

REPORT NUMBER: CAL-03-01

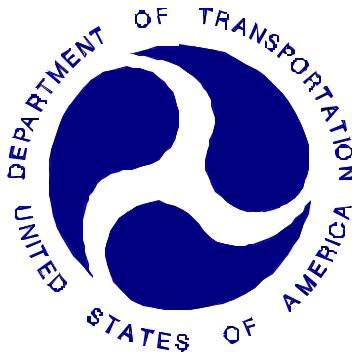
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

BAYERISCHE MOTOREWERKE AG
2003 BMW Z4
2-DOOR CONVERTIBLE

NHTSA NUMBER: M30503

VERIDIAN TEST NUMBER: 8642-NCAP-23

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



December 6, 2002

FINAL REPORT

PREPARED FOR:

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

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

Prepared by:

Patrick G. MacDiarmid, Jr., Project Engineer

Approved by:

David J. Travale, Program Manager
Transportation Science Center

Approval Date:

FINAL REPORT ACCEPTANCE BY OCS:

Manager, New Car Assessment Program (NCAP)
NHTSA, Office of Crashworthiness Standards

Date of Report Acceptance

COTR, New Car Assessment Program (NCAP)
NHTSA, Office of Crashworthiness Standards

Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. CAL-03-01		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of NEW CAR ASSESSMENT PROGRAM (NCAP) Testing of a 2003 BMW Z4 2-Door Convertible NHTSA No. M30503				5. Report Date December 6, 2002	
				6. Performing Organization Code CAL	
7. Author(s) David J. Travale, Program Manager Patrick G. MacDiarmid, Jr., Project Engineer				8. Performing Organization Report No. 8642-NCAP-23	
9. Performing Organization Name and Address Veridian Engineering 4455 Genesee Street Buffalo, New York 14225				10. Work Unit No.	
				11. Contract or Grant No. DTNH22-01-D-32005	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards Mail Code: NPS-10 400 Seventh, SW, Room 5313 Washington, D.C. 20590				13. Type of Report and Period Covered Final Report December 2002	
				14. Sponsoring Agency Code NVS-111	
15. Supplementary Notes					
16. Abstract A frontal load cell barrier test of a 2003 BMW Z4 2-Door Convertible was performed at Veridian Engineering crash test facility in Buffalo, New York, on December 6, 2002. The impact velocity was 56.97 kph and the temperature at the barrier face was 20°C. The maximum post-test vehicle crush was 482 mm. The test vehicle was equipped with 3-point restraint systems with buckle side pretensioners and load limiters, active knee bolster airbags, 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 (061)	846.6	46.3	34.1	2391.1	2951.7
Passenger (064)	670.1	46.9	25.7	3101.1	3109.1
17. Key Words 56 kph Frontal Barrier Impact test New Car Assessment Program (NCAP)			18. Distribution Statement <u>Copies of this report are available from:</u> NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, DC 20590		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages 296	22. Price

Form DOT F1700.7 (8-69)

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND SUMMARY OF NCAP TEST	1-1
2	OCCUPANT AND VEHICLE INFORMATION	2-1
<u>Data Sheet</u>	<u>Description</u>	
1.	CRASH TEST SUMMARY	2-1
2.	GENERAL TEST AND VEHICLE PARAMETER DATA	2-2
3.	POST IMPACT DATA	2-4
4.	TEST VEHICLE INFORMATION	2-5
5.	DUMMY POSITIONING IN VEHICLE	2-7
6.	SEAT BELT POSITIONING DATA	2-9
7.	VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY	2-10
8.	DUMMY INJURY CRITERIA VALUES	2-12
9.	SEAT BELT PERFORMANCE DATA	2-16
10.	SUMMARY OF FMVSS 212 DATA	2-17
11.	WINDSHIELD ZONE INTRUSION FMVSS 219 DATA	2-18
12.	FMVSS 301 FUEL SYSTEM INTEGRITY DATA	2-19
13.	FMVSS 301 ROLLOVER DATA	2-20
14.	VEHICLE MEASUREMENTS	2-21
15.	CAMERA DATA	2-29
16.	REFERENCE PHOTO TARGETS	2-31
17.	LOAD CELL LOCATIONS ON FIXED BARRIER	2-32
18.	POST TEST AIR BAG DATA	2-33
19.	ACCIDENT INVESTIGATION DIVISION DATA	2-34
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA	B-1
APPENDIX C	PART 572E DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TESTS	C-1
APPENDIX D	DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION	D-1

SECTION 1

PURPOSE AND SUMMARY OF TEST

1.1 PURPOSE

This 56.97 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.

1.2 TEST PROCEDURE

This 56.97 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 14 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 head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and passenger's shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 061) and the right-front passenger (position 2) ATD (Serial No.064) were used in one test (GM0301) previous to this test. 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 129 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 BMW Z4 2-Door Convertible at a velocity of 56.97 kph. The test was performed at Veridian Engineering on December 6, 2002. 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	846.6	46.3	34.1	2391.1	2951.7	-	-
Passenger ATD	670.1	46.9	25.7	3101.1	3109.1	-	-

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 482 mm and both the driver and passenger side doors remained closed and latched during the impact event and were operable without the use of tools 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 center of the headrest, the chest to the airbag and the left and right knee to the knee bolster airbag. The passenger's visible contact points were as follows: The face to the center of the airbag; the back of the head to the right of the center of the headrest, the chest to the airbag and the left and right knee to the knee bolster airbag.

The 2003 BMW Z4 2-Door Convertible 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.: M30503 Test Mode: 56.3 kph Frontal Barrier
Test Date: December 6, 2002 Time: 13:35 Temperature: 20 °C
Vehicle Make/Model/Body Style: 2003 BMW Z4 2-Door Convertible

Vehicle Test Weight: 1630.5 kg

Vehicle/Barrier Impact Angle: 0 °

Impact Velocity: 56.97 kph

Maximum Static Crush: 482 mm

Vehicle Rebound: 498 mm

DUMMIES:

DRIVER

PASSENGER

Type:

572E

572E

Restraint System:

Seatbelt with load limiter and
buckle pretensioner, Airbag,
Knee Bolster Airbag

Seatbelt with load limiter and
buckle pretensioner, Airbag,
Knee Bolster Airbag

Number of Data Channels: 129

Number of Cameras: 1 Real Time

14 High Speed

DOOR OPENING DATA:

Closed, Latched and Operable without Tools - Left Front

Closed, Latched and Operable without Tools - Right Front

Front Seat(s) Data:

DRIVER

PASSENGER

Seat Track Failure: (mm of shift)

0

0

Seat Back Failure:

None

None

VISIBLE DUMMY CONTACT POINTS:

DRIVER

PASSENGER

Head:

The face to the center of the
airbag; The back of the head to
the center of the headrest

The face to the center of the
airbag; The back of the head to
the right of the center of the
headrest

Abdomen:

None

None

Chest:

Airbag

Airbag

Knees:

Knee Bolster Airbag

Knee Bolster Airbag

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2003 BMW Z4 2-Door Convertible

NHTSA No. : M30503 ; VIN: 4USBT33473LR60820 ; Color: Silver

Engine Data: 6 cylinders; - CID; 2.5 Liters; - cc

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

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

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

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

Safety Belt Features - Passenger X Pretensioner (Buckle); X Load Limiter; - 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: 11-7-2002 ; Odometer Reading 26 km

Selling Dealer: Towne BMW

& Address: 8215 Main Street Williamsville, NY 14221

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Bayerische Motorewerke AG

Date of Manufacture 10/02

GVWR: 1580 kg; GAWR: 780 kg FRONT; 835 kg REAR

DATA FROM TIRE PLACARD:

Recommended Tire Size: P225/50R16 92V

* Recommended Cold Tire Pressure: 210 kPa FRONT; 210 kPa REAR

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P225/50R16 92V RSC ; Manufacturer: Bridgestone

Tire Pressure with Maximum Capacity Vehicle Load: Front: 350 kPa; Rear: 350 kPa

Treadwear: 140 ; Traction: A ; Temperature: A

VEHICLE CAPACITY DATA:

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

Number of Occupants: 2 Front; - Rear; 2 Total

Vehicle Capacity Weight (VCW) = 280 kg

No. of Occupants x 68.04 kg = 136.08 kg

Rated Cargo/Luggage Weight (RCLW) = 143.92 kg (136.1 kg maximum)

*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>335.0</u>	kg	Right Rear =	<u>345.0</u>	kg
Left Front =	<u>341.0</u>	kg	Left Rear =	<u>330.0</u>	kg
TOTAL FRONT =	<u>676.0</u>	kg	TOTAL REAR =	<u>675.0</u>	kg
TOTAL DELIVERED WEIGHT =	<u>1351.0</u>	kg			
% of Total Front of Vehicle Weight =	<u>50.0%</u>		% of Total Rear Weight =	<u>50.0%</u>	%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	<u>1351.0</u>	kg
Rated Cargo/Luggage Weight (RCLW) =	<u>136.1</u>	kg (136.1 kg maximum)
Weight of 2 p.572 Dummies @ 76 each =	<u>152</u>	kg
TARGET TEST WEIGHT =	<u>1639.1</u>	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 127.5 KG OF CARGO WEIGHT:

Right Front =	<u>348.5</u>	kg	Right Rear =	<u>474.5</u>	kg
Left Front =	<u>367.5</u>	kg	Left Rear =	<u>440.0</u>	kg
TOTAL FRONT =	<u>716.0</u>	kg	TOTAL REAR =	<u>914.5</u>	kg
TOTAL TEST WEIGHT =	<u>1630.5</u>	kg			
% of Total Front Weight =	<u>43.9%</u>	%	% of Total Rear Weight =	<u>56.1%</u>	%
Weight of Ballast Secured in Vehicle Trunk Area =	<u>52.6</u>	kg			
Vehicle Components Removed for Weight Reduction:	<u>None</u>				

VEHICLE ATTITUDE (all dimension in millimeters):

AS DELIVERED:	RF	<u>690</u>	LF	<u>687</u>	RR	<u>692</u>	LR	<u>694</u>
FULLY LOADED:	RF	<u>682</u>	LF	<u>677</u>	RR	<u>662</u>	LR	<u>665</u>
AS TESTED:	RF	<u>685</u>	LF	<u>685</u>	RR	<u>670</u>	LR	<u>665</u>
Vehicle's Wheel Base:	<u>2500</u>	mm						
Location of Vehicle's C.G.:	<u>1402</u>	mm rearward of front wheel center.						

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual =	<u>55</u>	liters
Usable Capacity Figure Furnished by COTR =	<u>55</u>	liters
Test Volume Range (92 to 94% of Usable Capacity) =	<u>50.6</u>	to <u>51.7</u> liters
ACTUAL TEST VOLUME=	<u>51.0</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: Filler neck – right side ahead of rear axle; Lines – inside left frame stiffener;		
<u>Tank – center ahead of rear axle.</u>		

DATA SHEET NO. 3 POST IMPACT DATA

TYPE OF TEST:

Type of Test: Frontal Barrier Impact Angle: 0°
Test Date: December 6, 2002 Time: 13:35 Temperature: 20 °C
Vehicle NHTSA No.: M30503
Required Impact Velocity Range: 55.5 to 57.1 kph

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

Trap No. 1 = 56.97 kph; Trap No. 2 = 56.97 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>3997</u> ; C/L = <u>4085</u> ; Right = <u>3997</u>
Post-Test	Left = <u>3614</u> ; C/L = <u>3615</u> ; Right = <u>3617</u>
Crush	Left = <u>383</u> ; C/L = <u>470</u> ; Right = <u>380</u>
AVERAGE	= <u>411</u> mm

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point:

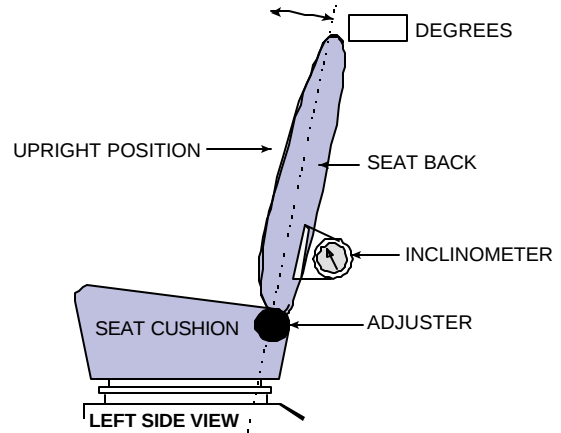
	Left = <u>493</u> ; C/L = <u>514</u> ; Right = <u>488</u>
AVERAGE	= <u>498</u> mm

DATA SHEET NO. 4 TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 2003 Vehicle Model: BMW Z4 Body Style : 2-Door Convertible

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: 10°

Measurement instructions: Set seat back angle to obtain a 25° back pan angle on h-point machine

Seat back angle for passenger's seat: 10°

Measurement instructions: Set seat back angle to obtain a 25° back pan angle on h-point machine

2. Seat Fore and Aft Positioning

Positioning of the driver's seat: Mid-position

Positioning of the passenger's seat: Mid-position

3. Fuel Tank Capacity Data

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 55 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 = 55 liters

3.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 51 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.

For 2 seconds when ignition is turned to the "ON" position.

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

4. STEERING COLUMN ADJUSTMENTS:

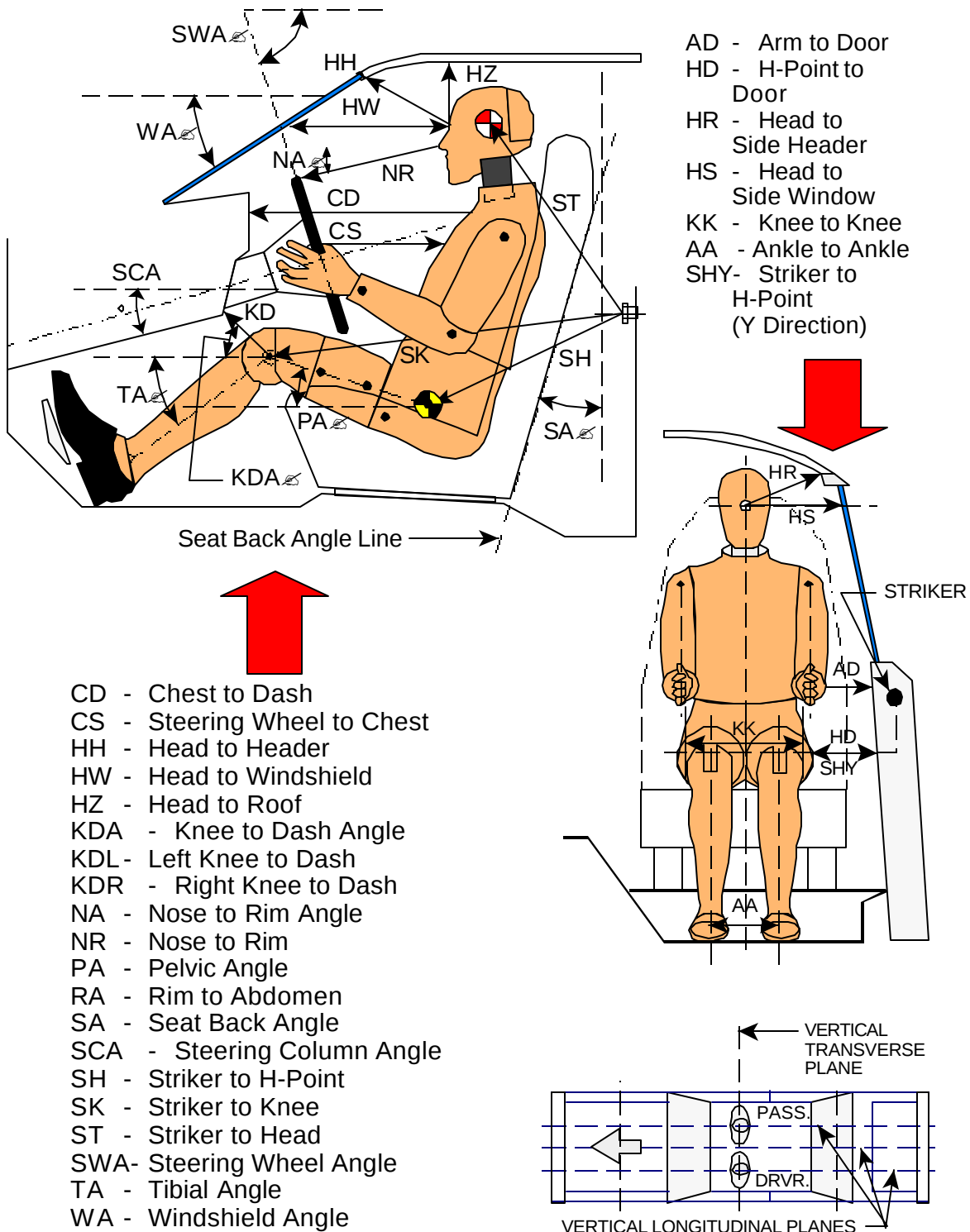
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine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

Operational Instructions: Mid tilt and telescope

5. SEAT BELT UPPER ANCHORAGE

Nominal design riding position: Not applicable

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



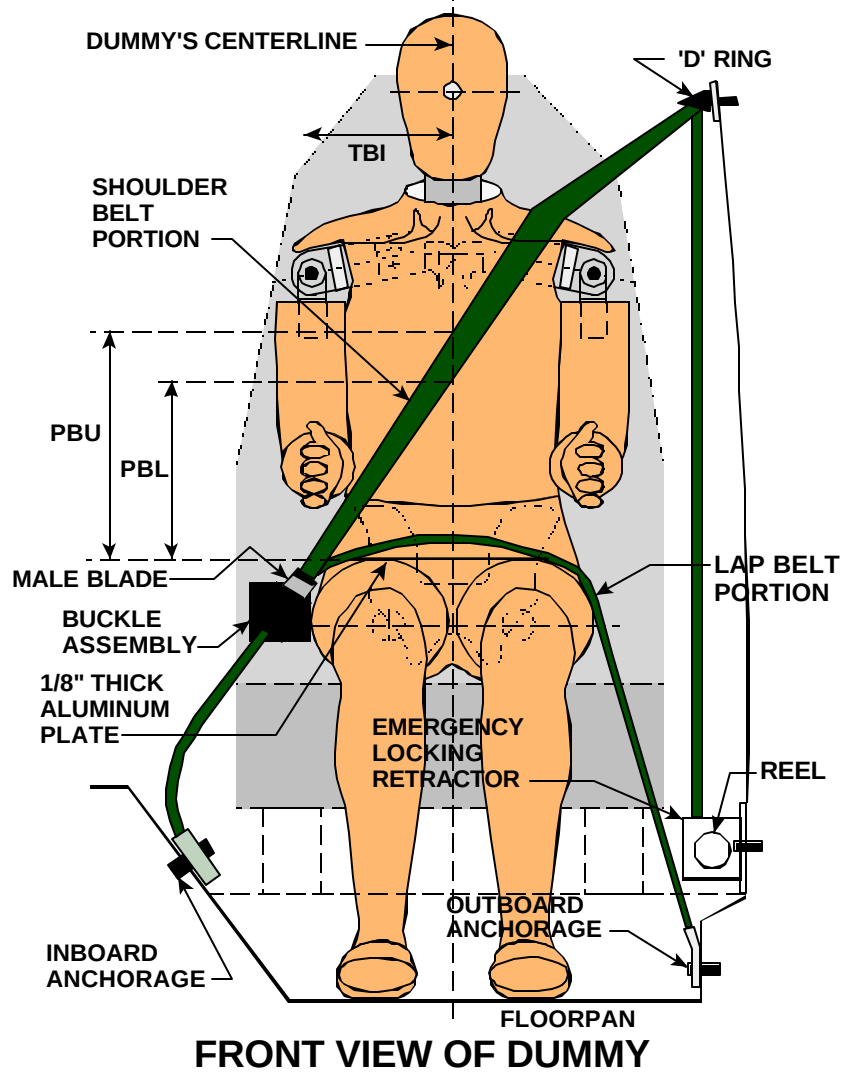
DATA SHEET NO. 5 FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE (cont.)

	DRIVER (Serial #061)			PASS. (Serial #064)		
WA ⁰	24.9 deg.			N/A		
SWA ⁰	71.5 deg.			N/A		
SCA ⁰	18.5 deg.			N/A		
SA ⁰	10 deg.			10 deg.		
HZ	185			182		
HH	382			382		
HW	623			617		
HR	209			207		
NR	395	Angle	-3 deg.	N/A		
CD	532			472		
CS	330			N/A		
RA	226			N/A		
KDL	232	Angle (KDA)	48 deg.	175		
KDR	157			223	Angle (KDA)	58 deg.
PA ⁰	22.3 deg.			24.3 deg.		
TA ⁰	30.5 deg.			23.2 deg.		
KK	320			270		
AA	320			225		
ST	445	Angle	18 deg.	455	Angle	20 deg.
SK	675	Angle	100 deg.	665	Angle	97 deg.
SH	370	Angle	127 deg.	370	Angle	125 deg.
SHY	215			215		
HS	293			293		
HD	127			123		
AD	91			85		

Dimensions in millimeters

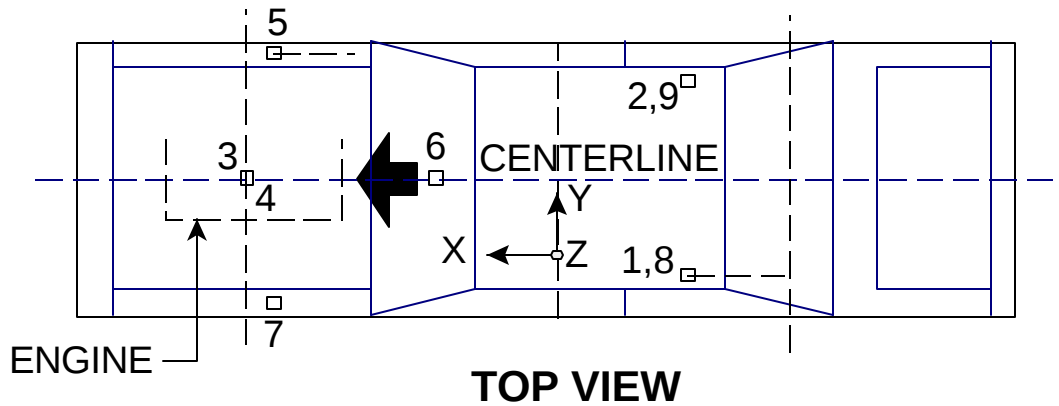
DATA SHEET NO. 6 SEAT BELT POSITIONING DATA

SEAT BELT POSITIONING DATA

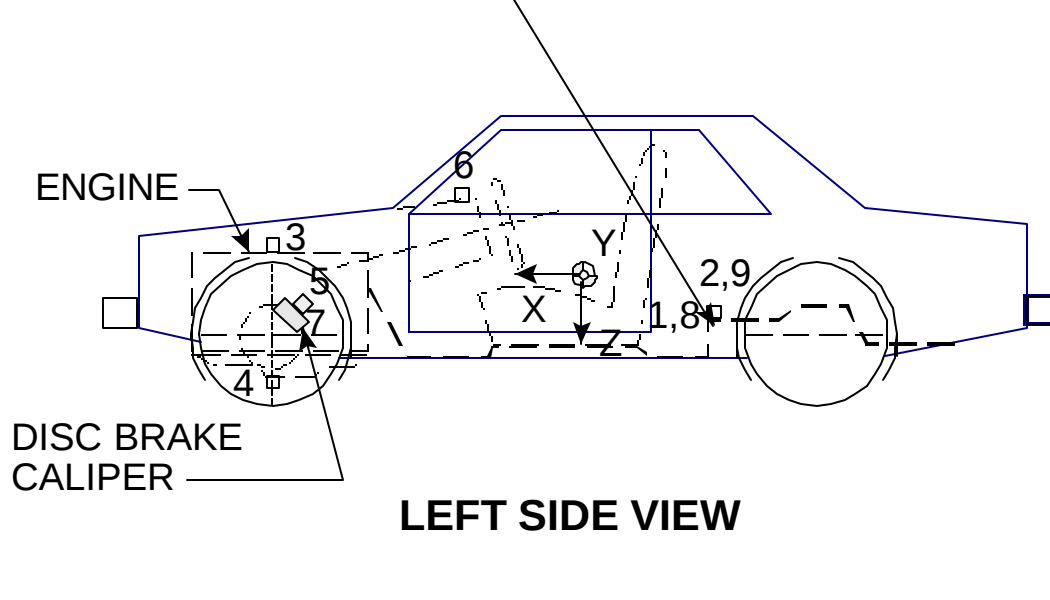


	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	330	330
PBL-- Top surface of alum. p late to belt lower edge	250	250
LAP BELT TENSION	10 N	10 N
SHOULDER BELT TENSION	Retractor	Retractor

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	822	-451	-530
2	Right Rear Seat Cross Member X	829	445	-530
3	Top of Engine Block	2911	-176	-769
4	Bottom of Engine	3066	160	-63
5	Disc Brake Caliper @ Right Side	3215	705	-423
6	Instrument Panel	2093	45	-693
7	Disc Brake Caliper @Left Side	3215	-705	-424
8	Left Rear Seat Cross Member Z	822	-451	-530
9	Right Rear Seat Cross Member Z	829	445	-530

LOCATION NUMBER	DESCRIPTION	MAXIMUM VALUE (g's)			
		Pos.	msec.	Neg.	msec.
1	Left Rear Seat Cross Member X	1.7	124.3	-32.7	51.6
2	Right Rear Seat Cross Member X	1.8	109.9	-32.1	53.2
3	Top of Engine Block	34.5	44.4	-145.6	31.4
4	Bottom of Engine	*	*	*	*
5	Disc Brake Caliper @ Right Side	44.5	58.8	-79.7	47.9
6	Instrument Panel	16.0	74.7	-58.0	40.1
7	Disc Brake Caliper @Left Side	32.1	60.4	-91.0	44.2
8	Left Rear Seat Cross Member Z	6.7	39.1	-10.4	46.0
9	Right Rear Seat Cross Member Z	7.5	38.6	-10.4	46.7

* Not accurate – Cable damaged at 57 ms

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES

Vehicle Year/Make/Model/Body Style: 2003 BMW Z4 2-Door Convertible

NHTSA Test No.: M30503 Test Date: December 6, 2002

		MAXIMUM VALUE							
		Driver				Passenger			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Head X	g	16.6	278.7	-101.6	85.4	6.4	299.9	-51.6	77.0
Head Y	g	4.7	48.3	-5.7	86.7	5.3	32.2	-31.5	86.5
Head Z	g	45.4	84.9	-3.7	89.6	31.4	77.7	-5.2	105.4
Head Resultant	g	107.2	85.3	0.0	-47.7	65.4	77.8	0.0	-32.3
Redundant Head X	g	*	*	*	*	6.6	40.7	-49.2	78.8
Redundant Head Y	g	4.6	48.3	-5.4	86.7	5.5	32.2	-33.6	86.5
Redundant Head Z	g	46.6	84.9	-2.2	101.7	31.5	77.2	-5.3	110.8
Redundant Head Resultant	g	*	*	*	*	65.0	78.8	0.0	-34.2
Upper Neck Fx	N	2082.5	86.2	-120.9	45.9	984.4	68.4	-233.7	143.2
Upper Neck Fy	N	155.0	59.3	-226.6	81.8	567.8	82.7	-139.6	127.4
Upper Neck Fz	N	2899.1	84.5	-106.2	299.9	1244.3	63.8	-265.8	95.6
Upper Neck F Resultant	N	3436.1	84.5	2.8	19.0	1506.1	65.0	0.5	-31.9
Upper Neck Mx	N-m	11.3	76.1	-10.8	105.6	3.3	233.9	-34.2	67.5
Upper Neck My	N-m	167.9	87.2	-32.7	115.3	74.5	67.5	-16.0	46.0
Upper Neck Mz	N-m	5.1	66.0	-3.5	105.6	40.7	93.2	-16.8	149.9
Upper Neck M Resultant	N-m	167.9	87.2	0.0	9.9	83.0	67.6	0.1	-33.3
Chest X	g	4.6	299.9	-45.5	80.1	2.0	181.1	-45.8	65.6
Chest Y	g	5.3	76.8	-3.5	33.0	2.1	34.1	-5.5	67.7
Chest Z	g	17.5	79.4	-2.9	103.9	18.5	76.6	-6.6	111.3
Chest Resultant	g	48.6	79.9	0.0	-48.1	48.0	65.6	0.0	-49.5

*Data is not accurate – Transducer was damaged during the event.

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

Vehicle Year/Make/Model/Body Style: 2003 BMW Z4 2-Door Convertible

NHTSA Test No.: M30503 Test Date: December 6, 2002

		MAXIMUM VALUE							
		Driver				Passenger			
DESCRIPTION	Unit	Pos	msec	Neg	msec	Pos	msec	Neg	msec
Redundant Chest X	g	4.6	299.7	-45.6	80.0	2.0	299.9	-46.4	65.3
Redundant Chest Y	g	5.7	76.8	-3.9	32.0	1.7	42.0	-5.7	83.1
Redundant Chest Z	g	17.5	79.4	-2.9	108.3	17.8	77.2	-6.7	111.4
Redundant Chest Resultant	g	48.7	79.8	0.0	-44.2	48.4	65.3	0.0	-46.8
Chest Displacement	mm	0.0	3.4	-34.1	85.5	0.0	6.2	-25.7	65.6
Pelvic X	g	2.7	112.5	-50.5	57.7	3.0	185.8	-64.3	40.2
Pelvic Y	g	7.6	67.2	-5.5	33.4	10.2	40.3	-7.5	61.7
Pelvic Z	g	2.6	90.1	-15.2	61.4	2.7	184.1	-15.9	57.4
Pelvic Resultant	g	52.4	57.7	0.0	-27.7	65.4	40.2	0.0	-32.3
Left Femur	N	14.5	-8.1	-2391.1	77.4	249.7	17.8	-3101.1	40.6
Right Femur	N	185.9	18.7	-2951.7	37.5	198.0	26.7	-3109.1	42.0
Left Upper Tibia Mx	N-m	24.5	71.3	-15.6	90.6	8.4	28.3	-74.8	77.3
Left Upper Tibia My	N-m	19.5	116.5	-75.3	68.0	23.1	115.3	-168.6	47.3
Left Lower Tibia Fz	N	169.8	181.4	-3428.9	71.5	122.9	24.0	-6205.5	46.8
Left Lower Tibia Mx	N-m	51.7	75.4	-6.7	125.3	60.7	83.8	-20.9	47.5
Left Lower Tibia My	N-m	66.0	79.1	-6.7	15.3	105.8	79.1	-24.3	56.1
Right Upper Tibia Mx	N-m	15.0	39.3	-17.2	60.5	60.2	76.4	-71.6	50.0
Right Upper Tibia My	N-m	18.8	24.9	-116.3	37.4	24.6	115.2	-209.8	49.2
Right Lower Tibia Fz	N	78.9	16.5	-5598.3	37.4	113.1	19.5	-6737.7	48.8
Right Lower Tibia Mx	N-m	69.8	72.4	-5.4	59.2	22.4	46.0	-145.4	49.4
Right Lower Tibia My	N-m	85.7	72.3	-30.4	58.8	69.1	81.7	-22.0	35.6
Left Foot Aft Ax	g	19.4	77.6	-51.9	31.4	26.3	82.9	-71.2	48.5
Left Foot Aft Az	g	4.0	18.6	-47.1	35.2	24.7	66.7	-110.1	46.3
Left Foot Fore Az	g	13.4	15.6	-70.0	37.5	101.7	38.2	-174.0	45.6
Right Foot Aft Ax	g	28.3	74.4	-87.1	36.2	26.3	76.8	-62.4	48.6
Right Foot Aft Az	g	3.3	154.0	-74.4	34.6	22.4	63.6	-97.3	45.3
Right Foot Fore Az	g	68.4	28.8	-143.0	34.5	96.9	38.9	-146.6	45.3
Torso Belt	N	4103.3	60.1	-28.9	295.2	4104.6	77.3	-13.1	186.2

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

Vehicle Year/Make/Model/Body Style: 2003 BMW Z4 2-Door Convertible

NHTSA Test No.: M30503 Test Date: December 6, 2002

HEAD INJURY CRITERIA (HIC)				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	846.6	64.3	100.3	56.0 g
Position #2 - Passenger	670.1	58.8	94.8	51.0 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	46.3	78.7	81.7	461.4
Position #2 - Passenger	46.9	64.4	67.7	458.3

* 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 BMW Z4 2-Door Convertible

NHTSA Test No.: M30503 Test Date: December 6, 2002

HEAD INJURY CRITERIA (HIC) REDUNDANT				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	855.0	64.3	100.3	56.3 g
Position #2 - Passenger	645.4	58.8	94.8	50.3 g

** HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds. Calculated using Head CG Ax accelerometer. Head CG RAx was damaged during the event.

CLIP SUMMARY* REDUNDANT				
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	46.3	78.6	81.6	460.7
Position #2 - Passenger	47.5	64.4	67.7	470.9

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

DATA SHEET NO. 9 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

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

Driver

Passenger

1730

1755

Shoulder belt length as measured
on Part 572 Dummy.

800

820

Lap belt length as measured
on Part 572 Dummy.

650

655

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 20 mm molding.

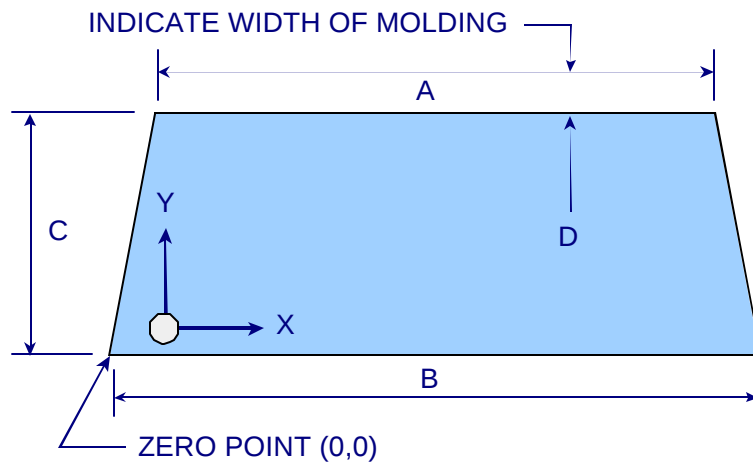
FMVSS 212 REQUIREMENTS:

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	1990	1990	100.0%
LEFT SIDE	1990	1990	100.0%
TOTAL	3980	3980	100.0%

AREA OF RETENTION FAILURE:



DIMENSIONS (mm)	
A	1230
B	1550
C	600
D	20

FRONT VIEW OF WINDSHIELD

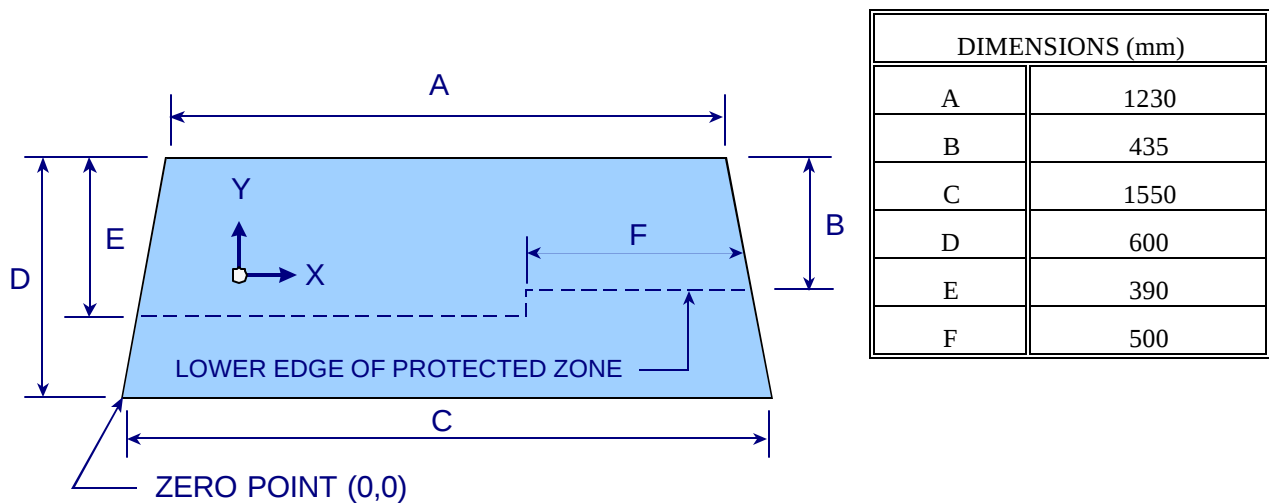
FAILURE DETAILS: None

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

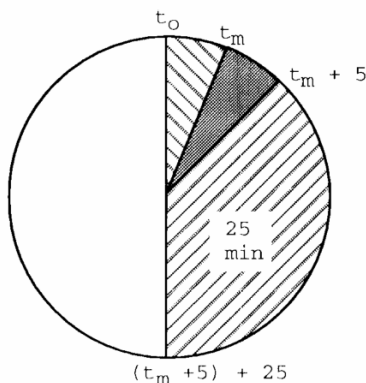
NHTSA TEST No.: M30503 TEST DATE: December 6, 2002
VEHICLE MAKE/MODEL: 2003 BMW Z4 2-Door Convertible

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

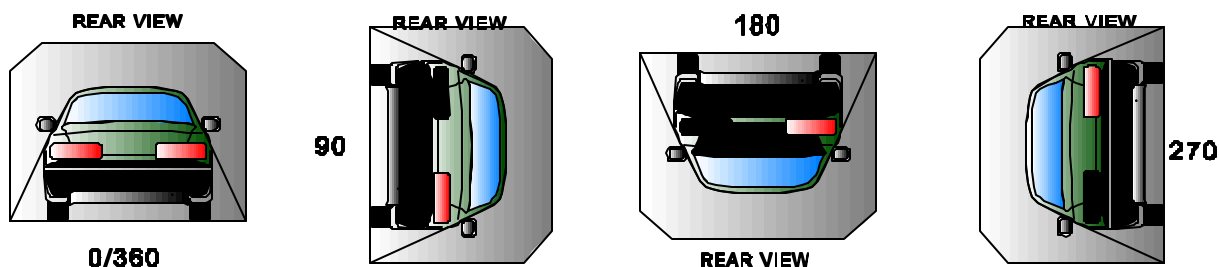
ACTUAL	MAX ALLOWED
0	28 g
0	141 g
0	28 g/min.

SOLVENT SPILLAGE DETAILS: None

DATA SHEET NO. 13 - ROLLOVER DATA

Vehicle: 2003 BMW Z4 2-Door Convertible

NHTSA No.: M30503



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	12	seconds	5	minutes	6	minutes	12	seconds	7	minutes
90° - 180°	1	minutes	02	seconds	5	minutes	6	minutes	2	seconds	7	minutes
180°-270°	1	minutes	03	seconds	5	minutes	6	minutes	3	seconds	7	minutes
270°-360°	1	minutes	11	seconds	5	minutes	6	minutes	11	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:

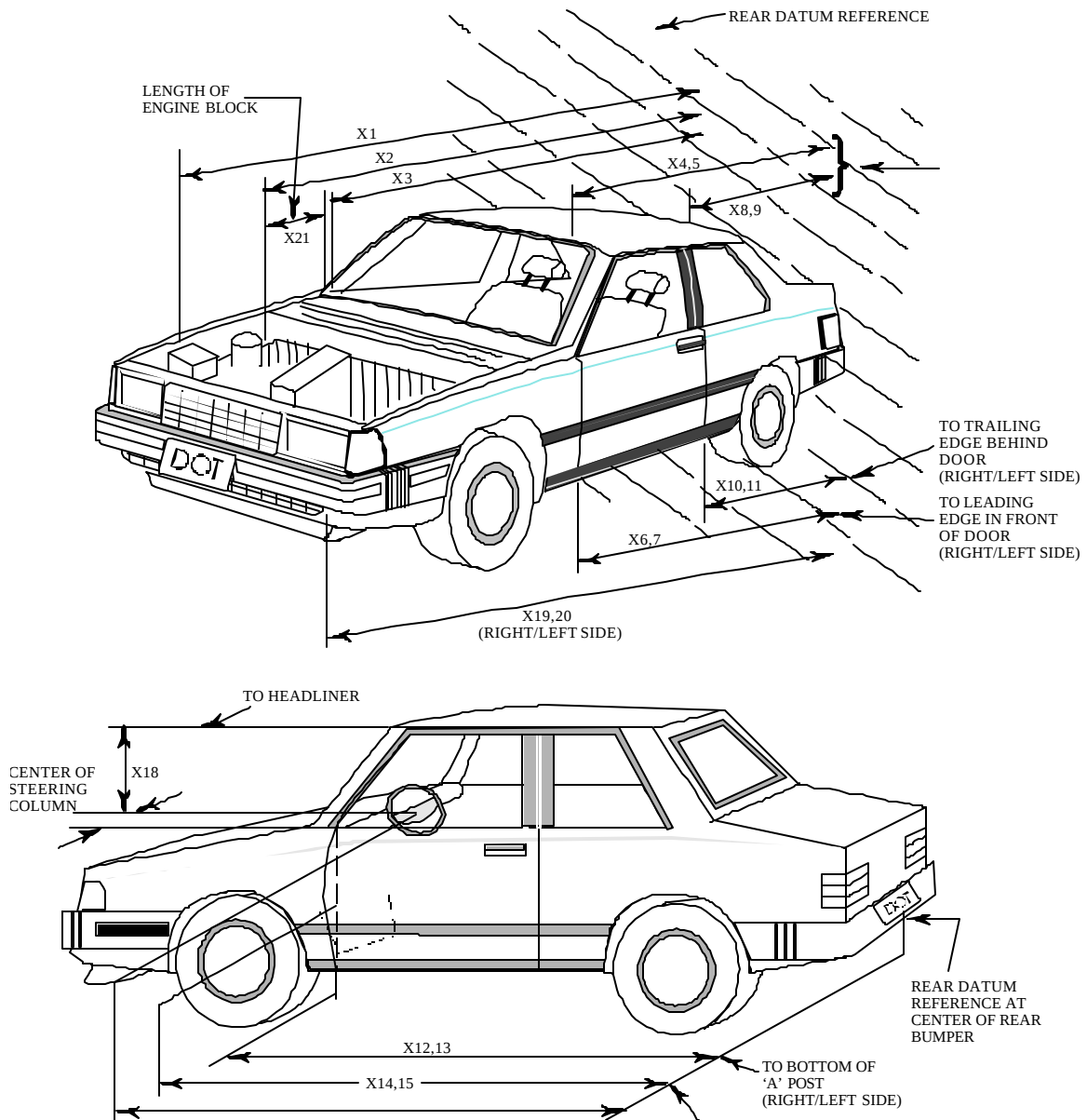
Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180°-270°	0	0	0	N/A
270°-360°	0	0	0	N/A

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

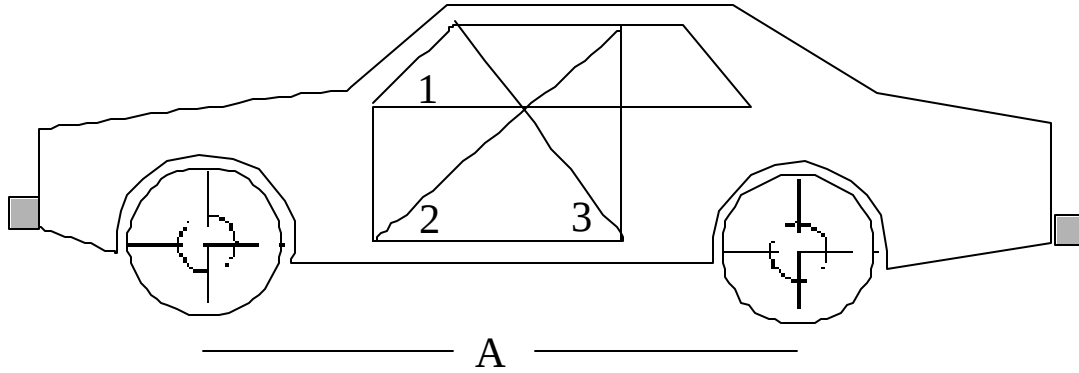


DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)

No.		Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	4085	3615	470
X2	Rear Surface of Vehicle to Front of Engine	3574	3334	240
X3	Rear Surface of Vehicle to Firewall	2746	2688	58
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	2341	2336	5
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	2342	2328	14
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	2388	2380	8
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	2380	2384	-4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	1239	1224	15
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	1238	1233	5
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	1405	1394	11
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	1400	1393	7
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	2290	2286	4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	2276	2272	4
X14	Rear Surface of Vehicle to Firewall, Right Side	2749	2716	33
X15	Rear Surface of Vehicle to Firewall, Left Side	2667	2642	25
X16	Rear Surface of Vehicle to Steering Column	1924	1962	-38
X17	Center of Steering Column to "A" Post	278	258	20
X18	Center of Steering Column to Headliner	368	338	30
X19	Rear Surface of Vehicle to Right Side of Front Bumper	3997	3617	380
X20	Rear Surface of Vehicle to Left Side of Front Bumper	3997	3614	383
X21	Length of Engine Block	707	707	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	2097	2088	9
CD	Rear Surface of Vehicle to Center of Dash Panel	2162	2146	16
LD	Rear Surface of Vehicle to Left Side of Dash Panel	2100	2094	6

All Dimensions in mm

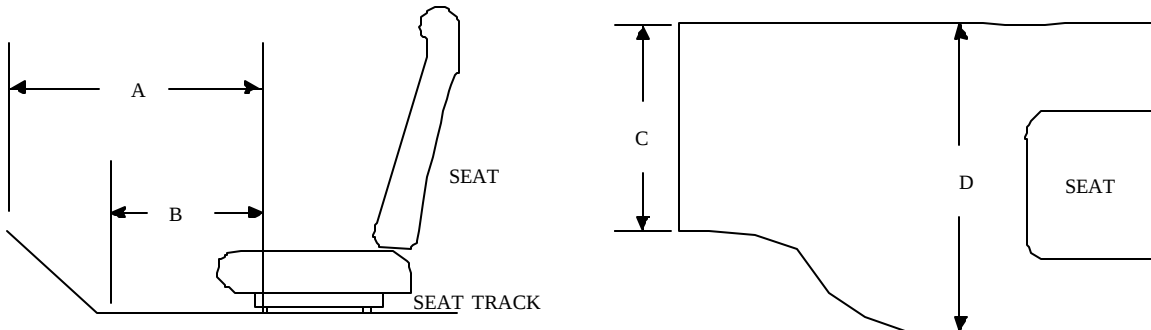
DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
 VEHICLE INTRUSION MEASUREMENTS
 DOOR OPENING WIDTH



UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	1008	1220	831	1015	1232	829
AFTER TEST	1016	1224	832	1010	1227	828
DIFFERENCE	-8	-4	-1	5	5	1

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2500	2500
AFTER TEST	2420	2403
DIFFERENCE	80	97

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



DRIVER

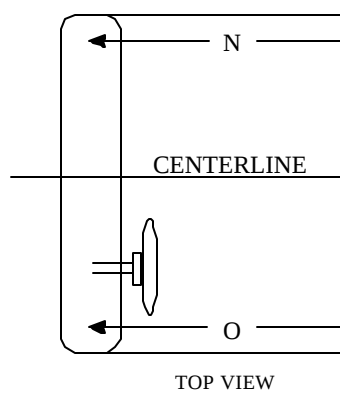
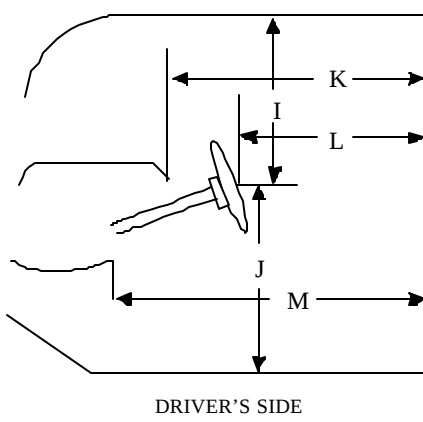
Measurement	Pre-Test	Post-Test	Difference
A	769	681	88
B	676	626	50
C	434	418	16
D	393	405	-12

PASSENGER

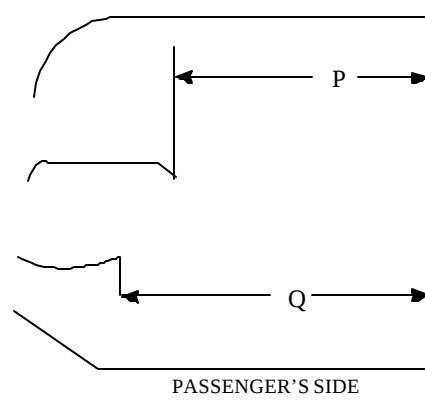
Measurement	Pre-Test	Post-Test	Difference
A	681	619	62
B	598	596	2
C	353	375	-22
D	415	412	3

Units = mm

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



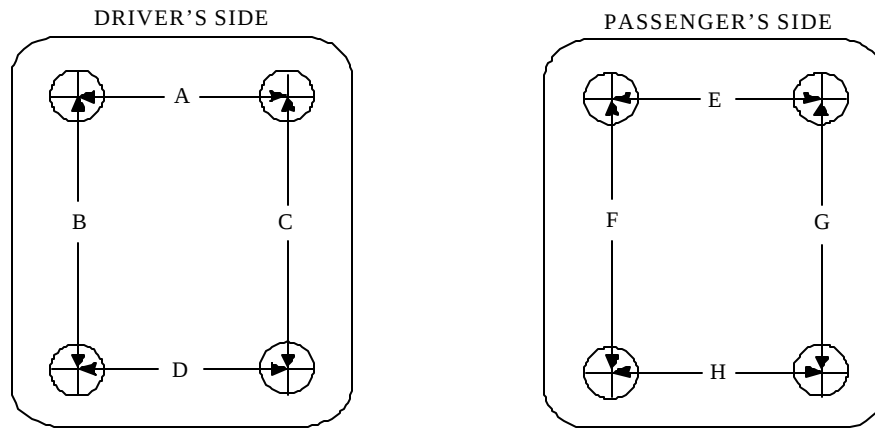
MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE



Measurement	Pre-Test	Post-Test	Difference
I	368	338	30
J	590	613	-23
K	834	848	-14
L	643	684	-41
M	937	931	6
N	809	803	6
O	820	816	4
P = K (PASS.)	869	856	13
Q = M (PASS.)	804	861	-57

Units = mm

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

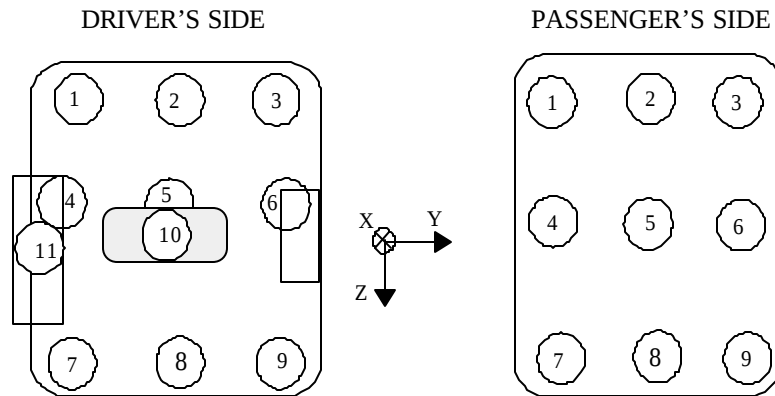


TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	434	418	16
B	376	349	27
C	406	361	45
D	393	405	-12
E	353	375	-22
F	464	414	50
G	448	432	16
H	415	412	3

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	2628	2554	74	-429	-432	3
2	2690	2593	97	-445	-457	12
3	2663	2603	60	-399	-421	22
4	2597	2523	74	-360	-368	8
5	2652	2573	79	-368	-358	-10
6	2642	2597	45	-352	-366	14
7	2564	2513	51	-279	-270	-9
8	2597	2539	58	-280	-282	2
9	2579	2560	19	-286	-290	4
10	2486	2464	22	-424	-399	-25
11	2545	2545	0	-421	-432	11

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	2604	2511	93	-453	-517	64
2	2612	2544	68	-491	-497	6
3	2631	2537	94	-494	-493	-1
4	2580	2512	68	-402	-403	1
5	2585	2532	53	-399	-400	1
6	2591	2550	41	-405	-408	3
7	2529	2518	11	-291	-290	-1
8	2530	2521	9	-284	-288	4
9	2548	2550	-2	-319	-295	-24

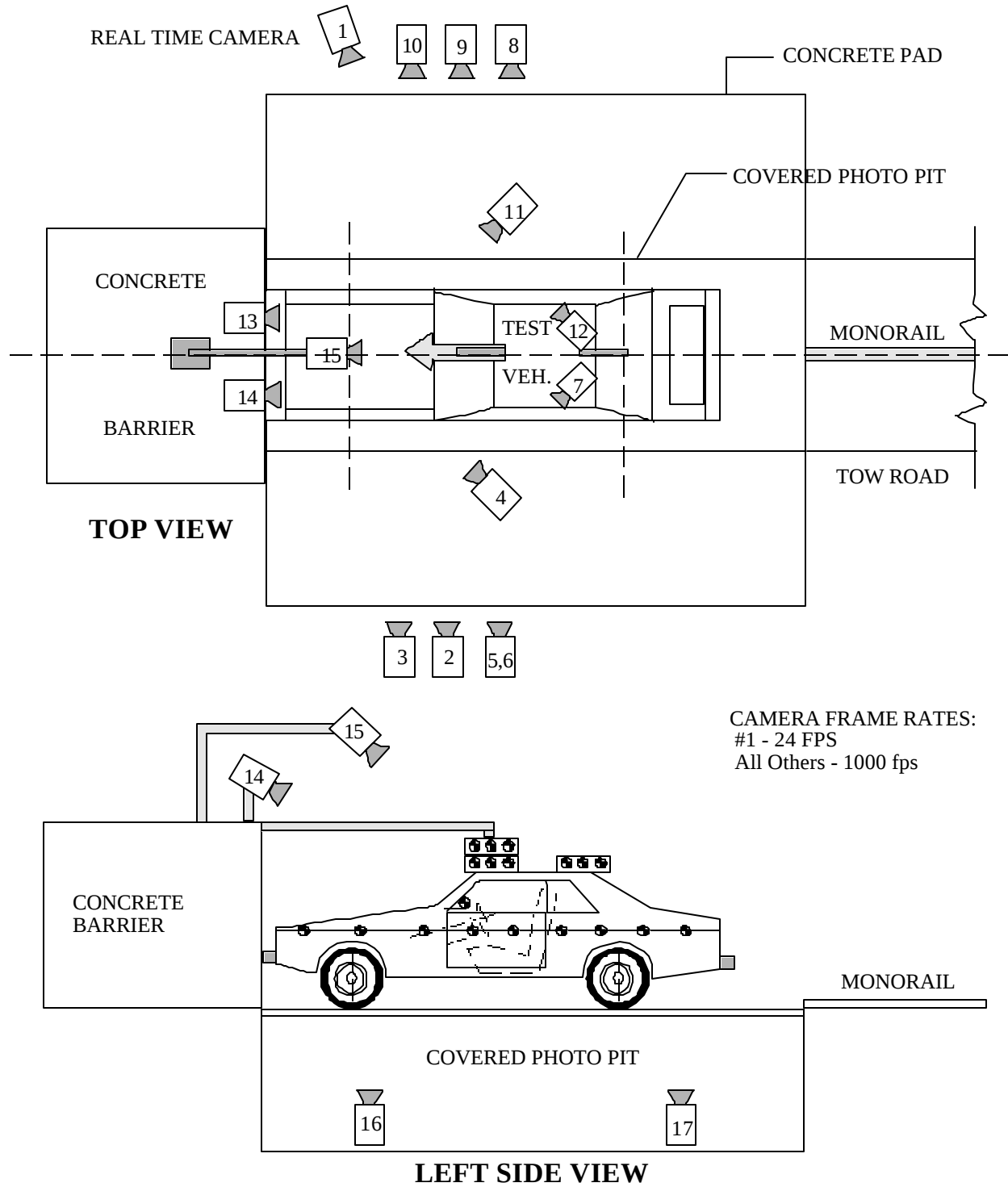
Reference: SAE: X = Rear Bumper (Positive: forward); Z = Ground (Positive: down)

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

	Elements	Pre-Test (mm)
1	Total length	4085
2	Total Width	1725
3	Bumper Top Height	505
4	Bumper Bottom Height	380
5	Longitudinal Member Top Height	465
6	Distance Between Longitudinal Members	835
7	Longitudinal Member Width	55
8	Engine top height	790
9	Engine bottom height	530
10	Engine and gearbox width	460
11	Front bumper-engine distance	500
12	Front shock absorber fixing height	780
13	Bonnet leading edge height	700
14	Front shock absorber fixing width	1040
15	Front bumper – front axle distance	800
16	Front axle – a pillar distance	994
17	A-pillar – B pillar distance	1011
18	B-pillar – rear axle distance	509
19	B-pillar – C Pillar distance	-
20	Roof sill bottom height	1125
21	Roof sill top height	1235
22	Floor sill bottom height	155
23	Floor sill top height	334

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.: M30503 Vehicle: 2003 BMW Z4 2-Door Convertible

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	6061	1556	1089	-4	5779	12.5	1000
3	Left Side View	8589	824	1090	-4	8307	25	1025
4	Driver and Interior View	7928	2673	1995	-15	-	25	1050
5	Steering Column (Bottom)	6874	1784	1177	-5	6592	25	1000
6	Steering Column (Top)	6874	1784	1777	-10	6592	25	1015
7	Left Belt	-	-	-	-	-	-	-
8	Overall Right Side	6306	1956	1103	-6	6586	12.5	1000
9	Right Side View	8595	1285	1115	-5	8875	25	1000
10	Right Passenger View	7470	1762	1386	-4	7750	35	1000
11	Passenger and Interior View	7547	2896	1975	-10	-	25	1000
12	Right Belt	-	-	-	-	-	-	-
13	Passenger Front View	620	-92	1987	-36	-	13	1000
14	Driver Front View	620	-92	1987	-36	-	13	1025
15	Windshield View	0	-530	3374	-52	-	13	1000
16	Pit View of Engine	0	615	-3048	90	-	13	1000
17	Pit View of Fuel Tank	0	2740	-3048	90	-	13	1000

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

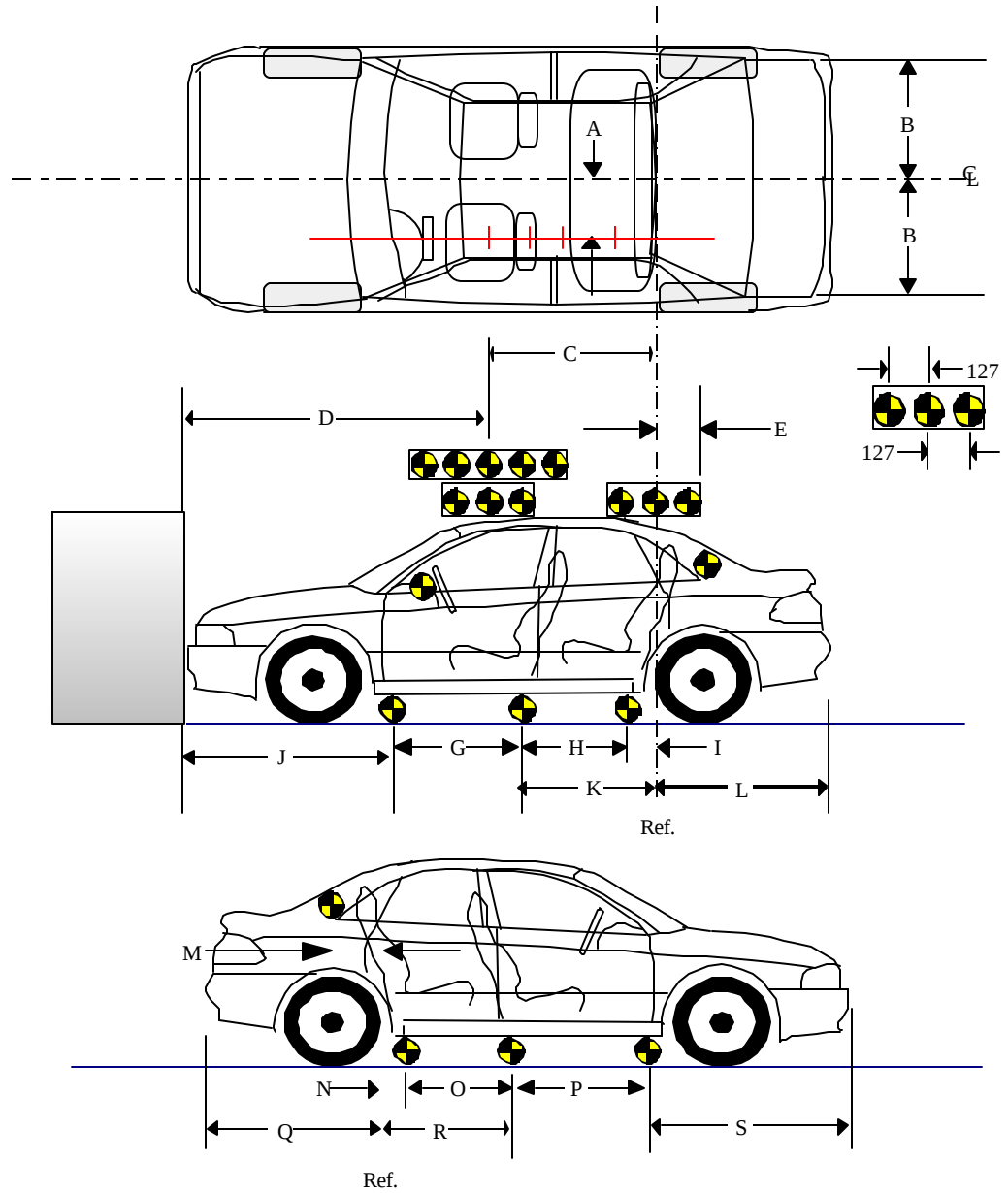
Y = film plane to impact location N.T. indicates No Timing

Z = film plane to ground

DATA SHEET NO. 16 VEHICLE REFERENCE PHOTO TARGET LOCATIONS

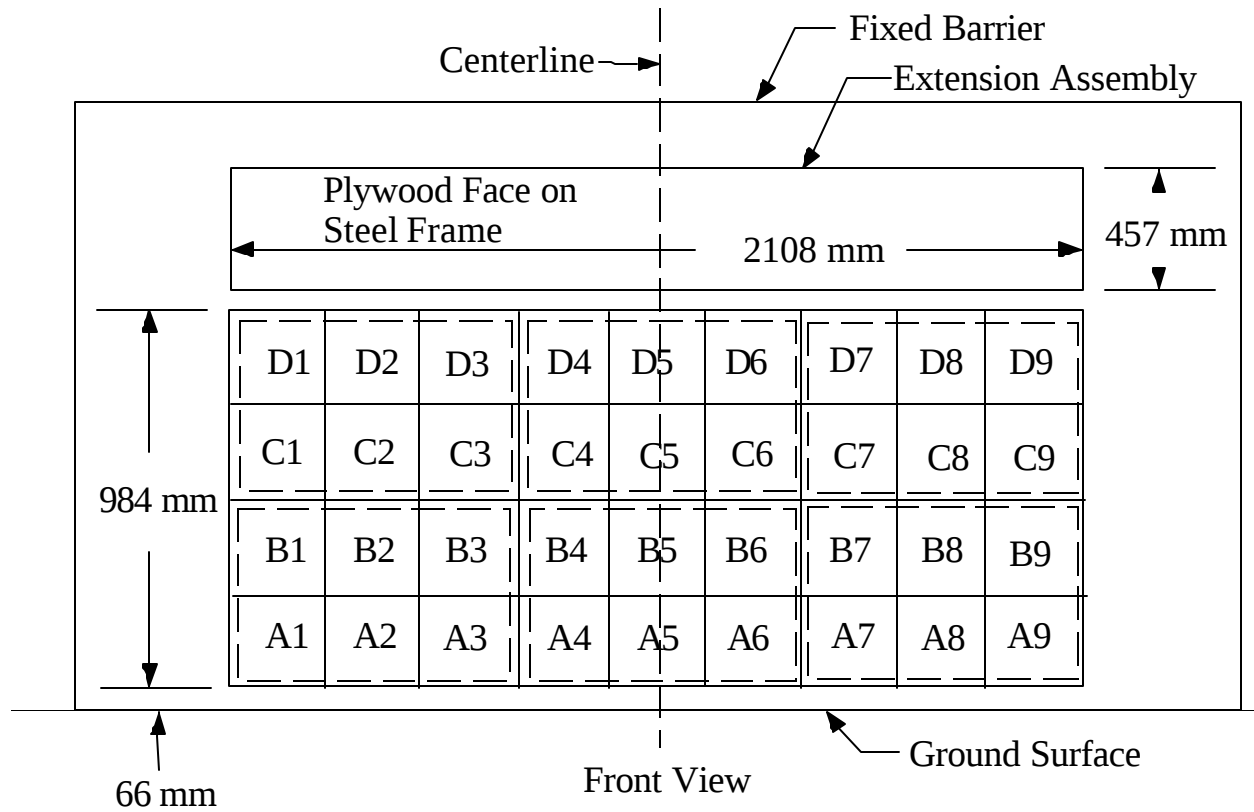
(Dimensions in millimeters)

A	356
B	562
C	251
D	2224
E	853
F	429
G	820
H	809
I	120
J	1249
K	929
L	1086
M	839
N	124
O	817
P	818
Q	1083
R	941
S	1242



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.: M30503; Test Date: December 6, 2002; Technician: P. MacDiarmid

Vehicle Model Year/Make/Model: 2003 BMW Z4 2-Door Convertible

A. No. of vent holes: 1 -Driver 2 -Passenger

B. Size of vent holes: (mm²) 962 -Driver 962 -Passenger

C. Total vent area: (mm²) 962 -Driver 1924 -Passenger

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

Driver: 750 -Height; 550 -Width; 500 -Depth

Passenger: 650 -Height; 500 -Width; 500 -Depth

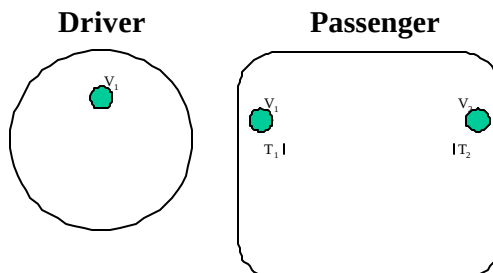
E. Is the air bag tethered?

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

Passenger: X -Yes; - -No; If yes, record length of tether- 350

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: PA 6.6 <ASCI 710603254403

Generator: 326758210033 02B2520P0030G SFG 2-64.54 2002 08460221401659

Passenger: Air bag: PA 6.6 <ASCI 8892 02336509 433423900327

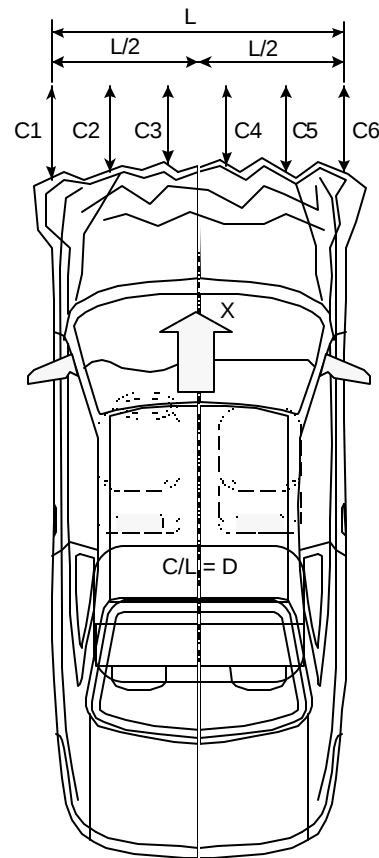
Generator: N/A

DATA SHEET NO. 19 ACCIDENT INVESTIGATION DIVISION DATA
FOR FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: BMW Z4 2-Door Convertible
 NHTSA Test No.: M30503 VIN: 4USBT33473LR60820
 Model Year: 2003 Build Date: 10/02 Test Date: December 6, 2002
 Vehicle Size Category: Two Seater Test Weight: 1630.5 kg
 Vehicle Wheelbase: 2500 mm; Front Overhang: 803 mm; Overall Width: 1725 mm
 Collision Deformation Classification (CDC) Code: 12FDEW2

Crush Depth Dimensions

	PRE (mm)	POST (mm)	DIFF (mm)
C1 =	3884	3563	321
C2 =	4014	3614	400
C3 =	4079	3638	441
C4 =	4079	3597	482
C5 =	4016	3618	398
C6 =	3886	3592	294



Midpoint of Damage: D = Vehicle Centerline (Longitudinal)

Length of Damaged Region: L1= 1418 mm
 L2= 709.0 mm
 L5= 283.6 mm

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-1	Load Cell Locations	A-4
A-2	Vehicle Placard	A-5
A-3	Tire Placard	A-6
A-4	Right Front, As Received	A-7
A-5	Left Rear, As Received	A-8
A-6	Pre-Test Front View	A-9
A-7	Post-Test Front View	A-10
A-8	Pre-Test Left Side View	A-11
A-9	Post-Test Left Side View	A-12
A-10	Pre-Test Right Side View	A-13
A-11	Post-Test Right Side View	A-14
A-12	Pre-Test Right Front Three-Quarter View	A-15
A-13	Post-Test Right Front Three-Quarter View	A-16
A-14	Pre-Test Left Rear Three-Quarter View	A-17
A-15	Post-Test Left Rear Three-Quarter View	A-18
A-16	Left Rear Three-Quarter View Of Doors After Impact	A-19
A-17	Right Rear Three-Quarter View Of Doors After Impact	A-20
A-18	Pre-Test Windshield View	A-21
A-19	Post-Test Windshield View	A-22
A-20	Pre-Test Engine Compartment View	A-23
A-21	Post-Test Engine Compartment View	A-24
A-22	Pre-Test Fuel Cap View	A-25
A-23	Post-Test Fuel Cap View	A-26
A-24	Pre-Test Front Underbody View	A-27
A-25	Post-Test Front Underbody View	A-28
A-26	Pre-Test Mid Underbody View	A-29
A-27	Post-Test Mid Underbody View	A-30
A-28	Pre-Test Rear Underbody View	A-31
A-29	Post-Test Rear Underbody View	A-32
A-30	Pre-Test Driver Head Location	A-33
A-31	Post-Test Driver Head Location	A-34
A-32	Pre-Test Driver Position View	A-35
A-33	Post-Test Driver Position View	A-36
A-34	Pre-Test Driver And Interior View	A-37
A-35	Post-Test Driver And Interior View	A-38
A-36	Pre-Test Driver Feet View	A-39
A-37	Post-Test Driver Feet View	A-40
A-38	Pre-Test Driver Knee Bolster View	A-41
A-39	Post-Test Driver Knee Bolster View	A-42
A-40	Pre-Test Driver Floor Pan View	A-43
A-41	Post-Test Driver Floor Pan View	A-44
A-42	Post-Test Driver Head View	A-45
A-43	Post-Test Driver Contact To Airbag	A-46

TABLE OF PHOTOGRAPHS (CONTINUED)

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-44	Pre-Test Passenger Head Location	A-47
A-45	Post-Test Passenger Head Location	A-48
A-46	Pre-Test Passenger Position View	A-49
A-47	Post-Test Passenger Position View	A-50
A-48	Pre-Test Passenger And Interior View	A-51
A-49	Post-Test Passenger And Interior View	A-52
A-50	Pre-Test Passenger Feet View	A-53
A-51	Post-Test Passenger Feet View	A-54
A-52	Pre-Test Passenger Knee Bolster View	A-55
A-53	Post-Test Passenger Knee Bolster View	A-56
A-54	Pre-Test Passenger Floor Pan View	A-57
A-55	Post-Test Passenger Floor Pan View	A-58
A-56	Post-Test Passenger Head View	A-59
A-57	Post-Test Passenger Contact To Airbag	A-60
A-58	Rollover View	A-61
A-59	Impact View	A-62



Figure A-2 VEHICLE CERTIFICATION PLACARD

Correct tire pressure is essential for your and everybody's safety. Incorrect tire pressure can lead to a serious crash (no vehicle stability, tire destruction).
La correcte pression de gonflage de pneus est essentielle pour votre sécurité et celle des autres. Une pression incorrecte de gonflage peut mener à des collisions graves (pas de stabilité du véhicule, destruction de pneu).

225/45 R 17 91 W 225/50 R 16 92 V 205/55 R 16 91 Q M+S 225/45 R 17 91 Q M+S 225/50 R 16 92 Q M+S 225/40 R 18 88 W 225/45 R 17 91 W 225/40 R 17 91 W 255/35 R 18 90 W	Dimension des pneus recommandée Recommended tire size	Vehicle capacity / Charge utile		617 lbs		280 kg	
		Designated seating capacity 2		front/avant		rear/arrière	
		Nombre de places désigné		2		0	
		Cold tire inflation pressure/ Pression de gonflage à froid		kPa	psi	kPa	psi
		Max. vehicle weight limit / Charge max. autorisée du véhicule		210	30	230	33
				▲210	▲30	●230	●33
		Load up to / Charge jusqu'à persons / personnes					

BMW

6 762 882

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

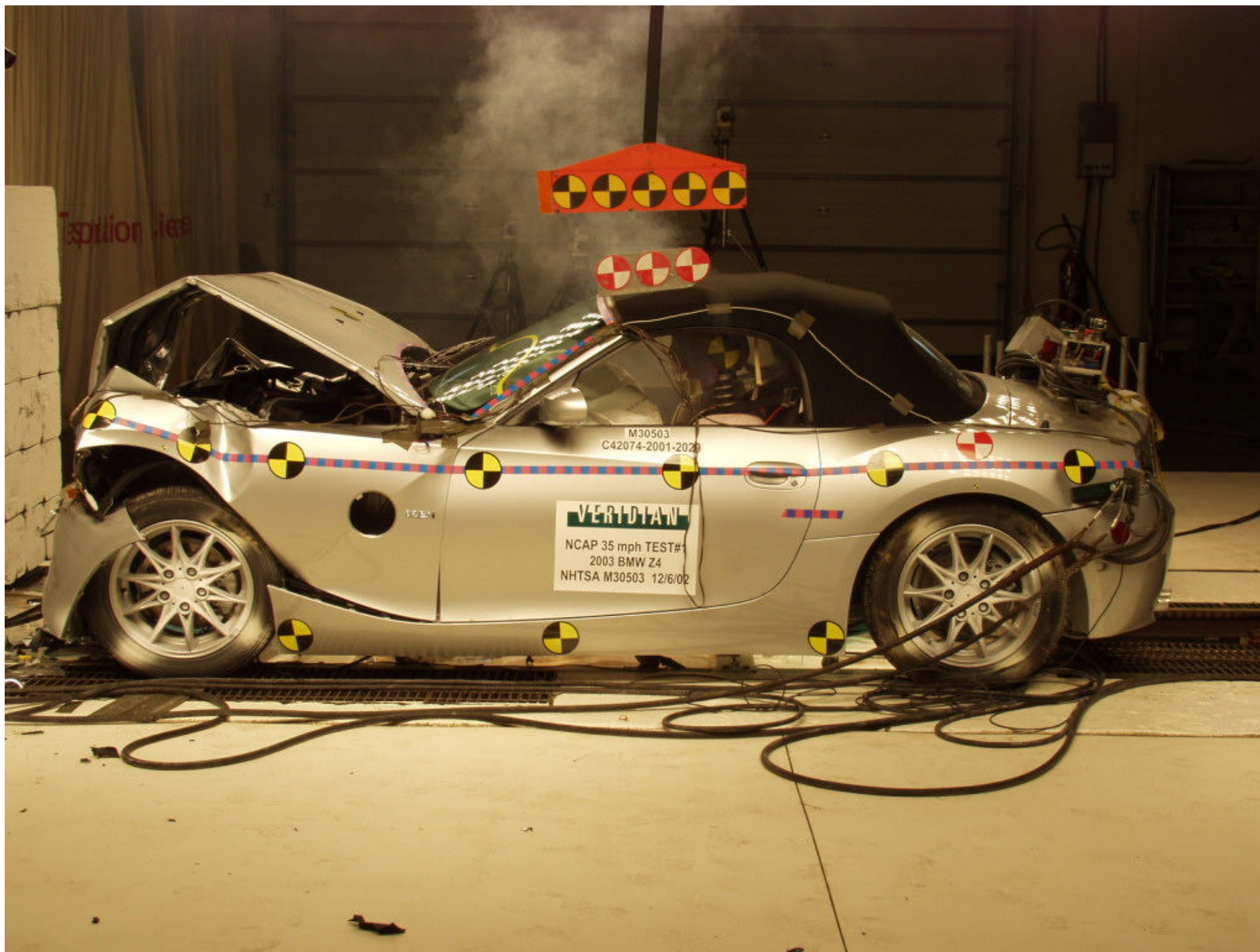


Figure A-9 POST-TEST LEFT SIDE VIEW



Figure A-10 PRE-TEST RIGHT SIDE VIEW



Figure A-11 POST-TEST RIGHT SIDE VIEW



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



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



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

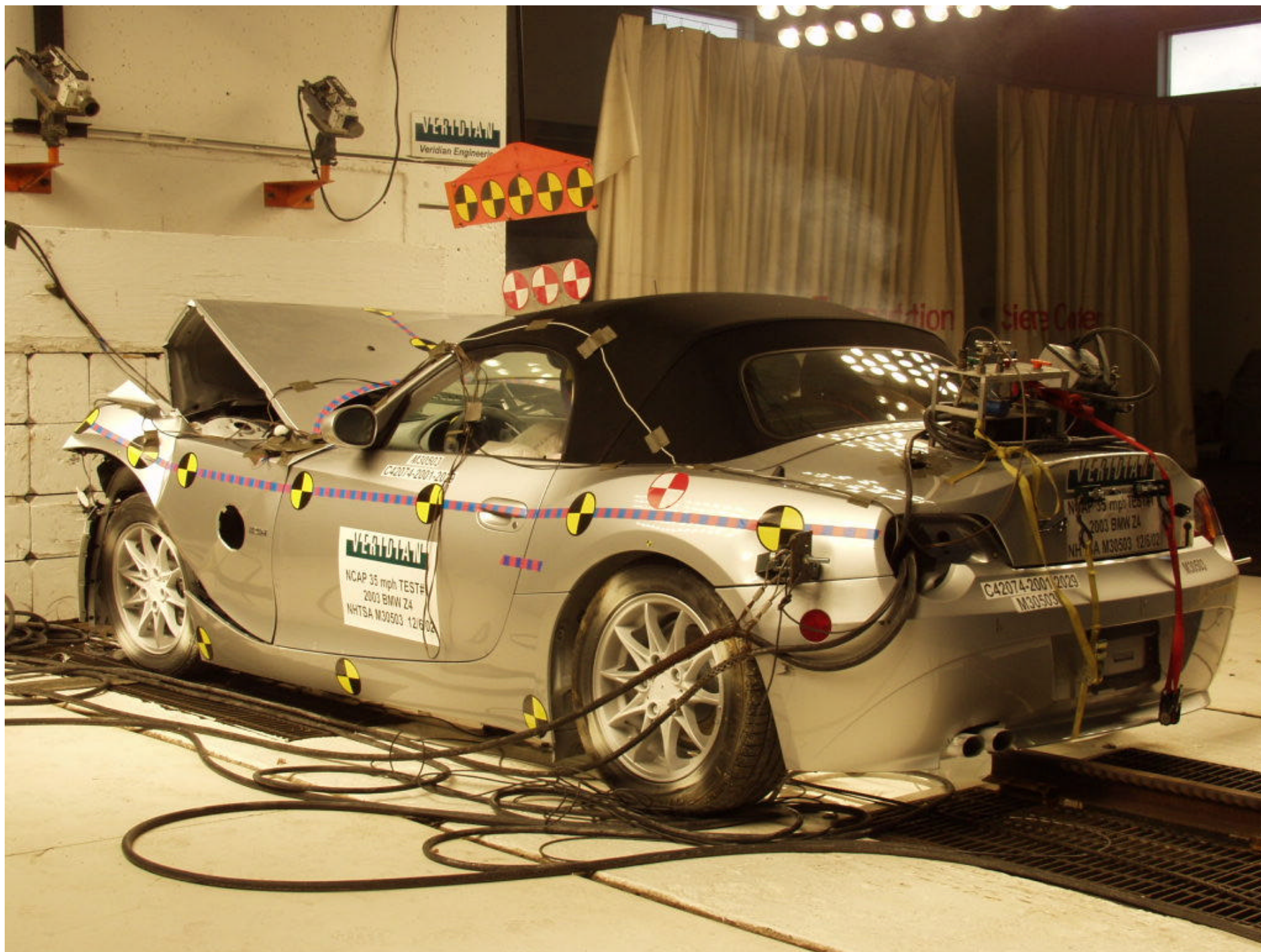


Figure A-15 POST-TEST LEFT REAR THREE-QUARTER VIEW



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

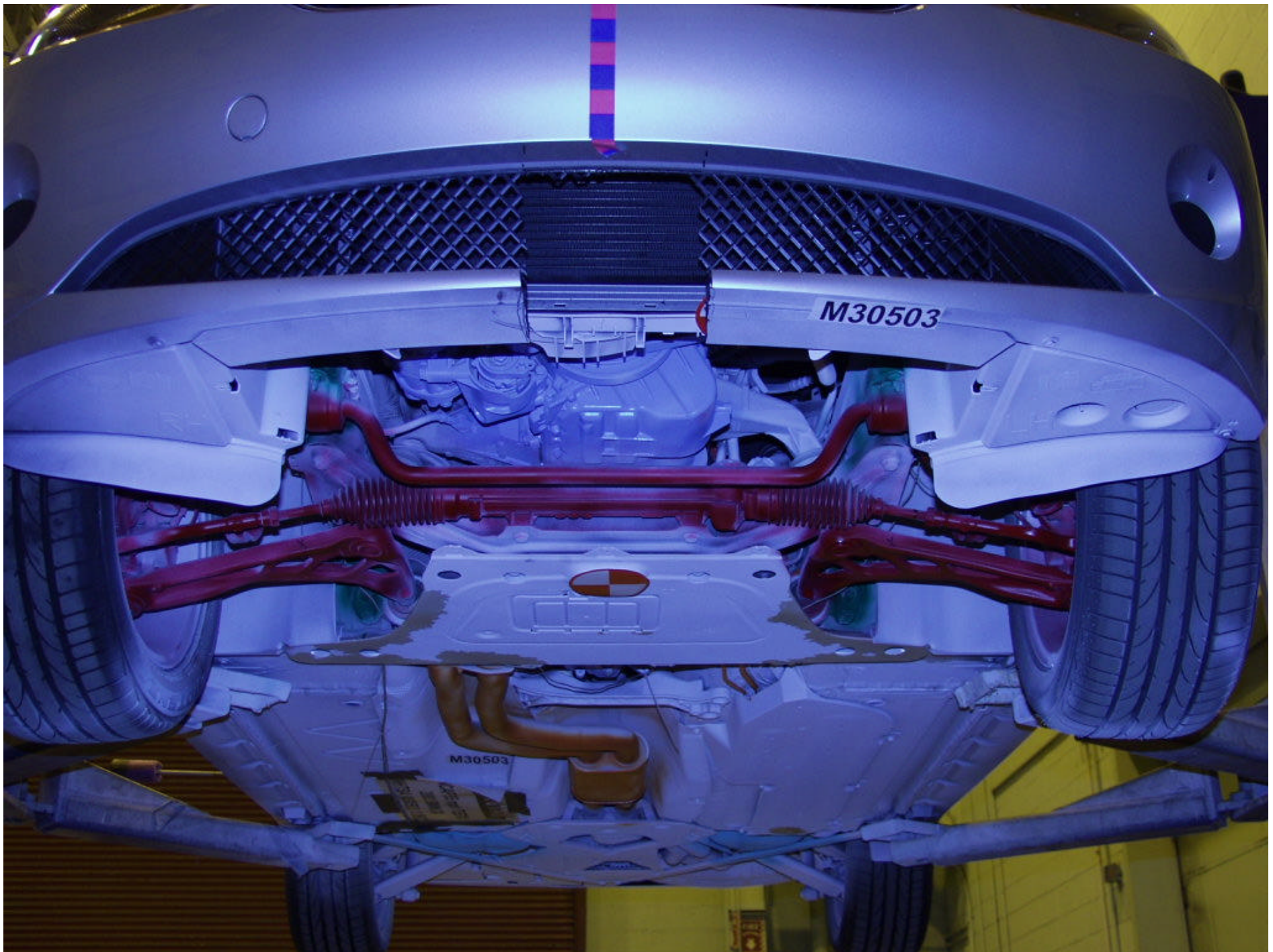


Figure A-24 PRE-TEST FRONT UNDERBODY VIEW



Figure A-25 POST-TEST FRONT UNDERBODY VIEW

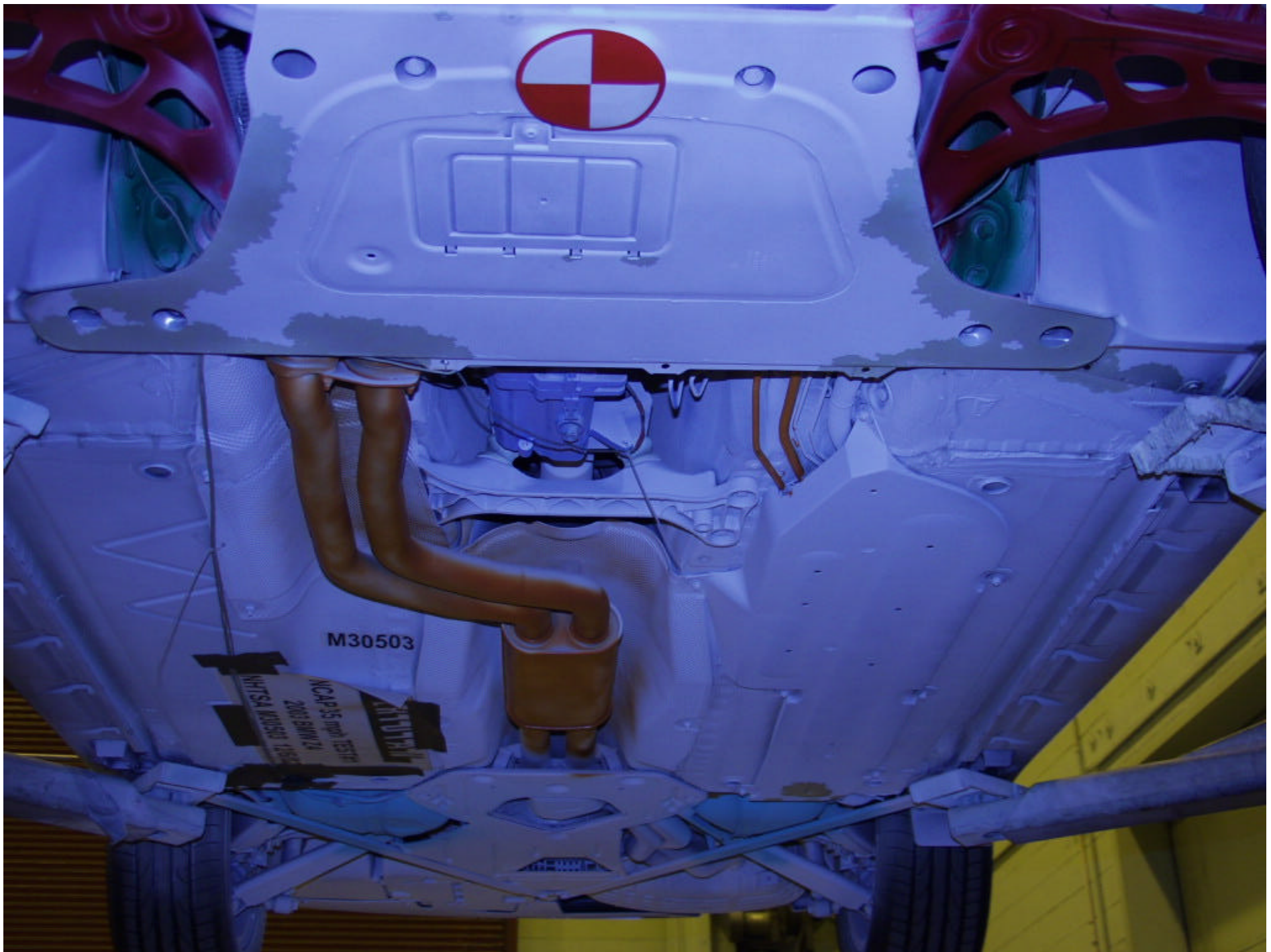


Figure A-26 PRE-TEST MID UNDERBODY VIEW

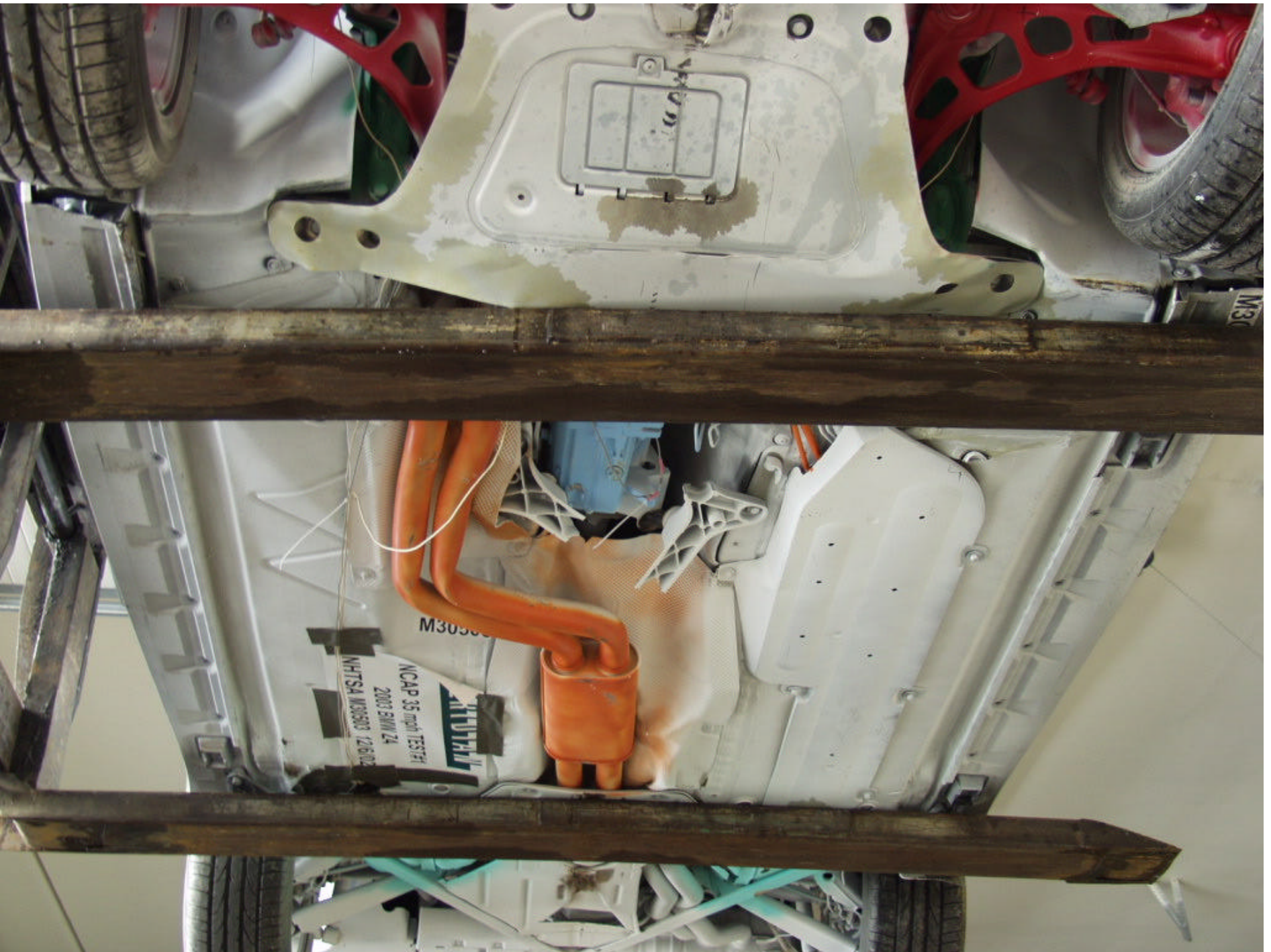


Figure A-27 POST-TEST MID UNDERBODY VIEW

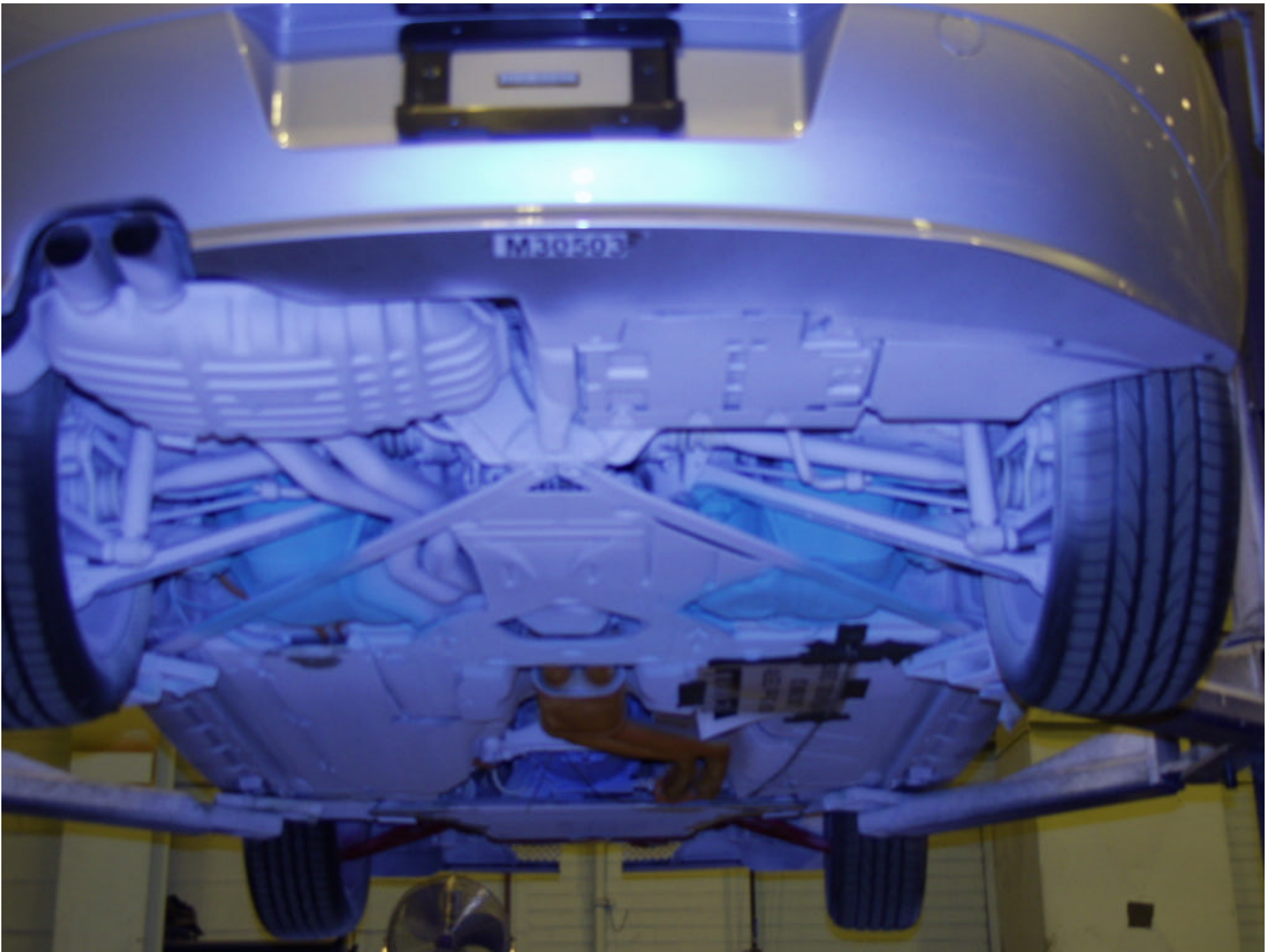


Figure A-28 PRE-TEST REAR UNDERBODY VIEW



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



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

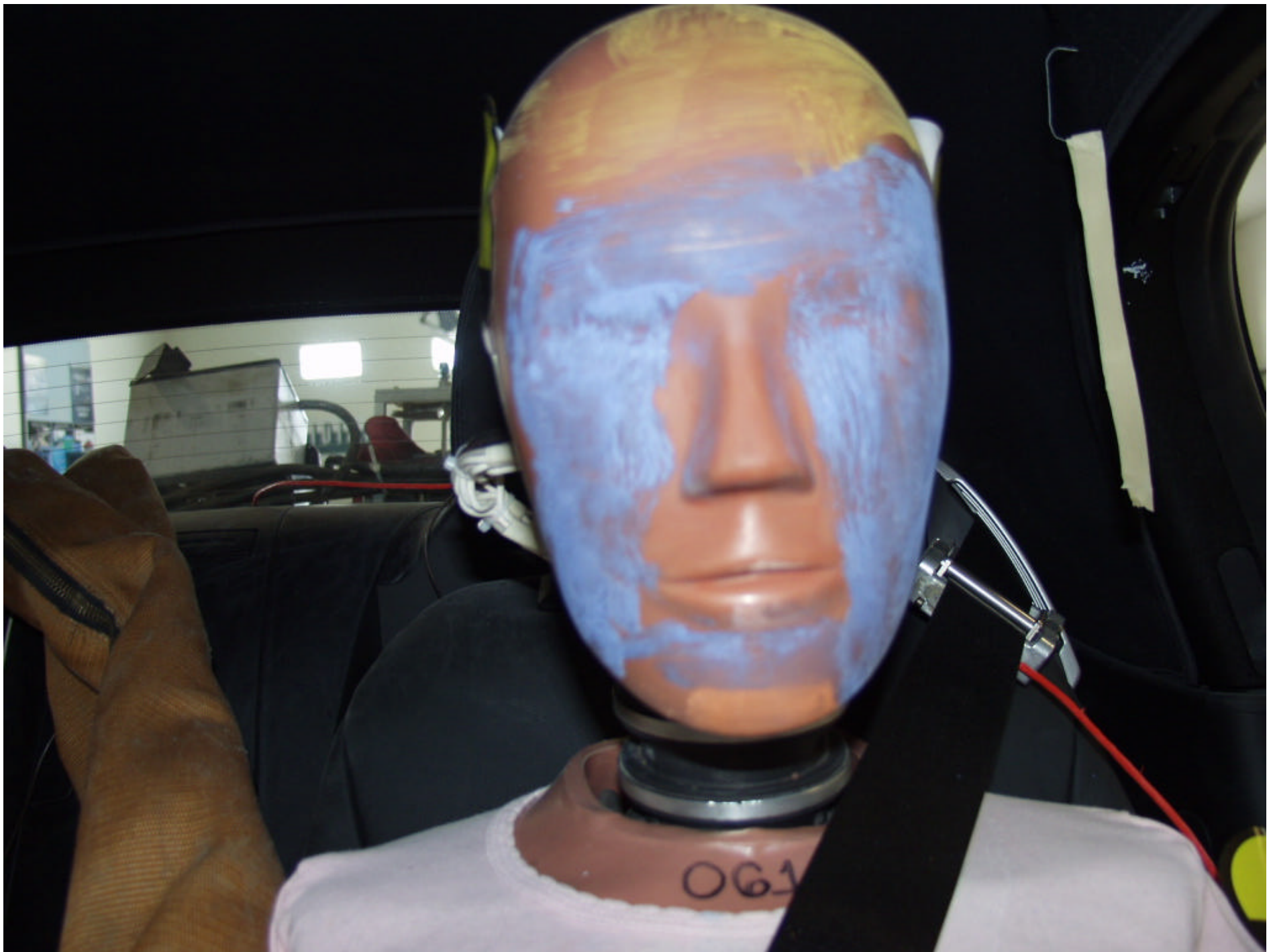


Figure A-42 POST-TEST DRIVER HEAD VIEW



Figure A-43 POST-TEST DRIVER CONTACT TO AIRBAG



Figure A-44 PRE-TEST PASSENGER HEAD LOCATION



Figure A-45 POST-TEST PASSENGER HEAD LOCATION



Figure A-46 PRE-TEST PASSENGER POSITION VIEW

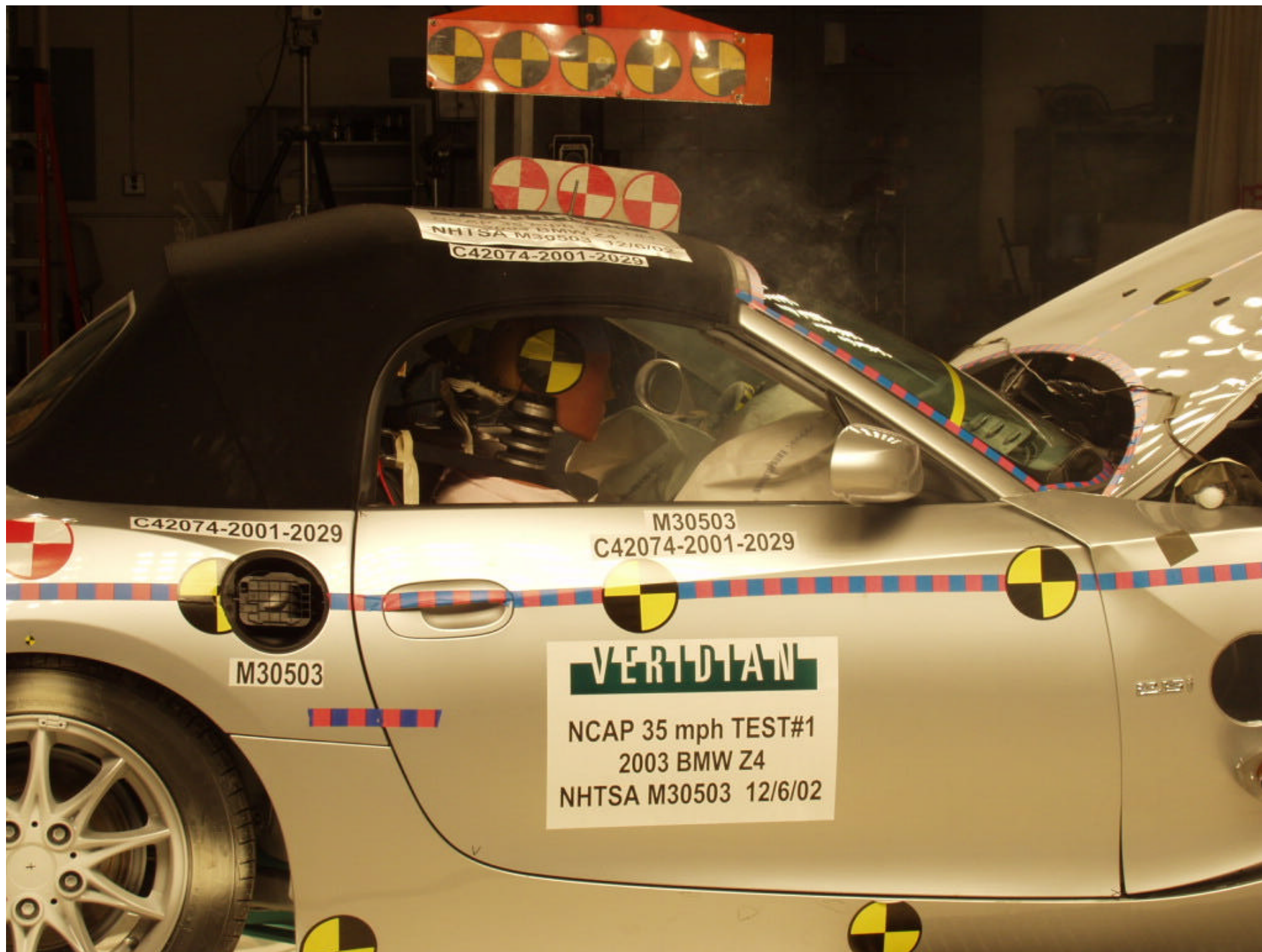


Figure A-47 POST-TEST PASSENGER POSITION VIEW



Figure A-48 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-49 POST-TEST PASSENGER AND INTERIOR VIEW



Figure A-50 PRE-TEST FEET VIEW



Figure A-51 POST-TEST FEET VIEW

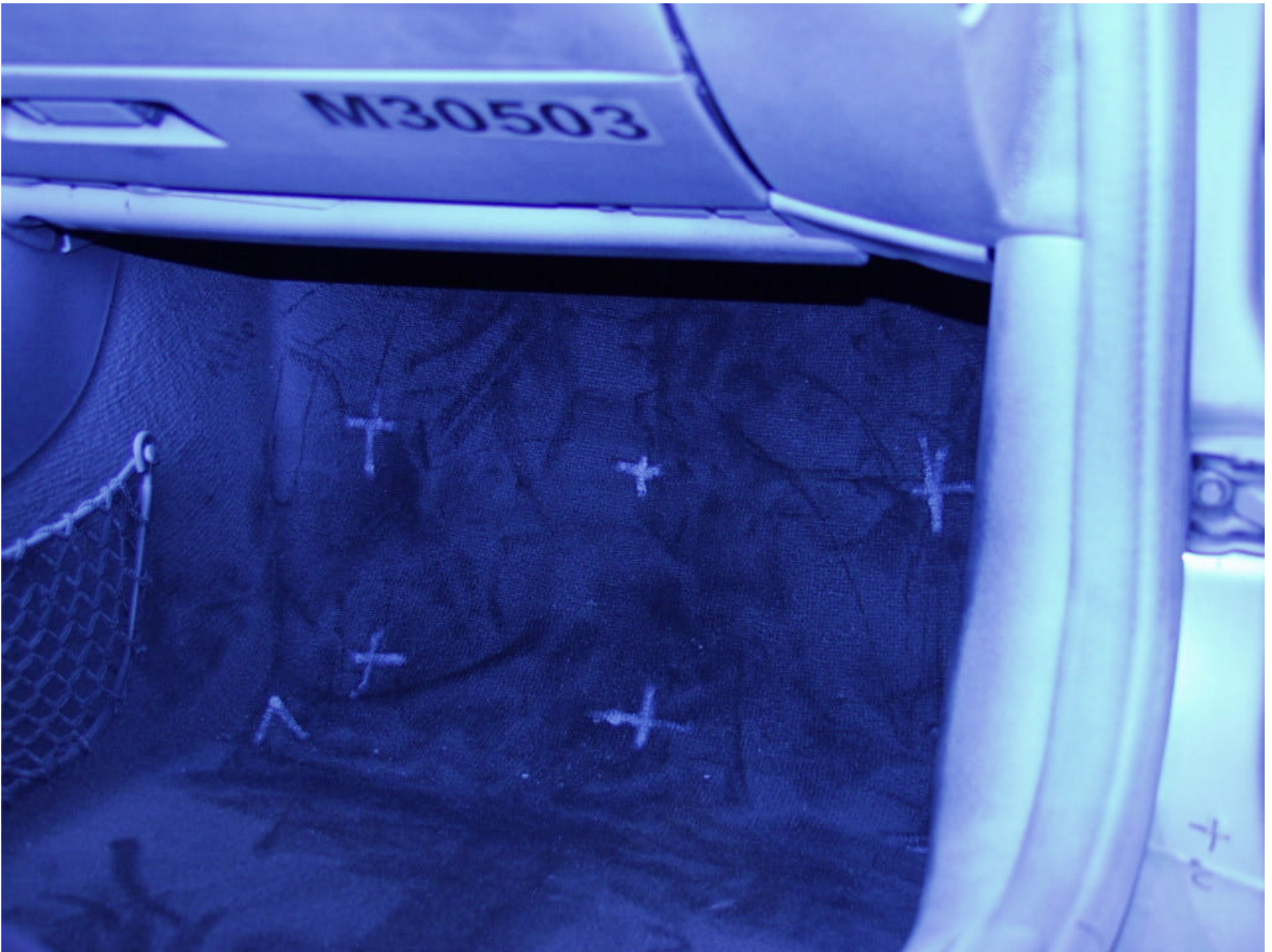


Figure A-52 PRE-TEST PASSENGER KNEE BOLSTER VIEW



Figure A-53 POST-TEST PASSENGER KNEE BOLSTER VIEW

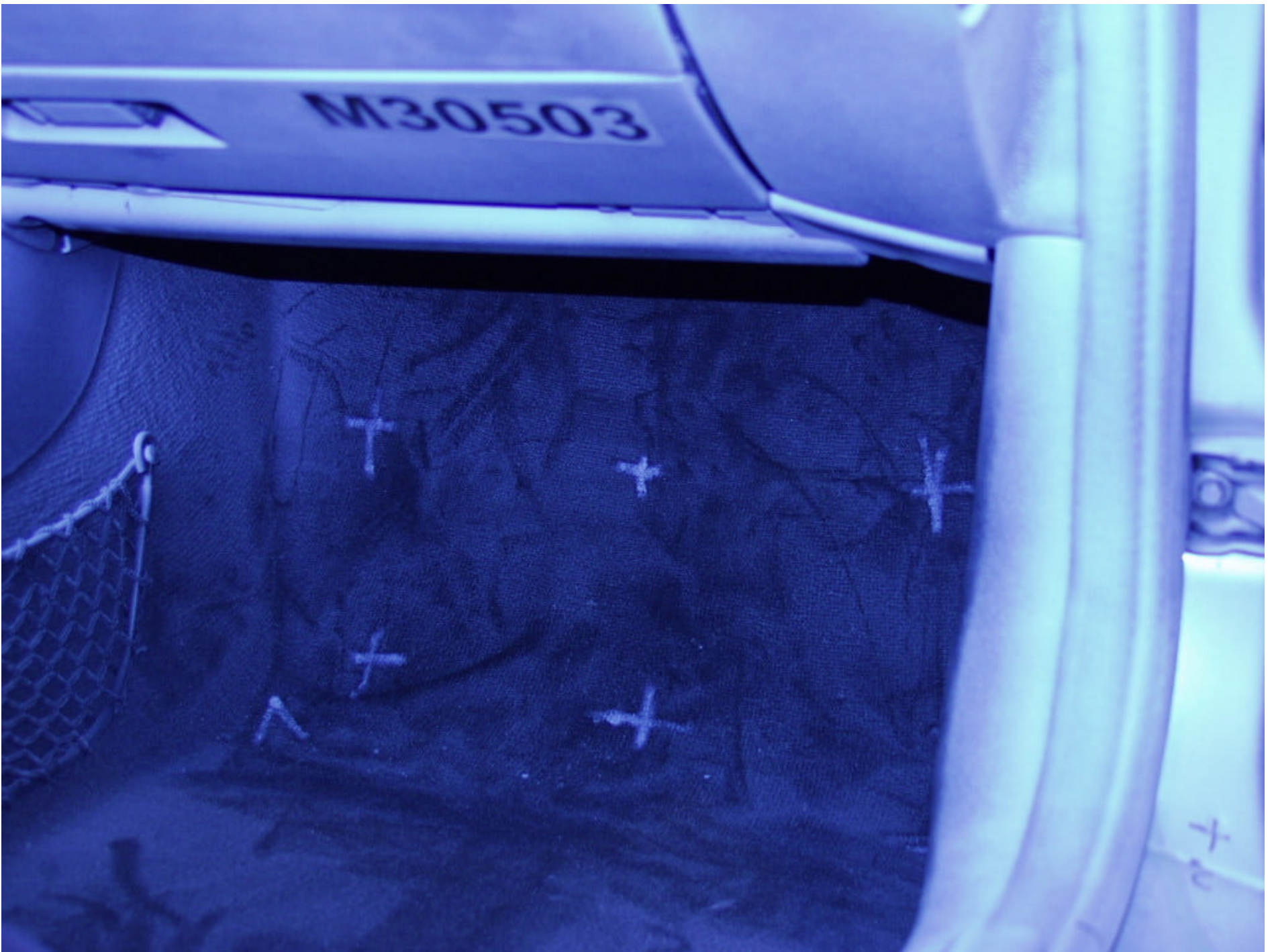


Figure A-54 PRE-TEST PASSENGER FLOOR PAN VIEW



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

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
47	V1P1 Right Foot Fore z [g, CFC_600]	B-54
48	V1 P1 Torso Belt [N, CFC_60]	B-55
49	V1P2 Head CG x [g, CFC_1000]	B-56
50	V1P2 Head CG y [g, CFC_1000]	B-57
51	V1P2 Head CG z [g, CFC_1000]	B-58
52	V1P2 Head CG Resultant [g, CFC_1000]	B-59
53	V1P2 Head CG Red x [g, CFC_1000]	B-60
54	V1P2 Head CG Red y [g, CFC_1000]	B-61
55	V1P2 Head CG Red z [g, CFC_1000]	B-62
56	V1P2 Head CG Red Resultant [g, CFC_1000]	B-63
57	V1P2 Upper Neck Fx [N, CFC_1000]	B-64
58	V1P2 Upper Neck Fy [N, CFC_1000]	B-65
59	V1P2 Upper Neck Fz [N, CFC_1000]	B-66
60	V1P2 Upper Neck F Resultant [N, CFC_1000]	B-67
61	V1P2 Upper Neck Mx [N-m, CFC_600]	B-68
62	V1P2 Upper Neck My [N-m, CFC_600]	B-69
63	V1P2 Upper Neck Mz [N-m, CFC_600]	B-70
64	V1P2 Upper Neck M Resultant [N-m, CFC_600]	B-71
65	V1P2 Chest x [g, CFC_180]	B-72
66	V1P2 Chest y [g, CFC_180]	B-73
67	V1P2 Chest z [g, CFC_180]	B-74
68	V1P2 Chest Resultant [g, CFC_180]	B-75
69	V1P2 Chest Red x [g, CFC_180]	B-76
70	V1P2 Chest Red y [g, CFC_180]	B-77
71	V1P2 Chest Red z [g, CFC_180]	B-78
72	V1P2 Chest Red Resultant [g, CFC_180]	B-79
73	V1P2 Chest Compression x [mm, CFC_600]	B-80
74	V1P2 Pelvic x [g, CFC_1000]	B-81
75	V1P2 Pelvic y [g, CFC_1000]	B-82
76	V1P2 Pelvic z [g, CFC_1000]	B-83
77	V1P2 Pelvic Resultant [g, CFC_1000]	B-84
78	V1P2 Left Femur z [N, CFC_600]	B-85
79	V1P2 Right Femur z [N, CFC_600]	B-86
80	V1P2 Left Upper Tibia Mx [N-m, CFC_600]	B-87
81	V1P2 Left Upper Tibia My [N-m, CFC_600]	B-88
82	V1P2 Left Lower Tibia Fz [N, CFC_600]	B-89
83	V1P2 Left Lower Tibia Mx [N-m, CFC_600]	B-90
84	V1P2 Left Lower Tibia My [N-m, CFC_600]	B-91
85	V1P2 Right Upper Tibia Mx [N-m, CFC_600]	B-92
86	V1P2 Right Upper Tibia My [N-m, CFC_600]	B-93
87	V1P2 Right Lower Tibia Fz [N, CFC_600]	B-94
88	V1P2 Right Lower Tibia Mx [N-m, CFC_600]	B-95
89	V1P2 Right Lower Tibia My [N-m, CFC_600]	B-96
90	V1P2 Left Foot Aft x [g, CFC_600]	B-97
91	V1P2 Left Foot Aft z [g, CFC_600]	B-98
92	V1P2 Left Foot Fore z [g, CFC_600]	B-99
93	V1P2 Right Foot Aft x [g, CFC_600]	B-100
94	V1P2 Right Foot Aft z [g, CFC_600]	B-101

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
95	V1P2 Right Foot Fore z [g, CFC_600]	B-102
96	V1 P2 Torso Belt [N, CFC_60]	B-103
97	V1 Left Rear #1x [g, CFC_60]	B-104
98	V1 Left Rear #1x Velocity [kph, CFC_180]	B-105
99	V1 Left Rear #1x Displacement [mm, CFC_180]	B-106
100	V1 Right Rear #2x [g, CFC_60]	B-107
101	V1 Right Rear #2x Velocity [kph, CFC_180]	B-108
102	V1 Right Rear #2x Displacement [mm, CFC_180]	B-109
103	V1 Engine Top #3x [g, CFC_60]	B-110
104	V1 Engine Top #3x Velocity [kph, CFC_180]	B-111
105	V1 Engine Top #3x Displacement [mm, CFC_180]	B-112
106	V1 Engine Bottom #4x [g, CFC_60]	B-113
107	V1 Engine Bottom #4x Velocity [kph, CFC_180]	B-114
108	V1 Engine Bottom #4x Displacement [mm, CFC_180]	B-115
109	V1 Right Caliper #5x [g, CFC_60]	B-116
110	V1 Right Caliper #5x Velocity [kph, CFC_180]	B-117
111	V1 Right Caliper #5x Displacement [mm, CFC_180]	B-118
112	V1 Instrument Panel #6x [g, CFC_60]	B-119
113	V1 Instrument Panel #6x Velocity [kph, CFC_180]	B-120
114	V1 Instrument Panel #6x Displacement [mm, CFC_180]	B-121
115	V1 Left Caliper #7x [g, CFC_60]	B-122
116	V1 Left Caliper #7x Velocity [kph, CFC_180]	B-123
117	V1 Left Caliper #7x Displacement [mm, CFC_180]	B-124
118	V1 Left Rear #8z [g, CFC_60]	B-125
119	V1 Left Rear #8z Velocity [kph, CFC_180]	B-126
120	V1 Left Rear #8z Displacement [mm, CFC_180]	B-127
121	V1 Right Rear #9z [g, CFC_60]	B-128
122	V1 Right Rear #9z Velocity [kph, CFC_180]	B-129
123	V1 Right Rear #9z Displacement [mm, CFC_180]	B-130
124	B1 LCA1 Fx [N, CFC_60]	B-131
125	B1 LCA2 Fx [N, CFC_60]	B-132
126	B1 LCA3 Fx [N, CFC_60]	B-133
127	B1 LCA4 Fx [N, CFC_60]	B-134
128	B1 LCA5 Fx [N, CFC_60]	B-135
129	B1 LCA6 Fx [N, CFC_60]	B-136
130	B1 LCA7 Fx [N, CFC_60]	B-137
131	B1 LCA8 Fx [N, CFC_60]	B-138
132	B1 LCA9 Fx [N, CFC_60]	B-139
133	B1 LCB1 Fx [N, CFC_60]	B-140
134	B1 LCB2 Fx [N, CFC_60]	B-141
135	B1 LCB3 Fx [N, CFC_60]	B-142
136	B1 LCB4 Fx [N, CFC_60]	B-143
137	B1 LCB5 Fx [N, CFC_60]	B-144
138	B1 LCB6 Fx [N, CFC_60]	B-145
139	B1 LCB7 Fx [N, CFC_60]	B-146
140	B1 LCB8 Fx [N, CFC_60]	B-147
141	B1 LCB9 Fx [N, CFC_60]	B-148
142	B1 LCC1 Fx [N, CFC_60]	B-149

PLOT	PLOT NAME[UNITS, CHANNEL FILTER CLASS]	PAGE
143	B1 LCC2 Fx [N, CFC_60]	B-150
144	B1 LCC3 Fx [N, CFC_60]	B-151
145	B1 LCC4 Fx [N, CFC_60]	B-152
146	B1 LCC5 Fx [N, CFC_60]	B-153
147	B1 LCC6 Fx [N, CFC_60]	B-154
148	B1 LCC7 Fx [N, CFC_60]	B-155
149	B1 LCC8 Fx [N, CFC_60]	B-156
150	B1 LCC9 Fx [N, CFC_60]	B-157
151	B1 LCD1 Fx [N, CFC_60]	B-158
152	B1 LCD2 Fx [N, CFC_60]	B-159
153	B1 LCD3 Fx [N, CFC_60]	B-160
154	B1 LCD4 Fx [N, CFC_60]	B-161
155	B1 LCD5 Fx [N, CFC_60]	B-162
156	B1 LCD6 Fx [N, CFC_60]	B-163
157	B1 LCD7 Fx [N, CFC_60]	B-164
158	B1 LCD8 Fx [N, CFC_60]	B-165
159	B1 LCD9 Fx [N, CFC_60]	B-166
160	Group 1 Load Cell Sum (A1,A2,A3,B1,B2,B3)	B-167
161	Group 2 Load Cell Sum (A4,A5,A6,B4,B5,B6)	B-168
162	Group 3 Load Cell Sum (A7,A8,A9,B7,B8,B9)	B-169
163	Group 4 Load Cell Sum (C1,C2,C3,D1,D2,D3)	B-170
164	Group 5 Load Cell Sum (C4,C5,C6,D4,D5,D6)	B-171
165	Group 6 Load Cell Sum (C7,C8,C9,D7,D8,D9)	B-172
166	Total Load Cell Sum (All 6 Groups)	B-173

NCAP Test #1 2003 BMW Z4

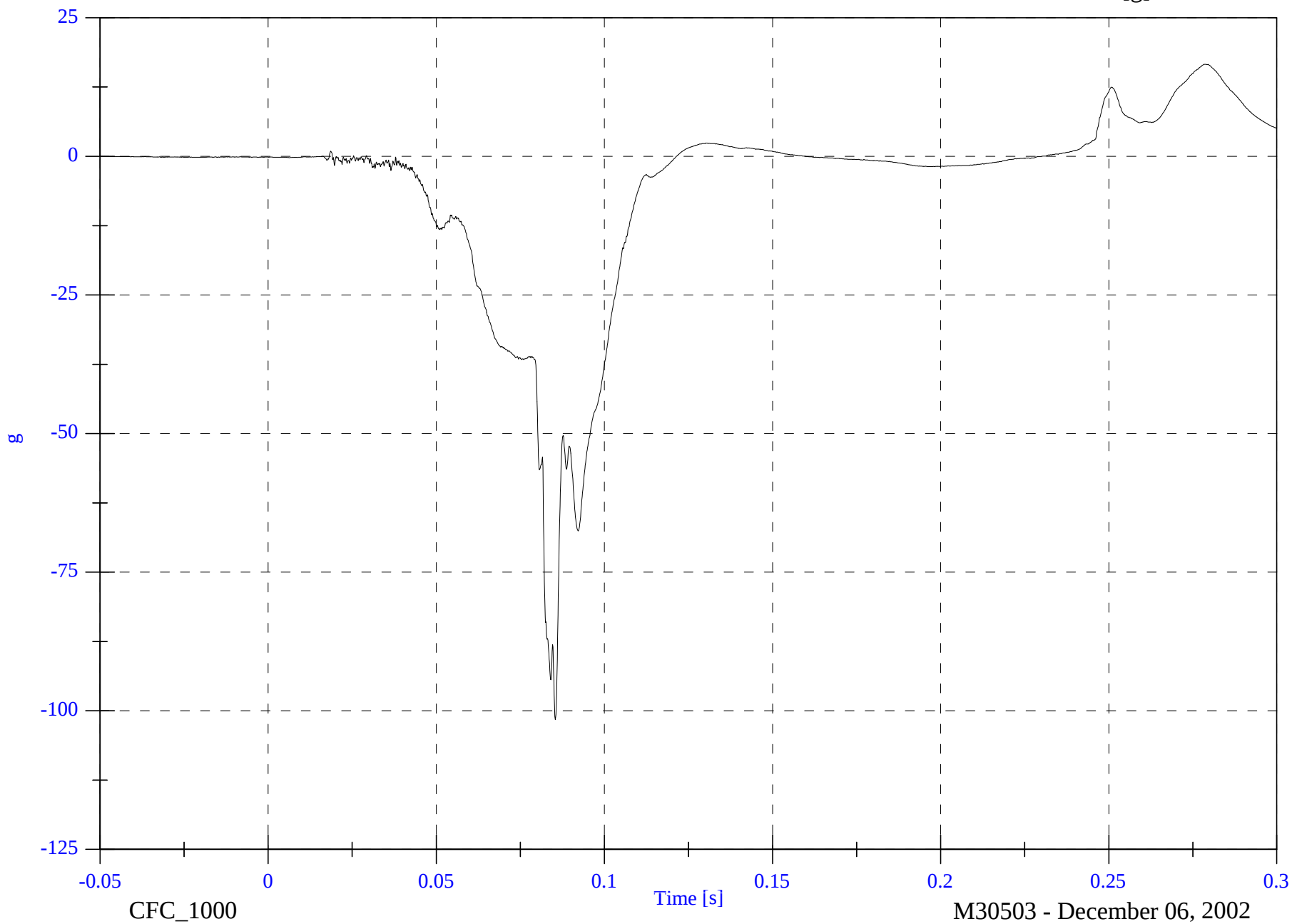
V1P1 Head CG x

Max: 16.6 [g] at 0.279 [s]

Min: -101.6 [g] at 0.085 [s]

B-8

8642-NCAP-23

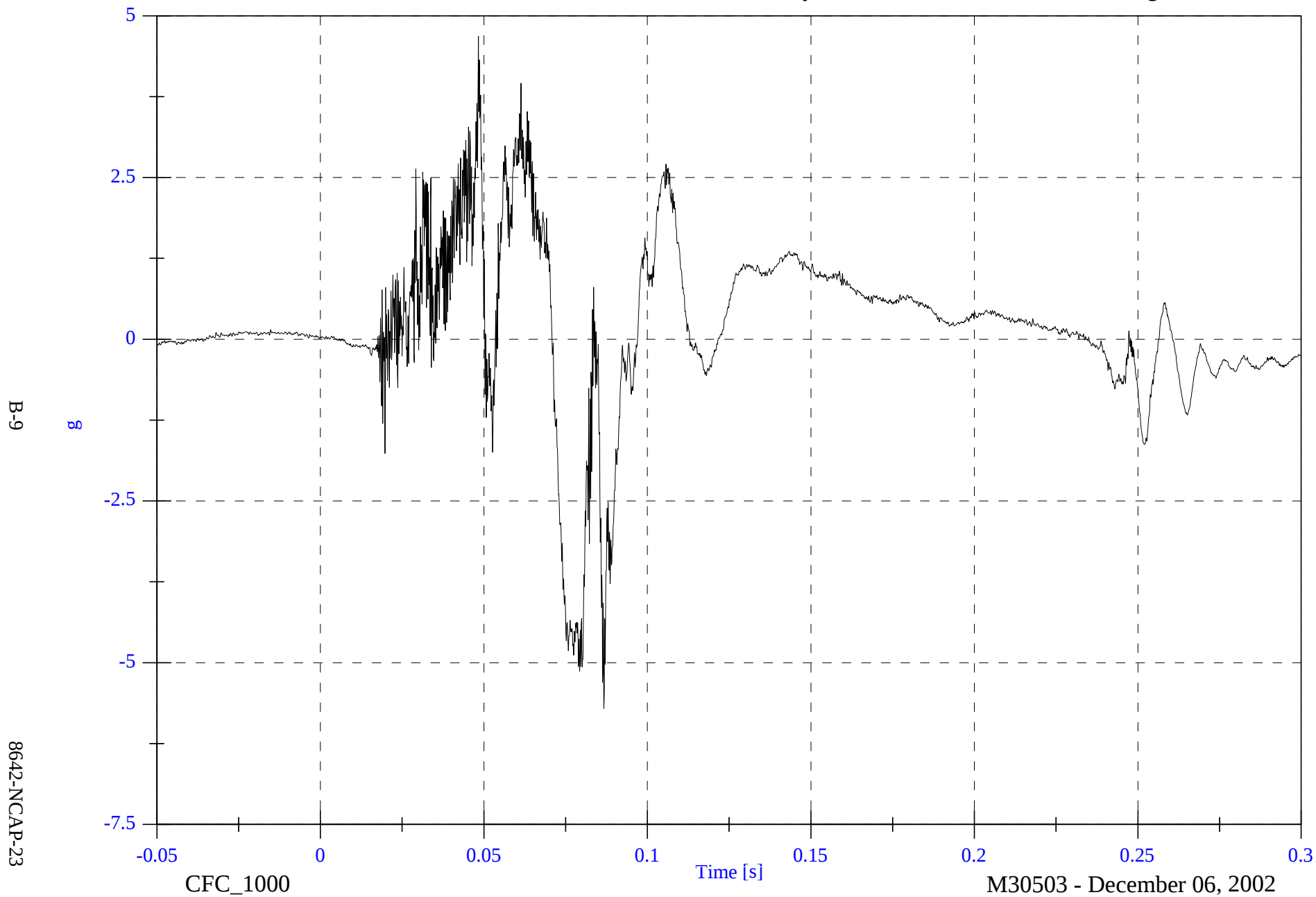


NCAP Test #1 2003 BMW Z4

V1P1 Head CG y

Max: 4.7 [g] at 0.048 [s]

Min: -5.7 [g] at 0.087 [s]



NCAP Test #1 2003 BMW Z4

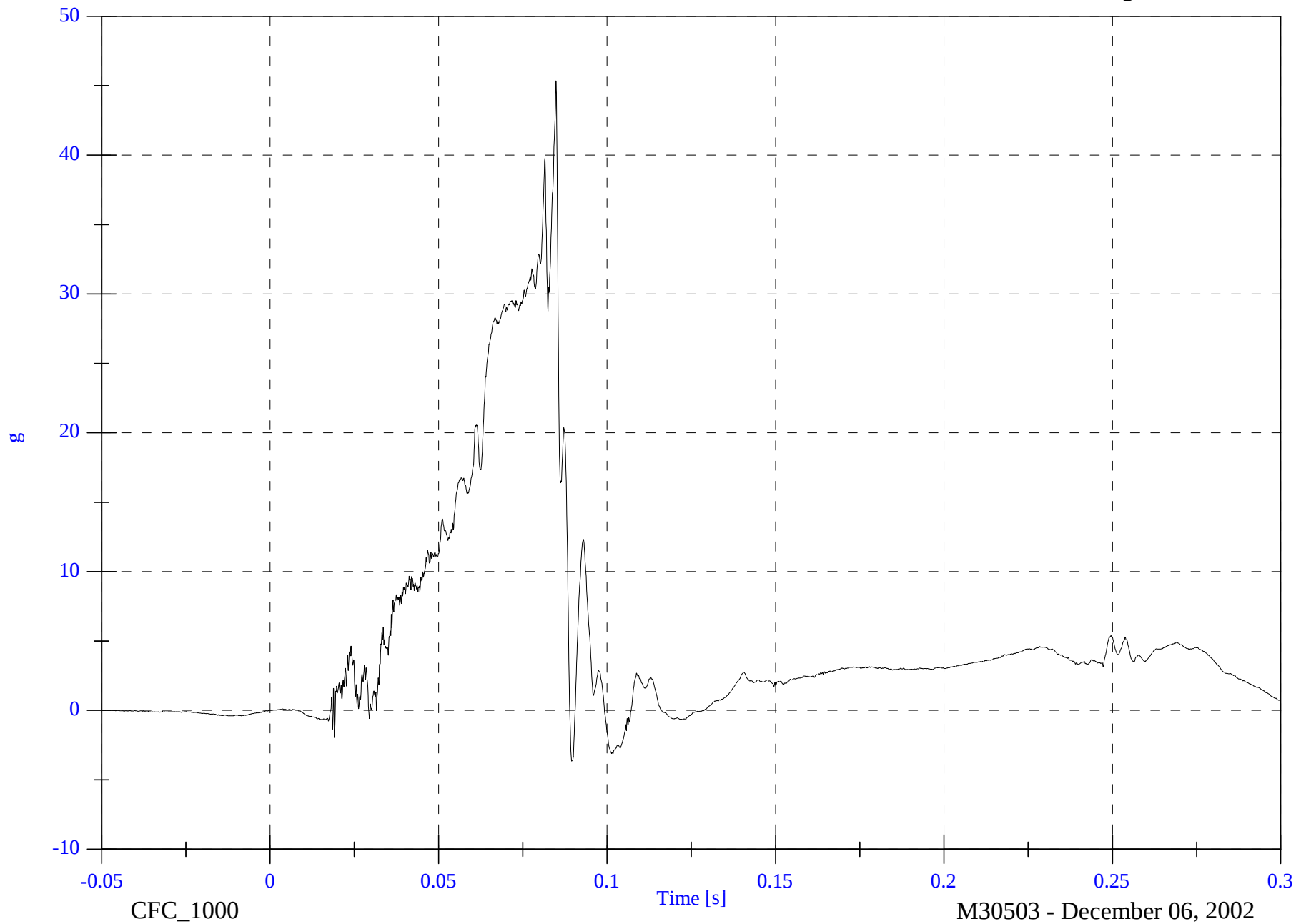
V1P1 Head CG z

Max: 45.4 [g] at 0.085 [s]

Min: -3.7 [g] at 0.090 [s]

B-10

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

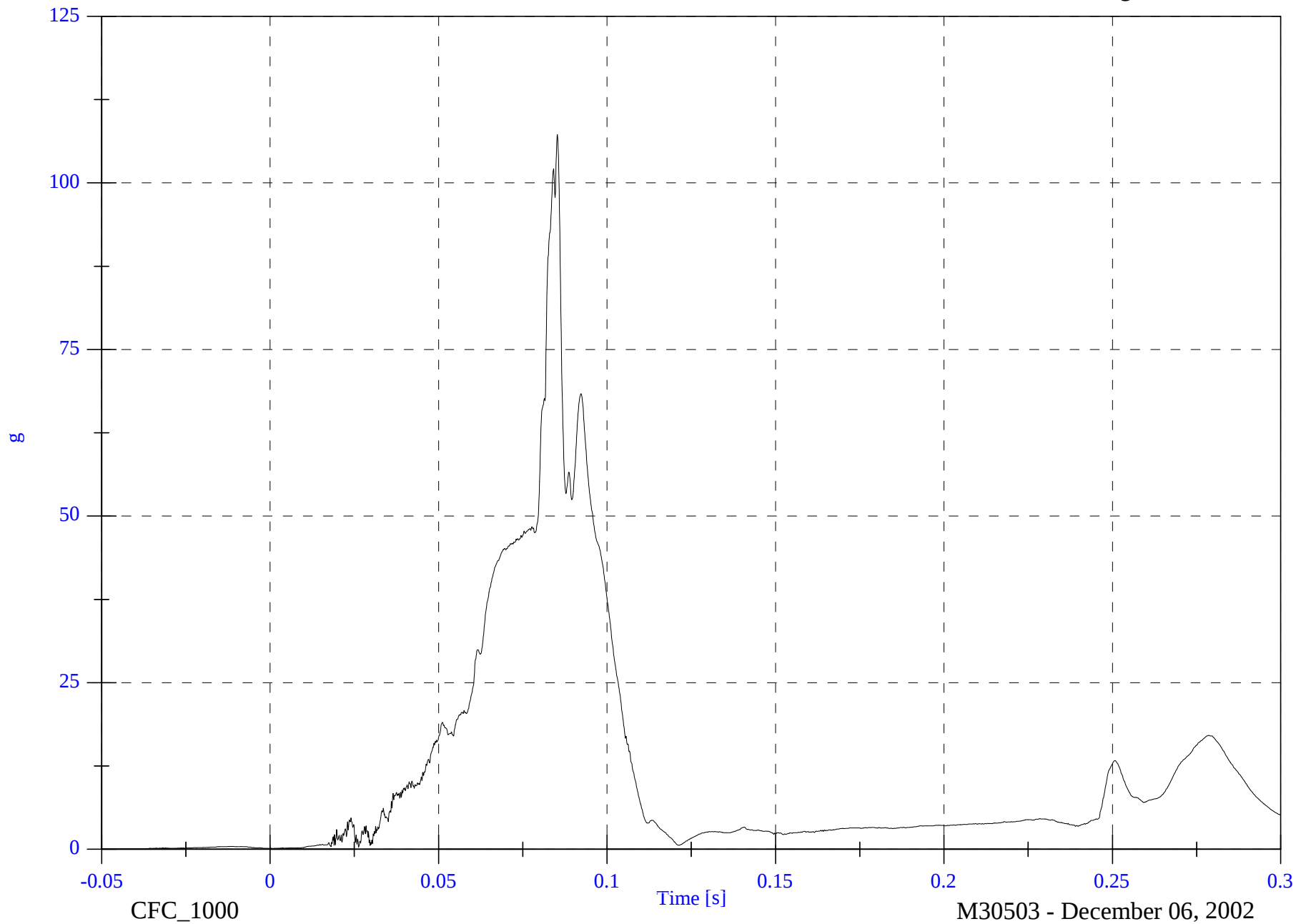
V1P1 Head CG Resultant

Max: 107.2 [g] at 0.085 [s]

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

B-11

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

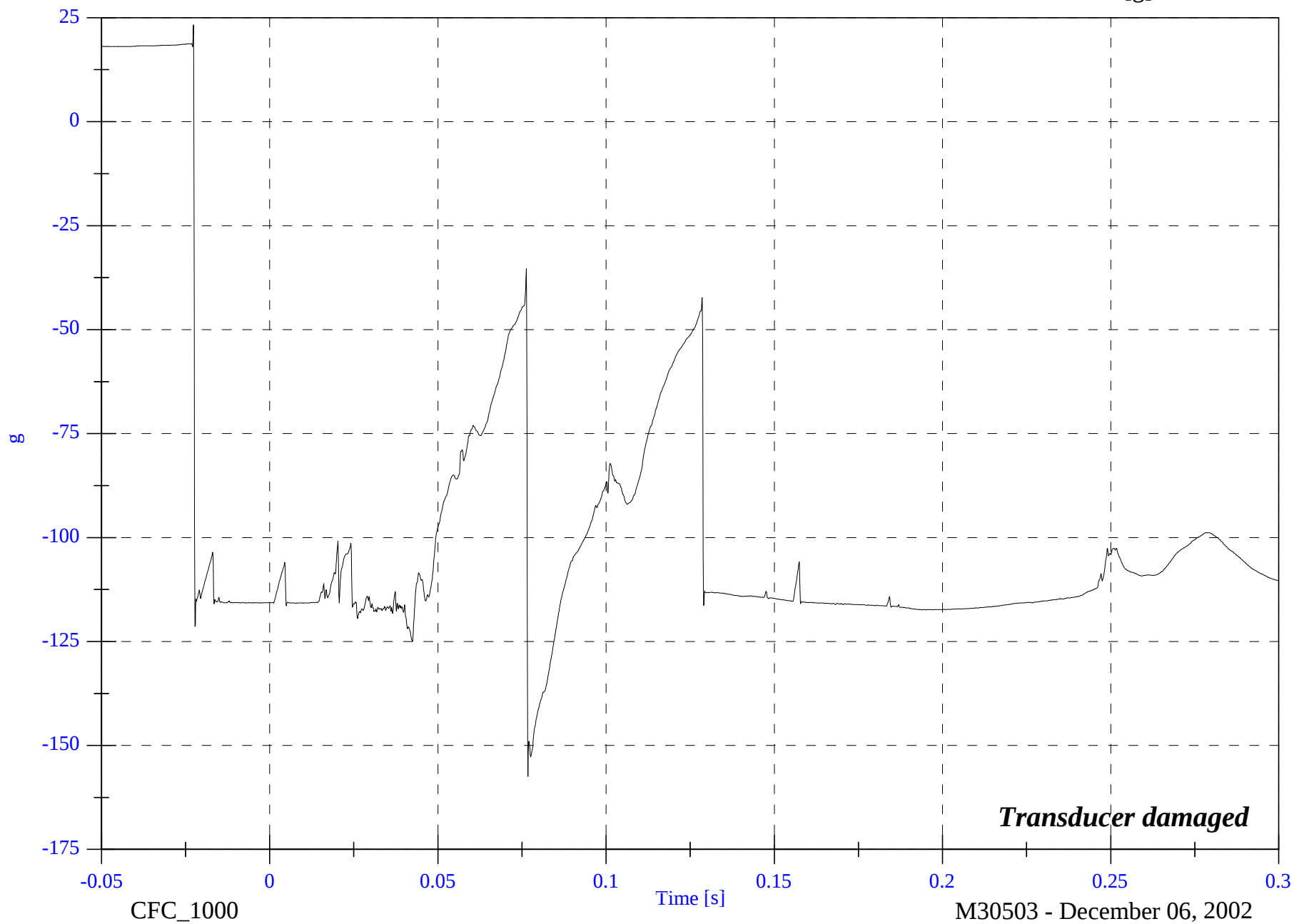
V1P1 Head CG Red x

Max: 23.3 [g] at -0.023 [s]

Min: -157.5 [g] at 0.077 [s]

B-12

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

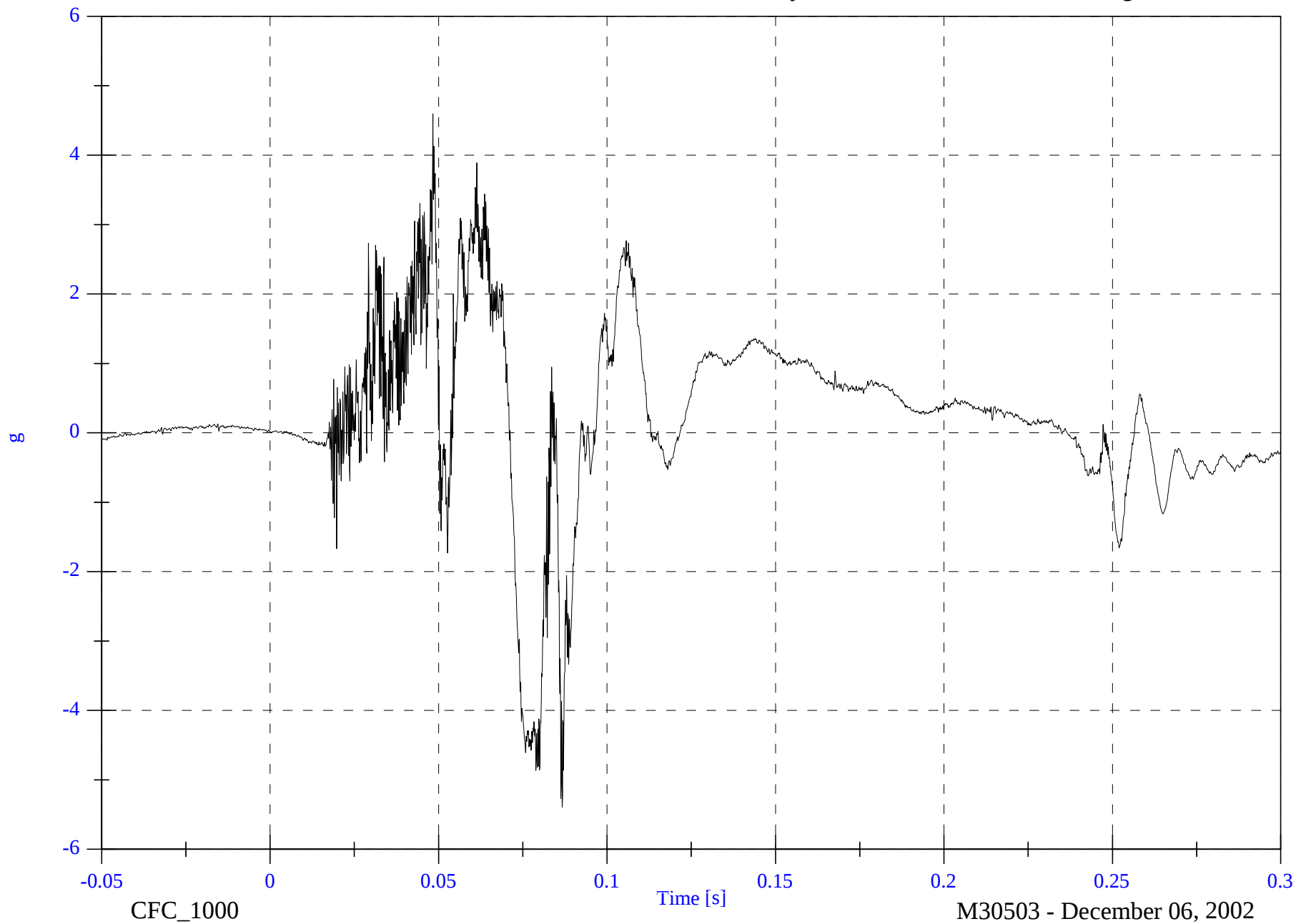
V1P1 Head CG Red y

Max: 4.6 [g] at 0.048 [s]

Min: -5.4 [g] at 0.087 [s]

B-13

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

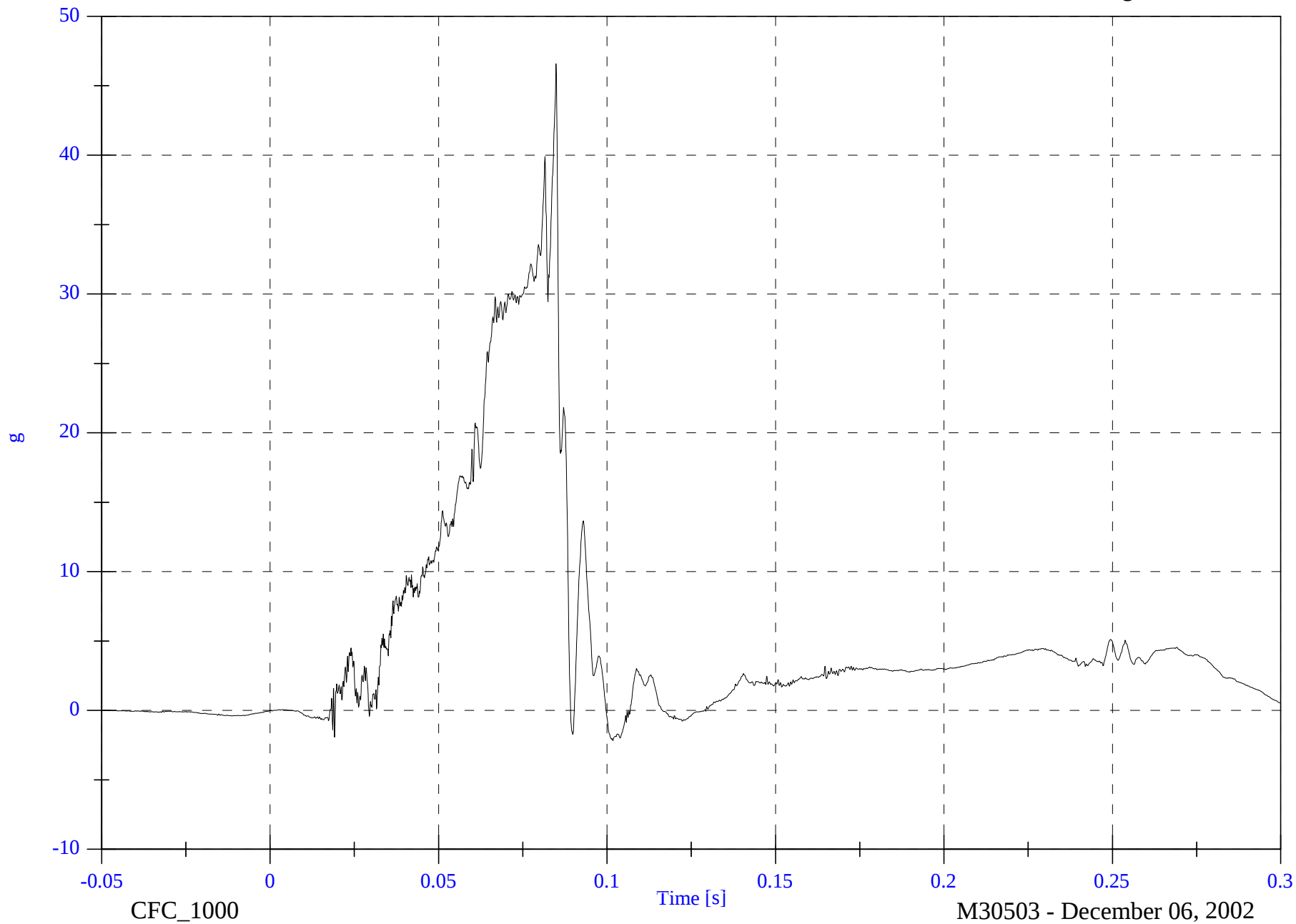
V1P1 Head CG Red z

Max: 46.6 [g] at 0.085 [s]

Min: -2.2 [g] at 0.102 [s]

B-14

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

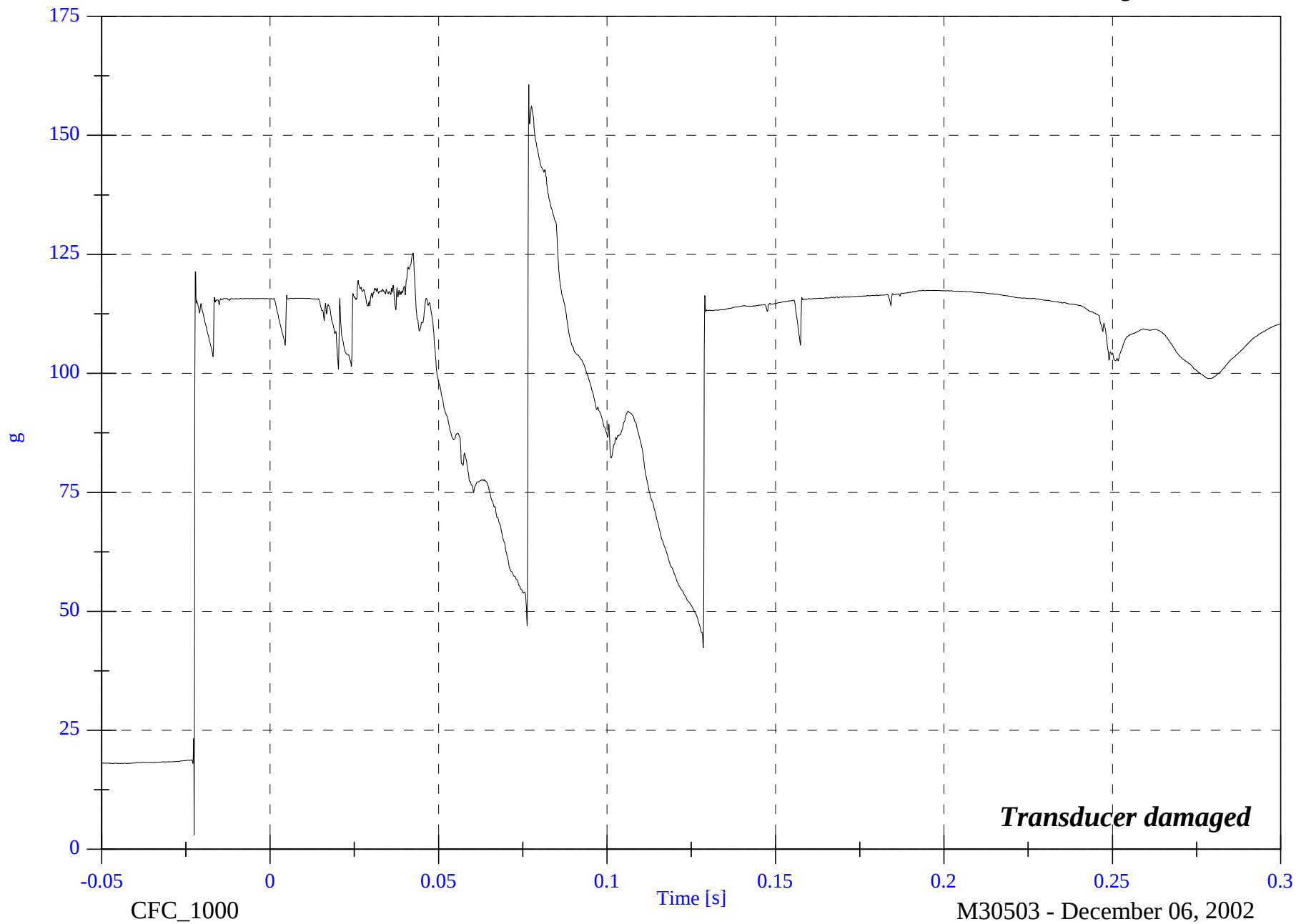
V1P1 Head CG Red Resultant

Max: 160.6 [g] at 0.077 [s]

Min: 3.0 [g] at -0.022 [s]

B-15

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

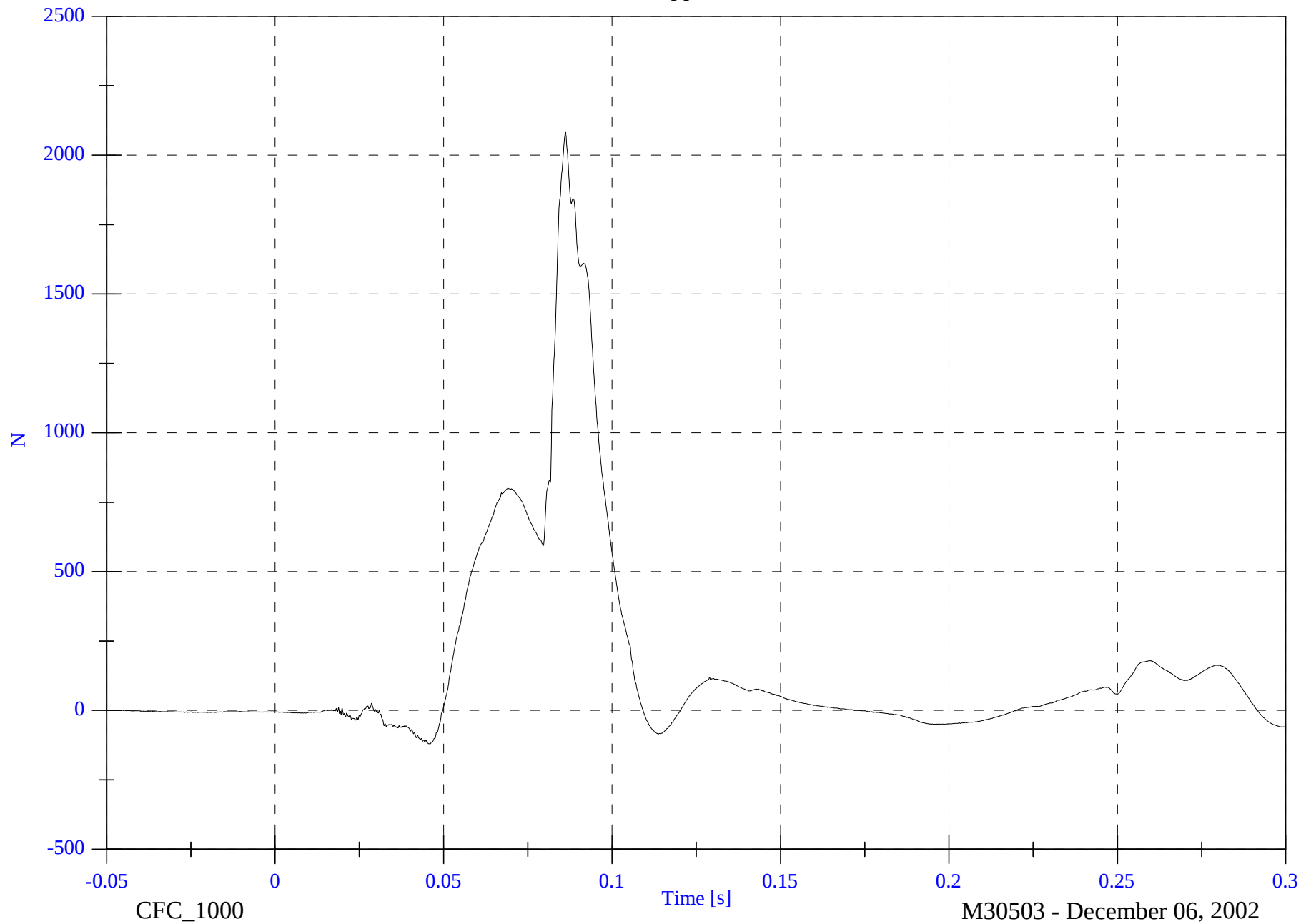
V1P1 Upper Neck Fx

Max: 2082.5 [N] at 0.086 [s]

Min: -120.9 [N] at 0.046 [s]

B-16

8642-NCAP-23

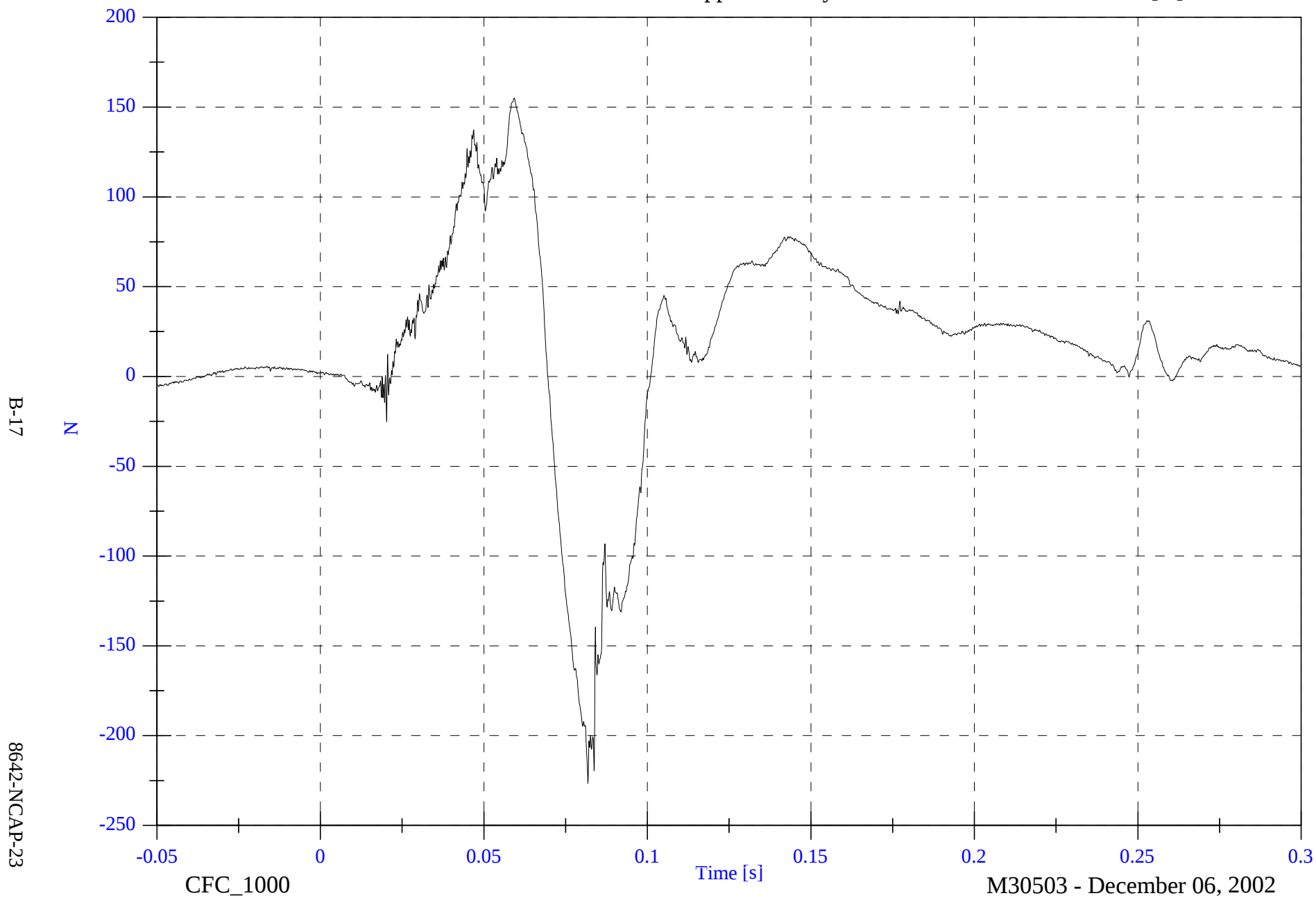


NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck Fy

Max: 155.0 [N] at 0.059 [s]

Min: -226.6 [N] at 0.082 [s]

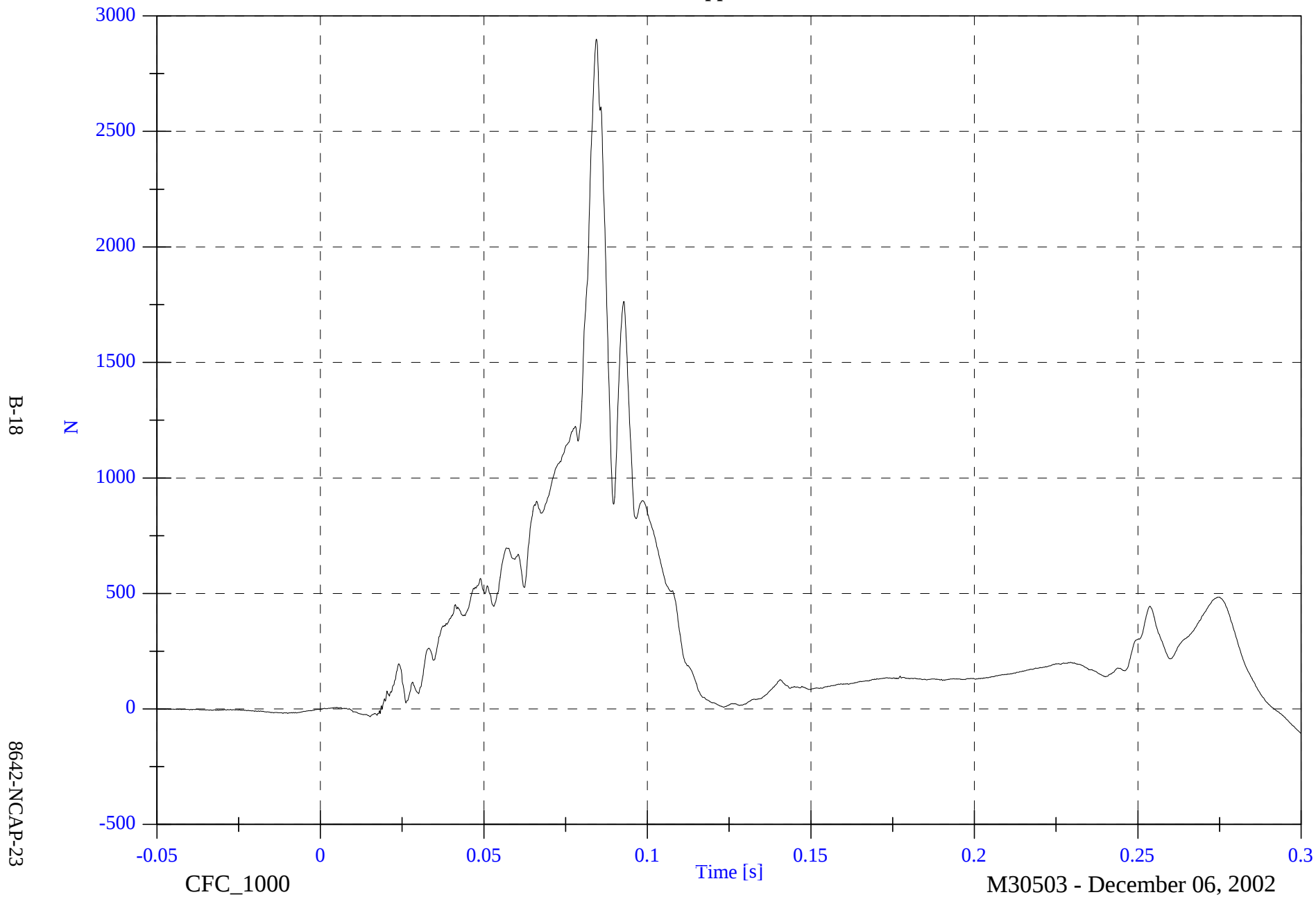


NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck Fz

Max: 2899.1 [N] at 0.084 [s]

Min: -106.2 [N] at 0.300 [s]

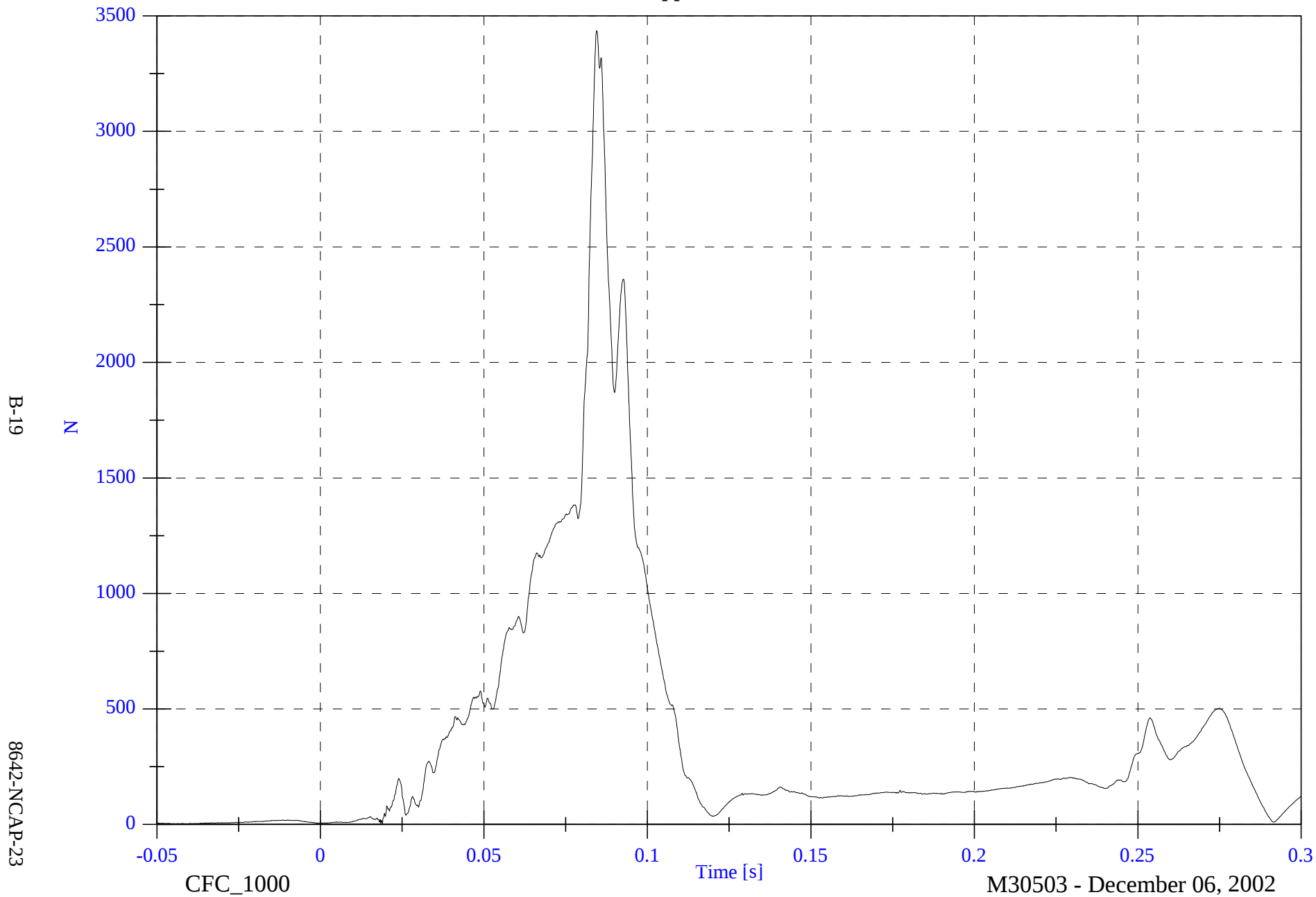


NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck F Resultant

Max: 3436.1 [N] at 0.084 [s]

Min: 2.8 [N] at 0.019 [s]



NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck Mx

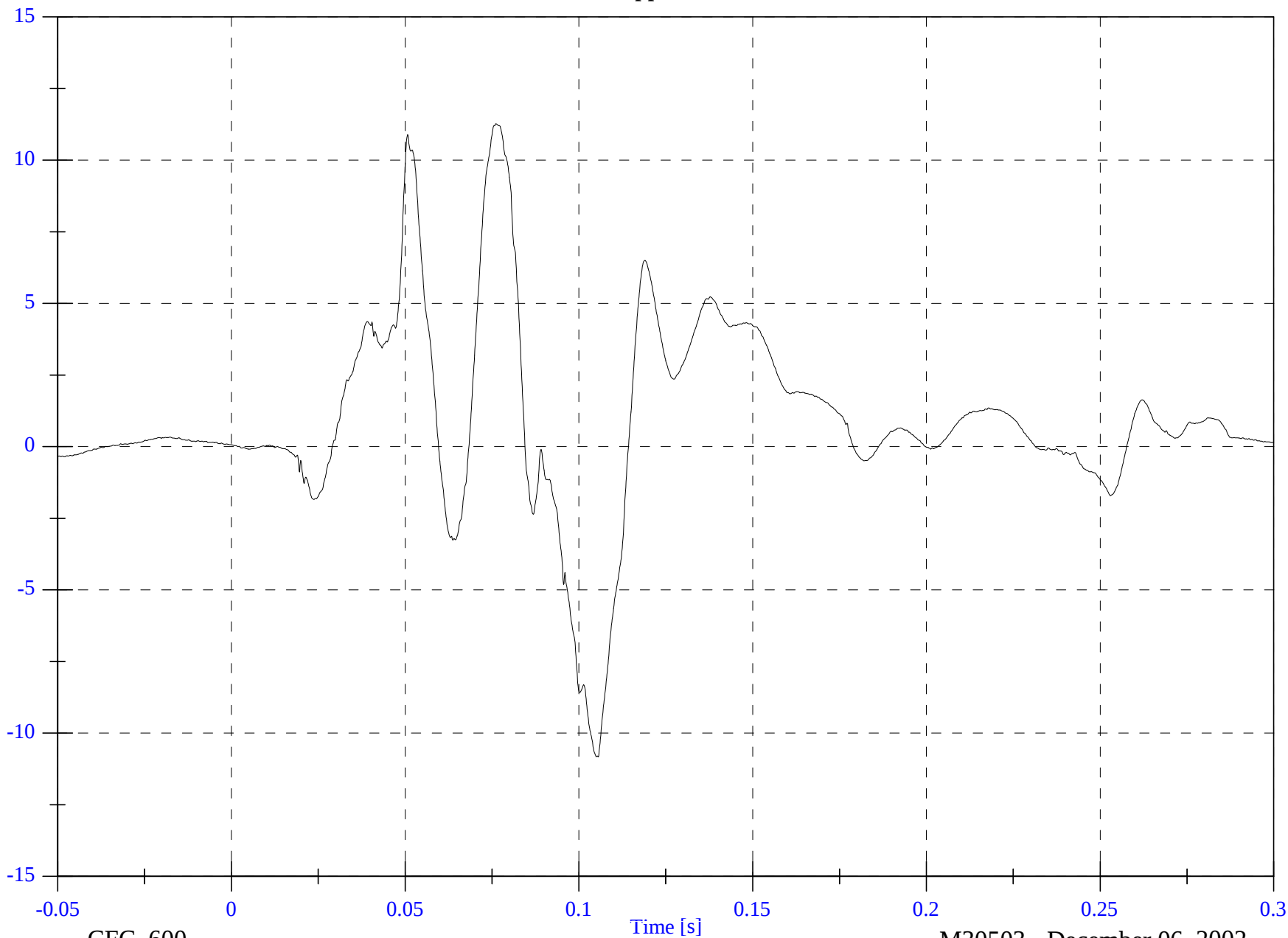
Max: 11.3 [N-m] at 0.076 [s]

Min: -10.8 [N-m] at 0.106 [s]

B-20

N-m

8642-NCAP-23



CFC_600

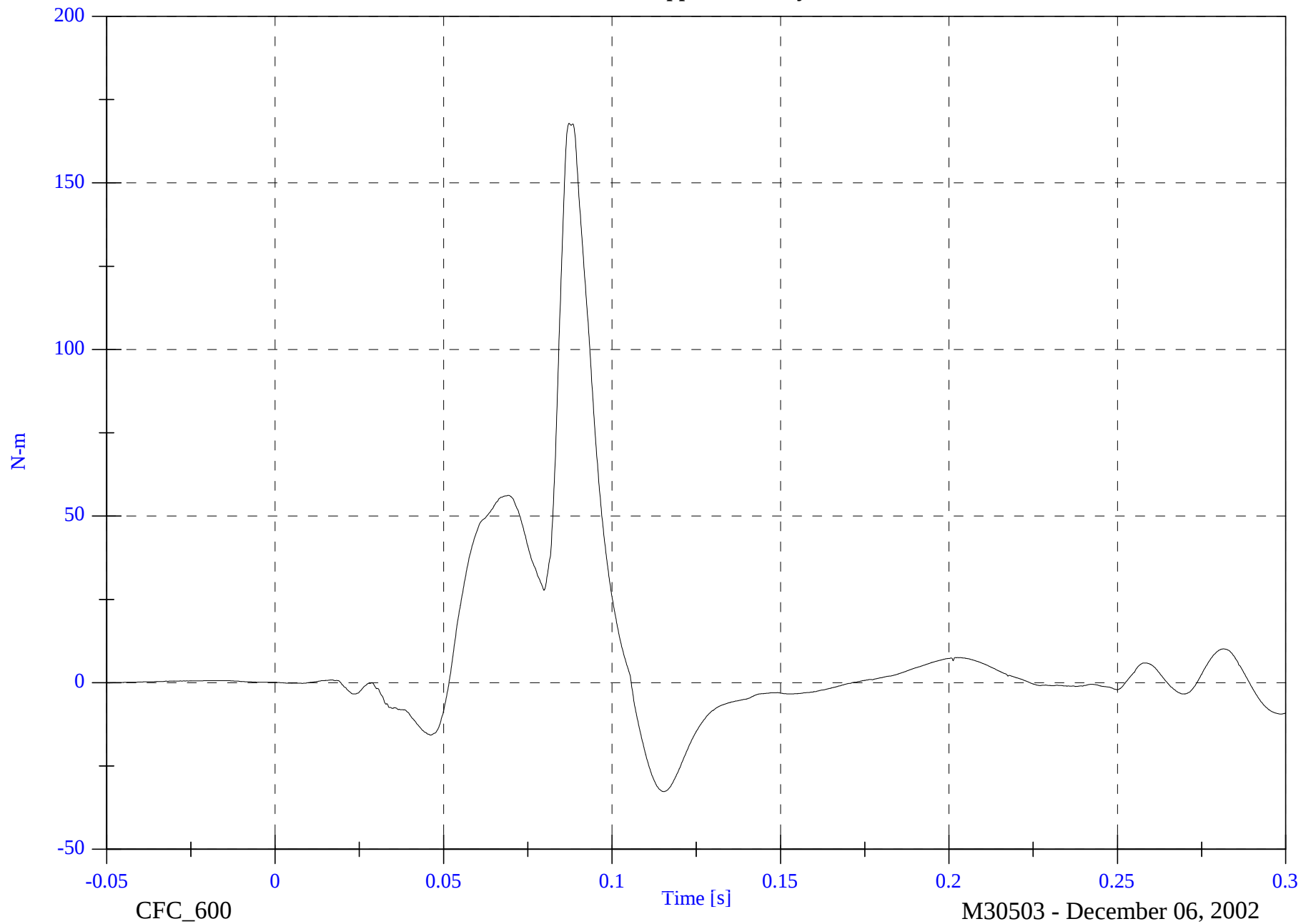
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck My

Max: 167.9 [N-m] at 0.087 [s]

Min: -32.7 [N-m] at 0.115 [s]



B-21

8642-NCAP-23

CFC_600

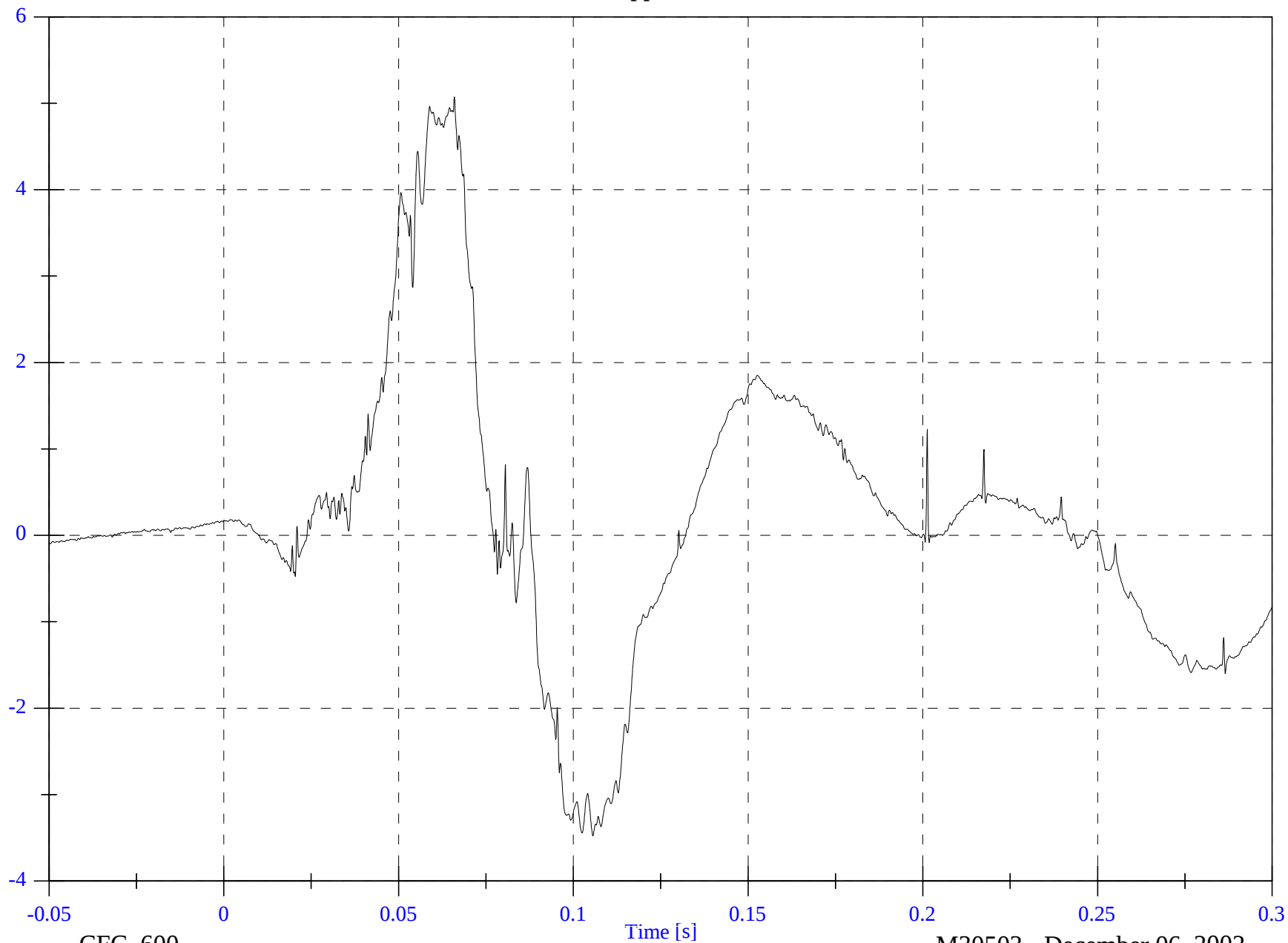
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck Mz

Max: 5.1 [N-m] at 0.066 [s]

Min: -3.5 [N-m] at 0.106 [s]



B-22

8642-NCAP-23

CFC_600

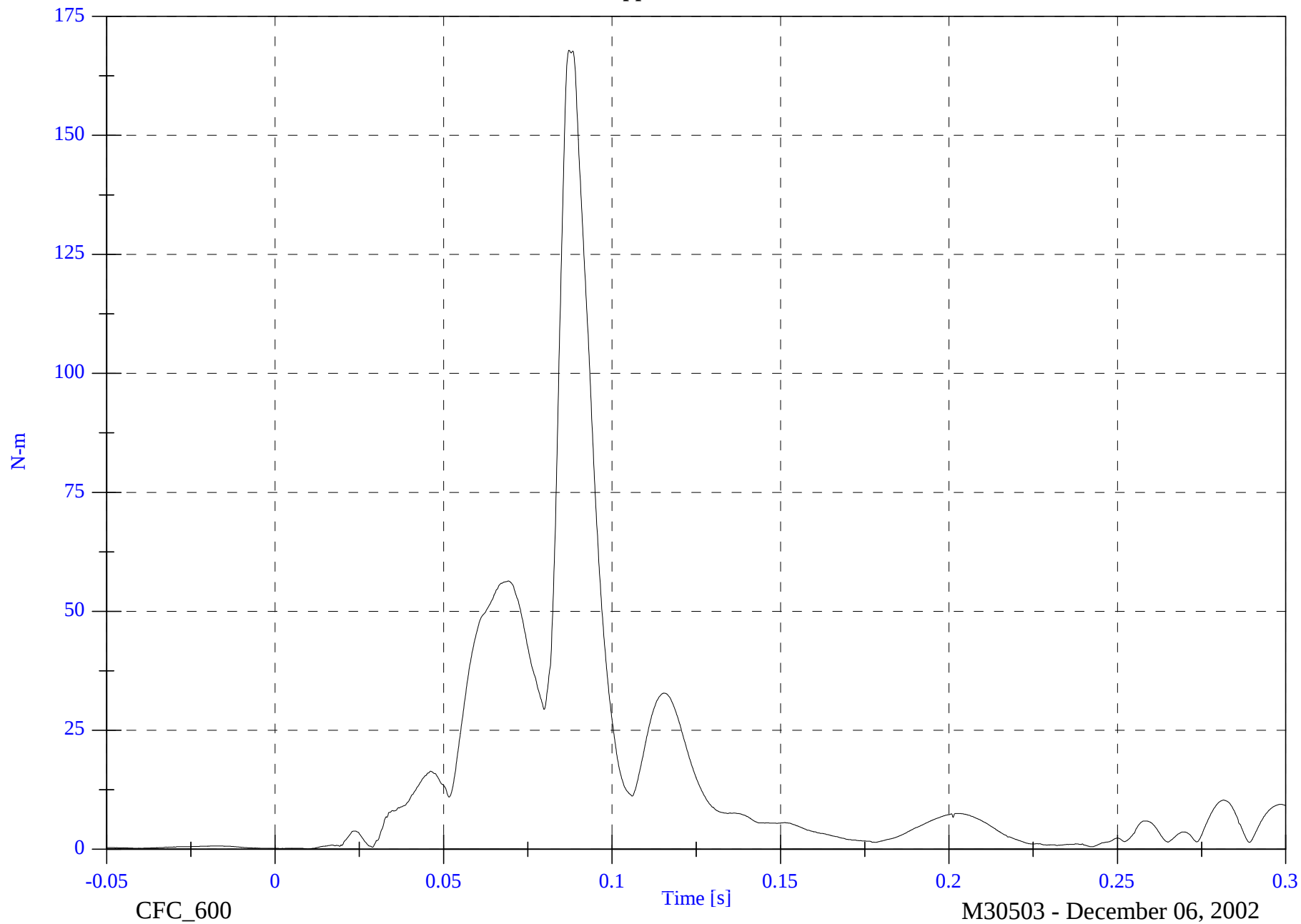
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P1 Upper Neck M Resultant

Max: 167.9 [N-m] at 0.087 [s]

Min: 0.0 [N-m] at 0.010 [s]



B-23

8642-NCAP-23

CFC_600

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

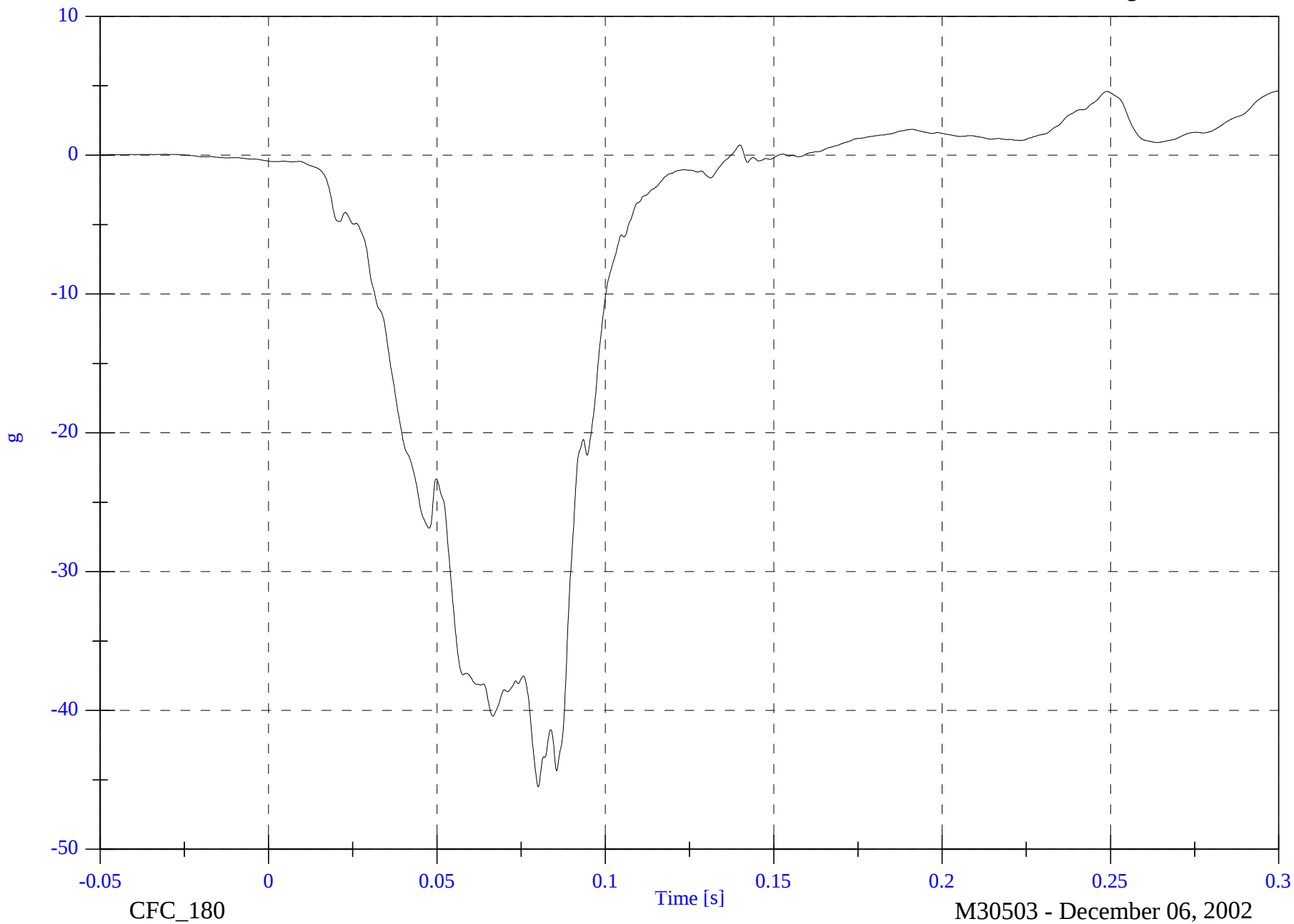
V1P1 Chest x

Max: 4.6 [g] at 0.300 [s]

Min: -45.5 [g] at 0.080 [s]

B-24

8642-NCAP-23

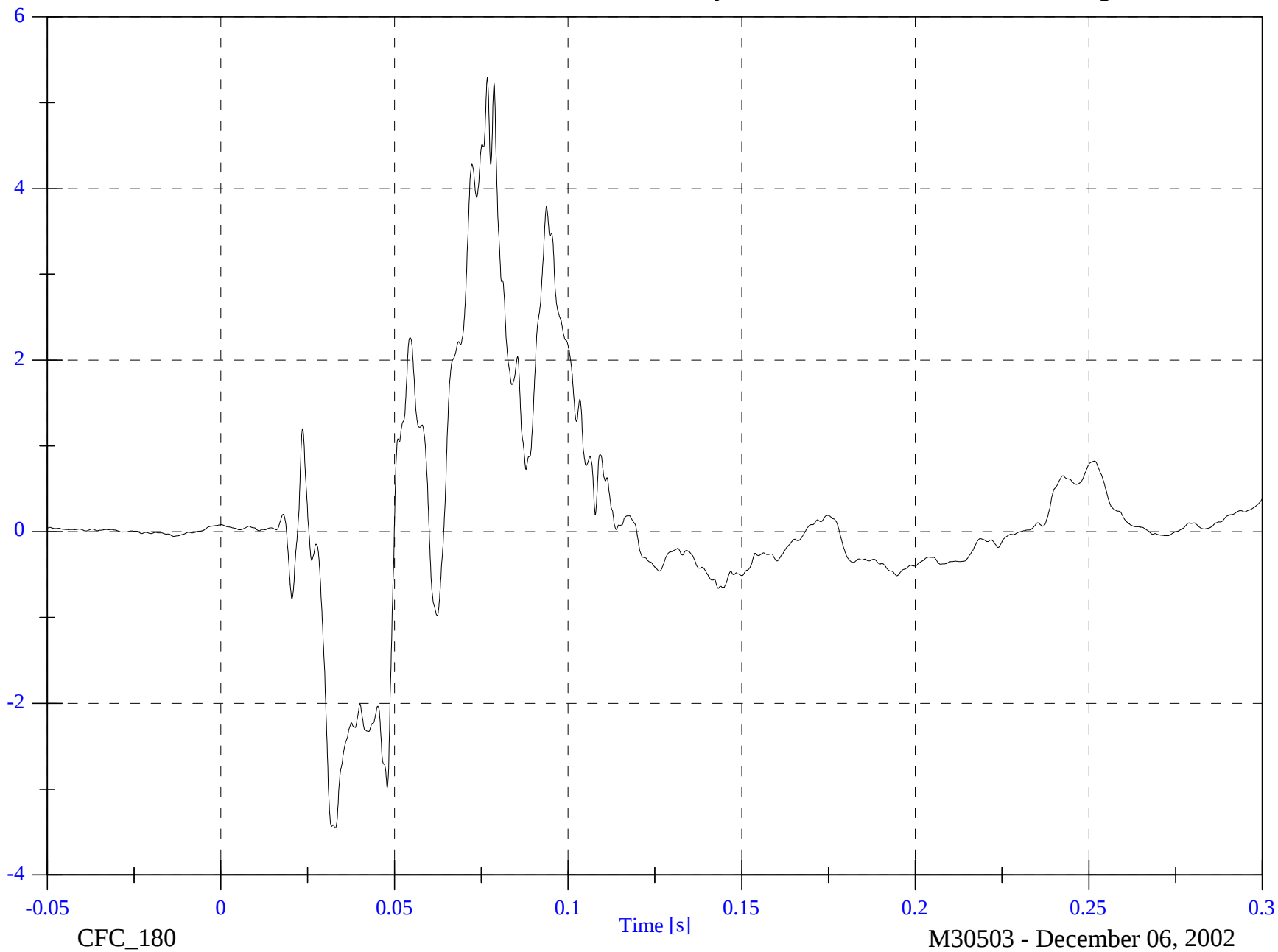


NCAP Test #1 2003 BMW Z4

V1P1 Chest y

Max: 5.3 [g] at 0.077 [s]

Min: -3.5 [g] at 0.033 [s]



B-25

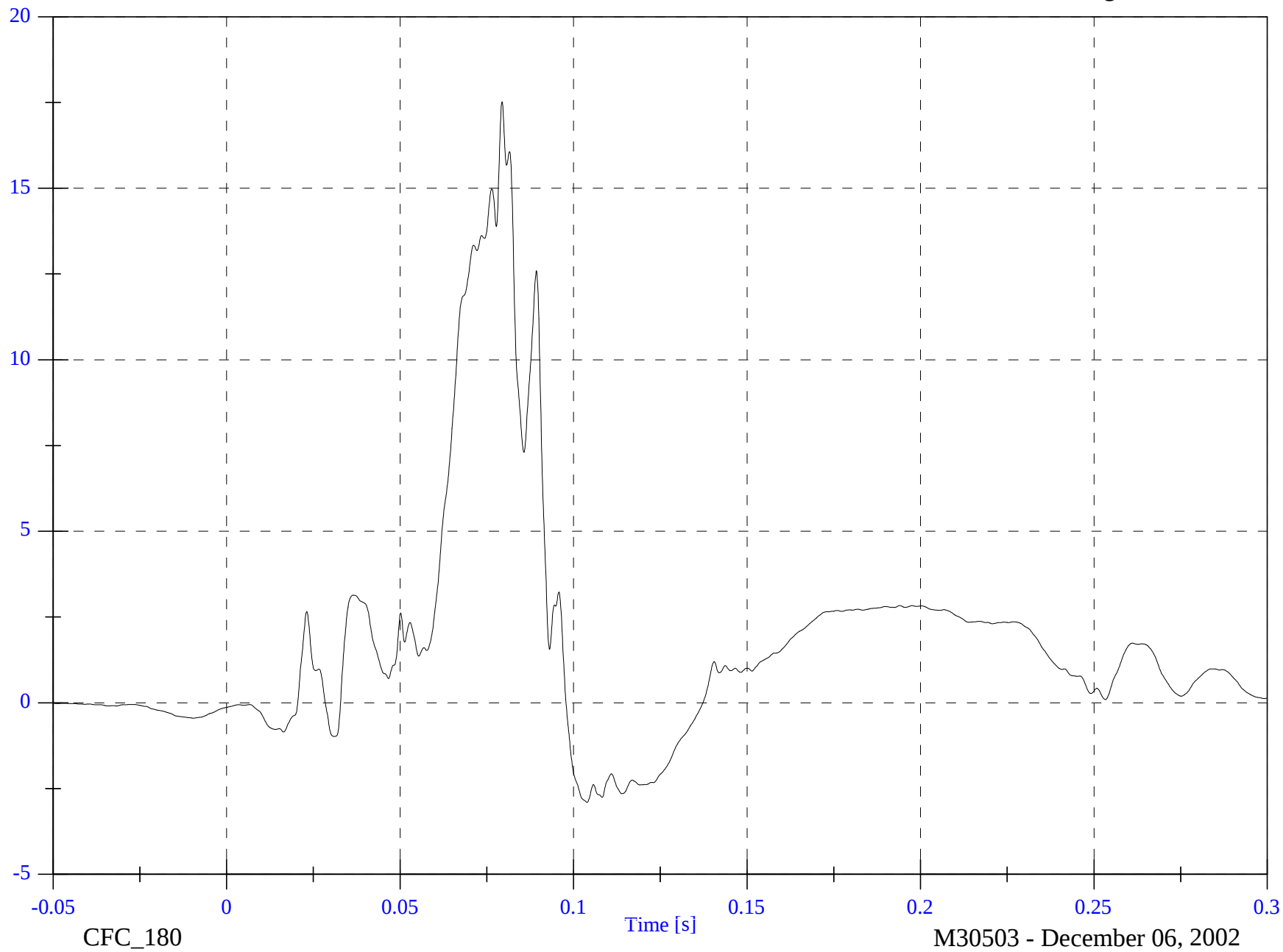
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Chest z

Max: 17.5 [g] at 0.079 [s]

Min: -2.9 [g] at 0.104 [s]



B-26

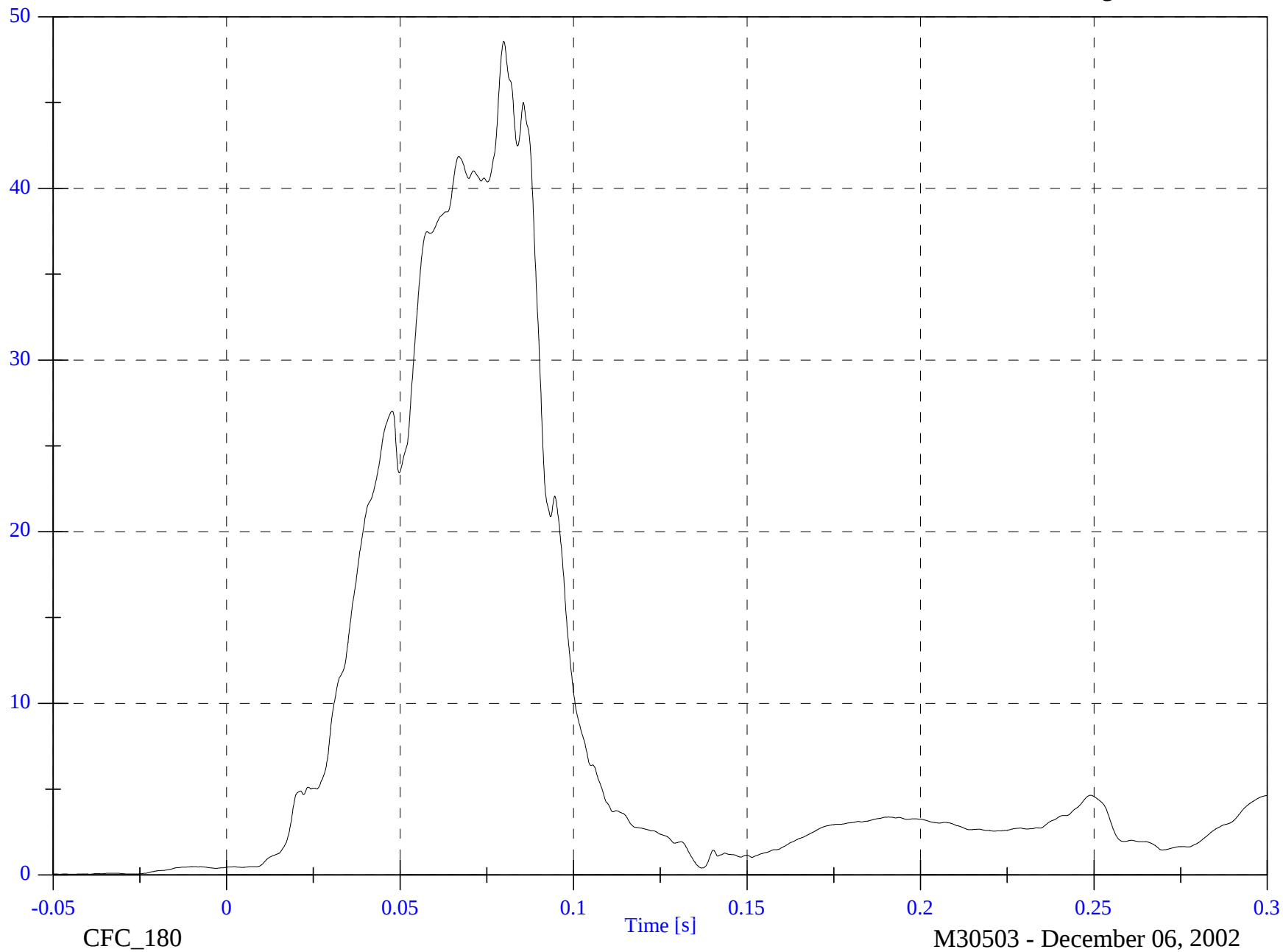
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Chest Resultant

Max: 48.6 [g] at 0.080 [s]

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



B-27

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

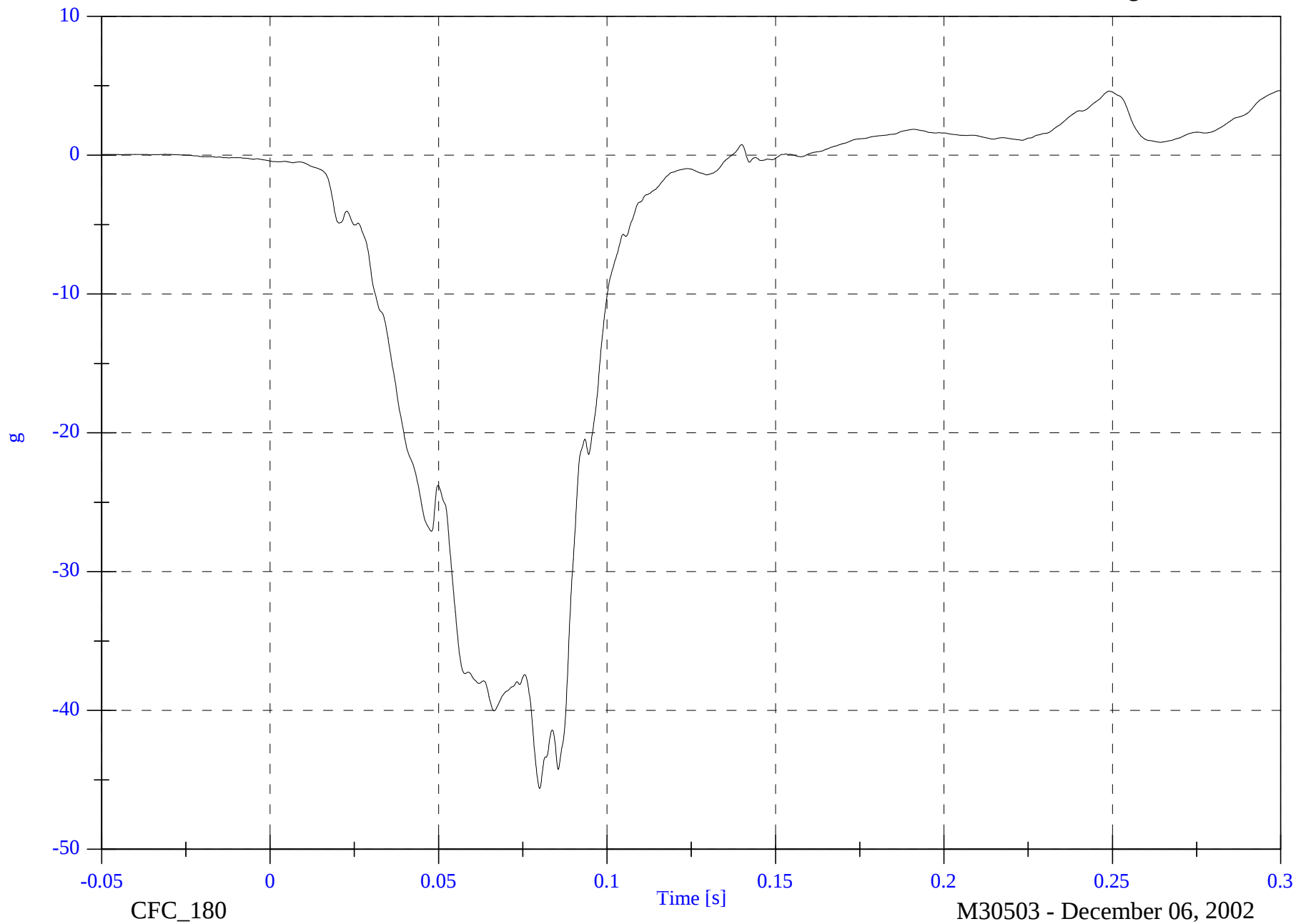
V1P1 Chest Red x

Max: 4.6 [g] at 0.300 [s]

Min: -45.6 [g] at 0.080 [s]

B-28

8642-NCAP-23

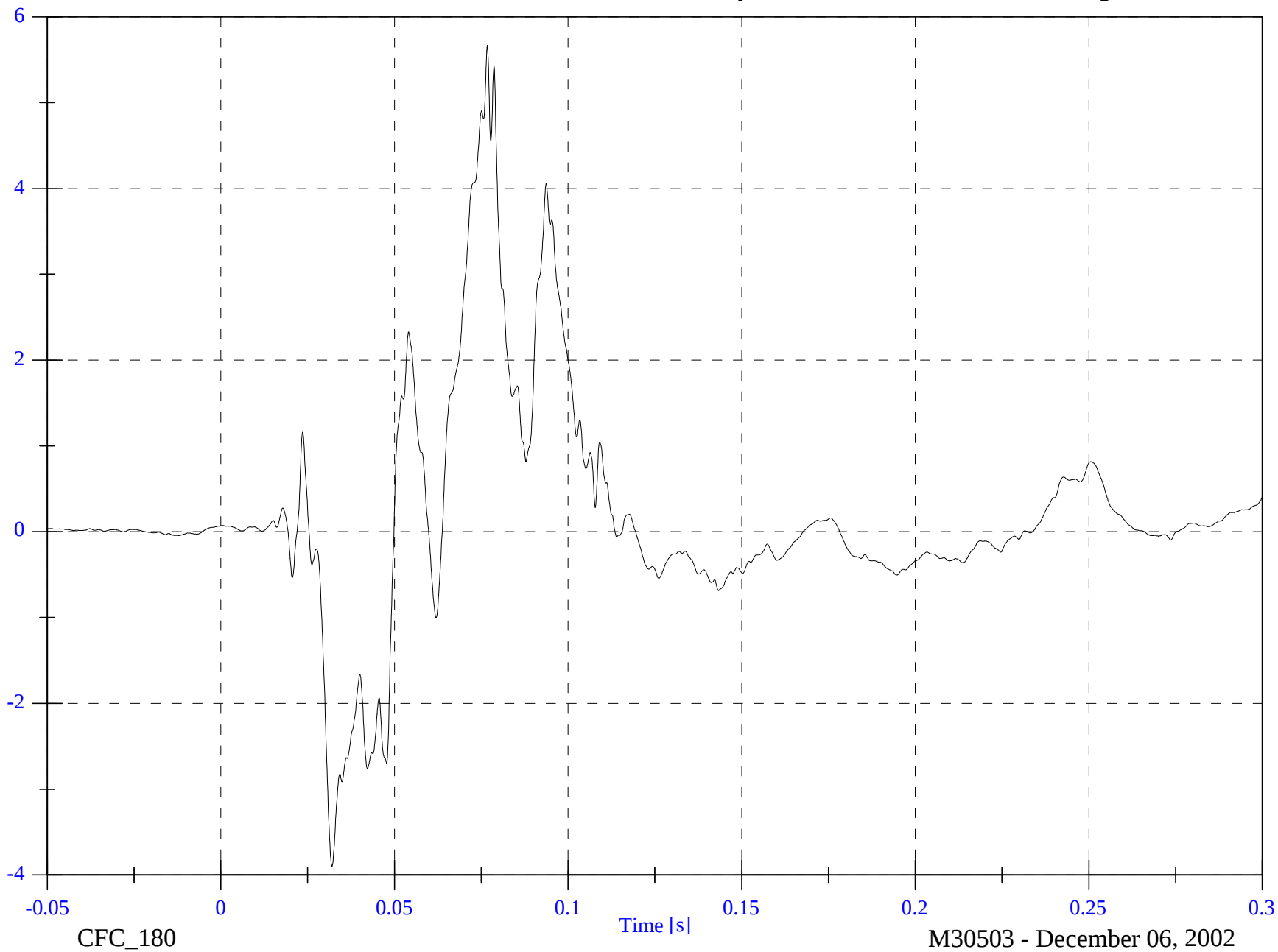


NCAP Test #1 2003 BMW Z4

V1P1 Chest Red y

Max: 5.7 [g] at 0.077 [s]

Min: -3.9 [g] at 0.032 [s]



B-29

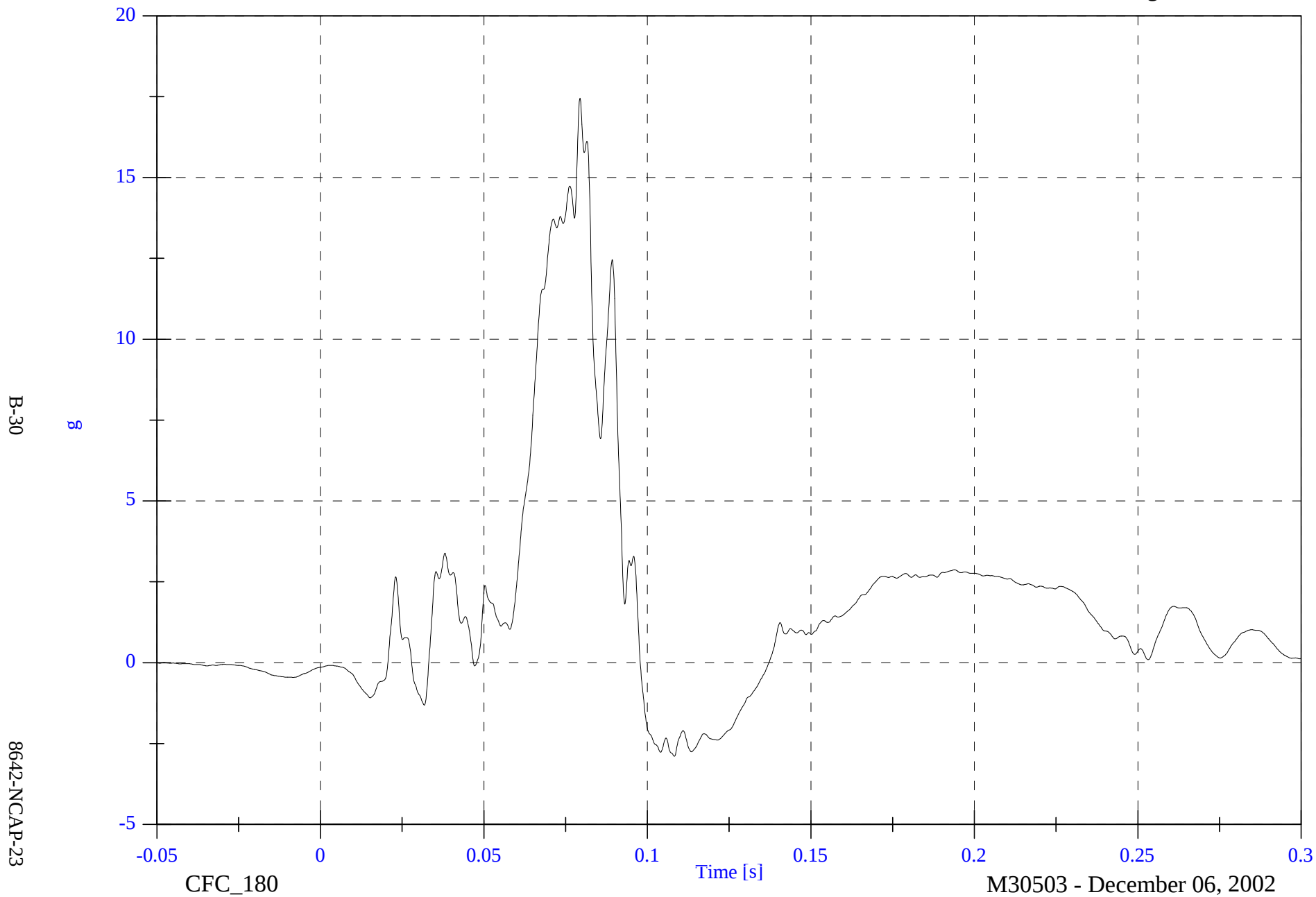
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Chest Red z

Max: 17.5 [g] at 0.079 [s]

Min: -2.9 [g] at 0.108 [s]



NCAP Test #1 2003 BMW Z4

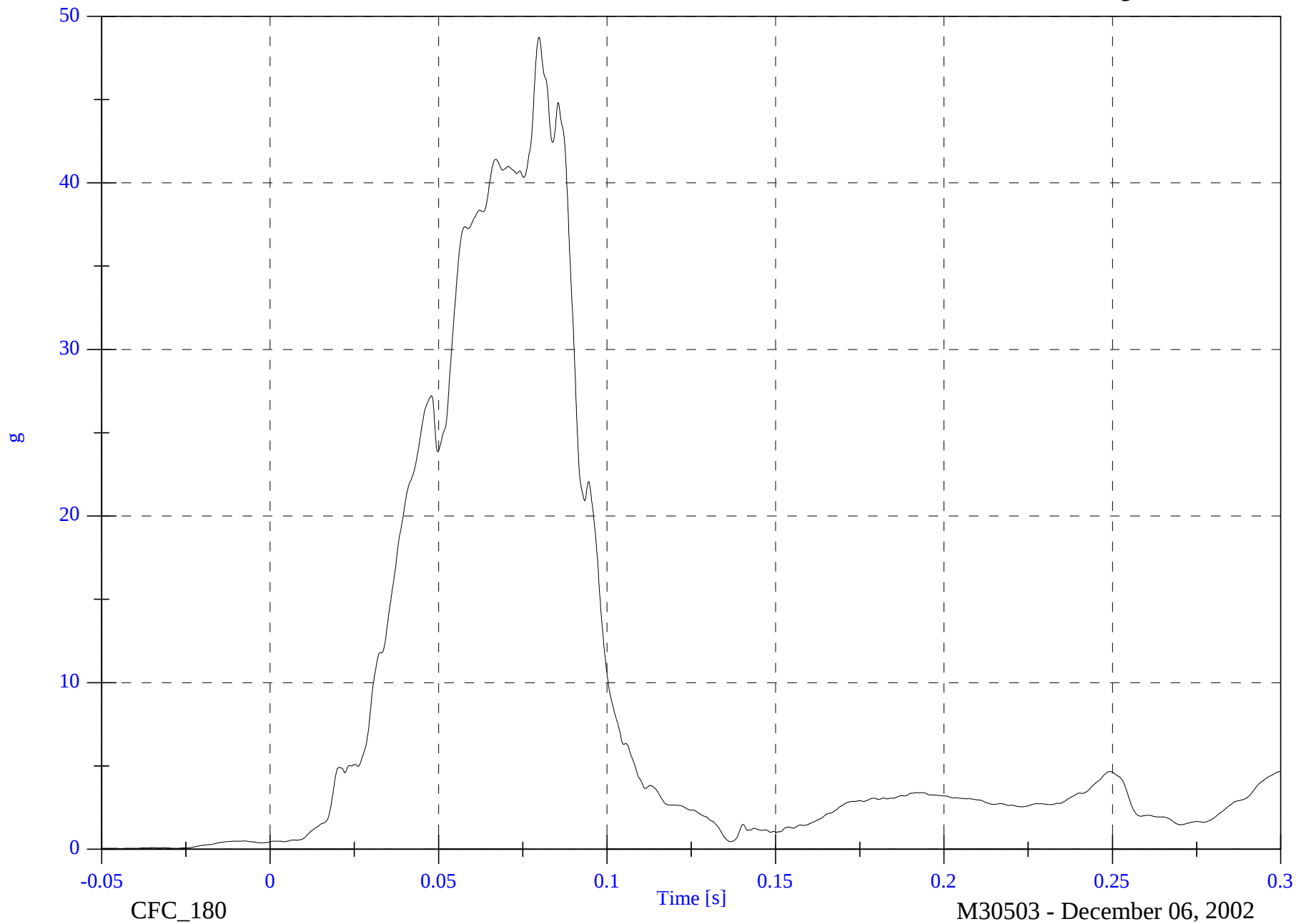
V1P1 Chest Red Resultant

Max: 48.7 [g] at 0.080 [s]

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

B-31

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

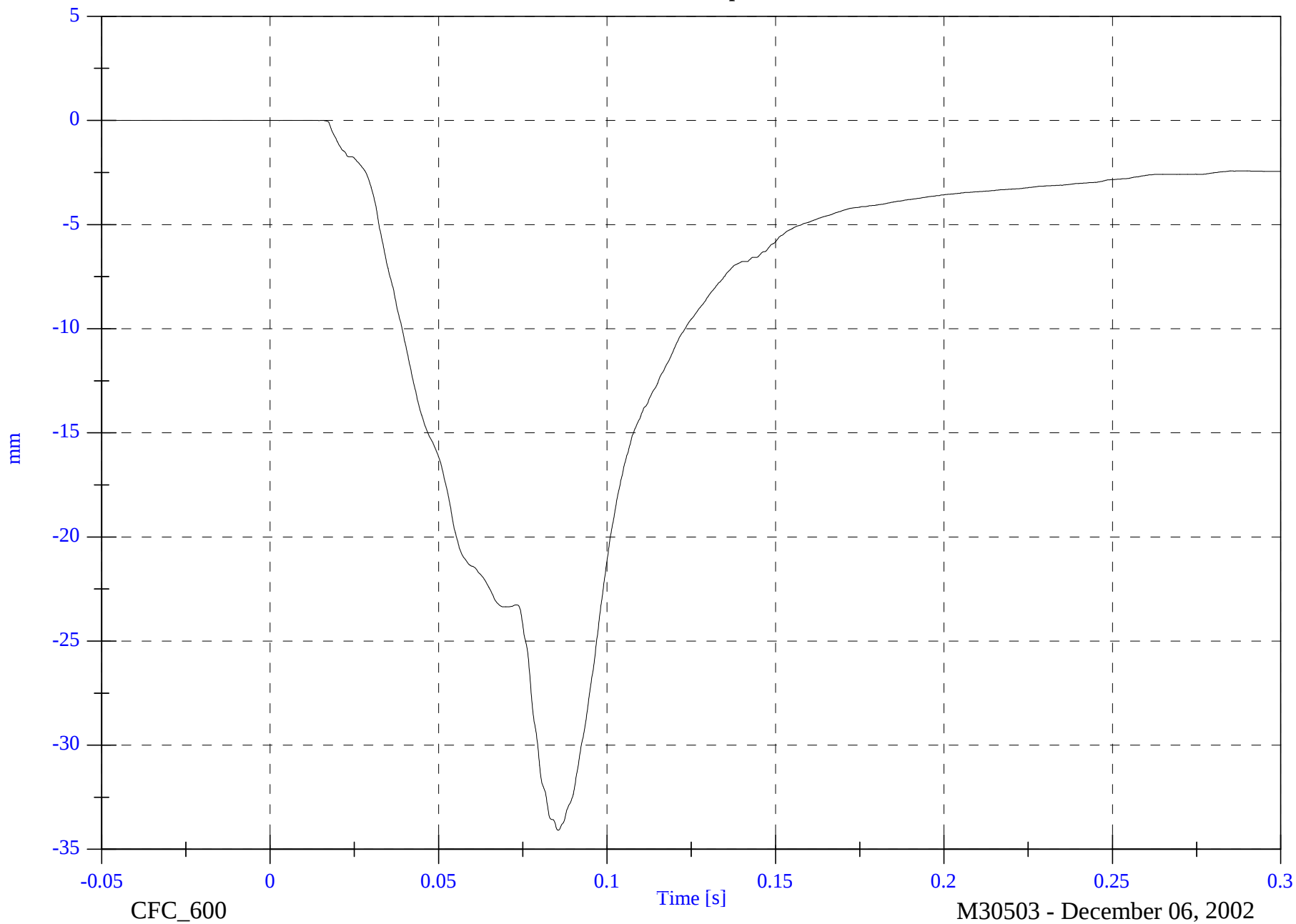
V1P1 Chest Compression x

Max: 0.0 [mm] at 0.003 [s]

Min: -34.1 [mm] at 0.086 [s]

B-32

8642-NCAP-23



CFC_600

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

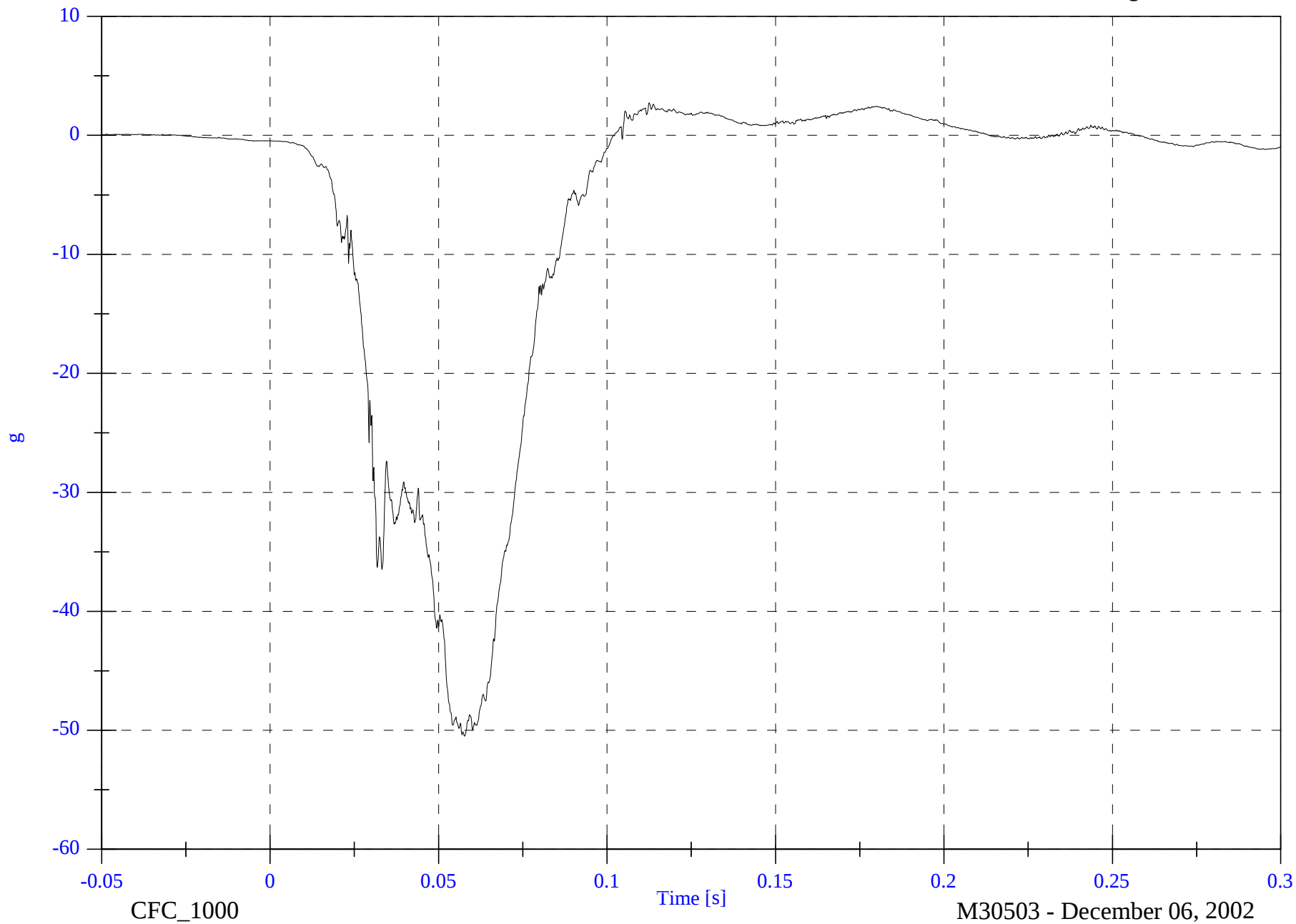
V1P1 Pelvic x

Max: 2.7 [g] at 0.112 [s]

Min: -50.5 [g] at 0.058 [s]

B-33

8642-NCAP-23

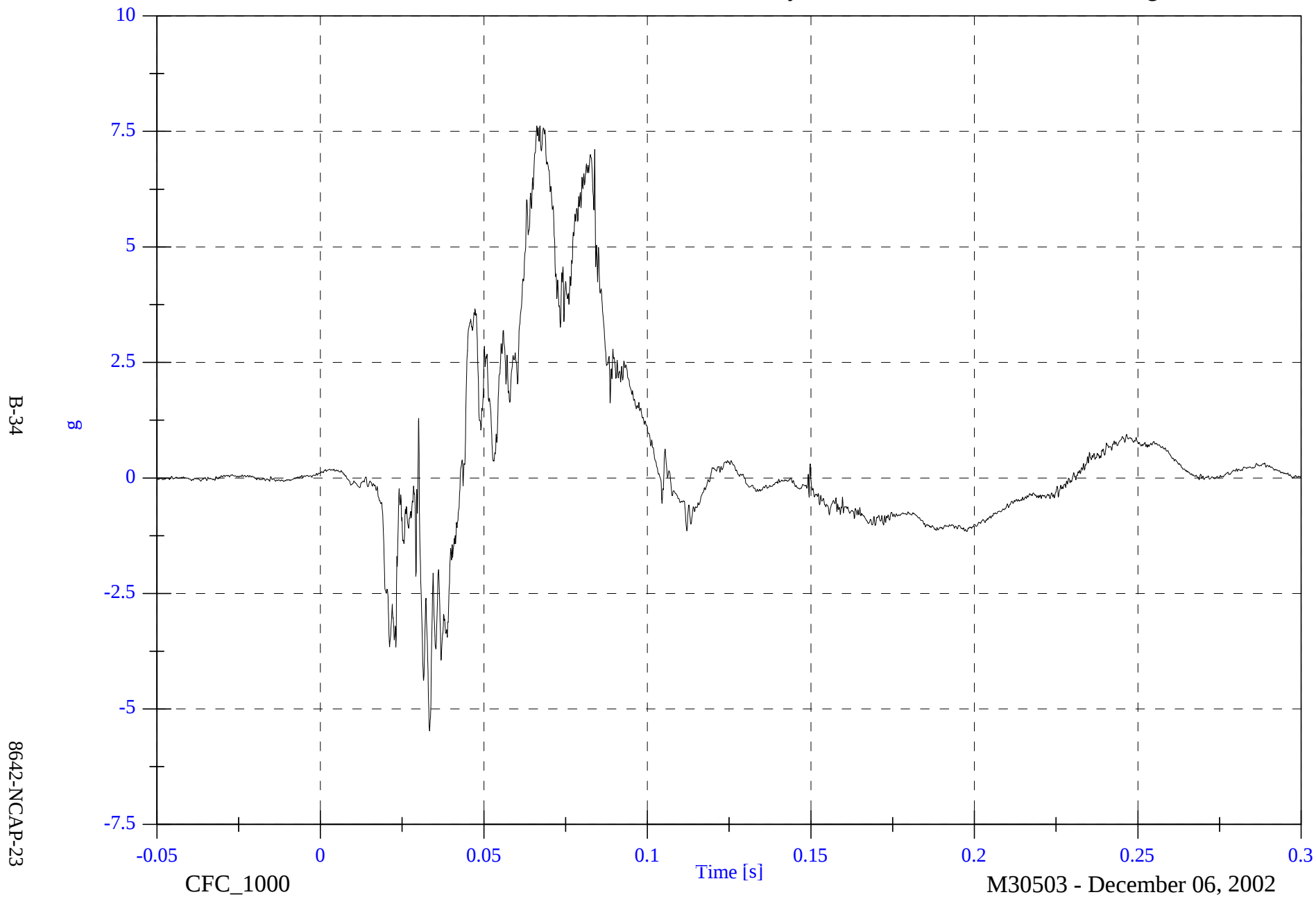


NCAP Test #1 2003 BMW Z4

V1P1 Pelvic y

Max: 7.6 [g] at 0.067 [s]

Min: -5.5 [g] at 0.033 [s]



NCAP Test #1 2003 BMW Z4

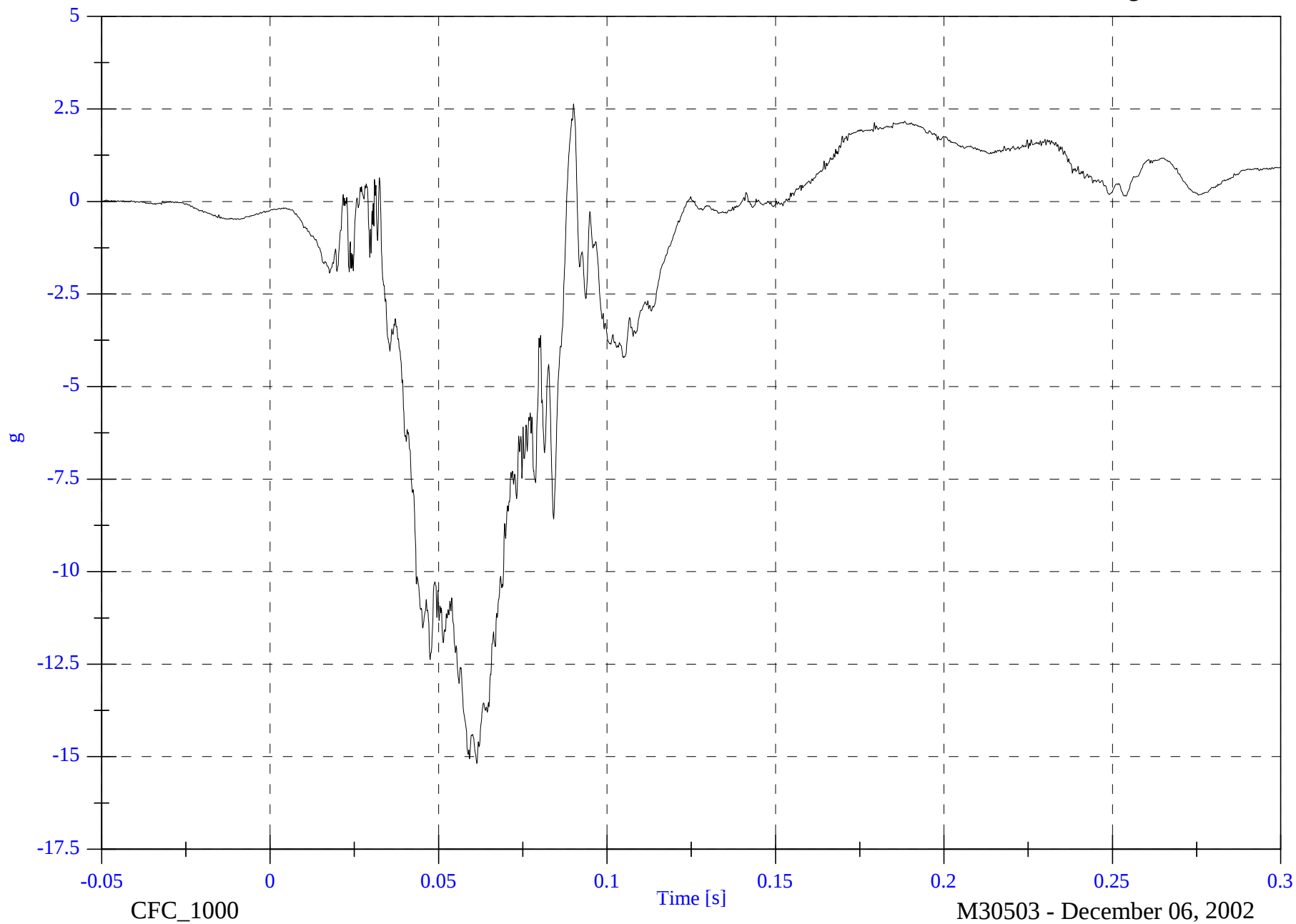
V1P1 Pelvic z

Max: 2.6 [g] at 0.090 [s]

Min: -15.2 [g] at 0.061 [s]

B-35

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

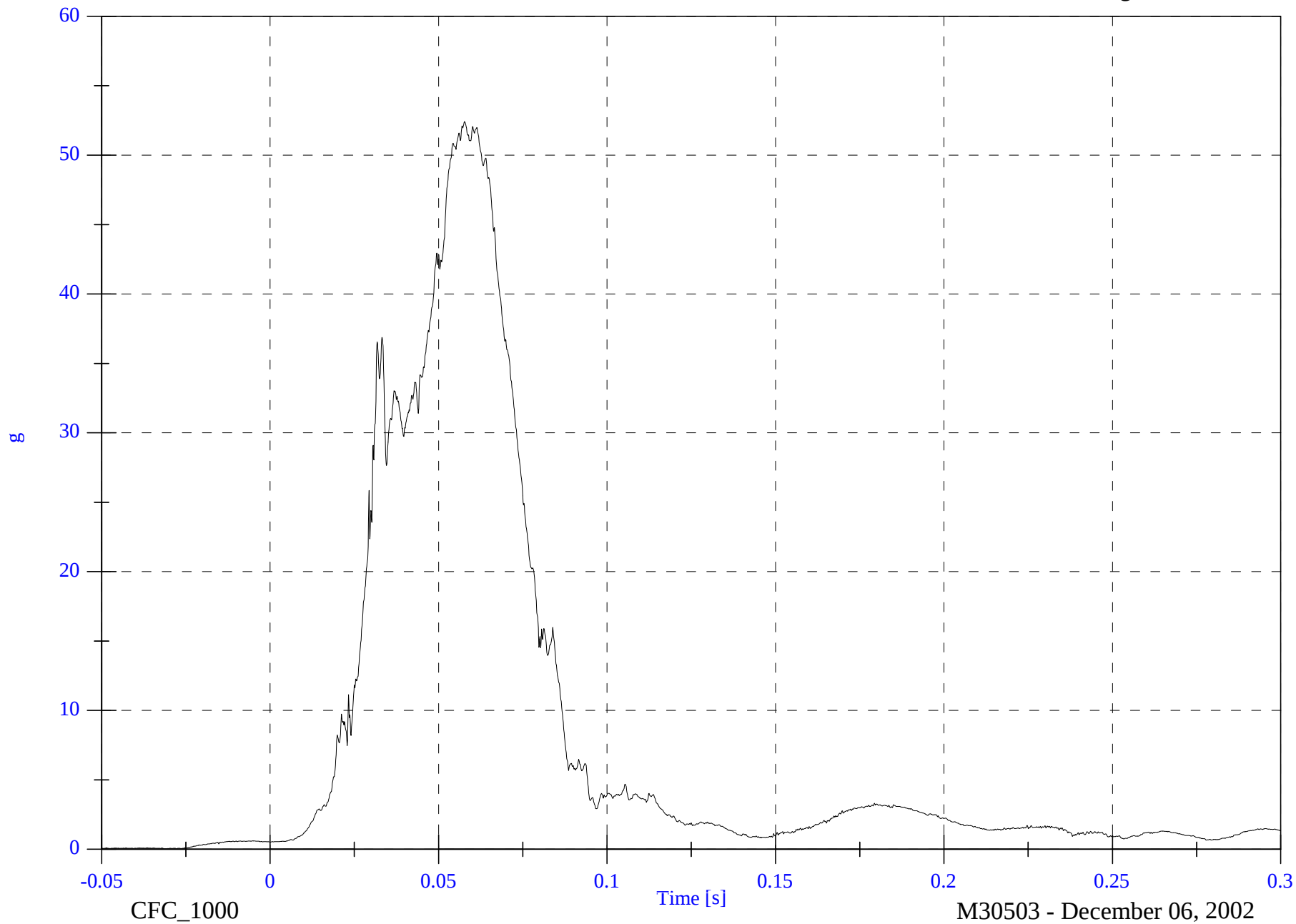
V1P1 Pelvic Resultant

Max: 52.4 [g] at 0.058 [s]

Min: 0.0 [g] at -0.028 [s]

B-36

8642-NCAP-23

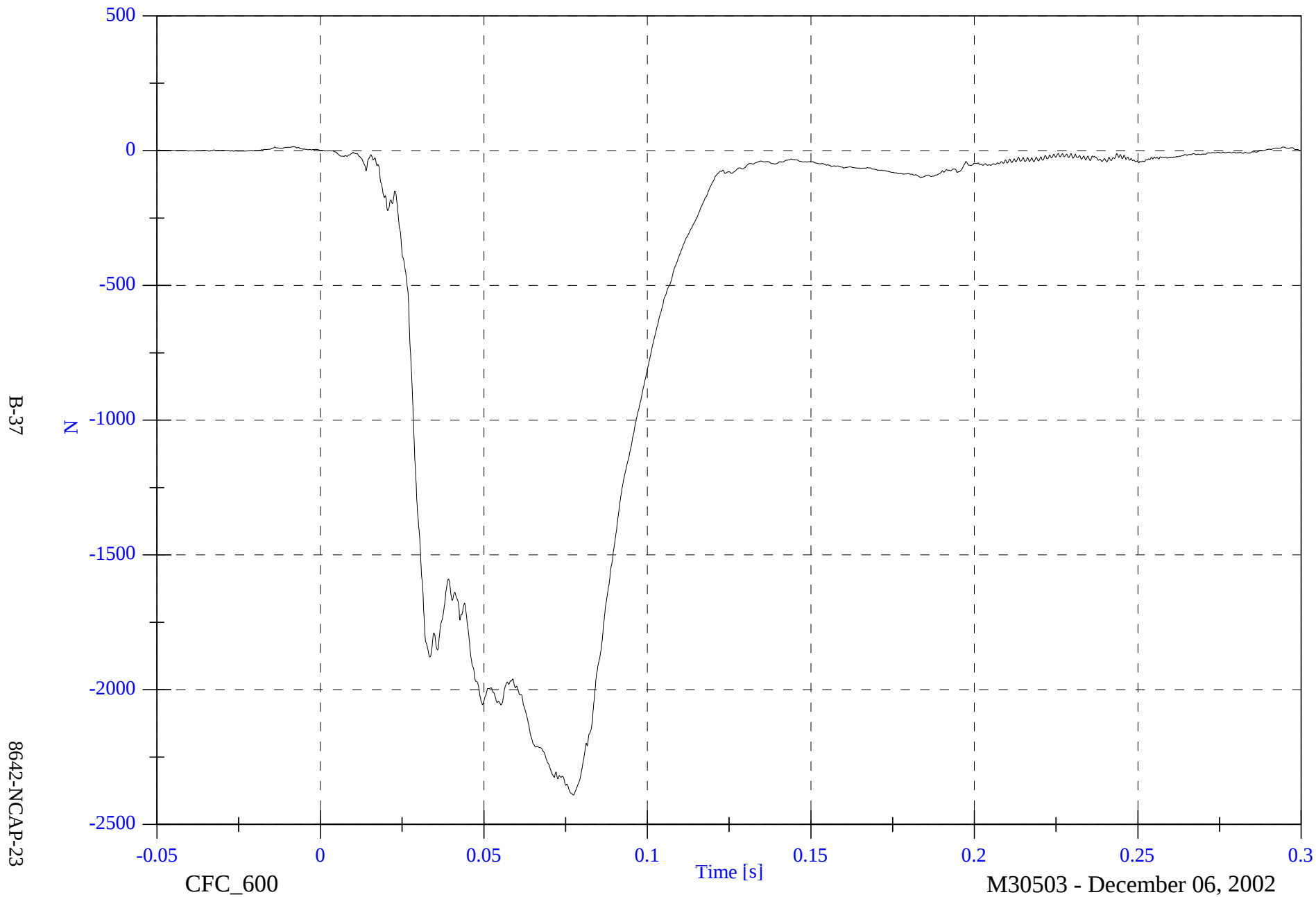


NCAP Test #1 2003 BMW Z4

V1P1 Left Femur z

Max: 14.5 [N] at -0.008 [s]

Min: -2391.1 [N] at 0.077 [s]

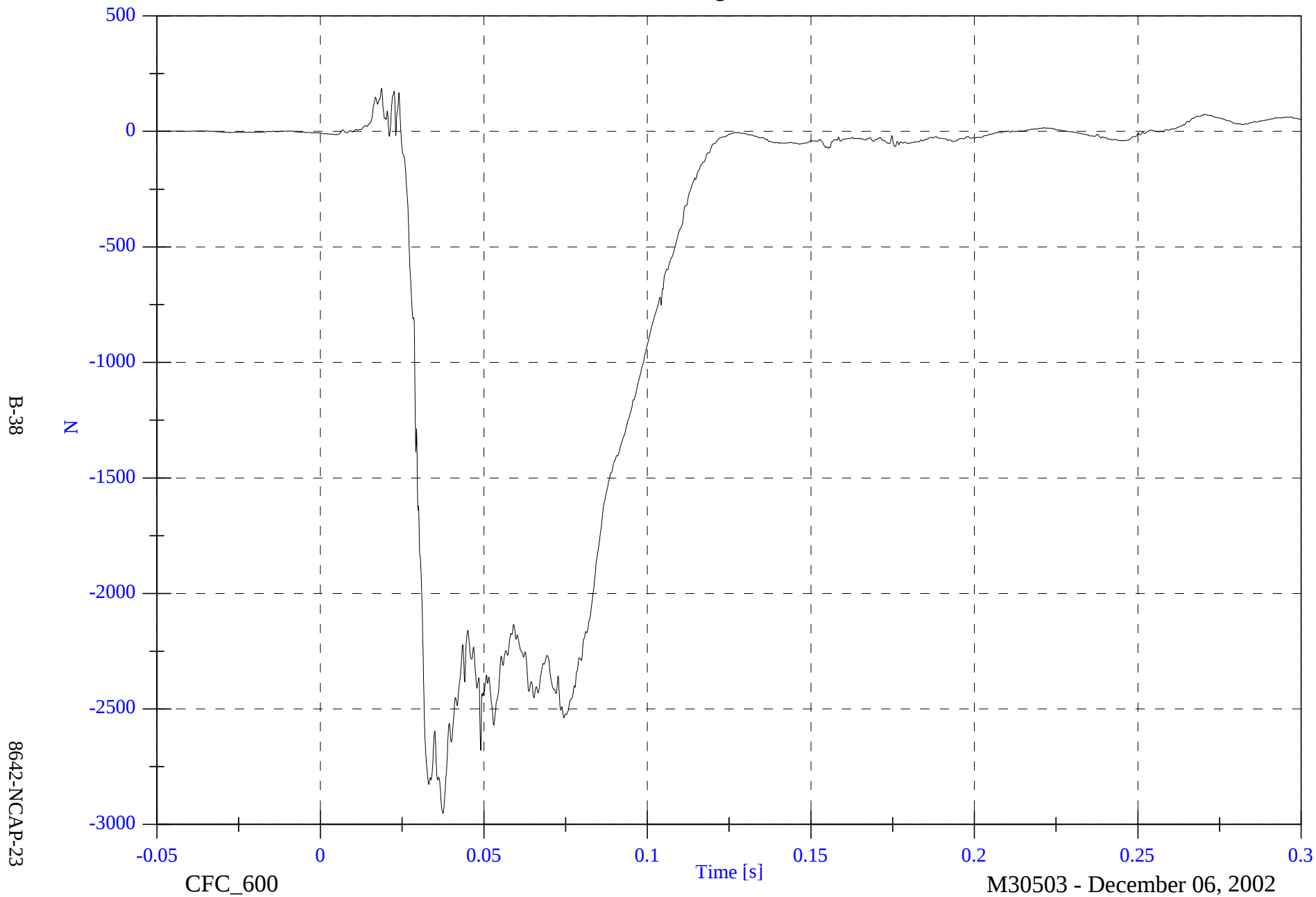


NCAP Test #1 2003 BMW Z4

V1P1 Right Femur z

Max: 185.9 [N] at 0.019 [s]

Min: -2951.7 [N] at 0.037 [s]

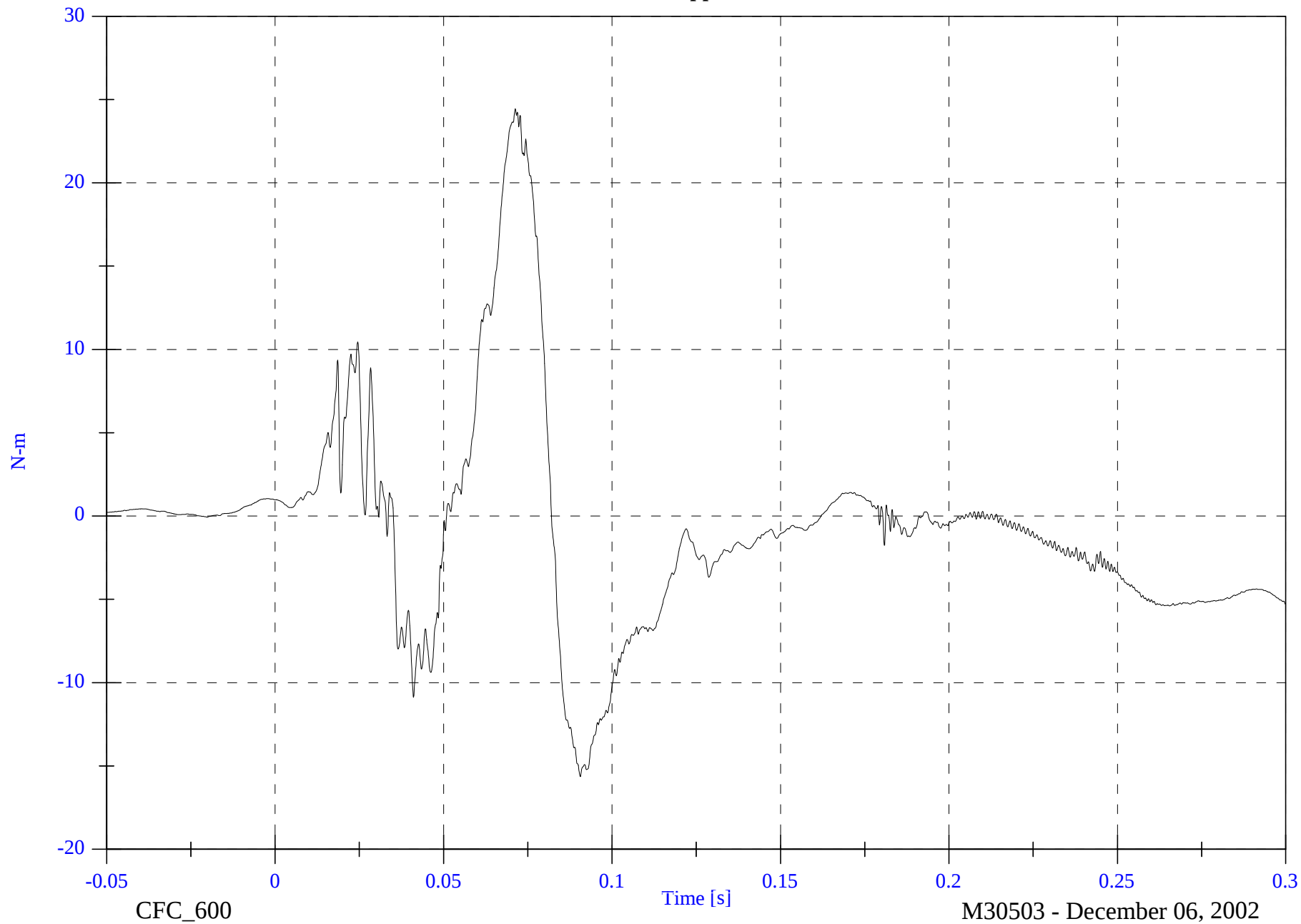


NCAP Test #1 2003 BMW Z4

V1P1 Left Upper Tibia Mx

Max: 24.5 [N-m] at 0.071 [s]

Min: -15.6 [N-m] at 0.091 [s]



B-39

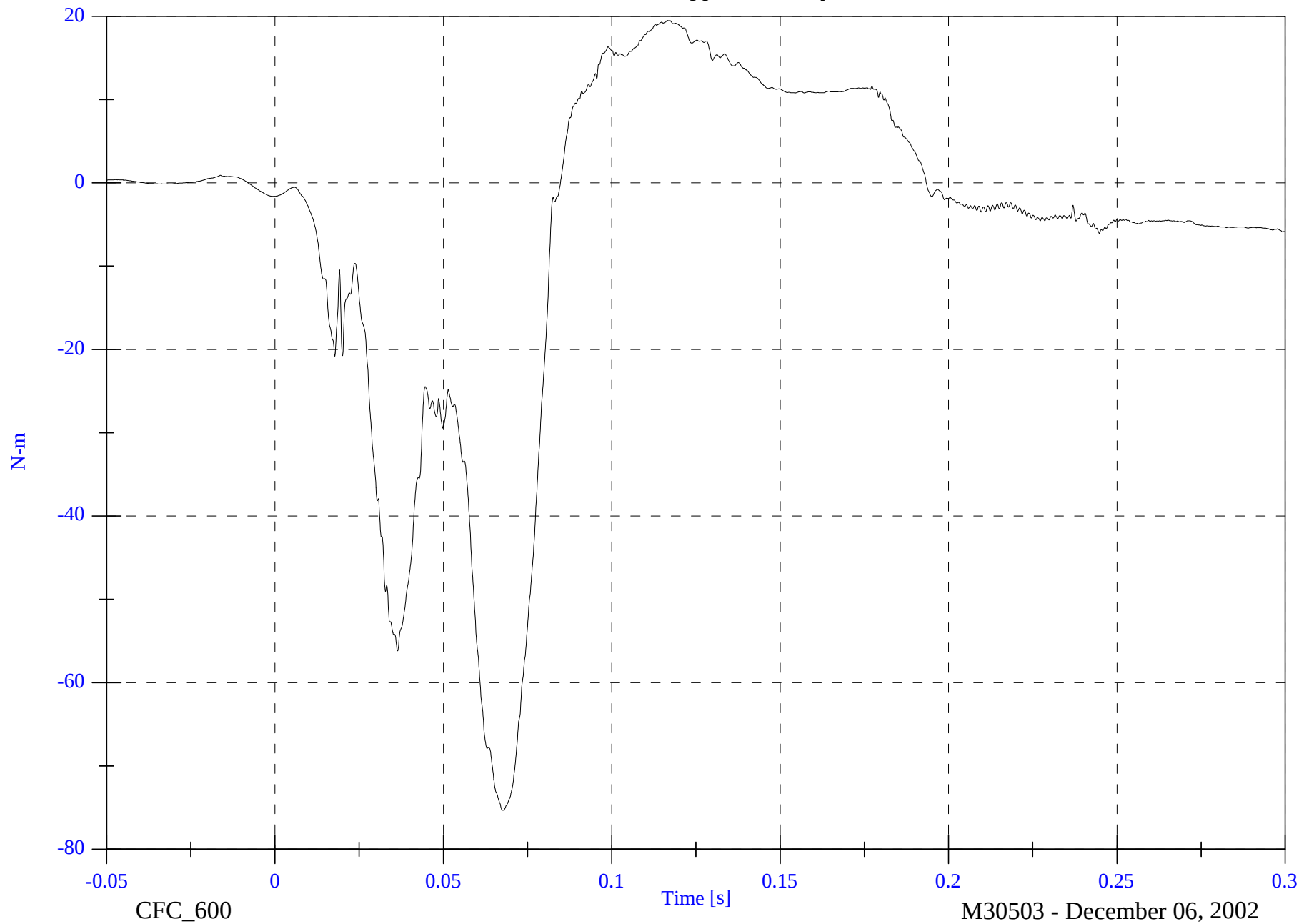
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Left Upper Tibia My

Max: 19.5 [N-m] at 0.116 [s]

Min: -75.3 [N-m] at 0.068 [s]



B-40

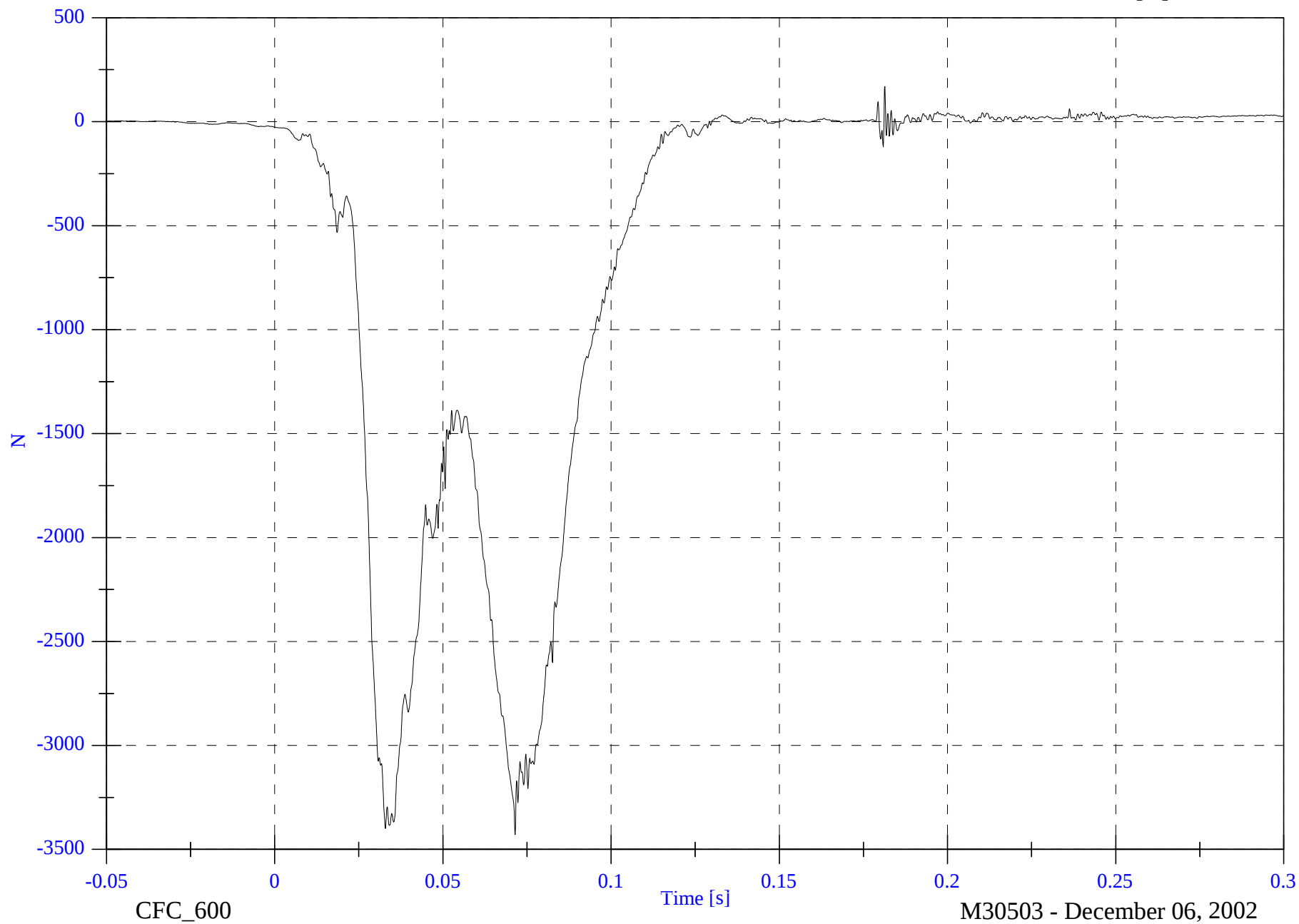
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Left Lower Tibia Fz

Max: 169.8 [N] at 0.181 [s]

Min: -3428.9 [N] at 0.072 [s]

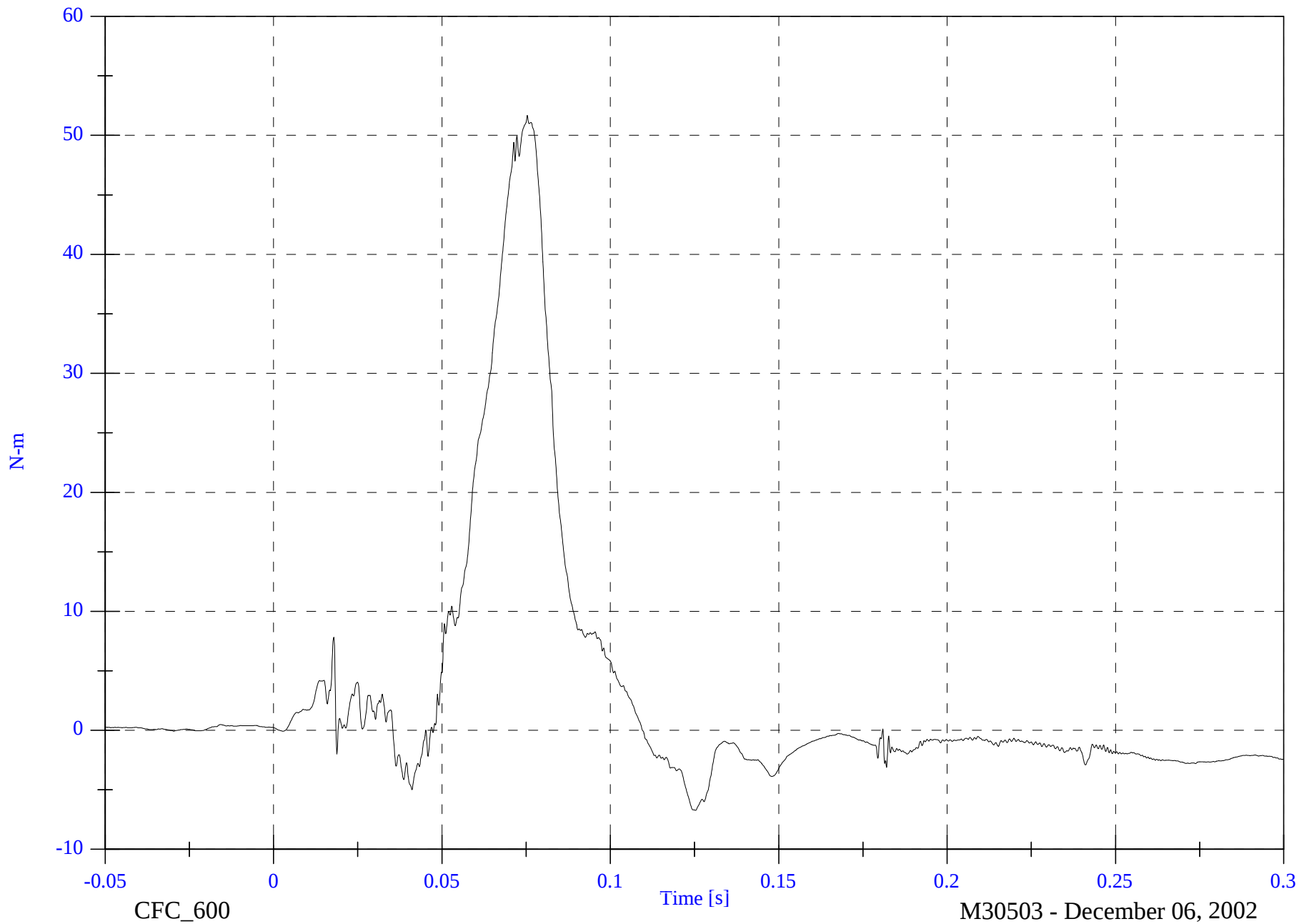


NCAP Test #1 2003 BMW Z4

V1P1 Left Lower Tibia Mx

Max: 51.7 [N-m] at 0.075 [s]

Min: -6.7 [N-m] at 0.125 [s]



B-42

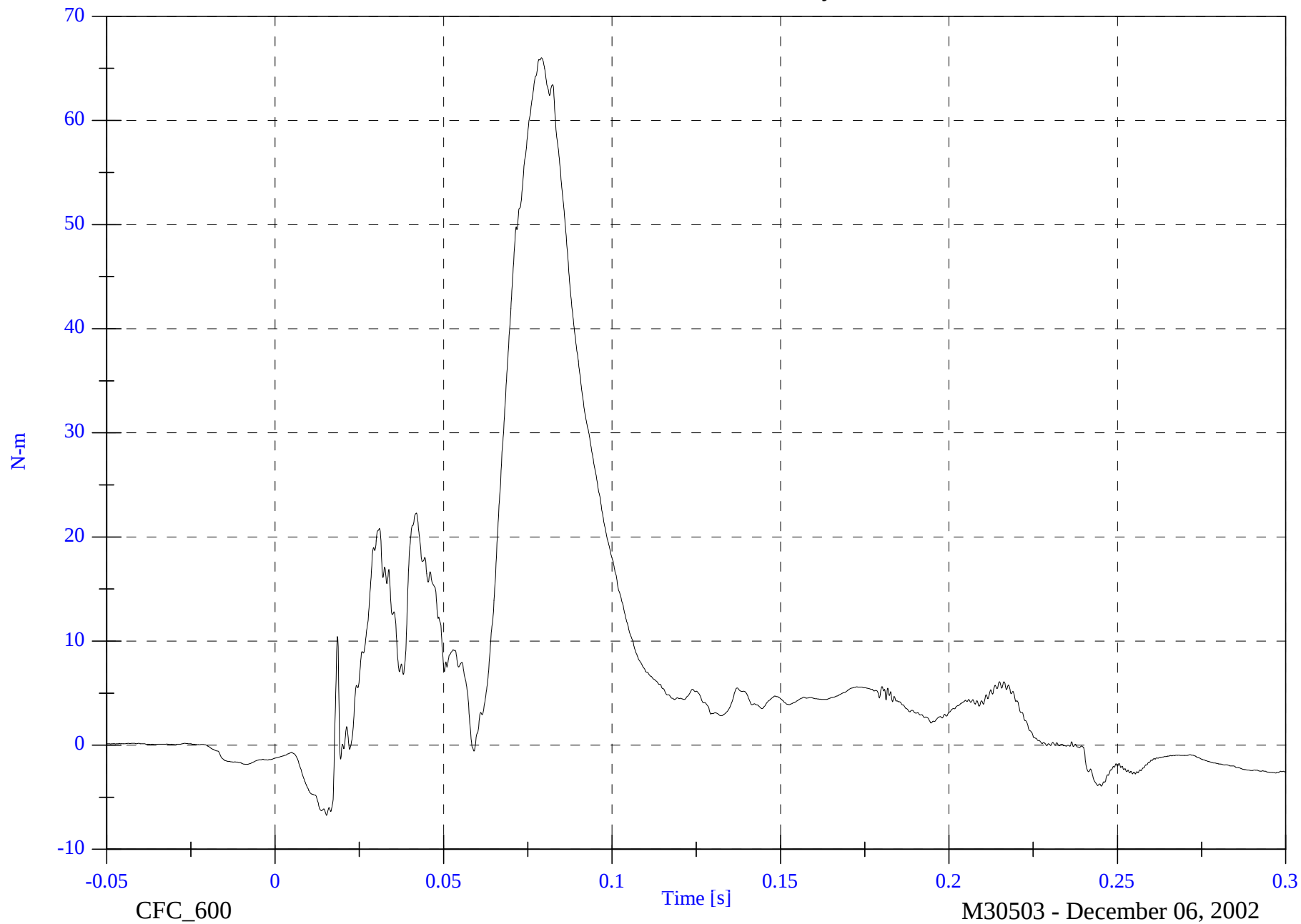
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Left Lower Tibia My

Max: 66.0 [N-m] at 0.079 [s]

Min: -6.7 [N-m] at 0.015 [s]



B-43

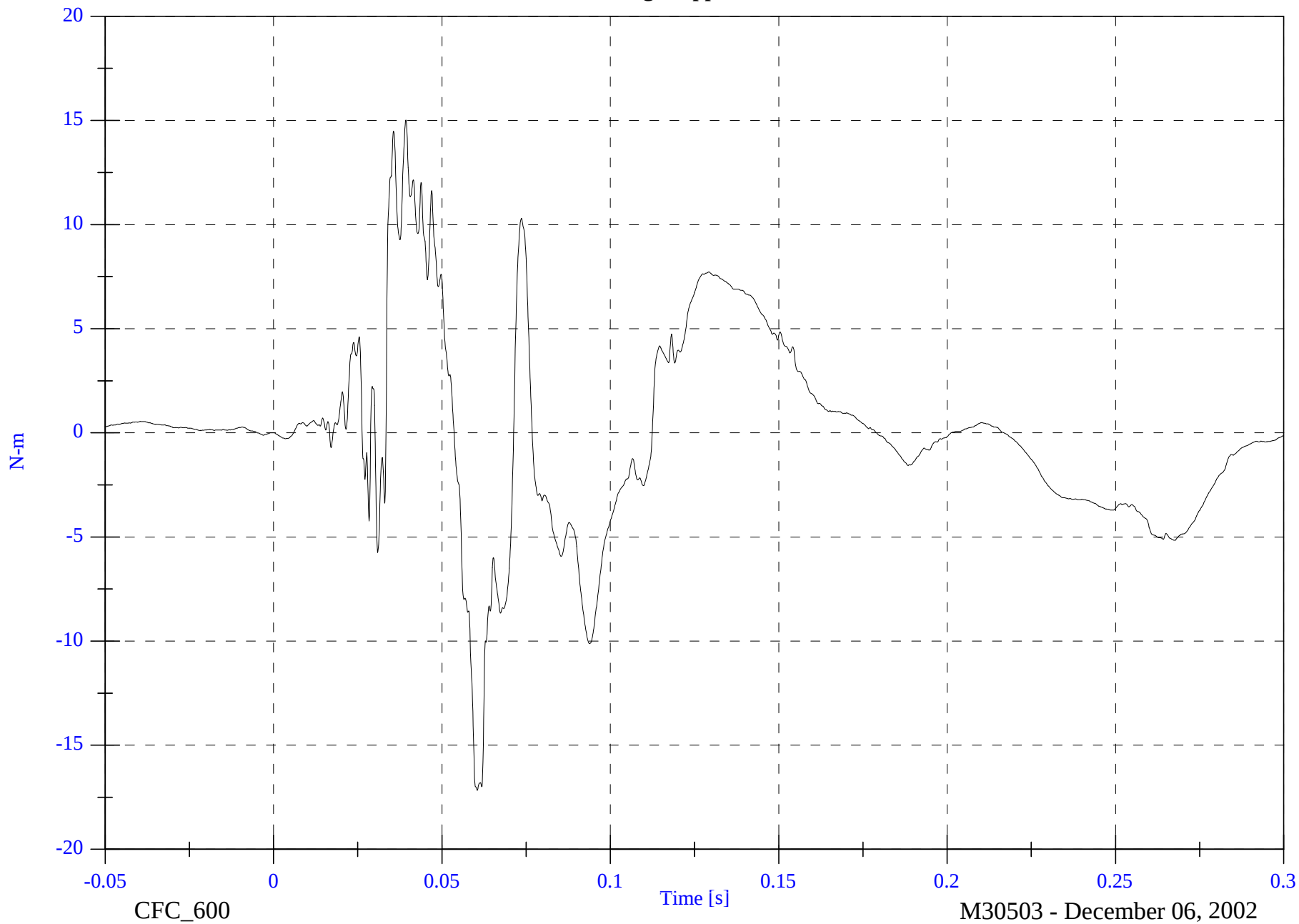
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Right upper Tibia Mx

Max: 15.0 [N-m] at 0.039 [s]

Min: -17.2 [N-m] at 0.060 [s]



B-44

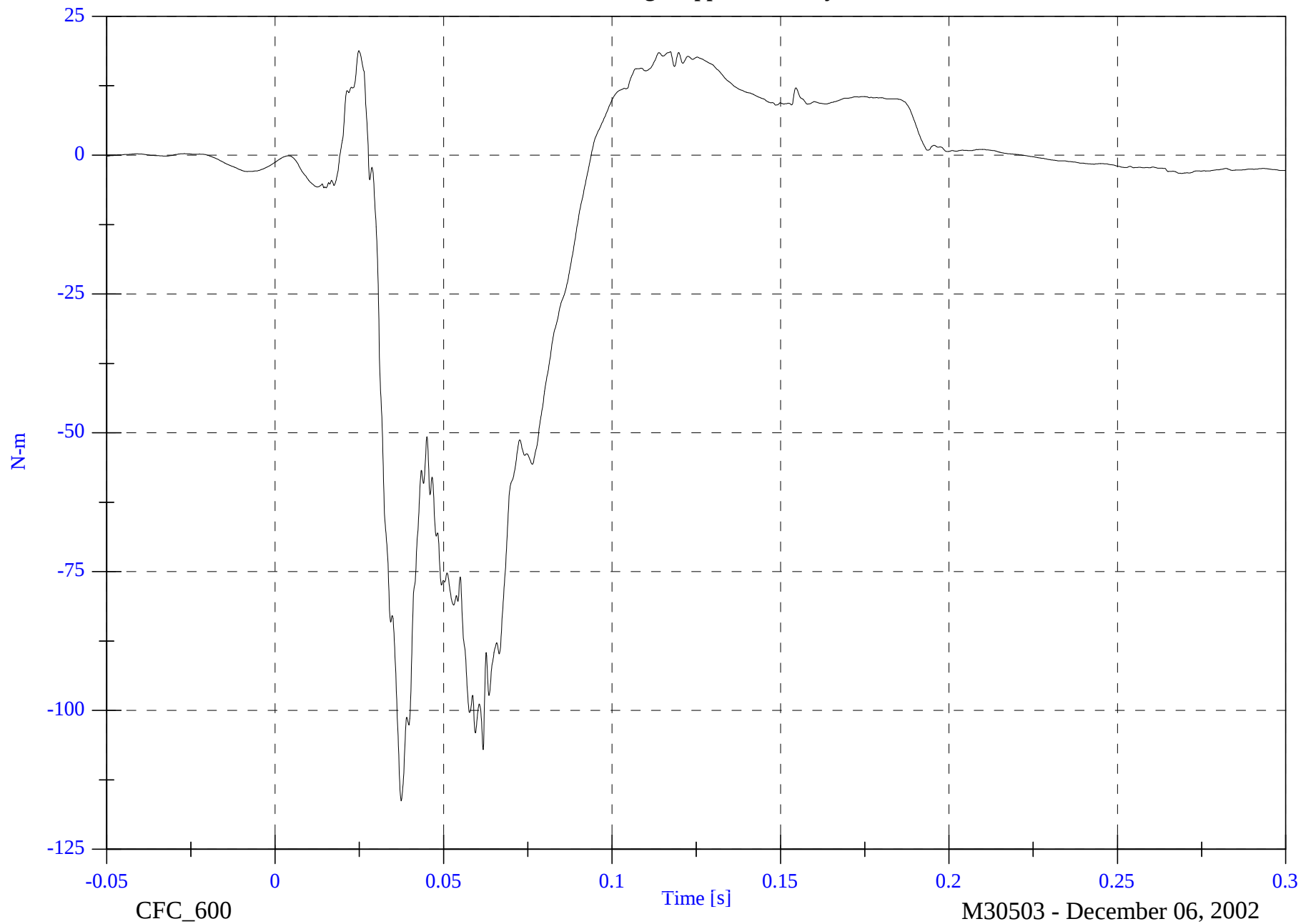
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Right upper Tibia My

Max: 18.8 [N-m] at 0.025 [s]

Min: -116.3 [N-m] at 0.037 [s]



B-45

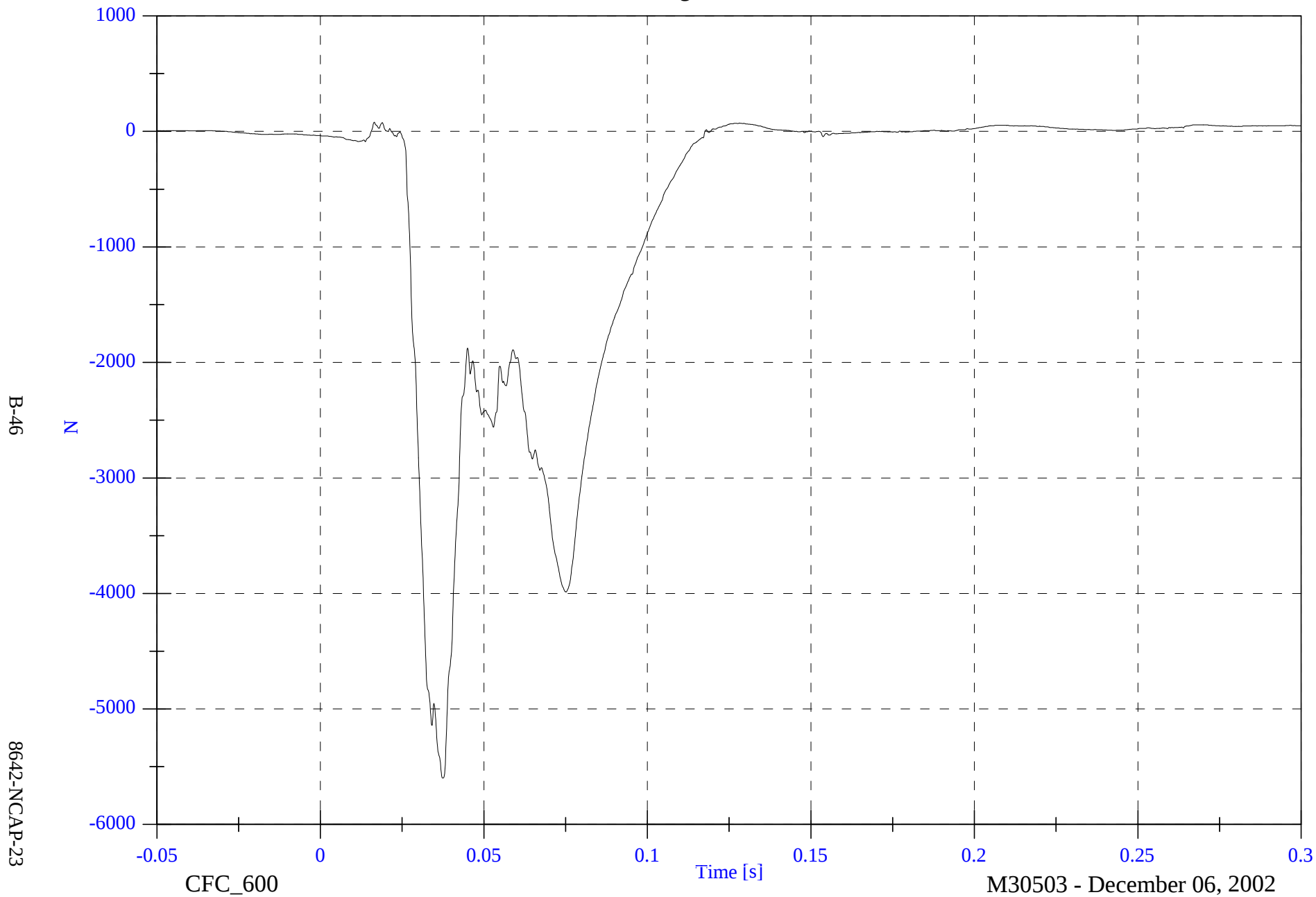
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Right Lower Tibia Fz

Max: 78.9 [N] at 0.016 [s]

Min: -5598.3 [N] at 0.037 [s]

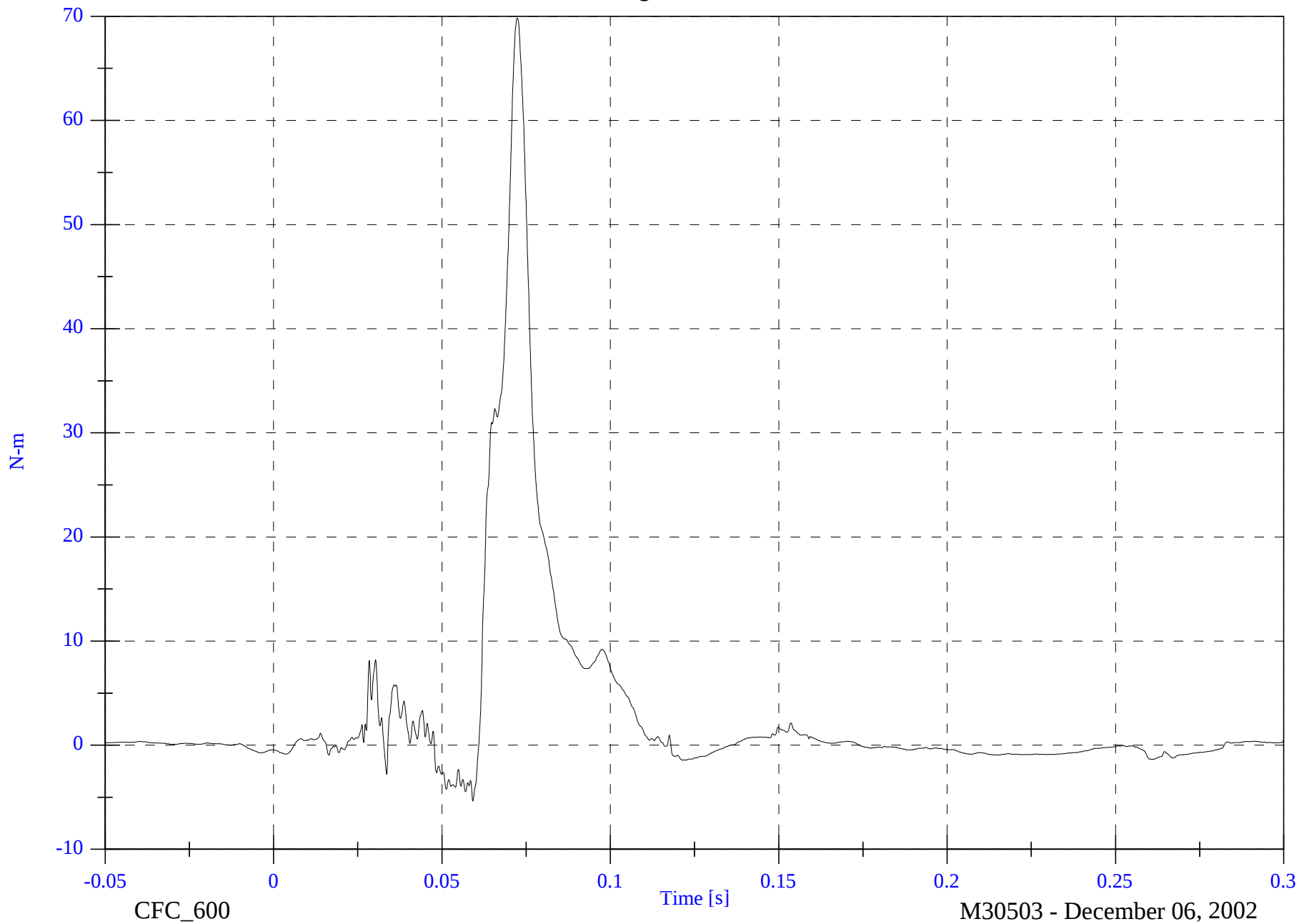


NCAP Test #1 2003 BMW Z4

V1P1 Right Lower Tibia Mx

Max: 69.8 [N-m] at 0.072 [s]

Min: -5.4 [N-m] at 0.059 [s]



B-47

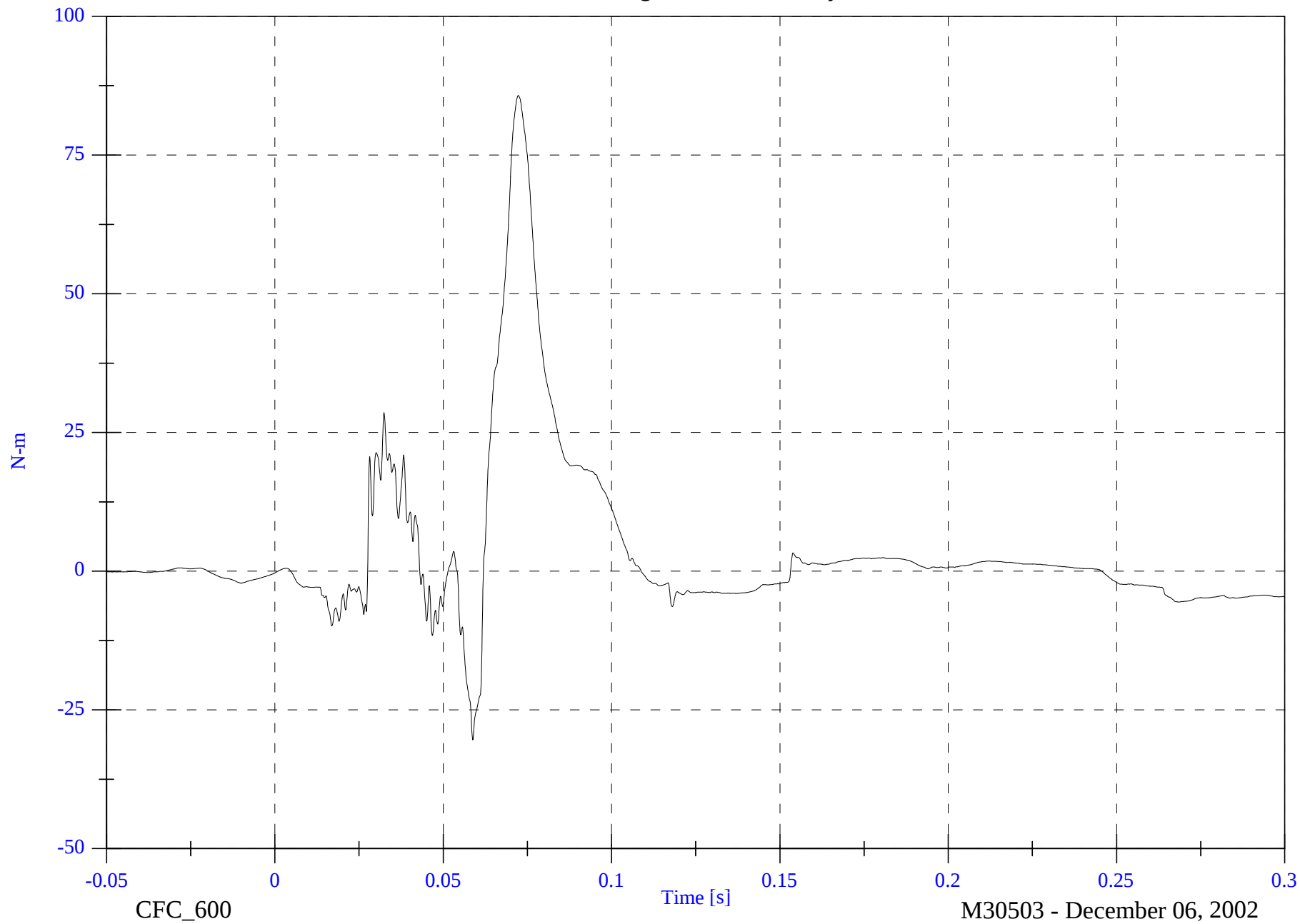
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P1 Right Lower Tibia My

Max: 85.7 [N-m] at 0.072 [s]

Min: -30.4 [N-m] at 0.059 [s]

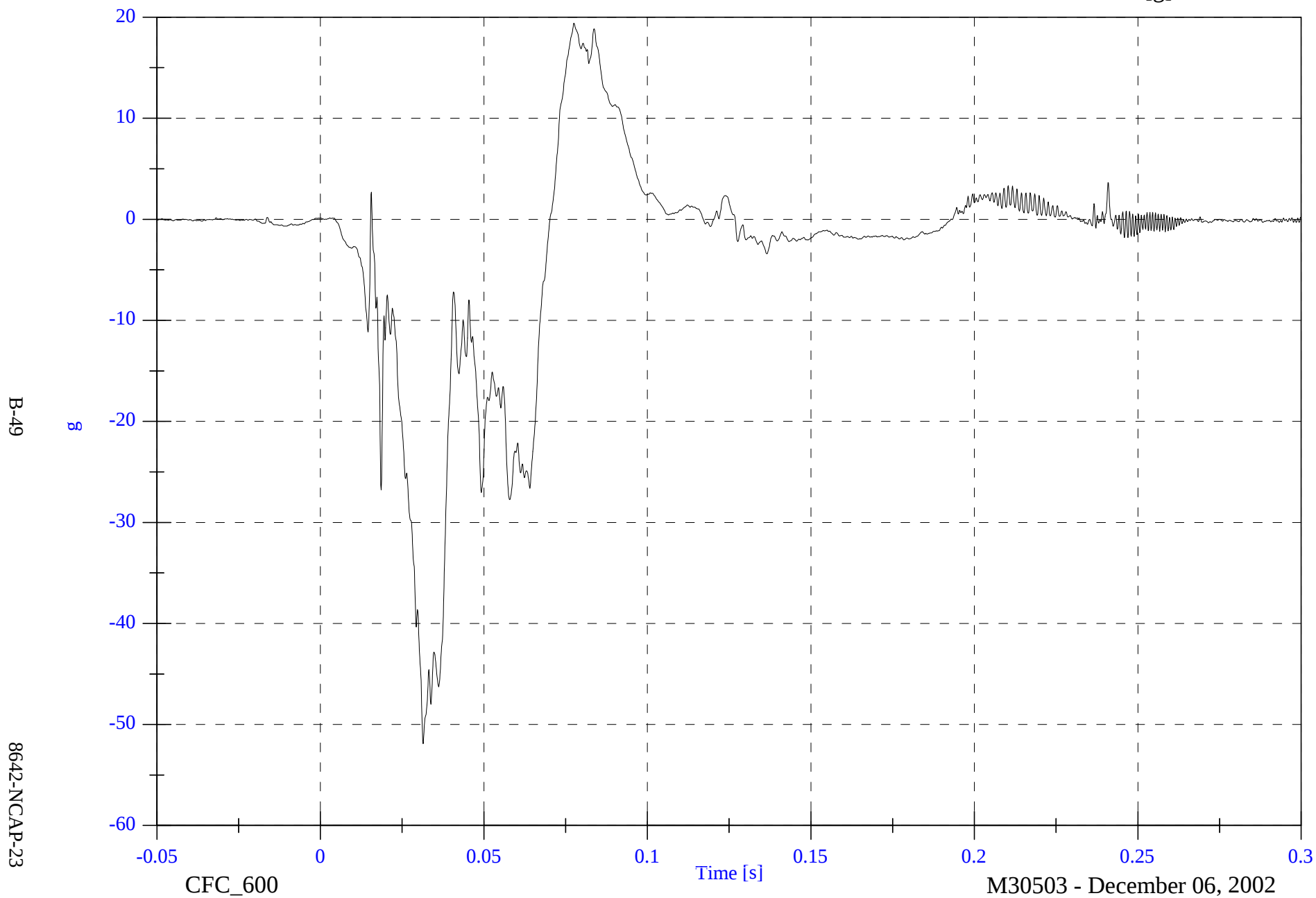


NCAP Test #1 2003 BMW Z4

Max: 19.4 [g] at 0.078 [s]

Min: -51.9 [g] at 0.031 [s]

V1P1 Left Foot Aft x



NCAP Test #1 2003 BMW Z4

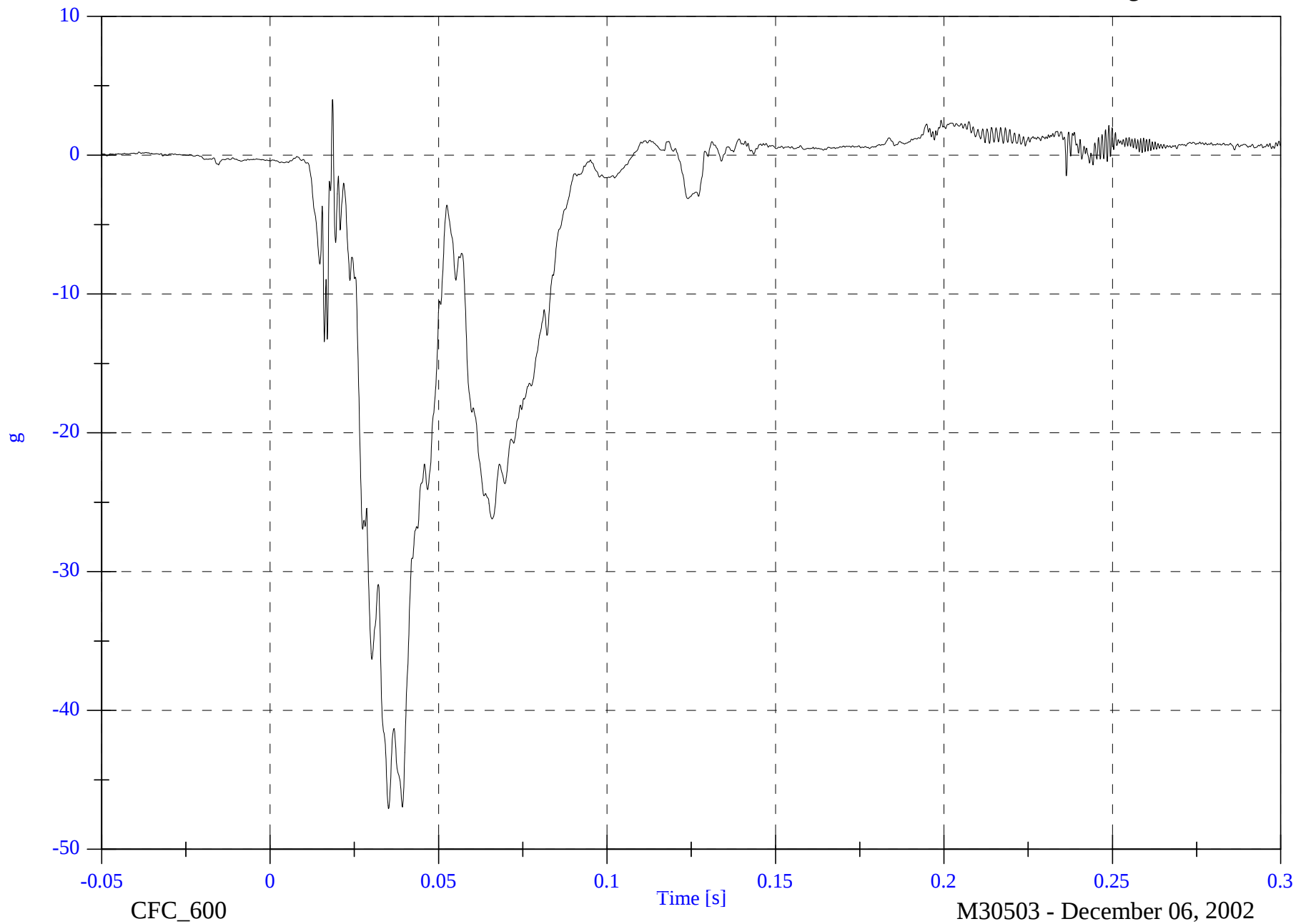
V1P1 Left Foot Aft z

Max: 4.0 [g] at 0.019 [s]

Min: -47.1 [g] at 0.035 [s]

B-50

8642-NCAP-23

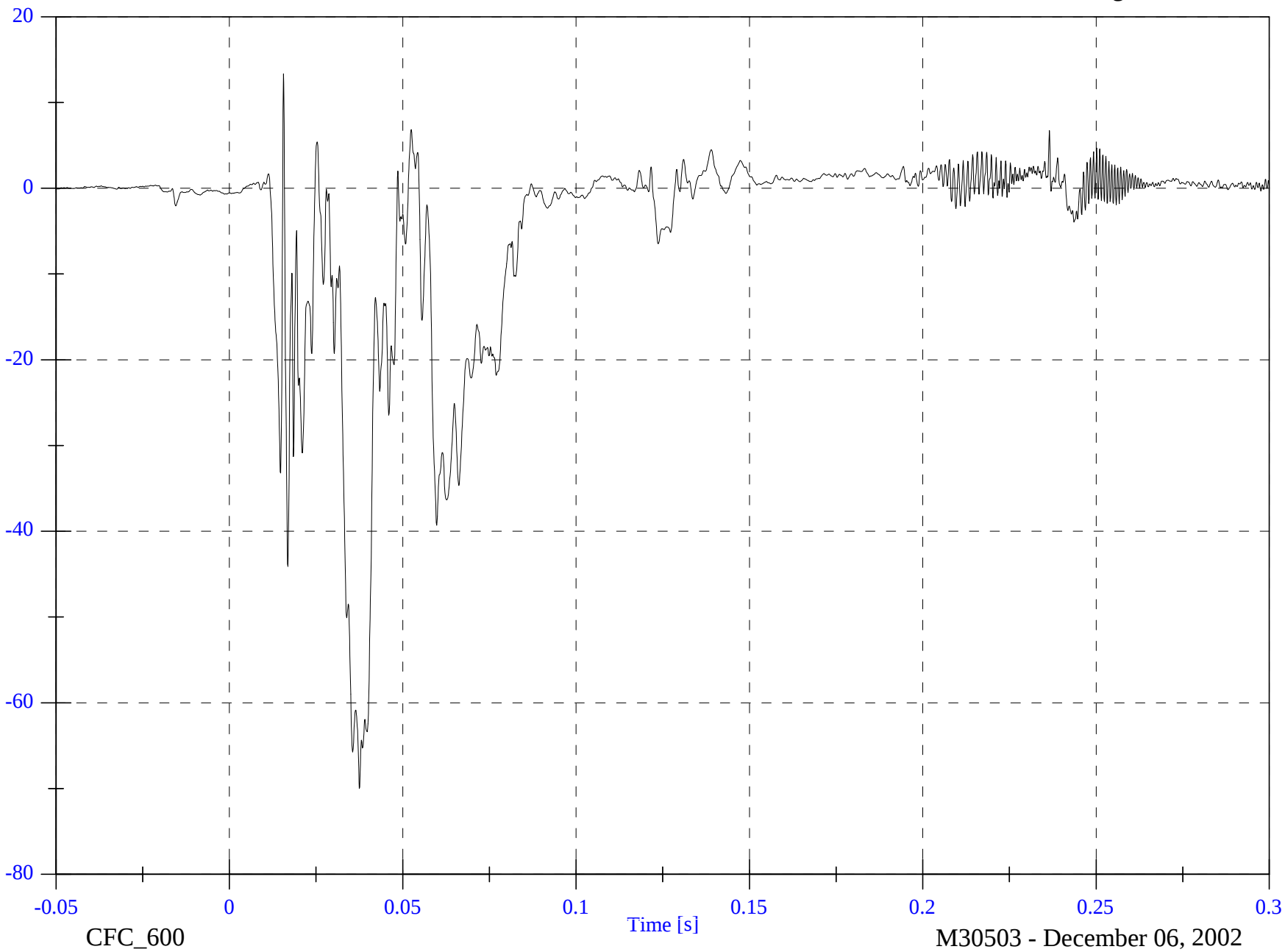


NCAP Test #1 2003 BMW Z4

V1P1 Left Foot Fore z

Max: 13.4 [g] at 0.016 [s]

Min: -70.0 [g] at 0.037 [s]



B-51

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

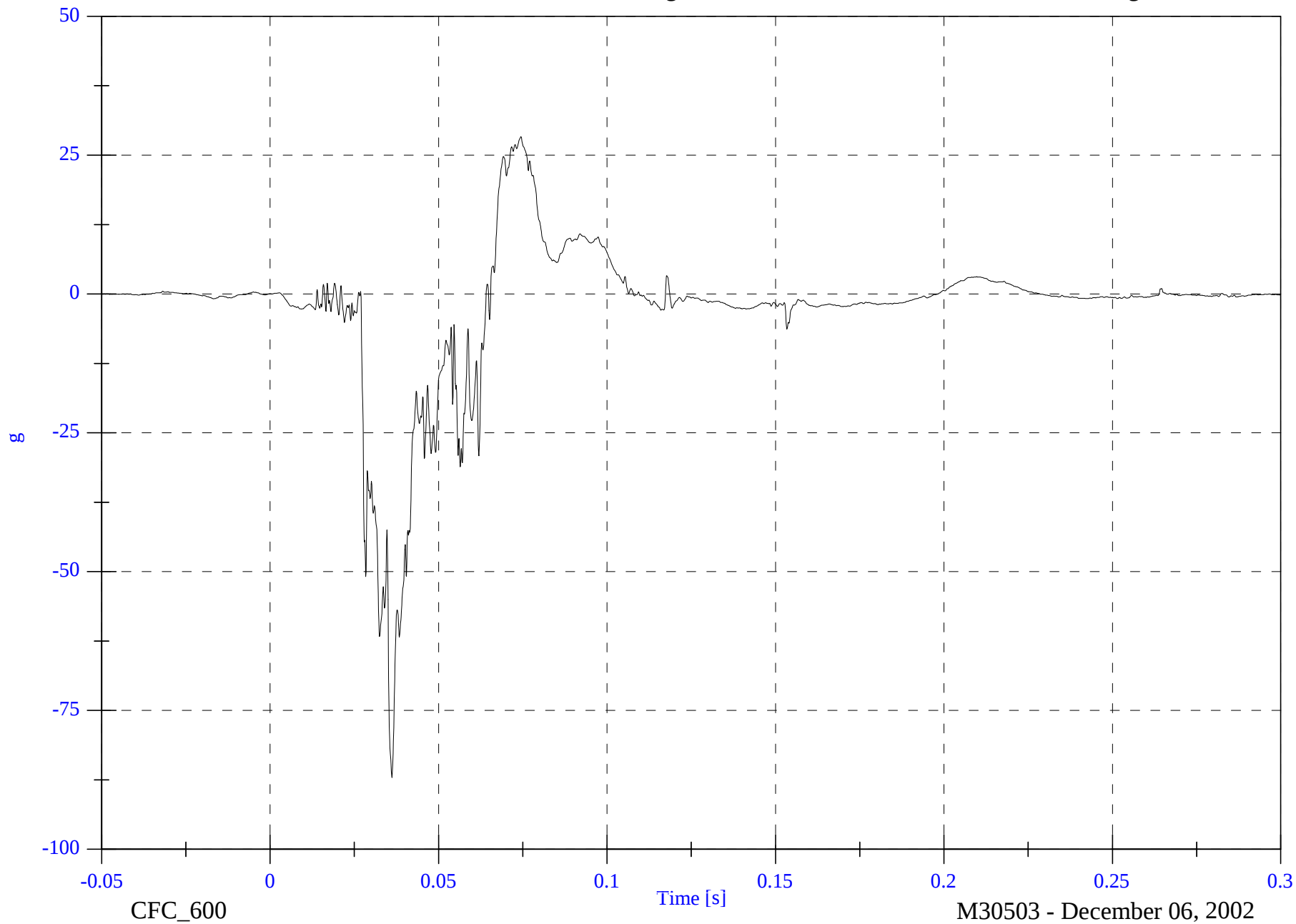
V1P1 Right Foot Aft x

Max: 28.3 [g] at 0.074 [s]

Min: -87.1 [g] at 0.036 [s]

B-52

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

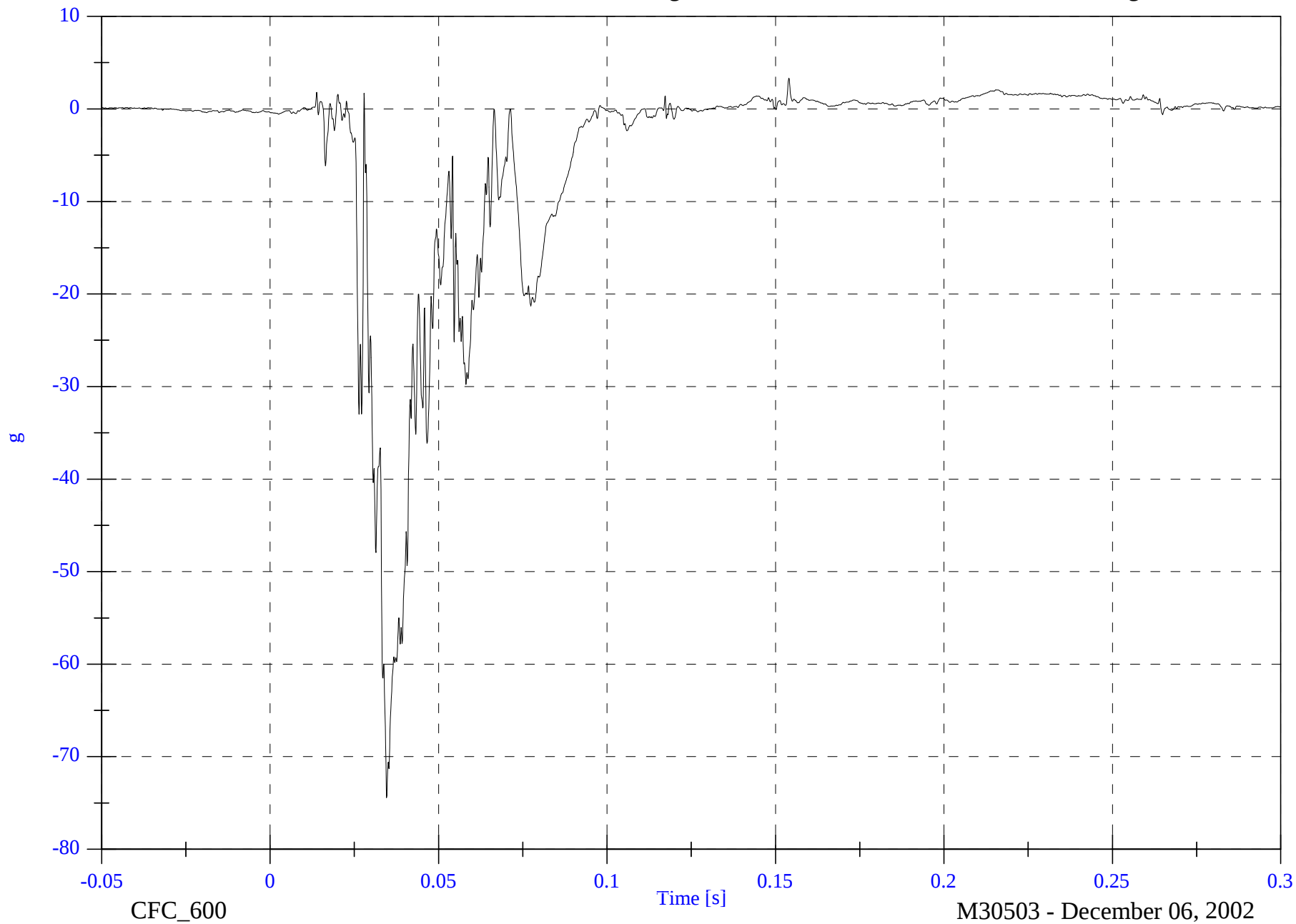
V1P1 Right foot Aft z

Max: 3.3 [g] at 0.154 [s]

Min: -74.4 [g] at 0.035 [s]

B-53

8642-NCAP-23

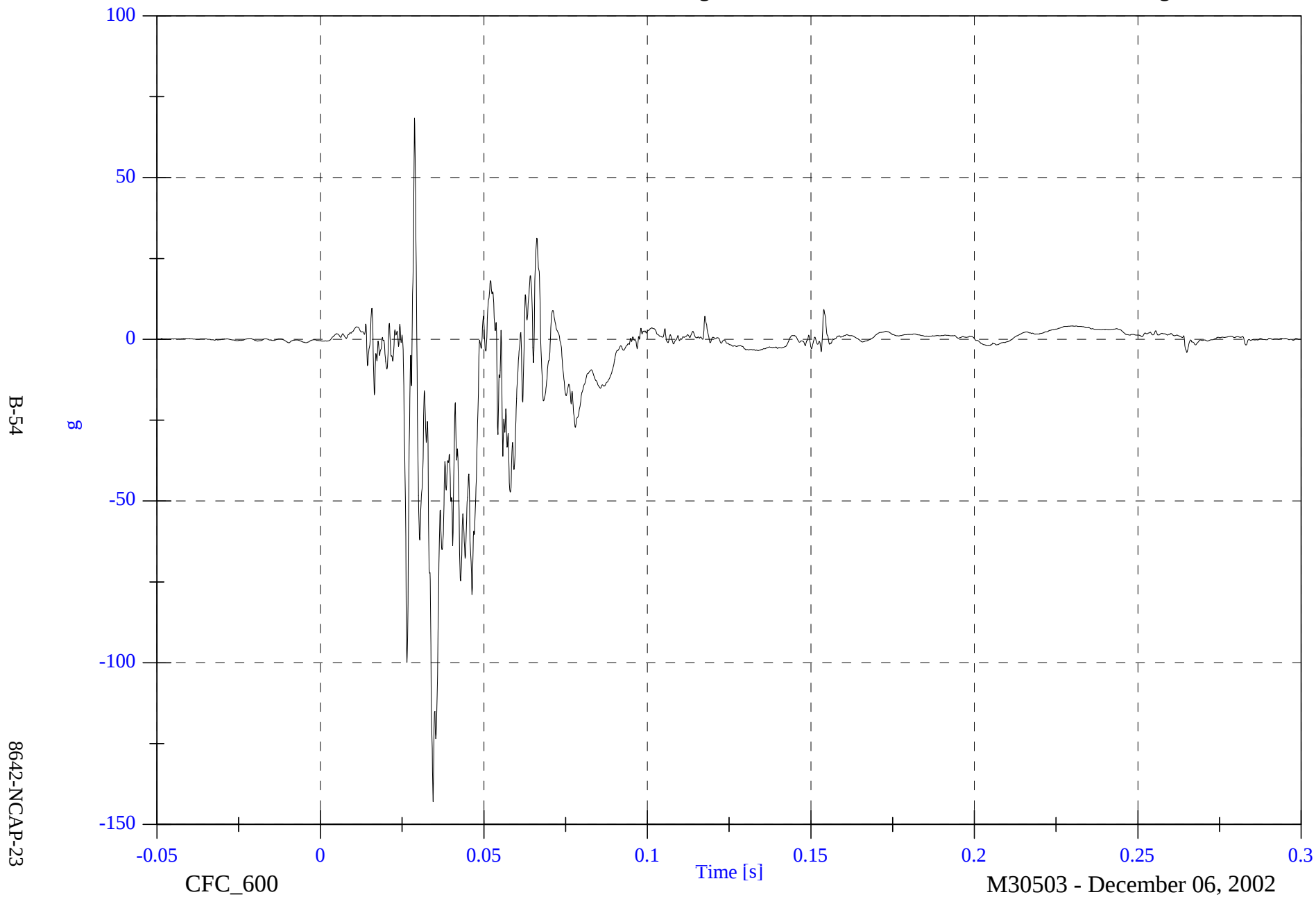


NCAP Test #1 2003 BMW Z4

V1P1 Right Foot Fore z

Max: 68.4 [g] at 0.029 [s]

Min: -143.0 [g] at 0.034 [s]

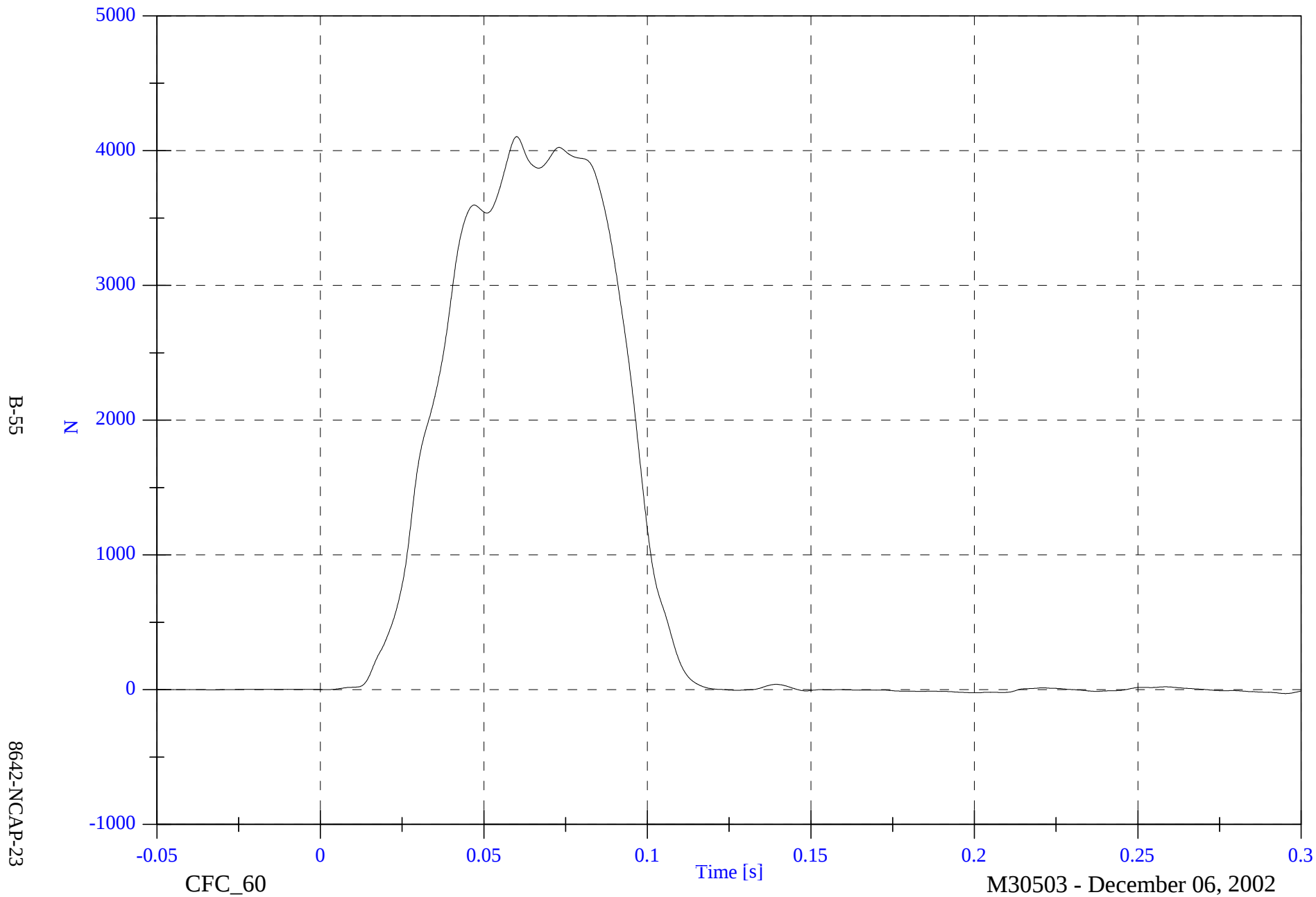


NCAP Test #1 2003 BMW Z4

V1 P1 Torso Belt

Max: 4103.3 [N] at 0.060 [s]

Min: -28.9 [N] at 0.295 [s]



NCAP Test #1 2003 BMW Z4

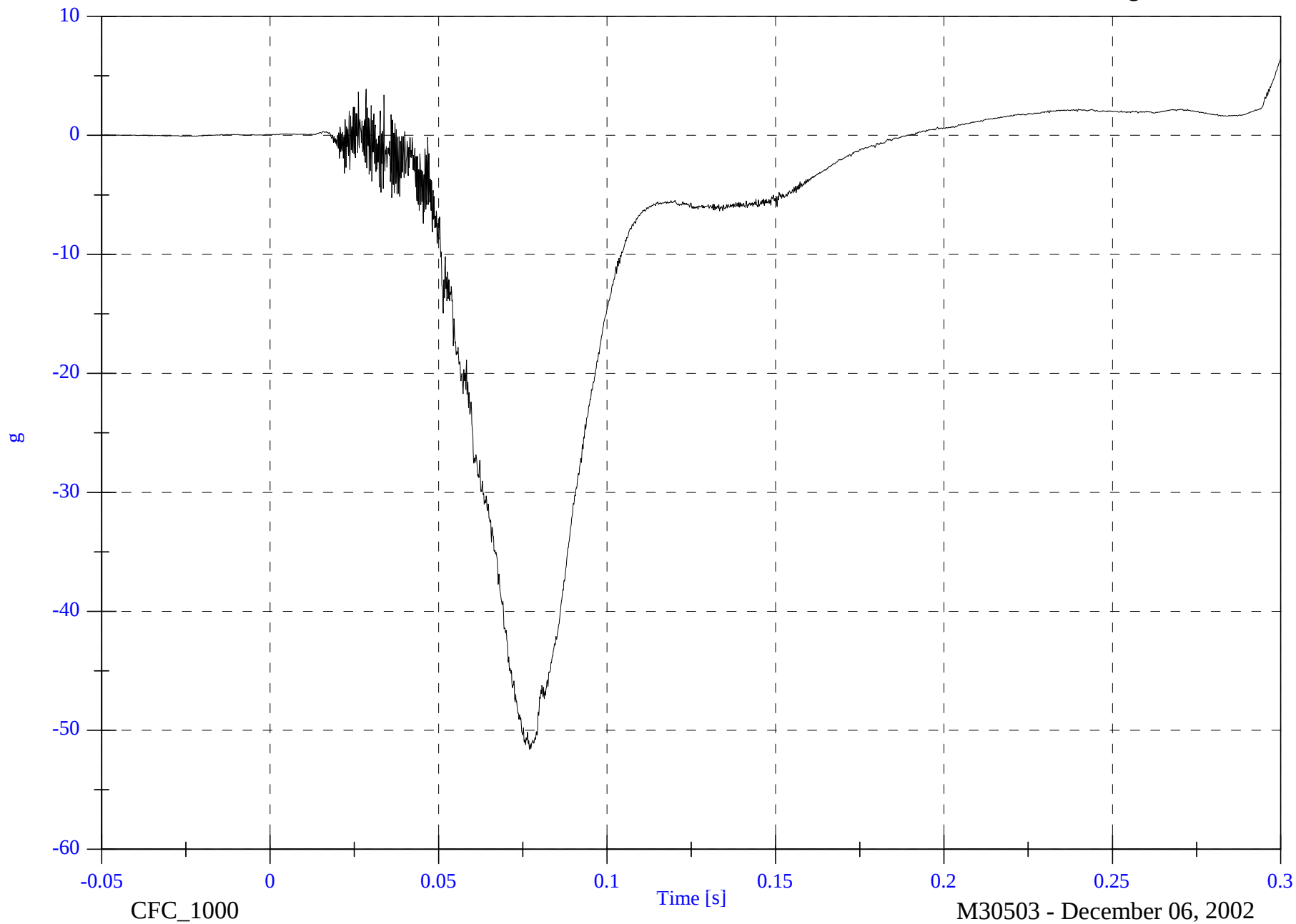
V1P2 Head CG x

Max: 6.4 [g] at 0.300 [s]

Min: -51.6 [g] at 0.077 [s]

B-56

8642-NCAP-23

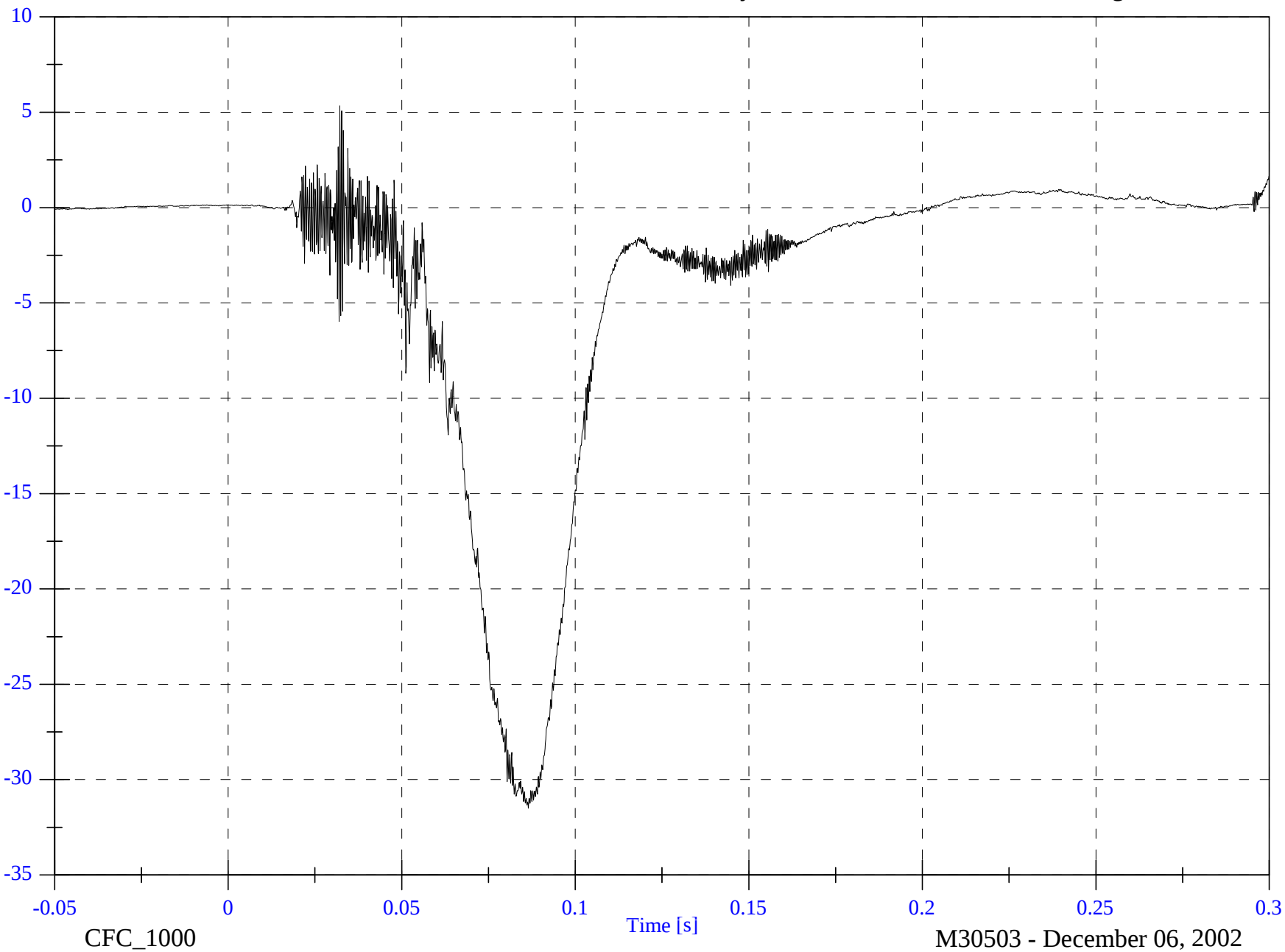


NCAP Test #1 2003 BMW Z4

V1P2 Head CG y

Max: 5.3 [g] at 0.032 [s]

Min: -31.5 [g] at 0.086 [s]



B-57

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

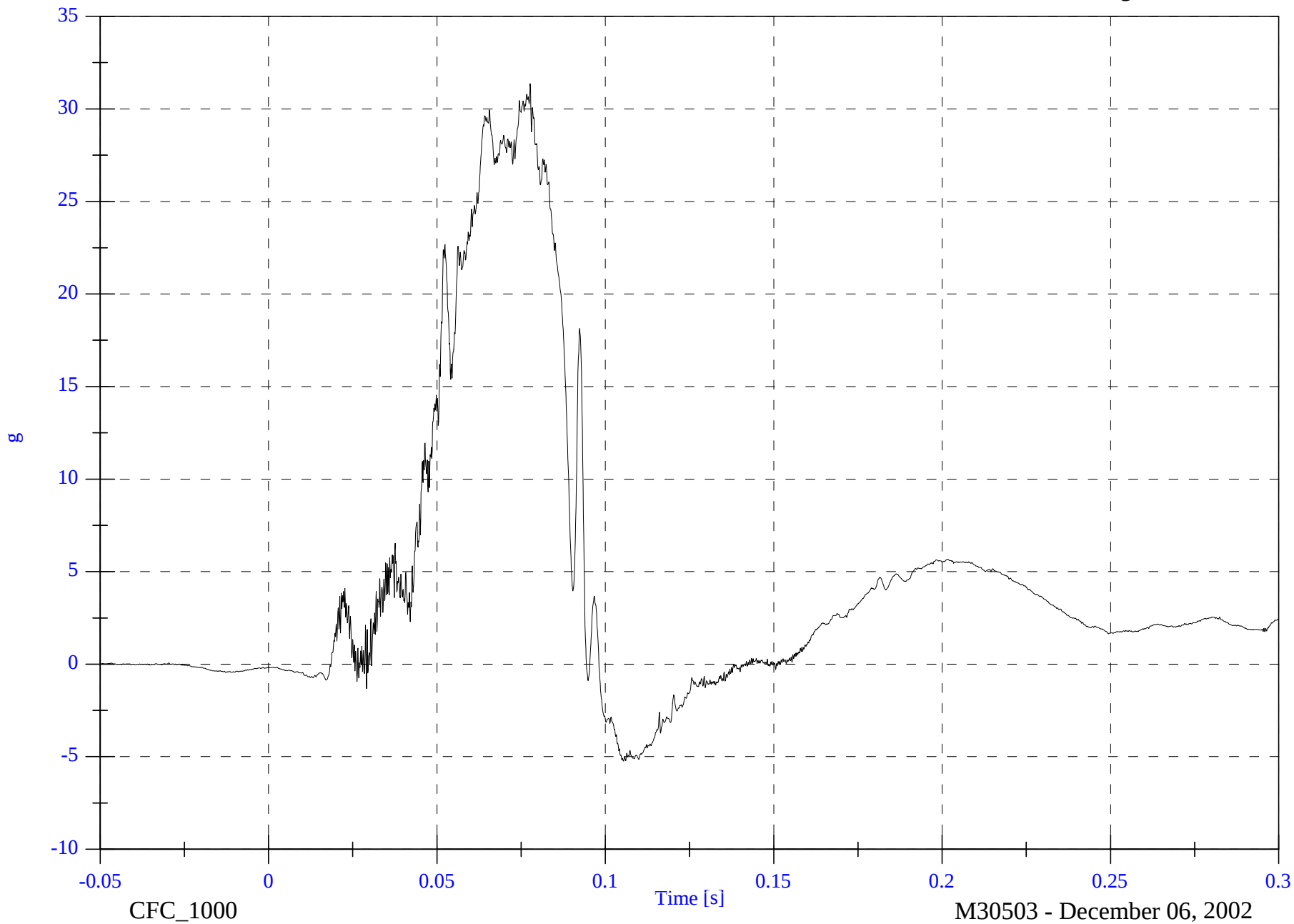
V1P2 Head CG z

Max: 31.4 [g] at 0.078 [s]

Min: -5.2 [g] at 0.105 [s]

B-58

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

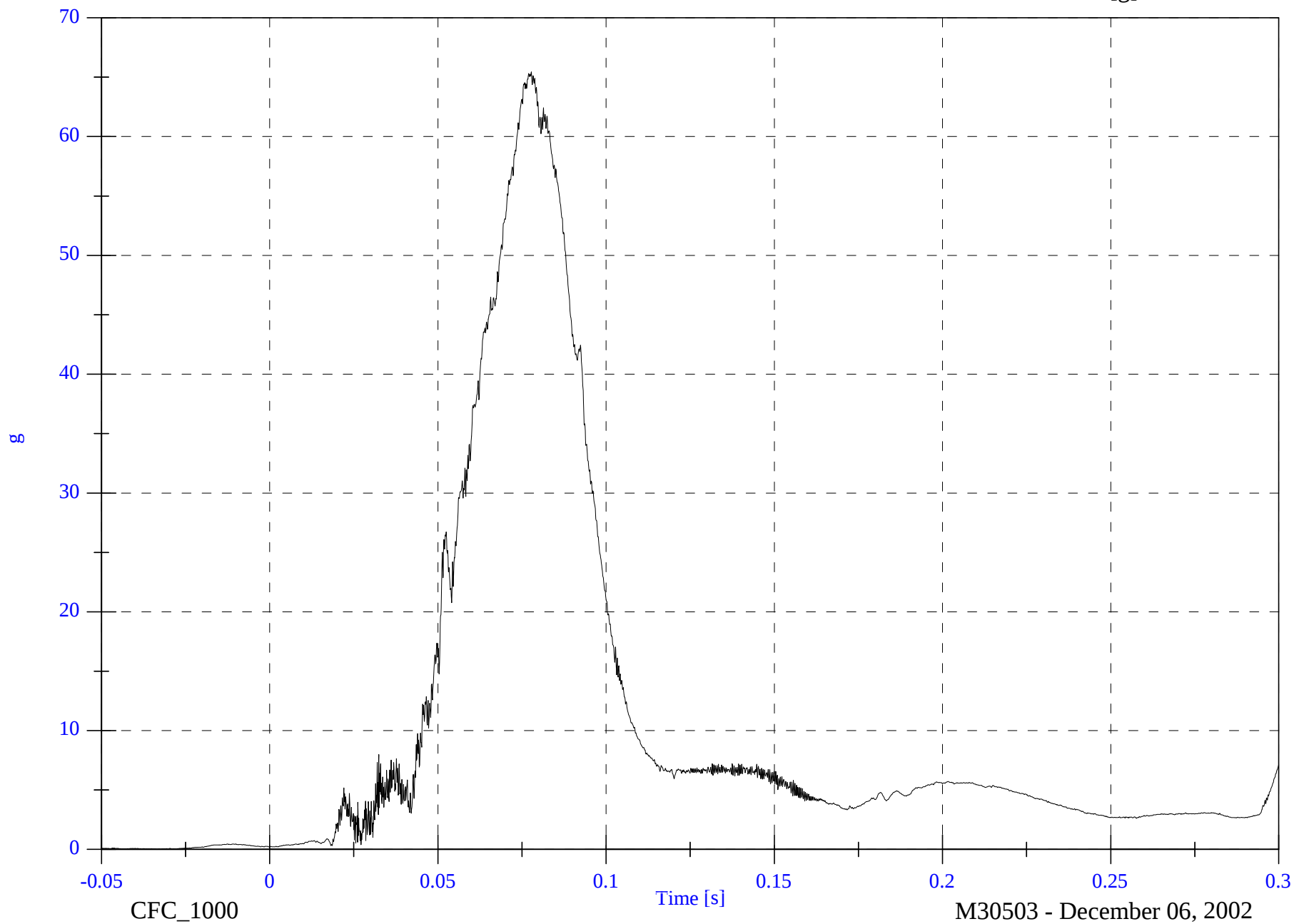
V1P2 Head CG Resultant

Max: 65.4 [g] at 0.078 [s]

Min: 0.0 [g] at -0.032 [s]

B-59

8642-NCAP-23

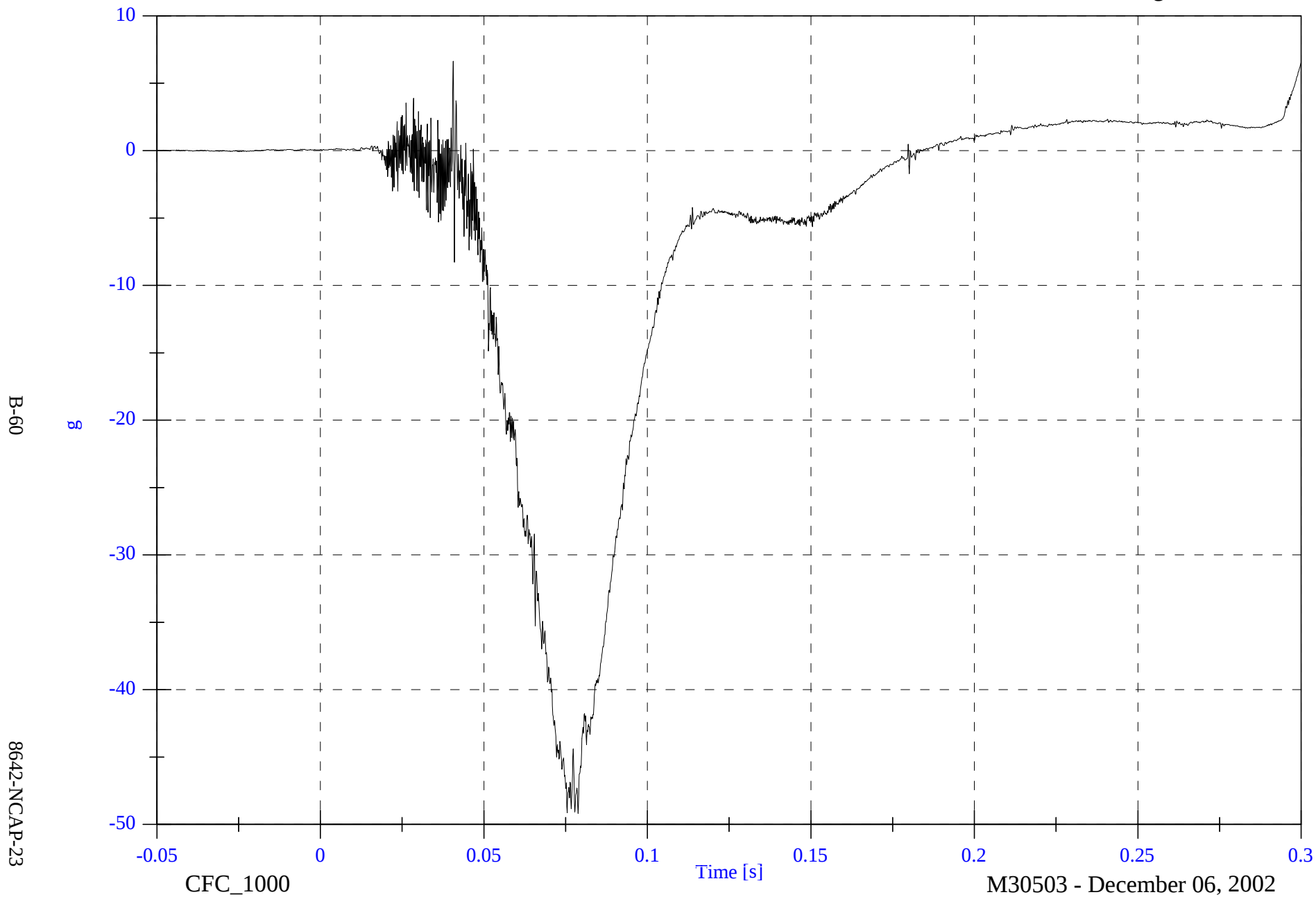


NCAP Test #1 2003 BMW Z4

V1P2 Head CG Red x

Max: 6.6 [g] at 0.041 [s]

Min: -49.2 [g] at 0.079 [s]



NCAP Test #1 2003 BMW Z4

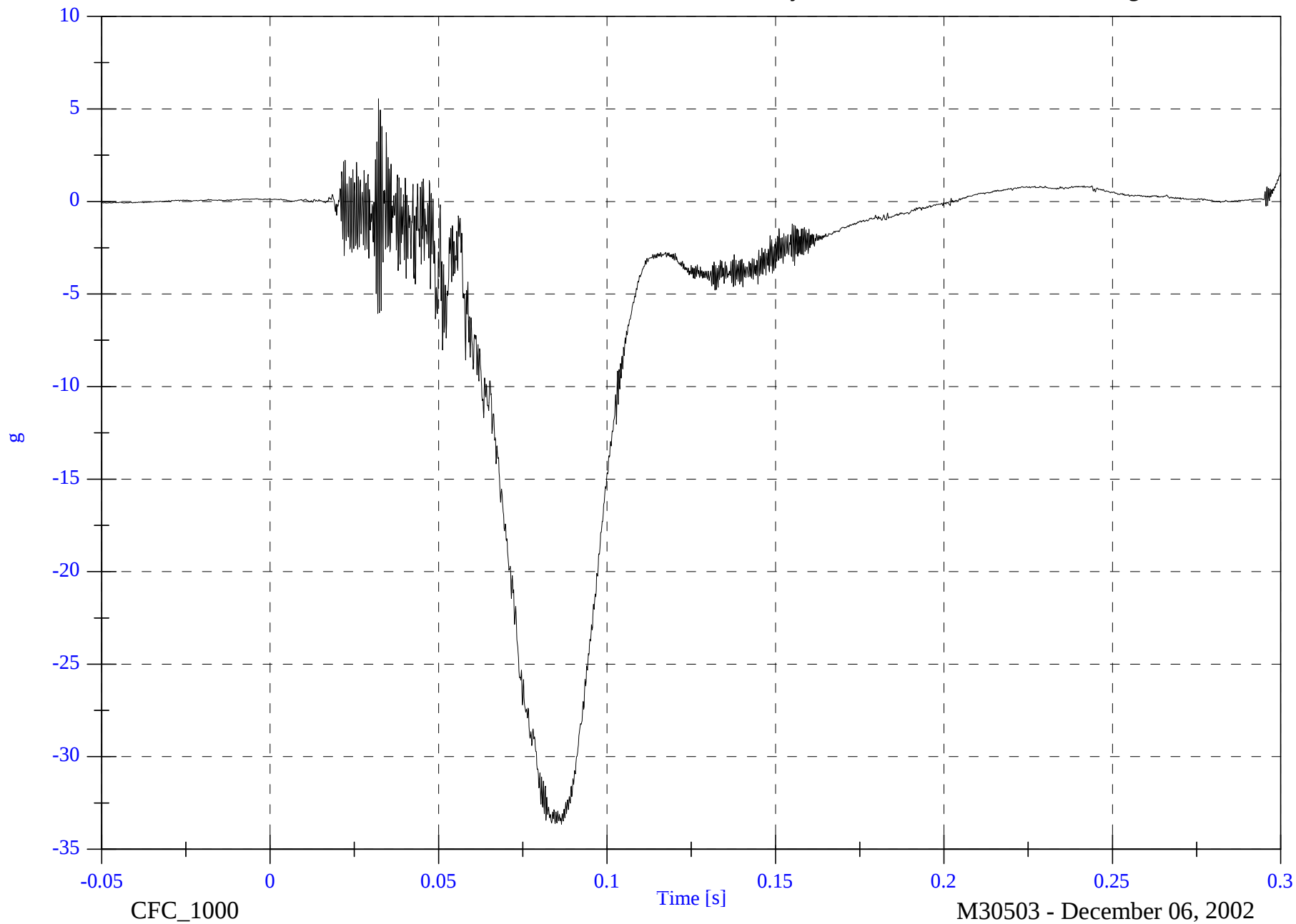
V1P2 Head CG Red y

Max: 5.5 [g] at 0.032 [s]

Min: -33.6 [g] at 0.086 [s]

B-61

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

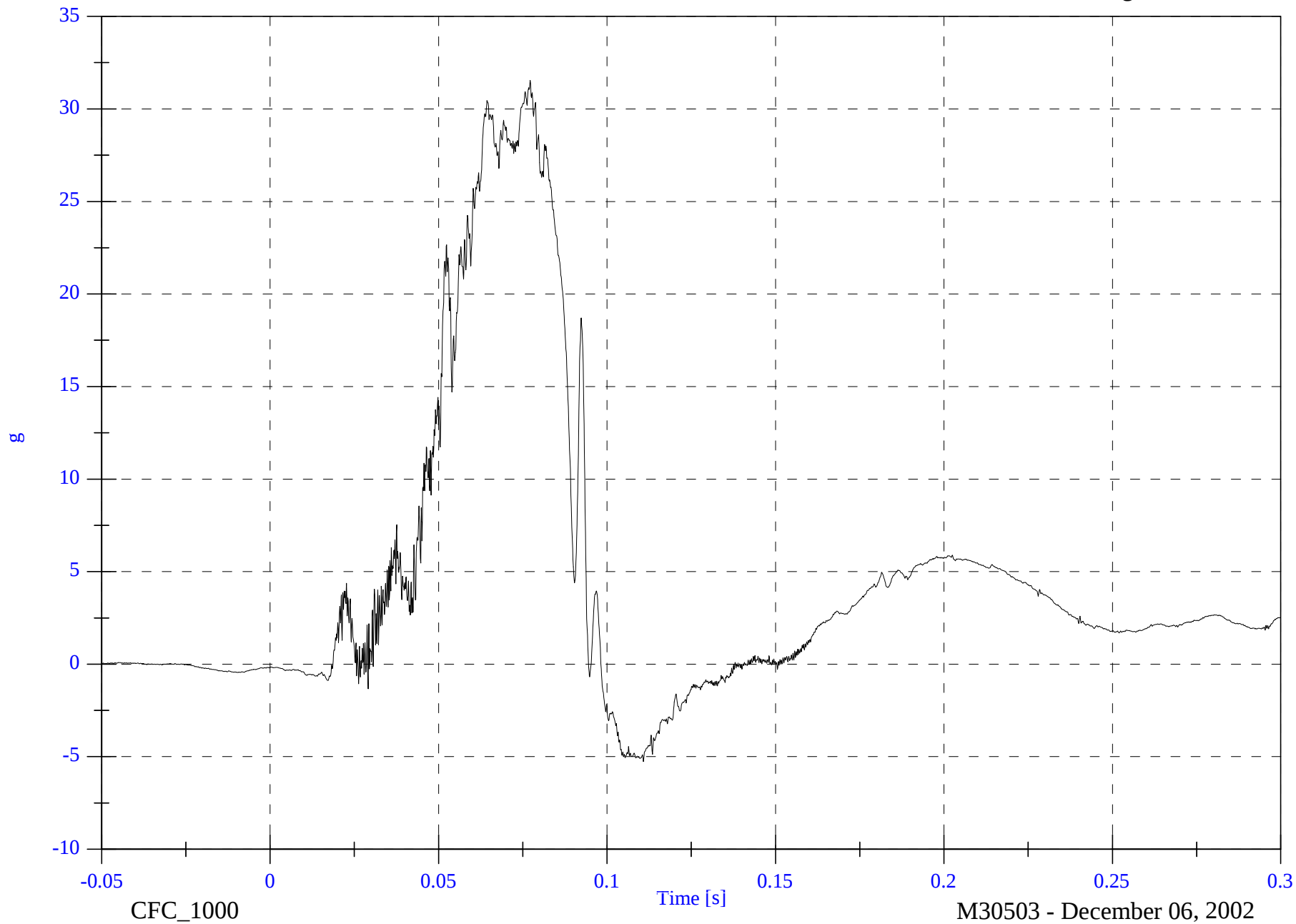
V1P2 Head CG Red z

Max: 31.5 [g] at 0.077 [s]

Min: -5.3 [g] at 0.111 [s]

B-62

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

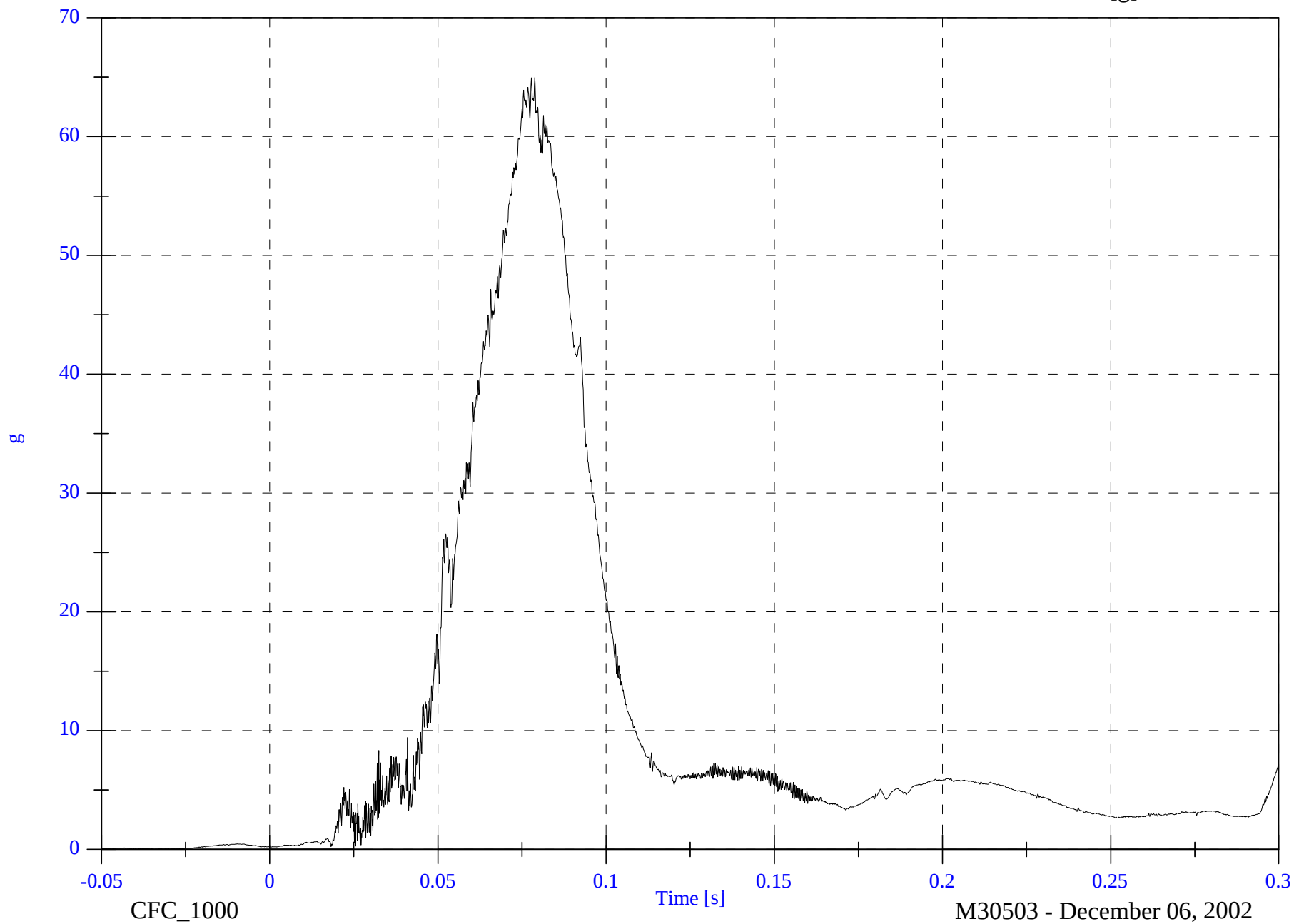
V1P2 Head CG Red Resultant

Max: 65.0 [g] at 0.079 [s]

Min: 0.0 [g] at -0.034 [s]

B-63

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck Fx

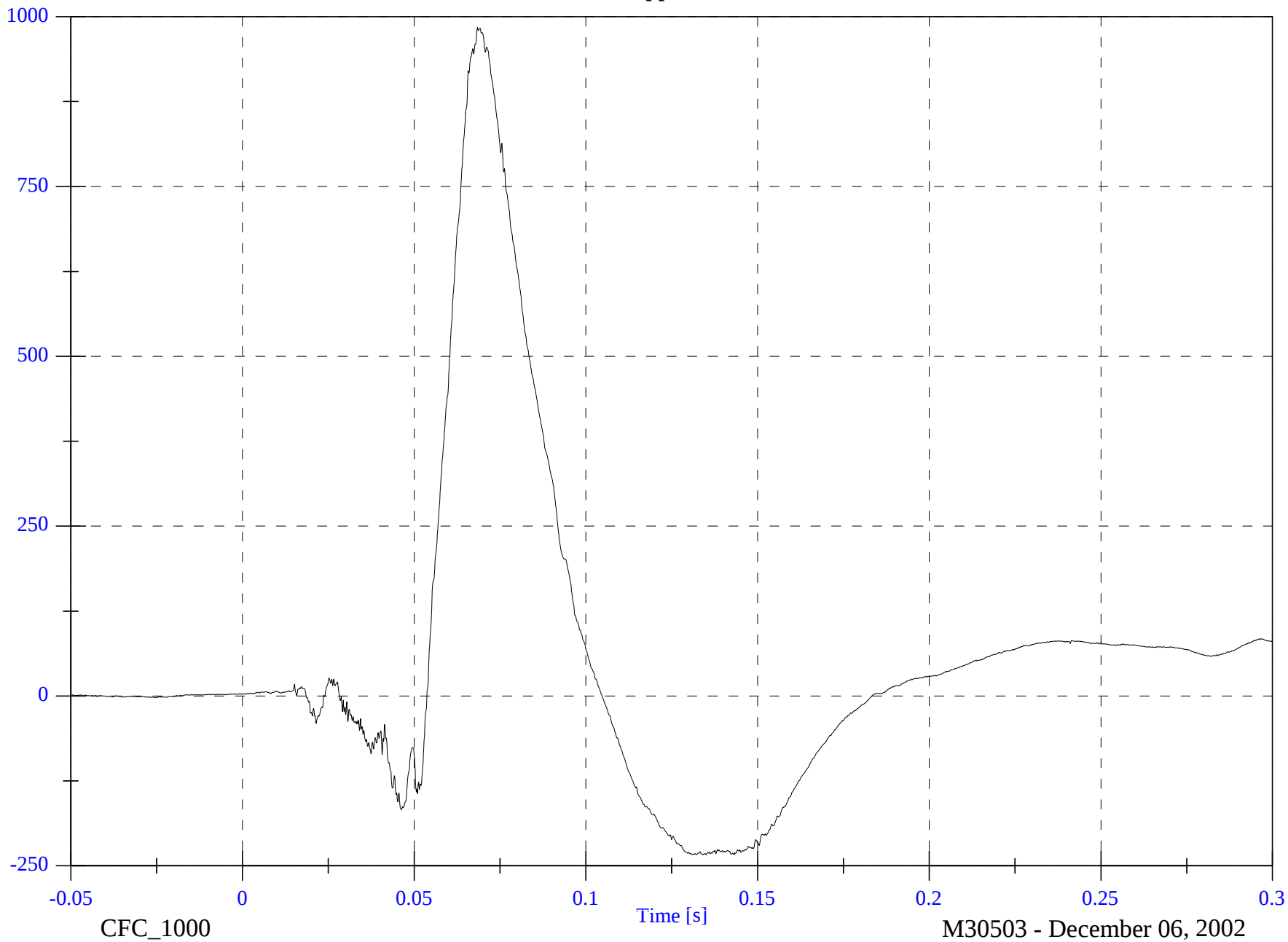
Max: 984.4 [N] at 0.068 [s]

Min: -233.7 [N] at 0.143 [s]

B-64

N

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck Fy

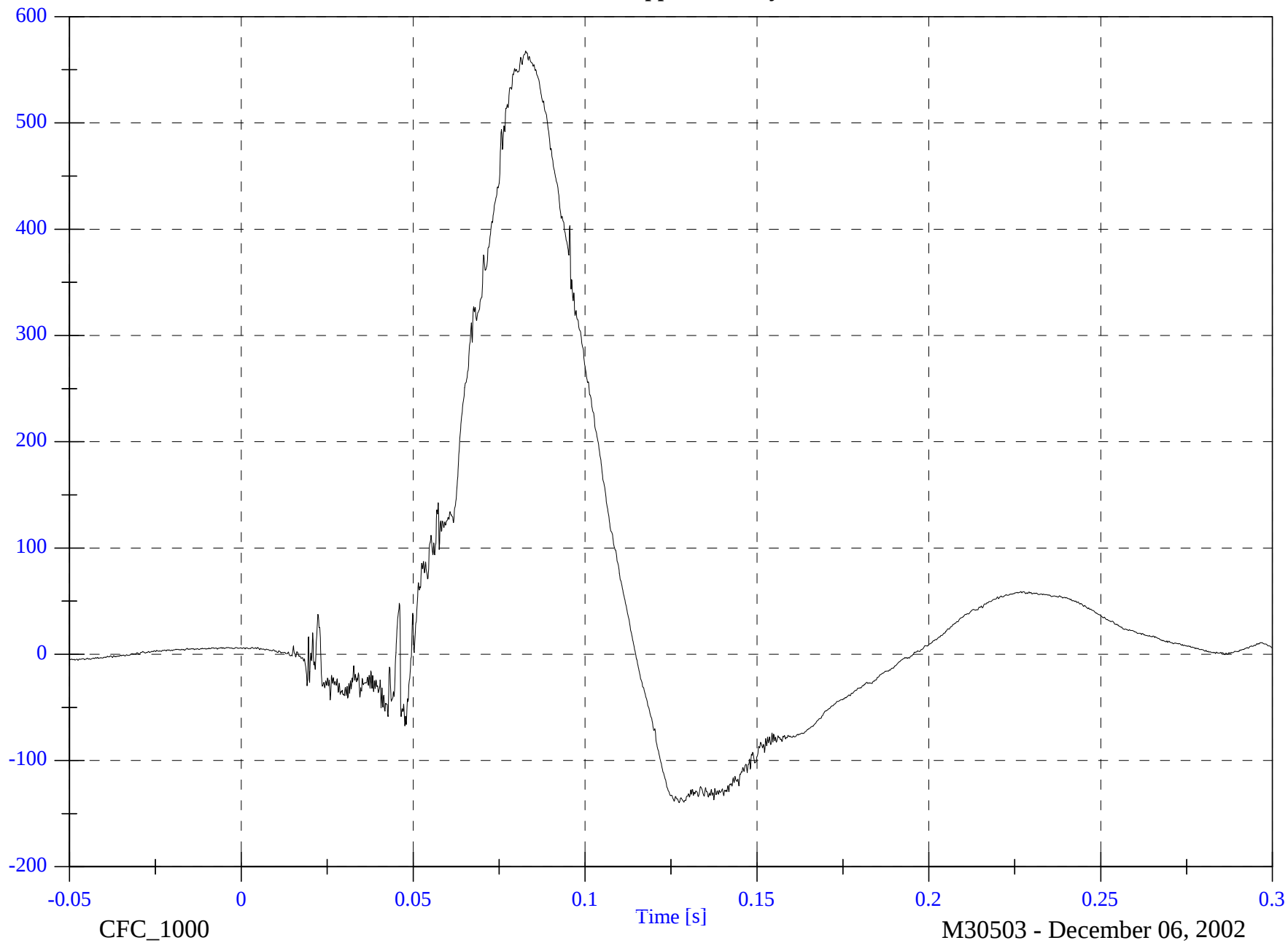
Max: 567.8 [N] at 0.083 [s]

Min: -139.6 [N] at 0.127 [s]

B-65

N

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck Fz

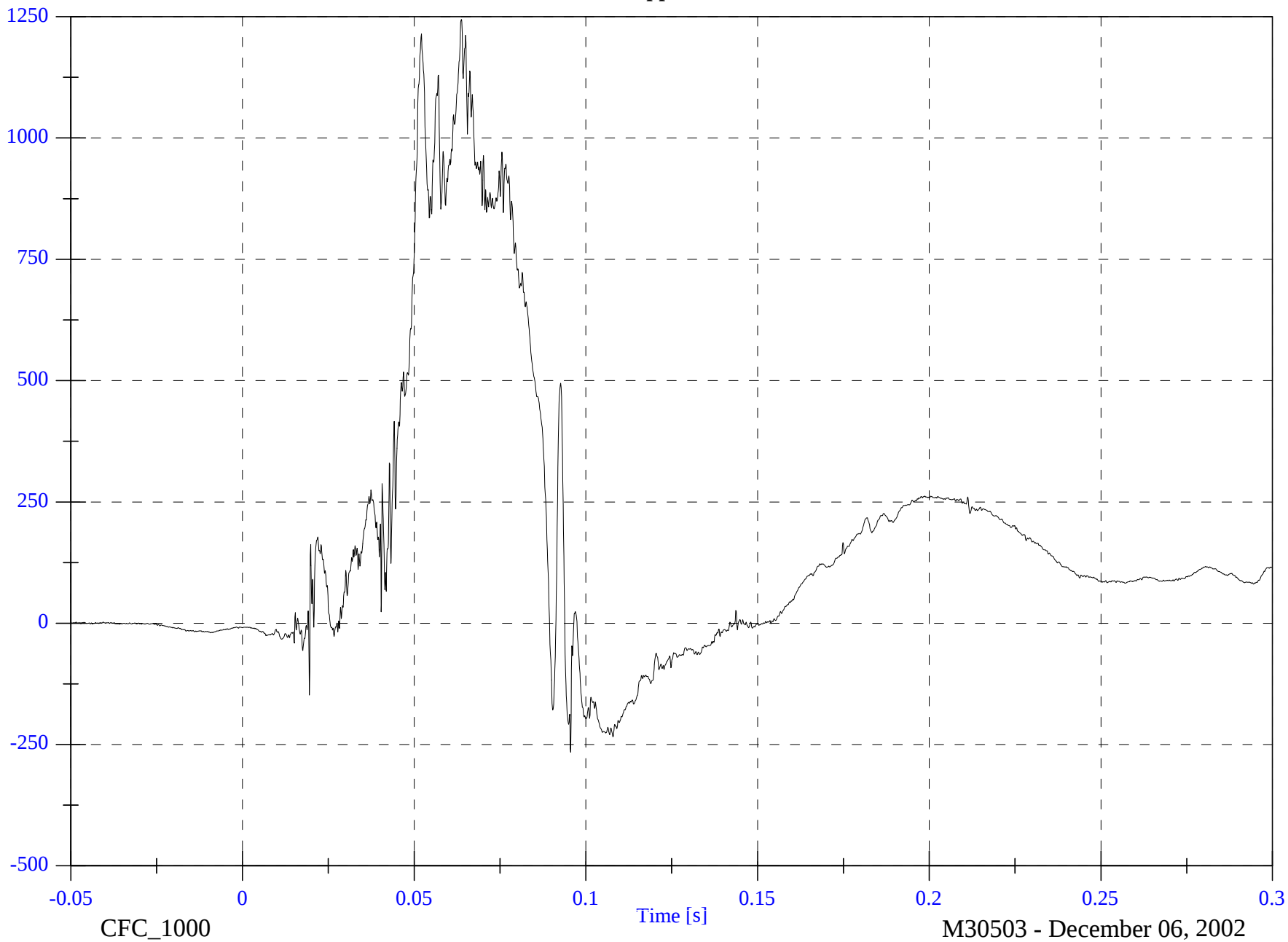
Max: 1244.3 [N] at 0.064 [s]

Min: -265.8 [N] at 0.096 [s]

B-66

N

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

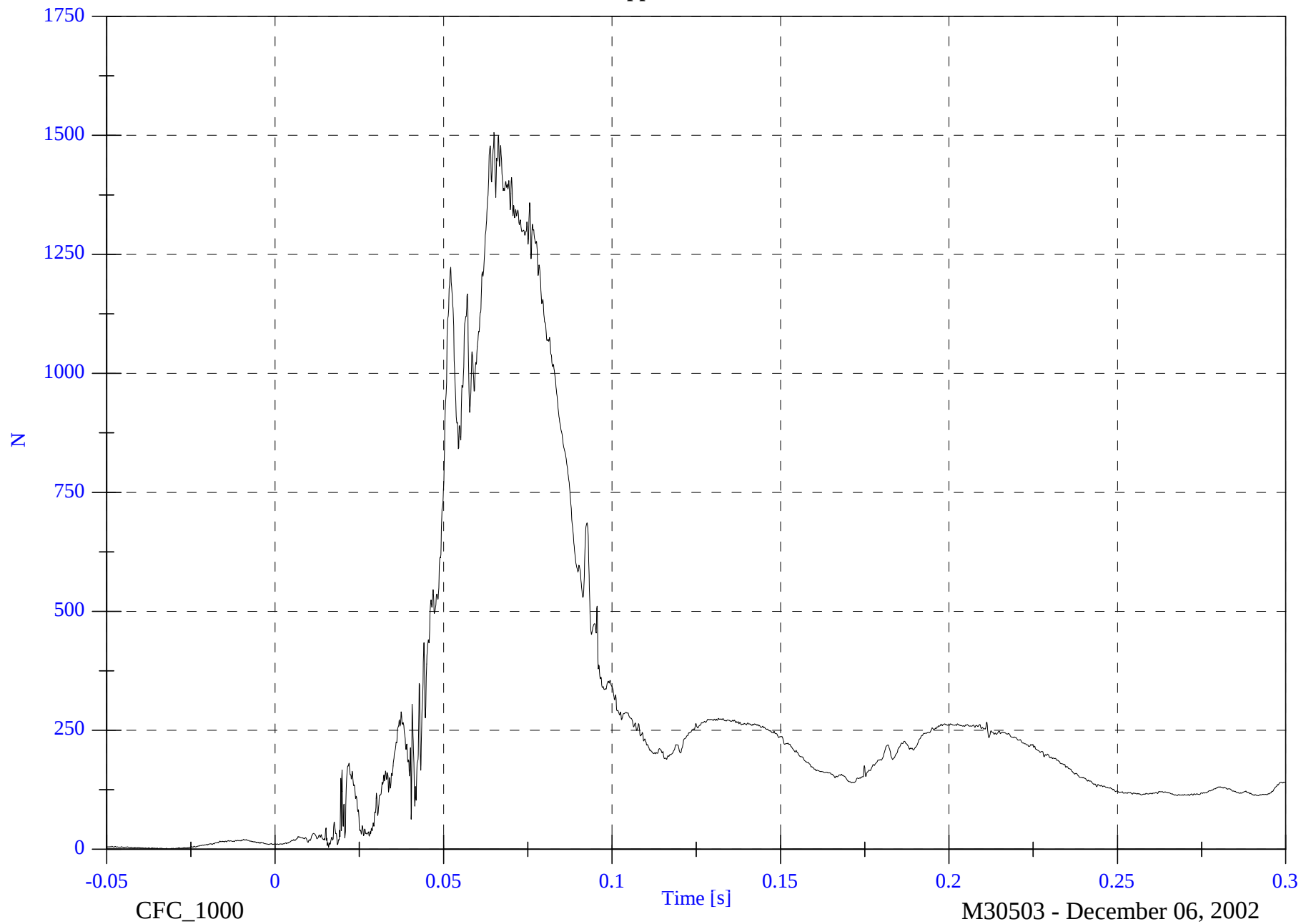
V1P2 Upper Neck F Resultant

Max: 1506.1 [N] at 0.065 [s]

Min: 0.5 [N] at -0.032 [s]

B-67

8642-NCAP-23

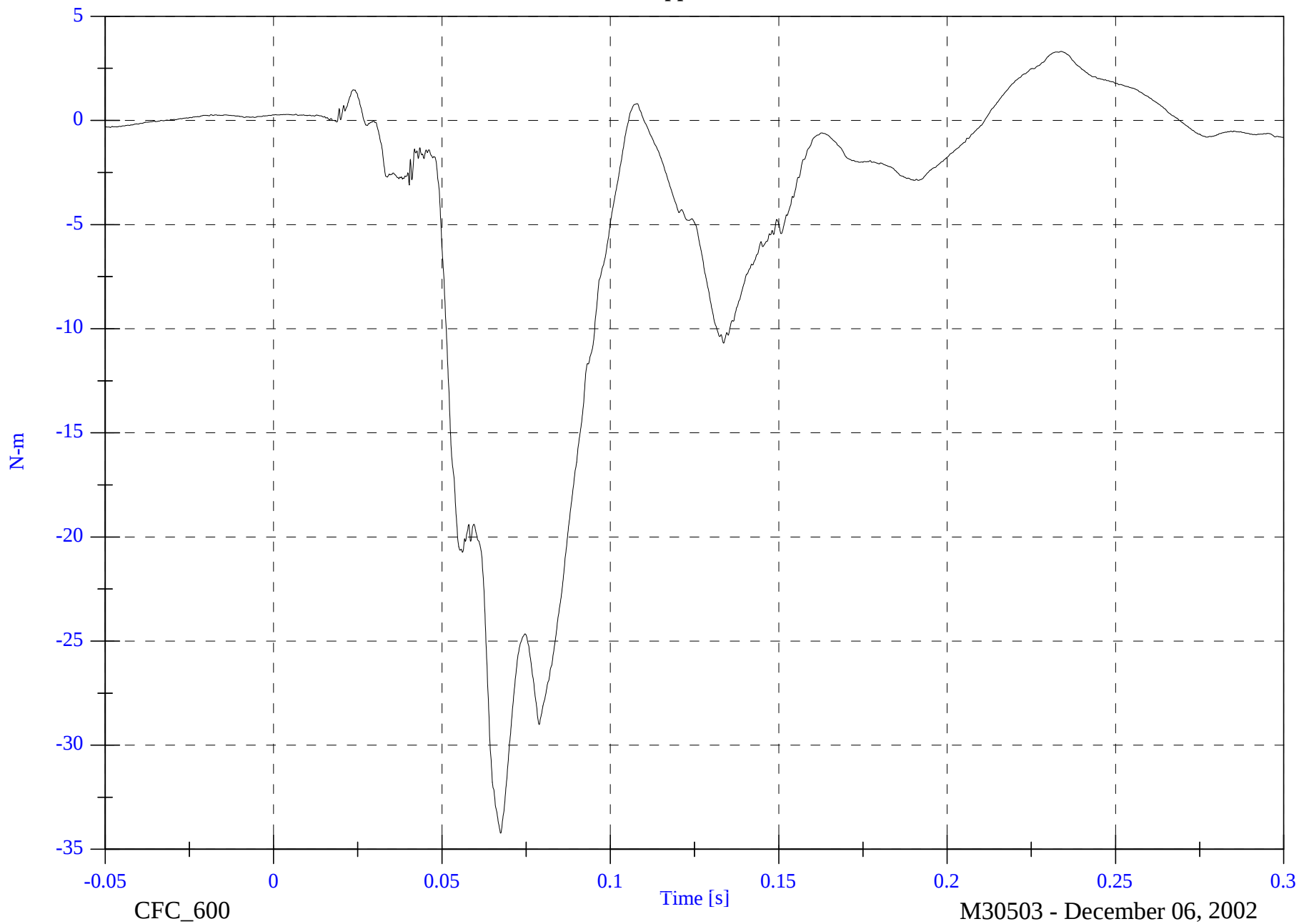


NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck Mx

Max: 3.3 [N-m] at 0.234 [s]

Min: -34.2 [N-m] at 0.067 [s]



B-68

8642-NCAP-23

CFC_600

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

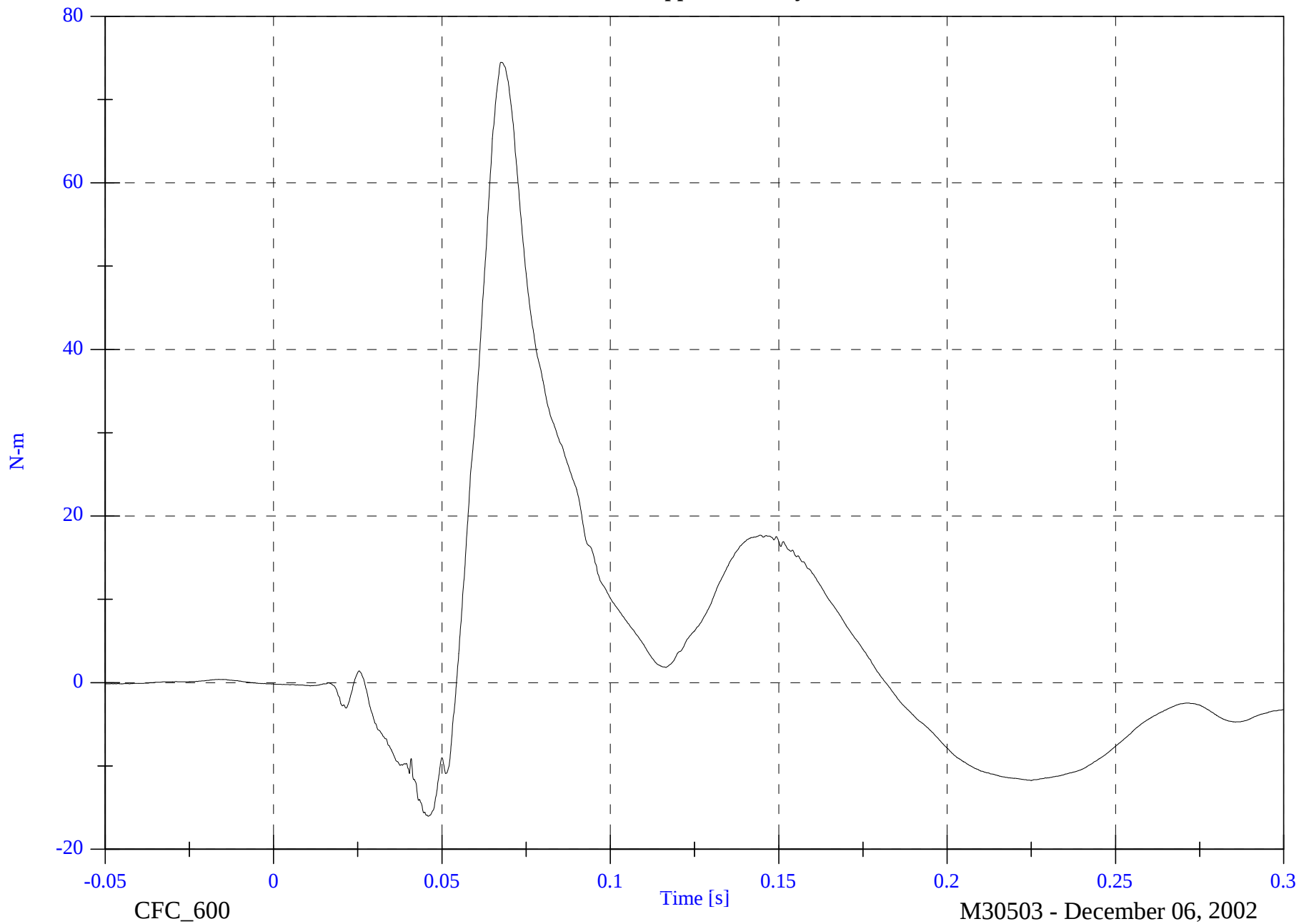
V1P2 Upper Neck My

Max: 74.5 [N-m] at 0.067 [s]

Min: -16.0 [N-m] at 0.046 [s]

B-69

8642-NCAP-23



CFC_600

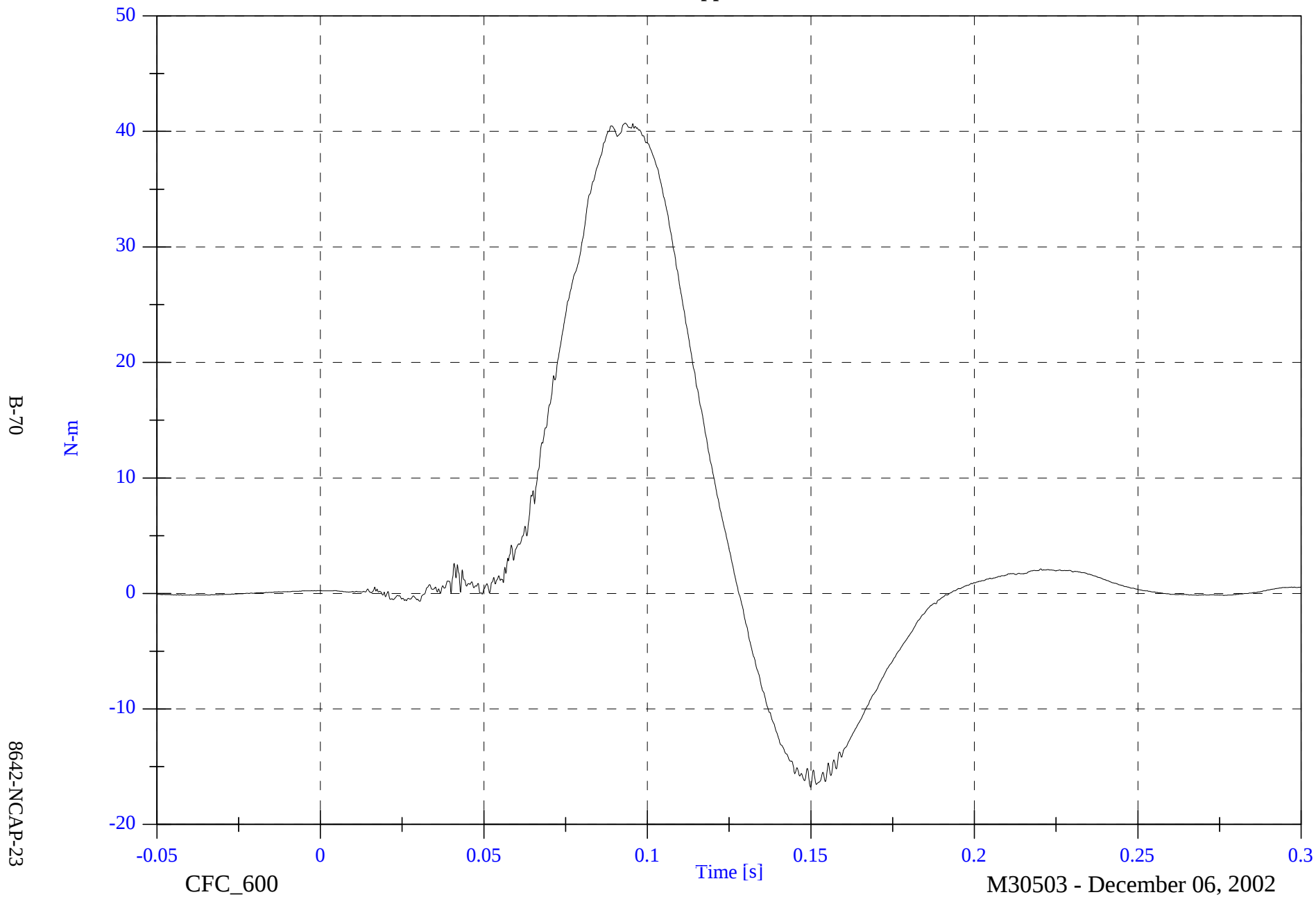
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck Mz

Max: 40.7 [N-m] at 0.093 [s]

Min: -16.8 [N-m] at 0.150 [s]

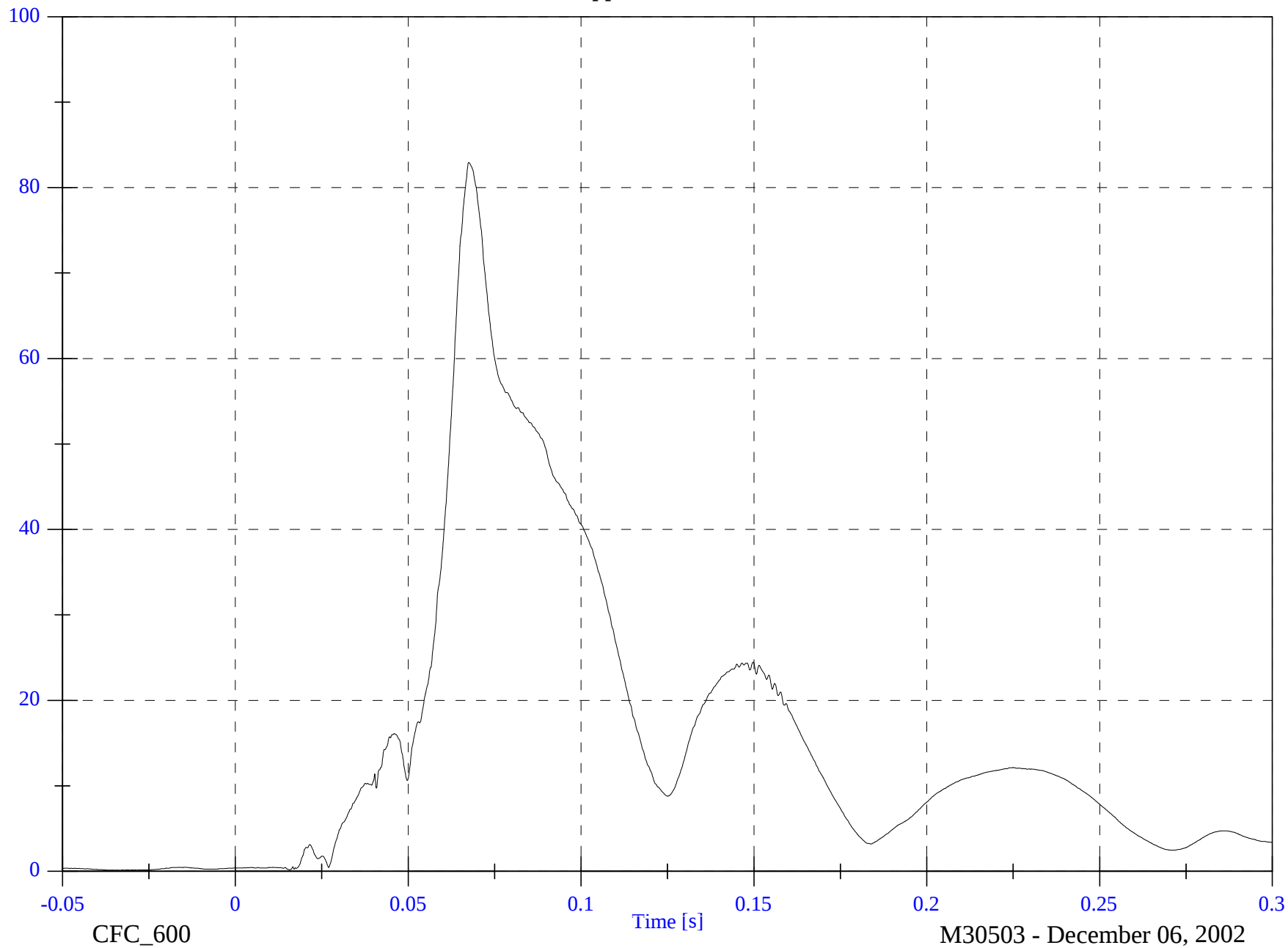


NCAP Test #1 2003 BMW Z4

V1P2 Upper Neck M Resultant

Max: 83.0 [N-m] at 0.068 [s]

Min: 0.1 [N-m] at -0.033 [s]



B-71

8642-NCAP-23

CFC_600

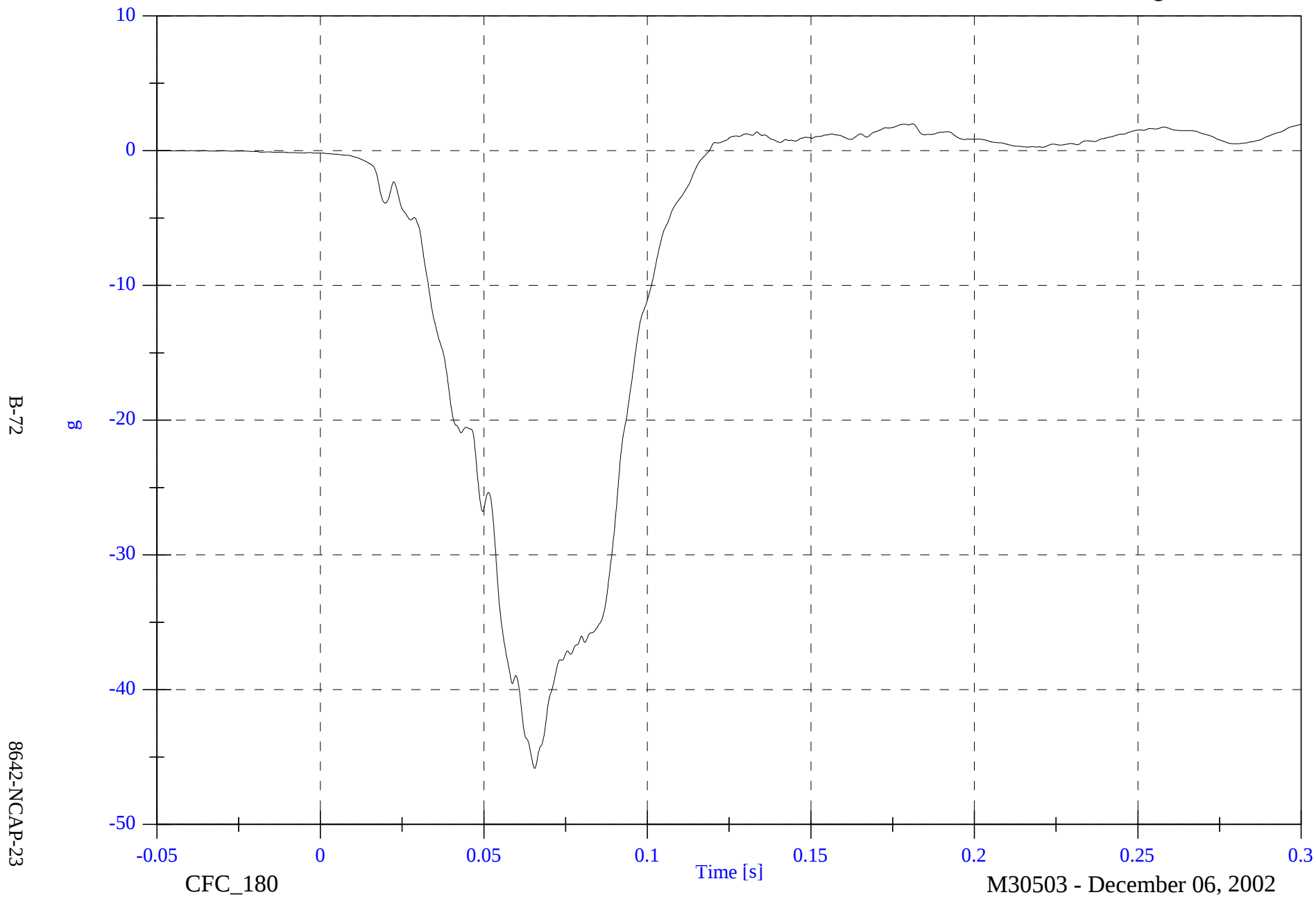
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P2 Chest x

Max: 2.0 [g] at 0.181 [s]

Min: -45.8 [g] at 0.066 [s]



NCAP Test #1 2003 BMW Z4

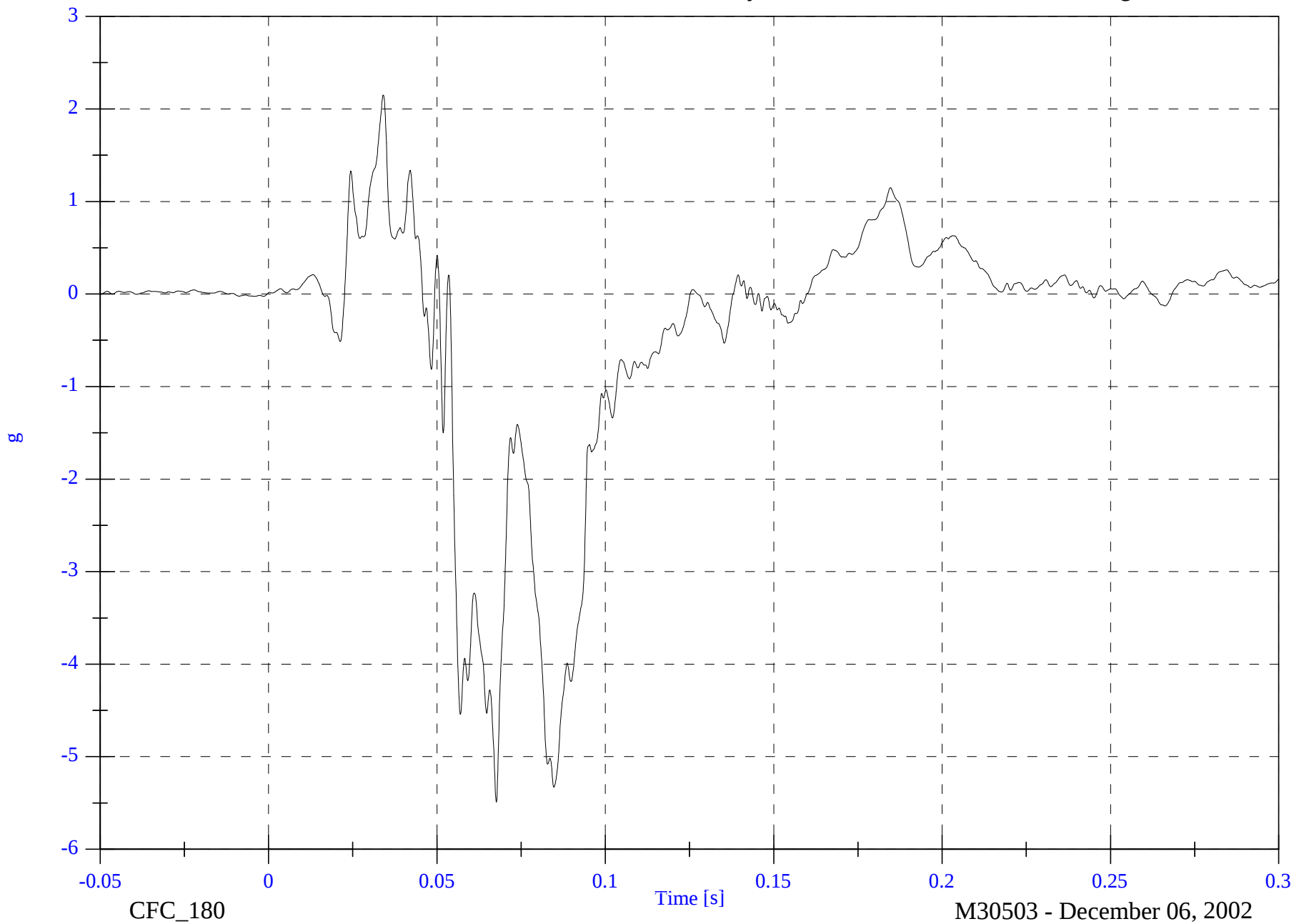
V1P2 Chest y

Max: 2.1 [g] at 0.034 [s]

Min: -5.5 [g] at 0.068 [s]

B-73

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

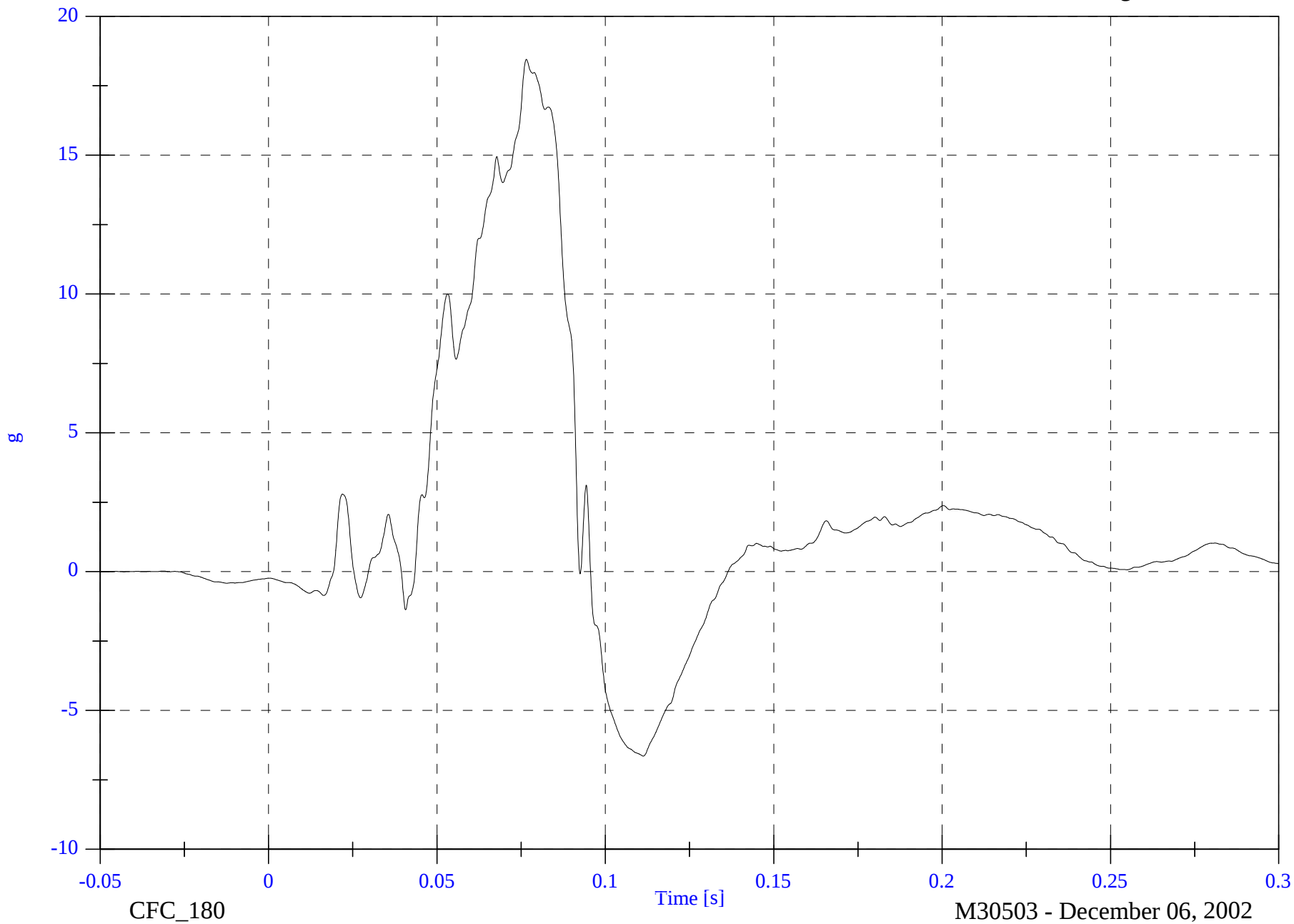
V1P2 Chest z

Max: 18.5 [g] at 0.077 [s]

Min: -6.6 [g] at 0.111 [s]

B-74

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

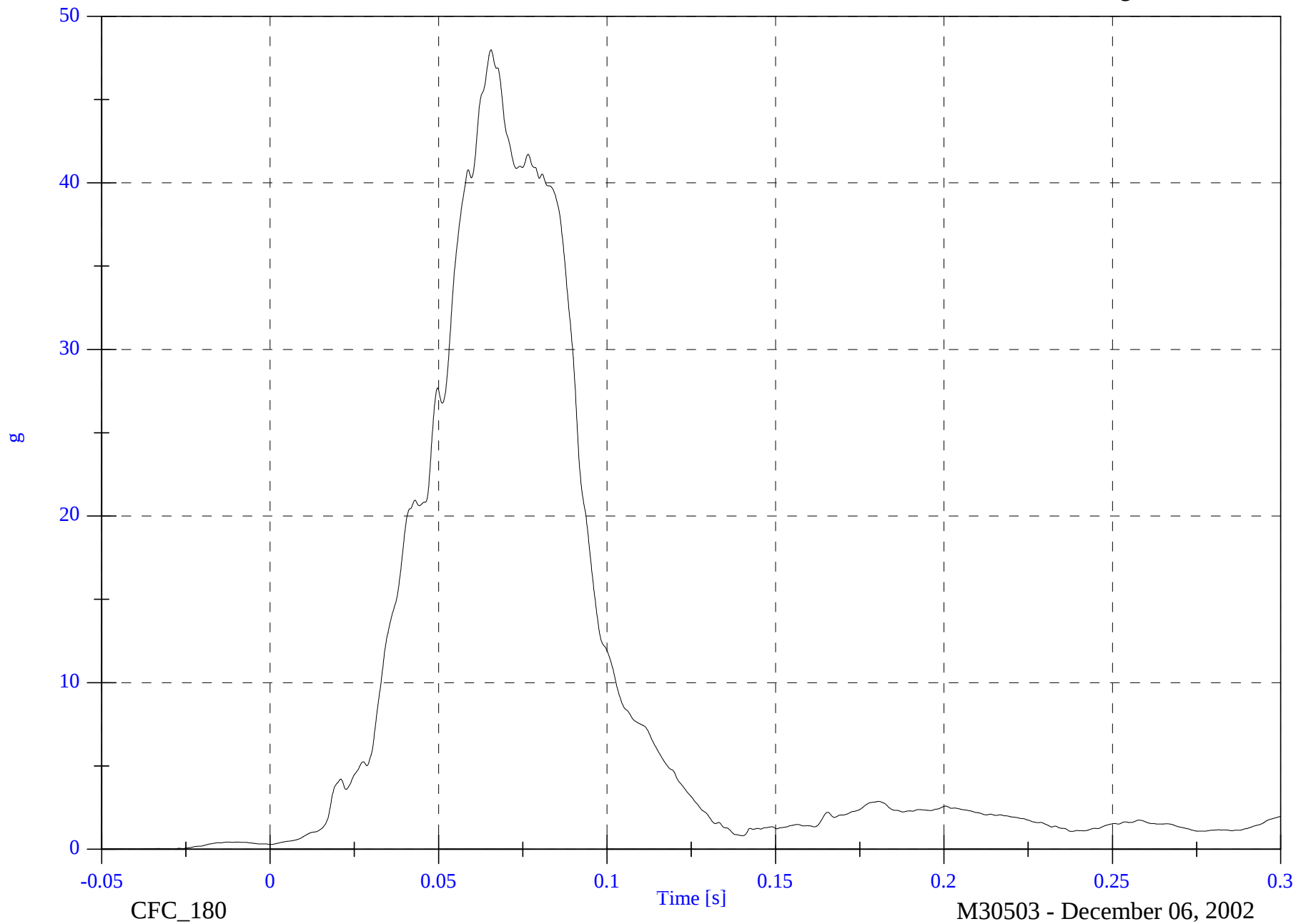
V1P2 Chest Resultant

Max: 48.0 [g] at 0.066 [s]

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

B-75

8642-NCAP-23

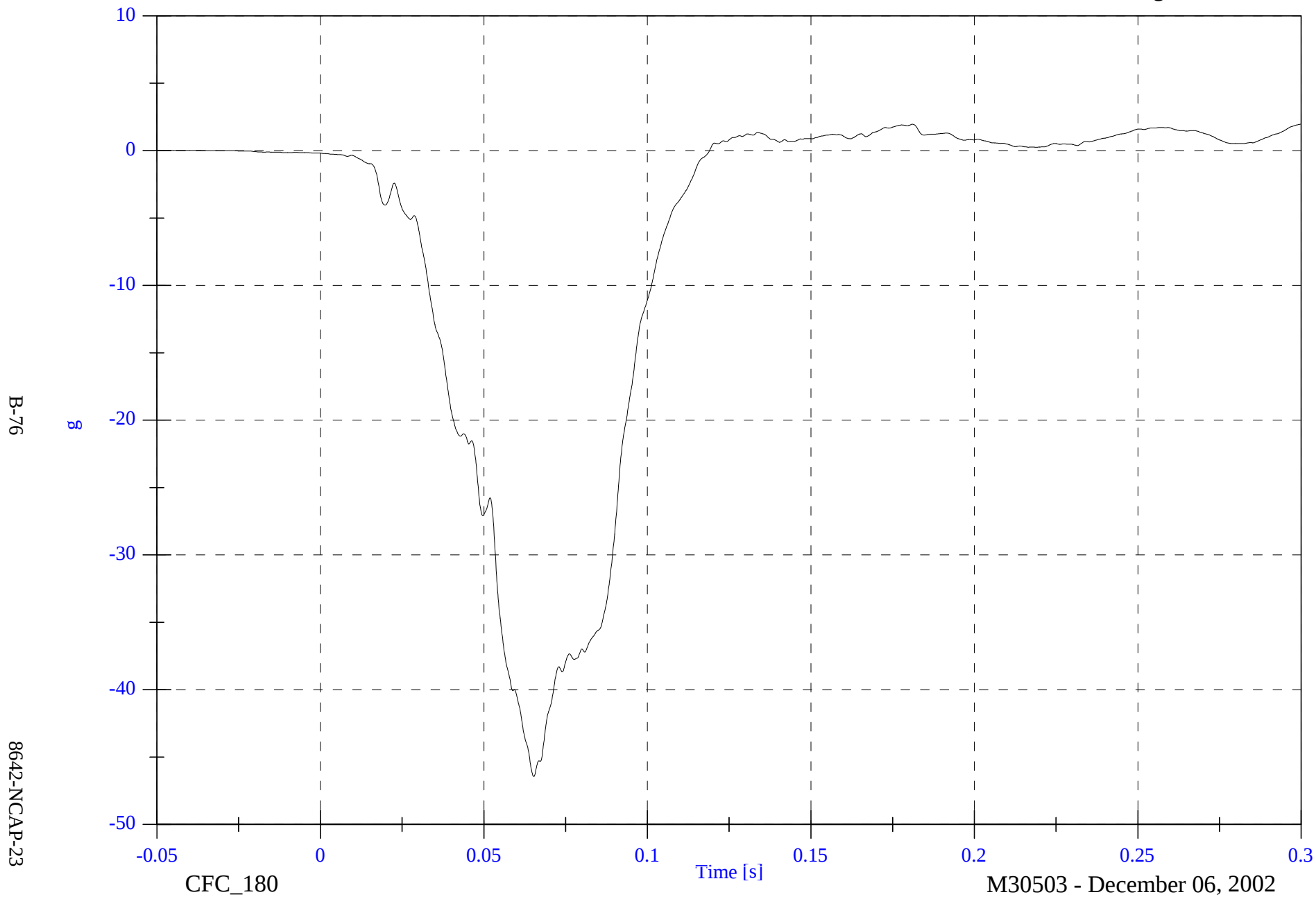


NCAP Test #1 2003 BMW Z4

V1P2 Chest Red x

Max: 2.0 [g] at 0.300 [s]

Min: -46.4 [g] at 0.065 [s]

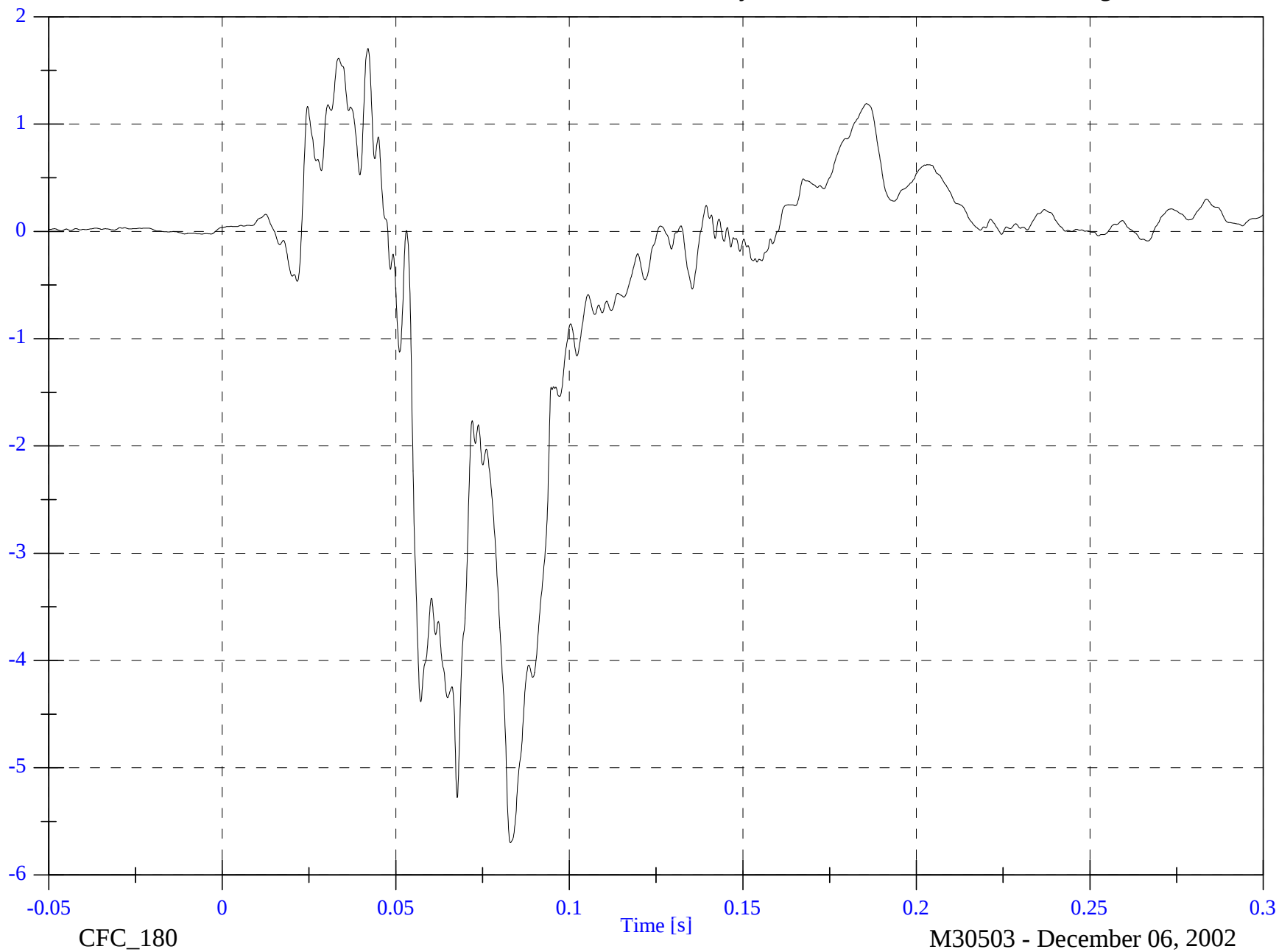


NCAP Test #1 2003 BMW Z4

V1P2 Chest Red y

Max: 1.7 [g] at 0.042 [s]

Min: -5.7 [g] at 0.083 [s]



B-77

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

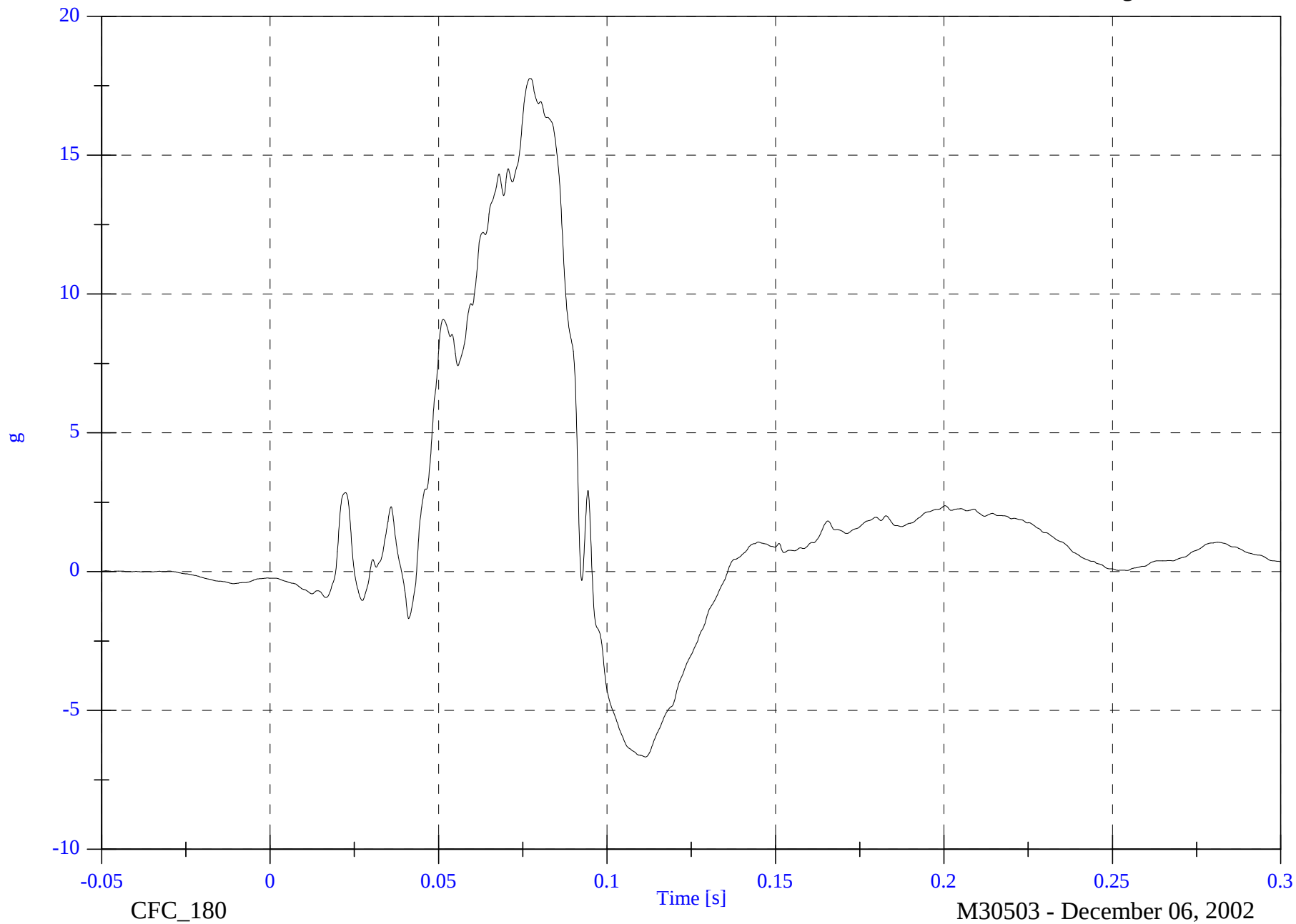
V1P2 Chest Red z

Max: 17.8 [g] at 0.077 [s]

Min: -6.7 [g] at 0.111 [s]

B-78

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

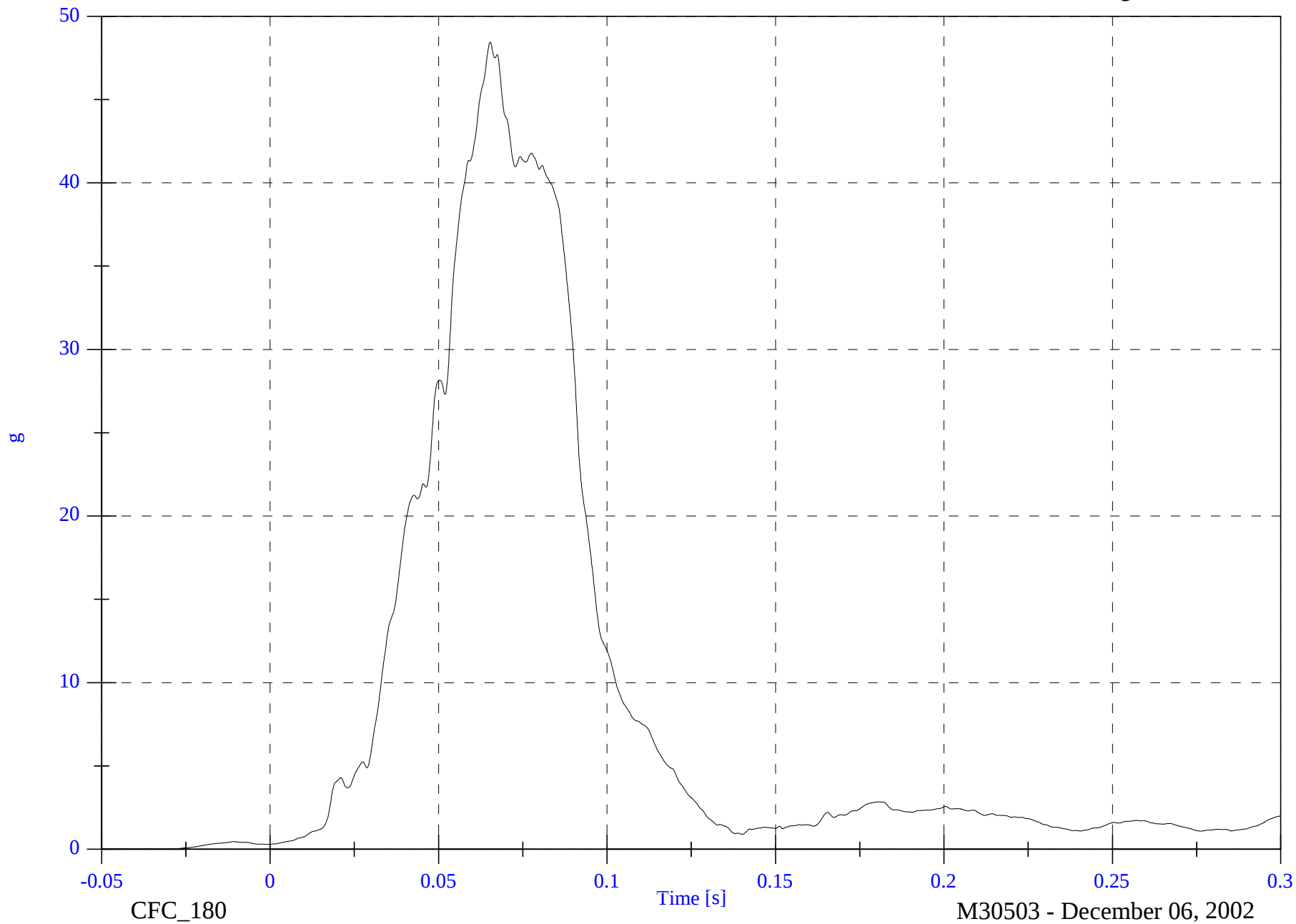
V1P2 Chest Red Resultant

Max: 48.4 [g] at 0.065 [s]

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

B-79

8642-NCAP-23

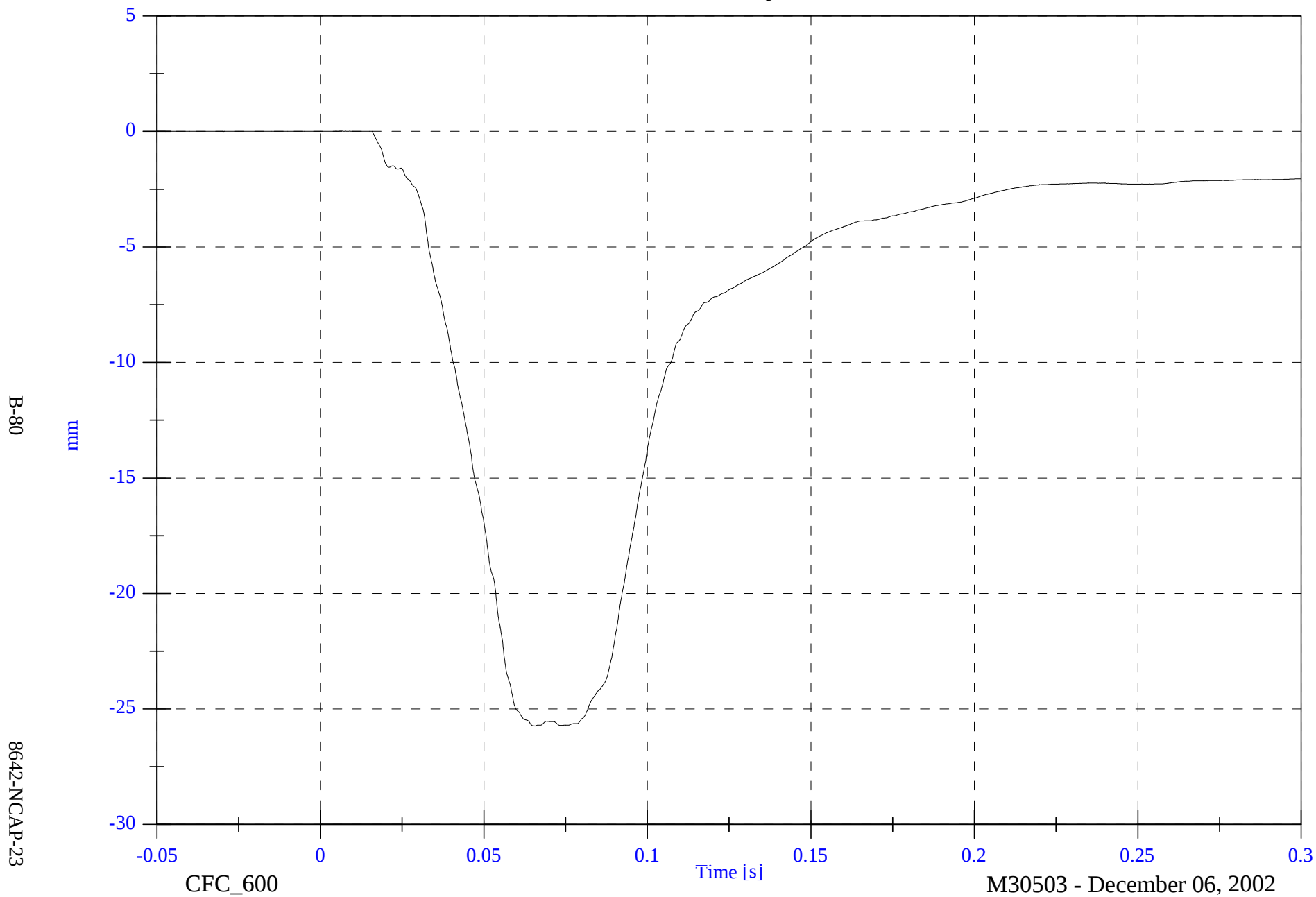


NCAP Test #1 2003 BMW Z4

V1P2 Chest Compression x

Max: 0.0 [mm] at 0.006 [s]

Min: -25.7 [mm] at 0.066 [s]

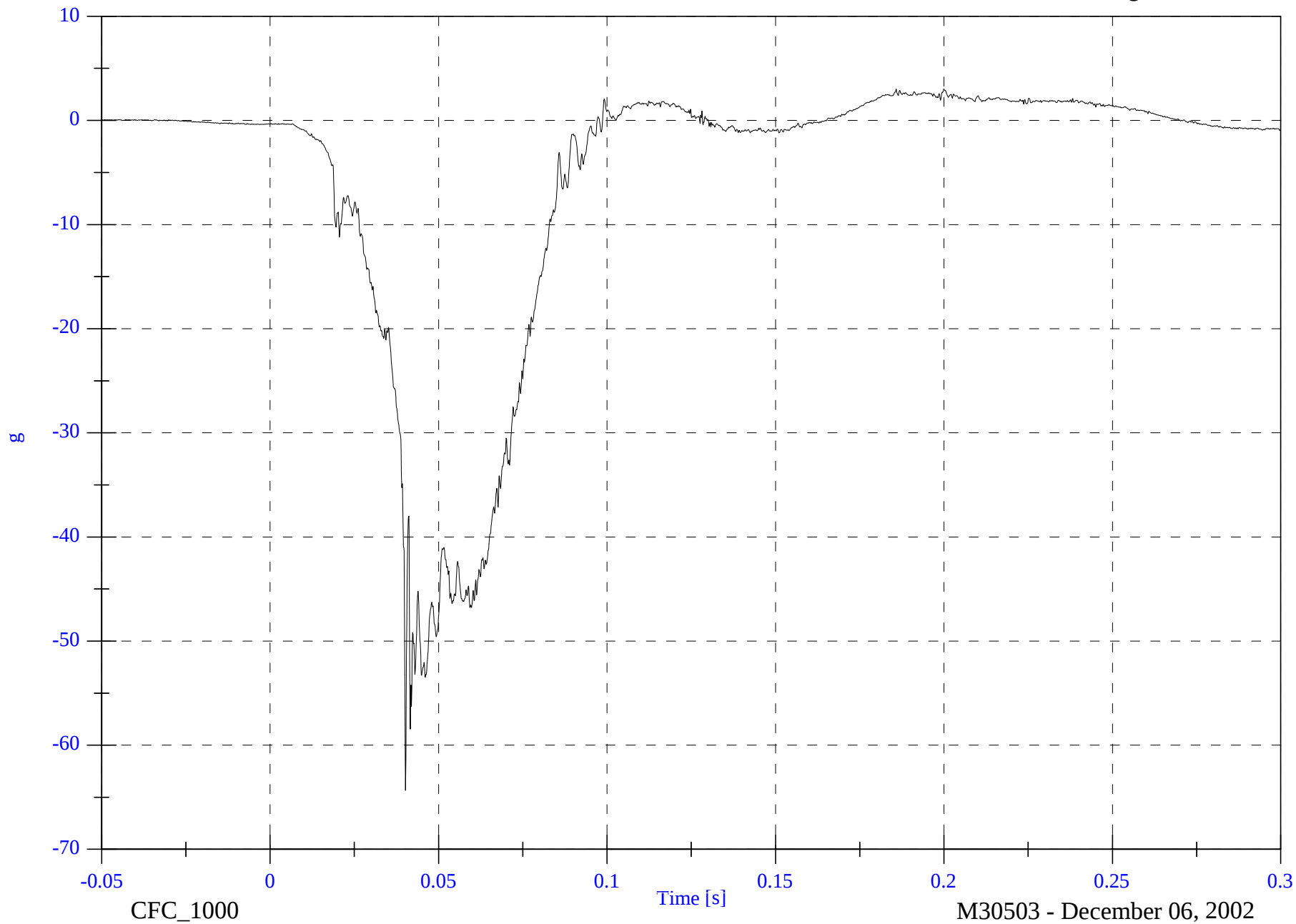


NCAP Test #1 2003 BMW Z4

V1P2 Pelvic x

Max: 3.0 [g] at 0.186 [s]

Min: -64.3 [g] at 0.040 [s]



B-81

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

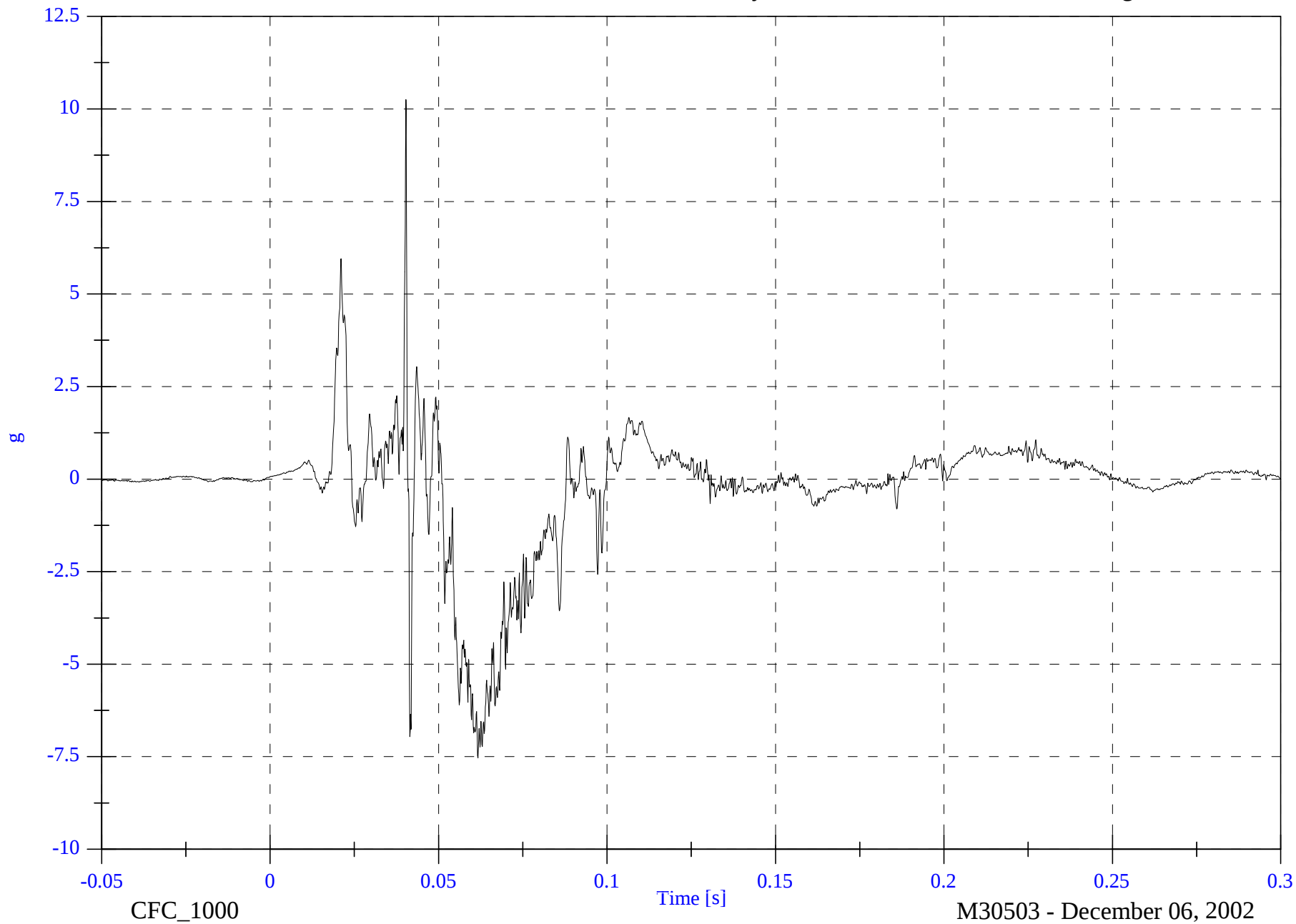
V1P2 Pelvic y

Max: 10.2 [g] at 0.040 [s]

Min: -7.5 [g] at 0.062 [s]

B-82

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

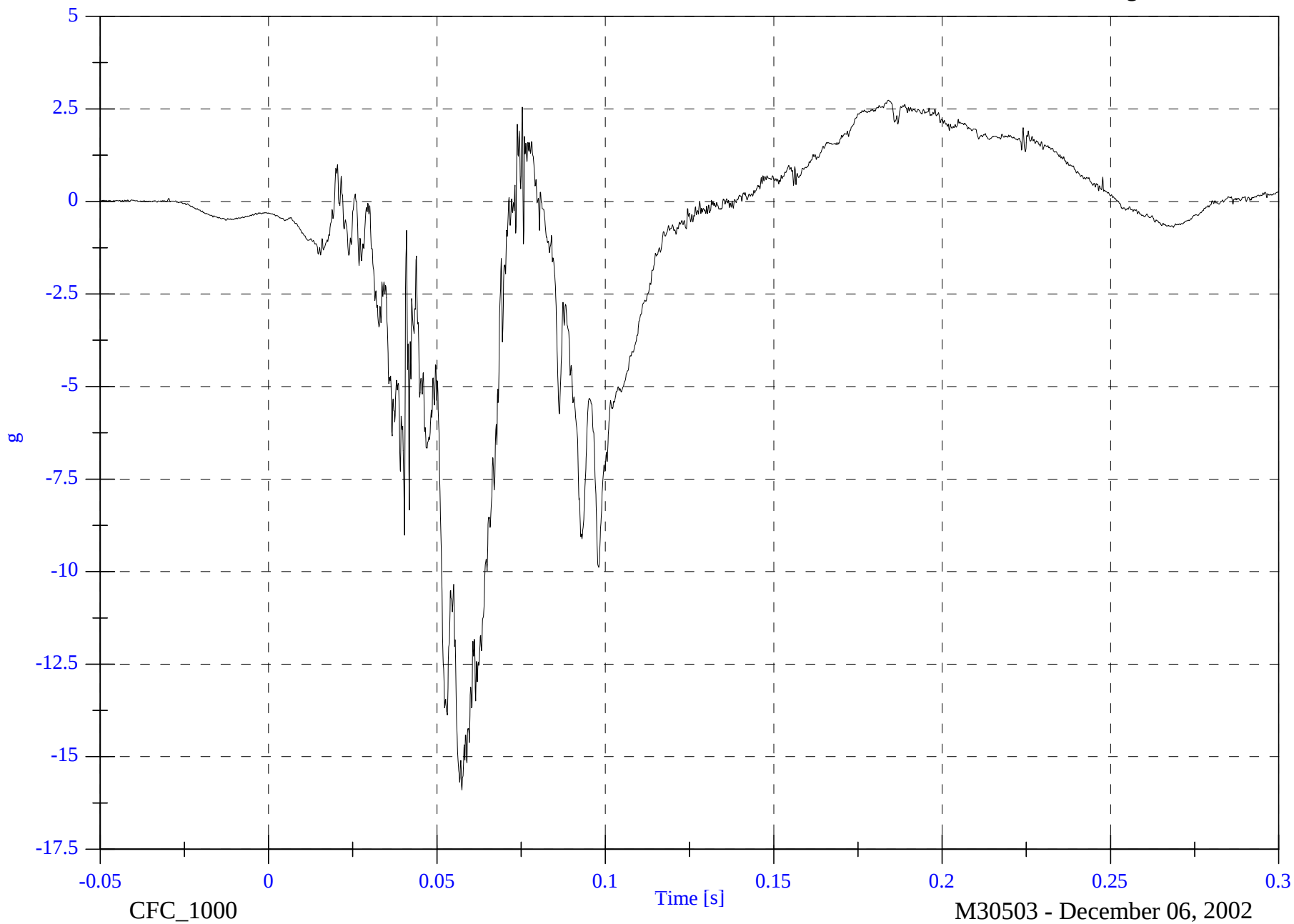
V1P2 Pelvic z

Max: 2.7 [g] at 0.184 [s]

Min: -15.9 [g] at 0.057 [s]

B-83

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

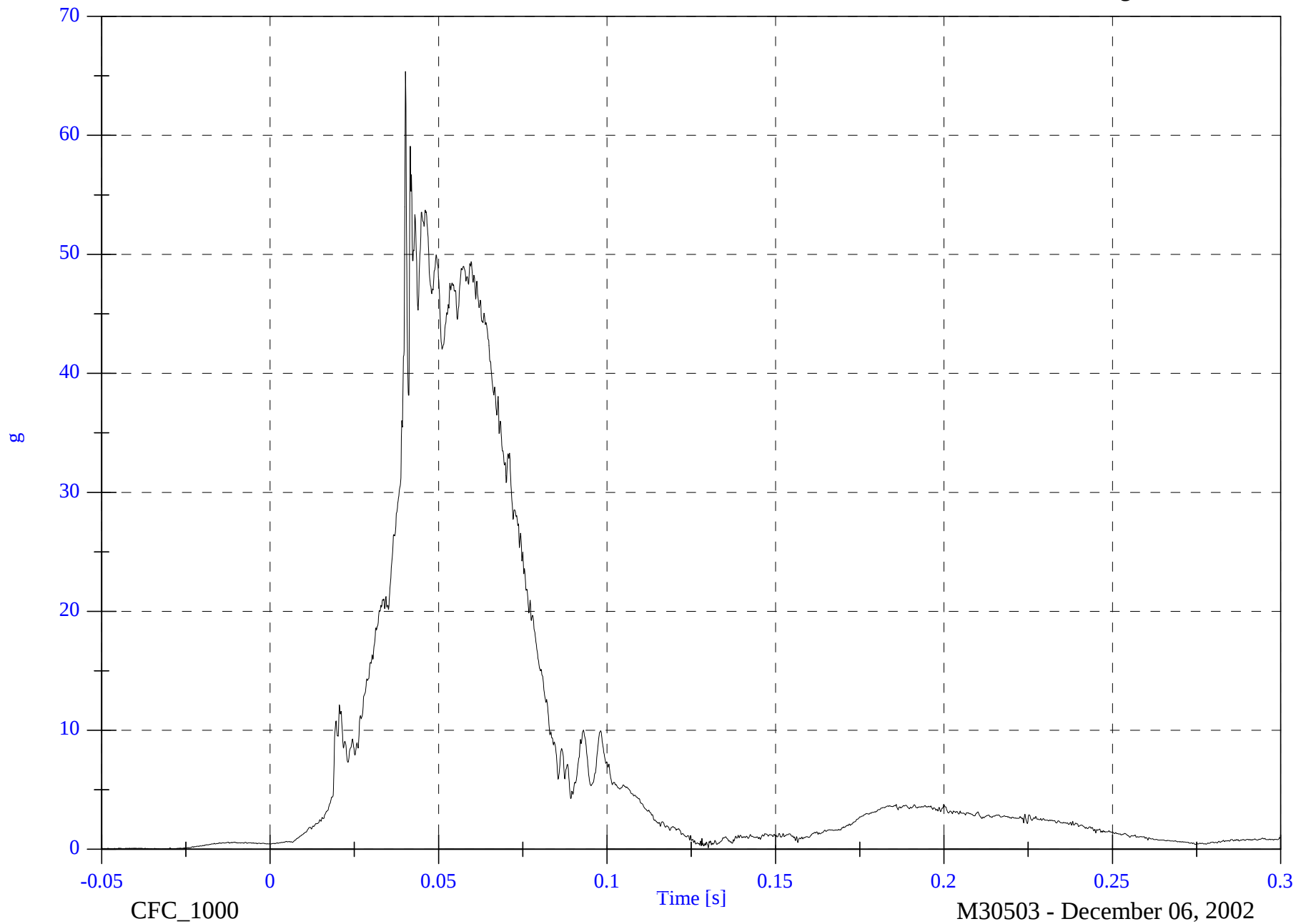
V1P2 Pelvic Resultant

Max: 65.4 [g] at 0.040 [s]

Min: 0.0 [g] at -0.032 [s]

B-84

8642-NCAP-23

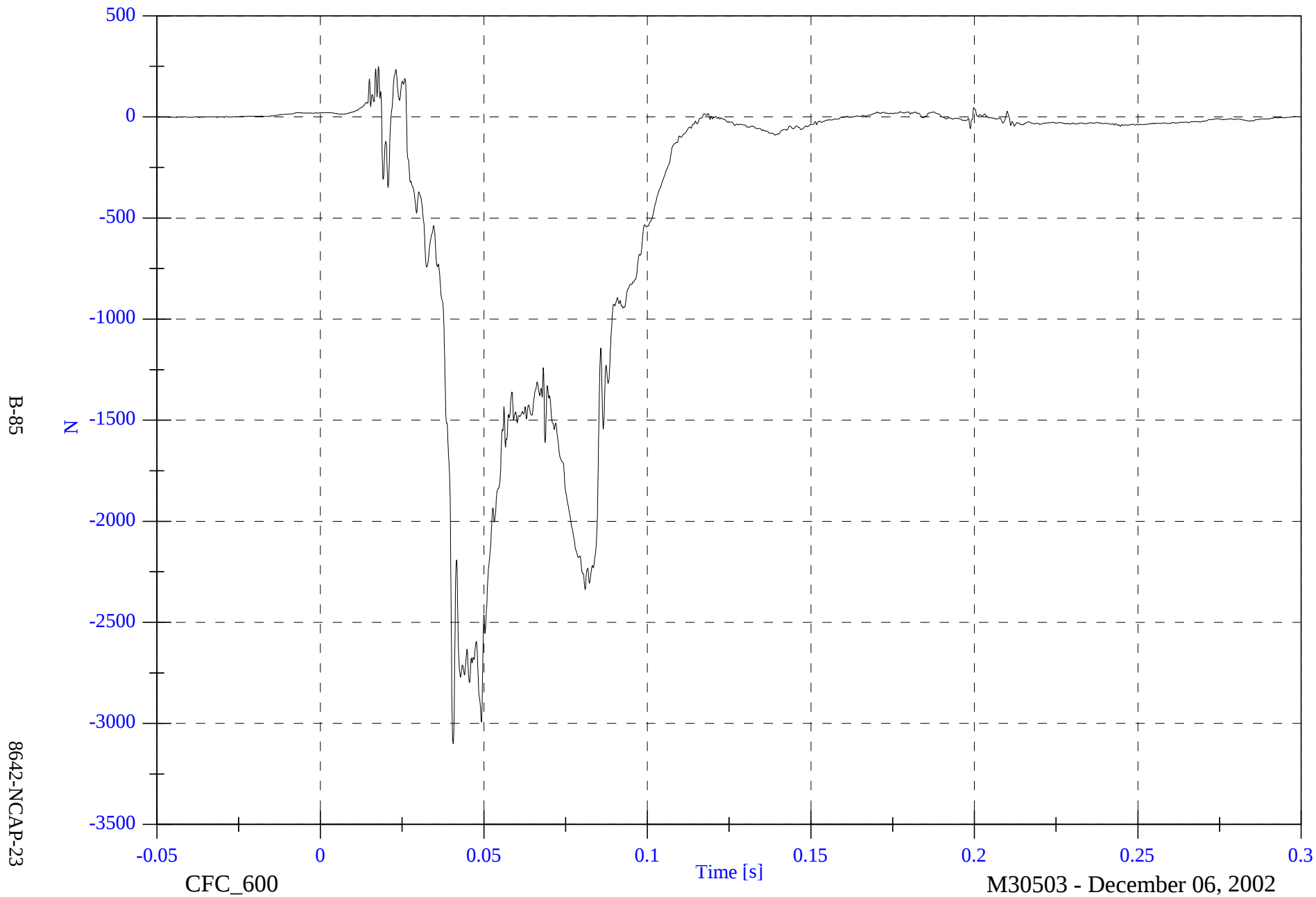


NCAP Test #1 2003 BMW Z4

V1P2 Left Femur z

Max: 249.7 [N] at 0.018 [s]

Min: -3101.1 [N] at 0.041 [s]

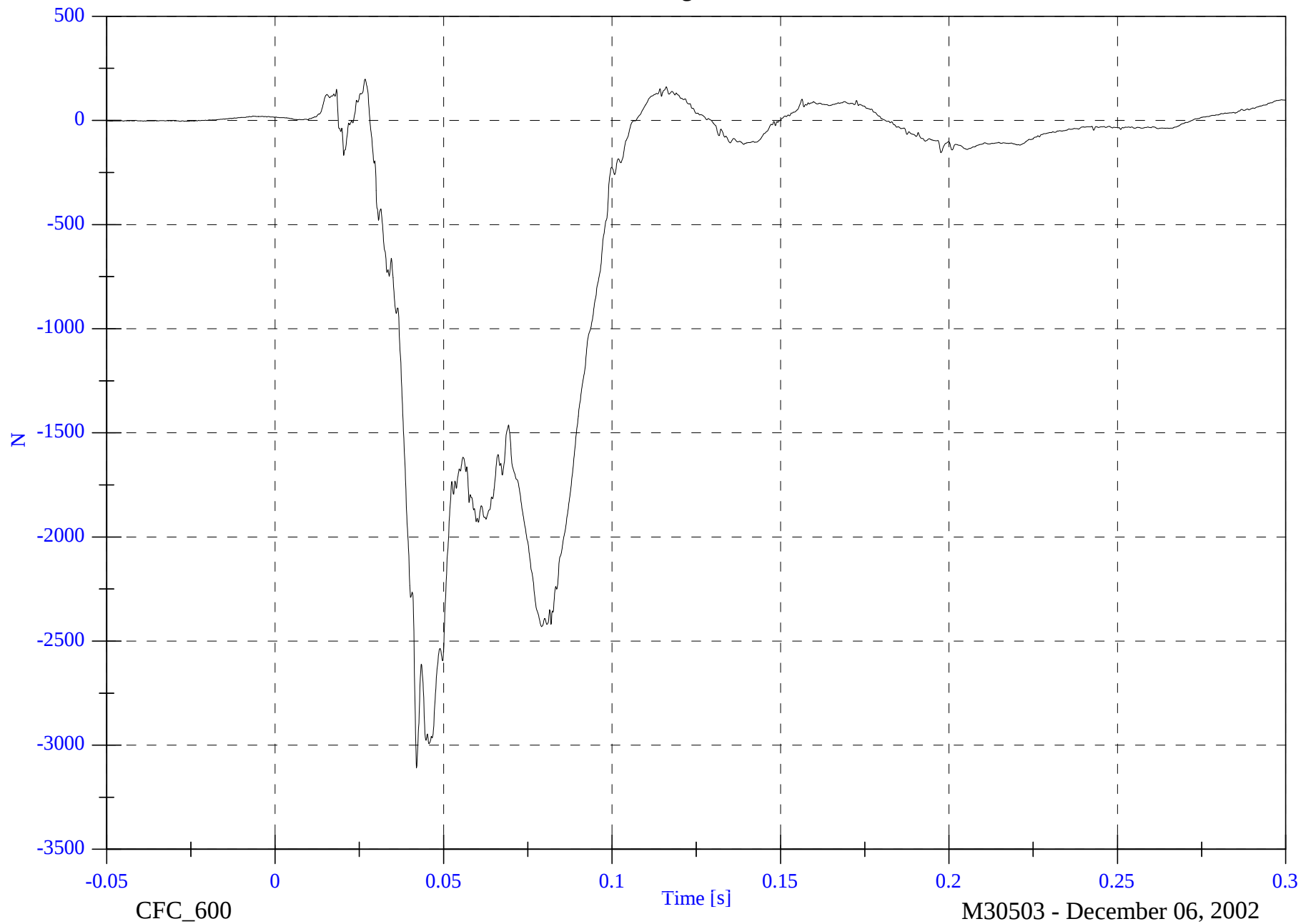


NCAP Test #1 2003 BMW Z4

V1P2 Right Femur z

Max: 198.0 [N] at 0.027 [s]

Min: -3109.1 [N] at 0.042 [s]



B-86

8642-NCAP-23

CFC_600

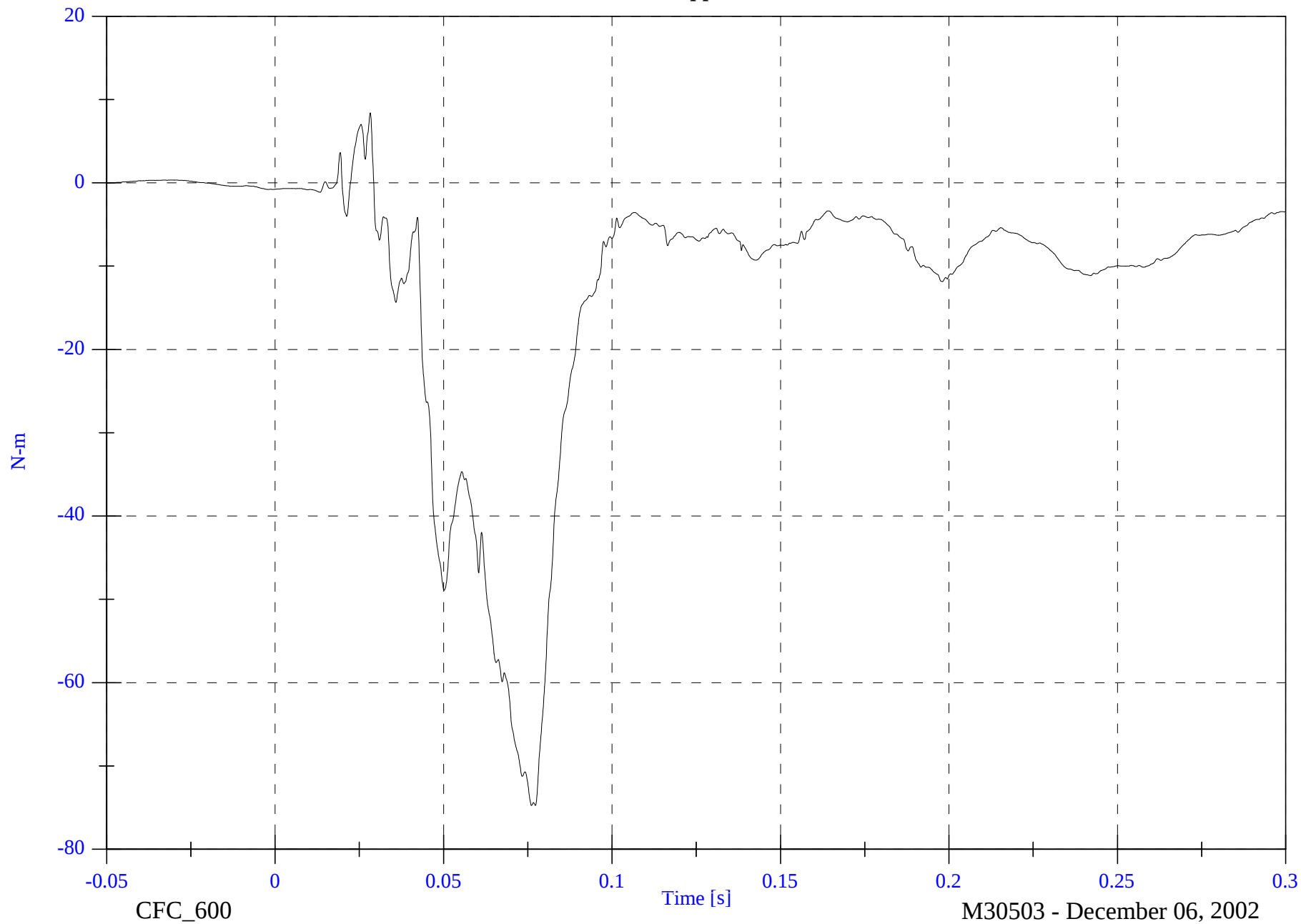
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P2 Left Upper Tibia Mx

Max: 8.4 [N-m] at 0.028 [s]

Min: -74.8 [N-m] at 0.077 [s]



B-87

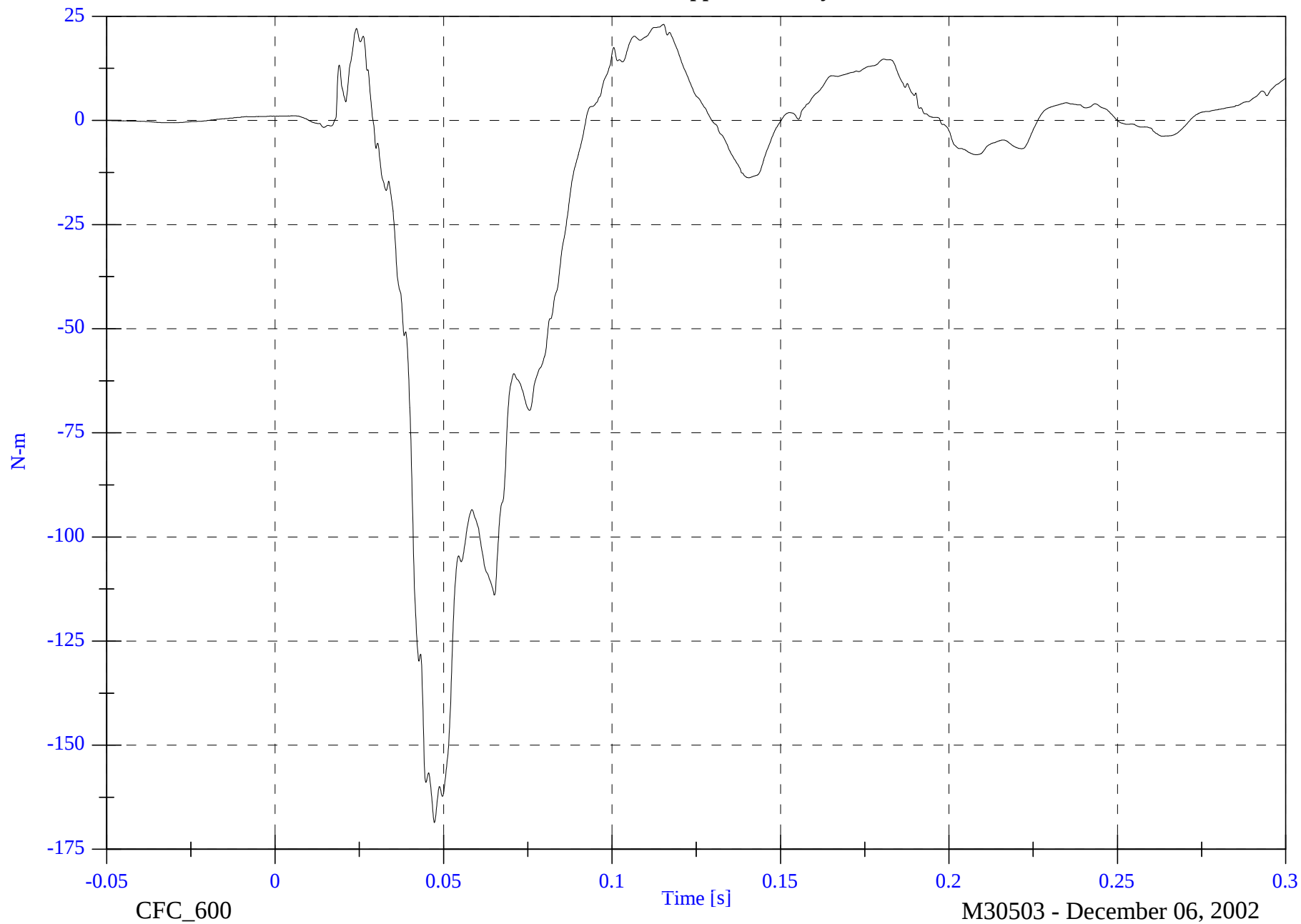
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P2 Left Upper Tibia My

Max: 23.1 [N-m] at 0.115 [s]

Min: -168.6 [N-m] at 0.047 [s]



B-88

8642-NCAP-23

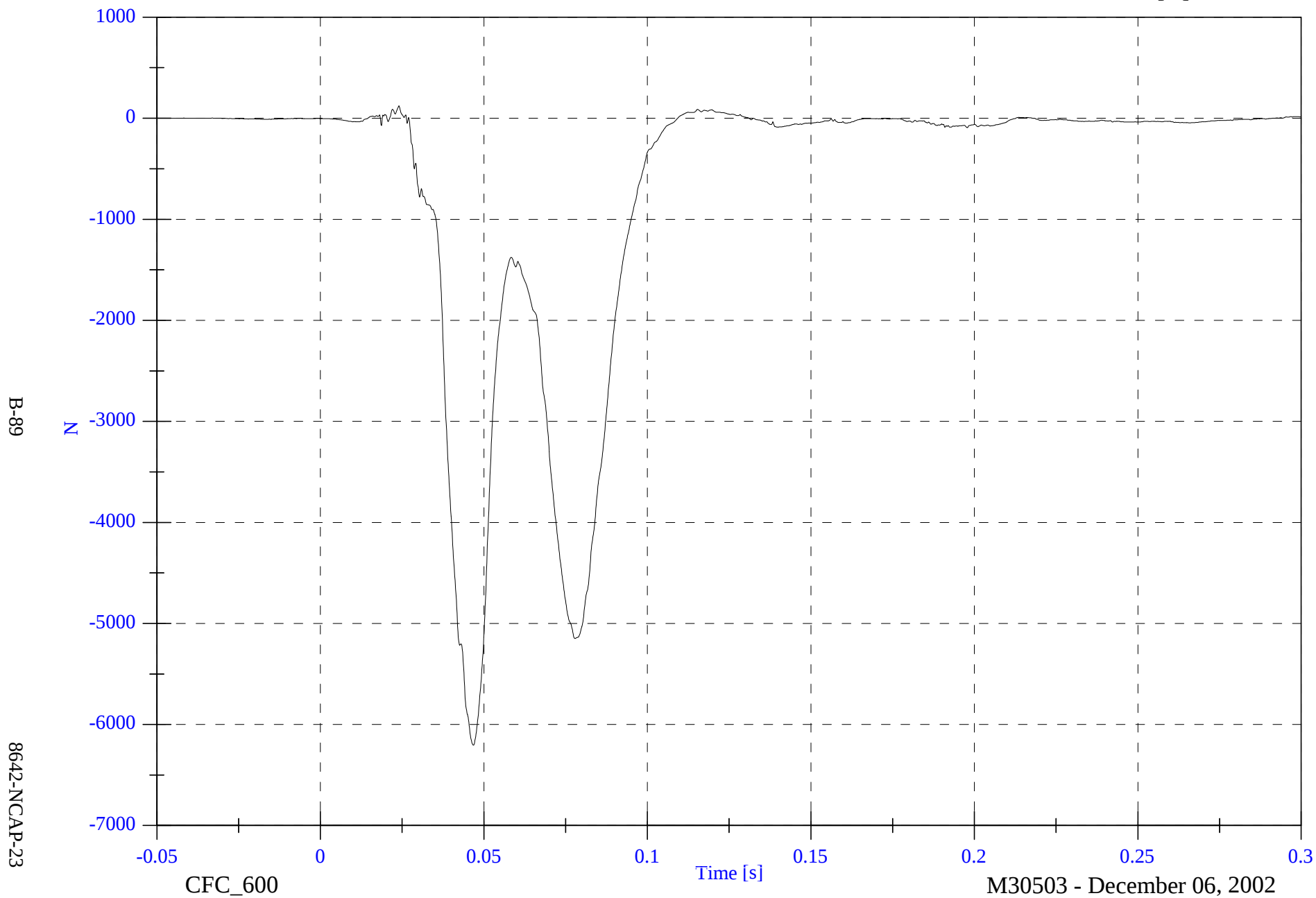
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P2 Left Lower Tibia Fz

Max: 122.9 [N] at 0.024 [s]

Min: -6205.5 [N] at 0.047 [s]



NCAP Test #1 2003 BMW Z4

V1P2 Left Lower Tibia Mx

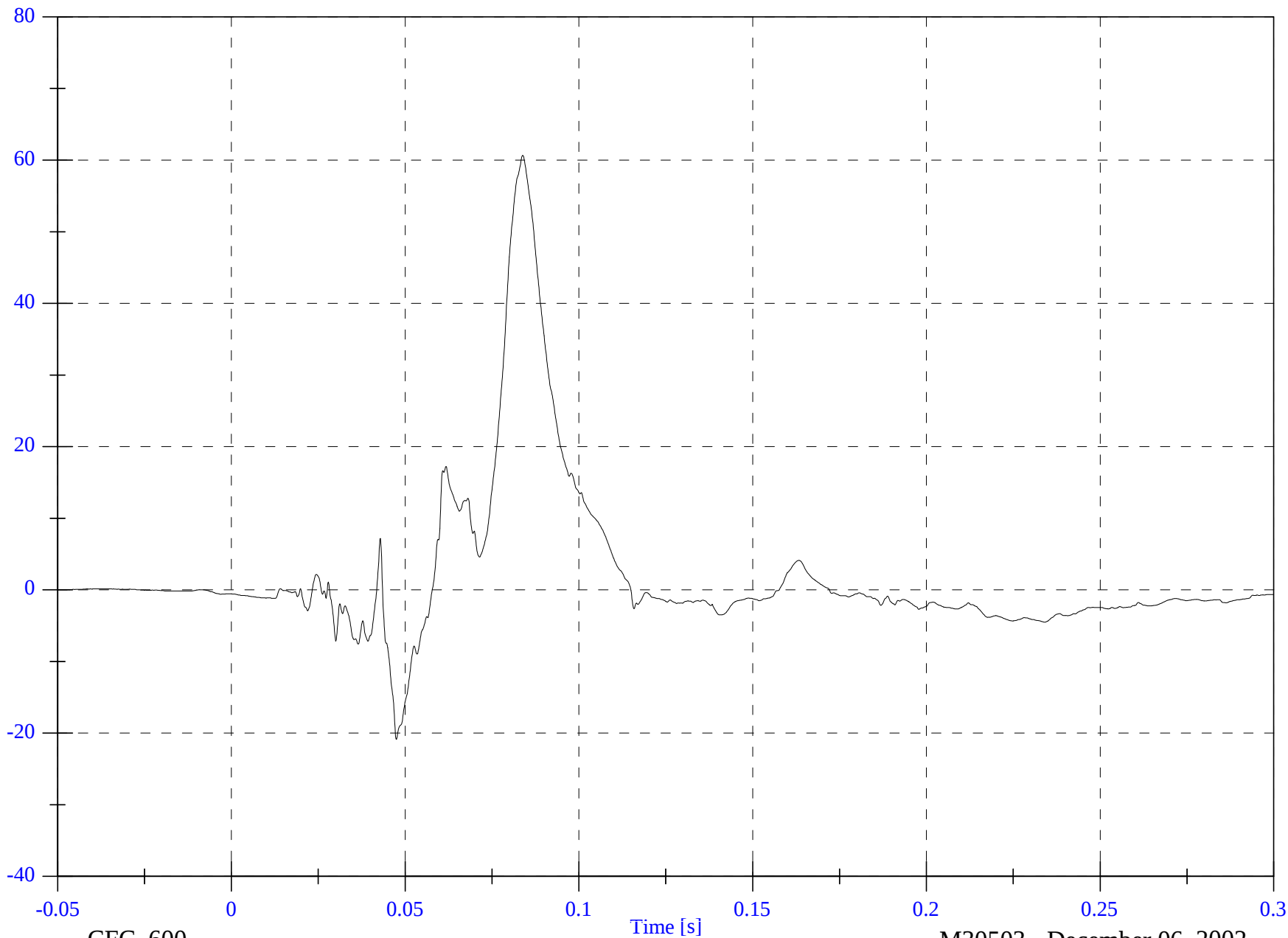
Max: 60.7 [N-m] at 0.084 [s]

Min: -20.9 [N-m] at 0.048 [s]

B-90

N-m

8642-NCAP-23



CFC_600

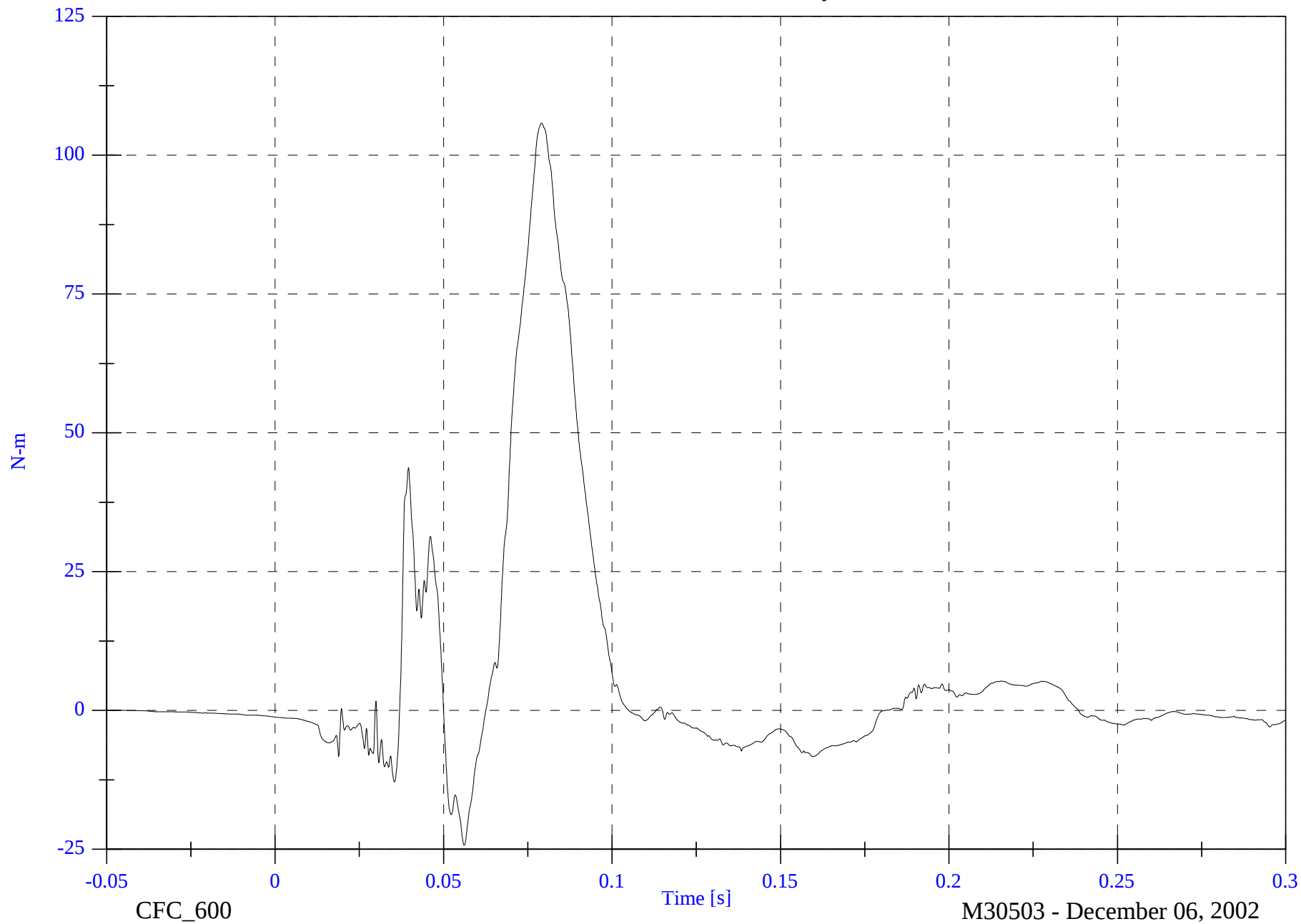
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1P2 Left Lower Tibia My

Max: 105.8 [N-m] at 0.079 [s]

Min: -24.3 [N-m] at 0.056 [s]



B-91

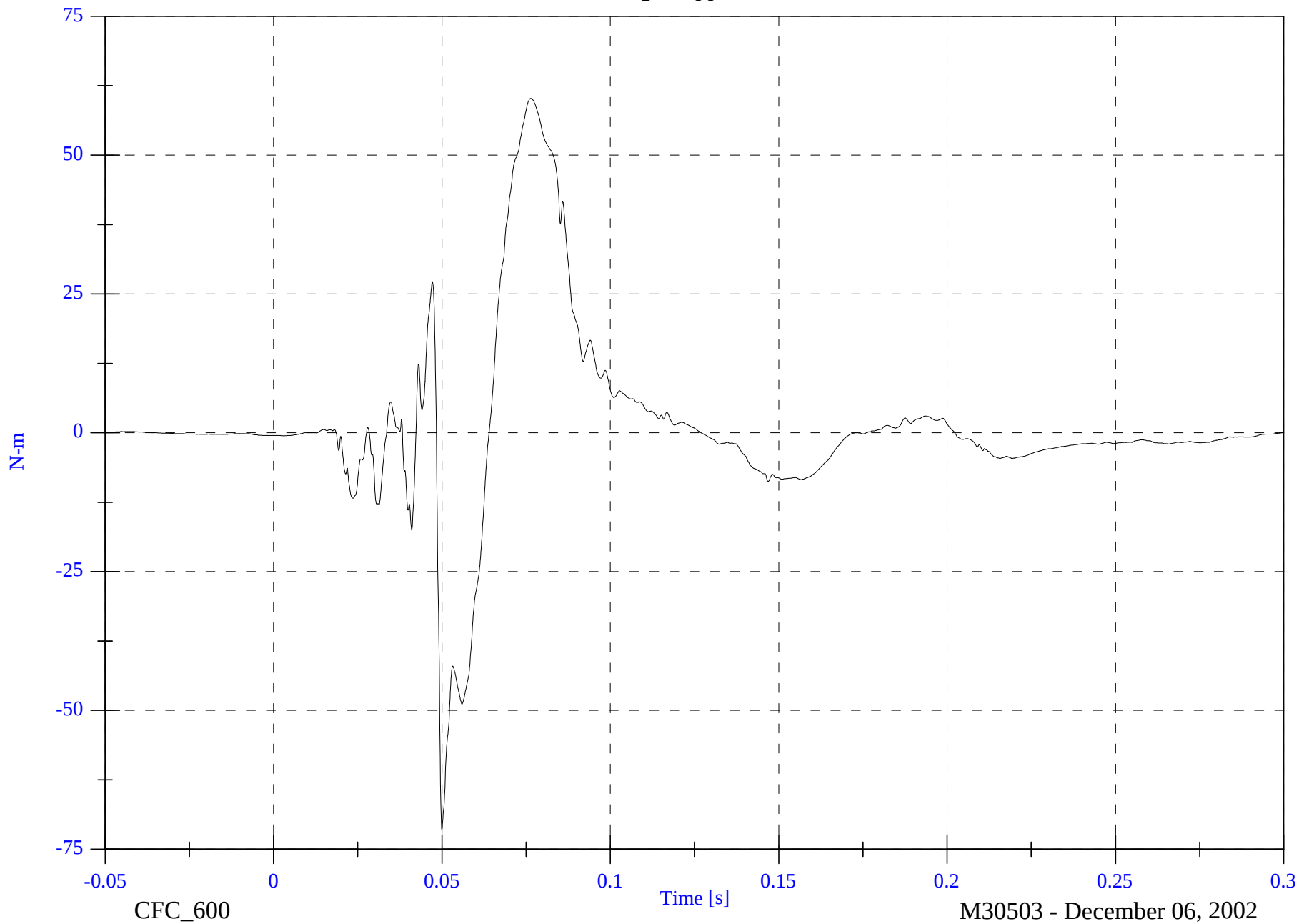
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1P2 Right Upper Tibia Mx

Max: 60.2 [N-m] at 0.076 [s]

Min: -71.6 [N-m] at 0.050 [s]

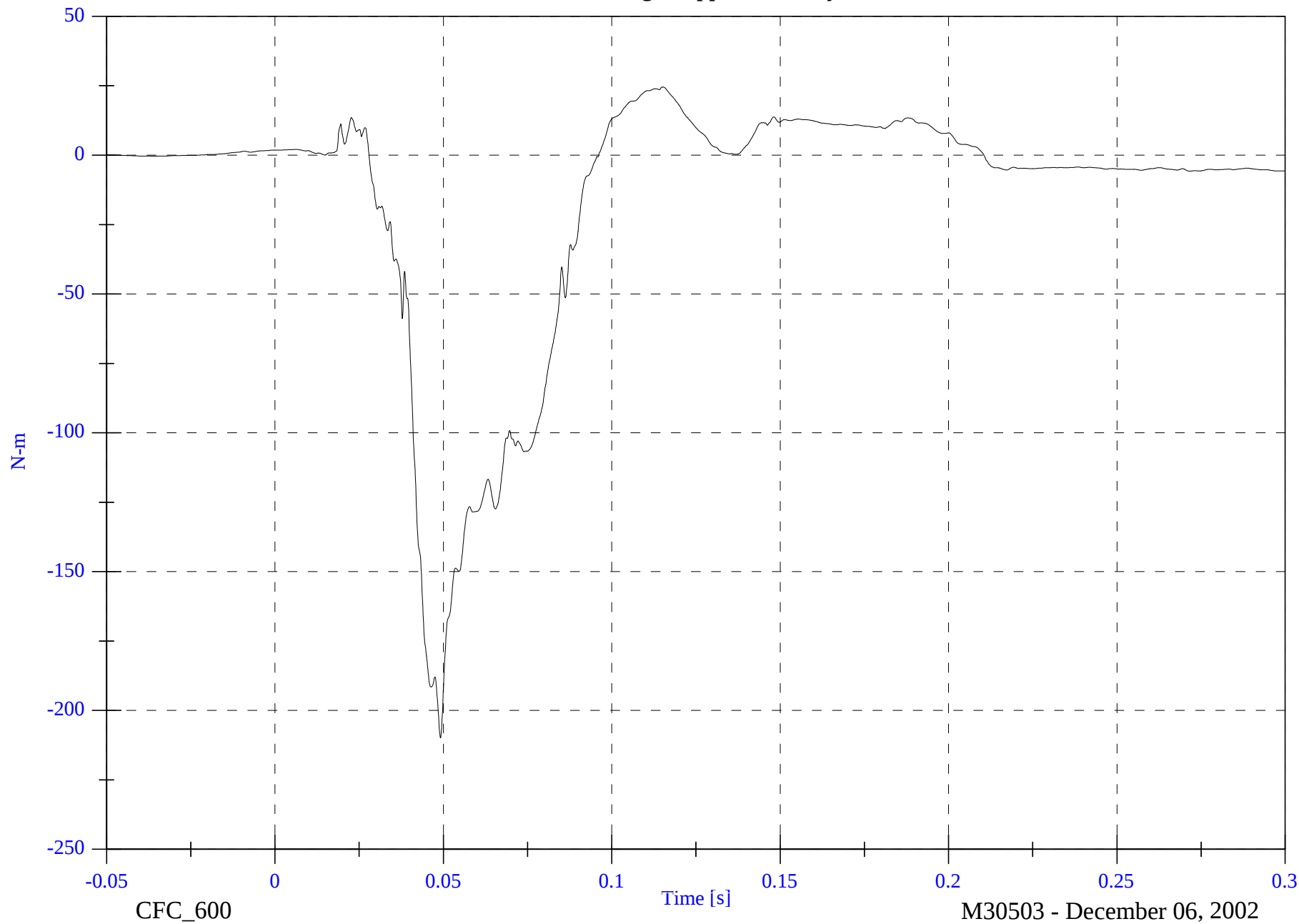


NCAP Test #1 2003 BMW Z4

V1P2 Right Upper Tibia My

Max: 24.6 [N-m] at 0.115 [s]

Min: -209.8 [N-m] at 0.049 [s]

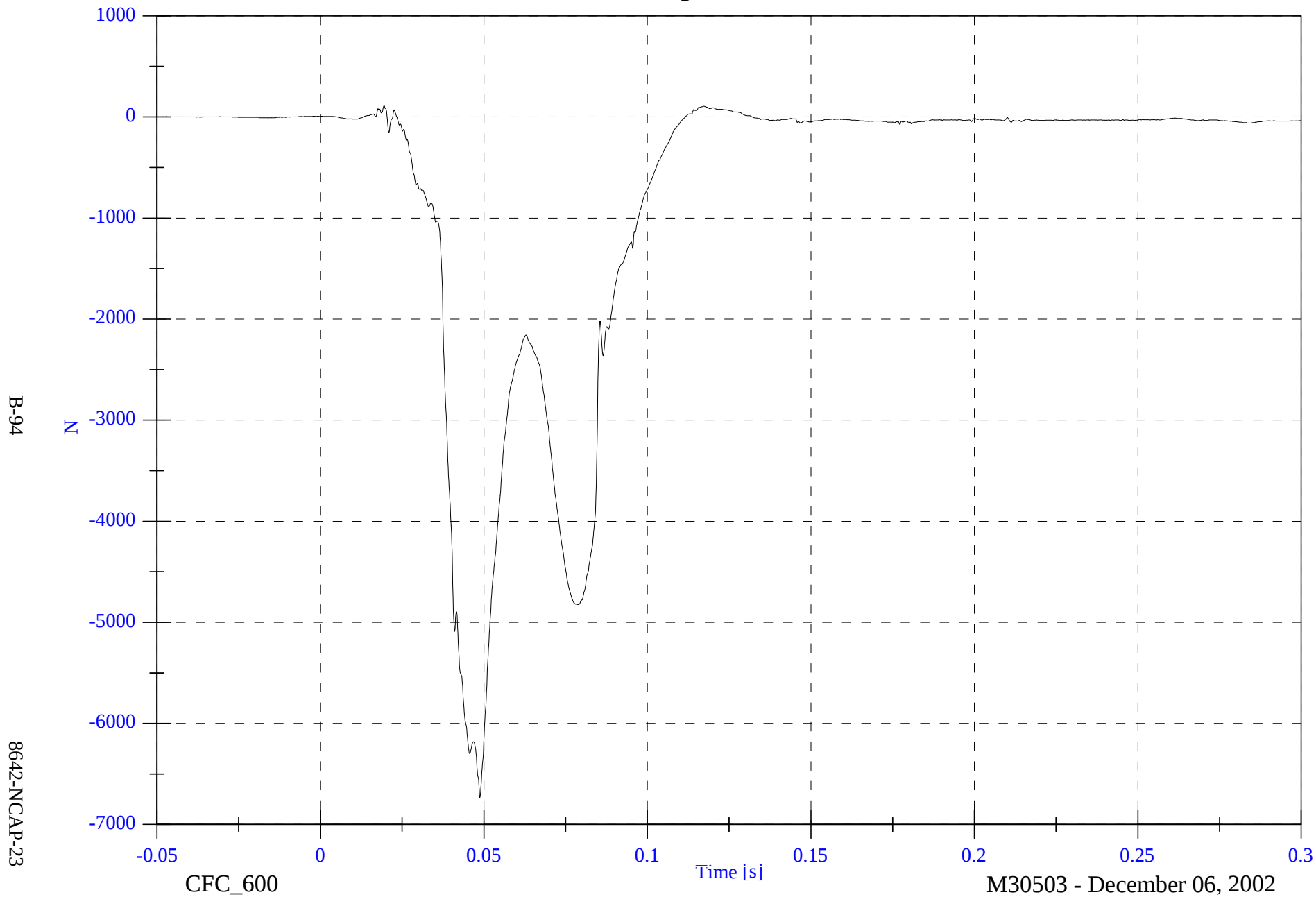


NCAP Test #1 2003 BMW Z4

V1P2 Right Lower Tibia Fz

Max: 113.1 [N] at 0.020 [s]

Min: -6737.7 [N] at 0.049 [s]

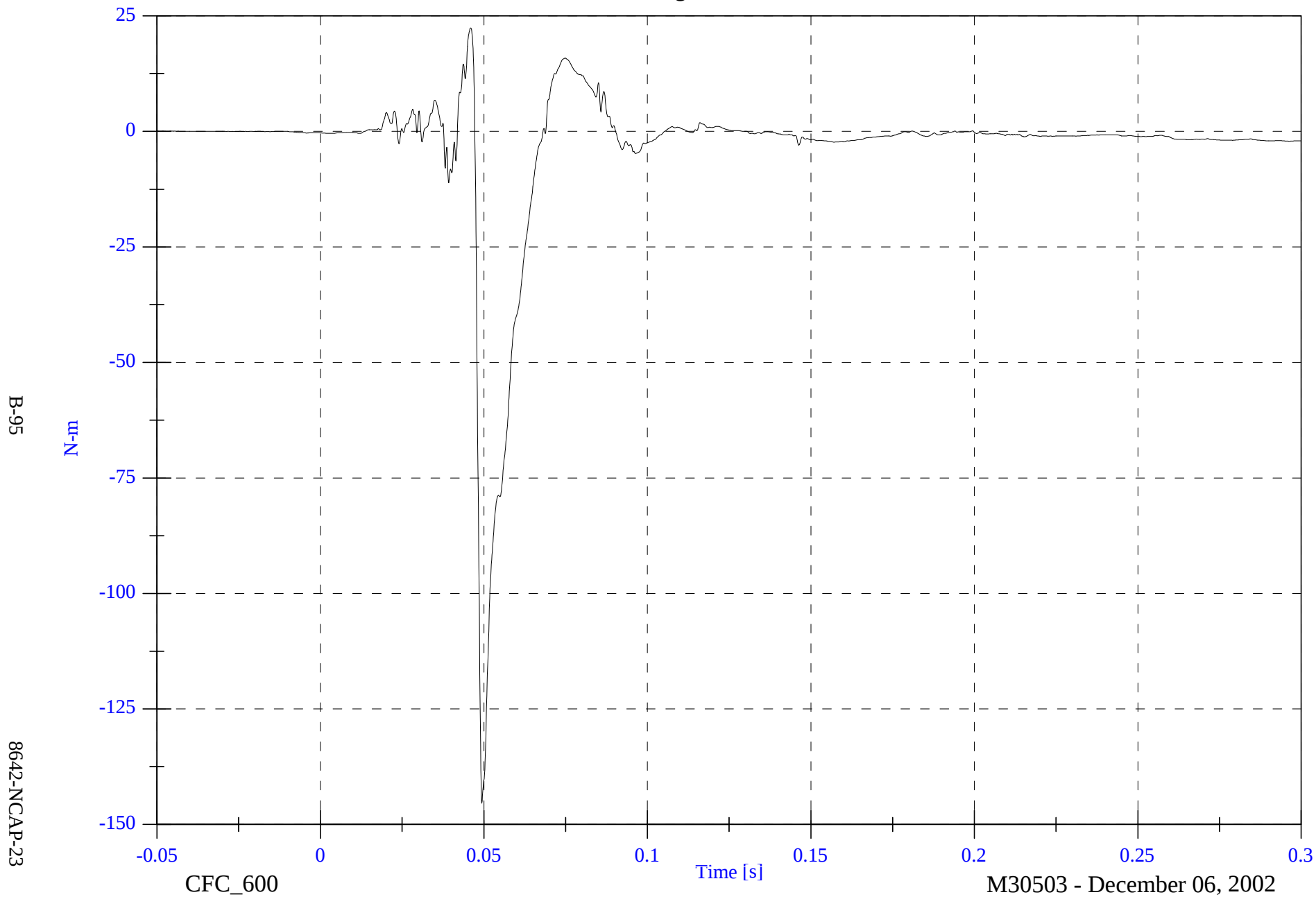


NCAP Test #1 2003 BMW Z4

V1P2 Right Lower Tibia Mx

Max: 22.4 [N-m] at 0.046 [s]

Min: -145.4 [N-m] at 0.049 [s]

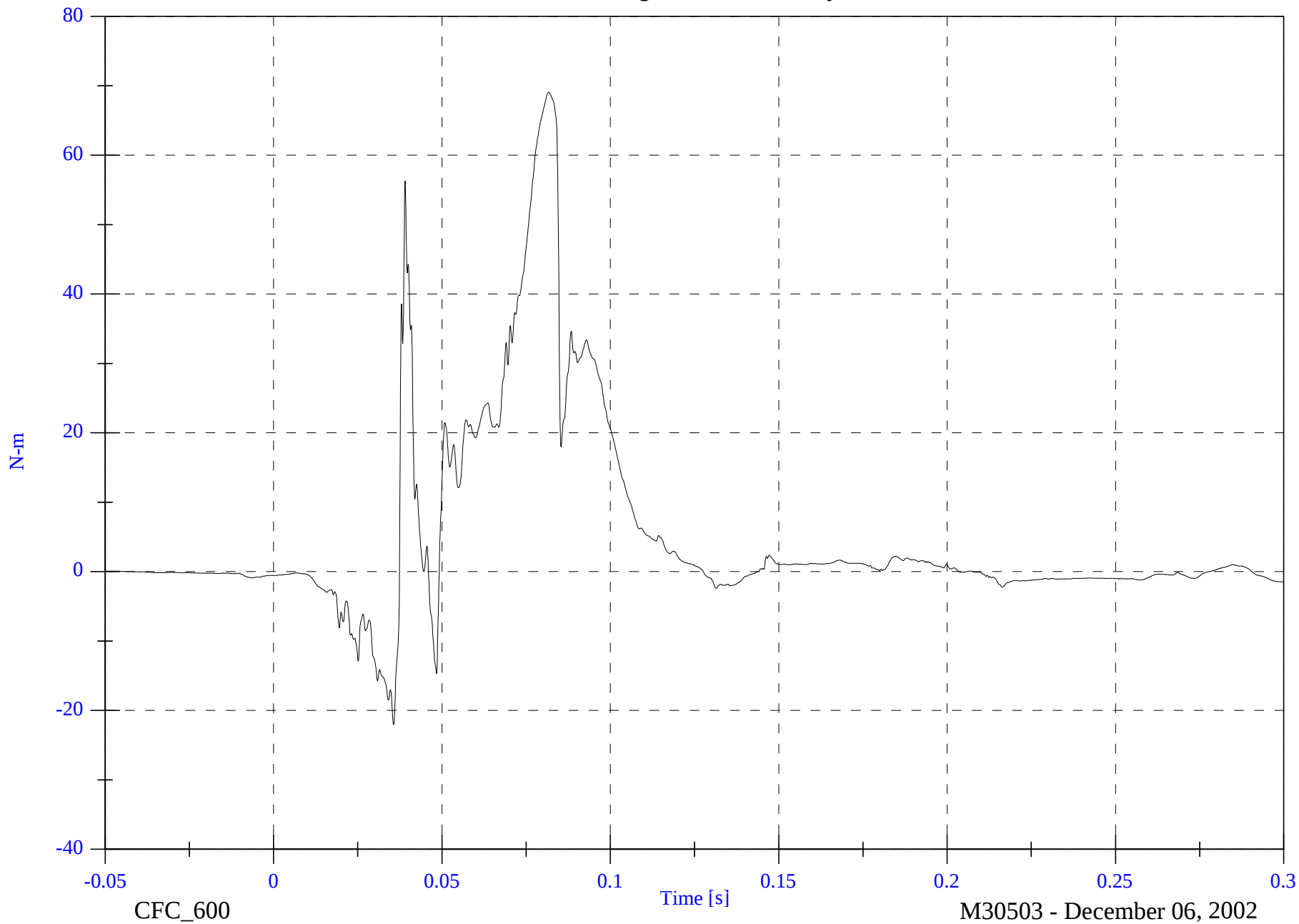


NCAP Test #1 2003 BMW Z4

V1P2 Right Lower Tibia My

Max: 69.1 [N-m] at 0.082 [s]

Min: -22.0 [N-m] at 0.036 [s]



B-96

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

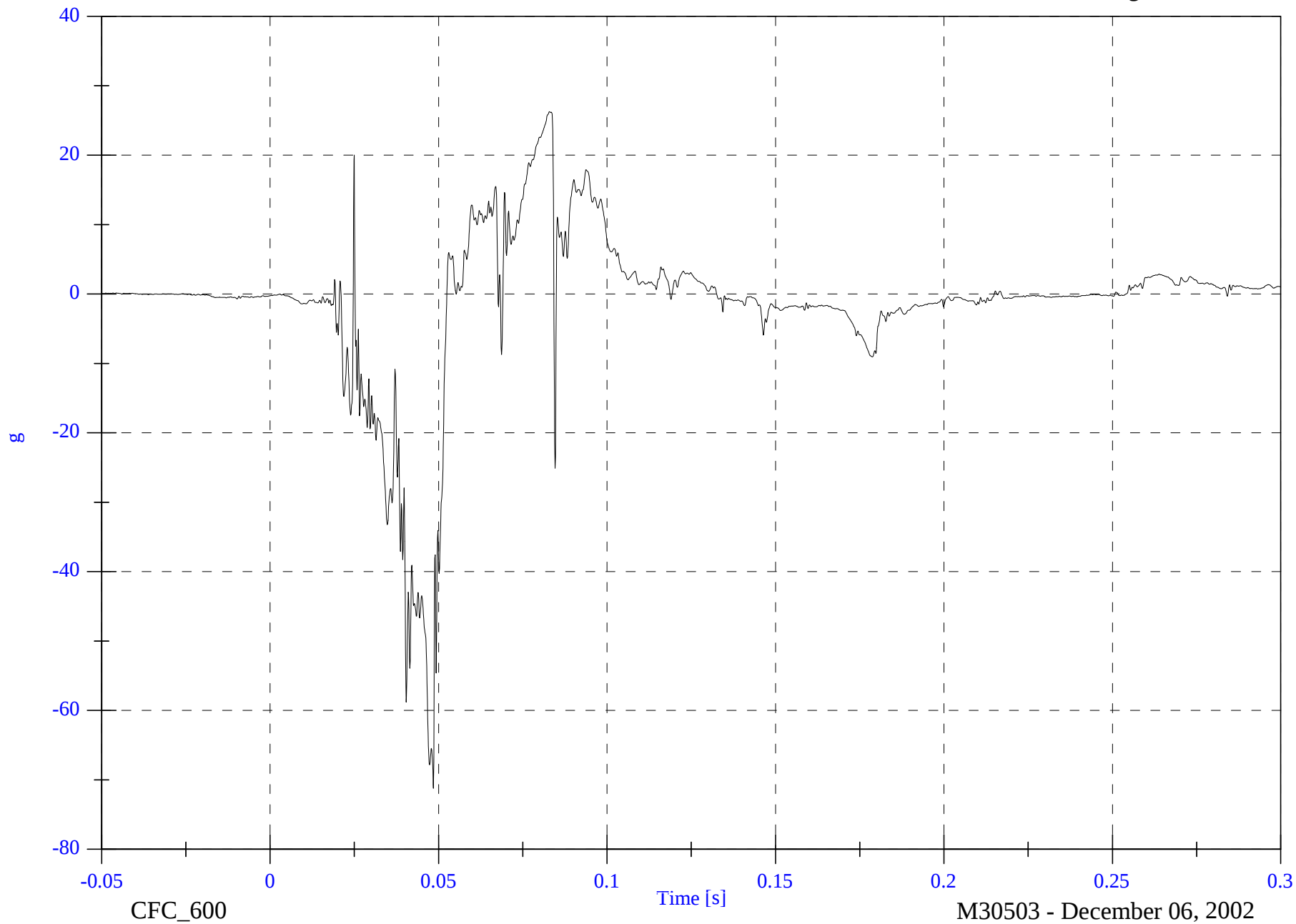
V1P2 Left Foot Aft x

Max: 26.3 [g] at 0.083 [s]

Min: -71.2 [g] at 0.048 [s]

B-97

8642-NCAP-23

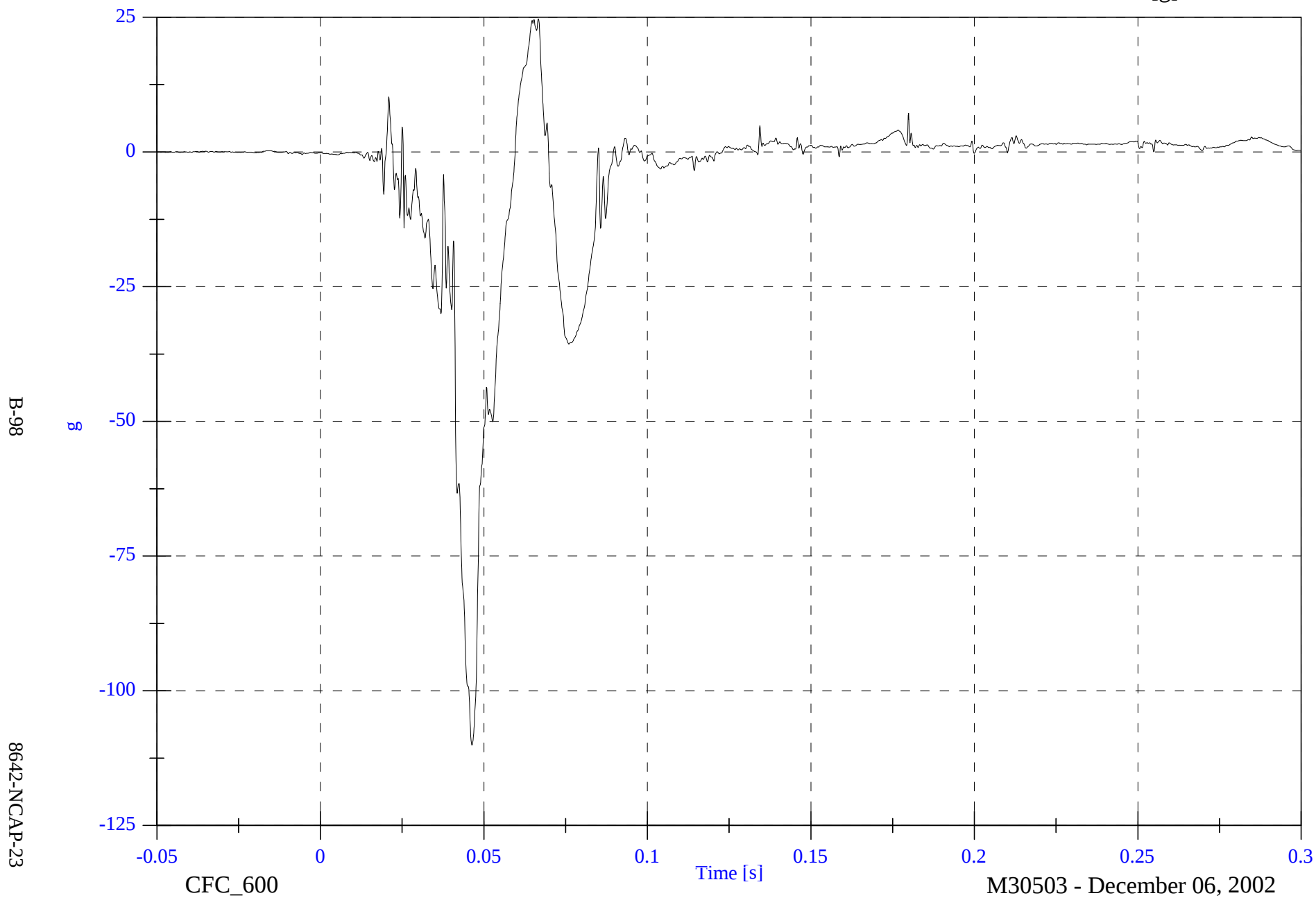


NCAP Test #1 2003 BMW Z4

V1P2 Left Foot Aft z

Max: 24.7 [g] at 0.067 [s]

Min: -110.1 [g] at 0.046 [s]

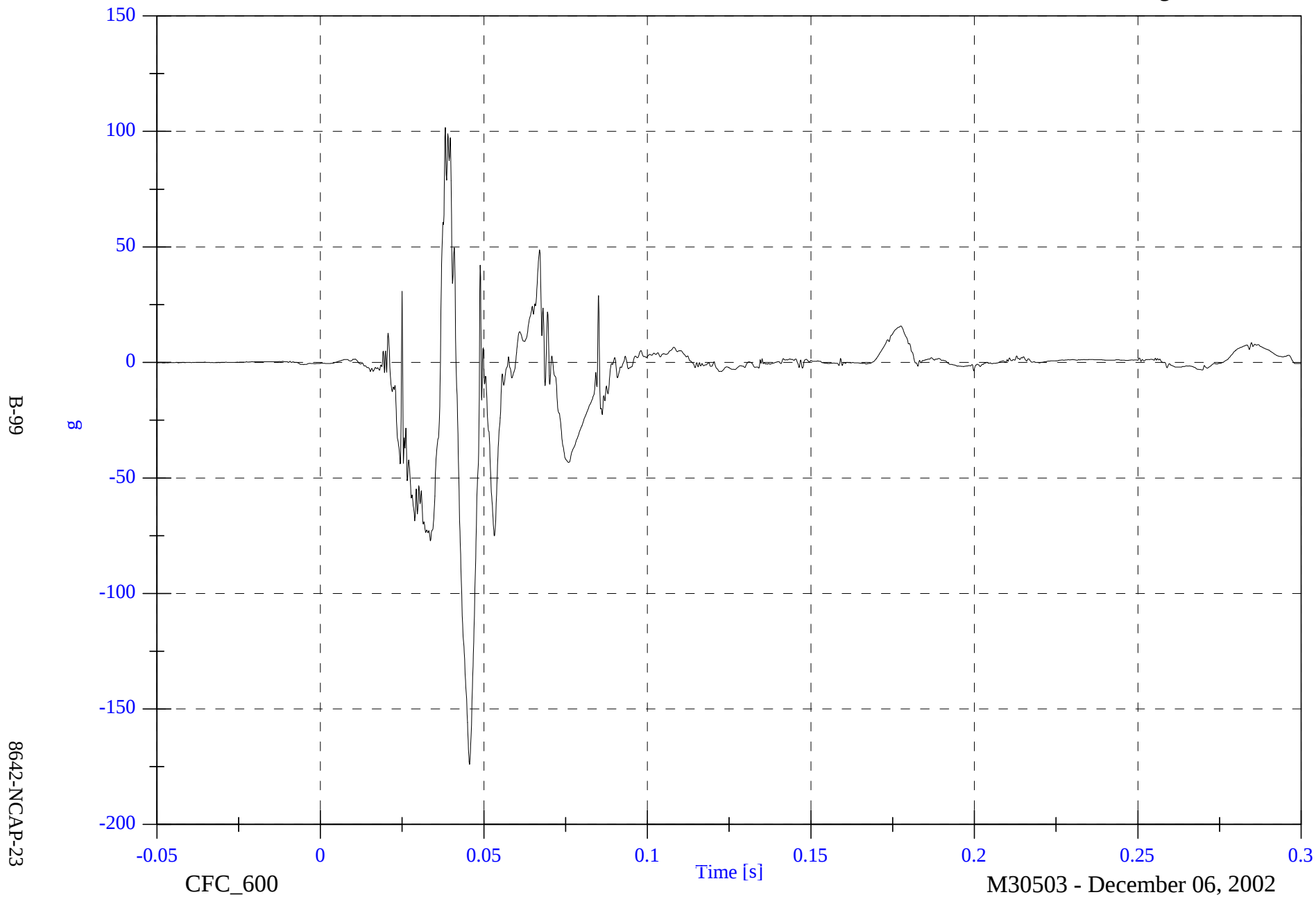


NCAP Test #1 2003 BMW Z4

V1P2 Left Foot Fore z

Max: 101.7 [g] at 0.038 [s]

Min: -174.0 [g] at 0.046 [s]



NCAP Test #1 2003 BMW Z4

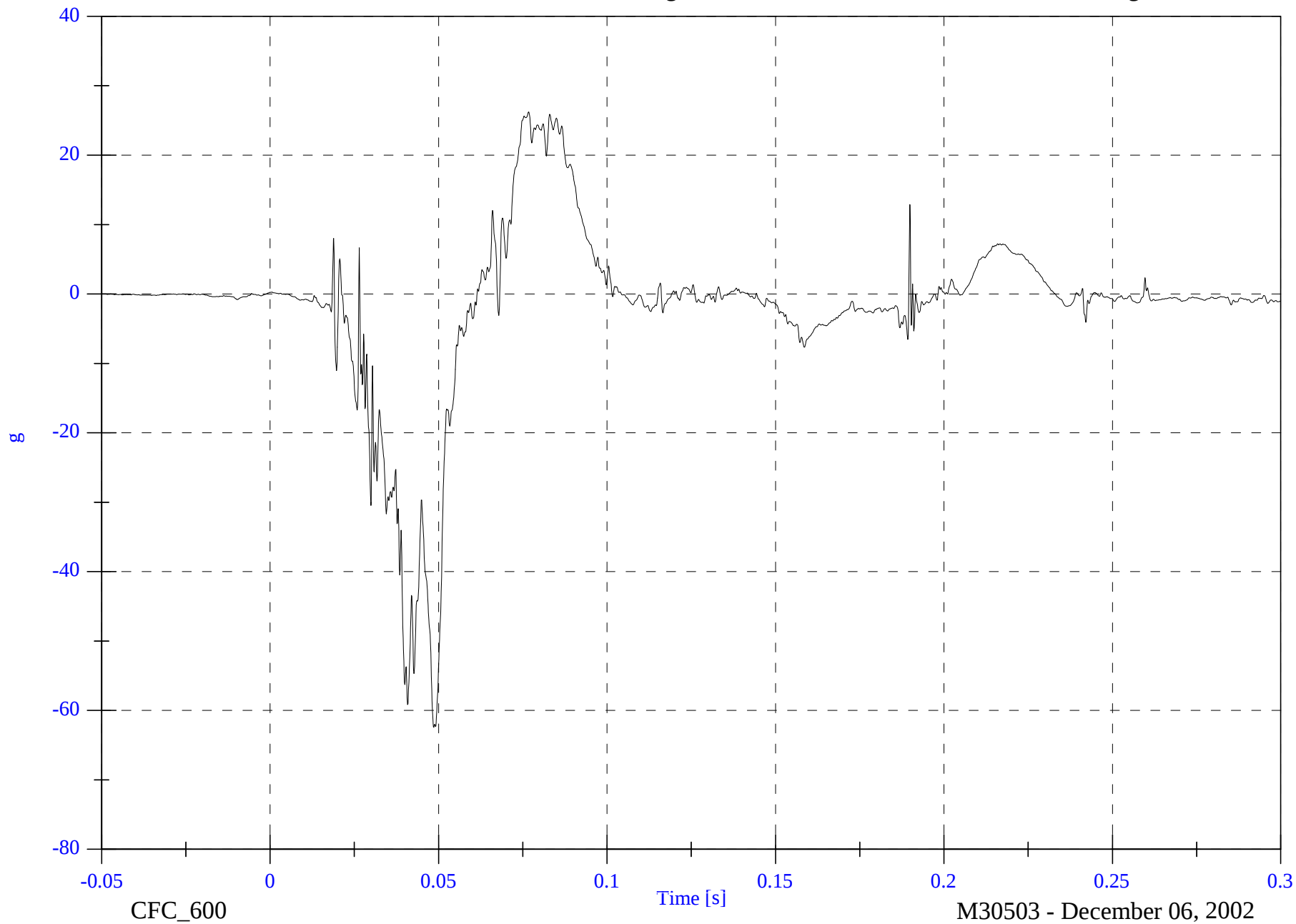
V1P2 Right Foot Aft x

Max: 26.3 [g] at 0.077 [s]

Min: -62.4 [g] at 0.049 [s]

B-100

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

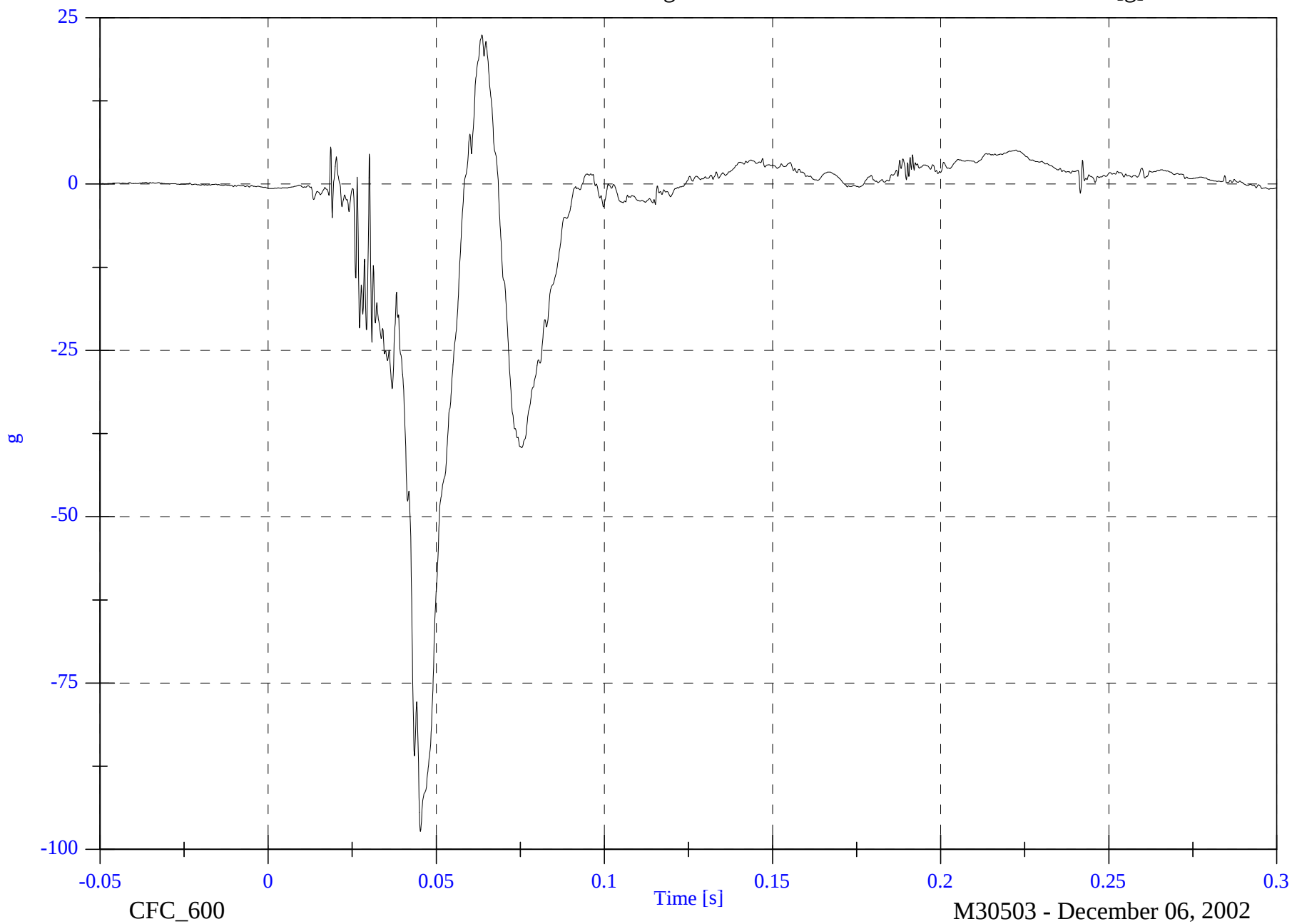
V1P2 Right Foot Aft z

Max: 22.4 [g] at 0.064 [s]

Min: -97.3 [g] at 0.045 [s]

B-101

8642-NCAP-23

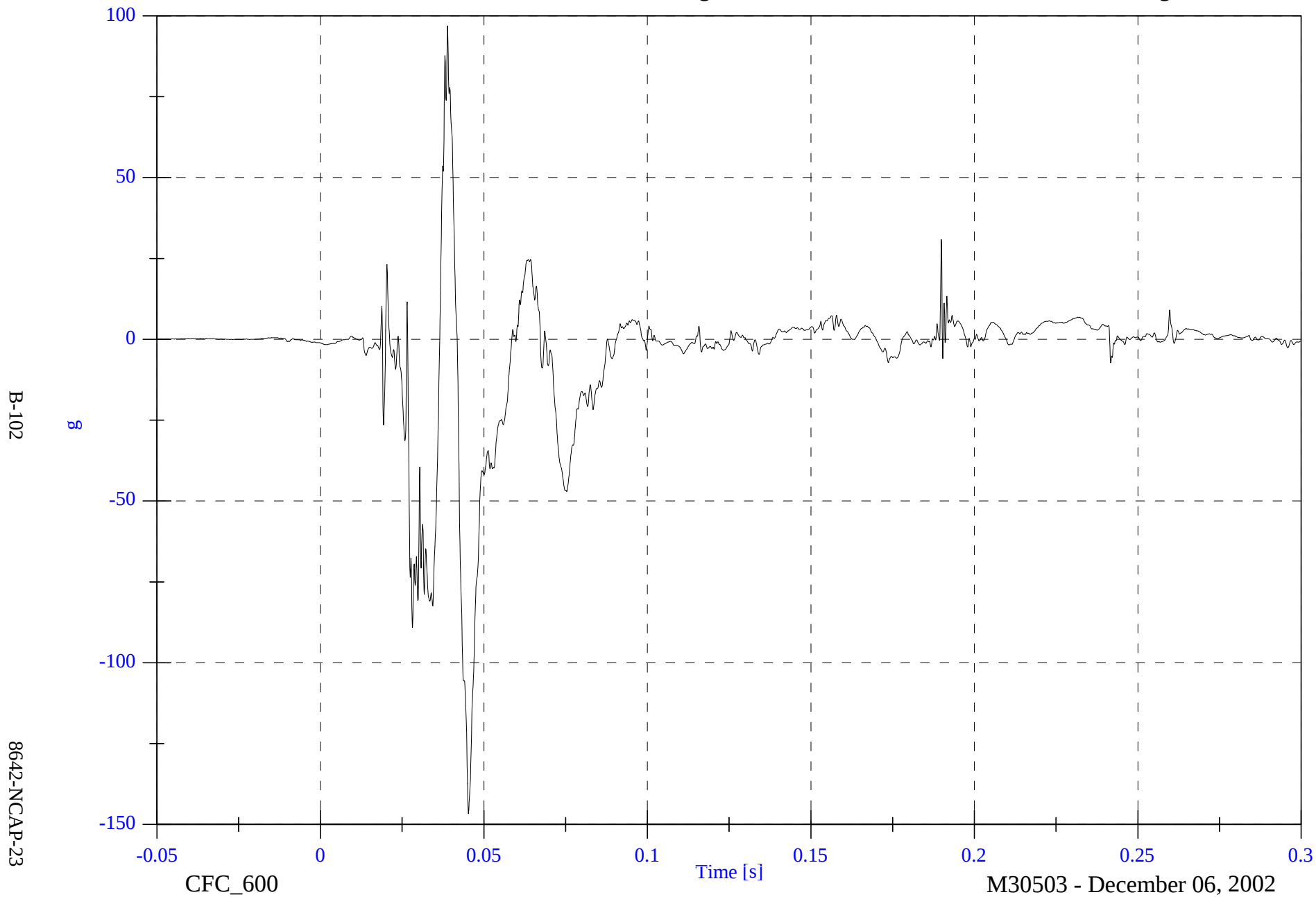


NCAP Test #1 2003 BMW Z4

V1P2 Right Foot Fore z

Max: 96.9 [g] at 0.039 [s]

Min: -146.6 [g] at 0.045 [s]

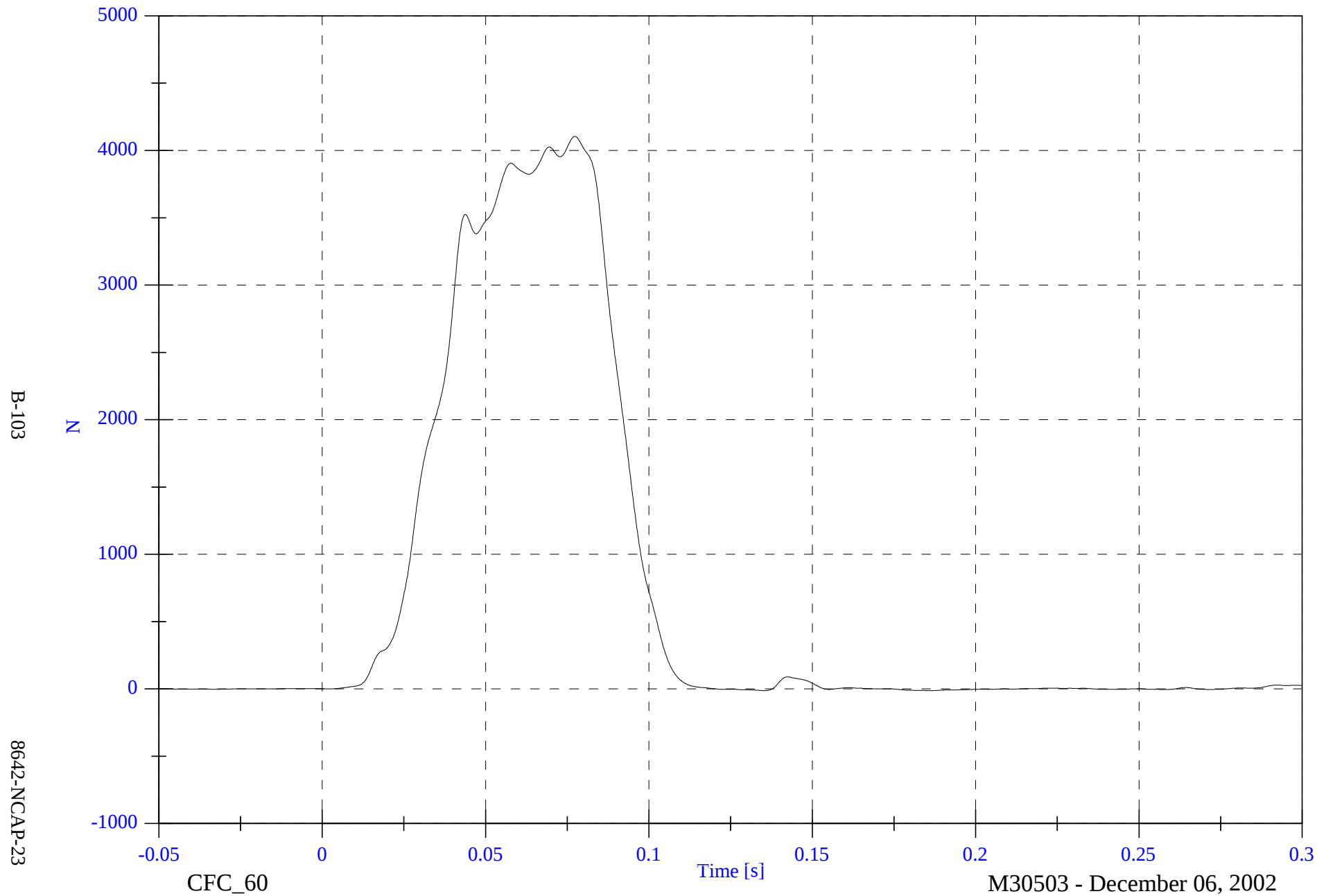


NCAP Test #1 2003 BMW Z4

V1 P2 Torso Belt

Max: 4104.6 [N] at 0.077 [s]

Min: -13.1 [N] at 0.186 [s]



NCAP Test #1 2003 BMW Z4

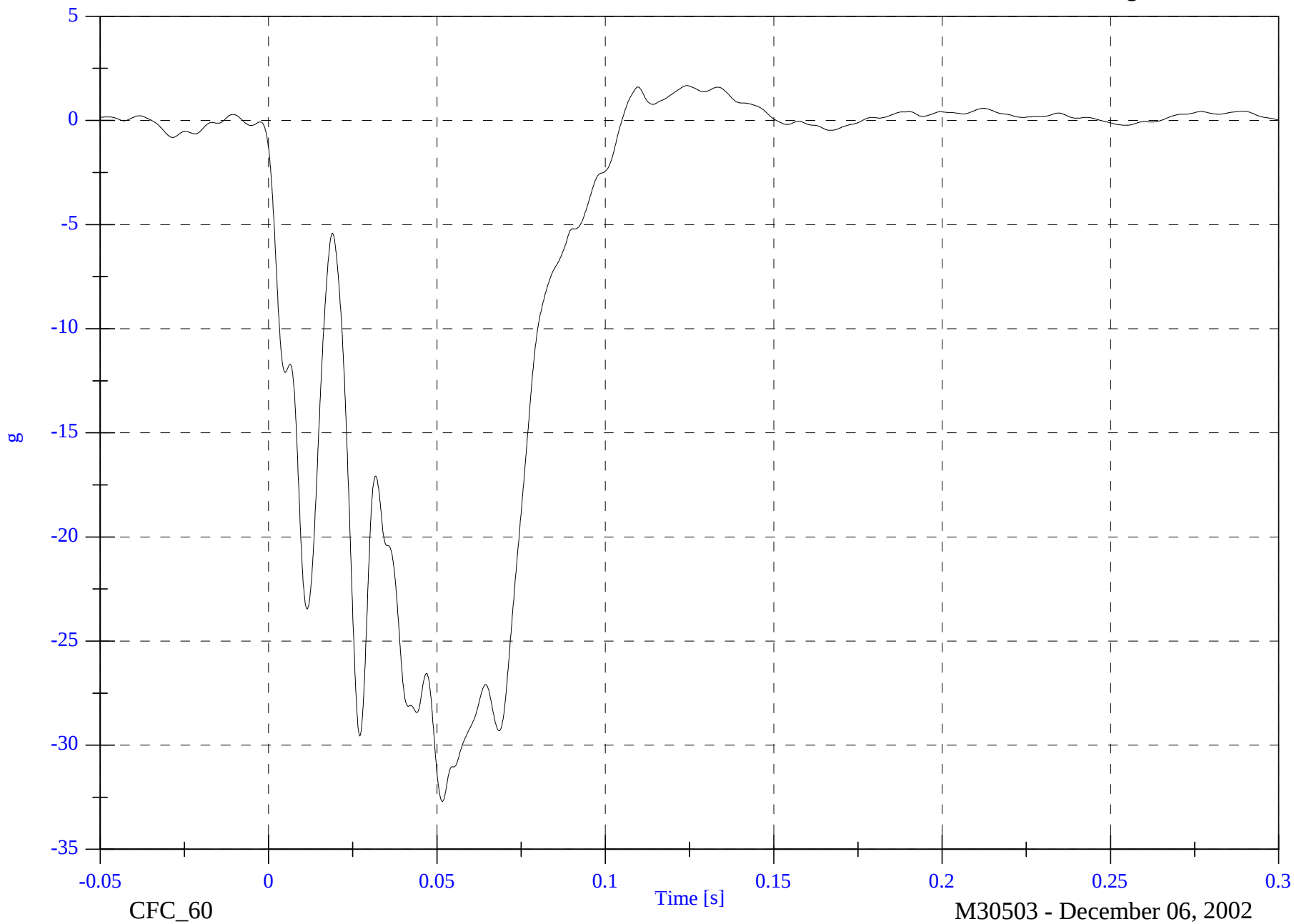
V1 Left Rear #1x

Max: 1.7 [g] at 0.124 [s]

Min: -32.7 [g] at 0.052 [s]

B-104

8642-NCAP-23

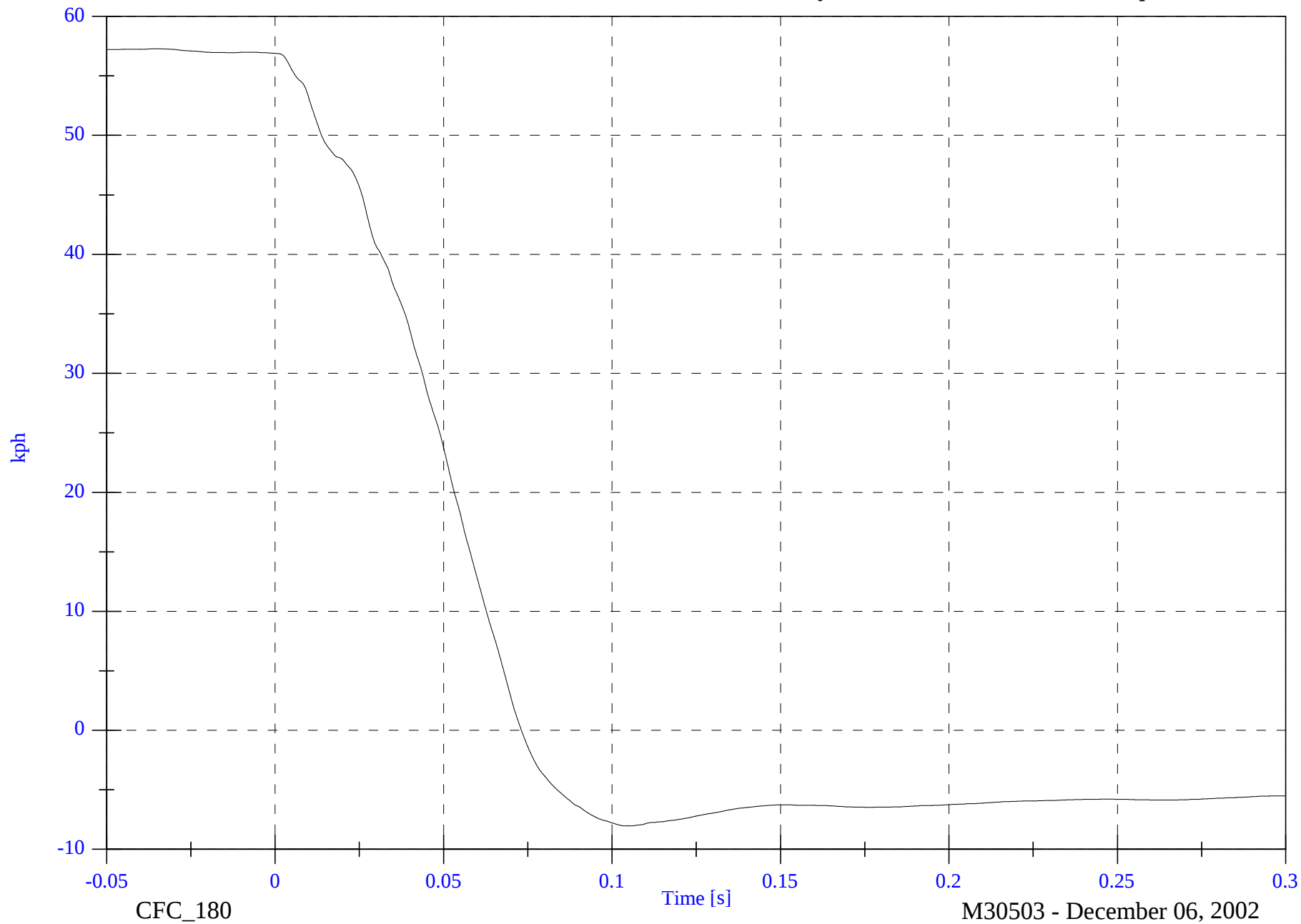


NCAP Test #1 2003 BMW Z4

V1 Left Rear #1x Velocity

Max: 57.3 [kph] at -0.035 [s]

Min: -8.0 [kph] at 0.105 [s]



B-105

8642-NCAP-23

CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

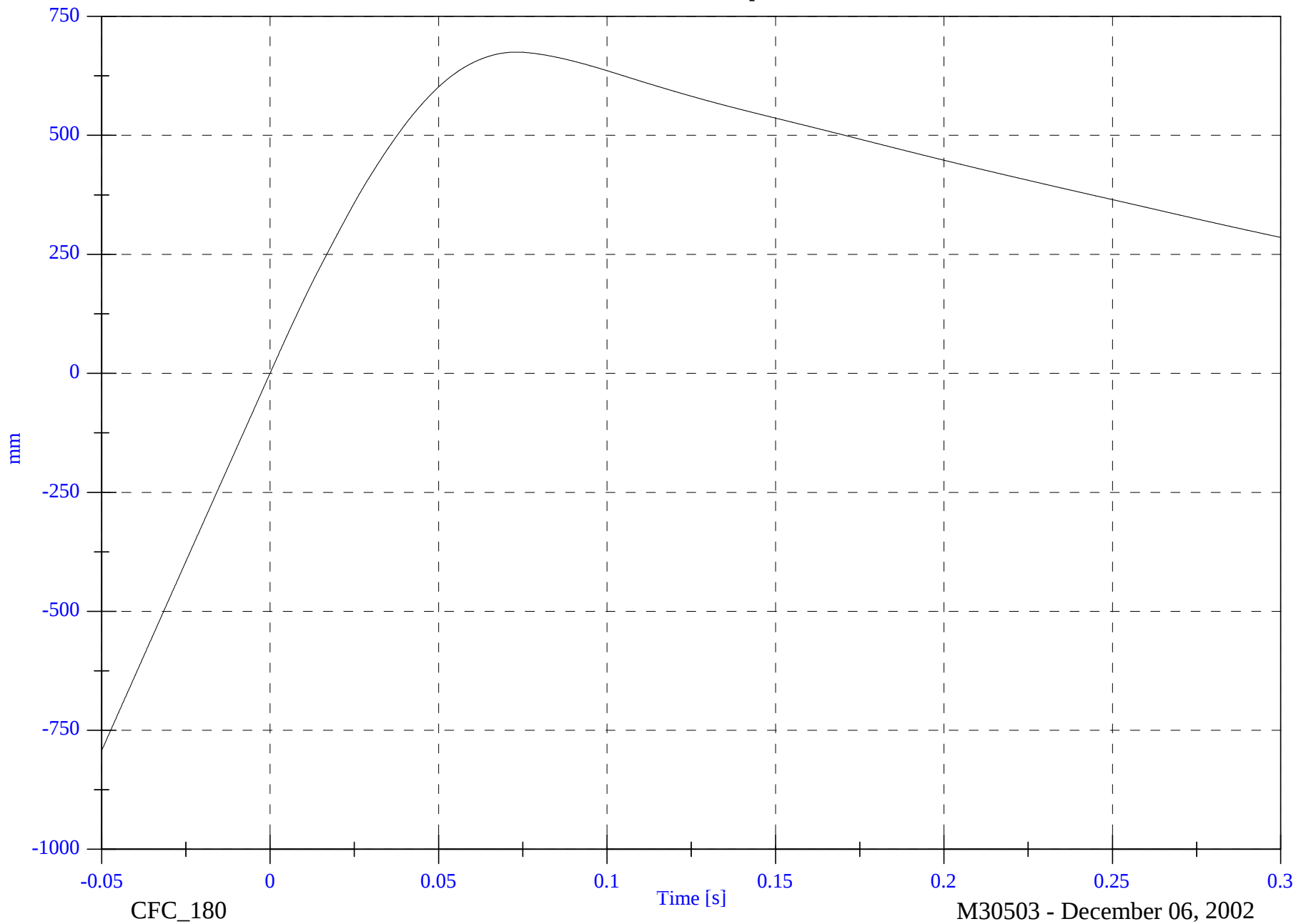
V1 Left Rear #1x Displacement

Max: 674.7 [mm] at 0.073 [s]

Min: -793.0 [mm] at -0.050 [s]

B-106

8642-NCAP-23



CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

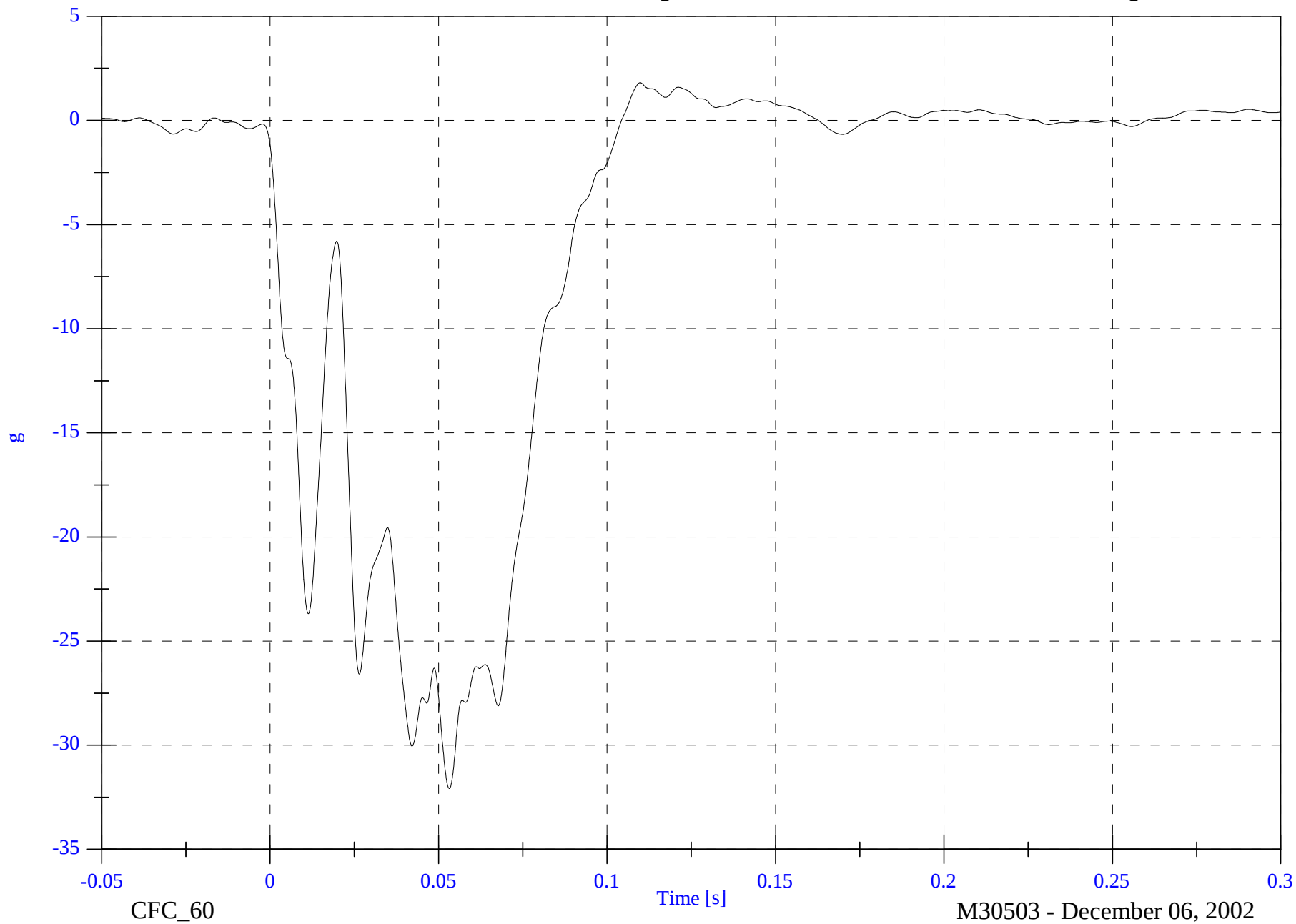
V1 Right Rear #2x

Max: 1.8 [g] at 0.110 [s]

Min: -32.1 [g] at 0.053 [s]

B-107

8642-NCAP-23

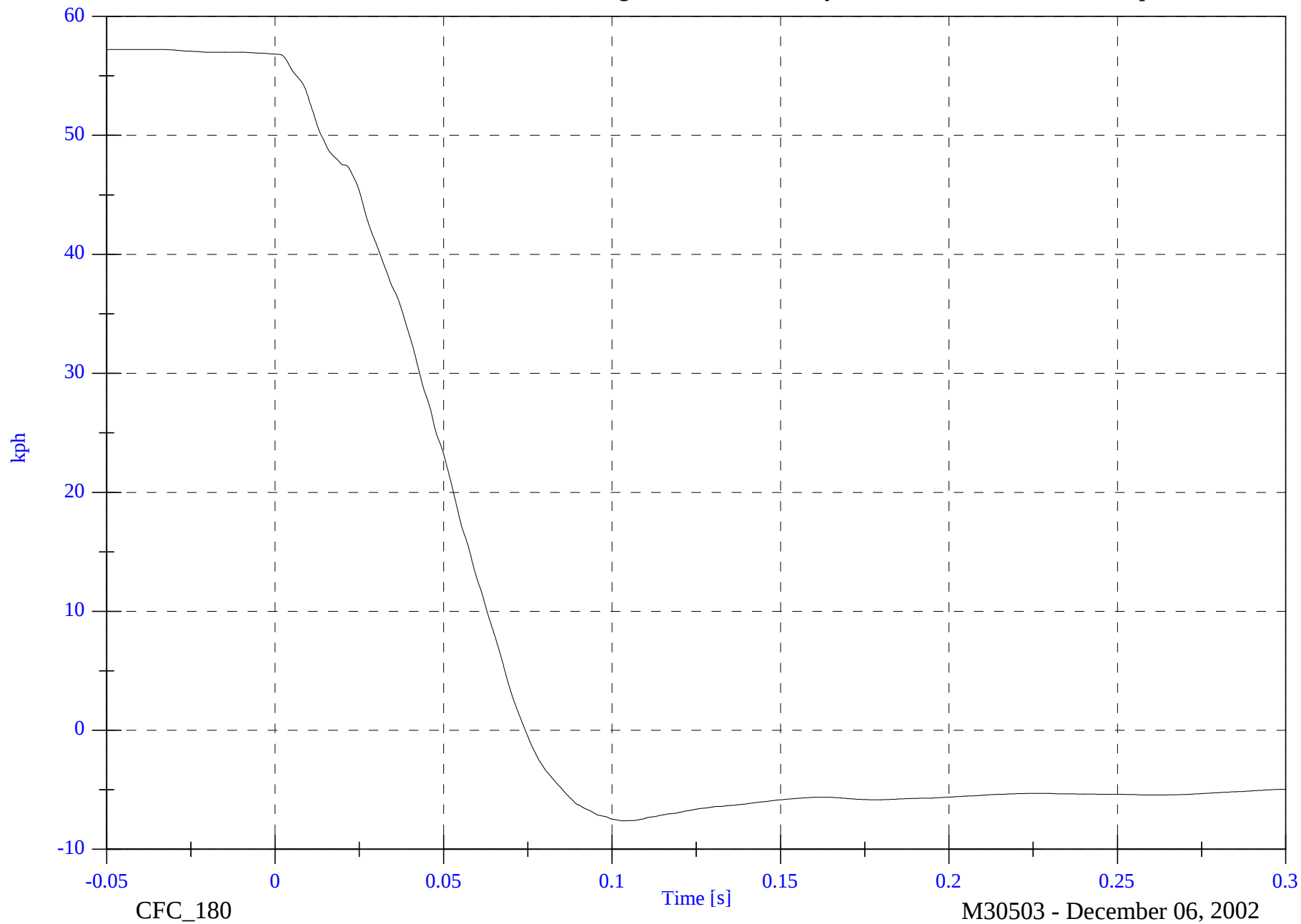


NCAP Test #1 2003 BMW Z4

V1 Right Rear #2x Velocity

Max: 57.2 [kph] at -0.037 [s]

Min: -7.6 [kph] at 0.104 [s]



B-108

8642-NCAP-23

CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

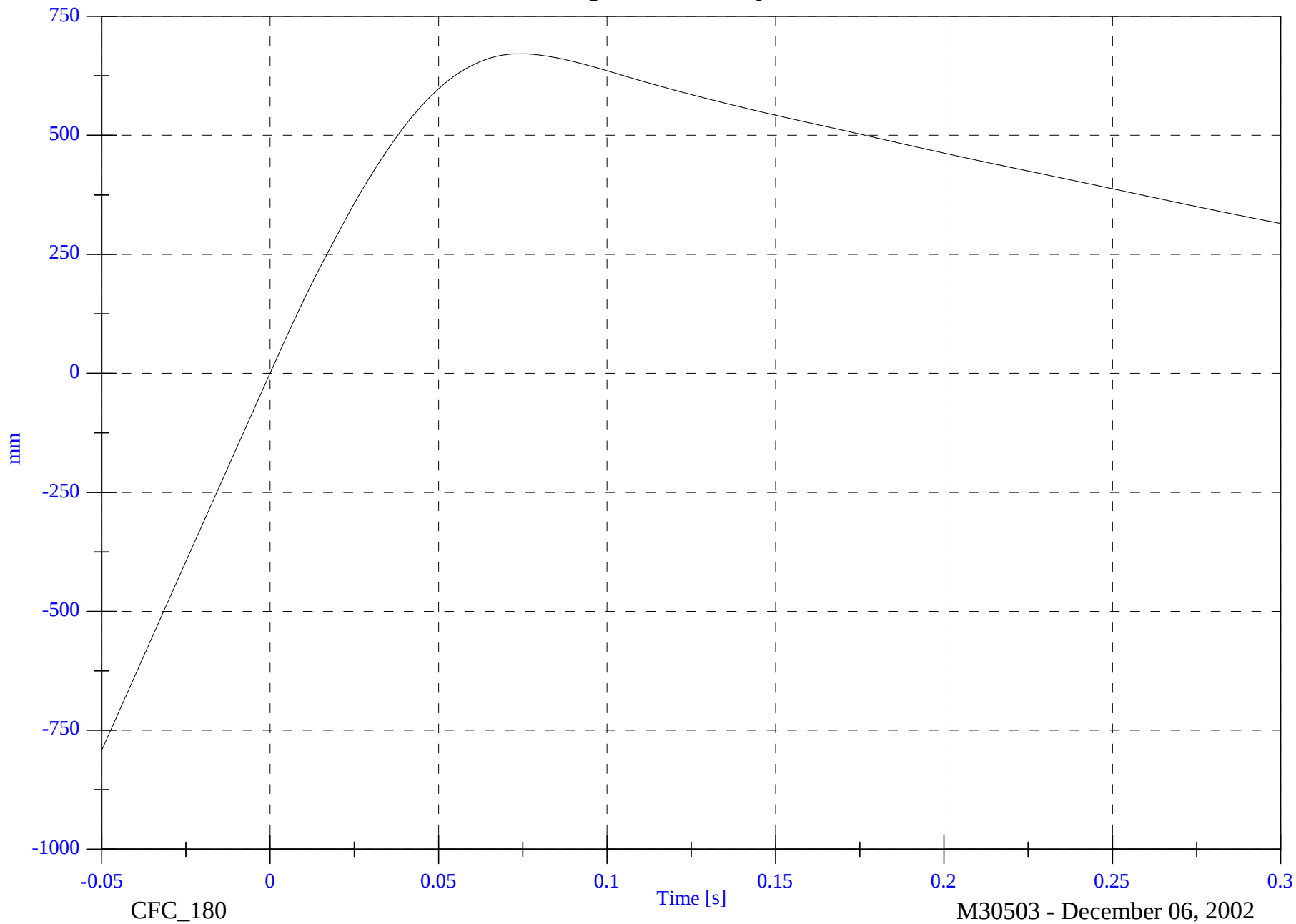
V1 Right Rear #2x Displacement

Max: 671.3 [mm] at 0.074 [s]

Min: -792.7 [mm] at -0.050 [s]

B-109

8642-NCAP-23



CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

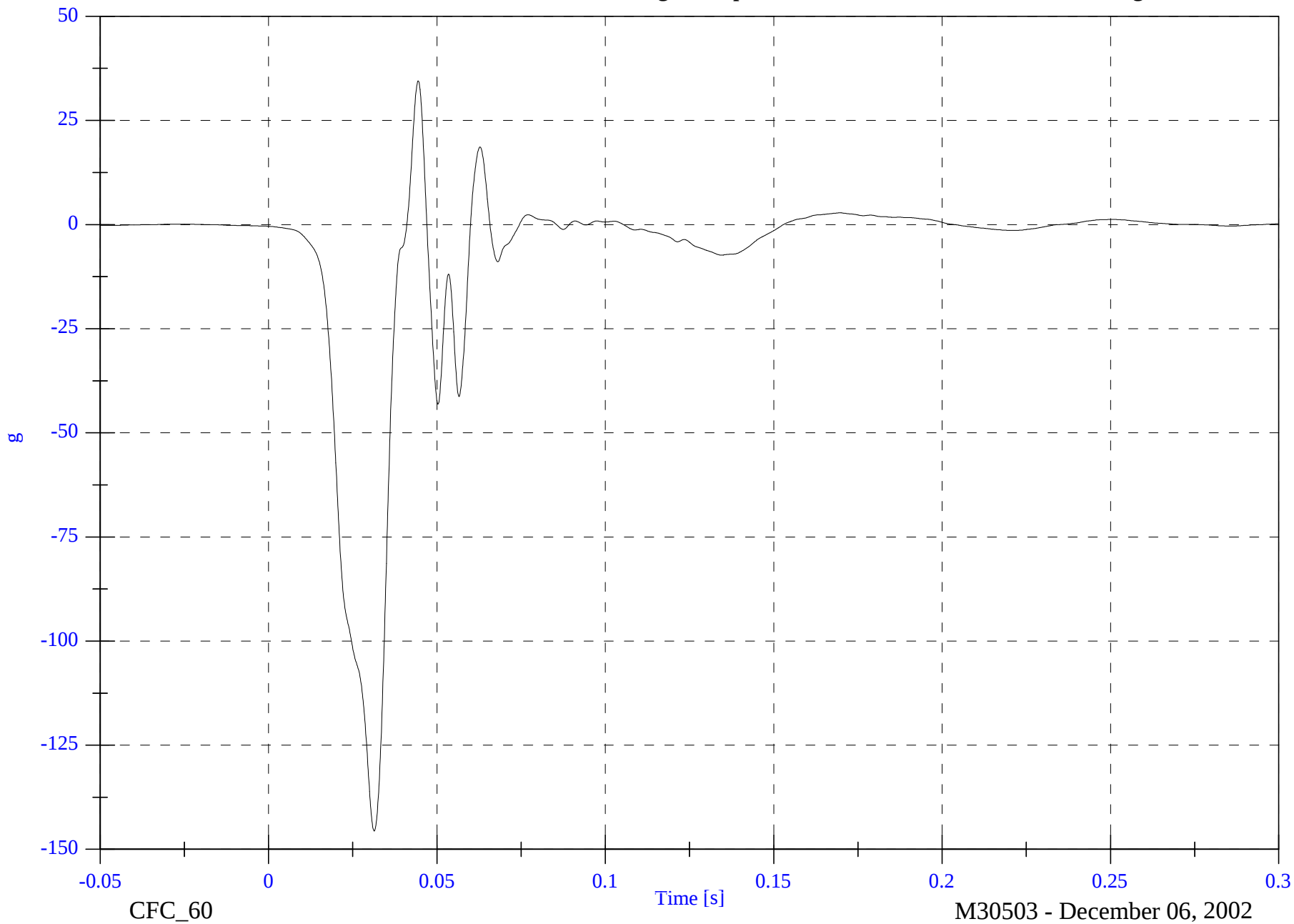
V1 Engine Top #3x

Max: 34.5 [g] at 0.044 [s]

Min: -145.6 [g] at 0.031 [s]

B-110

8642-NCAP-23

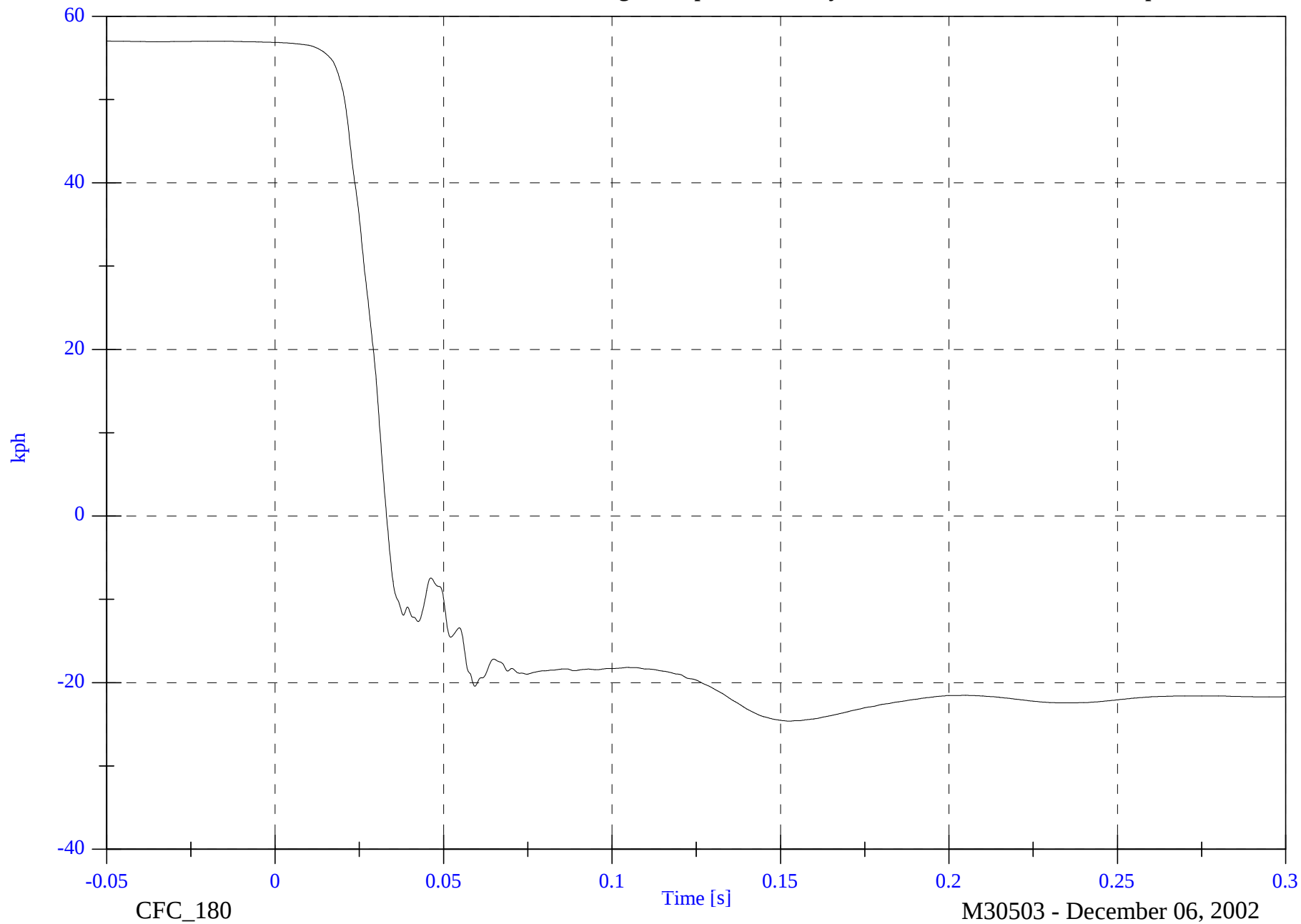


NCAP Test #1 2003 BMW Z4

V1 Engine Top #3x Velocity

Max: 57.0 [kph] at -0.050 [s]

Min: -24.6 [kph] at 0.153 [s]



B-111

8642-NCAP-23

NCAP Test #1 2003 BMW Z4

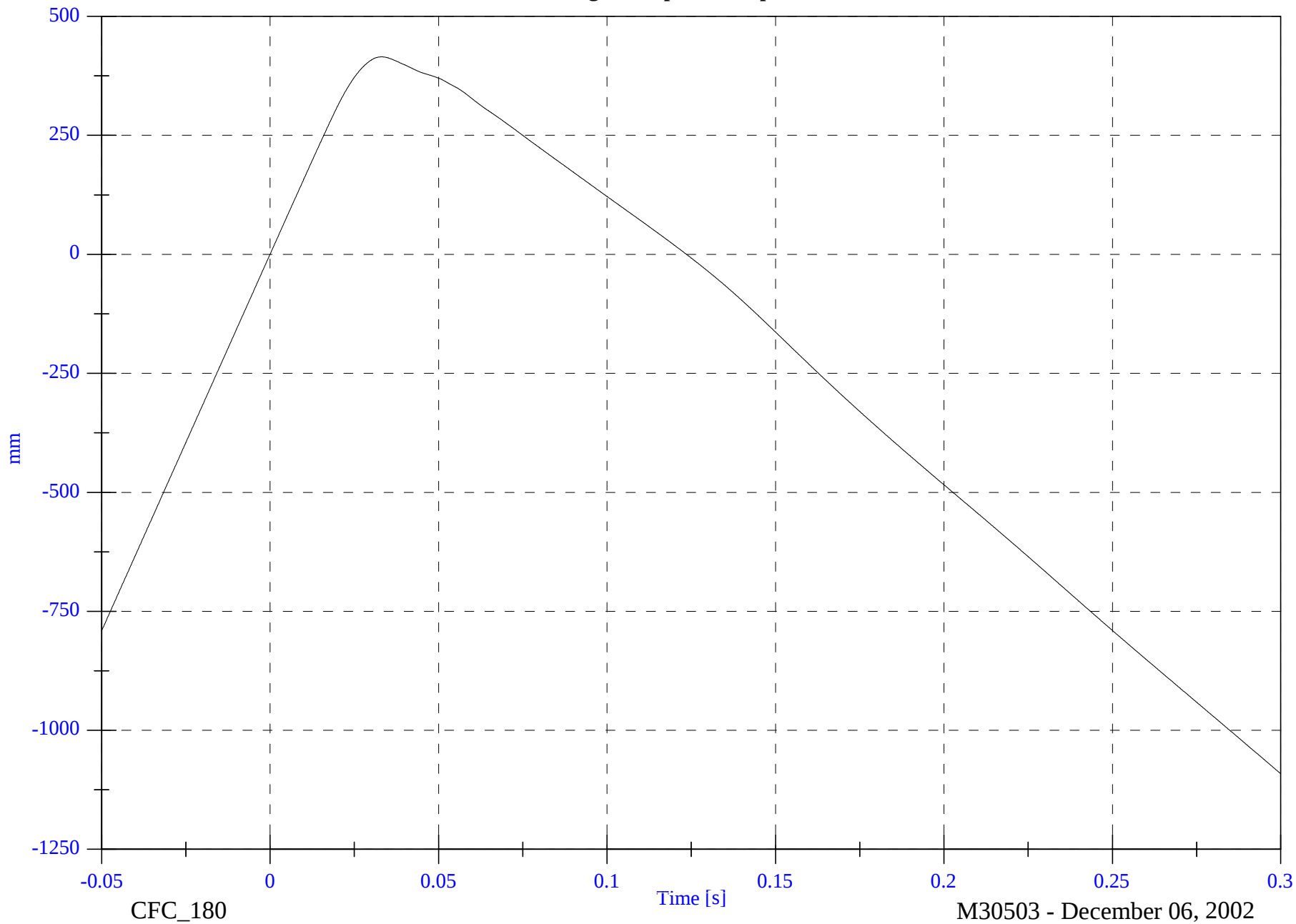
V1 Engine Top #3x Displacement

Max: 414.9 [mm] at 0.033 [s]

Min: -1090.8 [mm] at 0.300 [s]

B-112

8642-NCAP-23



CFC_180

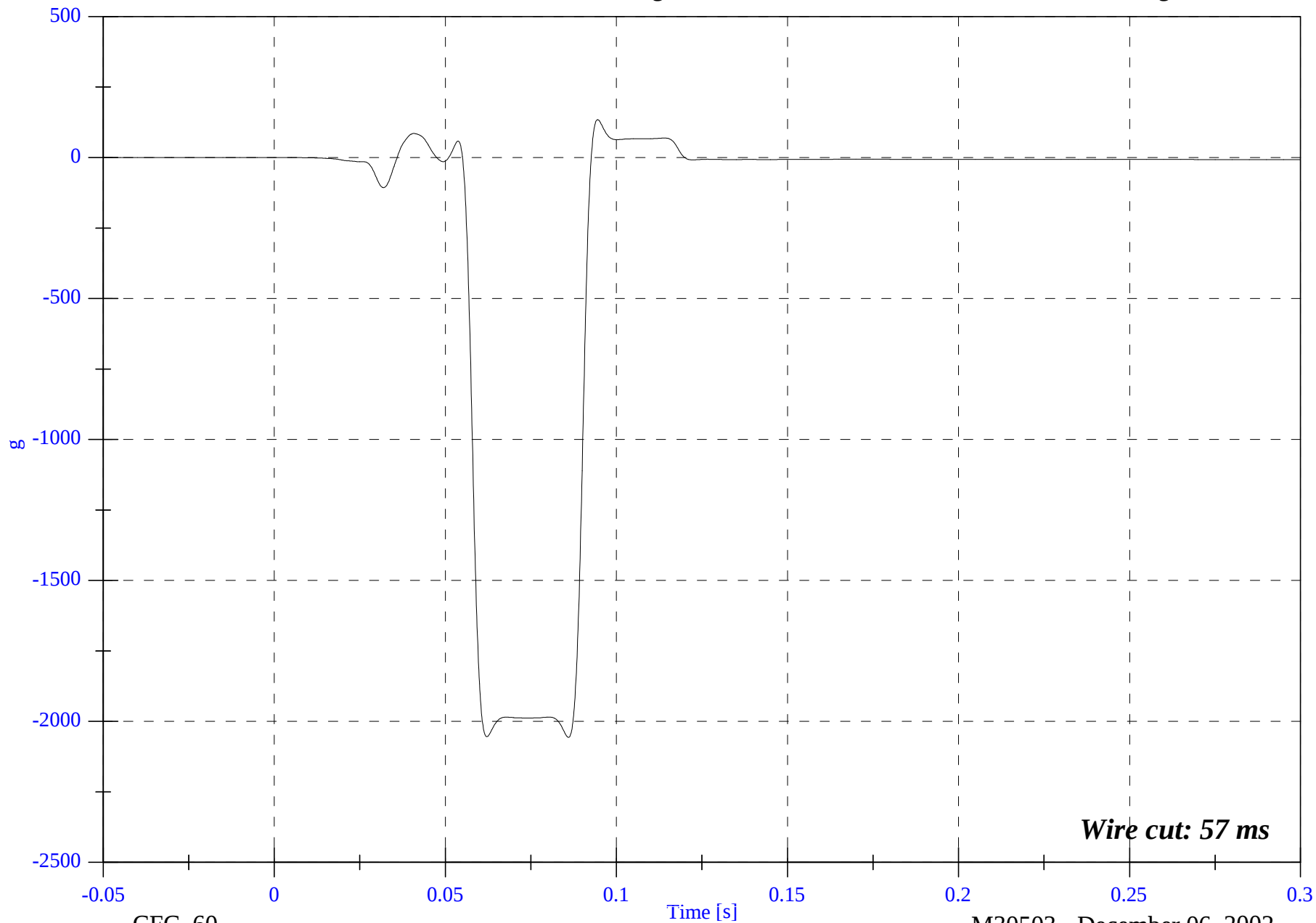
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1 Engine Bottom #4x

Max: 134.5 [g] at 0.095 [s]

Min: -2056.7 [g] at 0.086 [s]



B-113

8642-NCAP-23

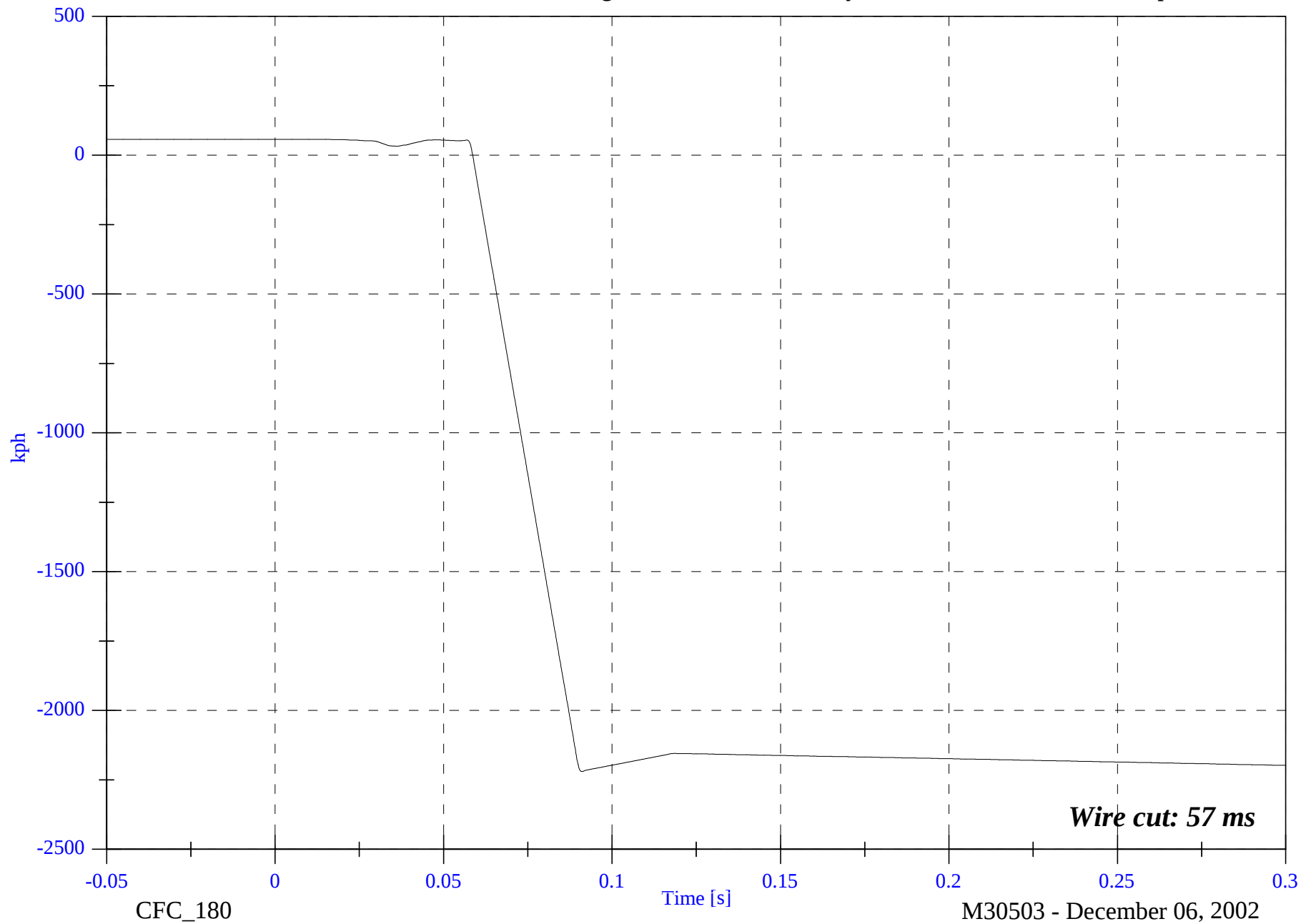
CFC_60

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1 Engine Bottom #4x Velocity

Max: 57.0 [kph] at 0.003 [s]
Min: -2220.0 [kph] at 0.091 [s]



B-114

8642-NCAP-23

CFC_180

Time [s]

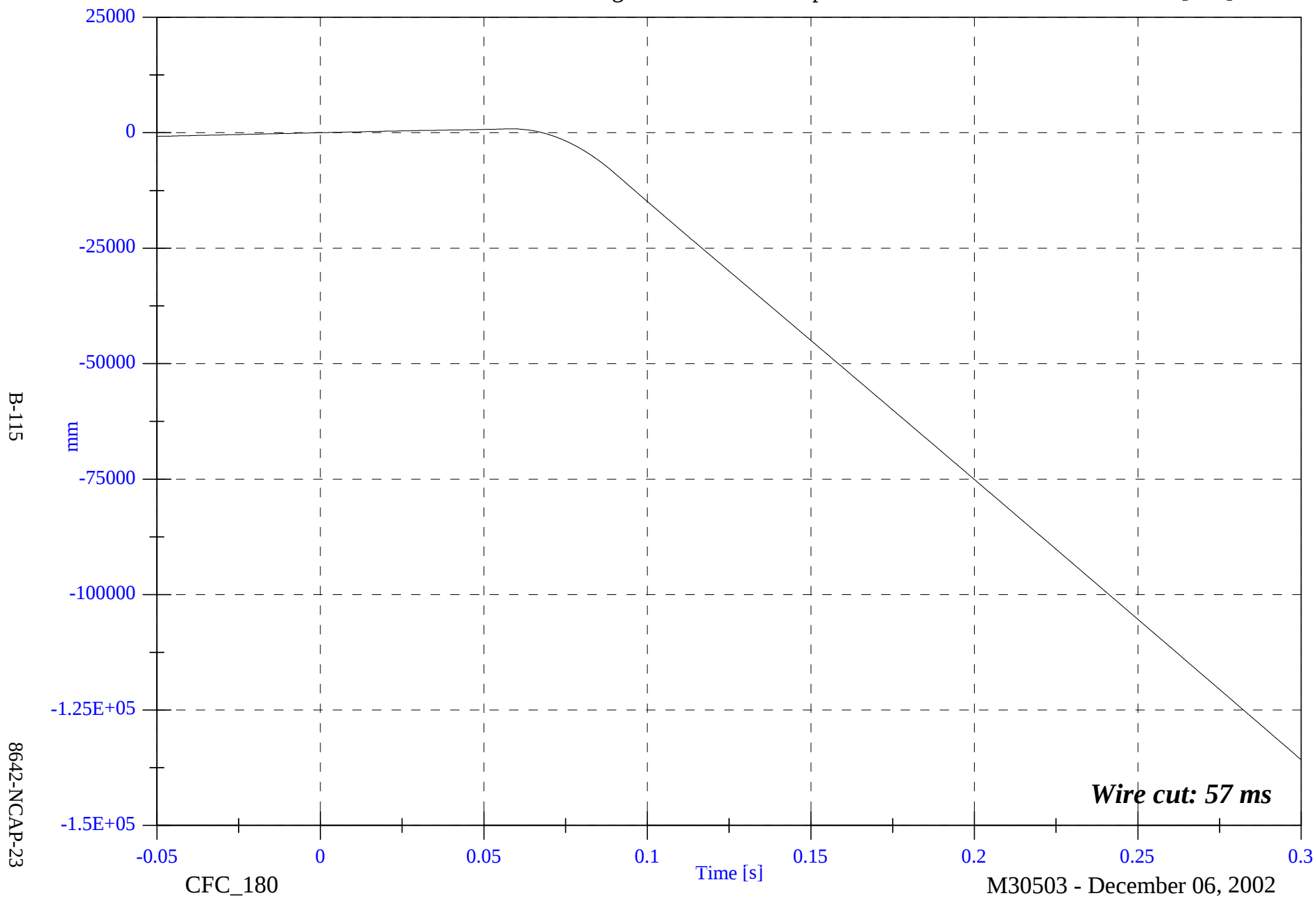
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1 Engine Bottom #4x Displacement

Max: 829.6 [mm] at 0.059 [s]

Min: -135720.6 [mm] at 0.300 [s]



NCAP Test #1 2003 BMW Z4

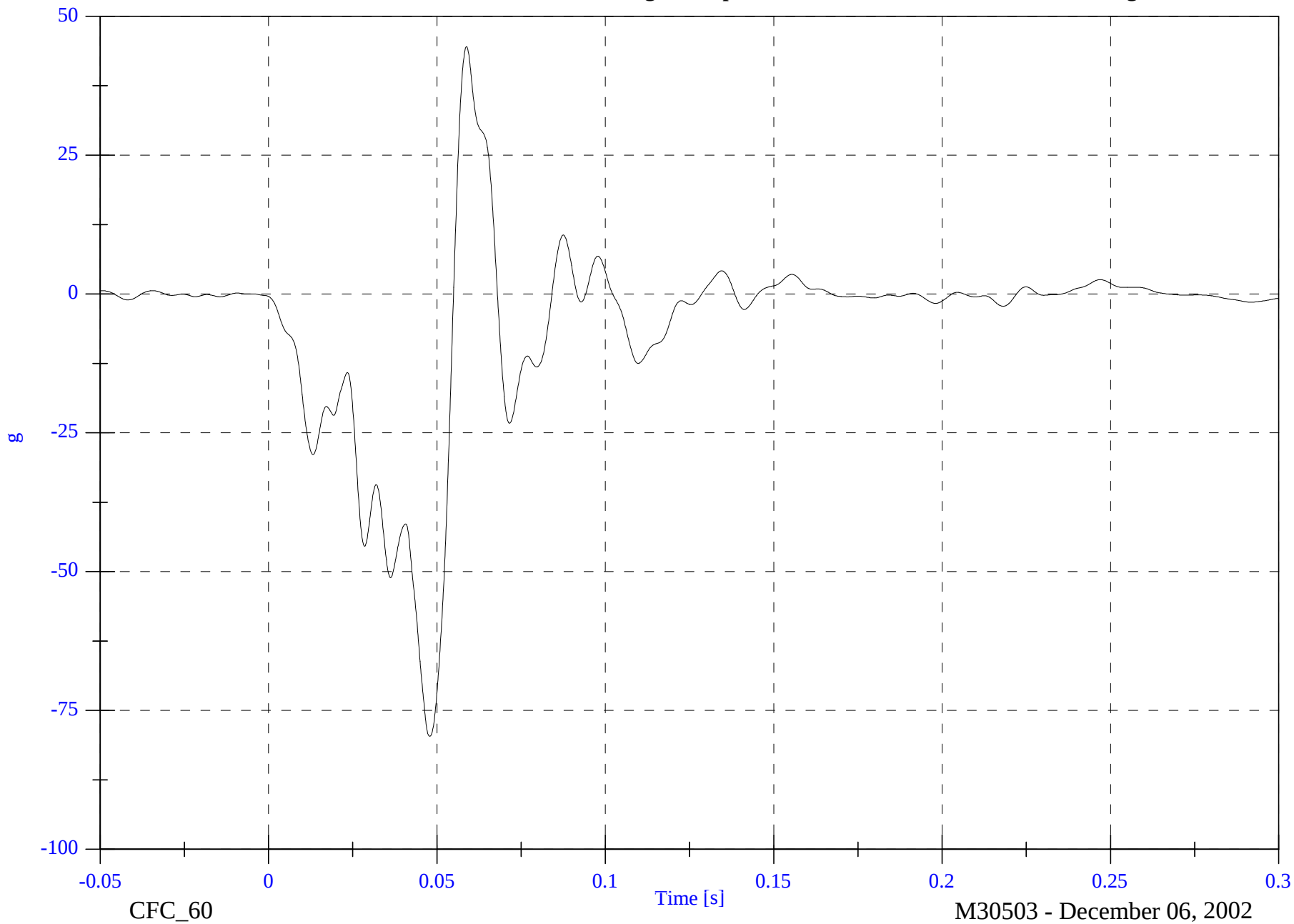
V1 Right Caliper #5x

Max: 44.5 [g] at 0.059 [s]

Min: -79.7 [g] at 0.048 [s]

B-116

8642-NCAP-23

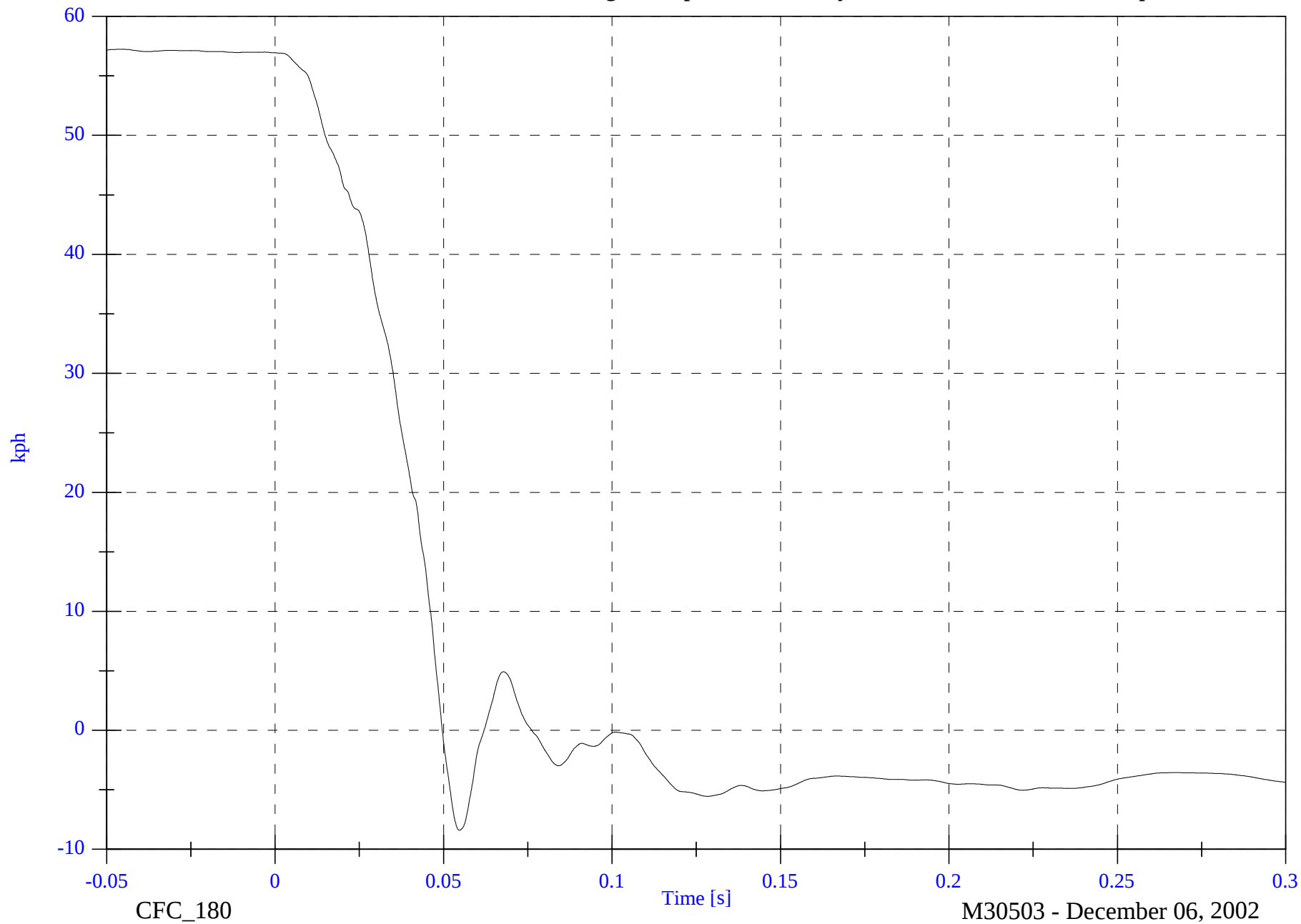


NCAP Test #1 2003 BMW Z4

V1 Right Caliper #5x Velocity

Max: 57.2 [kph] at -0.046 [s]

Min: -8.4 [kph] at 0.055 [s]



B-117

8642-NCAP-23

CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

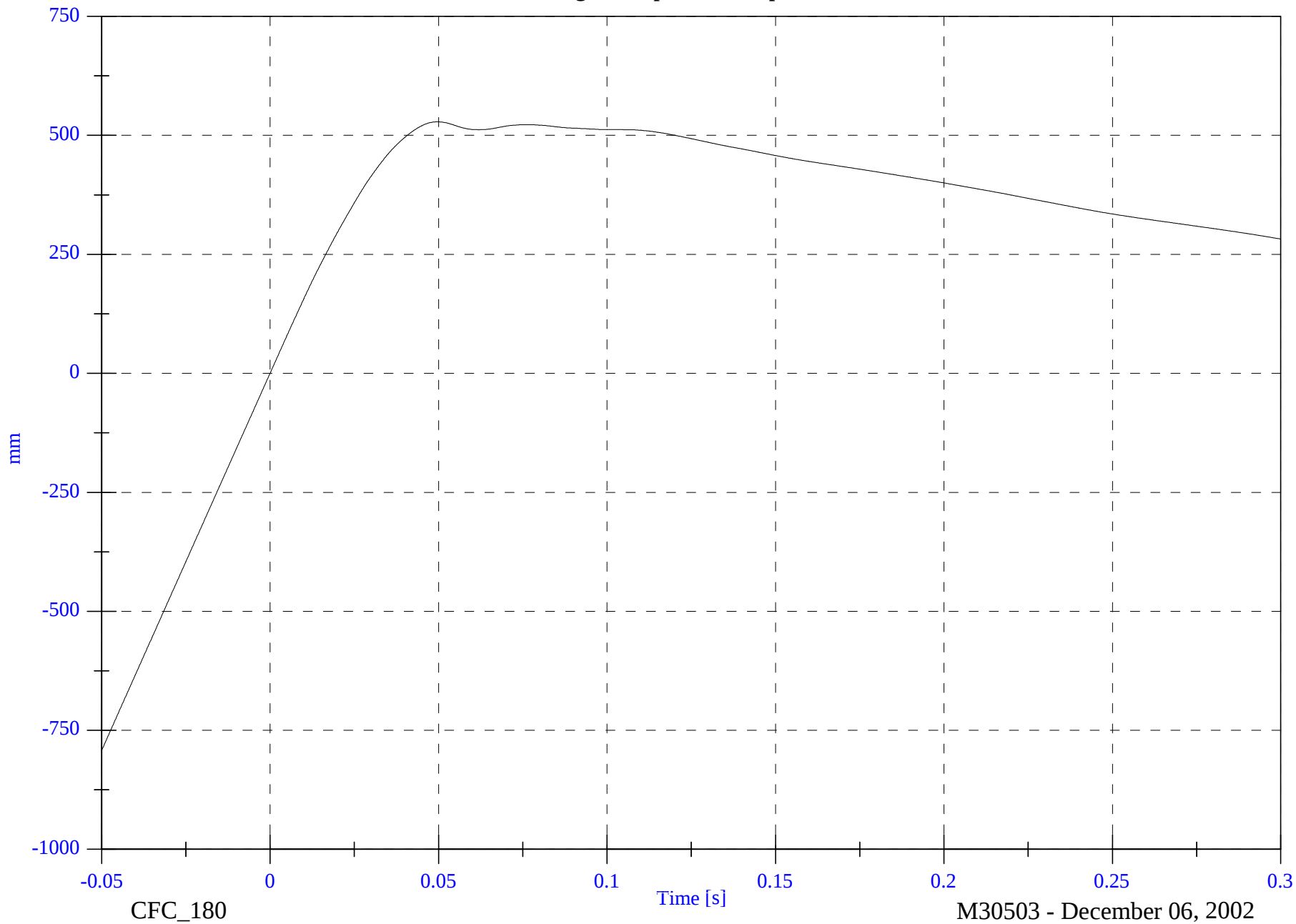
V1 Right Caliper #5x Displacement

Max: 528.4 [mm] at 0.050 [s]

Min: -792.7 [mm] at -0.050 [s]

B-118

8642-NCAP-23



CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

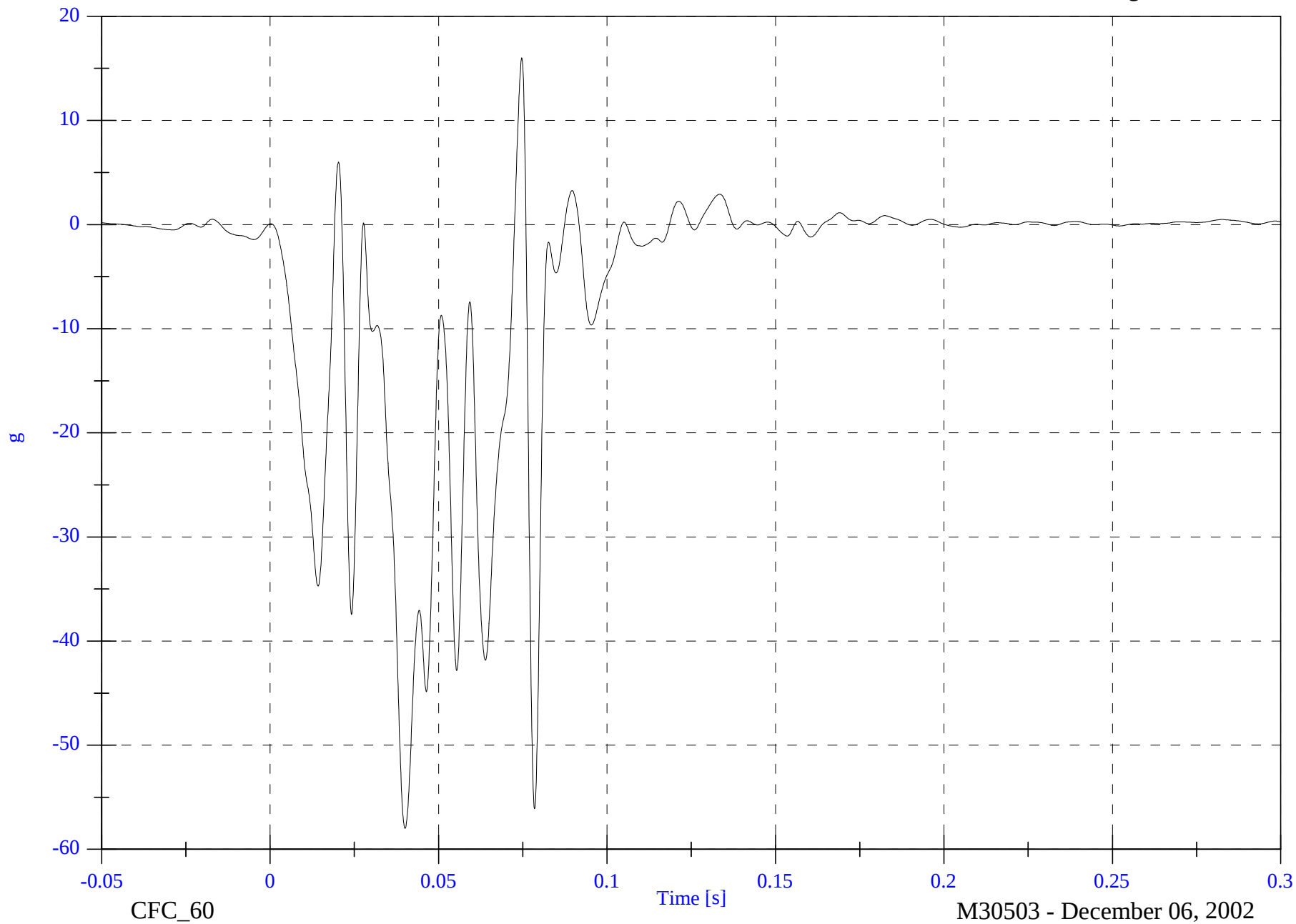
V1 Instrument Panel #6x

Max: 16.0 [g] at 0.075 [s]

Min: -58.0 [g] at 0.040 [s]

B-119

8642-NCAP-23

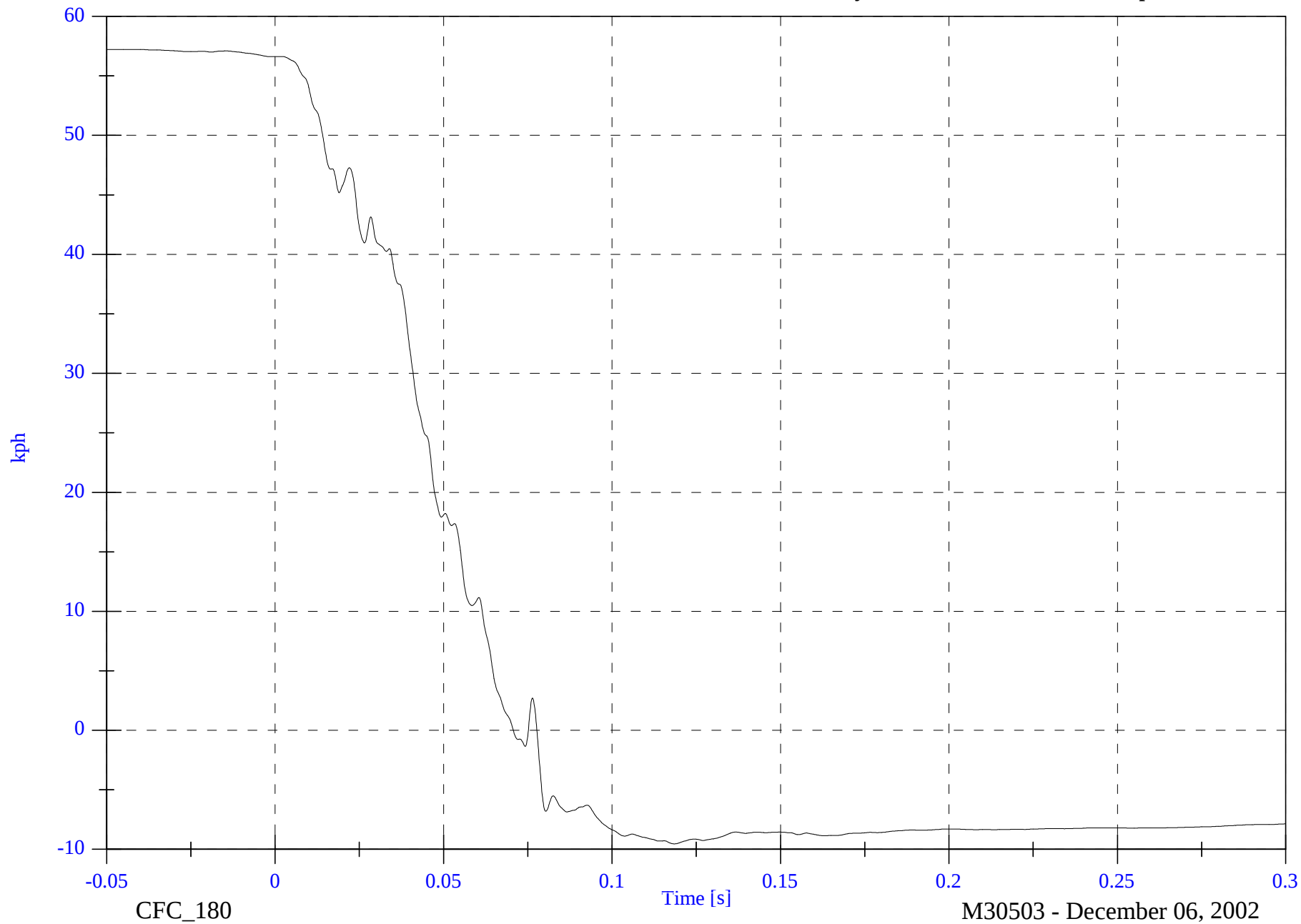


NCAP Test #1 2003 BMW Z4

V1 Instrument Panel #6x Velocity

Max: 57.2 [kph] at -0.043 [s]

Min: -9.5 [kph] at 0.119 [s]



NCAP Test #1 2003 BMW Z4

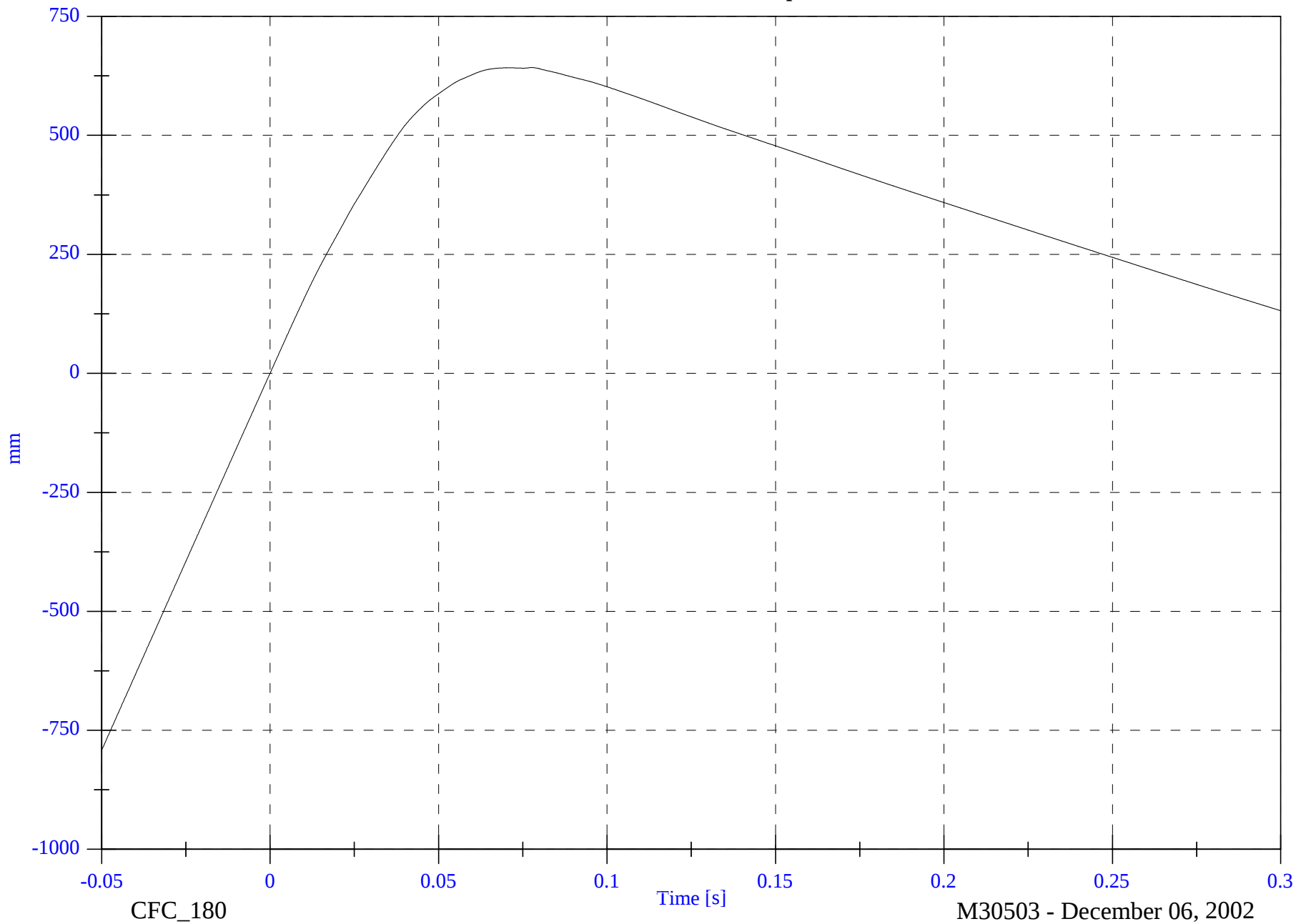
V1 Instrument Panel #6x Displacement

Max: 642.2 [mm] at 0.078 [s]

Min: -792.3 [mm] at -0.050 [s]

B-121

8642-NCAP-23



NCAP Test #1 2003 BMW Z4

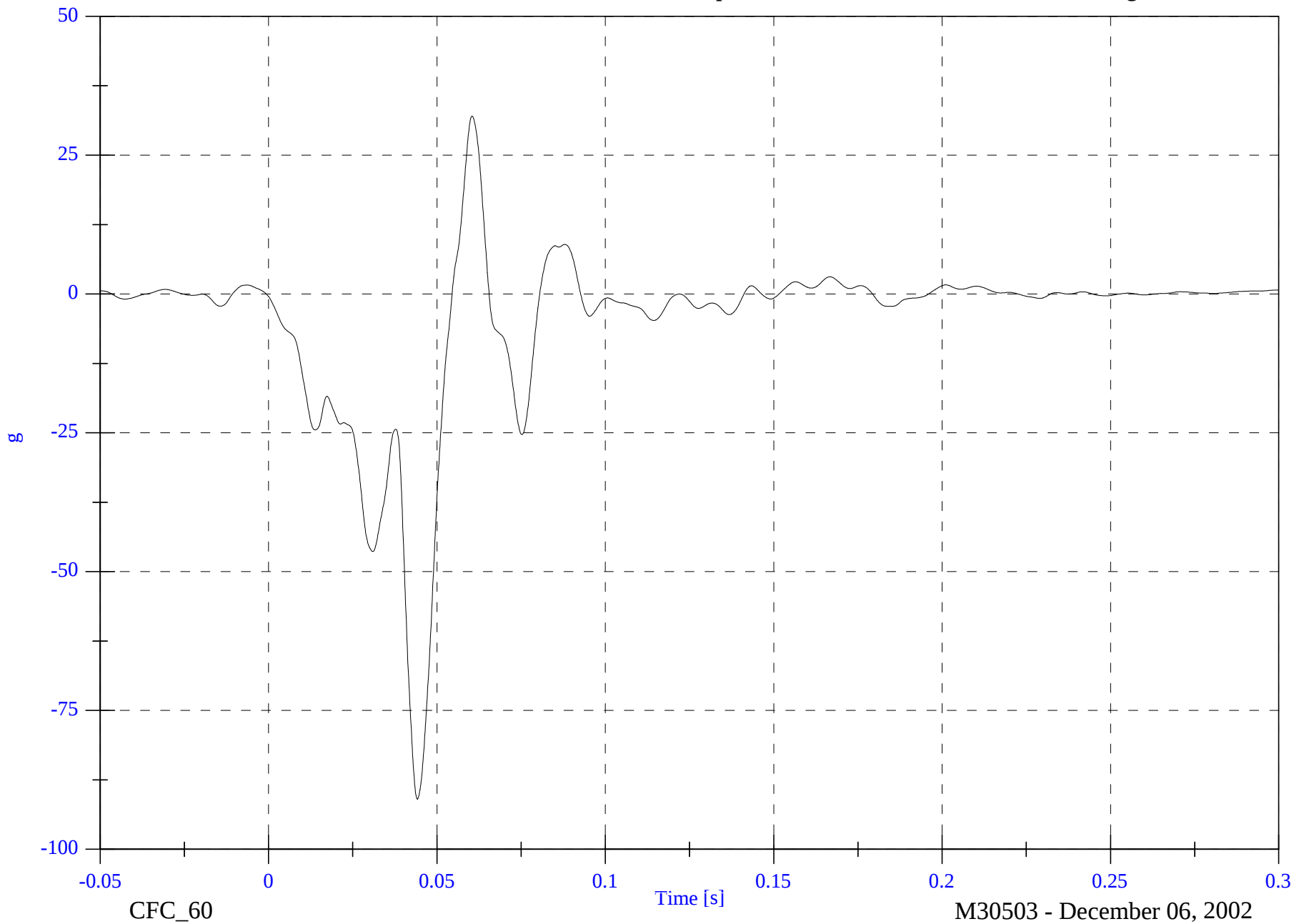
V1 Left Caliper #7x

Max: 32.1 [g] at 0.060 [s]

Min: -91.0 [g] at 0.044 [s]

B-122

8642-NCAP-23

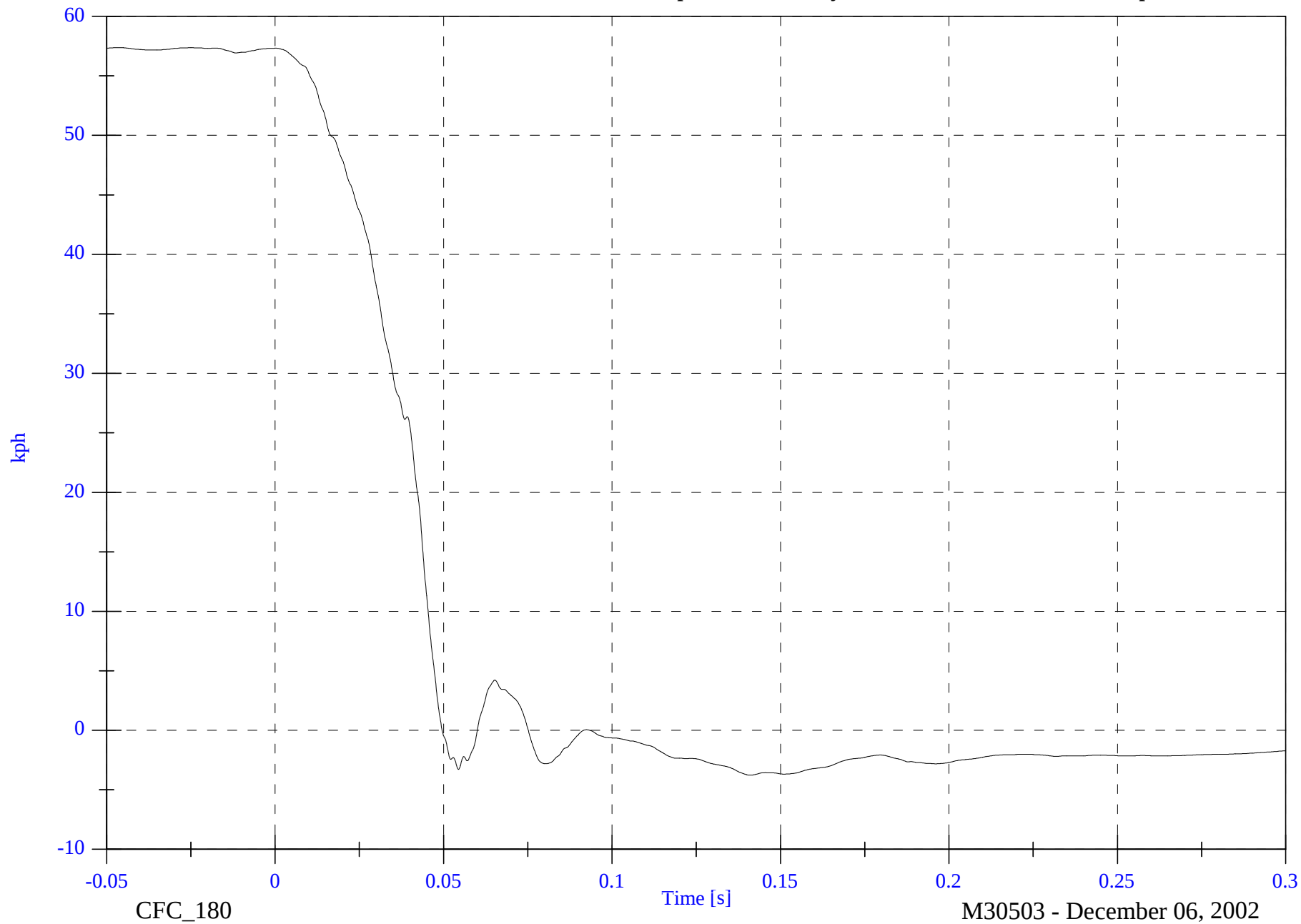


NCAP Test #1 2003 BMW Z4

V1 Left Caliper #7x Velocity

Max: 57.4 [kph] at -0.046 [s]

Min: -3.8 [kph] at 0.141 [s]



B-123

8642-NCAP-23

CFC_180

M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

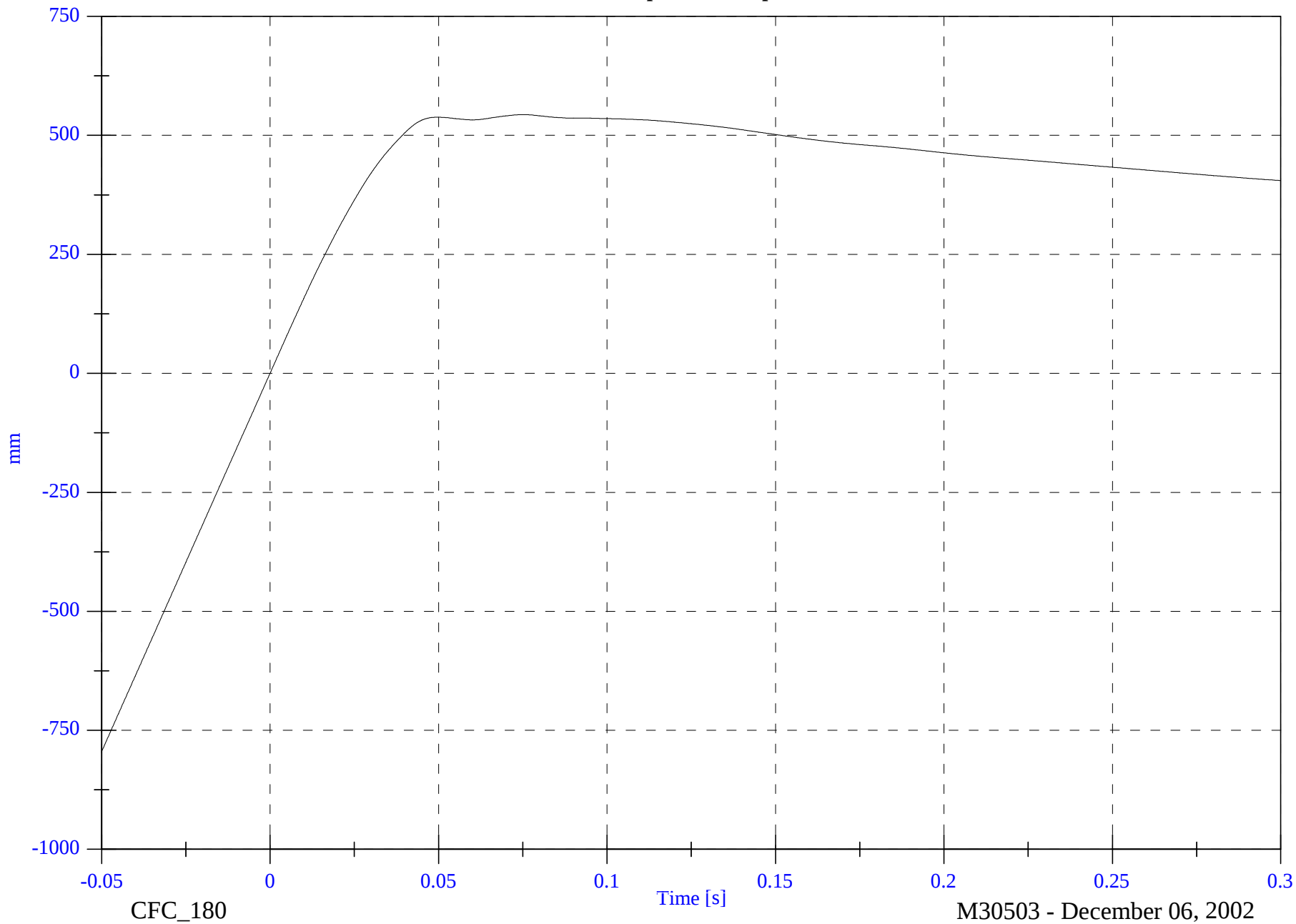
V1 Left Caliper #7x Displacement

Max: 543.5 [mm] at 0.075 [s]

Min: -795.0 [mm] at -0.050 [s]

B-124

8642-NCAP-23



CFC_180

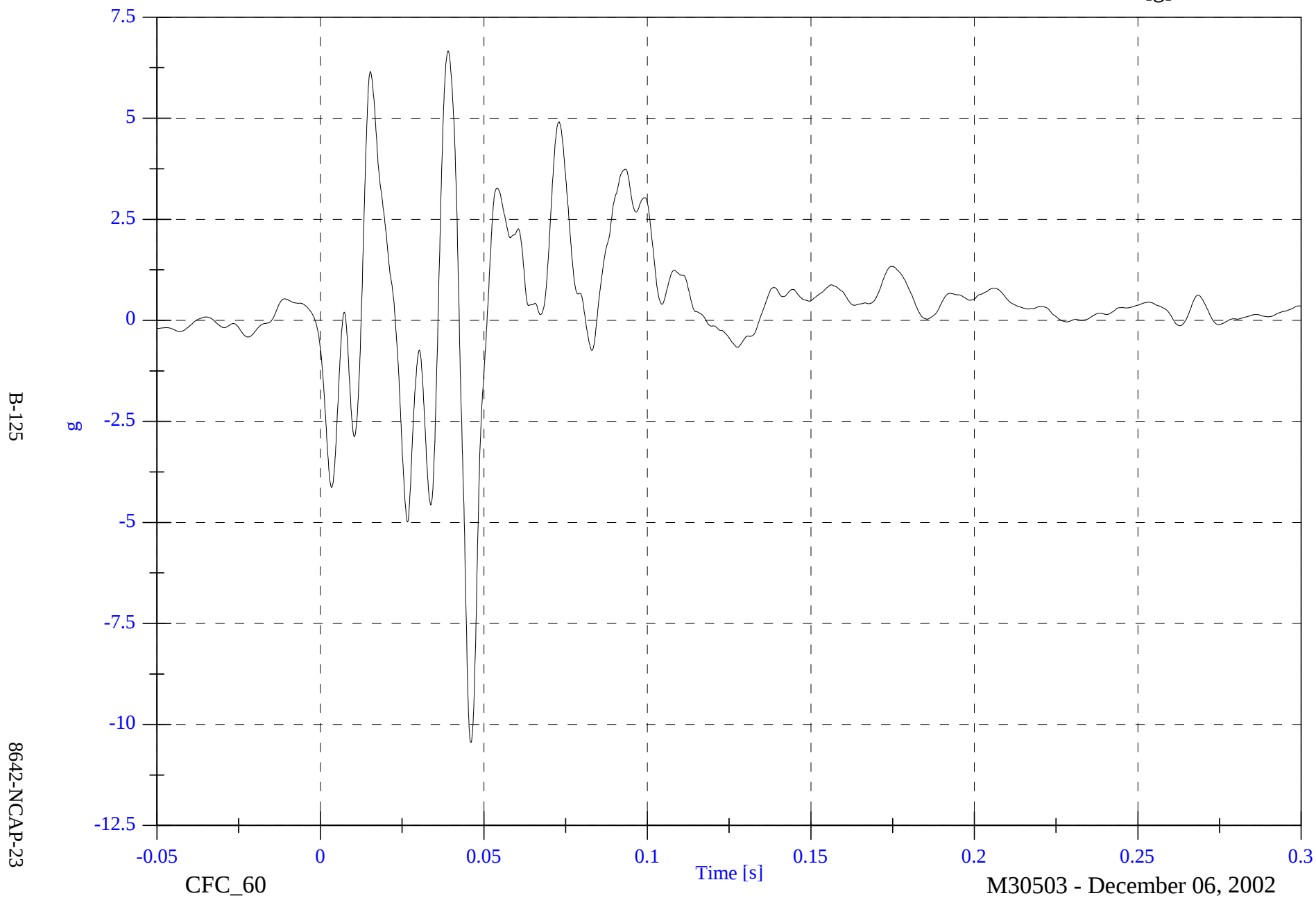
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1 Left Rear #8z

Max: 6.7 [g] at 0.039 [s]

Min: -10.4 [g] at 0.046 [s]

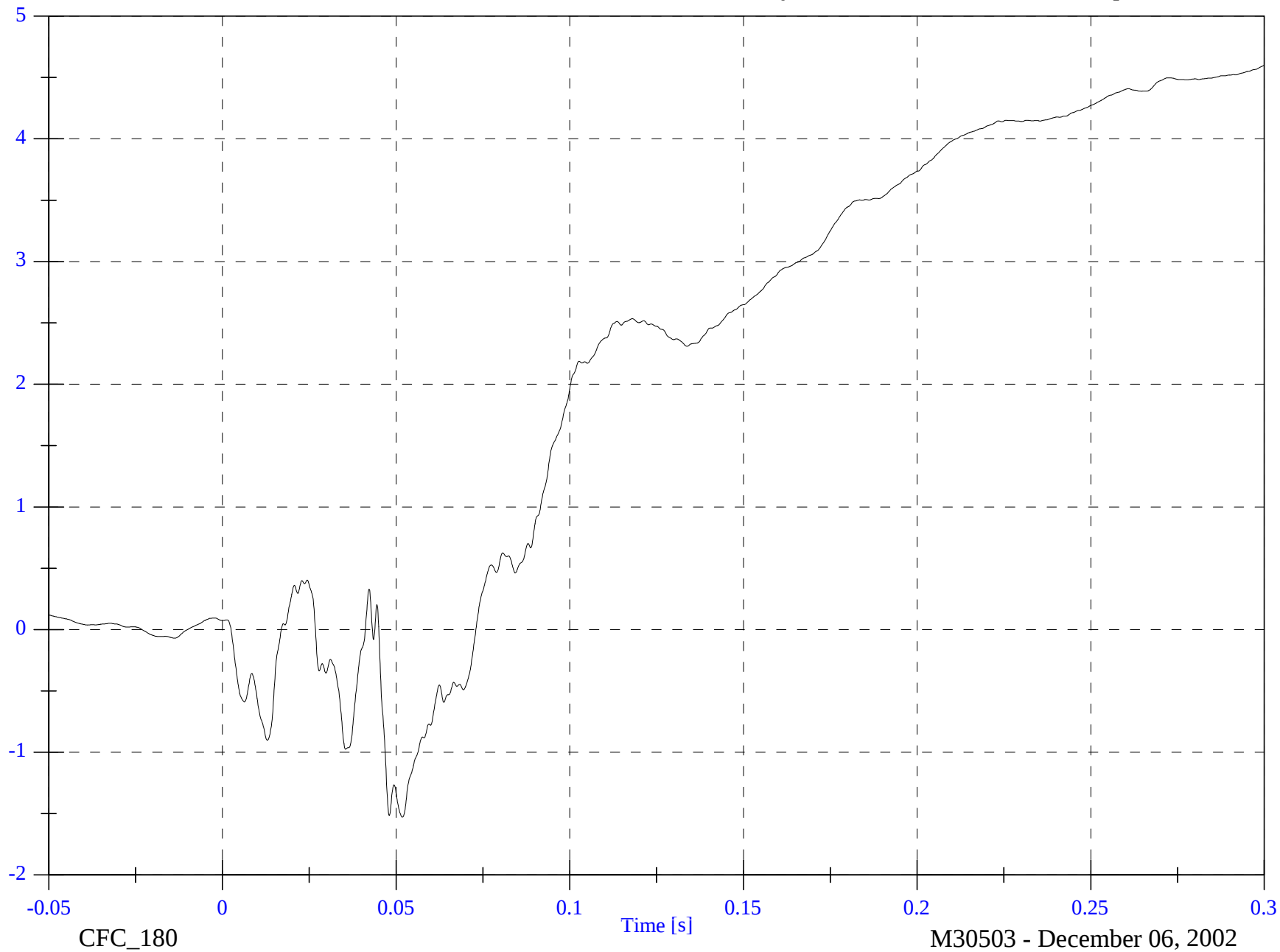


NCAP Test #1 2003 BMW Z4

V1 Left Rear #8z Velocity

Max: 4.6 [kph] at 0.300 [s]

Min: -1.5 [kph] at 0.052 [s]



B-126

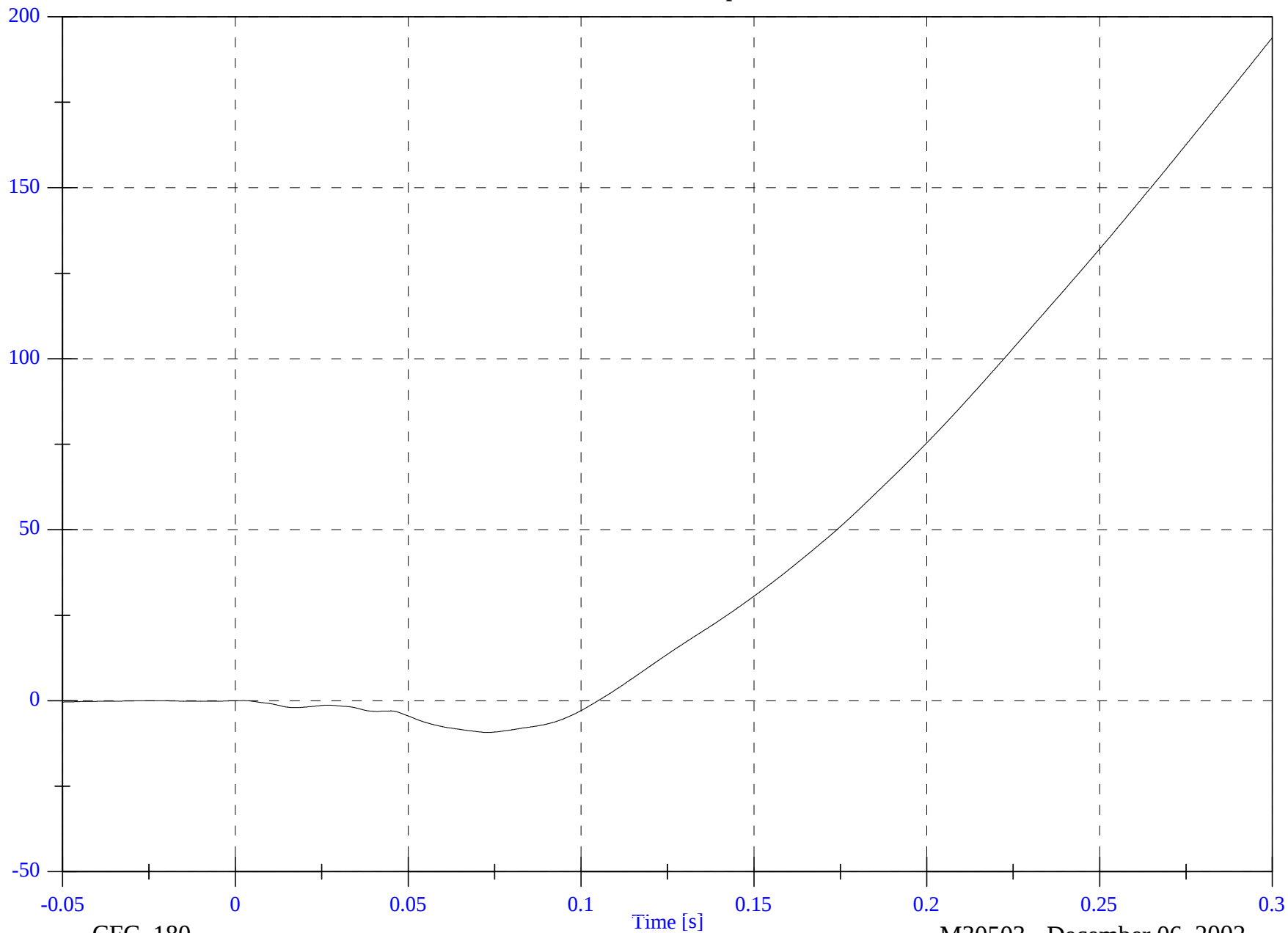
8642-NCAP-23

NCAP Test #1 2003 BMW Z4

V1 Left Rear #8z Displacement

Max: 193.8 [mm] at 0.300 [s]

Min: -9.3 [mm] at 0.073 [s]



B-127

8642-NCAP-23

CFC_180

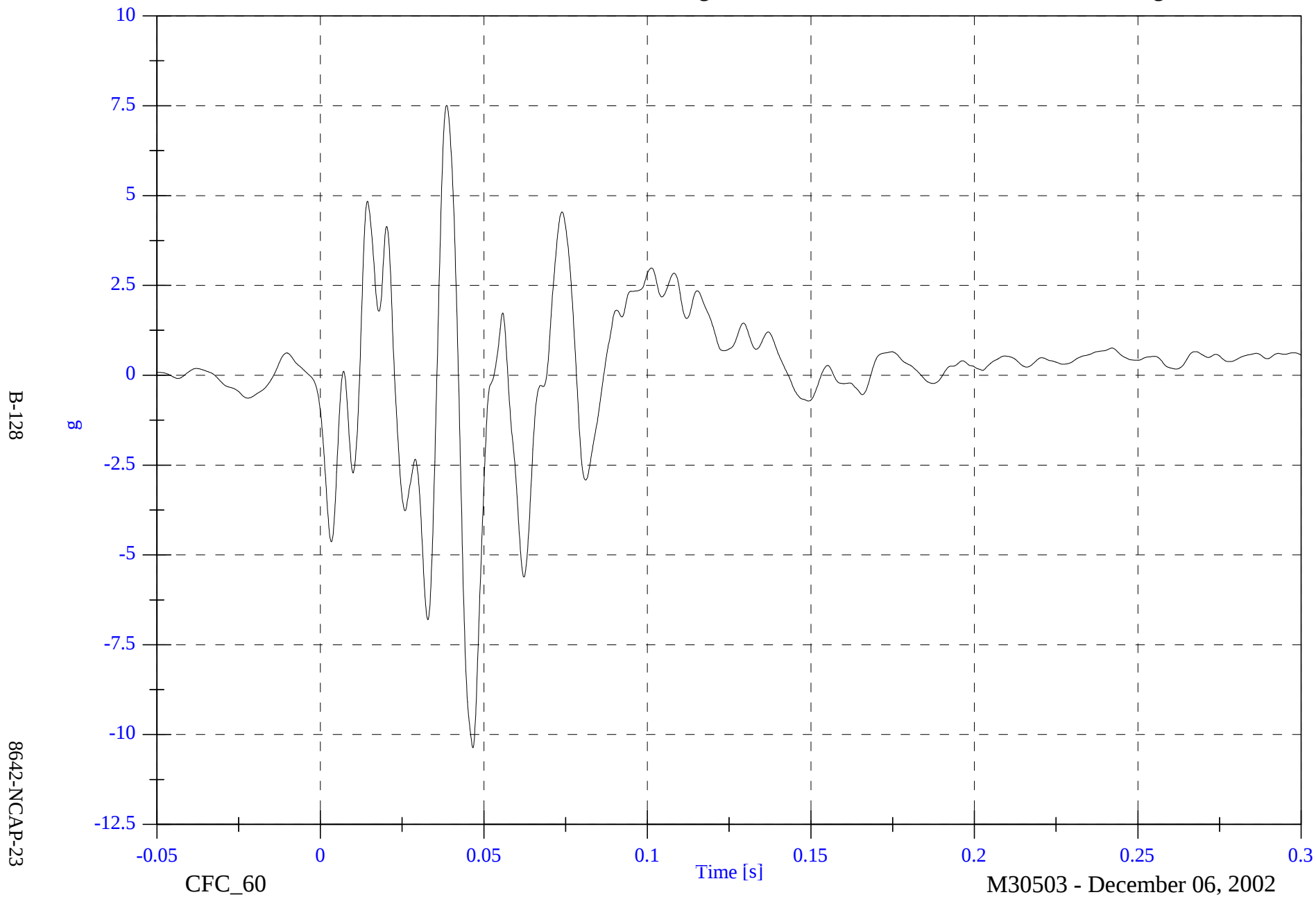
M30503 - December 06, 2002

NCAP Test #1 2003 BMW Z4

V1 Right Rear #9z

Max: 7.5 [g] at 0.039 [s]

Min: -10.4 [g] at 0.047 [s]



NCAP Test #1 2003 BMW Z4

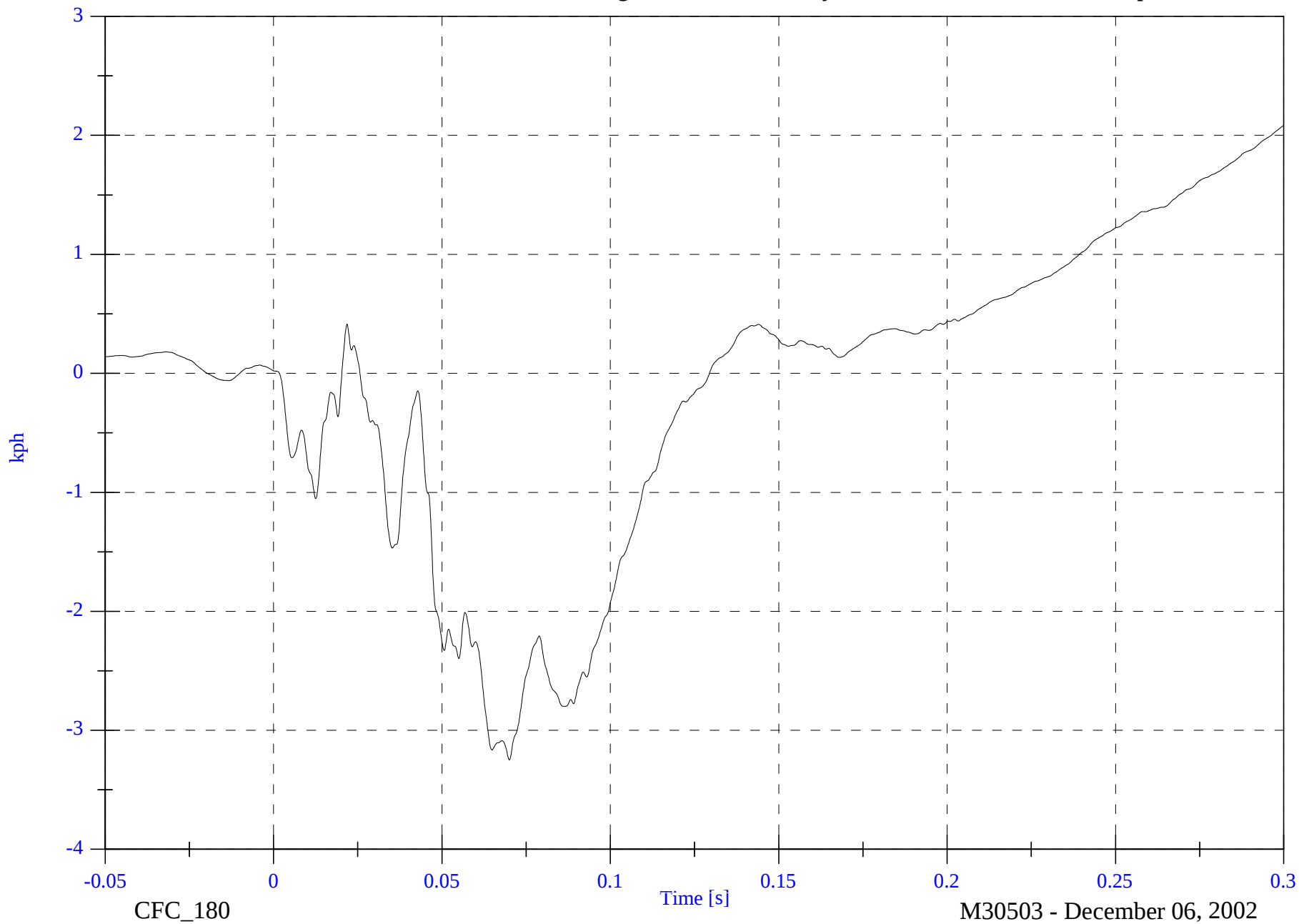
V1 Right Rear #9z Velocity

Max: 2.1 [kph] at 0.300 [s]

Min: -3.2 [kph] at 0.070 [s]

B-129

8642-NCAP-23

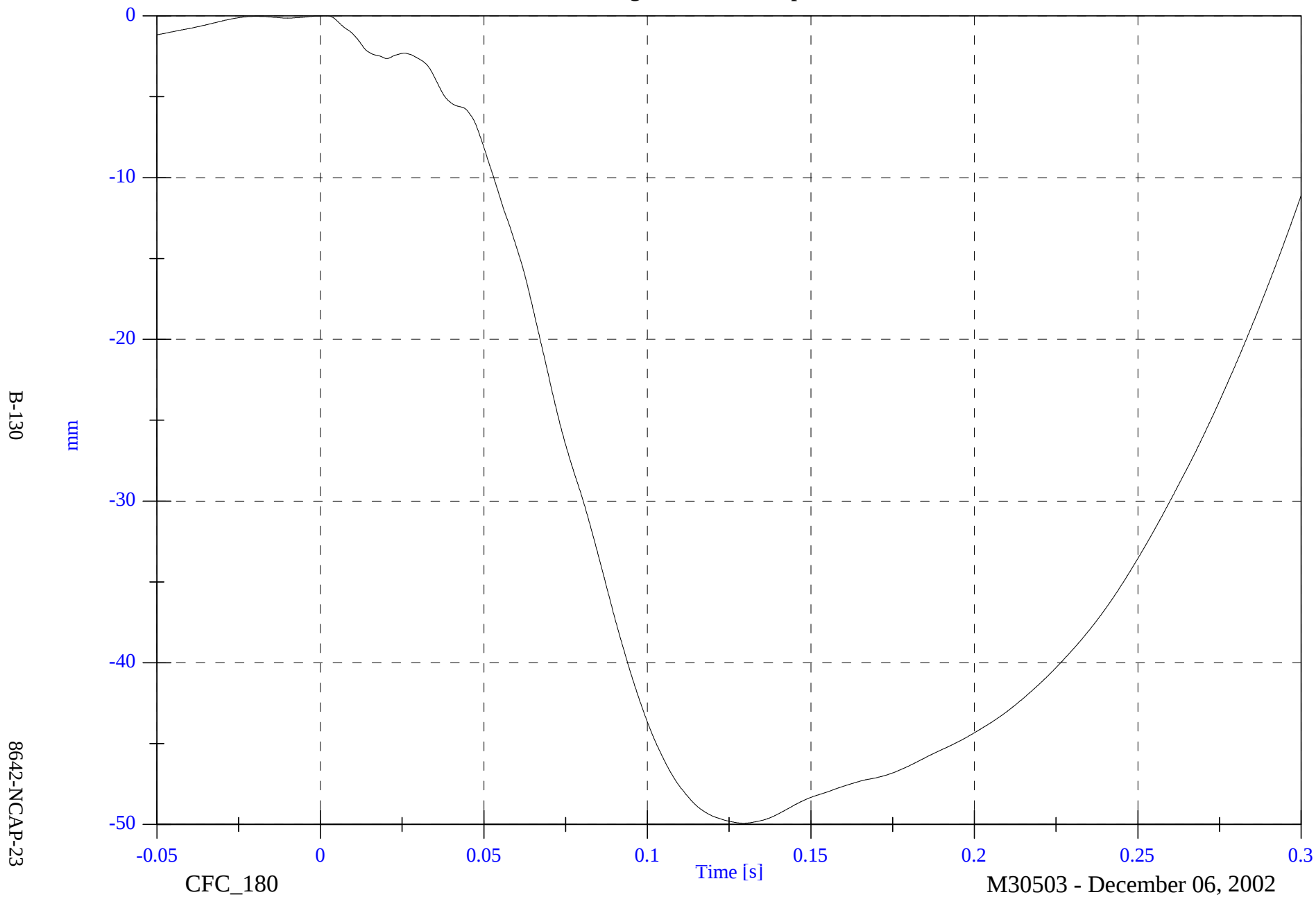


NCAP Test #1 2003 BMW Z4

V1 Right Rear #9z Displacement

Max: 0.0 [mm] at 0.002 [s]

Min: -49.9 [mm] at 0.129 [s]



NCAP Test #1- 2003 BMW Z4

Max: 1775.9 [N] at 0.042 [S]

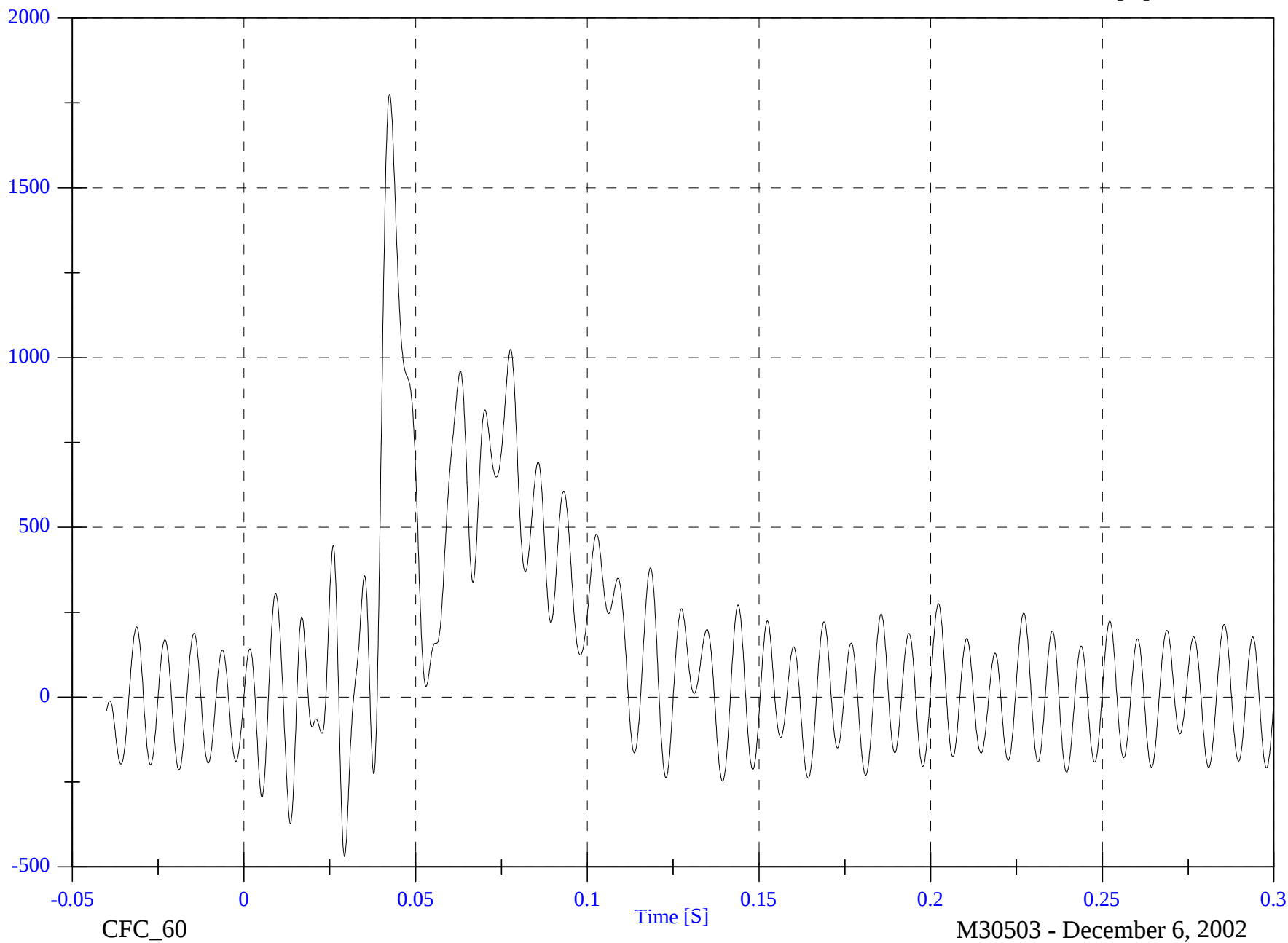
B1 LCA1 Fx

Min: -470.1 [N] at 0.029 [S]

B-131

N

8642-NCAP-23



NCAP Test #1- 2003 BMW Z4

B1 LCA2 Fx

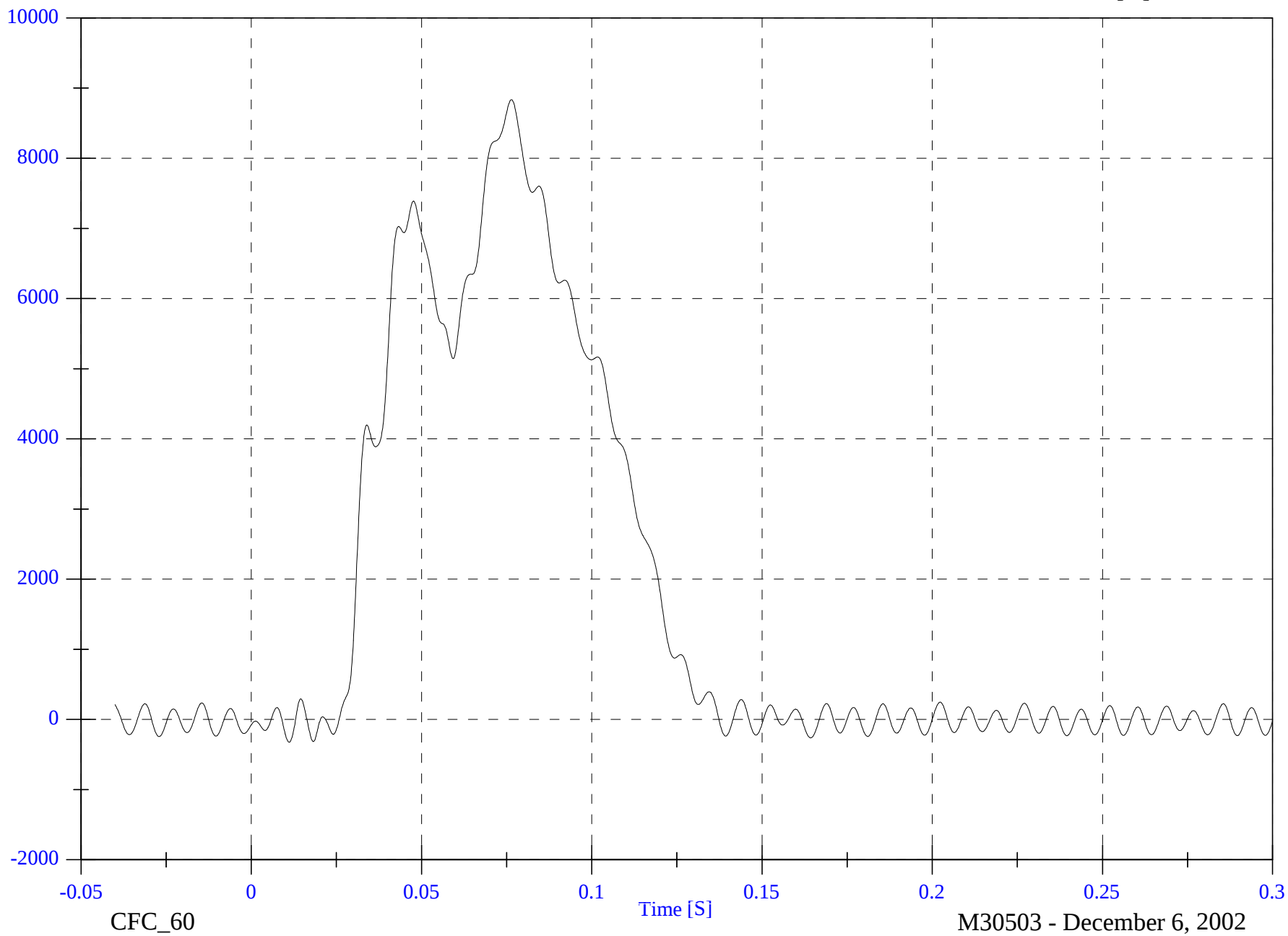
Max: 8835.1 [N] at 0.076 [S]

Min: -323.9 [N] at 0.011 [S]

B-132

N

8642-NCAP-23



NCAP Test #1- 2003 BMW Z4

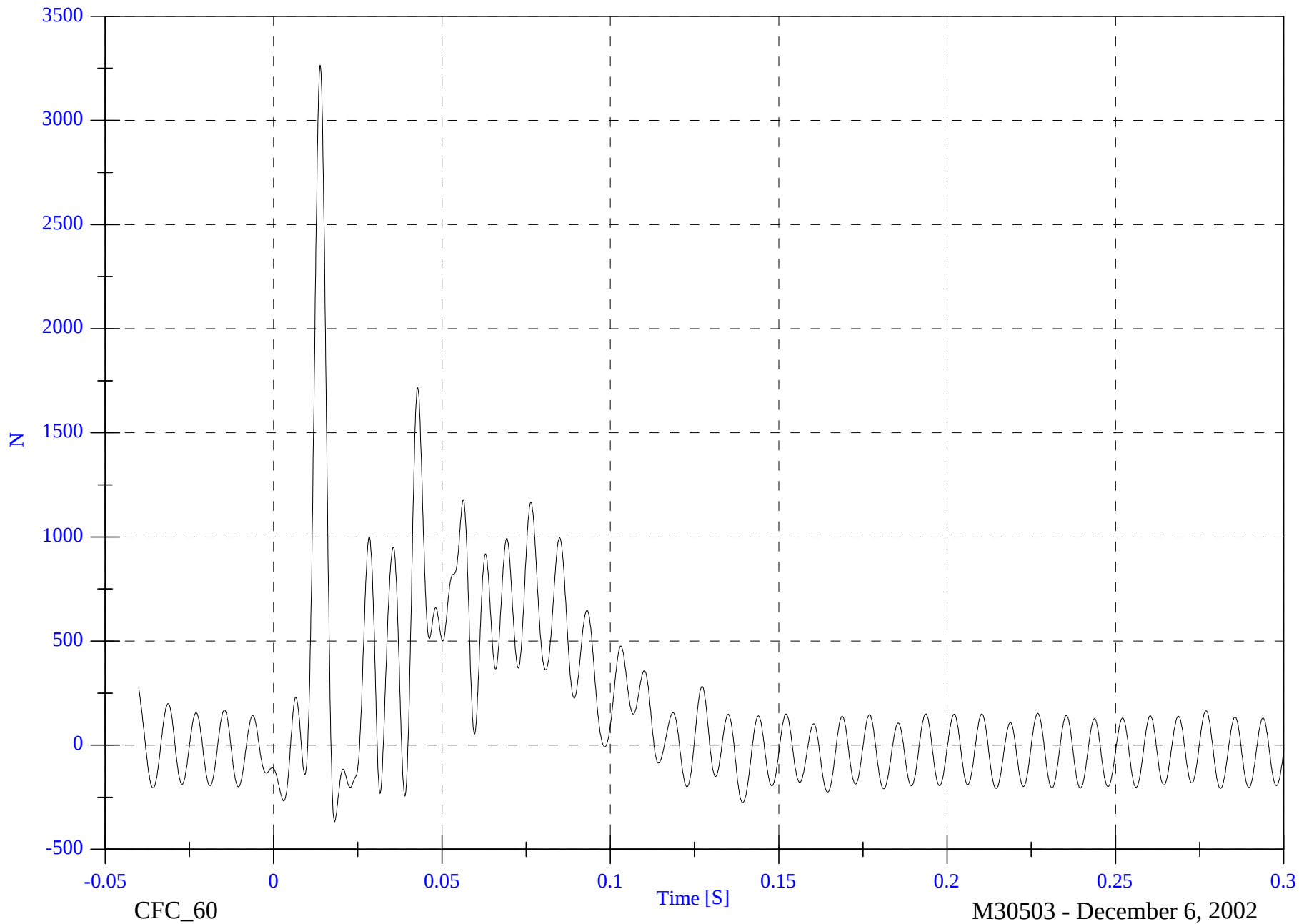
B1 LCA3 Fx

Max: 3264.6 [N] at 0.014 [S]

Min: -367.0 [N] at 0.018 [S]

B-133

8642-NCAP-23



NCAP Test #1- 2003 BMW Z4

B1 LCA4 Fx

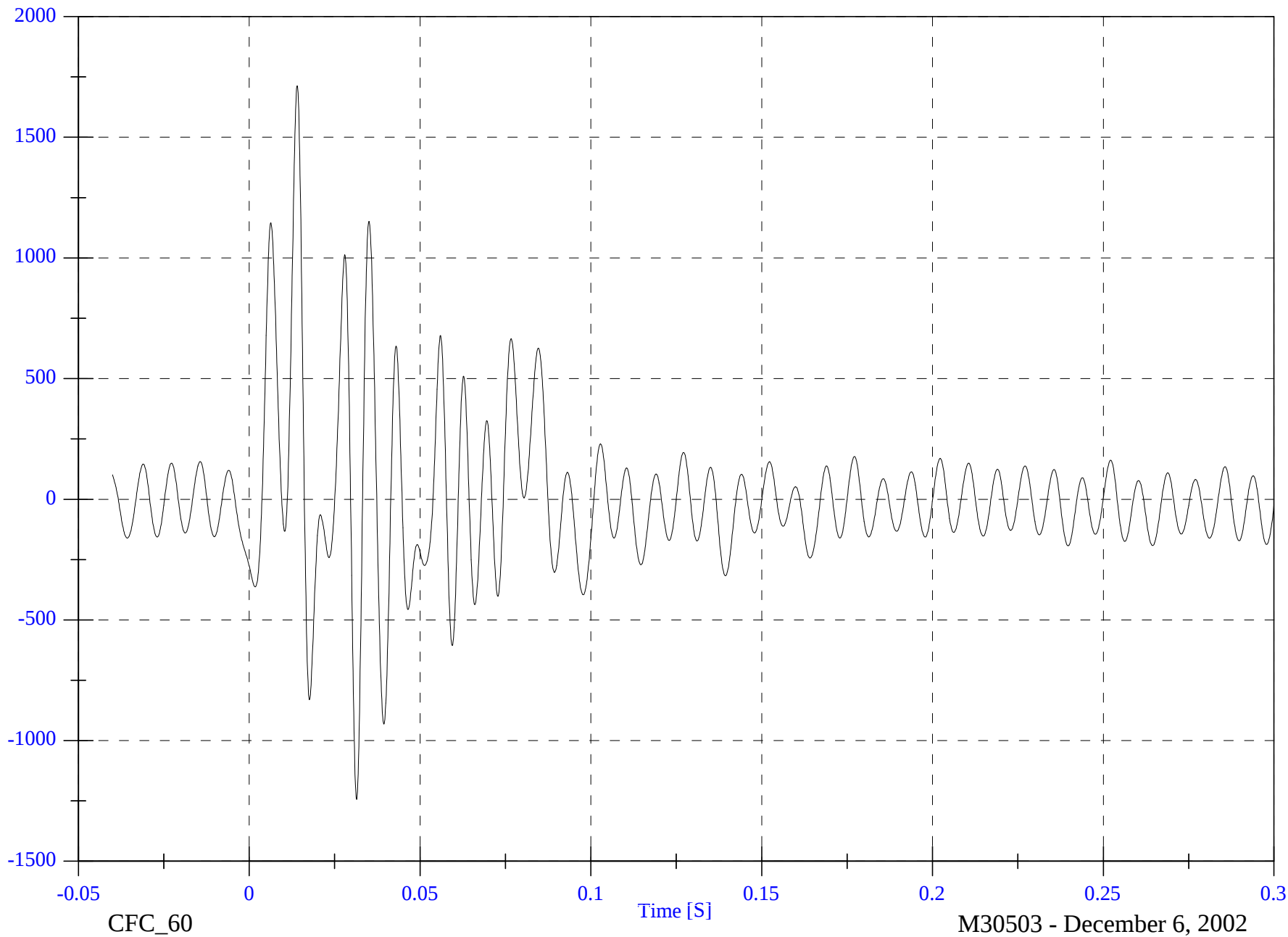
Max: 1712.8 [N] at 0.014 [S]

Min: -1244.4 [N] at 0.031 [S]

B-134

N

8642-NCAP-23

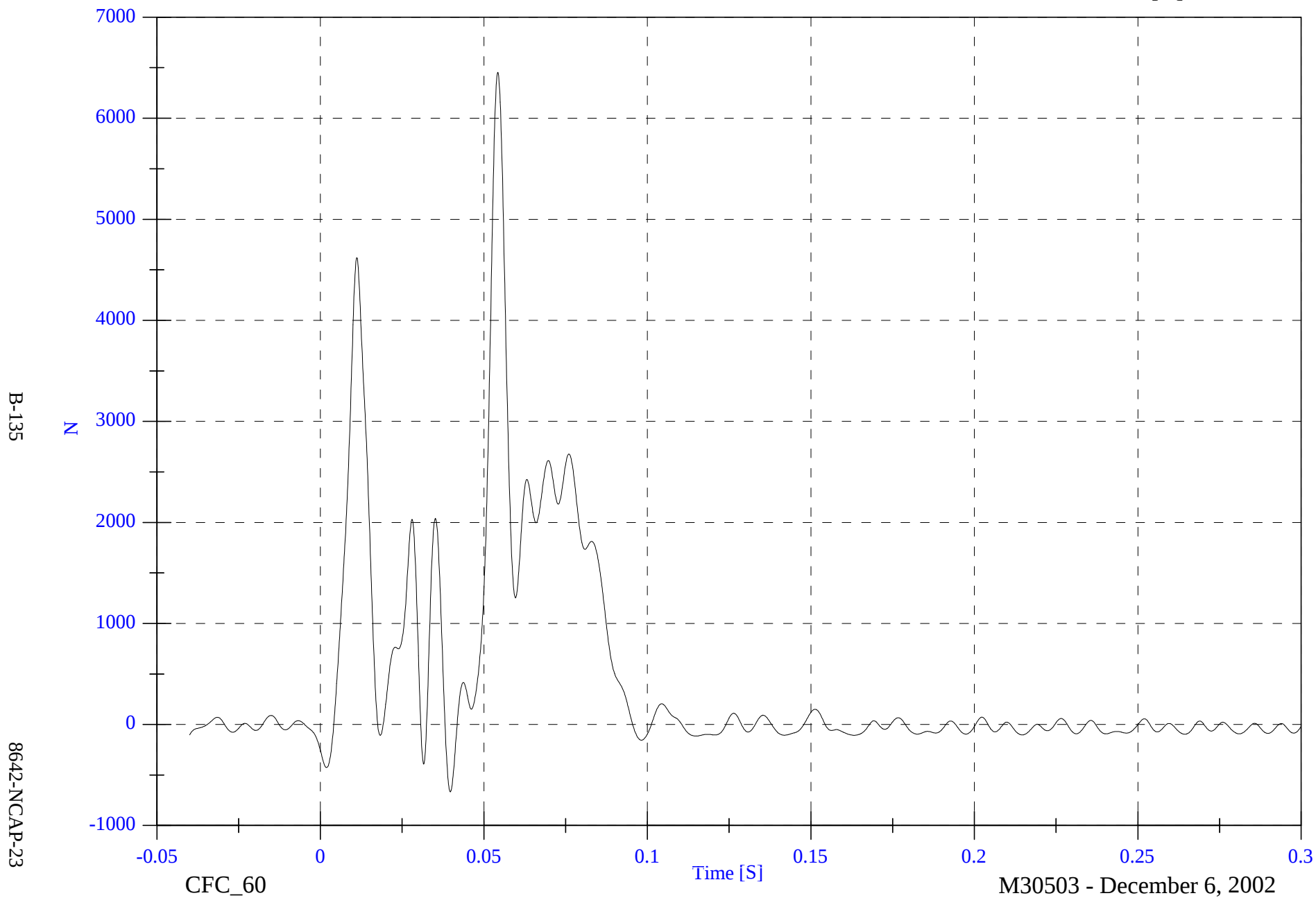


NCAP Test #1- 2003 BMW Z4

B1 LCA5 Fx

Max: 6454.4 [N] at 0.054 [S]

Min: -666.7 [N] at 0.040 [S]

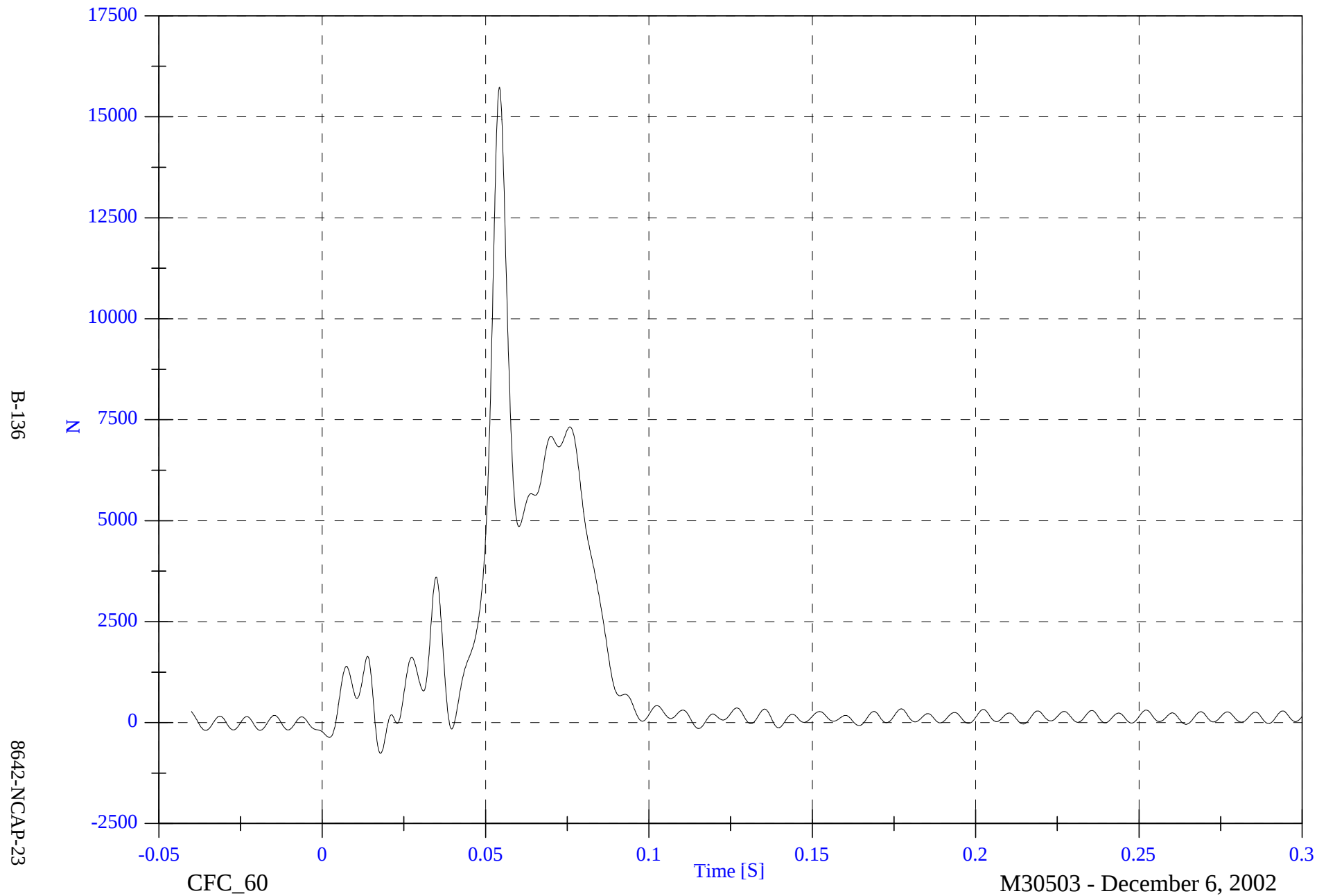


NCAP Test #1- 2003 BMW Z4

B1 LCA6 Fx

Max: 15728.8 [N] at 0.054 [S]

Min: -761.0 [N] at 0.018 [S]



NCAP Test #1- 2003 BMW Z4

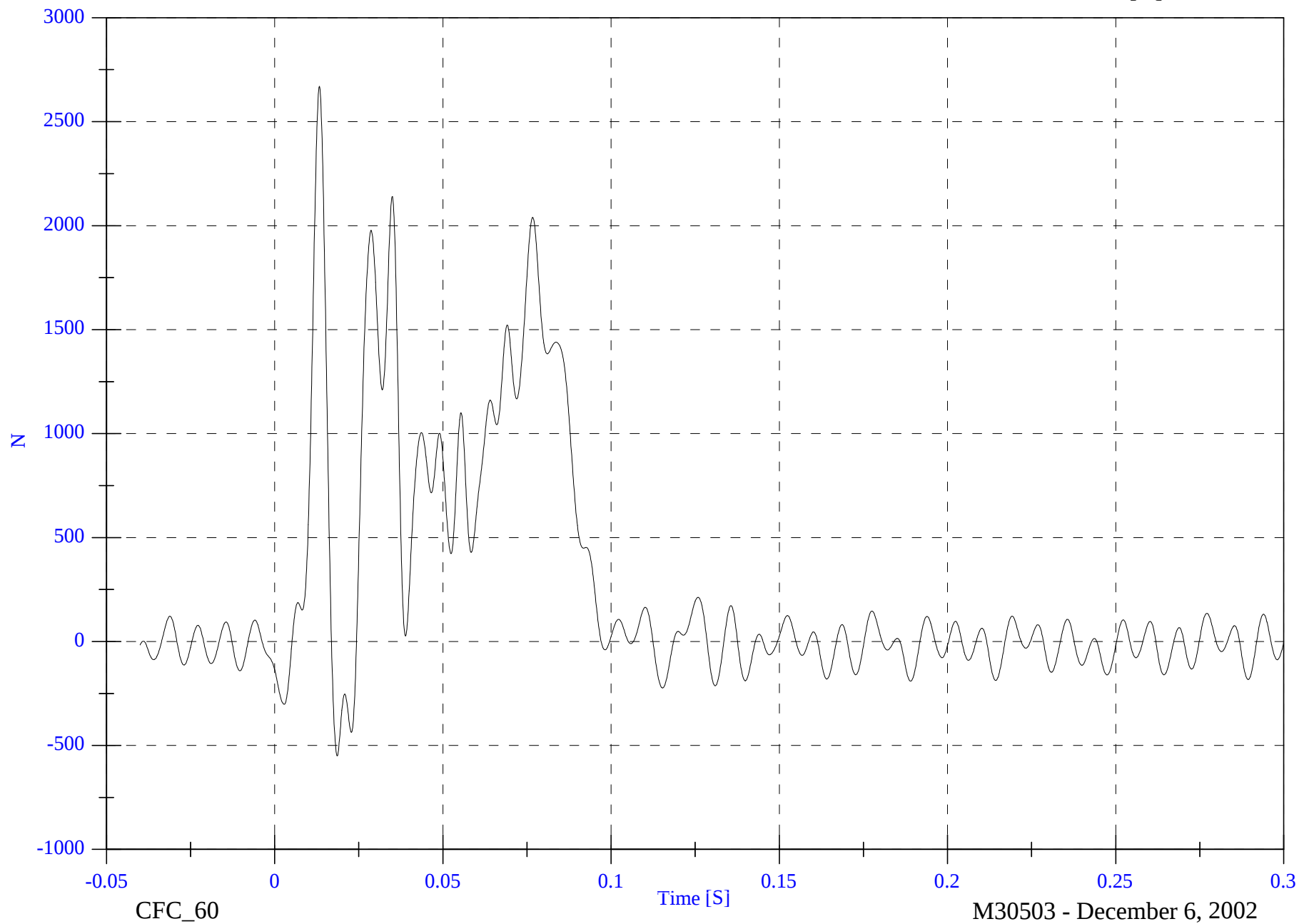
B1 LCA7 Fx

Max: 2670.6 [N] at 0.013 [S]

Min: -550.2 [N] at 0.019 [S]

B-137

8642-NCAP-23

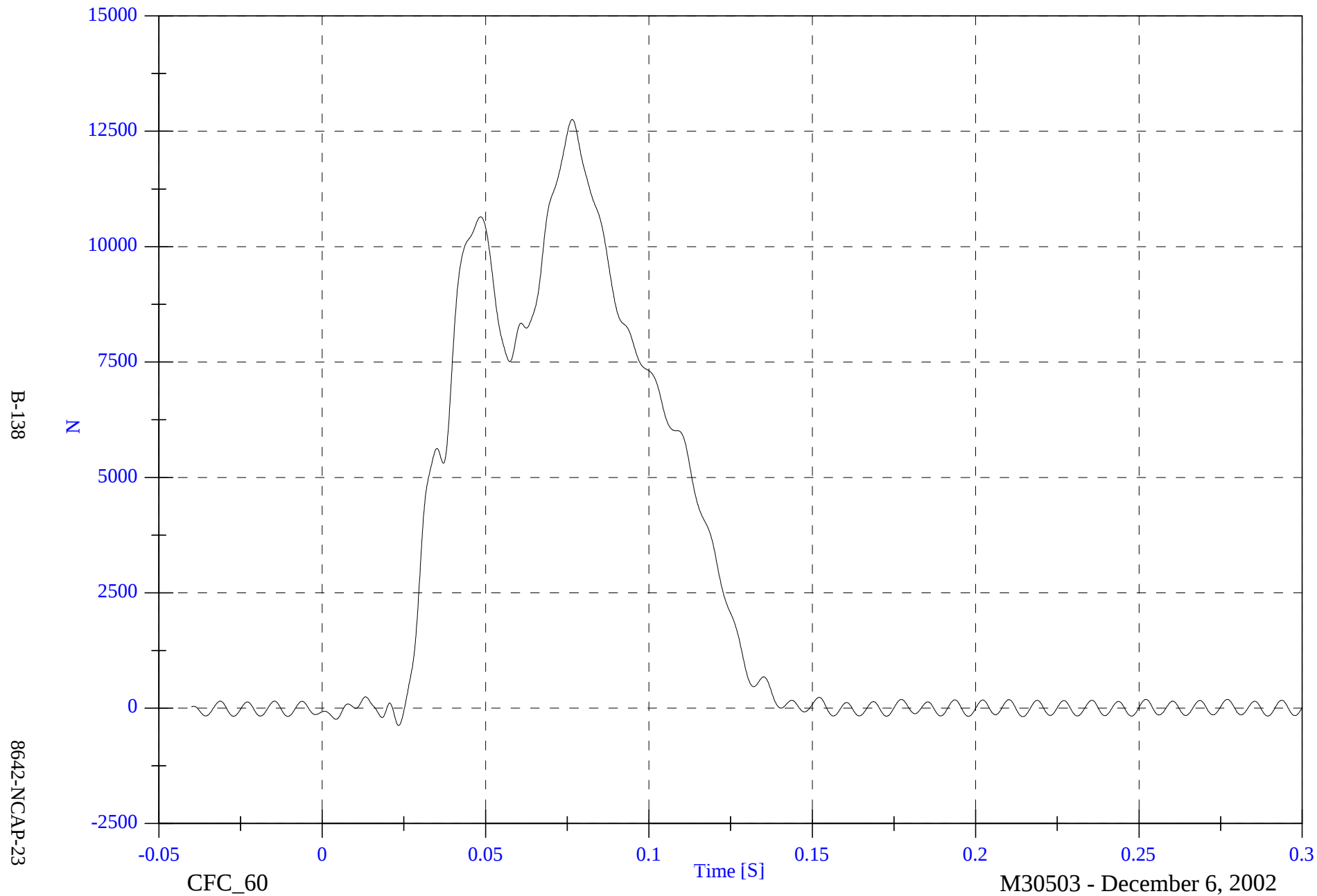


NCAP Test #1- 2003 BMW Z4

B1 LCA8 Fx

Max: 12752.8 [N] at 0.076 [S]

Min: -374.6 [N] at 0.023 [S]



NCAP Test #1- 2003 BMW Z4

B1 LCA9 Fx

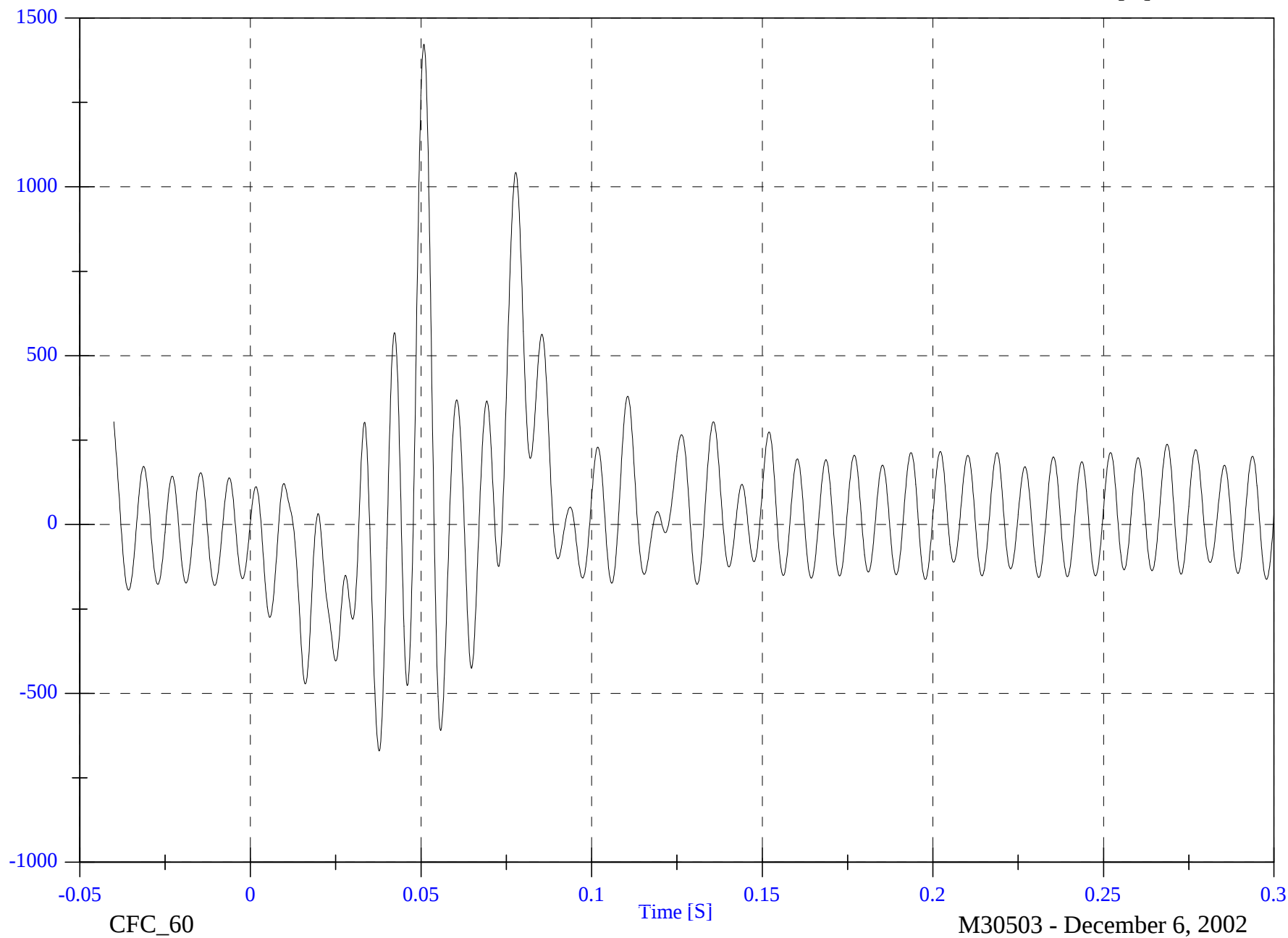
Max: 1422.0 [N] at 0.051 [S]

Min: -670.7 [N] at 0.038 [S]

B-139

N

8642-NCAP-23

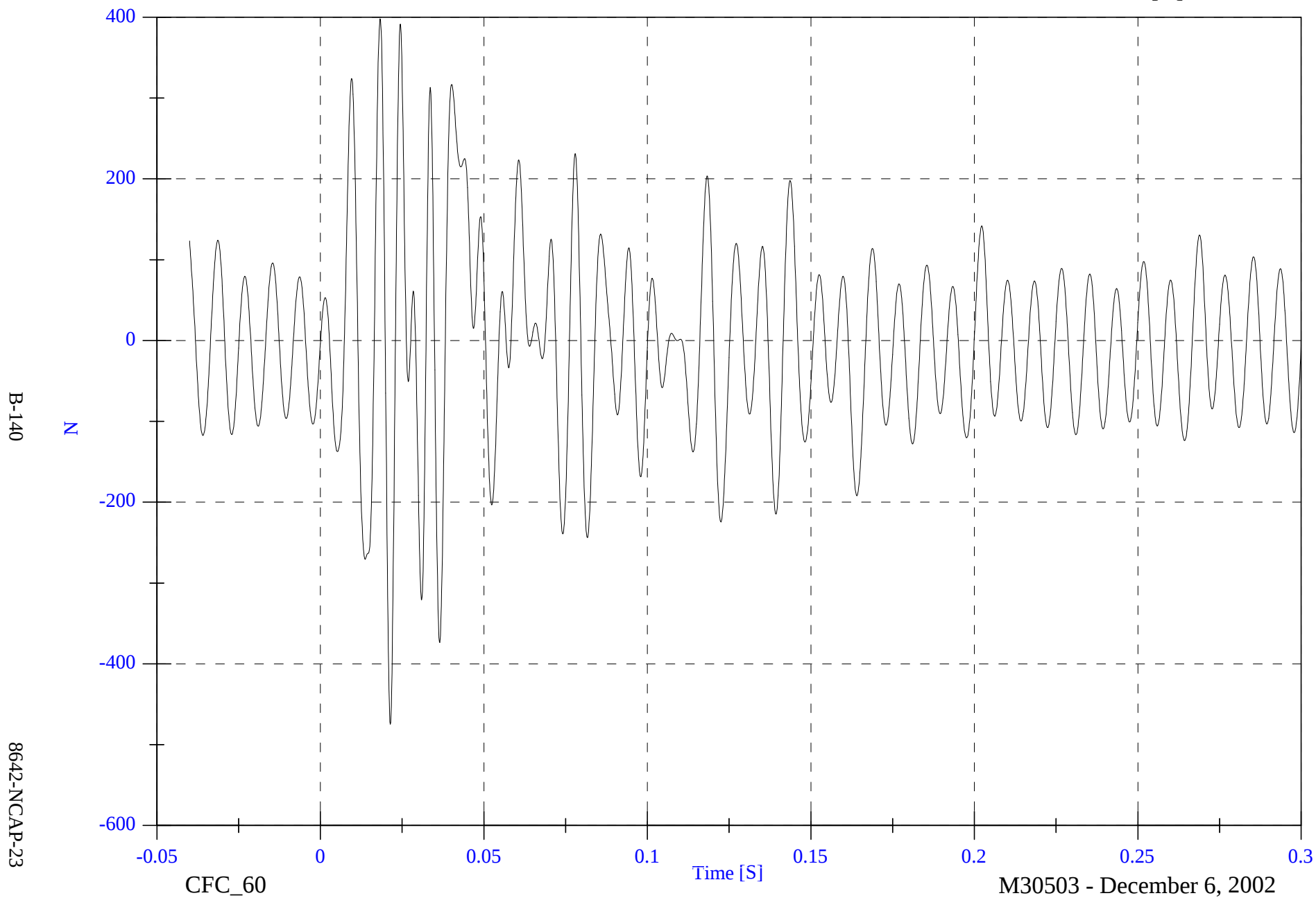


NCAP Test #1- 2003 BMW Z4

Max: 398.1 [N] at 0.018 [S]

Min: -474.8 [N] at 0.021 [S]

B1 LCB1 Fx

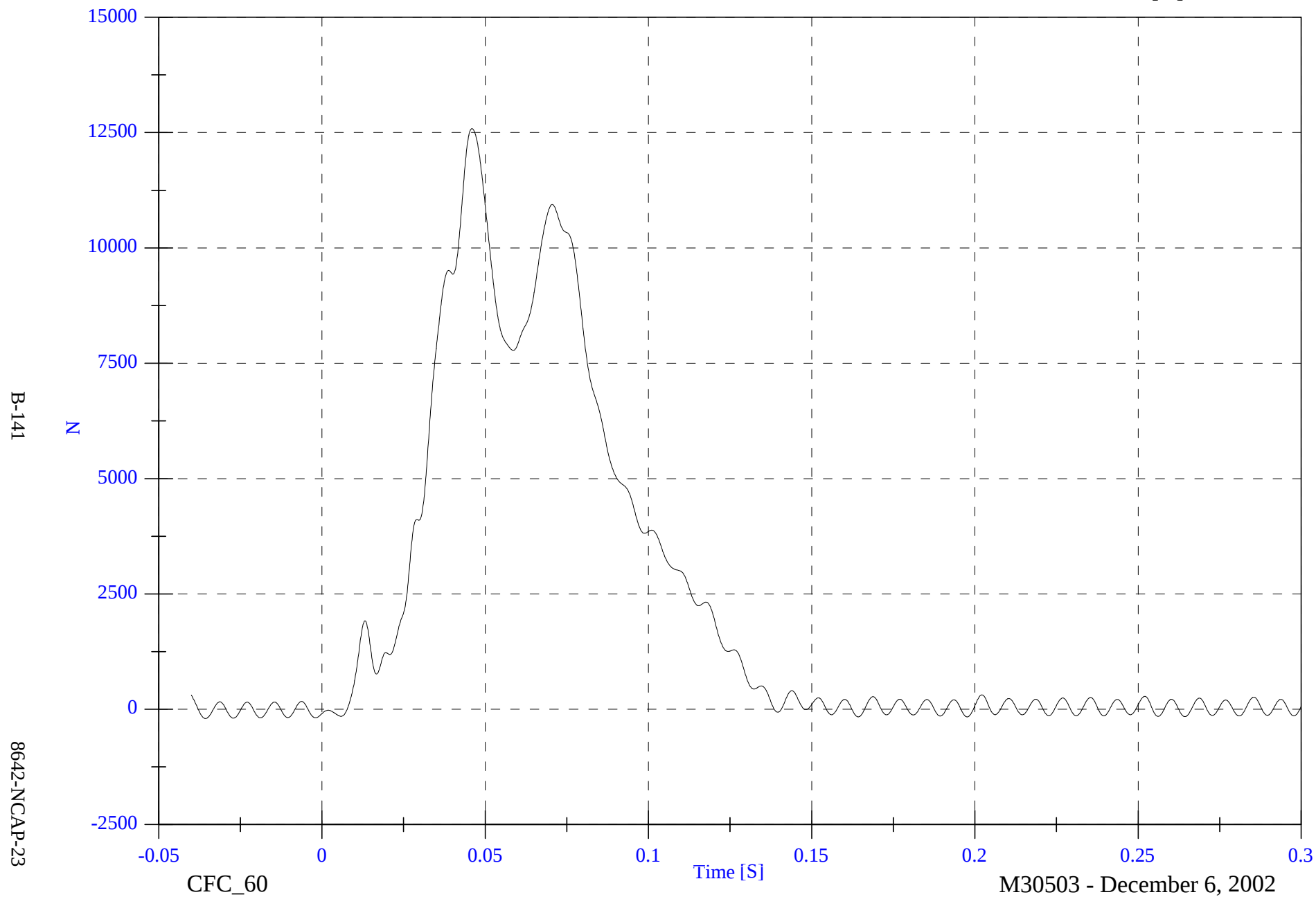


NCAP Test #1- 2003 BMW Z4

B1 LCB2 Fx

Max: 12584.2 [N] at 0.046 [S]

Min: -200.6 [N] at -0.036 [S]

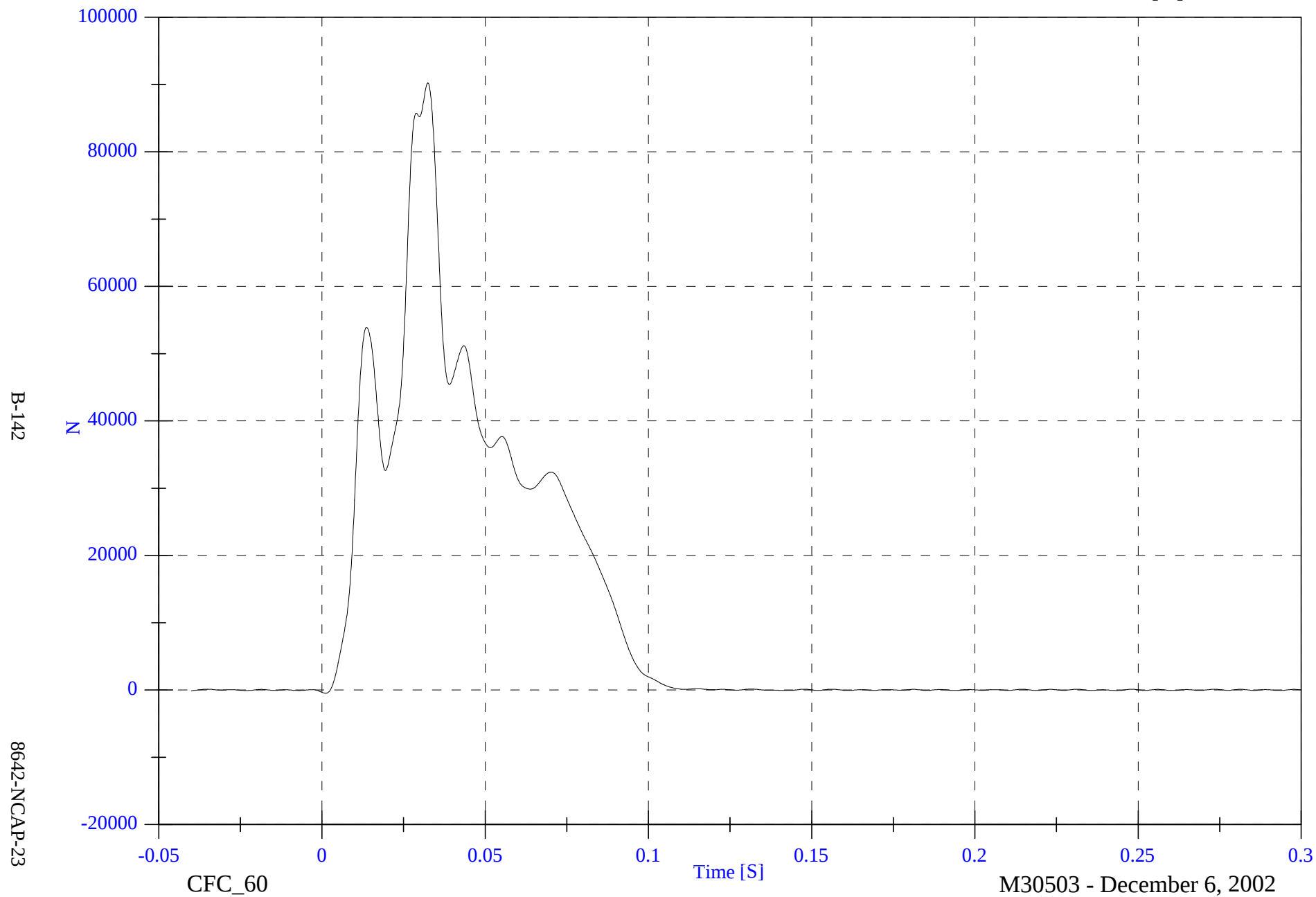


NCAP Test #1- 2003 BMW Z4

B1 LCB3 Fx

Max: 90238.2 [N] at 0.032 [S]

Min: -486.0 [N] at 0.001 [S]

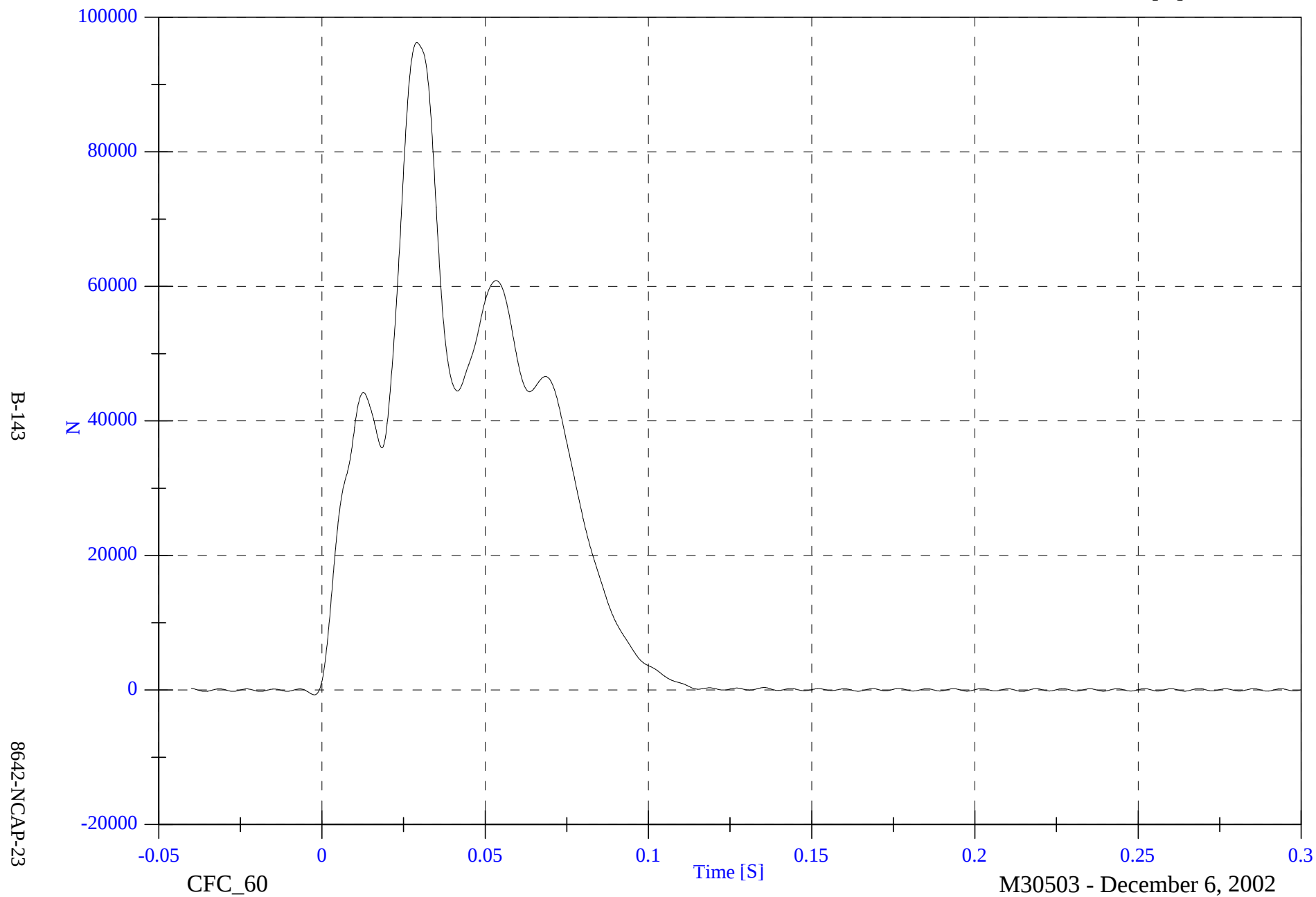


NCAP Test #1- 2003 BMW Z4

B1 LCB4 Fx

Max: 96228.7 [N] at 0.029 [S]

Min: -713.0 [N] at -0.002 [S]

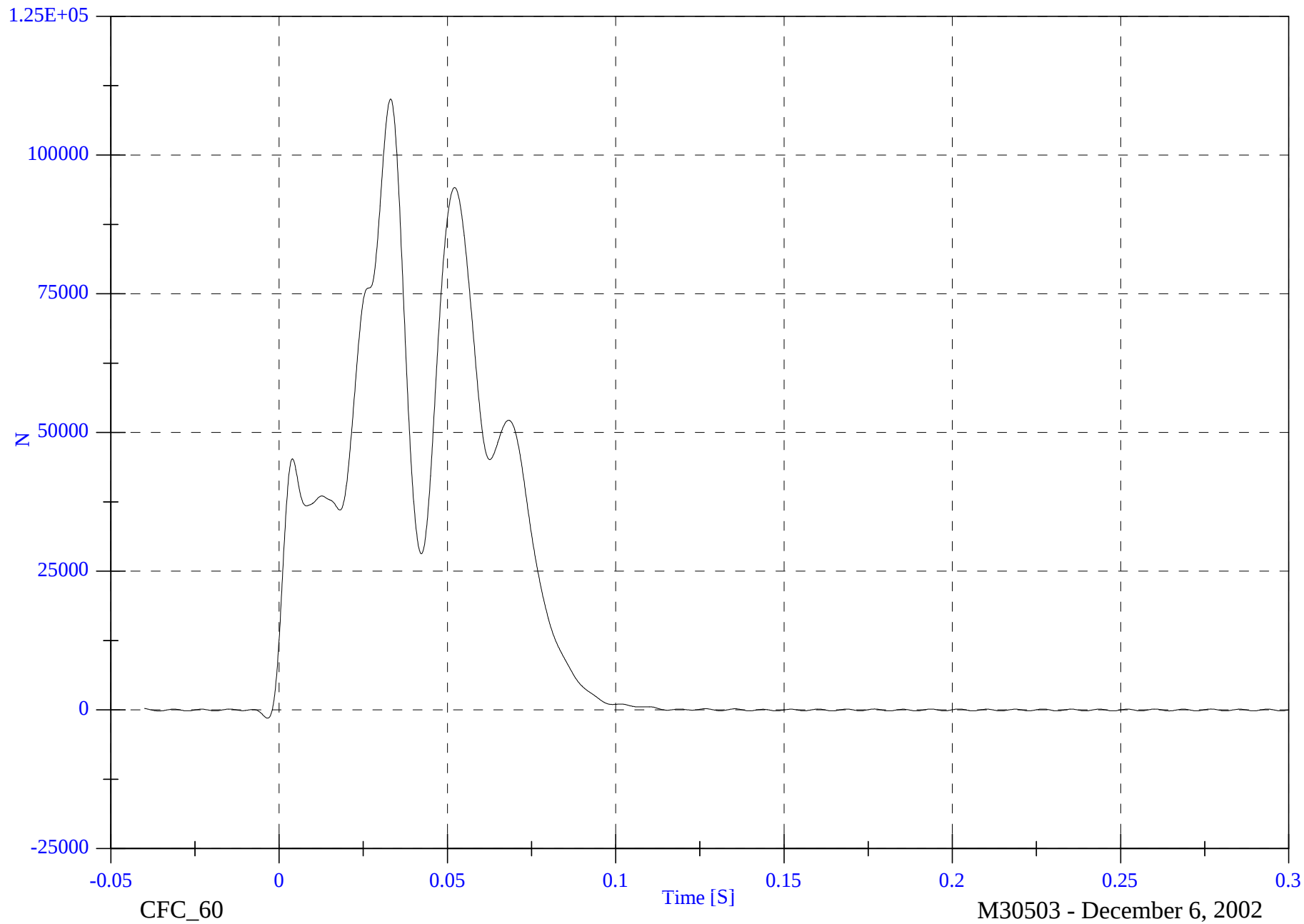


NCAP Test #1- 2003 BMW Z4

B1 LCB5 Fx

Max: 110095.2 [N] at 0.033 [S]

Min: -1494.2 [N] at -0.003 [S]



B-144

8642-NCAP-23

CFC_60

Time [S]

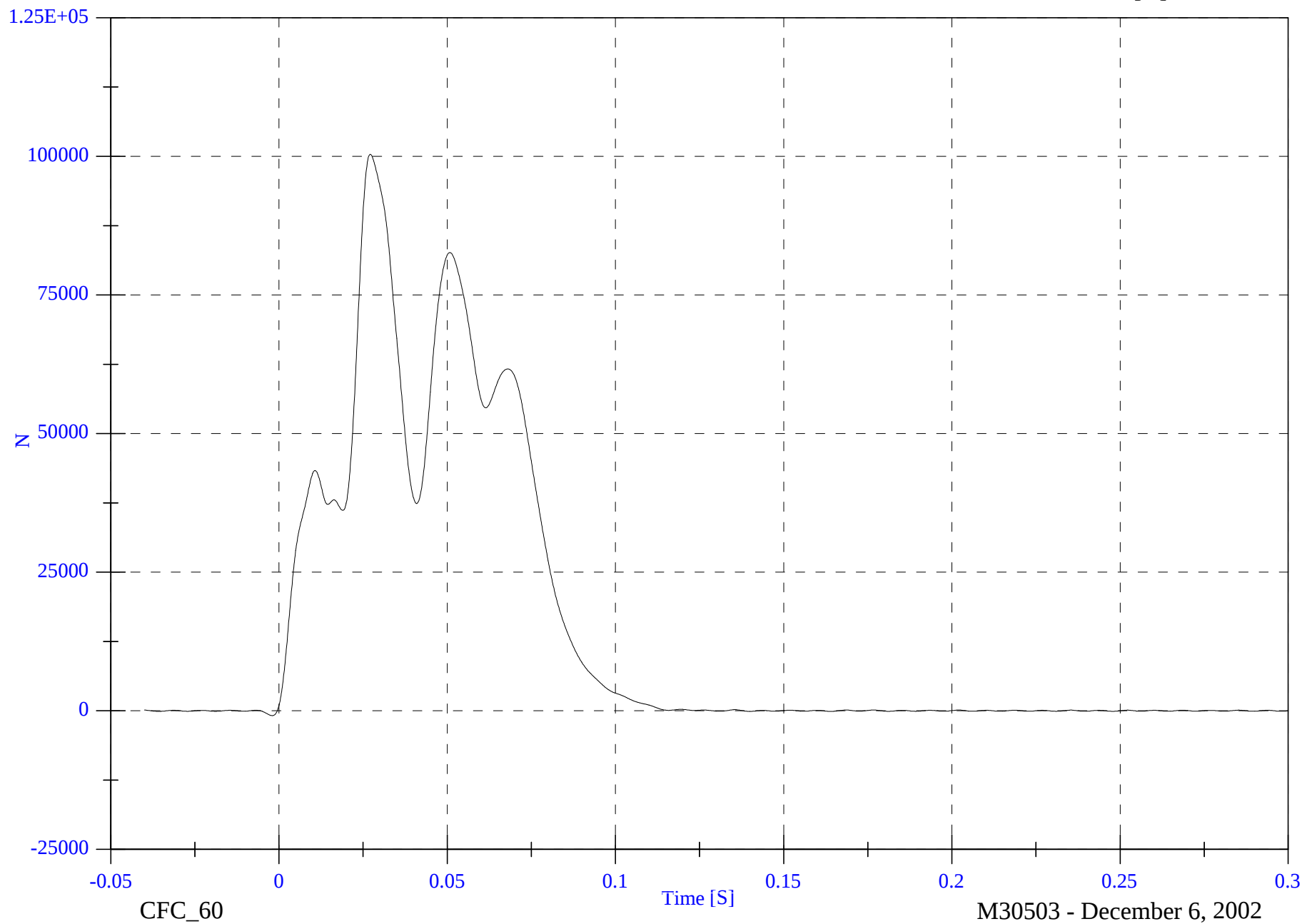
M30503 - December 6, 2002

NCAP Test #1- 2003 BMW Z4

B1 LCB6 Fx

Max: 100373.5 [N] at 0.027 [S]

Min: -879.0 [N] at -0.002 [S]



B-145

8642-NCAP-23

CFC_60

Time [S]

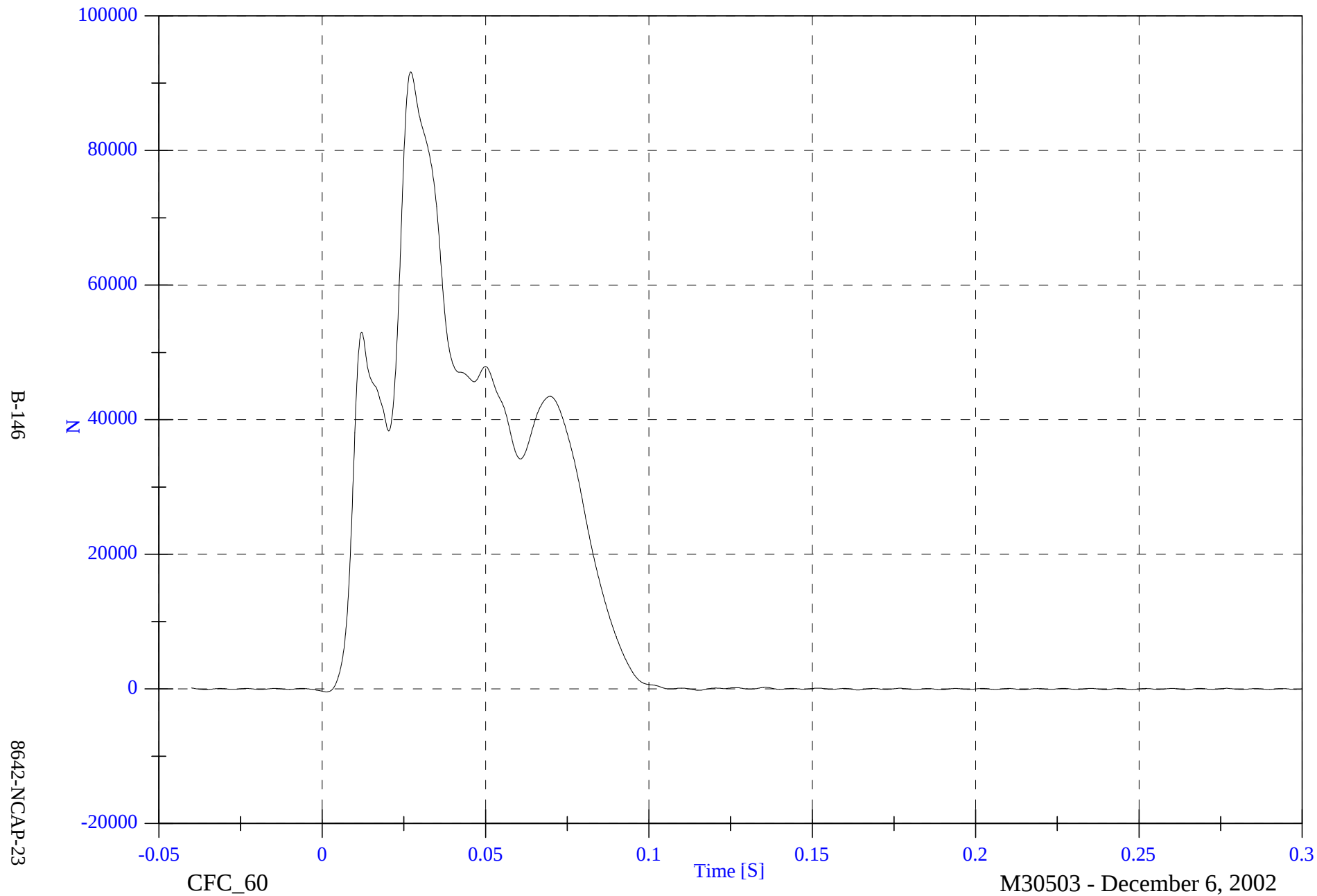
M30503 - December 6, 2002

NCAP Test #1- 2003 BMW Z4

B1 LCB7 Fx

Max: 91674.1 [N] at 0.027 [S]

Min: -441.3 [N] at 0.001 [S]

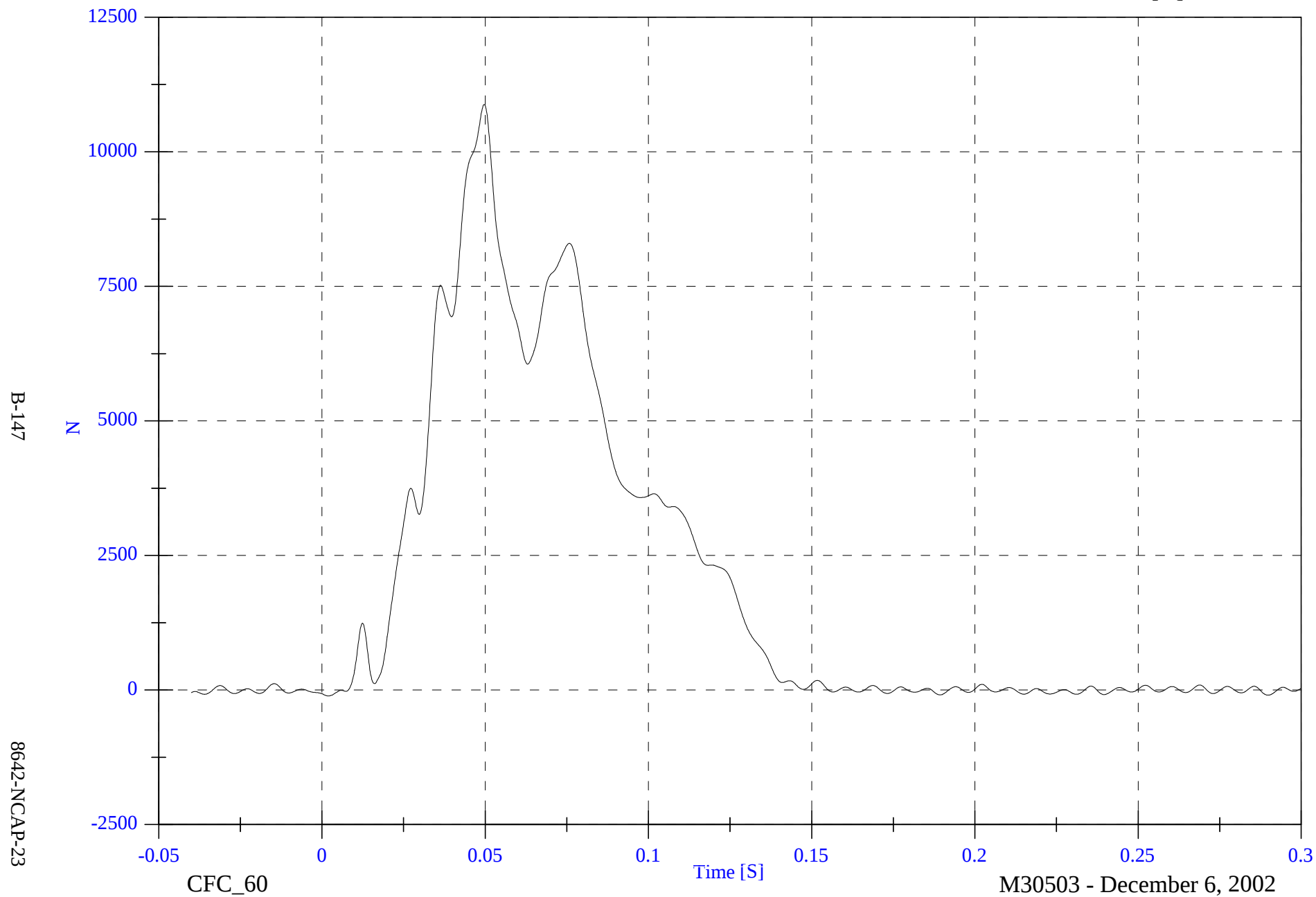


NCAP Test #1- 2003 BMW Z4

B1 LCB8 Fx

Max: 10879.7 [N] at 0.050 [S]

Min: -110.9 [N] at 0.002 [S]

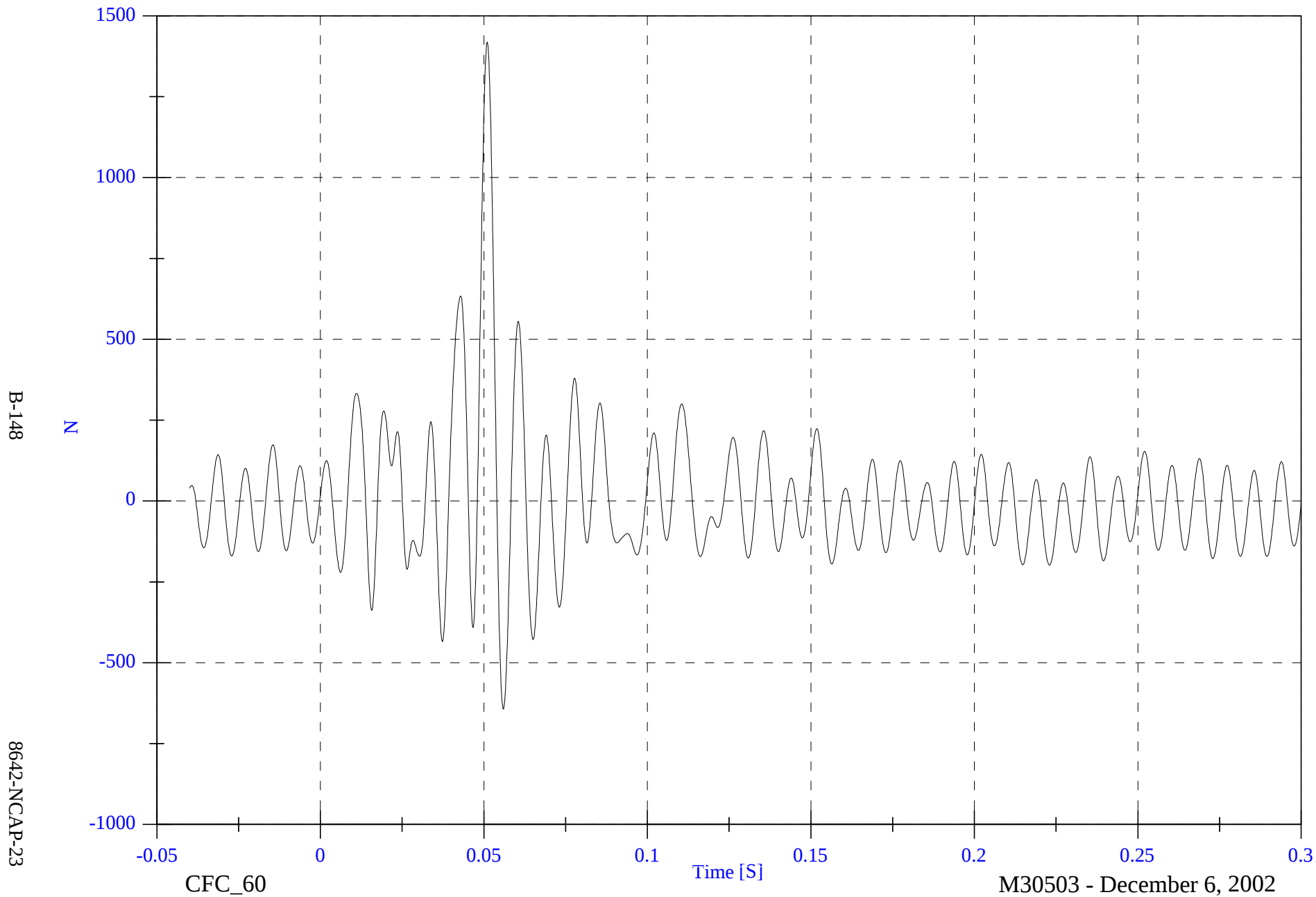


NCAP Test #1- 2003 BMW Z4

B1 LCB9 Fx

Max: 1419.0 [N] at 0.051 [S]

Min: -643.2 [N] at 0.056 [S]

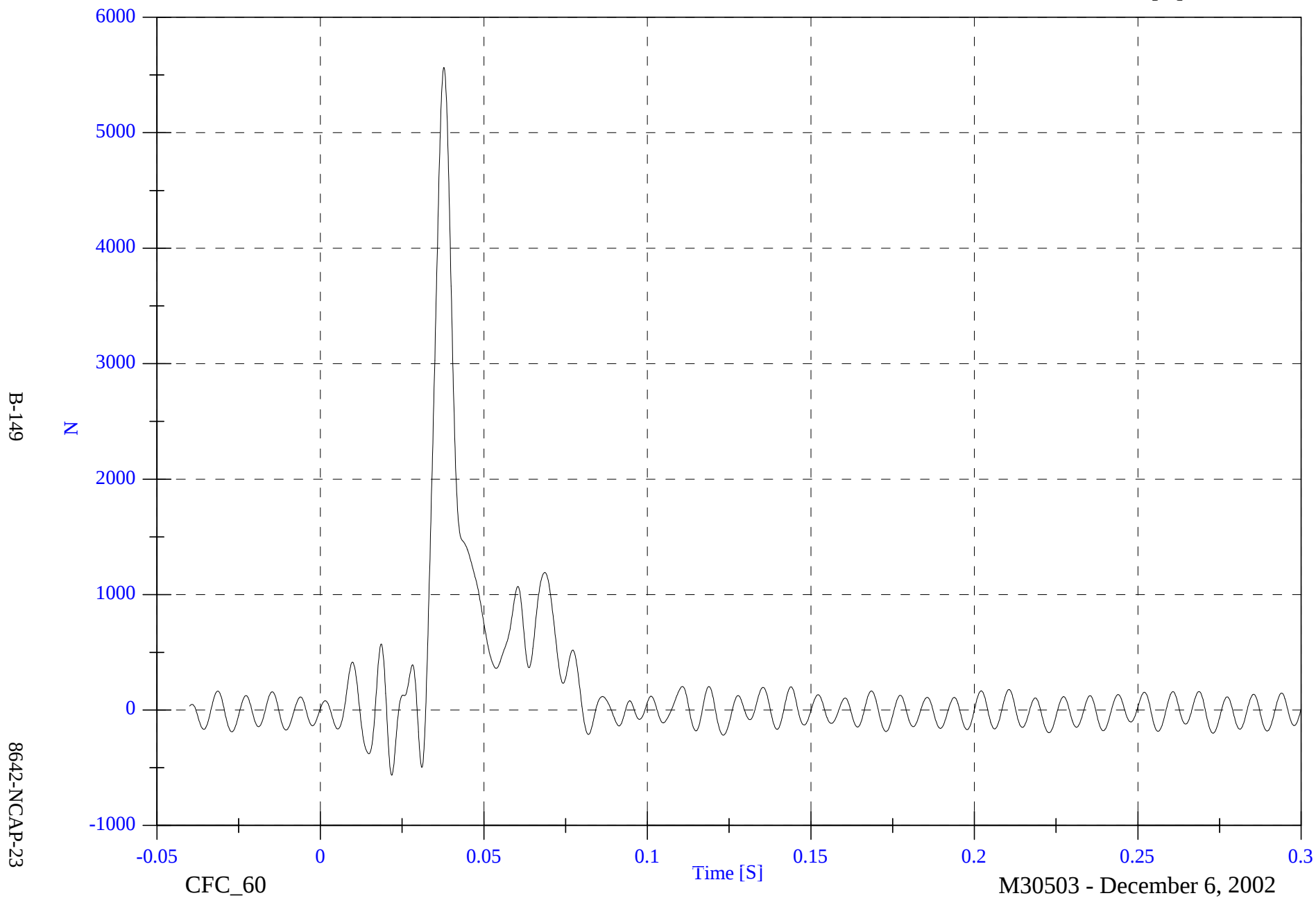


NCAP Test #1- 2003 BMW Z4

B1 LCC1 Fx

Max: 5565.4 [N] at 0.038 [S]

Min: -564.9 [N] at 0.022 [S]

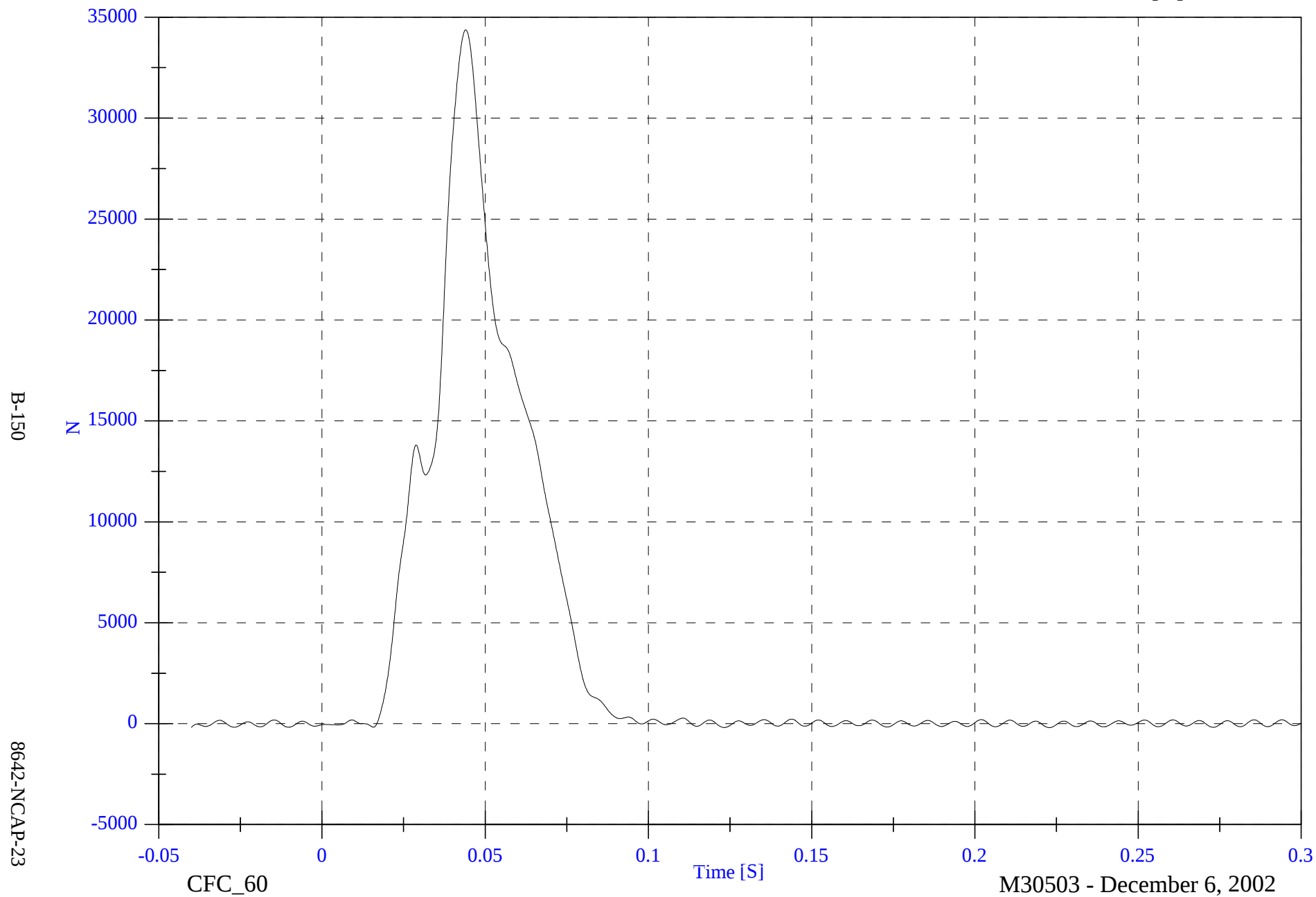


NCAP Test #1- 2003 BMW Z4

B1 LCC2 Fx

Max: 34372.9 [N] at 0.044 [S]

Min: -196.9 [N] at 0.223 [S]

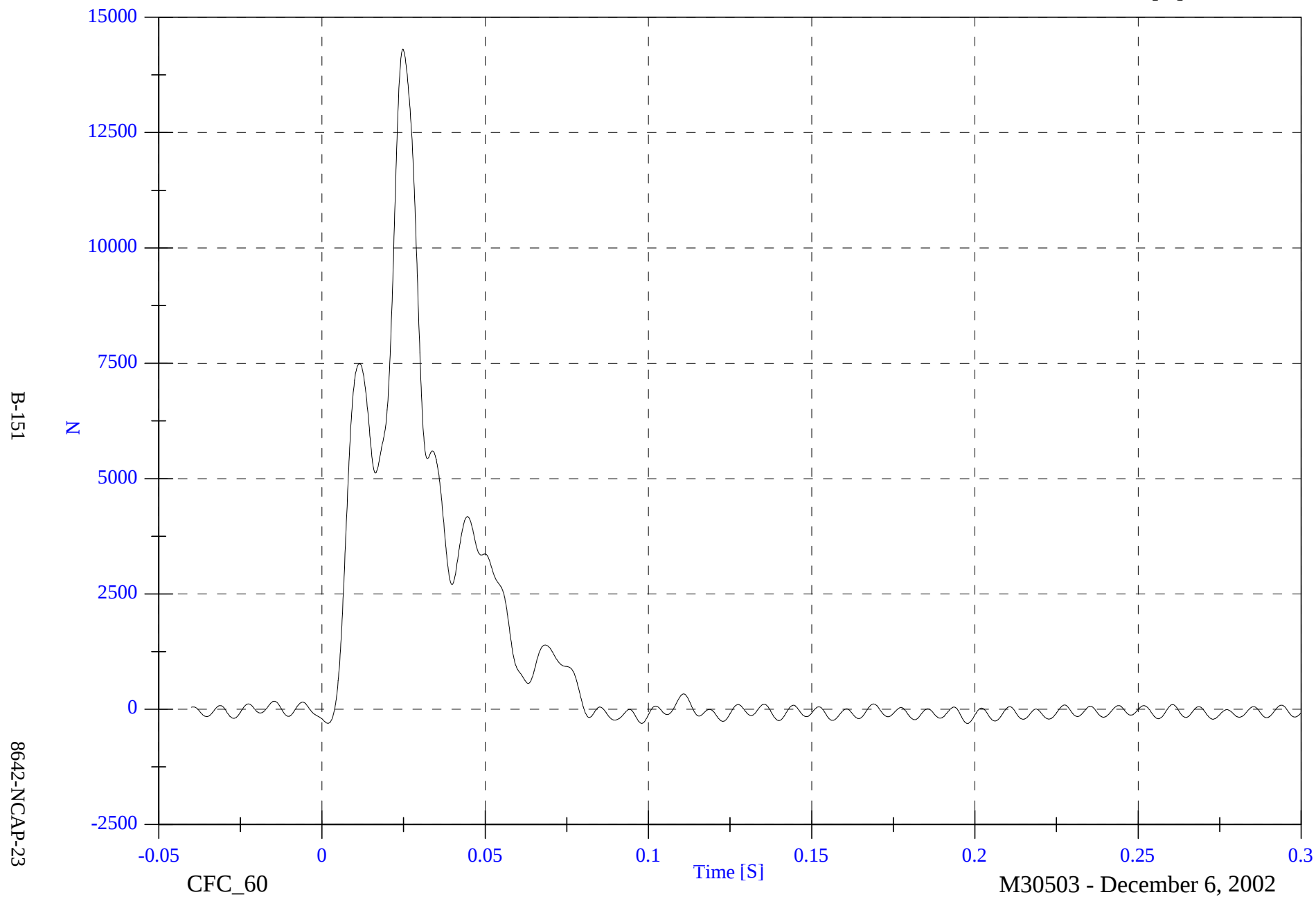


NCAP Test #1- 2003 BMW Z4

B1 LCC3 Fx

Max: 14306.5 [N] at 0.025 [S]

Min: -308.7 [N] at 0.198 [S]



NCAP Test #1- 2003 BMW Z4

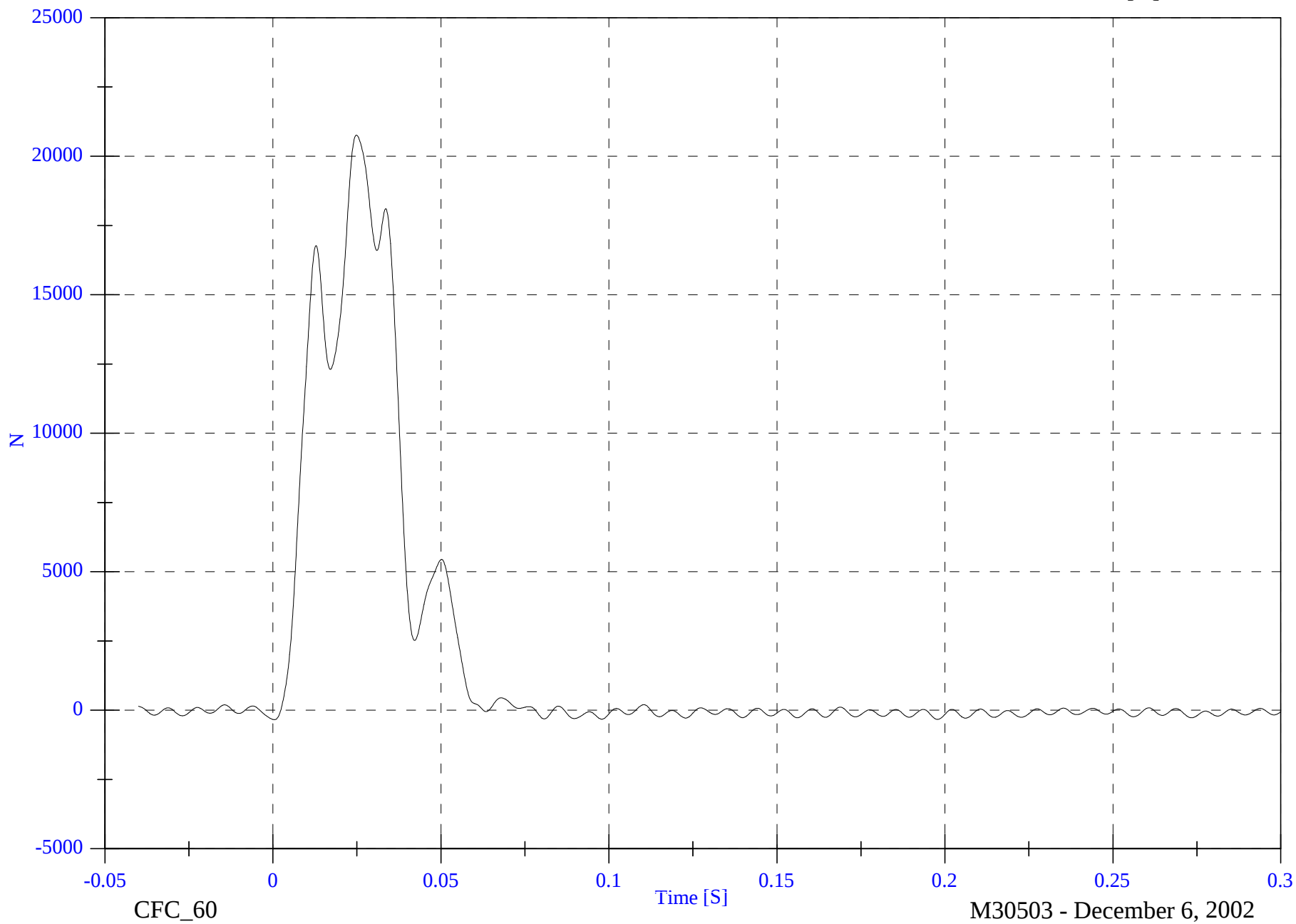
B1 LCC4 Fx

Max: 20762.1 [N] at 0.025 [S]

Min: -341.7 [N] at 0.000 [S]

B-152

8642-NCAP-23

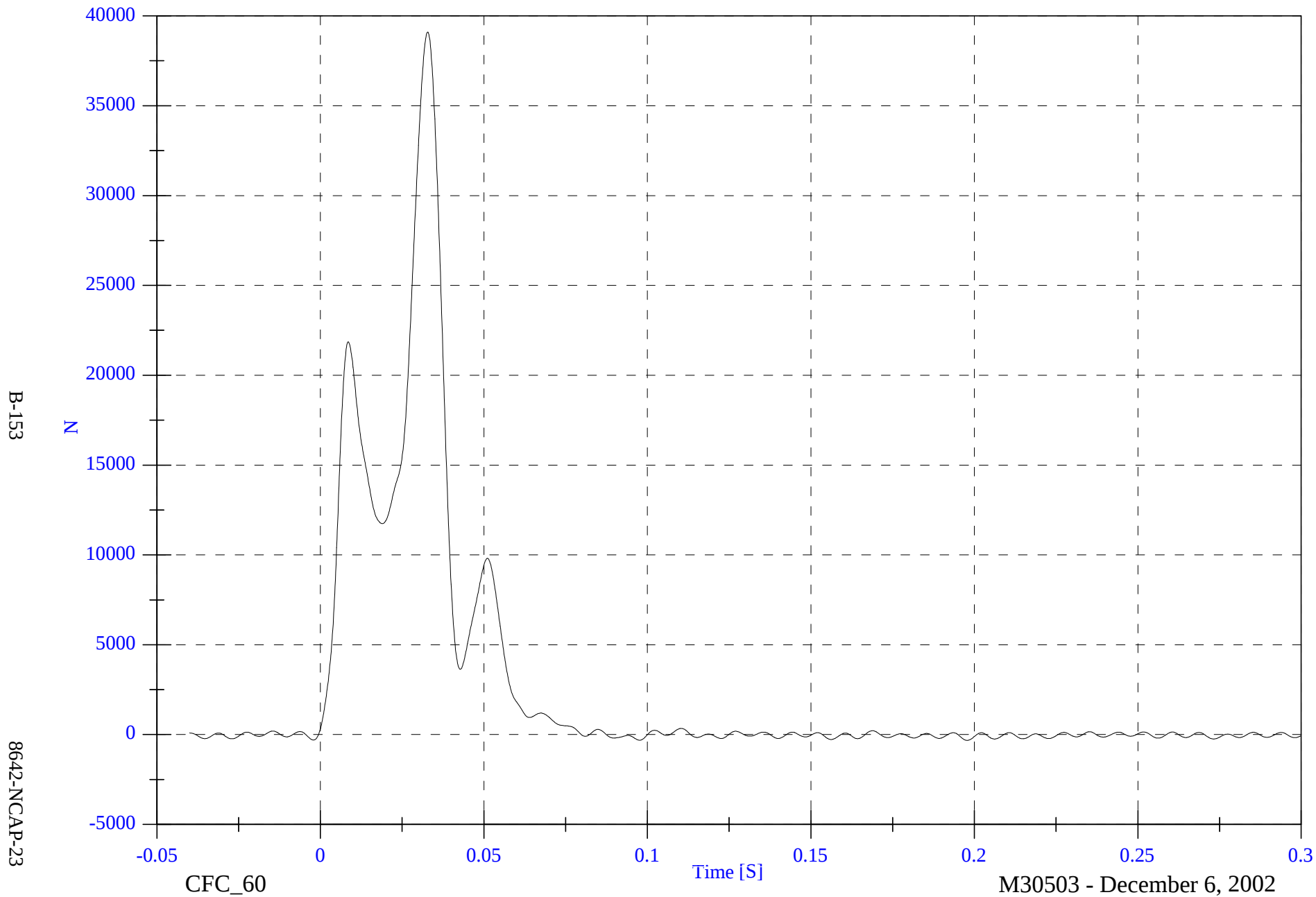


NCAP Test #1- 2003 BMW Z4

B1 LCC5 Fx

Max: 39099.5 [N] at 0.033 [S]

Min: -322.0 [N] at 0.198 [S]

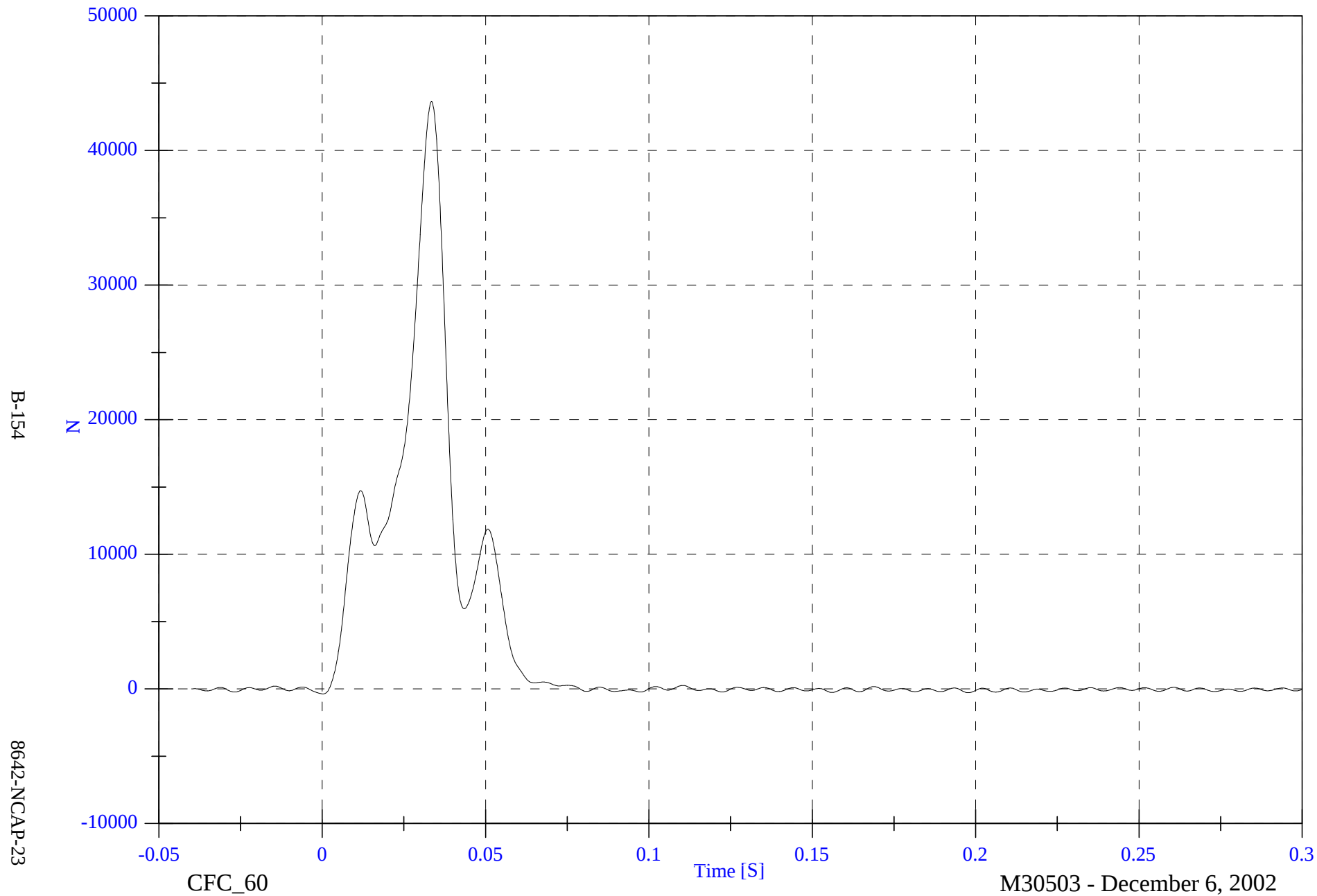


NCAP Test #1- 2003 BMW Z4

B1 LCC6 Fx

Max: 43637.7 [N] at 0.033 [S]

Min: -365.6 [N] at 0.000 [S]

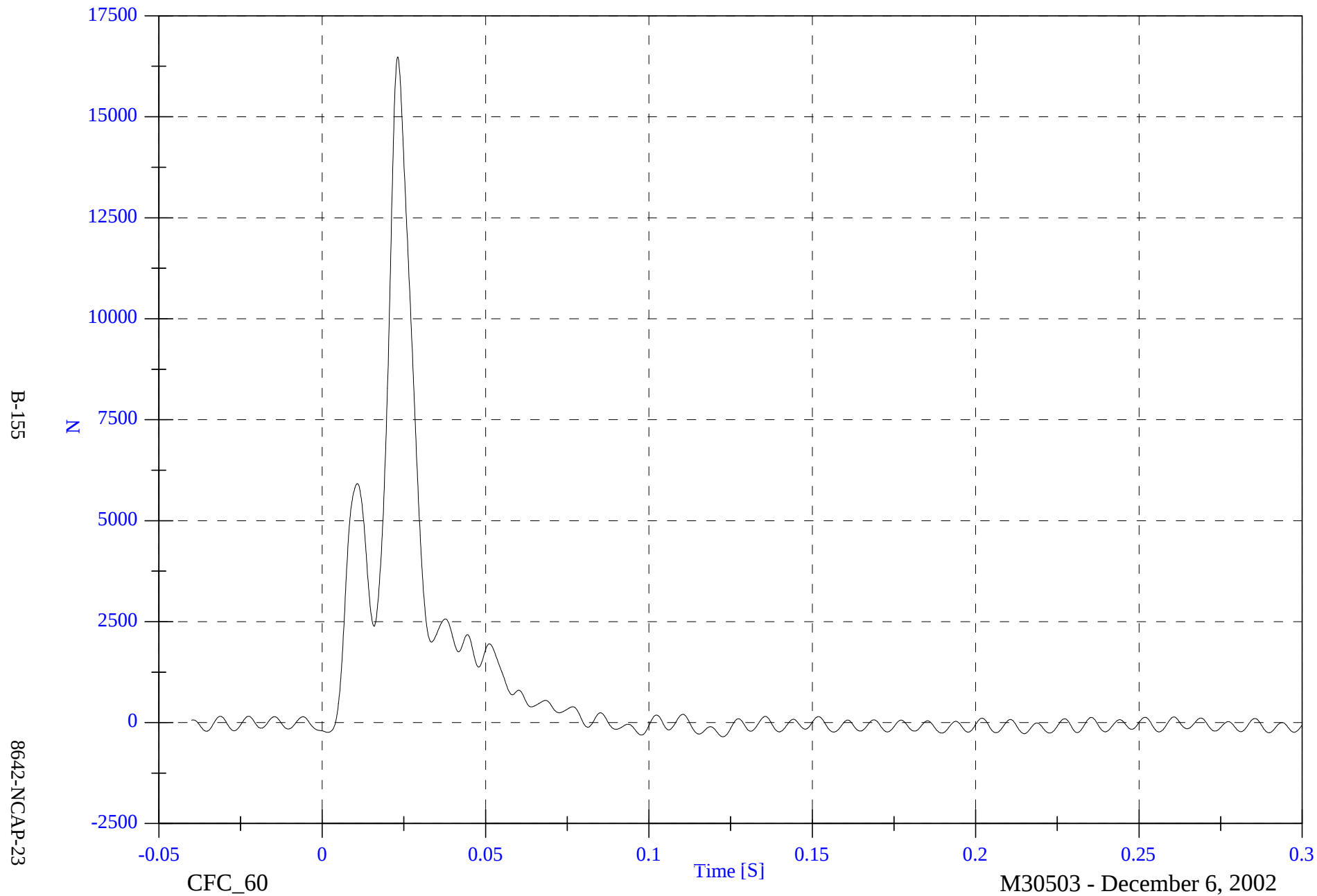


NCAP Test #1- 2003 BMW Z4

B1 LCC7 Fx

Max: 16483.6 [N] at 0.023 [S]

Min: -351.2 [N] at 0.123 [S]

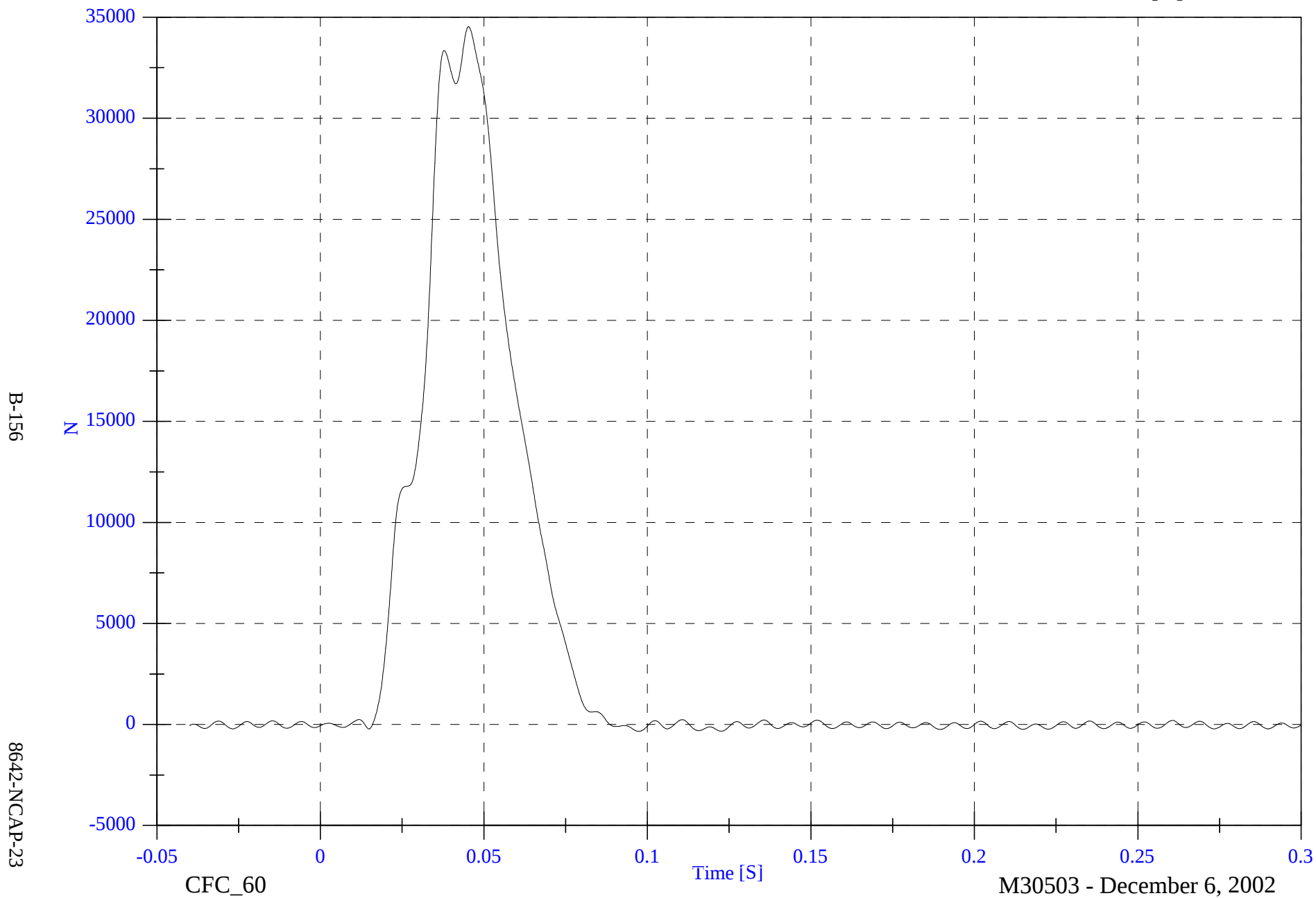


NCAP Test #1- 2003 BMW Z4

B1 LCC8 Fx

Max: 34536.1 [N] at 0.045 [S]

Min: -339.5 [N] at 0.097 [S]



NCAP Test #1- 2003 BMW Z4

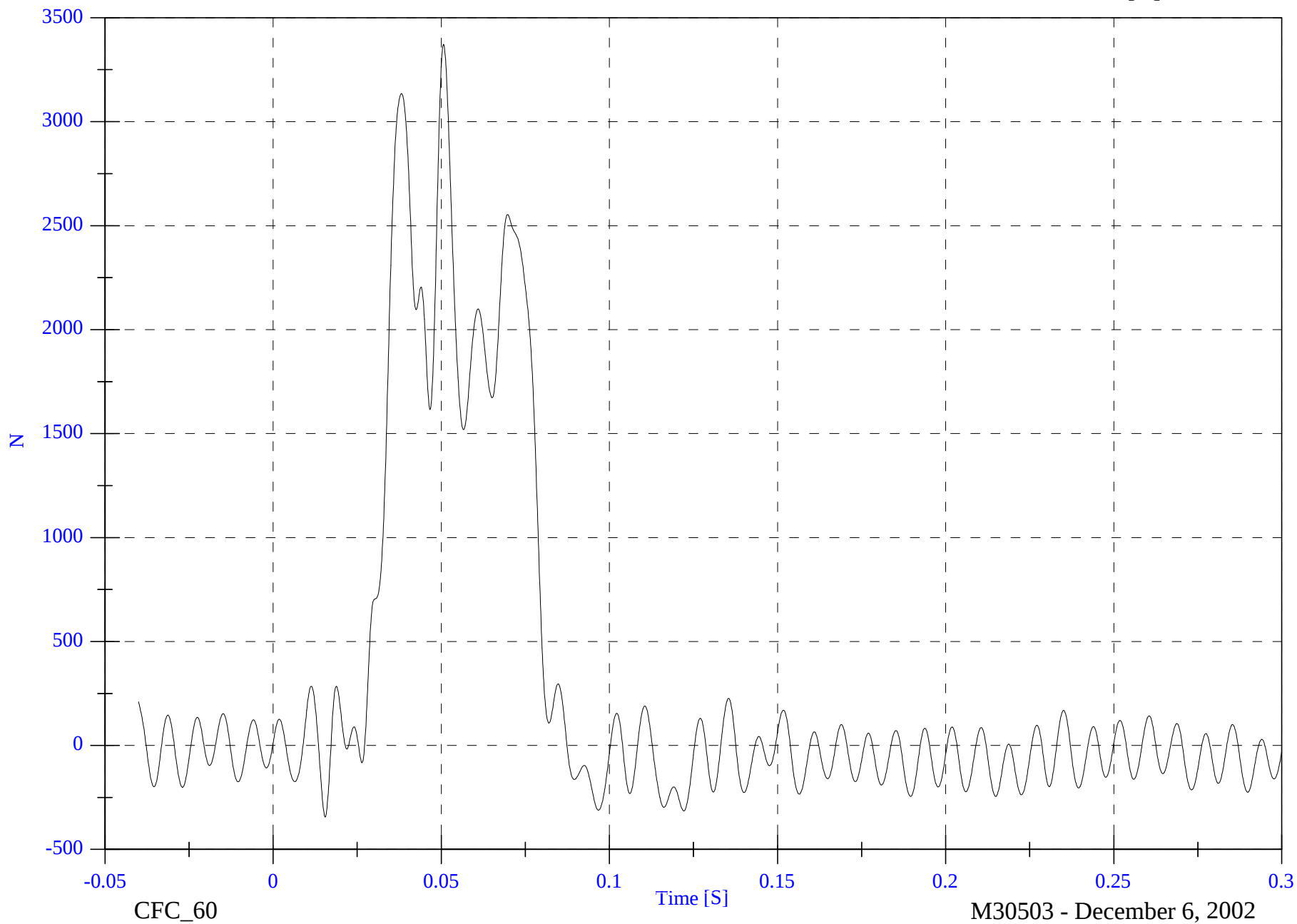
B1 LCC9 Fx

Max: 3372.3 [N] at 0.051 [S]

Min: -344.2 [N] at 0.015 [S]

B-157

8642-NCAP-23

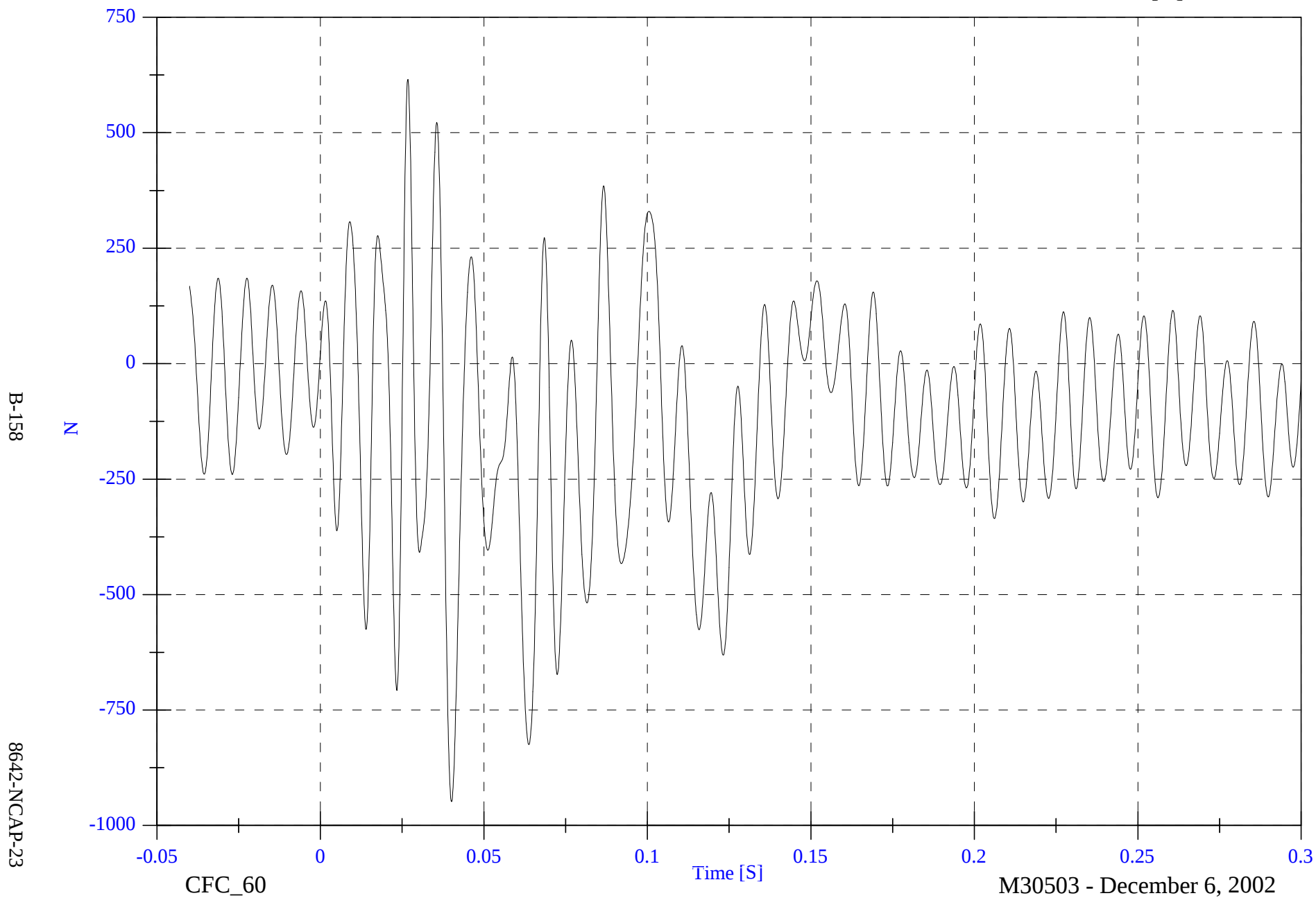


NCAP Test #1- 2003 BMW Z4

Max: 615.4 [N] at 0.027 [S]

Min: -948.7 [N] at 0.040 [S]

B1 LCD1 Fx

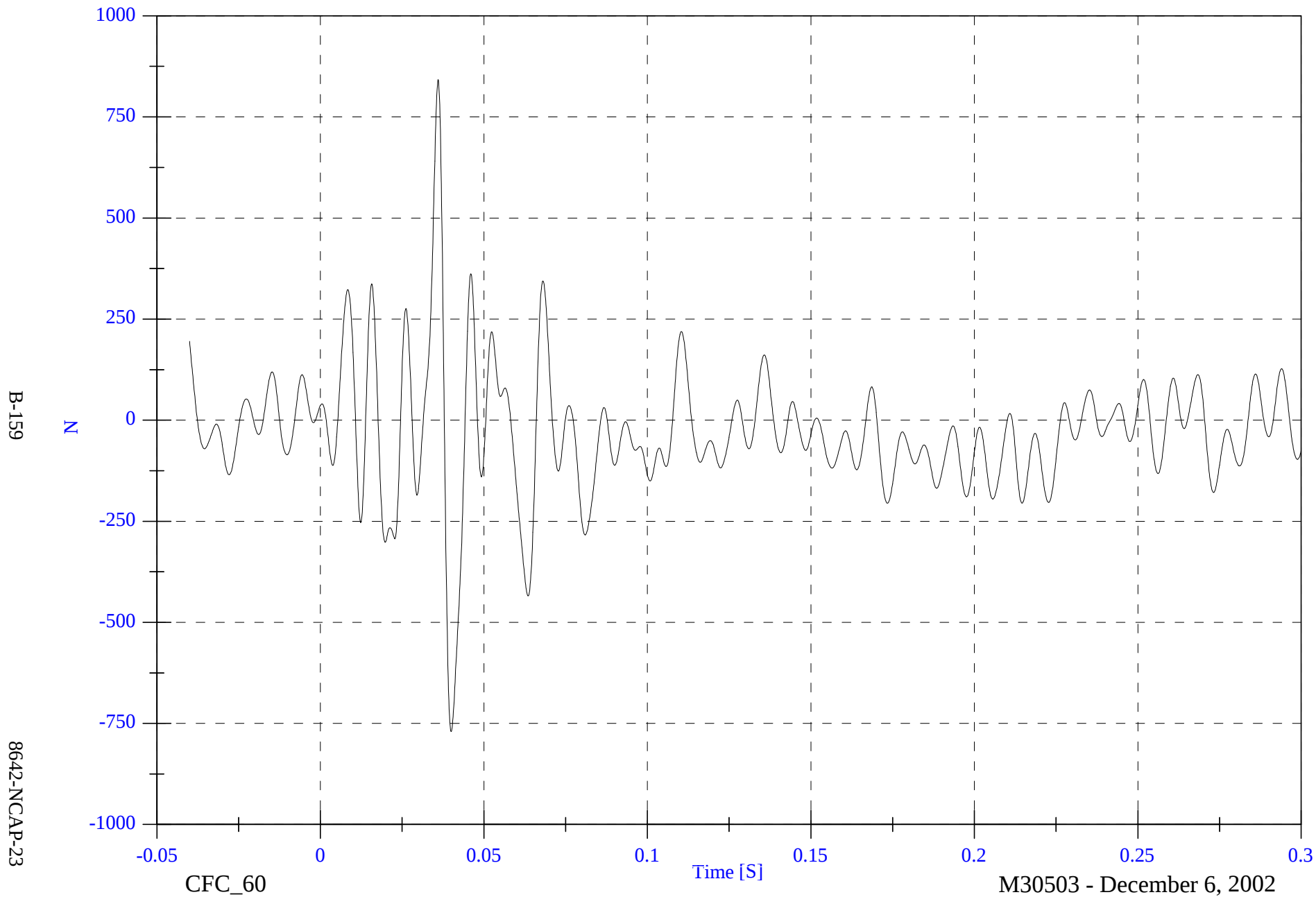


NCAP Test #1- 2003 BMW Z4

B1 LCD2 Fx

Max: 842.3 [N] at 0.036 [S]

Min: -770.0 [N] at 0.040 [S]

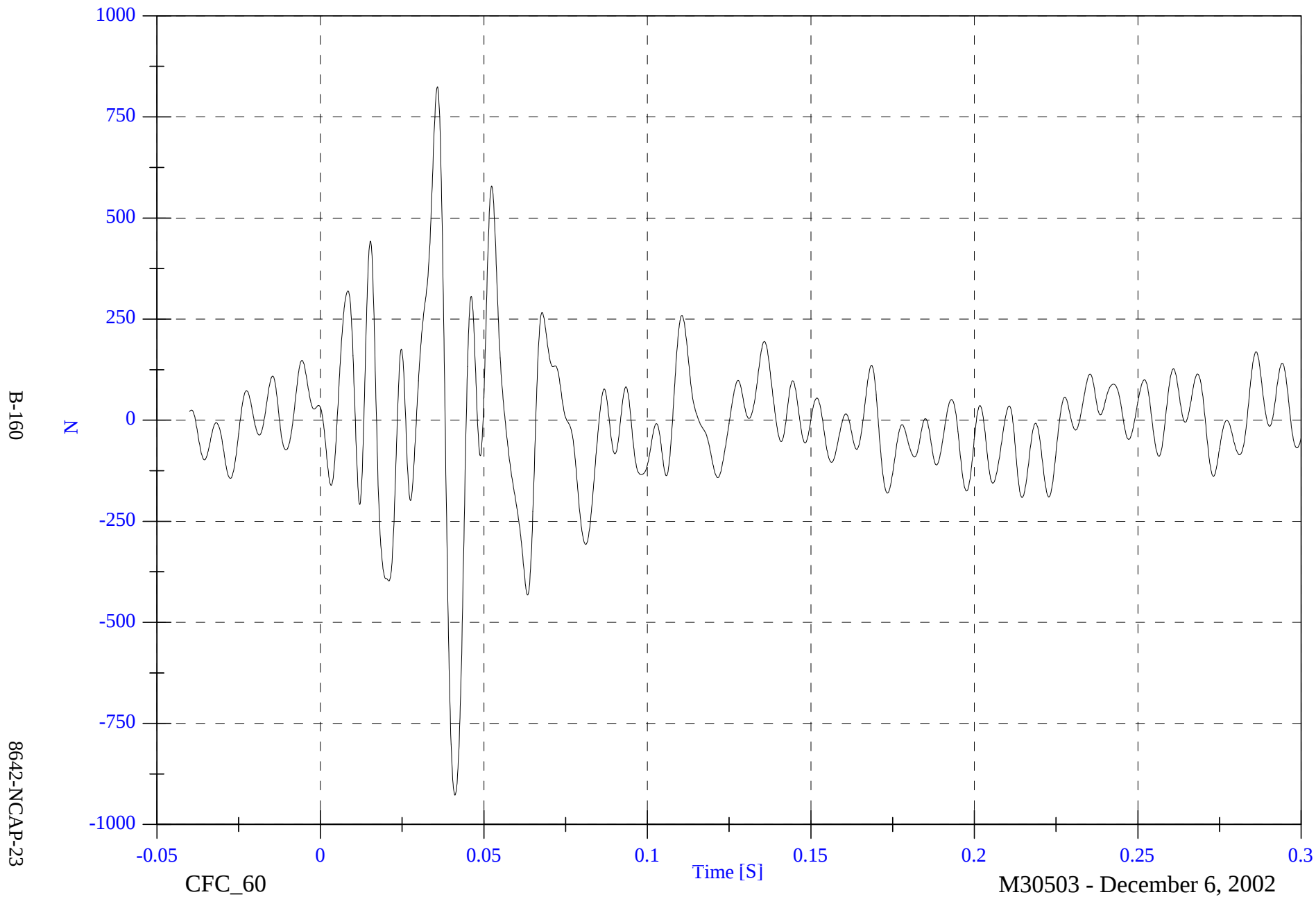


NCAP Test #1- 2003 BMW Z4

B1 LCD3 Fx

Max: 824.8 [N] at 0.036 [S]

Min: -927.5 [N] at 0.041 [S]

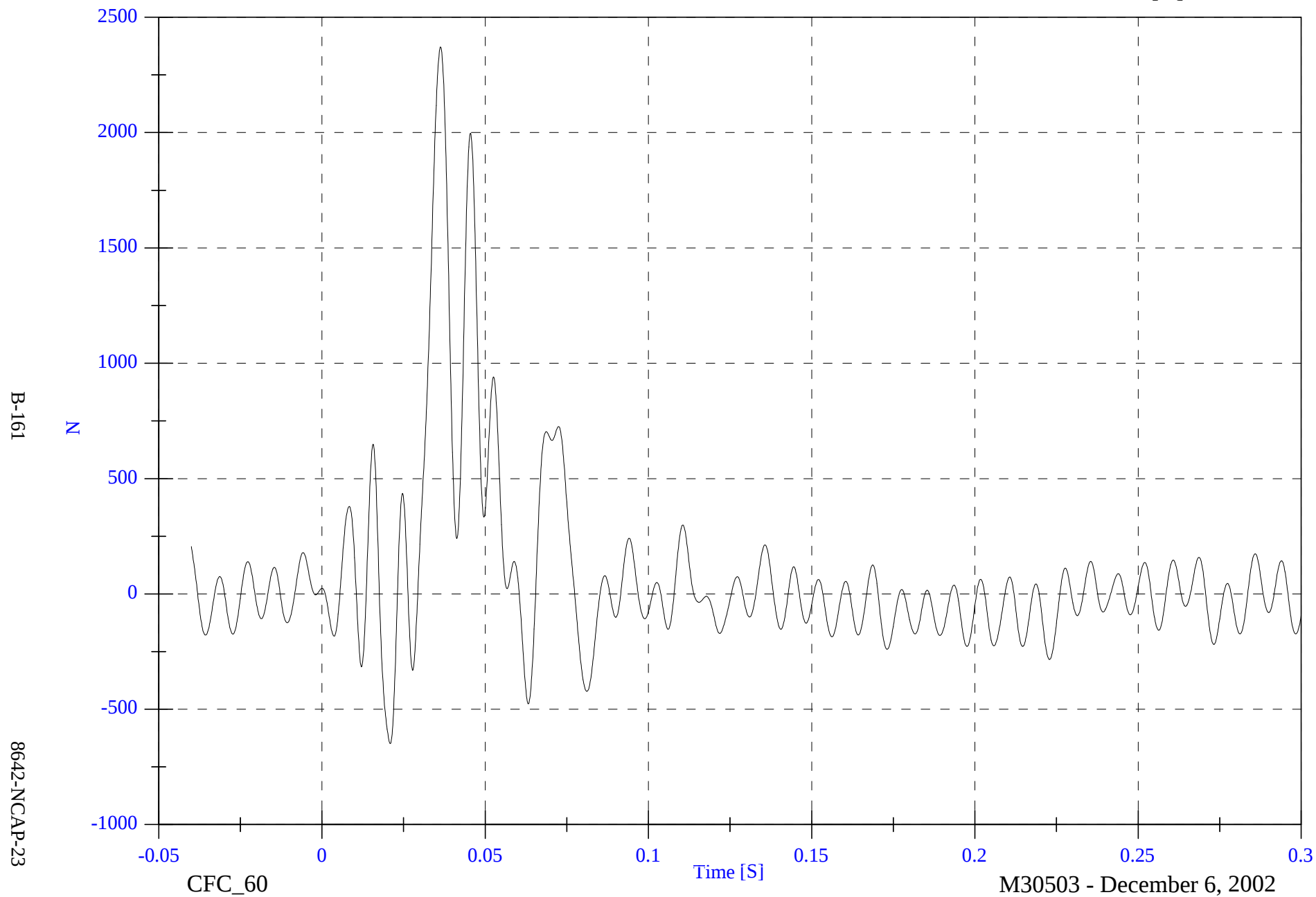


NCAP Test #1- 2003 BMW Z4

B1 LCD4 Fx

Max: 2371.0 [N] at 0.036 [S]

Min: -649.1 [N] at 0.021 [S]

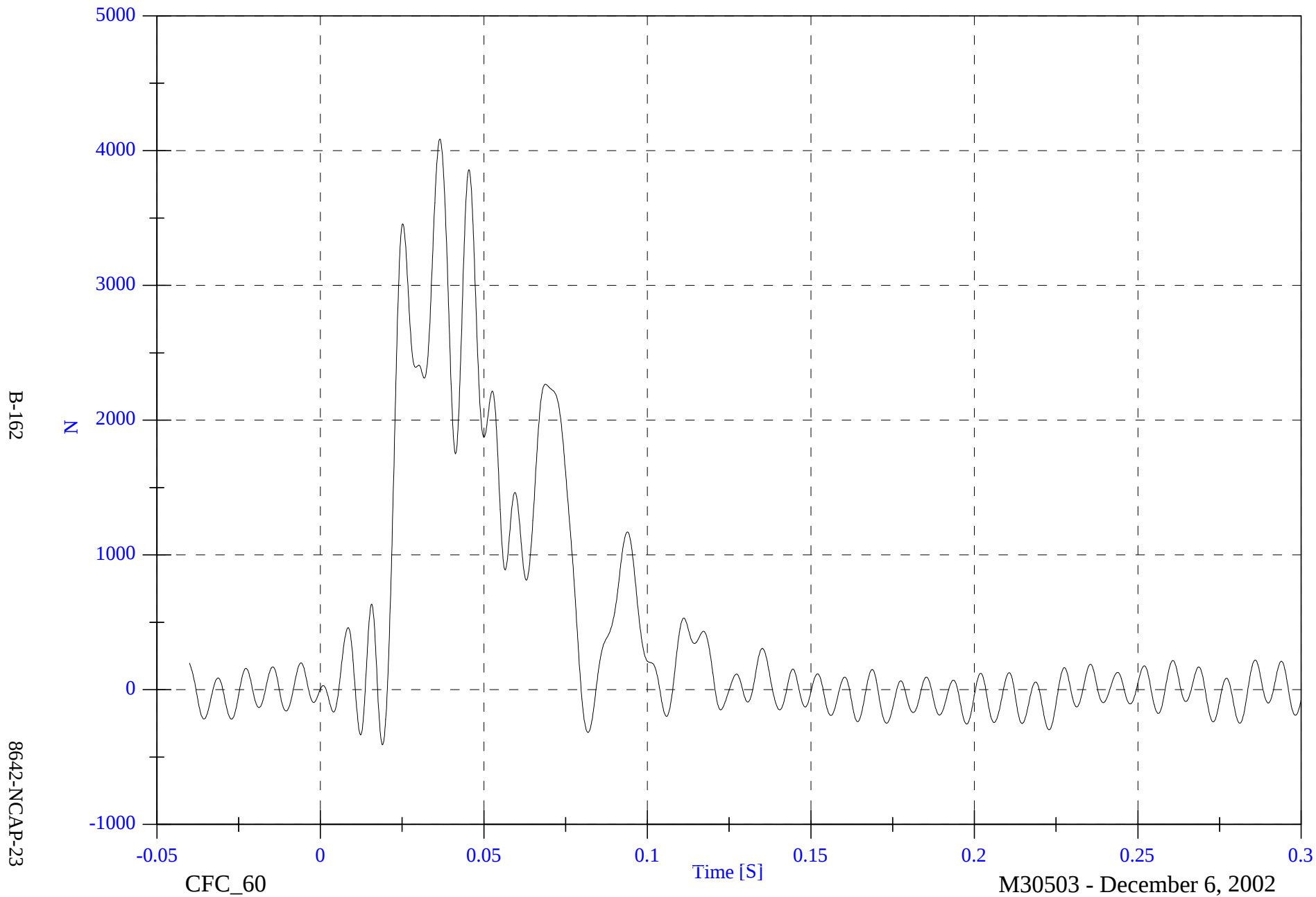


NCAP Test #1- 2003 BMW Z4

B1 LCD5 Fx

Max: 4086.0 [N] at 0.037 [S]

Min: -409.2 [N] at 0.019 [S]



NCAP Test #1- 2003 BMW Z4

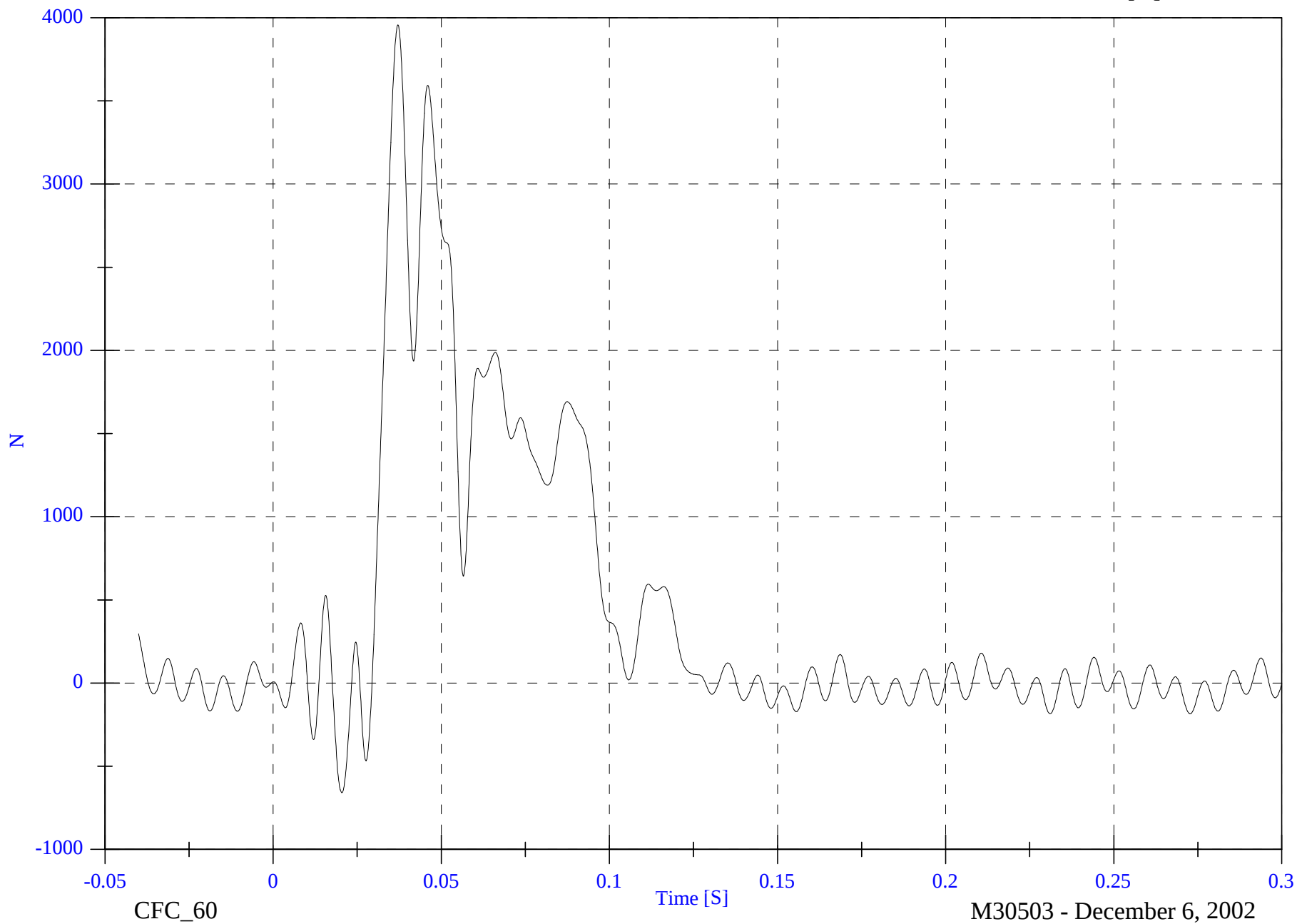
B1 LCD6 Fx

Max: 3957.2 [N] at 0.037 [S]

Min: -659.3 [N] at 0.020 [S]

B-163

8642-NCAP-23

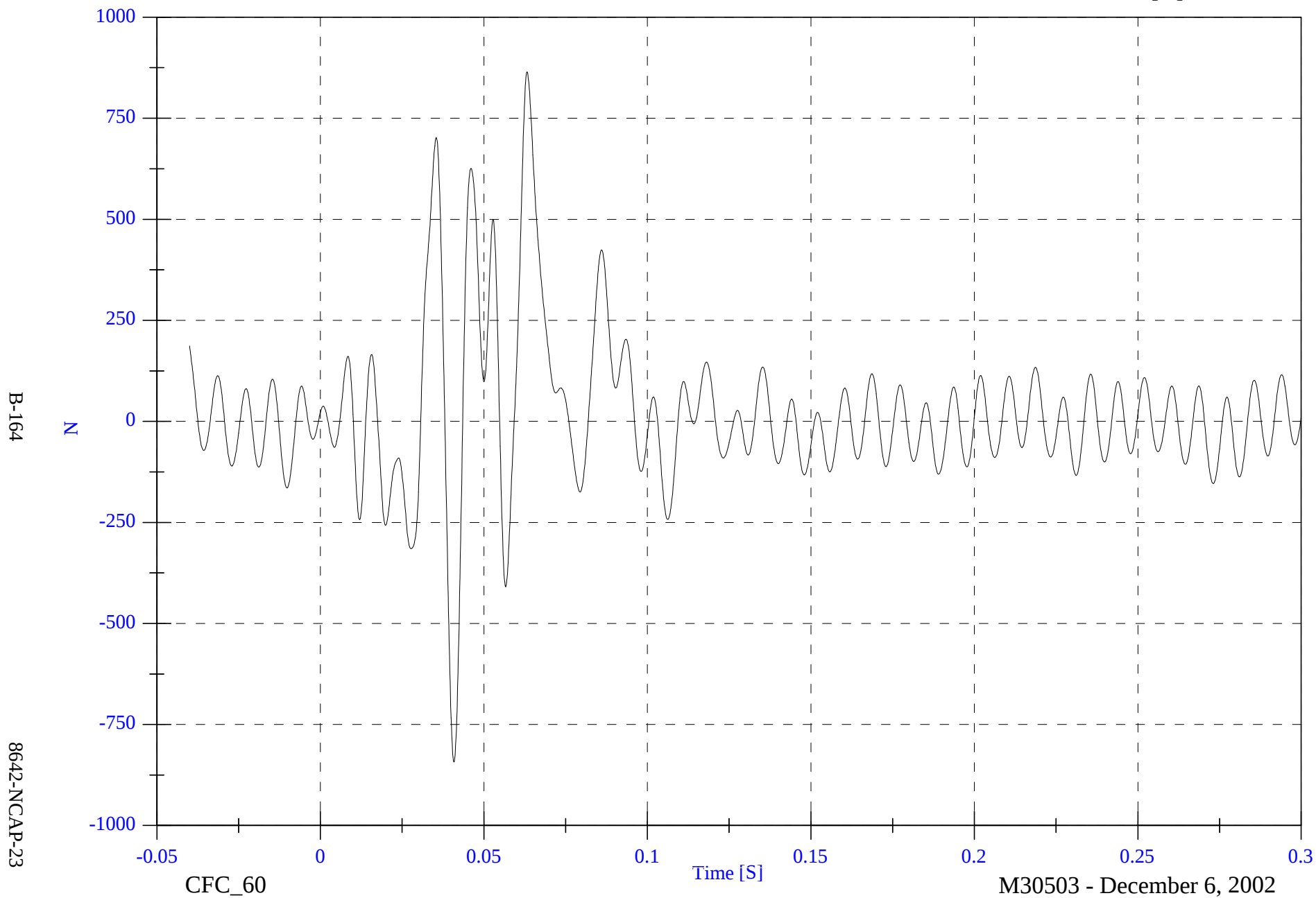


NCAP Test #1- 2003 BMW Z4

B1 LCD7 Fx

Max: 864.9 [N] at 0.063 [S]

Min: -842.7 [N] at 0.041 [S]

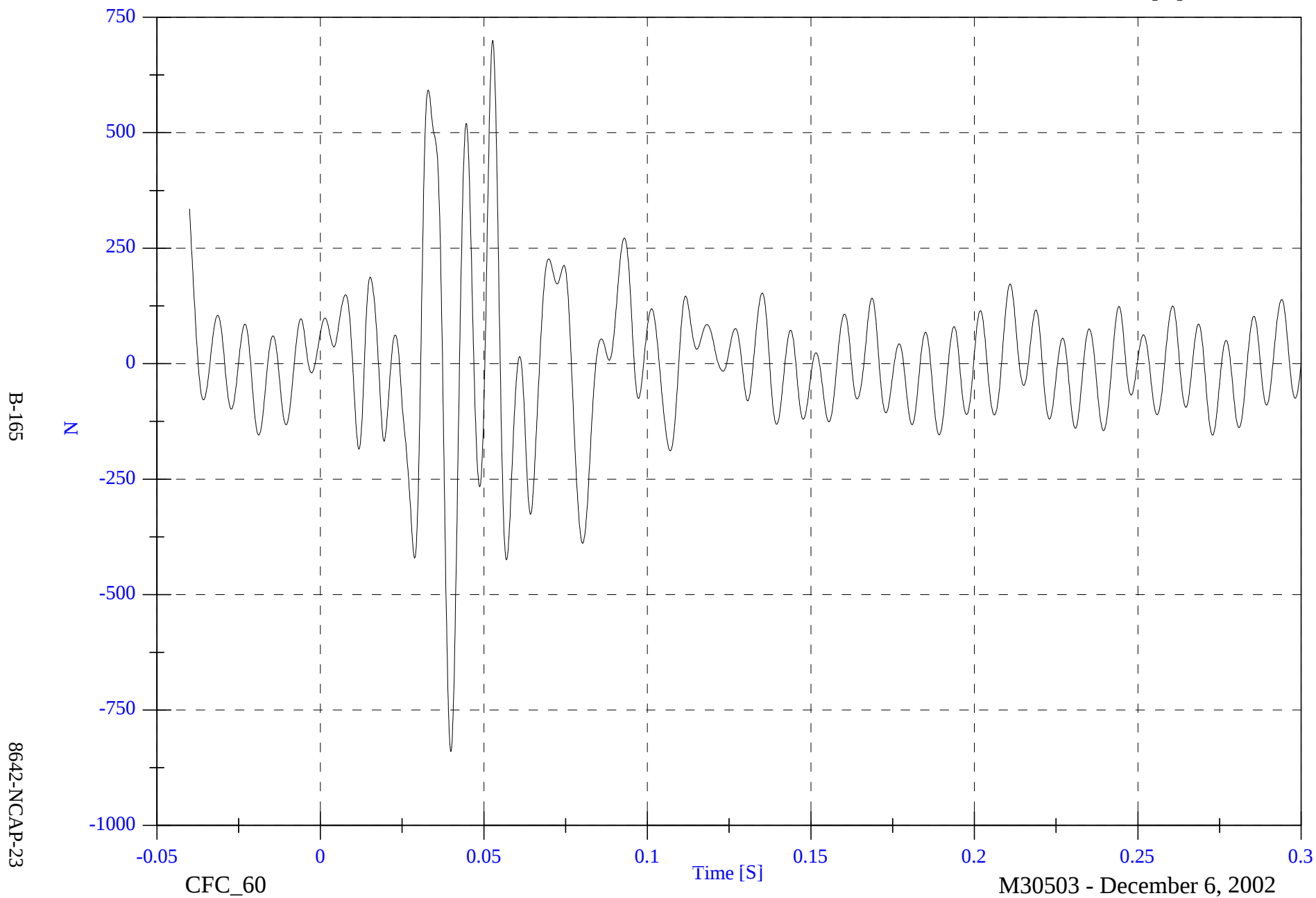


NCAP Test #1- 2003 BMW Z4

Max: 699.7 [N] at 0.053 [S]

Min: -840.0 [N] at 0.040 [S]

B1 LCD8 Fx

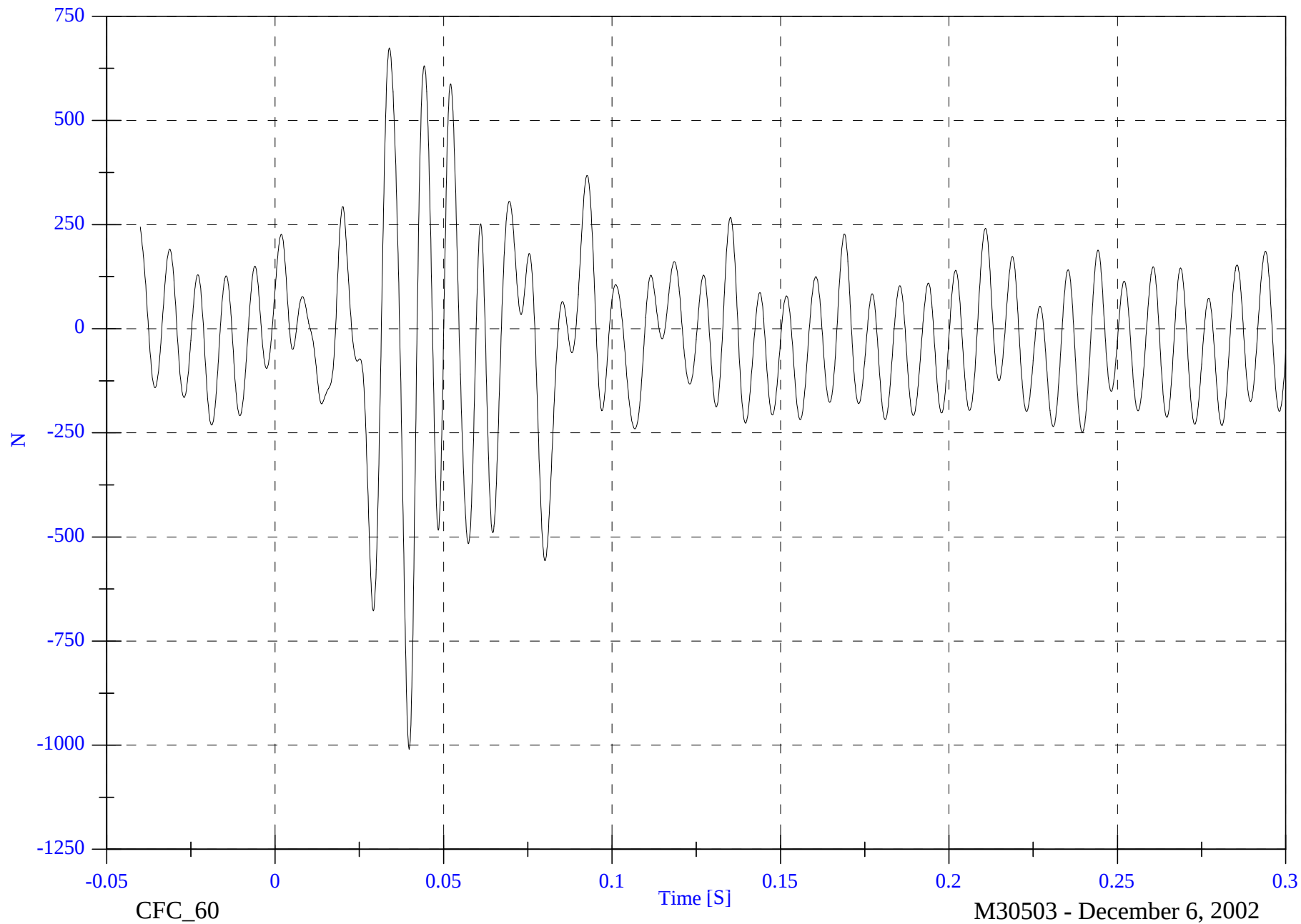


NCAP Test #1- 2003 BMW Z4

B1 LCD9 Fx

Max: 673.9 [N] at 0.034 [S]

Min: -1009.6 [N] at 0.040 [S]



B-166

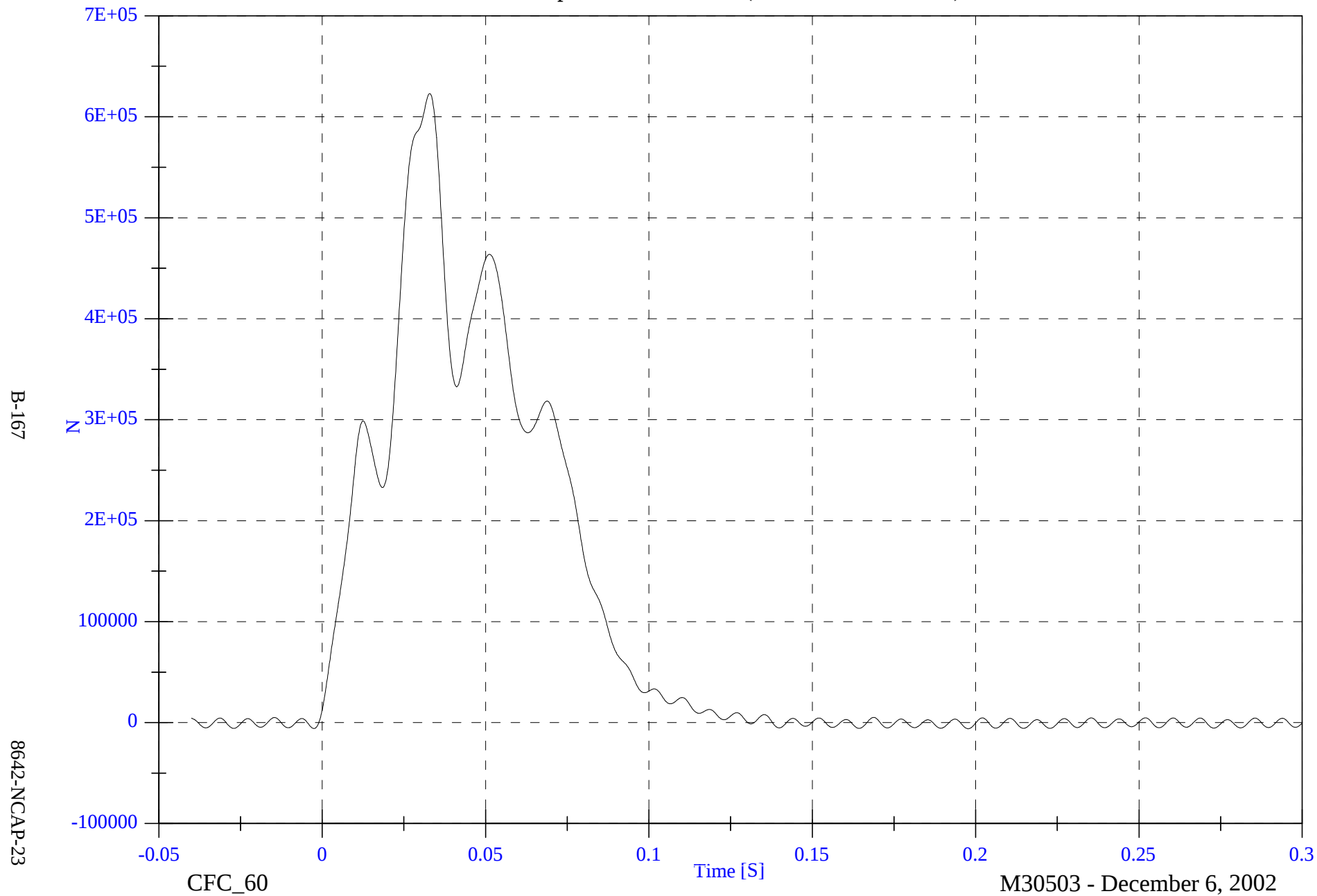
8642-NCAP-23

NCAP Test #1- 2003 BMW Z4

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

Max: 623039.4 [N] at 0.033 [S]

Min: -6358.4 [N] at 0.306 [S]

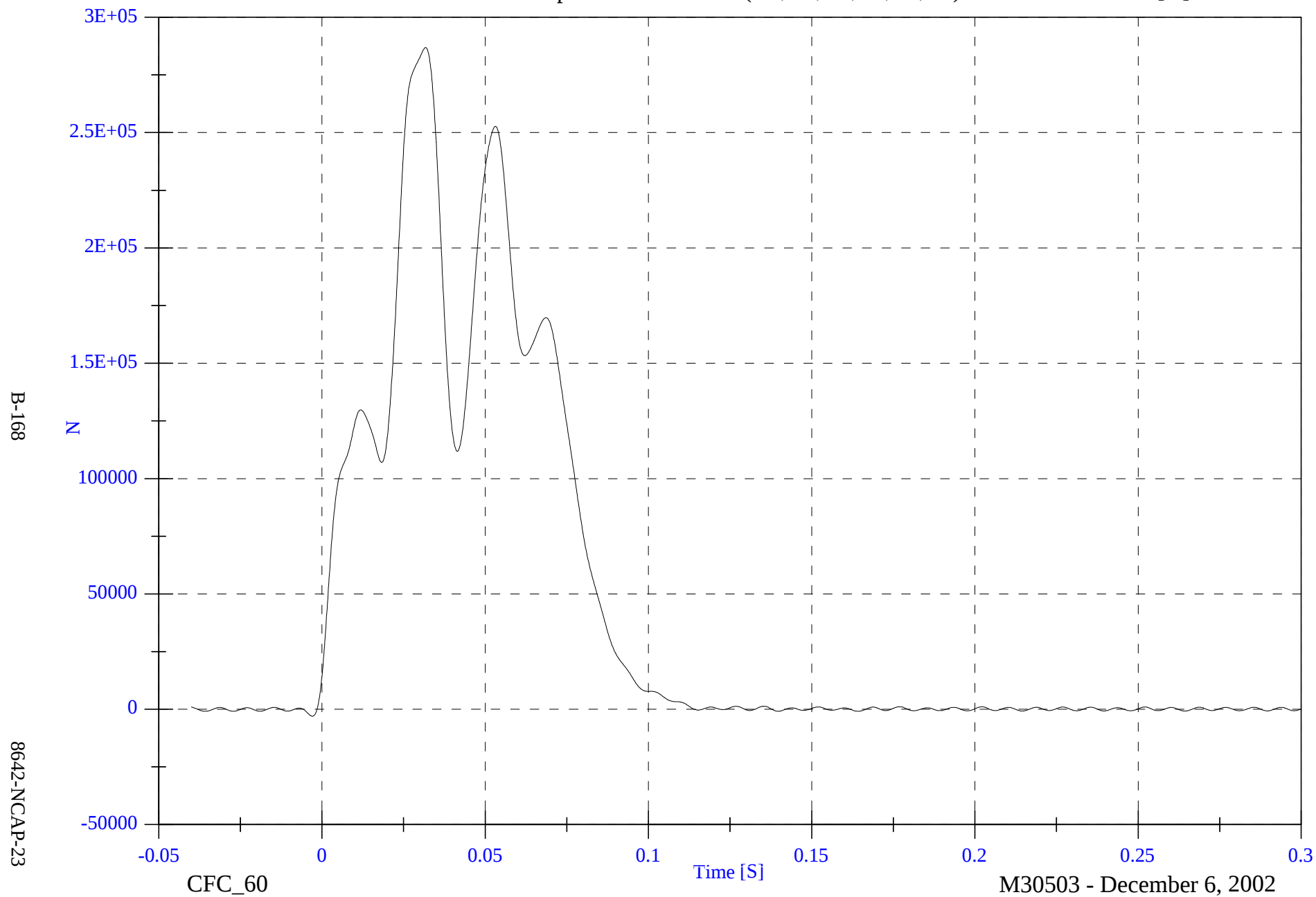


NCAP Test #1- 2003 BMW Z4

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

Max: 286855.6 [N] at 0.032 [S]

Min: -3021.0 [N] at -0.003 [S]

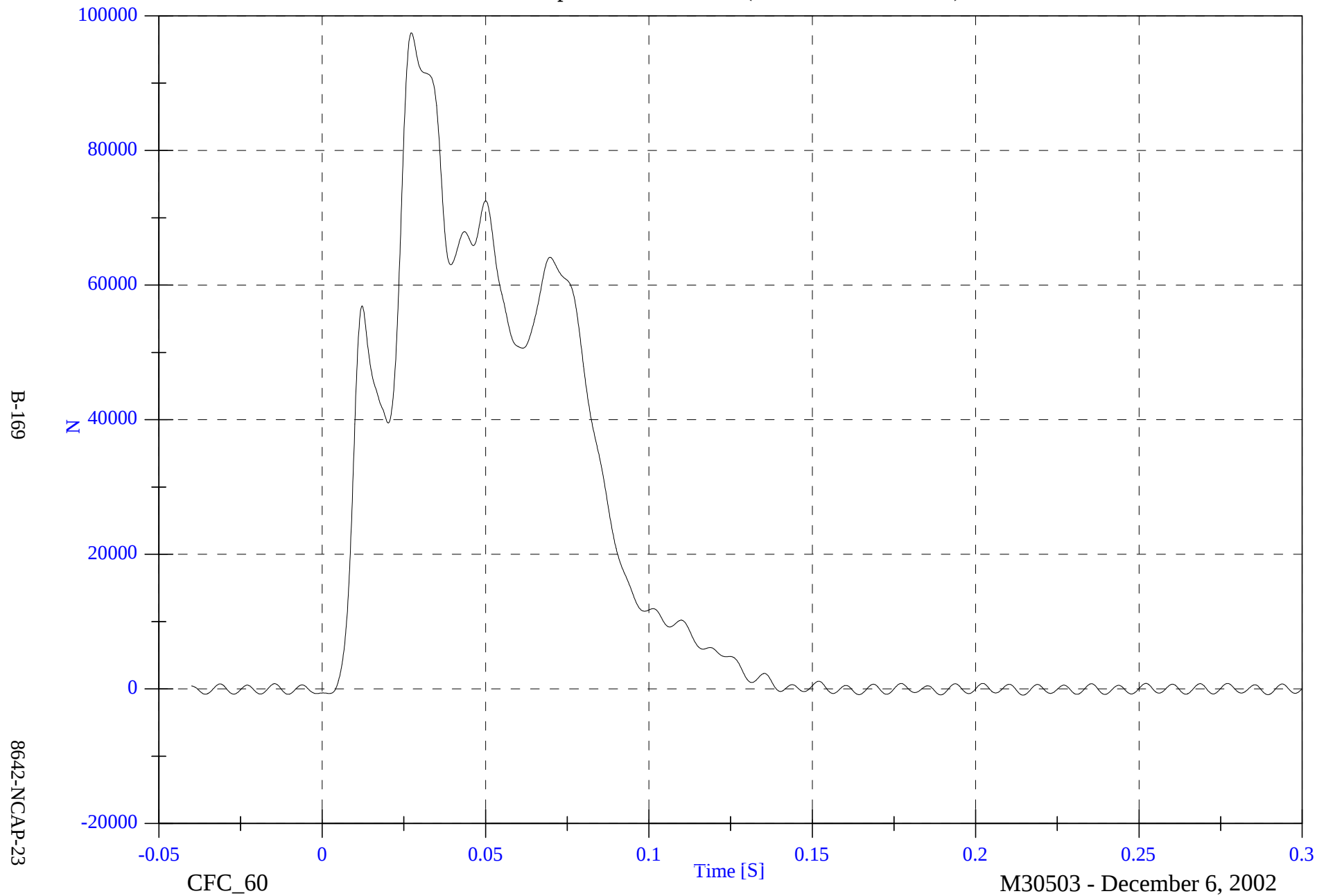


NCAP Test #1- 2003 BMW Z4

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

Max: 97476.3 [N] at 0.027 [S]

Min: -910.6 [N] at 0.214 [S]

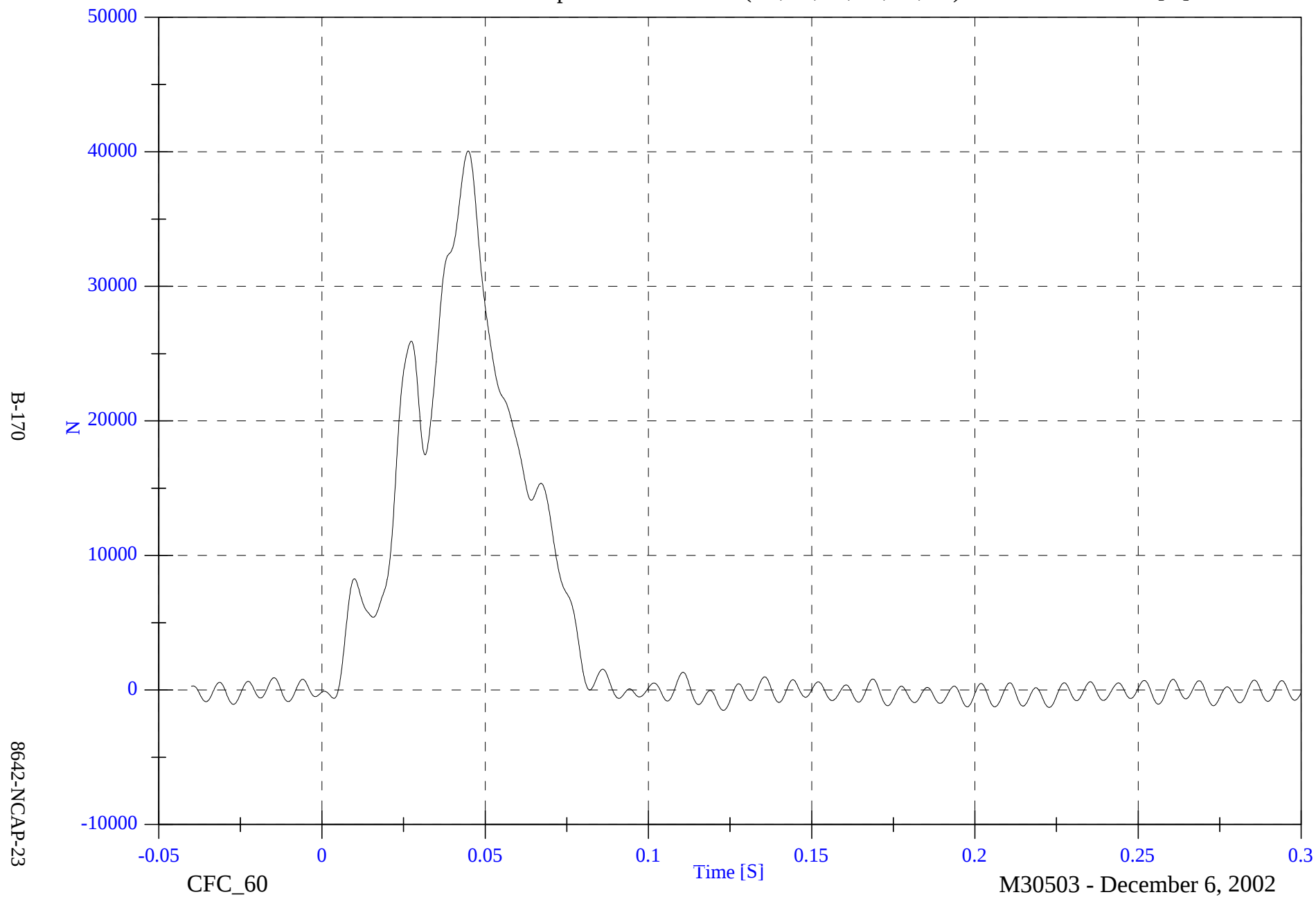


NCAP Test #1- 2003 BMW Z4

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

Max: 40061.3 [N] at 0.045 [S]

Min: -1512.7 [N] at 0.123 [S]

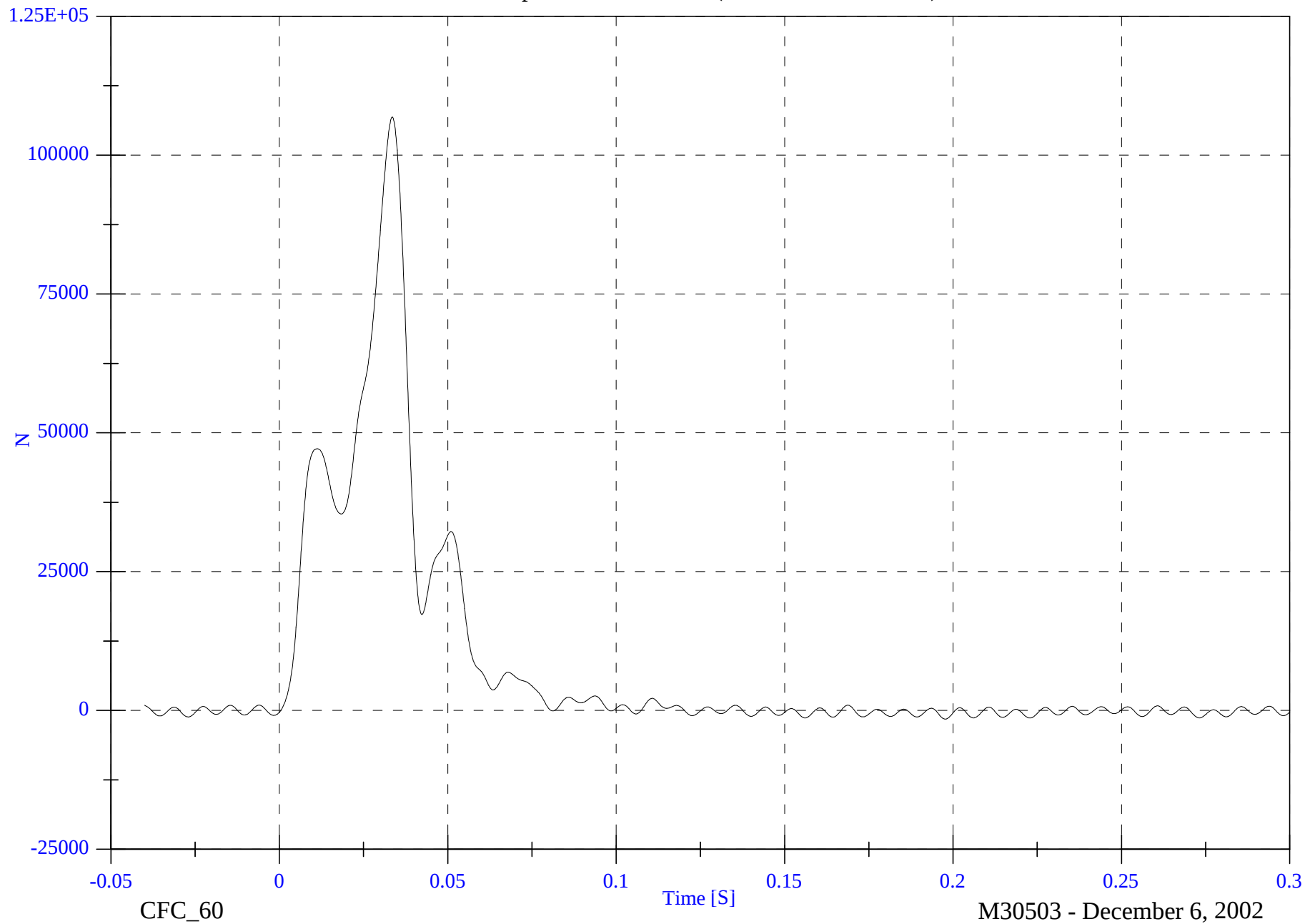


NCAP Test #1- 2003 BMW Z4

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

Max: 106860.6 [N] at 0.033 [S]

Min: -1582.1 [N] at 0.306 [S]



B-171

8642-NCAP-23

CFC_60

Time [S]

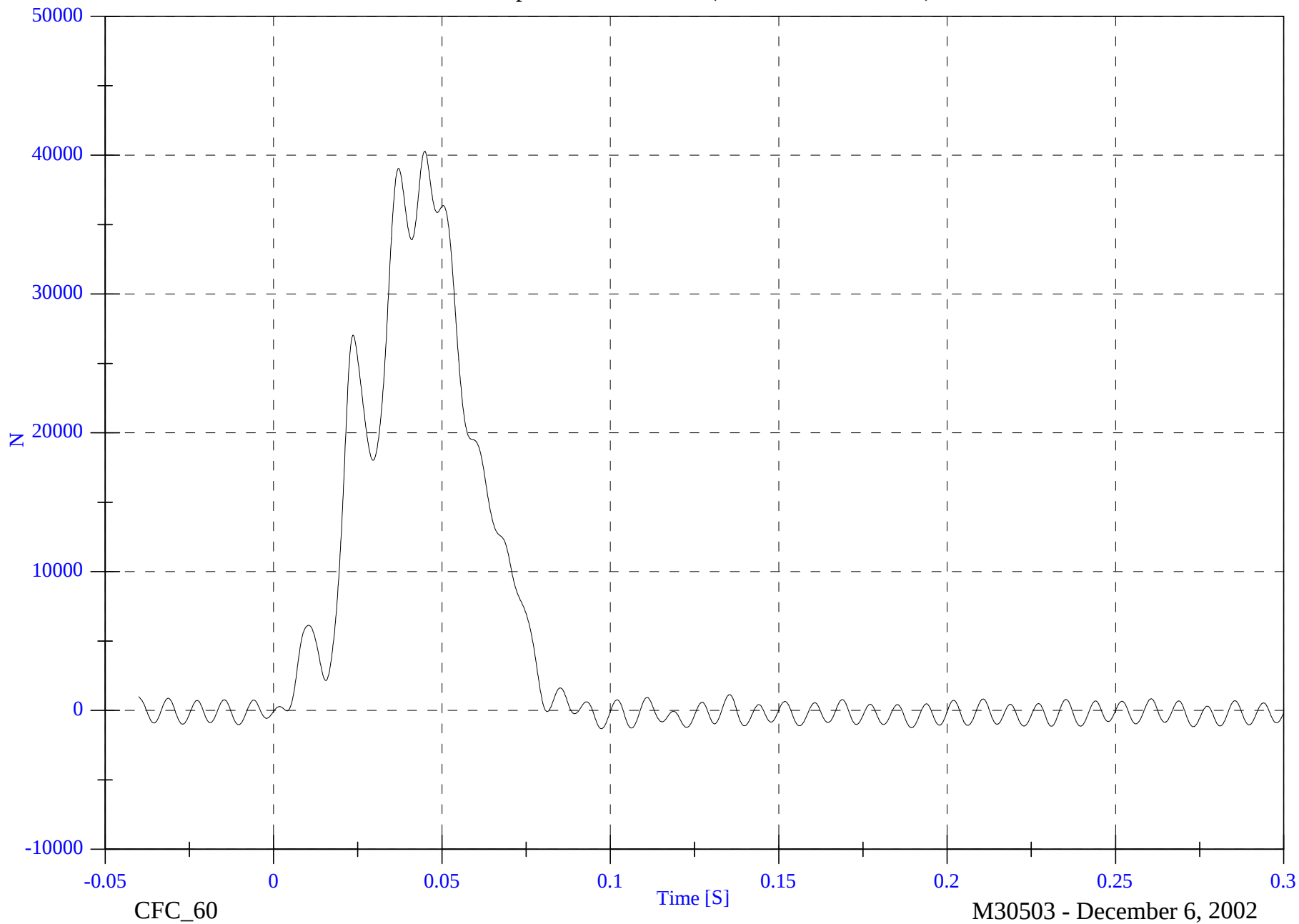
M30503 - December 6, 2002

NCAP Test #1- 2003 BMW Z4

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

Max: 40286.0 [N] at 0.045 [S]

Min: -1314.2 [N] at 0.097 [S]



B-172

8642-NCAP-23

CFC_60

Time [S]

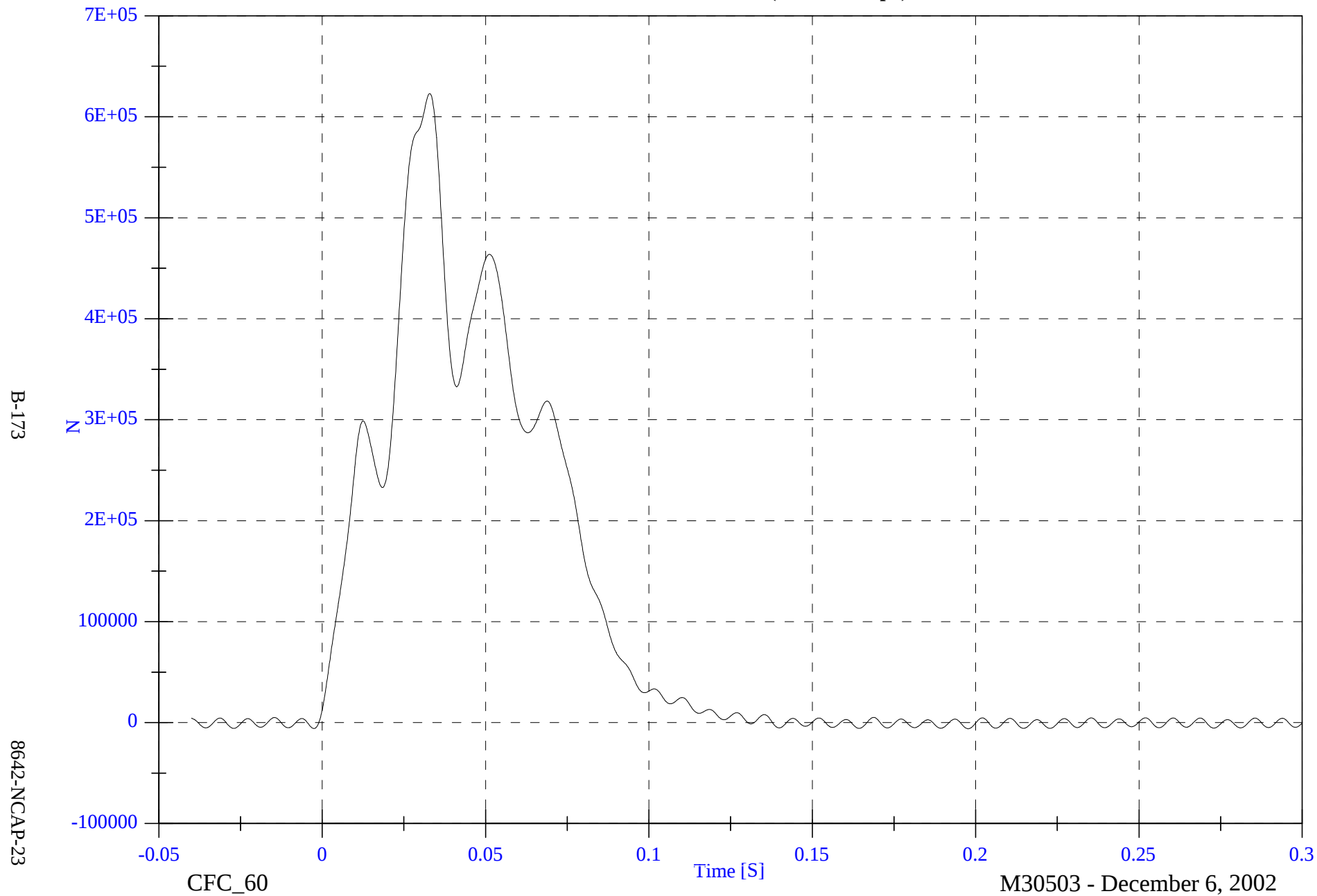
M30503 - December 6, 2002

NCAP Test #1- 2003 BMW Z4

Total Load Cell Sum (All 6 Groups)

Max: 623039.4 [N] at 0.033 [S]

Min: -6358.4 [N] at 0.306 [S]



APPENDIX C

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

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

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

Dummy serial numbers and certification dates are:

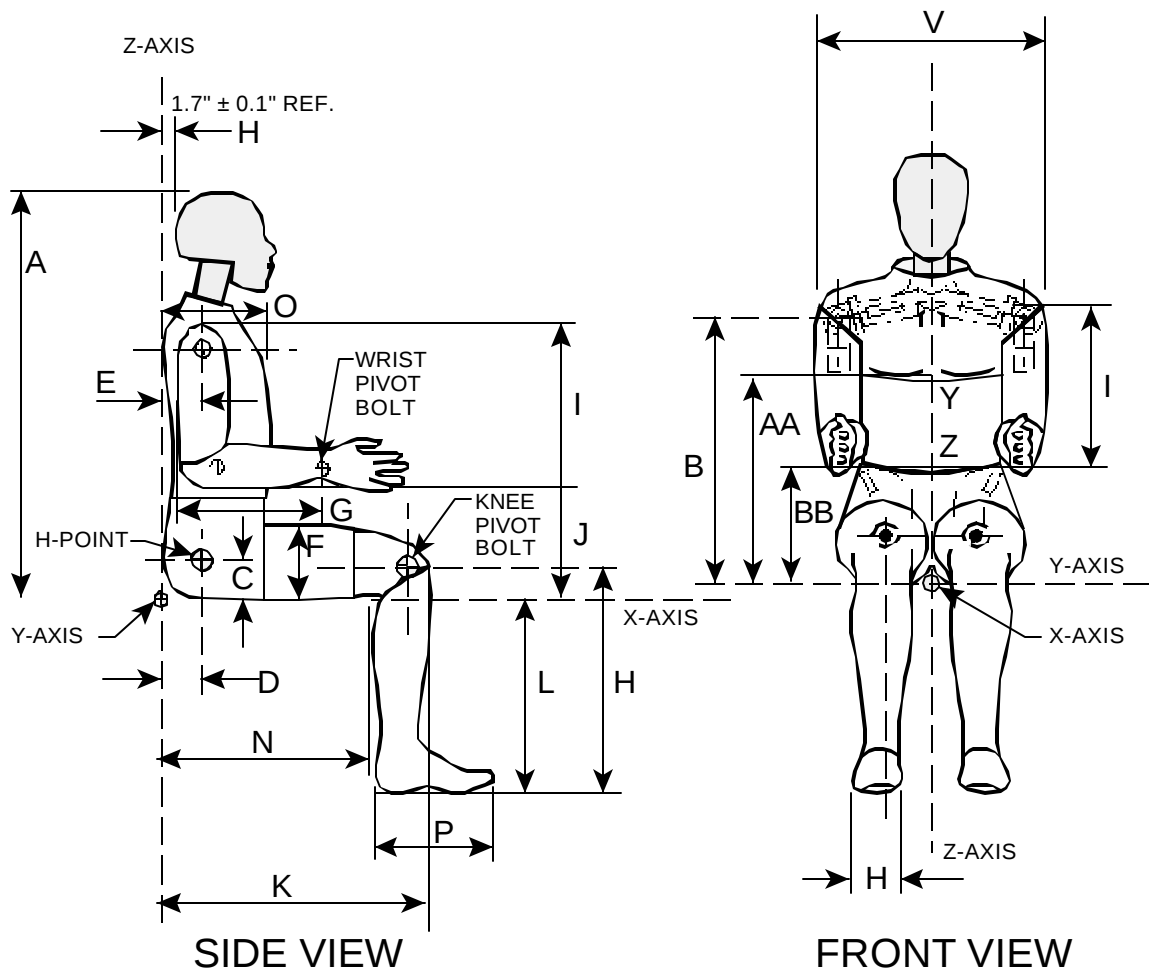
<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	061	December 2, 2002
#2/Right Front Passenger	064	December 2, 2002

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 061
Sequential Test Number 1
Date 11/23/02
Workfile 061H1 11-23-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70.0
Relative Humidity	10% - 70%	31.0
Peak Resultant Acceleration	225-275 G's	249.82
Peak Lateral Acceleration	15 G's Max	1.96
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	061	
Sequential Test Number	6	
Date	11/23/02	6 Axis Neck Transducer
Workfile	061Flx6 11-23-02	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	71.00
Relative Humidity		10% - 70%	31.00
Impact Velocity		22.60 - 23.40 Ft/s	23.07
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.08
	20 ms	17.60 - 22.60 G's	21.40
	30 ms	12.50 - 18.50 G's	18.10
Max Pendulum G's Above 30 ms		29 G's Max	18.10
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.30
D Plane Rotation	Max	64 - 78 Deg	68.67
	Time	57 - 64 ms	58.90
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	69.26
	Time	47 - 58 ms	51.20
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	113.10
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	101.00

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	061	
Sequential Test Number	1	
Date	11/23/02	6 Axis Neck Transducer
Workfile	061Ext1 11-23-02	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	71.00
Relative Humidity		10% - 70%	31.00
Impact Velocity		19.50 - 20.30 Ft/s	19.85
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.17
	20 ms	14.00 - 19.00 G's	16.42
	30 ms	11.00 - 16.00 G's	13.33
Max Pendulum G's Above 30 ms		22 G's Max	13.69
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	41.60
D Plane Rotation	Max	81 - 106 Deg	91.30
	Time	72 - 82 ms	76.40
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-57.50
	Time	65 - 79 ms	70.70
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	151.40
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	137.10

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 061
Sequential Test Number 1
Date December 2, 2002
Workfile 061T 12-2-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	69
Relative Humidity	10% - 70%	43
Pendulum Velocity	21.6 - 22.4 Ft/s	22.34
Maximum Deflection	2.50 - 2.86 in	2.61
Maximum Resistive Force	1160 - 1325 Lbs	1281.43
Internal Hysteresis	69 - 85 %	76.90

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 061
Sequential Test Number 1
Date 11/24/02
Workfile 061LF 11-24-02/061RF 11-24-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	71.0
Relative Humidity	10% - 70%	31.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1166.09
RIGHT KNEE		
Temperature	66 - 78 Deg F	71.0
Relative Humidity	10% - 70%	31.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1177.25

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 061
Sequential Test Number 1
Date 11/24/02

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			71
Relative Humidity			44
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	33.5
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	34.9
Thigh Clearance	F	5.5 - 6.1 in	6.1
Buttock Knee Length	K	22.8 - 23.8 in	23.6
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.7
Knee Pivot Height	M	19.1 - 19.7 in	19.4
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	3.5
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.1
Elbow Rest Height	J	7.5 - 8.3 in	7.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.4
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 064
Sequential Test Number 1
Date 11/23/02
Workfile 064H 11-23-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70.0
Relative Humidity	10% - 70%	31.00
Peak Resultant Acceleration	225-275 G's	261.35
Peak Lateral Acceleration	15 G's Max	4.66
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number	064	
Sequential Test Number	5	
Date	11/23/02	6 Axis Neck Transducer
Workfile	064Flx5 11-23-02	

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	71.00
Relative Humidity		10% - 70%	33.00
Impact Velocity		22.60 - 23.40 Ft/s	23.33
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	25.31
	20 ms	17.60 - 22.60 G's	20.44
	30 ms	12.50 - 18.50 G's	15.79
Max Pendulum G's Above 30 ms		29 G's Max	16.07
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	37.70
D Plane Rotation	Max	64 - 78 Deg	67.05
	Time	57 - 64 ms	60.40
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	76.08
	Time	47 - 58 ms	49.20
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	119.50
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.00

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number	064	
Sequential Test Number	1	
Date	11/23/02	6 Axis Neck Transducer
Workfile	064Ext 11-23-02	

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	19.75
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	17.61
	20 ms	14.00 - 19.00 G's	16.40
	30 ms	11.00 - 16.00 G's	13.39
Max Pendulum G's Above 30 ms		22 G's Max	13.48
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	41.70
D Plane Rotation	Max	81 - 106 Deg	81.62
	Time	72 - 82 ms	76.60
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-58.34
	Time	65 - 79 ms	72.30
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	153.40
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	137.10

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 064
Sequential Test Number 1
Date December 2, 2002
Workfile 064T 12-2-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	69
Relative Humidity	10% - 70%	44
Pendulum Velocity	21.6 - 22.4 Ft/s	22.28
Maximum Deflection	2.50 - 2.86 in	2.52
Maximum Resistive Force	1160 - 1325 Lbs	1320.69
Internal Hysteresis	69 - 85 %	75.05

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 064
Sequential Test Number 1
Date 11/24/02
Workfile 064LF 11-24-02/064RF 11-24-02

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	71.0
Relative Humidity	10% - 70%	31.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1120.80
RIGHT KNEE		
Temperature	66 - 78 Deg F	71.0
Relative Humidity	10% - 70%	31.00
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 - 1300 Lbs	1151.48

Remarks:

Laboratory Technician:

B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 064
Sequential Test Number 1
Date 11/24/02

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			71
Relative Humidity			44
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	33.6
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	23.6
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.3
Knee Pivot Height	M	19.1 - 19.7 in	19.4
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	3.6
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.4
Elbow Rest Height	J	7.5 - 8.3 in	8.0
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.4
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 061)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENTRAN	AC-00L13-F04	21-Aug-02	21-Feb-03
	Y	ENTRAN	AC-01G18-F15	21-Aug-02	21-Feb-03
	Z	ENTRAN	AC-01G18-F14	21-Aug-02	21-Feb-03
Head	X (R)	ENTRAN	AC-01G18-F20	21-Aug-02	21-Feb-03
	Y (R)	ENTRAN	AC-01G18-F05	21-Aug-02	21-Feb-03
	Z (R)	ENDEVCO	AC-J14668	21-Aug-02	21-Feb-03
Neck Load Cell	X	DENTON	LC-205Fx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-205Fy	15-Oct-02	15-Apr-03
	Z	DENTON	LC-205Fz	15-Oct-02	15-Apr-03
Neck Moment	X	DENTON	LC-205Mx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-205My	15-Oct-02	15-Apr-03
	Z	DENTON	LC-205Mz	15-Oct-02	15-Apr-03
Chest	X	ENDEVCO	AC-P21373	20-Aug-02	20-Feb-03
	Y	ENDEVCO	AC-P22639	20-Aug-02	20-Feb-03
	Z	ENDEVCO	AC-P21297	20-Aug-02	20-Feb-03
Chest	X (R)	ENDEVCO	AC-P21171	20-Aug-02	20-Feb-03
	Y (R)	ENDEVCO	AC-P23136	20-Aug-02	20-Feb-03
	Z (R)	ENDEVCO	AC-P23128	20-Aug-02	20-Feb-03
Chest Deflection	X	SERVO	DS-061	23-Sep-02	23-Mar-03
Pelvic	X	ENDEVCO	AC-P21441	20-Aug-02	20-Feb-03
	Y	ENDEVCO	AC-P19246	20-Aug-02	20-Feb-03
	Z	ENDEVCO	AC-P21516	20-Aug-02	20-Feb-03

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(Six Month Calibration Minimum)

DRIVER DUMMY (S/N 061)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	GSE	LC-659	25-Sep-02	25-Mar-03
Right Femur Load Cell	Fz	GSE	LC-723	25-Sep-02	25-Mar-03
Left Upper Tibia	Mx	DENTON	LC-016Mx	25-Oct-02	25-Apr-03
	My	DENTON	LC-016My	25-Oct-02	25-Apr-03
Left Lower Tibia	Fz	DENTON	LC-123Fz	25-Oct-02	25-Apr-03
	Mx	DENTON	LC-123Mx	25-Oct-02	25-Apr-03
	My	DENTON	LC-123My	25-Oct-02	25-Apr-03
Right Upper Tibia	Mx	DENTON	LC-023Mx	25-Oct-02	25-Apr-03
	My	DENTON	LC-023My	25-Oct-02	25-Apr-03
Right Lower Tibia	Fz	DENTON	LC-111Fz	25-Oct-02	25-Apr-03
	Mx	DENTON	LC-111Mx	25-Oct-02	25-Apr-03
	My	DENTON	LC-111My	25-Oct-02	25-Apr-03
Left Foot Rear	X	ENDEVCO	AC-P19343	20-Aug-02	20-Feb-03
	Z	ENDEVCO	AC-P16583	20-Aug-02	20-Feb-03
Left Foot Front	Z	ENDEVCO	AC-P18525	20-Aug-02	20-Feb-03
Right Foot Rear	X	ENDEVCO	AC-P18628	20-Aug-02	20-Feb-03
	Z	ENDEVCO	AC-P18741	20-Aug-02	20-Feb-03
Right Foot Front	Z	ENDEVCO	AC-P23276	20-Aug-02	20-Feb-03
Torso Belt Load Cell		LEBOW	LC-706	12-Nov-02	12-May-03

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 064)		Manufacturer	Serial #	Calibration	
				Last	Next
Head	X	ENDEVCO	AC-J32184	27-Aug-02	27-Feb-03
	Y	ENDEVCO	AC-J32185	27-Aug-02	27-Feb-03
	Z	ENDEVCO	AC-J31011	27-Aug-02	27-Feb-03
Head	X (R)	ENDEVCO	AC-J31020	27-Aug-02	27-Feb-03
	Y (R)	ENDEVCO	AC-J31101	27-Aug-02	27-Feb-03
	Z (R)	ENDEVCO	AC-J31059	27-Aug-02	27-Feb-03
Neck Load Cell	X	DENTON	LC-440Fx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-440Fy	15-Oct-02	15-Apr-03
	Z	DENTON	LC-440Fz	15-Oct-02	15-Apr-03
Neck Moment	X	DENTON	LC-440Mx	15-Oct-02	15-Apr-03
	Y	DENTON	LC-440My	15-Oct-02	15-Apr-03
	Z	DENTON	LC-440Mz	15-Oct-02	15-Apr-03
Chest	X	ENDEVCO	AC-J34019	28-Aug-02	1-Mar-03
	Y	ENDEVCO	AC-J33018	27-Aug-02	27-Feb-03
	Z	ENDEVCO	AC-J32783	28-Aug-02	1-Mar-03
Chest	X (R)	ENDEVCO	AC-J31066	28-Aug-02	1-Mar-03
	Y (R)	ENDEVCO	AC-P16979	27-Aug-02	27-Feb-03
	Z (R)	ENDEVCO	AC-J31022	28-Aug-02	1-Mar-03
Chest Deflection	X	SERVO	DS-064	23-Sep-02	23-Mar-03
Pelvic	X	ENDEVCO	AC-P23174	23-Aug-02	23-Feb-03
	Y	ENDEVCO	AC-P23164	23-Aug-02	23-Feb-03
	Z	ENDEVCO	AC-P23137	23-Aug-02	23-Feb-03

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(Six Month Calibration Minimum)

PASSENGER DUMMY (S/N 064)		Manufacturer	Serial #	Calibration	
				Last	Next
Left Femur Load Cell	Fz	GSE	LC-954	25-Sep-02	25-Mar-03
Right Femur Load Cell	Fz	GSE	LC-955	25-Sep-02	25-Mar-03
Left Upper Tibia	Mx	DENTON	LC-045Mx	24-Oct-02	24-Apr-03
	My	DENTON	LC-045My	24-Oct-02	24-Apr-03
Left Lower Tibia	Fz	DENTON	LC-125Fz	24-Oct-02	24-Apr-03
	Mx	DENTON	LC-125Mx	24-Oct-02	24-Apr-03
	My	DENTON	LC-125My	24-Oct-02	24-Apr-03
Right Upper Tibia	Mx	DENTON	LC-038Mx	24-Oct-02	24-Apr-03
	My	DENTON	LC-038My	24-Oct-02	24-Apr-03
Right Lower Tibia	Fz	DENTON	LC-124Fz	24-Oct-02	24-Apr-03
	Mx	DENTON	LC-124Mx	24-Oct-02	24-Apr-03
	My	DENTON	LC-124My	24-Oct-02	24-Apr-03
Left Foot Rear	X	ENDEVCO	AC-J30491	23-Aug-02	23-Feb-03
	Z	ENDEVCO	AC-J31026	23-Aug-02	23-Feb-03
Left Foot Front	Z	ENDEVCO	AC-J32831	23-Aug-02	23-Feb-03
Right Foot Rear	X	ENDEVCO	AC-J33376	23-Aug-02	23-Feb-03
	Z	ENDEVCO	AC-J32832	23-Aug-02	23-Feb-03
Right Foot Front	Z	ENDEVCO	AC-J31095	23-Aug-02	23-Feb-03
Torso Belt Load Cell		LEBOW	LC-707	12-Nov-02	12-May-03

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(Six Month Calibration Minimum)

	Manufacturer	Serial #	Calibration	
			Last	Next
Left Seat Rear Crossmember X	ICS	AC-8062-003	11-Nov-02	11-May-03
Right Rear Seat Crossmember X	ICS	AC-8084-020	20-Nov-02	20-May-03
Top of Engine	ENDEVCO	AC-P24011	04-Oct-02	04-Apr-03
Bottom of Engine	ENDEVCO	AC-APG46	09-Oct-02	09-Apr-03
Right Disc Brake Caliper	ENDEVCO	AC-J33198	01-Oct-02	01-Apr-03
Instrument Panel	ENDEVCO	AC-P18728	01-Oct-02	01-Apr-03
Left Disc Brake Caliper	ENDEVCO	AC-J31042	16-Aug-02	16-Apr-03
Left Seat Rear Crossmember Z	ICS	AC-8083-028	11-Nov-02	11-May-03
Right Seat Rear Crossmember Z	ICS	AC-6917-012	11-Nov-02	11-May-03