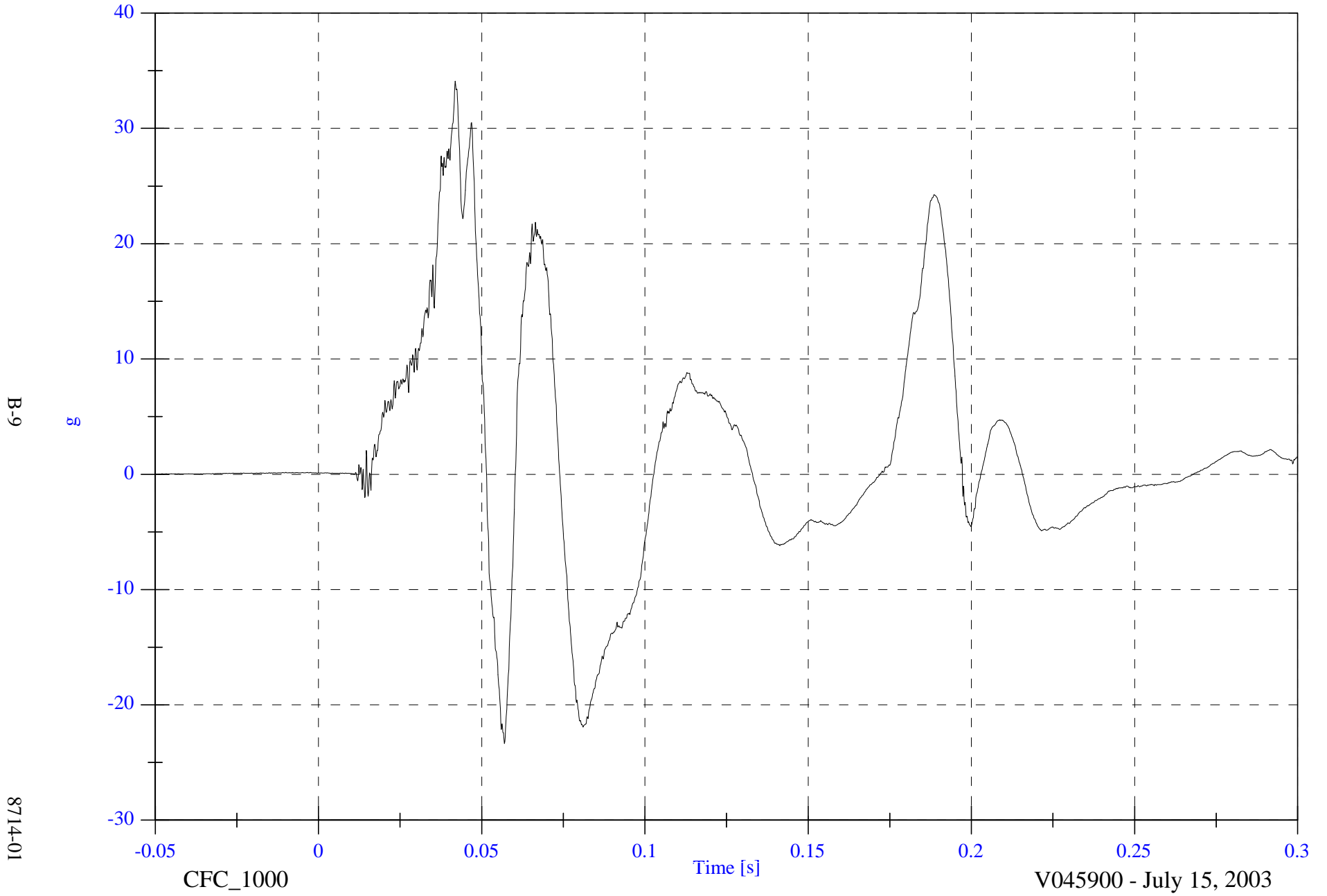
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Head 9 Array X Arm Az

Max: 34.1 [g] at 0.042 [s]

Min: -23.4 [g] at 0.057 [s]



B-9

8714-01

CFC_1000

Time [s]

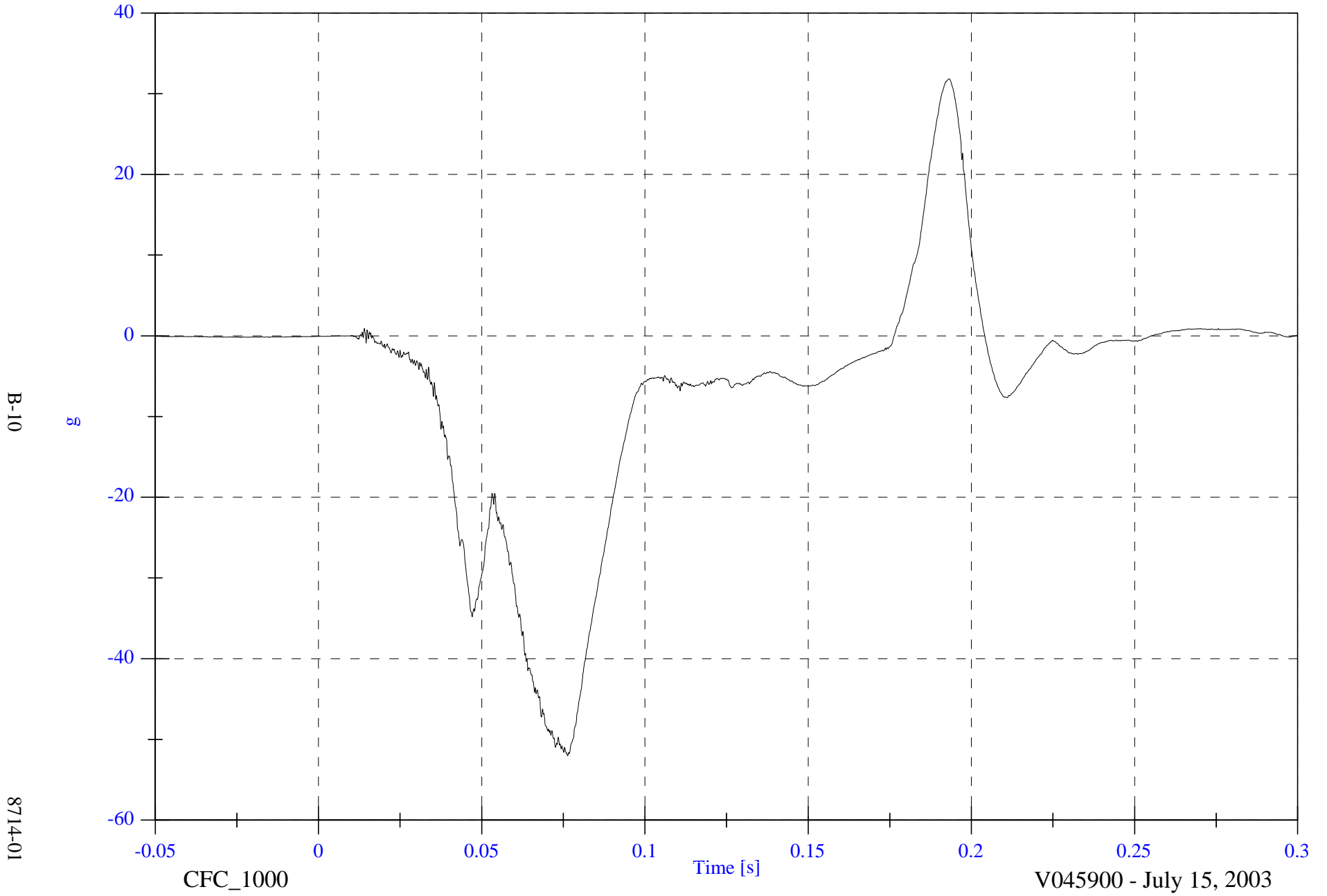
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Head 9 Array Y Arm Ax

Max: 31.8 [g] at 0.193 [s]

Min: -52.0 [g] at 0.076 [s]

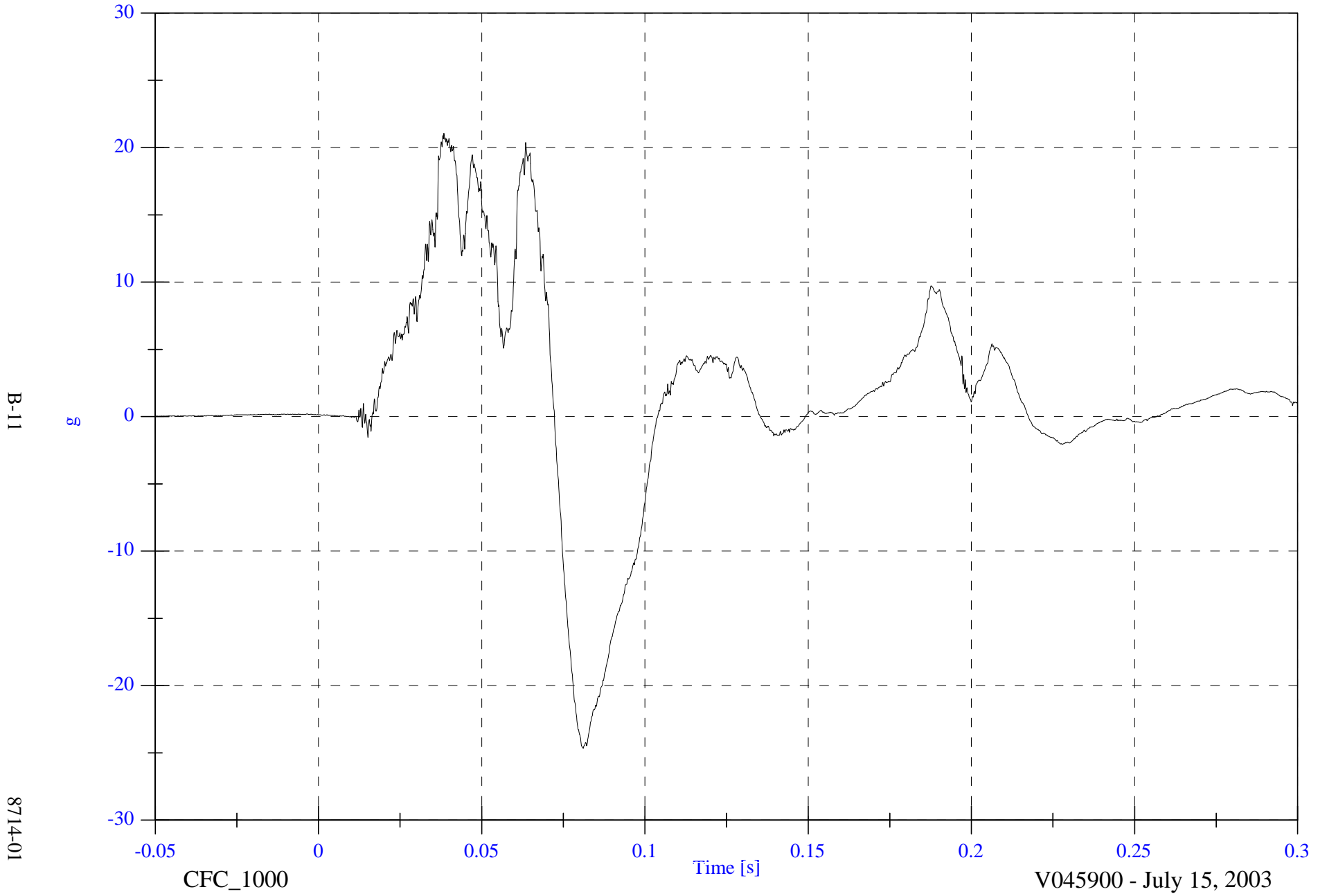


2004 Volvo XC90 NCAP

V1P1 Head 9 Array Y Arm Az

Max: 21.1 [g] at 0.039 [s]

Min: -24.6 [g] at 0.081 [s]

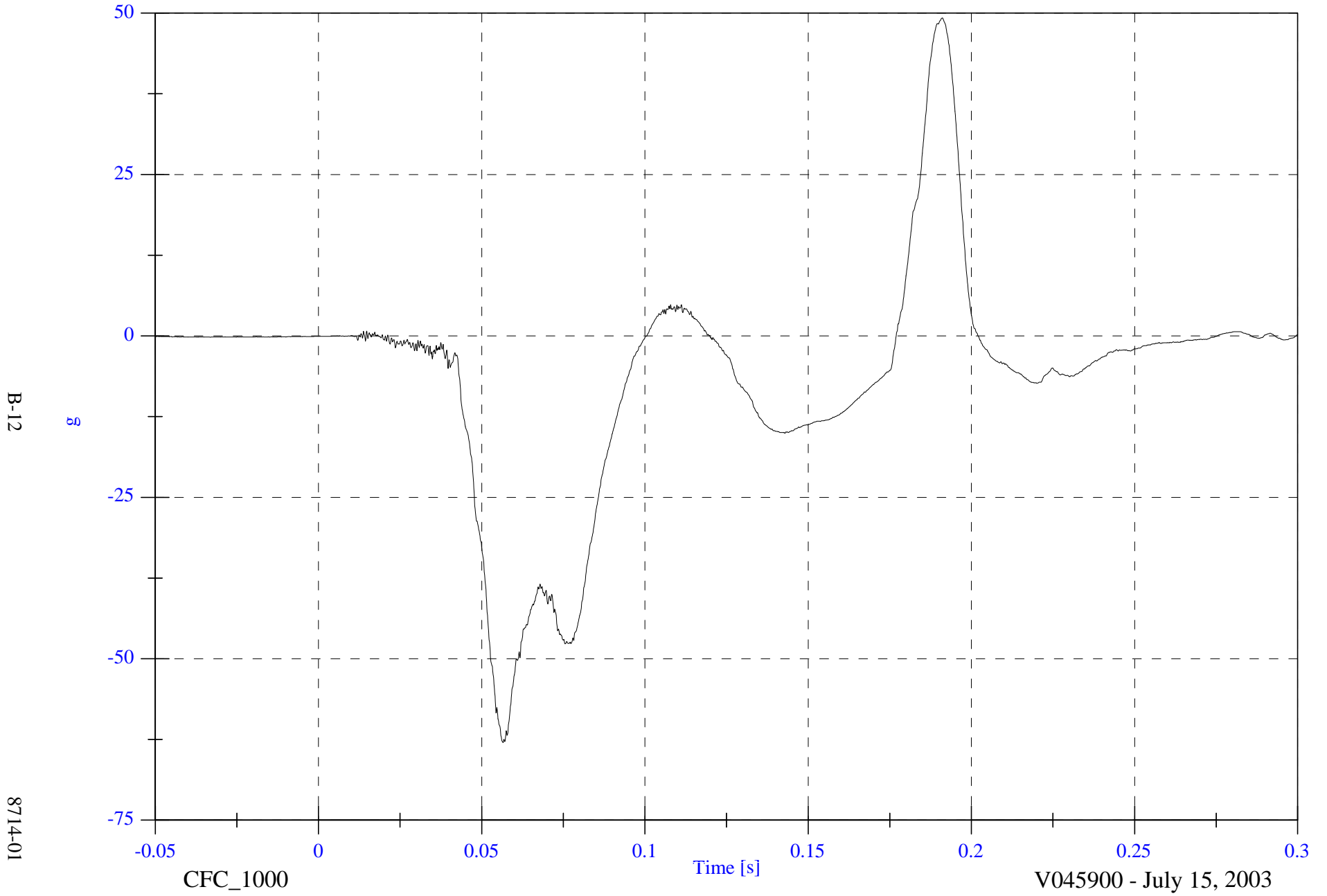


2004 Volvo XC90 NCAP

V1P1 Head 9 Array Z Arm Ax

Max: 49.2 [g] at 0.191 [s]

Min: -63.0 [g] at 0.057 [s]



B-12

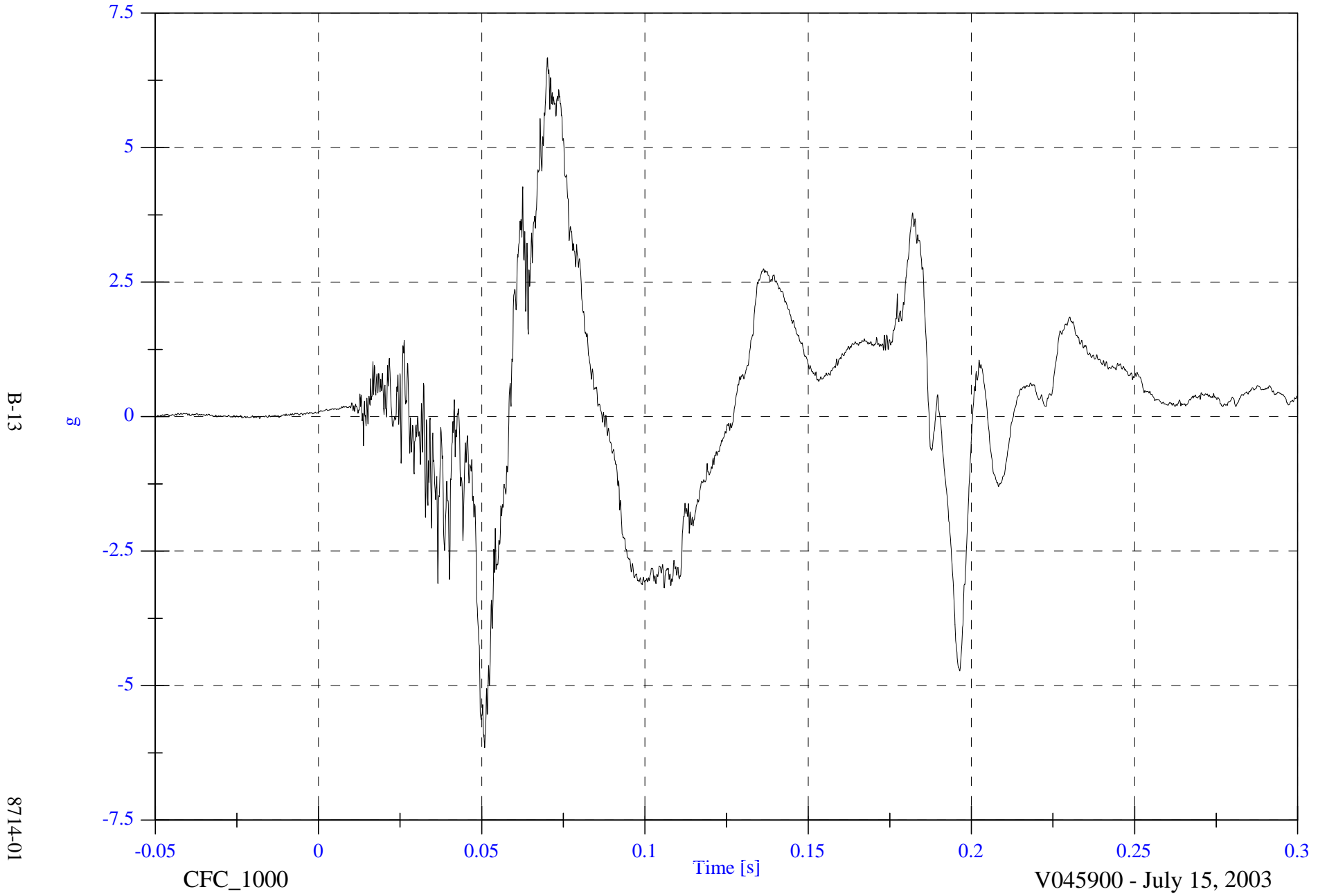
8714-01

2004 Volvo XC90 NCAP

V1P1 Head 9 Array Z Arm Ay

Max: 6.7 [g] at 0.070 [s]

Min: -6.2 [g] at 0.051 [s]

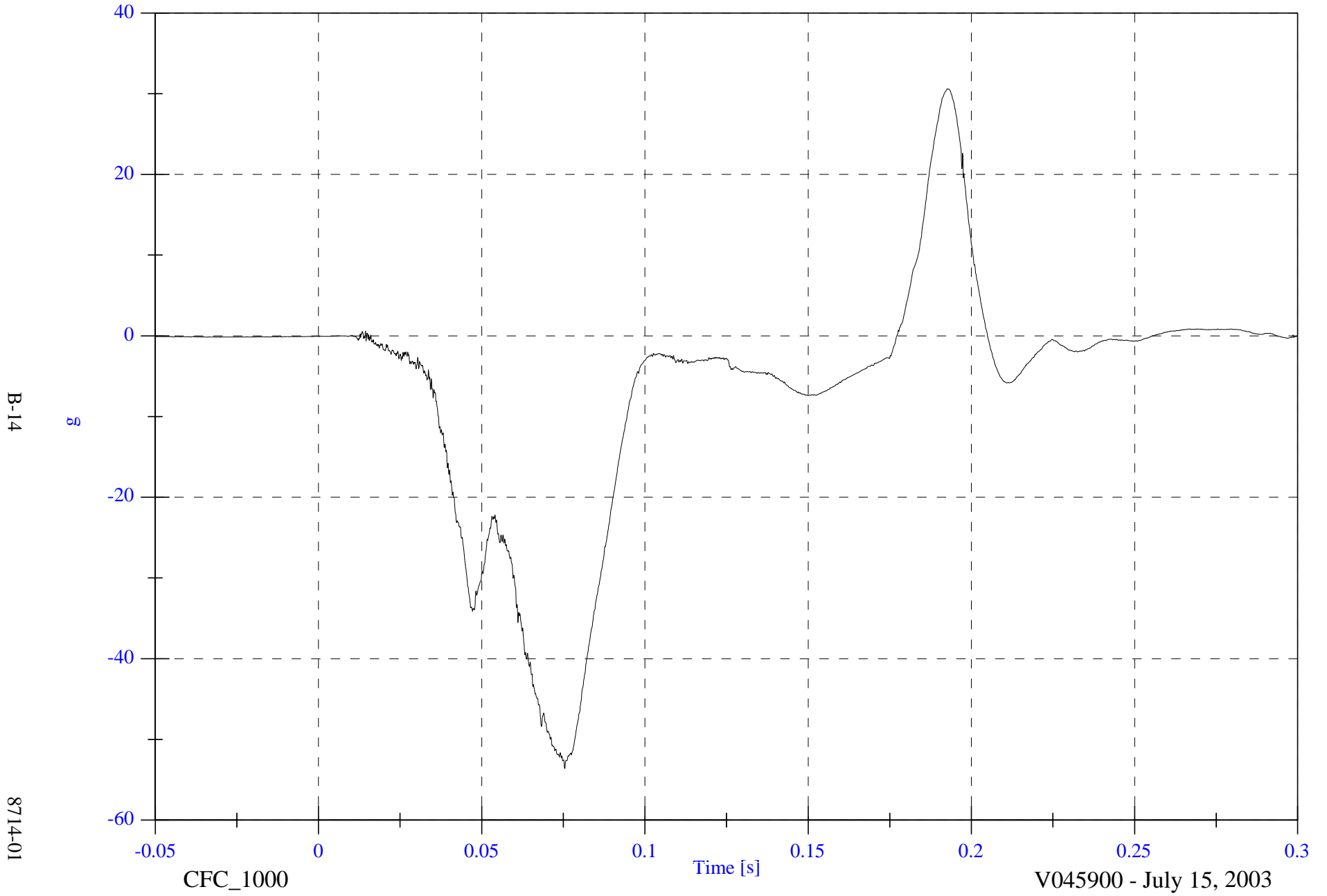


2004 Volvo XC90 NCAP

V1P1 Head CG x

Max: 30.6 [g] at 0.193 [s]

Min: -53.6 [g] at 0.076 [s]



B-14

g

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

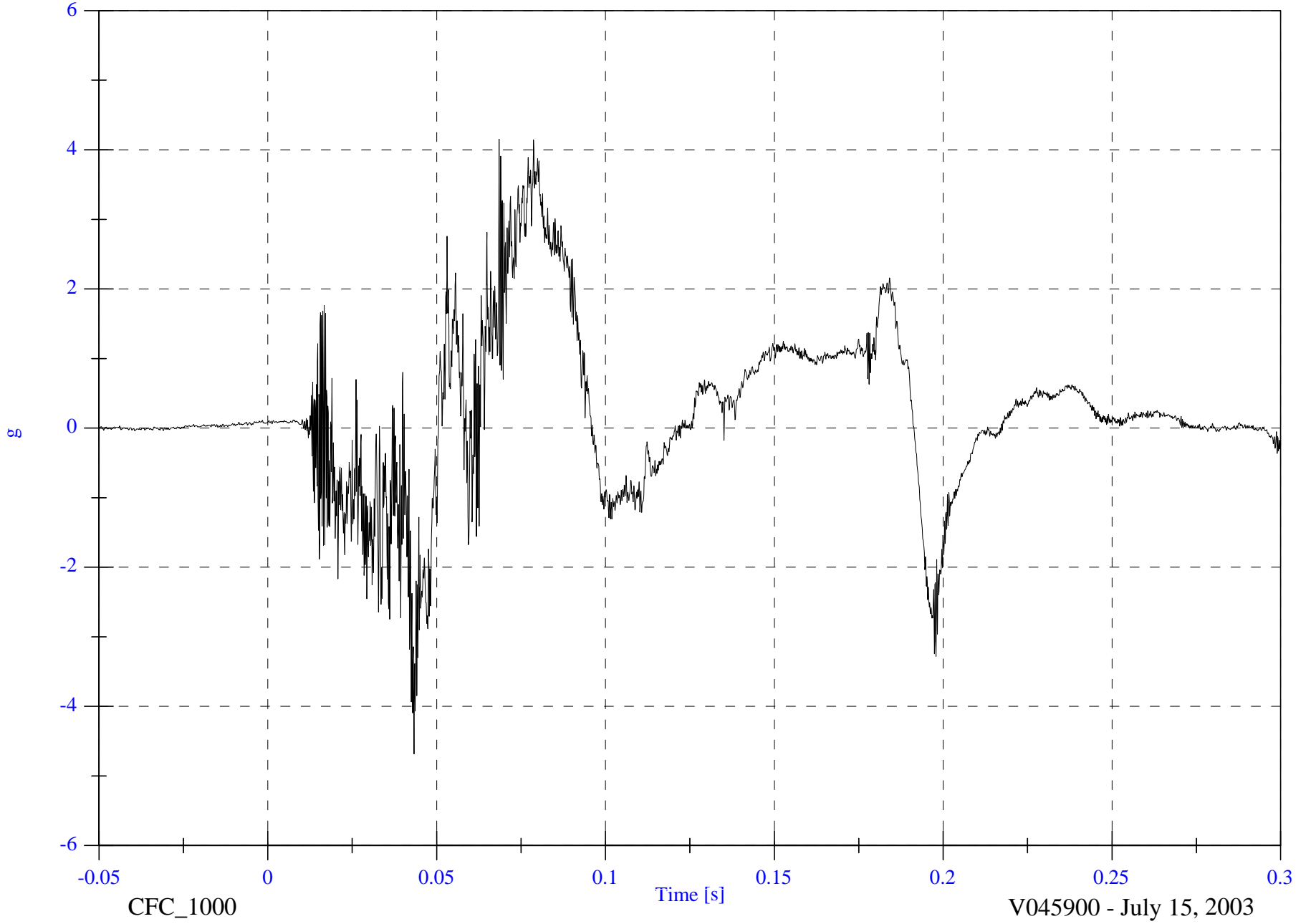
V1P1 Head CG y

Max: 4.2 [g] at 0.068 [s]

Min: -4.7 [g] at 0.043 [s]

B-15

8714-01



CFC_1000

Time [s]

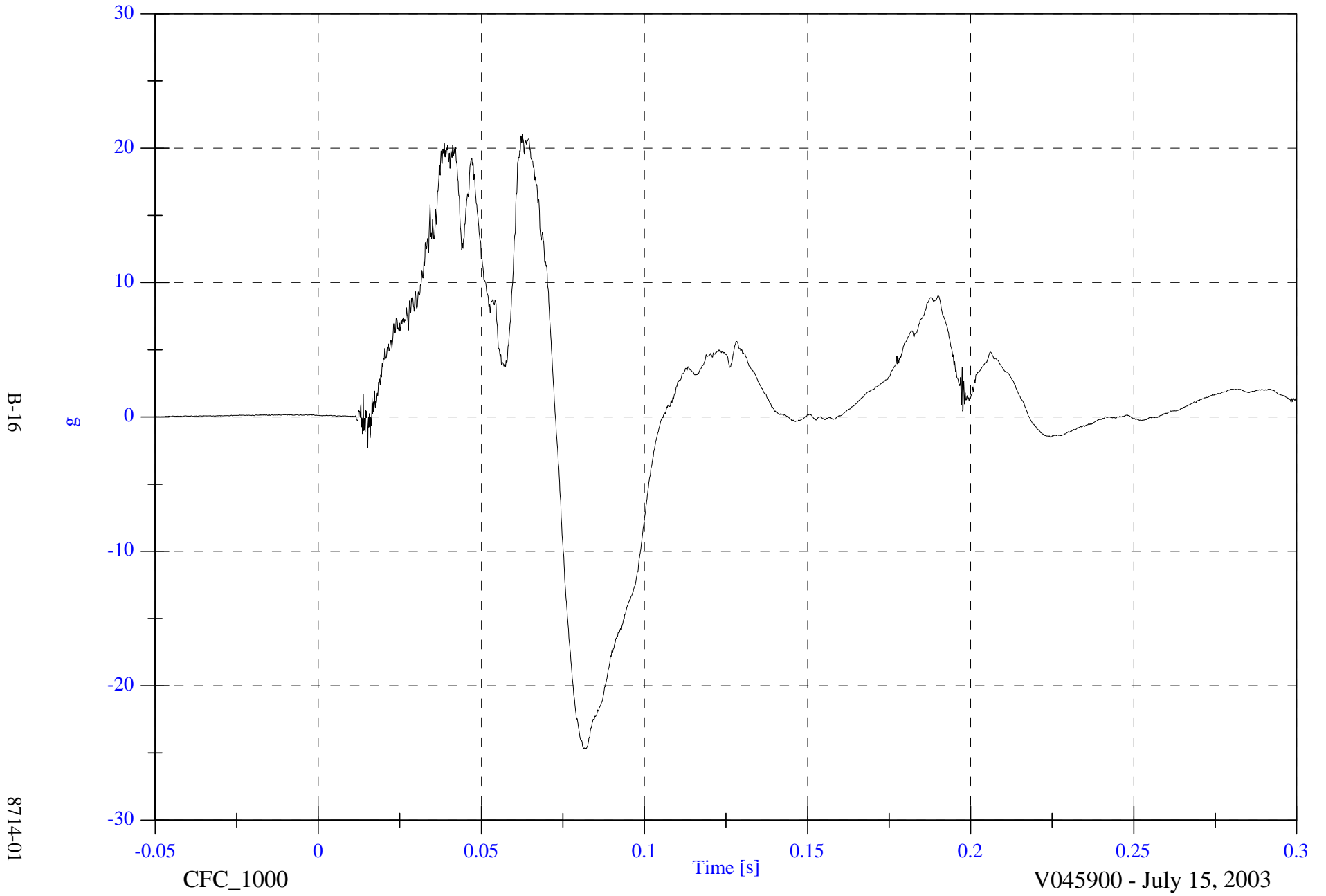
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Head CG z

Max: 21.0 [g] at 0.063 [s]

Min: -24.7 [g] at 0.082 [s]



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8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

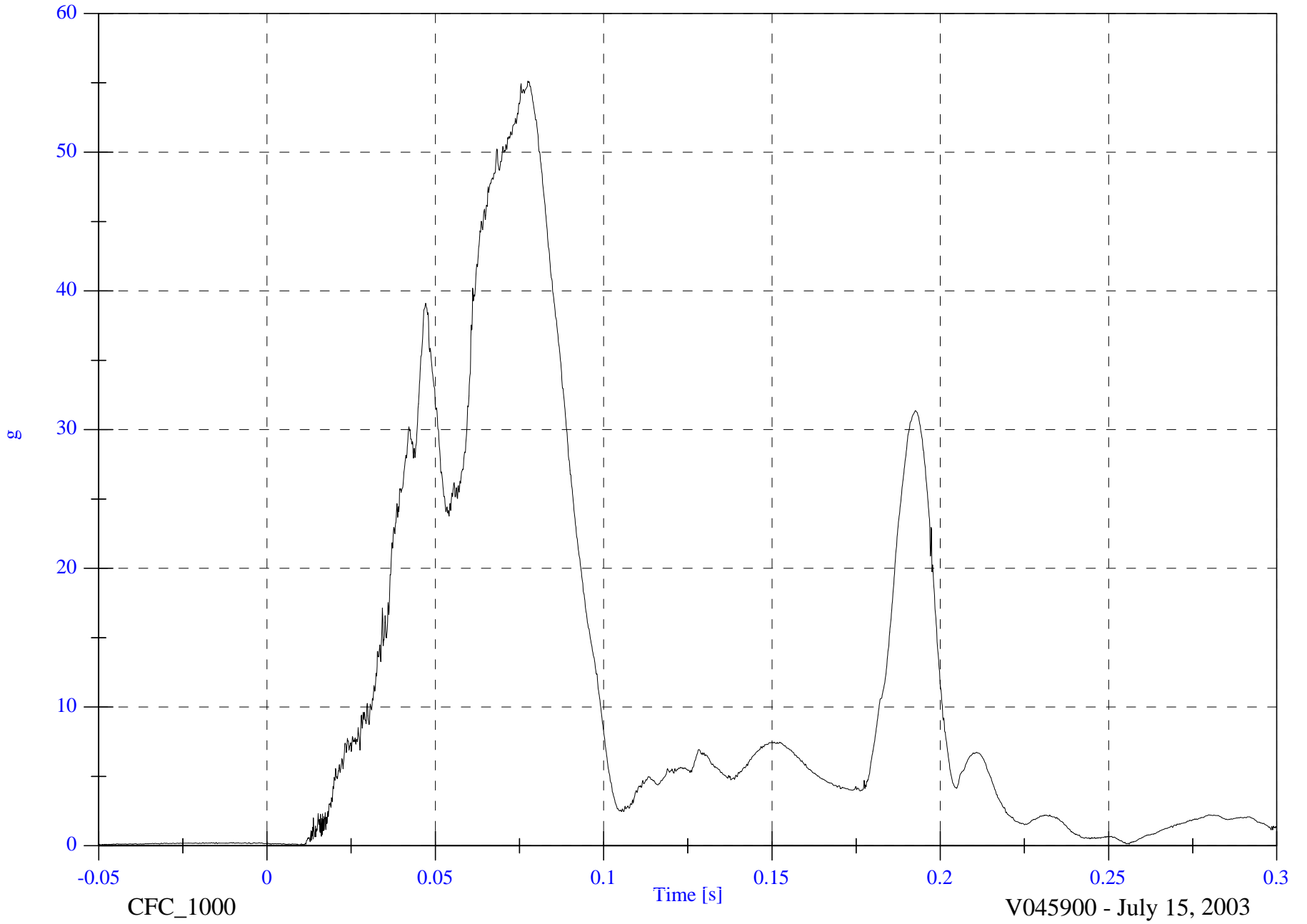
V1P1 Head CG Resultant

Max: 55.1 [g] at 0.077 [s]

Min: 0.1 [g] at 0.010 [s]

B-17

8714-01



CFC_1000

Time [s]

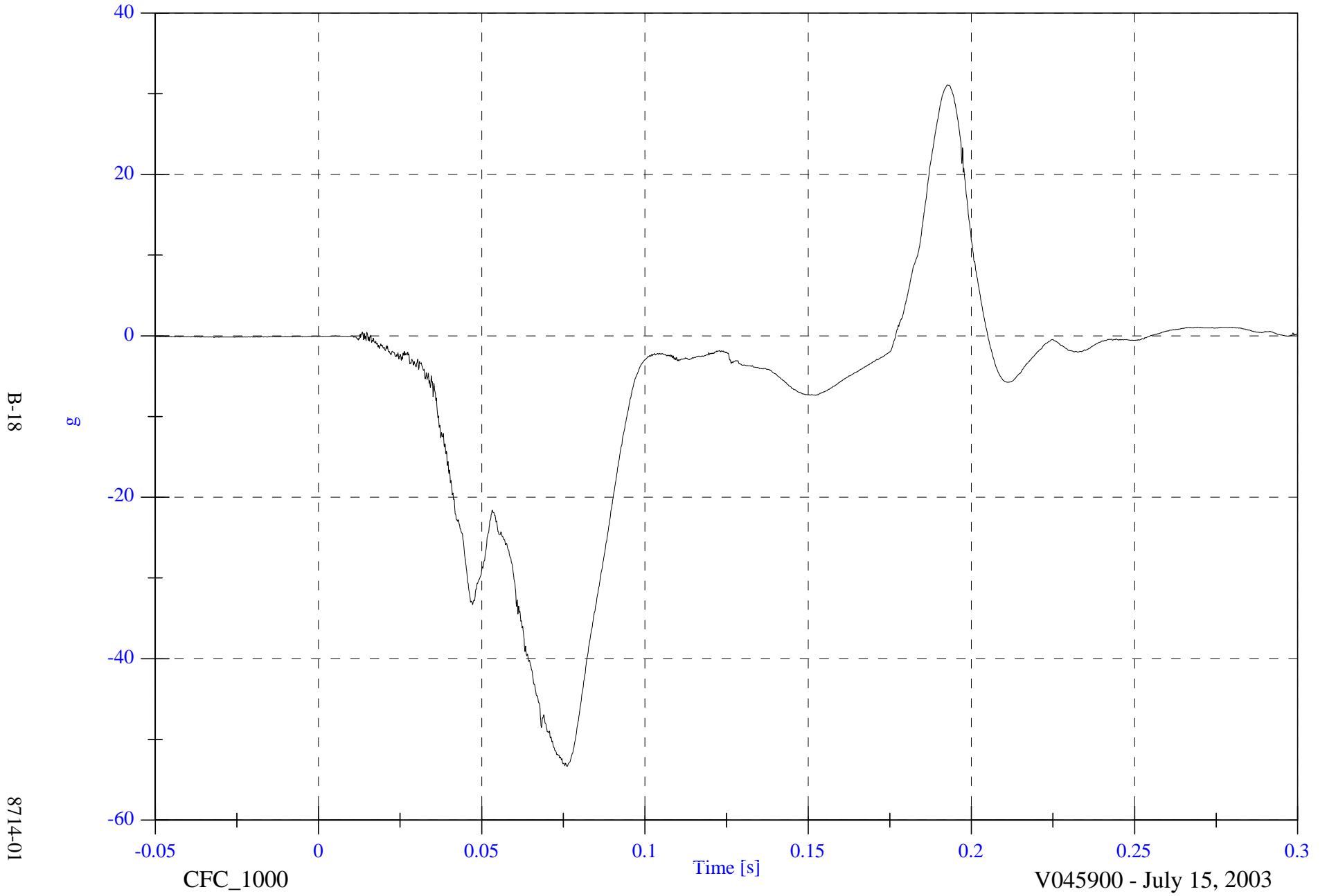
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Head CG Red x

Max: 31.1 [g] at 0.193 [s]

Min: -53.4 [g] at 0.076 [s]

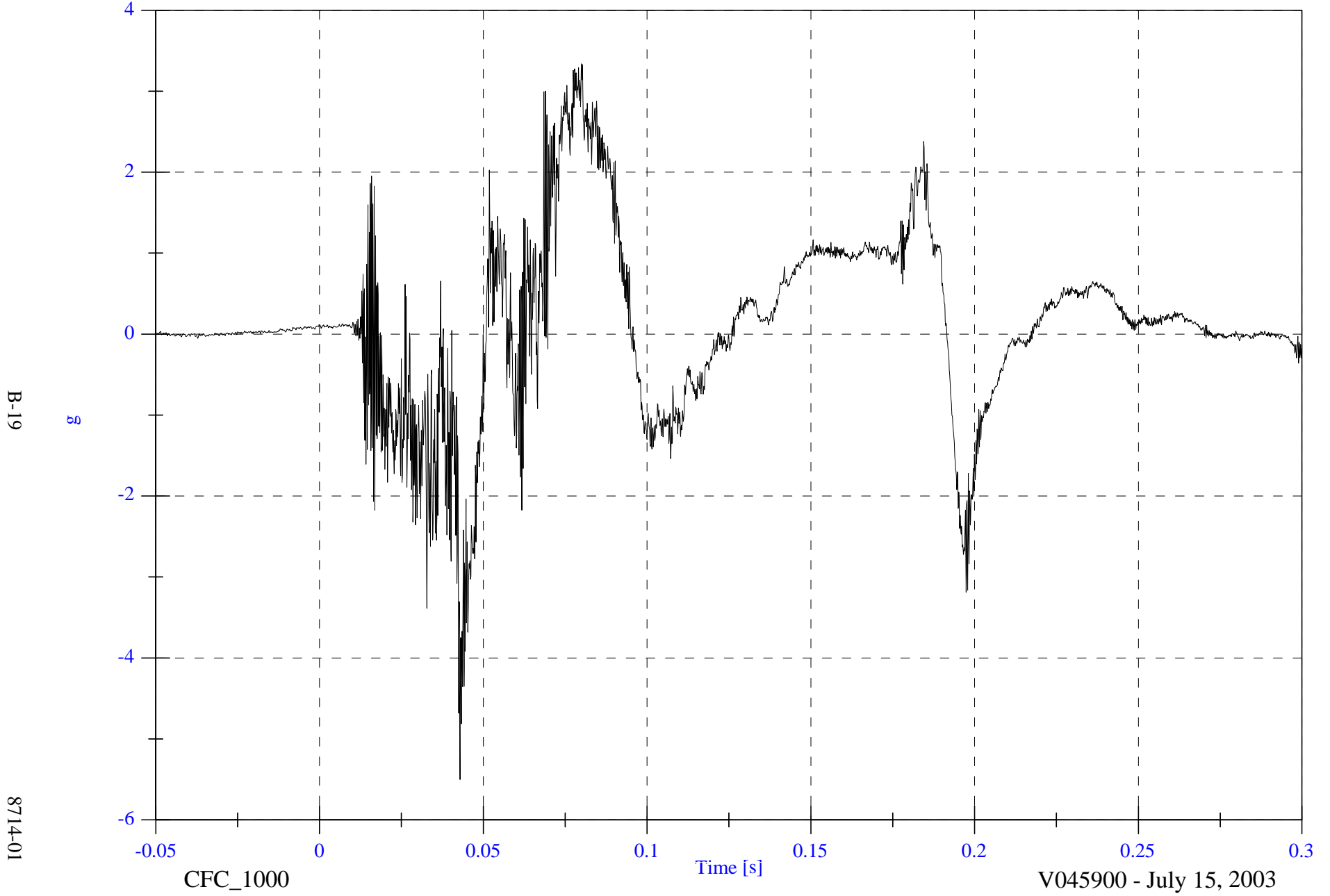


2004 Volvo XC90 NCAP

V1P1 Head CG Red y

Max: 3.3 [g] at 0.080 [s]

Min: -5.5 [g] at 0.043 [s]

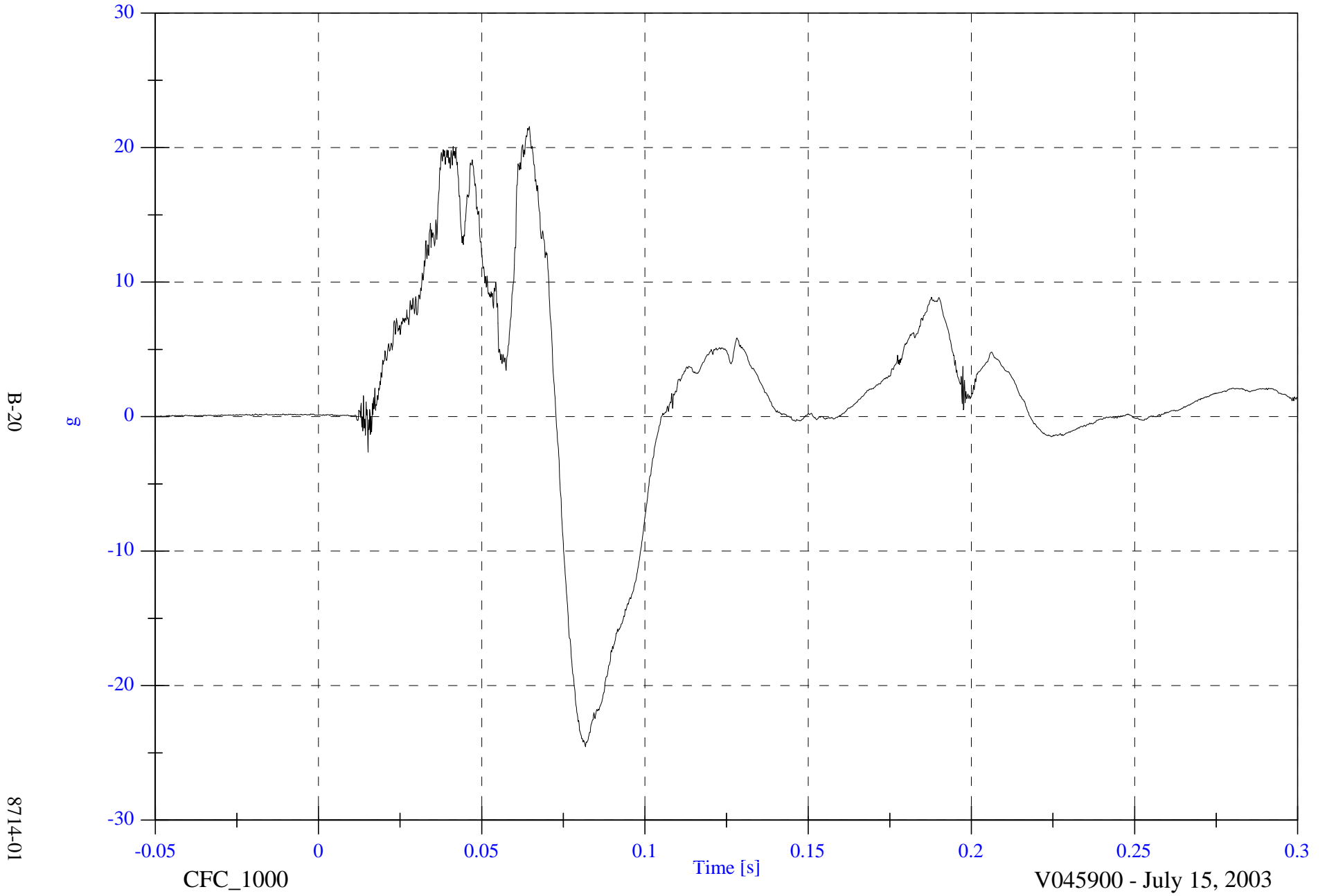


2004 Volvo XC90 NCAP

V1P1 Head CG Red z

Max: 21.6 [g] at 0.065 [s]

Min: -24.5 [g] at 0.082 [s]



2004 Volvo XC90 NCAP

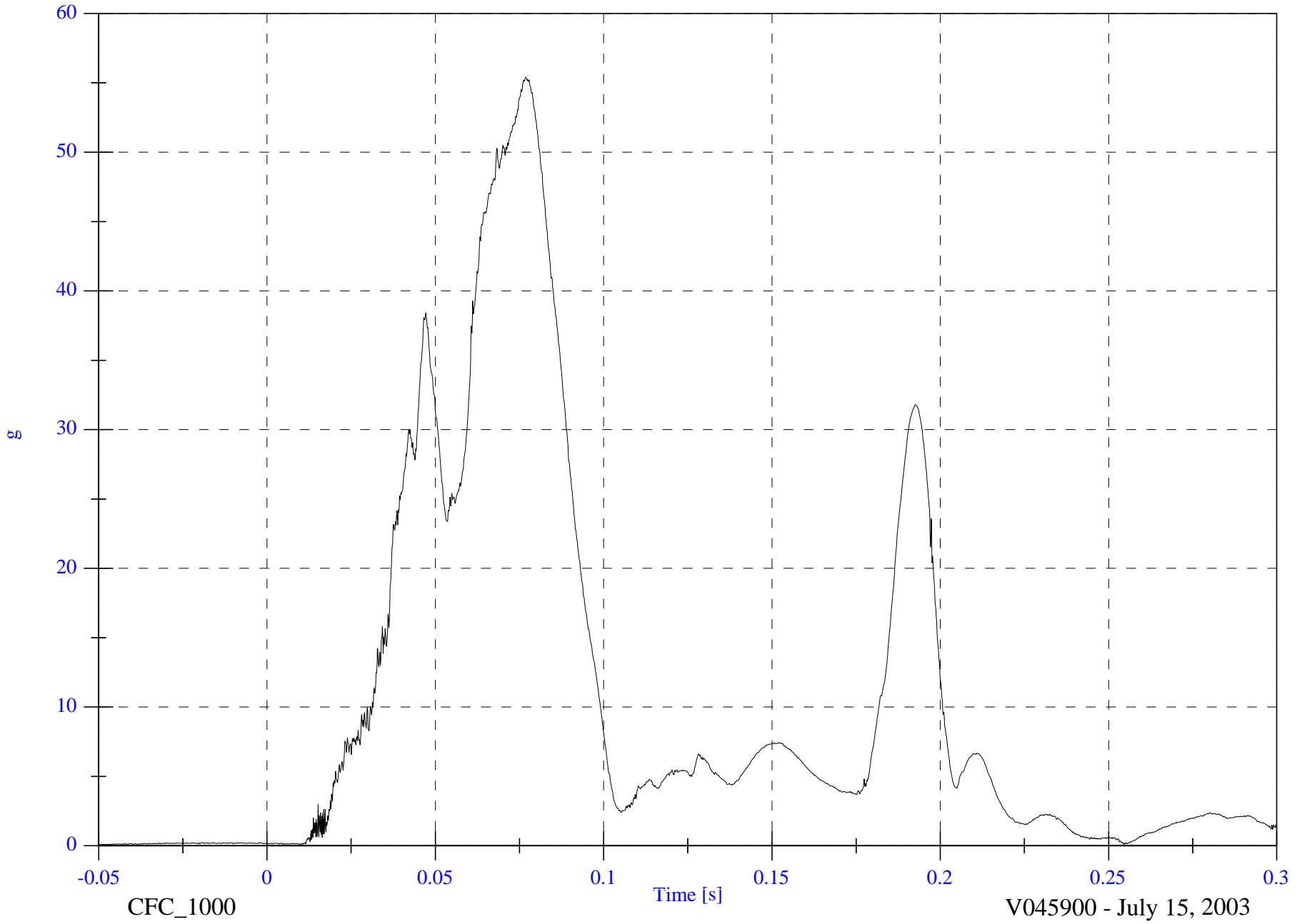
V1P1 Head CG Red Resultant

Max: 55.4 [g] at 0.077 [s]

Min: 0.1 [g] at -0.050 [s]

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2004 Volvo XC90 NCAP

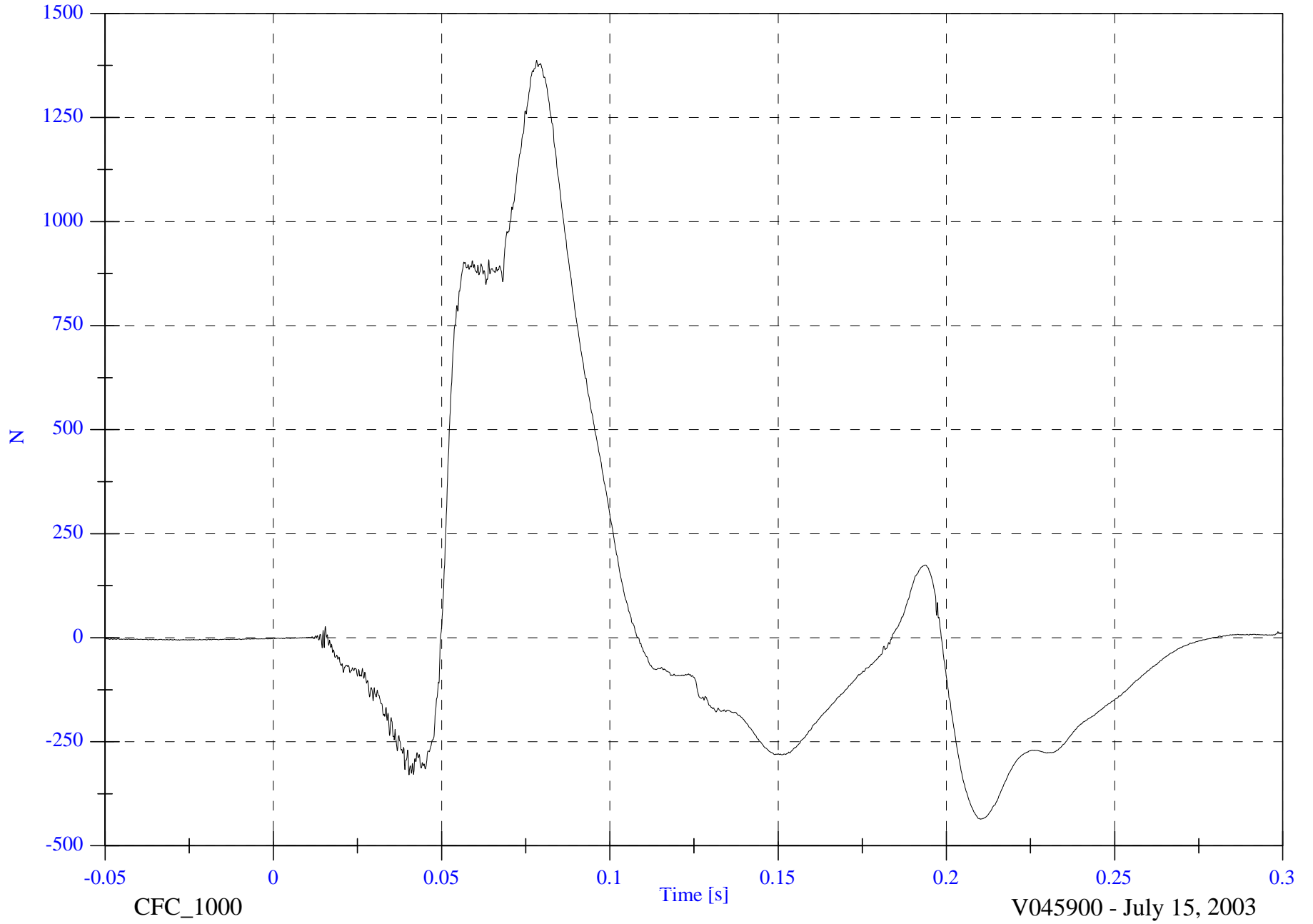
V1P1 Upper Neck Fx

Max: 1387.2 [N] at 0.078 [s]

Min: -436.0 [N] at 0.210 [s]

B-22

8714-01



CFC_1000

Time [s]

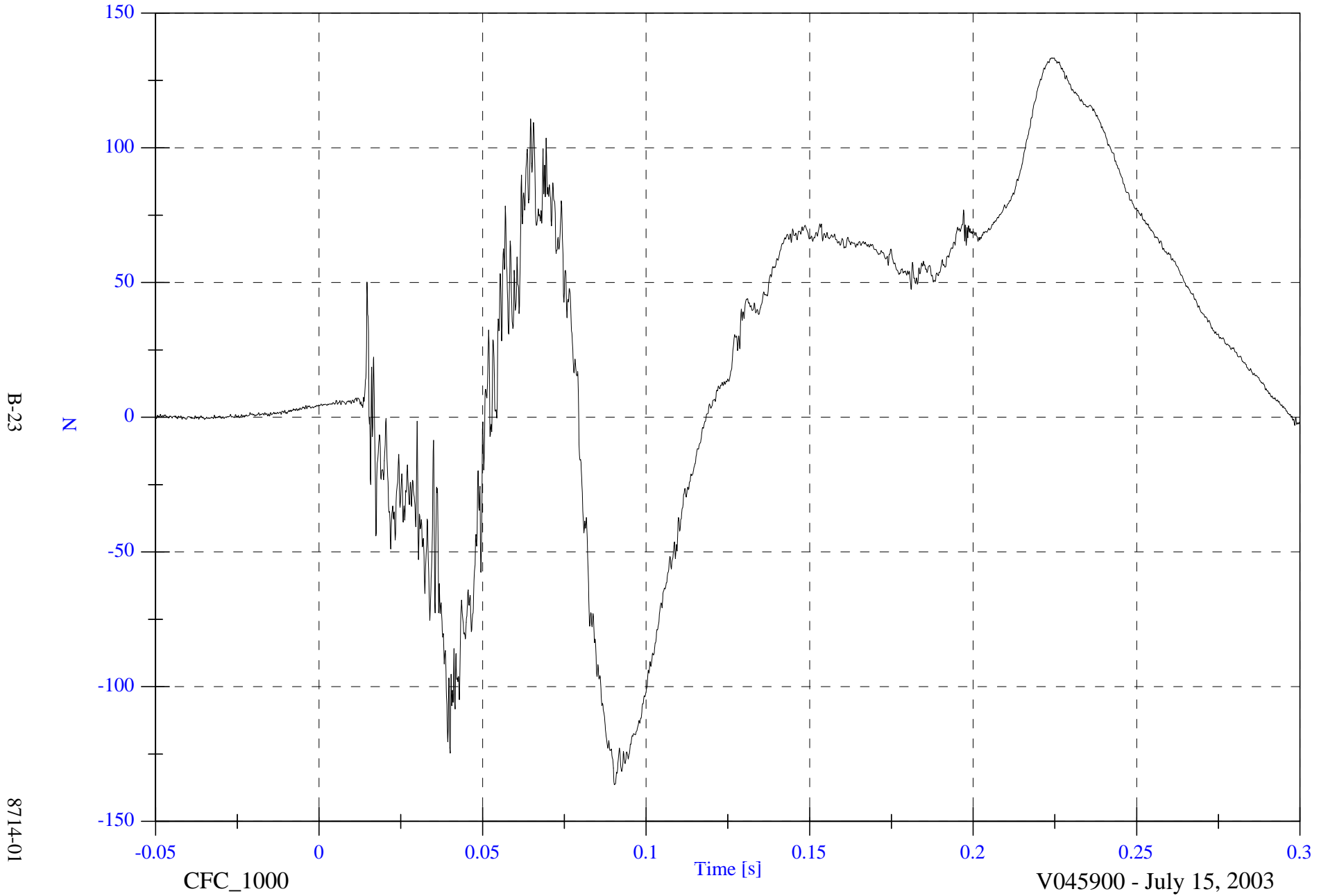
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Upper Neck Fy

Max: 133.4 [N] at 0.224 [s]

Min: -136.4 [N] at 0.090 [s]

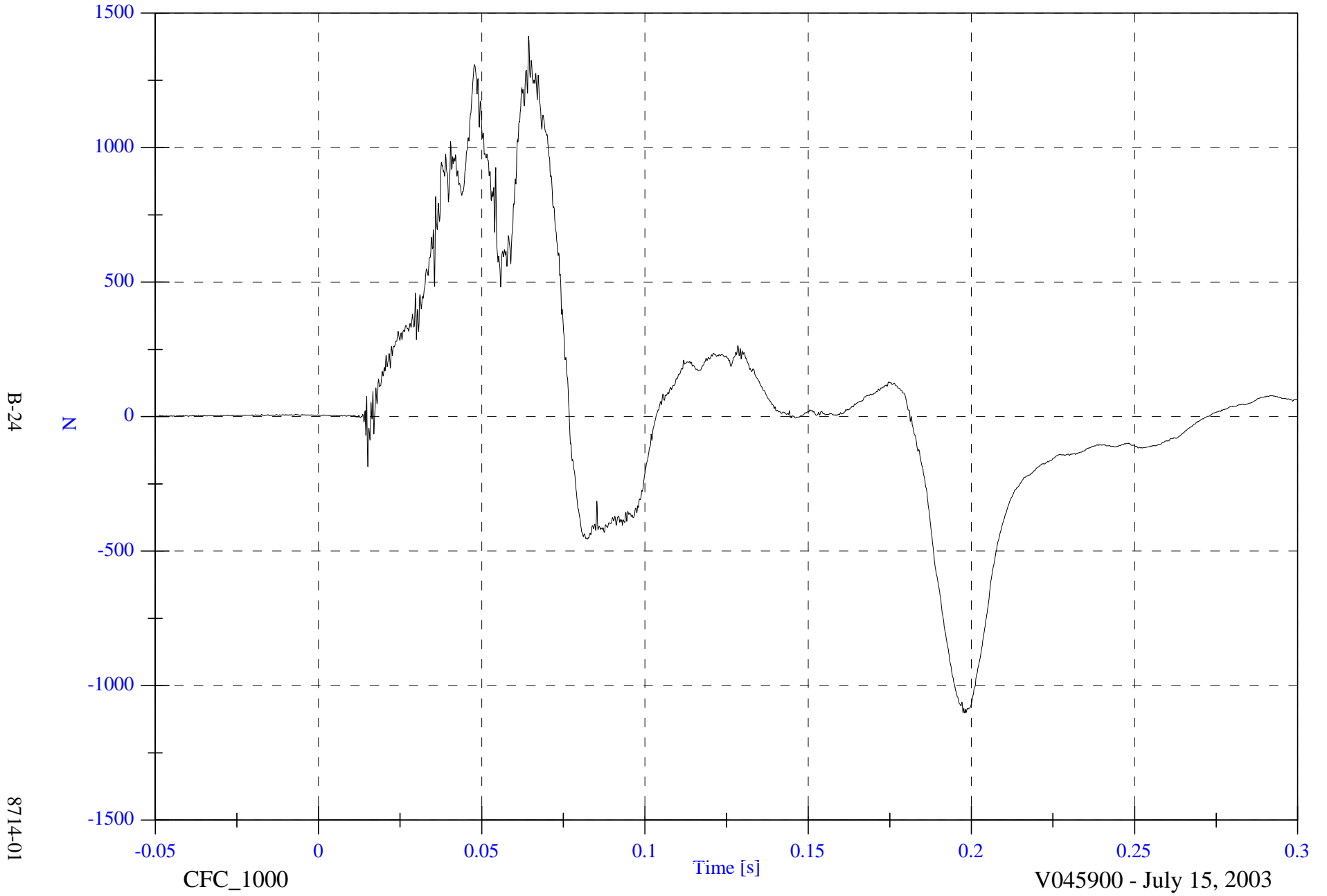


2004 Volvo XC90 NCAP

V1P1 Upper Neck Fz

Max: 1413.2 [N] at 0.064 [s]

Min: -1102.0 [N] at 0.198 [s]



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CFC_1000

Time [s]

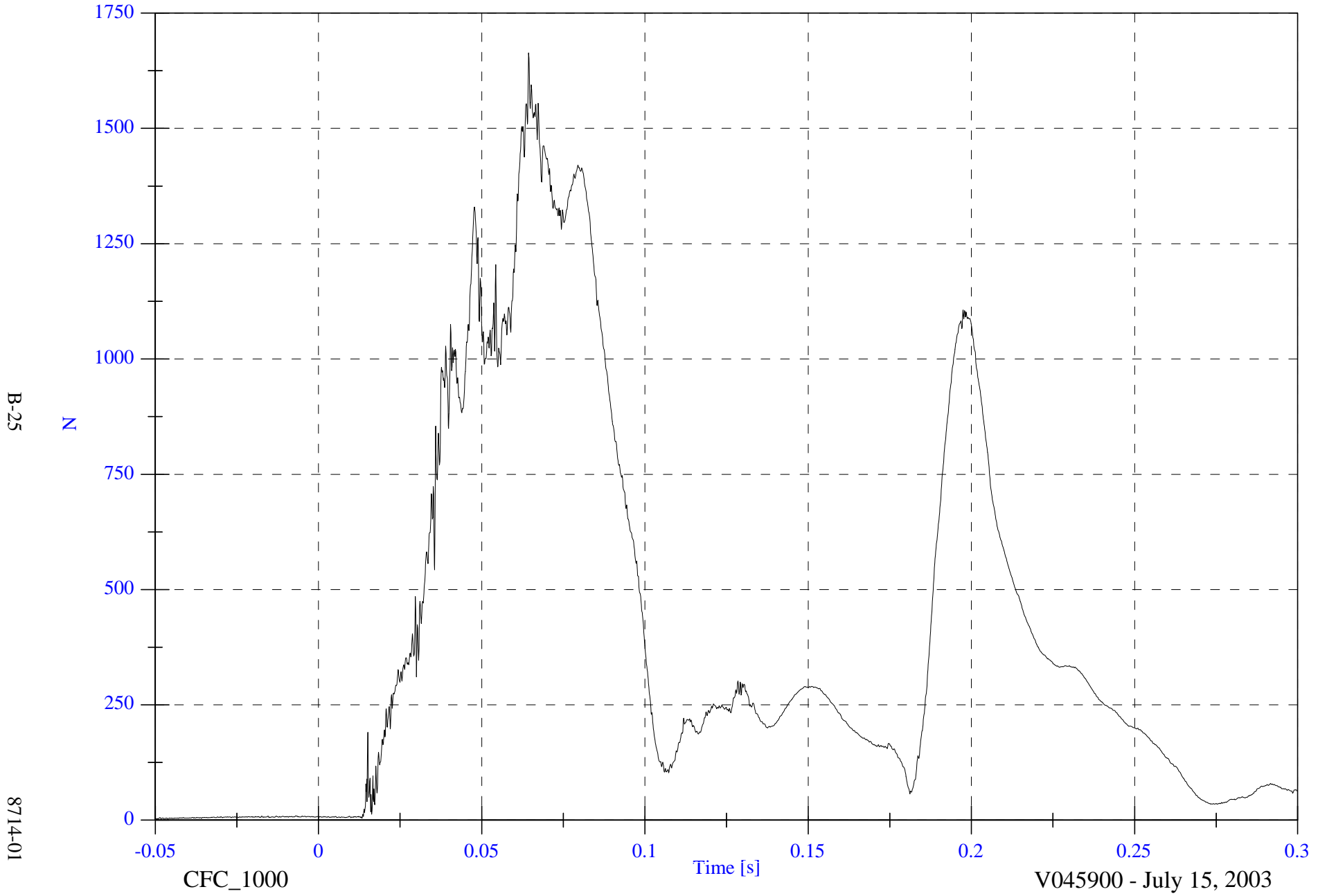
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Upper Neck F Resultant

Max: 1663.7 [N] at 0.064 [s]

Min: 2.6 [N] at -0.049 [s]



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CFC_1000

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

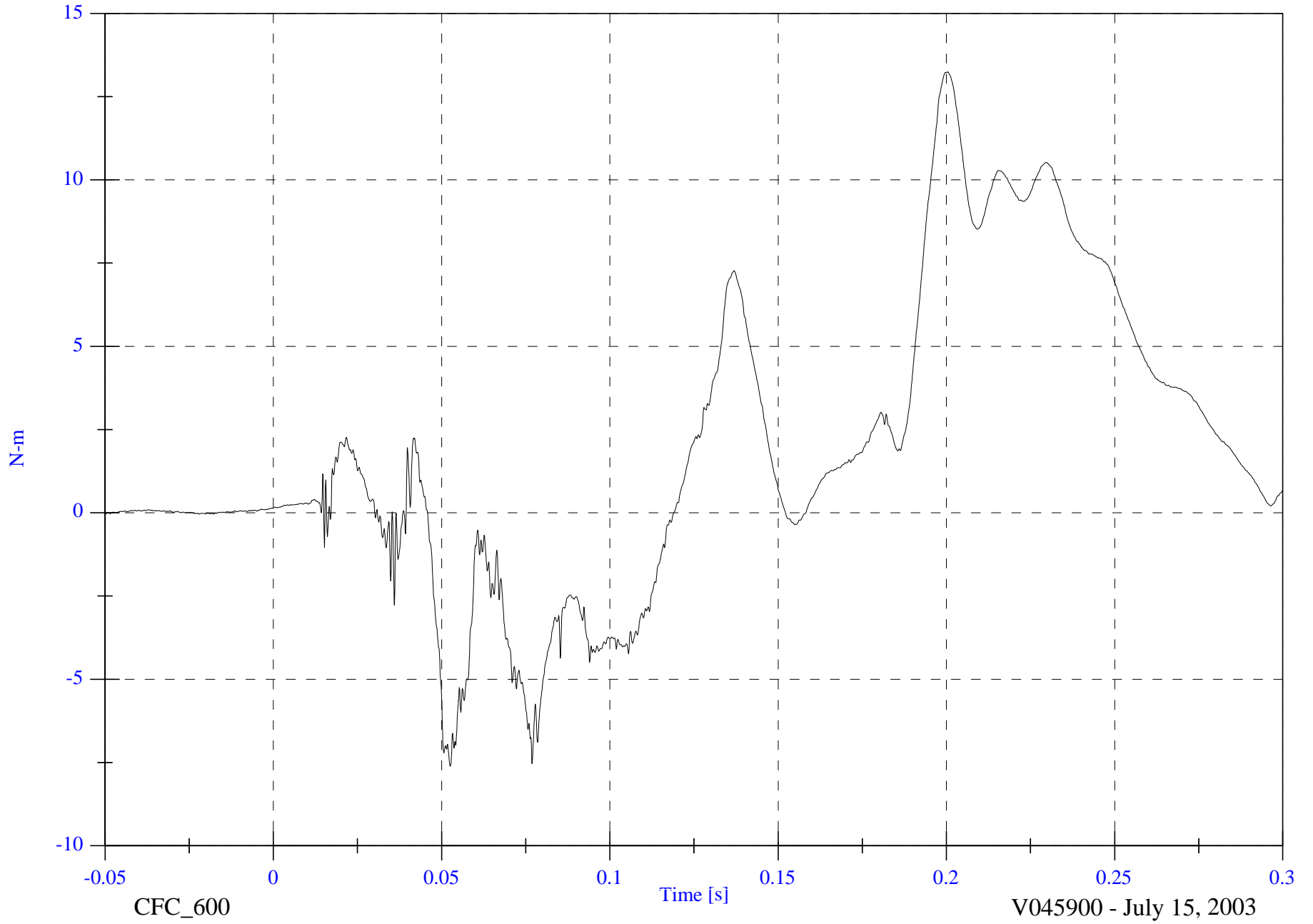
V1P1 Upper Neck Mx

Max: 13.2 [N-m] at 0.200 [s]

Min: -7.6 [N-m] at 0.053 [s]

B-26

8714-01

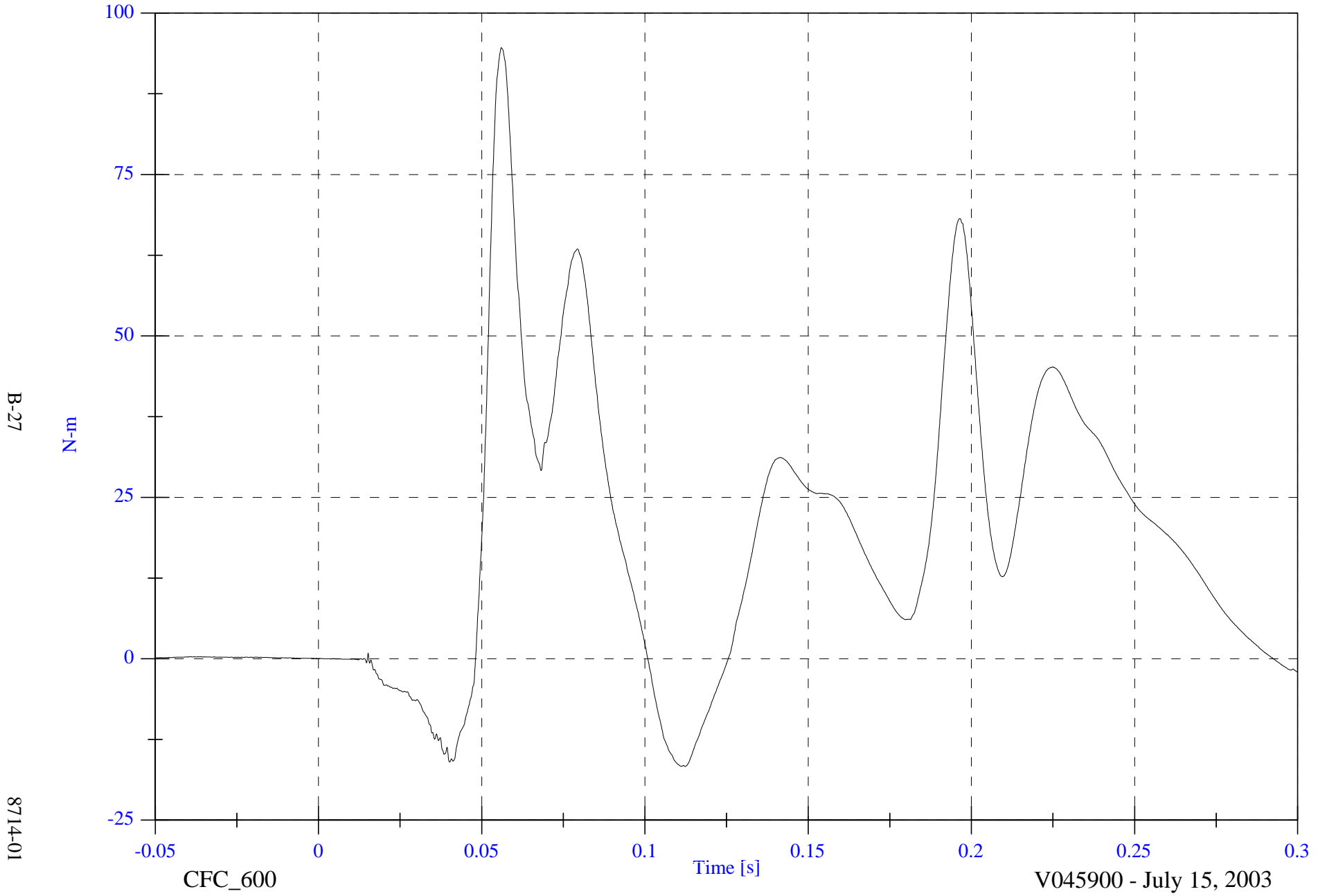


2004 Volvo XC90 NCAP

V1P1 Upper Neck My

Max: 94.7 [N-m] at 0.056 [s]

Min: -16.7 [N-m] at 0.112 [s]



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CFC_600

V045900 - July 15, 2003

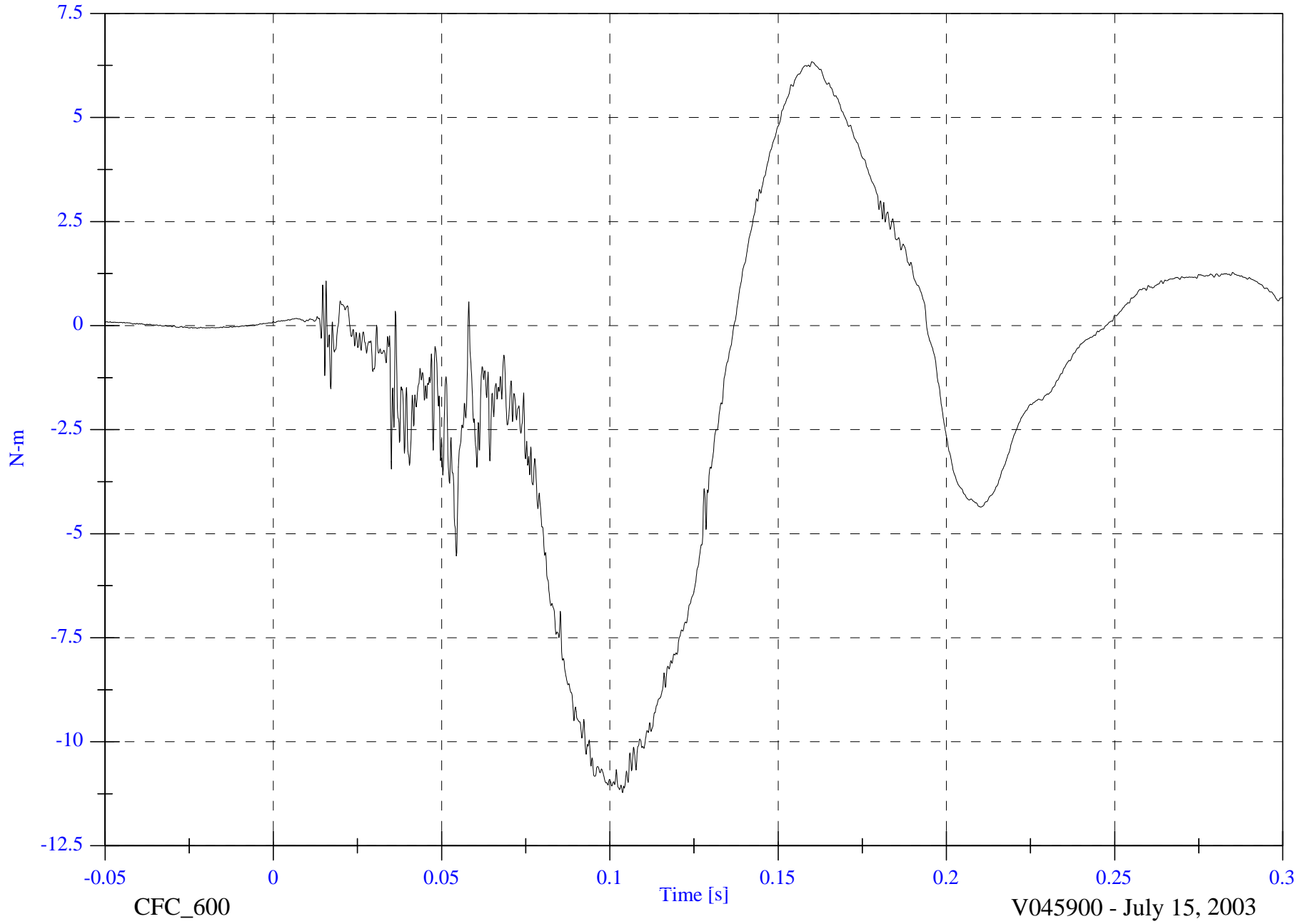
2004 Volvo XC90 NCAP

V1P1 Upper Neck Mz

Max: 6.3 [N-m] at 0.160 [s]
Min: -11.2 [N-m] at 0.104 [s]

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8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

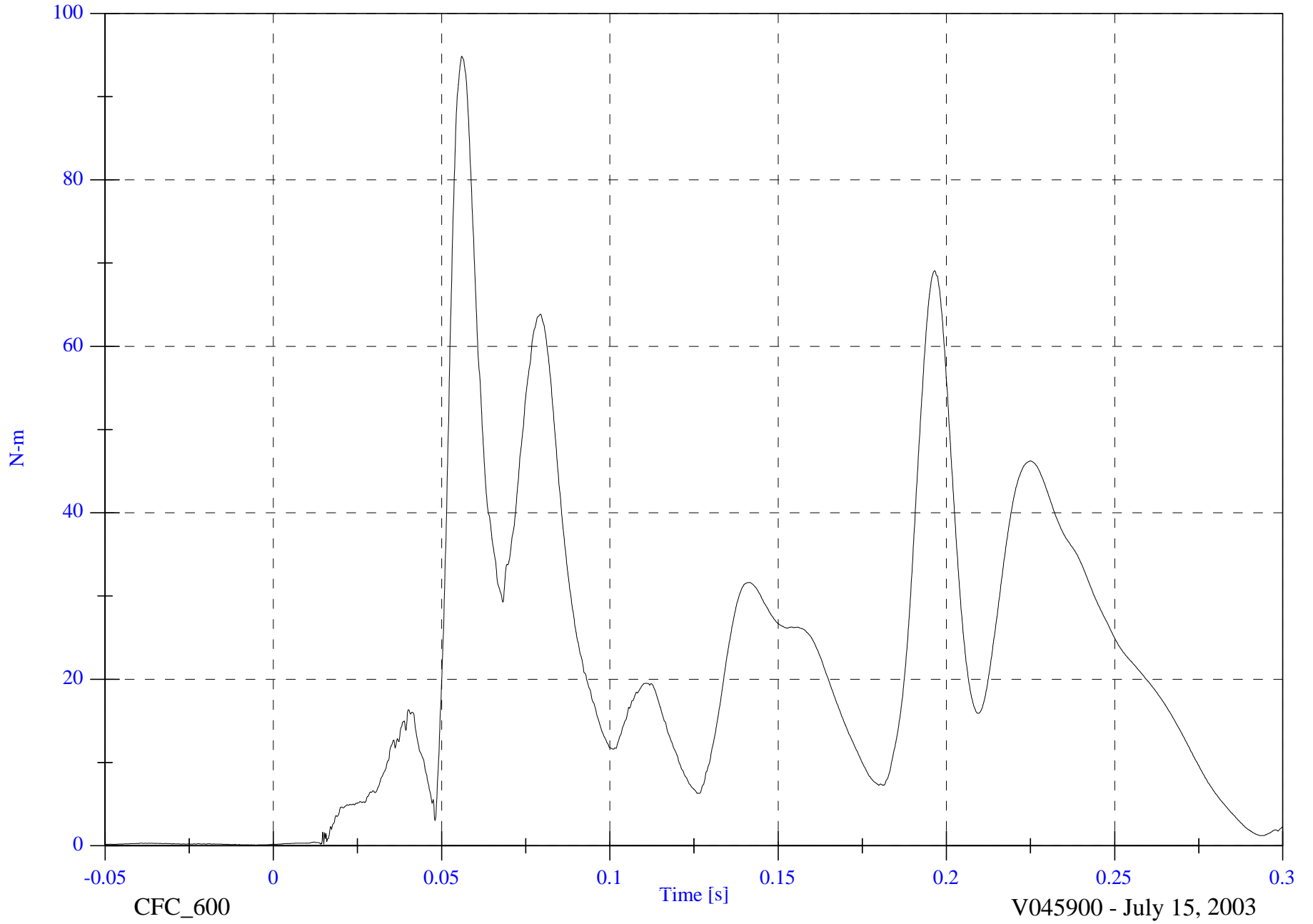
V1P1 Upper Neck M Resultant

Max: 94.9 [N-m] at 0.056 [s]

Min: 0.1 [N-m] at -0.005 [s]

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8714-01



CFC_600

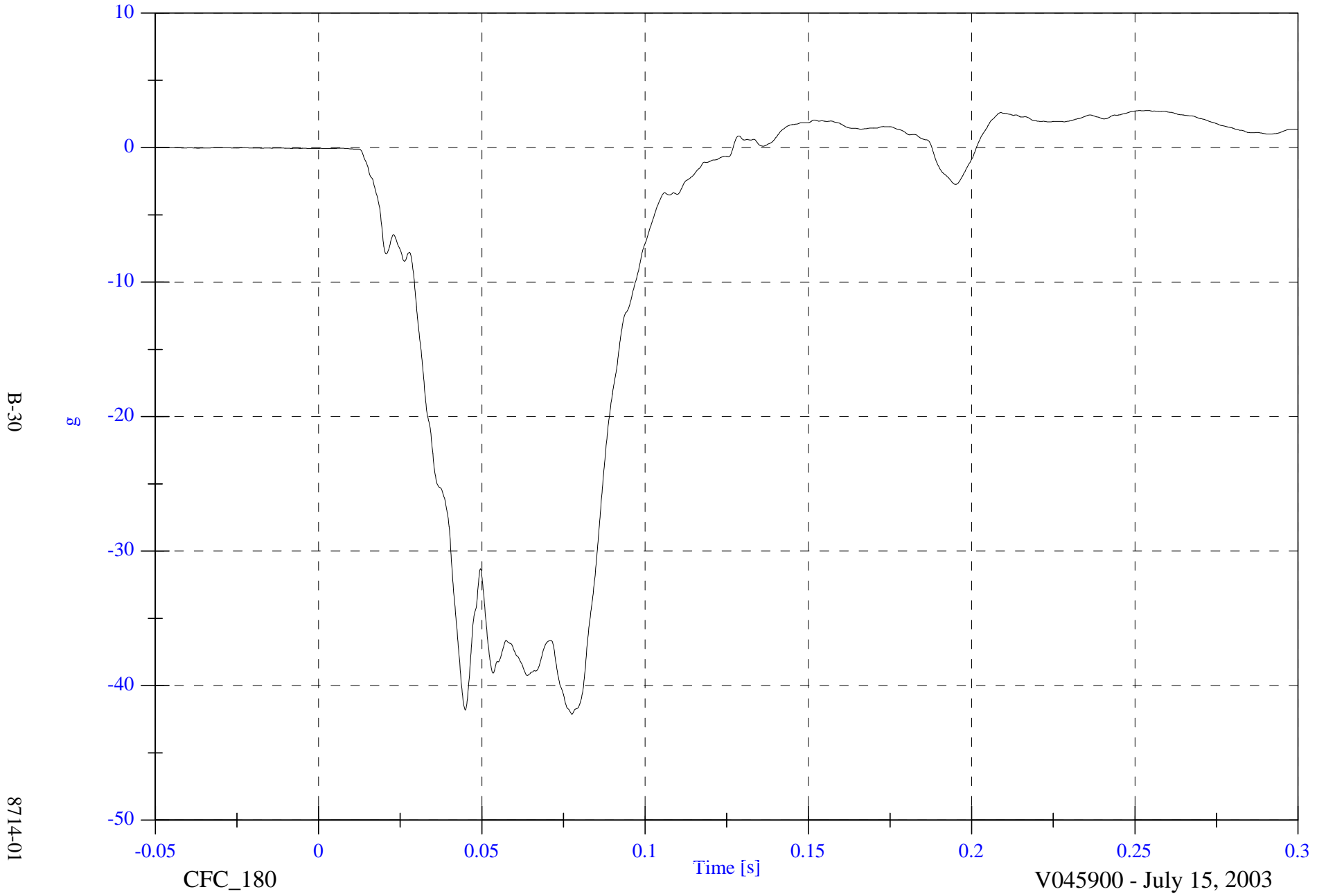
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

VIP1 Chest x

Max: 2.8 [g] at 0.254 [s]

Min: -42.1 [g] at 0.078 [s]

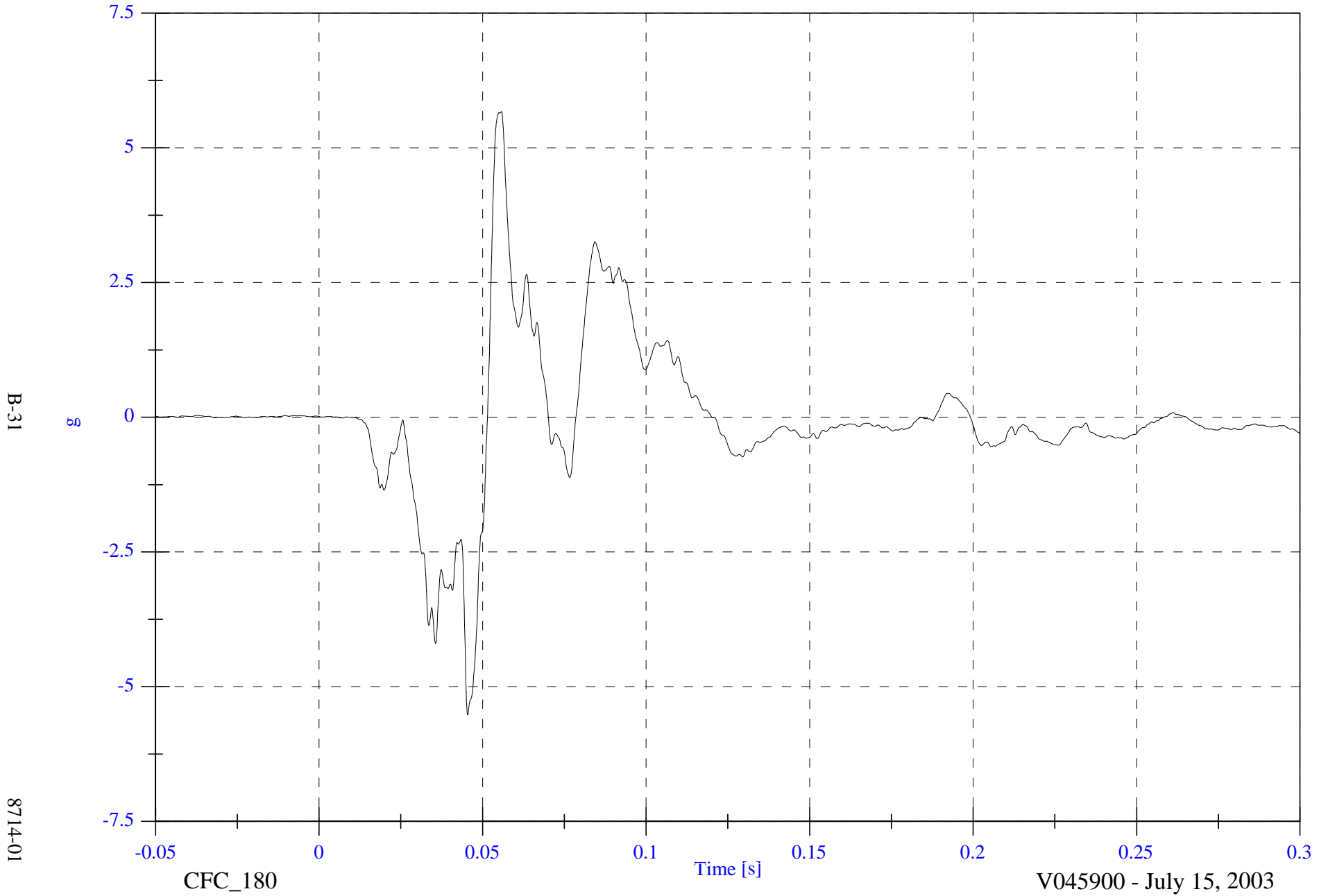


2004 Volvo XC90 NCAP

V1P1 Chest y

Max: 5.7 [g] at 0.056 [s]

Min: -5.5 [g] at 0.045 [s]

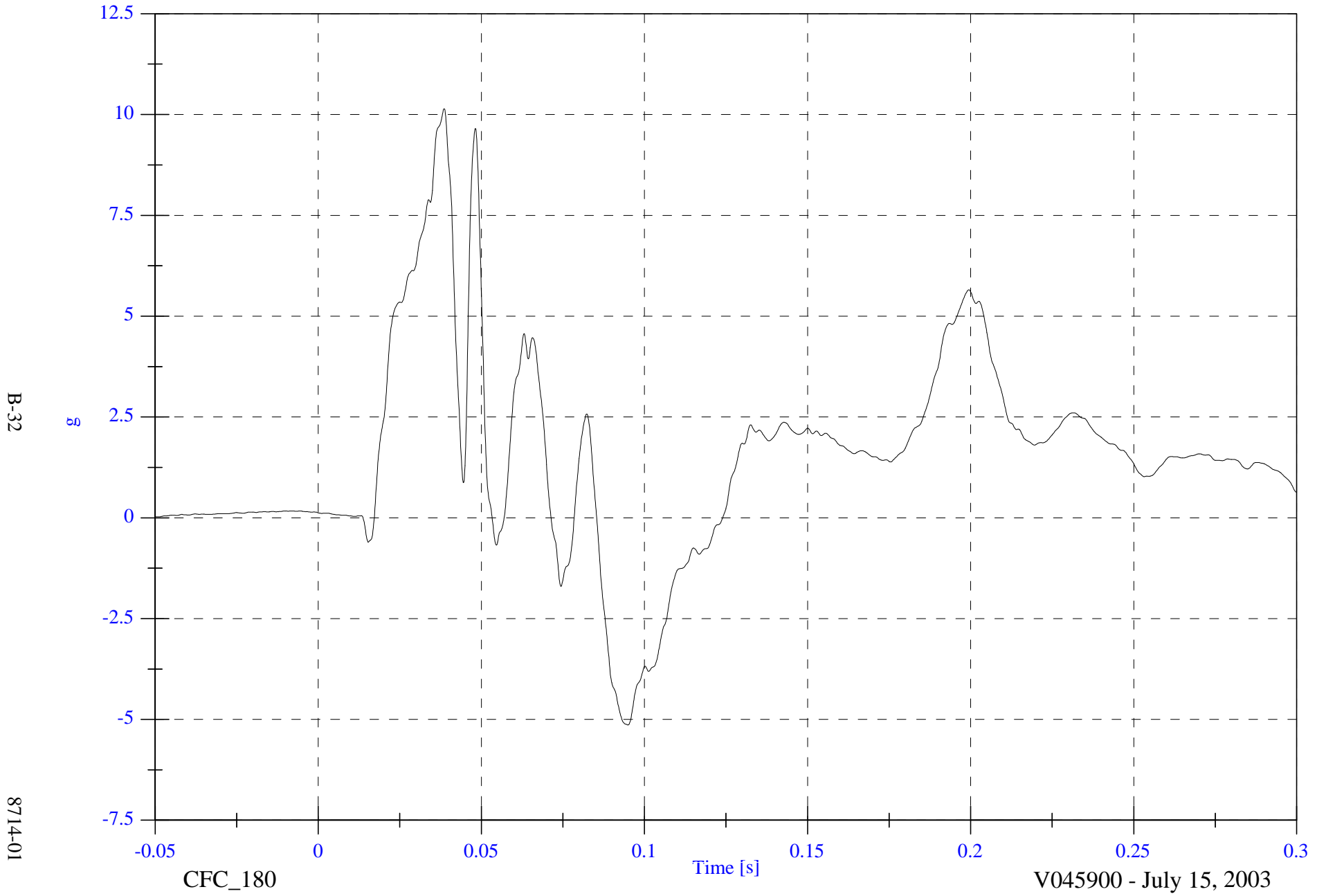


2004 Volvo XC90 NCAP

VIP1 Chest z

Max: 10.1 [g] at 0.039 [s]

Min: -5.1 [g] at 0.095 [s]



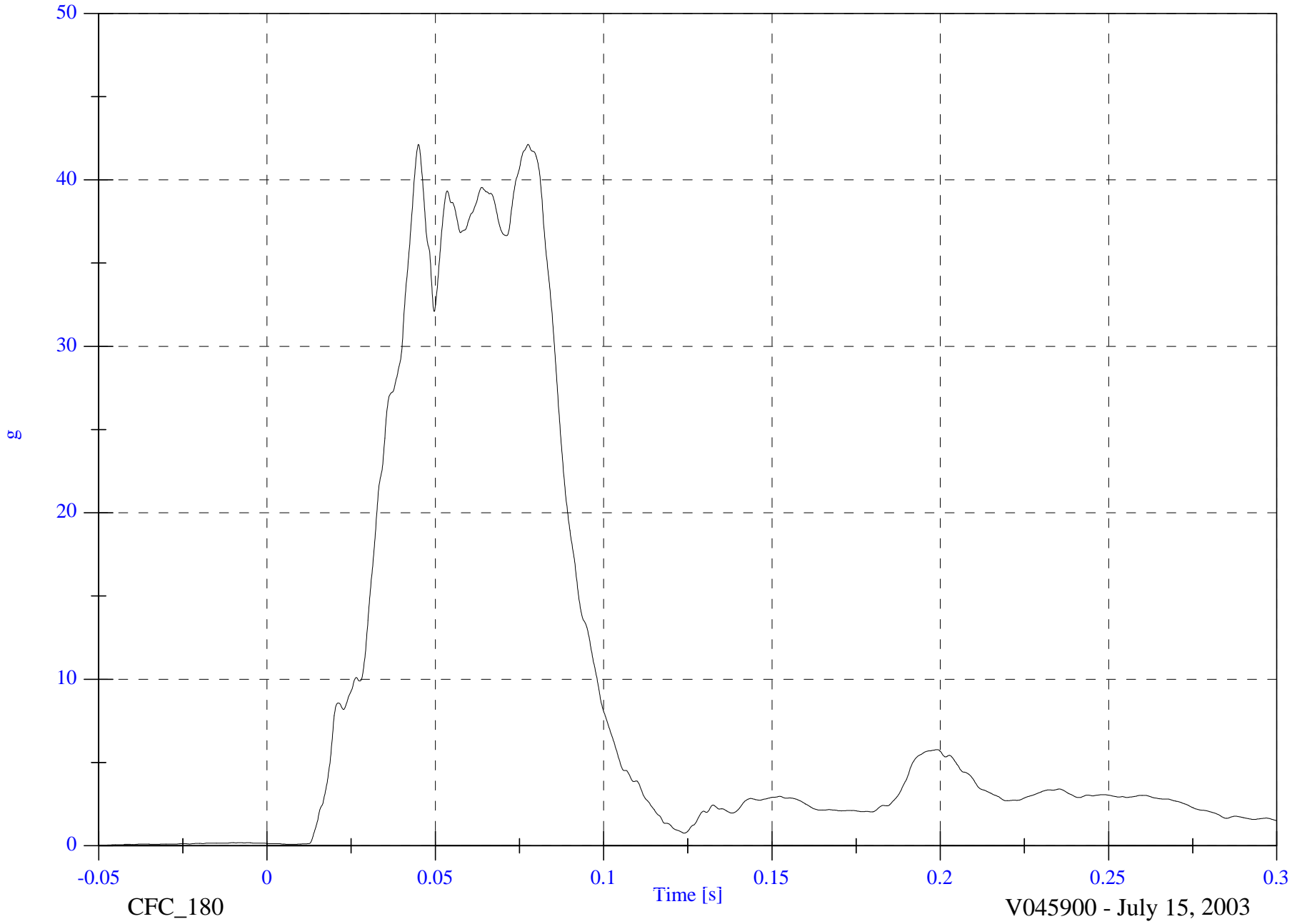
2004 Volvo XC90 NCAP

V1P1 Chest Resultant

Max: 42.1 [g] at 0.078 [s]
Min: 0.0 [g] at -0.050 [s]

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8714-01

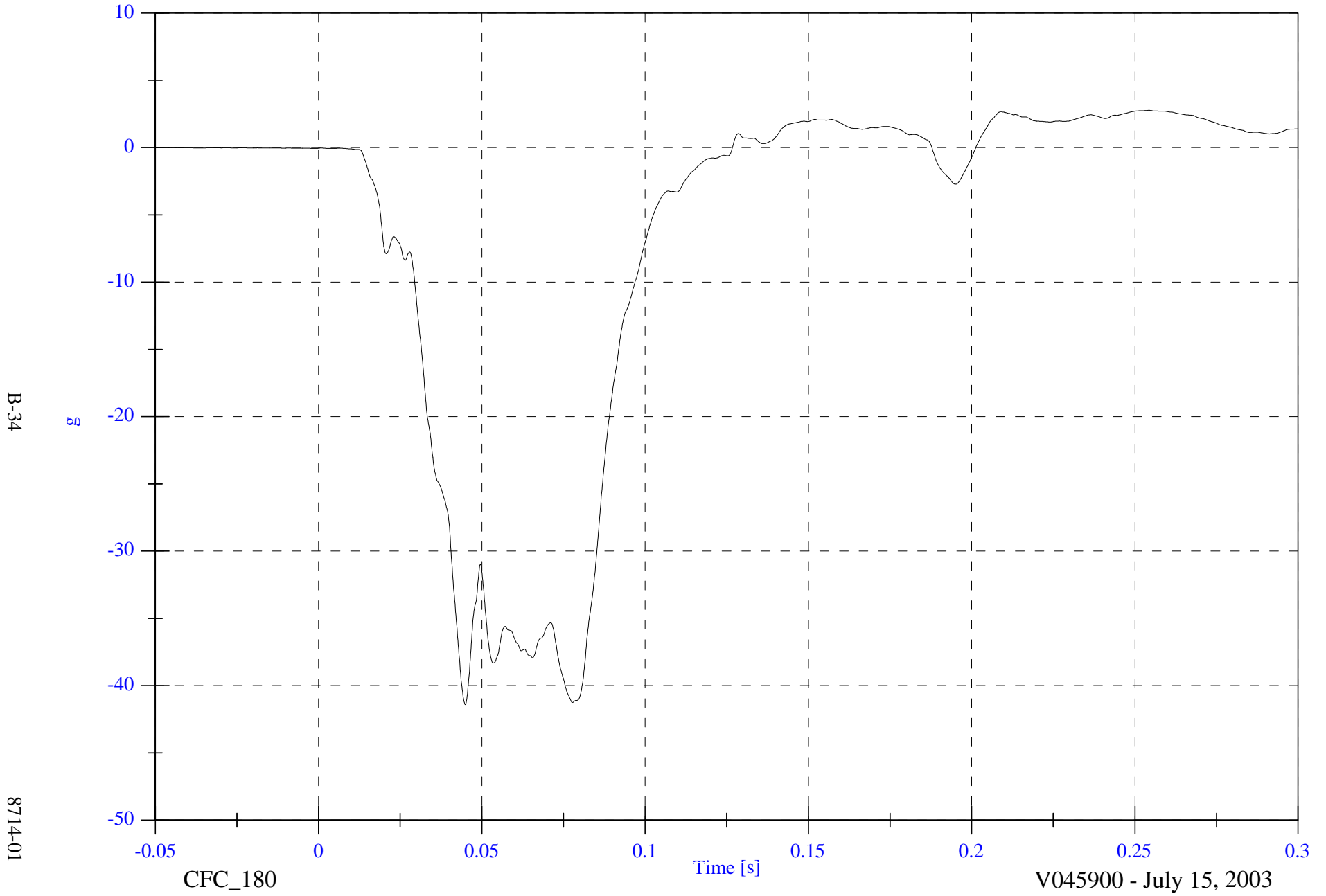


2004 Volvo XC90 NCAP

VIP1 Chest Red x

Max: 2.8 [g] at 0.254 [s]

Min: -41.4 [g] at 0.045 [s]

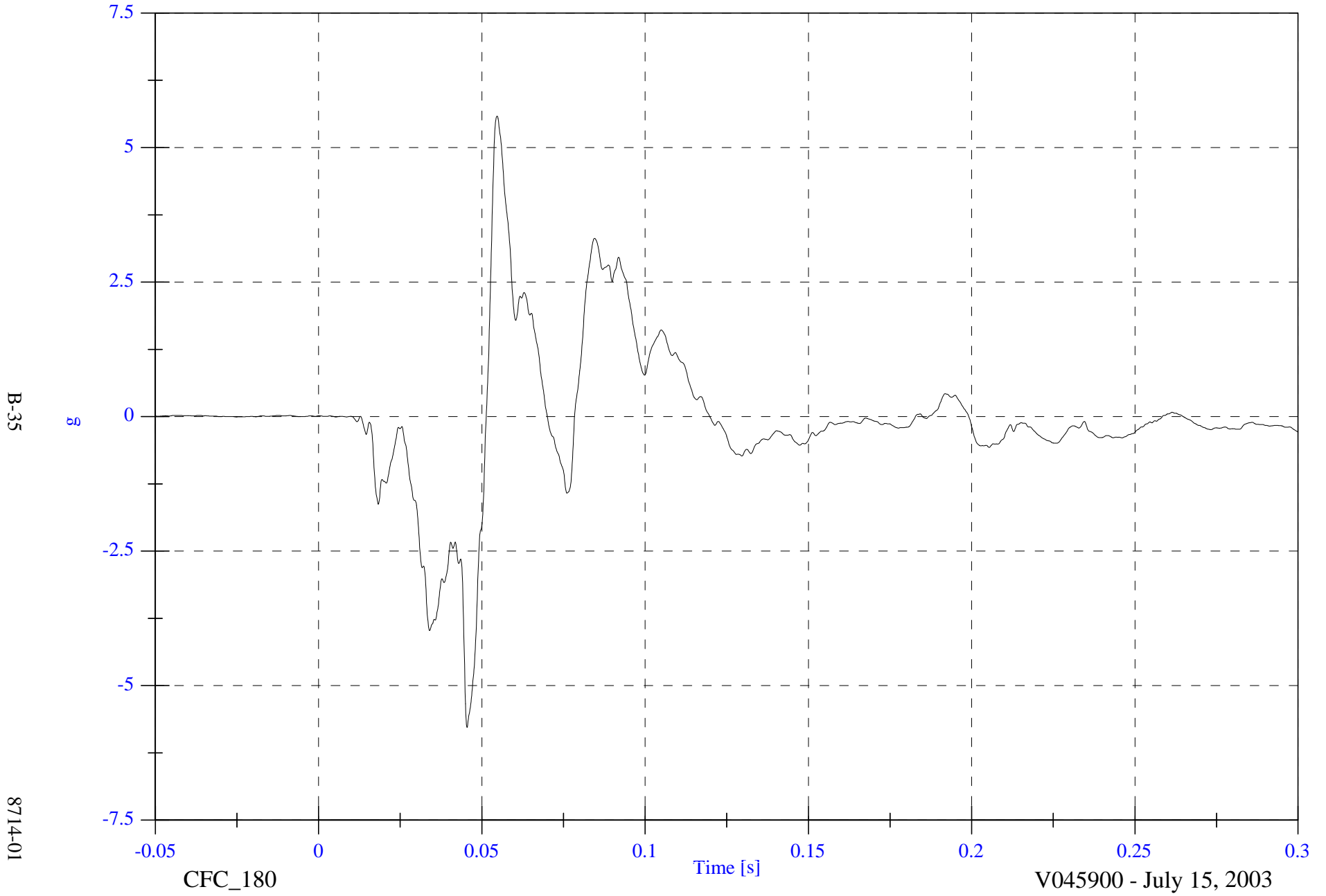


2004 Volvo XC90 NCAP

VIP1 Chest Red y

Max: 5.6 [g] at 0.055 [s]

Min: -5.8 [g] at 0.045 [s]

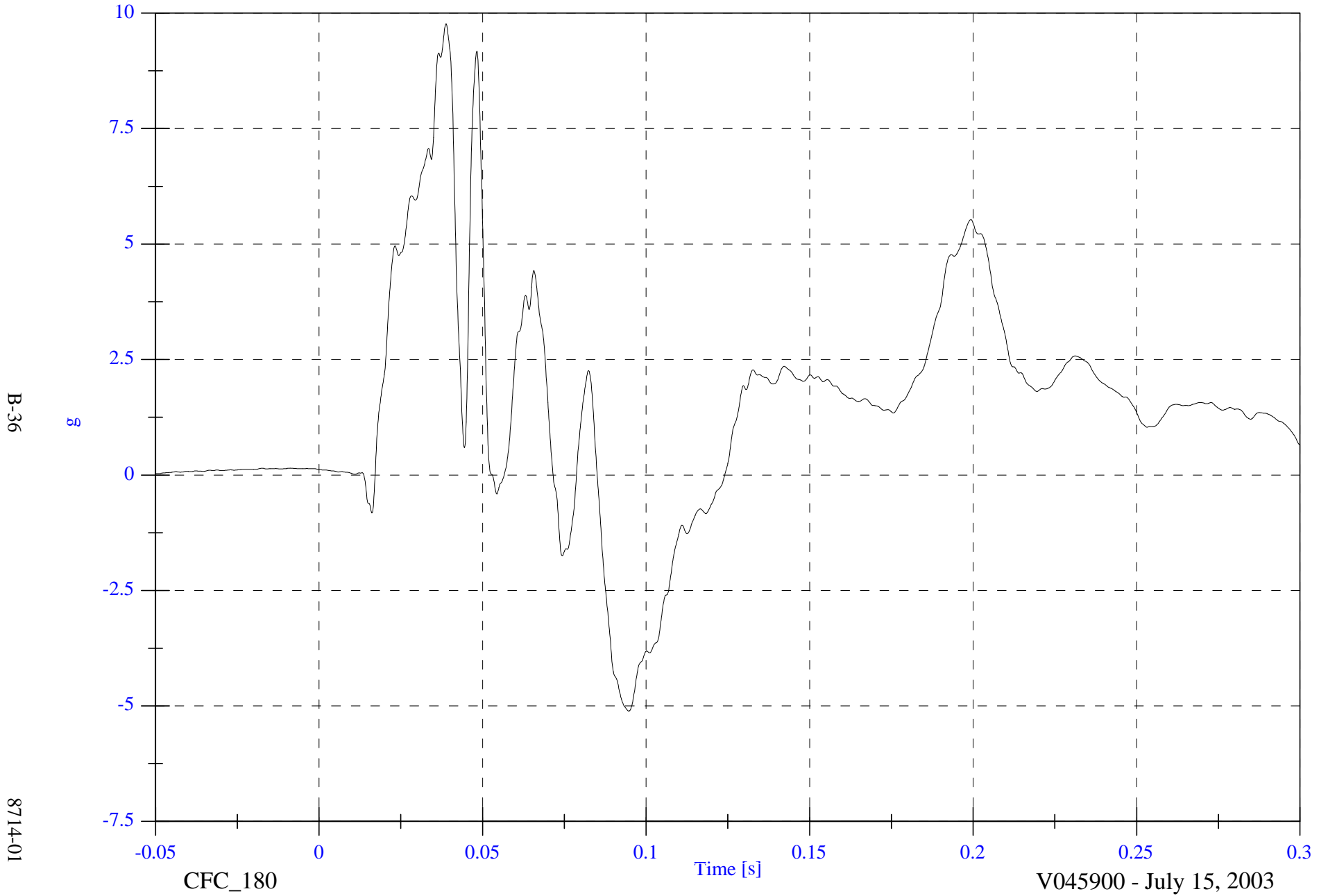


2004 Volvo XC90 NCAP

VIP1 Chest Red z

Max: 9.8 [g] at 0.039 [s]

Min: -5.1 [g] at 0.095 [s]



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2004 Volvo XC90 NCAP

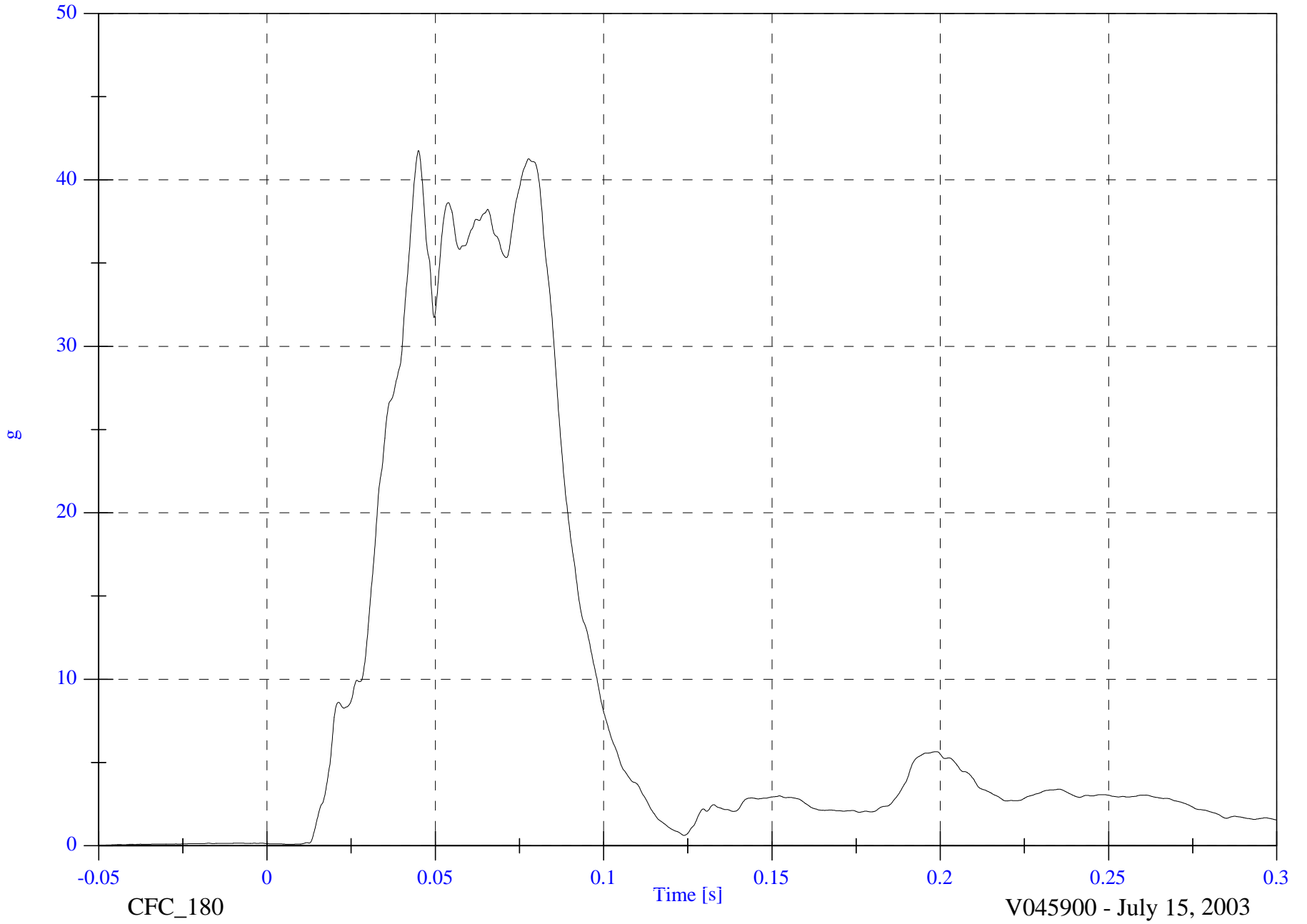
V1P1 Chest Red Resultant

Max: 41.8 [g] at 0.045 [s]

Min: 0.0 [g] at -0.049 [s]

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CFC_180

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

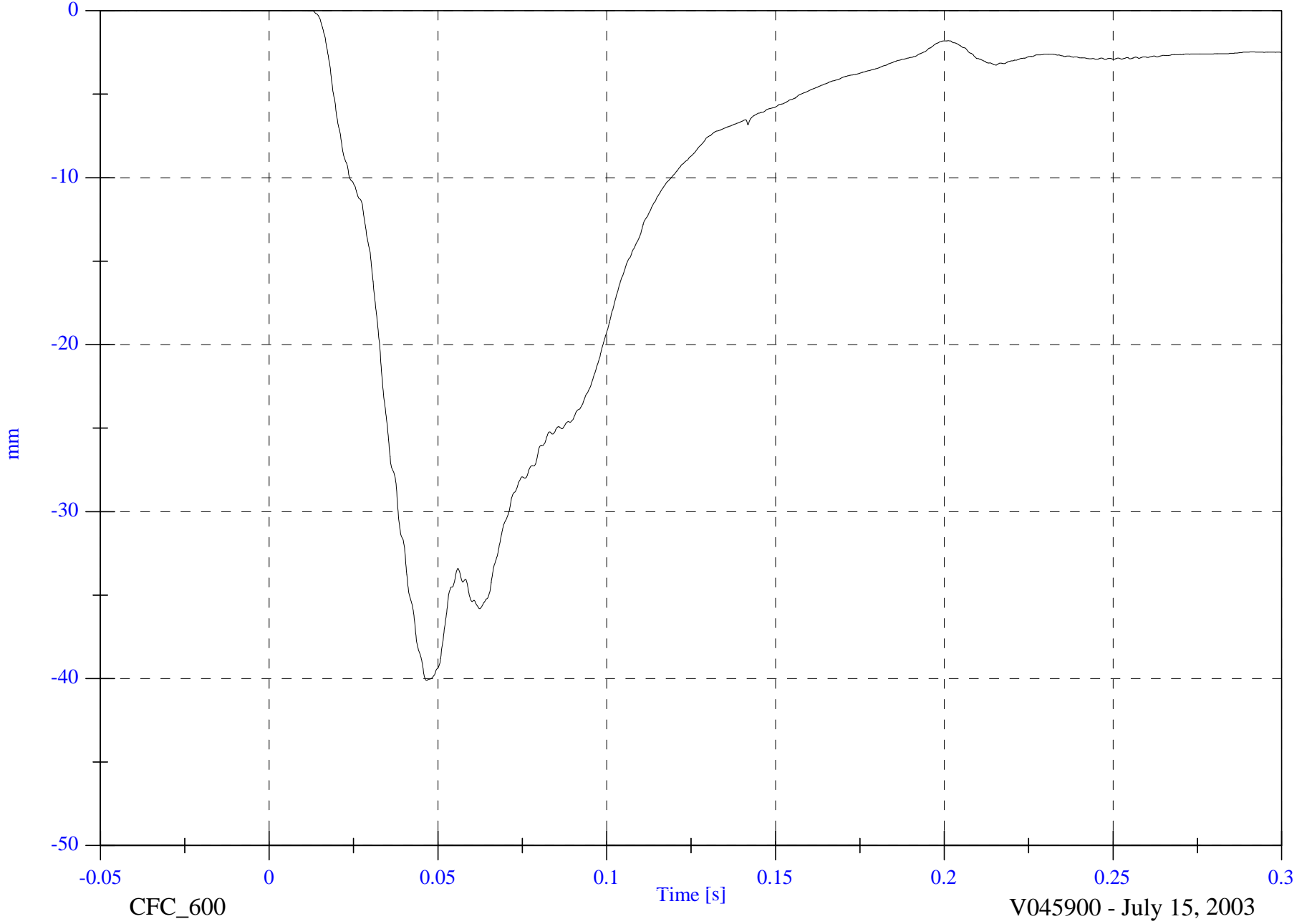
V1P1 Chest Compression

Max: 0.0 [mm] at 0.006 [s]

Min: -40.1 [mm] at 0.047 [s]

B-38

8714-01



CFC_600

Time [s]

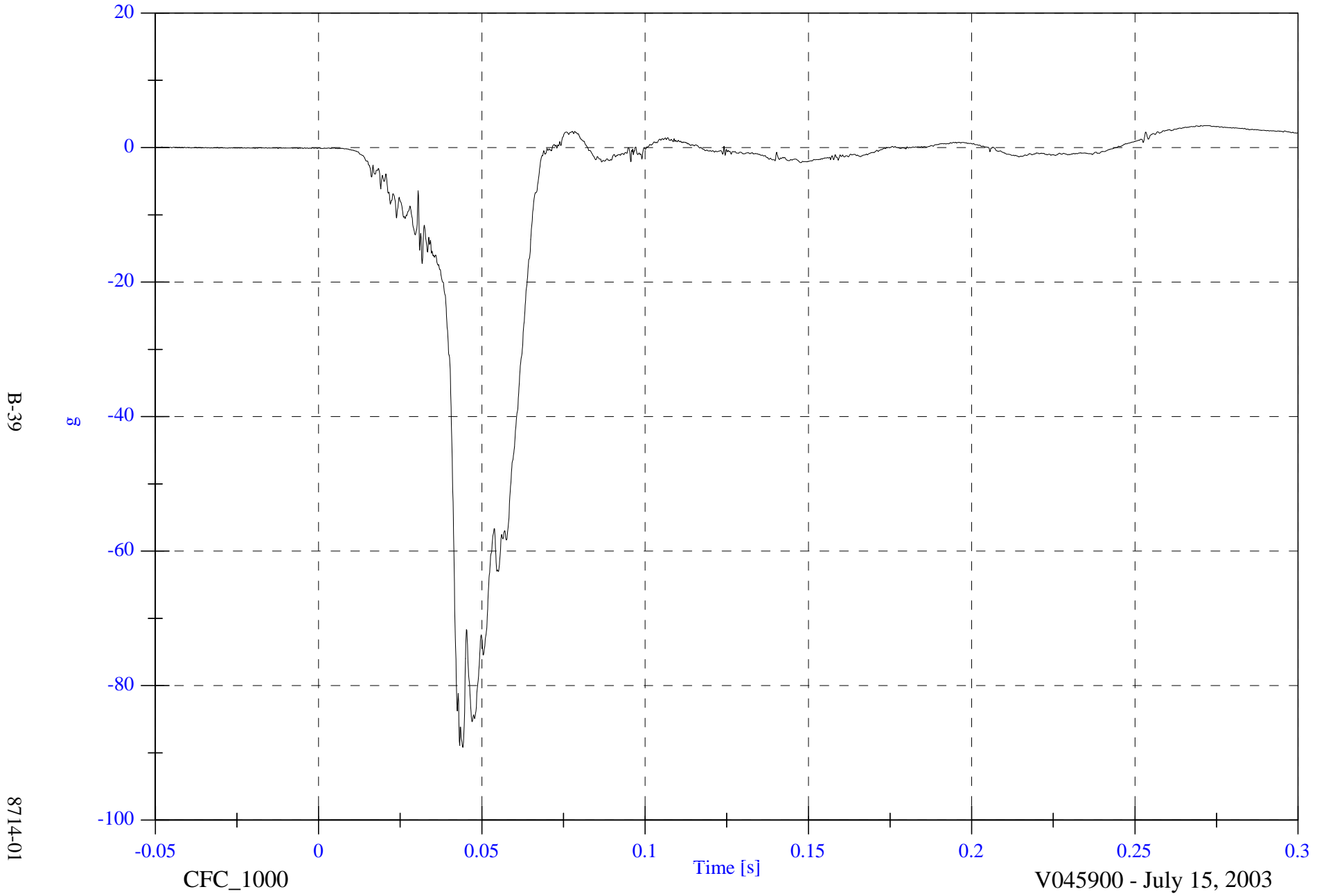
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Pelvic x

Max: 3.3 [g] at 0.272 [s]

Min: -89.2 [g] at 0.044 [s]



2004 Volvo XC90 NCAP

V1P1 Pelvic y

Max: 7.4 [g] at 0.061 [s]

Min: -9.7 [g] at 0.046 [s]



B-40

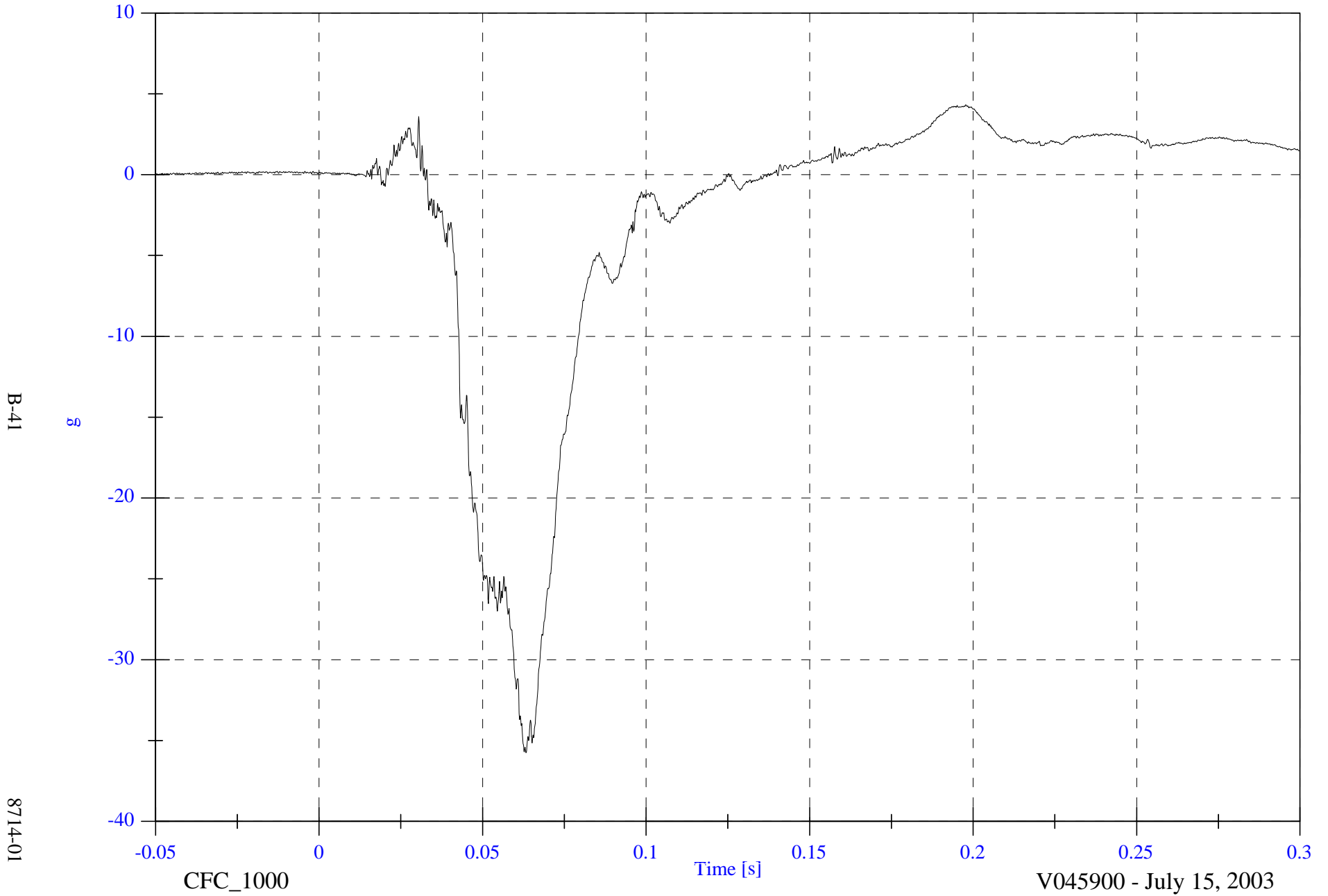
8714-01

2004 Volvo XC90 NCAP

V1P1 Pelvic z

Max: 4.3 [g] at 0.198 [s]

Min: -35.7 [g] at 0.063 [s]



2004 Volvo XC90 NCAP

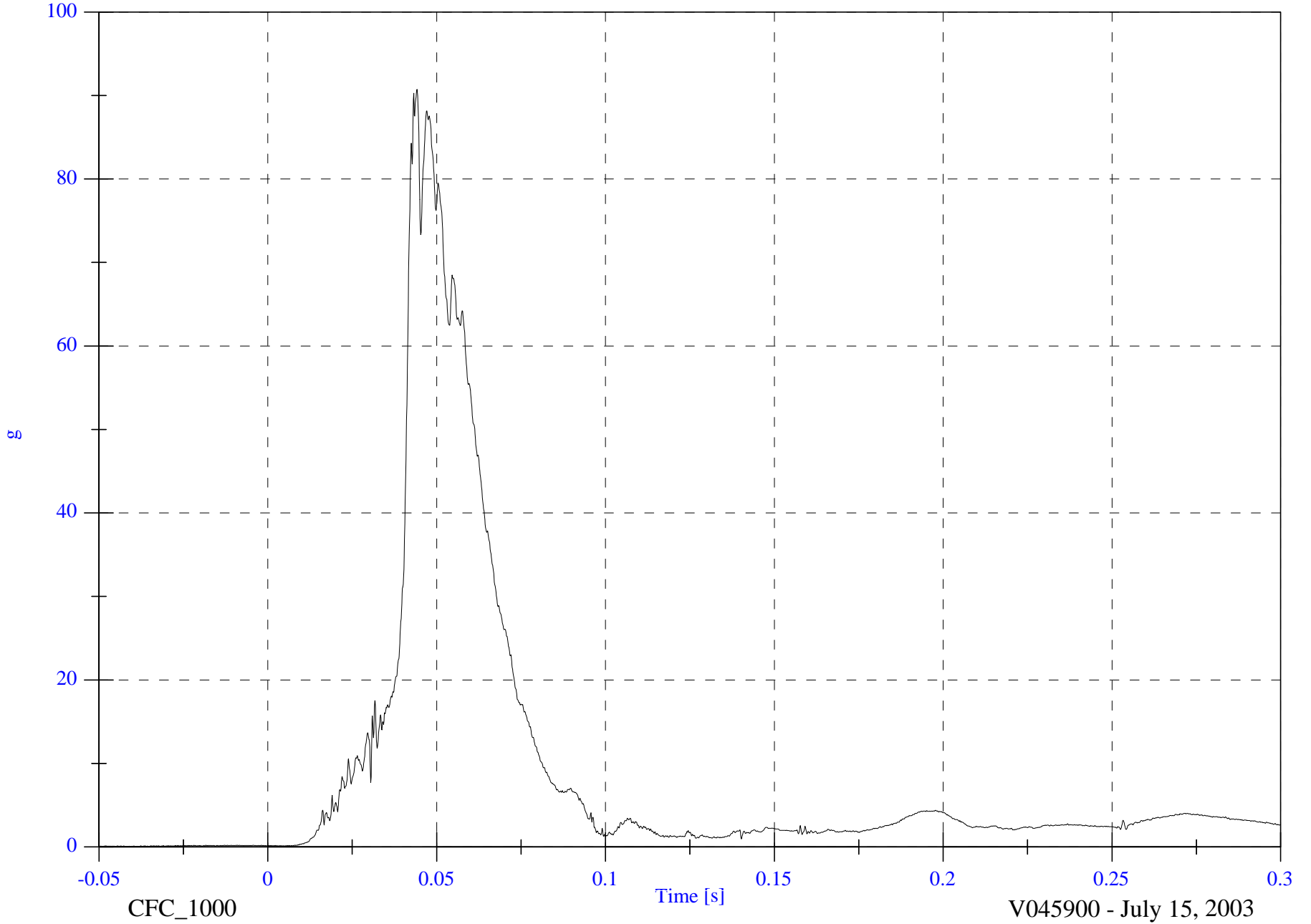
V1P1 Pelvic Resultant

Max: 90.7 [g] at 0.044 [s]

Min: 0.0 [g] at -0.041 [s]

B-42

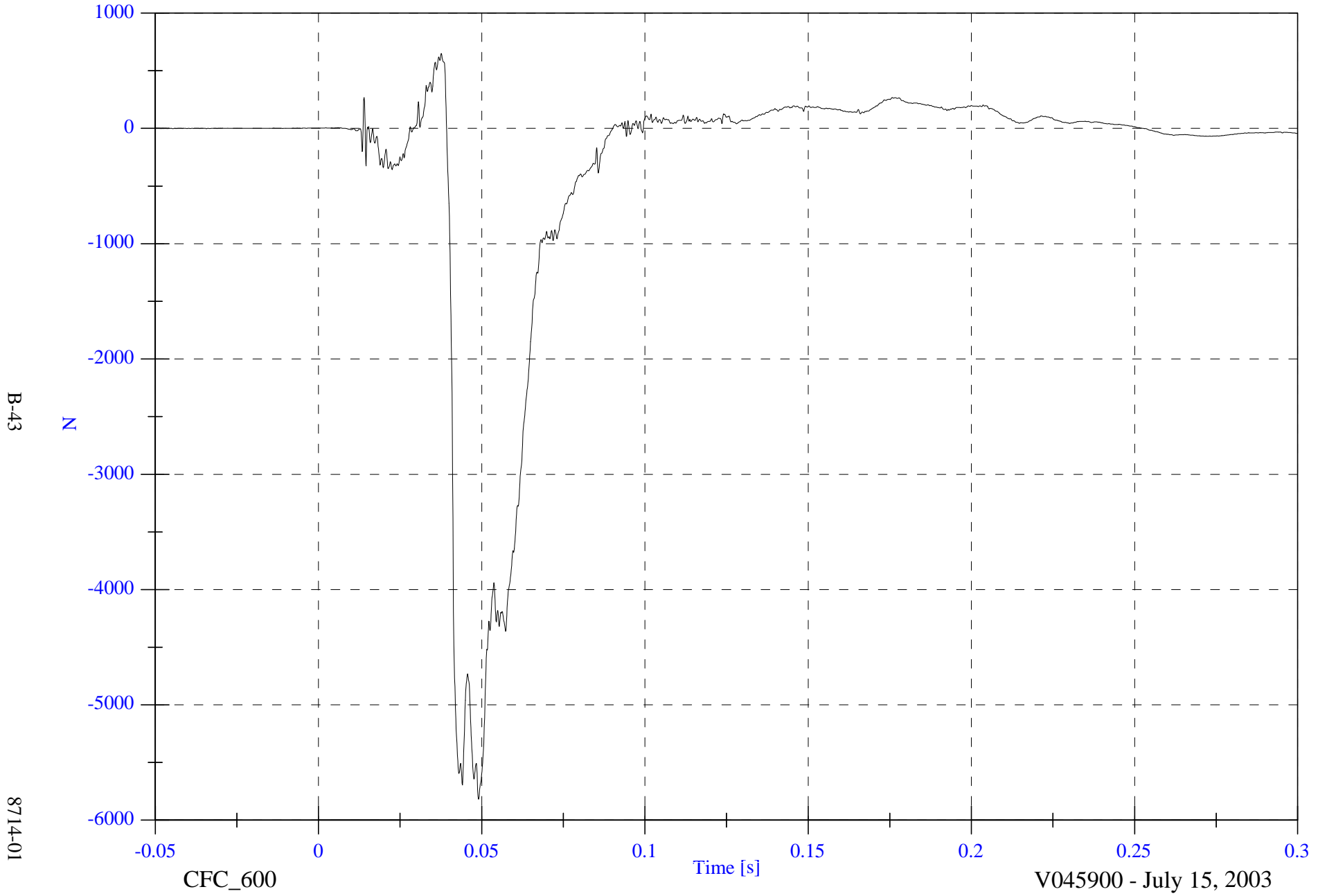
8714-01



2004 Volvo XC90 NCAP

V1P1 Left Femur

Max: 650.4 [N] at 0.038 [s]
Min: -5819.1 [N] at 0.049 [s]



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CFC_600

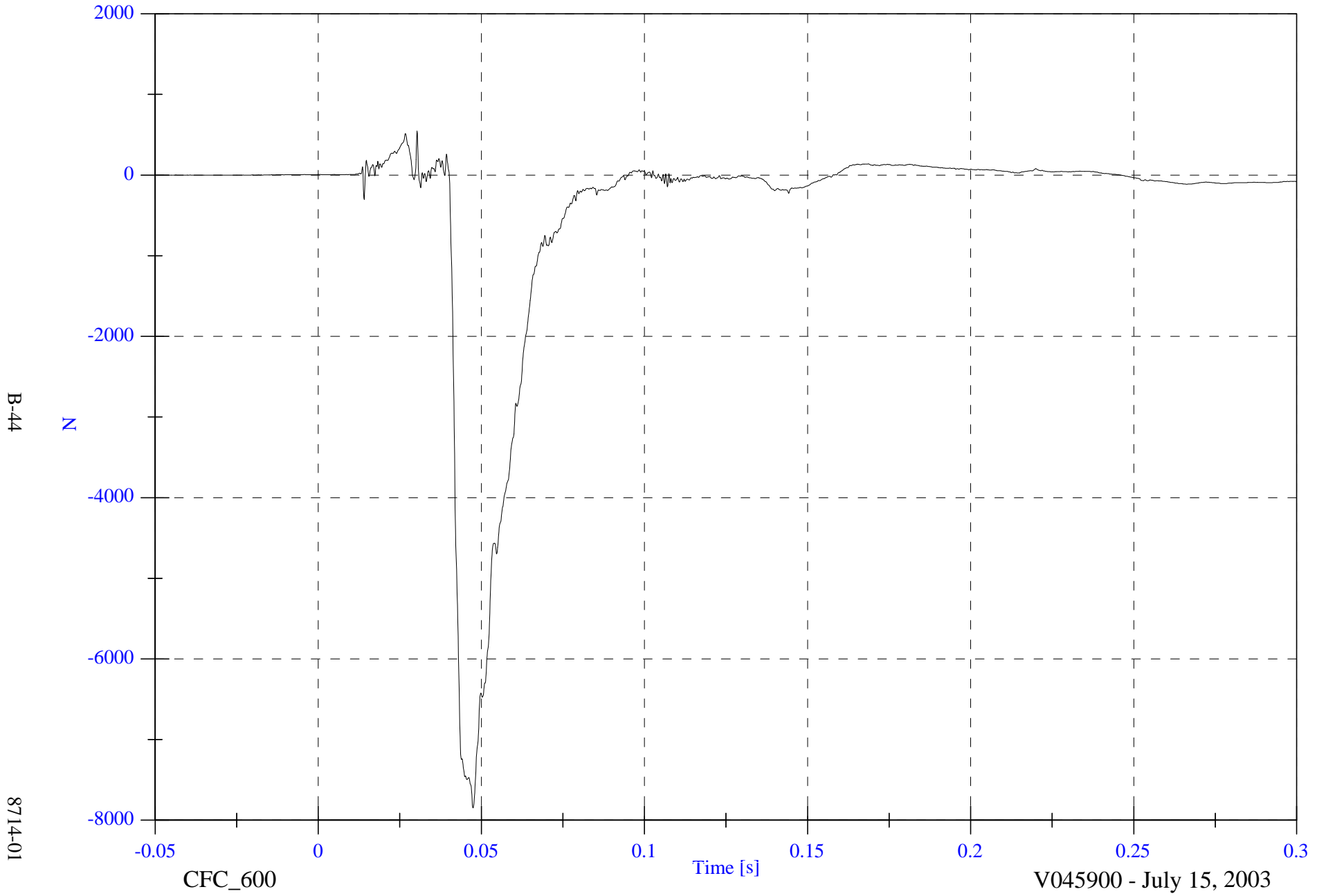
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Femur

Max: 546.8 [N] at 0.030 [s]
Min: -7848.6 [N] at 0.048 [s]



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CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

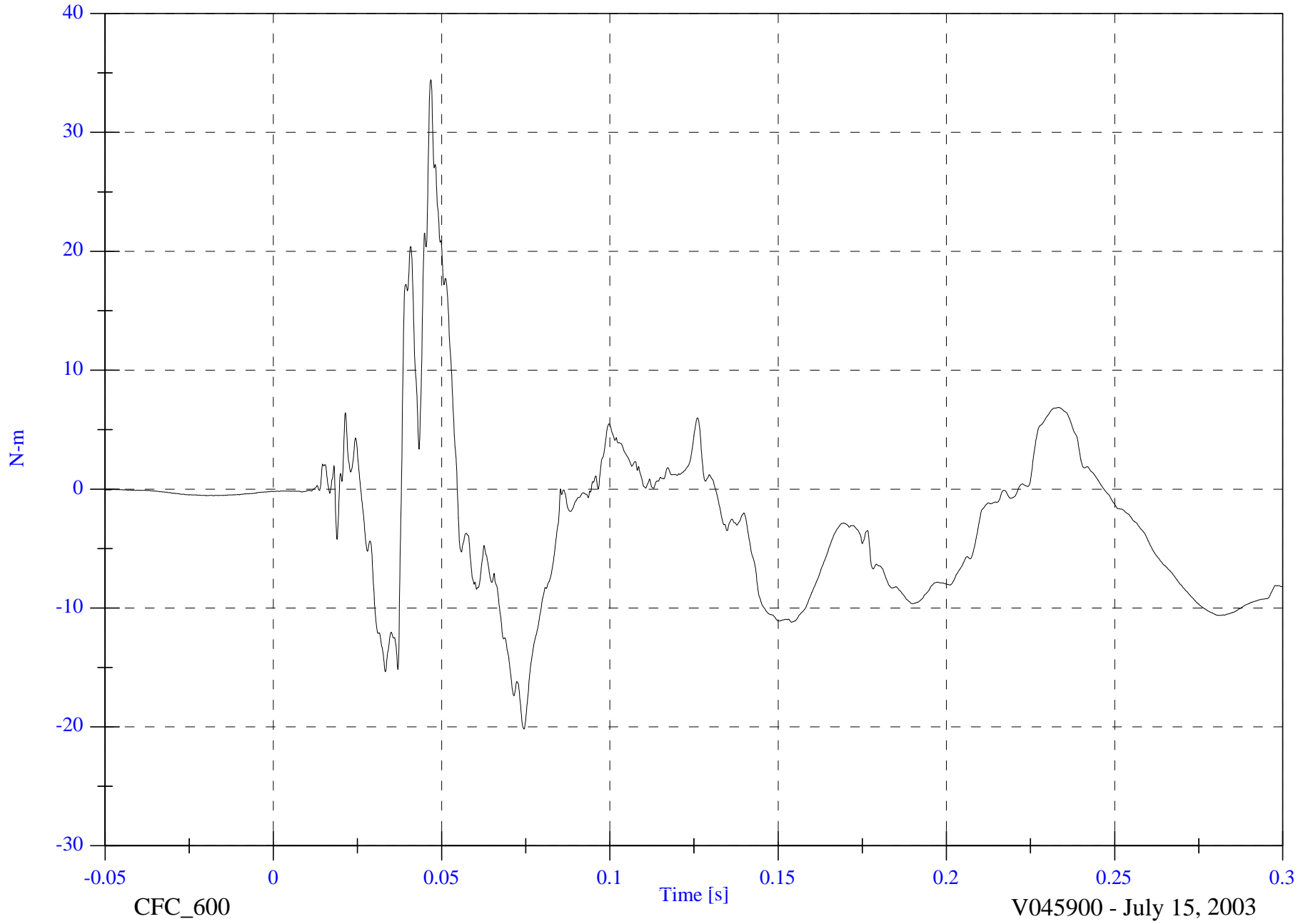
V1P1 Left Upper Tibia Mx

Max: 34.4 [N-m] at 0.047 [s]

Min: -20.2 [N-m] at 0.074 [s]

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8714-01



2004 Volvo XC90 NCAP

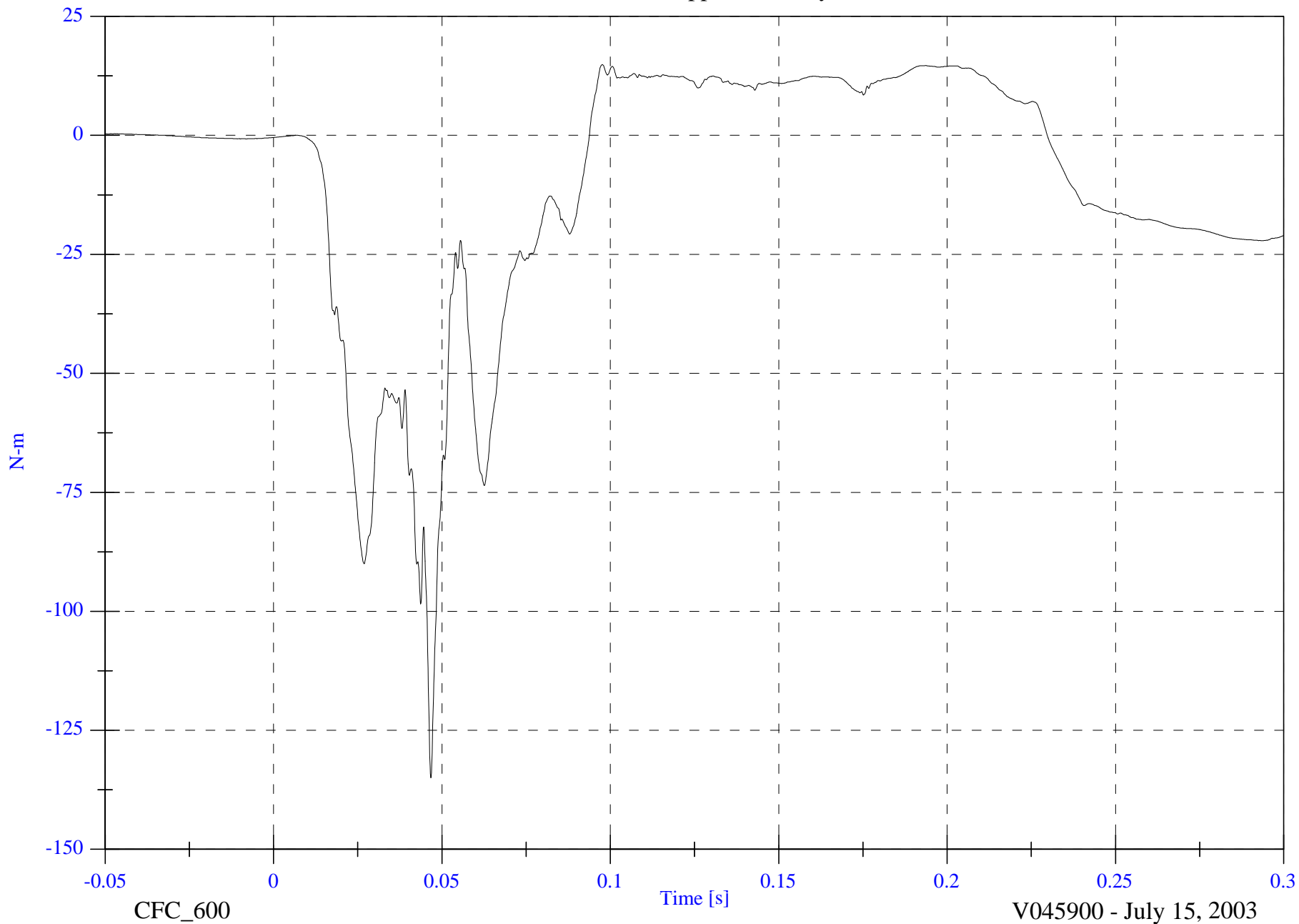
V1P1 Left Upper Tibia My

Max: 14.8 [N-m] at 0.098 [s]

Min: -135.0 [N-m] at 0.047 [s]

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8714-01



CFC_600

Time [s]

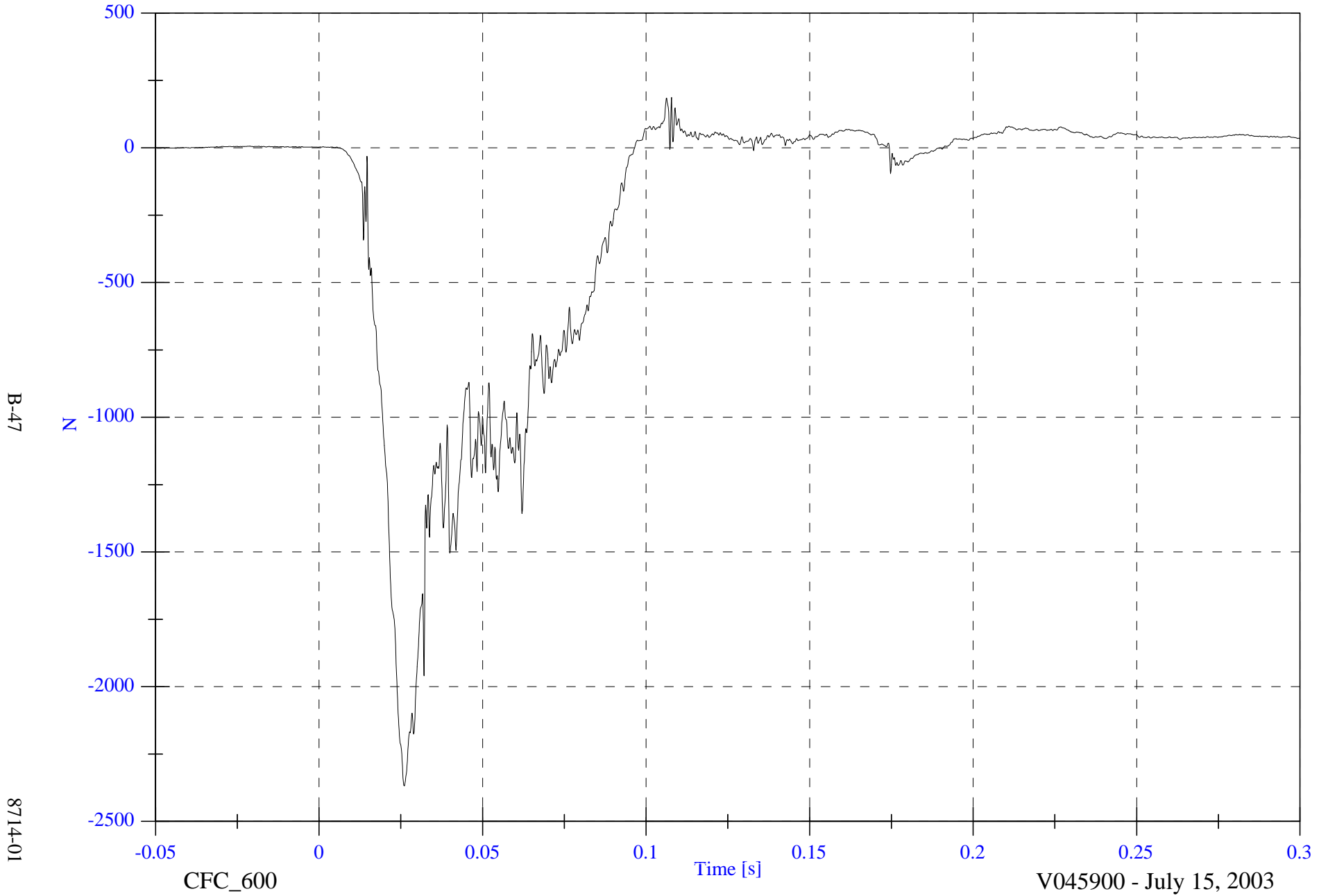
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Left Lower Tibia Fz

Max: 186.6 [N] at 0.108 [s]

Min: -2368.3 [N] at 0.026 [s]



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CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

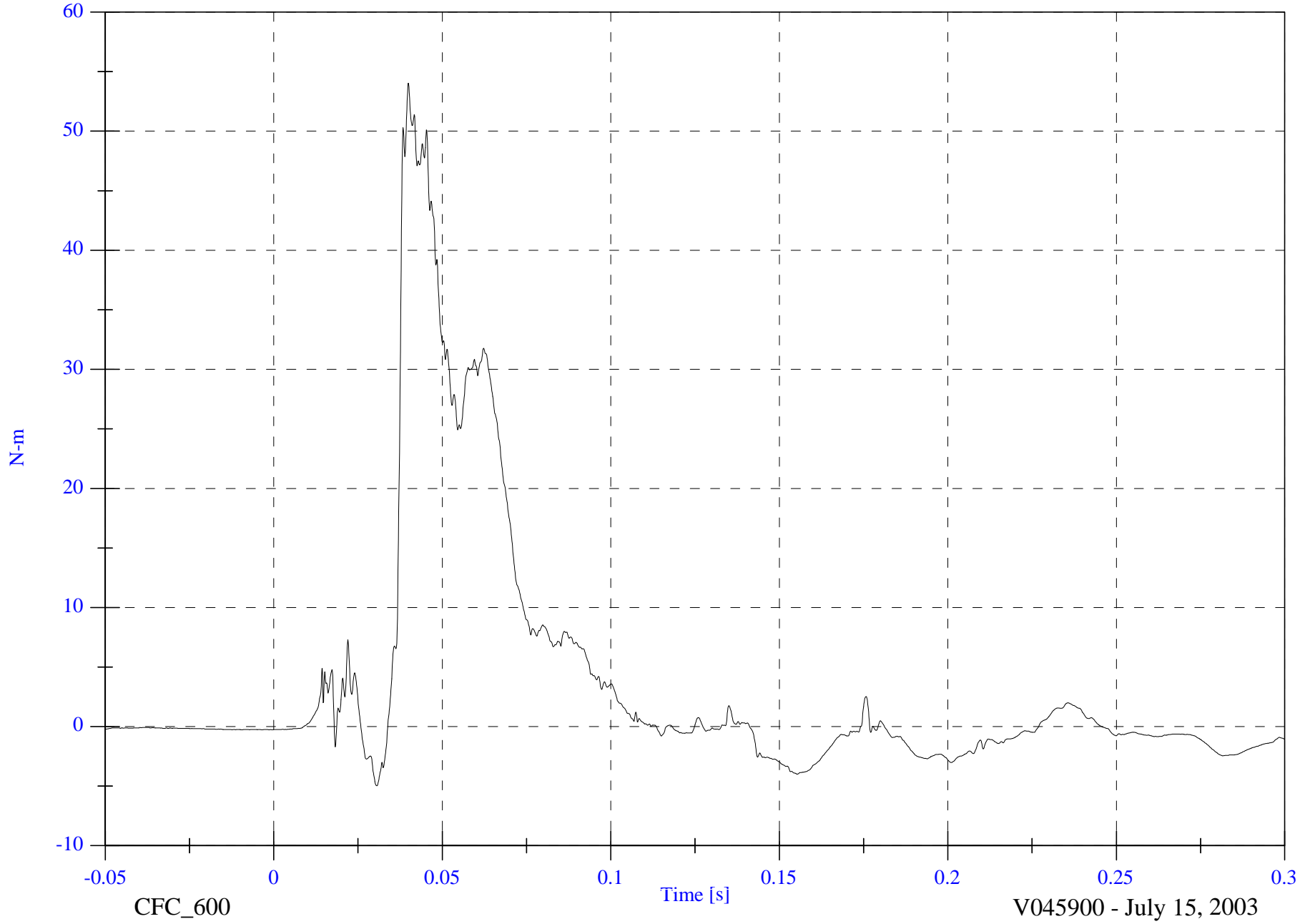
VIP1 Left Lower Tibia Mx

Max: 54.0 [N-m] at 0.040 [s]

Min: -5.0 [N-m] at 0.031 [s]

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CFC_600

Time [s]

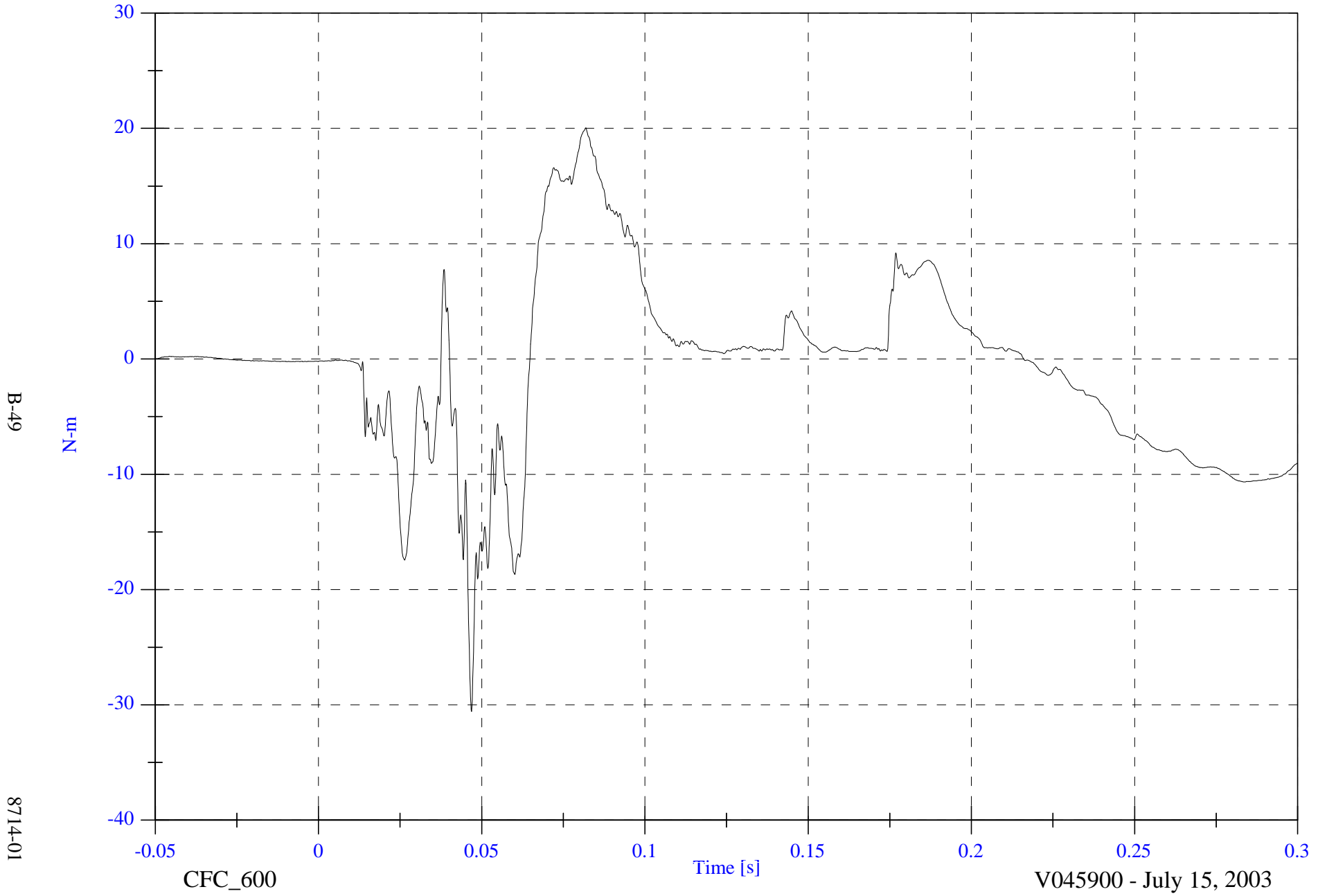
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Left Lower tibia My

Max: 20.0 [N-m] at 0.082 [s]

Min: -30.6 [N-m] at 0.047 [s]



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CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

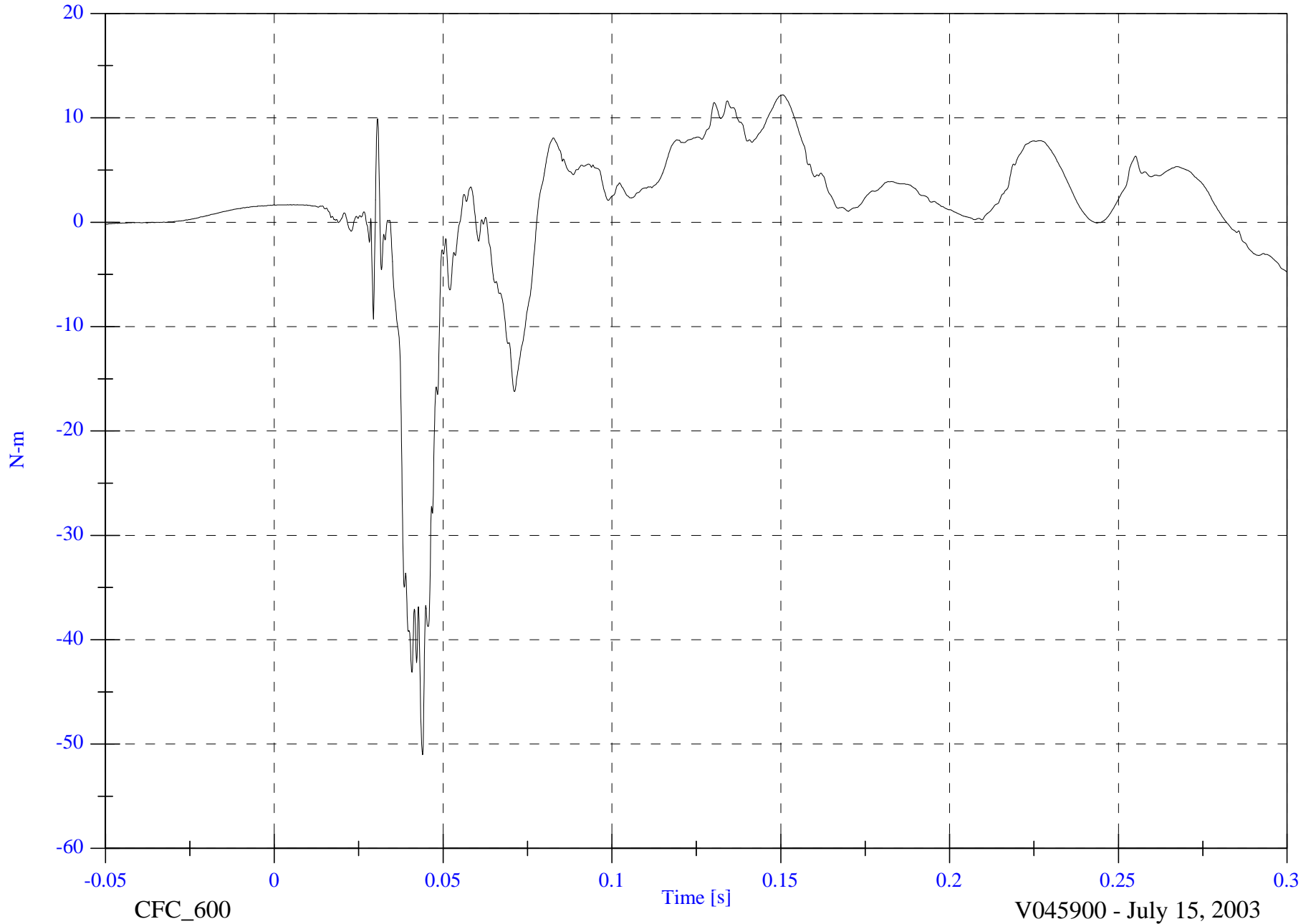
V1P1 Right Upper Tibia Mx

Max: 12.2 [N-m] at 0.151 [s]

Min: -51.0 [N-m] at 0.044 [s]

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8714-01



CFC_600

Time [s]

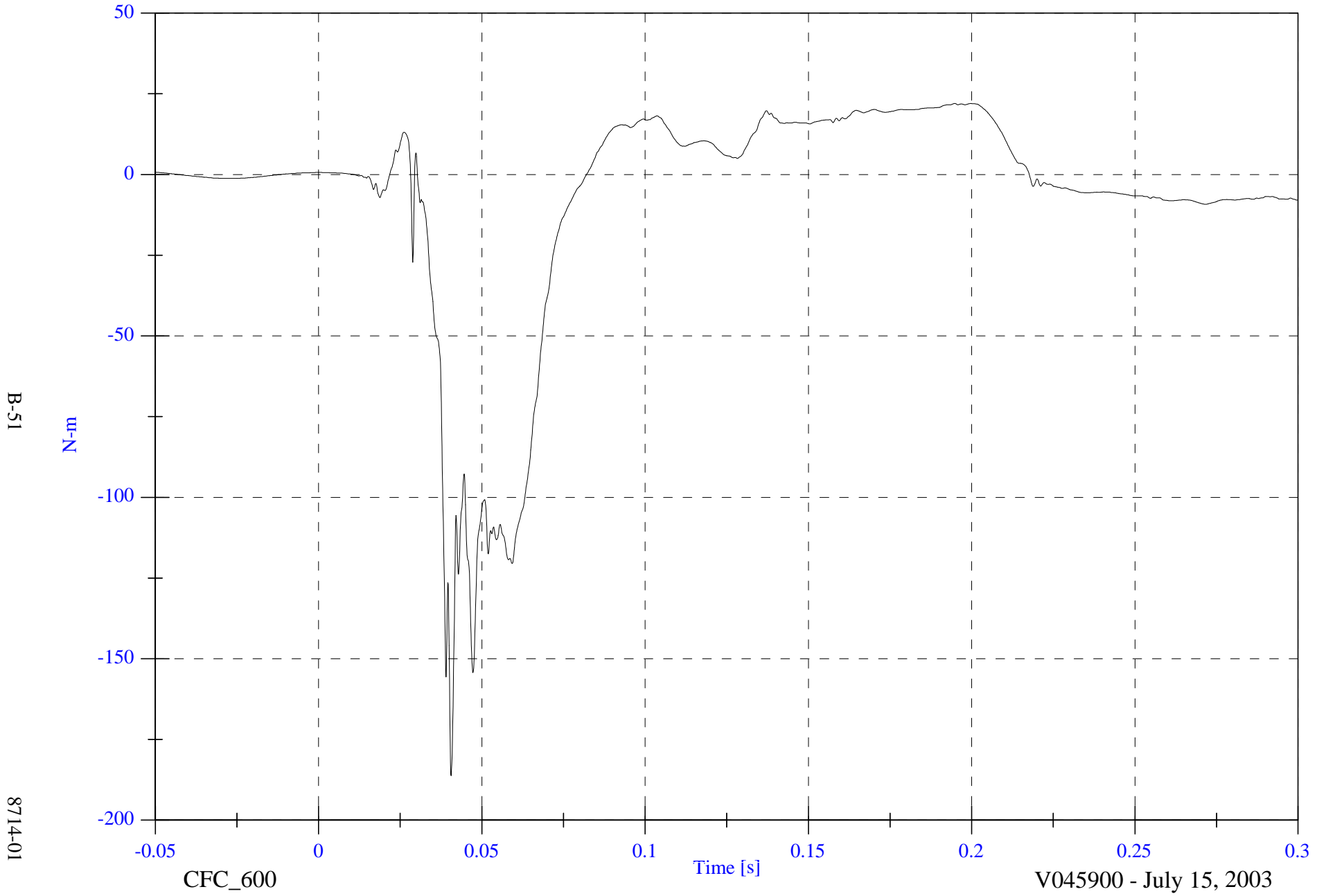
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Upper Tibia My

Max: 22.0 [N-m] at 0.195 [s]

Min: -186.2 [N-m] at 0.041 [s]



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8714-01

CFC_600

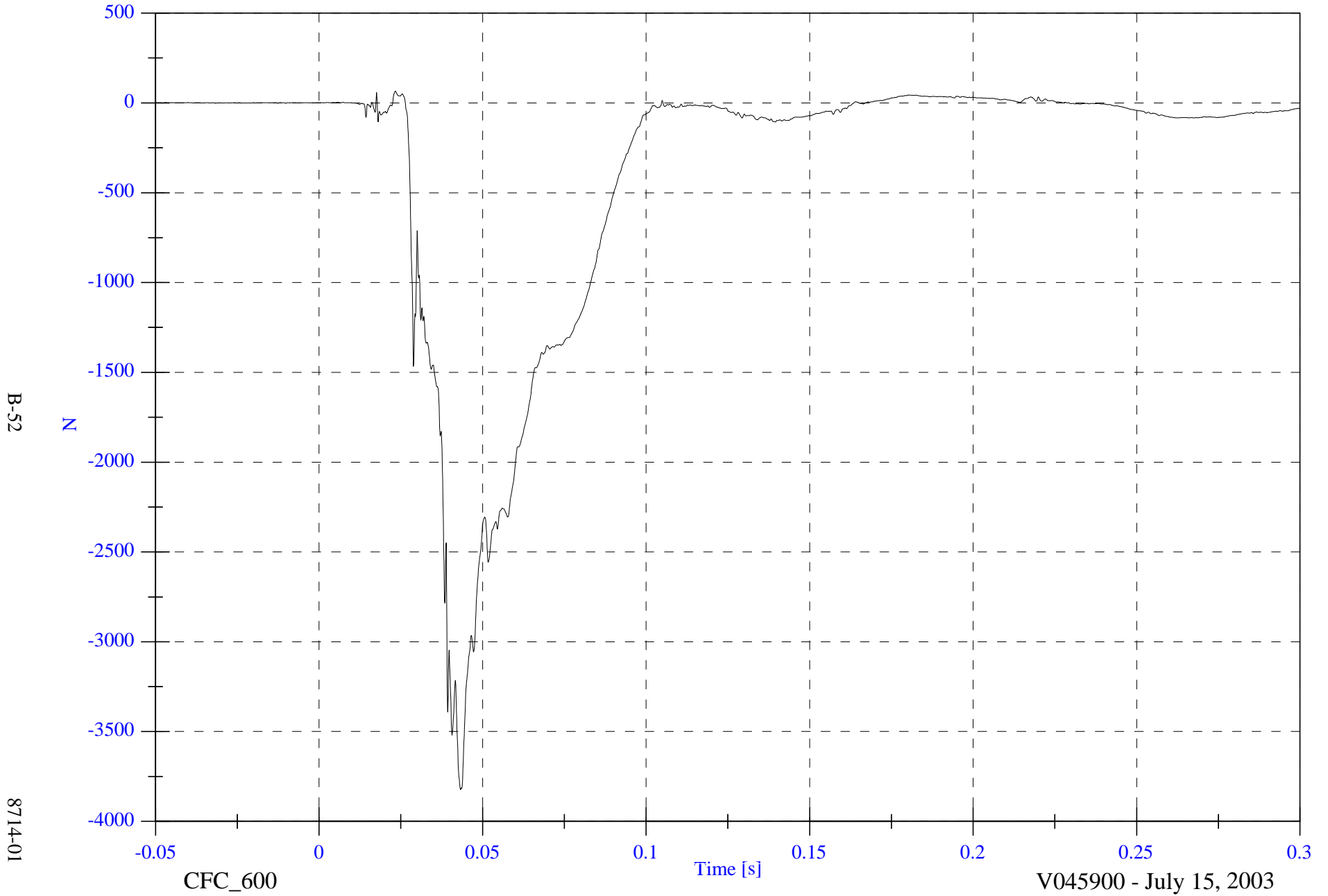
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Lower Tibia Fz

Max: 65.0 [N] at 0.023 [s]
Min: -3823.7 [N] at 0.043 [s]



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8714-01

CFC_600

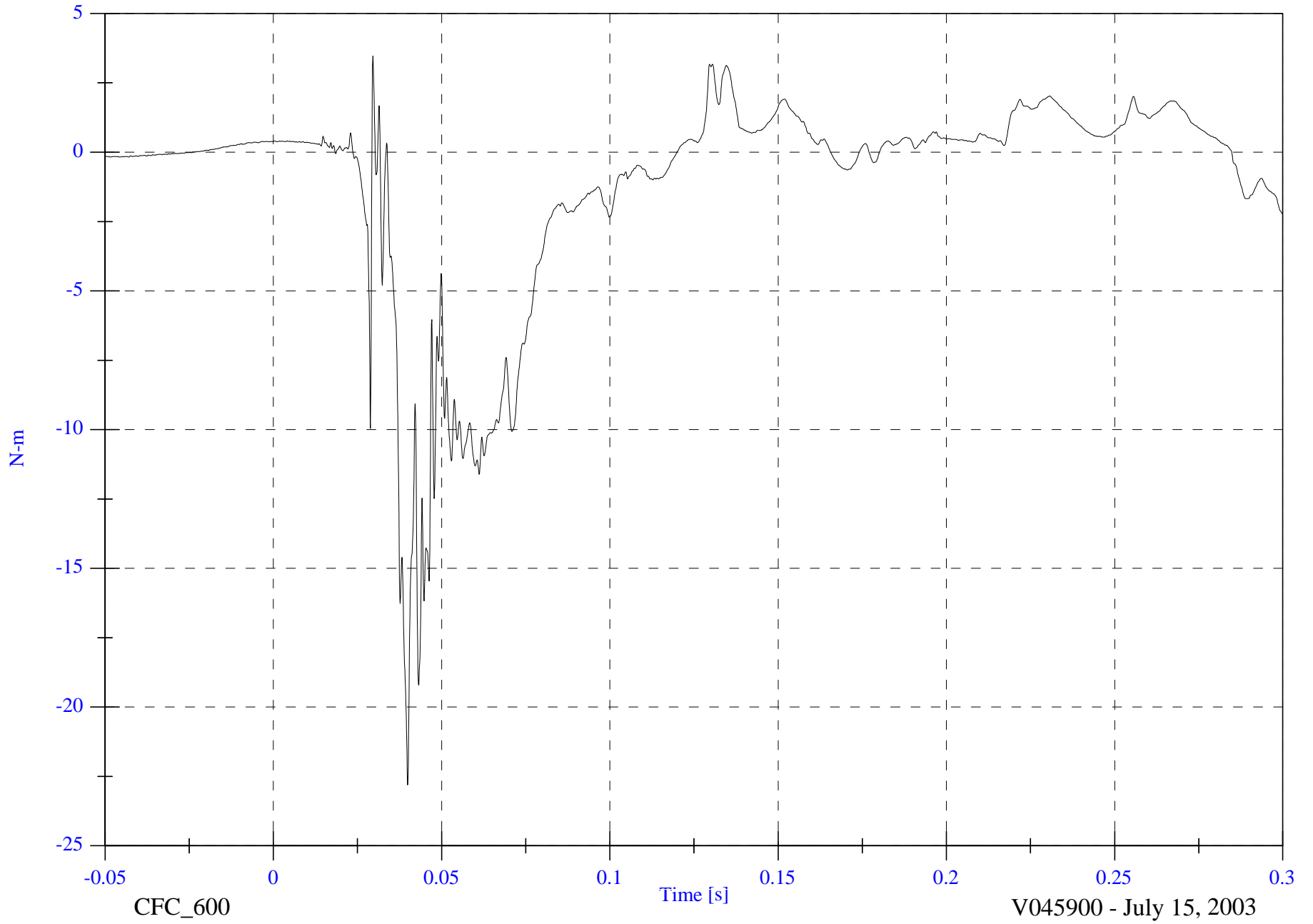
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Lower tibia Mx

Max: 3.5 [N-m] at 0.030 [s]
Min: -22.8 [N-m] at 0.040 [s]



B-53

8714-01

CFC_600

Time [s]

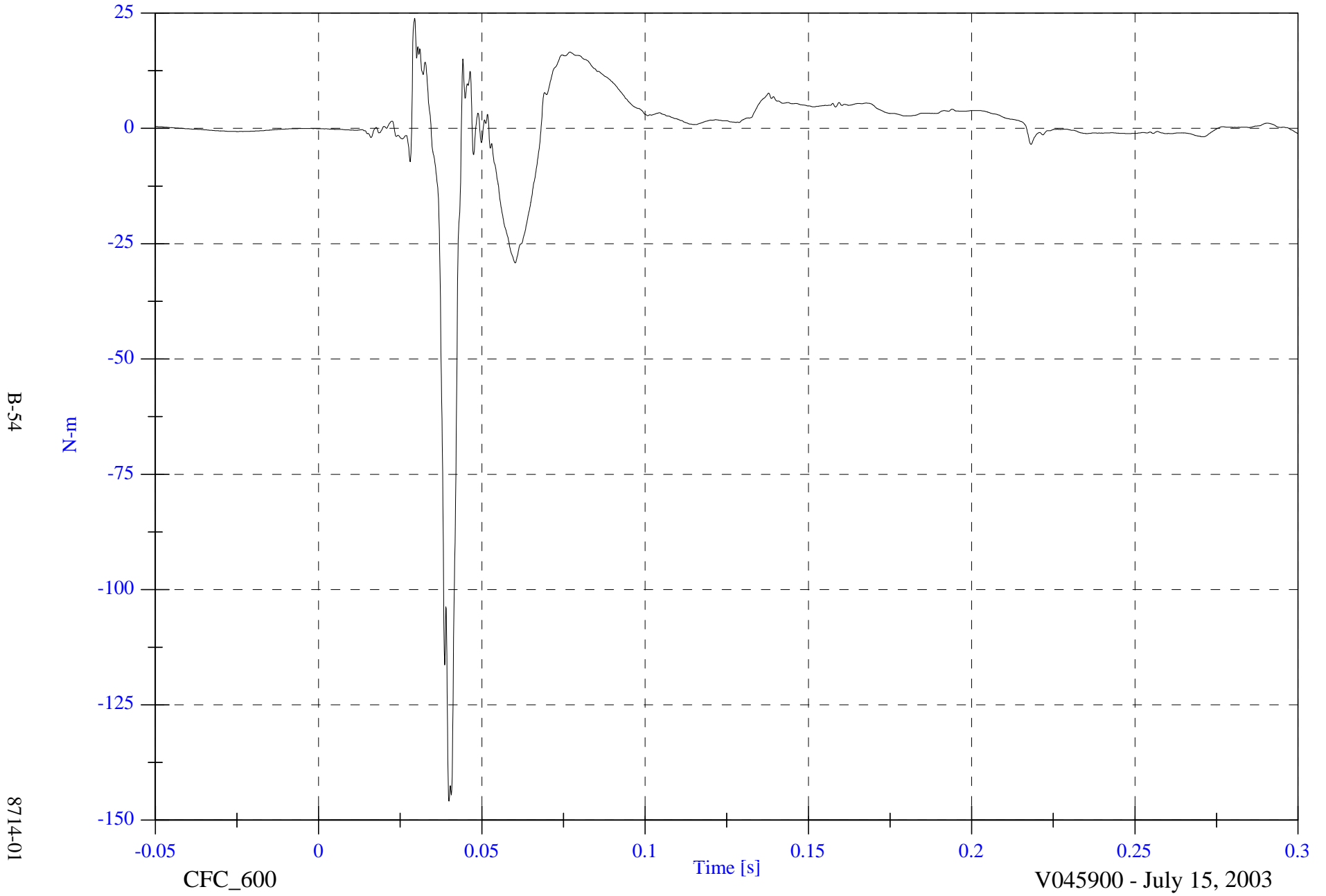
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Lower Tibia My

Max: 23.9 [N-m] at 0.029 [s]

Min: -145.9 [N-m] at 0.040 [s]



B-54

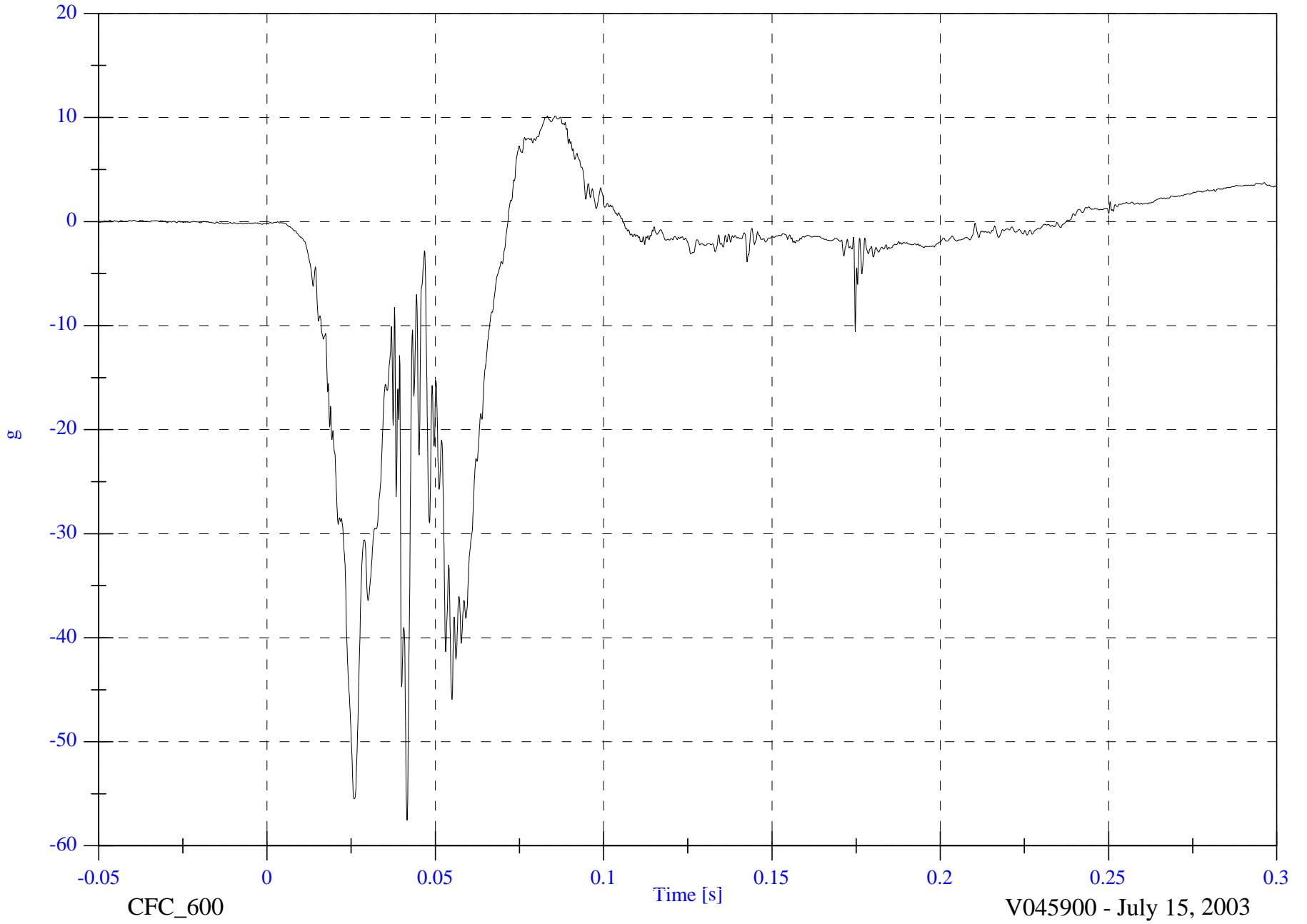
8714-01

2004 Volvo XC90 NCAP

V1P1 Left Foot Aft Ax

Max: 10.1 [g] at 0.083 [s]

Min: -57.6 [g] at 0.042 [s]



B-55

8714-01

CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

VIP1 Left Foot Aft Az

Max: 11.1 [g] at 0.047 [s]

Min: -49.2 [g] at 0.029 [s]



B-56

8714-01

CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Left Foot Fore Az

Max: 43.4 [g] at 0.038 [s]

Min: -75.2 [g] at 0.028 [s]



B-57

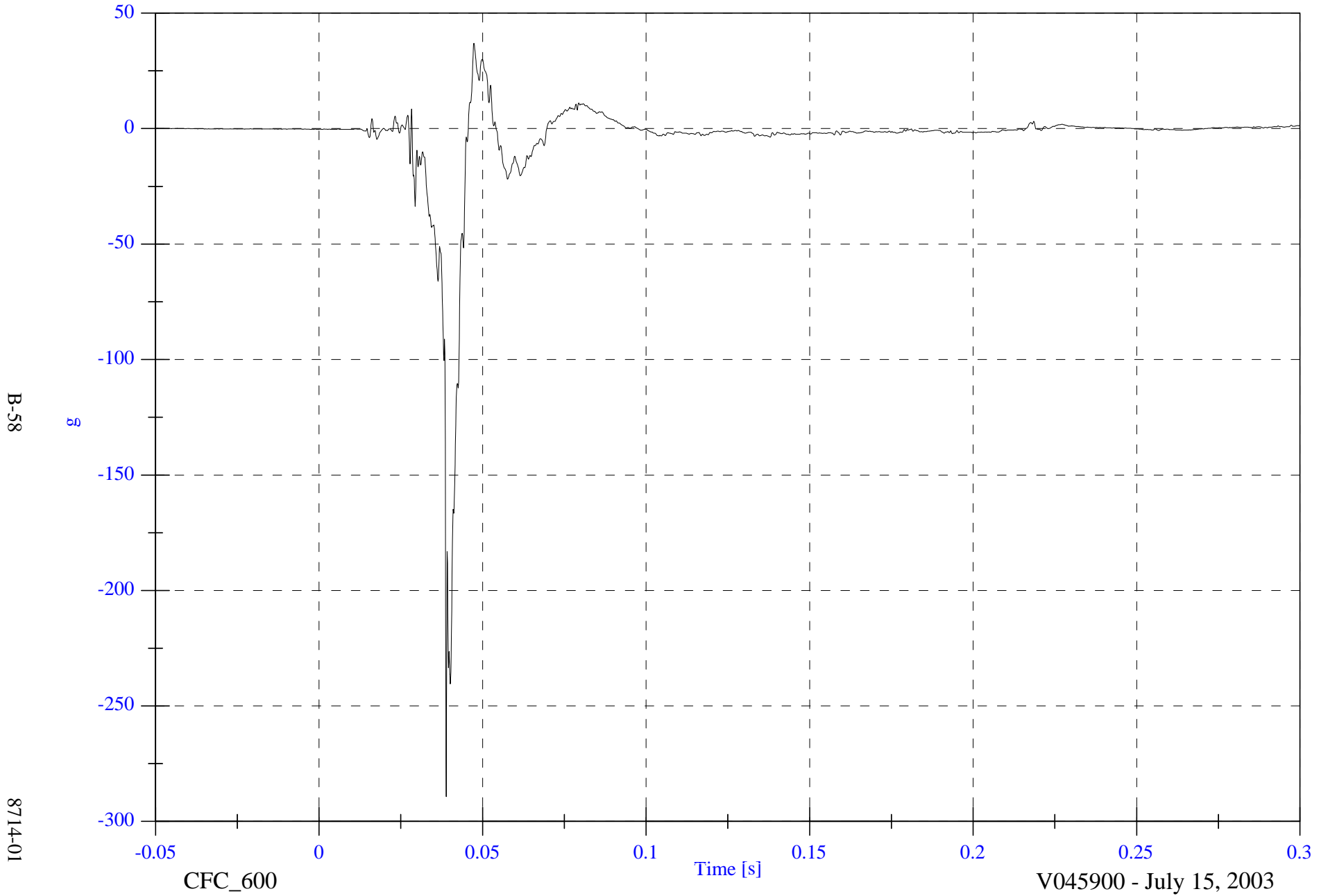
8714-01

2004 Volvo XC90 NCAP

V1P1 Right Foot Aft x

Max: 36.9 [g] at 0.047 [s]

Min: -289.3 [g] at 0.039 [s]



B-58

8714-01

CFC_600

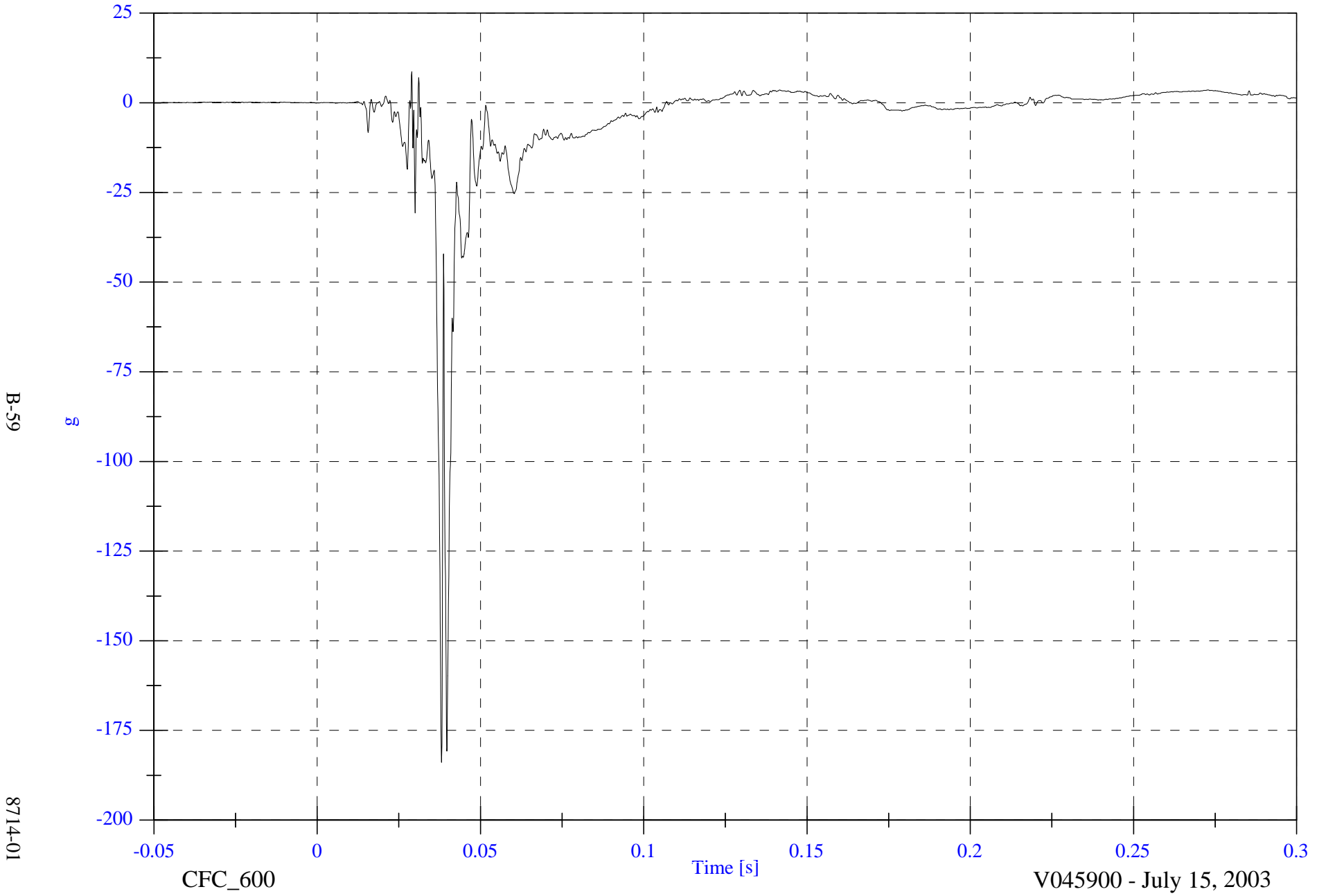
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Foot Aft z

Max: 8.6 [g] at 0.029 [s]
Min: -183.9 [g] at 0.038 [s]



B-59

8714-01

CFC_600

Time [s]

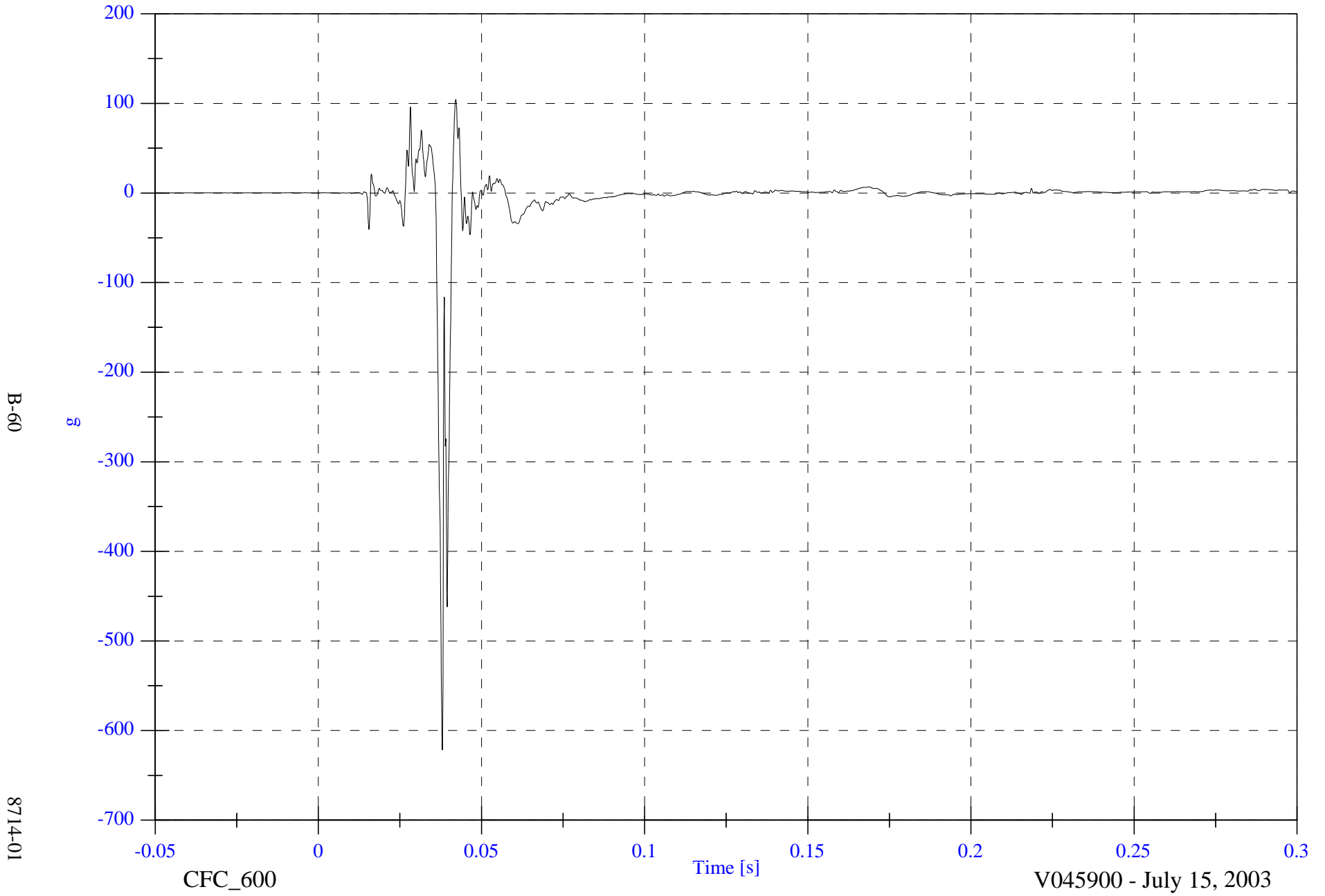
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P1 Right Foot Fore z

Max: 104.5 [g] at 0.042 [s]

Min: -621.6 [g] at 0.038 [s]



B-60

8714-01

CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

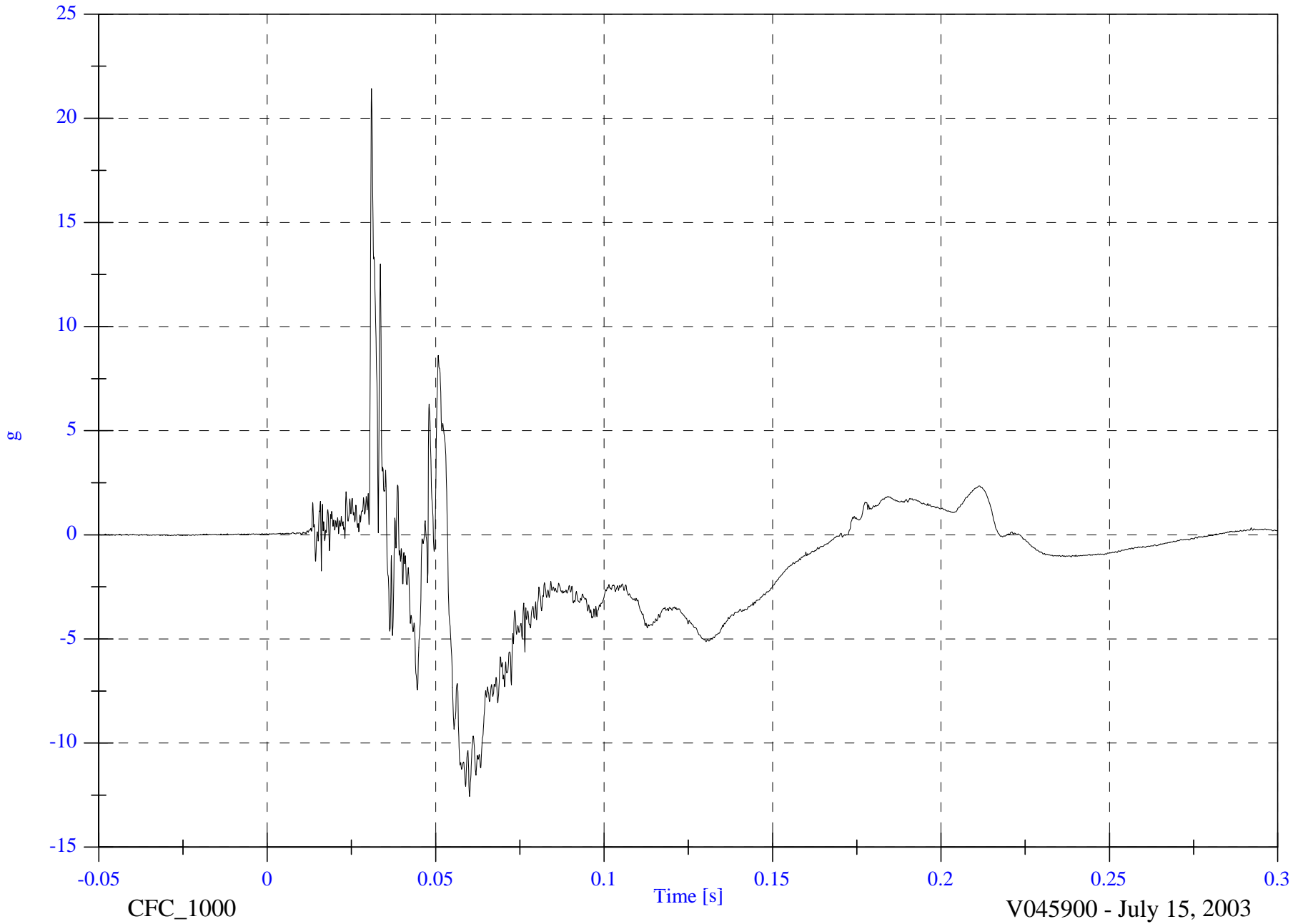
V1P2 Head 9 Array X Arm y

Max: 21.4 [g] at 0.031 [s]

Min: -12.6 [g] at 0.060 [s]

B-61

8714-01



CFC_1000

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

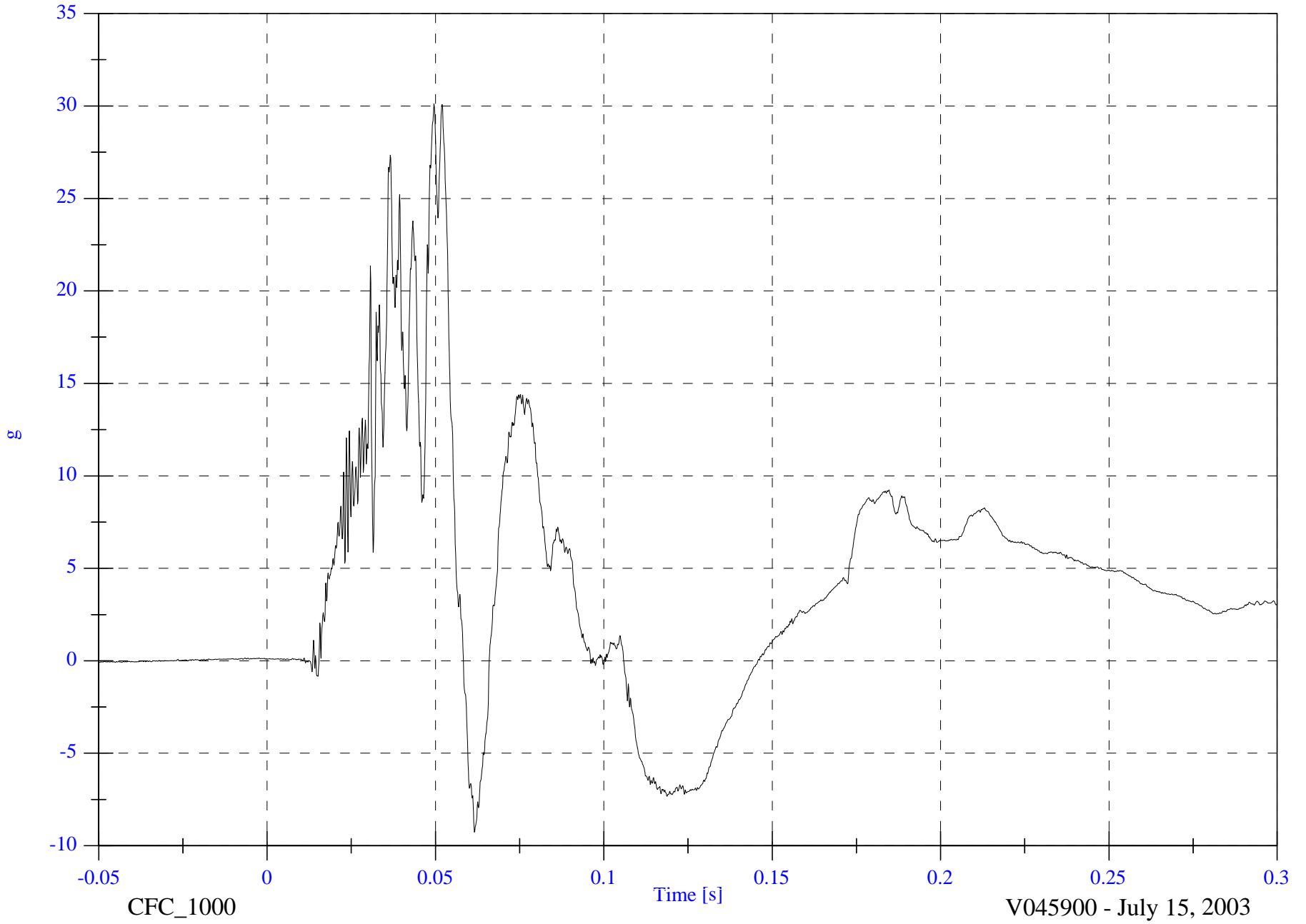
V1P2 Head 9 Array X Arm z

Max: 30.1 [g] at 0.050 [s]

Min: -9.3 [g] at 0.062 [s]

B-62

8714-01

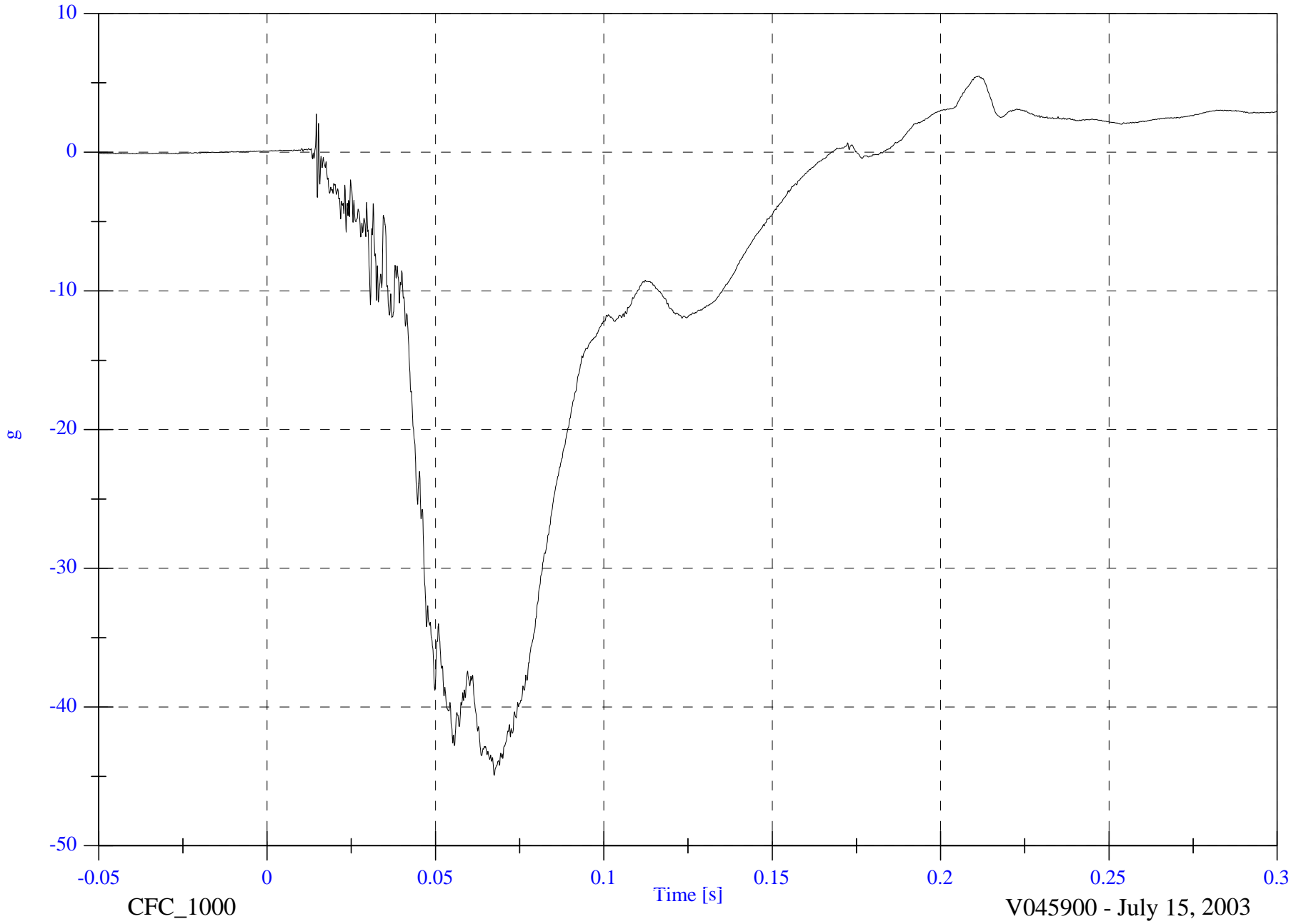


2004 Volvo XC90 NCAP

V1P2 Head 9 Array Y Arm x

Max: 5.5 [g] at 0.211 [s]

Min: -44.9 [g] at 0.067 [s]



B-63

8714-01

CFC_1000

Time [s]

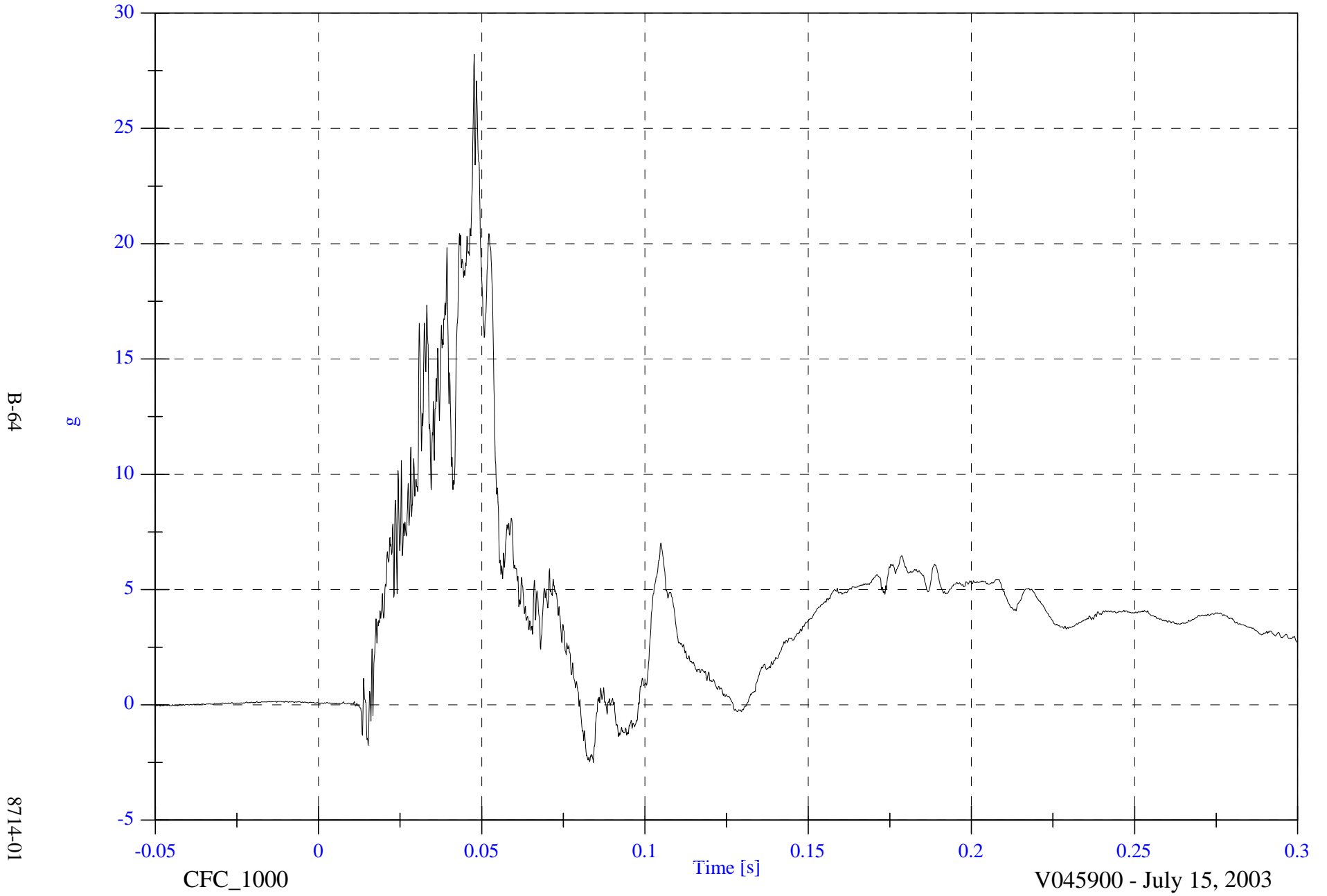
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Head 9 Array Y Arm z

Max: 28.2 [g] at 0.048 [s]

Min: -2.5 [g] at 0.084 [s]



B-64

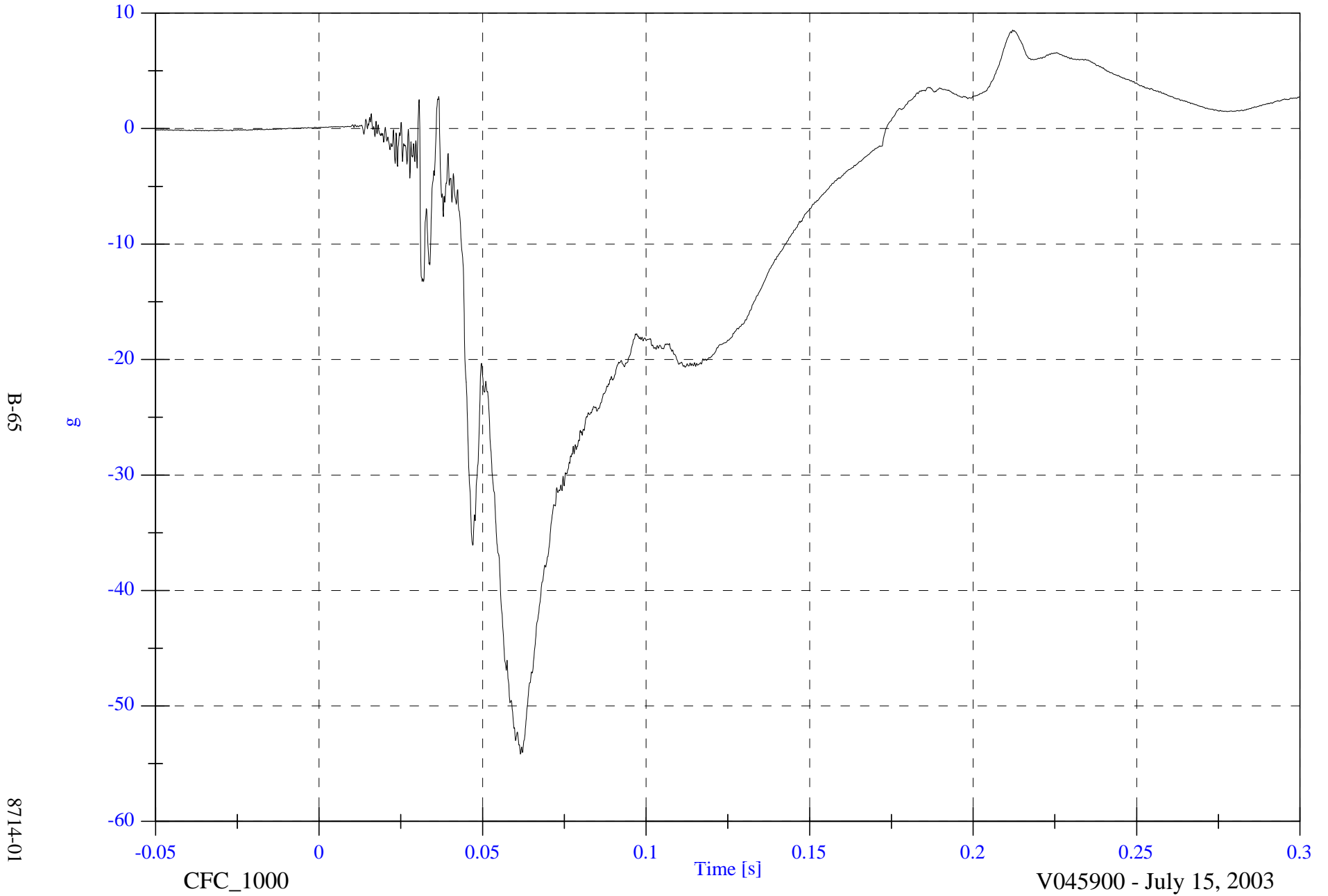
8714-01

2004 Volvo XC90 NCAP

V1P2 Head 9 Array Z Arm x

Max: 8.5 [g] at 0.212 [s]

Min: -54.2 [g] at 0.062 [s]

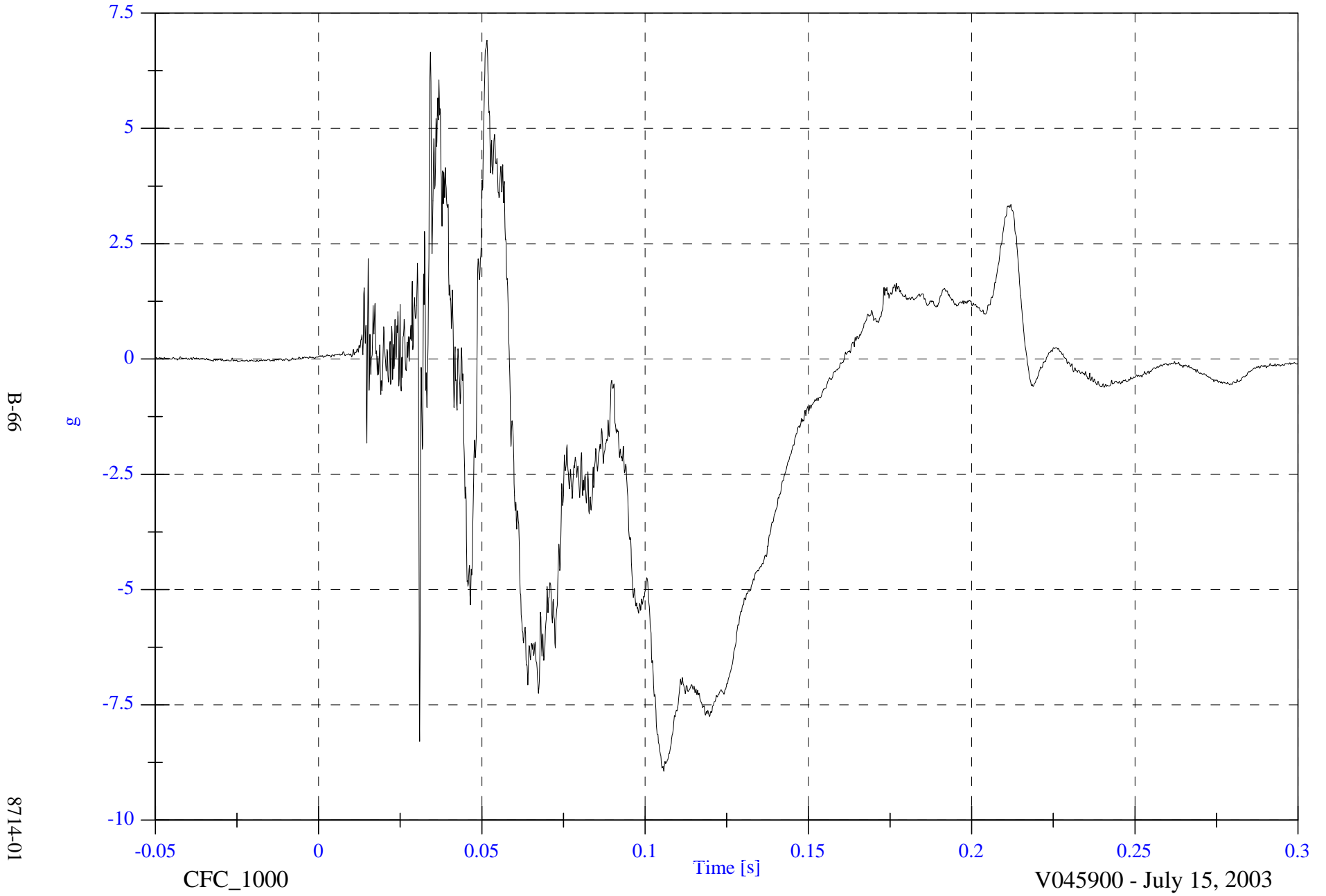


2004 Volvo XC90 NCAP

V1P2 Head 9 Array Z Arm y

Max: 6.9 [g] at 0.052 [s]

Min: -8.9 [g] at 0.106 [s]

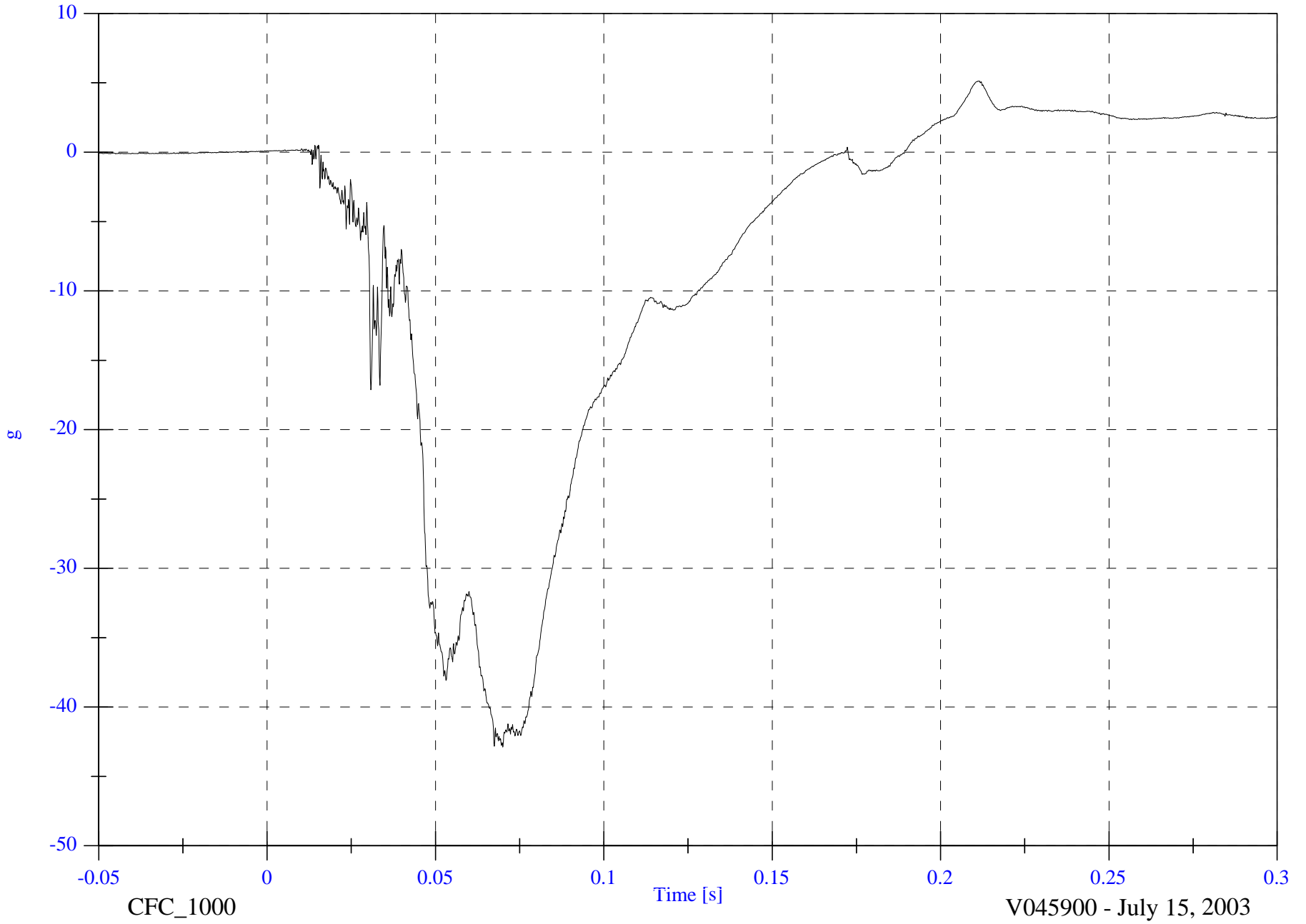


2004 Volvo XC90 NCAP

V1P2 Head CG x

Max: 5.1 [g] at 0.211 [s]

Min: -42.9 [g] at 0.070 [s]



B-67

8714-01

CFC_1000

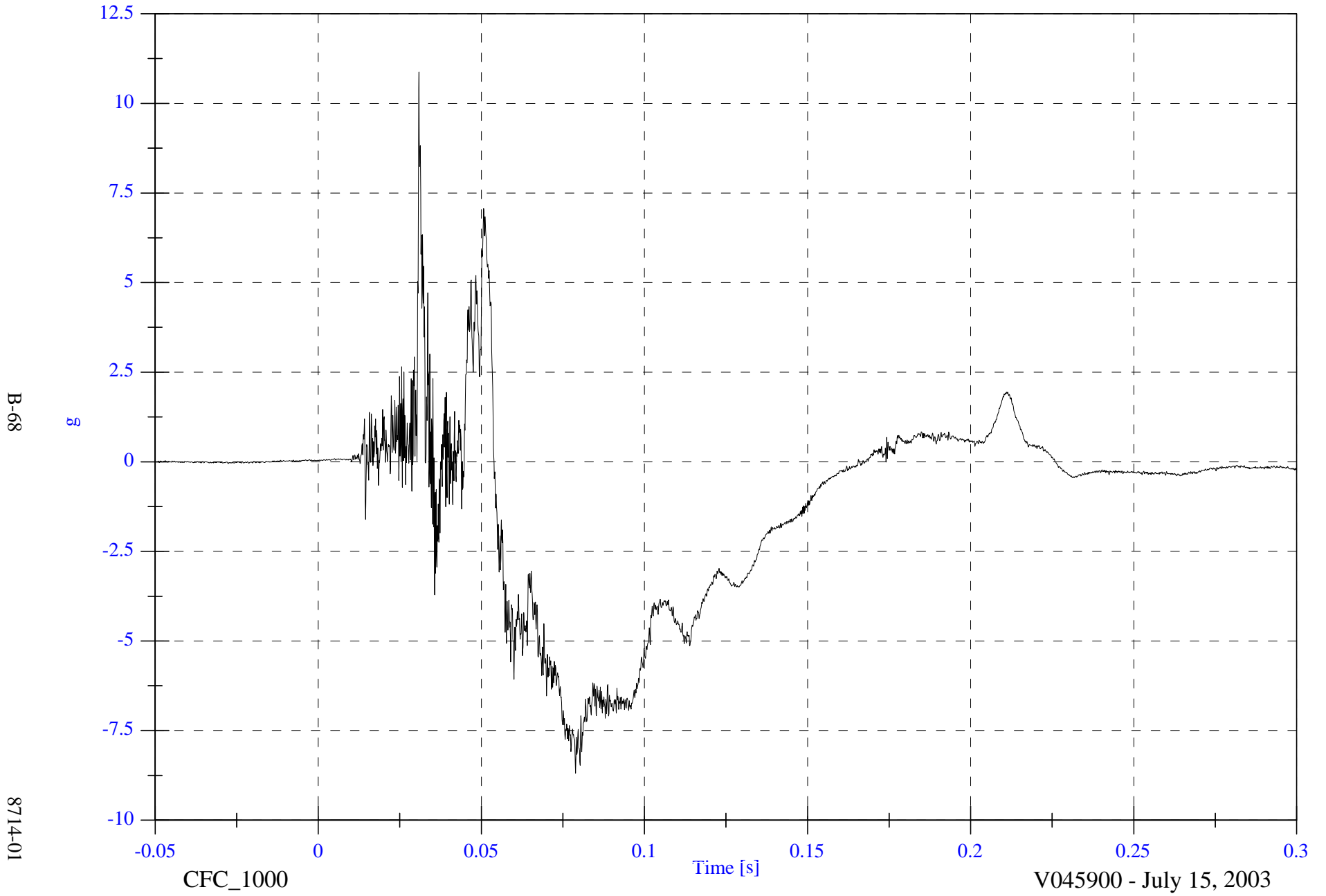
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Head CG y

Max: 10.9 [g] at 0.031 [s]
Min: -8.7 [g] at 0.079 [s]



B-68

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

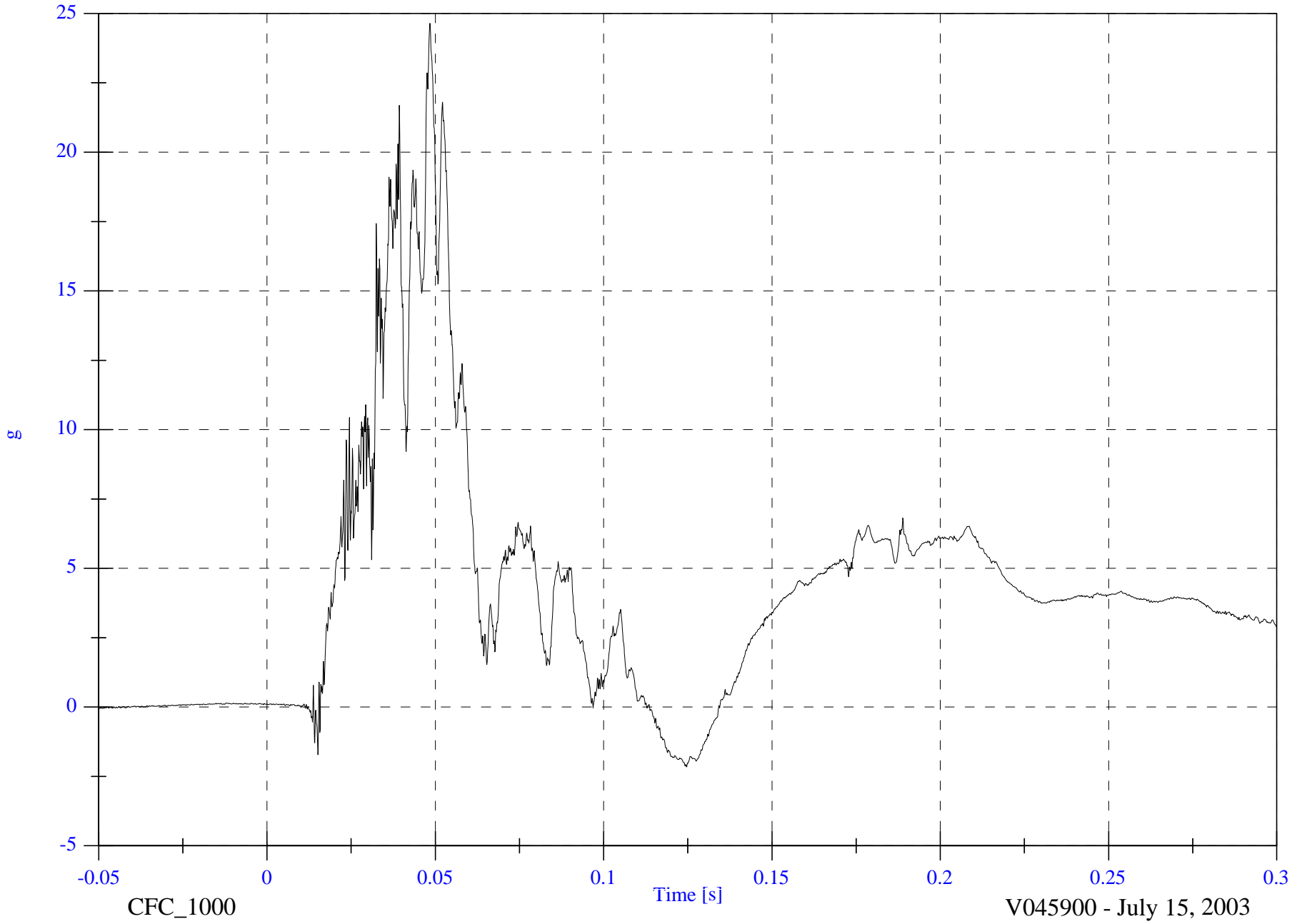
V1P2 Head CG z

Max: 24.6 [g] at 0.048 [s]

Min: -2.2 [g] at 0.125 [s]

B-69

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Head CG Resultant

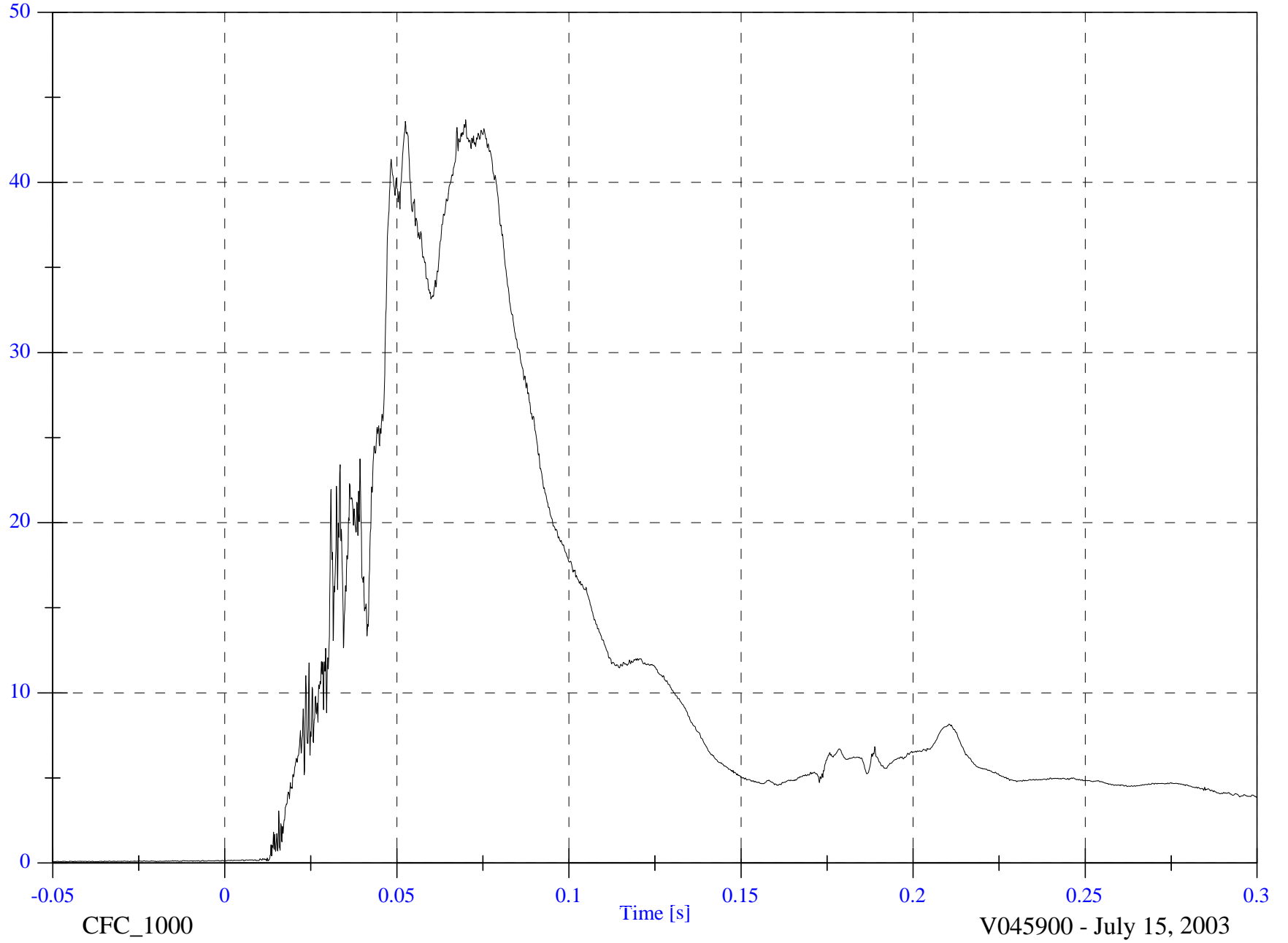
Max: 43.7 [g] at 0.070 [s]

Min: 0.1 [g] at -0.045 [s]

B-70

g

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Head CG Red x

Max: 5.5 [g] at 0.211 [s]

Min: -41.9 [g] at 0.070 [s]

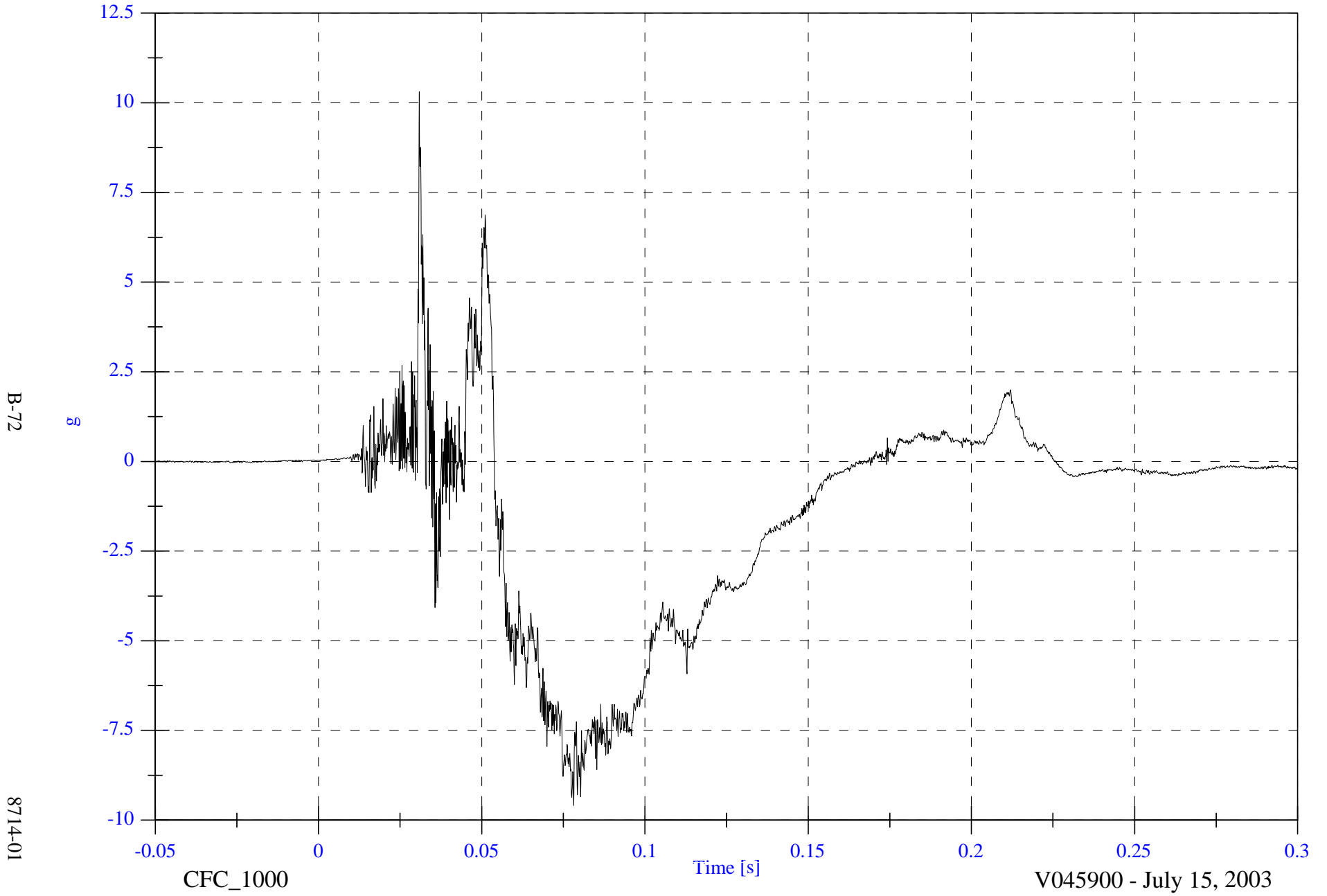


2004 Volvo XC90 NCAP

V1P2 Head CG Red y

Max: 10.3 [g] at 0.031 [s]

Min: -9.6 [g] at 0.078 [s]

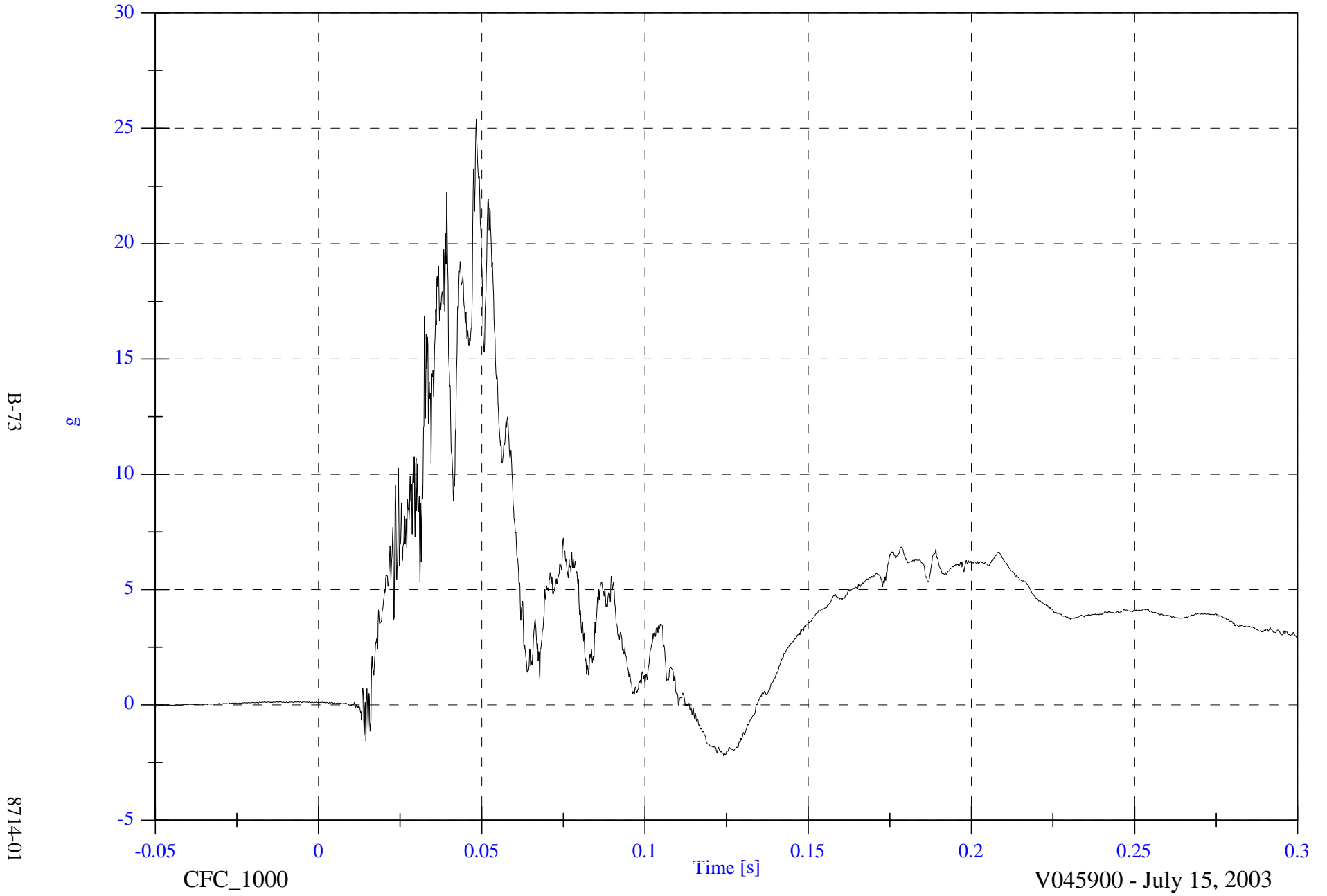


2004 Volvo XC90 NCAP

V1P2 Head CG Red z

Max: 25.4 [g] at 0.048 [s]

Min: -2.2 [g] at 0.124 [s]



B-73

g

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

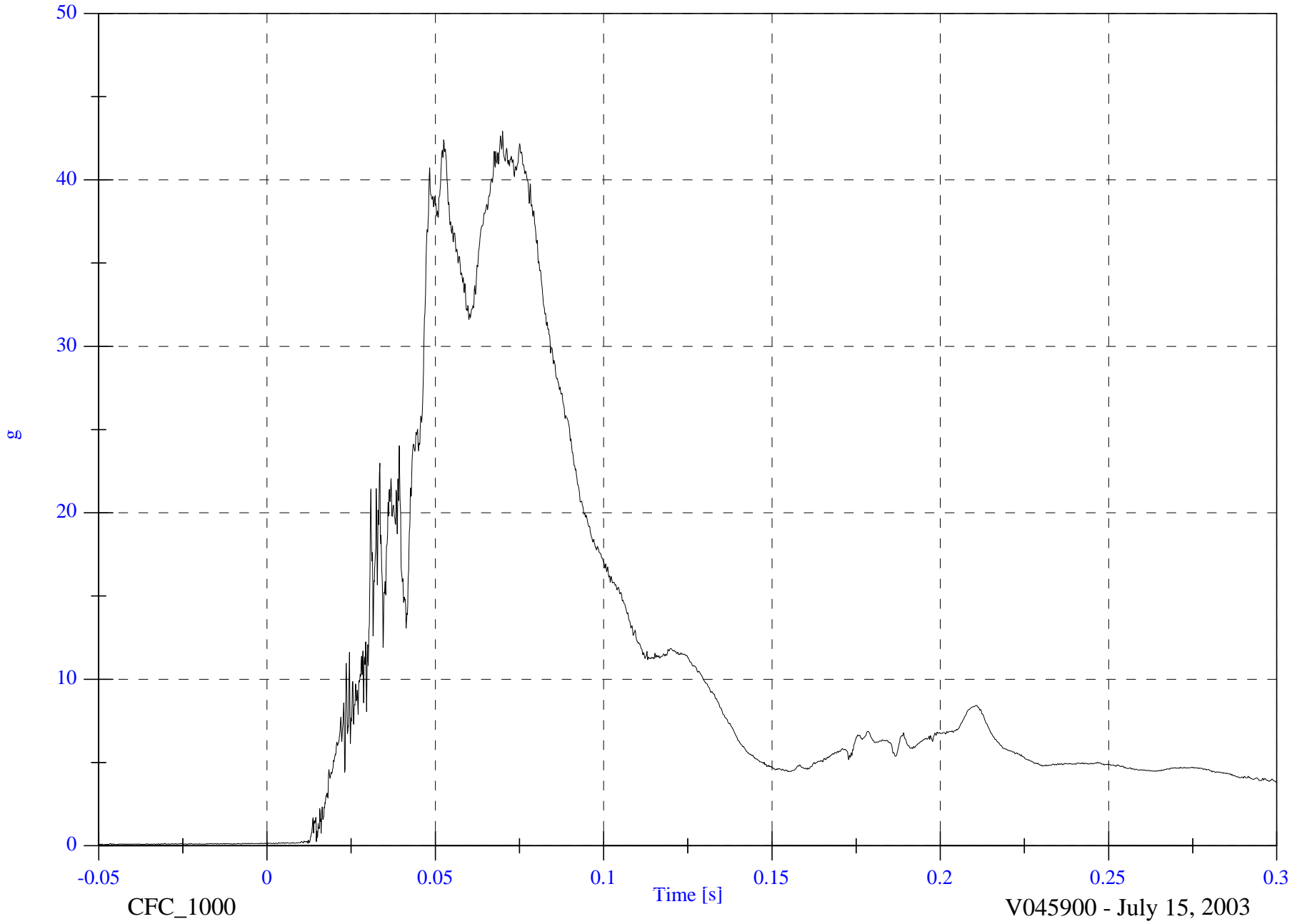
V1P2 Head CG Red Resultant

Max: 42.9 [g] at 0.070 [s]

Min: 0.1 [g] at -0.045 [s]

B-74

8714-01



CFC_1000

Time [s]

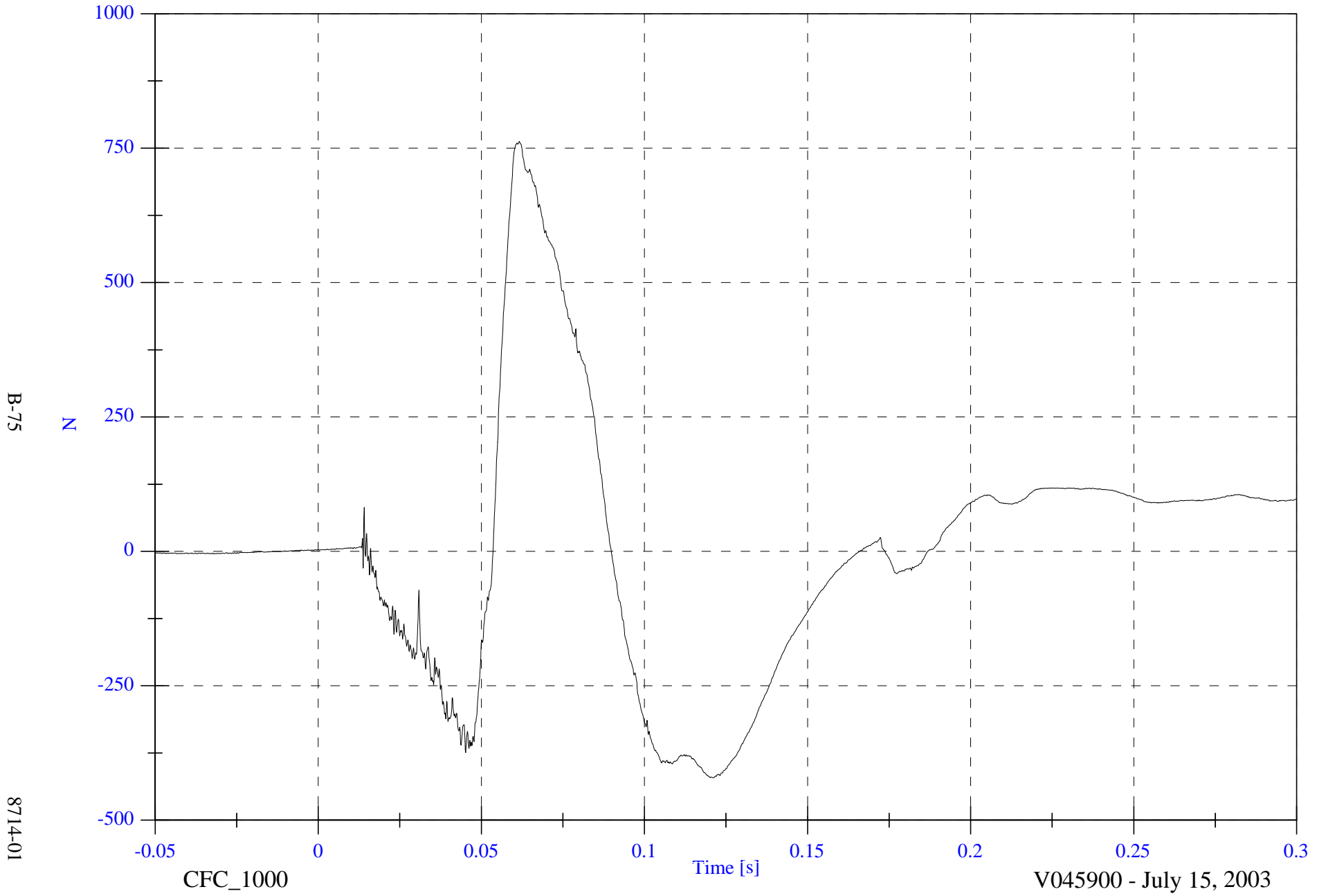
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Upper Neck Fx

Max: 762.5 [N] at 0.062 [s]

Min: -421.1 [N] at 0.121 [s]

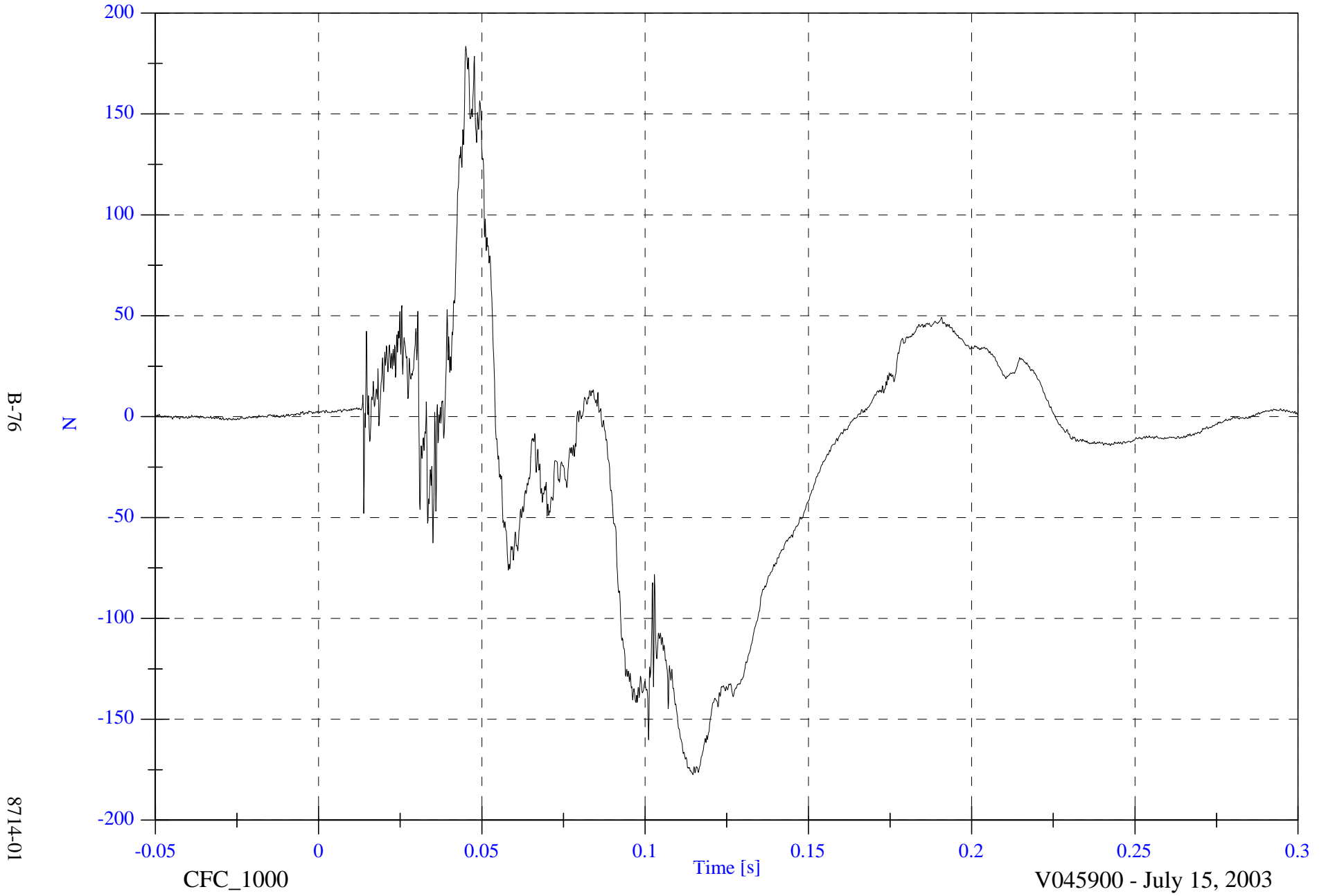


2004 Volvo XC90 NCAP

V1P2 Upper Neck Fy

Max: 183.6 [N] at 0.045 [s]

Min: -177.5 [N] at 0.115 [s]



B-76

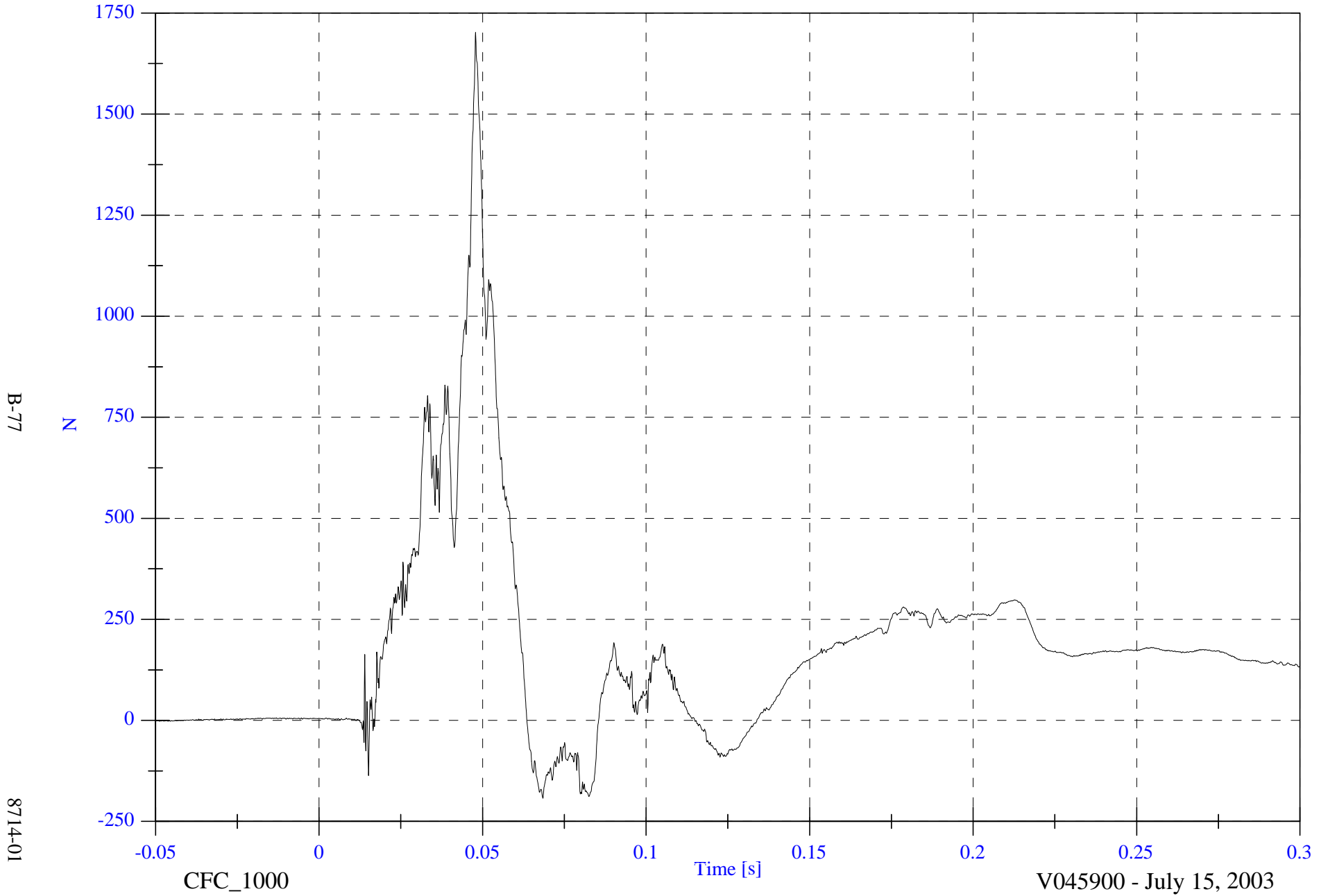
8714-01

2004 Volvo XC90 NCAP

V1P2 Upper Neck Fz

Max: 1702.1 [N] at 0.048 [s]

Min: -192.8 [N] at 0.068 [s]



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8714-01

CFC_1000

Time [s]

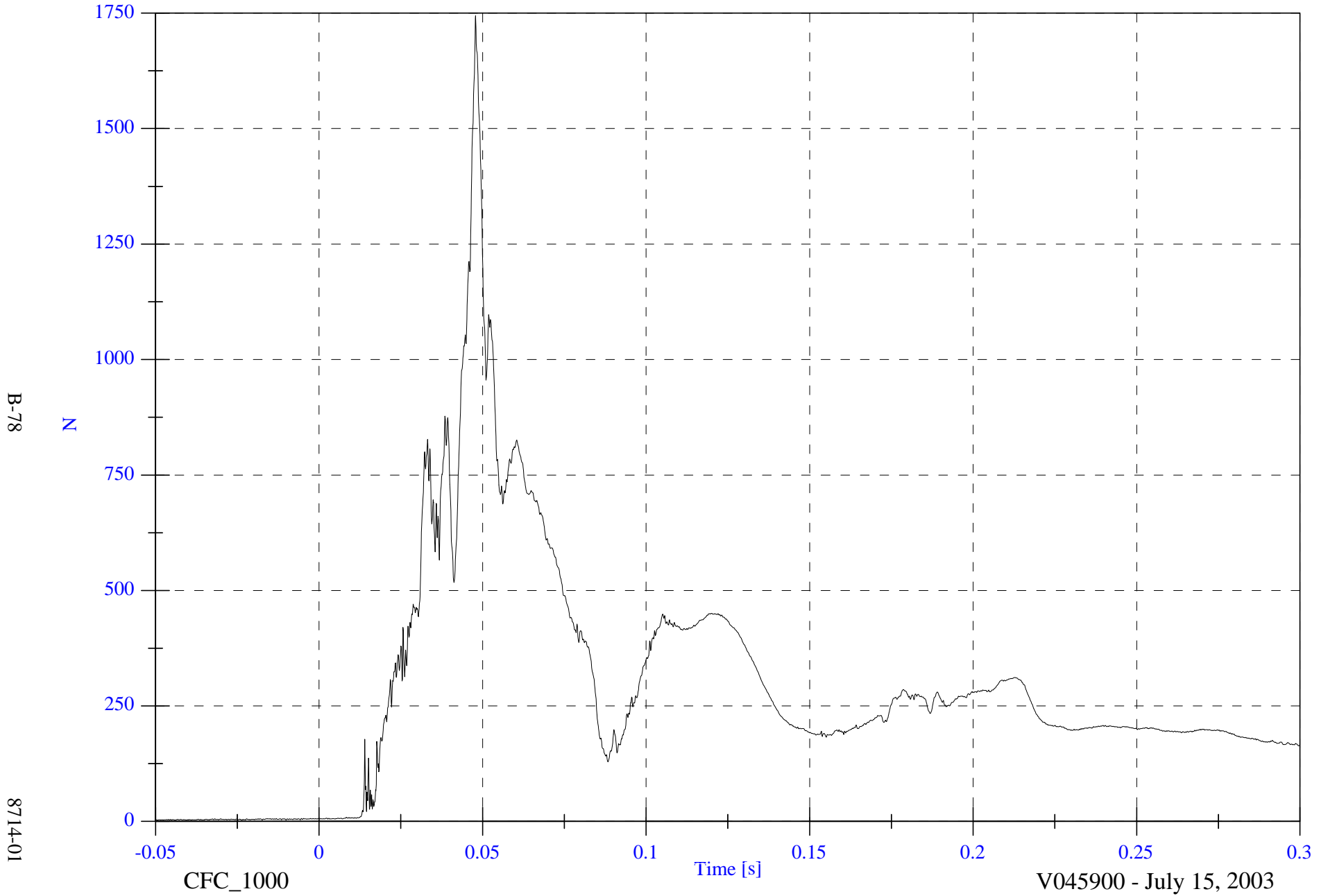
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Upper Neck F Resultant

Max: 1744.0 [N] at 0.048 [s]

Min: 2.8 [N] at -0.024 [s]



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8714-01

2004 Volvo XC90 NCAP

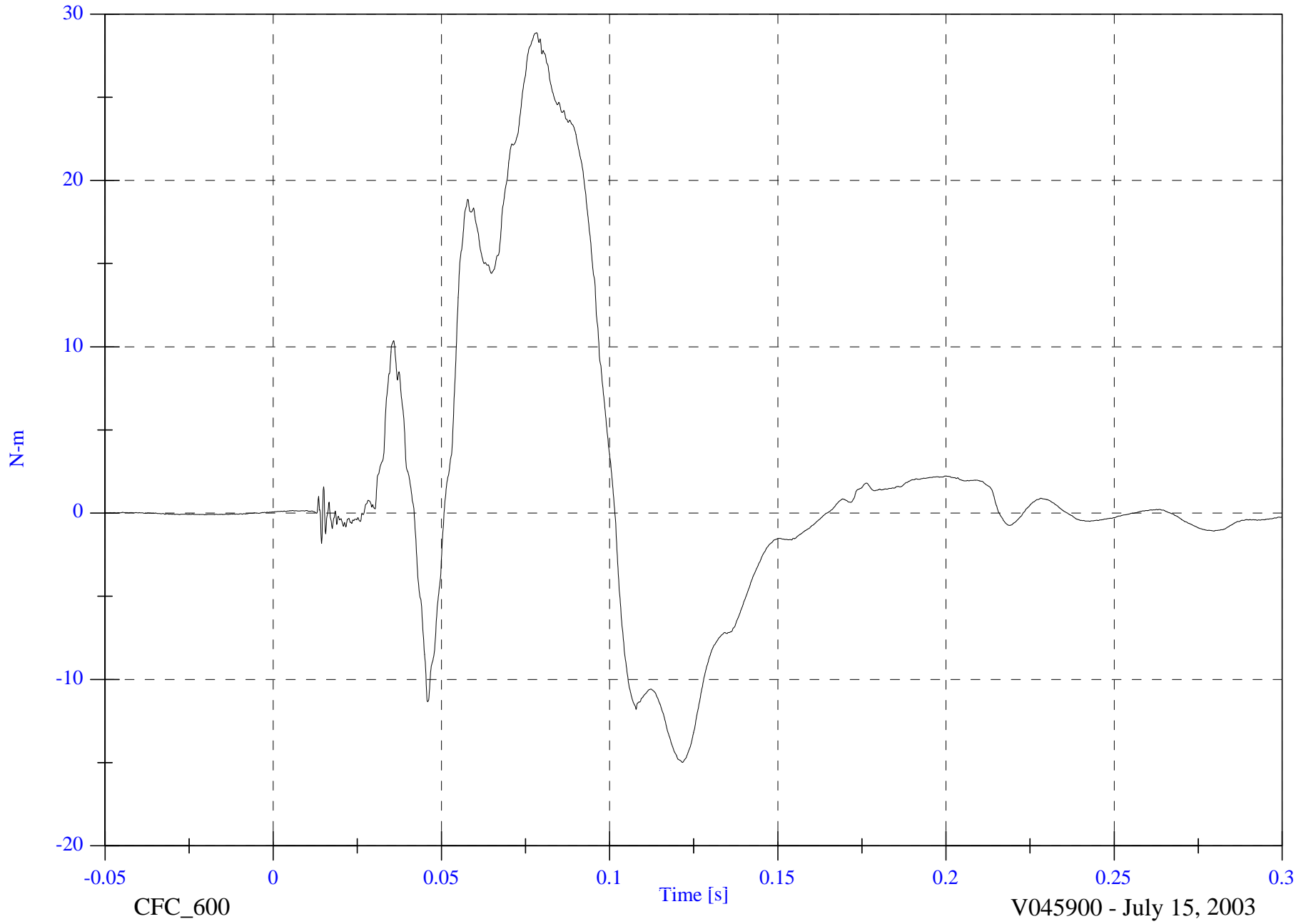
V1P2 Upper Neck Mx

Max: 28.9 [N-m] at 0.078 [s]

Min: -15.0 [N-m] at 0.122 [s]

B-79

8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

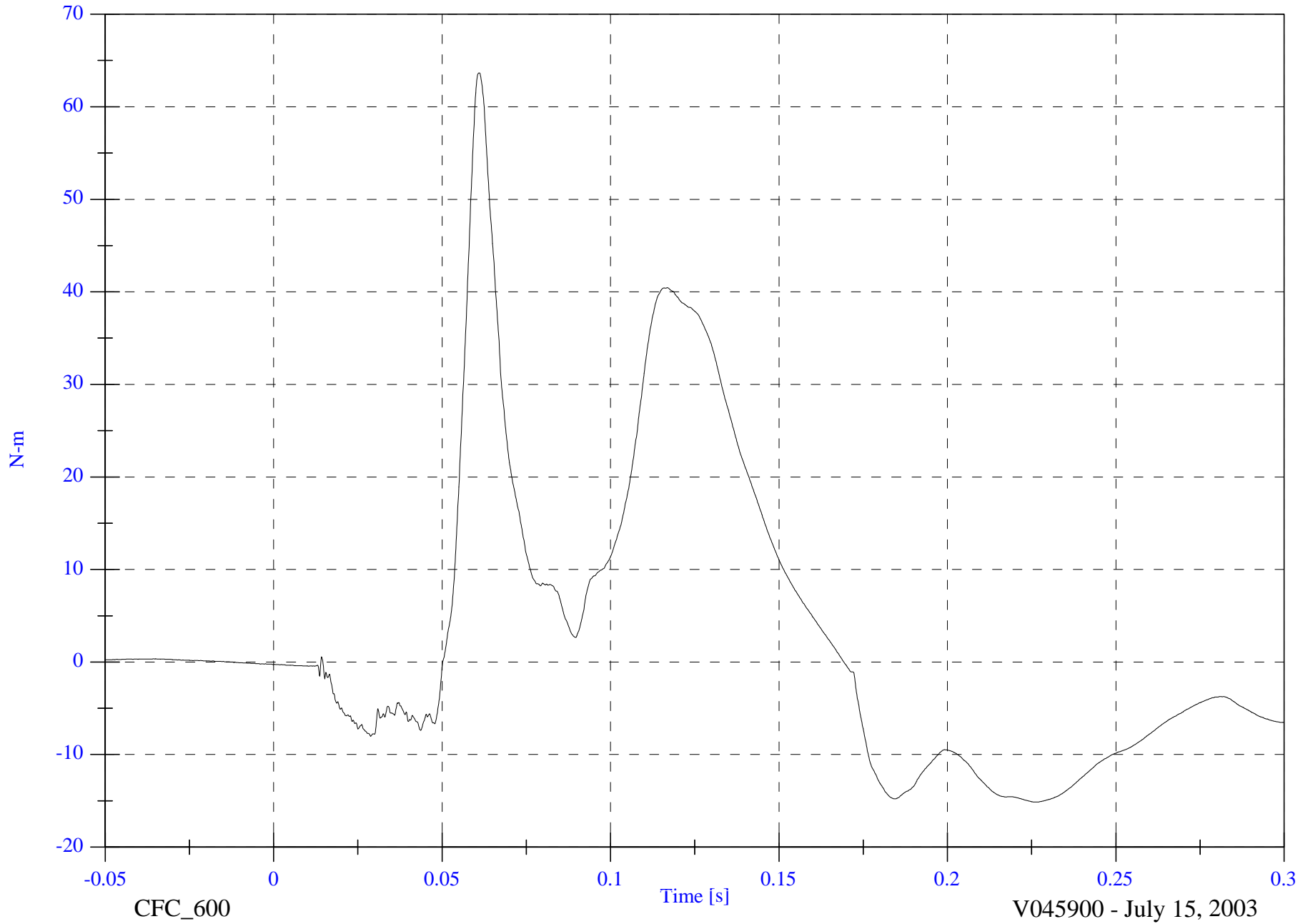
V1P2 Upper Neck My

Max: 63.7 [N-m] at 0.061 [s]

Min: -15.1 [N-m] at 0.226 [s]

B-80

8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

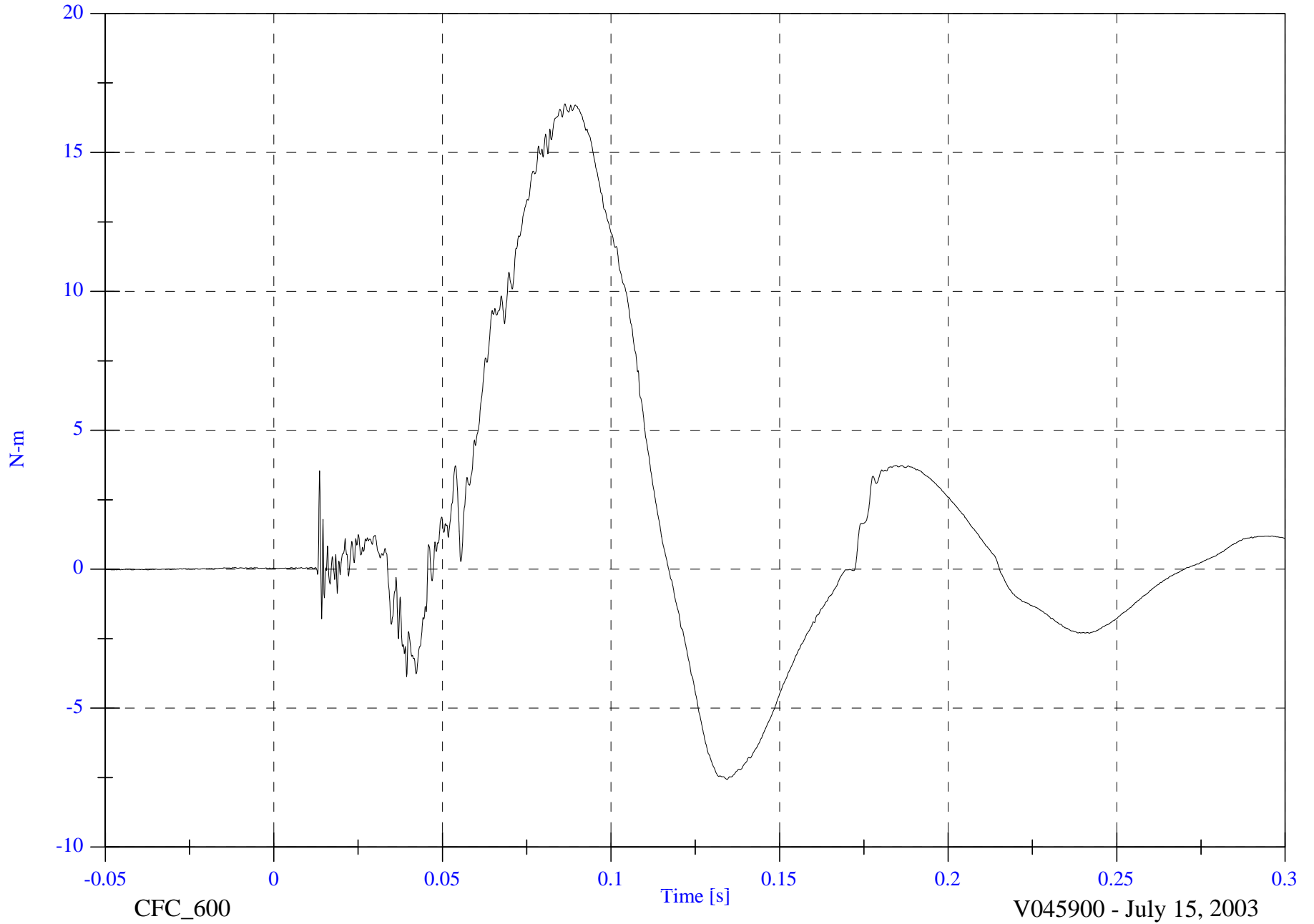
V1P2 Upper Neck Mz

Max: 16.7 [N-m] at 0.086 [s]

Min: -7.6 [N-m] at 0.134 [s]

B-81

8714-01

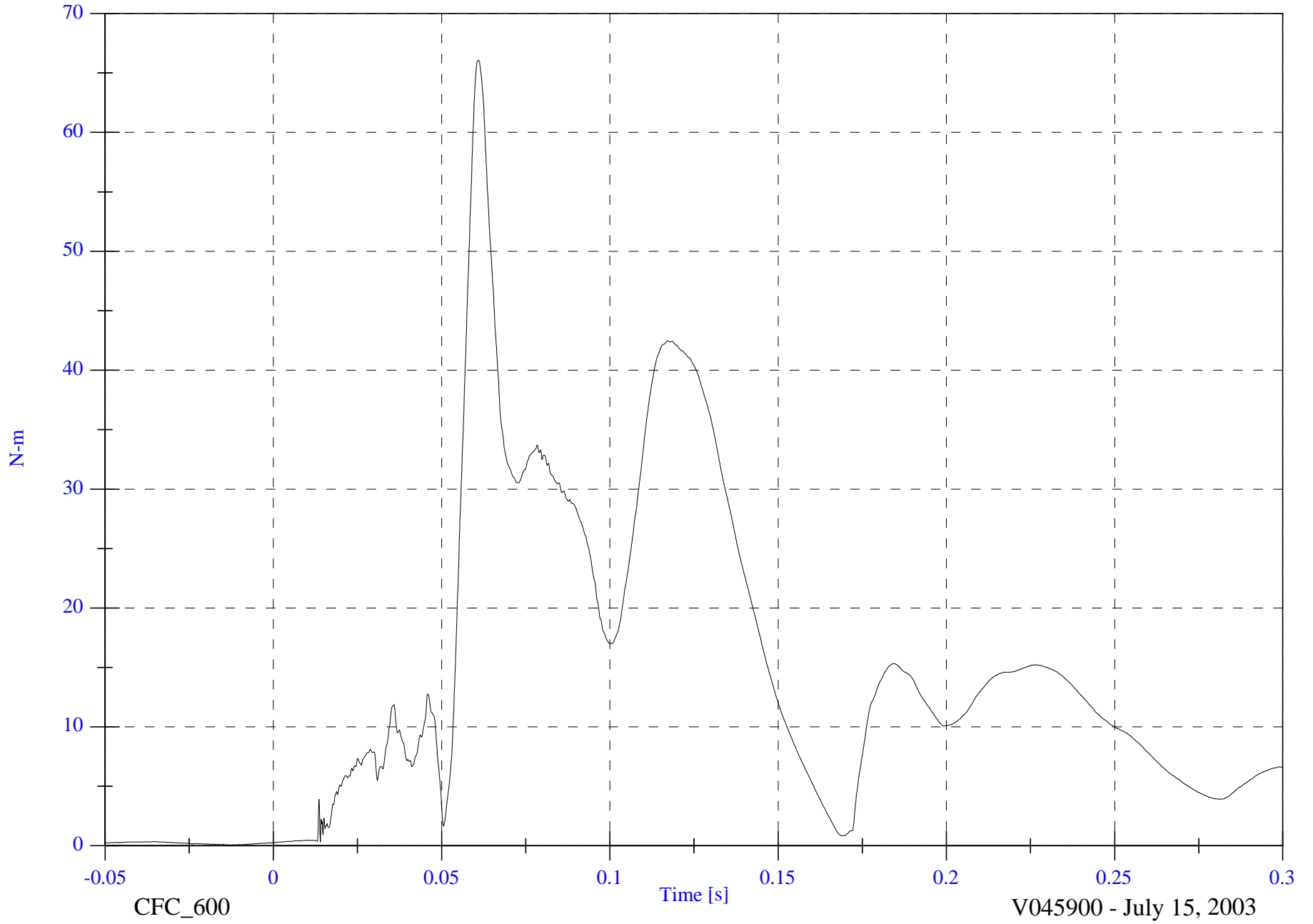


2004 Volvo XC90 NCAP

V1P2 Upper Neck M Resultant

Max: 66.1 [N-m] at 0.061 [s]

Min: 0.1 [N-m] at -0.013 [s]



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8714-01

CFC_600

Time [s]

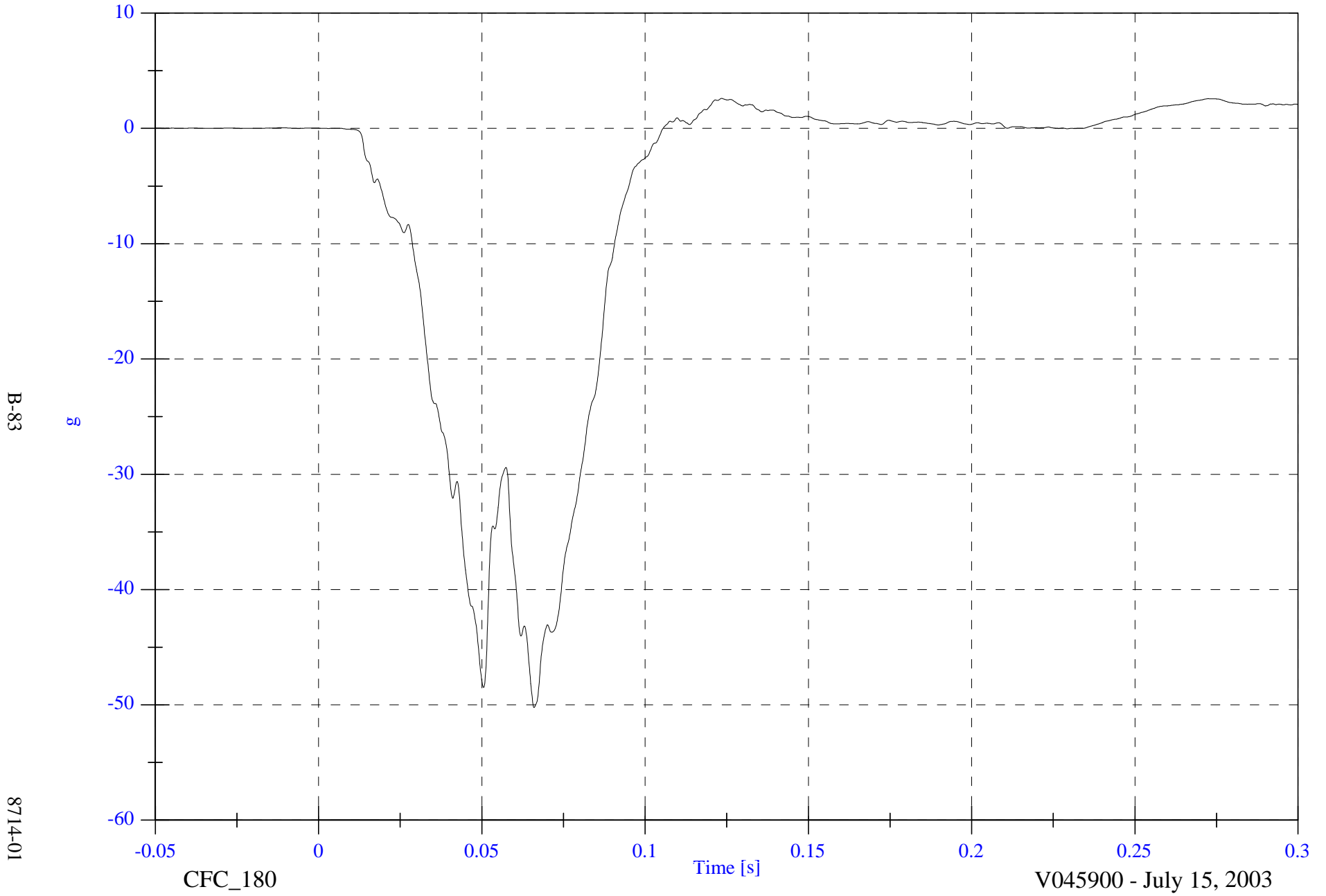
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Chest x

Max: 2.6 [g] at 0.123 [s]

Min: -50.2 [g] at 0.066 [s]



2004 Volvo XC90 NCAP

V1P2 Chest y

Max: 4.7 [g] at 0.037 [s]

Min: -7.5 [g] at 0.058 [s]

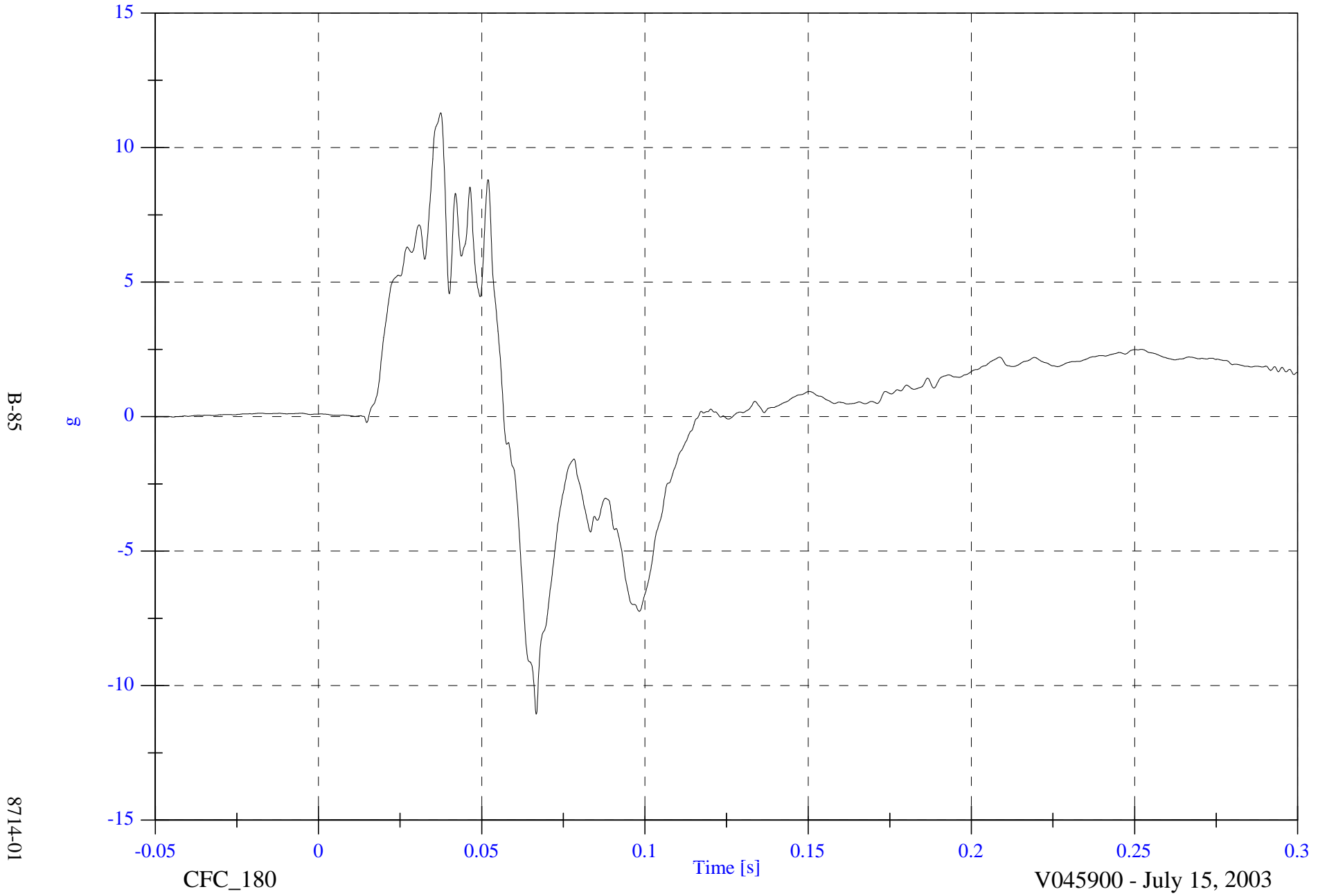


2004 Volvo XC90 NCAP

VIP2 Chest z

Max: 11.3 [g] at 0.037 [s]

Min: -11.1 [g] at 0.067 [s]



2004 Volvo XC90 NCAP

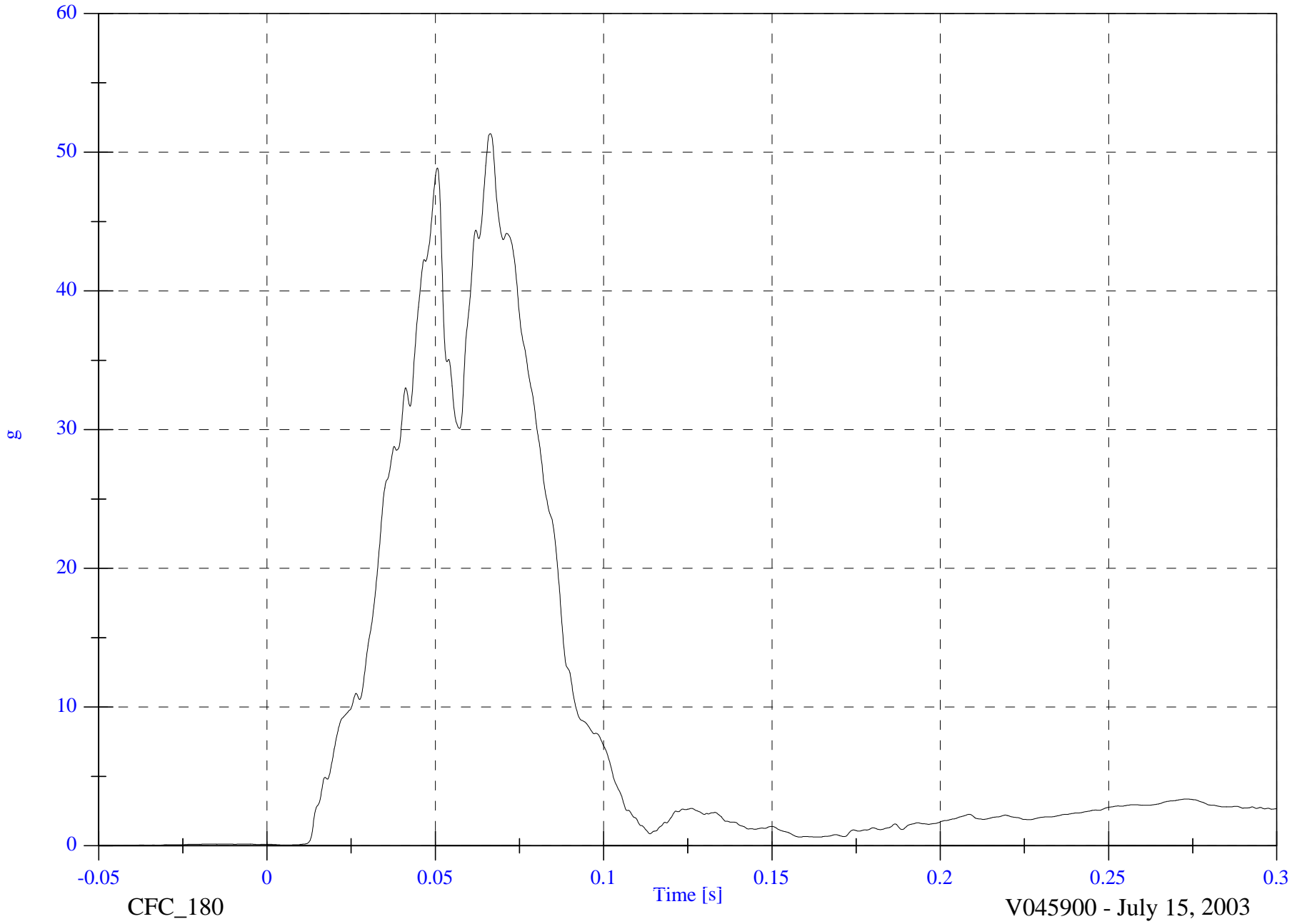
V1P2 Chest Resultant

Max: 51.3 [g] at 0.066 [s]

Min: 0.0 [g] at -0.044 [s]

B-86

8714-01

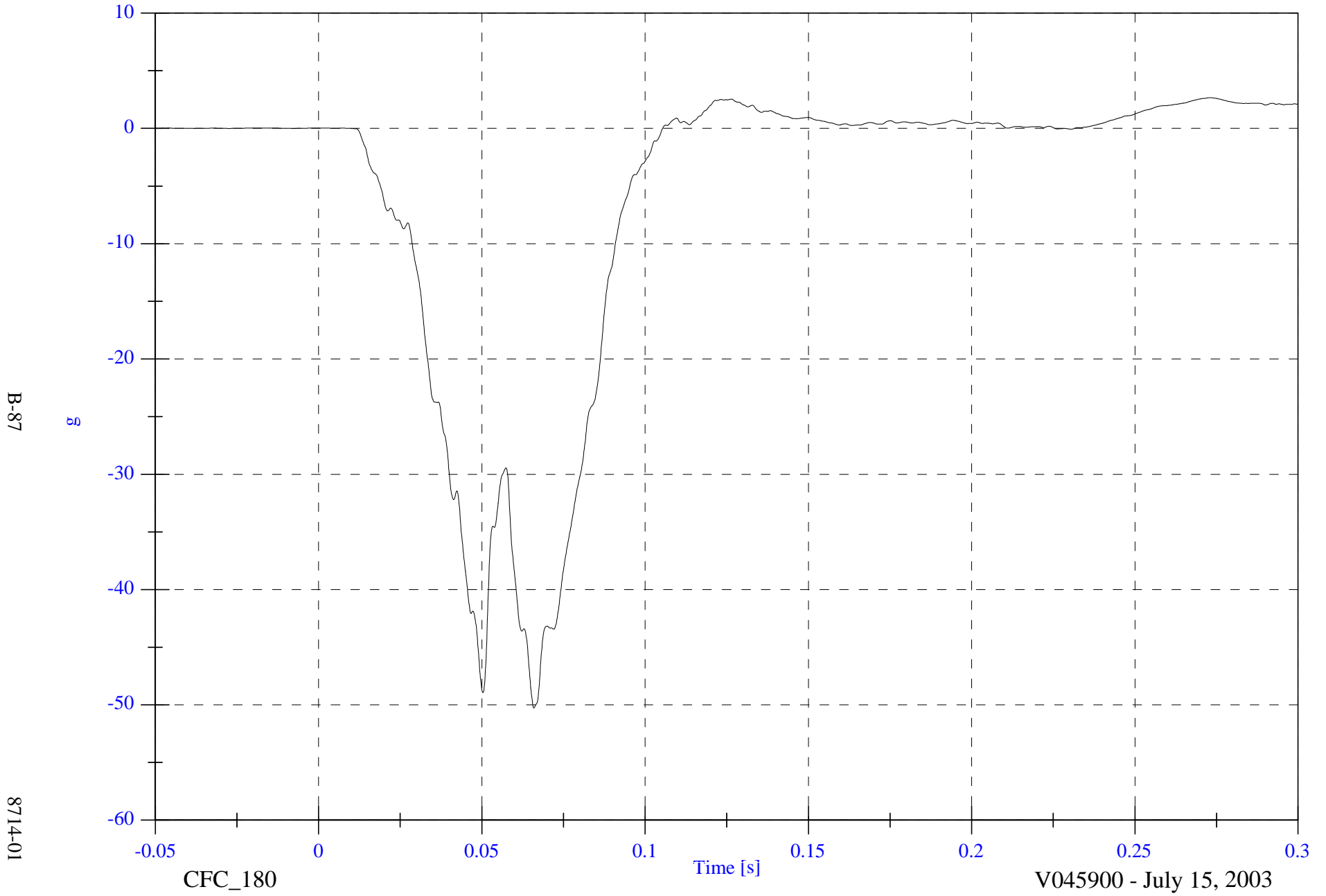


2004 Volvo XC90 NCAP

V1P2 Chest Red x

Max: 2.7 [g] at 0.273 [s]

Min: -50.3 [g] at 0.066 [s]

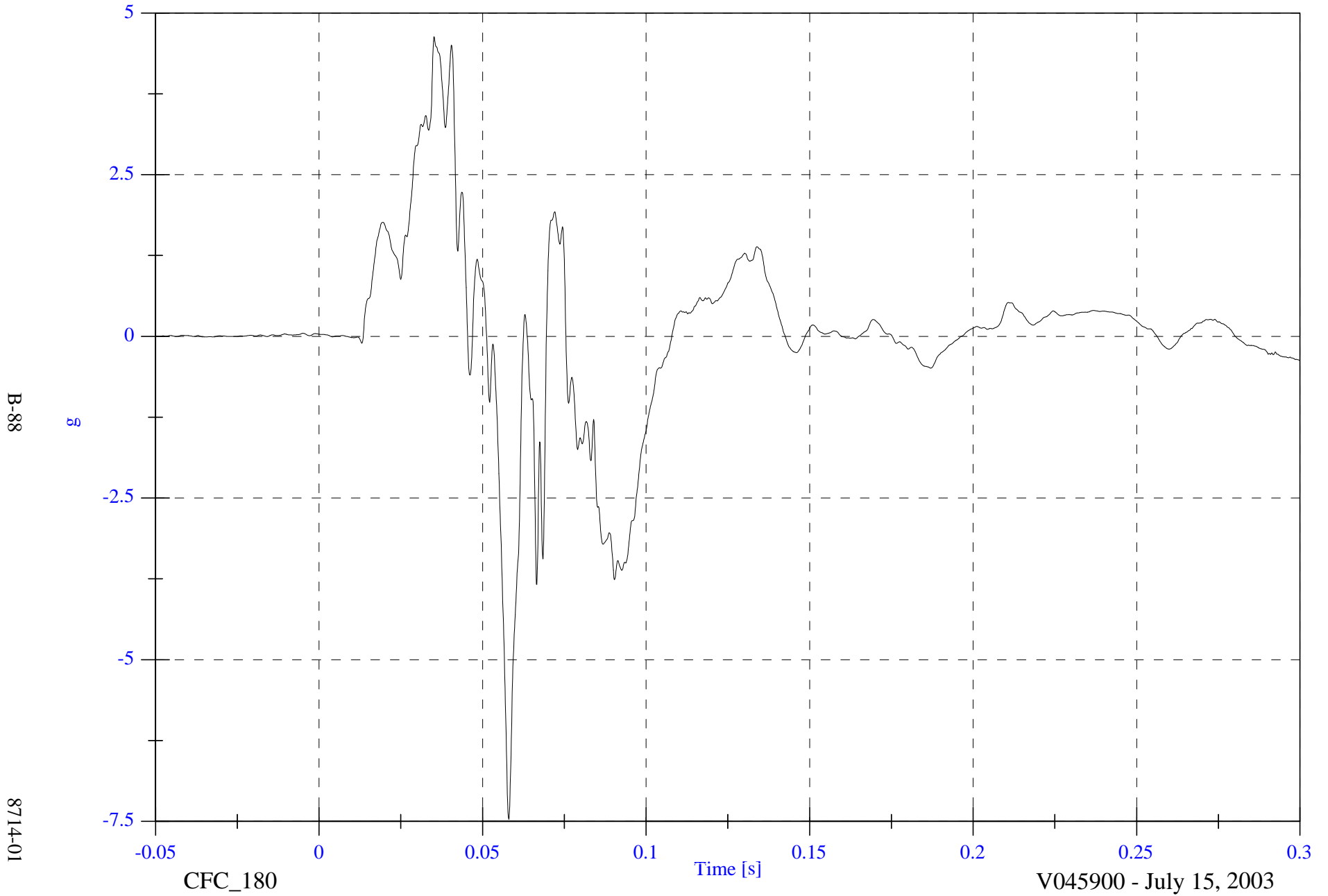


2004 Volvo XC90 NCAP

V1P2 Chest Red y

Max: 4.6 [g] at 0.035 [s]

Min: -7.5 [g] at 0.058 [s]

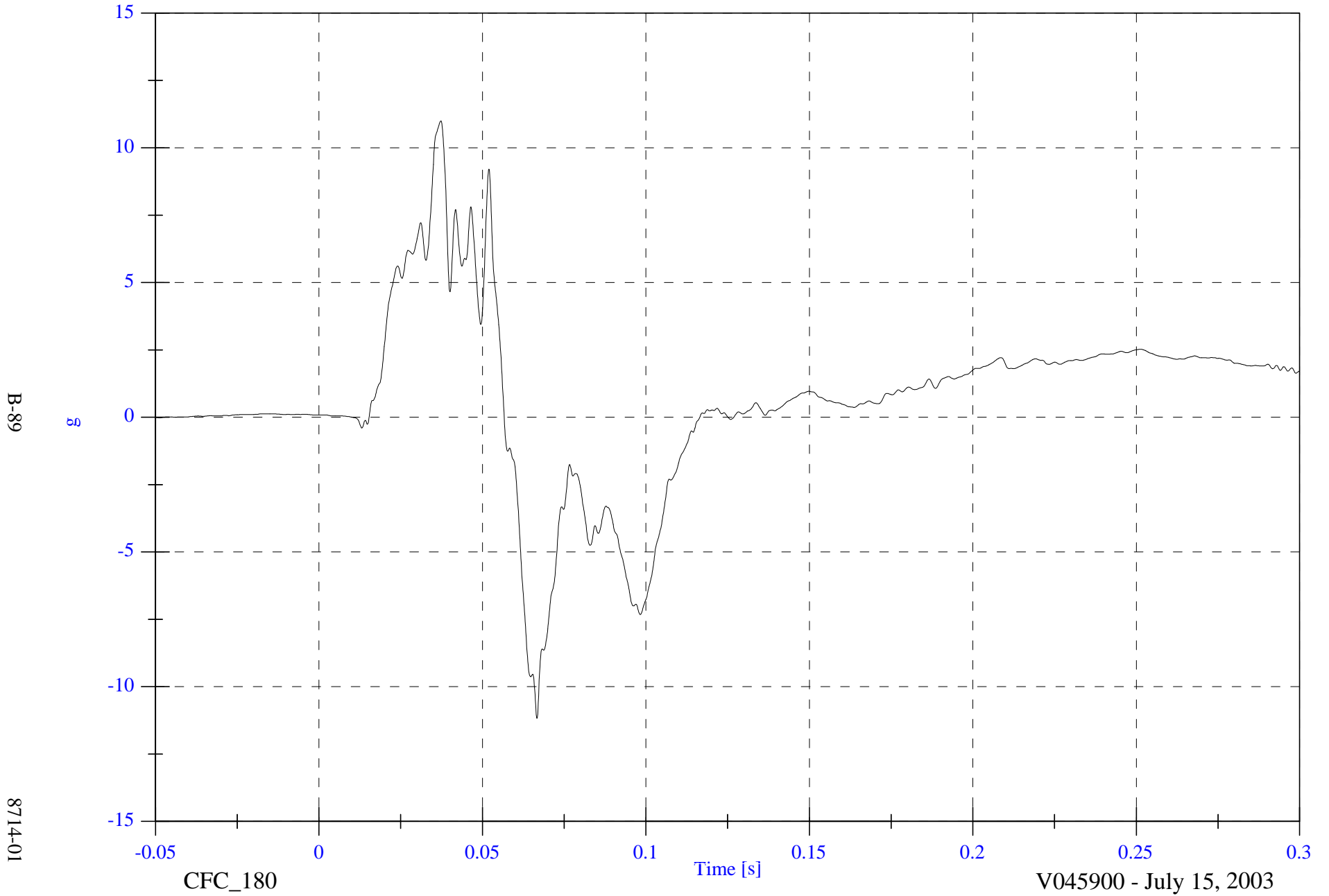


2004 Volvo XC90 NCAP

VIP2 Chest Red z

Max: 11.0 [g] at 0.037 [s]

Min: -11.2 [g] at 0.067 [s]



B-89

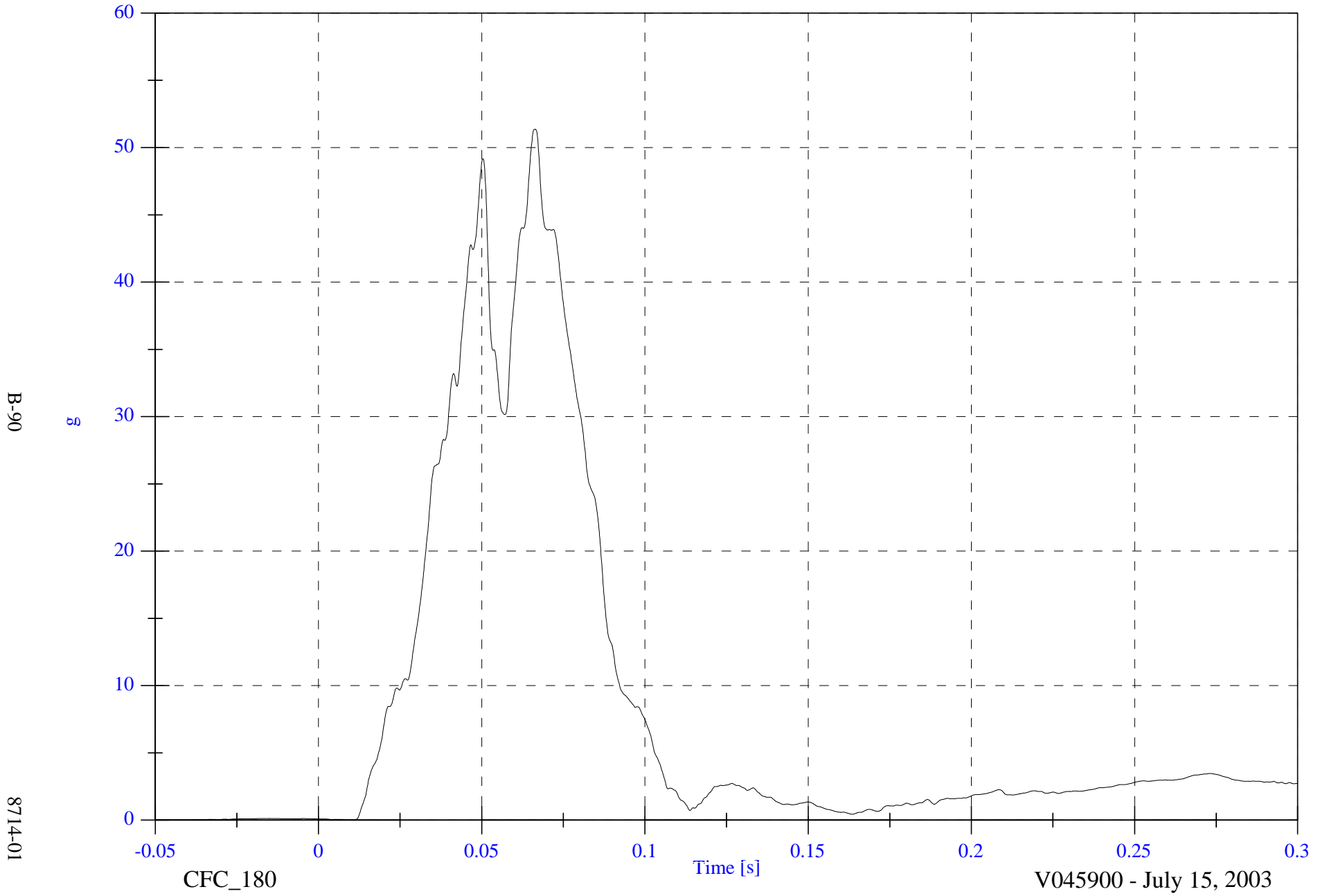
8714-01

2004 Volvo XC90 NCAP

V1P2 Chest Red Resultant

Max: 51.4 [g] at 0.066 [s]

Min: 0.0 [g] at -0.047 [s]



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8714-01

CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

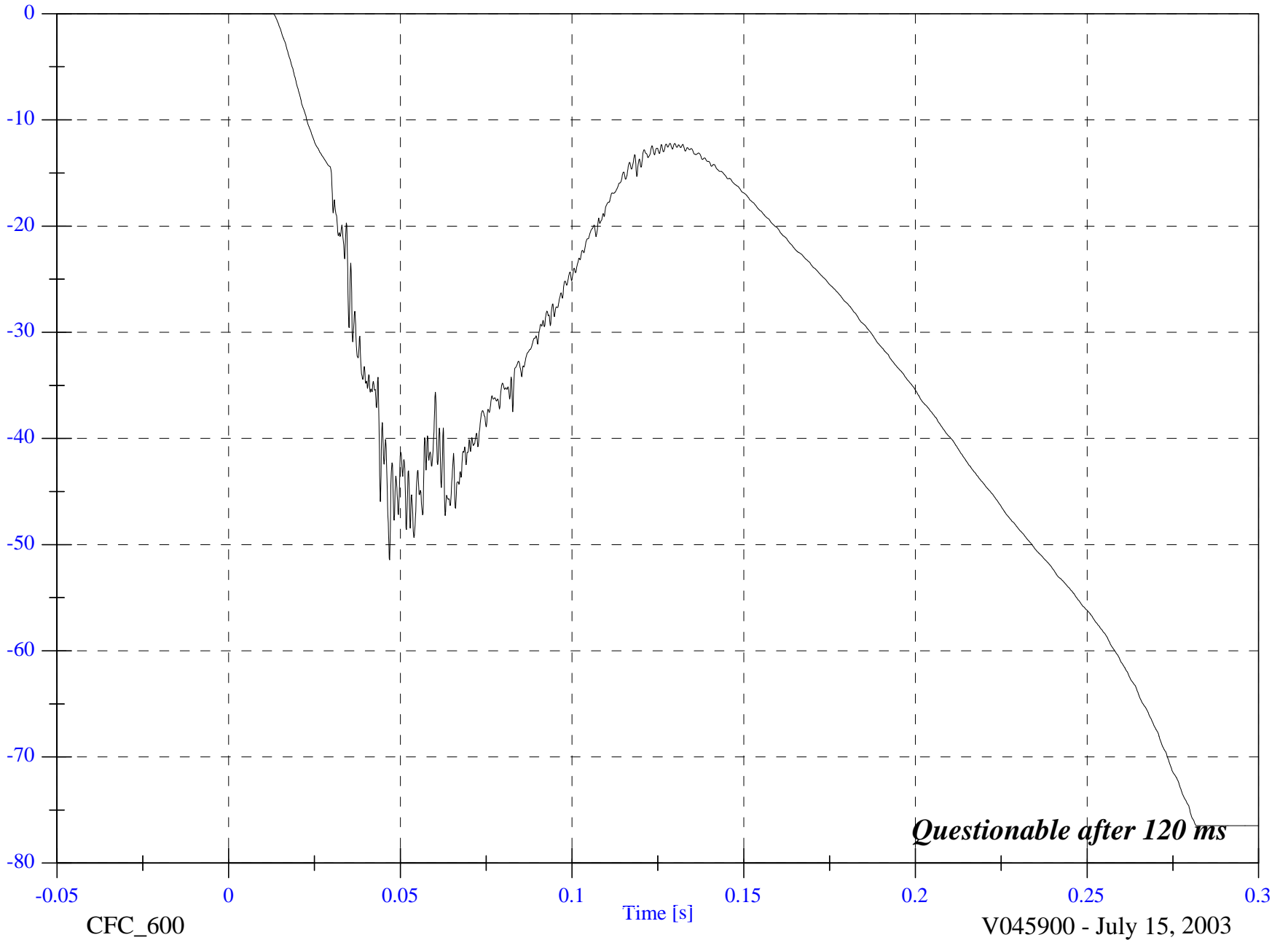
V1P2 Chest Compression

Max: 0.0 [mm] at -0.044 [s]

Min: -76.5 [mm] at 0.282 [s]

B-91

mm



8714-01

Questionable after 120 ms

CFC_600

Time [s]

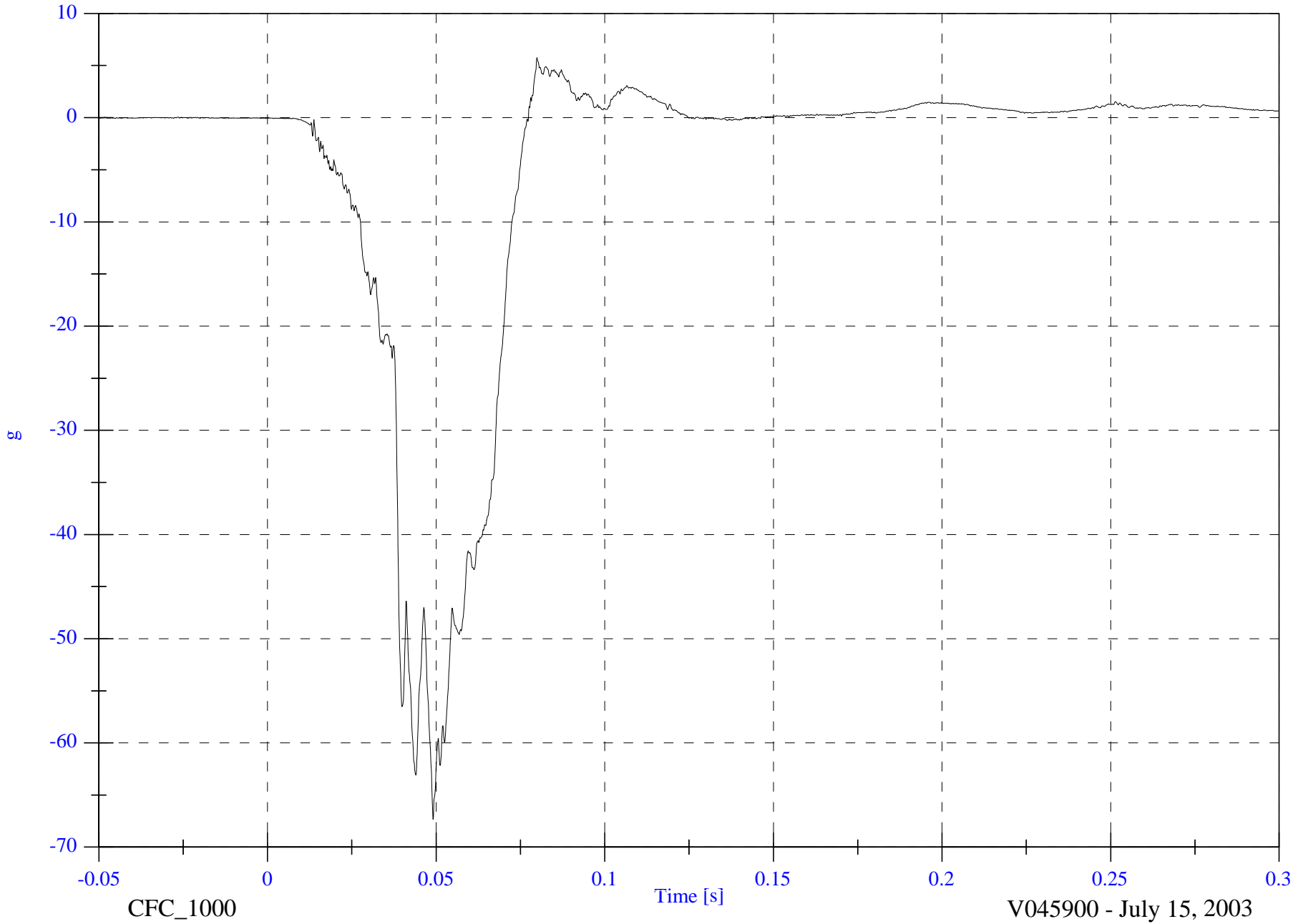
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Pelvic x

Max: 5.8 [g] at 0.080 [s]

Min: -67.3 [g] at 0.049 [s]



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8714-01

CFC_1000

Time [s]

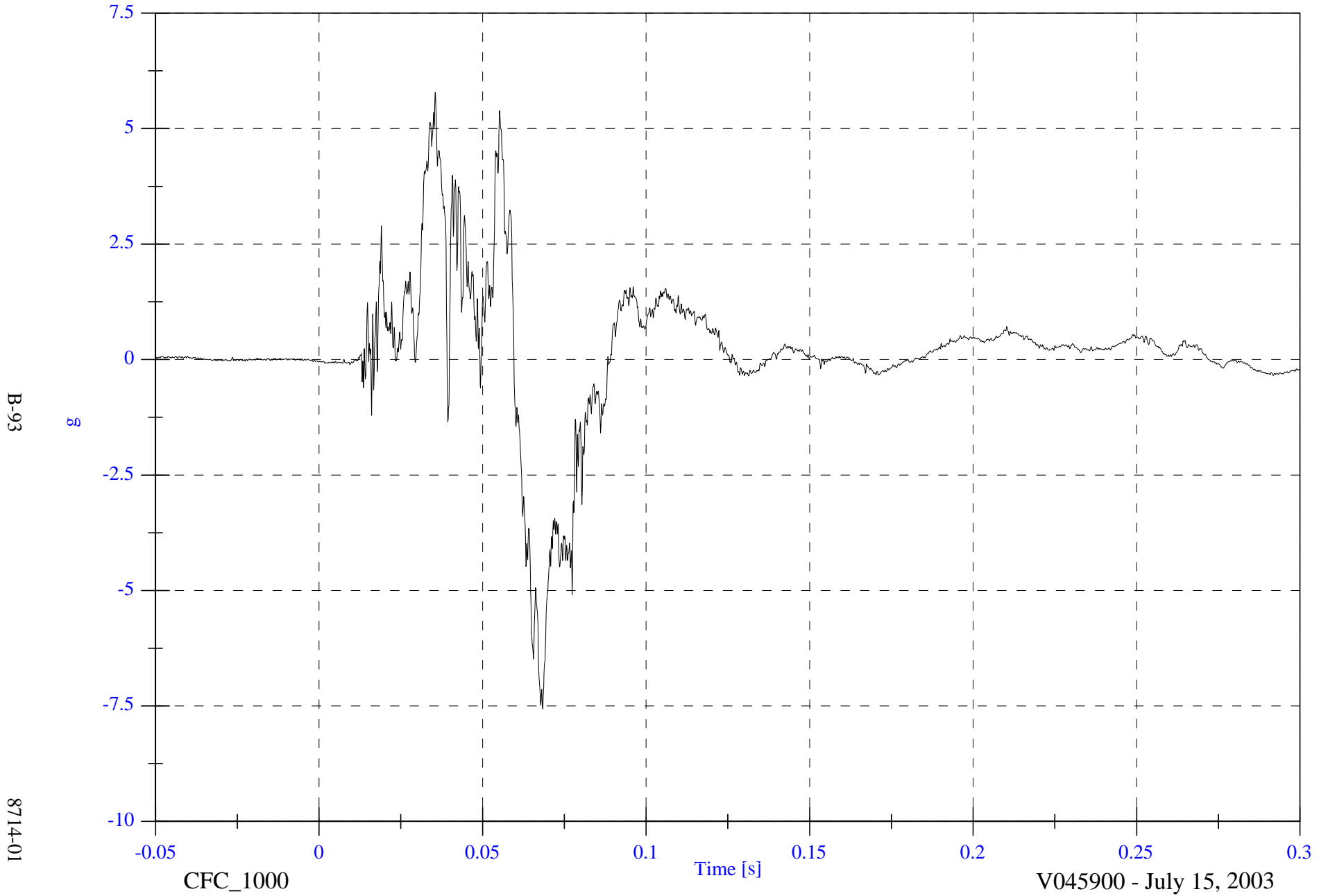
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Pelvic y

Max: 5.8 [g] at 0.035 [s]

Min: -7.6 [g] at 0.068 [s]

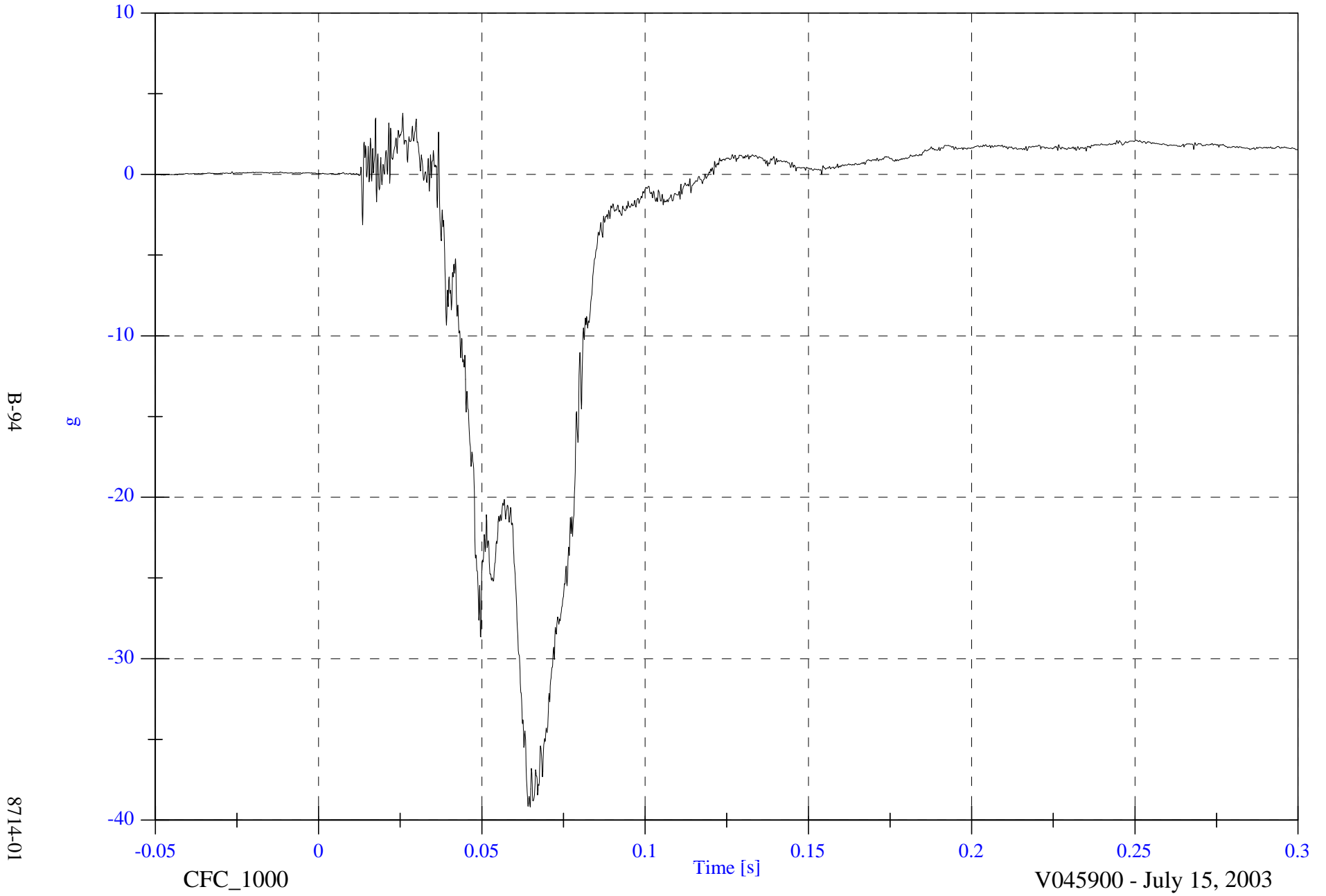


2004 Volvo XC90 NCAP

V1P2 Pelvic z

Max: 3.8 [g] at 0.026 [s]

Min: -39.2 [g] at 0.065 [s]



2004 Volvo XC90 NCAP

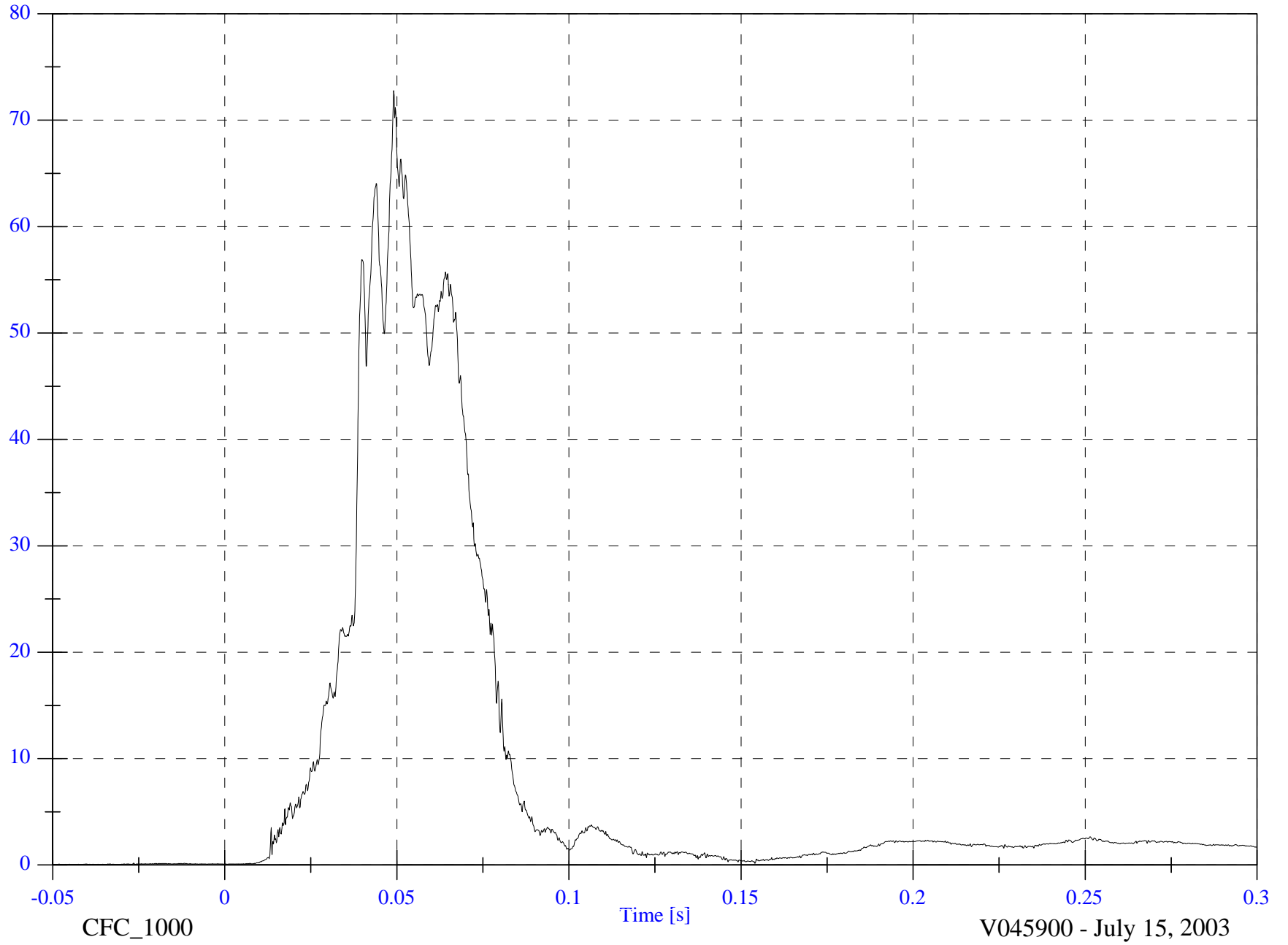
V1P2 Pelvic Resultant

Max: 72.8 [g] at 0.049 [s]

Min: 0.0 [g] at -0.050 [s]

B-95

g



8714-01

CFC_1000

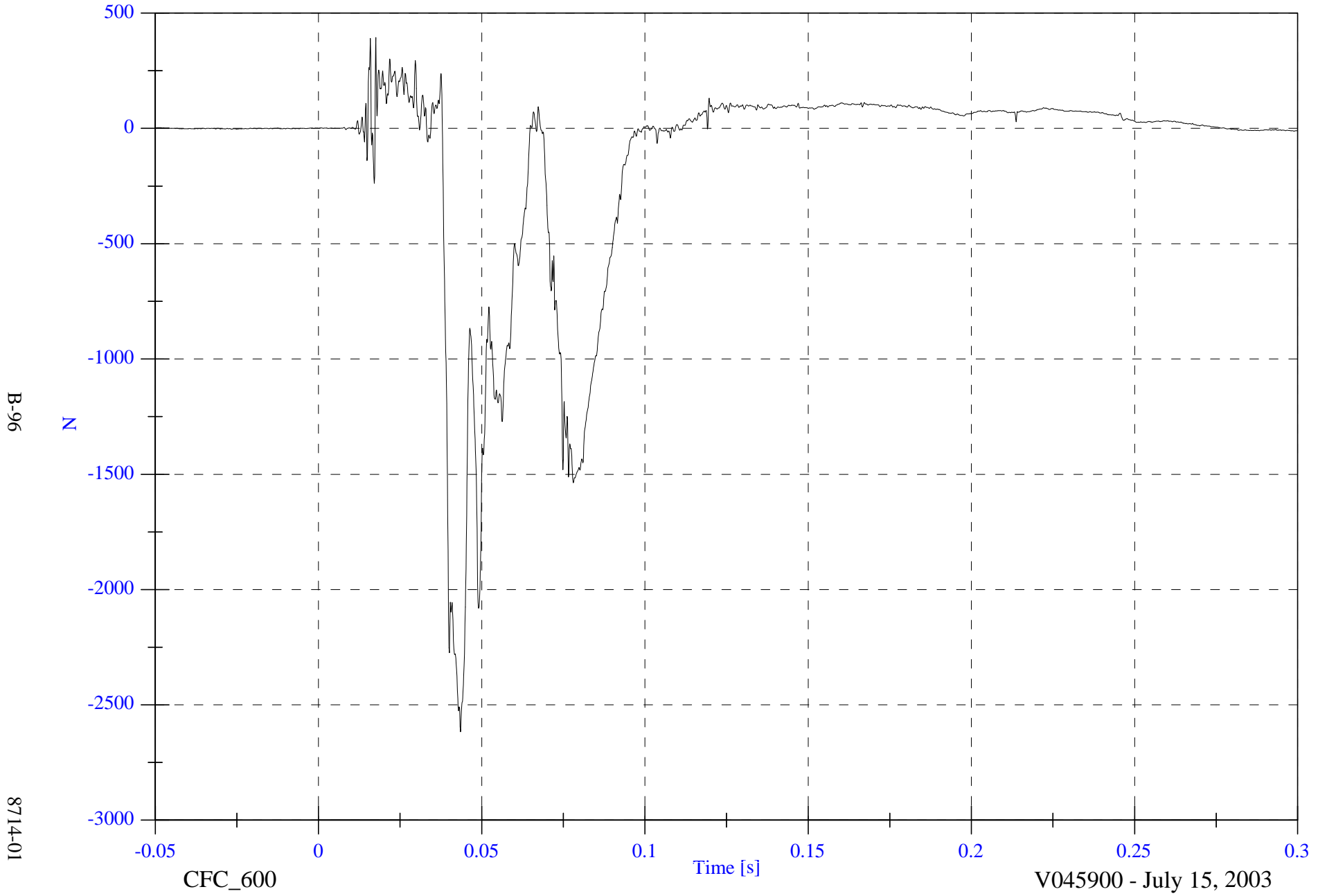
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Left Femur

Max: 393.9 [N] at 0.018 [s]
Min: -2617.4 [N] at 0.043 [s]



B-96

8714-01

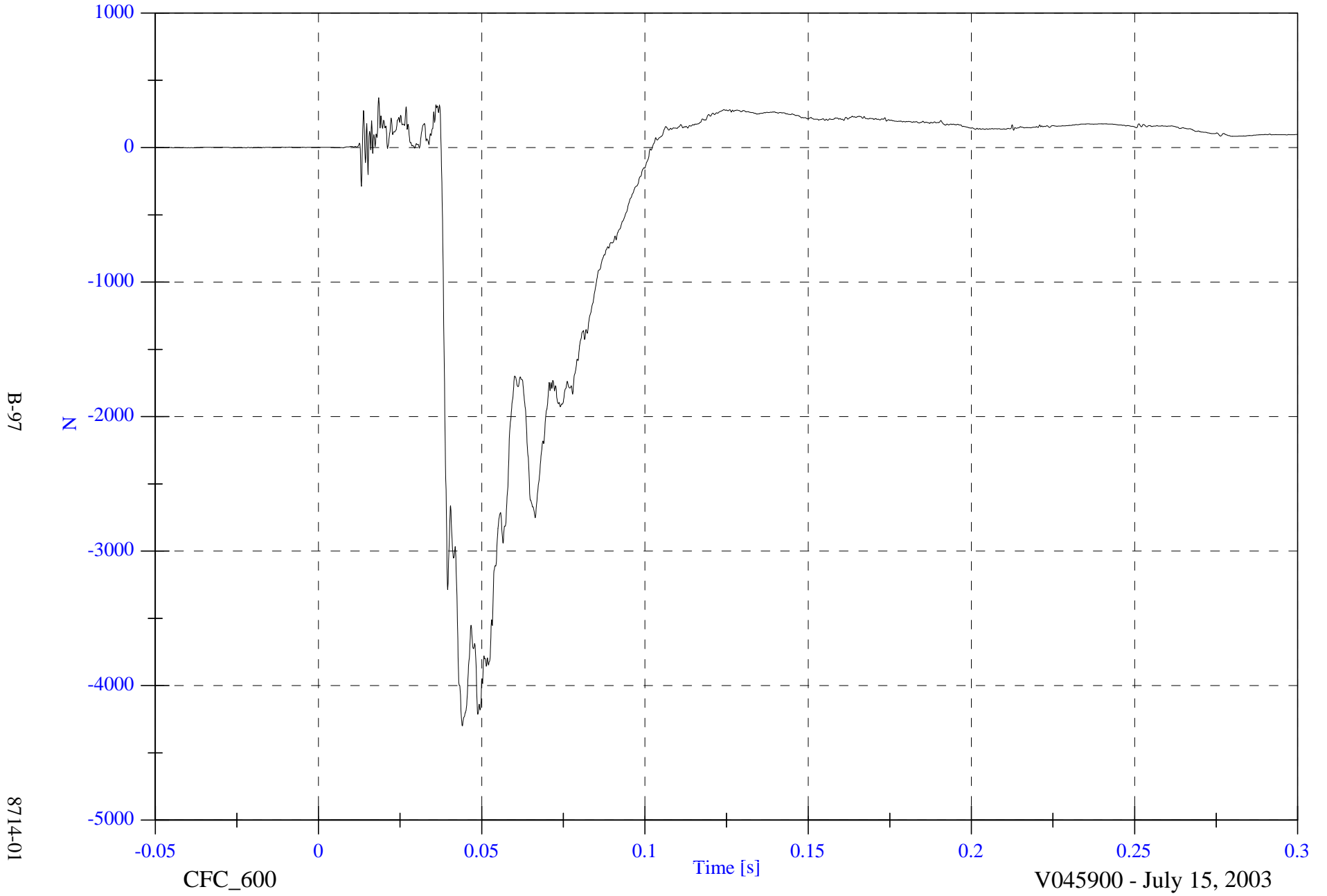
CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Right Femur

Max: 369.9 [N] at 0.018 [s]
Min: -4298.6 [N] at 0.044 [s]



B-97

8714-01

CFC_600

Time [s]

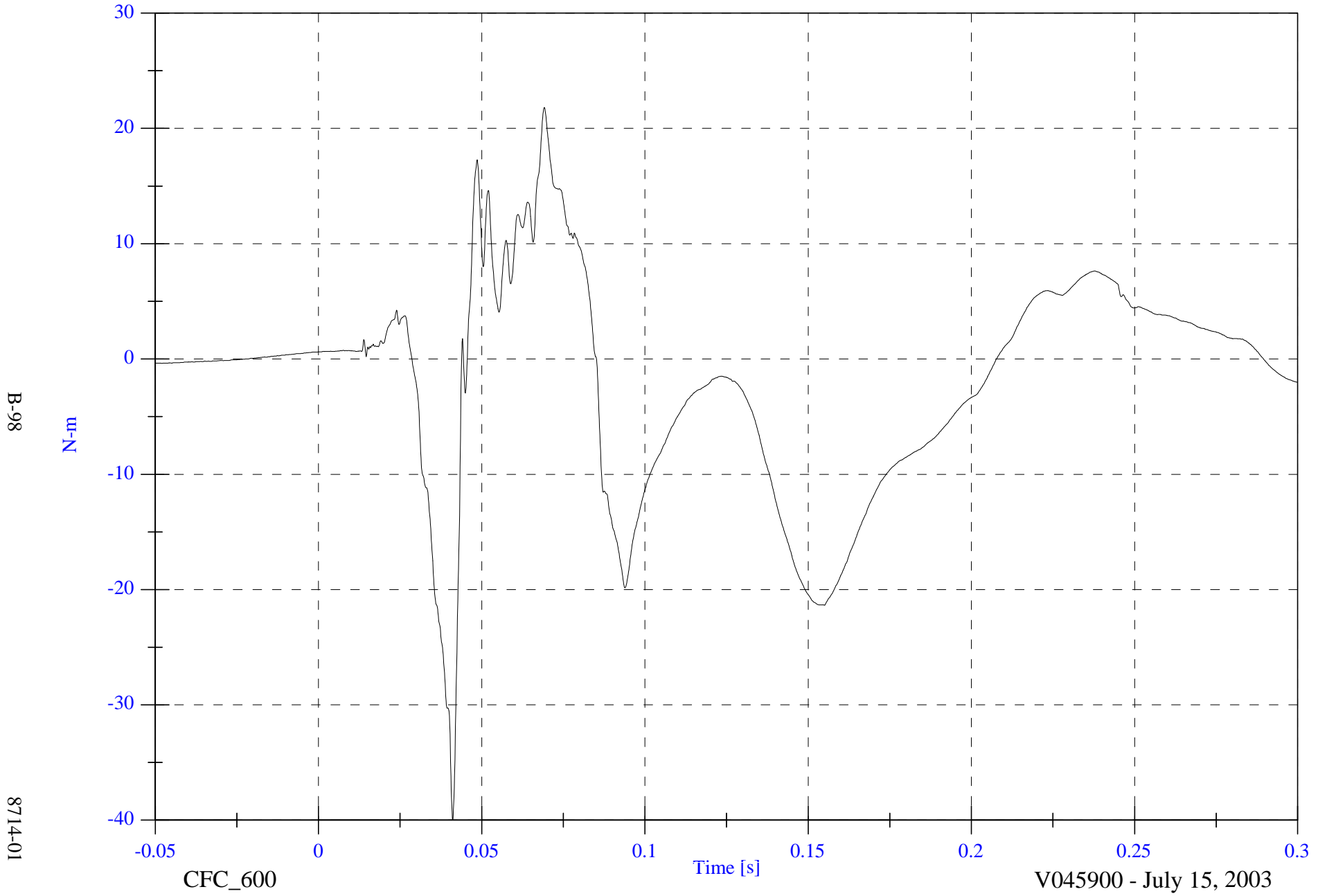
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Left Upper Tibia Mx

Max: 21.8 [N-m] at 0.069 [s]

Min: -40.0 [N-m] at 0.041 [s]



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8714-01

CFC_600

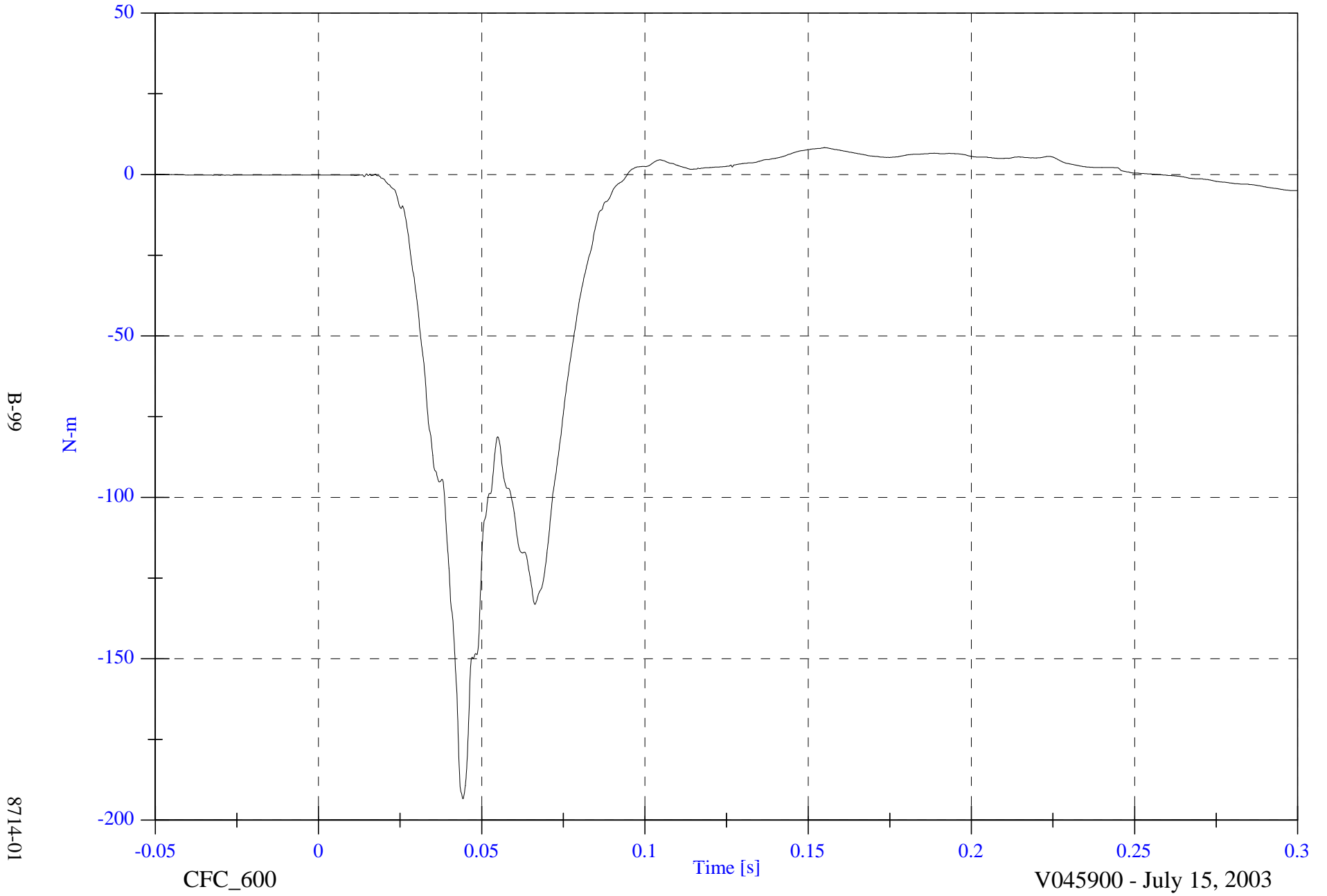
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Left Upper Tibia My

Max: 8.3 [N-m] at 0.155 [s]
Min: -193.4 [N-m] at 0.044 [s]



B-99

8714-01

CFC_600

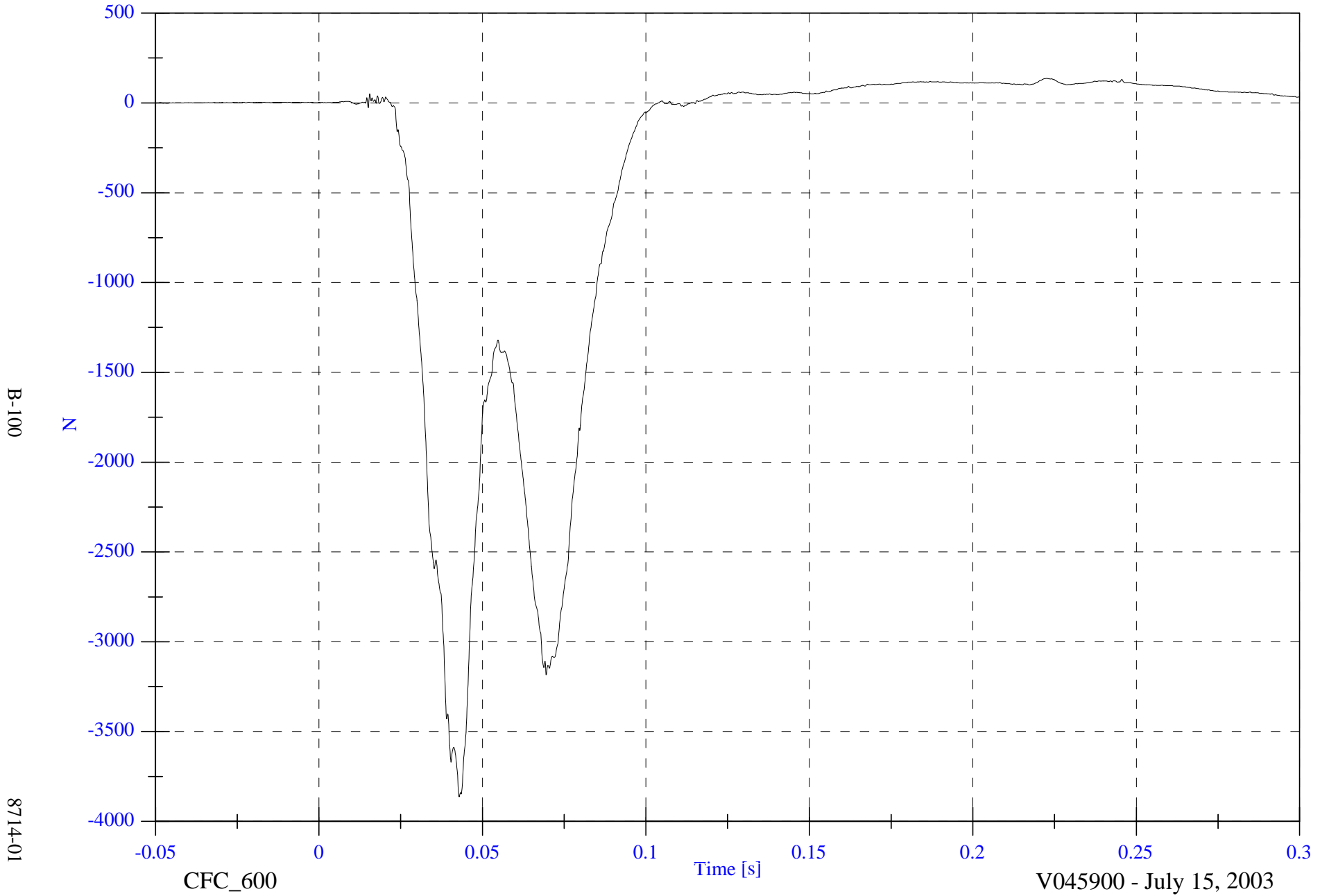
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Left Lower Tibia Fz

Max: 136.0 [N] at 0.223 [s]
Min: -3863.1 [N] at 0.043 [s]



B-100

8714-01

CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

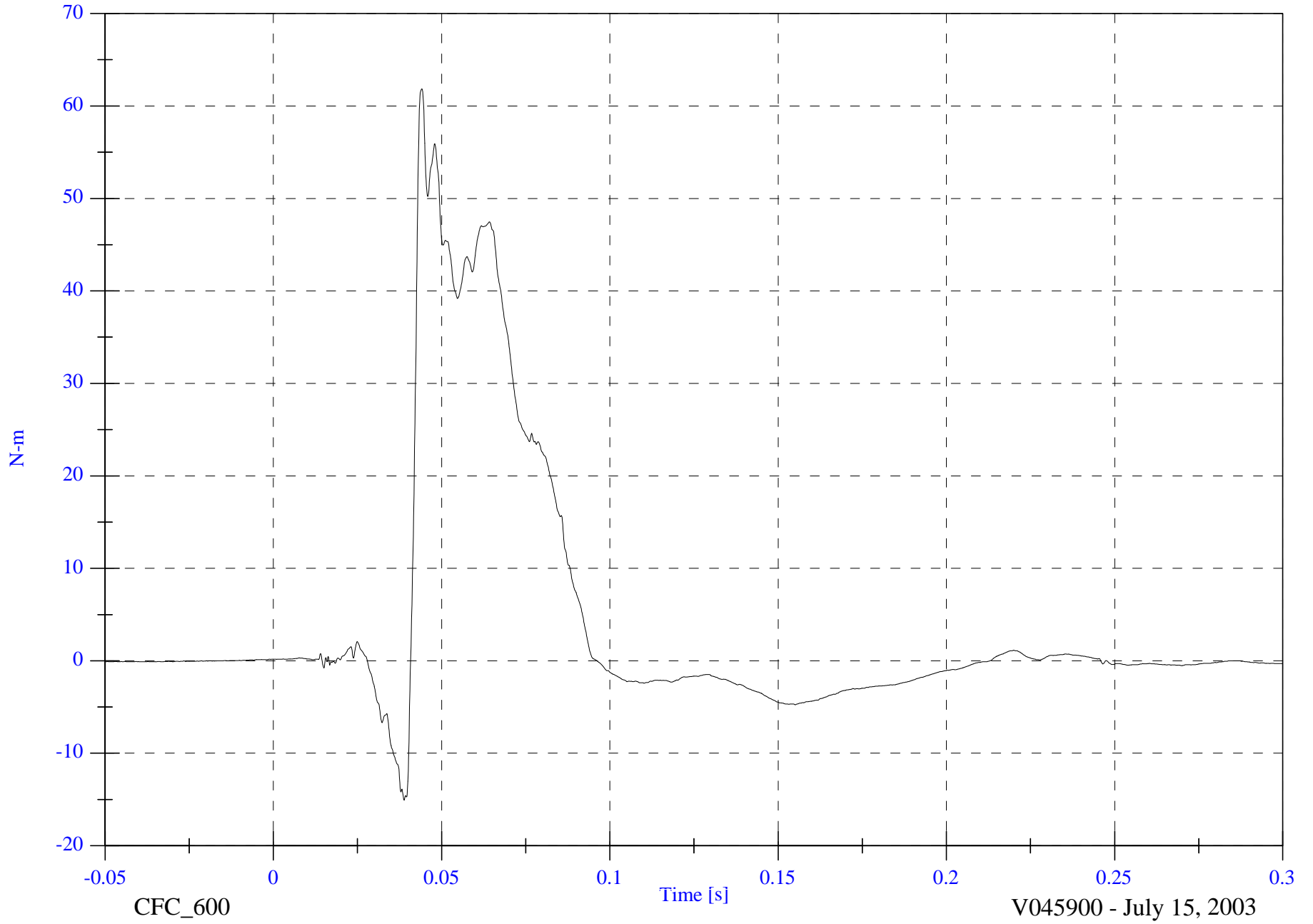
V1P2 Left Lower Tibia Mx

Max: 61.8 [N-m] at 0.044 [s]

Min: -15.1 [N-m] at 0.039 [s]

B-101

8714-01



CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

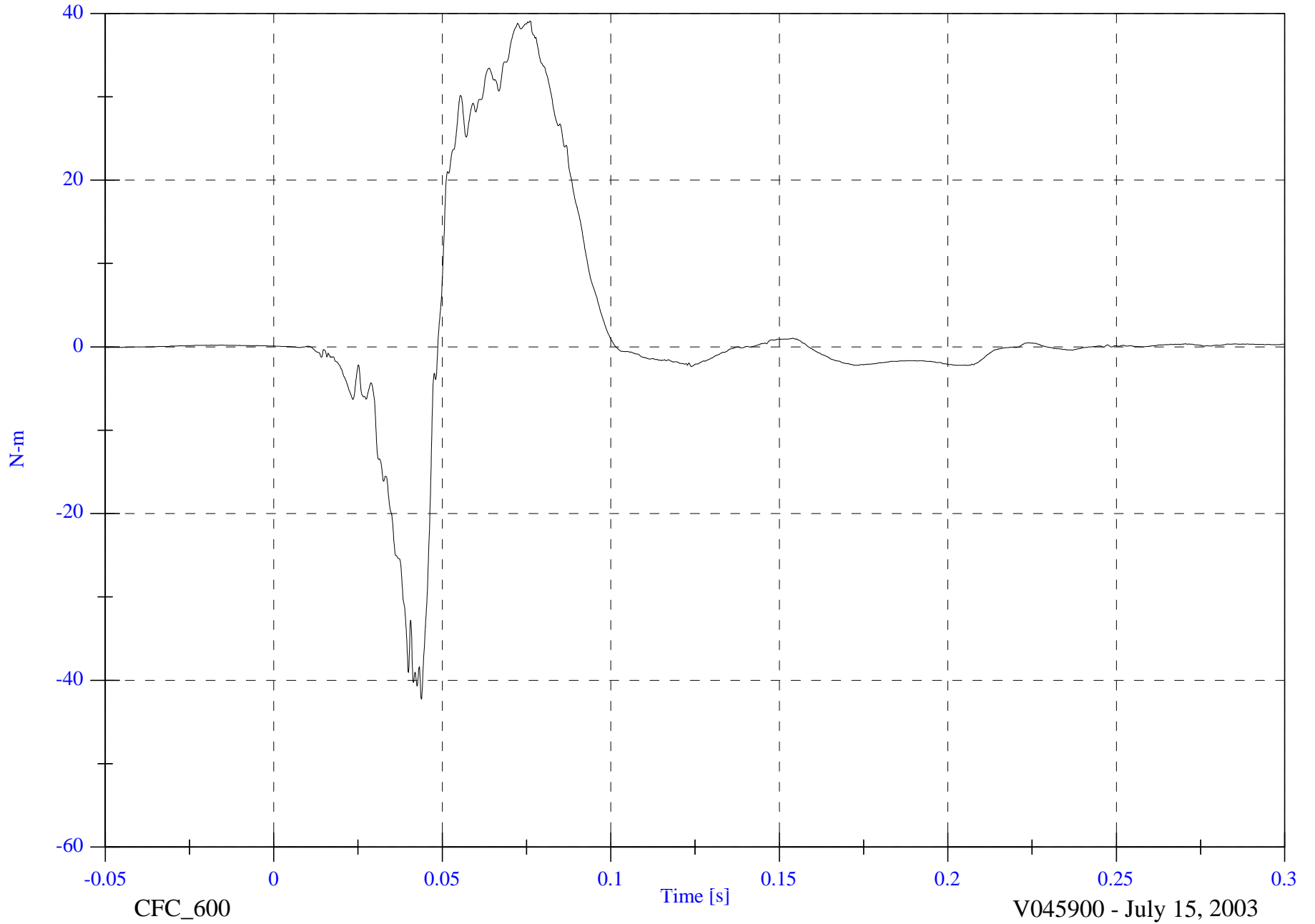
V1P2 Left Lower Tibia My

Max: 39.1 [N-m] at 0.076 [s]

Min: -42.2 [N-m] at 0.044 [s]

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8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

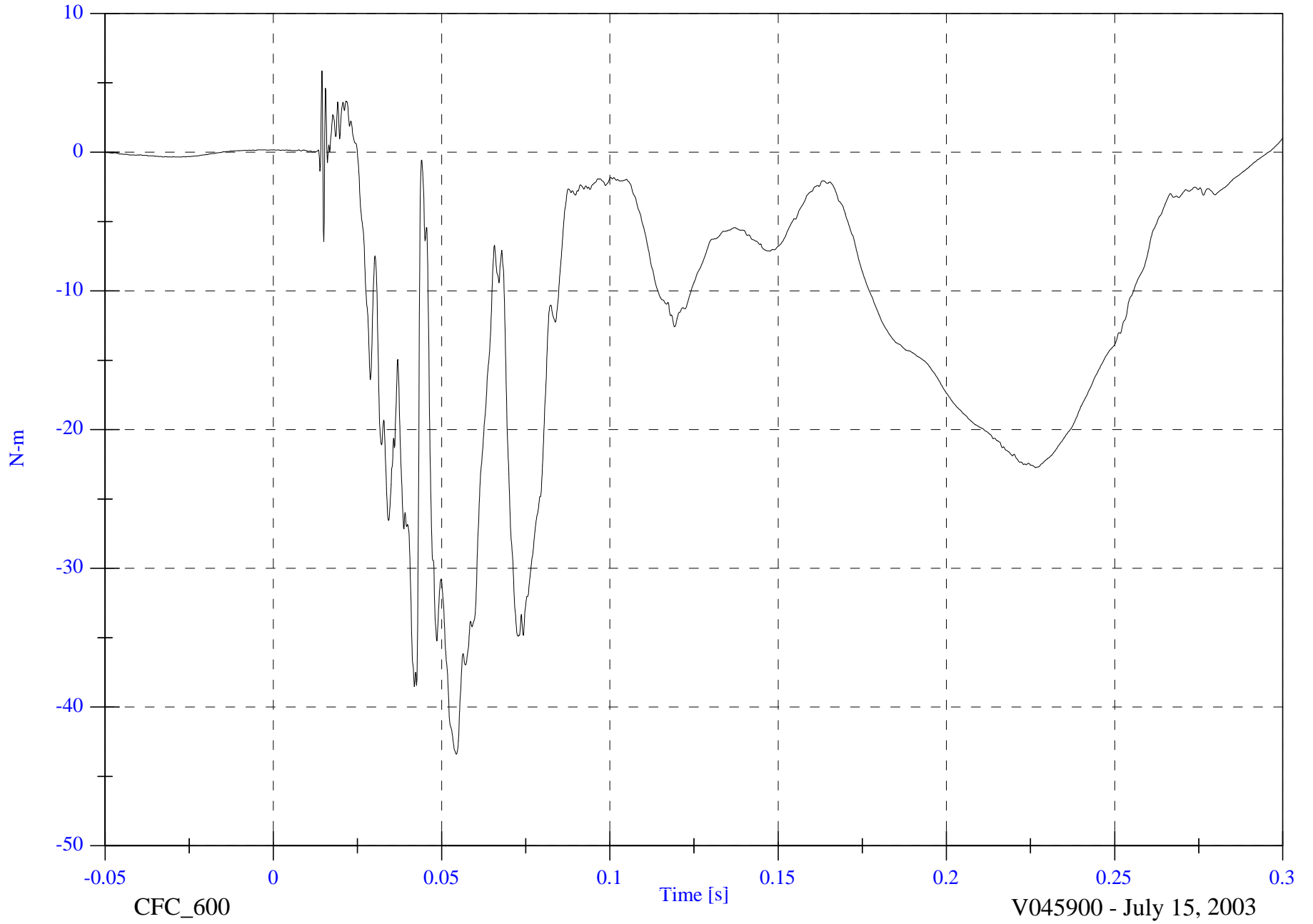
V1P2 Right Upper Tibia Mx

Max: 5.9 [N-m] at 0.014 [s]

Min: -43.4 [N-m] at 0.054 [s]

B-103

8714-01



CFC_600

Time [s]

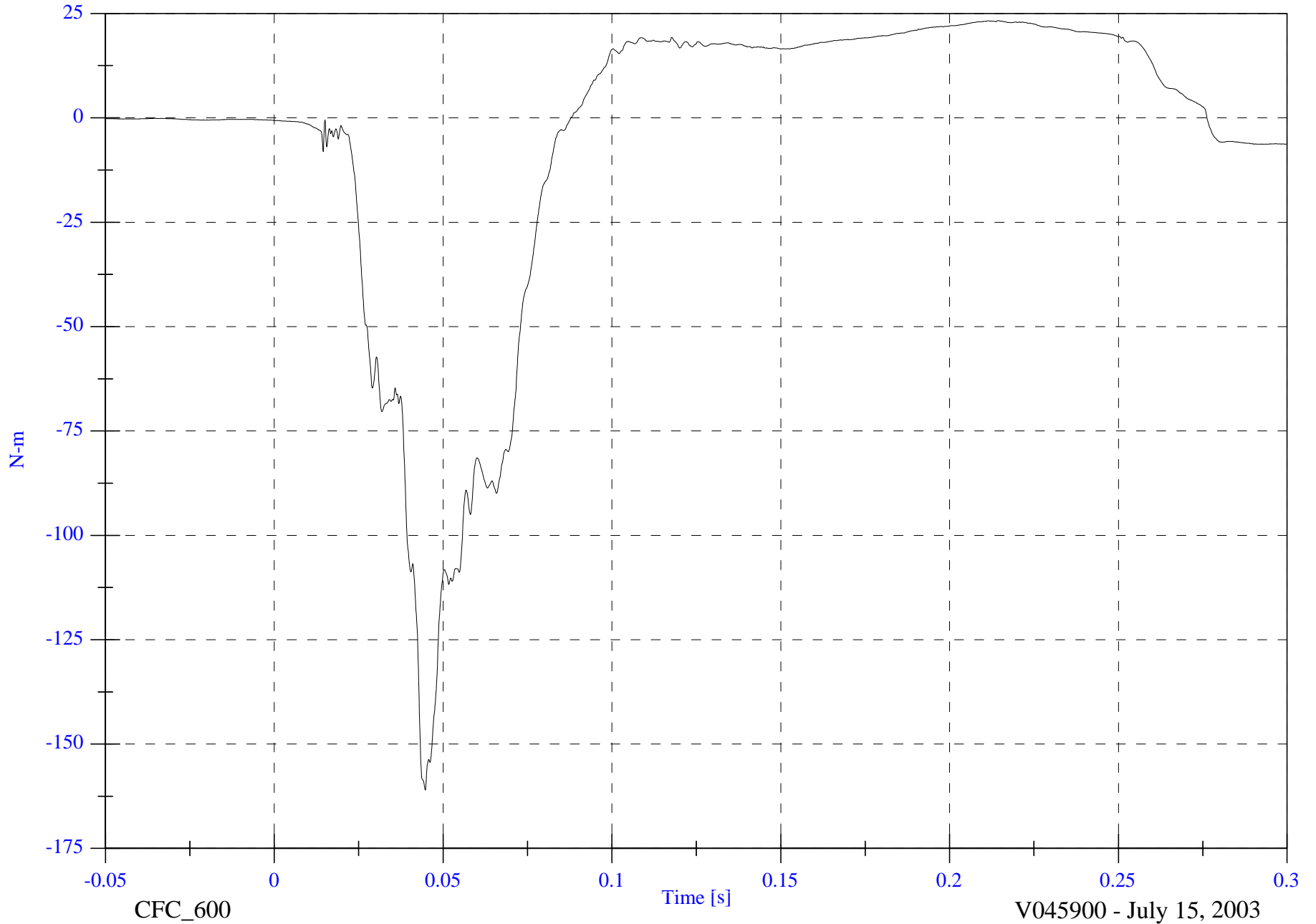
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Right Upper Tibia My

Max: 23.3 [N-m] at 0.214 [s]

Min: -161.0 [N-m] at 0.045 [s]



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8714-01

CFC_600

Time [s]

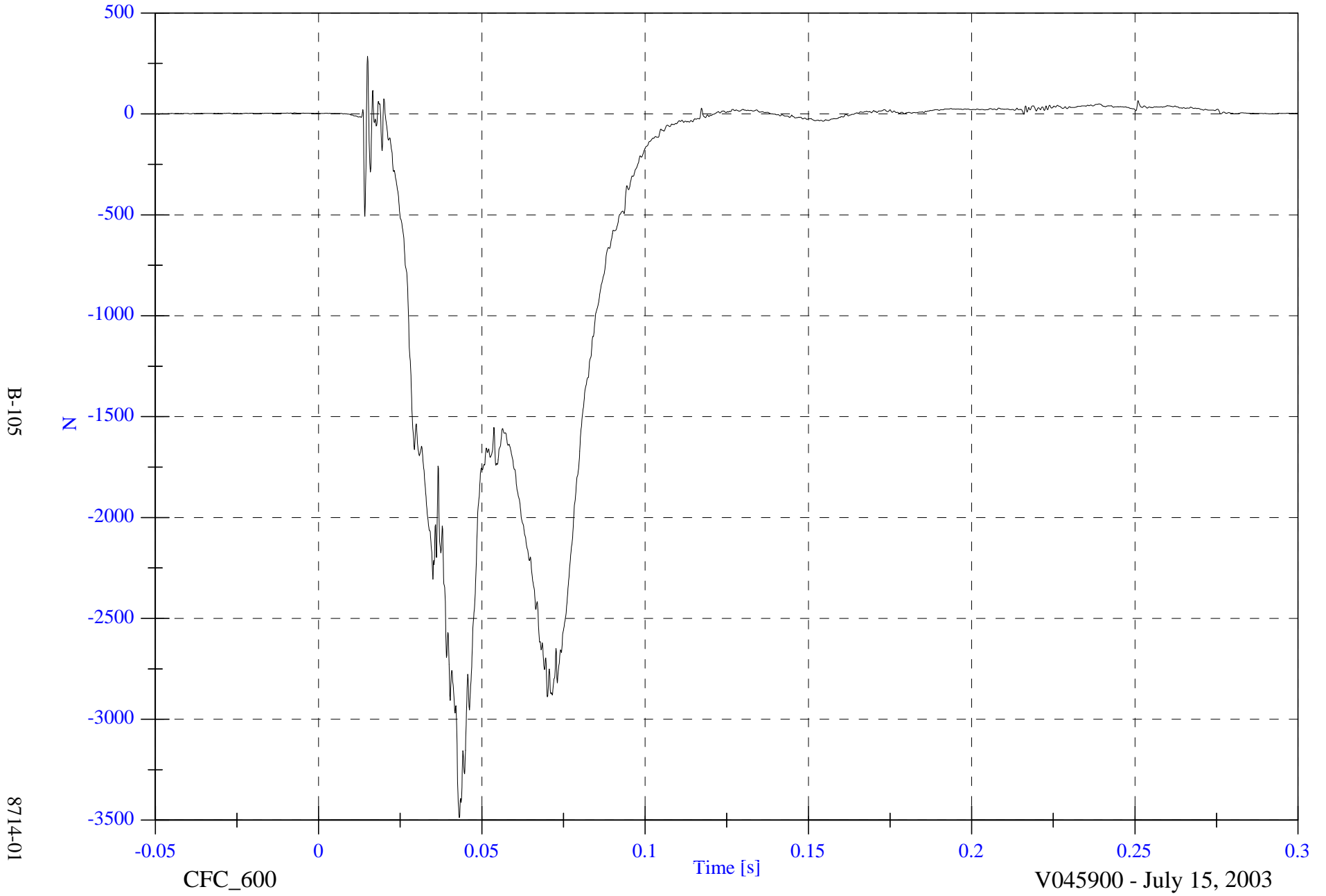
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Right Lower Tibia Fz

Max: 285.7 [N] at 0.015 [s]

Min: -3487.8 [N] at 0.043 [s]



B-105

8714-01

CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

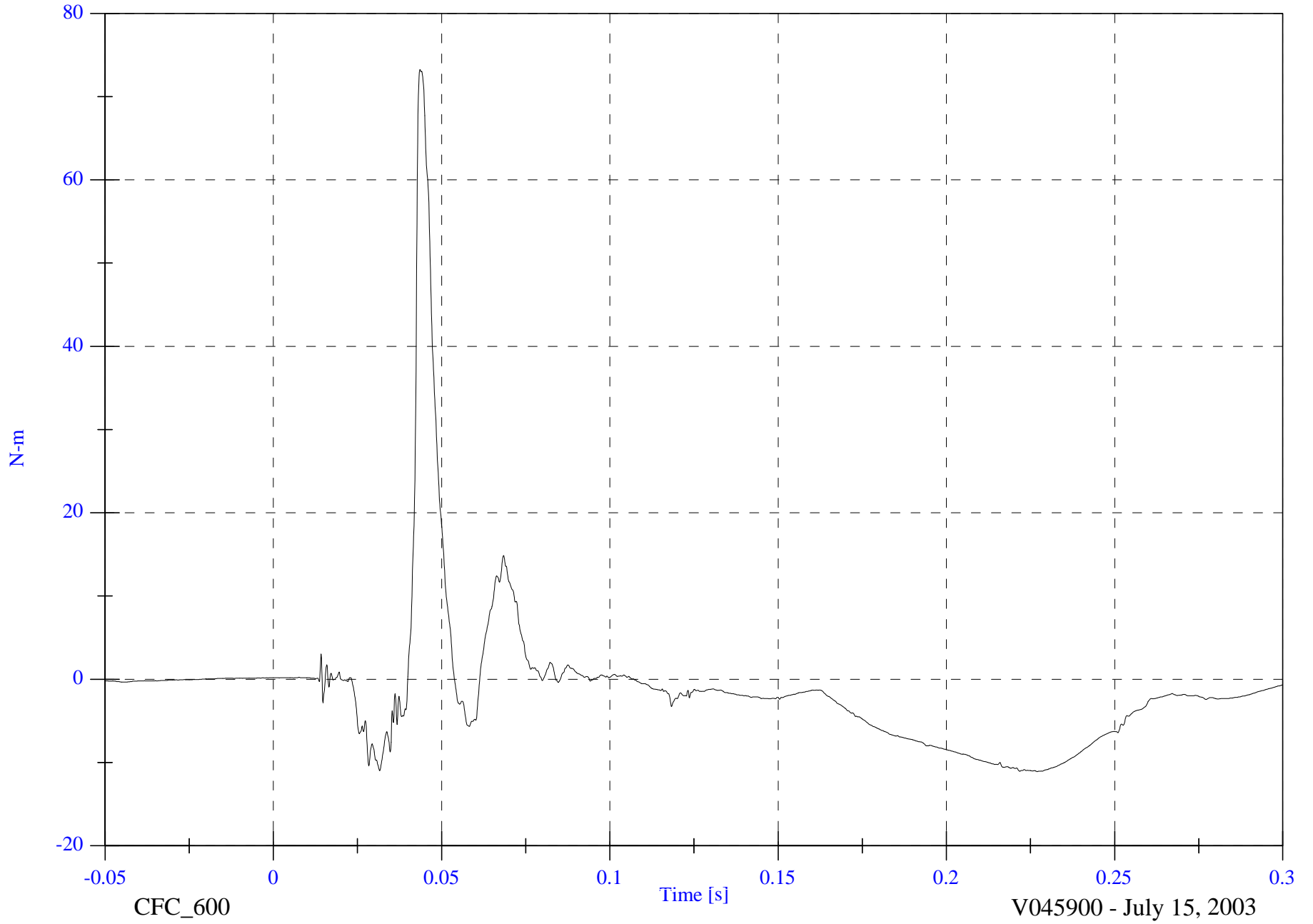
V1P2 Right Lower Tibia Mx

Max: 73.3 [N-m] at 0.044 [s]

Min: -11.1 [N-m] at 0.227 [s]

B-106

8714-01



CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

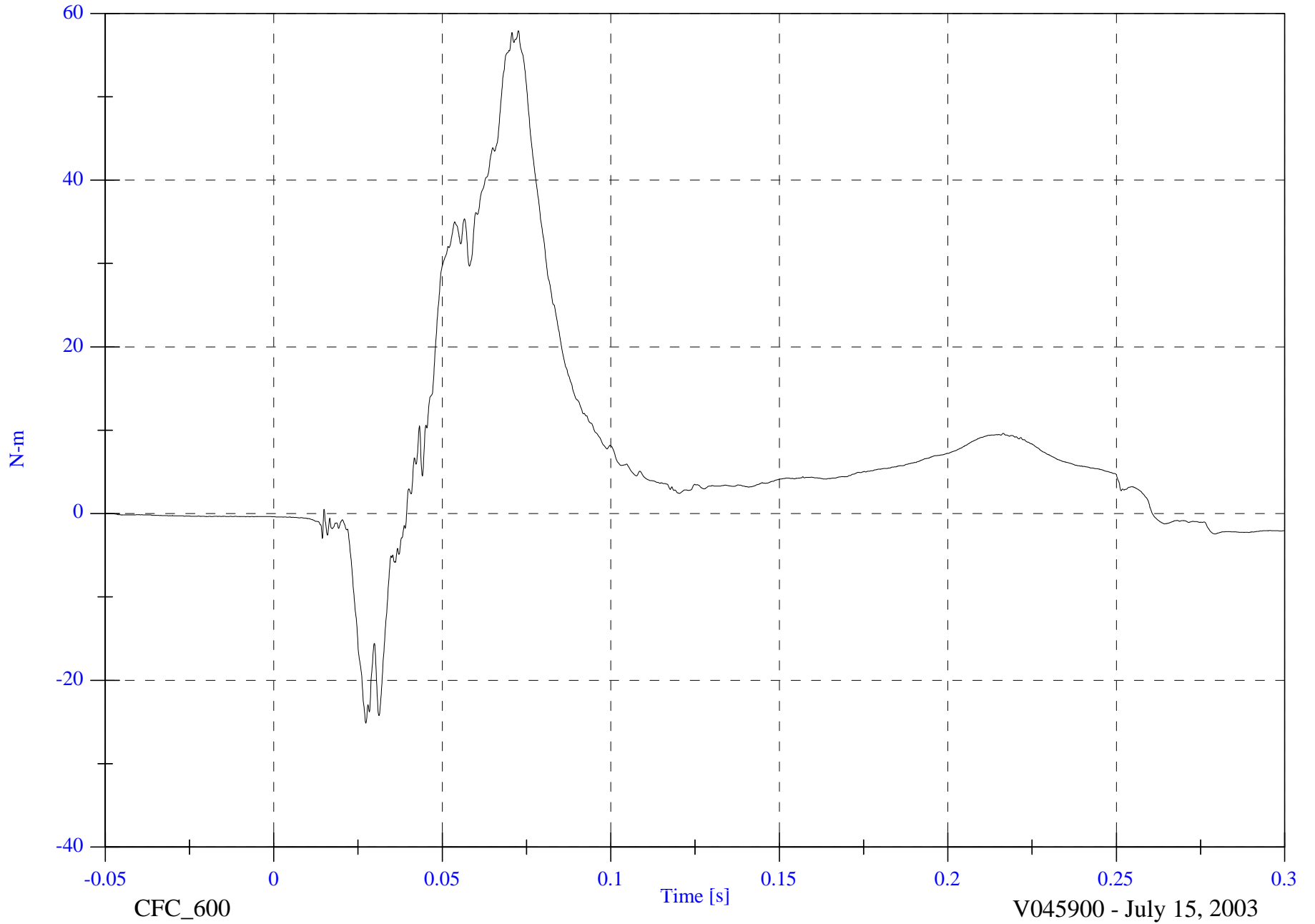
V1P2 Right Lower Tibia My

Max: 57.9 [N-m] at 0.073 [s]

Min: -25.1 [N-m] at 0.027 [s]

B-107

8714-01



CFC_600

Time [s]

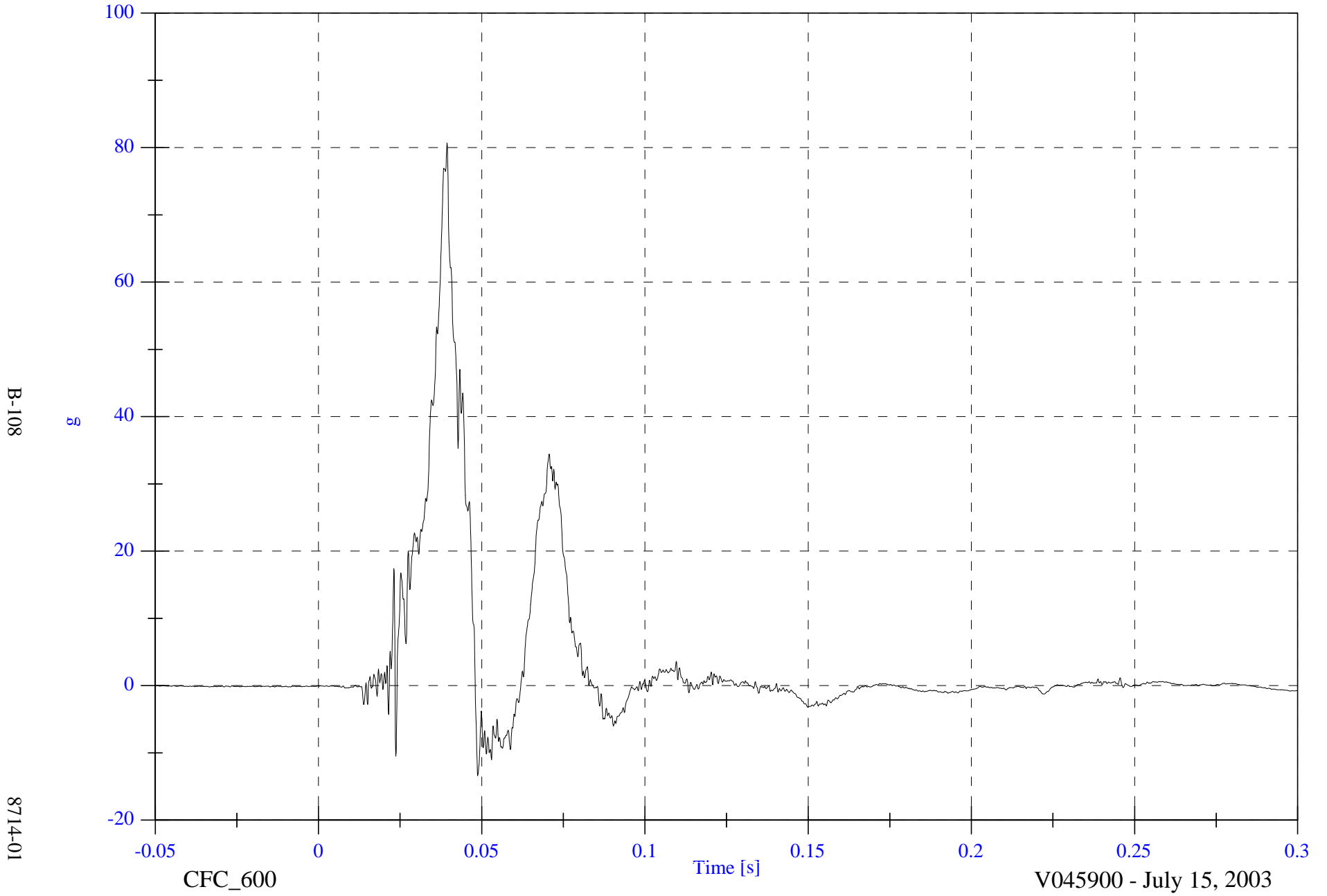
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Left Foot Aft x

Max: 80.7 [g] at 0.039 [s]

Min: -13.4 [g] at 0.049 [s]



B-108

8714-01

CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

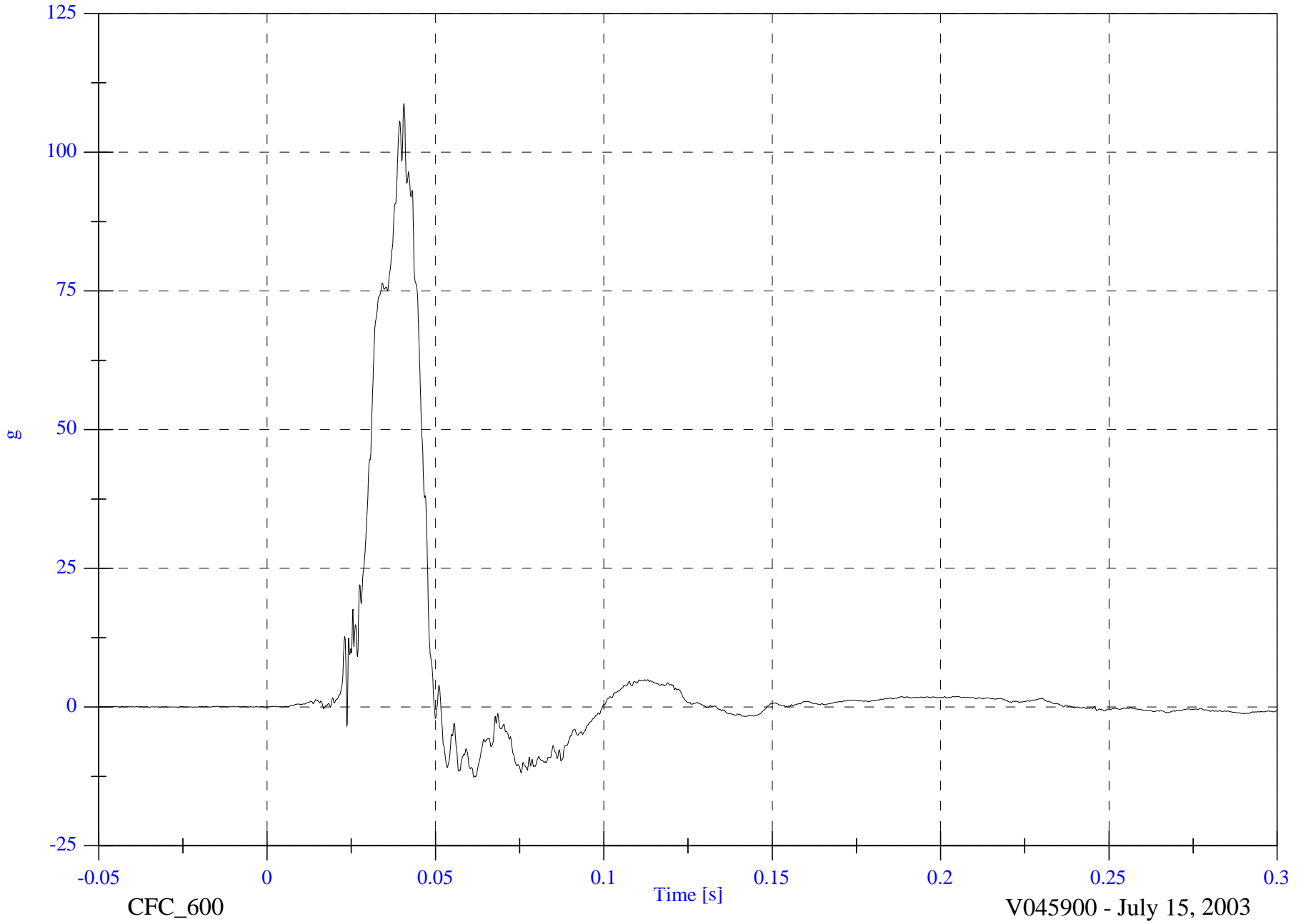
V1P2 Left Foot Aft z

Max: 108.8 [g] at 0.041 [s]

Min: -12.7 [g] at 0.061 [s]

B-109

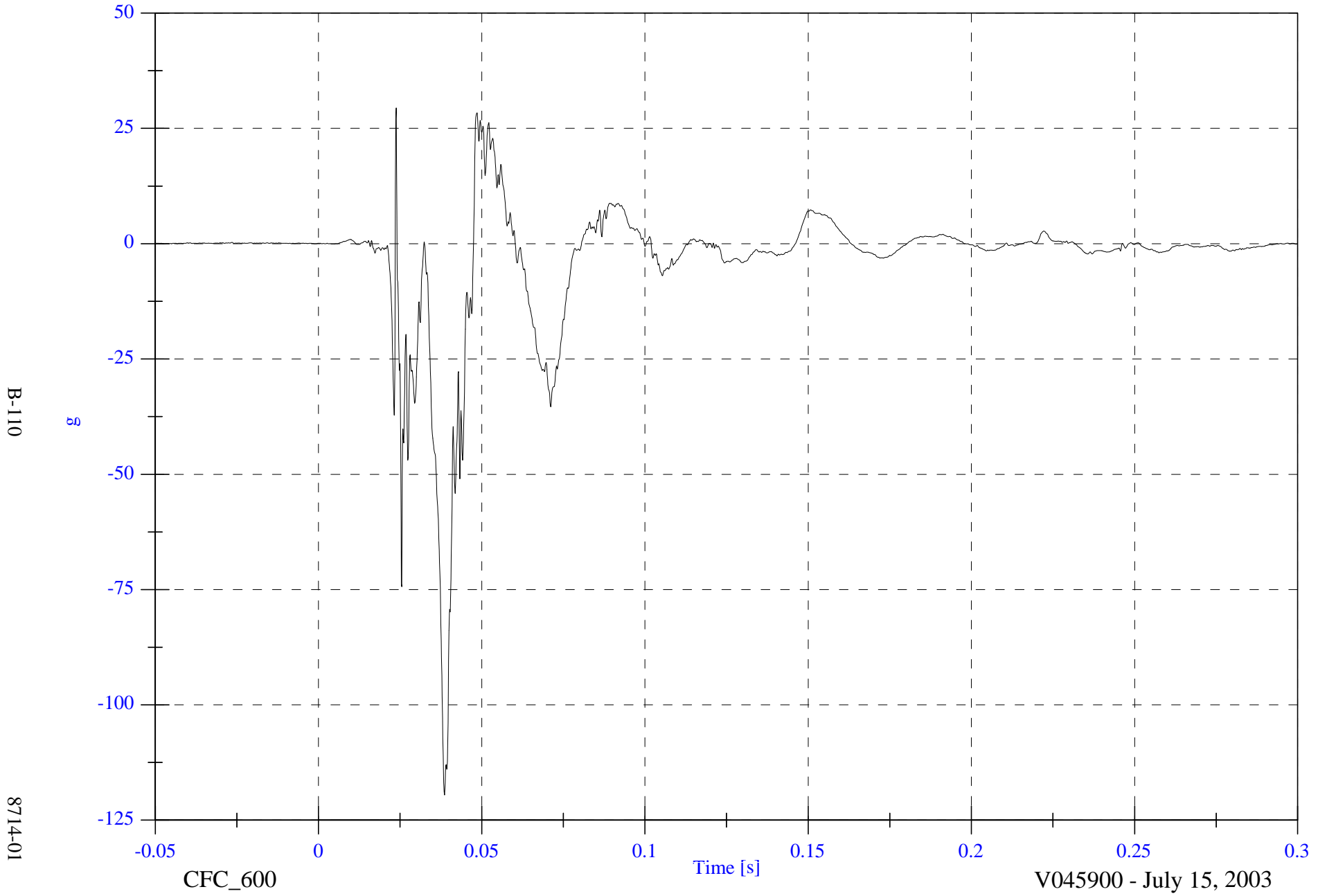
8714-01



2004 Volvo XC90 NCAP

V1P2 Left Foot Fore z

Max: 29.4 [g] at 0.024 [s]
Min: -119.6 [g] at 0.039 [s]

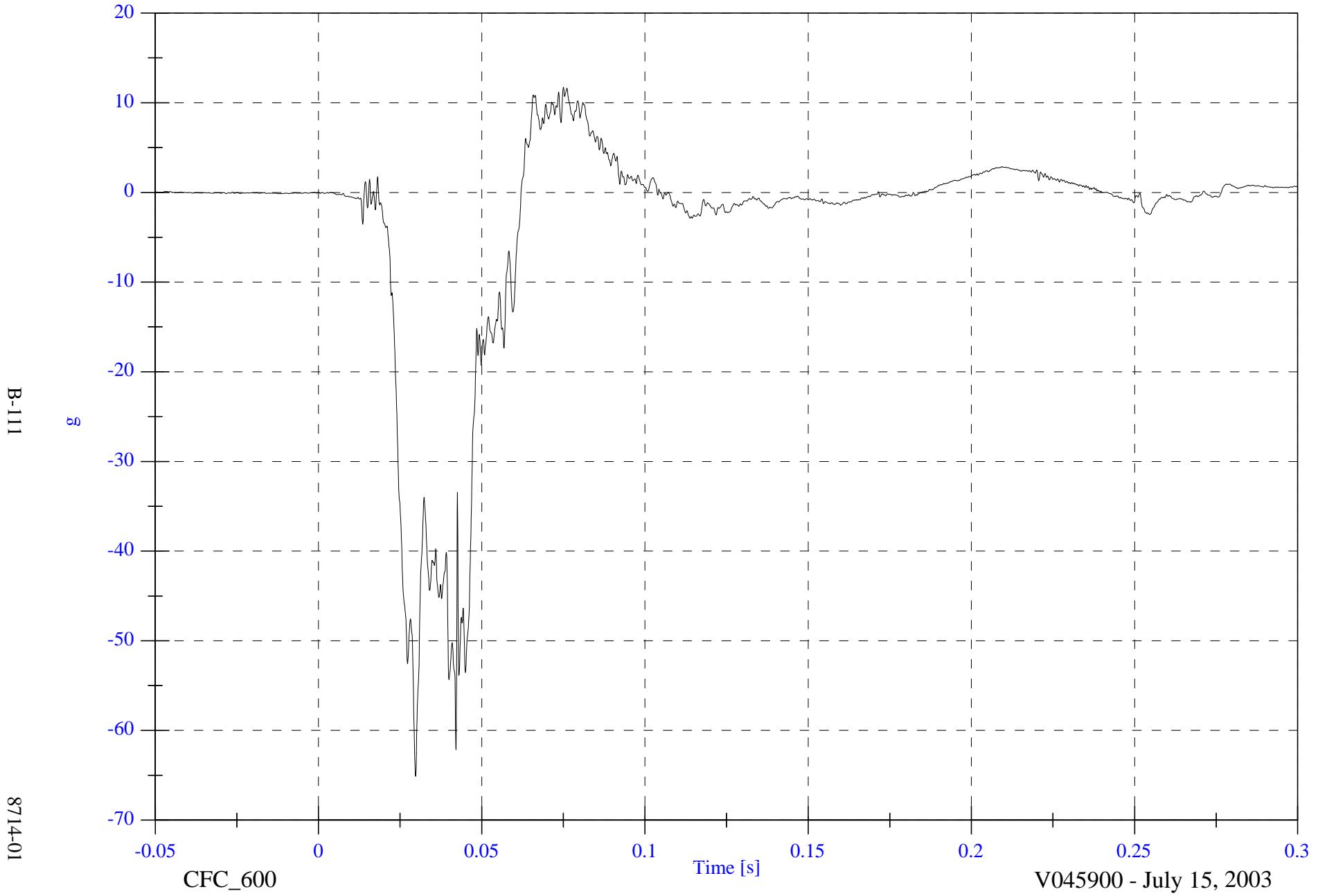


2004 Volvo XC90 NCAP

V1P2 Right Foot Aft x

Max: 11.7 [g] at 0.075 [s]

Min: -65.1 [g] at 0.030 [s]



B-111

8714-01

CFC_600

Time [s]

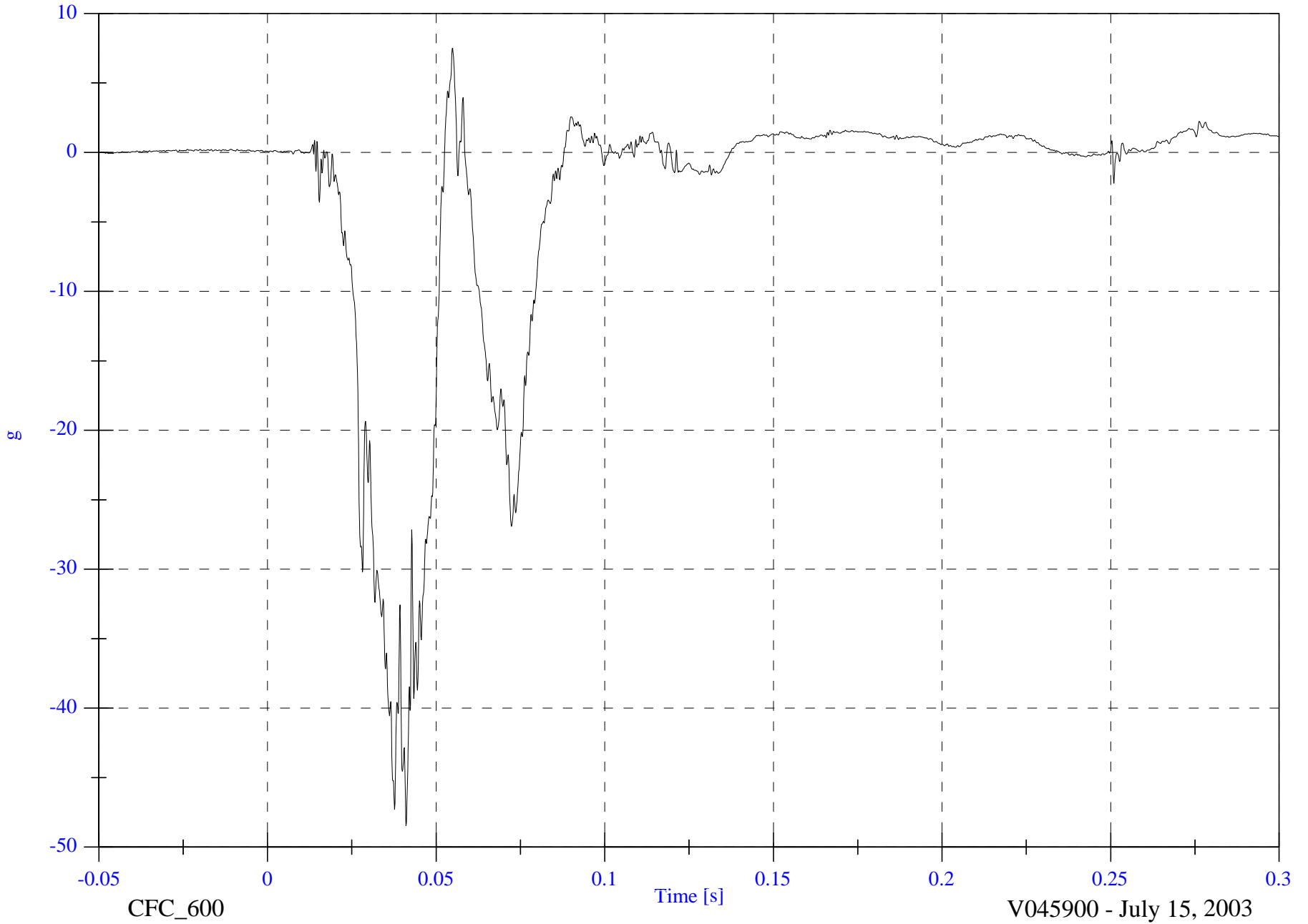
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Right Foot Aft z

Max: 7.5 [g] at 0.055 [s]

Min: -48.5 [g] at 0.041 [s]



B-112

8714-01

CFC_600

Time [s]

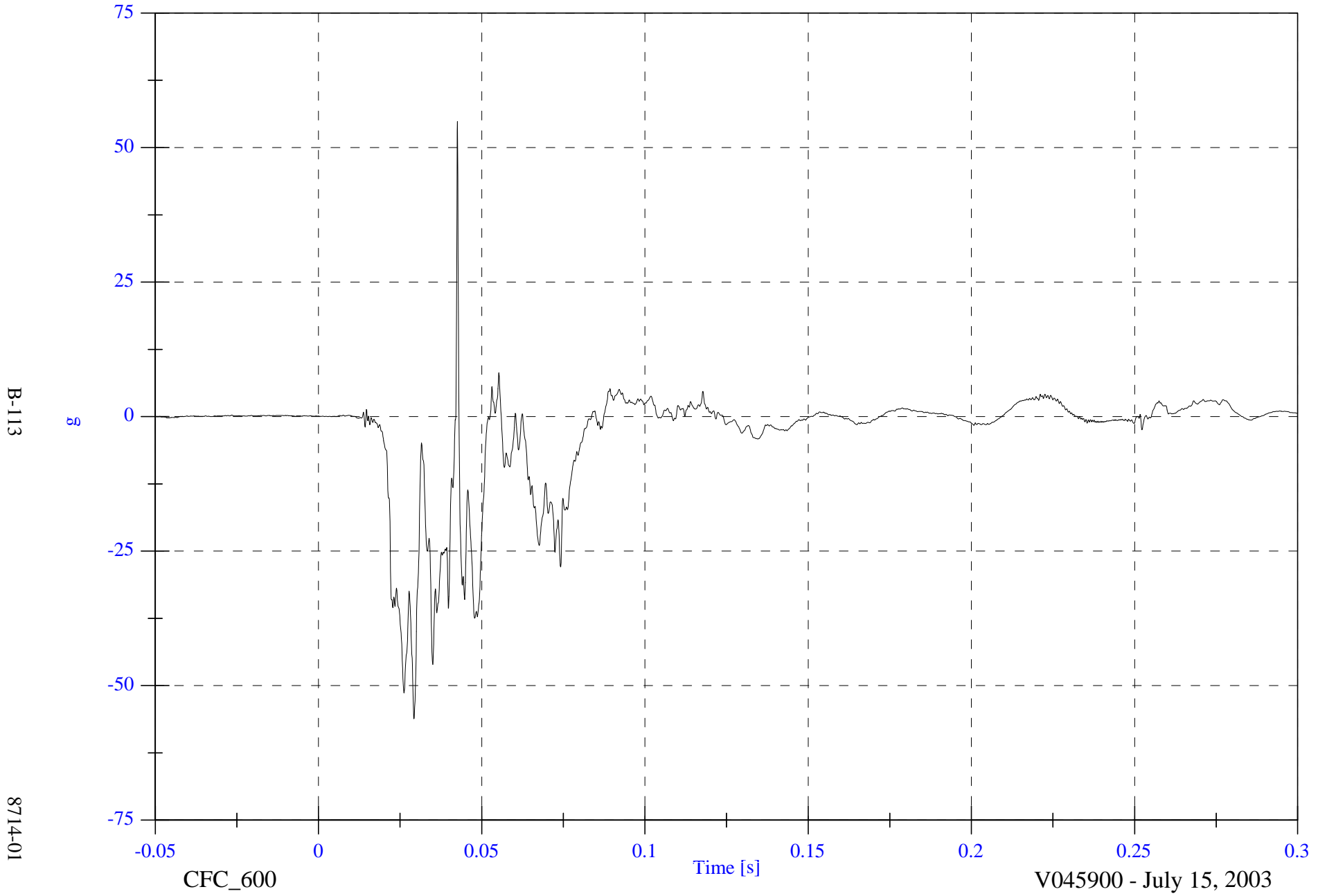
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P2 Right Foot Fore z

Max: 54.8 [g] at 0.043 [s]

Min: -56.2 [g] at 0.029 [s]



B-113

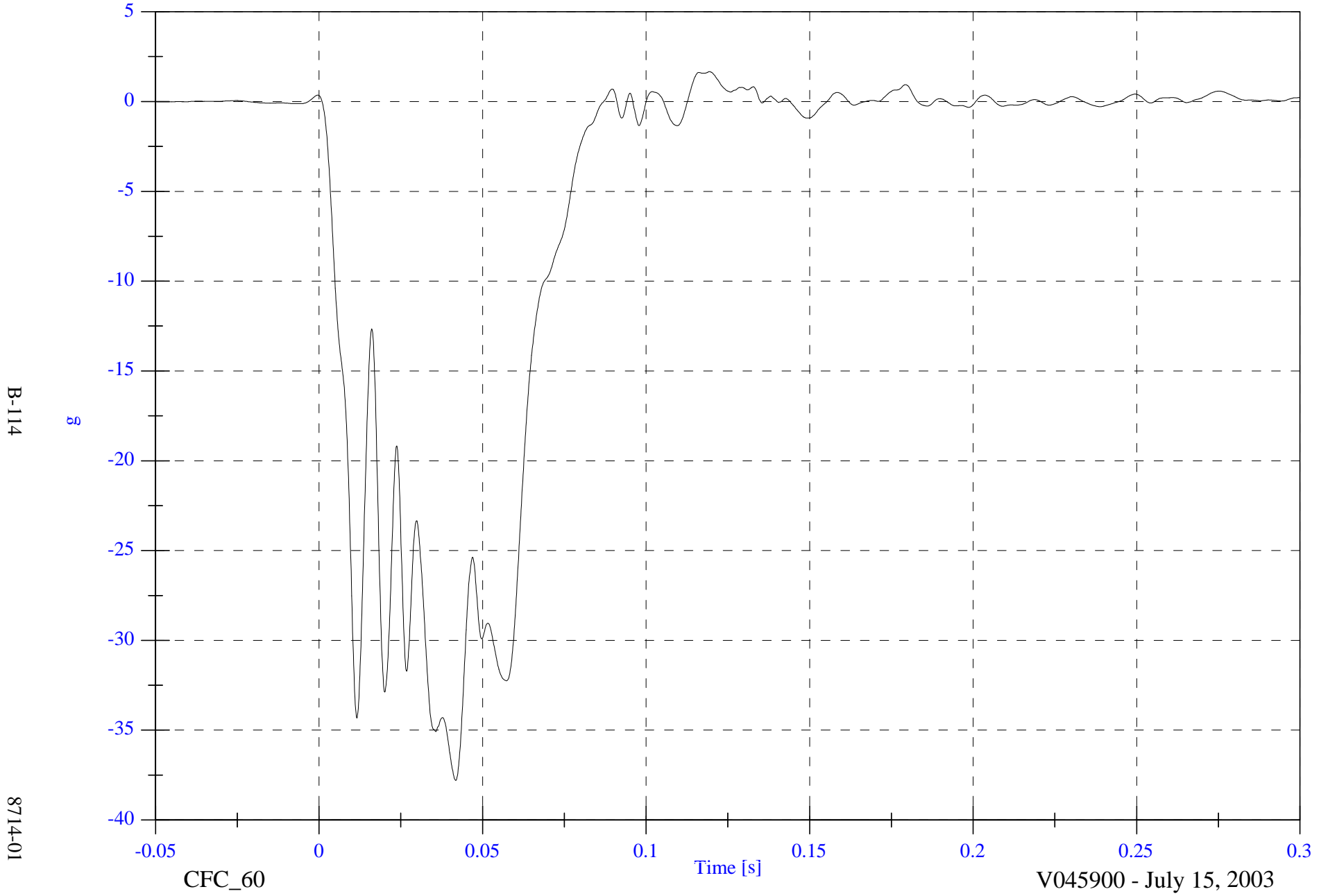
8714-01

2004 Volvo XC90 NCAP

V1 Left Rear #1x

Max: 1.7 [g] at 0.119 [s]

Min: -37.8 [g] at 0.042 [s]



2004 Volvo XC90 NCAP

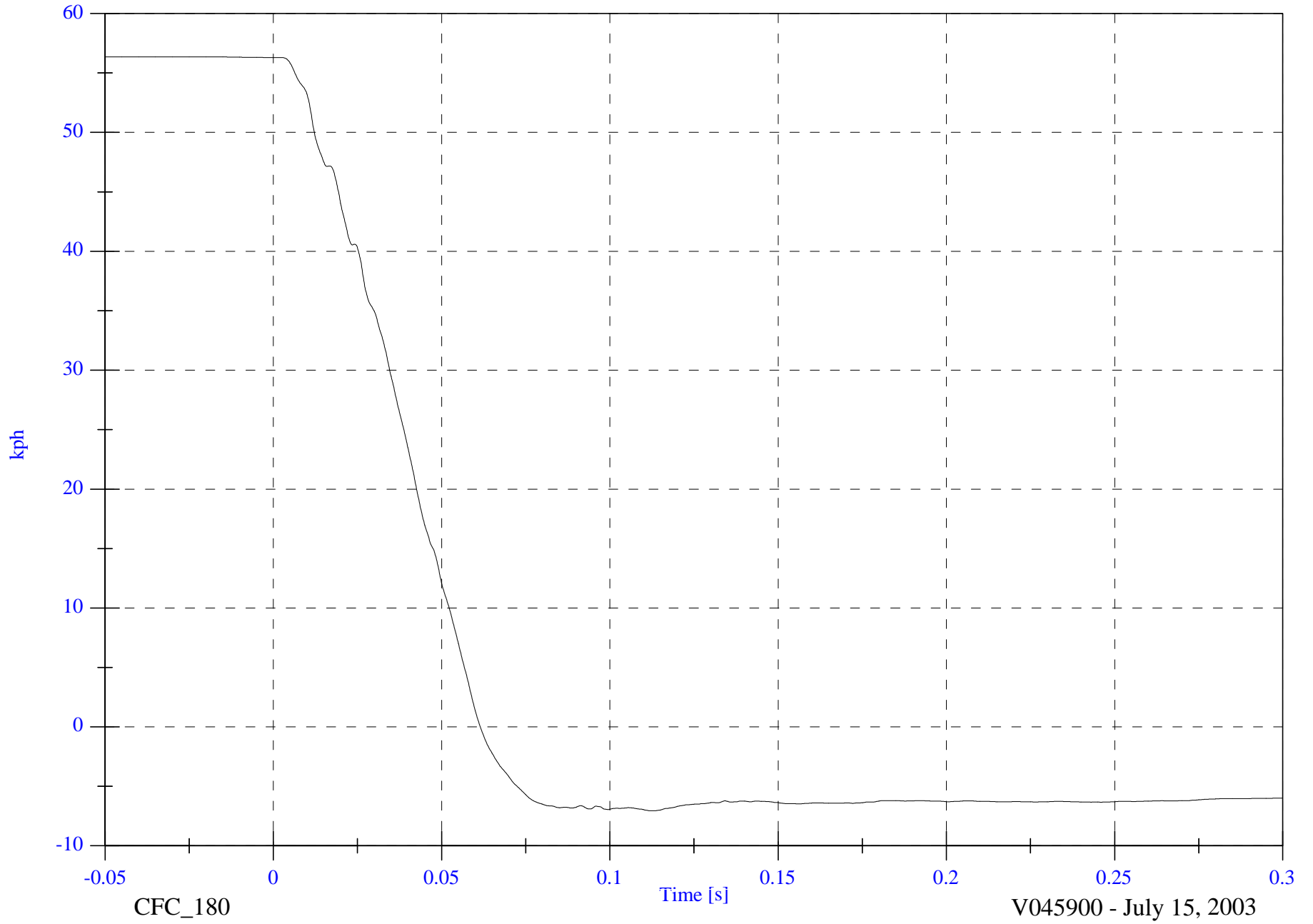
V1 Left Rear #1x Velocity

Max: 56.4 [kph] at -0.022 [s]

Min: -7.1 [kph] at 0.112 [s]

B-115

8714-01



CFC_180

Time [s]

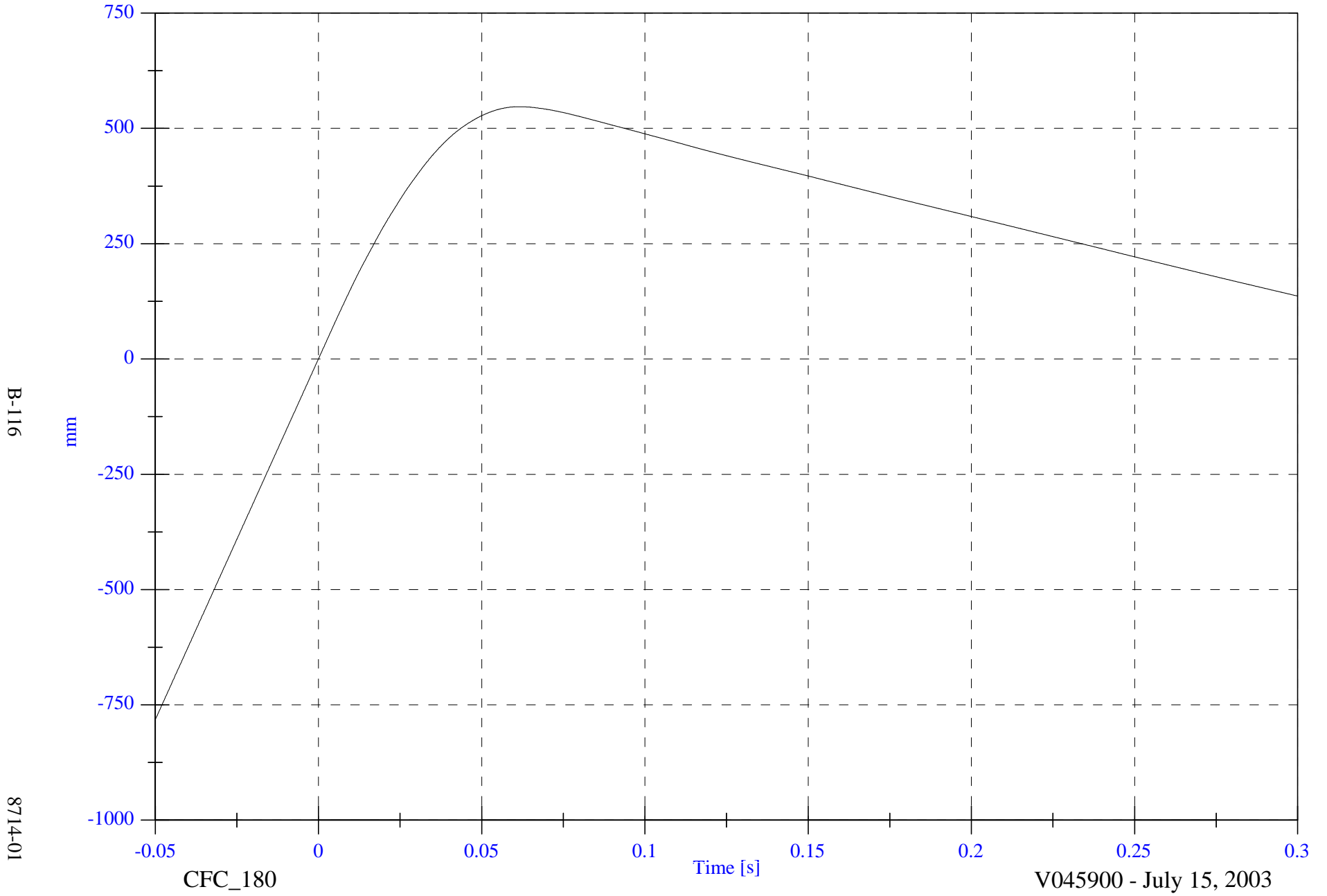
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Left Rear #1x Displacement

Max: 547.0 [mm] at 0.062 [s]

Min: -782.5 [mm] at -0.050 [s]



B-116

8714-01

CFC_180

Time [s]

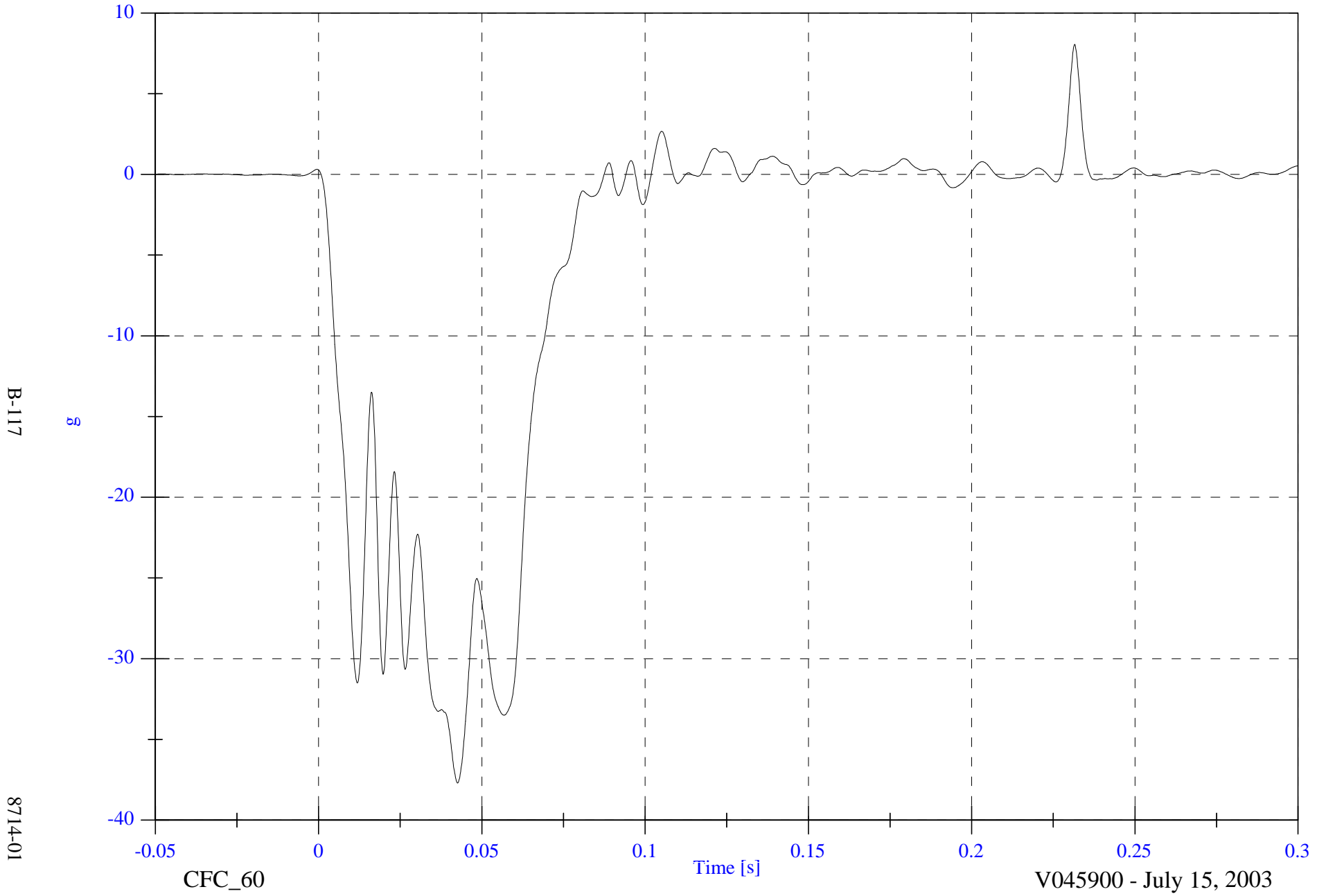
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Right Rear #2x

Max: 8.1 [g] at 0.232 [s]

Min: -37.7 [g] at 0.043 [s]



2004 Volvo XC90 NCAP

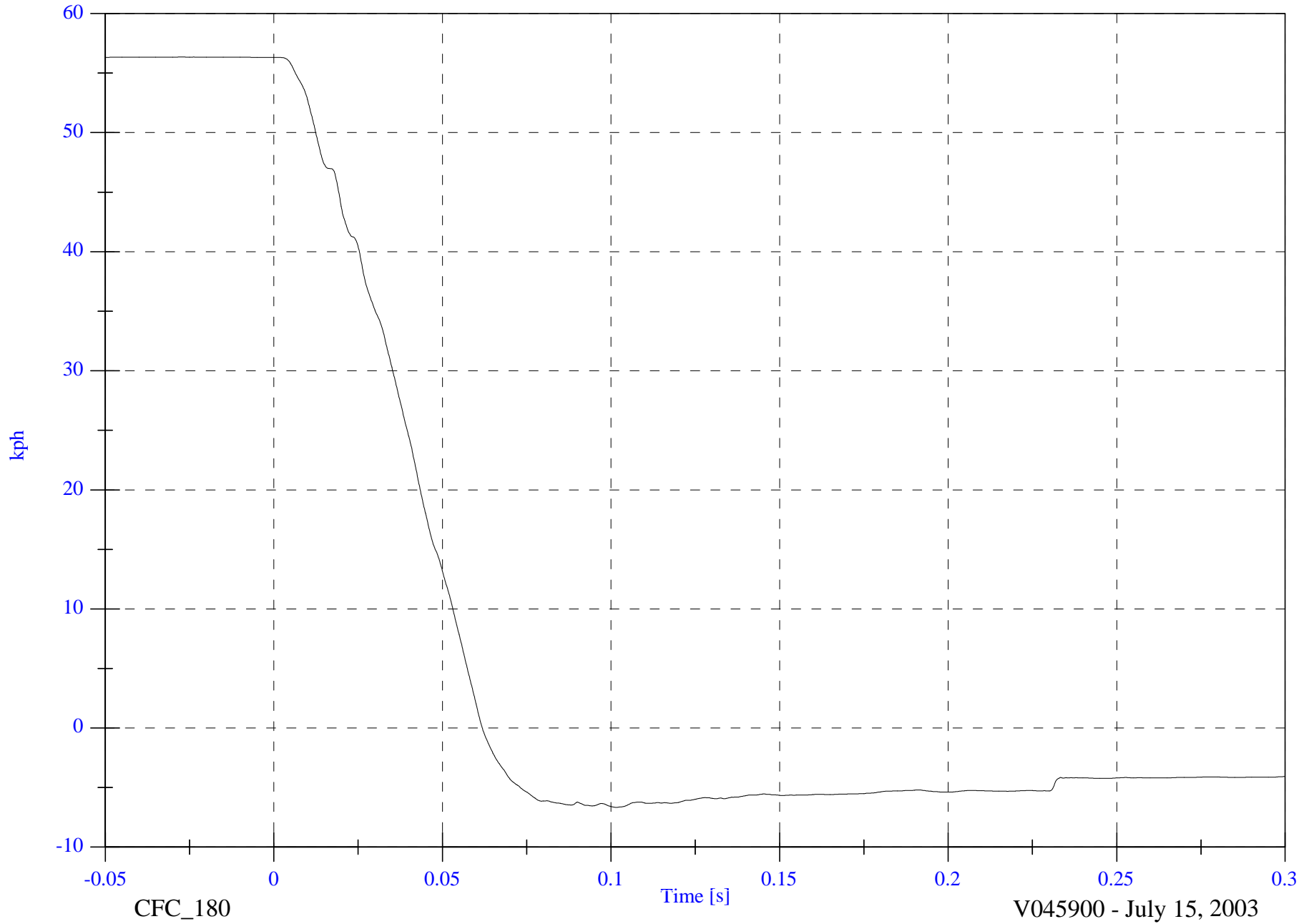
V1 Right Rear #2x Velocity

Max: 56.3 [kph] at -0.027 [s]

Min: -6.7 [kph] at 0.101 [s]

B-118

8714-01



CFC_180

Time [s]

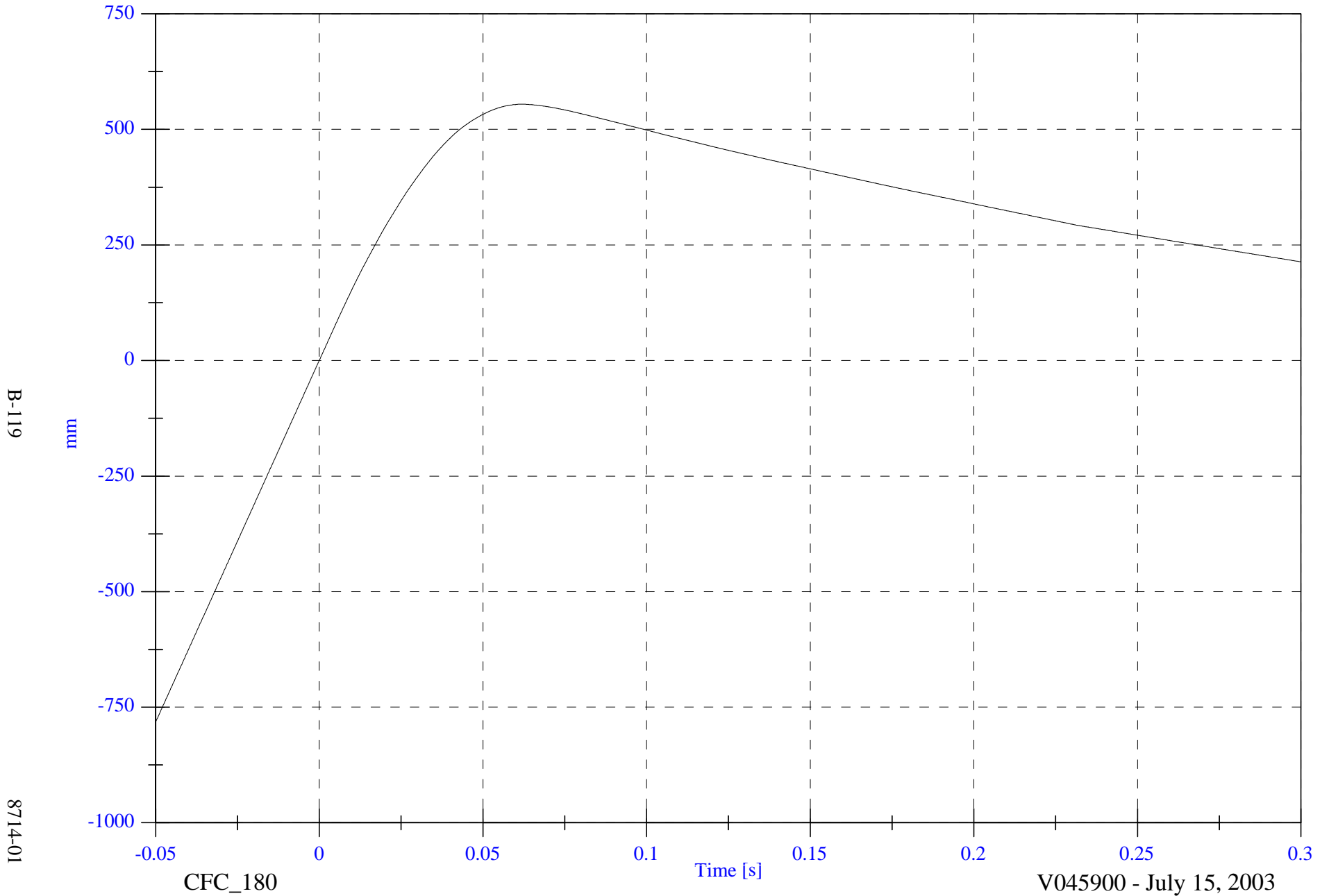
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Right Rear #2x Displacement

Max: 554.3 [mm] at 0.062 [s]

Min: -782.3 [mm] at -0.050 [s]



B-119

8714-01

CFC_180

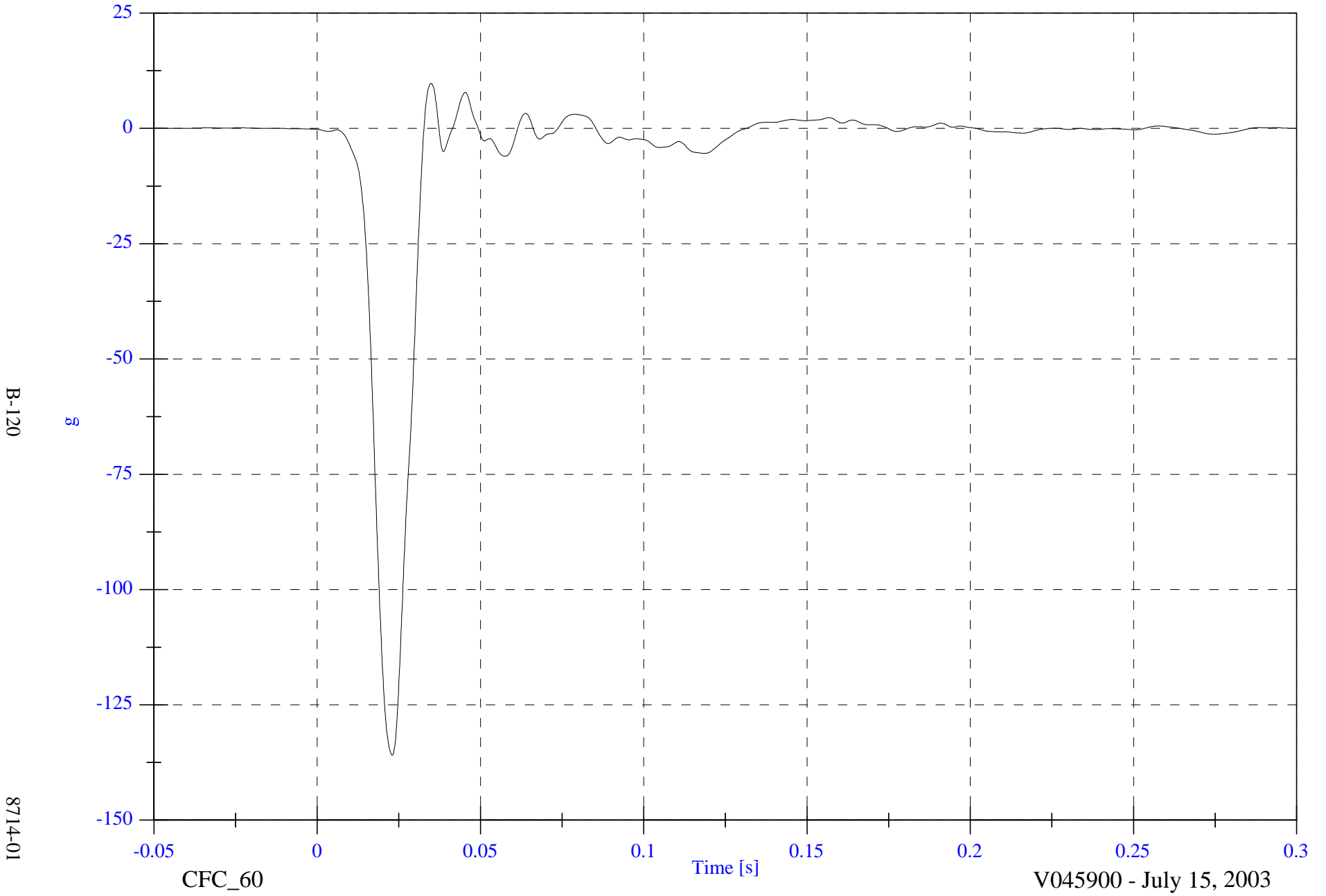
Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Engine Top #3x

Max: 9.7 [g] at 0.035 [s]
Min: -135.9 [g] at 0.023 [s]



B-120

8714-01

2004 Volvo XC90 NCAP

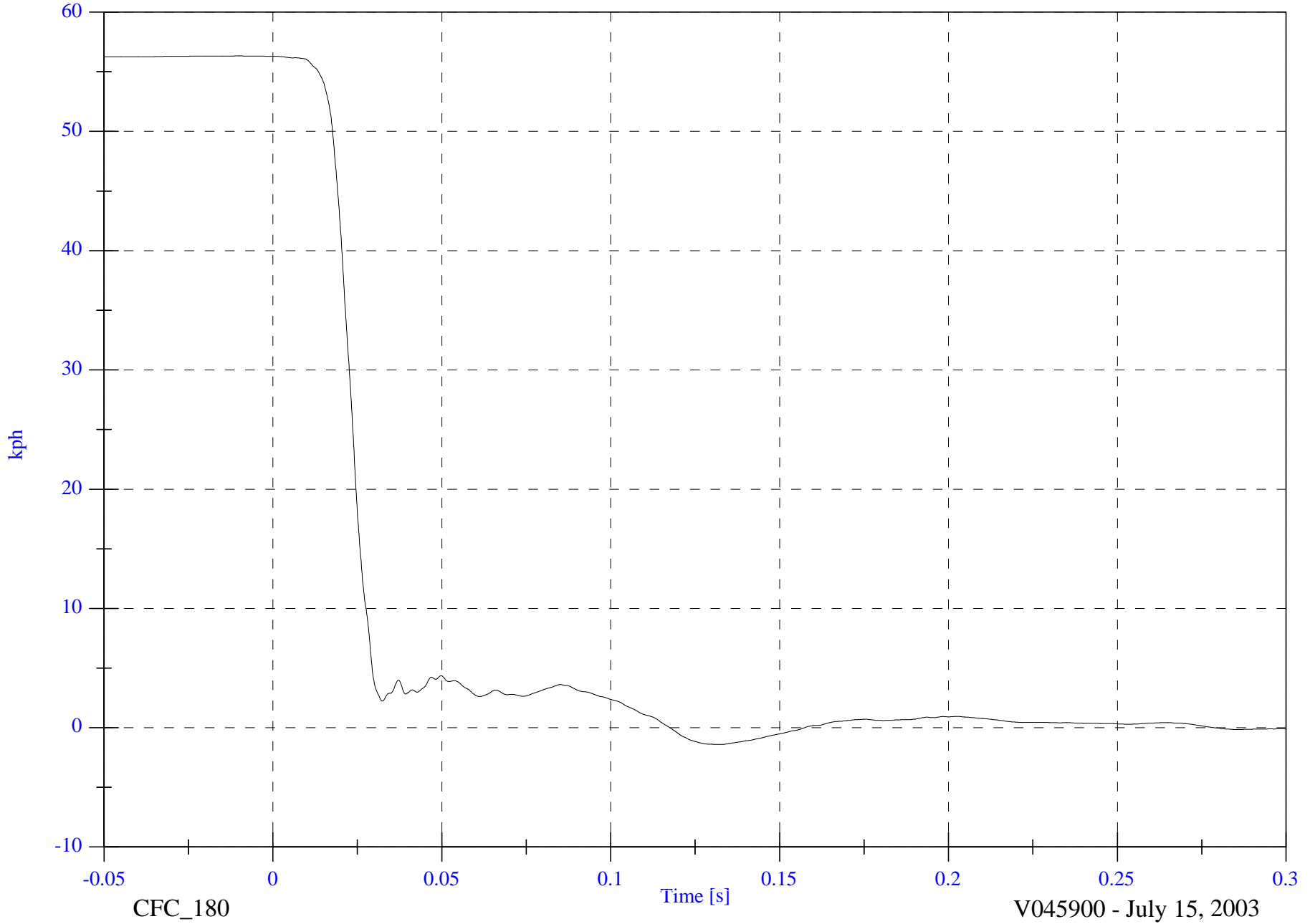
V1 Engine Top #3x Velocity

Max: 56.3 [kph] at -0.010 [s]

Min: -1.4 [kph] at 0.133 [s]

B-121

8714-01



CFC_180

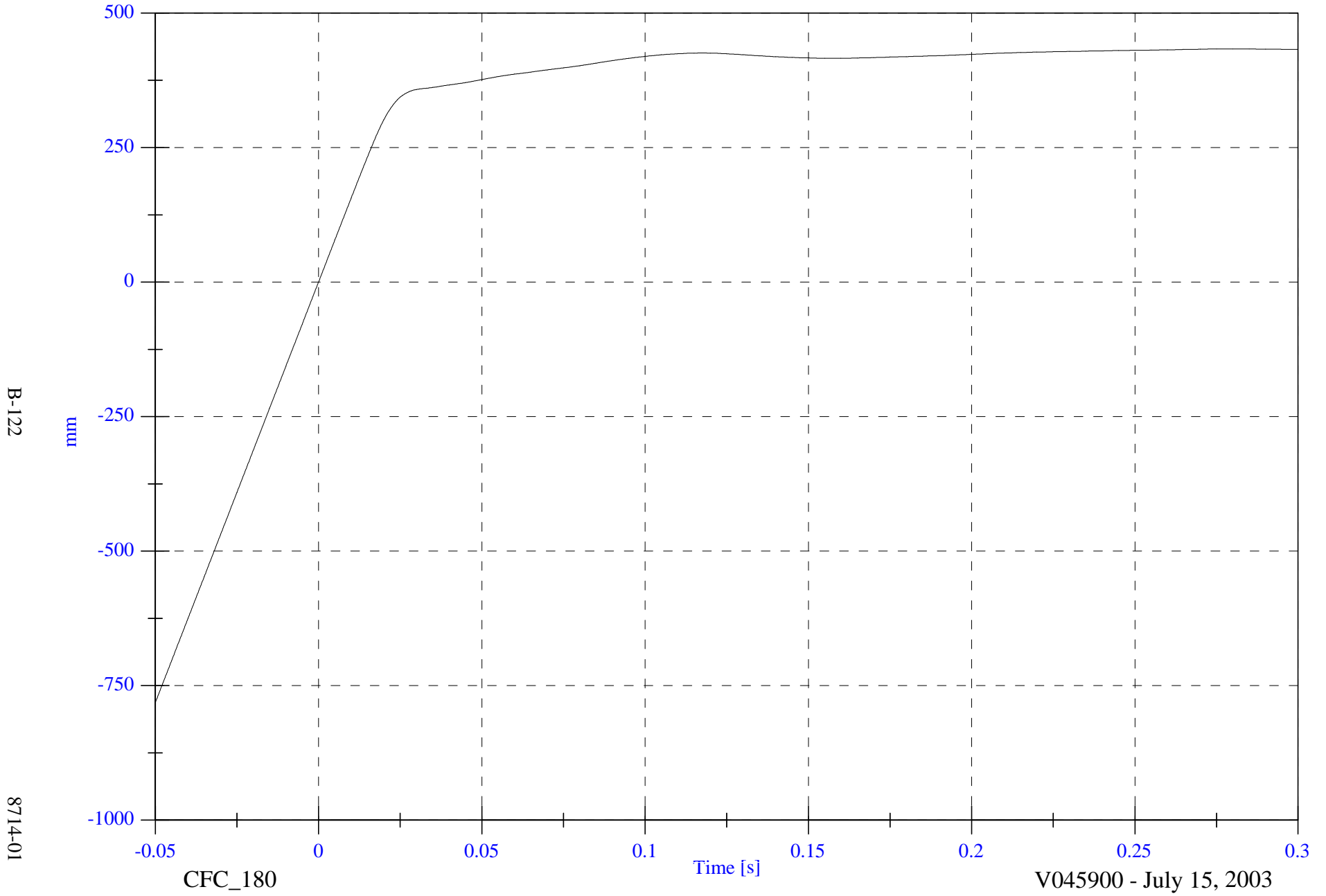
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Engine Top #3x Displacement

Max: 433.2 [mm] at 0.279 [s]

Min: -781.8 [mm] at -0.050 [s]



B-122

8714-01

CFC_180

Time [s]

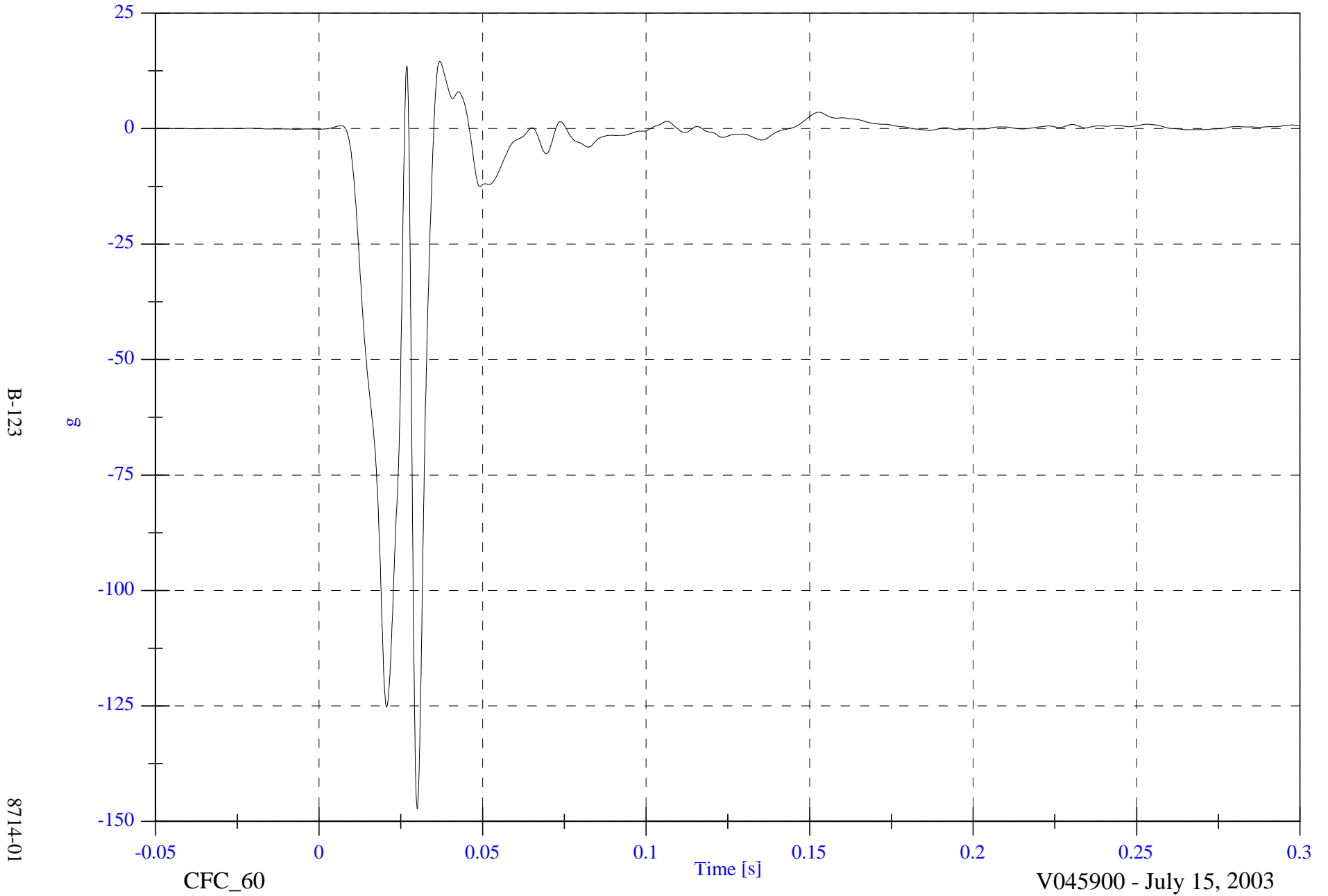
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Engine Bottom #4x

Max: 14.6 [g] at 0.037 [s]

Min: -147.2 [g] at 0.030 [s]



B-123

8714-01

CFC_60

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

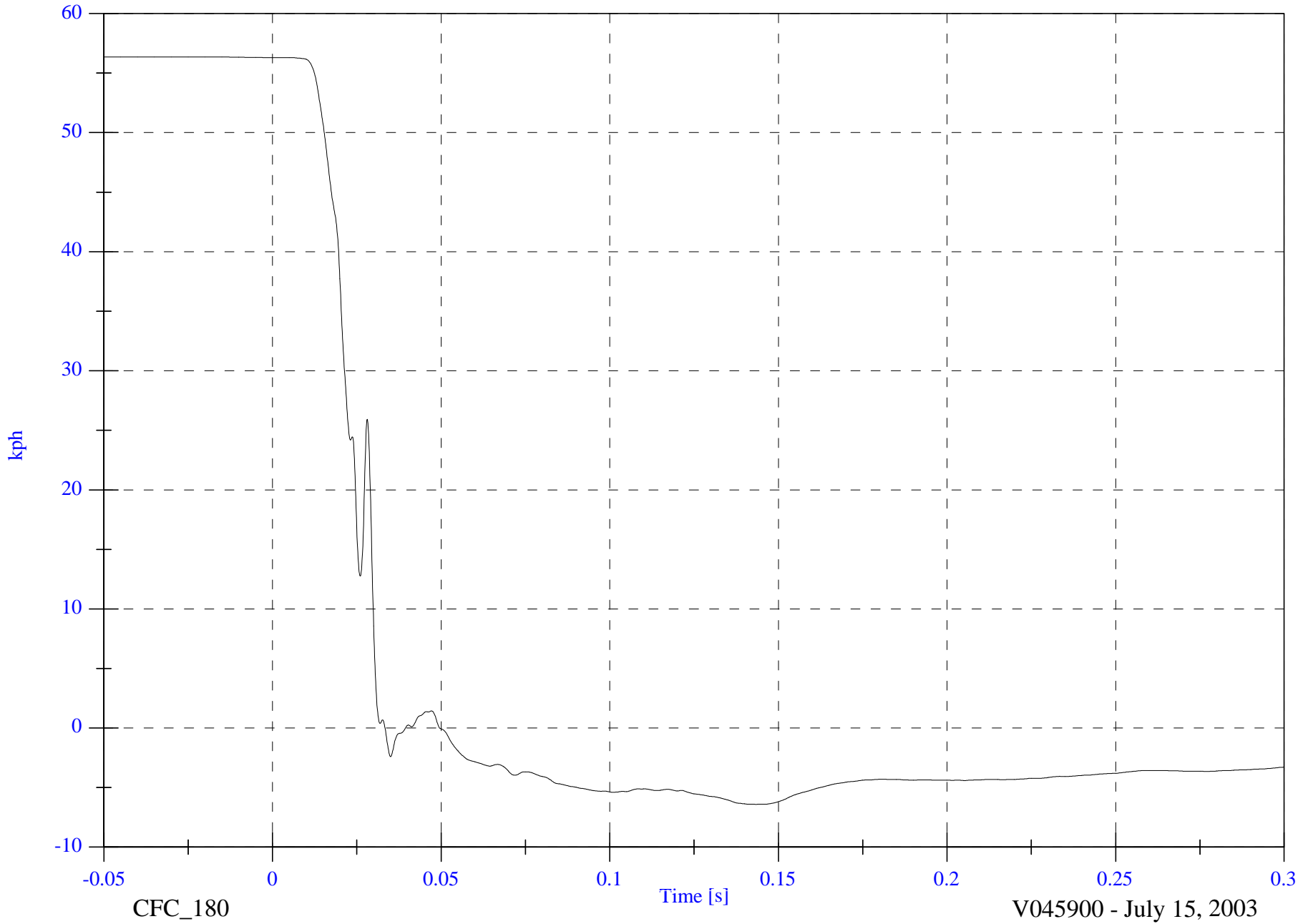
V1 Engine Bottom #4x Velocity

Max: 56.3 [kph] at -0.019 [s]

Min: -6.4 [kph] at 0.143 [s]

B-124

8714-01



CFC_180

Time [s]

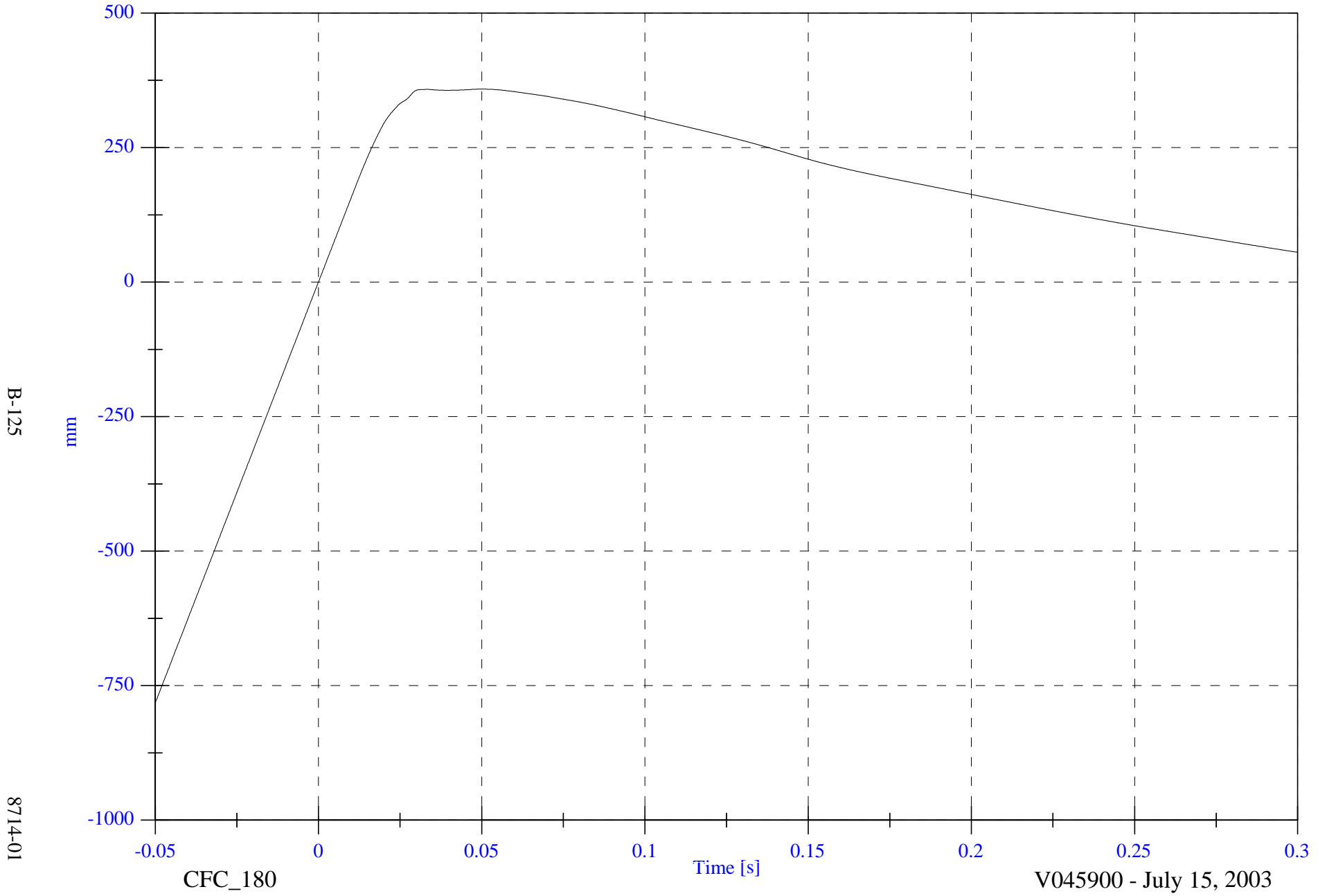
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Engine Bottom #4x Displacement

Max: 358.7 [mm] at 0.050 [s]

Min: -782.4 [mm] at -0.050 [s]



B-125

8714-01

CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

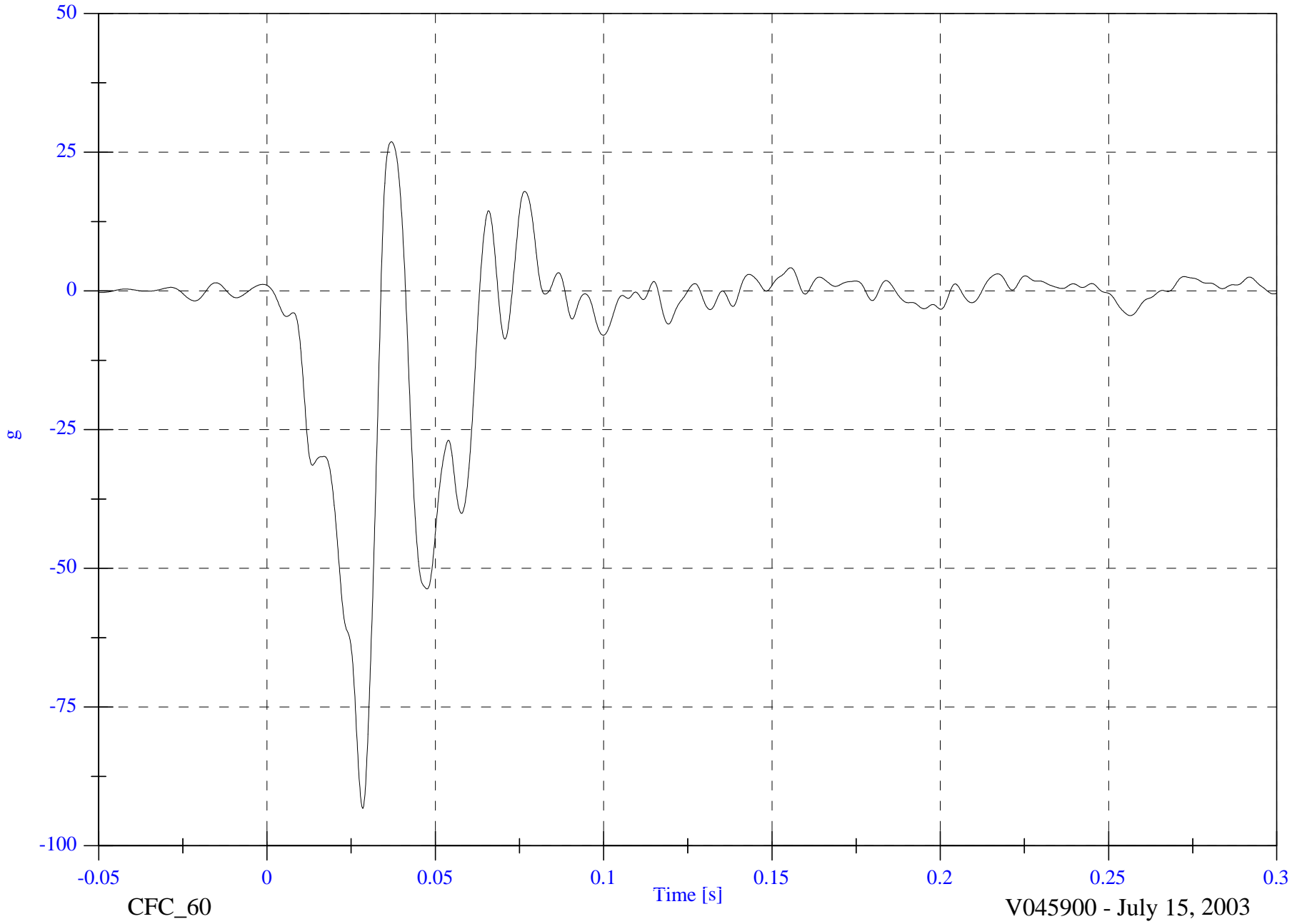
V1 Right Caliper #5x

Max: 26.9 [g] at 0.037 [s]

Min: -93.2 [g] at 0.029 [s]

B-126

8714-01



2004 Volvo XC90 NCAP

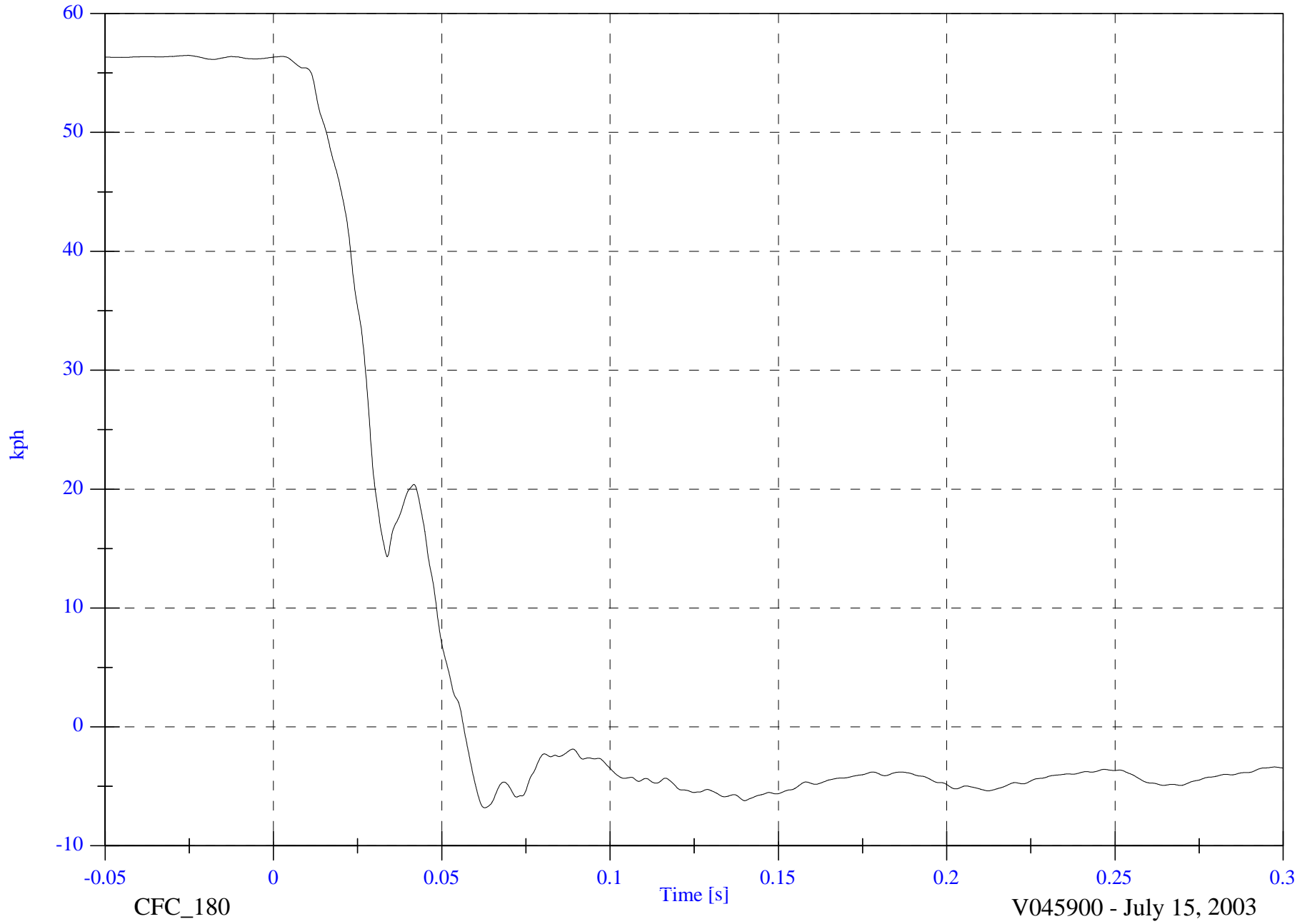
V1 Right Caliper #5x Velocity

Max: 56.5 [kph] at -0.025 [s]

Min: -6.8 [kph] at 0.063 [s]

B-127

8714-01



CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

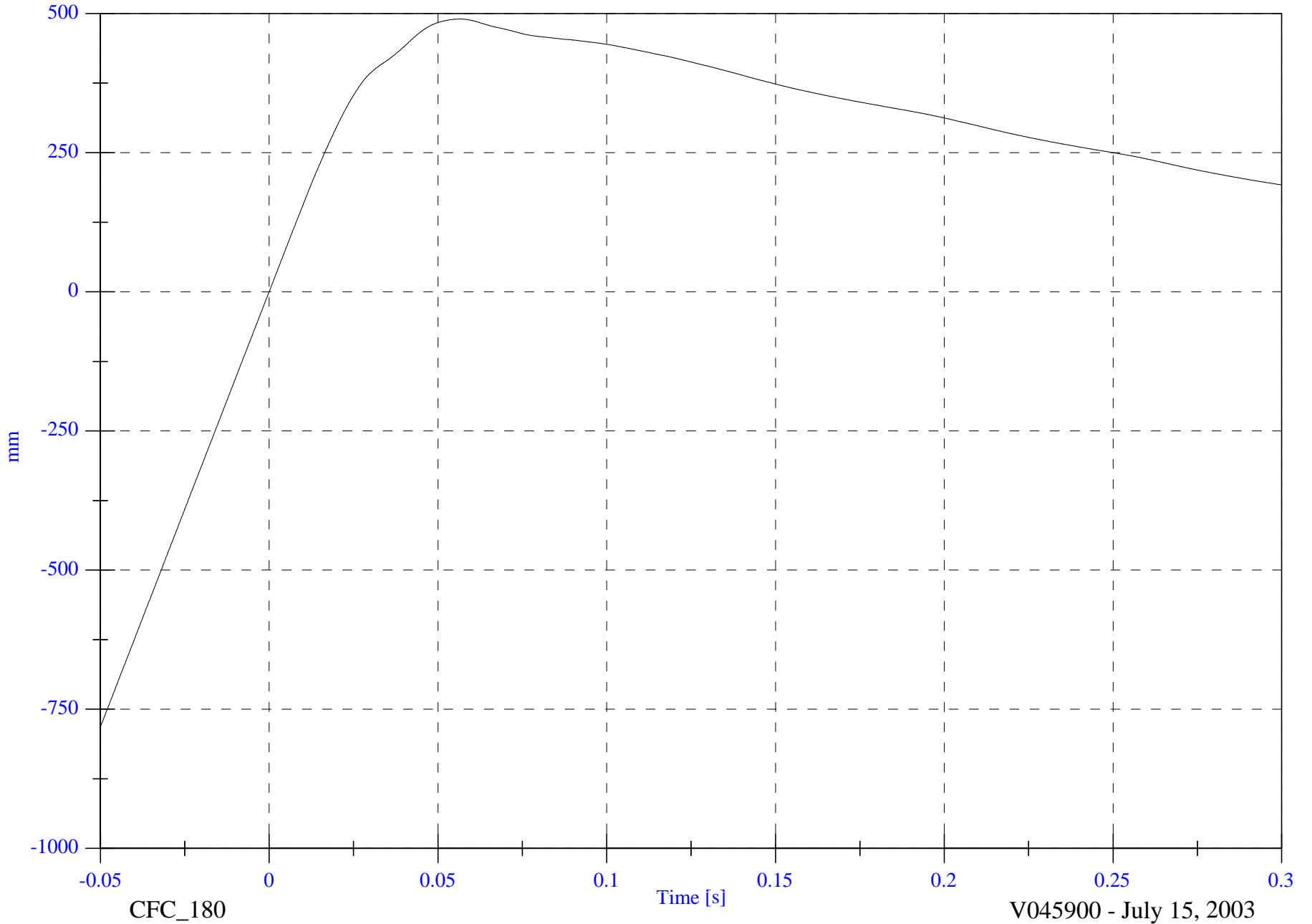
V1 Right Caliper #5x Displacement

Max: 490.0 [mm] at 0.057 [s]

Min: -782.1 [mm] at -0.050 [s]

B-128

8714-01



CFC_180

Time [s]

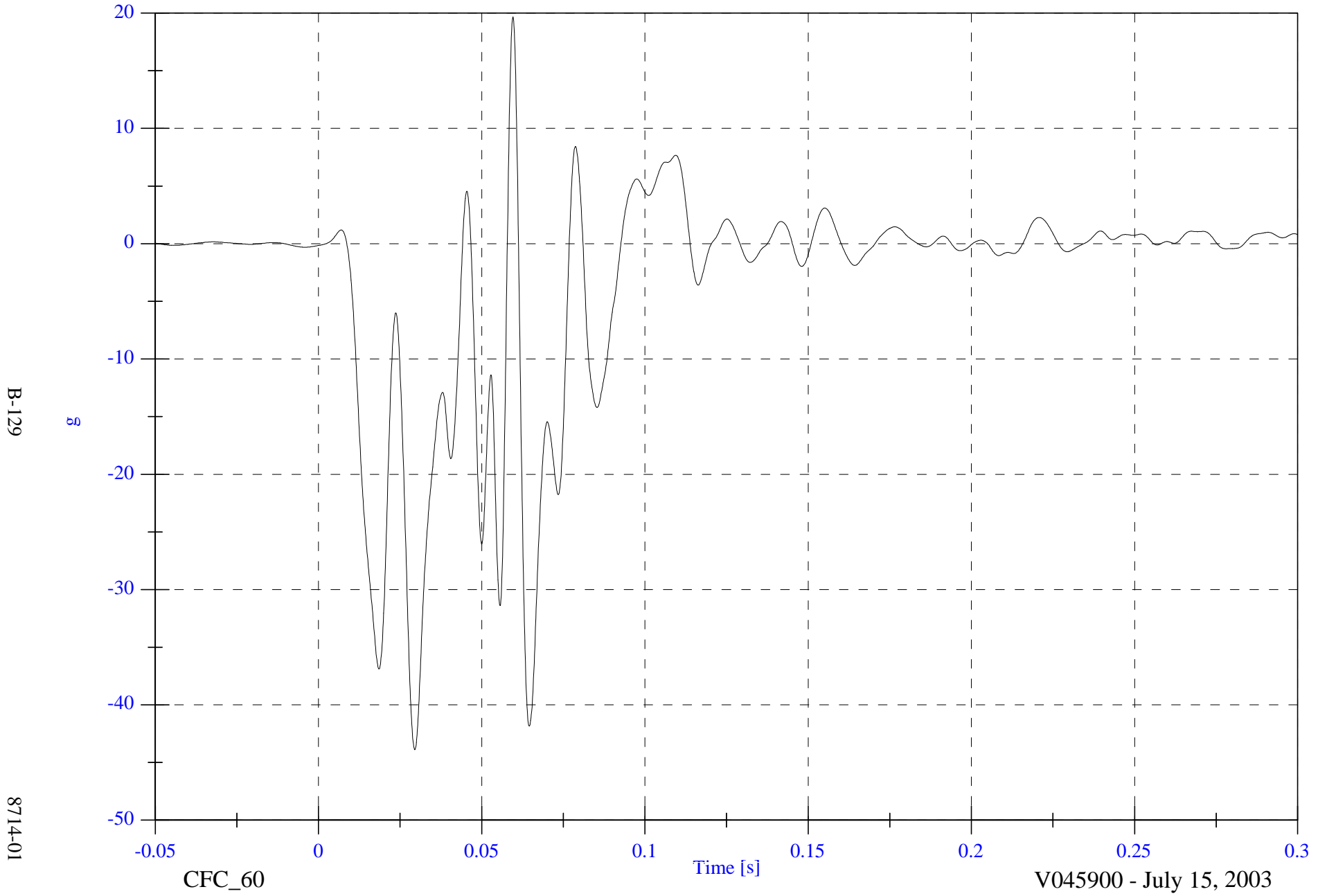
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Instrument Panel #6x

Max: 19.7 [g] at 0.060 [s]

Min: -43.9 [g] at 0.029 [s]



2004 Volvo XC90 NCAP

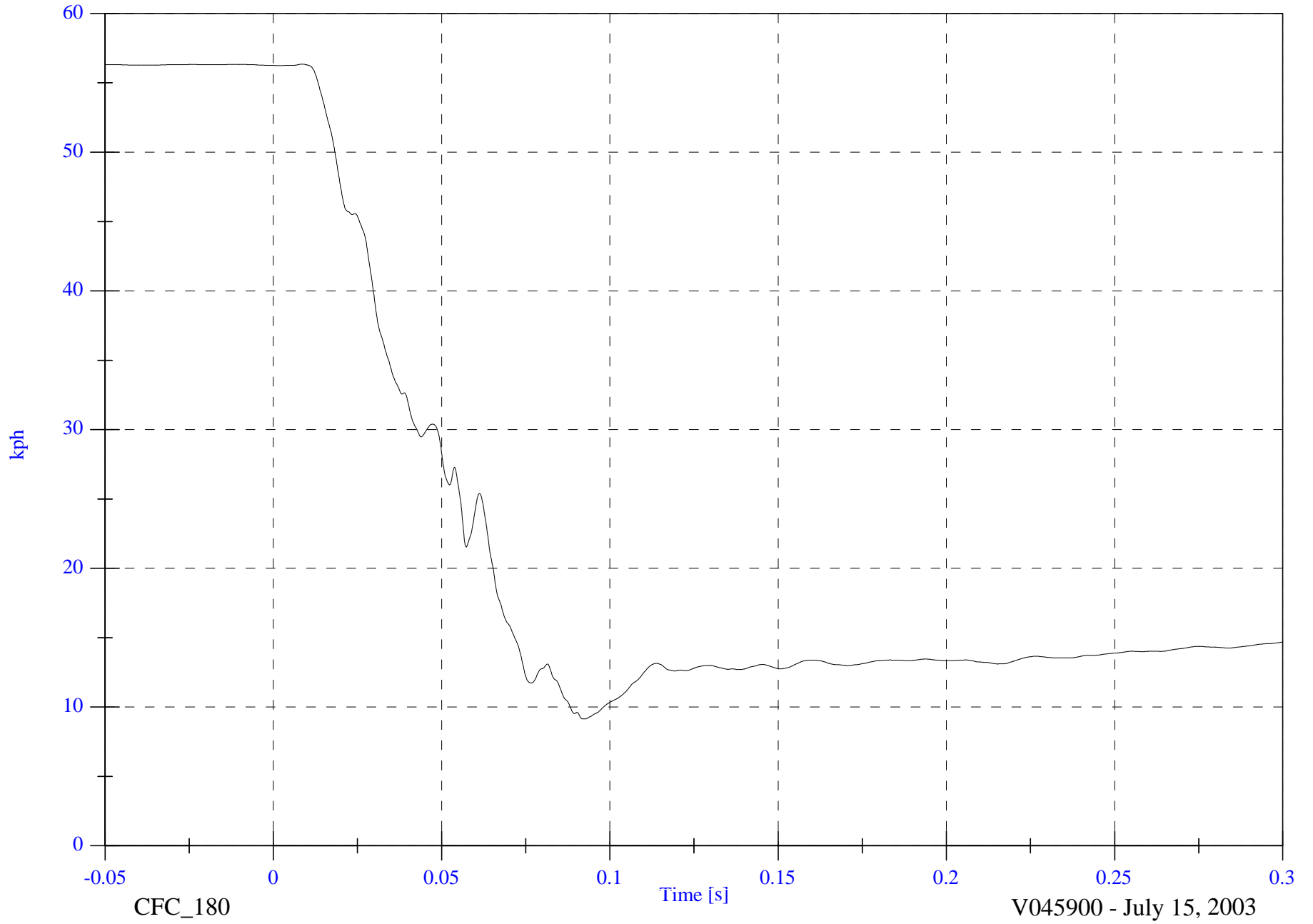
V1 Instrument Panel #6x Velocity

Max: 56.3 [kph] at 0.009 [s]

Min: 9.1 [kph] at 0.092 [s]

B-130

8714-01



CFC_180

Time [s]

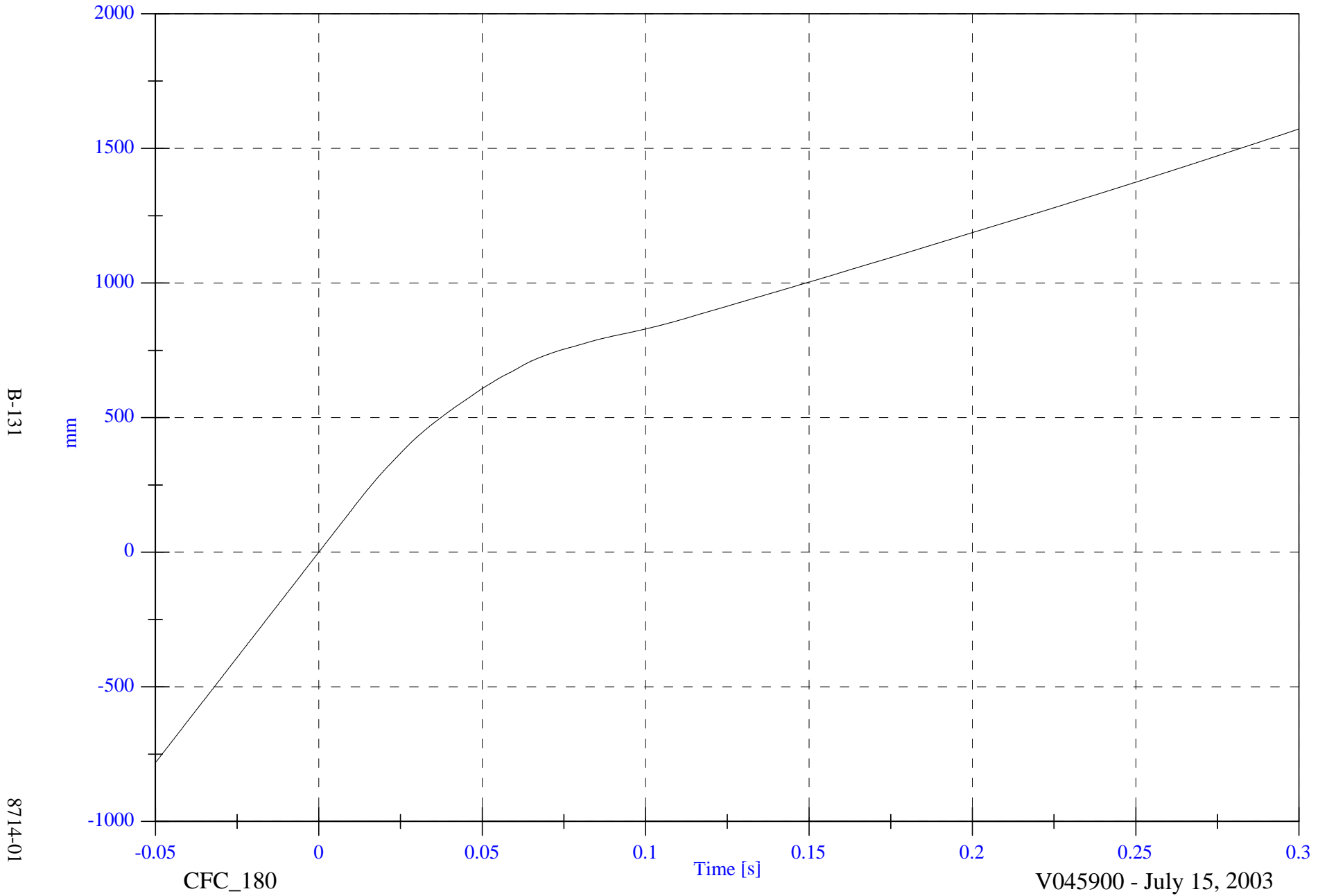
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Instrument Panel #6x Displacement

Max: 1571.9 [mm] at 0.300 [s]

Min: -782.0 [mm] at -0.050 [s]



B-131

8714-01

CFC_180

Time [s]

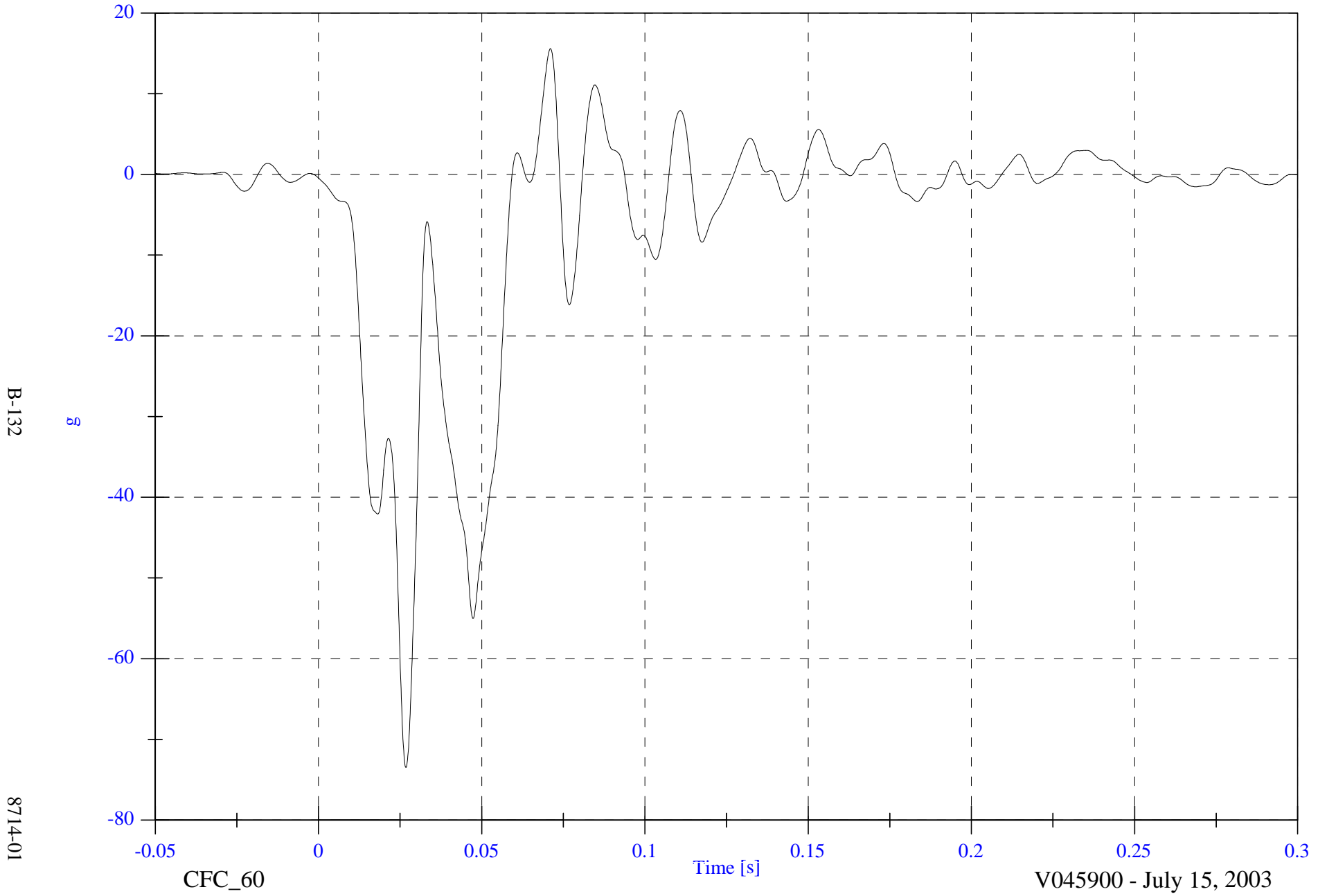
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Left Caliper #7x

Max: 15.6 [g] at 0.071 [s]

Min: -73.5 [g] at 0.027 [s]



2004 Volvo XC90 NCAP

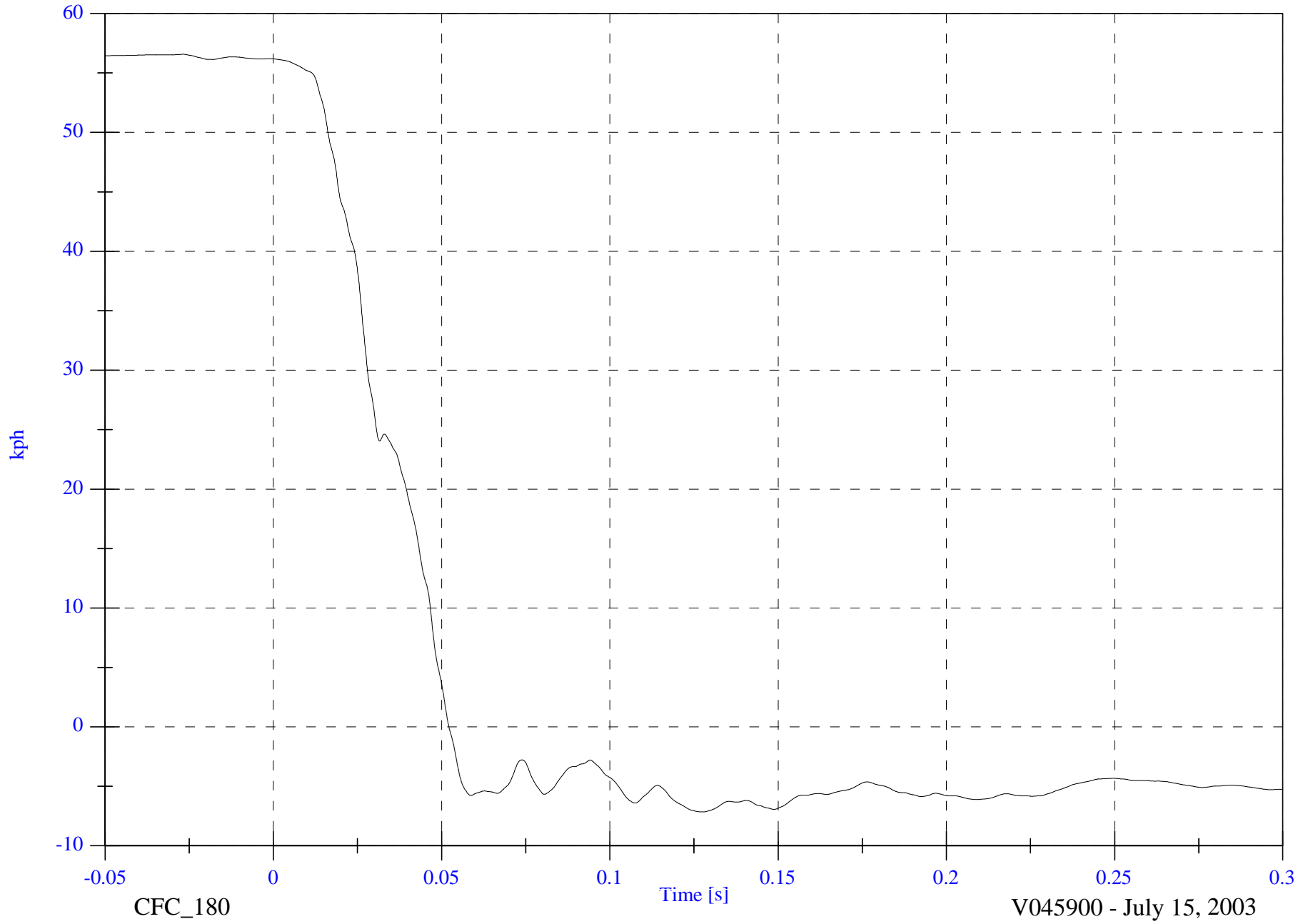
V1 Left Caliper #7x Velocity

Max: 56.6 [kph] at -0.027 [s]

Min: -7.2 [kph] at 0.128 [s]

B-133

8714-01



CFC_180

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

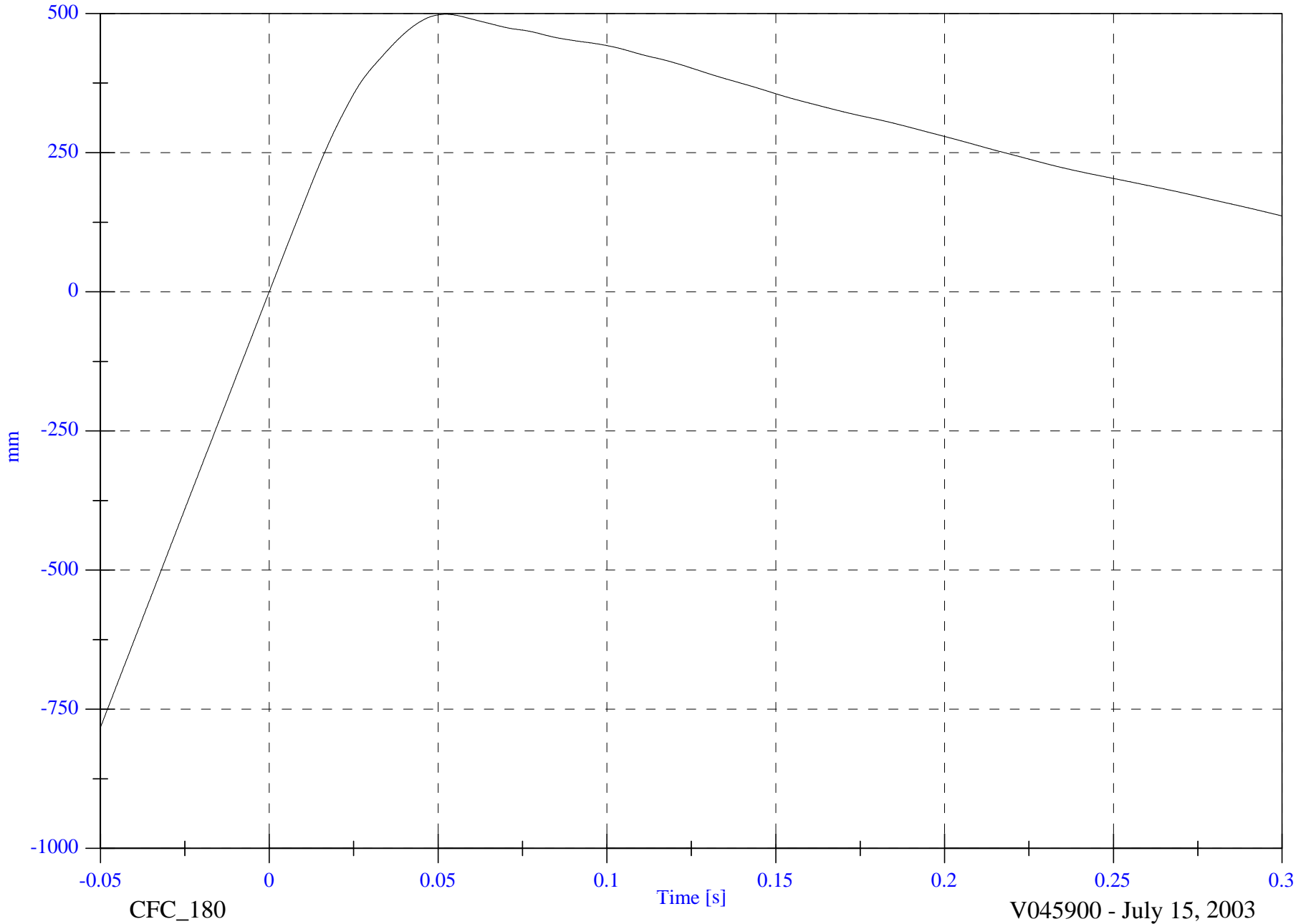
V1 Left Caliper #7x Displacement

Max: 498.5 [mm] at 0.052 [s]

Min: -783.0 [mm] at -0.050 [s]

B-134

8714-01



CFC_180

Time [s]

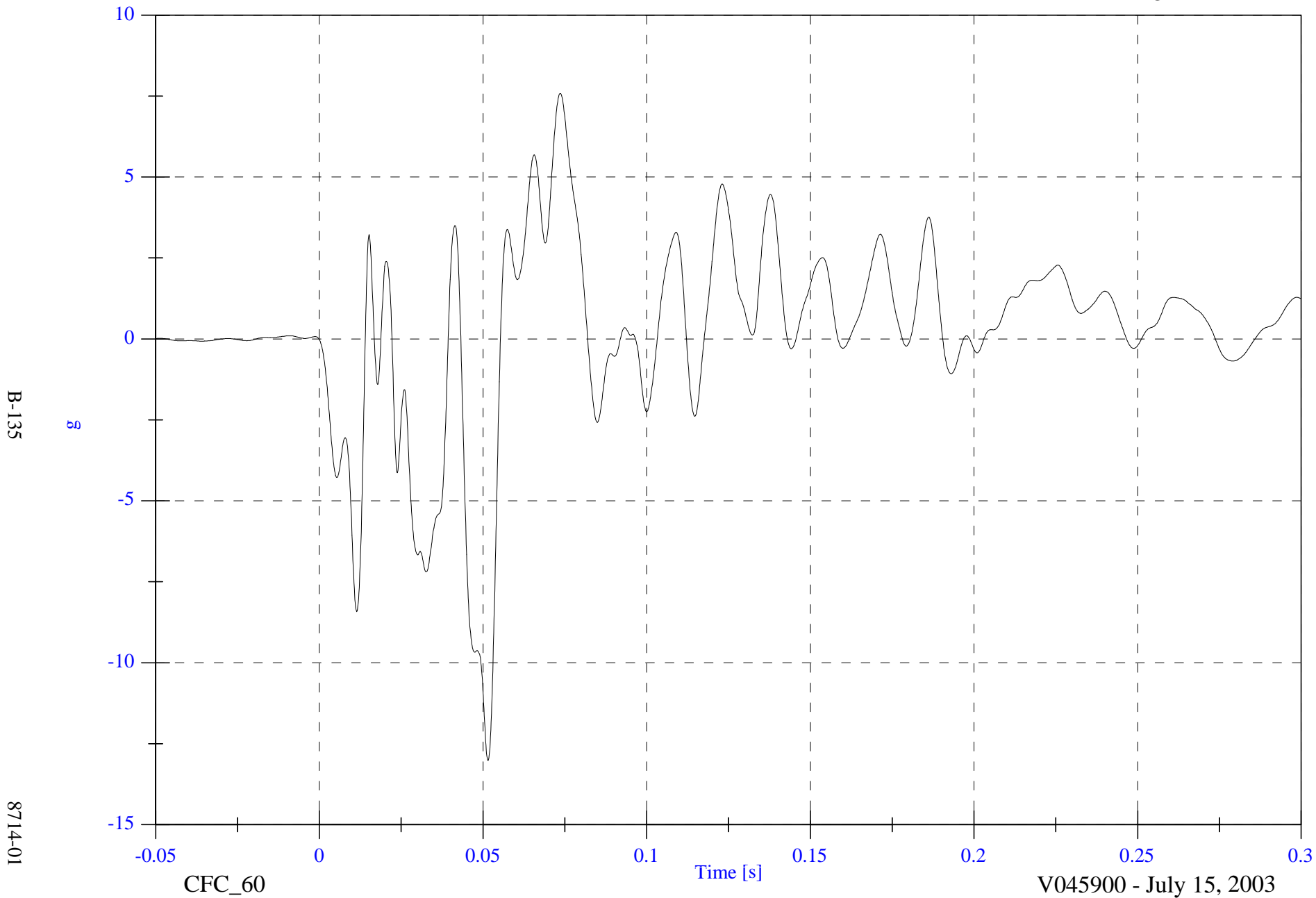
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Left Rear #8z

Max: 7.6 [g] at 0.074 [s]

Min: -13.0 [g] at 0.051 [s]



2004 Volvo XC90 NCAP

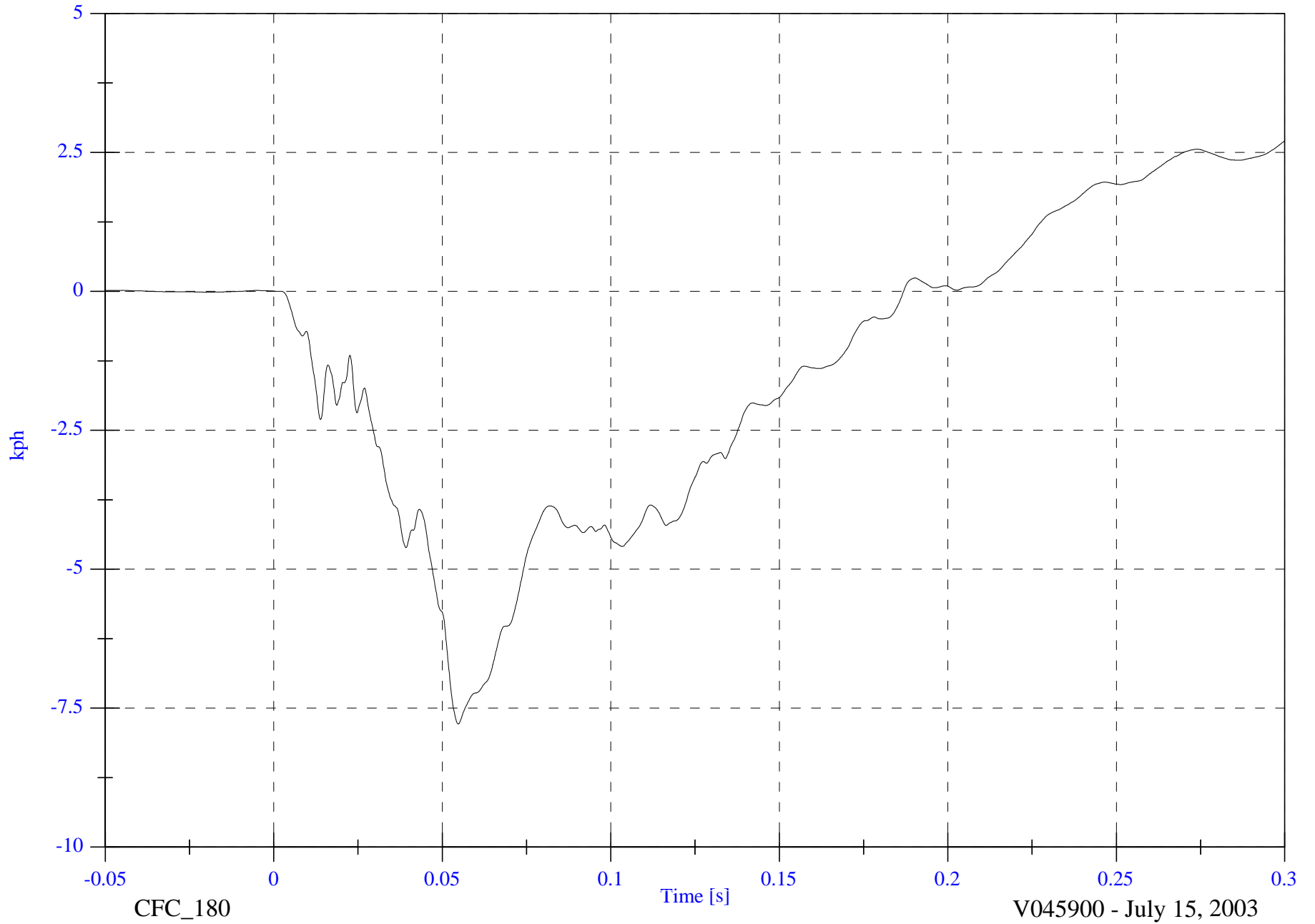
V1 Left Rear #8z Velocity

Max: 2.7 [kph] at 0.300 [s]

Min: -7.8 [kph] at 0.055 [s]

B-136

8714-01

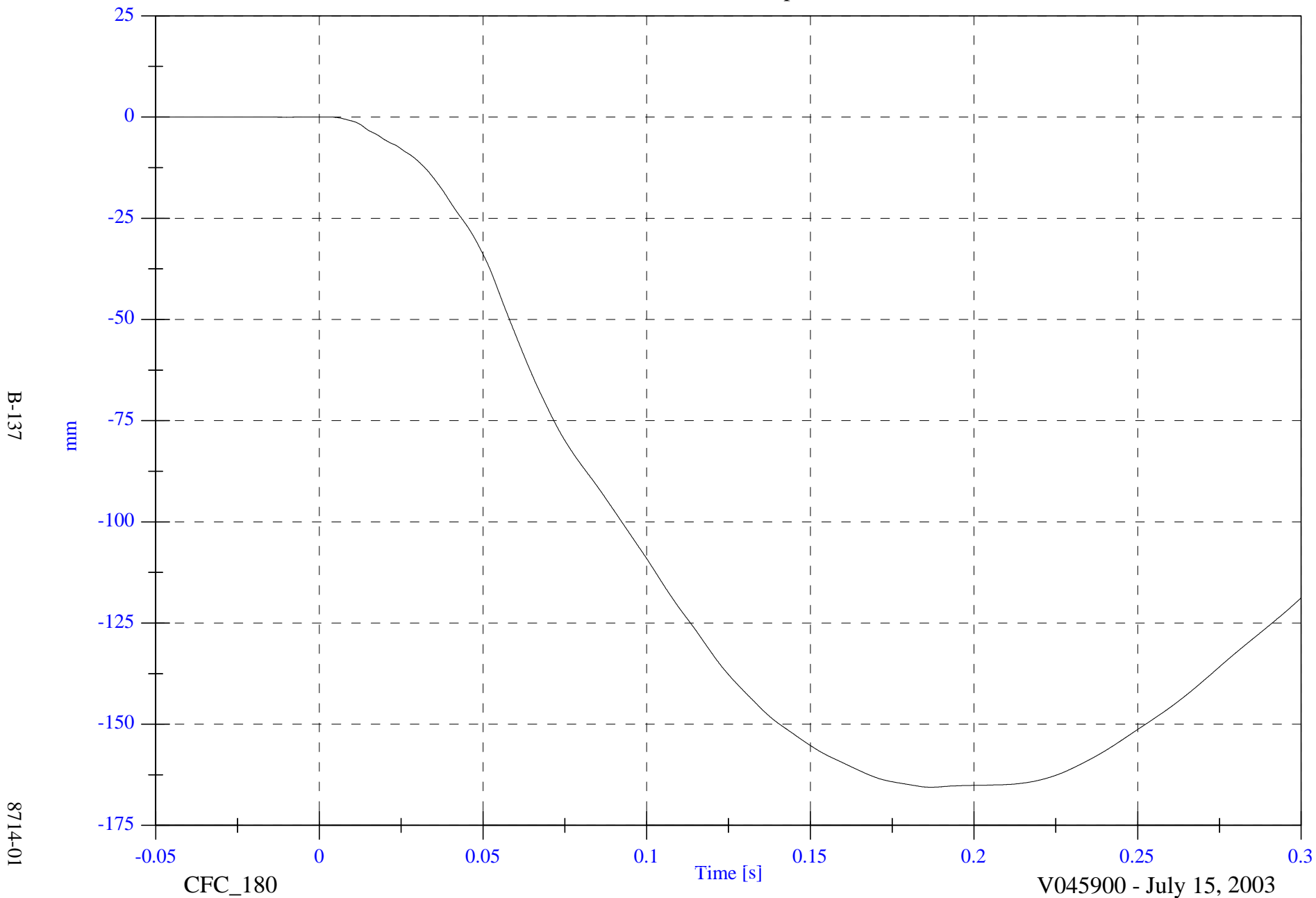


2004 Volvo XC90 NCAP

V1 Left Rear #8z Displacement

Max: 0.0 [mm] at -0.036 [s]

Min: -165.6 [mm] at 0.187 [s]



B-137

8714-01

CFC_180

Time [s]

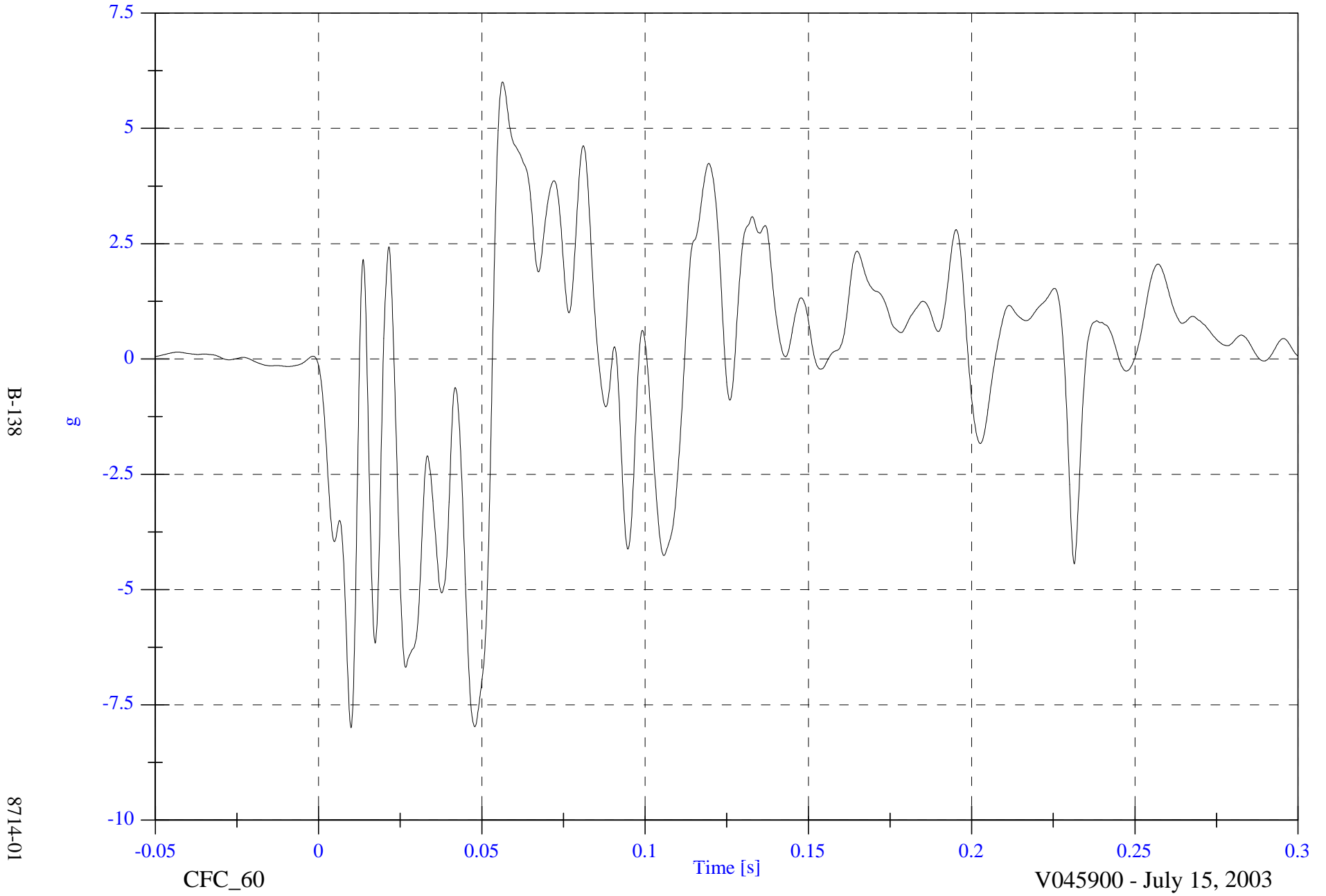
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Right Rear #9z

Max: 6.0 [g] at 0.056 [s]

Min: -8.0 [g] at 0.010 [s]



B-138

8714-01

CFC_60

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Right Rear #9z Velocity

Max: 0.7 [kph] at 0.299 [s]

Min: -7.0 [kph] at 0.053 [s]



B-139

8714-01

CFC_180

Time [s]

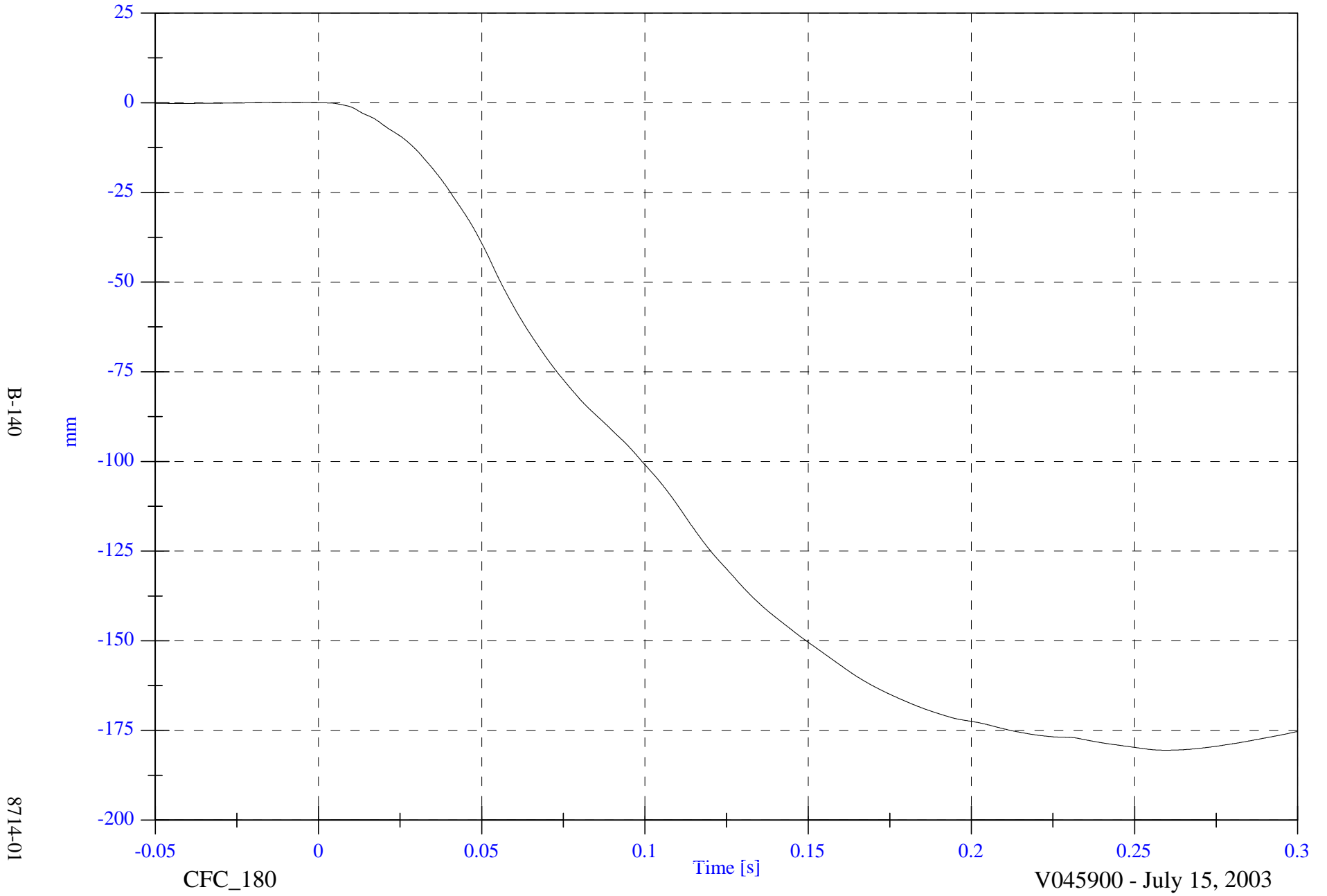
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1 Right Rear #9z Displacement

Max: 0.1 [mm] at -0.010 [s]

Min: -180.5 [mm] at 0.260 [s]



B-140

8714-01

CFC_180

Time [s]

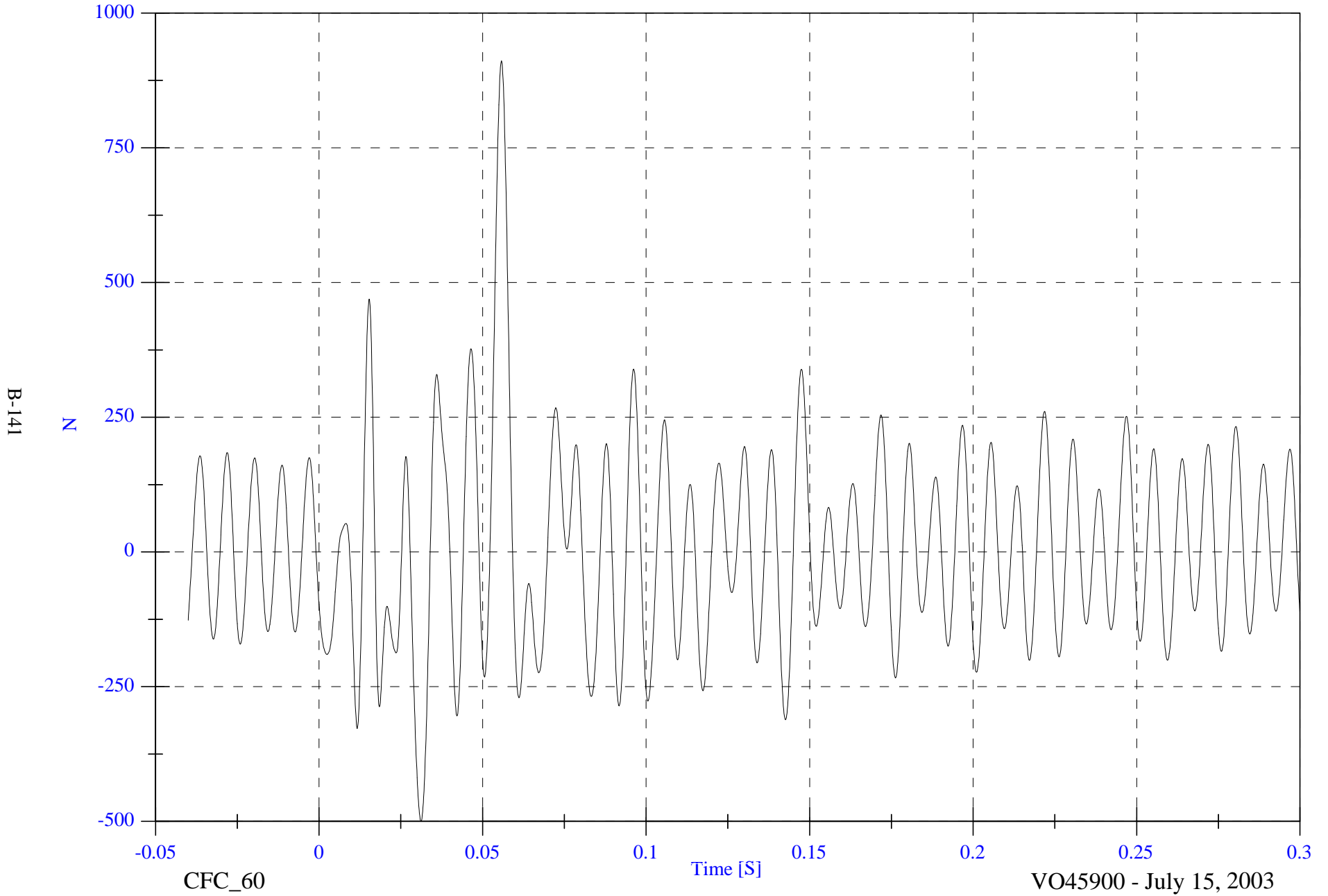
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell A1 Fx

Max: 911.5 [N] at 0.056 [S]

Min: -499.6 [N] at 0.031 [S]

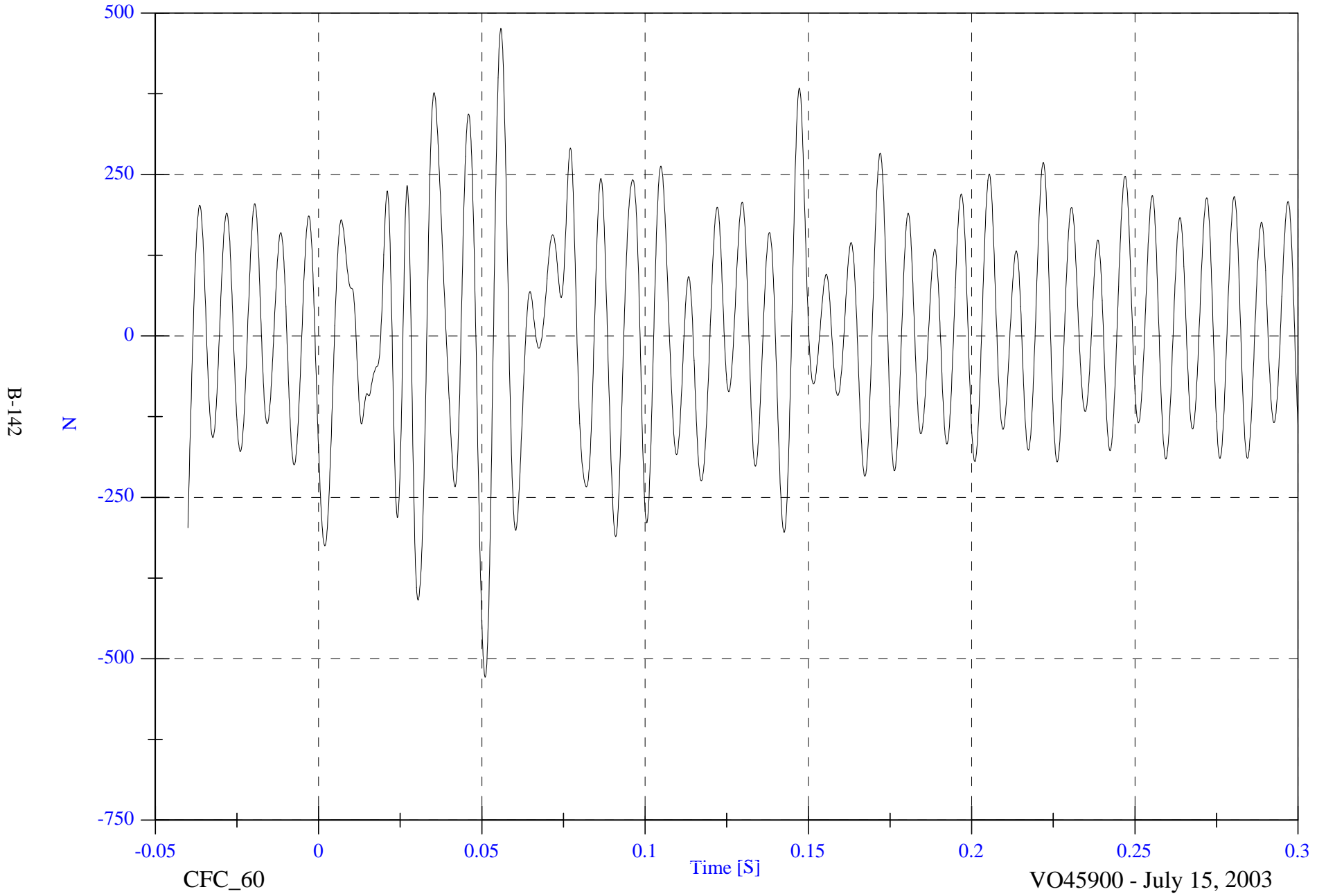


2004 Volvo XC90 NCAP

Barrier Load Cell A2 Fx

Max: 476.3 [N] at 0.056 [S]

Min: -528.7 [N] at 0.051 [S]

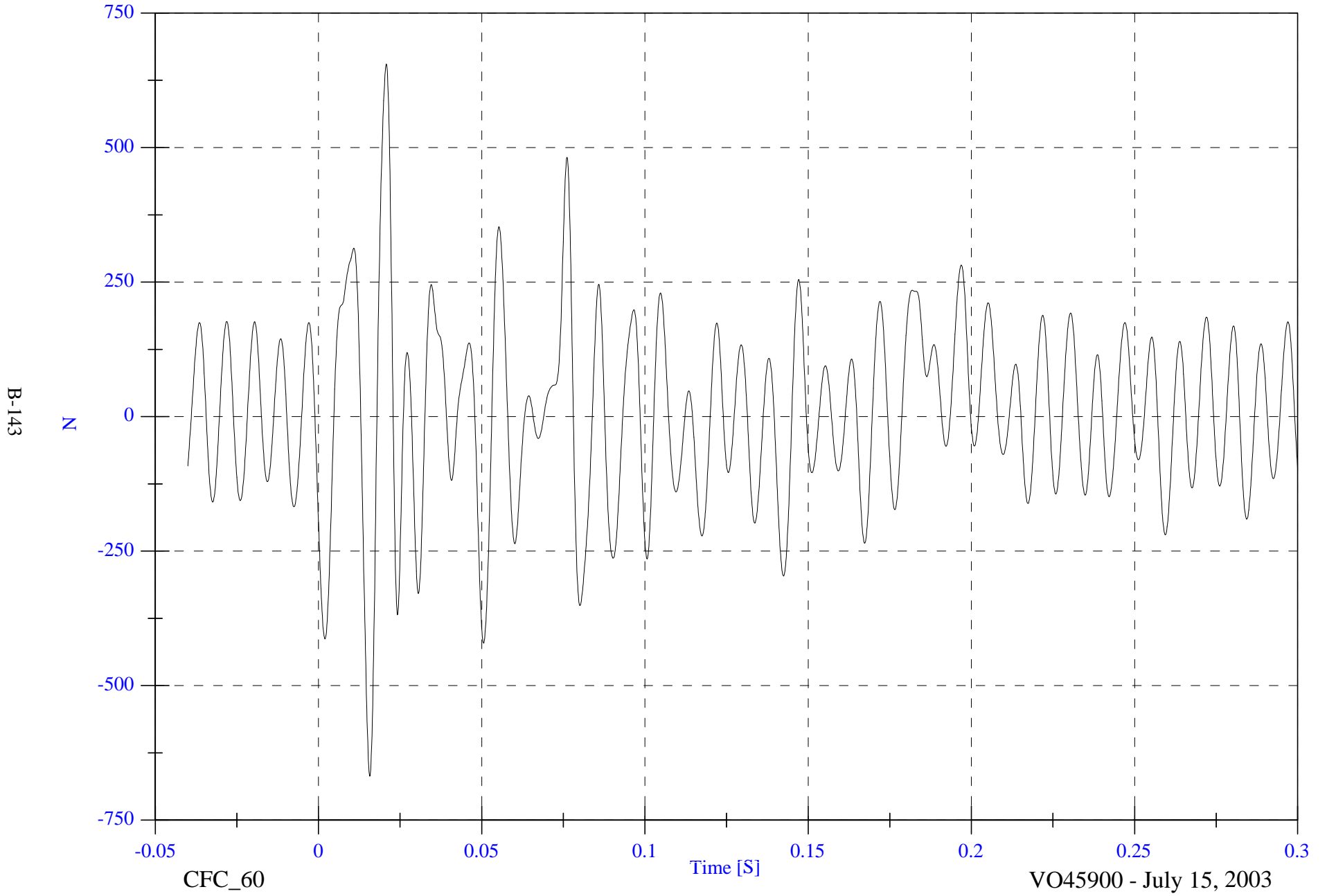


2004 Volvo XC90 NCAP

Barrier Load Cell A3 Fx

Max: 655.2 [N] at 0.021 [S]

Min: -668.2 [N] at 0.016 [S]



B-143

N

-0.05

0

0.05

0.1

Time [S]

0.15

0.2

0.25

0.3

CFC_60

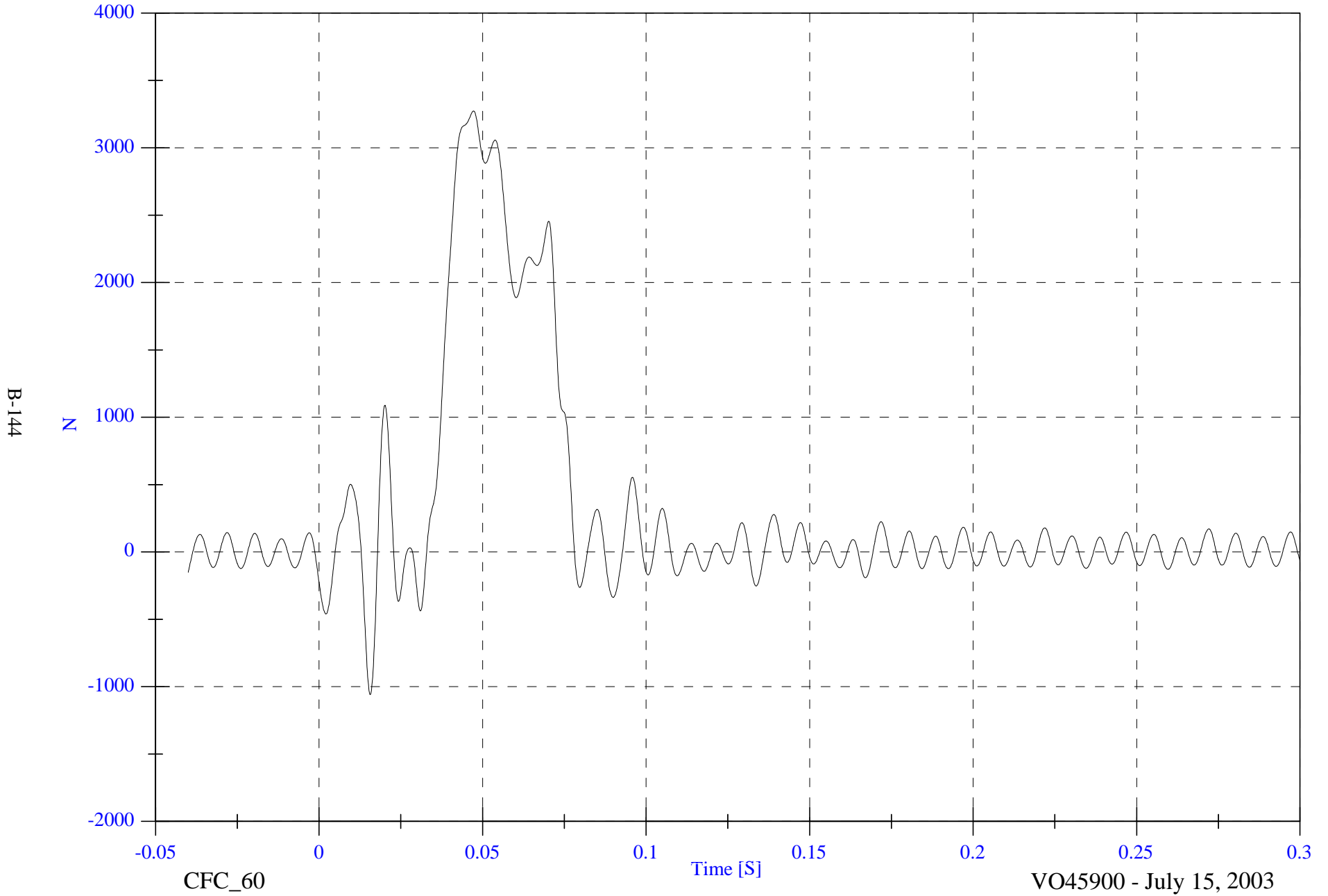
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell A4 Fx

Max: 3274.0 [N] at 0.047 [S]

Min: -1059.1 [N] at 0.016 [S]

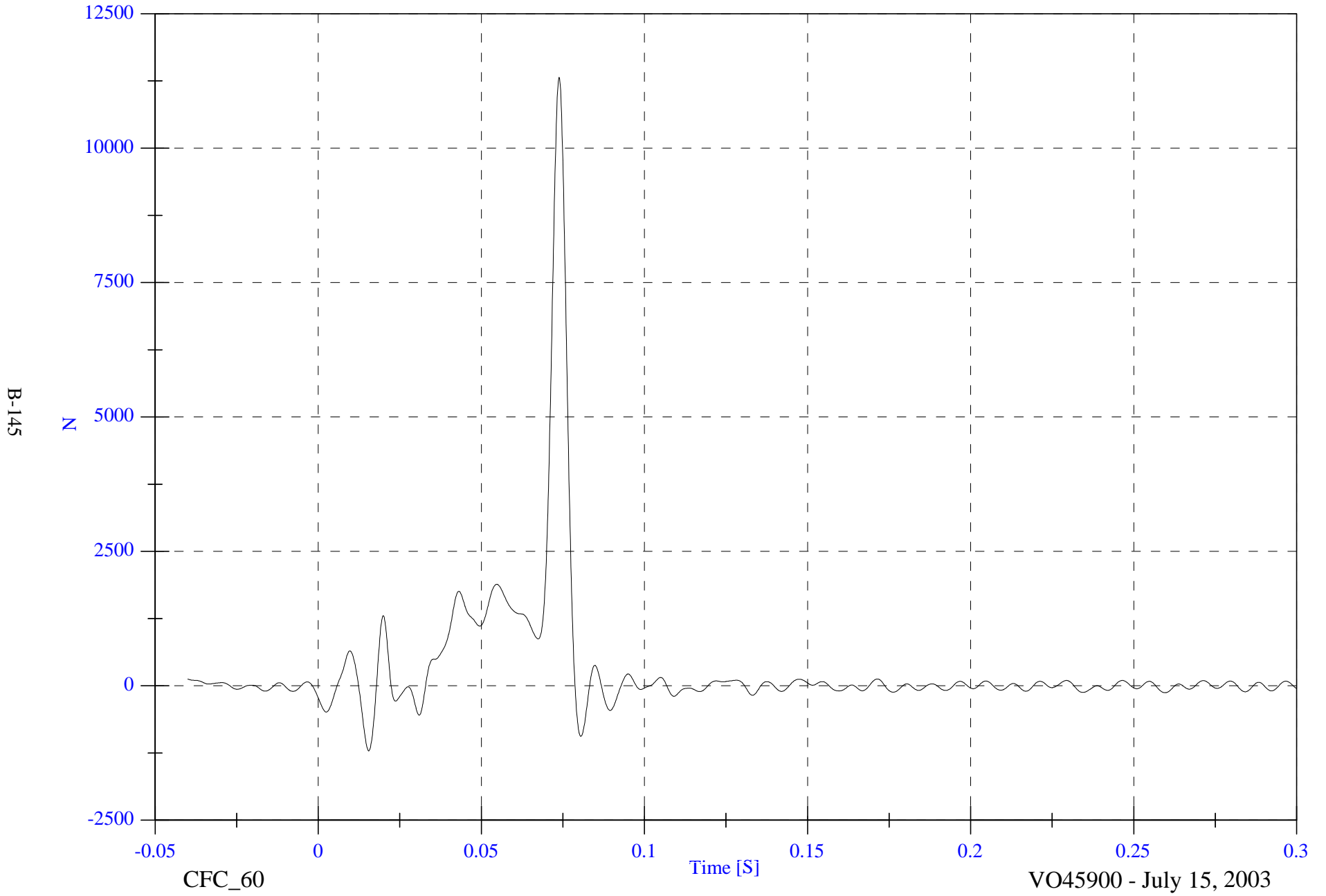


2004 Volvo XC90 NCAP

Barrier Load Cell A5 Fx

Max: 11315.2 [N] at 0.074 [S]

Min: -1210.6 [N] at 0.015 [S]

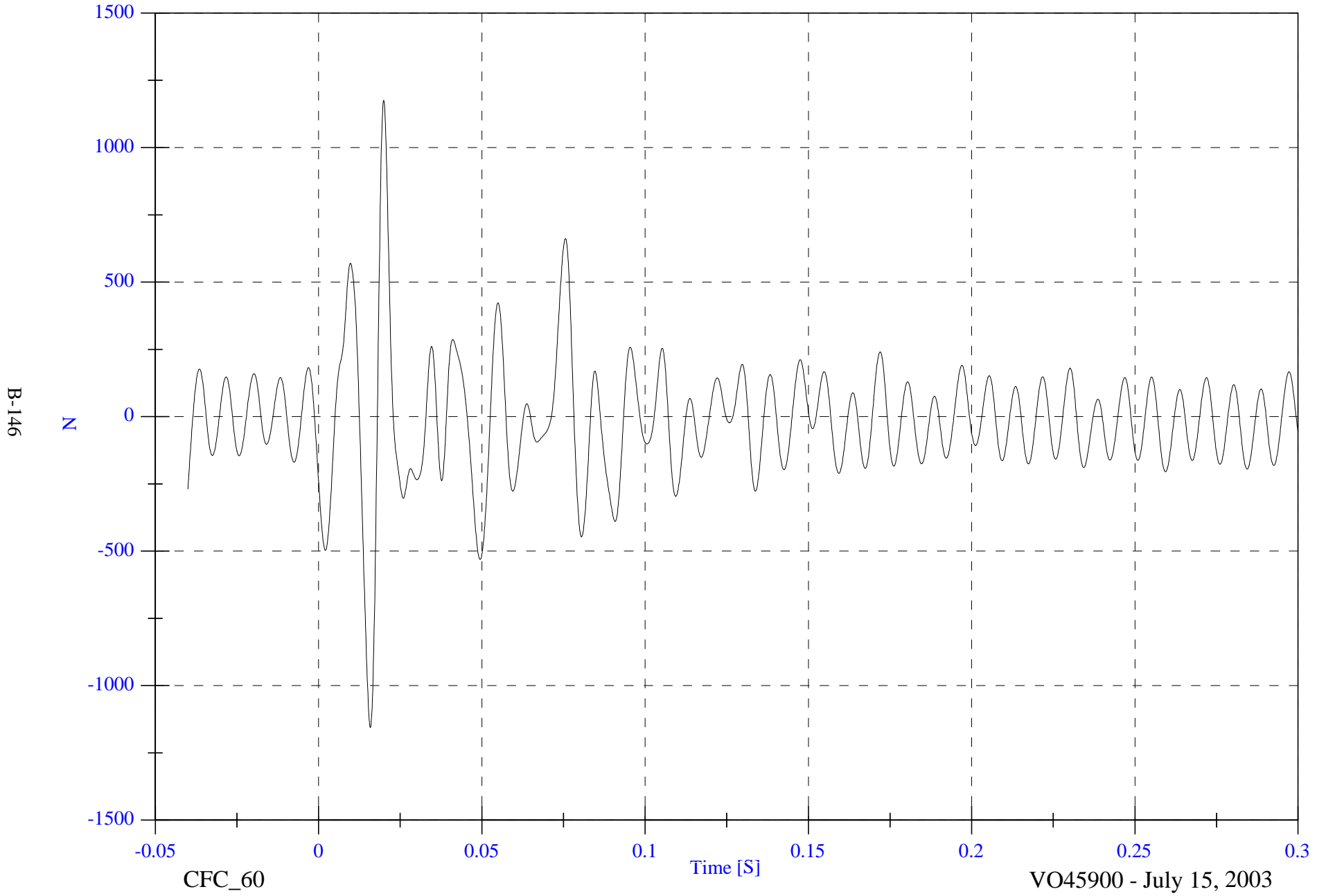


2004 Volvo XC90 NCAP

Barrier Load Cell A6 Fx

Max: 1175.3 [N] at 0.020 [S]

Min: -1155.9 [N] at 0.016 [S]



B-146

N

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_60

Time [S]

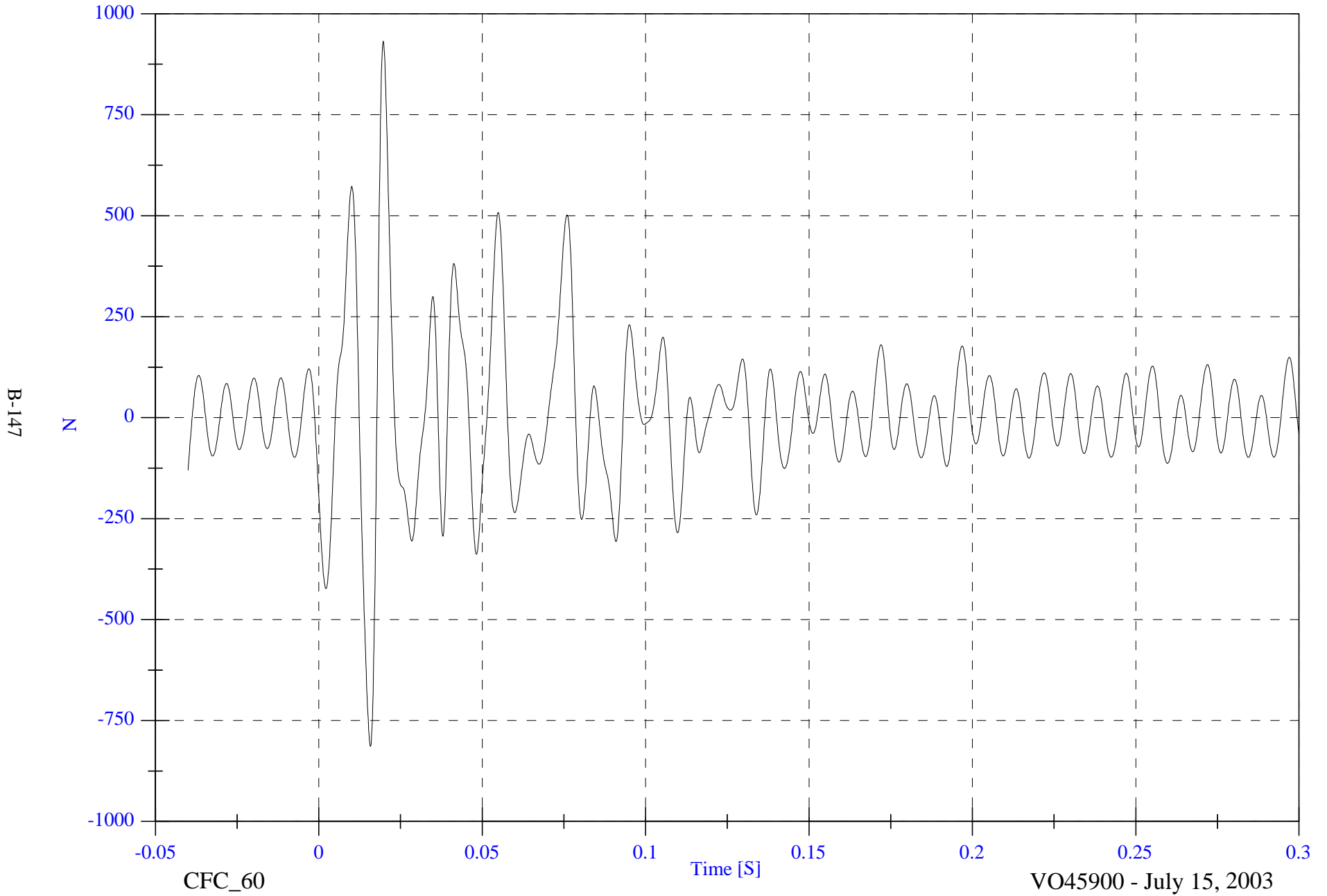
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell A7 Fx

Max: 932.1 [N] at 0.020 [S]

Min: -814.4 [N] at 0.016 [S]



B-147

N

-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_60

Time [S]

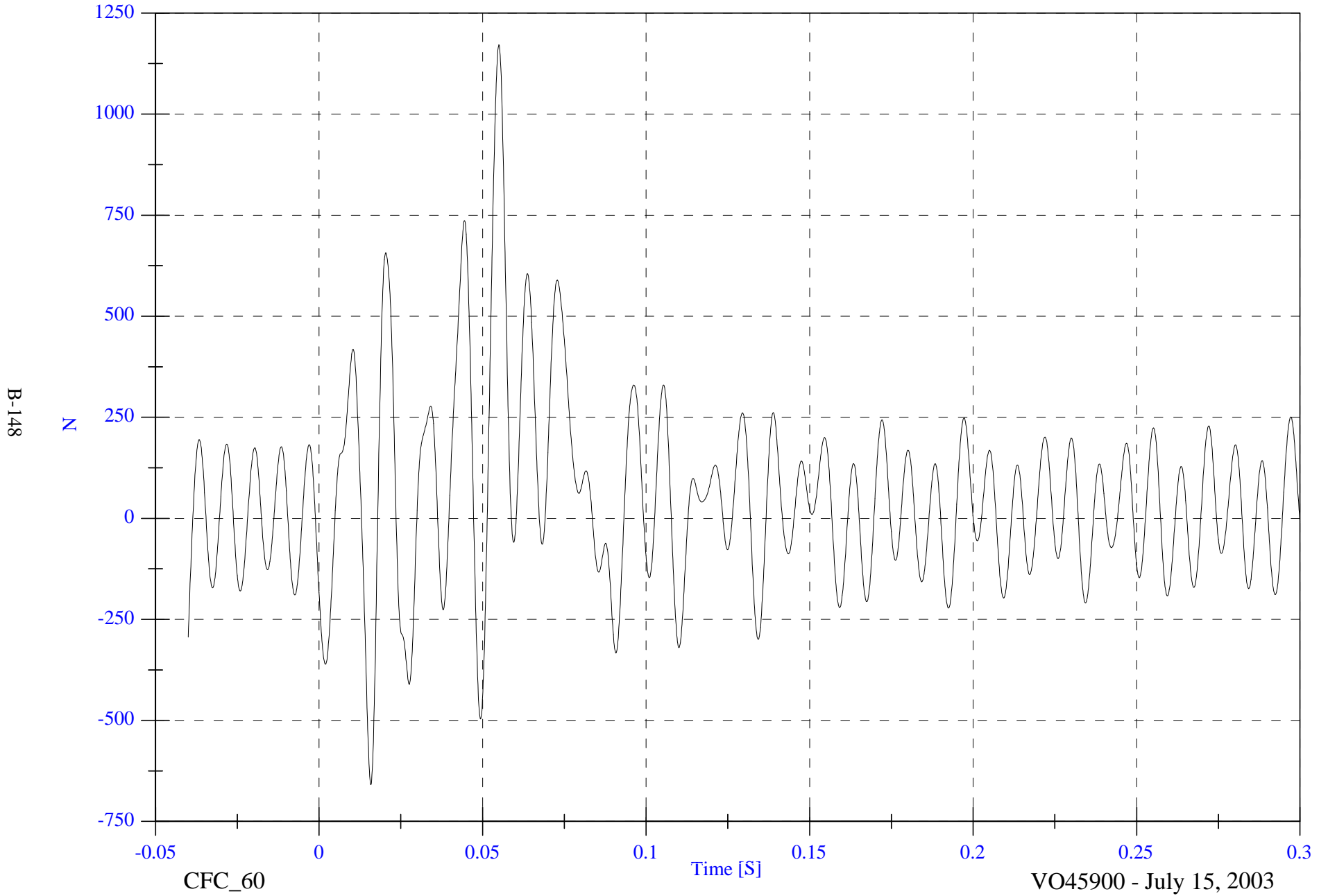
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell A8 Fx

Max: 1171.5 [N] at 0.055 [S]

Min: -659.1 [N] at 0.016 [S]

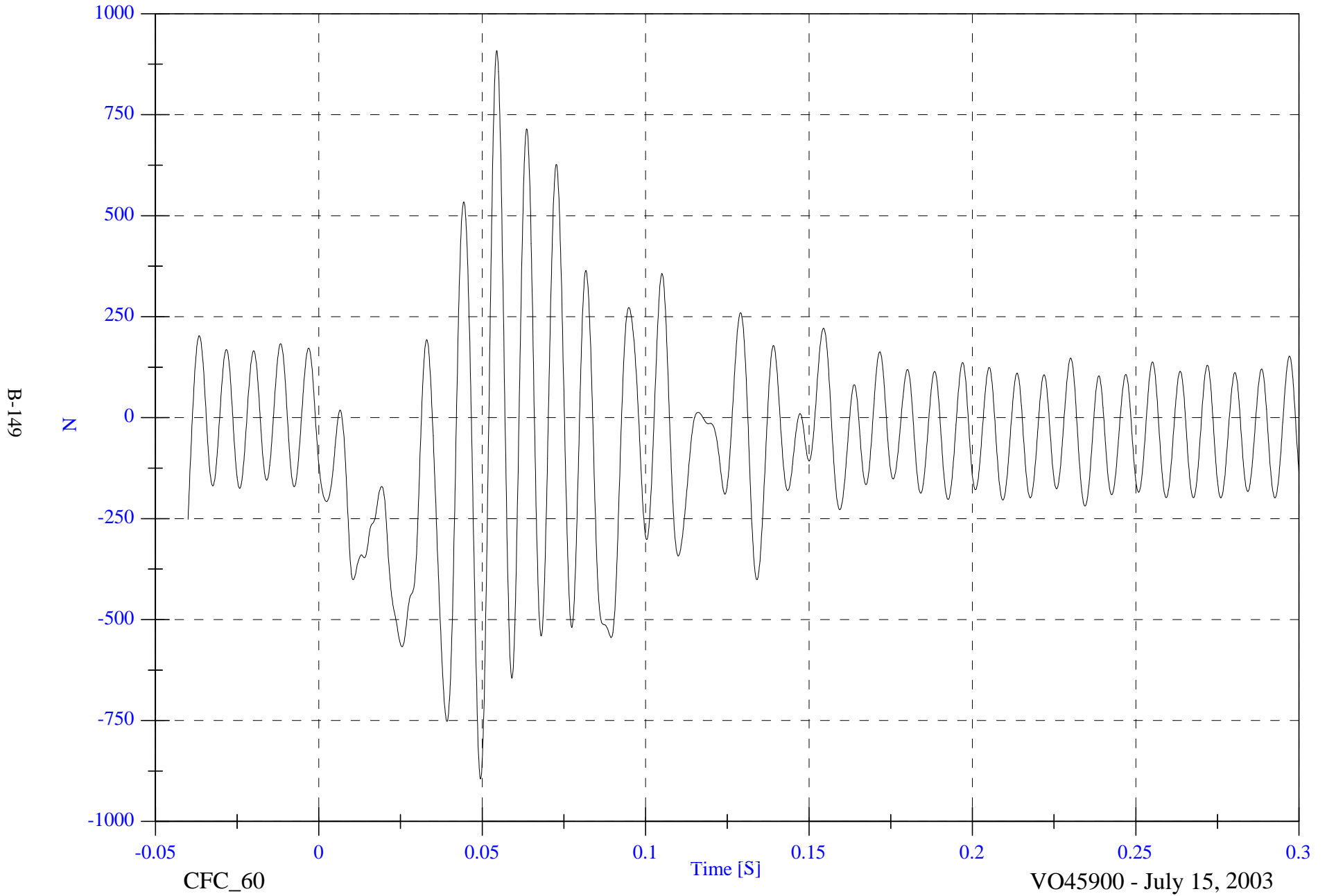


2004 Volvo XC90 NCAP

Barrier Load Cell A9 Fx

Max: 909.1 [N] at 0.054 [S]

Min: -895.0 [N] at 0.049 [S]

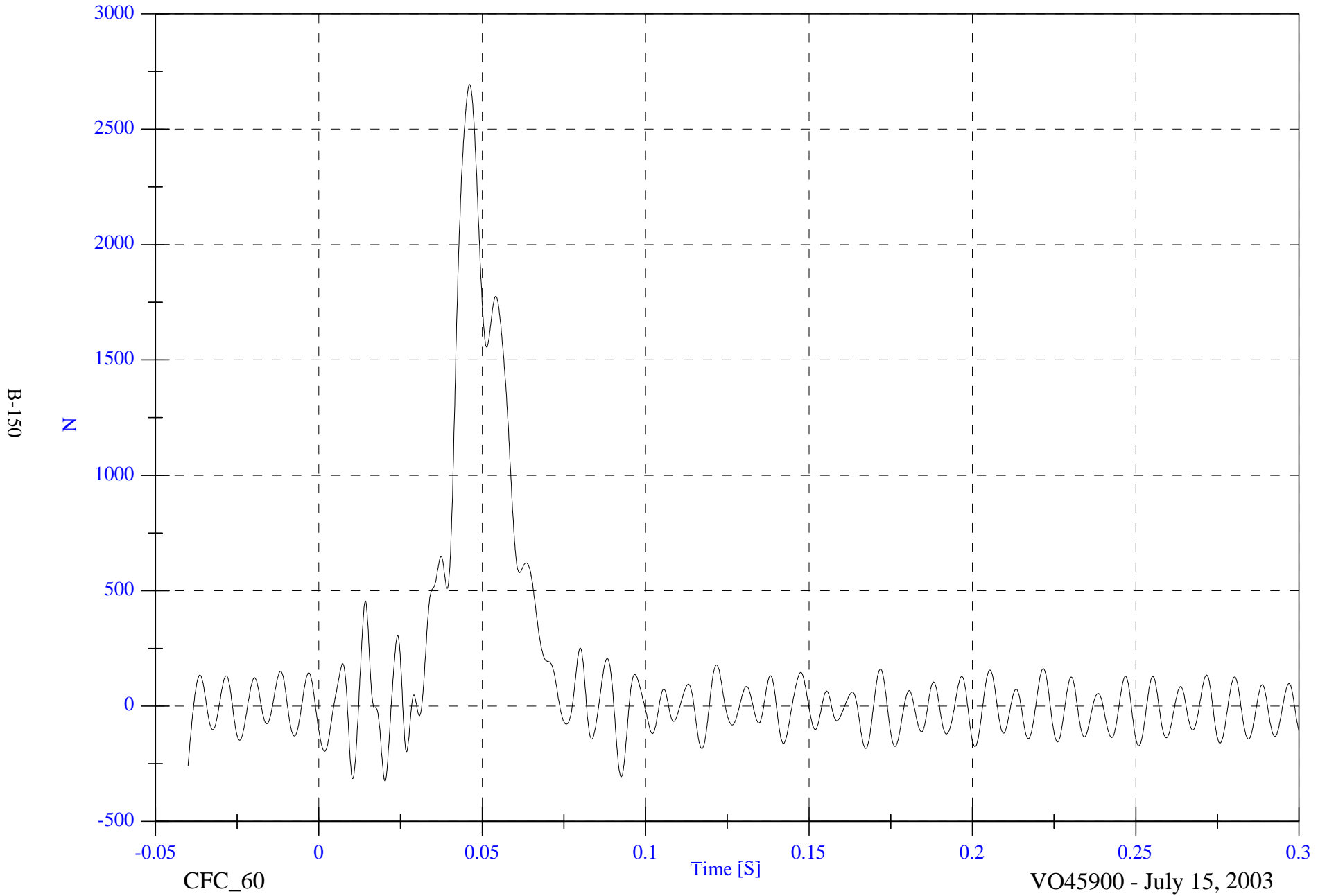


2004 Volvo XC90 NCAP

Barrier Load Cell B1 Fx

Max: 2693.6 [N] at 0.046 [S]

Min: -325.9 [N] at 0.020 [S]

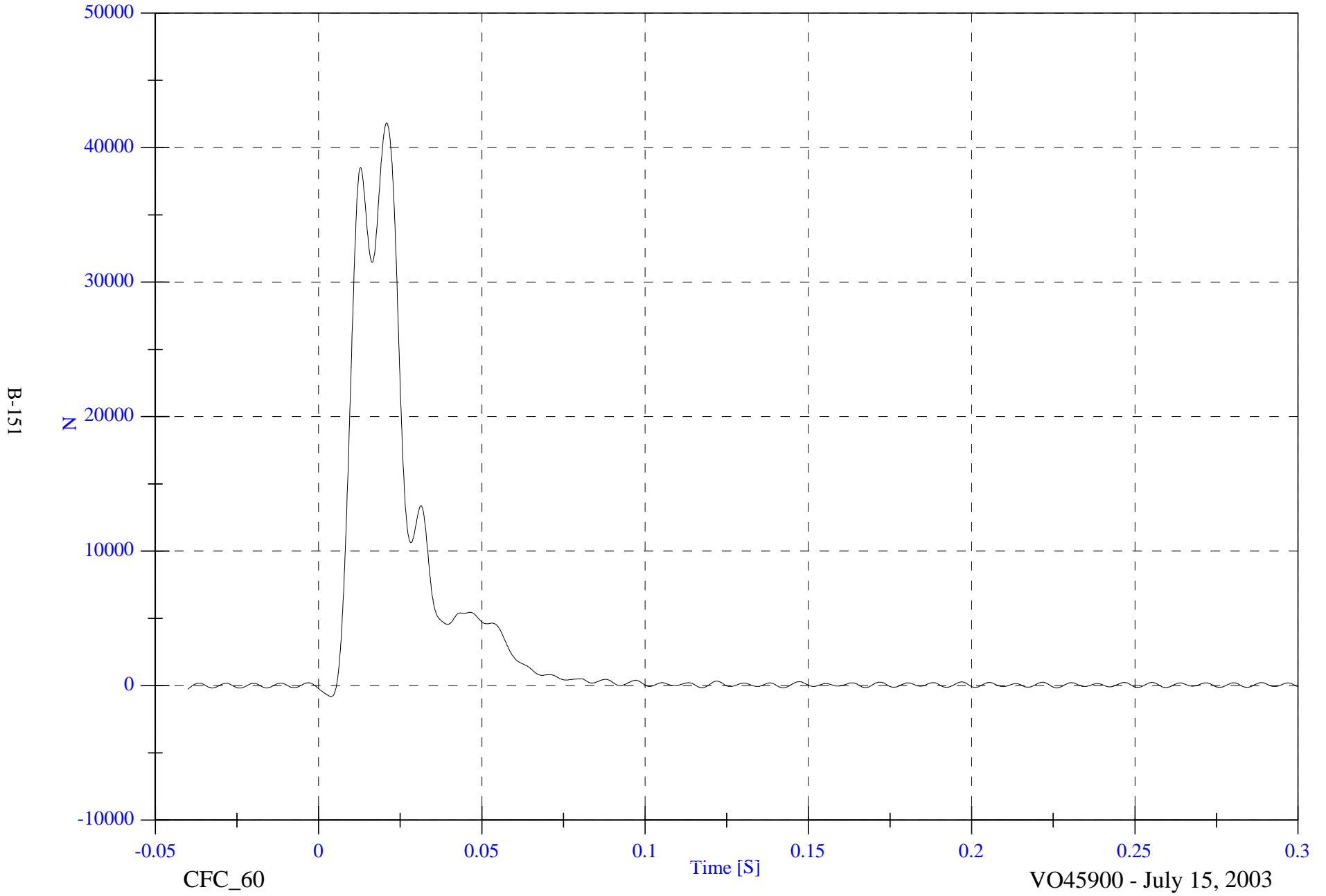


2004 Volvo XC90 NCAP

Barrier Load Cell B2 Fx

Max: 41829.1 [N] at 0.021 [S]

Min: -806.9 [N] at 0.004 [S]

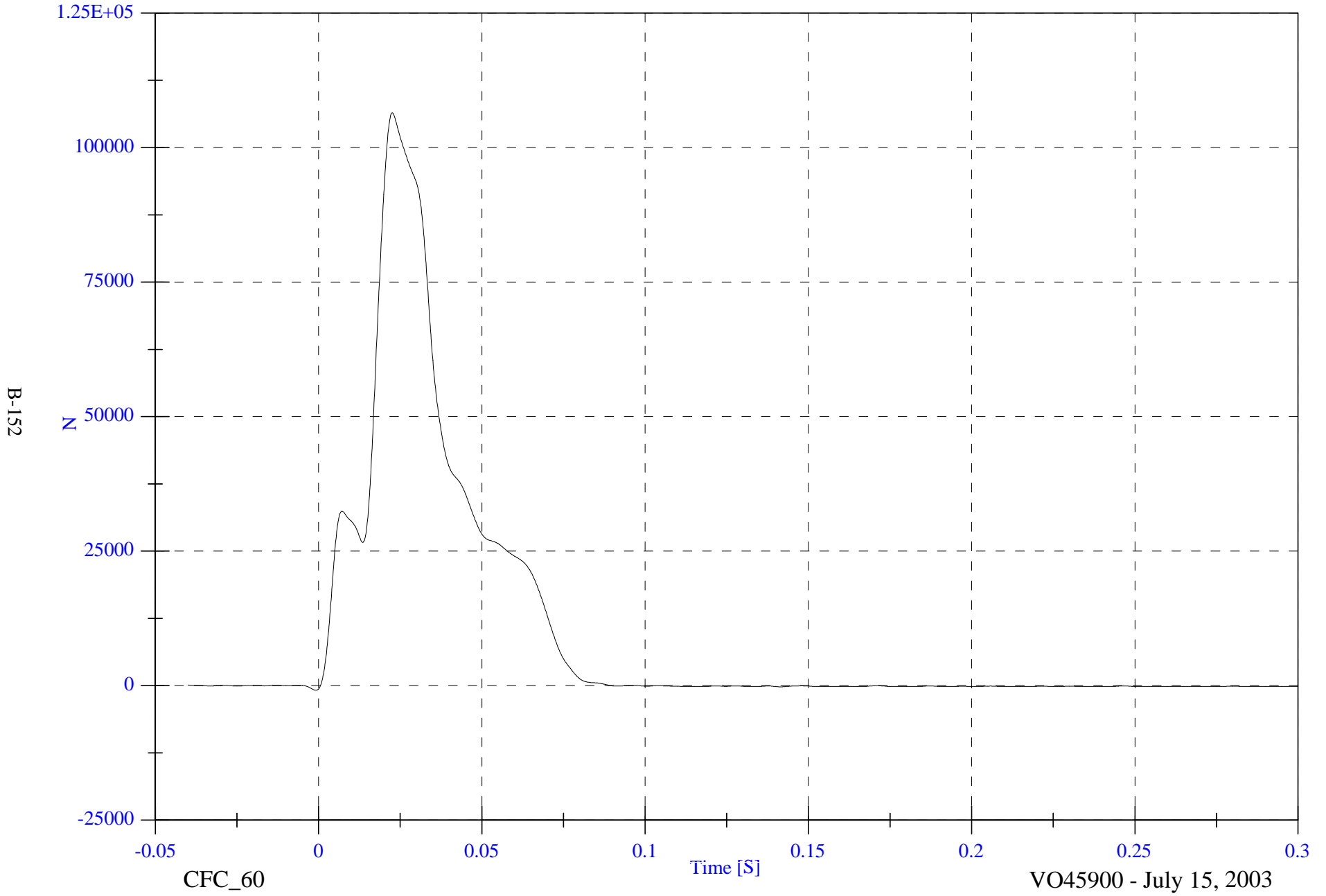


2004 Volvo XC90 NCAP

Barrier Load Cell B3 Fx

Max: 106476.4 [N] at 0.023 [S]

Min: -868.9 [N] at -0.001 [S]

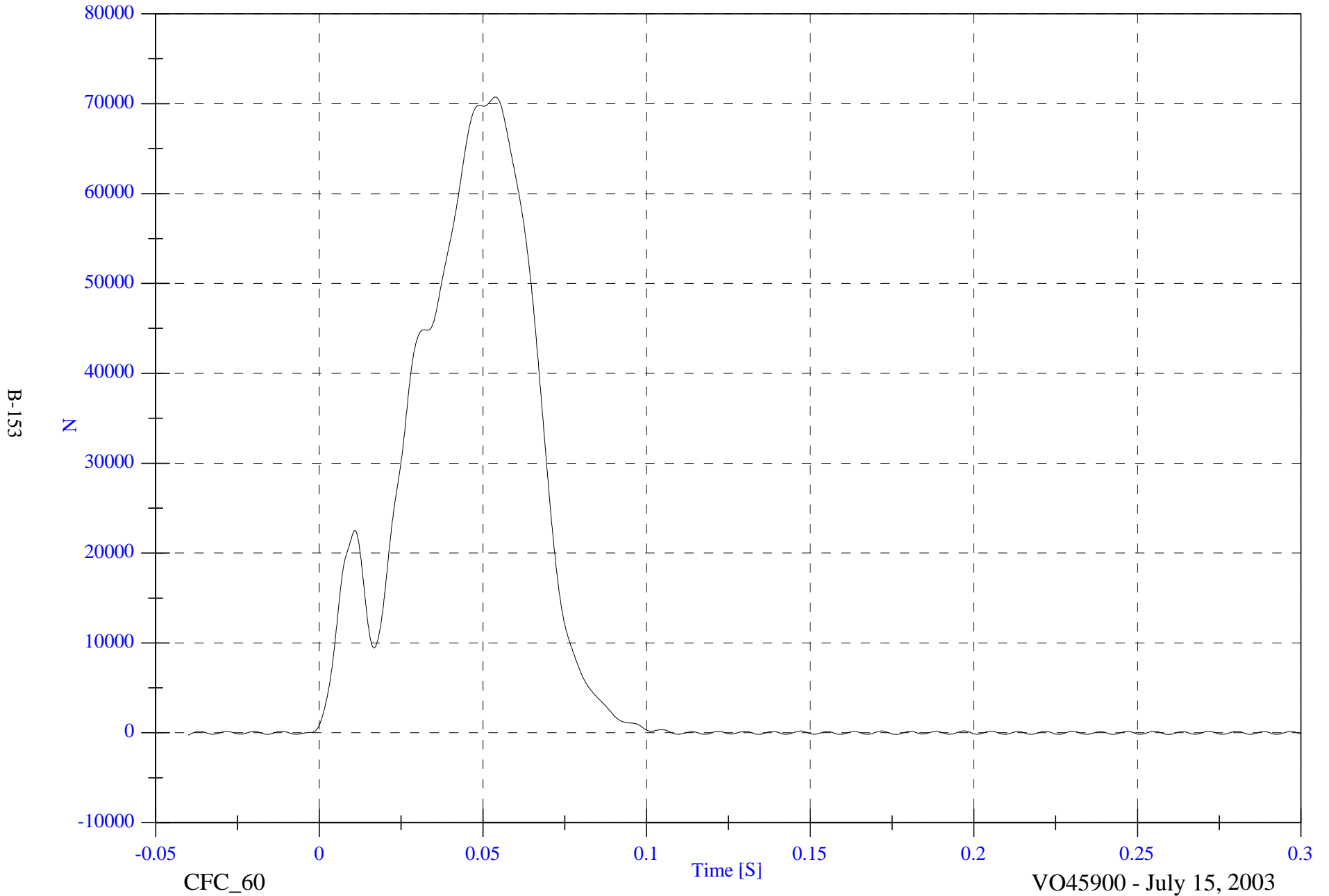


2004 Volvo XC90 NCAP

Barrier Load Cell B4 Fx

Max: 70745.3 [N] at 0.054 [S]

Min: -237.6 [N] at -0.040 [S]

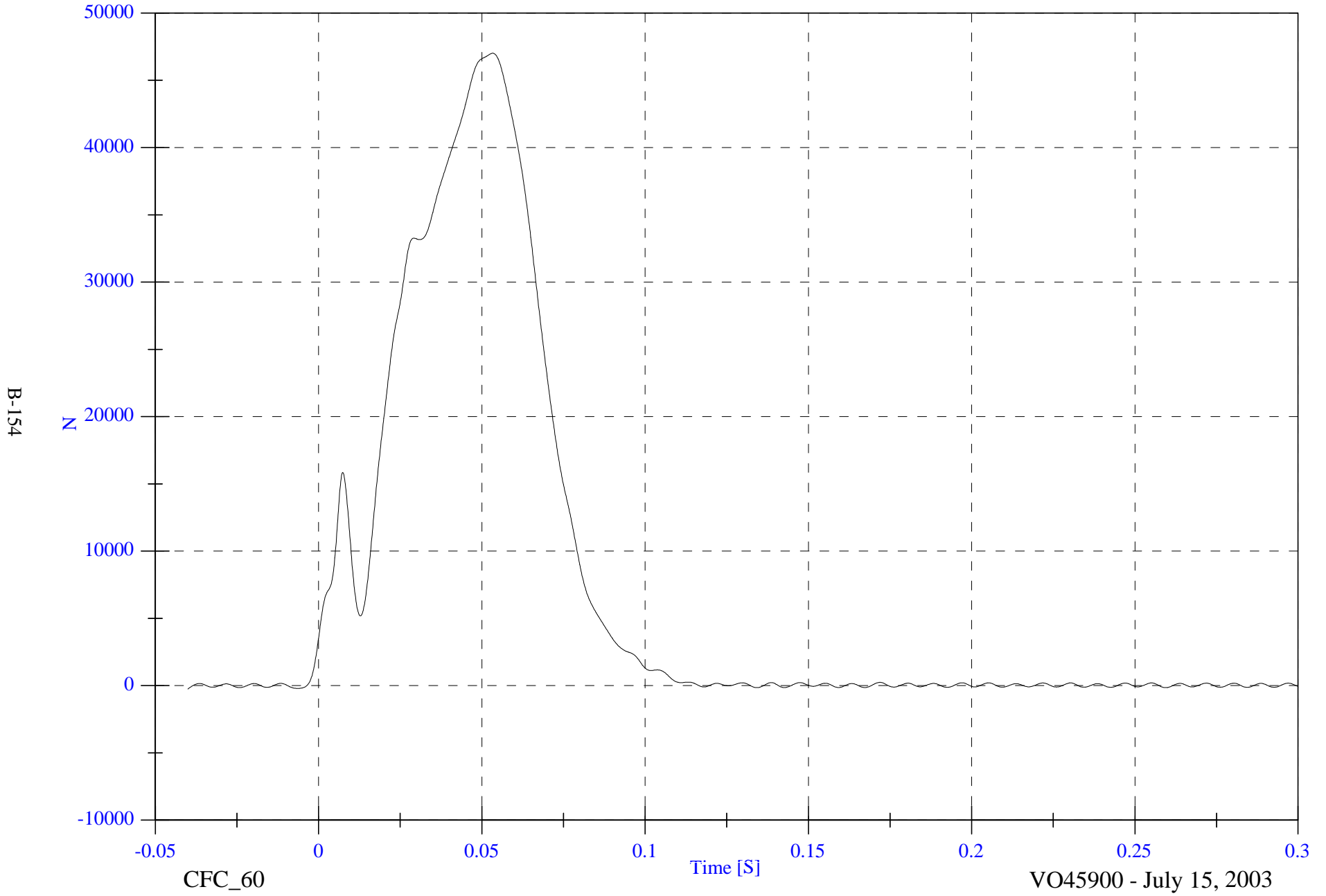


2004 Volvo XC90 NCAP

Barrier Load Cell B5 Fx

Max: 47010.9 [N] at 0.053 [S]

Min: -246.8 [N] at -0.040 [S]



CFC_60

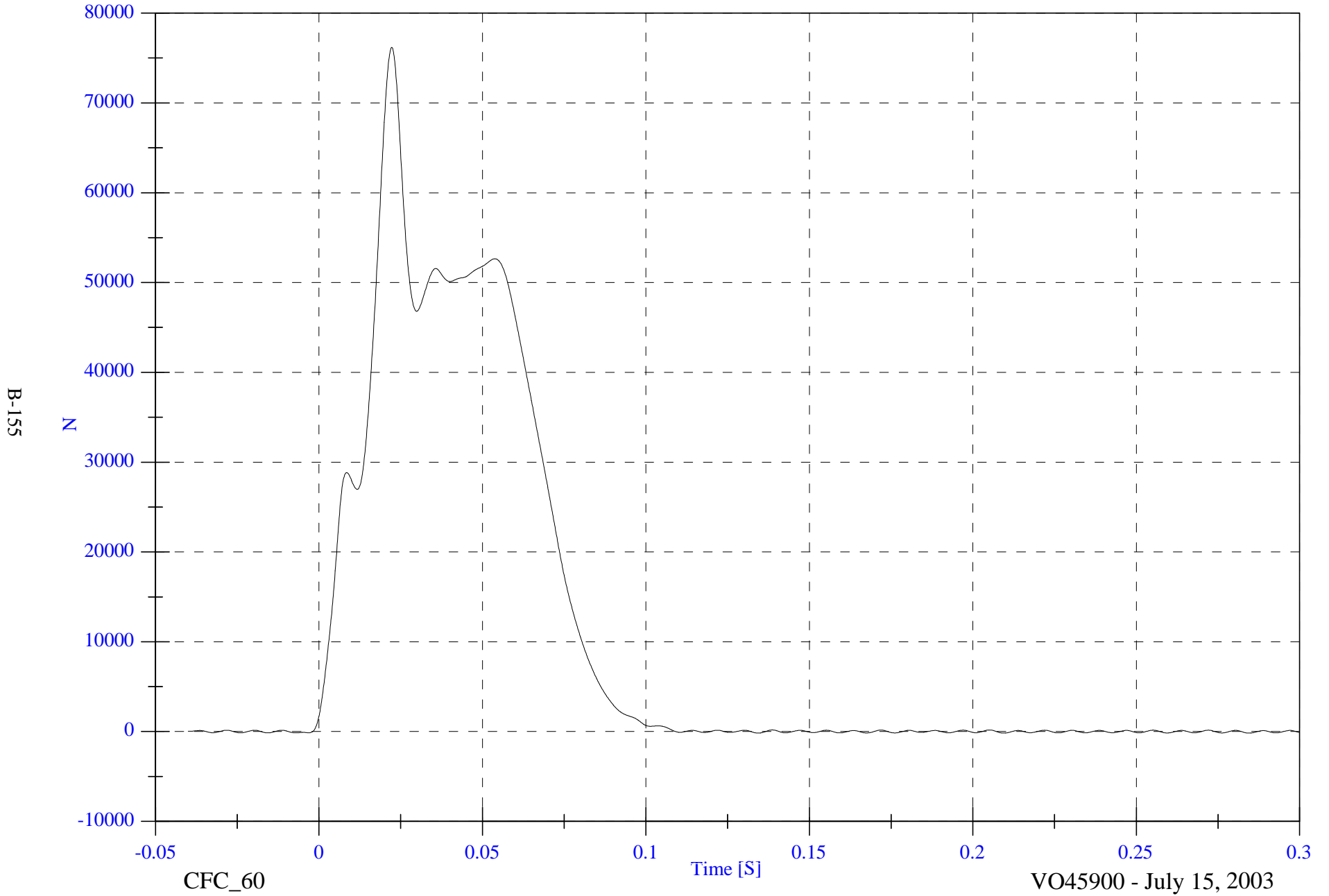
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell B6 Fx

Max: 76182.9 [N] at 0.022 [S]

Min: -166.8 [N] at 0.284 [S]

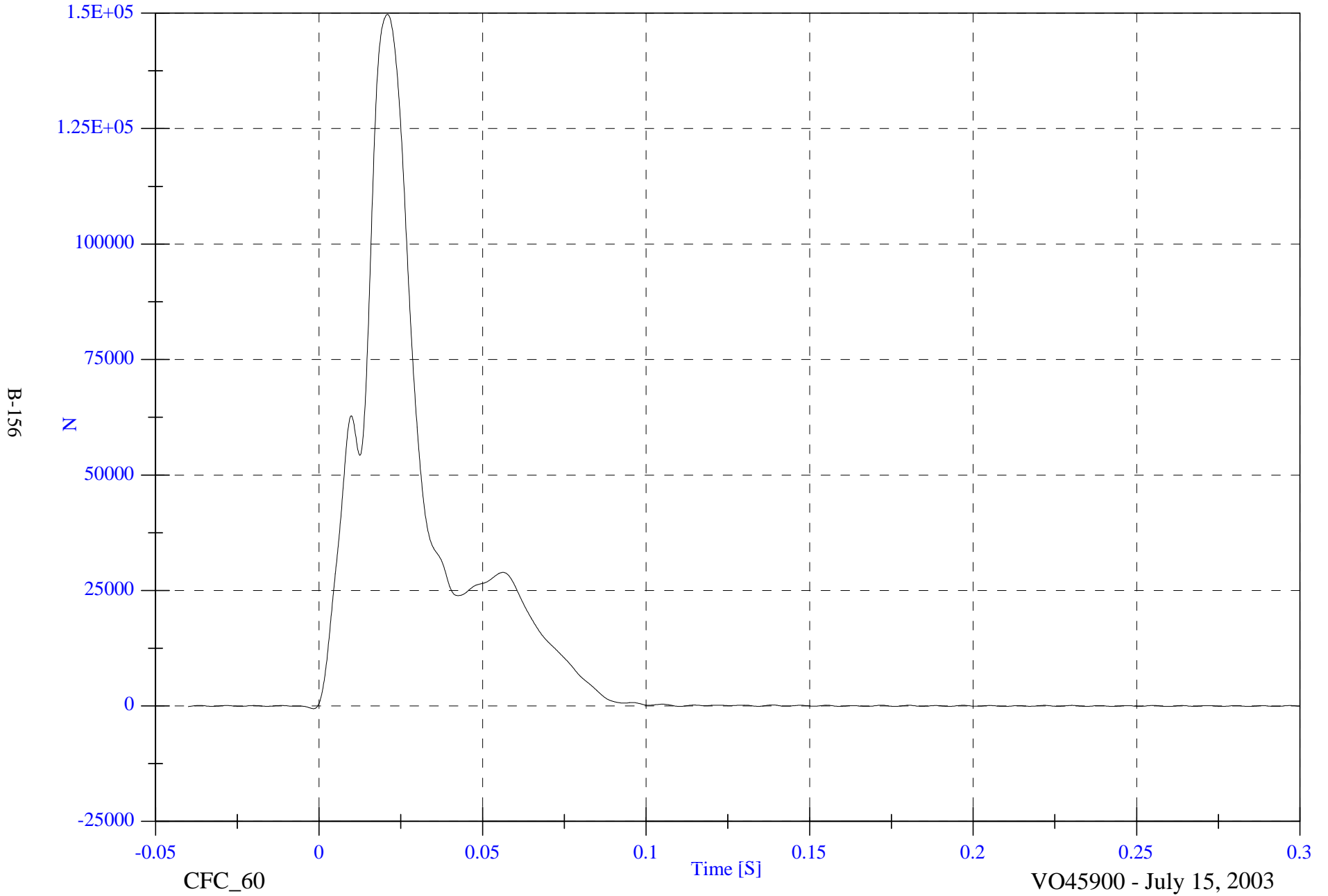


2004 Volvo XC90 NCAP

Barrier Load Cell B7 Fx

Max: 149718.0 [N] at 0.021 [S]

Min: -586.9 [N] at -0.002 [S]

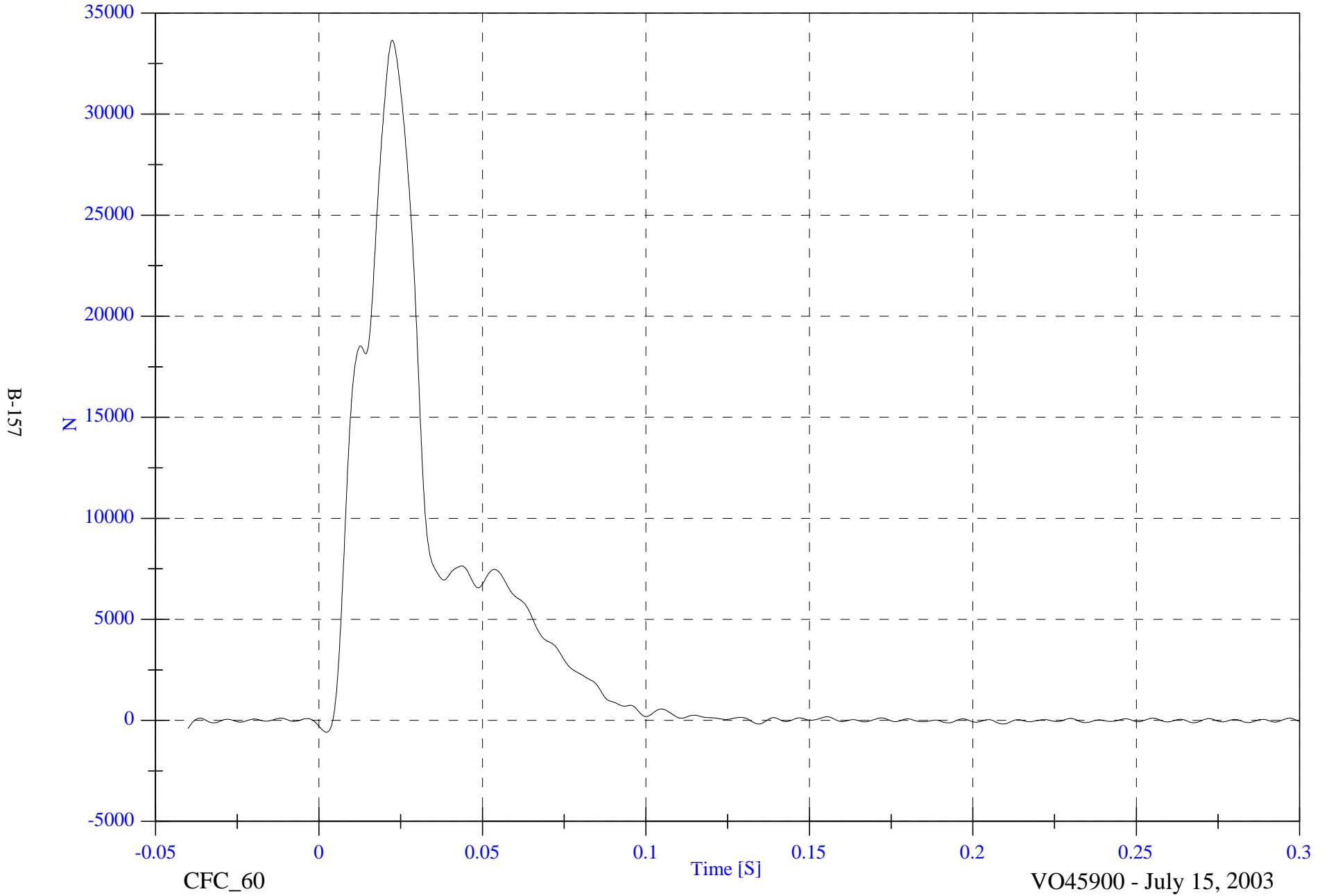


2004 Volvo XC90 NCAP

Barrier Load Cell B8 Fx

Max: 33644.6 [N] at 0.022 [S]

Min: -585.6 [N] at 0.002 [S]

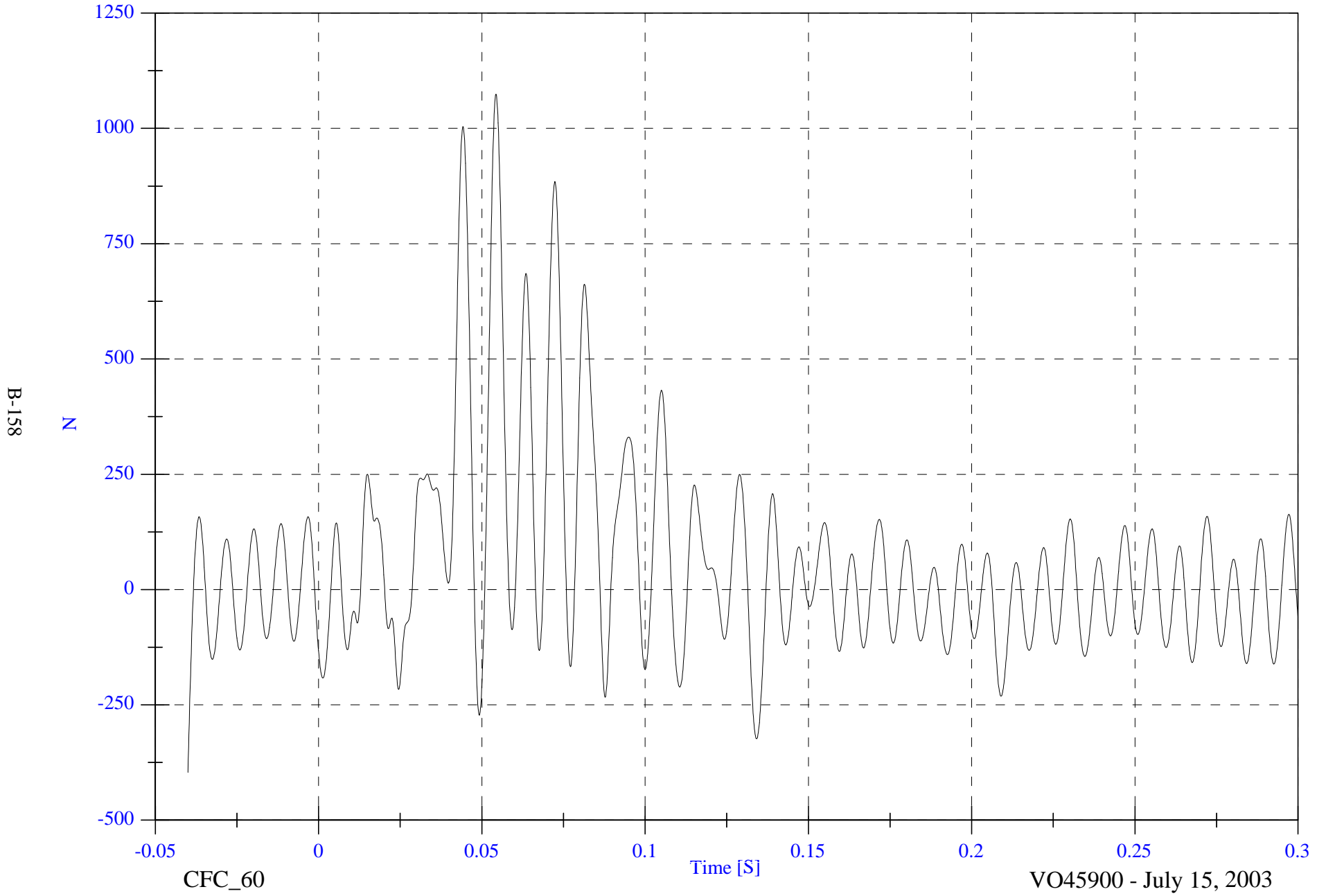


2004 Volvo XC90 NCAP

Barrier Load Cell B9 Fx

Max: 1074.1 [N] at 0.054 [S]

Min: -396.7 [N] at -0.040 [S]

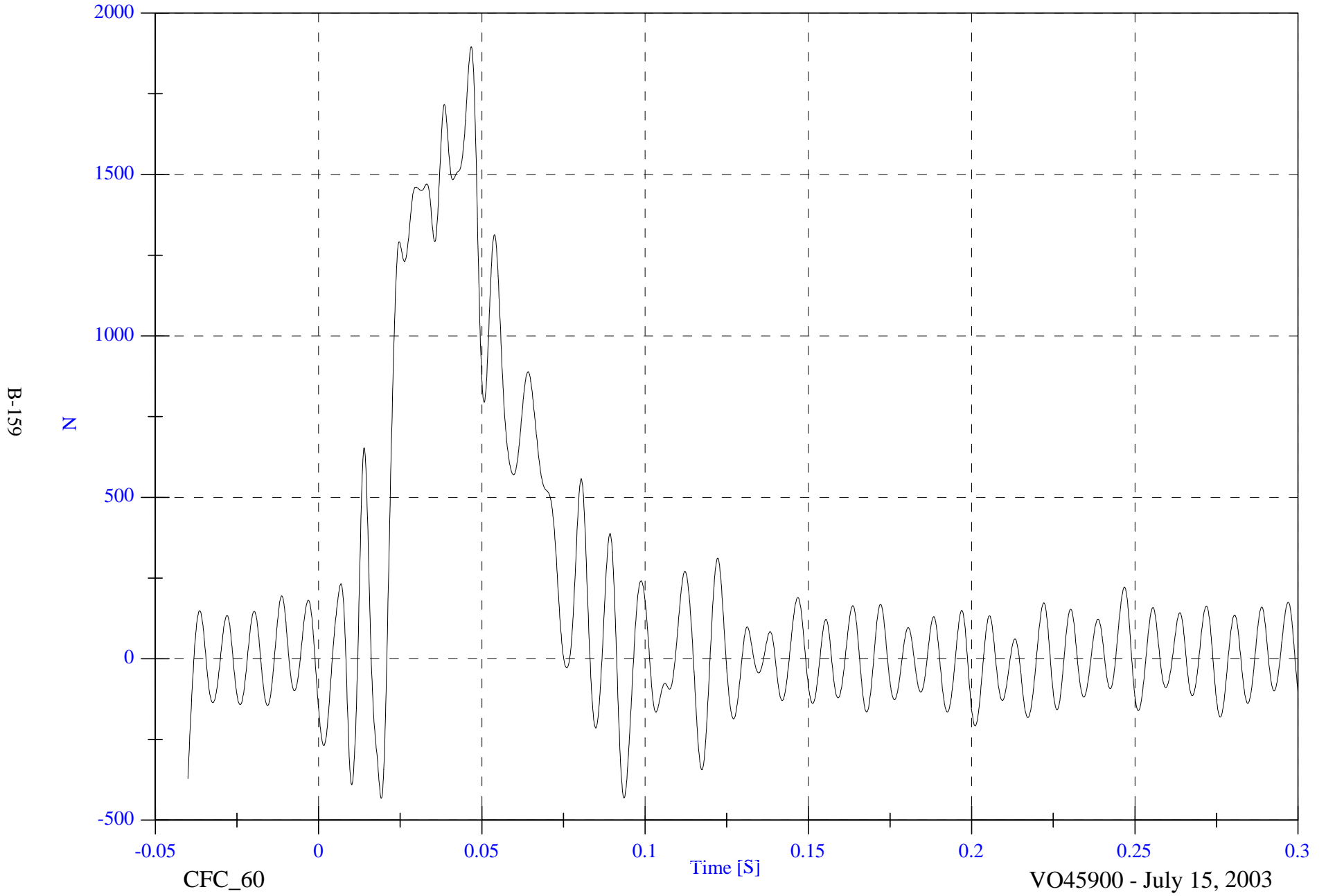


2004 Volvo XC90 NCAP

Barrier Load Cell C1 Fx

Max: 1895.8 [N] at 0.047 [S]

Min: -432.5 [N] at 0.019 [S]

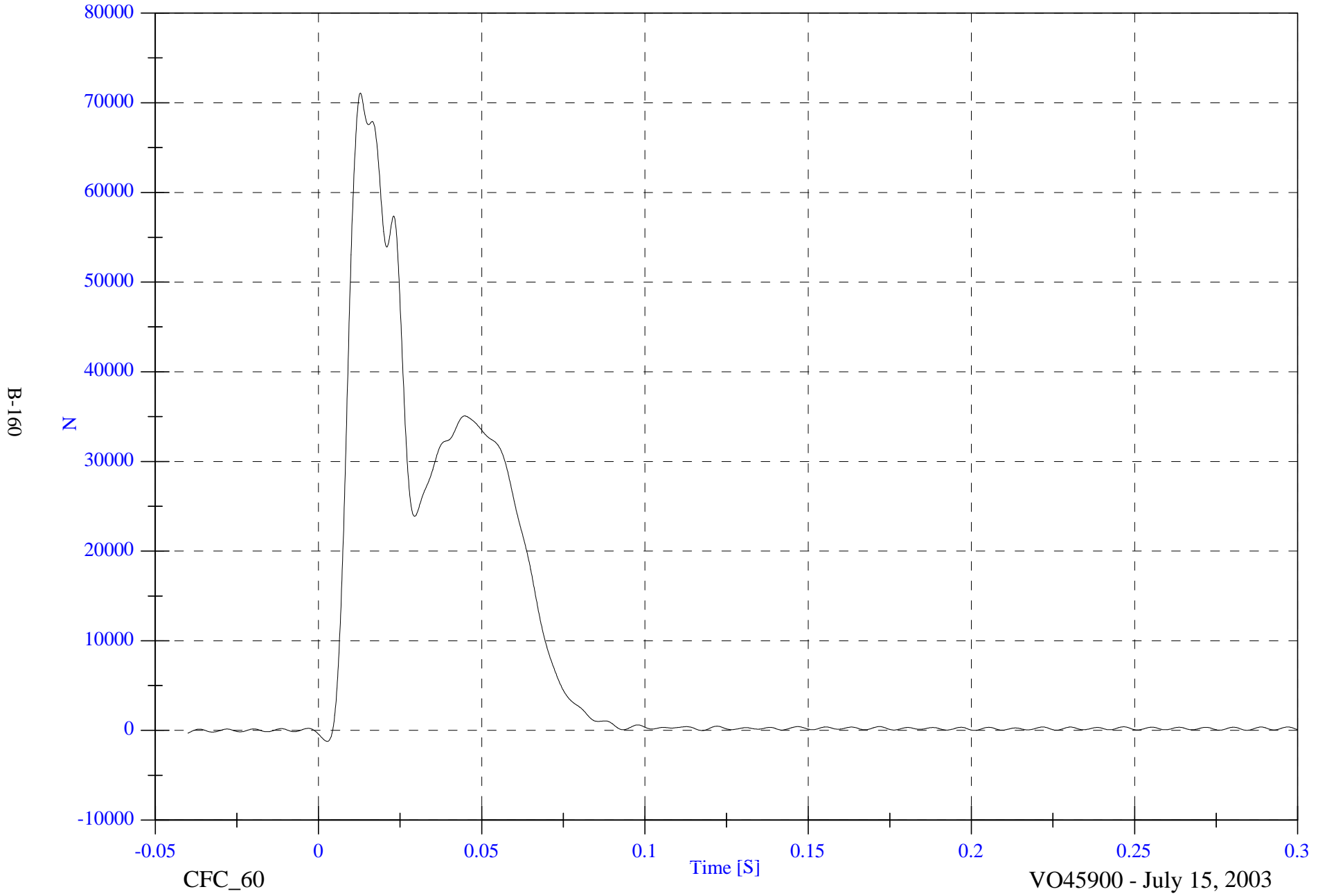


2004 Volvo XC90 NCAP

Barrier Load Cell C2 Fx

Max: 71086.9 [N] at 0.013 [S]

Min: -1220.2 [N] at 0.003 [S]

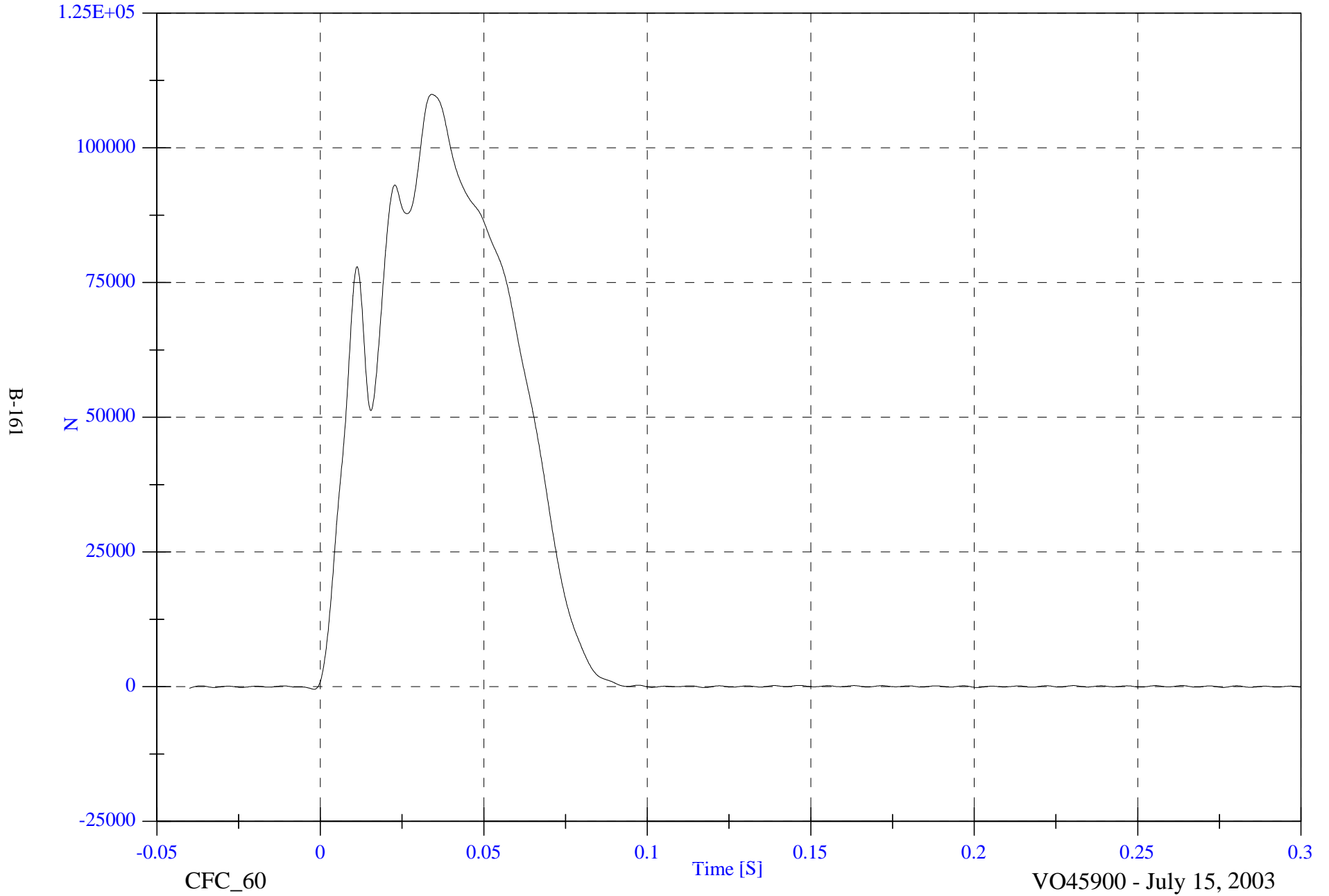


2004 Volvo XC90 NCAP

Barrier Load Cell C3 Fx

Max: 109908.2 [N] at 0.034 [S]

Min: -470.5 [N] at -0.002 [S]

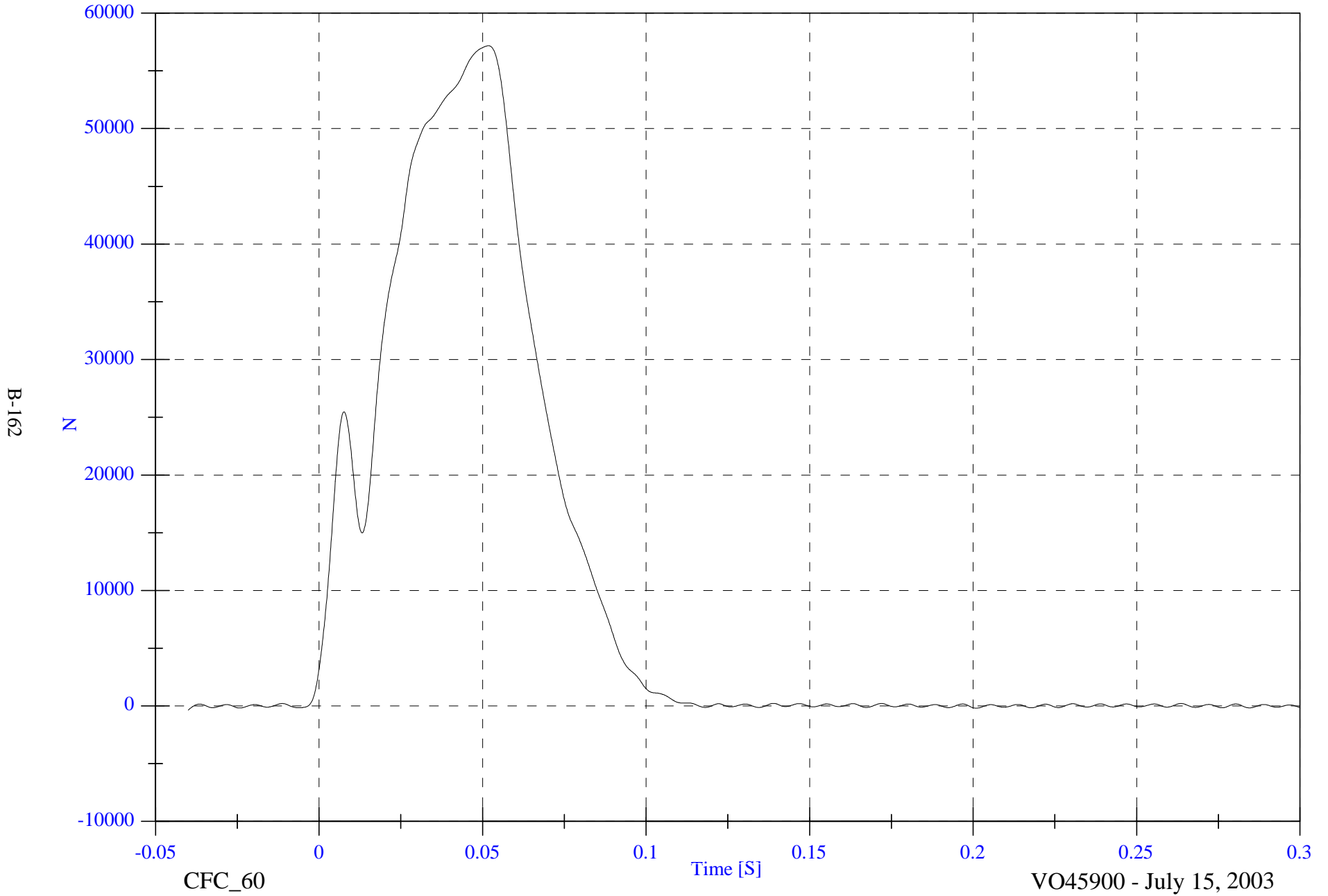


2004 Volvo XC90 NCAP

Barrier Load Cell C4 Fx

Max: 57170.5 [N] at 0.052 [S]

Min: -355.4 [N] at -0.040 [S]

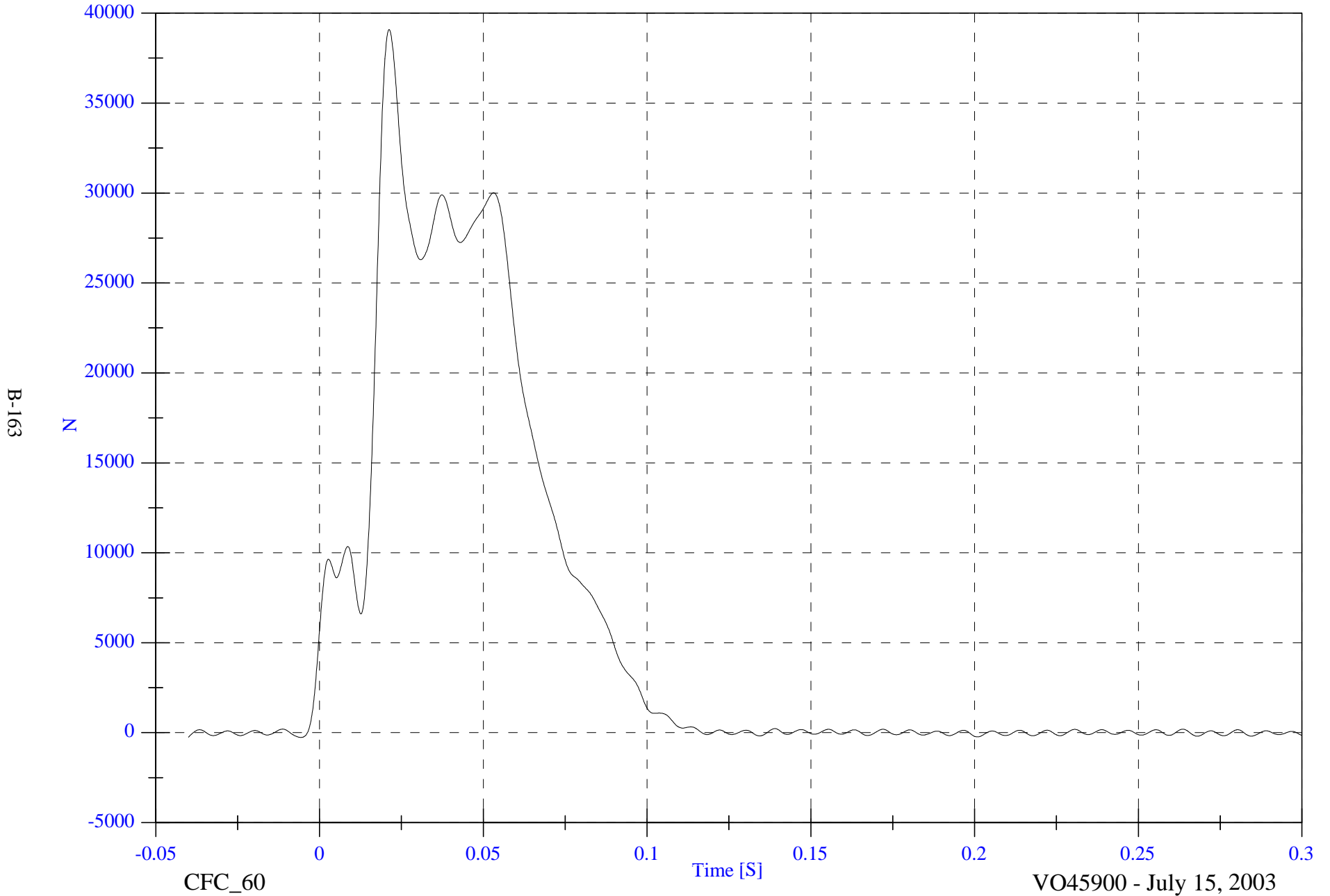


2004 Volvo XC90 NCAP

Barrier Load Cell C5 Fx

Max: 39086.6 [N] at 0.021 [S]

Min: -260.5 [N] at -0.006 [S]

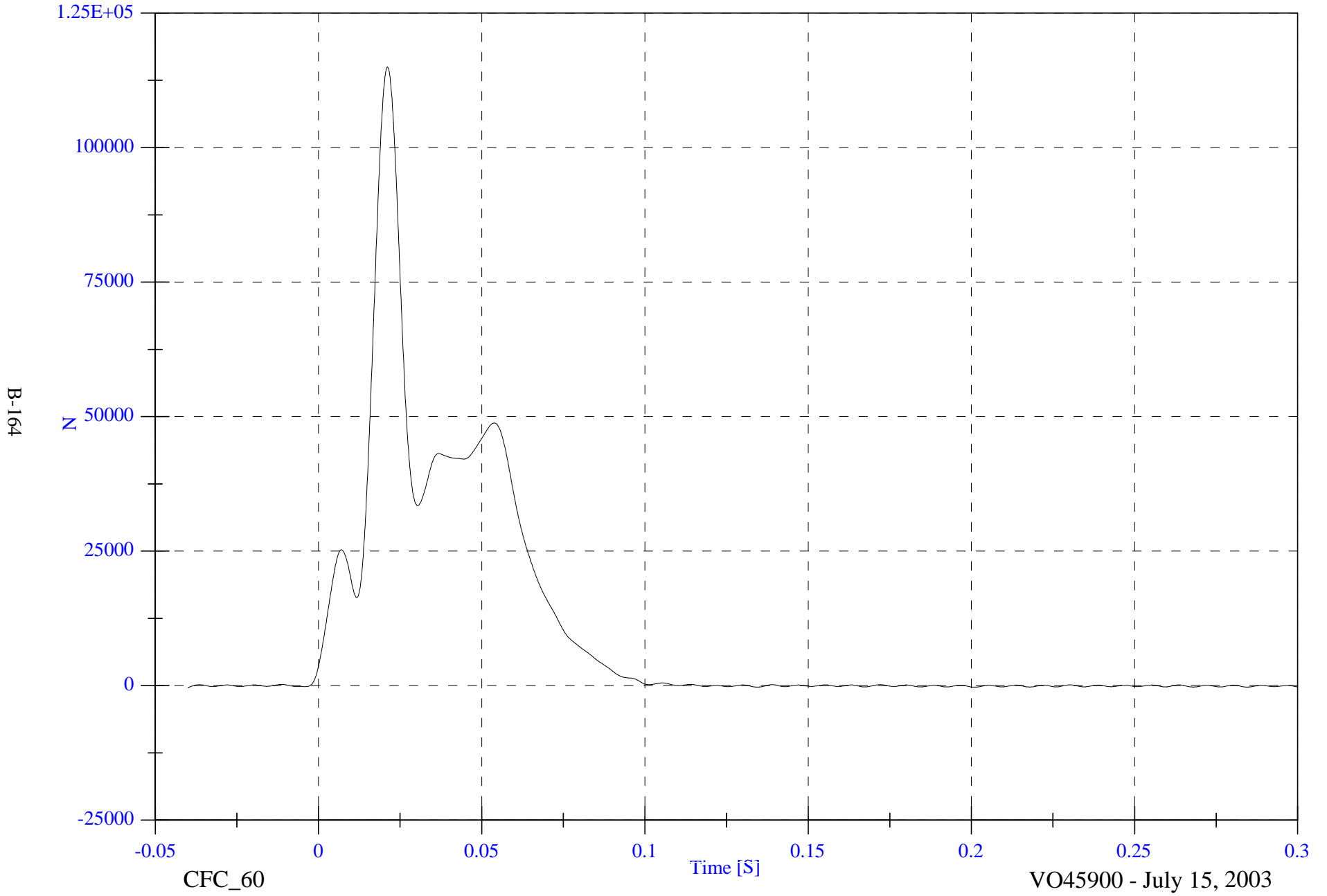


2004 Volvo XC90 NCAP

Barrier Load Cell C6 Fx

Max: 115003.3 [N] at 0.021 [S]

Min: -401.4 [N] at -0.040 [S]

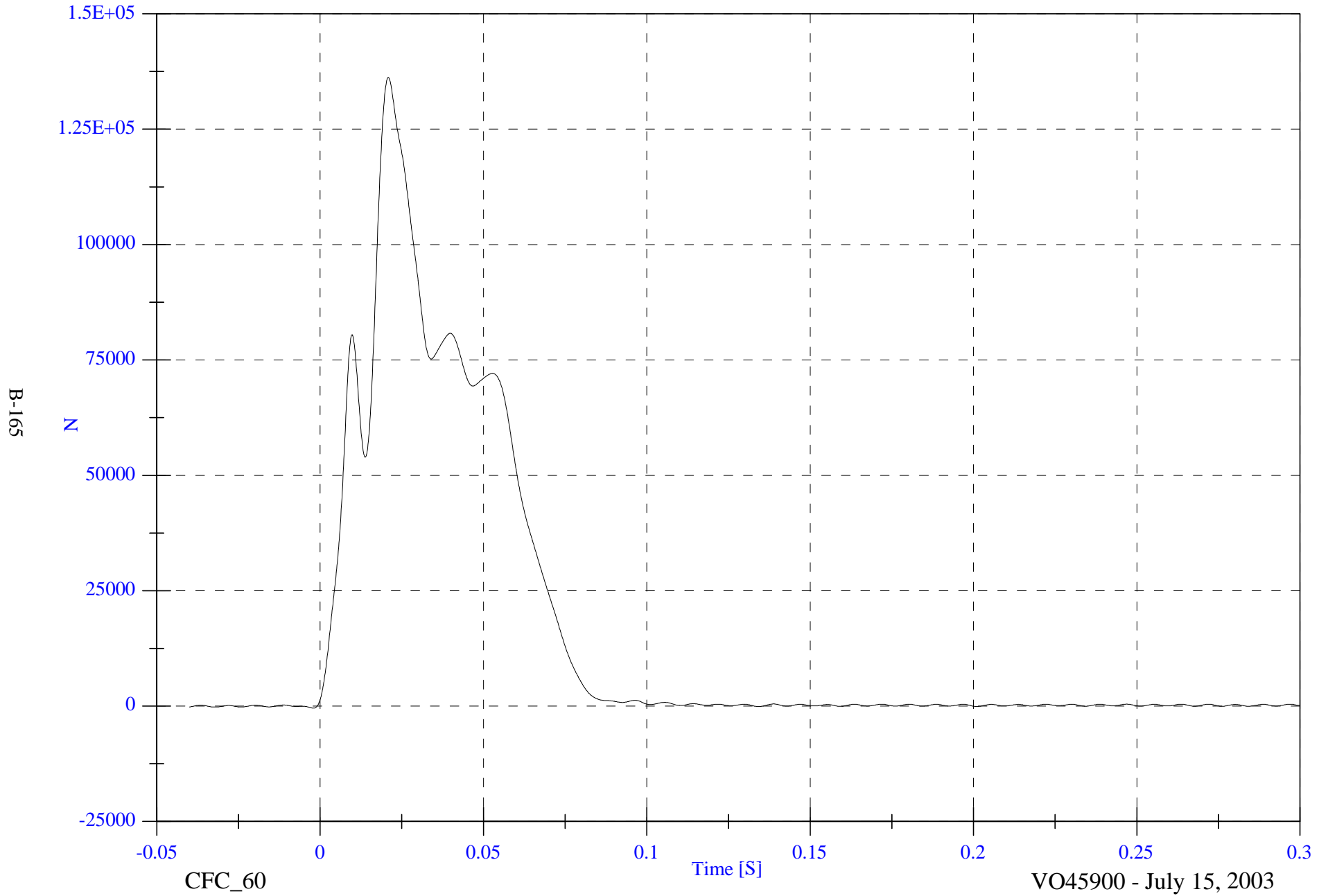


2004 Volvo XC90 NCAP

Barrier Load Cell C7 Fx

Max: 136212.7 [N] at 0.021 [S]

Min: -453.1 [N] at -0.002 [S]

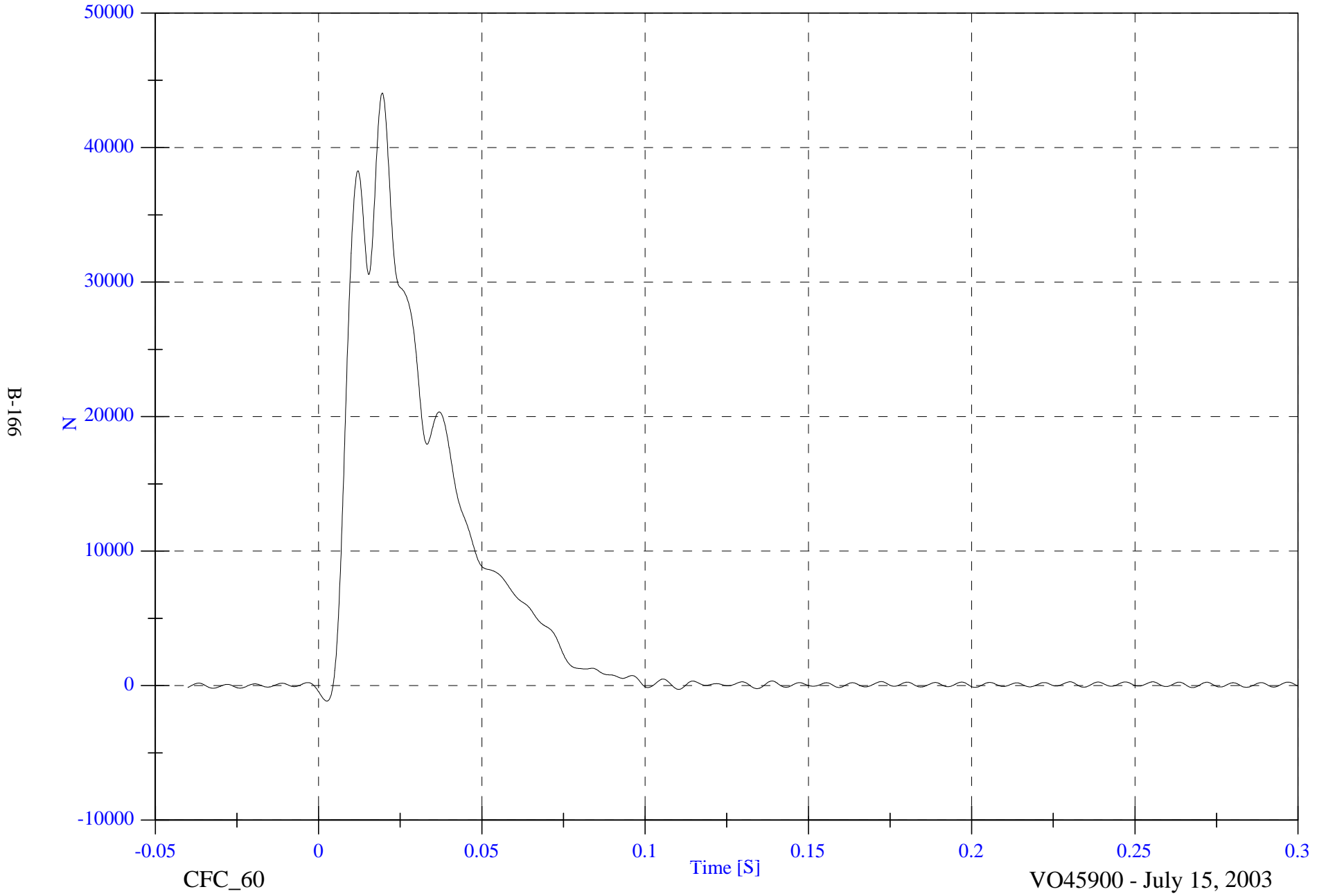


2004 Volvo XC90 NCAP

Barrier Load Cell C8 Fx

Max: 44058.6 [N] at 0.019 [S]

Min: -1150.7 [N] at 0.003 [S]



B-166

N

CFC_60

Time [S]

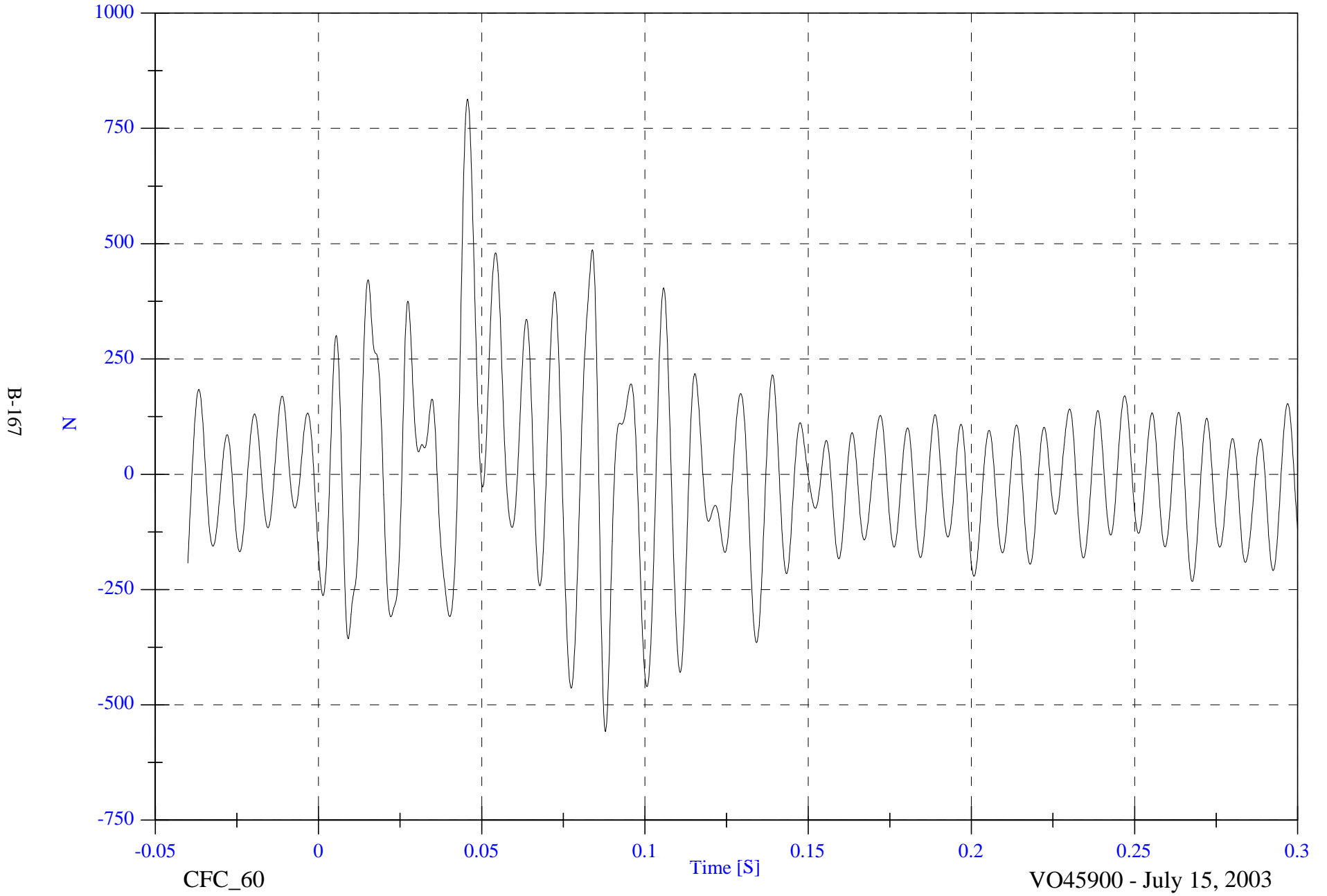
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell C9 Fx

Max: 813.6 [N] at 0.046 [S]

Min: -558.2 [N] at 0.088 [S]

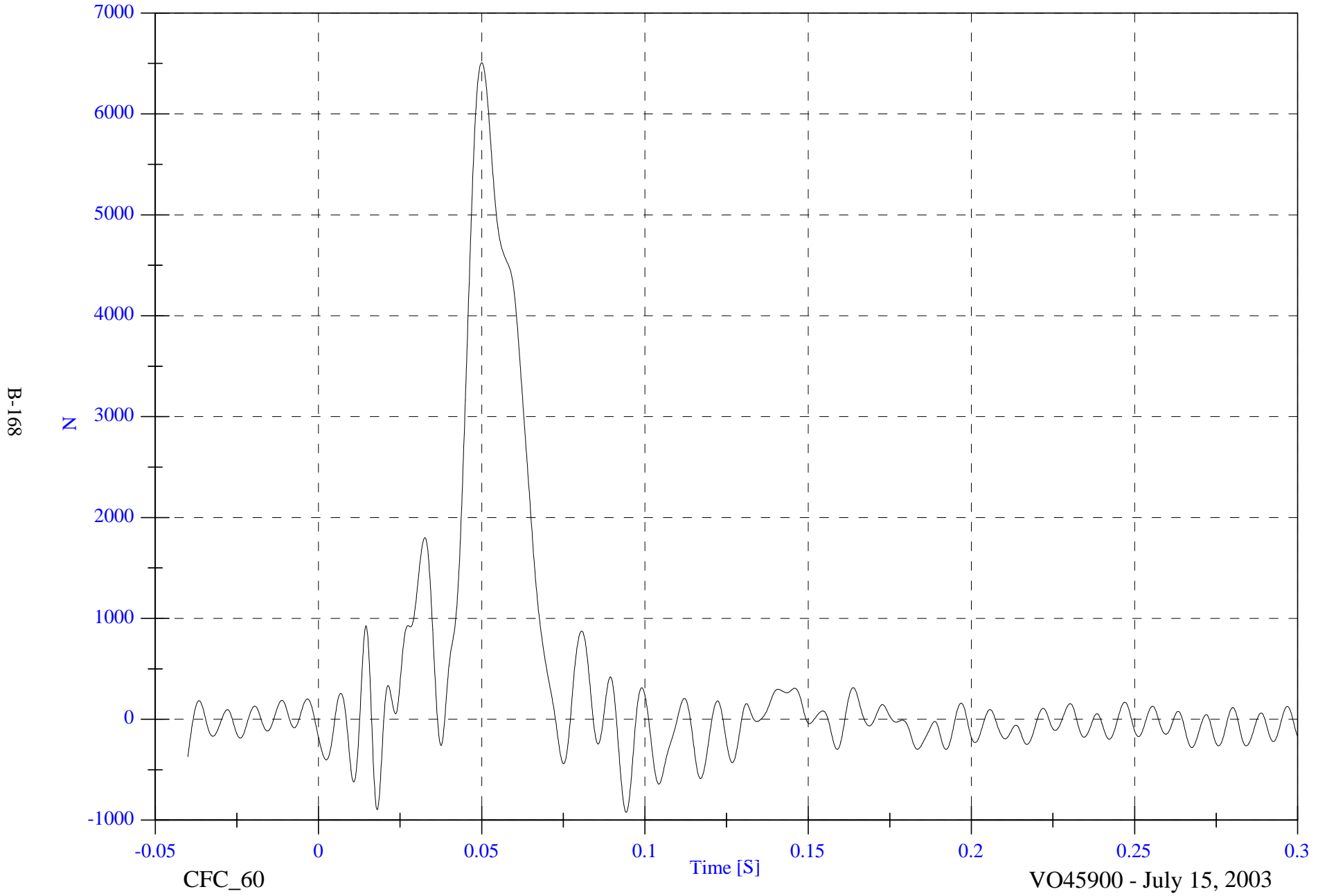


2004 Volvo XC90 NCAP

Barrier Load Cell D1 Fx

Max: 6507.5 [N] at 0.050 [S]

Min: -922.1 [N] at 0.094 [S]

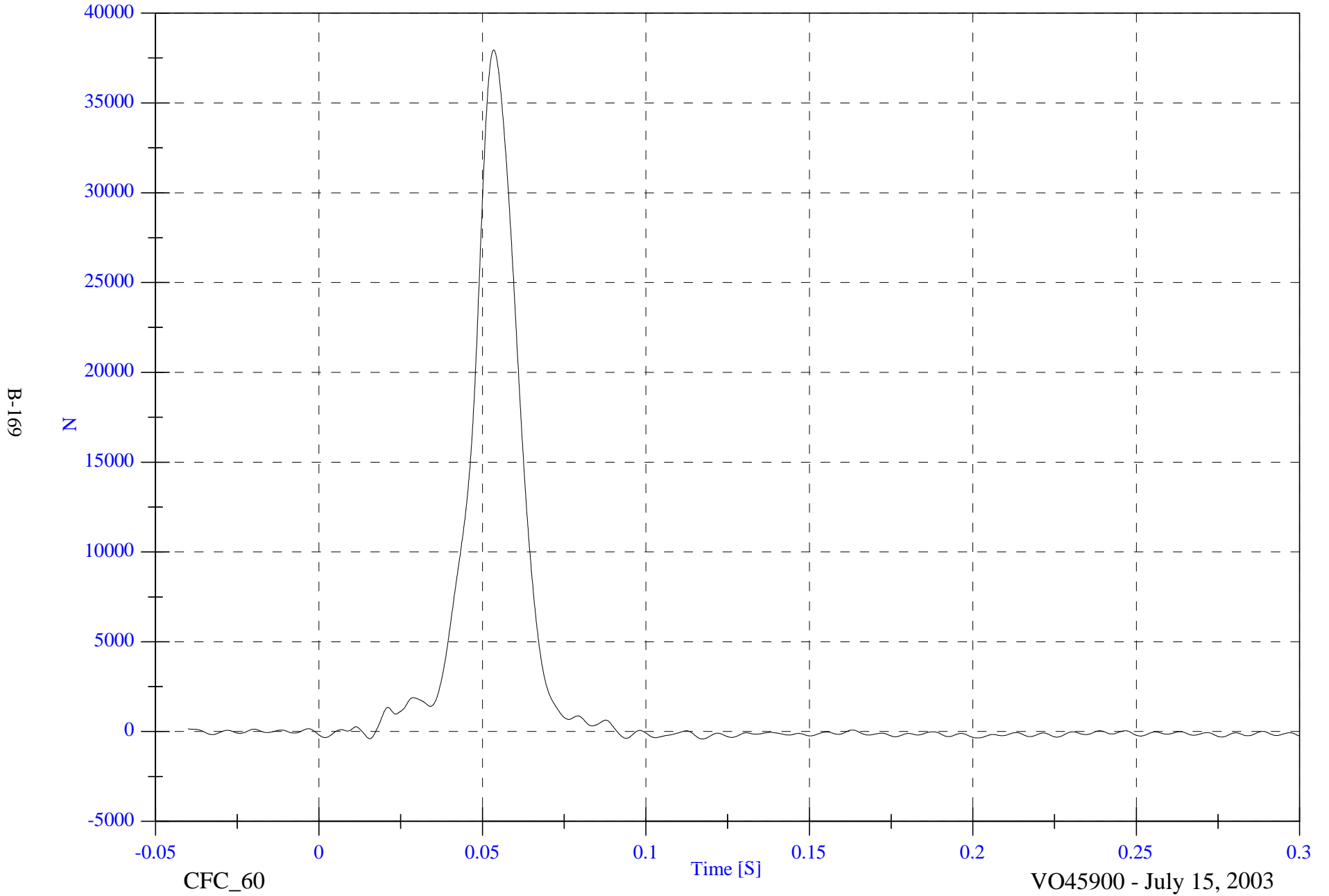


2004 Volvo XC90 NCAP

Barrier Load Cell D2 Fx

Max: 37945.4 [N] at 0.053 [S]

Min: -413.1 [N] at 0.117 [S]

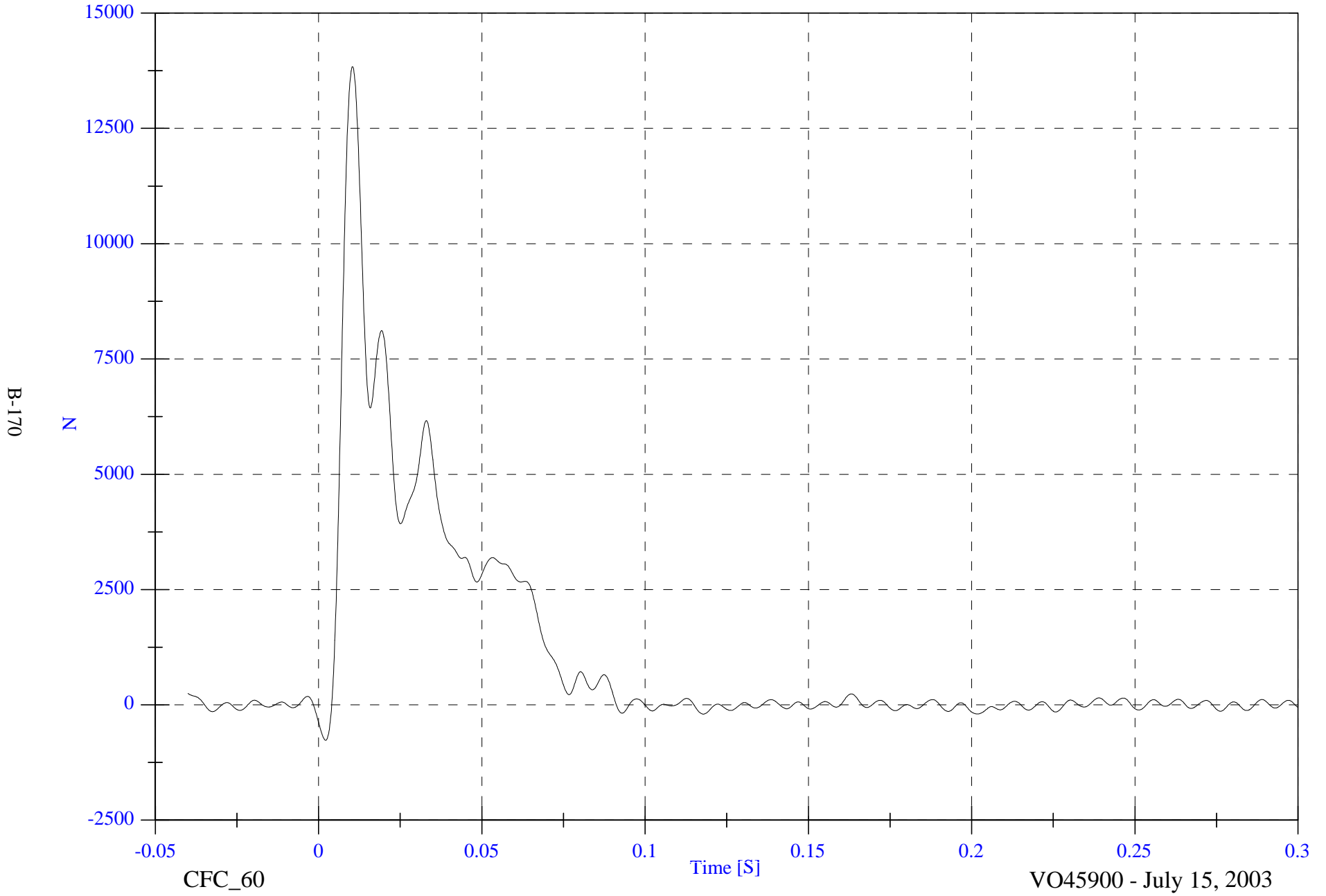


2004 Volvo XC90 NCAP

Barrier Load Cell D3 Fx

Max: 13837.7 [N] at 0.010 [S]

Min: -768.9 [N] at 0.002 [S]

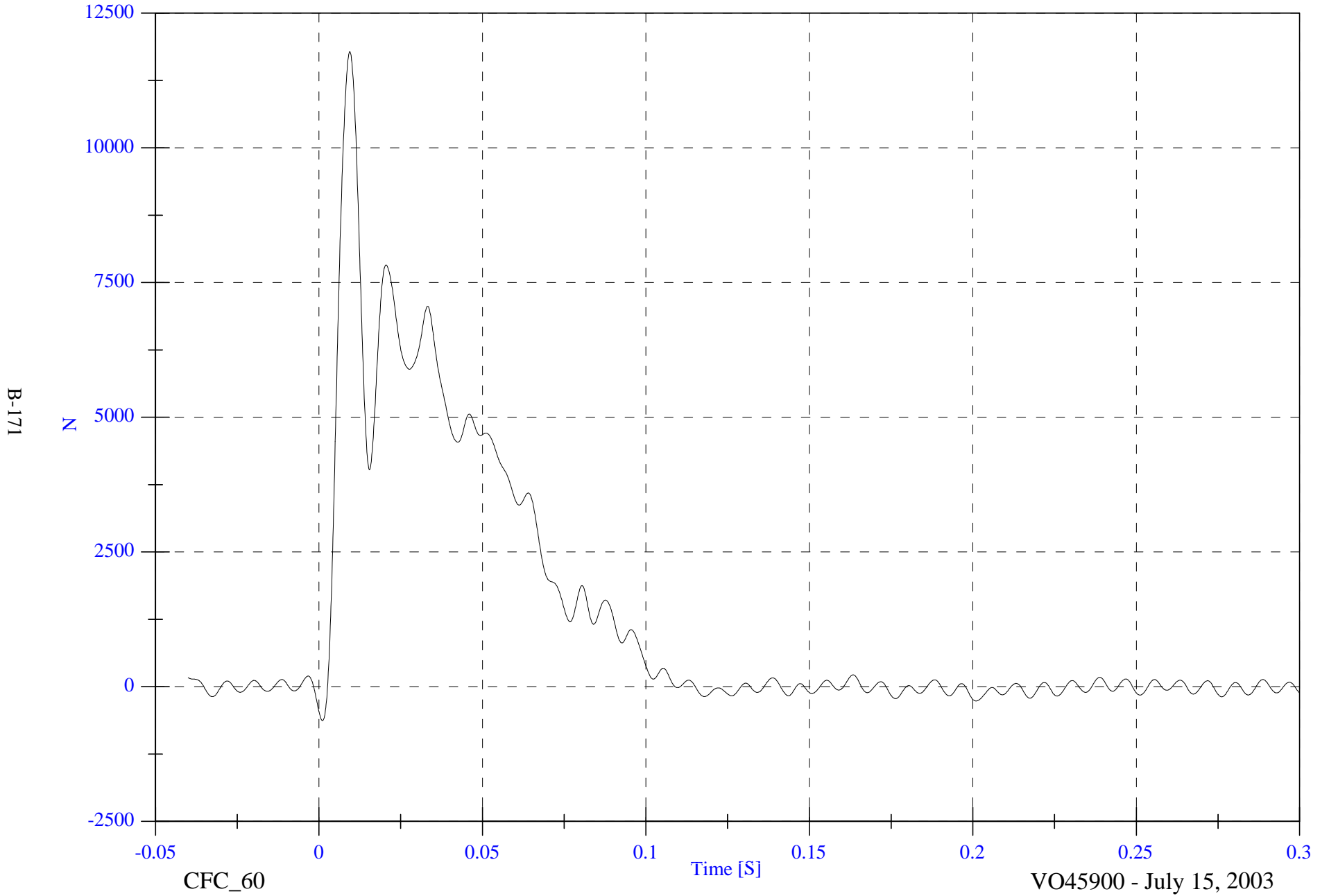


2004 Volvo XC90 NCAP

Barrier Load Cell D4 Fx

Max: 11784.3 [N] at 0.009 [S]

Min: -630.9 [N] at 0.001 [S]

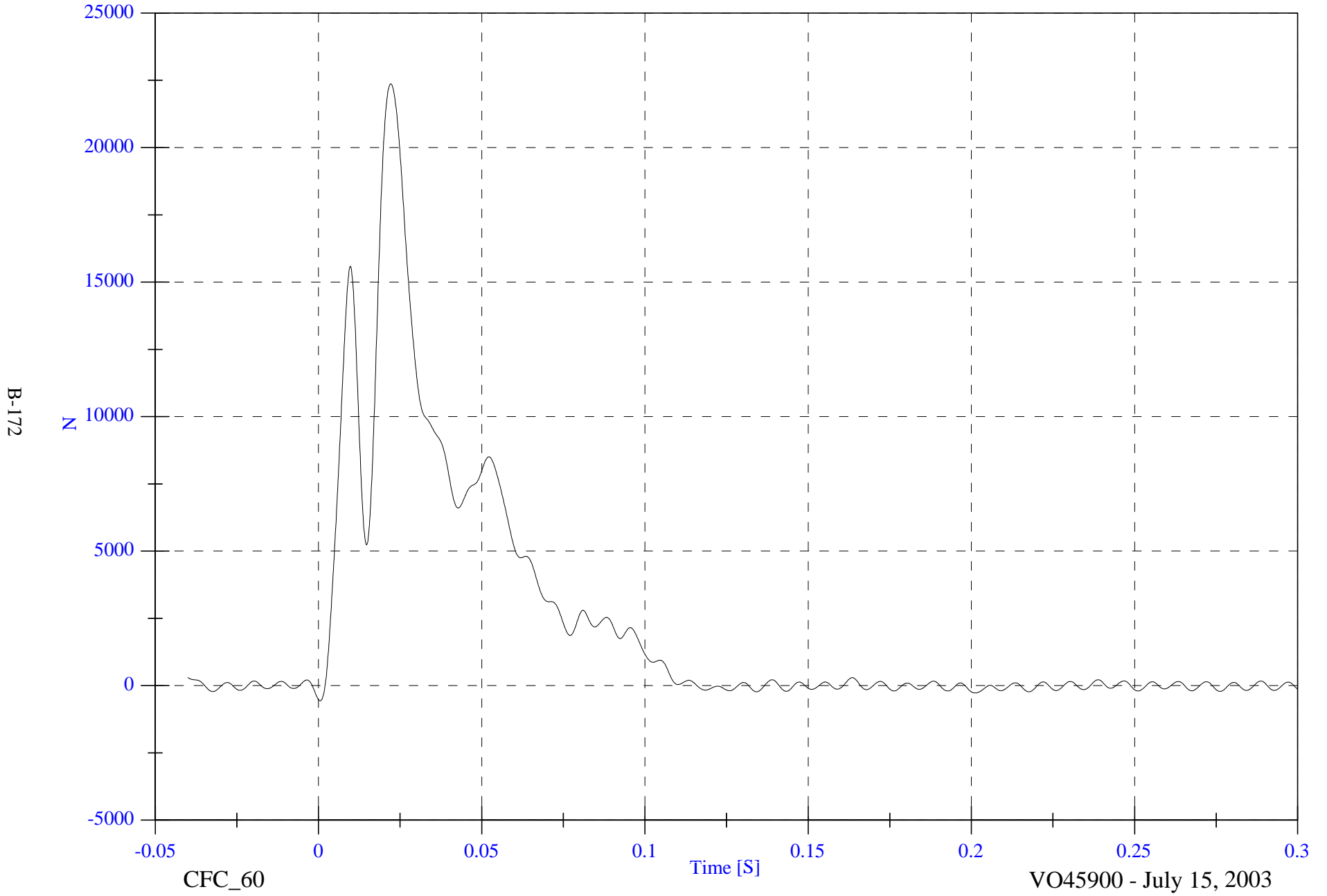


2004 Volvo XC90 NCAP

Barrier Load Cell D5 Fx

Max: 22370.2 [N] at 0.022 [S]

Min: -564.9 [N] at 0.000 [S]

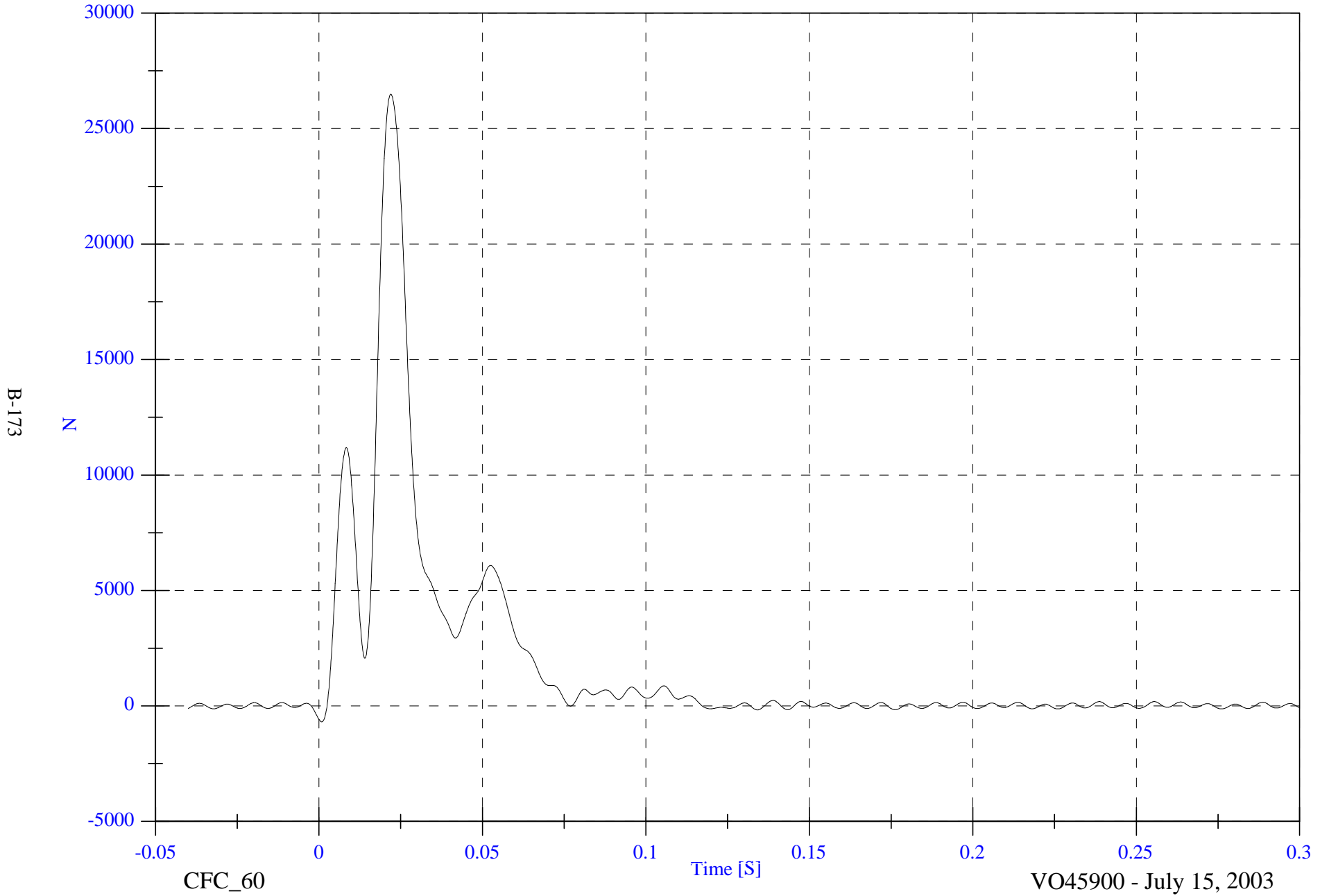


2004 Volvo XC90 NCAP

Barrier Load Cell D6 Fx

Max: 26490.1 [N] at 0.022 [S]

Min: -687.7 [N] at 0.001 [S]

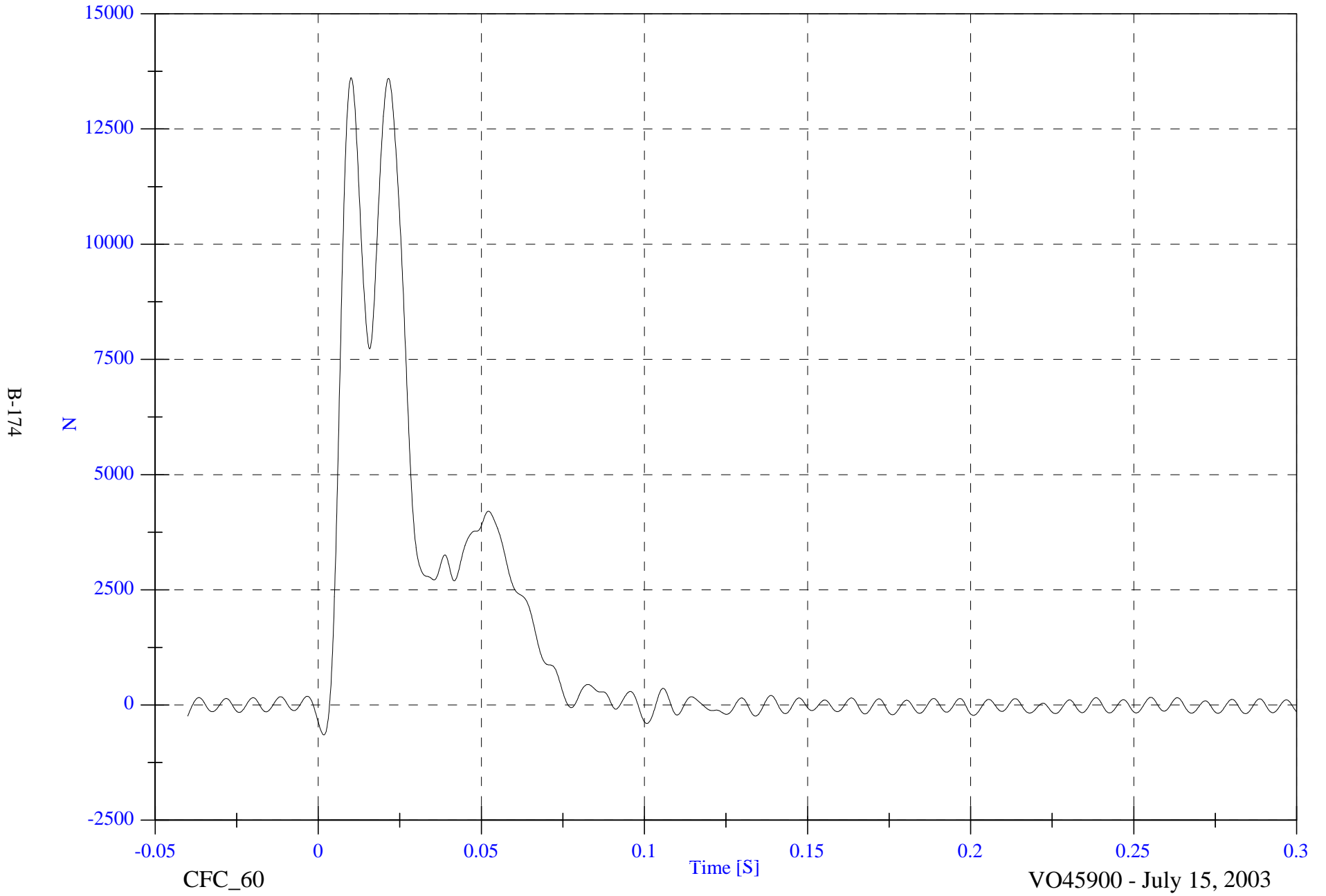


2004 Volvo XC90 NCAP

Barrier Load Cell D7 Fx

Max: 13611.2 [N] at 0.010 [S]

Min: -649.3 [N] at 0.002 [S]



B-174

N

CFC_60

Time [S]

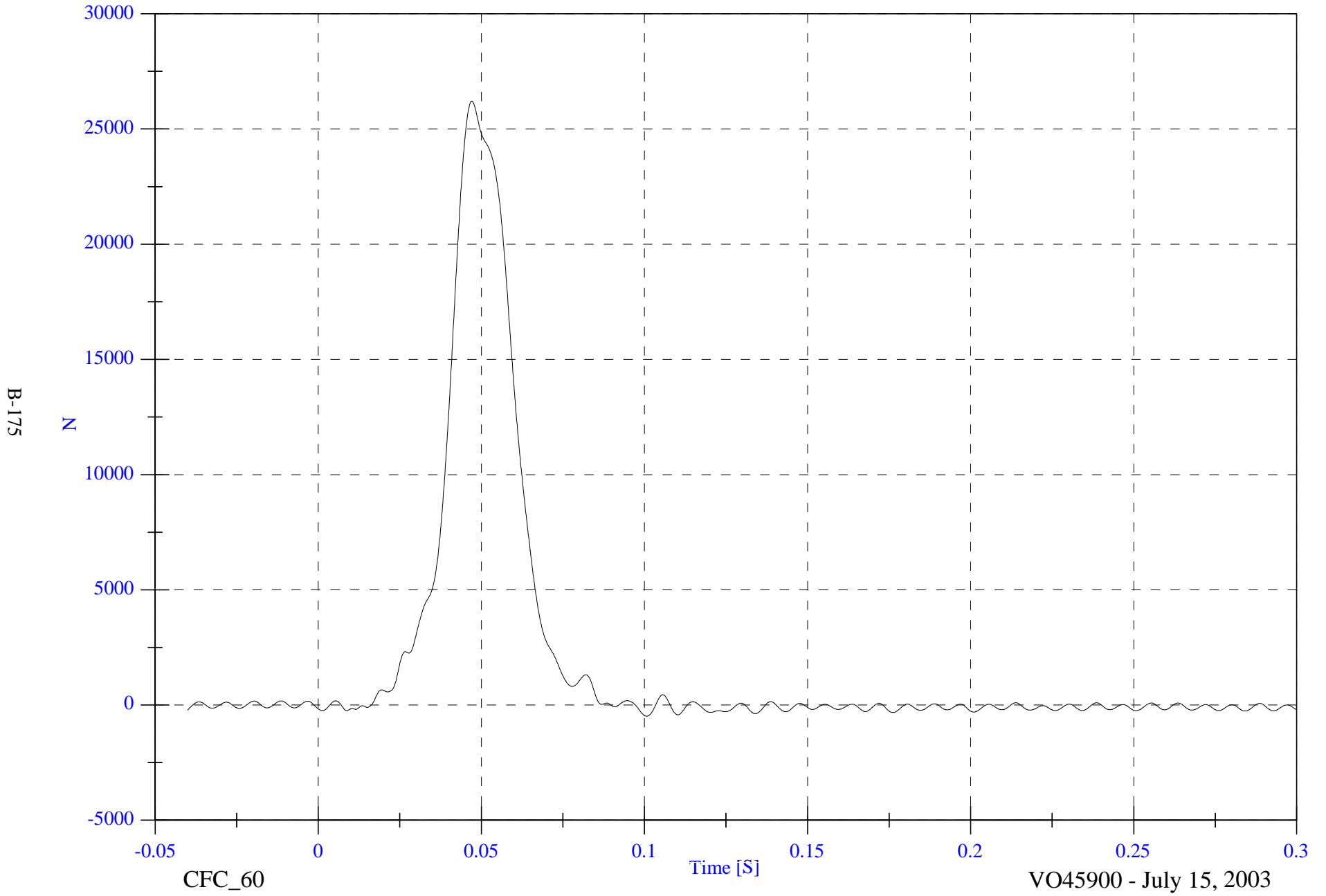
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Barrier Load Cell D8 Fx

Max: 26207.1 [N] at 0.047 [S]

Min: -487.8 [N] at 0.101 [S]

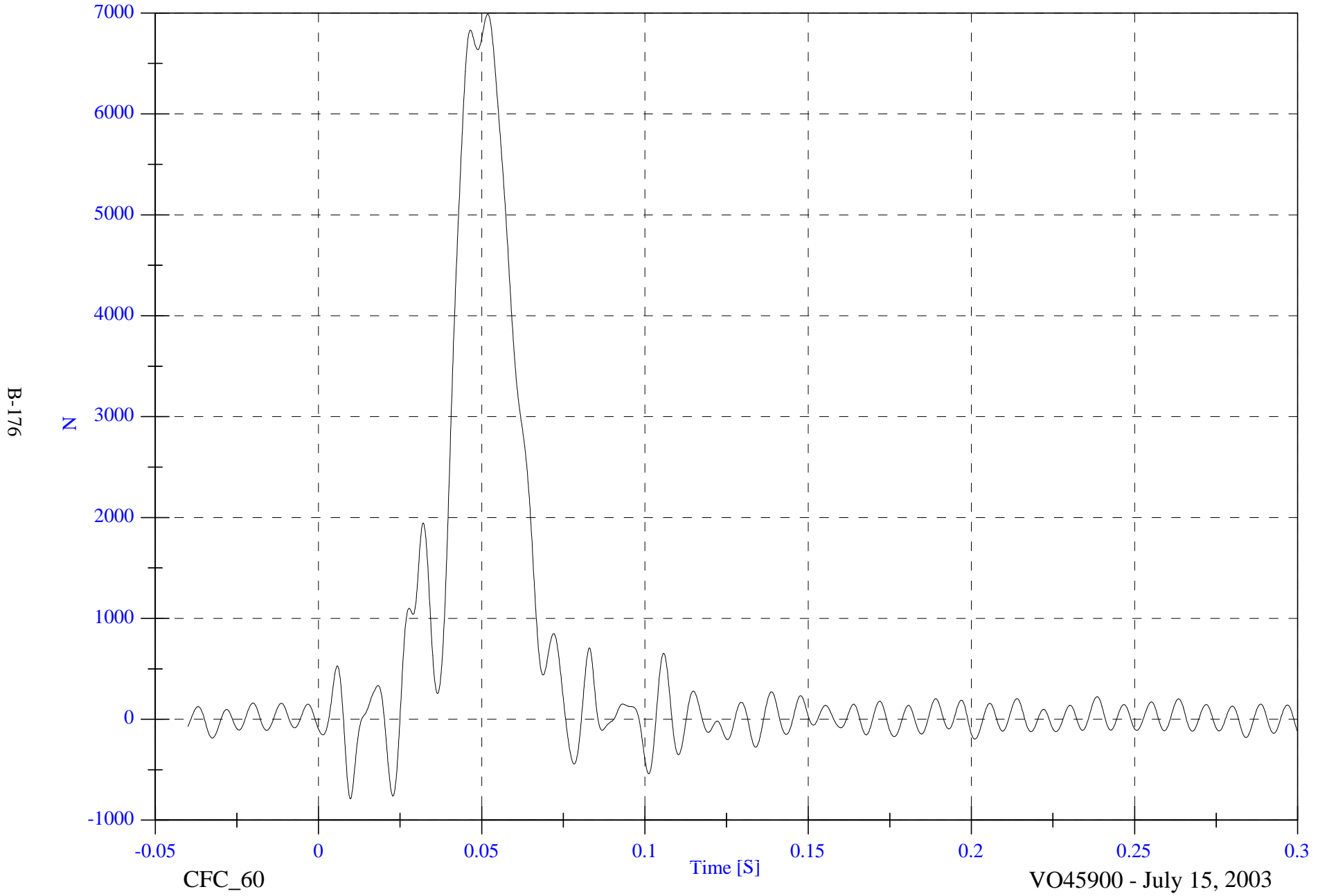


2004 Volvo XC90 NCAP

Barrier Load Cell D9 Fx

Max: 6987.8 [N] at 0.052 [S]

Min: -788.5 [N] at 0.010 [S]



B-176

N

-0.05

0

0.05

0.1

Time [S]

0.15

0.2

0.25

0.3

CFC_60

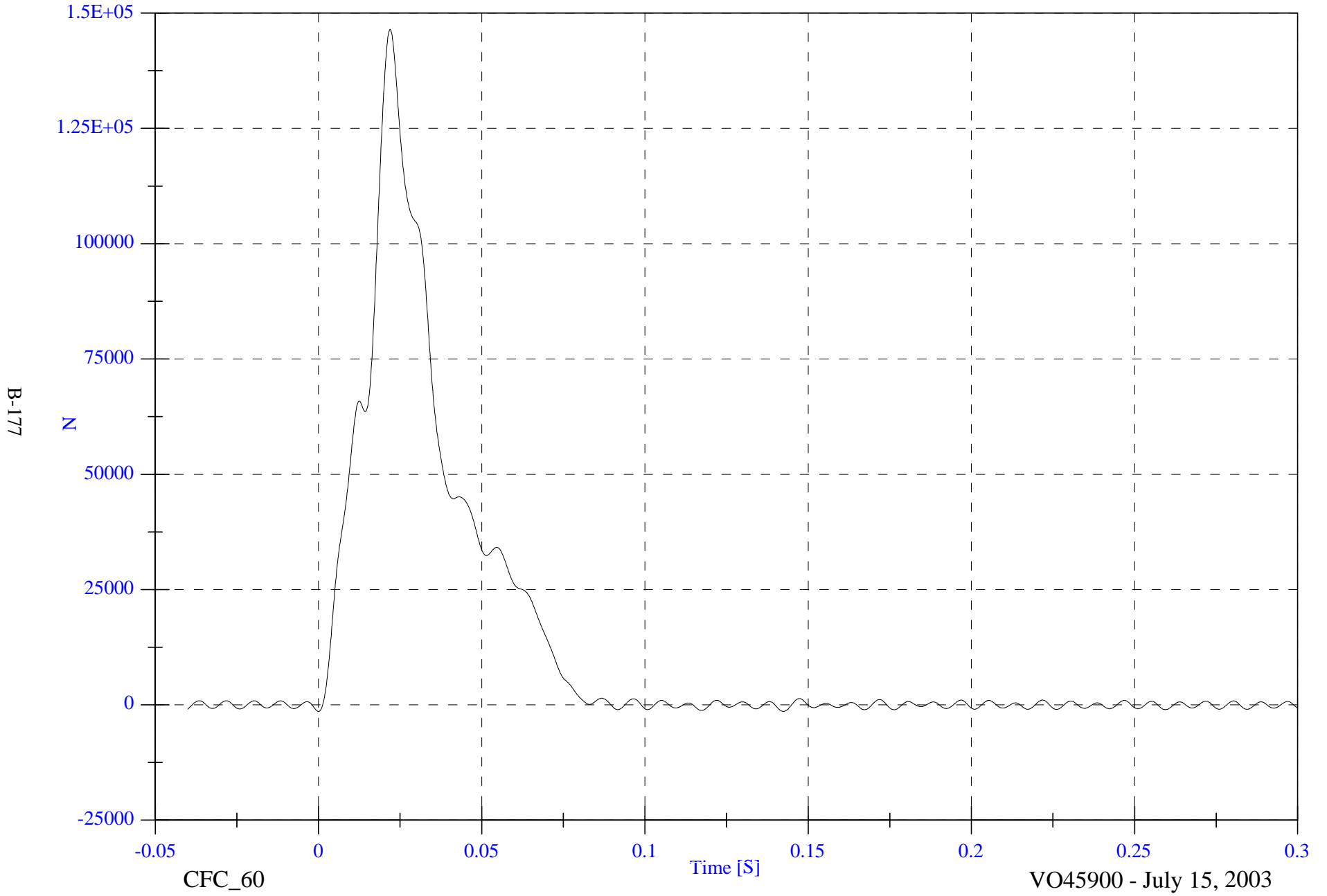
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Group 1 Load Cell Sum (A1,A2,A3,B1,B2,B3)

Max: 146489.8 [N] at 0.022 [S]

Min: -1425.0 [N] at -0.000 [S]



CFC_60

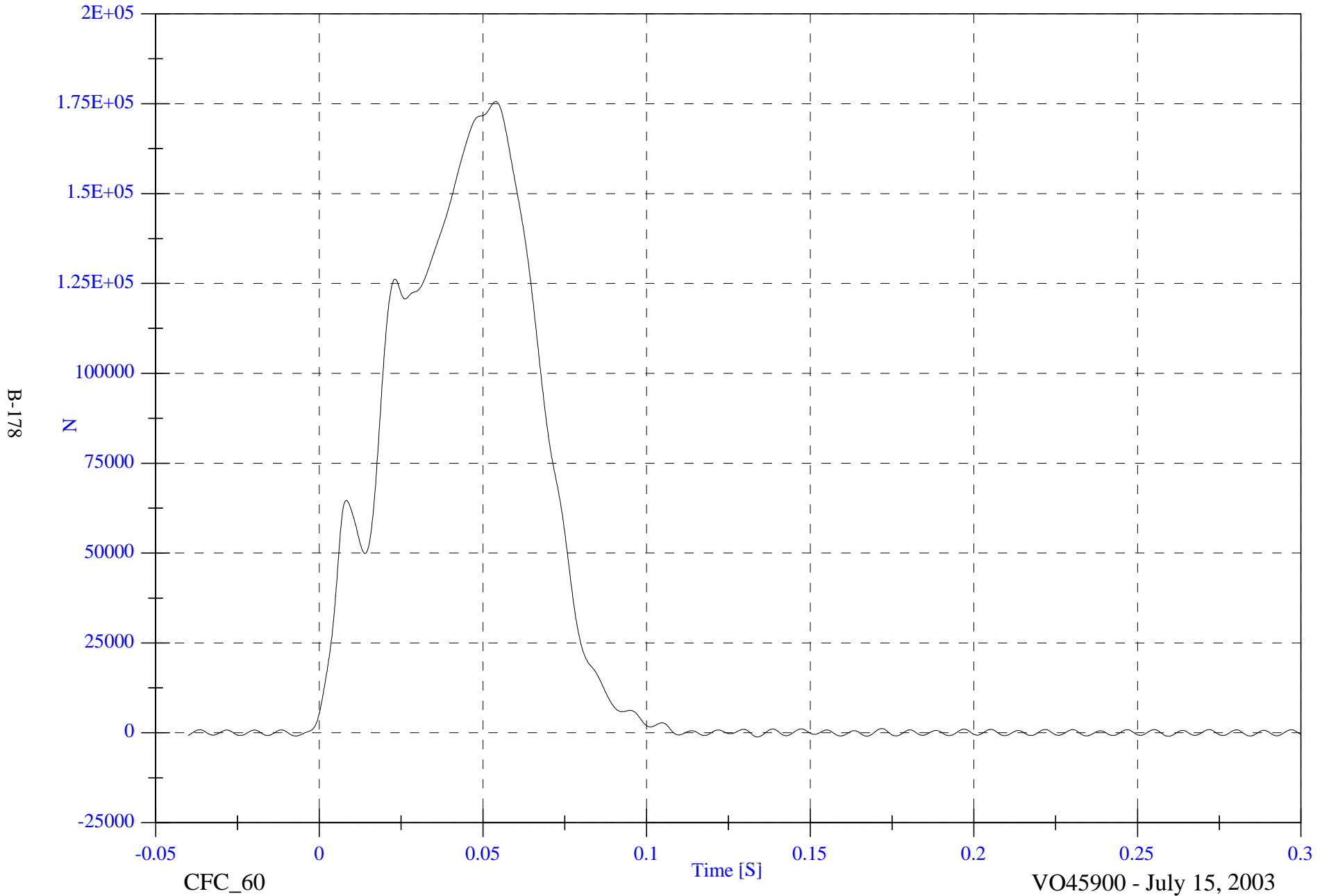
VO45900 - July 15, 2003

2004 Volvo XC90 NCAP

Group 2 Load Cell Sum (A4,A5,A6,B4,B5,B6)

Max: 175589.5 [N] at 0.054 [S]

Min: -1140.6 [N] at 0.134 [S]

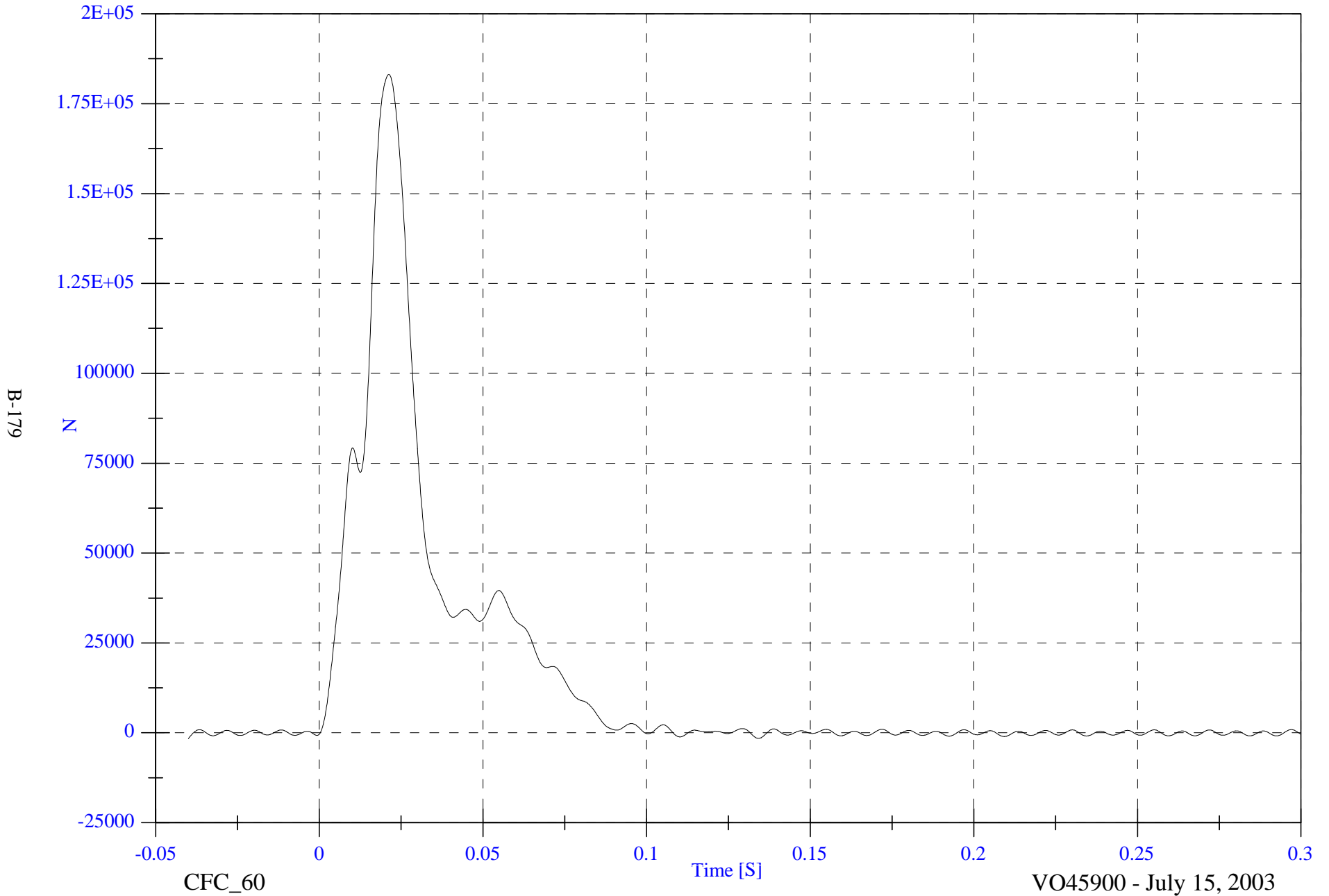


2004 Volvo XC90 NCAP

Group 3 Load Cell Sum (A7,A8,A9,B7,B8,B9)

Max: 183106.0 [N] at 0.021 [S]

Min: -1617.6 [N] at -0.040 [S]

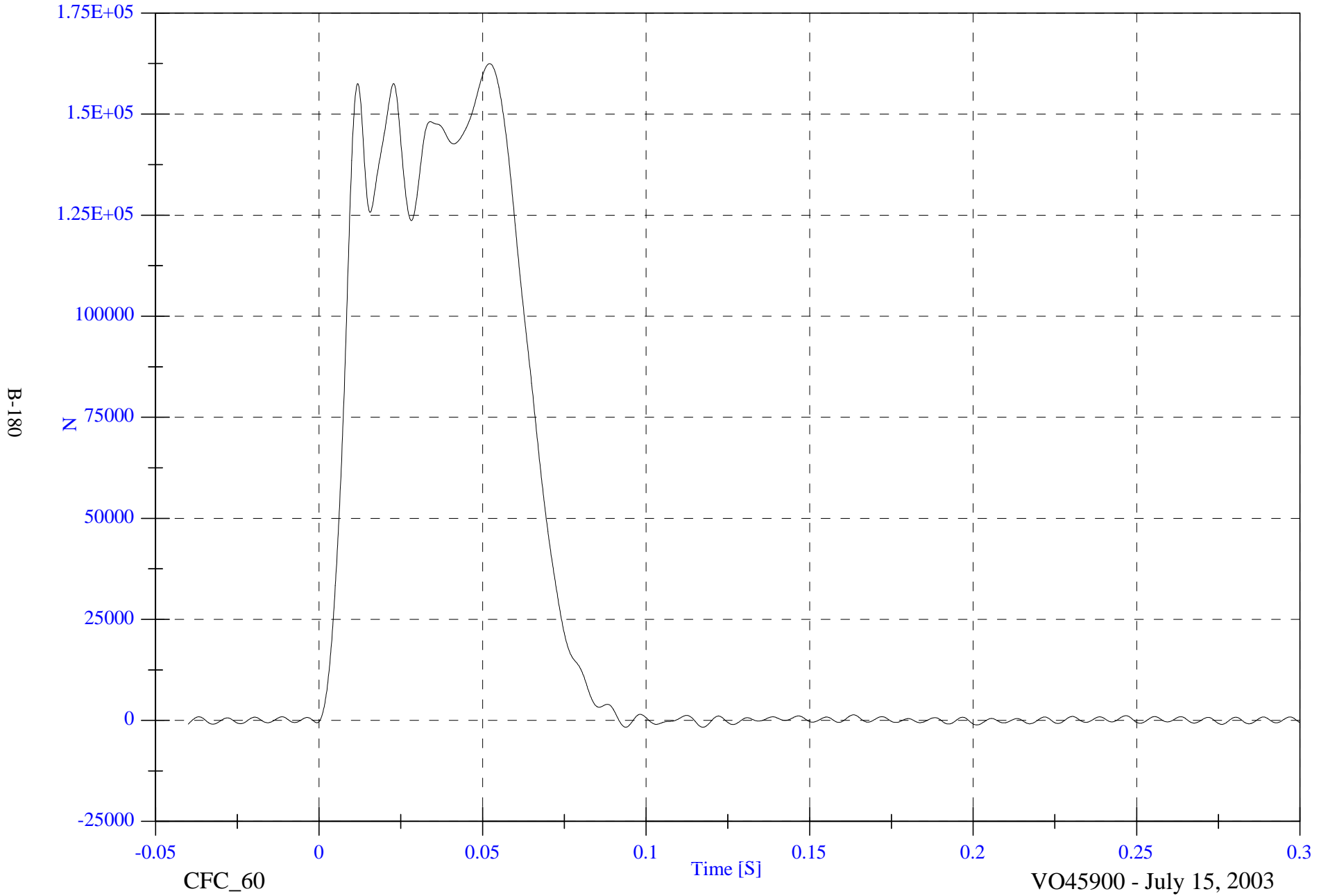


2004 Volvo XC90 NCAP

Group 4 Load Cell Sum (C1,C2,C3,D1,D2,D3)

Max: 162483.4 [N] at 0.052 [S]

Min: -1695.2 [N] at 0.117 [S]

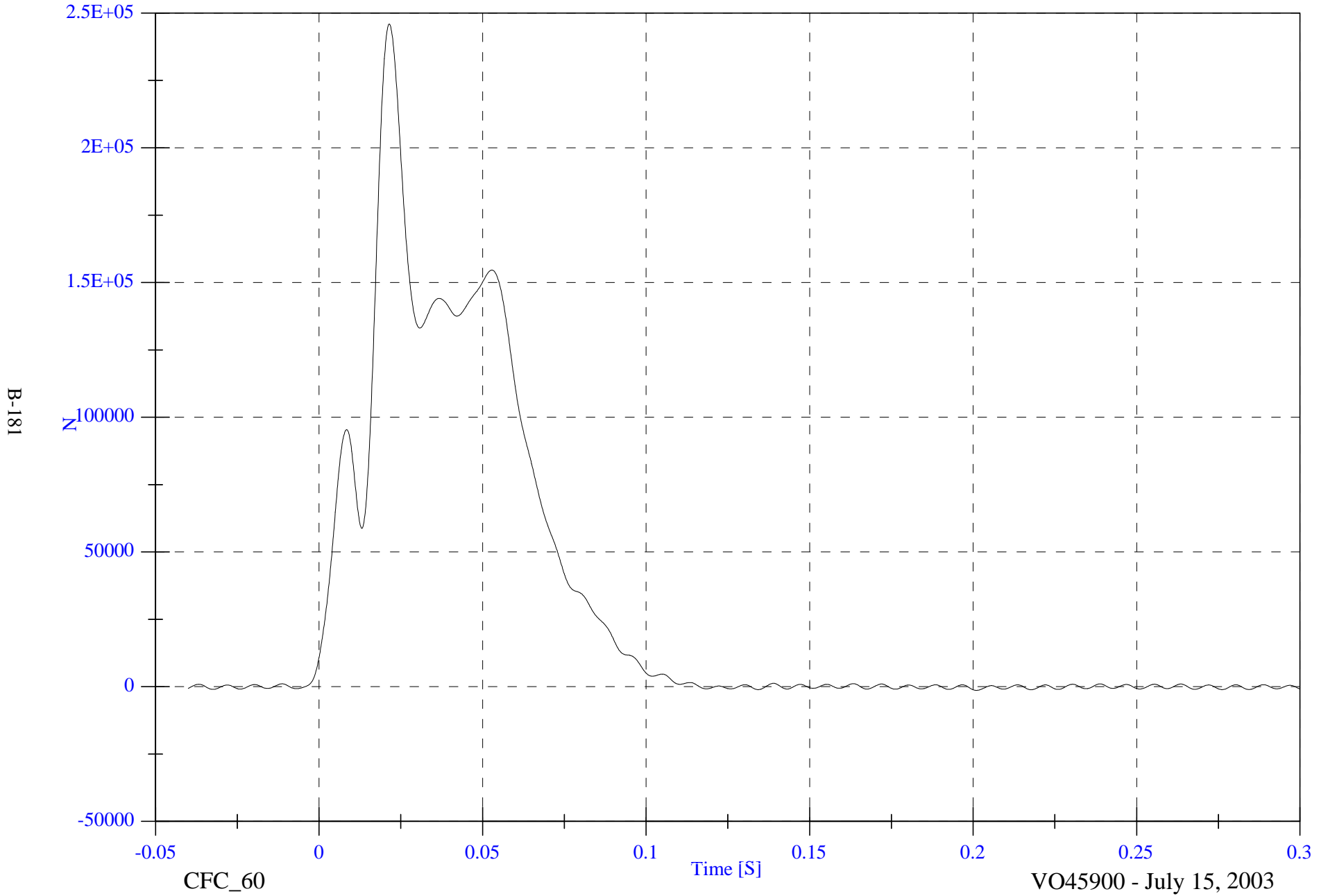


2004 Volvo XC90 NCAP

Group 5 Load Cell Sum (C4,C5,C6,D4,D5,D6)

Max: 245920.2 [N] at 0.021 [S]

Min: -1357.7 [N] at 0.201 [S]

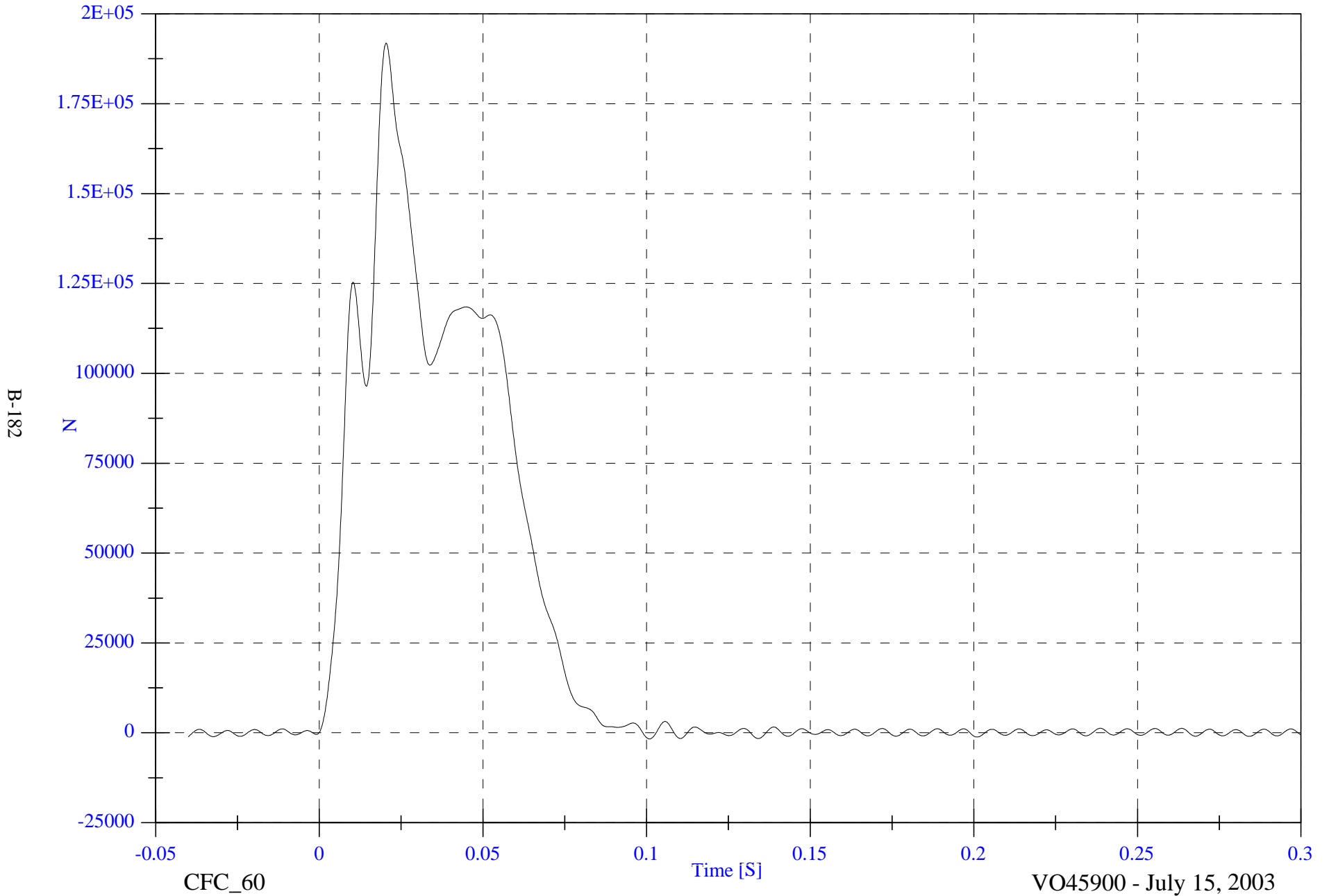


2004 Volvo XC90 NCAP

Group 6 Load Cell Sum (C7,C8,C9,D7,D8,D9)

Max: 191839.8 [N] at 0.020 [S]

Min: -1683.8 [N] at 0.101 [S]

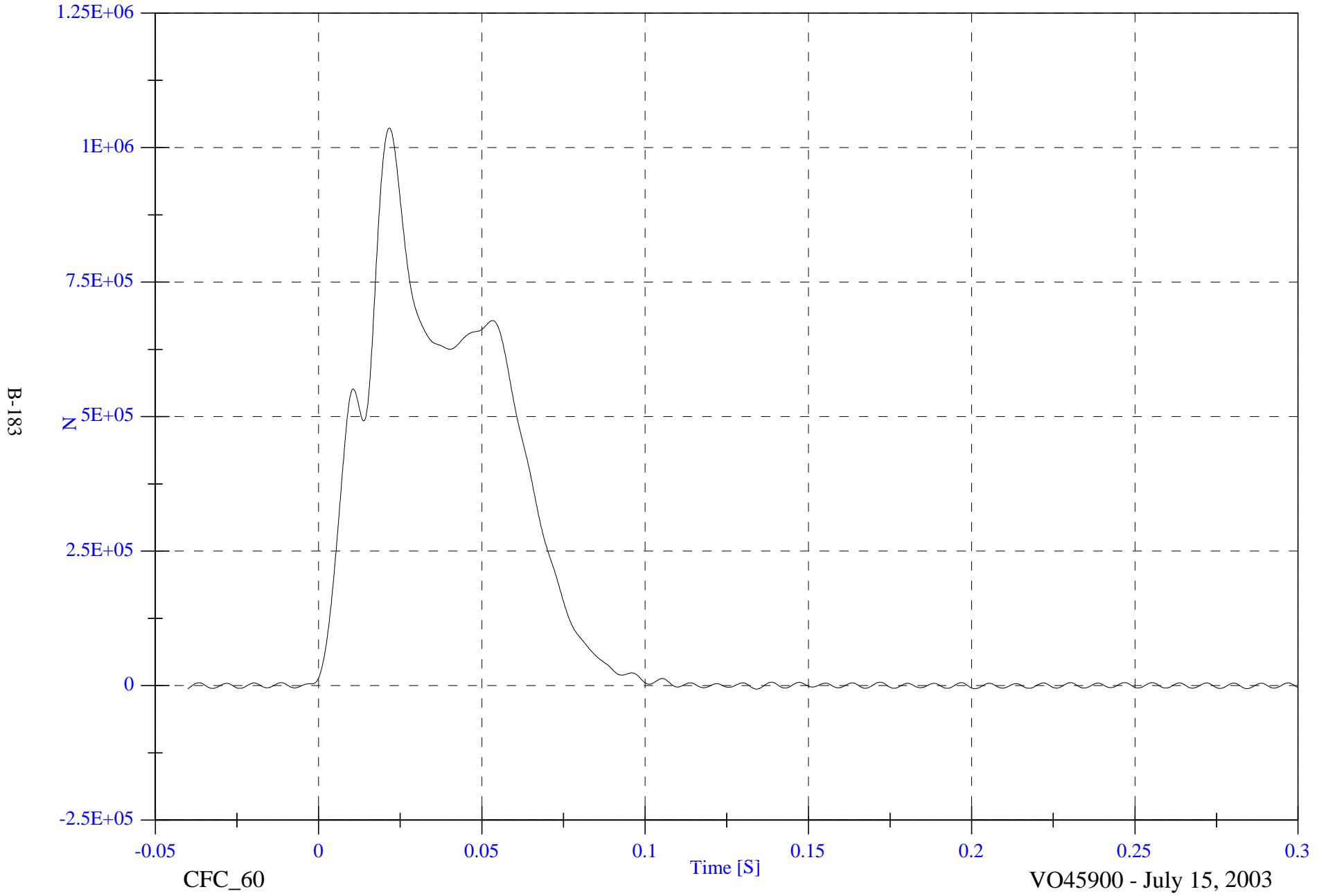


2004 Volvo XC90 NCAP

Total Load Cell Sum (All 6 Groups)

Max: 1036322.5 [N] at 0.022 [S]

Min: -6319.4 [N] at 0.134 [S]



APPENDIX C

**PART 572B/E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS**

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Veridian Engineering. A summary of the test results, and Part 572 specifications are included in this Appendix.

Dummy serial numbers and certification dates are:

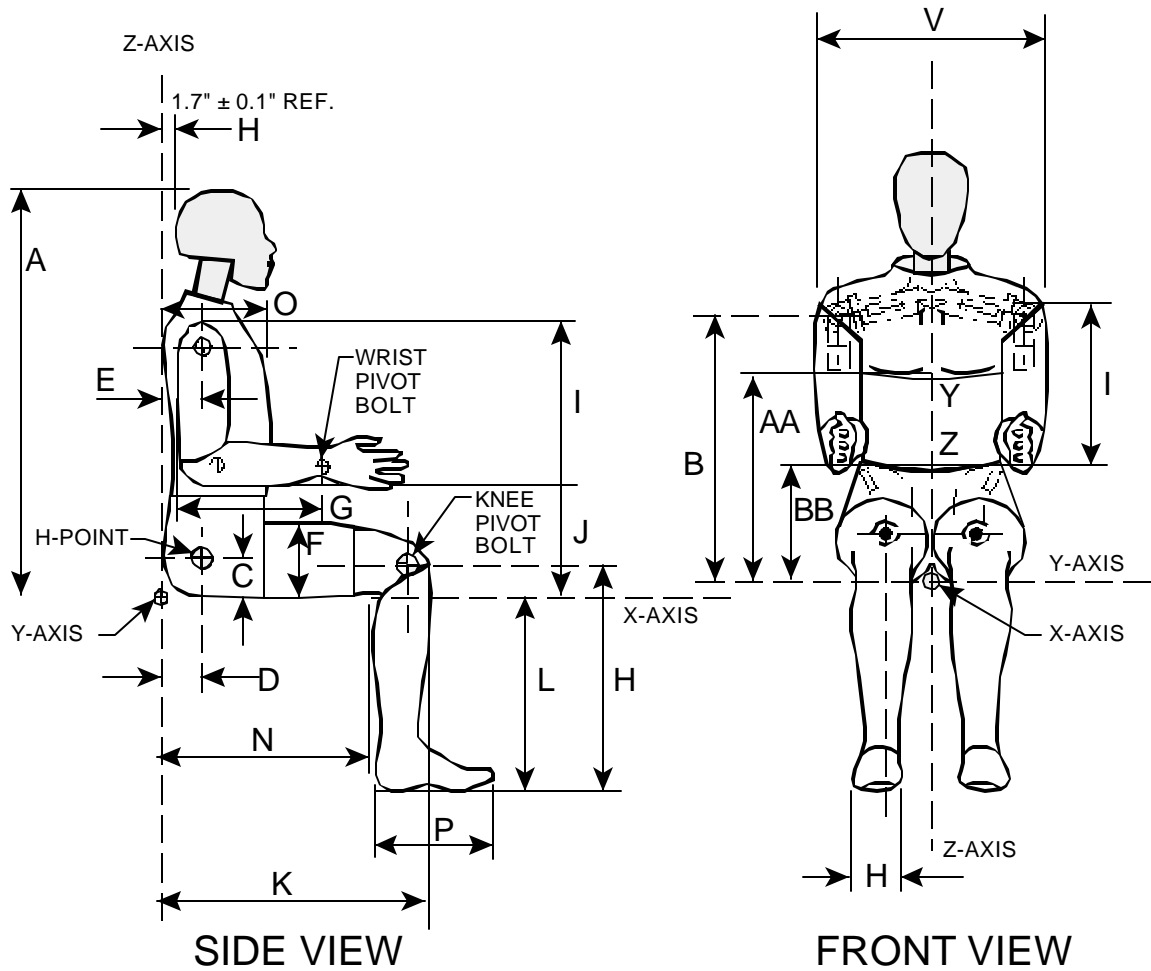
<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	150	03/11/03
#2/Right Front Passenger	245	03/11/03

Electronic Test Equipment

The complement of signal conditioning, recording and display equipment, in conjunction with dummy certification testing, can be found in New Car Assessment and Standards Indicant Testing Final Report No. 6525-V-1.

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.
(REF: S572.31(A)(6))

PART 572E
HEAD DROP TEST

Dummy Serial Number 150
Sequential Test Number 2
Date 03/05/03
Workfile 150H 3-5-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	71.0
Relative Humidity	10% - 70%	46.0
Peak Resultant Acceleration	225-275 G's	234.91
Peak Lateral Acceleration	15 G's Max	11.97
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	150	
Sequential Test Number	2	
Date	03/06/03	6 Axis Neck Transducer
Workfile	150FLX9 03-06-03	

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70.0
Relative Humidity	10% - 70%	31.0
Impact Velocity	22.60 - 23.40 Ft/s	23.01
Pendulum Deceleration 10 ms	22.50 - 27.50 G's	22.55
20 ms	17.60 - 22.60 G's	19.42
30 ms	12.50 - 18.50 G's	13.46
Max Pendulum G's Above 30 ms	29 G's Max	14.63
Deceleration - Time Curve Decay Time to 5 G's	34 - 42 ms	41.40
D Plane Rotation Max	64 - 78 Deg	68.63
Time	57 - 64 ms	58.80
Moment About Occipital Max	65 - 80 Ft-Lbs	77.19
Condyle Time	47 - 58 ms	53.20
Rotation Angle - Time Curve Decay Time to Zero	113 - 128 ms	114.20
Positive Moment - Time Curve Decay Time to Zero	97 - 107 ms	97.90

Remarks:

Laboratory Technician: _____ B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	150	
Sequential Test Number	2	
Date	03/06/03	6 Axis Neck Transducer
Workfile	150EXT 03-06-03	

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70.0
Relative Humidity	10% - 70%	31.0
Impact Velocity	19.50 - 20.30 Ft/s	19.63
Pendulum Deceleration	10 ms	17.20 - 21.20 G's
	20 ms	14.00 - 19.00 G's
	30 ms	11.00 - 16.00 G's
Max Pendulum G's Above 30 ms	22 G's Max	13.51
Deceleration - Time Curve Decay Time to 5 G's	38 - 46 ms	41.00
D Plane Rotation	Max	81 - 106 Deg
	Time	72 - 82 ms
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs
	Time	65 - 79 ms
Rotation Angle - Time Curve Decay Time to Zero	147 - 174 ms	154.20
Positive Moment - Time Curve Decay Time to Zero	120 - 148 ms	146.00

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 150
Sequential Test Number 2
Date 03/10/03
Workfile 150T 03-10-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	71.0
Relative Humidity	10% - 70%	38.0
Pendulum Velocity	21.6 - 22.4 Ft/s	22.07
Maximum Deflection	2.50 - 2.86 in	2.59
Maximum Resistive Force	1160 - 1325 Lbs	1288.70
Internal Hysteresis	69 - 85 %	72.69

Remarks:

Laboratory Technician:

_____ B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 150
 Sequential Test Number 2
 Date 03/11/03
 Workfile 150LF 03-11-03; 150LR 03-11-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	31.0
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1205.56
RIGHT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	31.0
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1228.49

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
 Sequential Test Number 2
 Date 03/11/03

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			35
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.2
Waist Circumference	Z	32.9 - 34.1 in	34.0
Chest Depth	O	8.4 - 9.0 in	8.4
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	5.8
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.6
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.7
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
Elbow Rest Height	J	7.5 - 8.3 in	8.1
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 245
Sequential Test Number 2
Date 03/05/03
Workfile 245H1 03-05-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70.0
Relative Humidity	10% - 70%	45.0
Peak Resultant Acceleration	225-275 G's	249.74
Peak Lateral Acceleration	15 G's Max	5.48
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	245	
Sequential Test Number	2	
Date	03/07/03	6 Axis Neck Transducer
Workfile	245FLX2 03-07-03	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70.0
Relative Humidity		10% - 70%	34.0
Impact Velocity		22.60 - 23.40 Ft/s	22.70
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	22.60
	20 ms	17.60 - 22.60 G's	19.71
	30 ms	12.50 - 18.50 G's	14.64
Max Pendulum G's Above 30 ms		29 G's Max	14.64
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	40.90
D Plane Rotation	Max	64 - 78 Deg	69.75
	Time	57 - 64 ms	57.20
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	78.38
	Time	47 - 58 ms	53.20
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	113.80
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	102.40

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	245	
Sequential Test Number	2	
Date	03/07/03	6 Axis Neck Transducer
Workfile	245EXT 03-07-03	

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70.0
Relative Humidity	10% - 70%	34.0
Impact Velocity	19.50 - 20.30 Ft/s	19.55
Pendulum Deceleration	10 ms	17.20 - 21.20 G's
	20 ms	14.00 - 19.00 G's
	30 ms	11.00 - 16.00 G's
Max Pendulum G's Above 30 ms	22 G's Max	12.52
Deceleration - Time Curve Decay Time to 5 G's	38 - 46 ms	44.20
D Plane Rotation	Max	81 - 106 Deg
	Time	72 - 82 ms
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs
	Time	65 - 79 ms
Rotation Angle - Time Curve Decay Time to Zero	147 - 174 ms	154.50
Positive Moment - Time Curve Decay Time to Zero	120 - 148 ms	141.60

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 245
Sequential Test Number 2
Date 03/10/03
Workfile 245T 03-10-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	71.0
Relative Humidity	10% - 70%	38.0
Pendulum Velocity	21.6 - 22.4 Ft/s	22.33
Maximum Deflection	2.50 - 2.86 in	2.54
Maximum Resistive Force	1160 - 1325 Lbs	1294.08
Internal Hysteresis	69 - 85 %	74.38

Remarks:

Laboratory Technician:

_____ B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 245
 Sequential Test Number 2
 Date 03/11/03

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			35
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.4
Waist Circumference	Z	32.9 - 34.1 in	34.0
Chest Depth	O	8.4 - 9.0 in	8.4
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	6.0
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.5
Knee Pivot Height	M	19.1 - 19.7 in	19.2
Foot Length	P	9.9 - 10.5 in	10.2
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.6
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
Elbow Rest Height	J	7.5 - 8.3 in	8.0
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician:

B. Swiecicki

APPENDIX D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 150)		Manufacturer	Serial #	Calibration	
				Last	Next
Head 9 Array	X Arm Y	ENDEVCO	AC-P17531	26-Jun-03	26-Dec-03
	X Arm Z	ENDEVCO	AC-P14965	26-Jun-03	26-Dec-03
	Y Arm X	ENDEVCO	AC-P17563	26-Jun-03	26-Dec-03
	Y Arm Z	ENDEVCO	AC-P18551	26-Jun-03	26-Dec-03
	Z Arm X	ENDEVCO	AC-P17539	26-Jun-03	26-Dec-03
	Z Arm Y	ENDEVCO	AC-P18718	26-Jun-03	26-Dec-03
Head	X	ENDEVCO	AC-P16832	22-May-03	22-Nov-03
	Y	ENDEVCO	AC-P16591	22-May-03	22-Nov-03
	Z	ENDEVCO	AC-P16286	22-May-03	22-Nov-03
Head	X (R)	ENDEVCO	AC-P17141	22-May-03	22-Nov-03
	Y (R)	ENDEVCO	AC-P17242	22-May-03	22-Nov-03
	Z (R)	ENDEVCO	AC-P17152	22-May-03	22-Nov-03
Neck Load Cell	X	DENTON	LC-441Fx	18-Jun-03	18-Dec-03
	Y	DENTON	LC-441Fy	18-Jun-03	18-Dec-03
	Z	DENTON	LC-441Fz	18-Jun-03	18-Dec-03
Neck Moment	X	DENTON	LC-441Mx	18-Jun-03	18-Dec-03
	Y	DENTON	LC-441My	18-Jun-03	18-Dec-03
	Z	DENTON	LC-441Mz	18-Jun-03	18-Dec-03
Chest	X	ENDEVCO	AC-P17235	21-May-03	21-Nov-03
	Y	ENDEVCO	AC-P14393	21-May-03	21-Nov-03
	Z	ENDEVCO	AC-P17285	21-May-03	21-Nov-03
Chest	X (R)	ENDEVCO	AC-P23640	21-May-03	21-Nov-03
	Y (R)	ENDEVCO	AC-P16863	21-May-03	21-Nov-03
	Z (R)	ENDEVCO	AC-P17283	21-May-03	21-Nov-03
Chest Deflection	X	SERVO	DS-150	19-Jun-03	19-Dec-03
Pelvic	X	ENDEVCO	AC-P23895	06-Mar-03	06-Sep-03
	Y	ENDEVCO	AC-P24145	06-Mar-03	06-Sep-03
	Z	ENDEVCO	AC-P23904	06-Mar-03	06-Sep-03

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 150)	Manufacturer	Serial #	Calibration		
			Last	Next	
Left Femur Load Cell	Fz	GSE	LC-418	28-May-03	28-Nov-03
Right Femur Load Cell	Fz	GSE	LC-419	28-May-03	28-Nov-03
Left Upper Tibia	Mx	DENTON	LC-265Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-265My	24-Oct-02	24-Apr-03*
Left Lower Tibia	Fz	DENTON	LC-178Fz	24-Oct-02	24-Apr-03*
	Mx	DENTON	LC-178Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-178My	24-Oct-02	24-Apr-03*
Right Upper Tibia	Mx	DENTON	LC-199Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-199My	24-Oct-02	24-Apr-03*
Right Lower Tibia	Fz	DENTON	LC-128Fz	24-Oct-02	24-Apr-03*
	Mx	DENTON	LC-128Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-128My	24-Oct-02	24-Apr-03*
Left Foot Rear	X	ENDEVCO	AC-J19868	27-May-03	27-Nov-03
	Z	ENDEVCO	AC-AJ8C0	27-May-03	27-Nov-03
Left Foot Front	Z	ENDEVCO	AC-J34378	27-May-03	27-Nov-03
Right Foot Rear	X	ENDEVCO	AC-AJ7F6	27-May-03	27-Nov-03
	Z	ENDEVCO	AC-J27079	27-May-03	27-Nov-03
Right Foot Front	Z	ENDEVCO	AC-J23997	27-May-03	27-Nov-03

* Exceeded calibration date

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 245)	Manufacturer	Serial #	Calibration		
			Last	Next	
Head 9 Array	X Arm Y	ENDEVCO	AC-P18558	12-Mar-03	12-Sep-03
	X Arm Z	ENDEVCO	AC-P19212	12-Mar-03	12-Sep-03
	Y Arm X	ENDEVCO	AC-P19197	12-Mar-03	12-Sep-03
	Y Arm Z	ENDEVCO	AC-P18738	12-Mar-03	12-Sep-03
	Z Arm X	ENDEVCO	AC-P19217	12-Mar-03	12-Sep-03
	Z Arm Y	ENDEVCO	AC-P18739	12-Mar-03	12-Sep-03
Head	X	ENDEVCO	AC-P19216	12-Mar-03	12-Sep-03
	Y	ENDEVCO	AC-P15534	12-Mar-03	12-Sep-03
	Z	ENDEVCO	AC-P23303	12-Mar-03	12-Sep-03
Head	X (R)	ENDEVCO	AC-P16576	12-Mar-03	12-Sep-03
	Y (R)	ENDEVCO	AC-P15526	12-Mar-03	12-Sep-03
	Z (R)	ENDEVCO	AC-P19255	12-Mar-03	12-Sep-03
Neck Load Cell	X	DENTON	LC-076Fx	18-Jun-03	18-Dec-03
	Y	DENTON	LC-076Fy	18-Jun-03	18-Dec-03
	Z	DENTON	LC-076Fz	18-Jun-03	18-Dec-03
Neck Moment	X	DENTON	LC-076Mx	18-Jun-03	18-Dec-03
	Y	DENTON	LC-076My	18-Jun-03	18-Dec-03
	Z	DENTON	LC-076Mz	18-Jun-03	18-Dec-03
Chest	X	ENDEVCO	AC-J34019	01-Apr-03	01-Oct-03
	Y	ENDEVCO	AC-J33018	01-Apr-03	01-Oct-03
	Z	ENDEVCO	AC-J32783	01-Apr-03	01-Oct-03
Chest	X (R)	ENDEVCO	AC-J31066	01-Apr-03	01-Oct-03
	Y (R)	ENDEVCO	AC-P16979	01-Apr-03	01-Oct-03
	Z (R)	ENDEVCO	AC-J31022	01-Apr-03	01-Oct-03
Chest Deflection	X	SERVO	DS-245	19-Jun-03	19-Dec-03
Pelvic	X	ENDEVCO	AC-P23792	18-Feb-03	18-Aug-03
	Y	ENDEVCO	AC-P17258	18-Feb-03	18-Aug-03
	Z	ENDEVCO	AC-J31010	18-Feb-03	18-Aug-03

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 245)	Manufacturer	Serial #	Calibration		
			Last	Next	
Left Femur Load Cell	Fz	GSE	LC-551	28-May-03	28-Nov-03
Right Femur Load Cell	Fz	GSE	LC-951	28-May-03	28-Nov-03
Left Upper Tibia	Mx	DENTON	LC-200Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-200My	24-Oct-02	24-Apr-03*
Left Lower Tibia	Fz	DENTON	LC-129Fz	24-Oct-02	24-Apr-03*
	Mx	DENTON	LC-129Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-129My	24-Oct-02	24-Apr-03*
Right Upper Tibia	Mx	DENTON	LC-264Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-264My	24-Oct-02	24-Apr-03*
Right Lower Tibia	Fz	DENTON	LC-177Fz	24-Oct-02	24-Apr-03*
	Mx	DENTON	LC-177Mx	24-Oct-02	24-Apr-03*
	My	DENTON	LC-177My	24-Oct-02	24-Apr-03*
Left Foot Rear	X	ENDEVCO	AC-J18059	13-Mar-03	13-Sep-03
	Z	ENDEVCO	AC-J36176	13-Mar-03	13-Sep-03
Left Foot Front	Z	ENDEVCO	AC-J18662	13-Mar-03	13-Sep-03
Right Foot Rear	X	ENDEVCO	AC-J20084	13-Mar-03	13-Sep-03
	Z	ENDEVCO	AC-AGRP4	13-Mar-03	13-Sep-03
Right Foot Front	Z	ENDEVCO	AC-J28727	13-Mar-03	13-Sep-03

* Exceeded calibration date

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	GS SENSORS	AC-8062-003	27-May-03	27-Nov-03
Right Rear Seat Crossmember X	GS SENSORS	AC-8086-047	27-May-03	27-Nov-03
Top of Engine	GS SENSORS	AC-9440-008	10-Jun-03	10-Dec-03
Bottom of Engine	GS SENSORS	AC-9440-031	02-Jun-03	02-Dec-03
Right Disc Brake Caliper	GS SENSORS	AC-9440-034	02-Jun-03	02-Dec-03
Instrument Panel	GS SENSORS	AC-9450-039	06-Jun-03	06-Dec-03
Left Disc Brake Caliper	GS SENSORS	AC-9440-029	02-Jun-03	02-Dec-03
Left Seat Rear Crossmember Z	ICS	AC-8083-028	27-May-03	27-NOV-03
Right Seat Rear Crossmember Z	ICS	AC-8084-023	27-May-03	27-NOV-03

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**EVENFLO VANGAURD 5 LATCH
GRACO MY CARGO BOOSTER
BUILT-IN BOOSTER**

NHTSA NUMBER: VO45900

VERIDIAN ENGINEERING TEST NUMBER: 8714-01

VERIDIAN ENGINEERING
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



July 15, 2003

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Rulemaking
Office of Crashworthiness Standards
Mail Code: NVS-111
400 Seventh Street, SW, Room No. 5313
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

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15. Supplementary Notes					
16. Abstract This CRS test was performed in conjunction with a New Car Assessment Program (NCAP) load cell barrier test. An Evenflo Vanguard 5 Comfort Touch Forward Facing Convertible was secured in Position 3 (P3) with the vehicle LATCH and top tether. A Graco My CarGo Booster was secured in Position 4 (P4) with the vehicle 3-point belt system. The vehicle built-in booster and the 3-point belt system were used in Position 6 (P6). This test was conducted at the Veridian Engineering Crash Test Facility in Buffalo, New York, on July 15, 2003.					
ATD Position		HIC 15		HIC 36	
P3 (Right Rear) (044)		1097.3		1948.3	
P6 (Center Rear) (144)		1324.5		1638.3	
P4 (Left Rear) (182)		824.5		1242.8	
§ - Data is not accurate – spikes are present in Chest X data					
17. Key Words New Car Assessment Program (NCAP)				18. Distribution Statement <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Technical Reference Division Room 5108 (NAD-52) 400 Seventh St., S.W. Washington, D.C. 20590 Telephone No. (202) 366-4946 ATTN: Robert Hornicle	
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SECTION 1

PURPOSE AND SUMMARY OF TEST VO45900

The purpose of this test was to obtain CRS performance data in a frontal impact NCAP condition. These data constitute part of the general consumer information collected by the New Car Assessment Program (NCAP).

The 56.33 kph NCAP frontal impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) NCAP Laboratory Test Procedure.

SUMMARY

All child dummies were instrumented with head, chest, and pelvic triaxial accelerometers, upper neck force and moment load cells and chest displacement transducers.

The right rear (Position 3) child dummy (serial no. 044), left rear (Position 4) child dummy (serial no. 144) and center rear (Position 6) child dummy (serial no. 182) were calibrated previous to this test. Child dummy certification information is found in section 5.

The right rear child dummy's HIC 15 was 1097.3, maximum chest deceleration over 3 ms was 54.9 g's. The left rear child dummy's HIC 15 was 824.5, maximum chest deceleration over 3 ms is not accurate due to data spikes in the Chest X sensor. The center rear child dummy's HIC 15 was 1324.5, maximum chest deceleration over 3 ms was 56.7 g's.

SECTION 2

DATA SHEET NO. 1

CRASH TEST SUMMARY

TEST DUMMY INFORMATION:

DESCRIPTION	Position #3 CRS	Position #4 CRS	Position #6
ATD Type/Serial No.	Hybrid III 3C/044	Hybrid III 6C /144	Hybrid III 6C /182
Restraint System:	Evenflo Vangaurd 5 LATCH	Graco My CarGo Booster	Built-in Booster

Number of Data Channels _____ 55 _____

Number of Cameras: _____ 2 _____ High Speed

POST TEST DOOR OPENING

DESCRIPTION	FRONT	REAR
Left Side Doors	Closed, Latched and Operable without tools	Closed, Latched and Operable without tools
Right Side Doors	Closed, Latched and Operable without tools	Closed, Latched and Operable without tools
Hatch/Other Door	N/A	Closed, Latched and Operable without tools

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
P1 (Left Front)	0	None
P2 (Right Front)	0	None
P3 (Right Rear)	0	None
P4 (Left Rear)	0	None
P6 (Center Rear)	0	None

VISIBLE DUMMY CONTACT POINTS

	Position #3 CRS	Position #4 CRS	Position #6 CRS
Head Contact:	The face and chin to the chest and the back of the head to the child restraint	The face and chin to the chest, the top of the head to the right thigh and the back of the head to the child restraint	The chin to the chest and top of the head to the head restraint.
Upper Torso Contact:	None	None	None
Lower Torso Contact:	None	None	None
Left Knee Contact:	None	None	None
Right Knee Contact:	None	None	None

DATA SHEET NO. 2

CRS PARAMETER DATA

CRS: Evenflo Vanguard 5 LATCH, Graco My CarGo Booster

NHTSA No. VO45900

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Delivered Weight of Vehicle with Maximum Fluids = 2180.0 kg (A)

AS TESTED WEIGHT OF VEHICLE:

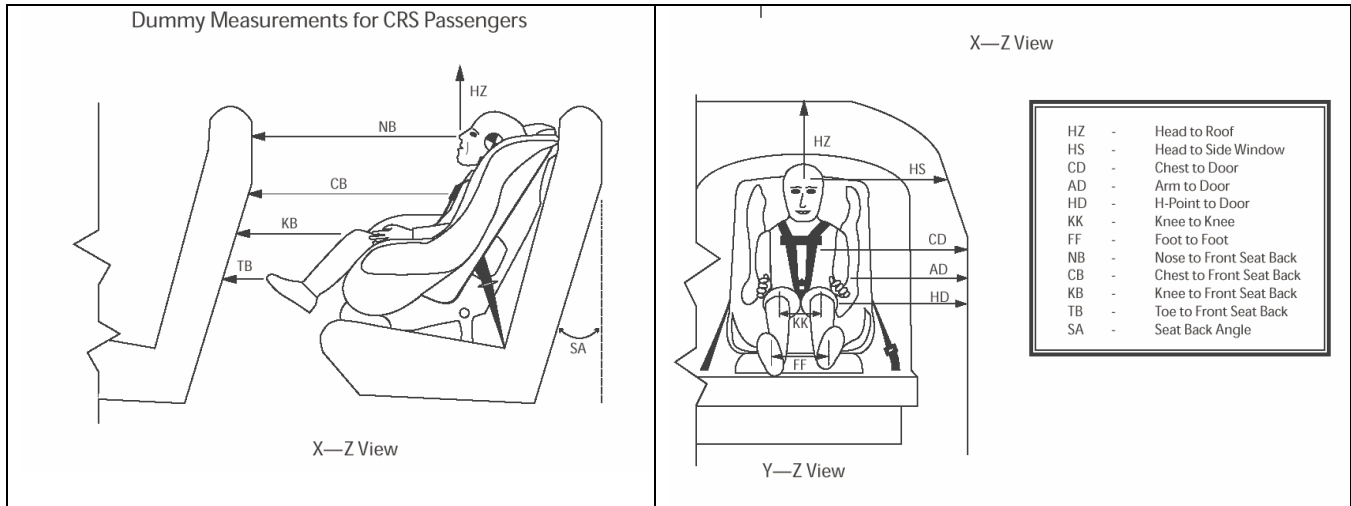
Left Front	=	<u>612.0</u>	kg	Left Rear	=	<u>593.5</u>	kg
Right Front	=	<u>614.0</u>	kg	Right Rear	=	<u>581.5</u>	kg
TOTAL FRONT	=	<u>1226.0</u>	kg	TOTAL REAR	=	<u>1175.0</u>	kg
TOTAL TEST WEIGHT =		<u>2401.0</u>	kg				

DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

CRS: Evenflo Vanguard 5 LATCH, Graco My CarGo Booster, Built-in Booster

NHTSA No. VO45900



Measurement	Pre-Test (mm)			Post Test (mm)		
	P3 (044)	P4 (144)	P6 (182)	P3 (044)	P4 (144)	P6 (182)
SA	25	25	25	25	25	25
HS	371	372	-	360	368	-
CD	403	408	-	400	399	-
AD	195	190	-	185	100	-
HD	255	255	-	252	250	-
HZ	390	389	389	398	389	395
NB	568	578	-	*	*	-
CB	518	533	-	*	*	-
KK	160	165	140	160	165	156
FF	170	140	185	180	180	210
KB – LEFT	345	277	340	*	*	322
KB – RIGHT	345	277	340	*	*	336
TB – LEFT	125	135	100	*	*	110
TB – RIGHT	125	135	100	*	*	137

All dimensions in mm (unless noted)

P3 – Right Rear Passenger (CRS #1)

P4 – Left Rear Passenger (CRS #2)

P6 – Center Rear Passenger (Built-in)

* Both the driver and passenger seat backs moved forward during the event which did not allow for a fixed reference measurement after the event.

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. VO45900

DESCRIPTION	Unit	MAXIMUM VALUE							
		Position #3				Position #4			
		Pos	msec	Neg	msec	Pos	msec	Neg	msec
Head X	g	192.6	185.6	-66.0	96.2	63.8	176.9	-39.1	92.0
Head Y	g	16.0	185.9	-67.1	96.1	2.8	55.8	-36.0	55.4
Head Z	g	85.6	96.1	-12.9	46.6	79.9	67.1	-1.8	31.6
Head Resultant	g	205.0	185.7	0.1	-45.9	83.3	67.1	0.0	-29.7
Upper Neck Fx	N	21.5	23.4	-1334.4	109.3	45.8	158.9	-750.2	61.7
Upper Neck Fy	N	268.3	101.5	-100.2	187.2	70.6	32.8	-119.5	86.4
Upper Neck Fz	N	2154.1	104.0	-485.7	187.7	2628.1	67.1	-338.5	212.4
Upper Neck F Resultant	N	2456.2	105.6	2.5	-13.4	2703.7	67.0	1.8	-28.9
Upper Neck Mx	N-m	5.8	73.0	-3.4	101.3	11.2	114.1	-5.4	237.2
Upper Neck My	N-m	9.6	299.9	-27.0	190.7	22.2	85.3	-28.5	210.7
Upper Neck Mz	N-m	3.0	162.7	-8.1	103.4	6.8	82.5	-6.2	118.1
Upper Neck M Resultant	N-m	27.1	190.7	0.1	-49.2	28.8	210.6	0.0	-15.9
Chest X	g	28.9	190.5	-56.8	76.7	**	**	**	**
Chest Y	g	7.4	91.8	-5.2	107.1	8.8	66.7	-5.0	94.8
Chest Z	g	29.1	96.6	-35.9	60.5	9.9	183.1	-28.8	56.3
Chest Resultant	g	58.8	64.9	0.0	-42.6	**	**	**	**
Chest Compression	mm	0.0	-28.1	-25.0	74.3	0.0	-39.0	-36.2	93.8
Pelvic X	g	24.6	134.6	-109.8	70.6	17.7	97.4	-43.6	29.8
Pelvic Y	g	11.4	69.5	-14.3	59.4	6.4	175.0	-17.2	212.6
Pelvic Z	g	31.8	66.2	-29.0	54.3	43.6	58.4	-7.4	184.1
Pelvic Resultant	g	110.4	69.9	0.0	-47.3	60.6	57.7	0.0	-33.4
Tether Belt Load	N	1381.9	93.3	-35.8	150.4	-	-	-	-
Lap Belt Load	N	-	-	-	-	3934.7	57.0	-11.7	107.2
Torso Belt Stretch	mm	-	-	-	-	†	†	†	†

** Data spikes are present

† Data is not accurate

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

CRS: Built-in Booster

NHTSA No. VO45900

DESCRIPTION	Unit	MAXIMUM VALUE			
		Position #6			
		Pos	msec	Neg	msec
Head X	g	44.6	189.3	-34.9	67.6
Head Y	g	9.0	189.0	-5.5	195.3
Head Z	g	6.4	28.2	-98.2	75.4
Head Resultant	g	101.9	75.4	0.0	-25.5
Upper Neck Fx	N	210.9	166.0	-820.2	70.2
Upper Neck Fy	N	158.0	161.5	-101.1	189.4
Upper Neck Fz	N	3128.3	75.2	-182.9	42.8
Upper Neck F Resultant	N	3216.1	75.2	1.1	-38.5
Upper Neck Mx	N-m	13.8	170.4	-13.3	99.9
Upper Neck My	N-m	38.1	102.6	-35.7	181.3
Upper Neck Mz	N-m	7.9	102.7	-7.7	204.1
Upper Neck M Resultant	N-m	40.4	102.0	0.1	-39.3
Chest X	g	23.2	134.3	-53.9	54.7
Chest Y	g	13.0	78.1	-7.6	98.3
Chest Z	g	26.5	80.0	-20.5	59.9
Chest Resultant	g	57.9	58.1	0.0	-26.5
Chest Compression	mm	0.0	-47.8	-37.5	57.1
Pelvic X	g	44.8	130.9	-87.5	49.8
Pelvic Y	g	24.7	47.6	-1.1	14.7
Pelvic Z	g	17.5	195.9	-41.2	55.7
Pelvic Resultant	g	93.7	49.9	0.0	-30.2
Lap Belt Load	N	6186.7	50.6	-14.1	8.9
Torso Belt Stretch	mm	§	§	§	§

§ Data is questionable

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. VO45900

		MAXIMUM VALUE							
		Position #3				Position #4			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Child Restraint X	g	33.2	62.6	-67.1	48.6	19.2	193.0	-48.7	56.8

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster, Built-in Booster

NHTSA No. VO45900

	HEAD INJURY CRITERIA (HIC)							
	HIC15				HIC36			
	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂	HIC	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #3 - Right	1097.3	83.1	98.1	88.2 g	1948.3	70.7	106.7	78.2 g
Position #4 - Left	824.5	58.8	73.8	78.7 g	1242.8	52.4	88.4	65.3 g
Position #6 - Center	1324.5	66.6	81.6	95.1 g	1638.3	60.2	87.4	81.6 g

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #3 - Right	54.9	63.3	66.3	829.5
Position #4 - Left	§	§	§	§
Position #6 - Center	56.7	56.6	59.6	746.2

* The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

§ - Data is not accurate – spikes are present in Chest X data

Position 3 Neck Injury Summary (HIII 3 year old – In Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.17	297.2	76.3	-134.3	9.4
Nte	1.66	108.3	2000.5	-1327.2	-24.1
Ncf	0.04	28.1	-73.5	8.1	0.1
Nce	1.02	217.2	-463.8	-297.2	-24.1

Peak Tension (CFC1000) 2154.1 N **Peak Compression (CFC1000)** -485.7 N

Nij Intercepts				Peak Limits	
Tension (CVt)	2340 N	Extension (mCVe)	30 N-m	Tension	1430 N
Compression (CVc)	2120 N	Flexion (mCVf)	68 N-m	Compression	-1380 N

Condyle Offset 0

Position 4 Neck Injury Summary (HIII 6 year old – In Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.99	86.8	2125.8	-362.3	28.2
Nte	0.97	58.7	2083.1	-732.9	-12.6
Ncf	0.06	299.9	-13.5	-66.2	5.1
Nce	0.73	211.2	-329.0	-164.8	-25.5

Peak Tension (CFC1000) 2628.1 N **Peak Compression (CFC1000)** -338.5 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	3096 N	Extension (mCVe)	42 N-m	Tension	1890 N
Compression (CVc)	2800 N	Flexion (mCVf)	93 N-m	Compression	-1820 N

Condyle Offset -0.01778

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

CRS: Built-in Booster

NHTSA No. VO45900

Position 6 Neck Injury Summary (HIII 6 year old – In Position)

Nij V10	Nij	Time (ms)	Z Force (N)	X Force (N)	Y Moment (N-m)
Ntf	0.81	80.7	2500.4	-544.3	0.1
Nte	1.27	68.9	2637.2	-814.5	-17.5
Ncf	0.19	157.0	-62.1	-53.3	15.6
Nce	0.48	204.0	-2.8	-97.6	-20.2

Peak Tension (CFC1000) 3128.3 N

Peak Compression (CFC1000) -182.9 N

Critical Values

Nij Intercepts				Peak Limits	
Tension (CVt)	3096 N	Extension (mCVe)	42 N-m	Tension	1890 N
Compression (CVc)	2800 N	Flexion (mCVf)	93 N-m	Compression	-1820 N

Condyle Offset -0.01778

DATA SHEET NO. 5

CRS PERFORMANCE DATA

CRS: Evenflo Vanguard 5 LATCH, Graco My CarGo Booster

NHTSA No. VO45900

POSITION #3 CRS POST-TEST INSPECTION (Serial No. 3691261 P1)

LOCATION	DAMAGE	REMARKS
Upper Tether Strap	No	None
Upper Tether Buckle	No	None
Upper Tether Hook	No	None
Vehicle Upper Tether Anchor	No	None
Lower Anchor Strap	No	None
Lower Anchor Buckle	No	None
Lower Anchor Hooks	No	None
Vehicle Lower CRS Anchors	No	None
Five Point Harness Connections	Yes	Lower buckle anchor dislodged during the event
Cracks on CRS	Yes	The CRS back pan was cracked after the event
Fabric Tears on CRS	No	None
Vehicle Seat Structure	No	None
Vehicle Seat Fabric Tears	No	None
Child Dummy	No	None

POSITION #4 CRS POST-TEST INSPECTION (Serial No. 8481 LAN)

LOCATION	DAMAGE	REMARKS
Upper Tether Strap	NA	NA
Upper Tether Buckle	NA	NA
Upper Tether Hook	NA	NA
Vehicle Upper Tether Anchor	NA	NA
Lower Anchor Strap	NA	NA
Lower Anchor Buckle	NA	NA
Lower Anchor Hooks	NA	NA
Vehicle Lower CRS Anchors	NA	NA
Five Point Harness Connections	NA	NA
Cracks on CRS	No	None
Fabric Tears on CRS	No	None
Vehicle Seat Structure	No	None
Vehicle Seat Fabric Tears	No	None
Child Dummy	No	None

DATA SHEET NO. 5

CRS PERFORMANCE DATA (CONTINUED)

CRS: Built-in Booster

NHTSA No. VO45900

POSITION #6 POST-TEST INSPECTION

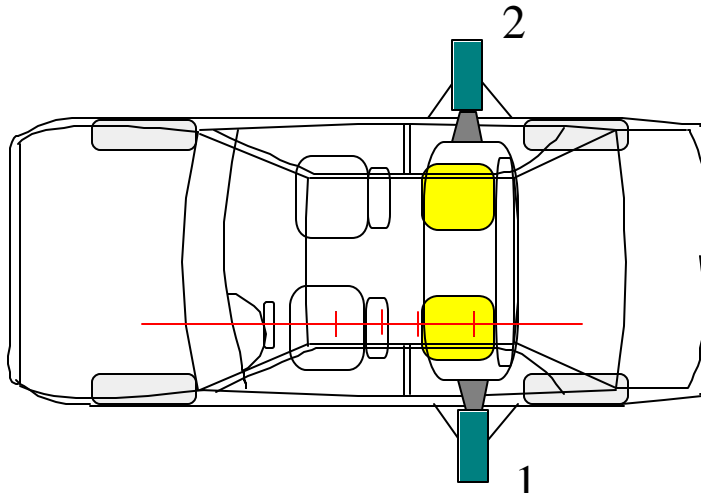
LOCATION	DAMAGE	REMARKS
Upper Tether Strap	N/A	None
Upper Tether Buckle	N/A	None
Upper Tether Hook	N/A	None
Vehicle Upper Tether Anchor	N/A	None
Lower Anchor Strap	N/A	None
Lower Anchor Buckle	N/A	None
Lower Anchor Hooks	N/A	None
Vehicle Lower CRS Anchors	N/A	None
Five Point Harness Connections	N/A	None
Cracks on CRS	N/A	None
Fabric Tears on CRS	N/A	None
Vehicle Seat Structure	No	None
Vehicle Seat Fabric Tears	No	None
Vehicle Belt Tears	Yes	Torso Belt had a longitudinal tear near belt guide
Child Dummy	No	None

DATA SHEET NO. 6

CRS CAMERA DATA

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. VO45900



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left side CRS lateral view	3658	2708	2555	-20	13	1005
2	Right side CRS lateral view	3642	2642	2567	-24	13	1005

* Reference (from point of impact); all measurements accurate to within ± 6 mm.

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

SECTION 3

PHOTOGRAPHS

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*The vehicle NHTSA number was changed to reflect the 2004 model year after testing. As a result, the photos display the NHTSA number originally assigned to the vehicle.

FOR YOUR CHILD'S CONTINUED SAFETY

Please take a few moments to promptly fill out and return the attached card.
Although child restraint systems undergo testing and evaluation, it is possible that a child restraint could be recalled.
In case of recall, we can reach you only if we have your name and address, so please send in the card to be on our recall list.

**Please fill this card out and mail it NOW,
while you are thinking about it.**

It's already addressed and we've paid the postage.

Tear off and mail this part

Consumer: Just fill in your name and address. **PLEASE PRINT**

Your name _____

Your street and address _____

City _____ State _____ Zip Code _____

CHILD RESTRAINT REGISTRATION CARD

Manufactured in 26APR03
Model # 3691331 P1

Figure 3-1 CLOSE-UP VIEW OF POSITION 3 CRS LABEL



Figure 3-2 PRE-TEST FRONTAL VIEW OF POSITION 3 CRS



Figure 3-3 POST-TEST FRONTAL VIEW OF POSITION 3 CRS



Figure 3-4 PRE-TEST REAR VIEW OF POSITION 3 CRS



Figure 3-5 POST-TEST REAR VIEW OF POSITION 3 CRS



Figure 3-6 PRE-TEST LEFT SIDE VIEW OF POSITION 3 CRS



Figure 3-7 POST-TEST LEFT SIDE VIEW OF POSITION 3 CRS



Figure 3-8 PRE-TEST RIGHT SIDE VIEW OF POSITION 3 CRS



Figure 3-9 POST-TEST RIGHT SIDE VIEW OF POSITION 3 CRS



Figure 3-11 PRE-TEST FRONTAL VIEW OF POSITION 4 CRS

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8714-01



Figure 3-12 POST-TEST FRONTAL VIEW OF POSITION 4 CRS



Figure 3-13 PRE-TEST REAR VIEW OF POSITION 4 CRS



Figure 3-14 POST-TEST REAR VIEW OF POSITION 4 CRS



Figure 3-15 PRE-TEST LEFT SIDE VIEW OF POSITION 4 CRS



Figure 3-16 POST-TEST LEFT SIDE VIEW OF POSITION 4 CRS



Figure 3-17 PRE-TEST RIGHT SIDE VIEW OF POSITION 4 CRS



Figure 3-18 POST-TEST RIGHT SIDE VIEW OF POSITION 4 CRS



Figure 3-19 PRE-TEST POSITION 3 LEFT SIDE VIEW



Figure 3-20 POST-TEST POSITION 3 LEFT SIDE VIEW



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8714-01

Figure 3-21 PRE-TEST POSITION 4 LEFT SIDE VIEW



Figure 3-22 POST-TEST POSITION 4 LEFT SIDE VIEW



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8714-01

Figure 3-23 PRE-TEST POSITION 3 RIGHT SIDE VIEW



Figure 3-24 POST-TEST POSITION 3 RIGHT SIDE VIEW



Figure 3-25 PRE-TEST POSITION 4 RIGHT SIDE VIEW



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8714-01

Figure 3-26 POST-TEST POSITION 4 RIGHT SIDE VIEW



Figure 3-27 PRE-TEST POSITION 3 FRONT VIEW



Figure 3-28 POST-TEST POSITION 3 FRONT VIEW



Figure 3-29 PRE-TEST POSITION 4 FRONT VIEW



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8714-01

Figure 3-30 POST-TEST POSITION 4 FRONT VIEW



Figure 3-31 PRE-TEST POSITION 6 BOOSTER VIEW

3-34

8714-01

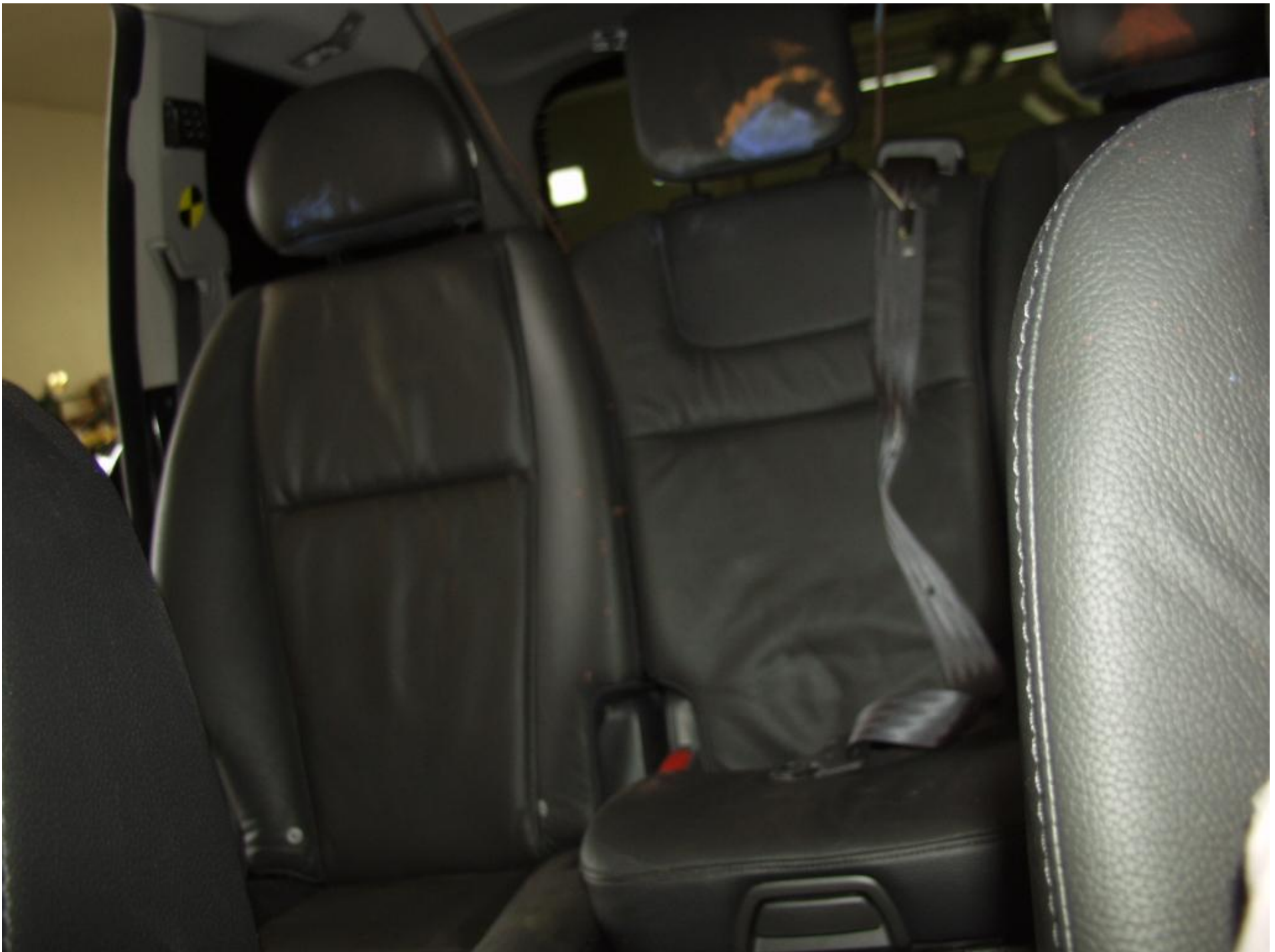


Figure 3-32 POST-TEST POSITION 6 BOOSTER VIEW



Figure 3-33 PRE-TEST POSITION 6 LEFT SIDE VIEW



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8714-01

Figure 3-34 POST-TEST POSITION 6 LEFT SIDE VIEW



Figure 3-35 PRE-TEST POSITION 6 RIGHT SIDE VIEW



Figure 3-36 POST-TEST POSITION 6 RIGHT SIDE VIEW



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Figure 3-37 PRE-TEST POSITION 6 FRONT VIEW



Figure 3-38 POST-TEST POSITION 6 FRONT VIEW

SECTION 4

CHILD DUMMY RESPONSE AND CRS DATA TRACES

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73	V1P4 Child Seat x Velocity [kph, CFC_180]	4-76
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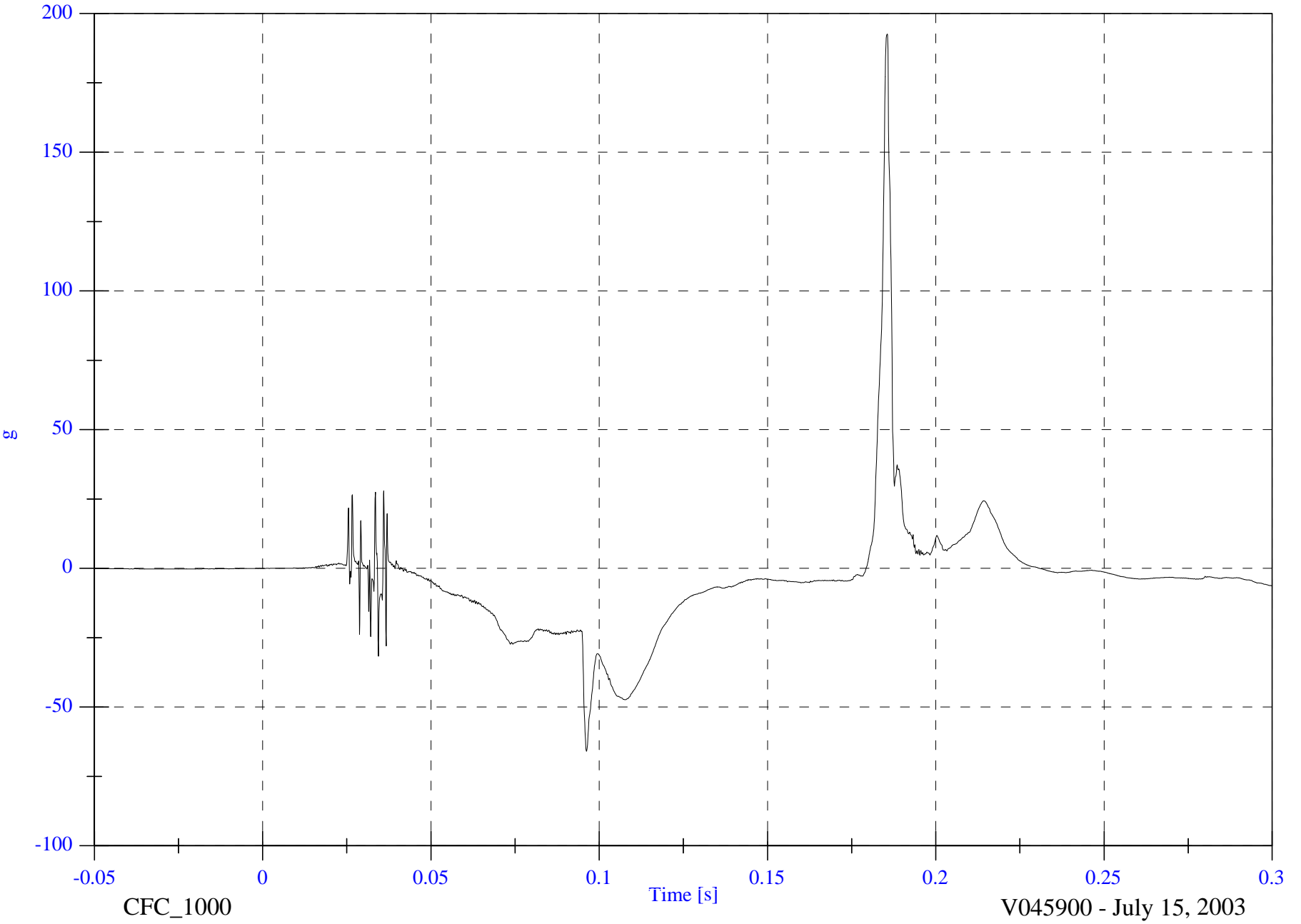
2004 Volvo XC90 NCAP

V1P3 Head x

Max: 192.6 [g] at 0.186 [s]

Min: -66.0 [g] at 0.096 [s]

4-4



8714-01

CFC_1000

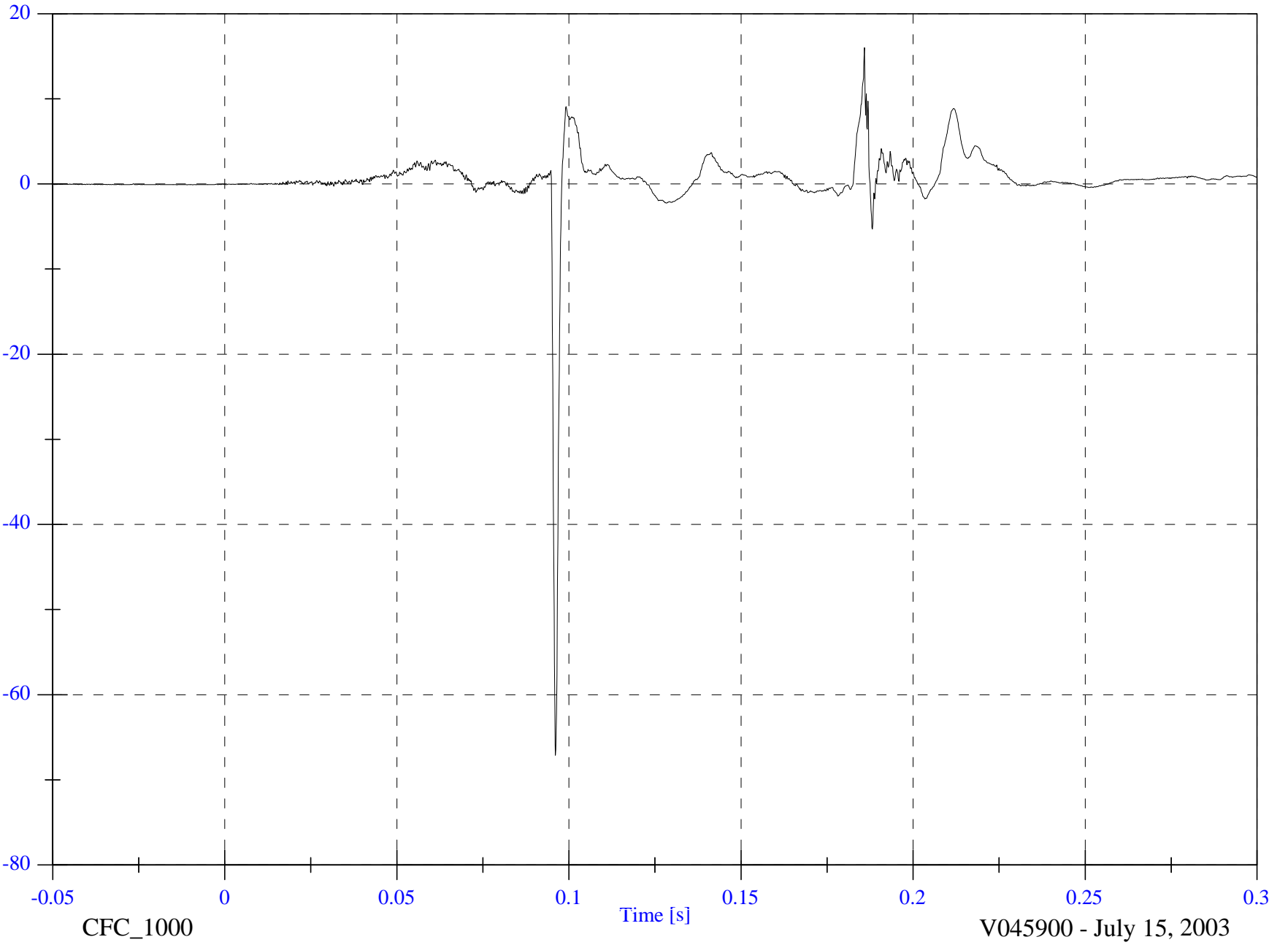
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P3 Head y

Max: 16.0 [g] at 0.186 [s]

Min: -67.1 [g] at 0.096 [s]



4-5

g

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P3 Head z

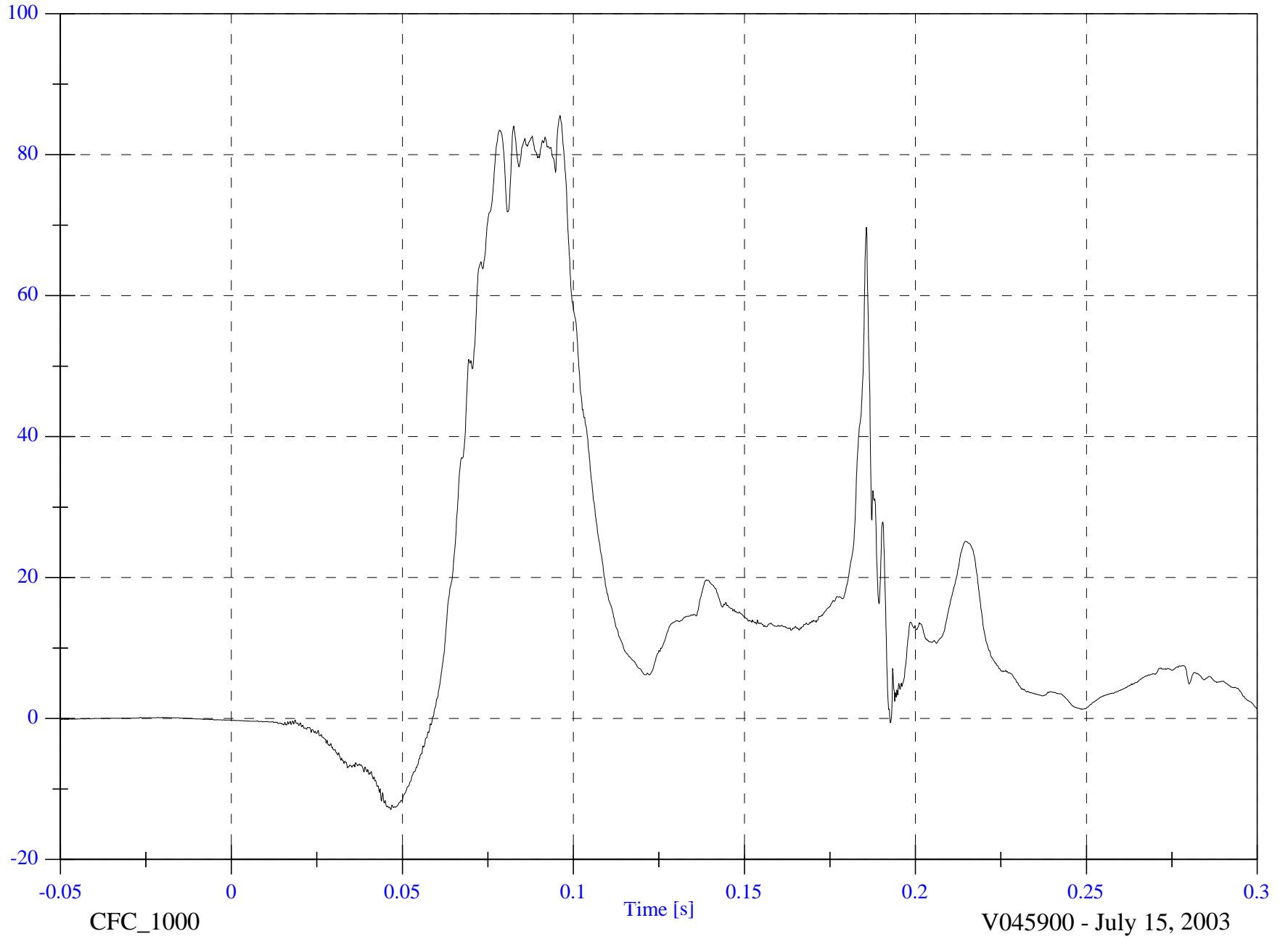
Max: 85.6 [g] at 0.096 [s]

Min: -12.9 [g] at 0.047 [s]

4-6

g

8714-01



2004 Volvo XC90 NCAP

V1P3 Head Resultant

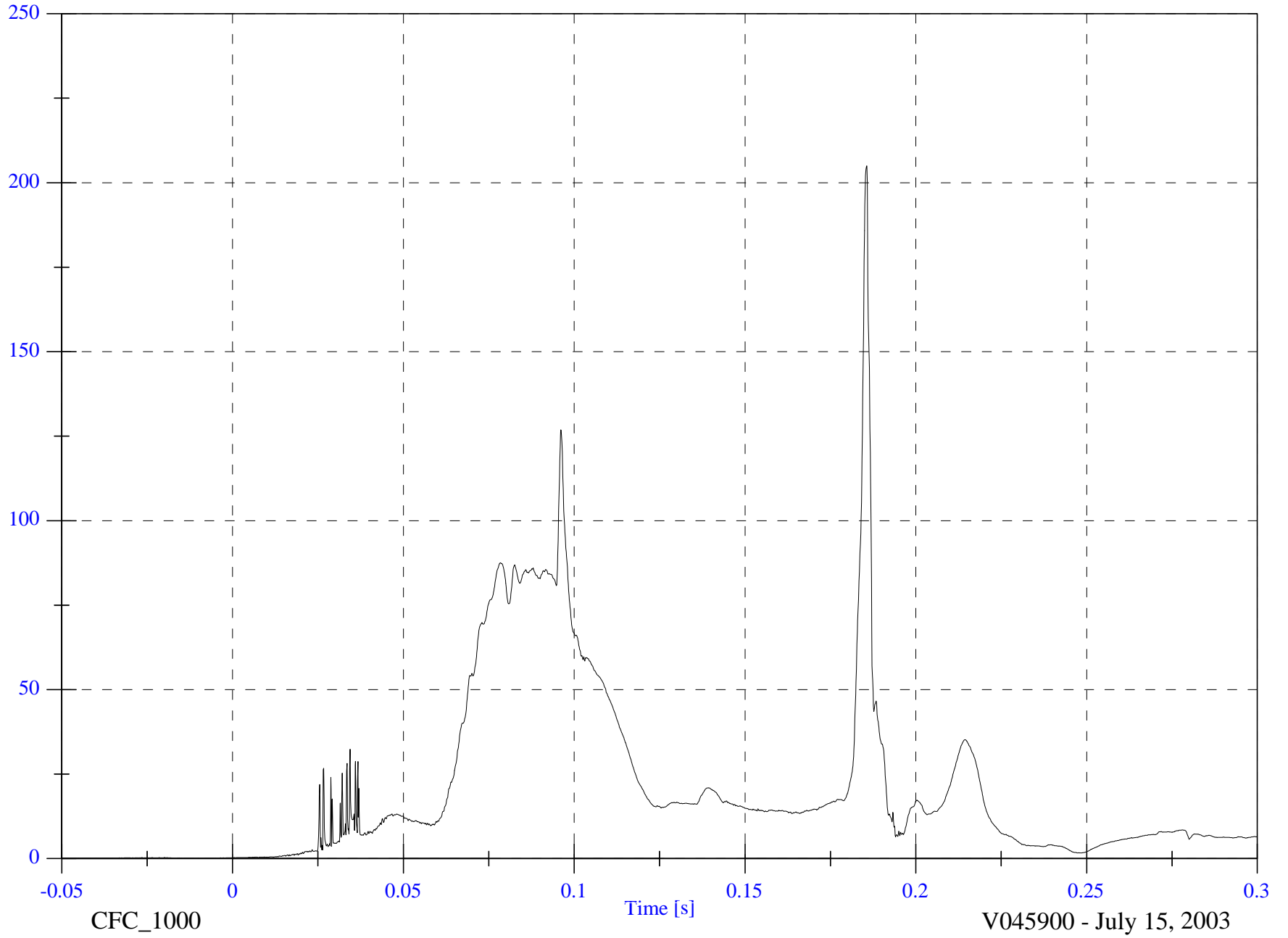
Max: 205.0 [g] at 0.186 [s]

Min: 0.1 [g] at -0.046 [s]

4-7

g

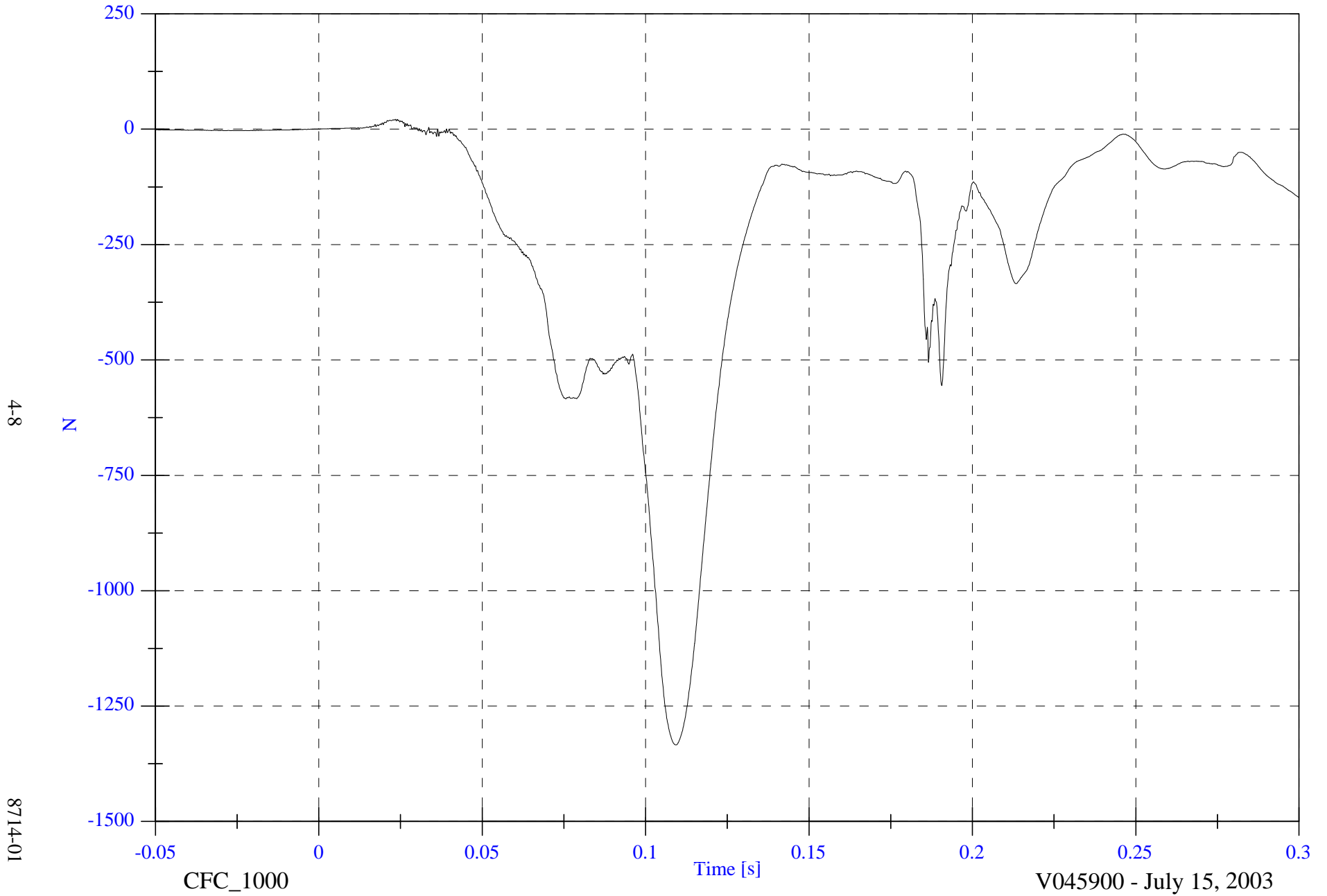
8714-01



2004 Volvo XC90 NCAP

V1P3 Upper Neck Fx

Max: 21.5 [N] at 0.023 [s]
Min: -1334.4 [N] at 0.109 [s]



4-8

8714-01

CFC_1000

Time [s]

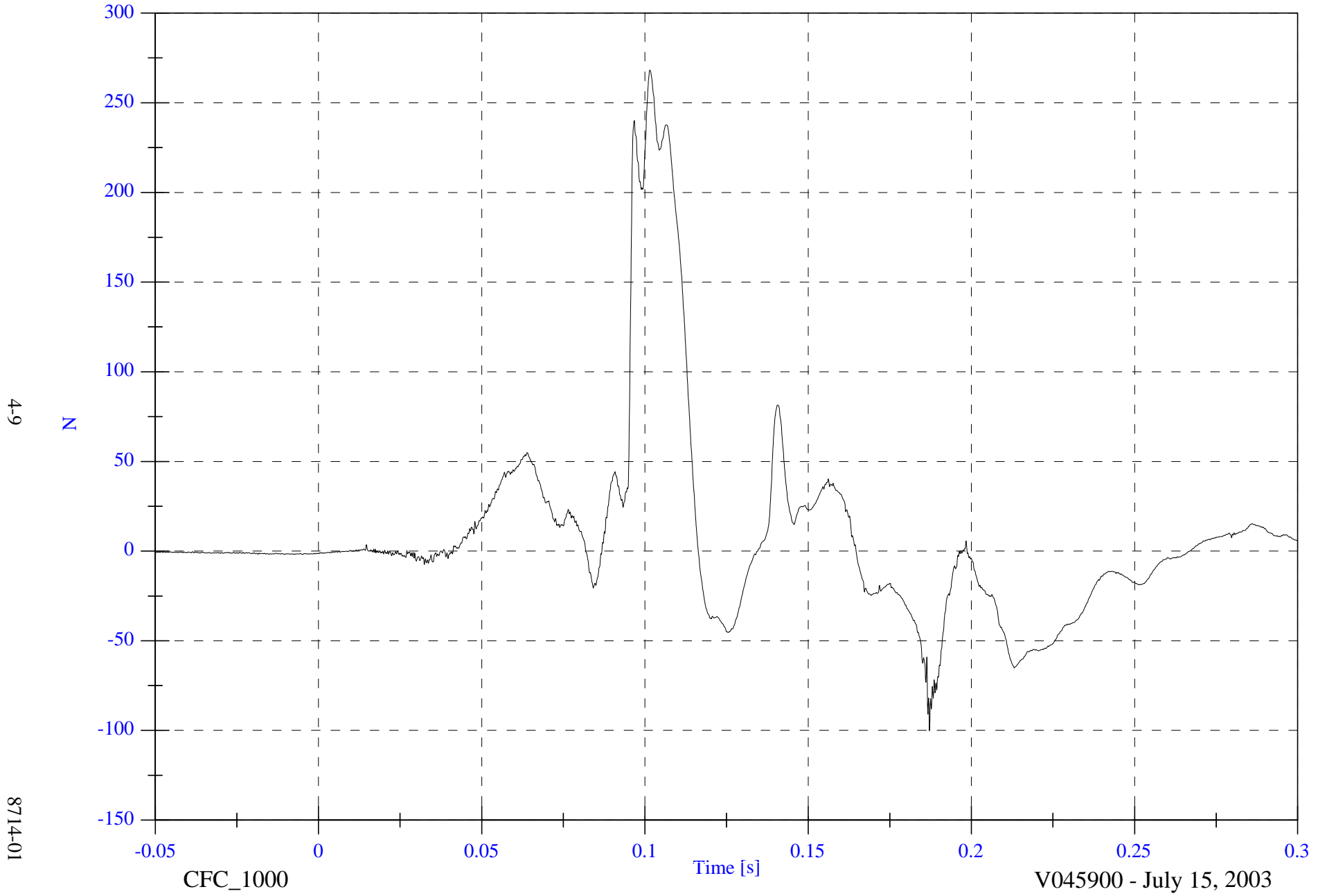
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P3 Upper Neck Fy

Max: 268.3 [N] at 0.101 [s]

Min: -100.2 [N] at 0.187 [s]

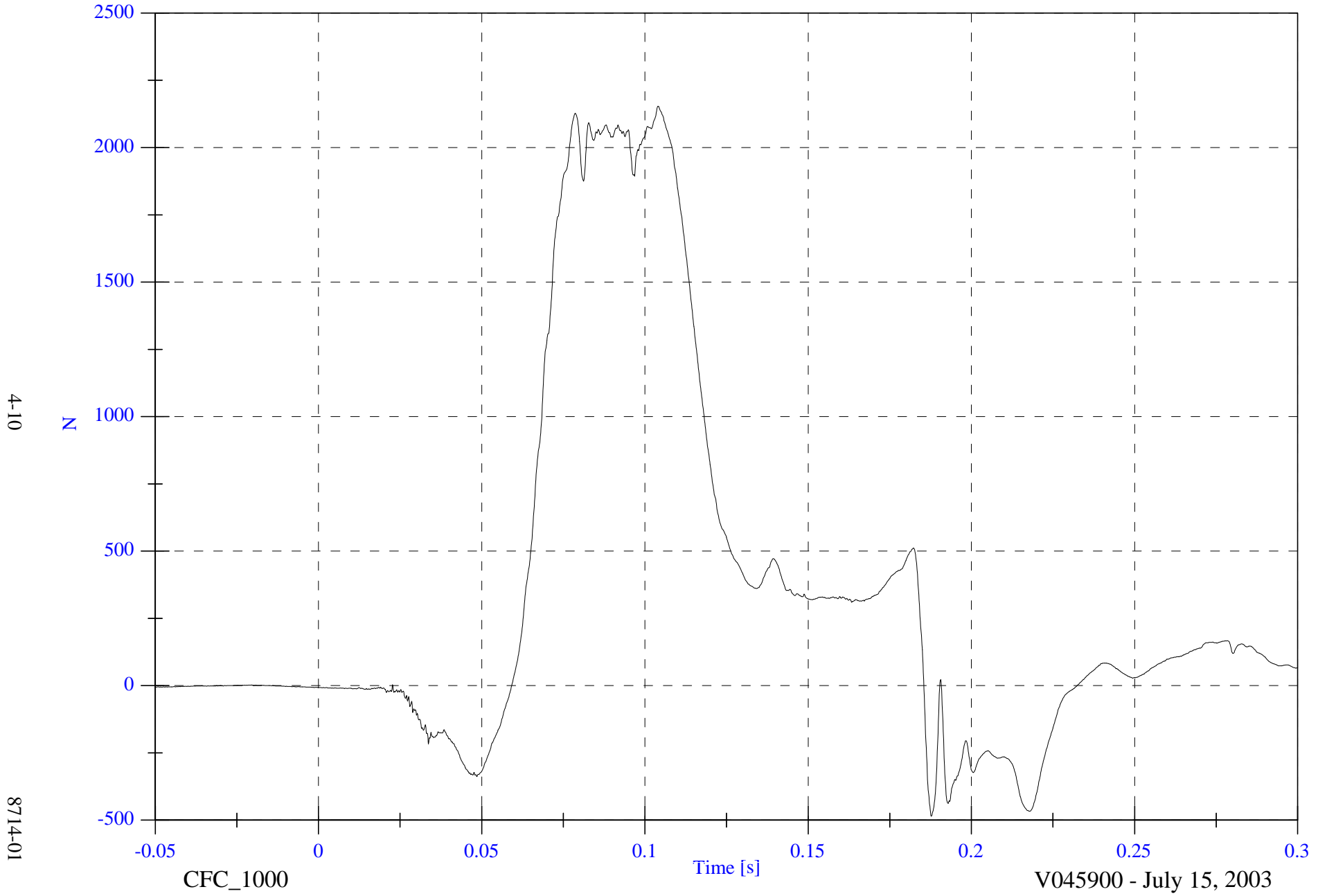


2004 Volvo XC90 NCAP

V1P3 Upper Neck Fz

Max: 2154.1 [N] at 0.104 [s]

Min: -485.7 [N] at 0.188 [s]



4-10

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

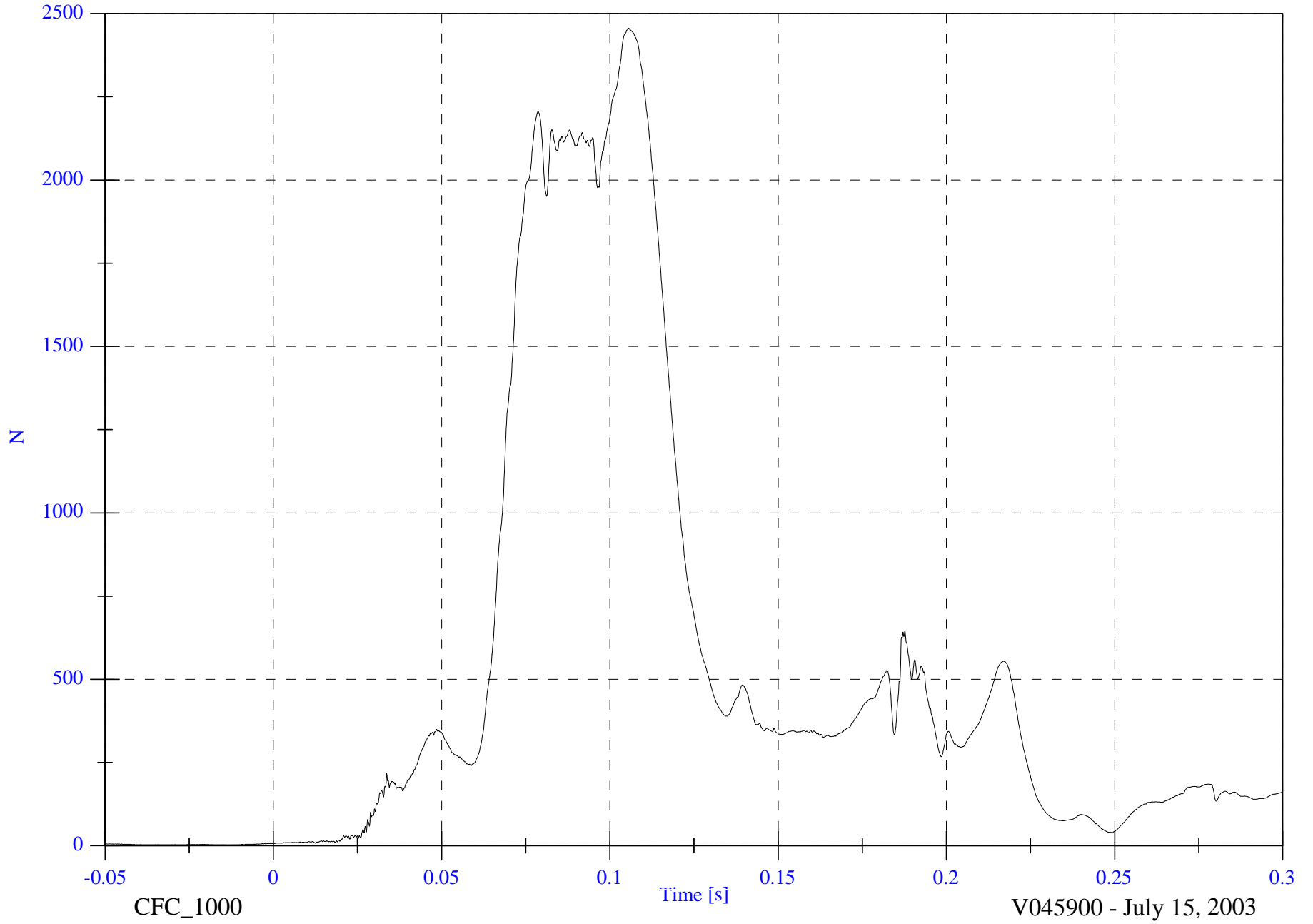
V1P3 Upper Neck F Resultant

Max: 2456.2 [N] at 0.106 [s]

Min: 2.5 [N] at -0.013 [s]

4-11

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

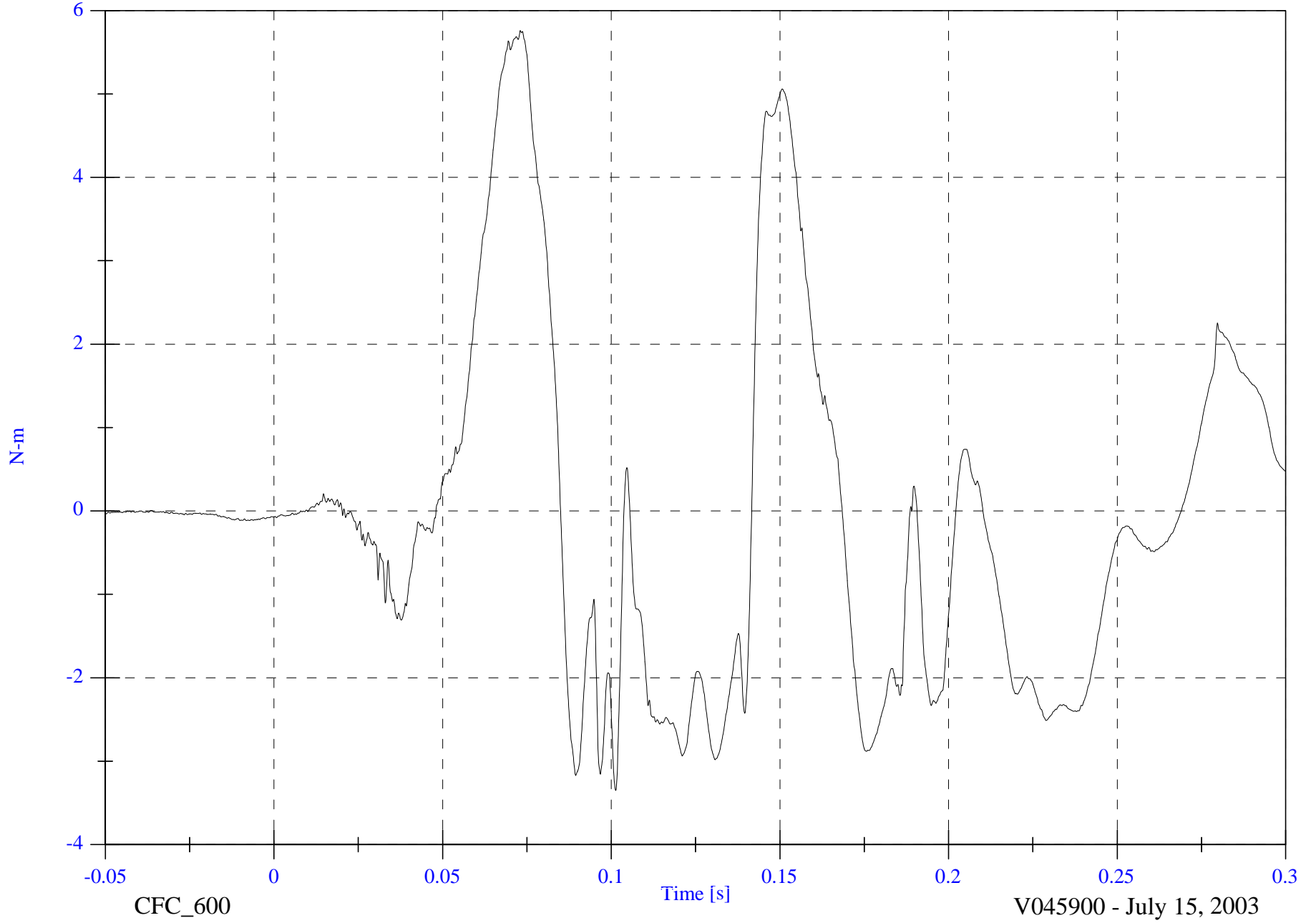
V1P3 Upper Neck Mx

Max: 5.8 [N-m] at 0.073 [s]

Min: -3.4 [N-m] at 0.101 [s]

4-12

8714-01



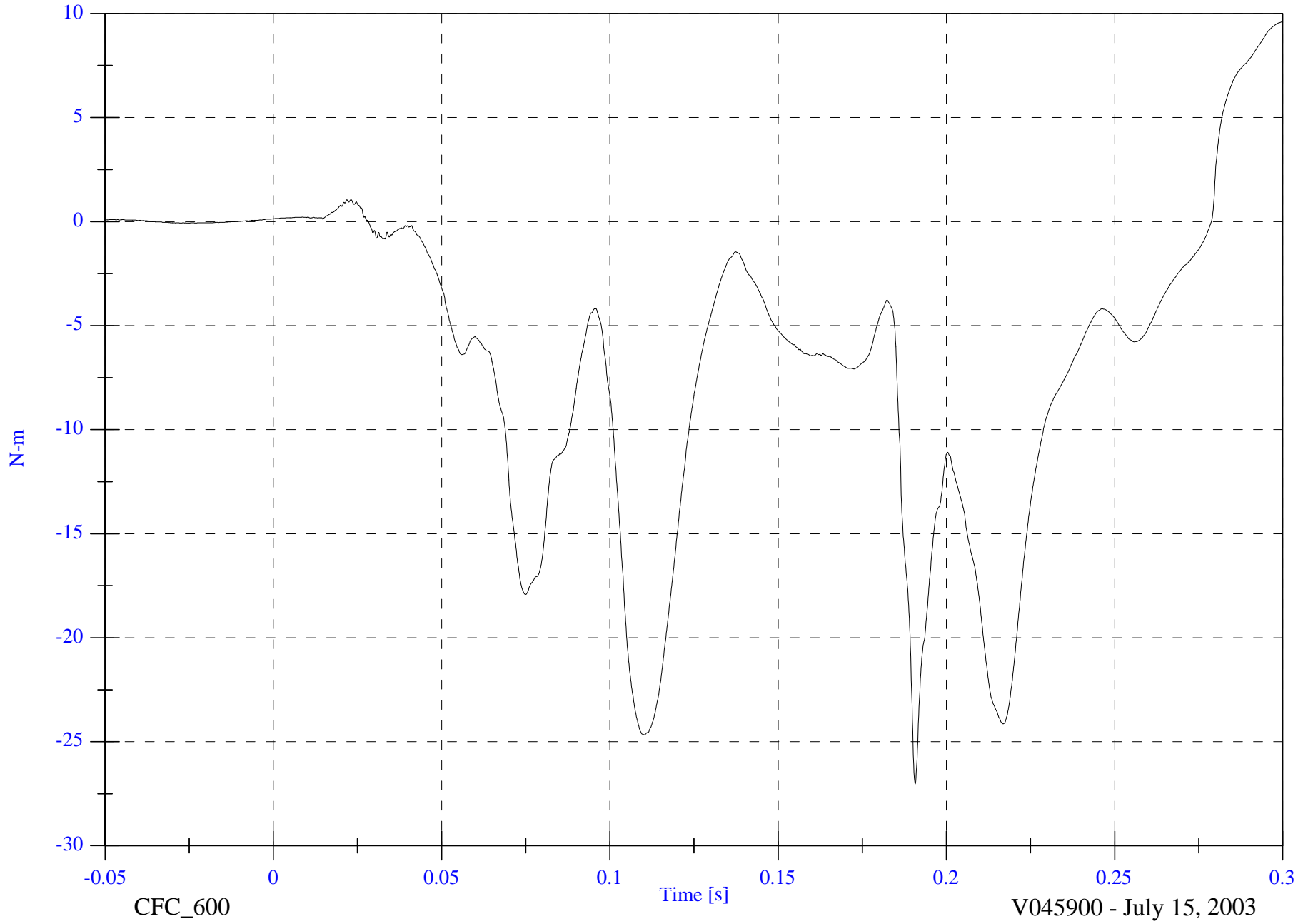
2004 Volvo XC90 NCAP

V1P3 Upper Neck My

Max: 9.6 [N-m] at 0.300 [s]
Min: -27.0 [N-m] at 0.191 [s]

4-13

8714-01

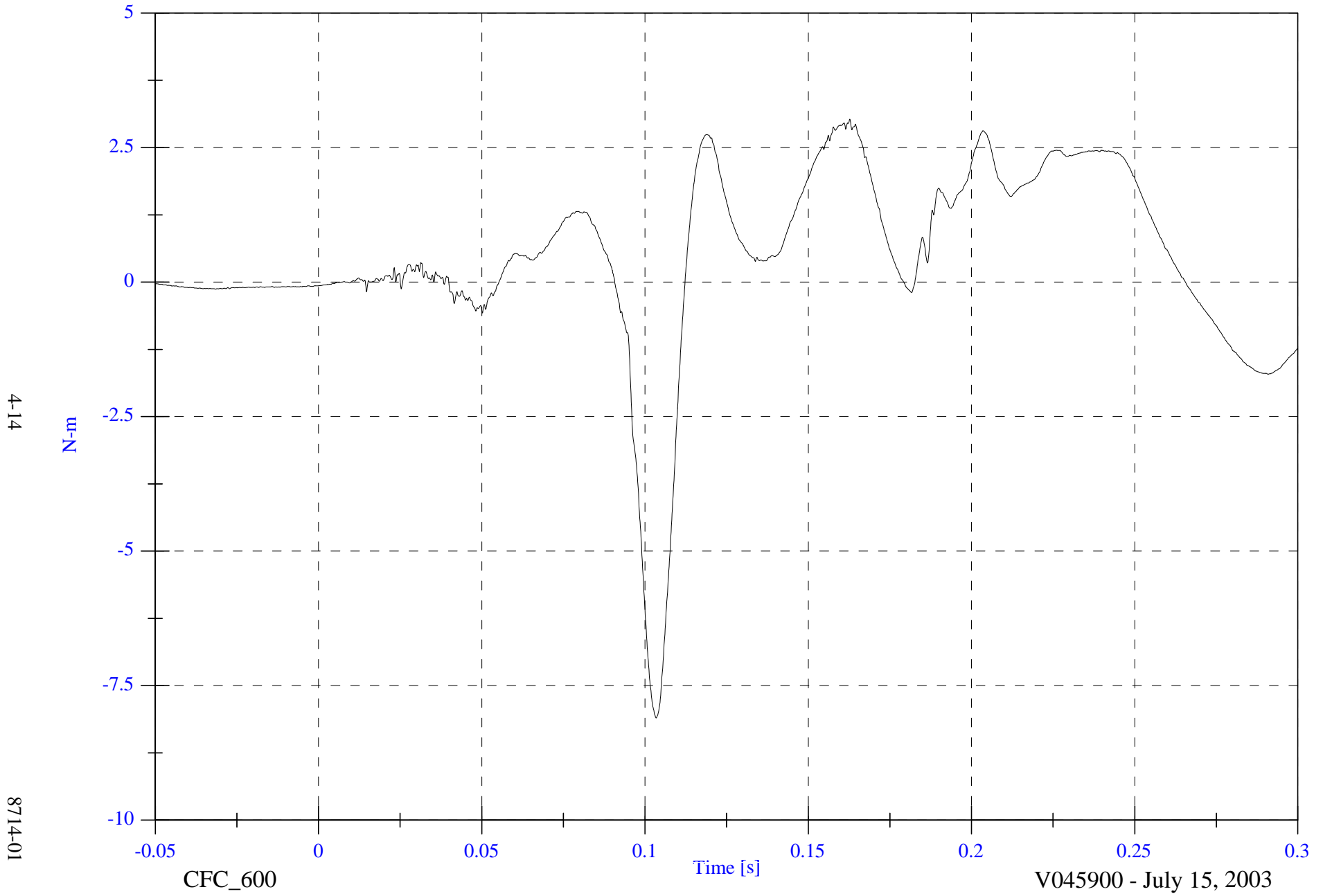


2004 Volvo XC90 NCAP

V1P3 Upper Neck Mz

Max: 3.0 [N-m] at 0.163 [s]

Min: -8.1 [N-m] at 0.103 [s]



4-14

8714-01

CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

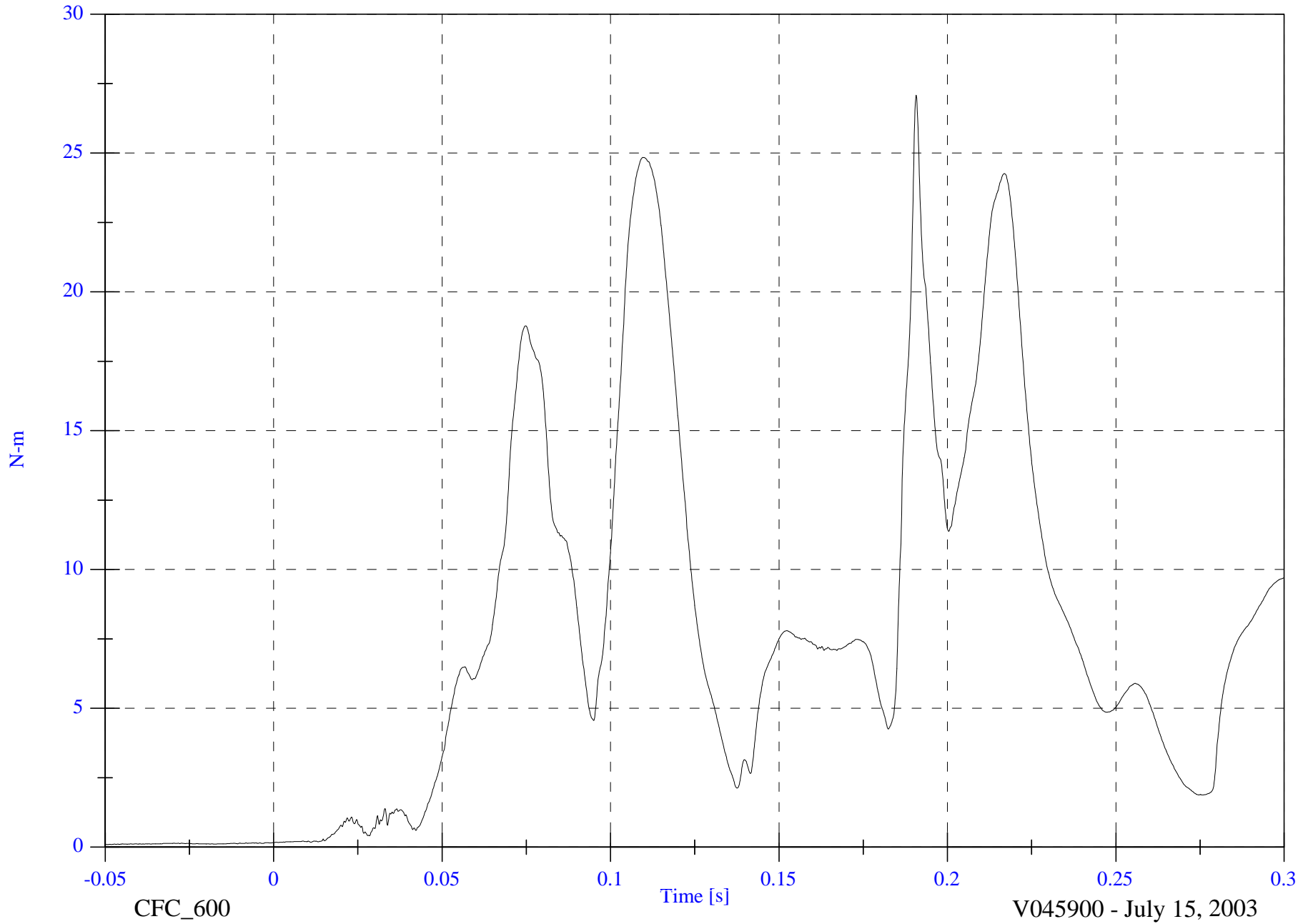
V1P3 Upper Neck M Resultant

Max: 27.1 [N-m] at 0.191 [s]

Min: 0.1 [N-m] at -0.049 [s]

4-15

8714-01



2004 Volvo XC90 NCAP

VIP3 Chest x

Max: 28.9 [g] at 0.190 [s]

Min: -56.8 [g] at 0.077 [s]



2004 Volvo XC90 NCAP

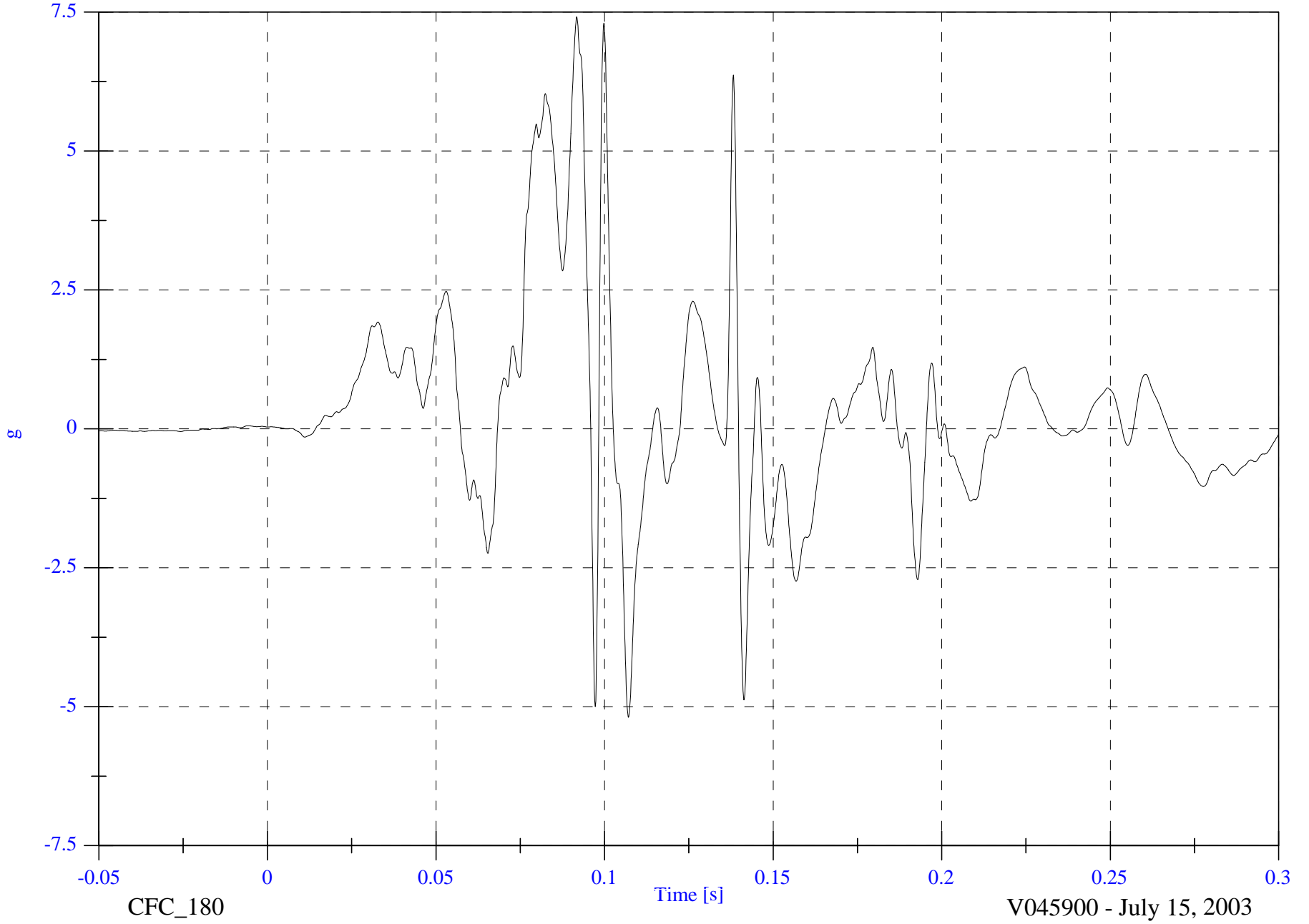
VIP3 Chest y

Max: 7.4 [g] at 0.092 [s]

Min: -5.2 [g] at 0.107 [s]

4-17

8714-01



2004 Volvo XC90 NCAP

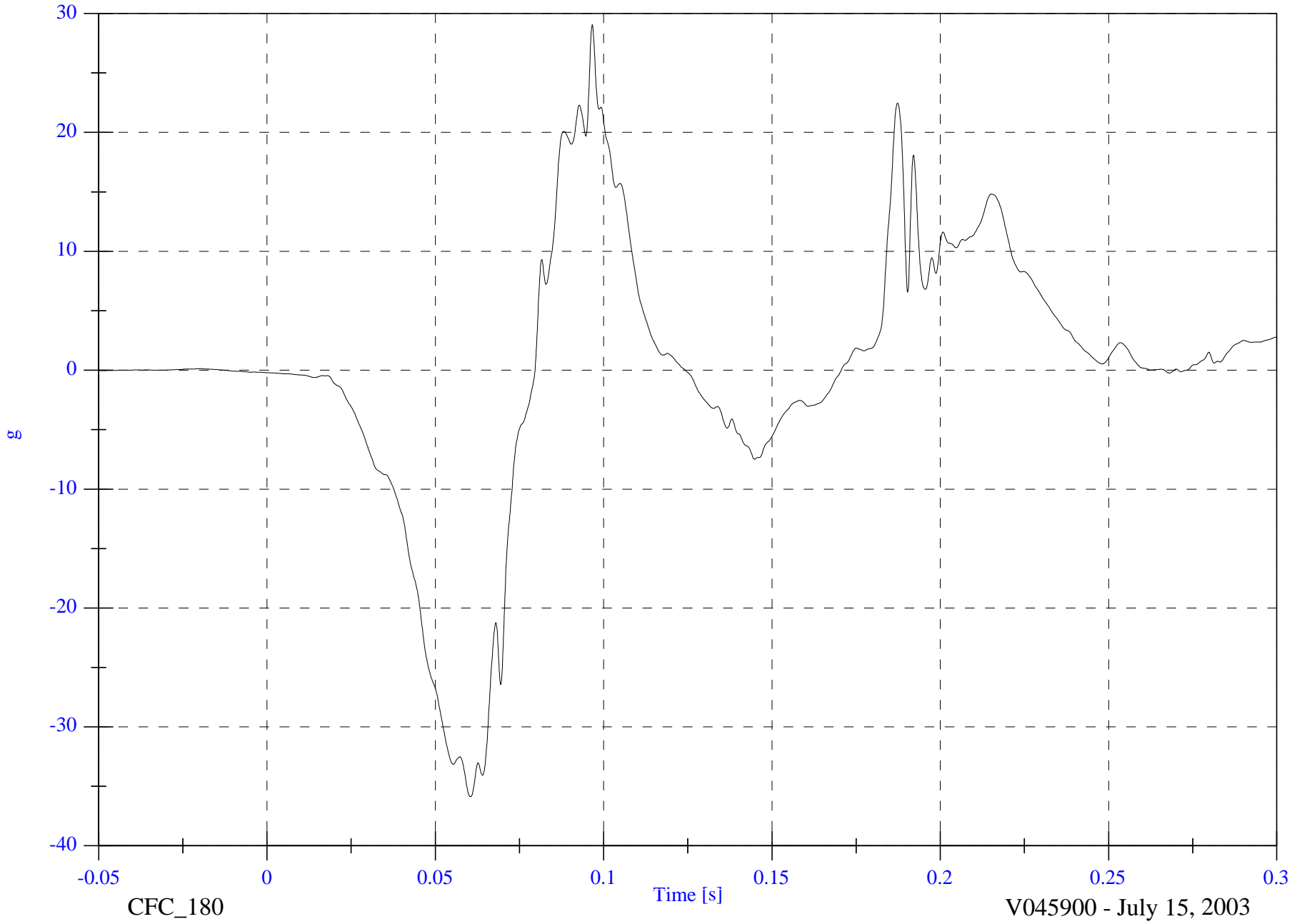
VIP3 Chest z

Max: 29.1 [g] at 0.097 [s]

Min: -35.9 [g] at 0.060 [s]

4-18

8714-01



CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

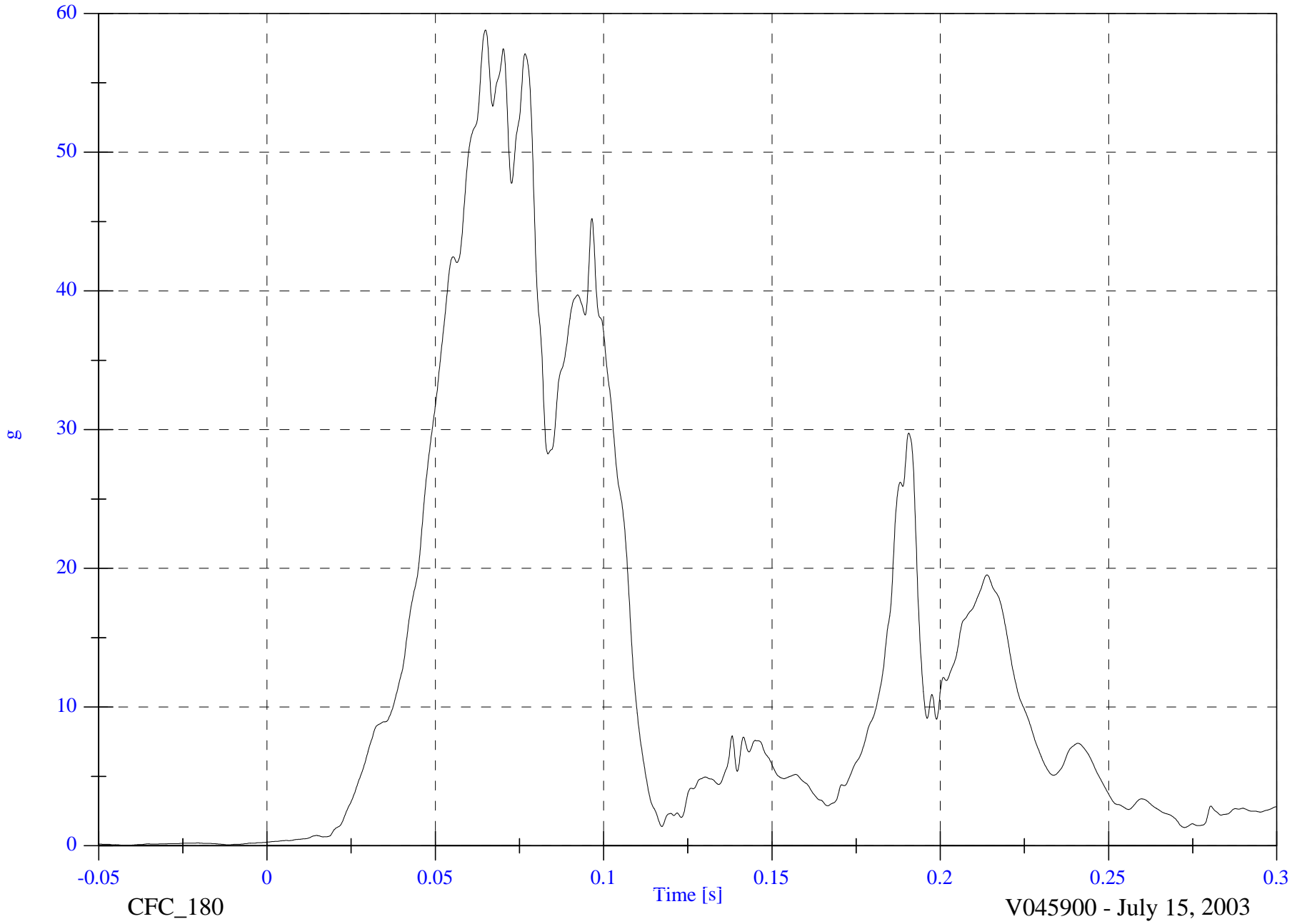
V1P3 Chest Resultant

Max: 58.8 [g] at 0.065 [s]

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

4-19

8714-01



2004 Volvo XC90 NCAP

V1P3 Chest Compression

Max: 0.0 [mm] at -0.028 [s]

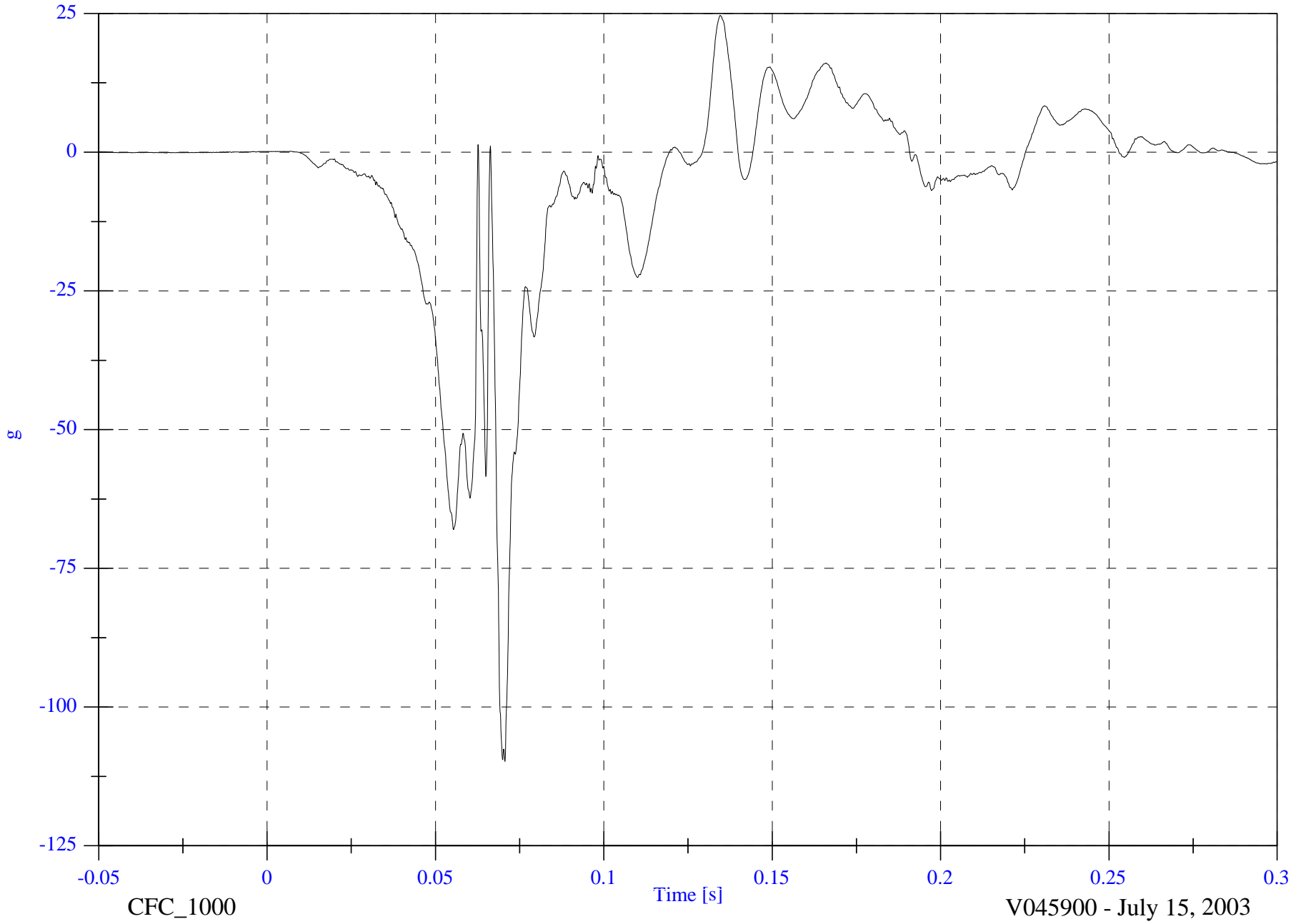
Min: -25.0 [mm] at 0.074 [s]



2004 Volvo XC90 NCAP

V1P3 Pelvic x

Max: 24.6 [g] at 0.135 [s]
Min: -109.8 [g] at 0.071 [s]



4-21

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

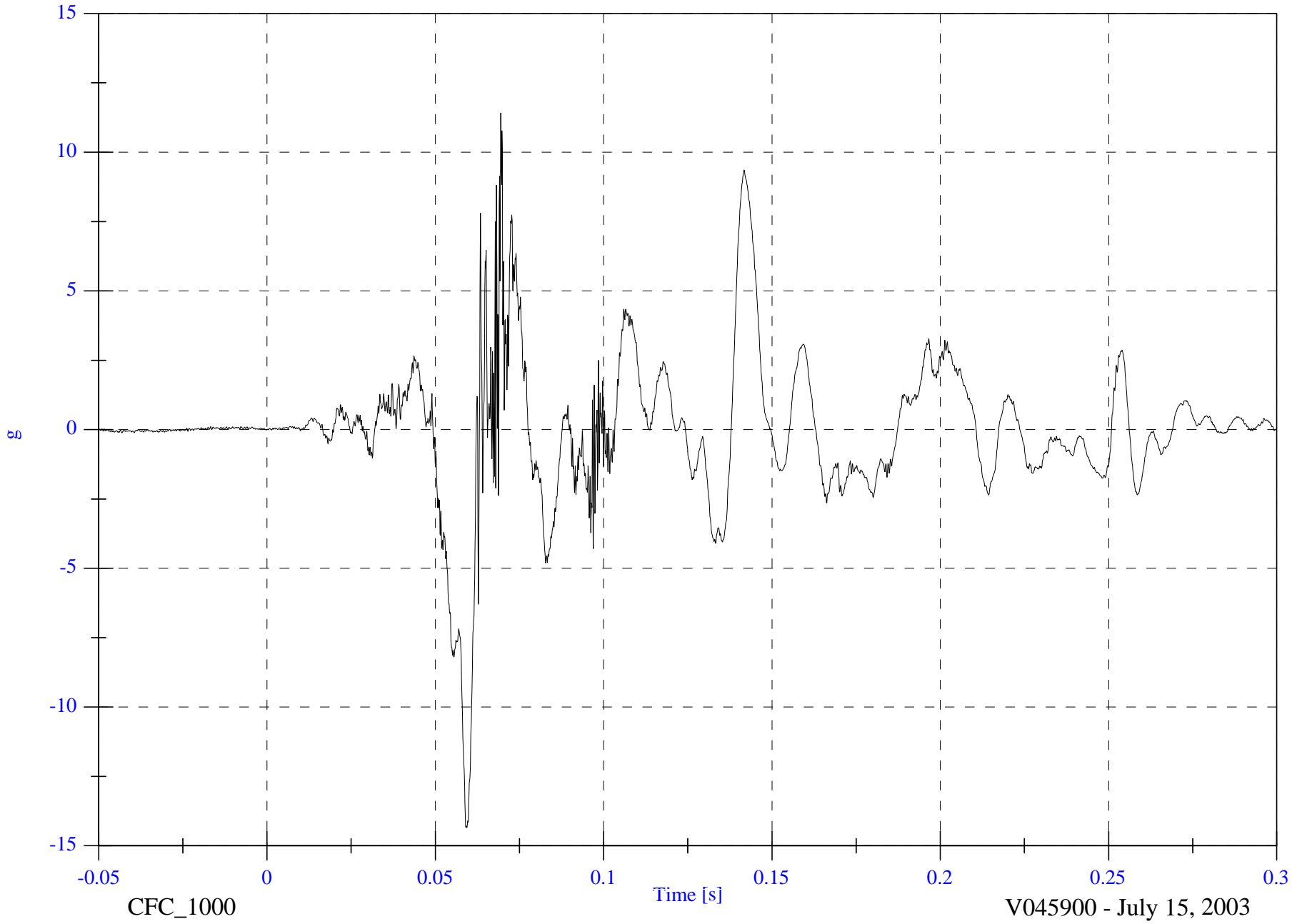
V1P3 Pelvic y

Max: 11.4 [g] at 0.069 [s]

Min: -14.3 [g] at 0.059 [s]

4-22

8714-01



2004 Volvo XC90 NCAP

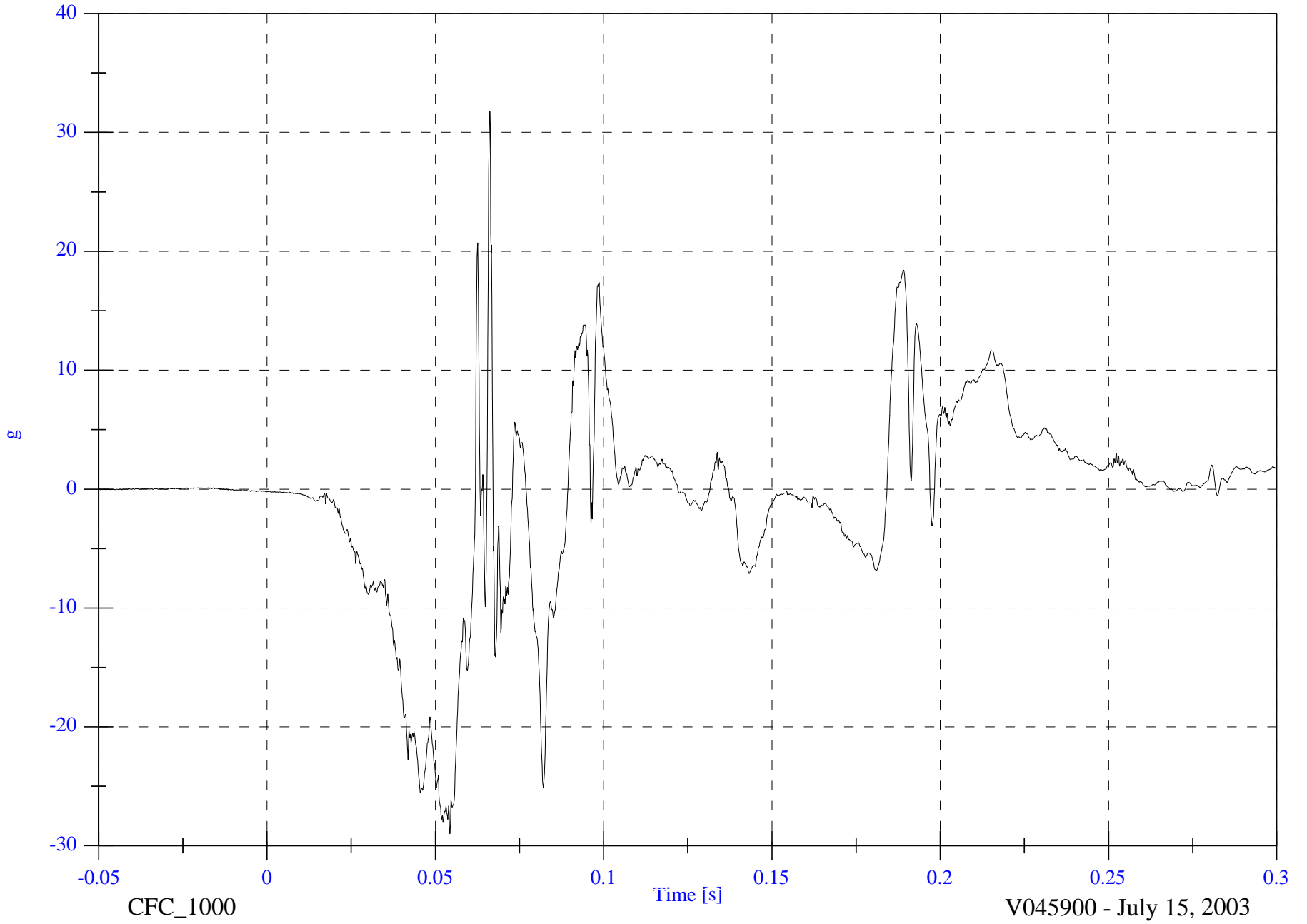
V1P3 Pelvic z

Max: 31.8 [g] at 0.066 [s]

Min: -29.0 [g] at 0.054 [s]

4-23

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

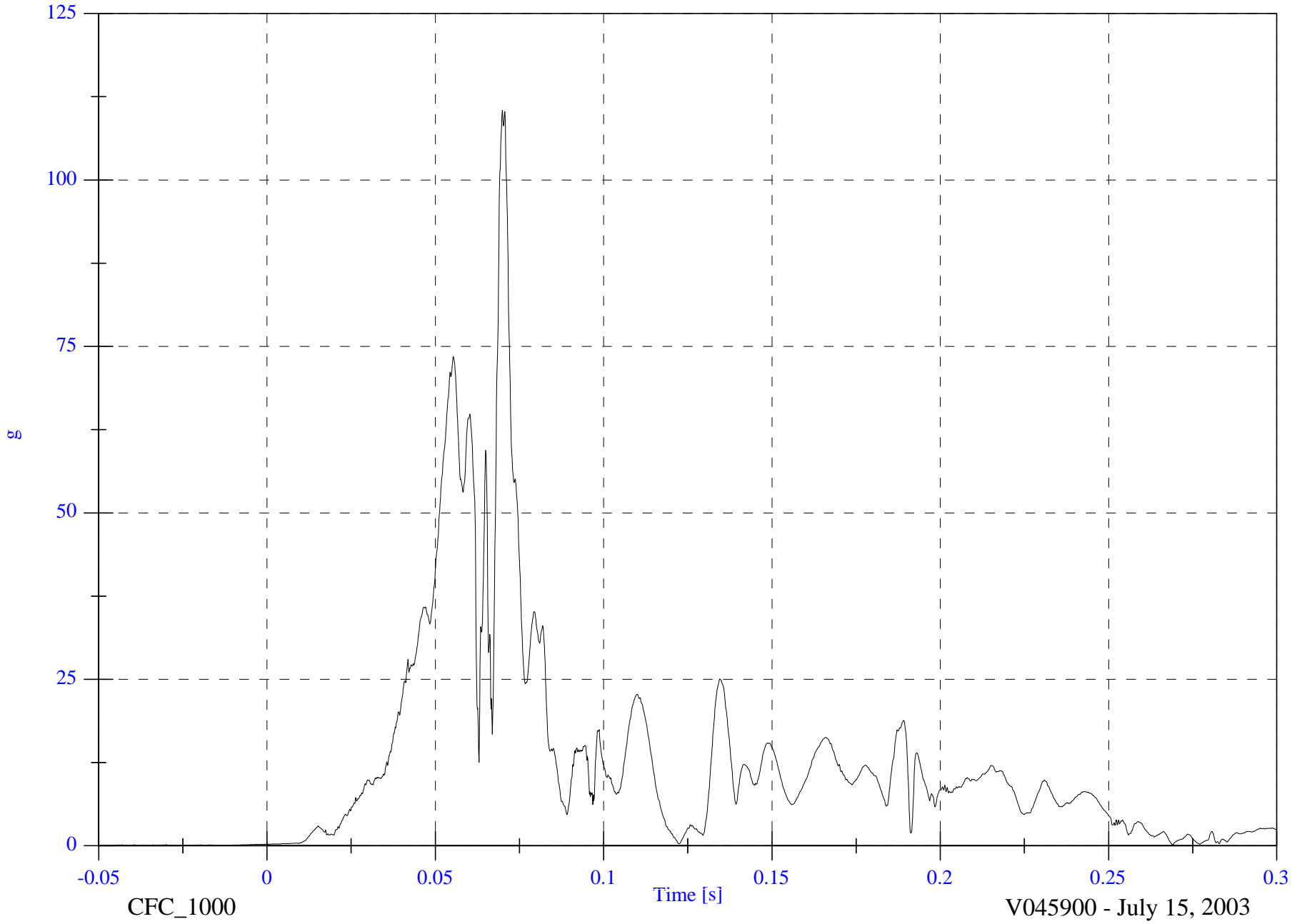
V1P3 Pelvic Resultant

Max: 110.4 [g] at 0.070 [s]

Min: 0.0 [g] at -0.047 [s]

4-24

8714-01

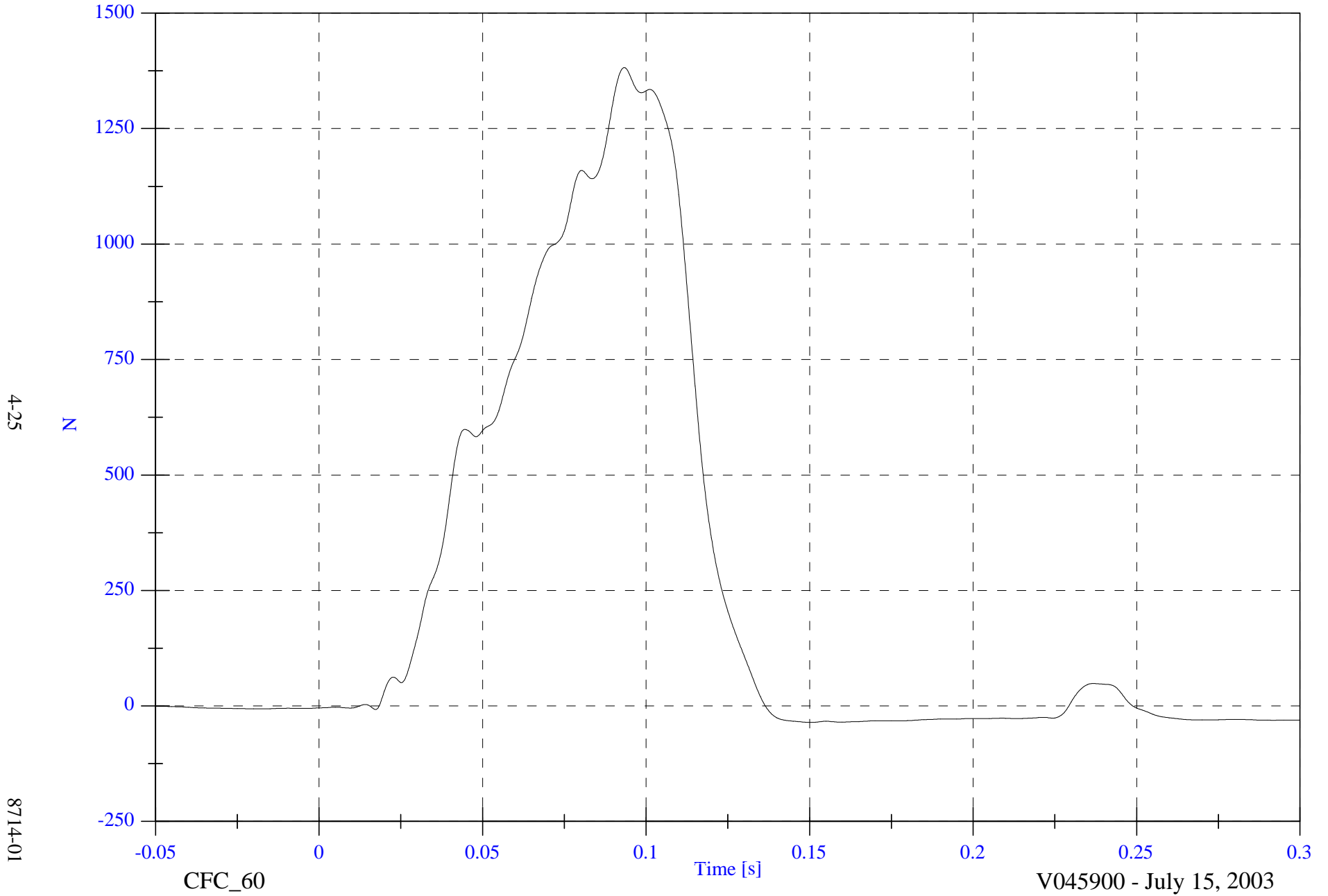


2004 Volvo XC90 NCAP

V1P3 Tether Load

Max: 1381.9 [N] at 0.093 [s]

Min: -35.8 [N] at 0.150 [s]



4-25

8714-01

CFC_60

Time [s]

V045900 - July 15, 2003

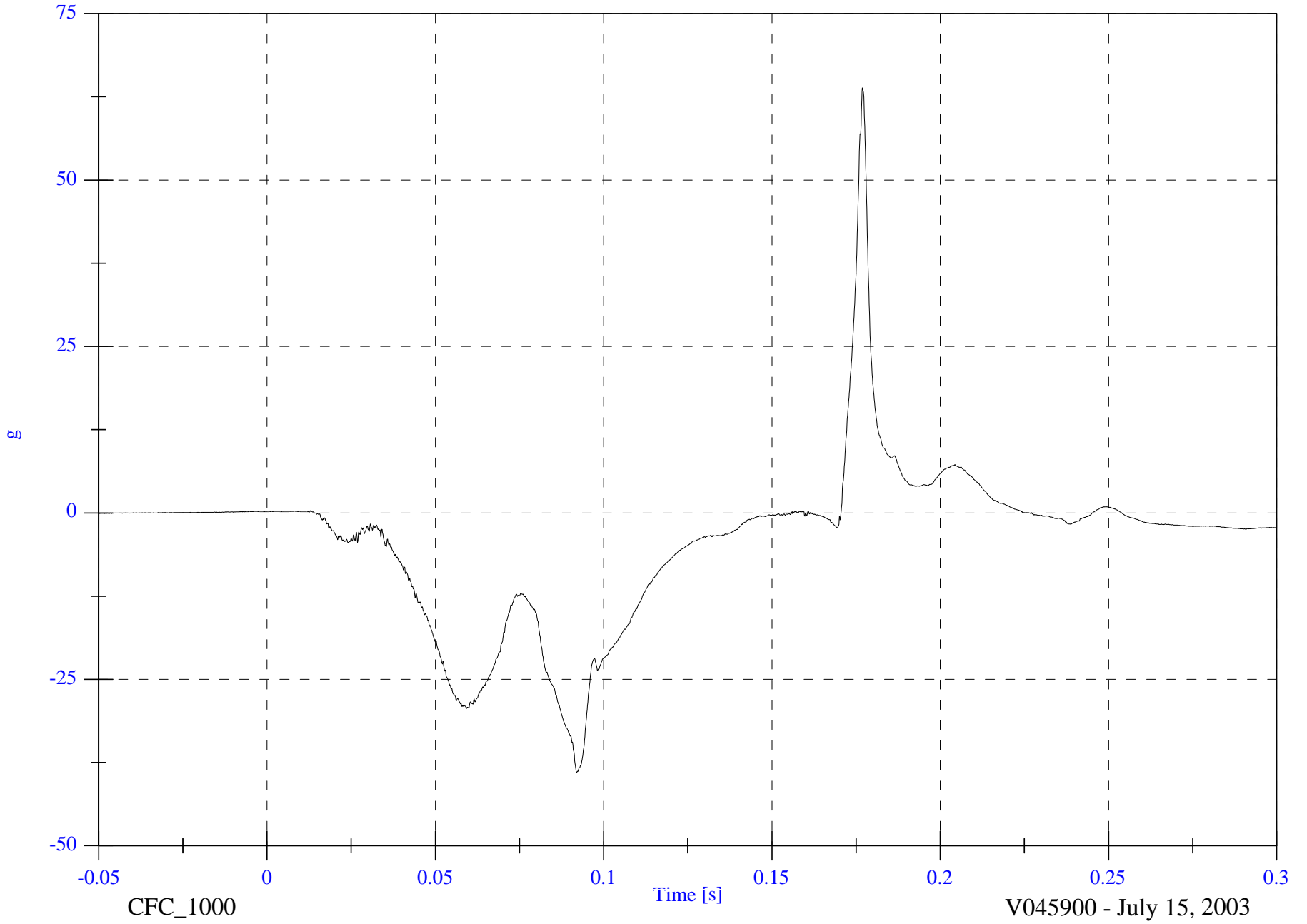
2004 Volvo XC90 NCAP

V1P4 Head x

Max: 63.8 [g] at 0.177 [s]
Min: -39.1 [g] at 0.092 [s]

4-26

8714-01



CFC_1000

Time [s]

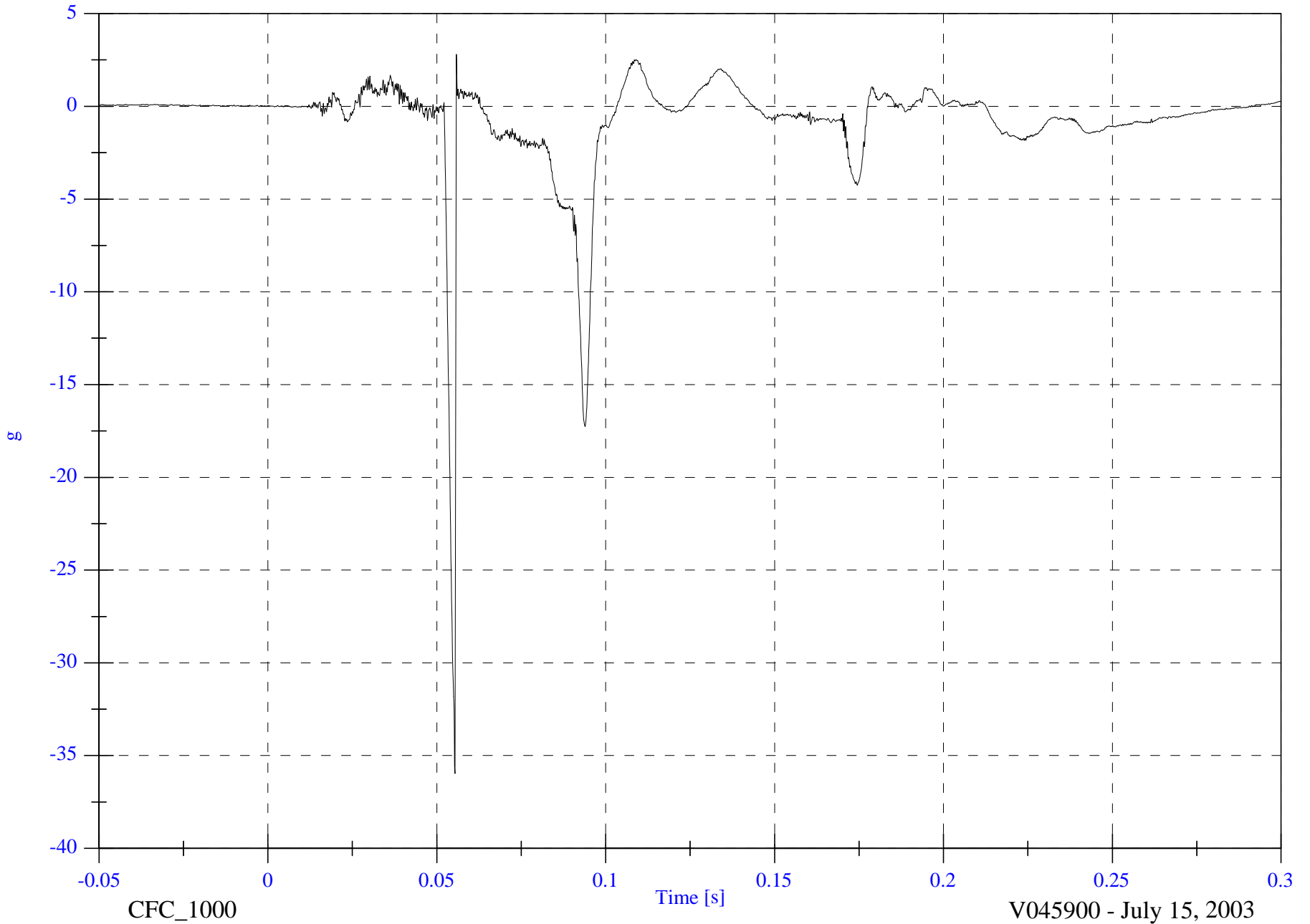
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P4 Head y

Max: 2.8 [g] at 0.056 [s]

Min: -36.0 [g] at 0.055 [s]



4-27

g

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

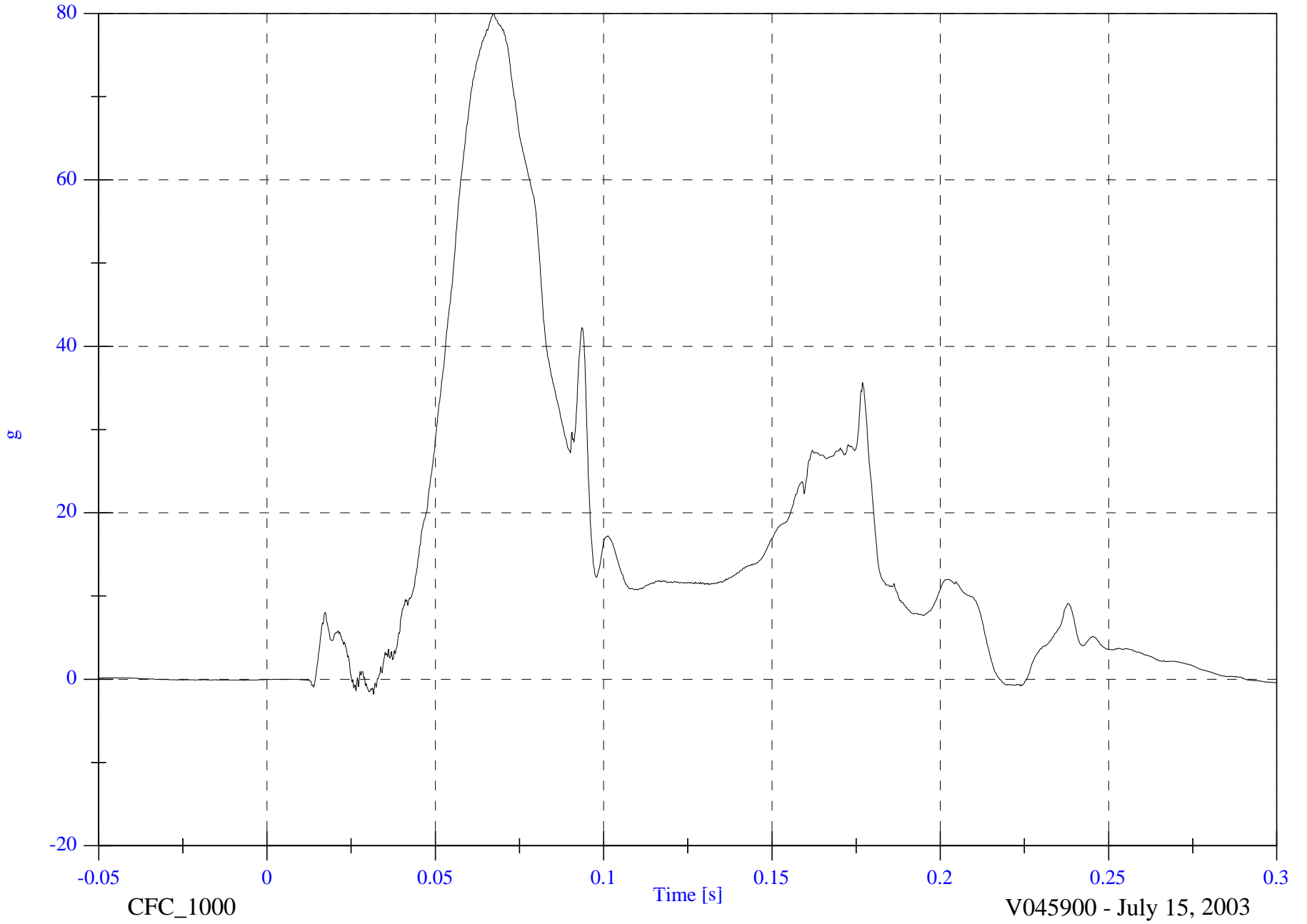
V1P4 Head z

Max: 79.9 [g] at 0.067 [s]

Min: -1.8 [g] at 0.032 [s]

4-28

8714-01



2004 Volvo XC90 NCAP

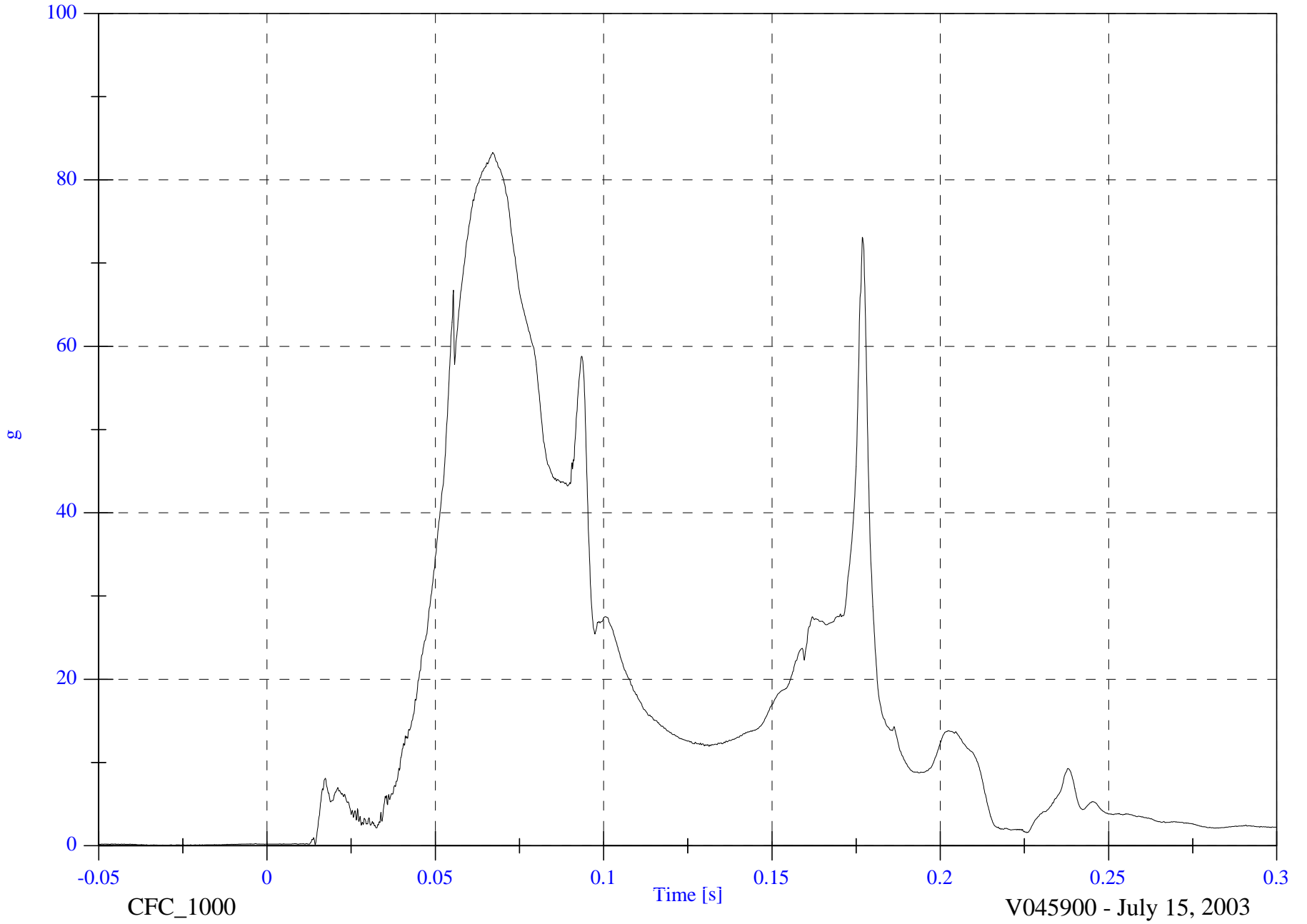
V1P4 Head Resultant

Max: 83.3 [g] at 0.067 [s]

Min: 0.0 [g] at -0.030 [s]

4-29

8714-01

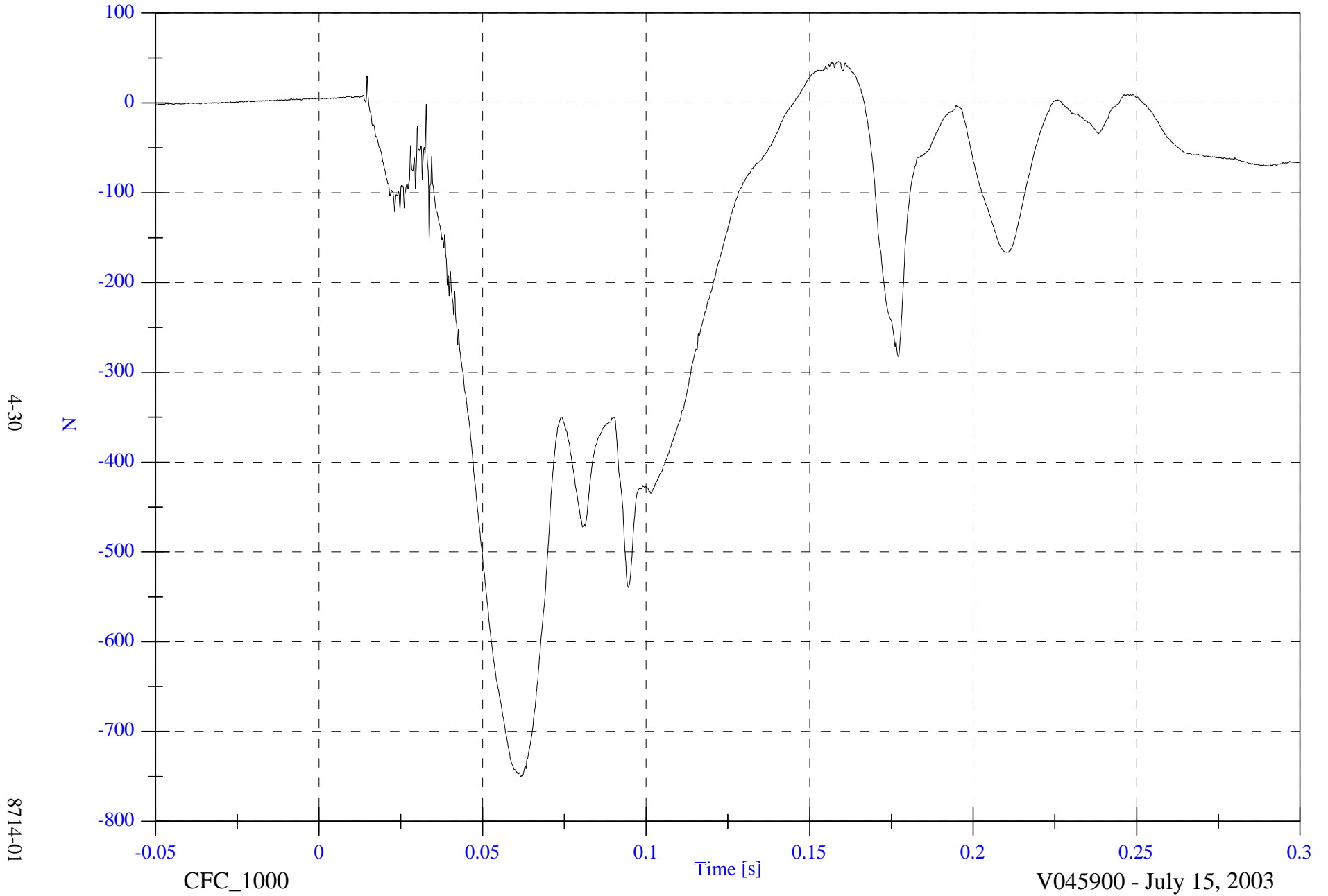


2004 Volvo XC90 NCAP

V1P4 Upper Neck Fx

Max: 45.8 [N] at 0.159 [s]

Min: -750.2 [N] at 0.062 [s]



4-30

8714-01

CFC_1000

Time [s]

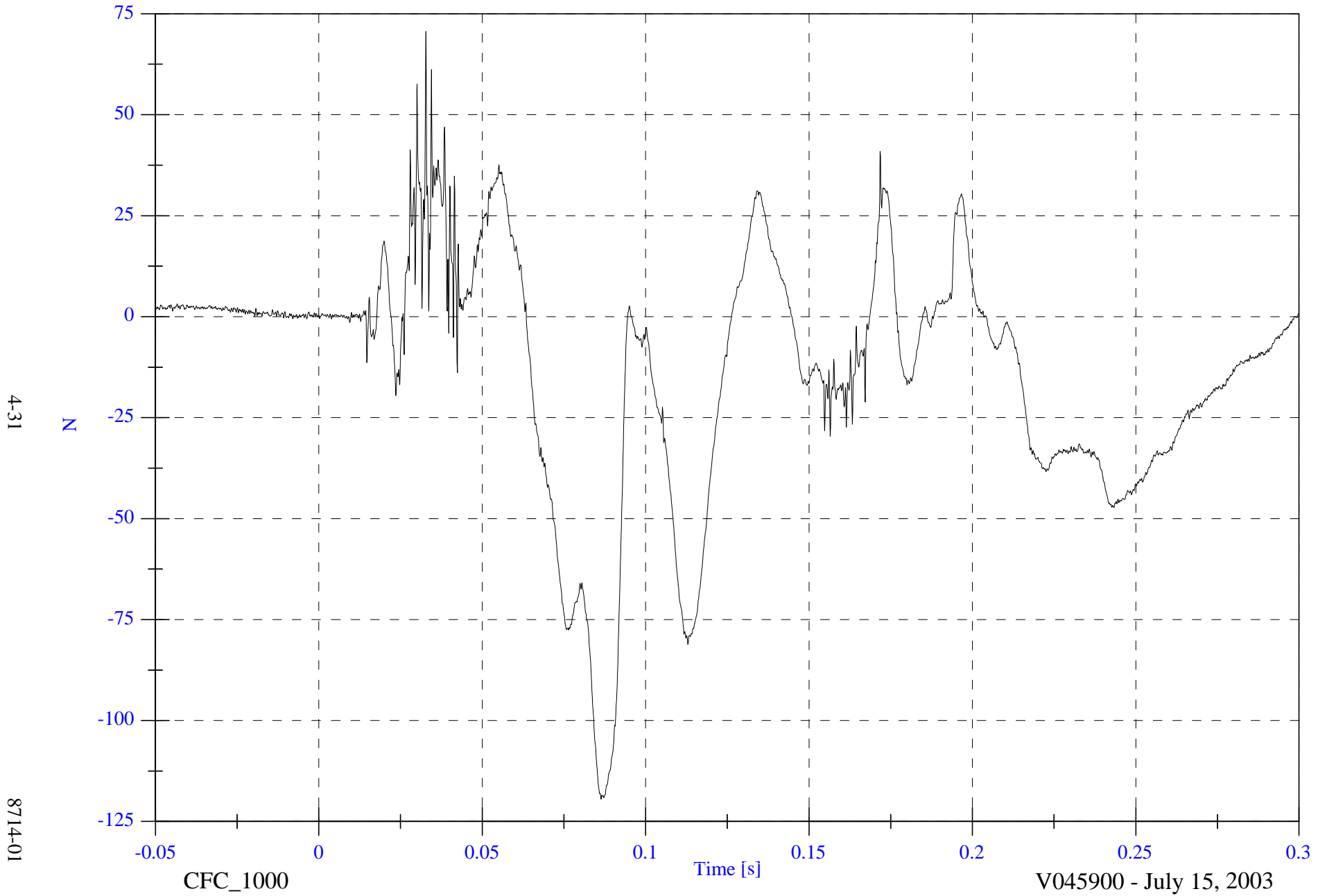
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P4 Upper Neck Fy

Max: 70.6 [N] at 0.033 [s]

Min: -119.5 [N] at 0.086 [s]



2004 Volvo XC90 NCAP

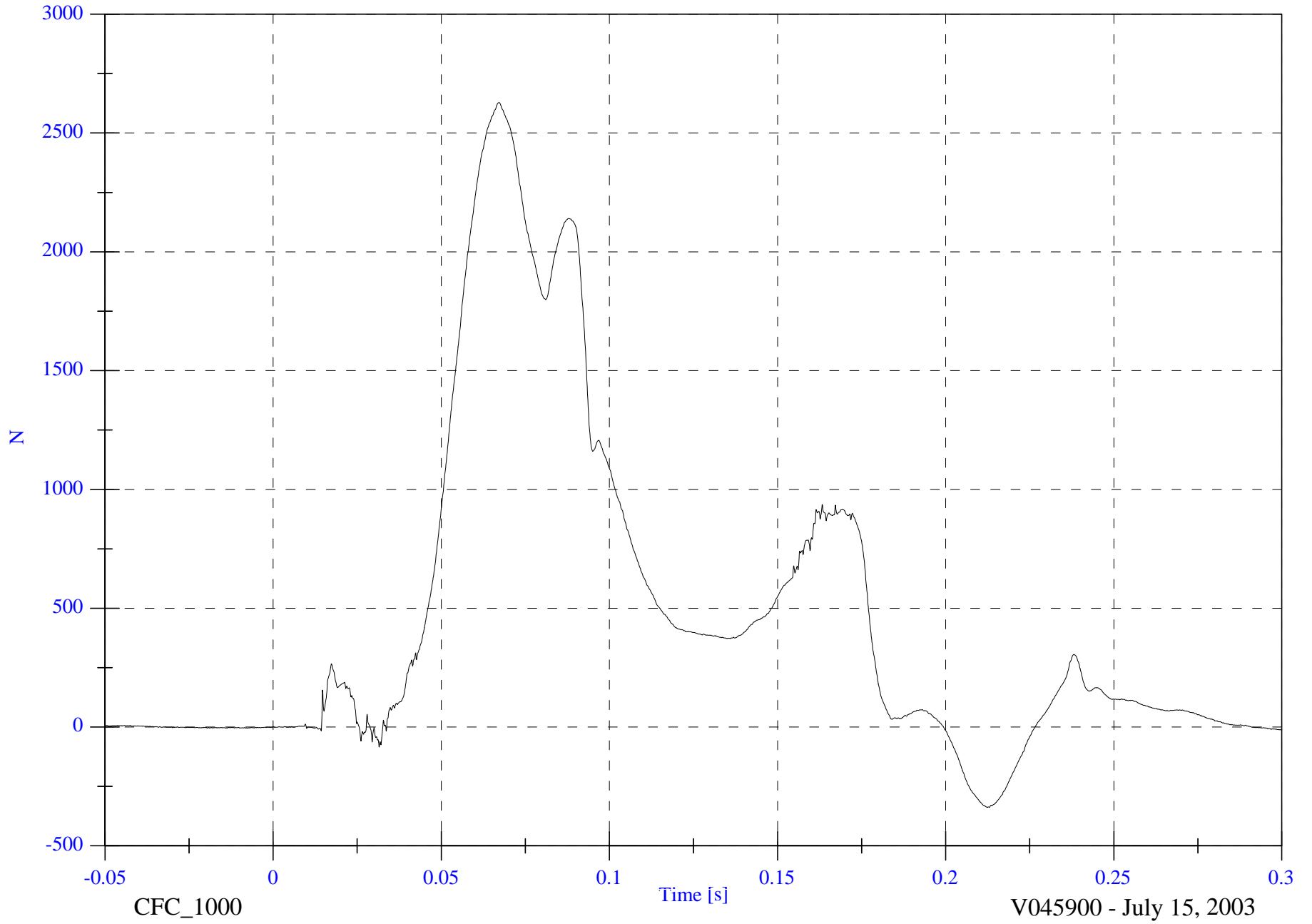
V1P4 Upper Neck Fz

Max: 2628.1 [N] at 0.067 [s]

Min: -338.5 [N] at 0.212 [s]

4-32

8714-01



2004 Volvo XC90 NCAP

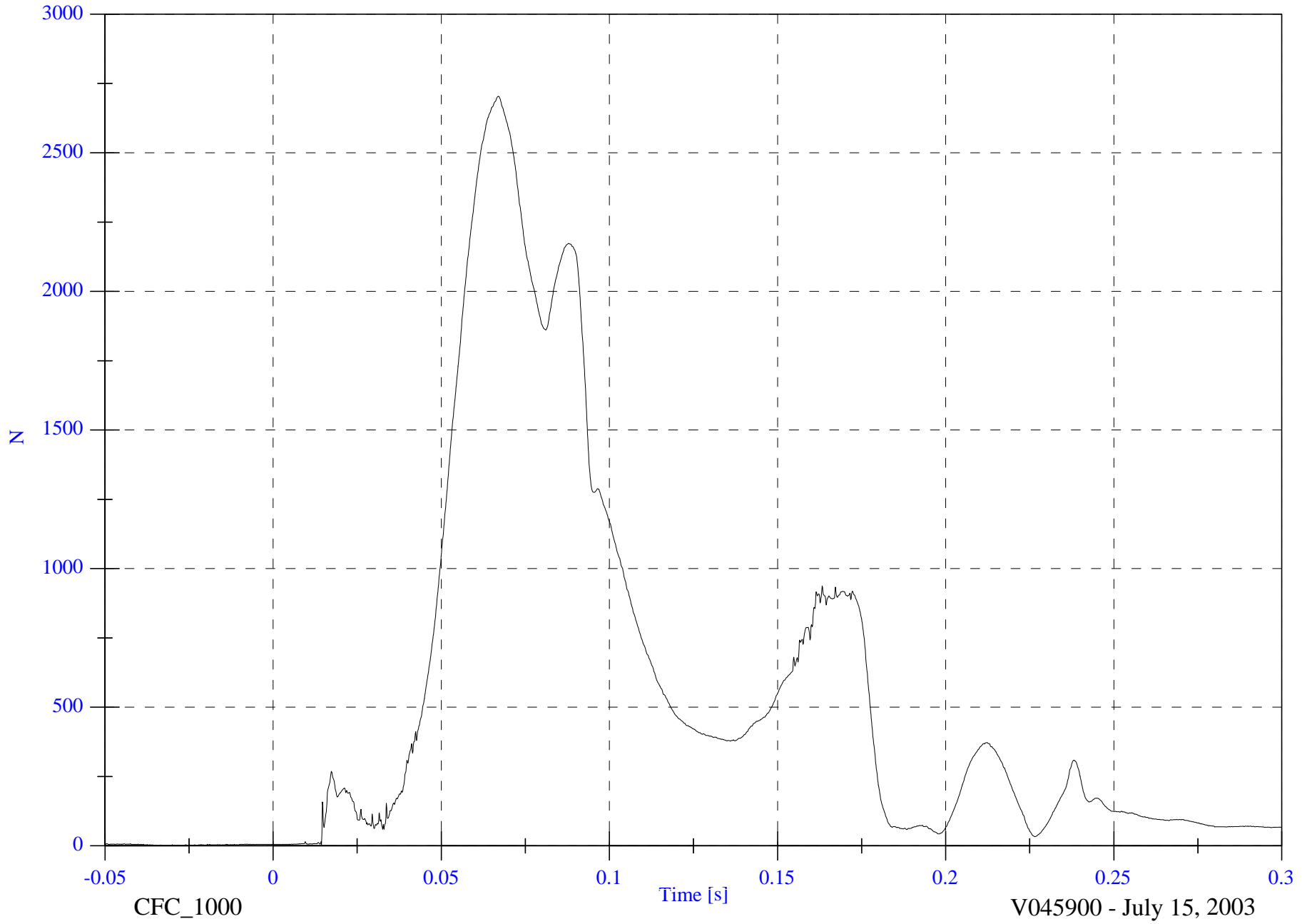
V1P4 Upper Neck F Resultant

Max: 2703.7 [N] at 0.067 [s]

Min: 1.8 [N] at -0.029 [s]

4-33

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

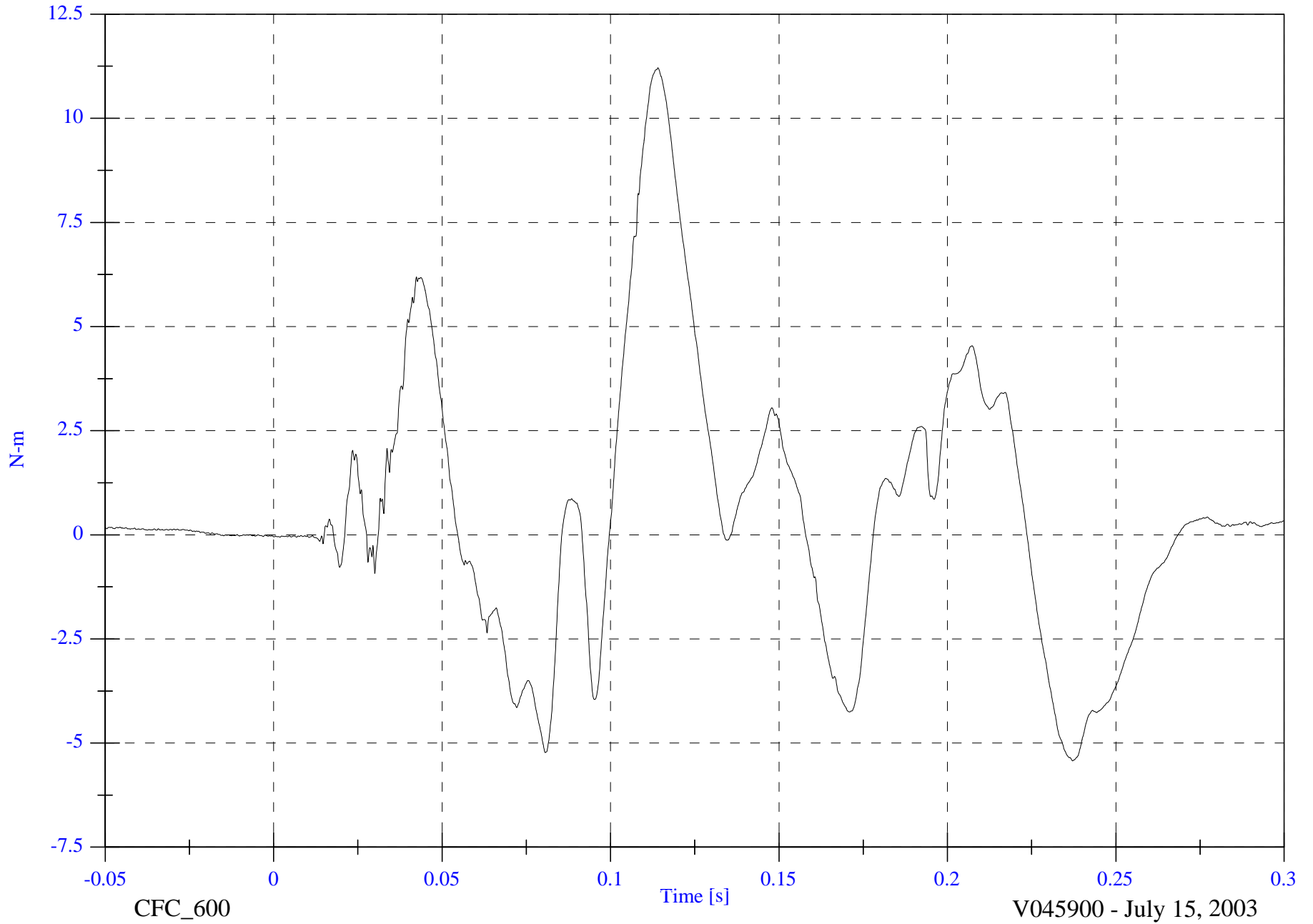
V1P4 Upper Neck Mx

Max: 11.2 [N-m] at 0.114 [s]

Min: -5.4 [N-m] at 0.237 [s]

4-34

8714-01



2004 Volvo XC90 NCAP

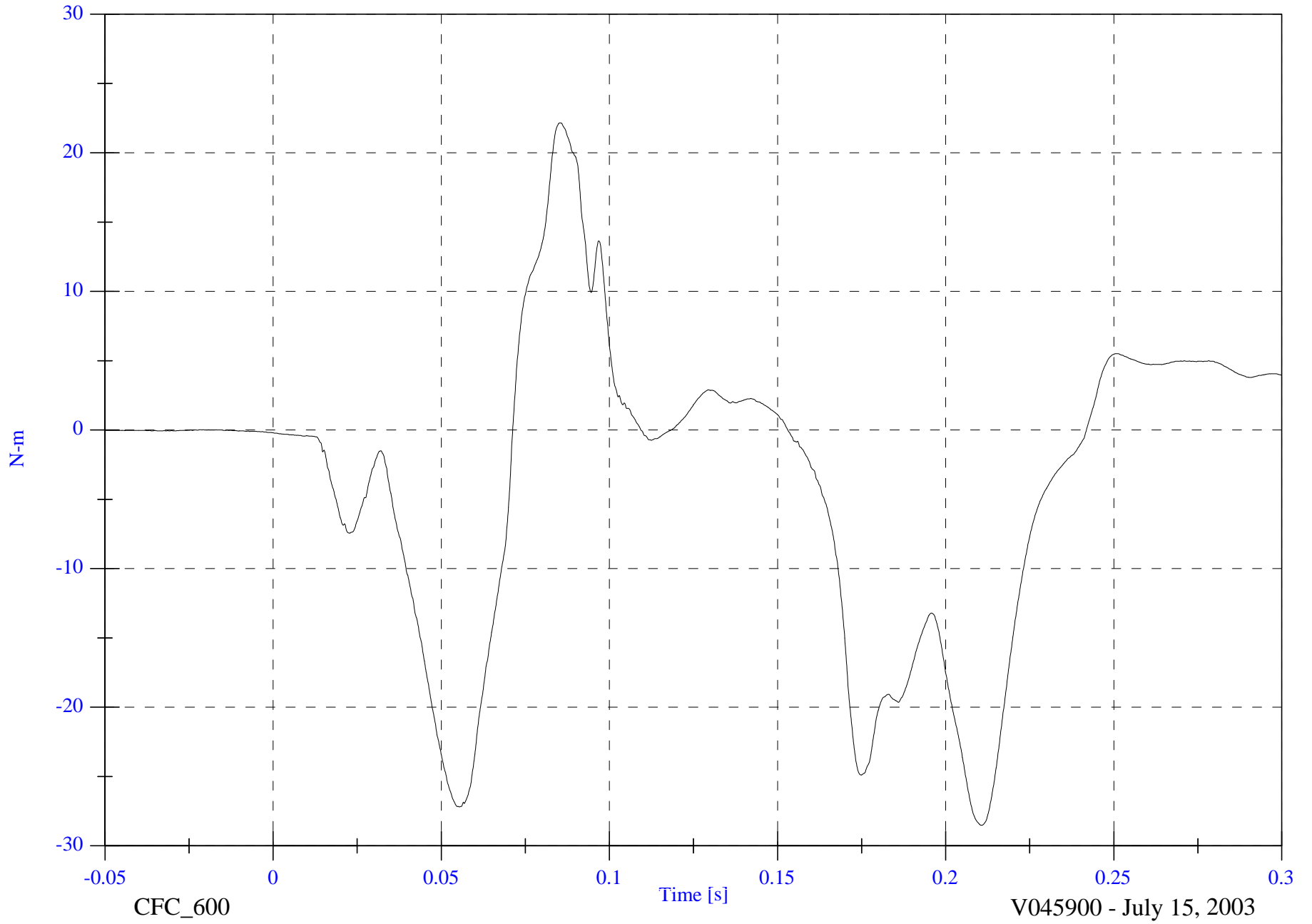
V1P4 Upper Neck My

Max: 22.2 [N-m] at 0.085 [s]

Min: -28.5 [N-m] at 0.211 [s]

4-35

8714-01



2004 Volvo XC90 NCAP

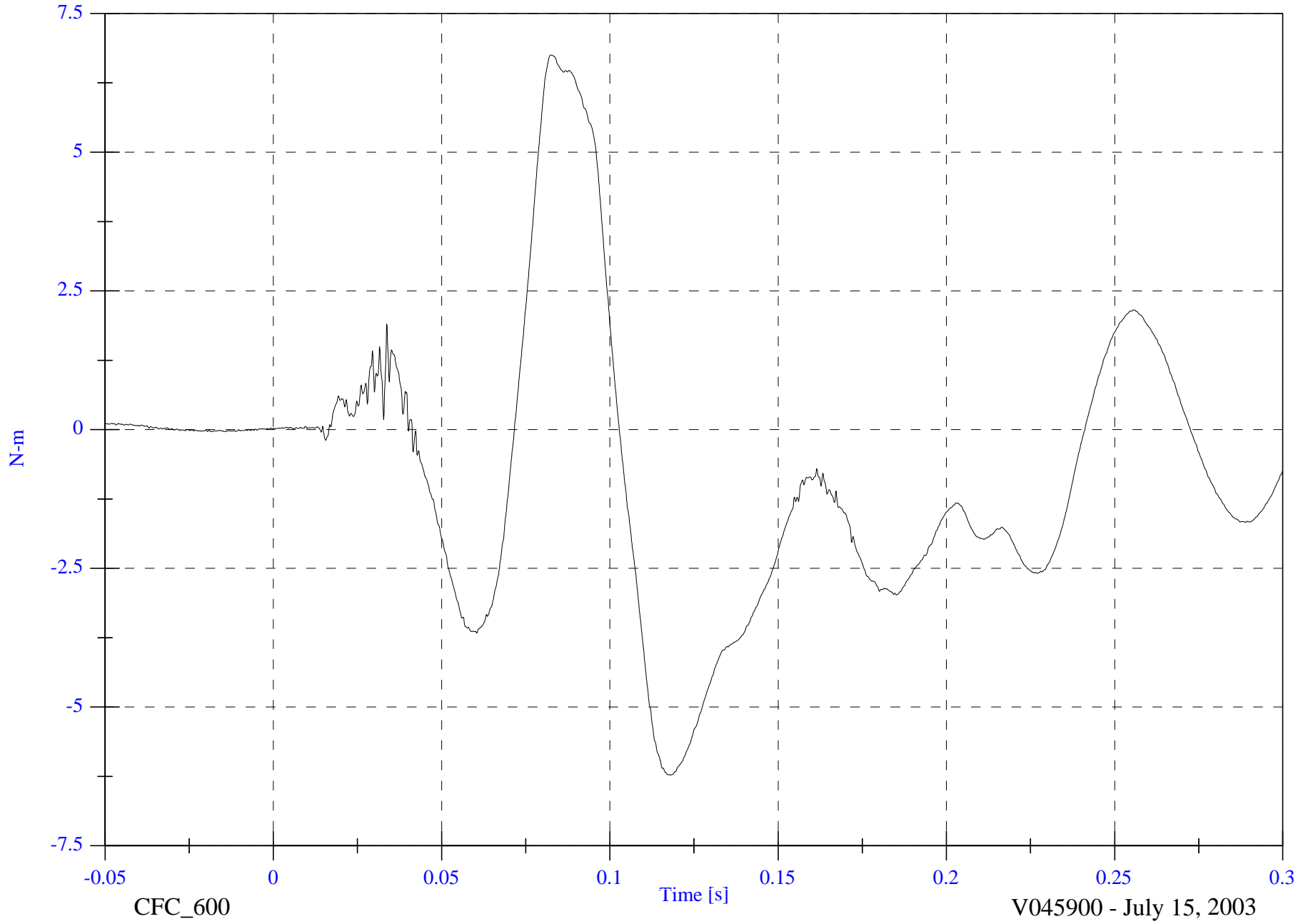
V1P4 Upper Neck Mz

Max: 6.8 [N-m] at 0.082 [s]

Min: -6.2 [N-m] at 0.118 [s]

4-36

8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

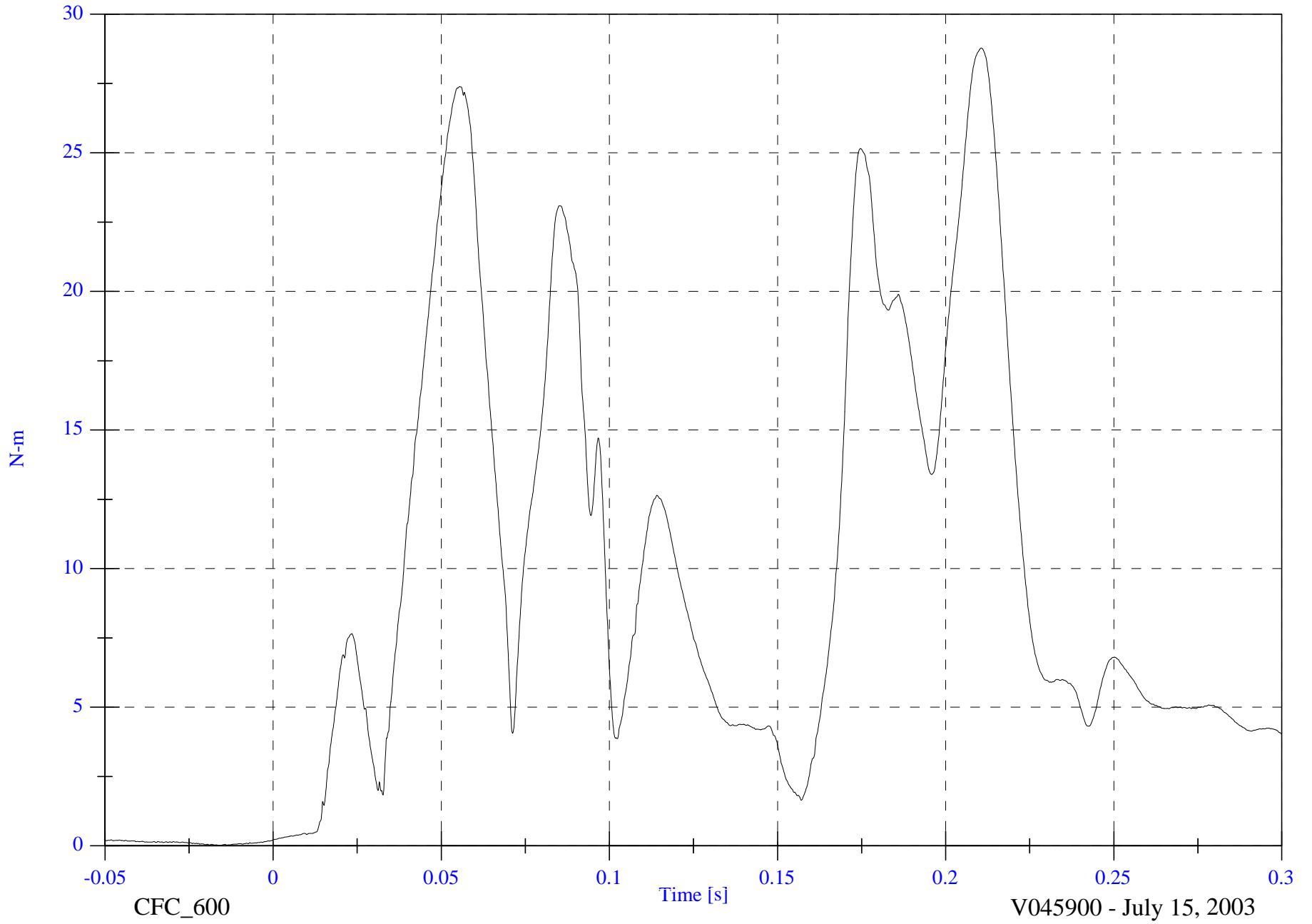
V1P4 Upper Neck M Resultant

Max: 28.8 [N-m] at 0.211 [s]

Min: 0.0 [N-m] at -0.016 [s]

4-37

8714-01



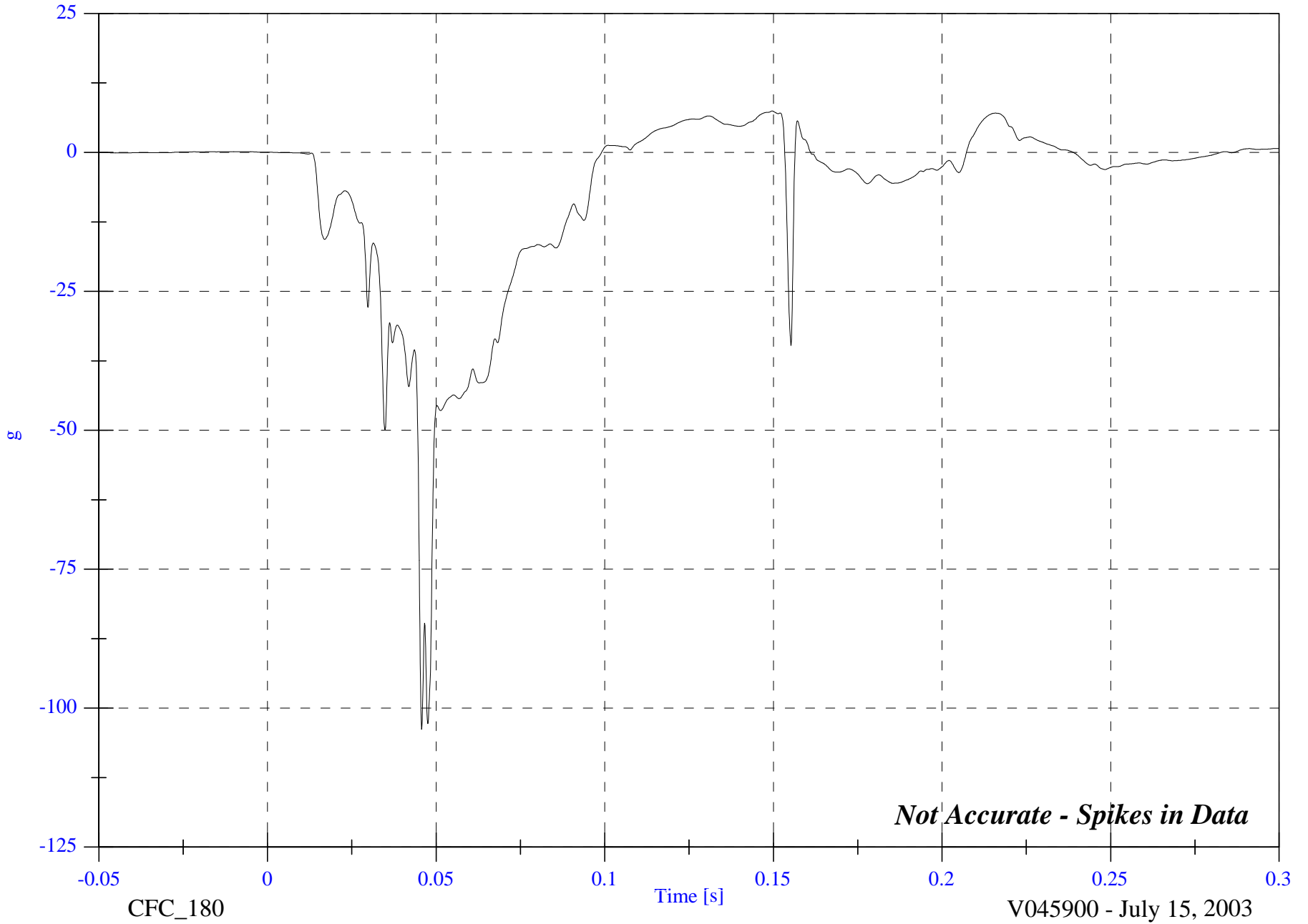
2004 Volvo XC90 NCAP

VIP4 Chest x

Max: 7.4 [g] at 0.150 [s]
Min: -103.8 [g] at 0.046 [s]

4-38

8714-01

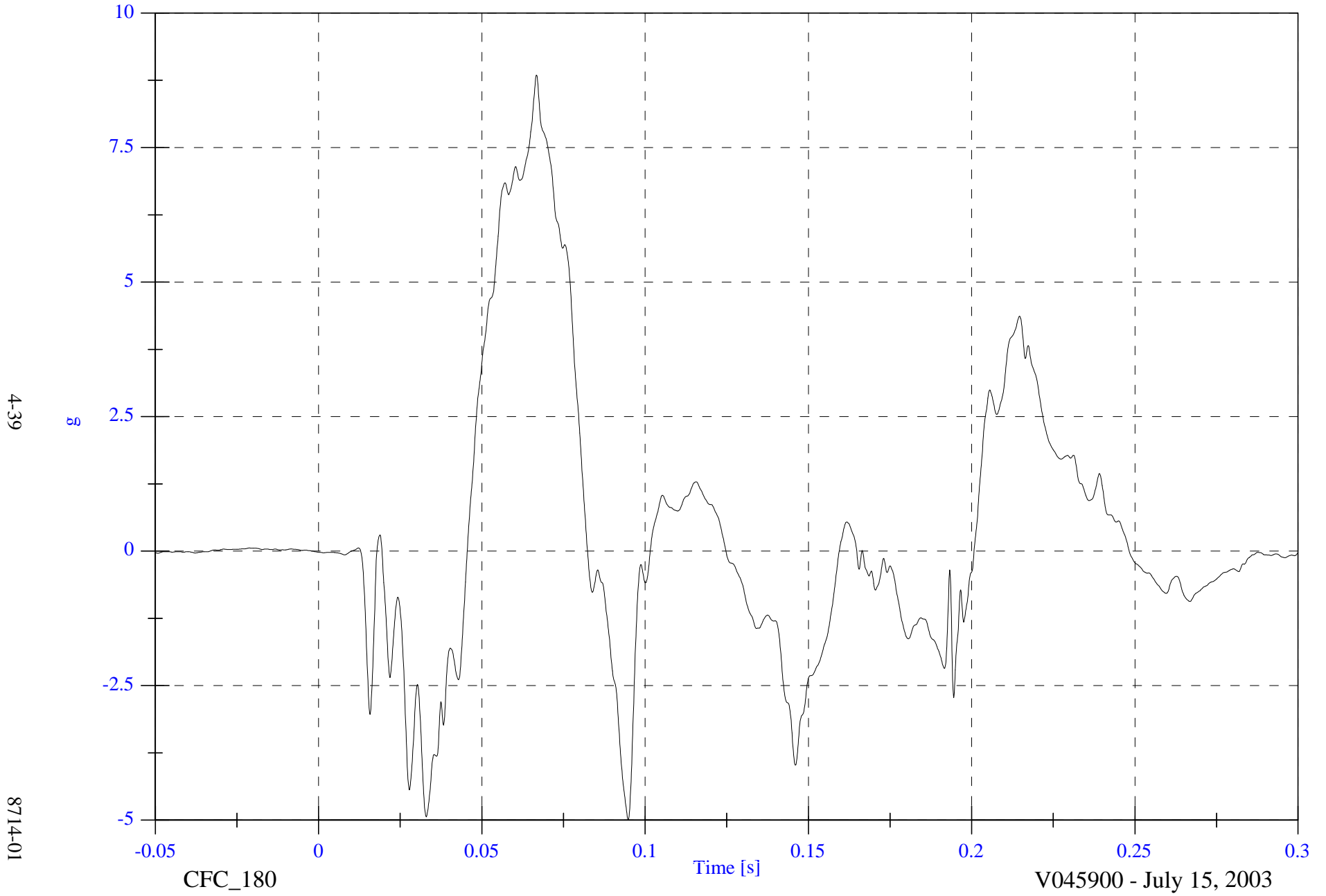


2004 Volvo XC90 NCAP

VIP4 Chest y

Max: 8.8 [g] at 0.067 [s]

Min: -5.0 [g] at 0.095 [s]



2004 Volvo XC90 NCAP

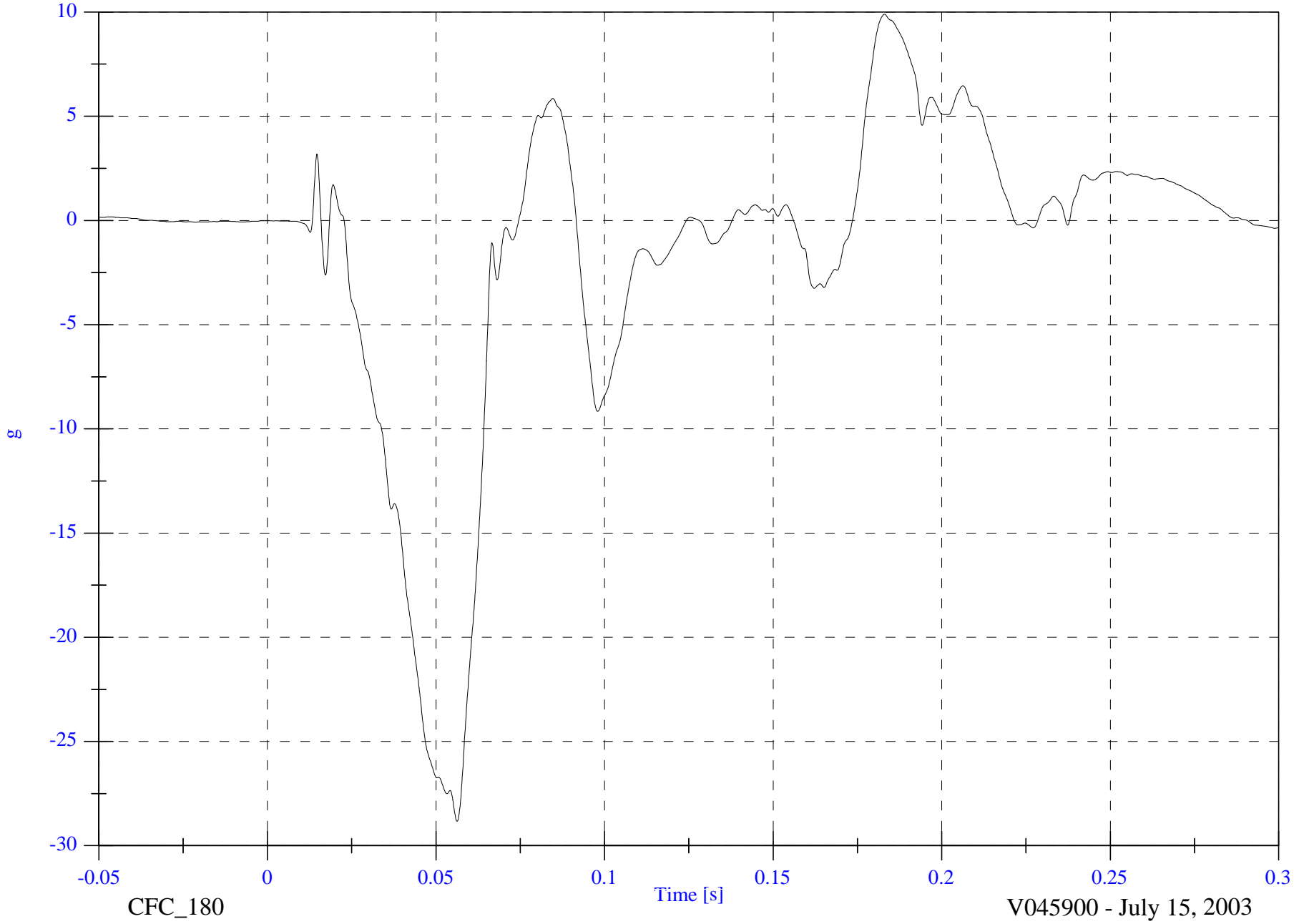
VIP4 Chest z

Max: 9.9 [g] at 0.183 [s]

Min: -28.8 [g] at 0.056 [s]

4-40

8714-01



2004 Volvo XC90 NCAP

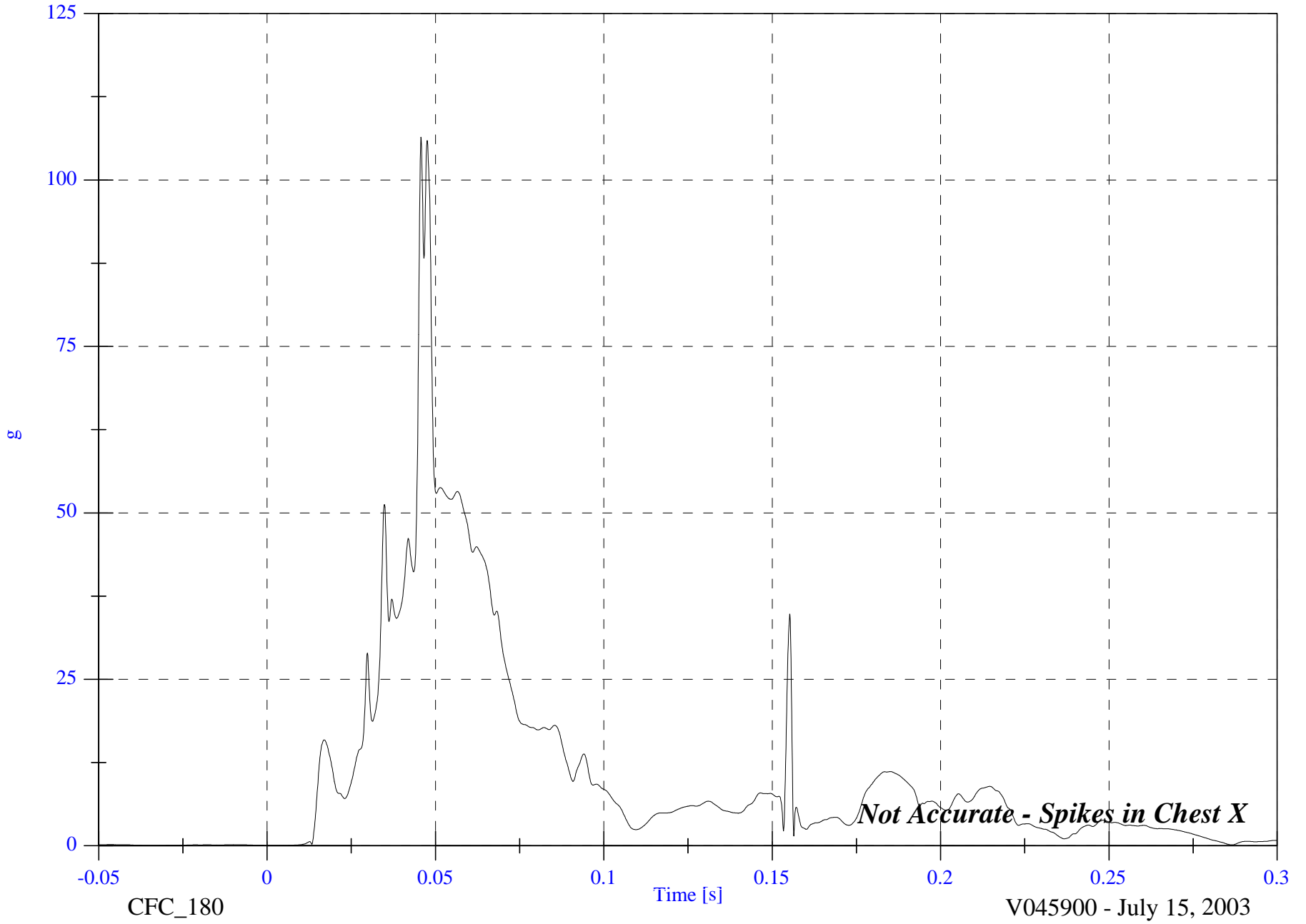
V1P4 Chest Resultant

Max: 106.4 [g] at 0.046 [s]

Min: 0.0 [g] at -0.035 [s]

4-41

8714-01



CFC_180

Time [s]

V045900 - July 15, 2003

Not Accurate - Spikes in Chest X

2004 Volvo XC90 NCAP

V1P4 Chest Compression

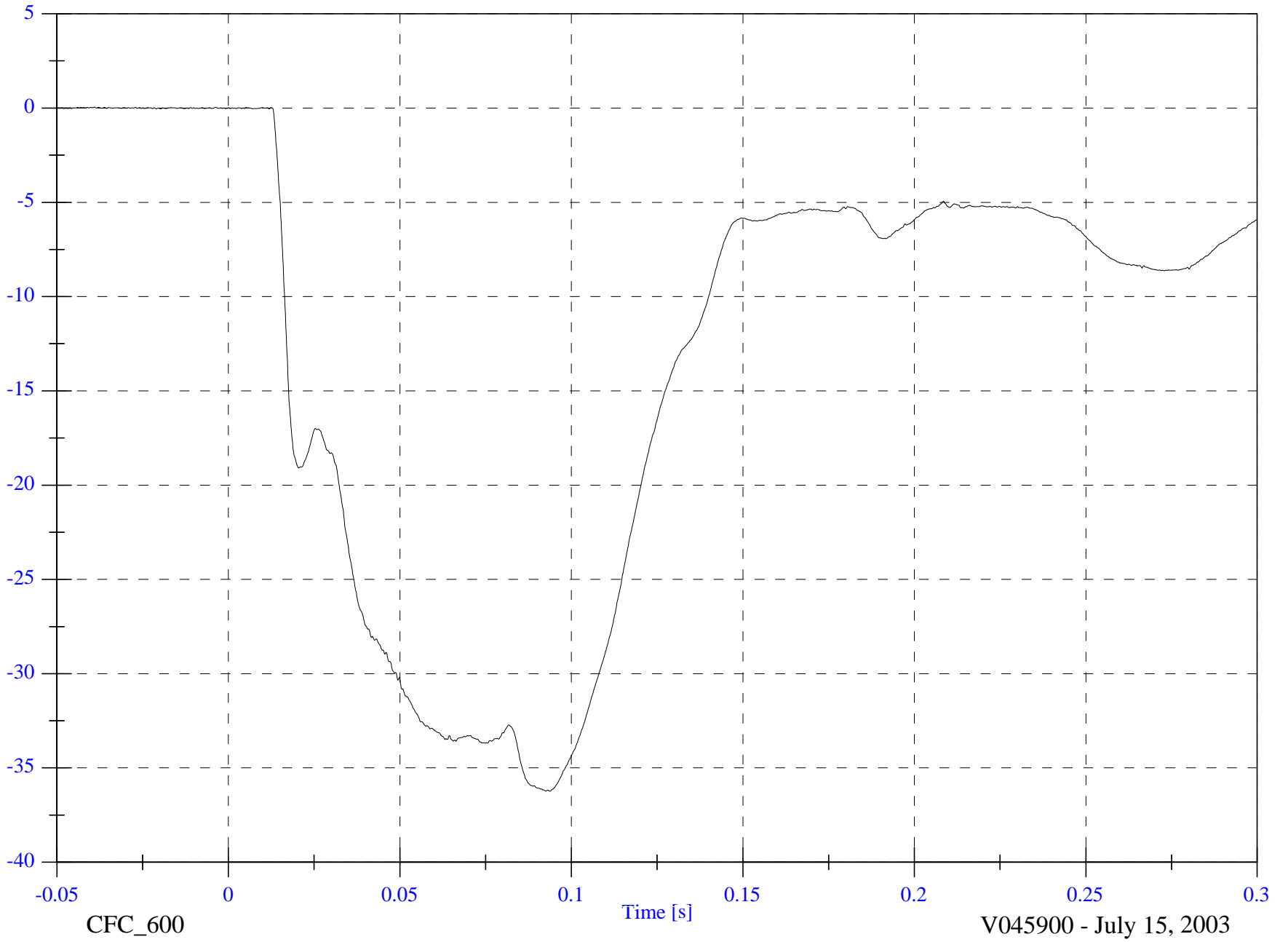
Max: 0.0 [mm] at -0.039 [s]

Min: -36.2 [mm] at 0.094 [s]

4-42

mm

8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P4 Pelvic x

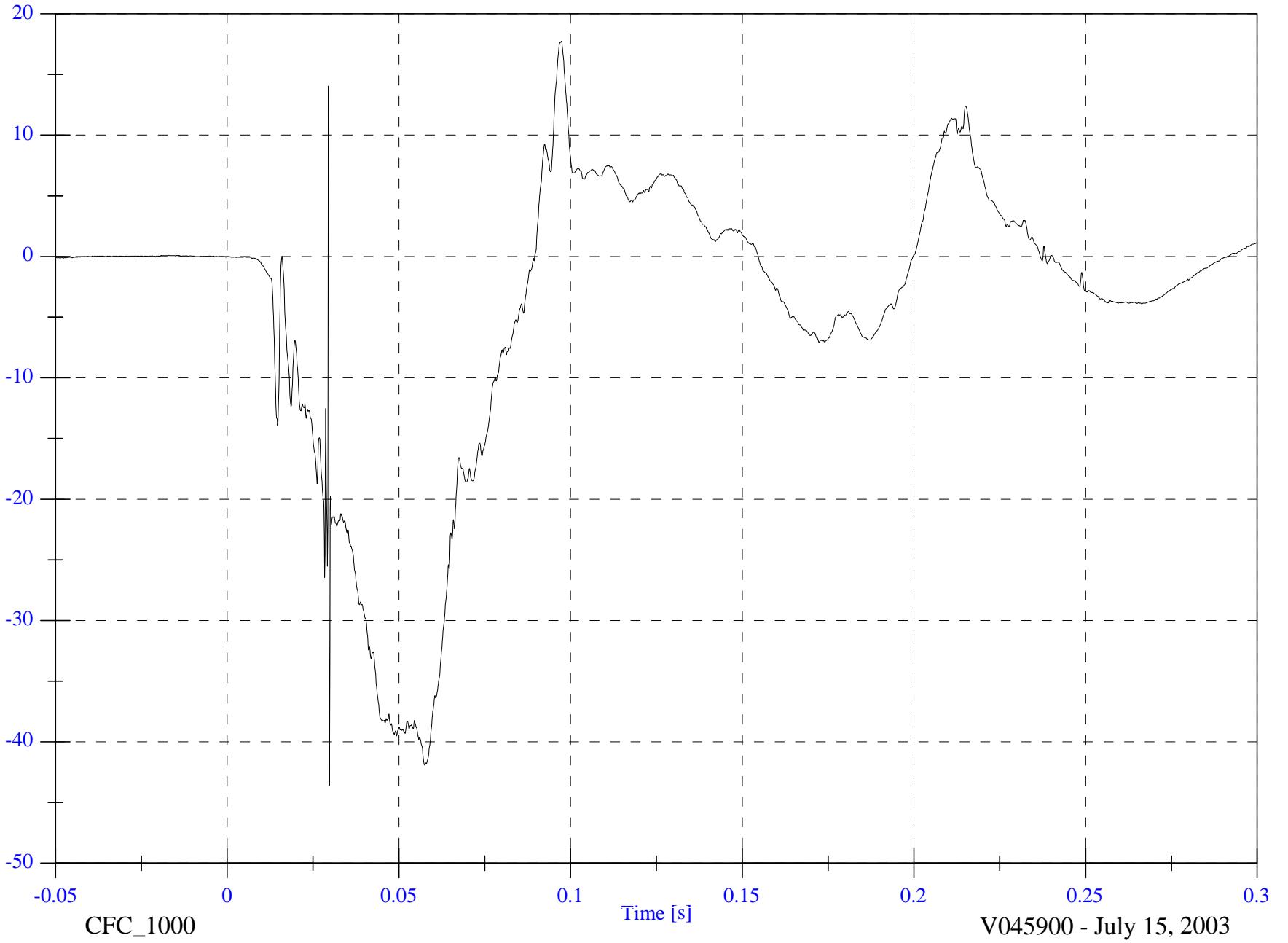
Max: 17.7 [g] at 0.097 [s]

Min: -43.6 [g] at 0.030 [s]

4-43

g

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P4 Pelvic y

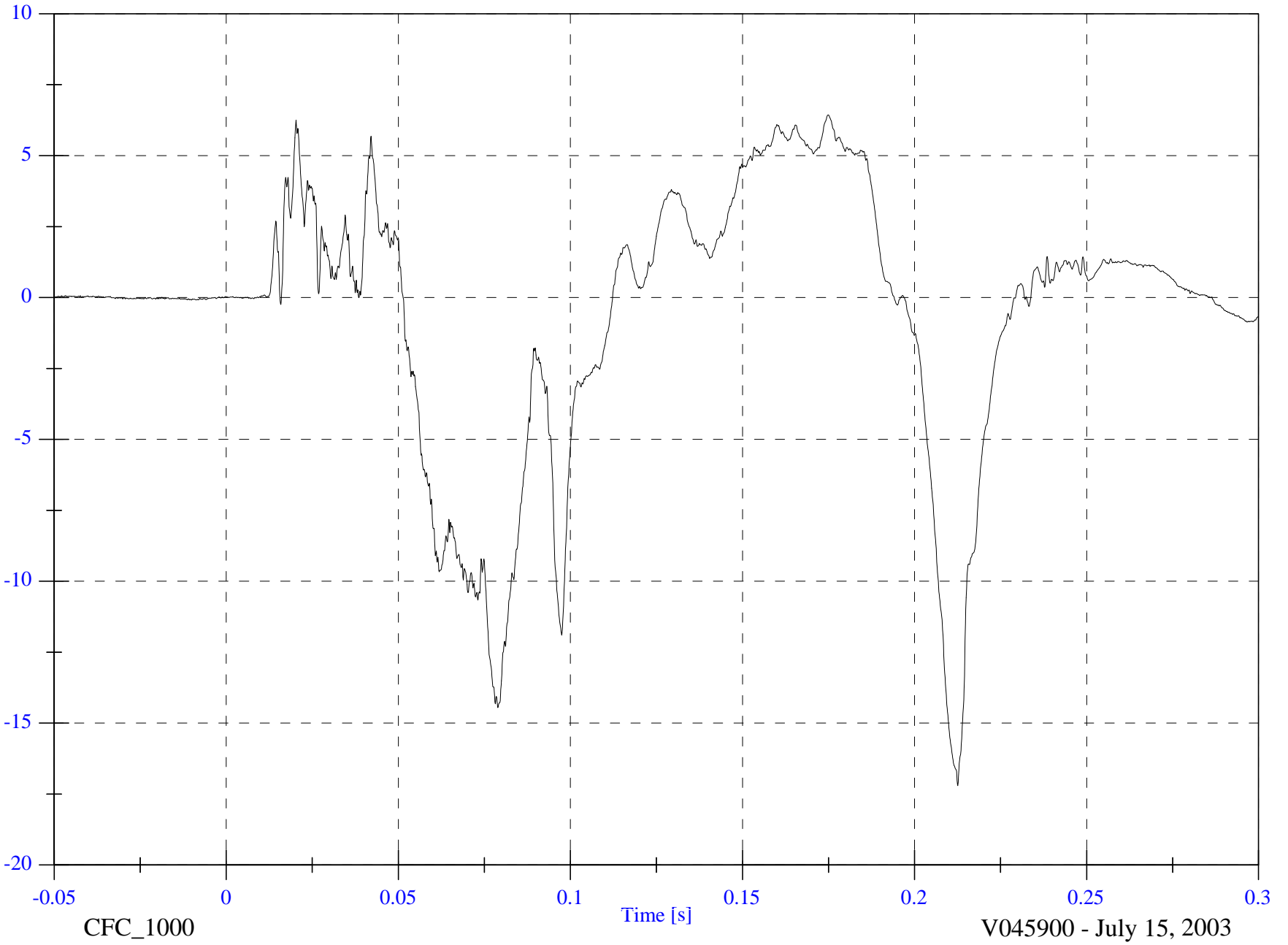
Max: 6.4 [g] at 0.175 [s]

Min: -17.2 [g] at 0.213 [s]

4-44

g

8714-01



2004 Volvo XC90 NCAP

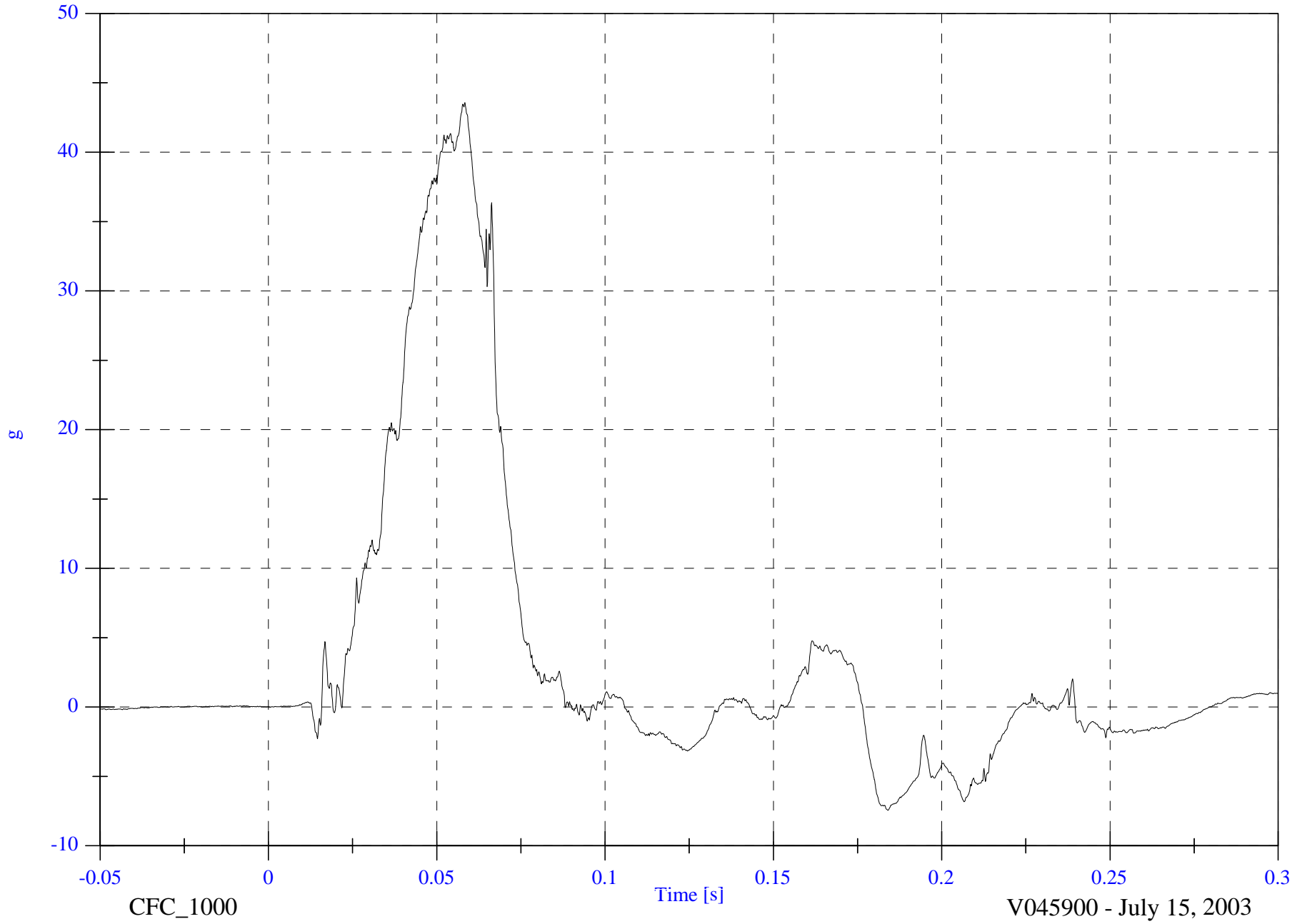
V1P4 Pelvic z

Max: 43.6 [g] at 0.058 [s]

Min: -7.4 [g] at 0.184 [s]

4-45

8714-01



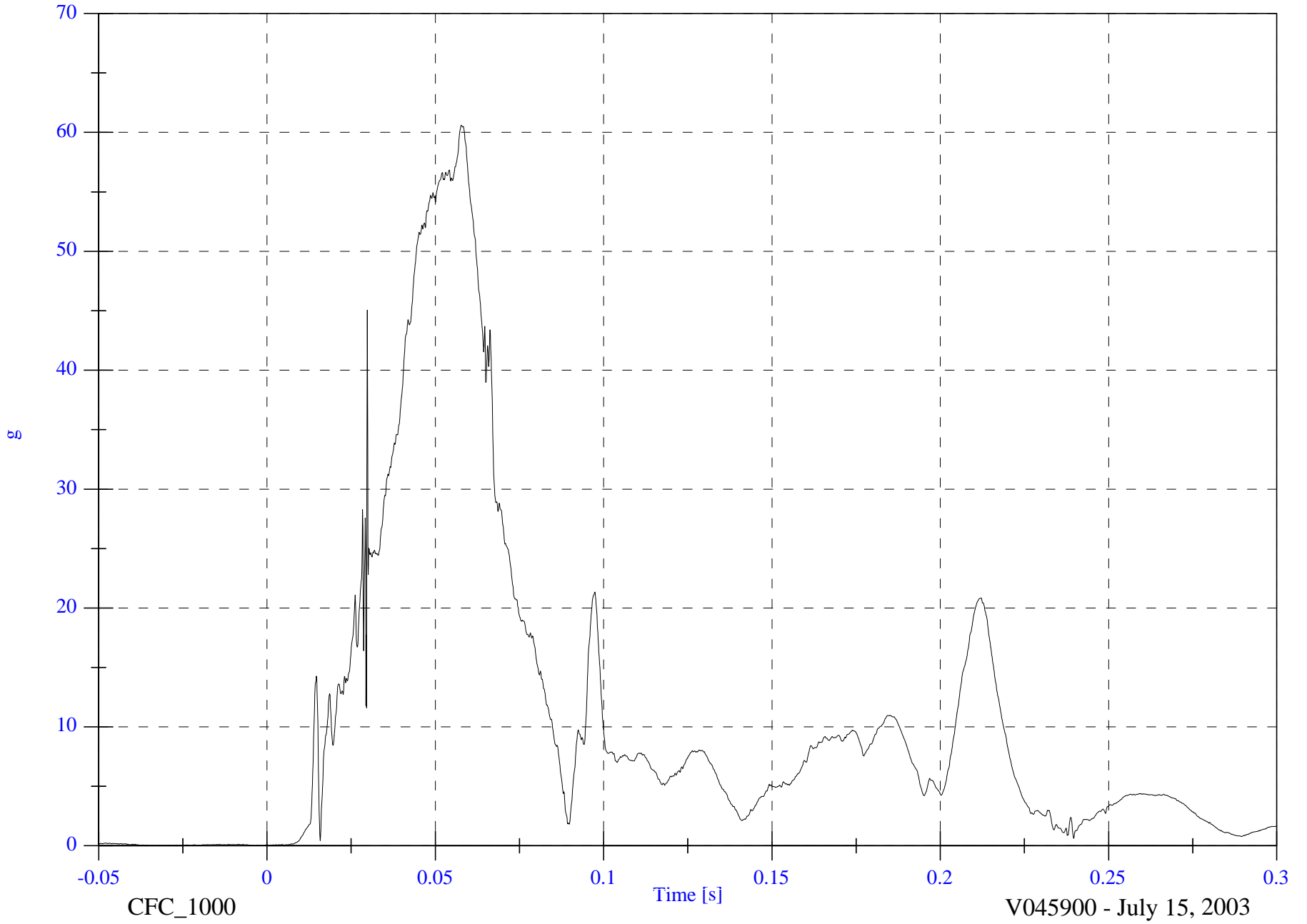
2004 Volvo XC90 NCAP

V1P4 Pelvic Resultant

Max: 60.6 [g] at 0.058 [s]
Min: 0.0 [g] at -0.033 [s]

4-46

8714-01

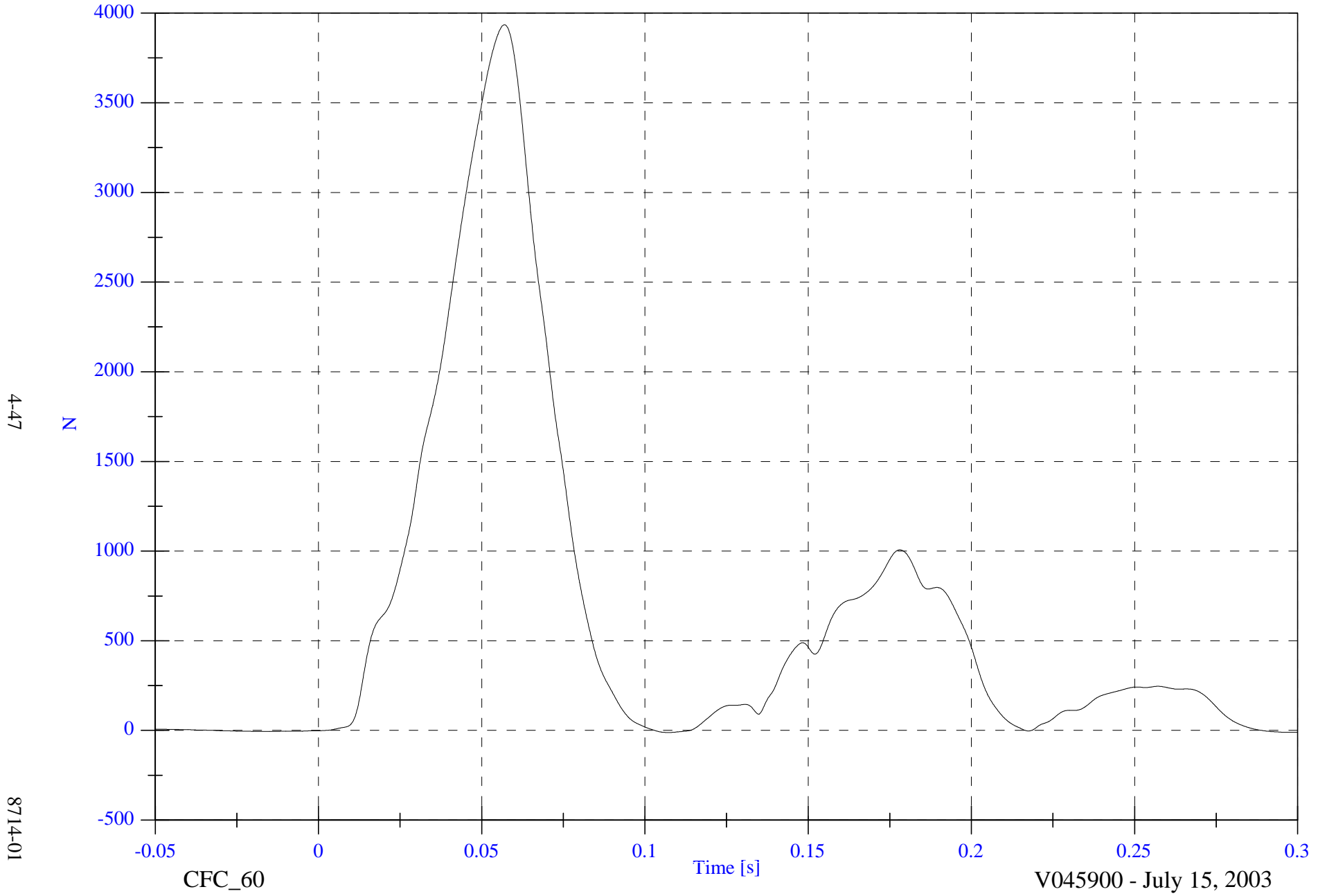


2004 Volvo XC90 NCAP

V1P4 Lap Belt Load

Max: 3934.7 [N] at 0.057 [s]

Min: -11.7 [N] at 0.107 [s]

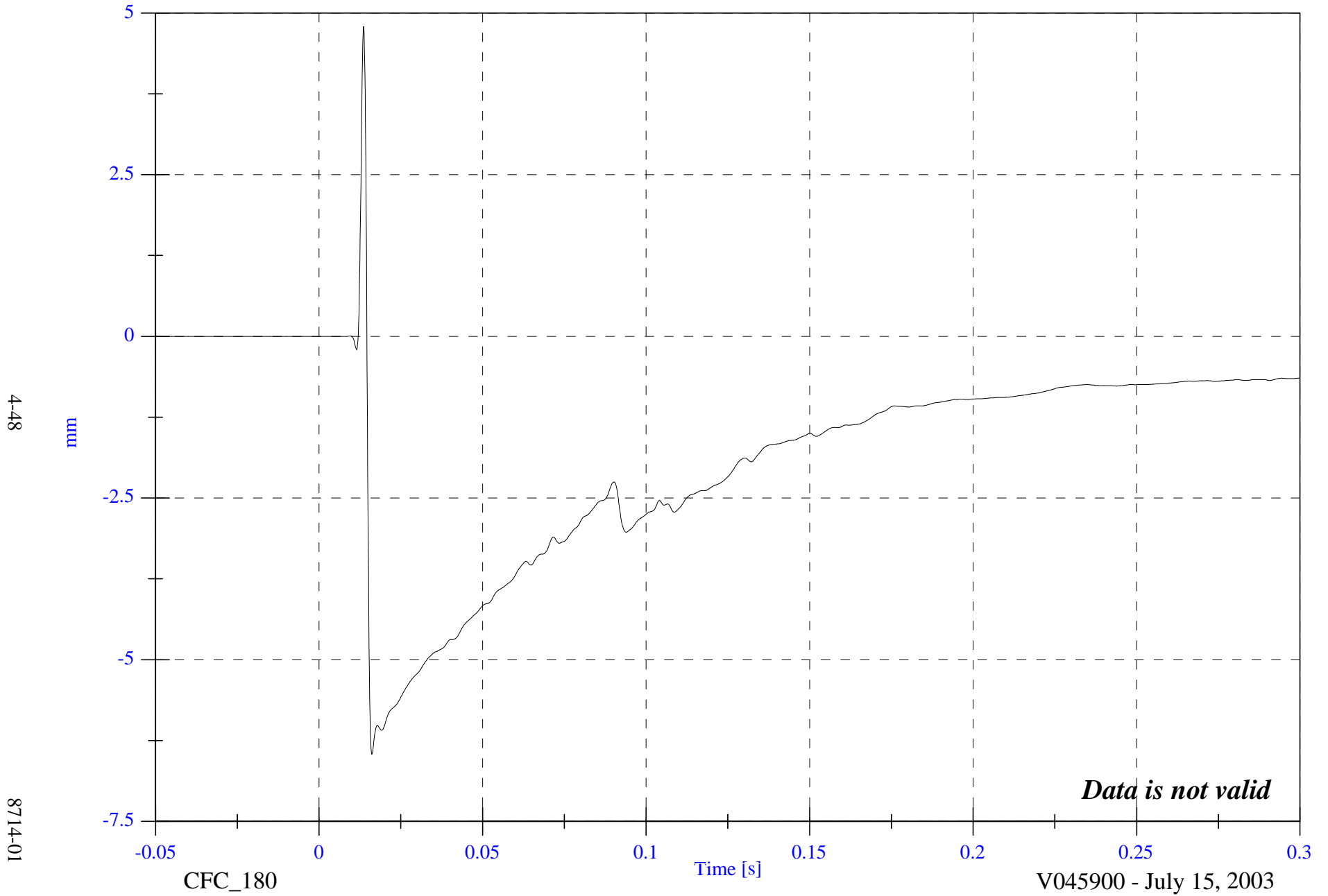


2004 Volvo XC90 NCAP

V1P4 Shoulder Belt Stretch

Max: 4.8 [mm] at 0.014 [s]

Min: -6.5 [mm] at 0.016 [s]



4-48

8714-01

Data is not valid

CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Head x

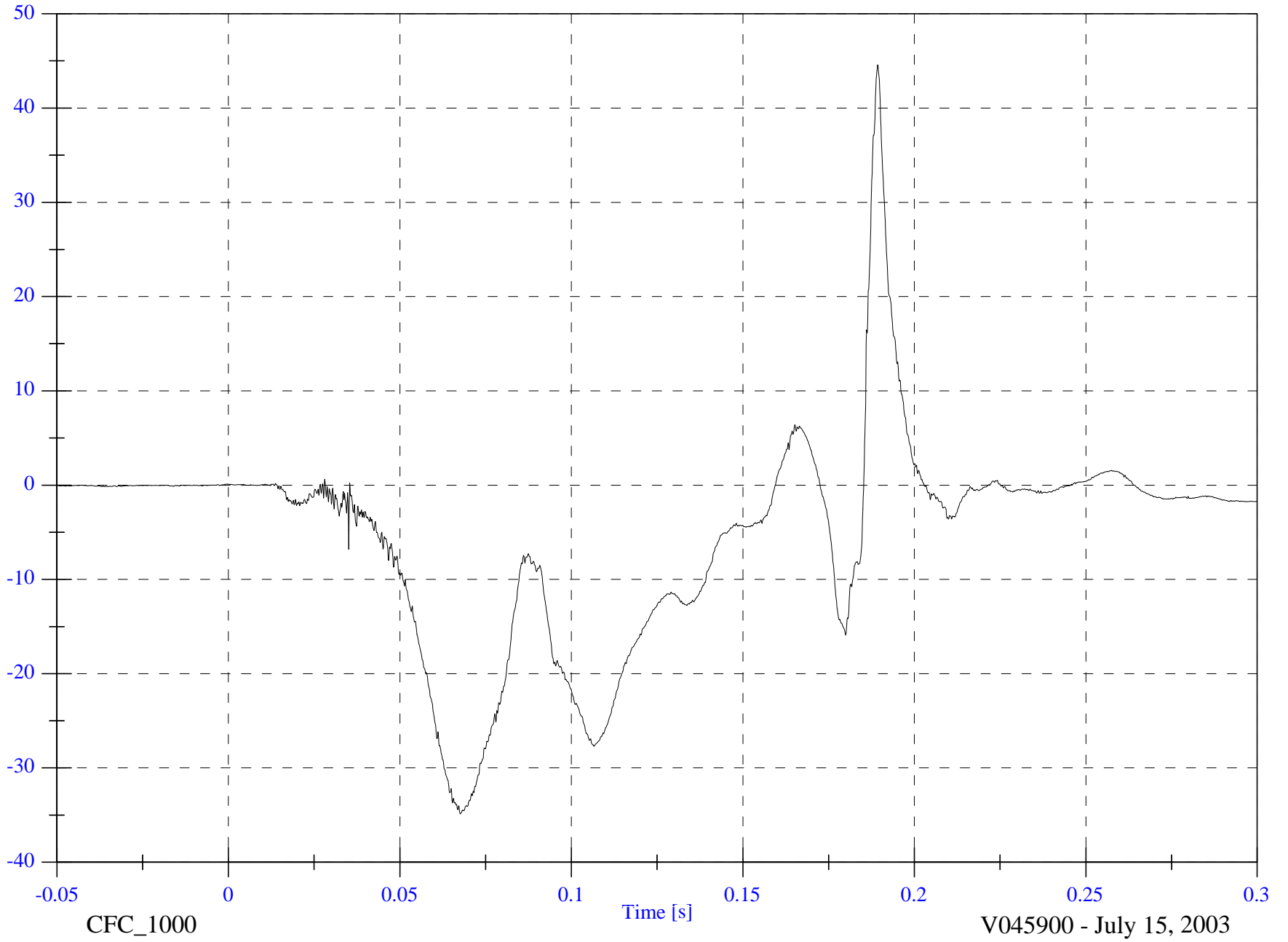
Max: 44.6 [g] at 0.189 [s]

Min: -34.9 [g] at 0.068 [s]

4-49

g

8714-01



CFC_1000

Time [s]

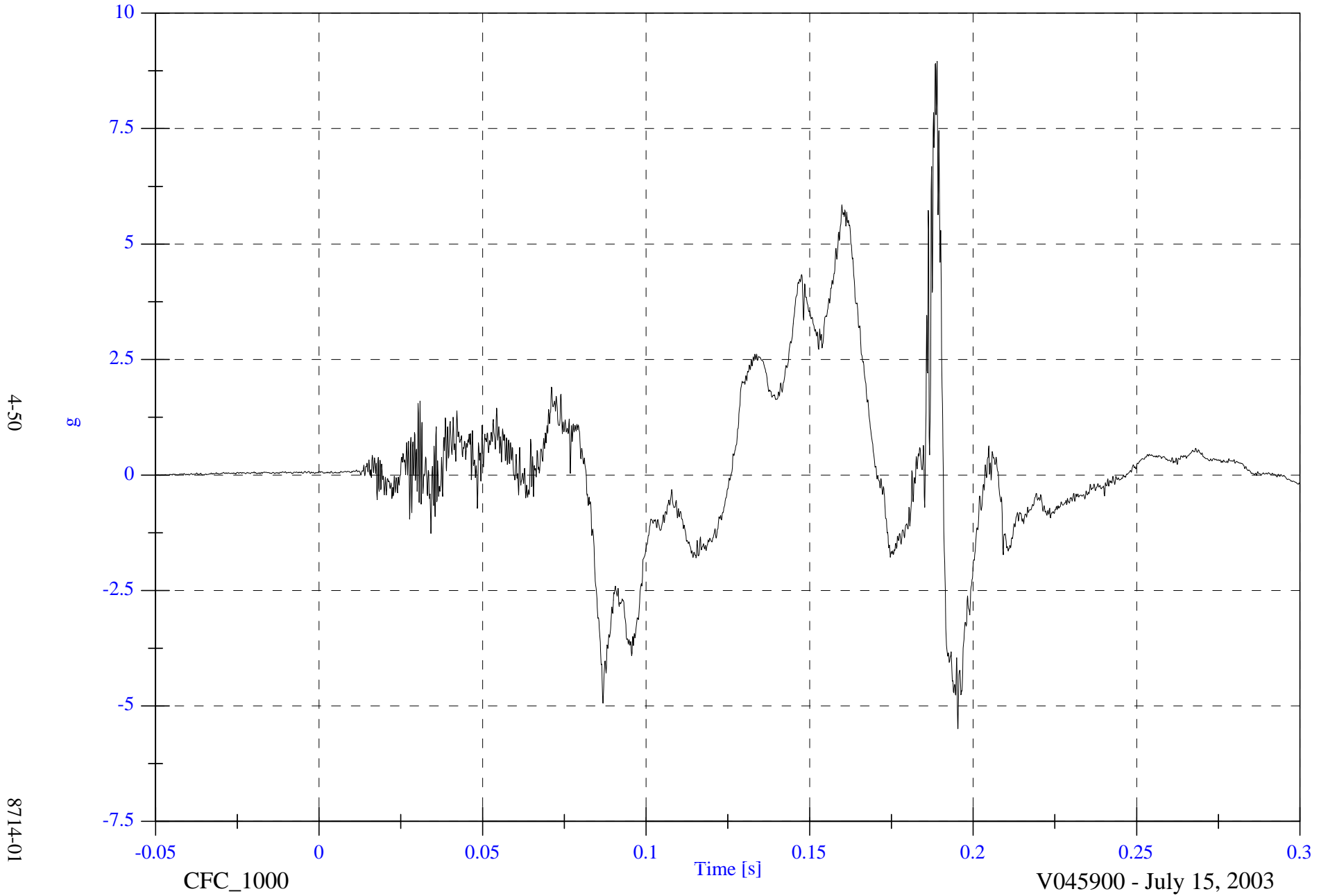
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Head y

Max: 9.0 [g] at 0.189 [s]

Min: -5.5 [g] at 0.195 [s]



4-50

g

8714-01

CFC_1000

Time [s]

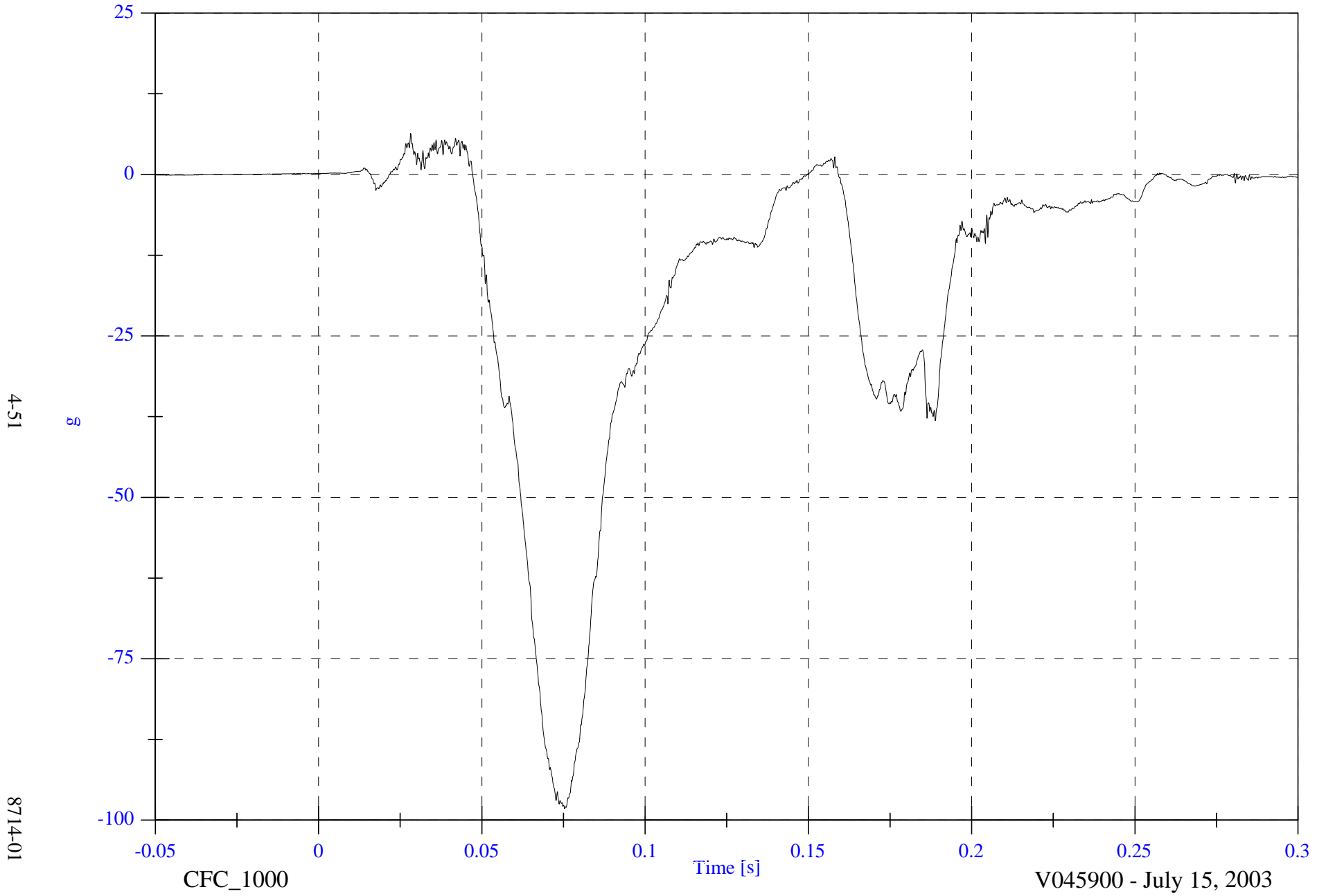
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Head z

Max: 6.4 [g] at 0.028 [s]

Min: -98.2 [g] at 0.075 [s]



4-51

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

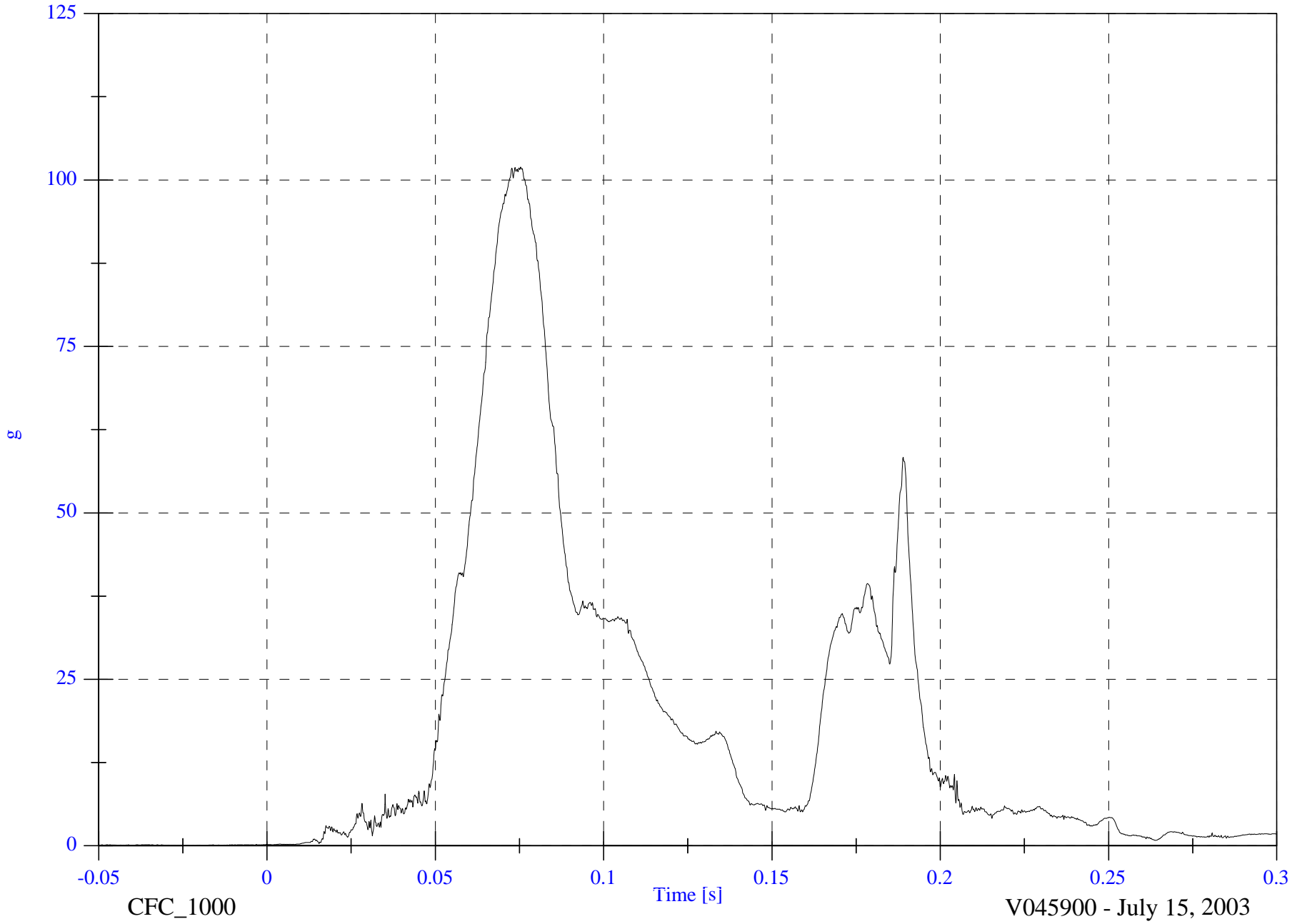
V1P6 Head Resultant

Max: 101.9 [g] at 0.075 [s]

Min: 0.0 [g] at -0.026 [s]

4-52

8714-01



CFC_1000

Time [s]

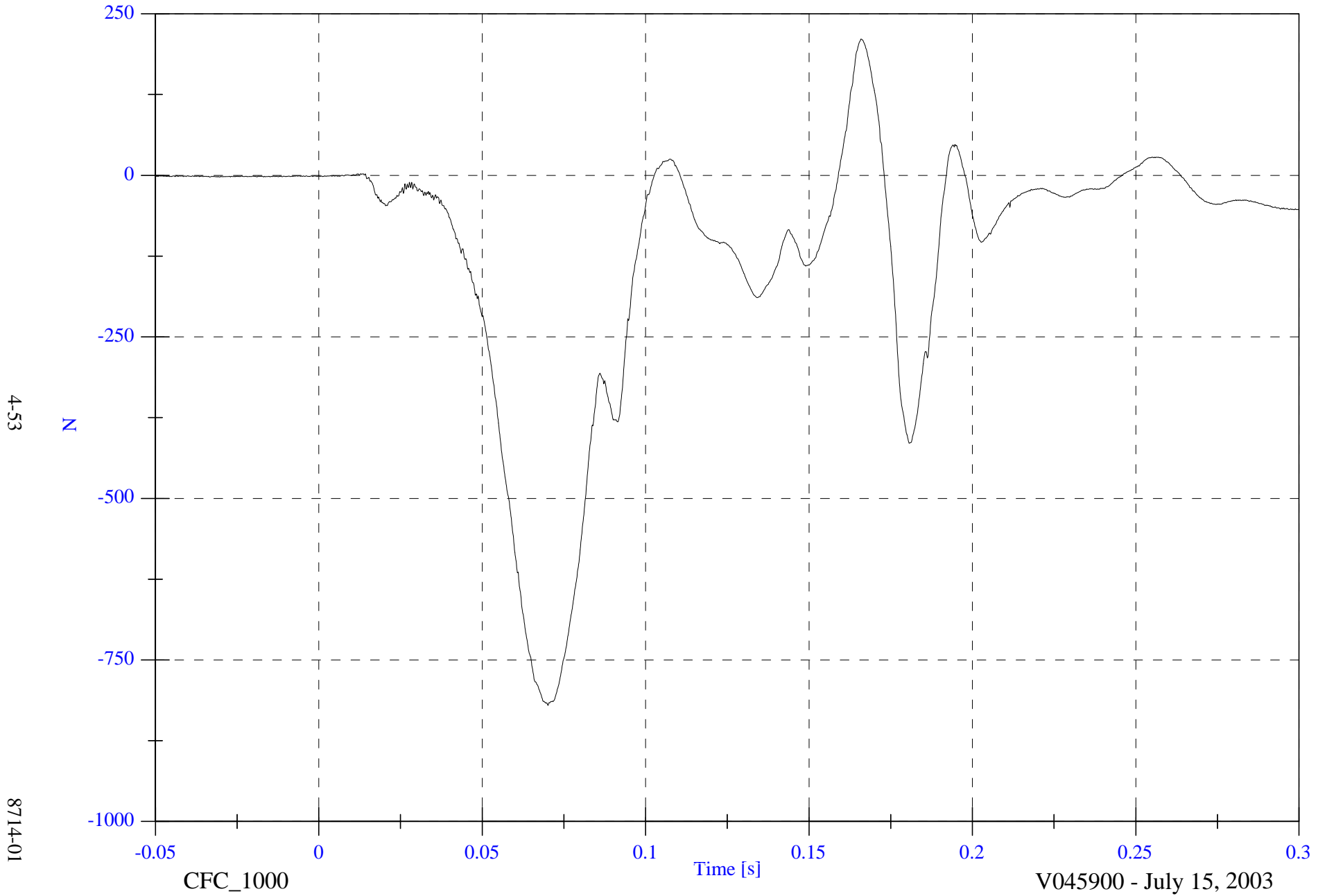
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Upper Neck Fx

Max: 210.9 [N] at 0.166 [s]

Min: -820.2 [N] at 0.070 [s]



4-53

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Upper Neck Fy

Max: 158.0 [N] at 0.161 [s]

Min: -101.1 [N] at 0.189 [s]



4-54

8714-01

CFC_1000

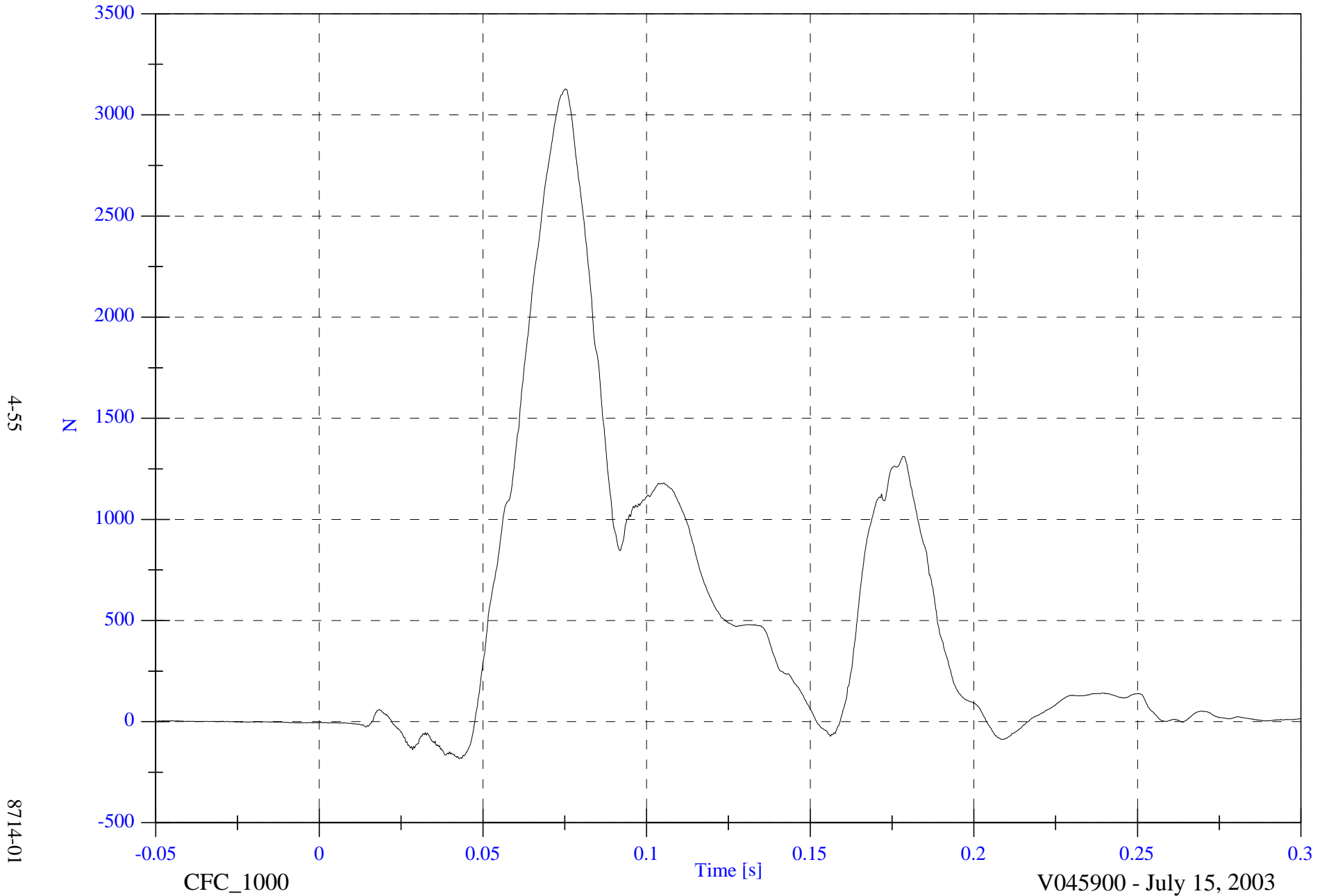
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Upper Neck Fz

Max: 3128.3 [N] at 0.075 [s]

Min: -182.9 [N] at 0.043 [s]



4-55

8714-01

CFC_1000

Time [s]

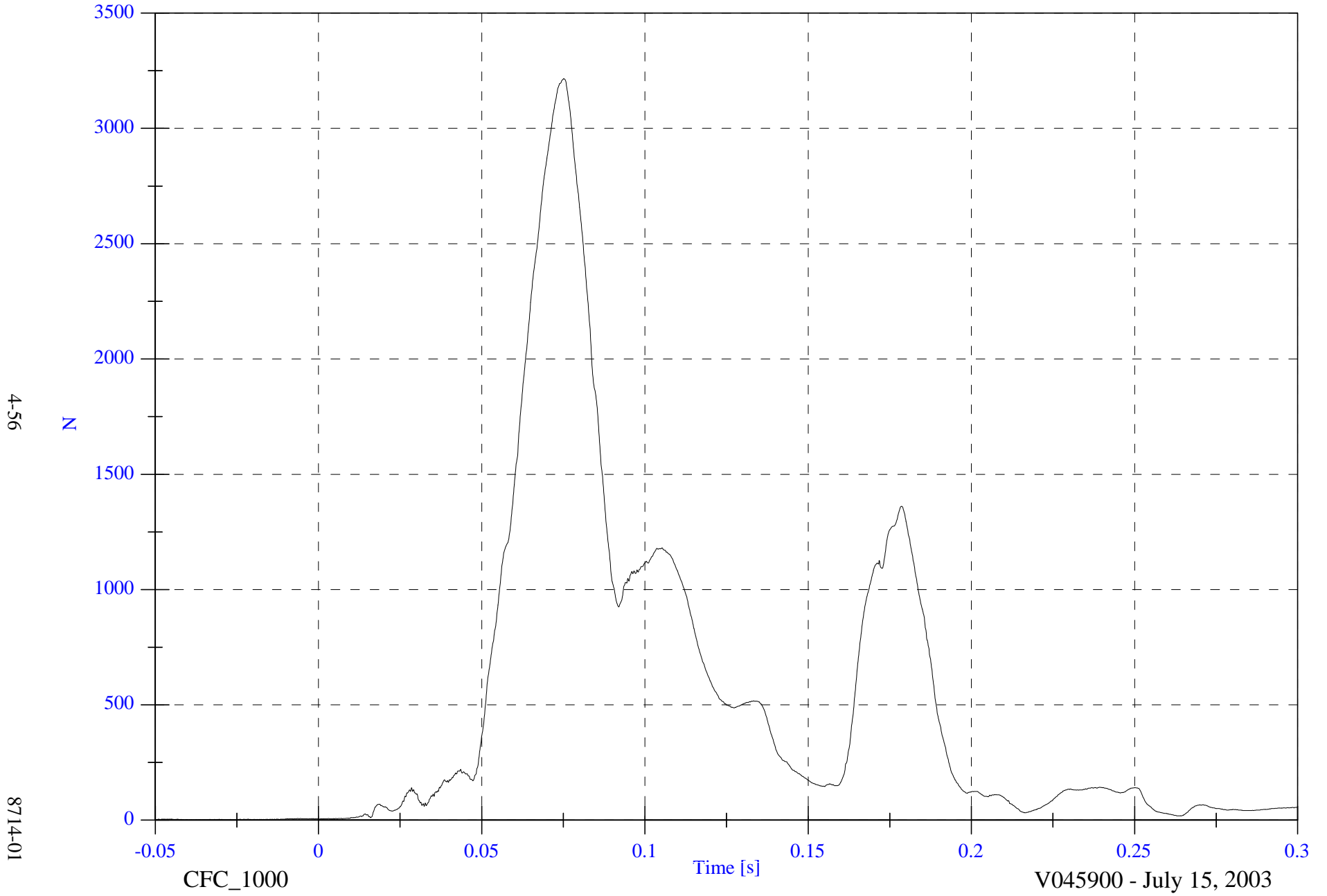
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Upper Neck F Resultant

Max: 3216.1 [N] at 0.075 [s]

Min: 1.1 [N] at -0.039 [s]



4-56

8714-01

CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

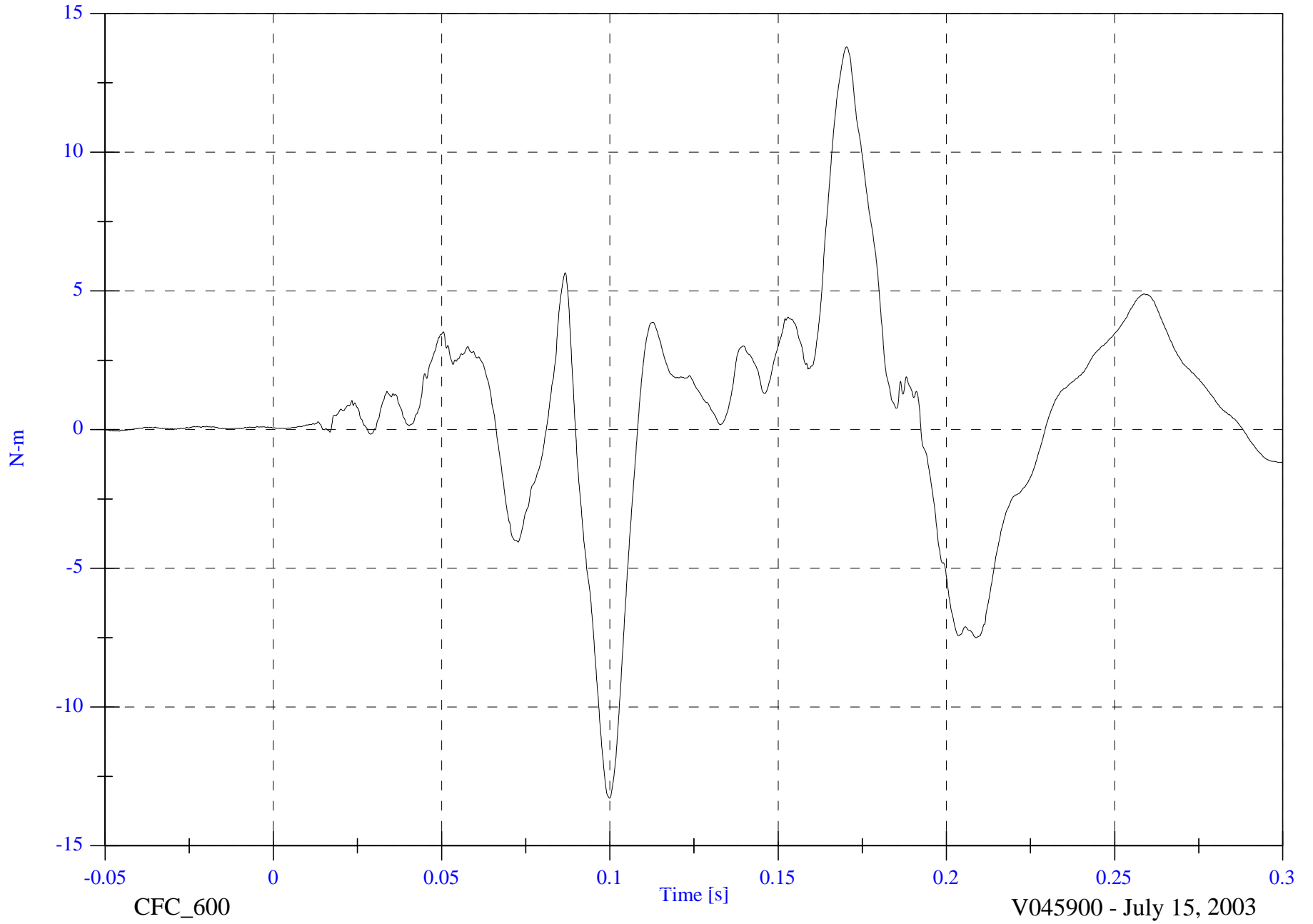
V1P6 Upper Neck Mx

Max: 13.8 [N-m] at 0.170 [s]

Min: -13.3 [N-m] at 0.100 [s]

4-57

8714-01



CFC_600

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

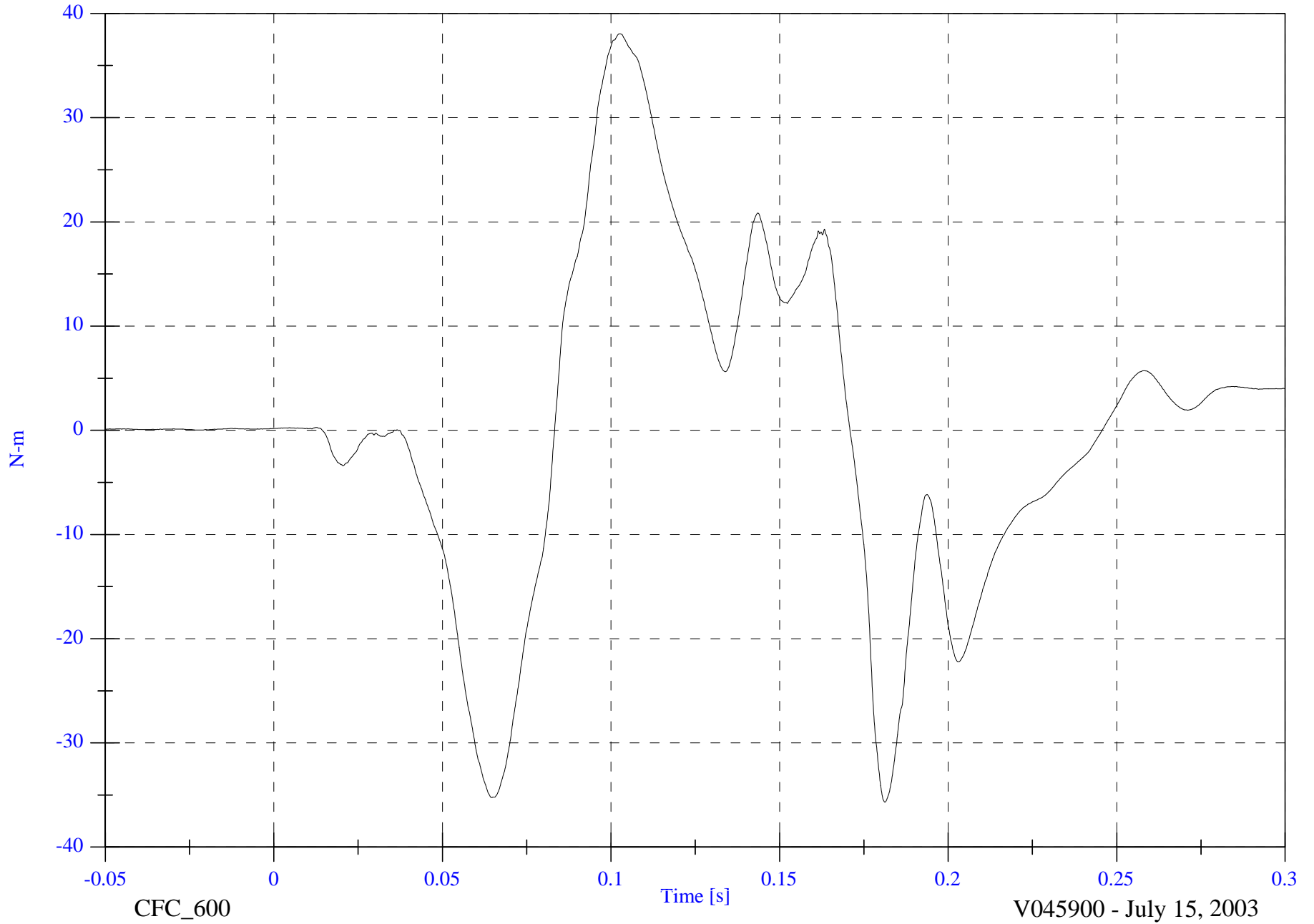
V1P6 Upper Neck My

Max: 38.1 [N-m] at 0.103 [s]

Min: -35.7 [N-m] at 0.181 [s]

4-58

8714-01



2004 Volvo XC90 NCAP

V1P6 Upper Neck Mz

Max: 7.9 [N-m] at 0.103 [s]

Min: -7.7 [N-m] at 0.204 [s]



4-59

8714-01

CFC_600

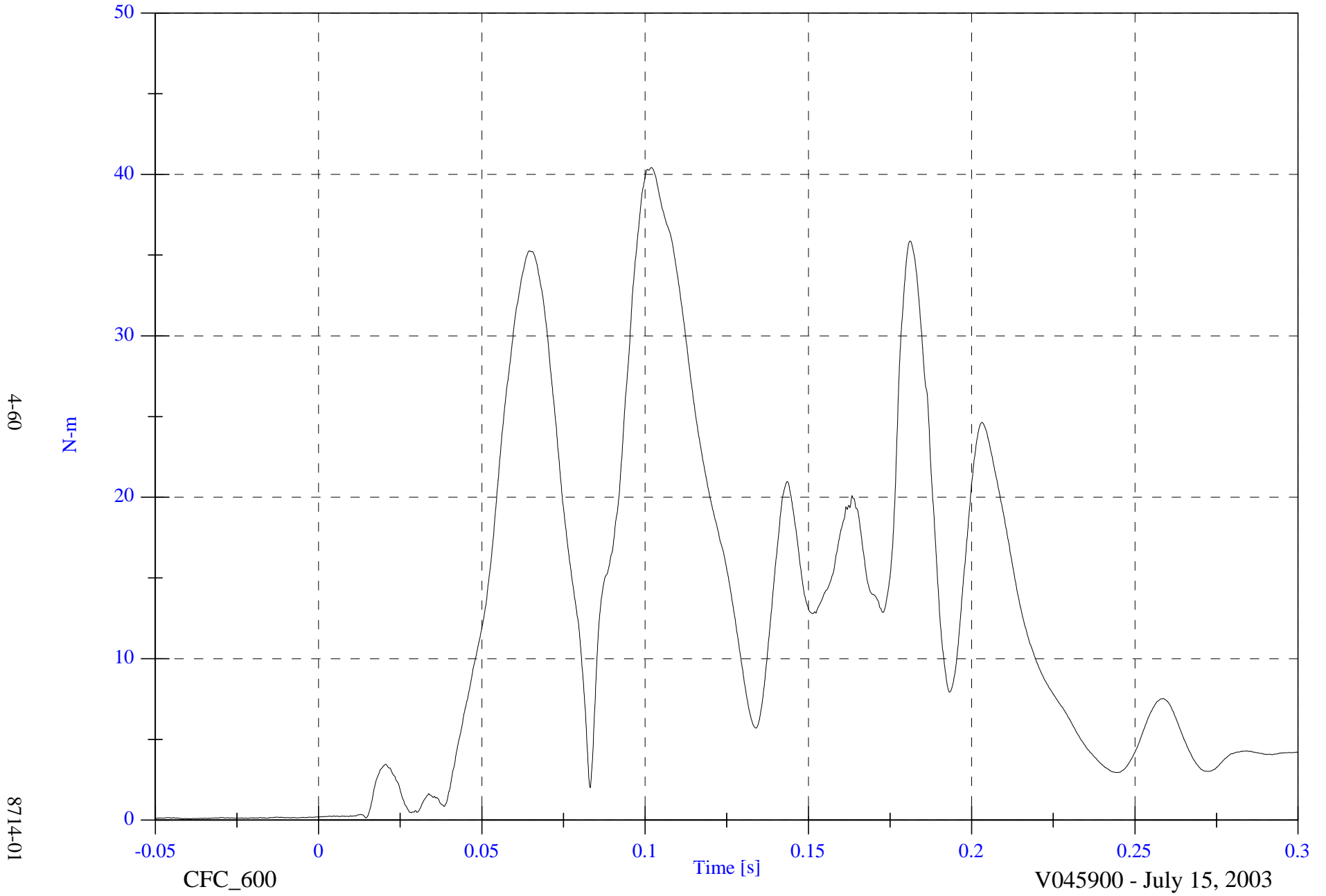
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Upper Neck M Resultant

Max: 40.4 [N-m] at 0.102 [s]

Min: 0.1 [N-m] at -0.039 [s]



4-60

8714-01

CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

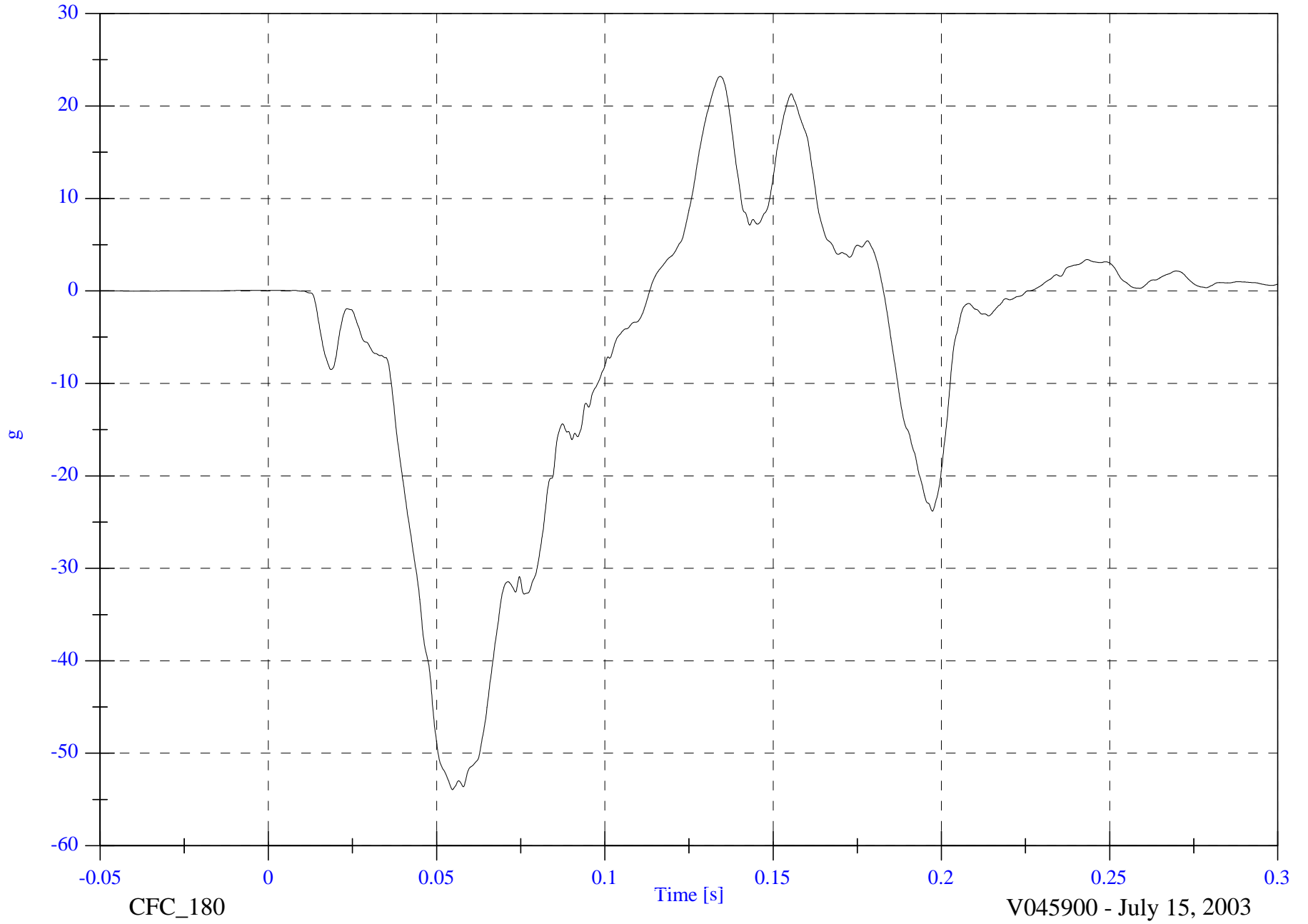
VIP6 Chest x

Max: 23.2 [g] at 0.134 [s]

Min: -53.9 [g] at 0.055 [s]

4-61

8714-01



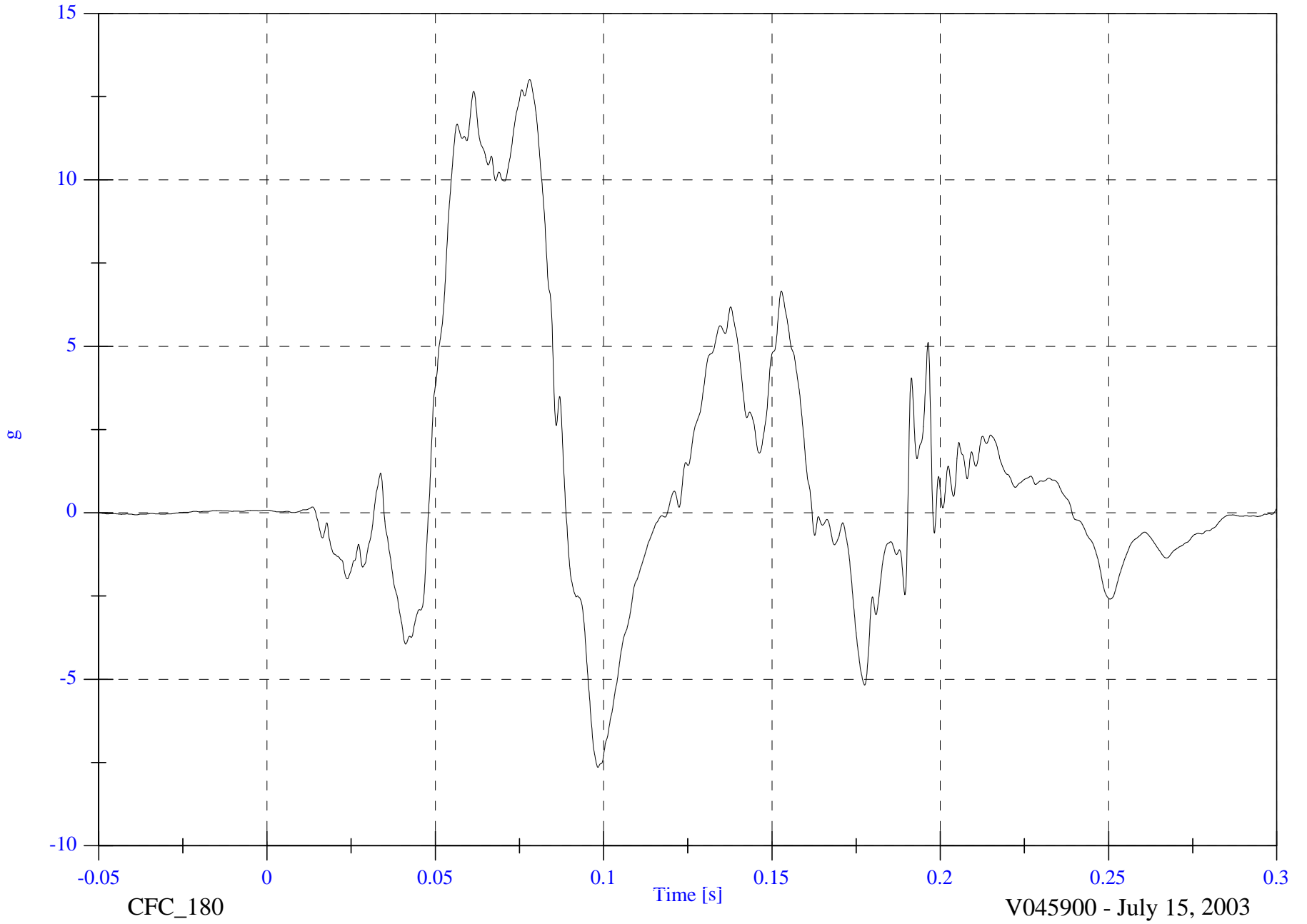
2004 Volvo XC90 NCAP

VIP6 Chest y

Max: 13.0 [g] at 0.078 [s]
Min: -7.6 [g] at 0.098 [s]

4-62

8714-01

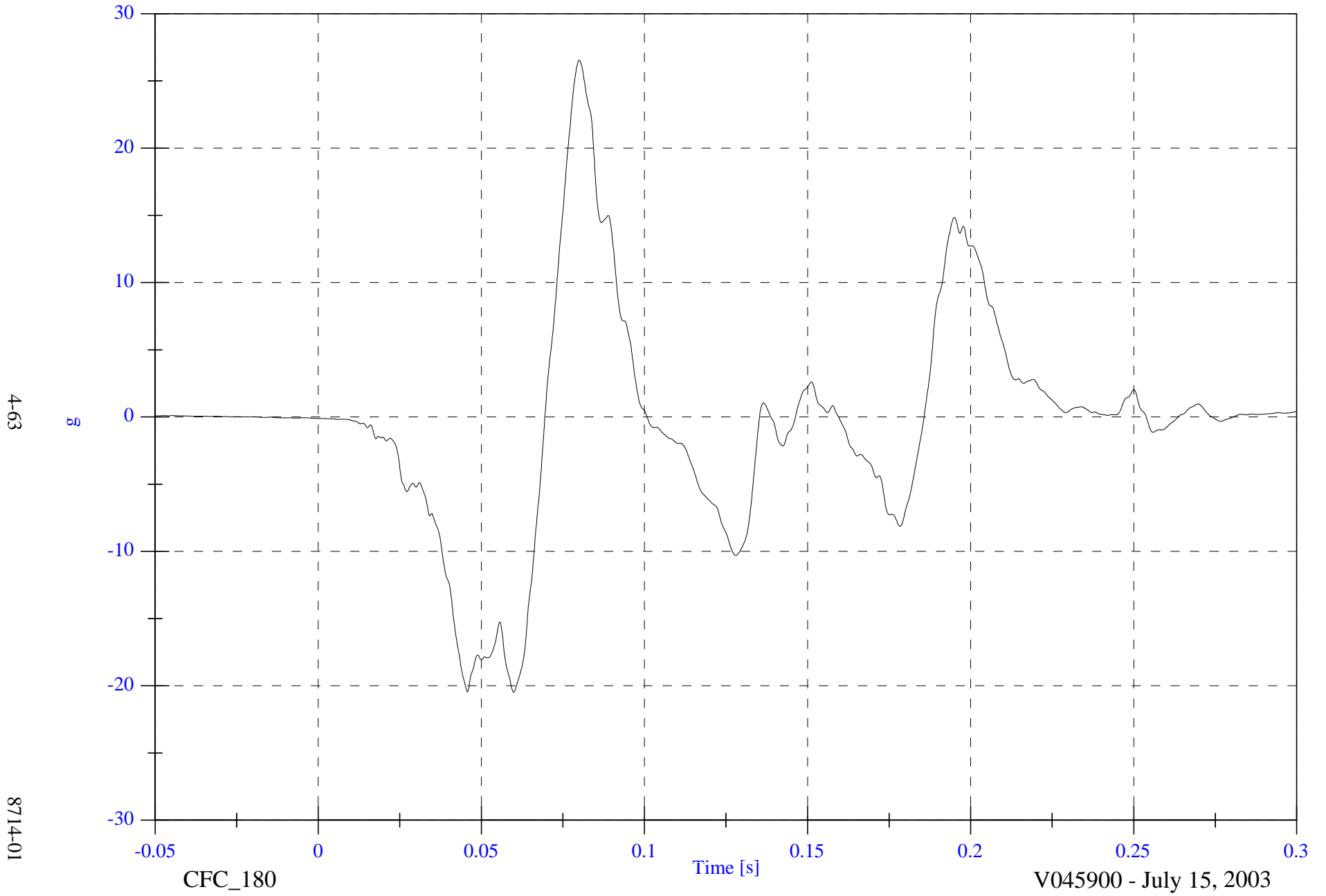


2004 Volvo XC90 NCAP

VIP6 Chest z

Max: 26.5 [g] at 0.080 [s]

Min: -20.5 [g] at 0.060 [s]



2004 Volvo XC90 NCAP

V1P6 Chest Resultant

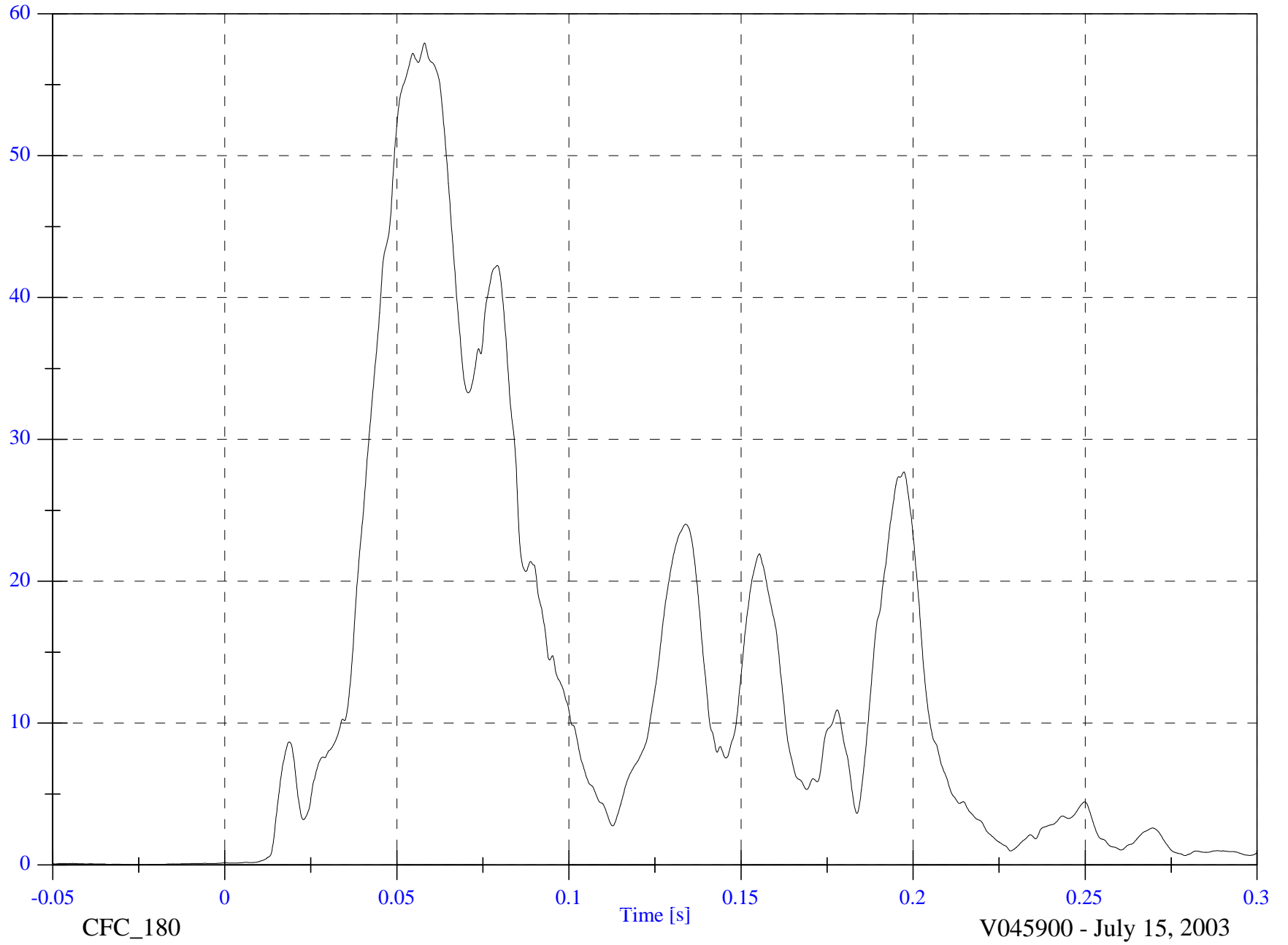
Max: 57.9 [g] at 0.058 [s]

Min: 0.0 [g] at -0.027 [s]

4-64

g

8714-01



CFC_180

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

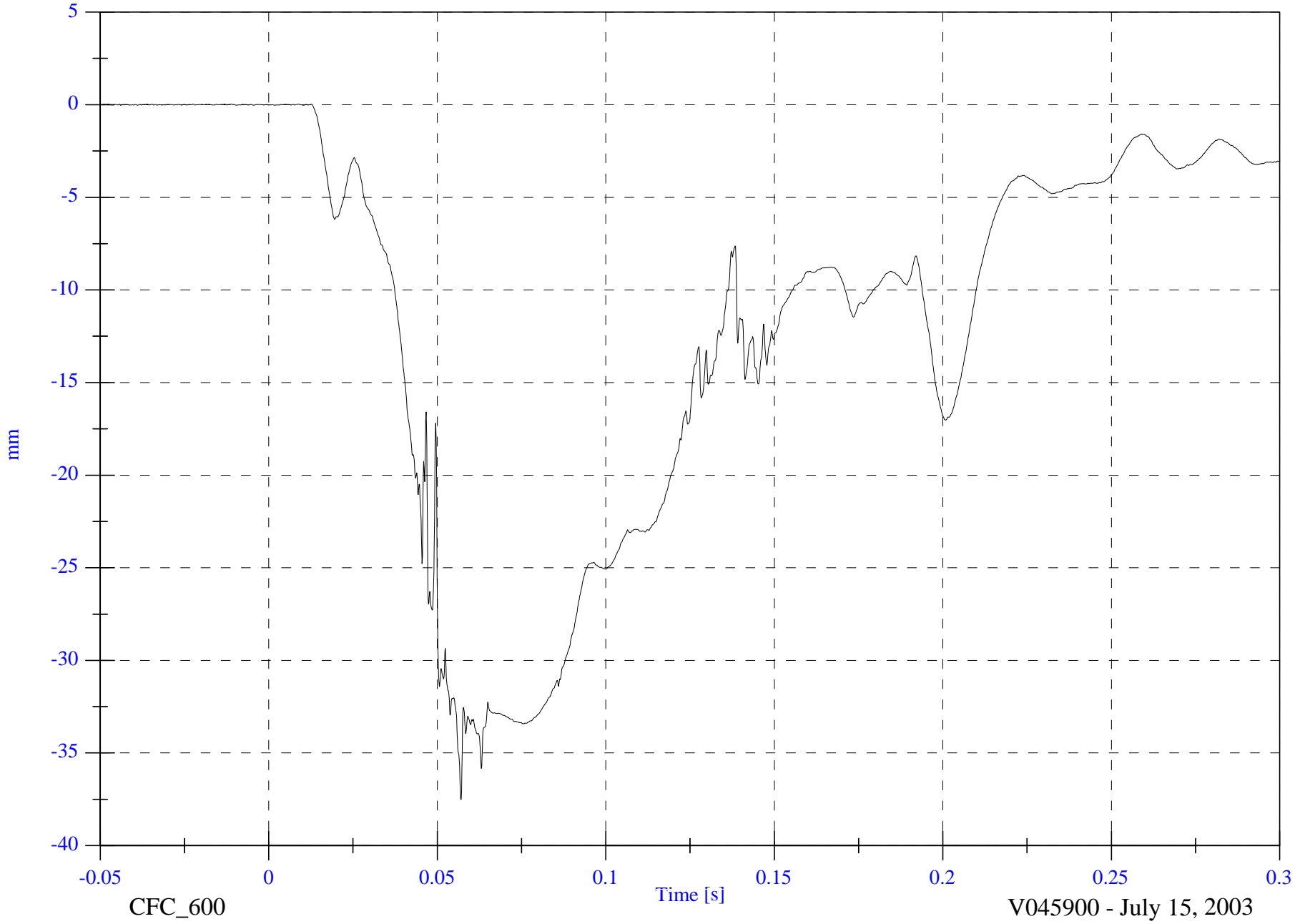
V1P6 Chest Pot

Max: 0.0 [mm] at -0.048 [s]

Min: -37.5 [mm] at 0.057 [s]

4-65

8714-01



CFC_600

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P6 Pelvic x

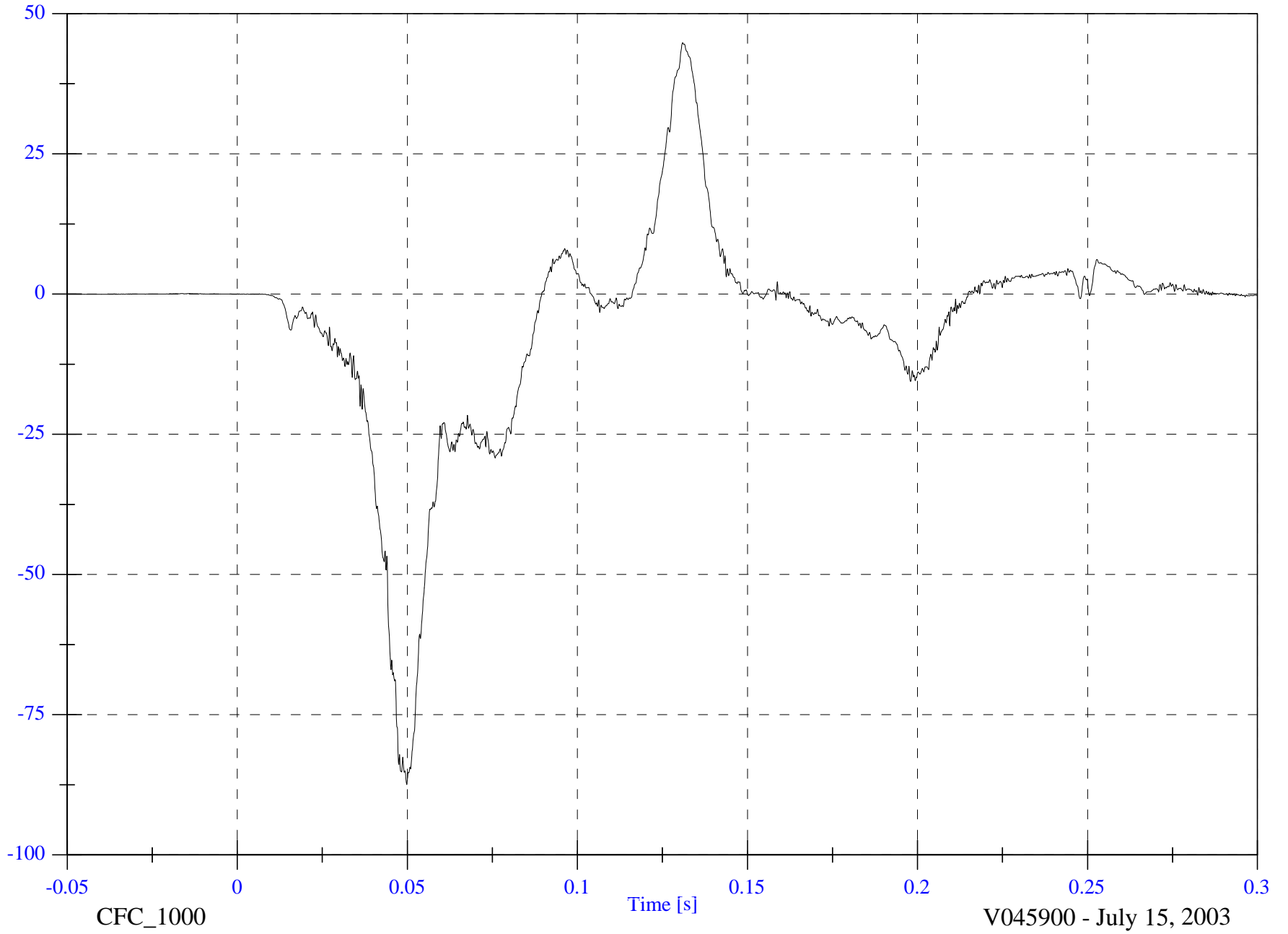
Max: 44.8 [g] at 0.131 [s]

Min: -87.5 [g] at 0.050 [s]

4-66

g

8714-01



2004 Volvo XC90 NCAP

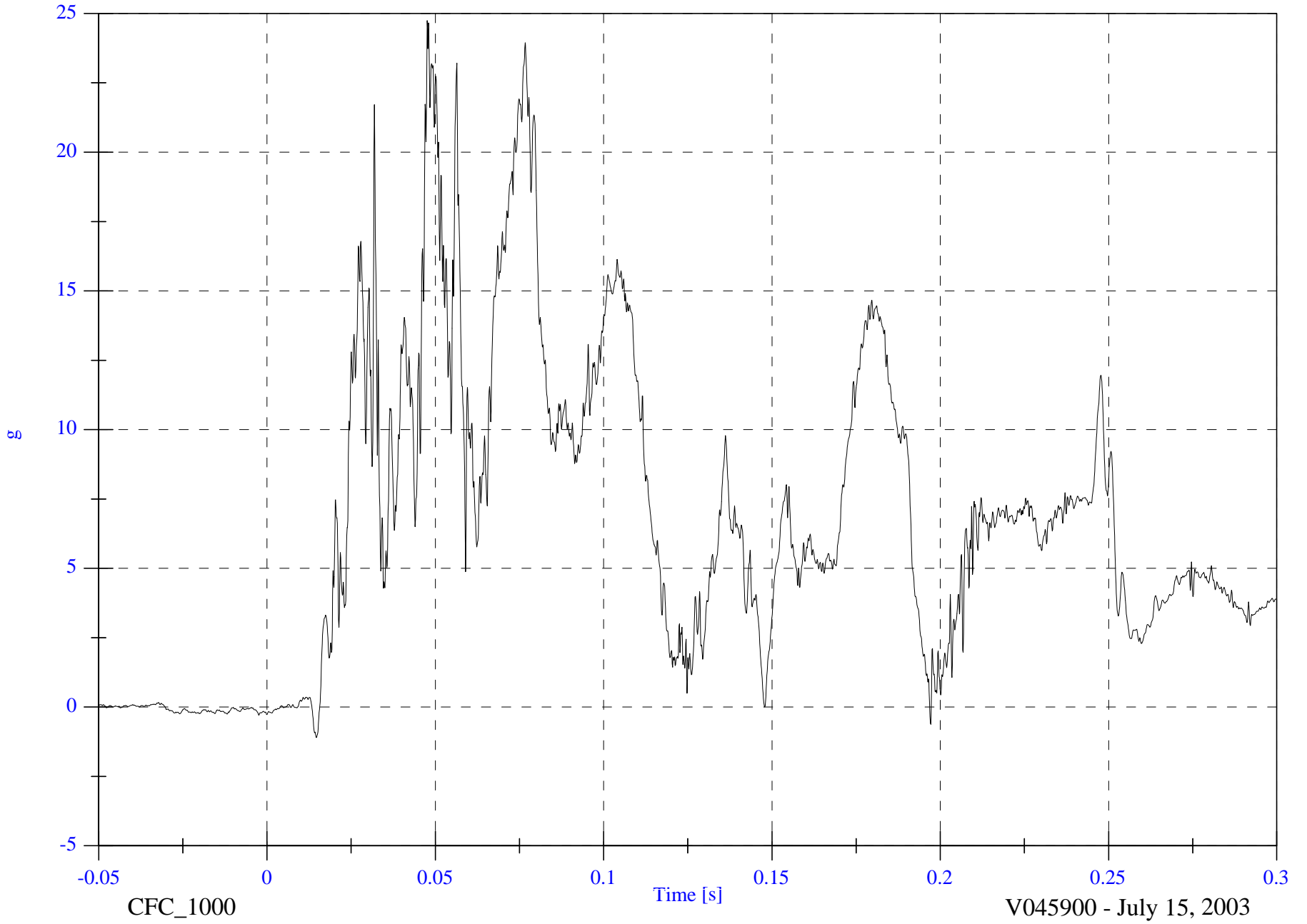
V1P6 Pelvic y

Max: 24.7 [g] at 0.048 [s]

Min: -1.1 [g] at 0.015 [s]

4-67

8714-01



2004 Volvo XC90 NCAP

V1P6 Pelvic z

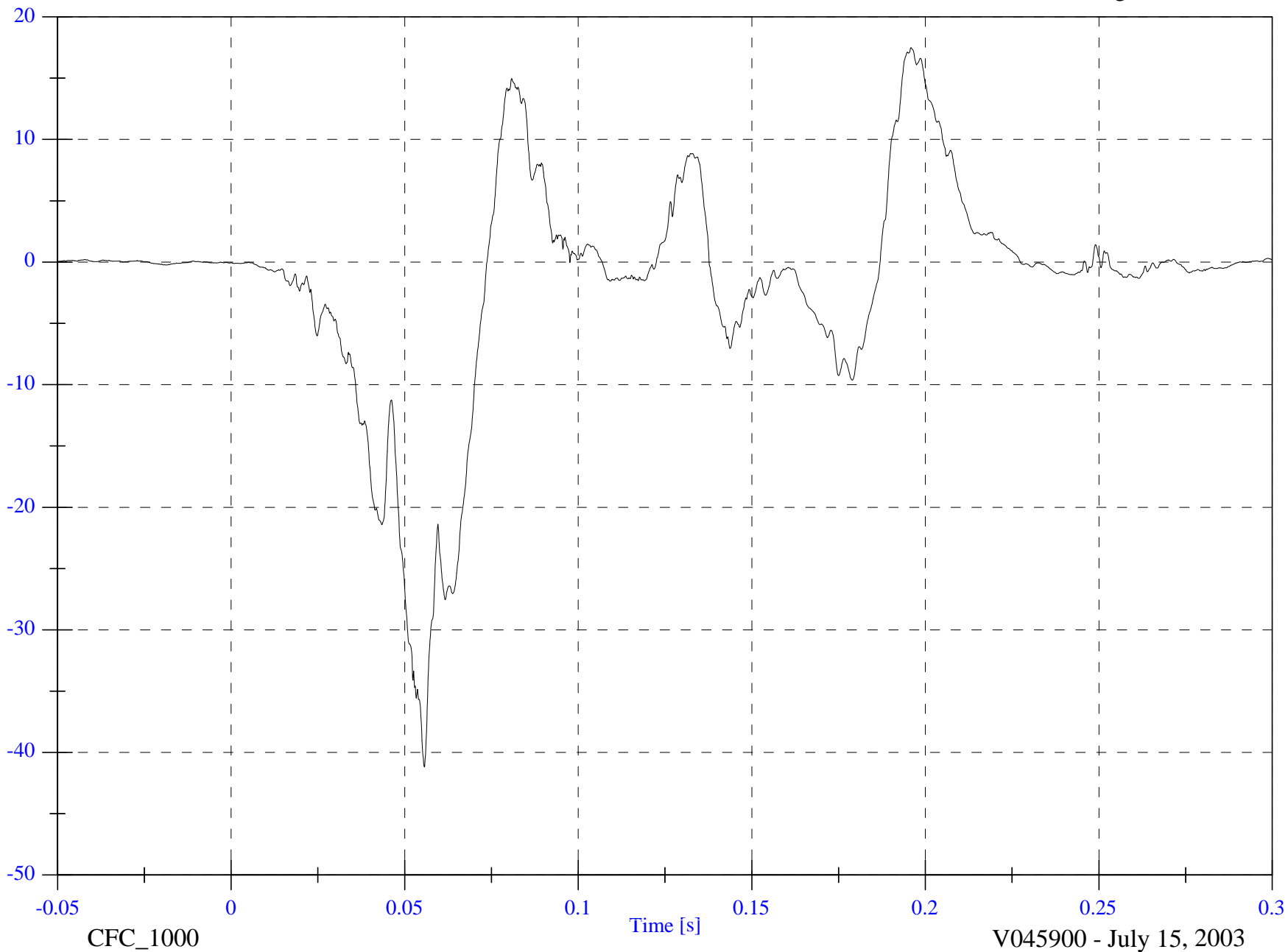
Max: 17.5 [g] at 0.196 [s]

Min: -41.2 [g] at 0.056 [s]

4-68

g

8714-01



CFC_1000

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

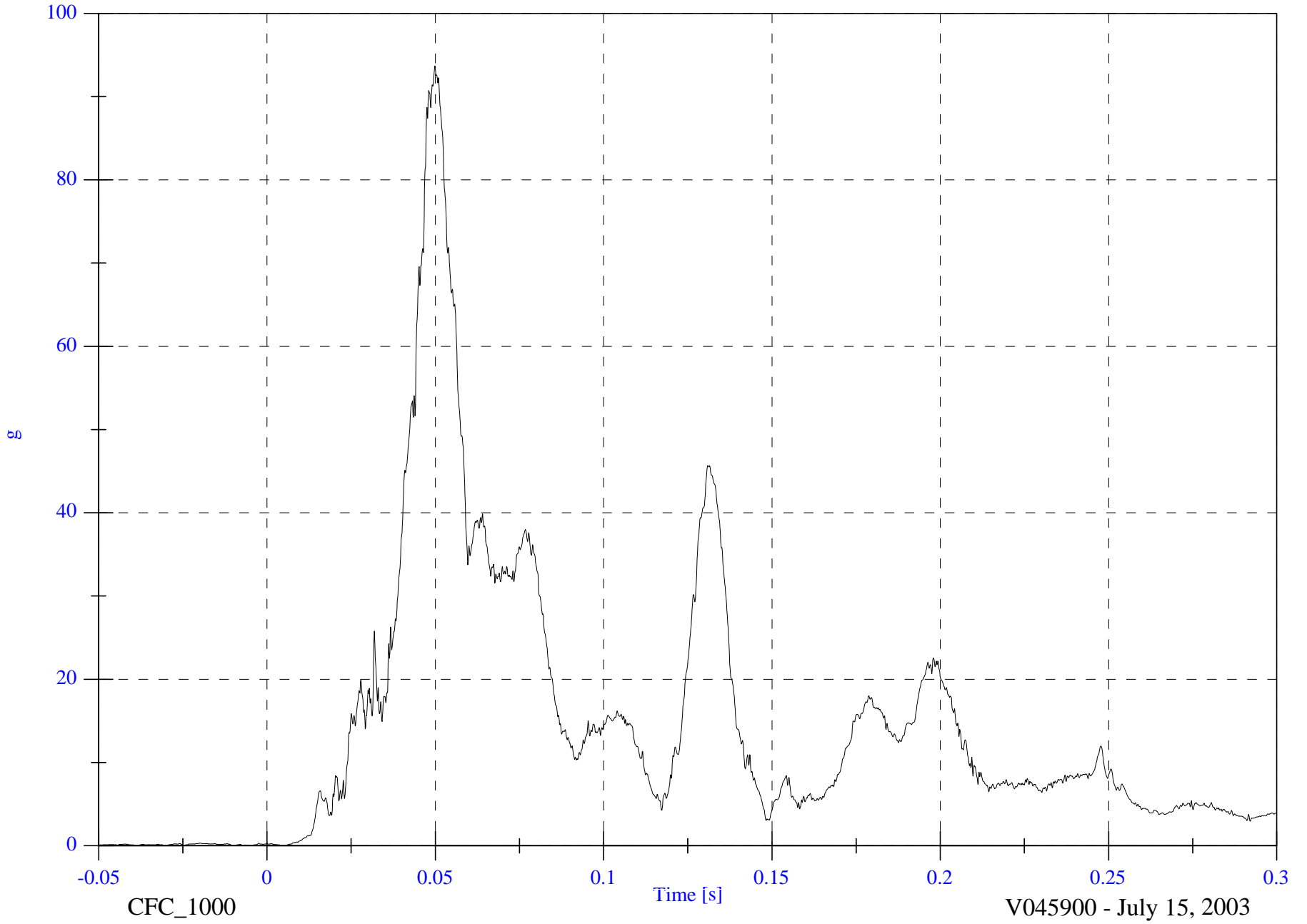
V1P6 Pelvic Resultant

Max: 93.7 [g] at 0.050 [s]

Min: 0.0 [g] at -0.030 [s]

4-69

8714-01

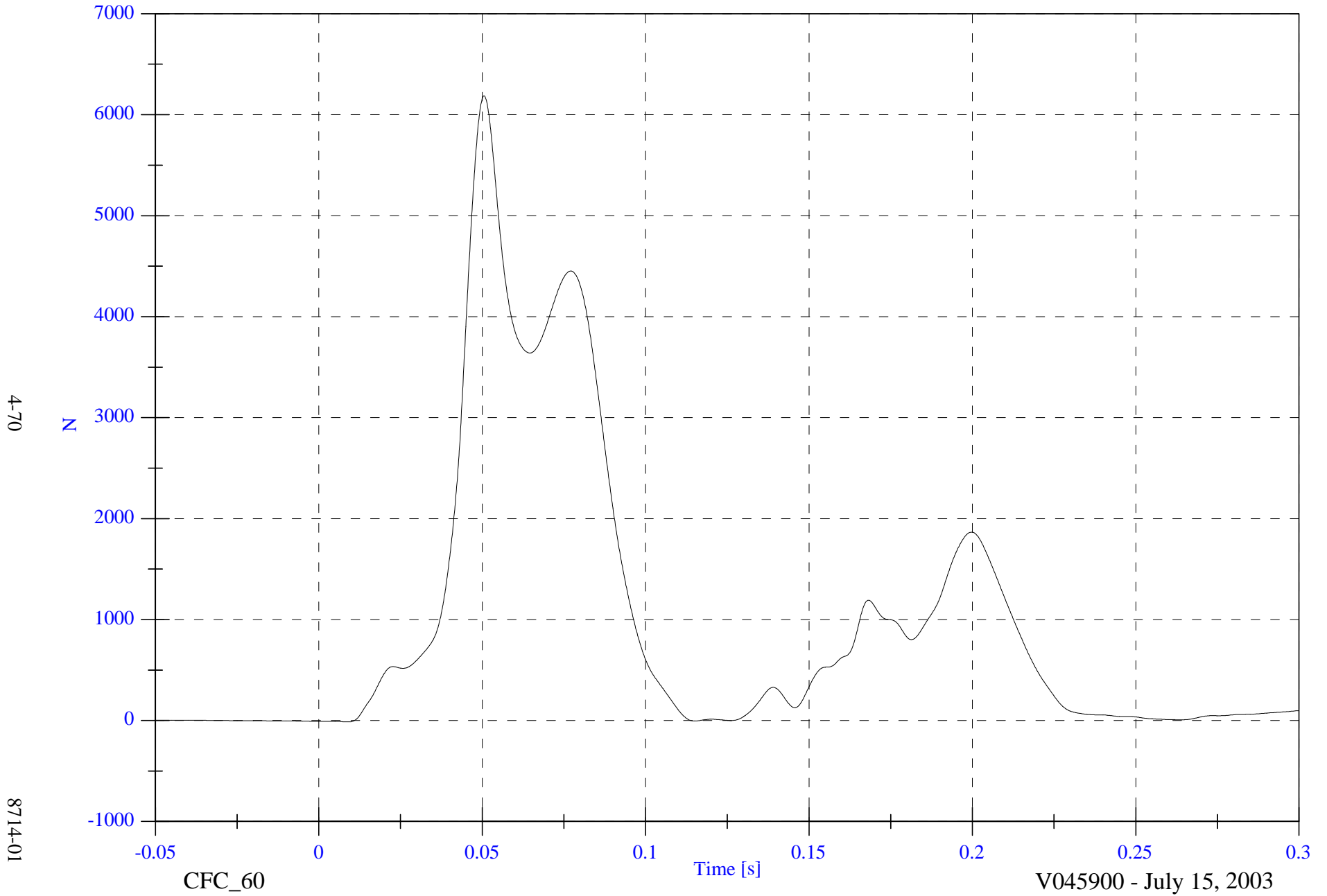


2004 Volvo XC90 NCAP

V1P6 Lap Belt Load

Max: 6186.7 [N] at 0.051 [s]

Min: -14.1 [N] at 0.009 [s]



4-70

8714-01

CFC_60

V045900 - July 15, 2003

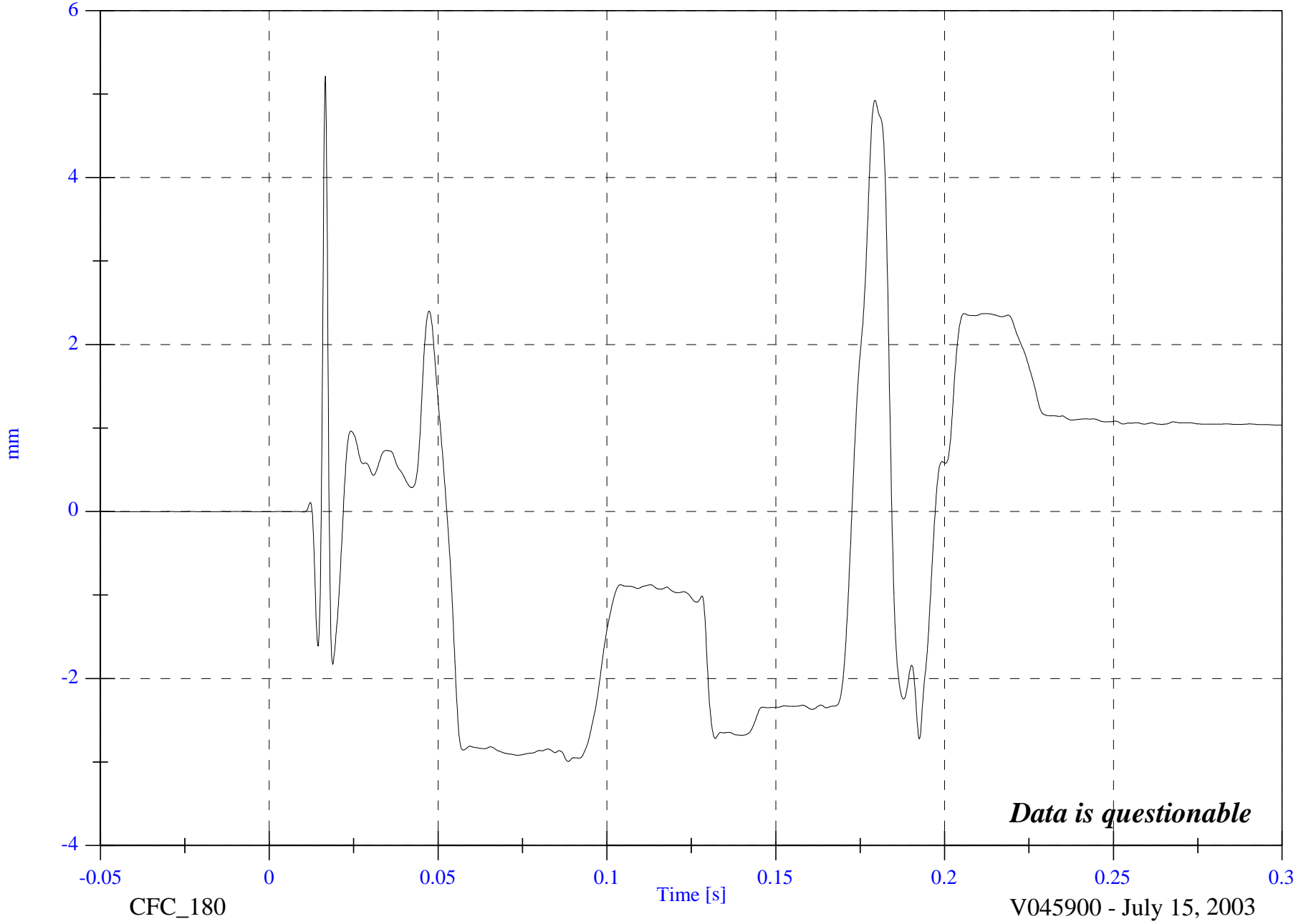
2004 Volvo XC90 NCAP

V1P6 Shoulder Belt Stretch

Max: 5.2 [mm] at 0.017 [s]
Min: -3.0 [mm] at 0.088 [s]

4-71

8714-01



Data is questionable

CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

VIP3 Child Seat x

Max: 33.2 [g] at 0.063 [s]

Min: -67.1 [g] at 0.049 [s]



2004 Volvo XC90 NCAP

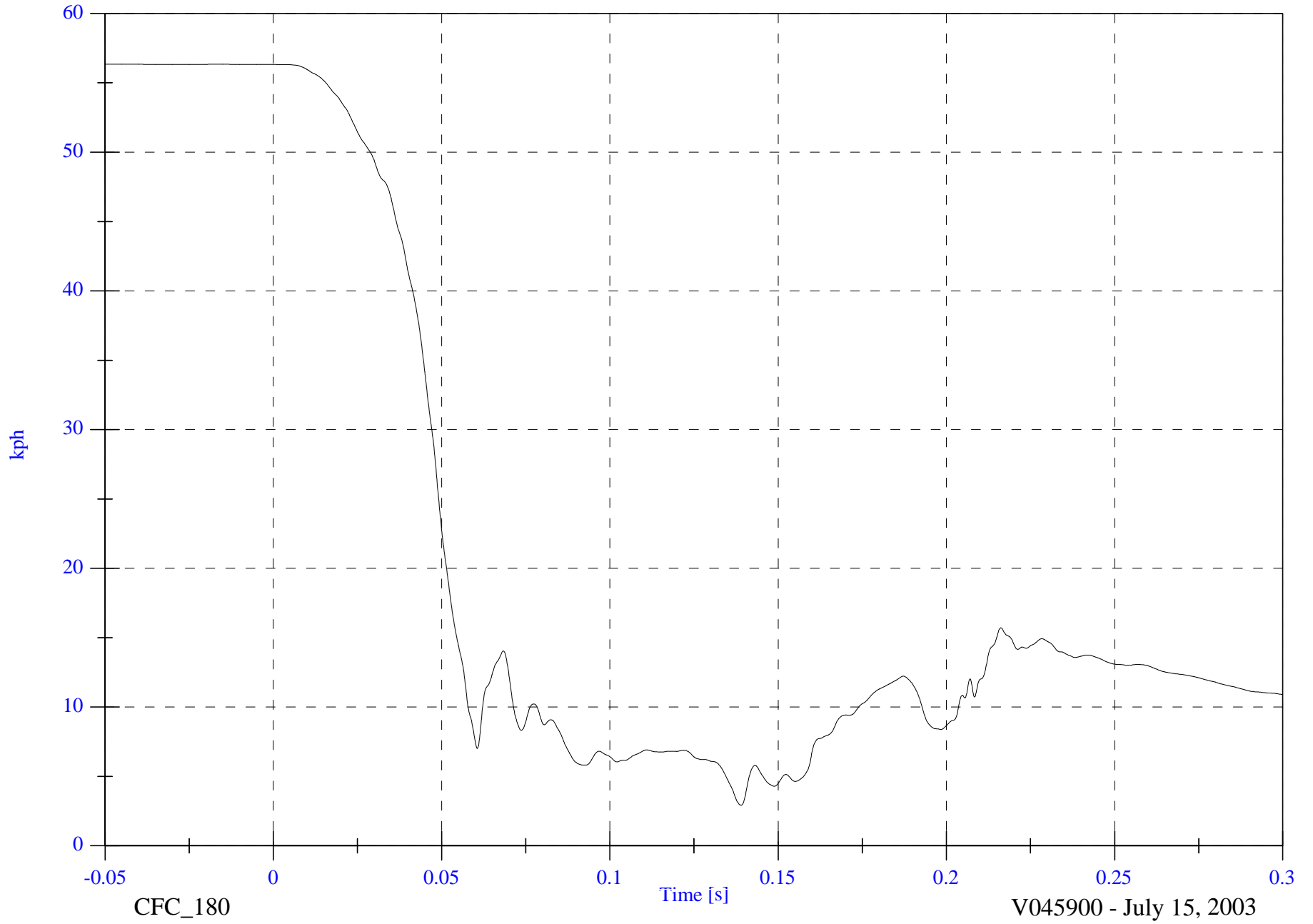
VIP3 Child Seat x Velocity

Max: 56.3 [kph] at -0.048 [s]

Min: 2.9 [kph] at 0.139 [s]

4-73

8714-01



CFC_180

Time [s]

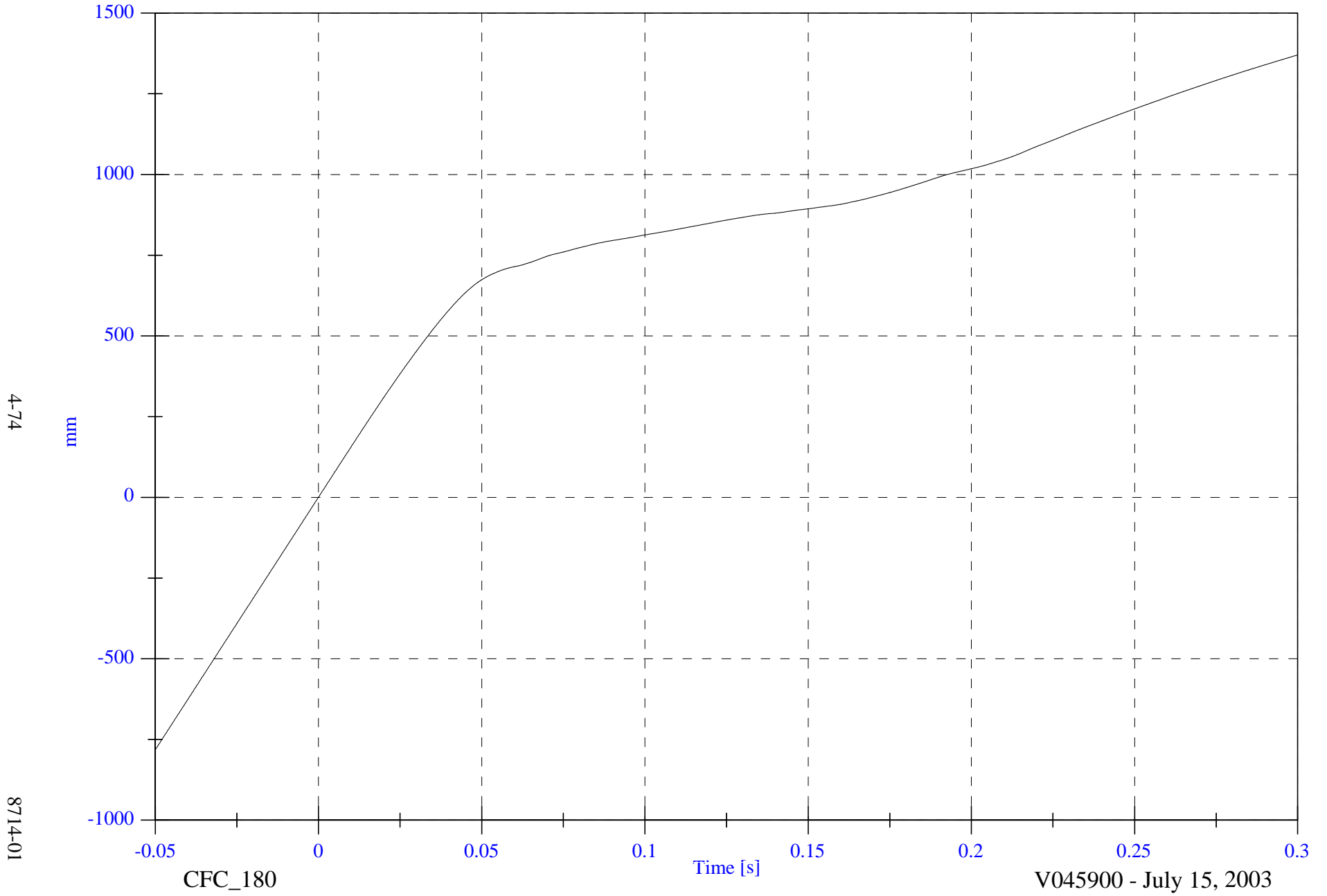
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P3 Child Seat x Displacement

Max: 1370.1 [mm] at 0.300 [s]

Min: -782.4 [mm] at -0.050 [s]



4-74

8714-01

CFC_180

Time [s]

V045900 - July 15, 2003

2004 Volvo XC90 NCAP

VIP4 Child Seat x

Max: 19.2 [g] at 0.193 [s]

Min: -48.7 [g] at 0.057 [s]



2004 Volvo XC90 NCAP

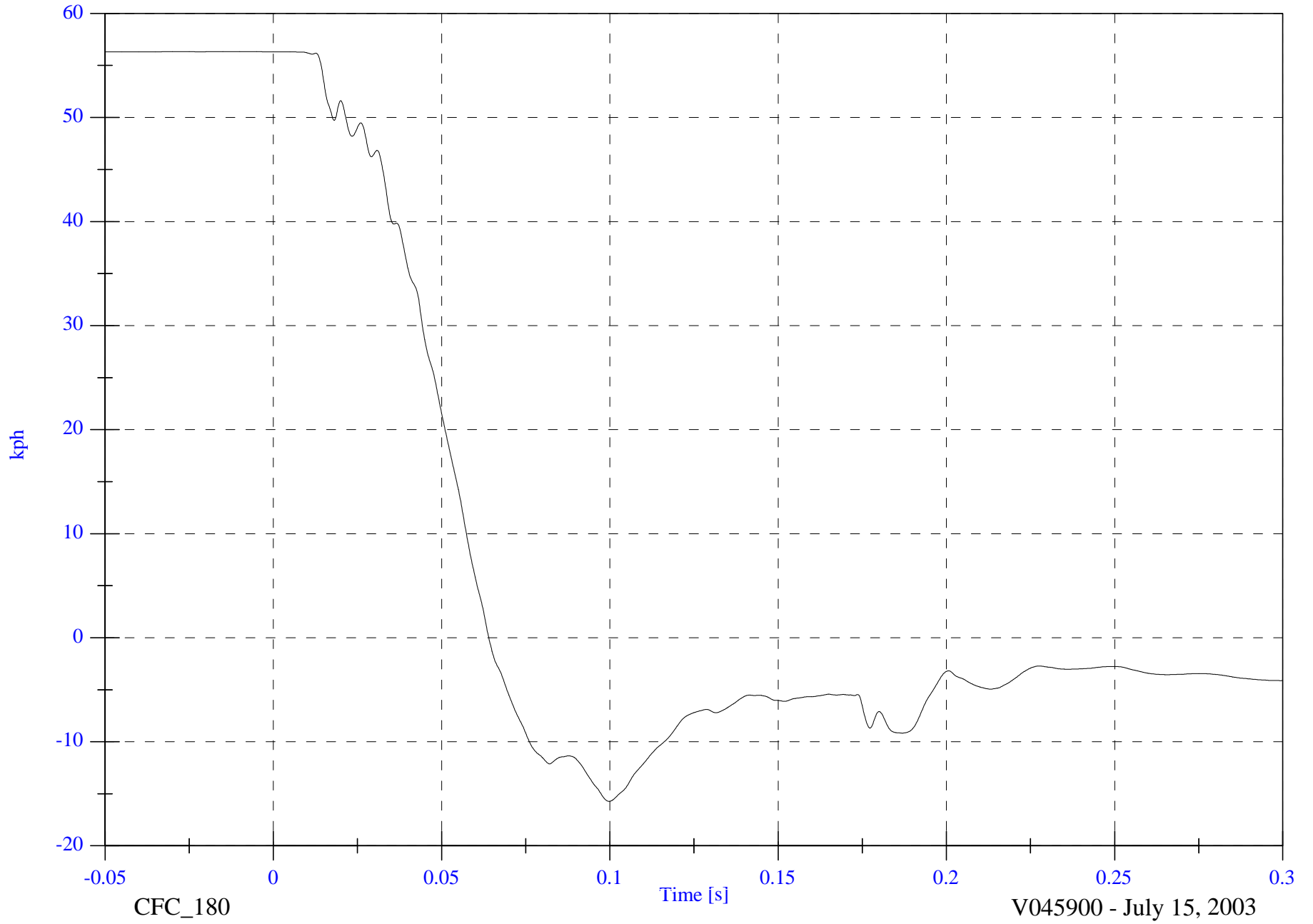
V1P4 Child Seat x Velocity

Max: 56.3 [kph] at -0.013 [s]

Min: -15.7 [kph] at 0.100 [s]

4-76

8714-01



CFC_180

Time [s]

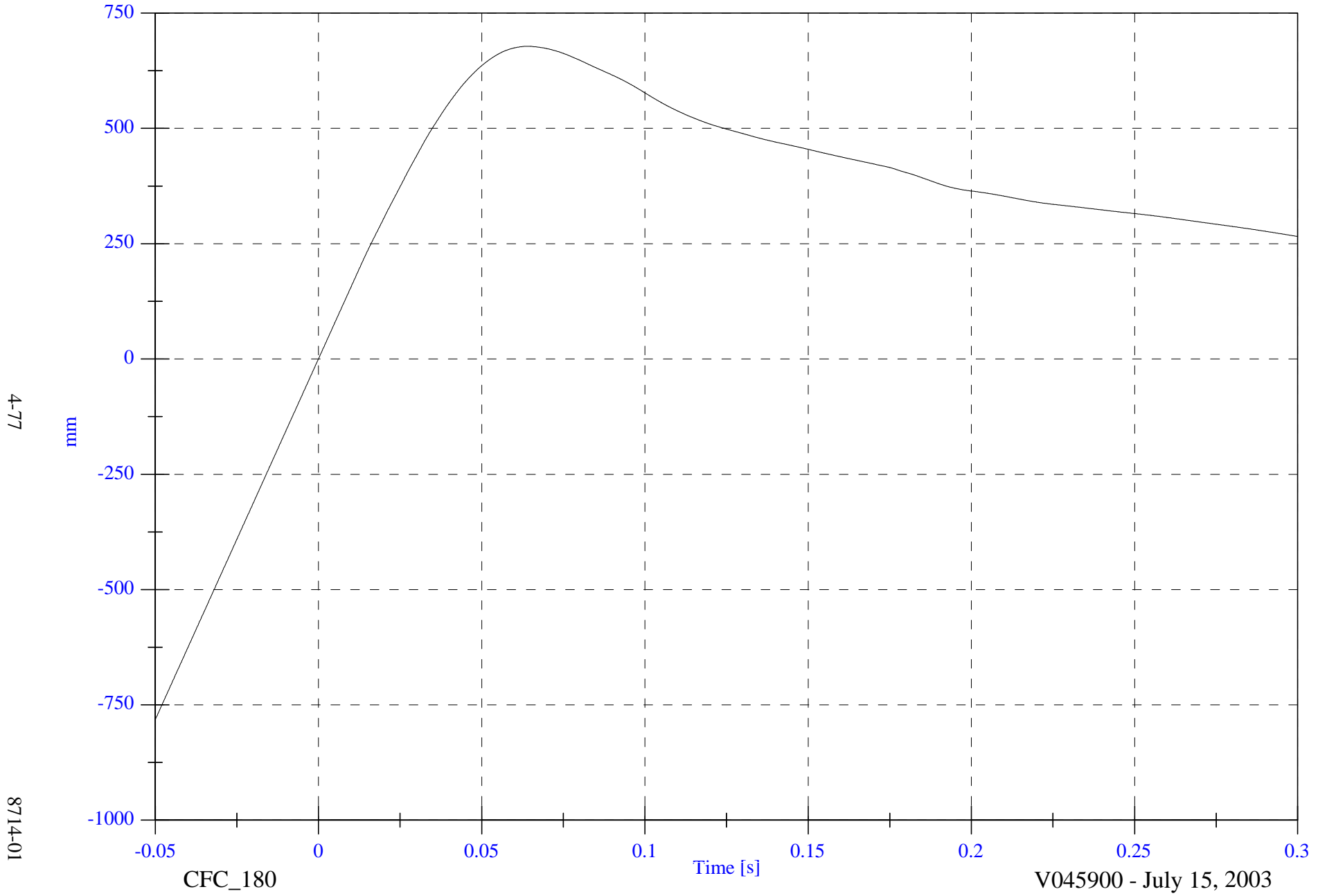
V045900 - July 15, 2003

2004 Volvo XC90 NCAP

V1P4 Child Seat x Displacement

Max: 677.8 [mm] at 0.064 [s]

Min: -782.3 [mm] at -0.050 [s]



4-77

8714-01

CFC_180

Time [s]

V045900 - July 15, 2003

SECTION 5

CHILD DUMMY CALIBRATION INFORMATION

044 Head Drop

Part 572P Head Drop

Calibration Date: 01-27-03

Serial No: 044

Work File: 044H 01-27-03

-----TEST RESULTS-----

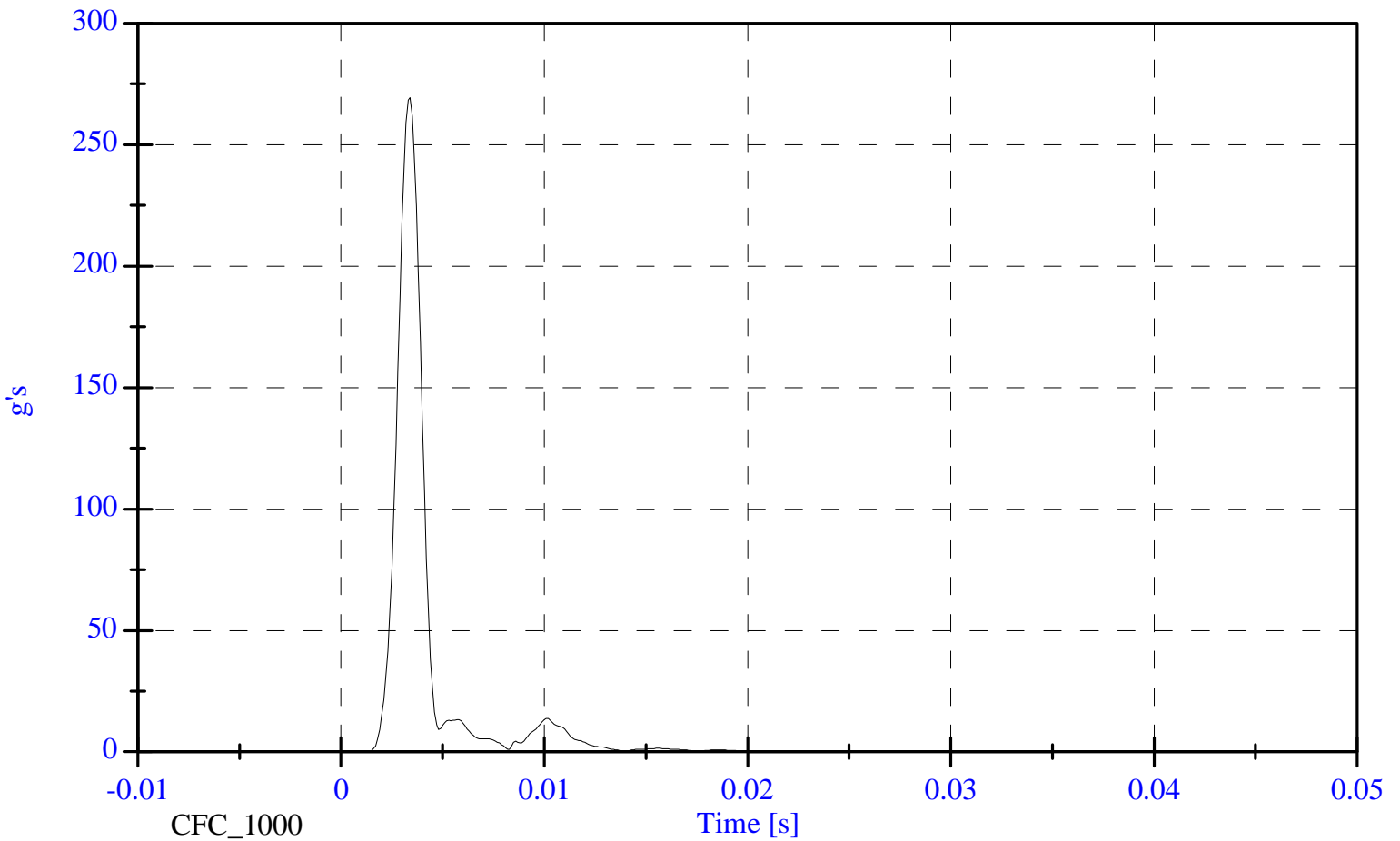
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	37.00 %	Passed
Peak Resultant Accel.:	250-280 Gs	269.30 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	3.21 Gs	Passed
Curve PerCent NonModal:	< 10%	5.12 %	Passed

044 Head Drop

Head Resultant

Max: 269.3 [g's] at 0.003 [s]

Min: 0.0 [g's] at -0.009 [s]



044 Neck Flexion

Part 572P Neck Flexion Test Calibration Date: 01-27-03
Serial No: 044 Work File: 044N 01-27-03

-----TEST RESULTS-----

<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	20.6-22.2 C	21.11 C	Passed
Lab Humidity:	10-70 %	37.00 %	Passed
Test Pendulum Speed:	5.40- 5.60 m/s	5.43 m/s	Passed

-----PENDULUM PULSE-----

Pulse at 10 ms:	2.00- 2.70 m/s	2.04 m/s	Passed
Pulse at 15 ms:	3.00- 4.00 m/s	3.05 m/s	Passed
Pulse at 20 ms:	4.00- 5.10 m/s	4.25 m/s	Passed

-----D PLANE ROTATION-----

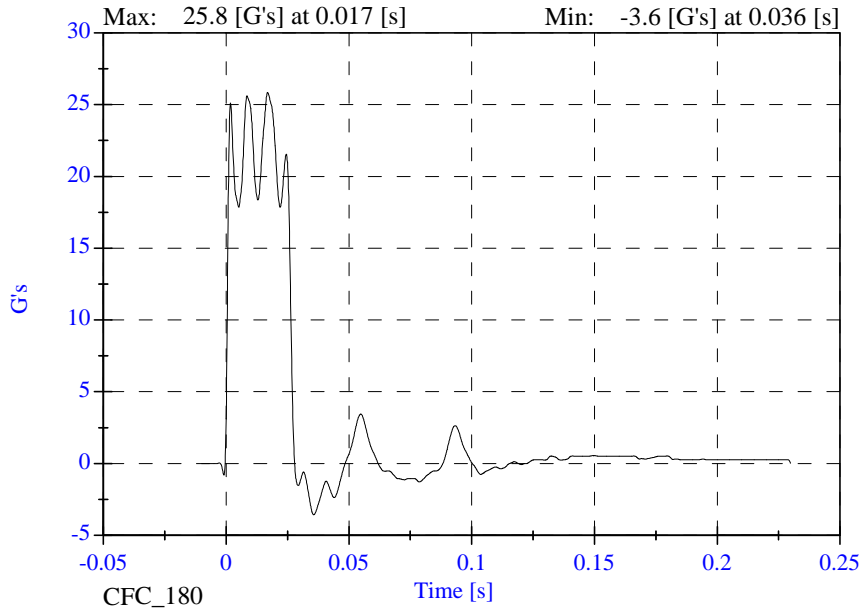
Maximum Rotation:	70.0-82.0 Deg	75.22 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	42.00- 53.00 N-m	45.09 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	76.10 ms	Passed

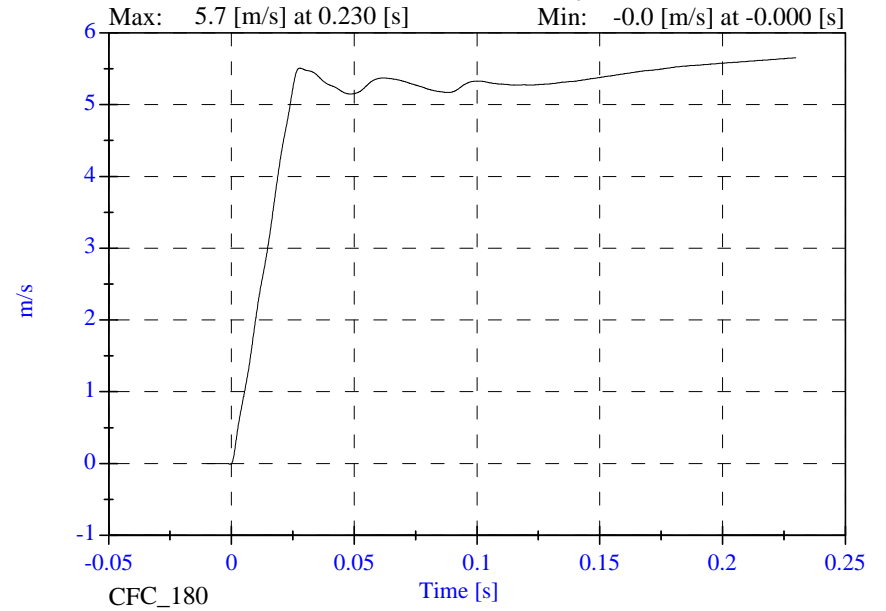
044 Neck Flexion

Pendulum Acceleration

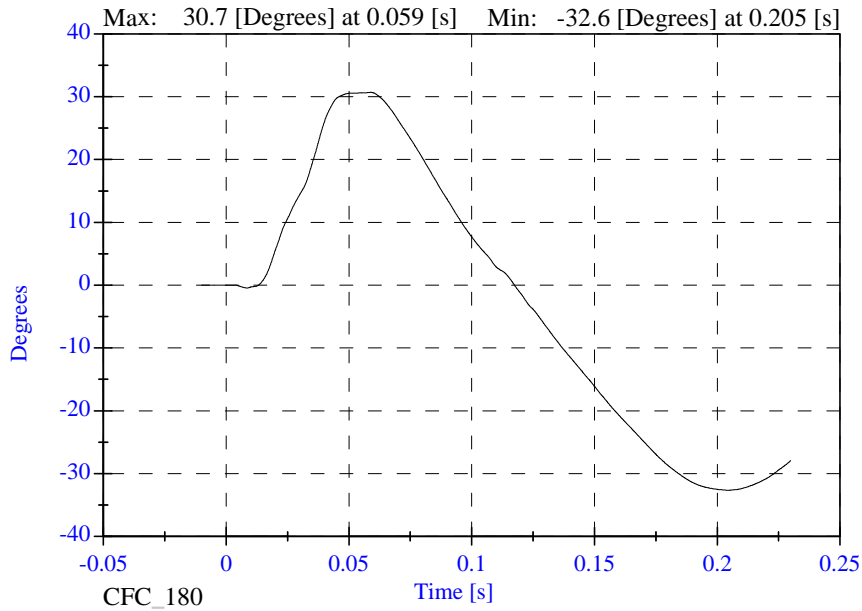


70 - 01-27-03

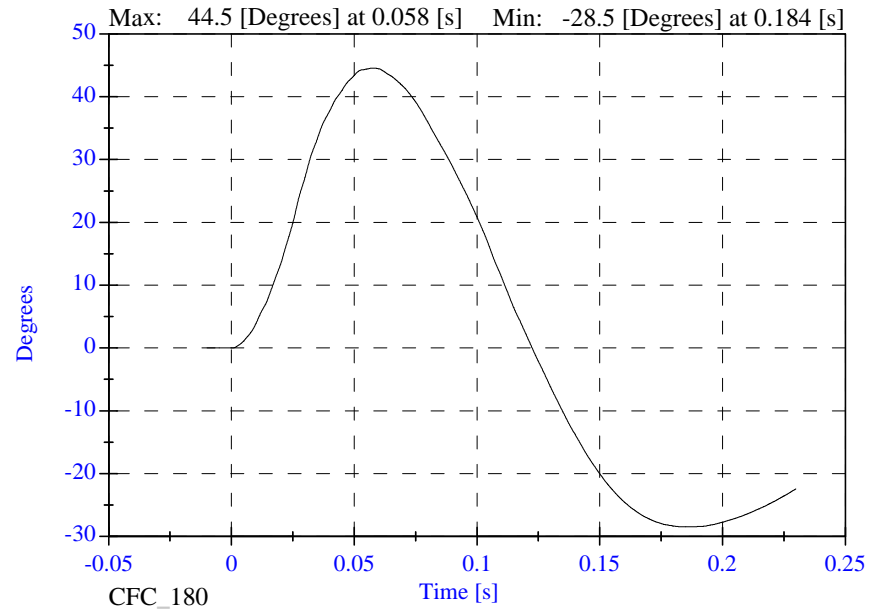
Pendulum Velocity



Head Rotation

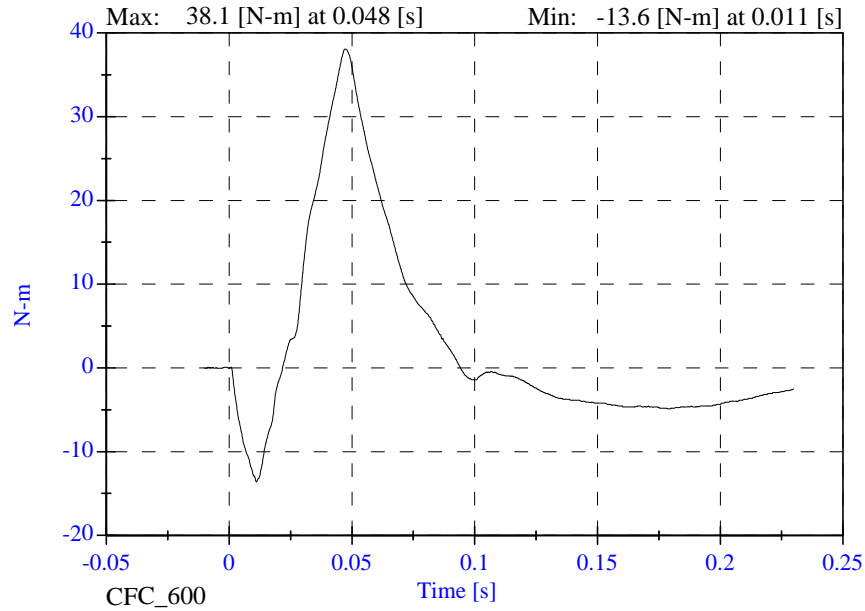


Arm Rotation



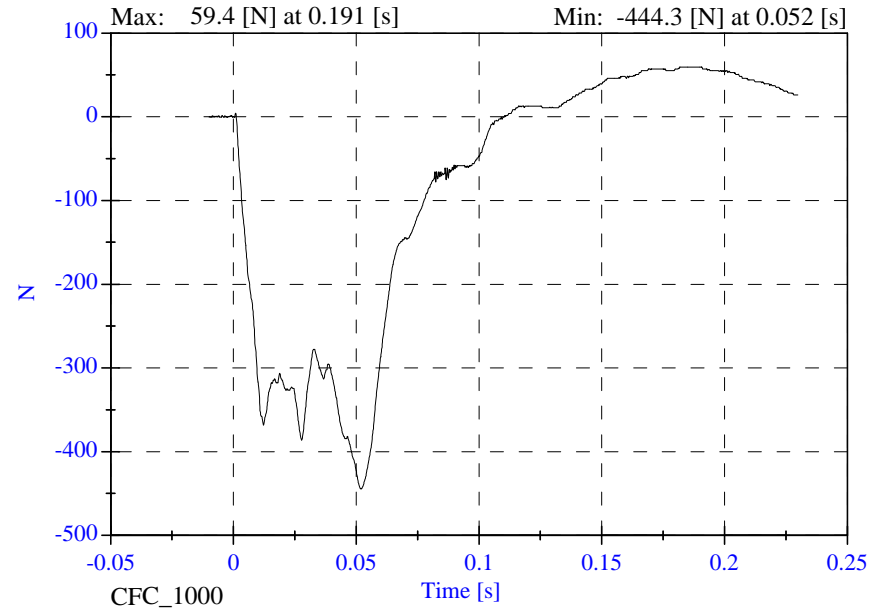
044 Neck Flexion

Neck Moment Y

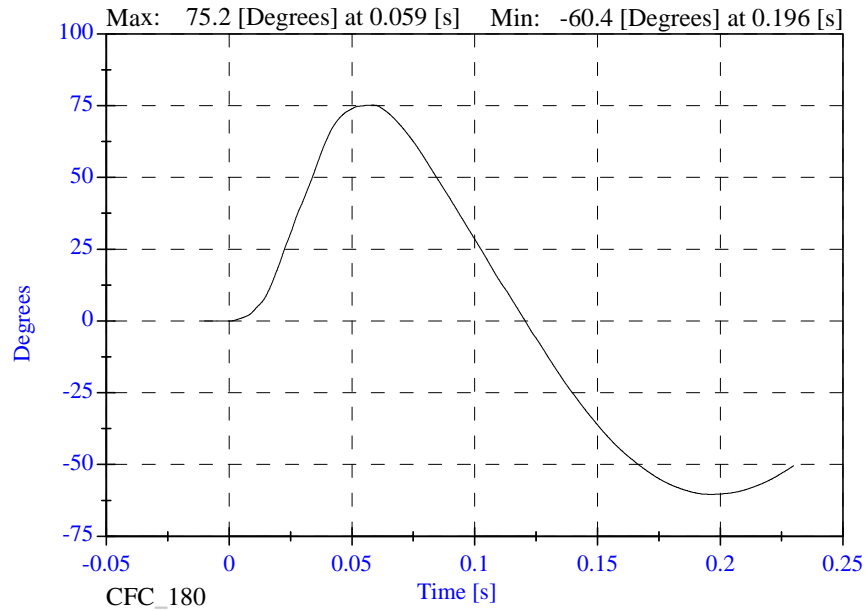


70 - 01-27-03

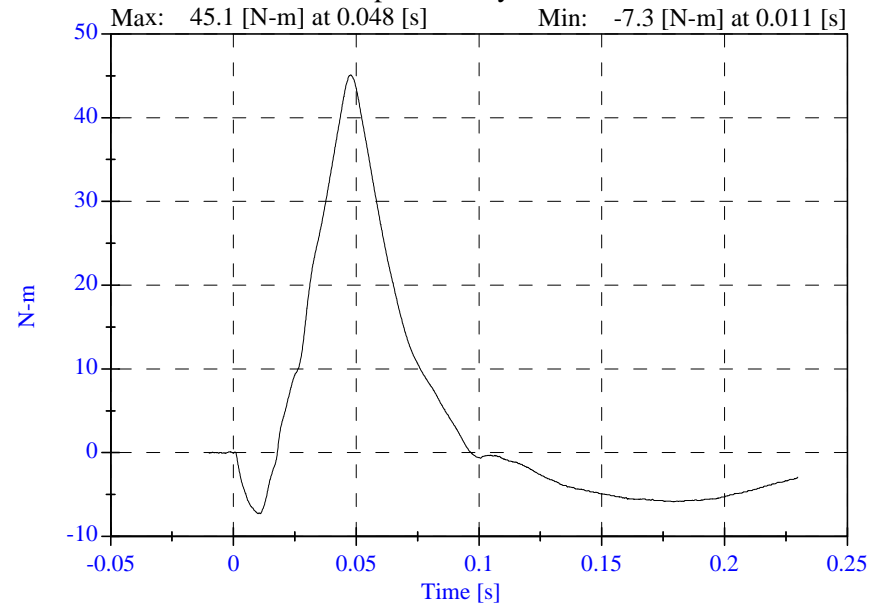
Neck Force X



Total Rotation



Occipital Condyle Moment



044 Neck Extension

Part 572P Neck Extension Test Calibration Date: 01-28-03
Serial No: 044 Work File: 044Ext3 01-28-03

-----TEST RESULTS-----

<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	69.0-72.0 F	71.00 F	Passed
Lab Humidity:	10-70 %	31.00 %	Passed
Test Pendulum Speed:	11.58-12.38 ft/s	12.05 ft/s	Passed

-----PENDULUM PULSE-----

Pulse at 6 ms:	3.30- 4.60 ft/s	3.69 ft/s	Passed
Pulse at 10 ms:	6.20- 8.20 ft/s	6.62 ft/s	Passed
Pulse at 14 ms:	9.20-11.50 ft/s	9.32 ft/s	Passed

-----D PLANE ROTATION-----

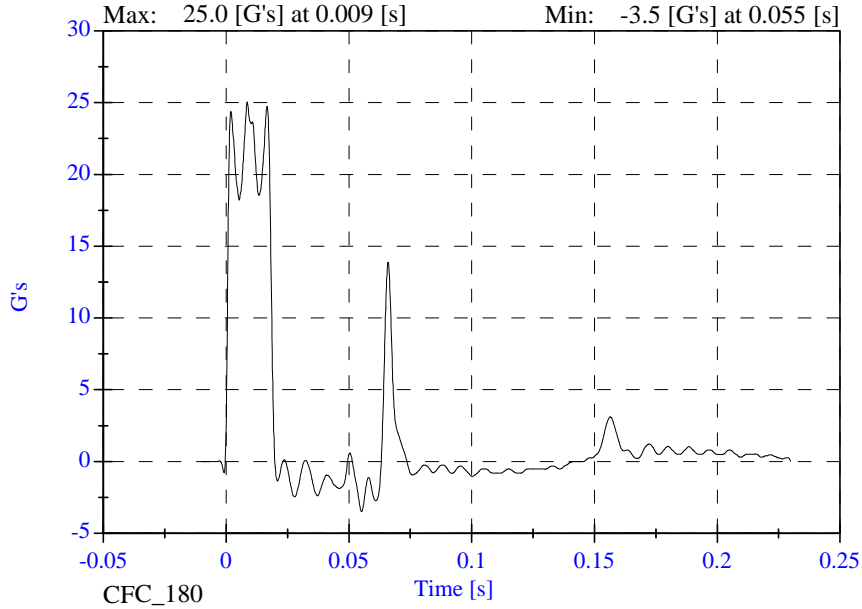
Maximum Rotation:	83.0-93.0 Deg	83.96 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

Max Occipital Moment:	-53.30--43.70 N-m	-51.96 N-m	Passed
Occipital Moment Decay:	60.0-80.0 ms	74.40 ms	Passed

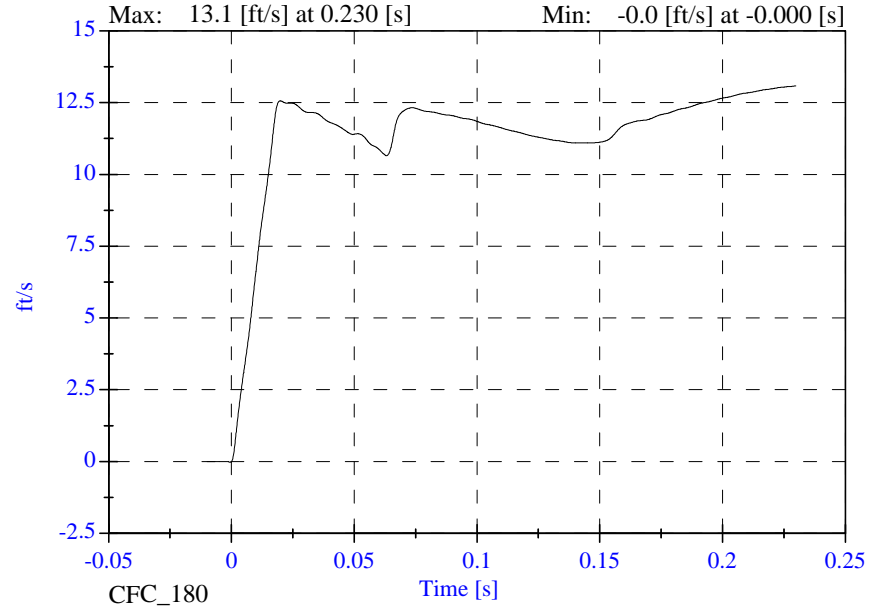
044 Neck Extension

Pendulum Acceleration

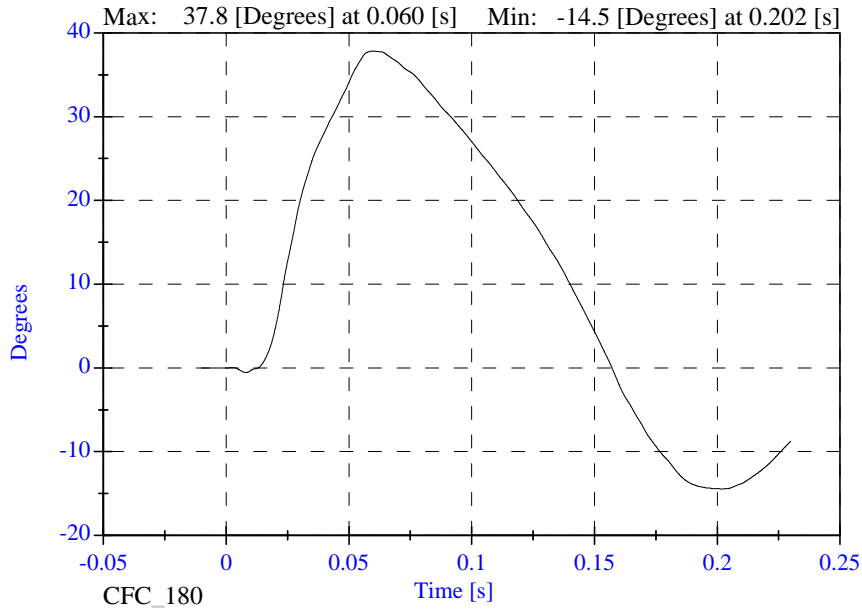


71 - 01-28-03

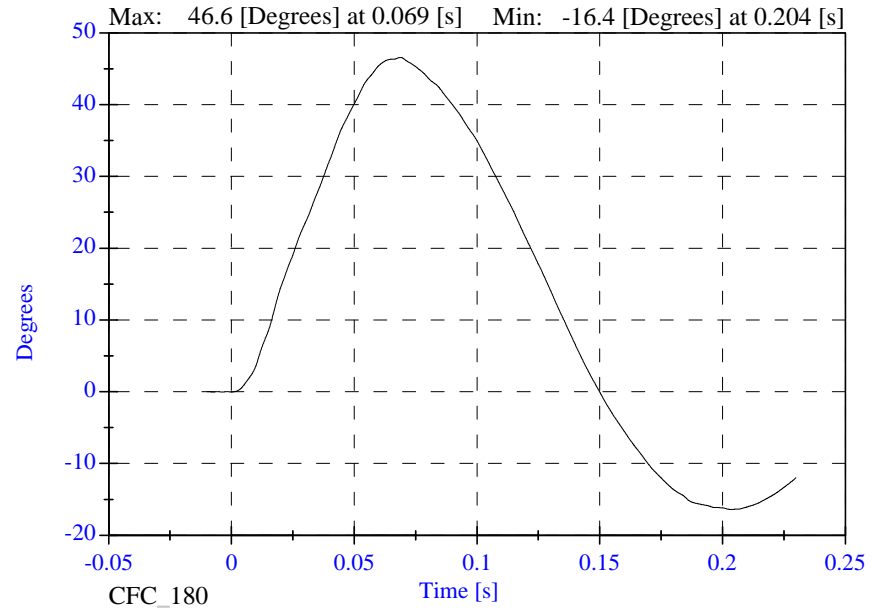
Pendulum Velocity



Head Rotation

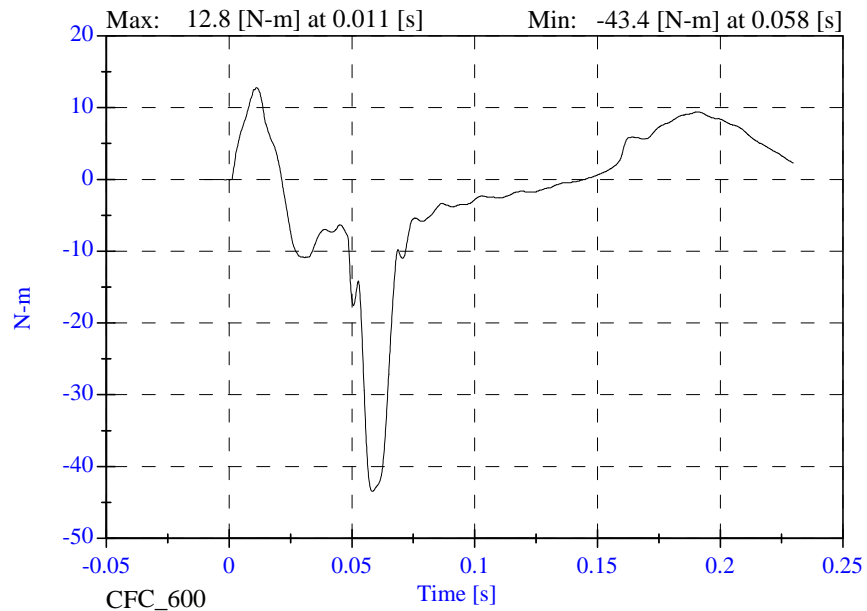


Arm Rotation



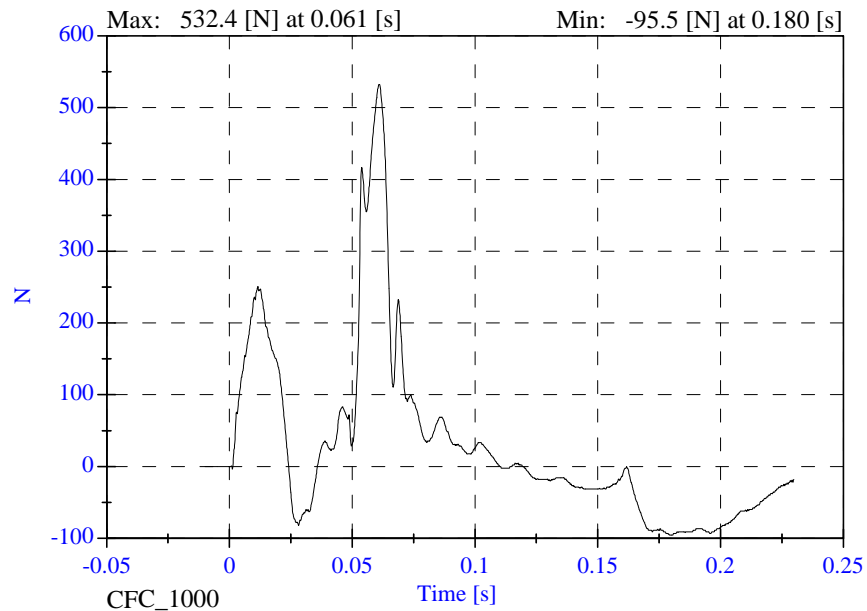
044 Neck Extension

Neck Moment Y

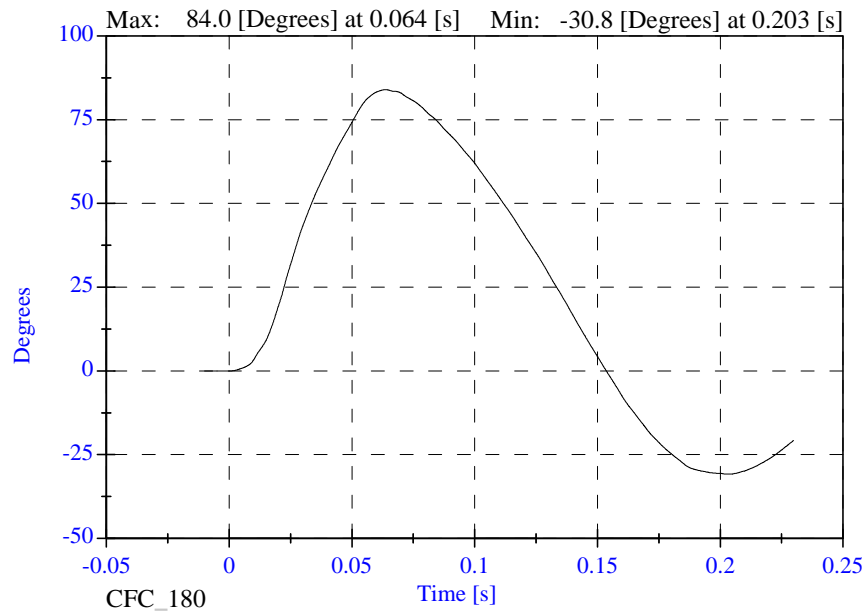


71 - 01-28-03

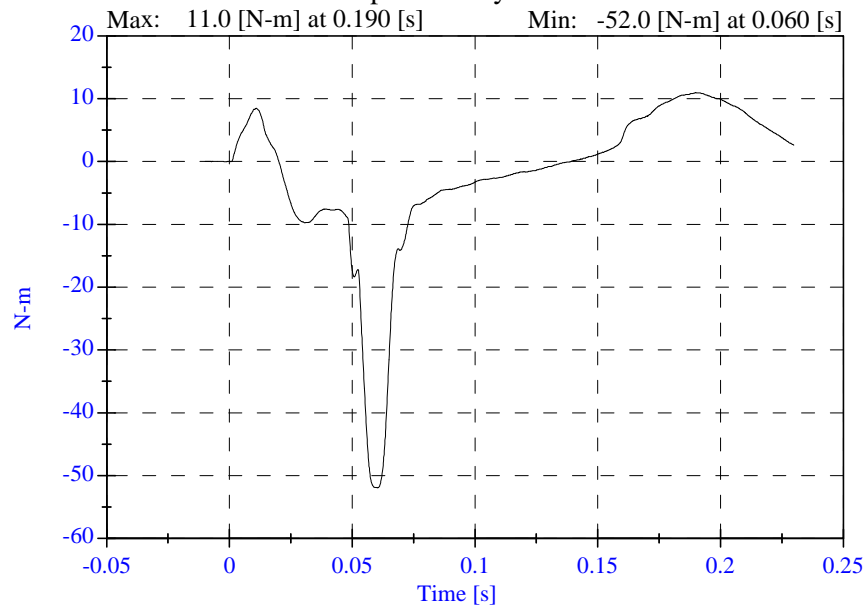
Neck Force X



Total Rotation



Occipital Condyle Moment



044 Chest Impact

Part 572P Thorax Impact

Calibration Date: 01-28-03

Serial No: 044

Work File: 044T1 01-28-03

-----TEST RESULTS-----

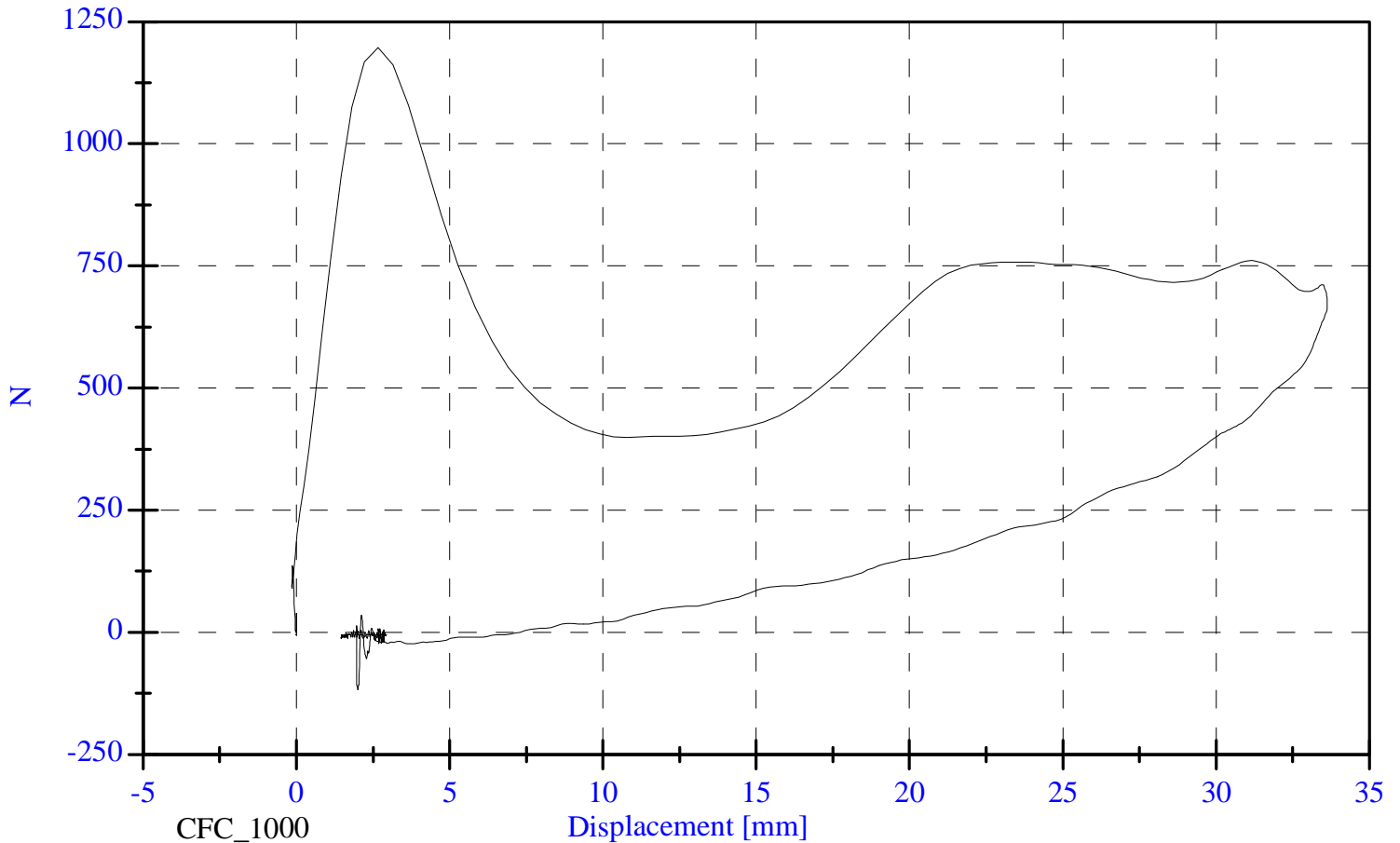
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	20.6-22.2 C	21.1 C	Passed
Lab Humidity:	10-70 %	33.00 %	Passed
Pendulum Velocity:	5.90- 6.10 m/s	5.94 m/s	Passed
Maximum Deflection:	32.00-38.00 mm	33.62 mm	Passed
Maximum Res. Force:	680.00- 810.00 N	740.30 N	Passed
Internal Hysteresis:	65-85 %	76.47 %	Passed
Pass Sternum Force Criteria?:	860.00 N	760.89	Passed

044 Chest Impact

Probe Force vs. Displacement

Max: 1196.8 [N] at 2.669 [mm]

Min: -117.8 [N] at 2.005 [mm]



044 Lumbar Spi ne Fl exi on Spi ne_Fl exi on_test. txt

Date: 1-28-03

Result: 45 degrees - 38.8 lbf

Certified By: B. Swiecki Date: 01-28-03

182 Head Drop
Part 572N Head Drop
Part 572N Serial No: 182
Calibration Date: 02-18-03
Work File: 182H2 02-18-03

-----Head Test Results-----

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	32.00 %	Passed
Peak Resultant Accel.:	245-300 Gs	273.34 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	14.82 Gs	Passed
Curve PerCent NonModal:	< 10%	4.64 %	Passed

Certified By:  _____

Date: 2-19-03

Neck Extension

Part 572N Neck Extension Test

Part 572N Serial No: 182

Calibration Date: 02-19-03

Work File: 182NE2 02-19-03

-----Neck Test Results-----

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	69.0-72.0 F	70.00 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Test Pendulum Speed:	13.70-14.50 ft/s	13.80 ft/s	Passed

-----Pendulum Pulse-----

Pulse at 10 ms:	3.30- 4.60 ft/s	4.39 ft/s	Passed
Pulse at 20 ms:	7.20- 9.80 ft/s	9.02 ft/s	Passed
Deceleration at 30 ms:	10.50-13.80 ft/s	13.19 ft/s	Passed

-----D Plane Rotation-----

Maximum Rotation:	85.0-103.0 Deg	99.27 Deg	Passed
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-----Moment About the Occipital Condyle-----

Max Occipital Moment:	-17.70--14.00 ft-lbf	-16.02 ft-lbf	Passed
Occipital Moment Decay:	123.0-147.0 ms	137.40 ms	Passed

Certified By: 

Date: 2-19-03

Neck Flexion

Part 572N Neck Flexion Test

Part 572N Serial No: 182

Calibration Date: 02-19-03

Work File: 182N5 02-19-03

-----Neck Test Results-----

TEST CONDITION	PARAMETERS	RESULTS	STATUS
Lab Temperature:	69.0-72.0 F	70.00 F	Passed
Lab Humidity:	10-70 %	35.00 %	Passed
Test Pendulum Speed:	15.80-16.60 ft/s	16.32 ft/s	Passed

-----Pendulum Pulse-----

Pulse at 10 ms:	3.90- 5.30 ft/s	5.29 ft/s	Passed
Pulse at 20 ms:	7.90-11.20 ft/s	10.46 ft/s	Passed
Deceleration at 30 ms:	12.50-16.40 ft/s	14.85 ft/s	Passed

-----D Plane Rotation-----

Maximum Rotation:	74.0-92.0 Deg	88.86 Deg	Passed
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-----Moment About the Occipital Condyle-----

Max Occipital Moment:	19.90- 24.30 ft-lbf	22.30 ft-lbf	Passed
Occipital Moment Decay:	103.0-123.0 ms	112.40 ms	Passed

Certified By:  _____

Date: 2-19-03

Thorax Impact

Part 572N Thorax Impact

Calibration Date: 02-19-03

Serial No: 182

Work File: 182C1 02-19-03

-----TEST RESULTS-----

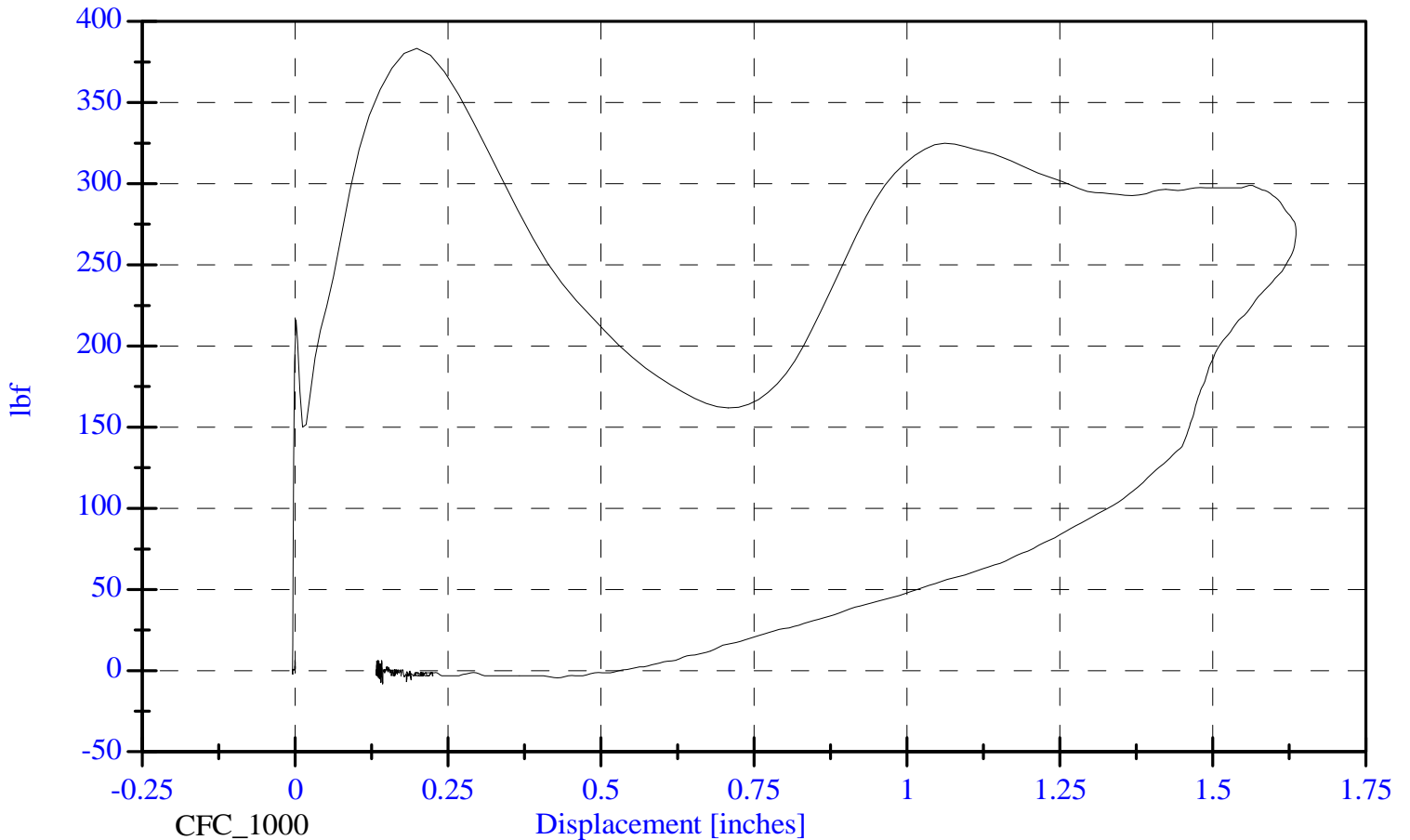
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	69.0-72.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	29.00 %	Passed
Pendulum Velocity:	21.60-22.40 ft/s	21.80 ft/s	Passed
Maximum Deflection:	1.50- 1.80 inche	1.64 inche	Passed
Maximum Res. Force:	259.00- 310.00 lbf	298.89 lbf	Passed
Internal Hysteresis:	65-85 %	80.37 %	Passed
Pass Sternum Force Criteria?:	105 %	100.00 %	Passed

Thorax Impact

Probe Force vs. Displacement

Max: 383.3 [lbf] at 0.199 [incl

Min: -8.2 [lbf] at 0.143 [inche



182 Lumbar Spine Flexion

Date: 02-20-03

Result: 45 degrees - 42.0 lbf

Certified By: B.Swiecicki Date: 02-20-03

SECTION 6

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572 HYBRID III 3C INSTRUMENTATION

	POSITION #3 (RIGHT) SERIAL NO.: 044		
	MANUFACTURER	SERIAL NUMBER	CALIBRATION DATE
HEAD AX	ENDEVCO	AC-P17912	11-Nov-02
HEAD AY	ENDEVCO	AC-P17743	11-Nov-02
HEAD AZ	ENDEVCO	AC-P15319	11-Nov-02
UPPER NECK FX	DENTON	LC-248-FX	15-Oct-02
UPPER NECK FY	DENTON	LC-248-FY	15-Oct-02
UPPER NECK FZ	DENTON	LC-248-FZ	15-Oct-02
UPPER NECK MX	DENTON	LC-248-MX	15-Oct-02
UPPER NECK MY	DENTON	LC-248-MY	15-Oct-02
UPPER NECK MZ	DENTON	LC-248-MZ	15-Oct-02
LOWER NECK FX	DENTON	LC-249-FX	15-Oct-02
LOWER NECK FY	DENTON	LC-249-FY	15-Oct-02
LOWER NECK FZ	DENTON	LC-249-FZ	15-Oct-02
LOWER NECK MX	DENTON	LC-249-MX	15-Oct-02
LOWER NECK MY	DENTON	LC-249-MY	15-Oct-02
LOWER NECK MZ	DENTON	LC-249-MZ	15-Oct-02
CHEST AX	ENDEVCO	AC-P15334	11-Nov-02
CHEST A Y	ENDEVCO	AC-P15321	11-Nov-02
CHEST AZ	ENDEVCO	AC-P17758	11-Nov-02
CHEST DISPLACEMENT X	SERVO	DS-044	12-Nov-02
PELVIS AX	ENDEVCO	AC-P16755	11-Nov-02
PELVIS AY	ENDEVCO	AC-P15591	11-Nov-02
PELVIS AZ	ENDEVCO	AC-P16155	11-Nov-02
TETHER F	LEBOW	LC-706	12-Jun-03

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572 HYBRID III 6C INSTRUMENTATION

	POSITION #4 (LEFT) SERIAL NO.: 144		
	MANUFACTURER	SERIAL NUMBER	CALIBRATION DATE
HEAD AX	ENTRAN	AC-02I02I10-N25	13-Nov-02
HEAD AY	ENTRAN	AC-02I02I10-N09	13-Nov-02
HEAD AZ	ENTRAN	AC-02I02I10-N17	13-Nov-02
UPPER NECK FX	DENTON	LC-1037Fx	05-Dec-02
UPPER NECK FY	DENTON	LC-1037Fy	05-Dec-02
UPPER NECK FZ	DENTON	LC-1037Fz	05-Dec-02
UPPER NECK MX	DENTON	LC-1037Mx	05-Dec-02
UPPER NECK MY	DENTON	LC-1037My	05-Dec-02
UPPER NECK MZ	DENTON	LC-1037Mz	05-Dec-02
CHEST AX	ENTRAN	AC-02I02I10-N04	14-Nov-02
CHEST AY	ENTRAN	AC-02I02I10-N15	14-Nov-02
CHEST AZ	ENTRAN	AC-02I02I24-N07	14-Nov-02
CHEST DISPLACEMENT X	SERVO	DS-144	22-Jan-03
PELVIS AX	ENTRAN	AC-02I02I10-N01	13-Nov-02
PELVIS AY	ENTRAN	AC-02I02I10-N02	13-Nov-02
PELVIS AZ	ENTRAN	AC-02A16-A28	12-Dec-02
LAP BELT LOAD	LEBOW	LC-707	12-Jun-03
TORSO BELT STRETCH	CAL	DS-E7	10-Jun-03

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

P572 HYBRID III 6C INSTRUMENTATION

	POSITION #6 (CENTER) SERIAL NO.: 182		
	MANUFACTURER	SERIAL NUMBER	CALIBRATION DATE
HEAD AX	ENDEVCO	AC-AGN83	16-Jan-03
HEAD AY	ENDEVCO	AC-ACC63	16-Jan-03
HEAD AZ	ENDEVCO	AC-AJ4Y5	16-Jan-03
UPPER NECK FX	DENTON	LC-1563Fx	07-Jan-03
UPPER NECK FY	DENTON	LC-1563Fy	07-Jan-03
UPPER NECK FZ	DENTON	LC-1563Fz	07-Jan-03
UPPER NECK MX	DENTON	LC-1563Mx	07-Jan-03
UPPER NECK MY	DENTON	LC-1563My	07-Jan-03
UPPER NECK MZ	DENTON	LC-1563Mz	07-Jan-03
CHEST AX	ENDEVCO	AC-ACC02	13-Jan-03
CHEST AY	ENDEVCO	AC-AKAA4	16-Jan-03
CHEST AZ	ENDEVCO	AC-AJ4R6	15-Jan-03
CHEST DISPLACEMENT X	SERVO	DS-182	11-Feb-03
PELVIS AX	ENTRAN	AC-AJ4G1	16-Jan-03
PELVIS AY	ENDEVCO	AC-AJ7H0	16-Jan-03
PELVIS AZ	ENDEVCO	AC-J20047	16-Jan-03
LAP BELT LOAD	LEBOW	LC-711	12-Jun-03
TORSO BELT STRETCH	CAL	DS-E9	10-Jun-03

REMARKS: None

TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

CHILD RESTRAINT INSTRUMENTATION

	MANUFACTURER	SERIAL NUMBER	CALIBRATION DATE
Position #3 CRS	GS SENSORS	9440-011	6/10/2003
Position #4 CRS	GS SENSORS	9440-027	6/2/2003

REMARKS: None