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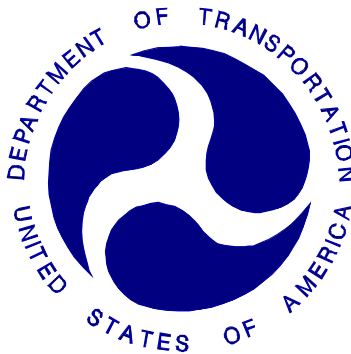
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

VOLVO GOTHENBURG SWEDEN
2003 VOLVO XC90
4-DOOR MPV

NHTSA NUMBER: M35900

VERIDIAN TEST NUMBER: 8642-NCAP-33

VERIDIAN ENGINEERING
TRANSPORTATION SCIENCES CENTER
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February 26, 2003

FINAL REPORT

PREPARED FOR:

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Rulemaking
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16. Abstract A frontal load cell barrier test of a 2003 Volvo XC90 4-Door MPV was performed at Veridian Engineering crash test facility in Buffalo, New York, on February 26, 2003. The impact velocity was 56.49 kph and the temperature at the barrier face was 20 °C. The maximum post-test vehicle crush was 329 mm. The test vehicle was equipped with 3-point restraint systems with torso belt pretensioners and load limiters, knee bolsters, whiplash protection systems, and airbags at both the driver and right outboard passenger seating positions. With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appeared to comply with head, chest, and femur requirements.					
ATD Position	HIC	Clip (g's)	Chest Disp (mm)	Left Femur (N)	Right Femur (N)
Driver (150)	609.0	49.7	31.7	6808.6	9855.3
Passenger (245)	390.9	58.0	35.7	3818.9	4420.2
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 56.49 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-01-D-32005. 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 56.49 kph frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Indicant Test procedure.

1.2 TEST PROCEDURE

This 56.49 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 (M35108 and M30208) previous to this test 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 2003 Volvo XC90 4-Door MPV at a velocity of 56.49 kph. The test was performed at Veridian Engineering on February 26, 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	609.0	49.7	31.7	6808.6	9855.3	-	-
Passenger ATD	390.9	58.0	35.7	3818.9	4420.2	-	-

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 329 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 back of the head to the left of center of the headrest, 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 center of the airbag, the top of the head to the right side rail headliner, the back of the head to the right of center of the headrest, the chest to the airbag and the left and right knee to the knee bolster.

The 2003 Volvo XC90 4-Door 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.:	M35900	Test Mode:	56.3 kph Frontal Barrier
Test Date:	February 26, 2003	Time:	14:20
		Temperature:	20 °C
Vehicle Make/Model/Body Style:	2003 Volvo XC90 4-Door MPV		
Vehicle Test Weight:	2386.0	kg	
Vehicle/Barrier Impact Angle:	0	°	
Impact Velocity:	56.49	kph	
Maximum Static Crush:	329	mm	
Vehicle Rebound:	796	mm	
<u>DUMMIES:</u>		<u>DRIVER</u>	<u>PASSENGER</u>
Type:		572E	572E
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	
<u>DOOR OPENING DATA:</u>	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)		18 mm forward	21 mm forward
Seat Back Failure:		None	None
<u>VISIBLE DUMMY CONTACT POINTS:</u>		<u>DRIVER</u>	<u>PASSENGER</u>
Head:		The face to the center of the airbag, the back of the head to the left of center of the headrest	The face to the right of center of the airbag, the top of the head to the right side rail headliner, the back of the head to the right of center of the headrest.
Abdomen:		-	-
Chest:		Airbag	Airbag
Knees:		Knee Bolster	Knee Bolster

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2003 Volvo XC90 4-Door MPV

NHTSA No. : M35900 ; VIN: YV1CZ91H631003540 ; Color: White

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

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

Transmission Data: 4 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: 1/20/2003 ; Odometer Reading 182 km

Selling Dealer: Jim Culligan, Inc.

& Address: 8129 Main Street Williamsville, NY 14231

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Volvo Gothenburg Sweden

Date of Manufacture 10/02

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: 240 kPa; Rear: 240 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) = 550.0 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>507.0</u>	kg
Left Front	=	<u>573.0</u>	kg	Left Rear	=	<u>512.5</u>	kg
TOTAL FRONT	=	<u>1147.0</u>	kg	TOTAL REAR	=	<u>1019.5</u>	kg
TOTAL DELIVERED WEIGHT	=	<u>2166.5</u>	kg				
% of Total Front of Vehicle Weight	=	<u>52.9%</u>		% of Total Rear Weight	=	<u>47.1%</u>	%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW)	=	<u>2166.5</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>2392.2</u>	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND

67.5

KG OF CARGO WEIGHT:

Right Front	=	<u>617.5</u>	kg	Right Rear	=	<u>578.0</u>	kg
Left Front	=	<u>625.5</u>	kg	Left Rear	=	<u>565.0</u>	kg
TOTAL FRONT	=	<u>1243.0</u>	kg	TOTAL REAR	=	<u>1143.0</u>	kg
TOTAL TEST WEIGHT	=	<u>2386.0</u>	kg				
% of Total Front Weight	=	<u>52.1%</u>	%	% of Total Rear Weight	=	<u>47.9%</u>	%
Weight of Ballast Secured in Vehicle Trunk Area	=	<u>0</u>	kg				
Vehicle Components Removed for Weight Reduction:		<u>Spare tire, third row seat, muffler, 20 L Stoddard</u>					

VEHICLE ATTITUDE (all dimension in millimeters):

AS DELIVERED:	RF	<u>810</u>	LF	<u>809</u>	RR	<u>835</u>	LR	<u>835</u>
FULLY LOADED:	RF	<u>805</u>	LF	<u>803</u>	RR	<u>812</u>	LR	<u>812</u>
AS TESTED:	RF	<u>805</u>	LF	<u>803</u>	RR	<u>821</u>	LR	<u>818</u>
Vehicle's Wheel Base:		<u>2850</u>	mm					
Location of Vehicle's C.G.:		<u>1365</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>45.4</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>
Details of Fuel System:	<u>Fuel tank – centered ahead of rear axle; Fuel lines – along right frame stiffener;</u>		
Fuel Filler	<u>– 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: February 26, 2003 Time: 14:20 Temperature: 20 °C
Vehicle NHTSA No.: M35900
Required Impact Velocity Range: 55.5 to 57.1 kph

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

Trap No. 1 = 56.49 kph; Trap No. 2 = 56.49 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 = <u>4771</u> ; C/L = <u>4807</u> ; Right = <u>4767</u>
Post-Test	Left = <u>4482</u> ; C/L = <u>4482</u> ; Right = <u>4496</u>
Crush	Left = <u>289</u> ; C/L = <u>325</u> ; Right = <u>271</u>
AVERAGE	= <u>295</u> mm

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point:

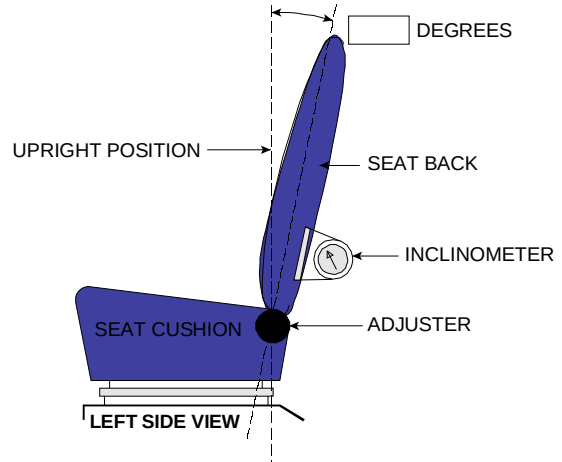
	Left = <u>793</u> ; C/L = <u>793</u> ; Right = <u>802</u>
AVERAGE	= <u>796</u> mm

DATA SHEET NO. 4 TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2003 Vehicle Model: Volvo XC90 Body Style : 4-Door 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.

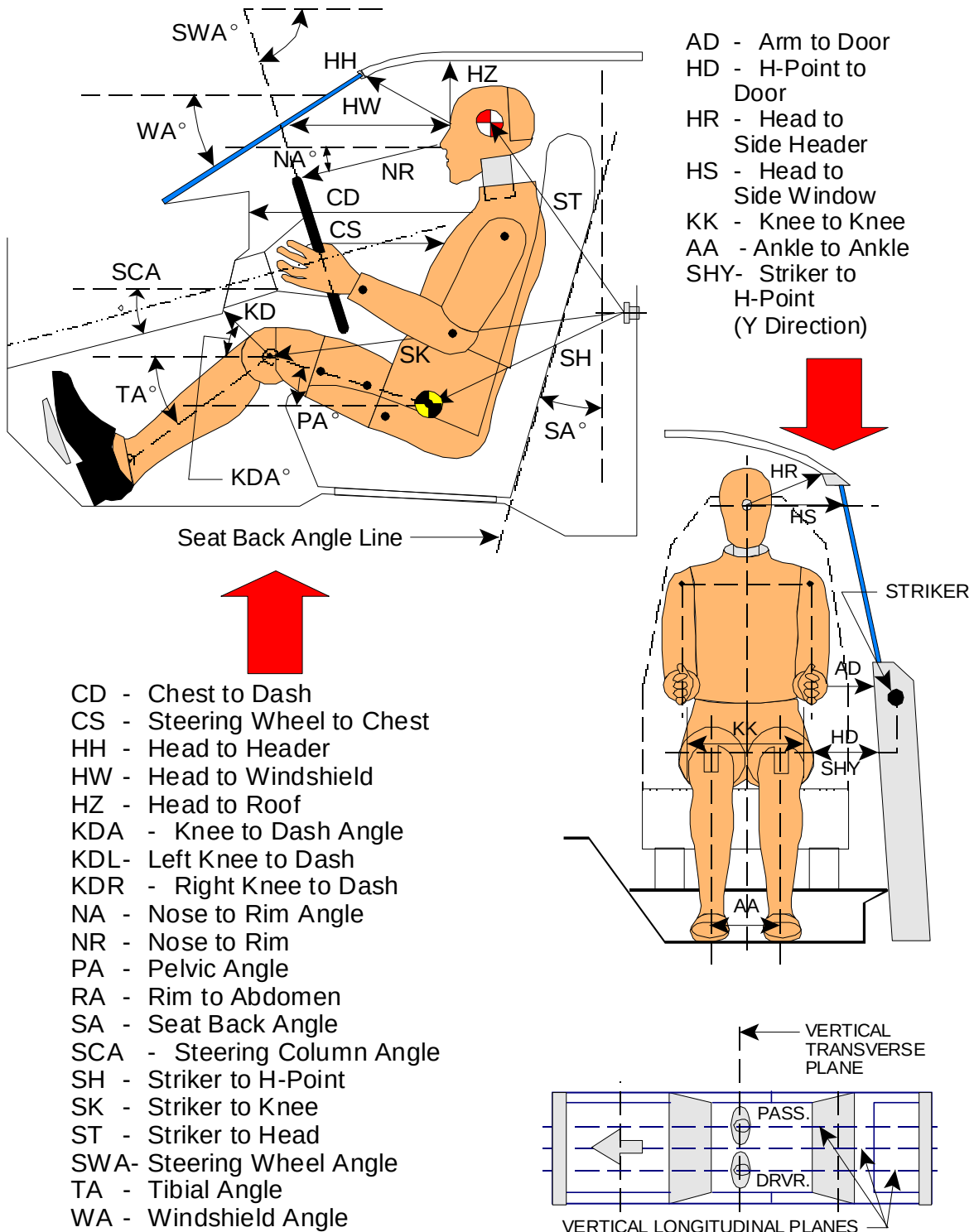
Operational Instructions: Place steering column in mid tilt and telescope position (angle should

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



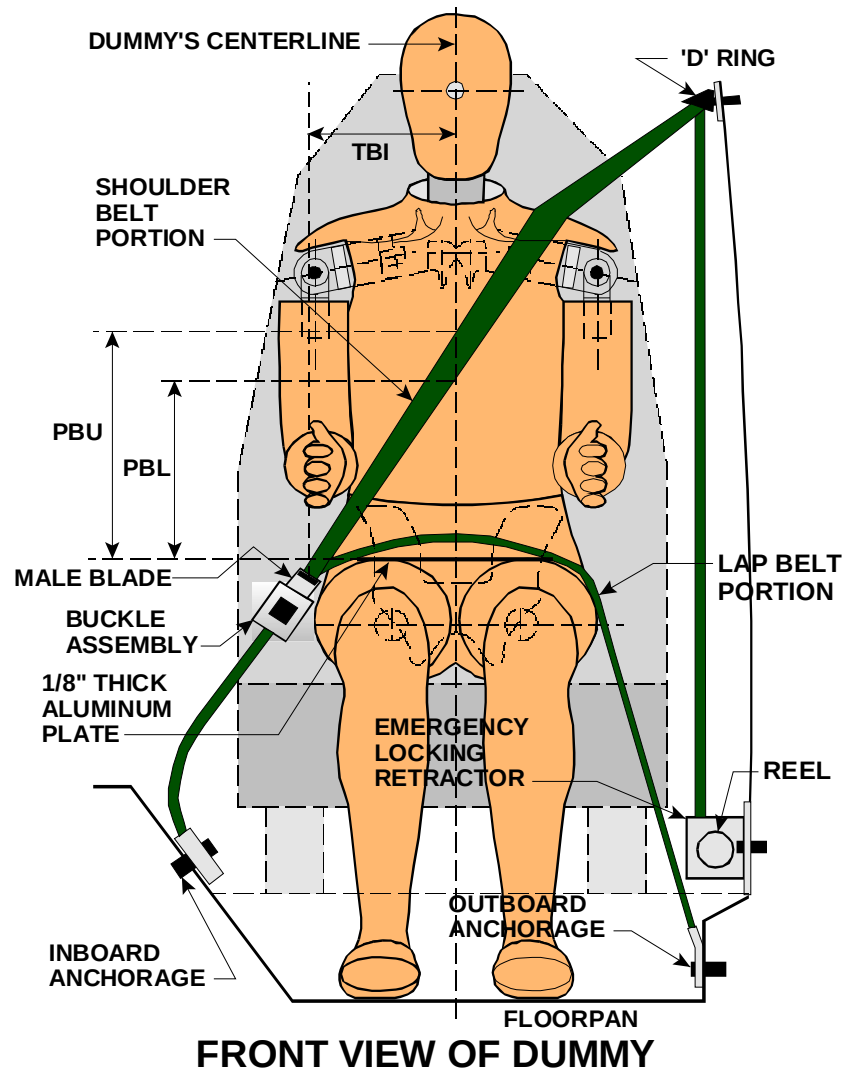
DATA SHEET NO. 5 FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #150)			PASS. (Serial #245)		
WA ^o	26.6 deg.			N/A		
SWA ^o	63.0 deg.			N/A		
SCA ^o	27.0 deg.			N/A		
SA ^o	19.0 deg.			19.0 deg.		
HZ	194			190		
HH	340			325		
HW	658			655		
HR	210			210		
NR	432	Angle	-12 deg.	N/A		
CD	552			538		
CS	305			N/A		
RA	194			N/A		
KDL	179	Angle (KDA)	34 deg.	168		
KDR	160			175	Angle (KDA)	28 deg.
PA ^o	22.4 deg.			24.2 deg.		
TA ^o	49.3 deg.			46.9 deg.		
KK	320			273		
AA	315			230		
ST	557	Angle	4 deg.	545	Angle	12 deg.
SK	600	Angle	92 deg.	612	Angle	96 deg.
SH	245	Angle	120 deg.	250	Angle	128 deg.
SHY	235			240		
HS	308			308		
HD	131			125		
AD	113			104		

Dimensions in millimeters

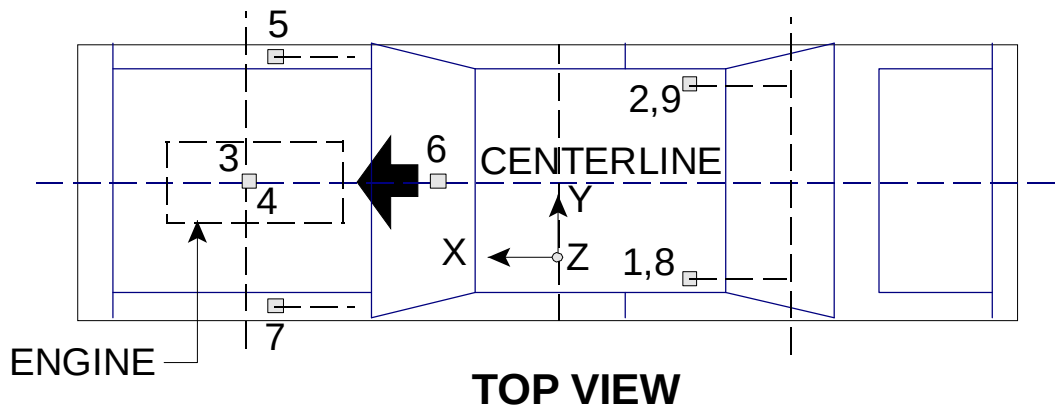
DATA SHEET NO. 6 SEAT BELT POSITIONING DATA

SEAT BELT POSITIONING DATA

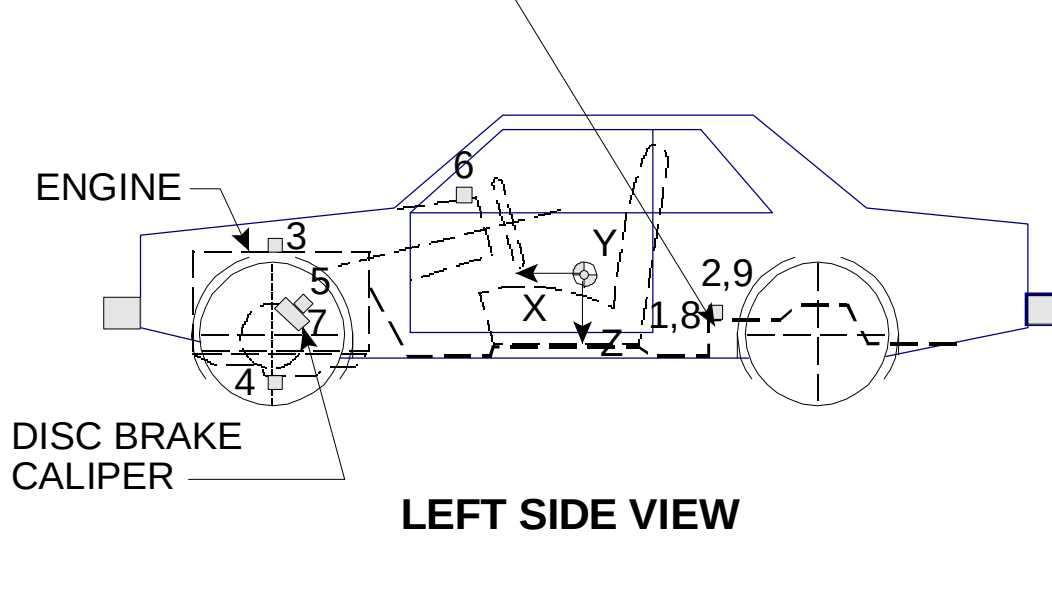


	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	360	360
PBL-- Top surface of alum. plate to belt lower edge	280	280
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

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	1442	-646	-620
2	Right Rear Seat Cross Member X	1440	648	-615
3	Top of Engine Block	3942	243	-834
4	Bottom of Engine	3599	-7	-276
5	Disc Brake Caliper @ Right Side	4022	884	-429
6	Instrument Panel	3200	-103	-1032
7	Disc Brake Caliper @Left Side	4020	-888	-433
8	Left Rear Seat Cross Member Z	1442	-646	-620
9	Right Rear Seat Cross Member Z	1440	648	-615

LOCATION NUMBER	DESCRIPTION	MAXIMUM VALUE (g's)			
		Pos.	msec.	Neg.	msec.
1	Left Rear Seat Cross Member X	5.1	143.7	-44.2	35.1
2	Right Rear Seat Cross Member X	2.0	102.0	-40.5	36.3
3	Top of Engine Block	*	*	*	*
4	Bottom of Engine	244.6	36.1	-153.8	28.3
5	Disc Brake Caliper @ Right Side	7.8	77.8	-86.6	26.8
6	Instrument Panel	29.3	66.3	-70.5	48.9
7	Disc Brake Caliper @Left Side	8.2	77.7	-67.9	25.4
8	Left Rear Seat Cross Member Z	10.6	64.2	-12.0	35.1
9	Right Rear Seat Cross Member Z	6.7	76.5	-16.9	30.2

* - Data is not accurate after 22 ms

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES

Vehicle Year/Make/Model/Body Style: 2003 Volvo XC90 4-Door MPV

NHTSA Test No.: M35900 Test Date: February 26, 2003

		MAXIMUM VALUE							
		Driver				Passenger			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Head 9 Array X Arm Y	g	5.1	38.2	-4.8	74.8	12.9	50.8	-12.4	58.5
Head 9 Array X Arm Z	g	31.1	43.2	-24.0	77.6	35.5	180.5	-16.9	193.8
Head 9 Array Y Arm X	g	39.6	176.2	-62.6	71.7	23.3	185.9	-50.8	66.5
Head 9 Array Y Arm Z	g	27.5	47.5	-28.6	76.2	28.1	42.2	-7.3	79.7
Head 9 Array Z Arm X	g	65.7	175.0	-58.5	56.0	55.9	182.9	-54.0	59.9
Head 9 Array Z Arm Y	g	4.3	169.6	-6.2	91.9	9.1	53.0	-7.9	64.2
Head X	g	41.0	176.1	-61.9	71.7	24.7	186.9	-51.0	70.3
Head Y	g	3.2	53.4	-3.9	16.6	8.2	50.8	-7.6	85.7
Head Z	g	26.4	61.0	-28.9	77.4	26.3	47.5	-3.7	79.4
Head Resultant	g	64.5	75.4	0.0	-48.2	51.8	70.3	0.1	-10.3
Redundant Head X	g	41.5	176.0	-62.4	71.7	25.0	186.9	-48.8	71.3
Redundant Head Y	g	3.3	16.4	-4.4	42.2	8.2	50.8	-8.4	85.2
Redundant Head Z	g	26.9	61.0	-29.1	77.0	26.8	42.3	-3.5	81.0
Redundant Head Resultant	g	64.8	75.4	0.0	-43.6	50.1	71.3	0.1	-18.7
Upper Neck Fx	N	1455.2	76.0	-548.2	190.9	958.0	60.8	-527.0	42.1
Upper Neck Fy	N	120.5	58.5	-118.8	41.2	208.3	46.6	-162.2	111.0
Upper Neck Fz	N	1669.5	61.6	-1392.2	181.7	1676.9	47.1	-1448.0	198.2
Upper Neck F Resultant	N	1910.4	61.1	2.2	-47.5	1724.8	47.1	4.4	-12.4
Upper Neck Mx	N-m	6.5	131.6	-9.8	51.0	25.9	74.4	-12.2	117.8
Upper Neck My	N-m	93.5	53.9	-16.0	109.8	76.3	60.4	-15.7	42.1
Upper Neck Mz	N-m	3.8	179.3	-3.9	49.4	14.9	90.0	-6.7	131.1
Upper Neck M Resultant	N-m	93.7	53.9	0.0	-32.8	77.5	60.3	0.1	-23.8
Chest X	g	3.4	188.9	-50.4	74.1	3.1	249.8	-58.6	61.5
Chest Y	g	5.2	80.3	-5.2	44.1	5.0	38.7	-7.0	65.8
Chest Z	g	10.8	47.1	-8.8	89.4	11.7	40.4	-12.3	63.5
Chest Resultant	g	50.4	74.1	0.0	-11.1	59.4	61.7	0.0	-13.5

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

Vehicle Year/Make/Model/Body Style: 2003 Volvo XC90 4-Door MPV

NHTSA Test No.: M35900 Test Date: February 26, 2003

		MAXIMUM VALUE							
		Driver				Passenger			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Redundant Chest X	g	3.5	189.0	-50.9	74.8	*	*	*	*
Redundant Chest Y	g	5.2	80.1	-5.5	43.8	**	**	**	**
Redundant Chest Z	g	10.3	46.7	-9.0	89.2	11.6	40.4	-12.8	63.6
Redundant Chest Resultant	g	50.9	74.8	0.0	-10.7	**	**	**	**
Chest Displacement	mm	0.0	8.8	-31.7	48.5	0.0	12.0	-35.7	62.2
Pelvic X	g	4.8	73.4	-98.0	43.8	7.1	78.6	-80.0	38.2
Pelvic Y	g	10.2	63.1	-13.7	40.6	11.3	38.3	-5.1	67.8
Pelvic Z	g	5.6	182.6	-38.4	62.7	5.5	199.1	-43.4	64.8
Pelvic Resultant	g	99.3	43.8	0.0	-49.5	80.7	38.2	0.1	-49.8
Left Femur	N	683.7	35.7	-6808.6	43.7	748.1	33.9	-3818.9	44.3
Right Femur	N	493.1	35.2	-9855.3	44.1	278.4	23.8	-4420.2	42.4
Left Upper Tibia Mx	N-m	55.1	46.7	-19.3	246.0	42.2	67.9	-25.4	87.2
Left Upper Tibia My	N-m	21.9	95.4	-140.8	43.6	12.9	179.8	-260.2	42.7
Left Lower Tibia Fz	N	102.3	174.2	-2143.8	27.2	150.1	206.0	-5333.3	42.5
Left Lower Tibia Mx	N-m	53.4	49.4	-9.5	61.2	46.7	67.8	-9.5	45.7
Left Lower Tibia My	N-m	36.9	82.2	-42.7	44.2	43.9	75.0	-102.4	40.7
Right Upper Tibia Mx	N-m	7.0	158.4	-42.1	41.5	49.2	42.5	-56.7	71.9
Right Upper Tibia My	N-m	20.7	183.3	-200.9	40.7	13.4	187.9	-193.3	43.0
Right Lower Tibia Fz	N	65.5	22.7	-4318.9	40.6	112.0	185.0	-4024.6	42.7
Right Lower Tibia Mx	N-m	7.1	40.0	-54.7	56.6	128.7	42.9	-19.8	36.6
Right Lower Tibia My	N-m	47.0	52.7	-194.7	37.5	70.5	72.4	-31.9	37.6
Left Foot Aft Ax	g	27.8	60.6	-60.2	26.0	23.0	70.9	-189.7	39.4
Left Foot Aft Az	g	6.2	48.7	-52.4	26.9	20.4	57.0	-117.5	39.5
Left Foot Fore Az	g	15.6	44.0	-62.2	26.1	50.5	53.0	-183.4	39.4
Right Foot Aft Ax	g	50.9	44.8	-272.7	36.4	22.2	75.3	-94.5	35.5
Right Foot Aft Az	g	12.7	51.0	-206.9	37.3	4.2	52.7	-73.2	39.8
Right Foot Fore Az	g	72.4	43.2	-474.0	37.0	***	***	***	***

* No Data Recorded

** Data is not accurate

***Data is clipped

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

Vehicle Year/Make/Model/Body Style: 2003 Volvo XC90 4-Door MPV

NHTSA Test No.: M35900 Test Date: February 26, 2003

HEAD INJURY CRITERIA (HIC)				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	609.0	56.5	87.6	52.1 g
Position #2 - Passenger	390.9	46.7	82.7	41.1 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	49.7	73.0	76.0	563.7
Position #2 - Passenger	58.0	60.2	63.2	590.0

* 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: 2003 Volvo XC90 4-Door MPV

NHTSA Test No.: M35900 Test Date: February 26, 2003

HEAD INJURY CRITERIA (HIC) REDUNDANT				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	611.7	56.5	87.7	52.1 g
Position #2 - Passenger	361.0	46.6	82.6	39.9 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	50.0	73.0	76.0	567.1
Position #2 - Passenger	58.0**	60.2	63.2	590.6

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

** Calculated using primary chest x and y accelerometers

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

1570

1570

Shoulder belt length as measured
on Part 572 Dummy.

910

910

Lap belt length as measured
on Part 572 Dummy.

660

660

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.

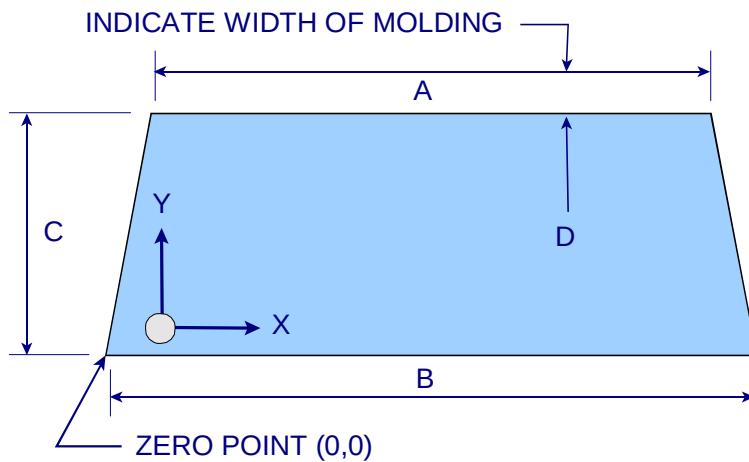
FMVSS 212 REQUIREMENTS:

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

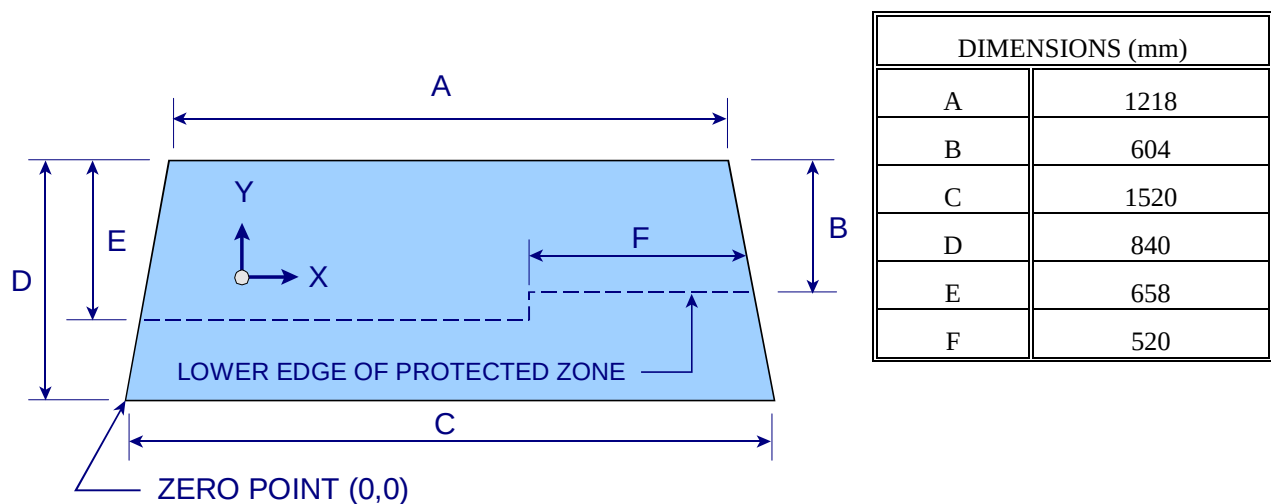
FAILURE DETAILS: None

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

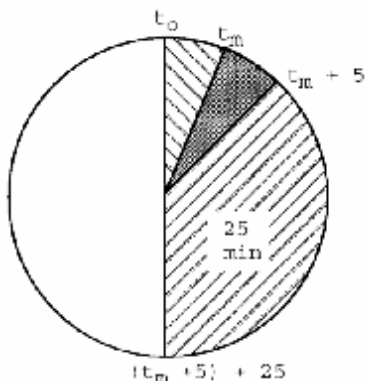
NHTSA TEST No.: M35900 TEST DATE: February 26, 2003
VEHICLE MAKE/MODEL: 2003 Volvo XC90 4-Door MPV

The test vehicle was filled from 92% to 94% of the manufacture'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

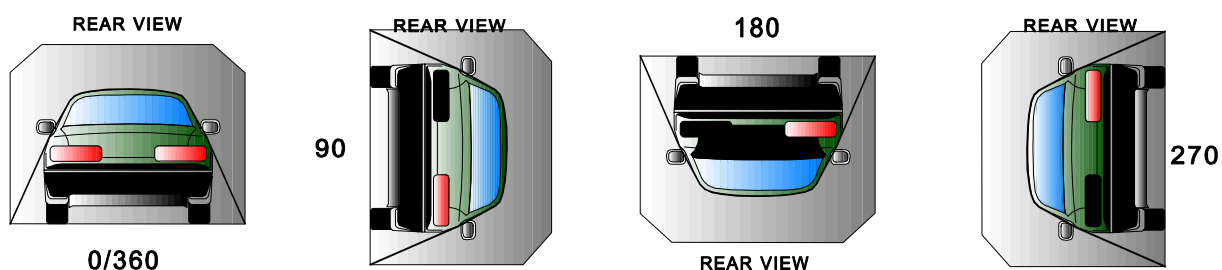
ACTUAL	MAX ALLOWED
0	28 g
0	141 g
0	28 g/min.

SOLVENT SPILLAGE DETAILS: None

DATA SHEET NO. 13 - ROLLOVER DATA

Vehicle: 2003 Volvo XC90 4-Door MPV

NHTSA No.: M35900



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	
0° - 90°	1	minutes	13	seconds	5	minutes	6	minutes	13	seconds	7	minutes
90° - 180°	1	minutes	05	seconds	5	minutes	6	minutes	5	seconds	7	minutes
180°-270°	1	minutes	00	seconds	5	minutes	6	minutes	0	seconds	7	minutes
270°-360°	1	minutes	14	seconds	5	minutes	6	minutes	14	seconds	7	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:

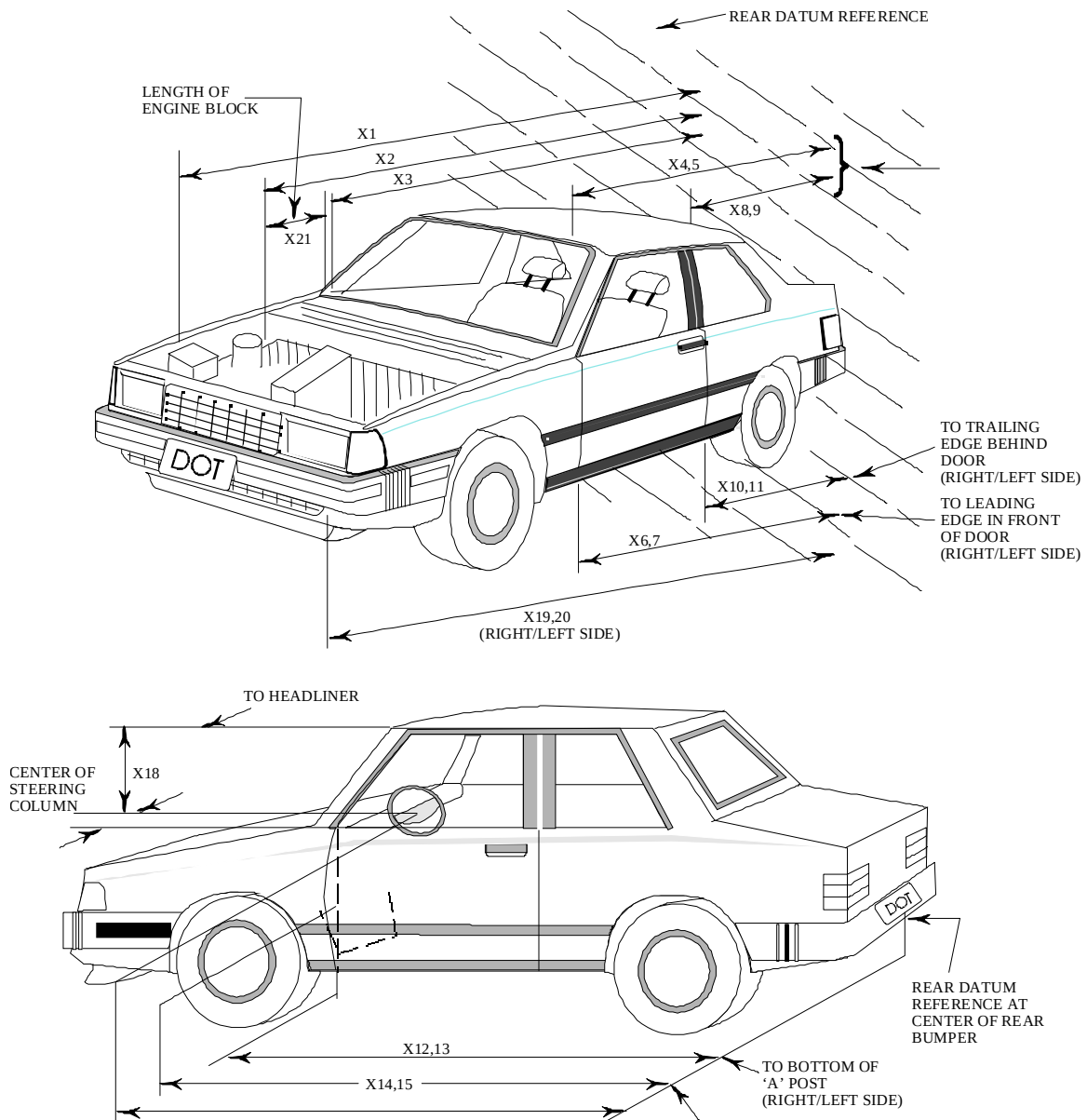
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180°-270°	0	0	0	N/A
270°-360°	0	0	0	N/A

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

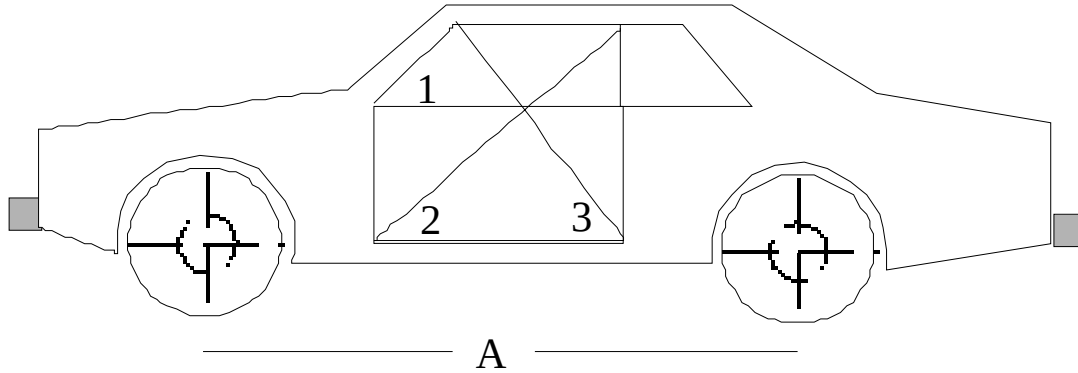


DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	4807	4482	325
X2	Rear Surface of Vehicle to Front of Engine	4372	4127	245
X3	Rear Surface of Vehicle to Firewall	3818	3788	30
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3332	3335	-3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3351	3345	6
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3350	3349	1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3363	3354	9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2278	2276	2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2290	2284	6
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2325	2320	5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2334	2325	9
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3400	3402	-2
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3408	3402	6
X14	Rear Surface of Vehicle to Firewall, Right Side	3737	3709	28
X15	Rear Surface of Vehicle to Firewall, Left Side	3733	3689	44
X16	Rear Surface of Vehicle to Steering Column	2922	2962	-40
X17	Center of Steering Column to "A" Post	325	322	3
X18	Center of Steering Column to Headliner	442	431	11
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4767	4496	271
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4771	4482	289
X21	Length of Engine Block	425	425	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3112	3110	2
CD	Rear Surface of Vehicle to Center of Dash Panel	3175	3178	-3
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3135	3104	31

All Dimensions in mm

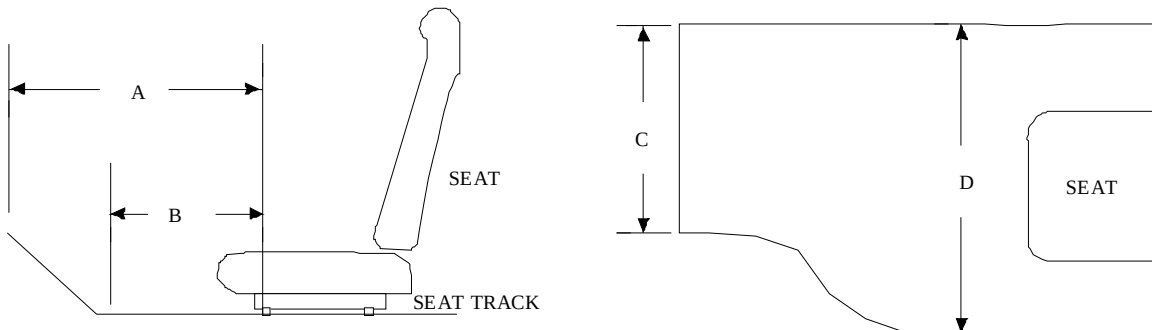
DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 VEHICLE INTRUSION MEASUREMENTS
 DOOR OPENING WIDTH



UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	959	1519	1044	954	1518	1049
AFTER TEST	954	1522	1042	946	1522	1052
DIFFERENCE	5	-3	2	8	-4	-3

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2850	2850
AFTER TEST	2789	2785
DIFFERENCE	61	65

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



DRIVER

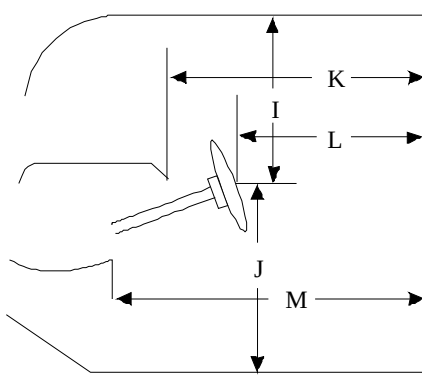
Measurement	Pre-Test	Post-Test	Difference
A	762	706	56
B	518	523	-5
C	446	445	1
D	397	390	7

PASSENGER

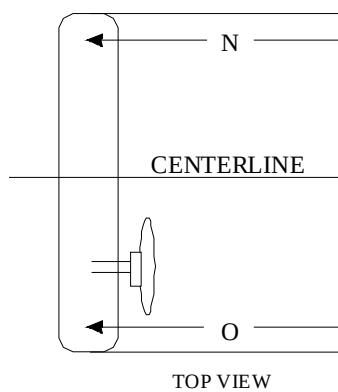
Measurement	Pre-Test	Post-Test	Difference
A	714	673	41
B	461	465	-4
C	413	379	34
D	450	386	64

Units = mm

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

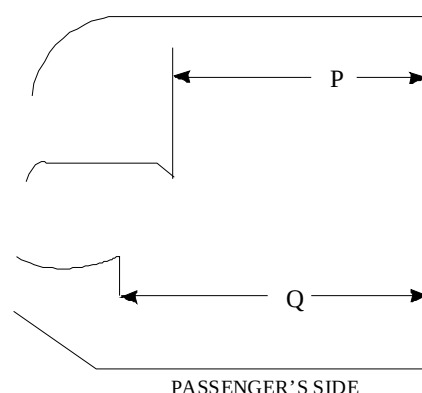


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE

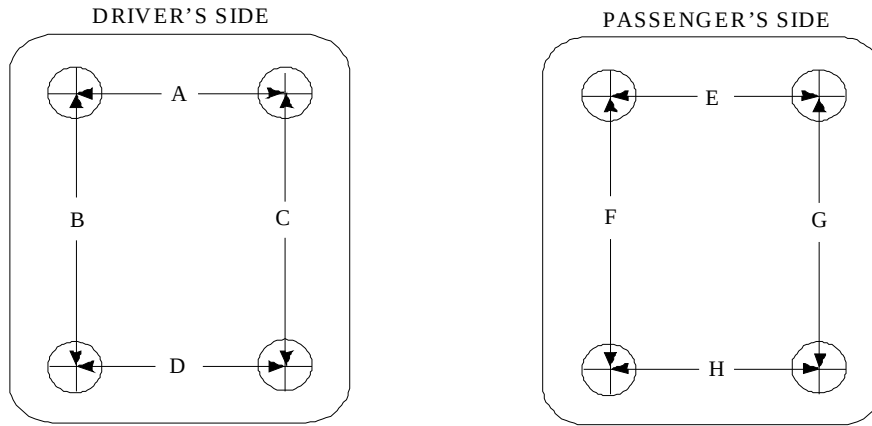


PASSENGER'S SIDE

Measurement	Pre-Test	Post-Test	Difference
I	442	431	11
J	718	749	-31
K	1789	1796	-7
L	1561	1602	-41
M	1818	1824	-6
N	1759	1757	2
O	1774	1744	30
P = K (PASS.)	1820	1816	4
Q = M (PASS.)	1817	1828	-11

Units = mm

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

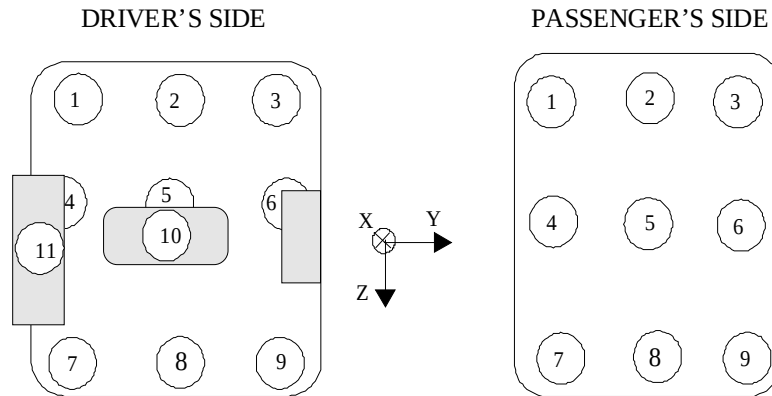


TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	446	445	1
B	323	329	-6
C	311	335	-24
D	397	390	7
E	413	379	33
F	410	396	14
G	354	371	-17
H	450	446	4

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	3560	3510	50	-573	-583	10
2	3629	3574	55	-565	-579	14
3	3615	3529	86	-566	-569	3
4	3517	3480	37	-432	-418	-14
5	3542	3517	25	-424	-430	6
6	3548	3524	24	-423	-422	-1
7	3361	3361	0	-374	-364	-10
8	3386	3391	-5	-376	-359	-17
9	3378	3391	-13	-376	-350	-26
10	3397	3460	-63	-553	-494	-59
11	3374	3372	2	-440	-428	-12

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	3570	3530	40	-548	-547	-1
2	3572	3534	38	-541	-555	14
3	3544	3508	36	-551	-576	25
4	3458	3439	19	-463	-430	-33
5	3472	3449	23	-461	-443	-18
6	3462	3449	13	-455	-448	-7
7	3318	3321	-3	-385	-341	-44
8	3319	3326	-7	-384	-352	-32
9	3323	3332	-9	-381	-359	-22

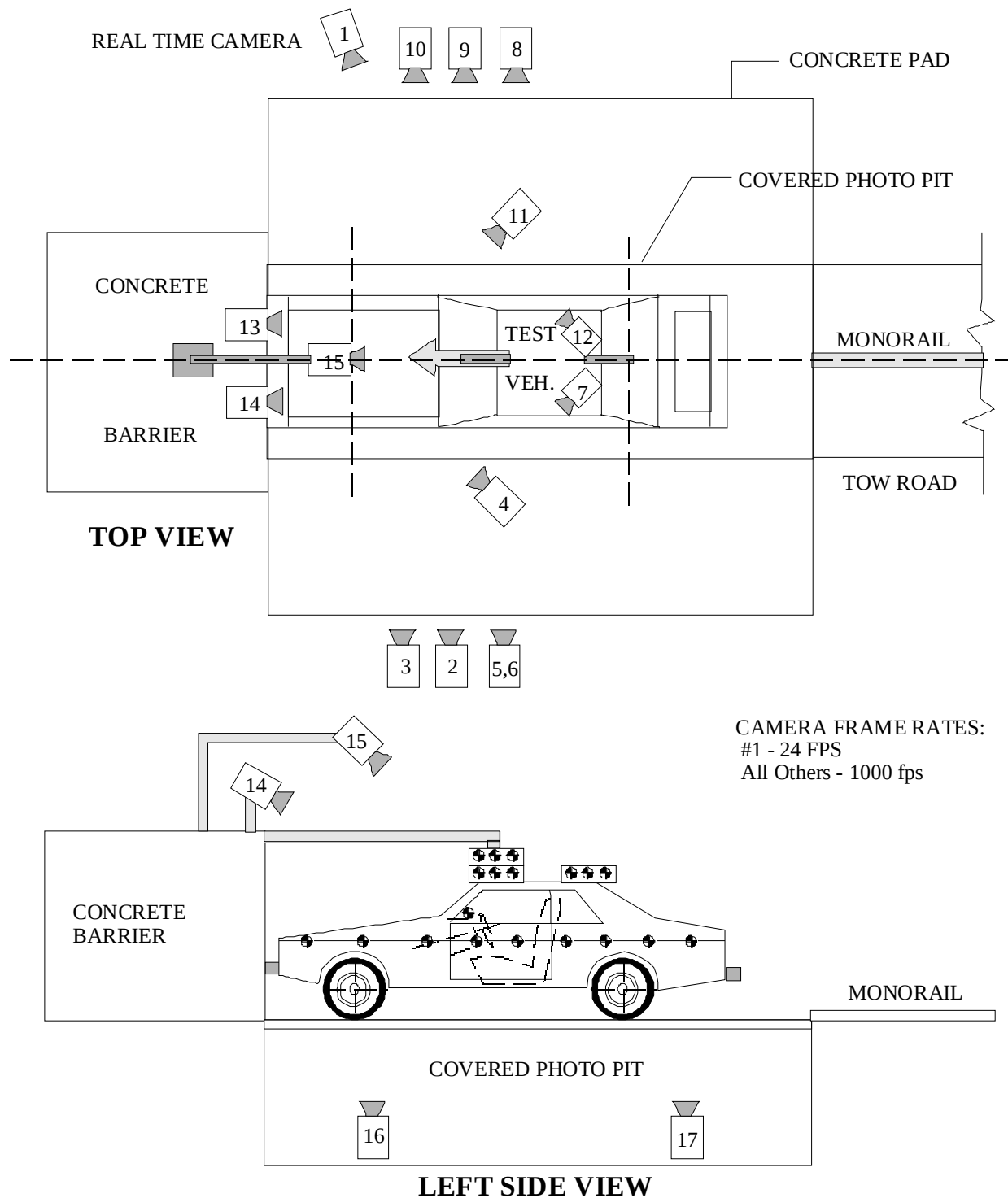
Reference: SAE: X = Rear Bumper (Positive: forward); Z = Ground (Positive: down)

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

	Elements	Pre-Test (mm)
1	Total length	4807
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.



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

NHTSA Test No.: M35900 Vehicle: 2003 Volvo XC90 4-Door 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	6769	1682	1091	0	6432	12.5	1015
3	Left Side View	8346	915	1076	-2	8009	25	1020
4	Driver and Interior View	7309	2721	1982	-14	-	25	1060
5	Steering Column (Bottom)	7244	1837	1176	-2	6907	25	1025
6	Steering Column (Top)	7244	1837	1780	-8	6907	25	1020
7	Left Side Lateral View	3658	2708	2555	-20	-	13	1035
8	Overall Right Side	7921	2090	1086	-1	8218	12.5	1020
9	Right Side View	7991	1361	1083	-2	8288	25	1005
10	Right Passenger View	6927	1732	1378	-3	7224	35	1025
11	Passenger and Interior View	6096	2166	1973	-15	-	25	1010
12	Right Side Lateral View	3642	2642	2567	-24	-	13	1015
13	Passenger Front View	620	-92	1987	-31	-	13	1005
14	Driver Front View	620	-92	1987	-34	-	13	1010
15	Windshield View	0	-530	3374	-52	-	13	1000
16	Pit View of Engine	0	615	-3048	90	-	13	1010
17	Pit View of Fuel Tank	0	2186	-3048	90	-	13	1055

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

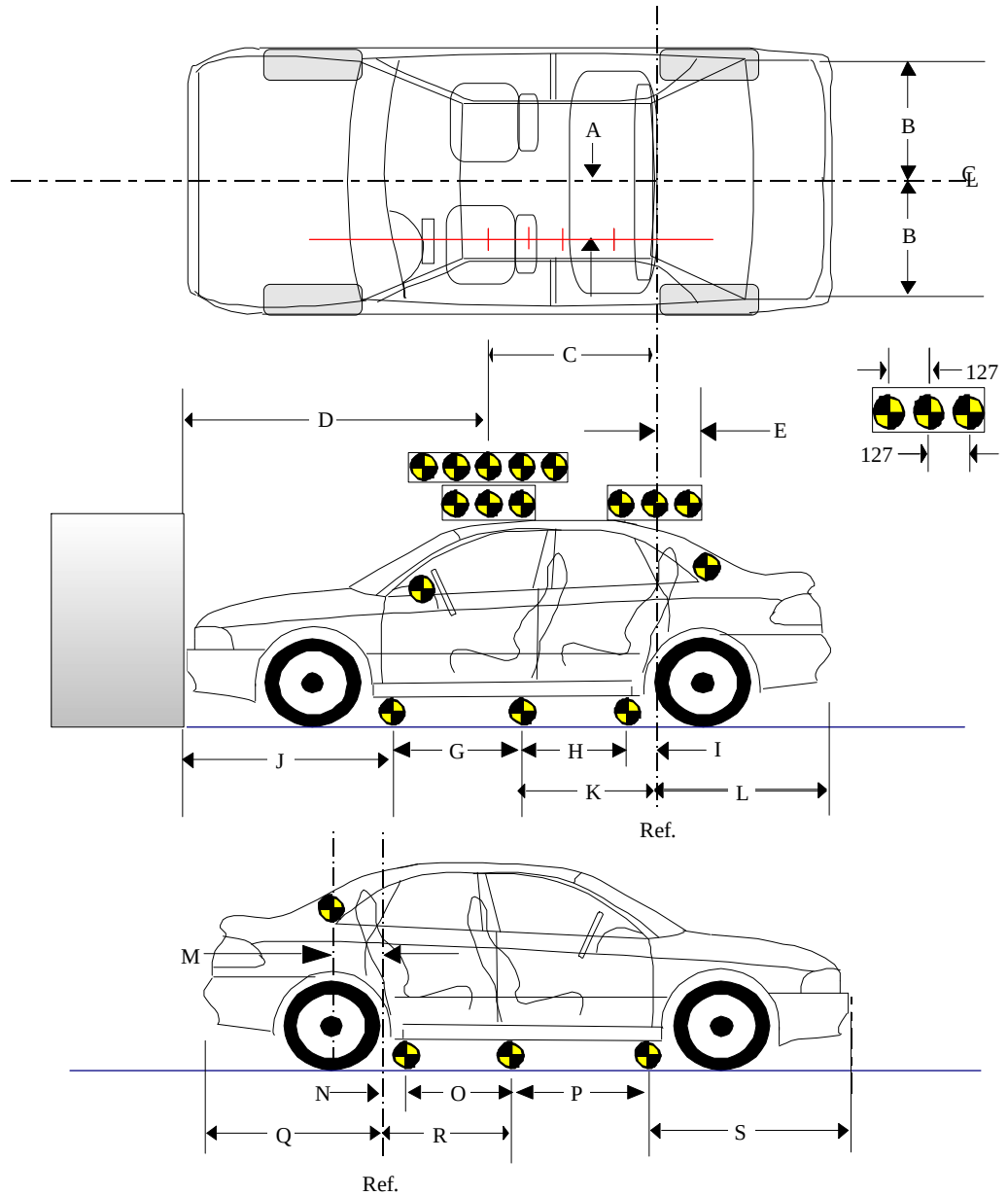
Y = film plane to impact location N.T. indicates No Timing

Z = film plane to ground

DATA SHEET NO. 16 VEHICLE REFERENCE PHOTO TARGET LOCATIONS

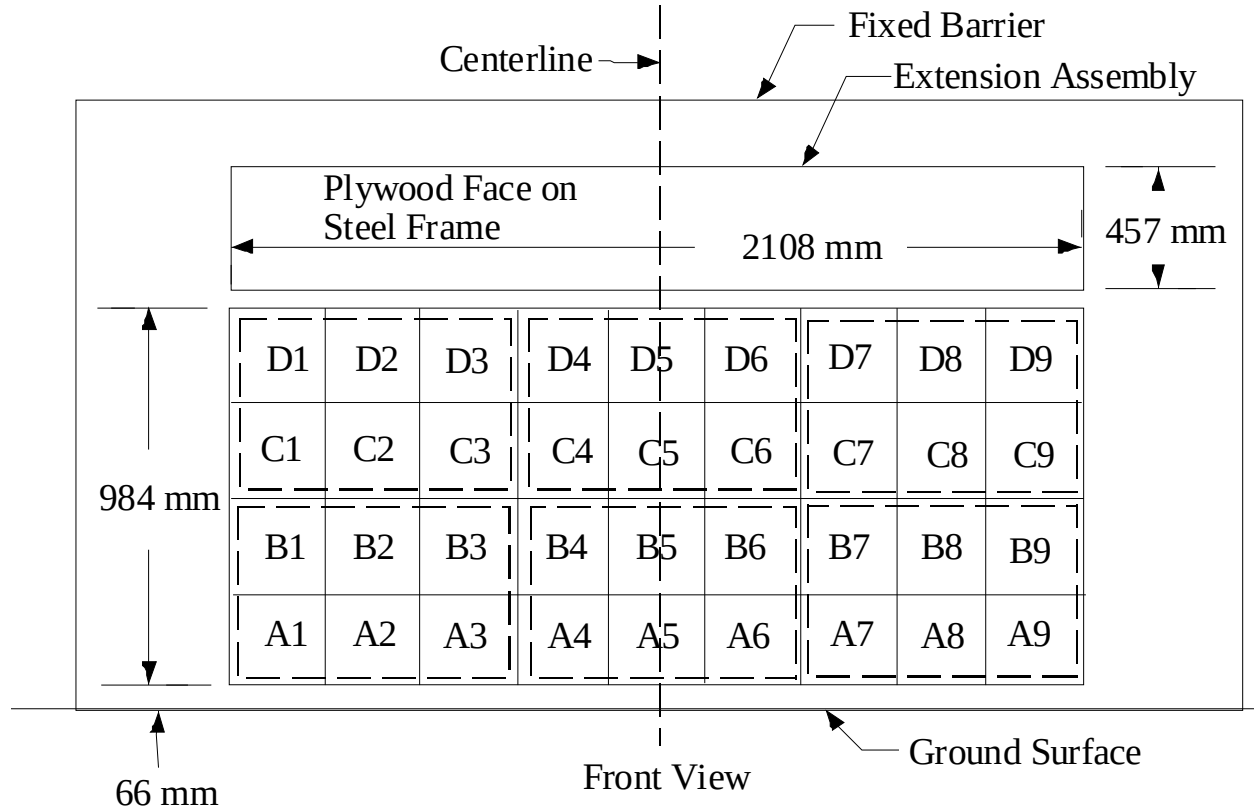
(Dimensions in millimeters)

A	373
B	634
C	1222
D	2375
E	150
F	1848
G	960
H	950
I	98
J	1375
K	1048
L	1424
M	142
N	128
O	908
P	964
Q	1419
R	1036
S	1388



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.: M35900; Test Date: February 26, 2003; Technician: P. MacDiarmid

Vehicle Model Year/Make/Model: 2003 Volvo XC90 4-Door 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

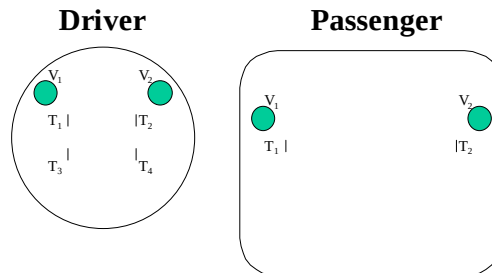
E. Is the air bag tethered?

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: 1200G 112000225A0900 No. 1200

Generator: -

Passenger: Air bag: 1089D 11089022480015 No. 1089

Generator: -

DATA SHEET NO. 19 ACCIDENT INVESTIGATION DIVISION DATA

FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Volvo XC90 4-Door MPV

NHTSA Test No.: M35900 VIN: YV1CZ91H631003540

Model Year: 2003 Build Date: 10/02 Test Date: February 26, 2003

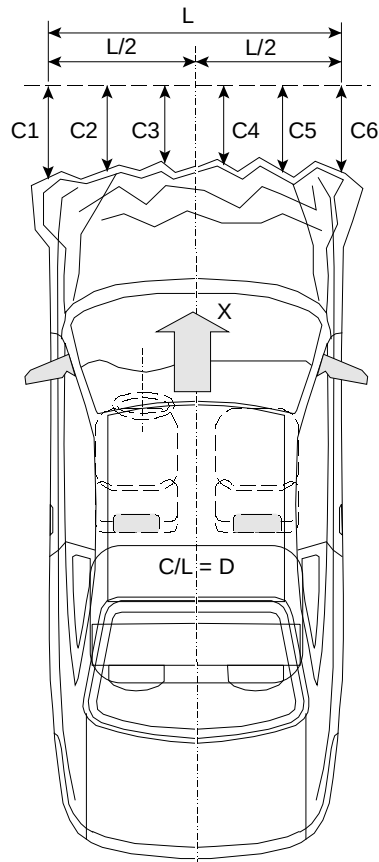
Vehicle Size Category: MPV Test Weight: 2386.0 kg

Vehicle Wheelbase: 2850 mm; Front Overhang: 900 mm; Overall Width: 1898 mm

Collision Deformation Classification (CDC) Code: 12FDEW2

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	4645	4466	179
C2 =	4781	4478	303
C3 =	4802	4473	329
C4 =	4804	4482	322
C5 =	4782	4489	293
C6 =	4647	4454	193



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

Length of Damaged Region: L1= 1466 mm

L2= 733.0 mm

L5= 293.2 mm

APPENDIX A
PHOTOGRAPHS

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Figure A-1 LOAD CELL LOCATIONS

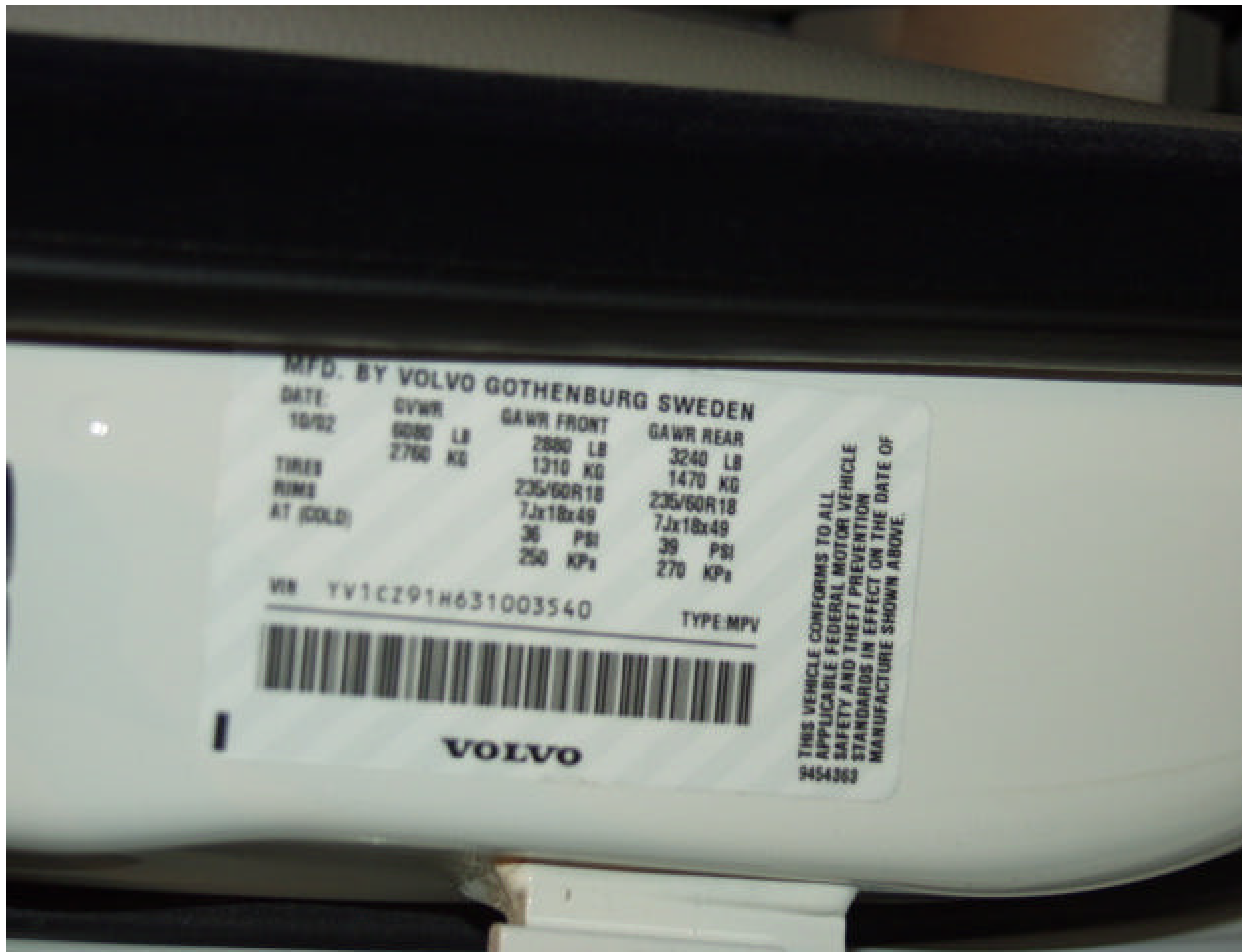


Figure A-2 VEHICLE CERTIFICATION PLACARD

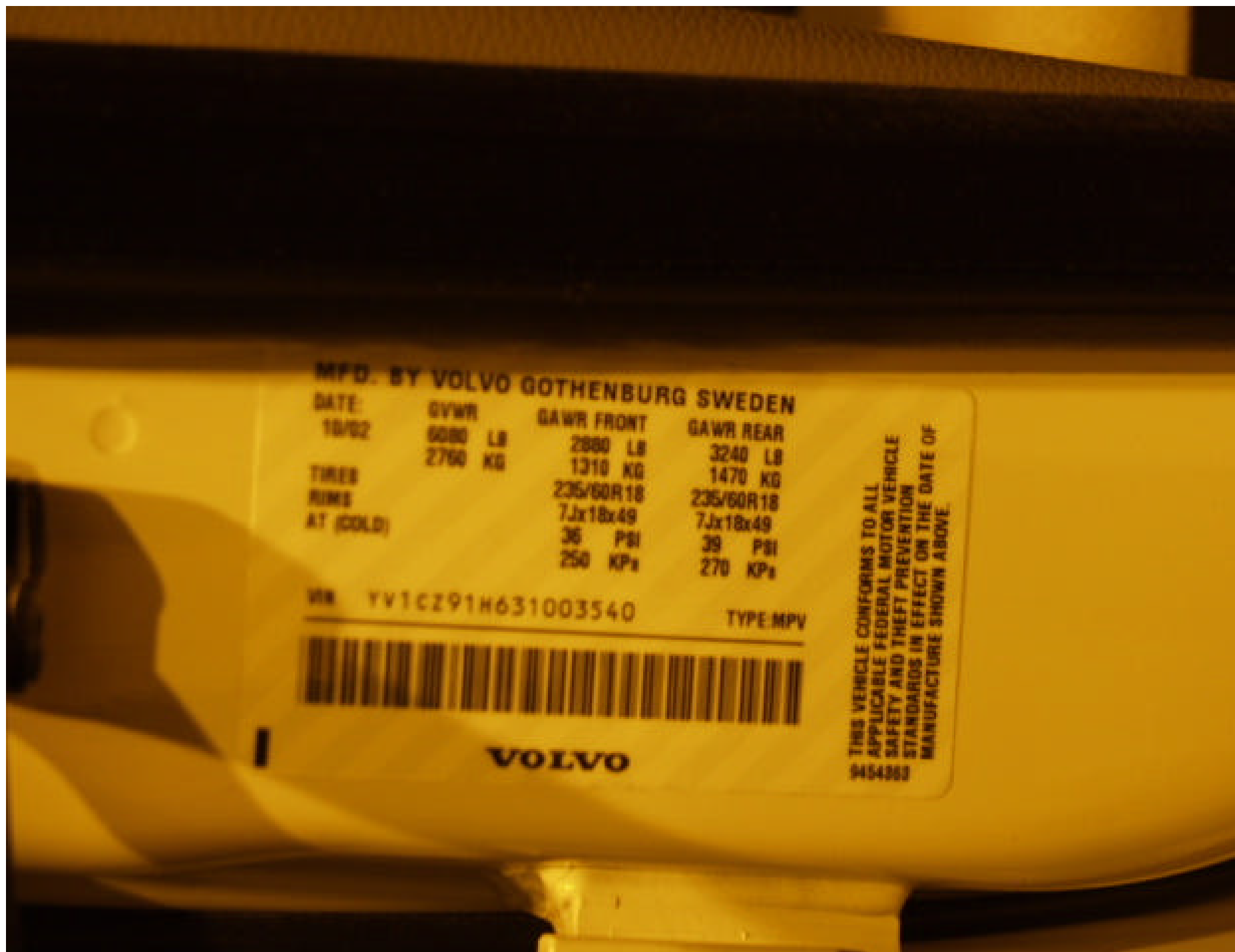


Figure A-3 VEHICLE TIRE PLACARD



Figure A-4 RIGHT FRONT, AS RECEIVED



Figure A-5 LEFT REAR, AS RECEIVED



Figure A-6 PRE-TEST FRONT VIEW



Figure A-7 POST-TEST FRONT VIEW



Figure A-8 PRE-TEST LEFT SIDE VIEW

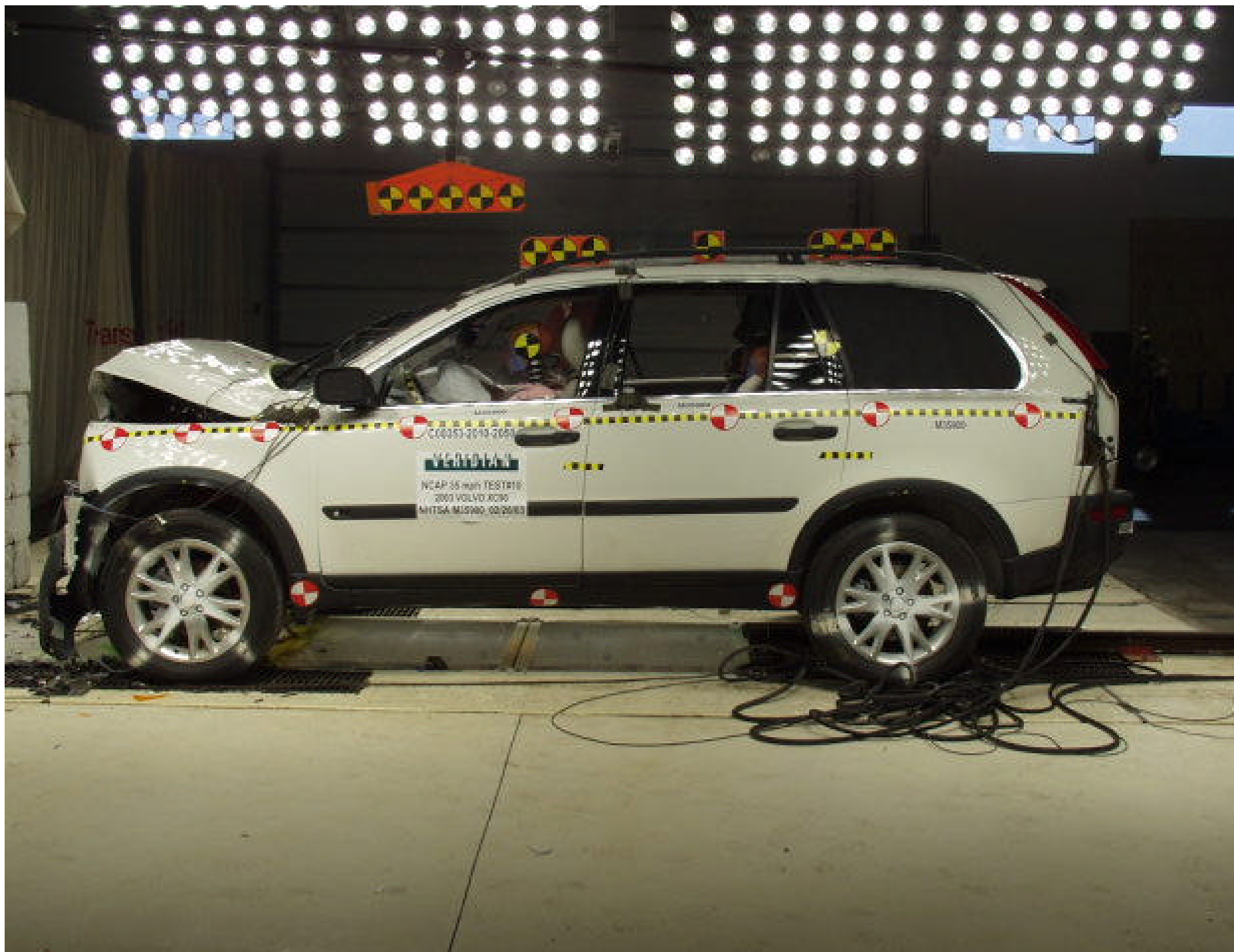


Figure A-9 POST-TEST LEFT SIDE VIEW



Figure A-10 PRE-TEST RIGHT SIDE VIEW



Figure A-11 POST-TEST RIGHT SIDE VIEW



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 WINDSHIELD VIEW



Figure A-20 PRE-TEST ENGINE COMPARTMENT VIEW



Figure A-21 POST-TEST ENGINE COMPARTMENT VIEW



Figure A-22 PRE-TEST FUEL CAP VIEW



Figure A-23 POST-TEST FUEL CAP VIEW



Figure A-24 PRE-TEST FRONT UNDERBODY VIEW



Figure A-25 POST-TEST FRONT UNDERBODY VIEW



Figure A-26 PRE-TEST MID UNDERBODY VIEW



Figure A-27 POST-TEST MID UNDERBODY VIEW



Figure A-28 PRE-TEST REAR UNDERBODY VIEW



Figure A-29 POST-TEST REAR UNDERBODY VIEW



Figure A-30 PRE-TEST DRIVER HEAD LOCATION



Figure A-31 POST-TEST DRIVER HEAD LOCATION



Figure A-32 PRE-TEST DRIVER POSITION VIEW



Figure A-33 POST-TEST DRIVER POSITION VIEW



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



Figure A-37 POST-TEST DRIVER FEET VIEW



Figure A-38 PRE-TEST DRIVER KNEE BOLSTER VIEW



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8642-NCAP-33

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



Figure A-43 POST-TEST DRIVER CONTACT TO AIRBAG



Figure A-44 PRE-TEST PASSENGER HEAD LOCATION



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8642-NCAP-33

Figure A-45 POST-TEST PASSENGER HEAD LOCATION



Figure A-46 PRE-TEST PASSENGER POSITION VIEW



Figure A-47 POST-TEST PASSENGER POSITION VIEW



Figure A-48 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-49 POST-TEST PASSENGER AND INTERIOR VIEW



Figure A-50 PRE- TEST PASSENGER FEET VIEW



Figure A-51 POST-TEST PASSENGER FEET VIEW



Figure A-52 PRE-TEST PASSENGER KNEE BOLSTER VIEW



Figure A-53 POST-TEST PASSENGER KNEE BOLSTER VIEW



Figure A-54 PRE-TEST PASSENGER FLOOR PAN VIEW



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



Figure A-58 ROLLOVER VIEW



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

TABLE OF DATA PLOTS

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
1	V1P1 Head 9 Array X Arm Ay [g, CFC_1000]	B-8
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

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PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
46	V1P1 Right Lower tibia Mx [N-m, CFC_600]	B-53
47	V1P1 Right Lower Tibia My [N-m, CFC_600]	B-54
48	V1P1 Left Foot Aft Ax [g, CFC_600]	B-55
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
77	V1P2 Chest y [g, CFC_180]	B-84
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

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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
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

TABLE OF DATA PLOTS (continued)

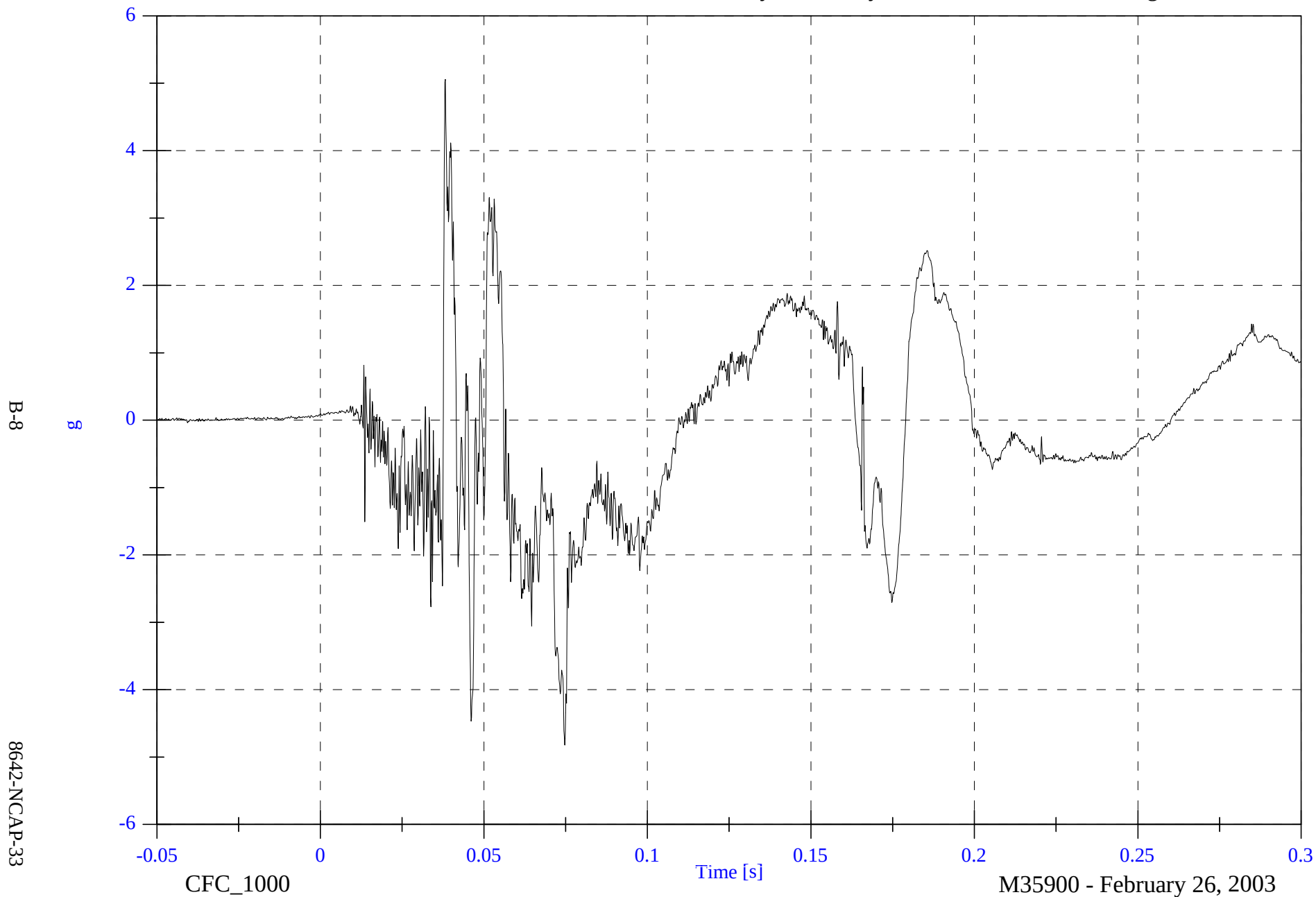
PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
135	Barrier Load Cell A2 Fx [N, CFC_60]	B-142
136	Barrier Load Cell A3 Fx [N, CFC_60]	B-143
137	Barrier Load Cell A4 Fx [N, CFC_60]	B-144
138	Barrier Load Cell A5 Fx [N, CFC_60]	B-145
139	Barrier Load Cell A6 Fx [N, CFC_60]	B-146
140	Barrier Load Cell A7 Fx [N, CFC_60]	B-147
141	Barrier Load Cell A8 Fx [N, CFC_60]	B-148
142	Barrier Load Cell A9 Fx [N, CFC_60]	B-149
143	Barrier Load Cell B1 Fx [N, CFC_60]	B-150
144	Barrier Load Cell B2 Fx [N, CFC_60]	B-151
145	Barrier Load Cell B3 Fx [N, CFC_60]	B-152
146	Barrier Load Cell B4 Fx [N, CFC_60]	B-153
147	Barrier Load Cell B5 Fx [N, CFC_60]	B-154
148	Barrier Load Cell B6 Fx [N, CFC_60]	B-155
149	Barrier Load Cell B7 Fx [N, CFC_60]	B-156
150	Barrier Load Cell B8 Fx [N, CFC_60]	B-157
151	Barrier Load Cell B9 Fx [N, CFC_60]	B-158
152	Barrier Load Cell C1 Fx [N, CFC_60]	B-159
153	Barrier Load Cell C2 Fx [N, CFC_60]	B-160
154	Barrier Load Cell C3 Fx [N, CFC_60]	B-161
155	Barrier Load Cell C4 Fx [N, CFC_60]	B-162
156	Barrier Load Cell C5 Fx [N, CFC_60]	B-163
157	Barrier Load Cell C6 Fx [N, CFC_60]	B-164
158	Barrier Load Cell C7 Fx [N, CFC_60]	B-165
159	Barrier Load Cell C8 Fx [N, CFC_60]	B-166
160	Barrier Load Cell C9 Fx [N, CFC_60]	B-167
161	Barrier Load Cell D1 Fx [N, CFC_60]	B-168
162	Barrier Load Cell D2 Fx [N, CFC_60]	B-169
163	Barrier Load Cell D3 Fx [N, CFC_60]	B-170
164	Barrier Load Cell D4 Fx [N, CFC_60]	B-171
165	Barrier Load Cell D5 Fx [N, CFC_60]	B-172
166	Barrier Load Cell D6 Fx [N, CFC_60]	B-173
167	Barrier Load Cell D7 Fx [N, CFC_60]	B-174
168	Barrier Load Cell D8 Fx [N, CFC_60]	B-175
169	Barrier Load Cell D9 Fx [N, CFC_60]	B-176
170	Group 1 Load Cell Sum (A1,A2,A3,B1,B2,B3)	B-177
171	Group 2 Load Cell Sum (A4,A5,A6,B4,B5,B6)	B-178
172	Group 3 Load Cell Sum (A7,A8,A9,B7,B8,B9)	B-179
173	Group 4 Load Cell Sum (C1,C2,C3,D1,D2,D3)	B-180
174	Group 5 Load Cell Sum (C4,C5,C6,D4,D5,D6)	B-181
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176	Total Load Cell Sum (All 6 Groups)	B-183

2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head 9 Array X Arm Ay

Max: 5.1 [g] at 0.038 [s]

Min: -4.8 [g] at 0.075 [s]

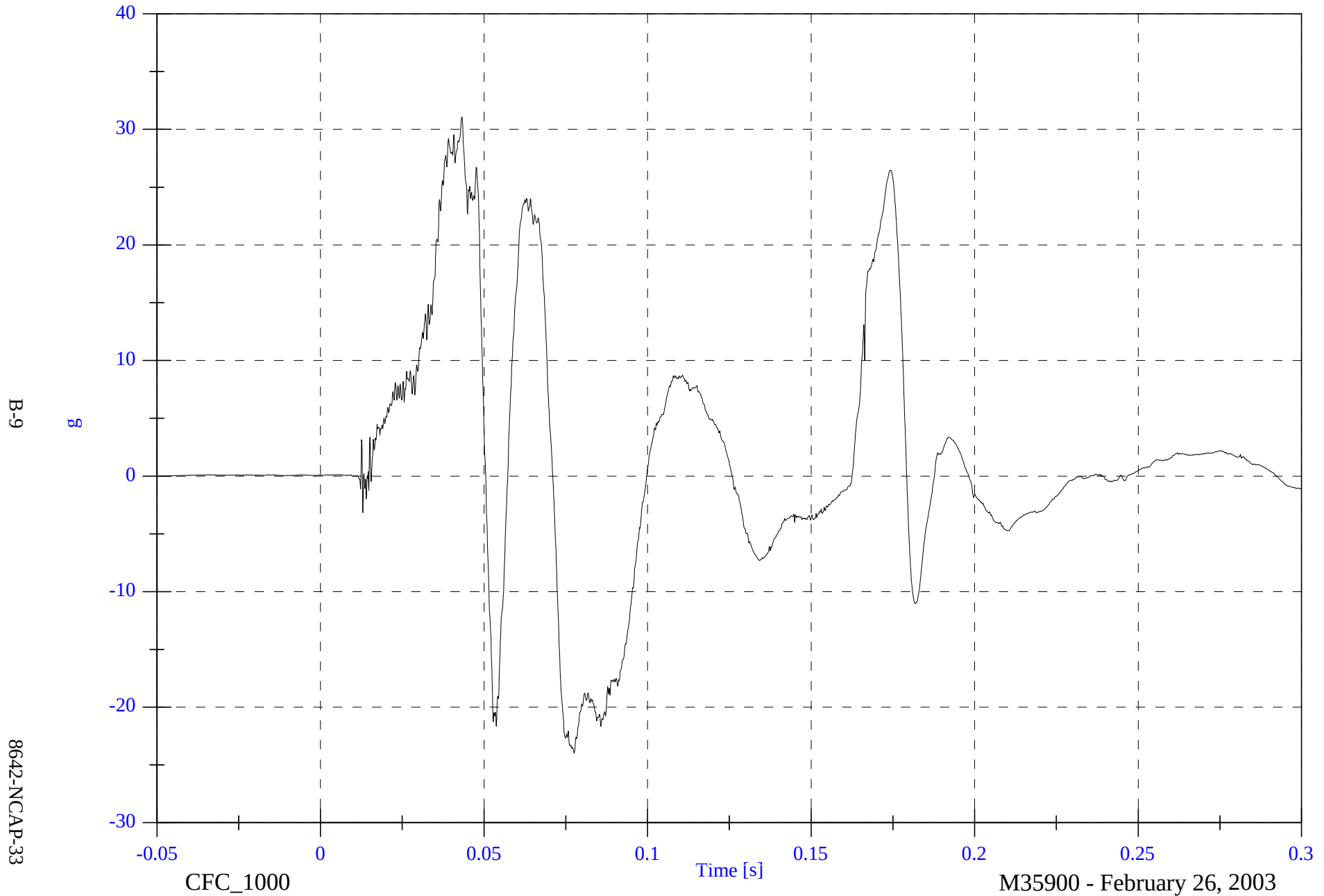


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head 9 Array X Arm Az

Max: 31.1 [g] at 0.043 [s]

Min: -24.0 [g] at 0.078 [s]

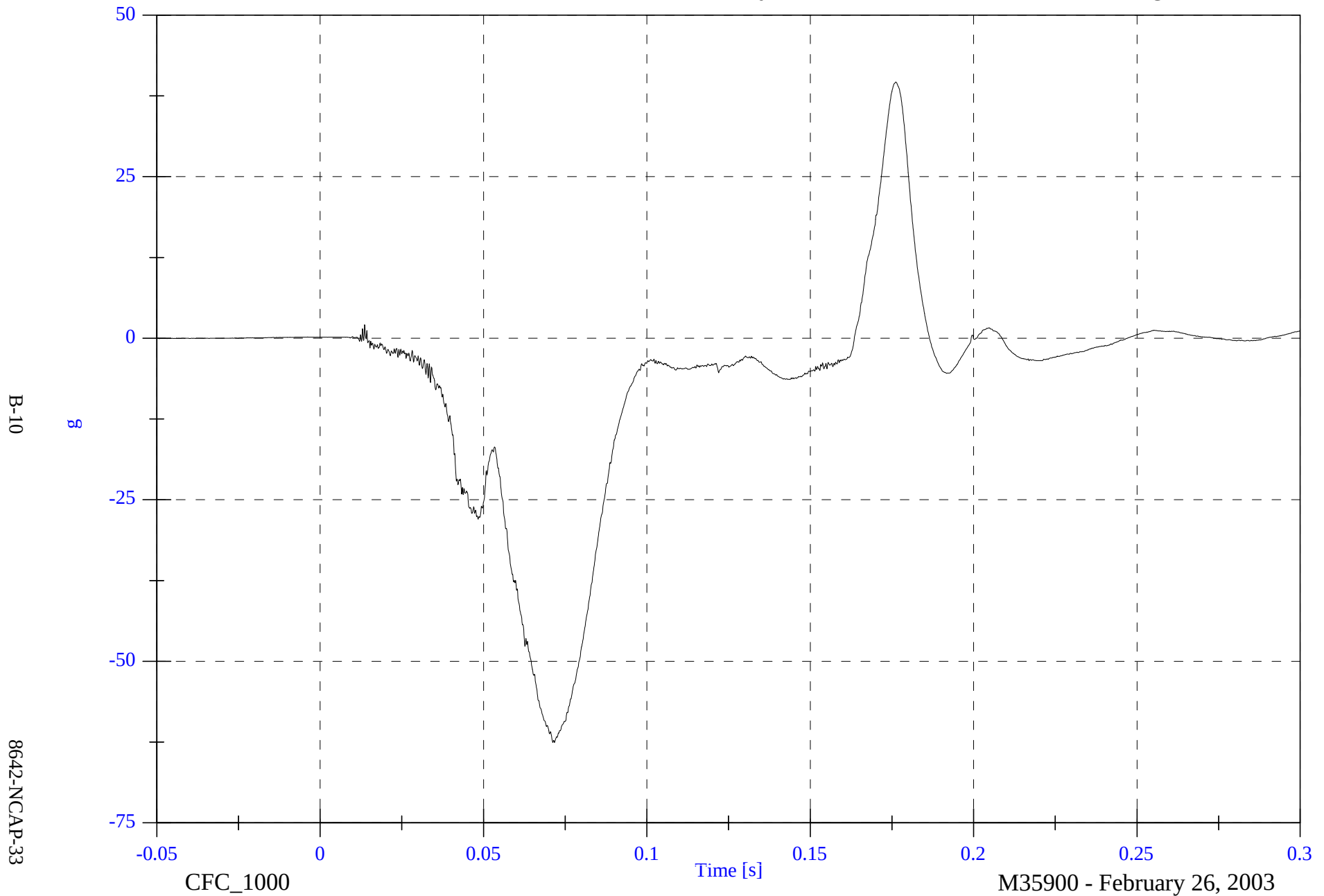


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head 9 Array Y Arm Ax

Max: 39.6 [g] at 0.176 [s]

Min: -62.6 [g] at 0.072 [s]



2003 NCAP Test 10 2003 Volvo XC90

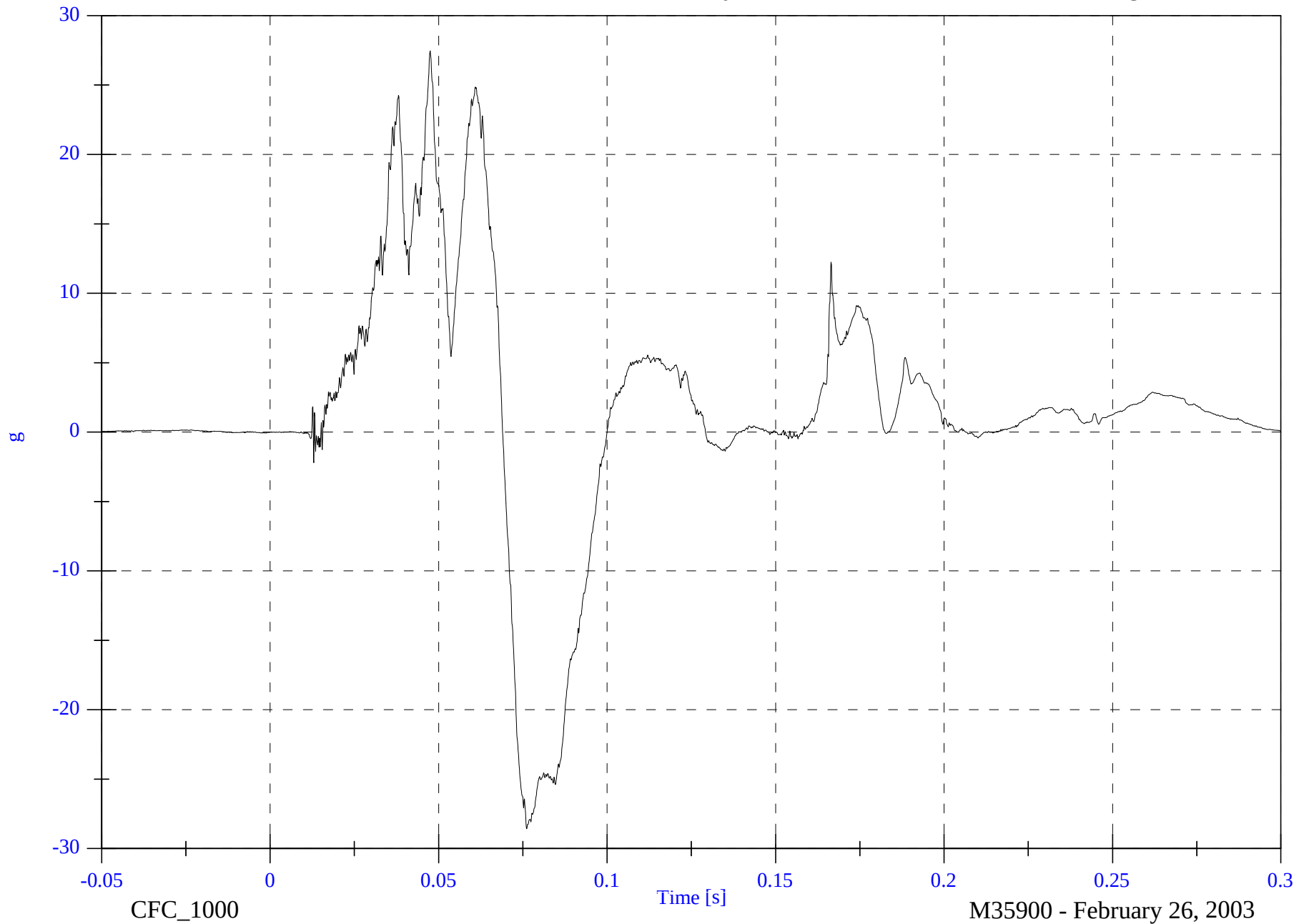
V1P1 Head 9 Array Y Arm Az

Max: 27.5 [g] at 0.048 [s]

Min: -28.6 [g] at 0.076 [s]

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2003 NCAP Test 10 2003 Volvo XC90

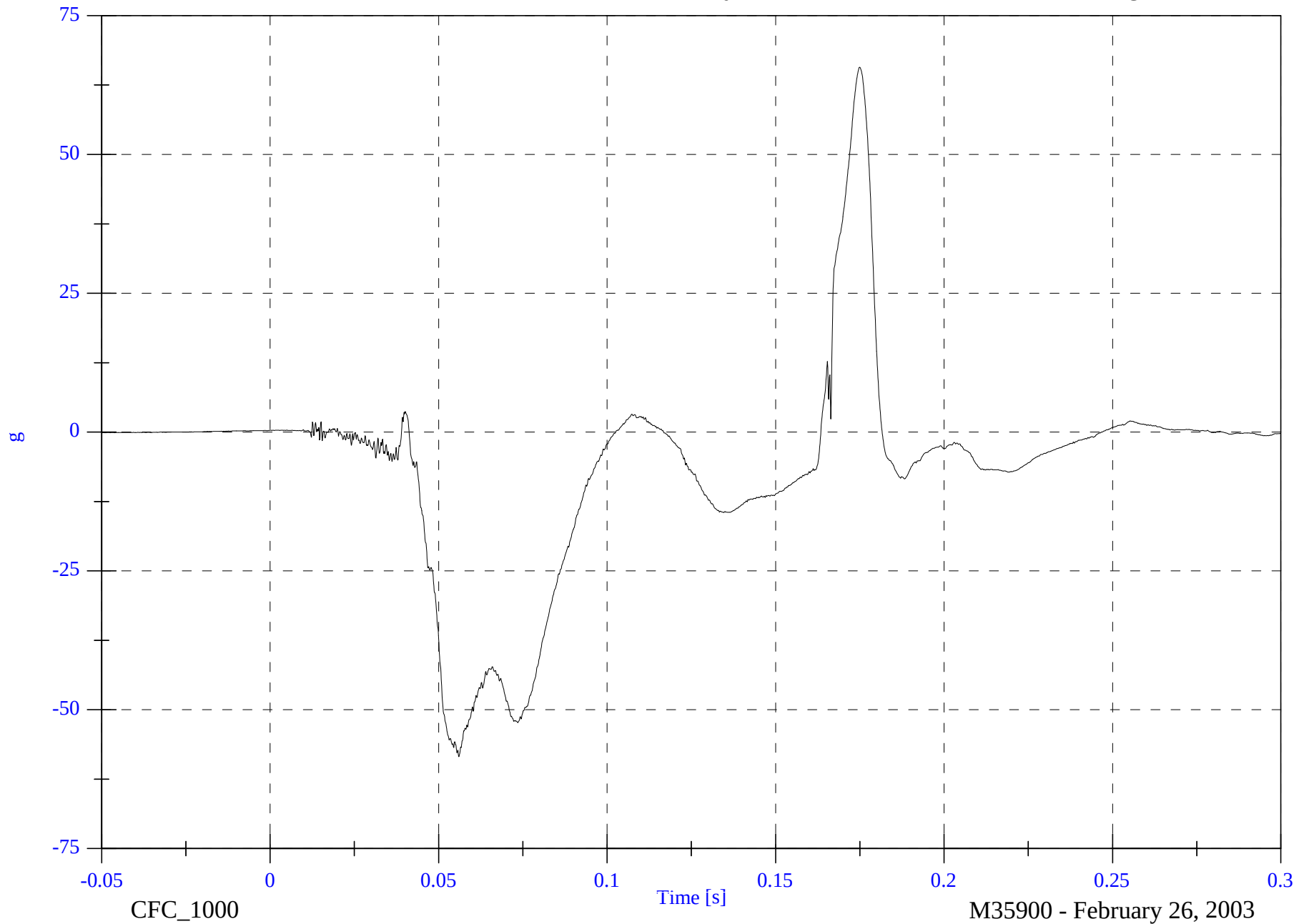
V1P1 Head 9 Array Z Arm Ax

Max: 65.7 [g] at 0.175 [s]

Min: -58.5 [g] at 0.056 [s]

B-12

8642-NCAP-33

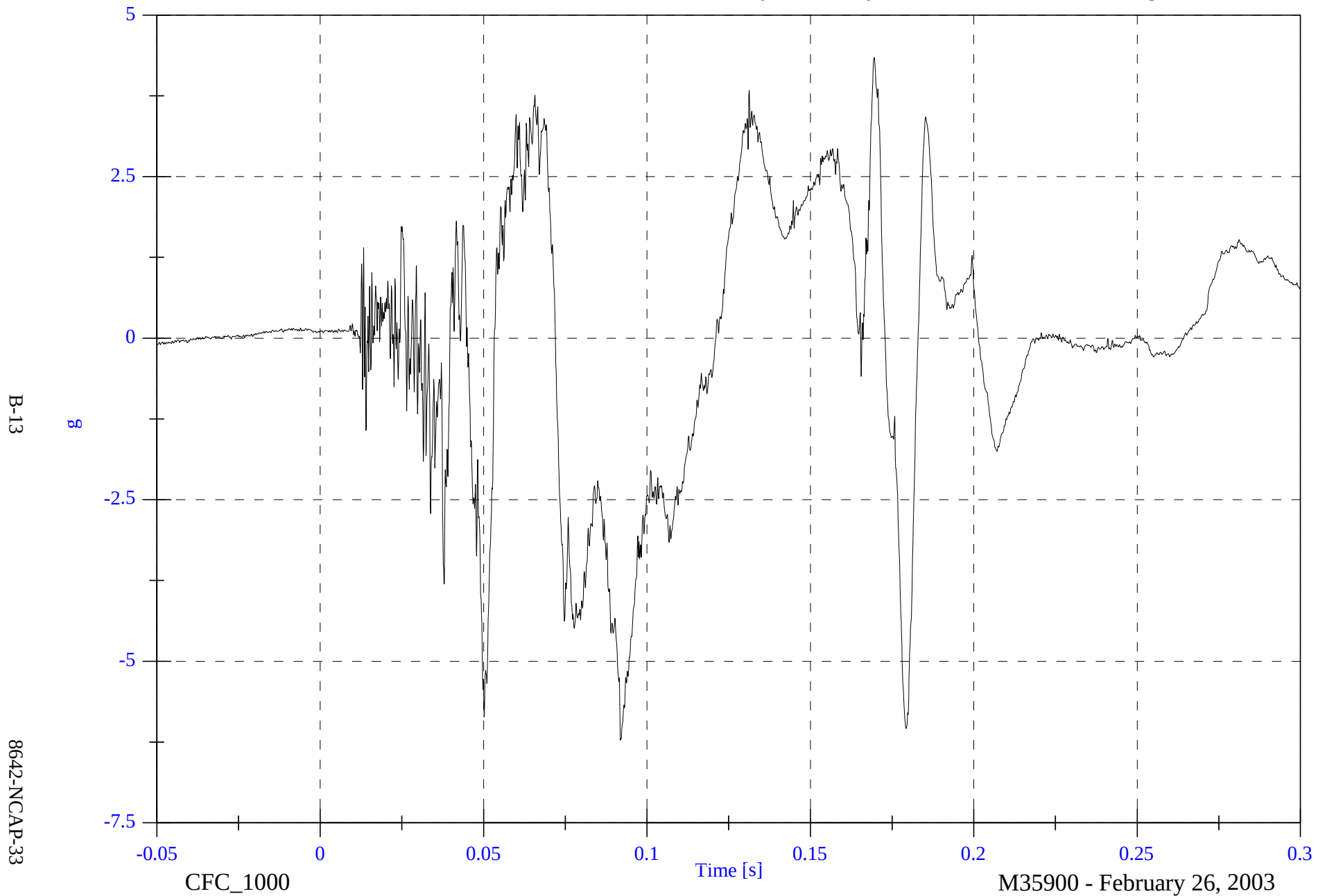


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head 9 Array Z Arm Ay

Max: 4.3 [g] at 0.170 [s]

Min: -6.2 [g] at 0.092 [s]

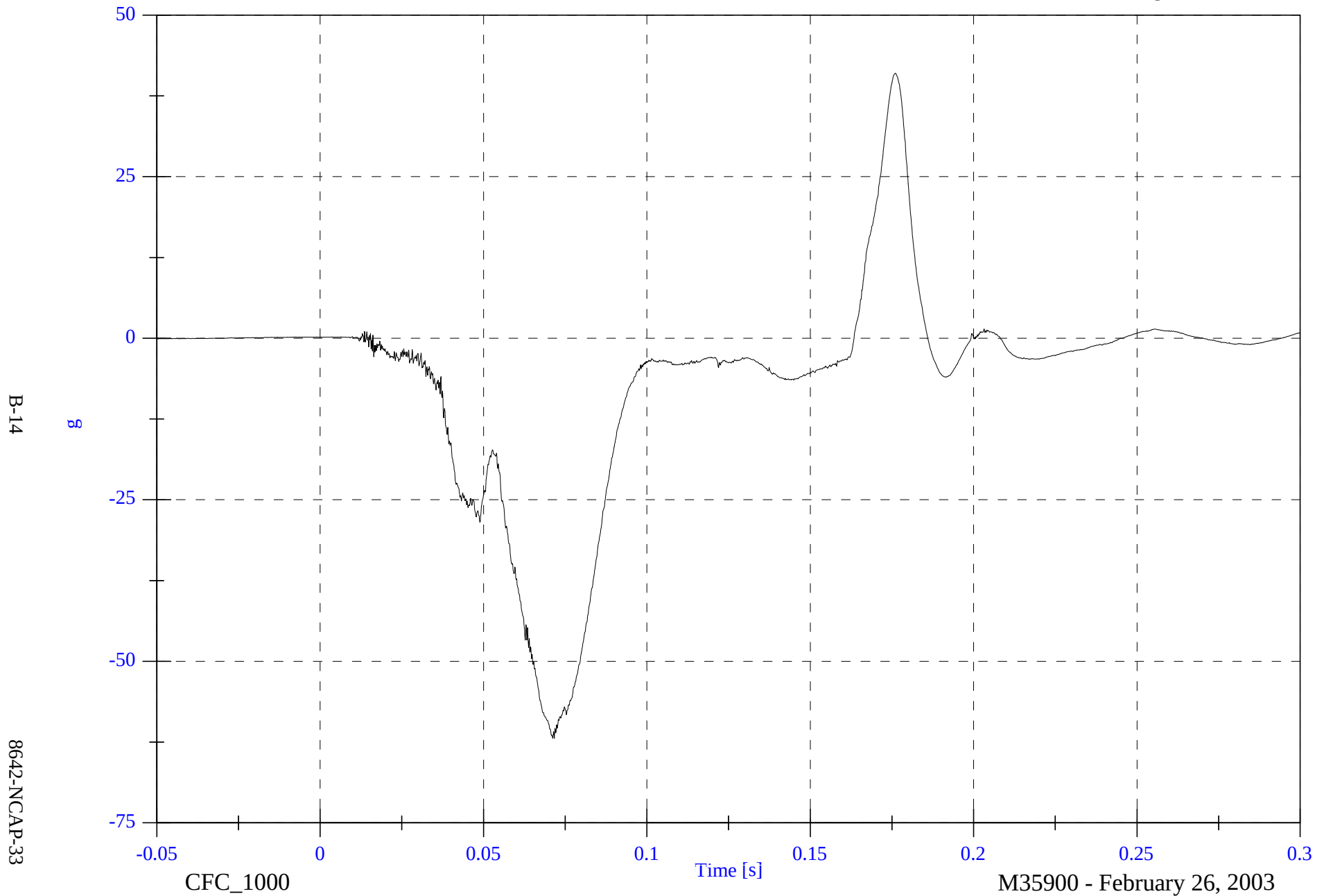


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head CG x

Max: 41.0 [g] at 0.176 [s]

Min: -61.9 [g] at 0.072 [s]

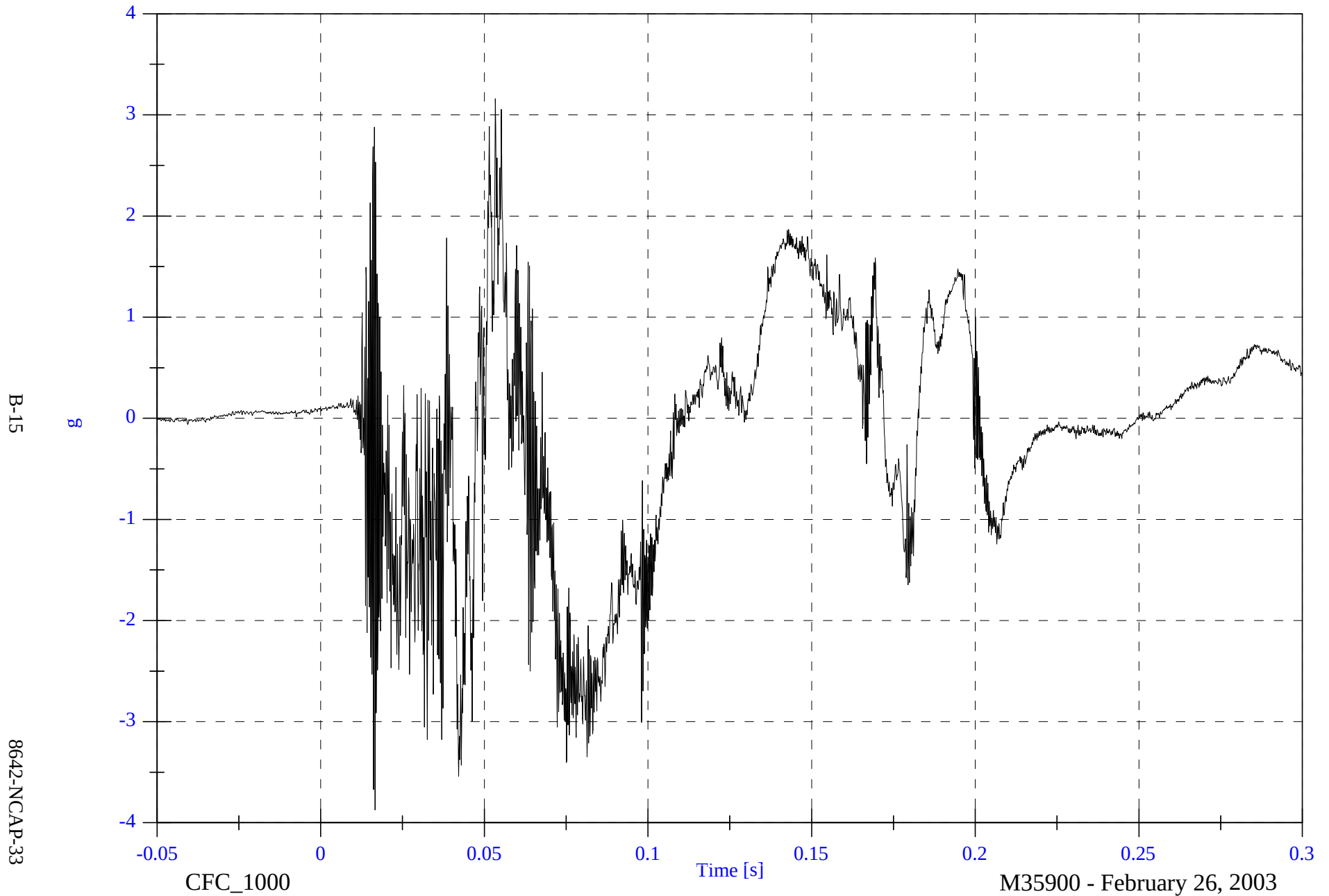


2003 NCAP Test 10 2003 Volvo XC90

Max: 3.2 [g] at 0.053 [s]

Min: -3.9 [g] at 0.017 [s]

V1P1 Head CG y



2003 NCAP Test 10 2003 Volvo XC90

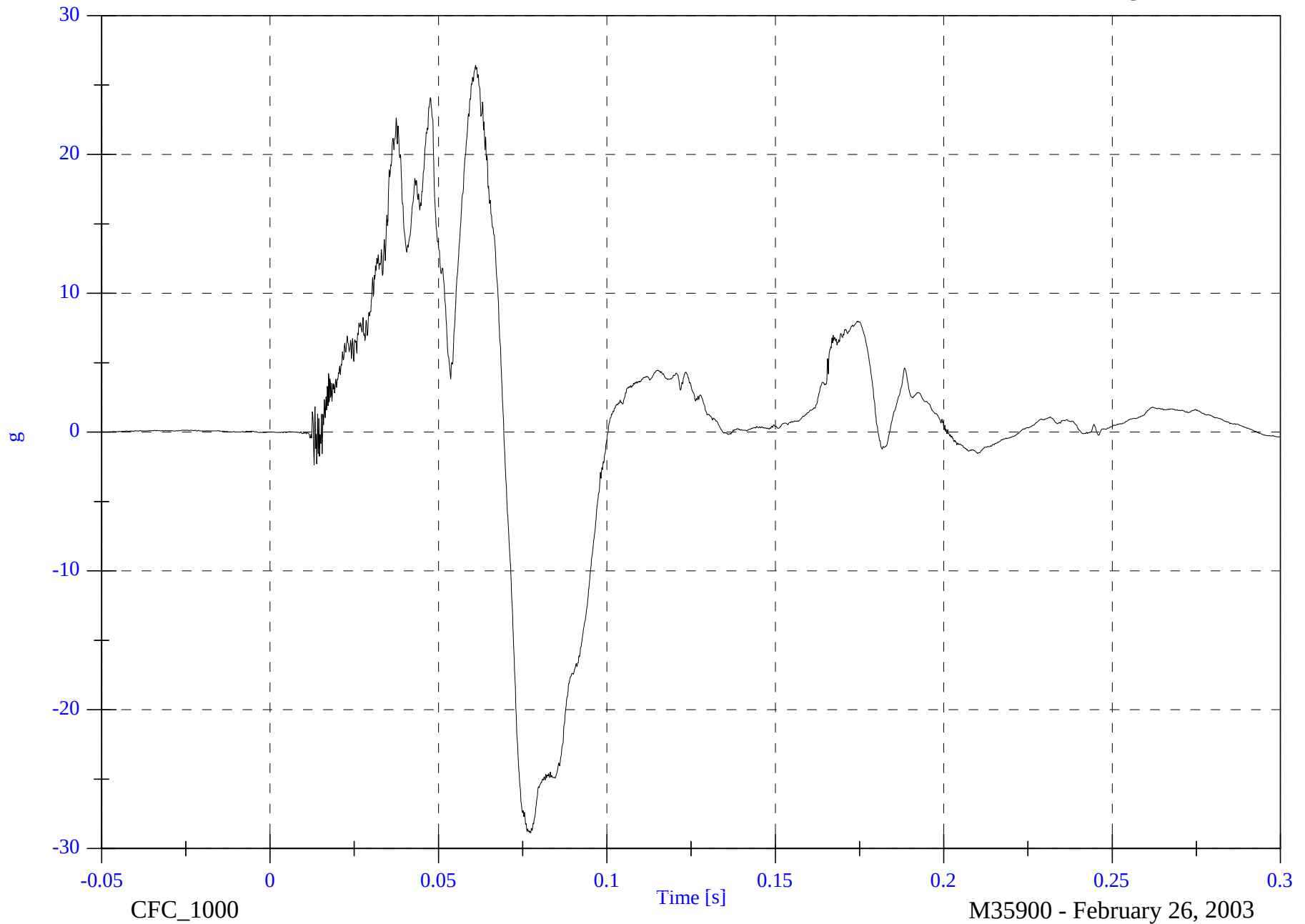
V1P1 Head CG z

Max: 26.4 [g] at 0.061 [s]

Min: -28.9 [g] at 0.077 [s]

B-16

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

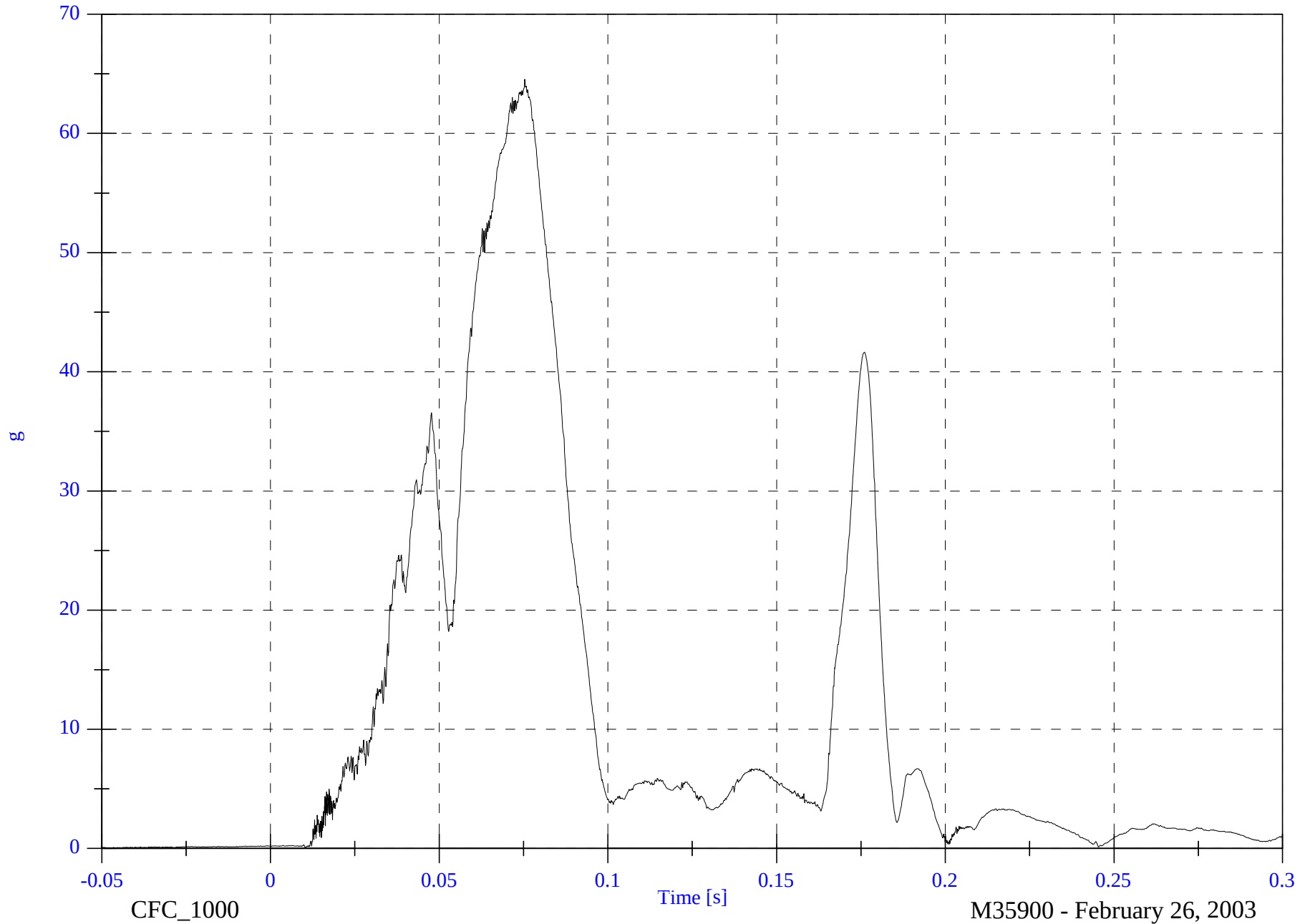
V1P1 Head CG Resultant

Max: 64.5 [g] at 0.075 [s]

Min: 0.0 [g] at -0.048 [s]

B-17

8642-NCAP-33

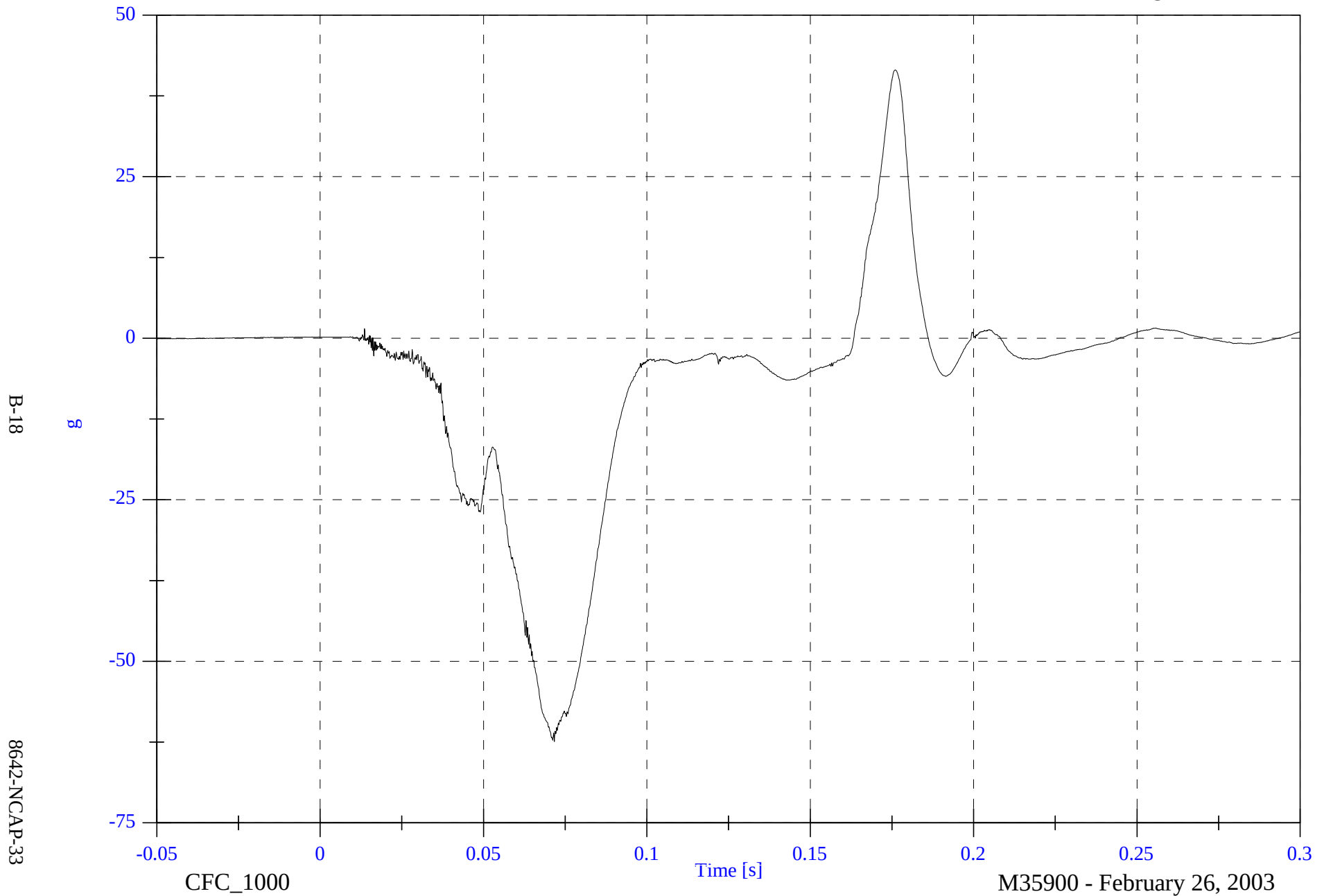


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head CG Red x

Max: 41.5 [g] at 0.176 [s]

Min: -62.4 [g] at 0.072 [s]



2003 NCAP Test 10 2003 Volvo XC90

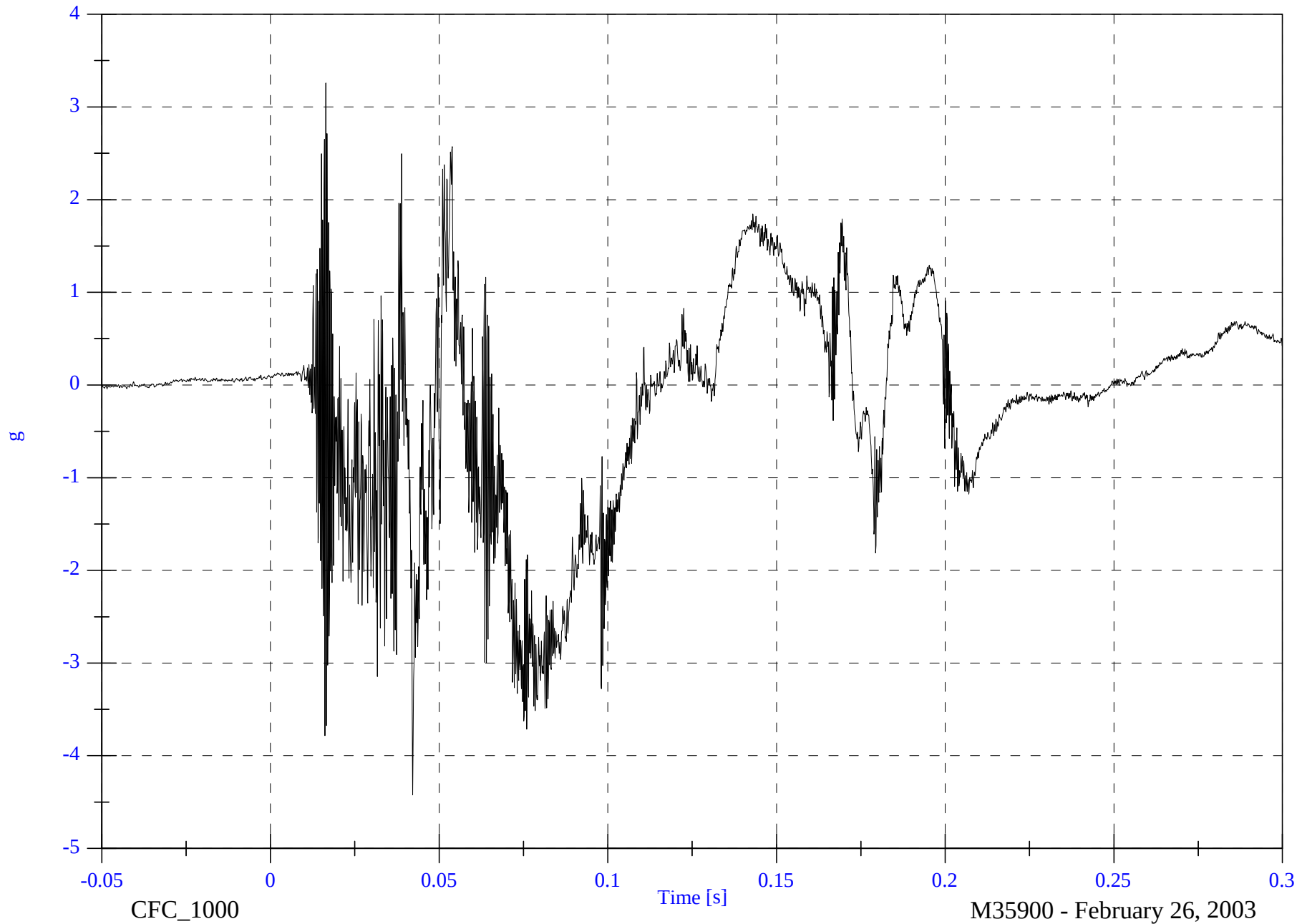
V1P1 Head CG Red y

Max: 3.3 [g] at 0.016 [s]

Min: -4.4 [g] at 0.042 [s]

B-19

8642-NCAP-33

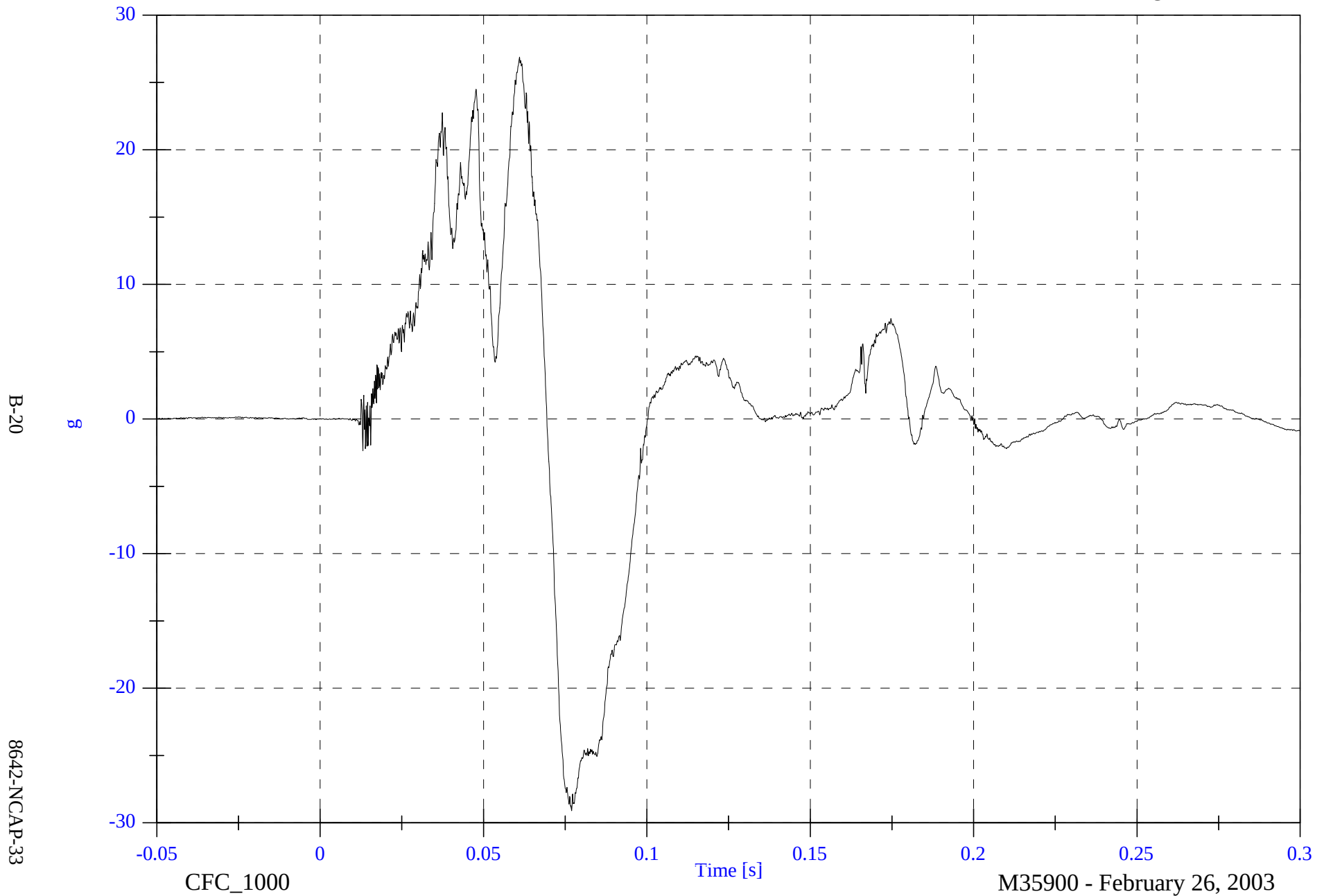


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head CG Red z

Max: 26.9 [g] at 0.061 [s]

Min: -29.1 [g] at 0.077 [s]

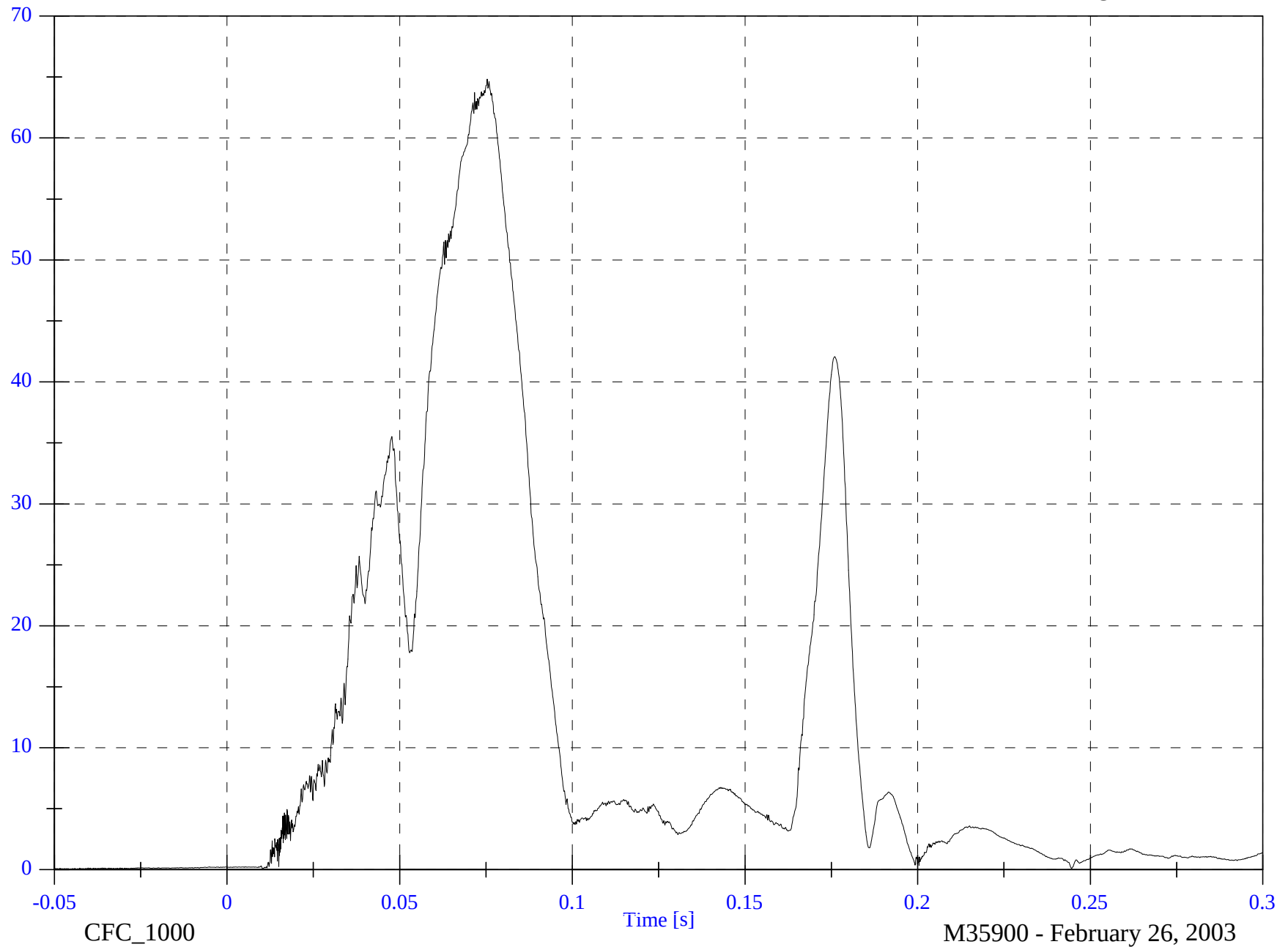


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Head CG Red Resultant

Max: 64.8 [g] at 0.075 [s]

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



B-21

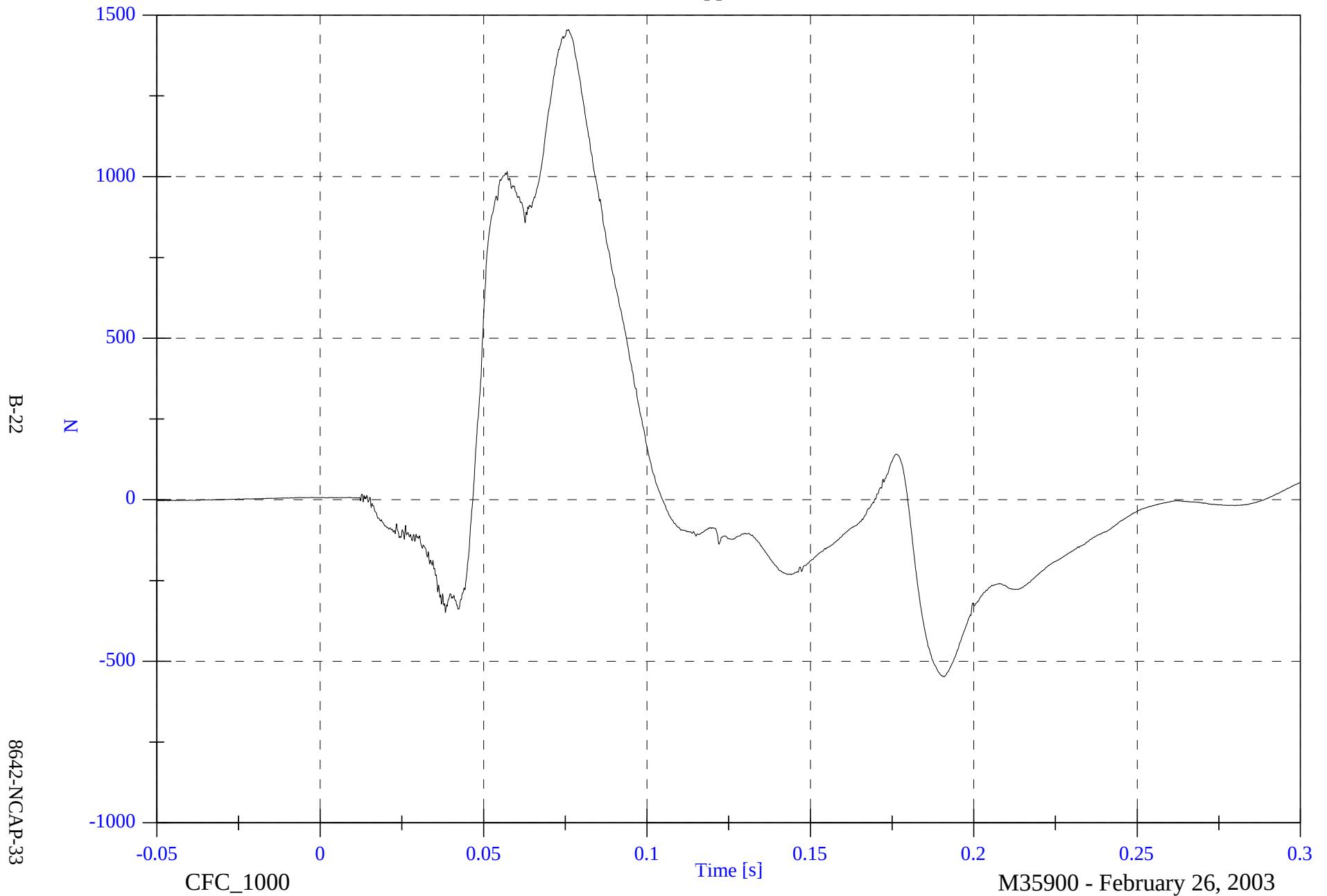
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 1455.2 [N] at 0.076 [s]

Min: -548.2 [N] at 0.191 [s]

V1P1 Upper Neck Fx

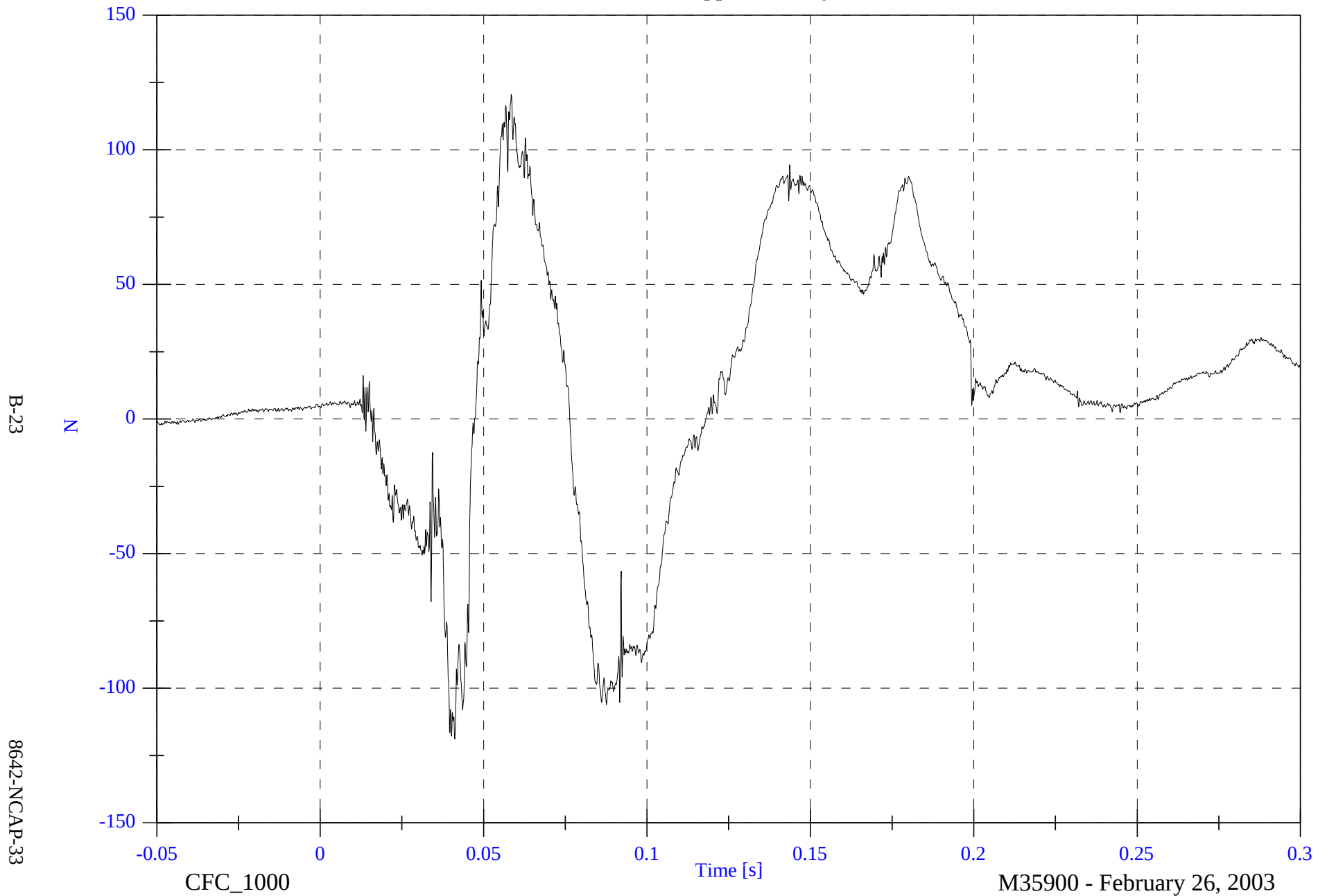


2003 NCAP Test 10 2003 Volvo XC90

Max: 120.5 [N] at 0.058 [s]

Min: -118.8 [N] at 0.041 [s]

V1P1 Upper Neck Fy

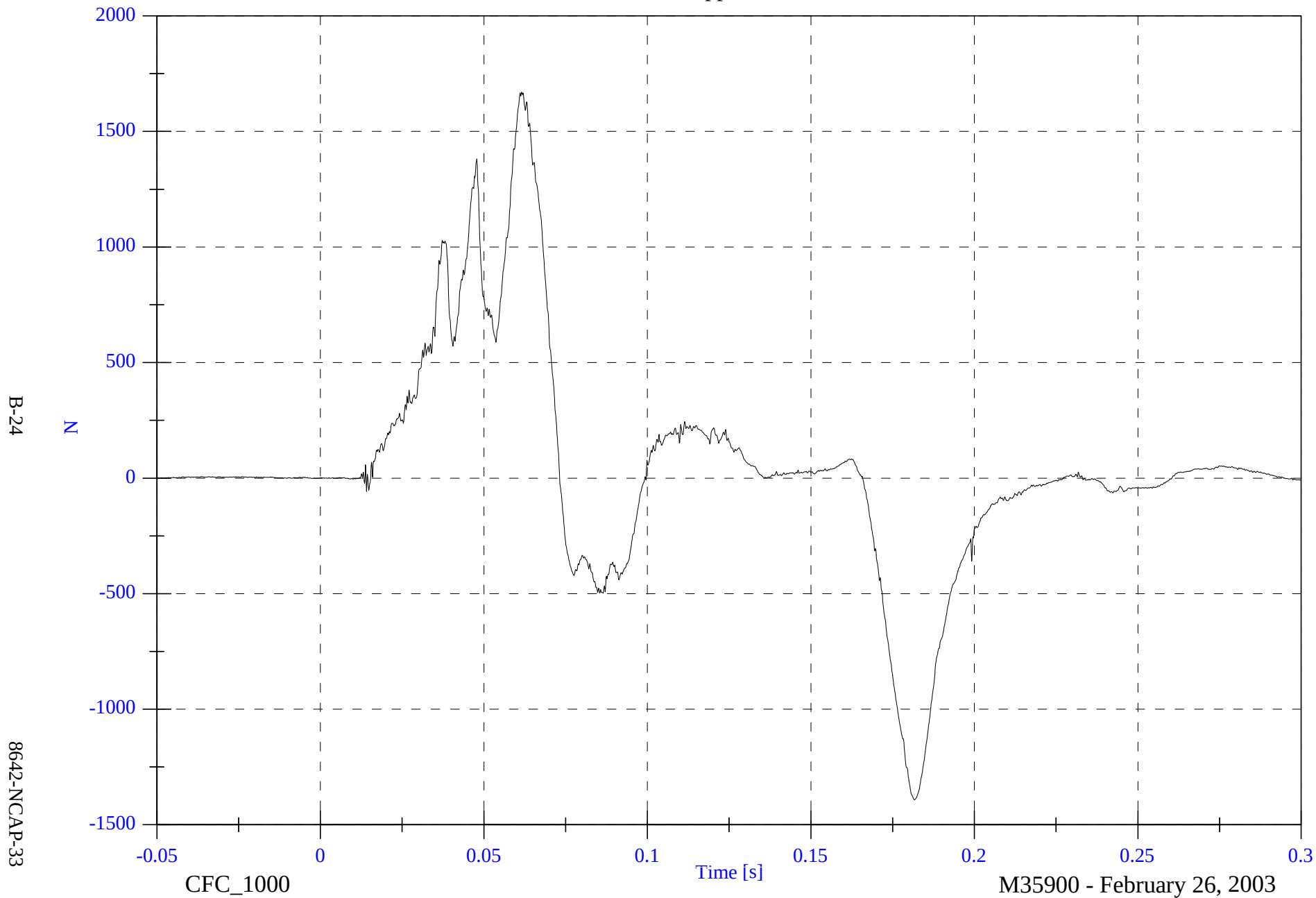


2003 NCAP Test 10 2003 Volvo XC90

Max: 1669.5 [N] at 0.062 [s]

Min: -1392.2 [N] at 0.182 [s]

V1P1 Upper Neck Fz

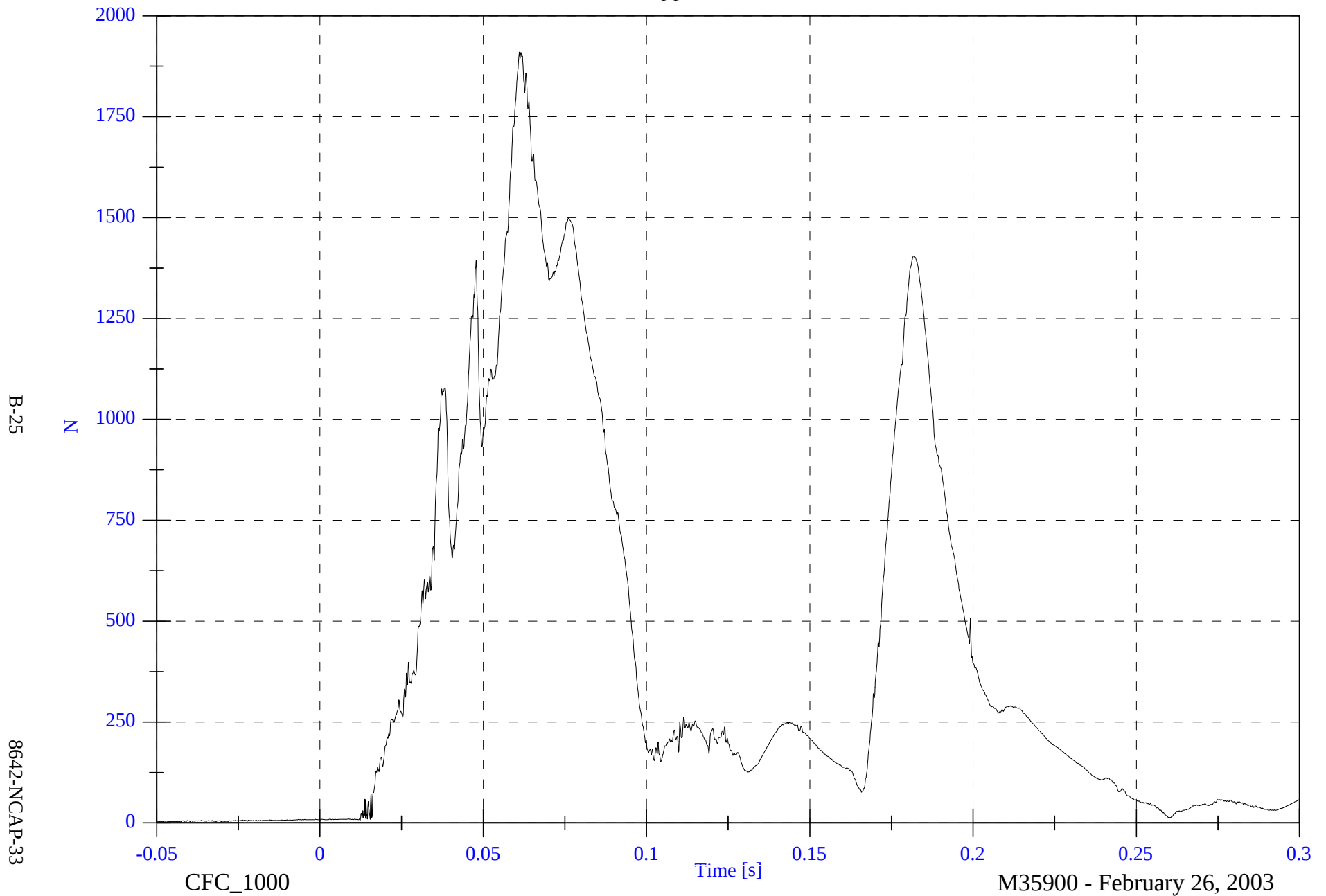


2003 NCAP Test 10 2003 Volvo XC90

Max: 1910.4 [N] at 0.061 [s]

Min: 2.2 [N] at -0.048 [s]

V1P1 Upper Neck F Resultant

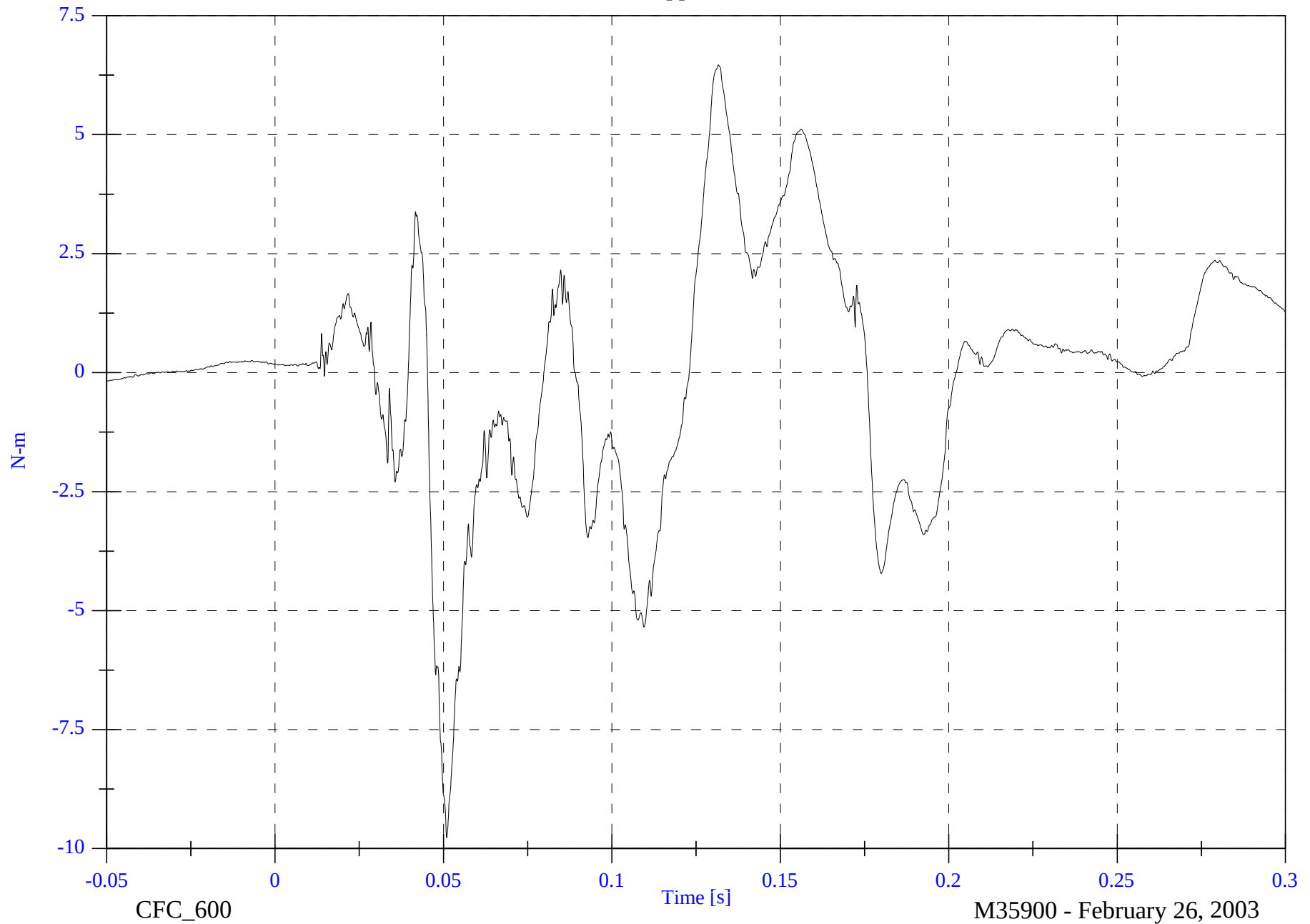


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Upper Neck Mx

Max: 6.5 [N-m] at 0.132 [s]

Min: -9.8 [N-m] at 0.051 [s]



B-26

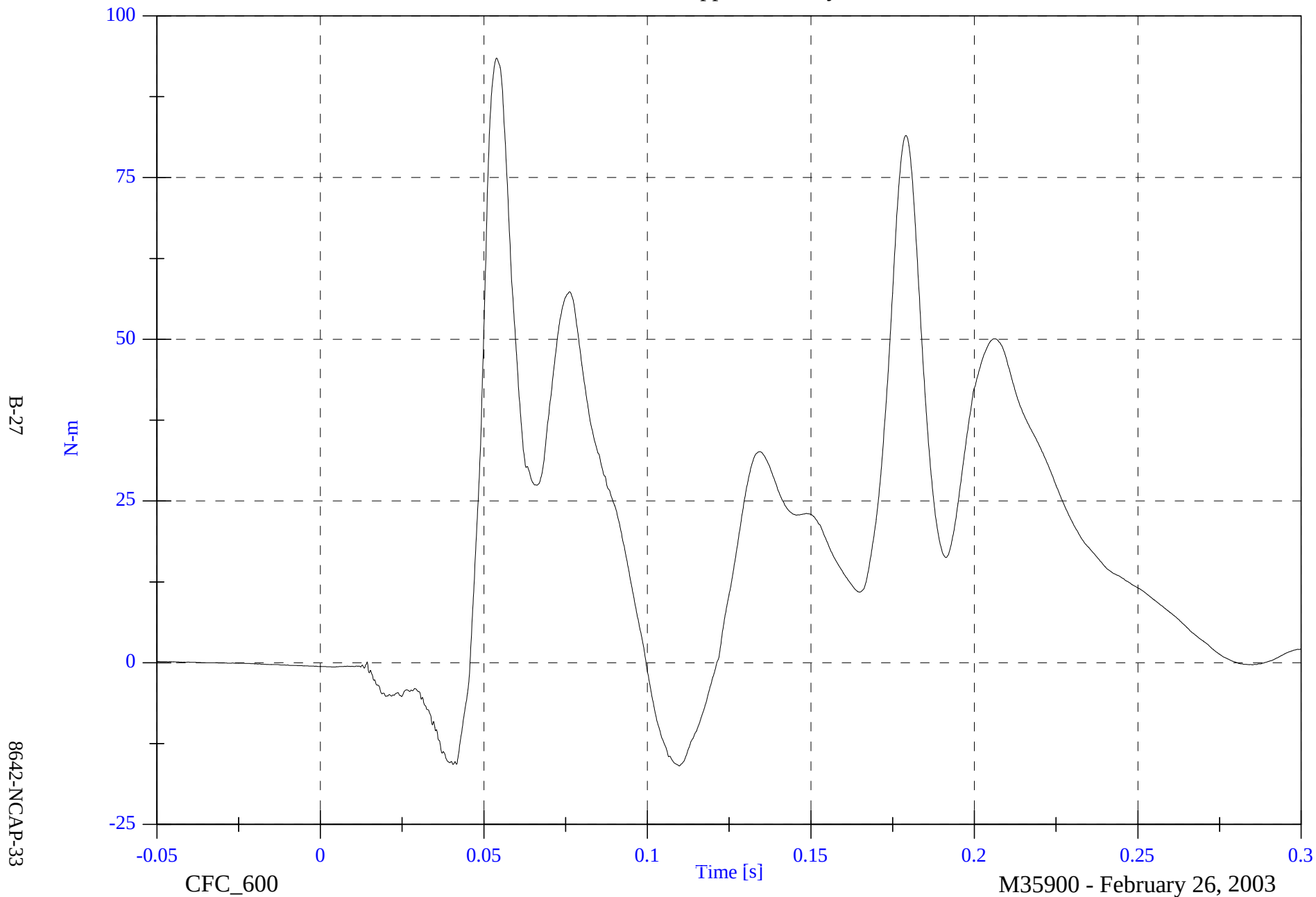
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 93.5 [N-m] at 0.054 [s]

Min: -16.0 [N-m] at 0.110 [s]

V1P1 Upper Neck My

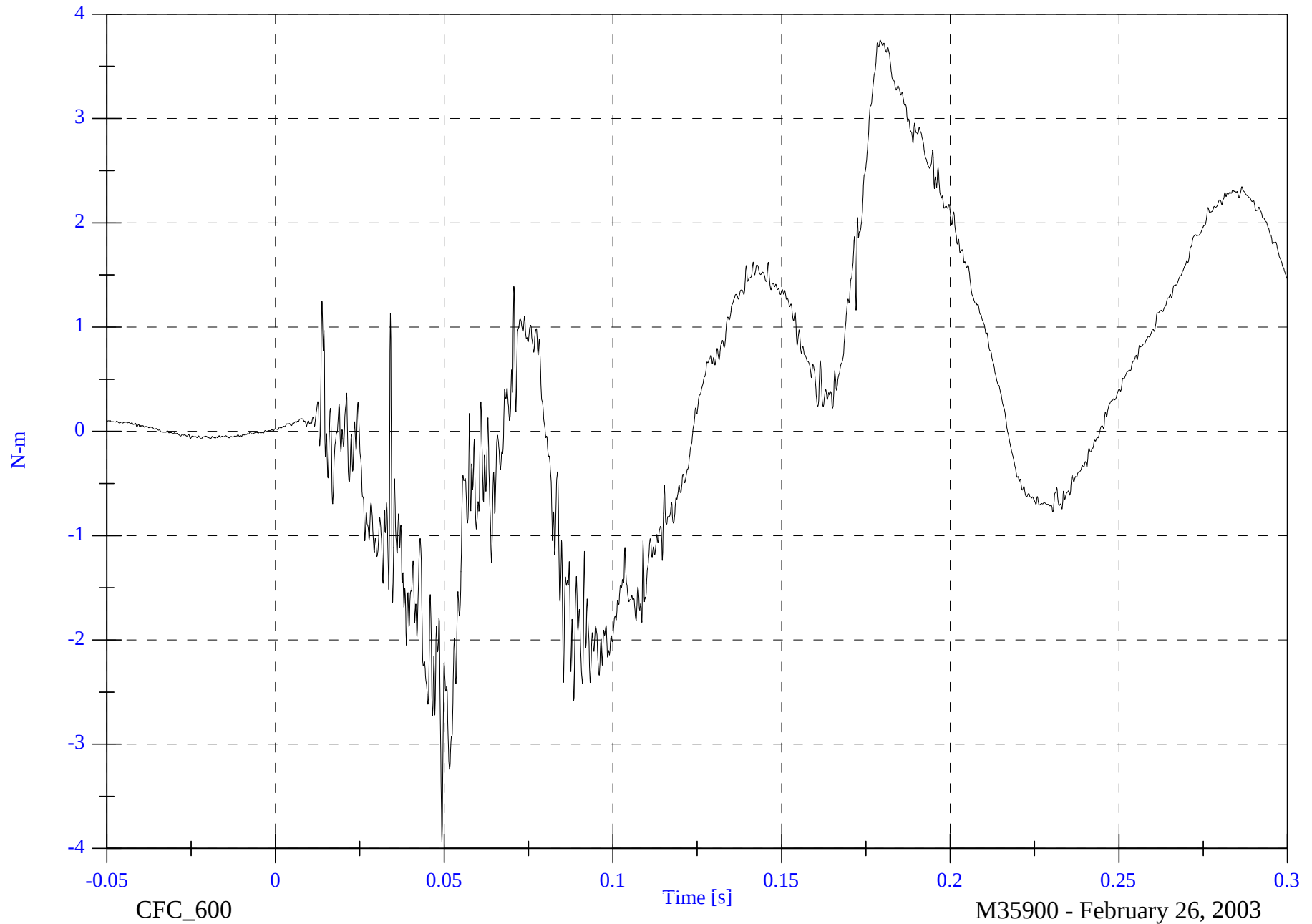


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Upper Neck Mz

Max: 3.8 [N-m] at 0.179 [s]

Min: -3.9 [N-m] at 0.049 [s]



B-28

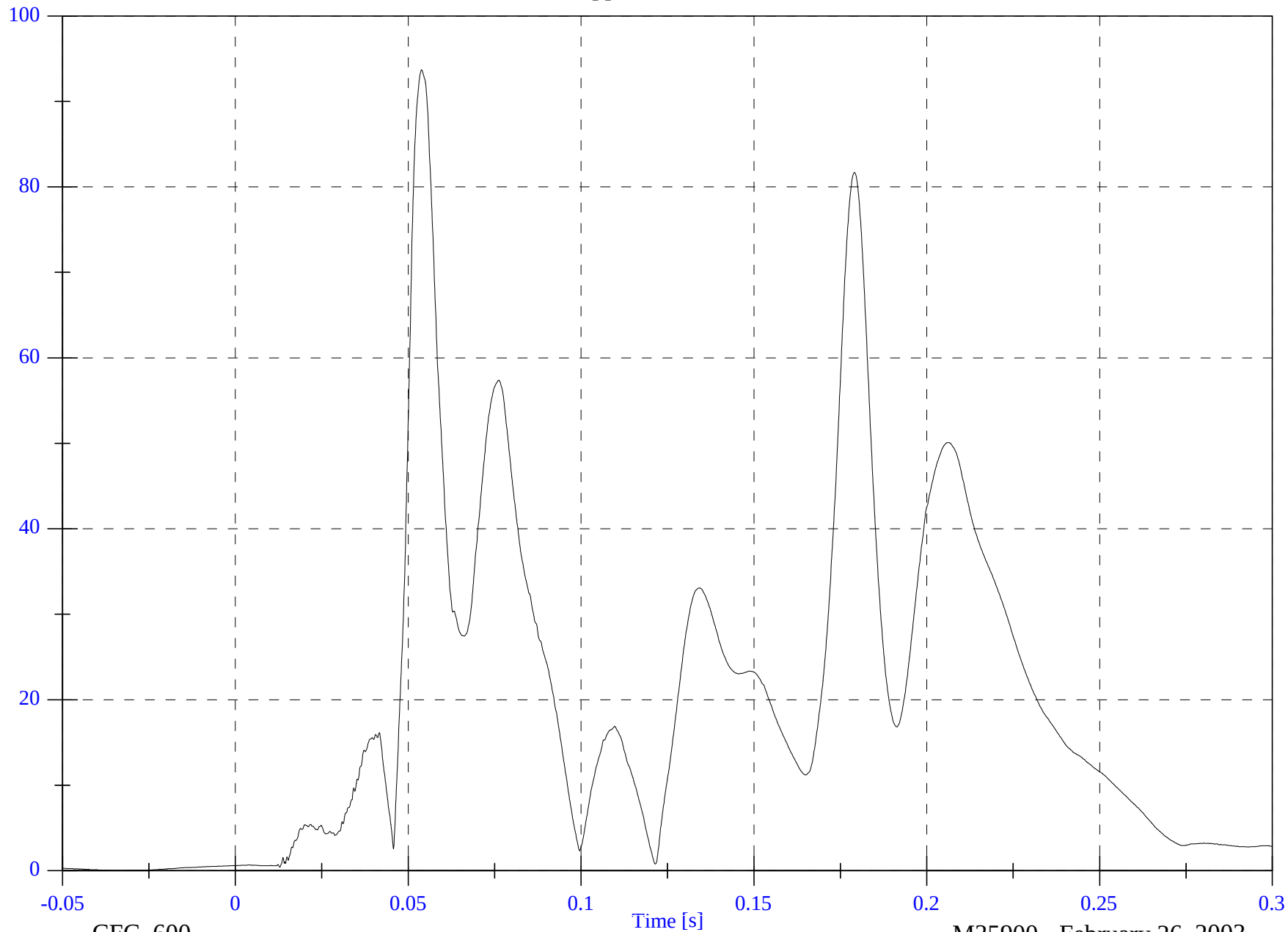
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

V1P1 Upper Neck M Resultant

Max: 93.7 [N-m] at 0.054 [s]

Min: 0.0 [N-m] at -0.033 [s]



B-29

8642-NCAP-33

CFC_600

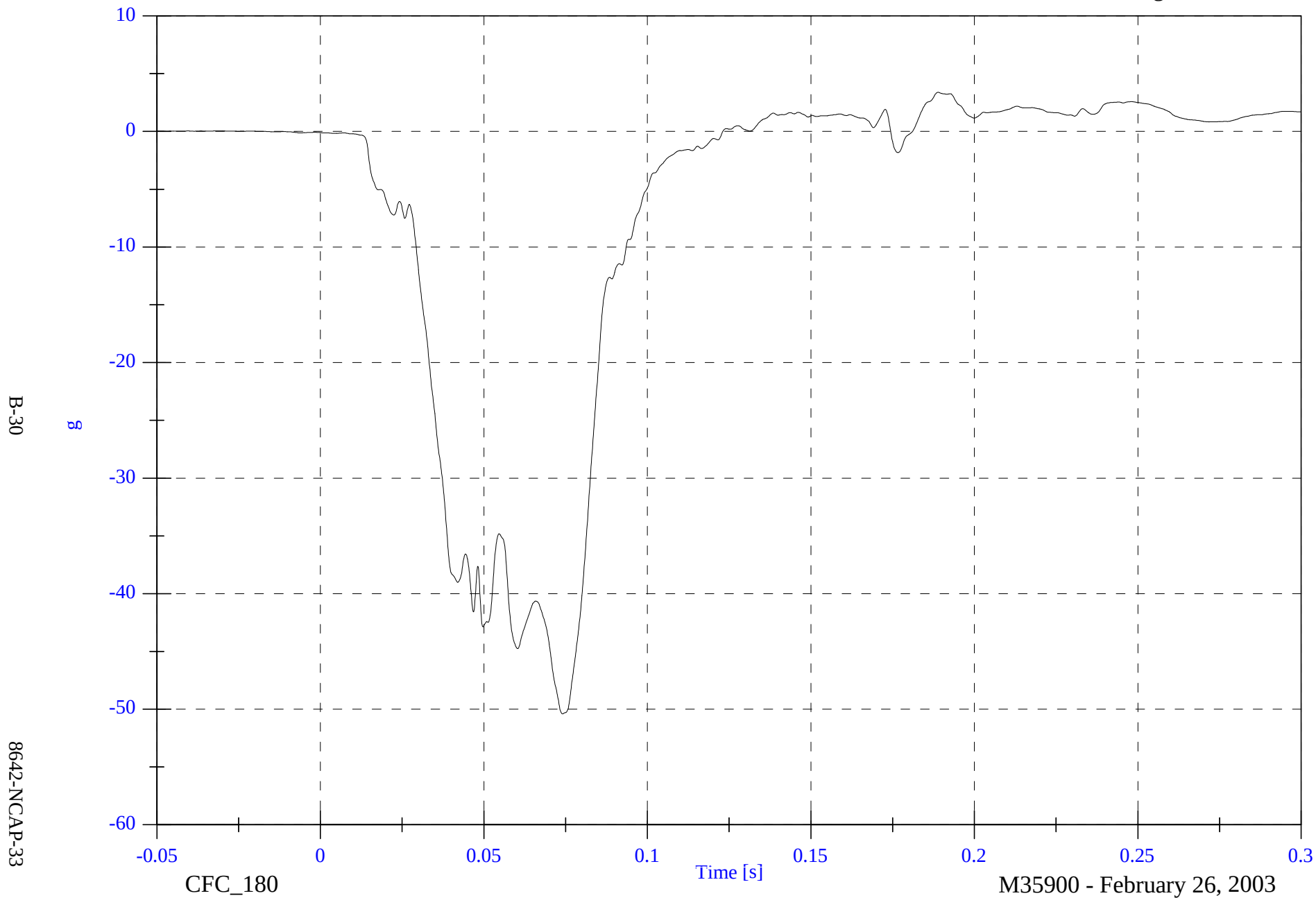
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

Max: 3.4 [g] at 0.189 [s]

Min: -50.4 [g] at 0.074 [s]

V1P1 Chest x



2003 NCAP Test 10 2003 Volvo XC90

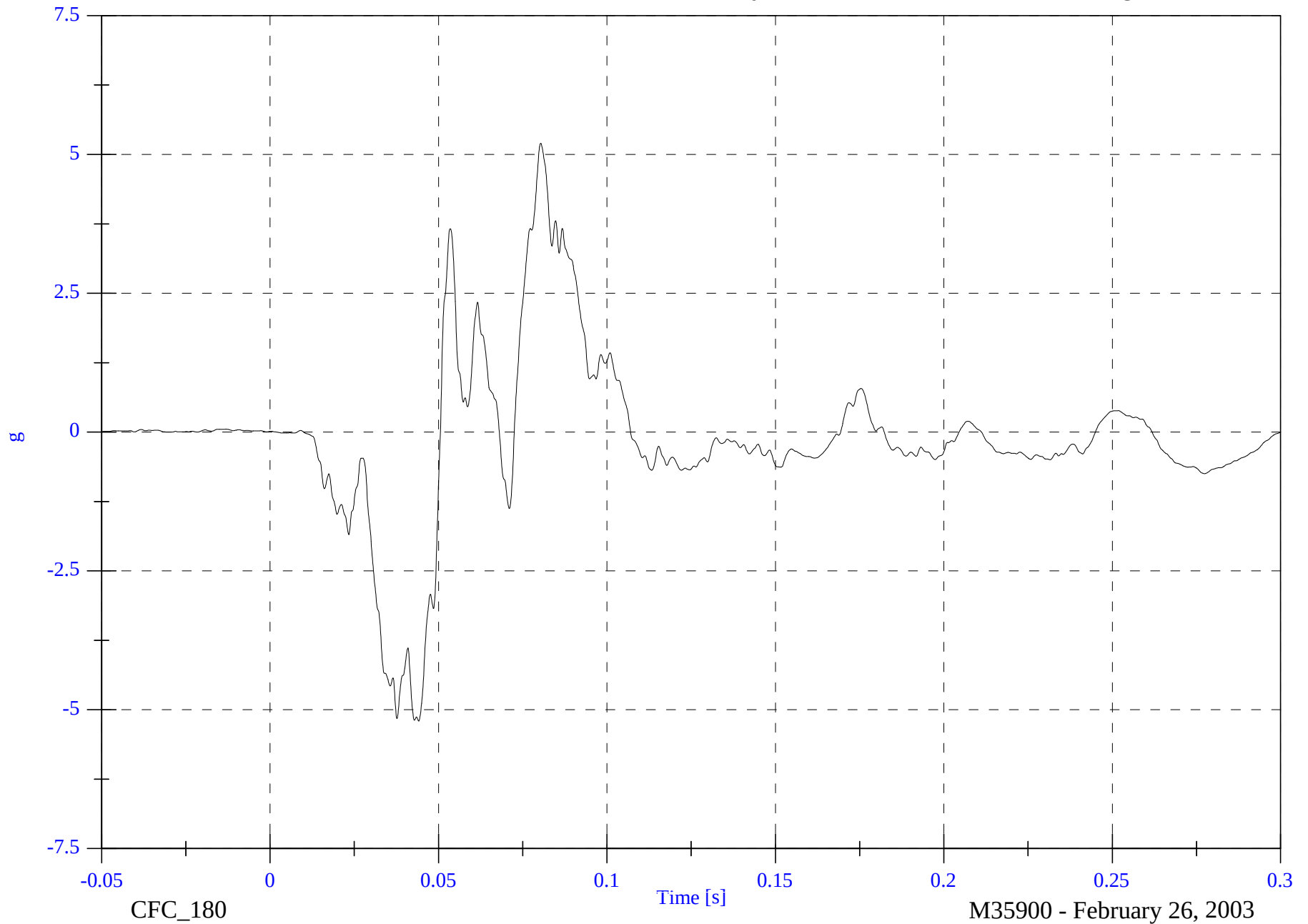
V1P1 Chest y

Max: 5.2 [g] at 0.080 [s]

Min: -5.2 [g] at 0.044 [s]

B-31

8642-NCAP-33

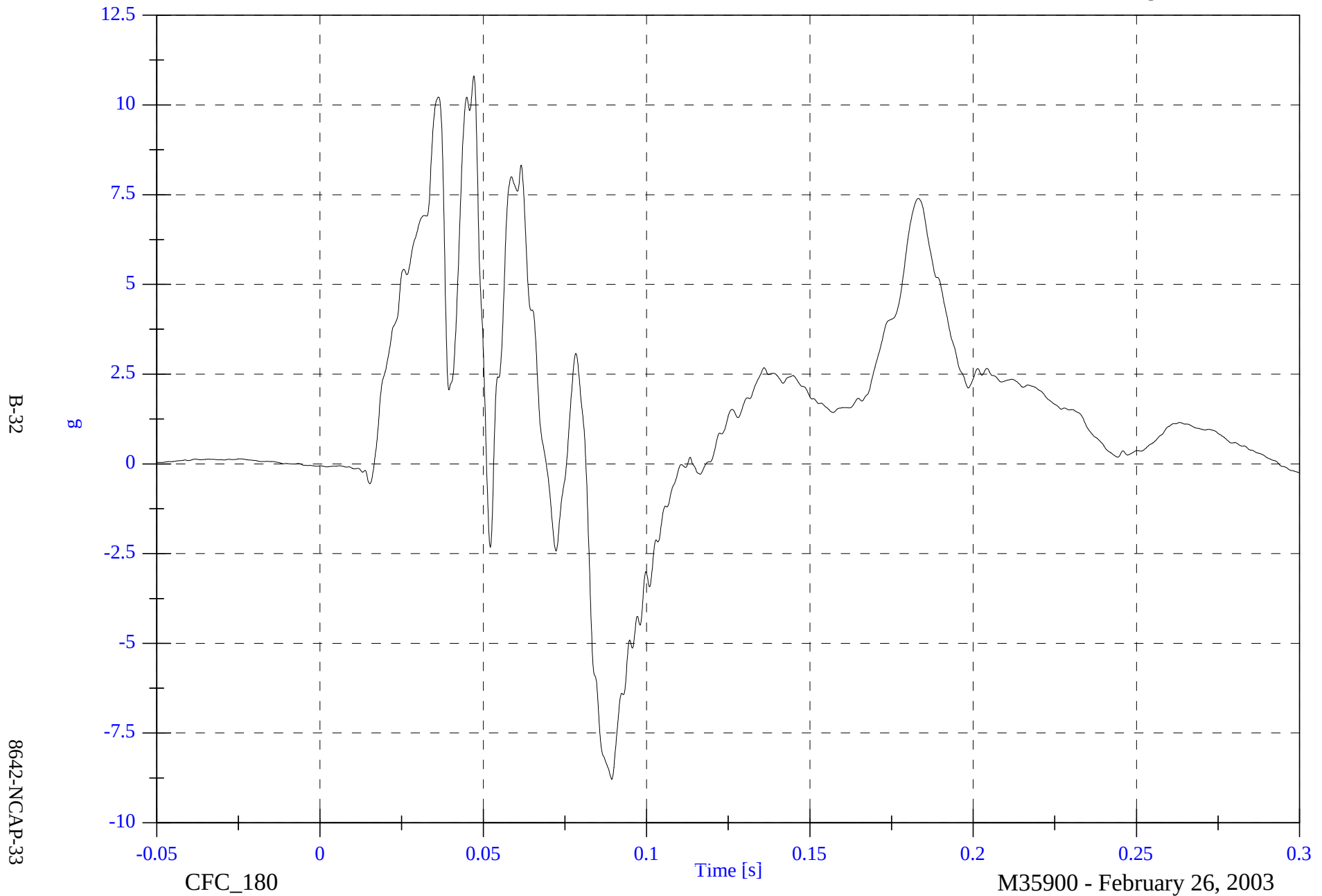


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Chest z

Max: 10.8 [g] at 0.047 [s]

Min: -8.8 [g] at 0.089 [s]



2003 NCAP Test 10 2003 Volvo XC90

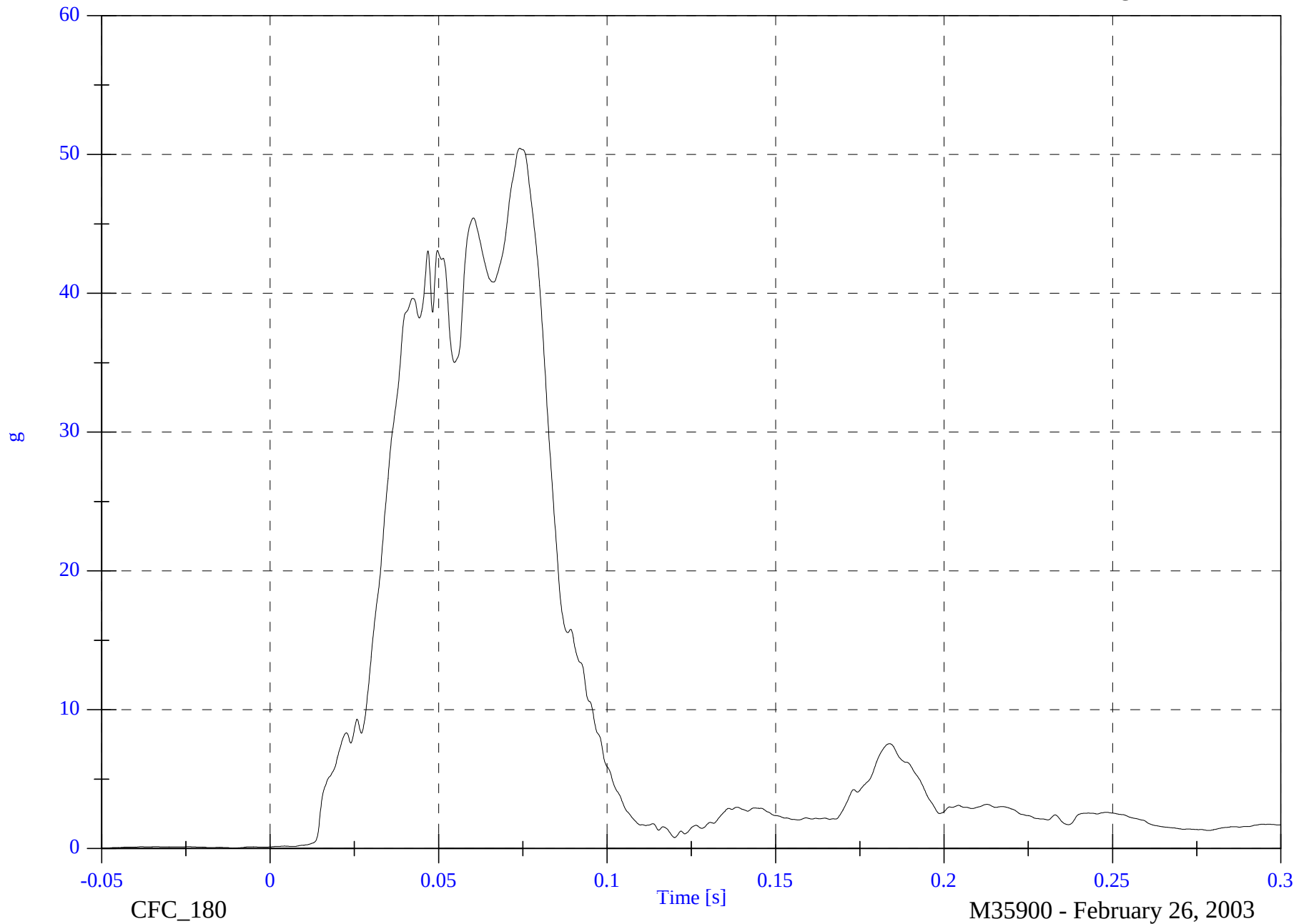
V1P1 Chest Resultant

Max: 50.4 [g] at 0.074 [s]

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

B-33

8642-NCAP-33

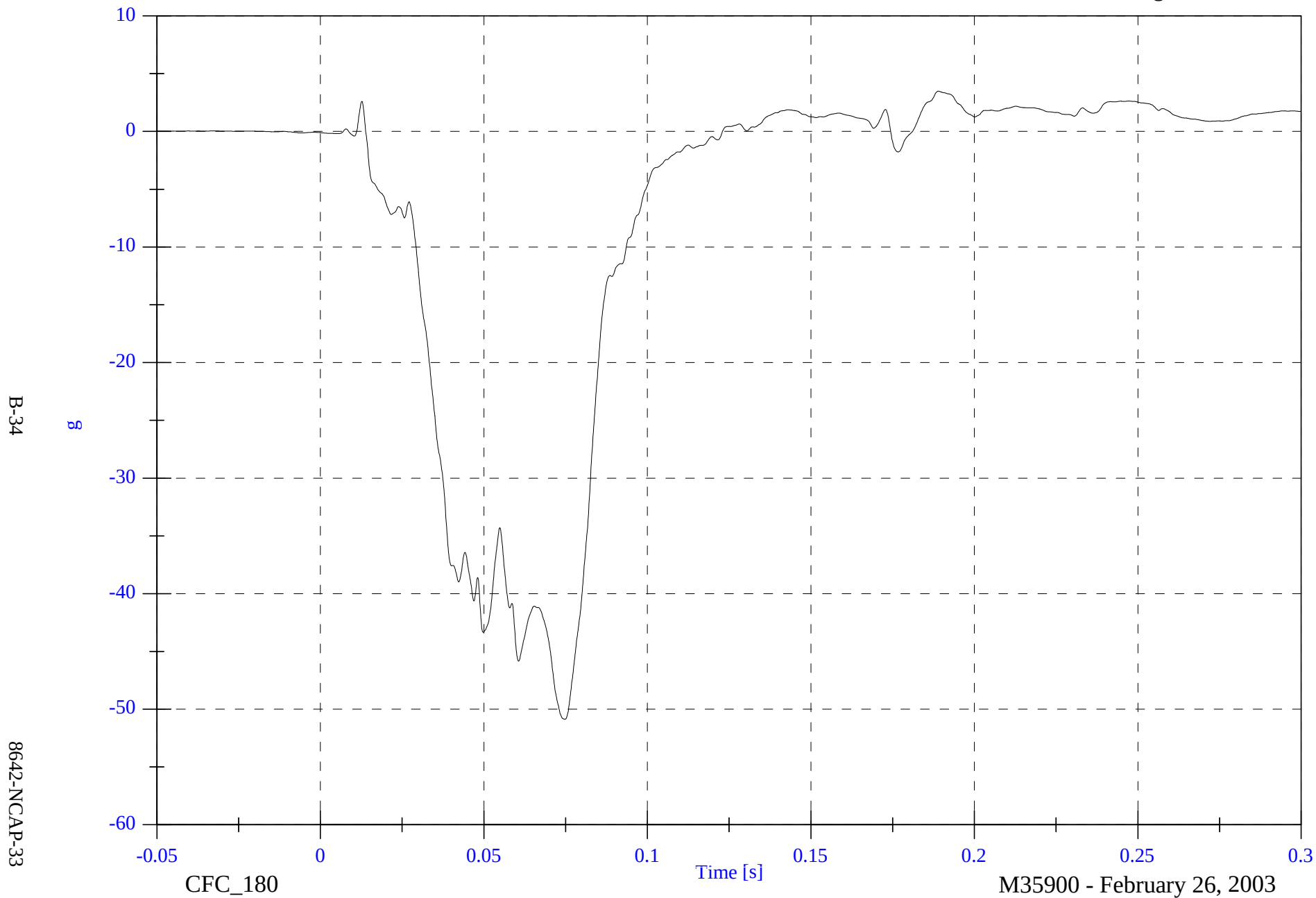


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Chest Red x

Max: 3.5 [g] at 0.189 [s]

Min: -50.9 [g] at 0.075 [s]

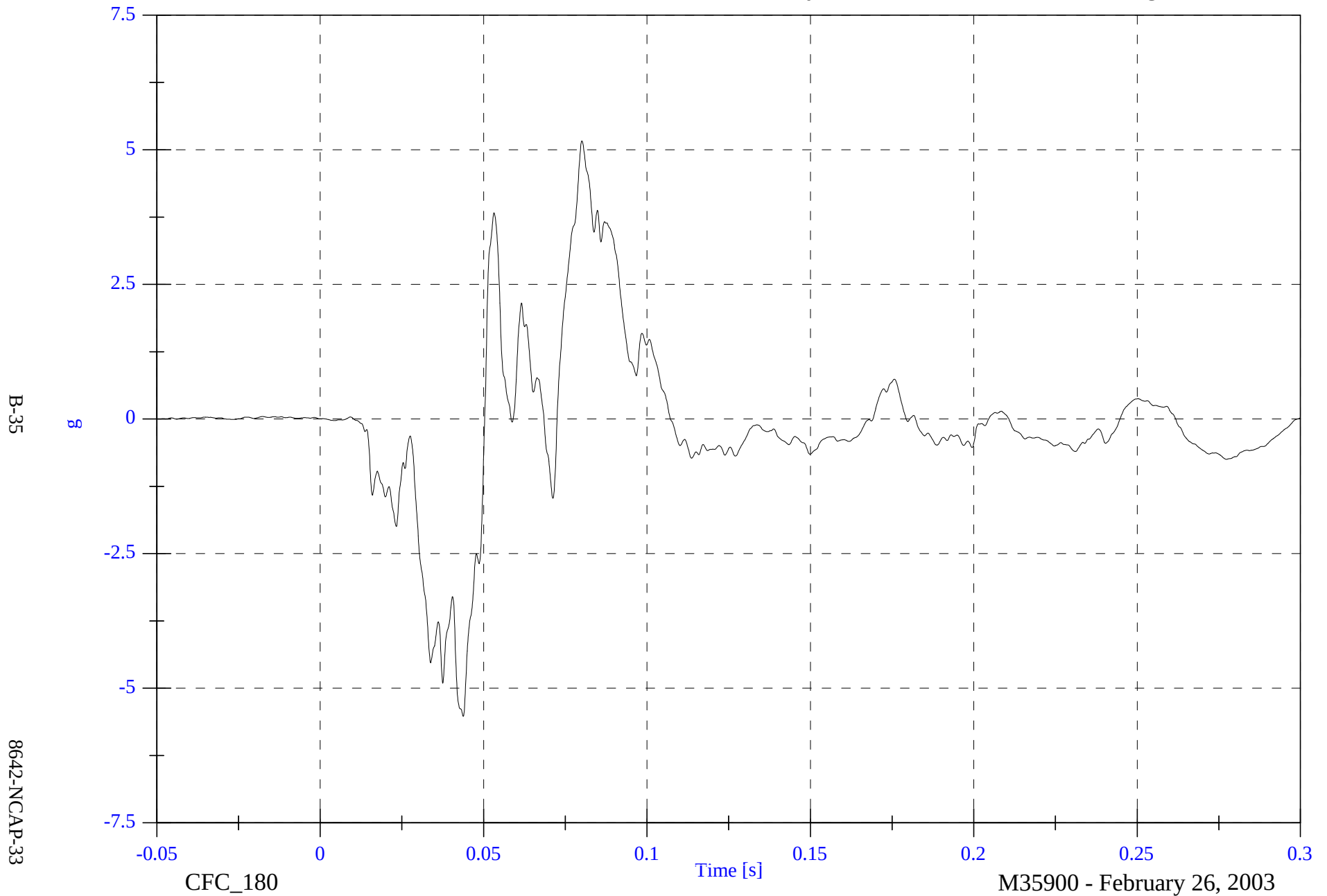


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Chest Red y

Max: 5.2 [g] at 0.080 [s]

Min: -5.5 [g] at 0.044 [s]

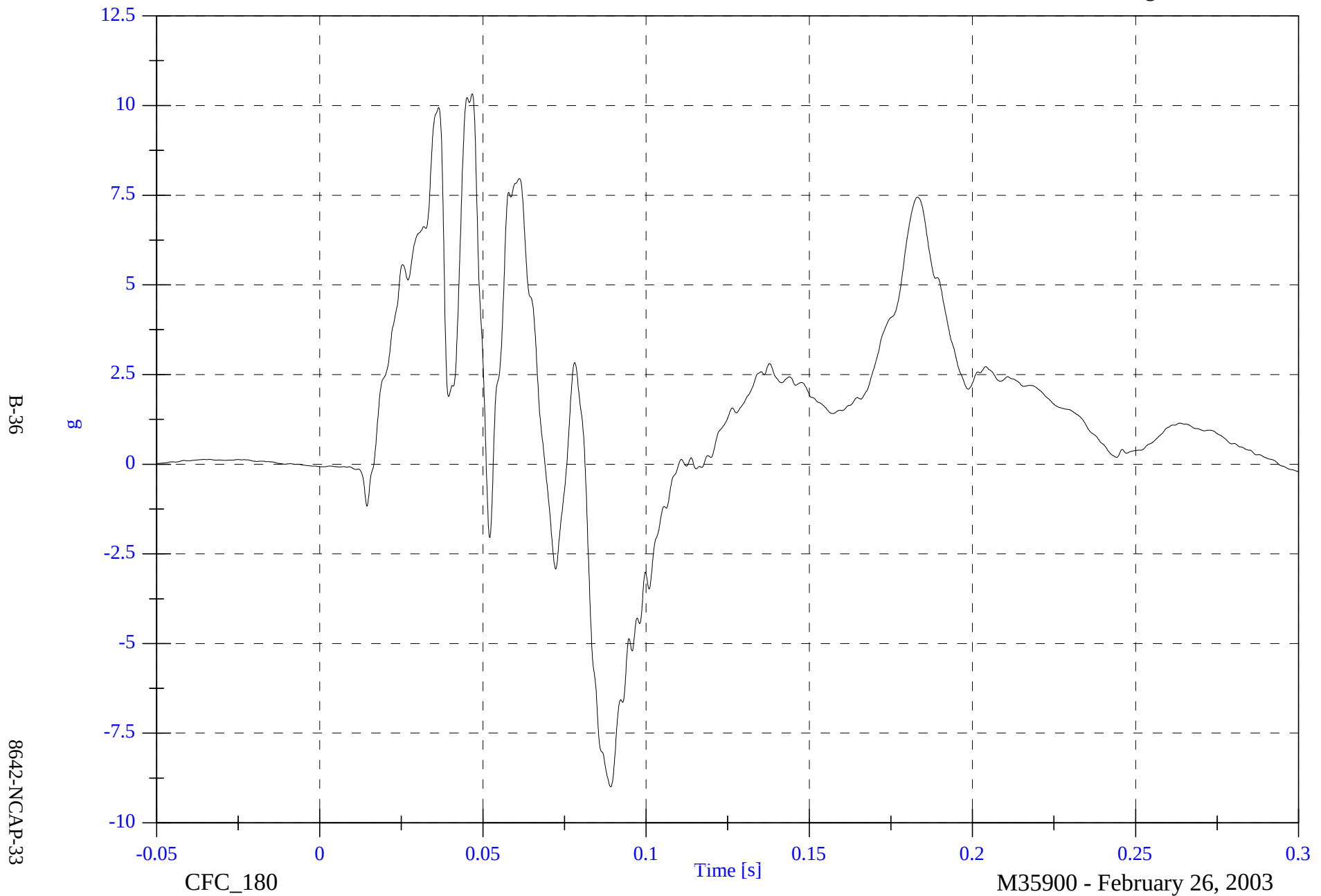


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Chest Red z

Max: 10.3 [g] at 0.047 [s]

Min: -9.0 [g] at 0.089 [s]



2003 NCAP Test 10 2003 Volvo XC90

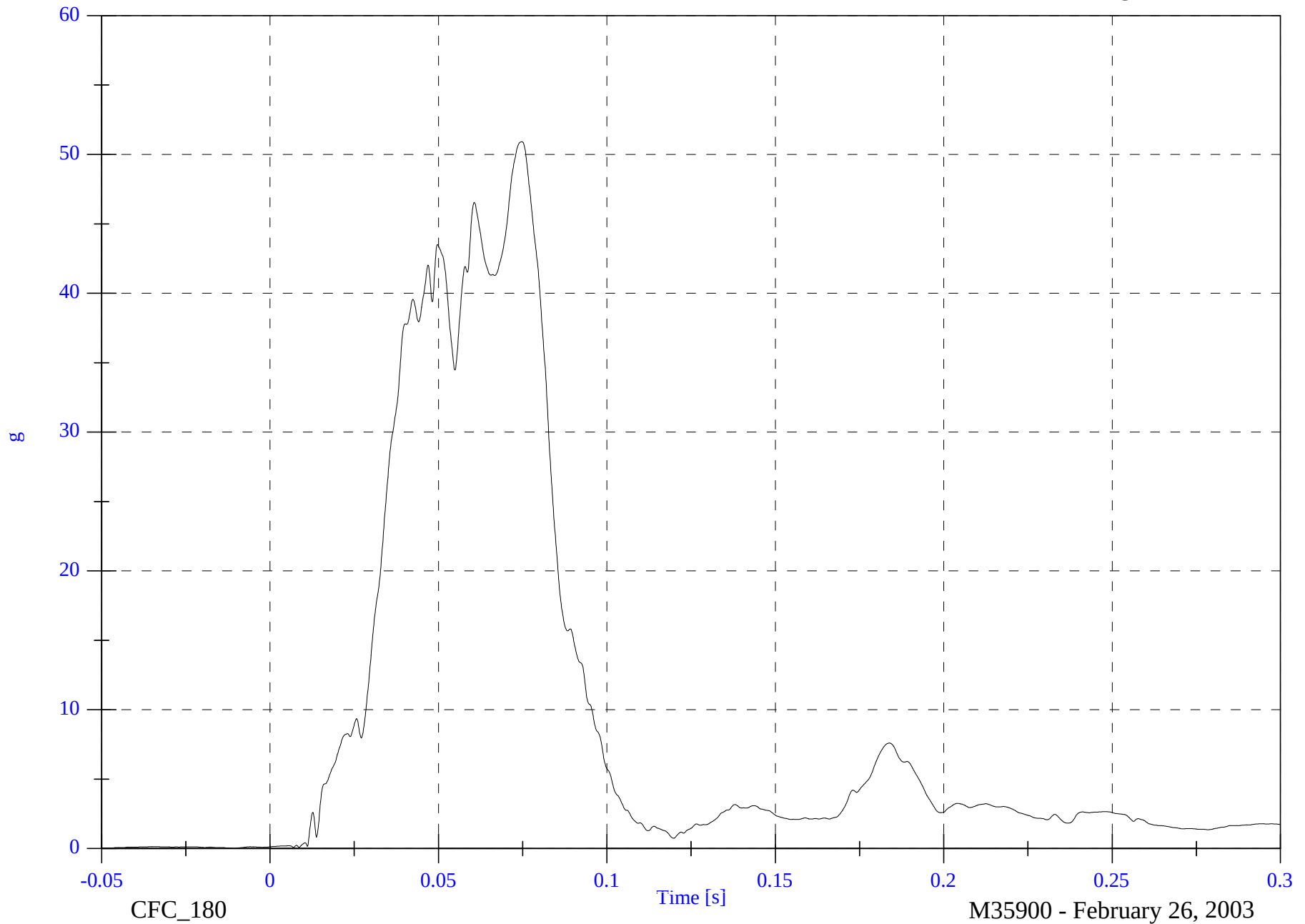
V1P1 Chest Red Resultant

Max: 50.9 [g] at 0.075 [s]

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

B-37

8642-NCAP-33

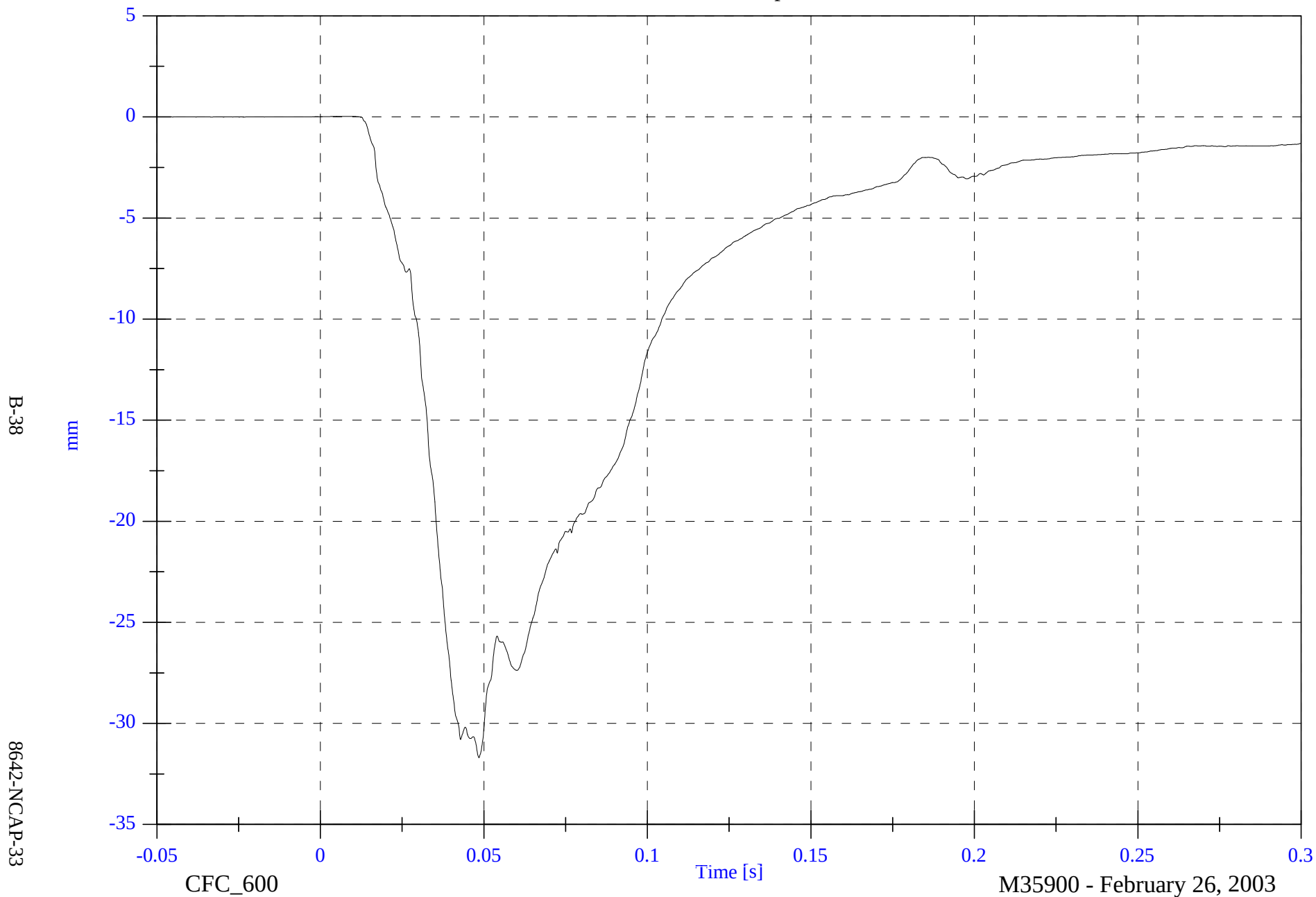


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Chest Compression

Max: 0.0 [mm] at 0.009 [s]

Min: -31.7 [mm] at 0.048 [s]

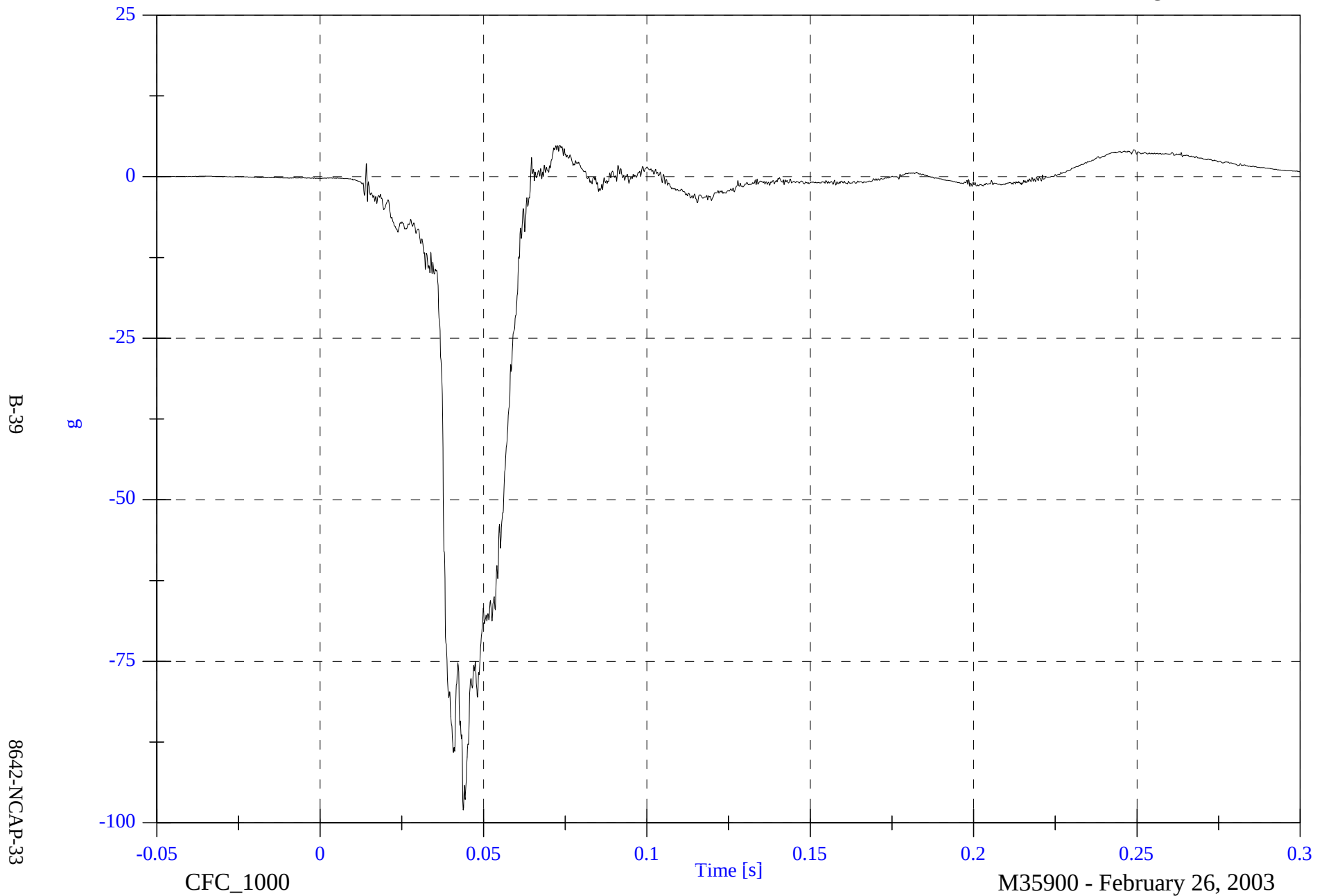


2003 NCAP Test 10 2003 Volvo XC90

Max: 4.8 [g] at 0.073 [s]

Min: -98.0 [g] at 0.044 [s]

V1P1 Pelvic x

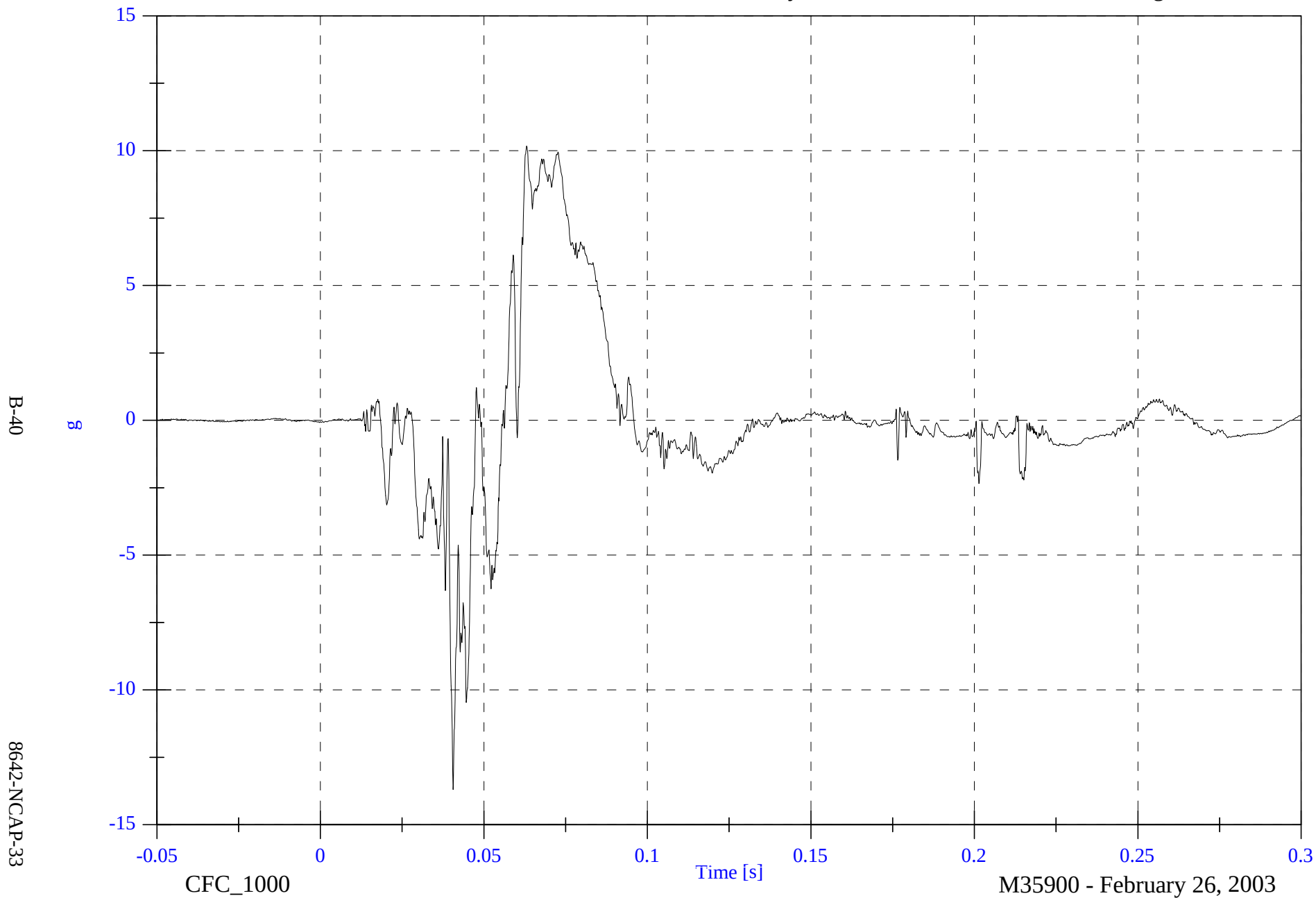


2003 NCAP Test 10 2003 Volvo XC90

Max: 10.2 [g] at 0.063 [s]

Min: -13.7 [g] at 0.041 [s]

V1P1 Pelvic y

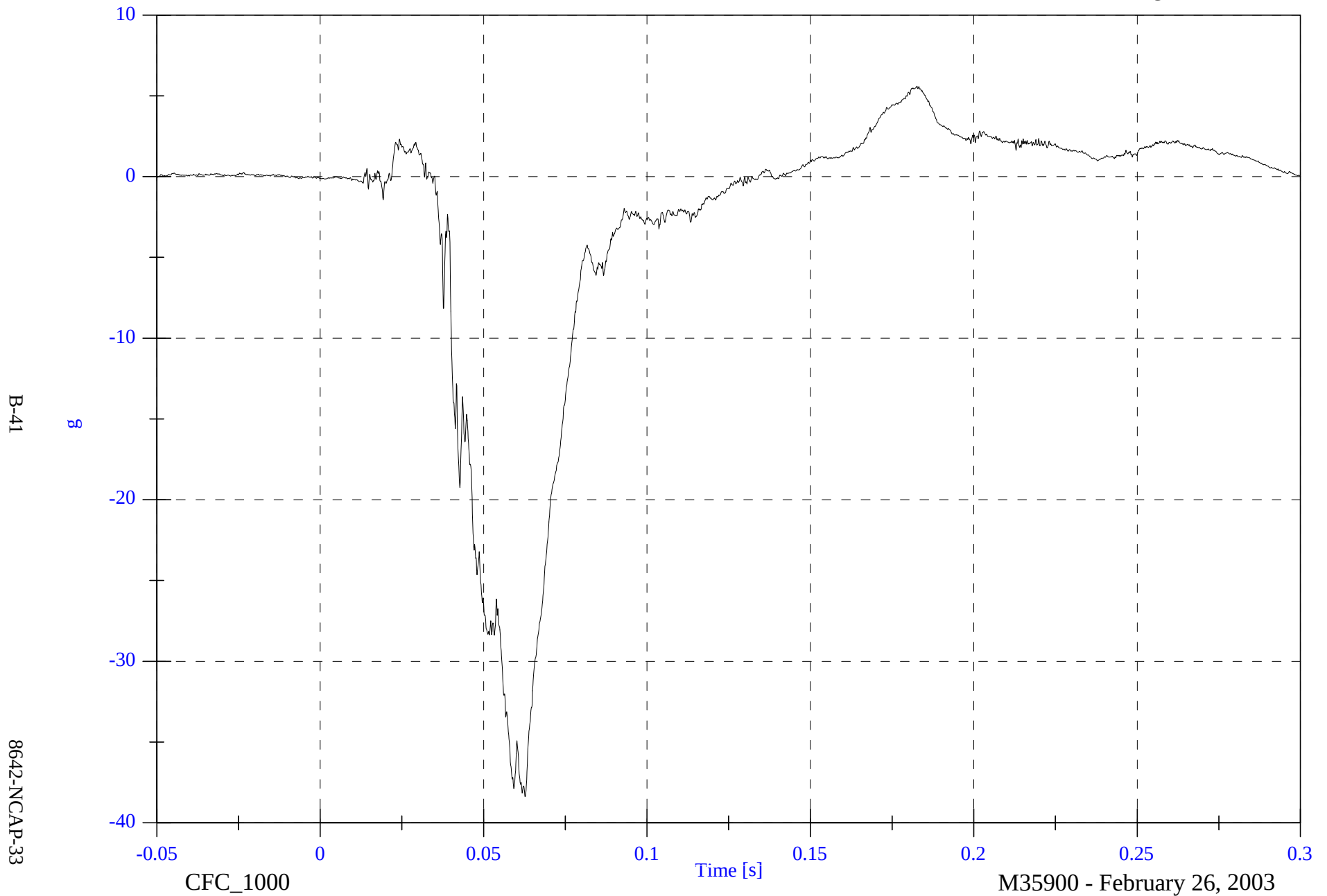


2003 NCAP Test 10 2003 Volvo XC90

Max: 5.6 [g] at 0.183 [s]

Min: -38.4 [g] at 0.063 [s]

V1P1 Pelvic z

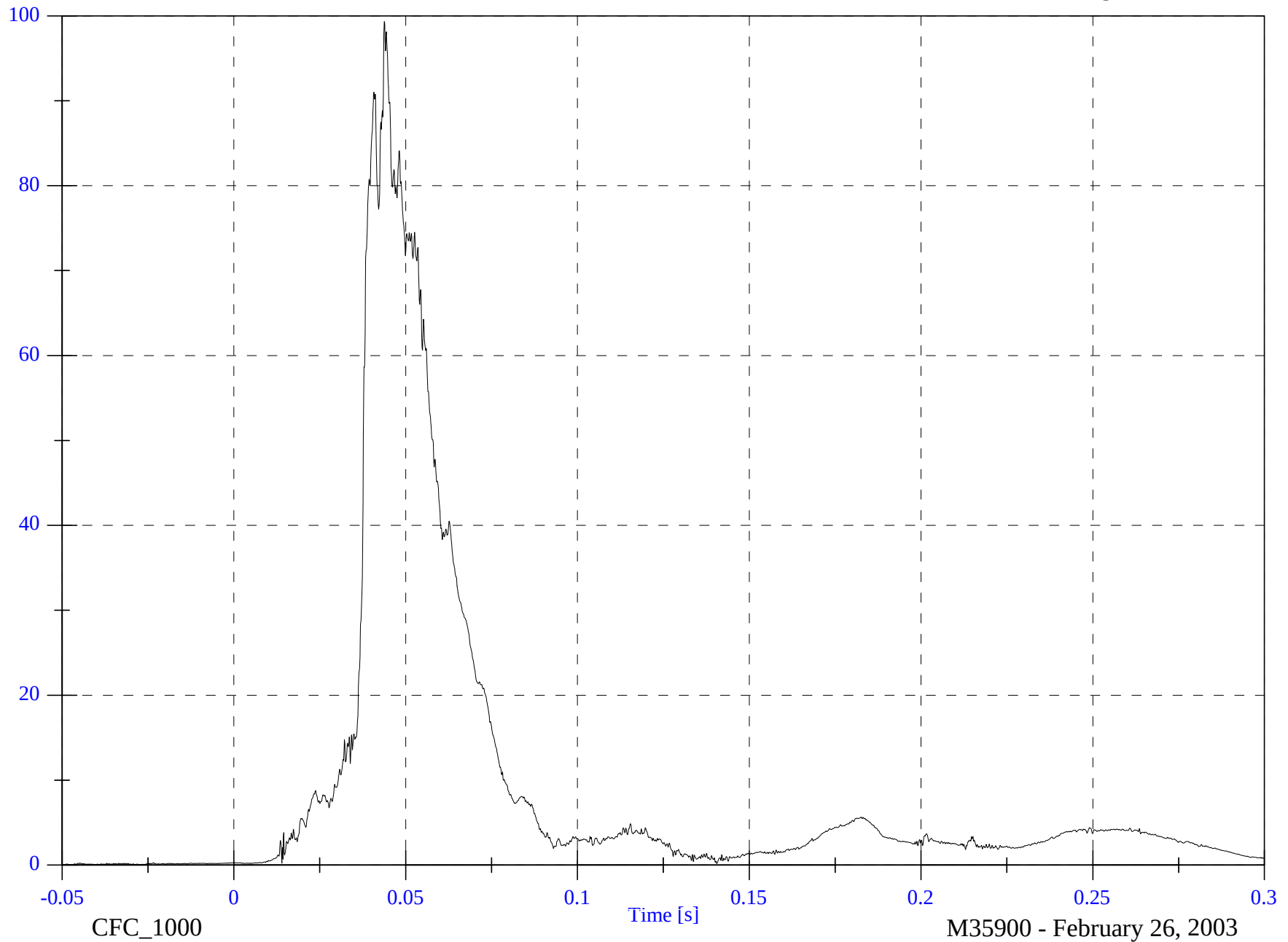


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Pelvic Resultant

Max: 99.3 [g] at 0.044 [s]

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

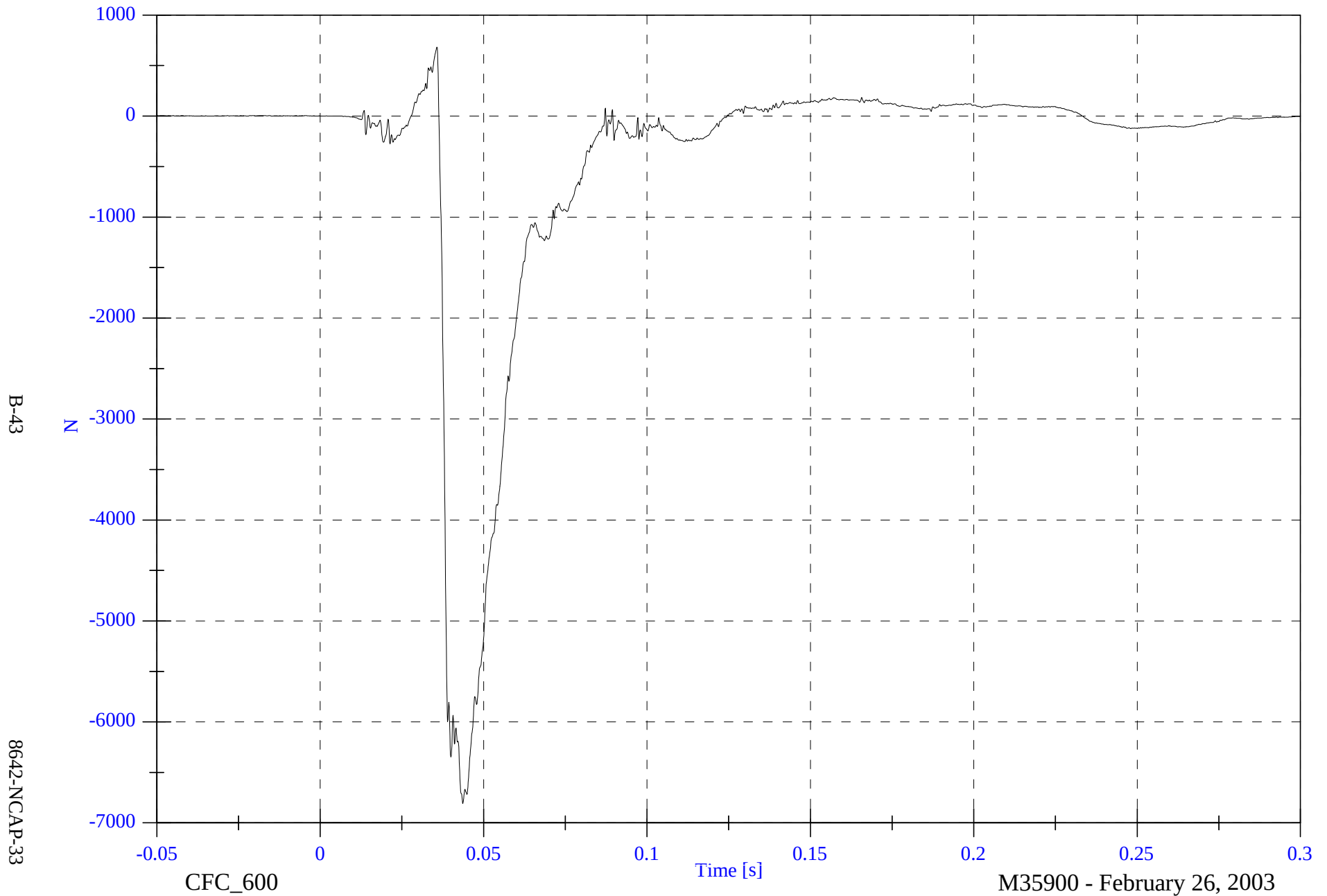


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left Femur

Max: 683.7 [N] at 0.036 [s]

Min: -6808.6 [N] at 0.044 [s]

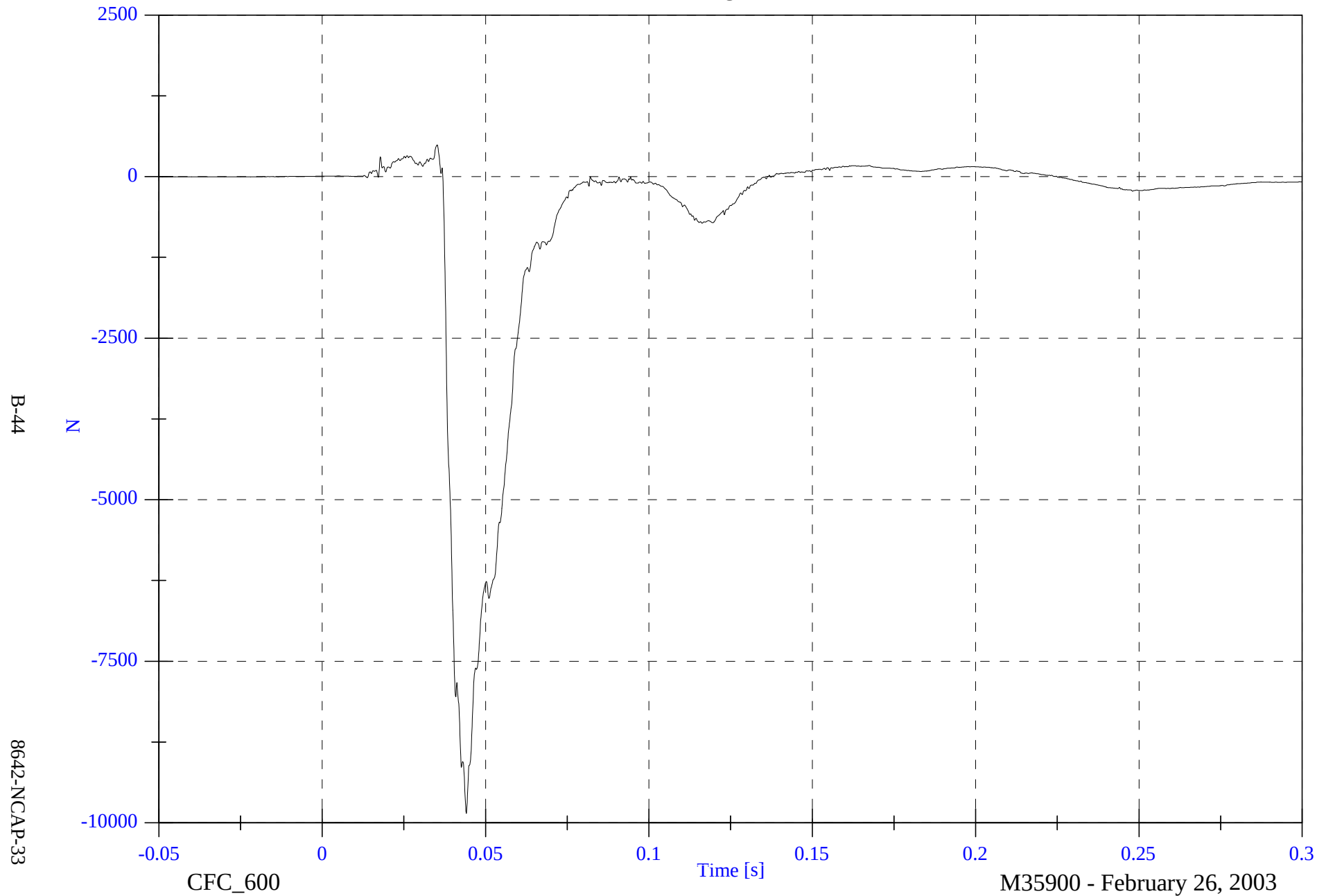


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Femur

Max: 493.1 [N] at 0.035 [s]

Min: -9855.3 [N] at 0.044 [s]



2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left Upper Tibia Mx

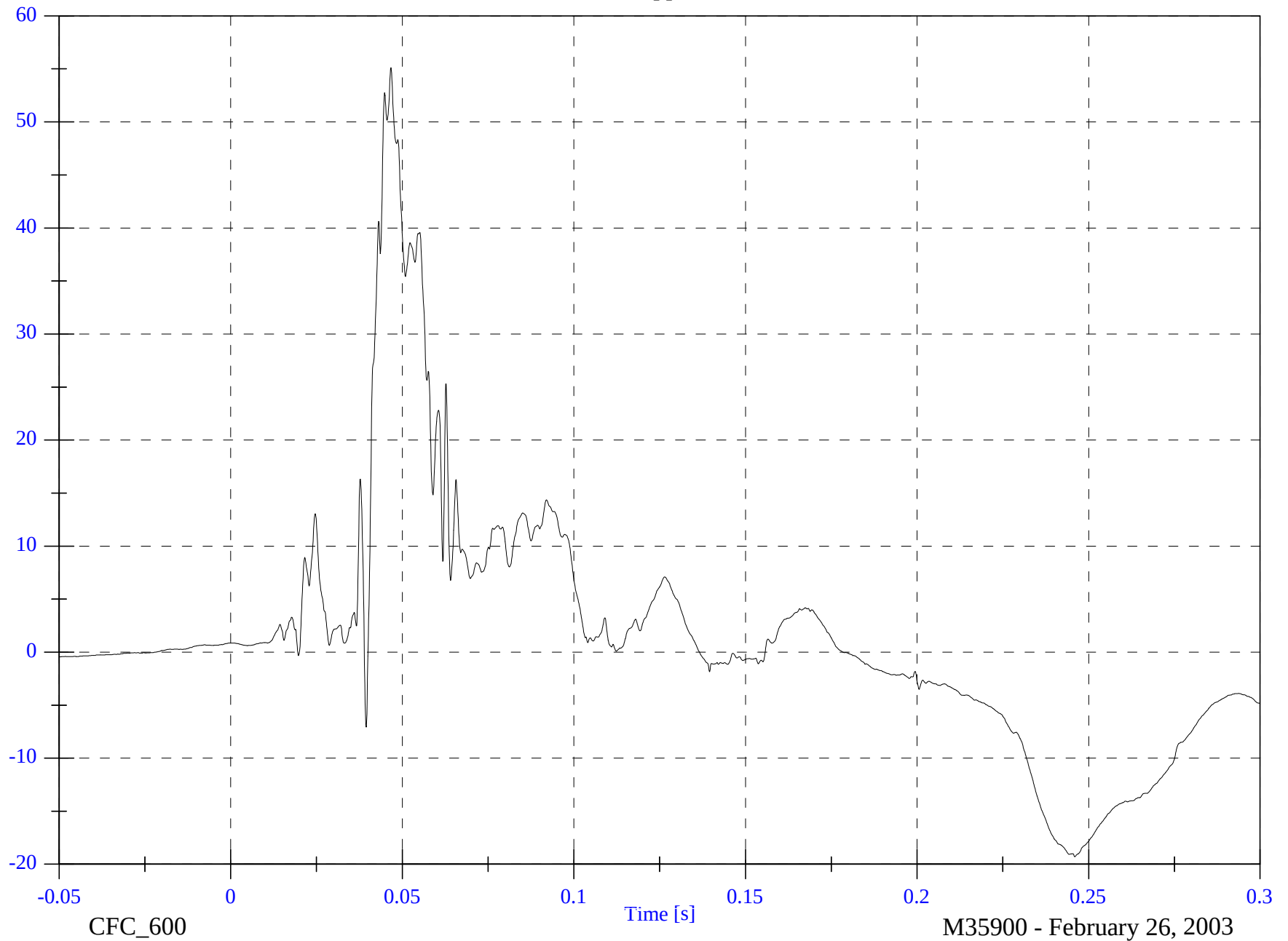
Max: 55.1 [N-m] at 0.047 [s]

Min: -19.3 [N-m] at 0.246 [s]

B-45

N-m

8642-NCAP-33



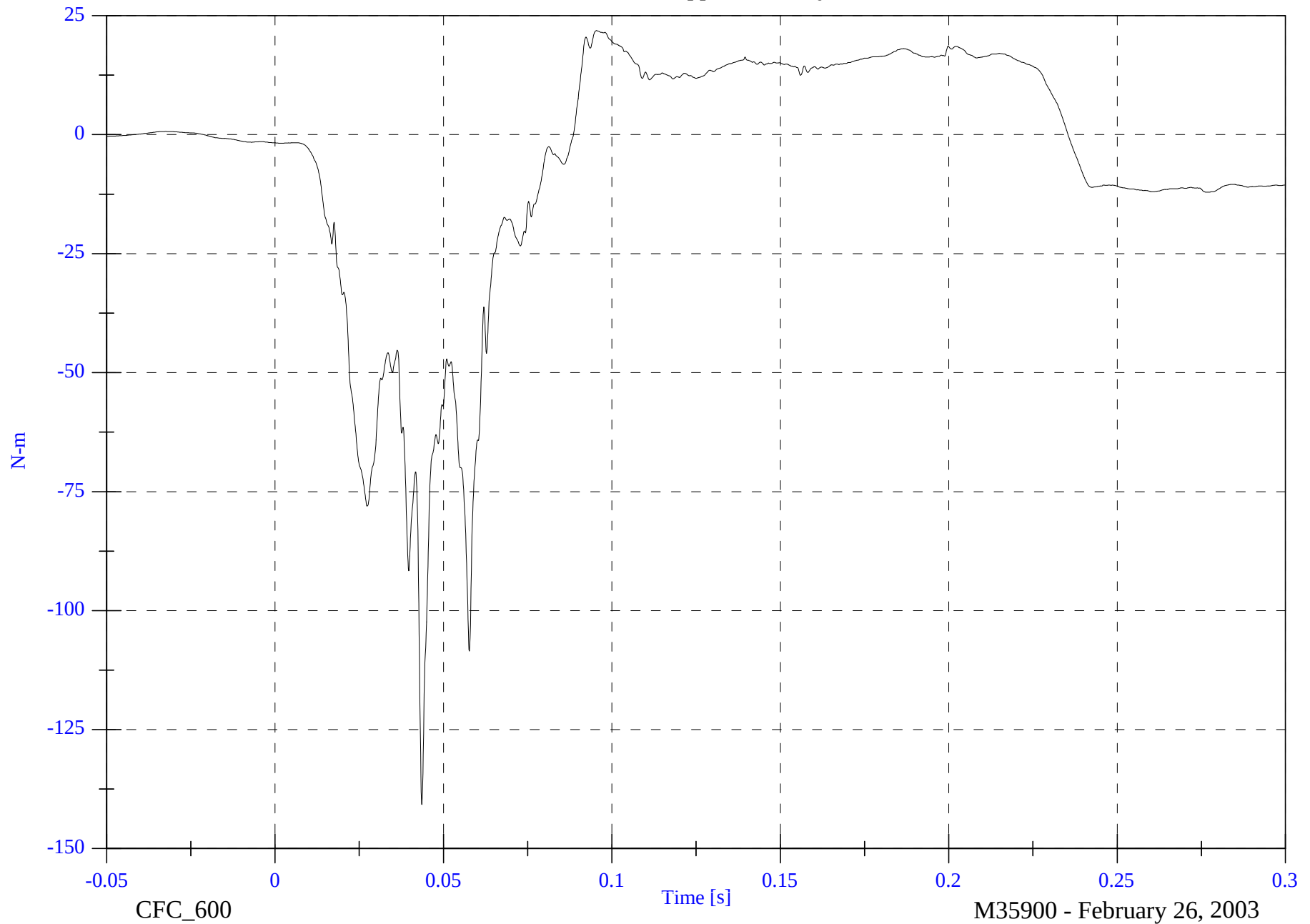
2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left upper Tibia My

Max: 21.9 [N-m] at 0.095 [s]
Min: -140.8 [N-m] at 0.044 [s]

B-46

8642-NCAP-33

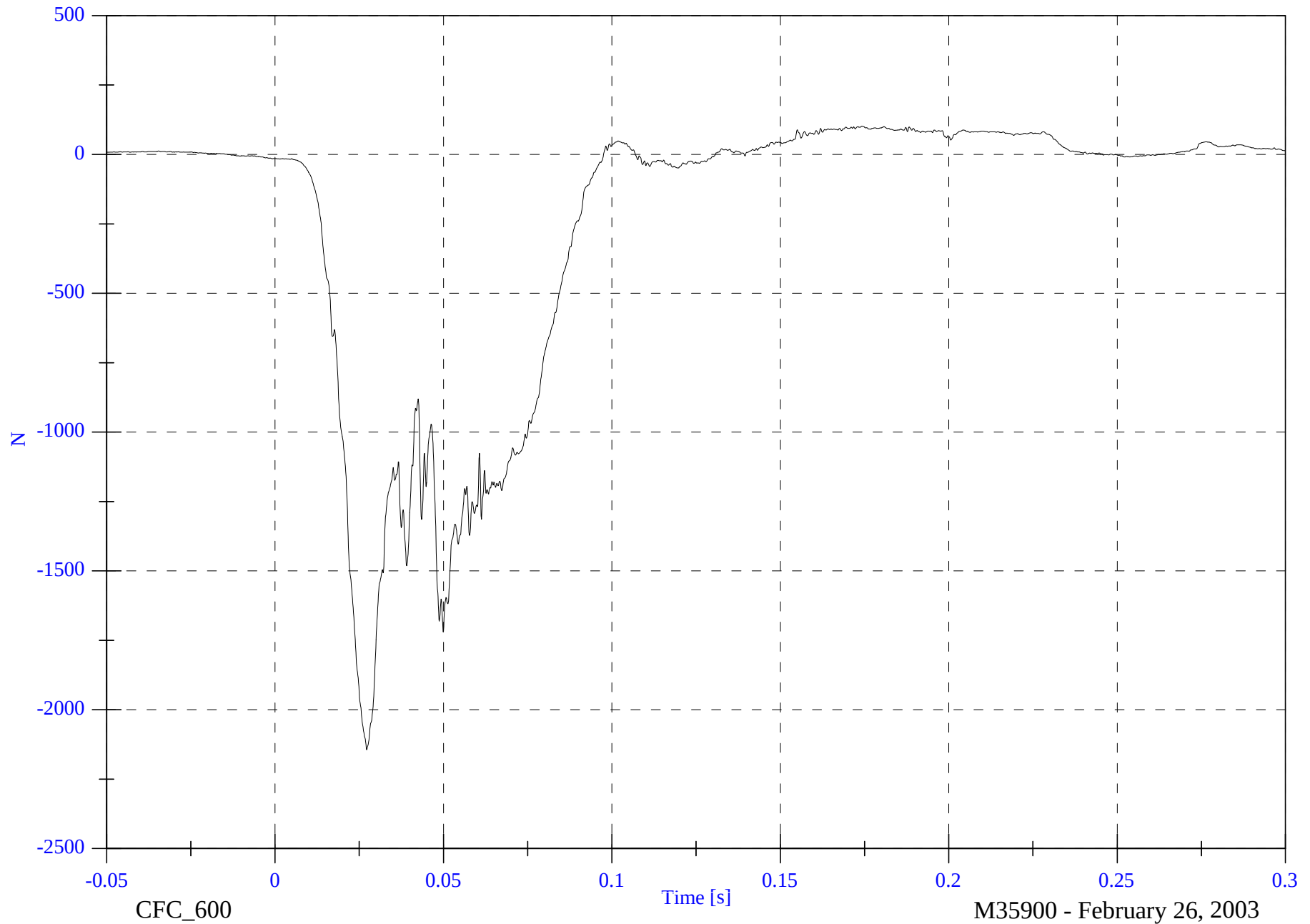


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left Lower Tibia Fz

Max: 102.3 [N] at 0.174 [s]

Min: -2143.8 [N] at 0.027 [s]



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8642-NCAP-33

CFC_600

Time [s]

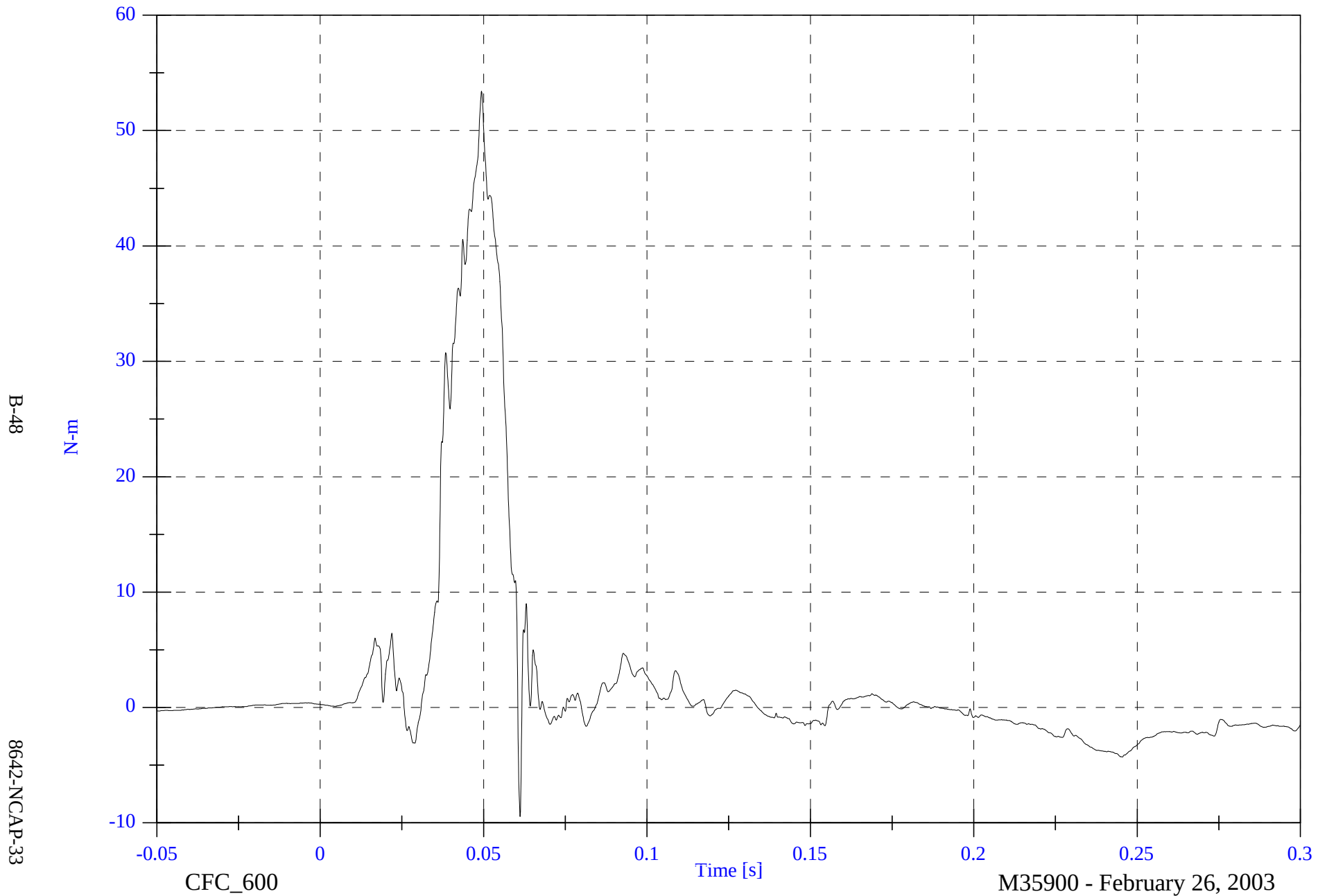
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left Lower Tibia Mx

Max: 53.4 [N-m] at 0.049 [s]

Min: -9.5 [N-m] at 0.061 [s]

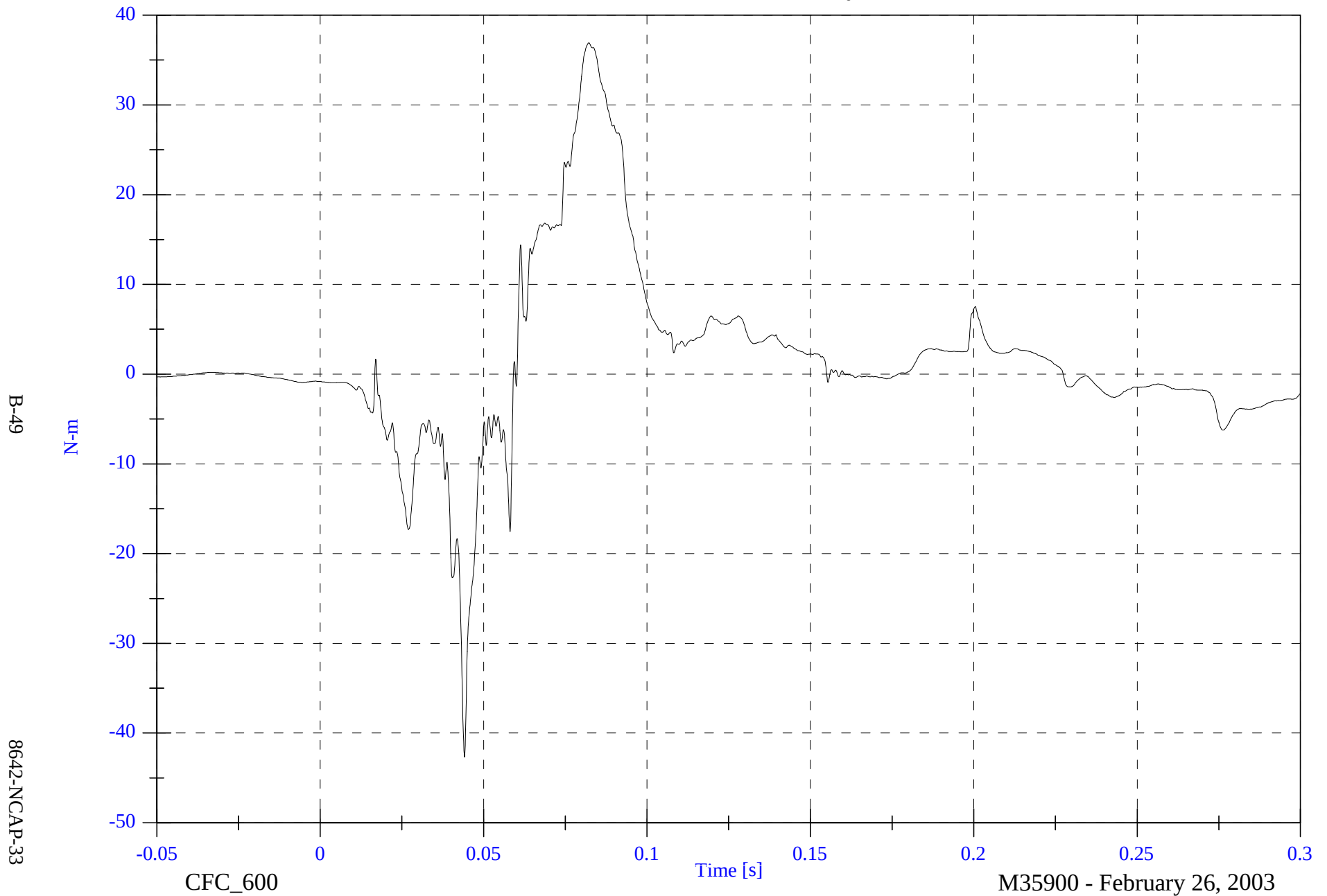


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Left Lower tibia My

Max: 36.9 [N-m] at 0.082 [s]

Min: -42.7 [N-m] at 0.044 [s]

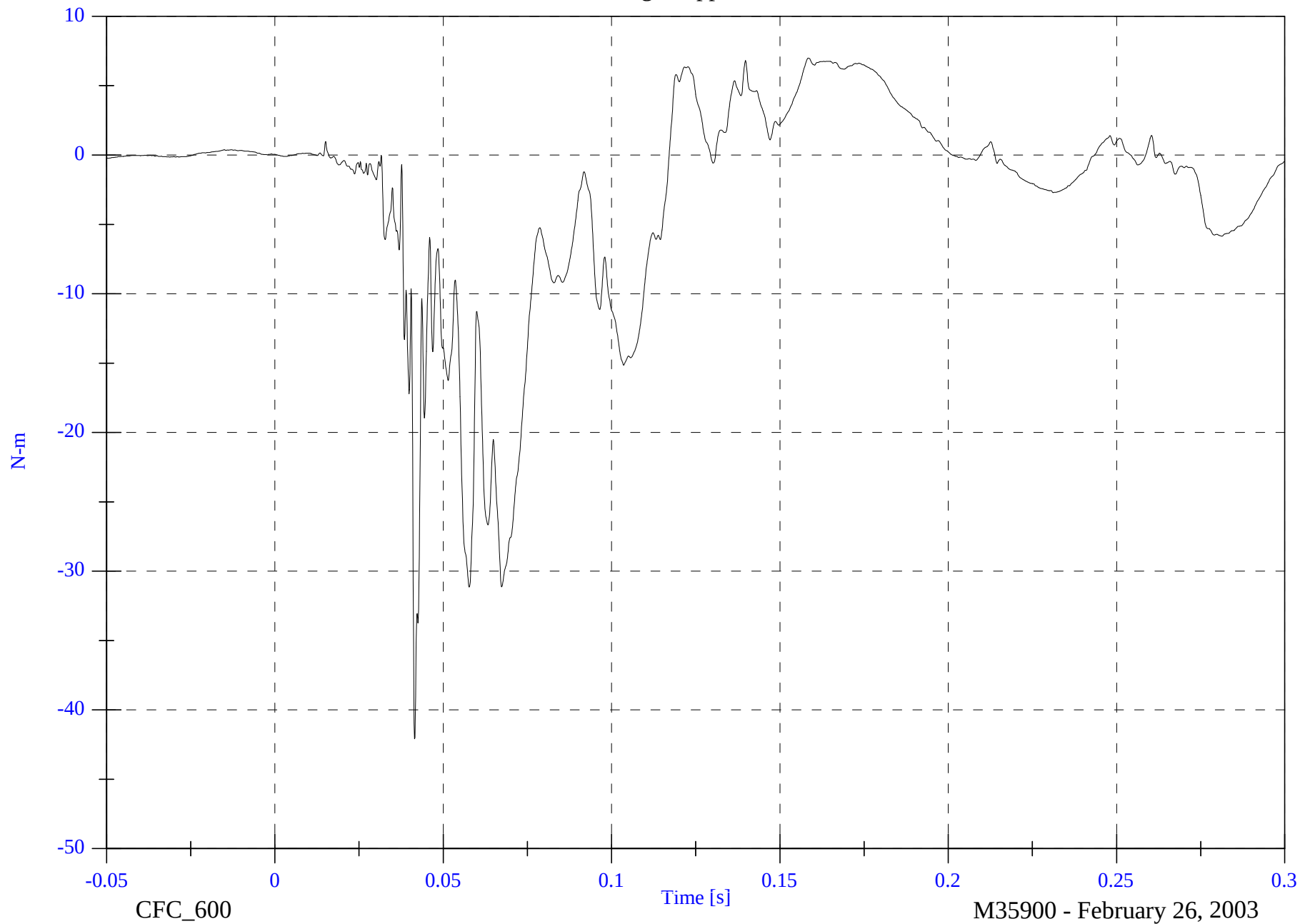


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Upper Tibia Mx

Max: 7.0 [N-m] at 0.158 [s]

Min: -42.1 [N-m] at 0.041 [s]

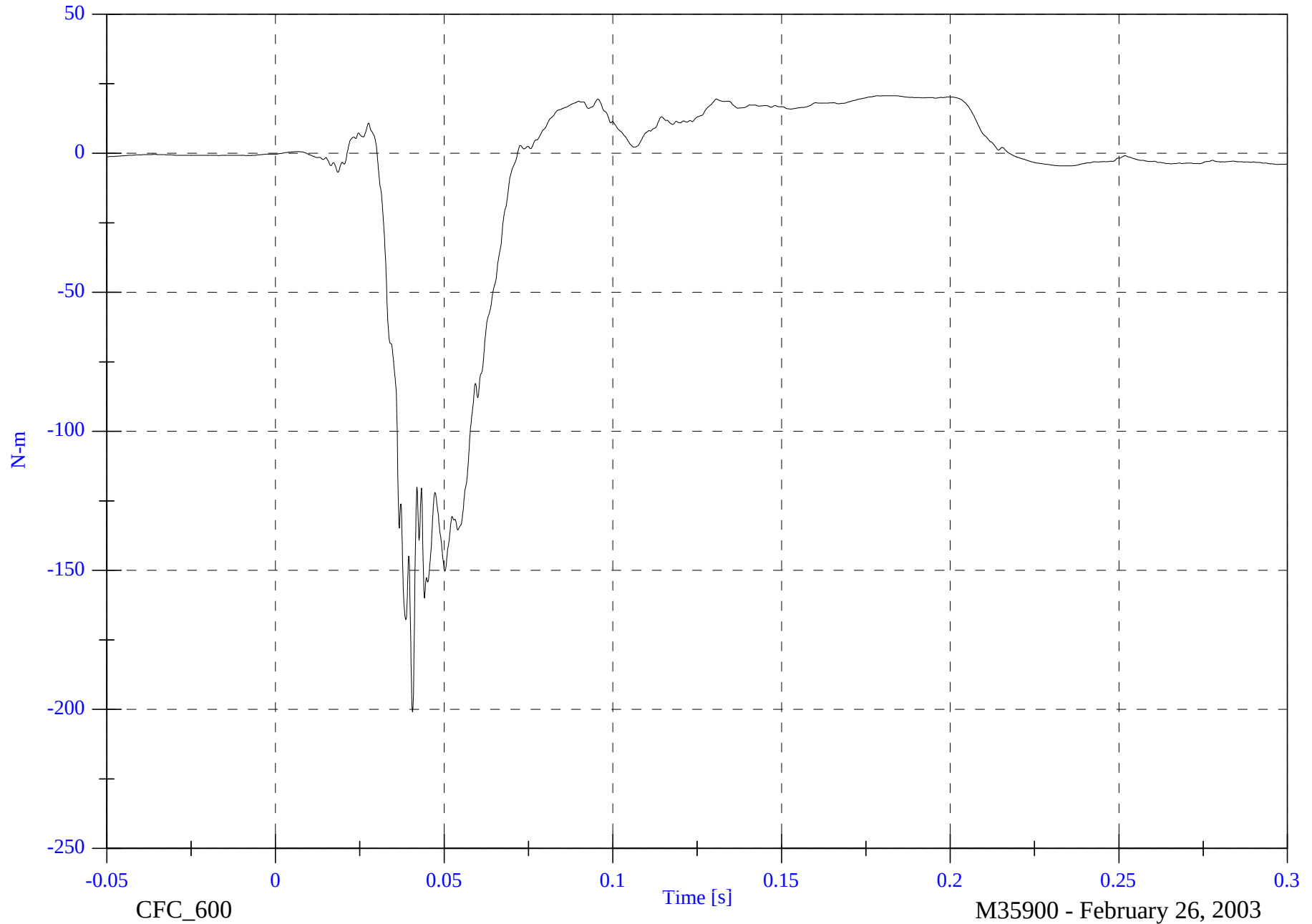


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Upper Tibia My

Max: 20.7 [N-m] at 0.183 [s]

Min: -200.9 [N-m] at 0.041 [s]



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8642-NCAP-33

CFC_600

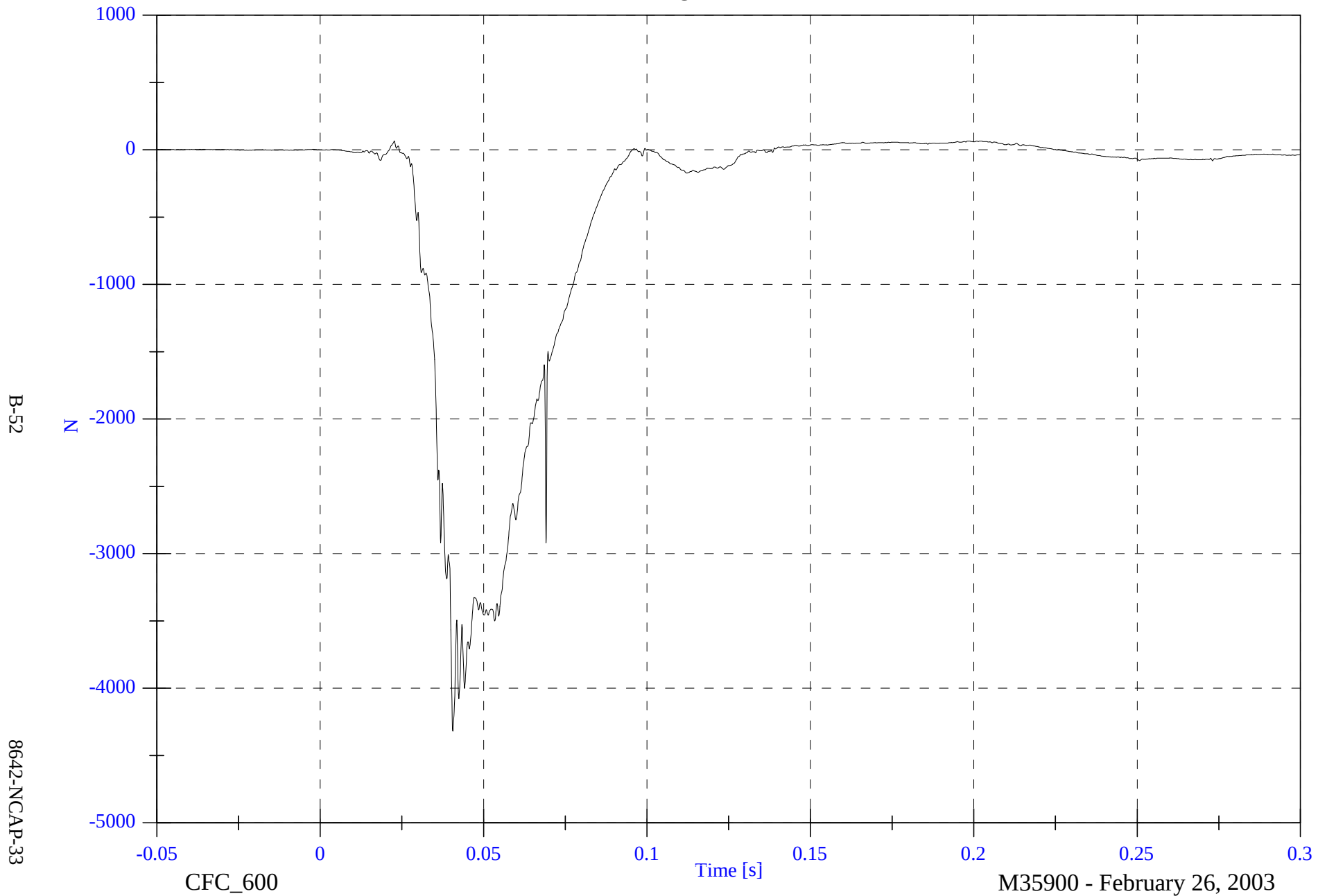
Time [s]

M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Lower Tibia Fz

Max: 65.5 [N] at 0.023 [s]
Min: -4318.9 [N] at 0.041 [s]

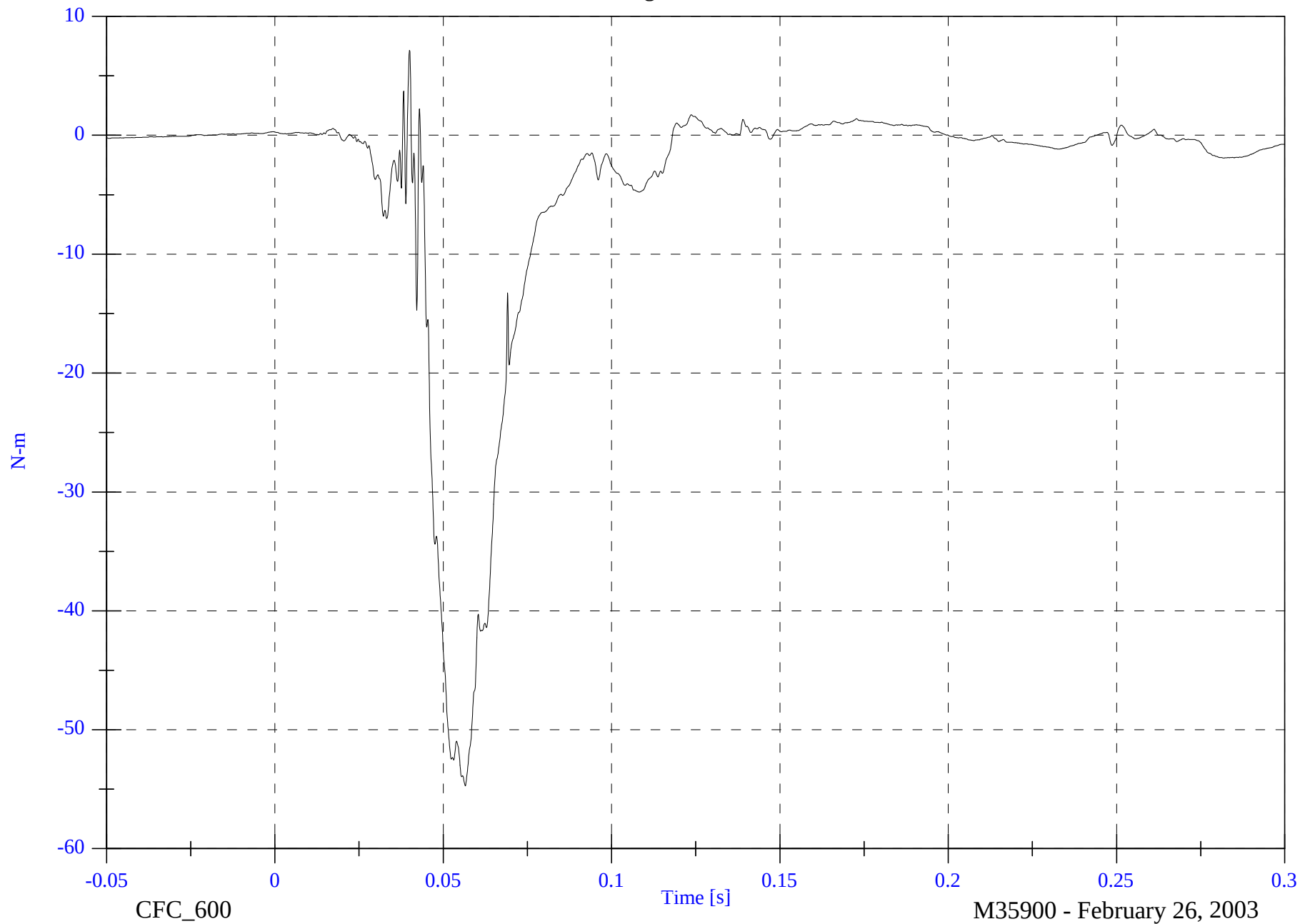


2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Lower tibia Mx

Max: 7.1 [N-m] at 0.040 [s]

Min: -54.7 [N-m] at 0.057 [s]



B-53

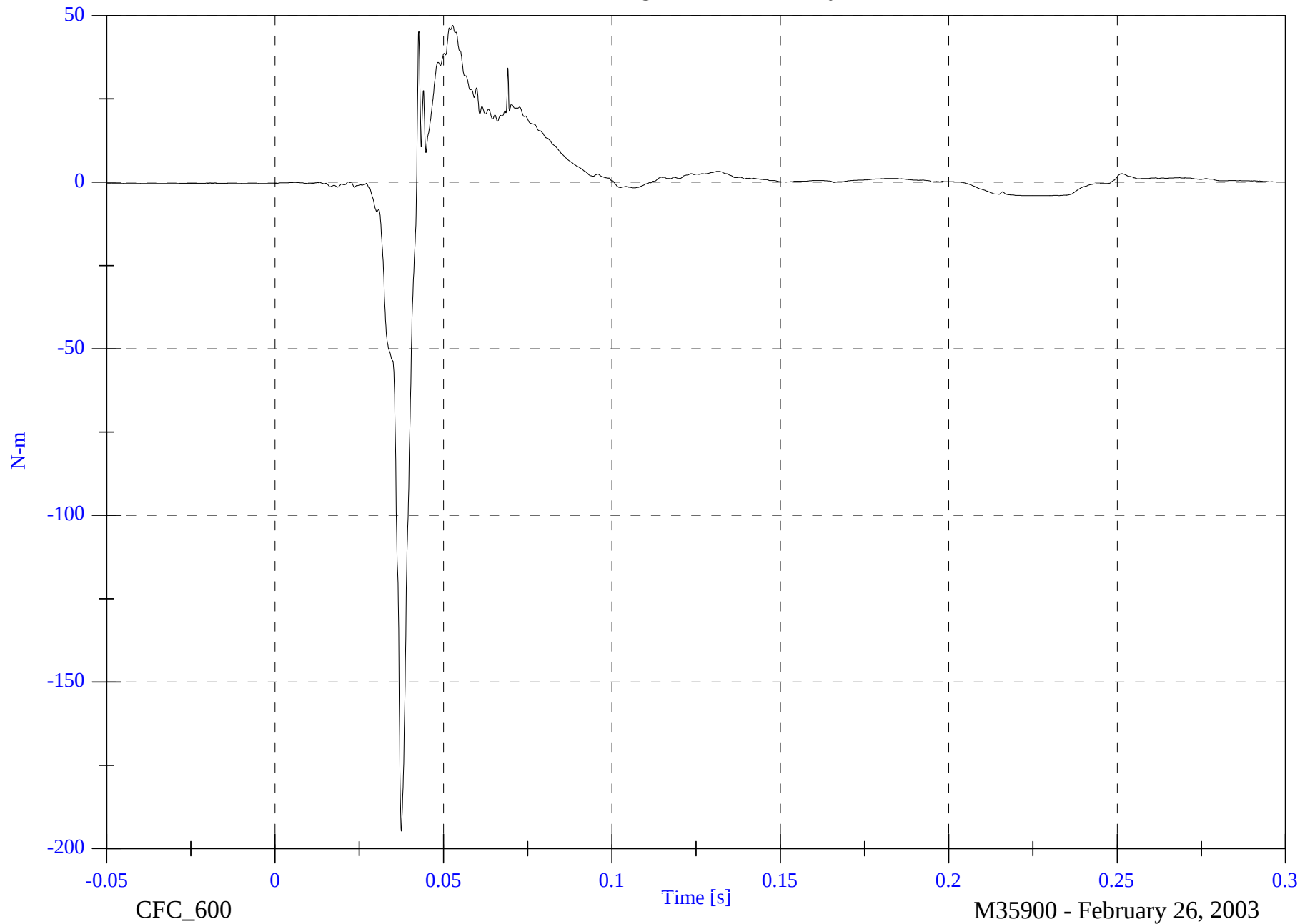
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

V1P1 Right Lower Tibia My

Max: 47.0 [N-m] at 0.053 [s]

Min: -194.7 [N-m] at 0.037 [s]



B-54

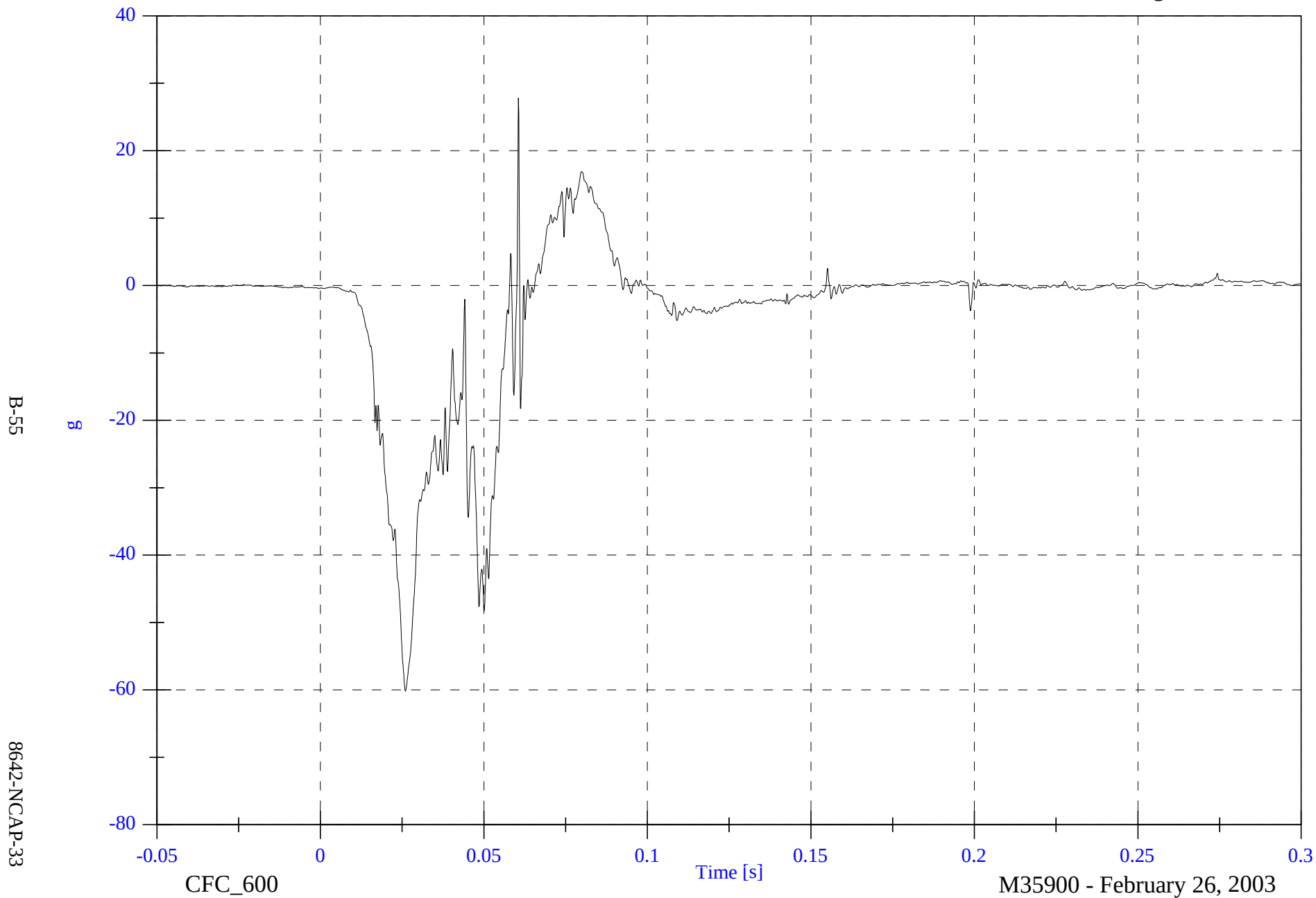
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 27.8 [g] at 0.061 [s]

Min: -60.2 [g] at 0.026 [s]

V1P1 Left Foot Aft Ax

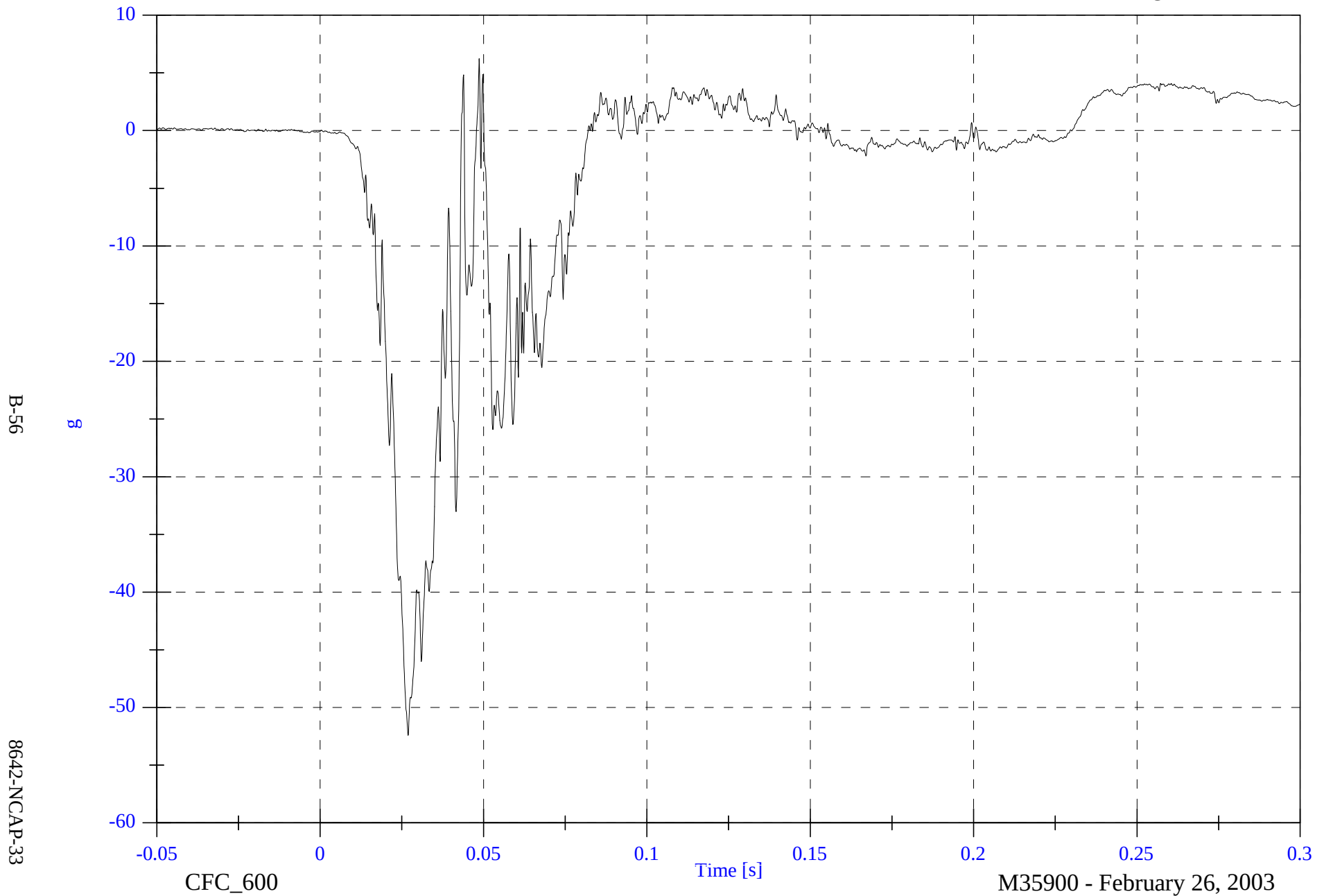


2003 NCAP Test 10 2003 Volvo XC90

Max: 6.2 [g] at 0.049 [s]

Min: -52.4 [g] at 0.027 [s]

V1P1 Left Foot Aft Az



2003 NCAP Test 10 2003 Volvo XC90

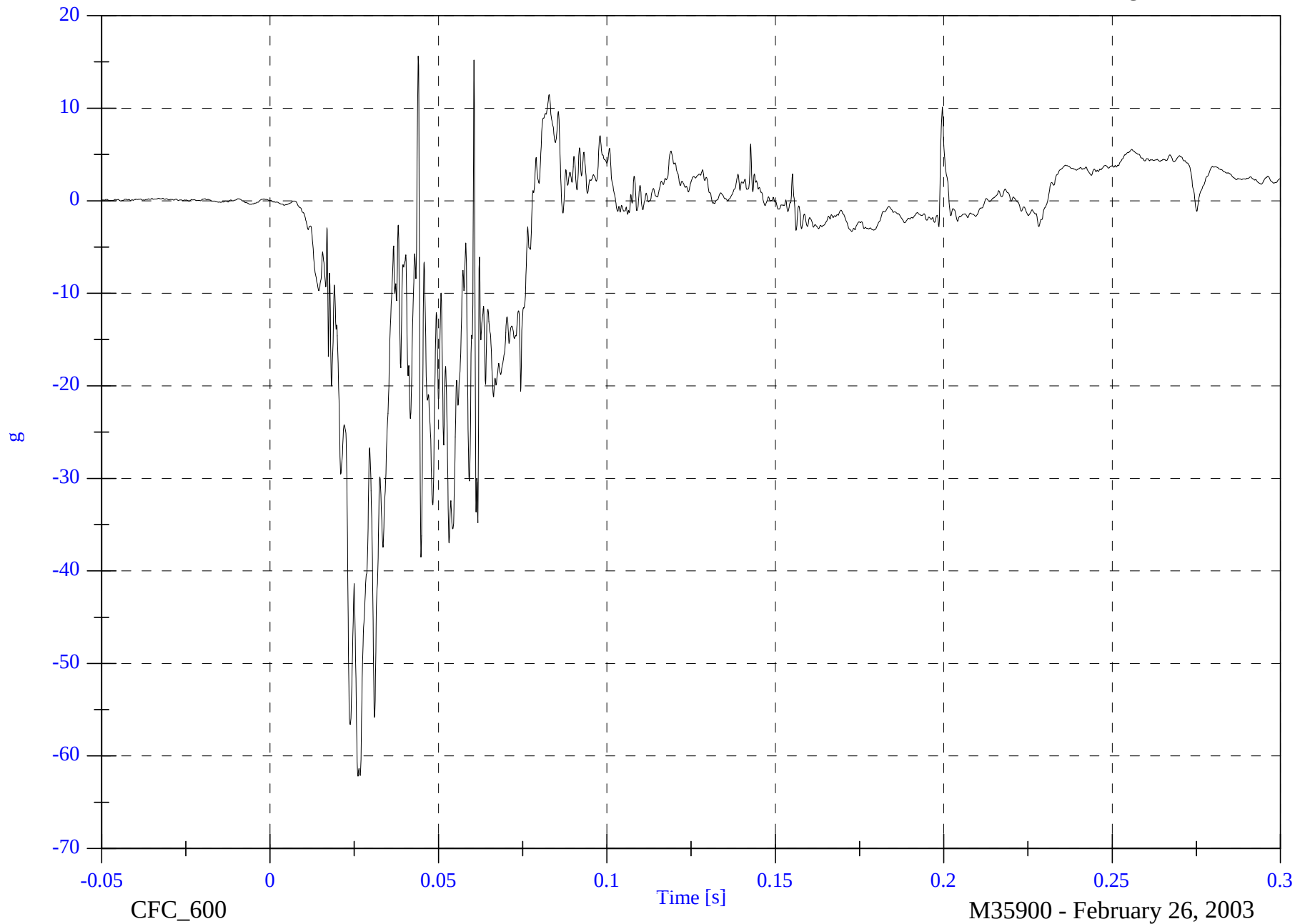
V1P1 Left Foot Fore Az

Max: 15.6 [g] at 0.044 [s]

Min: -62.2 [g] at 0.026 [s]

B-57

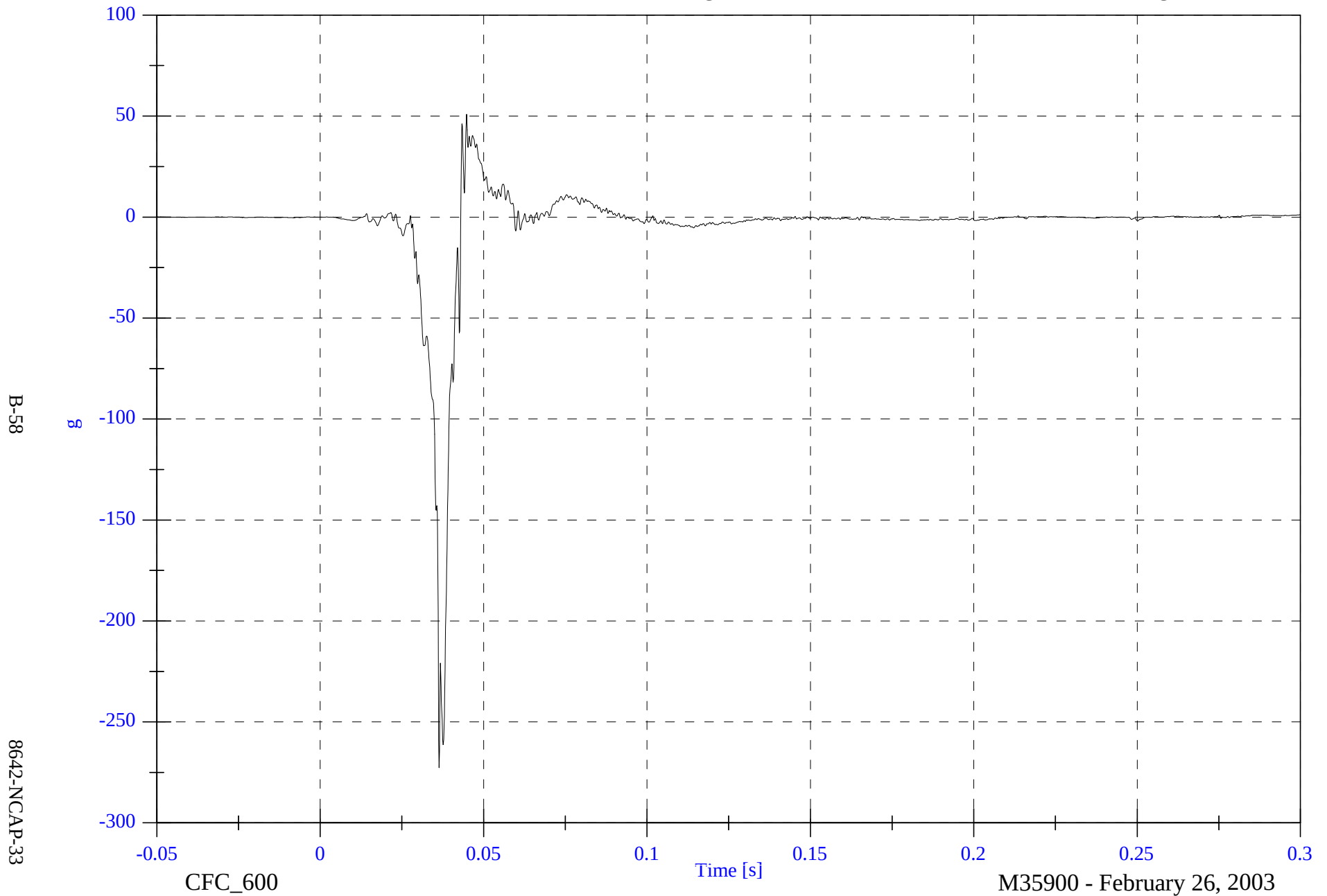
8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

Max: 50.9 [g] at 0.045 [s]
Min: -272.7 [g] at 0.036 [s]

V1P1 Right Foot Aft x

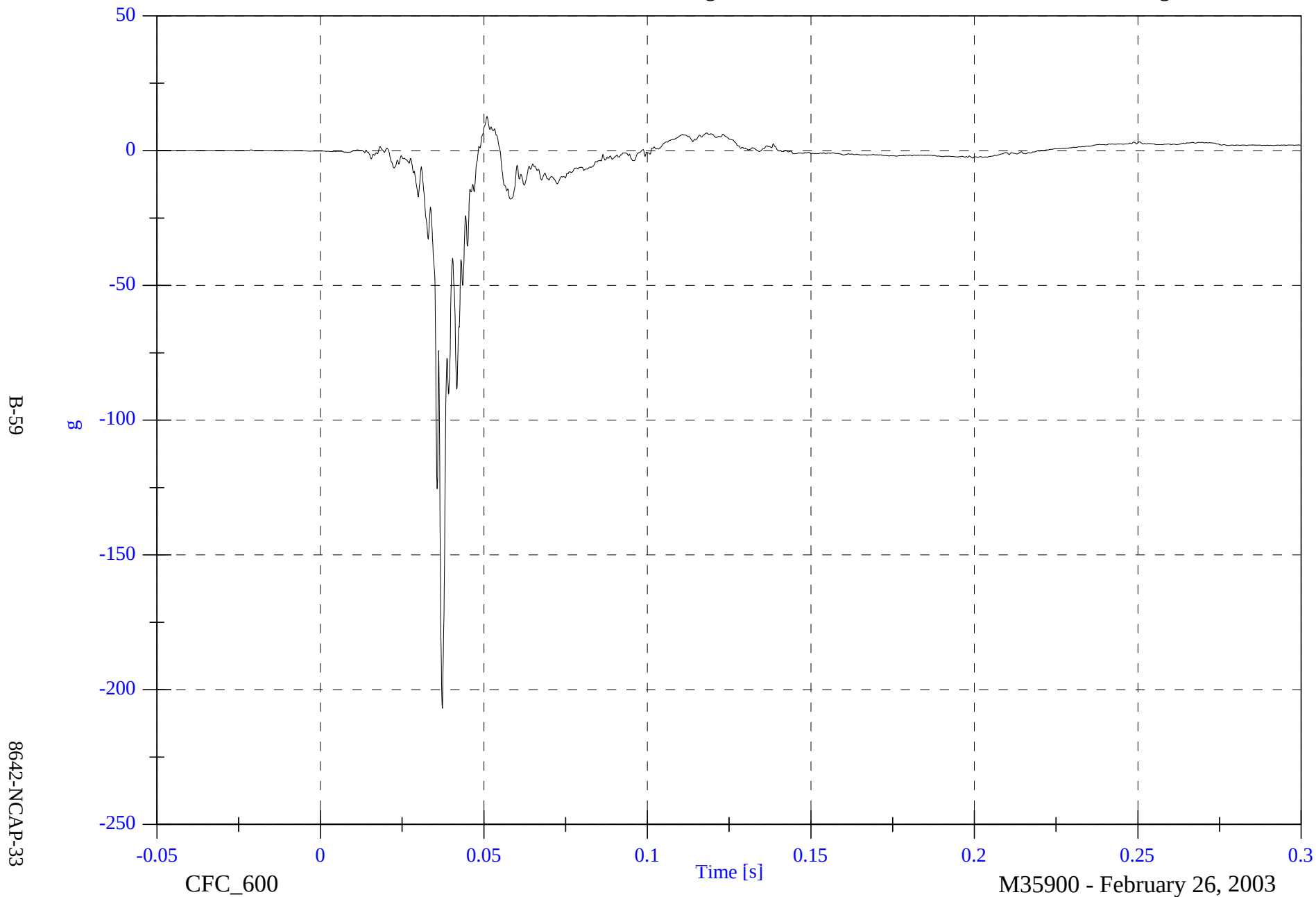


2003 NCAP Test 10 2003 Volvo XC90

Max: 12.7 [g] at 0.051 [s]

Min: -206.9 [g] at 0.037 [s]

V1P1 Right Foot Aft z

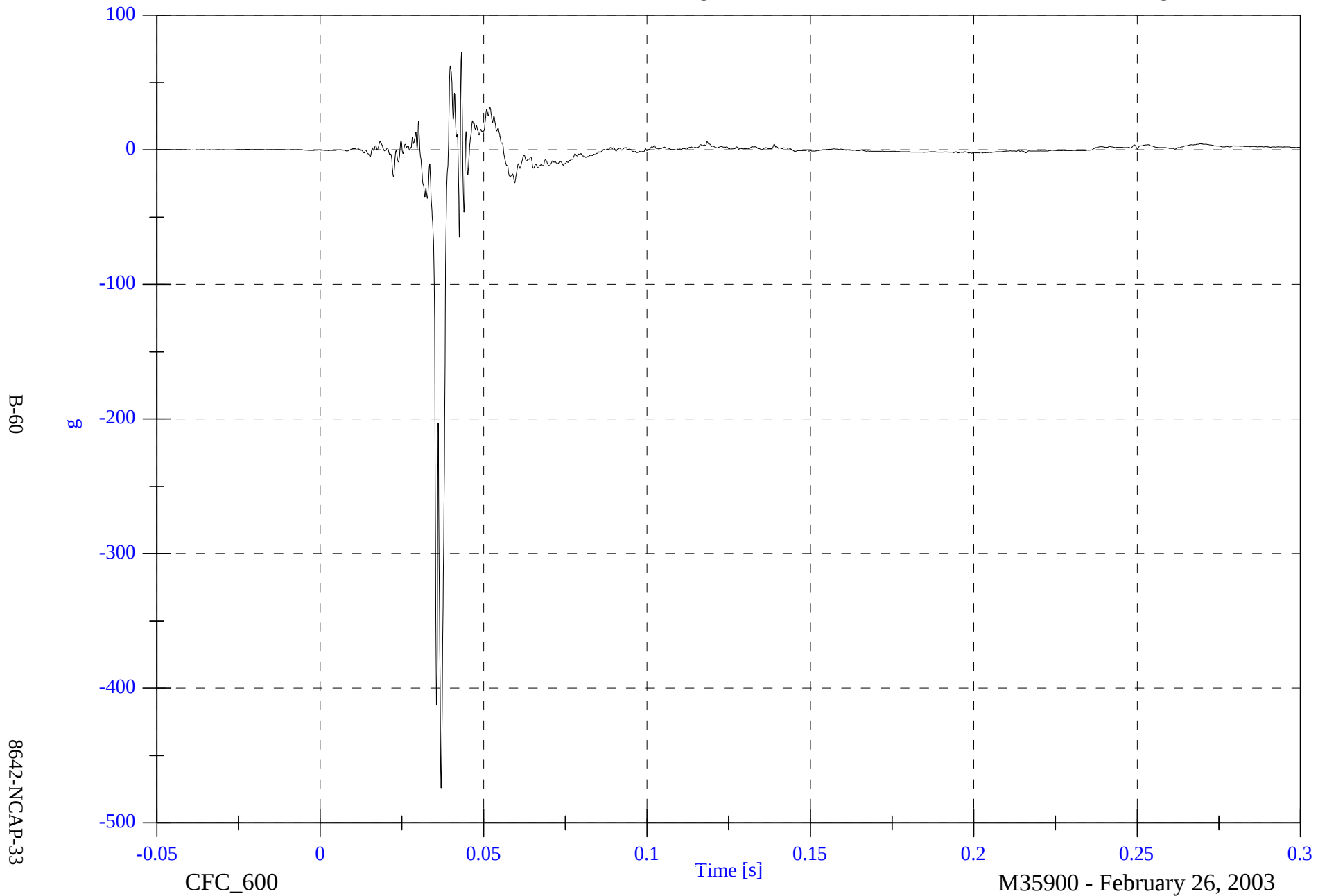


2003 NCAP Test 10 2003 Volvo XC90

Max: 72.4 [g] at 0.043 [s]

Min: -474.0 [g] at 0.037 [s]

V1P1 Right Foot Fore z



2003 NCAP Test 10 2003 Volvo XC90

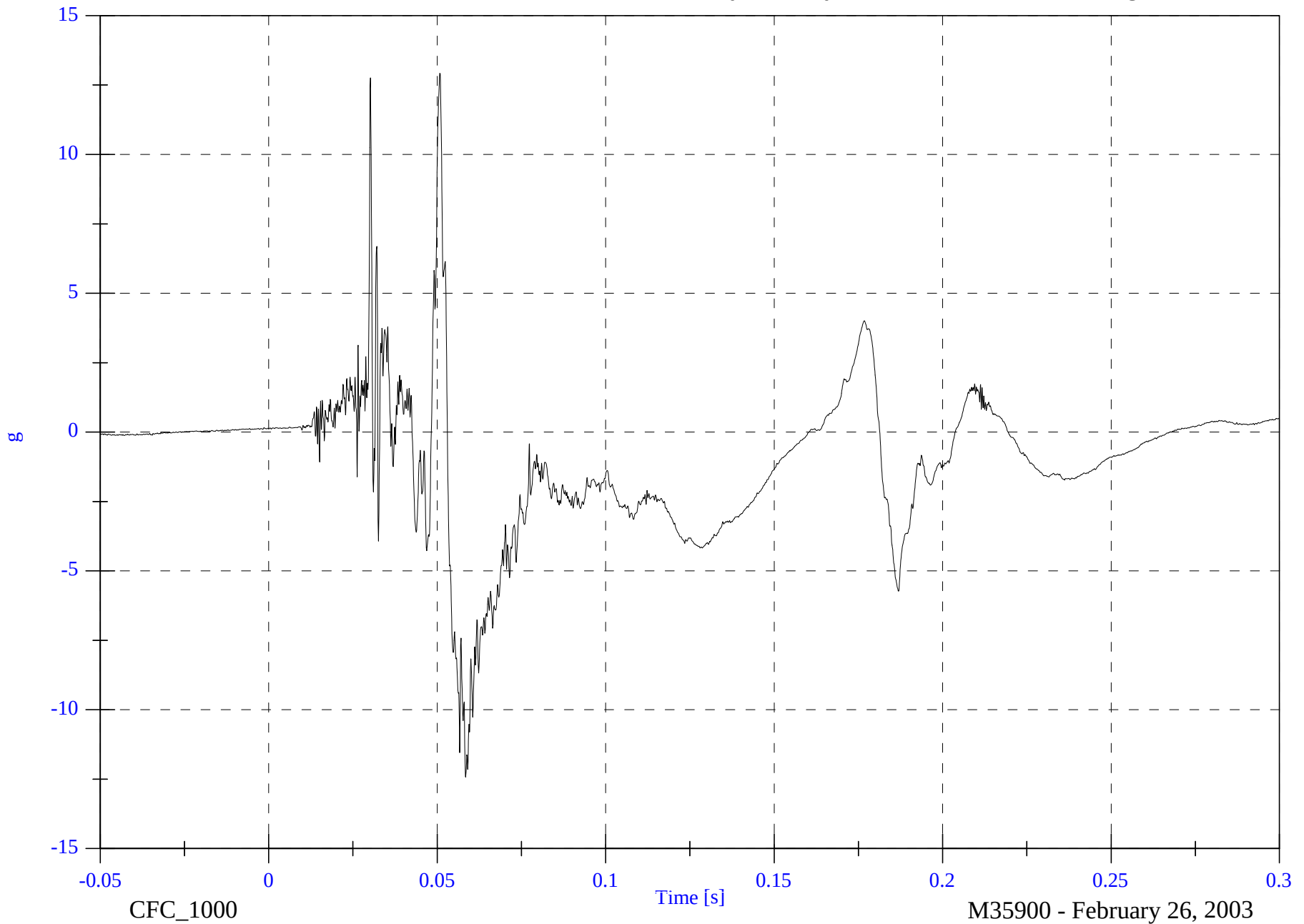
V1P2 Head 9 Array X Arm y

Max: 12.9 [g] at 0.051 [s]

Min: -12.4 [g] at 0.058 [s]

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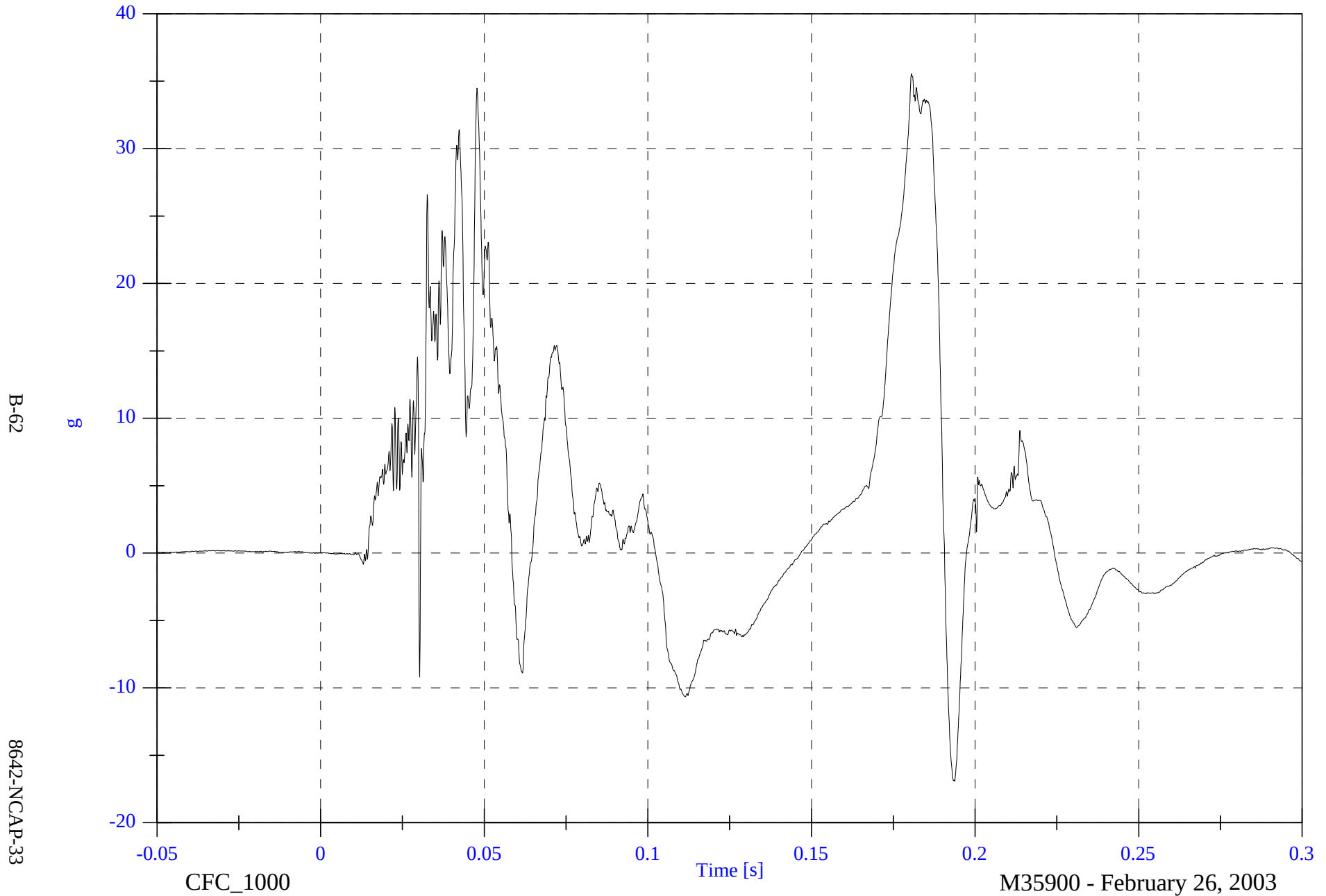


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head 9 Array X Arm z

Max: 35.5 [g] at 0.180 [s]

Min: -16.9 [g] at 0.194 [s]

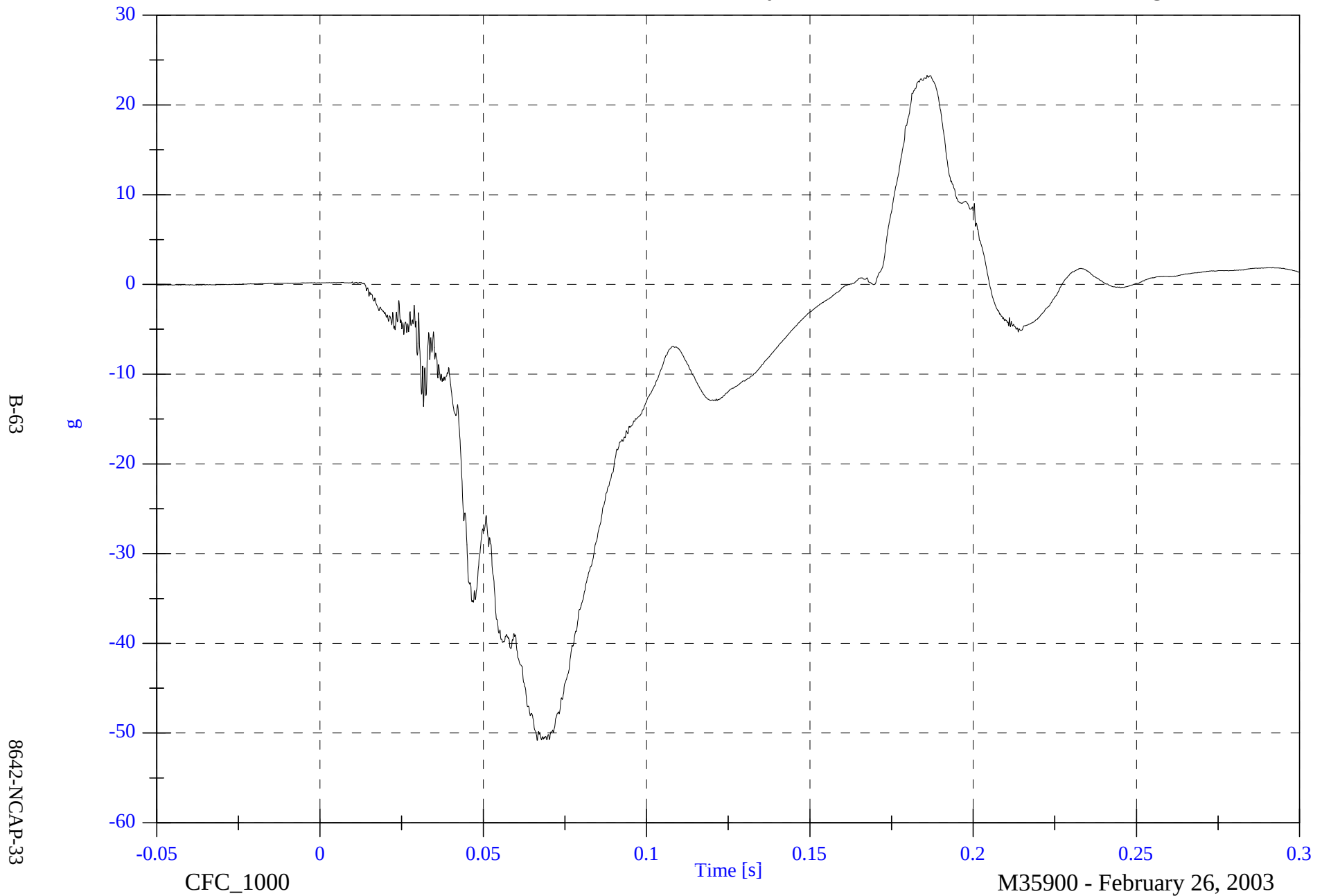


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head 9 Array Y Arm x

Max: 23.3 [g] at 0.186 [s]

Min: -50.8 [g] at 0.067 [s]

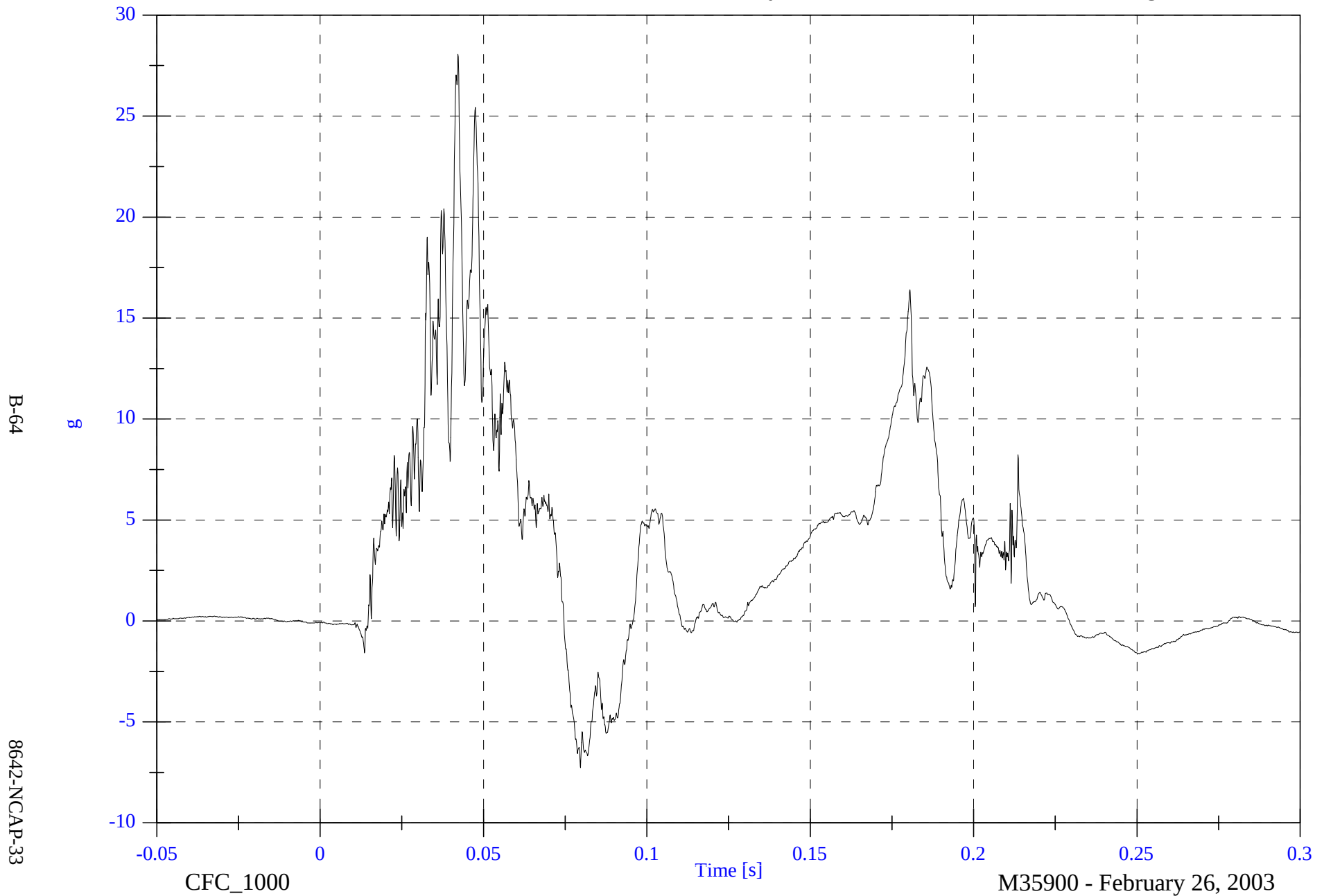


2003 NCAP Test 10 2003 Volvo XC90

Max: 28.1 [g] at 0.042 [s]

Min: -7.3 [g] at 0.080 [s]

V1P2 Head 9 Array Y Arm z

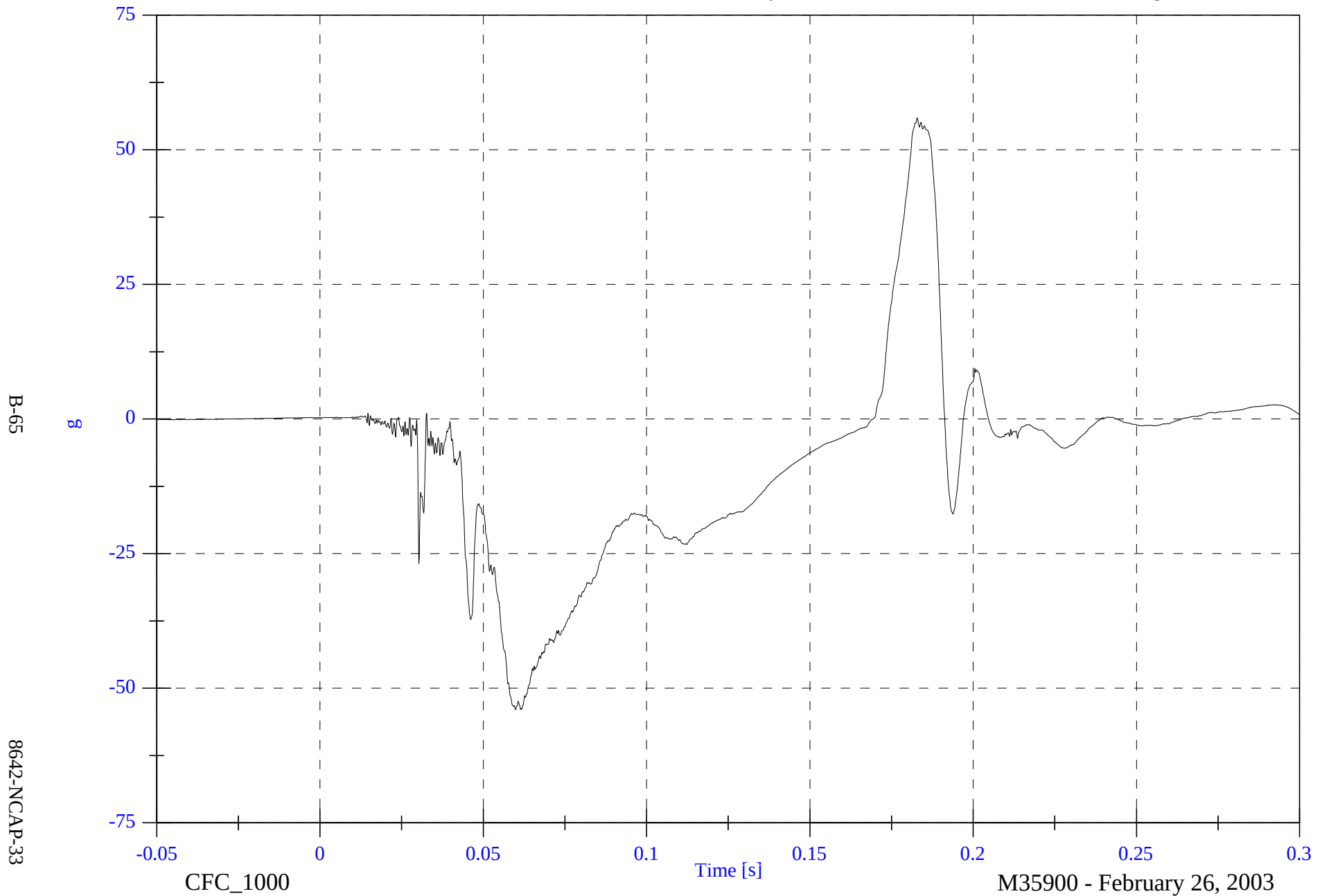


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head 9 Array Z Arm x

Max: 55.9 [g] at 0.183 [s]

Min: -54.0 [g] at 0.060 [s]

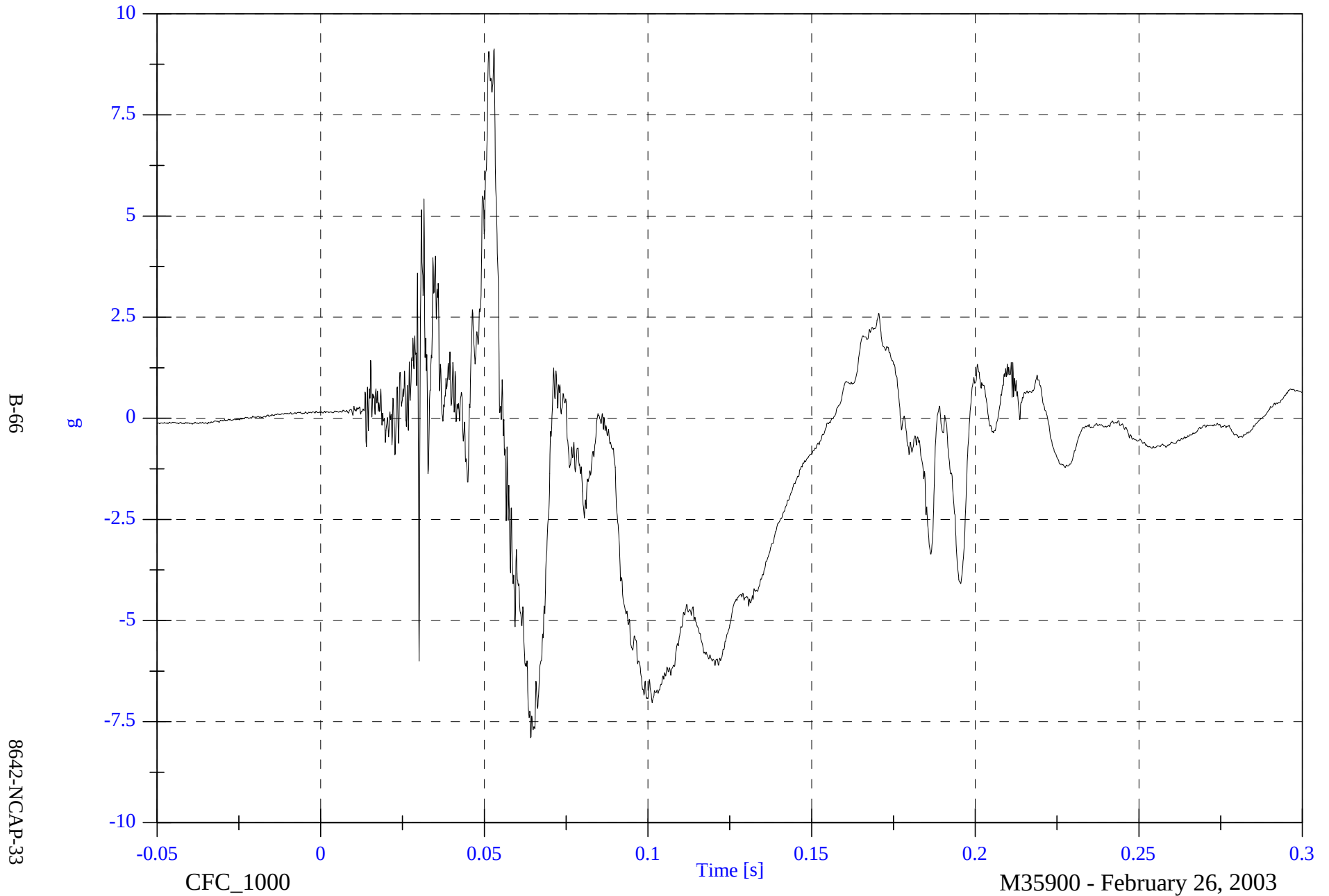


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head 9 Array Z Arm y

Max: 9.1 [g] at 0.053 [s]

Min: -7.9 [g] at 0.064 [s]

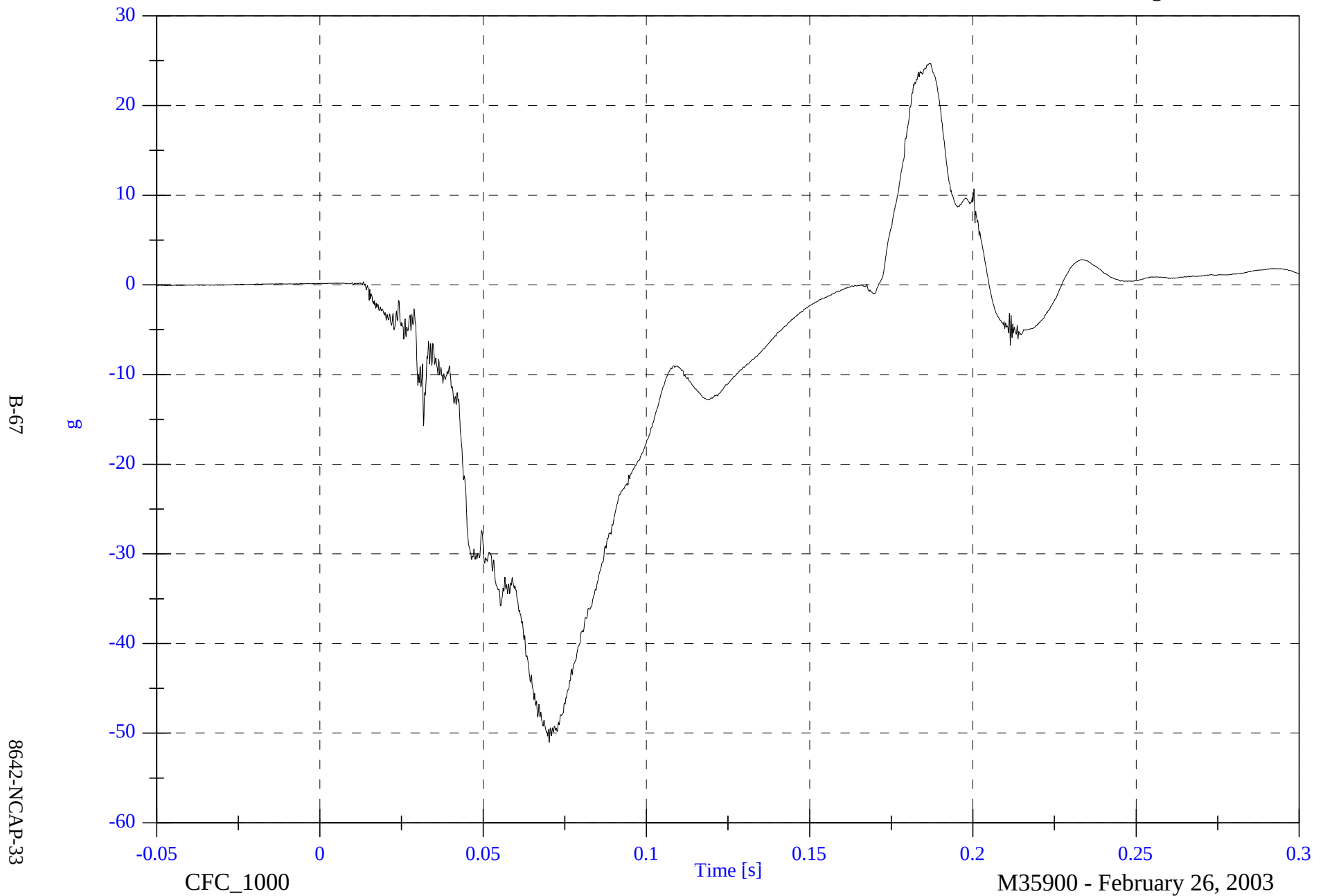


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head CG x

Max: 24.7 [g] at 0.187 [s]

Min: -51.0 [g] at 0.070 [s]

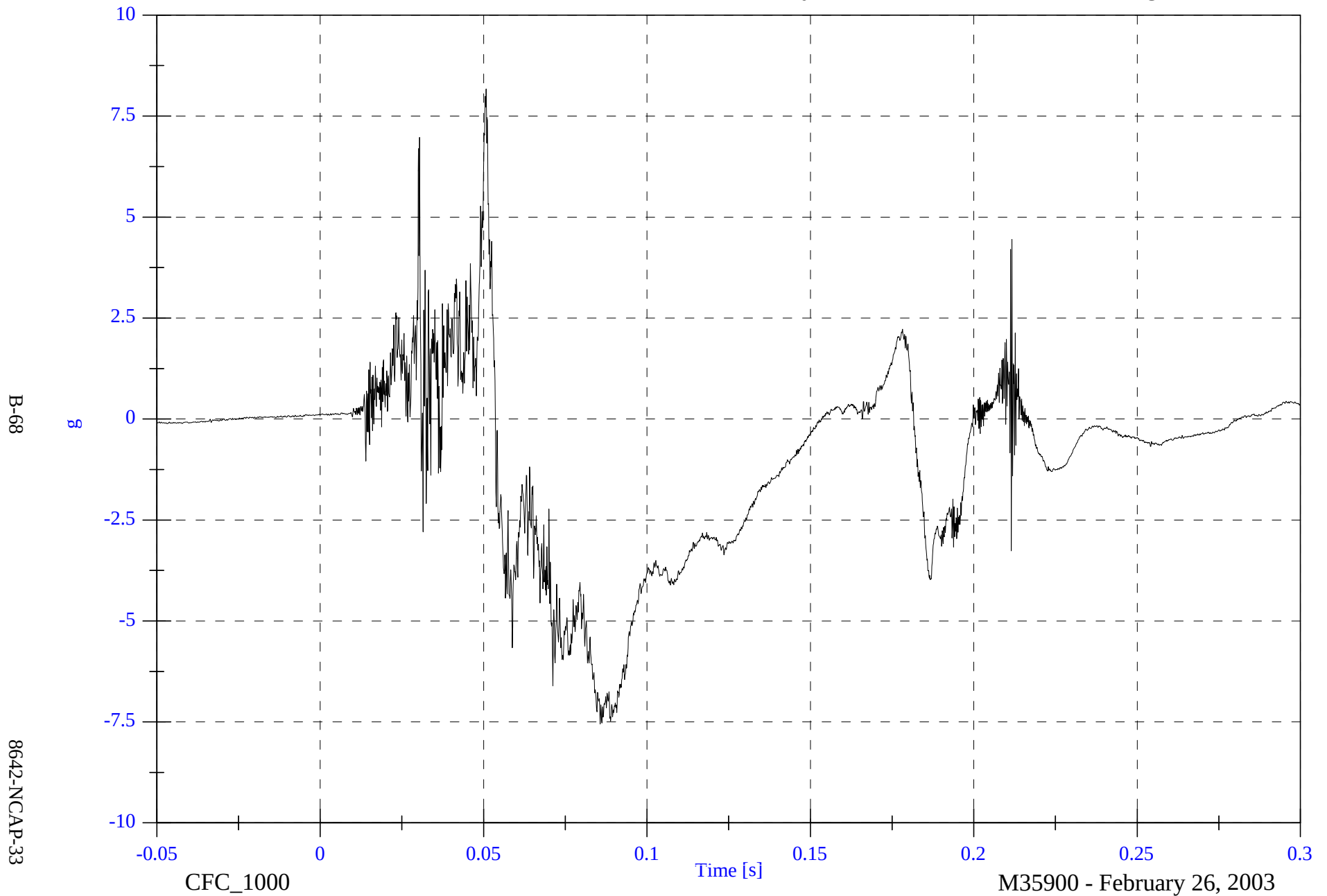


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head CG y

Max: 8.2 [g] at 0.051 [s]

Min: -7.6 [g] at 0.086 [s]



2003 NCAP Test 10 2003 Volvo XC90

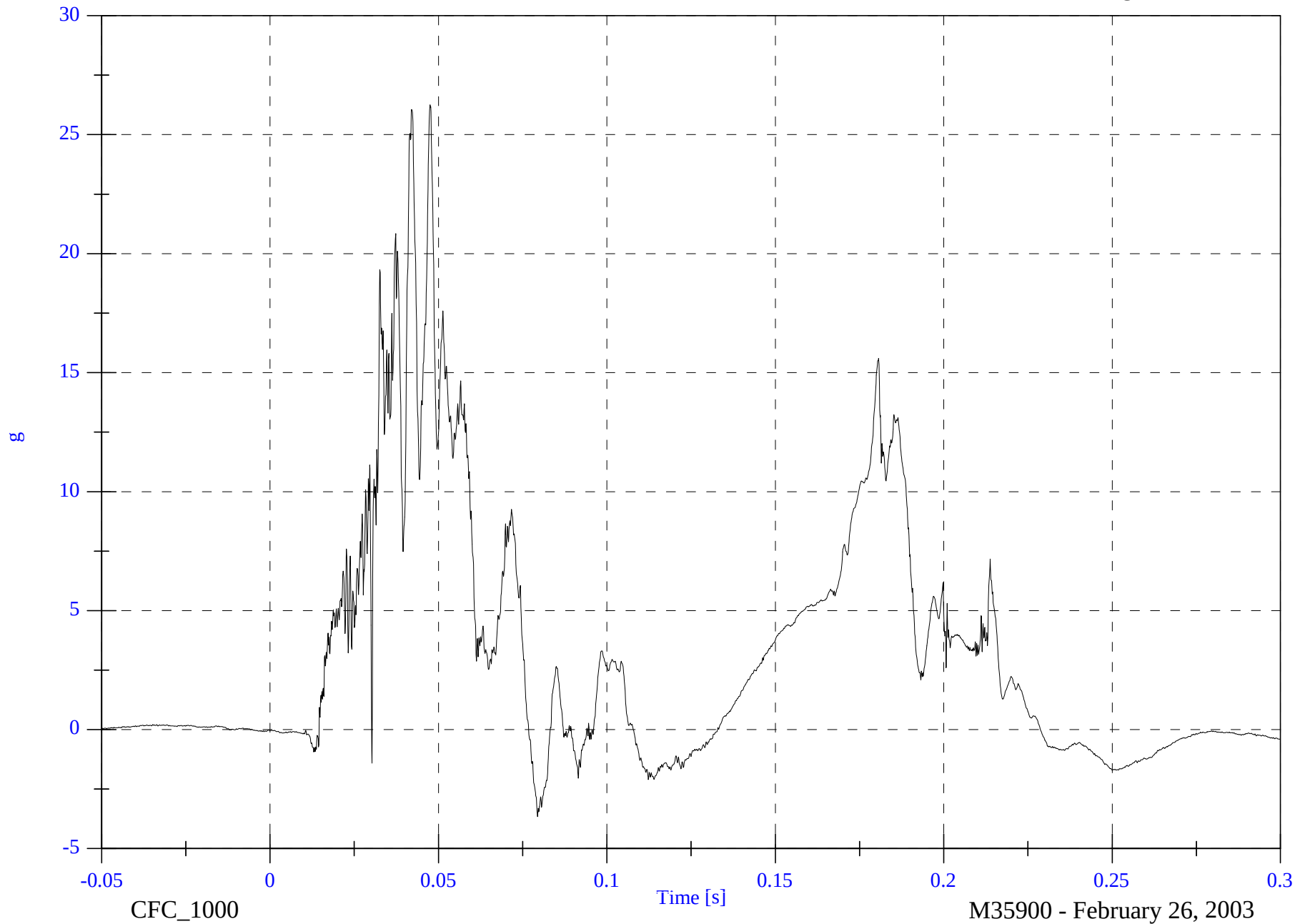
V1P2 Head CG z

Max: 26.3 [g] at 0.048 [s]

Min: -3.7 [g] at 0.079 [s]

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2003 NCAP Test 10 2003 Volvo XC90

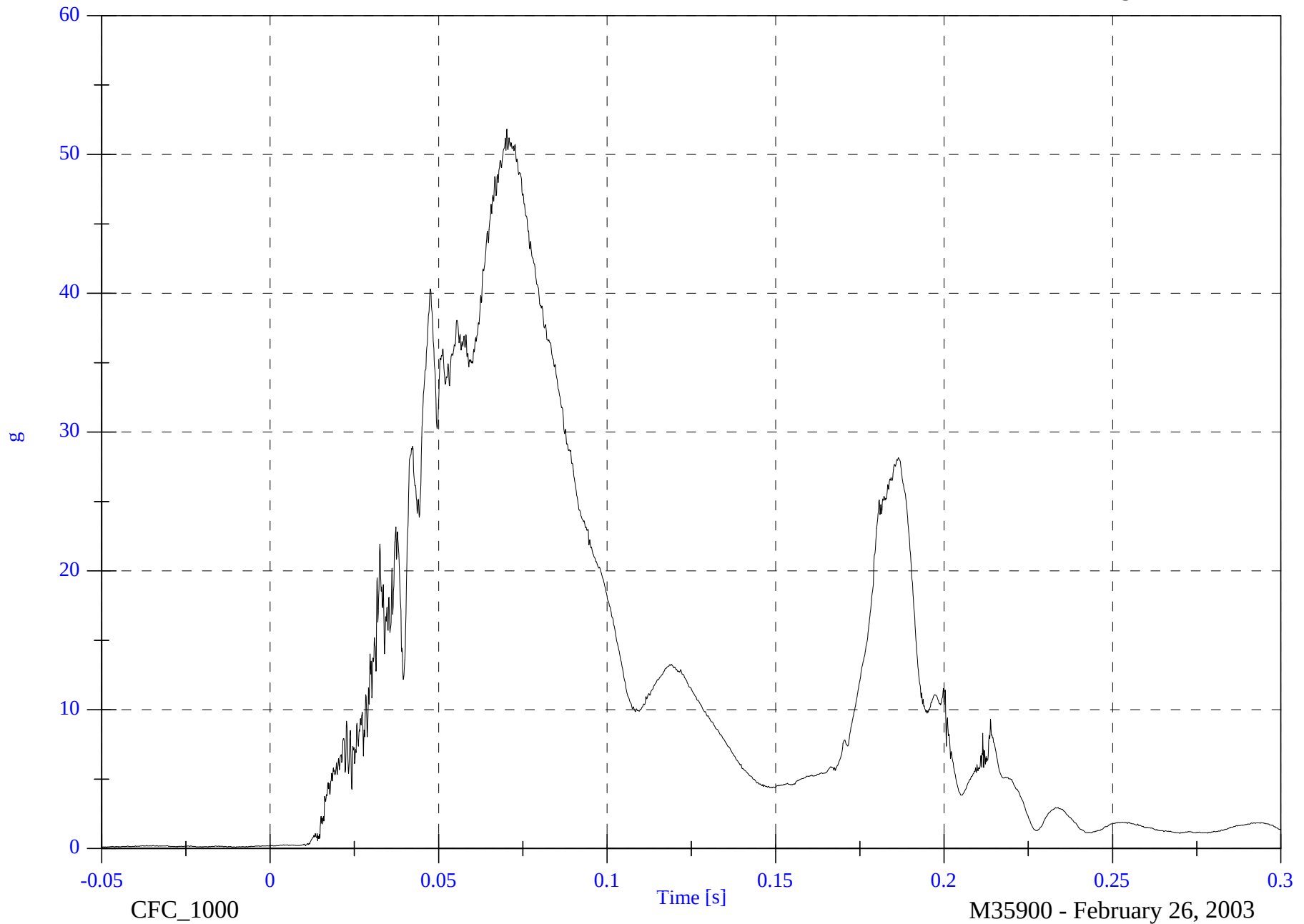
V1P2 Head CG Resultant

Max: 51.8 [g] at 0.070 [s]

Min: 0.1 [g] at -0.010 [s]

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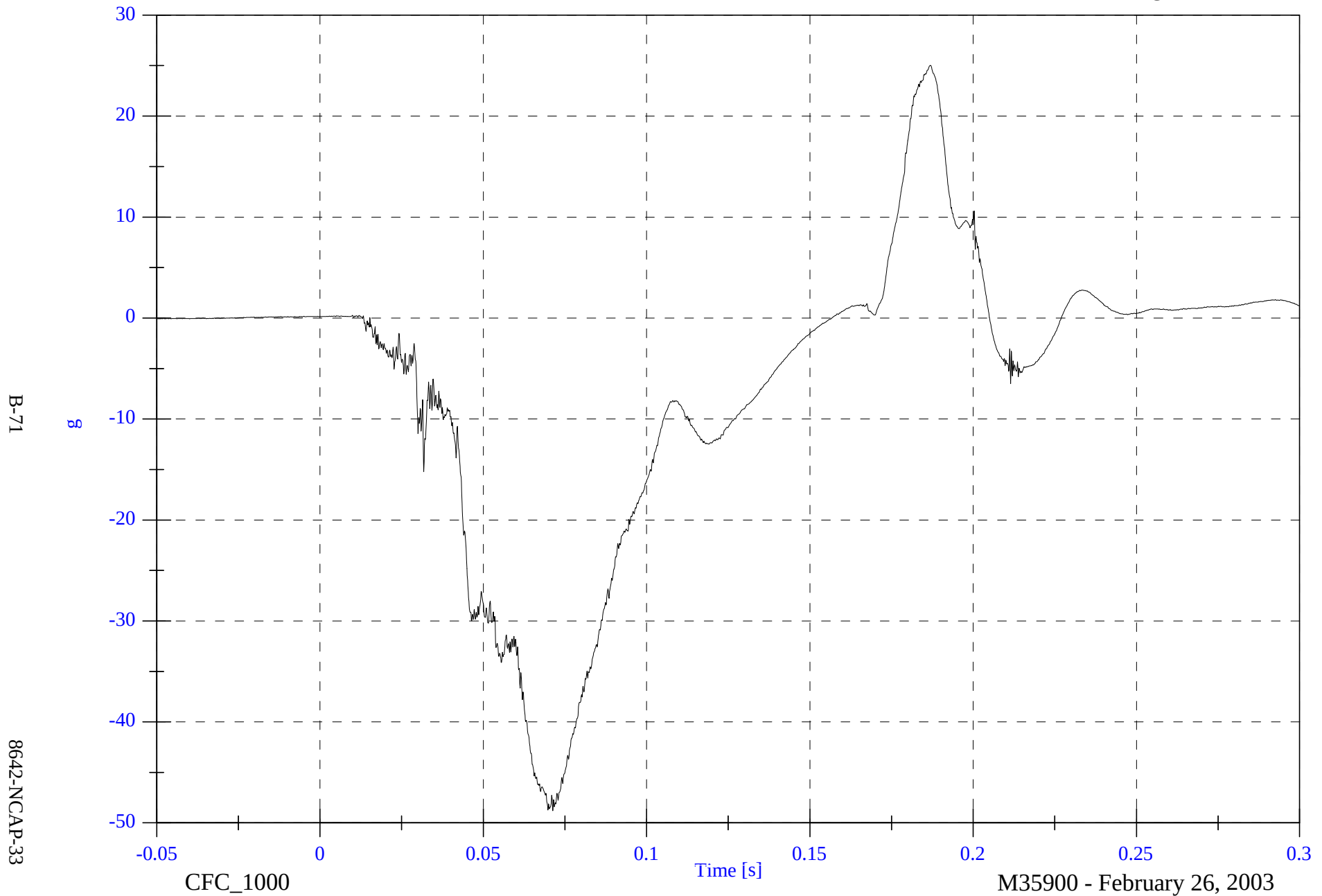


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head CG Red x

Max: 25.0 [g] at 0.187 [s]

Min: -48.8 [g] at 0.071 [s]

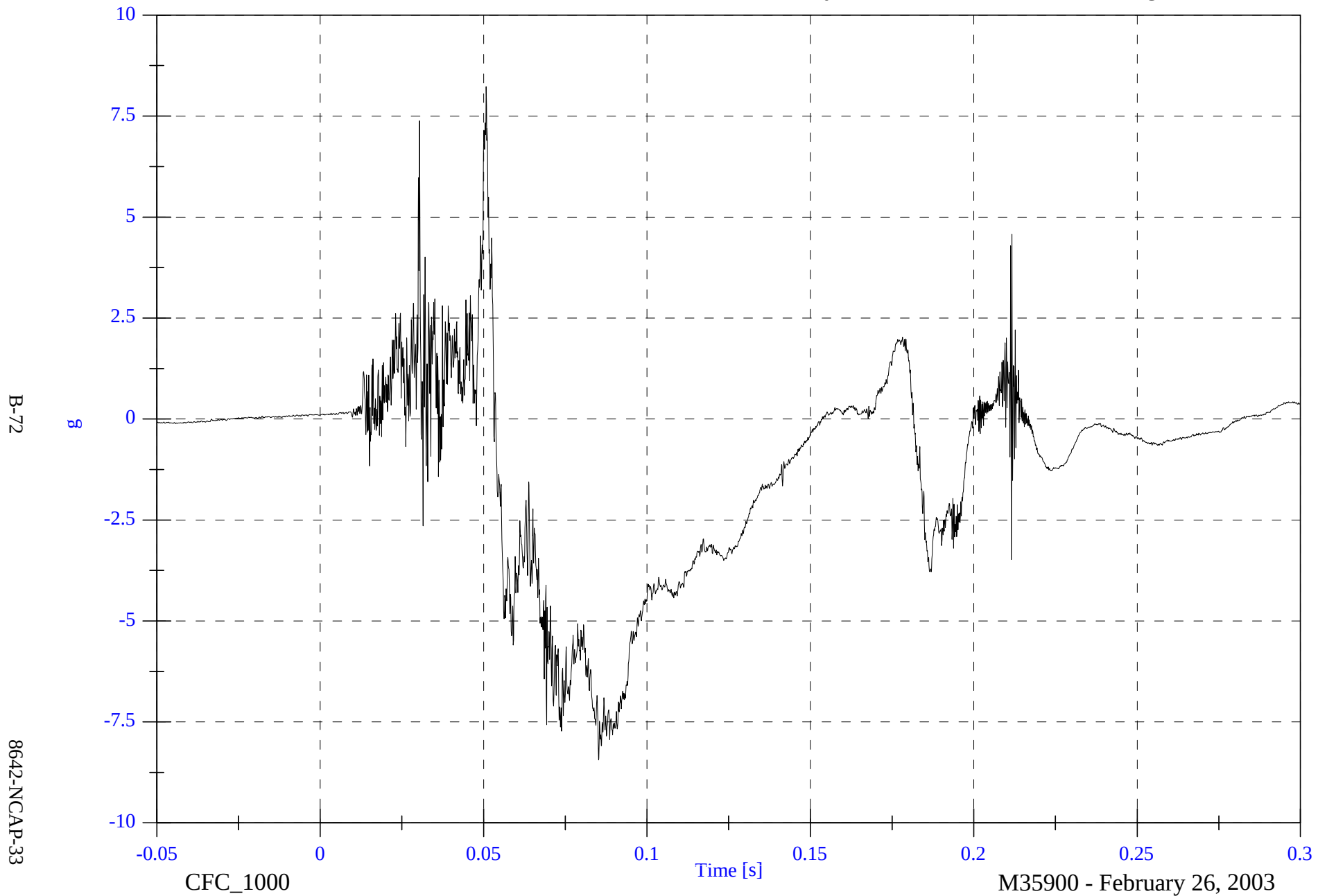


2003 NCAP Test 10 2003 Volvo XC90

Max: 8.2 [g] at 0.051 [s]

Min: -8.4 [g] at 0.085 [s]

V1P2 Head CG Red y

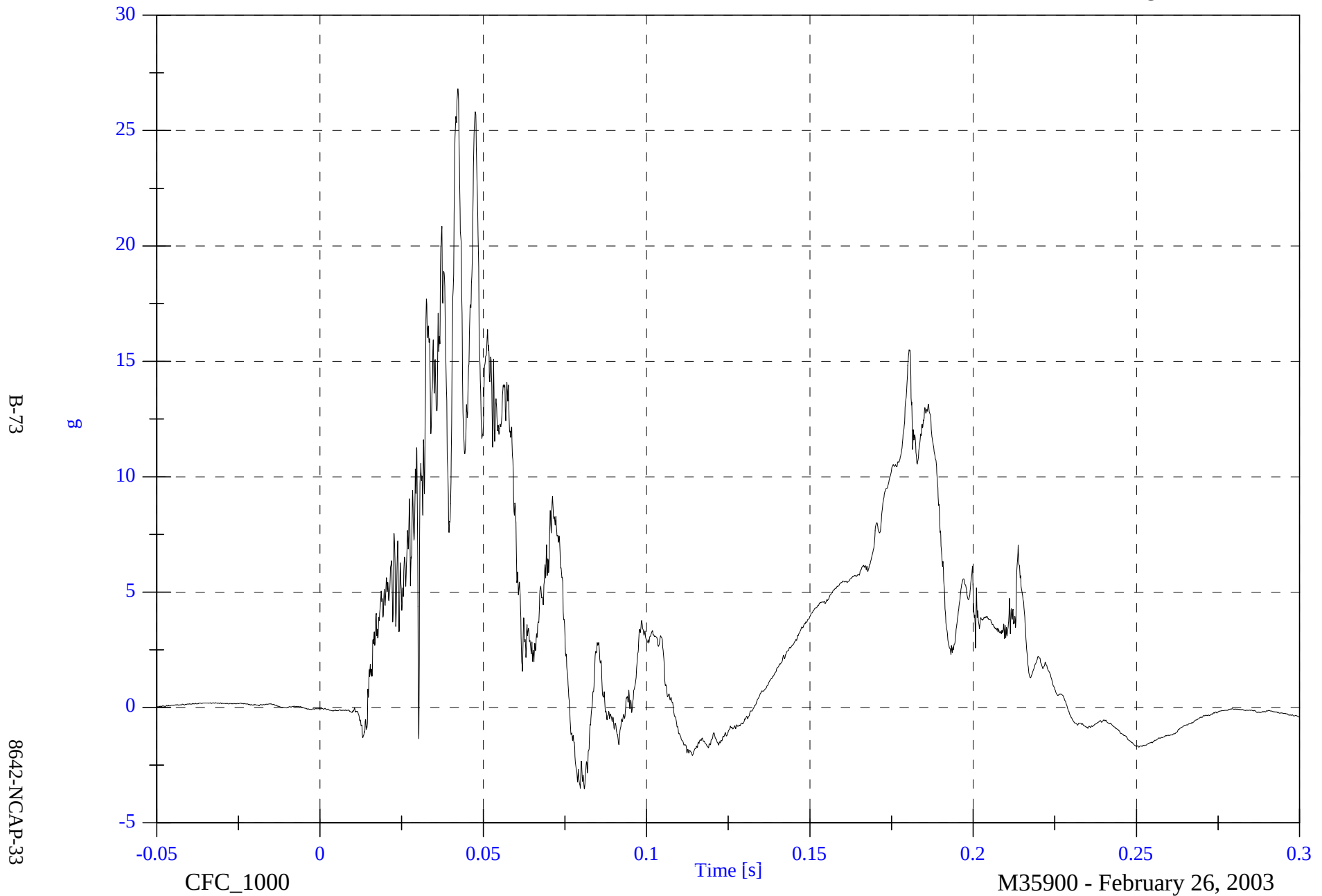


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Head CG Red z

Max: 26.8 [g] at 0.042 [s]

Min: -3.5 [g] at 0.081 [s]



2003 NCAP Test 10 2003 Volvo XC90

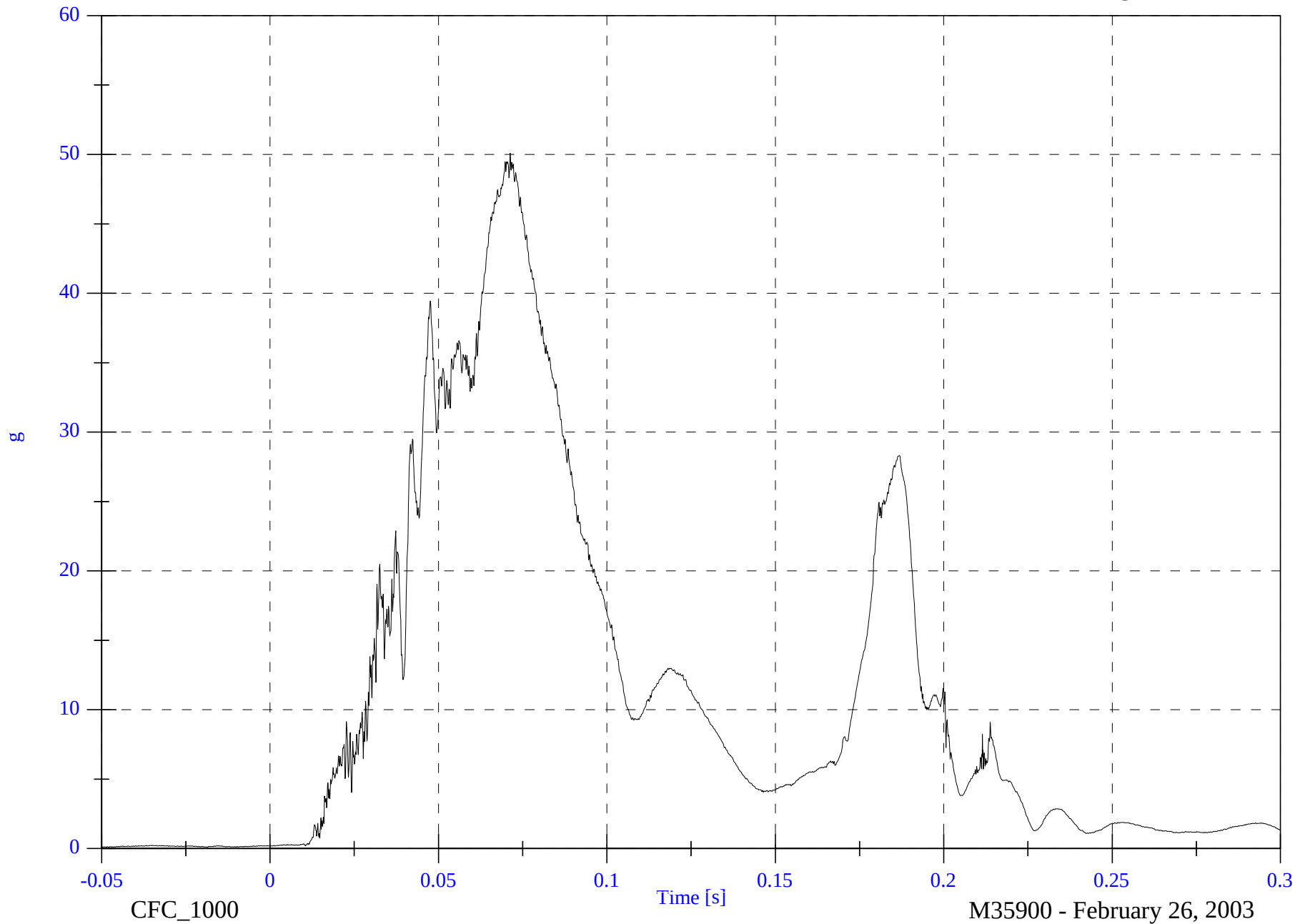
V1P2 Head CG Red Resultant

Max: 50.1 [g] at 0.071 [s]

Min: 0.1 [g] at -0.019 [s]

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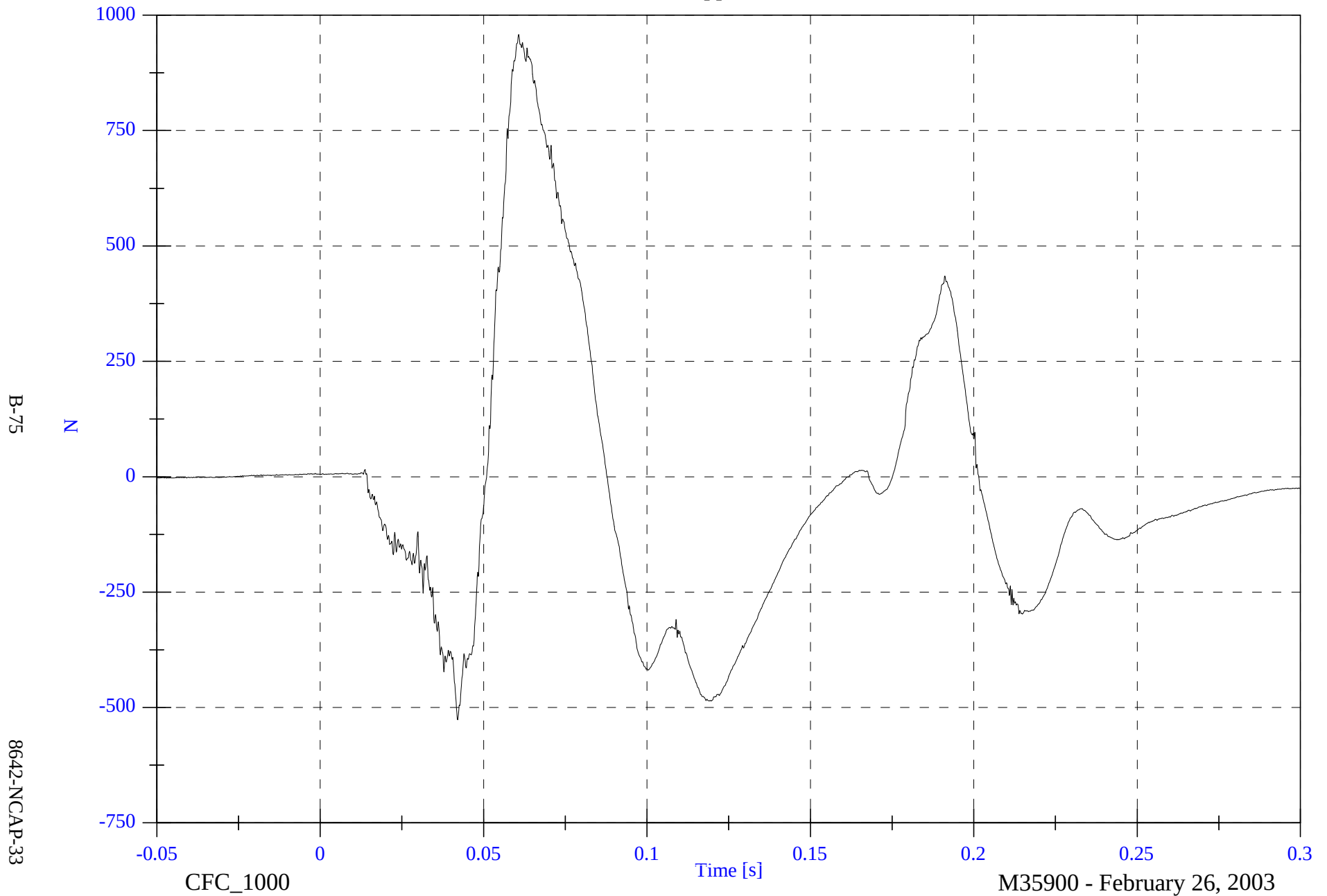


2003 NCAP Test 10 2003 Volvo XC90

Max: 958.0 [N] at 0.061 [s]

Min: -527.0 [N] at 0.042 [s]

V1P2 Upper Neck Fx

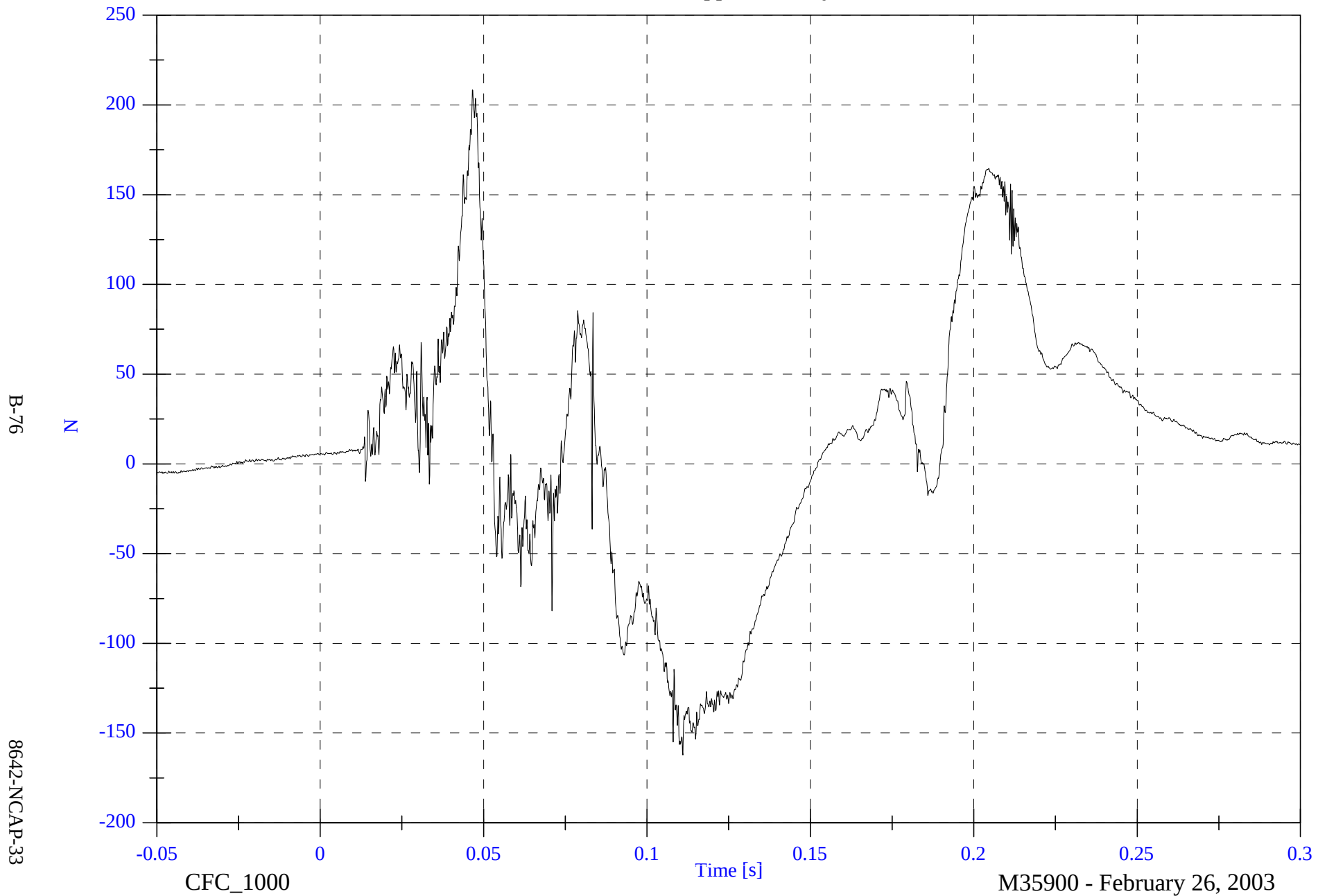


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Upper Neck Fy

Max: 208.3 [N] at 0.047 [s]

Min: -162.2 [N] at 0.111 [s]

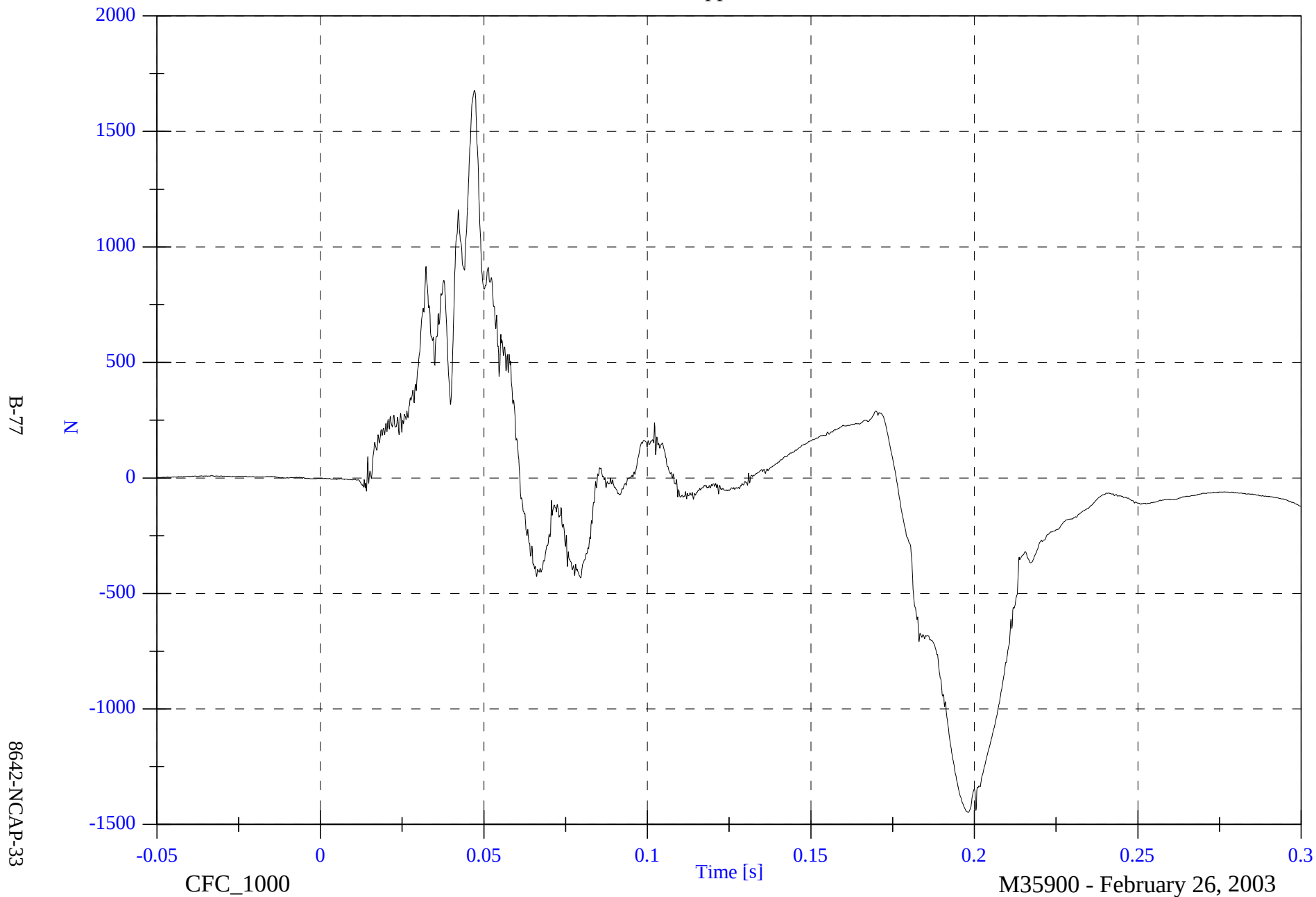


2003 NCAP Test 10 2003 Volvo XC90

Max: 1676.9 [N] at 0.047 [s]

Min: -1448.0 [N] at 0.198 [s]

V1P2 Upper Neck Fz

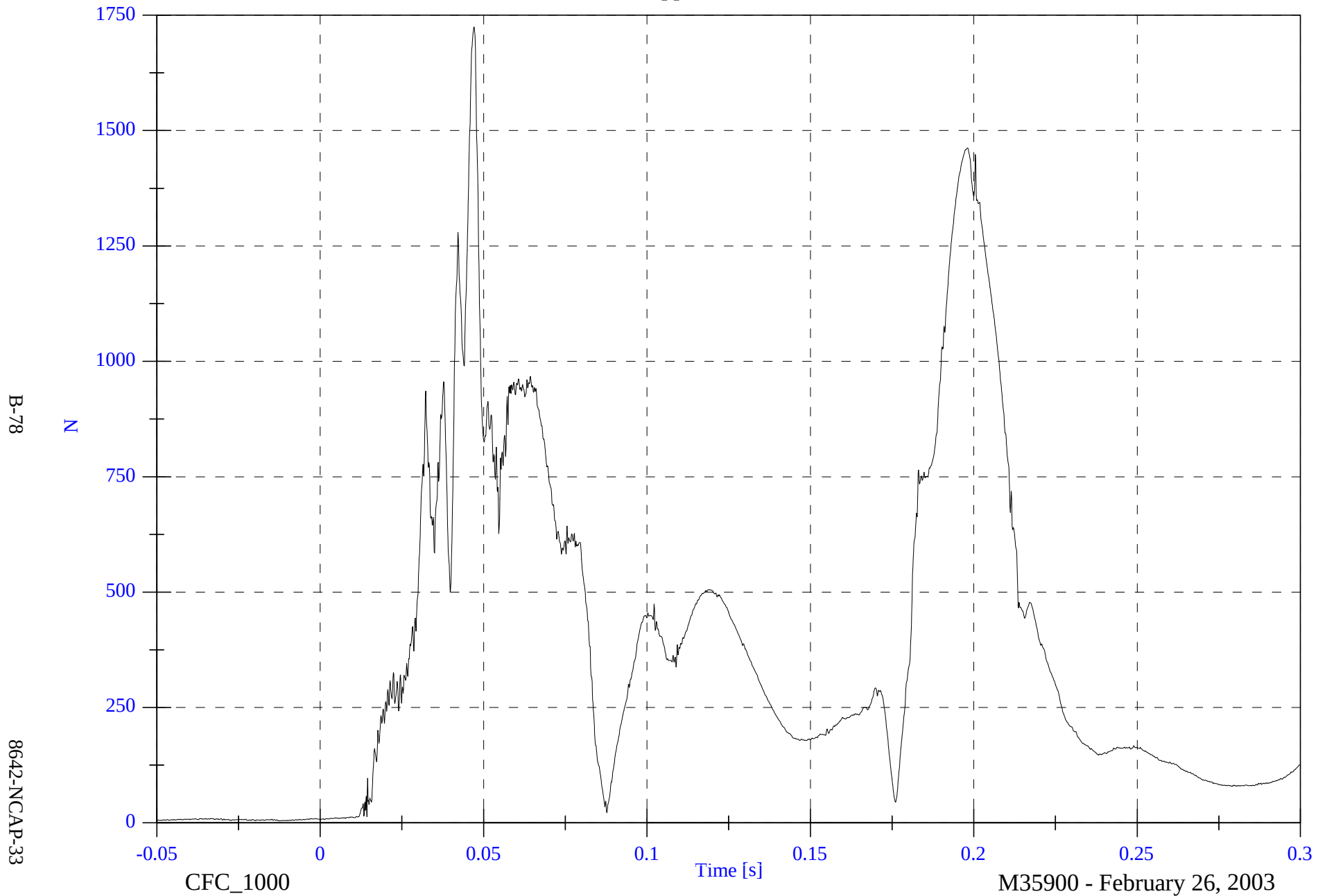


2003 NCAP Test 10 2003 Volvo XC90

Max: 1724.8 [N] at 0.047 [s]

V1P2 Upper Neck F Resultant

Min: 4.4 [N] at -0.012 [s]



2003 NCAP Test 10 2003 Volvo XC90

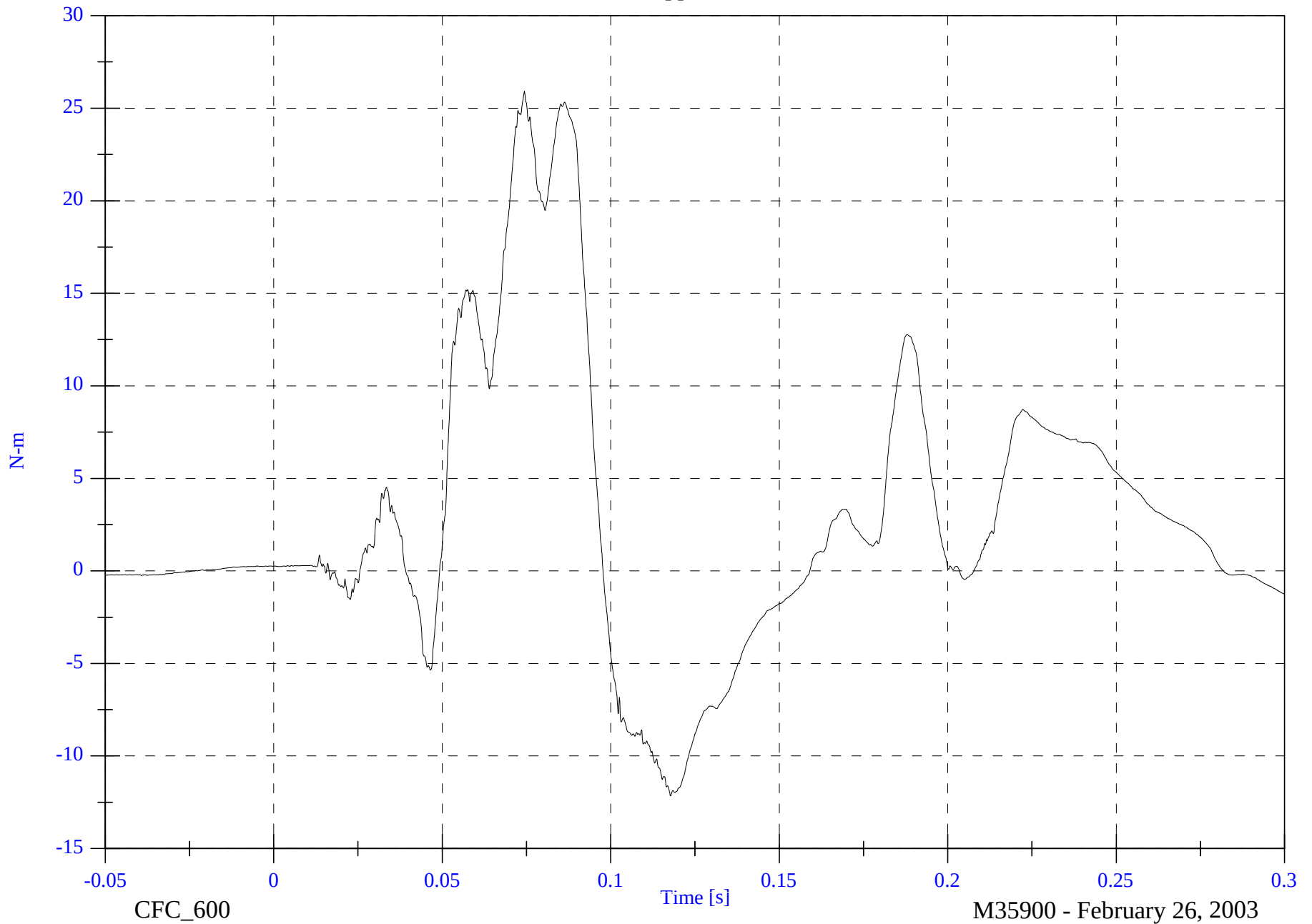
V1P2 Upper Neck Mx

Max: 25.9 [N-m] at 0.074 [s]

Min: -12.2 [N-m] at 0.118 [s]

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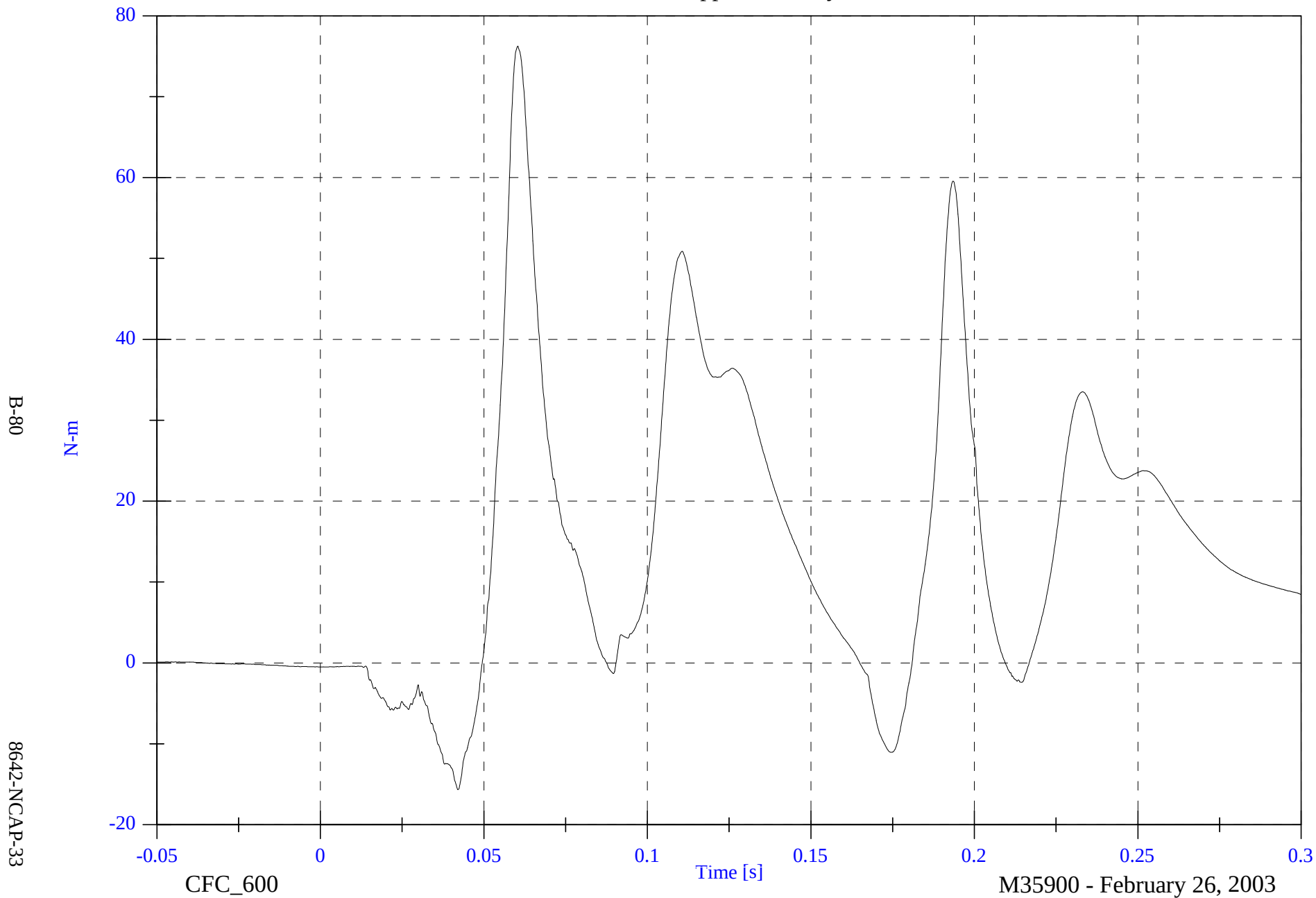


2003 NCAP Test 10 2003 Volvo XC90

Max: 76.3 [N-m] at 0.060 [s]

Min: -15.7 [N-m] at 0.042 [s]

V1P2 Upper Neck My



2003 NCAP Test 10 2003 Volvo XC90

Max: 14.9 [N-m] at 0.090 [s]

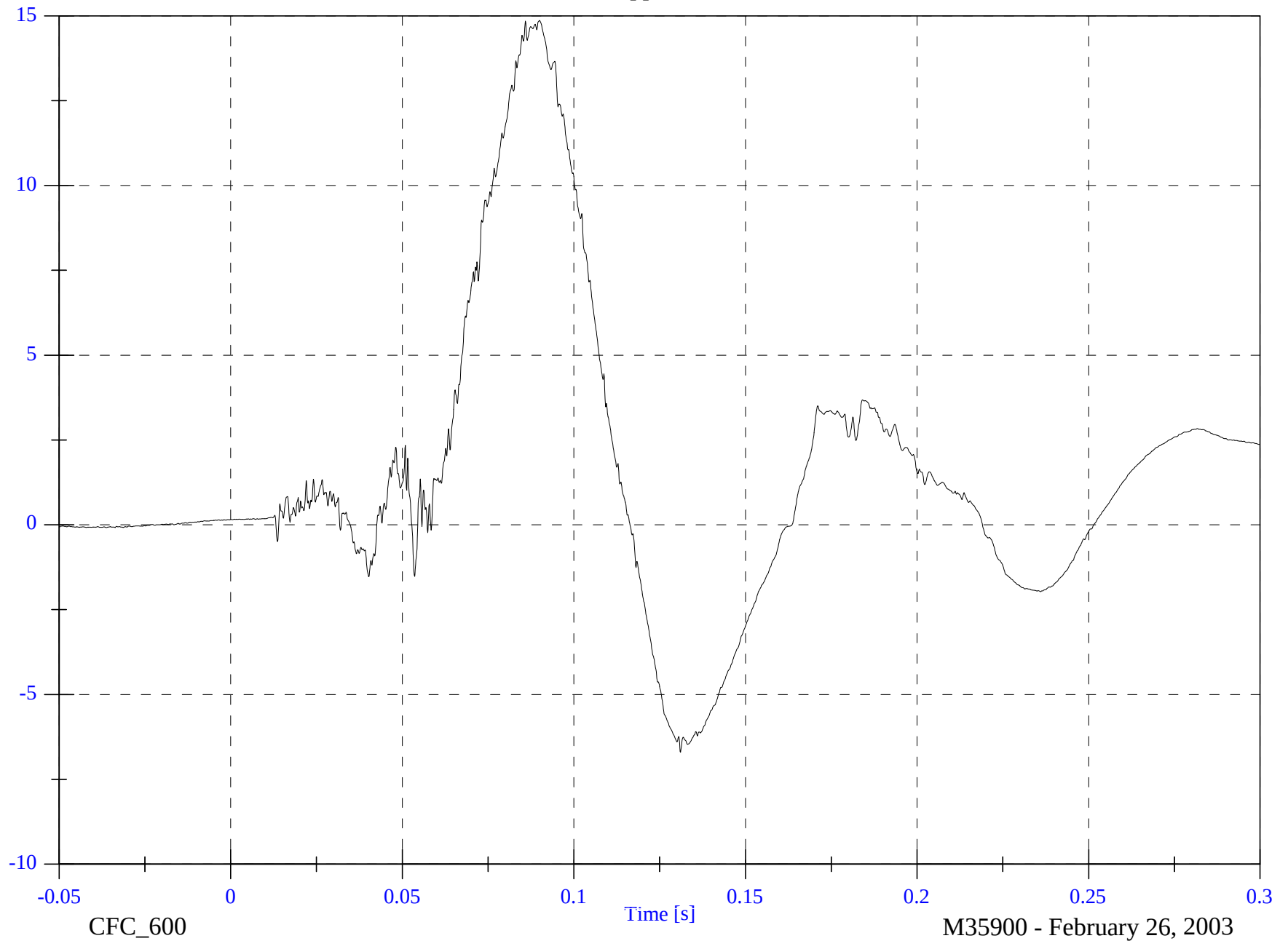
Min: -6.7 [N-m] at 0.131 [s]

V1P2 Upper Neck Mz

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N-m

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CFC_600

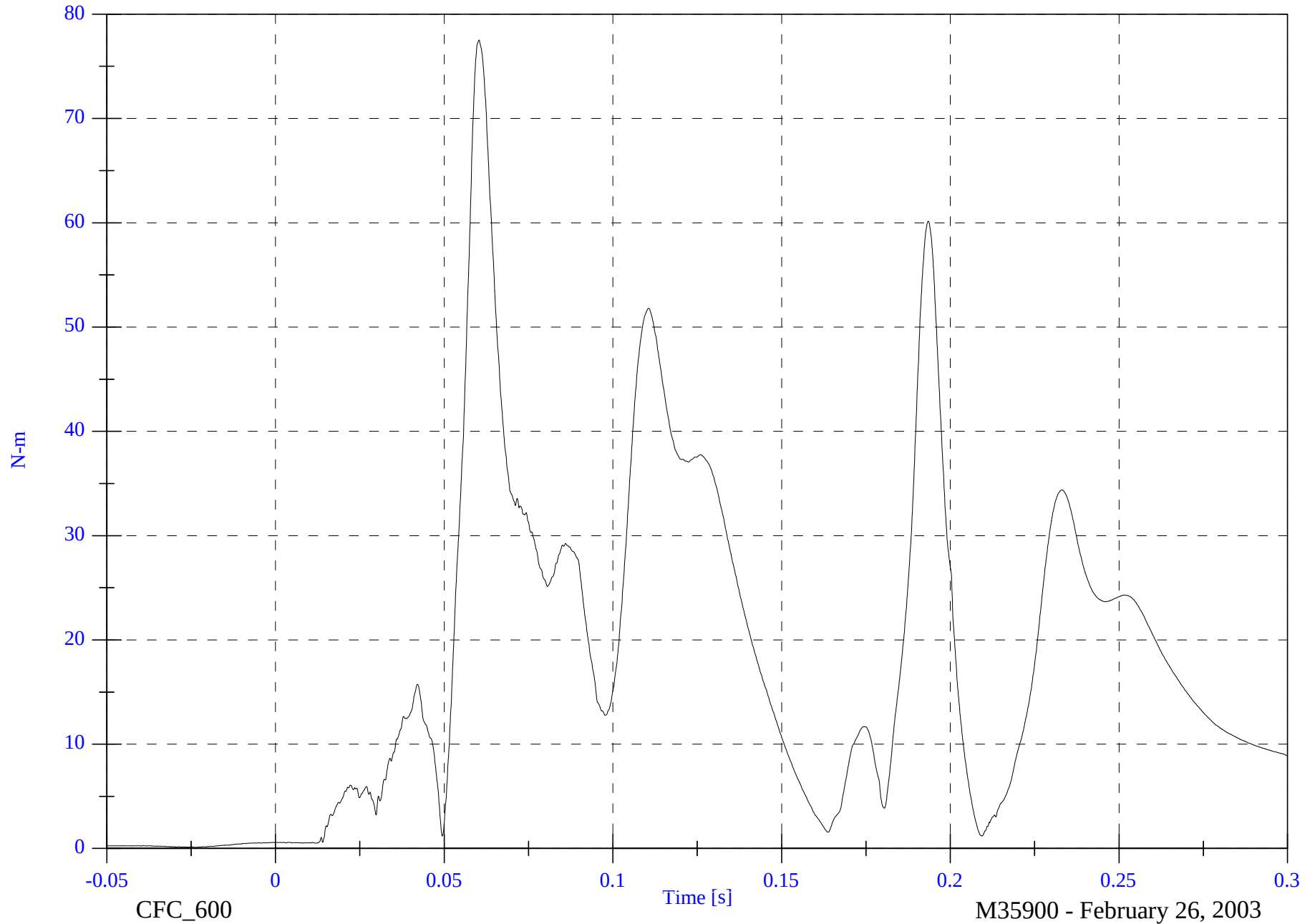
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P2 Upper Neck M Resultant

Max: 77.5 [N-m] at 0.060 [s]

Min: 0.1 [N-m] at -0.024 [s]



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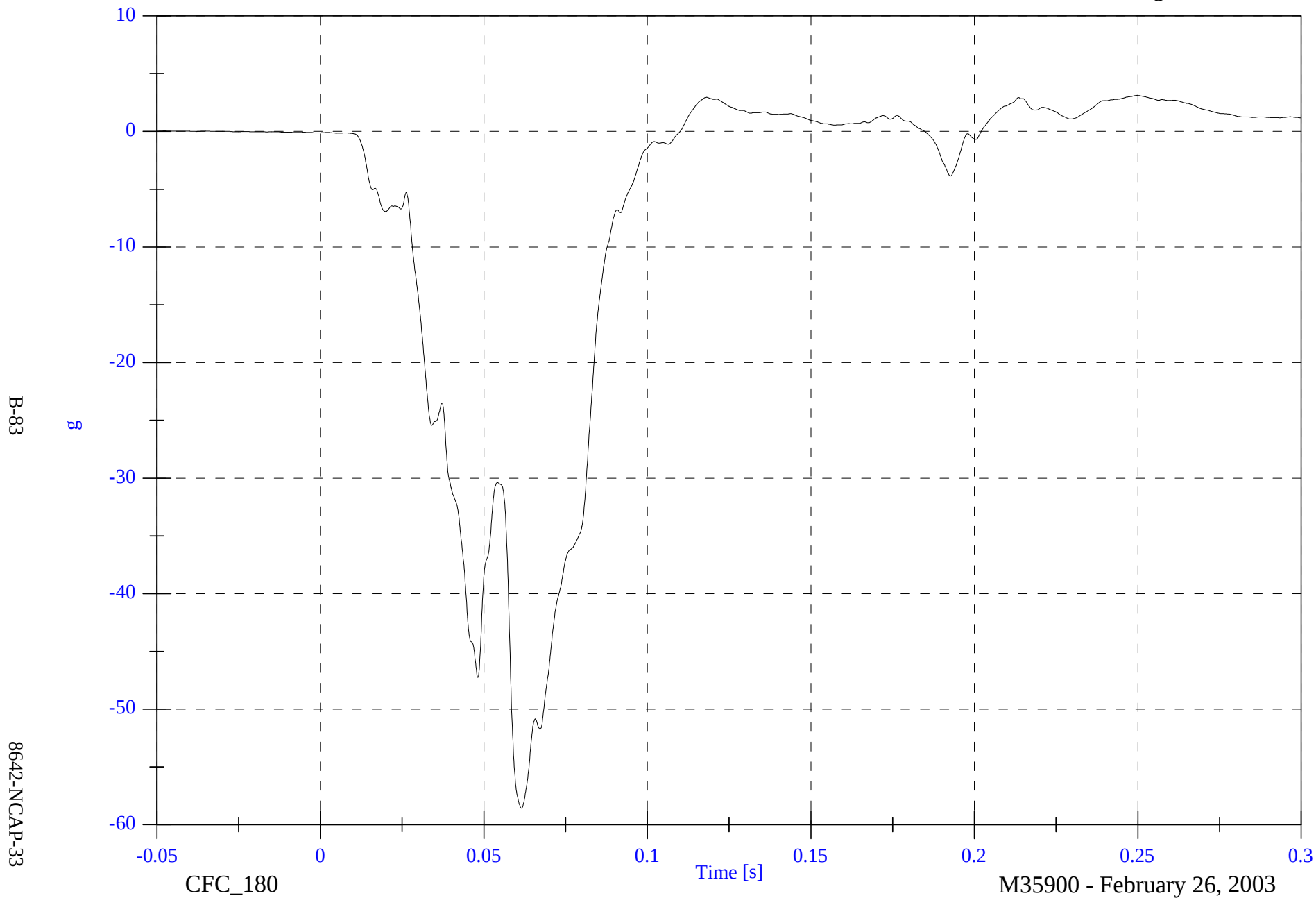
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 3.1 [g] at 0.250 [s]

Min: -58.6 [g] at 0.062 [s]

V1P2 Chest x

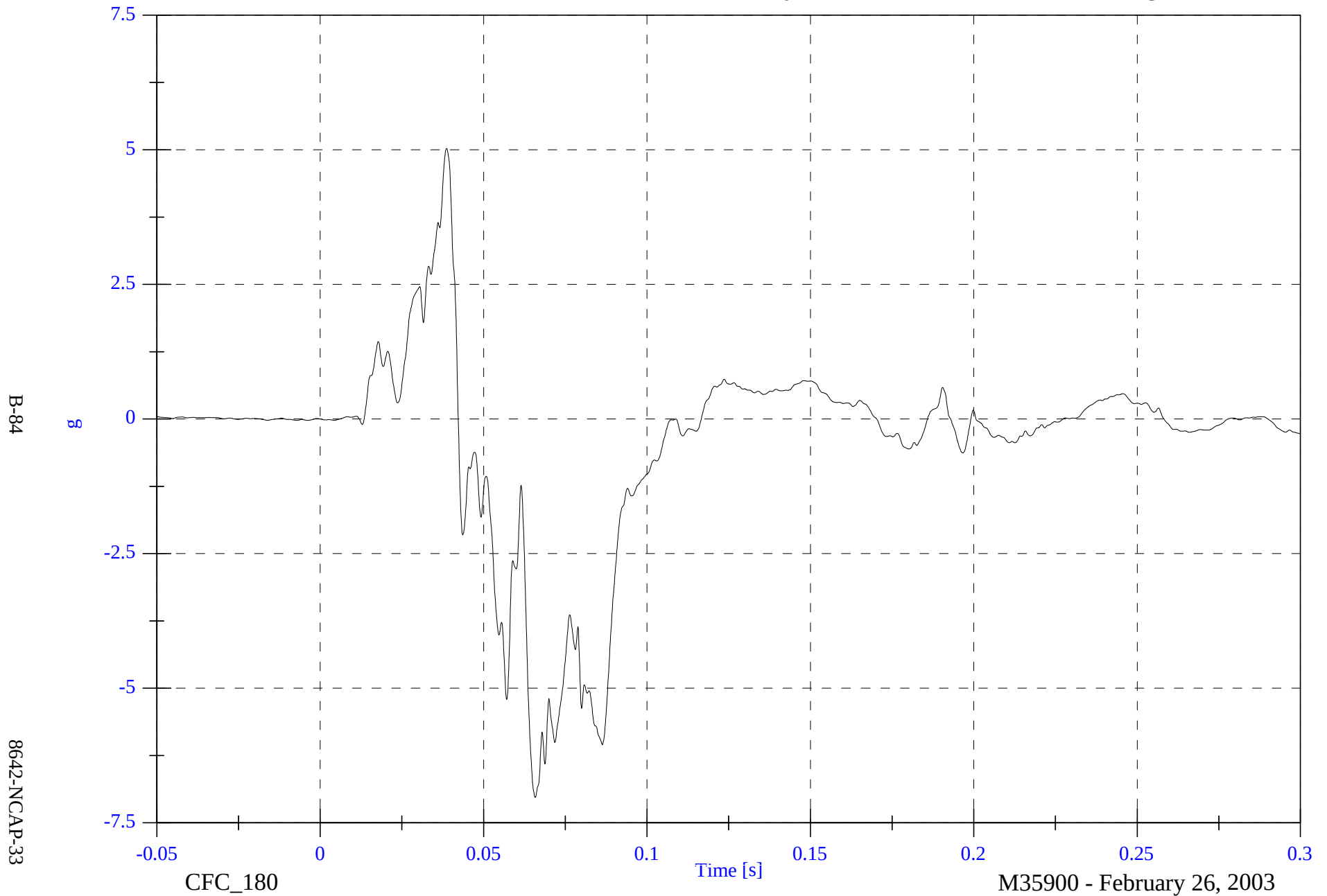


2003 NCAP Test 10 2003 Volvo XC90

Max: 5.0 [g] at 0.039 [s]

Min: -7.0 [g] at 0.066 [s]

V1P2 Chest y

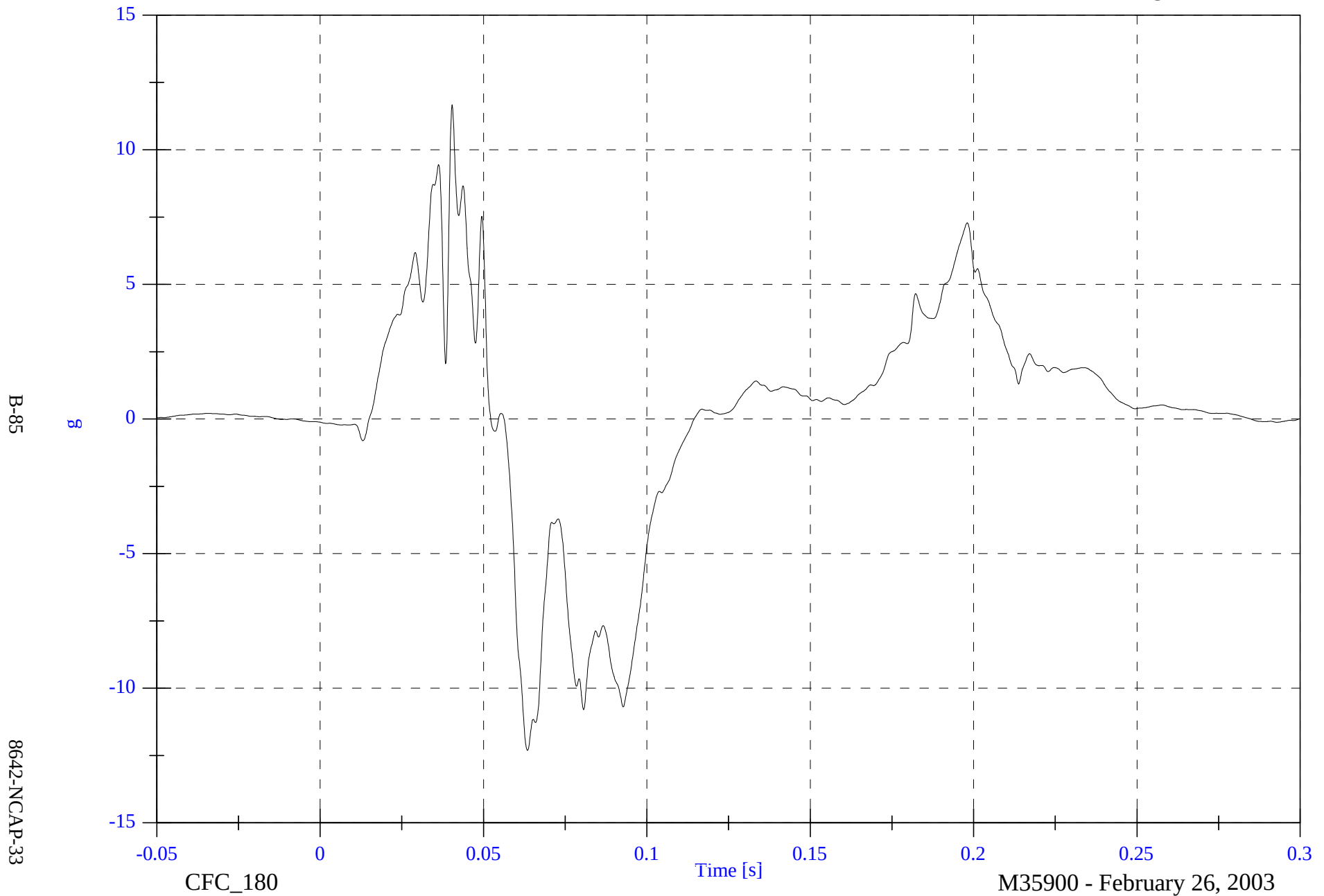


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest z

Max: 11.7 [g] at 0.040 [s]

Min: -12.3 [g] at 0.063 [s]



2003 NCAP Test 10 2003 Volvo XC90

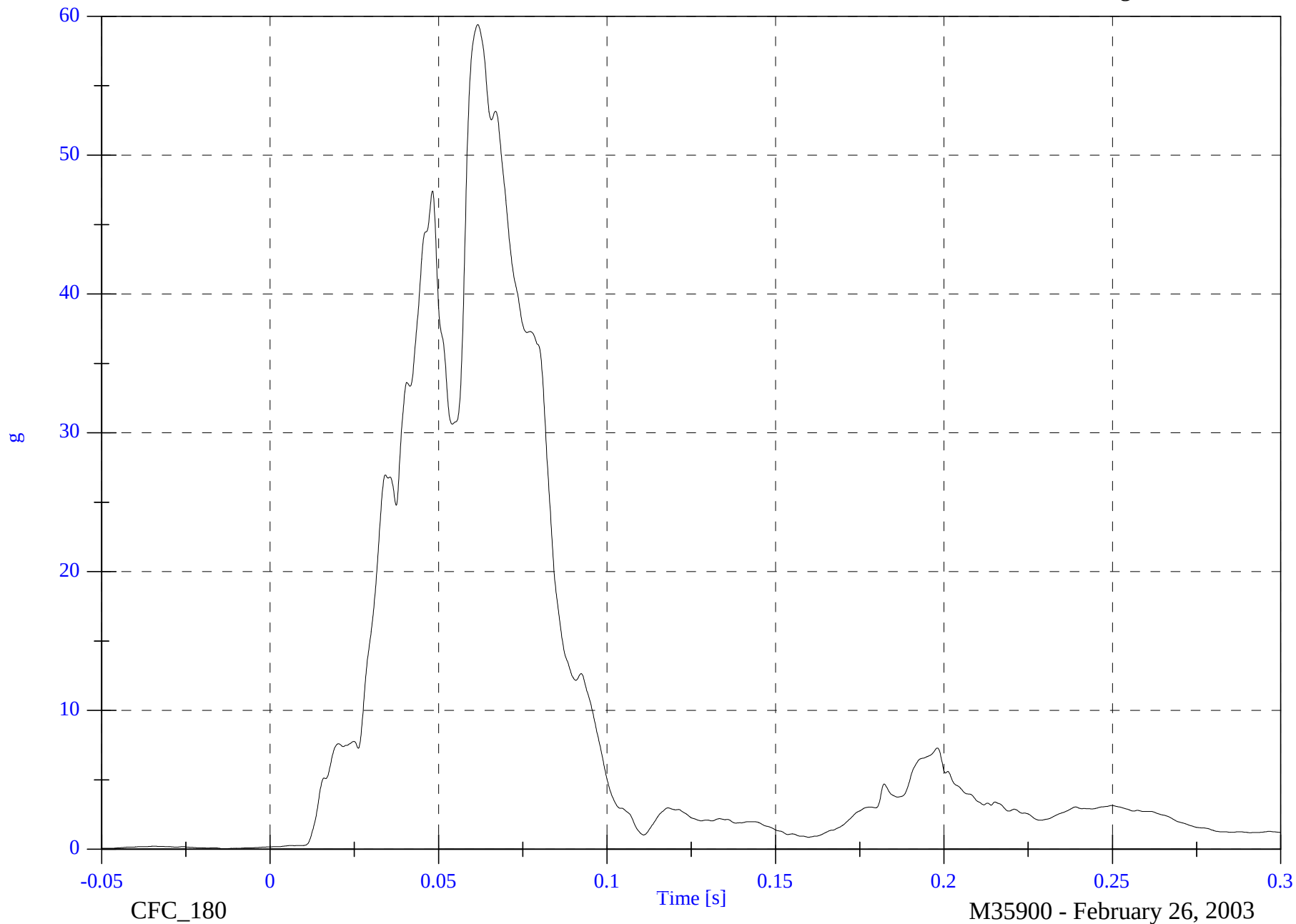
V1P2 Chest Resultant

Max: 59.4 [g] at 0.062 [s]

Min: 0.0 [g] at -0.013 [s]

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CFC_180

M35900 - February 26, 2003

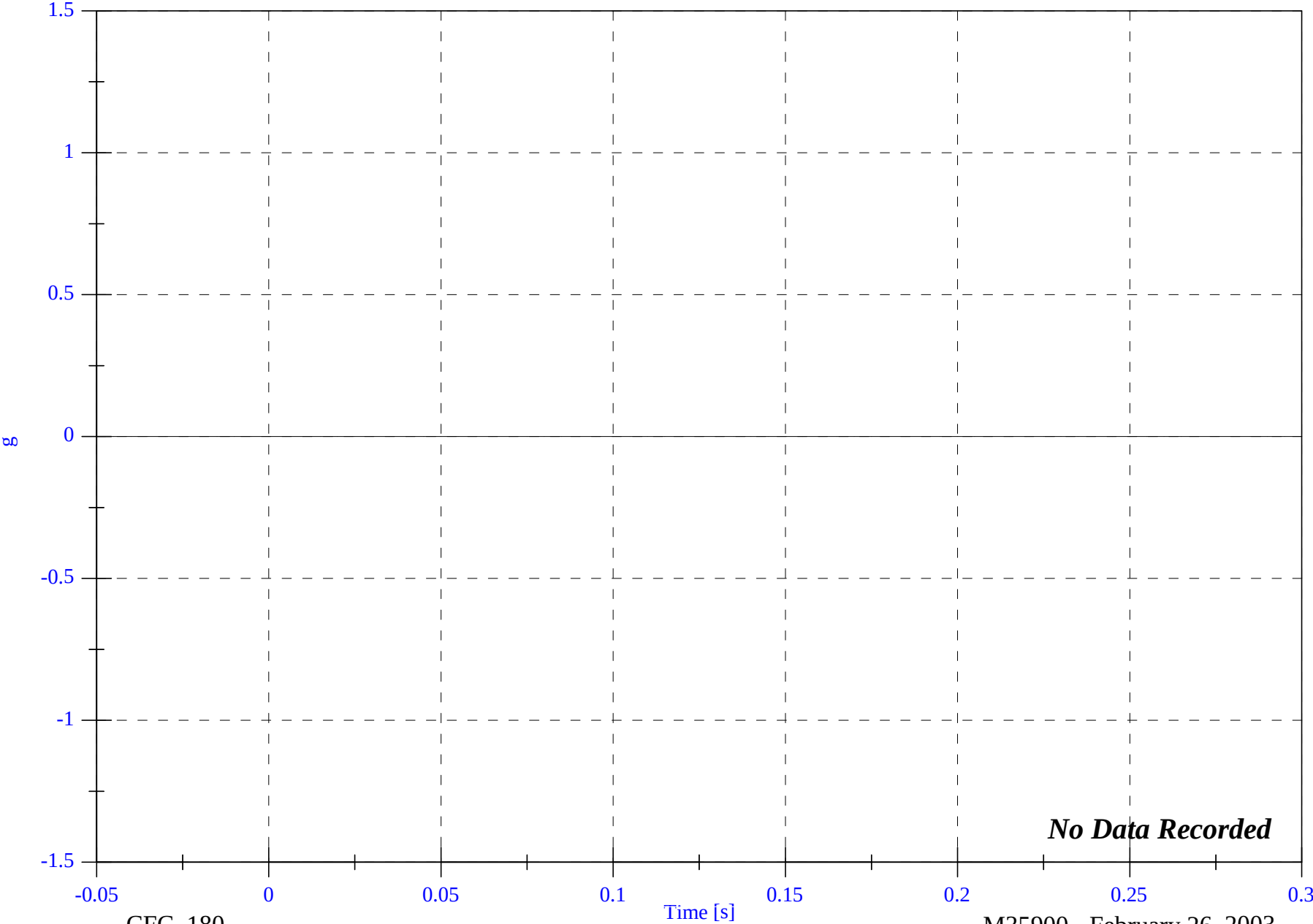
2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest Red x

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

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8642-NCAP-33

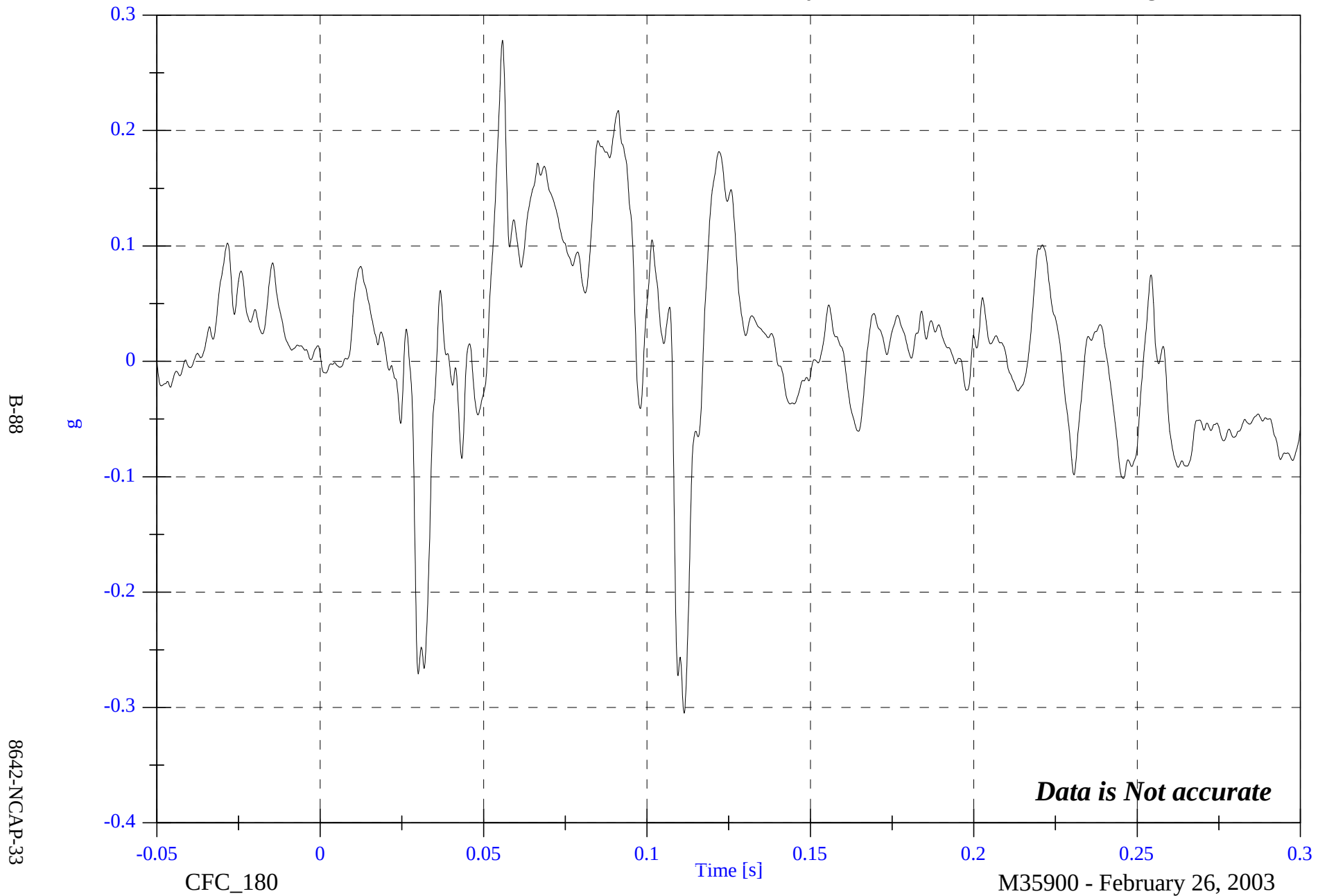


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest Red y

Max: 0.3 [g] at 0.056 [s]

Min: -0.3 [g] at 0.111 [s]

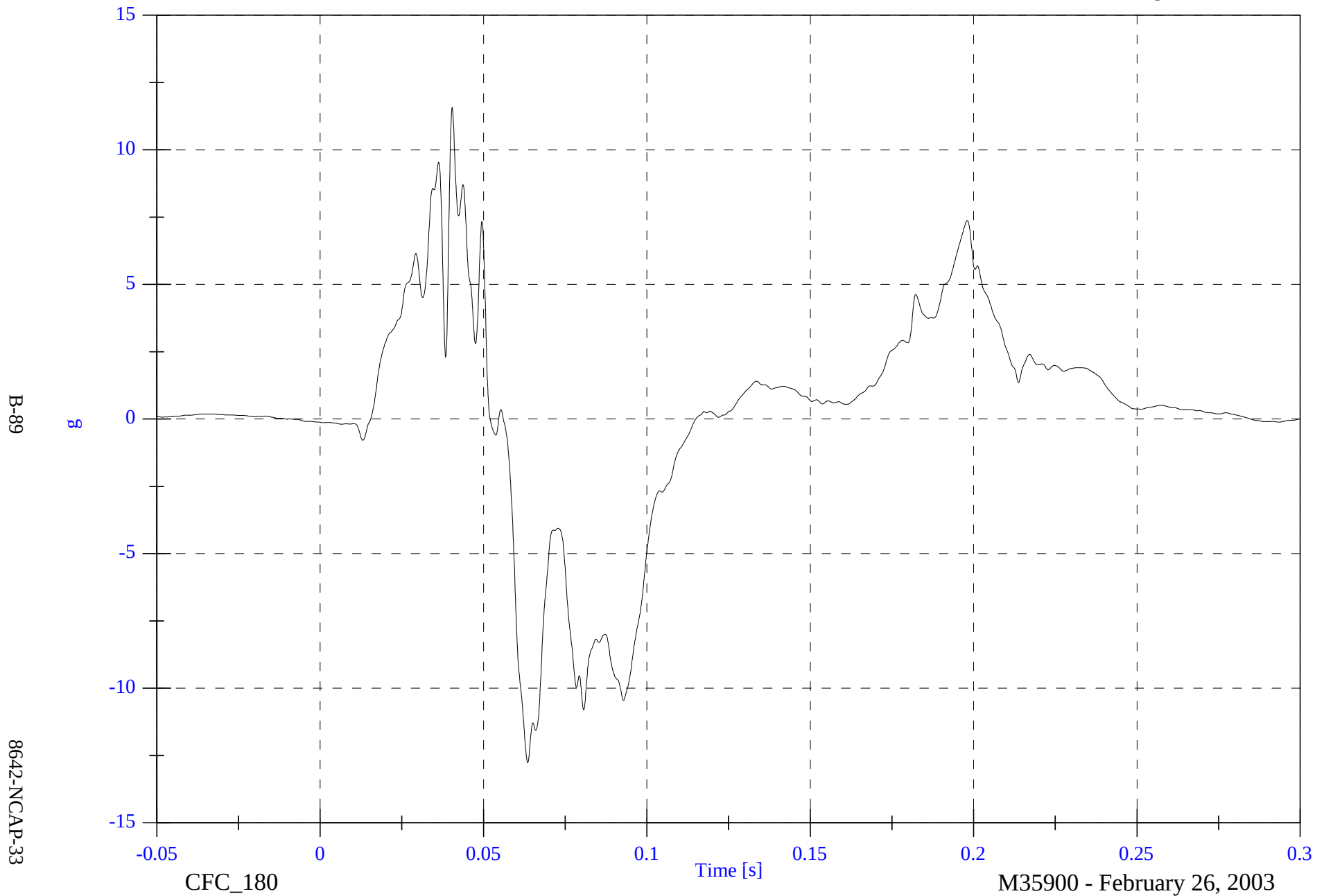


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest Red z

Max: 11.6 [g] at 0.040 [s]

Min: -12.8 [g] at 0.064 [s]

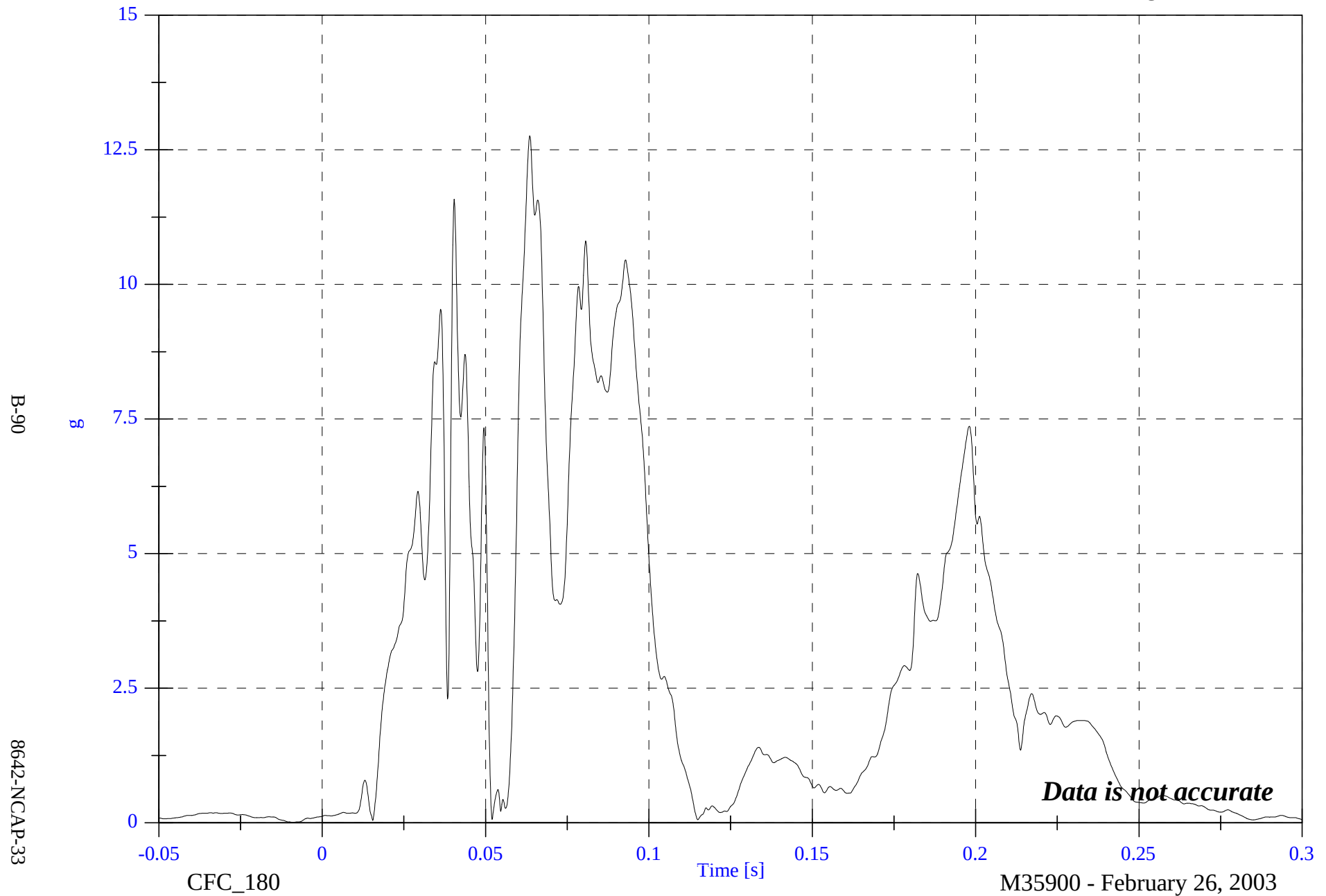


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest Red Resultant

Max: 12.8 [g] at 0.064 [s]

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

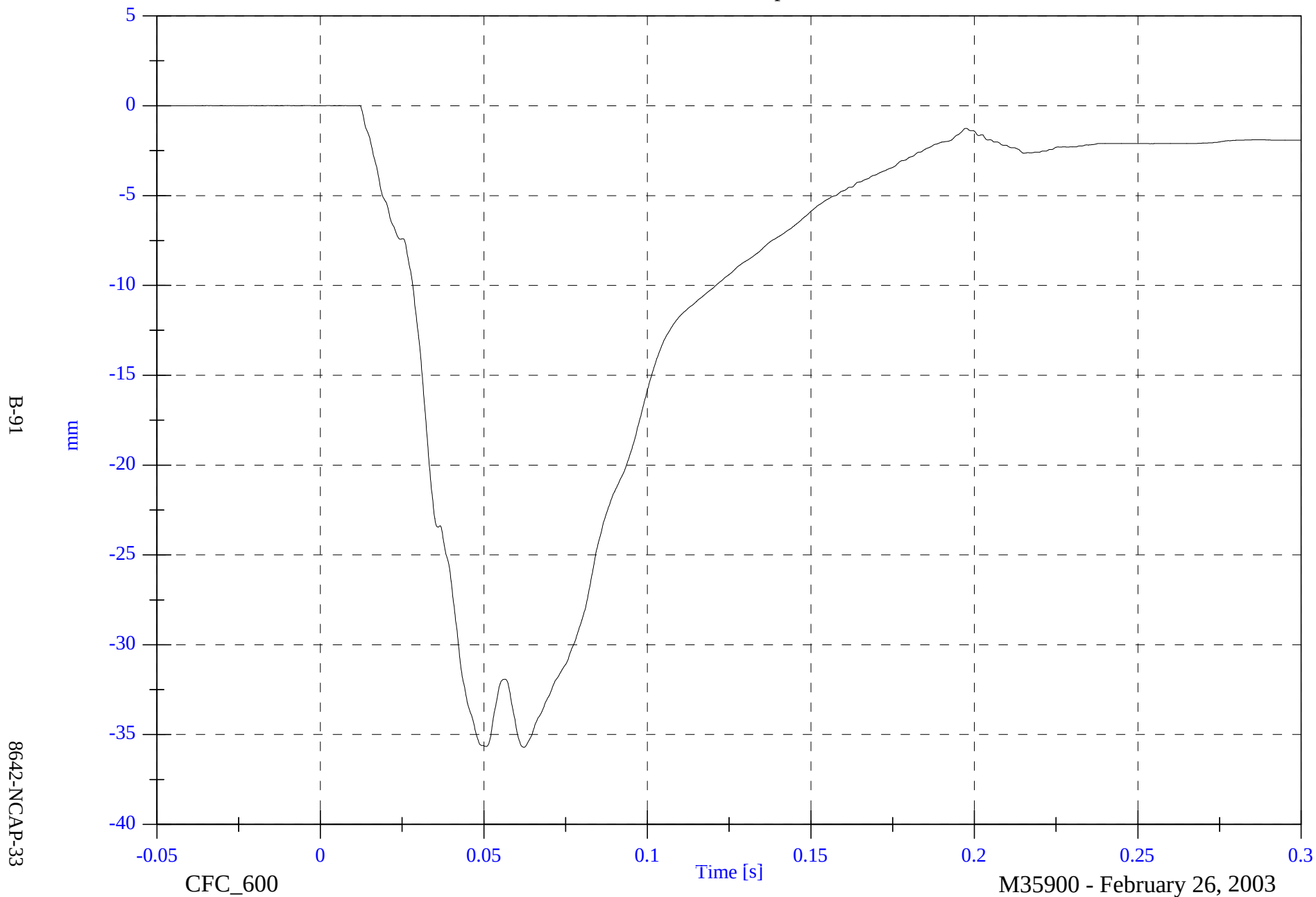


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Chest Compression

Max: 0.0 [mm] at 0.012 [s]

Min: -35.7 [mm] at 0.062 [s]

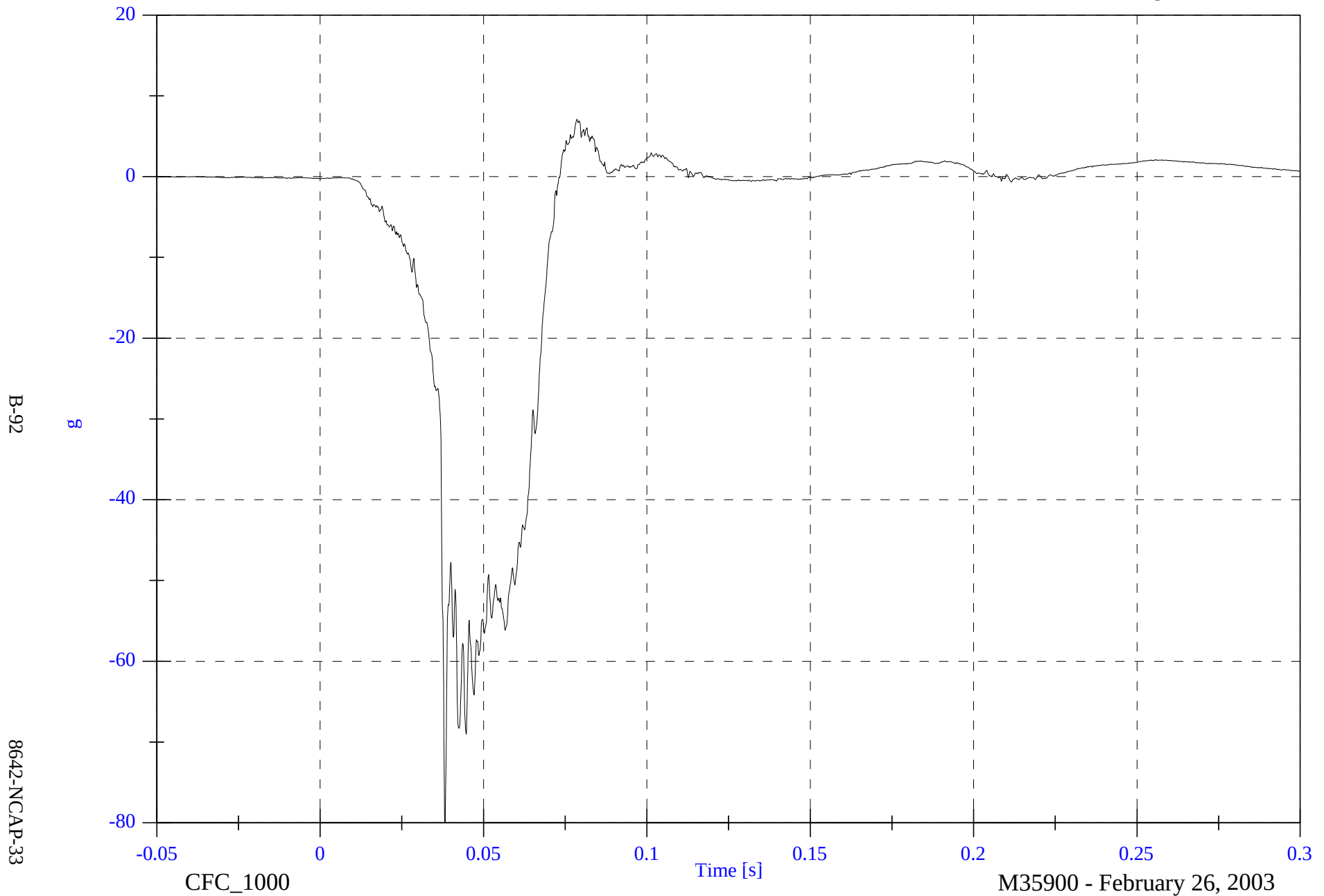


2003 NCAP Test 10 2003 Volvo XC90

Max: 7.1 [g] at 0.079 [s]

Min: -80.0 [g] at 0.038 [s]

V1P2 Pelvic x

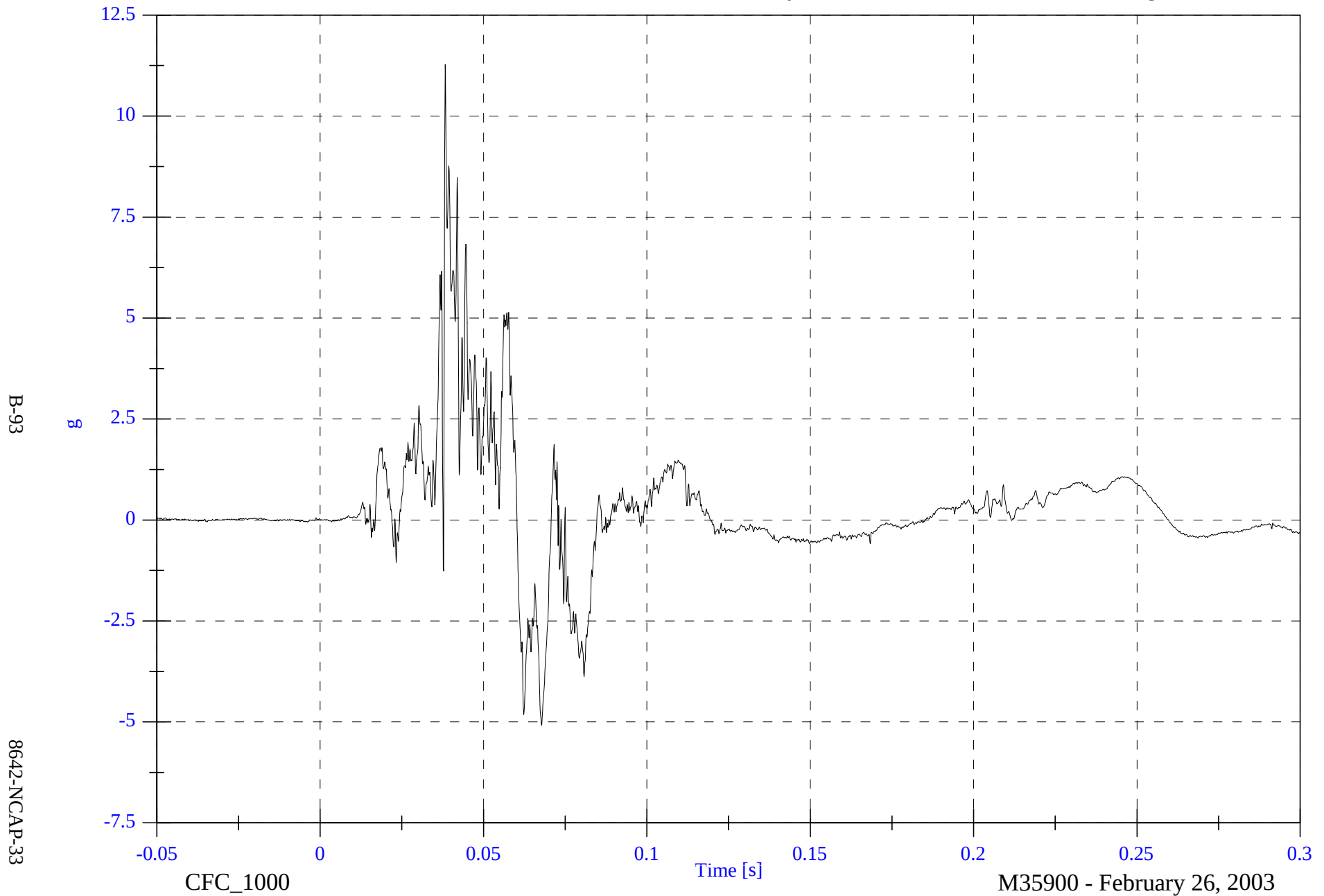


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Pelvic y

Max: 11.3 [g] at 0.038 [s]

Min: -5.1 [g] at 0.068 [s]

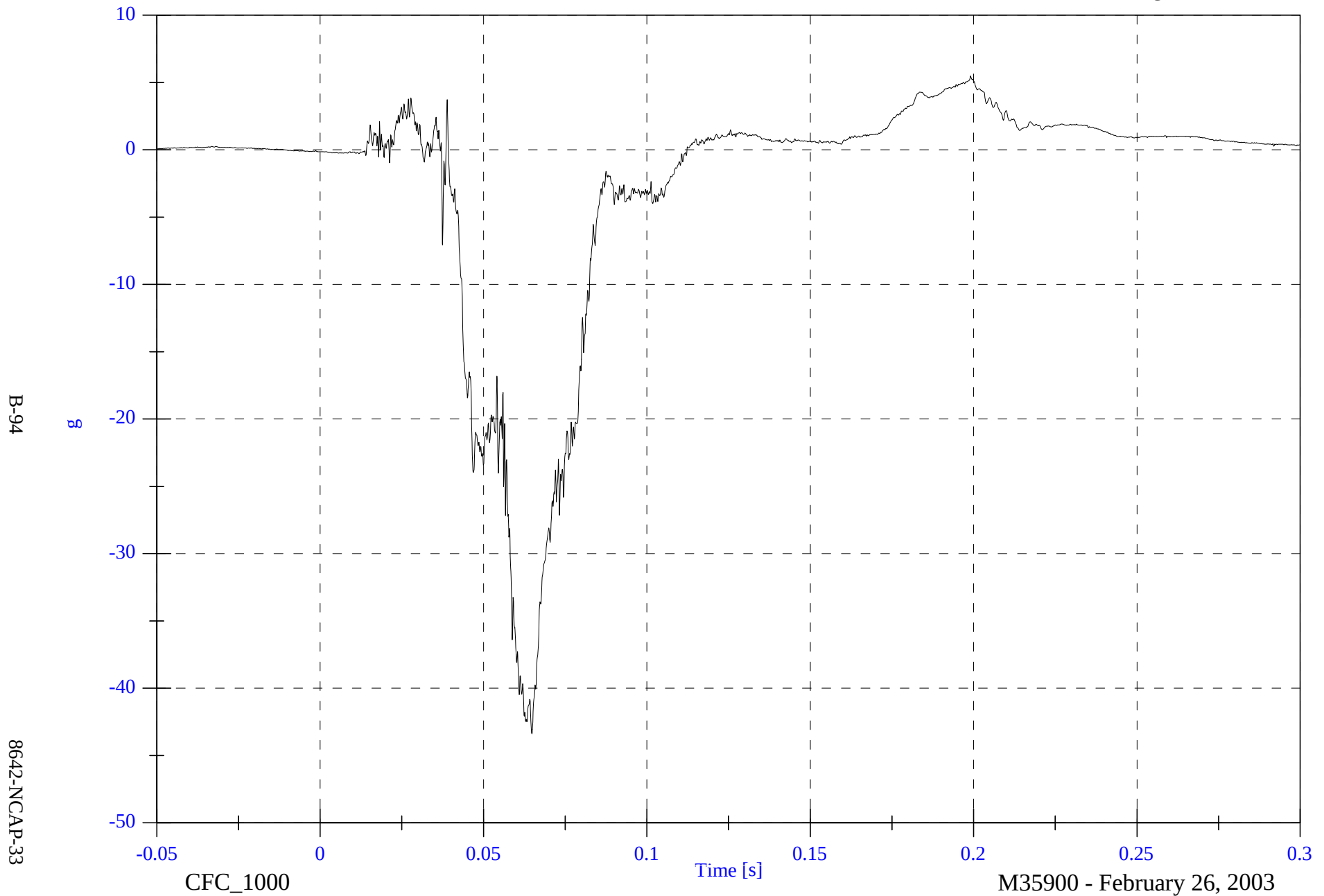


2003 NCAP Test 10 2003 Volvo XC90

Max: 5.5 [g] at 0.199 [s]

Min: -43.4 [g] at 0.065 [s]

V1P2 Pelvic z

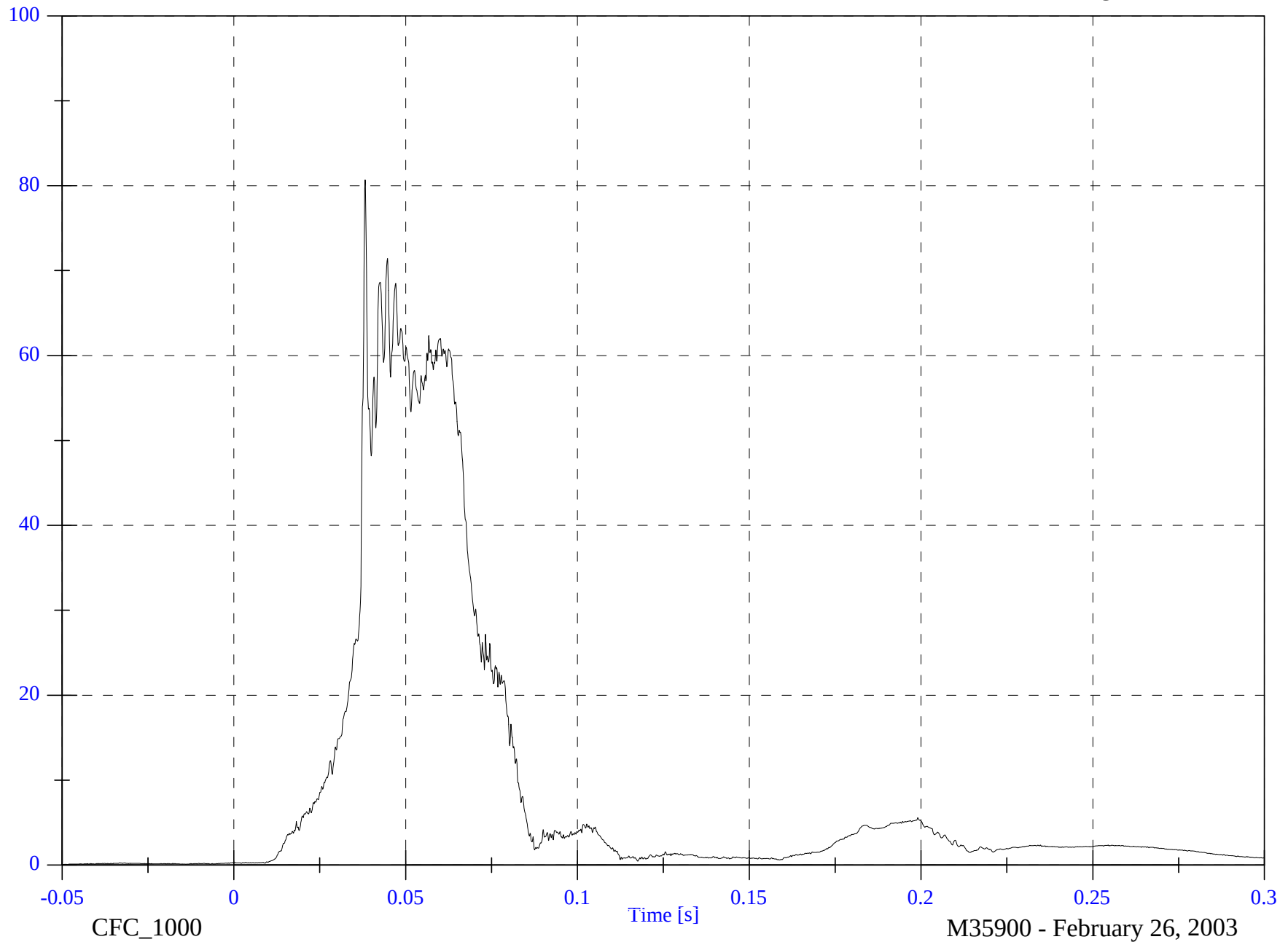


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Pelvic Resultant

Max: 80.7 [g] at 0.038 [s]

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



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CFC_1000

Time [s]

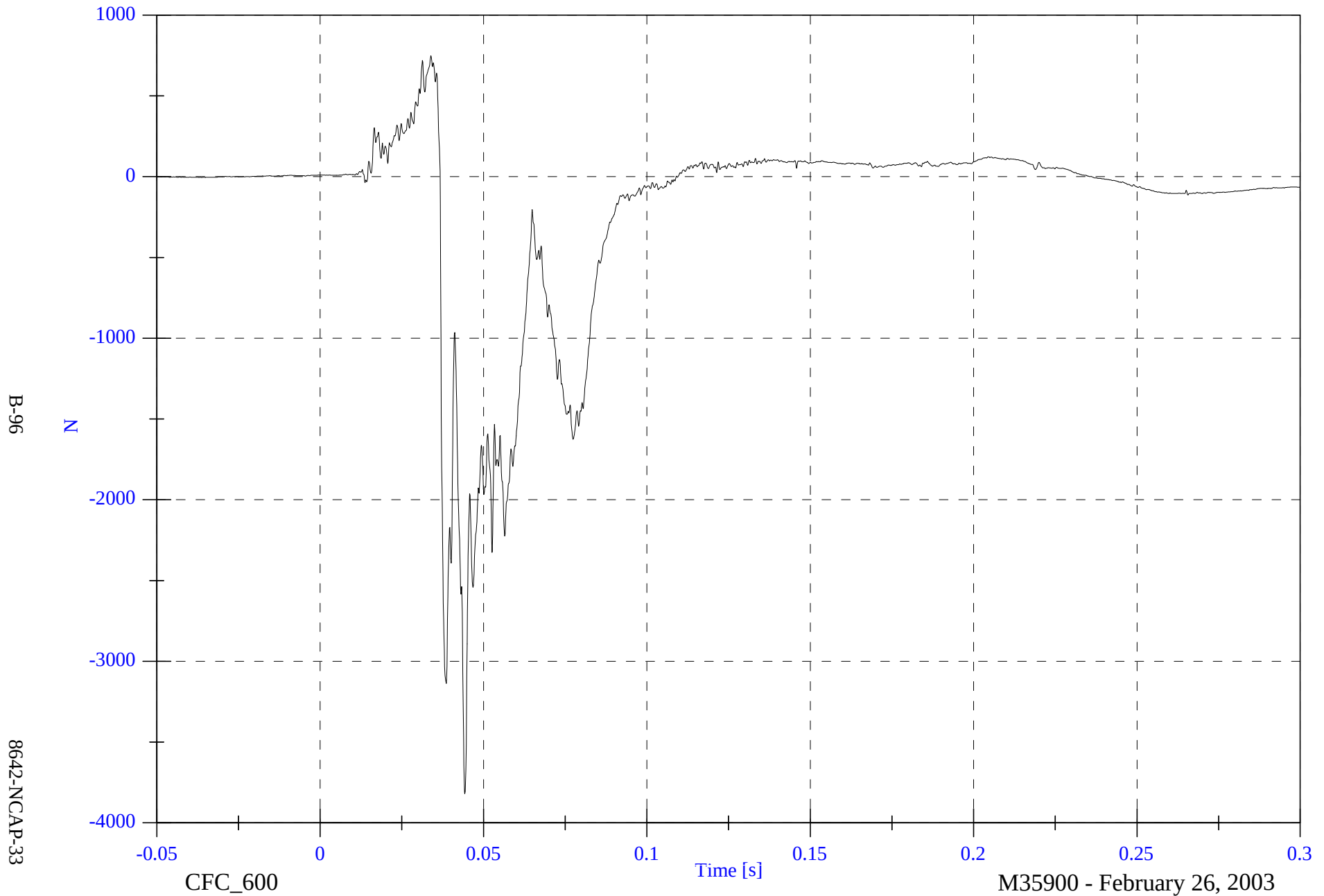
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P2 Left Femur

Max: 748.1 [N] at 0.034 [s]

Min: -3818.9 [N] at 0.044 [s]

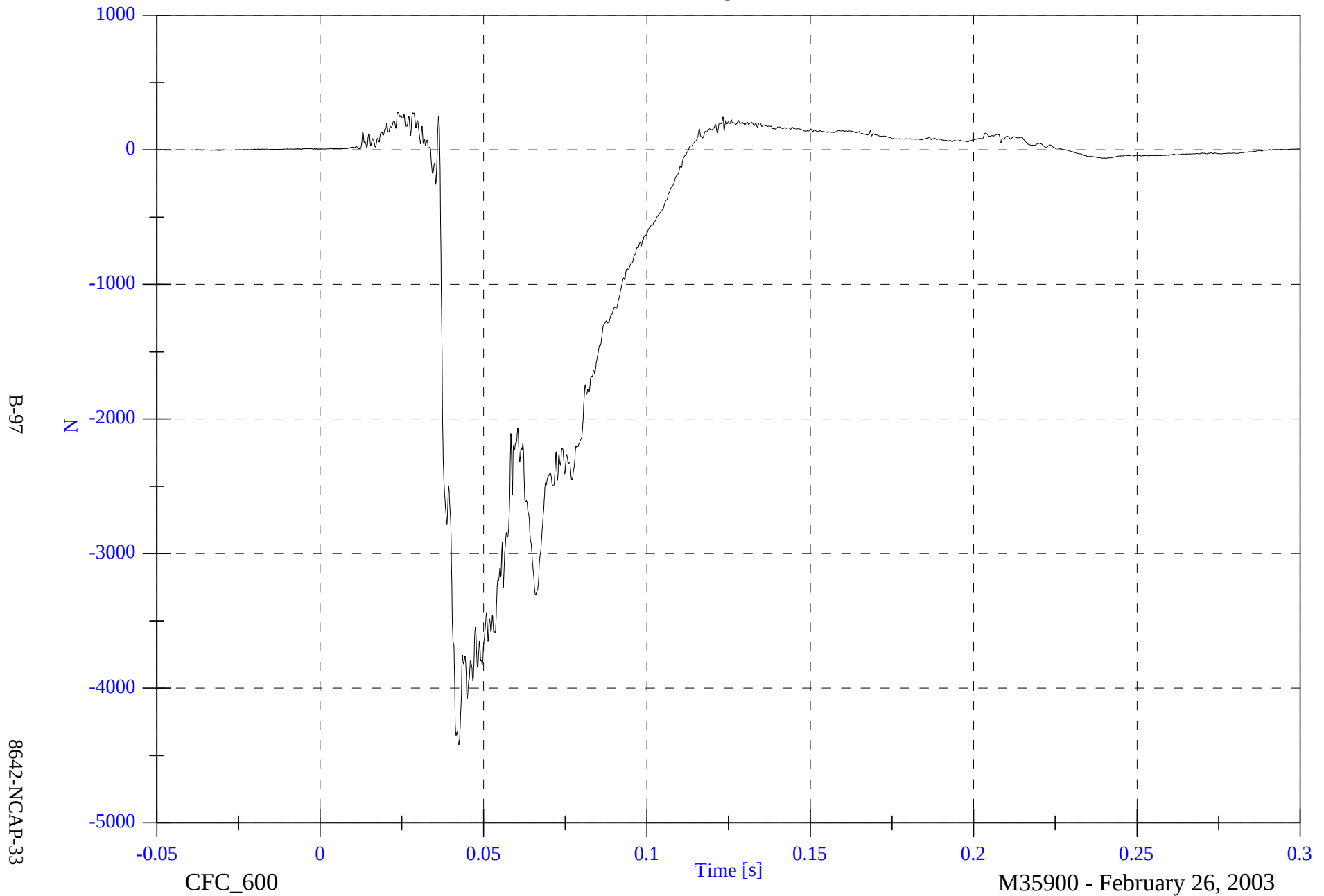


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Right Femur

Max: 278.4 [N] at 0.024 [s]

Min: -4420.2 [N] at 0.042 [s]



2003 NCAP Test 10 2003 Volvo XC90

V1P2 Left Upper Tibia Mx

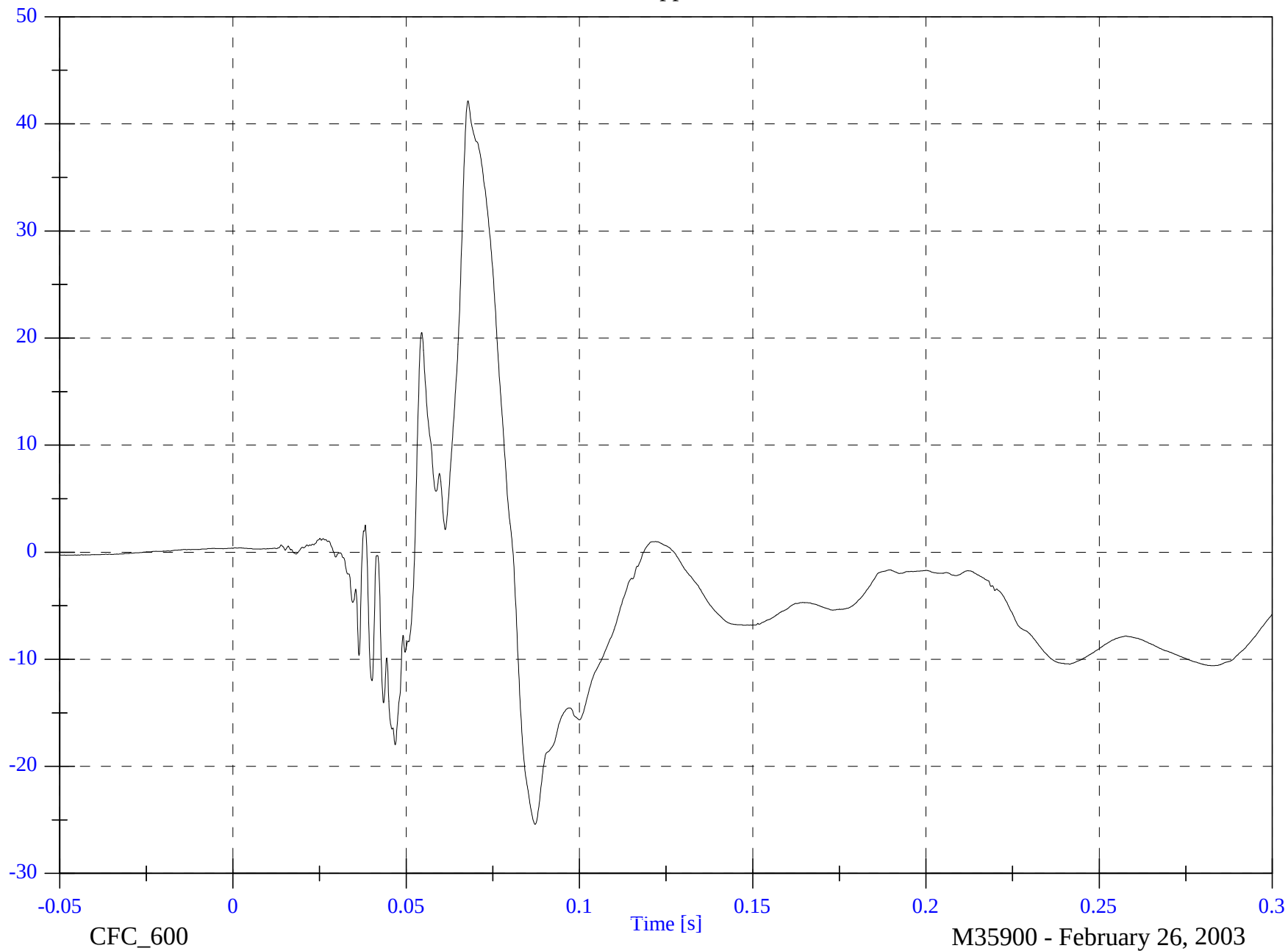
Max: 42.2 [N-m] at 0.068 [s]

Min: -25.4 [N-m] at 0.087 [s]

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N-m

8642-NCAP-33

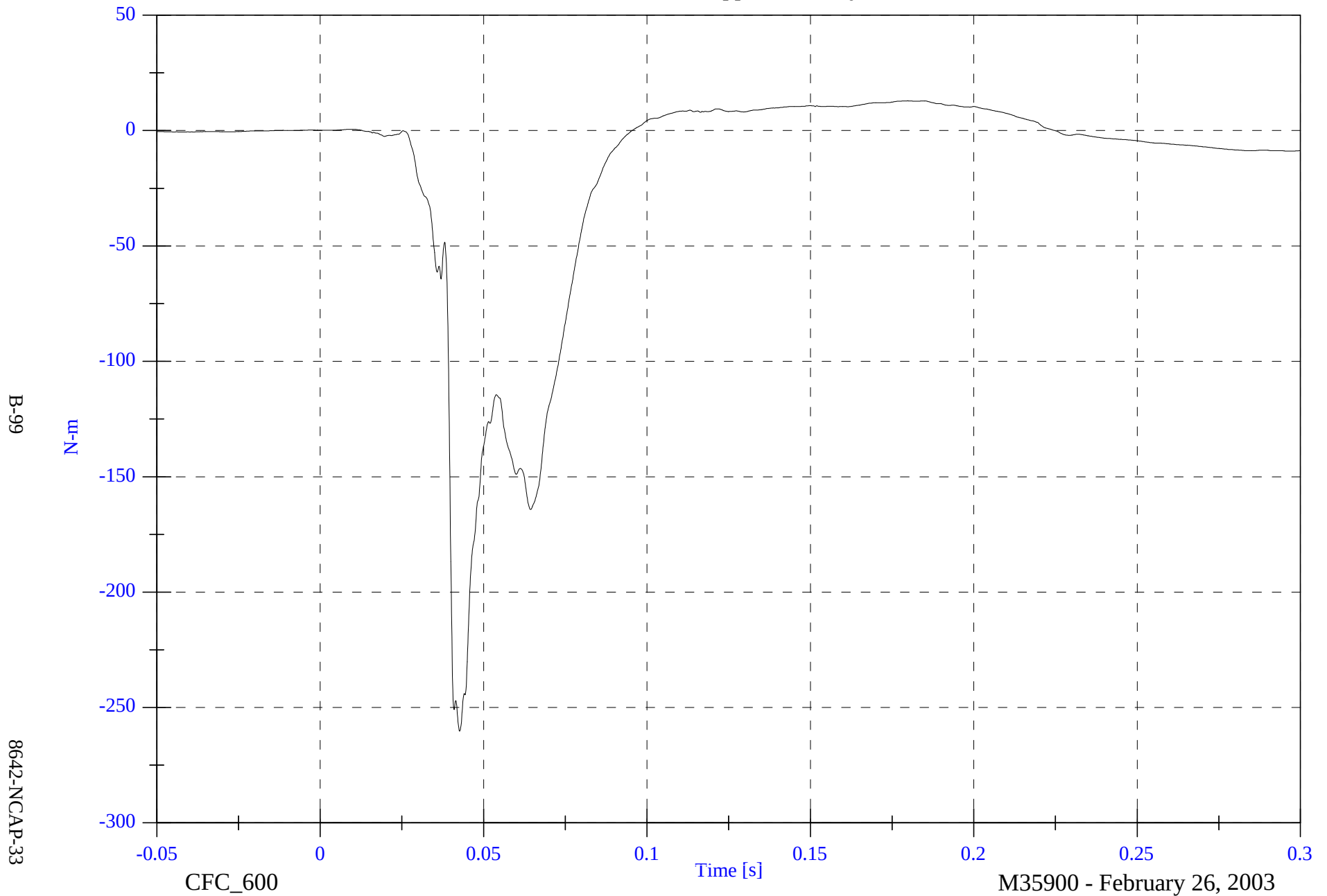


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Left Upper Tibia My

Max: 12.9 [N-m] at 0.180 [s]

Min: -260.2 [N-m] at 0.043 [s]

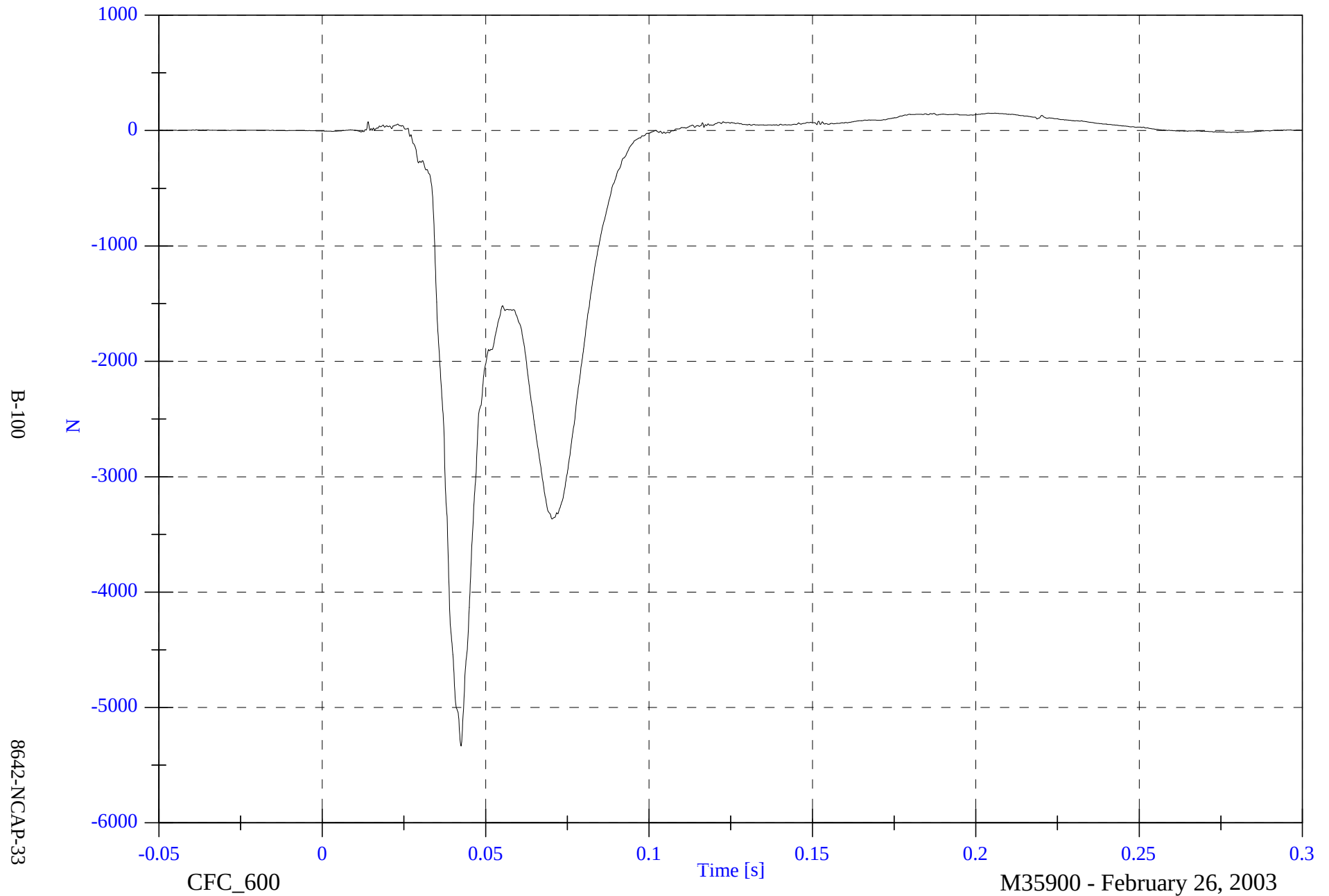


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Left Lower Tibia Fz

Max: 150.1 [N] at 0.206 [s]

Min: -5333.3 [N] at 0.043 [s]



2003 NCAP Test 10 2003 Volvo XC90

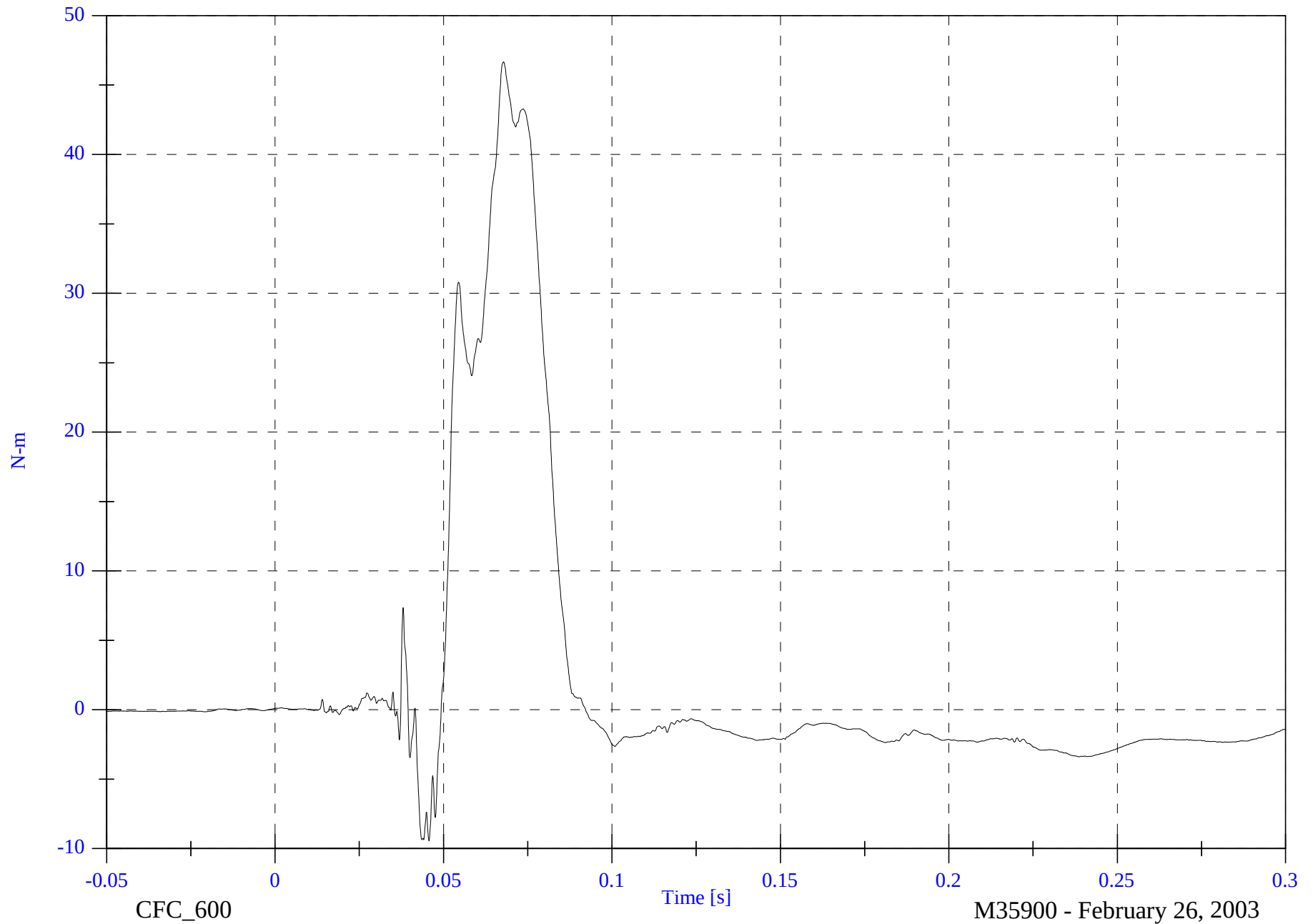
Max: 46.7 [N-m] at 0.068 [s]

Min: -9.5 [N-m] at 0.046 [s]

V1P2 Left Lower Tibia Mx

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8642-NCAP-33

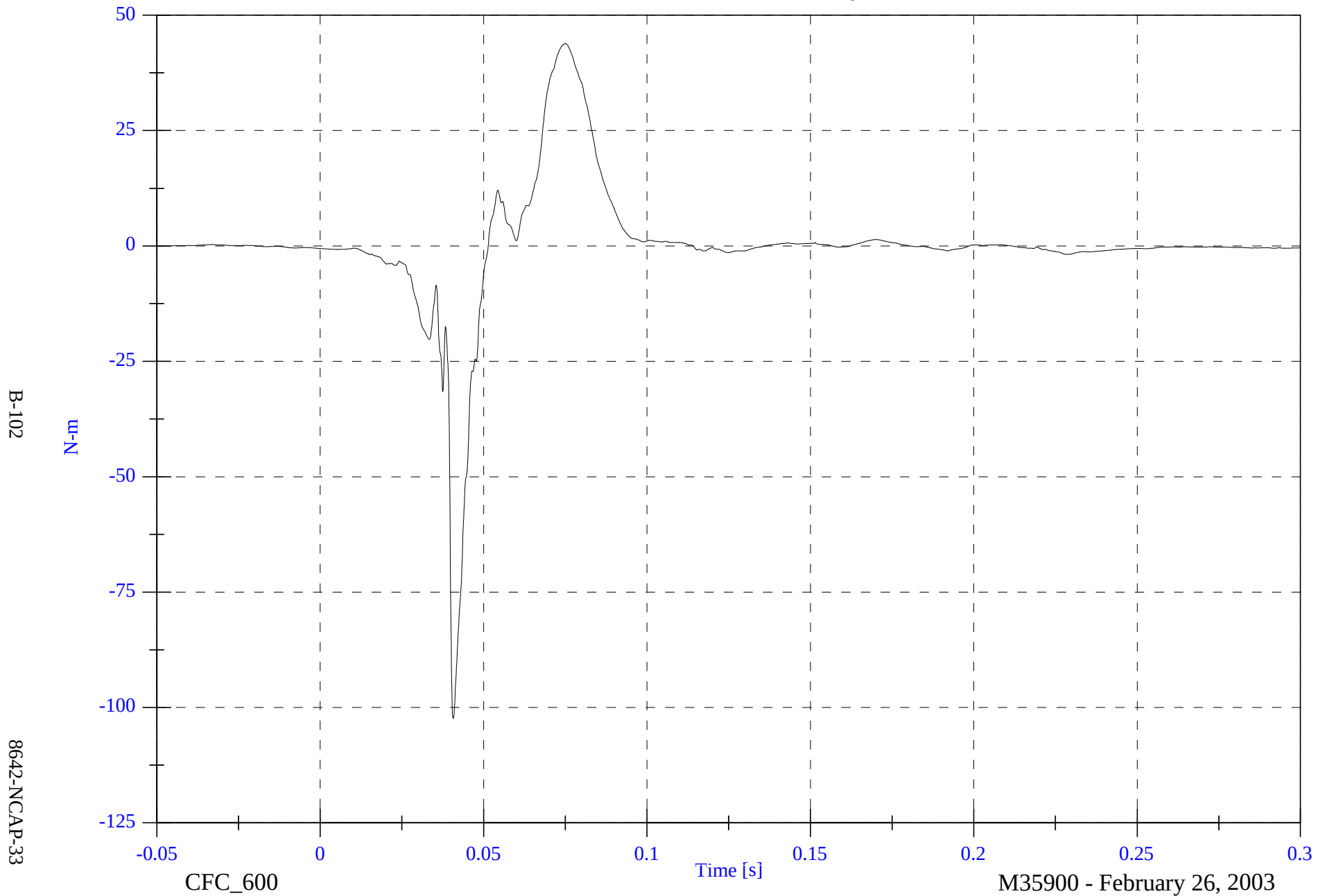


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Left Lower Tibia My

Max: 43.9 [N-m] at 0.075 [s]

Min: -102.4 [N-m] at 0.041 [s]

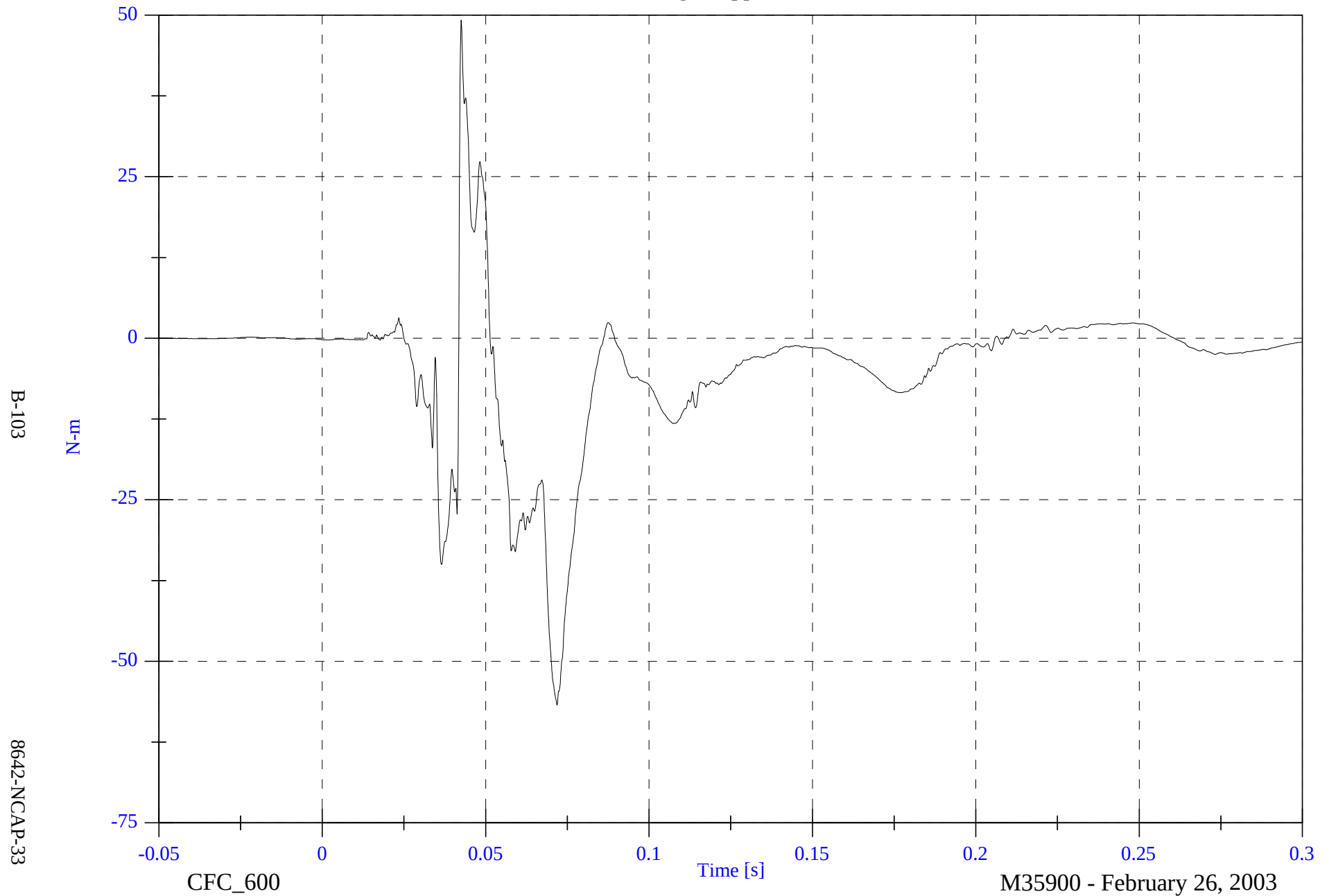


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Right Upper Tibia Mx

Max: 49.2 [N-m] at 0.043 [s]

Min: -56.7 [N-m] at 0.072 [s]

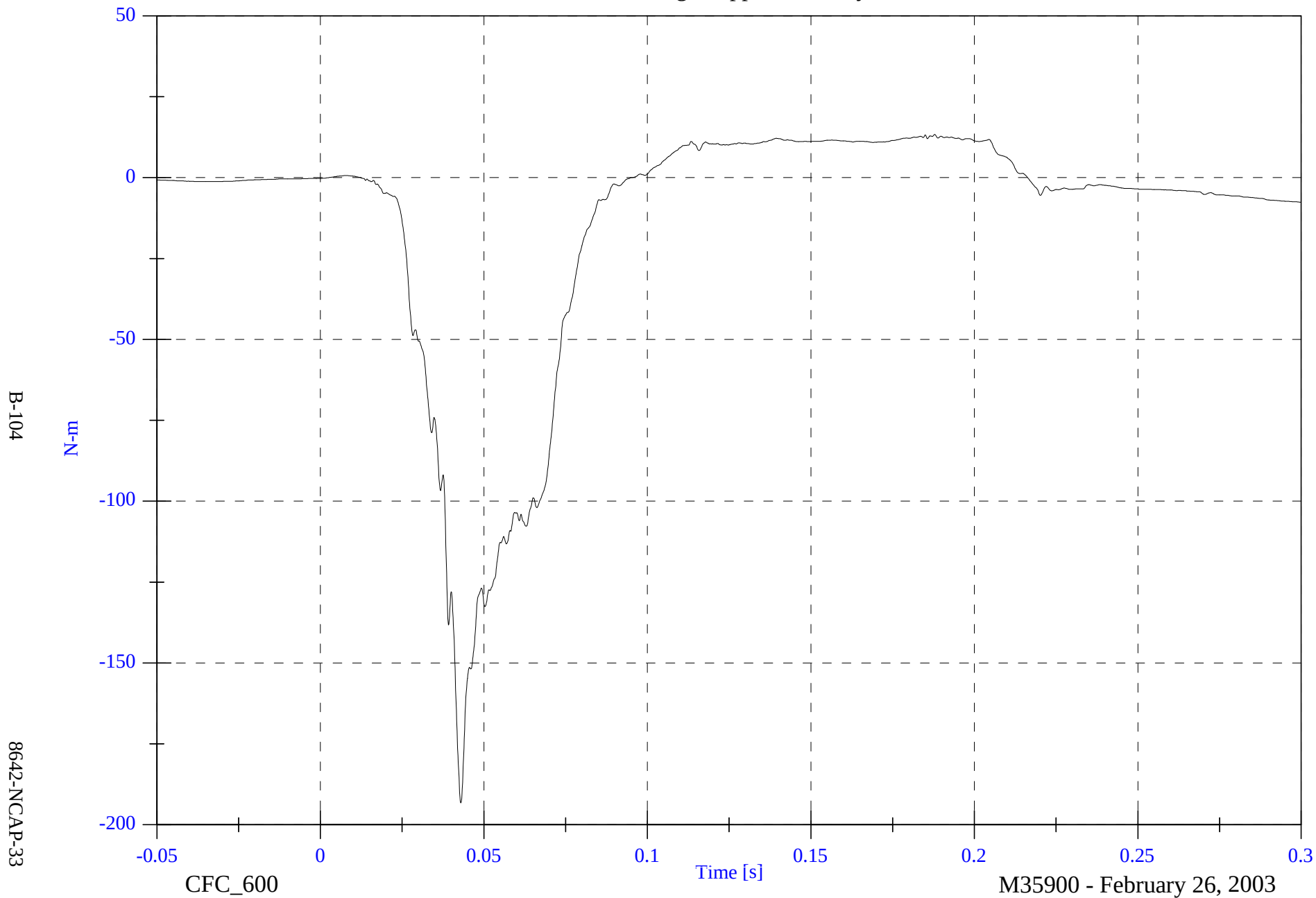


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Right Upper Tibia My

Max: 13.4 [N-m] at 0.188 [s]

Min: -193.3 [N-m] at 0.043 [s]

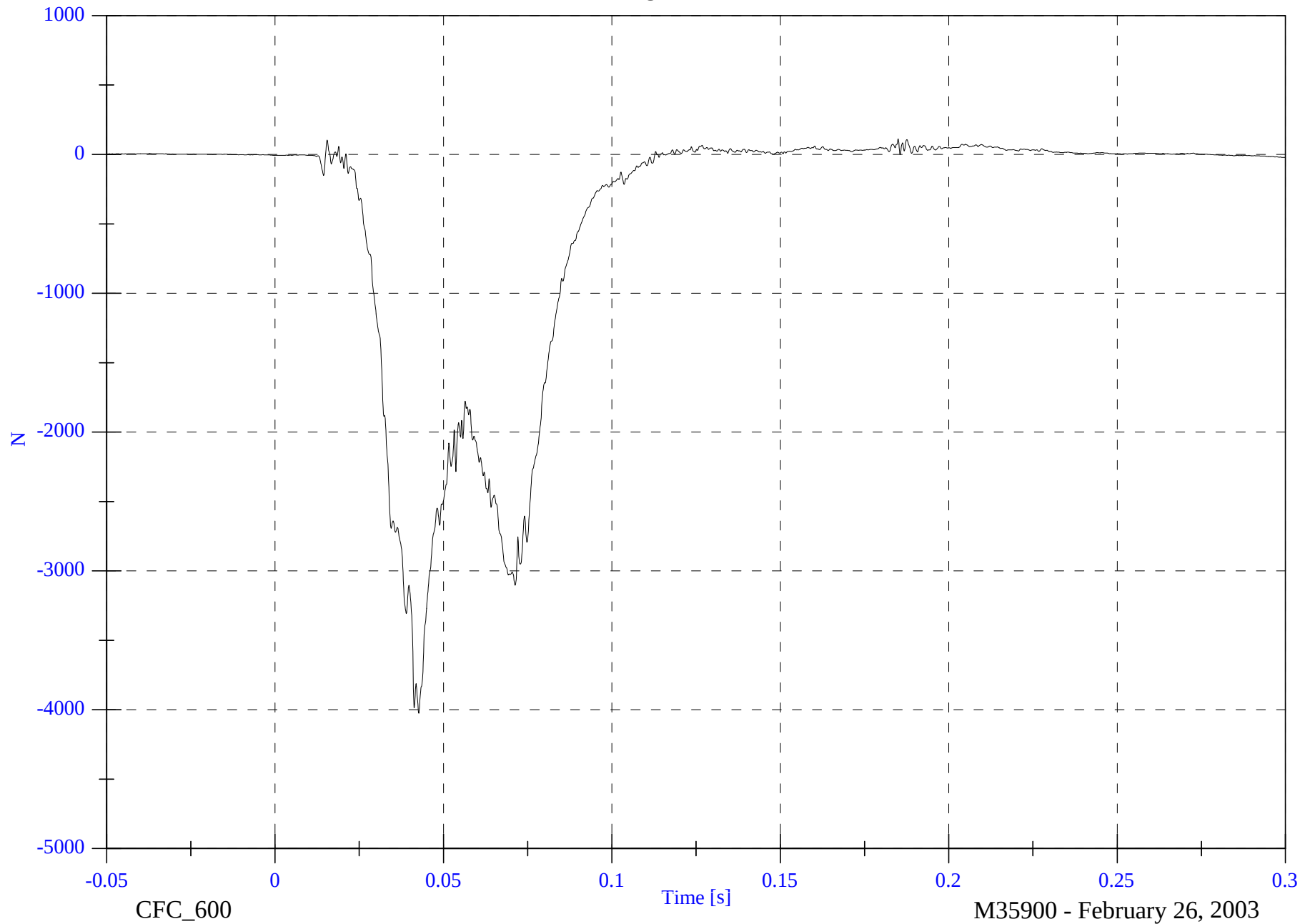


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Right Lower Tibia Fz

Max: 112.0 [N] at 0.185 [s]

Min: -4024.6 [N] at 0.043 [s]

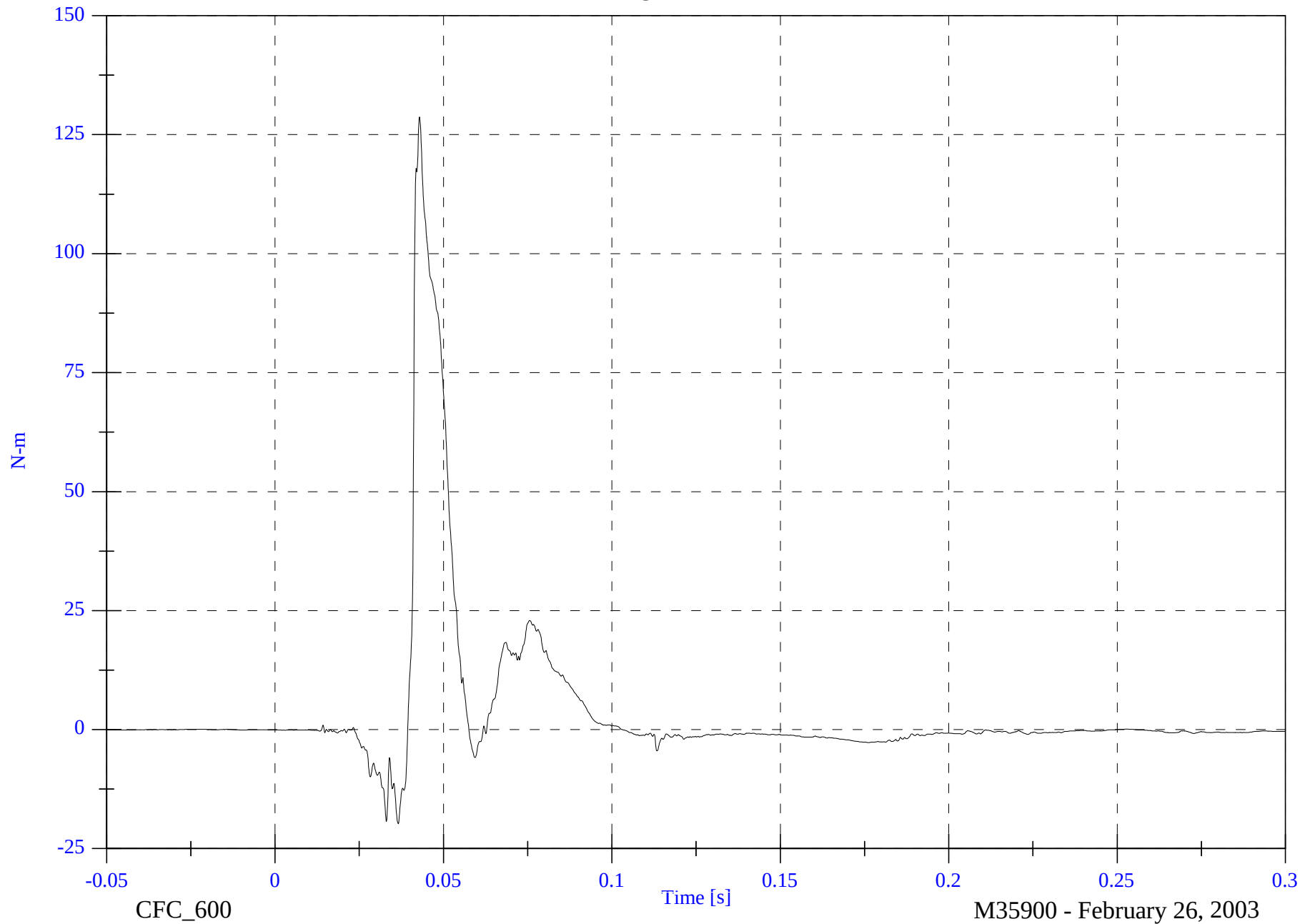


2003 NCAP Test 10 2003 Volvo XC90

V1P2 Right Lower Tibia Mx

Max: 128.7 [N-m] at 0.043 [s]

Min: -19.8 [N-m] at 0.037 [s]

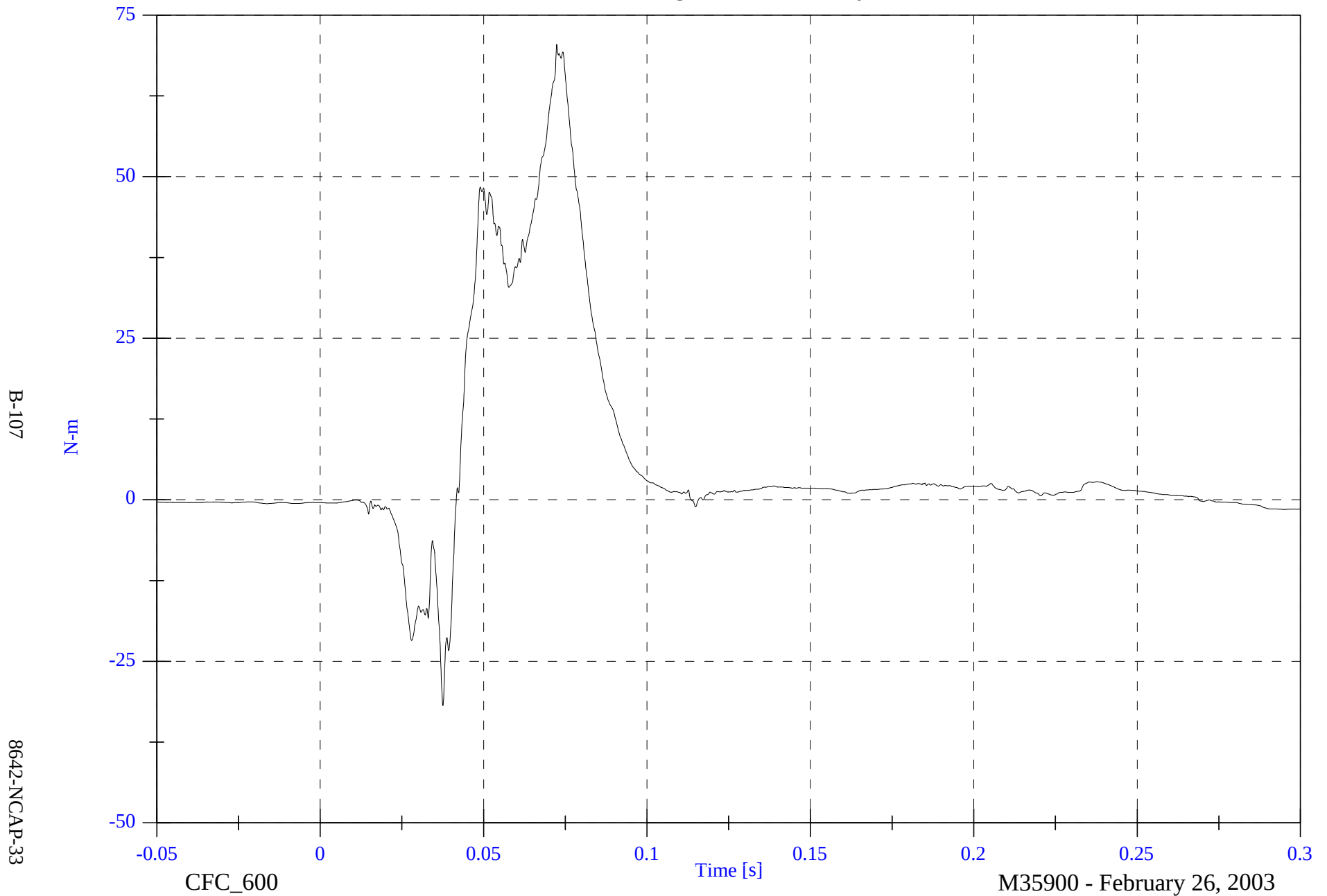


2003 NCAP Test 10 2003 Volvo XC90

Max: 70.5 [N-m] at 0.072 [s]

Min: -31.9 [N-m] at 0.038 [s]

V1P2 Right Lower Tibia My

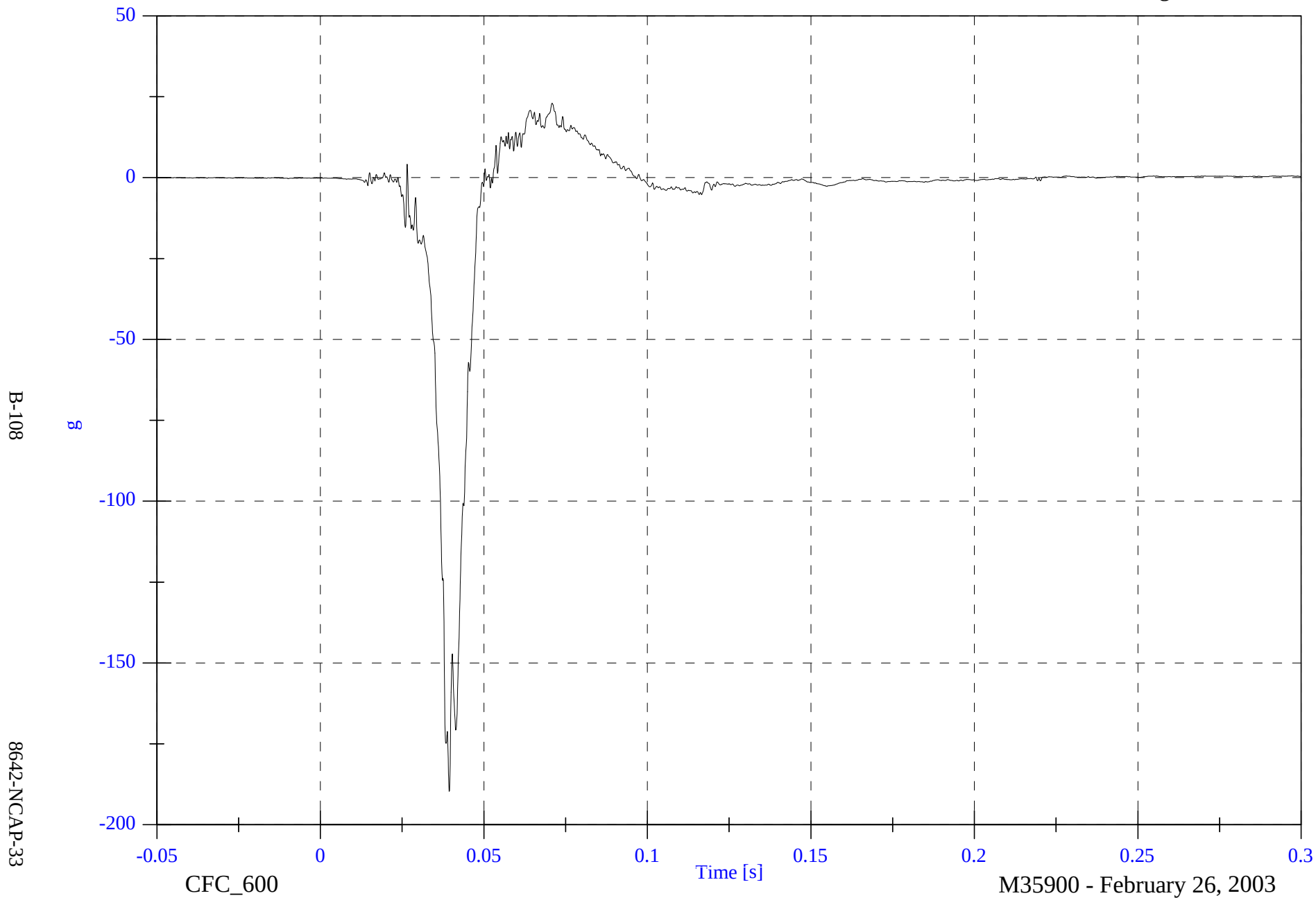


2003 NCAP Test 10 2003 Volvo XC90

Max: 23.0 [g] at 0.071 [s]

Min: -189.7 [g] at 0.039 [s]

V1P2 Left foot Aft x



2003 NCAP Test 10 2003 Volvo XC90

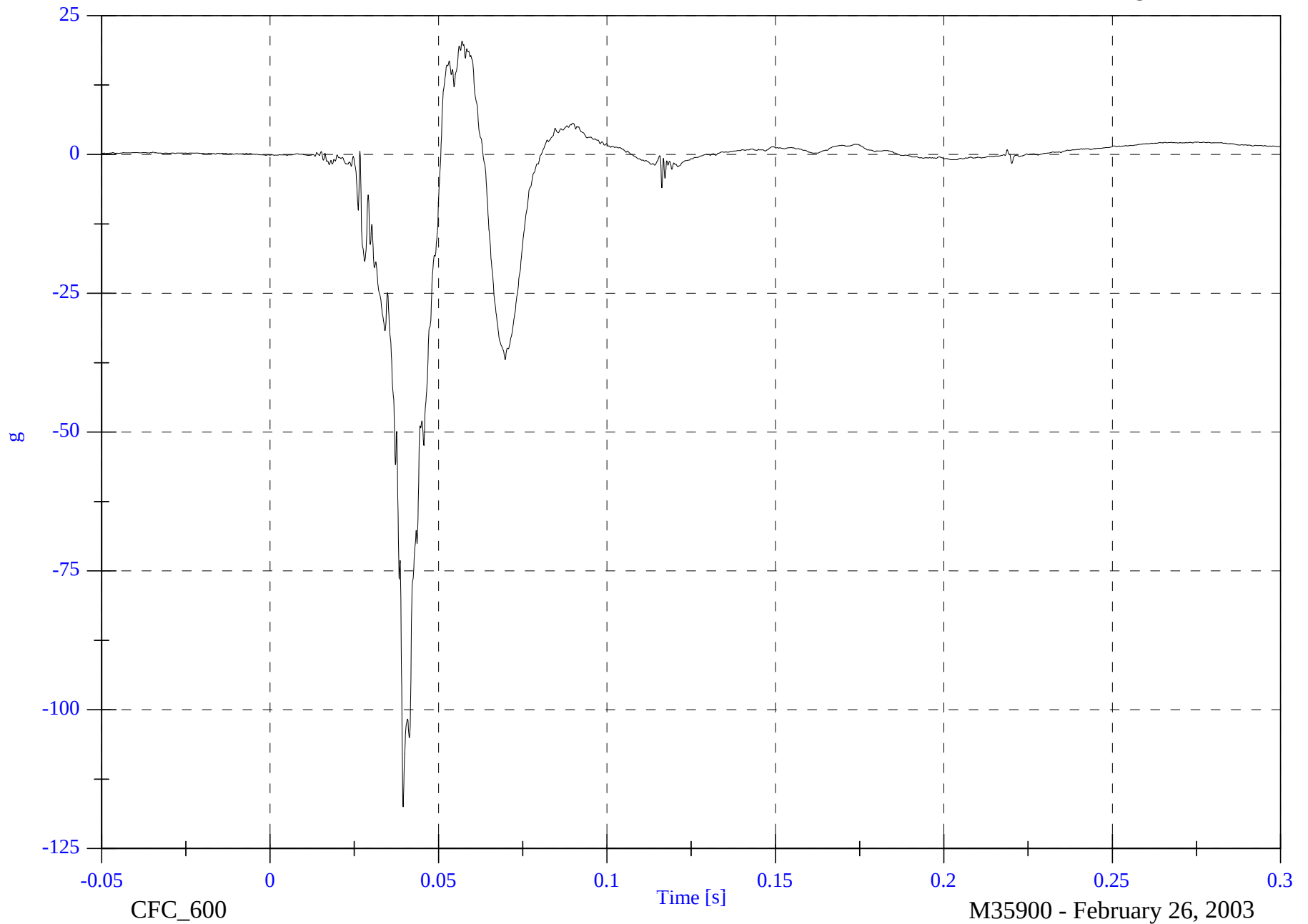
Max: 20.4 [g] at 0.057 [s]

Min: -117.5 [g] at 0.039 [s]

V1P2 Left Foot Aft z

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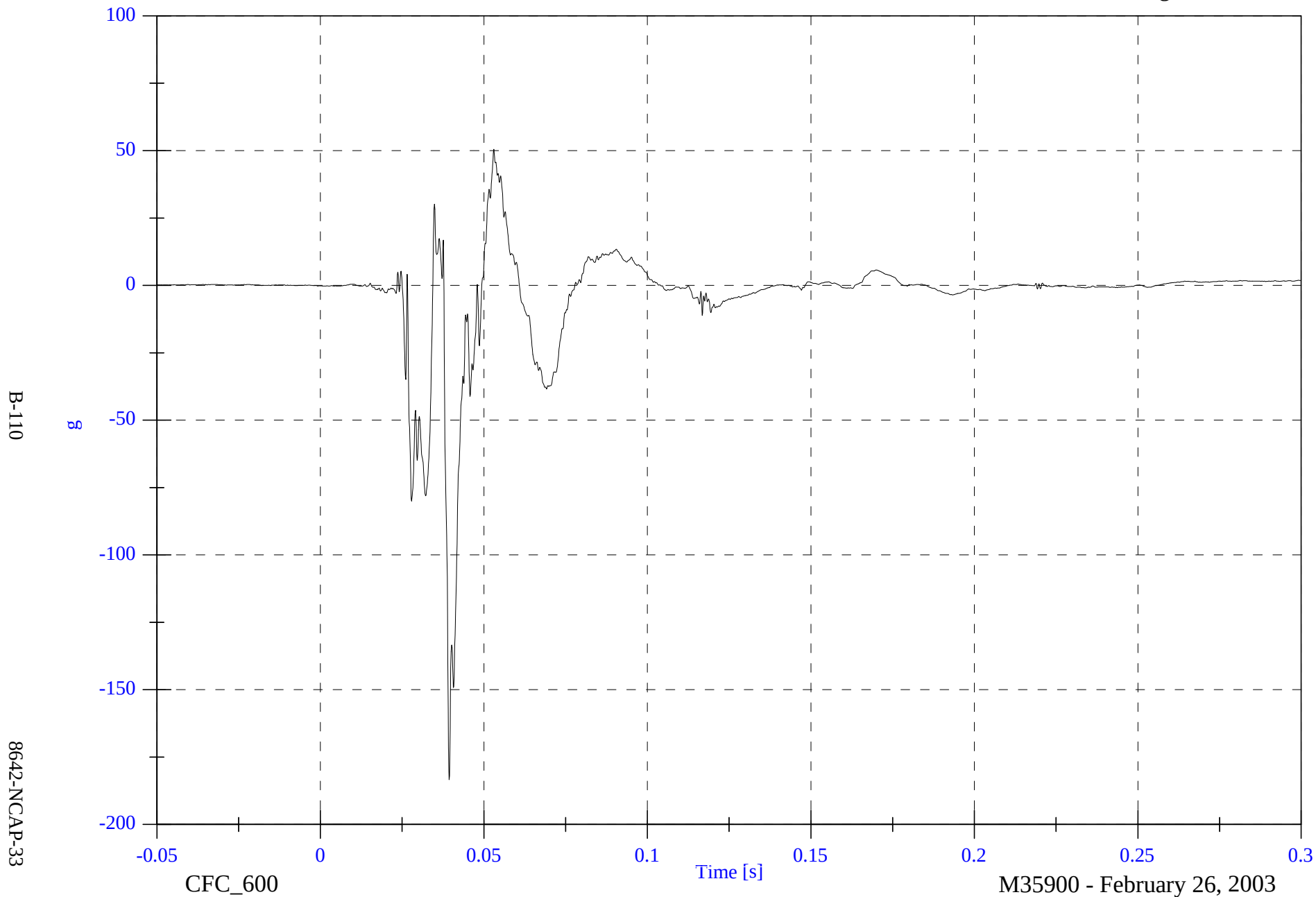


2003 NCAP Test 10 2003 Volvo XC90

Max: 50.5 [g] at 0.053 [s]

Min: -183.4 [g] at 0.039 [s]

V1P2 Left Foot Fore z

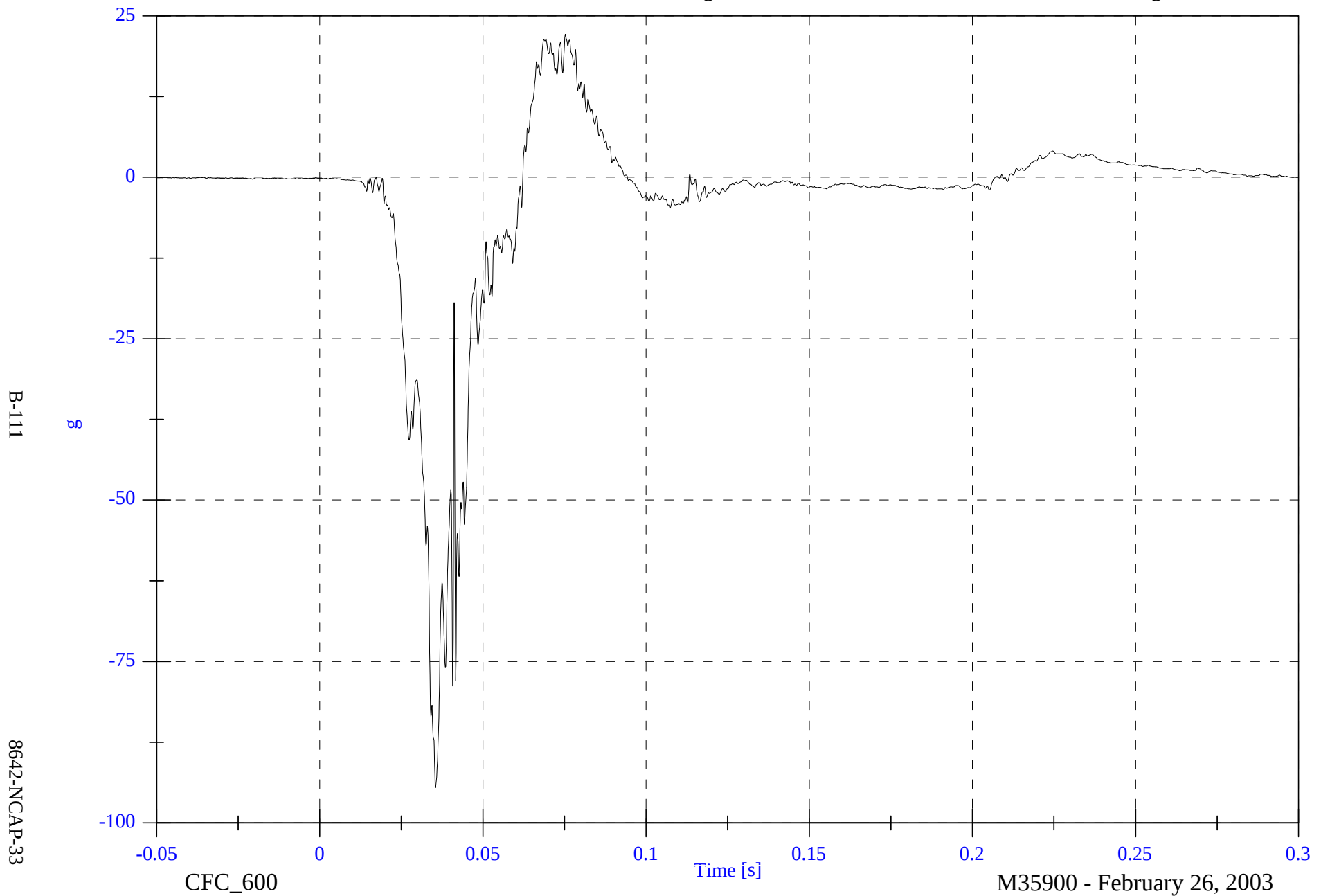


2003 NCAP Test 10 2003 Volvo XC90

Max: 22.2 [g] at 0.075 [s]

Min: -94.5 [g] at 0.035 [s]

V1P2 Right Foot Aft x

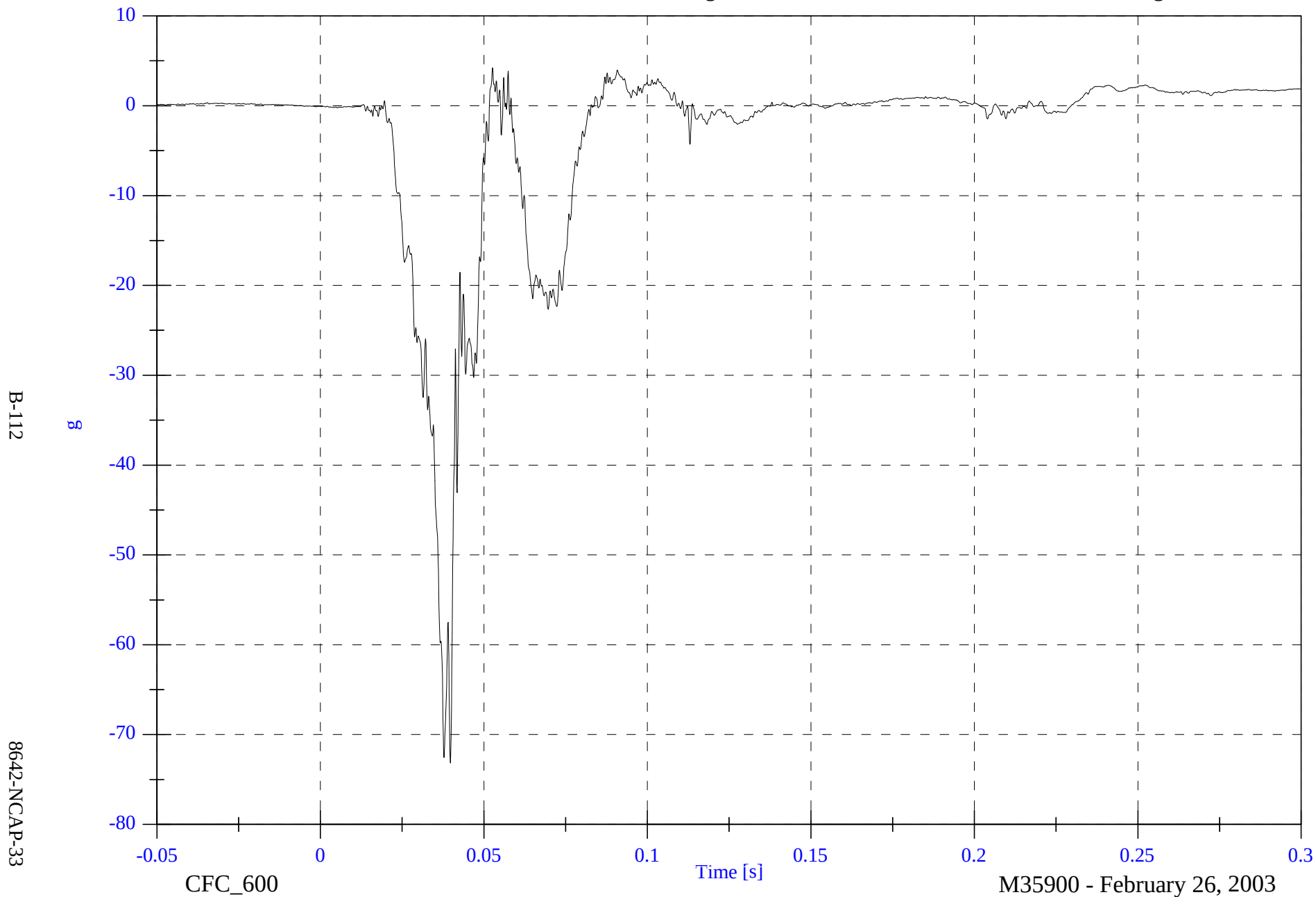


2003 NCAP Test 10 2003 Volvo XC90

Max: 4.2 [g] at 0.053 [s]

Min: -73.2 [g] at 0.040 [s]

V1P2 Right Foot Aft z

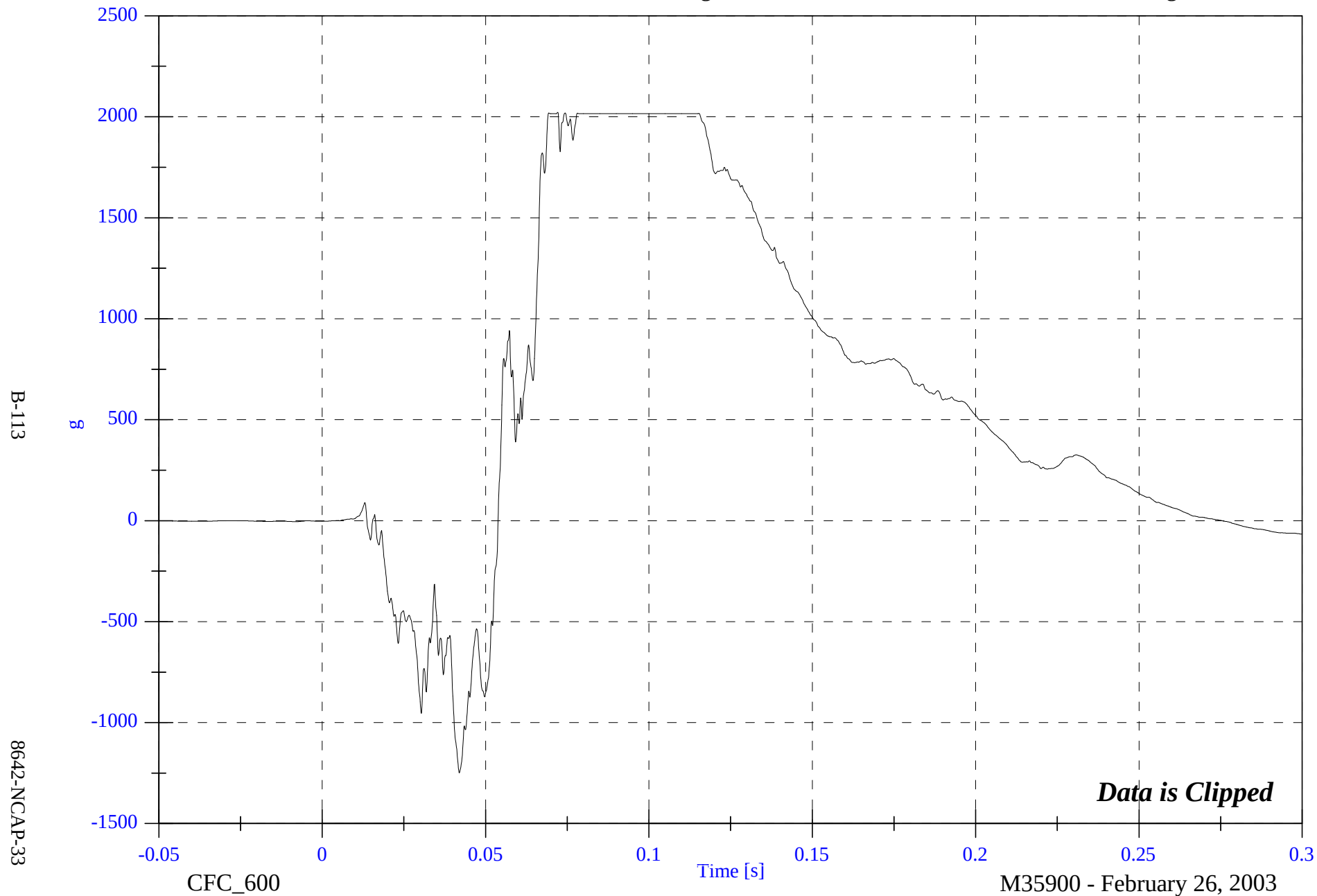


2003 NCAP Test 10 2003 Volvo XC90

Max: 2021.8 [g] at 0.072 [s]

Min: -1249.3 [g] at 0.042 [s]

V1P2 Right Foot Fore z



2003 NCAP Test 10 2003 Volvo XC90

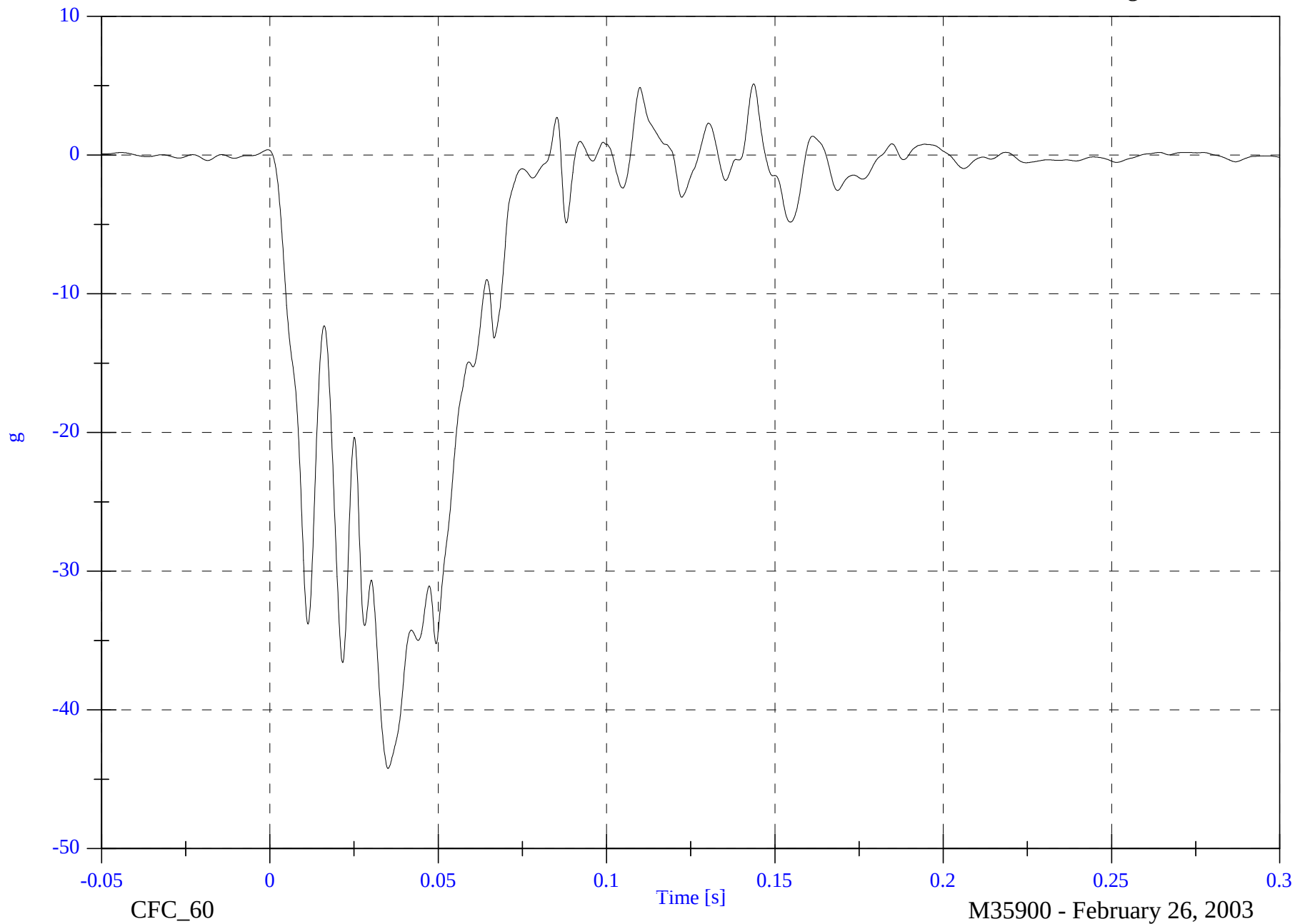
V1 Left Rear #1x

Max: 5.1 [g] at 0.144 [s]

Min: -44.2 [g] at 0.035 [s]

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8642-NCAP-33

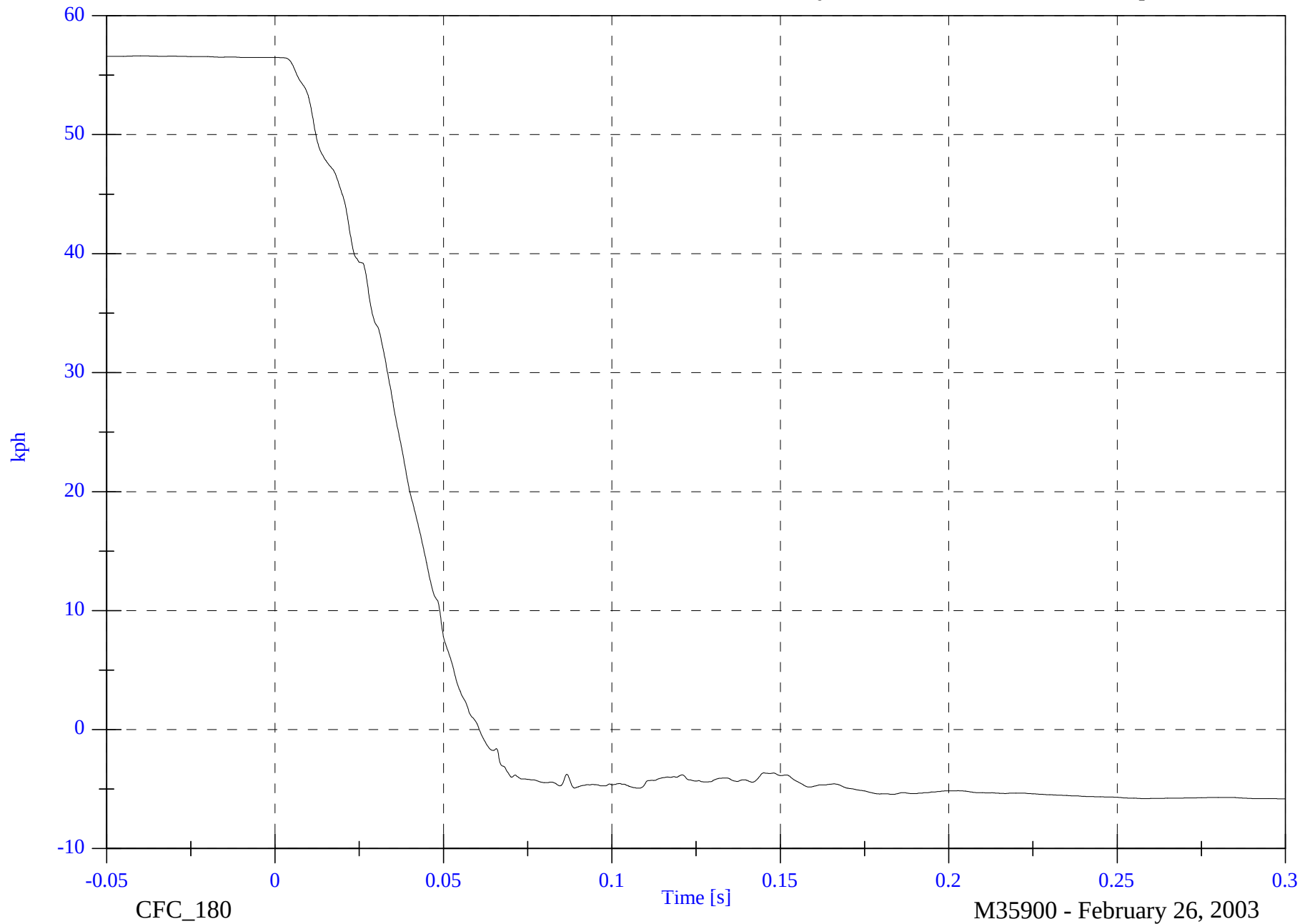


2003 NCAP Test 10 2003 Volvo XC90

Max: 56.6 [kph] at -0.040 [s]

Min: -5.8 [kph] at 0.300 [s]

V1 Left Rear #1x Velocity



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CFC_180

M35900 - February 26, 2003

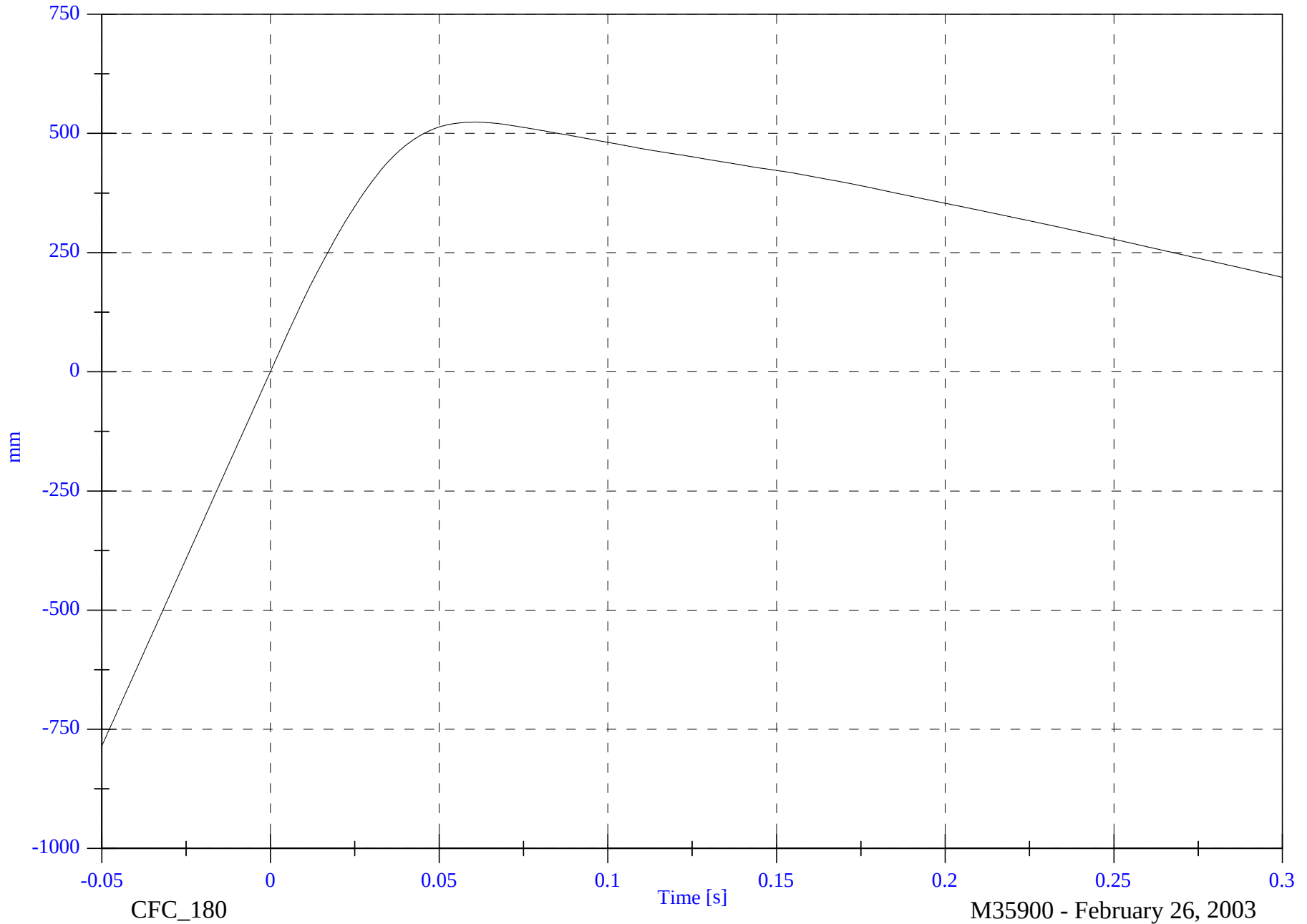
2003 NCAP Test 10 2003 Volvo XC90

V1 Left Rear #1x Displacement

Max: 523.5 [mm] at 0.061 [s]
Min: -785.4 [mm] at -0.050 [s]

B-116

8642-NCAP-33



CFC_180

M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

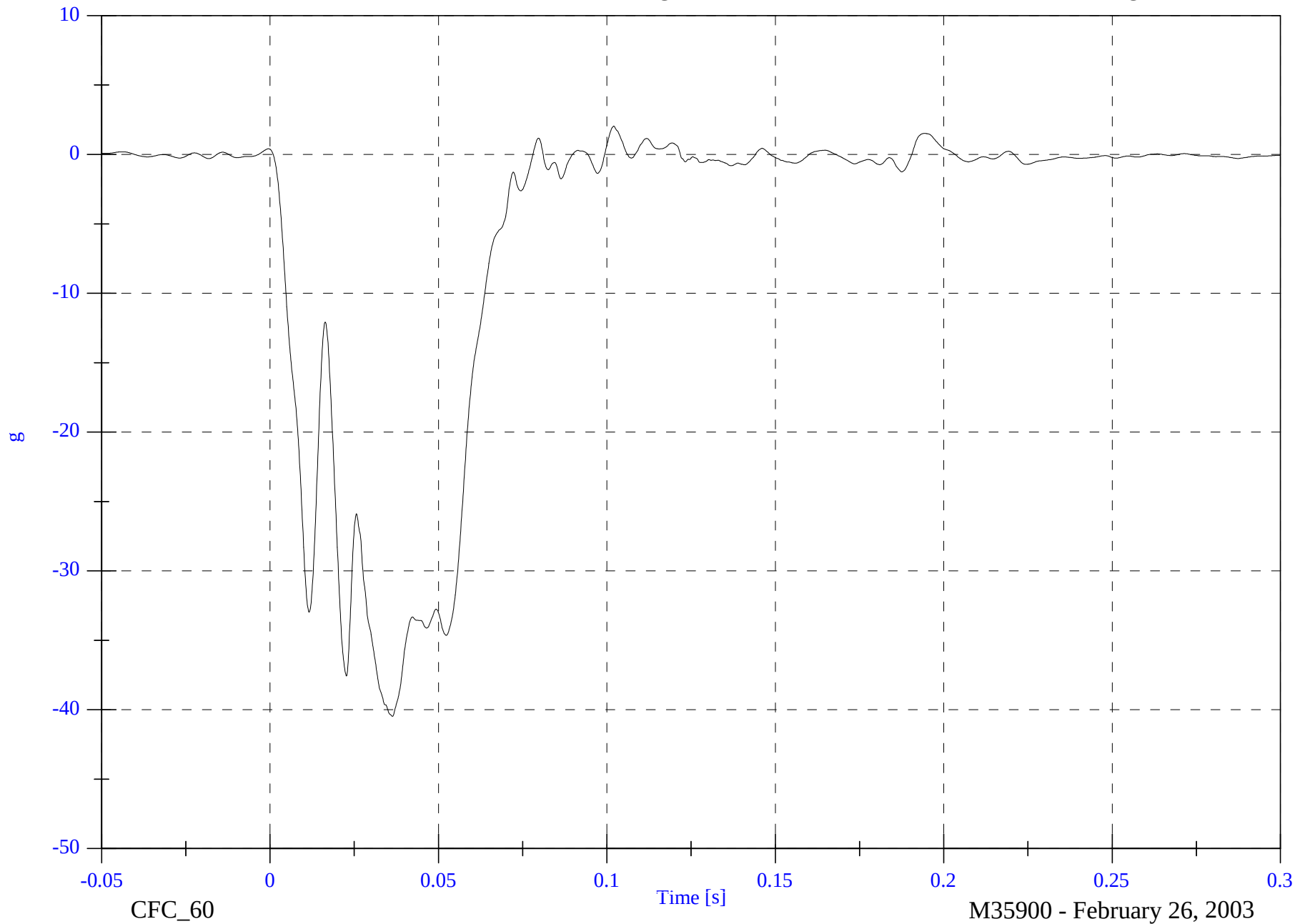
V1 Right Rear #2x

Max: 2.0 [g] at 0.102 [s]

Min: -40.5 [g] at 0.036 [s]

B-117

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

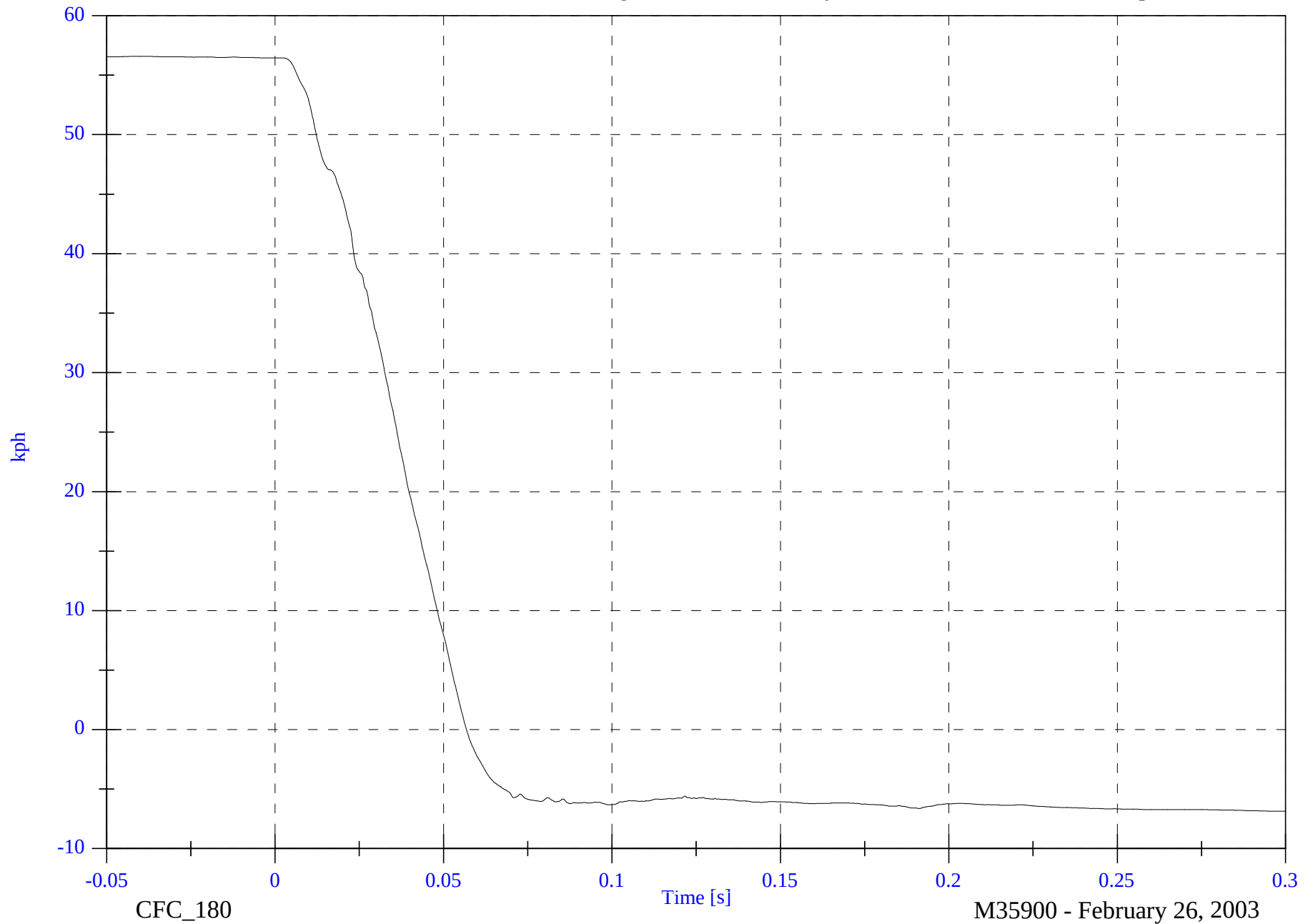
Max: 56.6 [kph] at -0.041 [s]

Min: -6.9 [kph] at 0.300 [s]

V1 Right Rear #2x Velocity

B-118

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2003 NCAP Test 10 2003 Volvo XC90

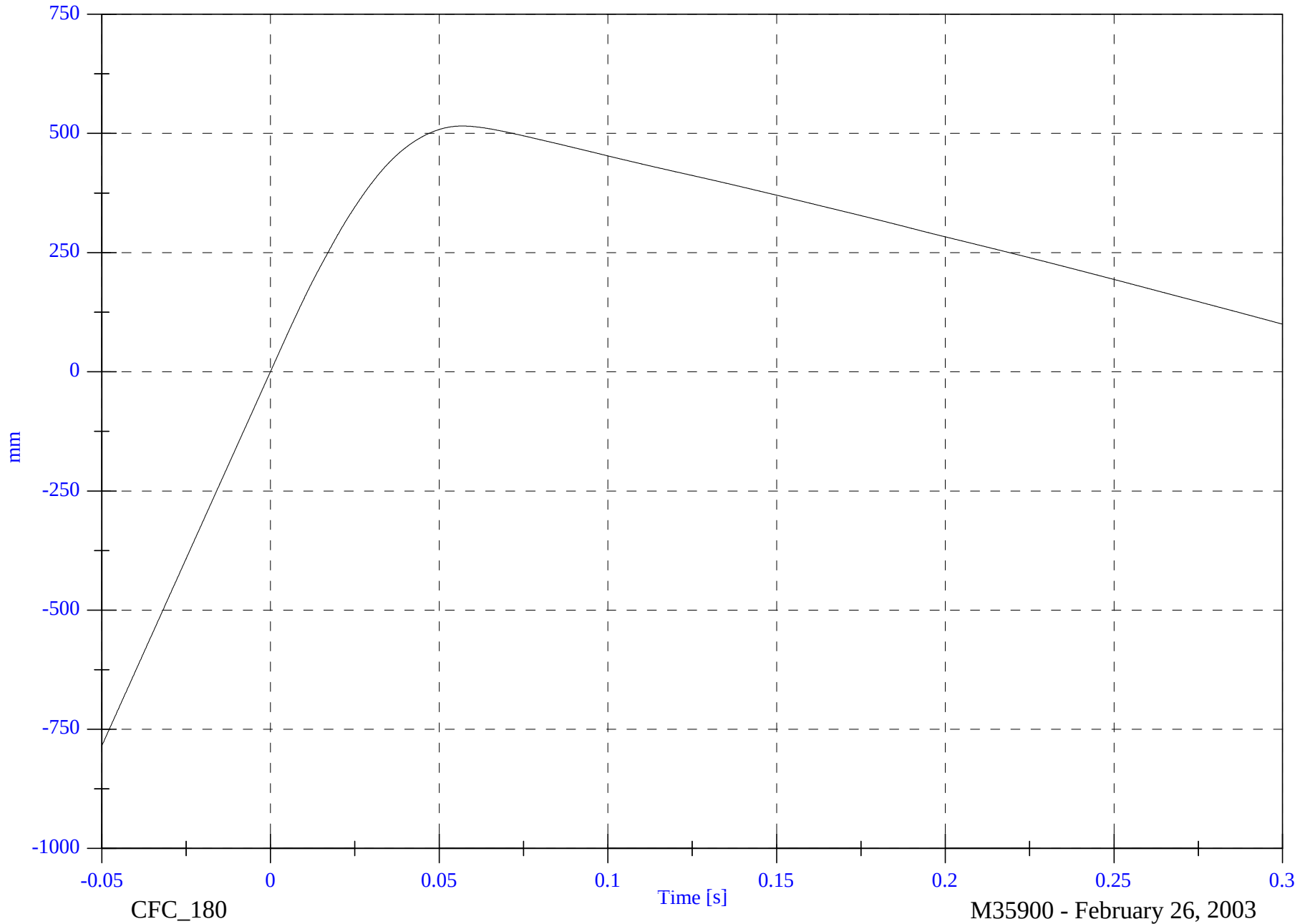
V1 Right Rear #2x Displacement

Max: 515.4 [mm] at 0.057 [s]

Min: -785.0 [mm] at -0.050 [s]

B-119

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CFC_180

M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

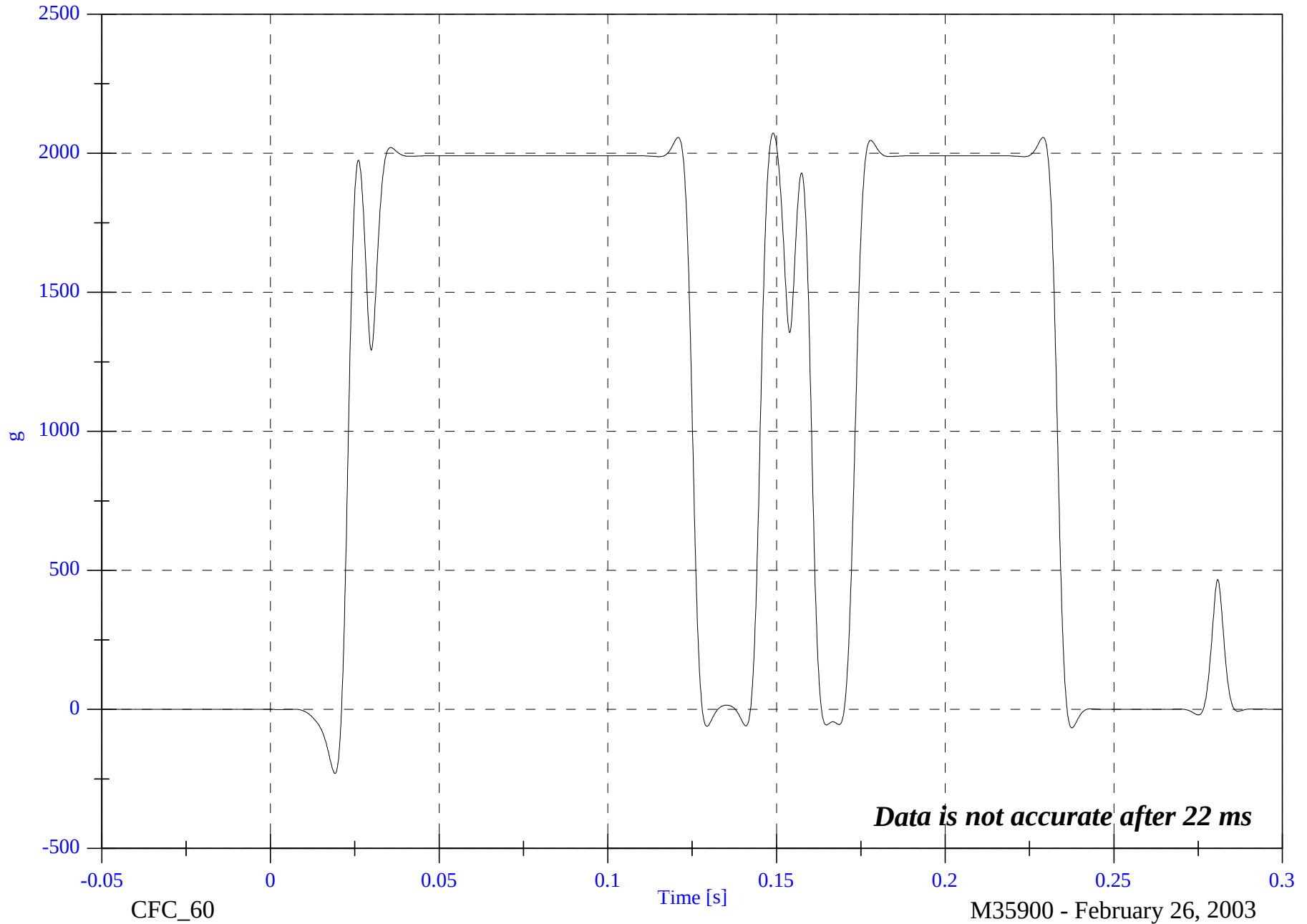
V1 Engine Top #3x

Max: 2072.5 [g] at 0.149 [s]

Min: -230.4 [g] at 0.019 [s]

B-120

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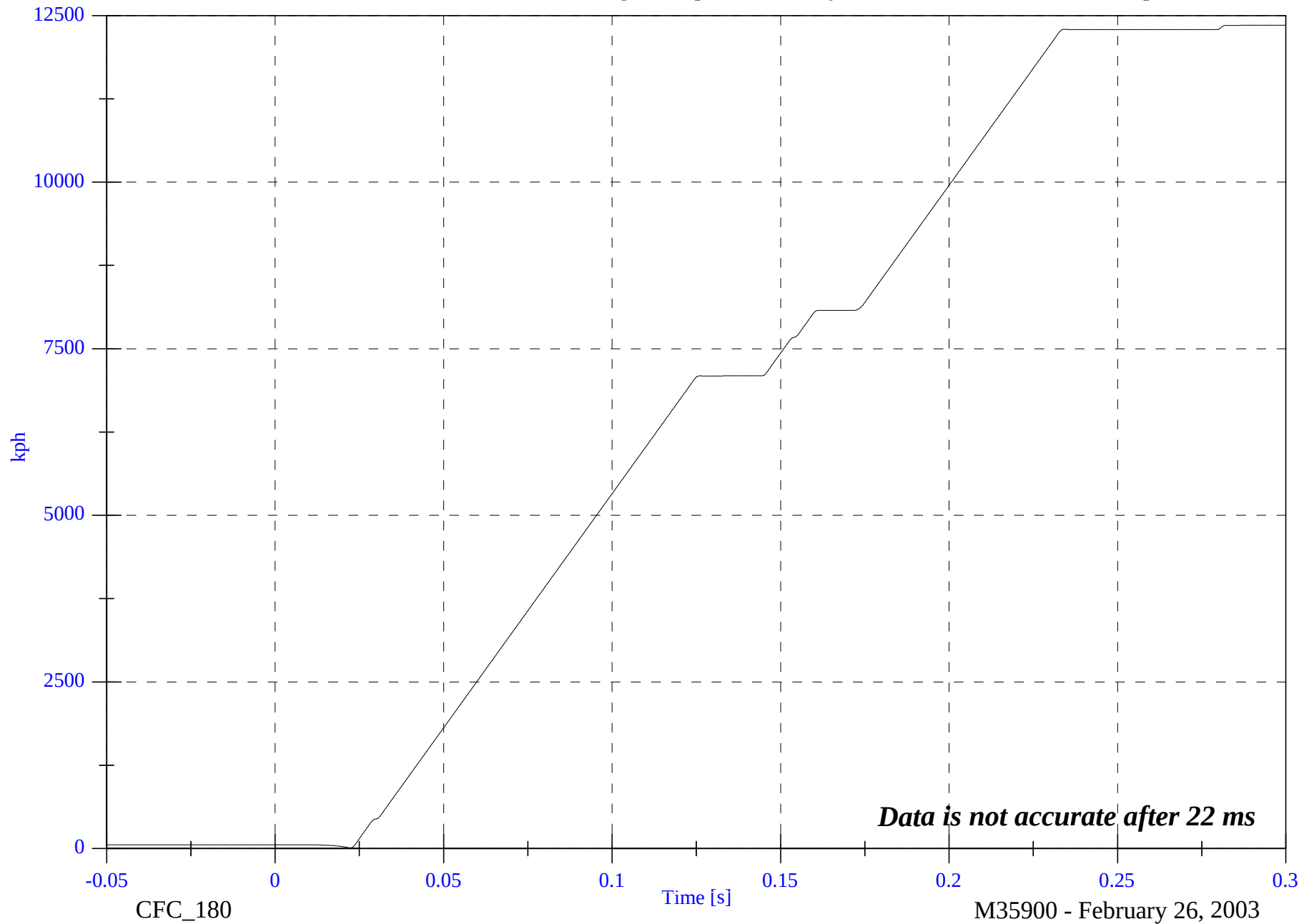


2003 NCAP Test 10 2003 Volvo XC90

V1 Engine Top #3x Velocity

Max: 12356.0 [kph] at 0.300 [s]

Min: 11.7 [kph] at 0.022 [s]



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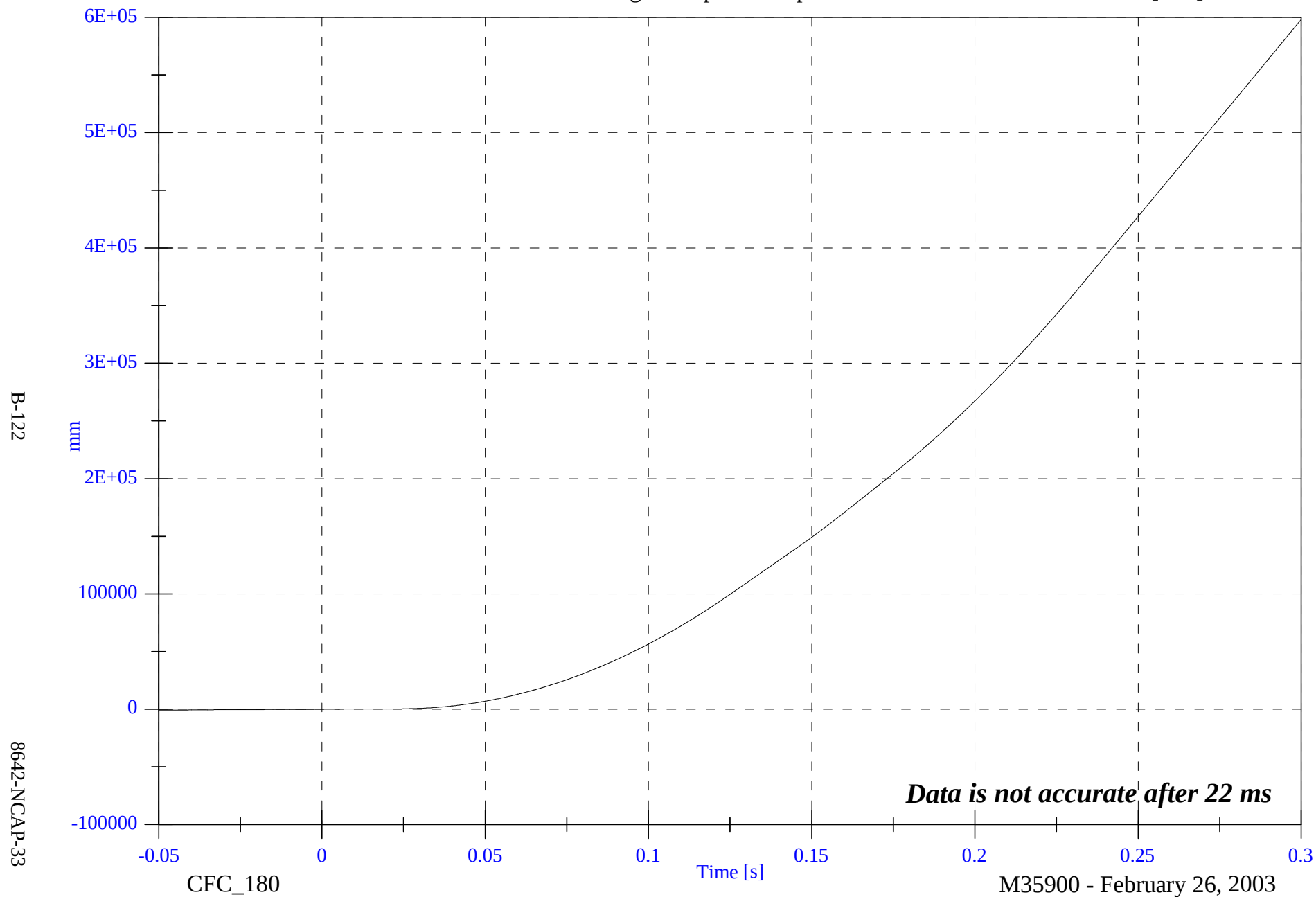
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

V1 Engine Top #3x Displacement

Max: 597864.9 [mm] at 0.300 [s]

Min: -784.9 [mm] at -0.050 [s]

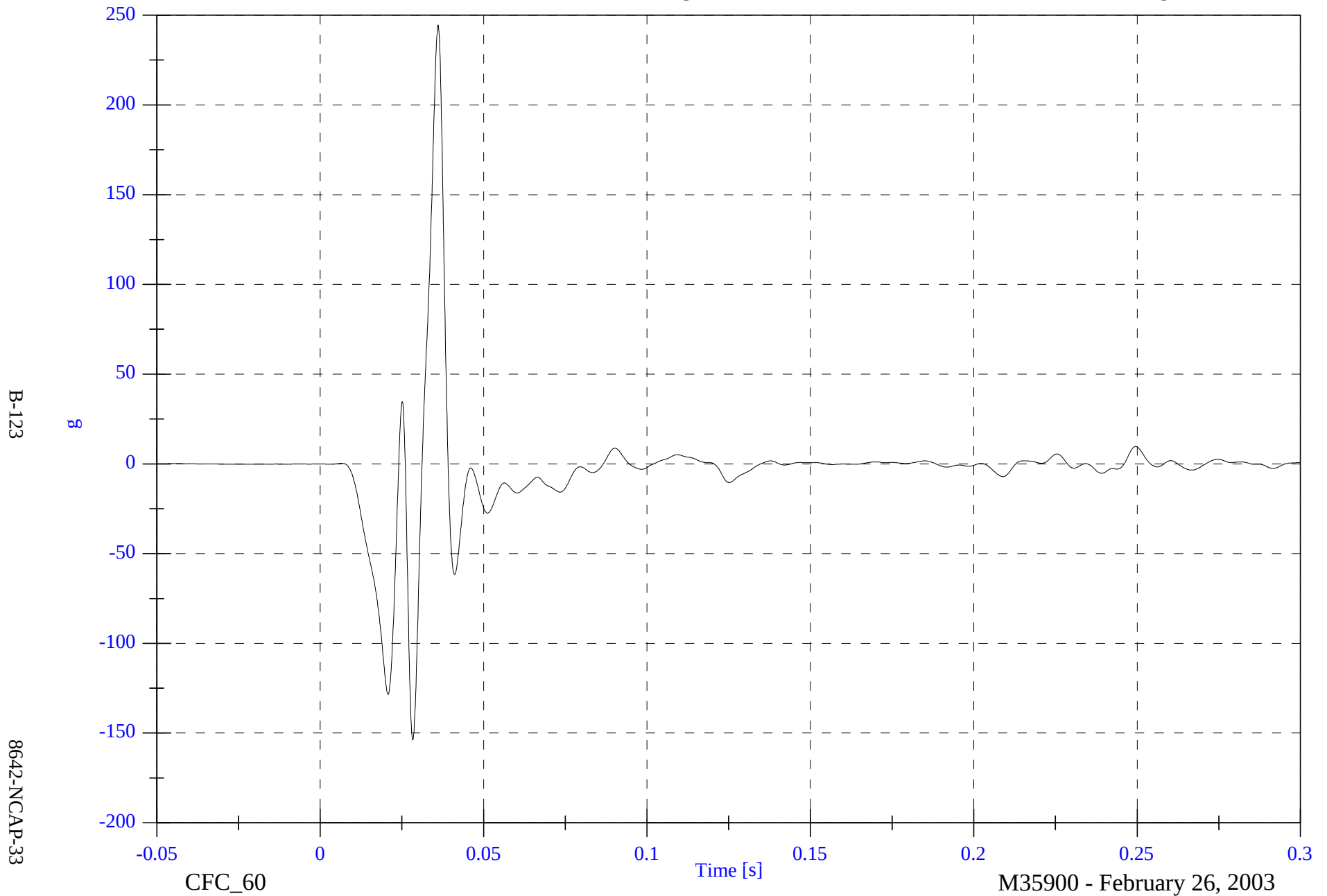


2003 NCAP Test 10 2003 Volvo XC90

V1 Engine Bottom #4x

Max: 244.6 [g] at 0.036 [s]

Min: -153.8 [g] at 0.028 [s]

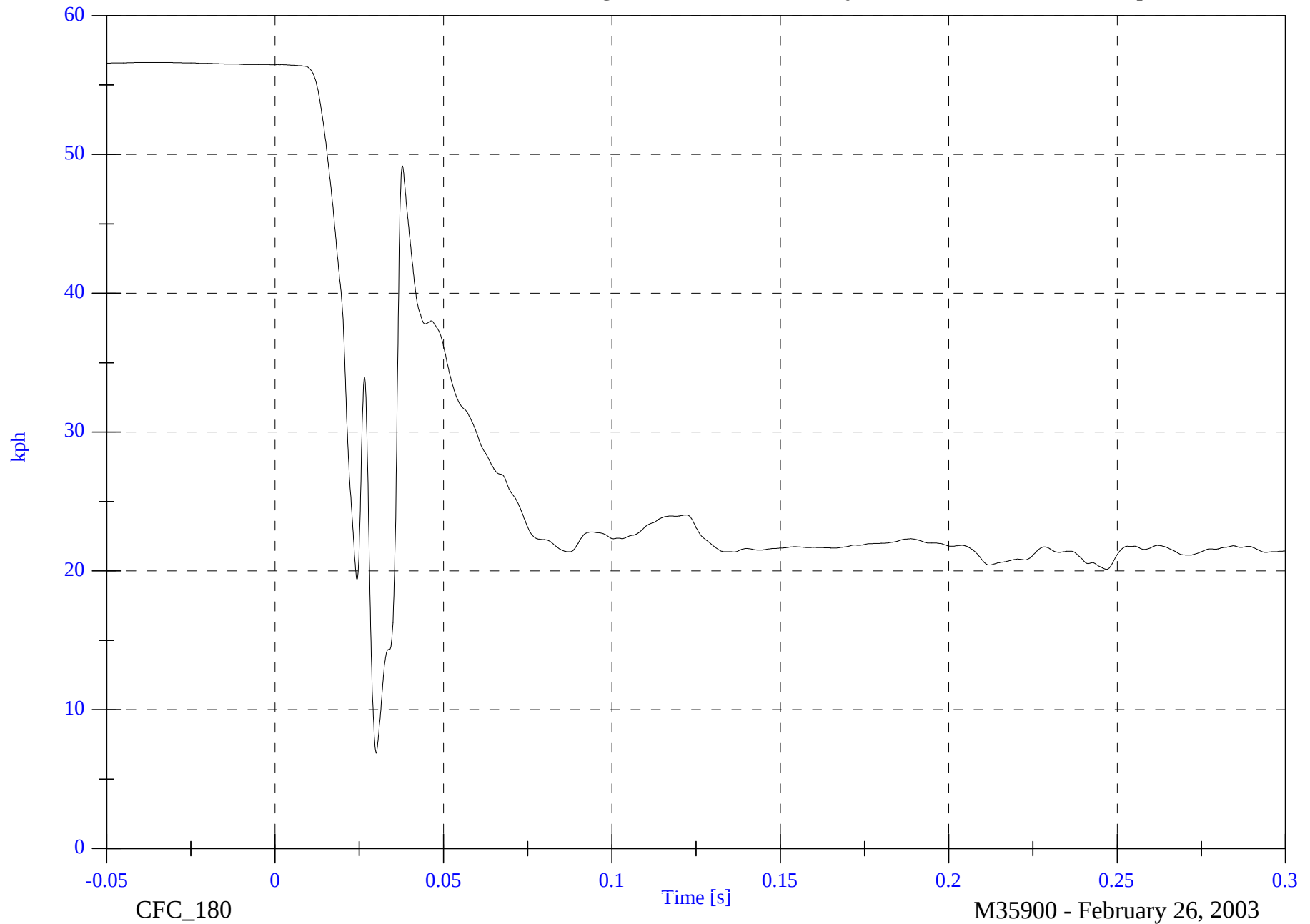


2003 NCAP Test 10 2003 Volvo XC90

V1 Engine Bottom #4x Velocity

Max: 56.6 [kph] at -0.035 [s]

Min: 6.9 [kph] at 0.030 [s]



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CFC_180

Time [s]

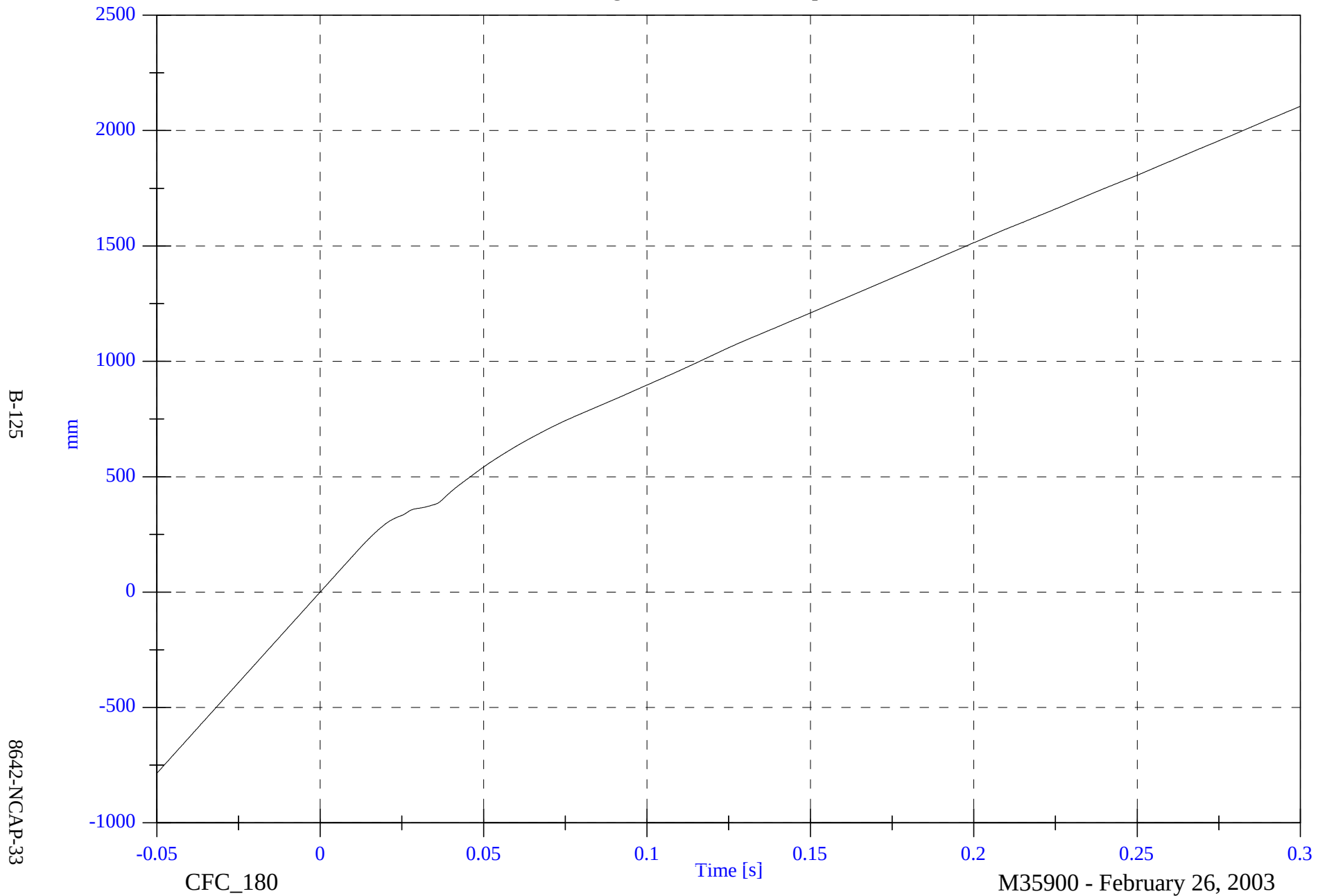
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Max: 2104.7 [mm] at 0.300 [s]

V1 Engine Bottom #4x Displacement

Min: -785.5 [mm] at -0.050 [s]



2003 NCAP Test 10 2003 Volvo XC90

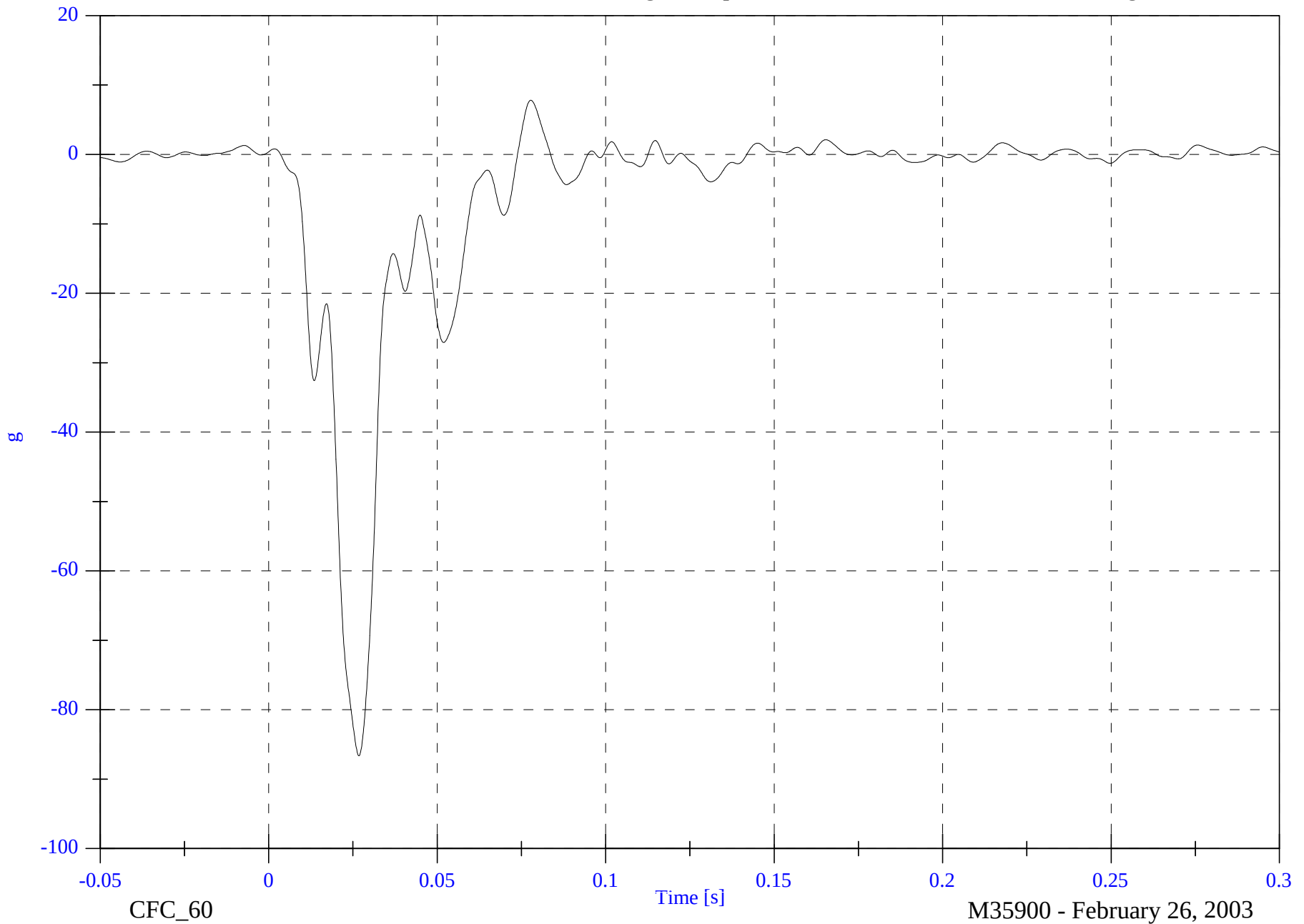
V1 Right Caliper #5x

Max: 7.8 [g] at 0.078 [s]

Min: -86.6 [g] at 0.027 [s]

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8642-NCAP-33

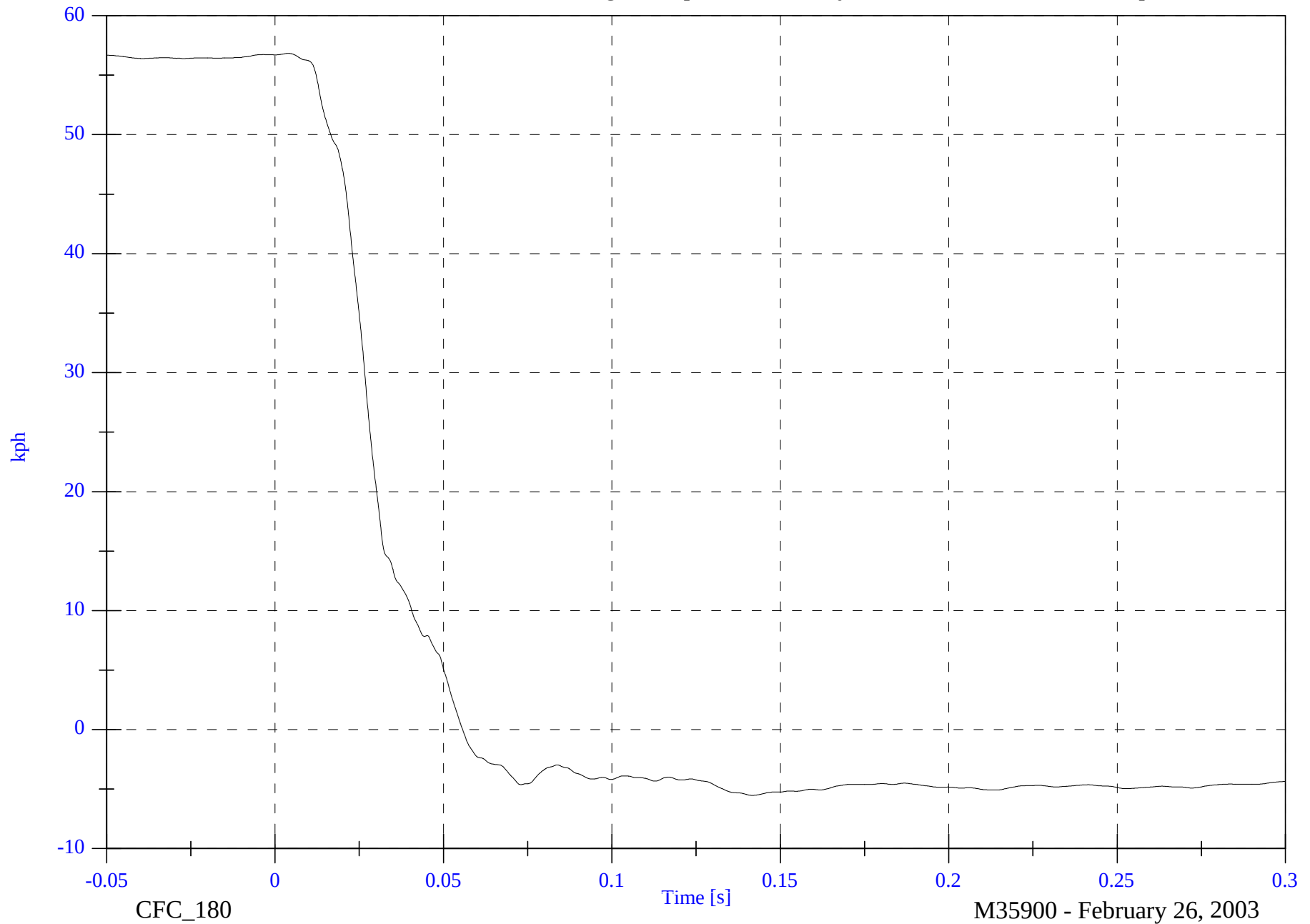


2003 NCAP Test 10 2003 Volvo XC90

V1 Right Caliper #5x Velocity

Max: 56.8 [kph] at 0.004 [s]

Min: -5.5 [kph] at 0.142 [s]



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CFC_180

Time [s]

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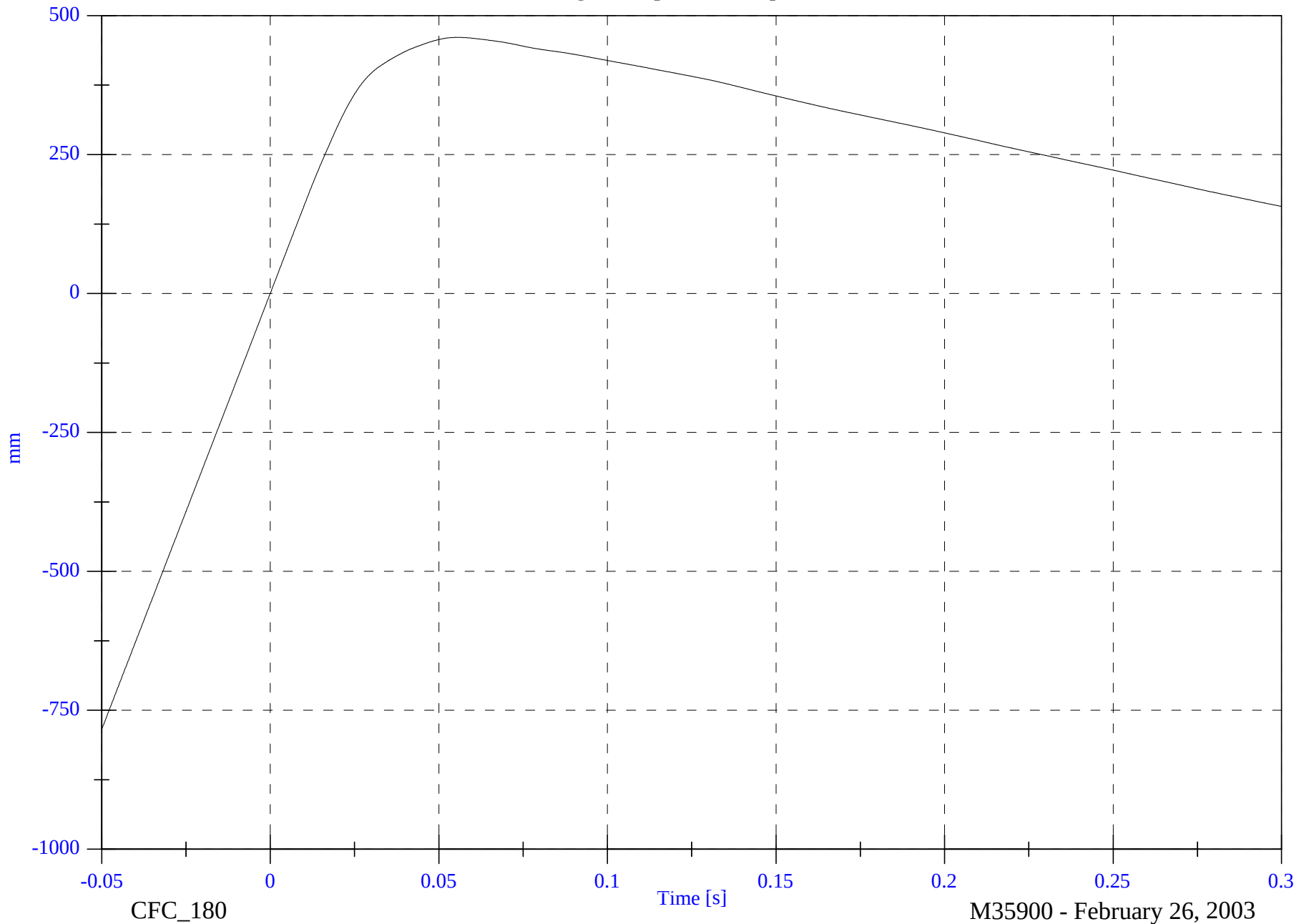
V1 Right Caliper #5x Displacement

Max: 460.9 [mm] at 0.056 [s]

Min: -784.7 [mm] at -0.050 [s]

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2003 NCAP Test 10 2003 Volvo XC90

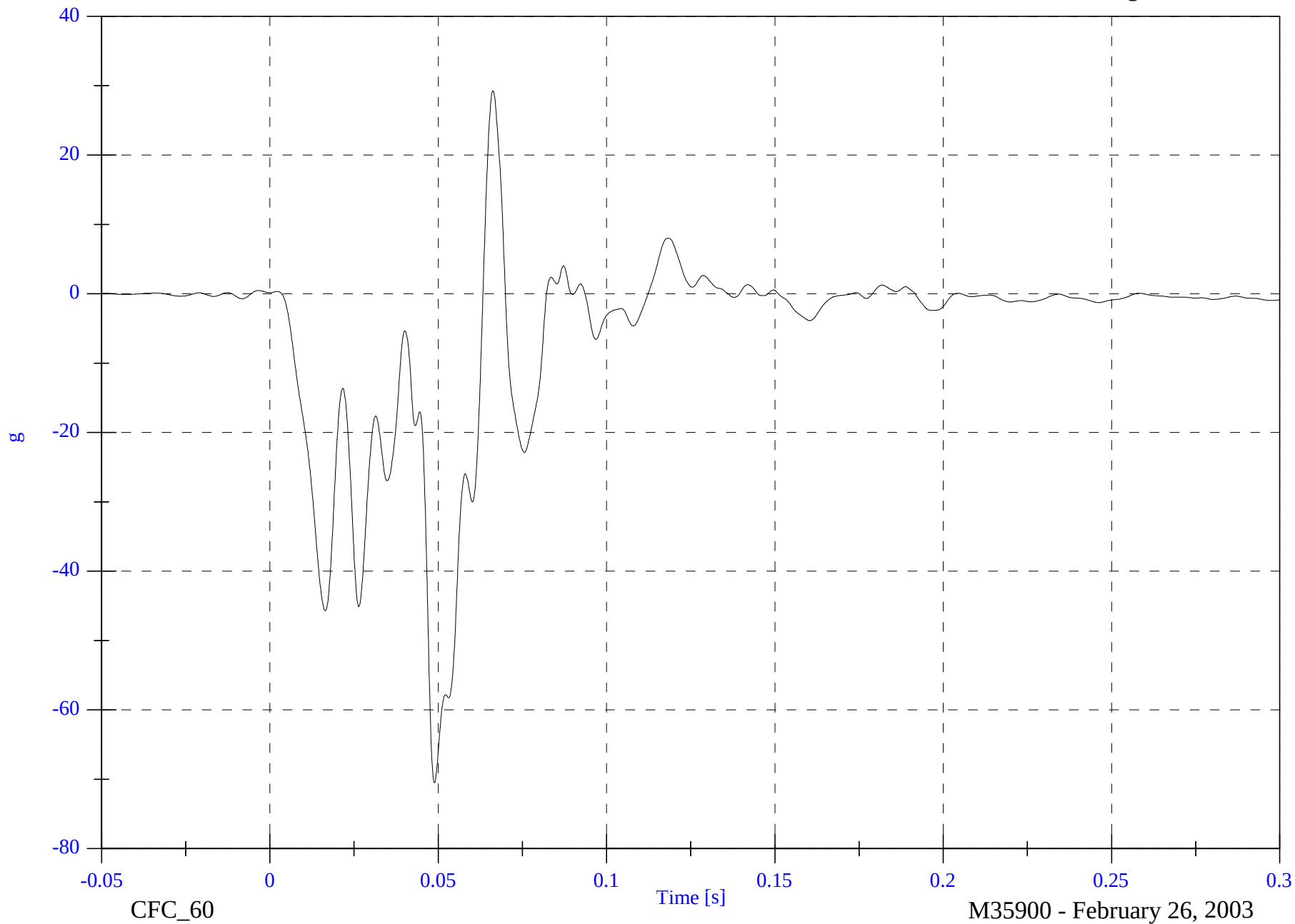
V1 Instrument Panel #6x

Max: 29.3 [g] at 0.066 [s]

Min: -70.5 [g] at 0.049 [s]

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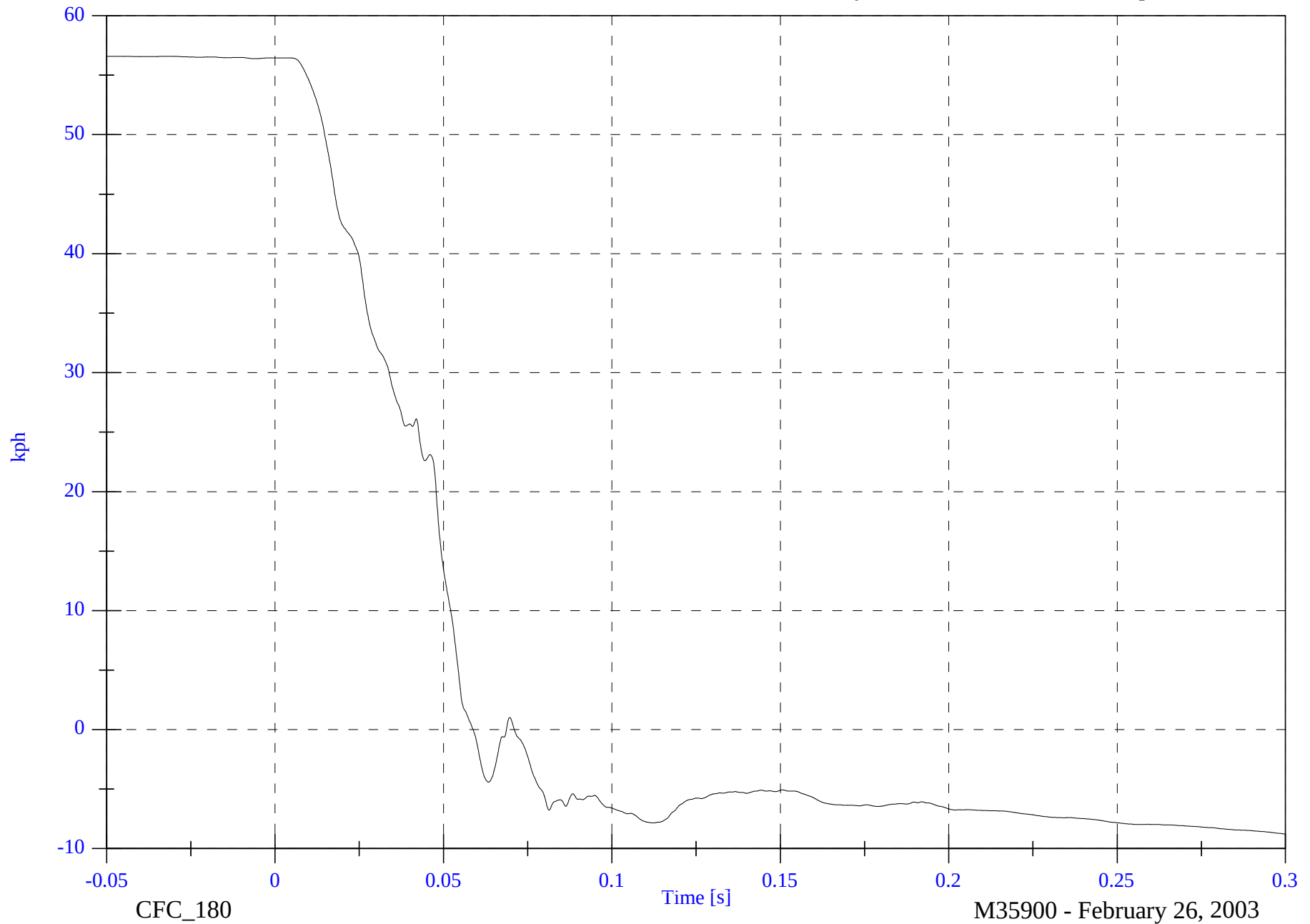


2003 NCAP Test 10 2003 Volvo XC90

V1 Instrument Panel #6x Velocity

Max: 56.6 [kph] at -0.046 [s]

Min: -8.8 [kph] at 0.300 [s]



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CFC_180

Time [s]

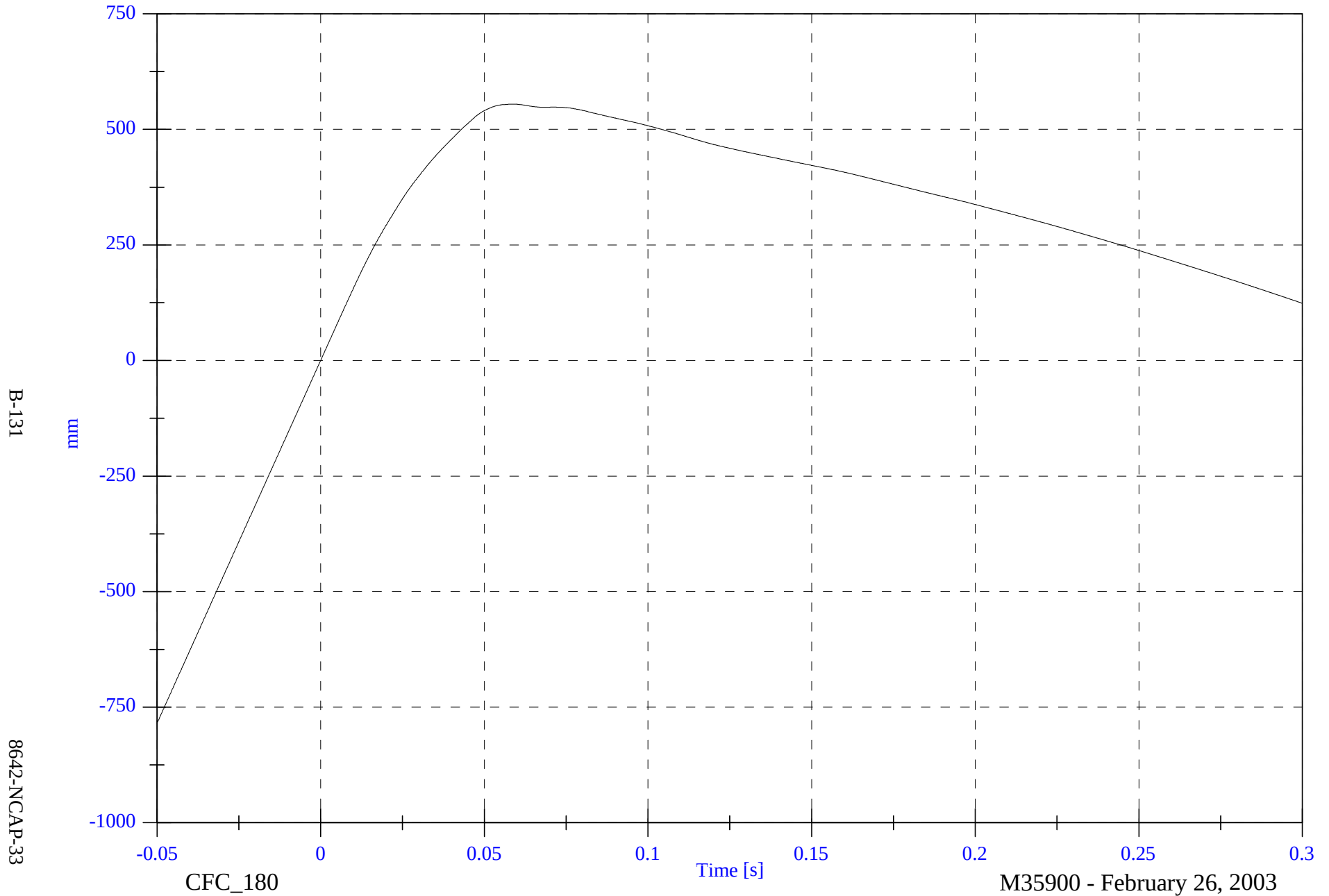
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V1 Instrument Panel #6x Displacement

Max: 554.3 [mm] at 0.059 [s]

Min: -784.9 [mm] at -0.050 [s]



2003 NCAP Test 10 2003 Volvo XC90

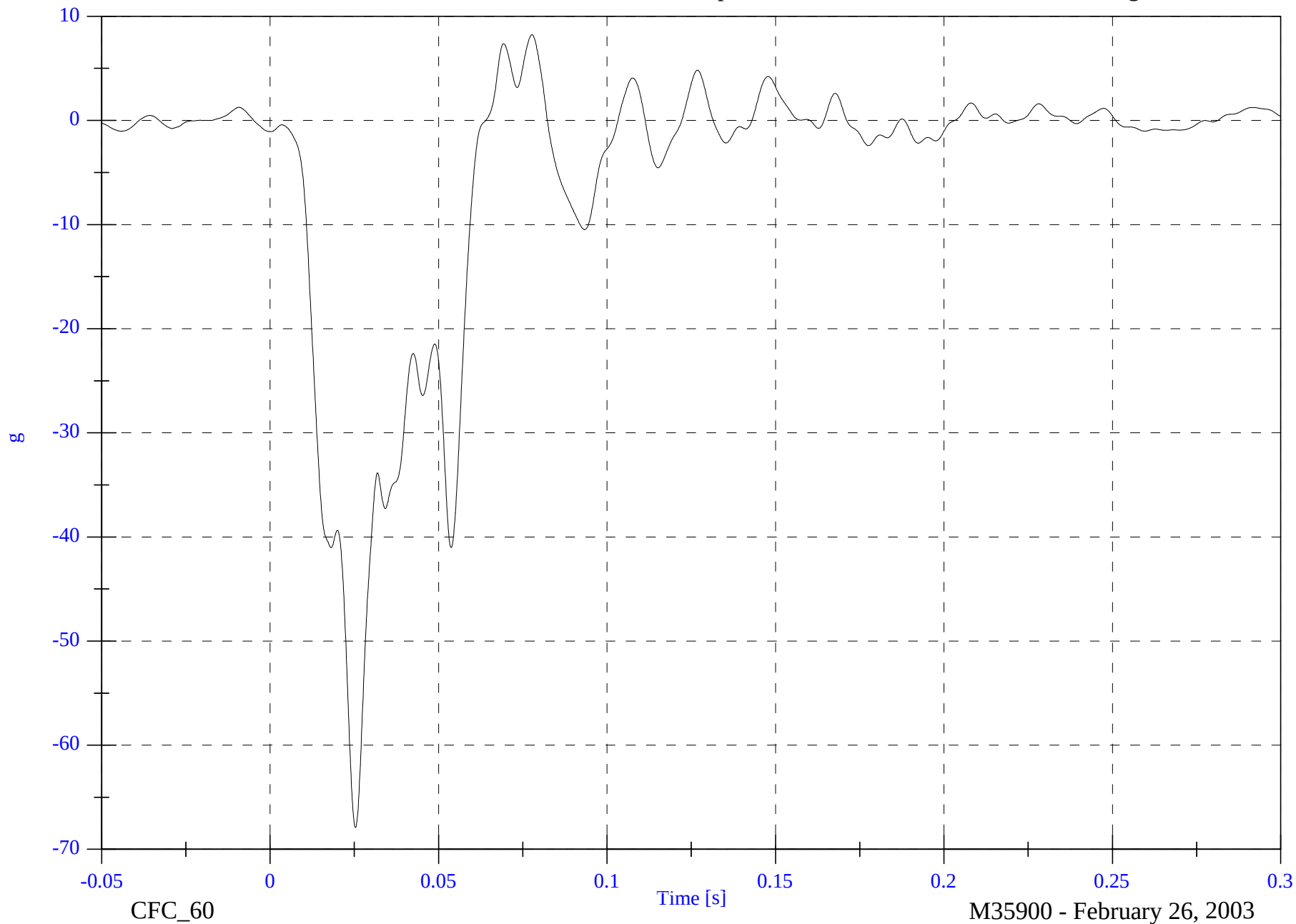
V1 Left Caliper #7x

Max: 8.2 [g] at 0.078 [s]

Min: -67.9 [g] at 0.025 [s]

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8642-NCAP-33

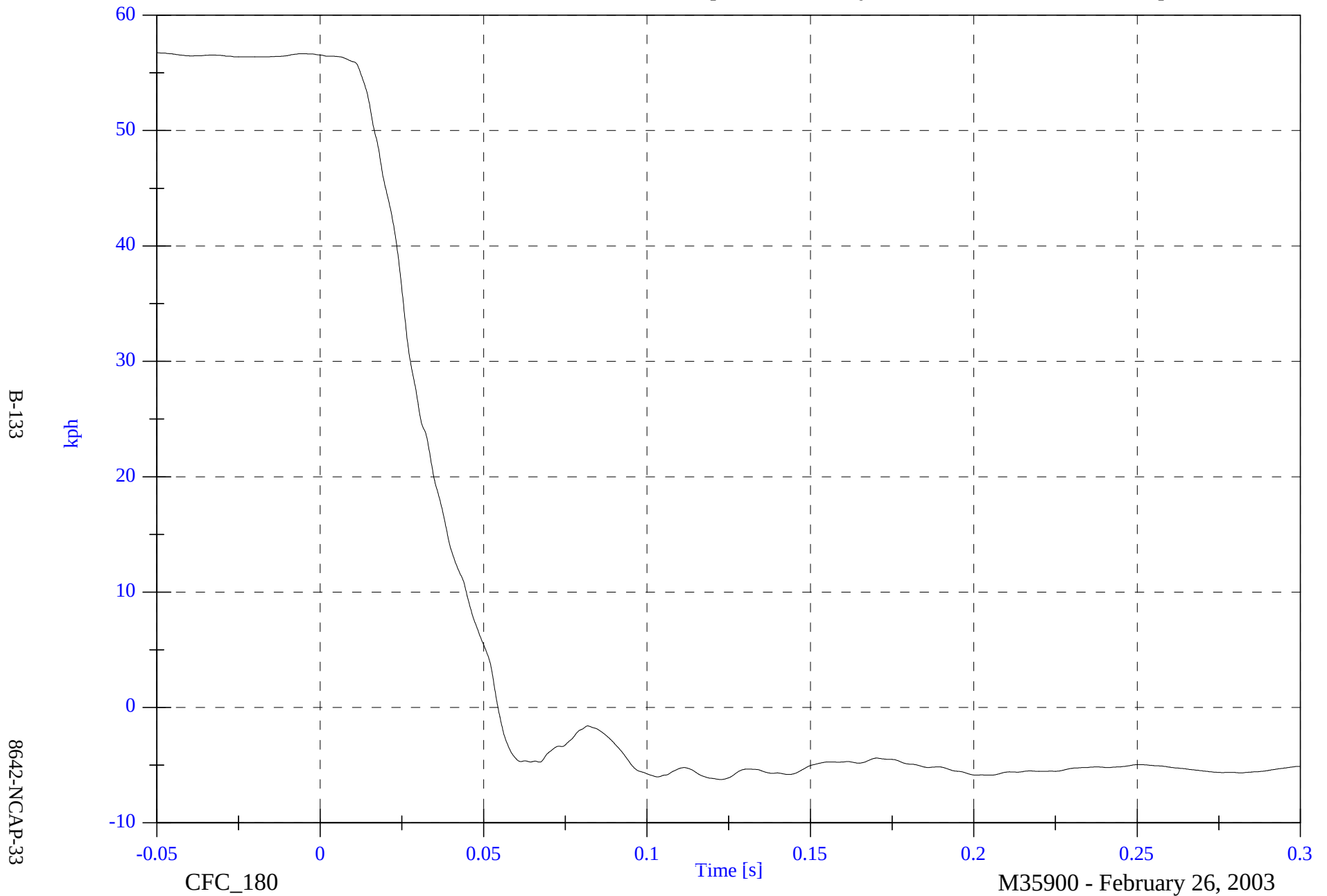


2003 NCAP Test 10 2003 Volvo XC90

Max: 56.7 [kph] at -0.050 [s]

Min: -6.2 [kph] at 0.123 [s]

V1 Left Caliper #7x Velocity



2003 NCAP Test 10 2003 Volvo XC90

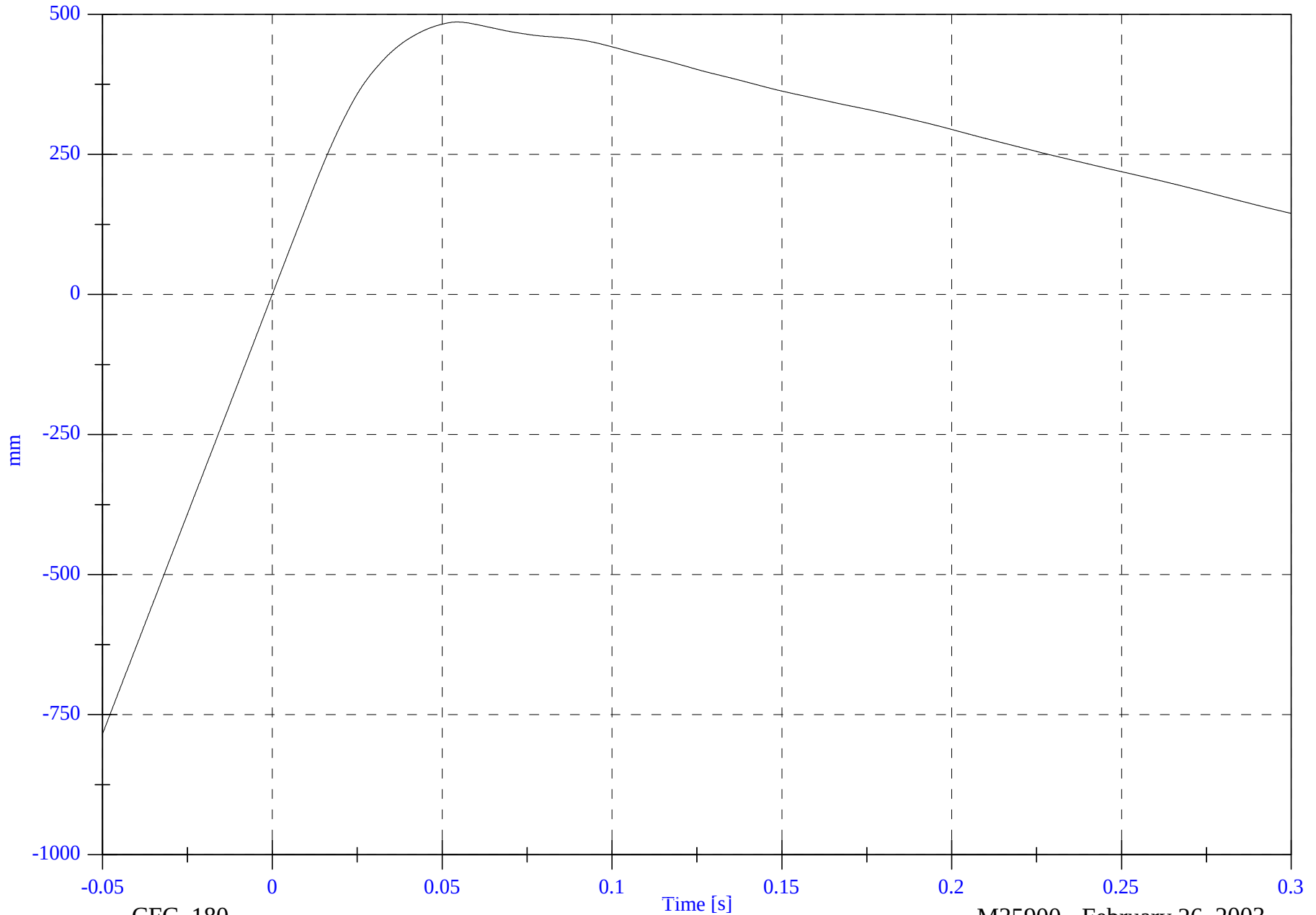
V1 Left Caliper #7x Displacement

Max: 486.3 [mm] at 0.054 [s]

Min: -784.9 [mm] at -0.050 [s]

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CFC_180

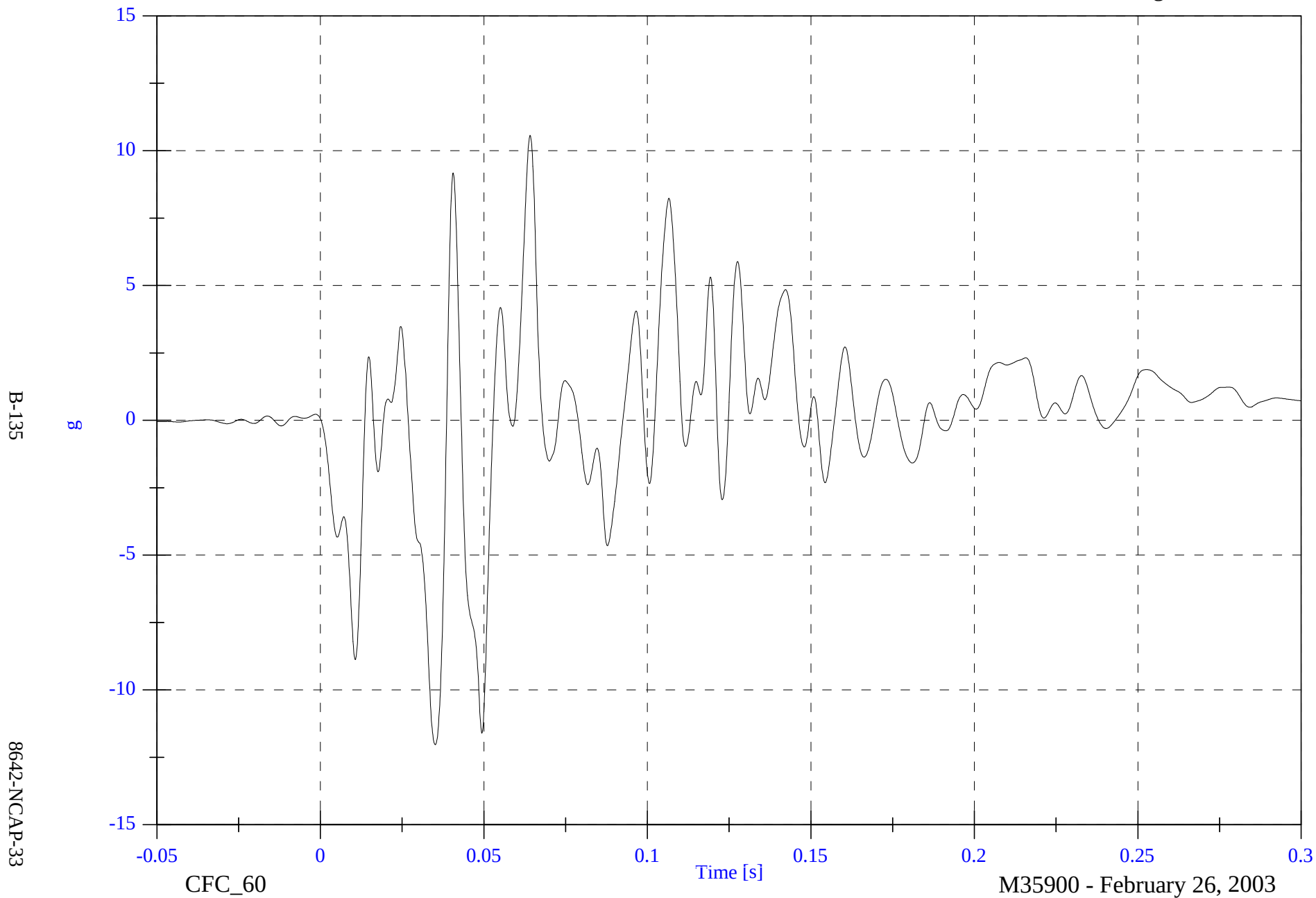
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V1 Left Rear #8z

Max: 10.6 [g] at 0.064 [s]

Min: -12.0 [g] at 0.035 [s]



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Max: 3.2 [kph] at 0.300 [s]

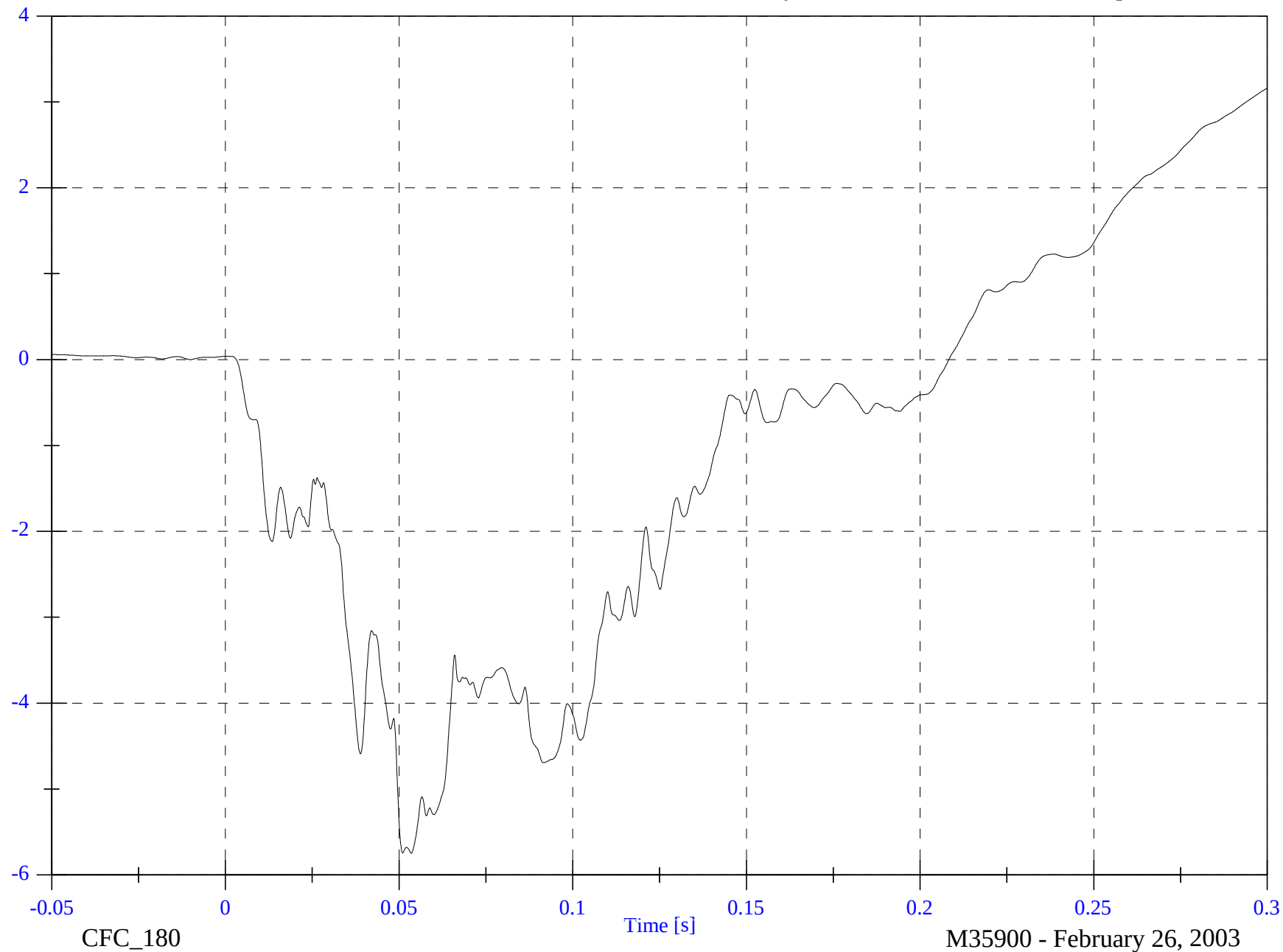
Min: -5.7 [kph] at 0.053 [s]

V1 Left Rear #8z Velocity

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kph



-0.05

0

0.05

0.1

0.15

0.2

0.25

0.3

CFC_180

Time [s]

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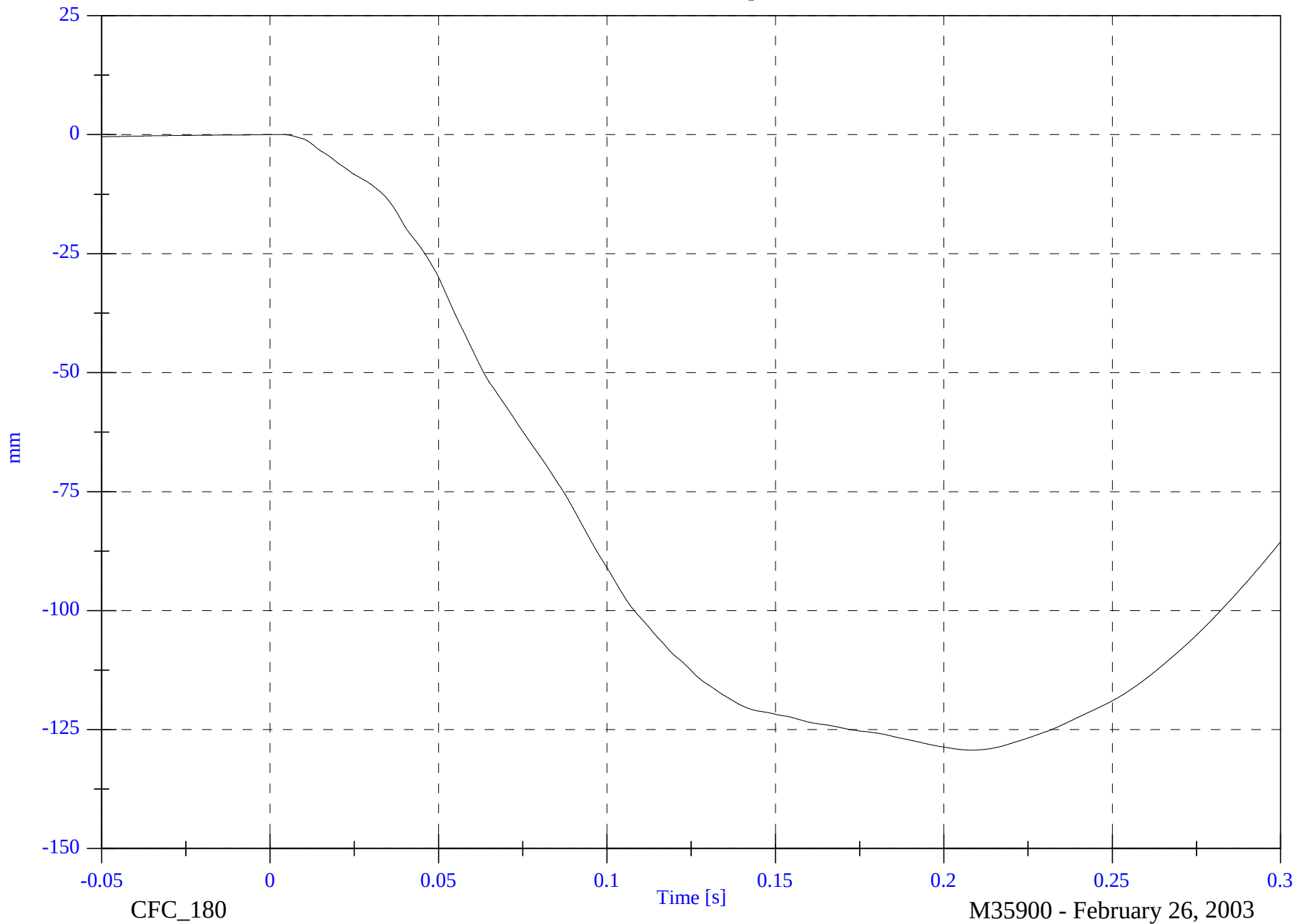
2003 NCAP Test 10 2003 Volvo XC90

V1 Left Rear #8z Displacement

Max: 0.0 [mm] at 0.003 [s]
Min: -129.3 [mm] at 0.208 [s]

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2003 NCAP Test 10 2003 Volvo XC90

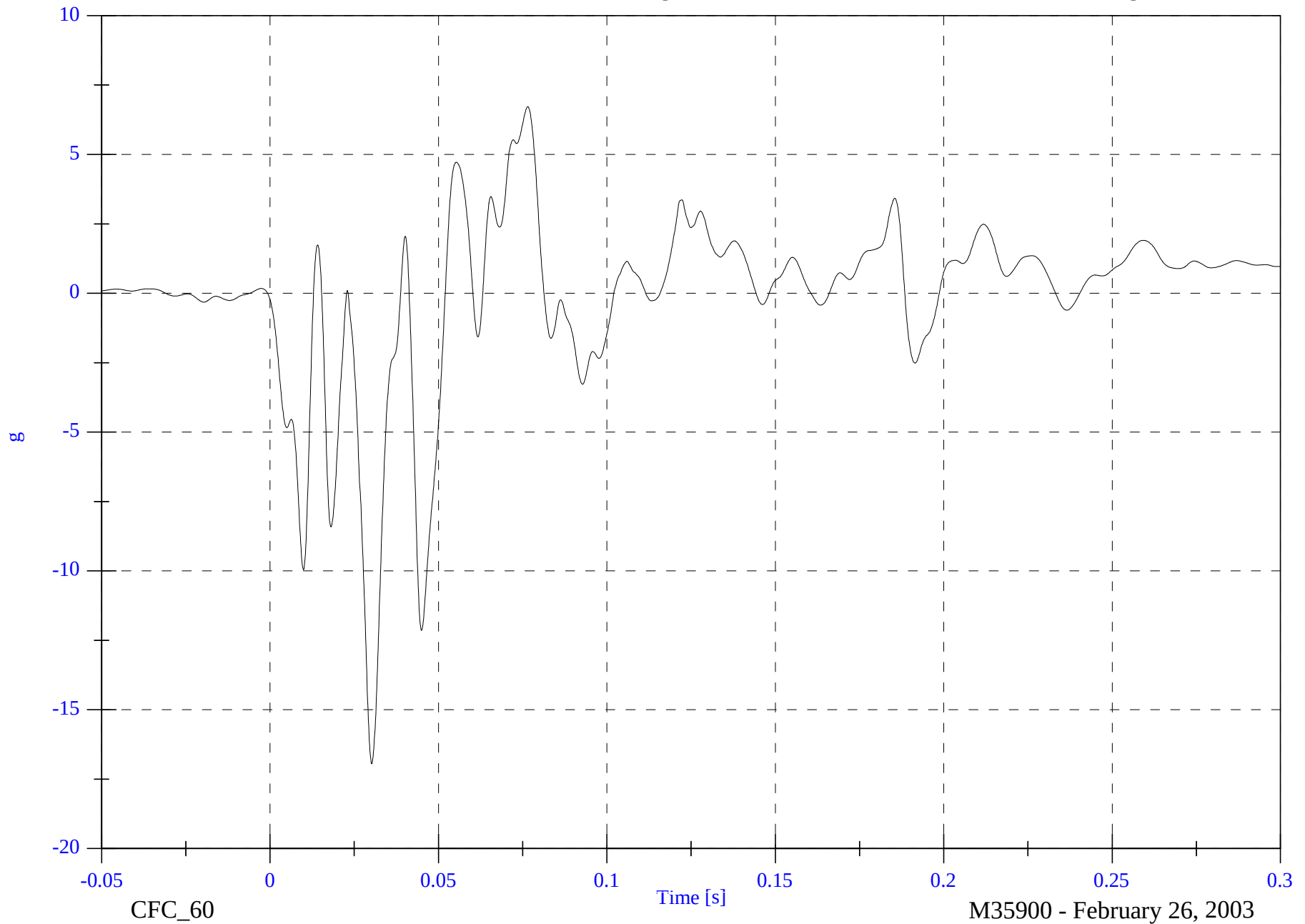
V1 Right Rear #9z

Max: 6.7 [g] at 0.076 [s]

Min: -16.9 [g] at 0.030 [s]

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8642-NCAP-33

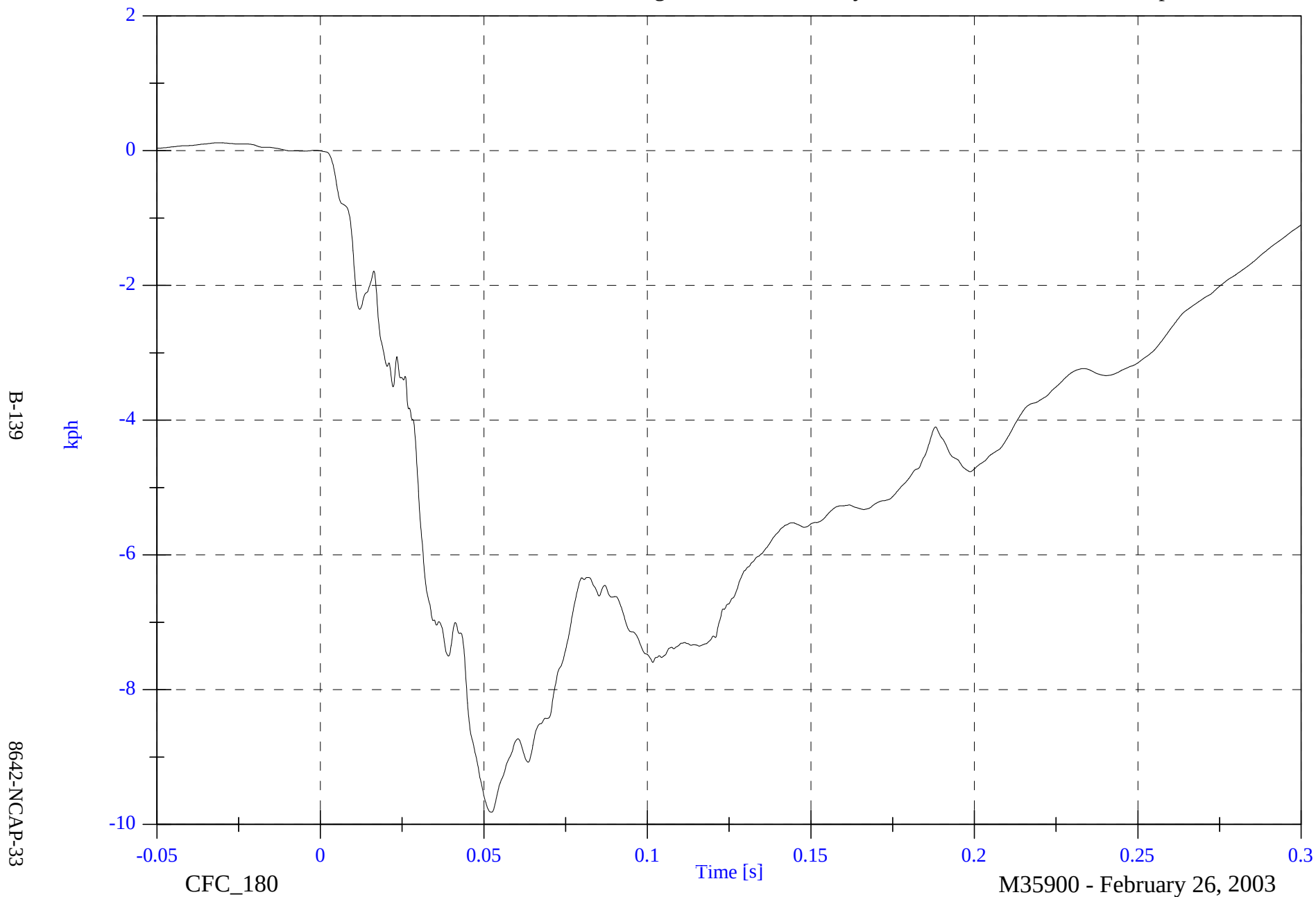


2003 NCAP Test 10 2003 Volvo XC90

Max: 0.1 [kph] at -0.031 [s]

Min: -9.8 [kph] at 0.052 [s]

V1 Right Rear #9z Velocity

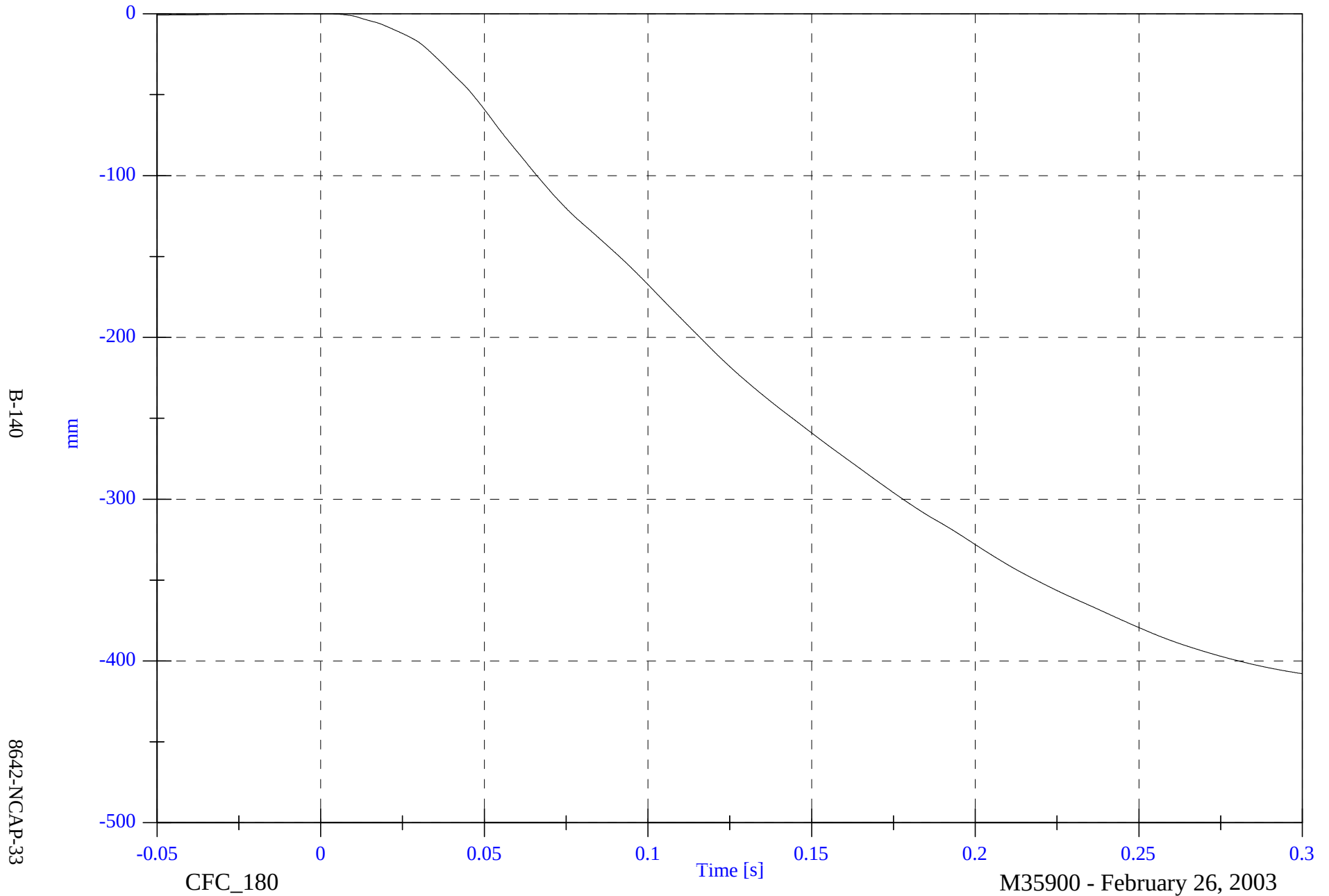


2003 NCAP Test 10 2003 Volvo XC90

V1 Right Rear #9z Displacement

Max: 0.0 [mm] at -0.010 [s]

Min: -407.9 [mm] at 0.300 [s]

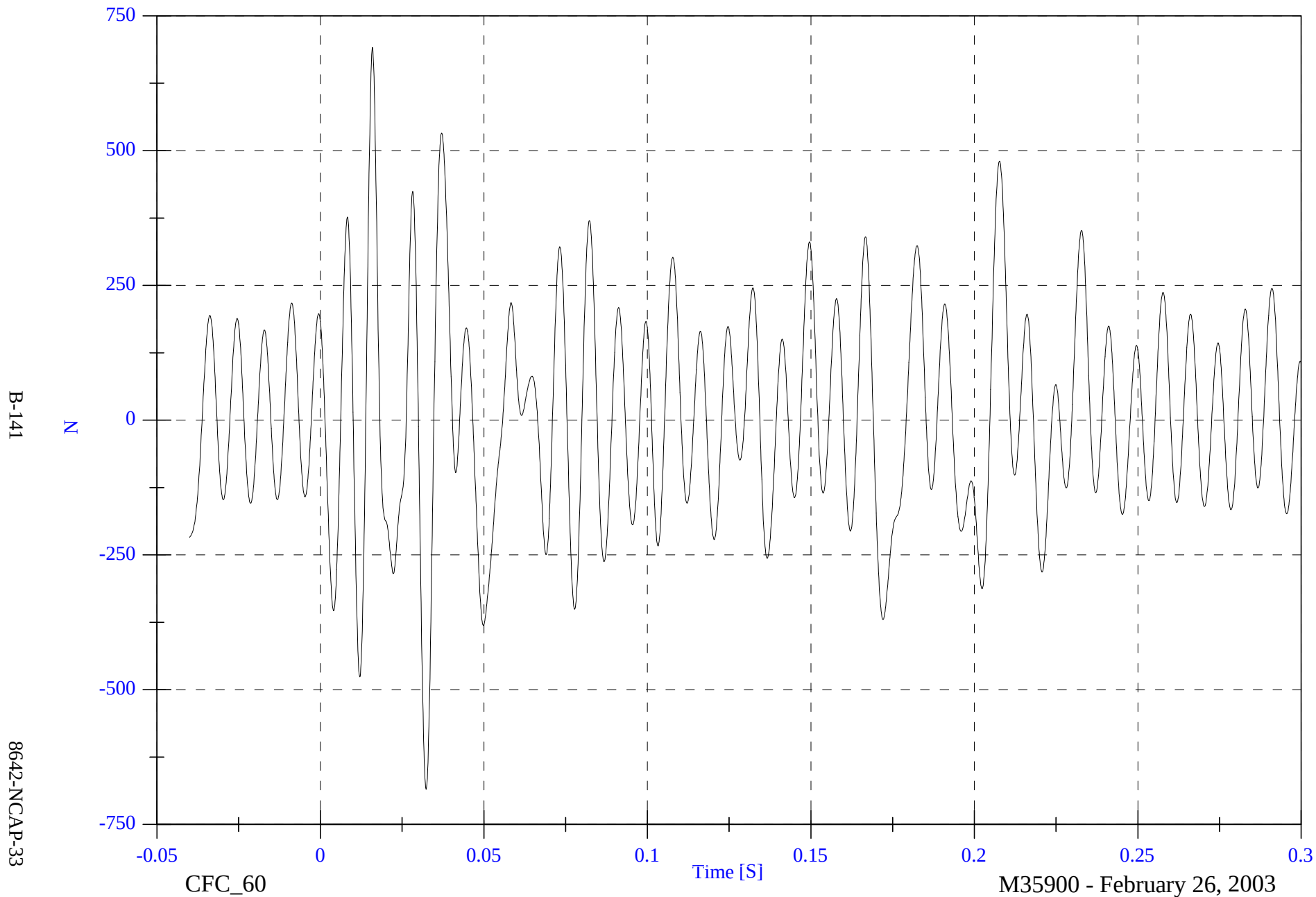


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A1 Fx

Max: 691.3 [N] at 0.016 [S]

Min: -684.8 [N] at 0.032 [S]

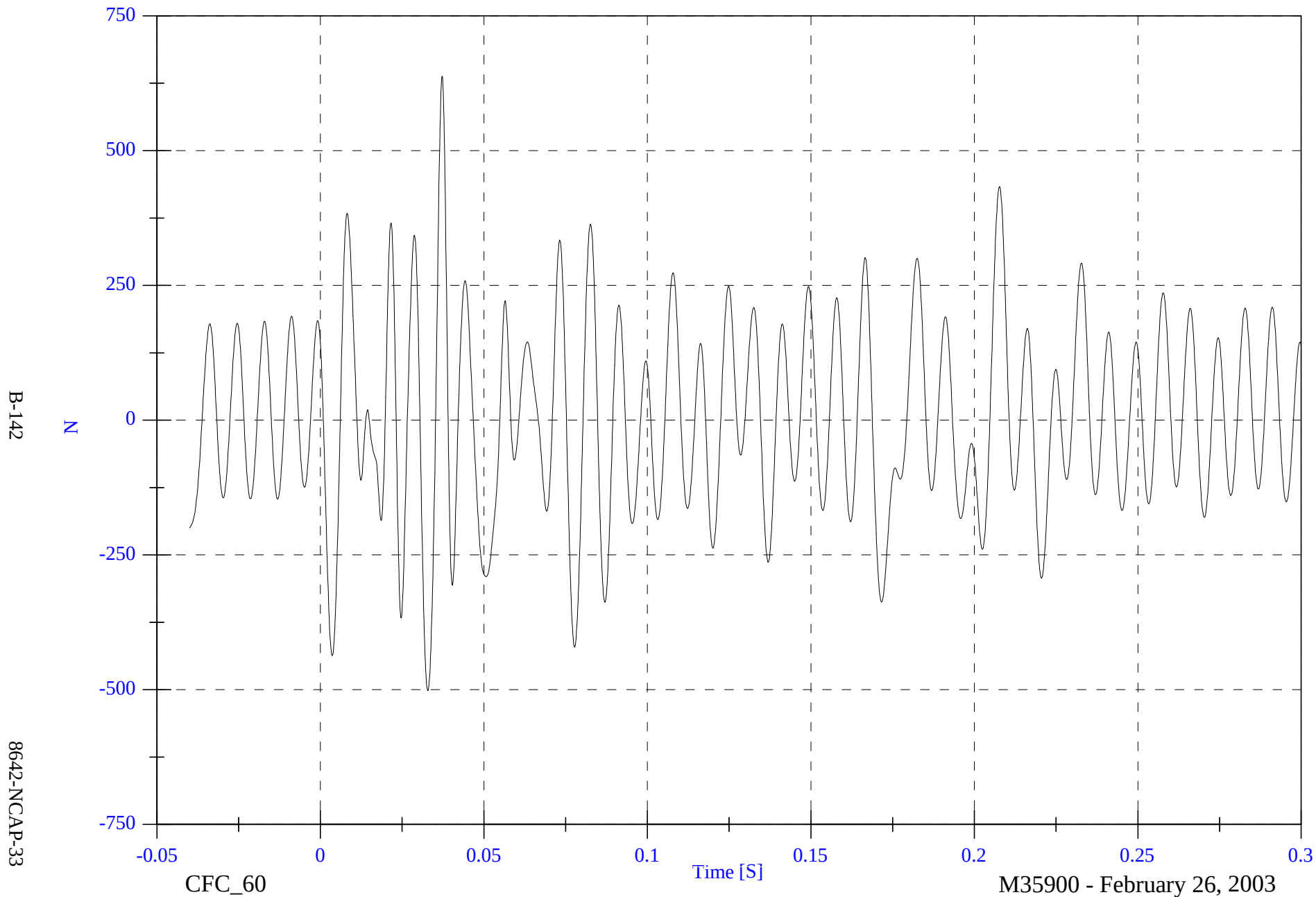


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A2 Fx

Max: 637.9 [N] at 0.037 [S]

Min: -501.8 [N] at 0.033 [S]

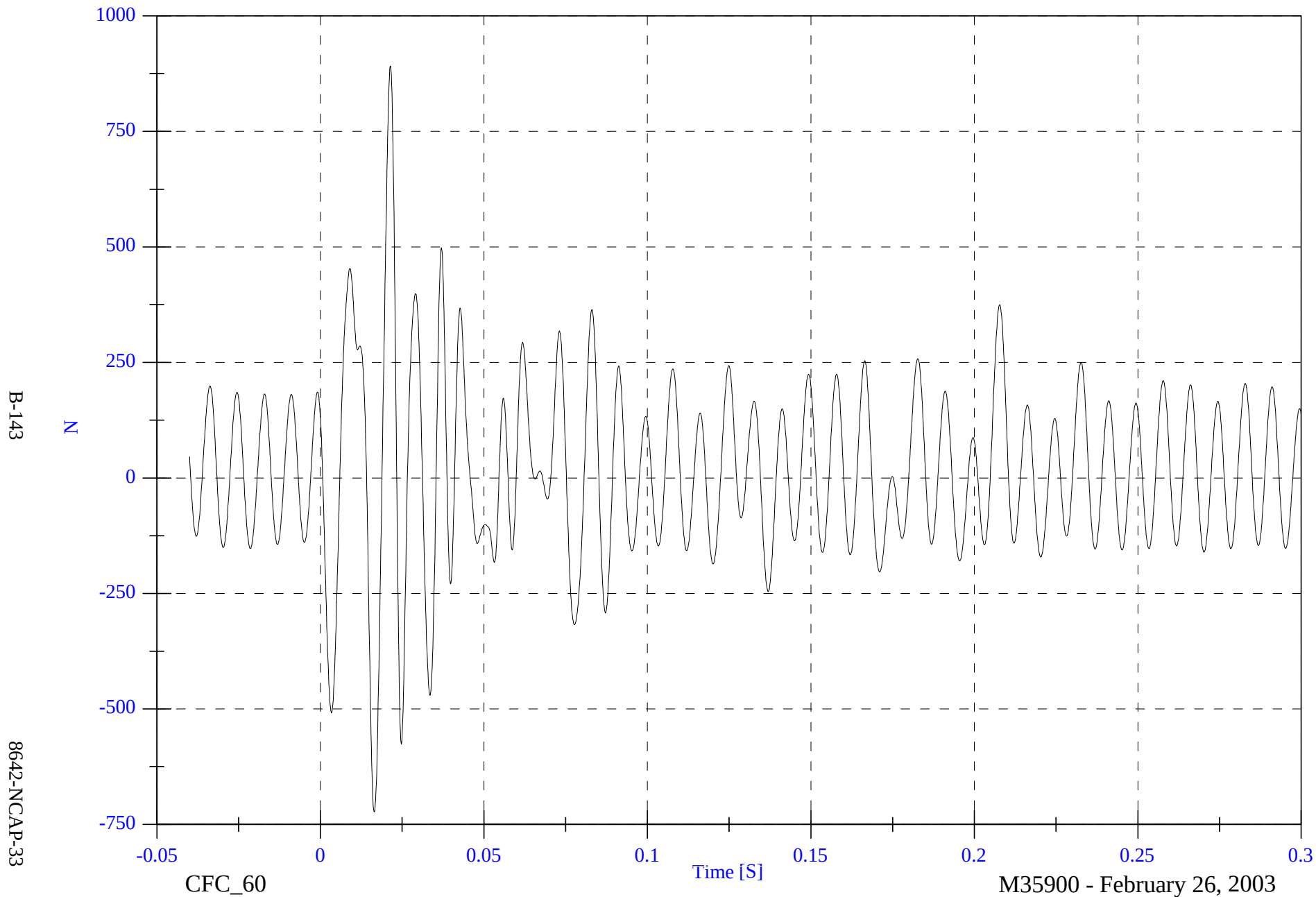


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A3 Fx

Max: 891.7 [N] at 0.021 [S]

Min: -722.9 [N] at 0.016 [S]

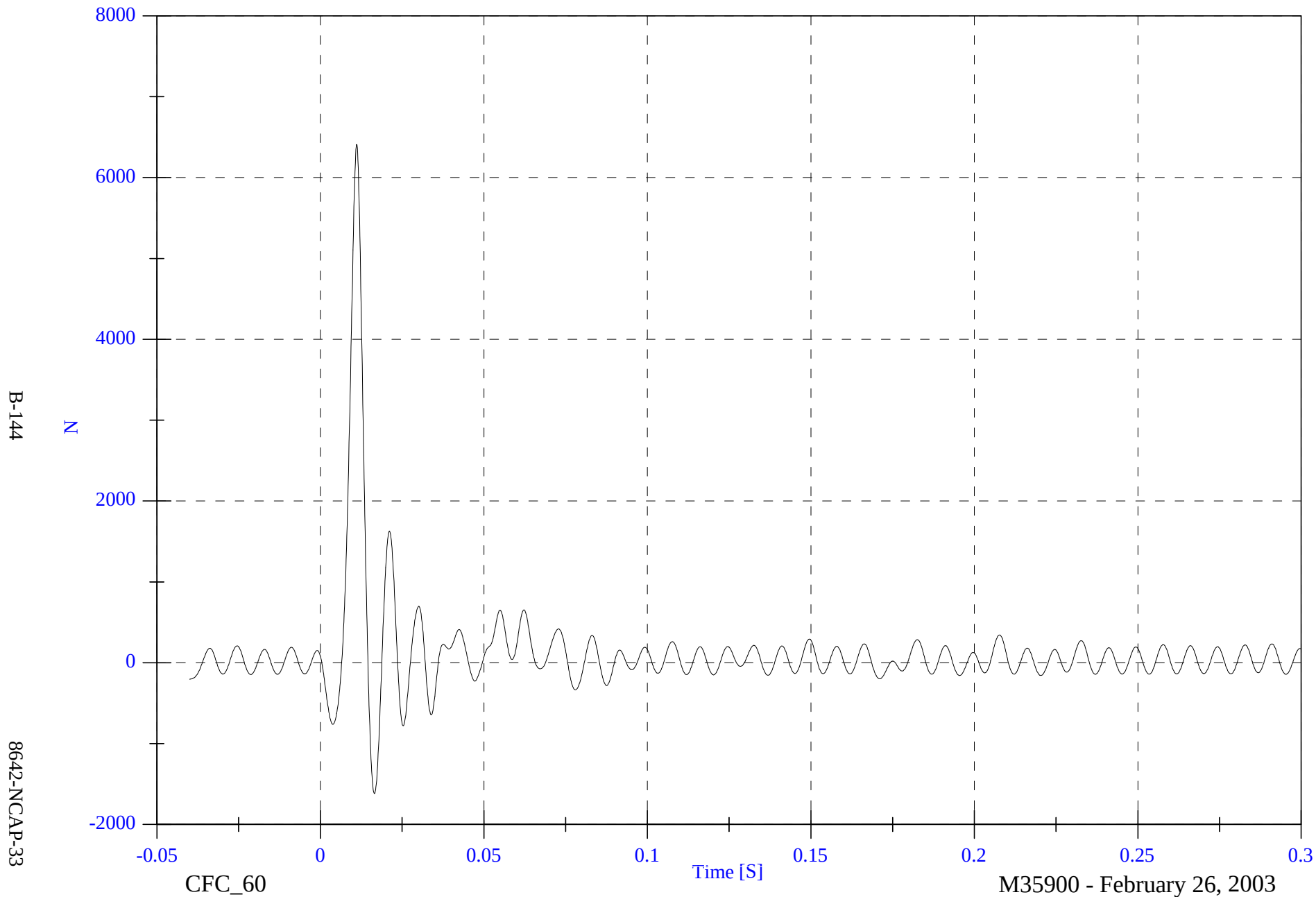


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A4 Fx

Max: 6409.2 [N] at 0.011 [S]

Min: -1618.1 [N] at 0.016 [S]

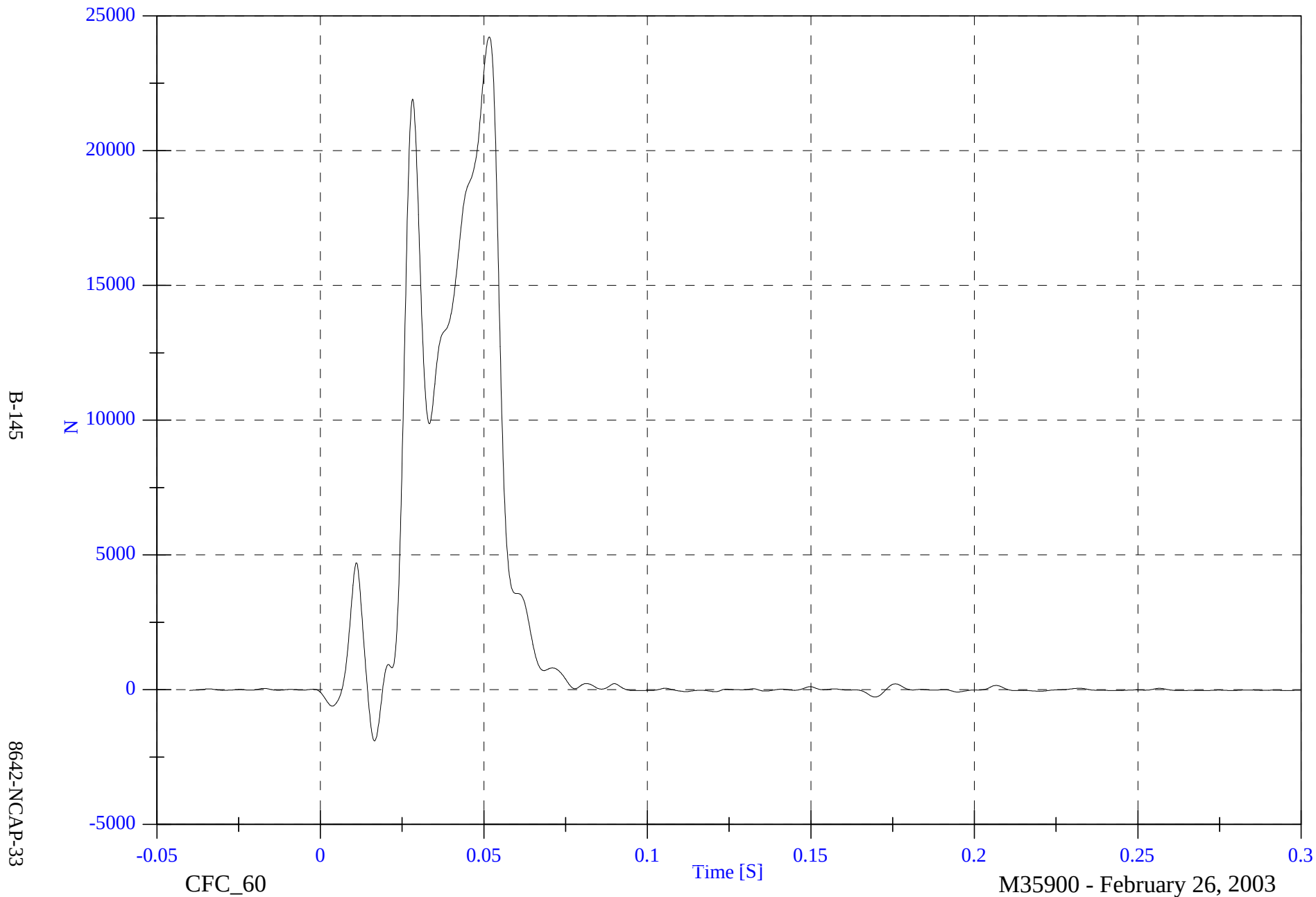


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A5 Fx

Max: 24220.0 [N] at 0.052 [S]

Min: -1897.6 [N] at 0.017 [S]

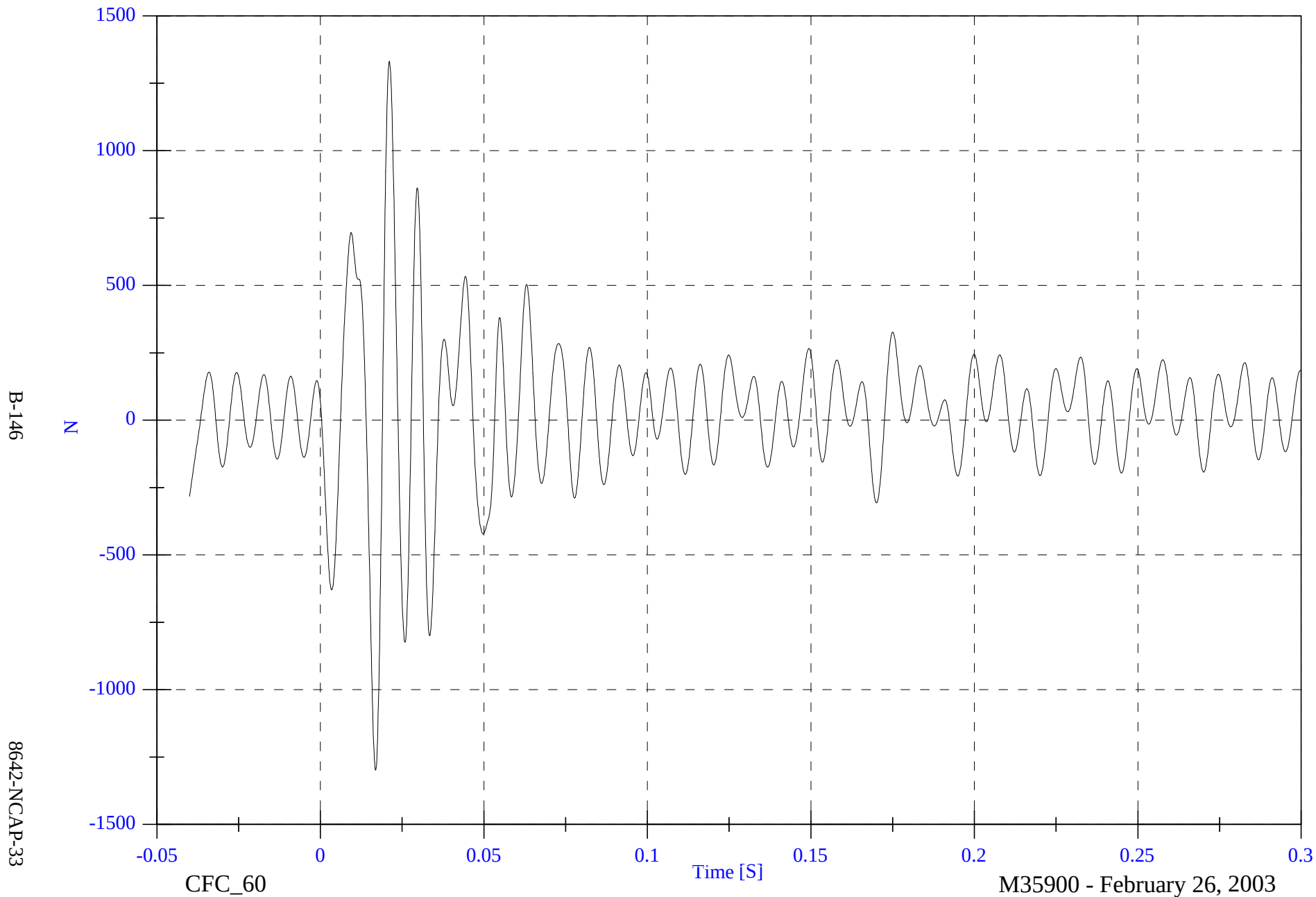


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A6 Fx

Max: 1332.1 [N] at 0.021 [S]

Min: -1299.0 [N] at 0.017 [S]

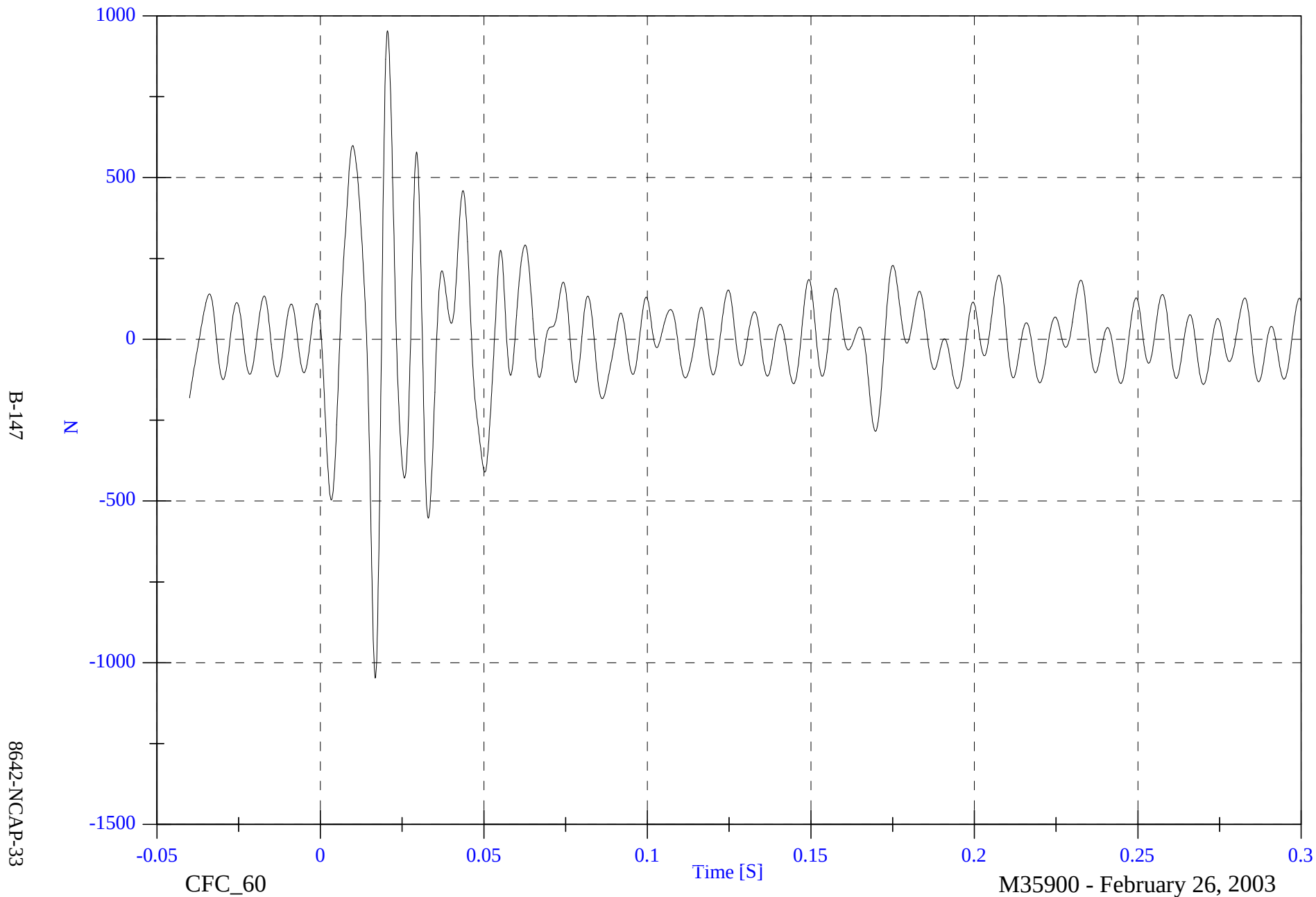


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A7 Fx

Max: 953.8 [N] at 0.020 [S]

Min: -1047.4 [N] at 0.017 [S]

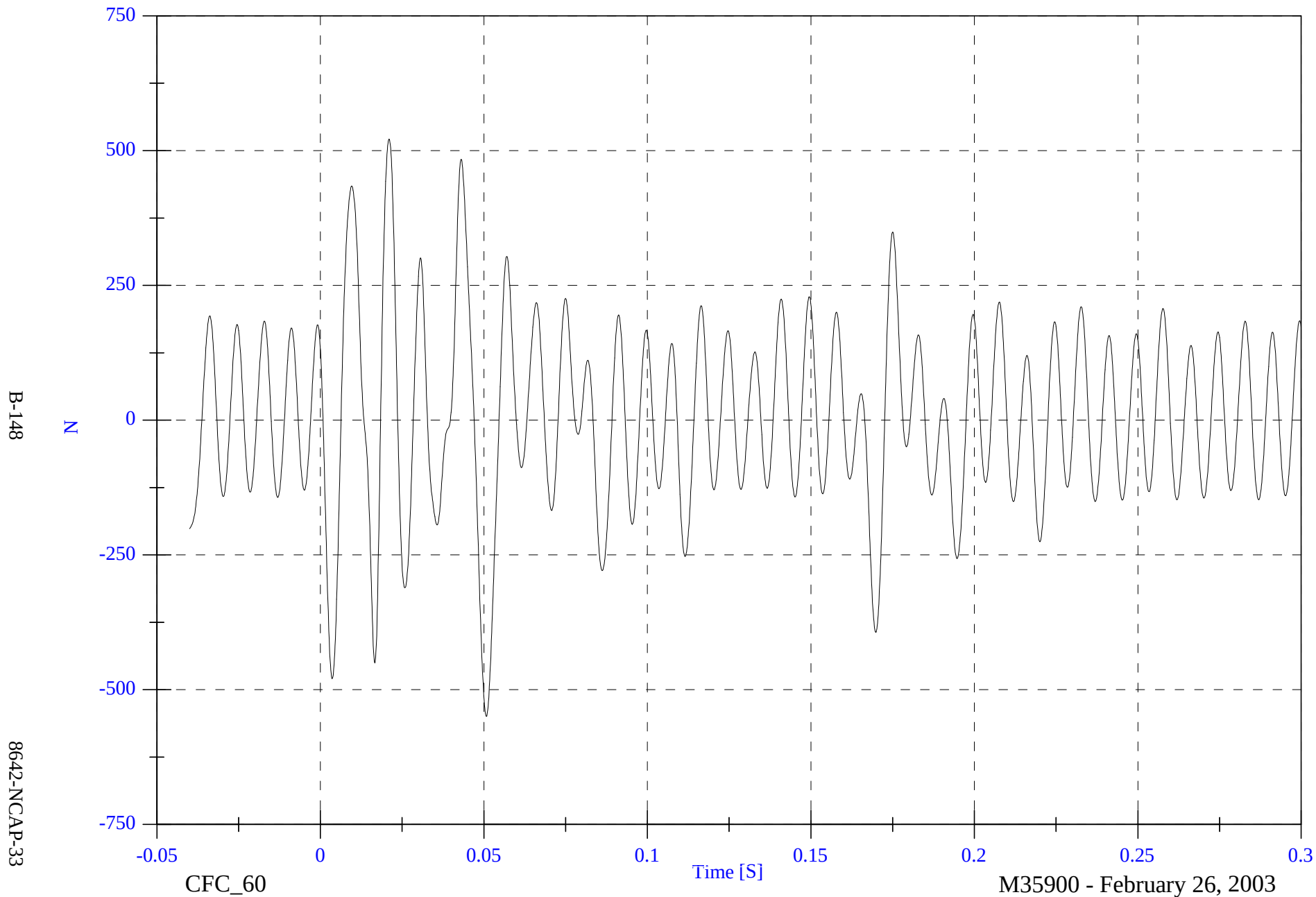


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A8 Fx

Max: 521.5 [N] at 0.021 [S]

Min: -549.8 [N] at 0.051 [S]

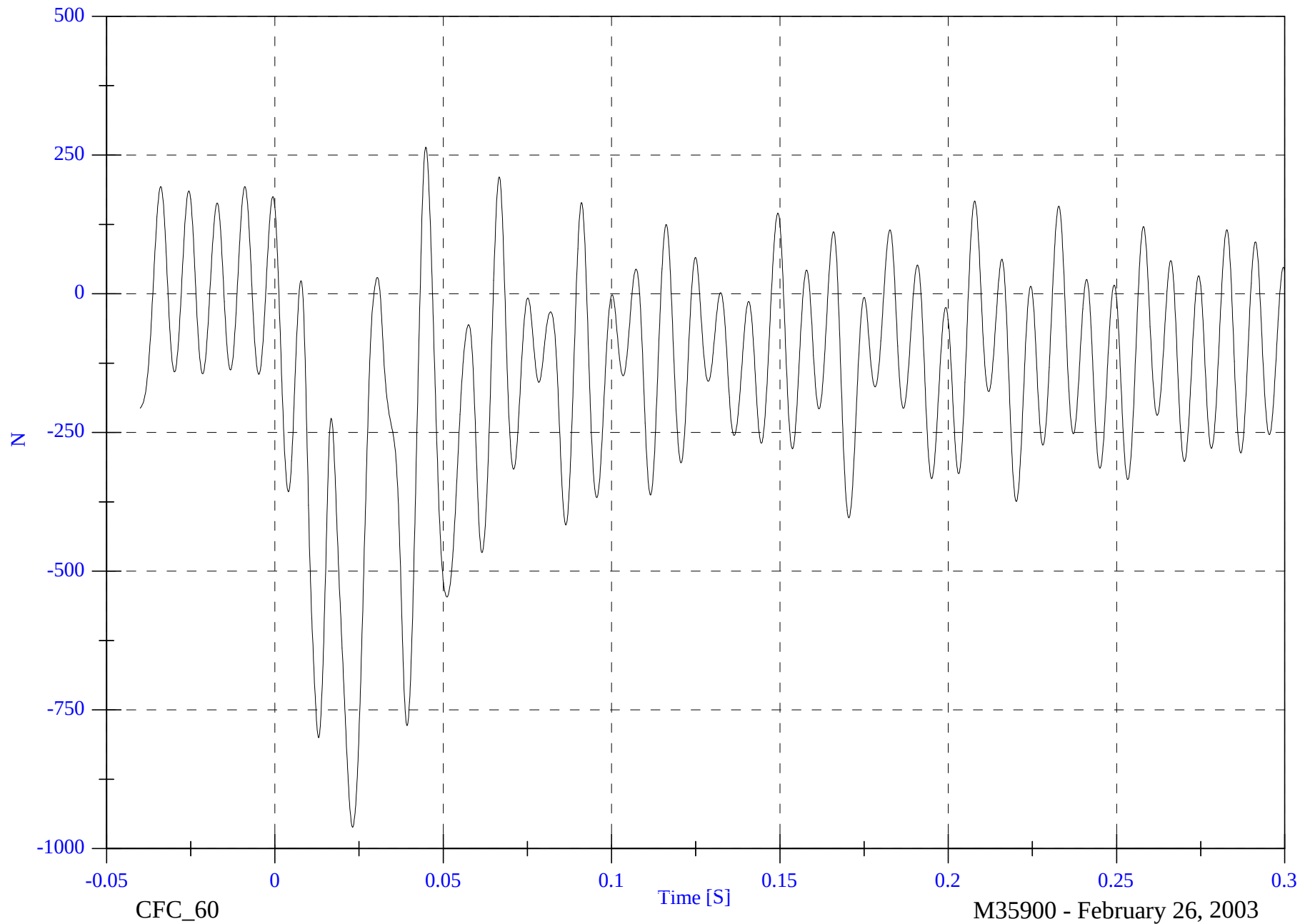


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell A9 Fx

Max: 264.4 [N] at 0.045 [S]

Min: -961.5 [N] at 0.023 [S]



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CFC_60

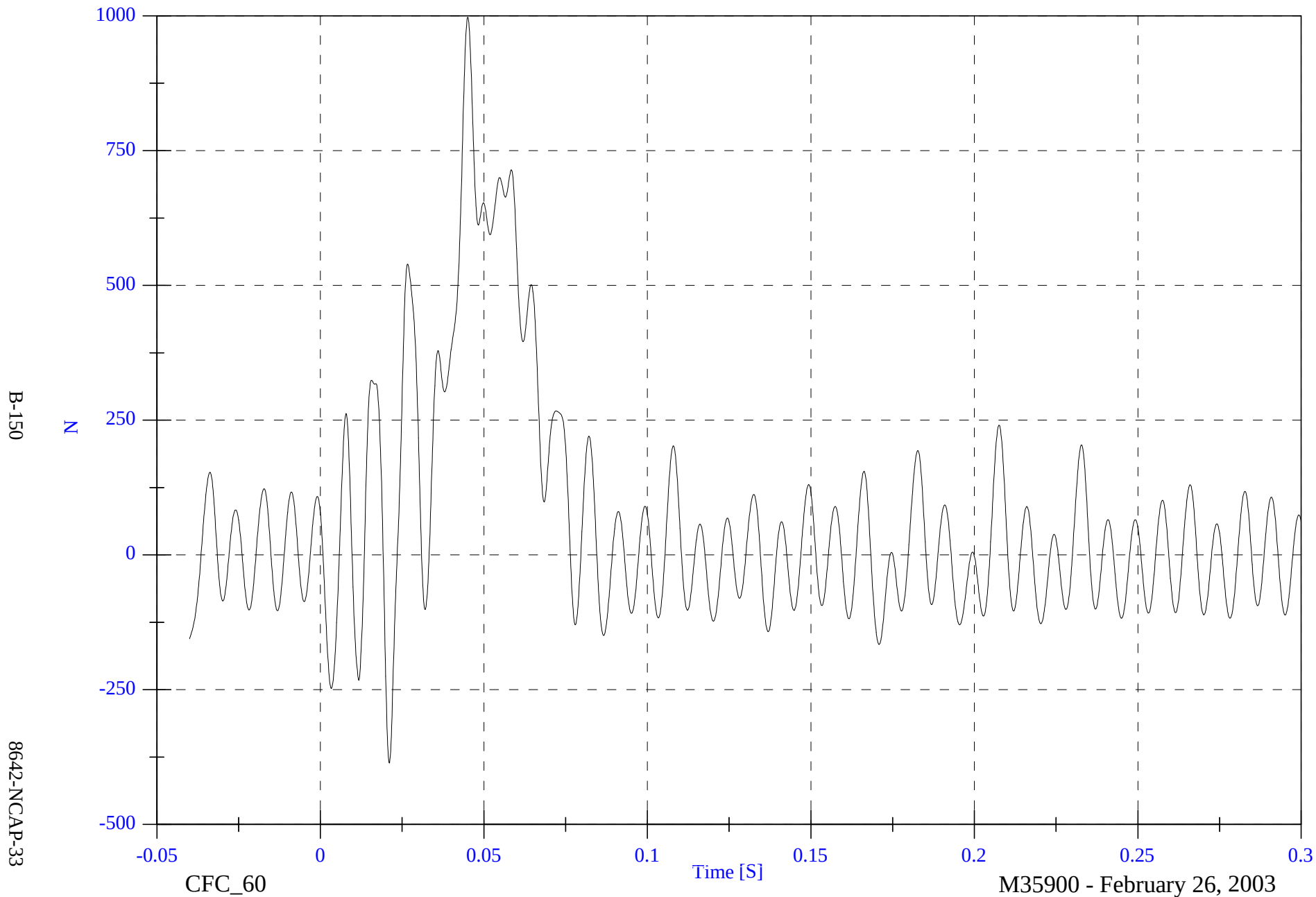
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Barrier Load Cell B1 Fx

Max: 997.6 [N] at 0.045 [S]

Min: -386.3 [N] at 0.021 [S]

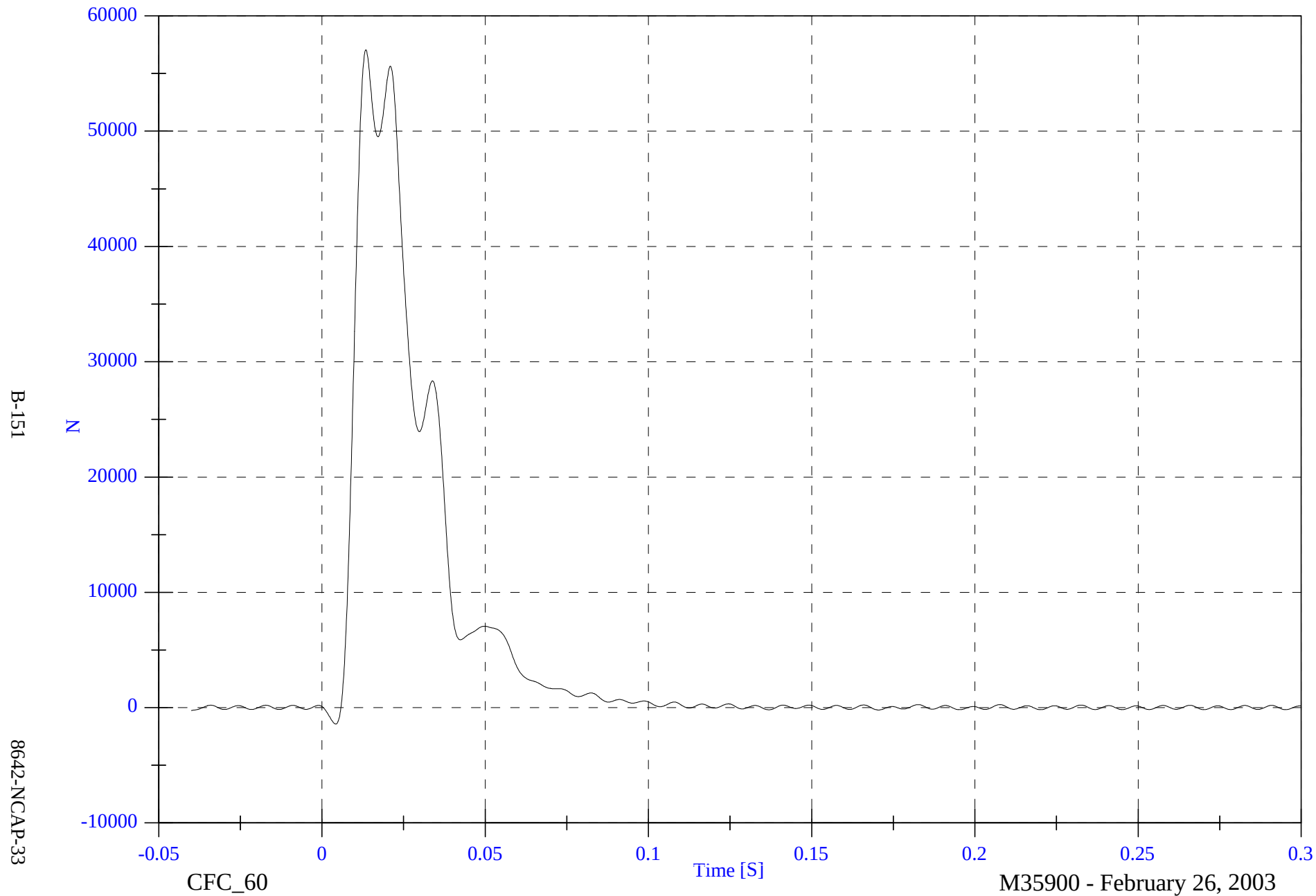


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B2 Fx

Max: 57056.9 [N] at 0.013 [S]

Min: -1426.4 [N] at 0.004 [S]

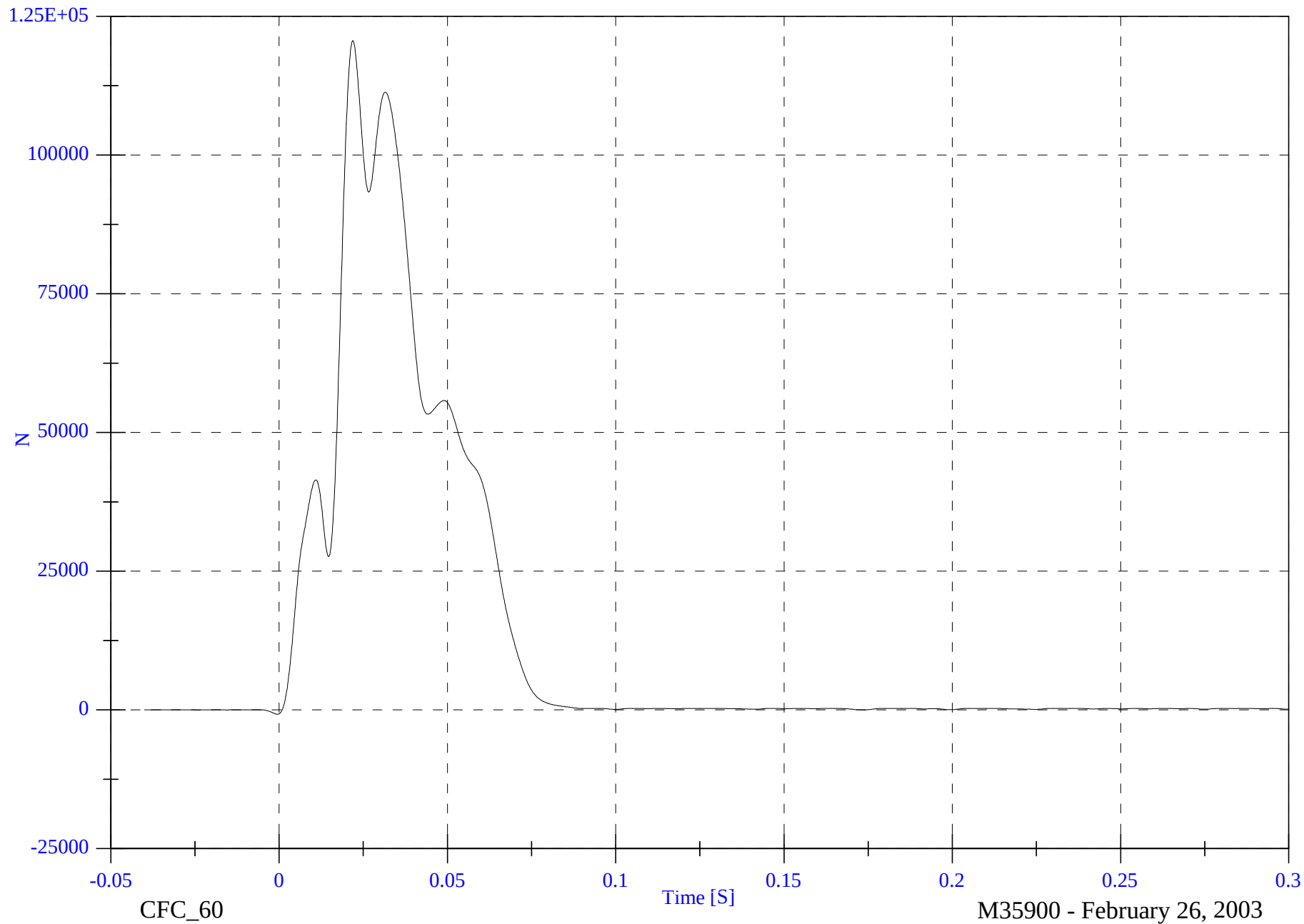


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B3 Fx

Max: 120633.7 [N] at 0.022 [S]

Min: -780.4 [N] at -0.001 [S]

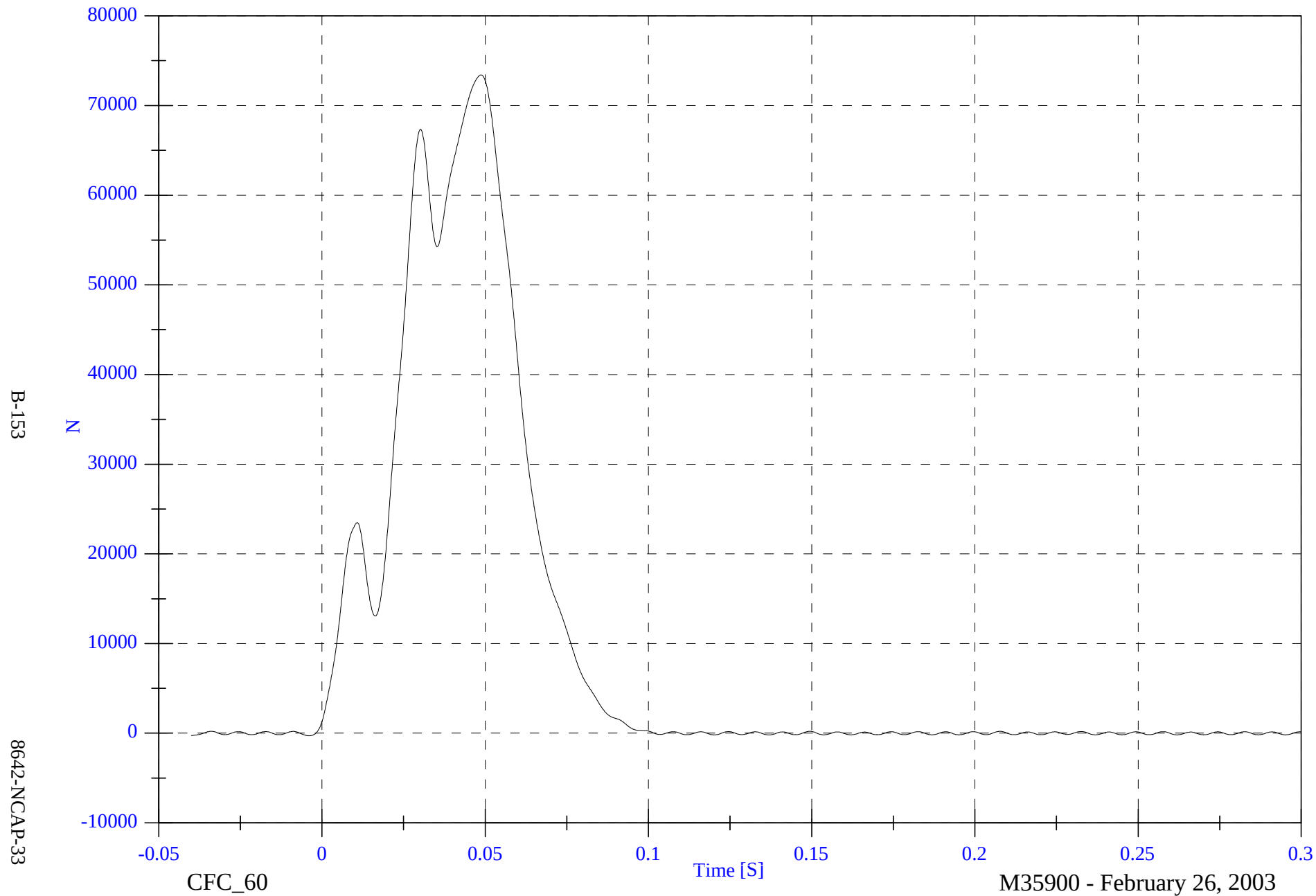


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B4 Fx

Max: 73415.9 [N] at 0.049 [S]

Min: -280.1 [N] at -0.004 [S]

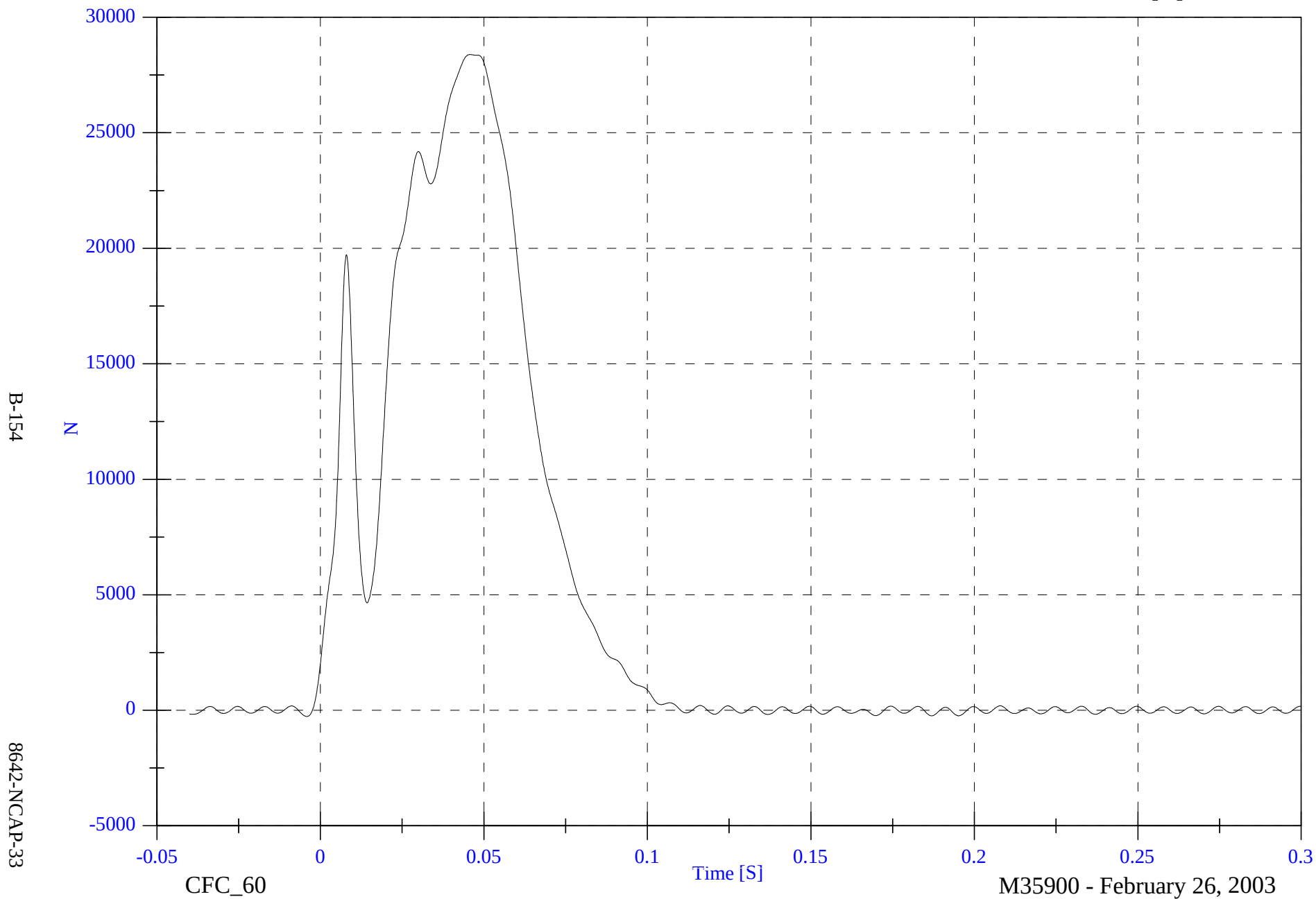


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B5 Fx

Max: 28384.8 [N] at 0.046 [S]

Min: -268.1 [N] at -0.004 [S]

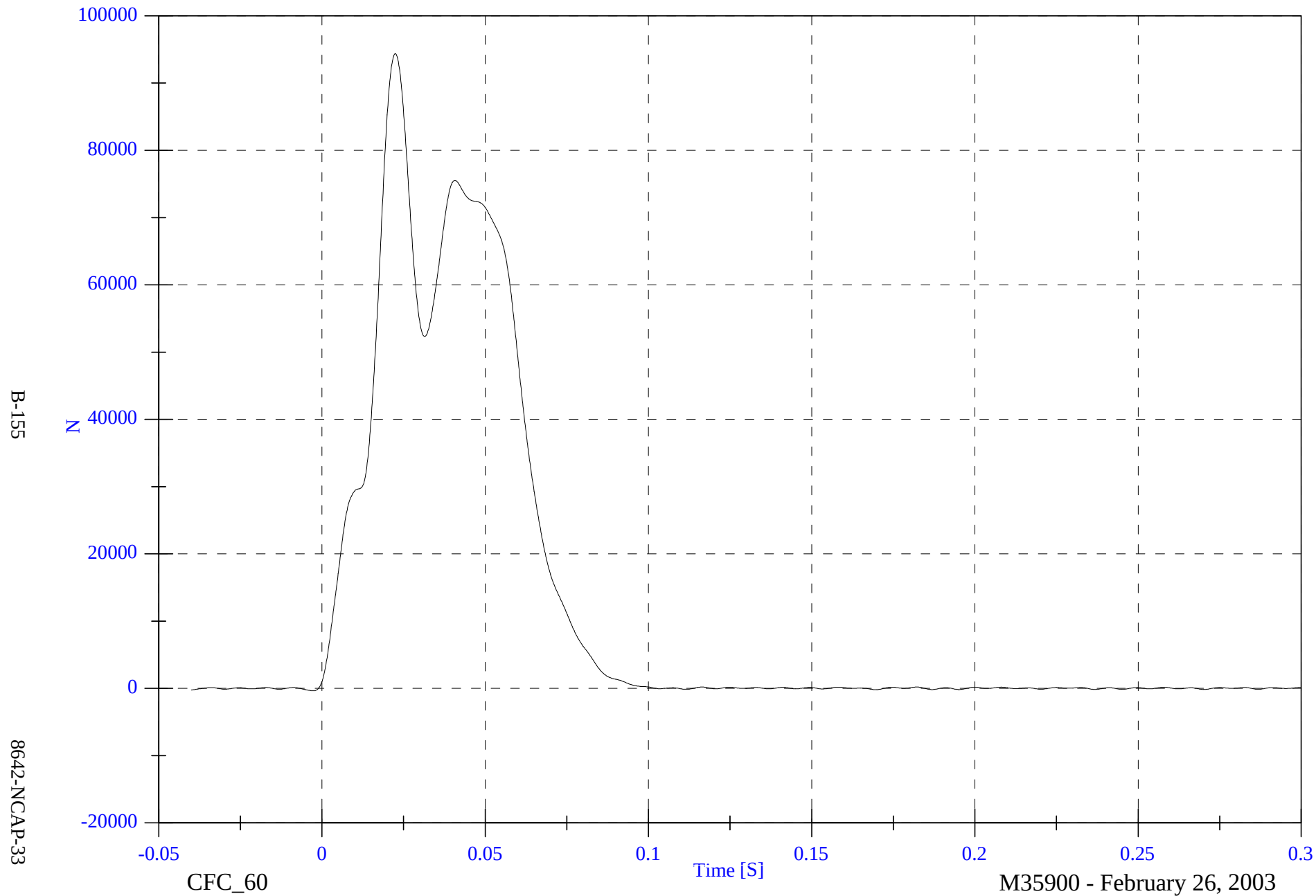


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B6 Fx

Max: 94368.1 [N] at 0.022 [S]

Min: -361.6 [N] at -0.003 [S]

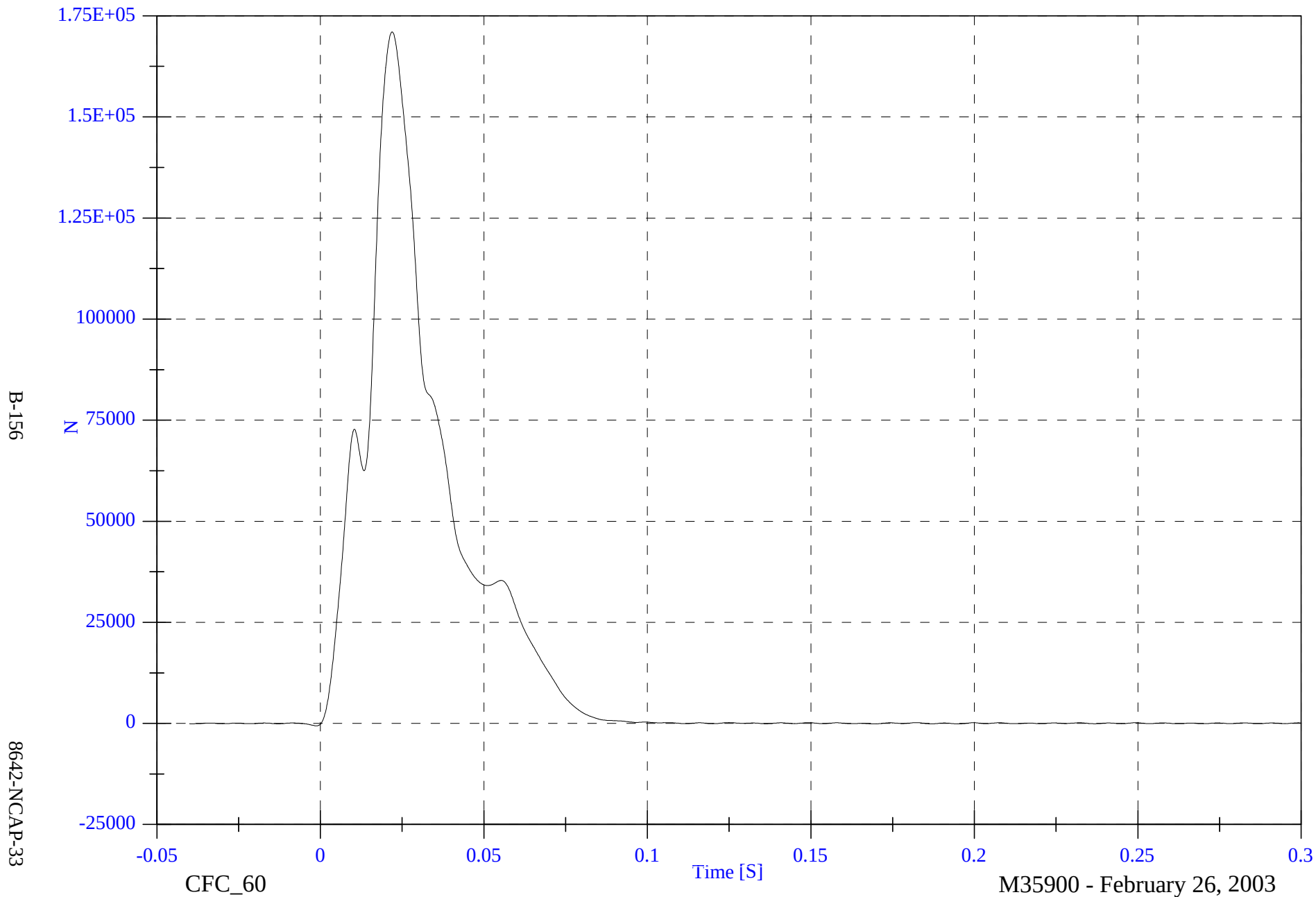


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B7 Fx

Max: 171043.4 [N] at 0.022 [S]

Min: -604.4 [N] at -0.001 [S]

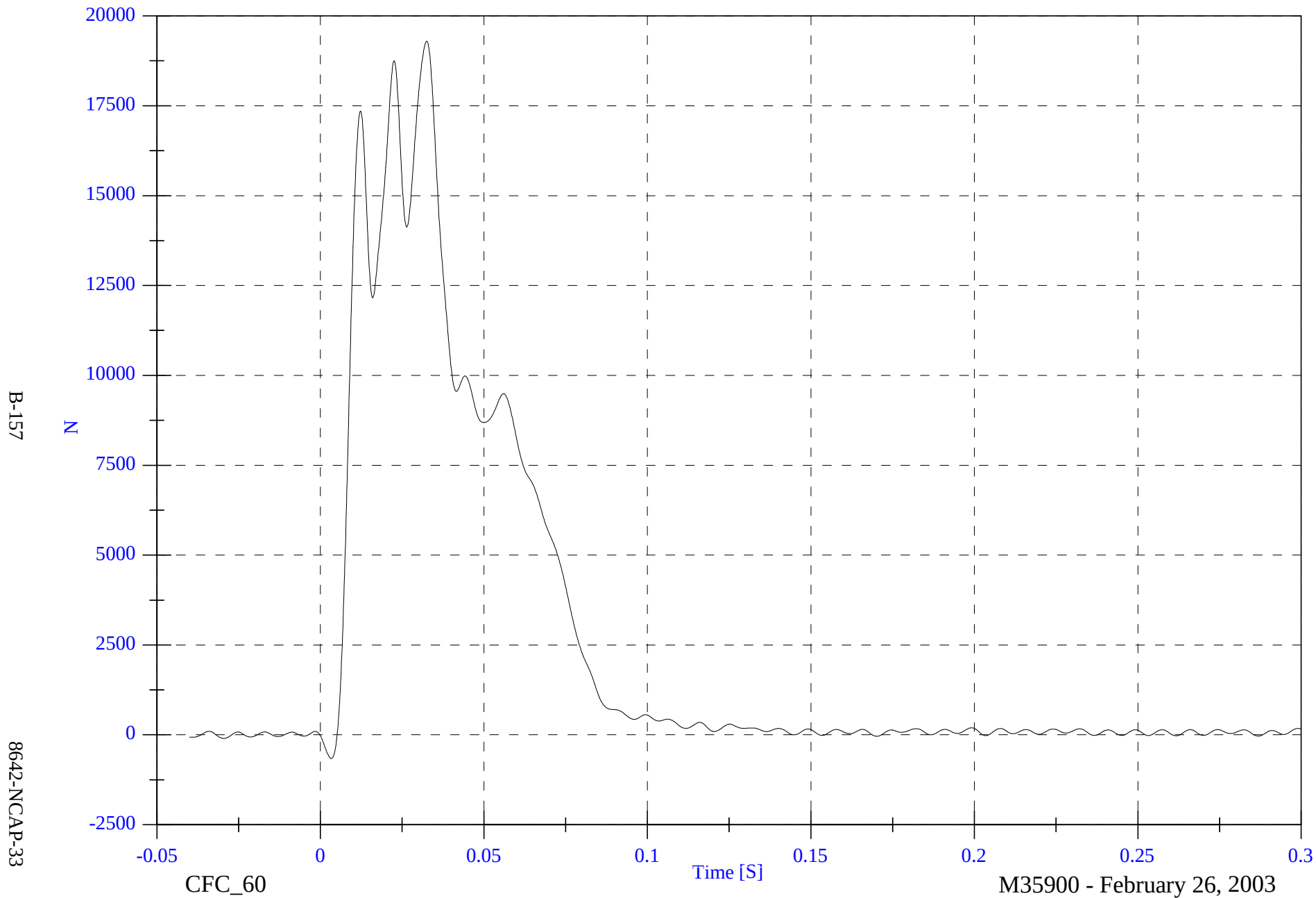


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B8 Fx

Max: 19296.2 [N] at 0.032 [S]

Min: -655.4 [N] at 0.003 [S]

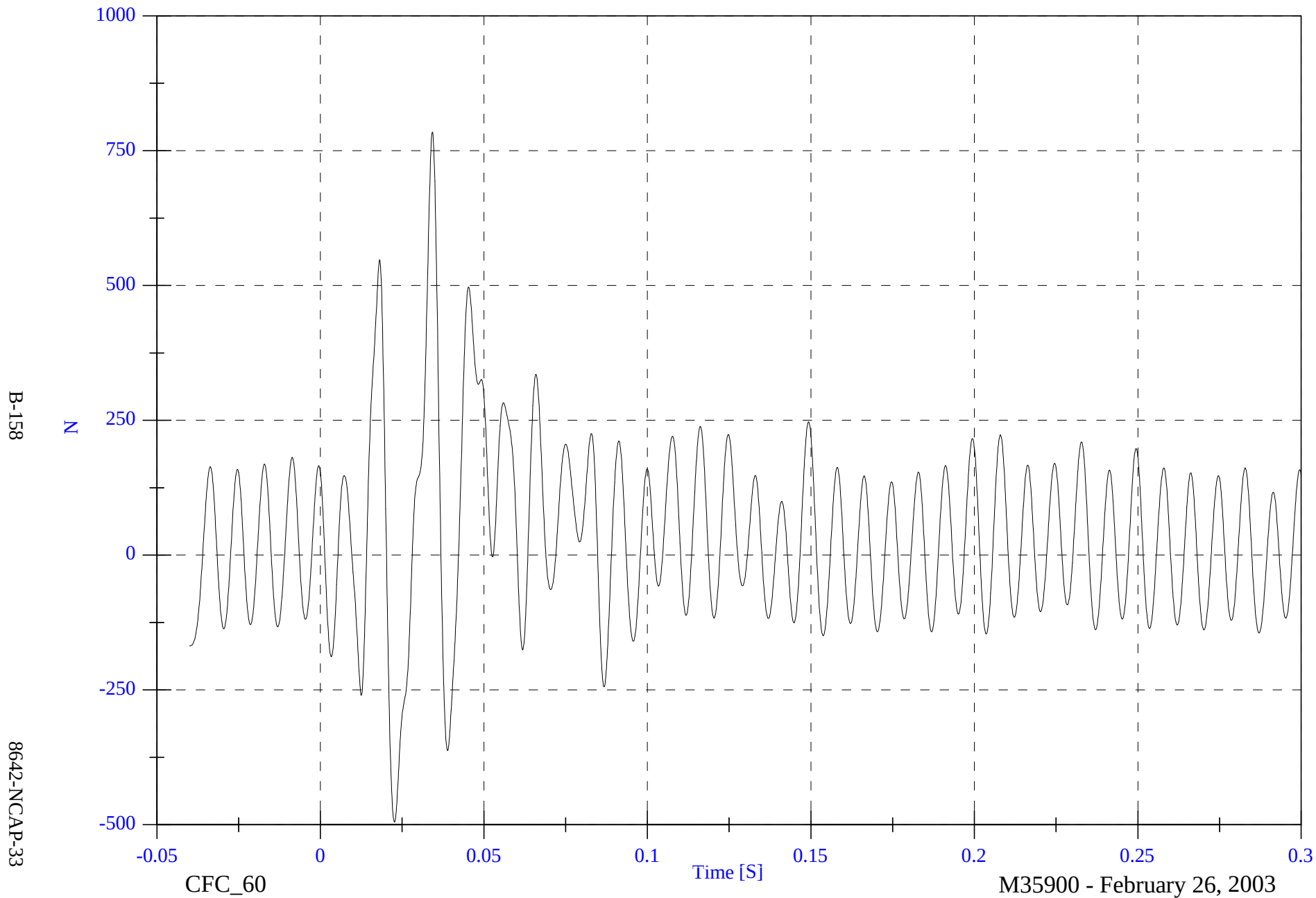


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell B9 Fx

Max: 784.7 [N] at 0.034 [S]

Min: -495.3 [N] at 0.023 [S]

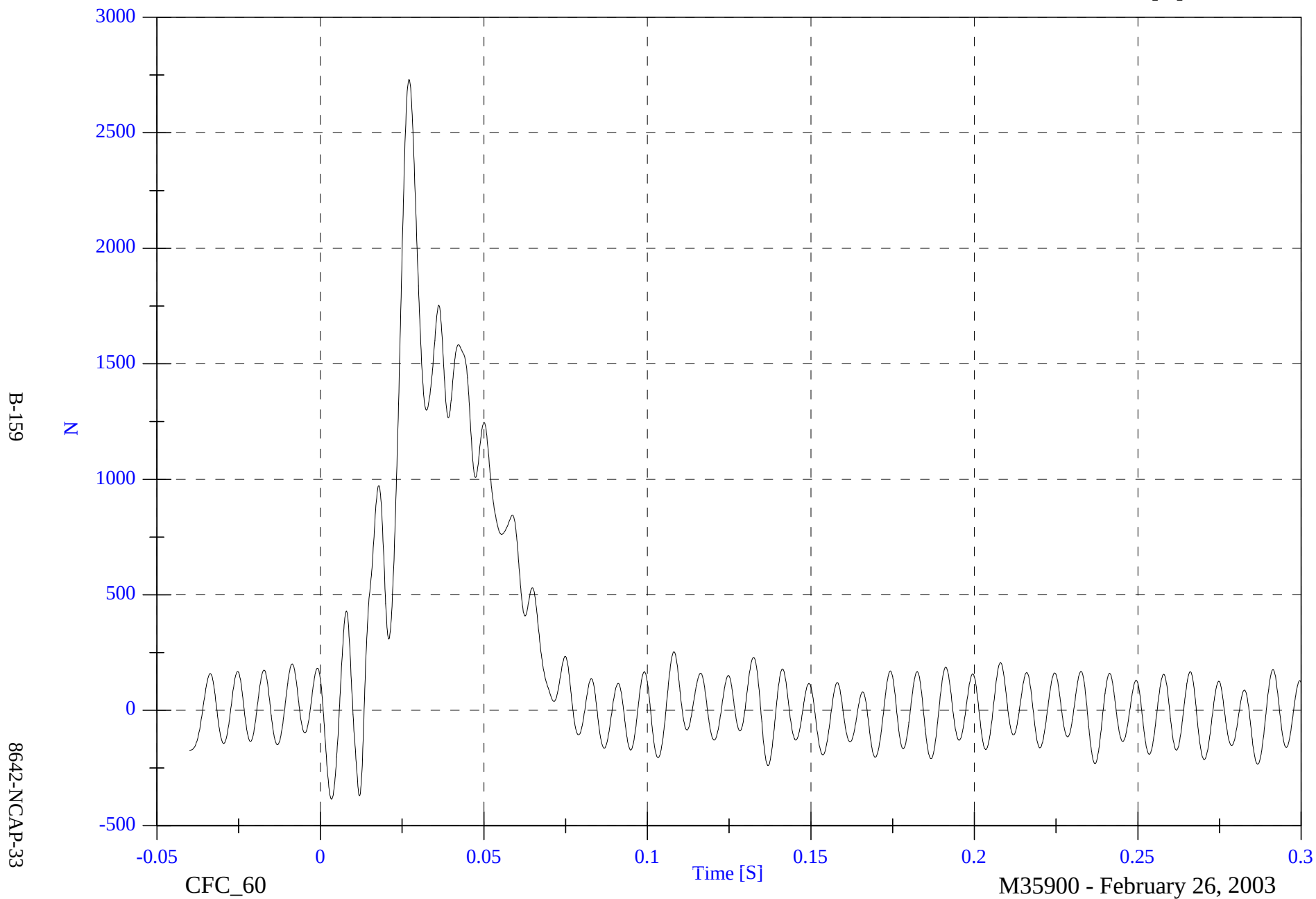


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C1 Fx

Max: 2731.0 [N] at 0.027 [S]

Min: -385.0 [N] at 0.003 [S]

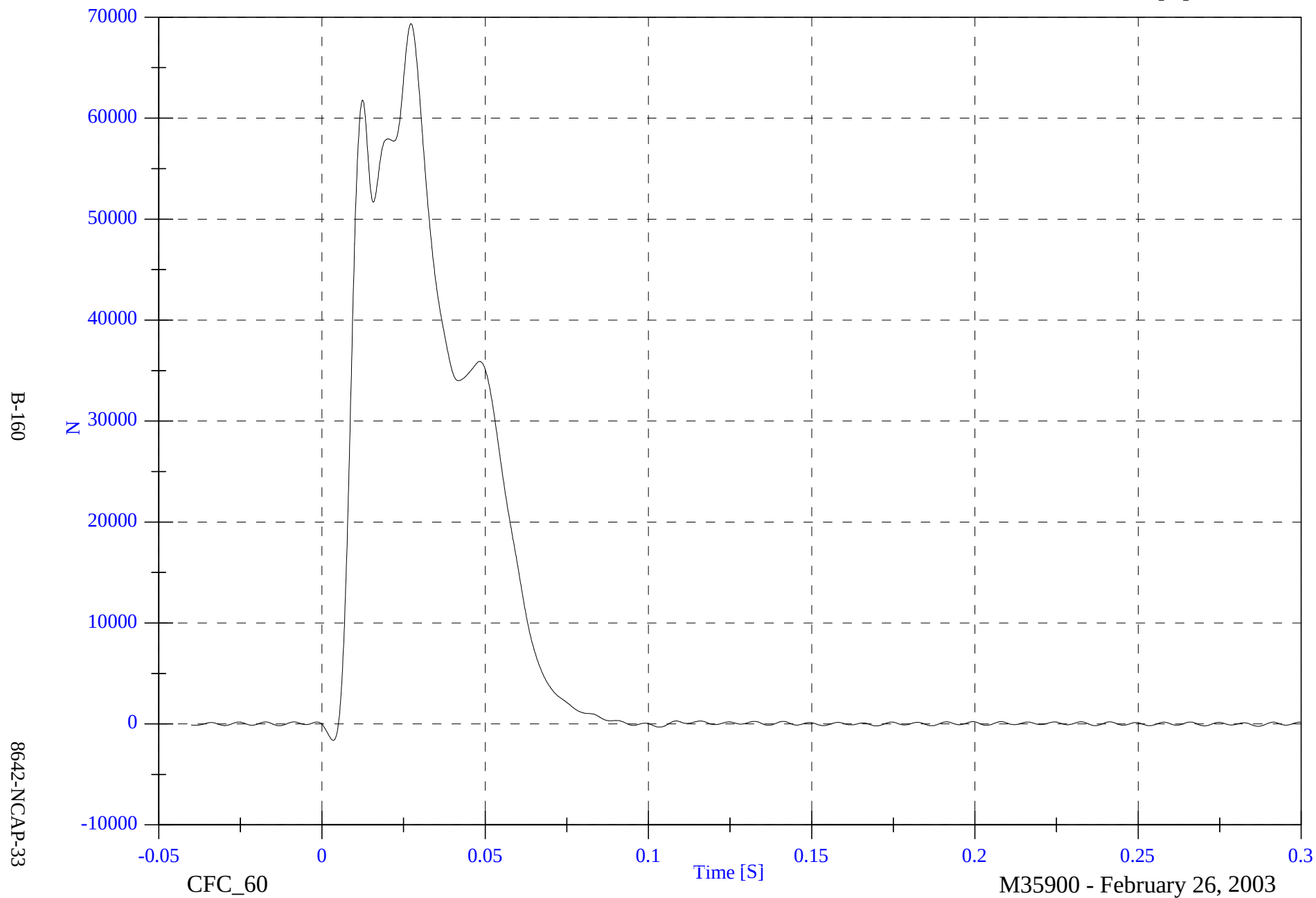


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C2 Fx

Max: 69357.9 [N] at 0.027 [S]

Min: -1628.1 [N] at 0.003 [S]

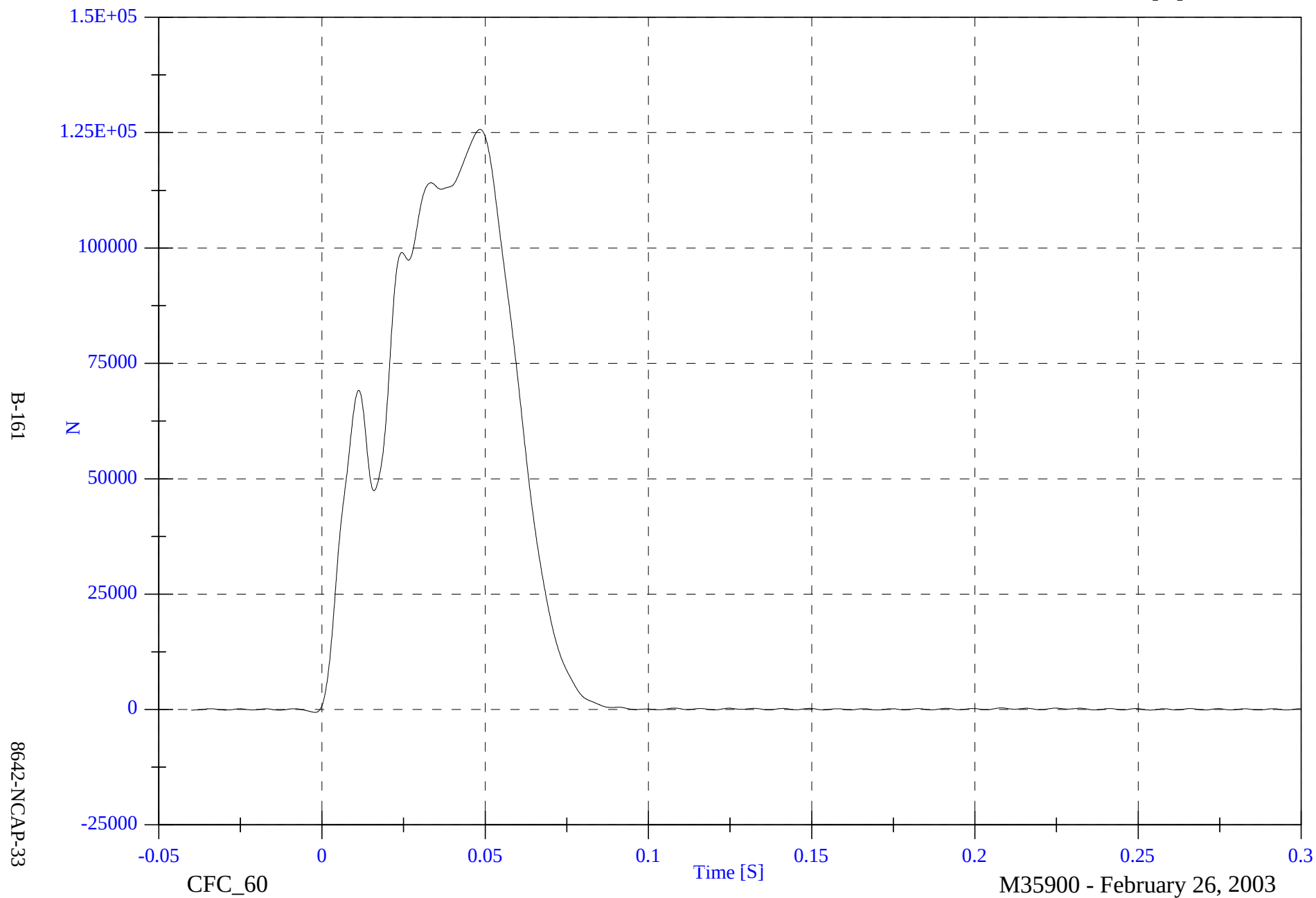


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C3 Fx

Max: 125706.2 [N] at 0.048 [S]

Min: -624.9 [N] at -0.002 [S]

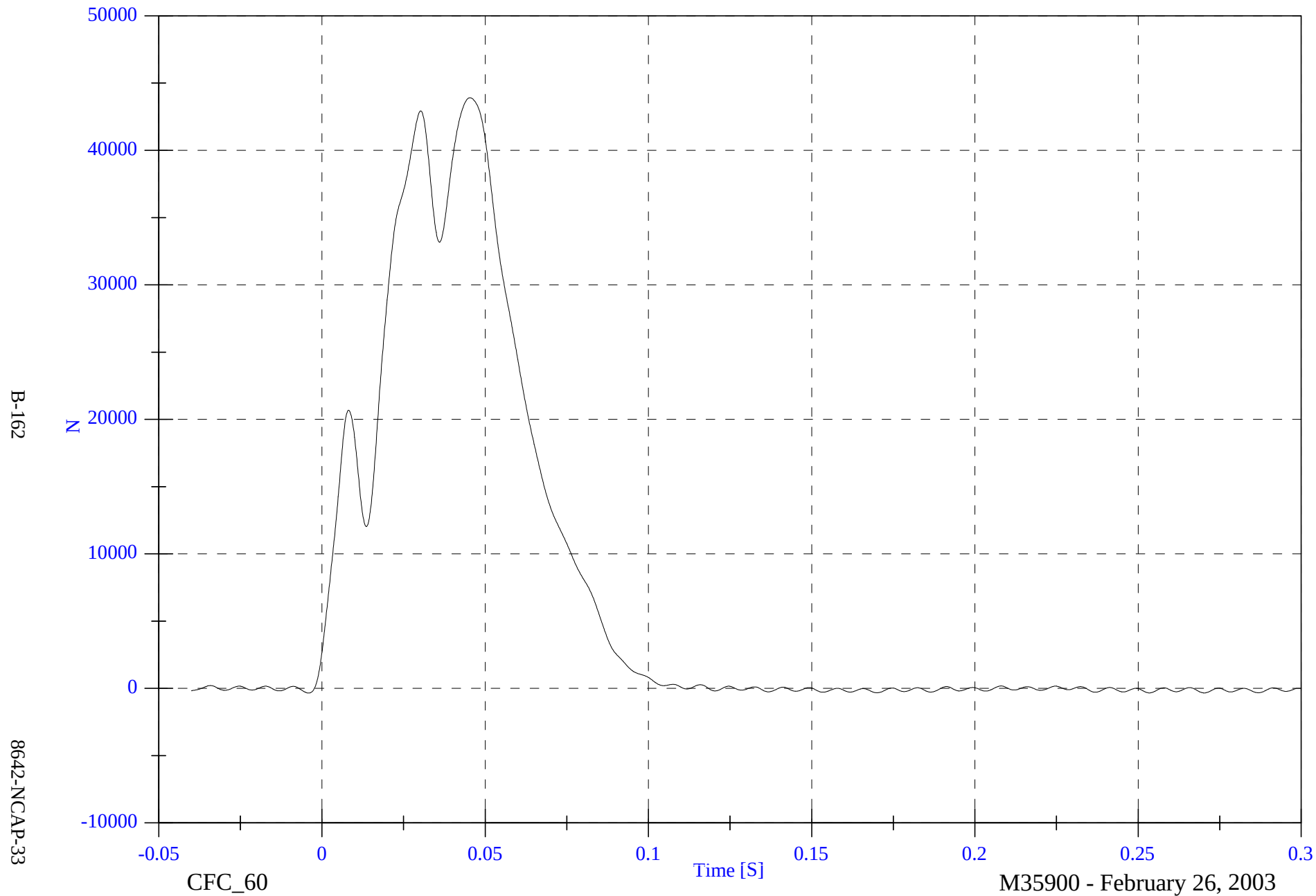


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C4 Fx

Max: 43912.4 [N] at 0.045 [S]

Min: -345.4 [N] at -0.004 [S]

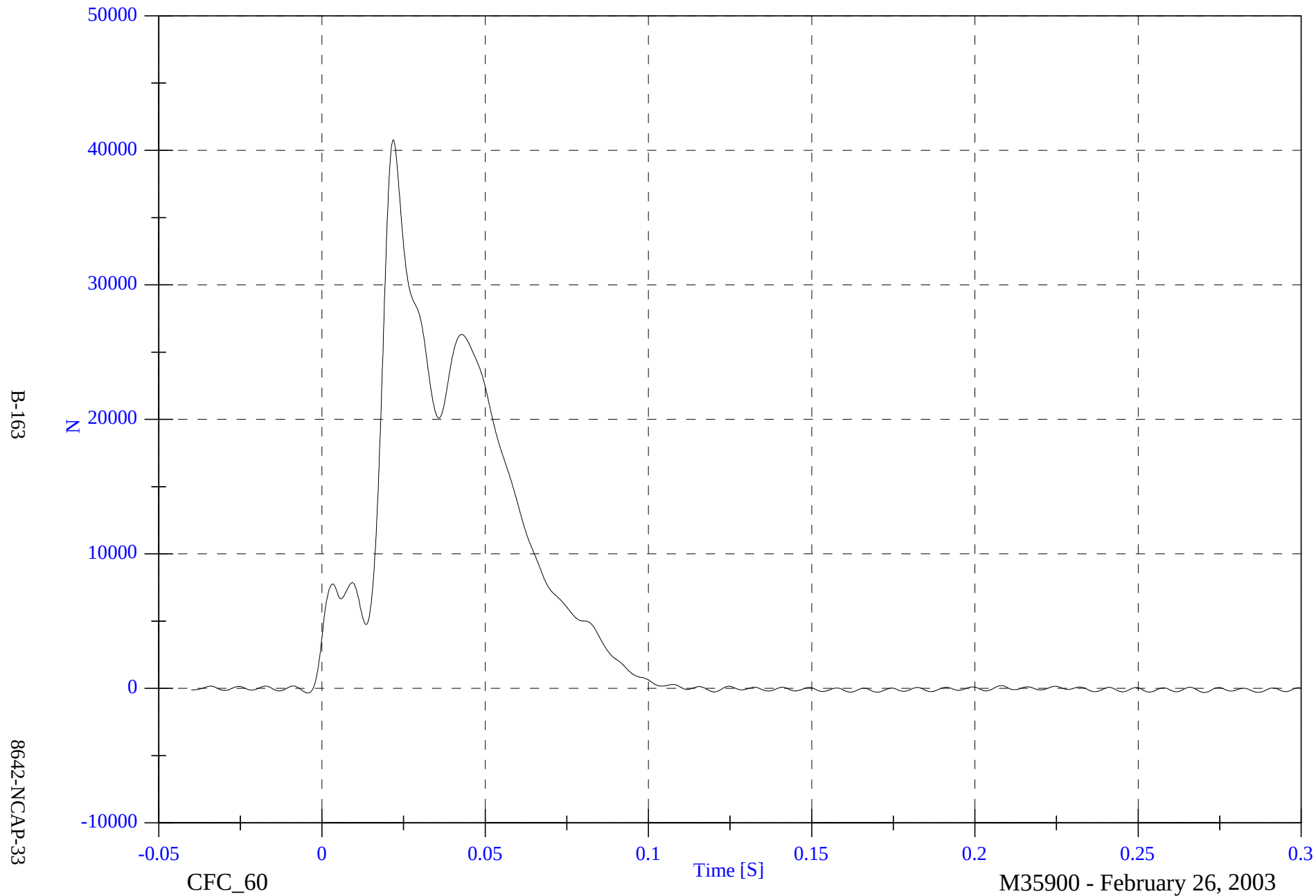


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C5 Fx

Max: 40771.5 [N] at 0.022 [S]

Min: -342.3 [N] at -0.004 [S]

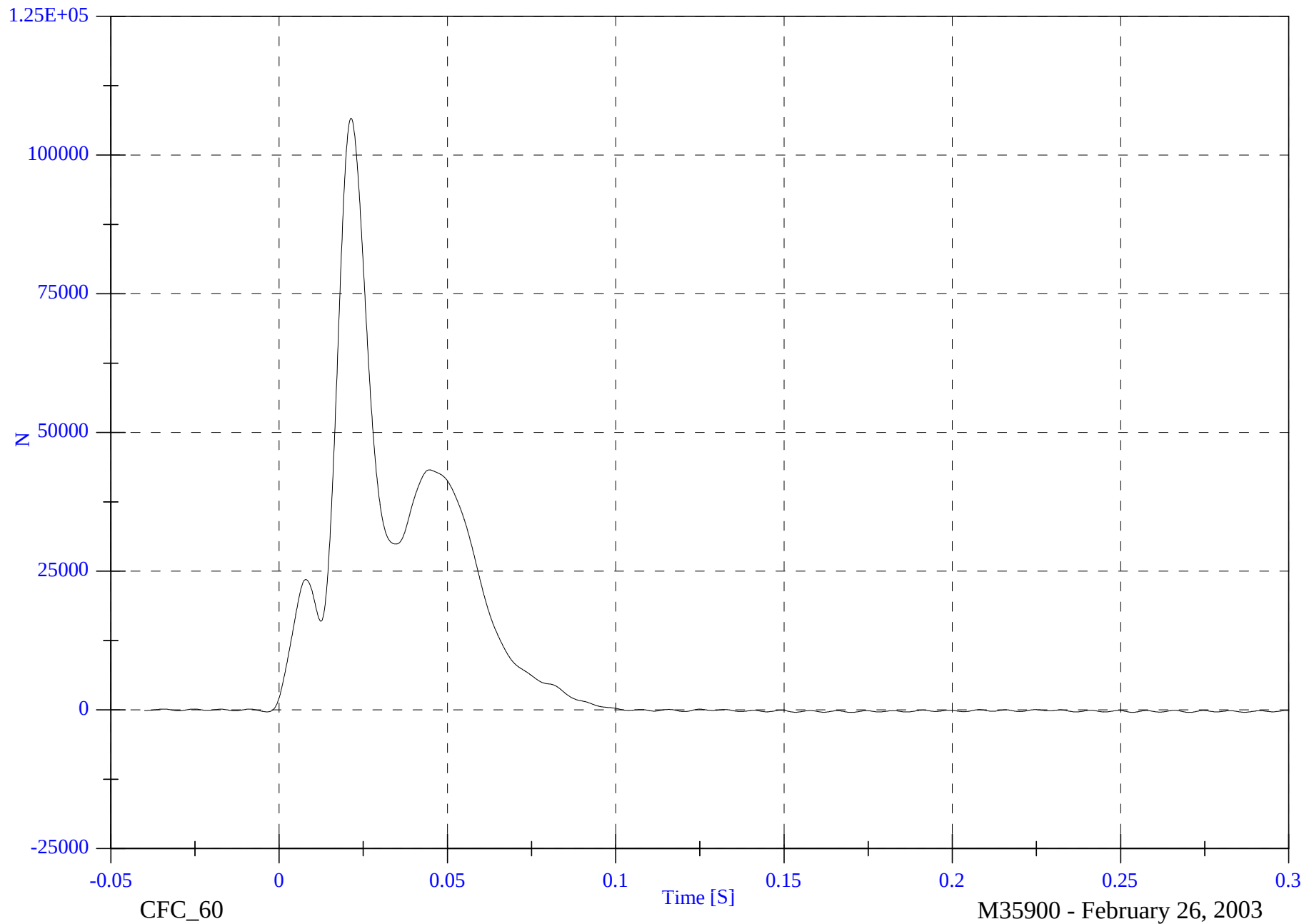


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C6 Fx

Max: 106632.2 [N] at 0.021 [S]

Min: -446.8 [N] at 0.170 [S]



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CFC_60

Time [S]

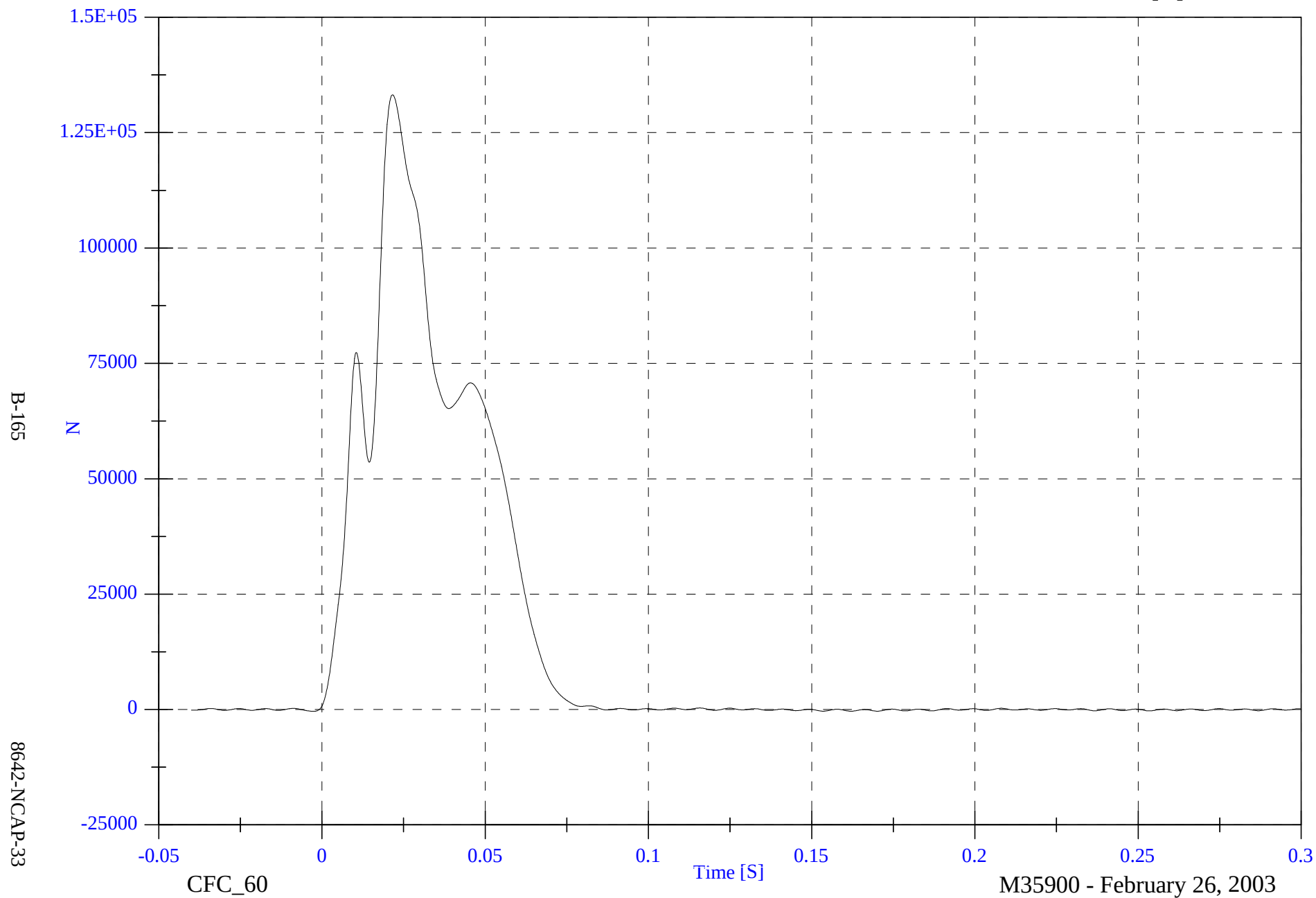
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Barrier Load Cell C7 Fx

Max: 133179.4 [N] at 0.022 [S]

Min: -379.8 [N] at -0.003 [S]

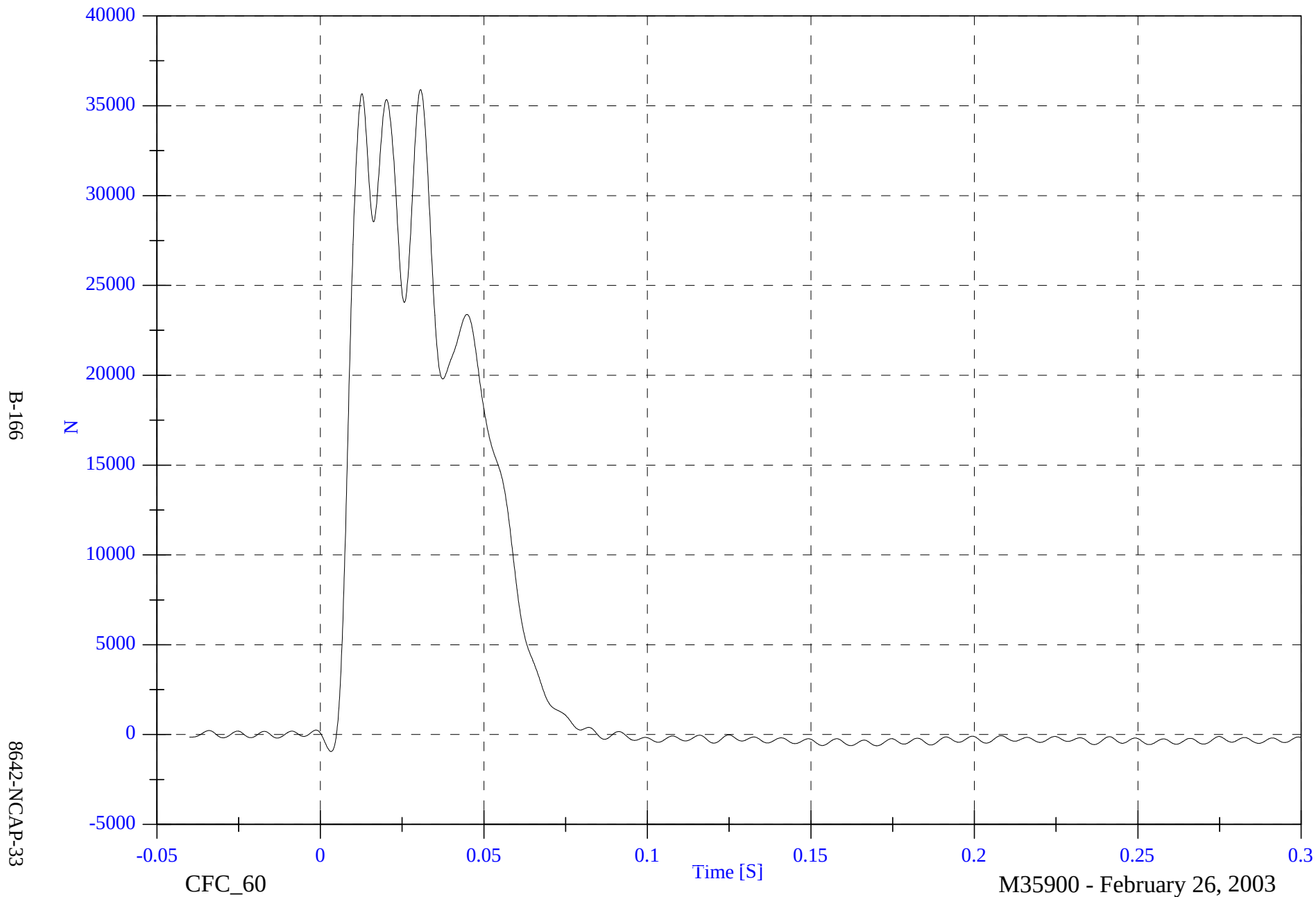


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C8 Fx

Max: 35898.9 [N] at 0.031 [S]

Min: -939.5 [N] at 0.003 [S]

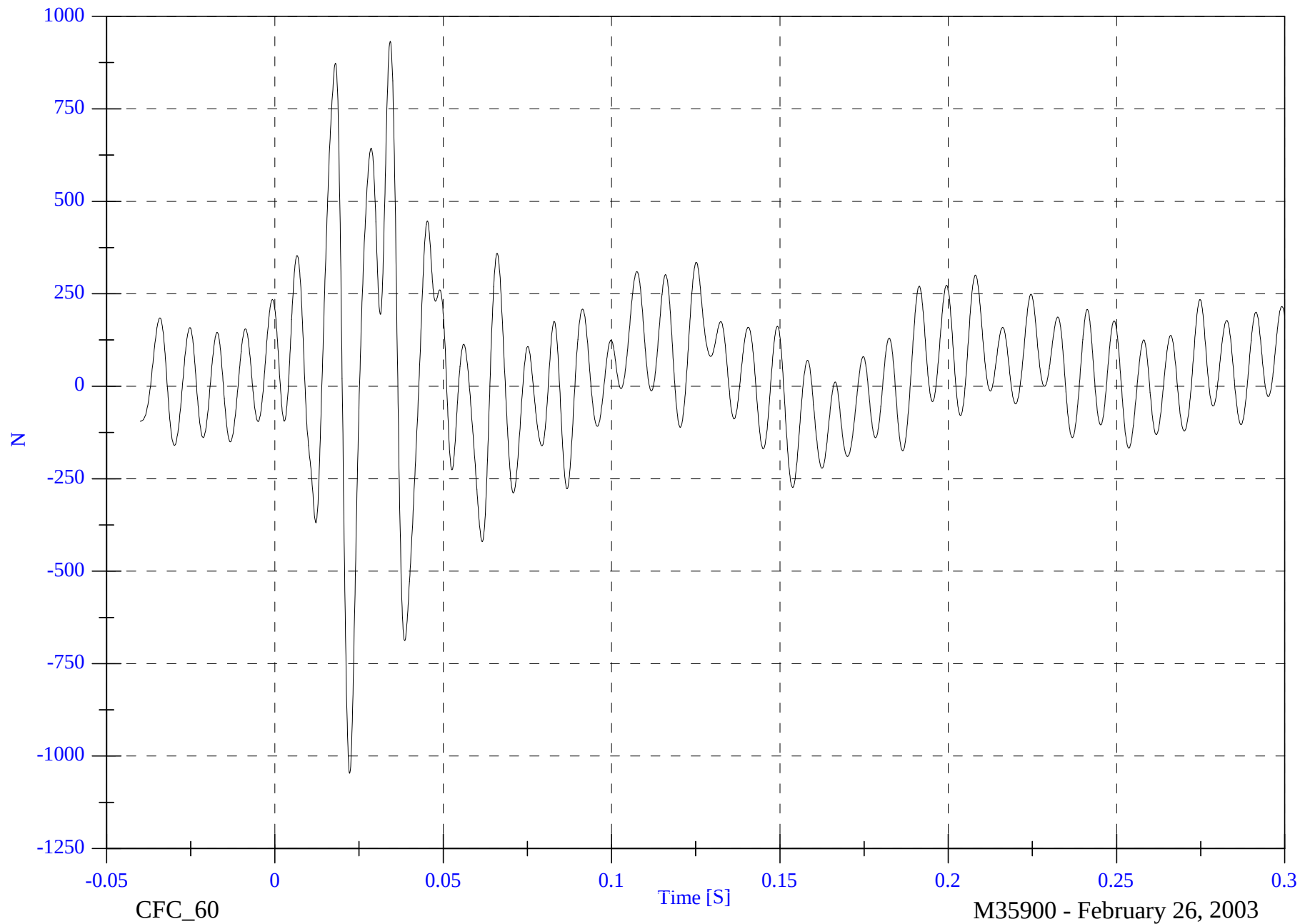


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell C9 Fx

Max: 932.3 [N] at 0.034 [S]

Min: -1046.8 [N] at 0.022 [S]



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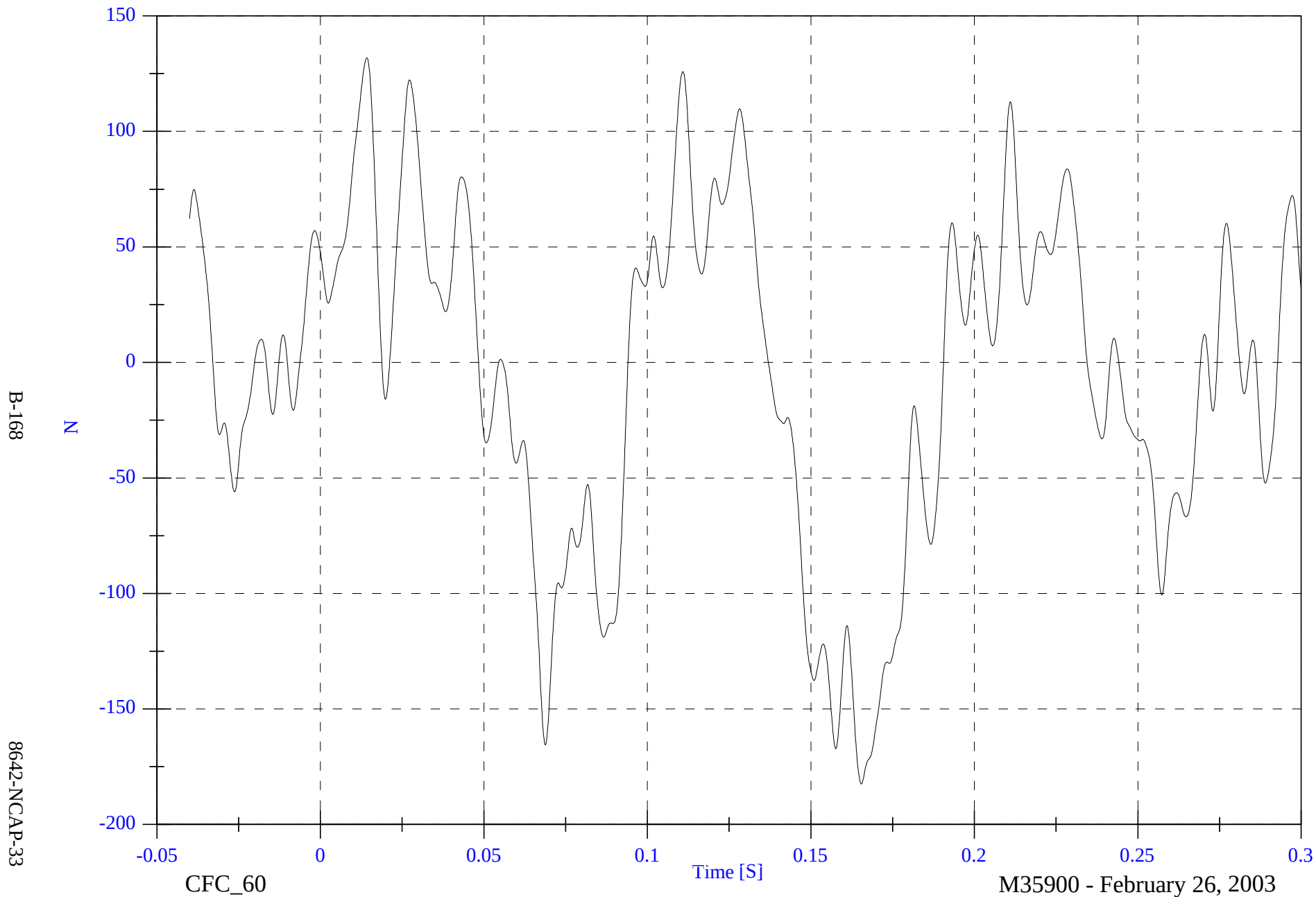
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NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D1 Fx

Max: 131.8 [N] at 0.014 [S]

Min: -182.5 [N] at 0.165 [S]

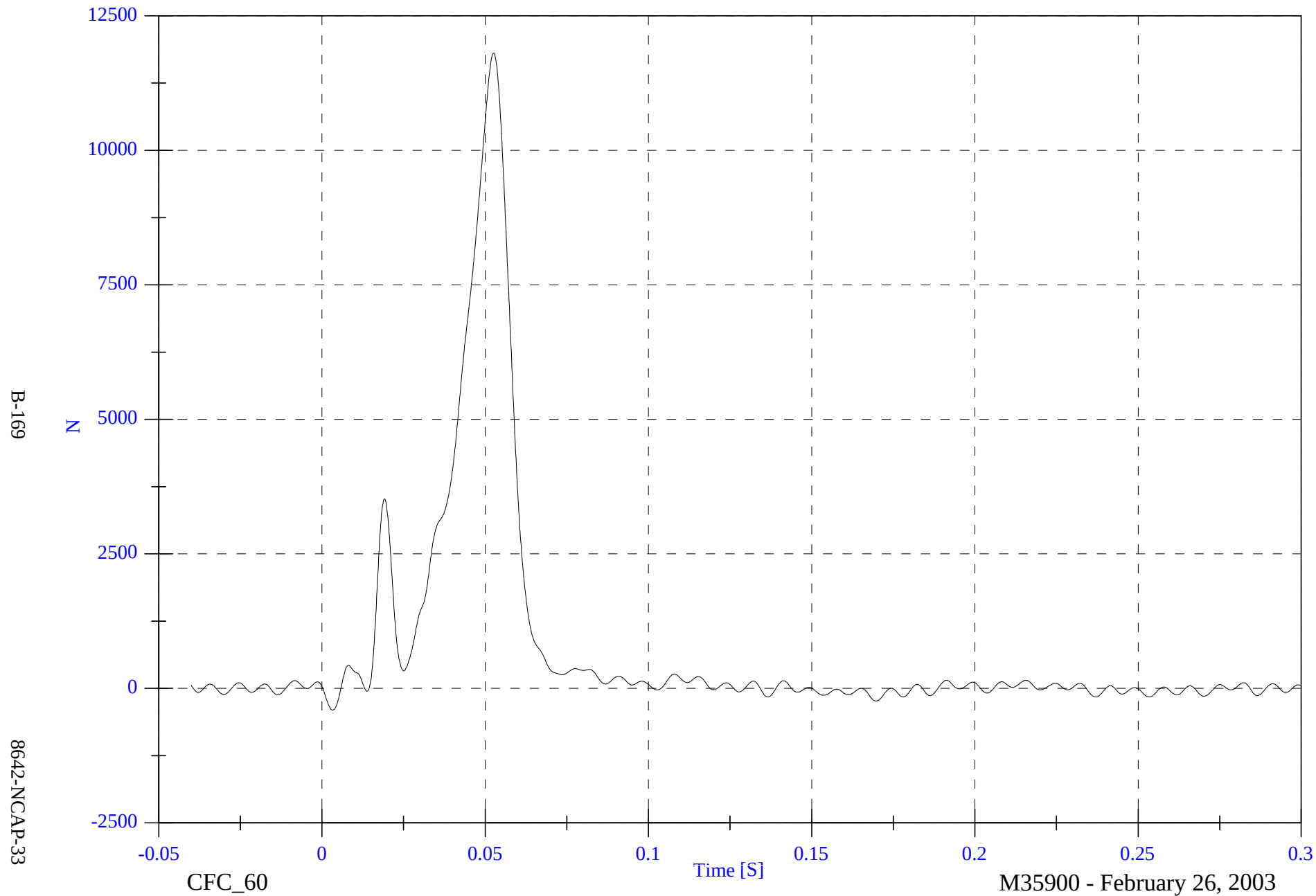


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D2 Fx

Max: 11807.9 [N] at 0.053 [S]

Min: -402.3 [N] at 0.003 [S]

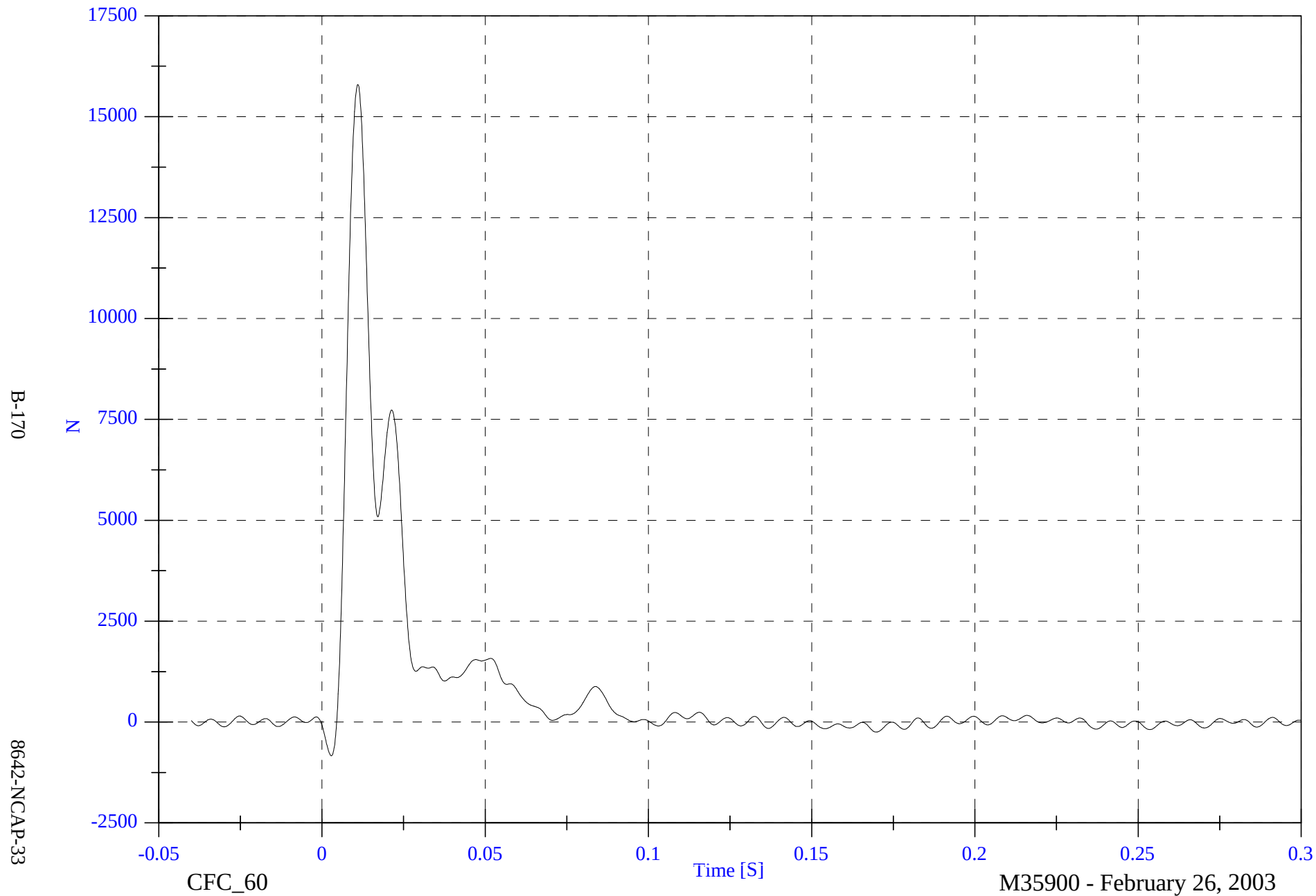


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D3 Fx

Max: 15800.5 [N] at 0.011 [S]

Min: -836.2 [N] at 0.003 [S]

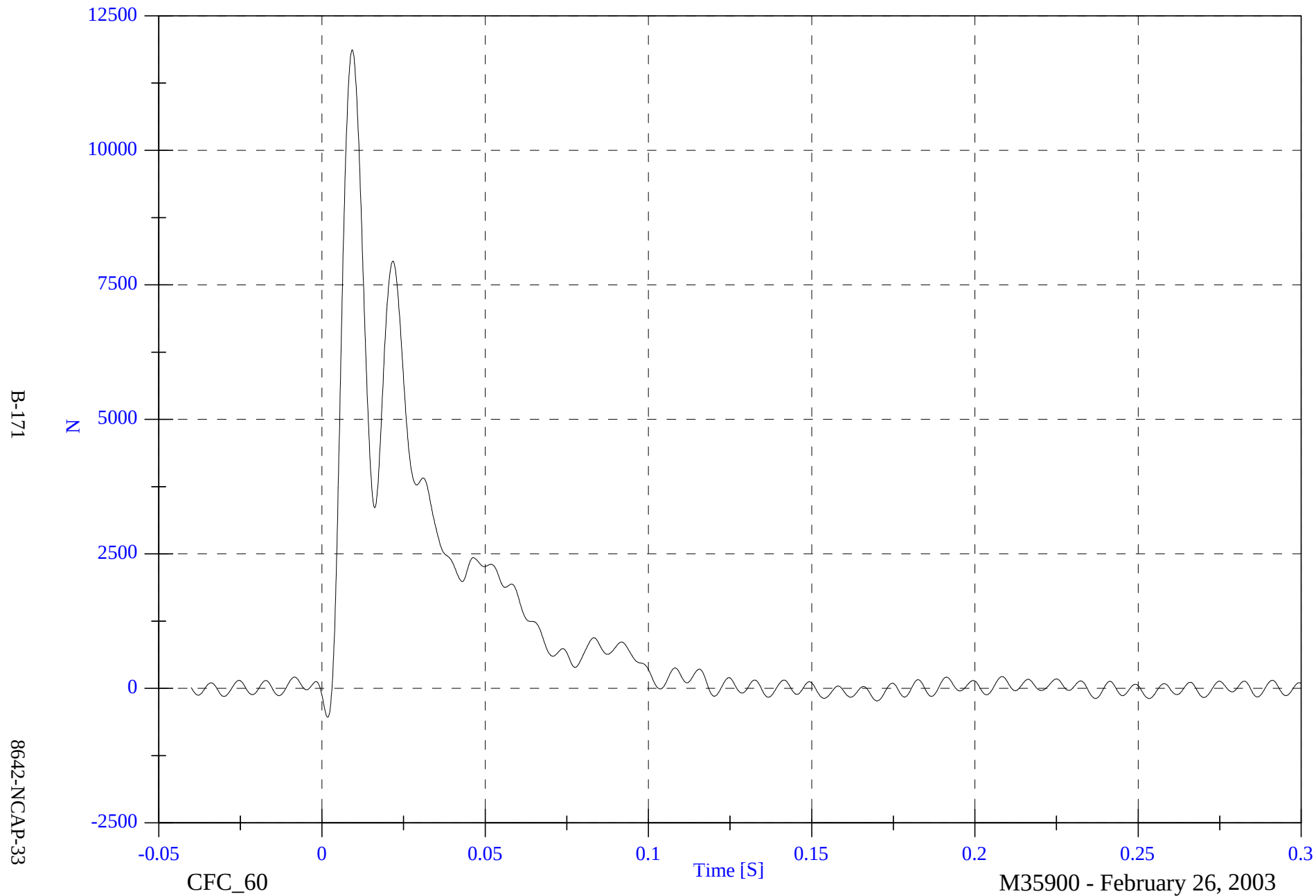


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D4 Fx

Max: 11869.4 [N] at 0.009 [S]

Min: -537.1 [N] at 0.002 [S]

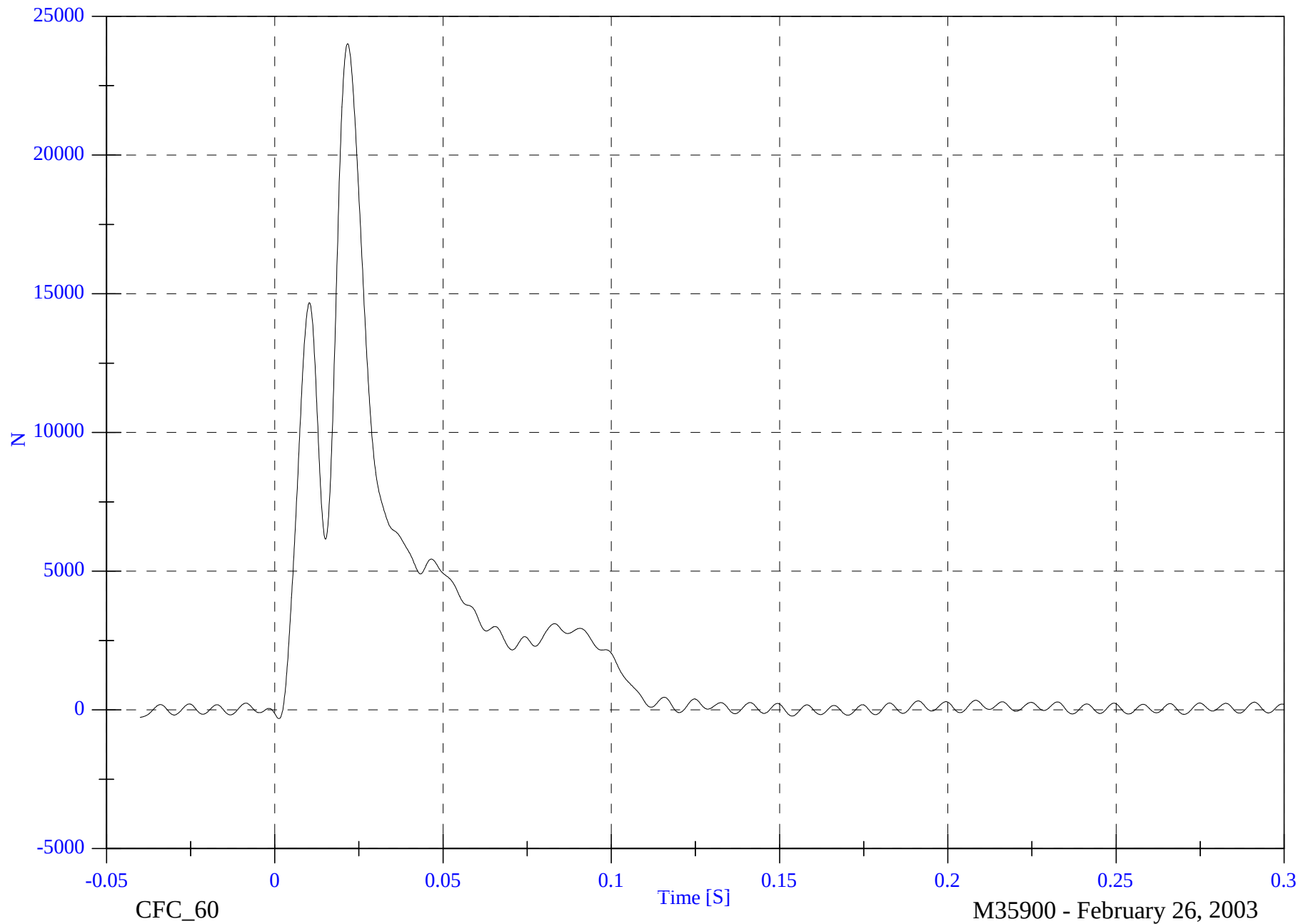


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D5 Fx

Max: 24014.7 [N] at 0.022 [S]

Min: -313.8 [N] at 0.001 [S]



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Time [S]

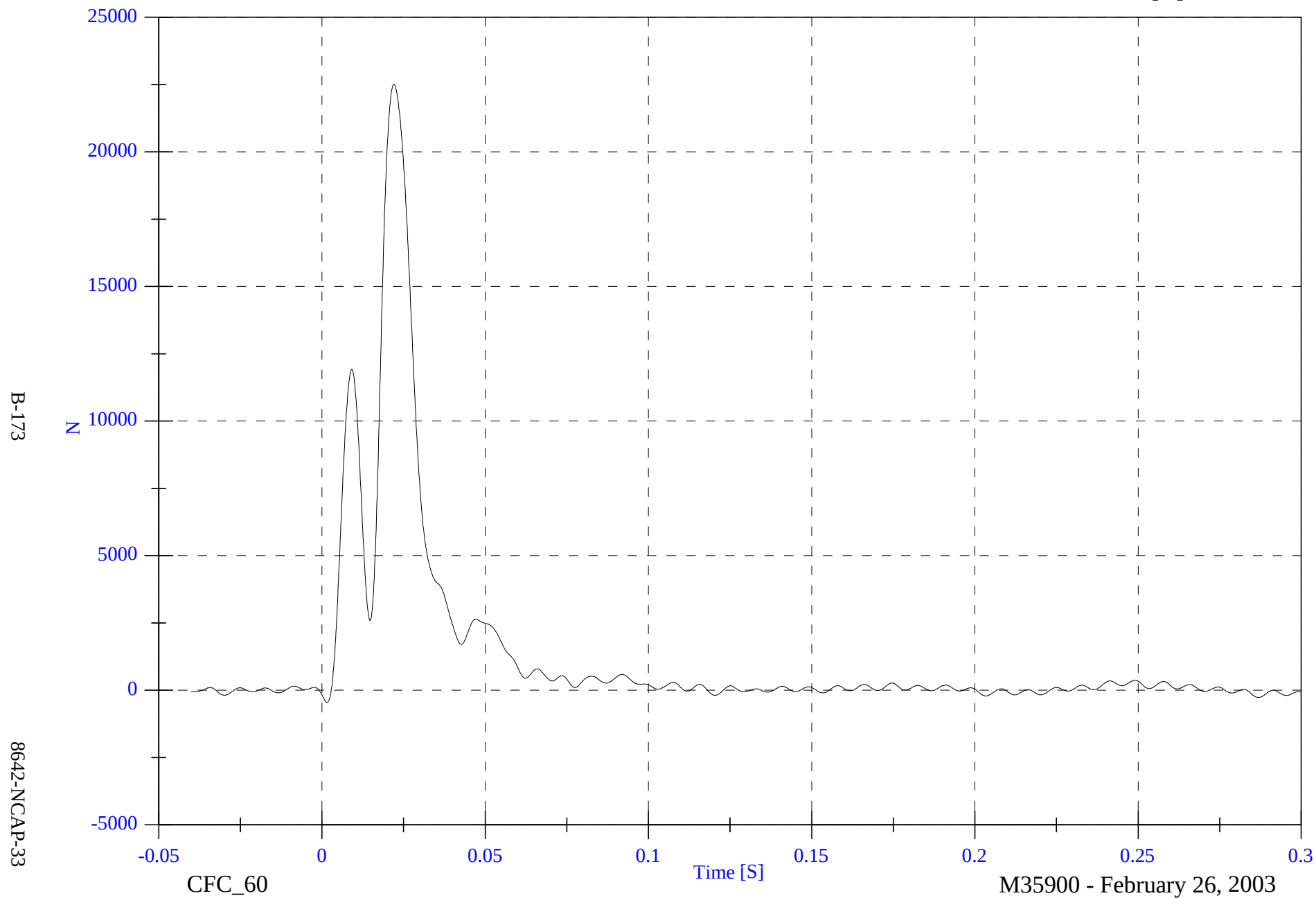
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NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D6 Fx

Max: 22511.5 [N] at 0.022 [S]

Min: -451.7 [N] at 0.002 [S]

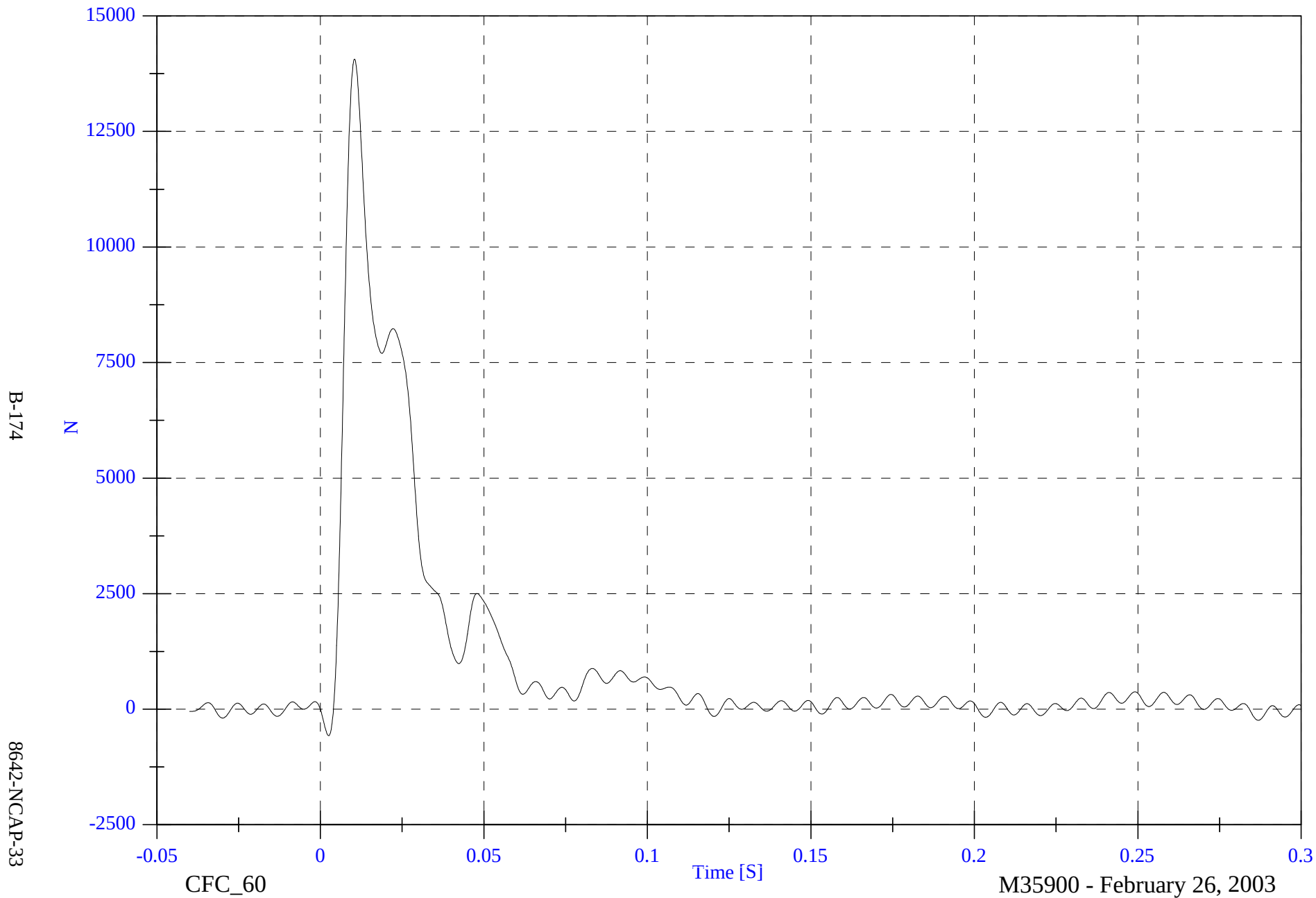


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D7 Fx

Max: 14062.6 [N] at 0.010 [S]

Min: -572.9 [N] at 0.003 [S]

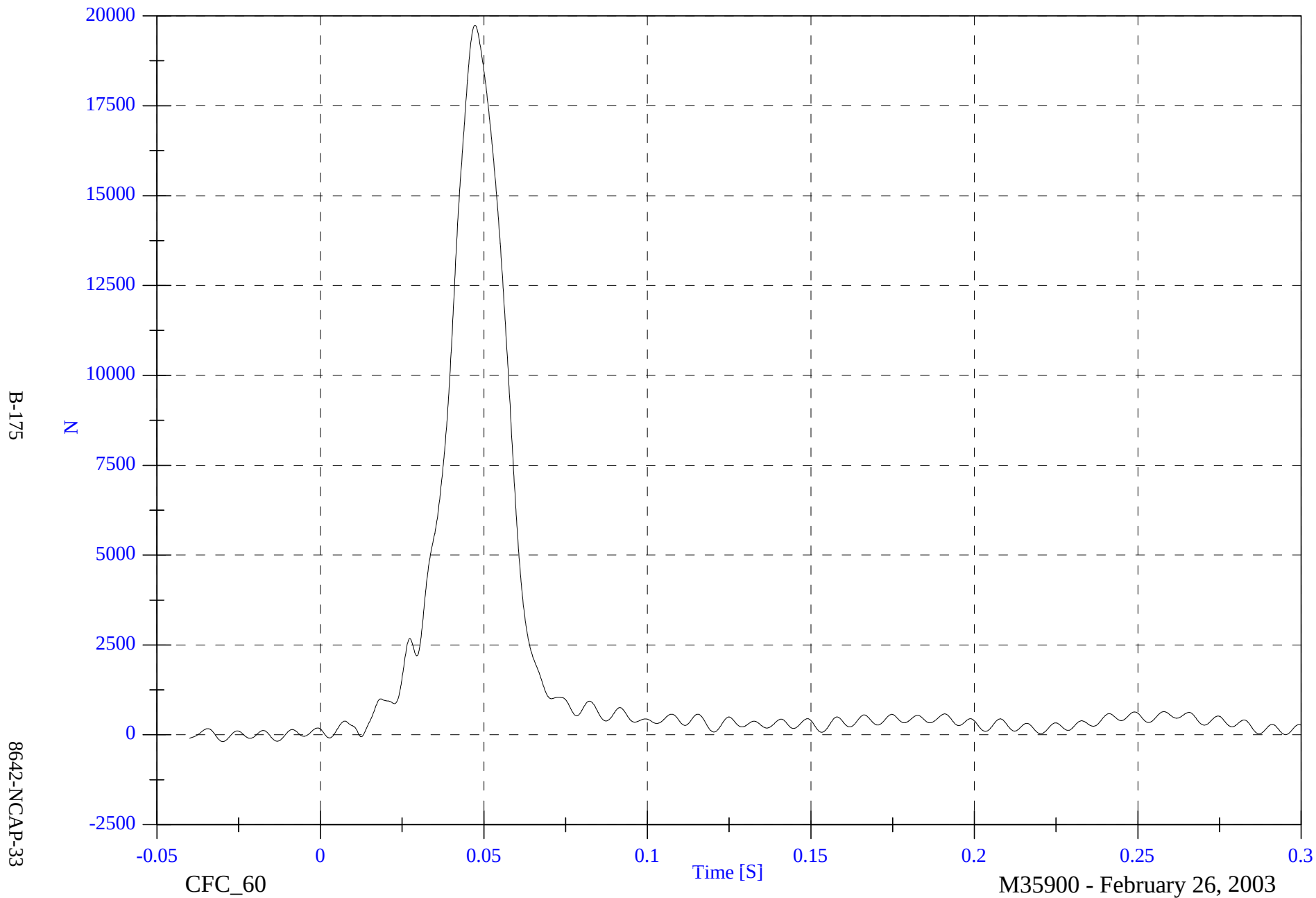


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D8 Fx

Max: 19739.5 [N] at 0.047 [S]

Min: -185.7 [N] at -0.030 [S]

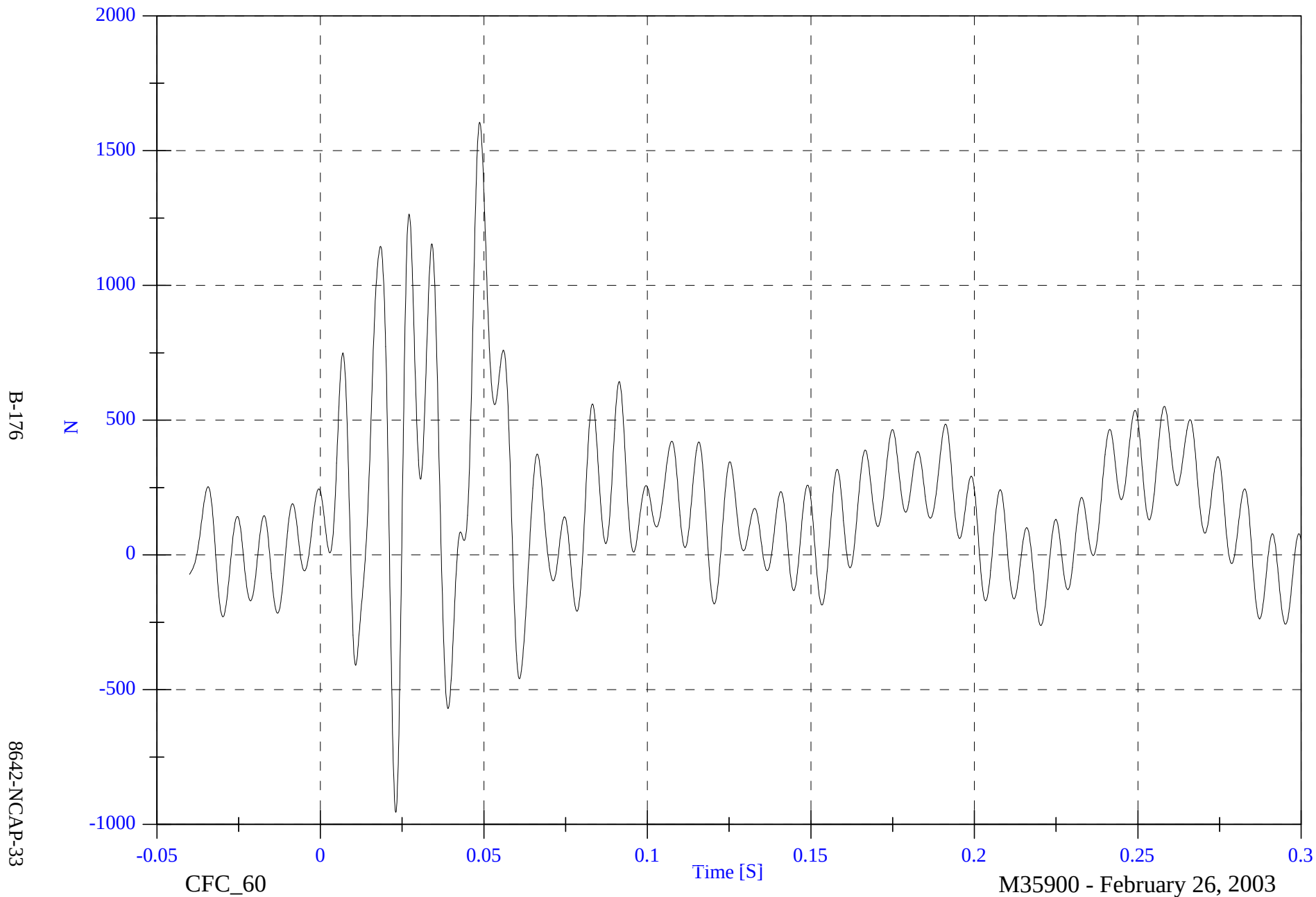


NCAP Test 10 2003 VOLVO XC90

Barrier Load Cell D9 Fx

Max: 1605.4 [N] at 0.049 [S]

Min: -955.7 [N] at 0.023 [S]

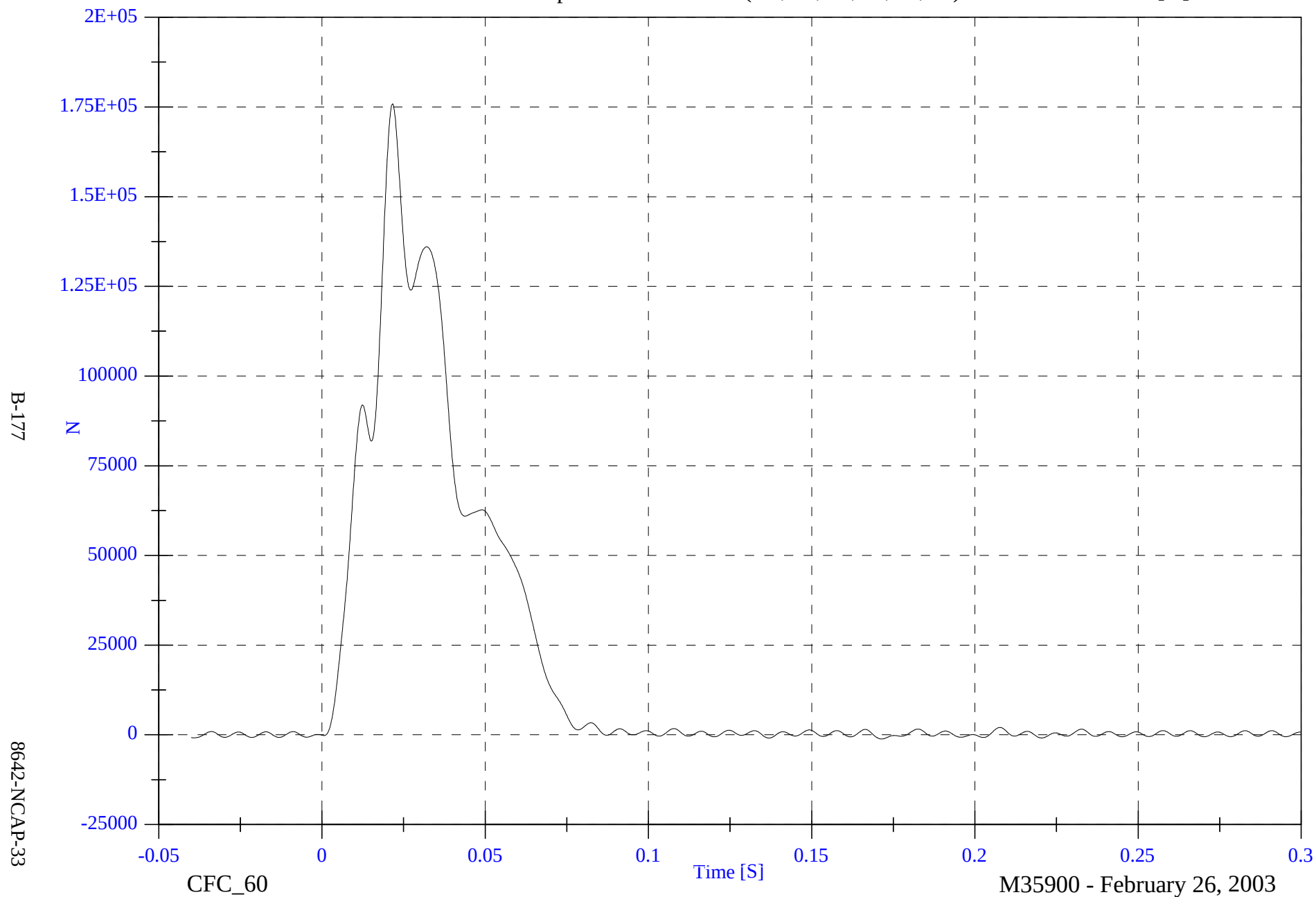


NCAP Test 10 2003 VOLVO XC90

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

Max: 175847.7 [N] at 0.022 [S]

Min: -1152.3 [N] at 0.171 [S]

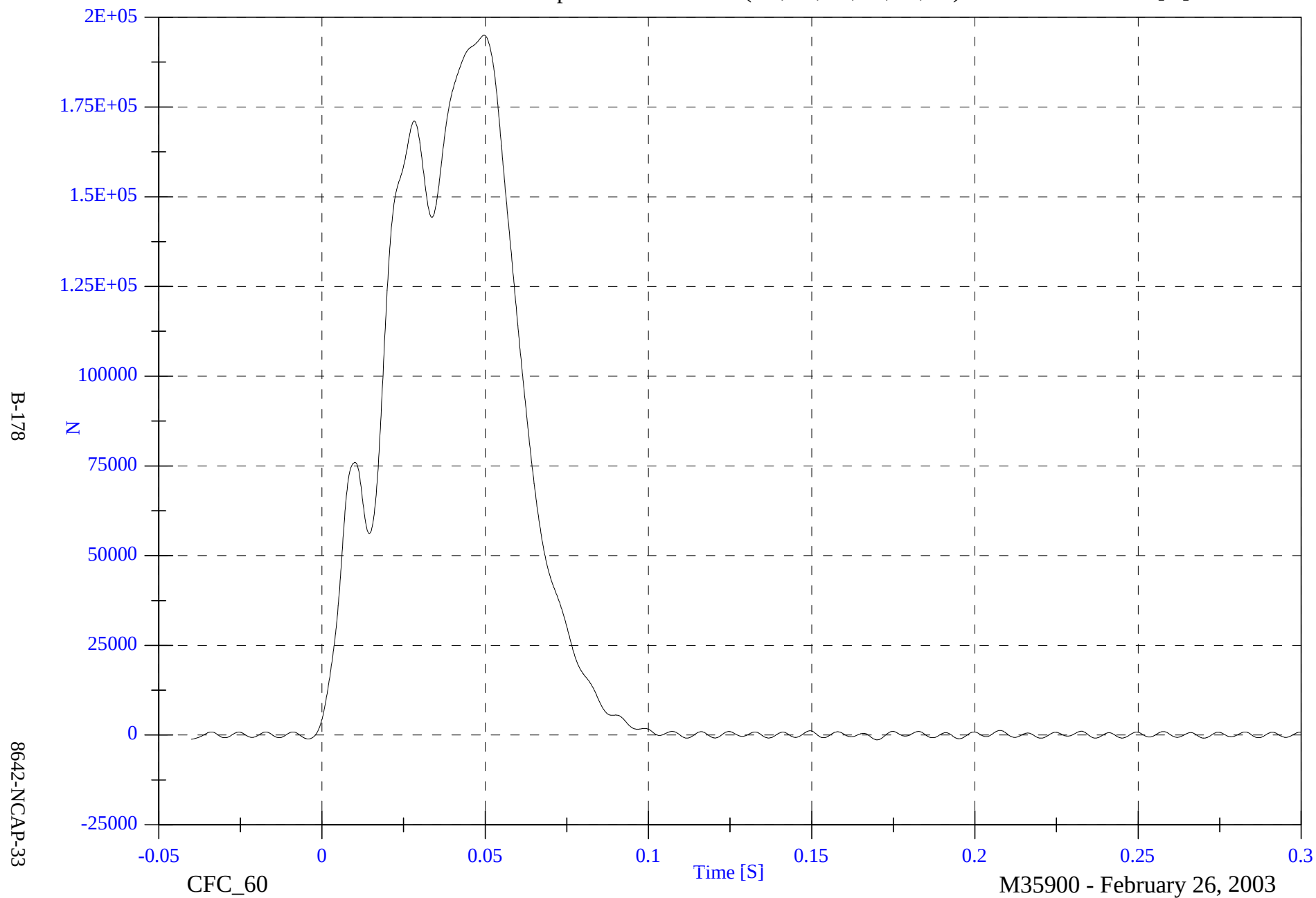


NCAP Test 10 2003 VOLVO XC90

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

Max: 194986.8 [N] at 0.050 [S]

Min: -1311.3 [N] at 0.170 [S]

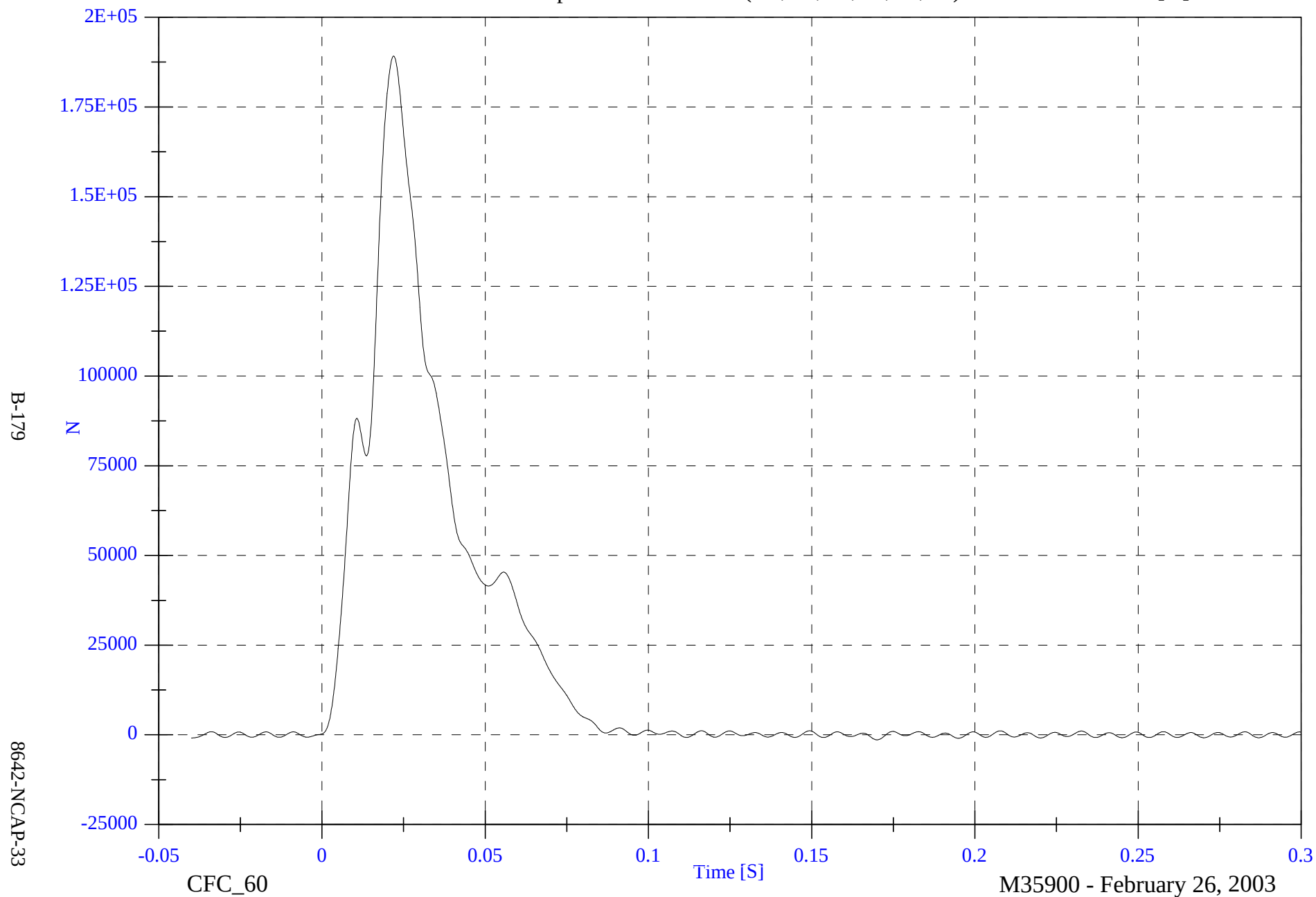


NCAP Test 10 2003 VOLVO XC90

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

Max: 189183.9 [N] at 0.022 [S]

Min: -1366.6 [N] at 0.170 [S]

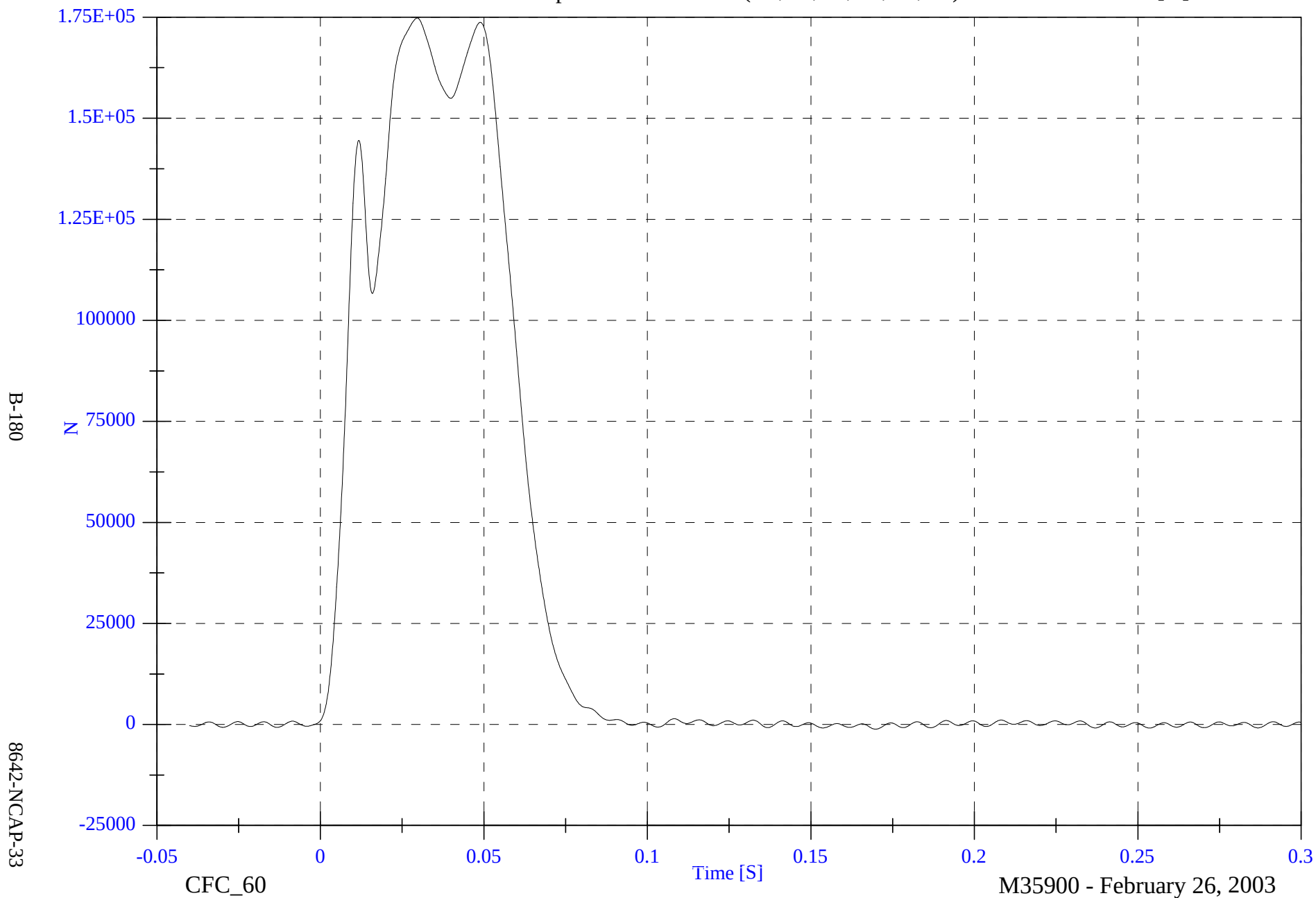


NCAP Test 10 2003 VOLVO XC90

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

Max: 174795.1 [N] at 0.030 [S]

Min: -1153.0 [N] at 0.170 [S]

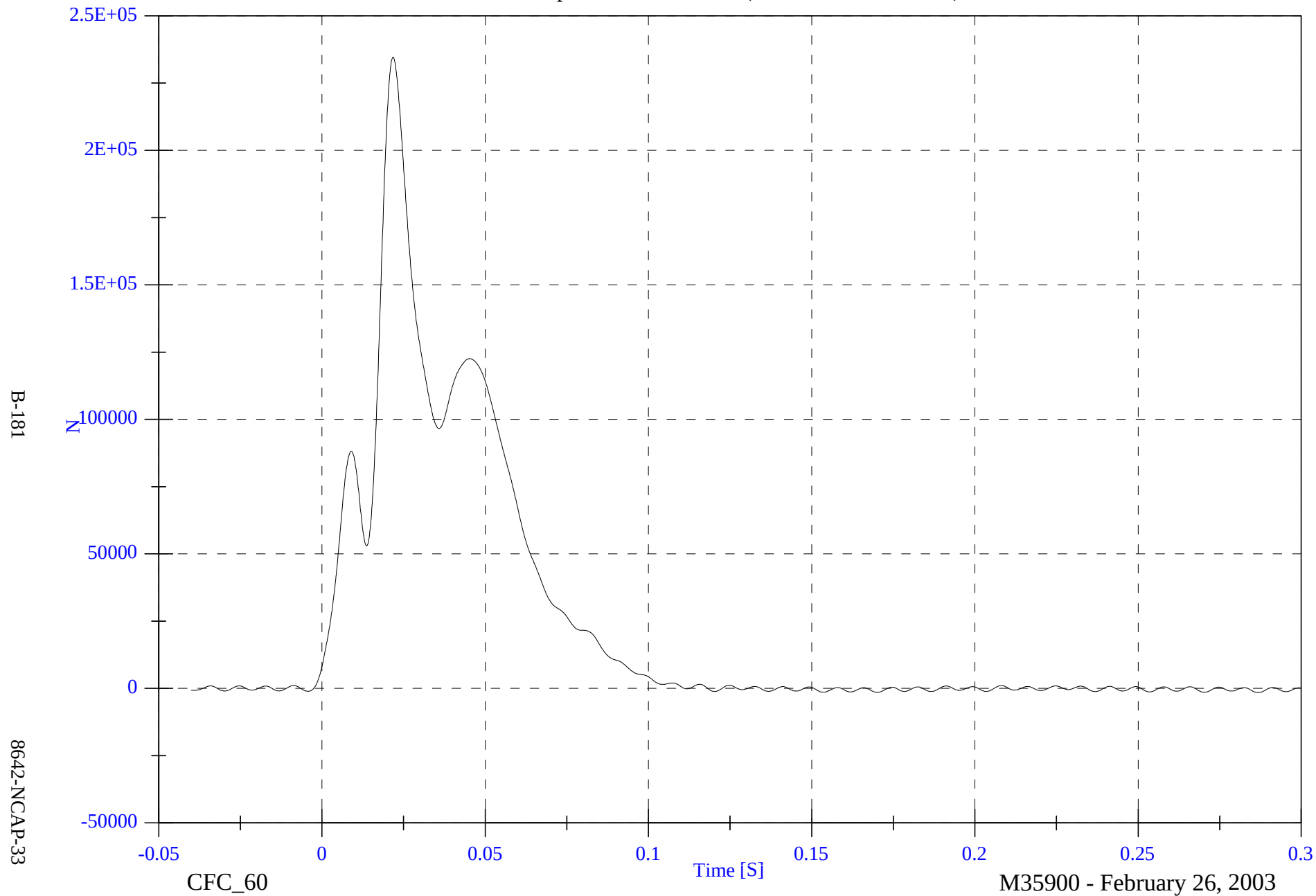


NCAP Test 10 2003 VOLVO XC90

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

Max: 234666.9 [N] at 0.022 [S]

Min: -1580.9 [N] at 0.287 [S]

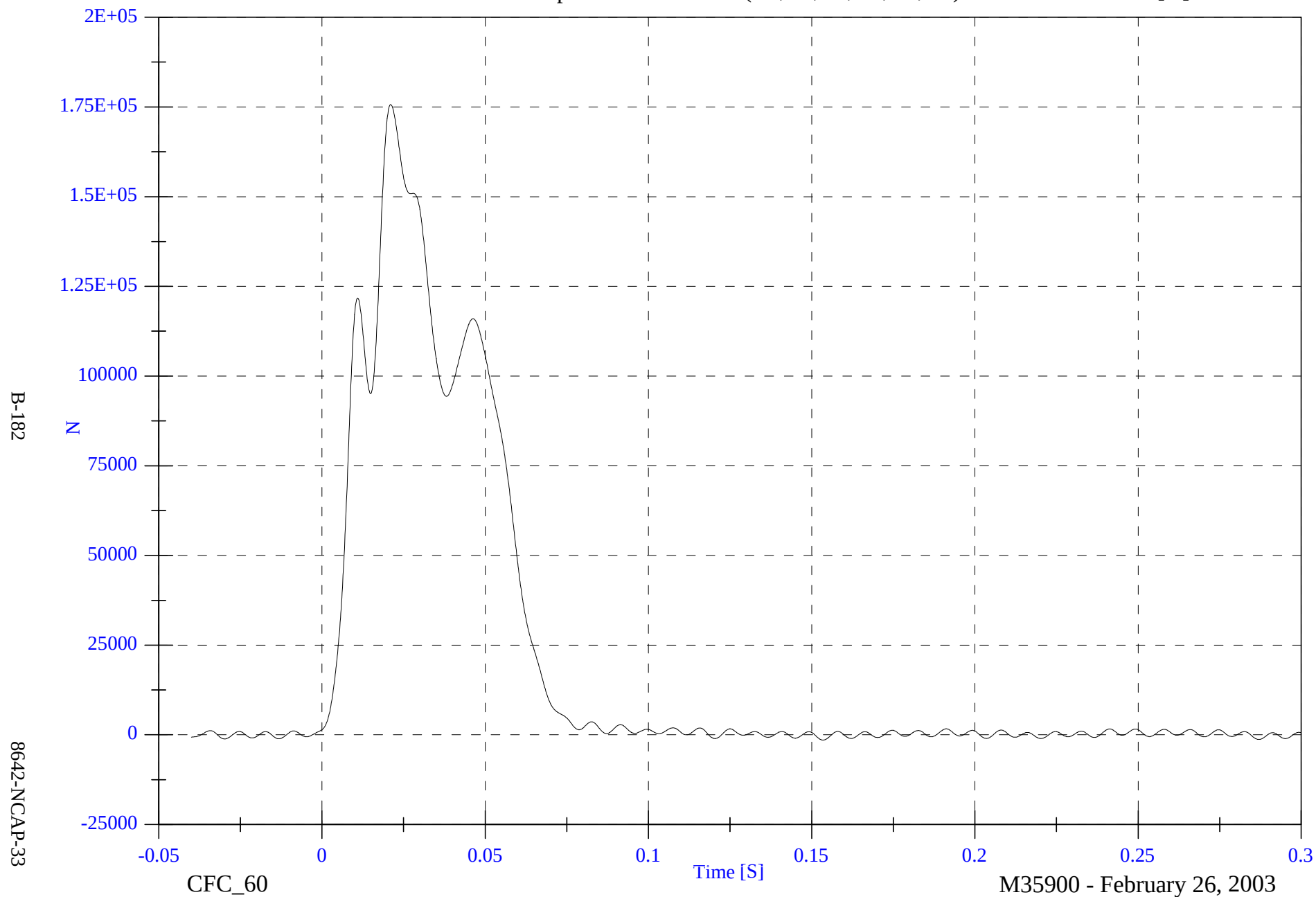


NCAP Test 10 2003 VOLVO XC90

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

Max: 175680.5 [N] at 0.021 [S]

Min: -1440.5 [N] at 0.153 [S]

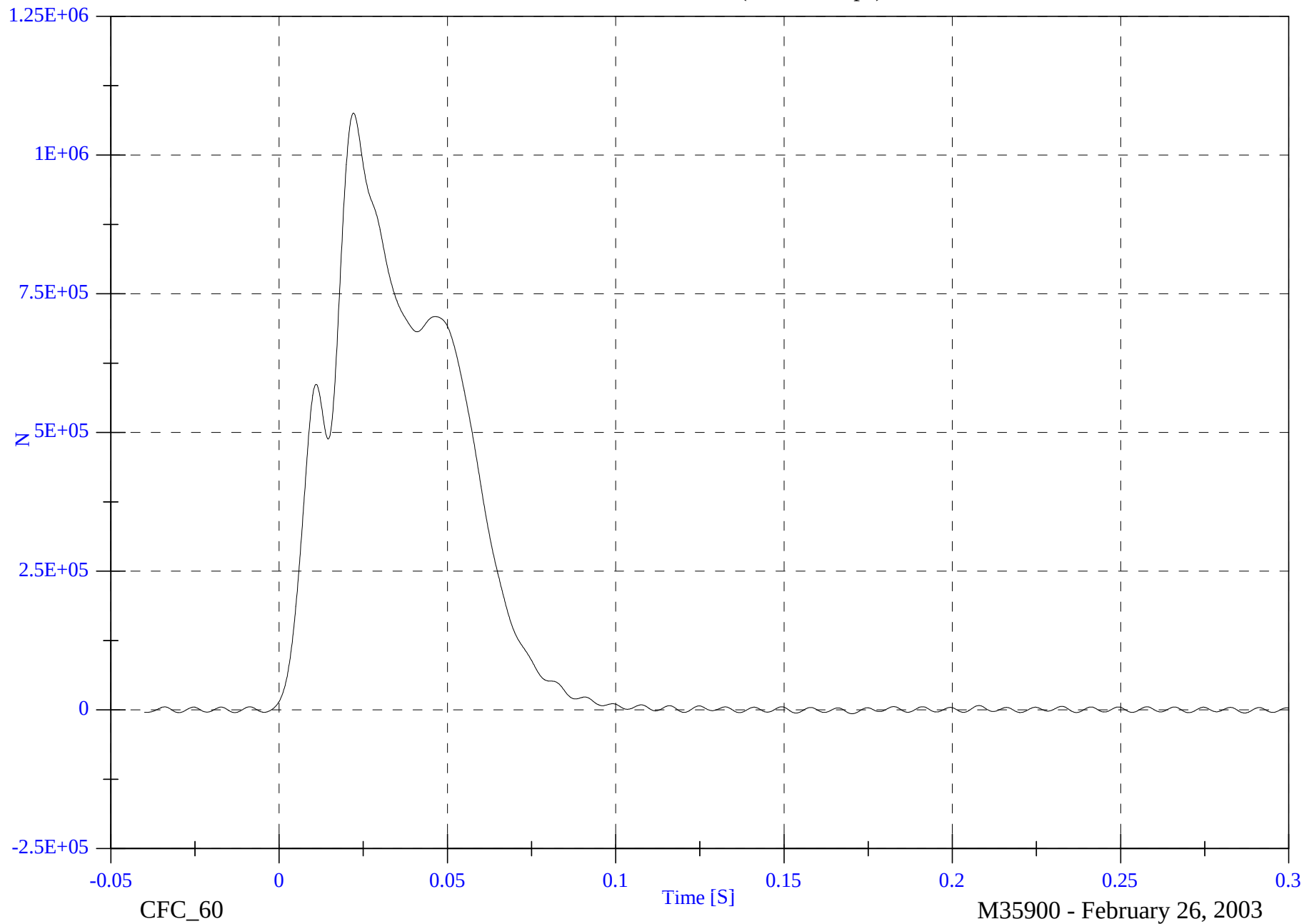


NCAP Test 10 2003 VOLVO XC90

Total Load Cell Sum (All 6 Groups)

Max: 1075727.1 [N] at 0.022 [S]

Min: -6867.9 [N] at 0.170 [S]



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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:

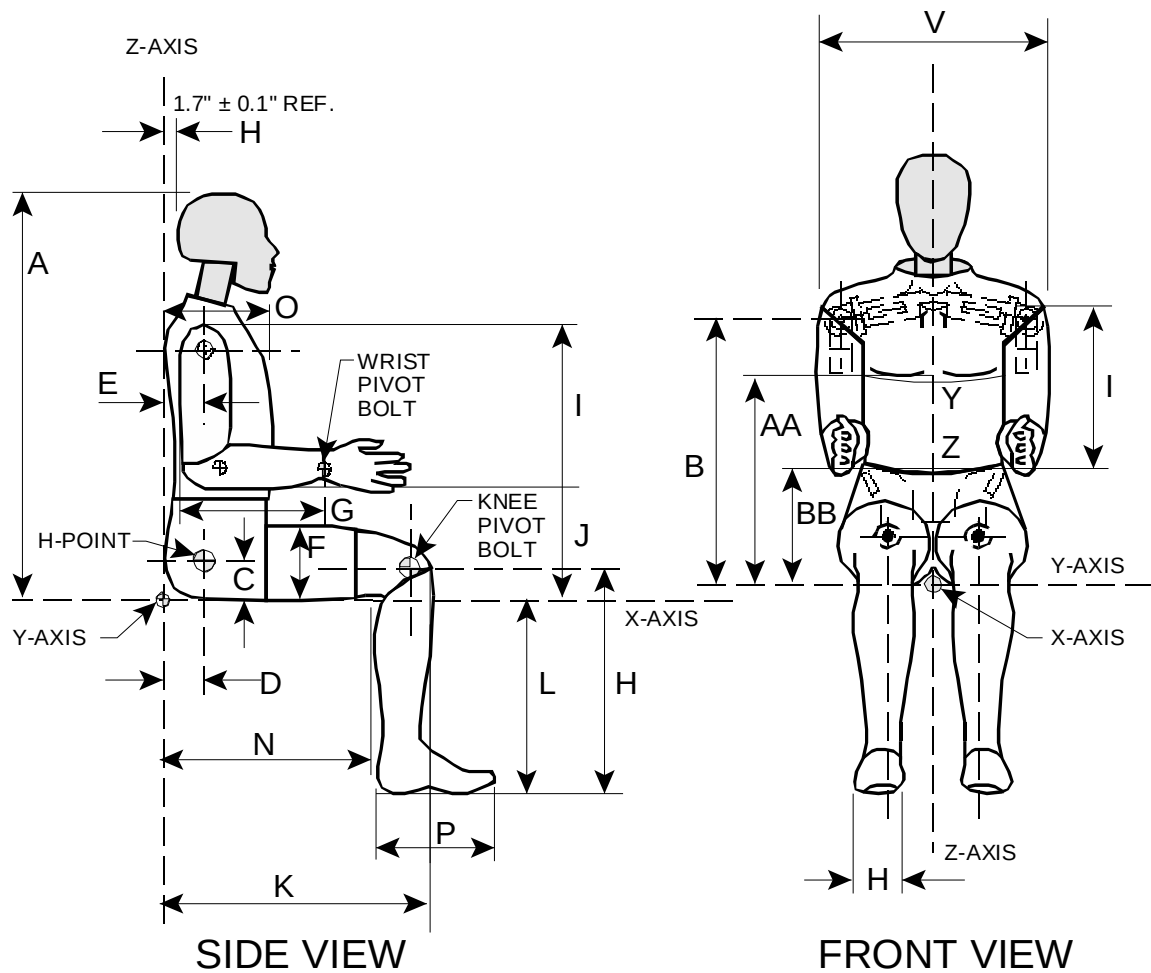
<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	150	February 11, 2003
#2/Right Front Passenger	245	February 11, 2003

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 Inducant 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 1
Date February 4, 2003
Workfile 150H 2-04-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	33
Peak Resultant Acceleration	225-275 G's	270.50
Peak Lateral Acceleration	15 G's Max	6.53
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	150	
Sequential Test Number	1	
Date	February 6, 2003	6 Axis Neck Transducer
Workfile	150Flx 2-06-03	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	37
Impact Velocity		22.60 - 23.40 Ft/s	22.70
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.60
	20 ms	17.60 - 22.60 G's	21.77
	30 ms	12.50 - 18.50 G's	16.93
Max Pendulum G's Above 30 ms		29 G's Max	16.93
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.50
D Plane Rotation	Max	64 - 78 Deg	67.66
	Time	57 - 64 ms	58.80
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	79.55
	Time	47 - 58 ms	50.50
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	113.10
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	102.20

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	150	
Sequential Test Number	1	
Date	February 6, 2003	6 Axis Neck Transducer
Workfile	150Ext 2-06-03	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	37
Impact Velocity		19.50 - 20.30 Ft/s	19.55
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.85
	20 ms	14.00 - 19.00 G's	16.46
	30 ms	11.00 - 16.00 G's	13.99
Max Pendulum G's Above 30 ms		22 G's Max	14.01
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	40.80
D Plane Rotation	Max	81 - 106 Deg	91.85
	Time	72 - 82 ms	77.80
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-58.27
	Time	65 - 79 ms	73.80
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	155.80
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	138.90

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 150
Sequential Test Number 1
Date February 10, 2003
Workfile 150T 02-10-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Pendulum Velocity	21.6 - 22.4 Ft/s	22.23
Maximum Deflection	2.50 - 2.86 in	2.56
Maximum Resistive Force	1160 - 1325 Lbs	1299.78
Internal Hysteresis	69 - 85 %	71.95

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 150
Sequential Test Number 1
Date February 11, 2003
Workfile 150LF 2-11-03/150RF 2-11-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1225.95
RIGHT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1229.79

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
Sequential Test Number 1
Date February 10, 2003

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			33
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 1
Date February 4, 2003
Workfile 245H1 2-04-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Peak Resultant Acceleration	225-275 G's	234.54
Peak Lateral Acceleration	15 G's Max	3.08
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	245	
Sequential Test Number	16	
Date	February 11, 2003	6 Axis Neck Transducer
Workfile	245Flx16a 02-11-03	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70.0
Relative Humidity		10% - 70%	33.0
Impact Velocity		22.60 - 23.40 Ft/s	22.82
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	24.20
	20 ms	17.60 - 22.60 G's	21.42
	30 ms	12.50 - 18.50 G's	15.92
Max Pendulum G's Above 30 ms		29 G's Max	15.92
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	41.70
D Plane Rotation	Max	64 - 78 Deg	67.04
	Time	57 - 64 ms	57.70
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	68.89
	Time	47 - 58 ms	53.50
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	113.10
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	1	
Date	February 11, 2003	6 Axis Neck Transducer
Workfile	245Ext 02-11-03	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70.0
Relative Humidity		10% - 70%	33.0
Impact Velocity		19.50 - 20.30 Ft/s	19.79
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.46
	20 ms	14.00 - 19.00 G's	15.36
	30 ms	11.00 - 16.00 G's	12.59
Max Pendulum G's Above 30 ms		22 G's Max	13.52
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	42.70
D Plane Rotation	Max	81 - 106 Deg	94.24
	Time	72 - 82 ms	76.10
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-56.16
	Time	65 - 79 ms	71.80
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	155.40
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	140.50

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 245
Sequential Test Number 1
Date February 10, 2003
Workfile 245T 02-10-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Pendulum Velocity	21.6 - 22.4 Ft/s	22.40
Maximum Deflection	2.50 - 2.86 in	2.51
Maximum Resistive Force	1160 - 1325 Lbs	1313.68
Internal Hysteresis	69 - 85 %	70.84

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 245
Sequential Test Number 1
Date February 11, 2003
Workfile 245LF 02-11-03 / 245RF 02-11-03

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1239.82
RIGHT KNEE		
Temperature	66 - 78 Deg F	70.0
Relative Humidity	10% - 70%	33.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1300.00

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 245
Sequential Test Number 1
Date February 10, 2003

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			33
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	33.4
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	22-Sep-02	22-Mar-03
	X Arm Z	ENDEVCO	AC-P14965	22-Sep-02	22-Mar-03
	Y Arm X	ENDEVCO	AC-P17563	22-Sep-02	22-Mar-03
	Y Arm Z	ENDEVCO	AC-P18551	22-Sep-02	22-Mar-03
	Z Arm X	ENDEVCO	AC-P17539	22-Sep-02	22-Mar-03
	Z Arm Y	ENDEVCO	AC-P18718	22-Sep-02	22-Mar-03
Head	X	ENDEVCO	AC-P16832	22-Sep-02	22-Mar-03
	Y	ENDEVCO	AC-P16591	22-Sep-02	22-Mar-03
	Z	ENDEVCO	AC-P16286	22-Sep-02	22-Mar-03
Head	X (R)	ENDEVCO	AC-P17141	22-Sep-02	22-Mar-03
	Y (R)	ENDEVCO	AC-P17242	22-Sep-02	22-Mar-03
	Z (R)	ENDEVCO	AC-P17152	22-Sep-02	22-Mar-03
Neck Load Cell	X	DENTON	LC-441Fx	14-Oct-02	14-Apr-03
	Y	DENTON	LC-441Fy	14-Oct-02	14-Apr-03
	Z	DENTON	LC-441Fz	14-Oct-02	14-Apr-03
Neck Moment	X	DENTON	LC-441Mx	14-Oct-02	14-Apr-03
	Y	DENTON	LC-441My	14-Oct-02	14-Apr-03
	Z	DENTON	LC-441Mz	14-Oct-02	14-Apr-03
Chest	X	ENDEVCO	AC-P17235	22-Sep-02	22-Mar-03
	Y	ENDEVCO	AC-P14393	22-Sep-02	22-Mar-03
	Z	ENDEVCO	AC-P17285	22-Sep-02	22-Mar-03
Chest	X (R)	ENDEVCO	AC-P16863	22-Sep-02	22-Mar-03
	Y (R)	ENDEVCO	AC-P17248	22-Sep-02	22-Mar-03
	Z (R)	ENDEVCO	AC-P17283	22-Sep-02	22-Mar-03
Chest Deflection	X	SERVO	DS-150	24-Sep-02	24-Mar-03
Pelvic	X	ENDEVCO	AC-J30041	22-Sep-02	22-Mar-03
	Y	ENDEVCO	AC-P13355	22-Sep-02	22-Mar-03
	Z	ENDEVCO	AC-P13329	22-Sep-02	22-Mar-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	25-Sep-02	25-Mar-03
Right Femur Load Cell	Fz	GSE	LC-419	25-Sep-02	25-Mar-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	22-Sep-02	22-Mar-03
	Z	ENDEVCO	AC-AJ8C0	22-Sep-02	22-Mar-03
Left Foot Front	Z	ENDEVCO	AC-J34378	22-Sep-02	22-Mar-03
Right Foot Rear	X	ENDEVCO	AC-AJ7F6	22-Sep-02	22-Mar-03
	Z	ENDEVCO	AC-J27079	22-Sep-02	22-Mar-03
Right Foot Front	Z	ENDEVCO	AC-J23997	22-Sep-02	22-Mar-03

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	27-Sep-02	27-Mar-03
	X Arm Z	ENDEVCO	AC-P19212	27-Sep-02	27-Mar-03
	Y Arm X	ENDEVCO	AC-P19197	27-Sep-02	27-Mar-03
	Y Arm Z	ENDEVCO	AC-P18738	27-Sep-02	27-Mar-03
	Z Arm X	ENDEVCO	AC-P19217	27-Sep-02	27-Mar-03
	Z Arm Y	ENDEVCO	AC-P18739	27-Sep-02	27-Mar-03
Head	X	ENDEVCO	AC-P19216	06-Sep-02	06-Mar-03
	Y	ENDEVCO	AC-P15534	06-Sep-02	06-Mar-03
	Z	ENDEVCO	AC-P23303	06-Sep-02	06-Mar-03
Head	X (R)	ENDEVCO	AC-P16576	06-Sep-02	06-Mar-03
	Y (R)	ENDEVCO	AC-P15526	06-Sep-02	06-Mar-03
	Z (R)	ENDEVCO	AC-P19255	06-Sep-02	06-Mar-03
Neck Load Cell	X	DENTON	LC-076Fx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-076Fy	15-Oct-02	15-Apr-03
	Z	DENTON	LC-076Fz	15-Oct-02	15-Apr-03
Neck Moment	X	DENTON	LC-076Mx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-076My	15-Oct-02	15-Apr-03
	Z	DENTON	LC-076Mz	15-Oct-02	15-Apr-03
Chest	X	ENTRAN	AC-01G18-F03	18-Feb-03	18-Aug-03
	Y	ENDEVCO	AC-AFW91	17-Feb-03	17-Aug-03
	Z	ENTRAN	AC-01J02-F09	18-Feb-03	18-Aug-03
Chest	X (R)	ENTRAN	AC-01G18-F18	18-Feb-03	18-Aug-03
	Y (R)	ENTRAN	AC-01G18-F10	18-Feb-03	18-Aug-03
	Z (R)	ENTRAN	AC-01G18-F09	18-Feb-03	18-Aug-03
Chest Deflection	X	SERVO	DS-245	11-Oct-02	11-Apr-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	25-Sep-02	25-Mar-03
Right Femur Load Cell	Fz	GSE	LC-951	25-Sep-02	25-Mar-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	27-Sep-02	27-Mar-03
	Z	ENDEVCO	AC-J18662	27-Sep-02	27-Mar-03
Left Foot Front	Z	ENDEVCO	AC-J36176	27-Sep-02	27-Mar-03
Right Foot Rear	X	ENDEVCO	AC-J20084	27-Sep-02	27-Mar-03
	Z	ENDEVCO	AC-AGRP4	16-Jan-03	16-Jul-03
Right Foot Front	Z	ENDEVCO	AC-J18738	27-Sep-02	27-Mar-03

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ICS	AC-8084-020	20-Nov-02	20-May-03
Right Rear Seat Crossmember X	ICS	AC-8062-003	11-Nov-02	11-May-03
Top of Engine	ICS	AC-8084-022	20-Nov-02	20-May-03
Bottom of Engine	ICS	AC-8084-024	11-Nov-02	11-May-03
Right Disc Brake Caliper	ICS	AC-8084-018	11-Nov-02	11-May-03
Instrument Panel	ICS	AC-6917-020	20-Nov-02	20-May-03
Left Disc Brake Caliper	ICS	AC-8083-037	21-Nov-02	21-May-03
Left Seat Rear Crossmember Z	ICS	AC-6917-012	11-Nov-02	11-May-03
Right Seat Rear Crossmember Z	ICS	AC-8083-028	11-Nov-02	11-May-03

REPORT NUMBER: CAL-03-10

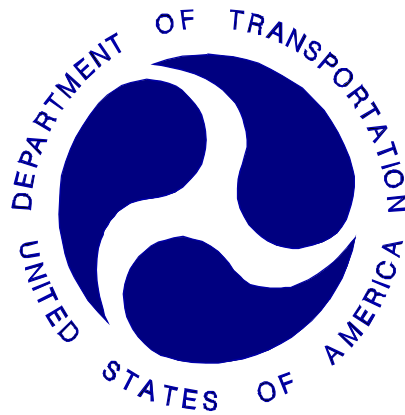
NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

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

NHTSA NUMBER: M35900

VERIDIAN ENGINEERING TEST NUMBER: 8642-NCAP-33

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



February 26, 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

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7. Author(s) Patrick G. MacDiarmid, Jr., Project Engineer David J. Travale, Program Manager				8. Performing Organization Report No. 8642-NCAP-33	
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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. This test was conducted at the Veridian Engineering Crash Test Facility in Buffalo, New York, on February 26, 2003.					
ATD Position		HIC 15		HIC 36	
P3 (Right Rear) (044)		1624.3		2351.1	
P6 (Center Rear) (144)		854.1		1392.7	
P4 (Left Rear) (182)		1411.9*		1621.3*	
* Head Y data is questionable					
17. Key Words New Car Assessment Program (NCAP)				18. Distribution Statement	
				Copies of this report are available from: 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 M35900

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 56.49 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. Position 3 was equipped with lower neck force and moment load cells.

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 1624.3, maximum chest deceleration over 3 ms was 63.1 g's. The left rear child dummy's HIC 15 was 854.1, maximum chest deceleration over 3 ms was 53.7 g's. The center rear child dummy's HIC 15 was 1411.9 with questionable head y data, maximum chest deceleration over 3 ms was 65.2 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 56
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 and the back of the head to the child restraint	The chin to the chest and top of the head to the left thigh.
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 Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. M35900

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Delivered Weight of Vehicle with Maximum Fluids = 2166.5 kg (A)

AS TESTED WEIGHT OF VEHICLE:

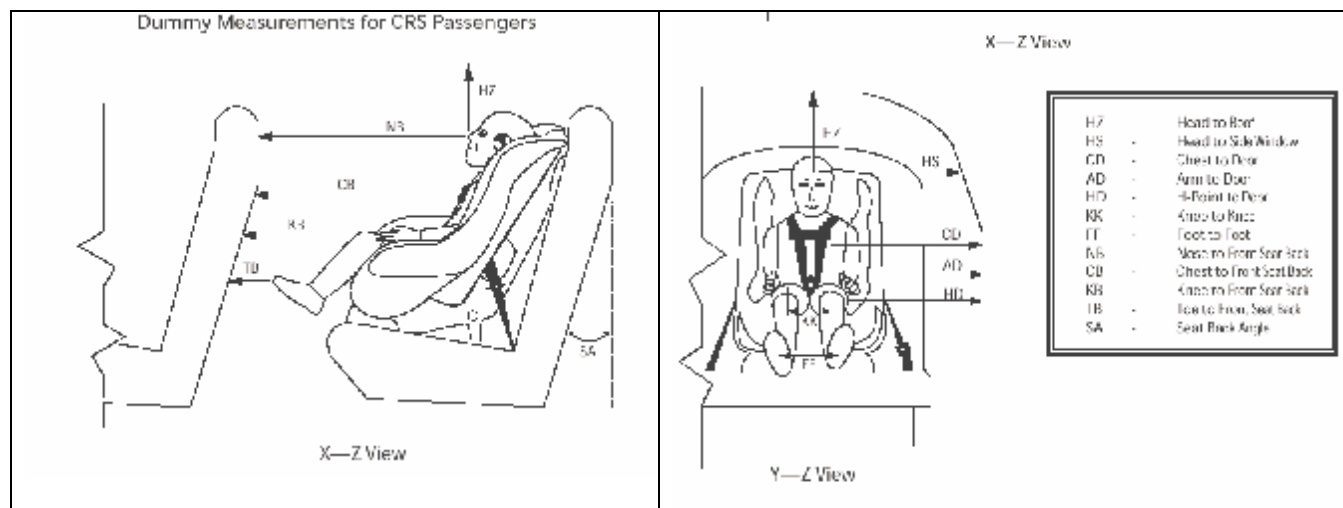
Left Front	=	<u>625.5</u>	kg	Left Rear	=	<u>565.0</u>	kg
Right Front	=	<u>617.5</u>	kg	Right Rear	=	<u>578.0</u>	kg
TOTAL FRONT	=	<u>1243.0</u>	kg	TOTAL REAR	=	<u>1143.0</u>	kg
TOTAL TEST WEIGHT =		<u>2386.0</u>	kg				

DATA SHEET NO. 3

CHILD DUMMY POSITIONING IN VEHICLE

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

NHTSA No. M35900



Measurement	Pre-Test (mm)			Post Test (mm)		
	P3 (044)	P4 (144)	P6 (182)	P3 (044)	P4 (144)	P6 (182)
SA	30	30	30	30	30	30
HS	308	375	-	360	323	-
CD	318	327	-	320	232	-
AD	188	202	-	185	104	-
HD	245	144	-	252	170	-
HZ	368	381	370	360	362	392
NB	561	565	795	618	630	790
CB	517	538	661	592	585	652
KB	161	135	130	160	130	160
FF	172	111	140	180	160	220
KB – LEFT	368	310	340	415	360	0
KB – RIGHT	362	320	340	425	355	50
TB – LEFT	95	120	40	142	180	340
TB – RIGHT	95	122	40	142	190	355

All dimensions in mm (unless noted)

P3 – Right Rear Passenger (CRS #1)

P4 – Left Rear Passenger (CRS #2)

P6 – Center Rear Passenger (Built-in)

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. M35900

DESCRIPTION	Unit	MAXIMUM VALUE							
		Position #3				Position #4			
		Pos	msec	Neg	msec	Pos	msec	Neg	msec
Head X	g	179.0	176.5	-51.7	97.0	45.4	166.4	-44.5	85.5
Head Y	g	10.6	119.3	-13.6	111.4	*	*	*	*
Head Z	g	103.9	76.7	-11.7	50.0	83.8	64.8	-2.4	27.4
Head Resultant	g	183.1	176.5	0.1	-48.4	*	*	*	*
Upper Neck Fx	N	230.0	172.3	-1461.7	101.1	114.6	149.4	-920.9	59.8
Upper Neck Fy	N	43.9	127.2	-106.7	77.9	78.5	49.4	-177.0	80.1
Upper Neck Fz	N	2668.2	76.9	-285.2	50.2	2954.1	84.9	-357.0	198.5
Upper Neck F Resultant	N	2771.2	76.9	1.4	-21.2	2976.7	84.9	0.1	-41.2
Upper Neck Mx	N-m	**	**	**	**	9.6	86.6	-3.5	259.7
Upper Neck My	N-m	11.4	172.0	-26.8	102.2	22.8	84.8	-32.2	56.3
Upper Neck Mz	N-m	3.8	176.8	-3.2	128.3	3.3	79.1	-7.2	188.2
Upper Neck M Resultant	N-m	**	**	**	**	32.7	56.3	0.0	-36.5
Lower Neck Fx	N	492.3	175.7	-1695.6	101.1	-	-	-	-
Lower Neck Fy	N	184.5	79.0	-86.0	177.3	-	-	-	-
Lower Neck Fz	N	2682.2	76.7	-367.7	50.2	-	-	-	-
Lower Neck F Resultant	N	2883.5	76.3	1.1	13.8	-	-	-	-
Lower Neck Mx	N-m	5.8	129.5	-17.6	88.0	-	-	-	-
Lower Neck My	N-m	173.2	99.1	-23.8	175.6	-	-	-	-
Lower Neck Mz	N-m	4.0	114.4	-9.8	85.1	-	-	-	-
Lower Neck M Resultant	N-m	173.5	99.1	0.2	15.0	-	-	-	-
Chest X	g	24.6	168.8	-62.8	67.6	9.4	200.5	-47.6	60.3
Chest Y	g	2.9	160.7	-7.2	94.9	10.1	60.4	-4.7	29.4
Chest Z	g	30.7	89.2	-40.2	53.5	21.6	17.9	-29.2	53.5
Chest Resultant	g	65.3	67.3	0.0	-21.5	54.8	53.5	0.0	-41.3
Chest Compression	mm	0.8	289.3	-30.3	104.6	0.1	12.3	-38.1	89.5

*Data is questionable

**Data is not accurate

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

CRS: Evenflo Vangaurd 5 LATCH, Graco My CarGo Booster

NHTSA No. M35900

		MAXIMUM VALUE							
		Position #3				Position #4			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Pelvic X	g	26.4	122.9	-78.8	55.7	17.9	96.6	-54.2	51.3
Pelvic Y	g	9.4	126.5	-11.6	51.6	14.7	73.0	-7.8	43.4
Pelvic Z	g	20.8	87.8	-42.7	46.5	9.7	197.3	-46.6	55.7
Pelvic Resultant	g	82.7	55.7	0.0	-20.8	70.0	54.8	0.0	-42.8
Tether Belt Load	N	1970.2	77.8	-30.3	190.2	-	-	-	-
Lap Belt Load	N	-	-	-	-	4055.1	49.5	-10.7	-21.4

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES

CRS: Built-in Booster

NHTSA No. M35900

		MAXIMUM VALUE			
		Position #6			
DESCRIPTION	Unit	Pos	msec	Neg	msec
Head X	g	81.2	198.6	-33.5	65.9
Head Y	g	23.8	197.4	-8.9	197.1
Head Z	g	4.9	35.2	-103.6	71.4
Head Resultant	g	108.0	71.4	0.0	-37.0
Upper Neck Fx	N	206.3	222.8	-826.0	68.5
Upper Neck Fy	N	*	*	*	*
Upper Neck Fz	N	3371.2	72.7	-212.7	38.5
Upper Neck F Resultant	N	*	*	*	*
Upper Neck Mx	N-m	14.2	81.0	-12.2	97.9
Upper Neck My	N-m	43.1	100.3	-30.1	66.1
Upper Neck Mz	N-m	10.7	103.0	-3.3	215.7
Upper Neck M Resultant	N-m	45.3	99.7	0.1	-50.0
Chest X	g	15.0	148.9	-62.3	50.1
Chest Y	g	18.1	60.8	-7.4	95.0
Chest Z	g	26.3	76.2	-24.3	49.7
Chest Resultant	g	66.8	50.0	0.0	-35.9
Chest Compression	mm	0.0	-20.4	-27.9	72.0
Pelvic X	g	47.6	118.2	-87.8	46.6
Pelvic Y	g	**	**	**	**
Pelvic Z	g	16.2	77.3	-46.0	54.7
Pelvic Resultant	g	**	**	**	**

* Data is questionable

** Data is questionable after 67 ms.

DATA SHEET 4

CHILD DUMMY INJURY CRITERIA VALUES (CONTINUED)

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

NHTSA No. M35900

	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	1624.3	72.0	87.0	103.2 g	2351.1	65.4	101.4	84.3 g
Position #4 - Left	854.1	57.4	72.4	79.8 g	1392.7	53.0	89.0	68.4 g
Position #6 - Center	1411.9	63.6	78.6	97.6 g	1621.3	57.8	83.4	83.3 g

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #3 - Right	63.1	65.5	68.5	968.5
Position #4 - Left	53.7	52.5	55.5	514.9
Position #6 - Center	65.2	49.3	52.3	738.4

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

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	0.61	175.6	1181.5	86.3	7.4
Nte	1.81	98.9	2227.1	-1445.3	-25.8
Ncf	0.07	25.0	-119.1	19.8	0.8
Nce	0.48	51.9	-220.0	-225.6	-11.3

Peak Tension (CFC1000) 2668.2 N

Peak Compression (CFC1000) -285.2 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	1.27	83.9	2934.8	-393.3	29.7
Nte	1.15	57.1	2397.2	-902.3	-15.7
Ncf	0.01	436.6	-8.6	-13.0	1.0
Nce	0.75	199.5	-353.9	-219.2	-26.1

Peak Tension (CFC1000) 2954.1 N

Peak Compression (CFC1000) -357.0 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. M35900

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	0.92	76.9	2835.1	-586.9	0.1
Nte	1.32	68.8	3119.6	-803.7	-13.0
Ncf	0.08	255.0	-18.1	30.4	7.0
Nce	0.53	204.5	-113.9	-11.6	-20.7

Peak Tension (CFC1000) 3371.2 N

Peak Compression (CFC1000) -259.3 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 Vangaurd 5 LATCH, Graco My CarGo BoosterNHTSA No. M35900**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	No	None
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

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 BoosterNHTSA No. M35900**POSITION #6 POST-TEST INSPECTION**

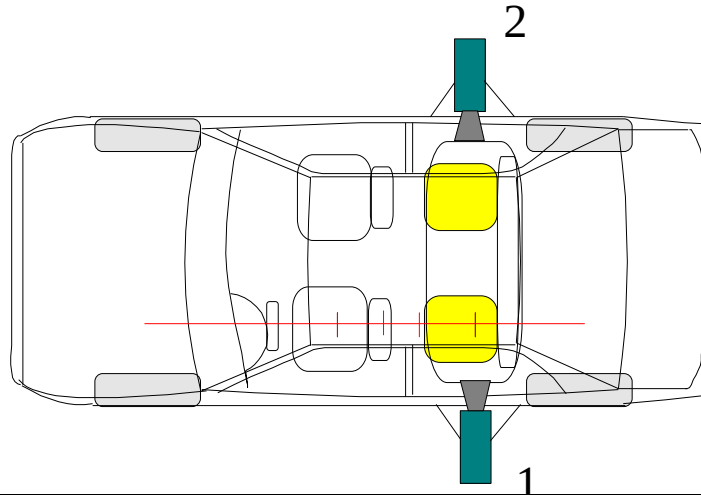
LOCATION	DAMAGE	REMARKS
Upper Tether Strap	N/A	None
Upper Tether Buckle	N/A	None
Upper Tether Hook	N/A	None
Vehicle Upper Tether Anchor	N/A	None
Lower Anchor Strap	N/A	None
Lower Anchor Buckle	N/A	None
Lower Anchor Hooks	N/A	None
Vehicle Lower CRS Anchors	N/A	None
Five Point Harness Connections	N/A	None
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. M35900



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	1035
2	Right side CRS lateral view	3642	2642	2567	-24	13	1015

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

X = + Forward

Y = + To Right

Z = + Down

SECTION 3

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Figure 3- 37	PRE-TEST POSITION 6 FRONT VIEW	3- 39
Figure 3- 38	POST-TEST POSITION 6 FRONT VIEW	3- 40

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 card

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 22NOV02
Model # 3691261 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

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 first name	
Your last name	
Your street address	
City	
State	
Zip Code	

CHILD RESTRAINT REGISTRATION CARD

MODEL **8481LAN**
Manufactured in 012303 10
GRACO CHILDREN'S PRODUCTS, INC.
EXTON, PA 19341 1-888-224-6549
Made in U.S.A.

012303-10

Figure 3-10 CLOSE-UP VIEW OF POSITION 4 CRS LABEL



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



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



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



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



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



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



Figure 3-30 POST-TEST POSITION 4 FRONT VIEW



Figure 3-31 PRE-TEST POSITION 6 BOOSTER VIEW



Figure 3-32 POST-TEST POSITION 6 BOOSTER VIEW



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



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



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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4	V1P3 Head Resultant [g, CFC_1000]	4-7
5	V1P3 Upper Neck Fx [N, CFC_1000]	4-8
6	V1P3 Upper Neck Fy [N, CFC_1000]	4-9
7	V1P3 Upper Neck Fz [N, CFC_1000]	4-10
8	V1P3 Upper Neck F Resultant [N, CFC_1000]	4-11
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68	V1P6 Chest Resultant [g, CFC_180]	4-71
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2003 NCAP Test 10 2003 Volvo XC90

Max: 179.0 [g] at 0.176 [s]

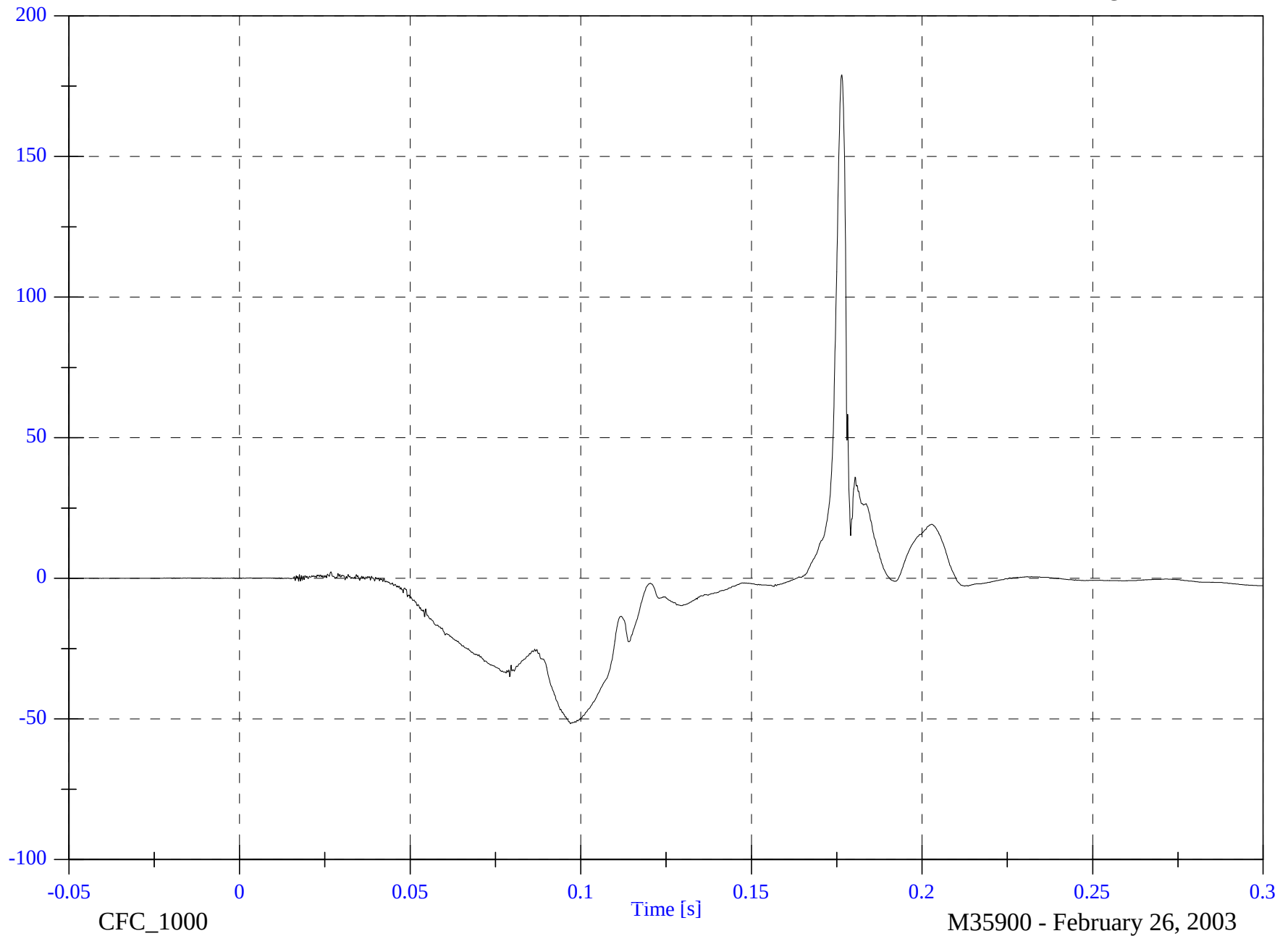
Min: -51.7 [g] at 0.097 [s]

V1P3 Head x

4-4

g

8642-NCAP-33

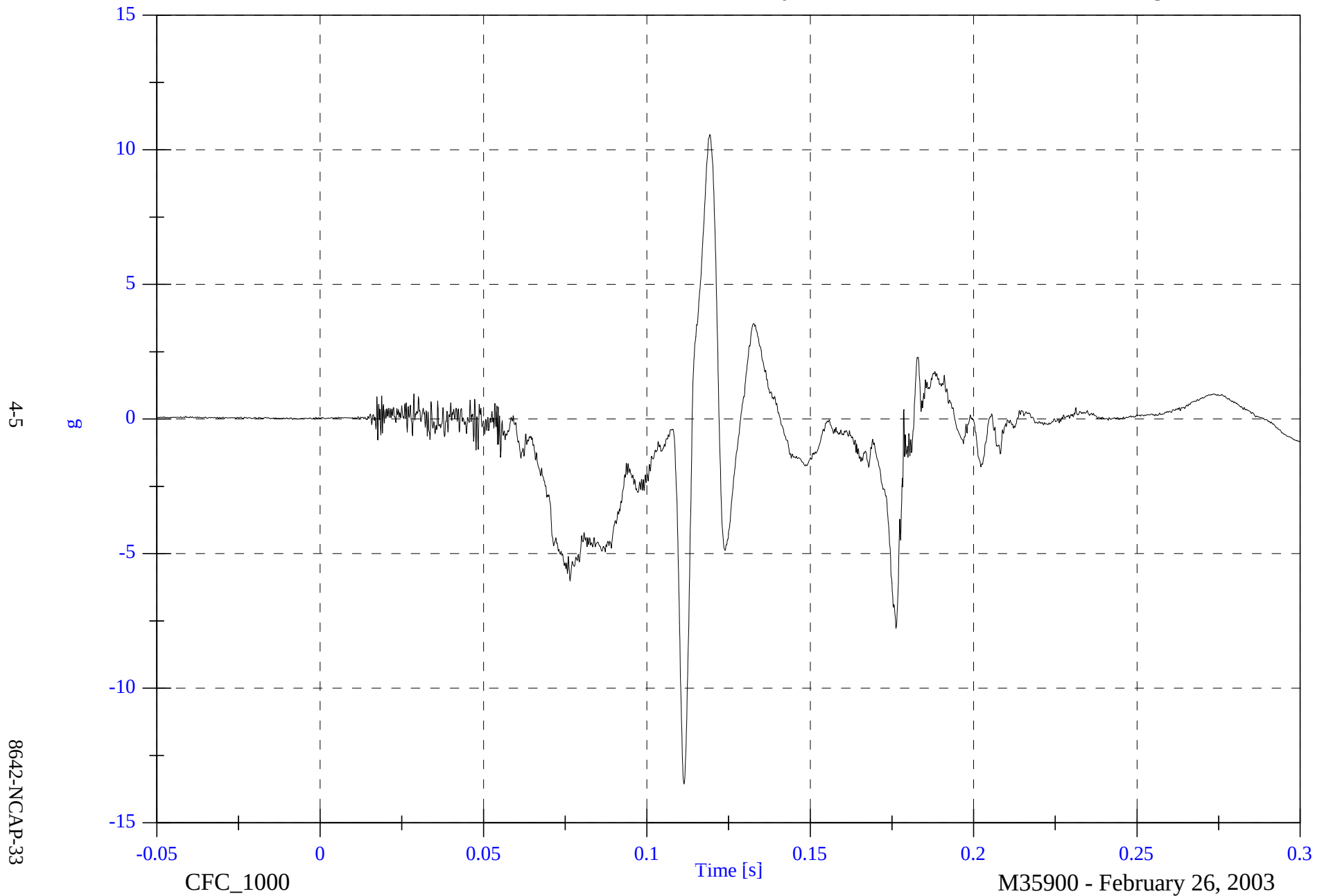


2003 NCAP Test 10 2003 Volvo XC90

Max: 10.6 [g] at 0.119 [s]

Min: -13.6 [g] at 0.111 [s]

V1P3 Head y

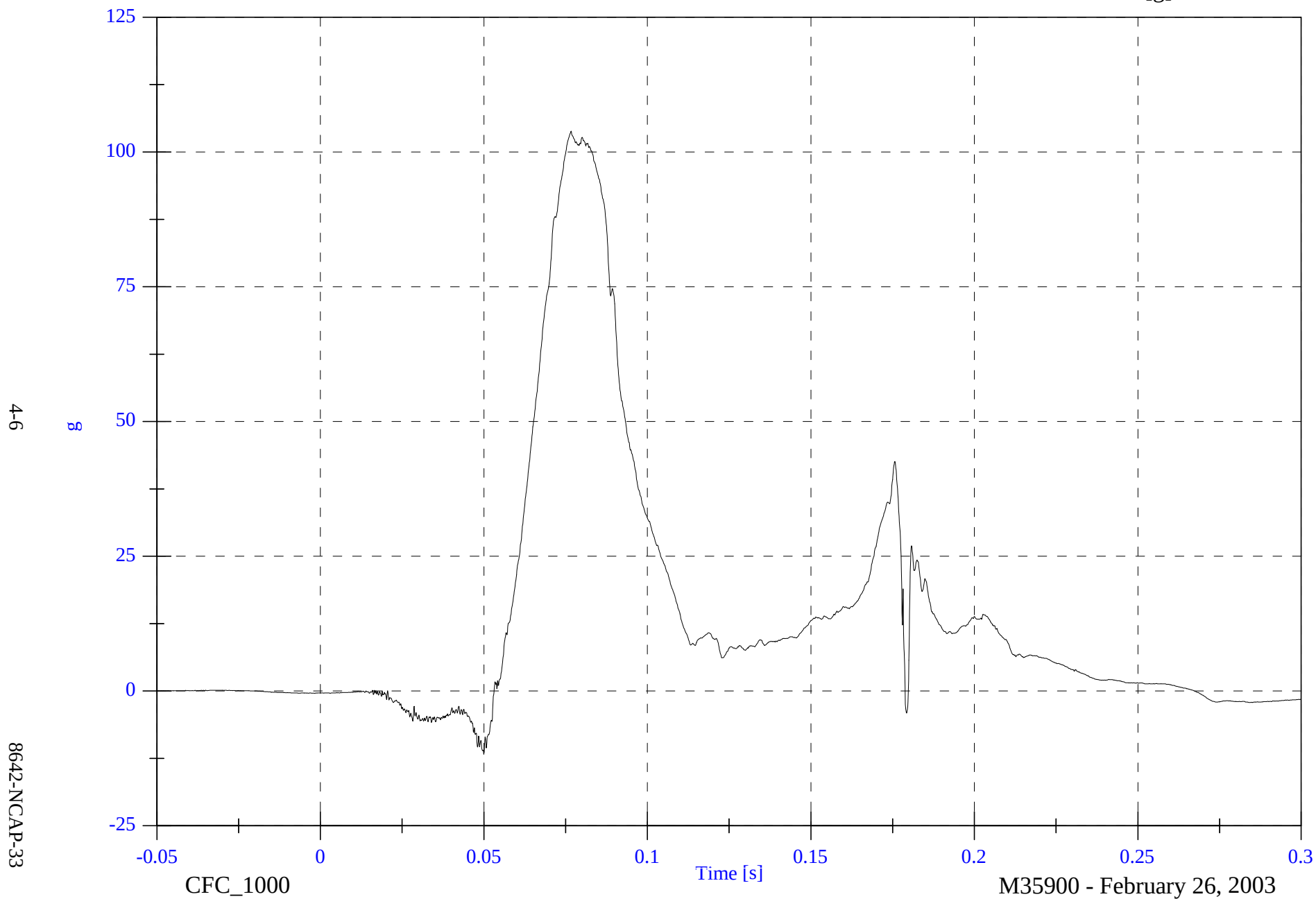


2003 NCAP Test 10 2003 Volvo XC90

Max: 103.9 [g] at 0.077 [s]

Min: -11.7 [g] at 0.050 [s]

V1P3 Head z



2003 NCAP Test 10 2003 Volvo XC90

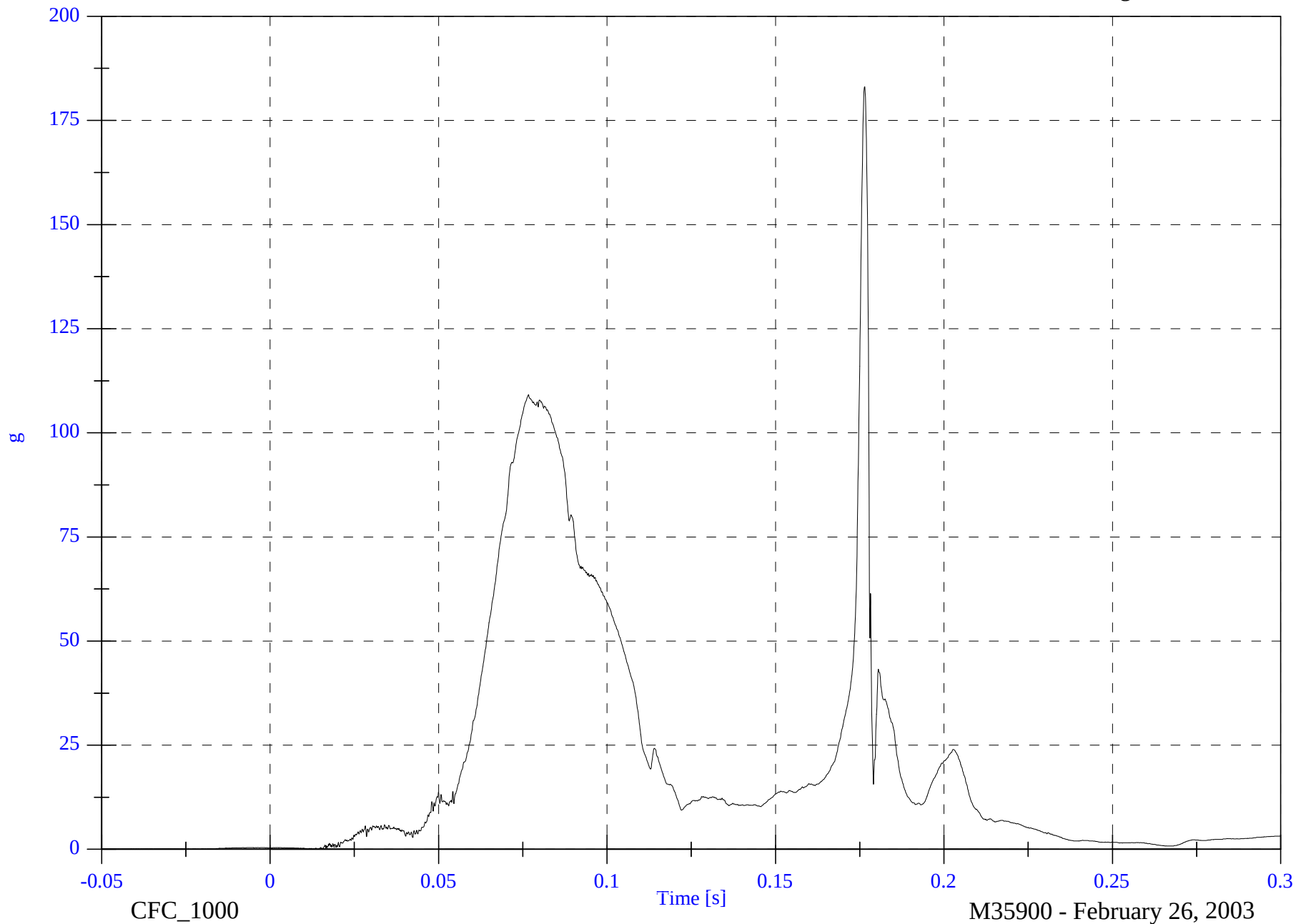
V1P3 Head Resultant

Max: 183.1 [g] at 0.176 [s]

Min: 0.1 [g] at -0.048 [s]

4-7

8642-NCAP-33

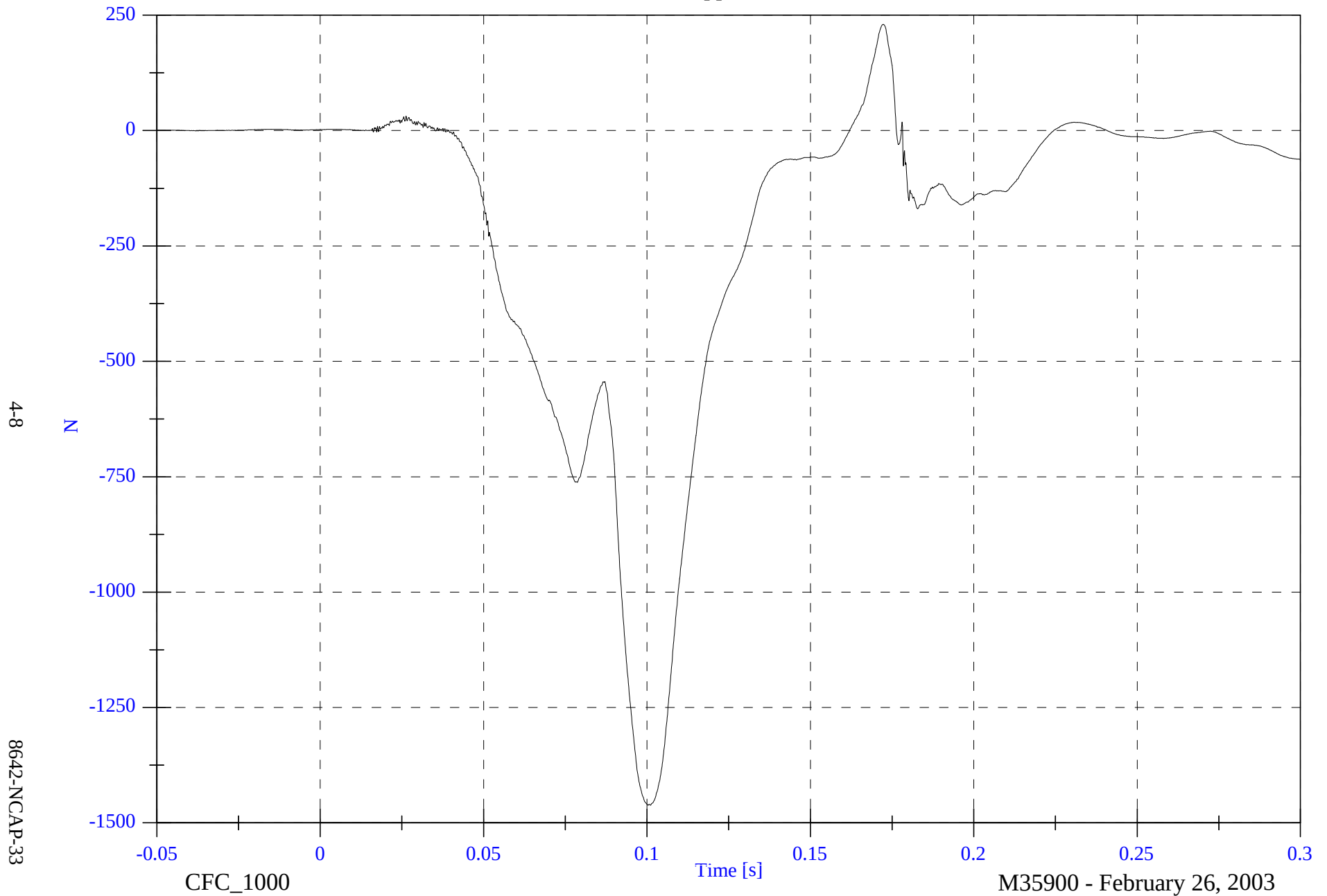


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Upper Neck Fx

Max: 230.0 [N] at 0.172 [s]

Min: -1461.7 [N] at 0.101 [s]

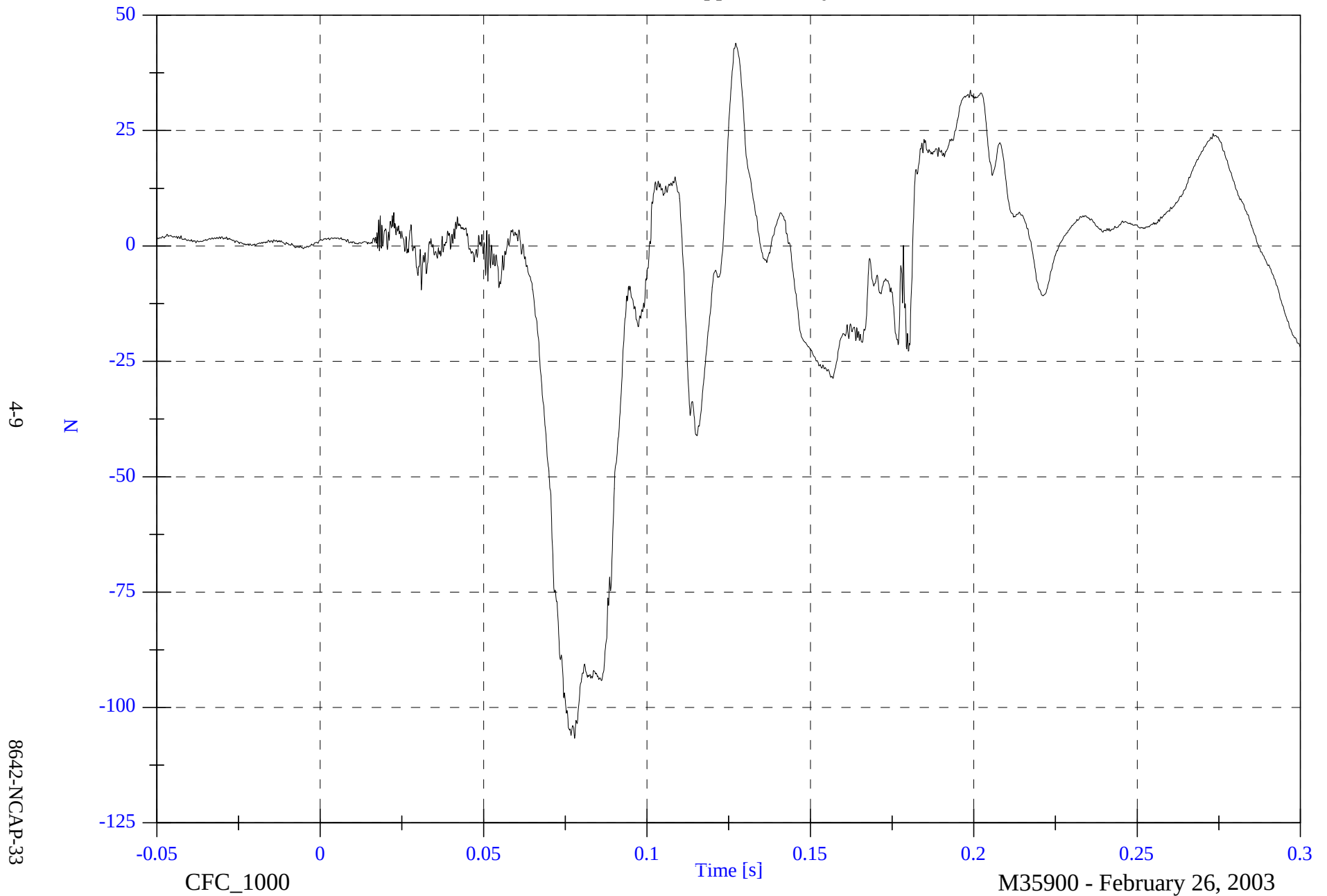


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Upper Neck Fy

Max: 43.9 [N] at 0.127 [s]

Min: -106.7 [N] at 0.078 [s]

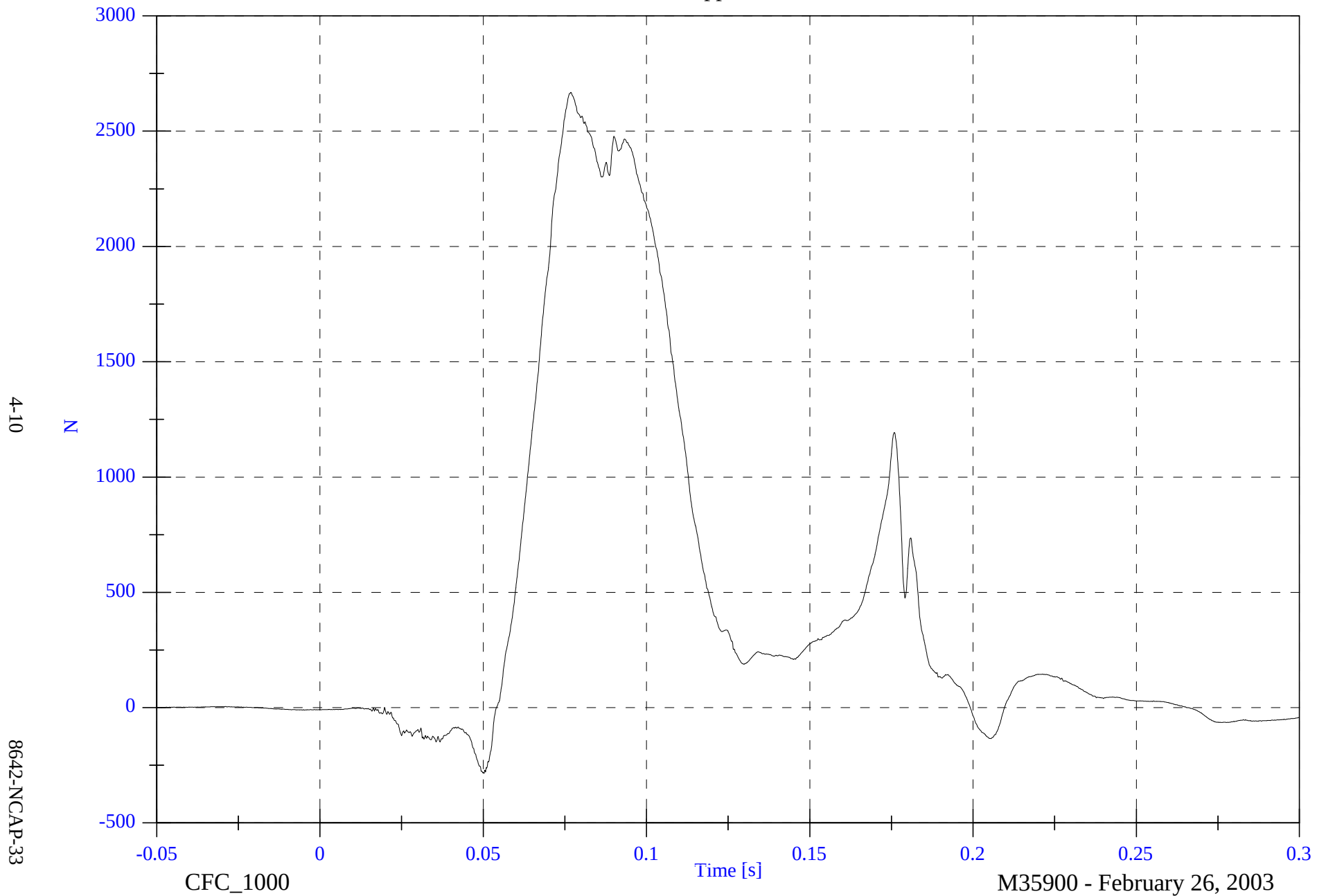


2003 NCAP Test 10 2003 Volvo XC90

Max: 2668.2 [N] at 0.077 [s]

Min: -285.2 [N] at 0.050 [s]

V1P3 Upper Neck Fz



2003 NCAP Test 10 2003 Volvo XC90

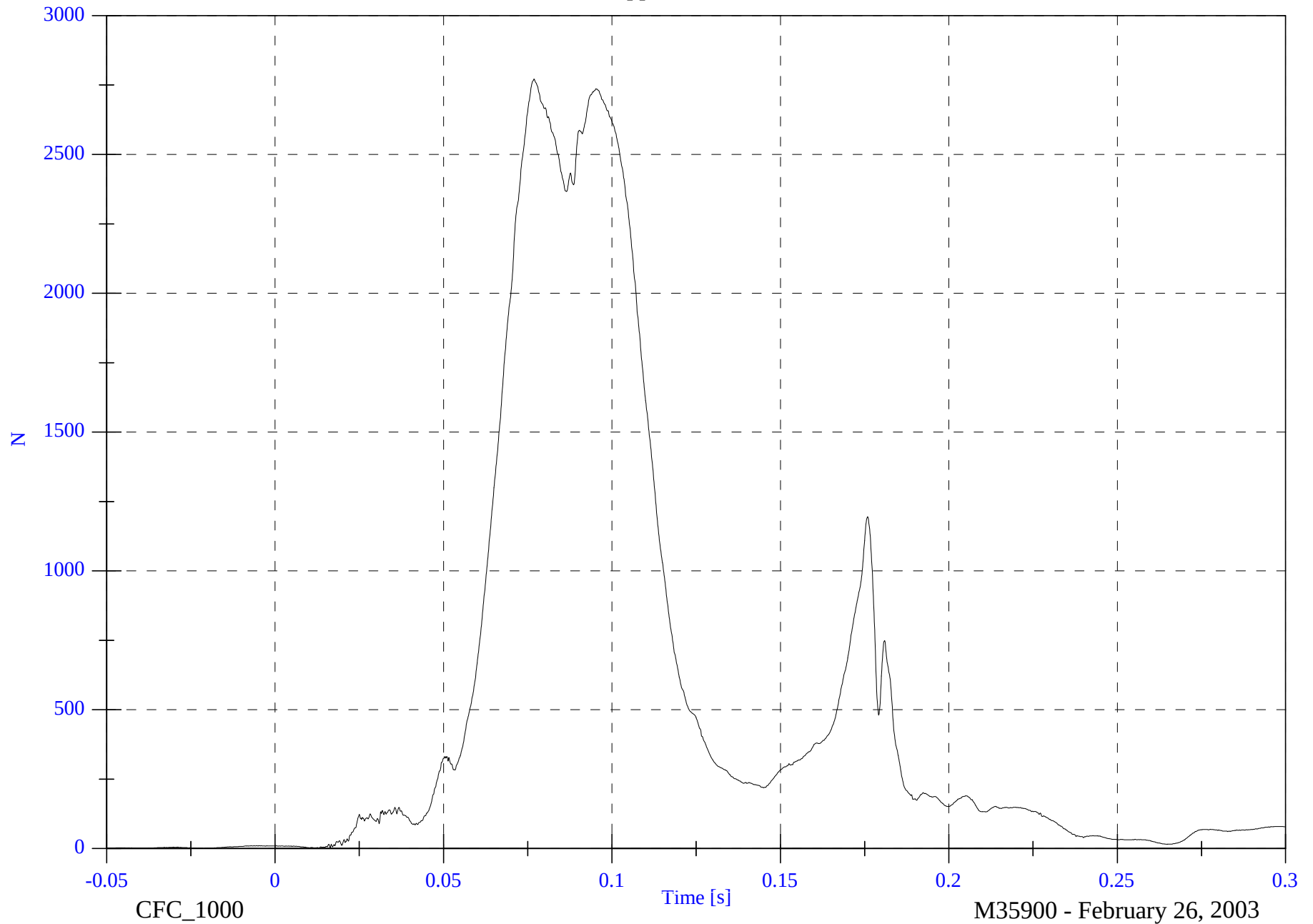
V1P3 Upper Neck F Resultant

Max: 2771.2 [N] at 0.077 [s]

Min: 1.4 [N] at -0.021 [s]

4-11

8642-NCAP-33

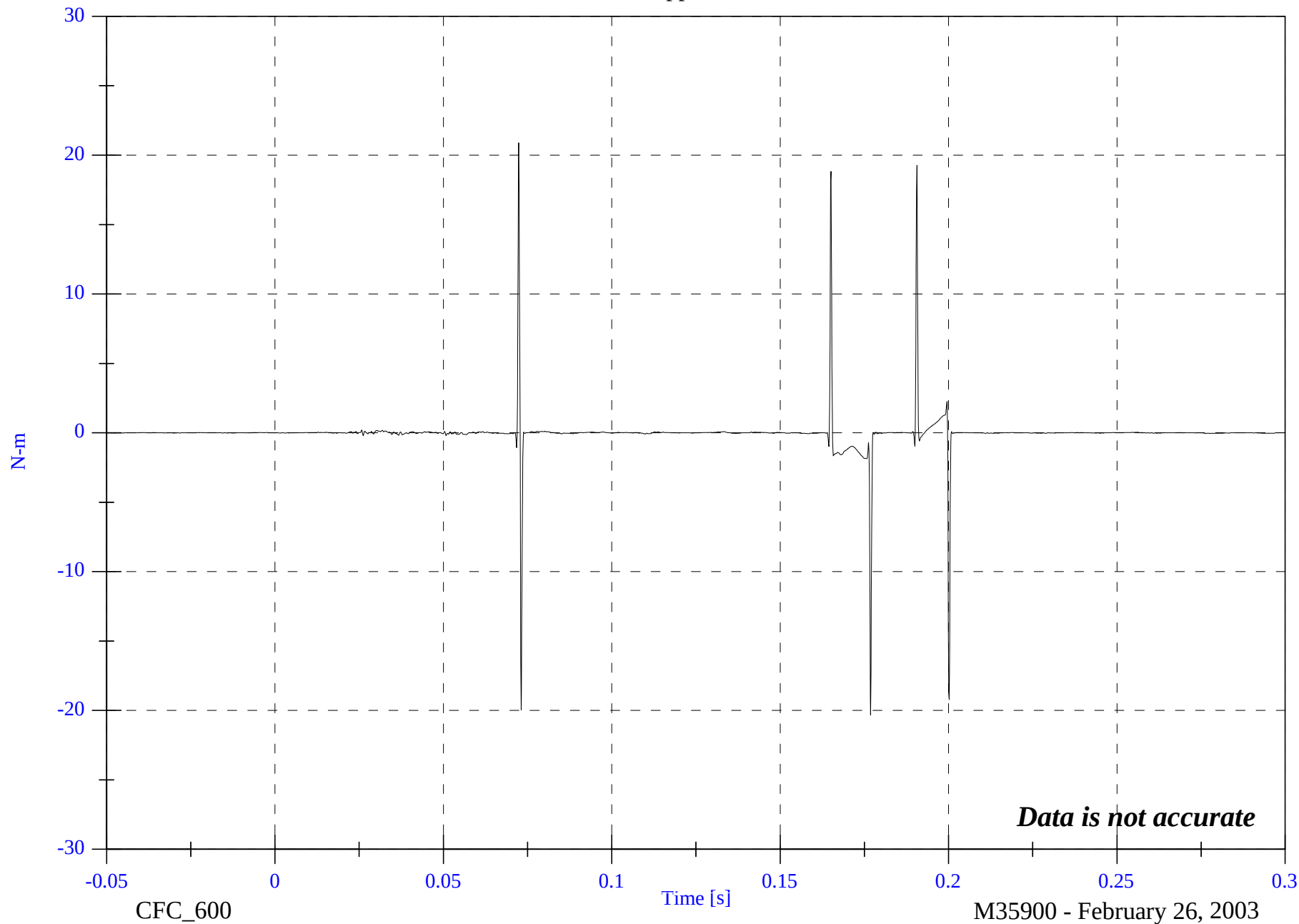


2003 NCAP Test 10 2003 Volvo XC90

Max: 20.9 [N-m] at 0.072 [s]

Min: -20.3 [N-m] at 0.177 [s]

V1P3 Upper Neck Mx



4-12

8642-NCAP-33

CFC_600

Time [s]

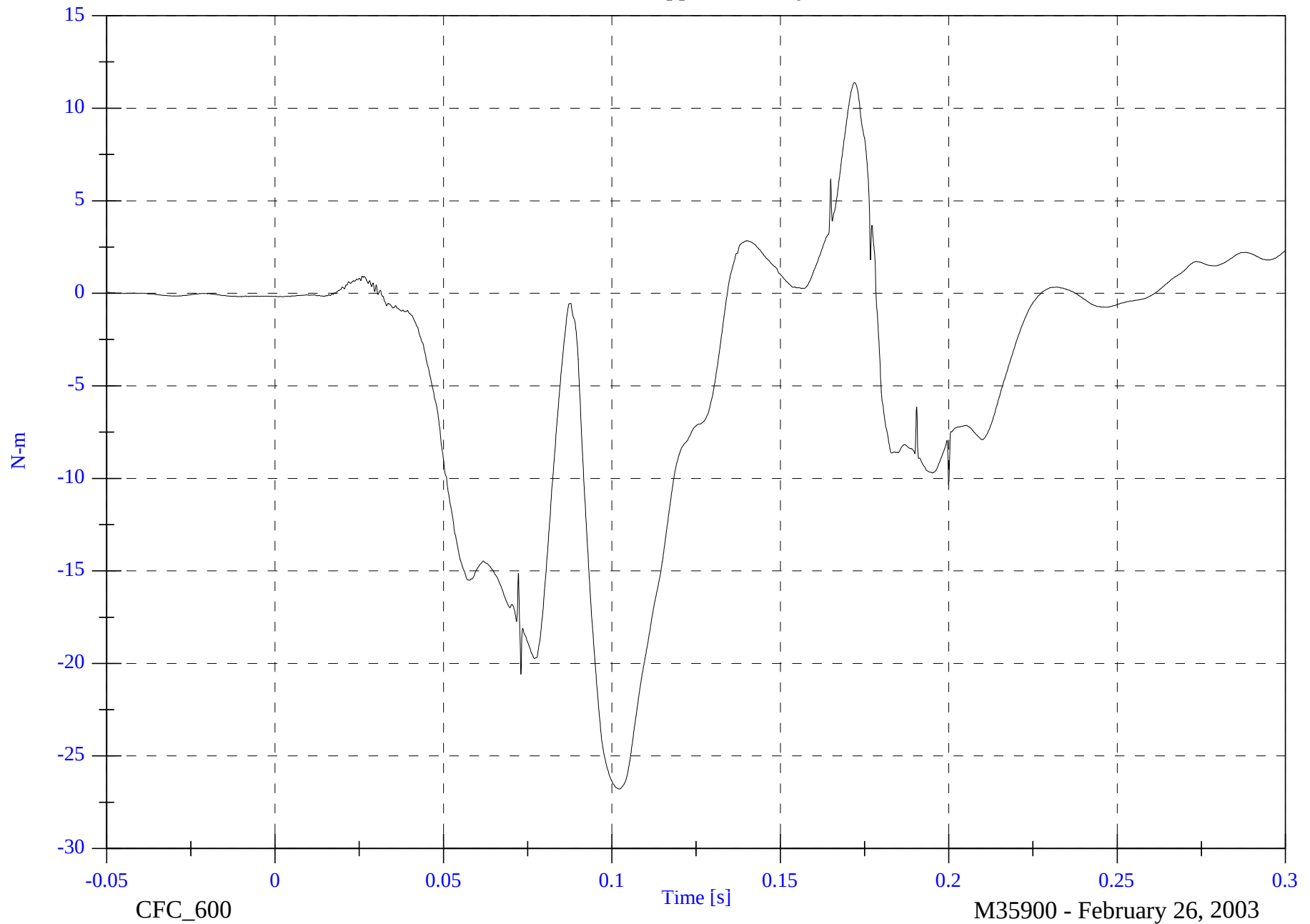
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P3 Upper Neck My

Max: 11.4 [N-m] at 0.172 [s]

Min: -26.8 [N-m] at 0.102 [s]



4-13

8642-NCAP-33

CFC_600

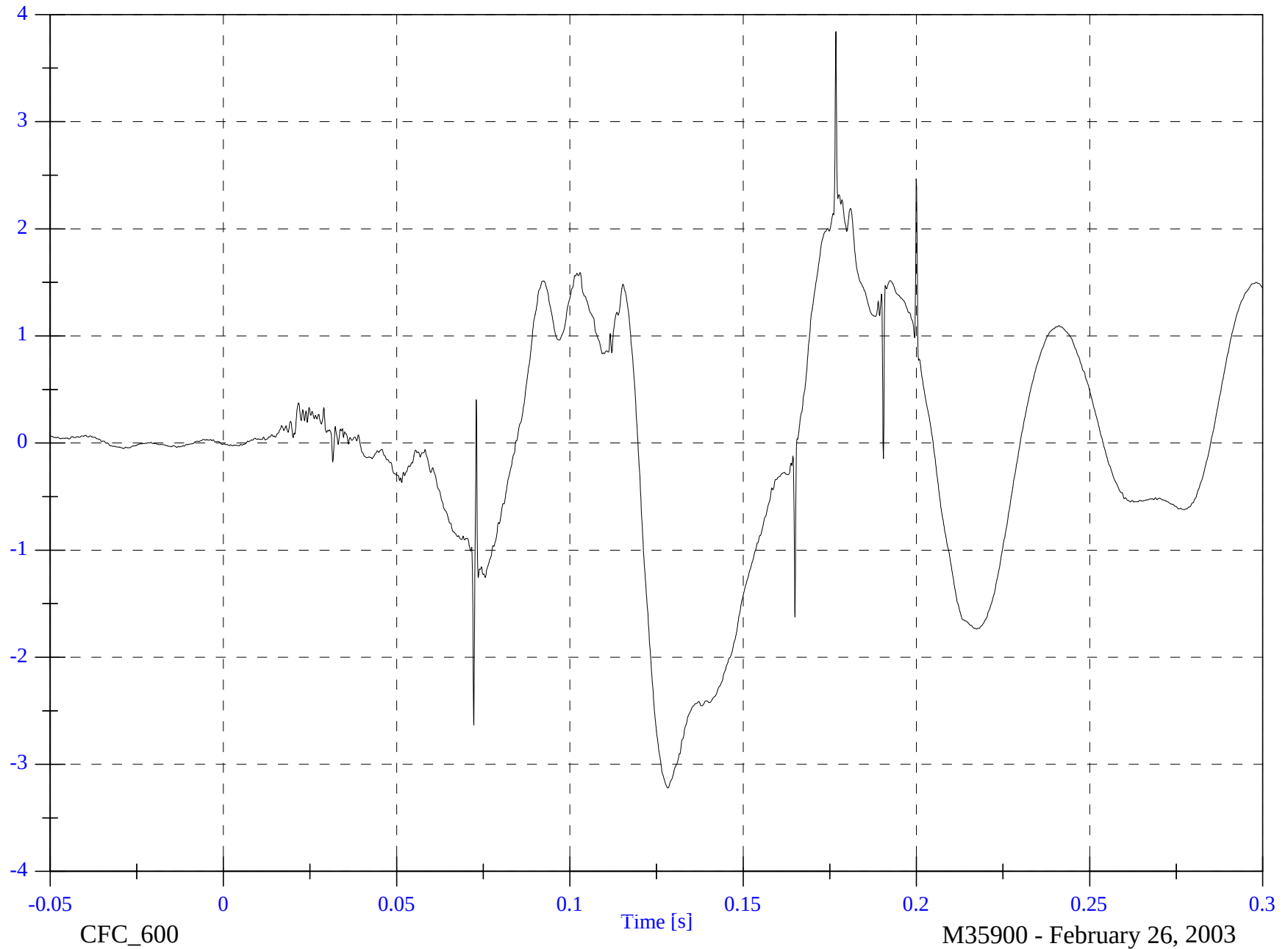
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P3 Upper Neck Mz

Max: 3.8 [N-m] at 0.177 [s]

Min: -3.2 [N-m] at 0.128 [s]



4-14

8642-NCAP-33

CFC_600

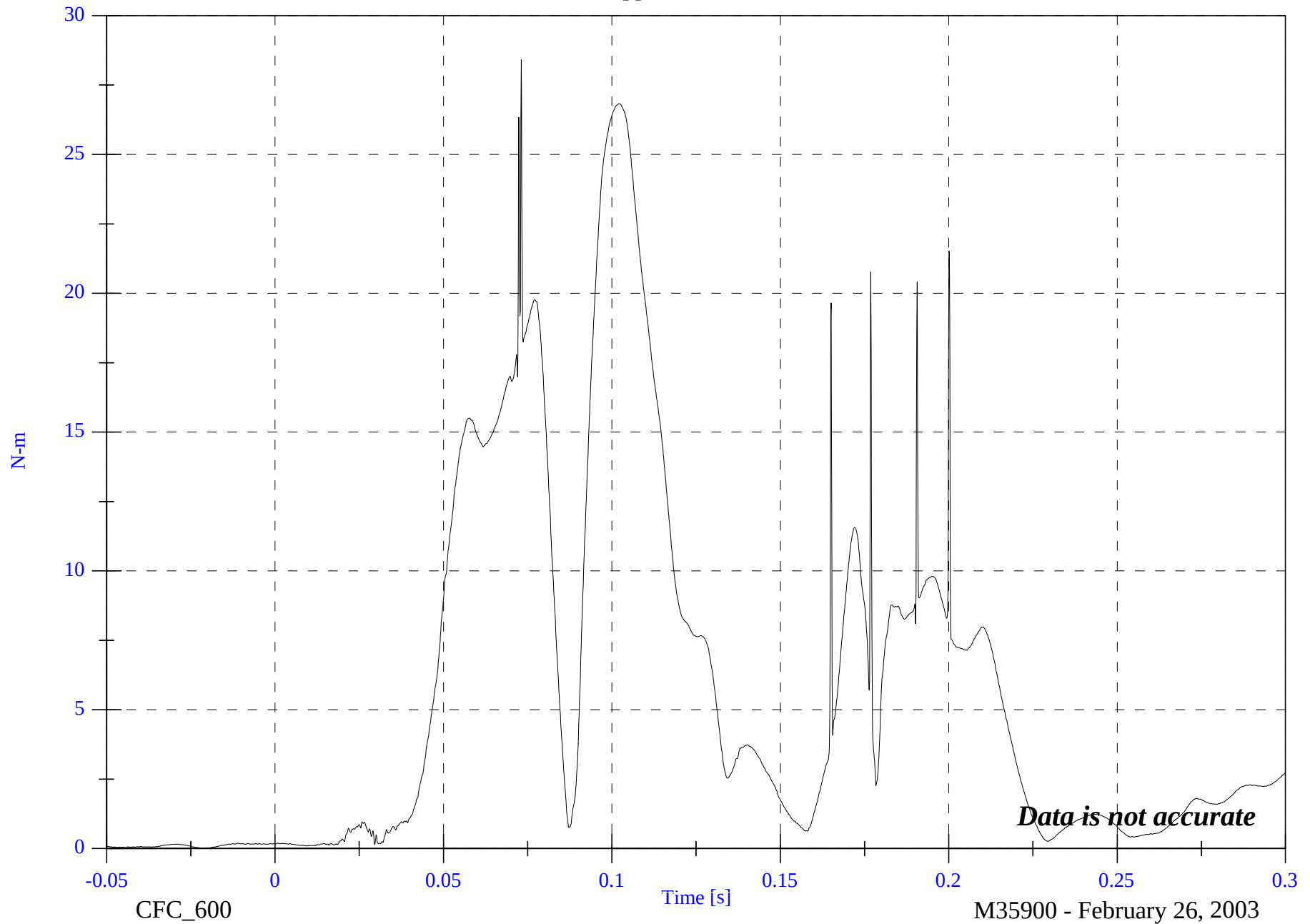
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

V1P3 Upper Neck M Resultant

Max: 28.4 [N-m] at 0.073 [s]

Min: 0.0 [N-m] at -0.021 [s]



4-15

8642-NCAP-33

CFC_600

Time [s]

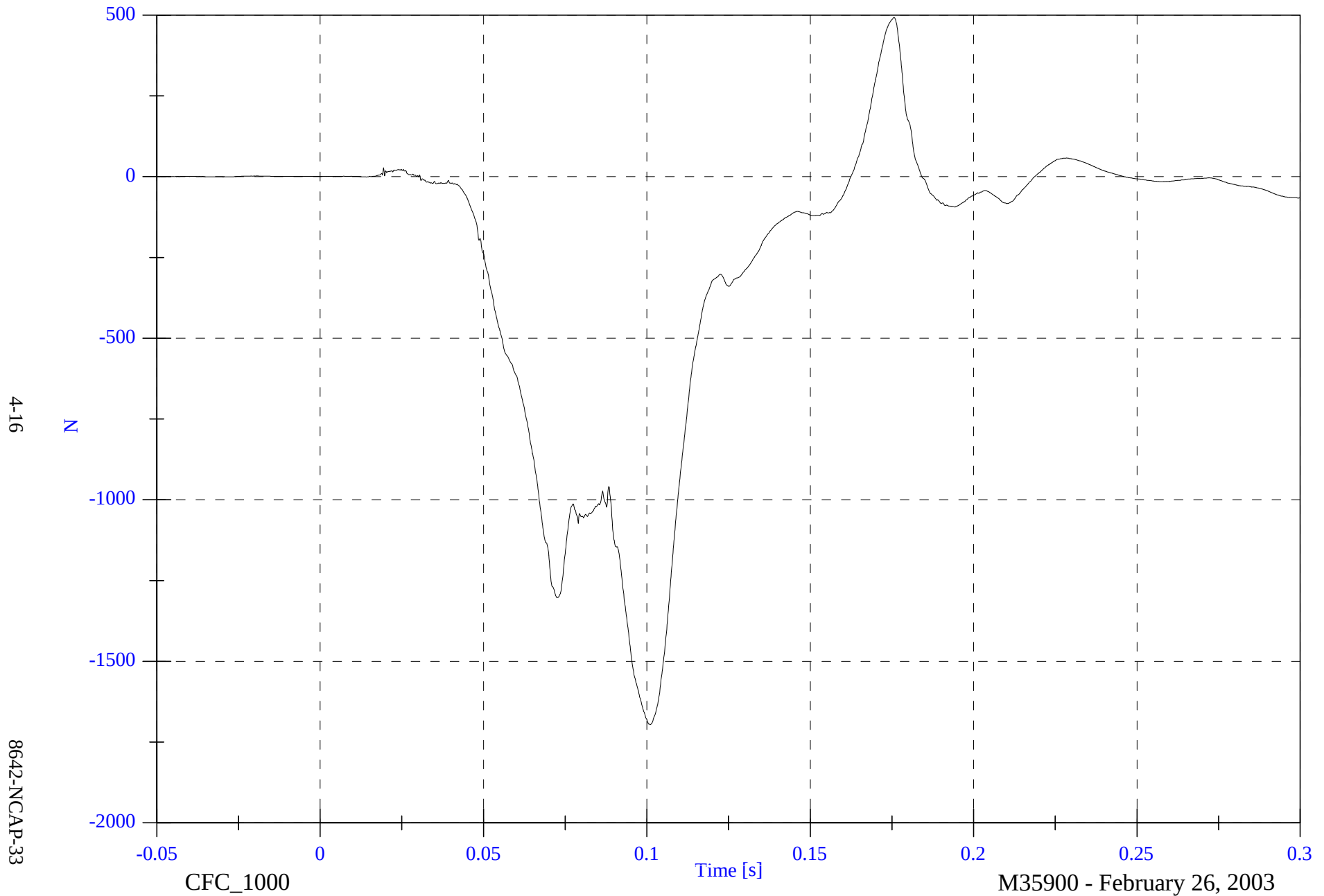
M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

Max: 492.3 [N] at 0.176 [s]

Min: -1695.6 [N] at 0.101 [s]

V1P3 Lower Neck Fx

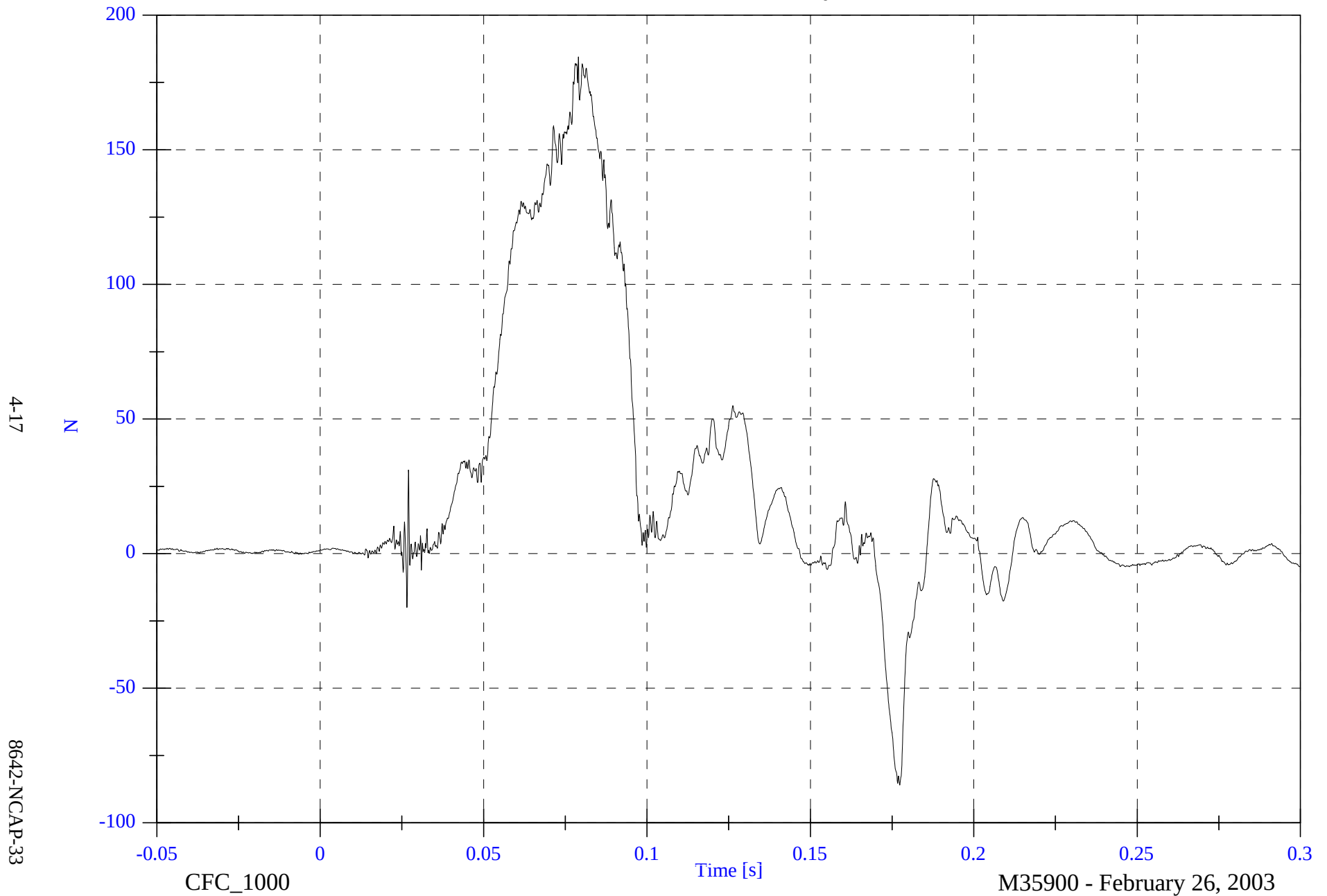


2003 NCAP Test 10 2003 Volvo XC90

Max: 184.5 [N] at 0.079 [s]

Min: -86.0 [N] at 0.177 [s]

V1P3 Lower Neck Fy

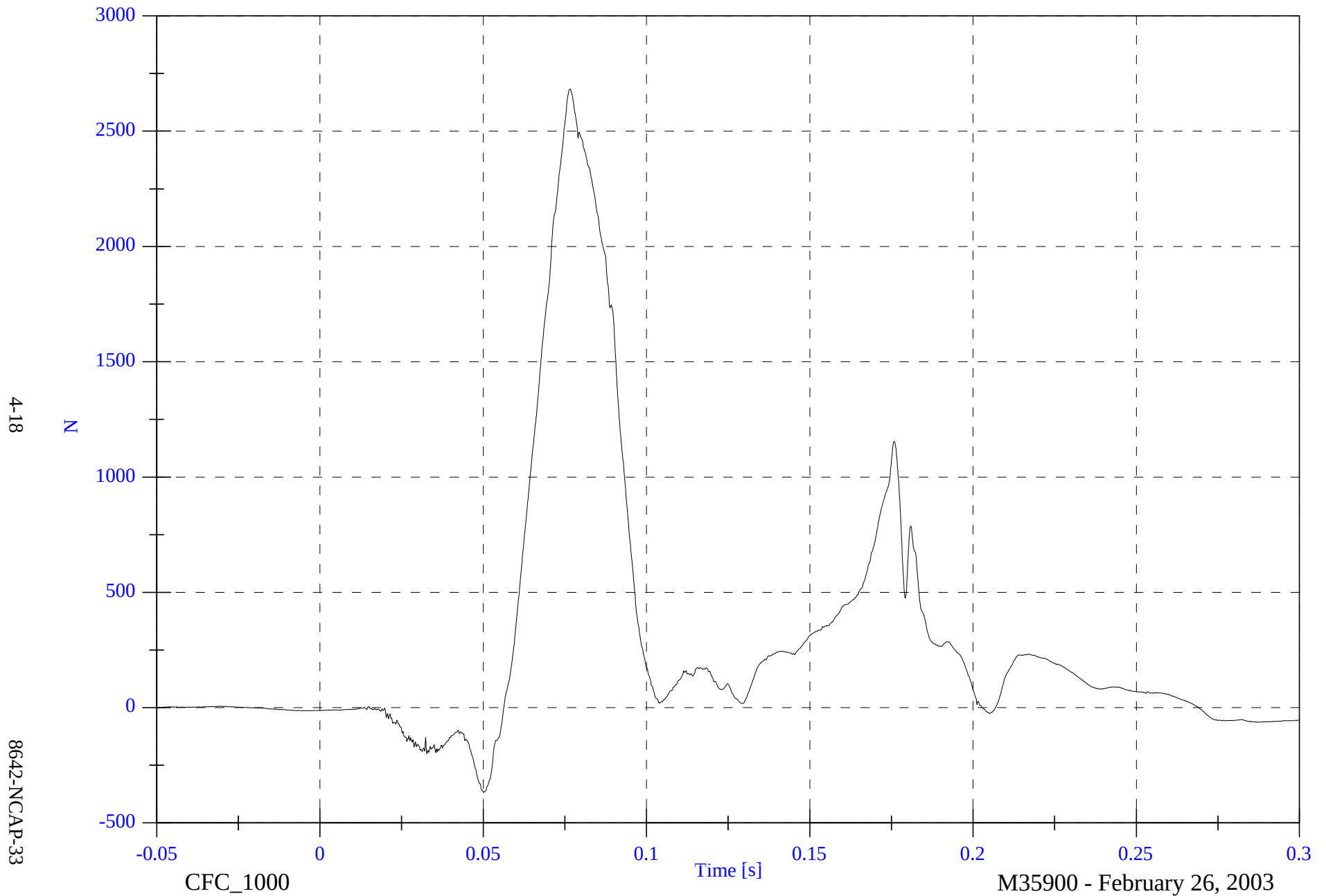


2003 NCAP Test 10 2003 Volvo XC90

Max: 2682.2 [N] at 0.077 [s]

Min: -367.7 [N] at 0.050 [s]

V1P3 Lower Neck Fz



2003 NCAP Test 10 2003 Volvo XC90

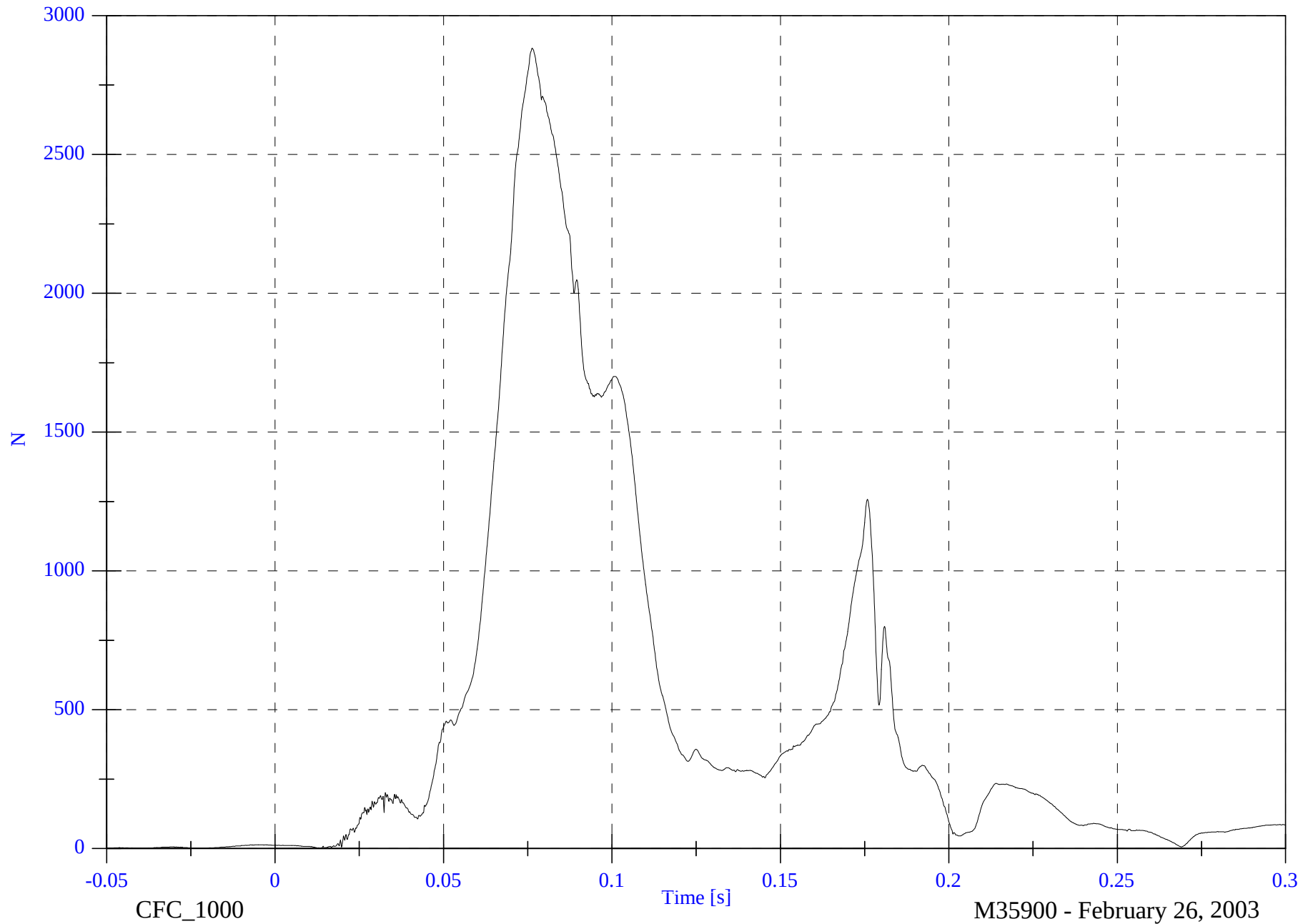
V1P3 Lower Neck F Resultant

Max: 2883.5 [N] at 0.076 [s]

Min: 1.1 [N] at 0.014 [s]

4-19

8642-NCAP-33

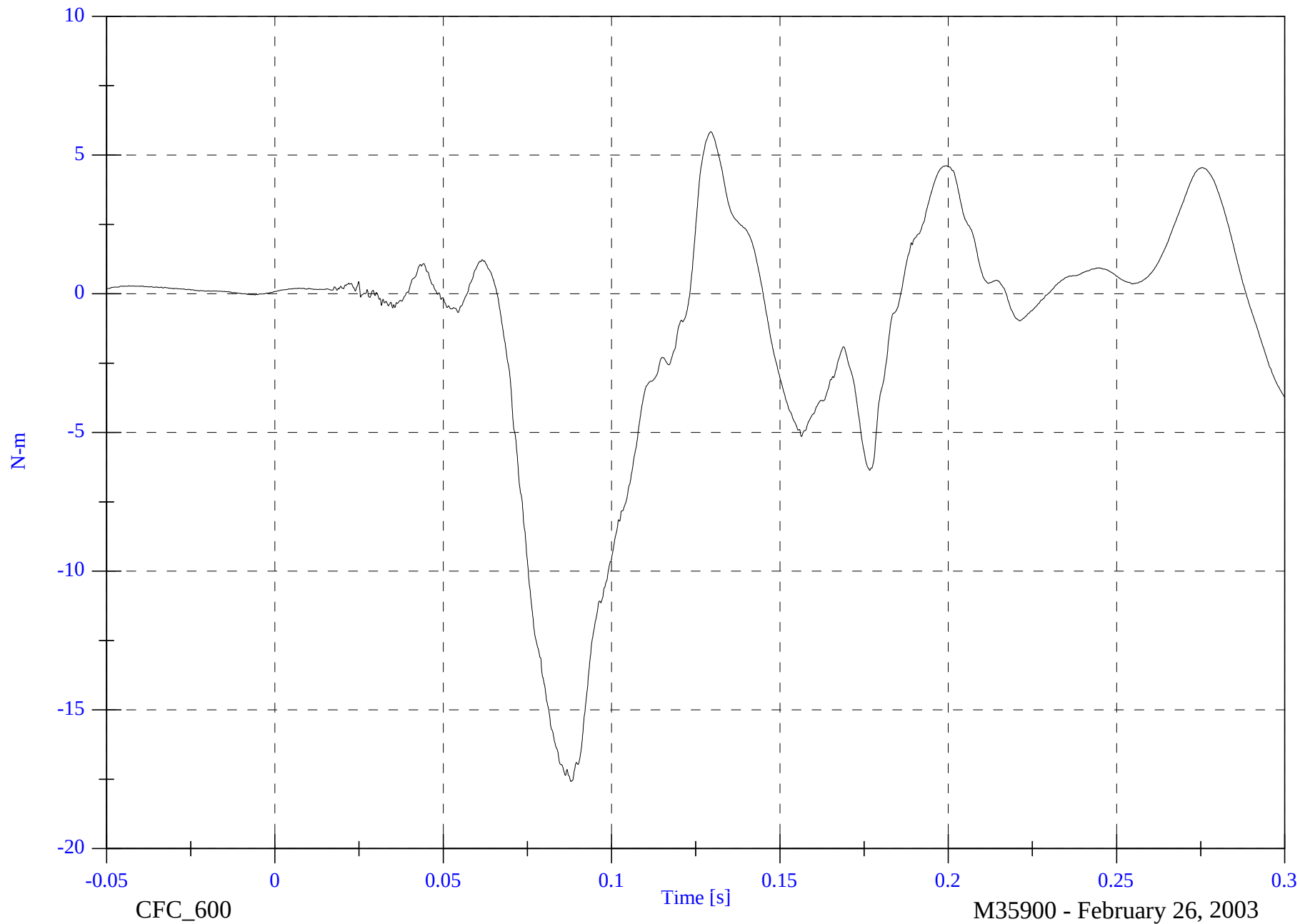


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Lower Neck Mx

Max: 5.8 [N-m] at 0.129 [s]

Min: -17.6 [N-m] at 0.088 [s]

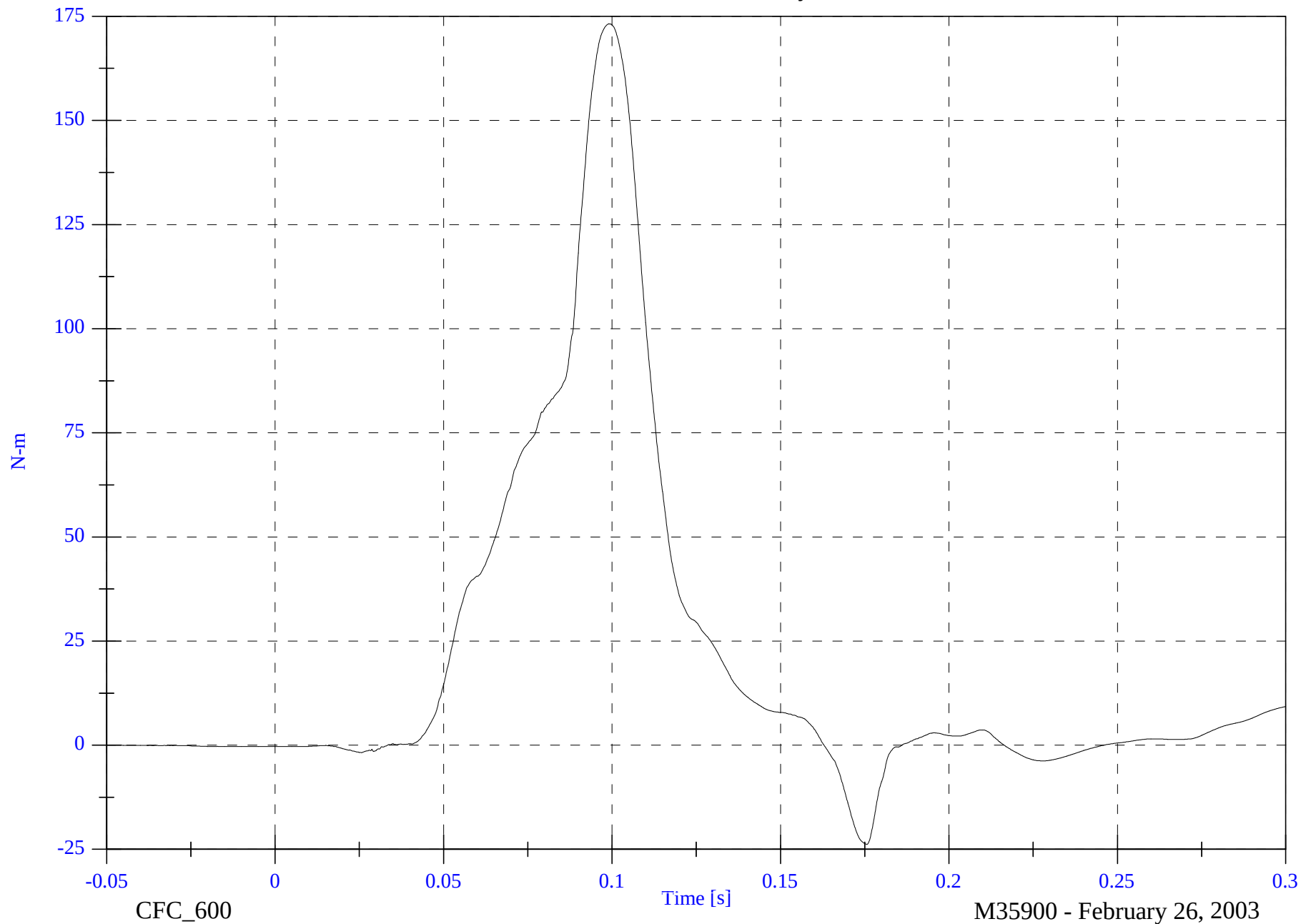


2003 NCAP Test 10 2003 Volvo XC90

Max: 173.2 [N-m] at 0.099 [s]

Min: -23.8 [N-m] at 0.176 [s]

V1P3 Lower Neck My

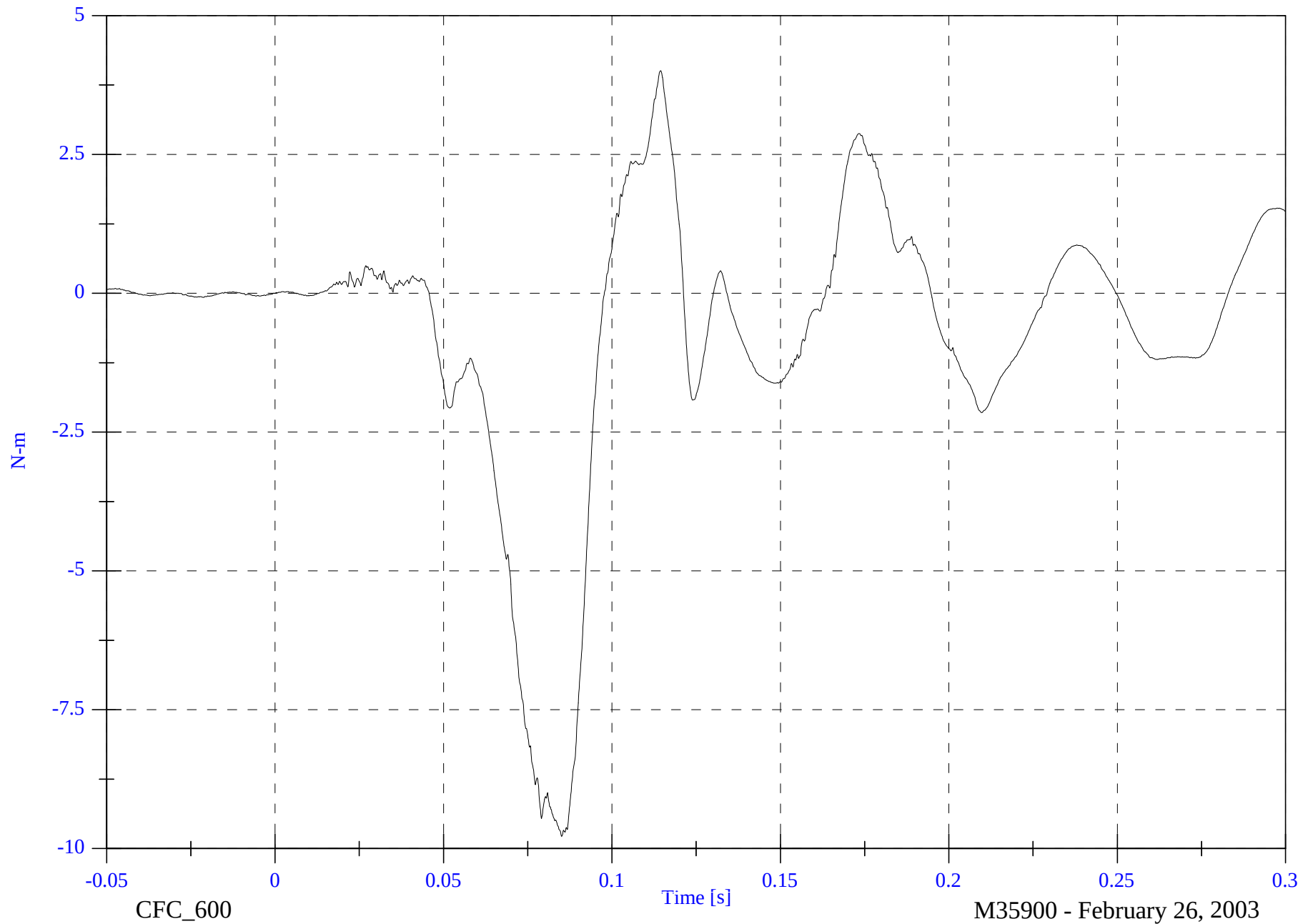


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Lower Neck Mz

Max: 4.0 [N-m] at 0.114 [s]

Min: -9.8 [N-m] at 0.085 [s]



4-22

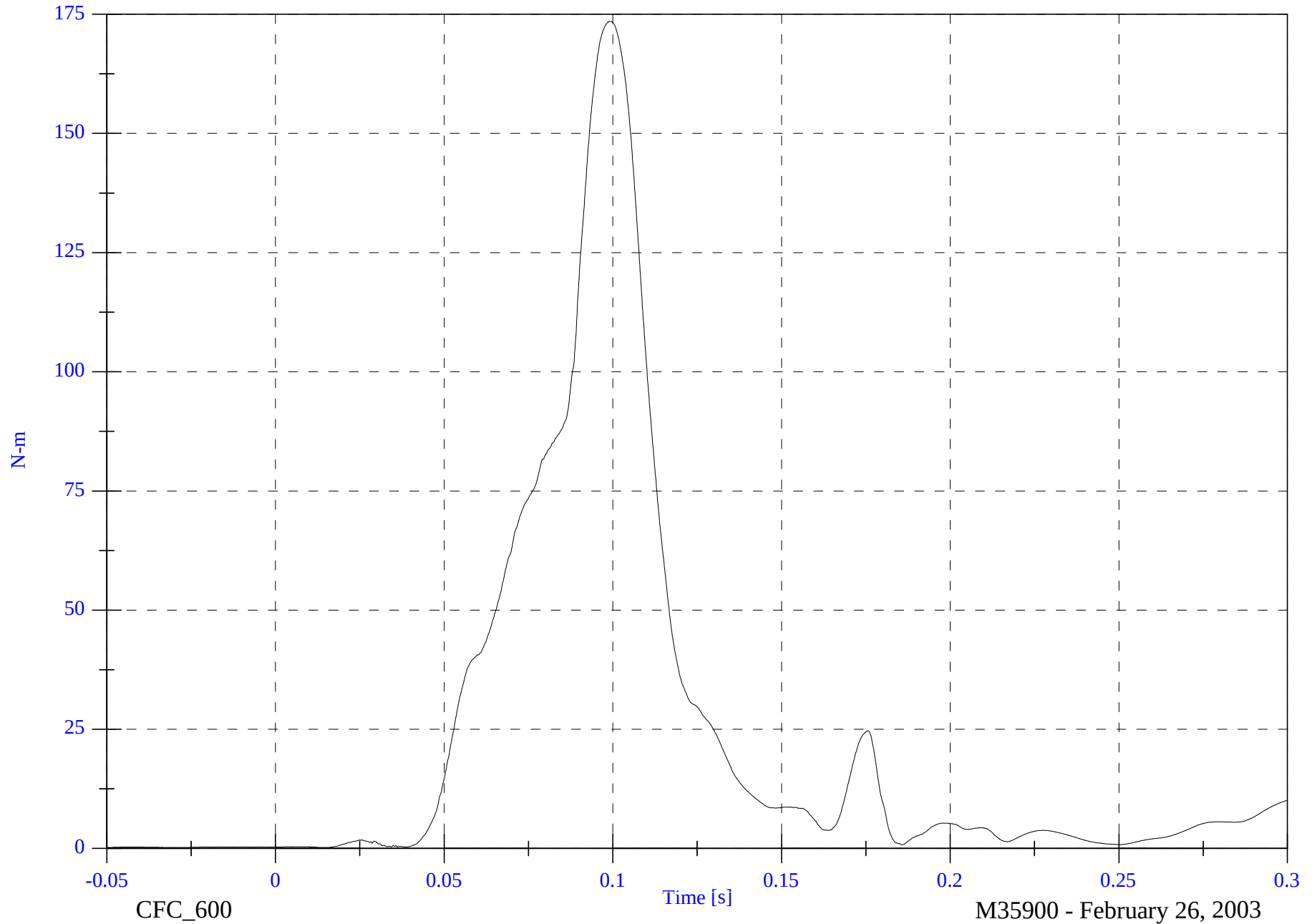
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

V1P3 Lower Neck M Resultant

Max: 173.5 [N-m] at 0.099 [s]

Min: 0.2 [N-m] at 0.015 [s]



4-23

8642-NCAP-33

CFC_600

M35900 - February 26, 2003

2003 NCAP Test 10 2003 Volvo XC90

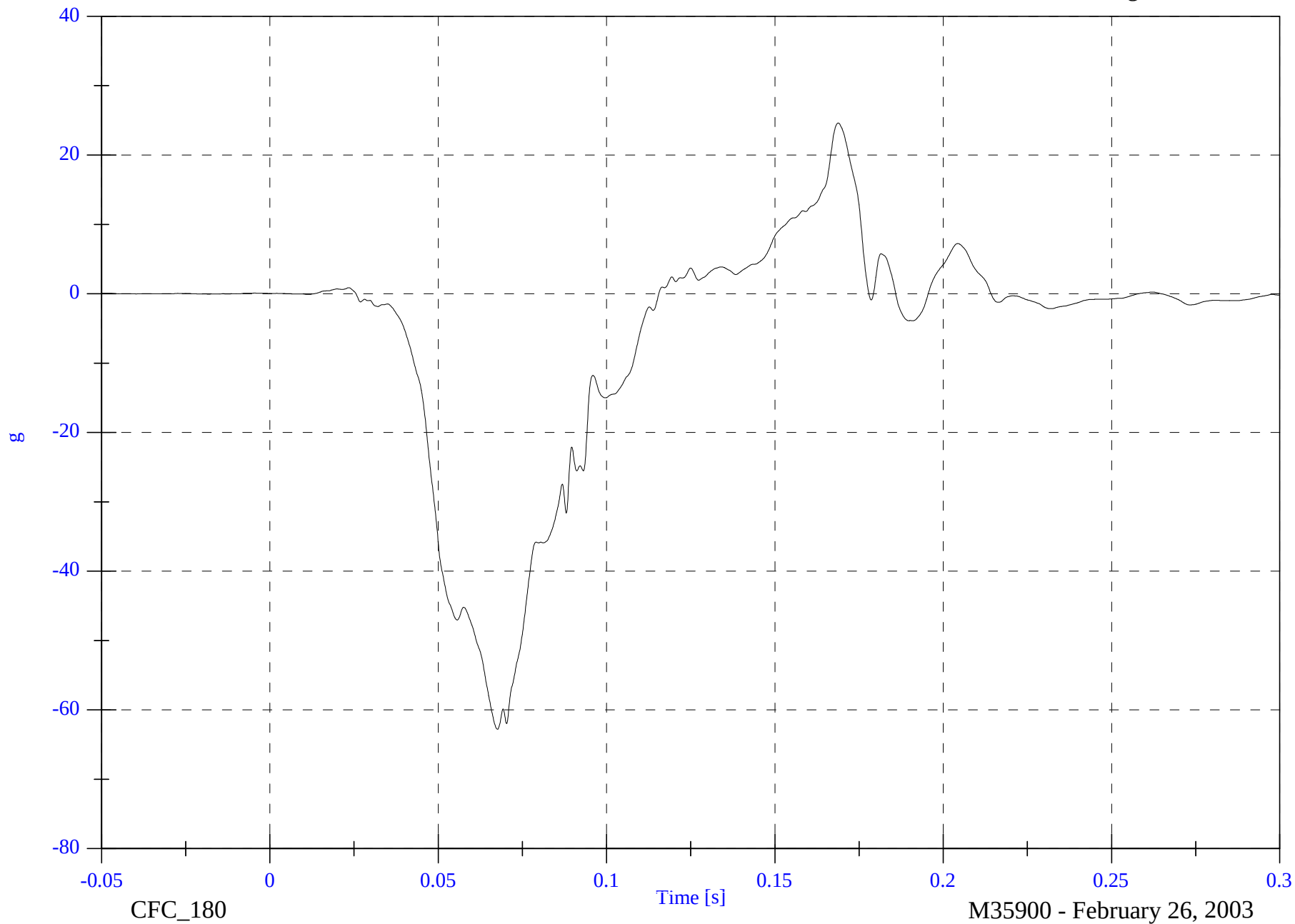
V1P3 Chest x

Max: 24.6 [g] at 0.169 [s]

Min: -62.8 [g] at 0.068 [s]

4-24

8642-NCAP-33

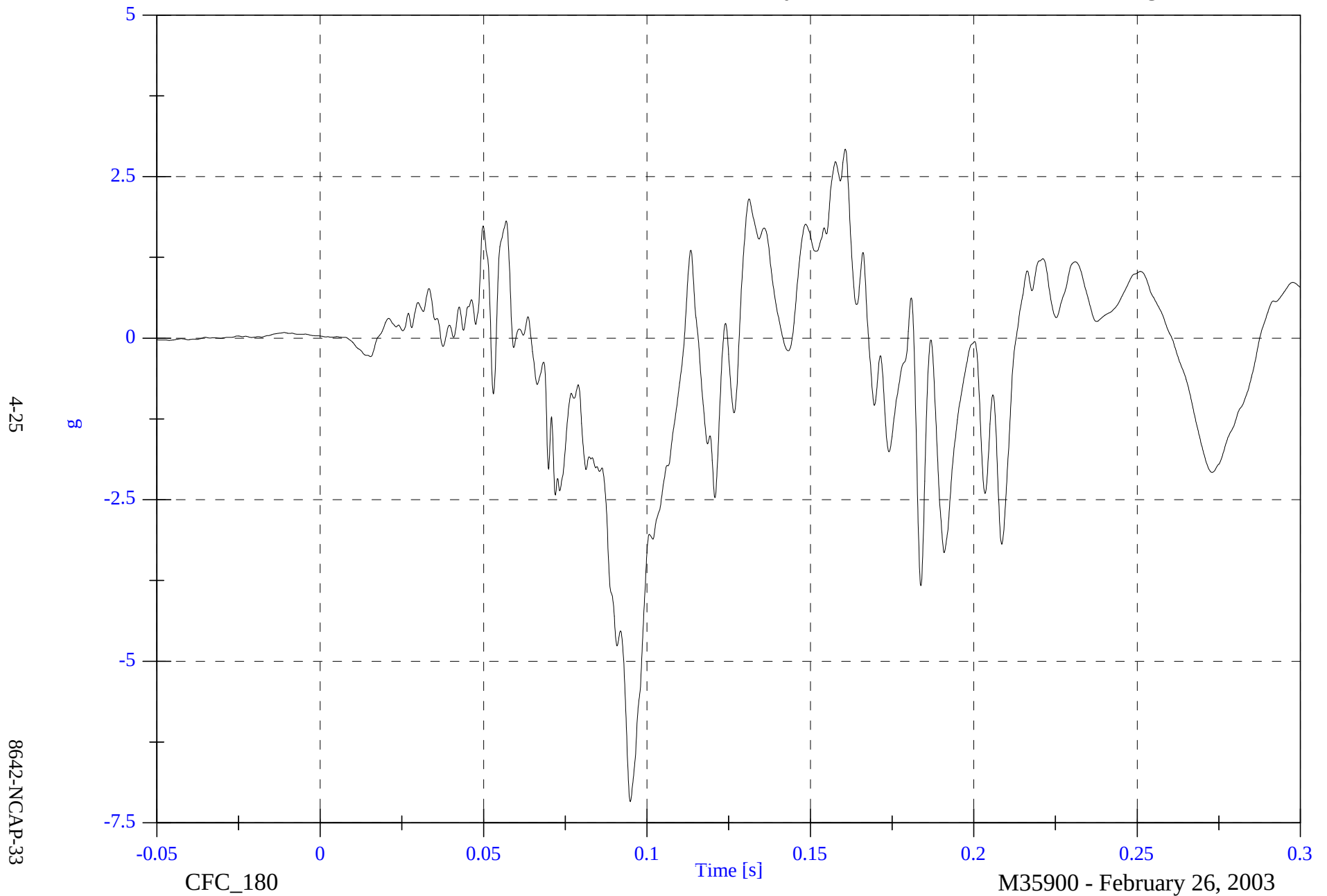


2003 NCAP Test 10 2003 Volvo XC90

Max: 2.9 [g] at 0.161 [s]

Min: -7.2 [g] at 0.095 [s]

V1P3 Chest y



2003 NCAP Test 10 2003 Volvo XC90

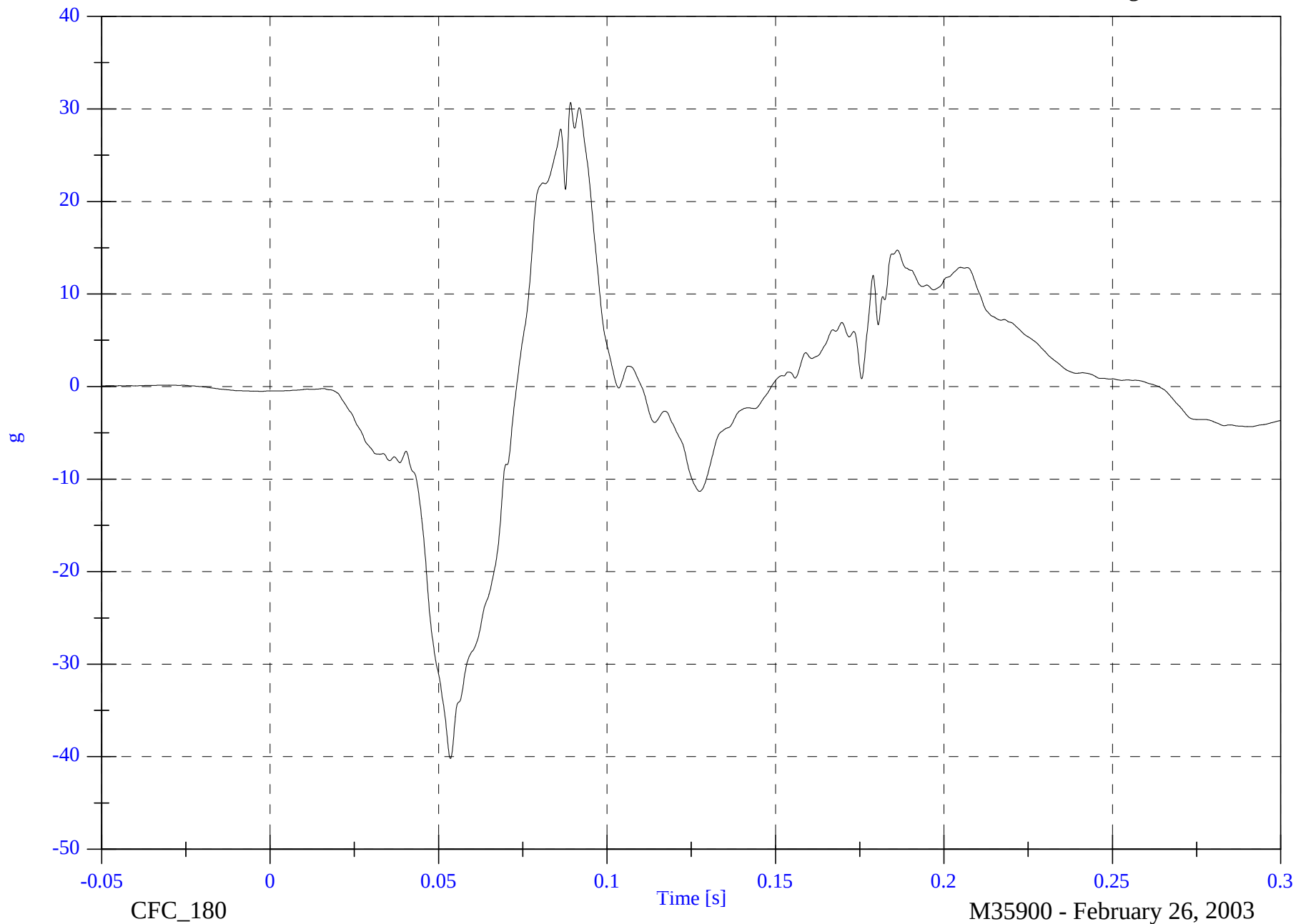
V1P3 Chest z

Max: 30.7 [g] at 0.089 [s]

Min: -40.2 [g] at 0.053 [s]

4-26

8642-NCAP-33

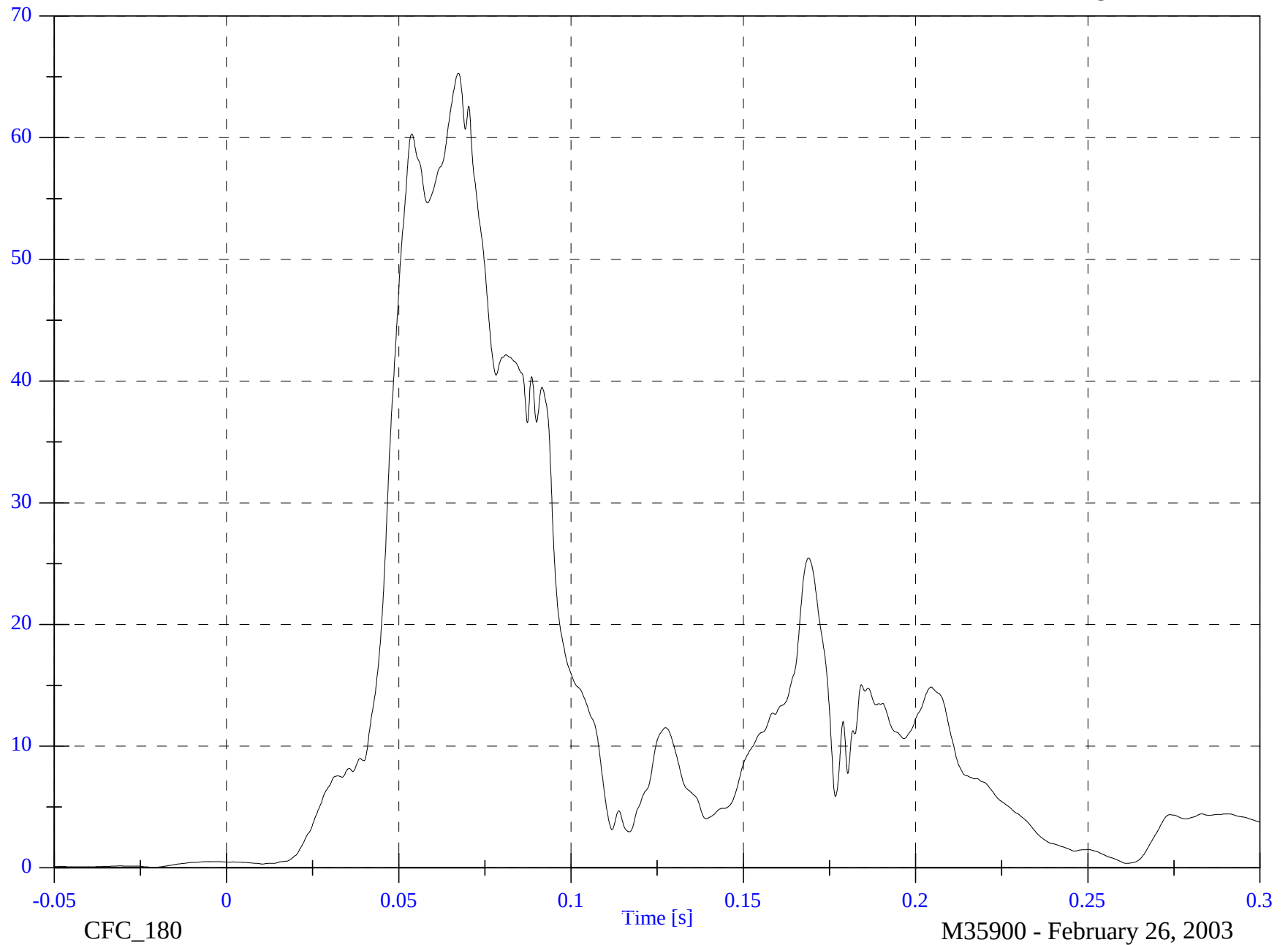


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Chest Resultant

Max: 65.3 [g] at 0.067 [s]

Min: 0.0 [g] at -0.022 [s]



2003 NCAP Test 10 2003 Volvo XC90

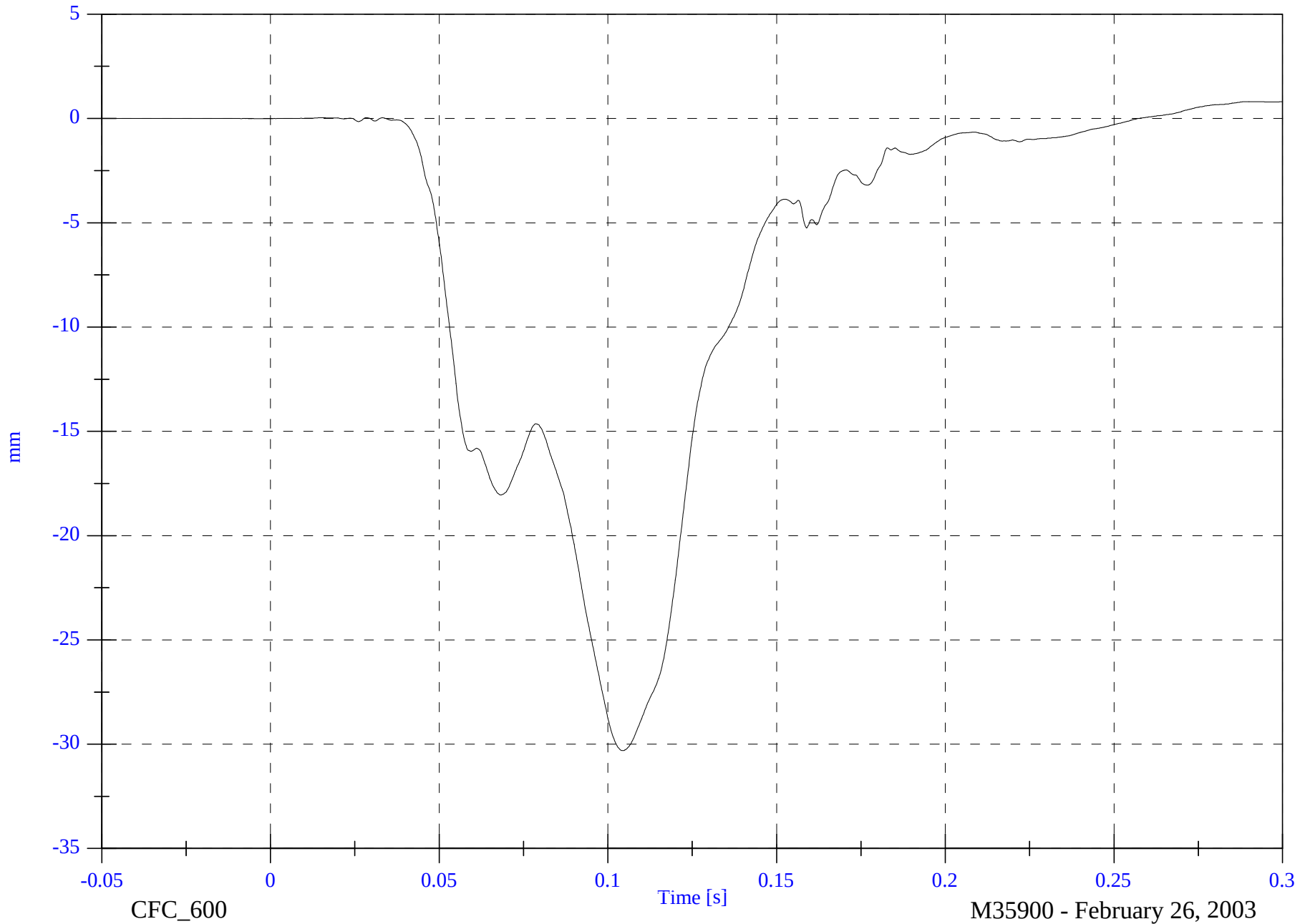
V1P3 Chest Compression

Max: 0.8 [mm] at 0.289 [s]

Min: -30.3 [mm] at 0.105 [s]

4-28

8642-NCAP-33

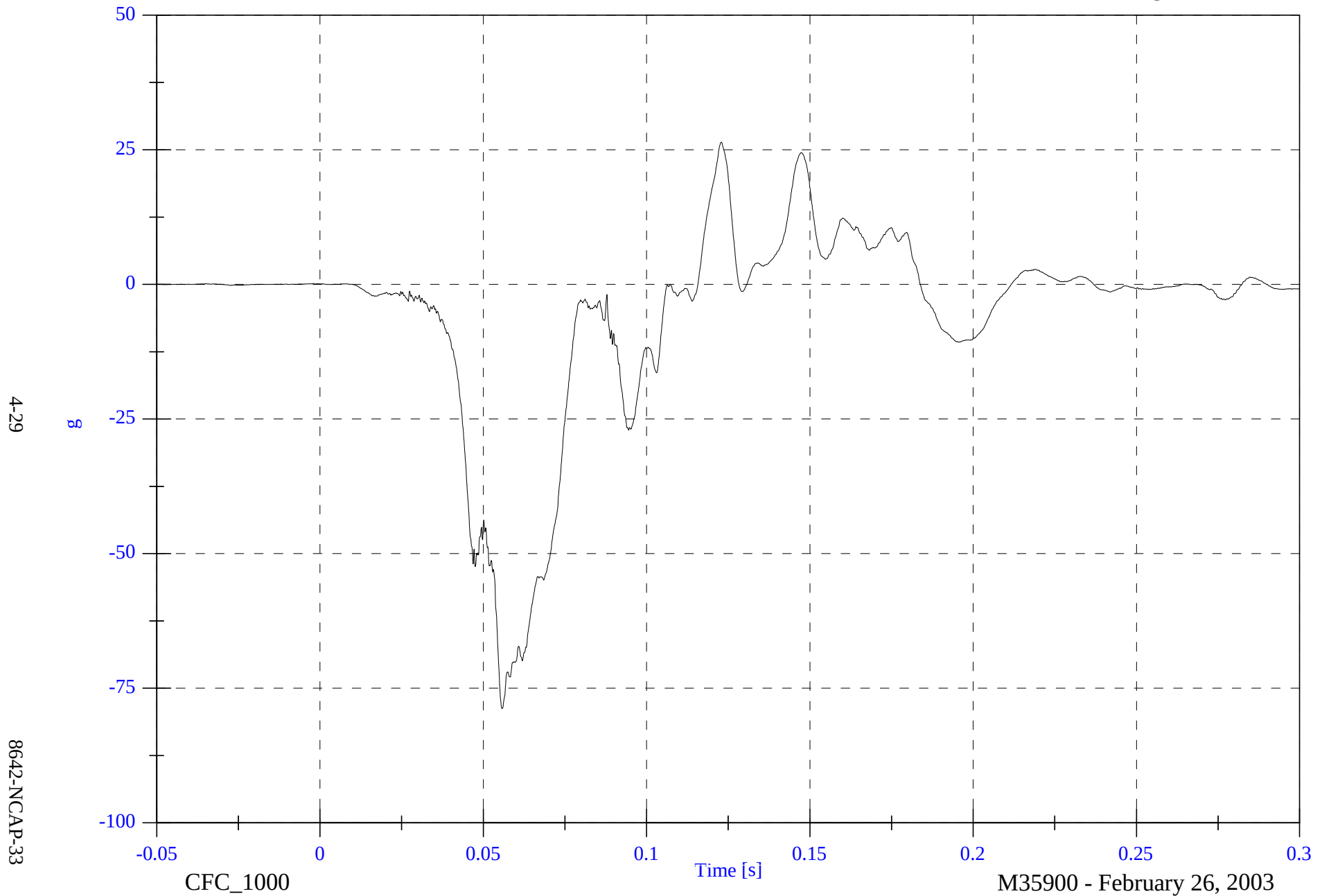


2003 NCAP Test 10 2003 Volvo XC90

Max: 26.4 [g] at 0.123 [s]

Min: -78.8 [g] at 0.056 [s]

V1P3 Pelvic x

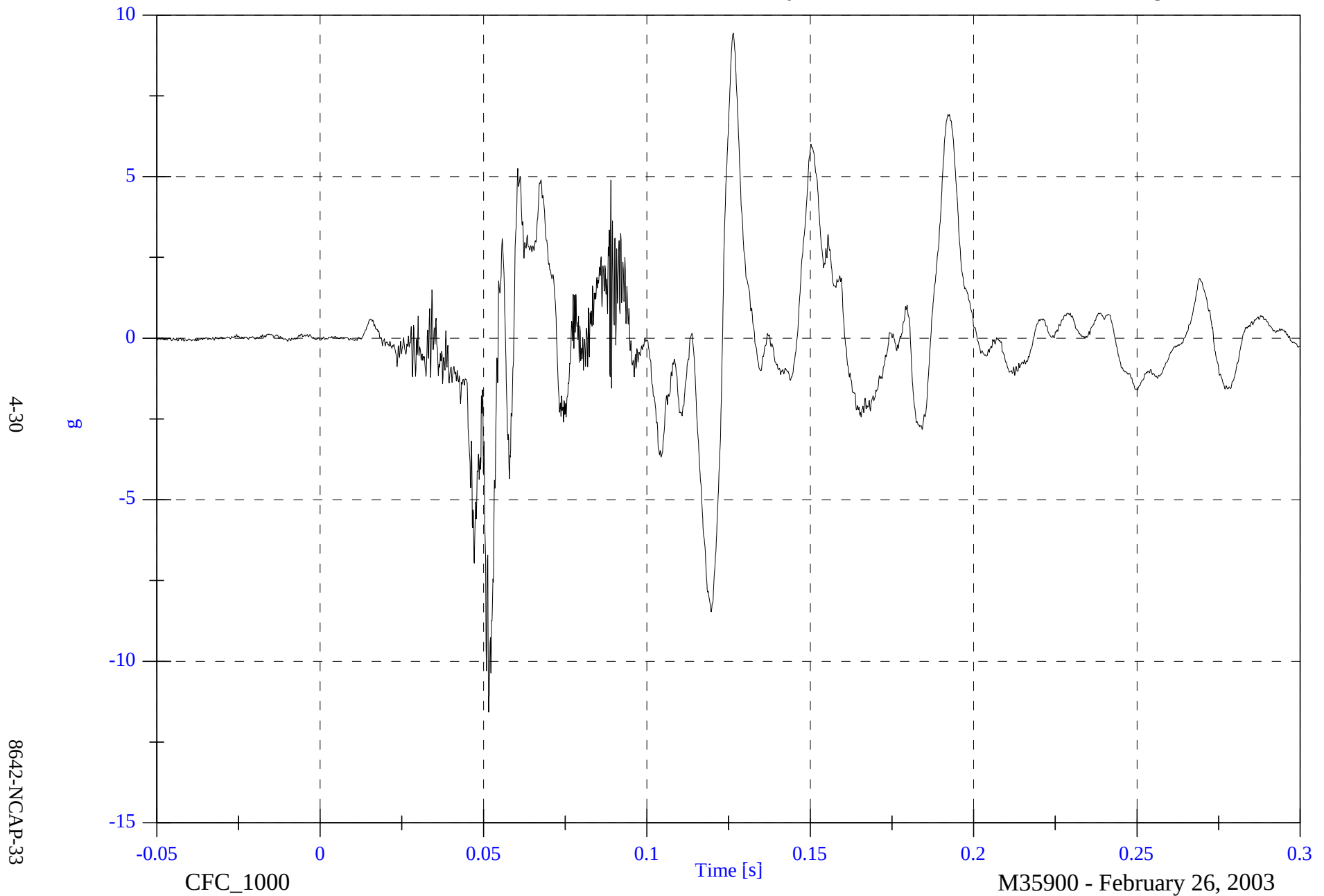


2003 NCAP Test 10 2003 Volvo XC90

Max: 9.4 [g] at 0.126 [s]

Min: -11.6 [g] at 0.052 [s]

V1P3 Pelvic y



2003 NCAP Test 10 2003 Volvo XC90

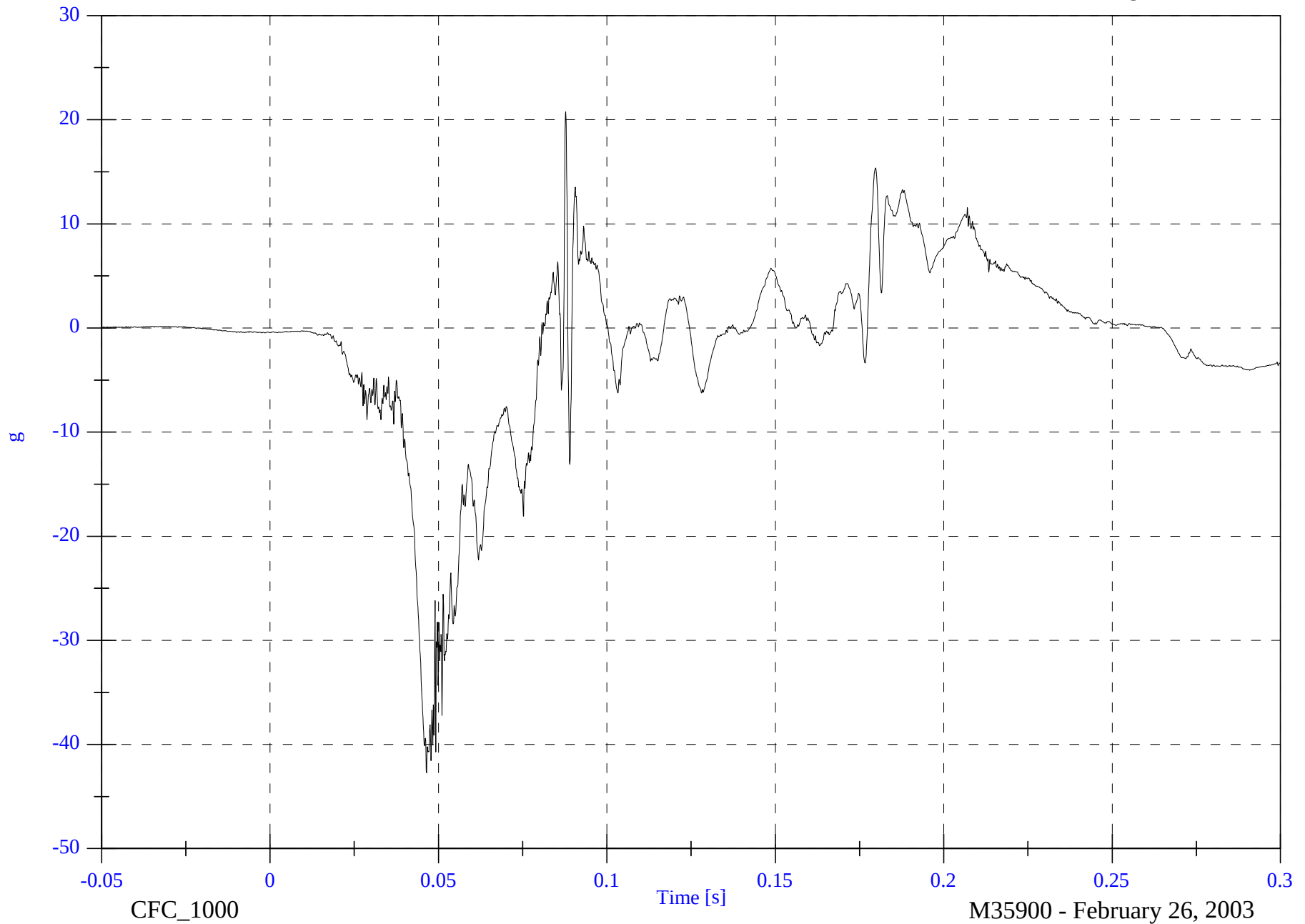
V1P3 Pelvic z

Max: 20.8 [g] at 0.088 [s]

Min: -42.7 [g] at 0.046 [s]

4-31

8642-NCAP-33

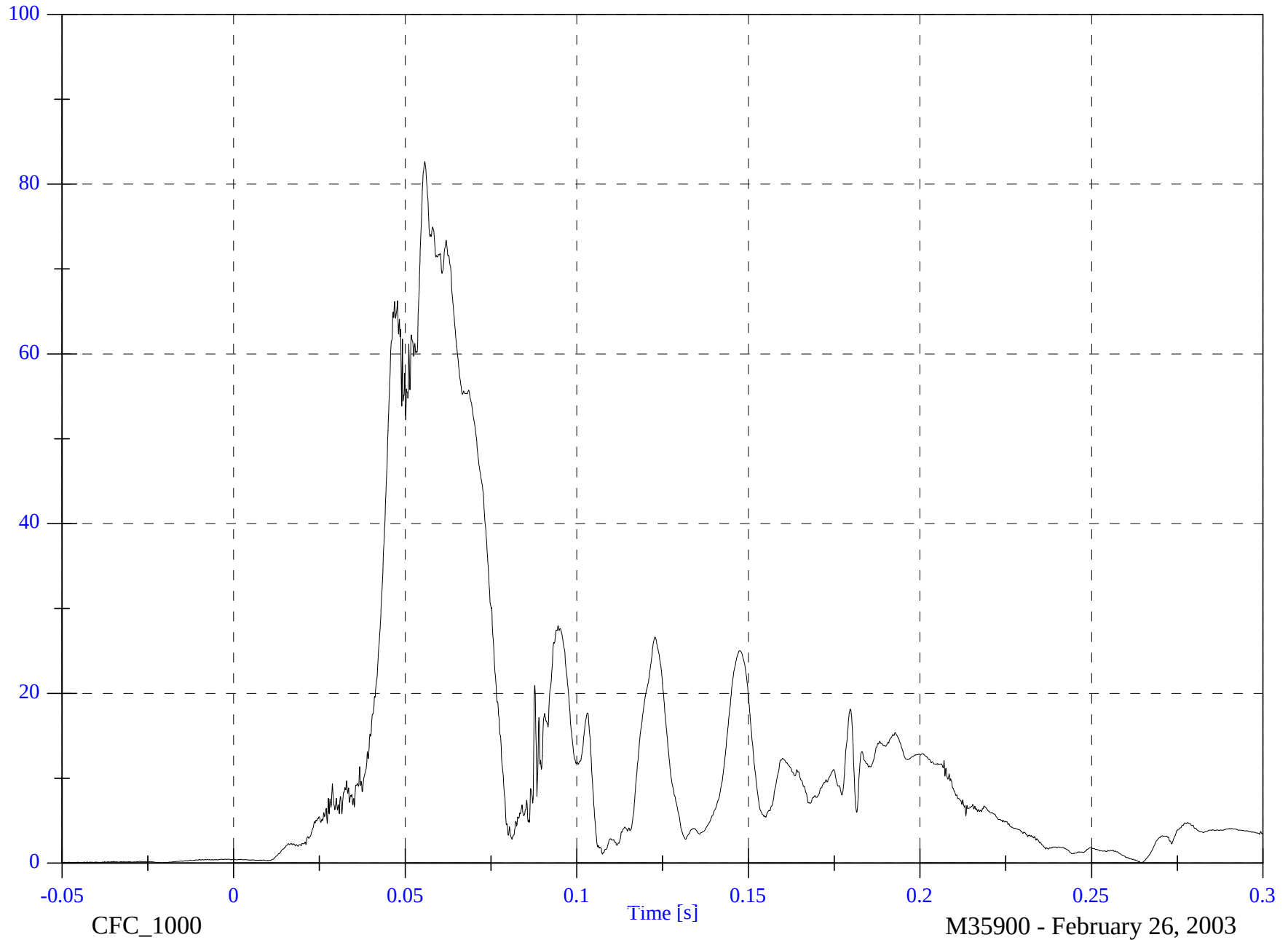


2003 NCAP Test 10 2003 Volvo XC90

V1P3 Pelvic Resultant

Max: 82.7 [g] at 0.056 [s]

Min: 0.0 [g] at -0.021 [s]



4-32

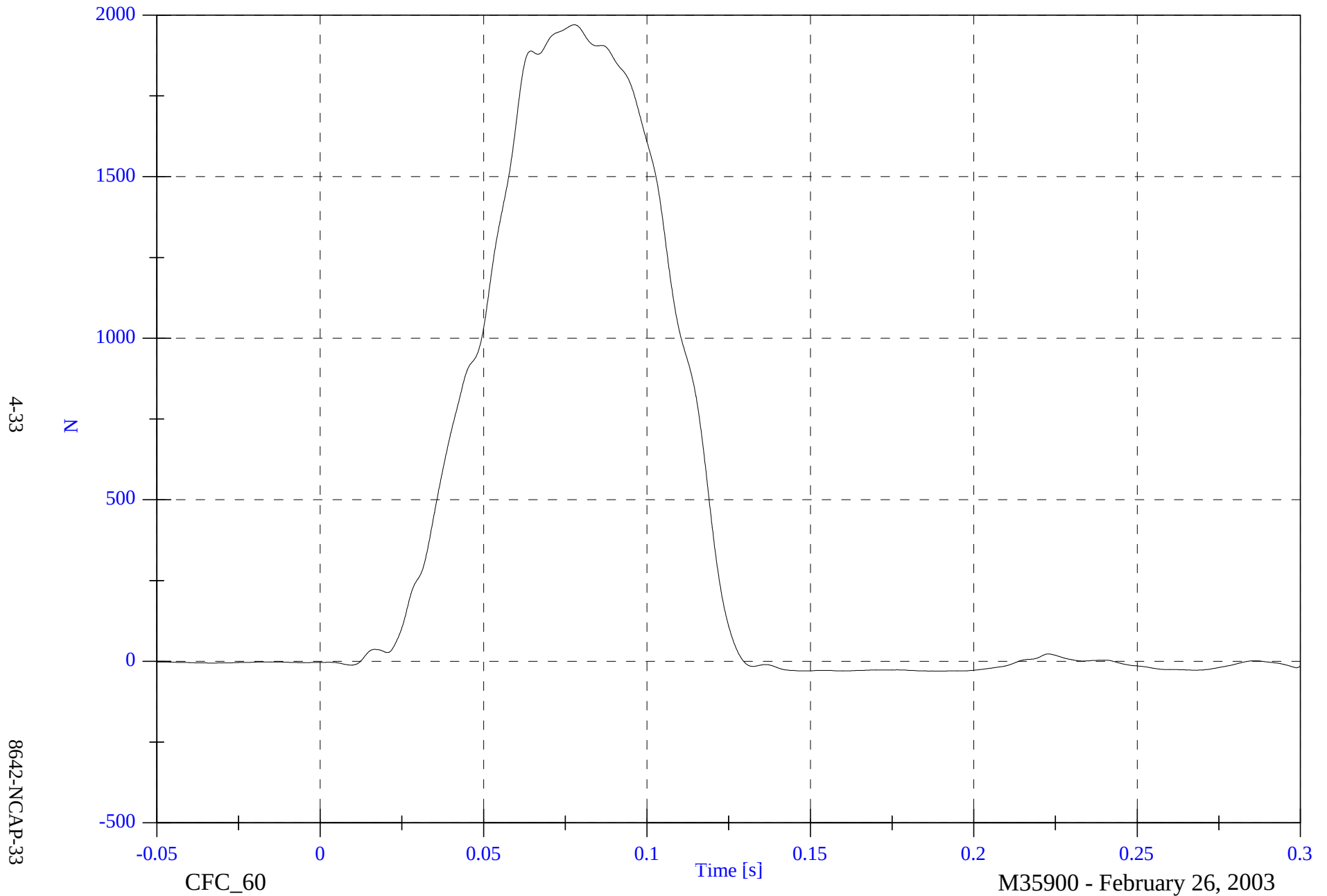
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 1970.2 [N] at 0.078 [s]

Min: -30.3 [N] at 0.190 [s]

V1P3 Tether Load



2003 NCAP Test 10 2003 Volvo XC90

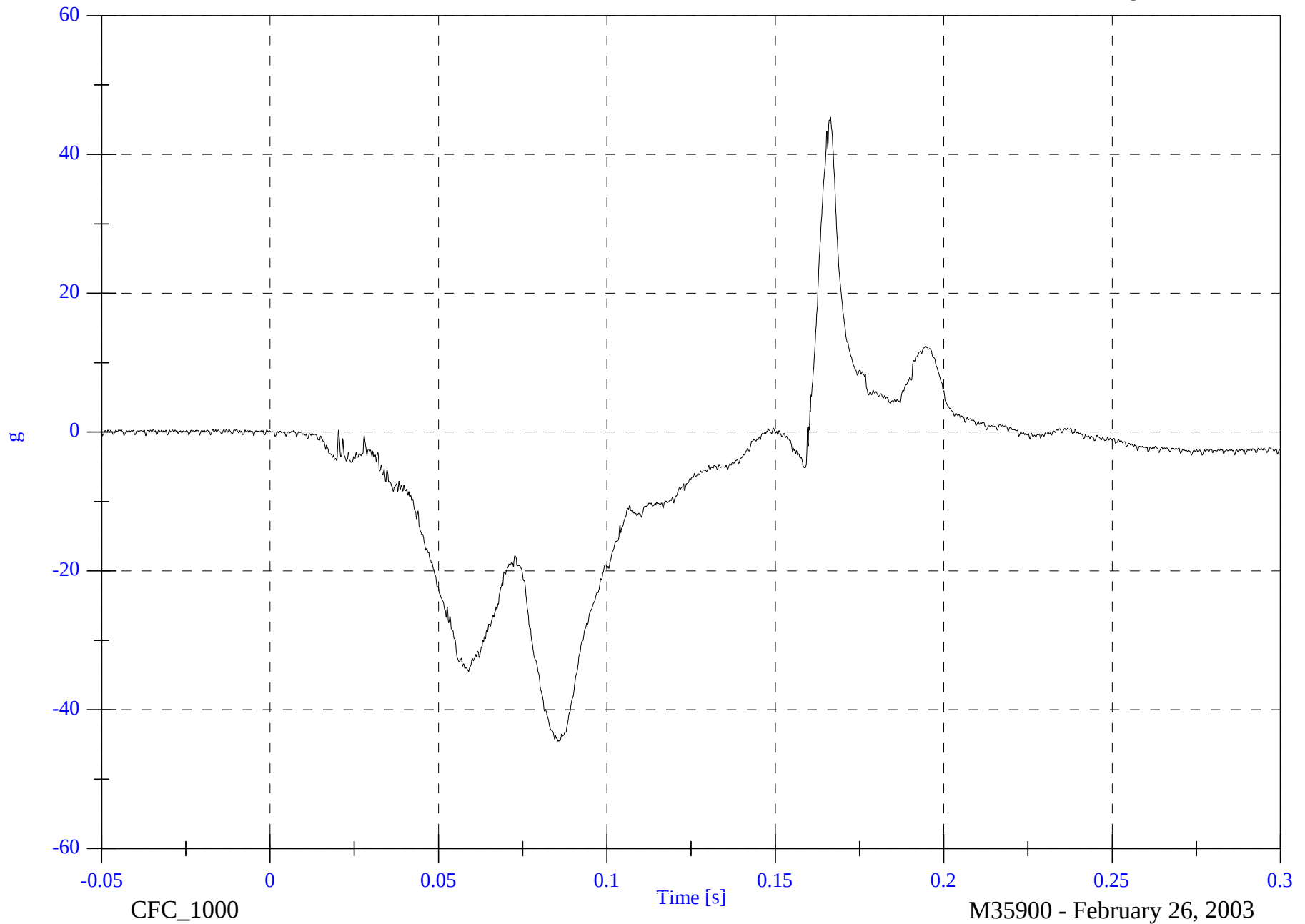
V1P4 Head x

Max: 45.4 [g] at 0.166 [s]

Min: -44.5 [g] at 0.086 [s]

4-34

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

Max: 2.5 [g] at 0.052 [s]

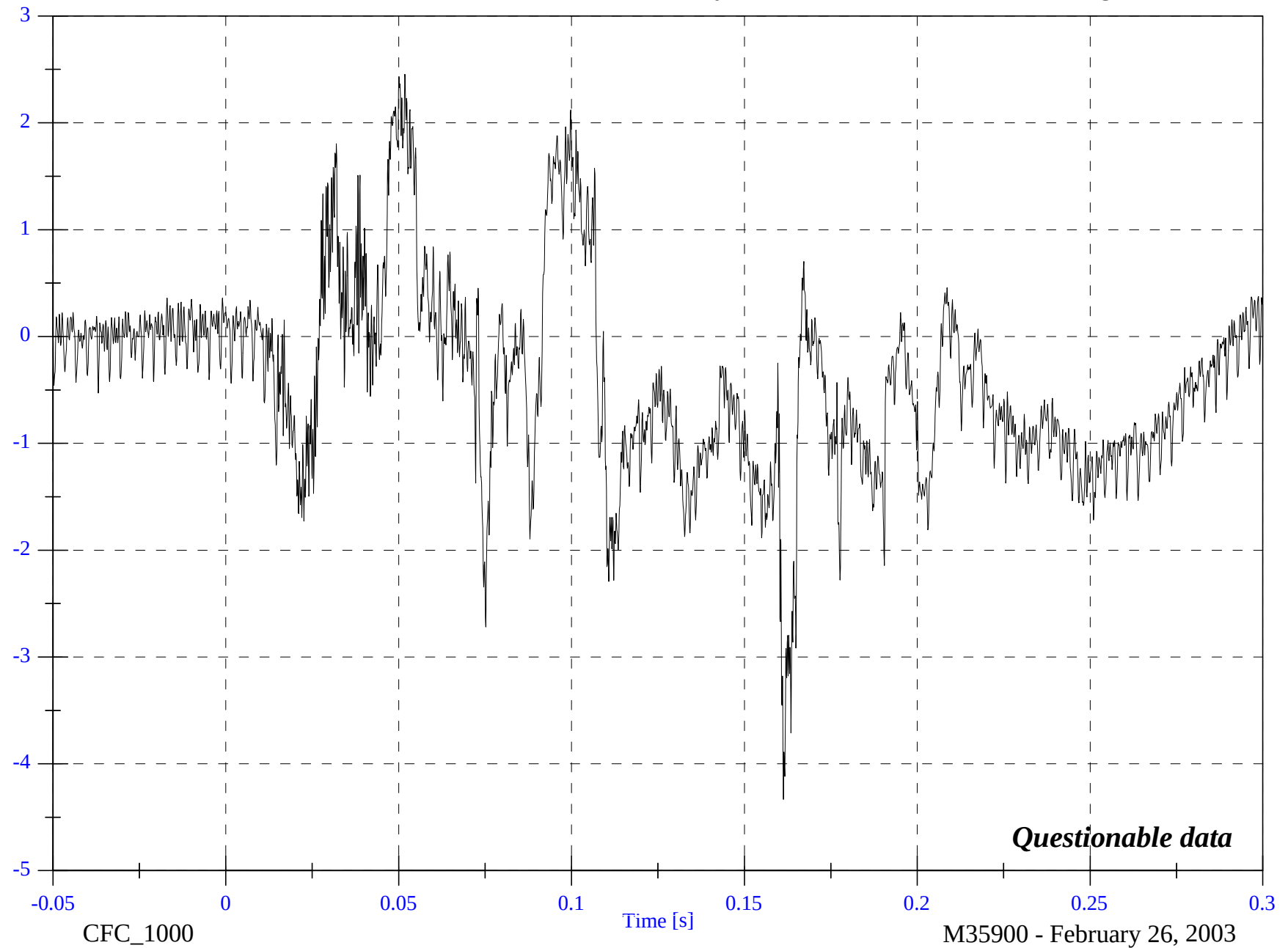
Min: -4.3 [g] at 0.161 [s]

V1P4 Head y

4-35

g

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

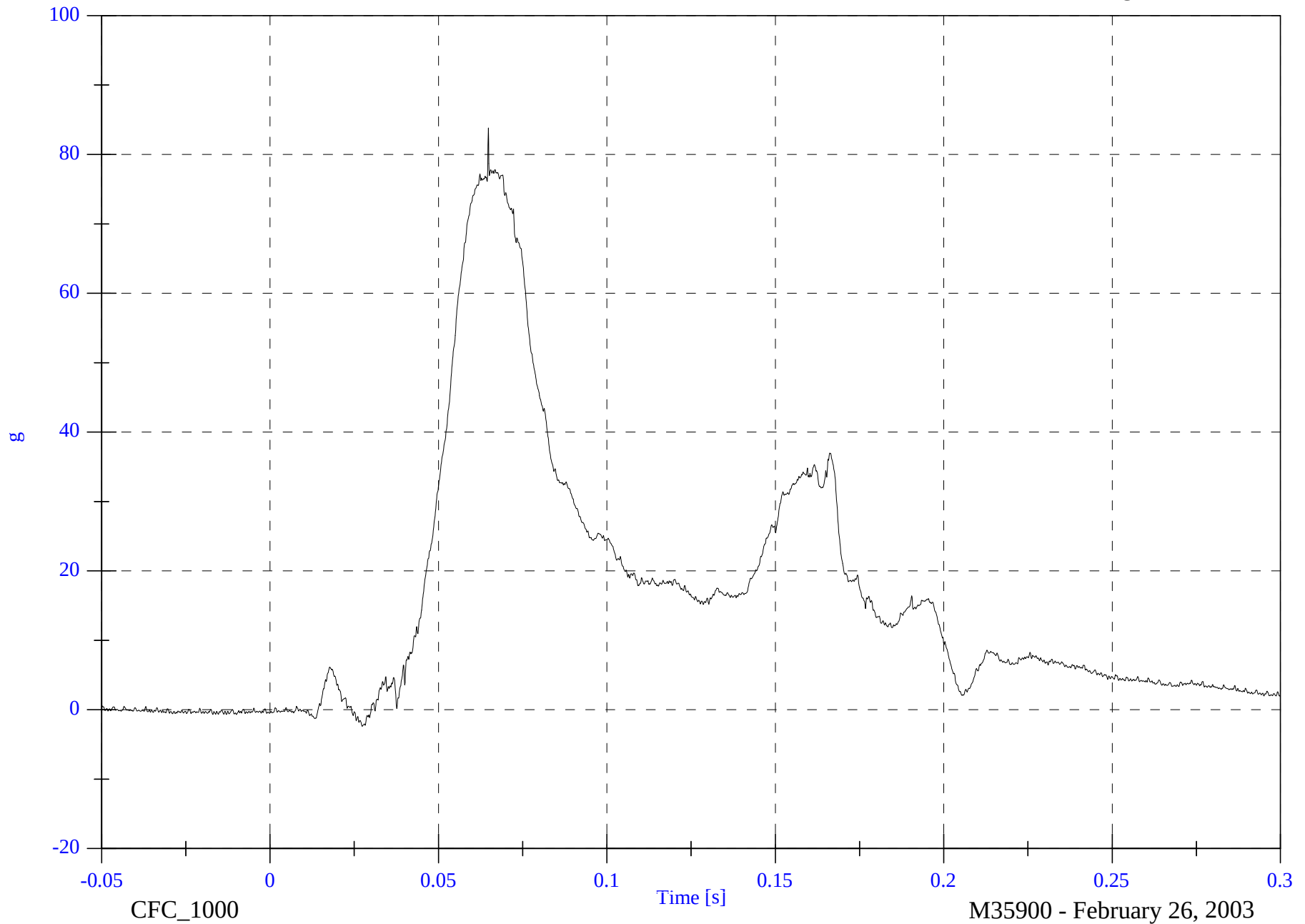
V1P4 Head z

Max: 83.8 [g] at 0.065 [s]

Min: -2.4 [g] at 0.027 [s]

4-36

8642-NCAP-33

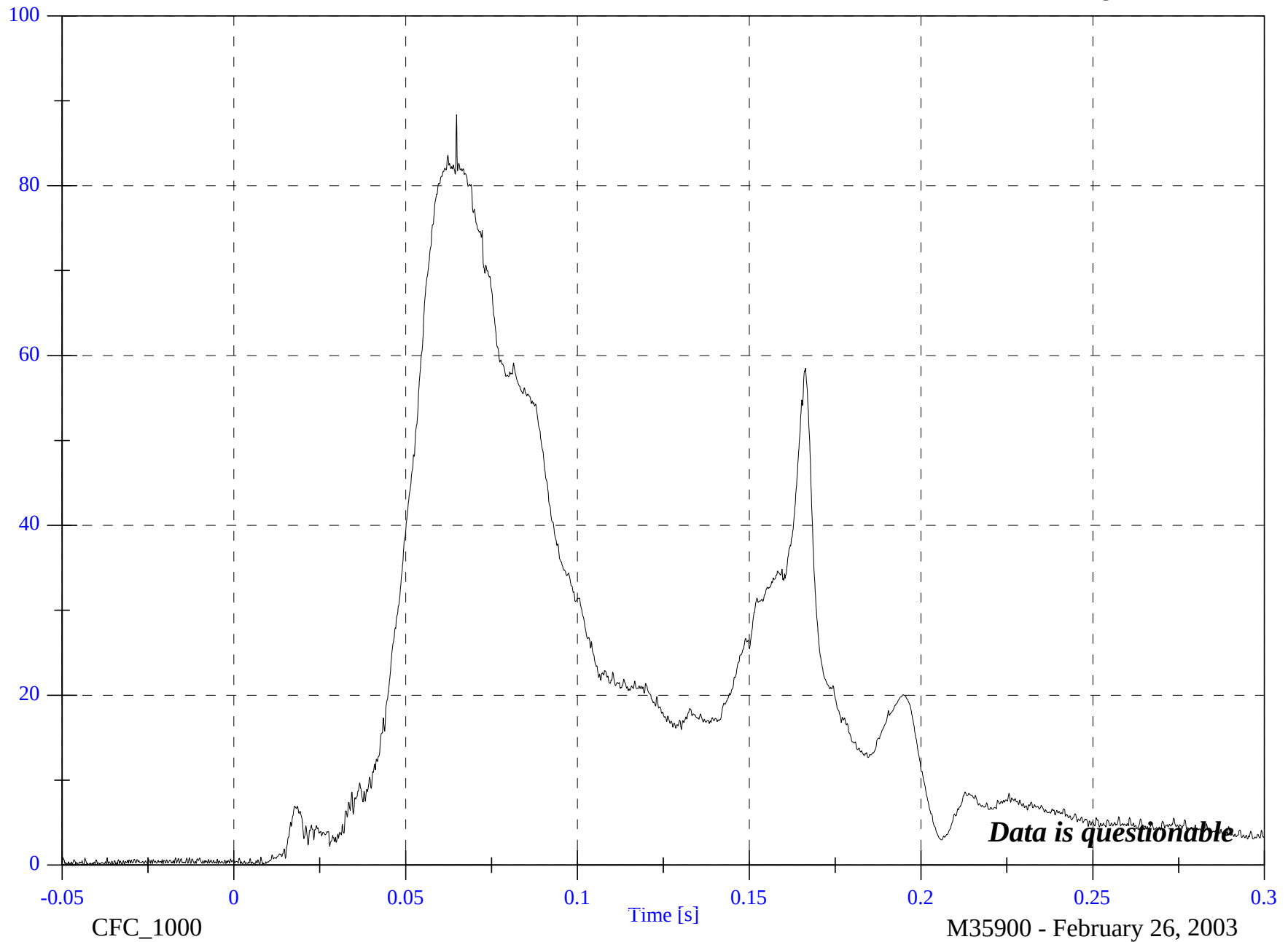


2003 NCAP Test 10 2003 Volvo XC90

V1P4 Head Resultant

Max: 88.4 [g] at 0.065 [s]

Min: 0.1 [g] at -0.040 [s]



4-37

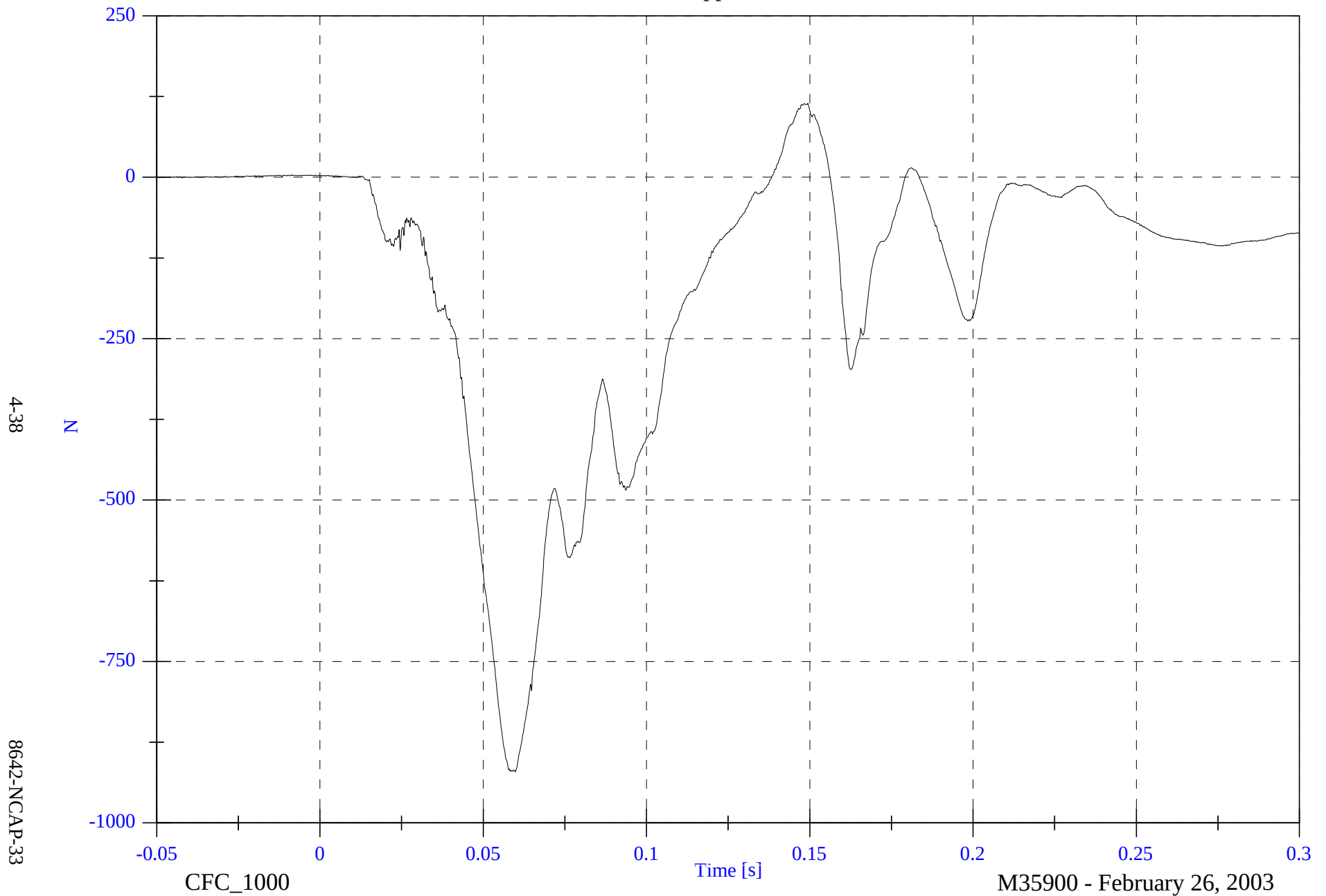
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

Max: 114.6 [N] at 0.149 [s]

Min: -920.9 [N] at 0.060 [s]

V1P4 Upper Neck Fx



2003 NCAP Test 10 2003 Volvo XC90

V1P4 Upper Neck Fy

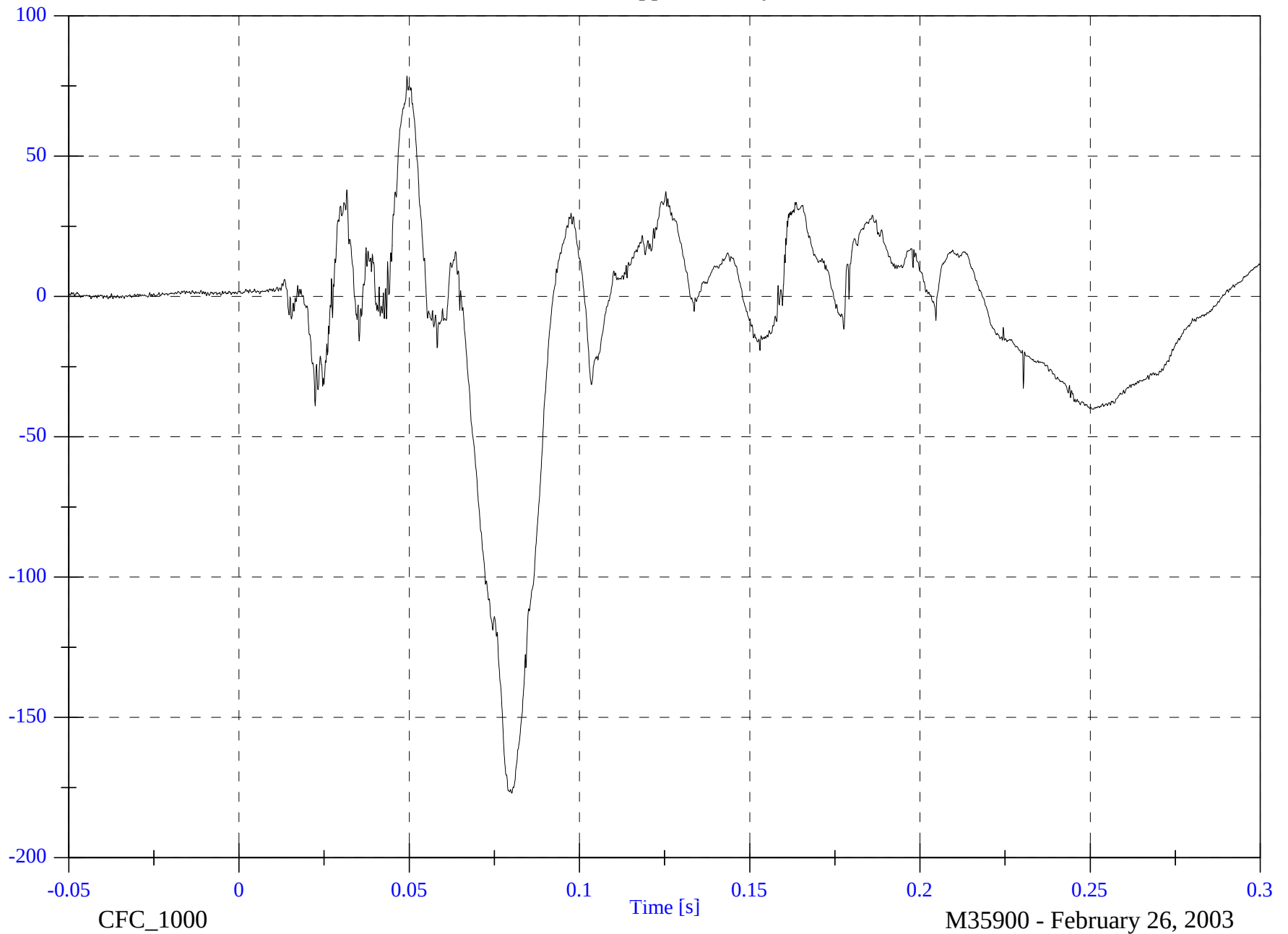
Max: 78.5 [N] at 0.049 [s]

Min: -177.0 [N] at 0.080 [s]

4-39

N

8642-NCAP-33

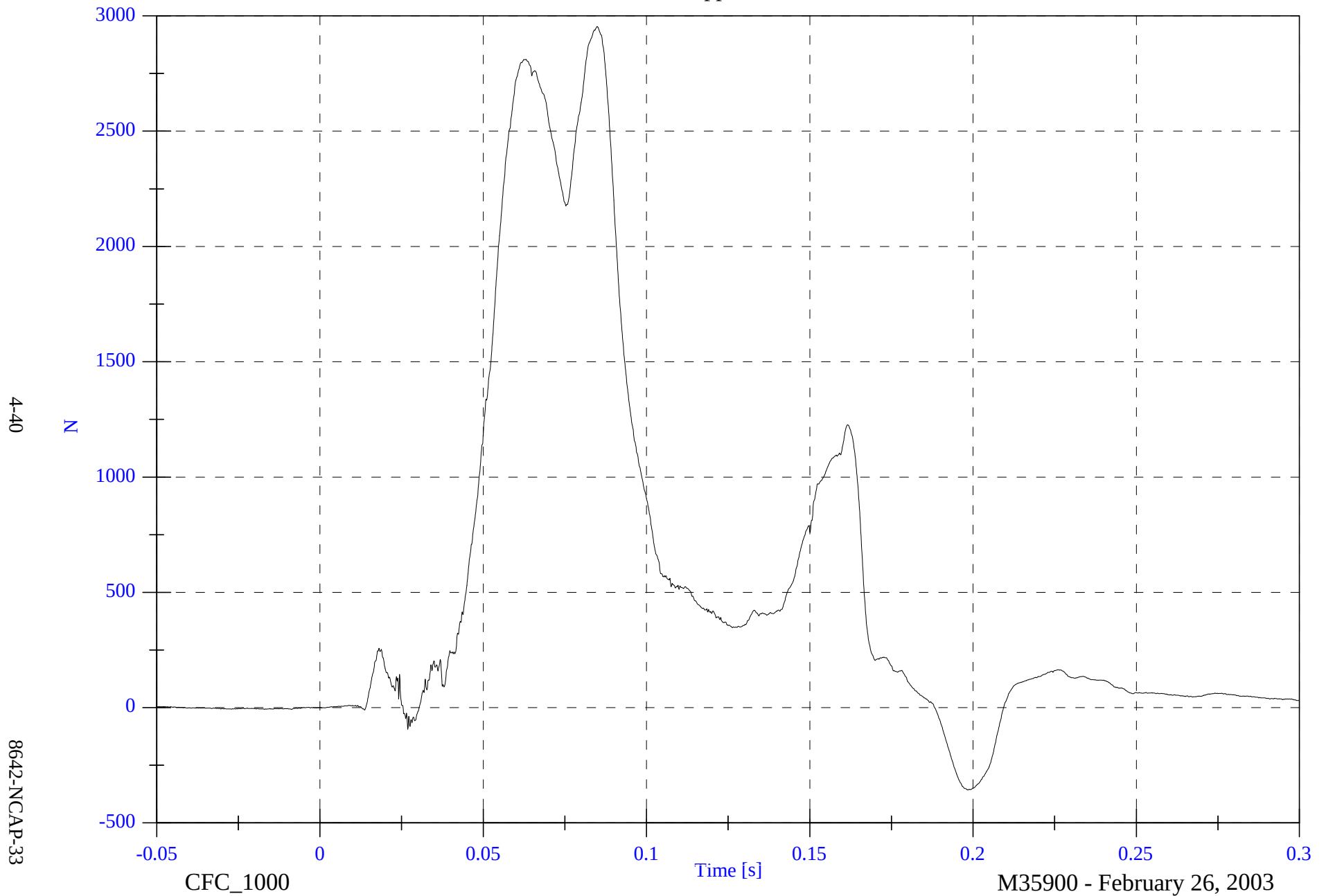


2003 NCAP Test 10 2003 Volvo XC90

Max: 2954.1 [N] at 0.085 [s]

Min: -357.0 [N] at 0.199 [s]

V1P4 Upper Neck Fz

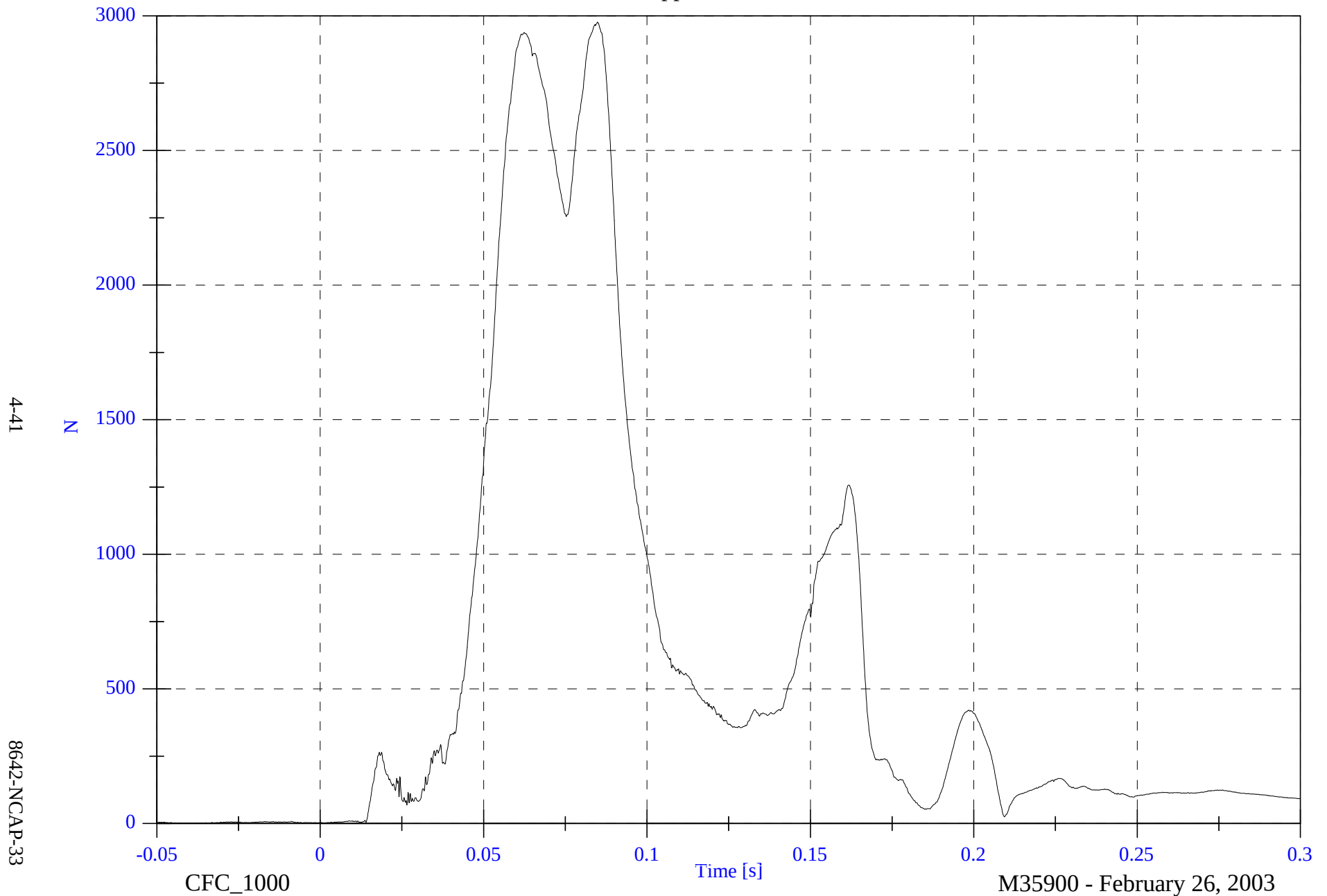


2003 NCAP Test 10 2003 Volvo XC90

Max: 2976.7 [N] at 0.085 [s]

Min: 0.1 [N] at -0.041 [s]

V1P4 Upper Neck F Resultant

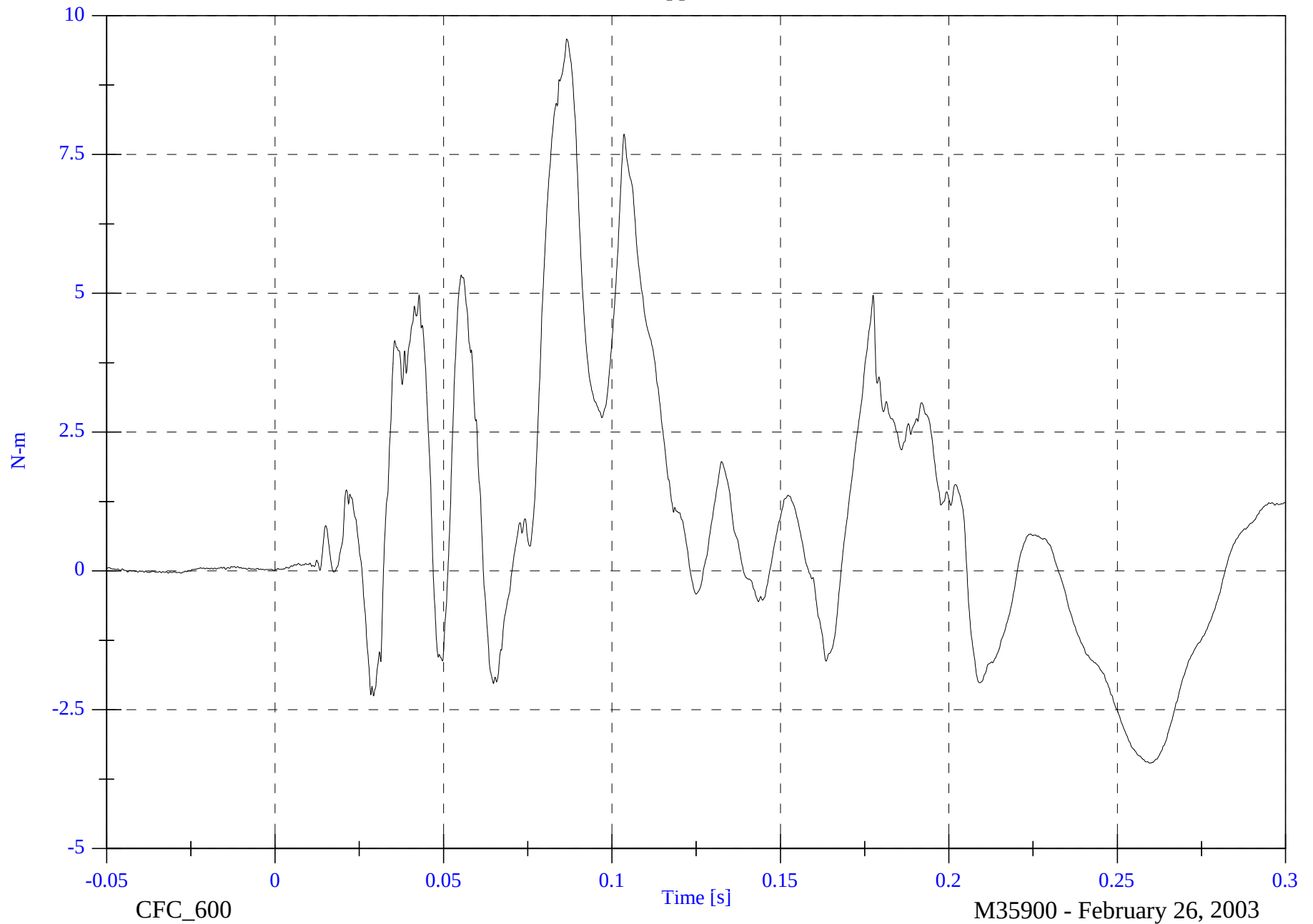


2003 NCAP Test 10 2003 Volvo XC90

V1P4 Upper Neck Mx

Max: 9.6 [N-m] at 0.087 [s]

Min: -3.5 [N-m] at 0.260 [s]



4-42

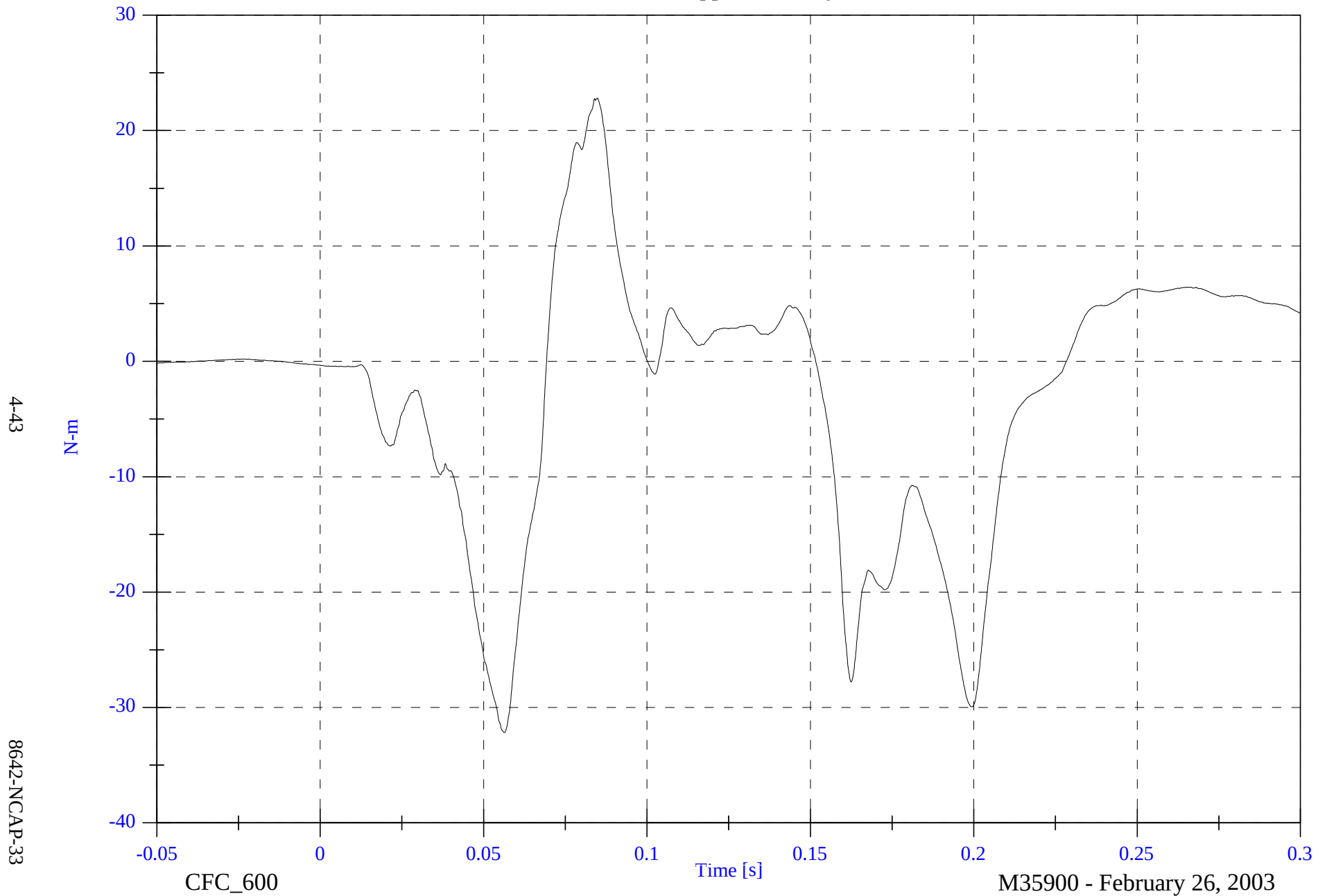
8642-NCAP-33

2003 NCAP Test 10 2003 Volvo XC90

V1P4 Upper Neck My

Max: 22.8 [N-m] at 0.085 [s]

Min: -32.2 [N-m] at 0.056 [s]



2003 NCAP Test 10 2003 Volvo XC90

V1P4 Upper Neck Mz

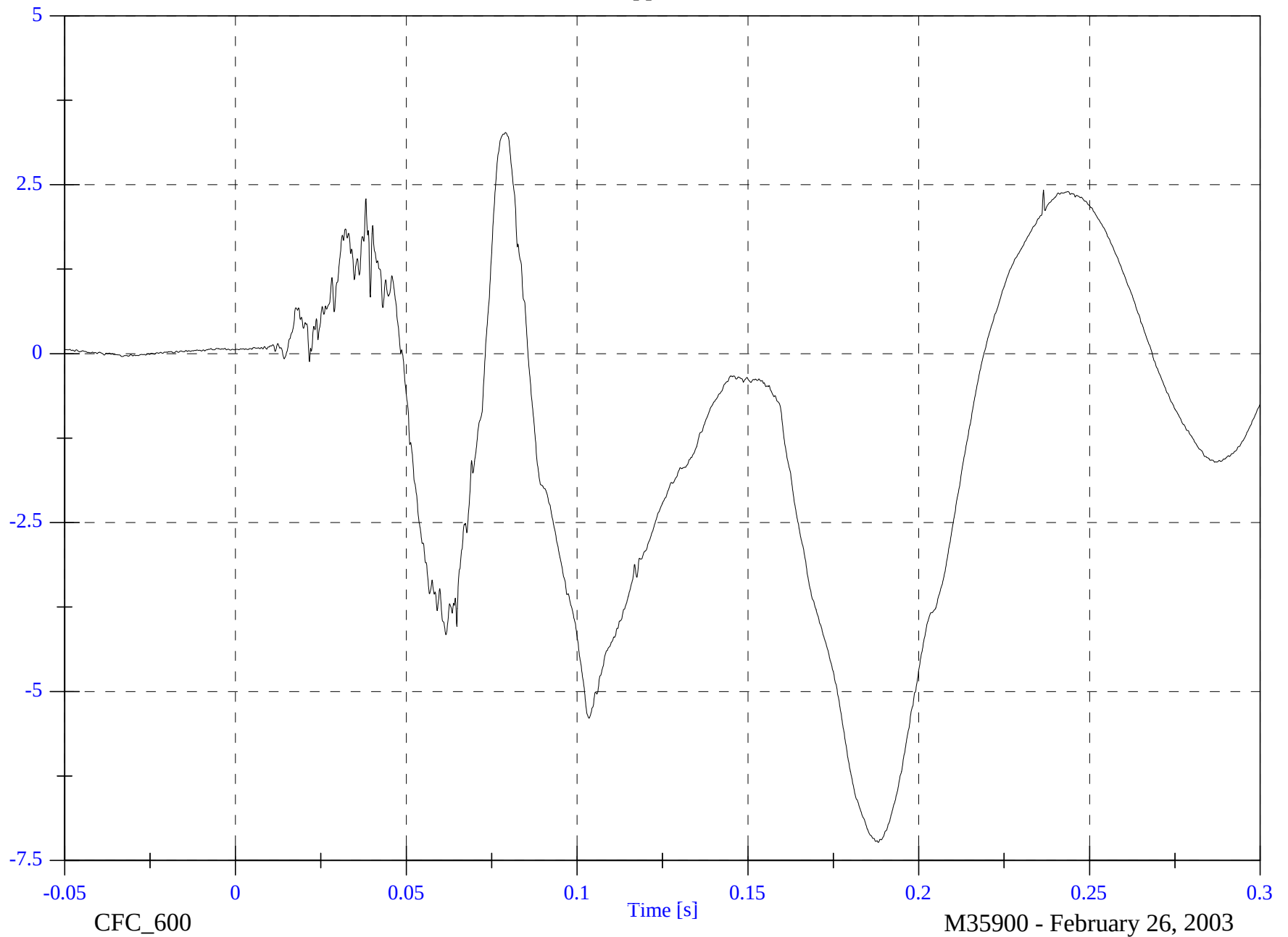
Max: 3.3 [N-m] at 0.079 [s]

Min: -7.2 [N-m] at 0.188 [s]

4-44

N-m

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

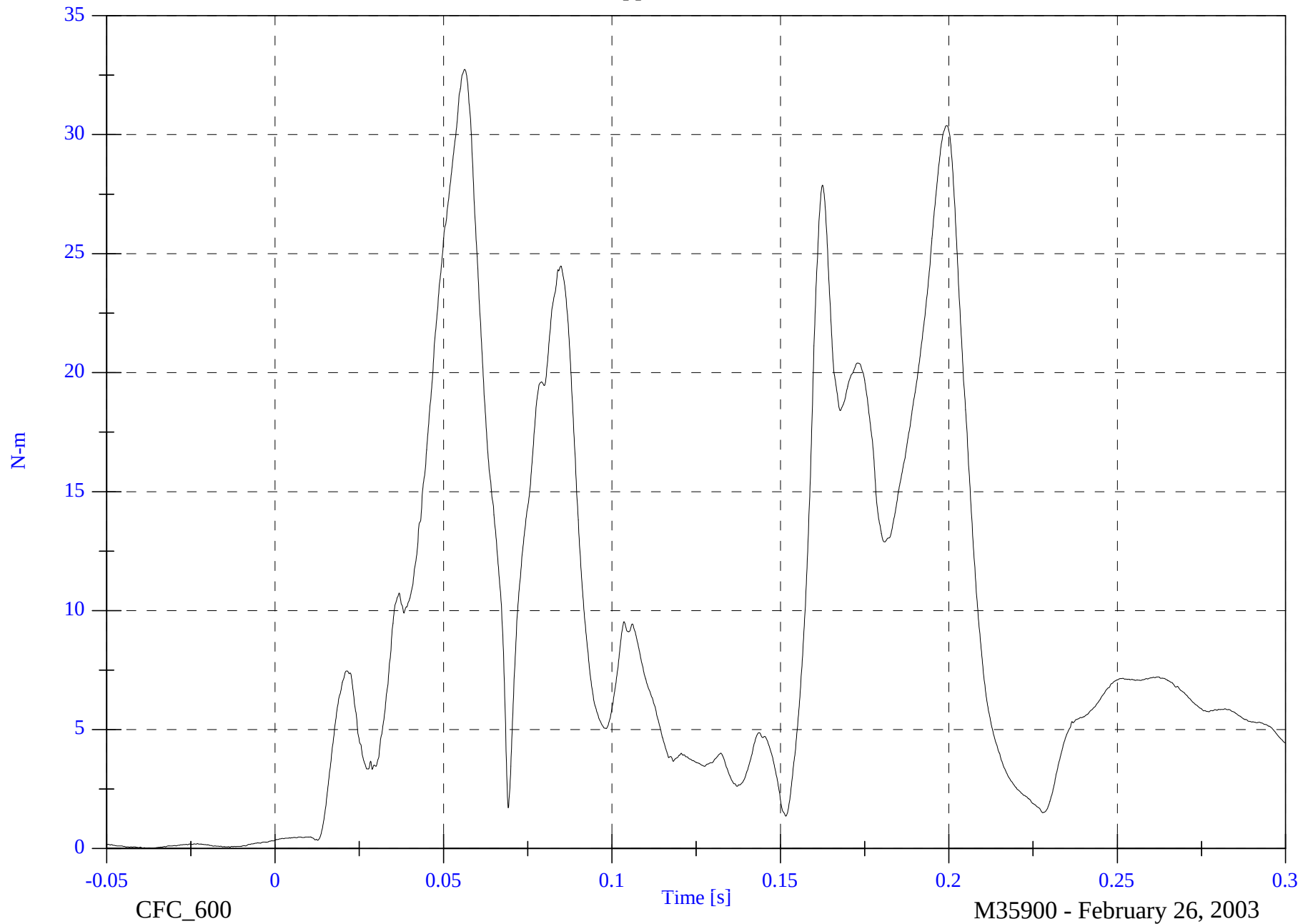
V1P4 Upper Neck M Resultant

Max: 32.7 [N-m] at 0.056 [s]

Min: 0.0 [N-m] at -0.037 [s]

4-45

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

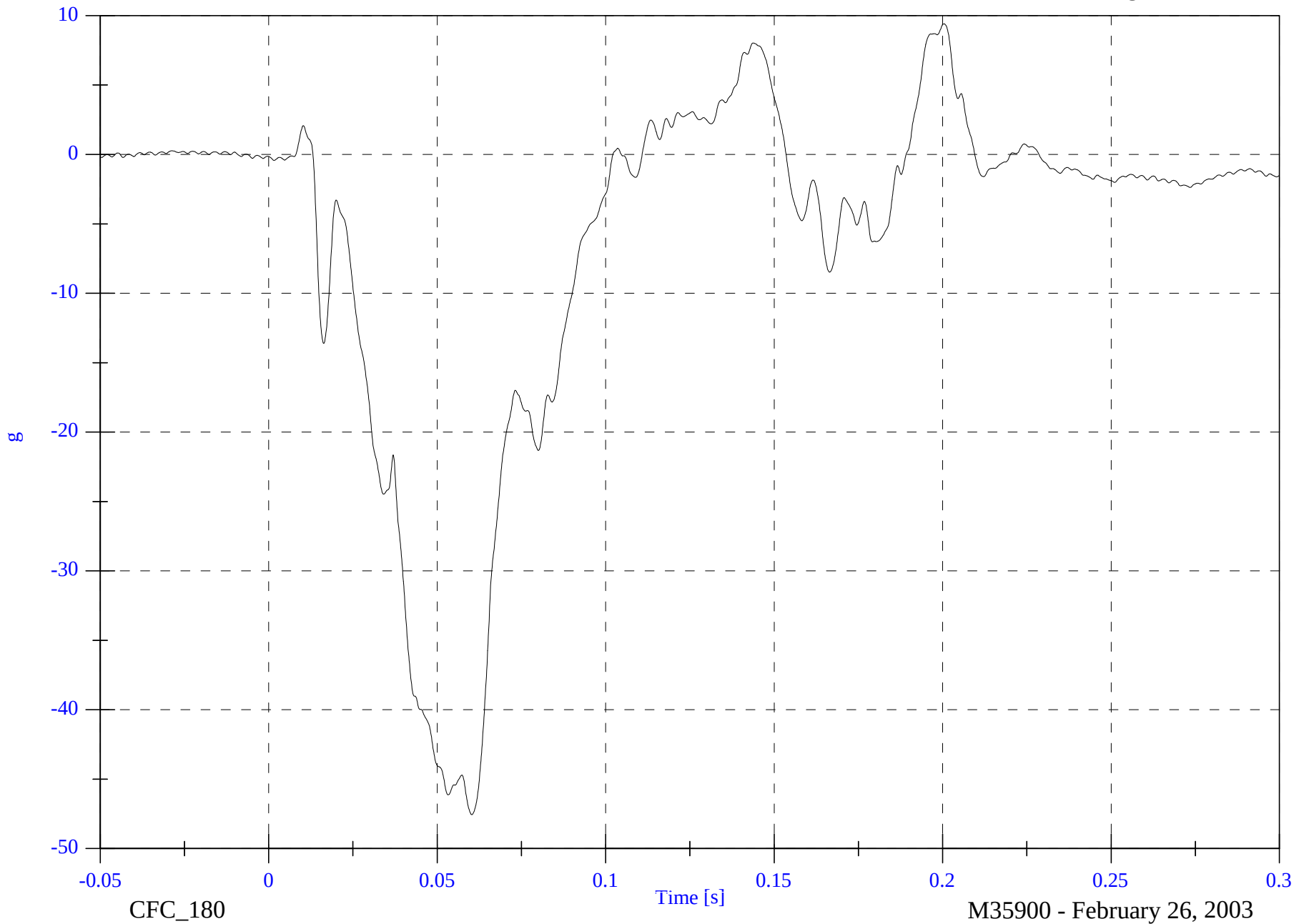
V1P4 Chest x

Max: 9.4 [g] at 0.200 [s]

Min: -47.6 [g] at 0.060 [s]

4-46

8642-NCAP-33

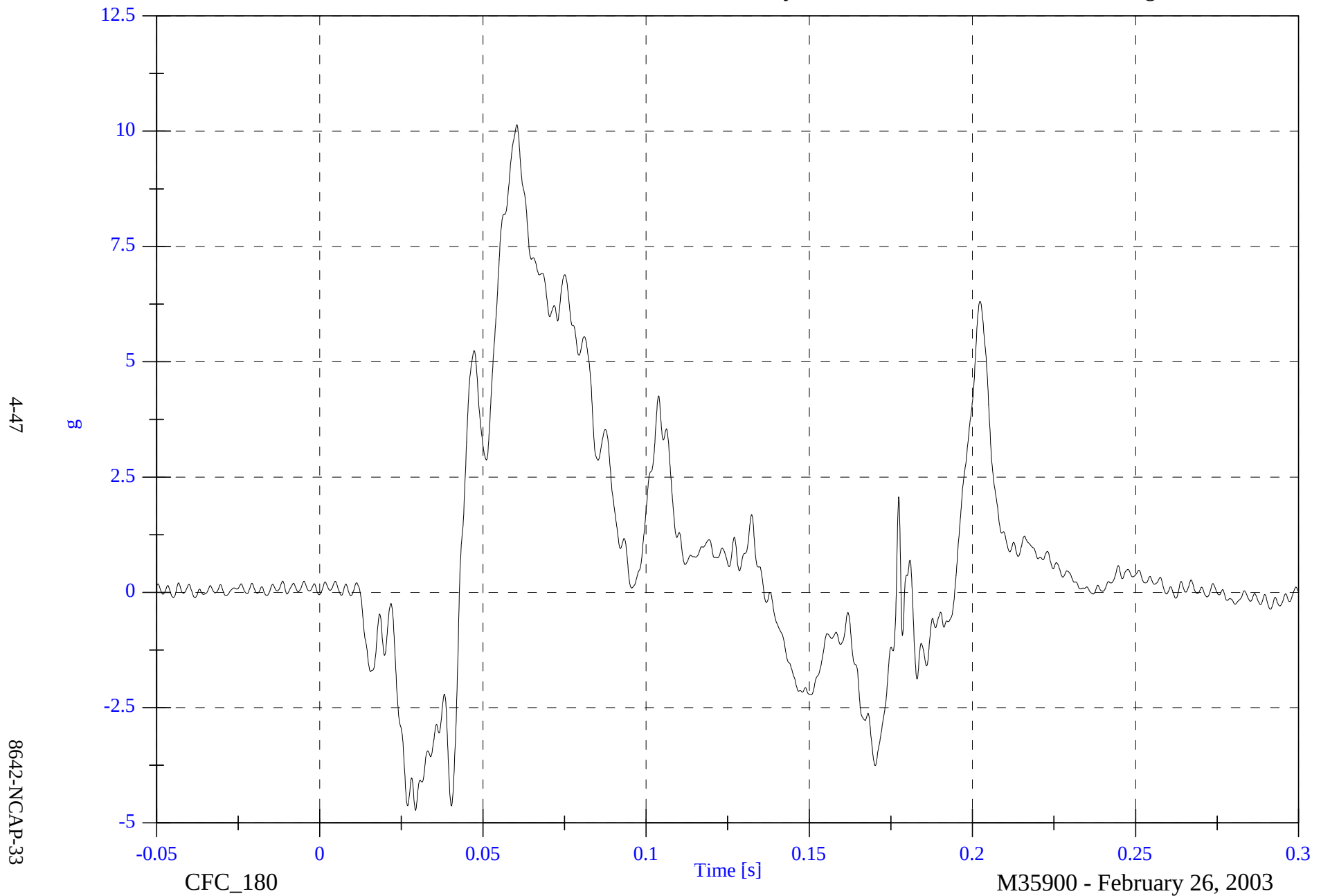


2003 NCAP Test 10 2003 Volvo XC90

Max: 10.1 [g] at 0.060 [s]

Min: -4.7 [g] at 0.029 [s]

V1P4 Chest y



2003 NCAP Test 10 2003 Volvo XC90

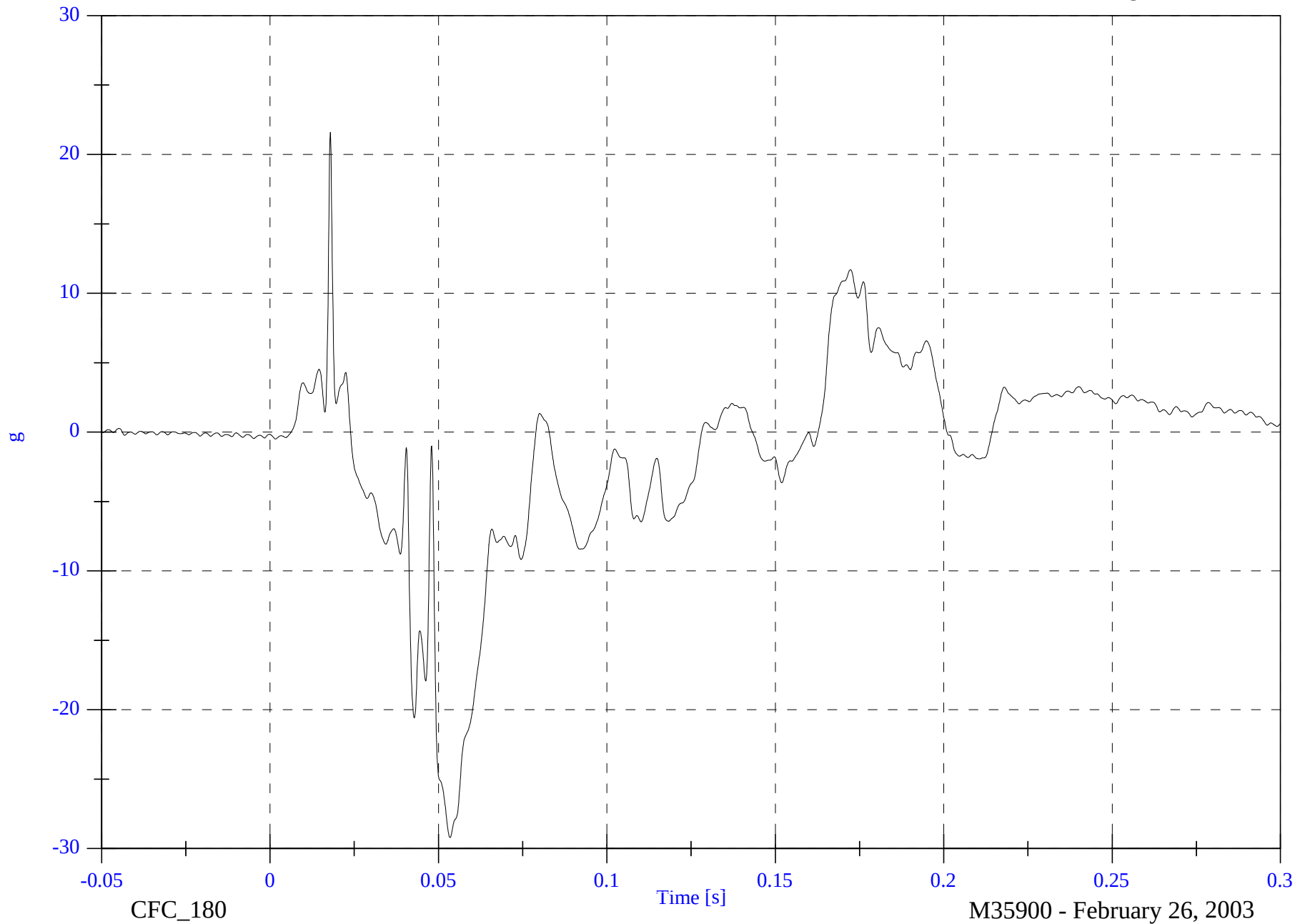
V1P4 Chest z

Max: 21.6 [g] at 0.018 [s]

Min: -29.2 [g] at 0.053 [s]

4-48

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

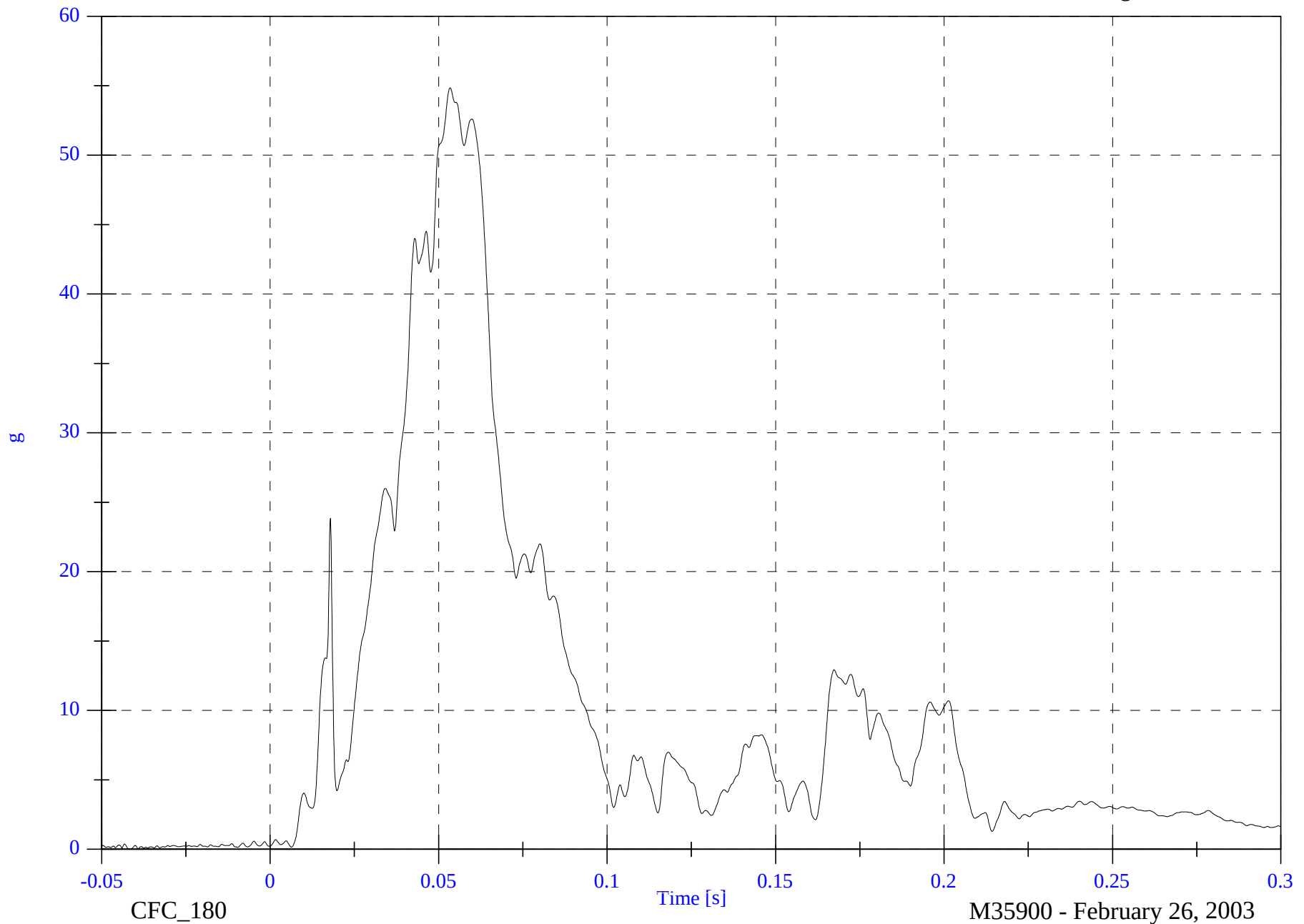
V1P4 Chest Resultant

Max: 54.8 [g] at 0.053 [s]

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

4-49

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

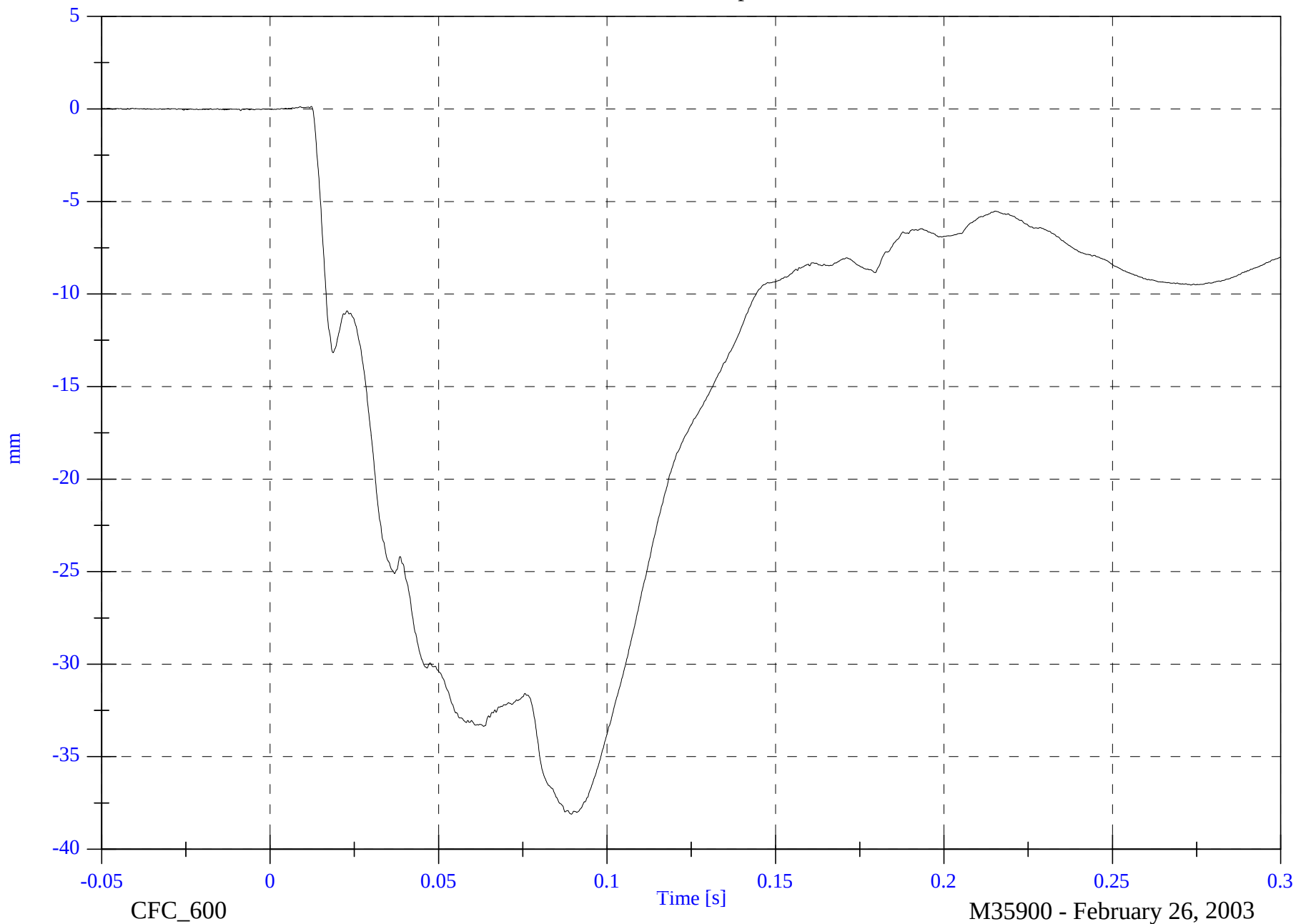
V1P4 Chest Compression

Max: 0.1 [mm] at 0.012 [s]

Min: -38.1 [mm] at 0.090 [s]

4-50

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

Max: 17.9 [g] at 0.097 [s]

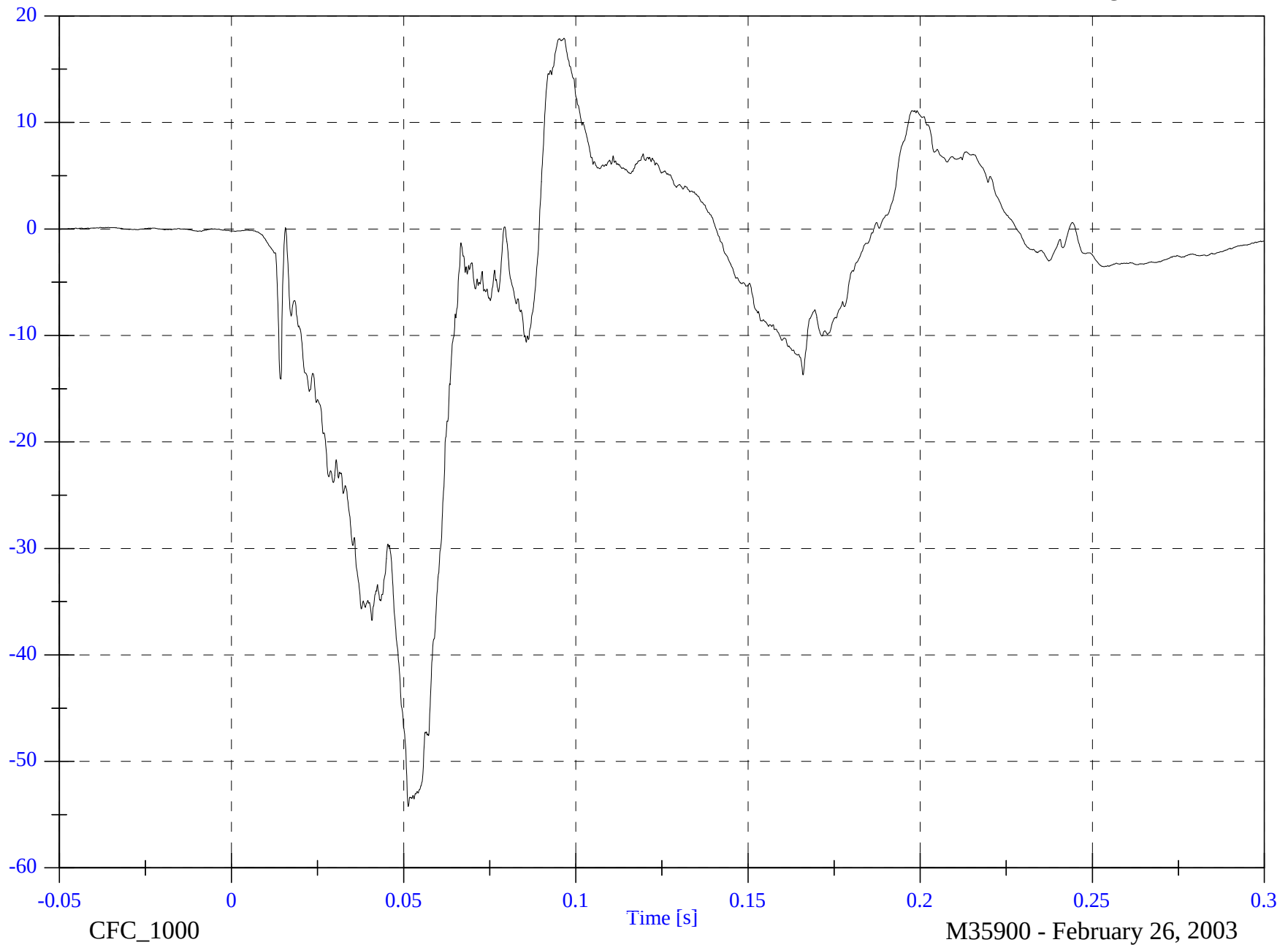
Min: -54.2 [g] at 0.051 [s]

V1P4 Pelvic x

4-51

g

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

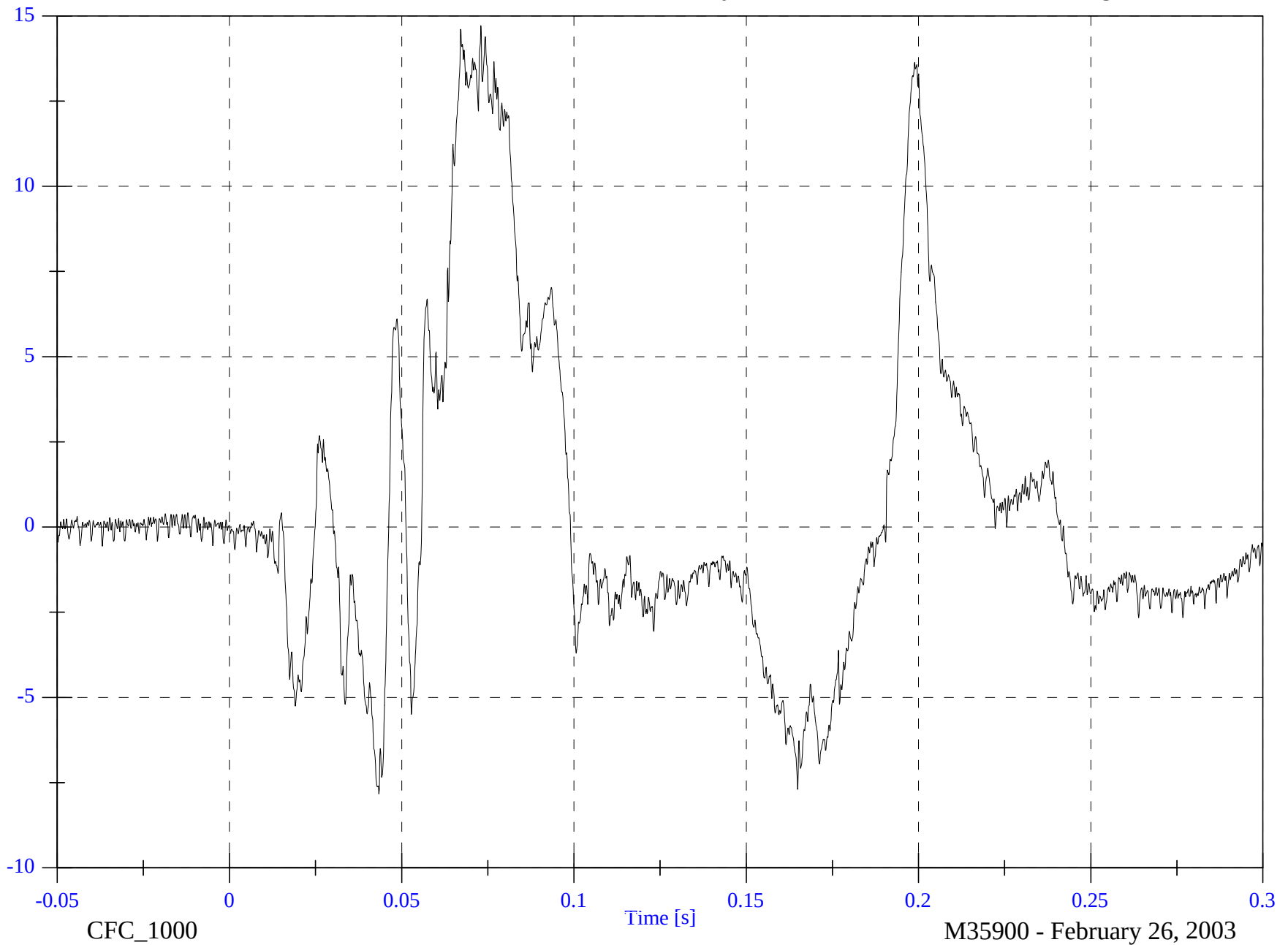
Max: 14.7 [g] at 0.073 [s]

Min: -7.8 [g] at 0.043 [s]

V1P4 Pelvic y

4-52

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

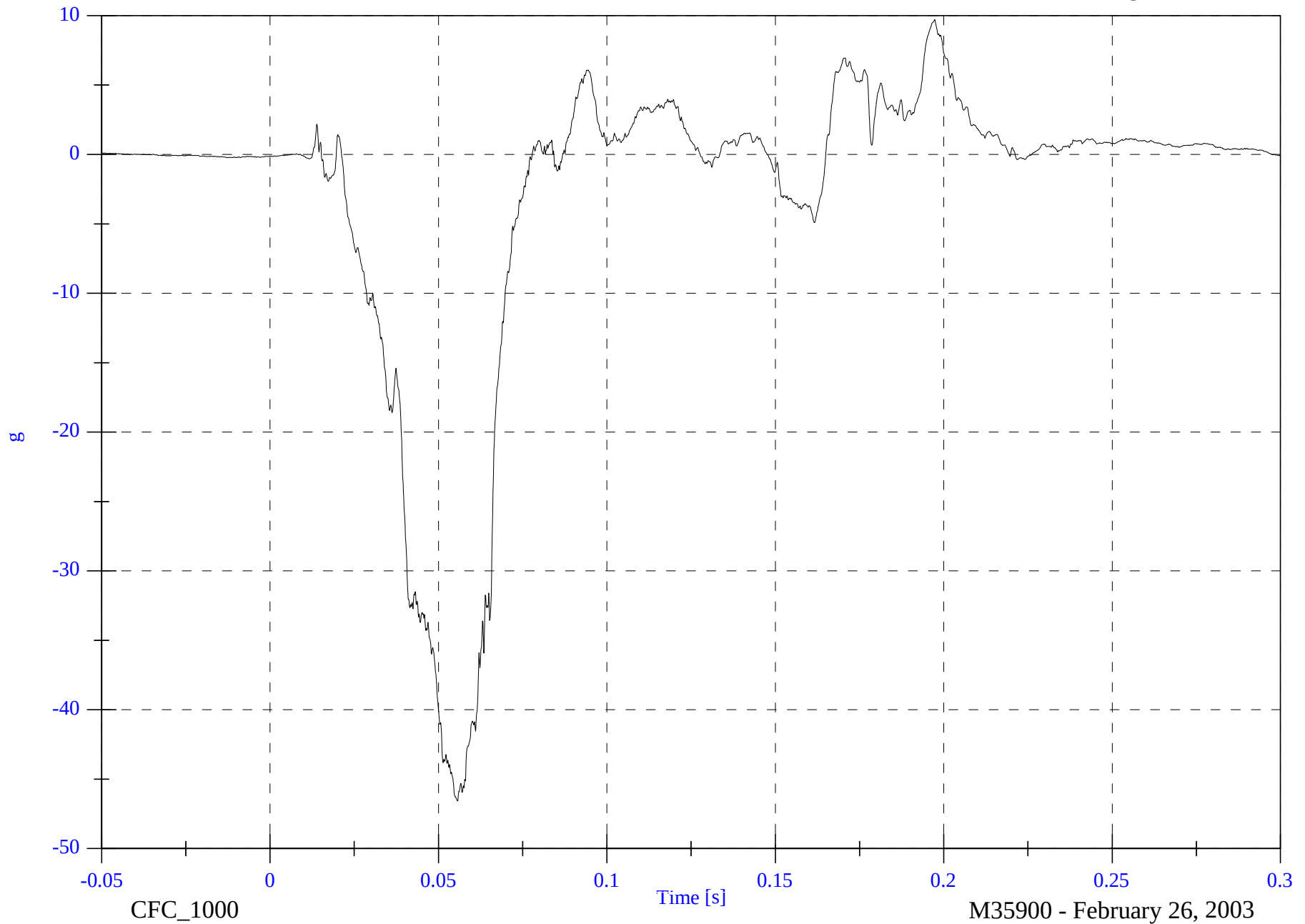
V1P4 Pelvic z

Max: 9.7 [g] at 0.197 [s]

Min: -46.6 [g] at 0.056 [s]

4-53

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

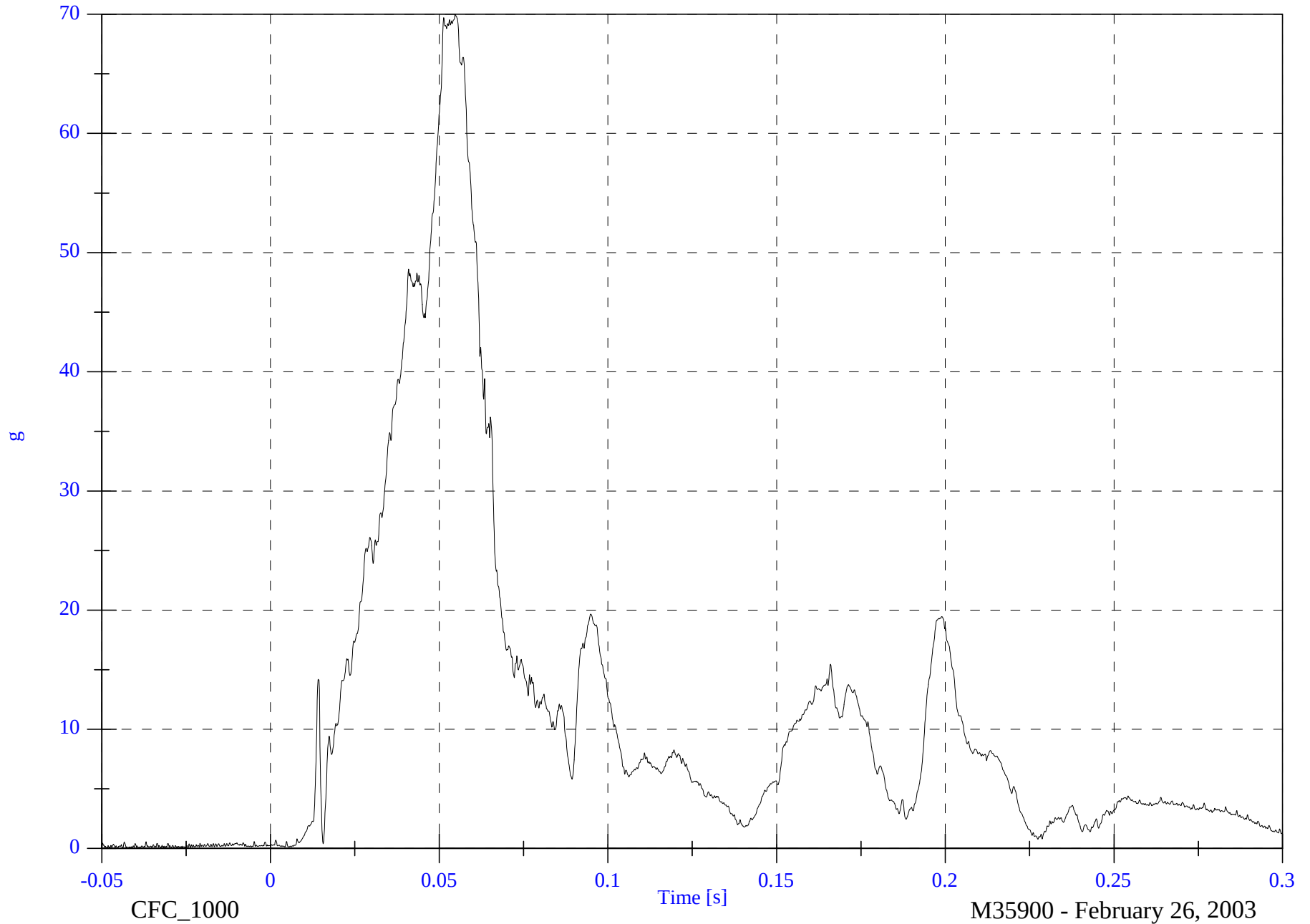
V1P4 Pelvic Resultant

Max: 70.0 [g] at 0.055 [s]

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

4-54

8642-NCAP-33

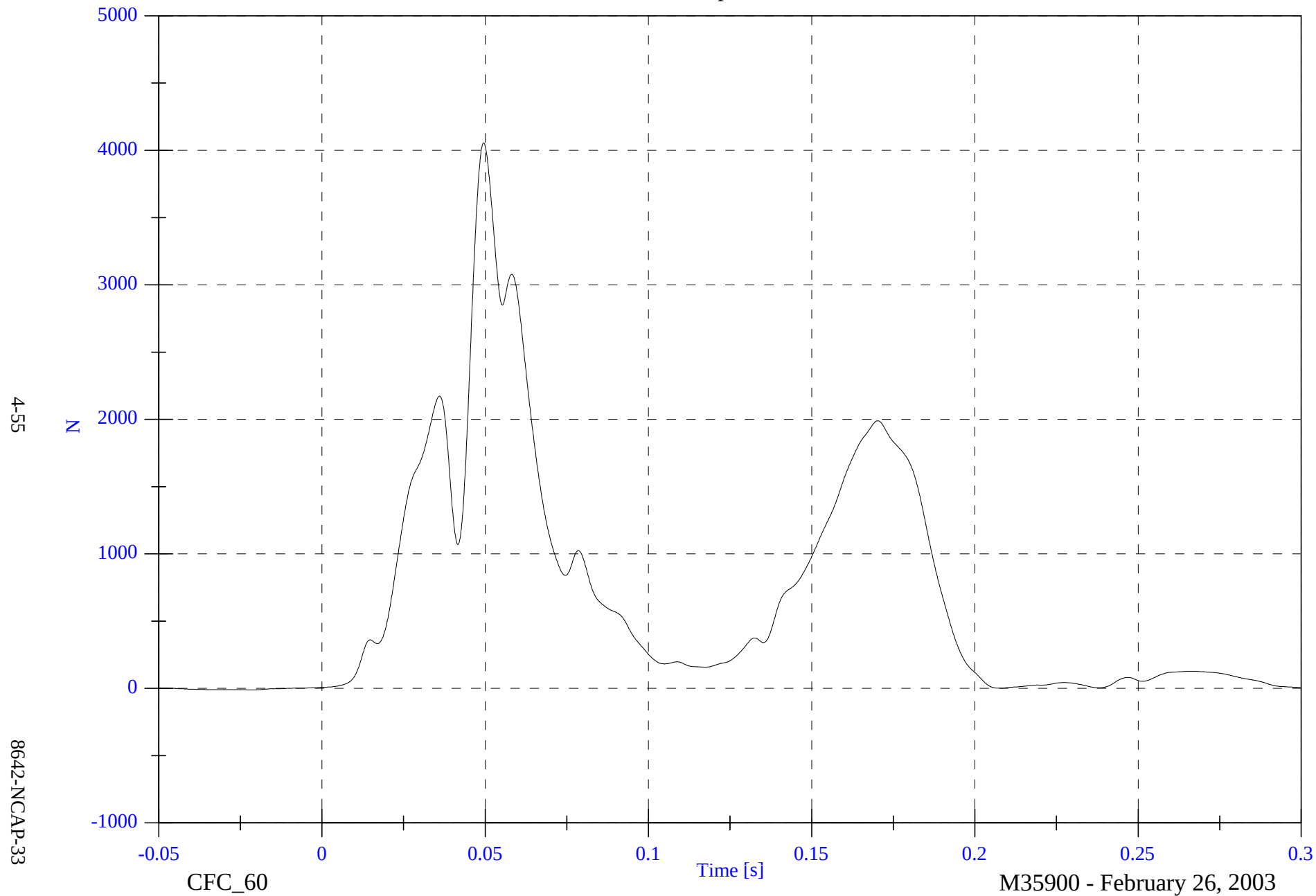


2003 NCAP Test 10 2003 Volvo XC90

Max: 4055.1 [N] at 0.049 [s]

Min: -10.7 [N] at -0.021 [s]

V1P4 Lap Belt Load

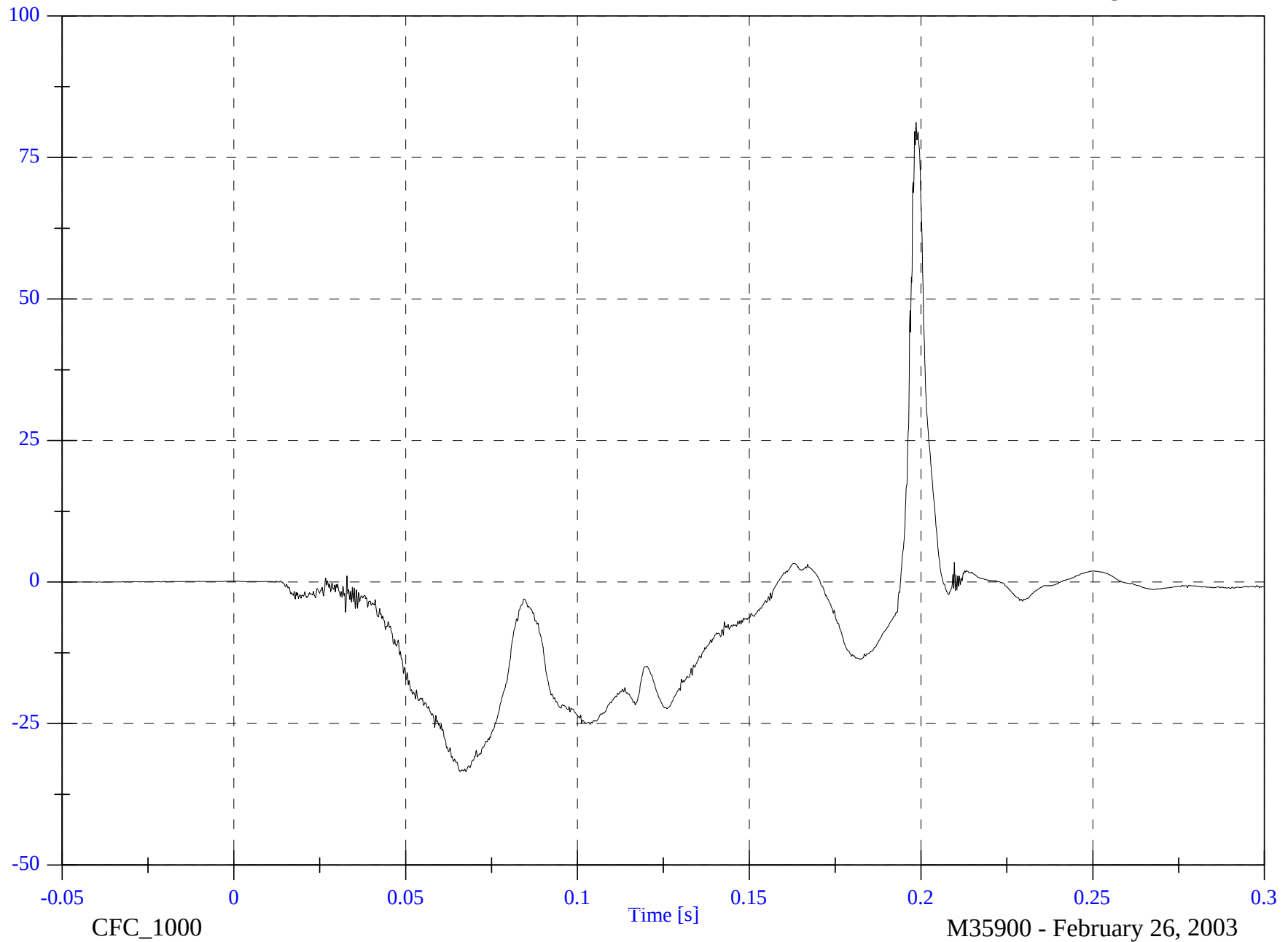


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Head x

Max: 81.2 [g] at 0.199 [s]

Min: -33.5 [g] at 0.066 [s]



2003 NCAP Test 10 2003 Volvo XC90

Max: 23.8 [g] at 0.197 [s]

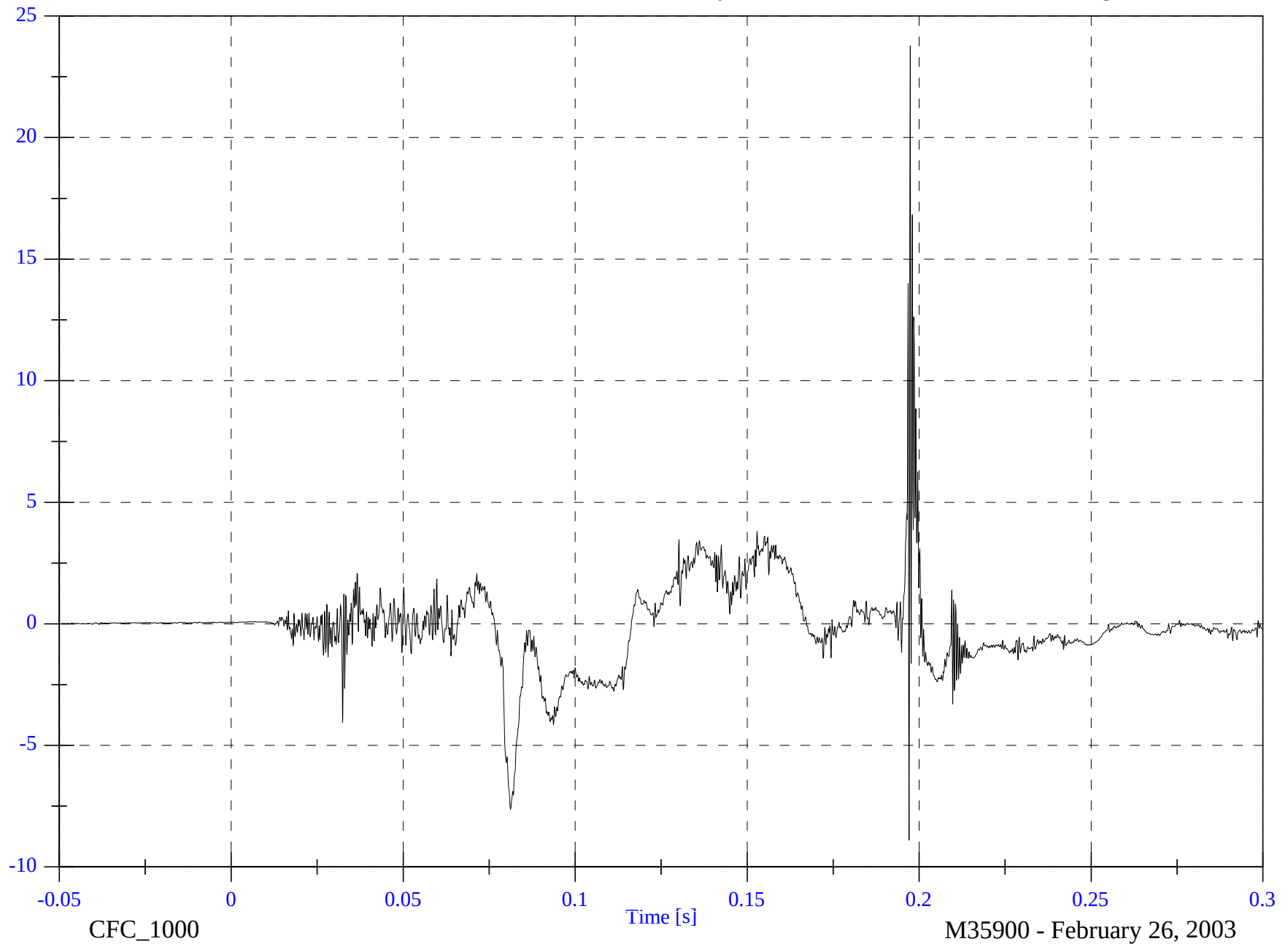
Min: -8.9 [g] at 0.197 [s]

V1P6 Head y

4-57

g

8642-NCAP-33



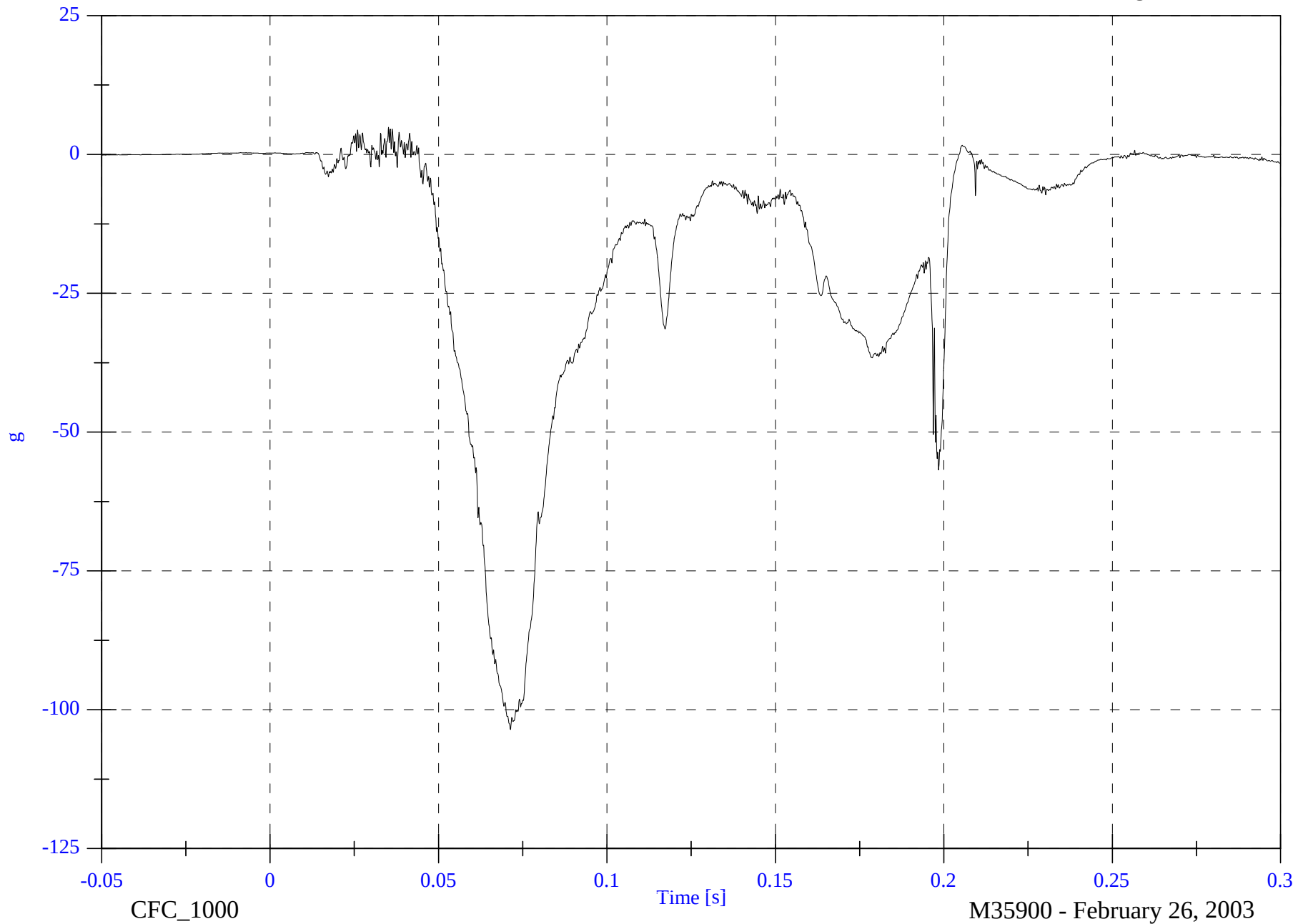
2003 NCAP Test 10 2003 Volvo XC90

V1P6 Head z

Max: 4.9 [g] at 0.035 [s]
Min: -103.6 [g] at 0.071 [s]

4-58

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

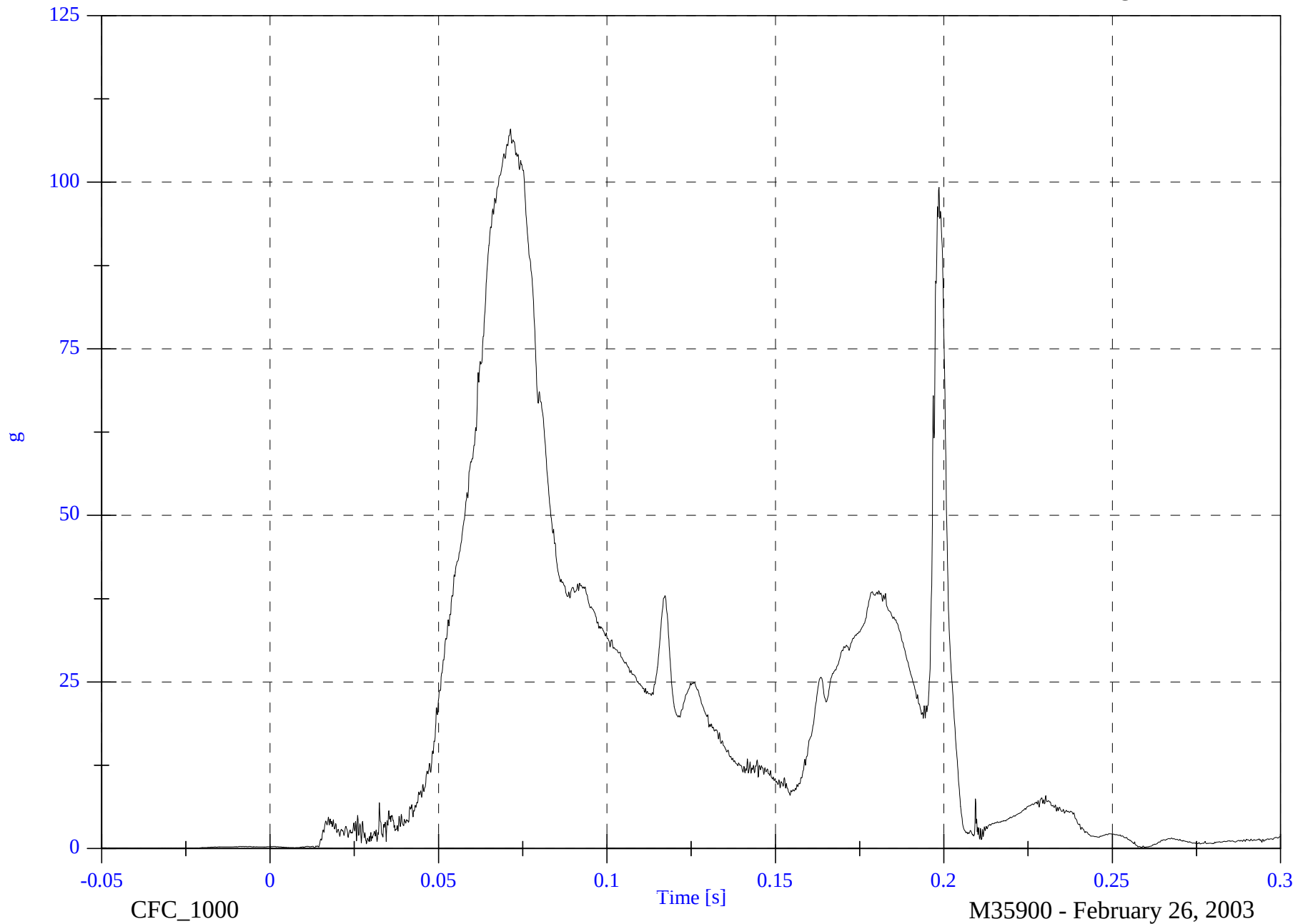
V1P6 Head Resultant

Max: 108.0 [g] at 0.071 [s]

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

4-59

8642-NCAP-33

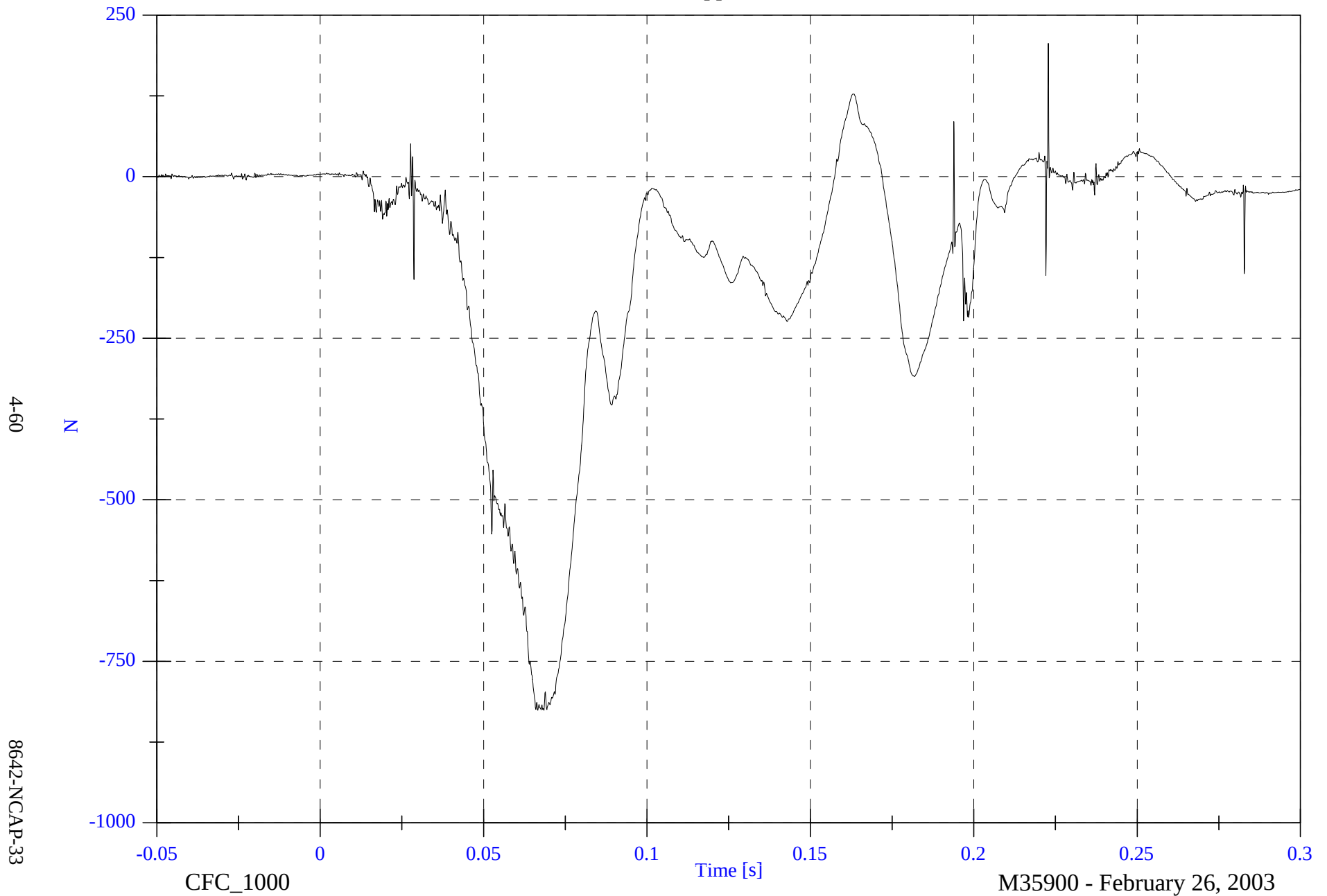


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Upper Neck Fx

Max: 206.3 [N] at 0.223 [s]

Min: -826.0 [N] at 0.068 [s]

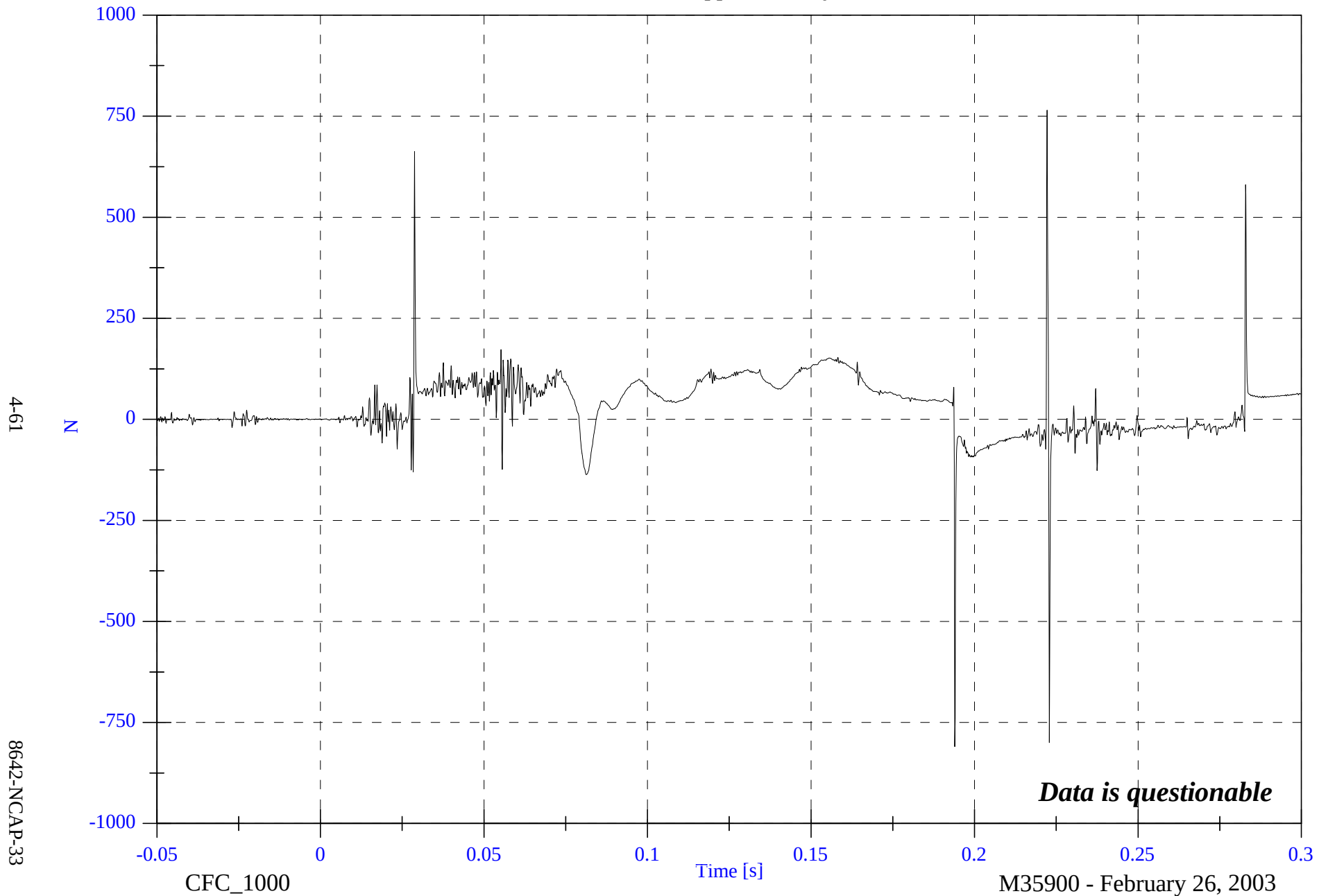


2003 NCAP Test 10 2003 Volvo XC90

Max: 764.9 [N] at 0.222 [s]

Min: -810.0 [N] at 0.194 [s]

V1P6 Upper Neck Fy



2003 NCAP Test 10 2003 Volvo XC90

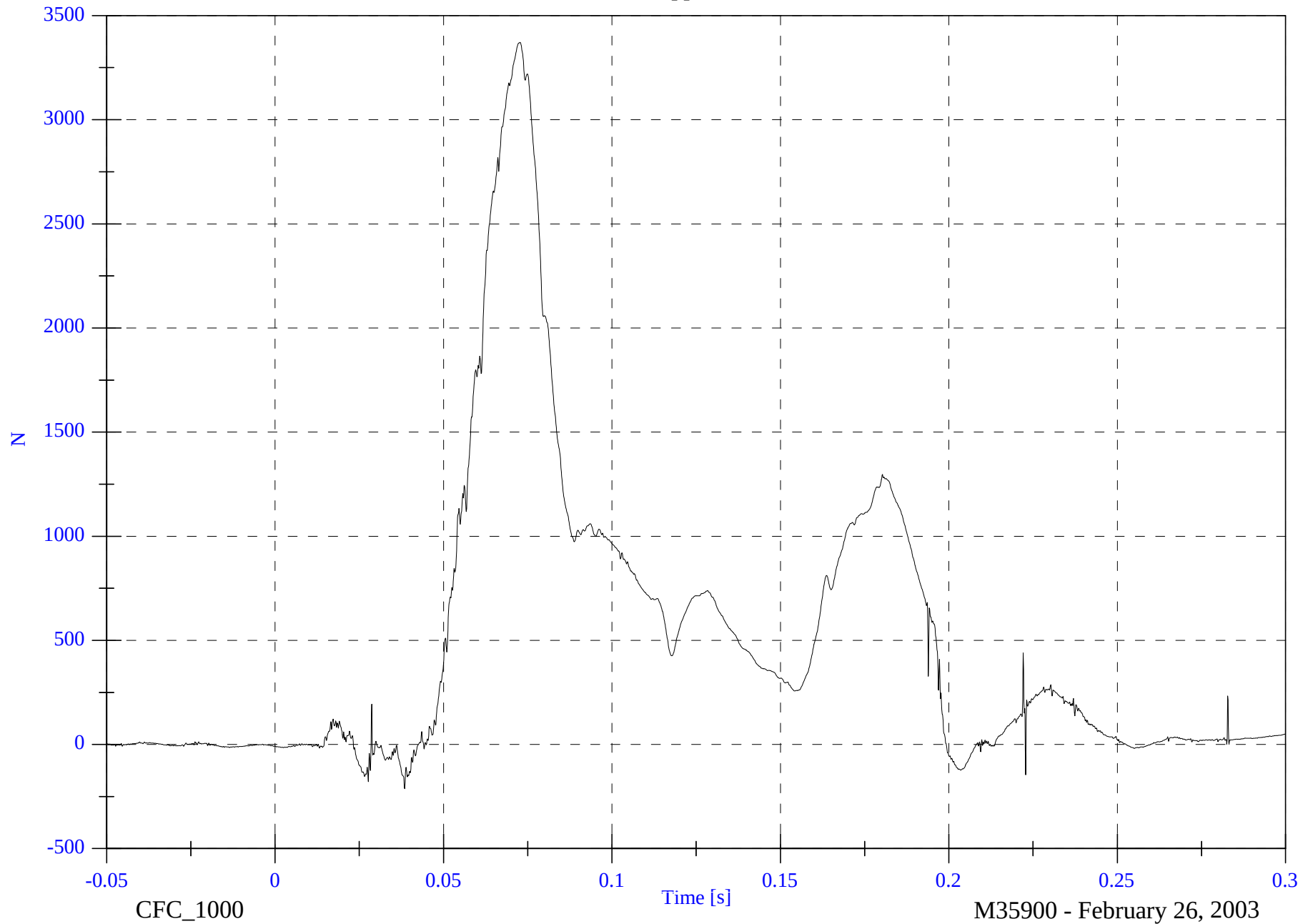
Max: 3371.2 [N] at 0.073 [s]

Min: -212.7 [N] at 0.039 [s]

V1P6 Upper Neck Fz

4-62

8642-NCAP-33



2003 NCAP Test 10 2003 Volvo XC90

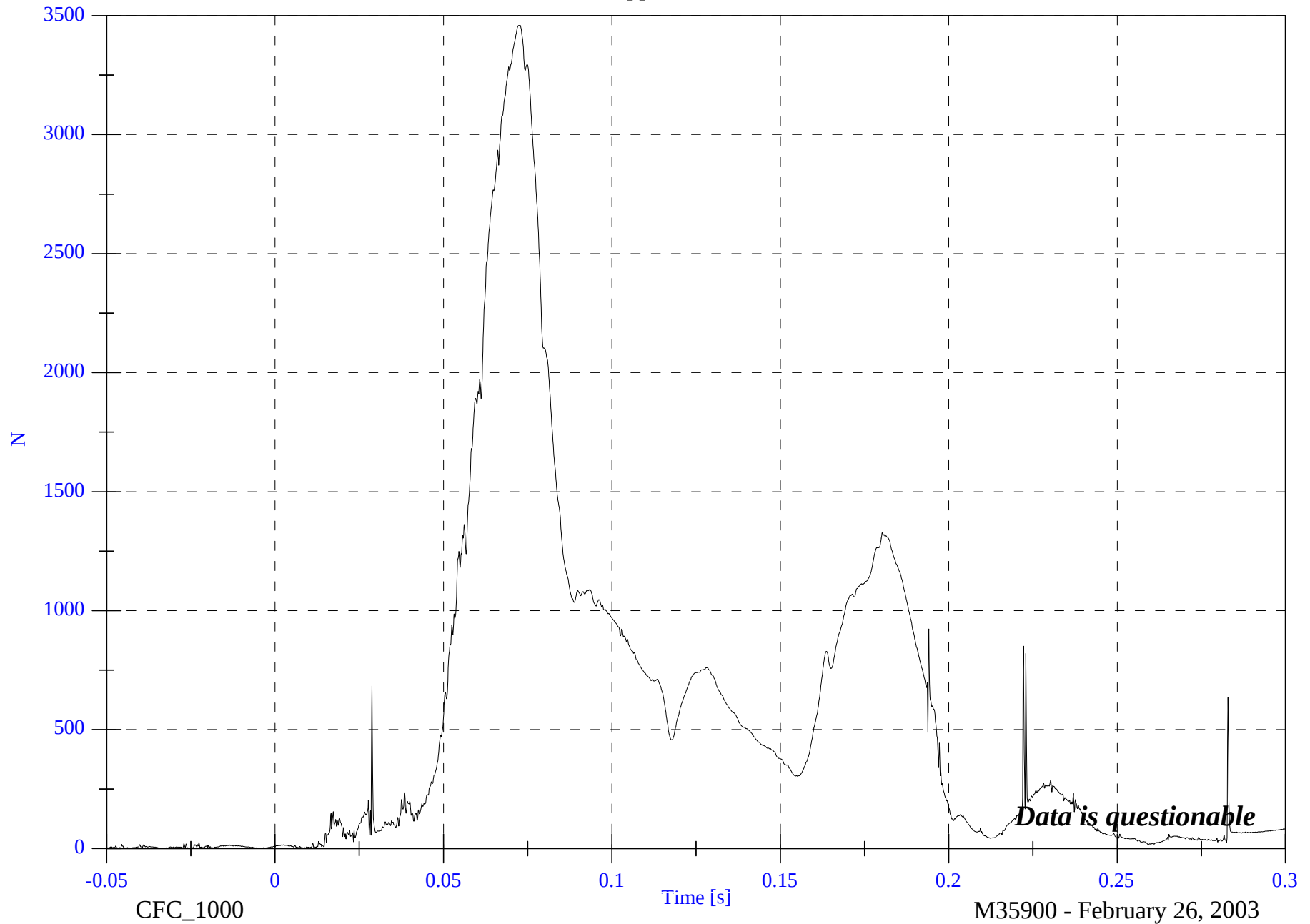
V1P6 Upper Neck F Resultant

Max: 3459.8 [N] at 0.073 [s]

Min: 0.5 [N] at -0.033 [s]

4-63

8642-NCAP-33

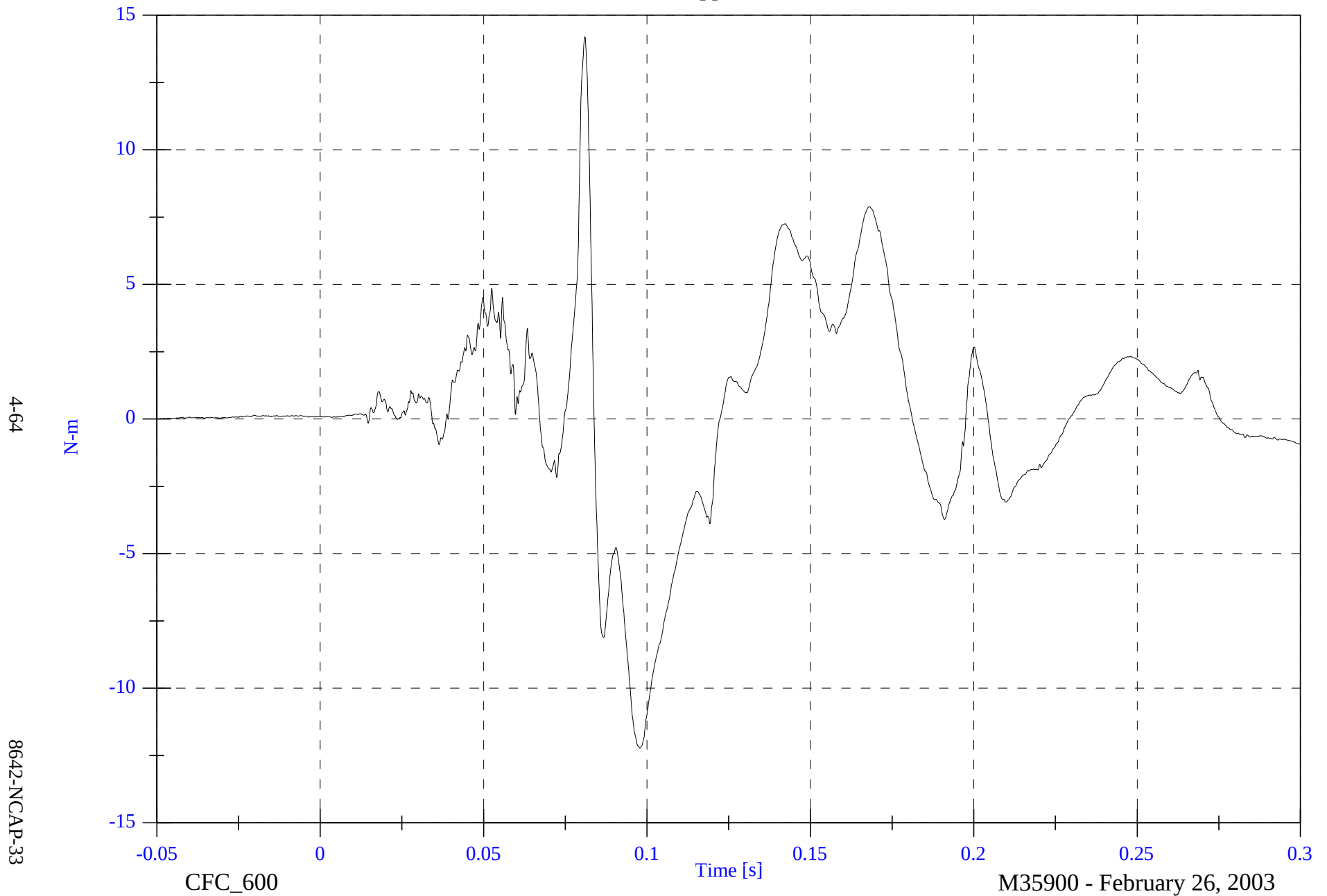


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Upper Neck Mx

Max: 14.2 [N-m] at 0.081 [s]

Min: -12.2 [N-m] at 0.098 [s]

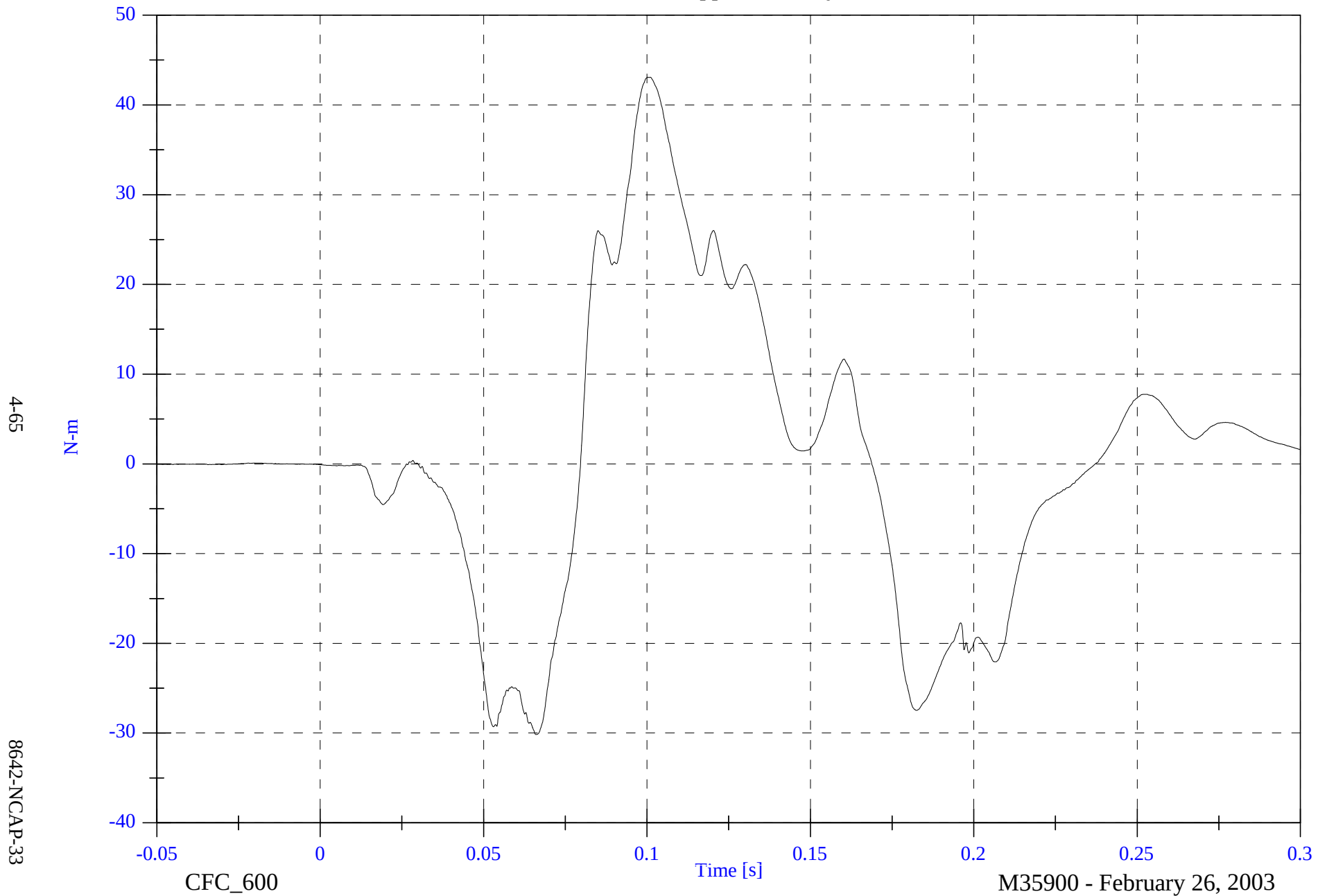


2003 NCAP Test 10 2003 Volvo XC90

Max: 43.1 [N-m] at 0.100 [s]

Min: -30.1 [N-m] at 0.066 [s]

V1P6 Upper Neck My

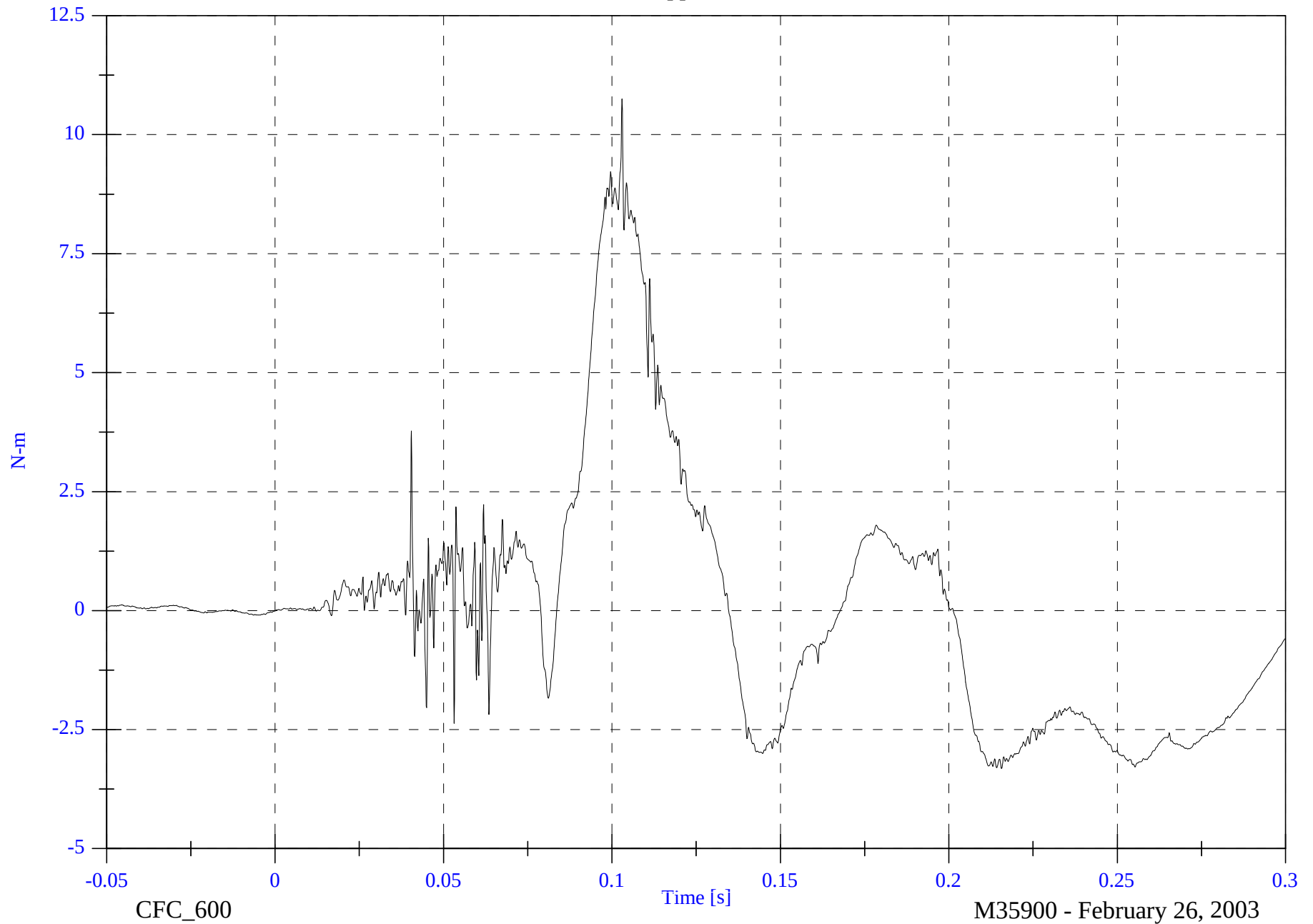


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Upper Neck Mz

Max: 10.7 [N-m] at 0.103 [s]

Min: -3.3 [N-m] at 0.216 [s]

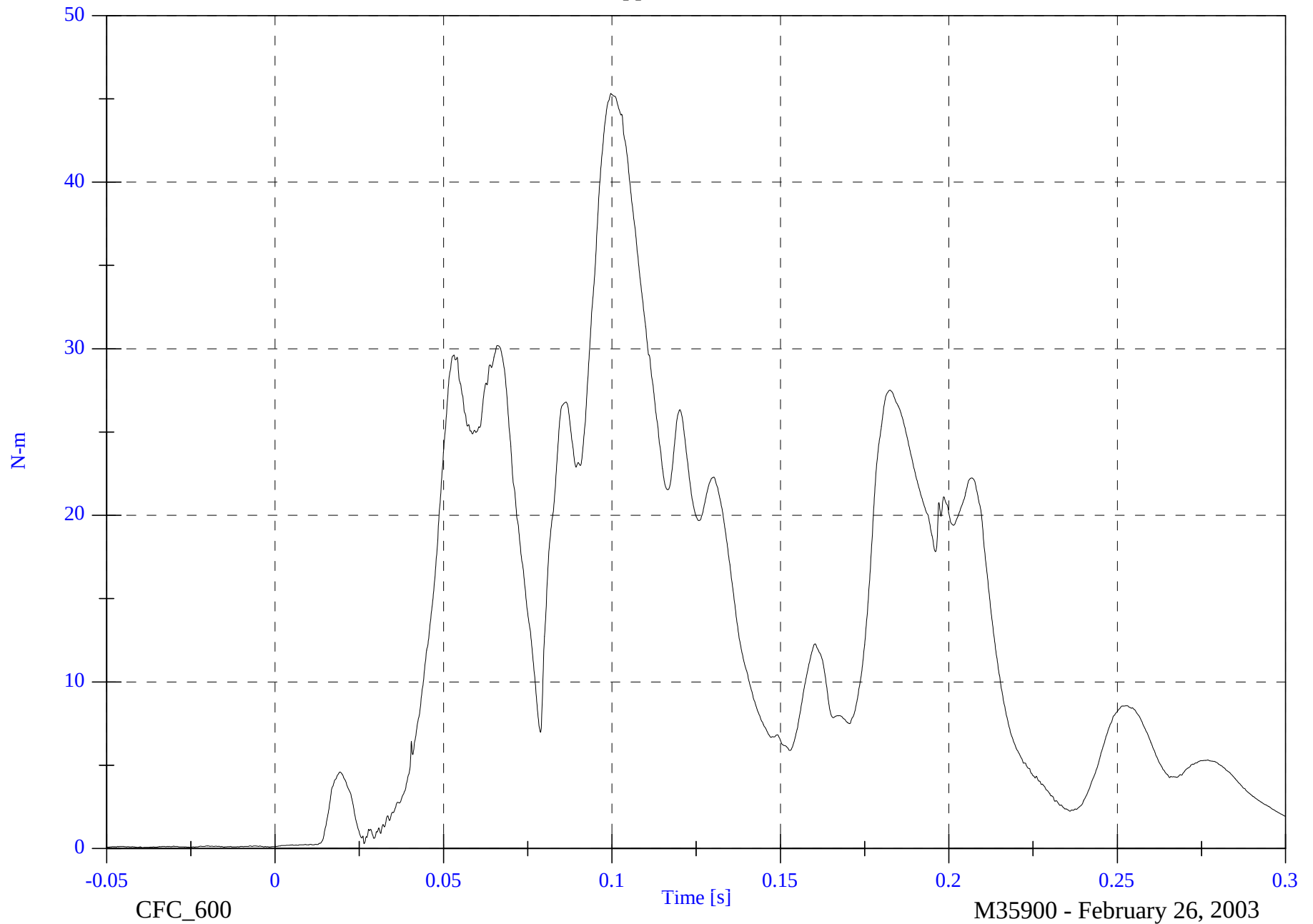


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Upper Neck M Resultant

Max: 45.3 [N-m] at 0.100 [s]

Min: 0.1 [N-m] at -0.050 [s]



4-67

8642-NCAP-33

CFC_600

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2003 NCAP Test 10 2003 Volvo XC90

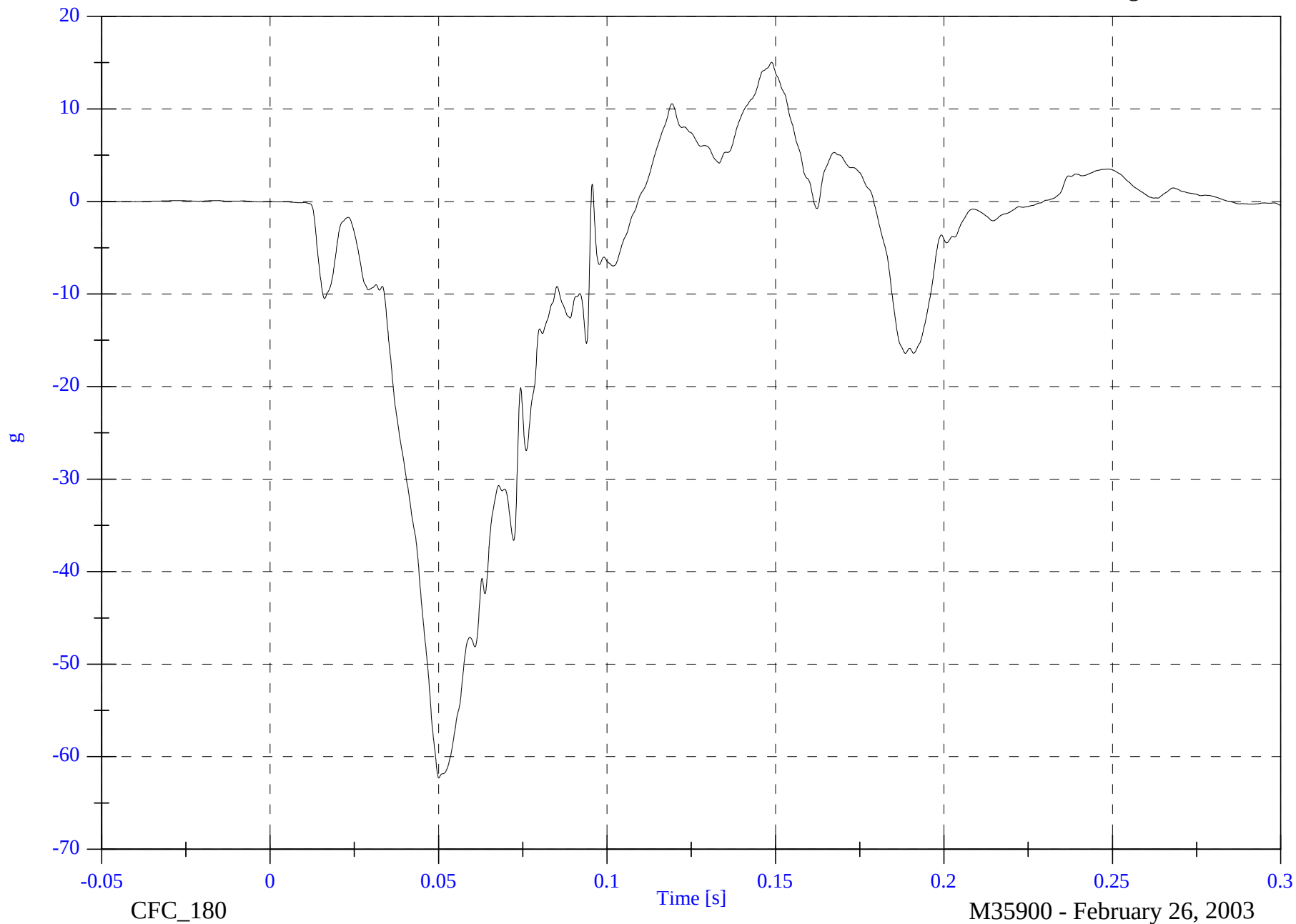
V1P6 Chest x

Max: 15.0 [g] at 0.149 [s]

Min: -62.3 [g] at 0.050 [s]

4-68

8642-NCAP-33

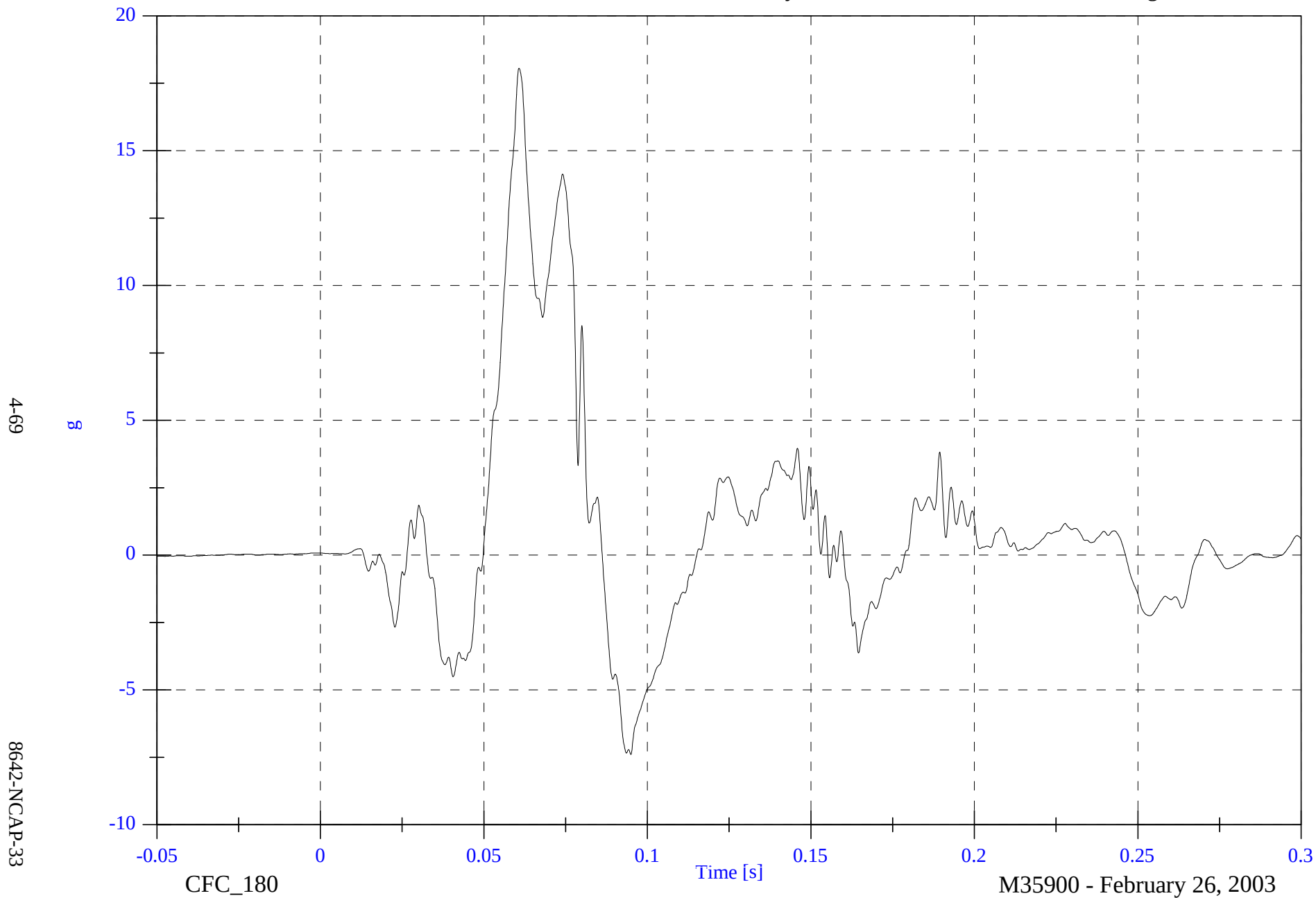


2003 NCAP Test 10 2003 Volvo XC90

Max: 18.1 [g] at 0.061 [s]

Min: -7.4 [g] at 0.095 [s]

V1P6 Chest y

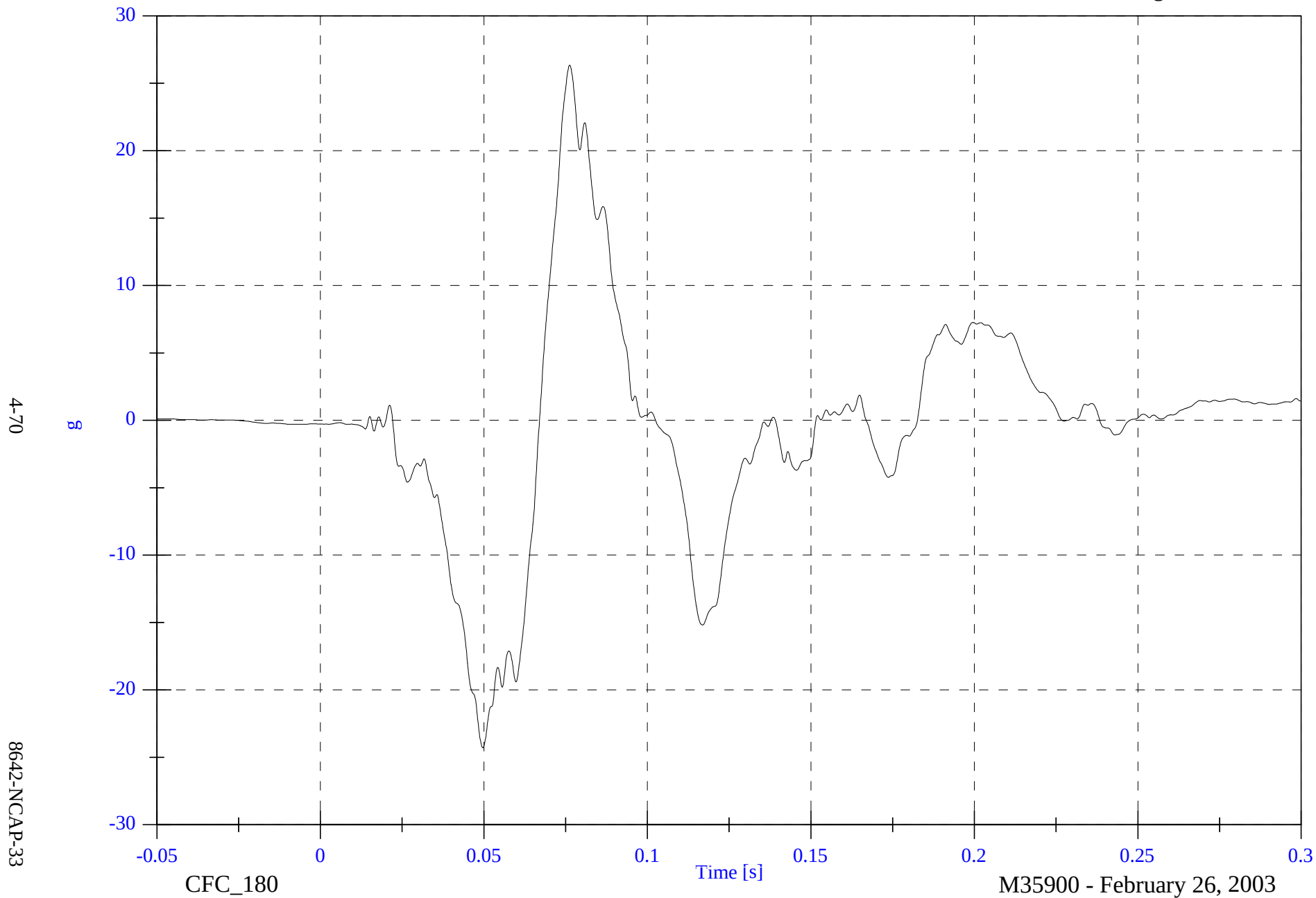


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Chest z

Max: 26.3 [g] at 0.076 [s]

Min: -24.3 [g] at 0.050 [s]



2003 NCAP Test 10 2003 Volvo XC90

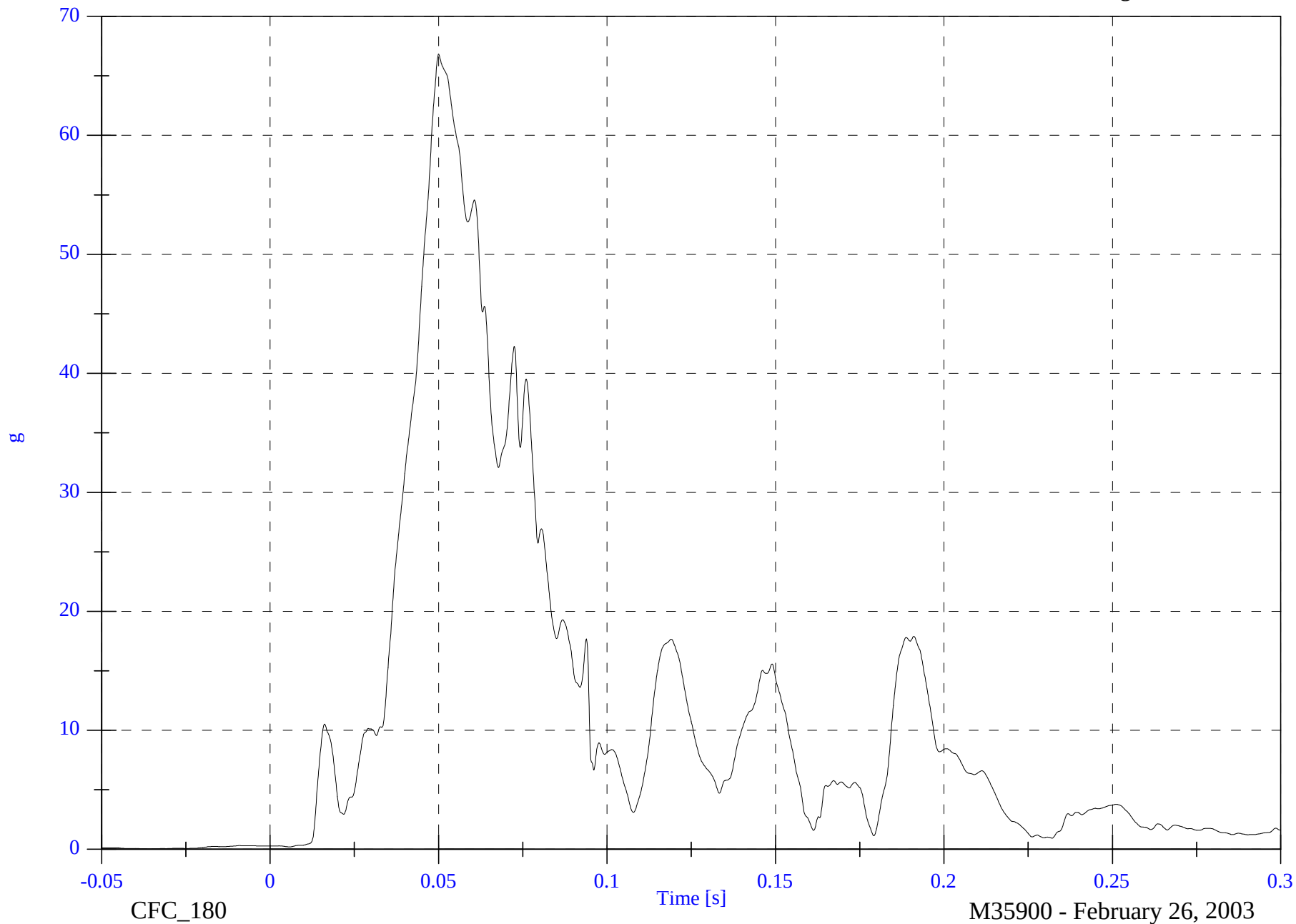
V1P6 Chest Resultant

Max: 66.8 [g] at 0.050 [s]

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

4-71

8642-NCAP-33

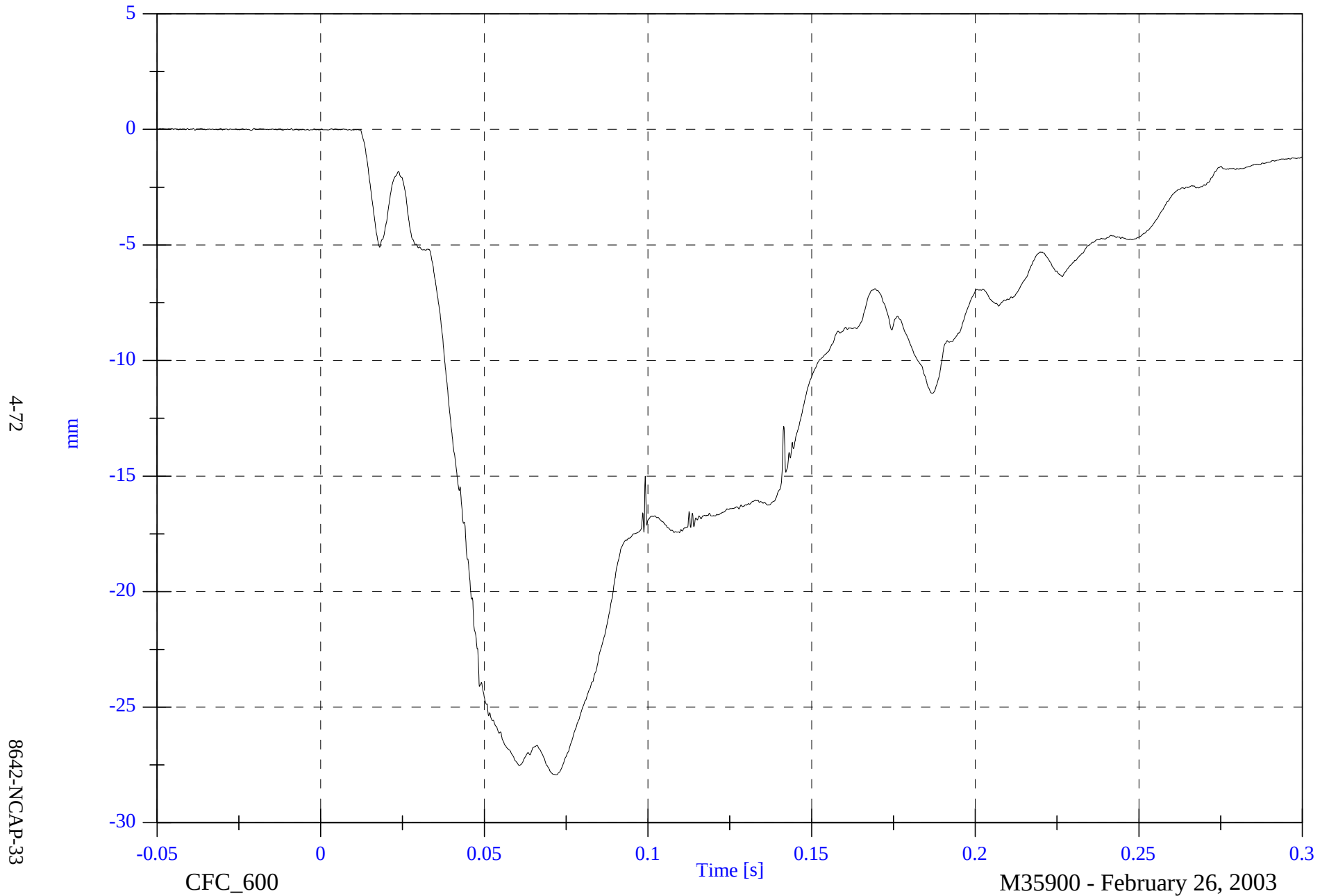


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Chest Compression

Max: 0.0 [mm] at -0.020 [s]

Min: -27.9 [mm] at 0.072 [s]

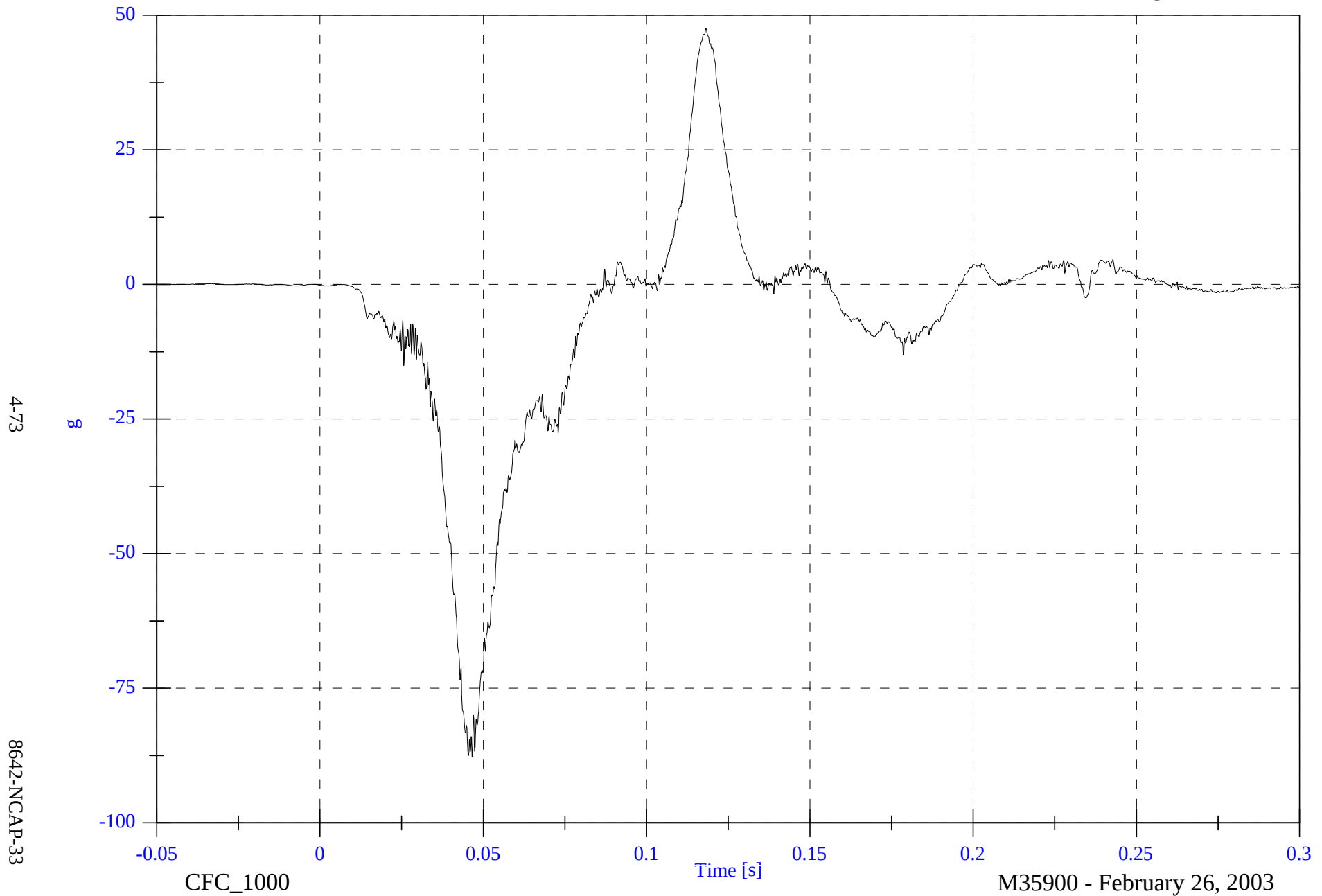


2003 NCAP Test 10 2003 Volvo XC90

Max: 47.6 [g] at 0.118 [s]

Min: -87.8 [g] at 0.047 [s]

V1P6 Pelvic x



2003 NCAP Test 10 2003 Volvo XC90

V1P6 Pelvic y

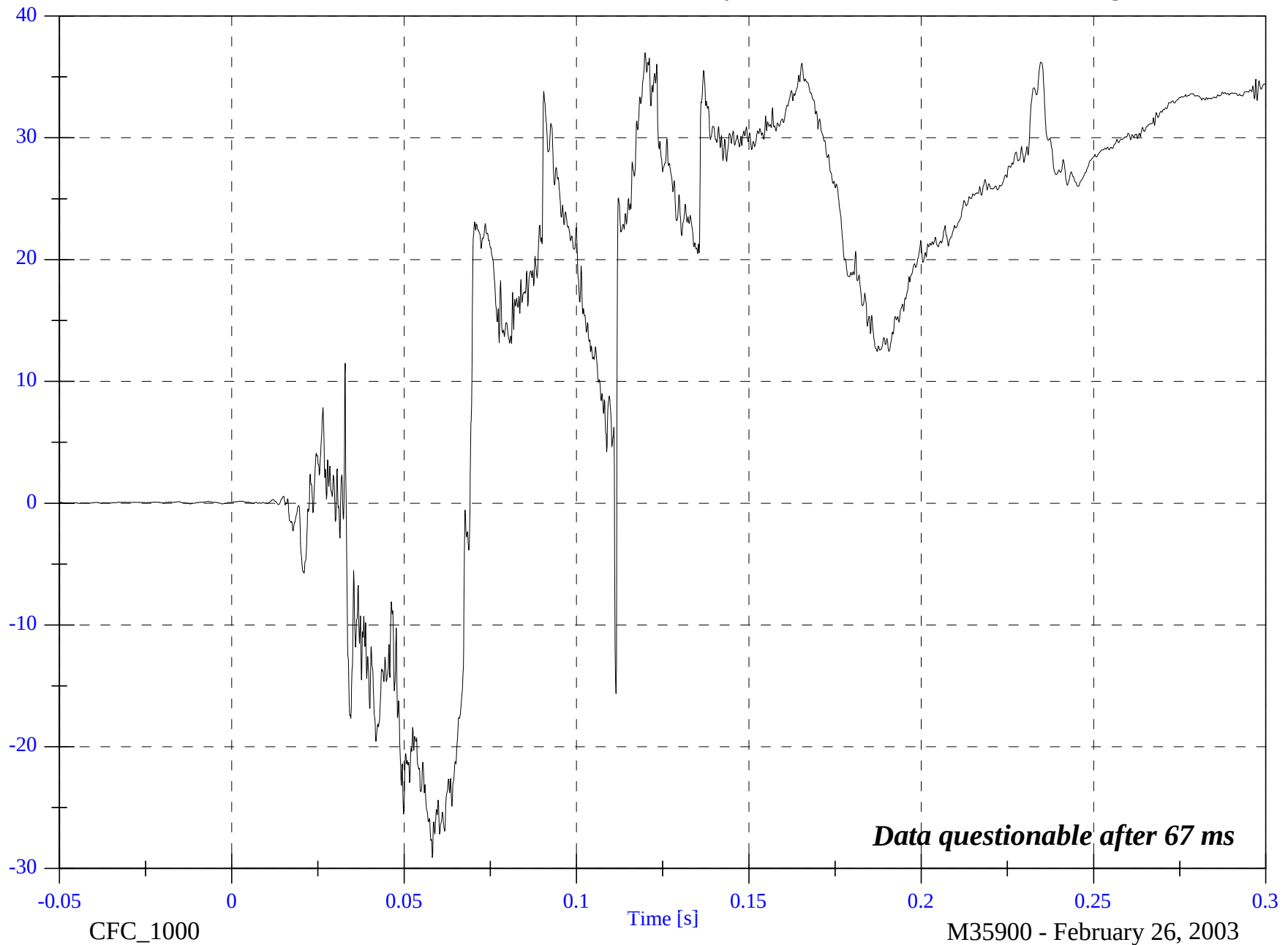
Max: 37.0 [g] at 0.120 [s]

Min: -29.1 [g] at 0.058 [s]

4-74

8642-NCAP-33

g

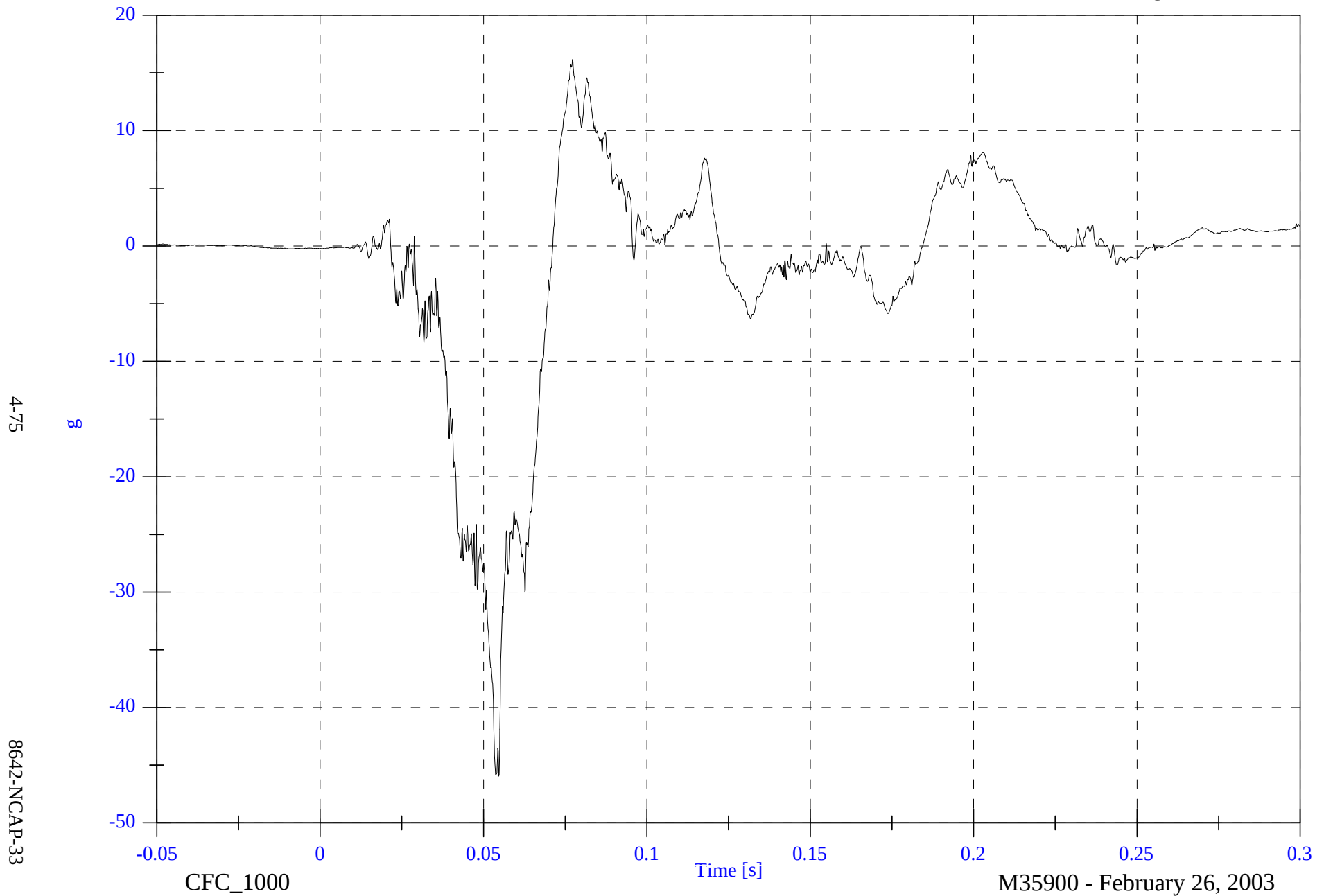


2003 NCAP Test 10 2003 Volvo XC90

V1P6 Pelvic z

Max: 16.2 [g] at 0.077 [s]

Min: -46.0 [g] at 0.055 [s]



2003 NCAP Test 10 2003 Volvo XC90

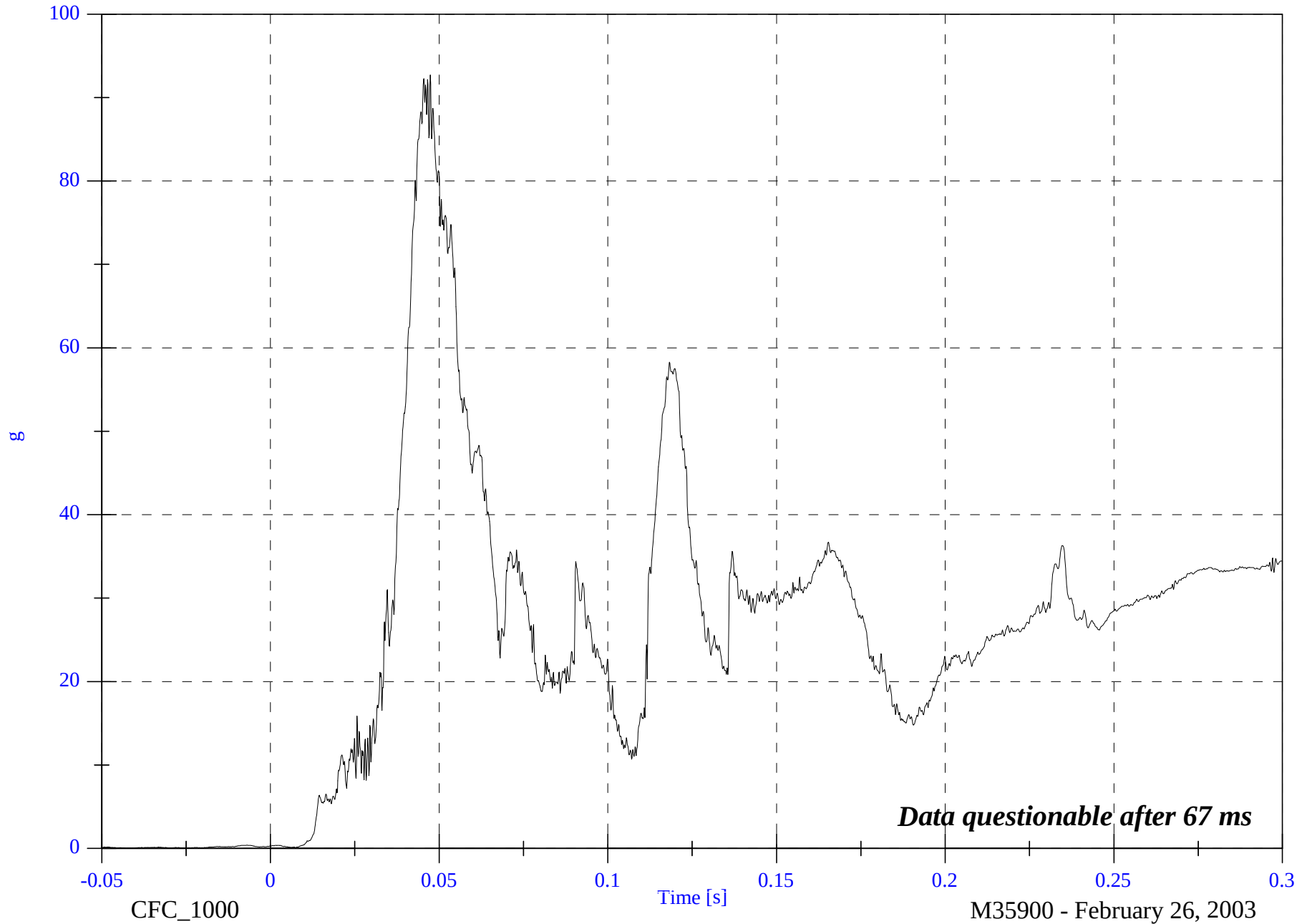
V1P6 Pelvic Resultant

Max: 92.7 [g] at 0.047 [s]

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

4-76

8642-NCAP-33



SECTION 5

CHILD DUMMY CALIBRATION INFORMATION

ATD 144 Was Certified by VRTC prior to this test program. The Certification data is available in the bound report.

044 Head Drop

Part 572P Head Drop

Calibration Date: 01-27-03

Serial No: 044

Work File: 044H 01-27-03

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

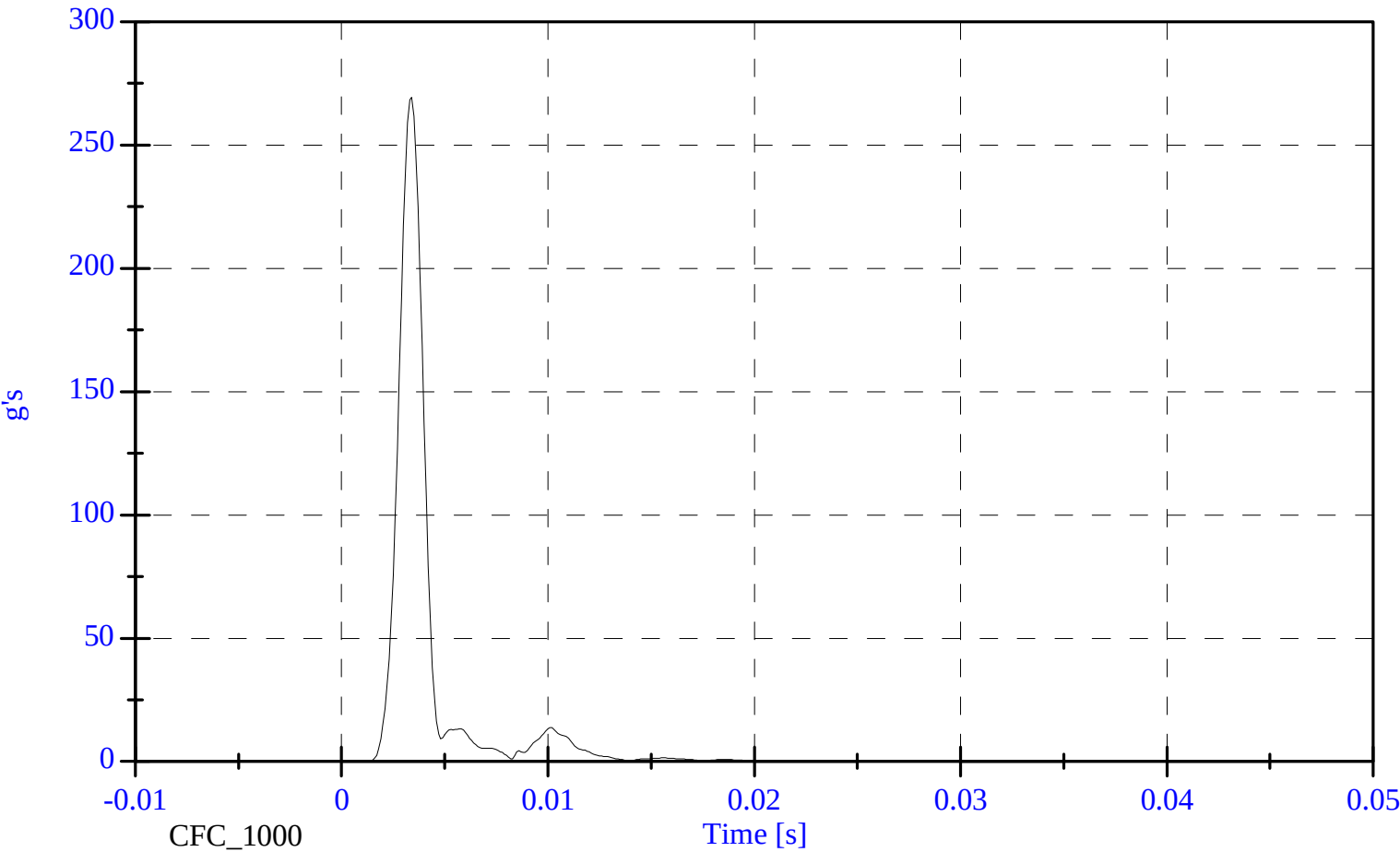
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	66.0-78.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	37.00 %	Passed
Peak Resultant Accel.:	250-280 Gs	269.30 Gs	Passed
Peak Lateral Accel.:	15 Gs Max	3.21 Gs	Passed
Curve PerCent NonModal:	< 10%	5.12 %	Passed

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-----

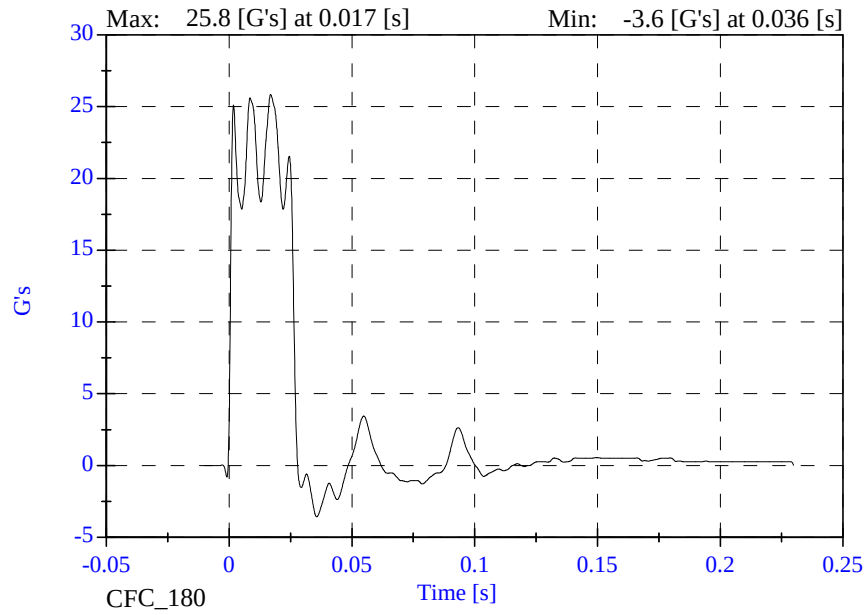
Maximum Rotation:	70.0-82.0 Deg	75.22 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

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

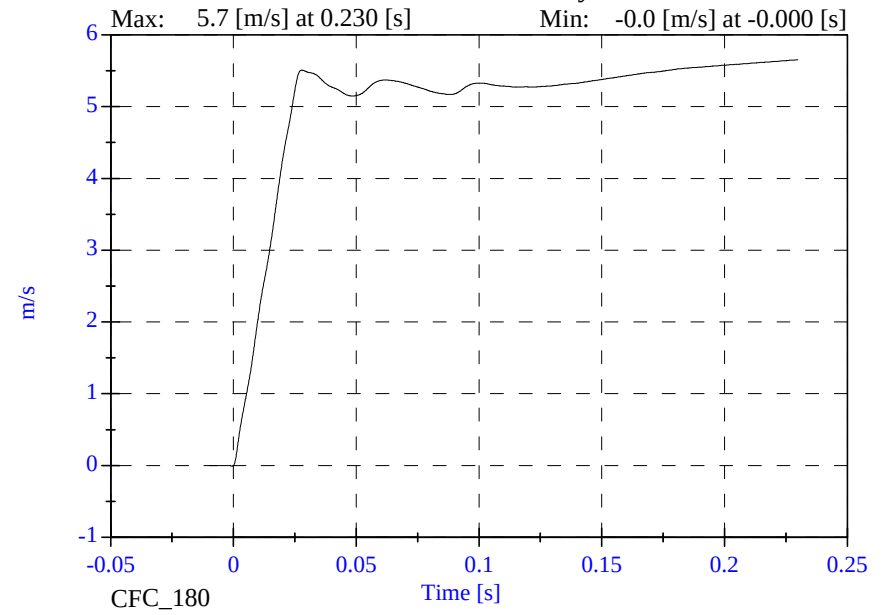
044 Neck Flexion

Pendulum Acceleration

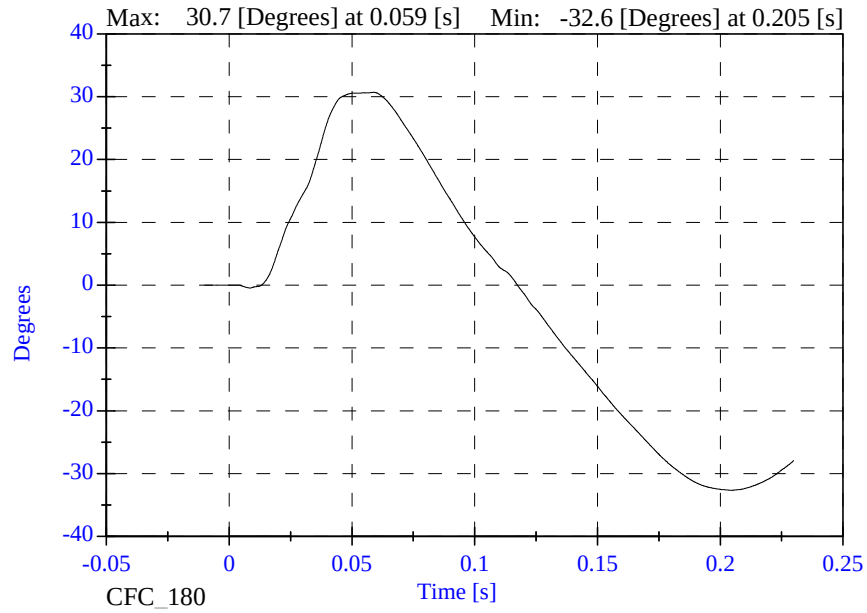


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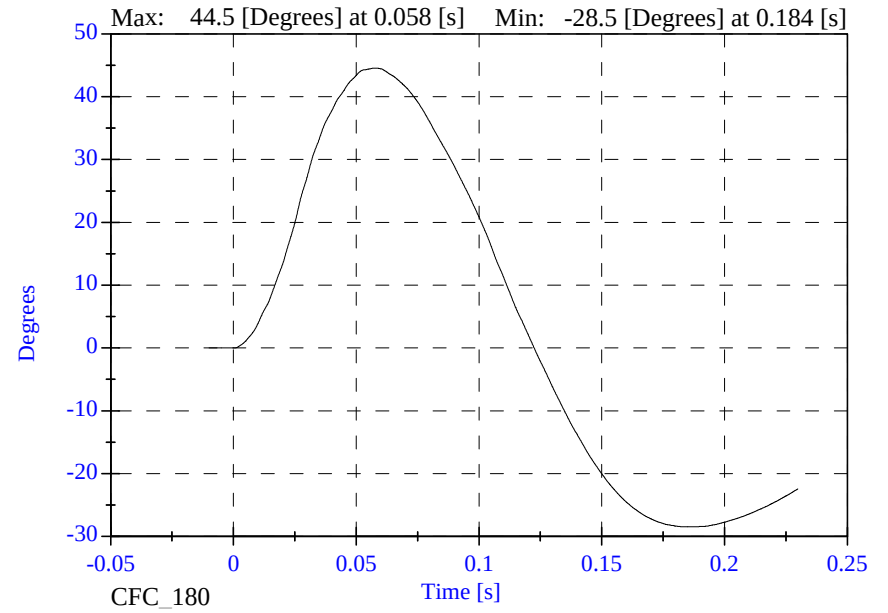
Pendulum Velocity



Head Rotation

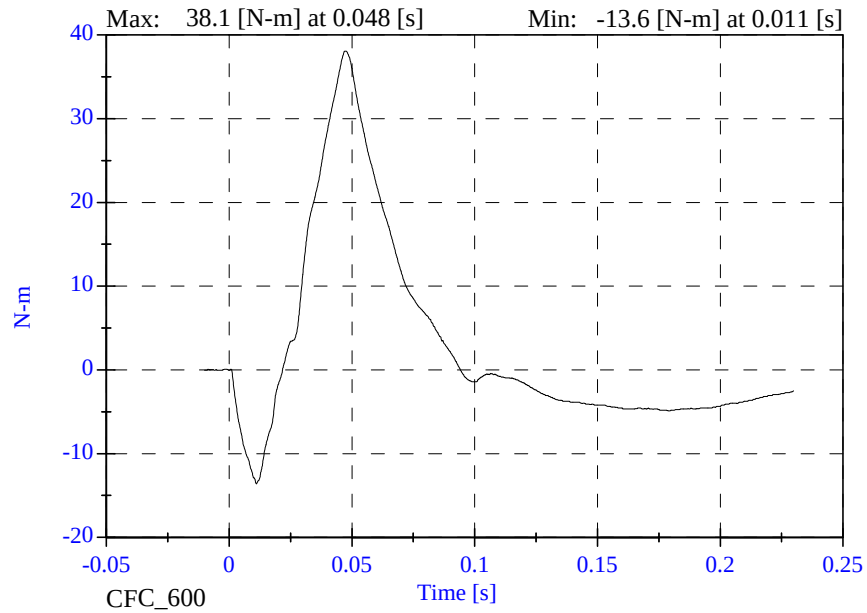


Arm Rotation



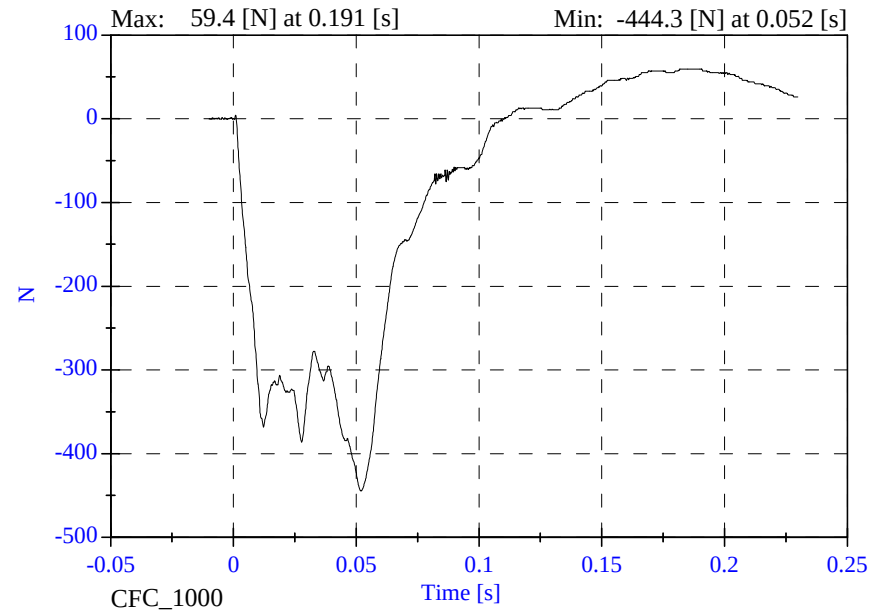
044 Neck Flexion

Neck Moment Y

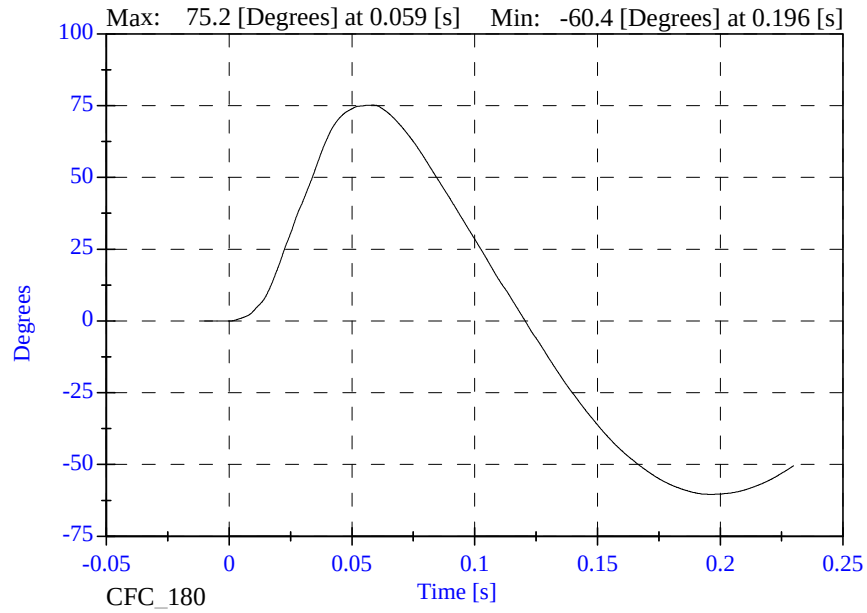


70 - 01-27-03

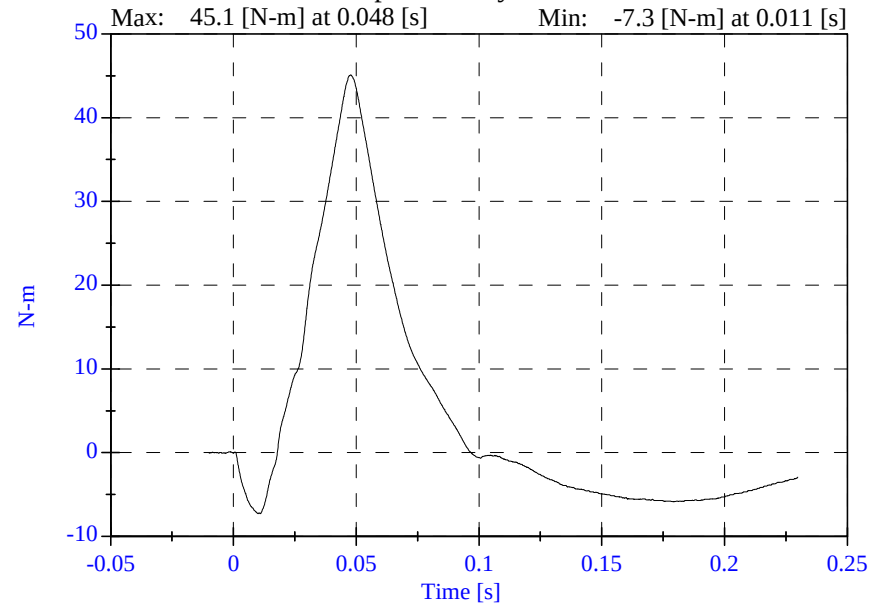
Neck Force X



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-----

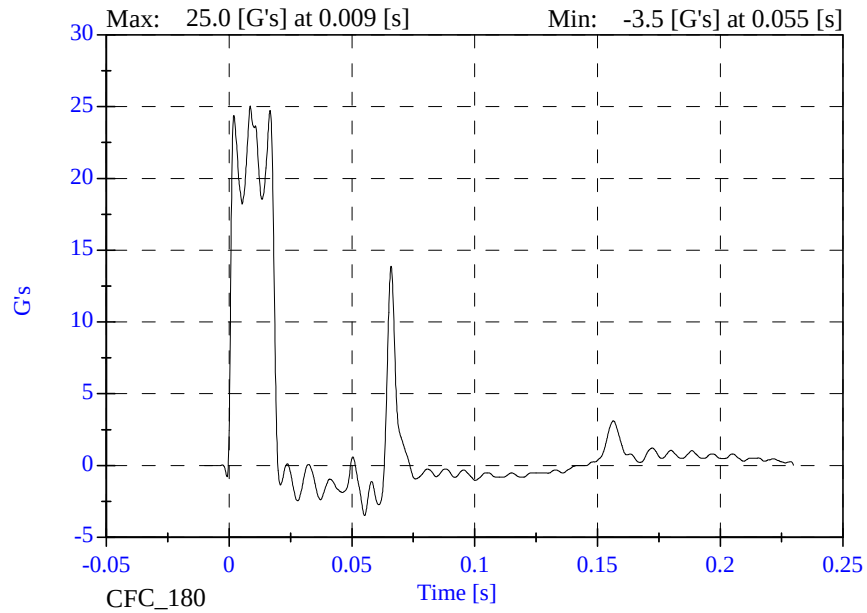
Maximum Rotation:	83.0-93.0 Deg	83.96 Deg	Passed
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-----MOMENT ABOUT THE OCCIPITAL CONDYLE-----

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

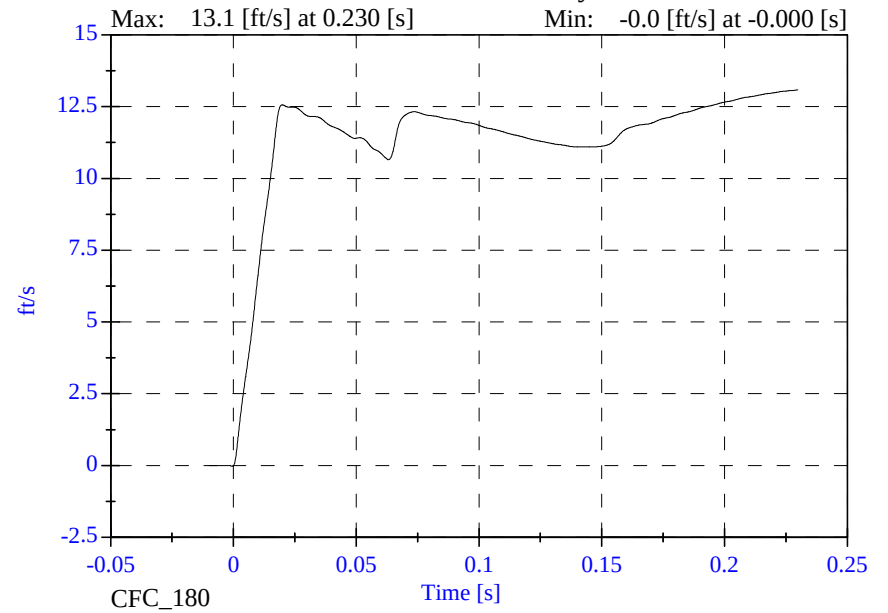
044 Neck Extension

Pendulum Acceleration

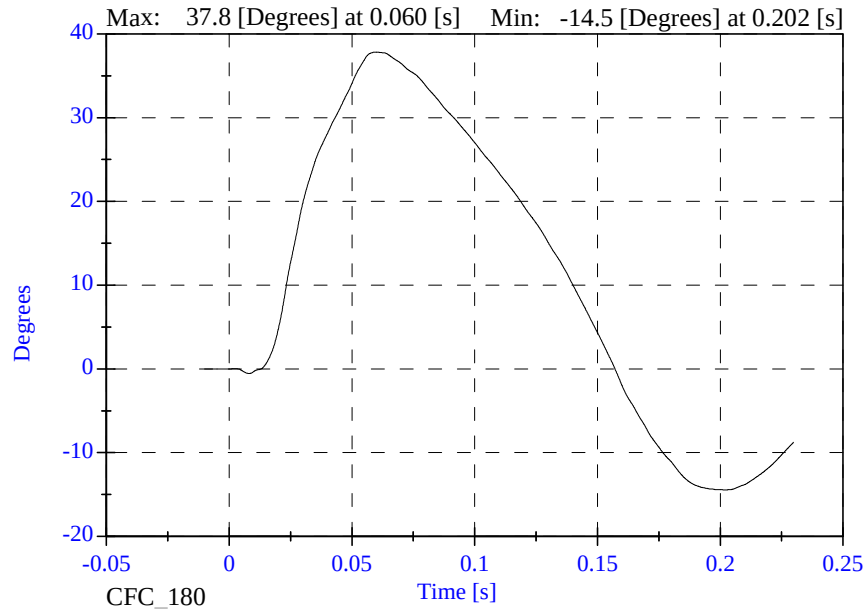


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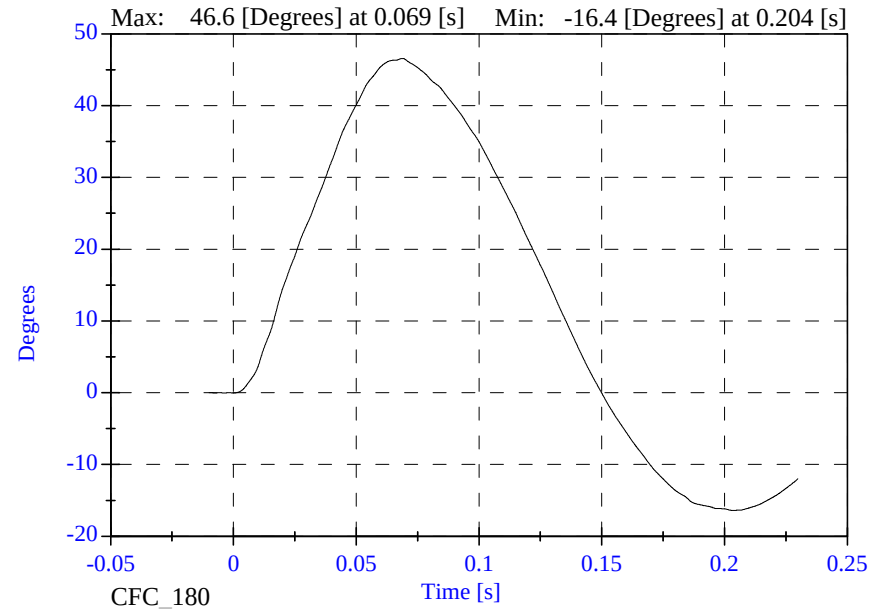
Pendulum Velocity



Head Rotation

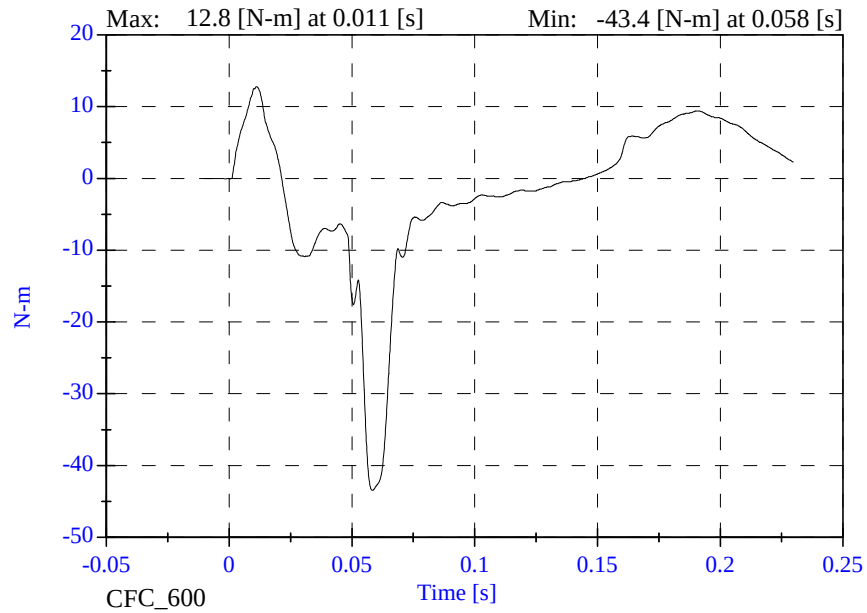


Arm Rotation



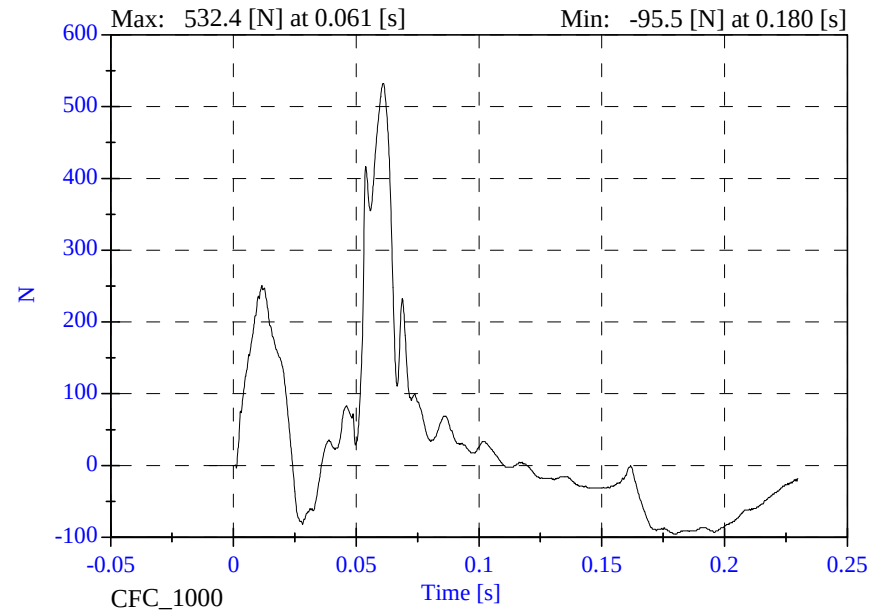
044 Neck Extension

Neck Moment Y

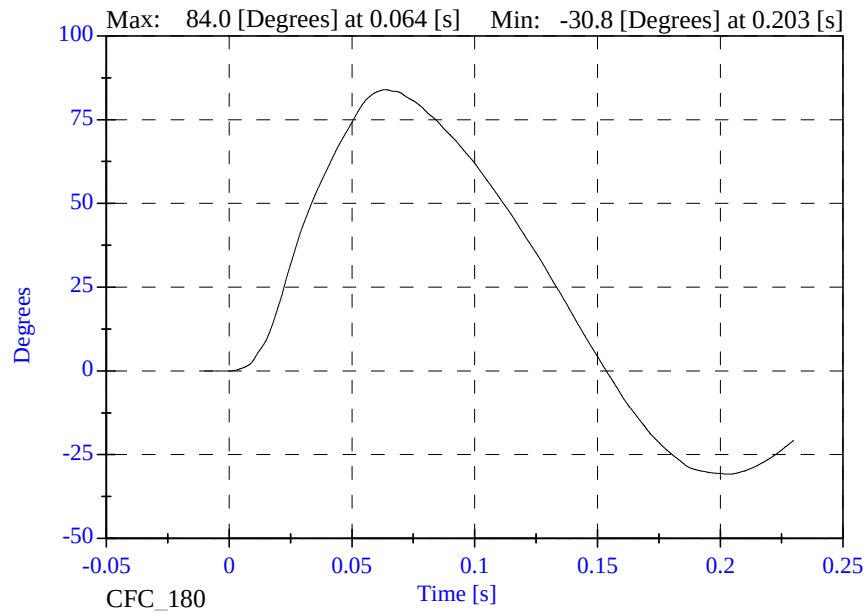


71 - 01-28-03

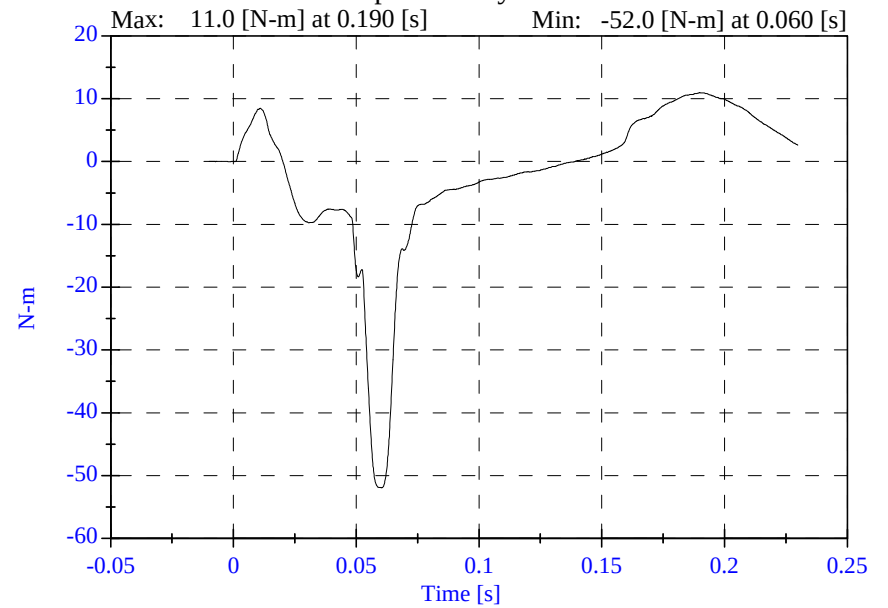
Neck Force X



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-----

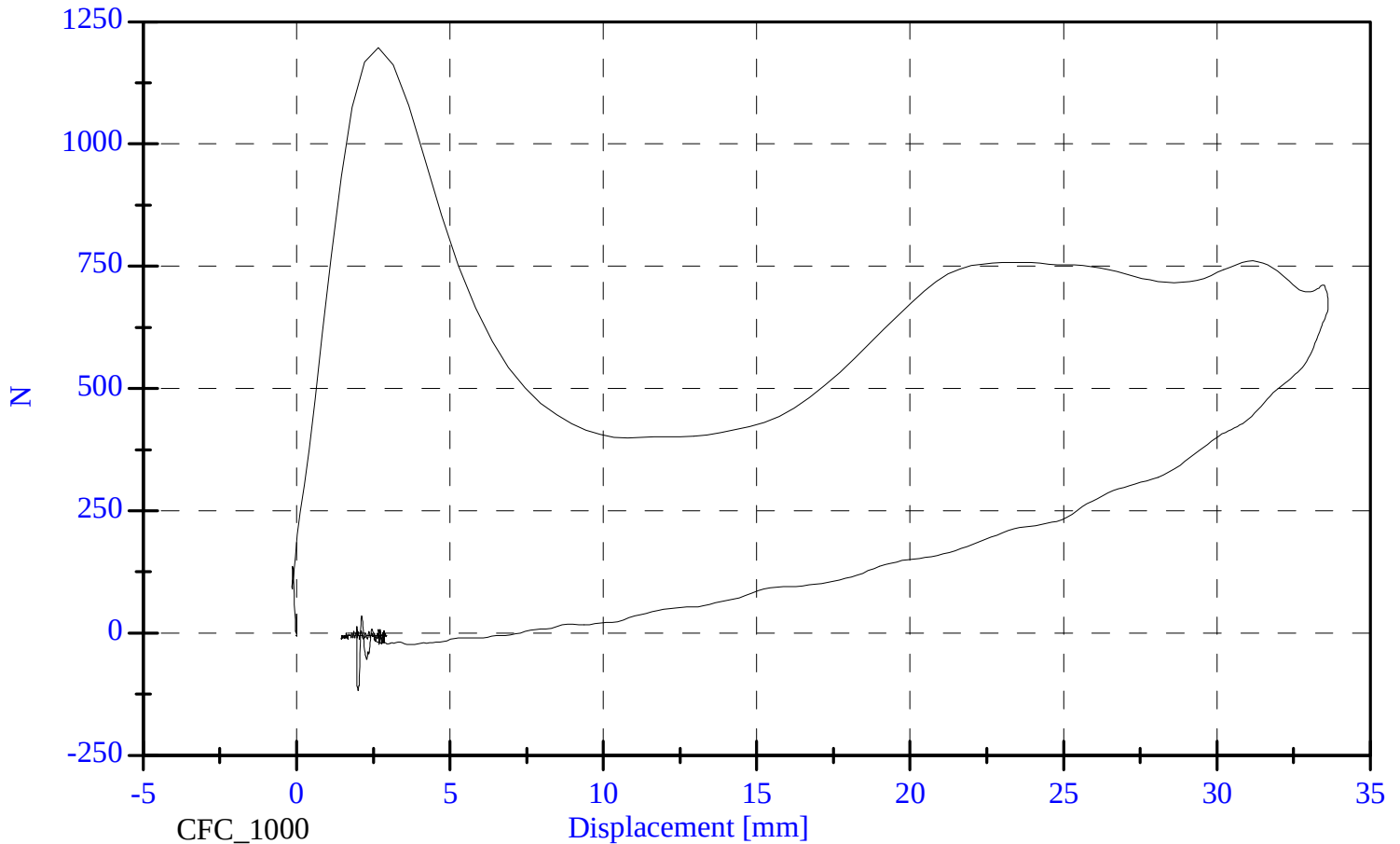
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	20.6-22.2 C	21.1 C	Passed
Lab Humidity:	10-70 %	33.00 %	Passed
Pendulum Velocity:	5.90- 6.10 m/s	5.94 m/s	Passed
Maximum Deflection:	32.00-38.00 mm	33.62 mm	Passed
Maximum Res. Force:	680.00- 810.00 N	740.30 N	Passed
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]



Spine_Flexion_test.txt

044 Lumbar Spine Flexion

Date: 1-28-03

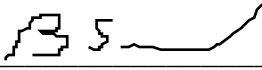
Result: 45 degrees - 38.8 lbf

Certified By: B.Swiecicki 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-----

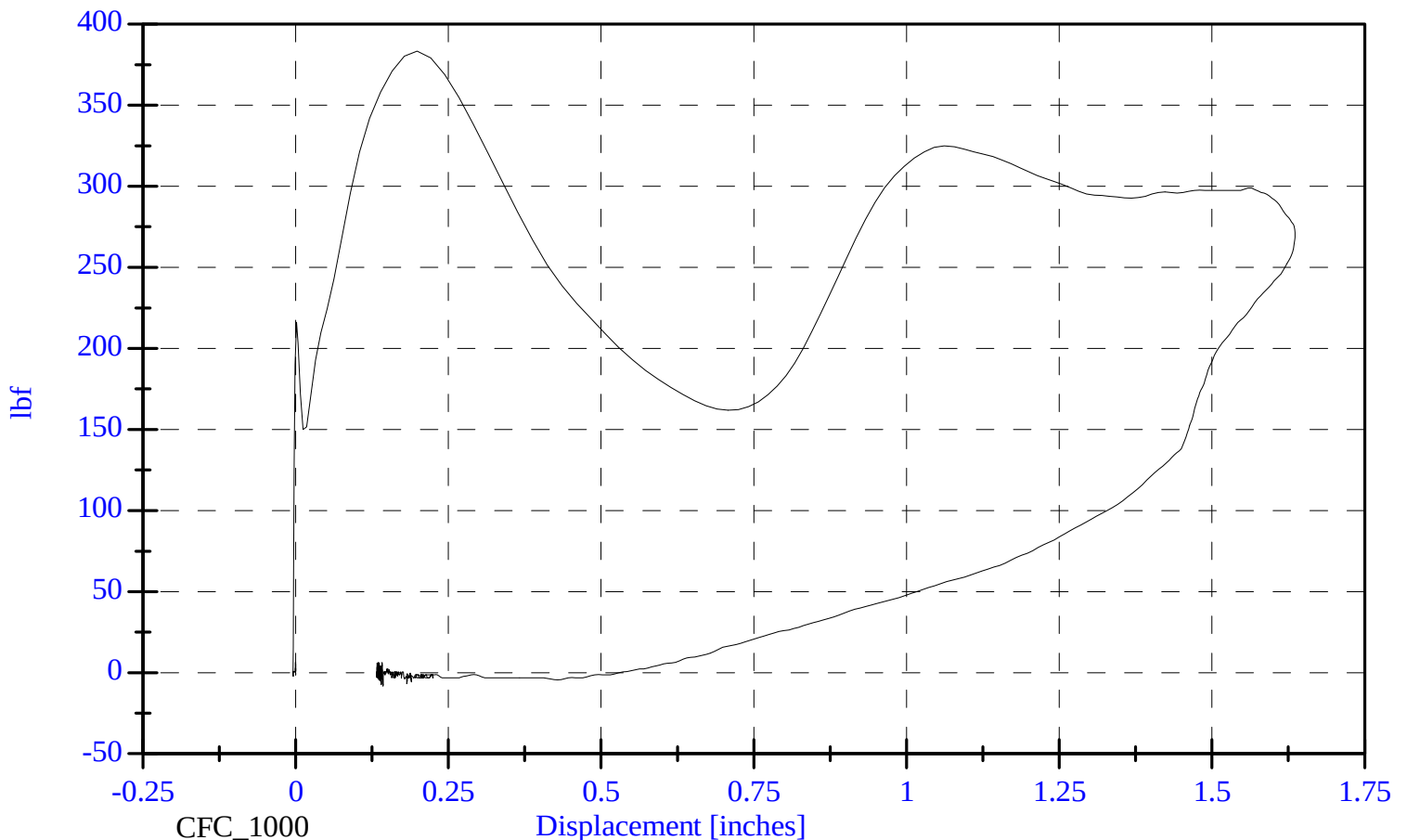
<u>TEST CONDITION</u>	<u>PARAMETERS</u>	<u>RESULTS</u>	<u>STATUS</u>
Lab Temperature:	69.0-72.0 F	70.0 F	Passed
Lab Humidity:	10-70 %	29.00 %	Passed
Pendulum Velocity:	21.60-22.40 ft/s	21.80 ft/s	Passed
Maximum Deflection:	1.50- 1.80 inche	1.64 inche	Passed
Maximum Res. Force:	259.00- 310.00 lbf	298.89 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 [inche]

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 AY	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-711	12-Nov-02

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-712	12-Nov-02

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

REMARKS: None