

REPORT NUMBER: 301-CAL-03-05

**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
MODERATE-TO-HIGH SPEED REAR IMPACT TEST**

**PERFORMED IN CONJUNCTION WITH  
SAFETY COMPLIANCE TESTING FOR FMVSS 301R  
FUEL SYSTEM INTEGRITY**

SATURN CORPORATION  
2003 SATURN ION  
4-DOOR SEDAN

NHTSA NUMBER: C30112

VERIDIAN TEST NUMBER: 8655-F301-14R

August 7, 2003

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



FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation  
National Highway Traffic Safety Administration  
Applied Research  
Crashworthiness Research Division  
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16. Abstract This test was performed in conjunction with Compliance Testing for FMVSS 301R, Fuel System Integrity. The purpose of this test is to evaluate the seat and occupant performance in moderate-to-high speed rear impacts. The base FMVSS 301R test was modified as follows: - 2 fully instrumented Hybrid III ATDs were positioned in the front seats (P1 and P2) in place of ballast ATDs. - 2 door mounted high speed cameras were installed. - 4 seatback frame and 2 front sill MHDs were installed. - 4 vehicle accelerometers were installed. - VRTC seatback translation was installed.  The ATDs were positioned following TP208-12 with the following exceptions: - Seatbacks for positions that contained a 50 <sup>th</sup> percentile male were set to 25 degrees ± 1 degree as measured with the SAE J826 manikin. - Seats that contained a 5 <sup>th</sup> percentile female were placed in a fore-aft position that allowed for the best high speed camera occupant view. If the 5 <sup>th</sup> percentile female was located in the P1 occupant position, the arms were positioned following TP208-12 S16.3.3.3 (against the seat cushion instead of on the steering wheel). - Moveable head restraints for seats that contained a 5 <sup>th</sup> percentile female were set full forward and closest to, but not less than, 750 mm as measured from the SAE J826 manikin hip pivot point to the top of the head restraint along the torso line.			
17. Key Words Seatback Rotation and Displacement Test FMVSS 301R Rear Impact Test		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division Room 5108 (NPO-230), 400 Seventh , S.W., Washington, D.C. 20590 Telephone No. (202) 366-4946	
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## SECTION 1

### PURPOSE OF TEST

This moderate-to-high speed rear impact test was performed in conjunction with a Federal Motor Vehicle Safety Standard (FMVSS) 301R 30 mph rear moving barrier impact test of a 2003 Saturn Ion 4-Door Sedan. The purpose of this test is to evaluate the seat and occupant performance in moderate-to-high speed rear impacts.

SECTION 2

SUMMARY OF TEST

A 1431.5 kg 2003 Saturn Ion 4-Door Sedan was impacted from the rear by an 1797 kg moving barrier at a velocity of 48.1 kph (29.9 mph). The test was performed by Veridian Engineering on August 7, 2003.

The test vehicle prepared for the Federal Motor Vehicle Safety Standard (FMVSS) 301R Compliance Test Program conducted for the National Highway Traffic Safety Administration (NHTSA) following the OVSC Laboratory Test Procedure No. TP-301-03, dated February 28, 2003. For the purpose of acquiring information for Applied Research, the test was modified as follows:

- An instrumented 50<sup>th</sup> percentile male Part 572E Hybrid III ATD was positioned in the driver seat (P1) in place of a ballast ATD.
- An instrumented 5<sup>th</sup> percentile female Part 572O Hybrid III ATD was positioned in the right front passenger seat (P2) in place of a ballast ATD.
- 2 high speed cameras were installed on the vehicle front doors.
- 4 front seatback frame MHDs and 2 front sill MHDs were to measure rotation about the Y-axis.
- 4 vehicle accelerometers were installed to measure acceleration along the X-axis.
- The VRTC seatback translation was installed.

The crash event was recorded by ten high-speed cameras and one real-time camera. Camera locations and other pertinent camera information are found on pages 3-13 and 3-14 of this report. Pre- and post-test photographs of the ATDs can be found in Appendix A. Electronic data plots are presented in Appendix B.

The occupant data is summarized below.

	HIC (36ms)	Nij				Head-to-Torso Rotation (deg)		Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
		Ntf	Nte	Ncf	Nce	Flexion	Extension				
<b>P1 ATD</b>	49.7	0.05	0.16	0.04	0.00	13.1	-45.5	16.2	-0.1	-1530.4	-717.3
<b>P2 ATD</b>	115.6	0.12	0.21	0.07	0.03	27.0	-27.6	18.1	-5.6	-154.2	-236.3

The P1 seat back tubular frame bent rearward on both sides at the top of the hinge plates, approximately 150 mm above the seat back pivot point. The seat back adjustment mechanism was damaged during the test. The seat back reclined statically 31.5 degrees from its pre-test position. The P2 seatback frame was deformed rearward and the adjustment mechanism remained operable. The seat back reclined statically 5.1 degrees from its pre-test position.

SECTION 3  
TEST DATA

DATA SHEET 1

TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2003 Saturn Ion 4-Door Sedan  
NHTSA No.: C30112 ; Color: \_\_\_\_\_  
Engine Data: 4 Cylinders; - CID; 2.2 Liters; - cc  
Placement: - Longitudinal or In-Line; X Transverse or Lateral  
Transmission Data: 5 Speeds; X Manual; - Automatic; - Overdrive  
Final Drive: - Rear Wheel Drive; X Front Wheel Drive; - Four Wheel Drive  
Major Options: - A/C; X Power Steering; X Power Brakes  
- Power Windows; - Power Door Locks; X Tilt Wheel  
Date Received: 04/10/03 ; Odometer Reading 187 km  
Selling Dealer: Saturn of Orchard Park  
& Address: 3559 Southwestern Blvd., Orchard Park, NY 14127

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Saturn Corporation  
Date of Manufacture: 01/03  
VIN: 1G8AF52F03Z138200  
GVWR: 1644 kg; GAWR-FRONT: 833 kg; GAWR-REAR: 811 kg

DATA FROM VEHICLE'S TIRE LABEL:

Location of Placard on Vehicle: Glove compartment door  
Recommended Tire Size: P185/70R14 S

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

DATA FROM TIRE SIDEWALL:

Size of Tires on Test Vehicle: P185/70R14 87S Manufacturer: \_\_\_\_\_  
Tire Pressure with Maximum Capacity Vehicle Load: FRONT: 300 kPa; REAR: 300 kPa  
Type of Spare Tire: Temporary T115/70R14

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; X Bucket; - Split Bench  
Number of Occupants: 2 Front; 3 Rear; 5 Total  
Vehicle Capacity Weight (VCW) = 408 kg  
No. of Occupants x 68.04 kg = 340.2 kg  
Rated Cargo/Luggage Weight (RCLW) = 67.8 kg

\*Tire pressure used for test

DATA SHEET 2

VEHICLE DATA

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

Right Front	=	<u>359.5</u>	kg	Right Rear =	<u>247.0</u>	kg
Left Front	=	<u>364.5</u>	kg.	Left Rear =	<u>249.0</u>	kg
TOTAL FRONT	=	<u>724</u>	kg	TOTAL REAR =	<u>496</u>	kg
TOTAL DELIVERED WEIGHT	=	<u>1220</u>	kg			
% of Total Front of Vehicle Weight	=	<u>59.3%</u>		of Total Rear Weight	=	<u>40.7%</u>

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight	=	<u>1220</u>	kg
Rated Cargo/Luggage Weight (RCLW)	=	<u>67.8</u>	kg
Weight of 2 p.572 Dummies, 74.4 kg	=	<u>148.8</u>	kg
TARGET TEST WEIGHT	=	<u>1436.6</u>	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 62.7 KG OF CARGO WEIGHT:

Right Front	=	<u>430.5</u>	kg	Right Rear =	<u>267.5</u>	kg
Left Front	=	<u>449.5</u>	kg	Left Rear =	<u>284.0</u>	kg
TOTAL FRONT	=	<u>880</u>	kg	TOTAL REAR =	<u>551.5</u>	kg
TOTAL TEST WEIGHT	=	<u>1431.5</u>	kg			
% of Total Front of Vehicle Weight	=	<u>61.5%</u>		of Total Rear Weight	=	<u>38.5%</u>

\* Weight of Ballast Secured in Vehicle Trunk Area = 0 kg

Type of Ballast: None

Method of Securing Ballast: -

Vehicle Components Removed for Weight Reduction: Bumper cover, front door glass, rear door trim and glass, engine air intake ducts.

VEHICLE ATTITUDE (all dimension in millimeters):

AS DELIVERED:	RF	<u>715</u>	LF	<u>714</u>	RR	<u>714</u>	LR	<u>711</u>
AS TESTED:	RF	<u>673</u>	LF	<u>663</u>	RR	<u>700</u>	LR	<u>698</u>
Vehicle's Wheel Base:		<u>2622</u>	mm					
Location of Vehicle's C.G.:		<u>1010</u>	millimeters rearward of front wheel center.					

DATA SHEET 2 (continued)

VEHICLE DATA

TYPE OF TEST:

Type of Test: Rear Barrier Impact Angle: 0°  
Test Date: August 7, 2003 Time: 11:58 Temperature: 26.1 °C  
Vehicle NHTSA No.: C30112 VIN: 1G8AF52F03Z138200  
Required Impact Velocity Range: 46.51 to 48.12 kph

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

Trap No. 1 = 48.1 kph; Trap No. 2 = 48.1 kph  
Average Impact Speed = 48.1 kph

VEHICLE STATIC CRUSH:

Vehicle Length:

Pre-Test Left = 4523 ; C/L = 4683 Right = 4525  
Post-Test Left = 4112 ; C/L = 4212 Right = 4198  
Crush Left = 411 ; C/L = 471 Right = 327  
AVERAGE = 403 millimeters

DATA SHEET 3

MOVING BARRIER DATA

WEIGHT OF MOVING BARRIER:

Right Front = 504.9 kg      Right Rear = 393.7 kg.  
Left Front = 499.9 kg      Left Rear = 398.3 kg  
TOTAL FRONT = 1004.8 kg      TOTAL REAR = 792.0 kg  
TOTAL BARRIER WEIGHT = 1796.8 kg

MOVING BARRIER DIMENSIONS:

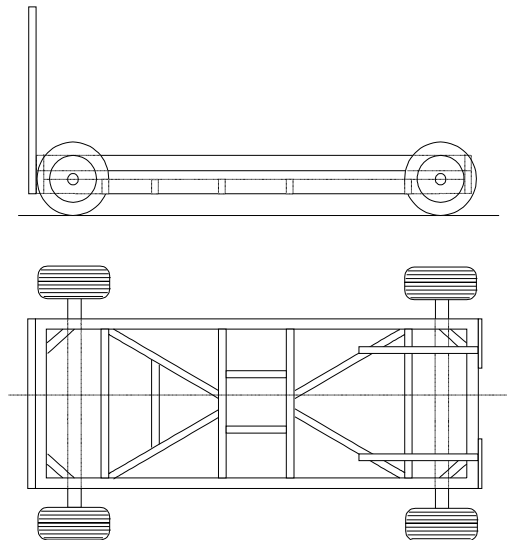
Barrier Face Height: 1524 mm  
Barrier Face Width: 1981 mm  
Barrier Face Ground Clearance: 127 mm  
Tread Width: 1511 mm  
Wheel Base: 3048 mm  
Location of C.G.: X: 1344 mm rearward of front wheel center.  
Y: 0 mm from longitudinal-vertical plane of symmetry.  
Z: 414 mm above ground.

MOVING BARRIER TIRES:

Manufacturer: Classic  
Model: Poly IV  
Size: 215/75D15  
Recommended Max Pressure: 240 kPa:

MOVING BARRIER ABORT SYSTEM:

Type: Trailing cable



DATA SHEET 4

SEAT DATA

PI DATA:

HEAD RESTRAINT	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Vertical Adjustment:	<u>X</u>	<u>-</u>		
Vertical Locks:	<u>X</u>	<u>-</u>	Prevents head restraint from sliding downward.	
Fore-Aft Adjustment:	<u>-</u>	<u>X</u>		
Fore-Aft Locks:	<u>-</u>	<u>X</u>		
SEATBACK RECLINE TYPE	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Power:	<u>-</u>	<u>X</u>		
Lever (with detents):	<u>X</u>	<u>-</u>		
Lever (infinite)	<u>-</u>	<u>X</u>		
Lever (ratchet)	<u>-</u>	<u>X</u>		
Rotary Knob:	<u>-</u>	<u>X</u>		
Pivot locks on Both Sides:	<u>X</u>	<u>-</u>		
LUMBAR ADJUSTMENT	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Adjustable:	<u>-</u>	<u>X</u>	Placed in retracted position for ICBC measurements and test.	
BOLSTER ADJUSTMENT	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Adjustable:	<u>-</u>	<u>X</u>	Placed in full open for ICBC measurements and test.	
SEAT CUSHION TYPE	YES	NO		DETAILS
Cushion moves vertically independently of seat back:	<u>-</u>	<u>X</u>		
SEAT CUSHION FORE-AFT	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Power:	<u>-</u>	<u>X</u>	Travel: <u>-</u> mm	
Manual-Detents:	<u>X</u>	<u>-</u>	First Detent: <u>0</u> Last Detent: <u>26</u>	Travel: <u>260</u> mm
Manual-Infinite:	<u>-</u>	<u>X</u>	Travel: <u>-</u> mm	
SEAT CUSHION VERTICAL	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Power:	<u>-</u>	<u>X</u>		
Manual-Detents	<u>-</u>	<u>X</u>		
Manual-Infinite	<u>-</u>	<u>X</u>		
SEAT TEST POSITION				
Seat Cushion Fore-aft:	<u>Mid-position (detent 13)</u>			
Seat Cushion Vertical:	<u>Fixed</u>			
Seat Back:	<u>25 degree torso angle as set with the H-point machine</u>			
Head Restraint:	<u>Full up</u>			

DATA SHEET 4 (continued)

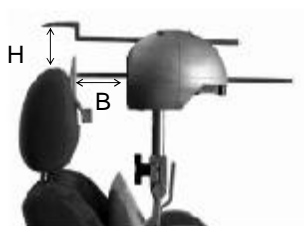
SEAT DATA

P2 DATA:

HEAD RESTRAINT	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Vertical Adjustment:	<u>X</u>	<u>-</u>		
Vertical Locks:	<u>X</u>	<u>-</u>	Prevents head restraint from sliding downward.	
Fore-Aft Adjustment:	<u>-</u>	<u>X</u>		
Fore-Aft Locks:	<u>-</u>	<u>X</u>		
SEATBACK RECLINE TYPE	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Power:	<u>-</u>	<u>X</u>		
Lever (with detents):	<u>X</u>	<u>-</u>		
Lever (infinite):	<u>-</u>	<u>X</u>		
Lever (ratchet):	<u>-</u>	<u>X</u>		
Rotary Knob:	<u>-</u>	<u>X</u>		
Pivot locks on Both Sides:	<u>X</u>	<u>-</u>		
LUMBAR ADJUSTMENT	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Adjustable:	<u>-</u>	<u>X</u>	Placed in retracted position for ICBC measurements and test.	
BOLSTER ADJUSTMENT	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Adjustable:	<u>-</u>	<u>X</u>	Placed in full open for ICBC measurements and test.	
SEAT CUSHION TYPE	YES	NO		DETAILS
Cushion moves vertically independently of seat back:	<u>-</u>	<u>X</u>		
SEAT CUSHION FORE-AFT	YES	NO		DETAILS
Fixed:	<u>-</u>	<u>X</u>		
Power:	<u>-</u>	<u>X</u>	Travel: <u>-</u> mm	
Manual-Detents:	<u>X</u>	<u>-</u>	First Detent: <u>0</u> Last Detent: <u>26</u>	Travel: <u>260</u> mm
Manual-Infinite:	<u>-</u>	<u>X</u>	Travel: <u>-</u> mm	
SEAT CUSHION VERTICAL	YES	NO		DETAILS
Fixed:	<u>X</u>	<u>-</u>		
Power:	<u>-</u>	<u>X</u>		
Manual-Detents:	<u>-</u>	<u>X</u>		
Manual-Infinite:	<u>-</u>	<u>X</u>		
SEAT TEST POSITION				
Seat Cushion Fore-aft:	<u>Mid-position (detent 13)</u>			
Seat Cushion Vertical:	<u>Fixed</u>			
Seat Back:	<u>22.5 degree torso angle as set with the Part 5720 ATD and measured with the H-point machine</u>			
Head Restraint:	<u>Head restraint set at 1 detent up from full down (777 mm from H-point machine pivot to top of head restraint along the torso line)</u>			

DATA SHEET 5

ICBC MEASUREMENTS



P1 DATA:

ICBC MEASUREMENTS

HEAD RESTRAINT POSITION (vertical/fore-aft)	B (mm, backset)	H (mm, height)	Torso Angle (deg)	Height Along Torso Line From Pivot (mm)
Full Up / Fixed:	67	29	24.5	821
Full Down / Fixed:	65	100	24.5	754

HEAD RESTRAINT POSITION – CONFIGURED FOR TEST (vertical/fore-aft)	B (mm, backset)	H (mm, height)	Torso Angle (deg)	Height Along Torso Line From Pivot (mm)
Full Up / Fixed:	67	29	24.5	821

Head restraint positioning details: None

P2 DATA:

ICBC MEASUREMENTS

HEAD RESTRAINT POSITION (vertical/fore-aft)	B (mm, backset)	H (mm, height)	Torso Angle (deg)	Height Along Torso Line From Pivot (mm)
Full Up / Fixed:	61	31	25.0	823
Full Down / Fixed:	59	99	25.0	755

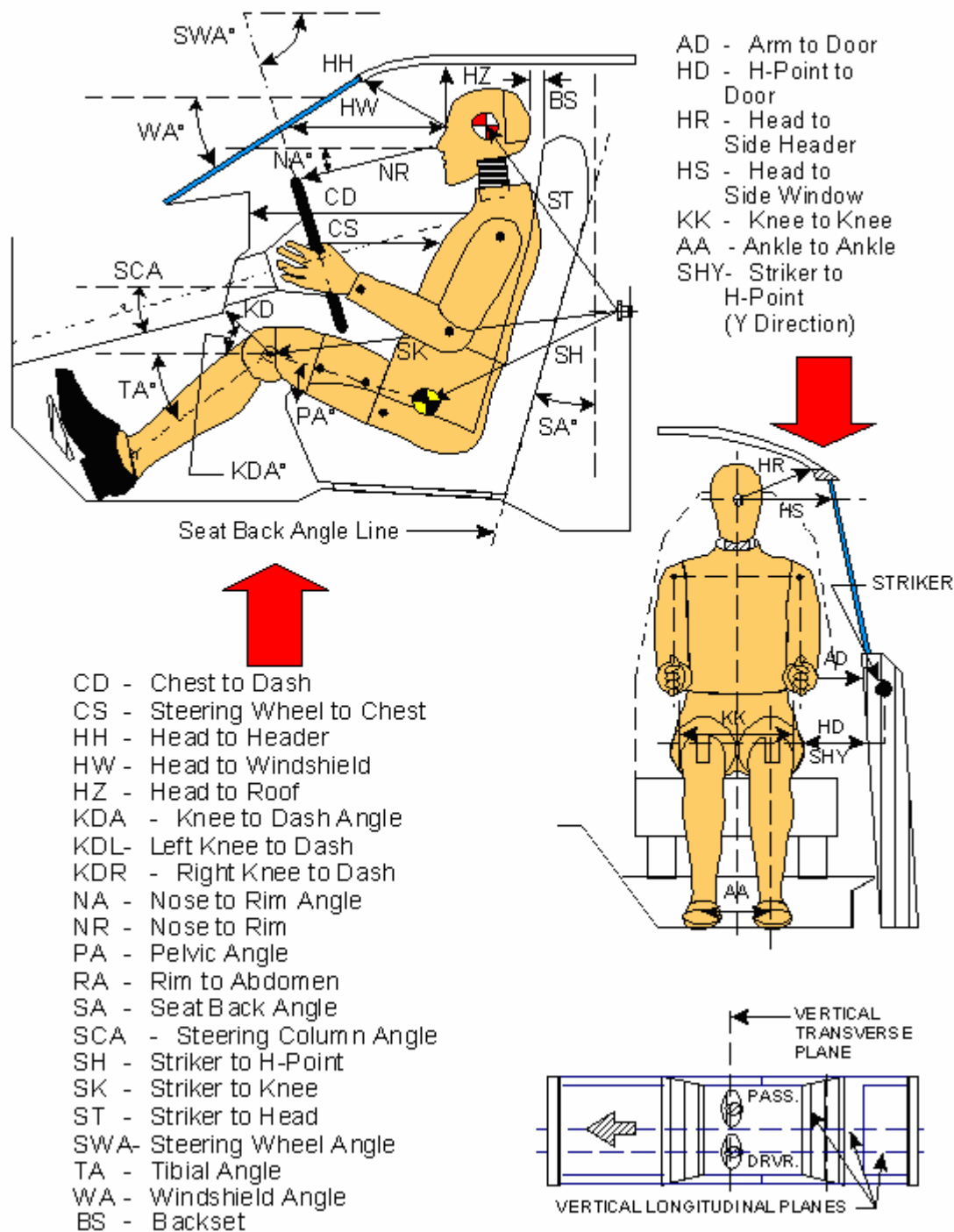
HEAD RESTRAINT POSITION – CONFIGURED FOR TEST (vertical/fore-aft)	B (mm, backset)	H (mm, height)	Torso Angle (deg)	Height Along Torso Line From Pivot (mm)
Full Up / Fixed:	49	72	22.5	777

Head restraint positioning details: Head restraint set at 1 detent up from full down

DATA SHEET 6

DUMMY MEASUREMENTS

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



DATA SHEET 6 (continued)

DUMMY MEASUREMENTS

	DRIVER (Serial #206)			PASS. (Serial #505)		
WA <sup>o</sup>	29.0 deg.			N/A		
SWA <sup>o</sup>	71.4 deg.			N/A		
SCA <sup>o</sup>	18.6 deg.			N/A		
SA <sup>o</sup>	24.5 deg.			22.5 deg.		
HZ	228			306		
HH	396			454		
HW	778			925		
HR	210			278		
NR	399	Angle	11 deg.	N/A		
CD	726			524		
CS	320			N/A		
RA	230			N/A		
KDL	154	Angle (KDA)	44 deg.	224		
KDR	157			216	Angle (KDA)	32 deg.
PA <sup>o</sup>	24.8 deg.			deg.21.4		
TA <sup>o</sup>	37.0 deg.			deg.34.2		
KK	270			165		
AA	265			178		
ST	533	Angle	6 deg.	435	Angle	4 deg.
SK	585	Angle	93 deg.	545	Angle	99 deg.
SH	241	Angle	124 deg.	245	Angle	119 deg.
SHY	226			251		
HS	361			388		
HD	126			152		
AD	109			155		
BS	80			52		

Dimensions in millimeters

DATA SHEET 7

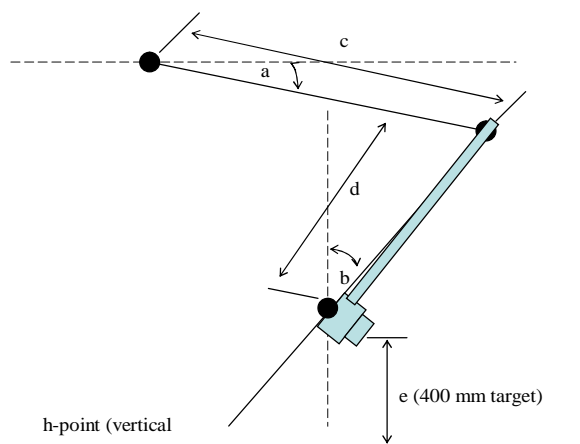
VEHICLE AND SEAT INSTRUMENTATION MEASUREMENTS

VEHICLE INSTRUMENTATION					
LOCATION	TRANSDUCER TYPE	DIRECTION OF MEASURE	PRE-TEST DIMENSIONS (mm) *		
			X	Y	Z
Left Rear Seat Cross Member	Accelerometer	X	1573	655	360
Left Rear Seat Cross Member Redundant	Accelerometer	X	1573	655	360
Right Rear Seat Cross Member Redundant	Accelerometer	X	1573	-655	360
Right Rear Seat Cross Member	Accelerometer	X	1573	-655	360
Left Front Sill	MHD ARS-06	About Y	2543	675	360
Right Front Sill	MHD ARS-01	About Y	2543	-675	360

\* X: From rear bumper, positive forward; Y: From long. centerline, positive right; Z: From ground, positive down.

DATA SHEET 7

VEHICLE AND SEAT INSTRUMENTATION MEASUREMENTS



DIMENSION	P1 LEFT	P1 RIGHT	P2 LEFT	P2 RIGHT
a (deg from horiz.)	2.8	3.0	1.2	1.4
b (deg from vertical)	24.6	24.6	22.8	23.0
c (mm)	659	661	630	632
d (mm)	363	372	366	370
e (mm, target=400)	322	321	330	320

SEATBACK ANGLE	P1		P2	
	PRE (deg)	POST (deg)	PRE (deg)	POST (deg)
Left MDH Bracket †	21.3	50.3	19.0	23.0
Right MHD Bracket †	21.7	54.1	19.4	23.4
Front Sill ‡	-0.9	-1.7	-0.5	-1.6

POST TEST DETAILS
Seatback Deformation: The P1 seat back tubular frame bent rearward on both sides at the top of the hinge plates approximately 150 mm above the seat back pivot point. The P1 seat back adjustment mechanism was damaged during the test. The P2 seat back deformed rearward and the recline mechanism remained operable.
Seat/Floor Attachment Point Deformation: None
Recliner Mechanism Deformation: The P1 seat back adjustment mechanism was not operable following the test. The P1 mechanism appeared to bind up due misalignment caused by the seat back frame deformation.
Comments:
P1 Contacts: Back of head to head restraint and back to seat back
P2 Contacts: Back of head to head restraint and back to seat back

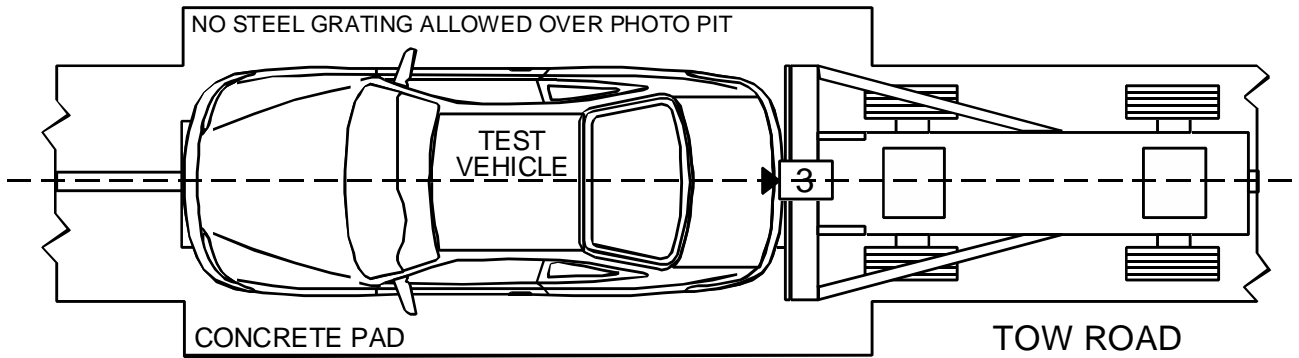
† Reference: From vertical, positive rearward (reclined).  
 ‡ Reference: From horizontal, positive front of sill higher than rear.

DATA SHEET 8

CAMERA POSITIONS FOR REAR IMPACTS

REAL TIME CAMERA → 

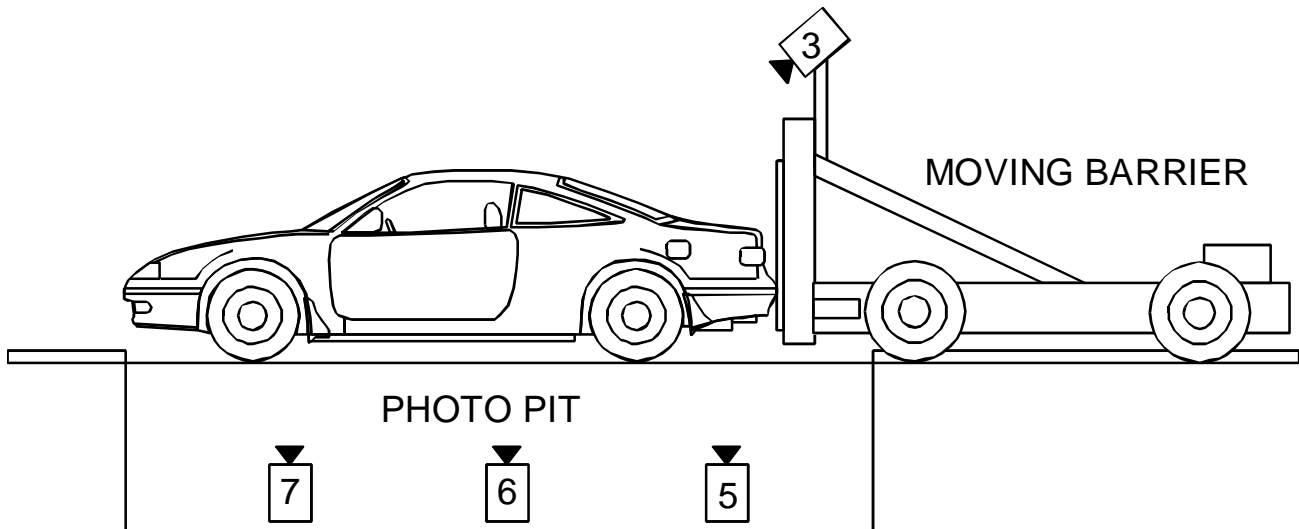
2	4
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▼  

1
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TOP VIEW



LEFT SIDE VIEW

DATA SHEET 8

**CAMERA POSITIONS FOR REAR IMPACTS**

NHTSA No. : C30112

Vehicle : 2003 Saturn Ion 4-Door Sedan

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)*			ANGLE** (degrees)	LENS (mm)	SPEED (fps)
		X	Y	Z			
1	Real-Time Camera	-	-	-	-	-	24
2	Right Side View	15480	1690	1095	-1	35	1000
3	Left Side View	16512	2078	1000	1	35	1000
4	Vehicle Front Underbody View	0	3380	-1956	90	13	995
5	Vehicle Mid-Section Underbody View	0	1938	-1956	90	13	1005
6	Vehicle Rear Underbody View	0	992	-1956	90	13	1030
7	Moving Barrier View	0	0	2515	-105	13	1000
8	Overhead Overall View	-508	0	9804	-90	13	1000
9†	Onboard Driver View	855	2715	970	-6	8	1000
10†	Onboard Passenger View	855	2702	975	-5	8	1000

- \* X = film plant to monorail centerline (+ to left of rail)
- Y = film plane to impact location (+ ahead of impact location)
- Z = film plane to ground (+ above ground)
- \*\* = referenced to horizontal plane

† Research cameras.

Appendix A  
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

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Figure A-1 DRIVER SEAT ICBC VIEW



Figure A-2 PASSENGER SEAT ICBC VIEW



Figure A-3 PRE-TEST DRIVER BACKSET VIEW



Figure A-4 PRE-TEST PASSENGER BACKSET VIEW



Figure A-5 PRE-TEST DRIVER SEAT VIEW



A-8

8655-F301-14R

Figure A-6 POST-TEST DRIVER SEAT VIEW



Figure A-7 PRE-TEST PASSENGER SEAT VIEW

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8655-F301-14R



Figure A-8 POST-TEST PASSENGER SEAT VIEW



Figure A-9 PRE-TEST DRIVER SIDE VIEW



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8655-F301-14R

Figure A-10 POST-TEST DRIVER SIDE VIEW



A-13

8655-F301-14R

Figure A-11 PRE-TEST PASSENGER SIDE VIEW



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8655-F301-14R

Figure A-12 POST-TEST PASSENGER SIDE VIEW



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8655-F301-14R

Figure A-13 PRE-TEST DRIVER ISOMETRICAL VIEW



Figure A-14 POST-TEST DRIVER ISOMETRICAL VIEW



A-17

8655-F301-14R

Figure A-15 PRE-TEST PASSENGER ISOMETRICAL VIEW



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8655-F301-14R

Figure A-16 POST-TEST PASSENGER ISOMETRICAL VIEW



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8655-F301-14R

Figure A-17 POST-TEST P1 SEAT BACK LEFT FRAME



A-20

8655-F301-14R

Figure A-18 POST-TEST P1 SEAT BACK RIGHT FRAME

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

## DATA CHANNEL FILTER CLASS SUMMARY

<b>DATA TYPE</b>	<b>SAE FILTER CLASS (Hz)</b>
Dummy Head Accelerations	1000
Dummy Head Angular Accelerations	1000
Dummy Neck Forces	1000
Dummy Neck Moments	600
Dummy Neck Accelerations	1000
Dummy Chest Accelerations	180
Dummy Chest Displacements	60
Dummy Chest Angular Accelerations	1000
Dummy Femur Forces	600
Dummy Belt Displacements	180
Dummy Belt Loads	60
Seat Angular Accelerations	1000
Vehicle Angular Accelerations	1000
Vehicle Accelerations	60
Vehicle Velocity Integrations	180
Vehicle Displacement Integrations	180
VRTC Seat Device Components	1000

All reported data is in the SAE coordinate system.



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=====
P2 HIC(36 ms): 115.6
  t1: 79.9 msec
  t2: 115.9 msec
  Duration: 36.0 msec
  Average Acceleration: 25.3 g
  Input channels: V2P2 Head Ax (29) CFC_1000
                  V2P2 Head Ay (30) CFC_1000
                  V2P2 Head Az (31) CFC_1000

P2 UP NECK Fx: Max:  110.8 N 74.0 msec
               Min: -179.3 N 211.5 msec
  Input channel: V2P2 Upper Neck Fx (32) CFC_1000

P2 UP NECK Fz: Max:  585.4 N 89.5 msec
               Min:  -10.1 N 445.0 msec
  Input channel: V2P2 Upper Neck Fz (34) CFC_1000

P2 UP NECK Mocy (5th Female)
  Max:  11.1 N-m 243.6 msec
  Min:  -7.6 N-m 124.1 msec
  Input channels: V2P2 Upper Neck Fx (32) CFC_600
                  V2P2 Upper Neck My (36) CFC_600
  Docy: 0.01778

P2 UP NECK Nij (5th Female)
  Ntf: 0.12 Nij 74.4 msec  CVt: 4287; CVf: 155
  Nte: 0.21 Nij 86.6 msec  CVt: 4287; CVe: 67
  Ncf: 0.07 Nij 279.1 msec CVc: 3880; CVf: 155
  Nce: 0.03 Nij 434.9 msec CVc: 3880; CVe: 67
  Input channels: V2P2 Upper Neck Fz (34) CFC_600
                  V2P2 Upper Neck Mocy [N-m, CFC_600] (87)

P2 CLIP(3 ms): 18.1 g
  t1: 68.3 msec
  t2: 71.3 msec
  Duration: 3.0 msec
P2 CSI: 58.5
  Input channels: V2P2 Chest Ax (44) CFC_180
                  V2P2 Chest Ay (45) CFC_180
                  V2P2 Chest Az (46) CFC_180

P2 CHEST DISP: Max:  2.7 mm 78.5 msec
               Min:  -5.6 mm 218.1 msec
  Input channel: V2P2 Chest Displacement (52) CFC_600

P2 LEFT FEMUR: Max:  237.5 N 212.6 msec
               Min: -145.2 N  53.4 msec
  Input channel: V2P2 Left Femur (50) CFC_600

P2 RIGHT FEMUR: Max:  205.8 N 201.3 msec
                 Min: -236.3 N 156.2 msec
  Input channel: V2P2 Right Femur (51) CFC_600
=====

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NAME	Unit	Max	msec	Min	msec	Comment
V2P1 Head Ax	g	16.8	139.6	-3.3	301.8	
V2P1 Head Ay	g	0.7	385.9	-1.9	117.6	
V2P1 Head Az	g	12.6	123.6	-1.3	450.1	
V2P1 Head A Resultant	g	19.8	138.2	0.0	-44.8	
V2P1 Head Comp AVy	deg/s	1242.5	94.1	-869.1	251.8	f2=0.287 Hz; f4=0.001 Hz
V2P1 Head Comp ADy	deg	77.2	146.7	-21.9	434.9	f2=0.287 Hz; f4=0.001 Hz
V2P1 Upper Neck Fx	N	144.8	137.2	-132.7	297.3	
V2P1 Upper Neck Fy	N	33.3	385.7	-66.6	139.4	
V2P1 Upper Neck Fz	N	496.7	111.4	-59.0	451.7	
V2P1 Upper Neck F Resultant	N	507.6	112.2	0.1	-96.8	
V2P1 Upper Neck Mx	N-m	2.3	91.9	-2.1	103.6	
V2P1 Upper Neck My	N-m	9.3	290.2	-12.0	101.6	
V2P1 Upper Neck Mz	N-m	1.1	372.2	-2.2	189.9	
V2P1 Upper Neck M Resultant	N-m	12.2	101.6	0.0	-62.3	
V2P1 Lower Neck Fx	N	583.2	132.8	-109.9	298.8	
V2P1 Lower Neck Fy	N	57.5	73.2	-135.6	117.5	
V2P1 Lower Neck Fz	N	420.9	84.2	-68.6	451.8	
V2P1 Lower Neck F Resultant	N	658.1	111.9	0.2	-40.0	
V2P1 Lower Neck Mx	N-m	7.1	386.5	-15.0	128.9	
V2P1 Lower Neck My	N-m	30.8	296.0	-86.1	128.1	
V2P1 Lower Neck Mz	N-m	3.6	77.3	-5.3	119.2	
V2P1 Lower Neck M Resultant	N-m	87.5	128.1	0.0	-39.6	
V2P1 Lower Neck Ax	g	14.2	81.5	-2.0	391.3	
V2P1 Chest Ax	g	15.5	83.2	-1.7	461.5	
V2P1 Chest Ay	g	0.9	174.3	-1.4	87.0	
V2P1 Chest Az	g	6.1	76.8	-1.8	451.1	
V2P1 Chest A Resultant	g	16.4	82.8	0.0	-64.1	
V2P1 Chest Dx	mm	2.2	94.5	-0.1	19.6	
V2P1 Chest Comp AVy	deg/s	577.9	107.1	-275.5	197.1	f2=0.296 Hz; f4=0.001 Hz
V2P1 Chest Comp ADy	deg	32.5	156.1	-11.0	478.5	f2=0.296 Hz; f4=0.001 Hz
V2P1 Pelvic Ax	g	19.8	81.9	-4.4	126.0	
V2P1 Pelvic Ay	g	2.4	169.5	-2.1	105.2	
V2P1 Pelvic Az	g	9.9	81.6	-2.3	111.7	
V2P1 Pelvic A Resultant	g	22.0	81.9	0.0	-30.1	
V2P1 Left Femur Fz	N	27.8	457.1	-1530.4	122.0	
V2P1 Right Femur Fz	N	162.6	114.5	-717.3	153.5	
V2P1 Head to Chest Comp ADy	deg	13.1	301.0	-45.5	142.2	
V2P1 Lap Belt F	N	127.4	140.8	-55.8	59.4	
V2P2 Head Ax	g	27.5	99.0	-5.7	264.1	
V2P2 Head Ay	g	2.4	118.8	-3.3	88.4	
V2P2 Head Az	g	11.1	85.2	-0.3	445.2	
V2P2 Head A Resultant	g	28.9	89.1	0.0	-33.4	
V2P2 Head Comp AVy	deg/s	953.1	78.5	-808.9	162.5	f2=0.292 Hz; f4=0.001 Hz
V2P2 Head Comp ADy	deg	34.4	101.0	-43.9	272.0	f2=0.292 Hz; f4=0.001 Hz
V2P2 Upper Neck Fx	N	110.8	74.0	-179.3	211.5	
V2P2 Upper Neck Fy	N	62.2	259.3	-45.5	91.7	
V2P2 Upper Neck Fz	N	585.4	89.5	-10.1	445.0	

NAME	Unit	Max	msec	Min	msec	Comment
V2P2 Upper Neck F Resultant	N	589.0	89.4	0.1	-12.9	
V2P2 Upper Neck Mx	N-m	3.7	270.3	-2.0	117.7	
V2P2 Upper Neck My	N-m	8.4	243.6	-8.8	122.4	
V2P2 Upper Neck Mz	N-m	2.1	113.8	-1.0	58.7	
V2P2 Upper Neck M Resultant	N-m	9.1	122.3	0.0	-51.0	
V2P2 Lower Neck Fx	N	271.4	96.3	-167.2	231.6	
V2P2 Lower Neck Fy	N	72.4	259.3	-49.6	89.4	
V2P2 Lower Neck Fz	N	529.5	90.1	-102.1	268.1	
V2P2 Lower Neck F Resultant	N	579.1	93.4	0.2	-53.7	
V2P2 Lower Neck Mx	N-m	12.9	259.5	-5.3	89.4	
V2P2 Lower Neck My	N-m	37.3	262.9	-65.4	90.6	
V2P2 Lower Neck Mz	N-m	3.8	108.3	-6.0	76.5	
V2P2 Lower Neck M Resultant	N-m	65.7	90.5	0.0	-44.7	
V2P2 Lower Neck Ax	g	19.0	87.4	-5.4	207.6	
V2P2 Chest Ax	g	18.2	69.9	-4.9	208.2	
V2P2 Chest Ay	g	1.8	105.8	-1.0	67.5	
V2P2 Chest Az	g	3.9	56.9	-1.6	262.0	
V2P2 Chest A Resultant	g	18.5	69.8	0.0	-68.4	
V2P2 Chest Dx	mm	2.7	78.5	-5.6	218.1	
V2P2 Chest Comp AVy	deg/s	239.9	86.8	-223.9	133.4	f2=0.298 Hz; f4=0.001 Hz
V2P2 Chest Comp ADy	deg	11.7	488.6	-17.2	263.3	f2=0.298 Hz; f4=0.001 Hz
V2P2 Pelvic Ax	g	20.5	77.2	-5.7	198.5	
V2P2 Pelvic Ay	g	2.0	182.3	-1.3	210.9	
V2P2 Pelvic Az	g	9.9	81.5	-49.3	-84.4	Data is invalid
V2P2 Pelvic A Resultant	g	49.3	-84.4	0.0	-18.3	
V2P2 Left Femur Fz	N	237.5	212.6	-145.2	53.4	
V2P2 Right Femur Fz	N	205.8	201.3	-236.3	156.2	
V2P2 Head to Chest Comp ADy	deg	27.0	278.1	-27.6	95.6	
V2P2 Lap Belt F	N	457.8	203.3	-111.3	28.7	
V2 Left X Member Ax	g	16.4	48.1	-1.4	163.5	
V2 Left X Member Red Ax	g	16.0	48.0	-2.5	25.5	
V2 Right X Member Ax	g	12.9	48.4	-1.2	163.3	
V2 Right X Member Red Ax	g	12.9	42.6	-1.1	162.2	
V2 Left Front Sill Comp AVy	deg/s	44.7	27.0	-29.7	33.2	f2=0.308 Hz; f4=0.001 Hz
V2 Left Front Sill Comp ADy	deg	0.6	69.5	-1.5	249.3	f2=0.308 Hz; f4=0.001 Hz
V2P1 Left Seat Comp AVy	deg/s	675.1	86.1	-168.3	190.4	f2=0.283 Hz; f4=0.001 Hz
V2P1 Left Seat Comp ADy	deg	35.8	154.3	0.0	4.6	f2=0.283 Hz; f4=0.001 Hz
V2P1 Right Seat Comp AVy	deg/s	840.1	94.7	-208.2	189.0	f2=0.283 Hz; f4=0.001 Hz
V2P1 Right Seat Comp ADy	deg	41.7	154.8	0.0	-35.9	f2=0.283 Hz; f4=0.001 Hz
V2P2 Left Seat Comp AVy	deg/s	243.6	66.7	-262.1	118.6	f2=0.3 Hz; f4=0.001 Hz
V2P2 Left Seat Comp ADy	deg	12.4	100.5	0.0	-80.2	f2=0.3 Hz; f4=0.001 Hz
V2P2 Right Seat Comp AVy	deg/s	301.4	58.6	-315.6	121.3	f2=0.294 Hz; f4=0.001 Hz
V2P2 Right Seat Comp ADy	deg	13.2	102.1	0.0	5.6	f2=0.294 Hz; f4=0.001 Hz
V2P1 Left Link ADy	deg	19.6	166.1	-1.6	55.6	
V2P1 Right Link ADy	deg	23.6	168.5	-9.0	69.7	
V2P1 Left Span Bar D	mm	386.0	157.9	0.0	-60.5	
V2P1 Right Span Bar D	mm	426.8	158.4	-0.1	11.5	
V2P2 Left Link ADy	deg	17.7	106.5	-6.4	53.2	

<b>NAME</b>	<b>Unit</b>	<b>Max</b>	<b>msec</b>	<b>Min</b>	<b>msec</b>	<b>Comment</b>
V2P2 Right Link ADy	deg	2.0	143.0	-11.3	109.8	
V2P2 Left Span Bar D	mm	160.2	99.3	0.0	-60.5	
V2P2 Right Span Bar D	mm	163.4	102.6	0.0	-100.0	
P1 Left Change in Seat Back Angle WRT Sill	deg	36.2	154.9	0.0	4.5	
P1 Left Change in String Angle	deg	0.0	4.7	-17.6	152.9	
P1 Left Seat X Displacement	mm	161.1	167.8	-1.1	9.8	
P1 Right Change in Seat Back Angle WRT Sill	deg	42.1	155.3	0.0	4.5	
P1 Right Change in String Angle	deg	5.6	61.9	-26.4	157.8	
P1 Right Seat X Displacement	mm	167.4	169.5	-4.7	12.5	
P2 Left Change in Seat Back Angle WRT Sill	deg	12.2	100.7	0.0	4.5	
P2 Left Change in String Angle	deg	8.1	167.2	-13.7	94.8	
P2 Left Seat X Displacement	mm	91.9	102.8	-0.4	10.7	
P2 Right Change in Seat Back Angle WRT Sill	deg	13.0	102.1	0.0	4.5	
P2 Right Change in String Angle	deg	0.6	11.6	-23.3	109.4	
P2 Right Seat X Displacement	mm	55.7	121.2	-0.4	8.9	

**Table of Data Plots**

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1	V2P1 Head Ax [g, CFC_1000]	B-11
2	V2P1 Head Ay [g, CFC_1000]	B-12
3	V2P1 Head Az [g, CFC_1000]	B-13
4	V2P1 Head A Resultant [g, CFC_1000]	B-14
5	V2P1 Head AVy [deg/s, CFC_180]	B-15
6	V2P1 Head Comp AVy [deg/s, CFC_180]	B-16
7	V2P1 Head Comp ADy [deg/s, CFC_180]	B-17
8	V2P1 Upper Neck Fx [N, CFC_1000]	B-18
9	V2P1 Upper Neck Fy [N, CFC_1000]	B-19
10	V2P1 Upper Neck Fz [N, CFC_1000]	B-20
11	V2P1 Upper Neck F Resultant [N, CFC_1000]	B-21
12	V2P1 Upper Neck Mx [N-m, CFC_600]	B-22
13	V2P1 Upper Neck My [N-m, CFC_600]	B-23
14	V2P1 Upper Neck Mz [N-m, CFC_600]	B-24
15	V2P1 Upper Neck M Resultant [N-m, CFC_600]	B-25
16	V2P1 Lower Neck Fx [N, CFC_1000]	B-26
17	V2P1 Lower Neck Fy [N, CFC_1000]	B-27
18	V2P1 Lower Neck Fz [N, CFC_1000]	B-28
19	V2P1 Lower Neck F Resultant [N, CFC_1000]	B-29
20	V2P1 Lower Neck Mx [N-m, CFC_600]	B-30
21	V2P1 Lower Neck My [N-m, CFC_600]	B-31
22	V2P1 Lower Neck Mz [N-m, CFC_600]	B-32
23	V2P1 Lower Neck M Resultant [N-m, CFC_600]	B-33
24	V2P1 Lower Neck Ax [g, CFC_1000]	B-34
25	V2P1 Chest Ax [g, CFC_180]	B-35
26	V2P1 Chest Ay [g, CFC_180]	B-36
27	V2P1 Chest Az [g, CFC_180]	B-37
28	V2P1 Chest A Resultant [g, CFC_180]	B-38
29	V2P1 Chest Dx [mm, CFC_600]	B-39
30	V2P1 Chest AVy [deg/s, CFC_180]	B-40
31	V2P1 Chest Comp AVy [deg/s, CFC_180]	B-41
32	V2P1 Chest Comp ADy [deg/s, CFC_180]	B-42
33	V2P1 Pelvic Ax [g, CFC_1000]	B-43
34	V2P1 Pelvic Ay [g, CFC_1000]	B-44
35	V2P1 Pelvic Az [g, CFC_1000]	B-45
36	V2P1 Pelvic A Resultant [g, CFC_1000]	B-46
37	V2P1 Left Femur Fz [N, CFC_600]	B-47
38	V2P1 Right Femur Fz [N, CFC_600]	B-48
39	V2P1 Head to Chest Comp ADy	B-49
40	V2P1 Lap Belt F [N, CFC_60]	B-50
41	V2P1 Belt Spoolout [mm, CFC_180]	B-51
42	V2P2 Head Ax [g, CFC_1000]	B-52
43	V2P2 Head Ay [g, CFC_1000]	B-53
44	V2P2 Head Az [g, CFC_1000]	B-54
45	V2P2 Head A Resultant [g, CFC_1000]	B-55
46	V2P2 Head AVy [deg/s, CFC_180]	B-56
47	V2P2 Head Comp AVy [deg/s, CFC_180]	B-57
48	V2P2 Head Comp ADy [deg/s, CFC_180]	B-58

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50	V2P2 Upper Neck Fy [N, CFC_1000]	B-60
51	V2P2 Upper Neck Fz [N, CFC_1000]	B-61
52	V2P2 Upper Neck F Resultant [N, CFC_1000]	B-62
53	V2P2 Upper Neck Mx [N-m, CFC_600]	B-63
54	V2P2 Upper Neck My [N-m, CFC_600]	B-64
55	V2P2 Upper Neck Mz [N-m, CFC_600]	B-65
56	V2P2 Upper Neck M Resultant [N-m, CFC_600]	B-66
57	V2P2 Lower Neck Fx [N, CFC_1000]	B-67
58	V2P2 Lower Neck Fy [N, CFC_1000]	B-68
59	V2P2 Lower Neck Fz [N, CFC_1000]	B-69
60	V2P2 Lower Neck F Resultant [N, CFC_1000]	B-70
61	V2P2 Lower Neck Mx [N-m, CFC_600]	B-71
62	V2P2 Lower Neck My [N-m, CFC_600]	B-72
63	V2P2 Lower Neck Mz [N-m, CFC_600]	B-73
64	V2P2 Lower Neck M Resultant [N-m, CFC_600]	B-74
65	V2P2 Lower Neck Ax [g, CFC_1000]	B-75
66	V2P2 Chest Ax [g, CFC_180]	B-76
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68	V2P2 Chest Az [g, CFC_180]	B-78
69	V2P2 Chest A Resultant [g, CFC_180]	B-79
70	V2P2 Chest Dx [mm, CFC_600]	B-80
71	V2P2 Chest AVy [deg/s, CFC_180]	B-81
72	V2P2 Chest Comp AVy [deg/s, CFC_180]	B-82
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74	V2P2 Pelvic Ax [g, CFC_1000]	B-84
75	V2P2 Pelvic Ay [g, CFC_1000]	B-85
76	V2P2 Pelvic Az [g, CFC_1000]	B-86
77	V2P2 Pelvic A Resultant [g, CFC_1000]	B-87
78	V2P2 Left Femur Fz [N, CFC_600]	B-88
79	V2P2 Right Femur Fz [N, CFC_600]	B-89
80	V2P2 Head to Chest Comp ADy	B-90
81	V2P2 Lap Belt F [N, CFC_60]	B-91
82	V2P2 Belt Spoolout [mm, CFC_180]	B-92
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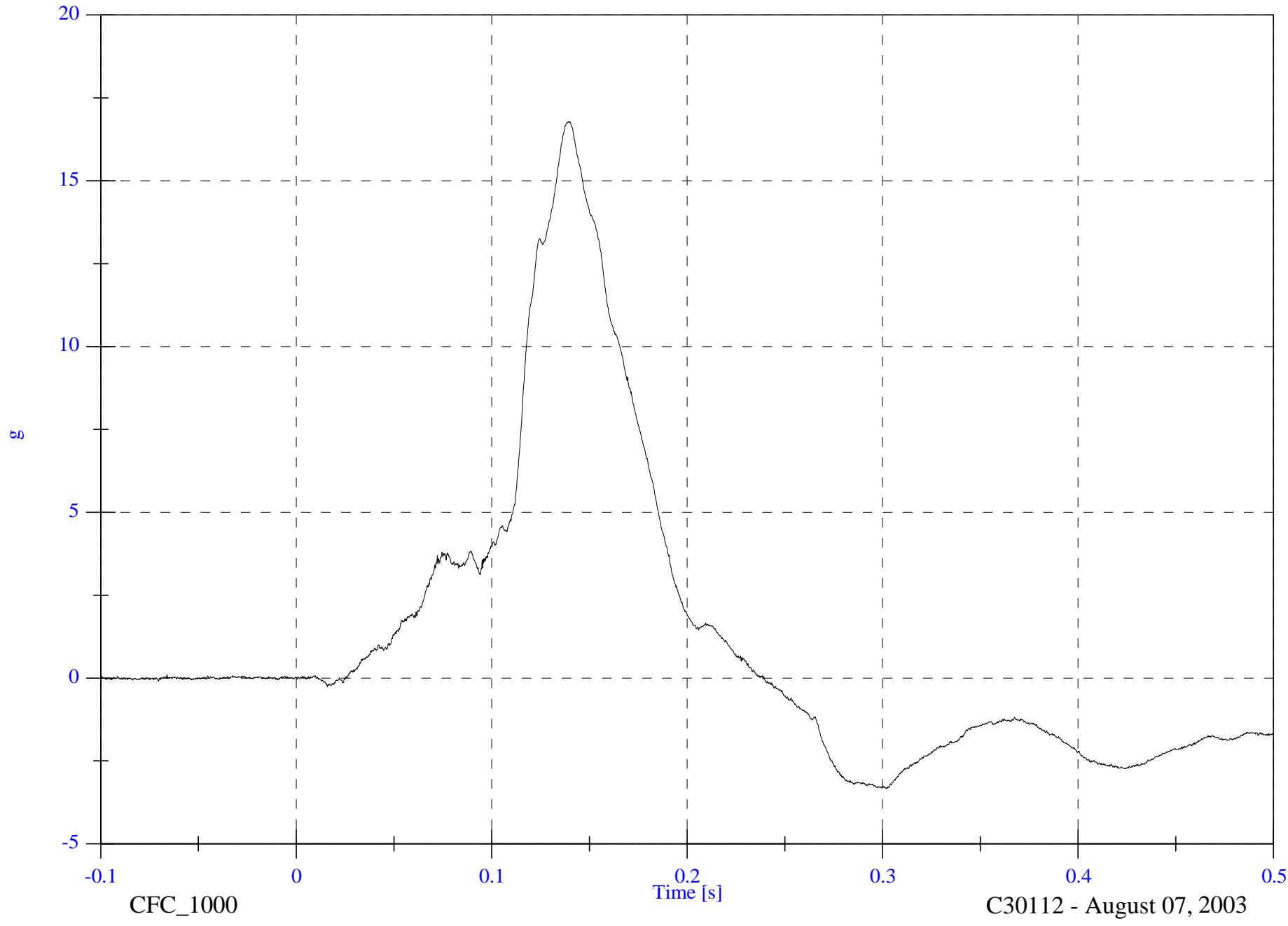
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head Ax

Max: 16.8 [g] at 0.140 [s]  
Min: -3.3 [g] at 0.302 [s]

B-11

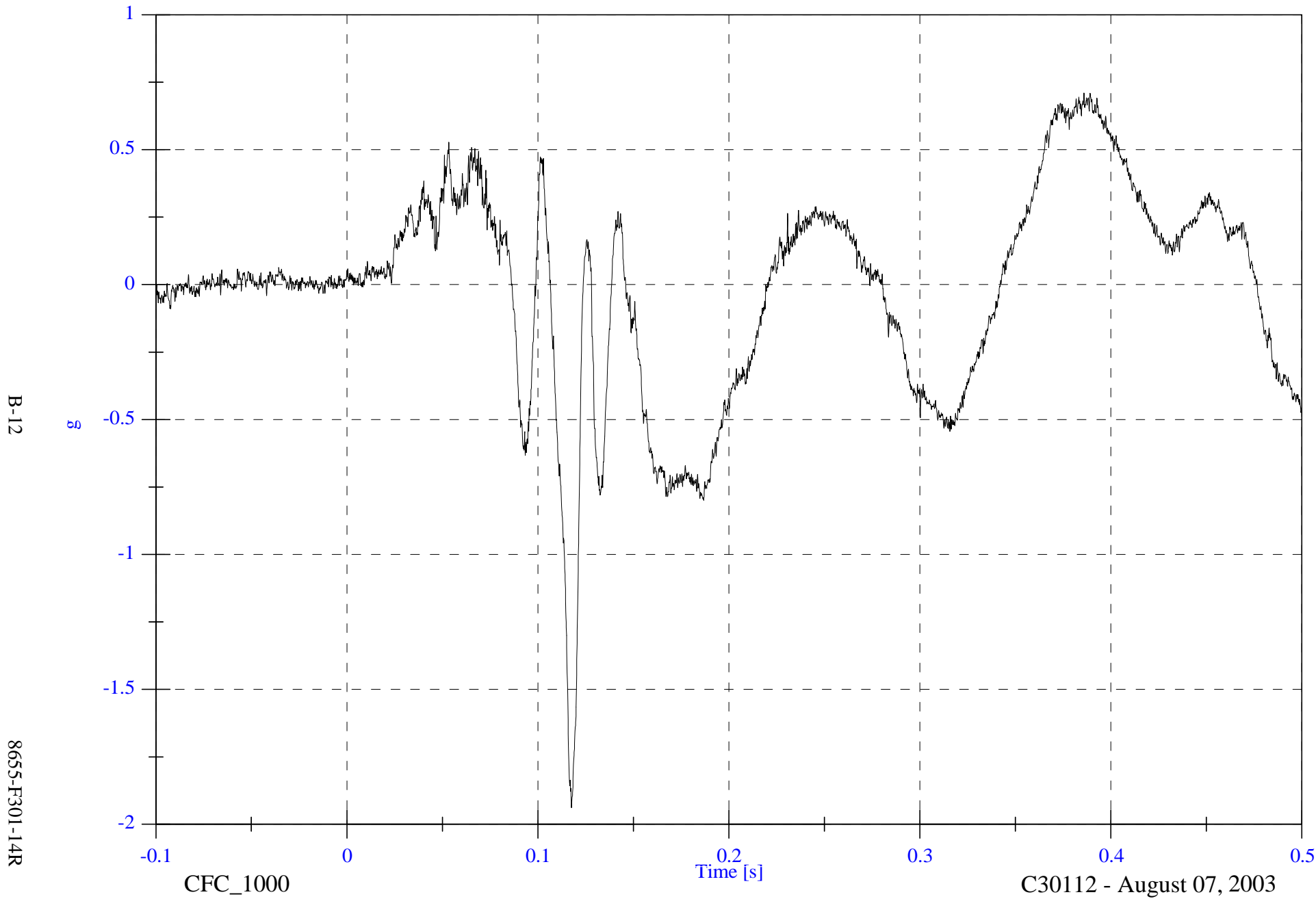
8655-F301-14R



FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head Ay

Max: 0.7 [g] at 0.386 [s]  
Min: -1.9 [g] at 0.118 [s]



B-12

8655-F301-14R

CFC\_1000

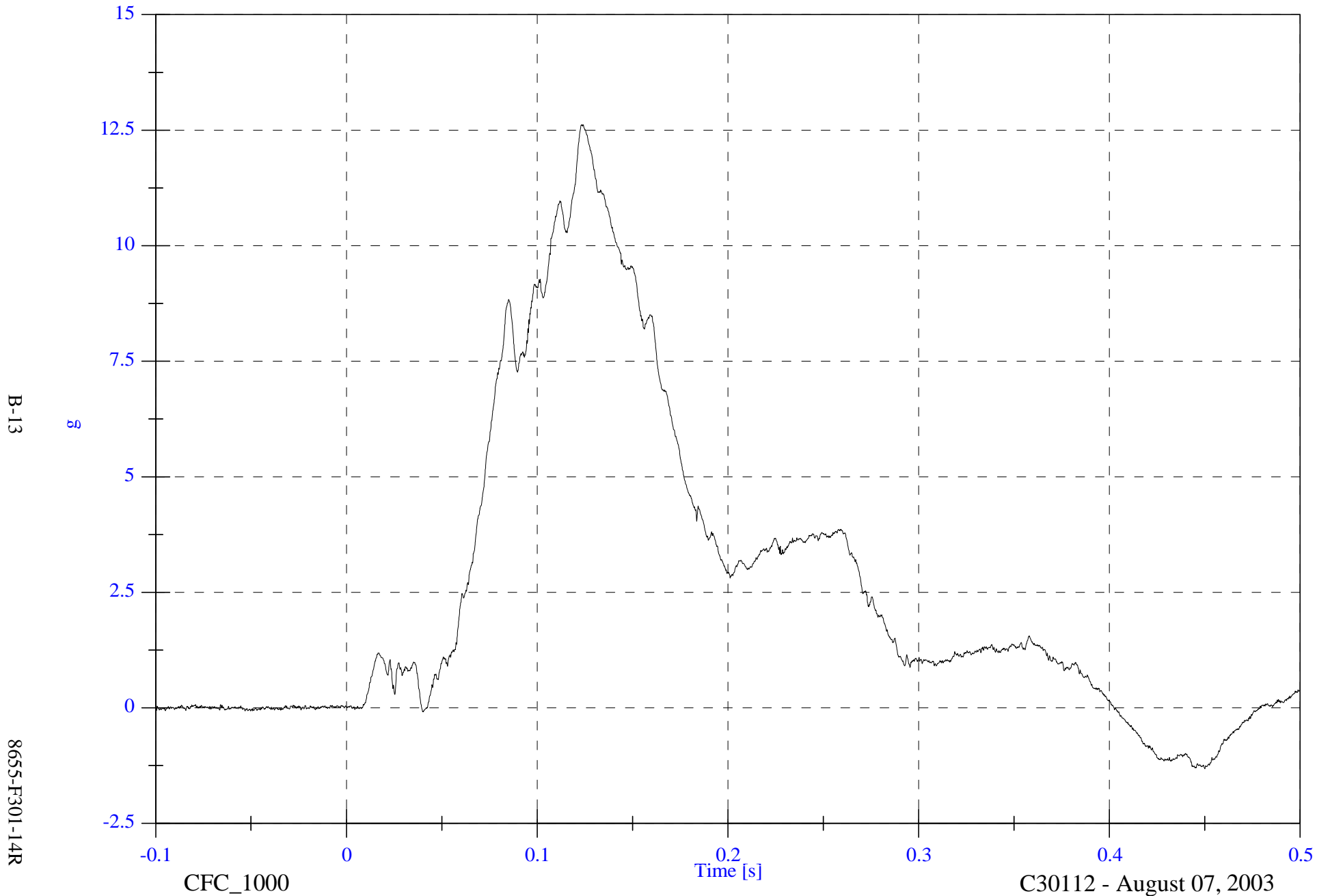
Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head Az

Max: 12.6 [g] at 0.124 [s]  
Min: -1.3 [g] at 0.450 [s]



FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head A Resultant

Max: 19.8 [g] at 0.138 [s]

Min: 0.0 [g] at -0.045 [s]

B-14

8655-F301-14R



CFC\_1000

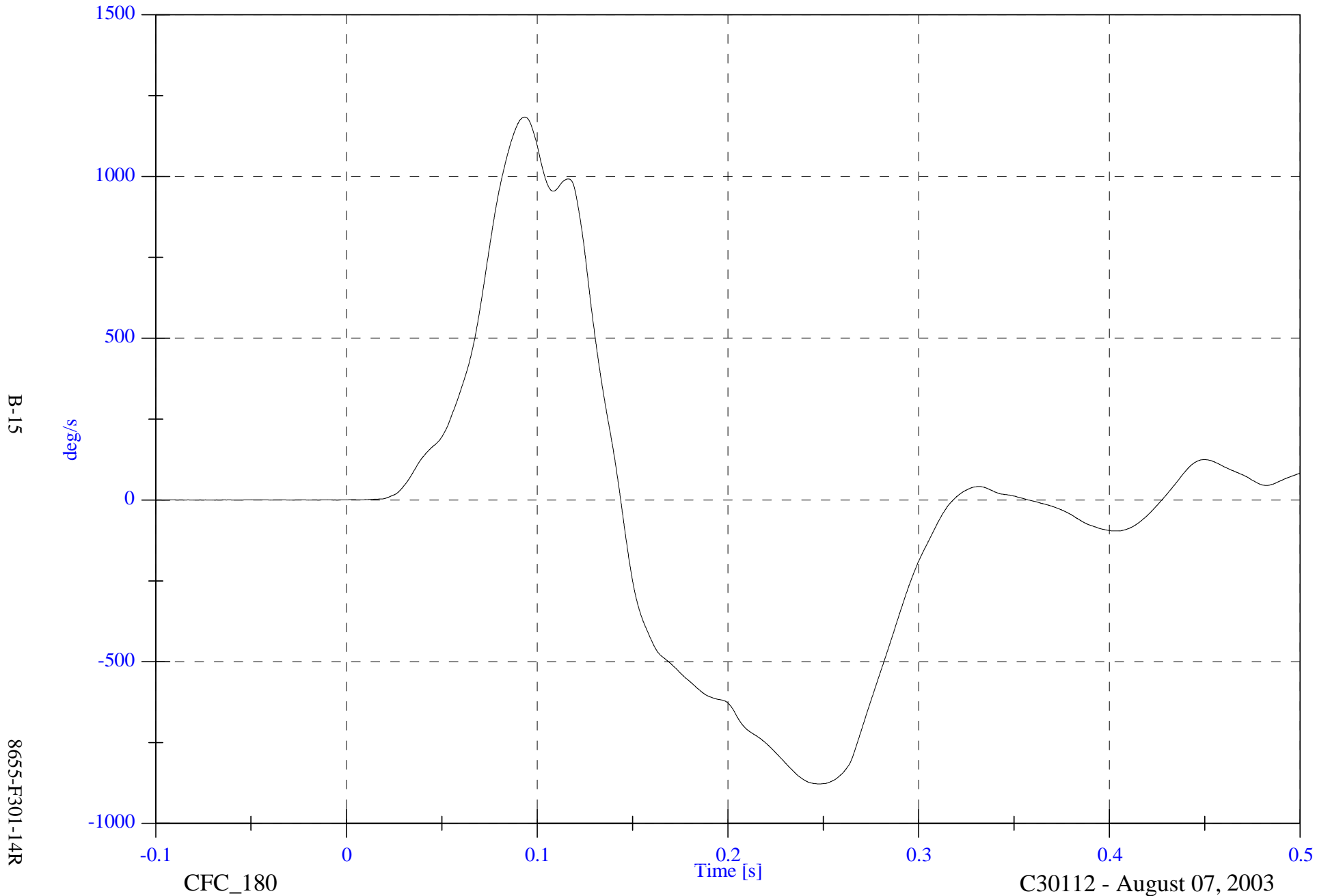
Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head AVy

Max: 1183.6 [deg/s] at 0.093 [s]  
Min: -878.1 [deg/s] at 0.248 [s]



B-15

8655-F301-14R

CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

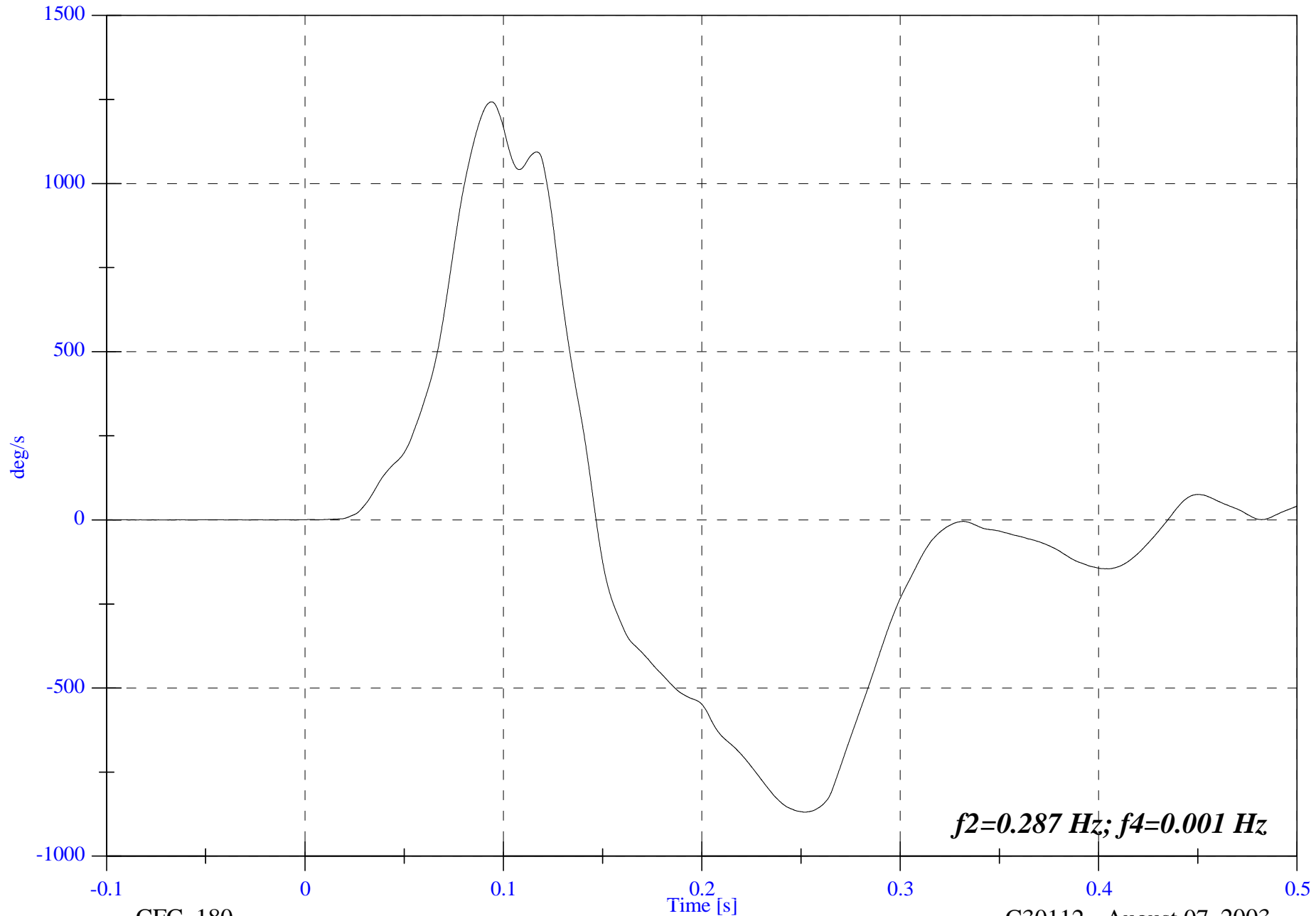
V2P1 Head Comp AVy

Max: 1242.5 [deg/s] at 0.094 [s]

Min: -869.1 [deg/s] at 0.252 [s]

B-16

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

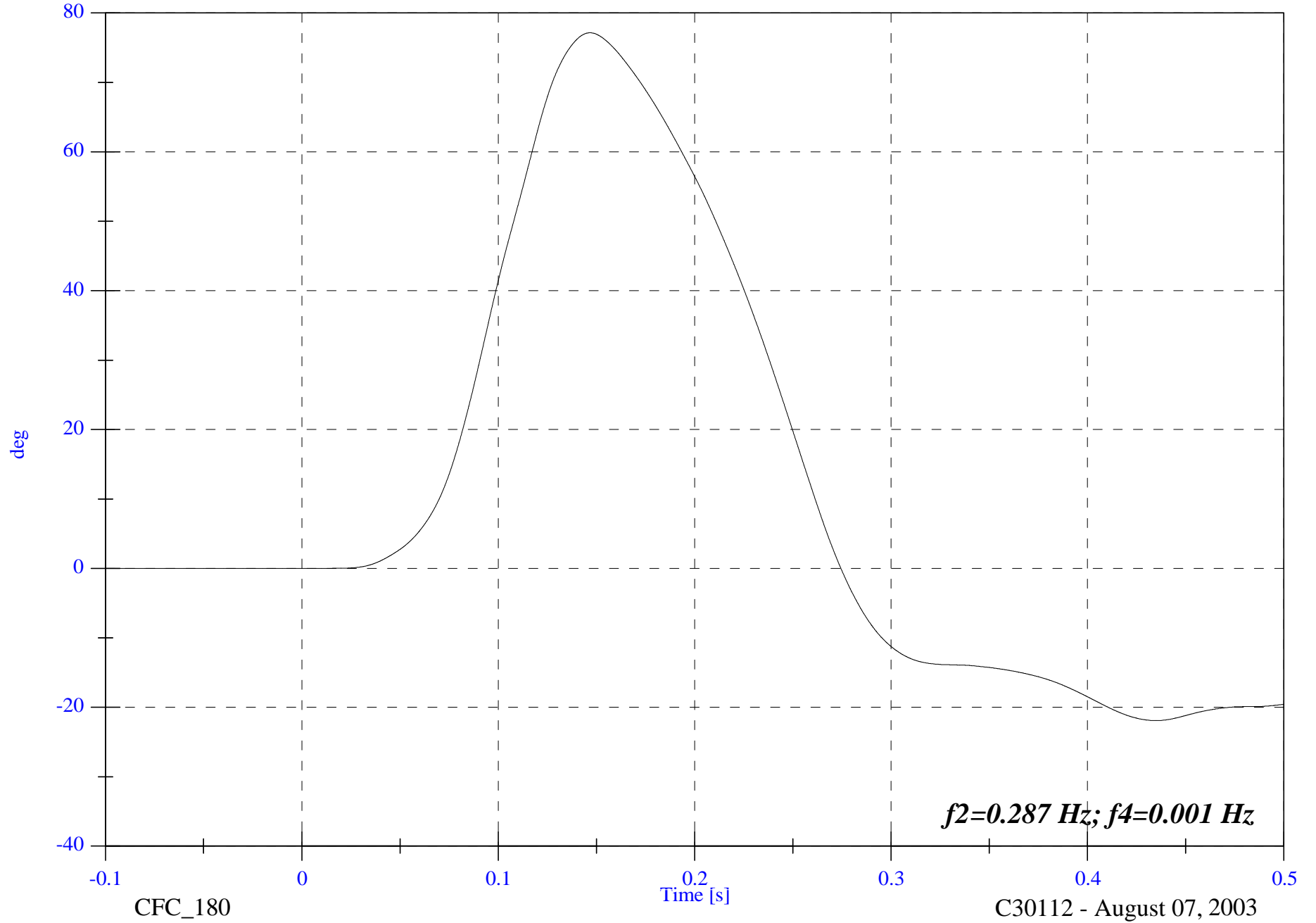
V2P1 Head Comp ADy

Max: 77.2 [deg] at 0.147 [s]

Min: -21.9 [deg] at 0.435 [s]

B-17

8655-F301-14R



CFC\_180

Time [s]

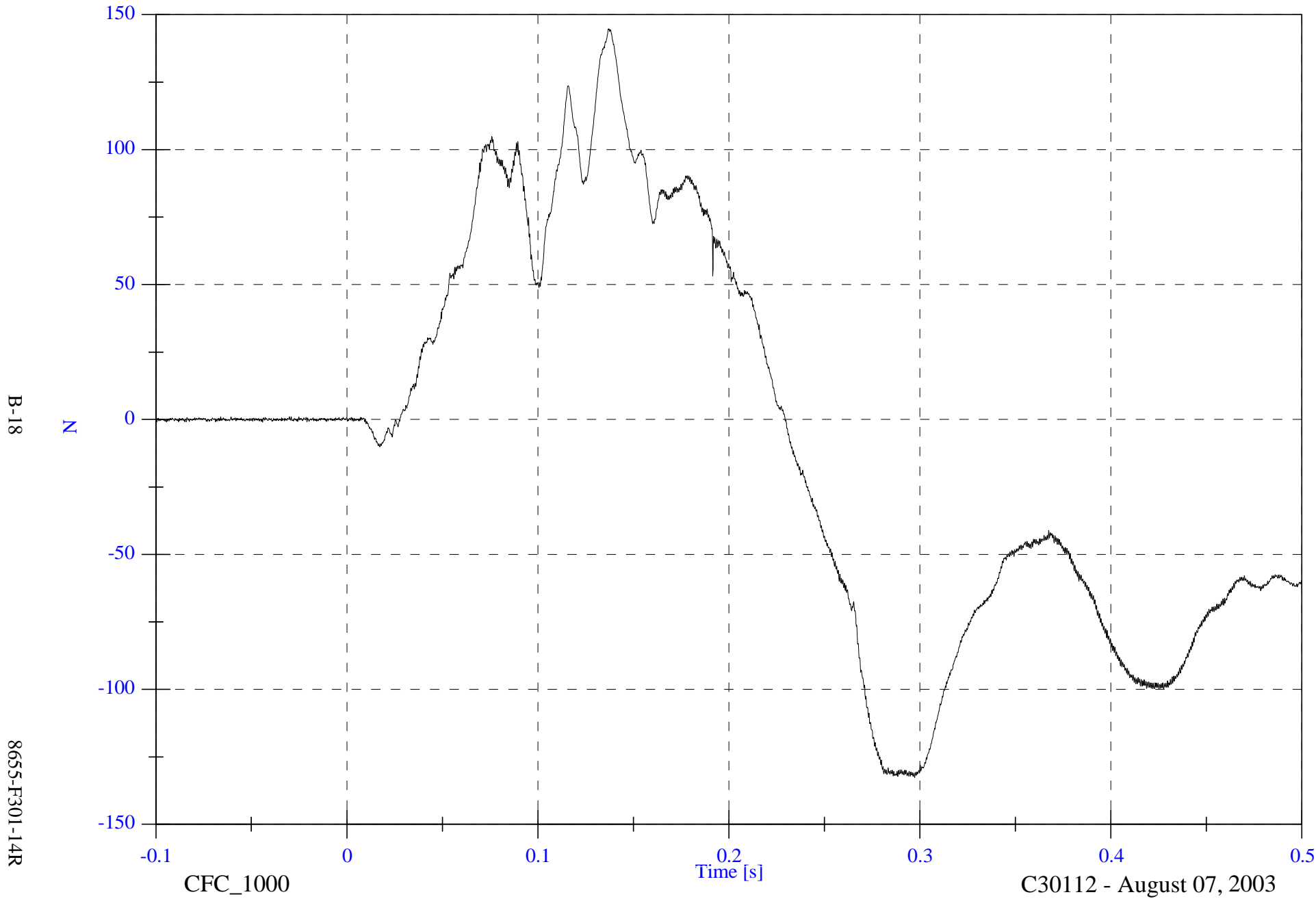
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Upper Neck Fx

Max: 144.8 [N] at 0.137 [s]

Min: -132.7 [N] at 0.297 [s]



B-18

N

8655-F301-14R

CFC\_1000

Time [s]

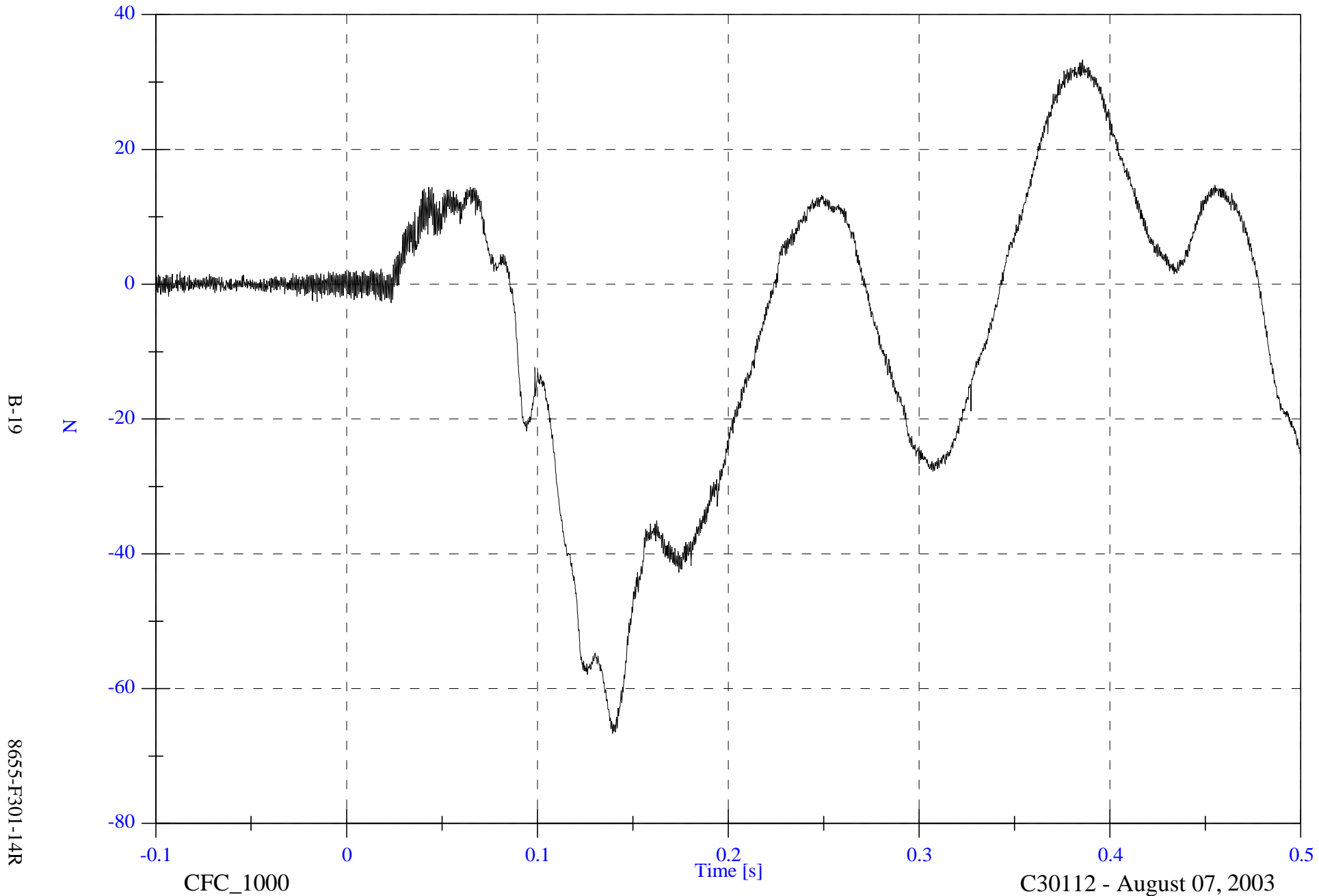
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Upper Neck Fy

Max: 33.3 [N] at 0.386 [s]

Min: -66.6 [N] at 0.139 [s]



B-19

8655-F301-14R

CFC\_1000

Time [s]

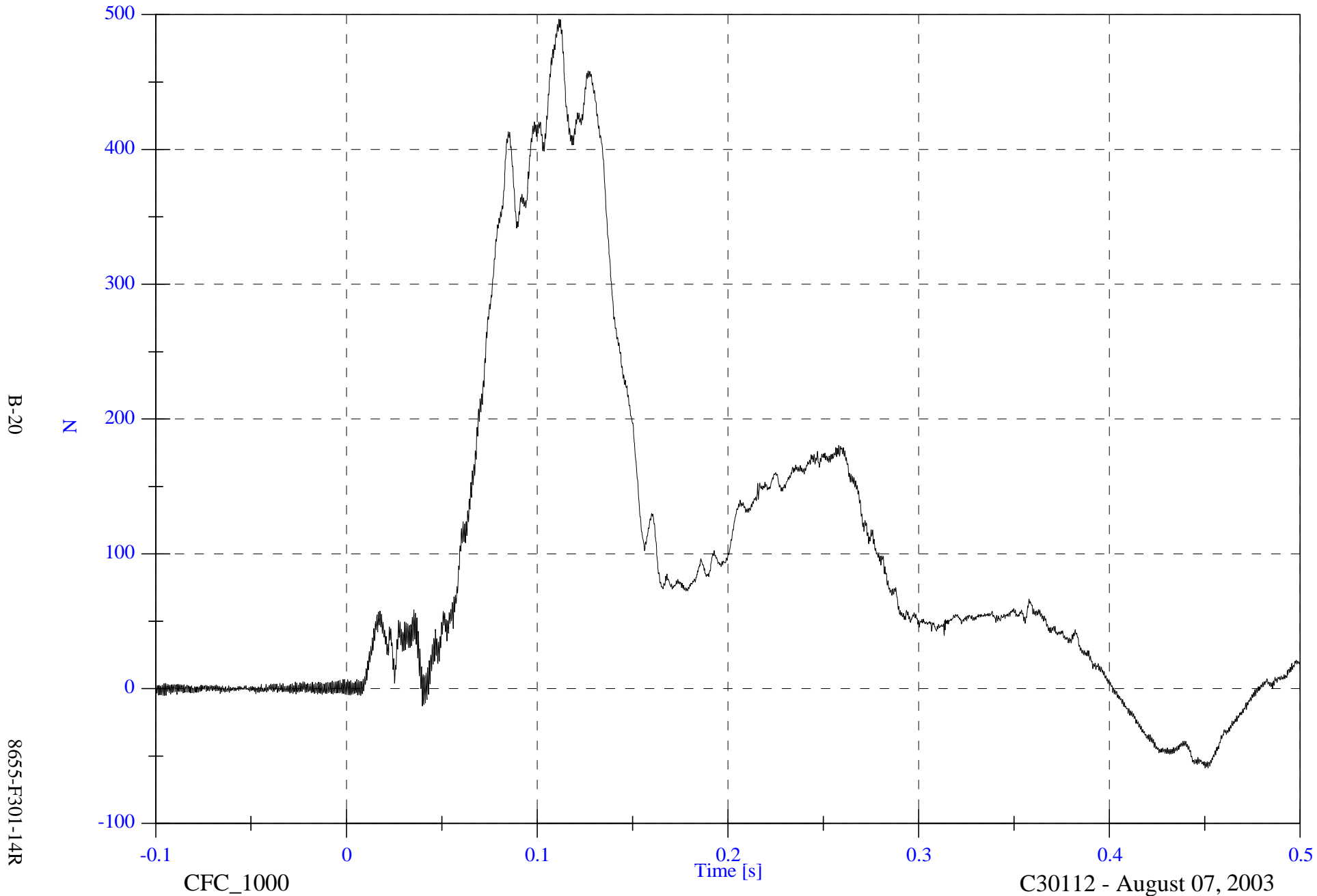
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Upper Neck Fz

Max: 496.7 [N] at 0.111 [s]

Min: -59.0 [N] at 0.452 [s]



B-20

N

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

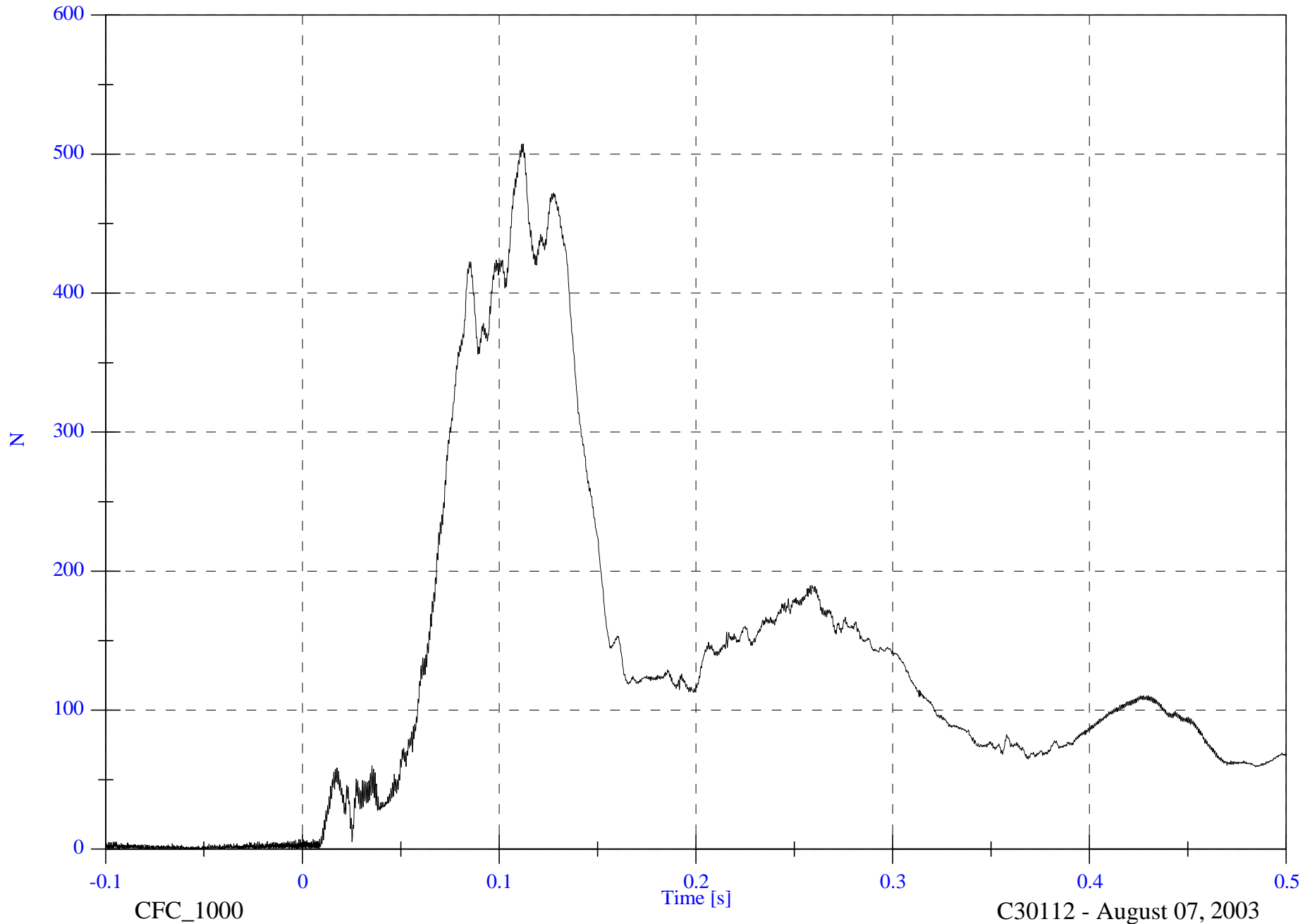
V2P1 Upper Neck F Resultant

Max: 507.6 [N] at 0.112 [s]

Min: 0.1 [N] at -0.097 [s]

B-21

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

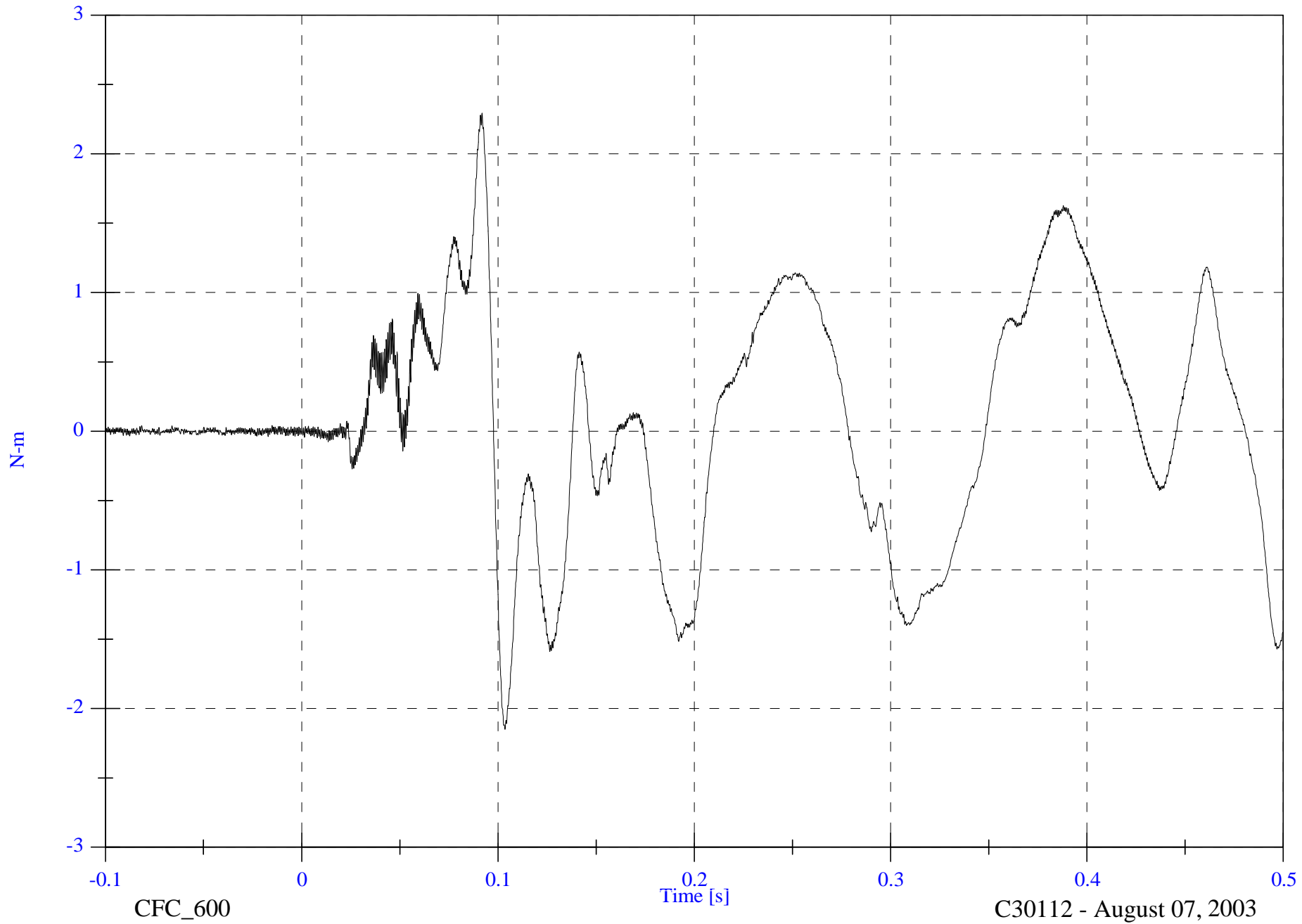
V2P1 Upper Neck Mx

Max: 2.3 [N-m] at 0.092 [s]

Min: -2.1 [N-m] at 0.104 [s]

B-22

8655-F301-14R



CFC\_600

Time [s]

C30112 - August 07, 2003

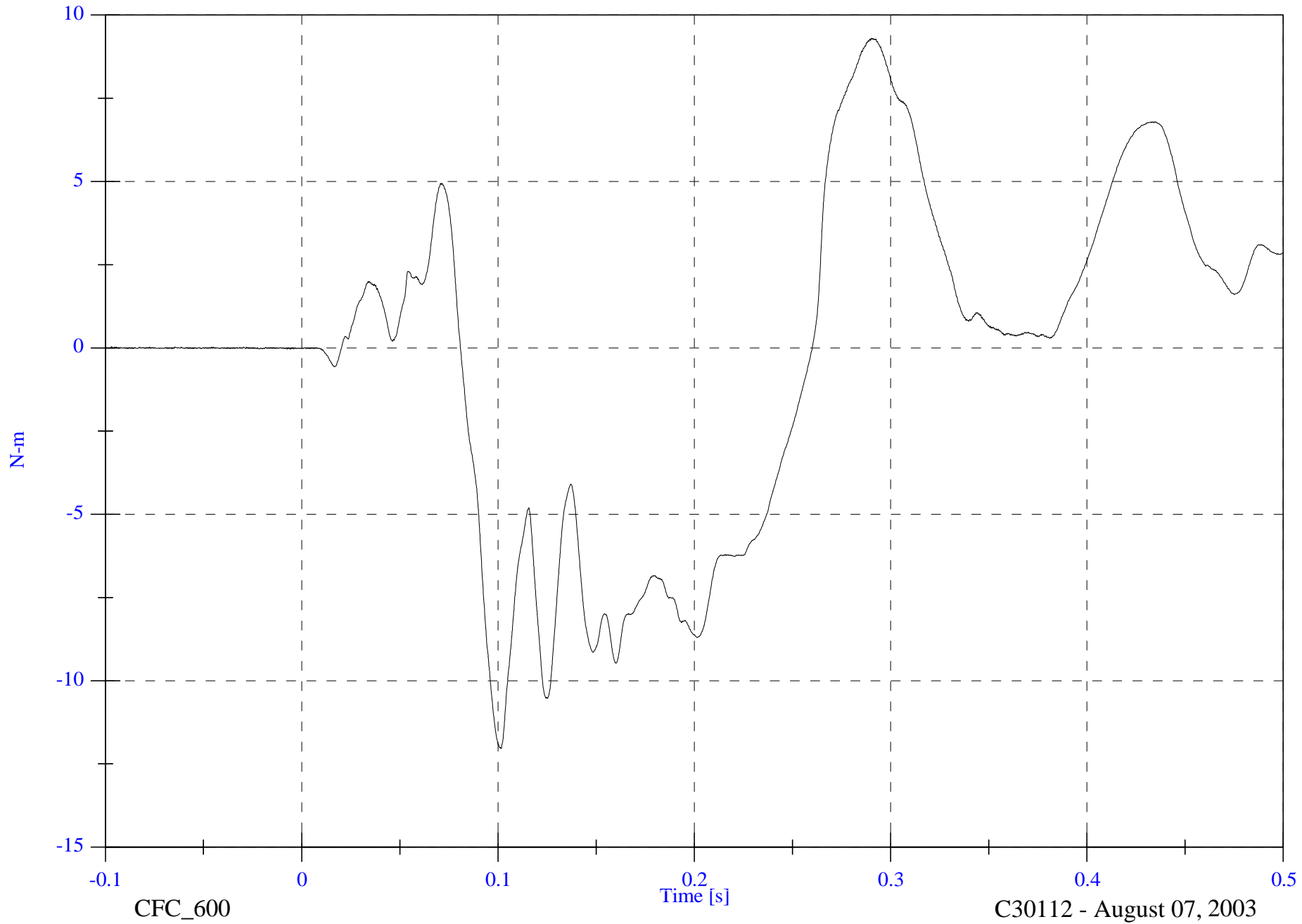
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Upper Neck My

Max: 9.3 [N-m] at 0.290 [s]  
Min: -12.0 [N-m] at 0.102 [s]

B-23

8655-F301-14R



CFC\_600

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

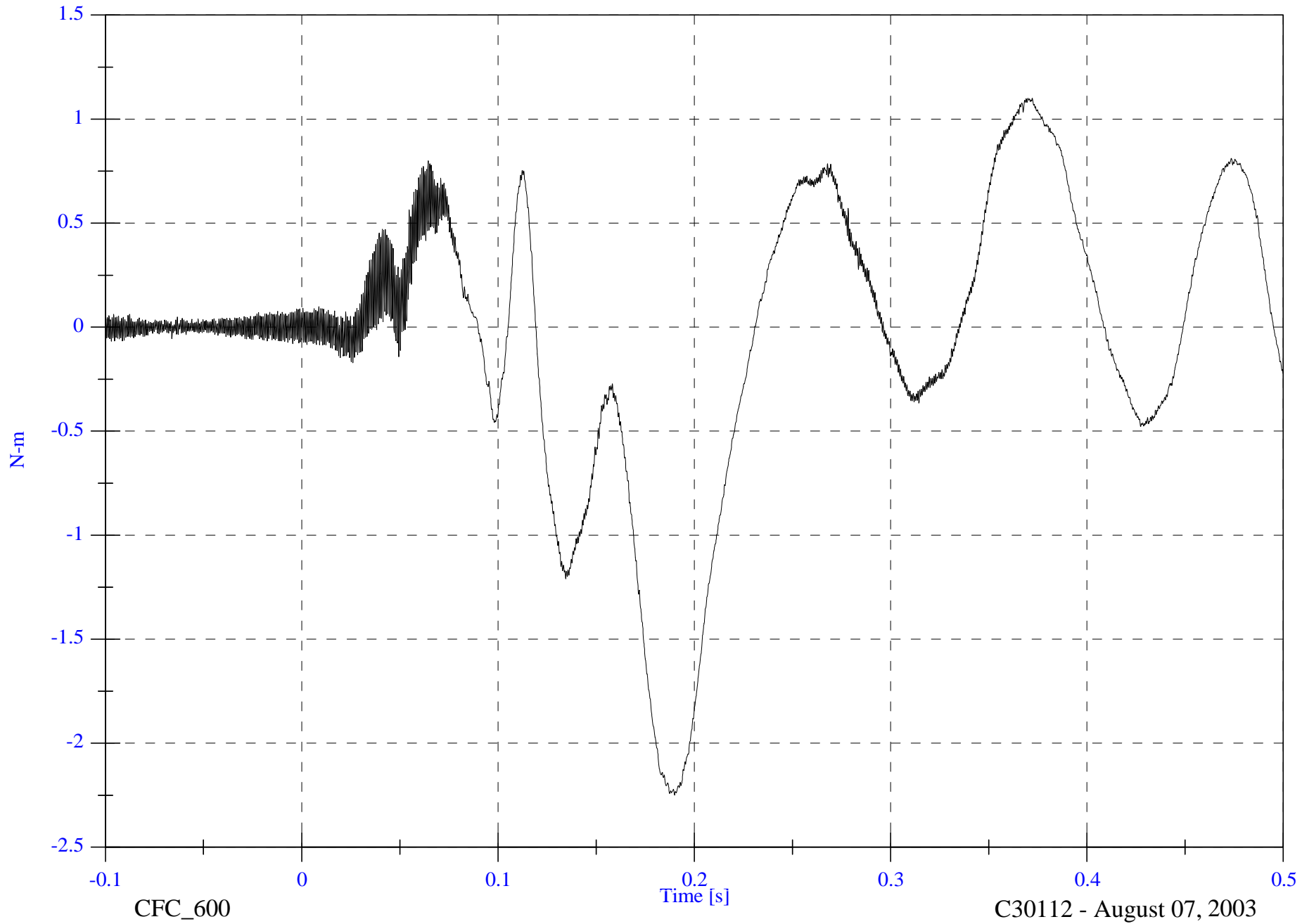
V2P1 Upper Neck Mz

Max: 1.1 [N-m] at 0.372 [s]

Min: -2.2 [N-m] at 0.190 [s]

B-24

8655-F301-14R



CFC\_600

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

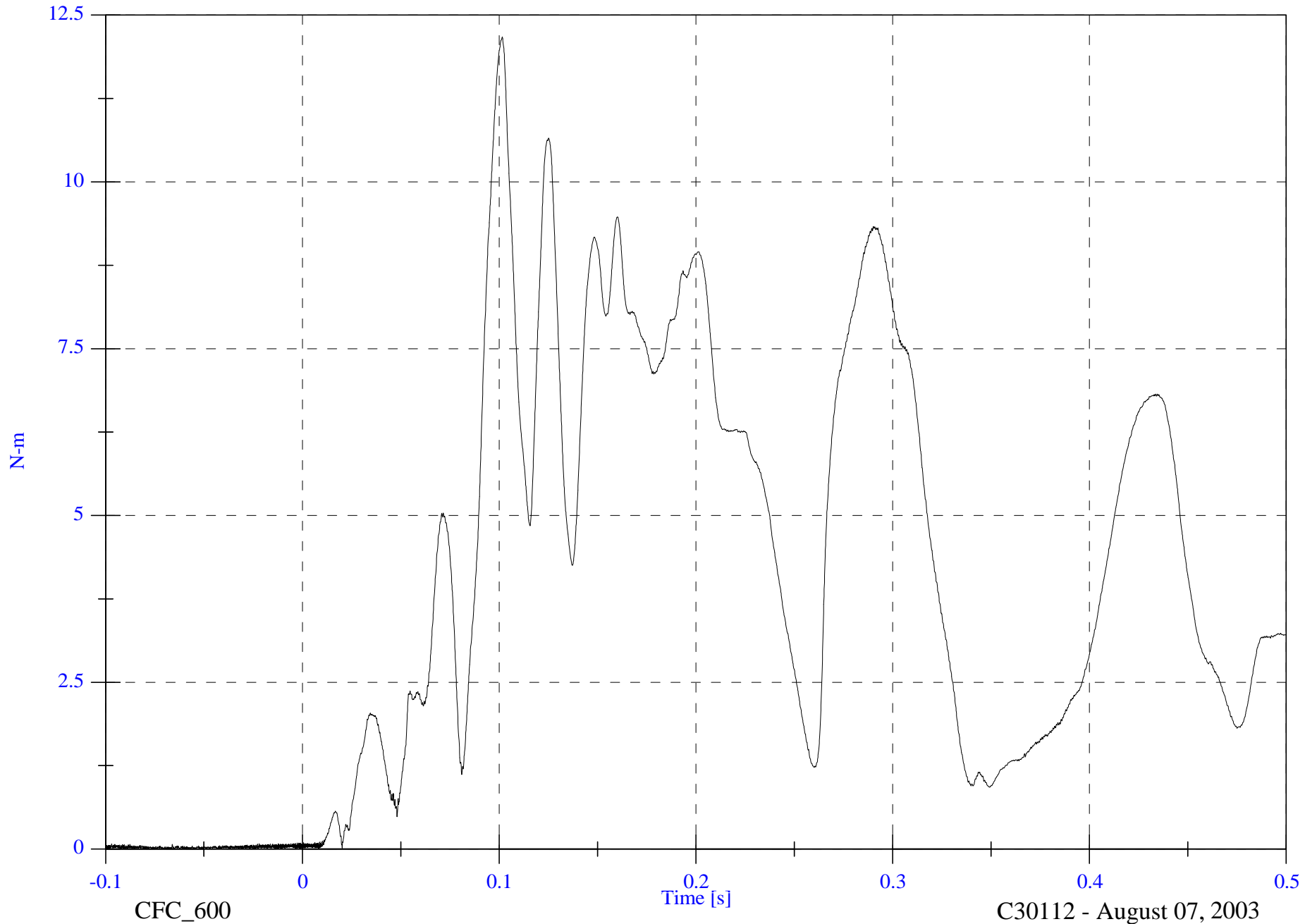
V2P1 Upper Neck M Resultant

Max: 12.2 [N-m] at 0.102 [s]

Min: 0.0 [N-m] at -0.062 [s]

B-25

8655-F301-14R



CFC\_600

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

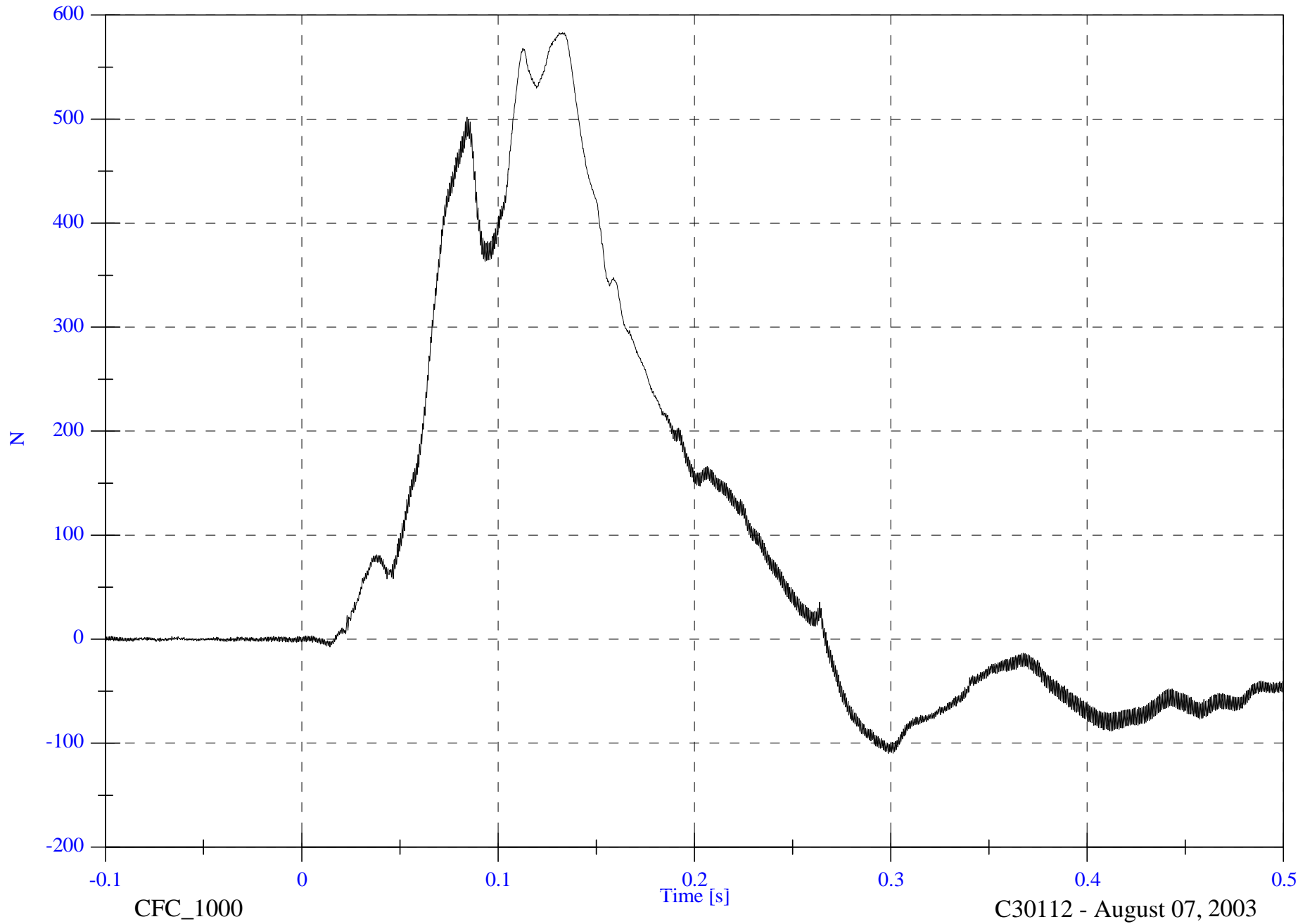
V2P1 Lower Neck Fx

Max: 583.2 [N] at 0.133 [s]

Min: -109.9 [N] at 0.299 [s]

B-26

8655-F301-14R

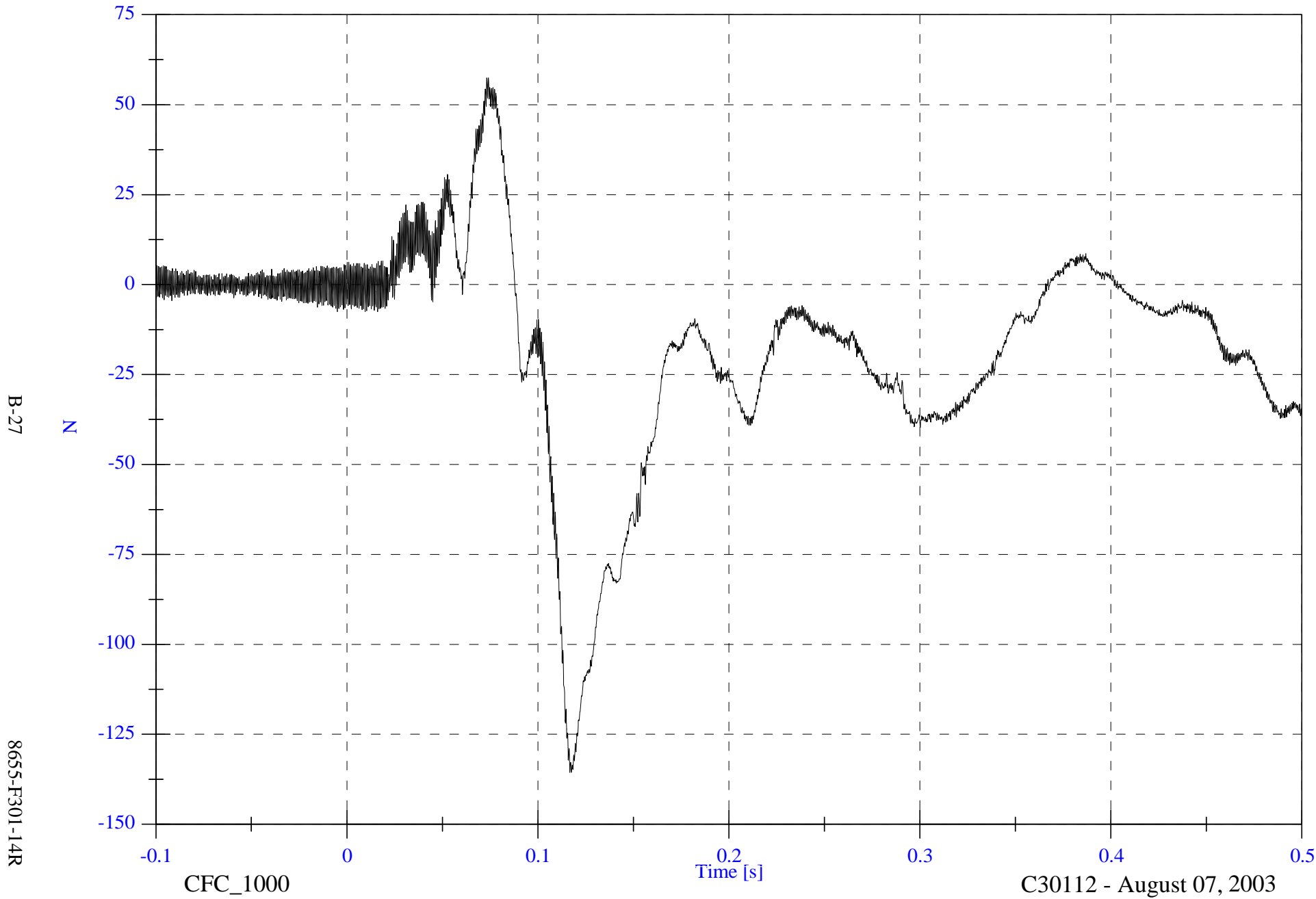


FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lower Neck Fy

Max: 57.5 [N] at 0.073 [s]

Min: -135.6 [N] at 0.117 [s]



B-27

8655-F301-14R

CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

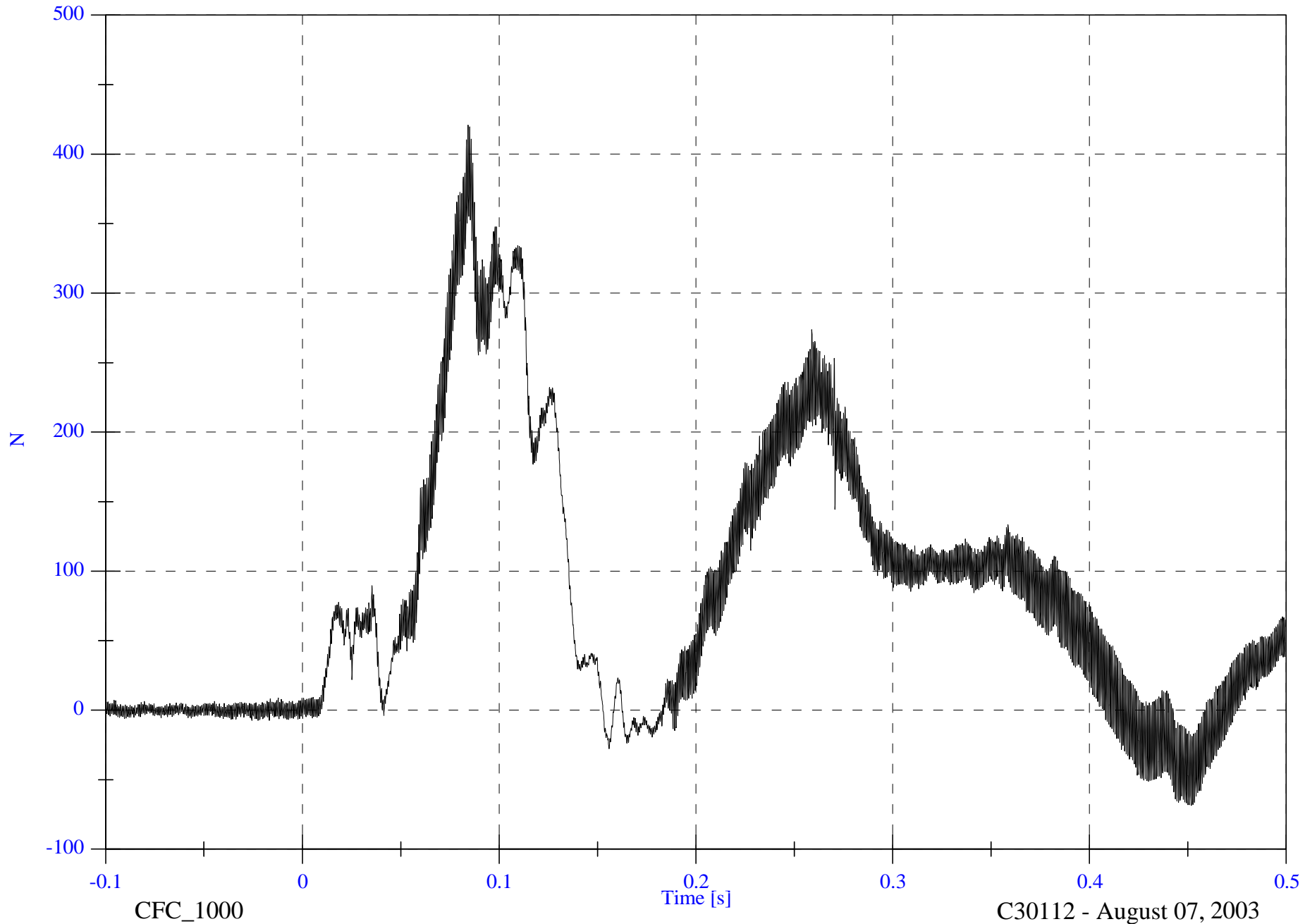
V2P1 Lower Neck Fz

Max: 420.9 [N] at 0.084 [s]

Min: -68.6 [N] at 0.452 [s]

B-28

8655-F301-14R

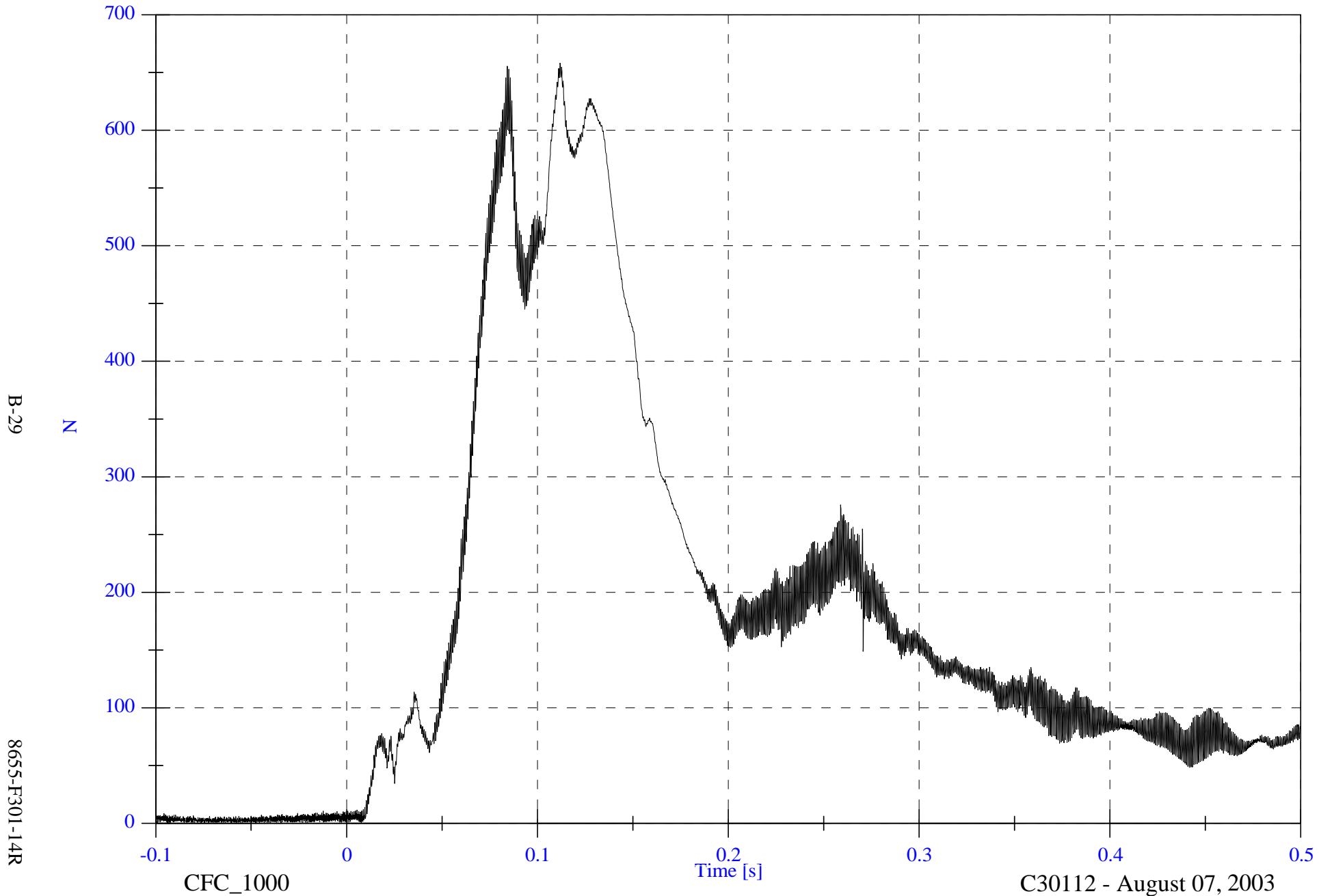


FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lower Neck F Resultant

Max: 658.1 [N] at 0.112 [s]

Min: 0.2 [N] at -0.040 [s]



B-29

8655-F301-14R

CFC\_1000

Time [s]

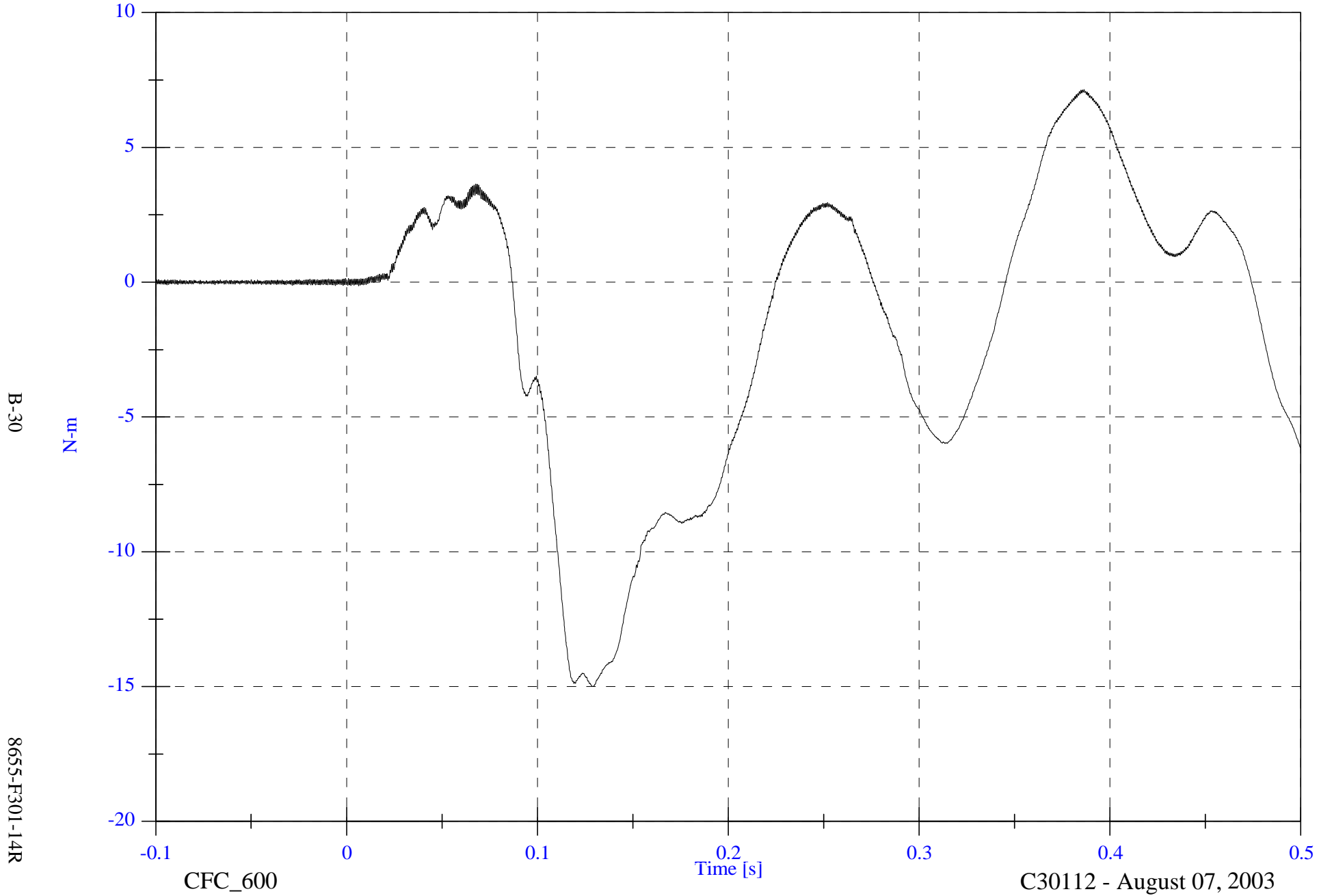
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lower Neck Mx

Max: 7.1 [N-m] at 0.387 [s]

Min: -15.0 [N-m] at 0.129 [s]



FMVSS 301 Test 5 - 2003 Saturn Ion

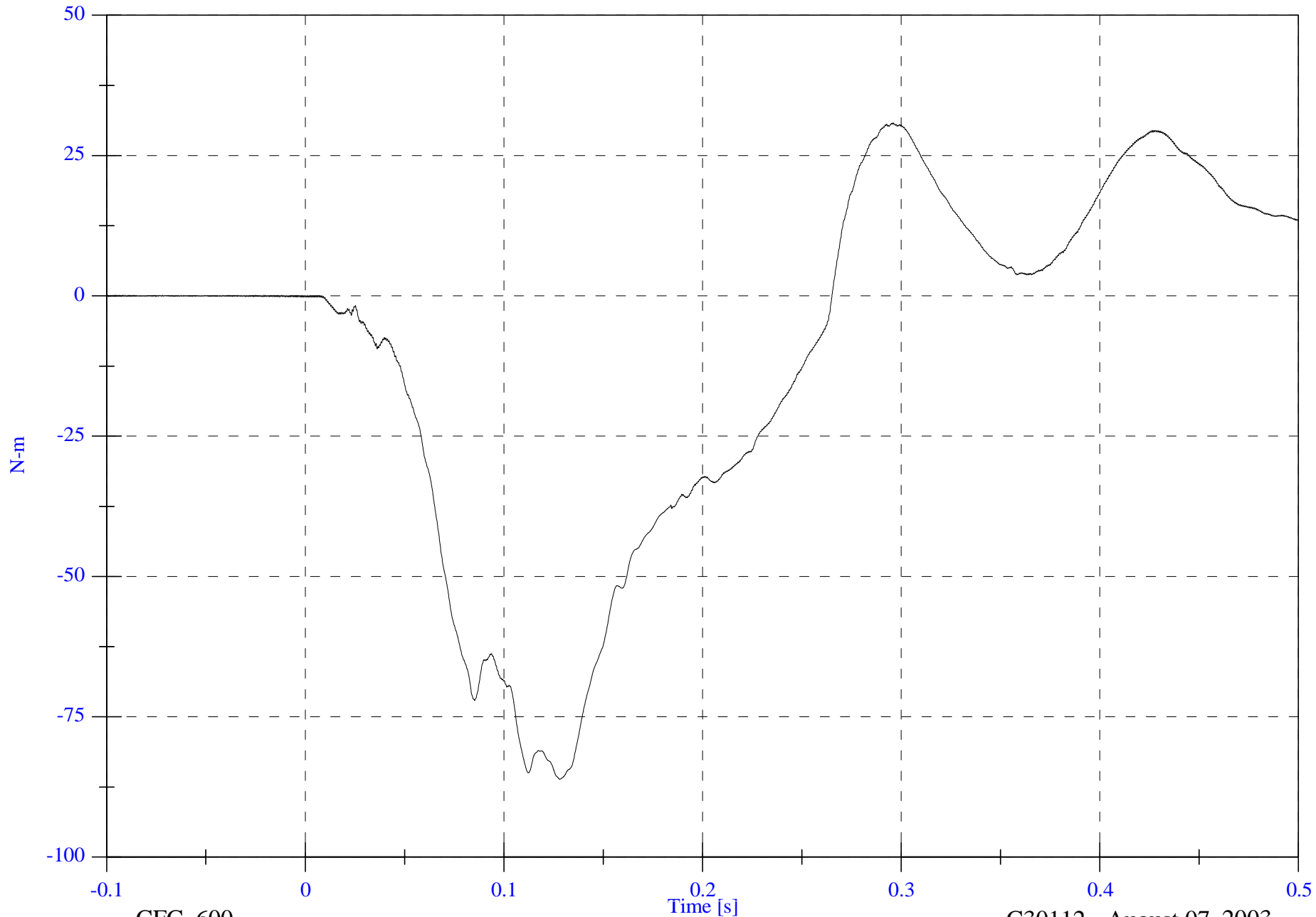
V2P1 Lower Neck My

Max: 30.8 [N-m] at 0.296 [s]

Min: -86.1 [N-m] at 0.128 [s]

B-31

8655-F301-14R



CFC\_600

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lower Neck Mz

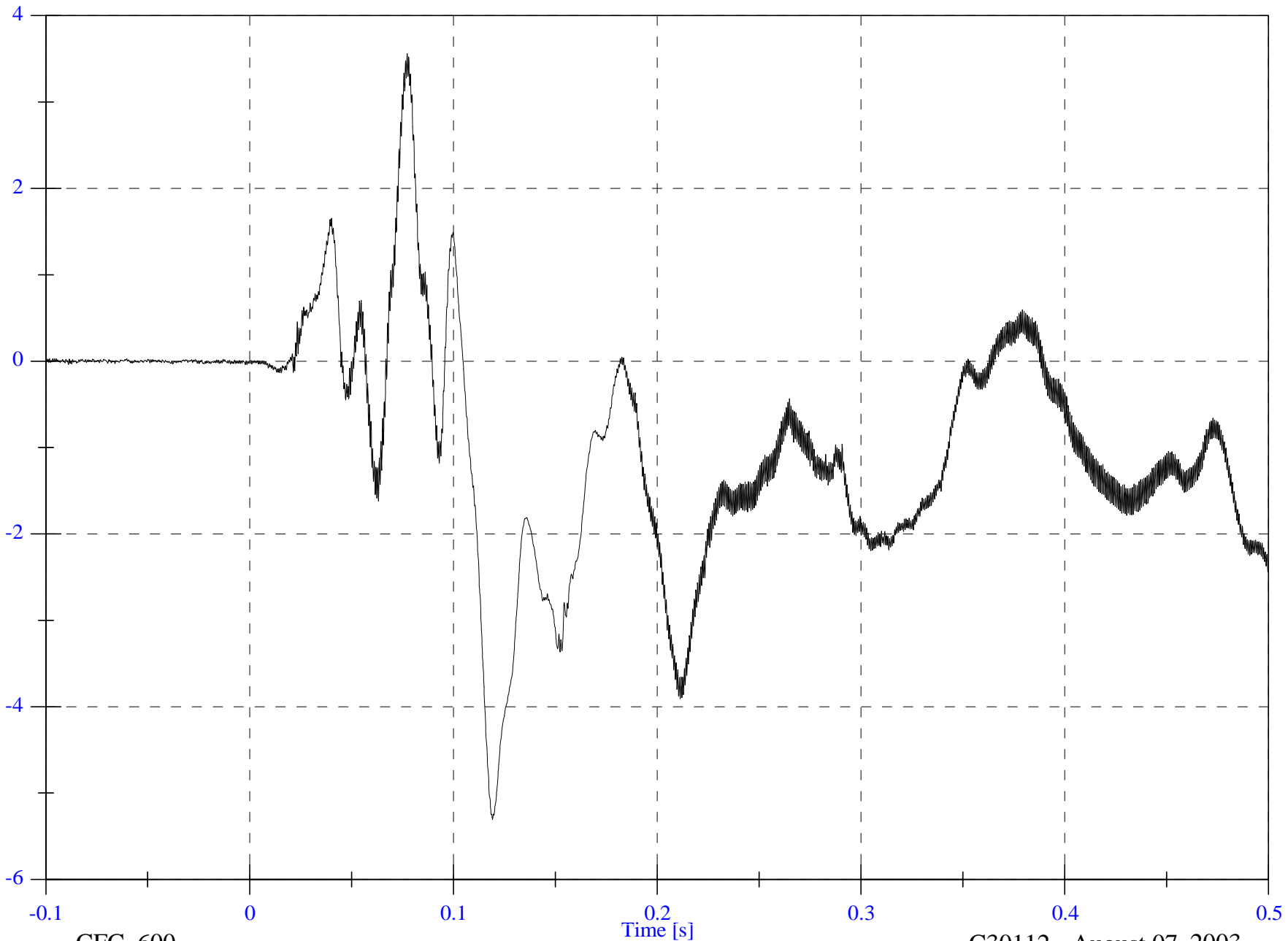
Max: 3.6 [N-m] at 0.077 [s]

Min: -5.3 [N-m] at 0.119 [s]

B-32

8655-F301-14R

N-m



CFC\_600

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

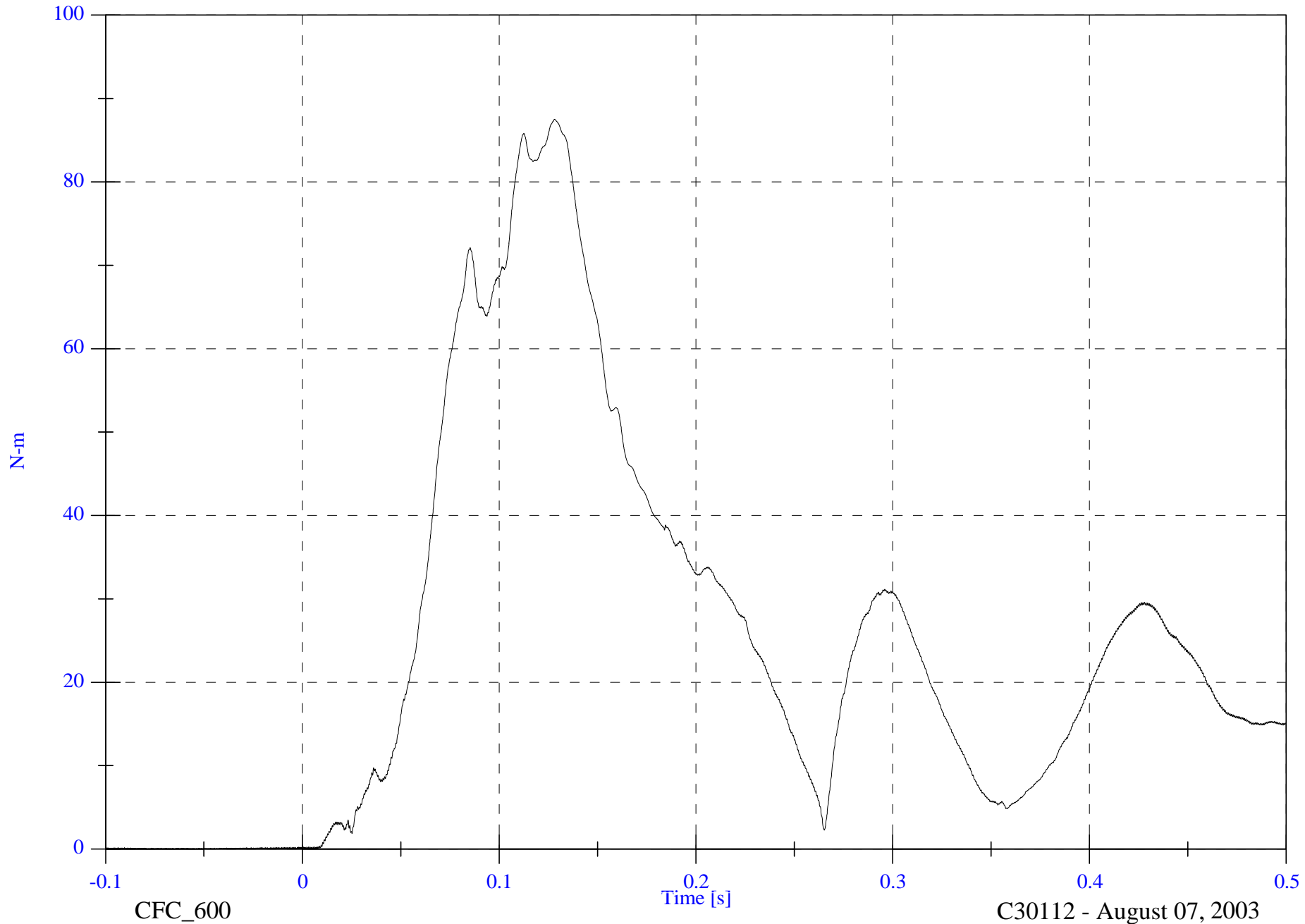
V2P1 Lower Neck M Resultant

Max: 87.5 [N-m] at 0.128 [s]

Min: 0.0 [N-m] at -0.040 [s]

B-33

8655-F301-14R



CFC\_600

Time [s]

C30112 - August 07, 2003

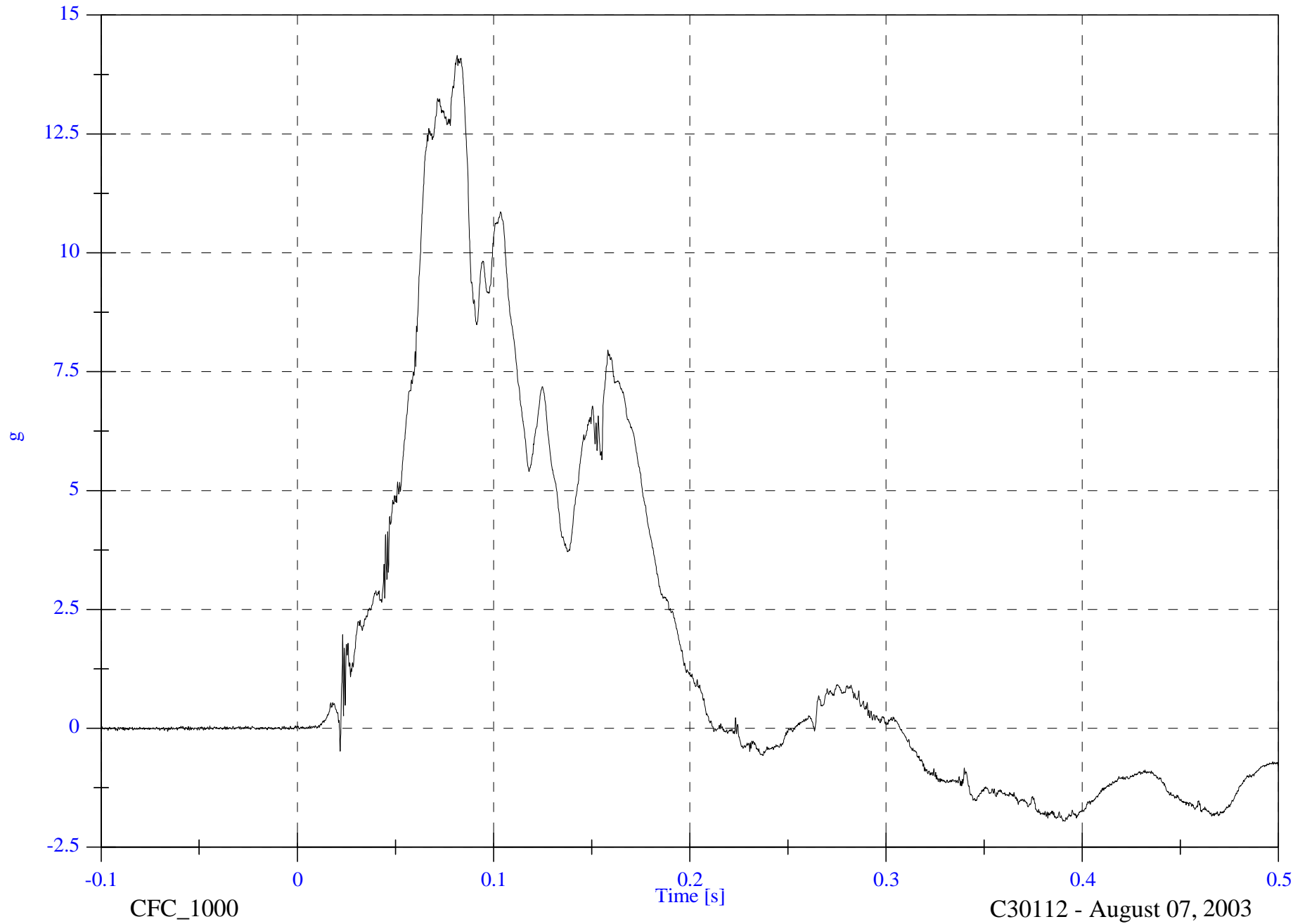
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lower Neck Ax

Max: 14.2 [g] at 0.081 [s]  
Min: -2.0 [g] at 0.391 [s]

B-34

8655-F301-14R



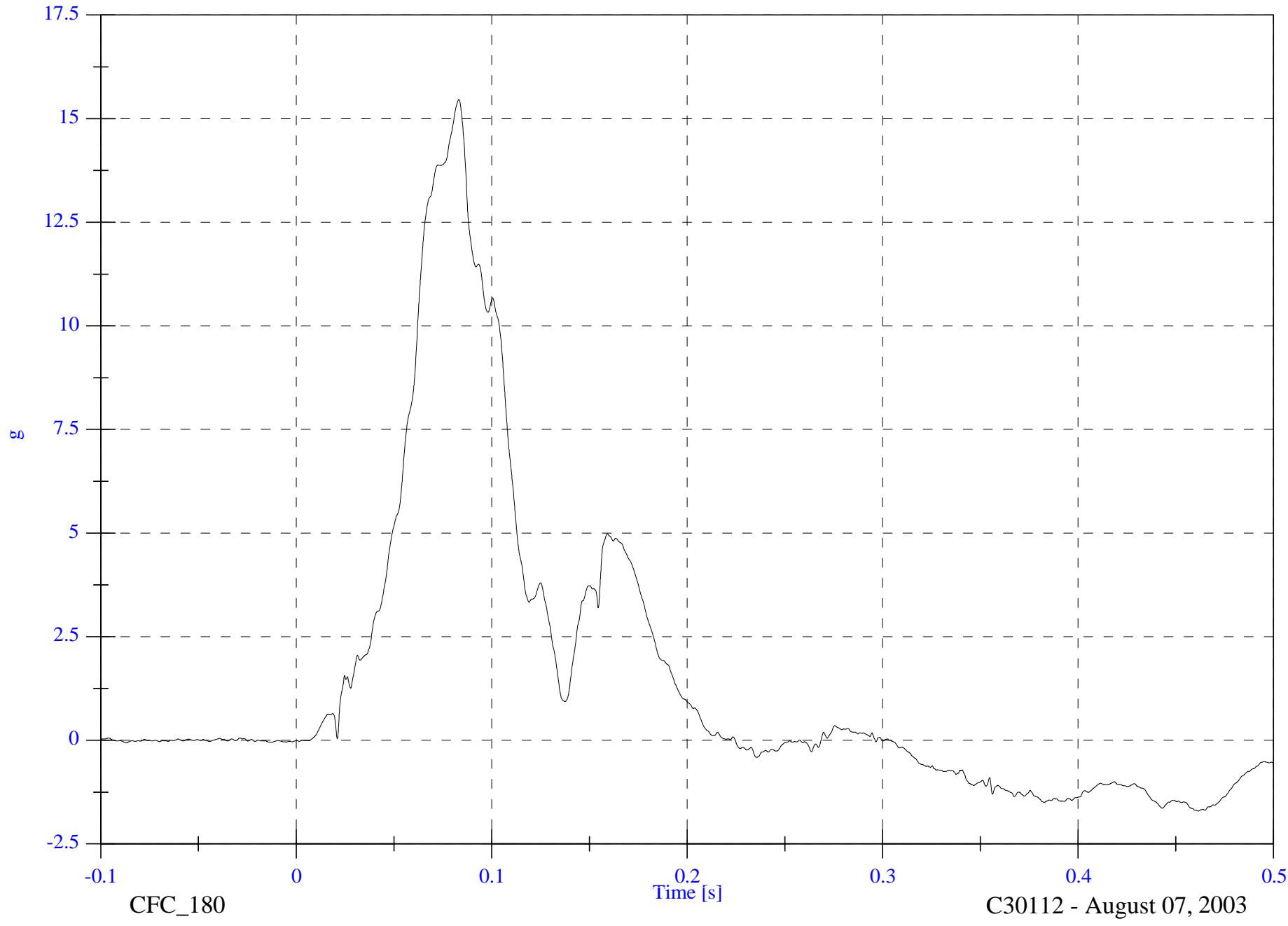
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Chest Ax

Max: 15.5 [g] at 0.083 [s]  
Min: -1.7 [g] at 0.462 [s]

B-35

8655-F301-14R



FMVSS 301 Test 5 - 2003 Saturn Ion

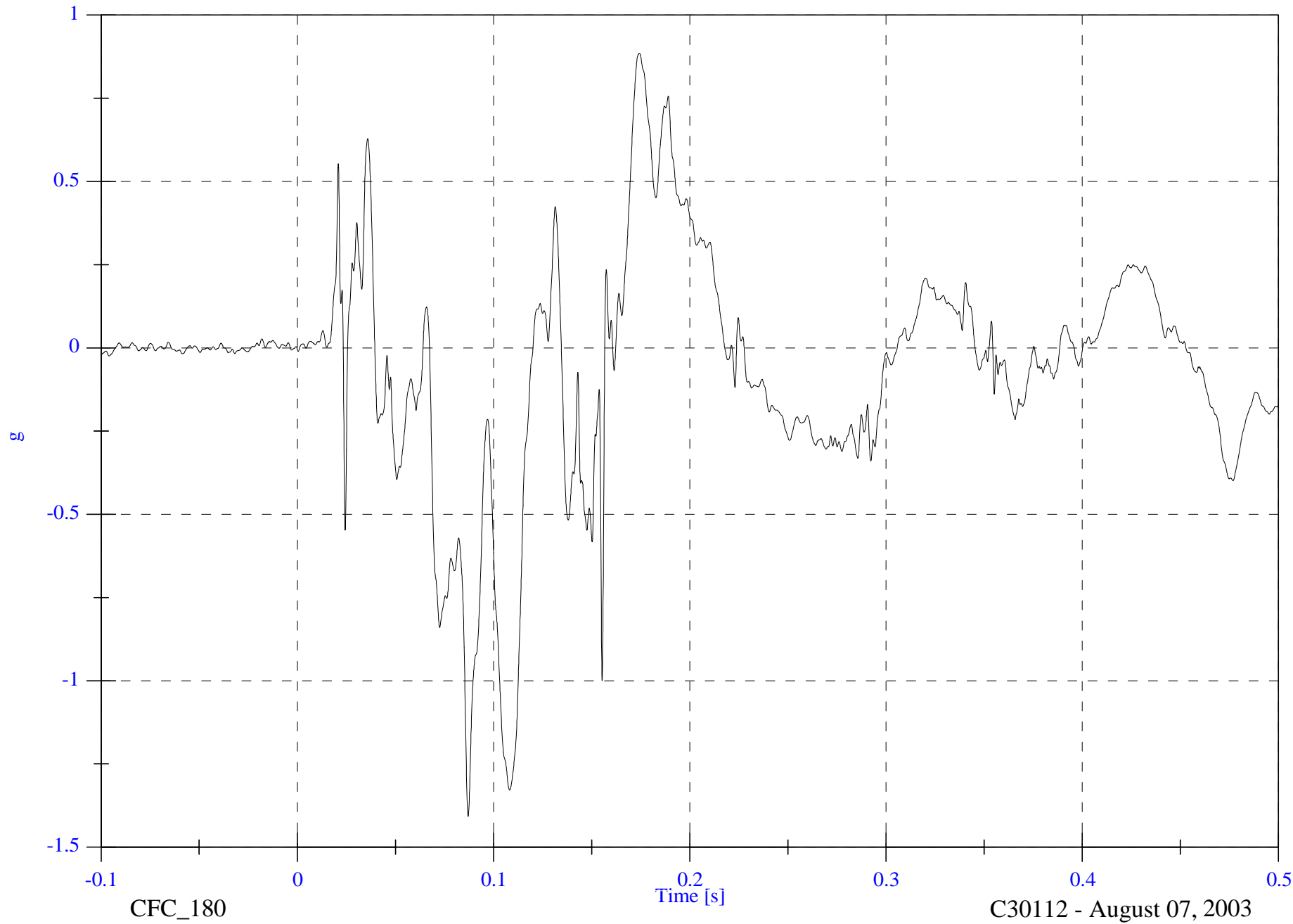
V2P1 Chest Ay

Max: 0.9 [g] at 0.174 [s]

Min: -1.4 [g] at 0.087 [s]

B-36

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

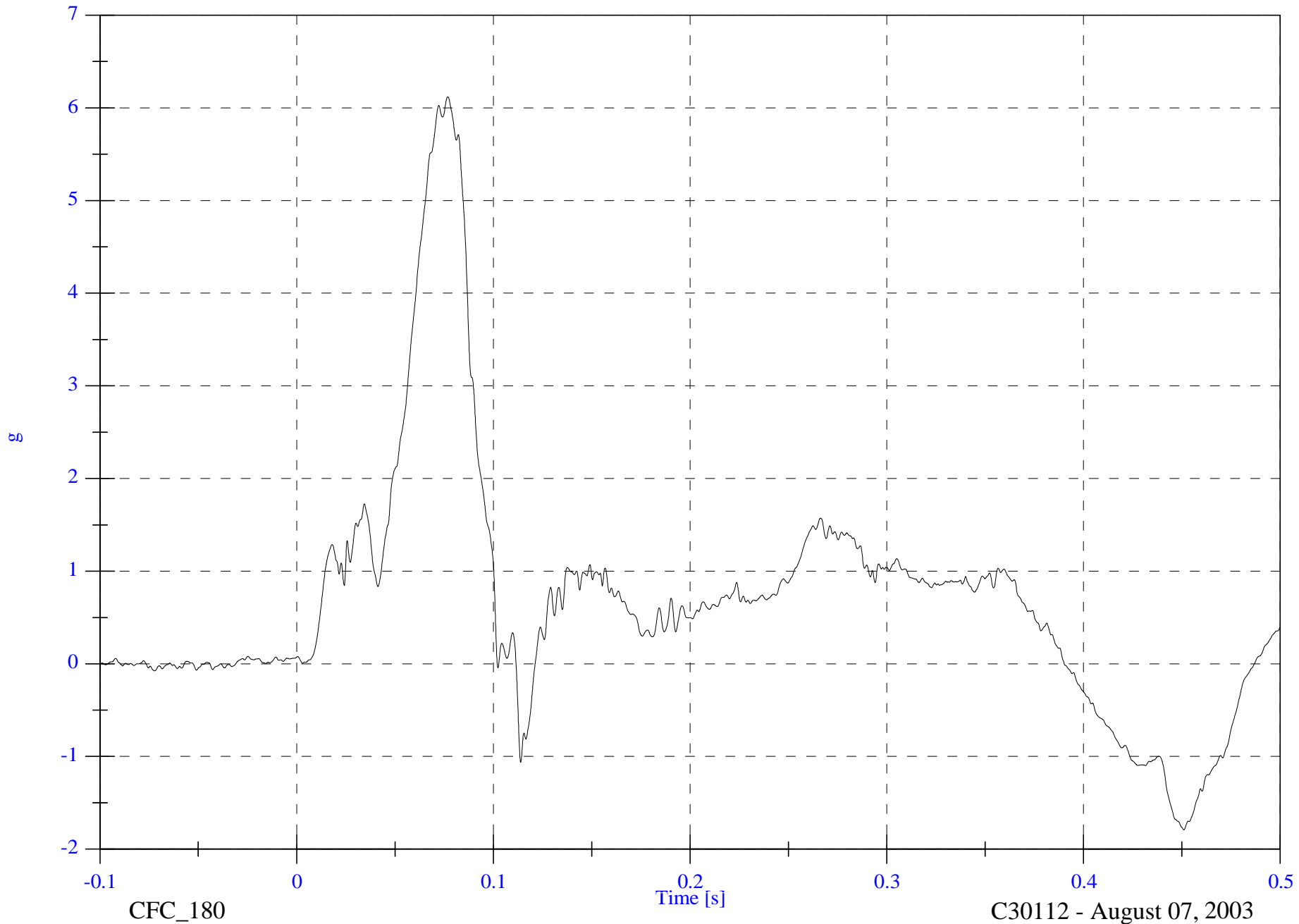
V2P1 Chest Az

Max: 6.1 [g] at 0.077 [s]

Min: -1.8 [g] at 0.451 [s]

B-37

8655-F301-14R



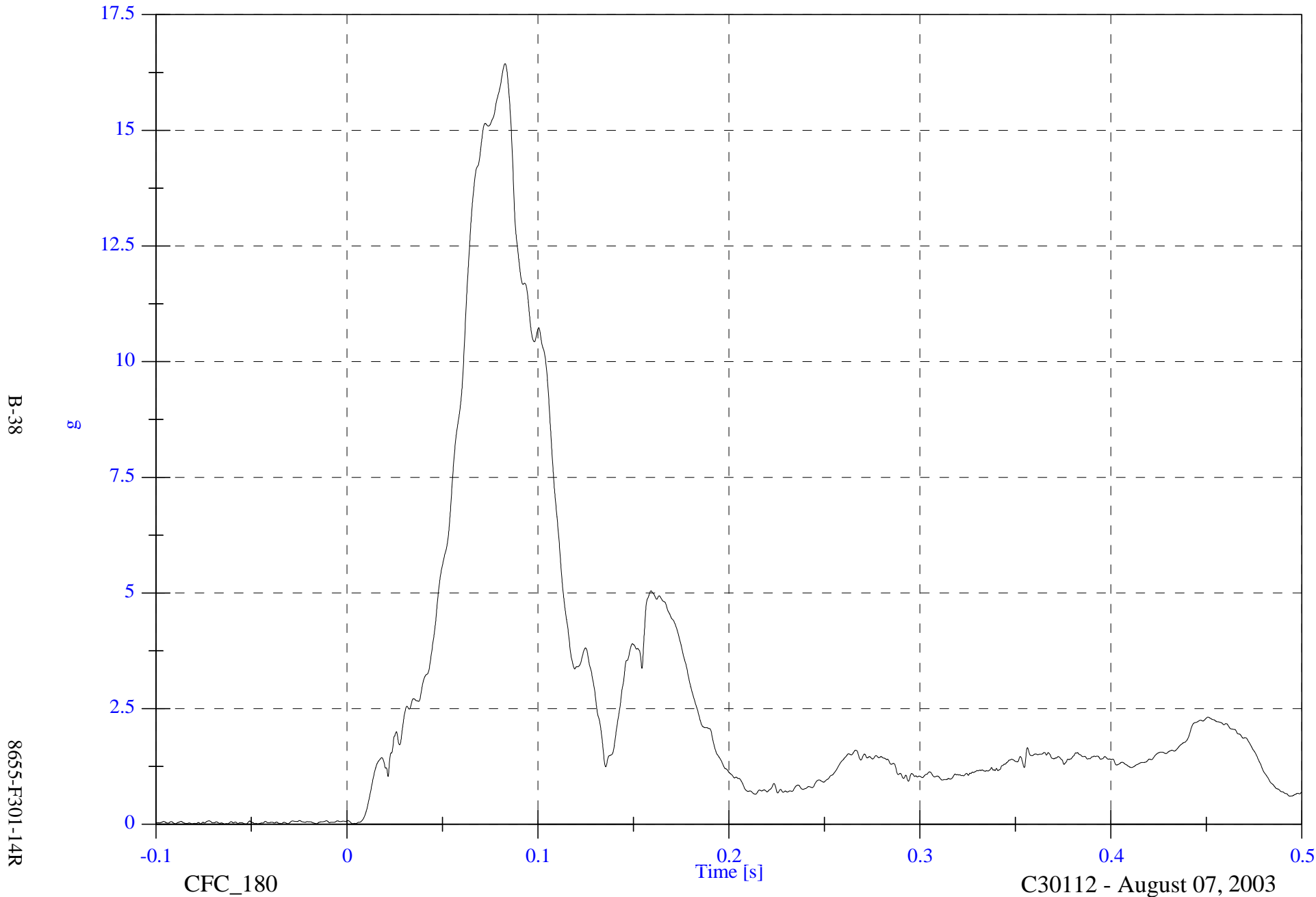
CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Chest A Resultant

Max: 16.4 [g] at 0.083 [s]  
Min: 0.0 [g] at -0.064 [s]



B-38

8655-F301-14R

CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

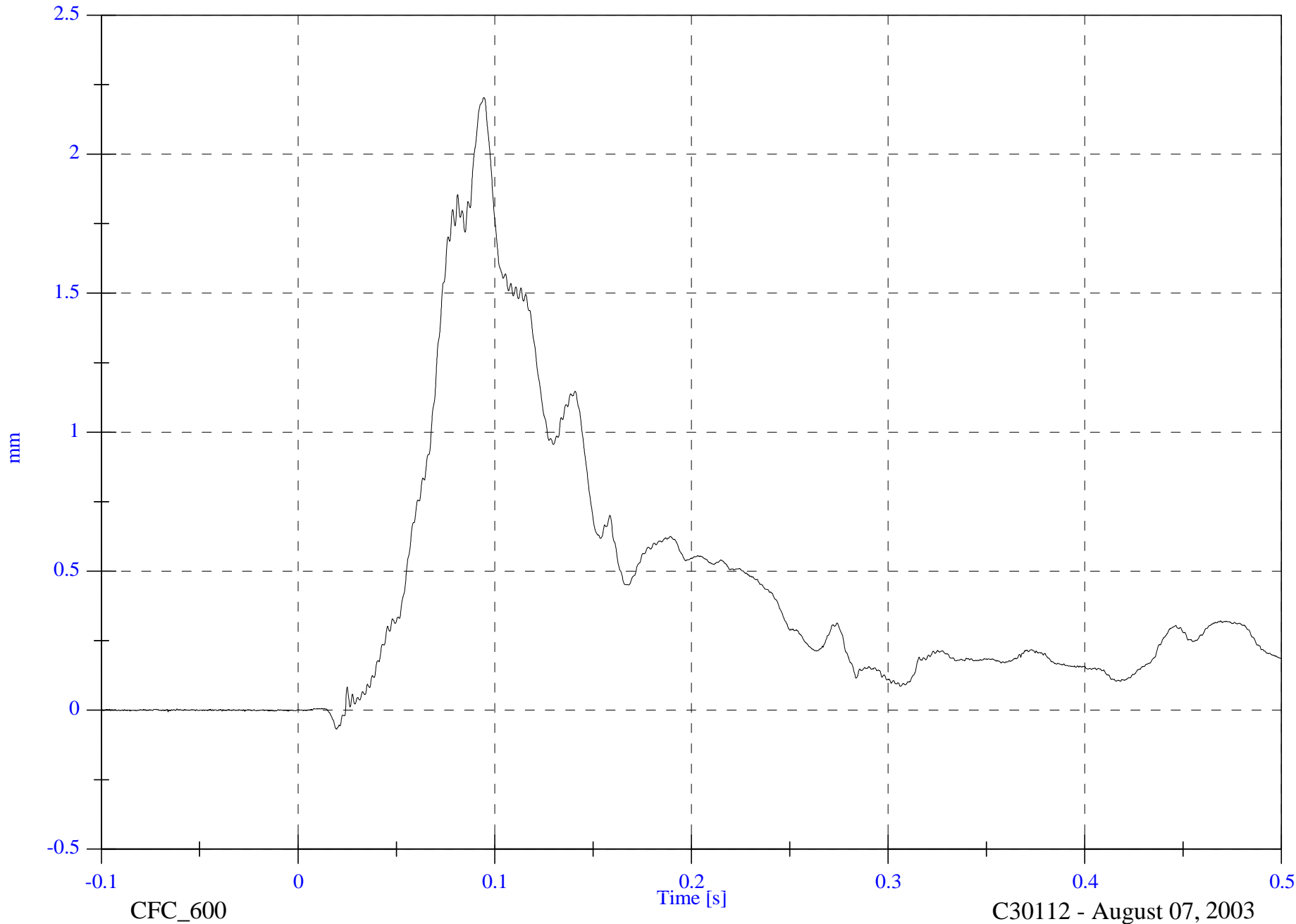
V2P1 Chest Dx

Max: 2.2 [mm] at 0.095 [s]

Min: -0.1 [mm] at 0.020 [s]

B-39

8655-F301-14R



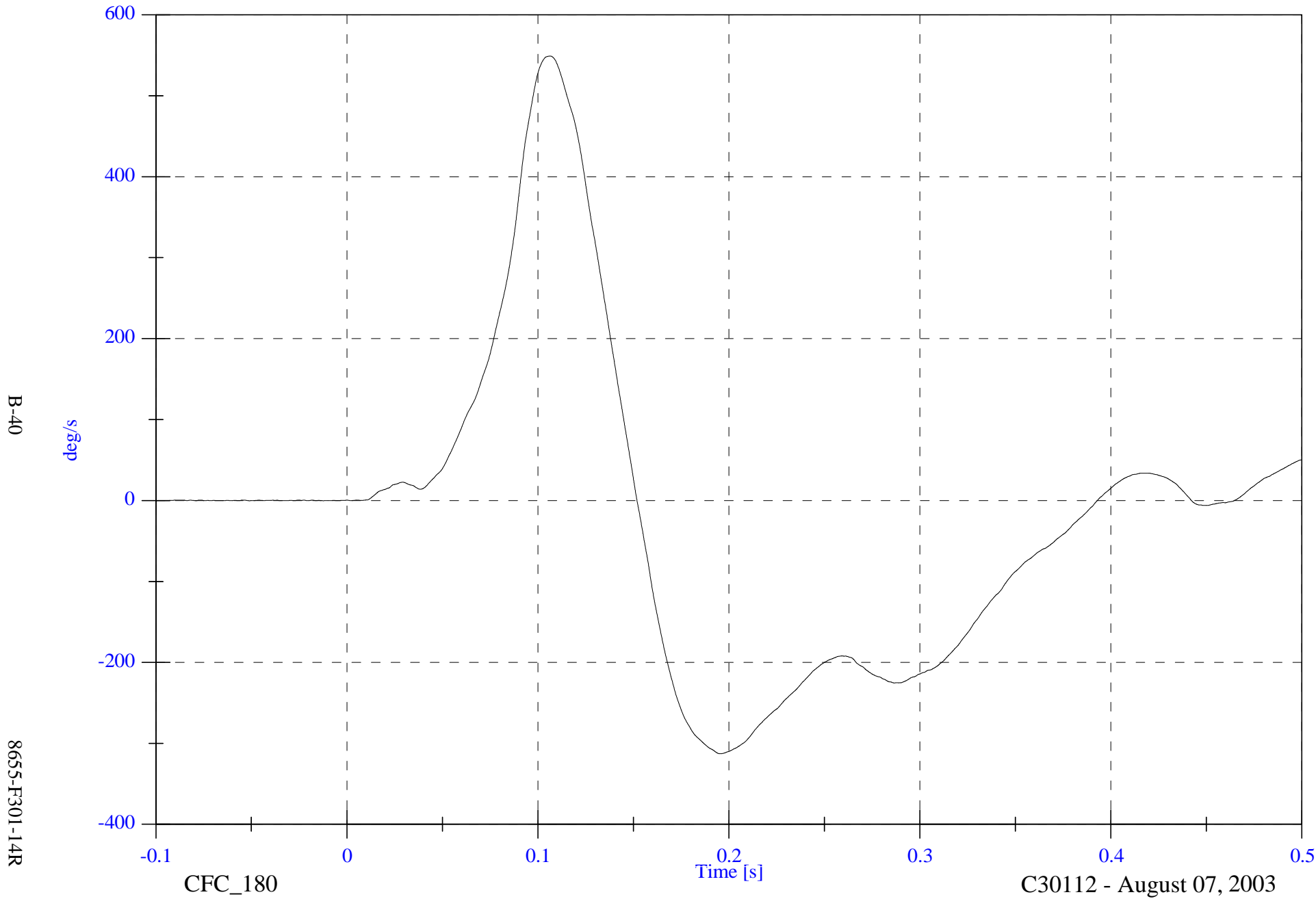
CFC\_600

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Chest AVy

Max: 549.1 [deg/s] at 0.106 [s]  
Min: -312.8 [deg/s] at 0.195 [s]



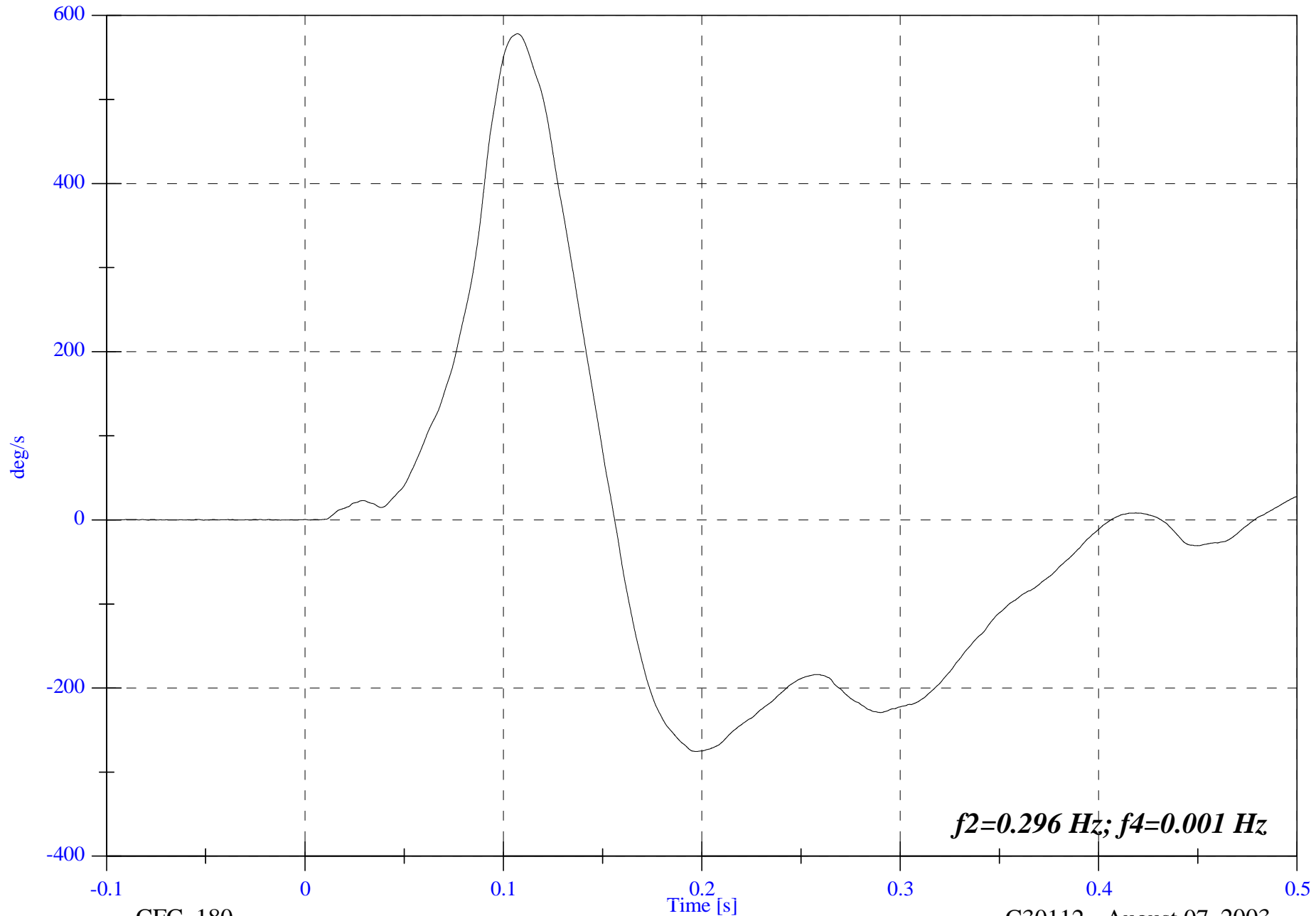
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Chest Comp AVy

Max: 577.9 [deg/s] at 0.107 [s]  
Min: -275.5 [deg/s] at 0.197 [s]

B-41

8655-F301-14R



***f2=0.296 Hz; f4=0.001 Hz***

CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

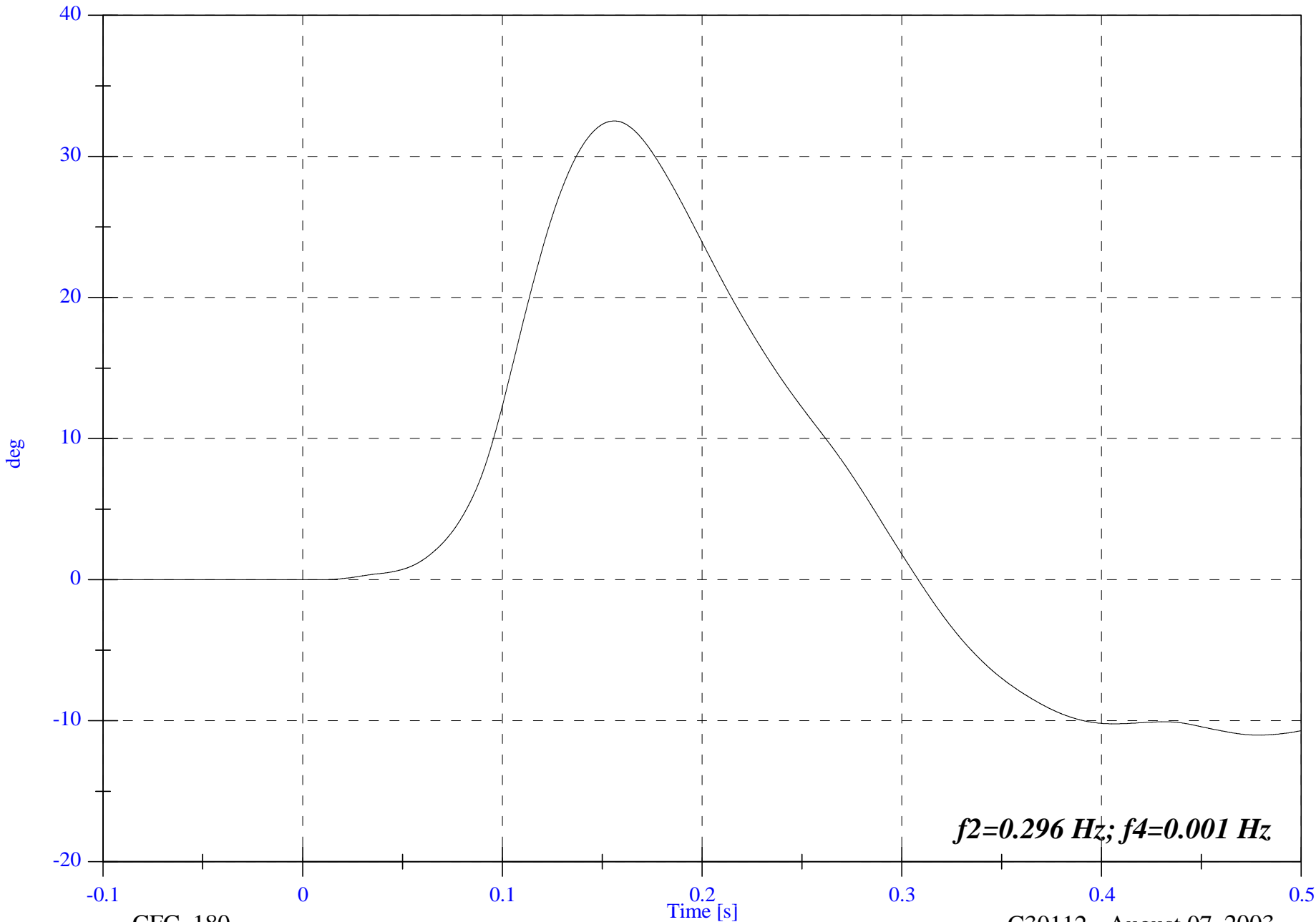
V2P1 Chest Comp ADy

Max: 32.5 [deg] at 0.156 [s]

Min: -11.0 [deg] at 0.478 [s]

B-42

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

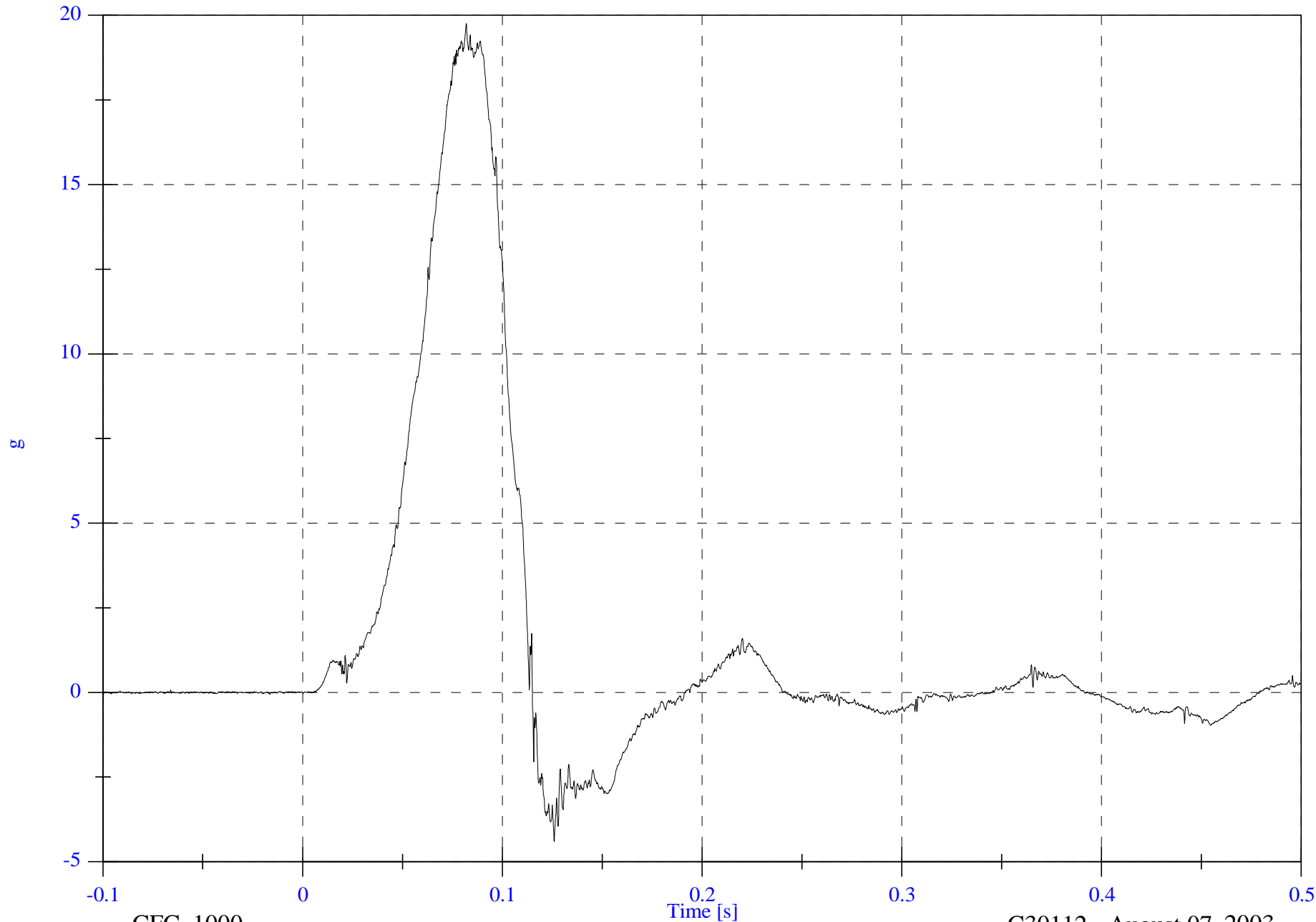
V2P1 Pelvic Ax

Max: 19.8 [g] at 0.082 [s]

Min: -4.4 [g] at 0.126 [s]

B-43

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

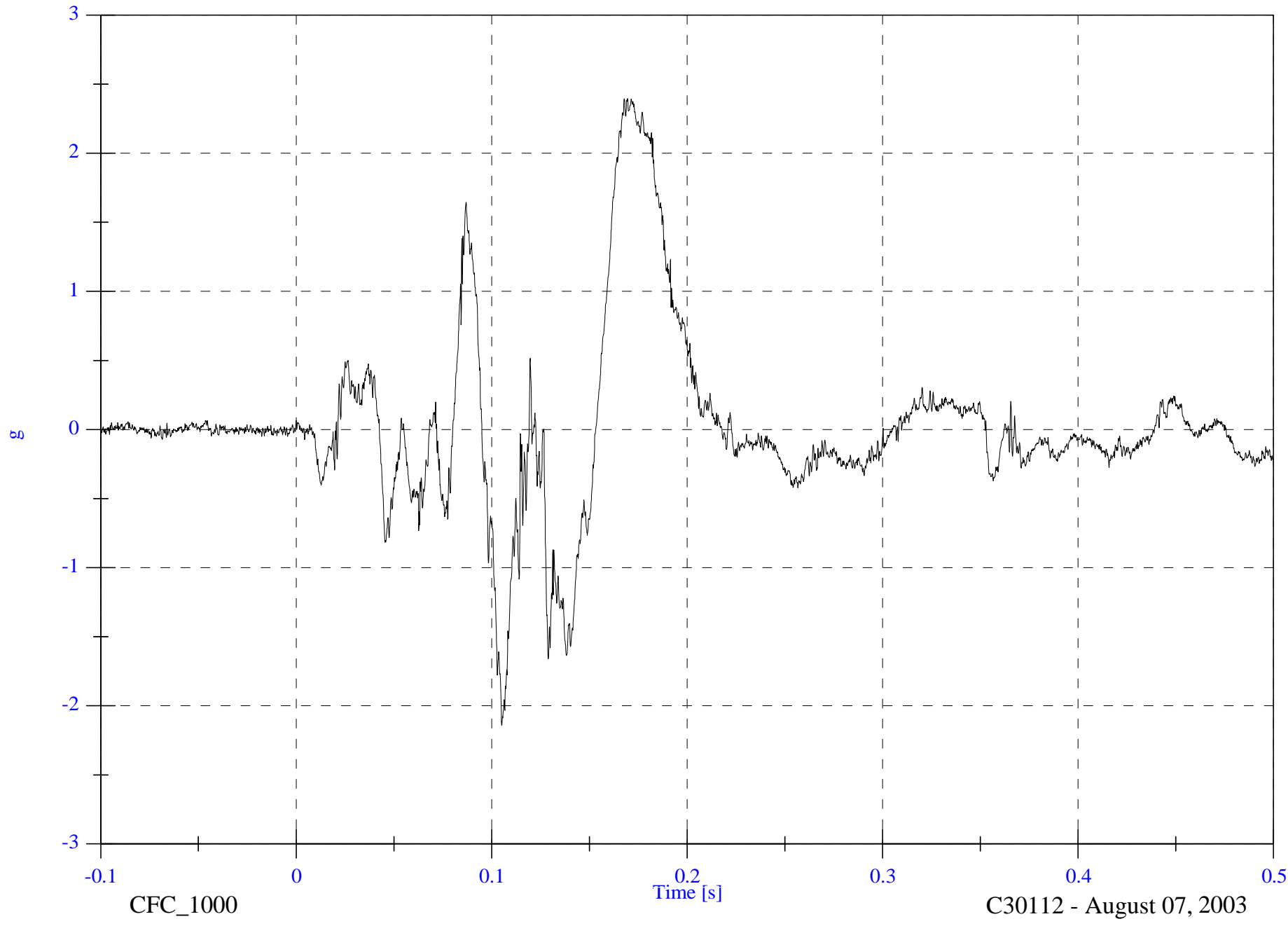
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Pelvic Ay

Max: 2.4 [g] at 0.170 [s]  
Min: -2.1 [g] at 0.105 [s]

B-44

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

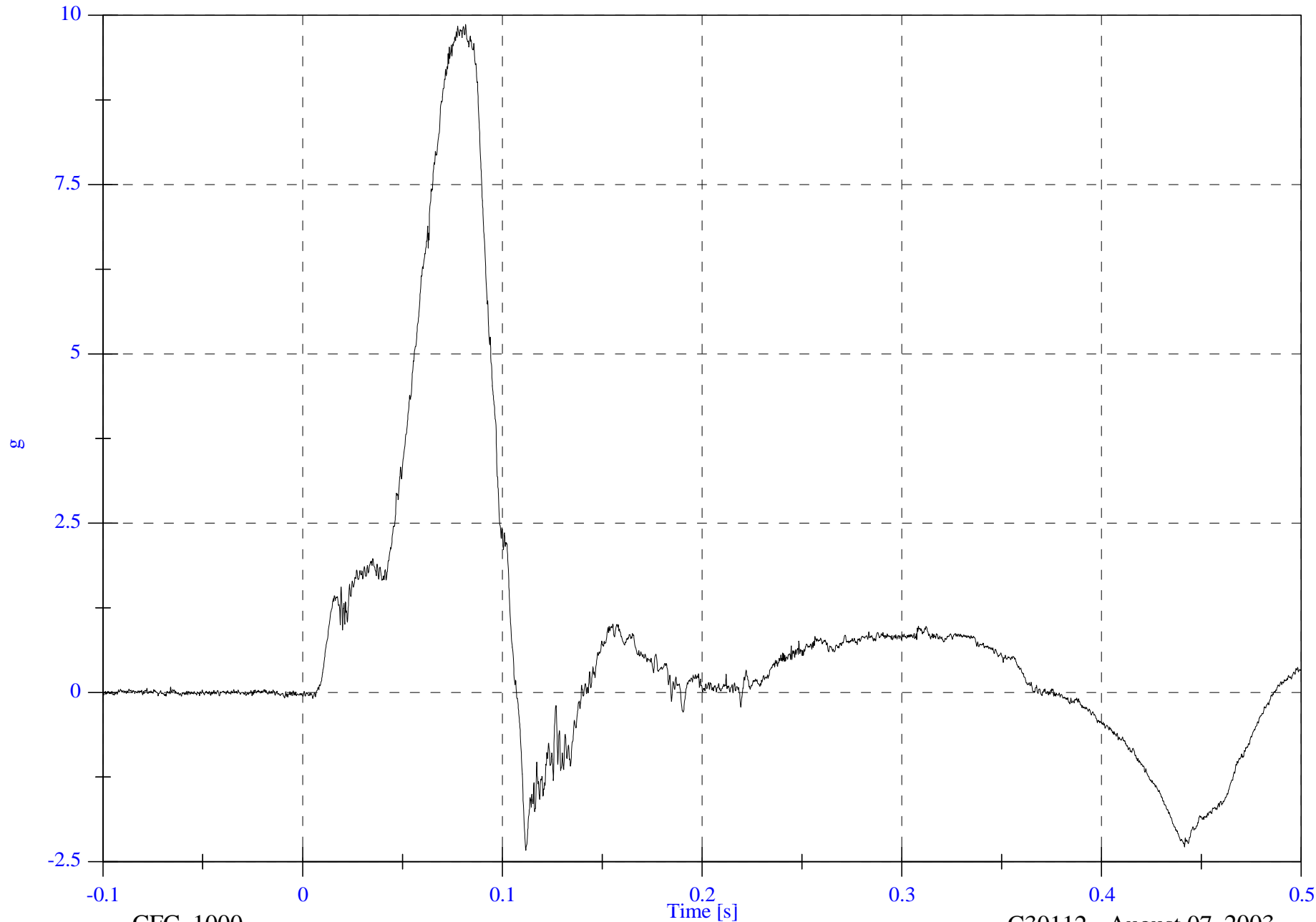
V2P1 Pelvic Az

Max: 9.9 [g] at 0.082 [s]

Min: -2.3 [g] at 0.112 [s]

B-45

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

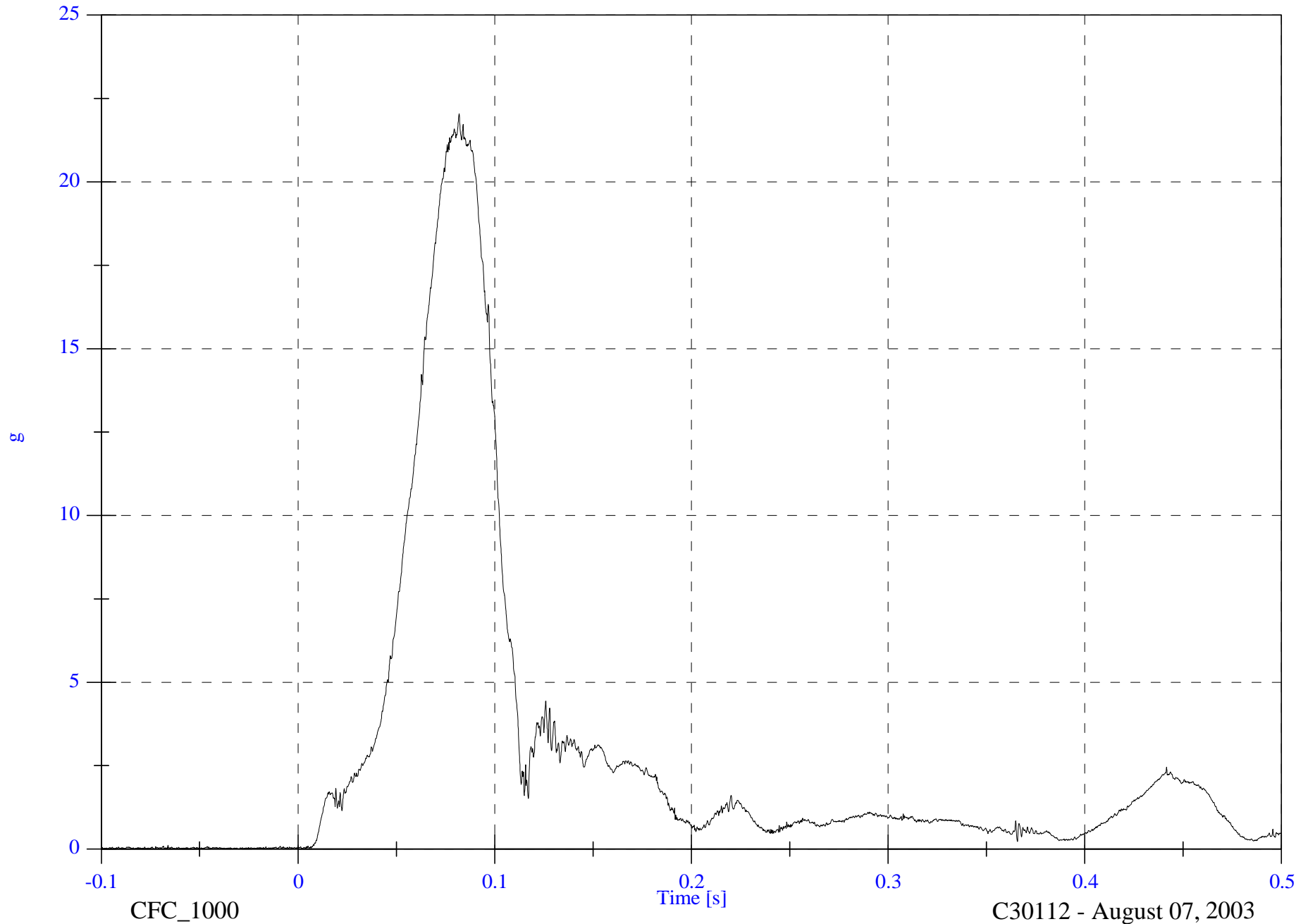
V2P1 Pelvic A Resultant

Max: 22.0 [g] at 0.082 [s]

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

B-46

8655-F301-14R



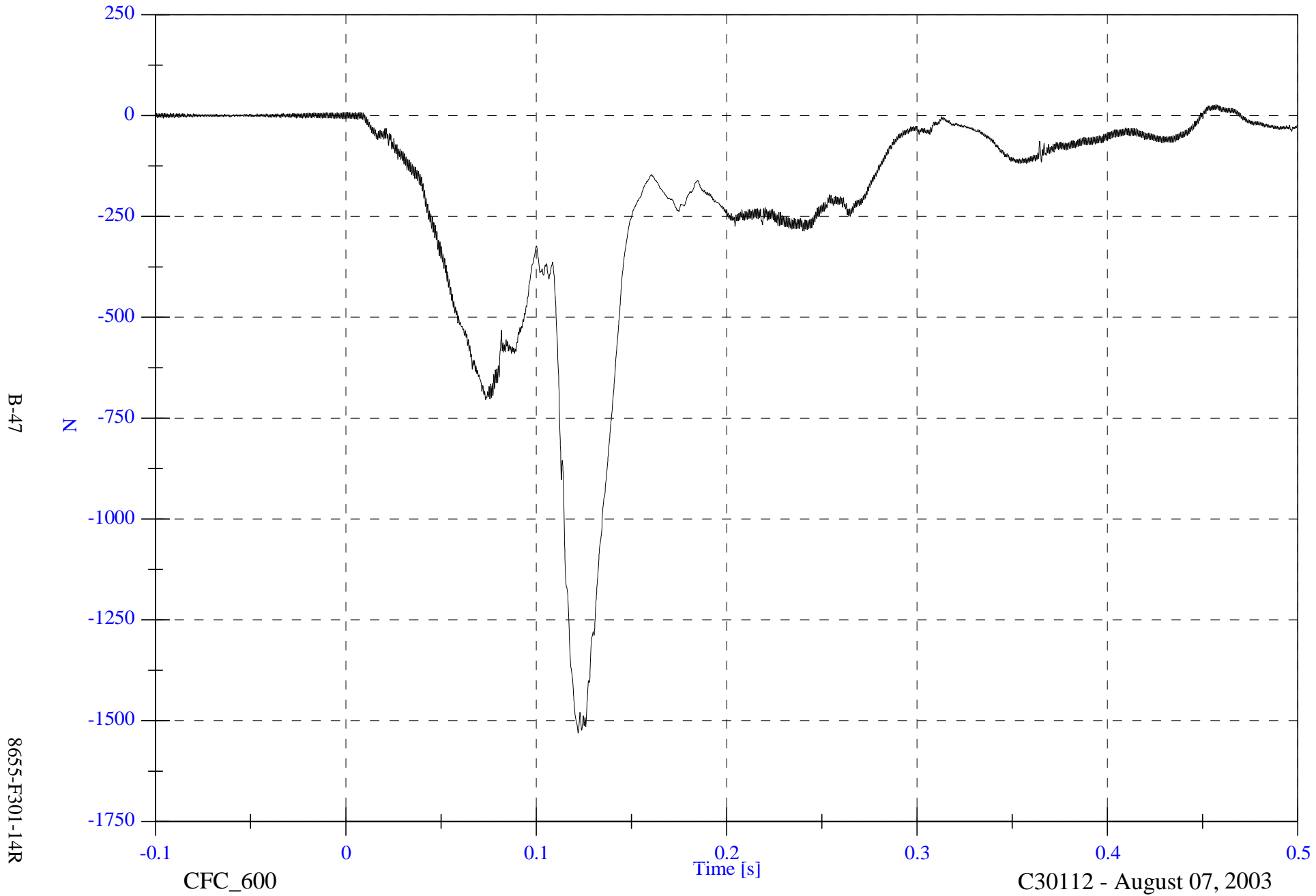
CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Left Femur Fz

Max: 27.8 [N] at 0.457 [s]  
Min: -1530.4 [N] at 0.122 [s]



B-47

N

8655-F301-14R

CFC\_600

Time [s]

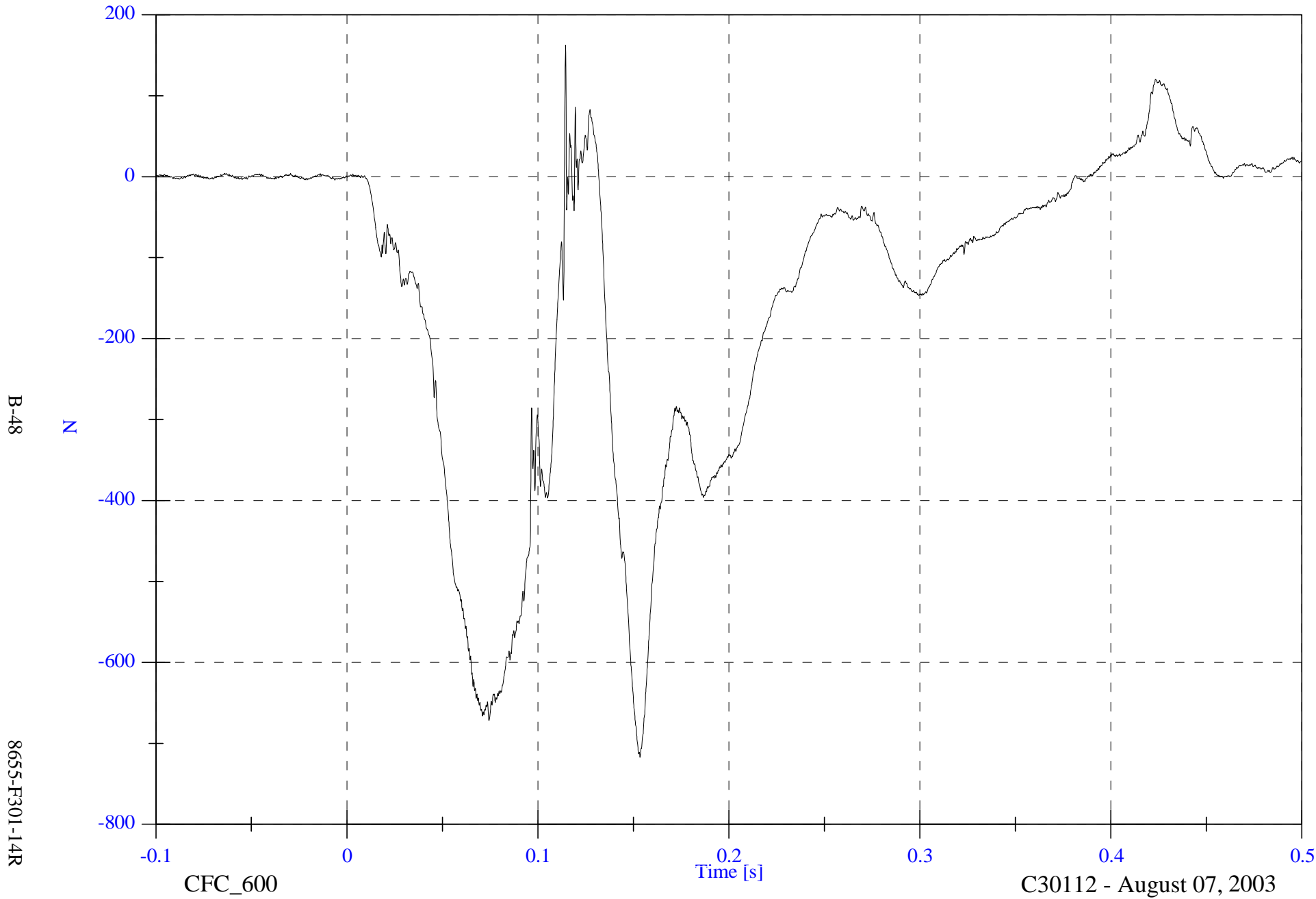
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Right Femur Fz

Max: 162.6 [N] at 0.114 [s]

Min: -717.3 [N] at 0.153 [s]



B-48

8655-F301-14R

CFC\_600

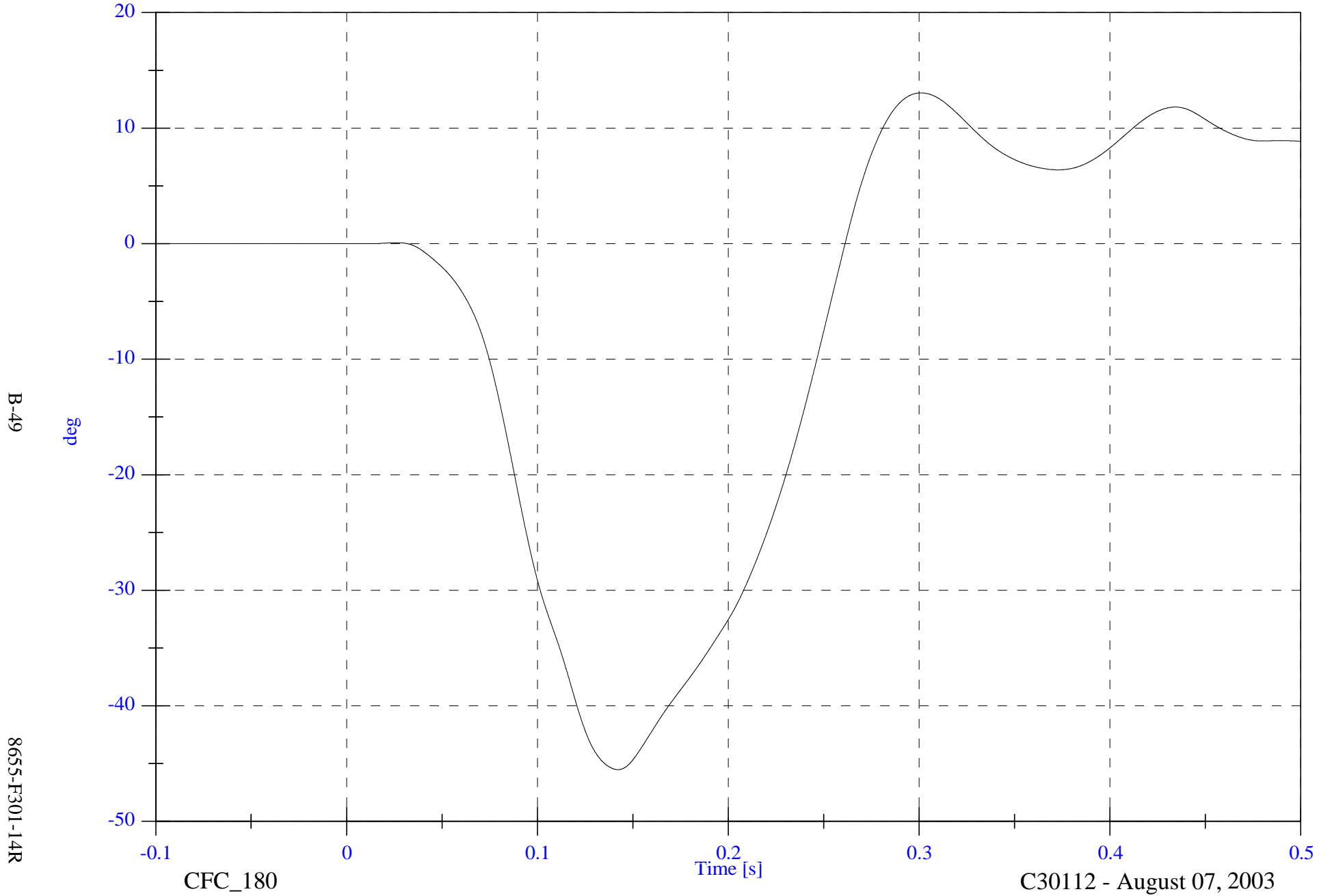
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Head to Chest Comp ADy

Max: 13.1 [deg] at 0.301 [s]

Min: -45.5 [deg] at 0.142 [s]



B-49

8655-F301-14R

CFC\_180

Time [s]

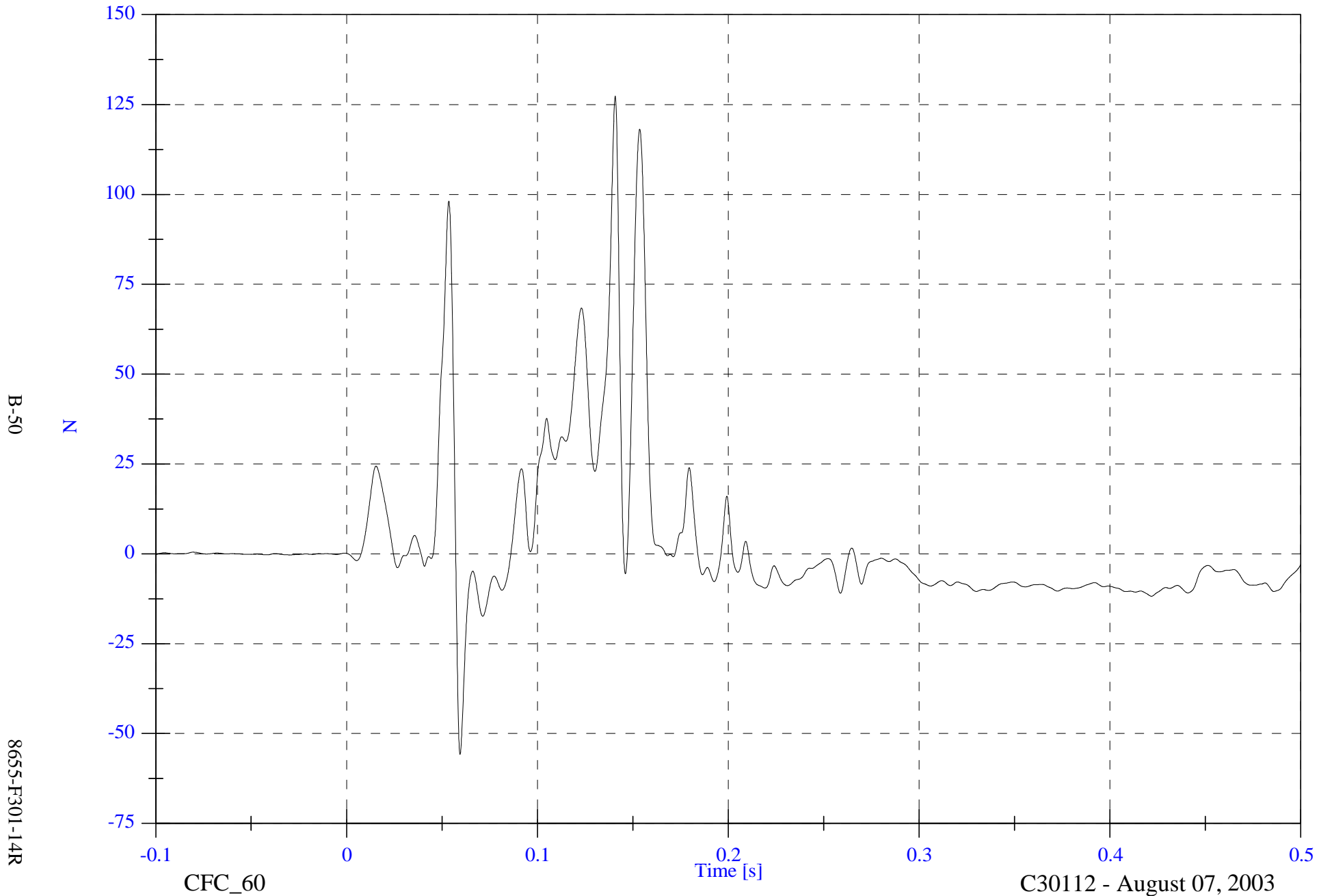
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Lap Belt F

Max: 127.4 [N] at 0.141 [s]

Min: -55.8 [N] at 0.059 [s]



B-50

N

8655-F301-14R

CFC\_60

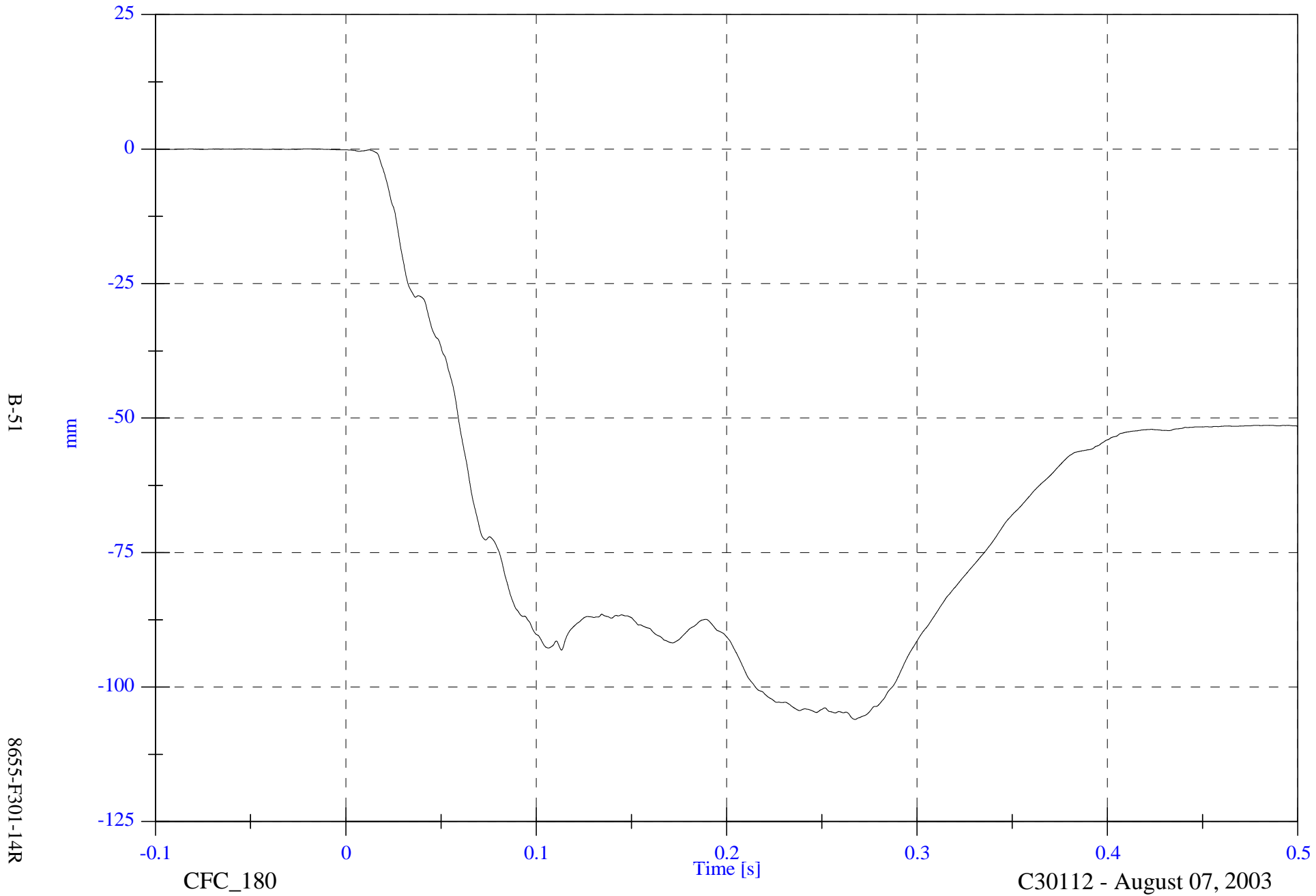
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Belt Spoolout

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

Min: -106.0 [mm] at 0.267 [s]



B-51

8655-F301-14R

CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

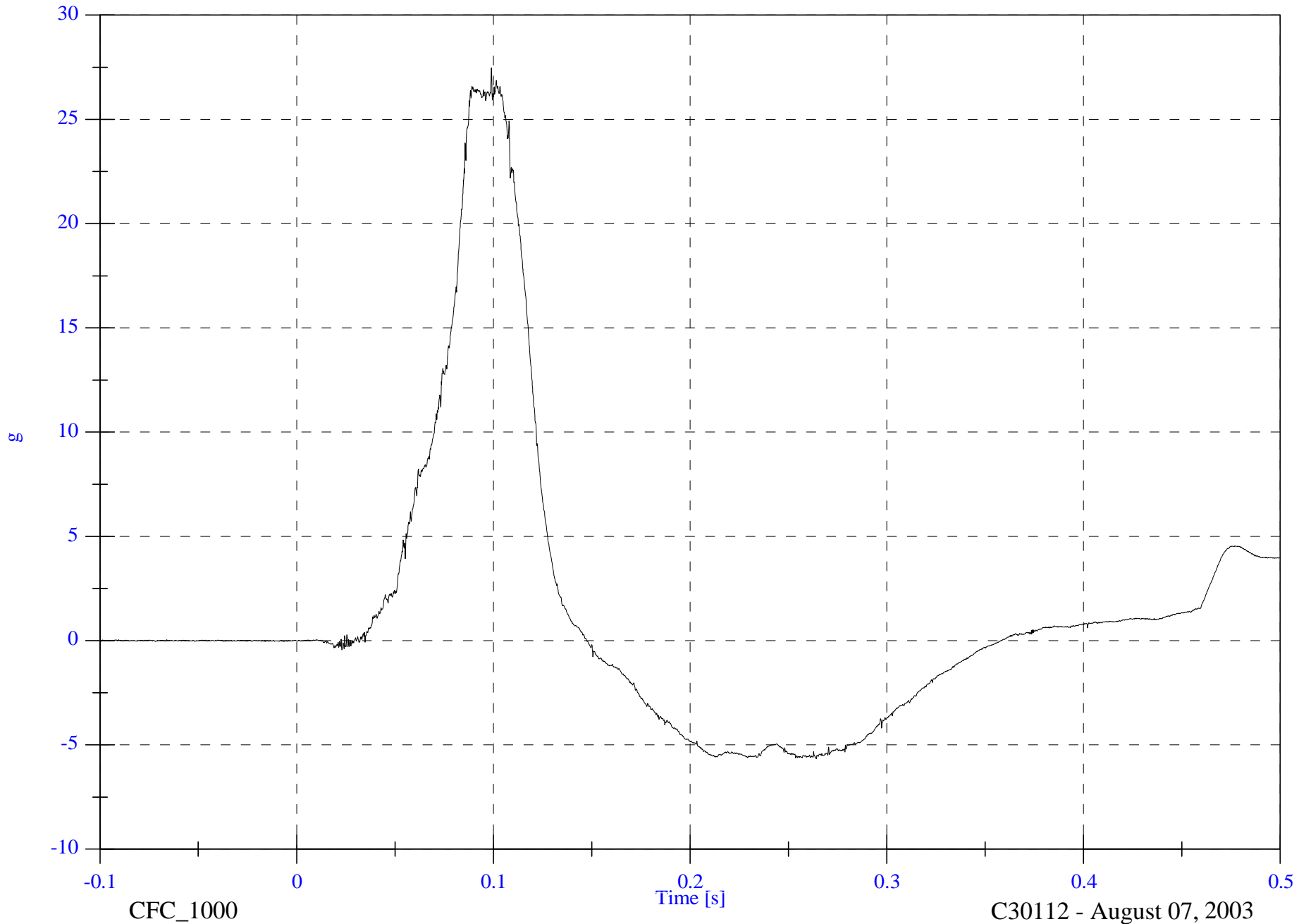
V2P2 Head Ax

Max: 27.5 [g] at 0.099 [s]

Min: -5.7 [g] at 0.264 [s]

B-52

8655-F301-14R



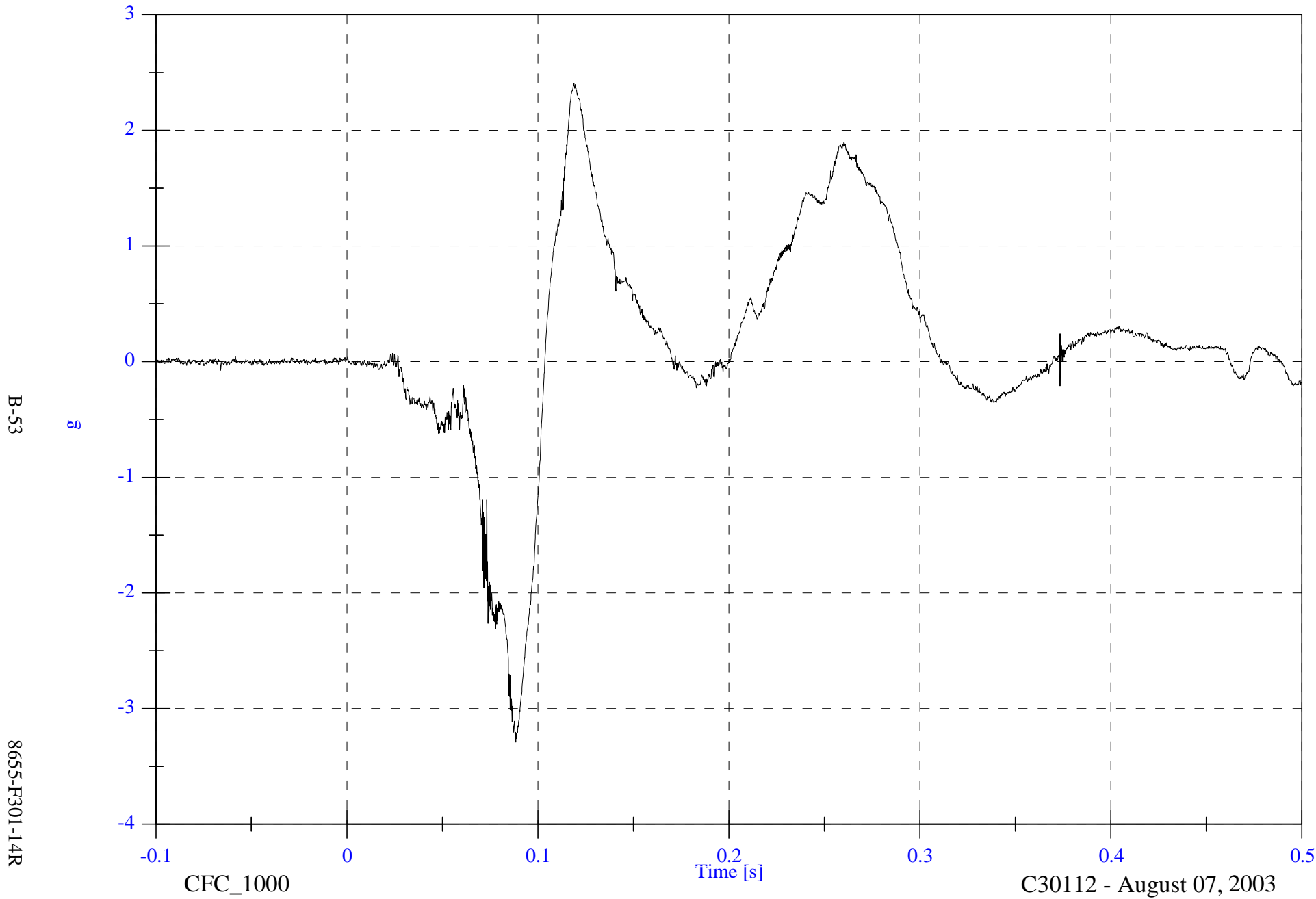
CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Head Ay

Max: 2.4 [g] at 0.119 [s]  
Min: -3.3 [g] at 0.088 [s]



B-53

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

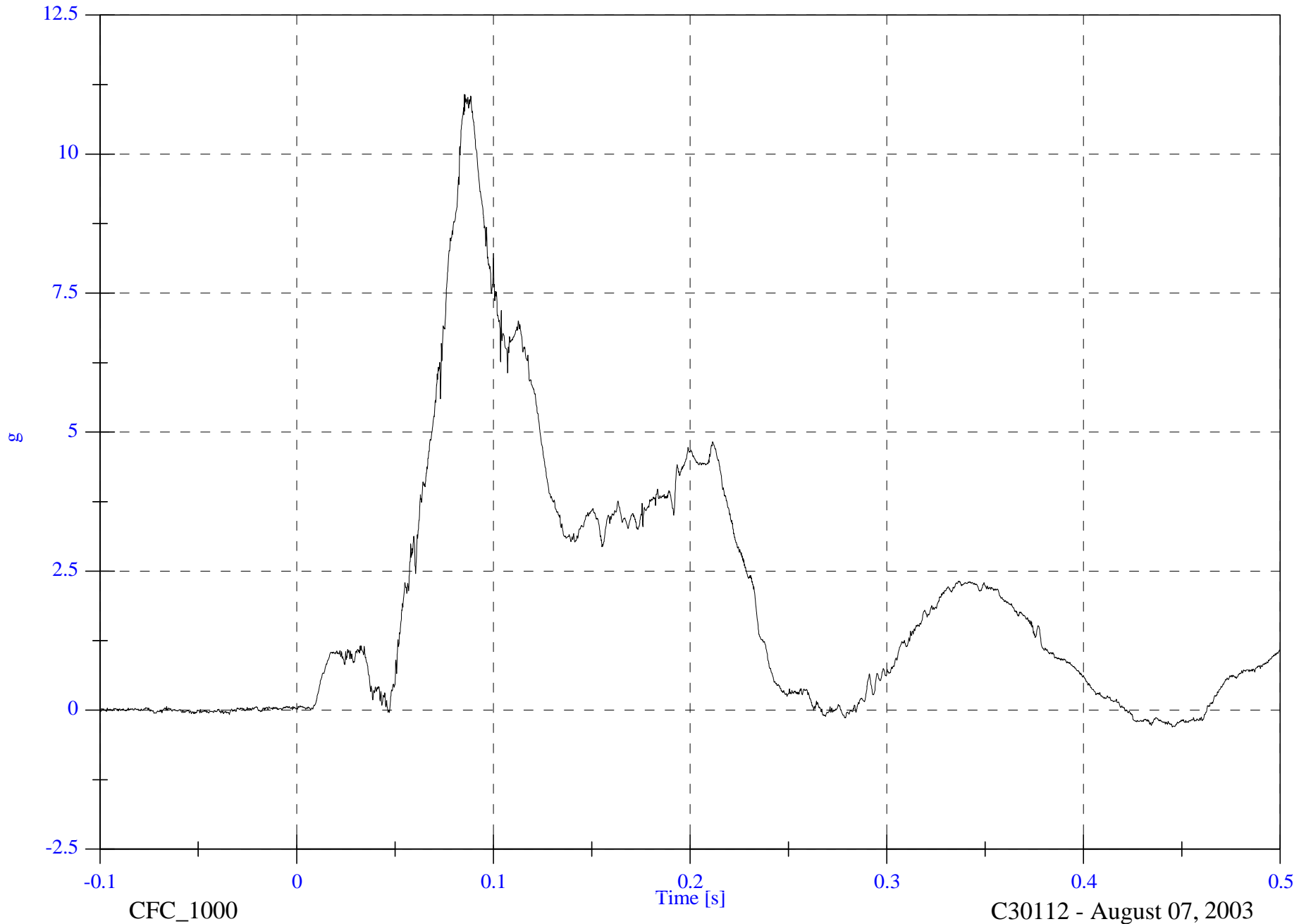
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Head Az

Max: 11.1 [g] at 0.085 [s]  
Min: -0.3 [g] at 0.445 [s]

B-54

8655-F301-14R



FMVSS 301 Test 5 - 2003 Saturn Ion

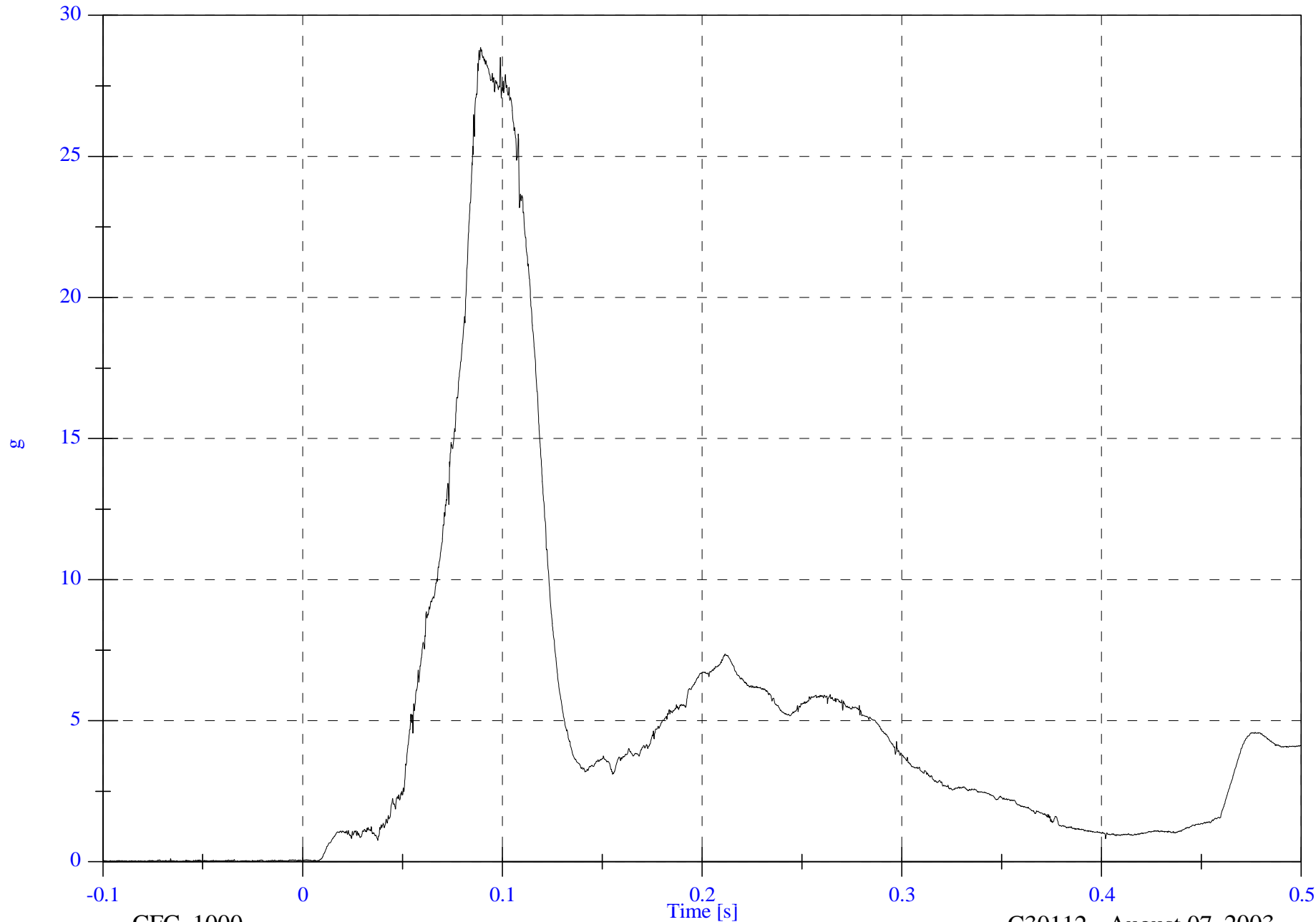
V2P2 Head A Resultant

Max: 28.9 [g] at 0.089 [s]

Min: 0.0 [g] at -0.033 [s]

B-55

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

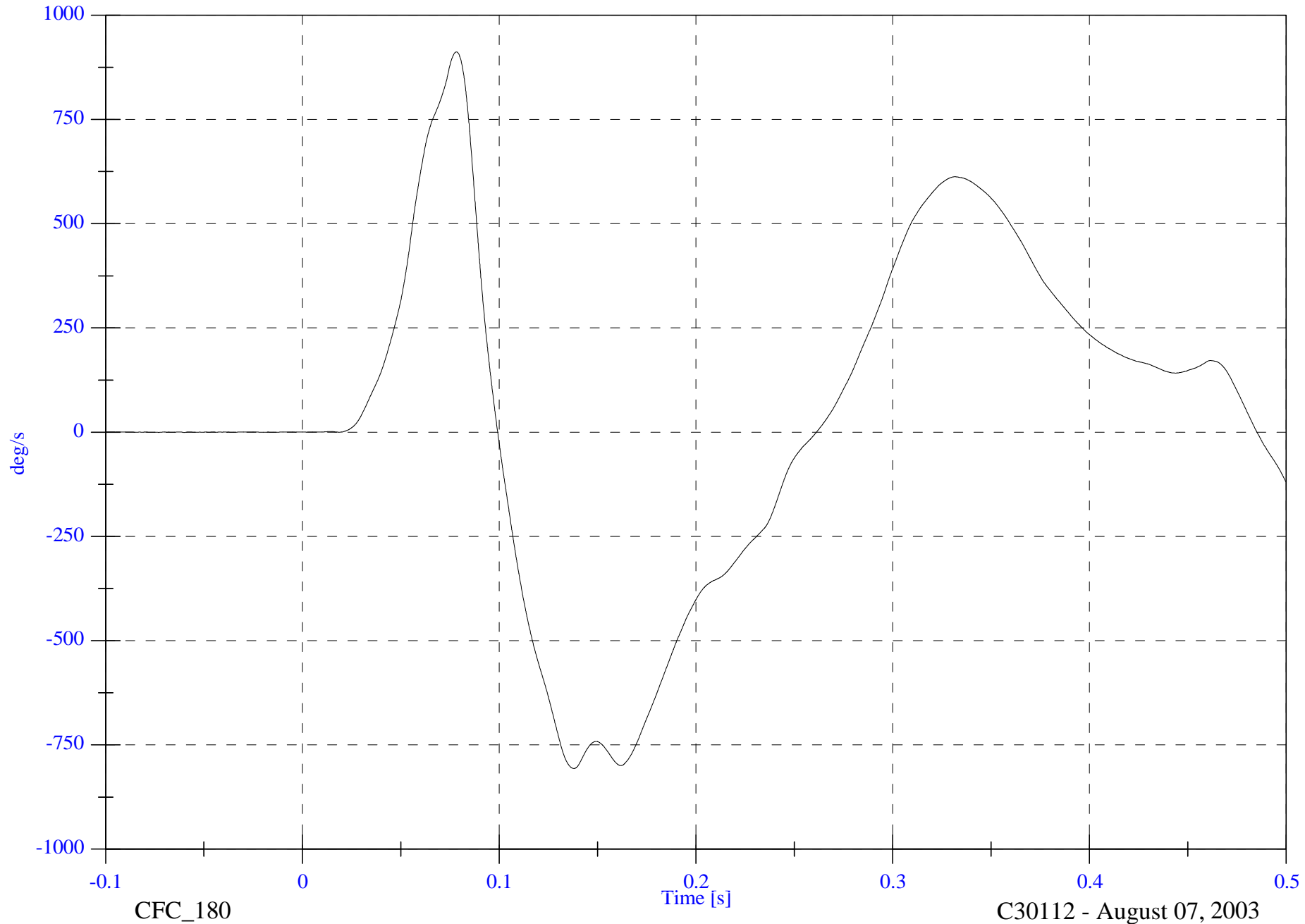
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Head AVy

Max: 912.0 [deg/s] at 0.078 [s]  
Min: -806.6 [deg/s] at 0.138 [s]

B-56

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

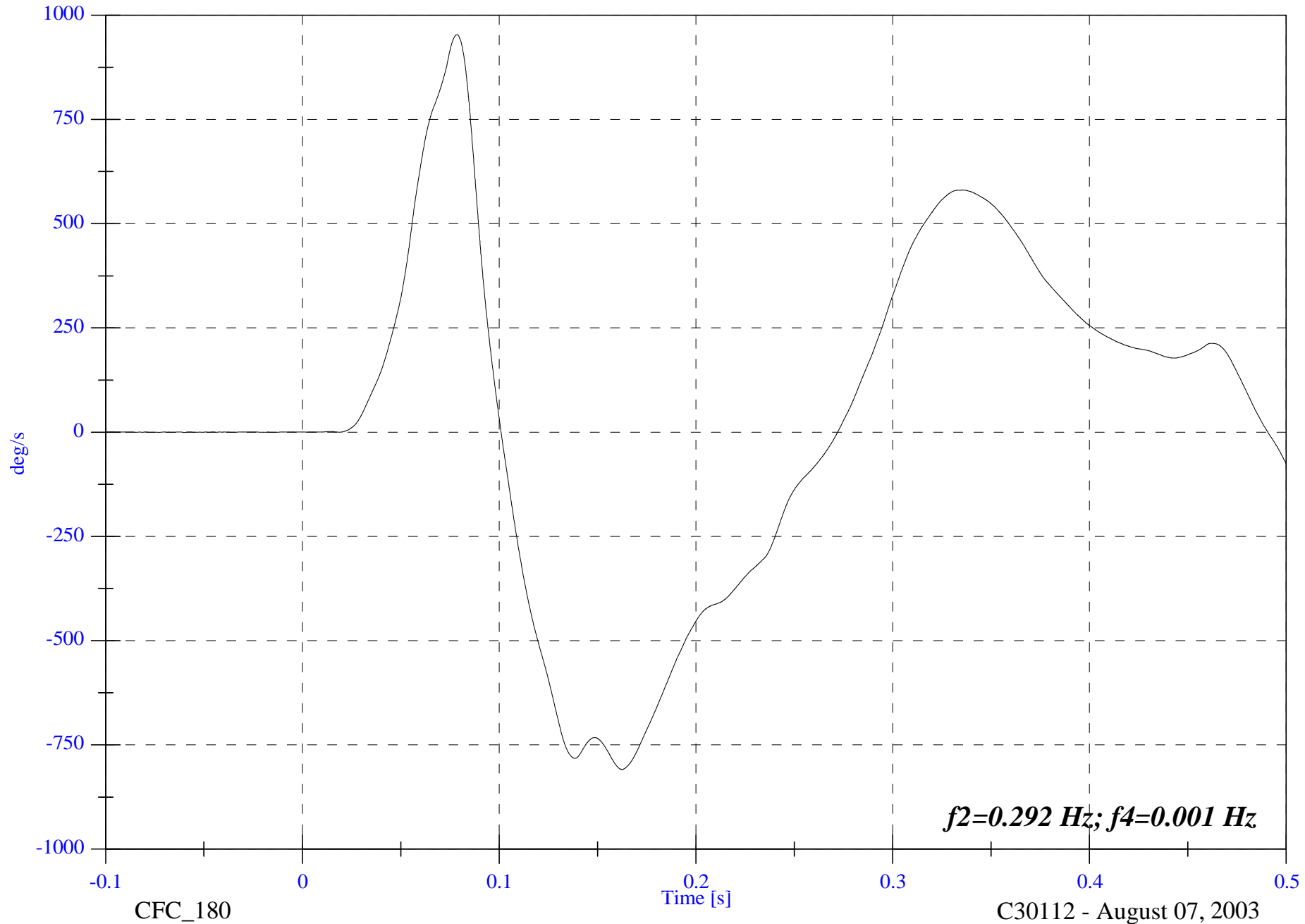
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Head Comp AVy

Max: 953.1 [deg/s] at 0.078 [s]  
Min: -808.9 [deg/s] at 0.162 [s]

B-57

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

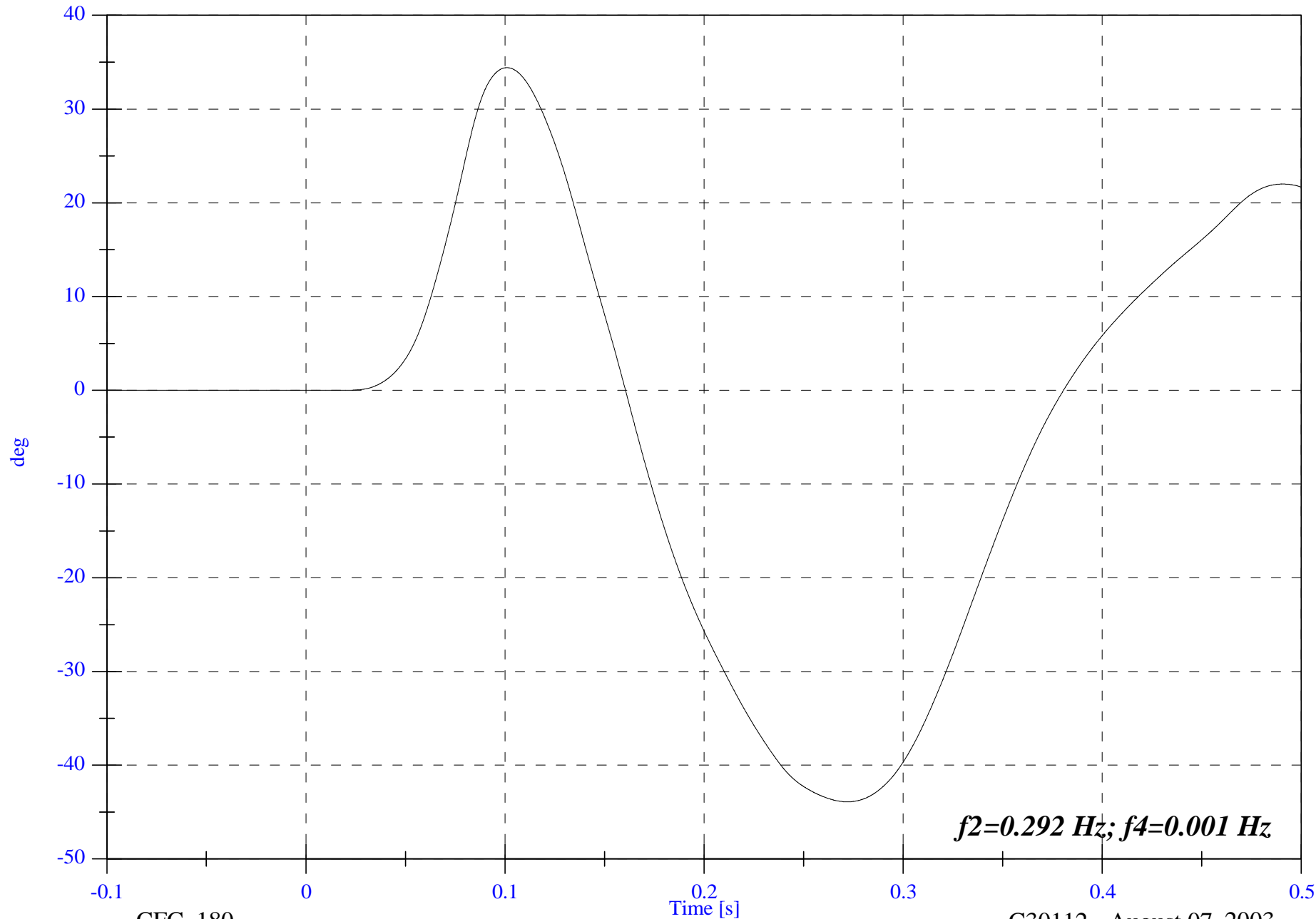
V2P2 Head Comp ADy

Max: 34.4 [deg] at 0.101 [s]

Min: -43.9 [deg] at 0.272 [s]

B-58

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

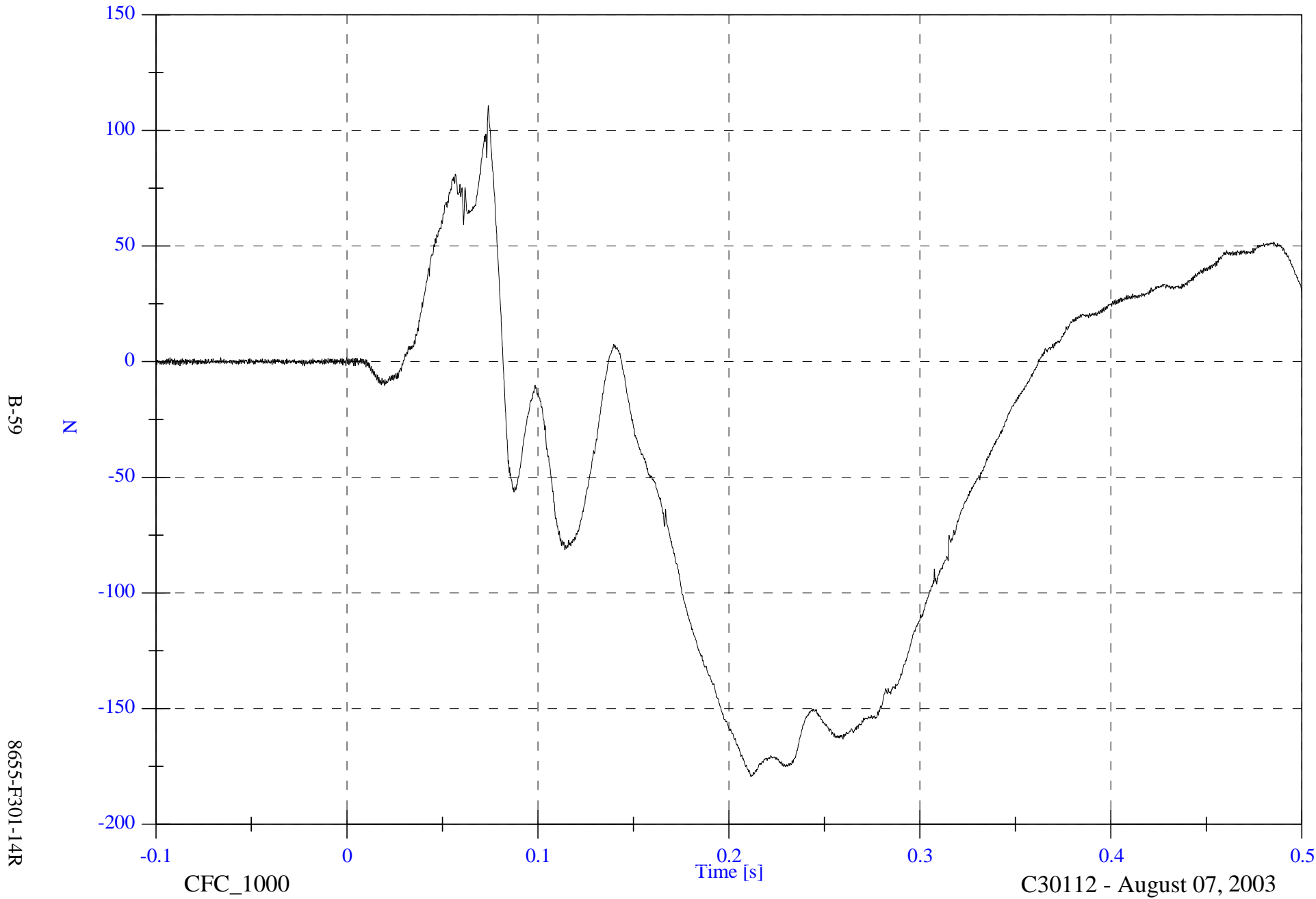
*$f_2=0.292$  Hz;  $f_4=0.001$  Hz*

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Upper Neck Fx

Max: 110.8 [N] at 0.074 [s]

Min: -179.3 [N] at 0.211 [s]



B-59

N

8655-F301-14R

CFC\_1000

Time [s]

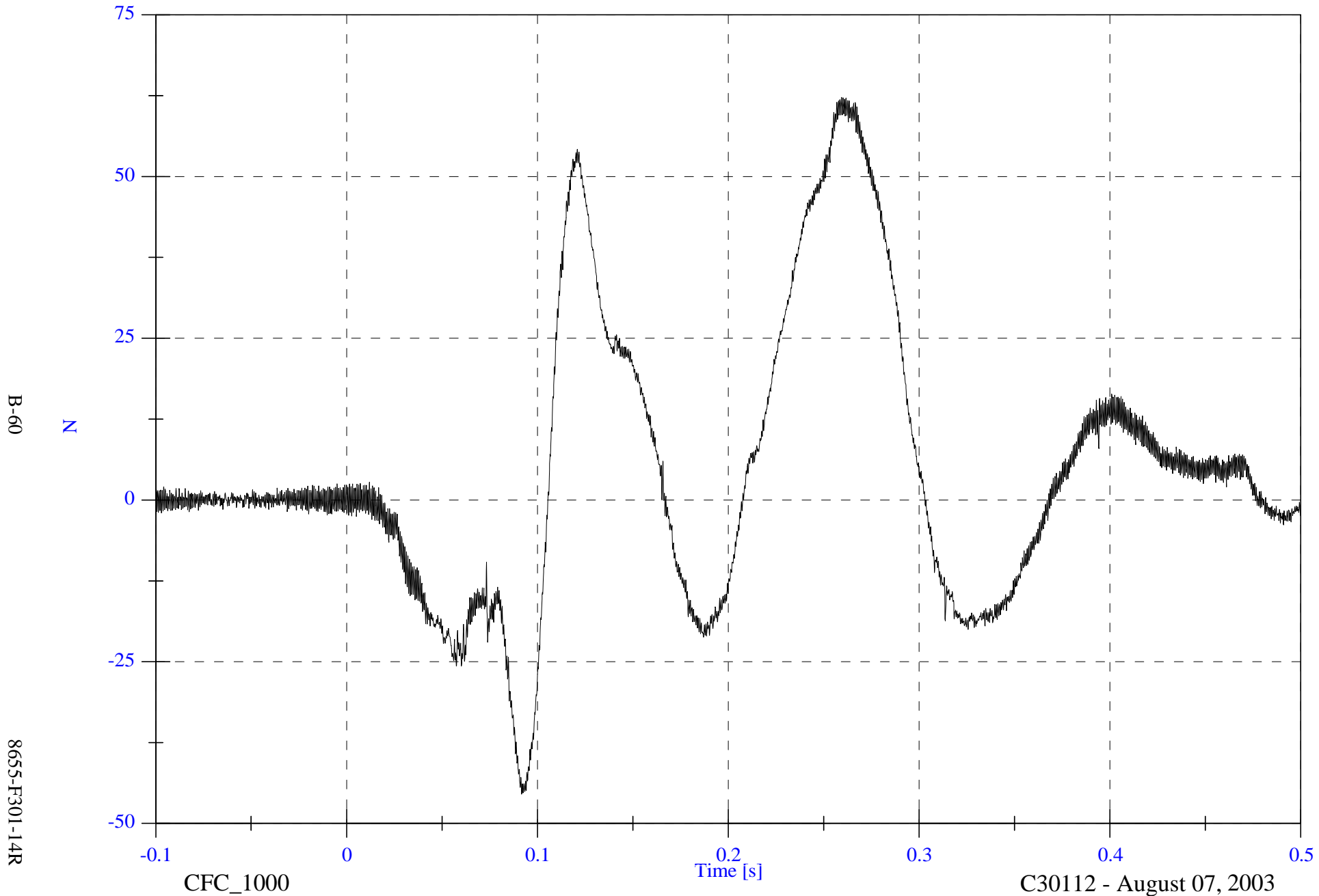
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Upper Neck Fy

Max: 62.2 [N] at 0.259 [s]

Min: -45.5 [N] at 0.092 [s]



B-60

N

8655-F301-14R

CFC\_1000

Time [s]

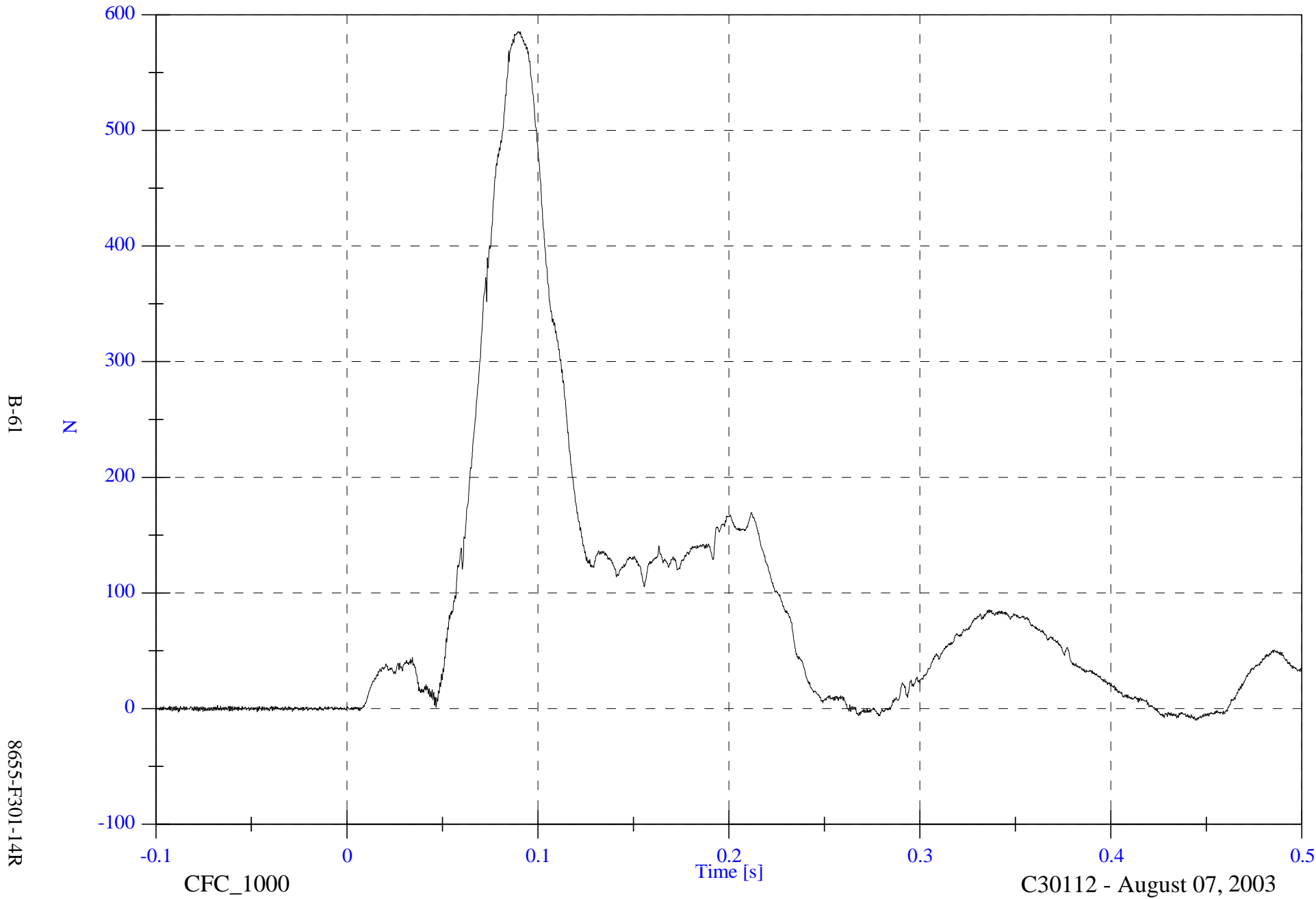
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Upper Neck Fz

Max: 585.4 [N] at 0.090 [s]

Min: -10.1 [N] at 0.445 [s]



B-61

8655-F301-14R

CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

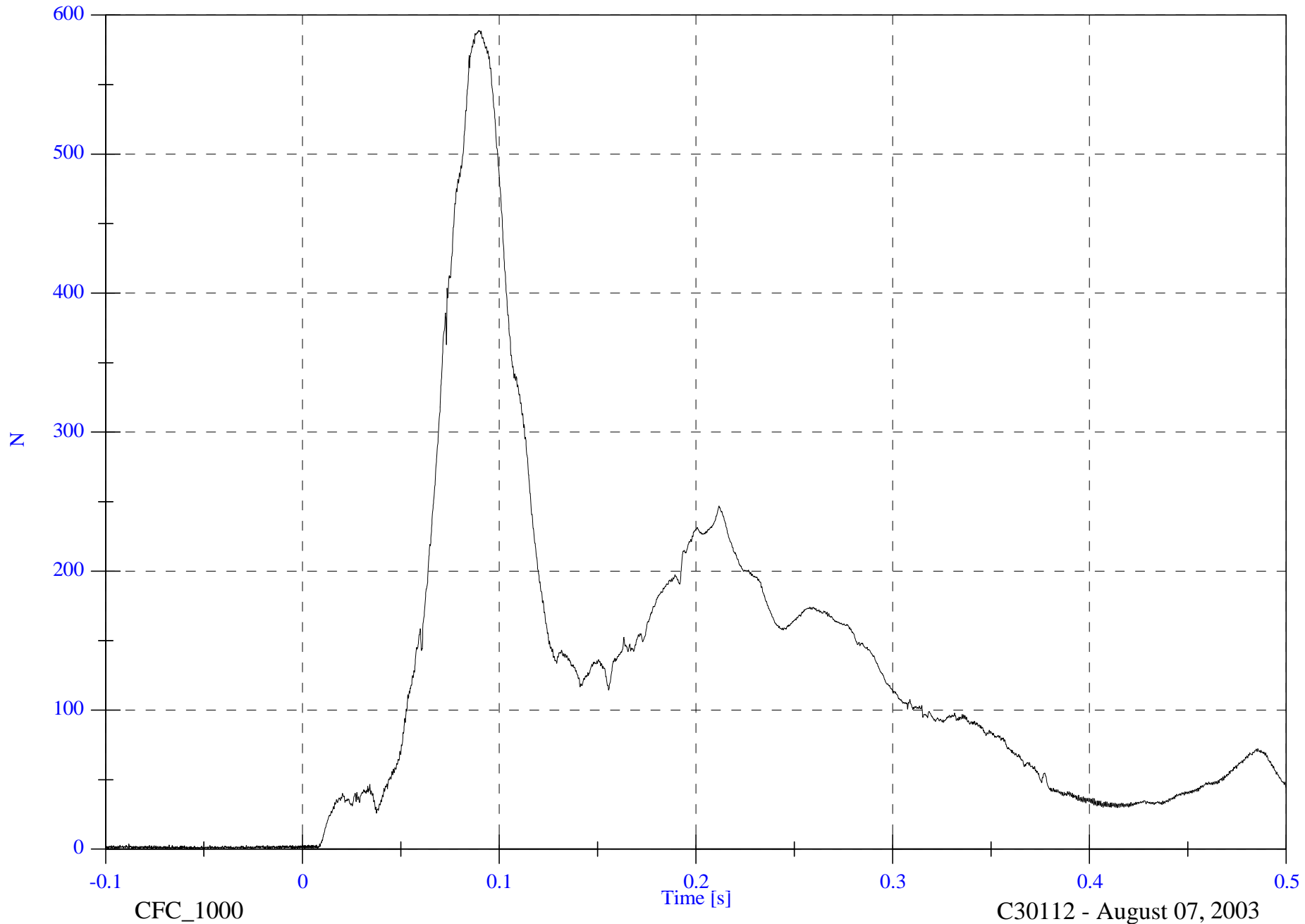
V2P2 Upper Neck F Resultant

Max: 589.0 [N] at 0.089 [s]

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

B-62

8655-F301-14R



CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

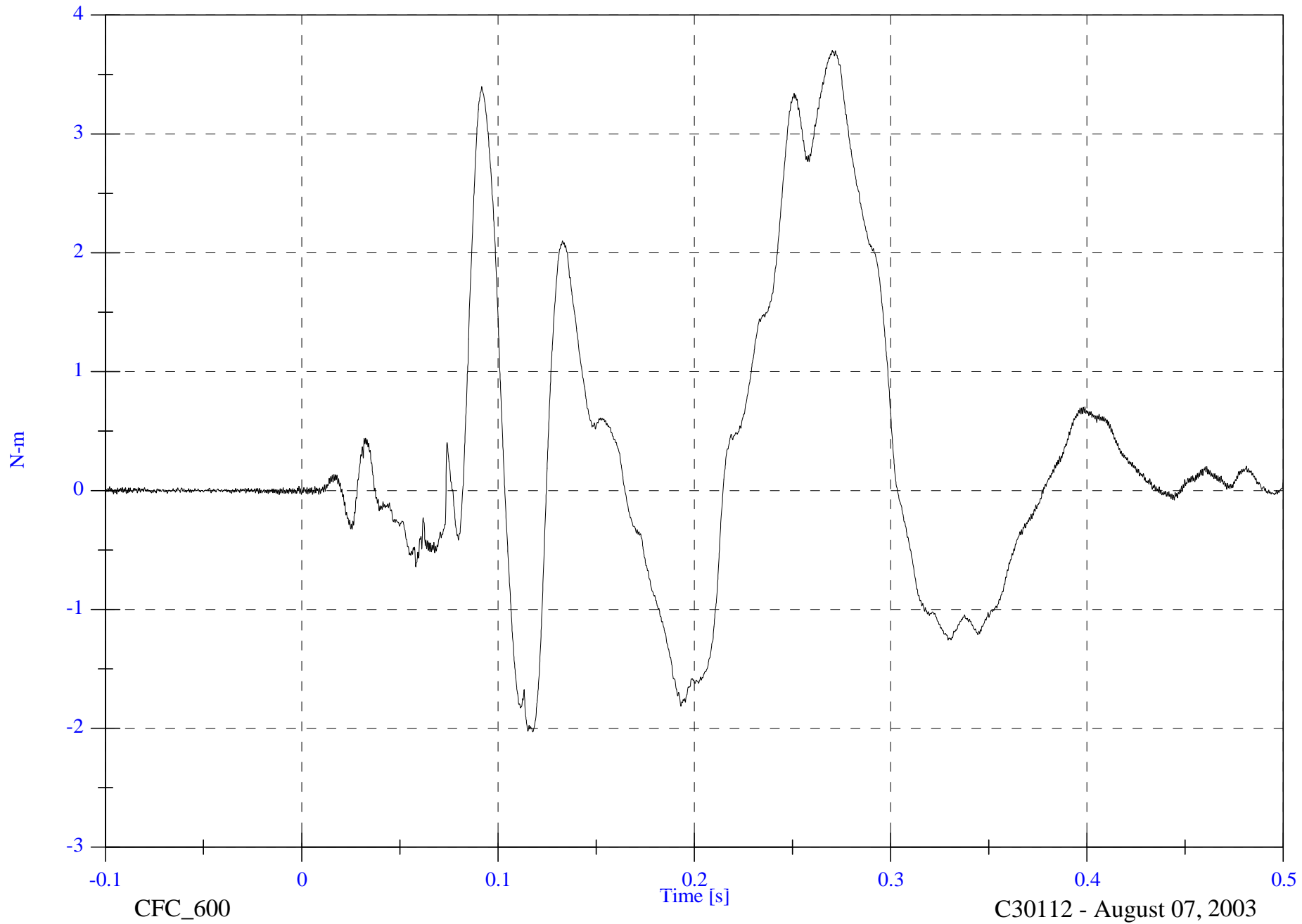
V2P2 Upper Neck Mx

Max: 3.7 [N-m] at 0.270 [s]

Min: -2.0 [N-m] at 0.118 [s]

B-63

8655-F301-14R



CFC\_600

Time [s]

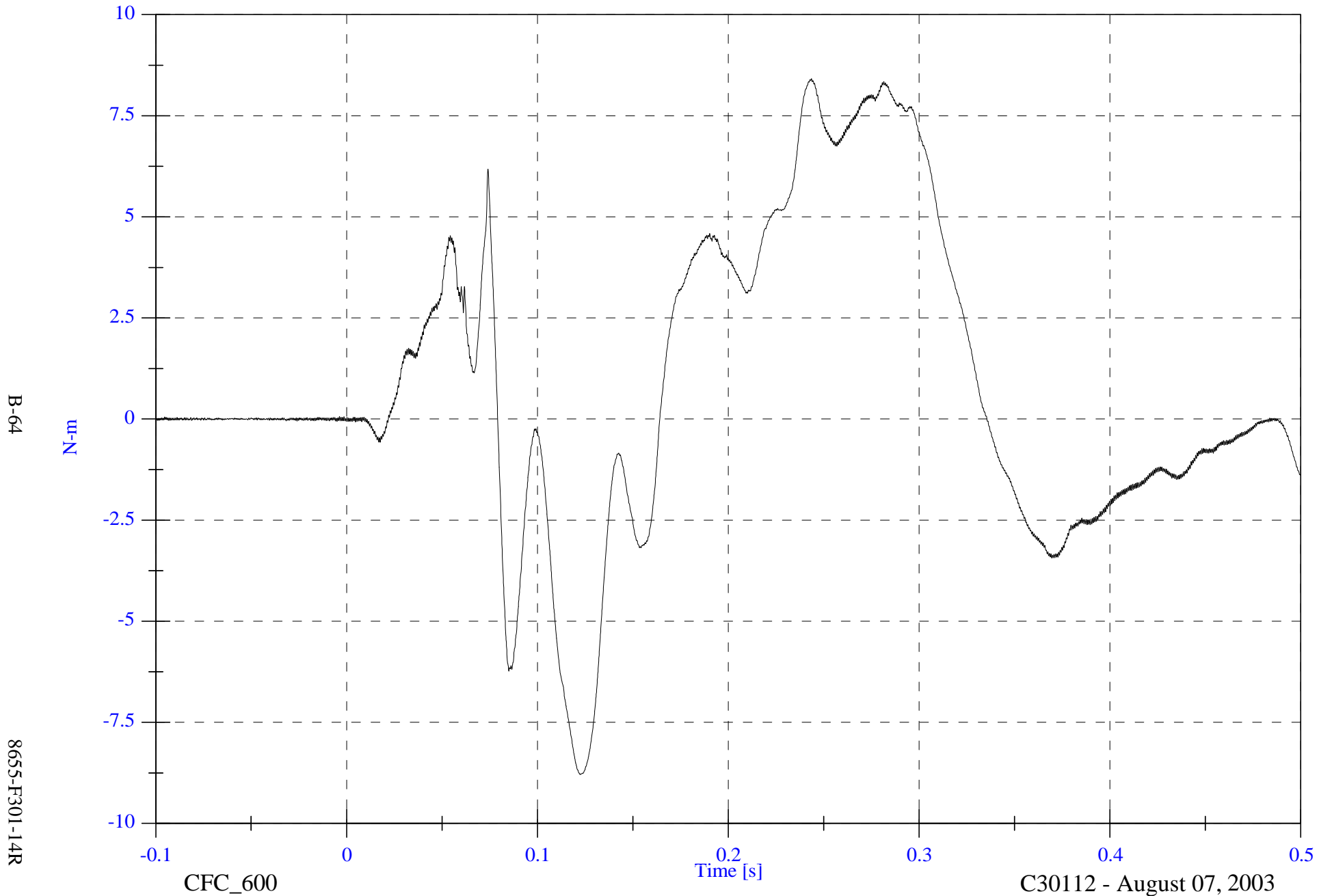
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Upper Neck My

Max: 8.4 [N-m] at 0.244 [s]

Min: -8.8 [N-m] at 0.122 [s]



B-64

8655-F301-14R

CFC\_600

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

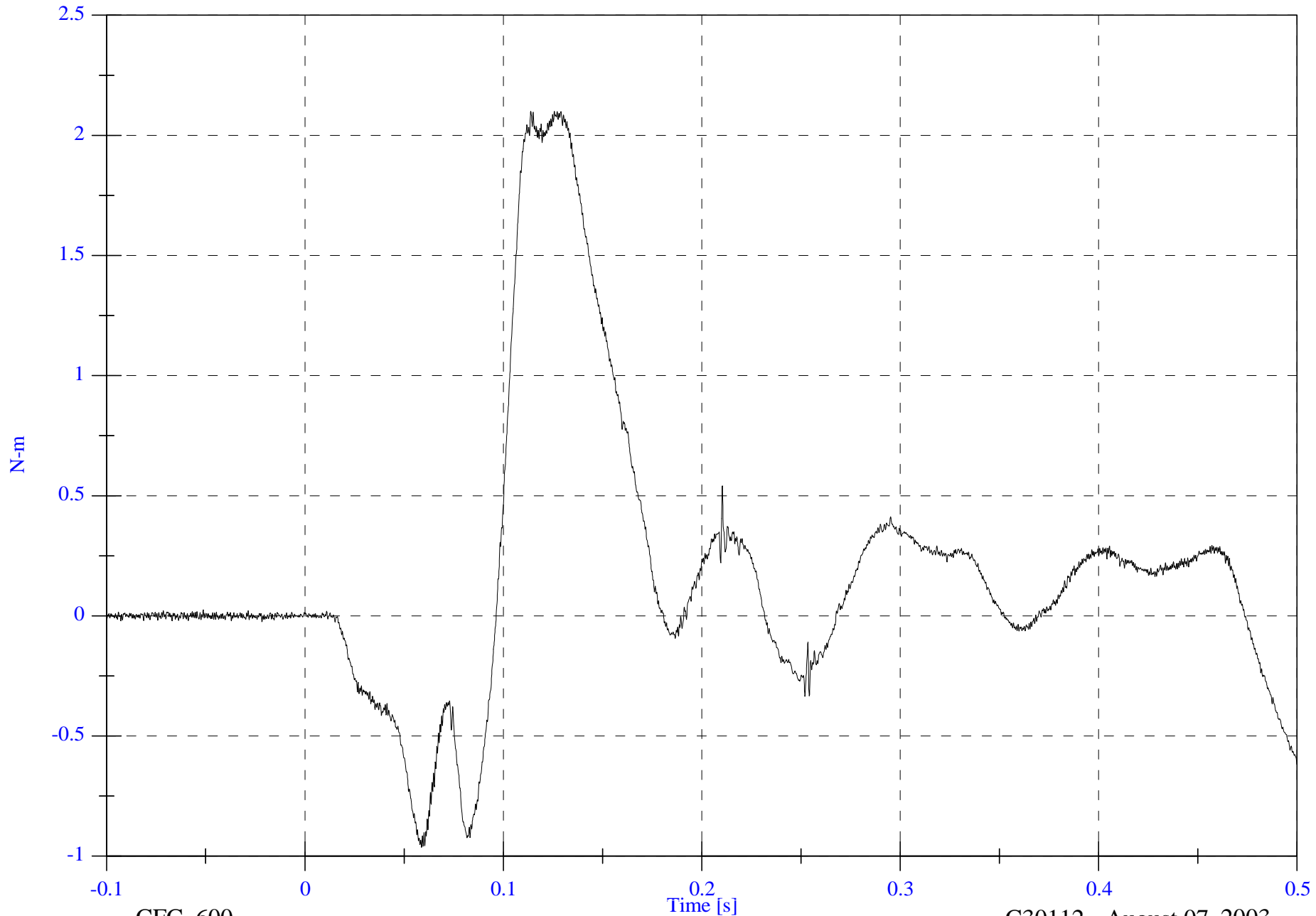
V2P2 Upper Neck Mz

Max: 2.1 [N-m] at 0.114 [s]

Min: -1.0 [N-m] at 0.059 [s]

B-65

8655-F301-14R



CFC\_600

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

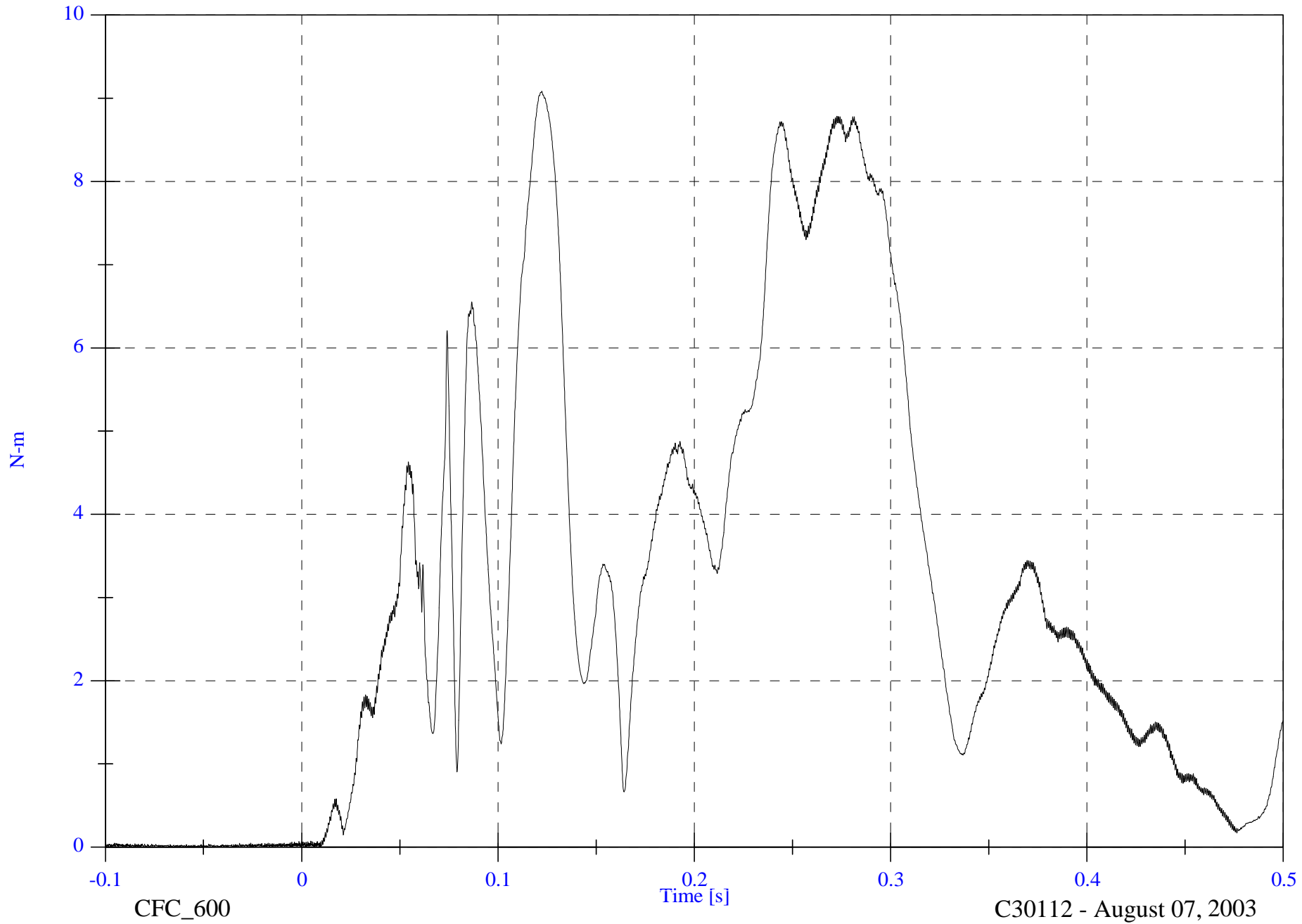
V2P2 Upper Neck M Resultant

Max: 9.1 [N-m] at 0.122 [s]

Min: 0.0 [N-m] at -0.051 [s]

B-66

8655-F301-14R



CFC\_600

Time [s]

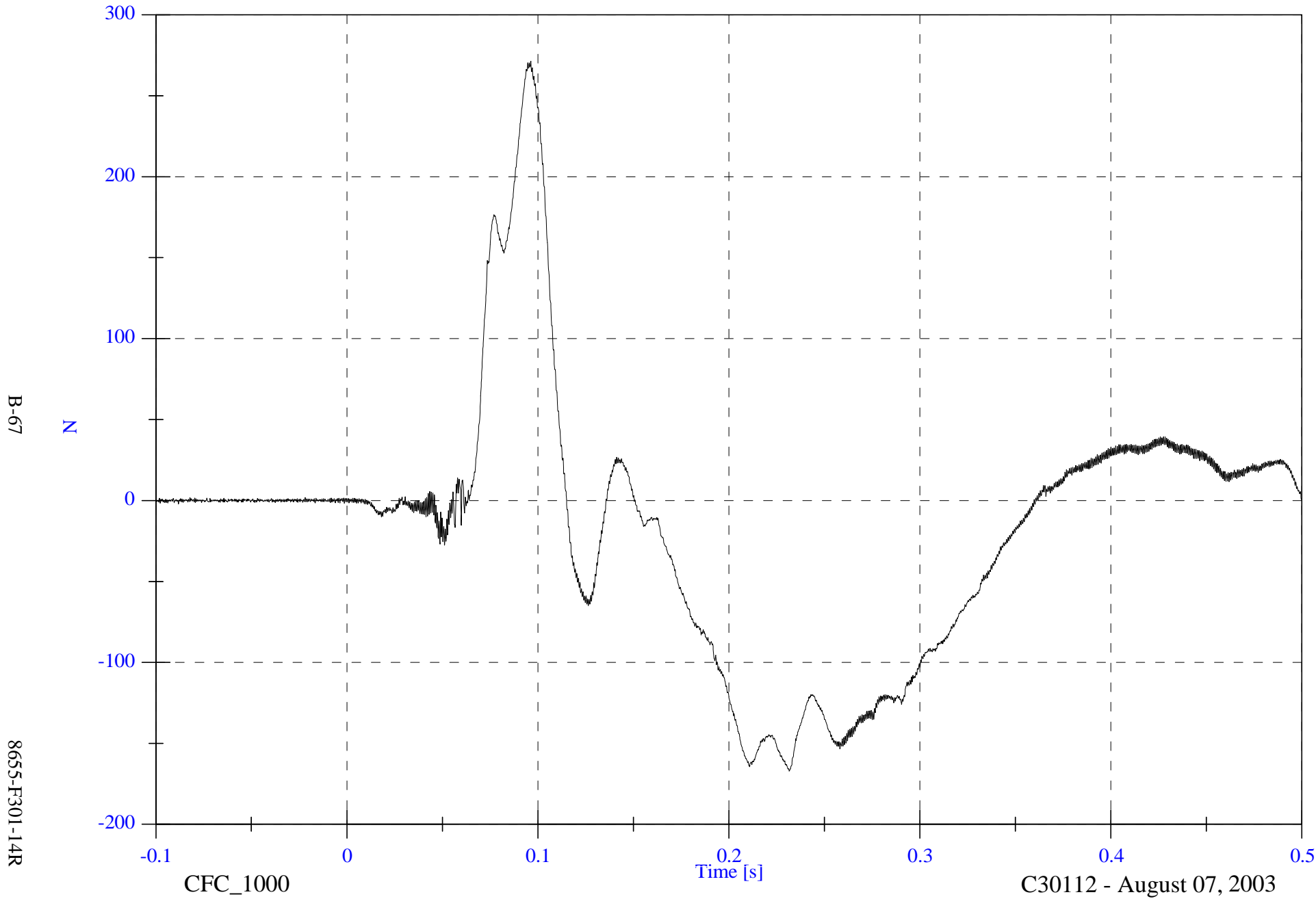
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck Fx

Max: 271.4 [N] at 0.096 [s]

Min: -167.2 [N] at 0.232 [s]



B-67

N

8655-F301-14R

CFC\_1000

Time [s]

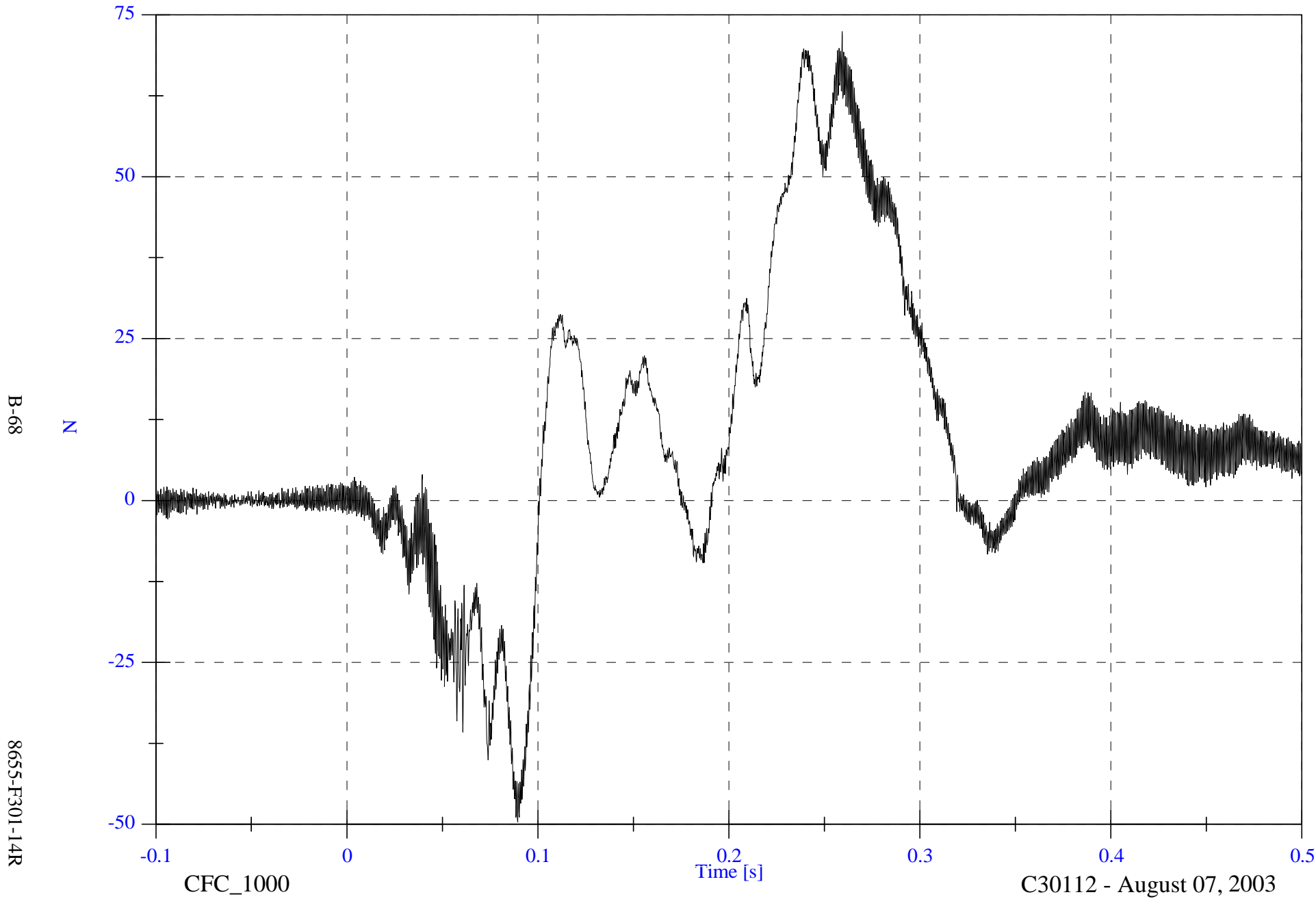
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck Fy

Max: 72.4 [N] at 0.259 [s]

Min: -49.6 [N] at 0.089 [s]



B-68

N

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck Fz

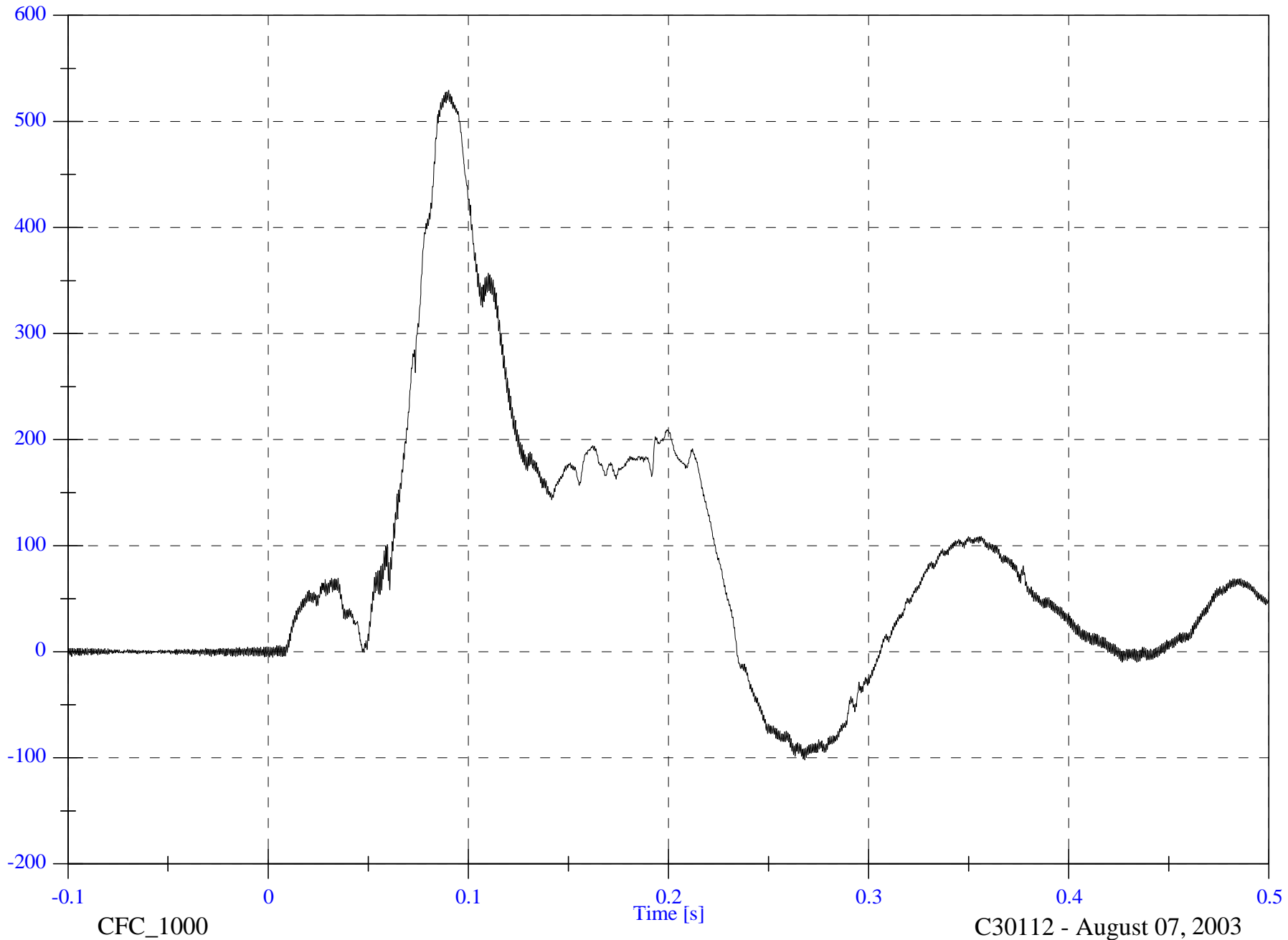
Max: 529.5 [N] at 0.090 [s]

Min: -102.1 [N] at 0.268 [s]

B-69

N

8655-F301-14R



CFC\_1000

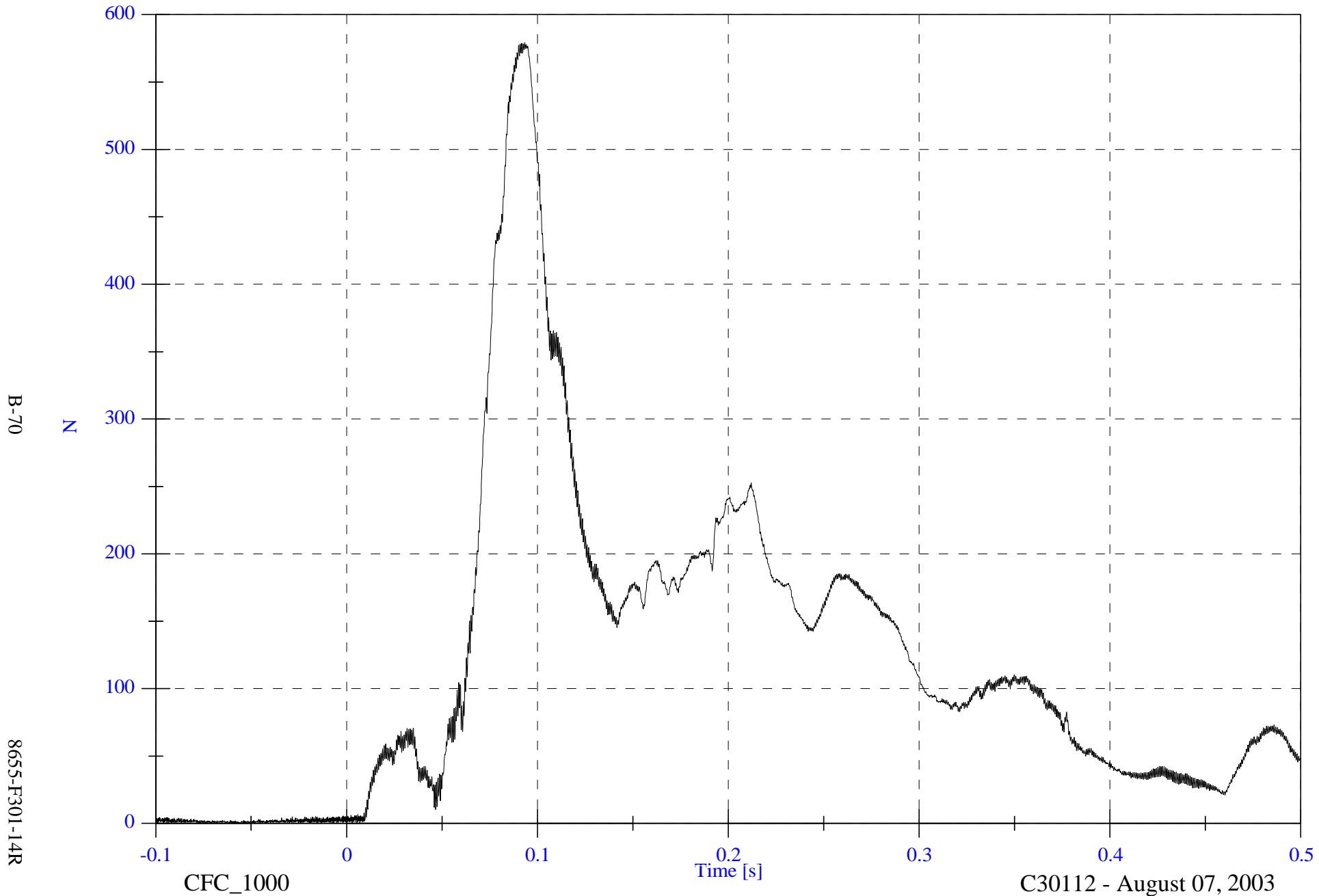
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck F Resultant

Max: 579.1 [N] at 0.093 [s]

Min: 0.2 [N] at -0.054 [s]



B-70

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

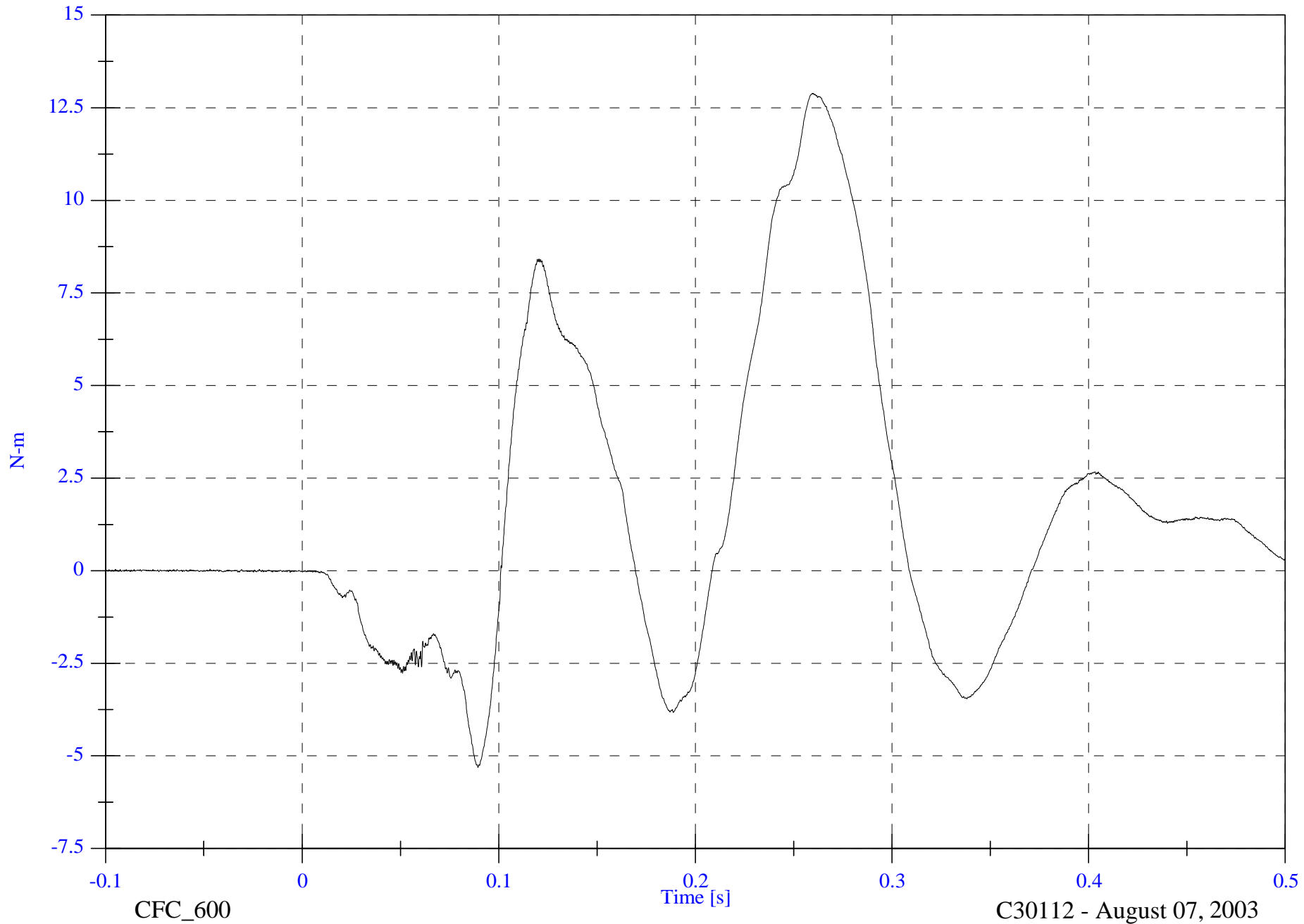
V2P2 Lower Neck Mx

Max: 12.9 [N-m] at 0.260 [s]

Min: -5.3 [N-m] at 0.089 [s]

B-71

8655-F301-14R

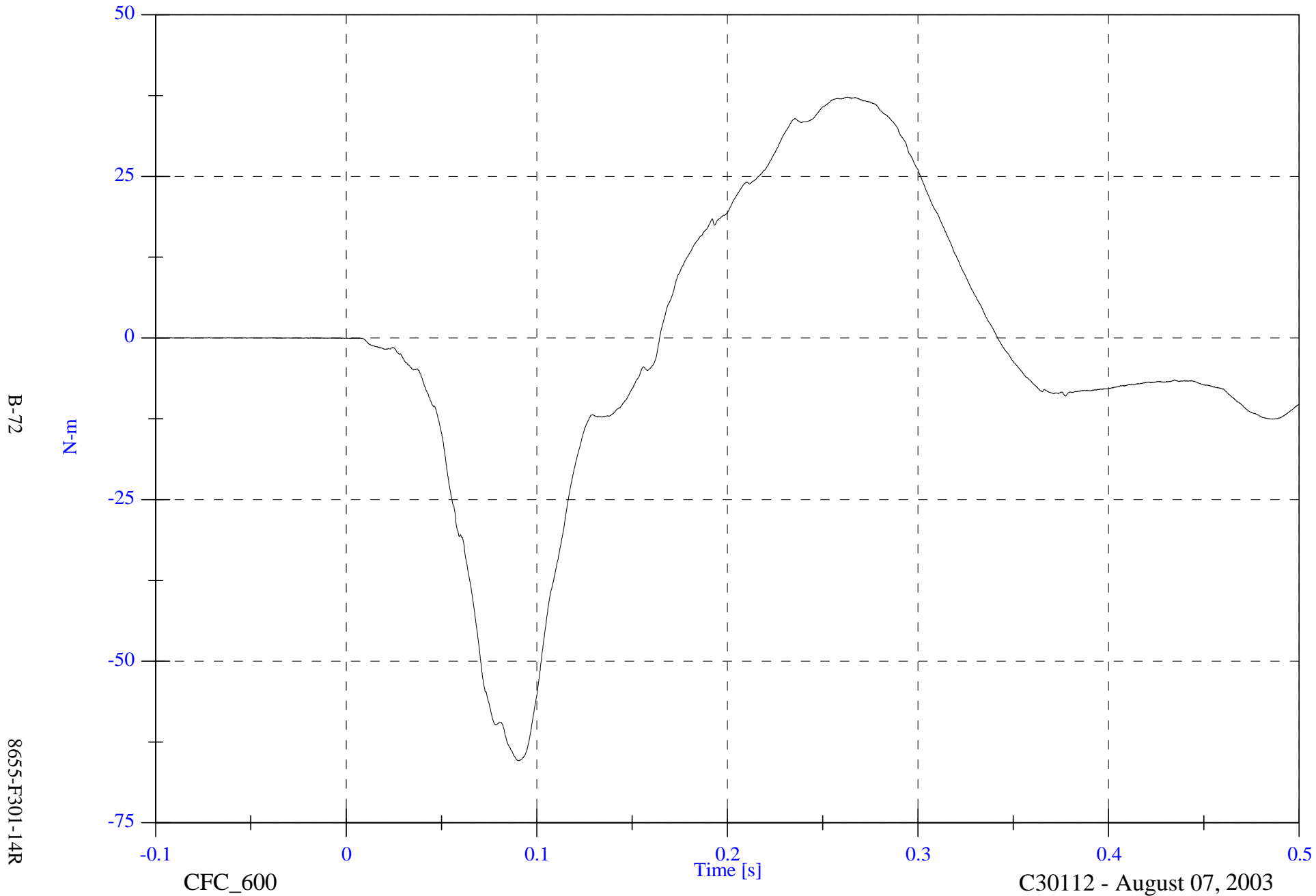


FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck My

Max: 37.3 [N-m] at 0.263 [s]

Min: -65.4 [N-m] at 0.091 [s]



B-72

8655-F301-14R

CFC\_600

Time [s]

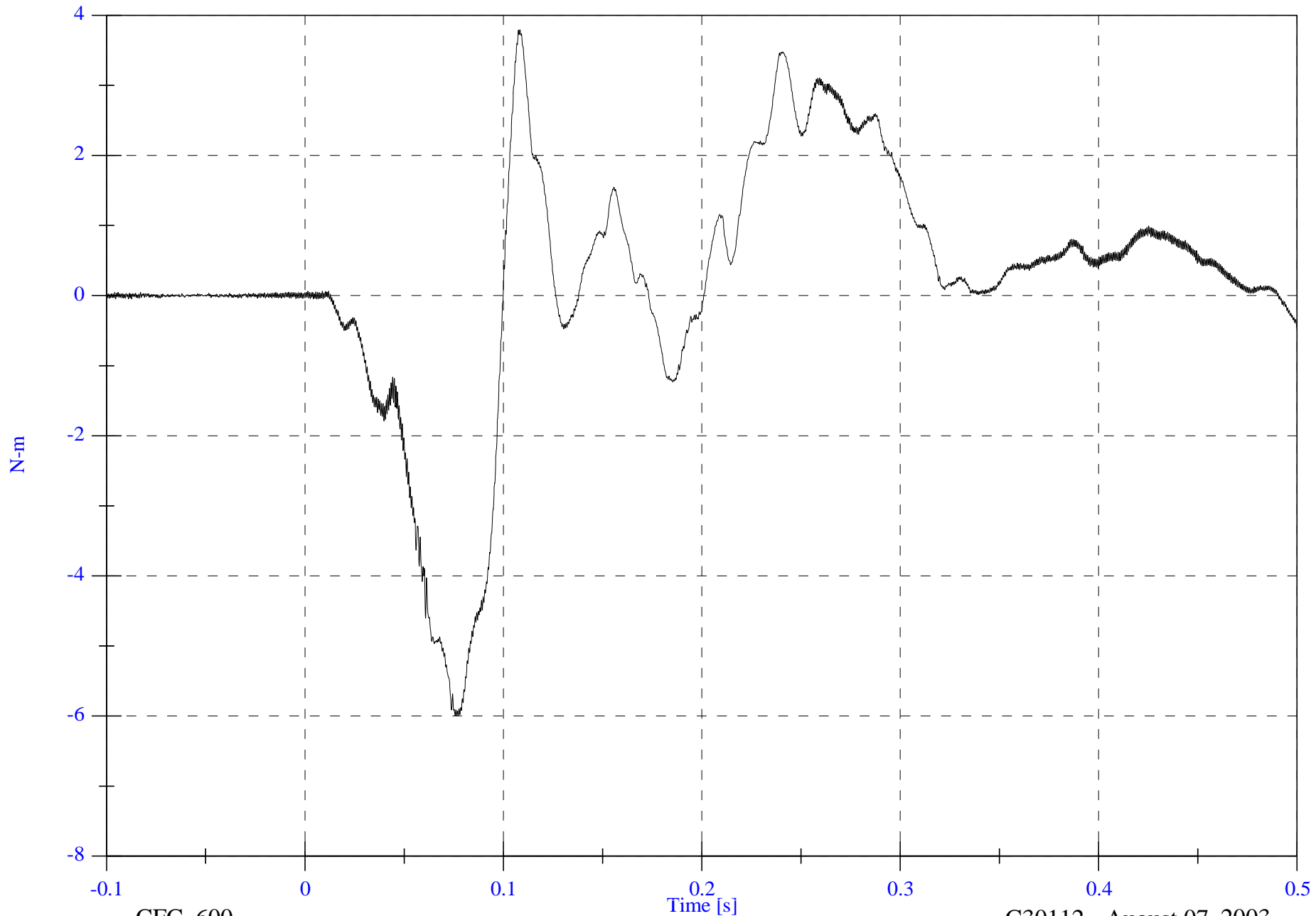
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck Mz

Max: 3.8 [N-m] at 0.108 [s]

Min: -6.0 [N-m] at 0.076 [s]



B-73

8655-F301-14R

CFC\_600

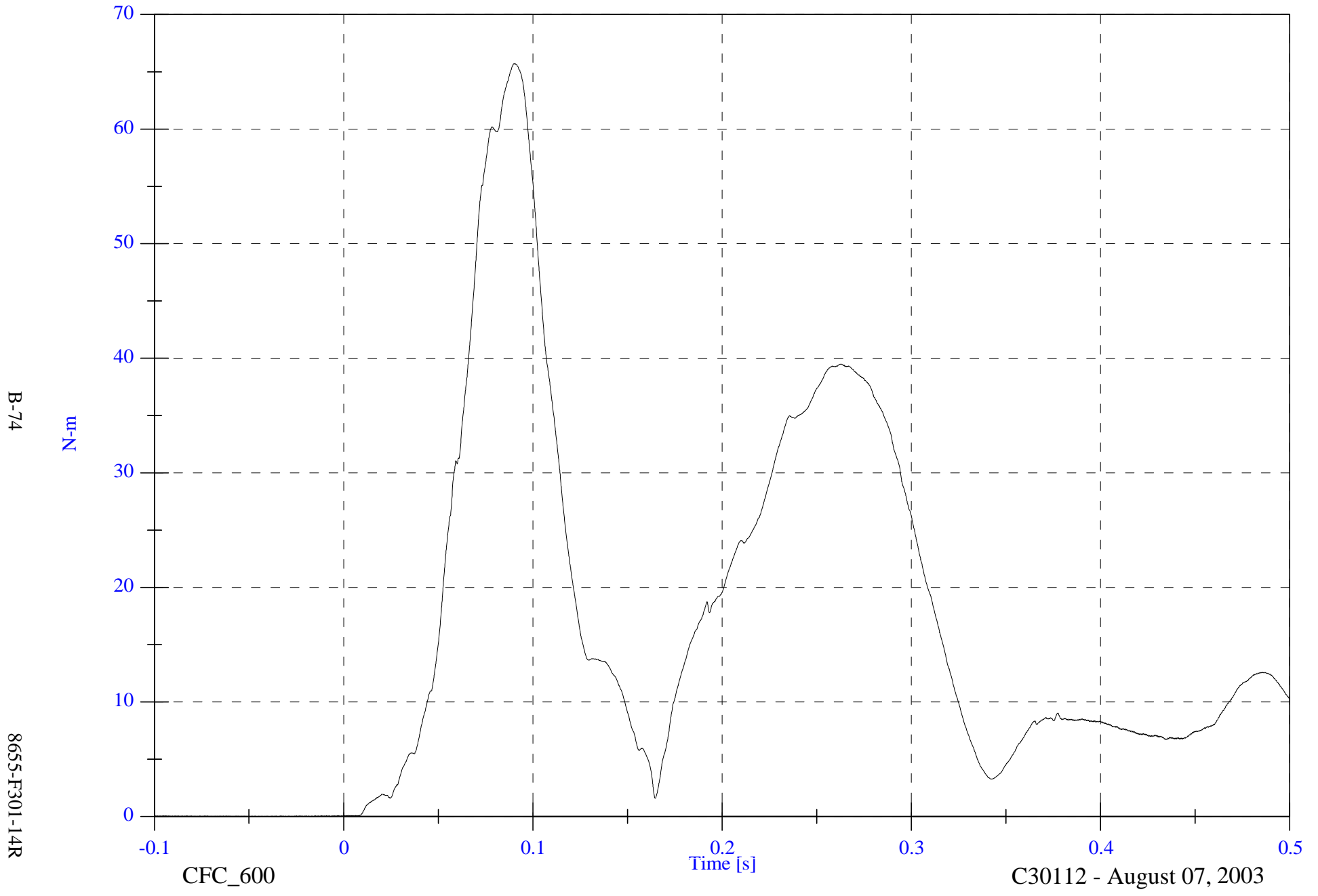
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck M Resultant

Max: 65.7 [N-m] at 0.090 [s]

Min: 0.0 [N-m] at -0.045 [s]



B-74

8655-F301-14R

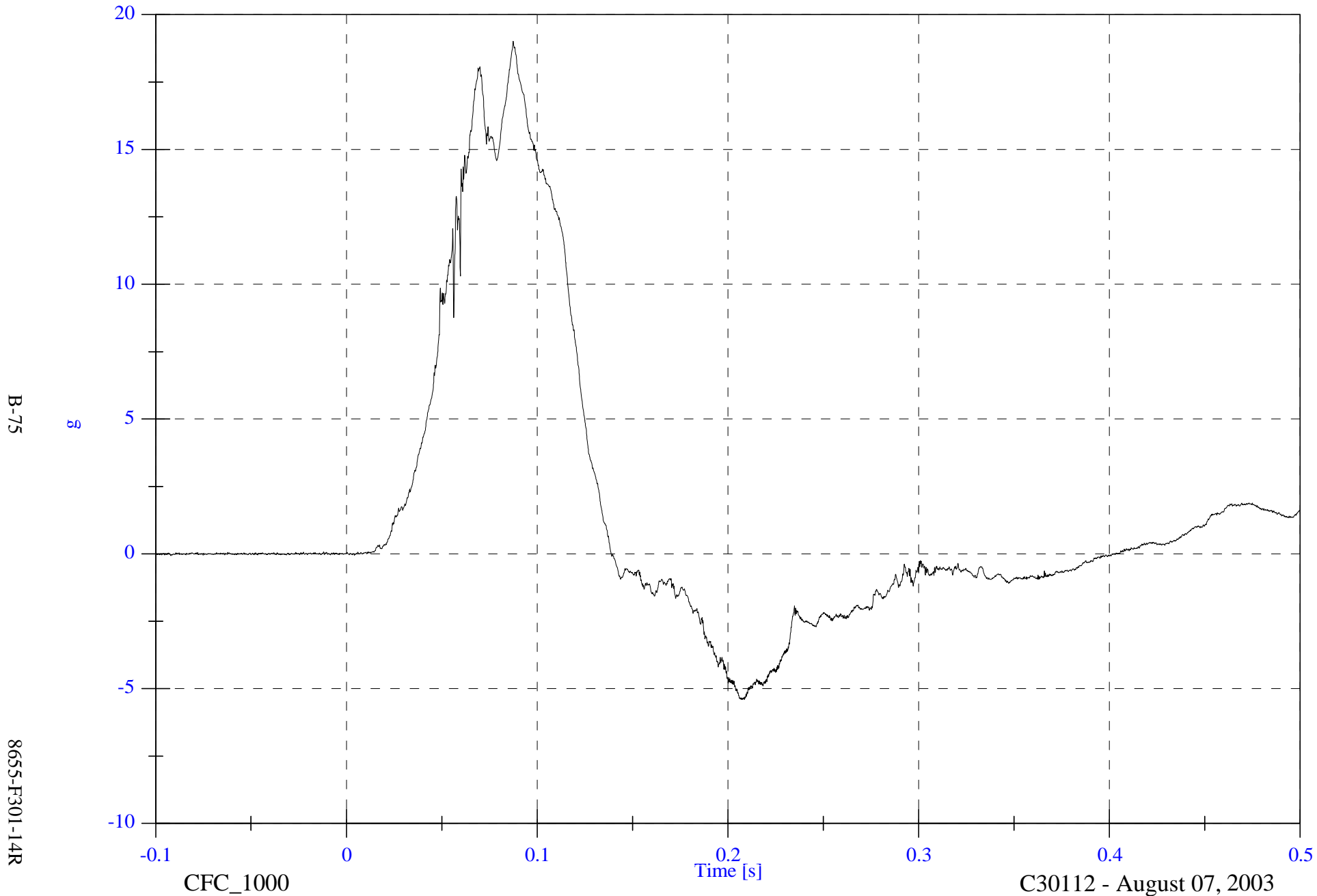
CFC\_600

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lower Neck Ax

Max: 19.0 [g] at 0.087 [s]  
Min: -5.4 [g] at 0.208 [s]



B-75

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

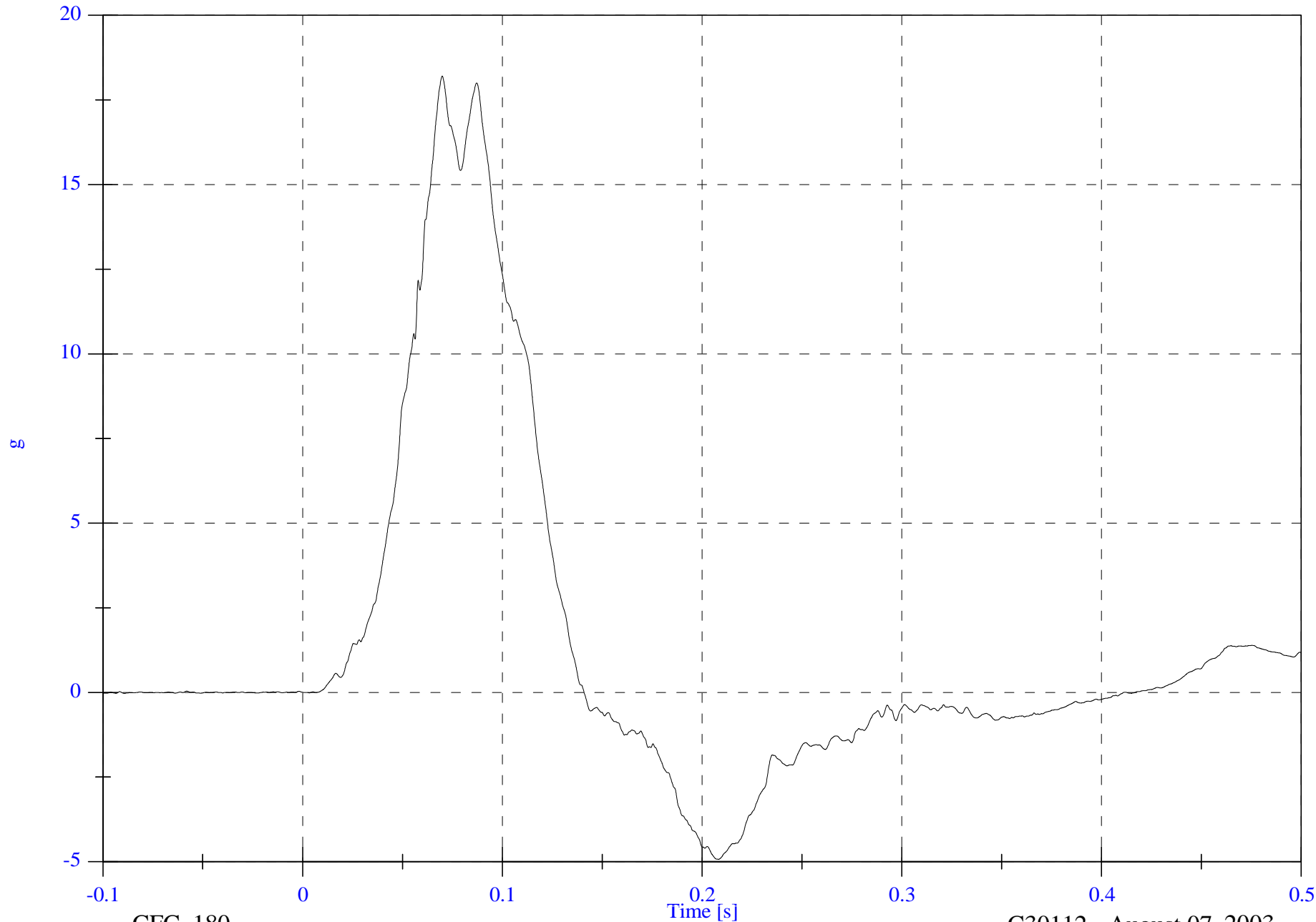
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Chest Ax

Max: 18.2 [g] at 0.070 [s]  
Min: -4.9 [g] at 0.208 [s]

B-76

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

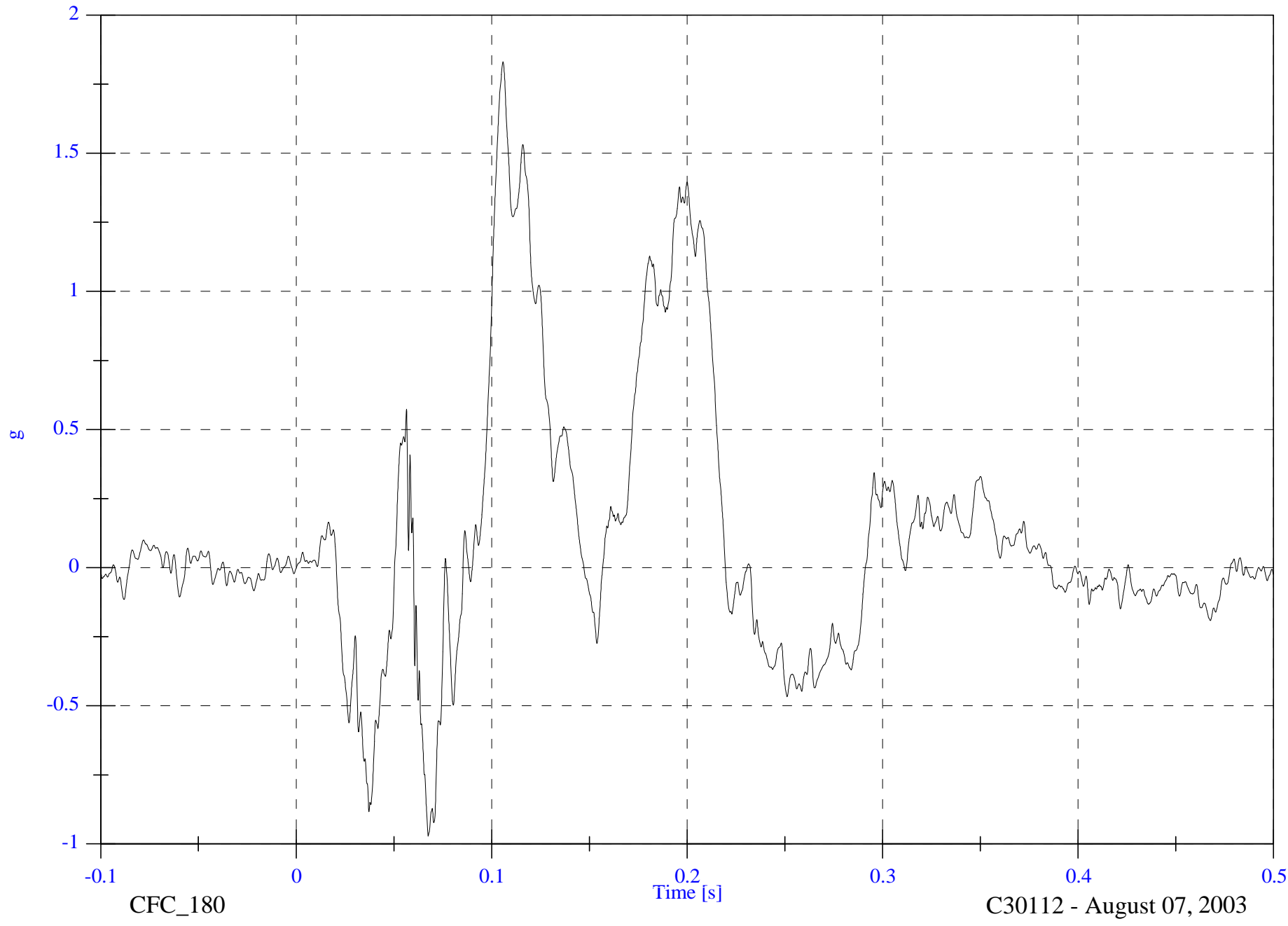
V2P2 Chest Ay

Max: 1.8 [g] at 0.106 [s]

Min: -1.0 [g] at 0.067 [s]

B-77

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

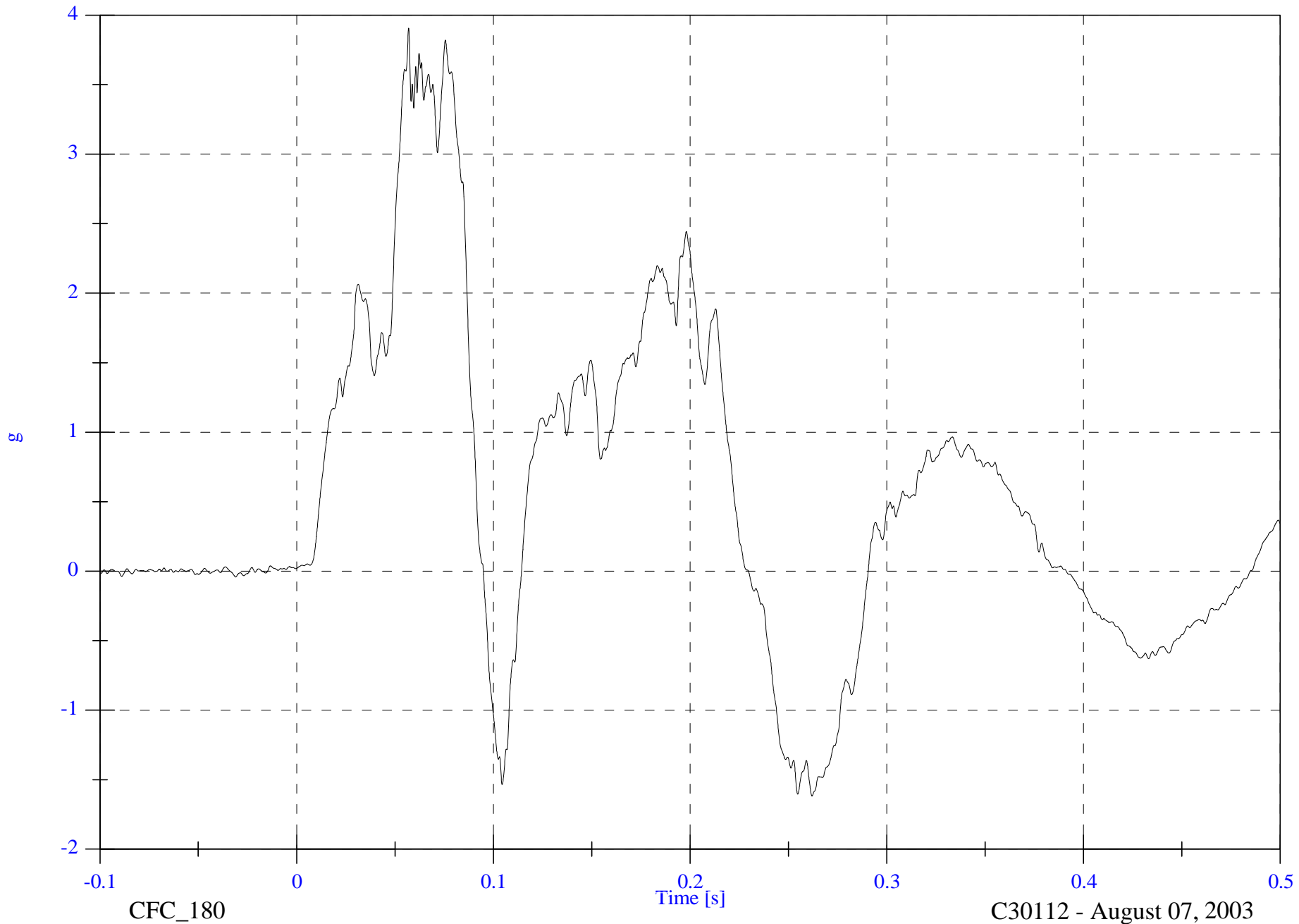
V2P2 Chest Az

Max: 3.9 [g] at 0.057 [s]

Min: -1.6 [g] at 0.262 [s]

B-78

8655-F301-14R



CFC\_180

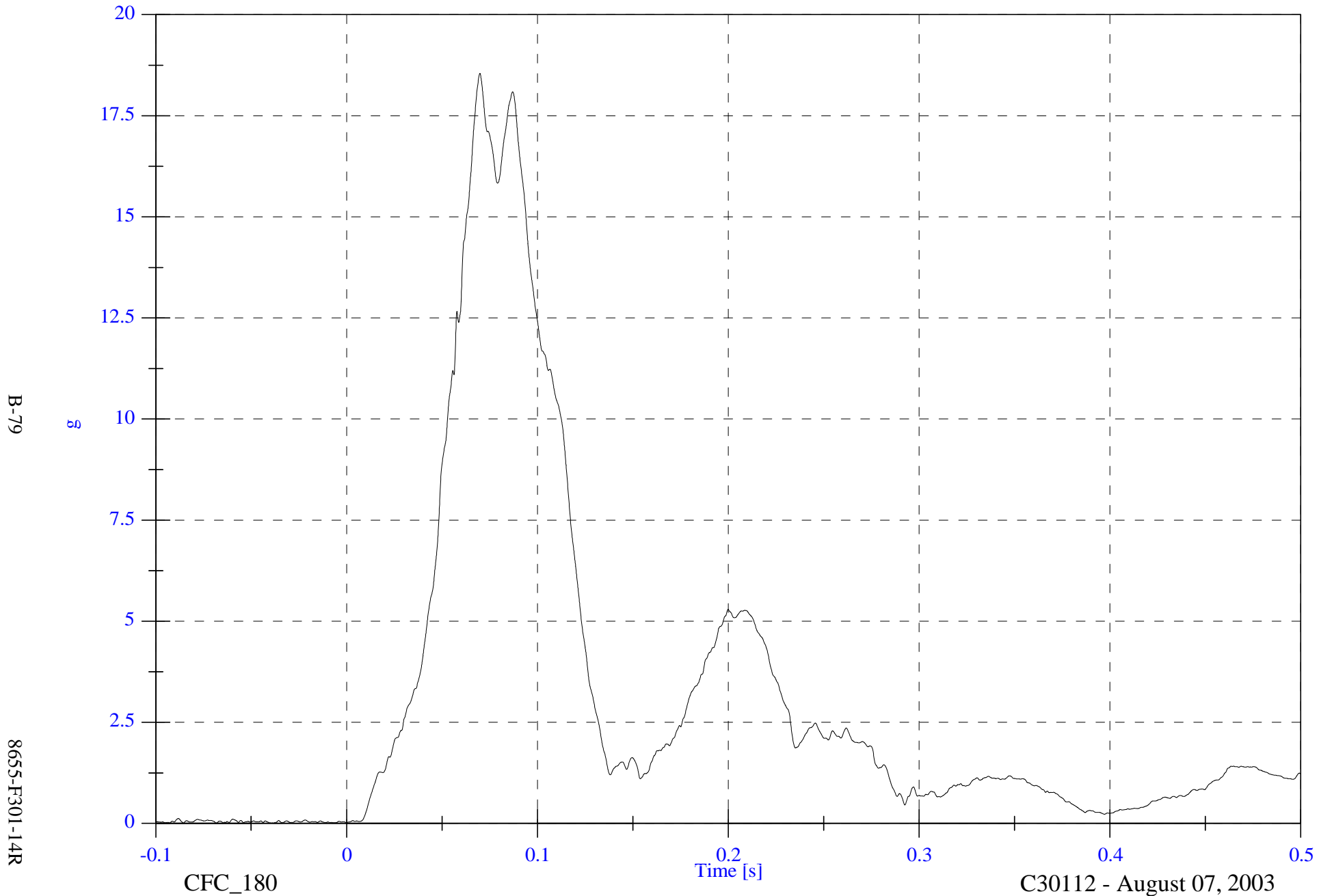
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Chest A Resultant

Max: 18.5 [g] at 0.070 [s]

Min: 0.0 [g] at -0.068 [s]



B-79

8655-F301-14R

CFC\_180

Time [s]

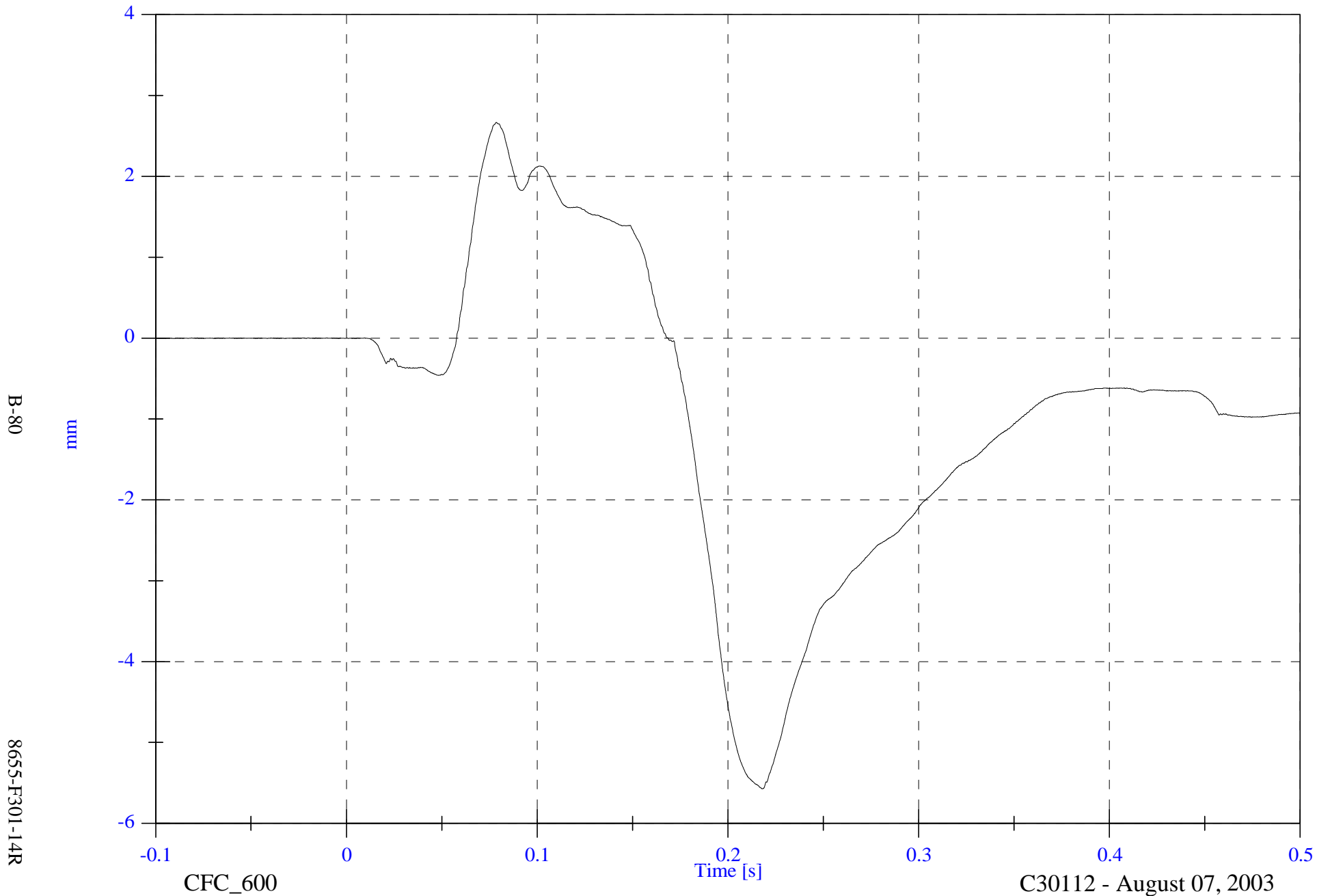
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Chest Dx

Max: 2.7 [mm] at 0.078 [s]

Min: -5.6 [mm] at 0.218 [s]



B-80

8655-F301-14R

CFC\_600

C30112 - August 07, 2003

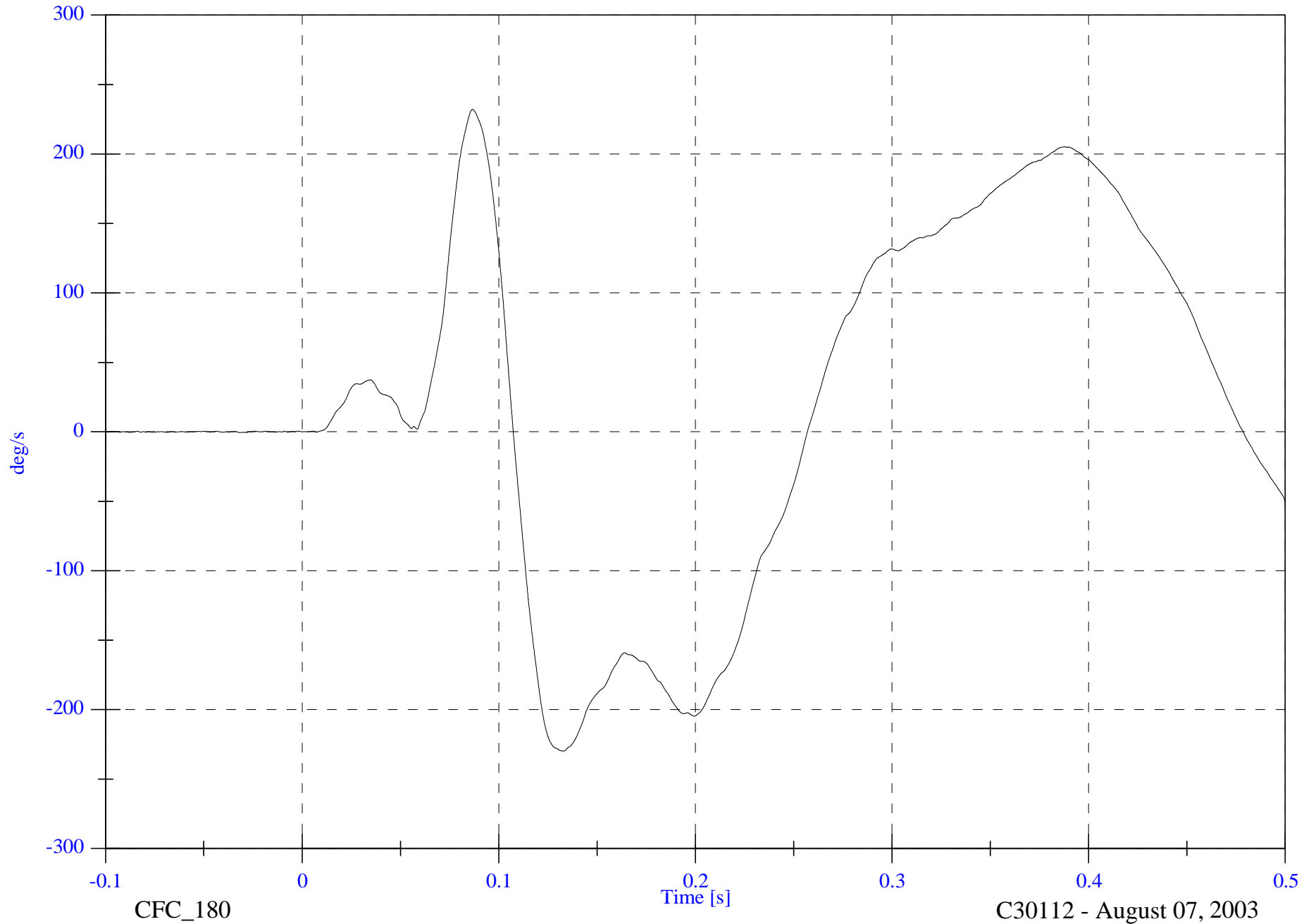
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Chest AVy

Max: 232.1 [deg/s] at 0.087 [s]  
Min: -229.8 [deg/s] at 0.133 [s]

B-81

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

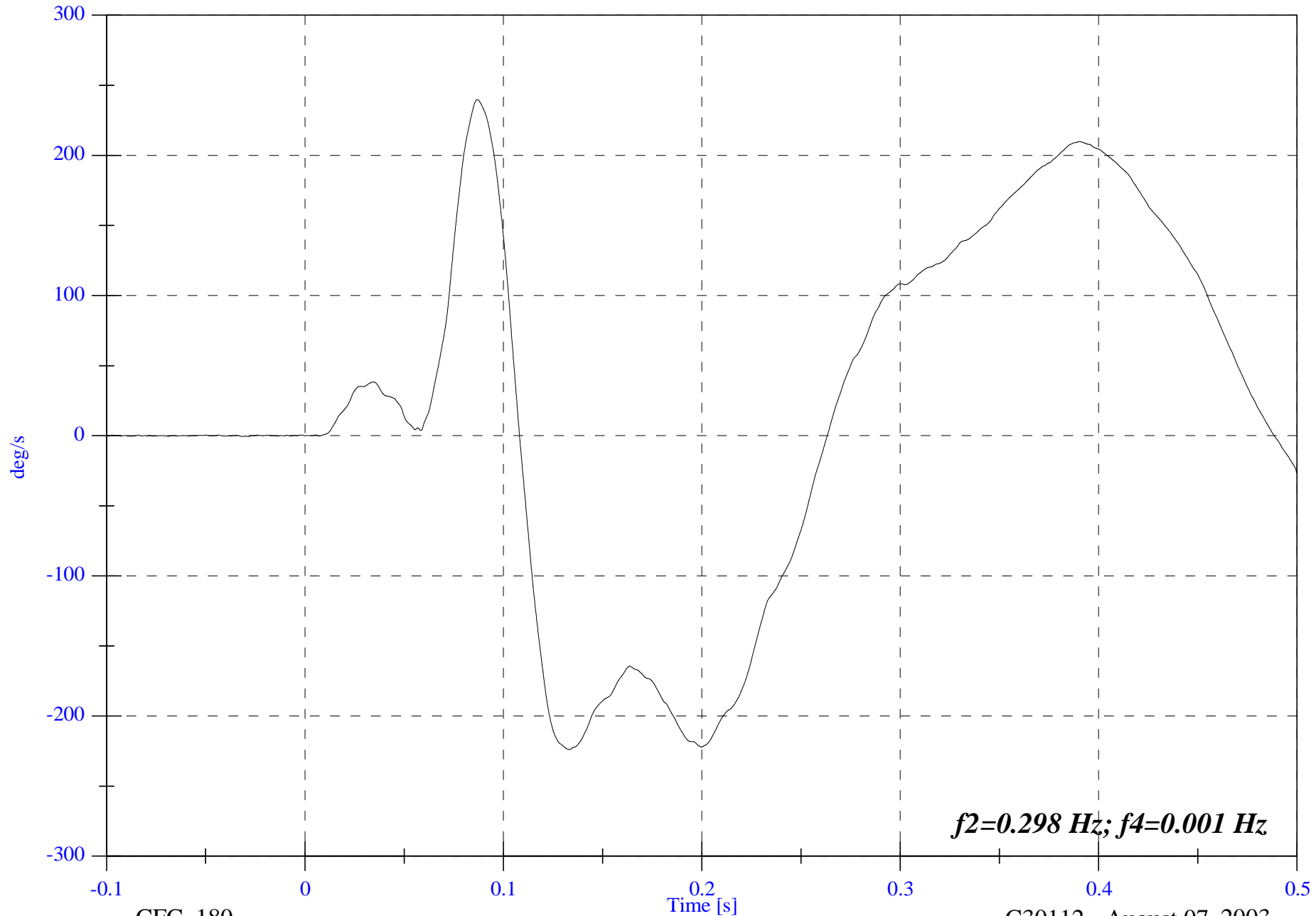
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Chest Comp AVy

Max: 239.9 [deg/s] at 0.087 [s]  
Min: -223.9 [deg/s] at 0.133 [s]

B-82

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

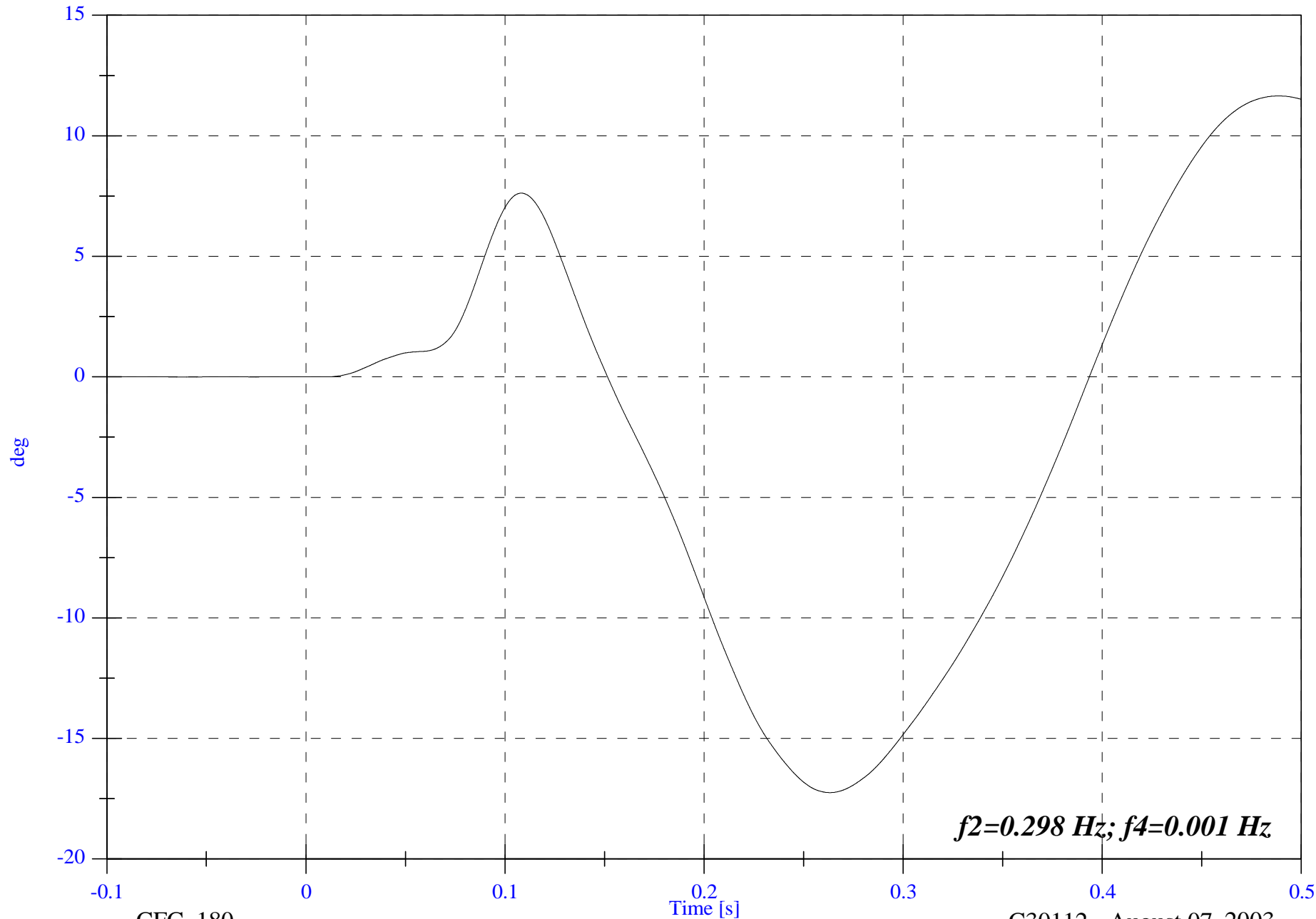
V2P2 Chest Comp ADy

Max: 11.7 [deg] at 0.489 [s]

Min: -17.2 [deg] at 0.263 [s]

B-83

8655-F301-14R



***f2=0.298 Hz; f4=0.001 Hz***

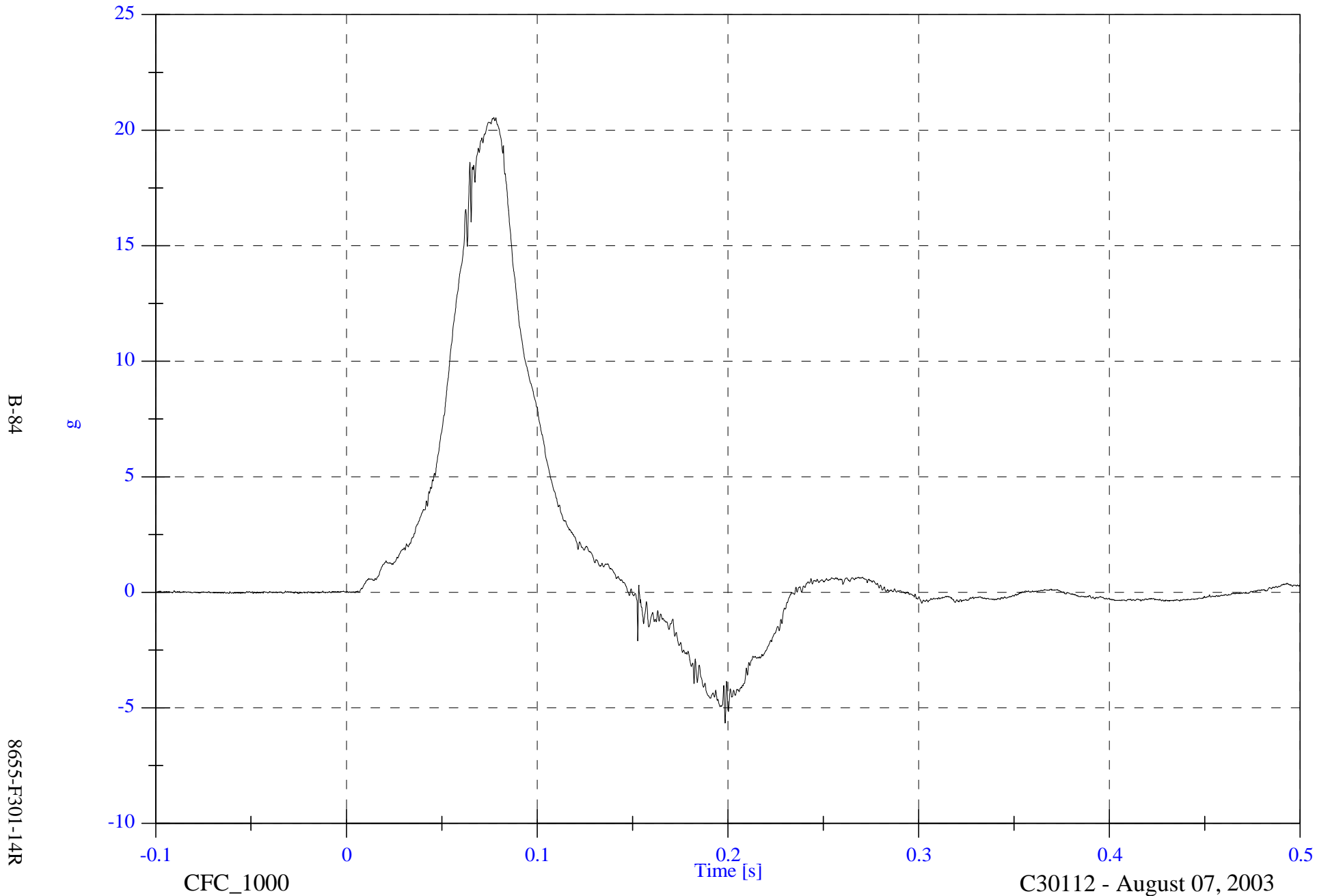
CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Pelvic Ax

Max: 20.5 [g] at 0.077 [s]  
Min: -5.7 [g] at 0.199 [s]



B-84

8655-F301-14R

CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

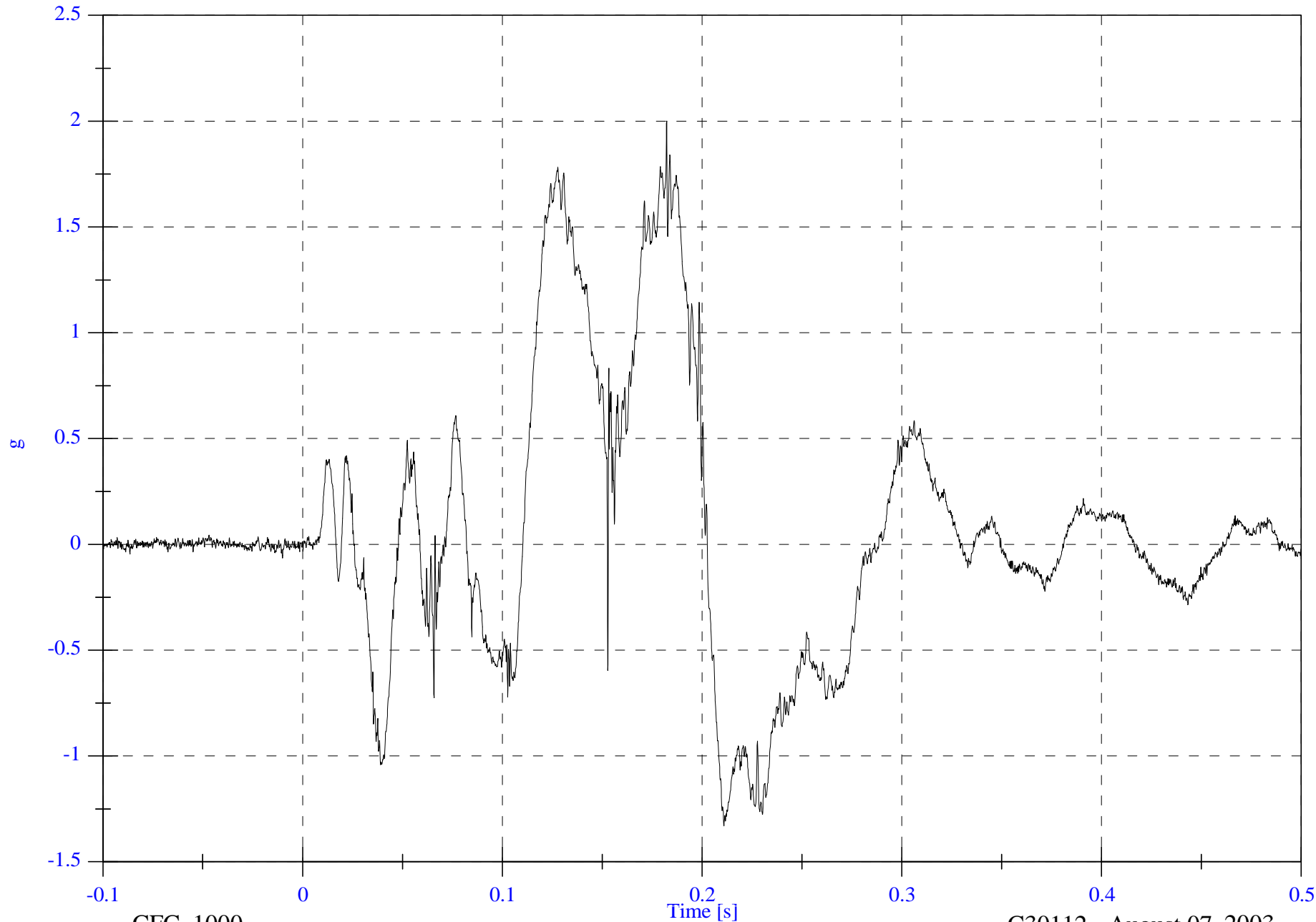
V2P2 Pelvic Ay

Max: 2.0 [g] at 0.182 [s]

Min: -1.3 [g] at 0.211 [s]

B-85

8655-F301-14R



CFC\_1000

C30112 - August 07, 2003

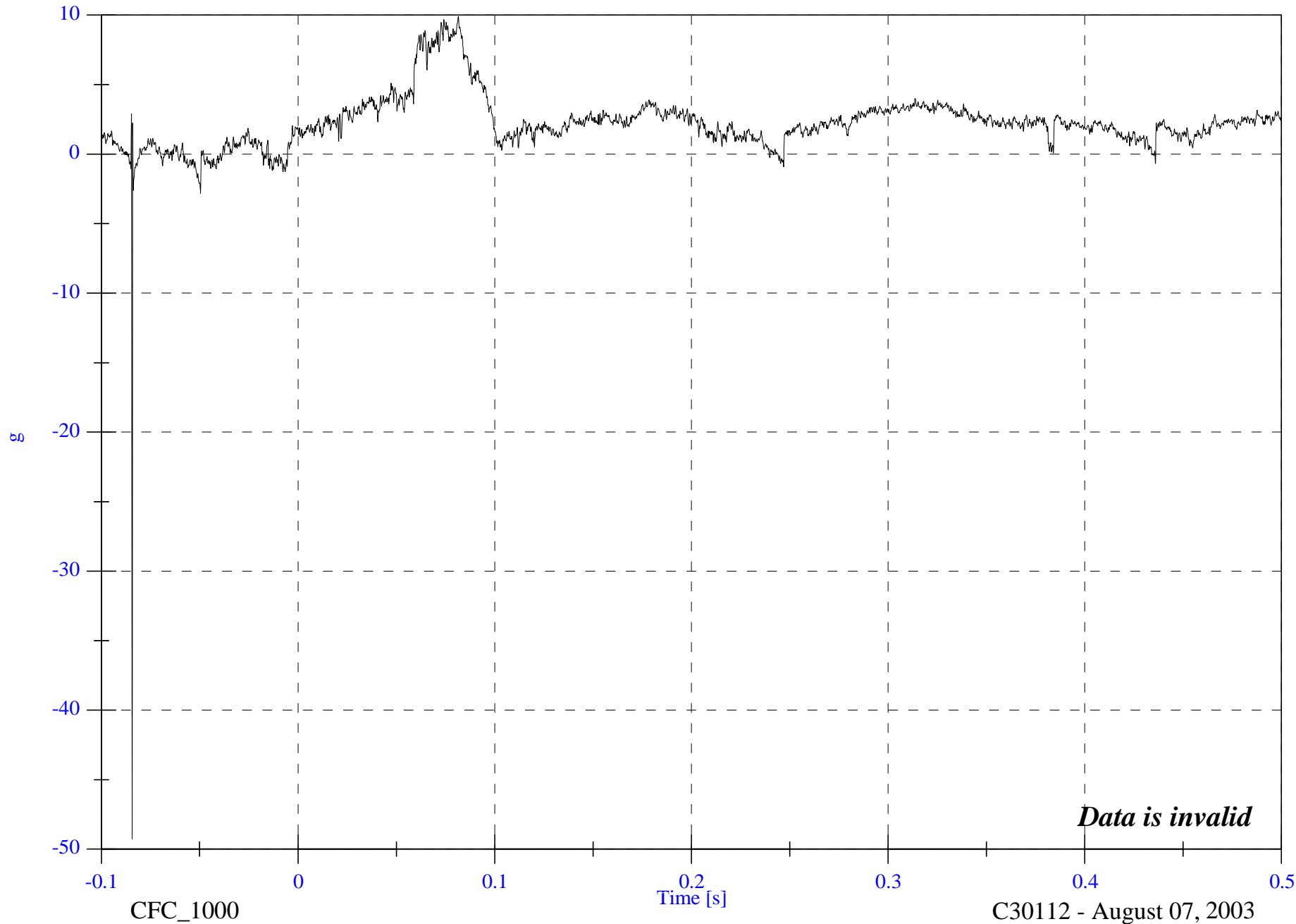
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Pelvic Az

Max: 9.9 [g] at 0.081 [s]  
Min: -49.3 [g] at -0.084 [s]

B-86

8655-F301-14R



*Data is invalid*

CFC\_1000

Time [s]

C30112 - August 07, 2003

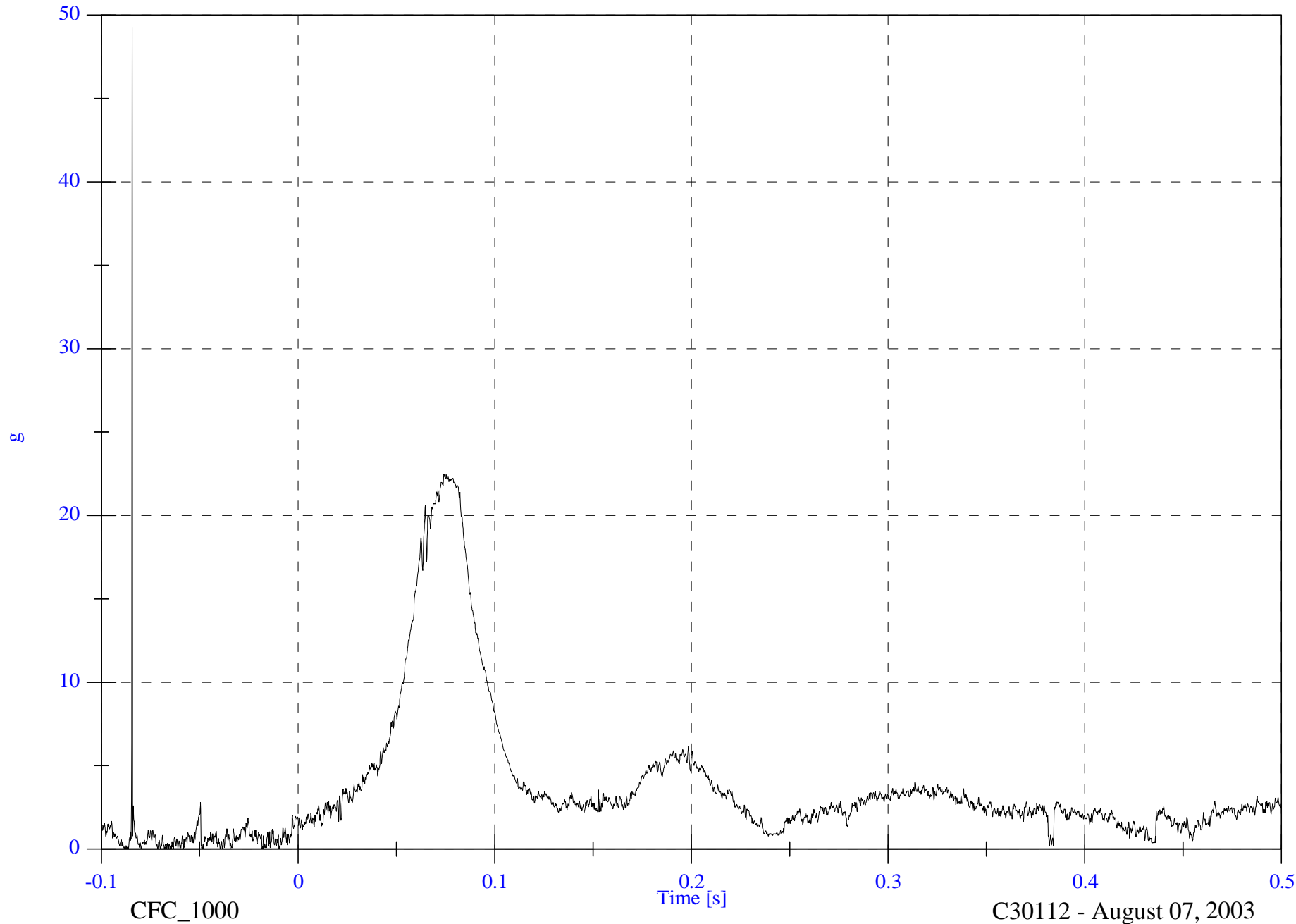
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Pelvic A Resultant

Max: 49.3 [g] at -0.084 [s]  
Min: 0.0 [g] at -0.018 [s]

B-87

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

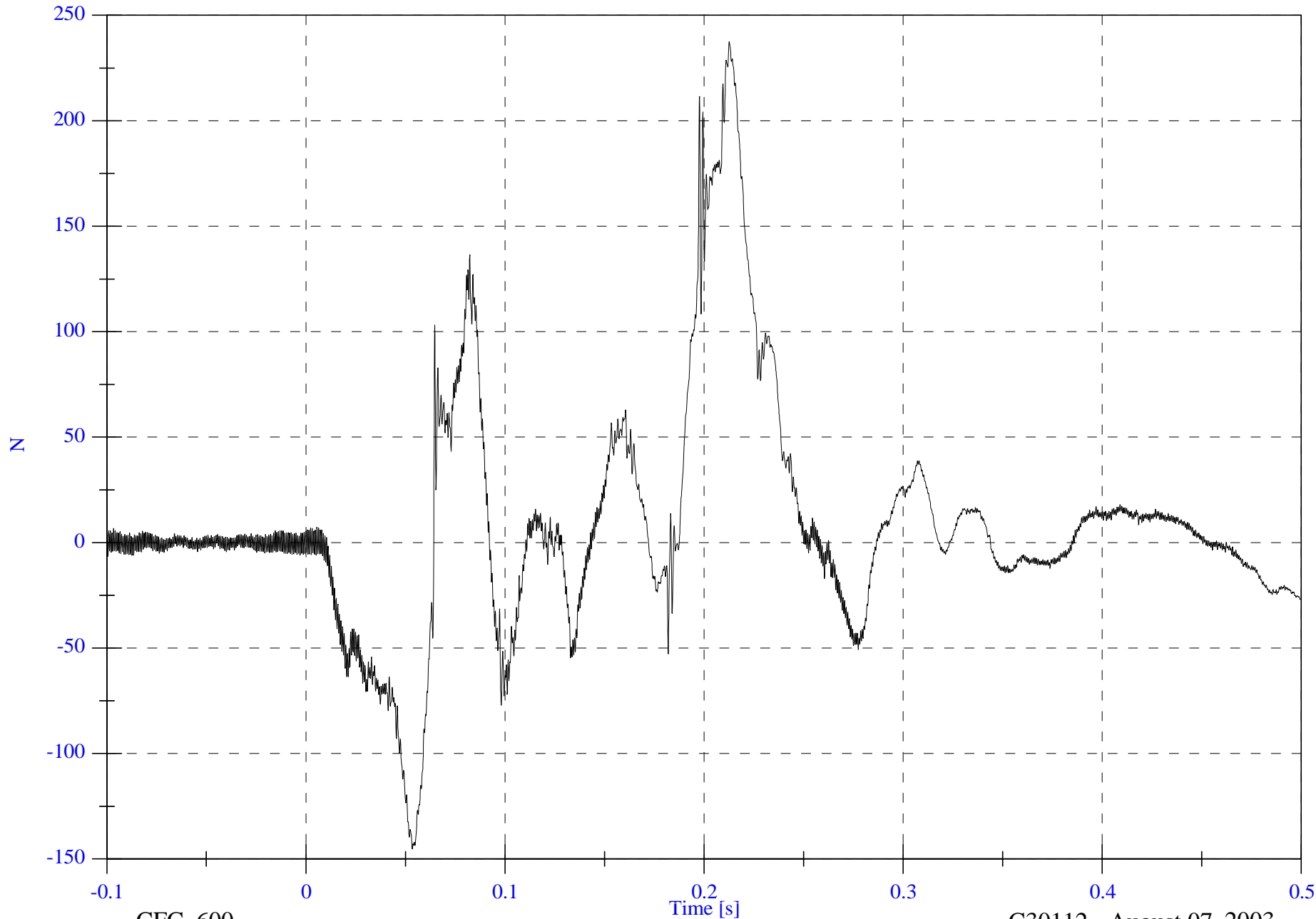
V2P2 Left Femur Fz

Max: 237.5 [N] at 0.213 [s]

Min: -145.2 [N] at 0.053 [s]

B-88

8655-F301-14R



CFC\_600

Time [s]

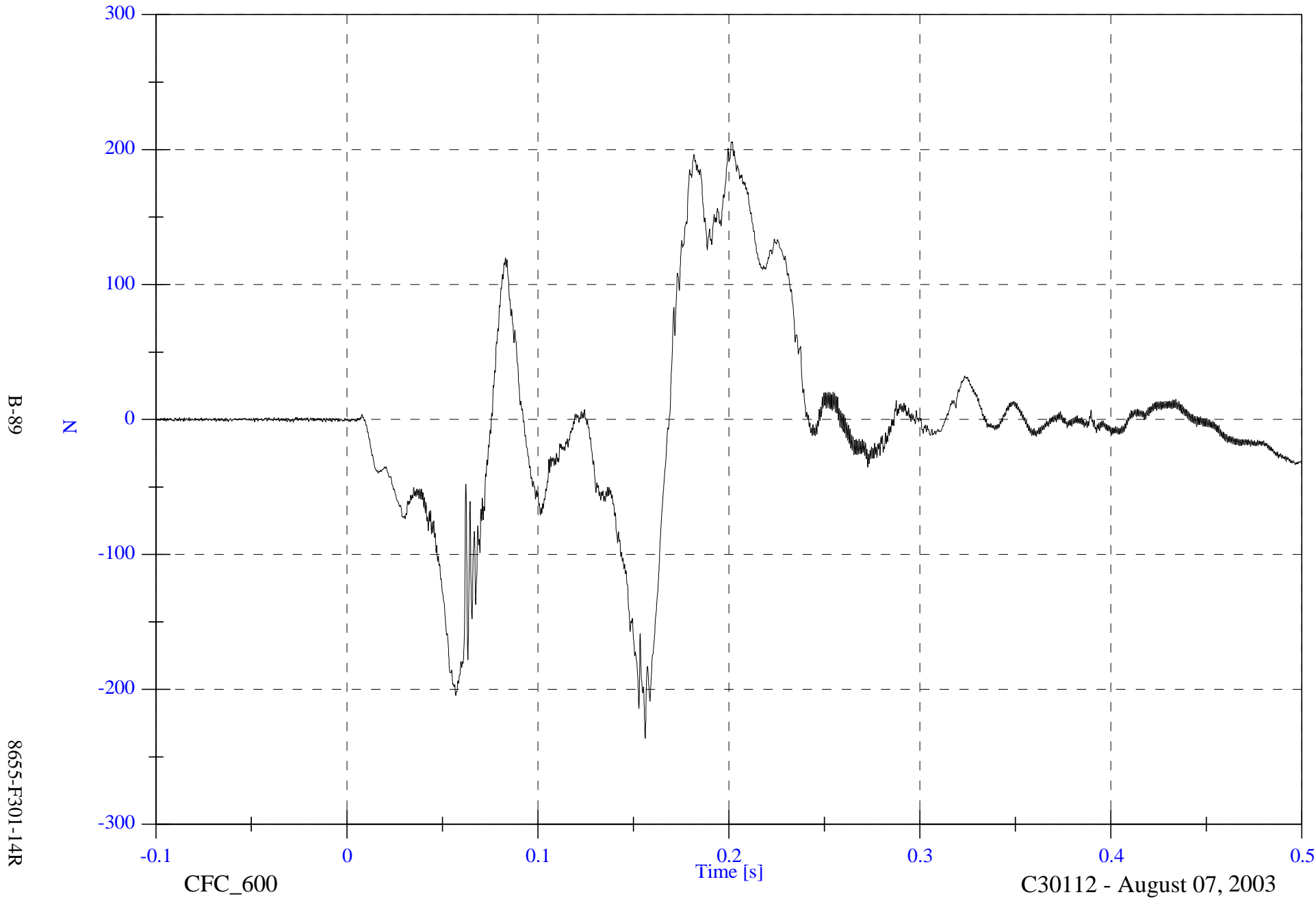
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Right Femur Fz

Max: 205.8 [N] at 0.201 [s]

Min: -236.3 [N] at 0.156 [s]



B-89

8655-F301-14R

CFC\_600

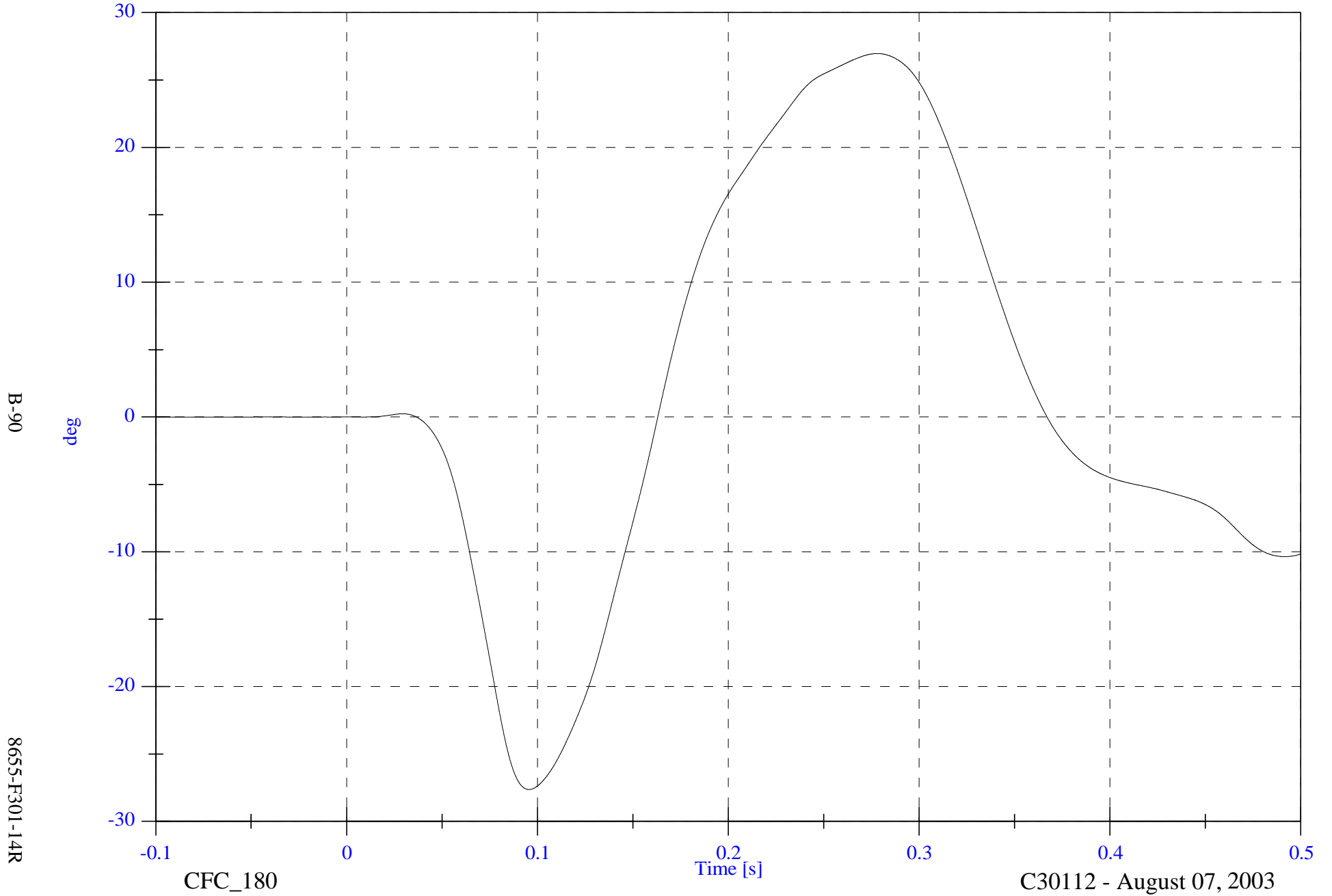
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Head to Chest Comp ADy

Max: 27.0 [deg] at 0.278 [s]

Min: -27.6 [deg] at 0.096 [s]

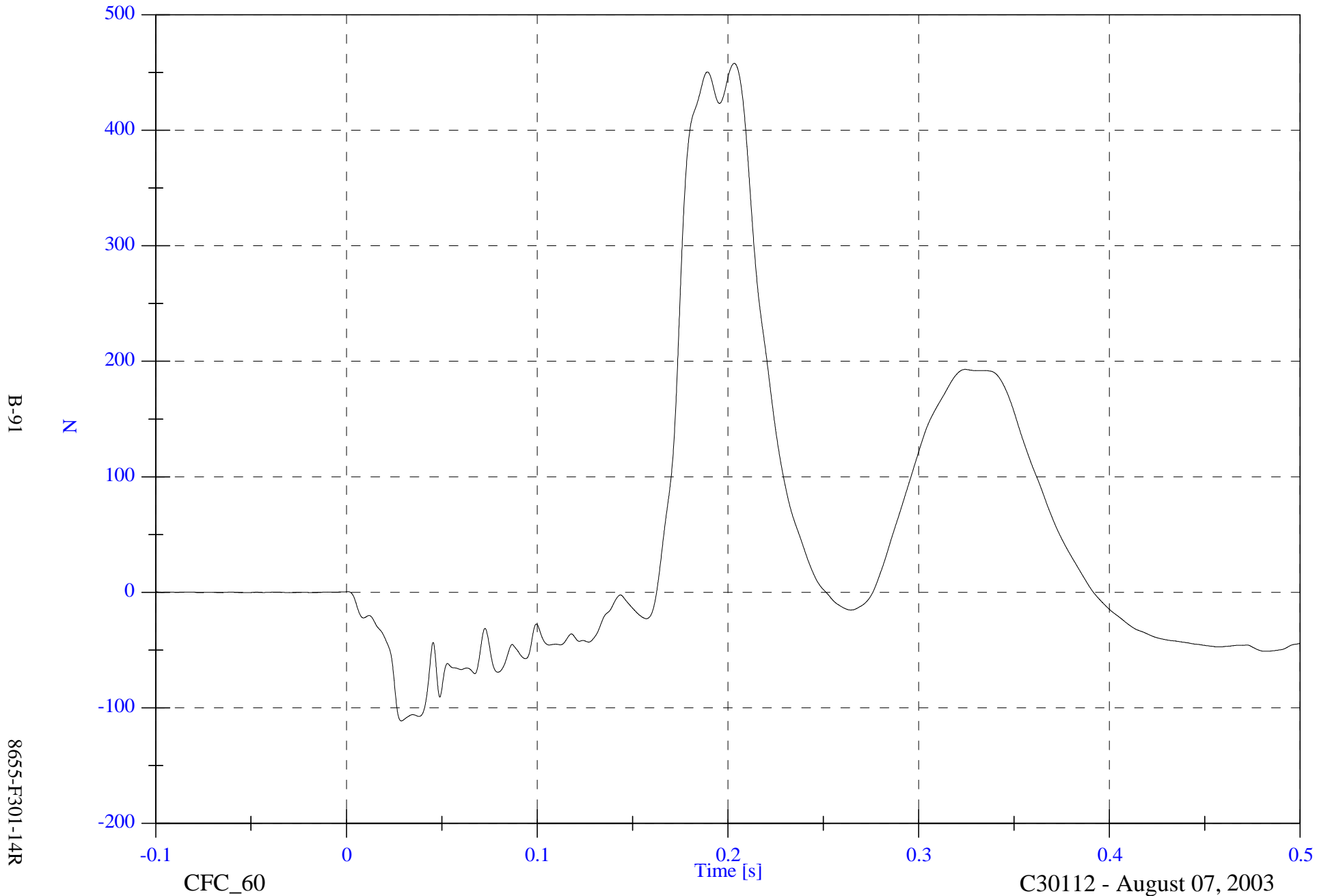


FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Lap Belt F

Max: 457.8 [N] at 0.203 [s]

Min: -111.3 [N] at 0.029 [s]



B-91

8655-F301-14R

CFC\_60

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

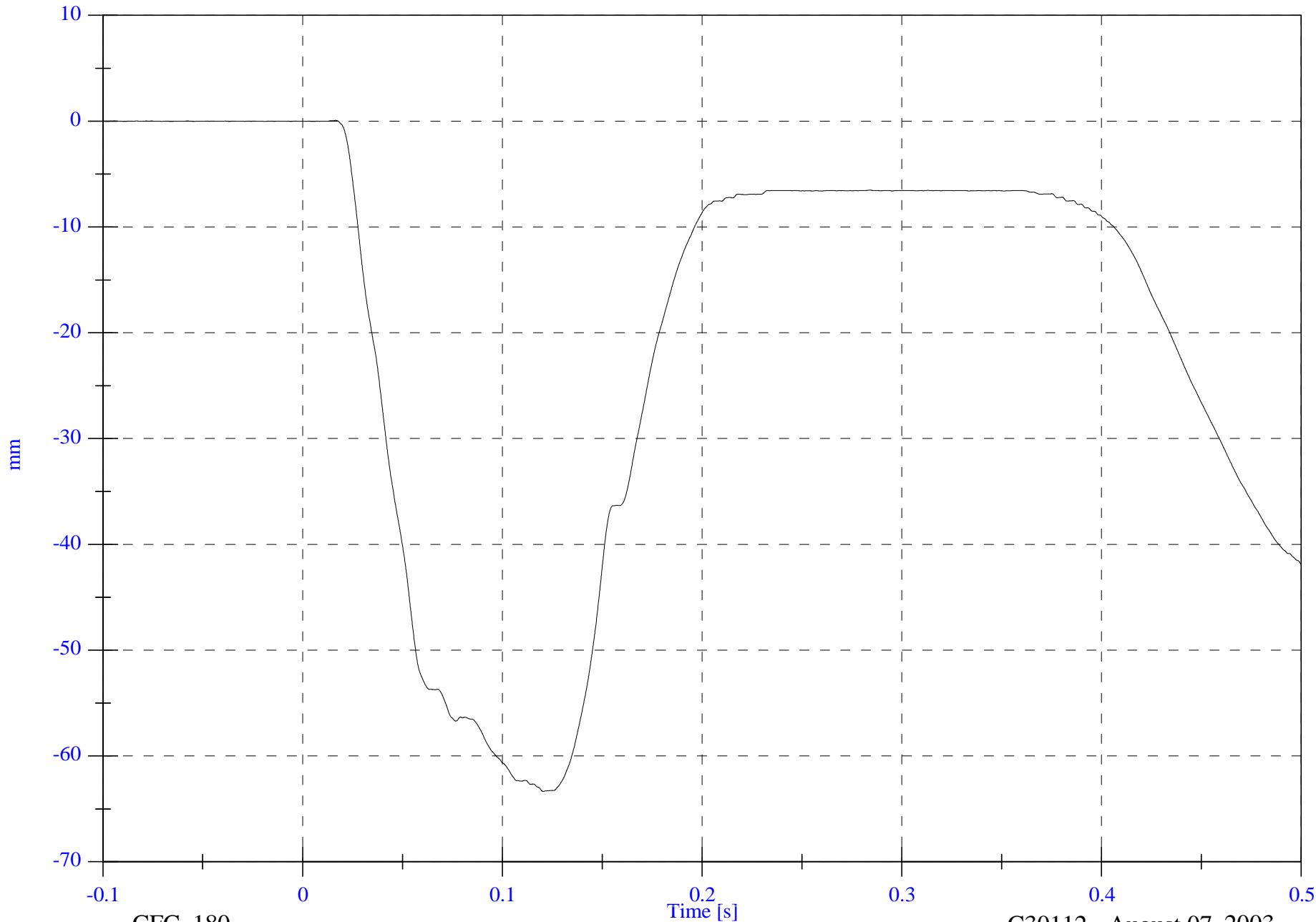
V2P2 Belt Spoolout

Max: 0.1 [mm] at 0.016 [s]

Min: -63.3 [mm] at 0.120 [s]

B-92

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

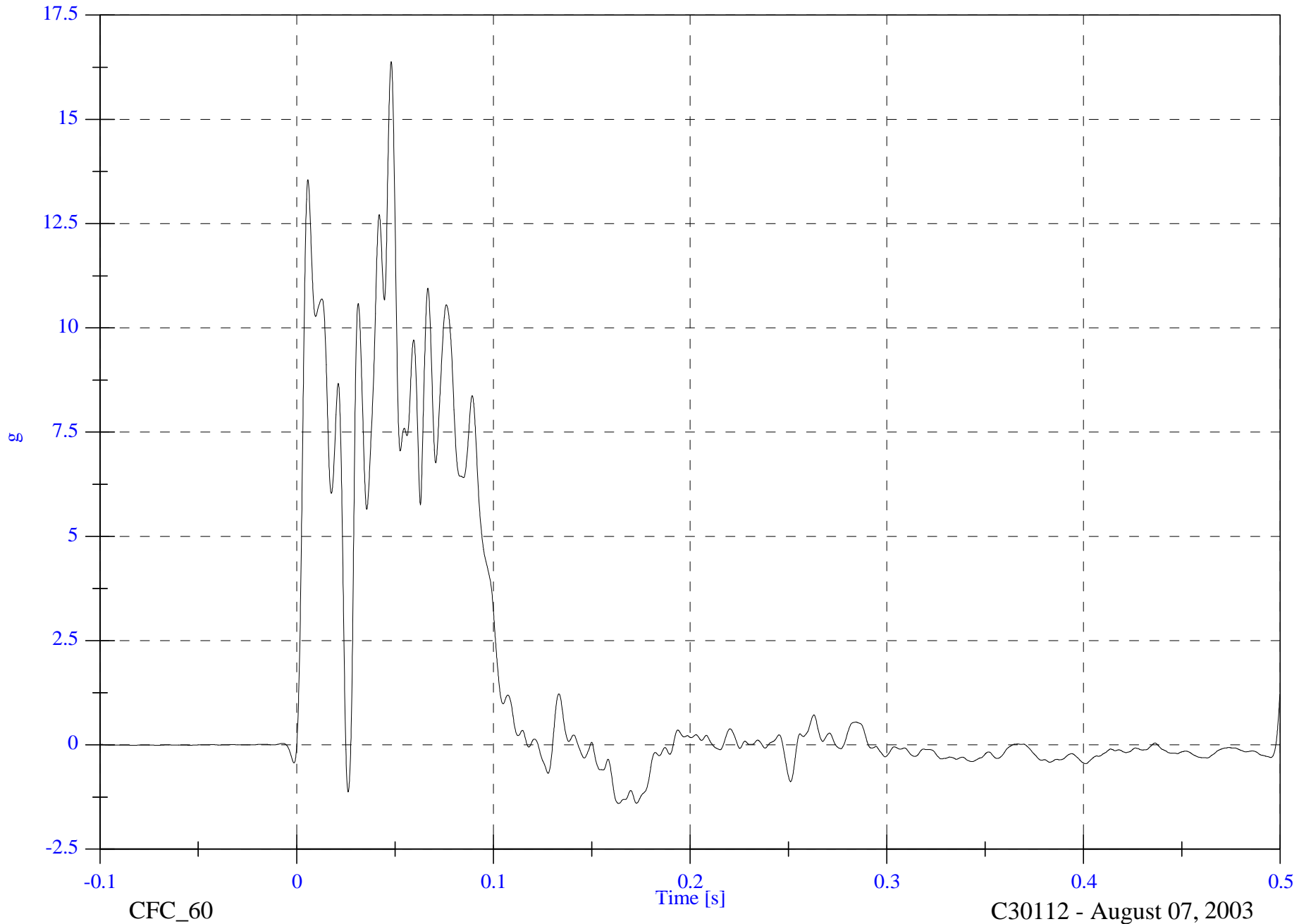
FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Ax

Max: 16.4 [g] at 0.048 [s]  
Min: -1.4 [g] at 0.163 [s]

B-93

8655-F301-14R



C30112 - August 07, 2003

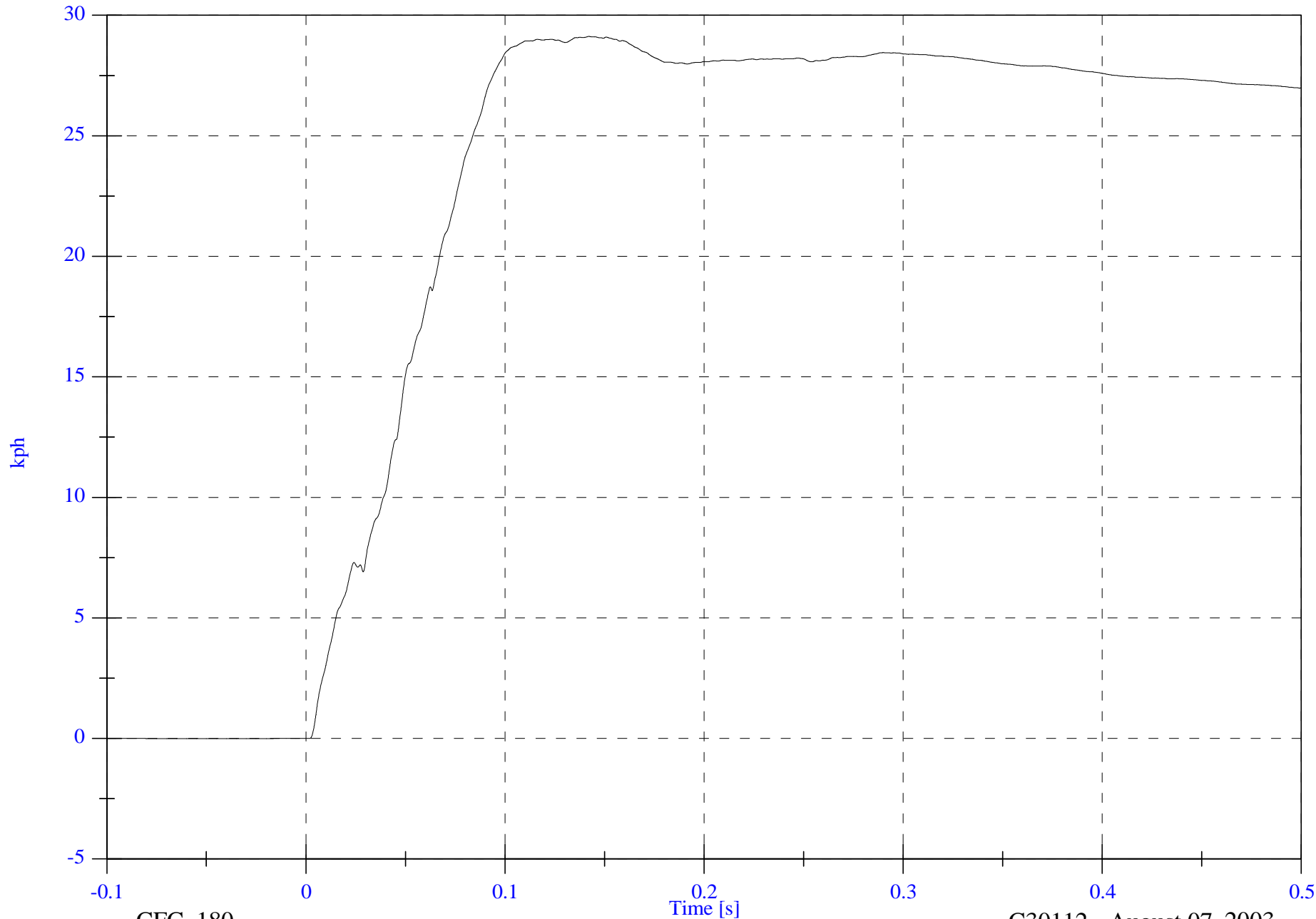
FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Ax Velocity

Max: 29.1 [kph] at 0.142 [s]  
Min: -0.0 [kph] at -0.052 [s]

B-94

8655-F301-14R



CFC\_180

Time [s]

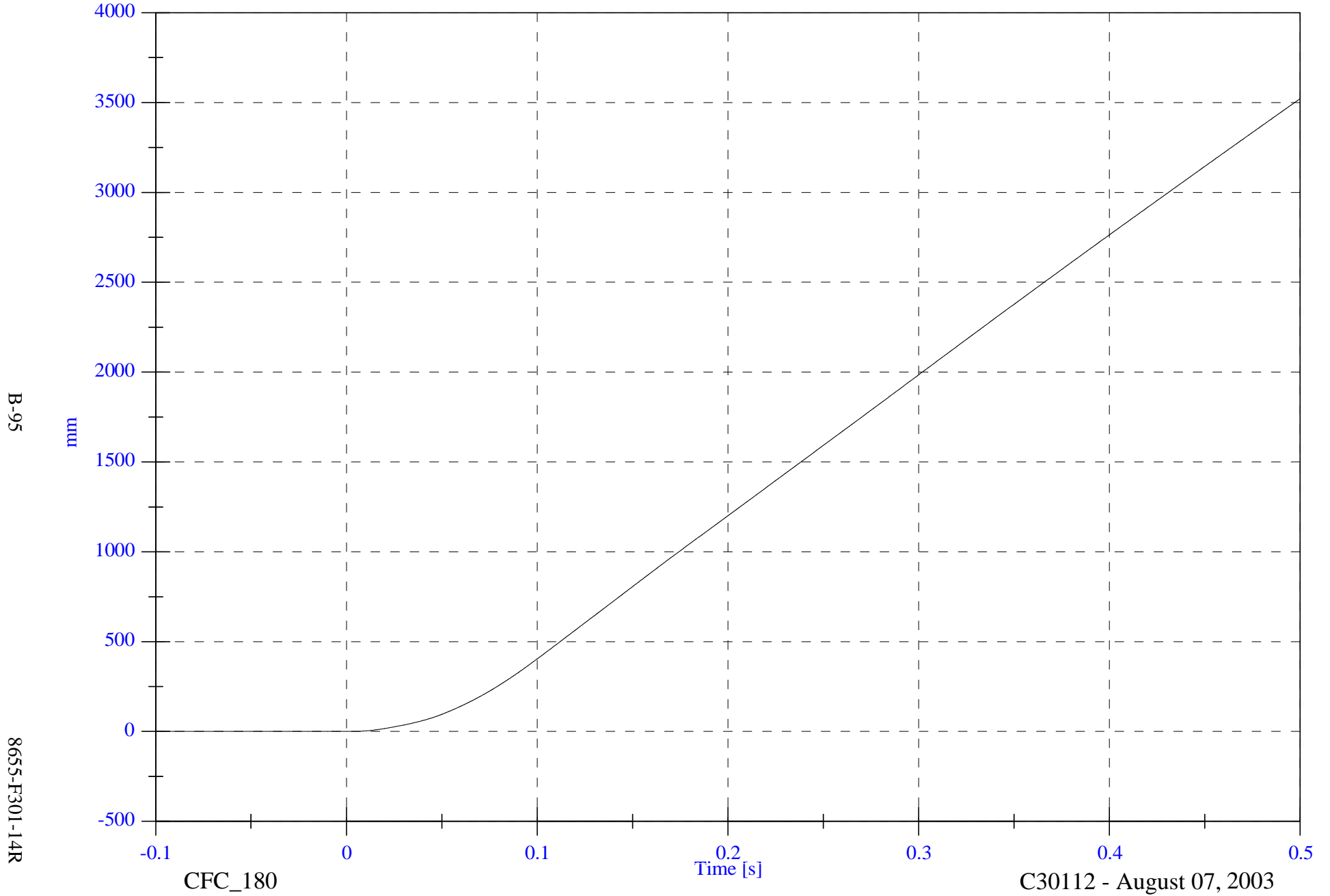
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Ax Displacement

Max: 3520.5 [mm] at 0.500 [s]

Min: -0.0 [mm] at -0.012 [s]



B-95

8655-F301-14R

CFC\_180

Time [s]

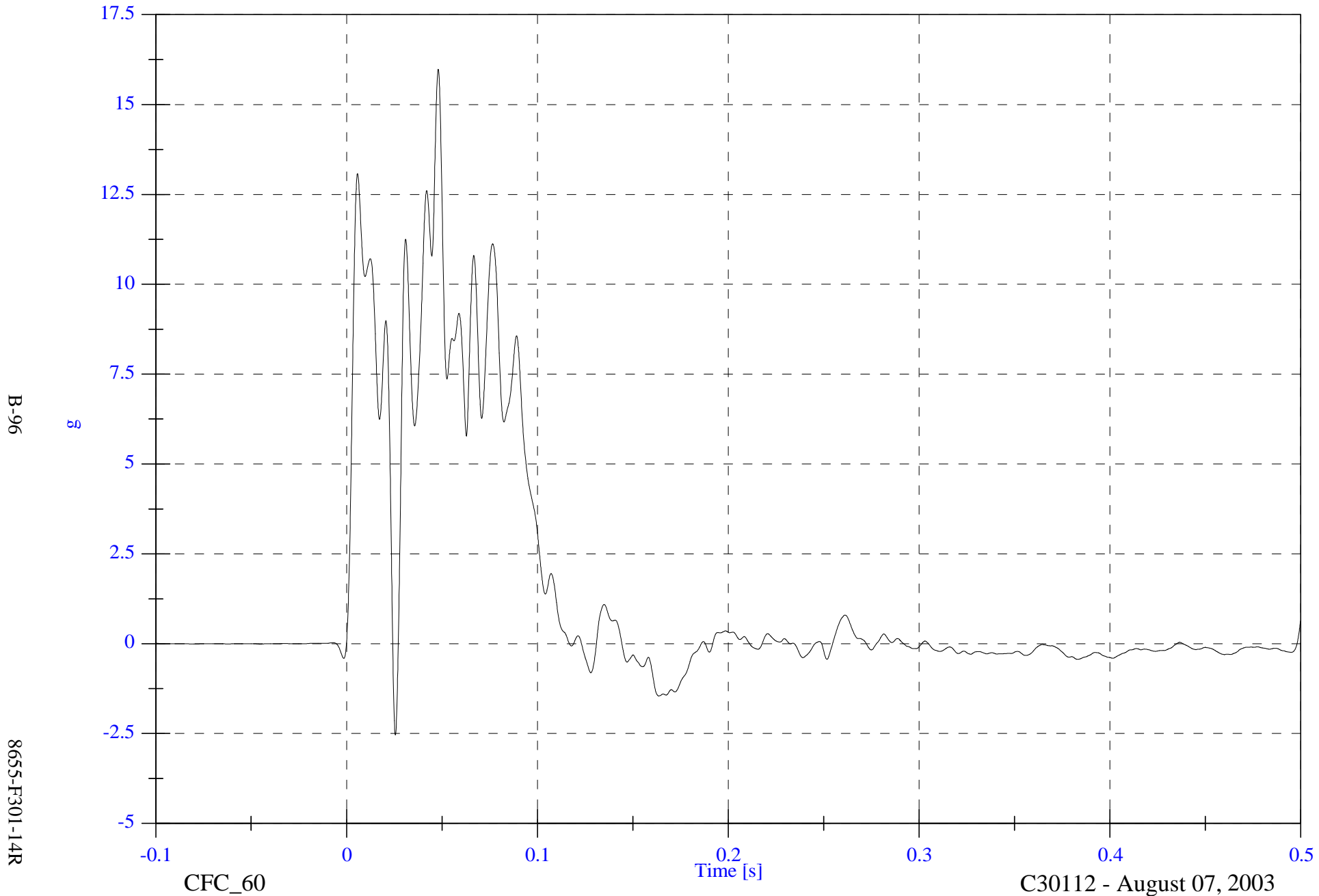
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Red Ax

Max: 16.0 [g] at 0.048 [s]

Min: -2.5 [g] at 0.025 [s]



B-96

8655-F301-14R

CFC\_60

Time [s]

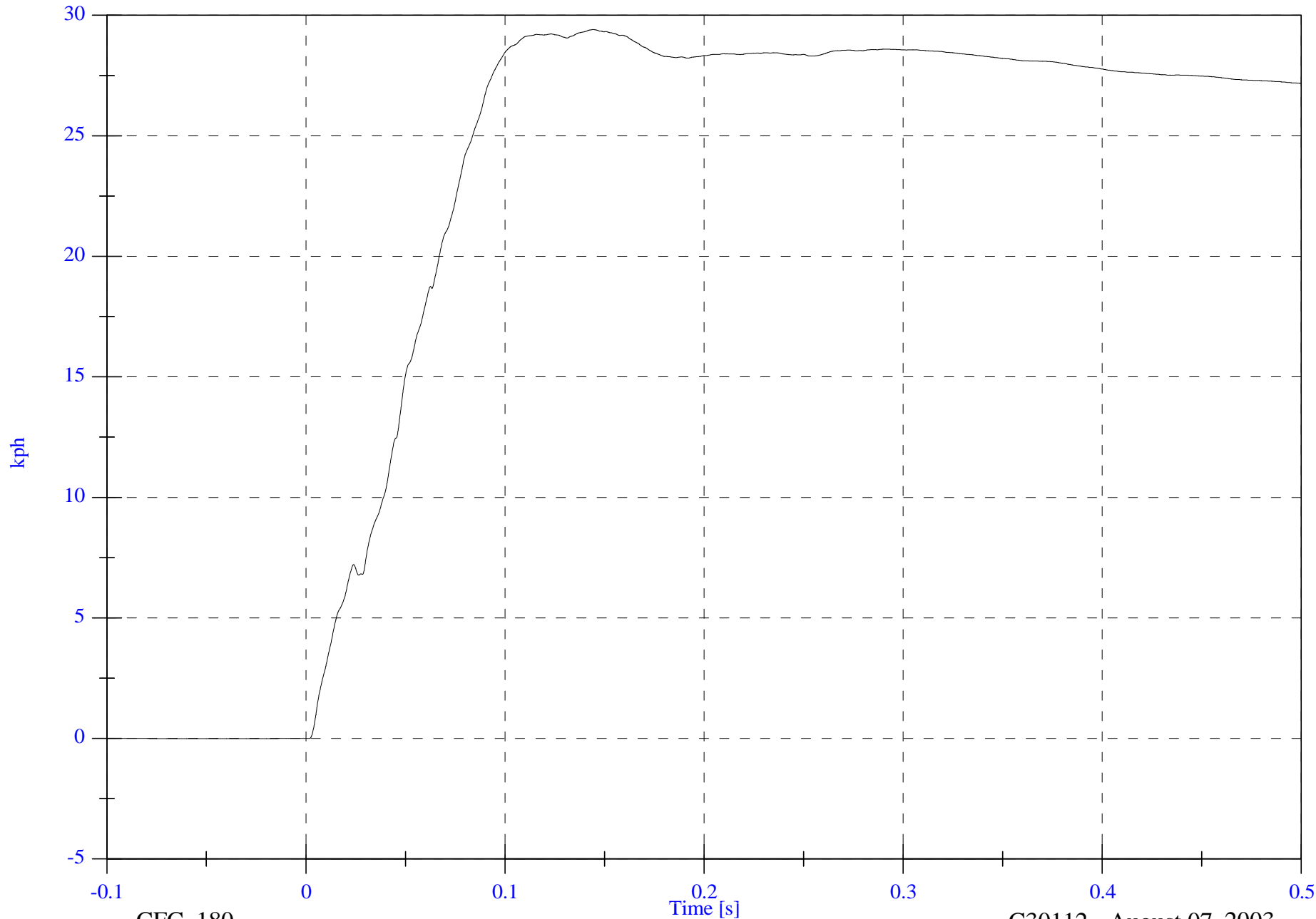
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Red Ax Velocity

Max: 29.4 [kph] at 0.144 [s]

Min: -0.0 [kph] at -0.038 [s]



B-97

8655-F301-14R

CFC\_180

Time [s]

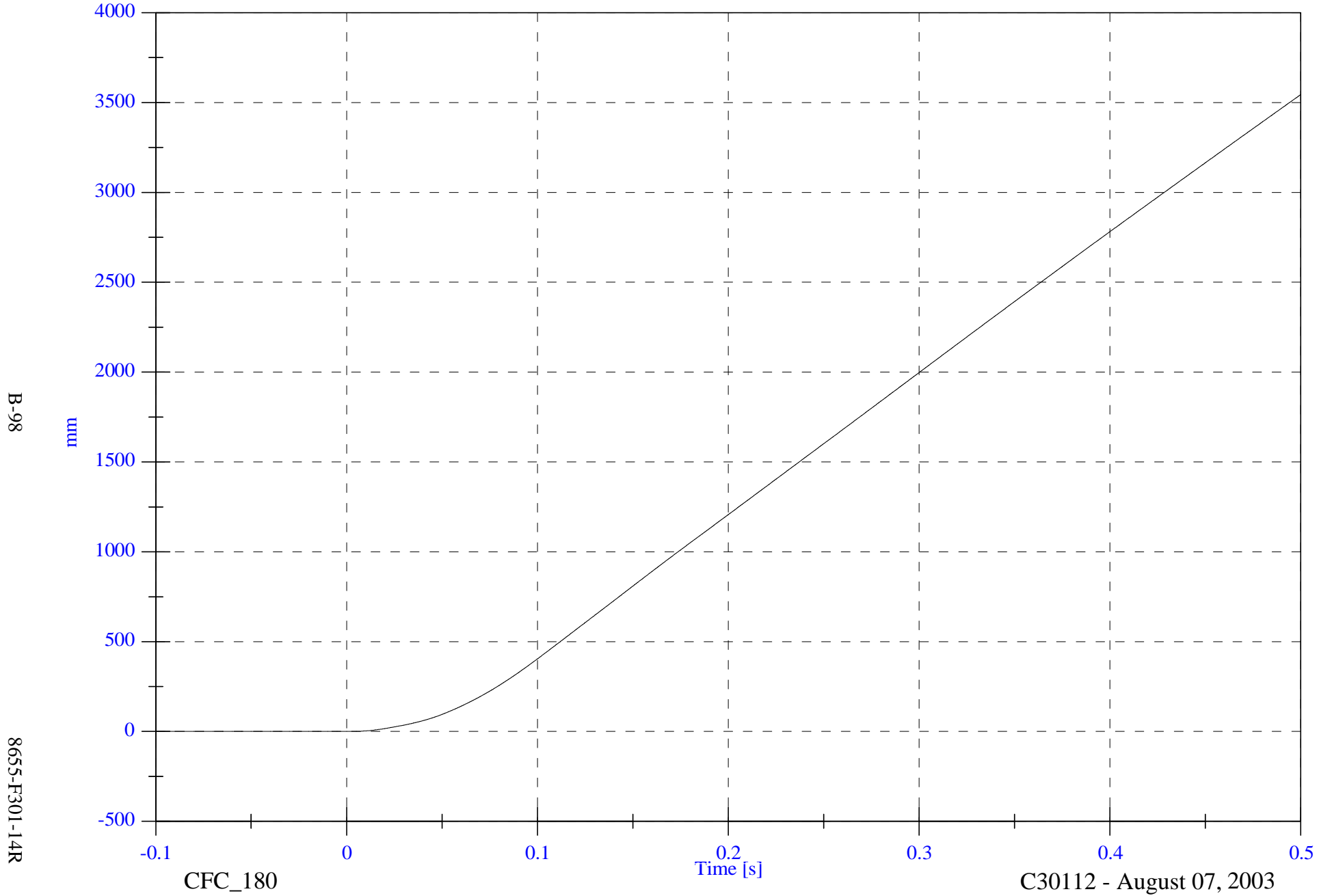
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left X Member Red Ax Displacement

Max: 3543.1 [mm] at 0.500 [s]

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



B-98

8655-F301-14R

CFC\_180

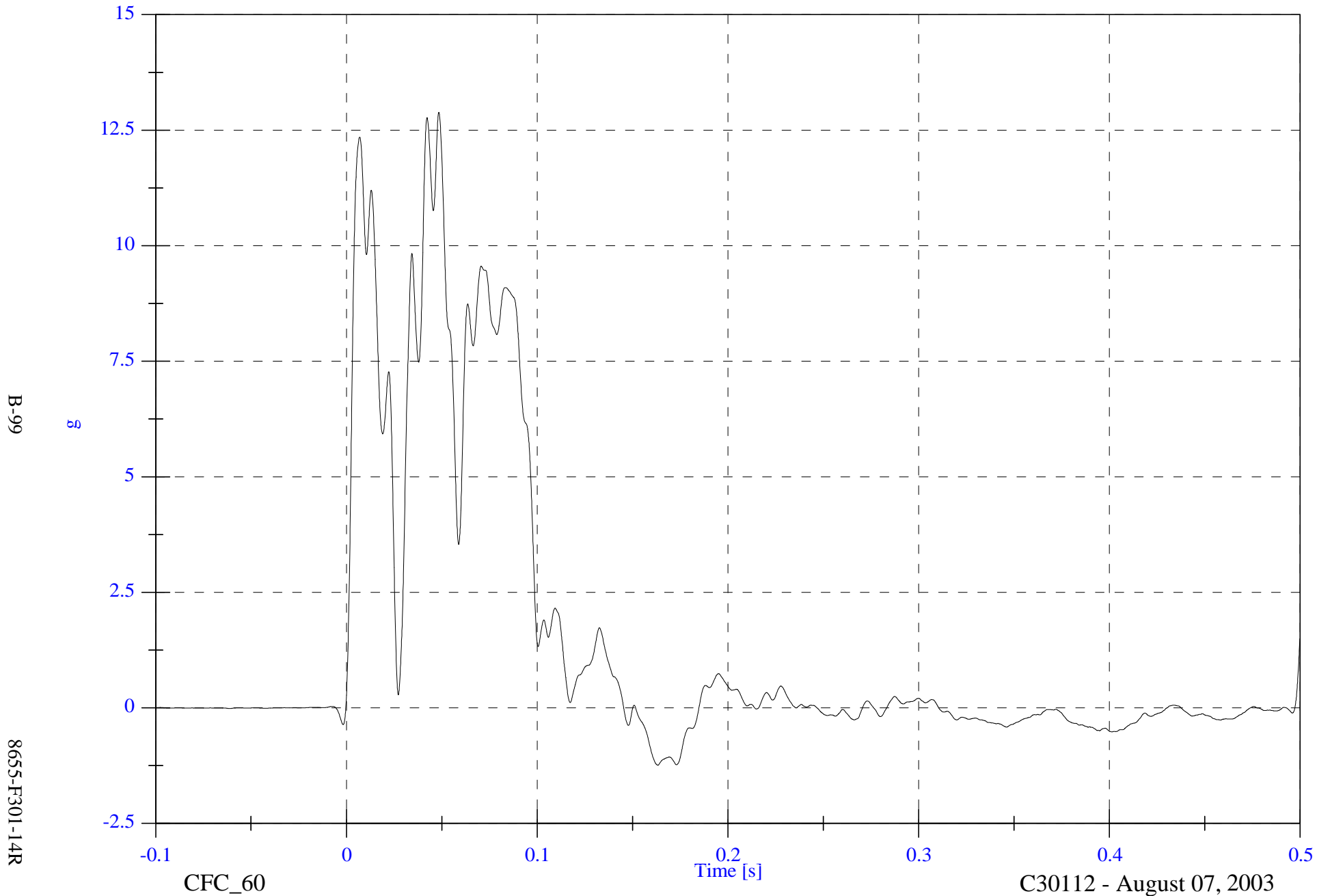
Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Right X Member Ax

Max: 12.9 [g] at 0.048 [s]  
Min: -1.2 [g] at 0.163 [s]



B-99

8655-F301-14R

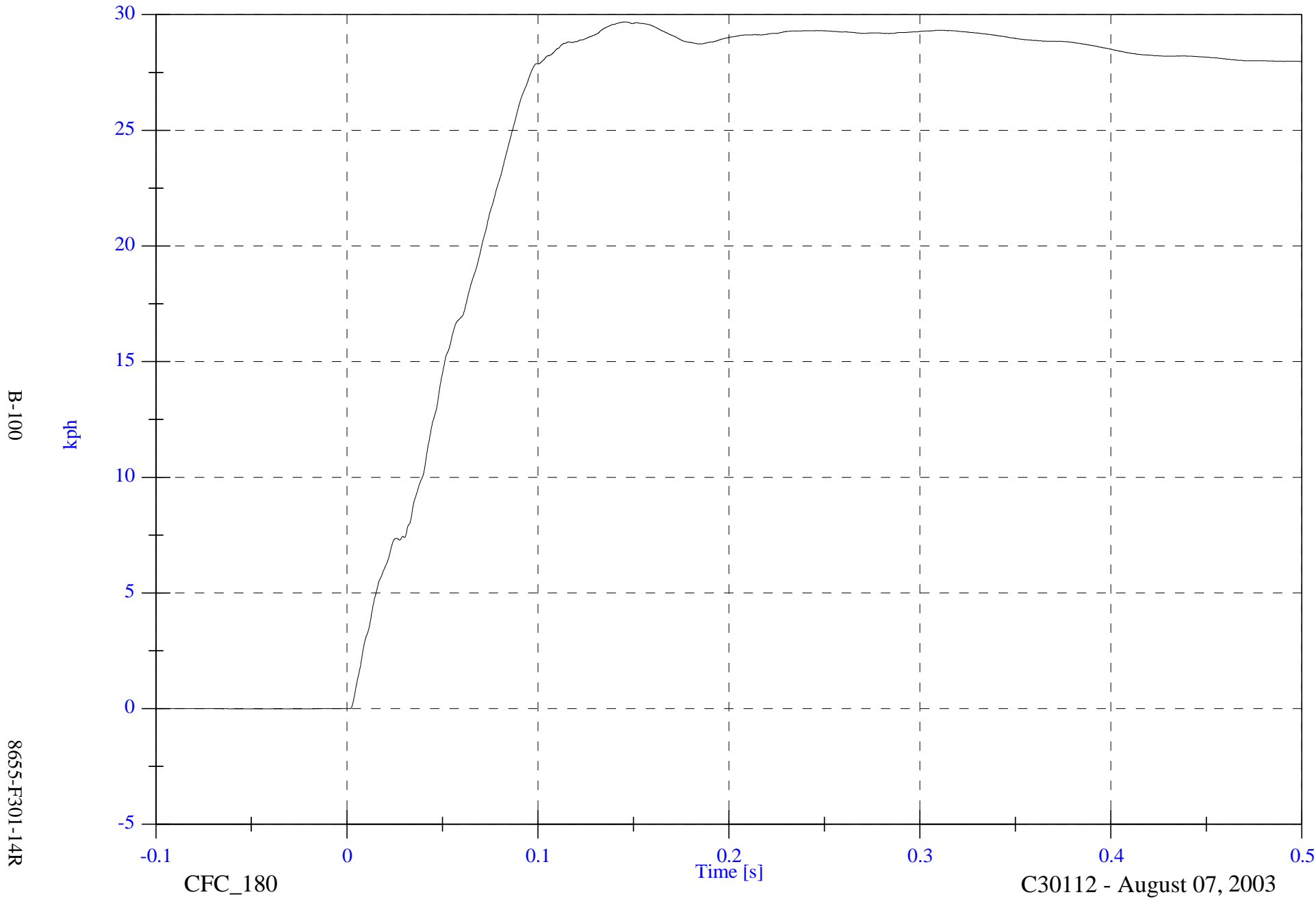
CFC\_60

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

Max: 29.7 [kph] at 0.145 [s]  
Min: -0.0 [kph] at -0.034 [s]

V2 Right X Member Ax Velocity



B-100

8655-F301-14R

CFC\_180

Time [s]

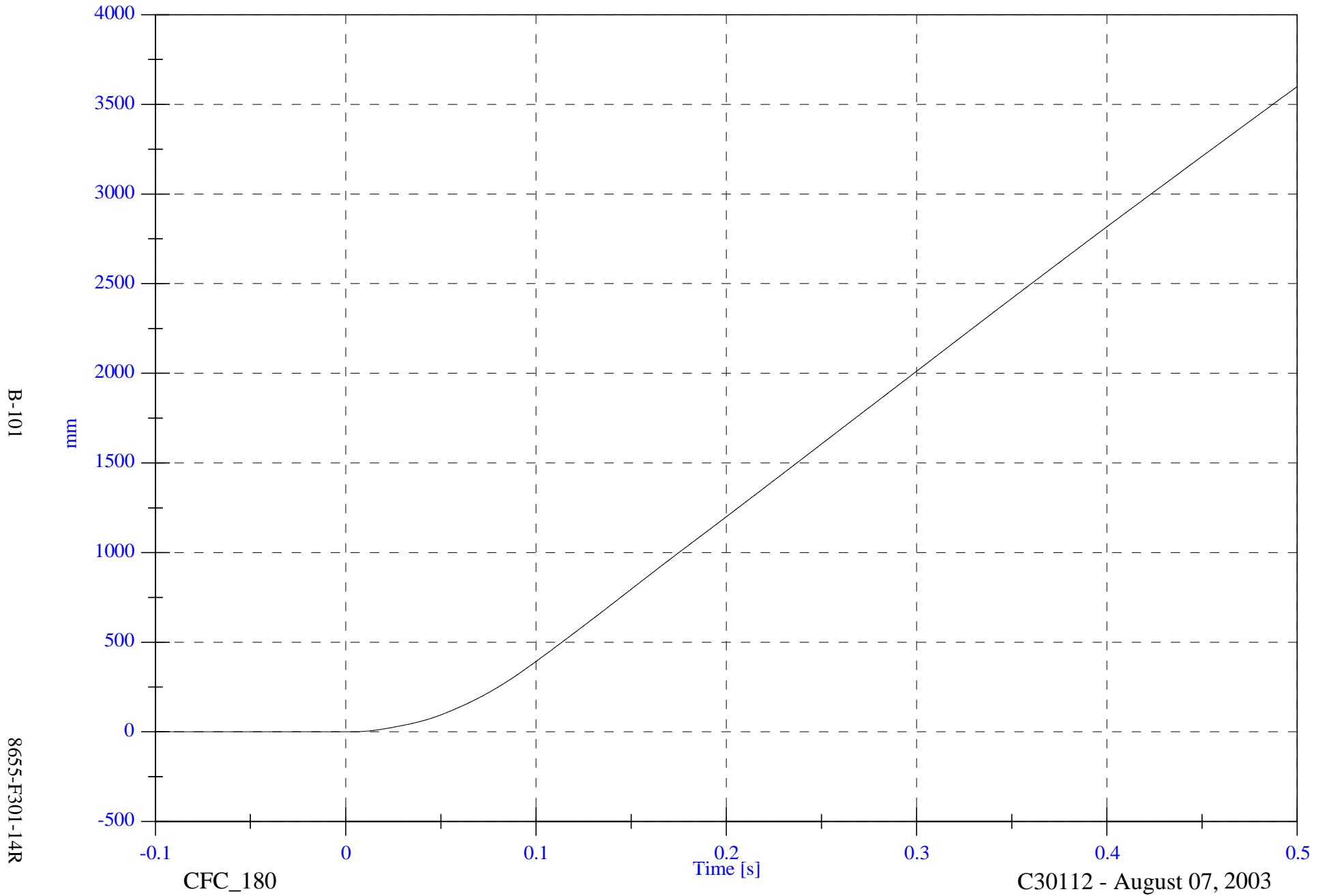
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Right X Member Ax Displacement

Max: 3598.2 [mm] at 0.500 [s]

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



B-101

8655-F301-14R

CFC\_180

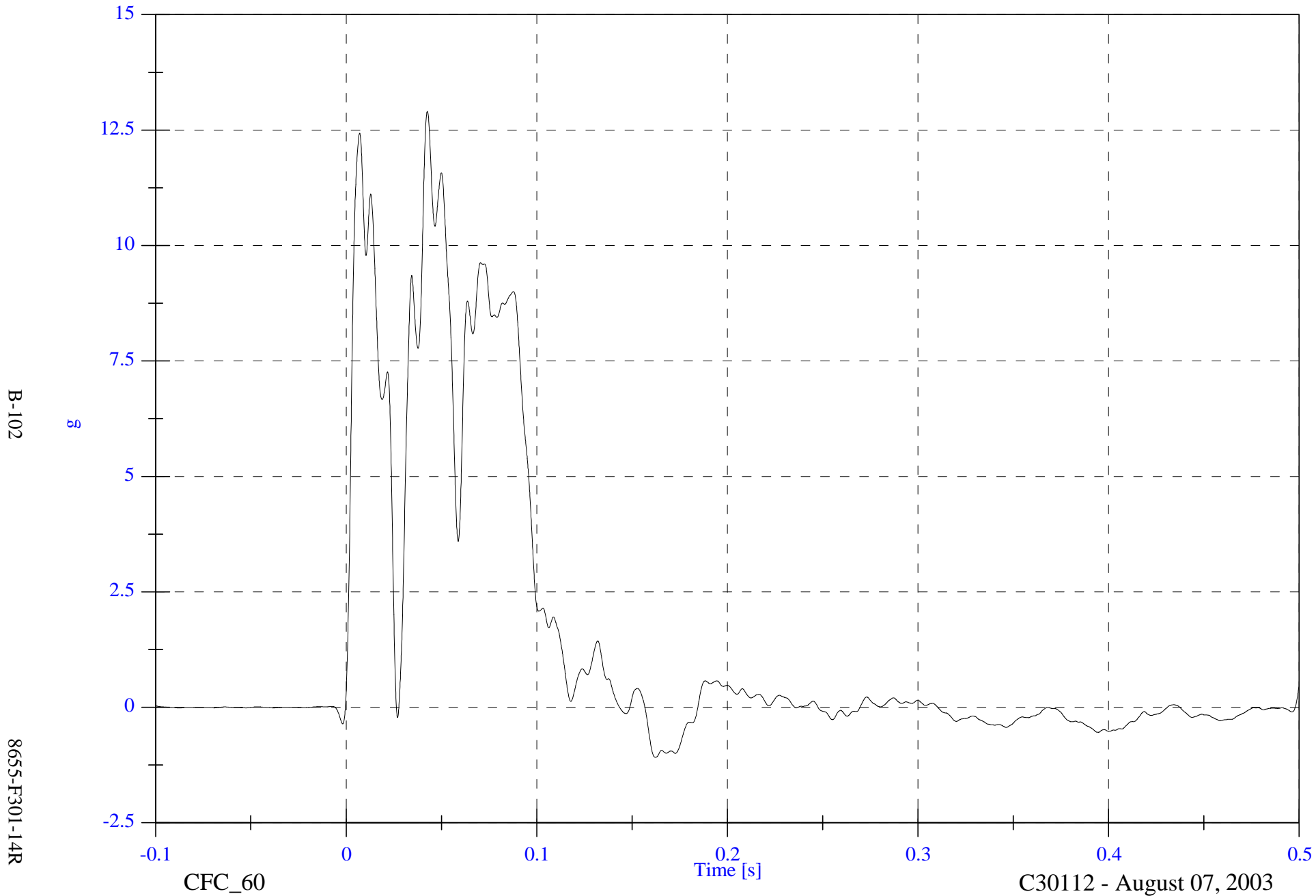
Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Right X Member Red Ax

Max: 12.9 [g] at 0.043 [s]  
Min: -1.1 [g] at 0.162 [s]



B-102

8655-F301-14R

CFC\_60

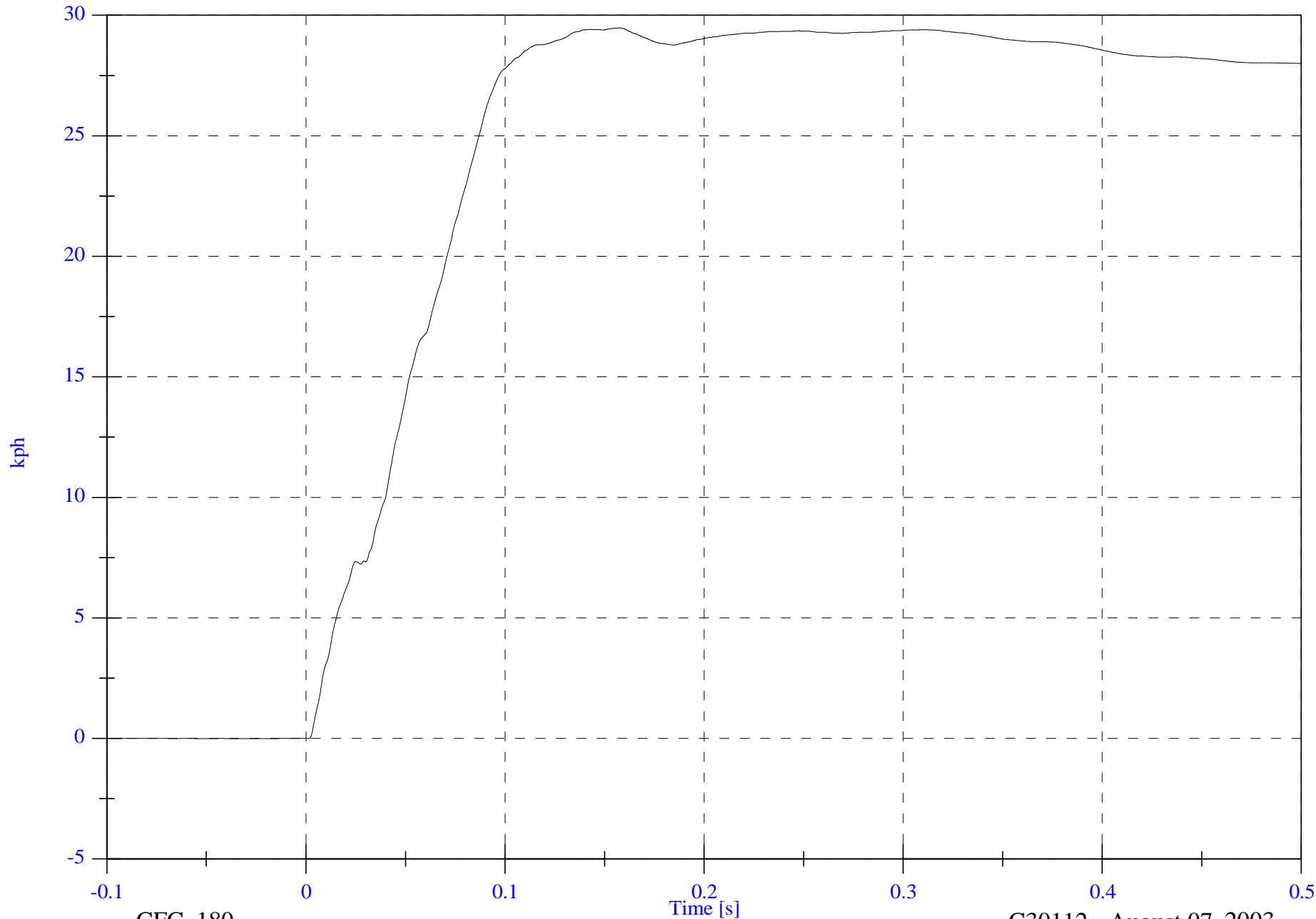
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

Max: 29.5 [kph] at 0.157 [s]

V2 Right X Member Red Ax Velocity

Min: -0.0 [kph] at -0.019 [s]



B-103

8655-F301-14R

CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

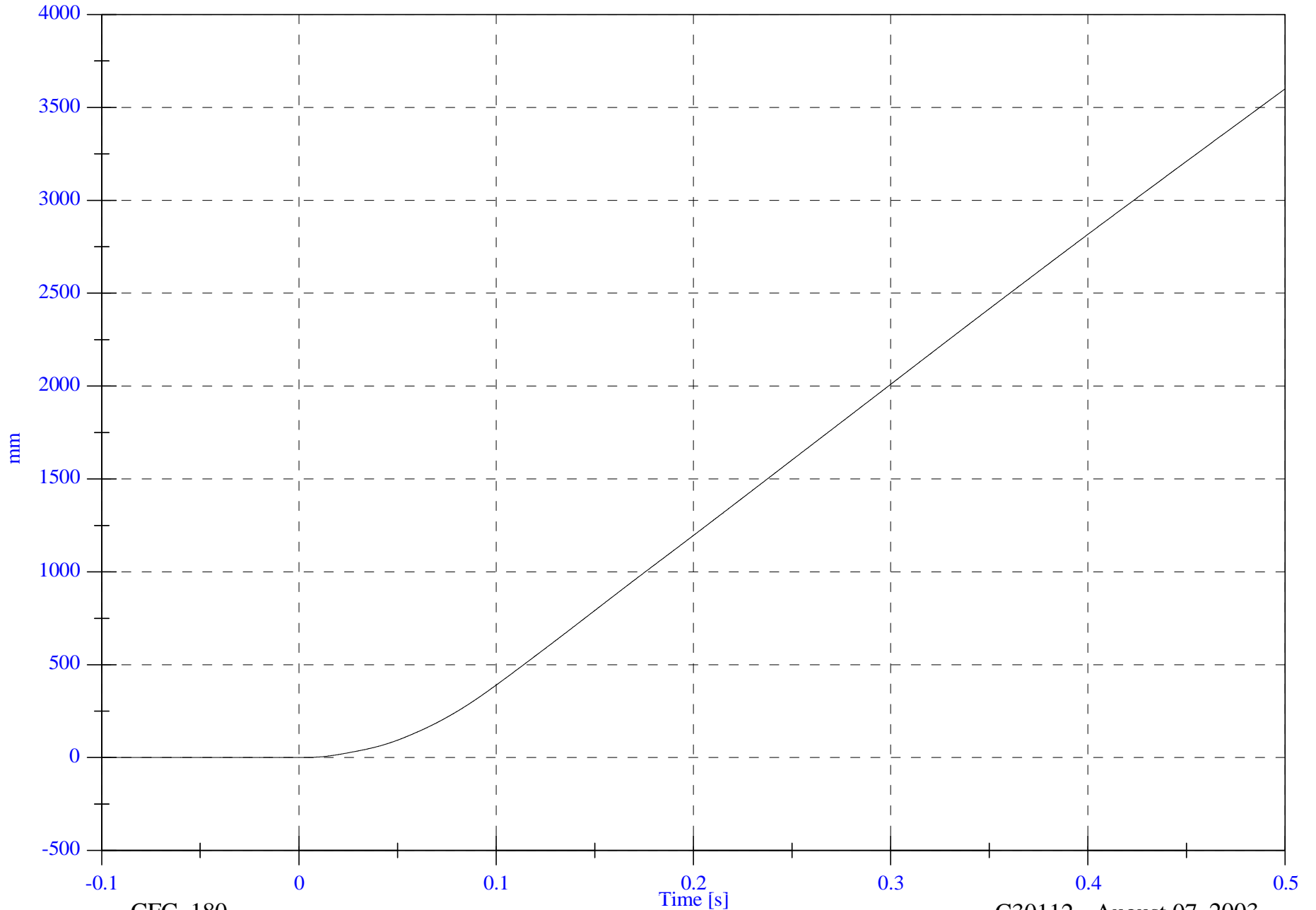
V2 Right X Member Red Ax Displacement

Max: 3598.7 [mm] at 0.500 [s]

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

B-104

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

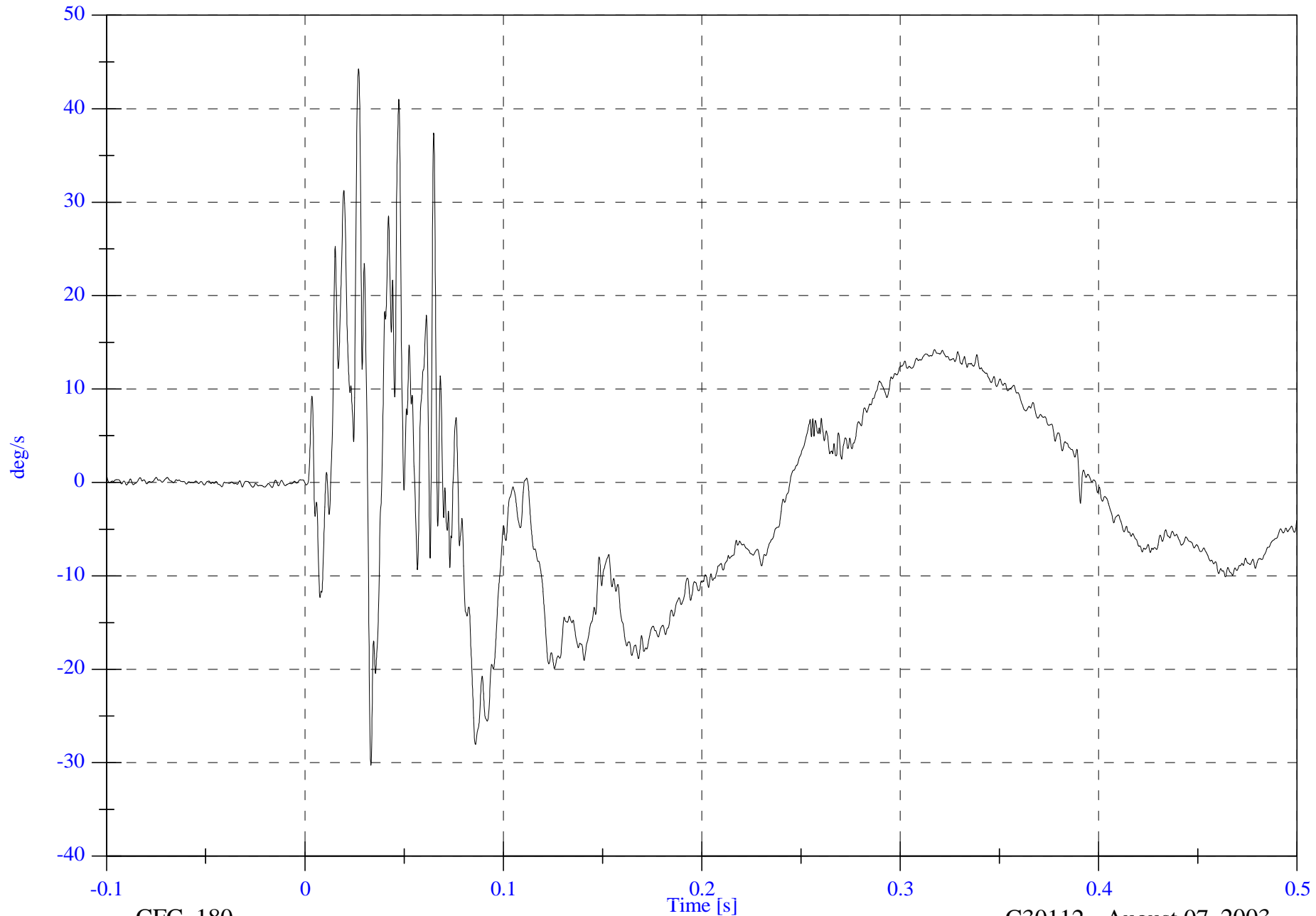
V2 Left Front Sill AVy

Max: 44.3 [deg/s] at 0.027 [s]

Min: -30.3 [deg/s] at 0.033 [s]

B-105

8655-F301-14R



CFC\_180

Time [s]

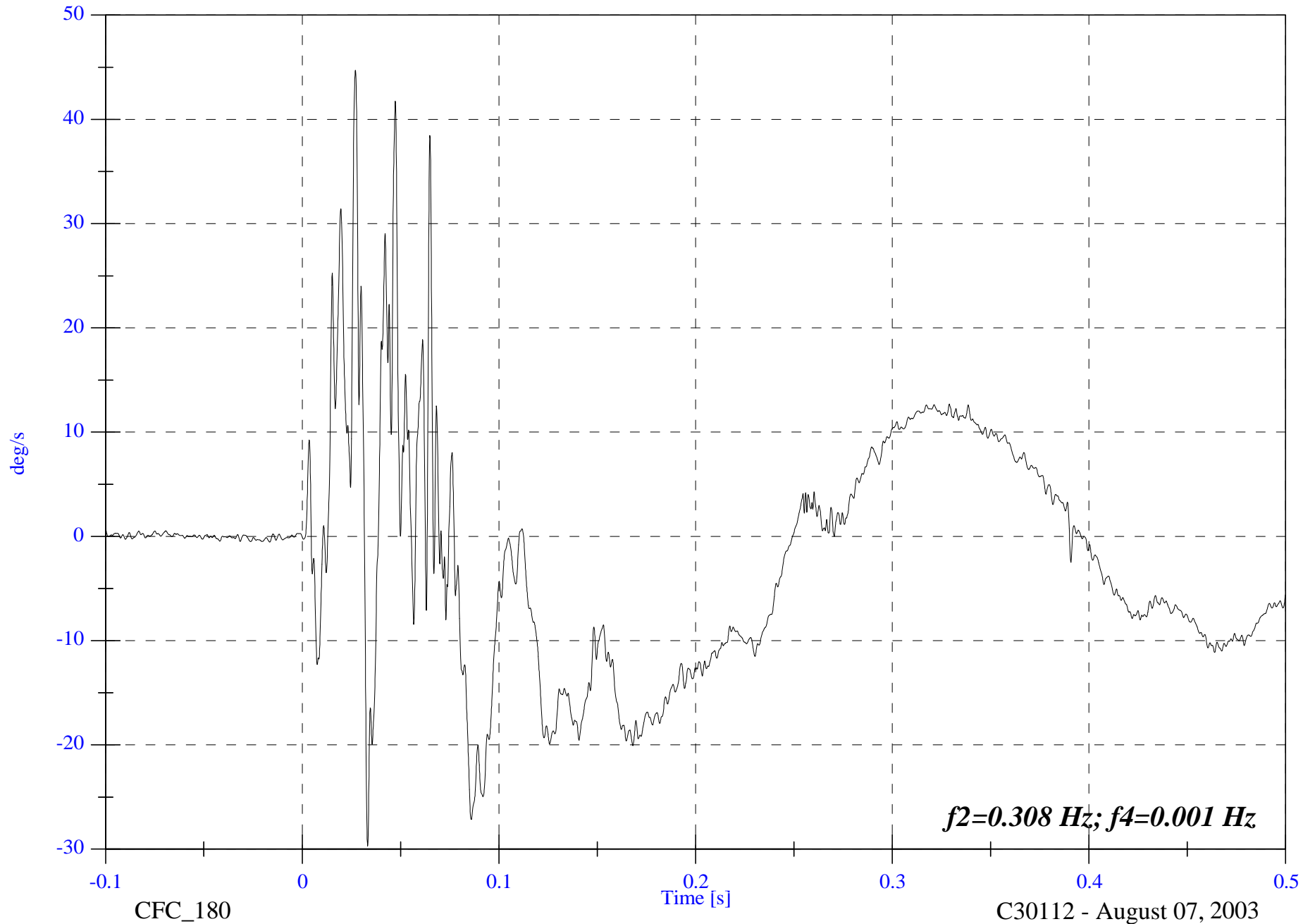
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left Front Sill Comp AVy

Max: 44.7 [deg/s] at 0.027 [s]

Min: -29.7 [deg/s] at 0.033 [s]



***$f_2=0.308$  Hz;  $f_4=0.001$  Hz***

B-106

8655-F301-14R

CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2 Left Front Sill Comp ADy

Max: 0.6 [deg] at 0.069 [s]

Min: -1.5 [deg] at 0.249 [s]

B-107

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

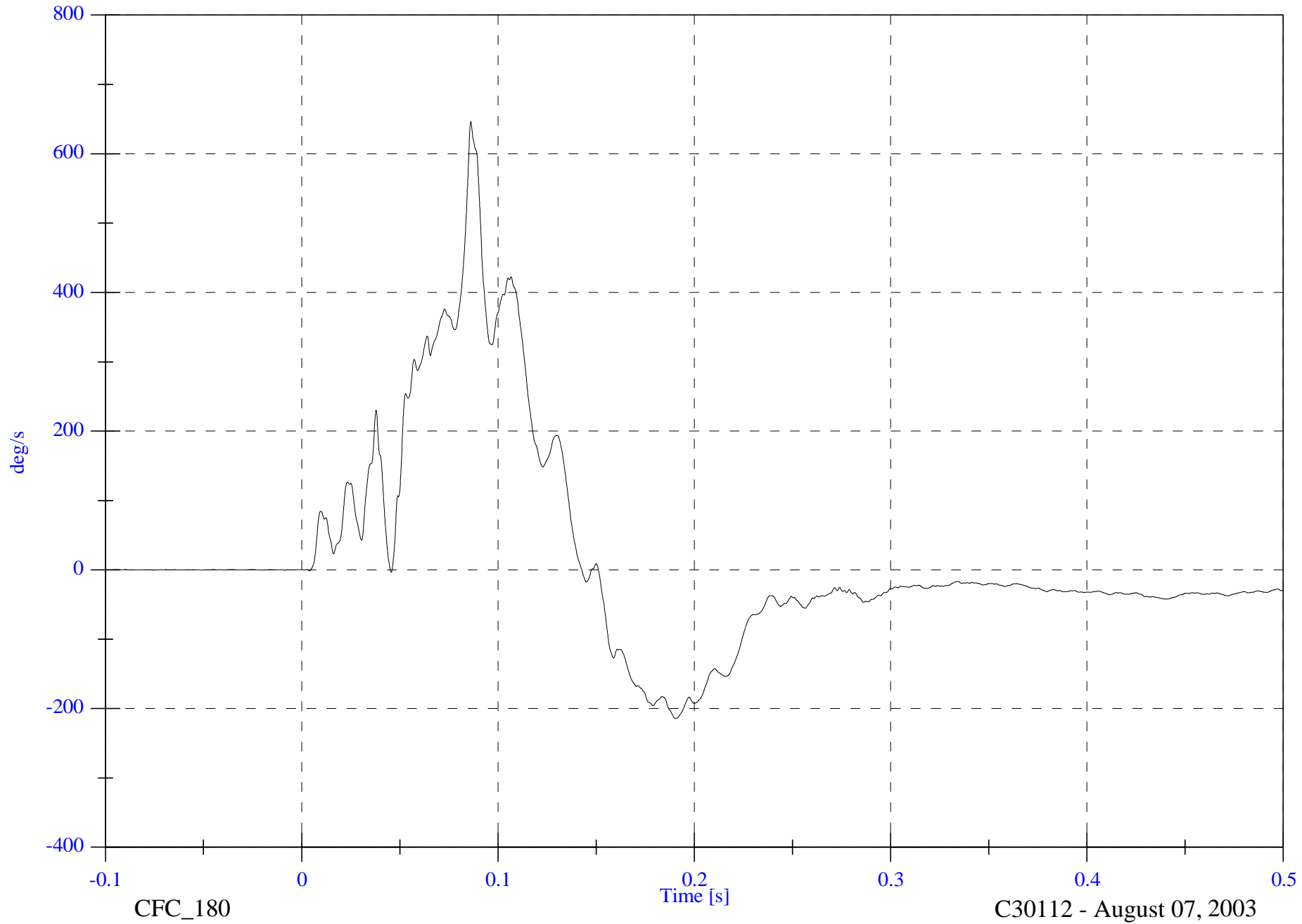
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Left Seat AVy

Max: 646.6 [deg/s] at 0.086 [s]  
Min: -214.3 [deg/s] at 0.190 [s]

B-108

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

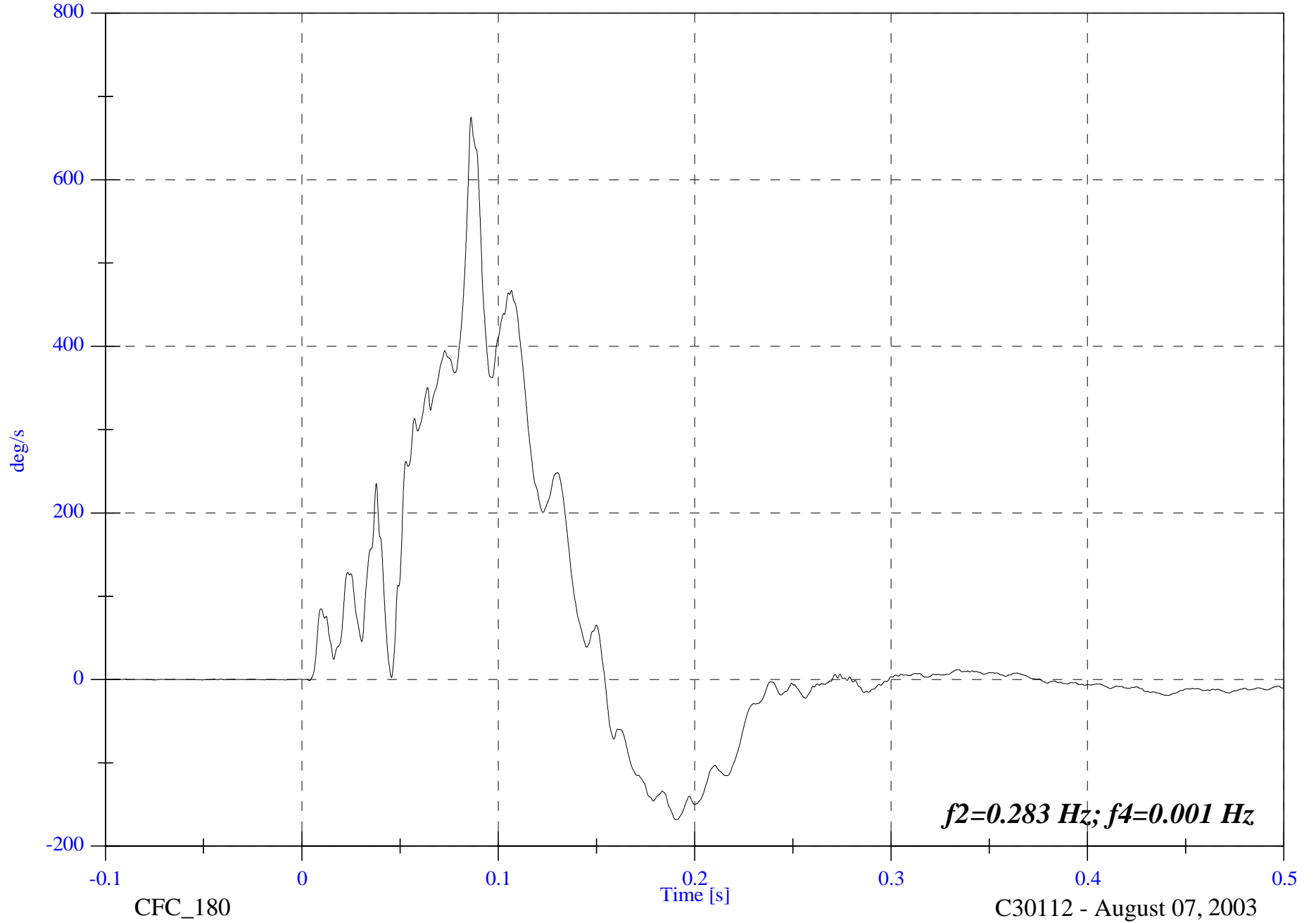
V2P1 Left Seat Comp AVy

Max: 675.1 [deg/s] at 0.086 [s]

Min: -168.3 [deg/s] at 0.190 [s]

B-109

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

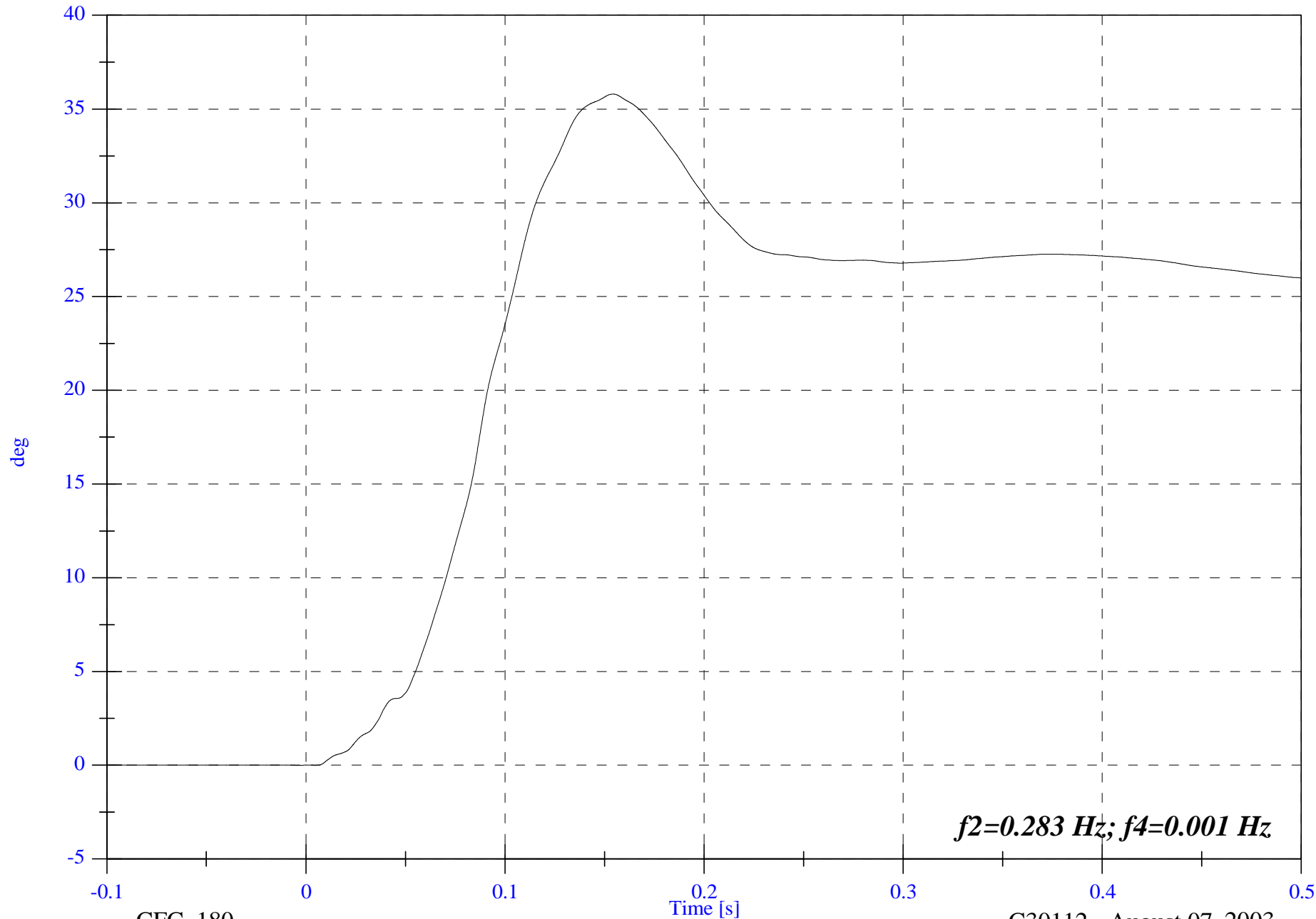
V2P1 Left Seat Comp ADy

Max: 35.8 [deg] at 0.154 [s]

Min: -0.0 [deg] at 0.005 [s]

B-110

8655-F301-14R



*f2=0.283 Hz; f4=0.001 Hz*

CFC\_180

C30112 - August 07, 2003

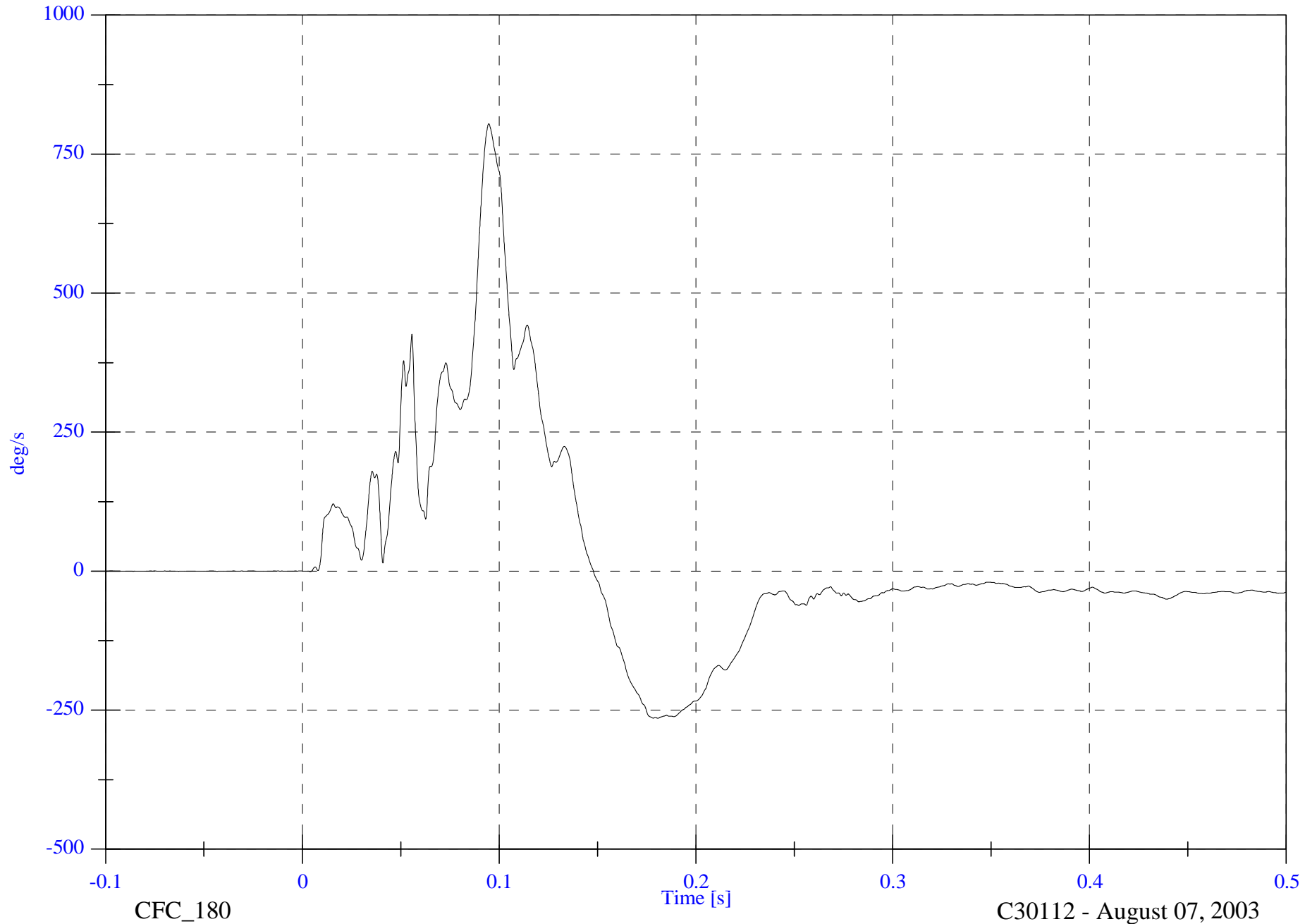
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Right Seat AVy

Max: 804.7 [deg/s] at 0.095 [s]  
Min: -264.5 [deg/s] at 0.181 [s]

B-111

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

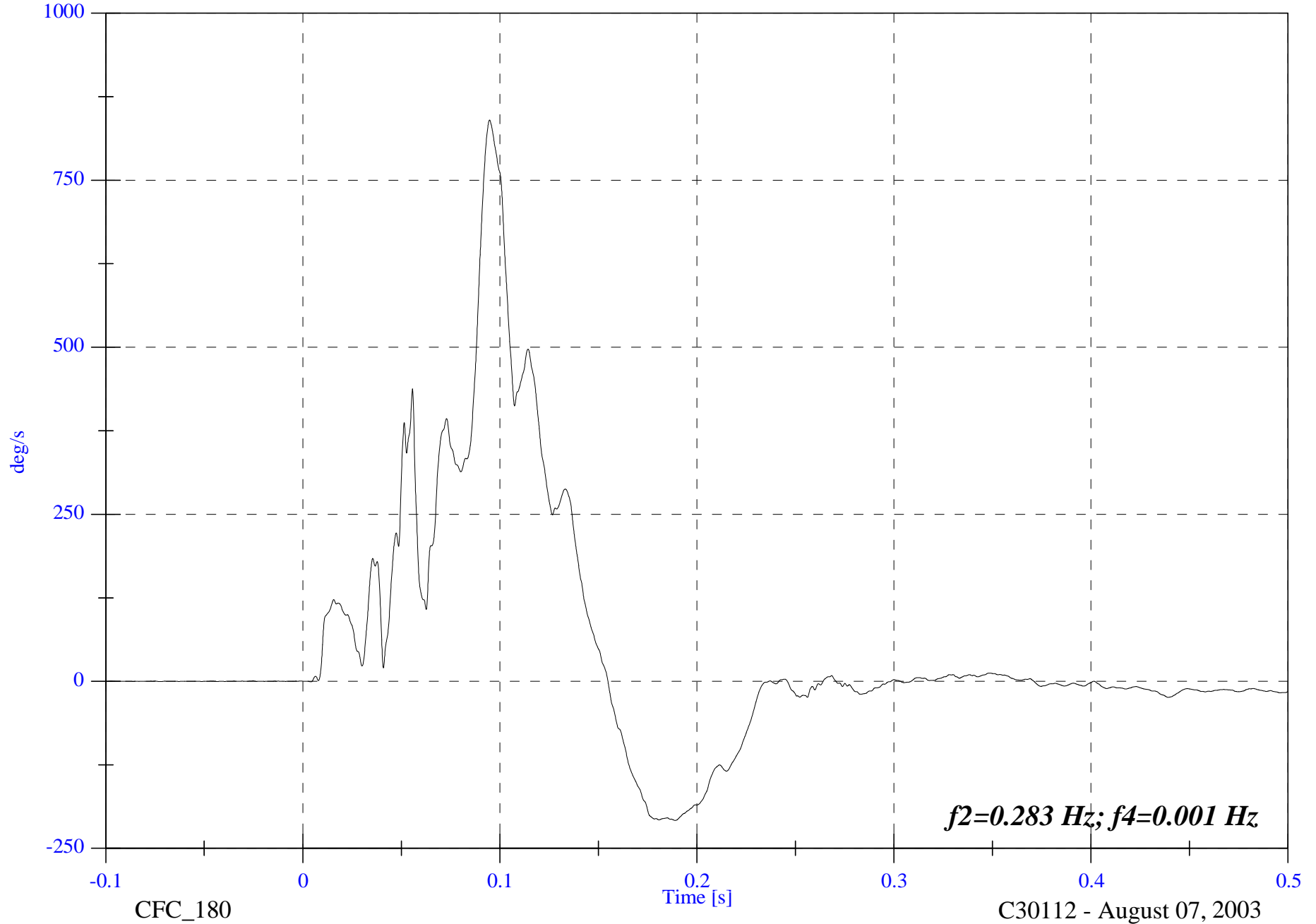
V2P1 Right Seat Comp AVy

Max: 840.1 [deg/s] at 0.095 [s]

Min: -208.2 [deg/s] at 0.189 [s]

B-112

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

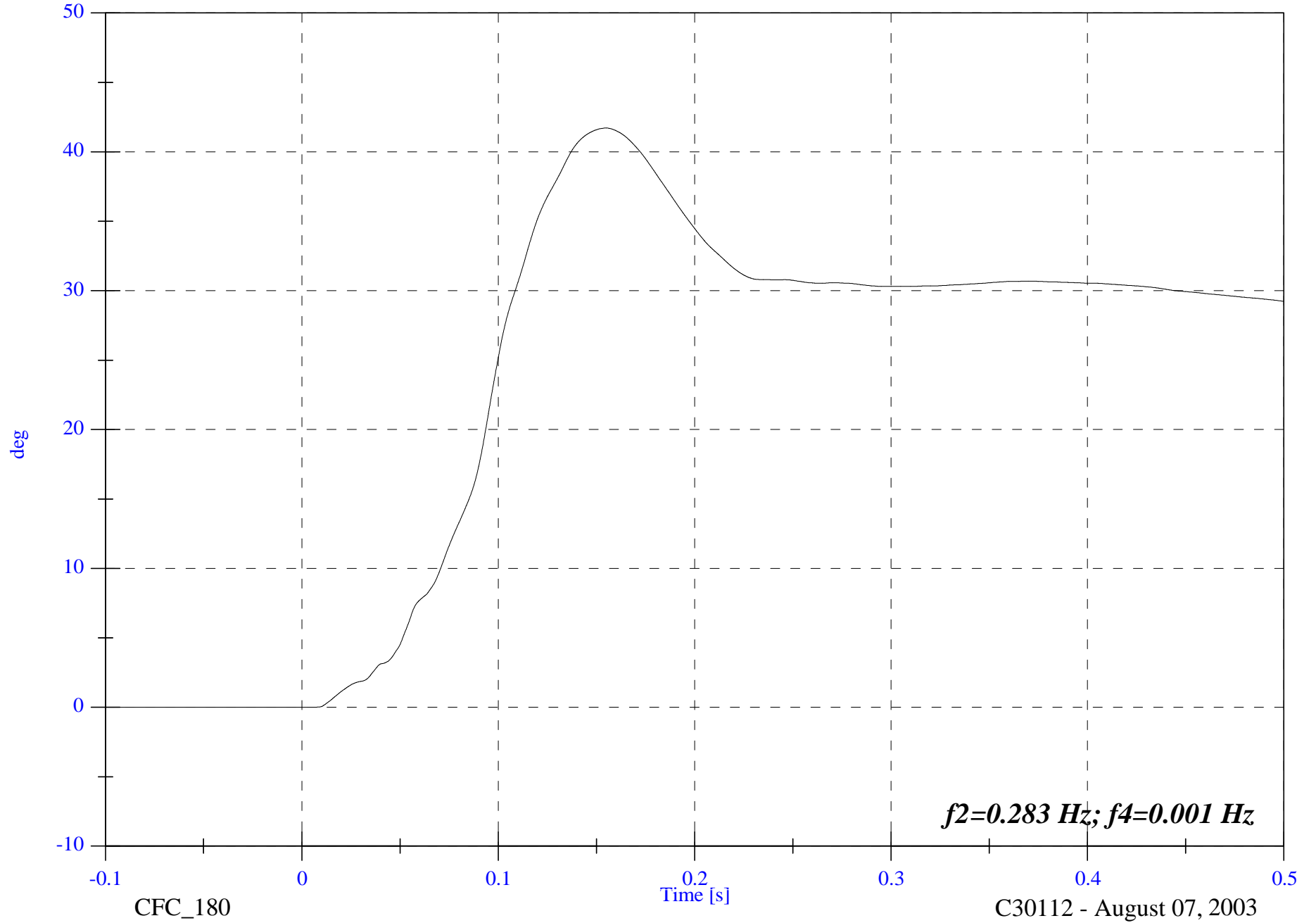
V2P1 Right Seat Comp ADy

Max: 41.7 [deg] at 0.155 [s]

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

B-113

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

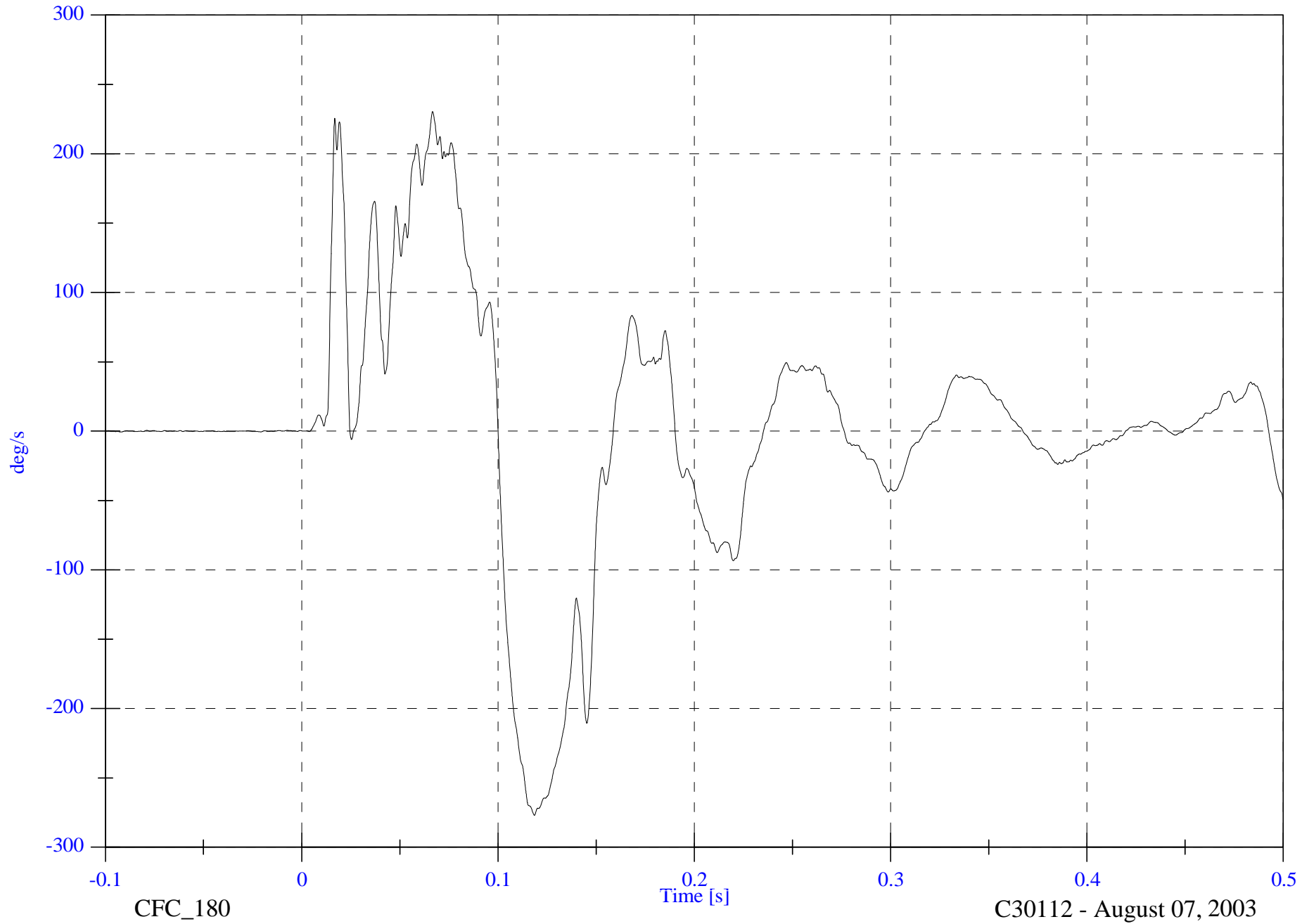
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Left Seat AVy

Max: 230.6 [deg/s] at 0.067 [s]  
Min: -277.0 [deg/s] at 0.118 [s]

B-114

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

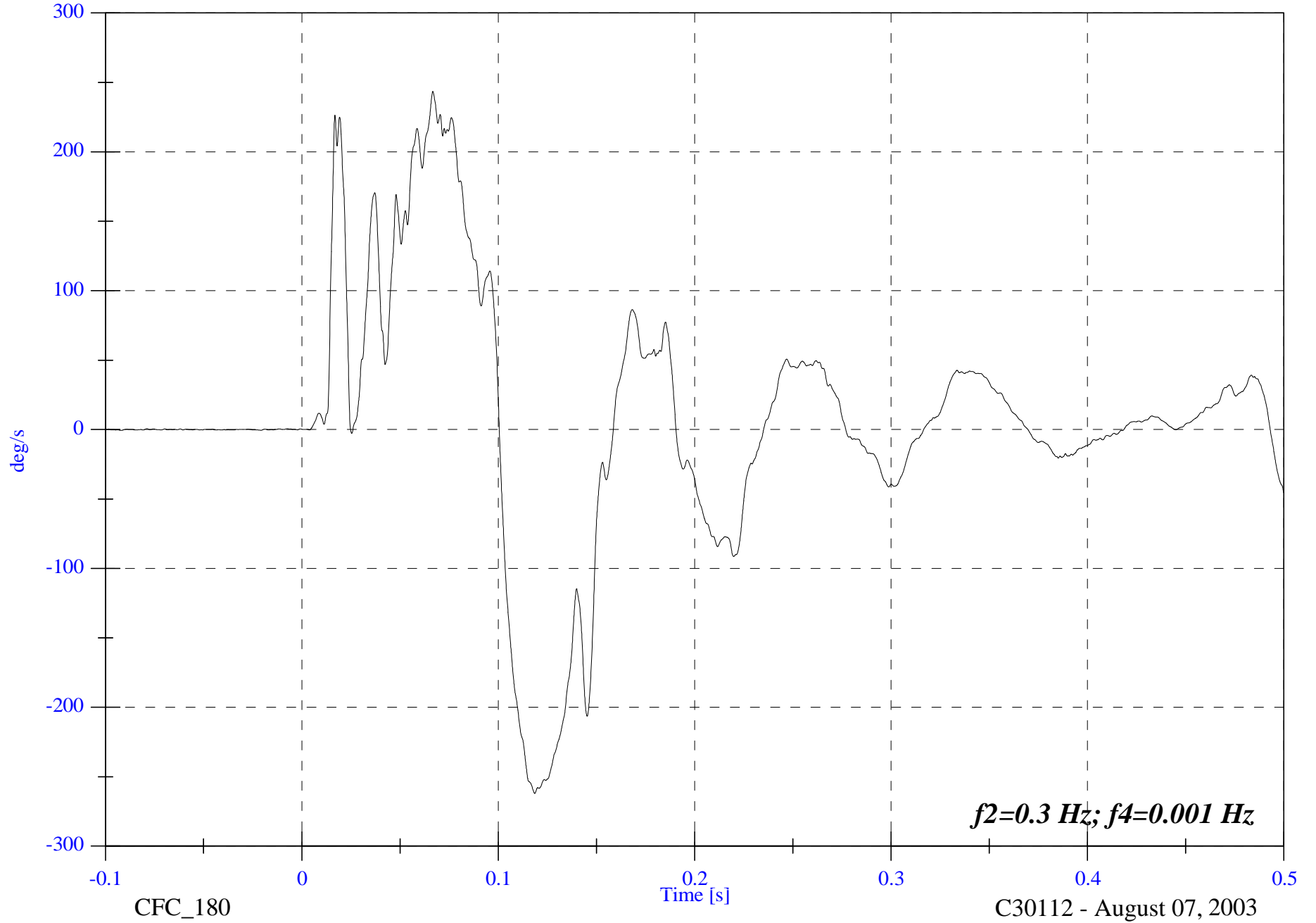
V2P2 Left Seat Comp AVy

Max: 243.6 [deg/s] at 0.067 [s]

Min: -262.1 [deg/s] at 0.119 [s]

B-115

8655-F301-14R



CFC\_180

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

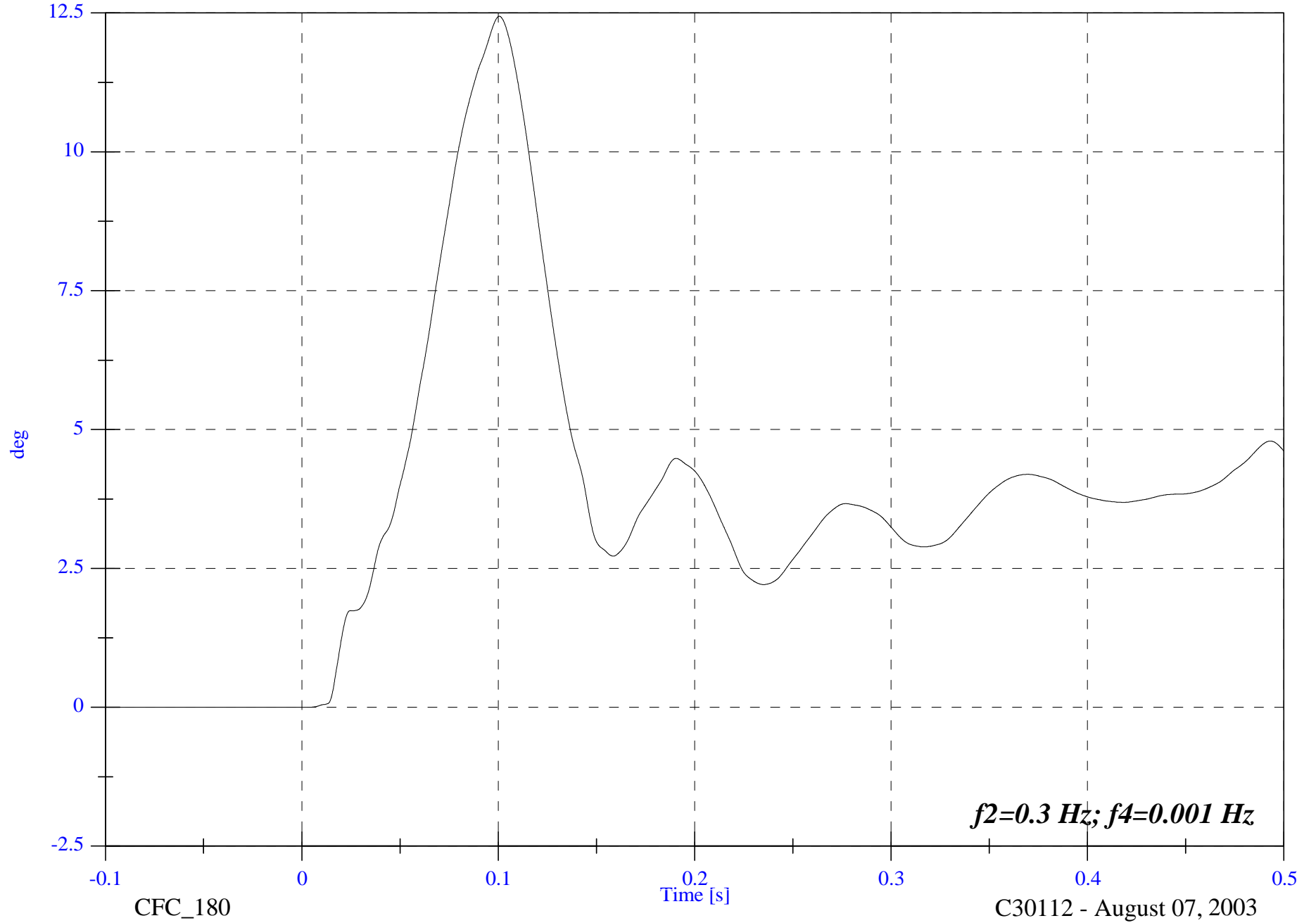
V2P2 Left Seat Comp ADy

Max: 12.4 [deg] at 0.100 [s]

Min: -0.0 [deg] at -0.080 [s]

B-116

8655-F301-14R



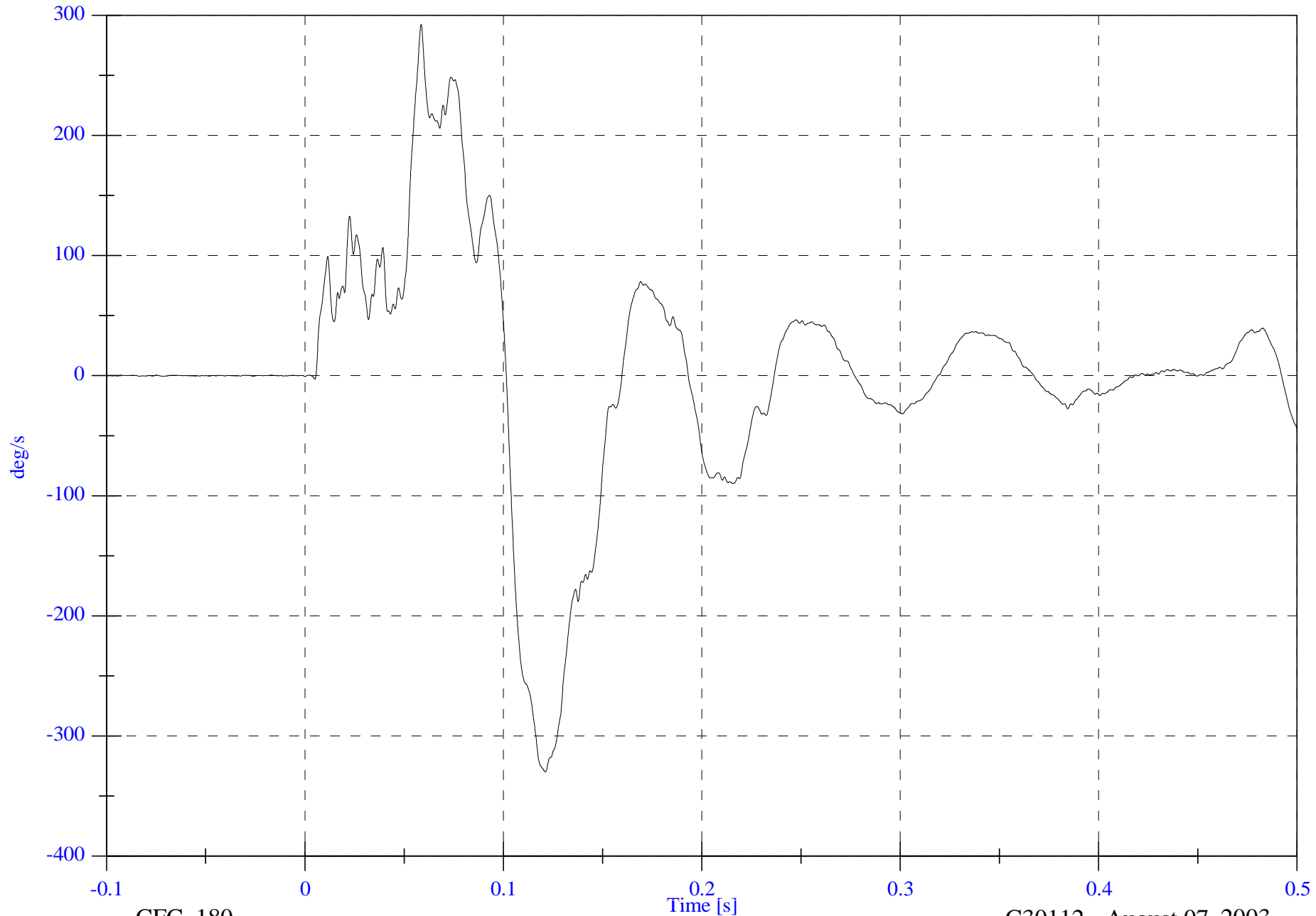
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Right Seat AVy

Max: 292.3 [deg/s] at 0.059 [s]  
Min: -329.8 [deg/s] at 0.121 [s]

B-117

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

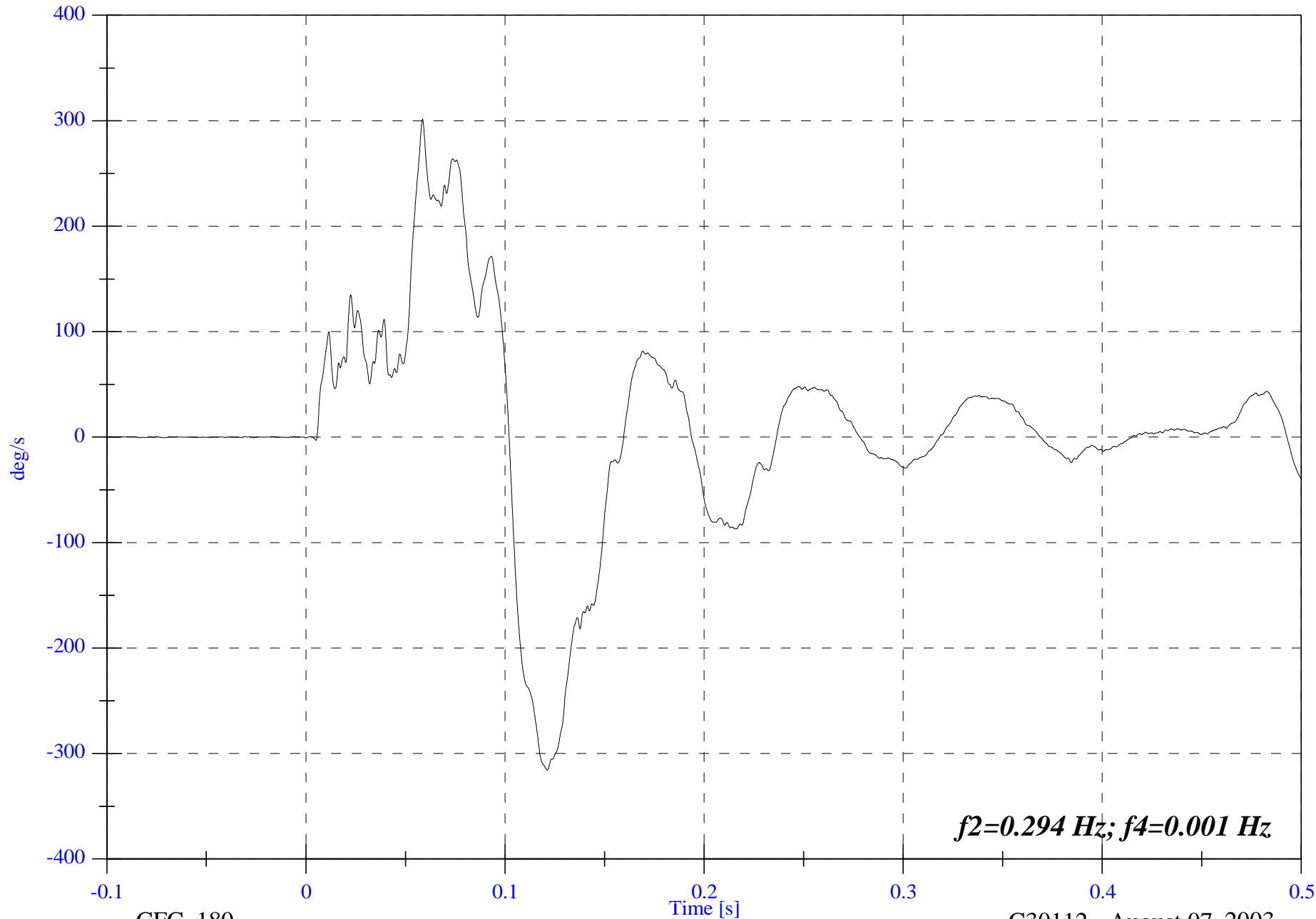
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Right Seat Comp AVy

Max: 301.4 [deg/s] at 0.059 [s]  
Min: -315.6 [deg/s] at 0.121 [s]

B-118

8655-F301-14R



CFC\_180

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

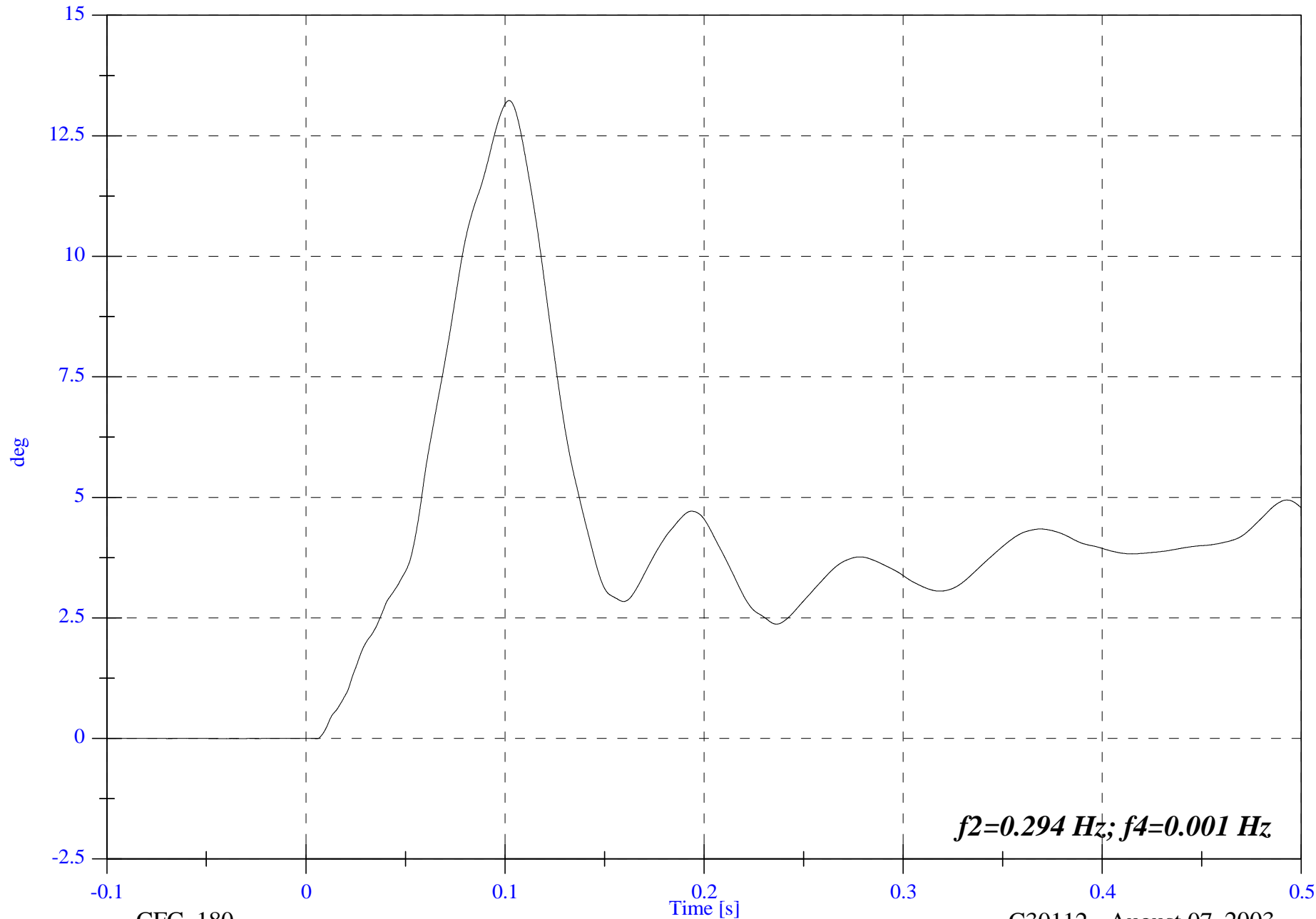
V2P2 Right Seat Comp ADy

Max: 13.2 [deg] at 0.102 [s]

Min: -0.0 [deg] at 0.006 [s]

B-119

8655-F301-14R



CFC\_180

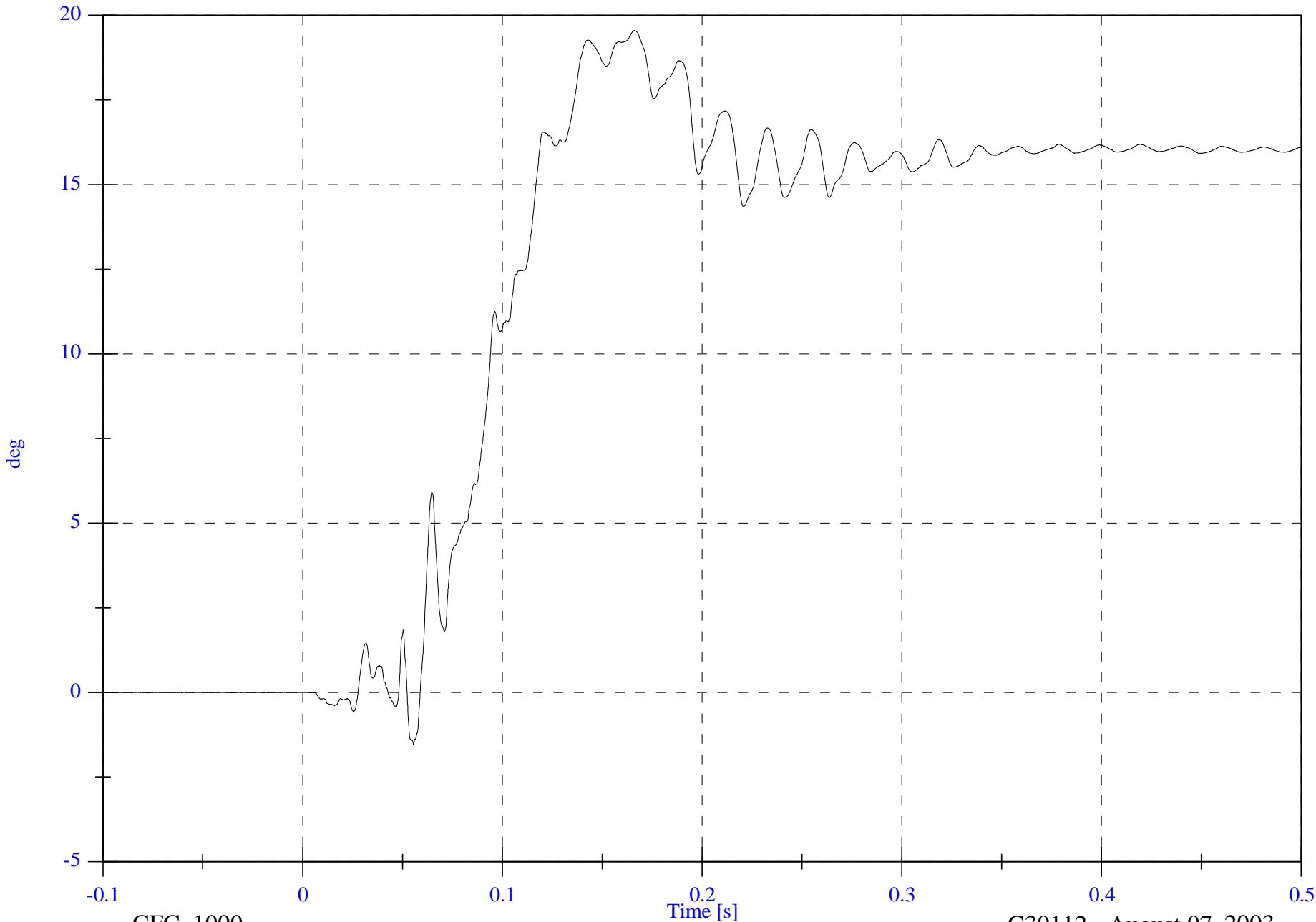
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

V2P1 Left Link ADy

Max: 19.6 [deg] at 0.166 [s]

Min: -1.6 [deg] at 0.056 [s]



B-120

8655-F301-14R

CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

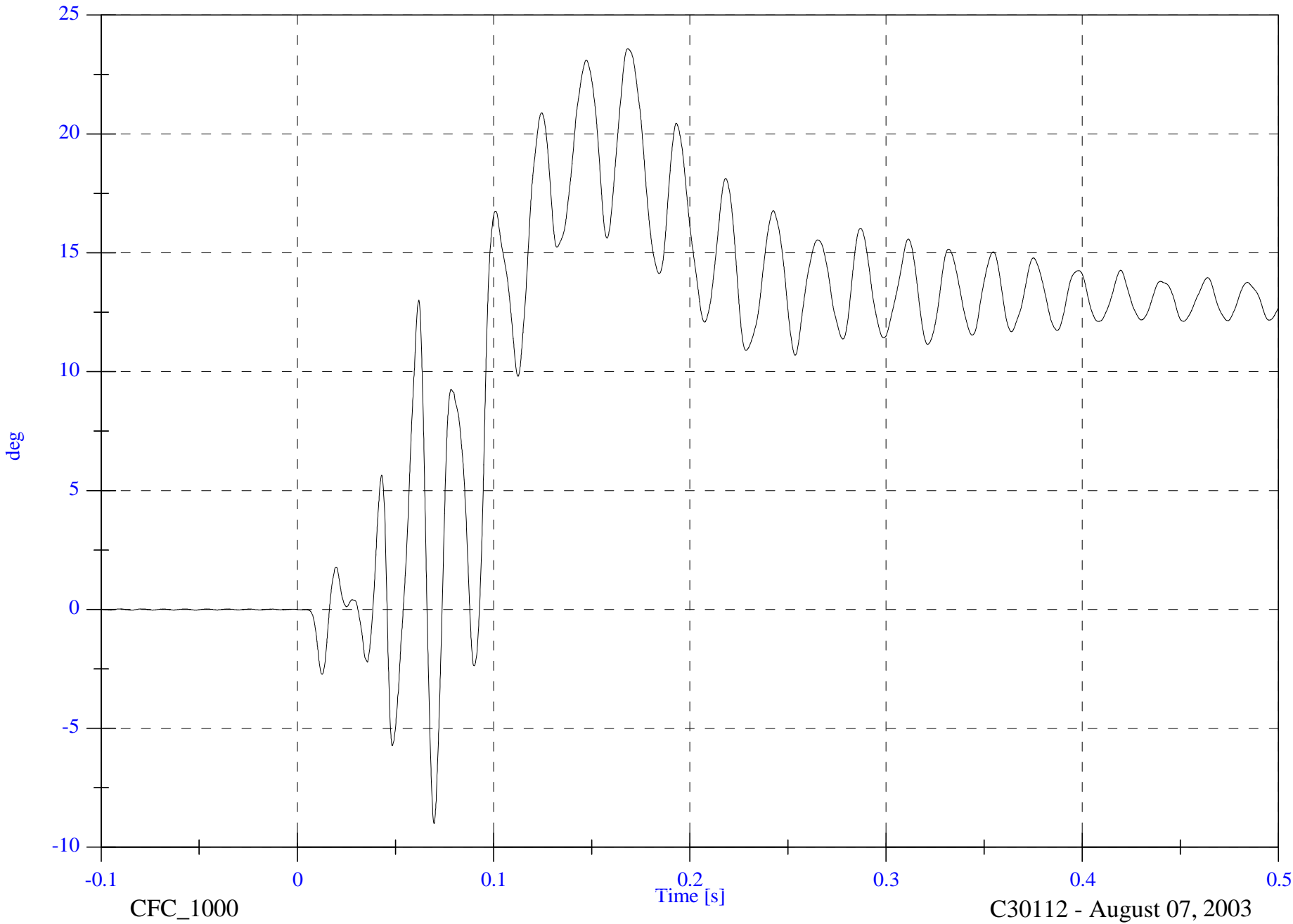
V2P1 Right Link ADy

Max: 23.6 [deg] at 0.168 [s]

Min: -9.0 [deg] at 0.070 [s]

B-121

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

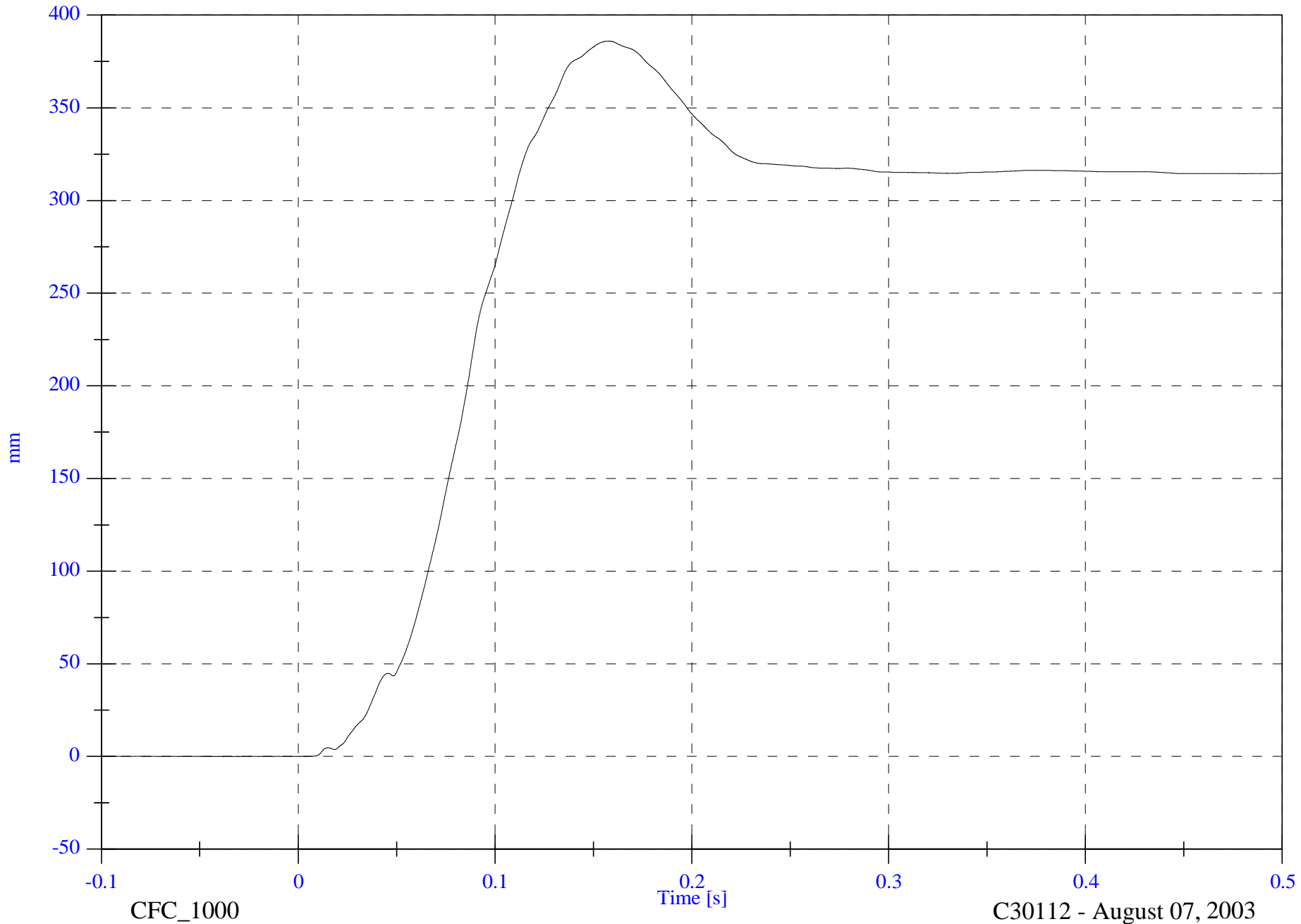
V2P1 Left Span Bar D

Max: 386.0 [mm] at 0.158 [s]

Min: -0.0 [mm] at -0.060 [s]

B-122

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

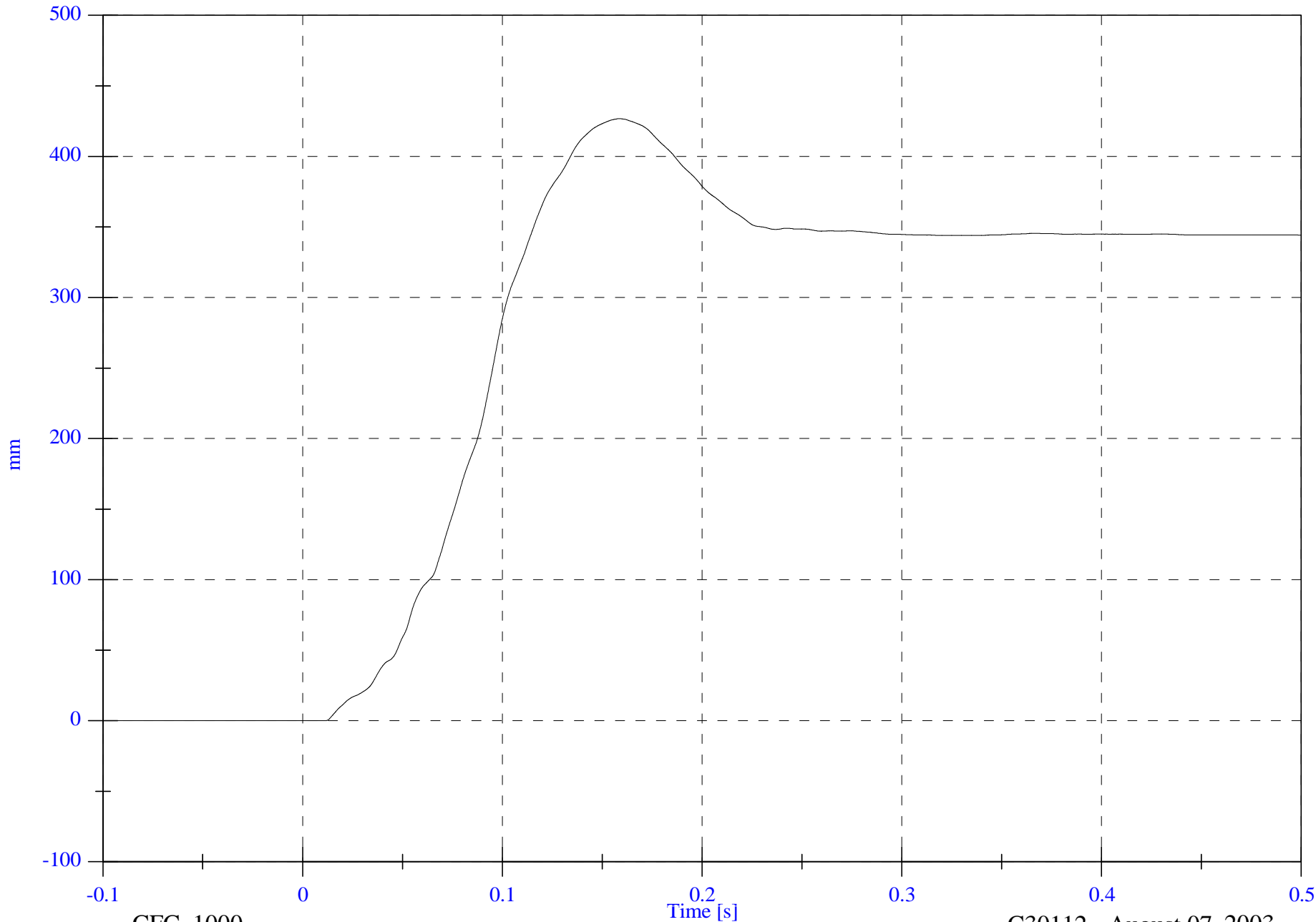
V2P1 Right Span Bar D

Max: 426.8 [mm] at 0.158 [s]

Min: -0.1 [mm] at 0.011 [s]

B-123

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

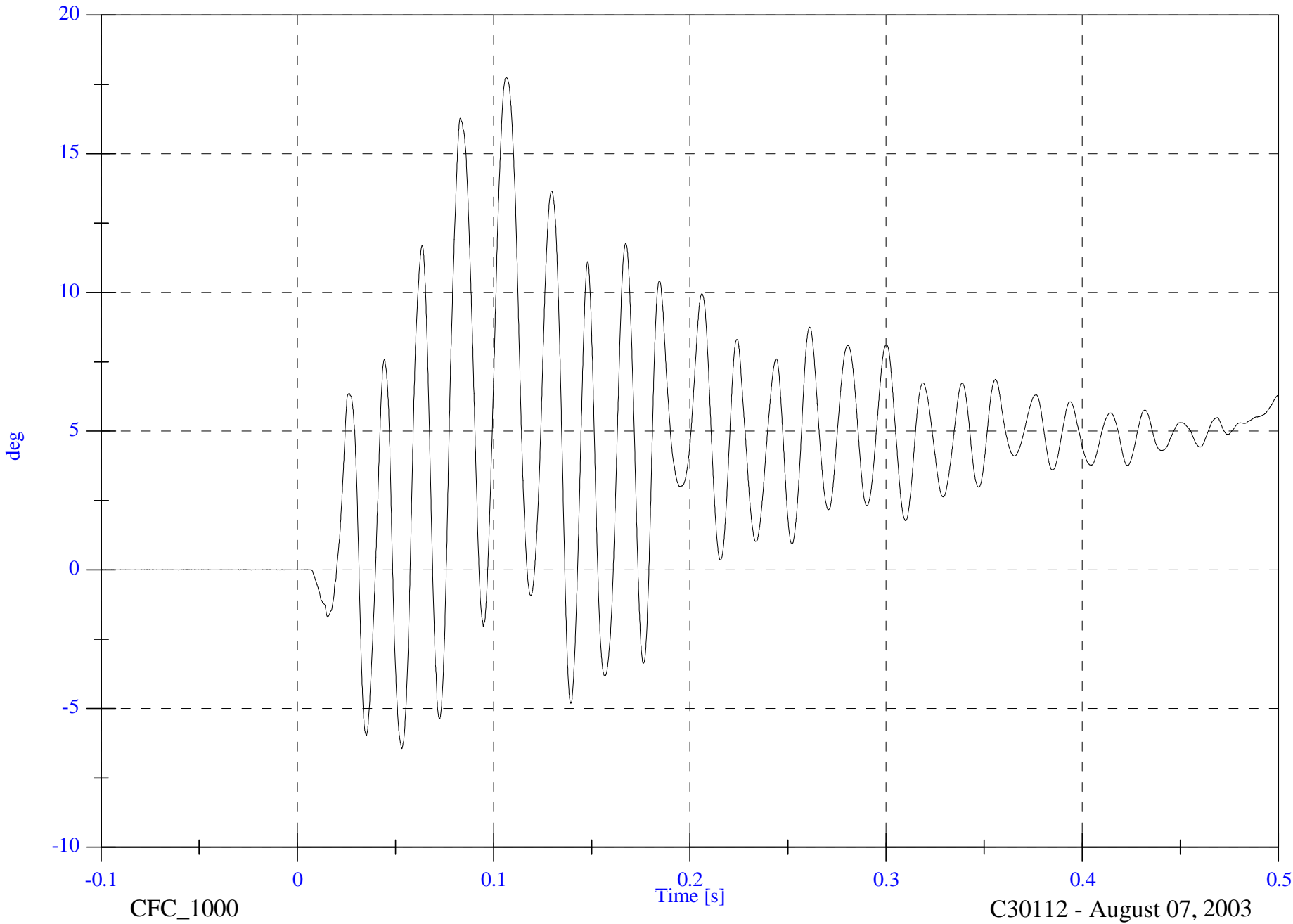
V2P2 Left Link ADy

Max: 17.7 [deg] at 0.106 [s]

Min: -6.4 [deg] at 0.053 [s]

B-124

8655-F301-14R



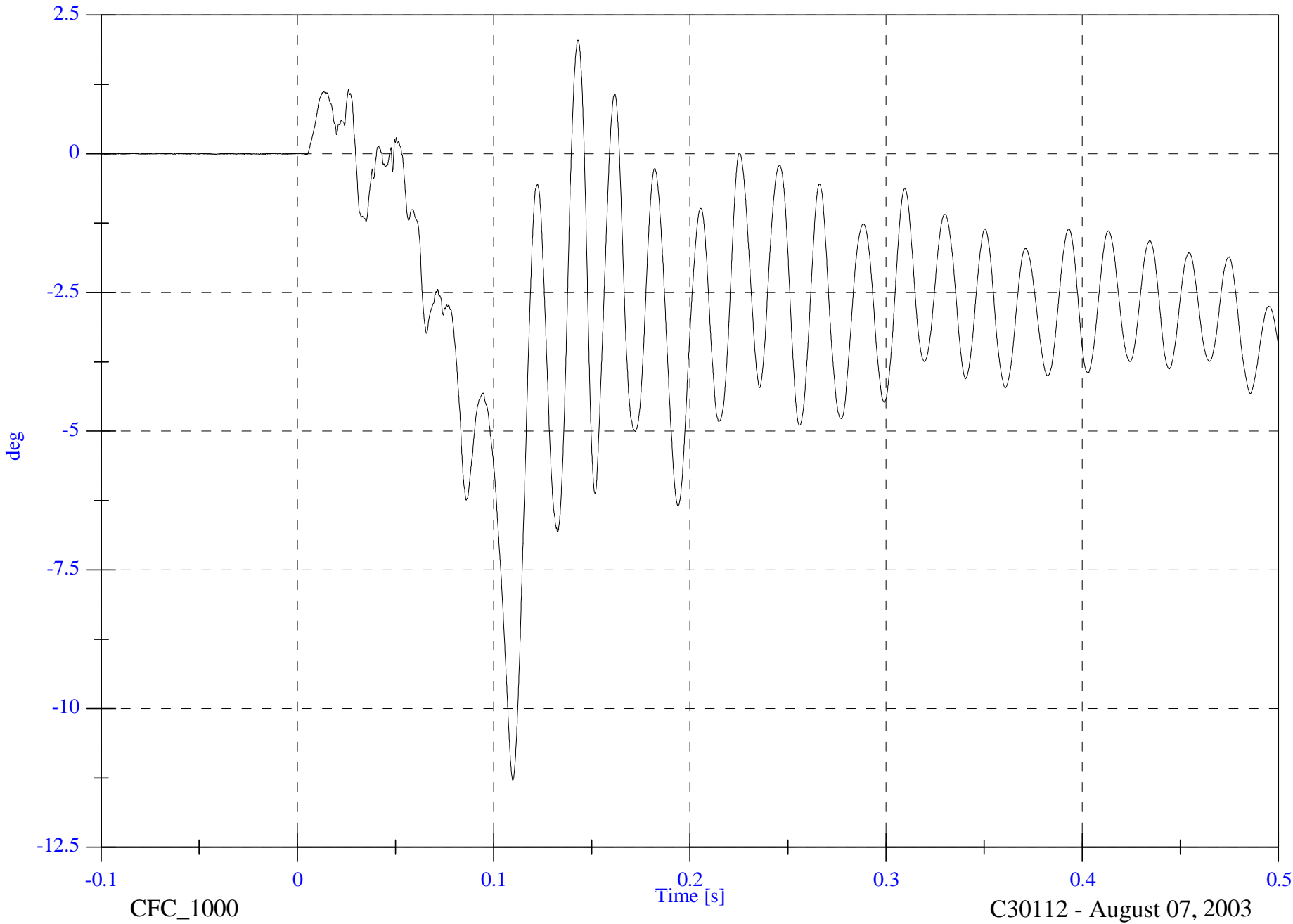
FMVSS 301 Test 5 - 2003 Saturn Ion

V2P2 Right Link ADy

Max: 2.0 [deg] at 0.143 [s]  
Min: -11.3 [deg] at 0.110 [s]

B-125

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

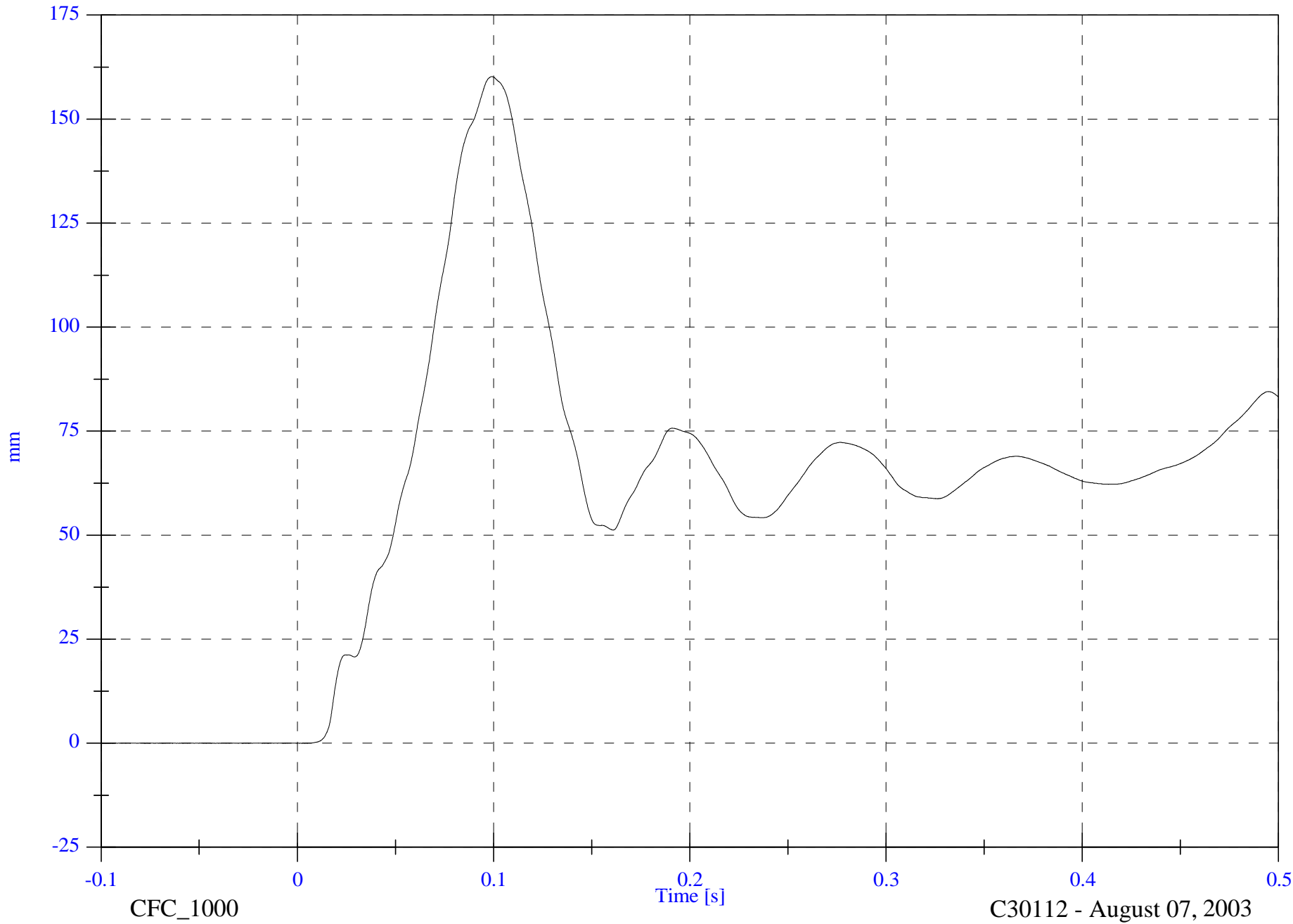
V2P2 Left Span Bar D

Max: 160.2 [mm] at 0.099 [s]

Min: -0.0 [mm] at -0.060 [s]

B-126

8655-F301-14R



CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

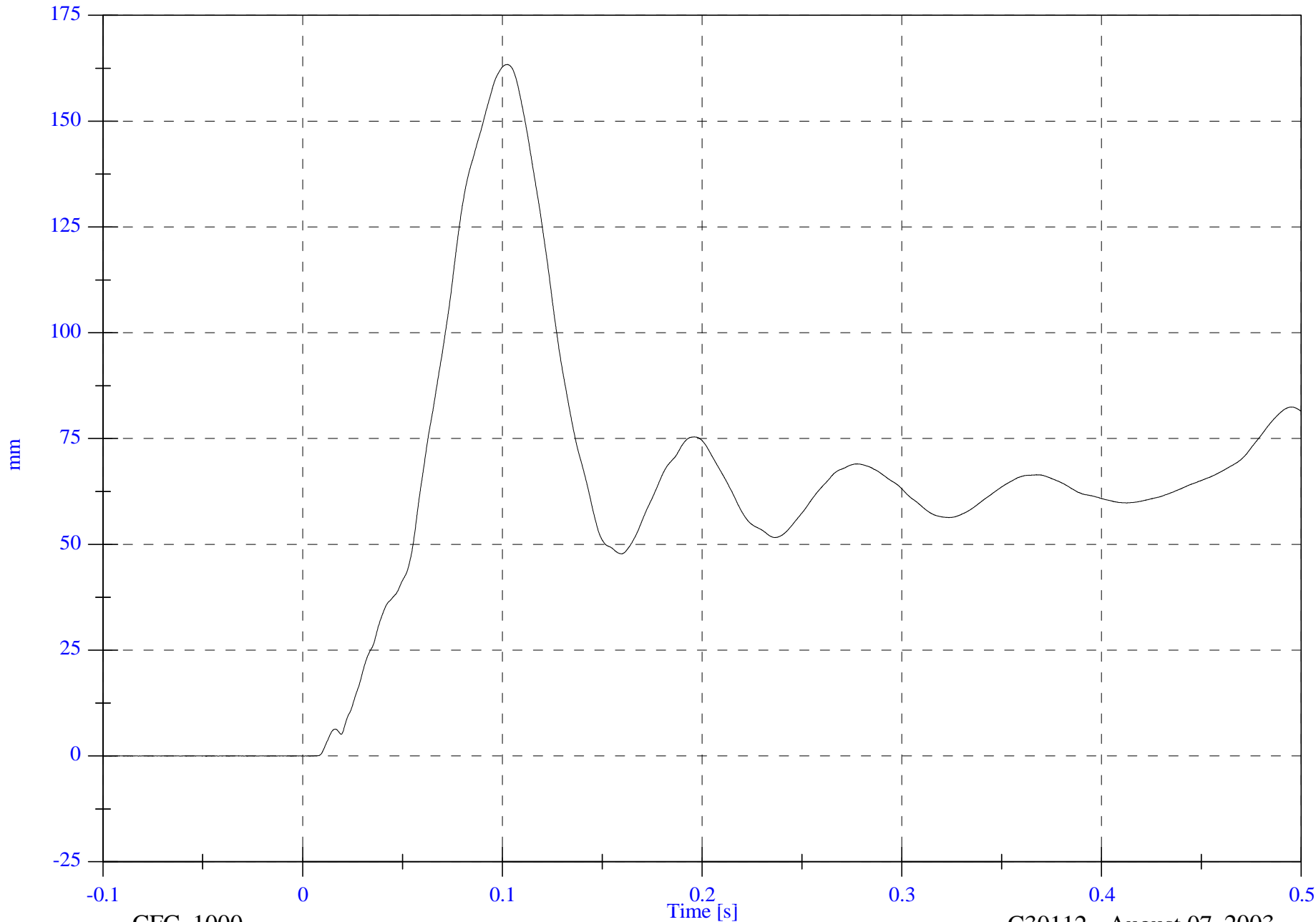
V2P2 Right Span Bar D

Max: 163.4 [mm] at 0.103 [s]

Min: -0.0 [mm] at -0.100 [s]

B-127

8655-F301-14R



CFC\_1000

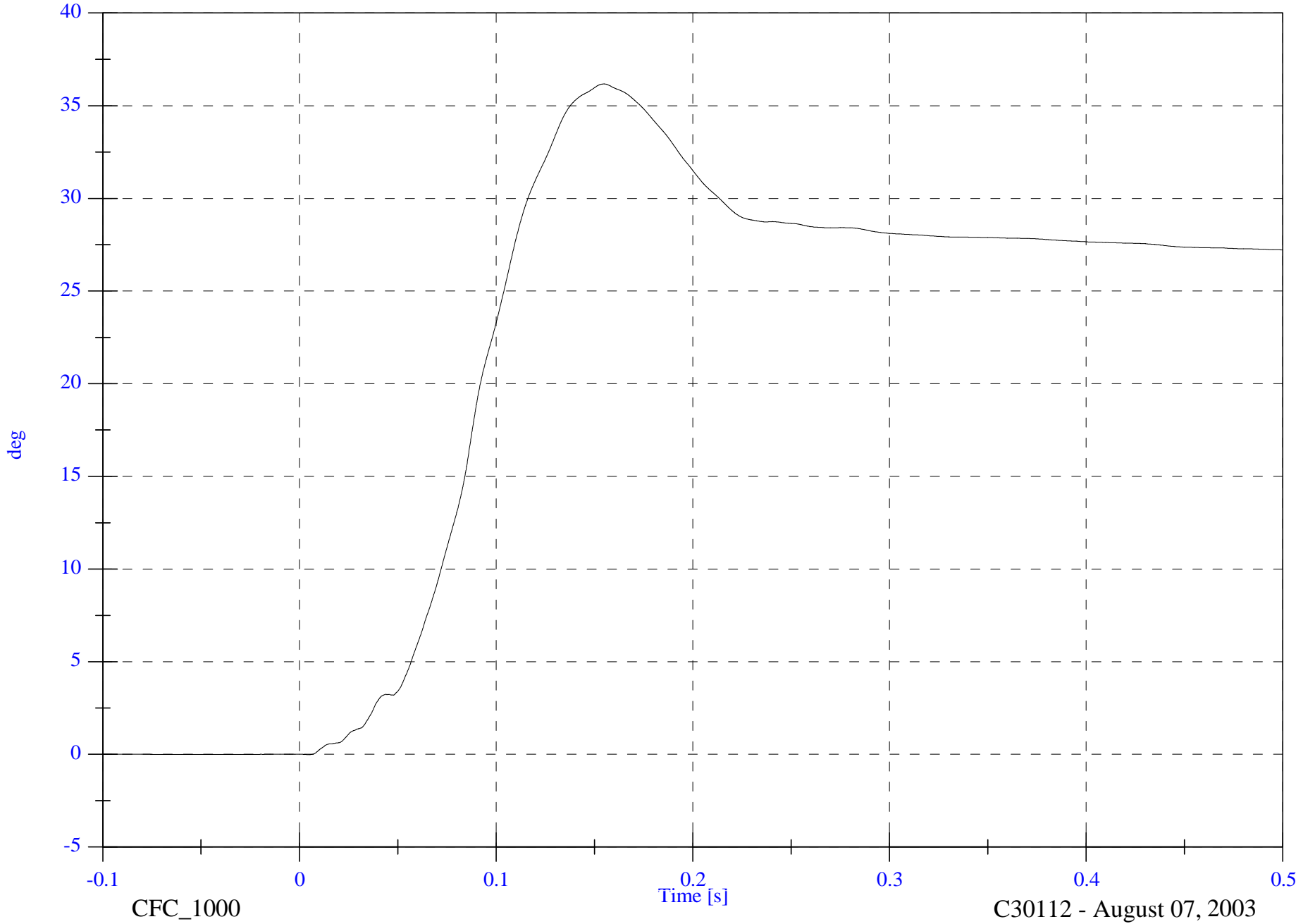
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

P1 Left Change in Seat Back Angle WRT Sill

Max: 36.2 [deg] at 0.155 [s]

Min: -0.0 [deg] at 0.004 [s]



B-128

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

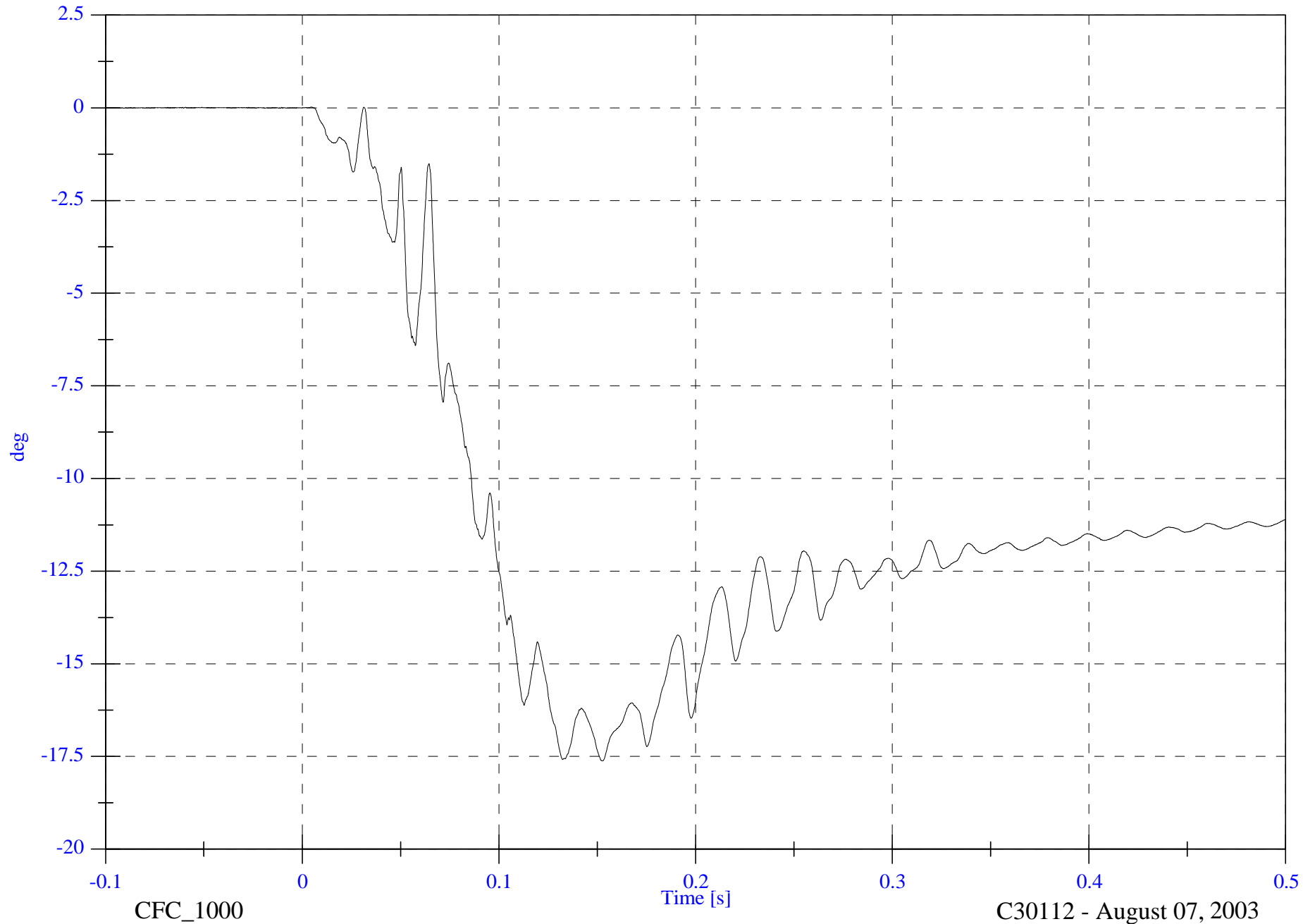
P1 Left Change in String Angle

Max: 0.0 [deg] at 0.005 [s]

Min: -17.6 [deg] at 0.153 [s]

B-129

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

P1 Left Seat X Displacement

Max: 161.1 [mm] at 0.168 [s]  
Min: -1.1 [mm] at 0.010 [s]

B-130

8655-F301-14R



CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

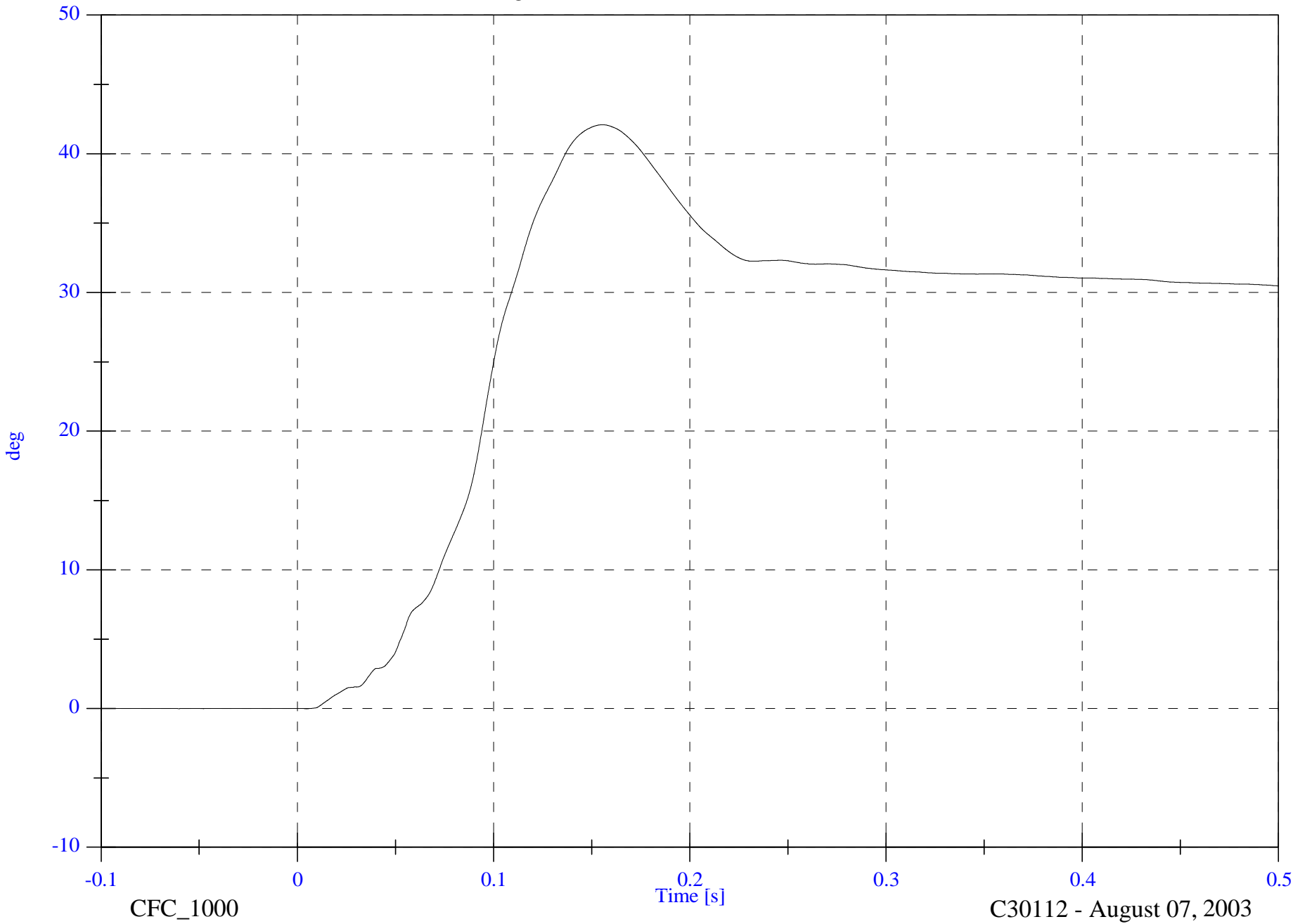
P1 Right Change in Seat Back Angle WRT Sill

Max: 42.1 [deg] at 0.155 [s]

Min: -0.0 [deg] at 0.004 [s]

B-131

8655-F301-14R



CFC\_1000

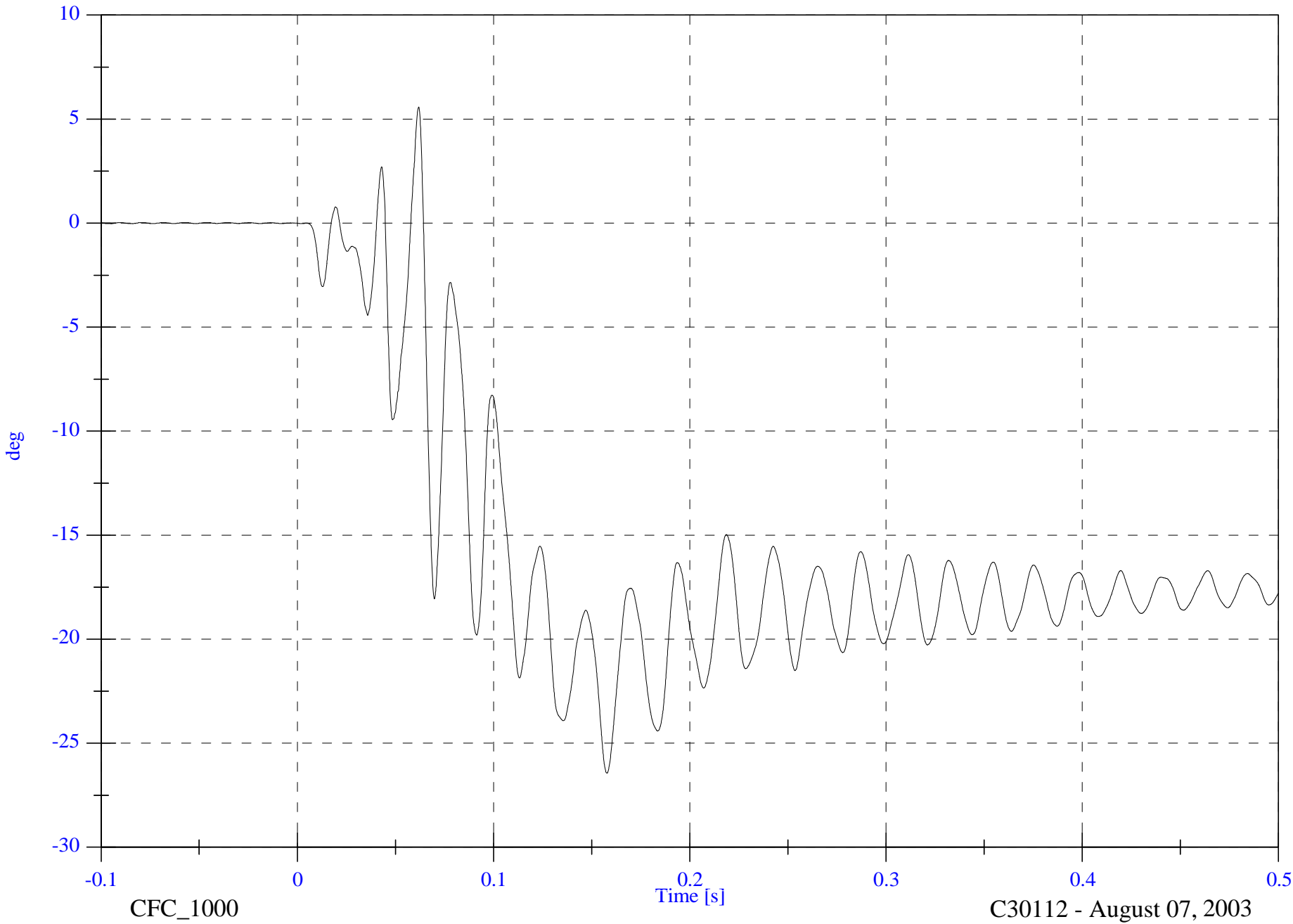
Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

P1 Right Change in String Angle

Max: 5.6 [deg] at 0.062 [s]  
Min: -26.4 [deg] at 0.158 [s]



B-132

8655-F301-14R

CFC\_1000

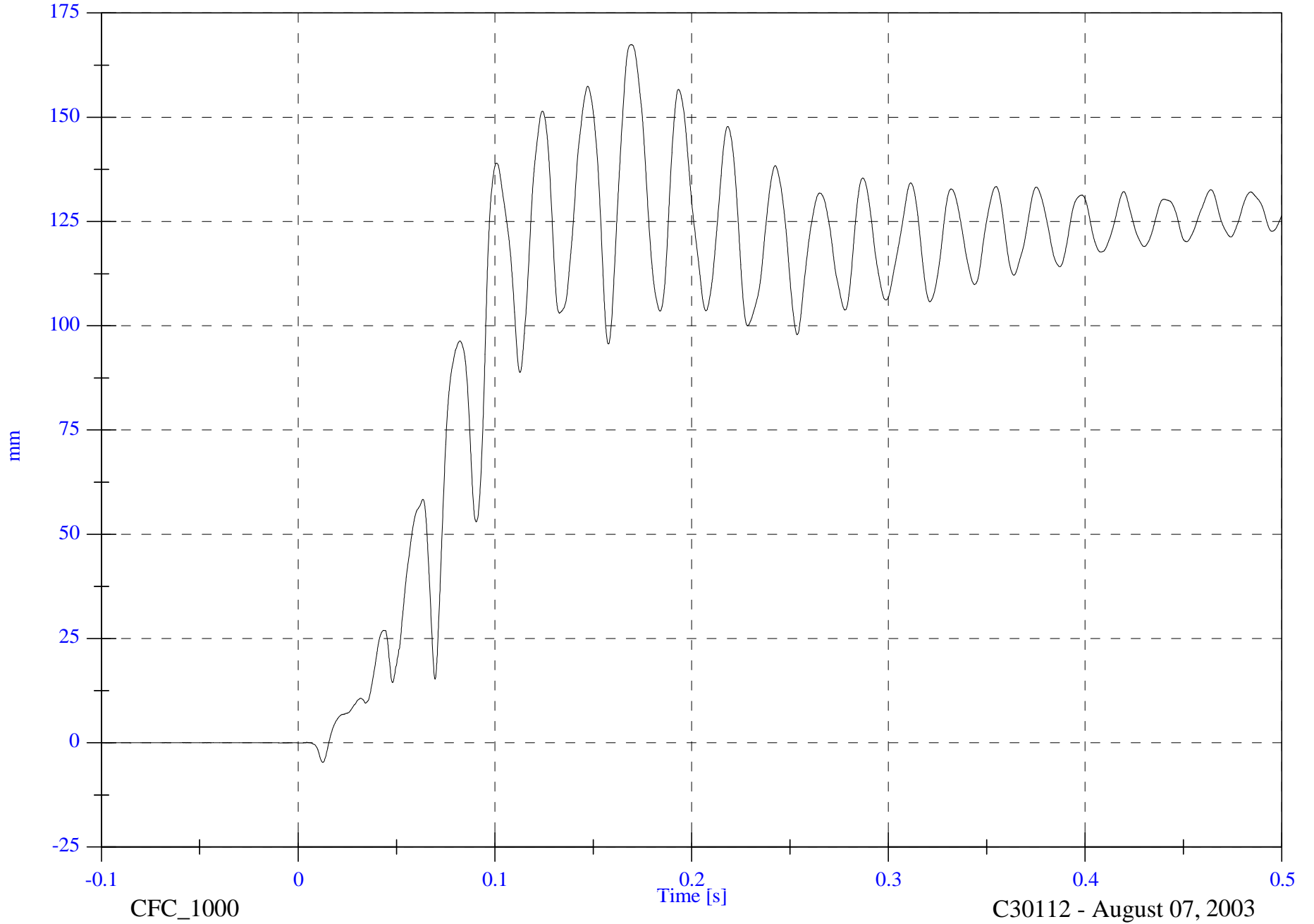
C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

Max: 167.4 [mm] at 0.170 [s]

P1 Right Seat X Displacement

Min: -4.7 [mm] at 0.012 [s]



B-133

8655-F301-14R

CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

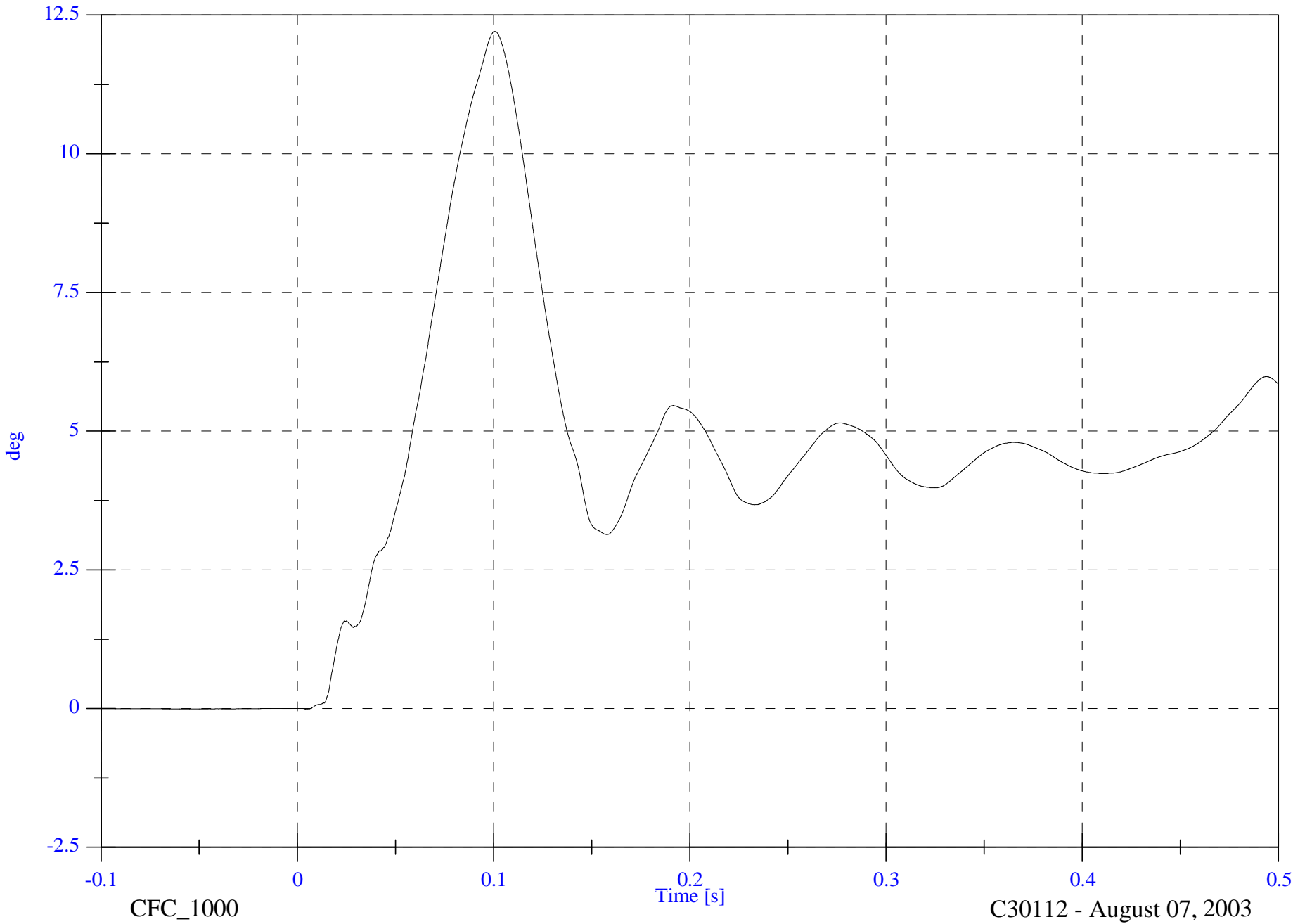
Max: 12.2 [deg] at 0.101 [s]

P2 Left Change in Seat Back Angle WRT Sill

Min: -0.0 [deg] at 0.004 [s]

B-134

8655-F301-14R



FMVSS 301 Test 5 - 2003 Saturn Ion

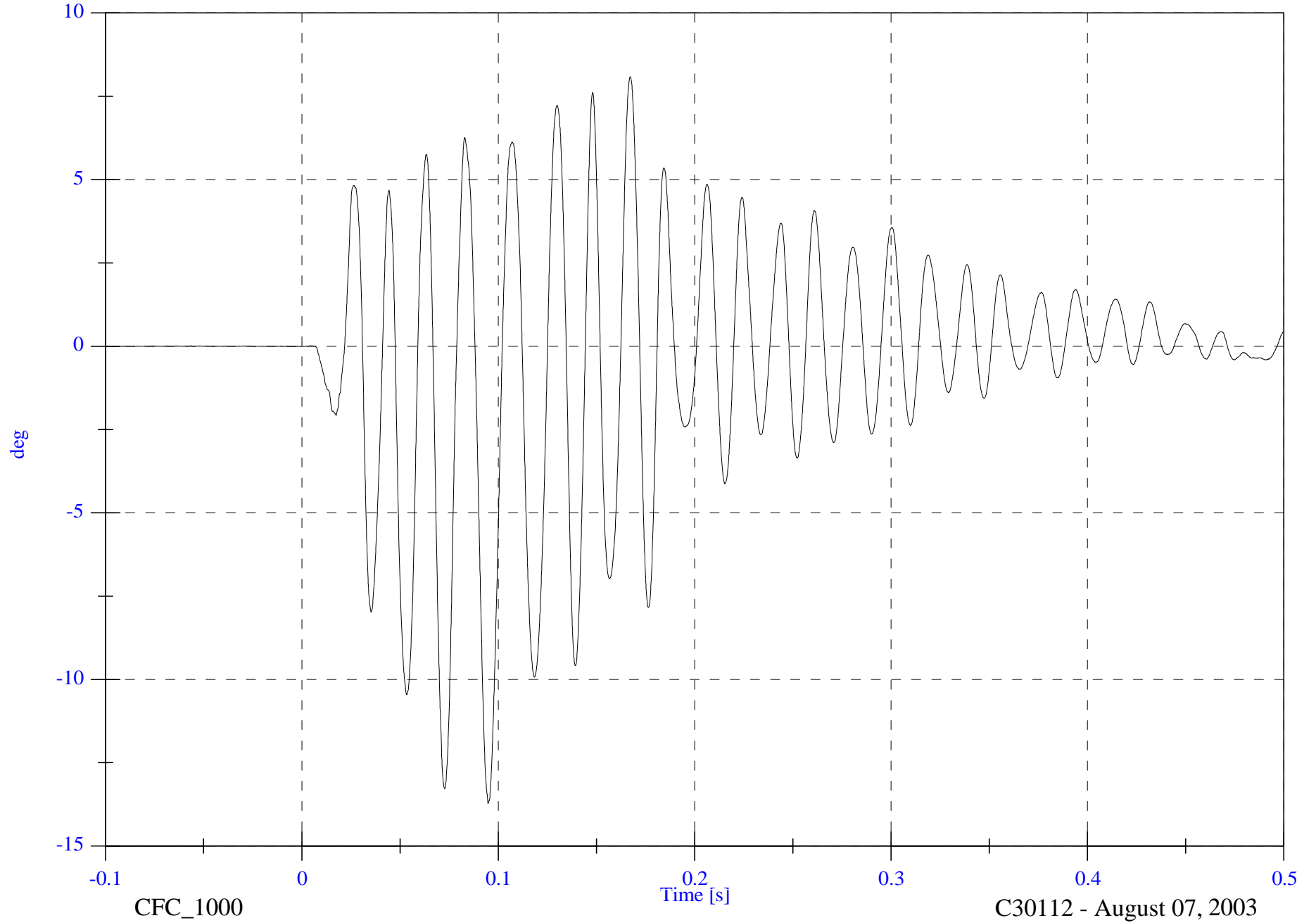
P2 Left Change in String Angle

Max: 8.1 [deg] at 0.167 [s]

Min: -13.7 [deg] at 0.095 [s]

B-135

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

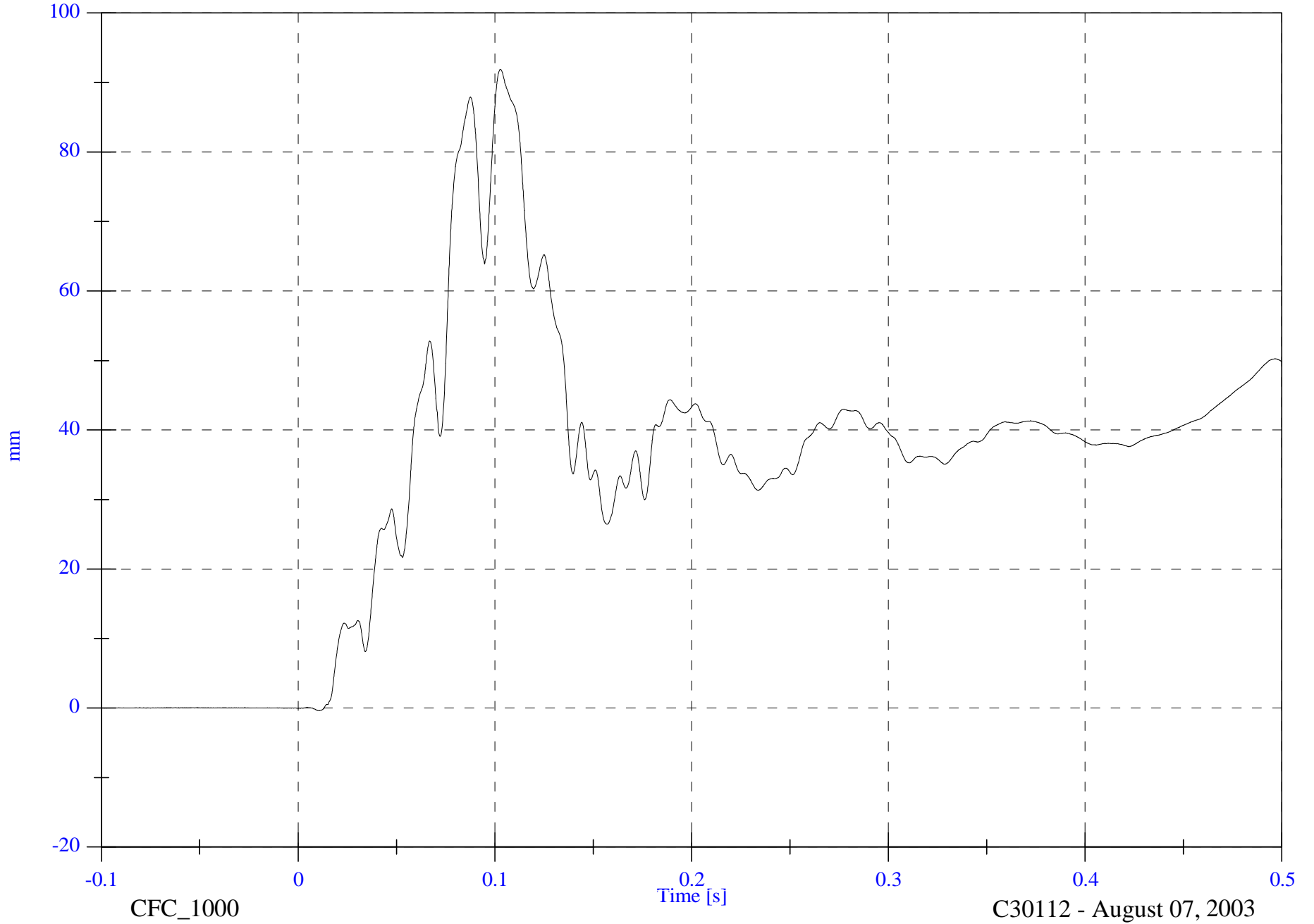
P2 Left Seat X Displacement

Max: 91.9 [mm] at 0.103 [s]

Min: -0.4 [mm] at 0.011 [s]

B-136

8655-F301-14R



FMVSS 301 Test 5 - 2003 Saturn Ion

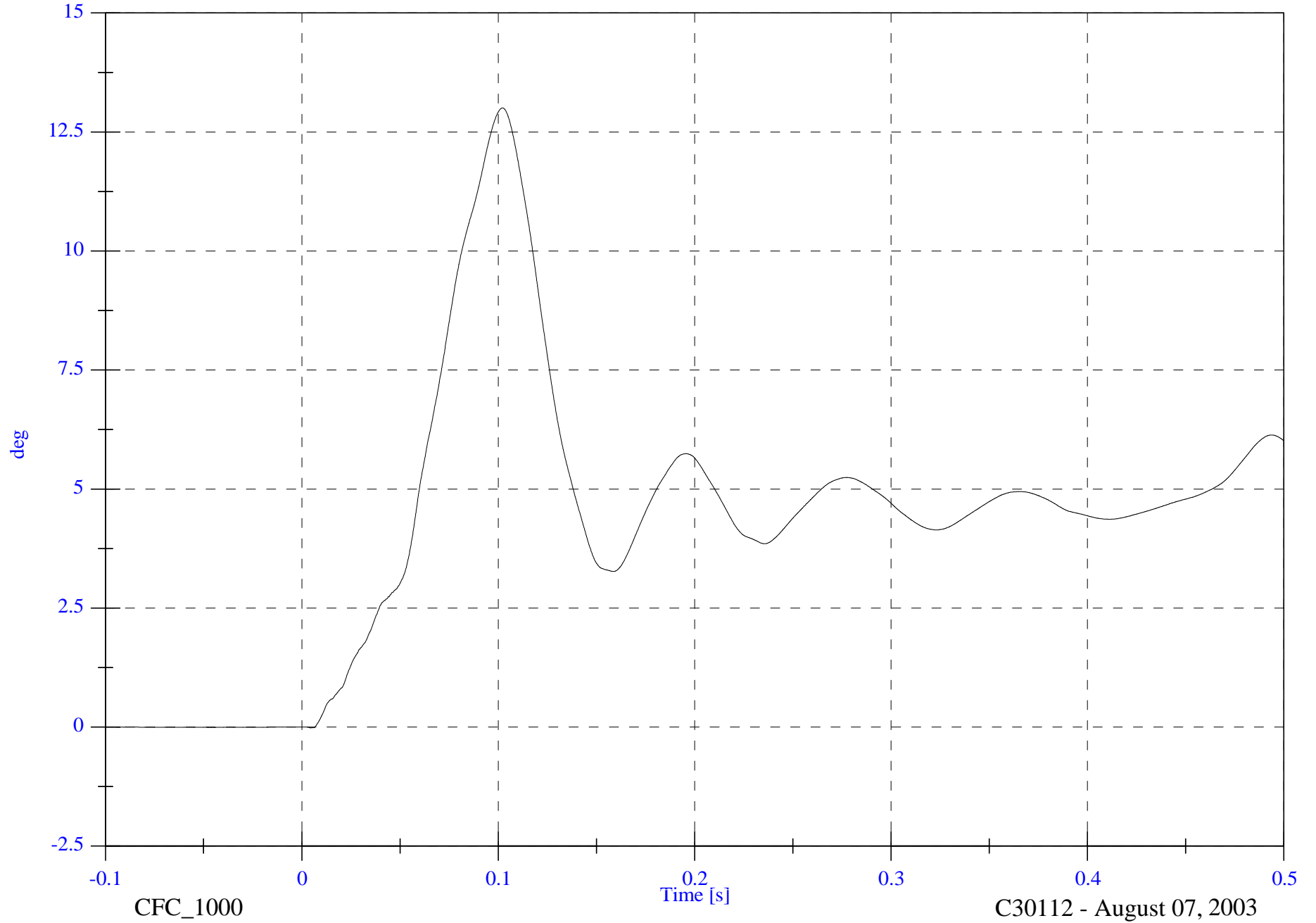
P2 Right Change in Seat Back Angle WRT Sill

Max: 13.0 [deg] at 0.102 [s]

Min: -0.0 [deg] at 0.004 [s]

B-137

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

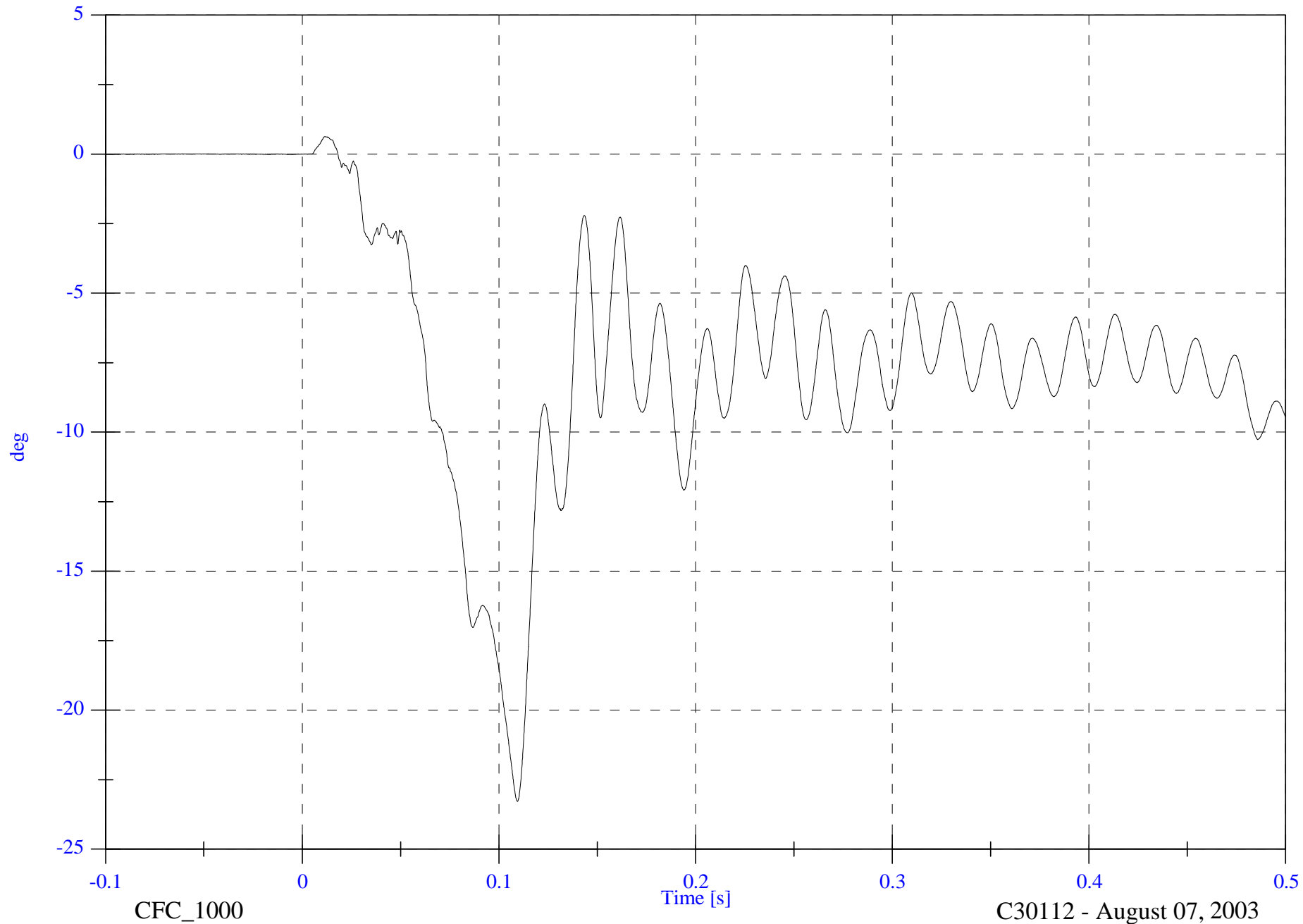
P2 Right Change in String Angle

Max: 0.6 [deg] at 0.012 [s]

Min: -23.3 [deg] at 0.109 [s]

B-138

8655-F301-14R



CFC\_1000

C30112 - August 07, 2003

FMVSS 301 Test 5 - 2003 Saturn Ion

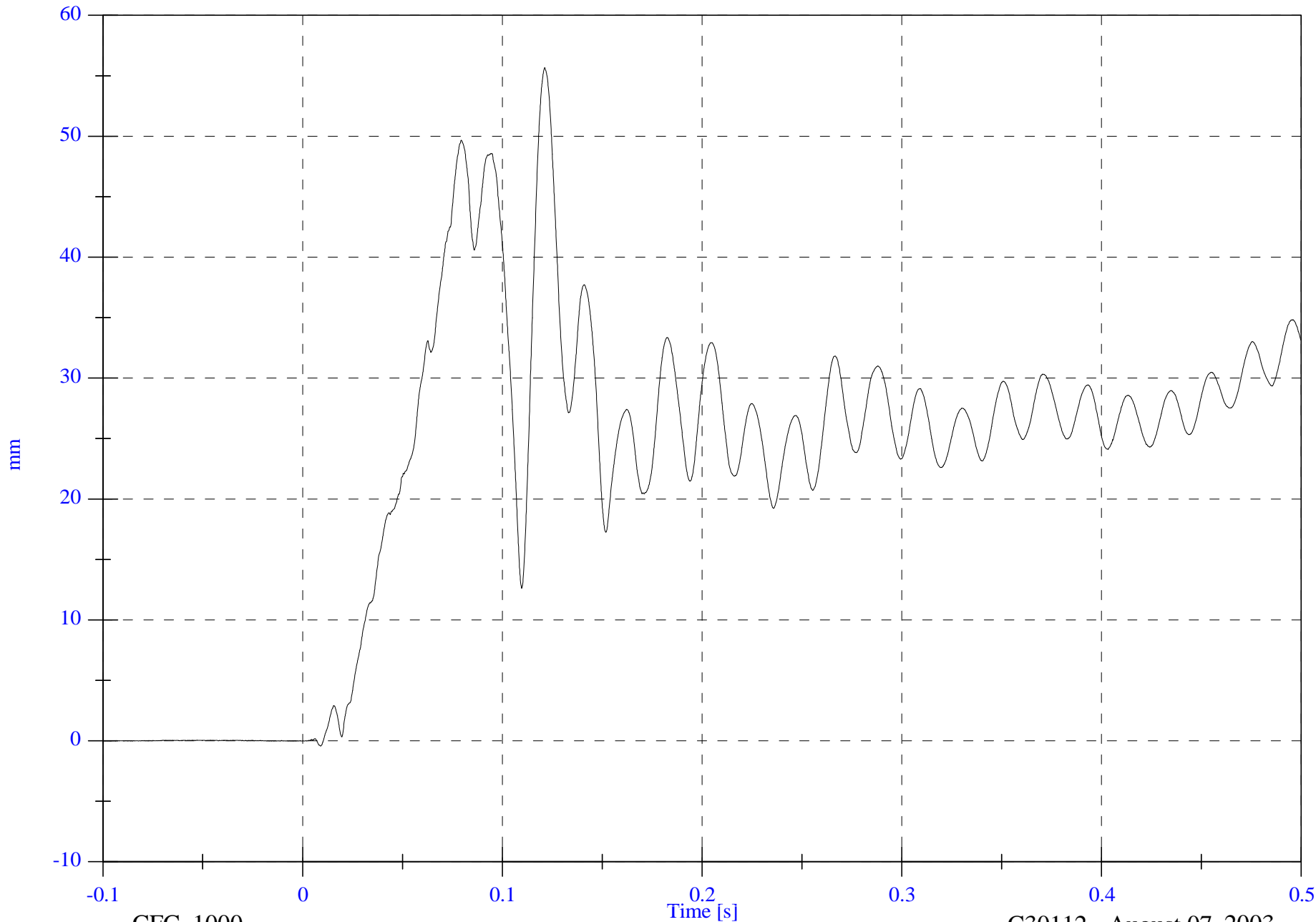
P2 Right Seat X Displacement

Max: 55.7 [mm] at 0.121 [s]

Min: -0.4 [mm] at 0.009 [s]

B-139

8655-F301-14R



CFC\_1000

Time [s]

C30112 - August 07, 2003