

**REPORT NUMBER TR-P23001-08-NC**

**NEW CAR ASSESSMENT PROGRAM  
FRONTAL BARRIER IMPACT TEST**

**SATURN CORPORATION  
2003 SATURN ION  
4 DOOR SEDAN**

**NHTSA NUMBER: M30112**

**PREPARED BY:  
KARCO ENGINEERING, LLC  
9270 HOLLY ROAD  
ADELANTO, CALIFORNIA 92301**



**FEBRUARY 11, 2003**

**FINAL REPORT**

**PREPARED FOR:  
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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
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Prepared by: \_\_\_\_\_  
Mr. James E. Gorth, Project Engineer  
KARCO Engineering, LLC

Date: February 28, 2003

Reviewed by: \_\_\_\_\_  
Mr. Jerry L. Kratzke, Director of Operations  
KARCO Engineering, LLC

Date: February 28, 2003

Approved by: \_\_\_\_\_  
Mr. Frank D. Richardson, Program Manager  
KARCO Engineering, LLC

Date: February 28, 2003

FINAL REPORT ACCEPTED BY:

\_\_\_\_\_  
Manager, New Car Assessment Program

\_\_\_\_\_  
Date of Acceptance

\_\_\_\_\_  
COTR, NCAP Frontal Impact Program

\_\_\_\_\_  
Date of Acceptance

## Technical Report Documentation Page

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<b>7. Authors</b> Mr. James E. Gorth, Project Engineer, Karco Mr. Frank Richardson, Project Manager, Karco		<b>10. Work Unit No.</b>			
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		<b>15. Supplementary Notes</b>			
<b>16. Abstract</b>					
<p>A 35mph (56.3 km/h) frontal barrier impact was conducted on a 2003 Saturn Ion 4 Door Sedan at KARCO Engineering, LLC on 2/11/03. This test was conducted to obtain data indicant of FVMSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity is 56.06 km/h. The ambient temperature at the barrier face at the time of impact is 5.0 degrees Celcius. The test vehicle sustained post-impact maximum static crush of 565 mm at the vehicle centerline. The test vehicle is equipped with a 3-point continuous belt system and second generation supplemental airbags in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows:</p>					
<b>Measurement Description</b>		<b>Units</b>	<b>Threshold</b>	<b>Driver ATD</b>	<b>Pass. ATD</b>
Head Injury Criteria (HIC)		N/A	1000	376.2	304.9
Max. Thorax Accel. (3 msec clip)		G's	60	42.4	35.9
Left Femur Force		Newtons	10009	-2818.5	-1753.6
Right Femur Force		Newtons	10009	-2182.3	-1656.1
<b>17. Key Words</b>  56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2003 Saturn Ion 4 Door Sedan NHTSA No. M30112			<b>18. Distribution Statement</b>  Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, D.C. 20590		
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## SECTION 1

### PURPOSE AND SUMMARY OF TEST M30112

#### 1.1 PURPOSE

This 35 mph (56.3 km/h) 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-02005. 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 30 mph (48.3 km/h) requirements.

The 35 mph (56.3 km/h) frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Test procedure.

#### 1.2 SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2003 Saturn Ion 4 Door Sedan at a velocity of 56.06 km/h. The test was performed at Karco Engineering, LLC on February 11, 2003.

One real-time and 19 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, 50<sup>th</sup> 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 (primary and redundant), chest (primary and redundant) and pelvis triaxial accelerometers, chest displacement potentiometers, six-axis upper neck transducers, right/left femur load cells, and lower leg instrumentation. Load cells were also placed on the driver's and passenger's lap belts to measure pelvic section loading. The driver (position 1) ATD (Serial No. 35) and the right-front passenger (position 2) ATD (Serial No. 34) were calibrated one test prior to this test.

Ninety Seven (97) channels of data were recorded using an on-board data acquisition system. Appendix A contains Pre and Post Test Photographs. Appendix B contains the vehicle and dummy response data traces. Appendix C contains Load Cell Barrier information. Appendix D contains the Instrumentation Data Channel assignments. Appendix E contains the Dummy Calibration Data and Appendix F contains the Child Restraint System (CRS).

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

The maximum static crush of the vehicle was 565 mm and both the driver and the passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver ATD head and chest contacted the airbag, the abdomen had no contact. and both knees contacted the dash.

The passenger's visible contact points were as follows: The passenger ATD head contacted the airbag and headrest. The chest and abdomen contacted the airbag. Both knees contacted the knee bolster.

Occupant injury data is contained in table below.

**OCCUPANT DATA SUMMARY**

ATD Position	HIC	Clip (g)	Chest Disp (mm)	Left Femur (N)	Right Femur (N)	Belt Spool (mm)
Driver	376.2	42.4	-28.3	-2818.5	-2182.3	202.2
Passenger	304.9	35.9	-22.1	-1753.6	-1656.1	137.1

**SECTION 2**  
**OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**CONVERSION FACTORS USED IN THIS REPORT\***

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	mile/h	km/h	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in <sup>2</sup>	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	=(tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

\* Based on the Recommended Practice in SAE J916, May 85

**DATA SHEET NO. 1  
CRASH TEST SUMMARY**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**PRIMARY IMPACT DATA**

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.06
Test Weight	kg	1444
Impact Angle	degrees	0
Average Rebound	mm	3402
Maximum Static Crush	mm	565

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger
Front Door Opening	Remained closed, opened w/o tools	Remained closed, opened w/o tools
Rear Door Opening	Remained closed/ opened w/o tools	Remained closed, opened w/o tools
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None

**TEST DUMMY INFORMATION**

Description	Driver	Passenger
Dummy Type / Serial No.	50% Male Hybrid III / No. 35	50% Male Hybrid III / No. 34
Head Contact	Airbag	Airbag/Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	None	Airbag
Left Knee Contact	Dash	Knee Bolster
Right Knee Contact	Dash	Knee Bolster

**16mm MOVIE COVERAGE**

High Speed	19
Real Time	1
Total	20

**DATA CHANNELS**

Driver ATD Sensors	40
Passenger ATD Sensors	40
Belt Assessment Sensors	8
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	36
Total	133

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

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**TEST VEHICLE INFORMATION**

Make	Saturn of Antelope Valley
Model	Ion
Body Style	4 Door Sedan
NHTSA No.	M30112
VIN	1G8AF52F33Z141088
Color	Black
Delivery Date	2/4/2003
Odometer Reading (mi.)	65
Dealer	Saturn of Antelope Valley
Transmission	5 Speed Manual
Final Drive	Front
Type/No. Cylinders	In-Line 4
Engine Displacement (L)	2.2
Engine Placement	Transverse
Roof Rack	No
Sunroof/T-Top	No
Tinted Glass	Yes
Traction Control	No
Power Brakes	Yes
Front Disc	Yes
Rear Disc	No

**TEST VEHICLE OPTIONS**

Anti-Lock Brakes (ABS)	No
All Wheel Drive	No
Power Steering	Yes
Driver Airbag	Yes
Driver Side Bag	No
Driver Head Bag	No
Pass. Airbag	Yes
Pass. Side Bag	No
Pass. Head Bag	No
Pre-tensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes
Center Console	Yes
Air Cond.	Yes
AM/Fm Cassette	Yes
Tilt Steering	Yes
Power Door Locks	No
Power Windows	No
Power Seats	No
Other	

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Saturn Corporation	GVWR (kg)	1656
Date of Manufacture	January-03	GAWR Front (kg)	844
		GAWR Rear (kg)	812

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	None	
Number of Occupants	2	3	0	5
Capacity Wt. (VCW) (kg)				408
Cargo Weight (RCLW) (kg)				68

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

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
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NHTSA No.: M30112  
 Test Date: 2/11/03

**TIRE INFORMATION**

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	308	308
Cold Pressure (kPa)	210	210
Recommend Tire Size	P185/70R14	P185/70R14
Tire Size on Vehicle	P185/70R14	P185/70R14
Tire Manufacturer	Firestone	Firestone
Treadwear	440	440
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index/Speed Symbol	90 S	90 S
Tire Material	Steel/Polyester	Steel/Polyester
DOT Safety Code Right	W2RVF904802	W2RVF904802
DOT Safety Code Left	W2RVF904802	W2RVF904802

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

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**TEST VEHICLE WEIGHTS**

	Units	As Delivered ( <i>UVW</i> )			As Tested ( <i>ATW</i> )		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	368	250		412	317	
Right	kg	368	246		411	304	
Ratio	%	59.7	40.3		57.0	43.0	
Totals	kg	736	496	1232	823	621	1444

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight ( <i>UVW</i> )	kg	1232
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight ( <i>RCLW</i> )	kg	68
Calculated Vehicle Target Weight ( <i>TVTW</i> )	kg	1452

**TEST VEHICLE ATTITUDE AND CG**

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	694	694	695	695	1057
As Tested	mm	678	680	666	671	1127

Vehicle Wheel base (mm): 2622

Weight of Ballast secured in cargo area (kg): 57

Vehicle Components Removed: trunk lid, rear bumper, muffler, tail lights and hub caps

\* Ballast weight does not include cameras, instrumentation, and brake abort system.

**FUEL SYSTEM DATA**

Fuel System Capacity From Owner's Manual (L): 50.3

Usable Capacity Figure Furnished by COTR (L): 50.3

Actual Test Volume with entire fuel System Filled (L): 15.6\*

Test Fluid Type: Stoddard Solvent ; Specific Gravity: 0.764

Kinematic Viscosity: as per ASTM Standard D484-71 ; Color: Purple

Is Vehicle Fuel Pump Electric or Mechanical?: Electric

If electric, does pump operate with ignition switch "ON" & engine "OFF"? Yes

Fuel System Particulars: Driver side filler door, tank mounted at rear.

\*Note: Solvent level decreased to make target test weight.

**DATA SHEET NO. 3  
POST IMPACT DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**SPEED TRAP DATA**

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.51 to 57.12	56.06
Trap No. 1 Entry Distance	mm	< 1524	1524
Trap No. 1 Exit Distance	mm	< 1524	305
Trap No. 2 Velocity (Redundant)	km/h	55.51 to 57.12	56.08
Trap No. 2 Entry Distance	mm	< 1524	1524
Trap No. 2 Exit Distance	mm	< 1524	305

**VEHICLE STATIC CRUSH**

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4485	4075	-410
Center	mm	4665	4100	-565
Right Side	mm	4485	4070	-415

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	3452
Center	mm	3405
Right Side	mm	3350
Average	mm	3402

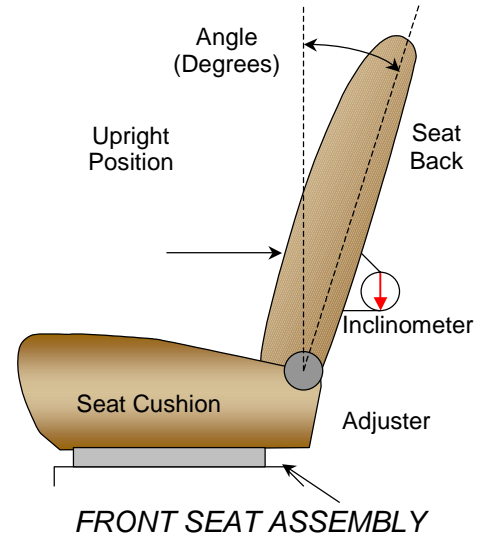
**DATA SHEET NO. 4  
TEST VEHICLE INFORMATION**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**NOMINAL DESIGN RIDING POSITION**

The driver and passenger seat backs are positioned to the manufacturers designated angle. The procedure is as follows: A special application tool with pointed probes is inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly, approximately 13 inches above the pivot point of the seat back. An inclinometer is placed against the flat surface of the tool and the seat back angle is measured directly from the dial face.



**SEAT BACK ANGLES**

	Deg.
Driver w/seated Dummy	9
Passenger w/seated Dummy	9

**SEAT FORE/AFT POSITIONS**

The first or forward most position is counted as number one (1). The fore/aft position is set aft of the middle position for both the driver and passenger.

**SEAT FORE/AFT POSITIONING**

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	27	14
Passenger Seat	27	14

**SEAT BELT UPPER ANCHORAGE**

Position number one (1) is the uppermost position.

**SEAT BELT UPPER ANCHORAGE**

	Total # of Positions	Placed in Position #
Driver Seat	5	2
Passenger Seat	5	2

**DATA SHEET NO. 4...(CONTINUED)**  
**TEST VEHICLE INFORMATION**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

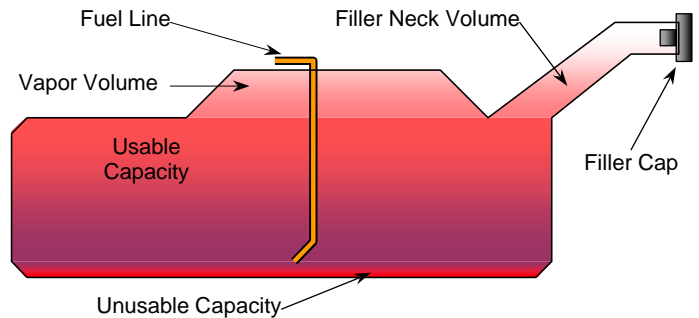
NHTSA No.: M30112  
 Test Date: 2/11/03

**FUEL TANK CAPACITY DATA**

	<b>Liters</b>
Usable Capacity of "Standard Tank"	50.3
Usable Capacity of "Optional Tank"	N/A
Usable Capacity used for FMVSS 301	46.30 to 47.32
Actual Amount of Solvent Used	15.6*

\* Solvent level decreased to make target test weight

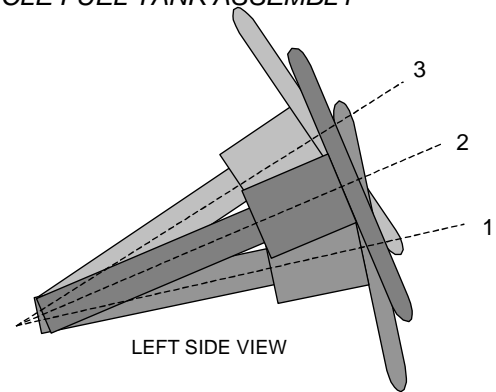
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area under the rear seat.



*VEHICLE FUEL TANK ASSEMBLY*

**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



*STEERING COLUMN ASSEMBLY*

**STEERING COLUMN POSITIONS**

	<b>Degrees</b>
Lowermost; position No. 1	17
Geometric center; position No. 2	19
Uppermost; position No. 3	21

**DATA SHEET NO. 5**  
**DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
Test Date: 2/11/03

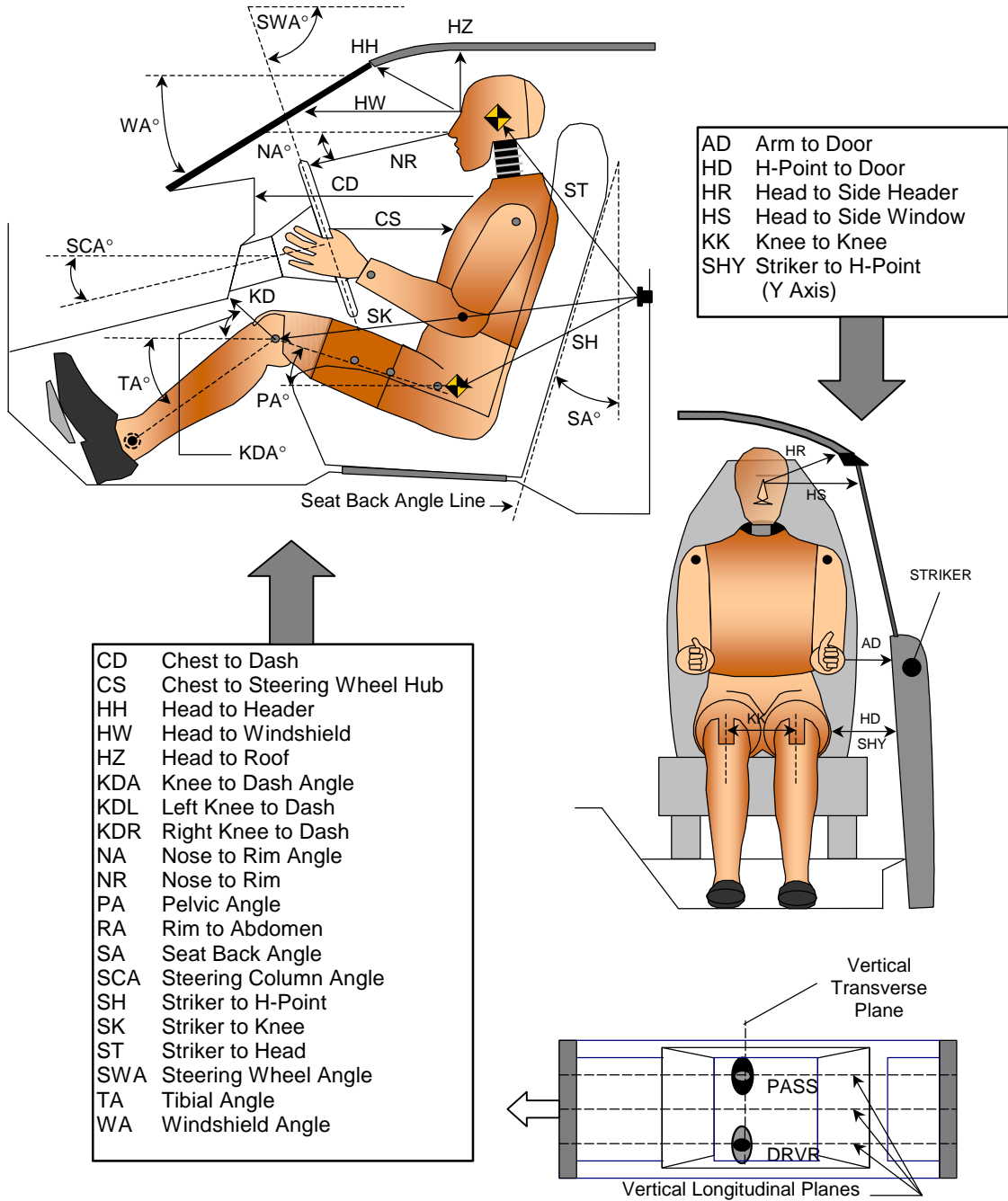
**TEST DUMMY POSITION MEASUREMENTS**

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		27		
SWA	Steering Wheel Angle		71.0		
SCA	Steering Column Angle		19.0		
SA	Seat Back Angle		9.2		9.2
HZ	Head to Roof (Z)	207	90	218	90
HH	Head to Header	387		392	
HW	Head to Windshield	700		705	
HR	Head to Side Header (Y)	280		280	
NR	Nose to Rim	395	17		
CD	Chest to Dash	728		740	
CS	Chest to Steering Hub	320			
RA	Rim to Abdomen	225			
KDL	Left Knee to Dash	180	13	178	
KDR	Right Knee to Dash	170		145	30
PA	Pelvic Angle		23		24
TA	Tibia Angle		33		41
KK	Knee to Knee (Y)	270		280	
ST	Striker to Head	590	4	610	2
SK	Striker to Knee	555	77	540	83
SH	Striker to H-Point	210		215	
SHY	Striker to H-Point (Y)	245		220	
HS	Head to Side Window	365		345	
HD	H-Point to Door (Y)	110		105	
AD	Arm to Door (Y)	115		95	

**DATA SHEET NO. 5...(CONTINUED)**  
**DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



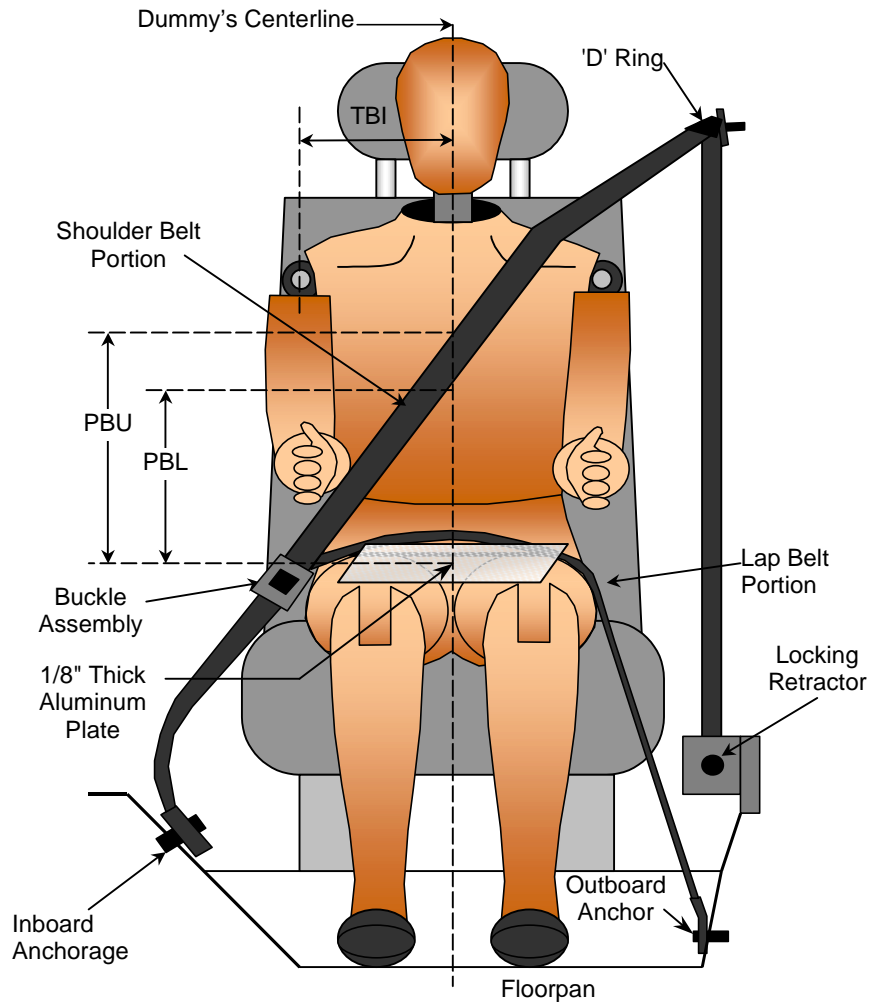
- CD Chest to Dash
- CS Chest to Steering Wheel Hub
- HH Head to Header
- HW Head to Windshield
- HZ Head to Roof
- KDA Knee to Dash Angle
- KDL Left Knee to Dash
- KDR Right Knee to Dash
- NA Nose to Rim Angle
- NR Nose to Rim
- PA Pelvic Angle
- RA Rim to Abdomen
- SA Seat Back Angle
- SCA Steering Column Angle
- SH Striker to H-Point
- SK Striker to Knee
- ST Striker to Head
- SWA Steering Wheel Angle
- TA Tibial Angle
- WA Windshield Angle

**DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS**

**DATA SHEET NO. 6**  
**SEATBELT POSITIONING DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	220	210
PBU - Top surface of reference to belt upper edge	mm	315	350
PBL - Top surface of reference to belt lower edge	mm	240	260
Lap Belt tension	Newton's	10	10
Shoulder Belt tension	N/A	Retractor	Retractor

# DATA SHEET NO. 7 - VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

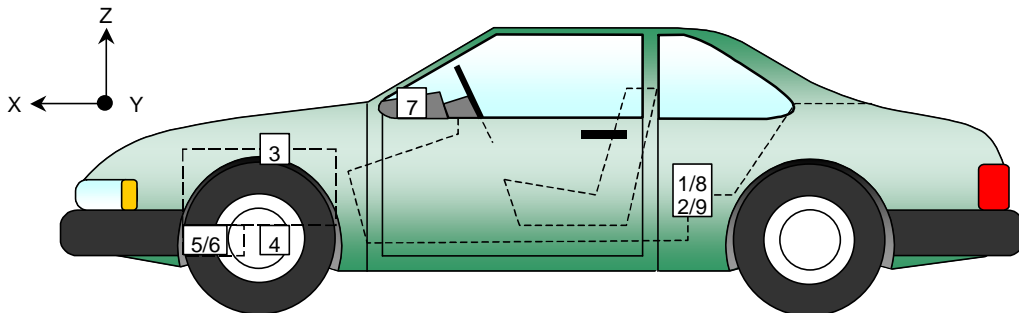
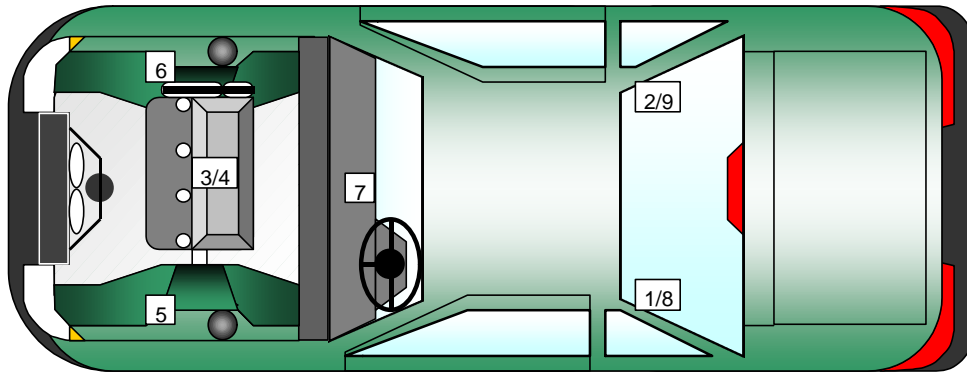
Test Date: 2/11/03

## VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member	2030	-640	270	G's	3.9	21.9	-36.3	65.2
2	Right Rear X-Member	1775	640	270	G's	2.5	121.9	-37.8	73.2
3	Engine Top	3820	195	850	G's	28.3	61.3	-103.6	39.1
4	Engine Bottom	3705	100	195	G's	34.1	53.1	-124.8	36.0
5	Left Brake Caliper	3715	-680	245	G's	0.2	0.4	-50.6	35.2
6	Right Brake Caliper	3715	680	245	G's	37.0	62.7	-86.9	34.4
7	Instrument Panel	2965	0	915	G's	30.5	25.2	-64.4	57.9
8	Left Rear X-Member (Z-Axis)	2030	-635	355	G's	8.4	46.1	-4.4	64.8
9	Right Rear X-Member (Z-Axis)	1775	635	355	G's	5.2	82.4	-4.0	27.0

Reference Planes: X=From Rear Surface of Vehicle, Y=Vehicle Centerline, Z=Ground Plane

1.) Channel failed at 37.1 msec.



**DATA SHEET NO. 8 - HYBRID III ATD INJURY CRITERIA AND SENSOR DATA**

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

**HEAD PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	7.2	240.4	-48.7	87.5	6.0	226.4	-36.4	102.6
Head CG	Y	G's	5.3	78.8	-3.5	33.4	3.2	226.3	-10.5	102.3
Head CG	Z	G's	15.3	77.5	-2.1	13.8	25.7	89.8	-1.9	14.7
Head CG Resultant	N/A	G's	49.6	87.5			43.4	102.7		

**CHEST PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.9	147.0	-42.9	74.7	1.1	177.1	-36.7	82.5
Chest CG	Y	G's	4.1	65.3	-3.7	19.8	2.9	18.4	-10.8	86.2
Chest CG	Z	G's	4.1	20.5	-3.7	74.1	7.0	91.4	-8.5	70.3
Chest CG Resultant	N/A	G's	43.1	74.8			37.8	82.6		

**FEMUR PEAK FORCES**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	681.3	57.4	-2818.5	65.0	853.8	60.2	-1753.6	78.6
Right Femur	Z	Newtons	859.6	64.6	-2182.3	75.3	534.8	60.6	-1656.1	73.7

**SEAT BELT SENSOR PEAK VALUES**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Shoulder Belt Pullout	N/A	MM	202.2	107.3	-64.8	39.0	137.1	98.9	-70.6	38.0
Shoulder Belt Stretch	N/A	MM/CM	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Lap Belt Force	N/A	Newtons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shoulder Belt Force	N/A	Newtons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.) Not used with pre-tensioner

2.) Not installed

Location	Driver				Passenger			
	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G
Head CG Primary	376.2	64.1	100.0	40.5	304.9	77.6	113.5	37.3

**PRIMARY CHEST CLIP (3MSEC)**

Location	Driver			Passenger		
	CLIP	T <sup>1</sup>	T <sup>2</sup>	CLIP	T <sup>1</sup>	T <sup>2</sup>
Chest CG Primary	42.4	73.9	76.9	35.9	81.1	84.1

**DATA SHEET NO. 8...(continued)**

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

**PELVIC PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	4.9	104.1	-57.4	67.9	3.2	127.1	-53.3	73.2
Pelvis	Y	G's	14.8	82.6	-5.9	51.4	7.0	101.9	-11.7	79.5
Pelvis	Z	G's	3.1	285.0	-30.2	74.3	2.4	116.8	-33.5	81.3
Pelvis Resultant	N/A	G's	62.6	67.9			62.2	74.8		

**UPPER NECK PEAK FORCES AND MOMENTS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	828.0	89.4	-424.4	140.3	136.8	251.1	-506.2	132.5
Neck Force	Y	Newtons	123.6	152.0	-290.6	93.1	106.9	221.4	-265.1	104.1
Neck Force	Z	Newtons	813.9	70.5	-251.9	284.9	1078.3	82.9	-171.2	11.1
Neck Force Resultant	N/A	Newtons	1022.5	83.1			1119.6	82.6		
Neck Moment	X	N•m	10.9	93.2	-9.5	107.5	18.4	103.9	-13.1	142.6
Neck Moment	Y	N•m	65.0	74.1	-22.6	293.9	38.1	144.5	-19.6	107.9
Neck Moment	Z	N•m	3.4	151.0	-10.5	92.8	4.3	117.3	-6.6	160.0
Neck Moment Resultant	N/A	N•m	65.1	74.1			40.3	144.4		

**FOOT PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	16.4	44.2	-36.7	74.8	12.4	78.0	-86.2	55.4
Left Foot Aft	Z	G's	1.2	263.5	-38.2	38.4	6.2	69.5	-32.1	50.2
Left Foot Fore	Z	G's	5.7	17.6	-44.4	60.9	17.1	76.4	-66.9	56.6
Right Foot Aft	X	G's	39.7	47.0	-72.8	55.9	6.9	113.7	-41.7	65.5
Right Foot Aft	Z	G's	20.9	70.5	-130.1	54.3	2.4	109.5	-32.2	41.1
Right Foot Fore	Z	G's	40.4	62.2	-251.4	47.5	5.9	22.6	-45.9	41.0

**UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Upper Moment	X	N•m	13.7	96.1	-19.8	61.4	104.9	57.4	-18.7	246.1
Left Upper Moment	Y	N•m	30.0	61.0	-127.6	71.0	21.6	69.2	-10.5	244.6
Right Upper Moment	X	N•m	41.3	101.4	-57.8	58.1	59.6	58.4	-22.0	69.0
Right Upper Moment	Y	N•m	24.3	108.1	-129.1	56.1	43.4	105.4	-32.2	60.1
Left Lower Moment	X	N•m	7.2	41.7	-11.7	73.7	15.0	51.6	-30.5	94.6
Left Lower Moment	Y	N•m	30.2	41.4	-37.1	71.0	8.0	85.2	-39.0	58.3
Left Lower Force	Z	Newtons	68.0	151.3	-2804.3	41.5	225.9	19.8	-2833.8	51.1
Right Lower Moment	X	N•m	90.0	53.2	-17.5	48.9	80.2	59.4	-17.9	114.6
Right Lower Moment	Y	N•m	78.4	66.1	-8.8	24.4	38.6	81.2	-12.9	20.7
Right Lower Force	Z	Newtons	85.2	192.3	-5084.3	52.4	199.9	24.4	-1643.4	84.9

**DATA SHEET NO. 8...(continued)**

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

**CHEST PEAK DISPLACEMENTS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	MM	0.1	3.6	-28.3	78.7	0.3	8.7	-22.1	61.7

**HEAD REDUNDANT PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	7.3	240.2	-48.5	85.5	4.9	226.4	-35.8	103.1
Head CG	Y	G's	5.8	79.2	-2.9	62.7	3.6	226.4	-10.5	102.0
Head CG	Z	G's	14.5	80.2	-2.1	14.9	25.5	89.9	-1.6	14.8
Head CG Resultant	N/A	G's	49.7	85.5			42.8	103.1		

**CHEST REDUNDANT PEAK ACCELERATIONS**

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	3.0	147.3	-42.8	74.7	1.0	163.0	-36.3	82.2
Chest CG	Y	G's	4.1	66.2	-3.9	19.7	3.3	18.5	-10.5	86.3
Chest CG	Z	G's	3.9	20.5	-3.8	74.3	6.6	91.5	-8.4	70.4
Chest CG Resultant	N/A	G's	43.0	74.8			37.1	82.4		

**REDUNDANT HEAD INJURY CRITERIA (HIC)**

Location	Driver				Passenger			
	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G
Head CG Redundant	375.6	64.0	99.9	40.5	302.3	78.1	114.0	37.1

**REDUNDANT CHEST CLIP (3MSEC)**

Location	Driver			Passenger		
	CLIP	T <sup>1</sup>	T <sup>2</sup>	CLIP	T <sup>1</sup>	T <sup>2</sup>
Chest CG Redundant	42.3	73.8	76.8	35.8	81.0	84.0

**DATA SHEET NO. 9**  
**SEATBELT ASSESSMENT TEST DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
Test Date: 2/11/03

**SEAT BELT PLACEMENT MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	220	210
PBU -Top surface of reference to belt upper edge	mm	315	350
PBL - Top surface of reference to belt lower edge	mm	240	260
Lap Belt tension	Newton's	10	10
Shoulder Belt tension	N/A	Retractor	Retractor

**BELT LENGTH DATA**

Measurement Description	Units	Driver	Passenger
Retractor reel to 'D' ring	mm	610	610
Shoulder belt length as measured on ATD	mm	830	775
Lap belt length as measured on ATD	mm	720	730
Remainder of belt on reel	mm	690	750
Total belt length for continuous webbing systems	mm	2850	2865

**SHOULDER BELT SPOOL-OFF DATA**

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	N/A	N/A
As determined electronically	mm	202.2	137.1

**BELT STRETCH DATA**

Measurement Description	Units	Driver	Passenger
Electronically between shoulder belt load cell and "D" ring	mm/cm	*	*
Mechanically	mm/cm	N/A	N/A

\*Not used with shoulder belt pre-tensioner systems.

**DATA SHEET NO. 10  
SUMMARY OF FMVSS 212 DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

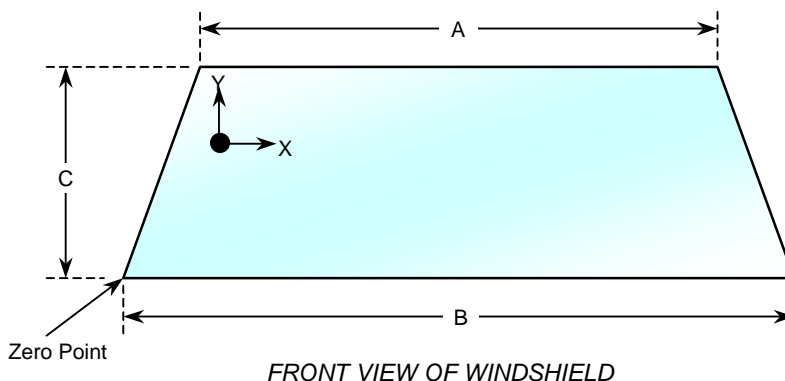
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with a rubber type adhesive. No molding covers the windshield periphery at any point.

The standard requires that the posttest retention measurement be a minimum of 75 percent of the pretest total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles that are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.1 °C

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test(mm)	Post-Test (mm)	% of Retention
Left Side	2184.0	2184.0	100
Right Side	2184.0	2184.0	100
Total	4368.0	4368.0	100



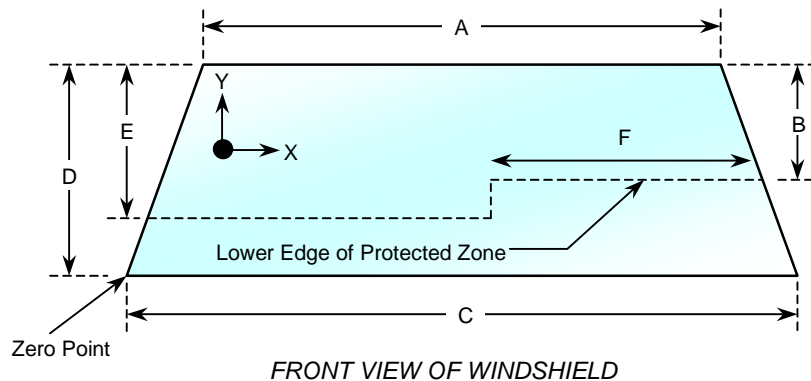
**WINDSHIELD DIMENSIONS**

Item	Units	Segment Length	Molding Width
A	mm	1188	24
B	mm	1480	20
C	mm	850	0
C	mm	1480	0

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

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



**WINDSHIELD AND  
 PROTECTED ZONE**

Item	Units	Value
A	mm	1188
B	mm	573
C	mm	1480
D	mm	850
E	mm	571
F	mm	818

**AREA OF PROTECTED ZONE FAILURES**

- A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 in. by a vehicle component other than one that is normally in contact with the windshield.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

- B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

**DATA SHEET NO. 12**  
**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

Test Time: 12:30 PM

Temperature at Test Time: 12.8 Deg. C

**STODDARD SOLVENT SPILLAGE MEASUREMENTS**

A. From impact until vehicle motion ceases: 0.0 oz.

(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0.0 oz.

(Maximum Allowable = 5 ounces)

C. For the following 25 minutes: 0.0 oz.

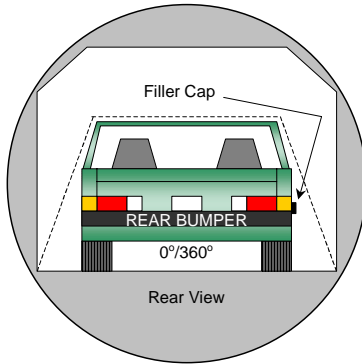
(Maximum Allowable = 1 oz./minute)

D. Spillage Location Details: No leakage occurred

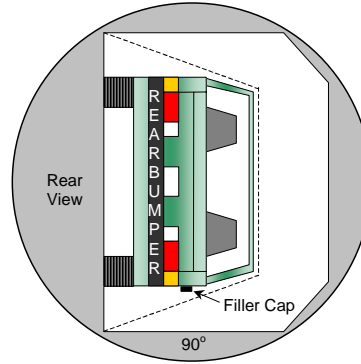
**DATA SHEET NO. 13**  
**FMVSS 301 STATIC ROLLOVER DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

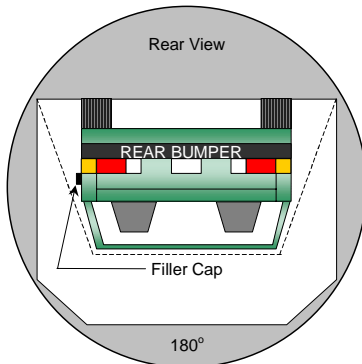
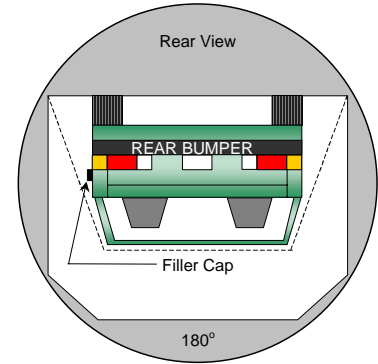
NHTSA No.: M30112  
 Test Date: 2/11/03



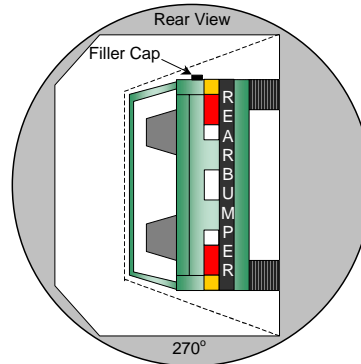
**0° to 90°**



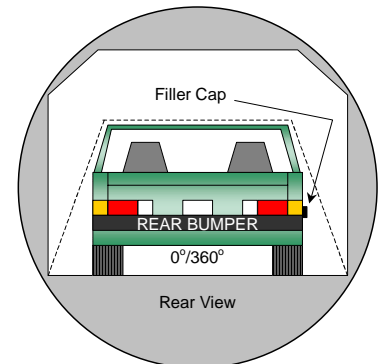
**90° to 180°**



**180° to 270°**



**270° to 360°**



1. The specified fixture rollover rate for each 90° of rotation is 60 to 120 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. No solvent leakage occurred during rollover.

**DATA SHEET NO. 13....(CONTINUED)**  
**FMVSS 301 STATIC ROLLOVER DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	83	300	383
90° to 180°	83	300	383
180° to 270°	80	300	380
270° to 360°	82	300	382

**FMVSS 301 SPILLAGE REQUIREMENT TABLE (oz.)**

First 5 minutes	5.0
Sixth Minute	1.0
Seventh minute	1.0
Eighth Minute	1.0

**ACTUAL TEST VEHICLE SOLVENT SPILLAGE (oz.)**

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

**SOLVENT SPILLAGE LOCATION TABLE**

Test Phase	SPILLAGE LOCATION
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

**DATA SHEET NO. 14**  
**VEHICLE MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
Test Date: 2/11/03

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4665	4100	-565
2	RSOV to front of engine	mm	3915	3830	-85
3	RSOV to firewall centerline	mm	3604	3148	-456
4	RSOV to leading edge of right door	mm	3170	3169	-1
5	RSOV to leading edge of left door	mm	3172	3173	1
6	RSOV to lower leading edge of right door	mm	3146	3137	-9
7	RSOV to lower leading edge of left door	mm	3145	3150	5
8	RSOV to upper trailing edge of right door	mm	2127	2127	0
9	RSOV to upper trailing edge of left door	mm	2128	2129	1
10	RSOV to lower trailing edge of right door	mm	2154	2145	-9
11	RSOV to lower trailing edge of left door	mm	2153	2163	10
12	RSOV to bottom of right 'A' pillar	mm	3142	3136	-6
13	RSOV to bottom of left 'A' pillar	mm	3142	3136	-6
14	RSOV to firewall on right side	mm	3559	3190	-369
15	RSOV to firewall of left side	mm	3568	3138	-430
16	RSOV to steering column	mm	2741	2755	14
17	Center of steering column to left 'A' pillar	mm	393	374	-19
18	Center of steering column to headlining	mm	425	405	-20
19	RSOV to right side of front bumper	mm	4485	4070	-415
20	RSOV to left side of front bumper	mm	4485	4075	-410
21	Length of engine block	mm	465	465	0
RD	RSOV to right side of dash panel	mm	2936	2910	-26
CD	RSOV to center of dash panel	mm	2876	2857	-19
LD	RSOV to left side of dash panel	mm	2936	2900	-36

**DATA SHEET NO. 14.....(CONTINUED)**  
**VEHICLE STRUCTURAL MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

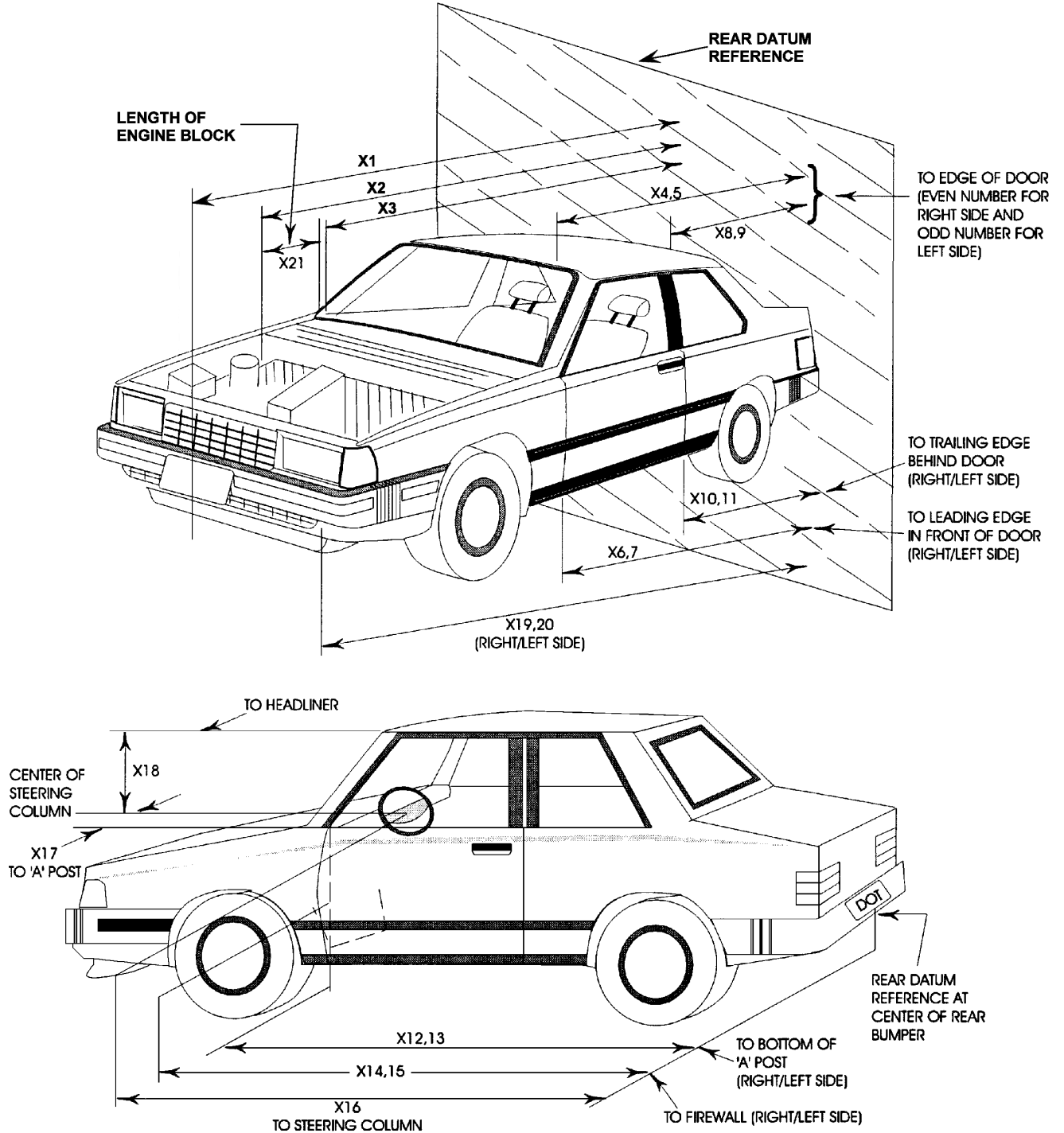
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total Length	mm	4665	4100	-565
2	Total Width	mm	1233	1235	2
3	Bumper Top Height	mm	597	540	-57
4	Bumper Bottom Height	mm	258	300	42
5	Longitudinal Member Top Height	mm	605	485	-120
6	Longitudinal Member Bottom Height	mm	485	255	-230
7	Distance Between Longitudinal Members	mm	870	850	-20
8	Longitudinal Member Width	mm	120	120	0
9	Engine Top Height	mm	801	800	-1
10	Engine Bottom Height	mm	170	170	0
11	Engine and Gear Box Width	mm	230	230	0
12	Front Bumper to Engine Distance	mm	765	280	-485
13	Front Shock Absorber Fixing Width	mm	343	136	-207
14	Bonnet Leading Edge Height	mm	749	735	-14
15	Front Schock Absorber Fixing Width	mm	1116	1040	-76
16	Front Bumper to Front Axle Distance	mm	1022	500	-522
17	Front Axle to A-Pillar Distance	mm	501	490	-11
18	A-Pillar to B-Pillar Distance	mm	1033	1000	-33
19	B-Pillar to Rear Axla Distance	mm	1106	1115	9
20	B-Pillar to C-Pillar Distance	mm	1050	1050	0
21	Roof Sill Bottom Height	mm	1290	1286	-4
22	Roof Sill Top Heigth	mm	1395	1400	5
23	Floor Sill Bottom Height	mm	205	195	-10
24	Floor Sill Top Height	mm	384	375	-9

All Measurements in millimeters

**DATA SHEET NO. 14...(CONTINUED)**  
**VEHICLE MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



**DATA SHEET NO. 15**  
**CAMERA LOCATIONS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
Test Date: 2/11/03

No.	Camera View	Location (mm)			Angle (Deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Right Side, Real Time	18288	-22860	2540	10	N/A	Zoom	24
2	Driver Overall	1930	8357	1321	4	7855	13	1010
2b	Driver Overall	1626	8230	1092	4	7751	17	900
3	Driver Close-up	1727	8230	1600	4	7742	35	980
4	3/4 Driver	6477	10185	4648	13	11062	35	1000
5	Steering Column	1524	8230	3404	20	8016	19	1040
6	Steering Column	1524	8230	2997	16	7923	19	1050
7	Passenger Overall	2057	-8306	1219	6	7802	14	1000
8	Passenger Close-up	1676	-8052	1219	4	7566	35	1040
9	3/4 Passenger	8026	-8941	2997	9	10358	80	890
10	Passenger Door	2438	-13106	1524	4	12601	50	920
11	Overhead	610	0	6172	90	N/A	13	1080
12	Driver Front	-610	406	2743	40	N/A	12	800
13	Passenger Front	-610	406	2743	40	N/A	13	820
14	Pit Engine	762	0	-1499	90	N/A	10	1100
16	Pit Fuel Tank	3658	0	-1499	90	N/A	6	980
16B	Driver Side Child	2642	8230	2286	15	7871	35	1010
17	Driver Side Child	2642	6096	1524	1	5673	25	510
18	Passenger Side Child	2438	-9144	2032	10	8785	25	720
18b	Passenger Side Child	2743	-8331	1524	1	7920	25	510

X - Barrier Face Y - Monorail Centerline Z -

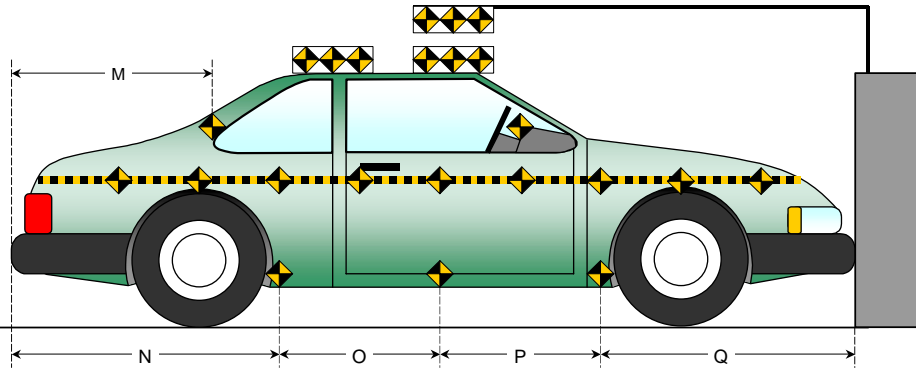
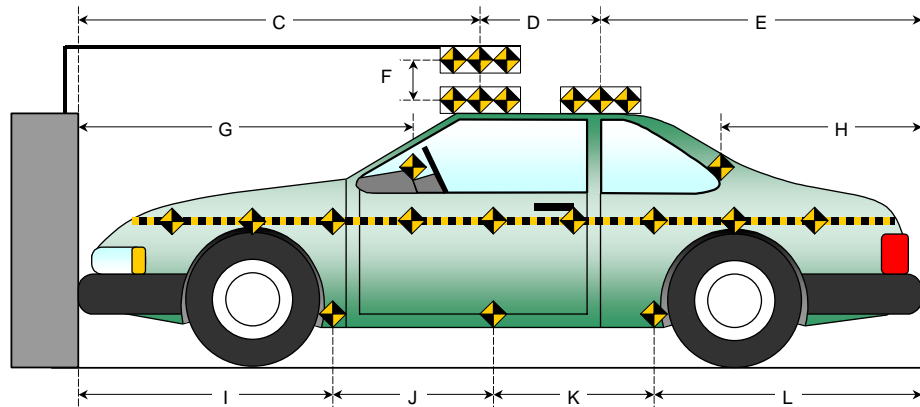
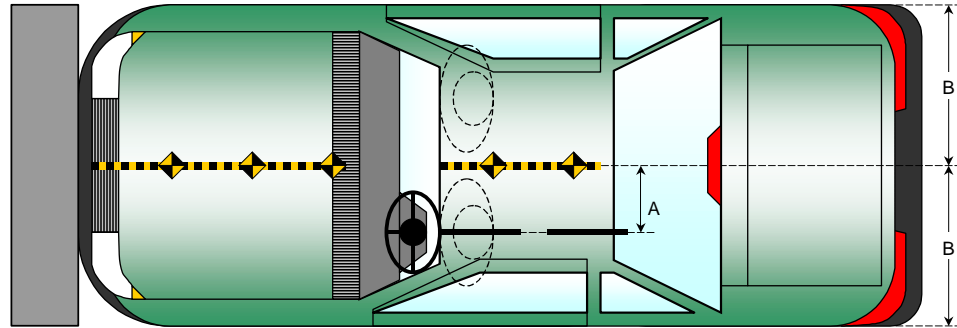
**DATA SHEET NO. 16**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

All Dimensions  
 in mm

Item	Value
A	391
B	861
C	2381
D	610
E	1700
F	155
G	1745
H	1051
I	1459
J	870
K	870
L	1481
M	1051
N	1481
O	870
P	870
Q	1459



**DATA SHEET NO. 17**  
**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

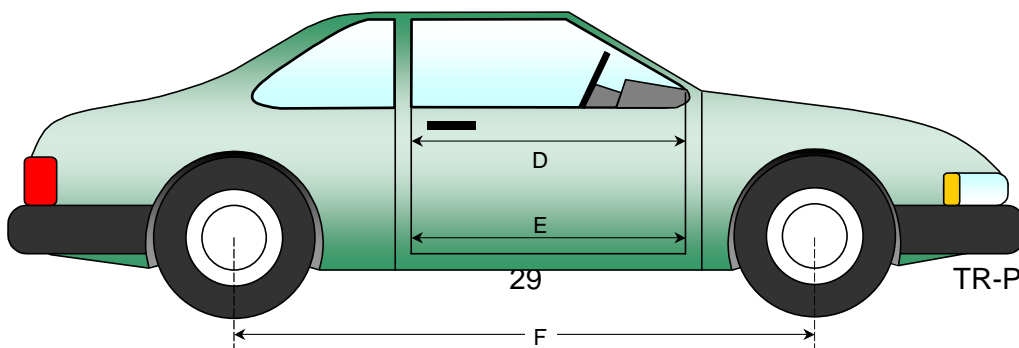
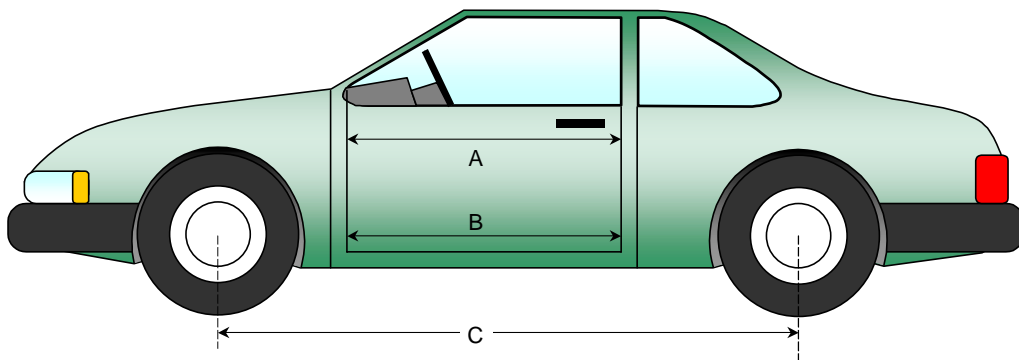
NHTSA No.: M30112  
 Test Date: 2/11/03

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	944	938	-6
B	Left Side Lower	mm	873	866	-7
D	Right Side Upper	mm	944	942	-2
E	Right Side Lower	mm	873	867	-6

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheel base	mm	2622	2571	-51
F	Right Side Wheel base	mm	2622	2545	-77



**DATA SHEET NO. 17...(CONTINUED)**  
**VEHICLE INTRUSION MEASUREMENTS**

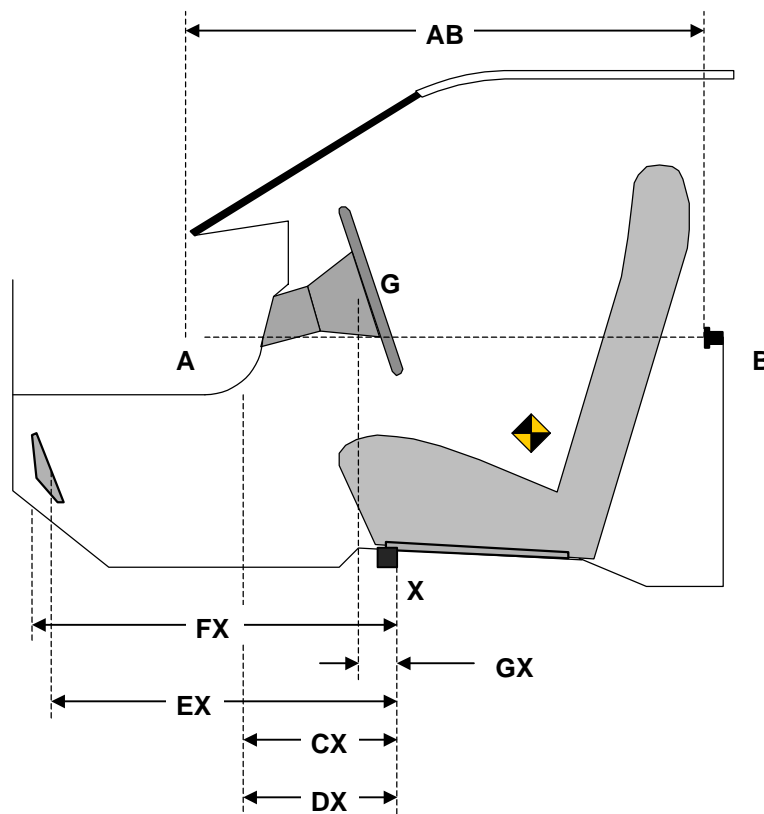
Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	944	938	-6
CX	Left Knee Bolster to X	mm	375	330	-45
DX	Right Knee Bolster to X	mm	373	287	-86
EX	Brake Pedal to X	mm	621	525	-96
FX	Foot Rest to X	mm	666	700	34
GX	Center of Steering Wheel Hub to X	mm	188	110	-78

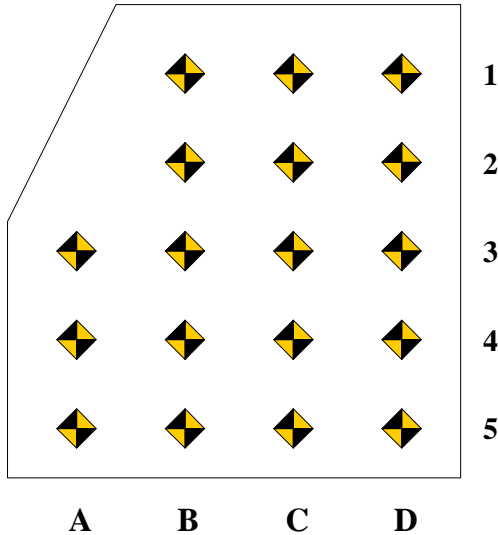
X = Left Front Seat Outboard Anchor Bolt Head



**DATA SHEET NO. 17...(CONTINUED)  
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



Measurement reference point for X and Z-axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3,4 and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.

**DRIVER FLOOR PAN X-AXIS**

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		720	719	735		723	727	738		3	8	3
2		620	619	631		645	645	643		25	26	12
3	518	519	517	527	551	545	545	543	33	26	28	16
4	416	417	415	417	448	445	445	445	32	28	30	28
5	317	317	315	317	345	345	345	345	28	28	30	28

**DRIVER FLOOR PAN Z-AXIS**

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-24	-25	-45		2	4	-13		26	29	32
2		-79	-78	-104		-66	-54	-83		13	24	21
3	-105	-100	-97	-107	-100	-94	-90	-103	5	6	7	4
4	-106	-104	-105	-105	-104	-104	-100	-108	2	0	5	-3
5	-110	-105	-110	-111	-110	-108	-108	-94	0	-3	2	17

**DATA SHEET NO. 17...(CONTINUED)  
VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

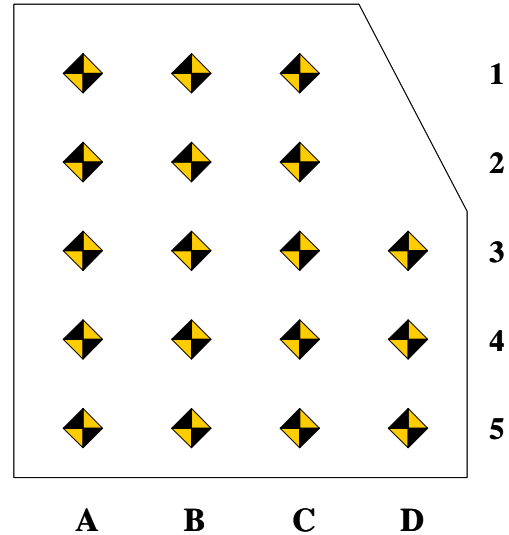
NHTSA No.: M30112  
 Test Date: 2/11/03

Measurement reference point for X and Z axis is the forward outboard seat mounting bolt.

Columns A through D are evenly spaced.

Rows 1 and 2 are on the toe kick portion of the floor pan. Rows 3,4, and 5 are located on the most level portion of the floor pan.

Row 3 will be at the intersection of the toe kick and the level sections of the floor pan.



**PASSENGER FLOOR PAN X-AXIS**

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	694	688	694		668	672	673		-26	-16	-21	
2	595	590	594		595	602	603		0	12	9	
3	494	490	494	493	500	502	503	508	6	12	9	15
4	395	390	389	383	400	400	398	398	5	10	9	15
5	295	290	289	283	300	298	298	298	5	8	9	15

**PASSENGER FLOOR PAN Z-AXIS**

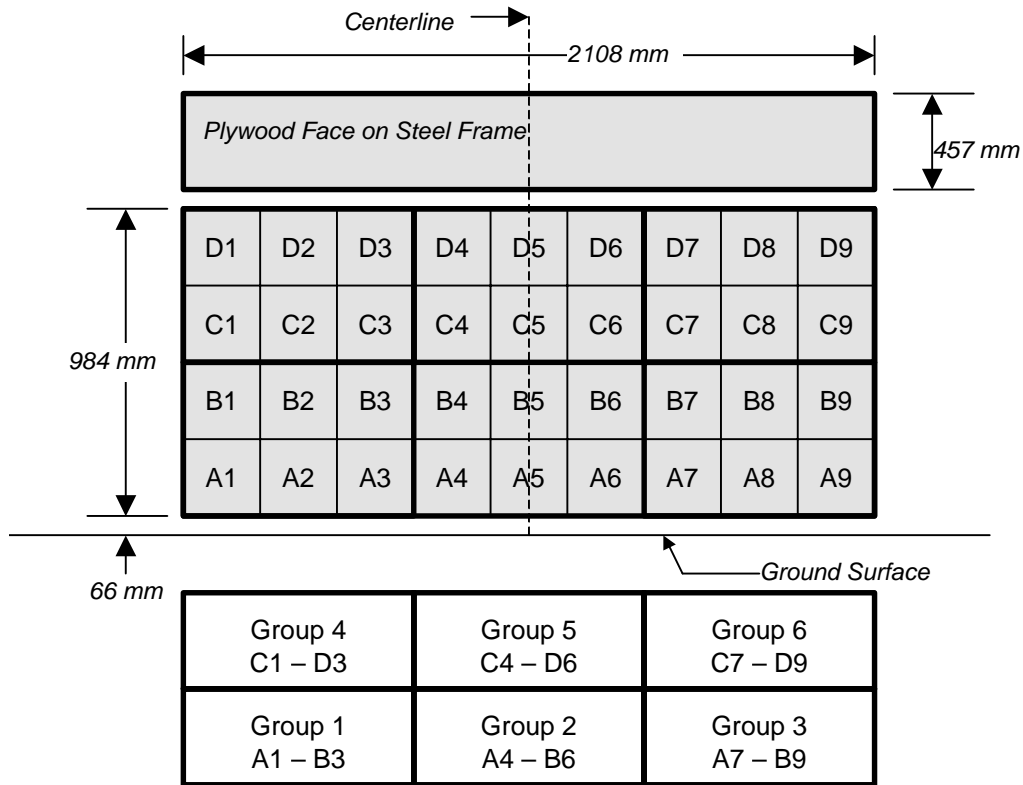
	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-42	-37	-35		-52	-50	-55		-10	-13	-20	
2	-97	-86	-86		-101	-90	-90		-4	-4	-4	
3	-111	-99	-96	-110	-131	-120	-105	-115	-20	-21	-9	-5
4	-117	-103	-103	-109	-145	-120	-114	-110	-28	-17	-11	-1
5	-119	-106	-103	-118	-140	-124	-115	-122	-21	-18	-12	-4

**DATA SHEET NO. 18**  
**FIXED BARRIER LOAD CELL LOCATIONS**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**36 Load Cell Rigid Barrier (NHTSA Standard)**  
**Load Cell Locations on Fixed Barrier**



6 Groups of 6 Load Cells Each

The Data is presented in Appendix C with the following requirements:

- 1.) Data from 36 individual load cells
- 2.) Sum data from 6 groupings shown above (6 cells/group)
- 3.) Total or sum of all 36 individual load cells
- 4.) Sum of all 36 individual load cells vs. vehicle dynamic crush

**DATA SHEET NO. 19**  
**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**VEHICLE INFORMATION**

VIN: 1G8AF52F33Z141088  
 Vehicle Size Category: 4 Door Sedan

Wheel base (mm): 2622  
 Test Weight (kg): 1444

**ACCELEROMETER DATA**

Accelerometer Location: Left rear floor pan  
 Cal. Procedure/Interval: 6 months / drop test  
 Integration Algorithm: NHTSA Standard  
 Impact Velocity (km/h): 56.06  
 Velocity Change (km/h): 79.6

Linearity: Good

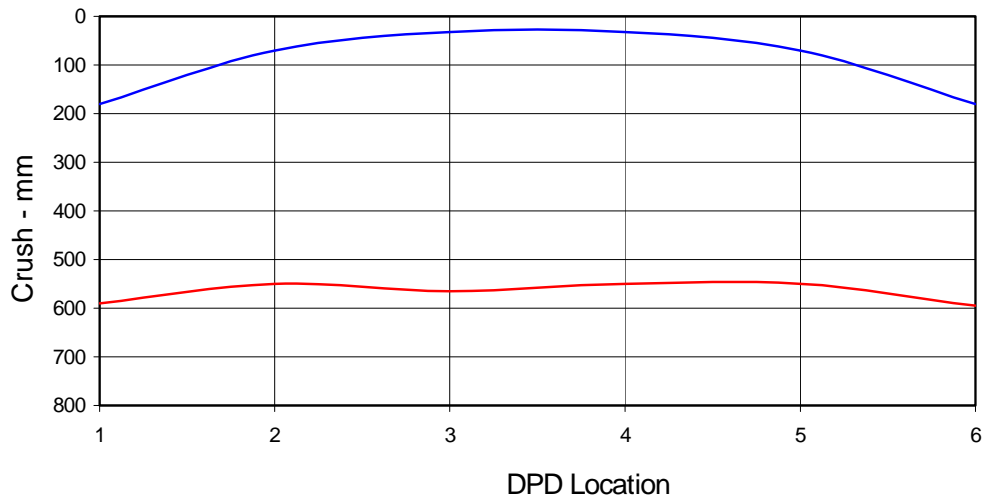
Time of Separation (msec): 66.5

**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW6  
 Damage Region Length (mm): 1233

Midpoint of Damage: Vehicle Centerline  
 Impact Mode: Full Frontal

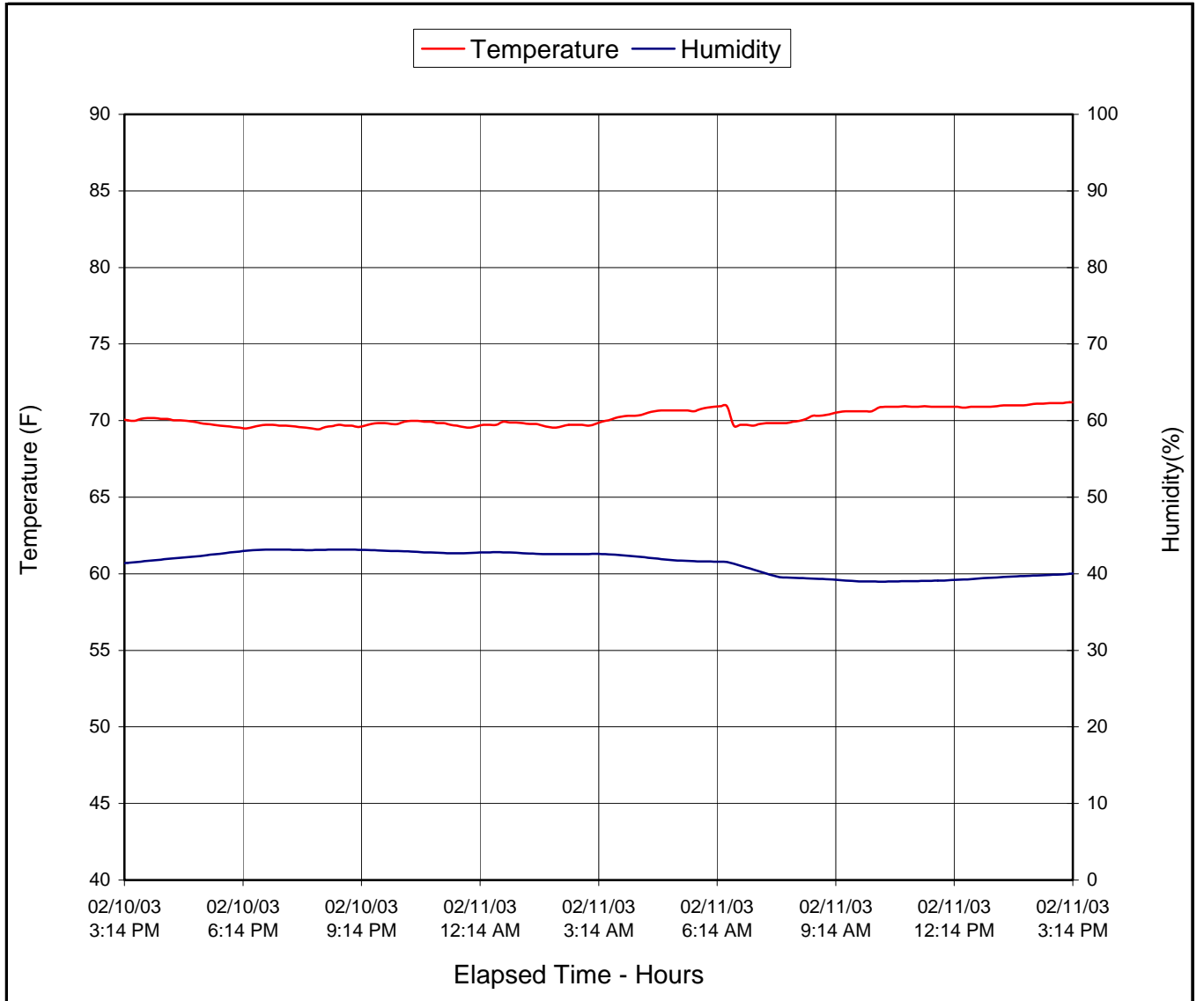
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	180	590	-410
C2	Crush zone 2 on left side	mm	70	550	-480
C3	Crush zone 3 on left side	mm	32	565	-533
C4	Crush zone 4 on right side	mm	32	550	-518
C5	Crush zone 5 on right side	mm	70	550	-480
C6	Crush zone 6 at right side	mm	180	595	-415



**DATA SHEET NO. 20**  
**DUMMY/VEHICLE TEMPERATURE STABILIZATION**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
Test Date: 2/11/03



**APPENDIX A**

**PHOTOGRAPHS**

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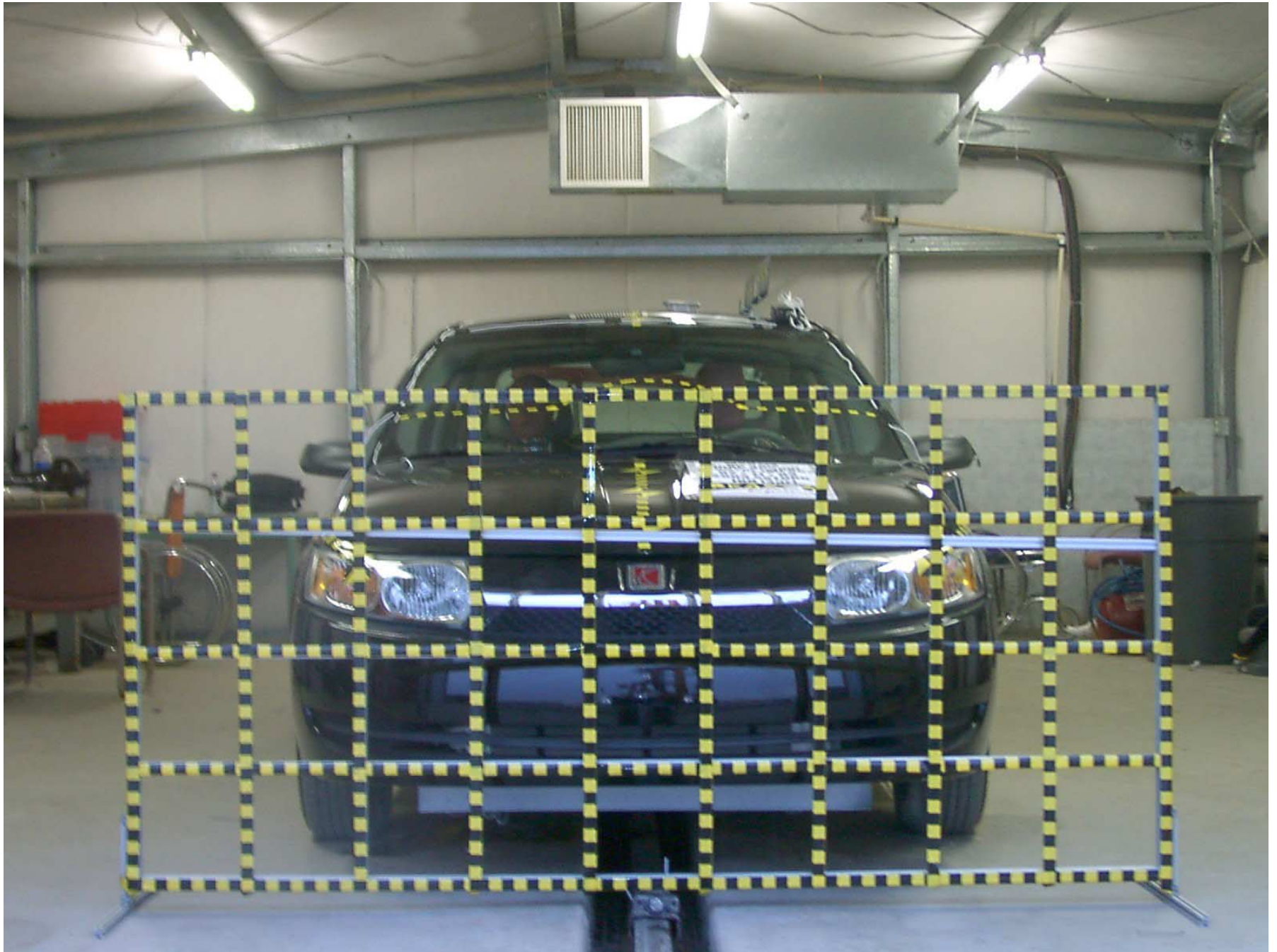


Figure A-1: Load Cell Location



MFD BY SATURN CORPORATION

DATE	GVWR	GAWR FRT	GAWR RR
01/03	3650LB 1656KG	1860LB 0844KG	1790LB 0812KG

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

1G8AF52F33Z141088

PASS CAR



Figure A-2: Vehicle Certification Label



# TIRE-LOADING INFORMATION

OCCUPANTS VEHICLE CAPACITY WT.  
FRT. CTR. RR. TOTAL LBS KG.  
2 0 3 5 899 408  
MAXIMUM LOADING AT GVWR:  
SAME AS VEHICLE CAPACITY WEIGHT

ZZHB

COLD TIRE  
PRESSURE

	TIRE SIZE	SPEED RATING	PSI/KPA
FRONT	P185/70R14	S	30/210
REAR	P185/70R14	S	30/210
SPARE	T115/70R14	M	60/420

IF TIRES ARE HOT, ADD 4 PSI (28 KPA)  
SEE OWNER'S MANUAL FOR ADDITIONAL  
INFORMATION

Figure A-3: Vehicle Tire Label



Figure A-4: Right Front  $\frac{3}{4}$  View, As Received



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Figure A-5: Left Rear  $\frac{3}{4}$  View, as Received



Figure A-6: Pre-Test Front View



Figure A-7: Post-Test Front View



Figure A-8: Pre-Test Left Side View



Figure A-9: Post-Test Left Side View



Figure A-10: Pre-Test Right Side View



Figure A-11: Post-Test Right Side View



Figure A-12: Pre-Test Right Front ¾ View



Figure A-13: Post-Test Right Front  $\frac{3}{4}$  View



Figure A-14: Pre-Test Left Rear  $\frac{3}{4}$  View



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Figure A-15: Post-Test Left Rear 3/4 View



Figure A-16: Left Rear ¾ View of Doors After Impact



Figure A-17: Right Rear 3/4 View of Doors After Impact

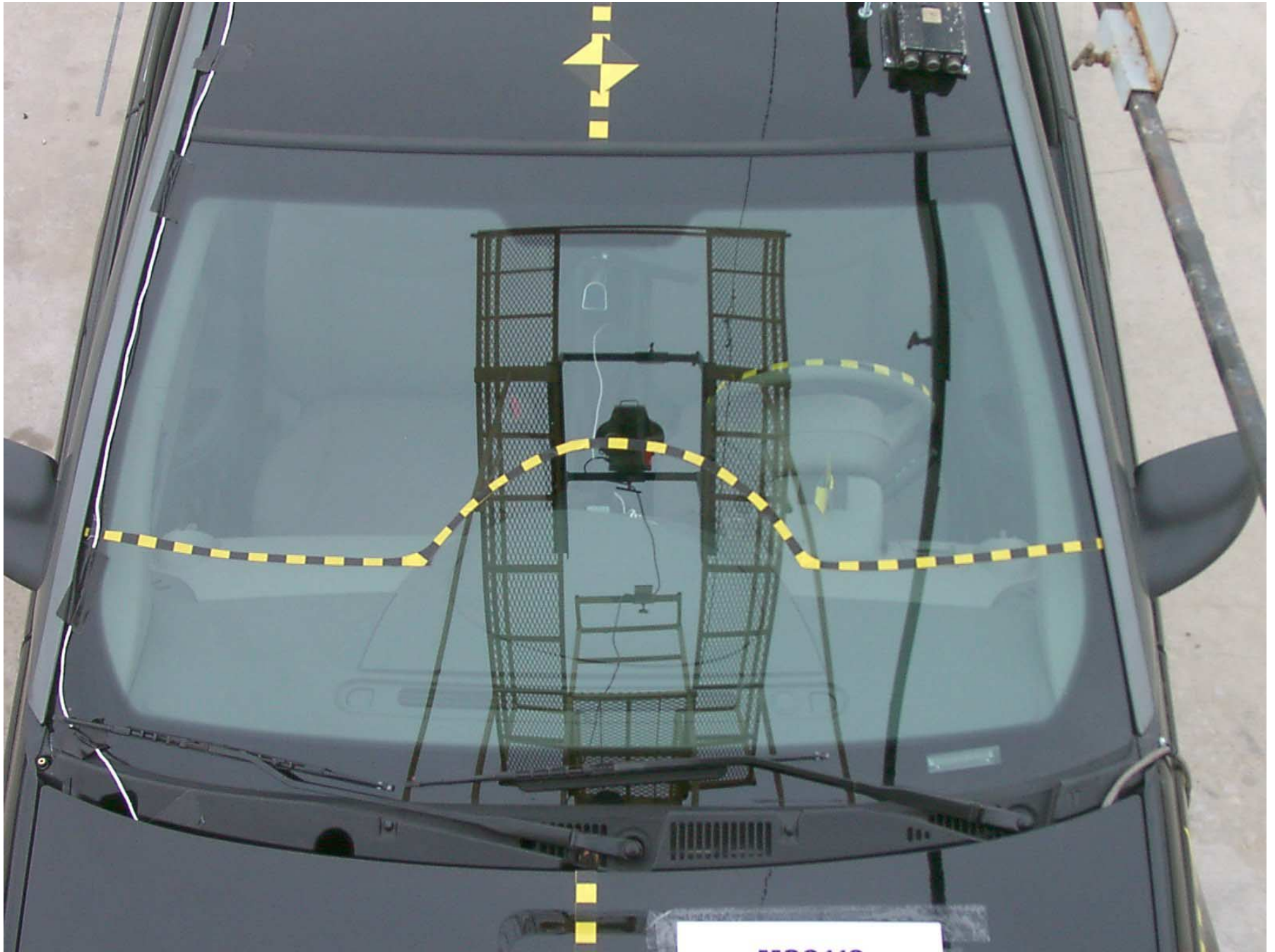


Figure A-18: Pre-Test Windshield View



Figure A-19: Post-Test Windshield View

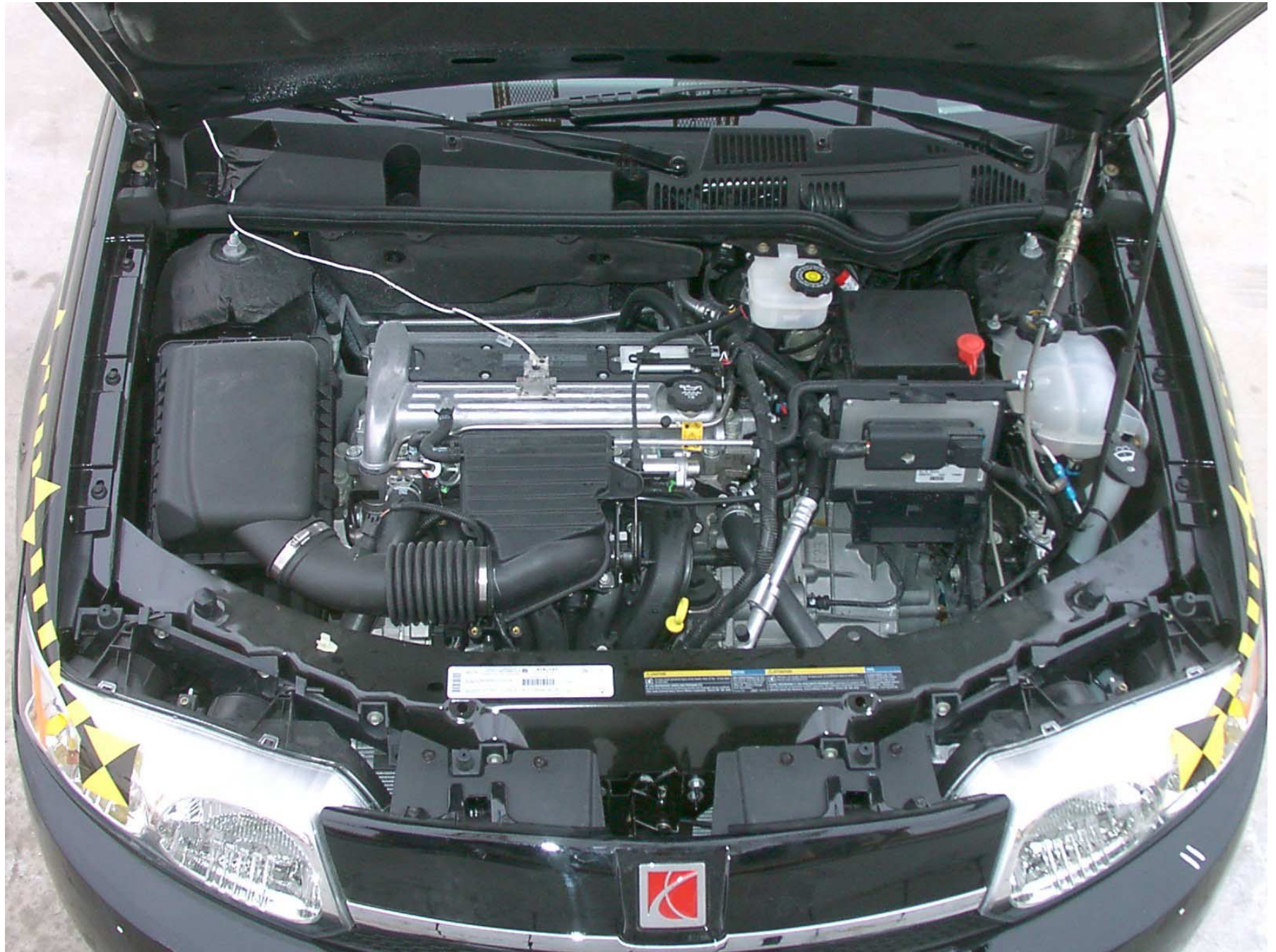


Figure A-20: Pre-Test Engine Compartment

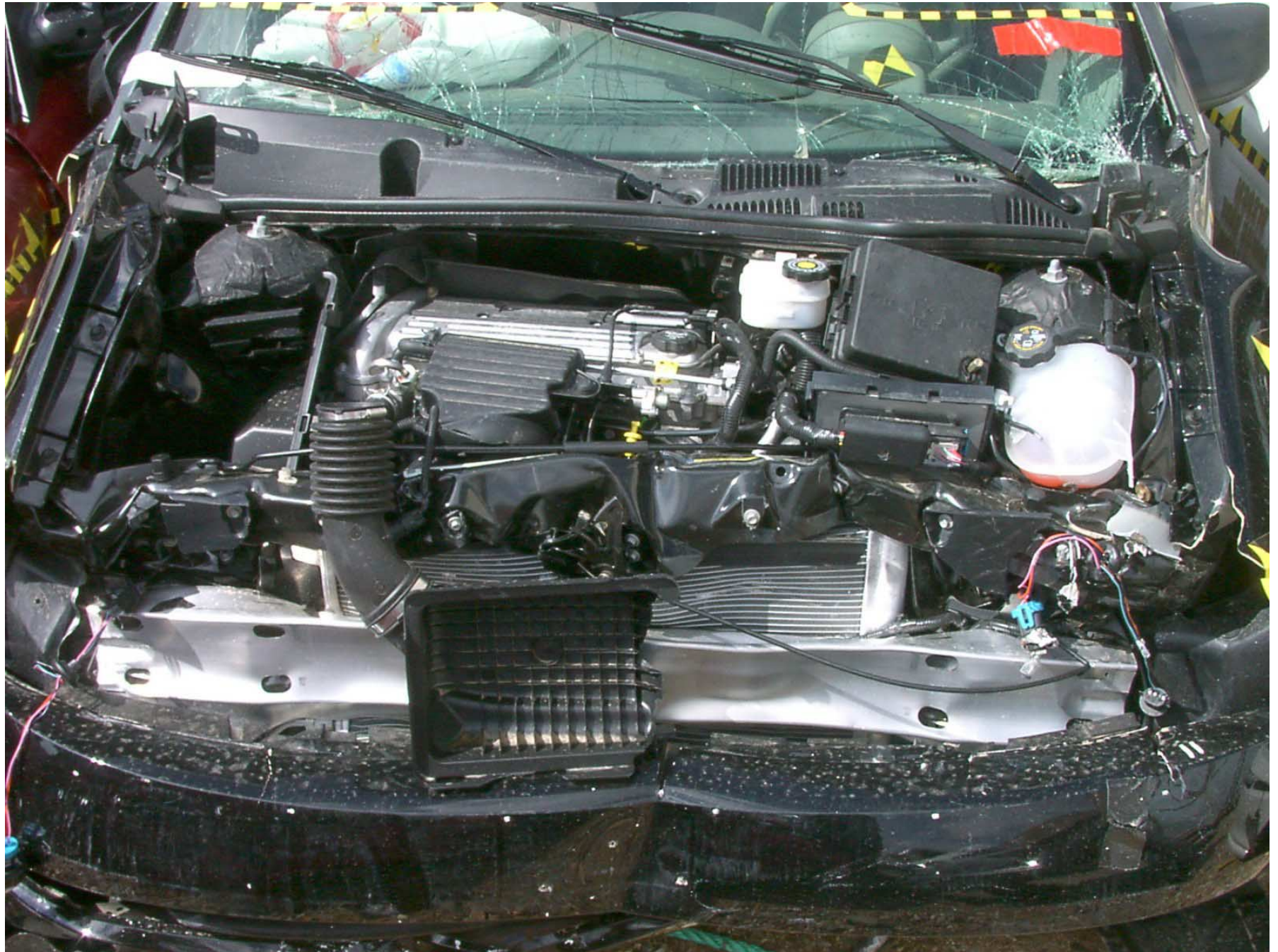


Figure A-21: Post-Test Engine Compartment



Figure A-22: Pre-Test Fuel Cap



Figure A-23: Post-Test Fuel Cap

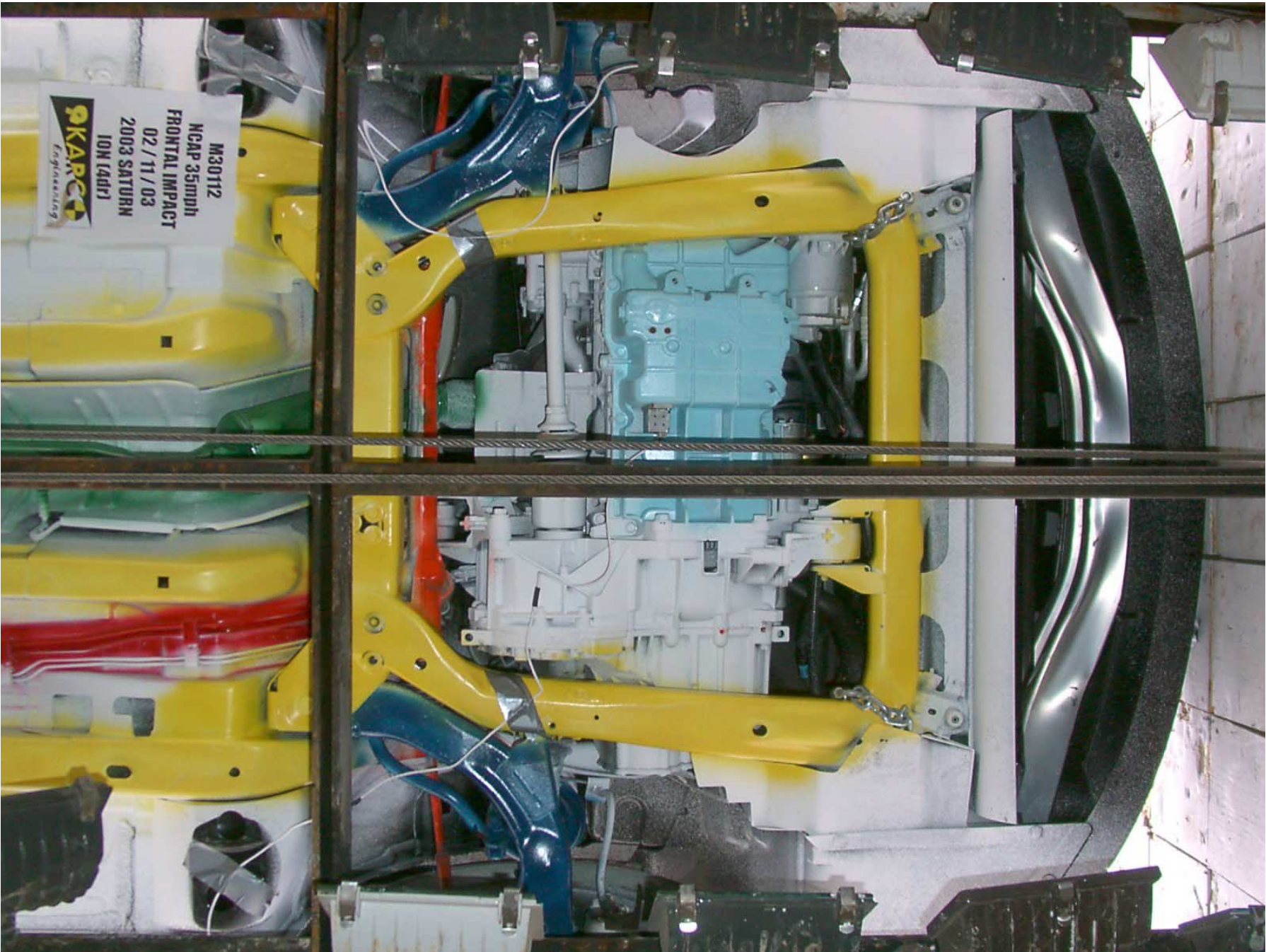


Figure A-24: Pre-Test Front Underbody View

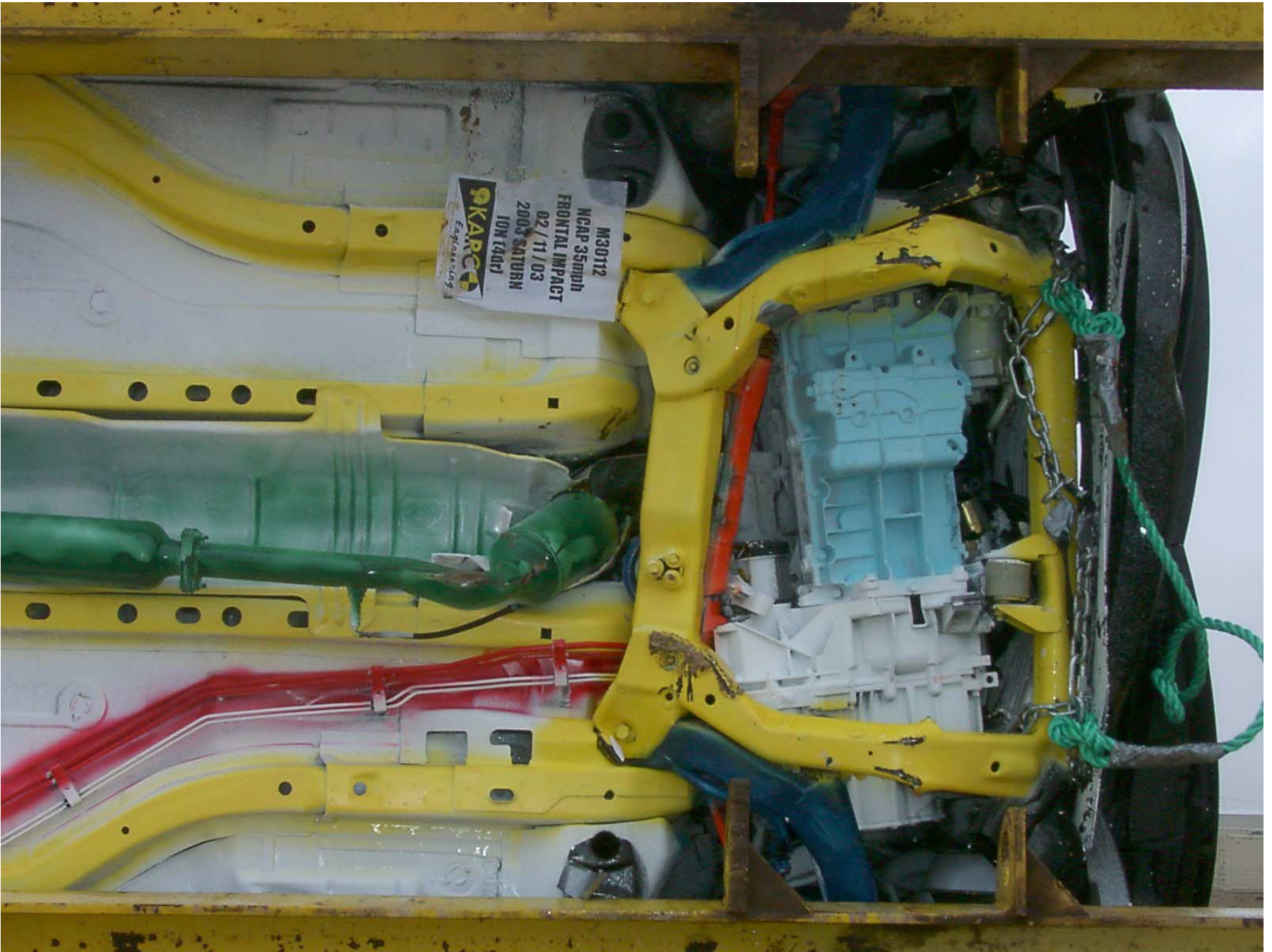


Figure A-25: Post-Test Front Underbody View

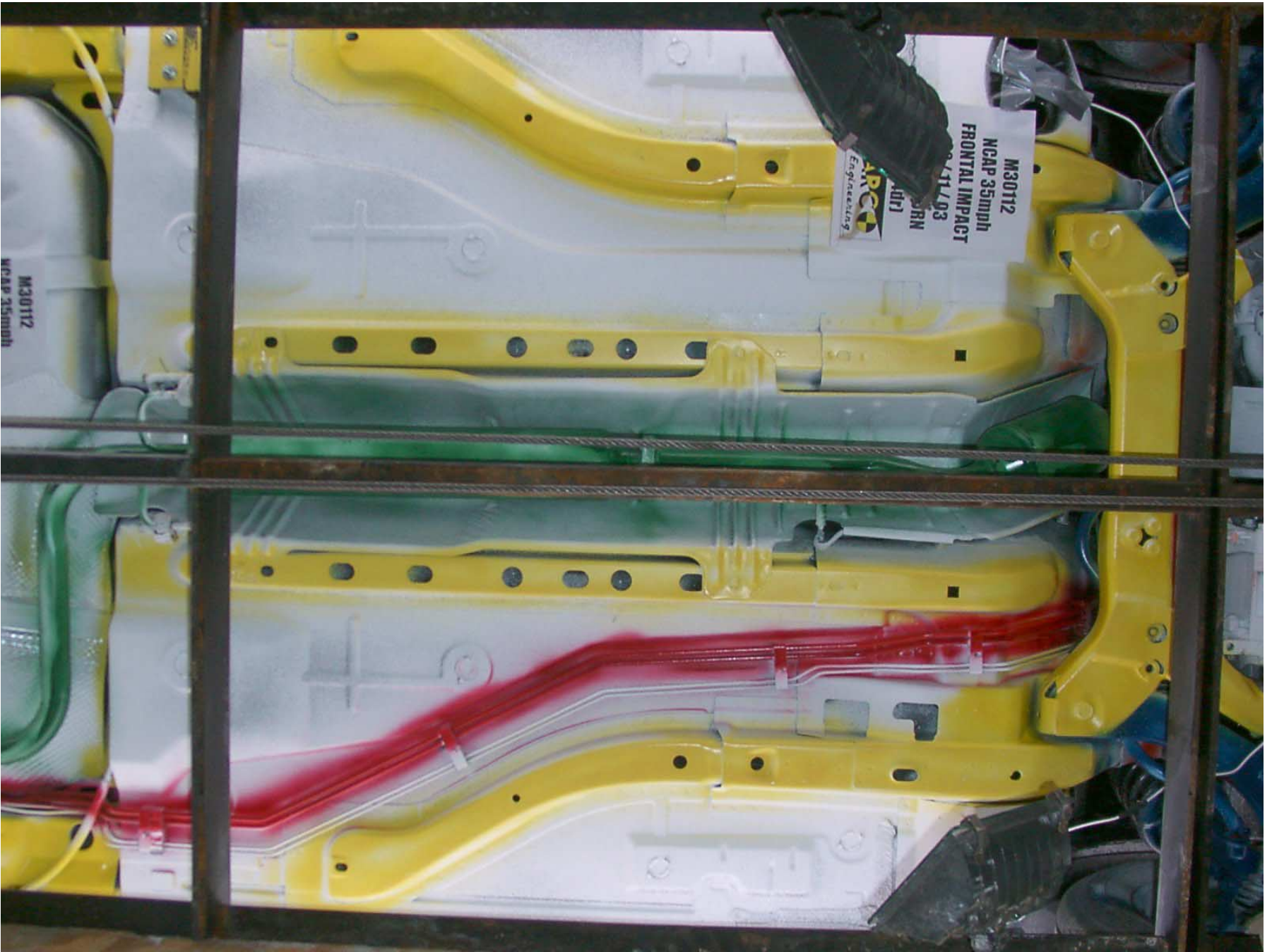


Figure A-26: Pre-Test Mid Underbody View

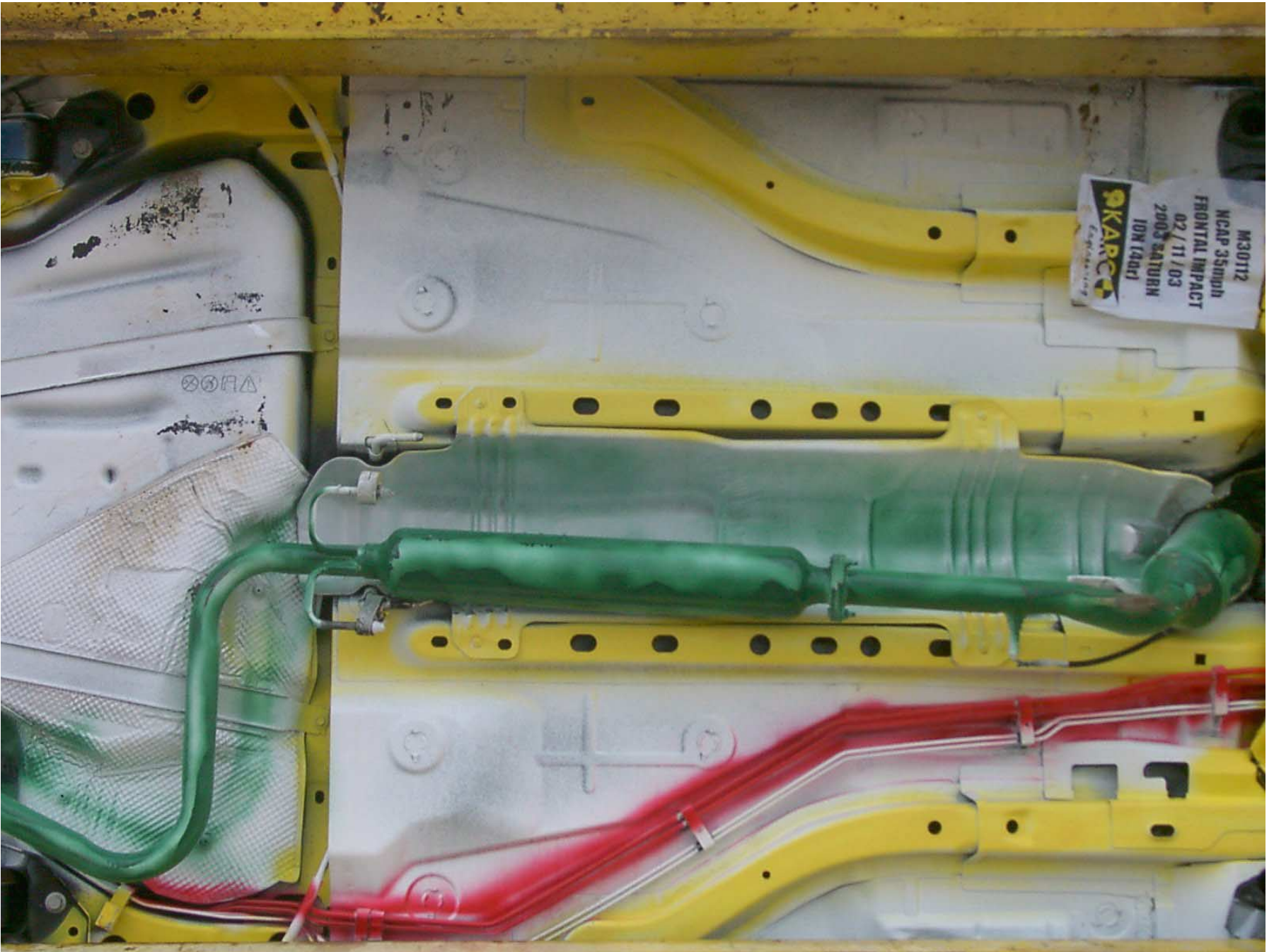


Figure A-27: Post-Test Mid Underbody View

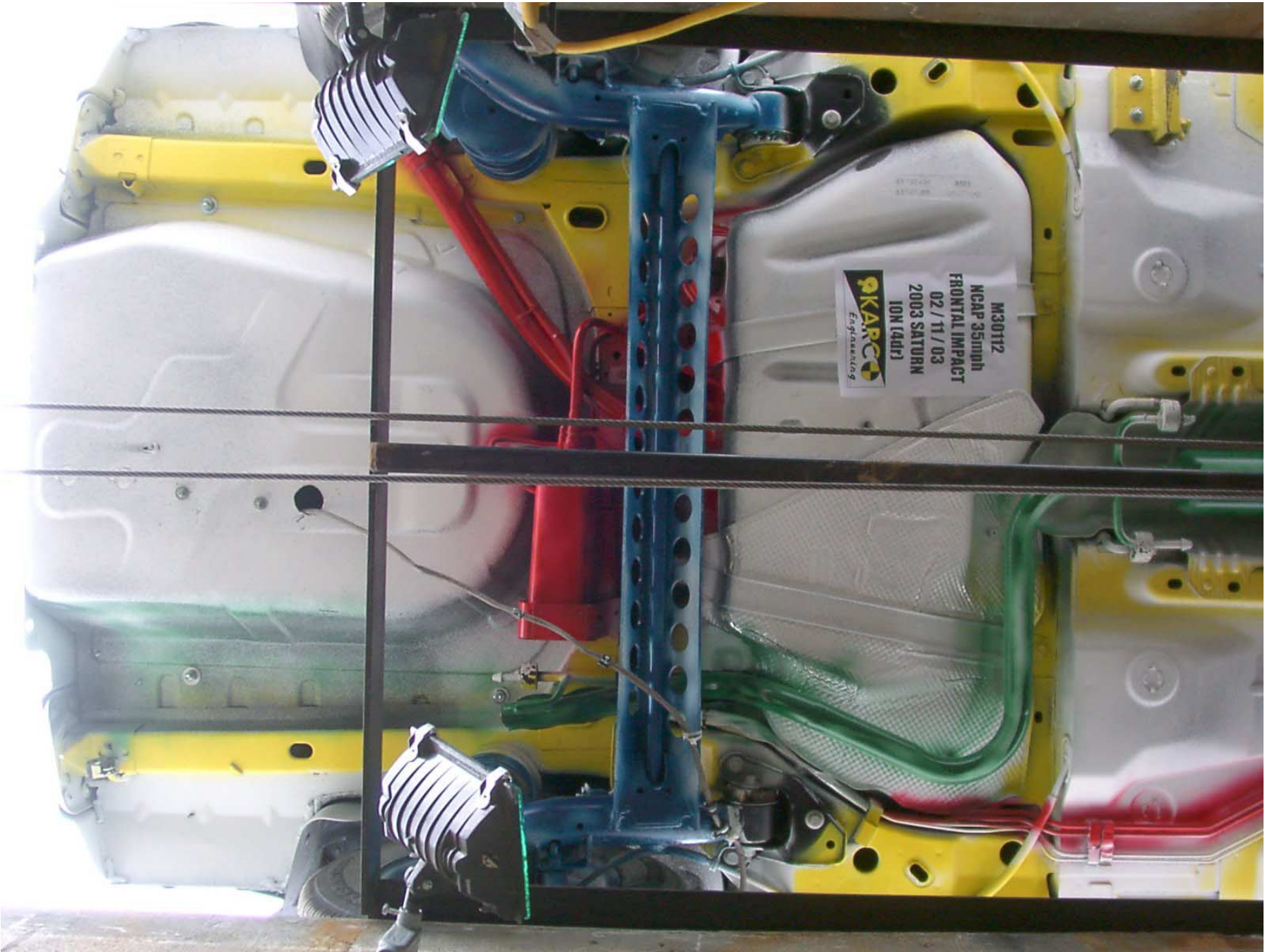


Figure A-28: Pre-Test Rear Underbody View

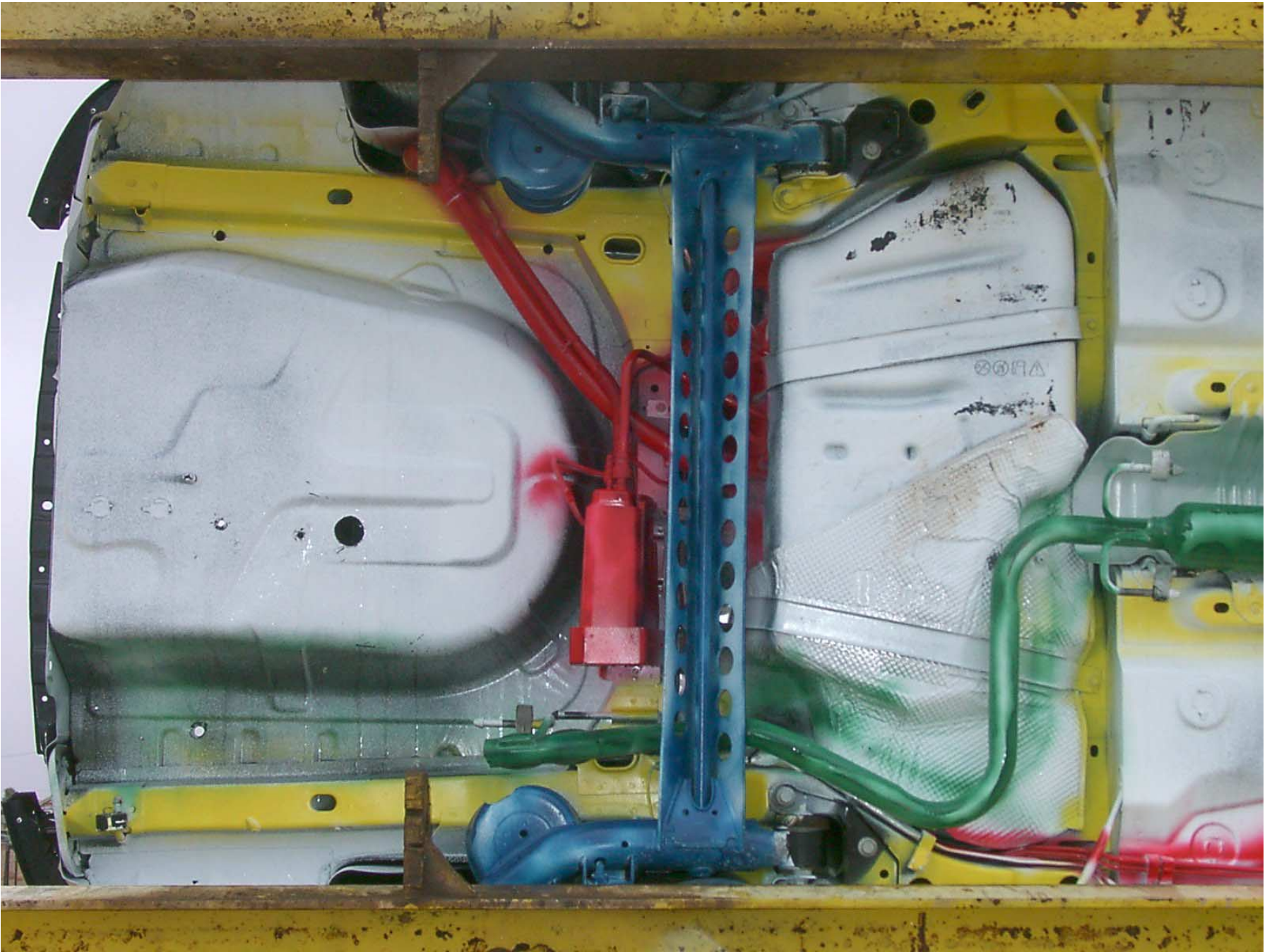


Figure A-29: Post-Test Rear Underbody View

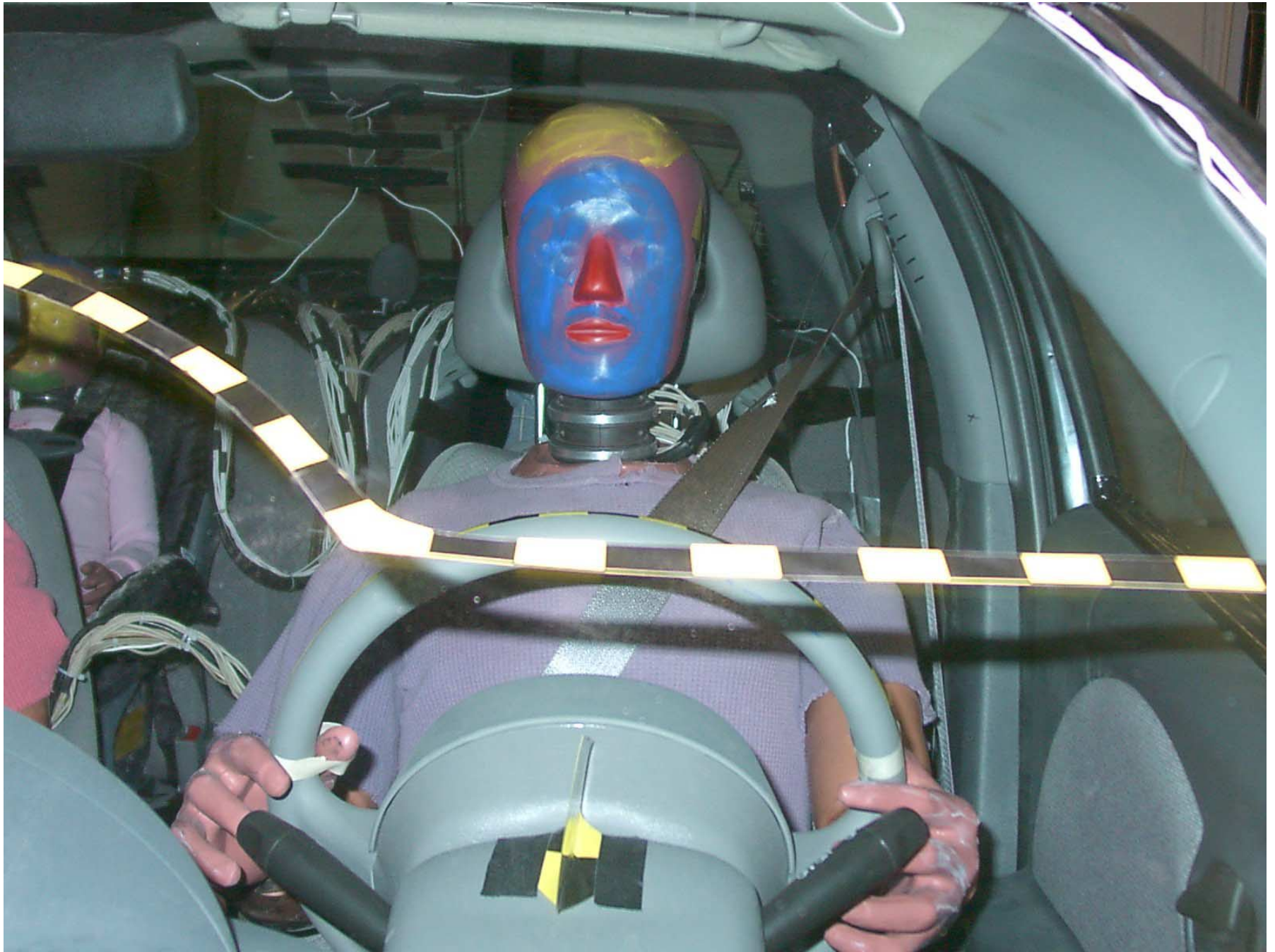


Figure A-30: Pre-Test Driver Dummy Front View (Head Position)



Figure A-31: Post-Test Driver Dummy Front View (Head Position)



Figure A-32: Pre-Test Driver Dummy Front Through Window



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Figure A-33: Post-Test Driver Dummy Front Through Window



Figure A-34: Pre-Test Driver Dummy Door Open



Figure A-35: Post-Test Driver Dummy Door Open



Figure A-36: Pre-Test Driver Dummy Feet



Figure A-37: Post-Test Driver Dummy Feet



Figure A-38: Pre-Test Driver Side Knee Bolster

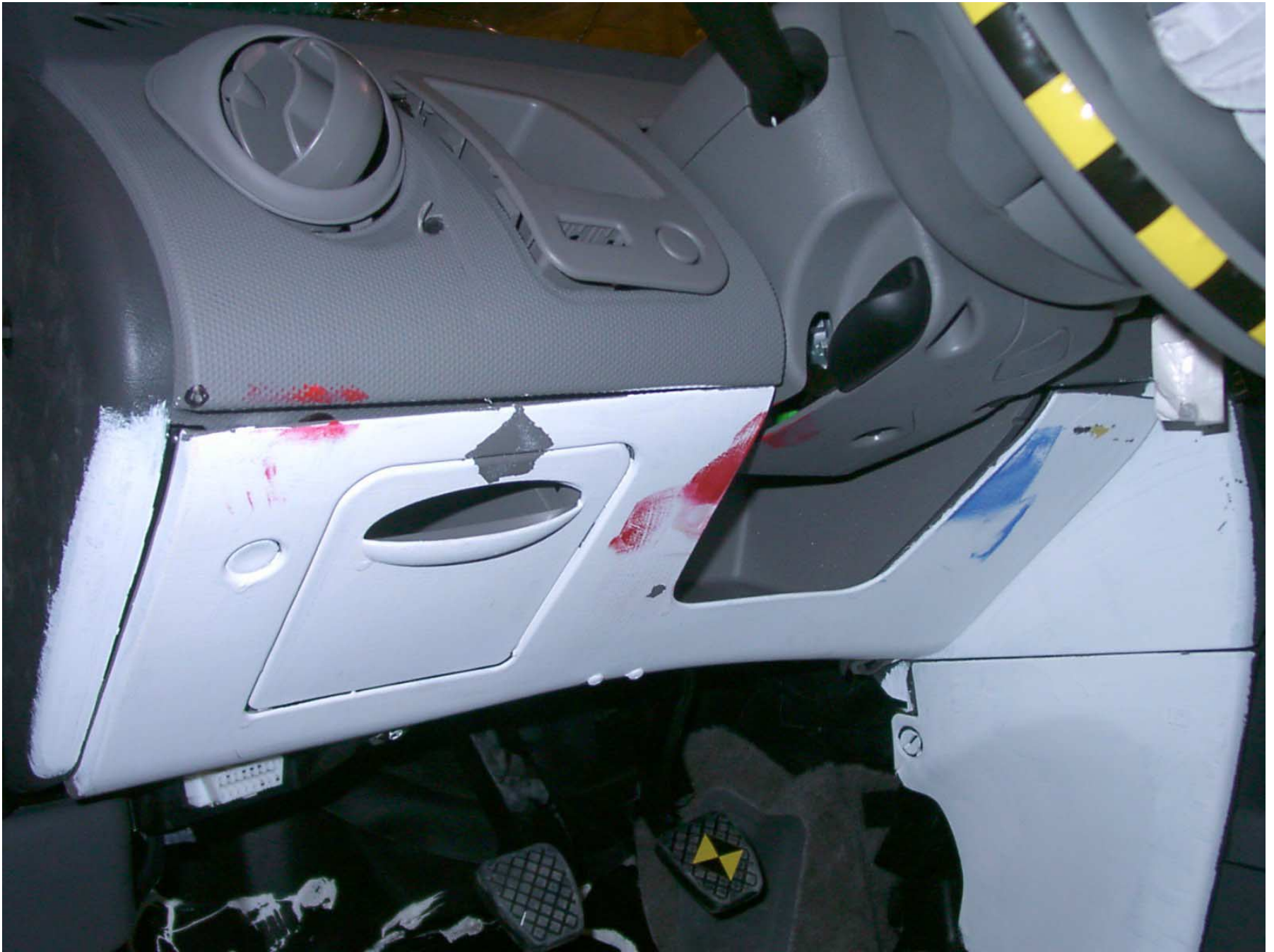


Figure A-39: Post-Test Driver Side Knee Bolster



Figure A-40: Pre-Test Driver Side Floor Pan



Figure A-41: Post-Test Driver Side Floor Pan



Figure A-42: Post-Test Driver Dummy Head



Figure A-43: Post-Test Driver Dummy Contact to Air Bag



Figure A-44: Pre-Test Passenger Dummy Front View (Head Position)



Figure A-45: Post-Test Passenger Dummy Front View (Head Position)



Figure A-46: Pre-Test Passenger Dummy Front Through Window

**Photograph Not  
Available**

Figure A-47: Post-Test Passenger Dummy Front Through Window





Figure A-49: Post-Test Passenger Dummy Door Open

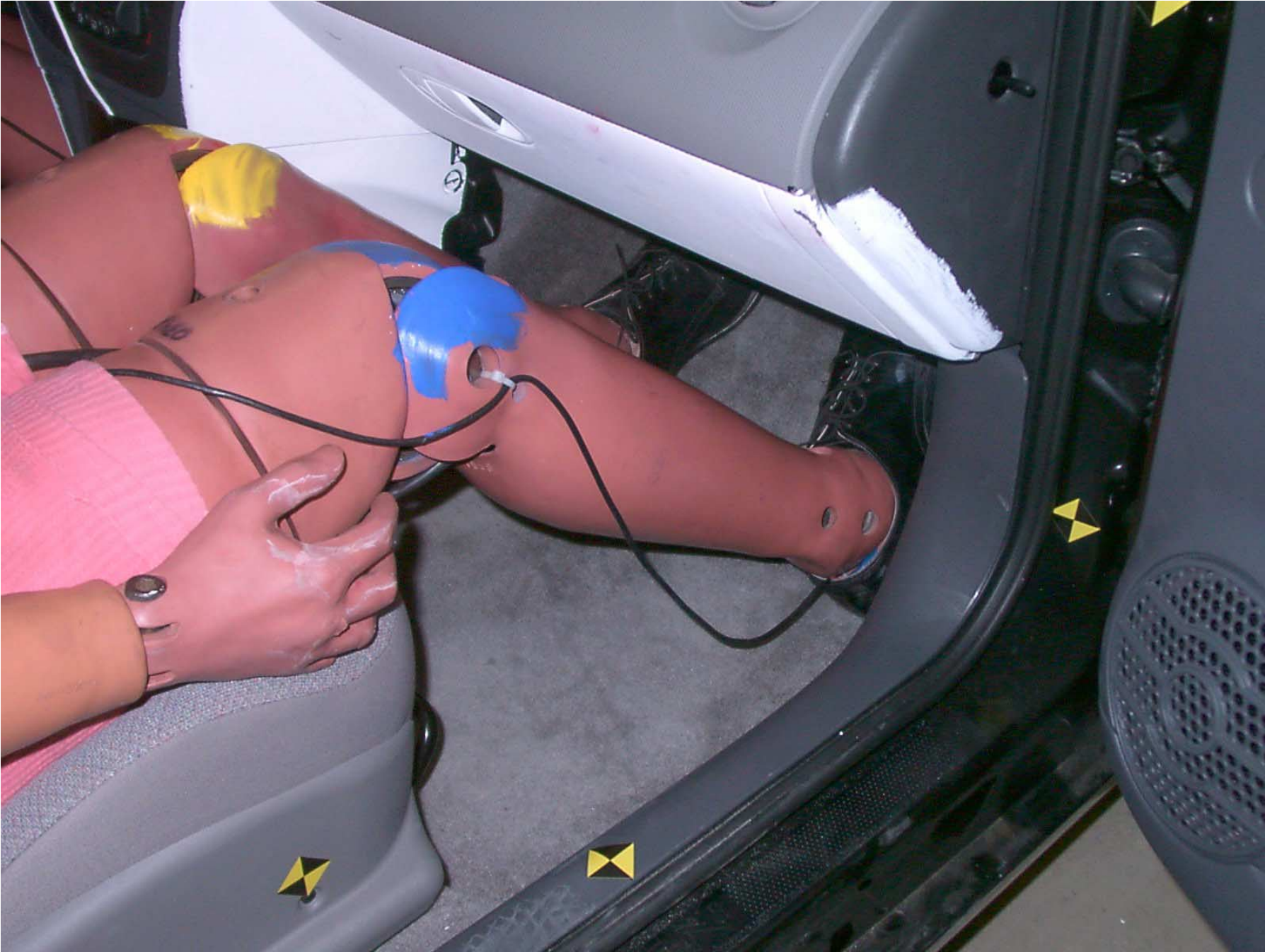


Figure A-50: Pre-Test Passenger Dummy Feet



Figure A-51: Post-Test Passenger Dummy Feet



Figure A-52: Pre-Test Passenger Side Floor Pan



Figure A-53: Post-Test Passenger Side Floor Pan



Figure A-54: Pre-Test Passenger Side Knee Bolster



Figure A-55: Post-Test Passenger Side Knee Bolster



Figure A-56: Post-Test Passenger Dummy Head



Figure A-57: Post-Test Passenger Dummy Contact to Air Bag



Figure A-58: Vehicle on Rollover Device



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TR-P23001-08-NC

Figure A-59: Vehicle During Impact

## **APPENDIX B**

### **DATA PLOTS**

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B-21	B-21
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B-23	B-23
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B-25	B-25
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B-48	Driver Left Lower Tibia Force Z	B-48
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LIST OF DATA PLOTS...(Continued)

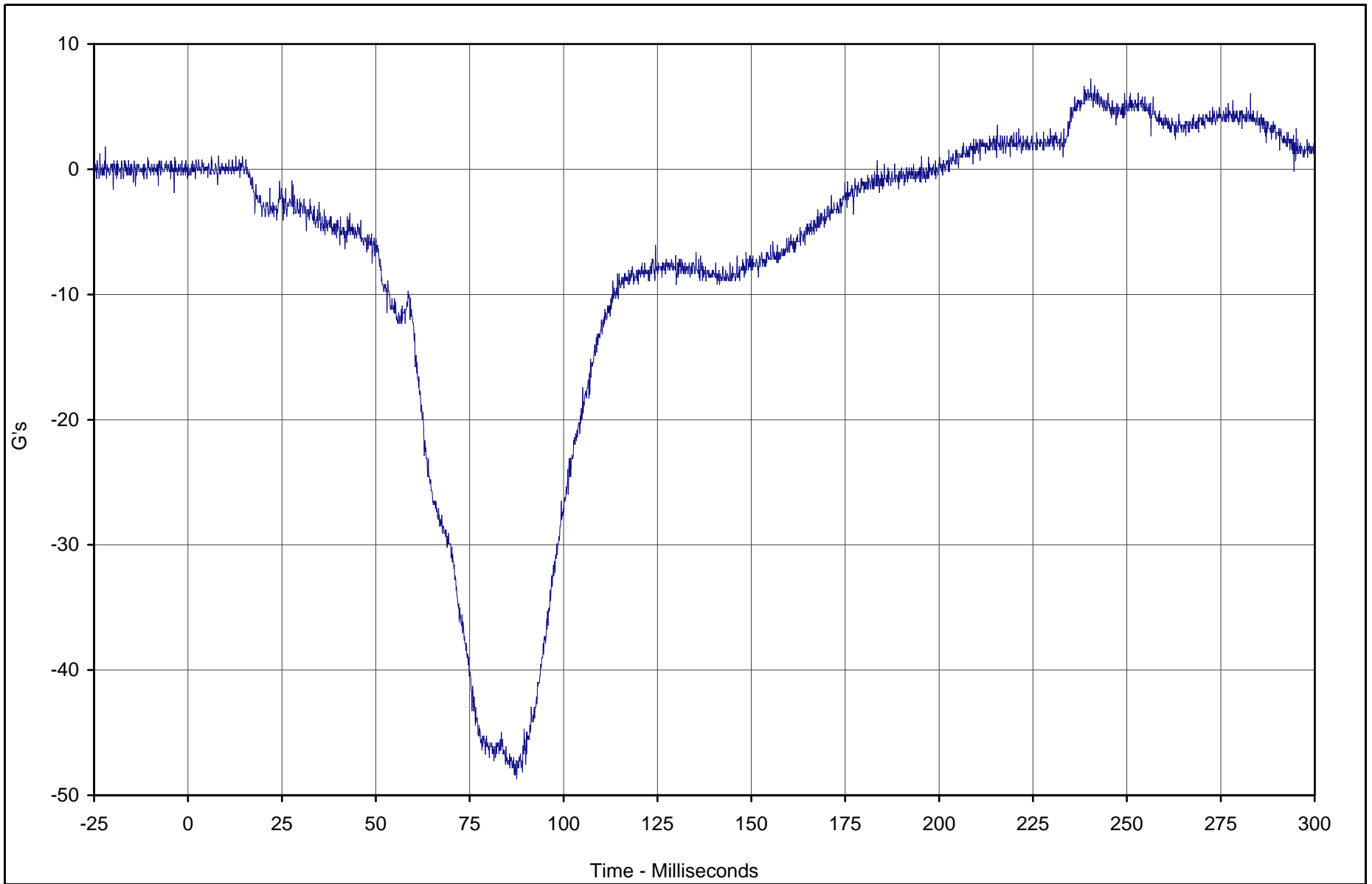
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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X	001	FIL	G's	7.2	240.4	-48.7	87.5	1000

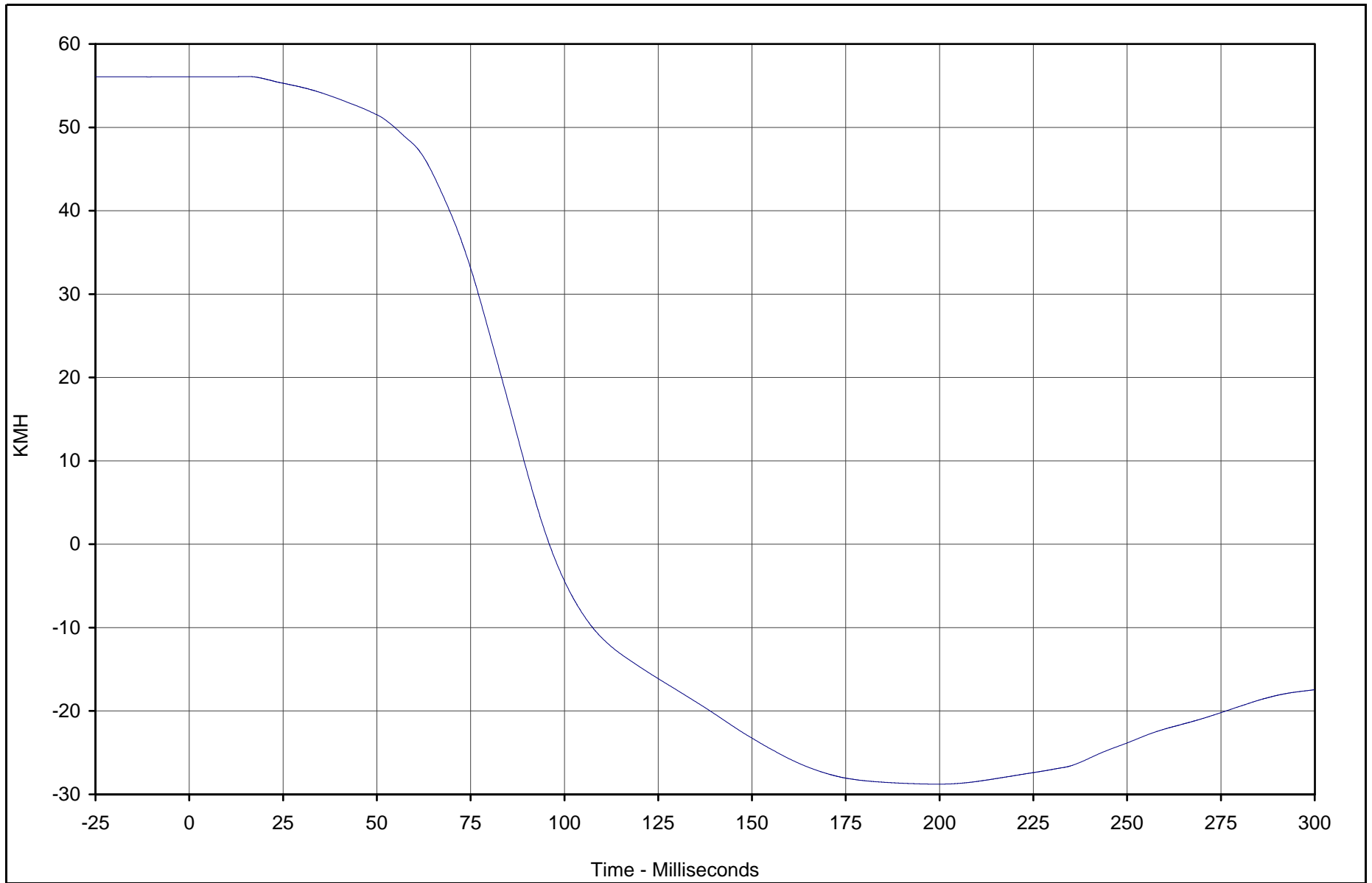


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X Velocity	001	IN1	KMH	56.1	15.6	-28.8	199.5	180

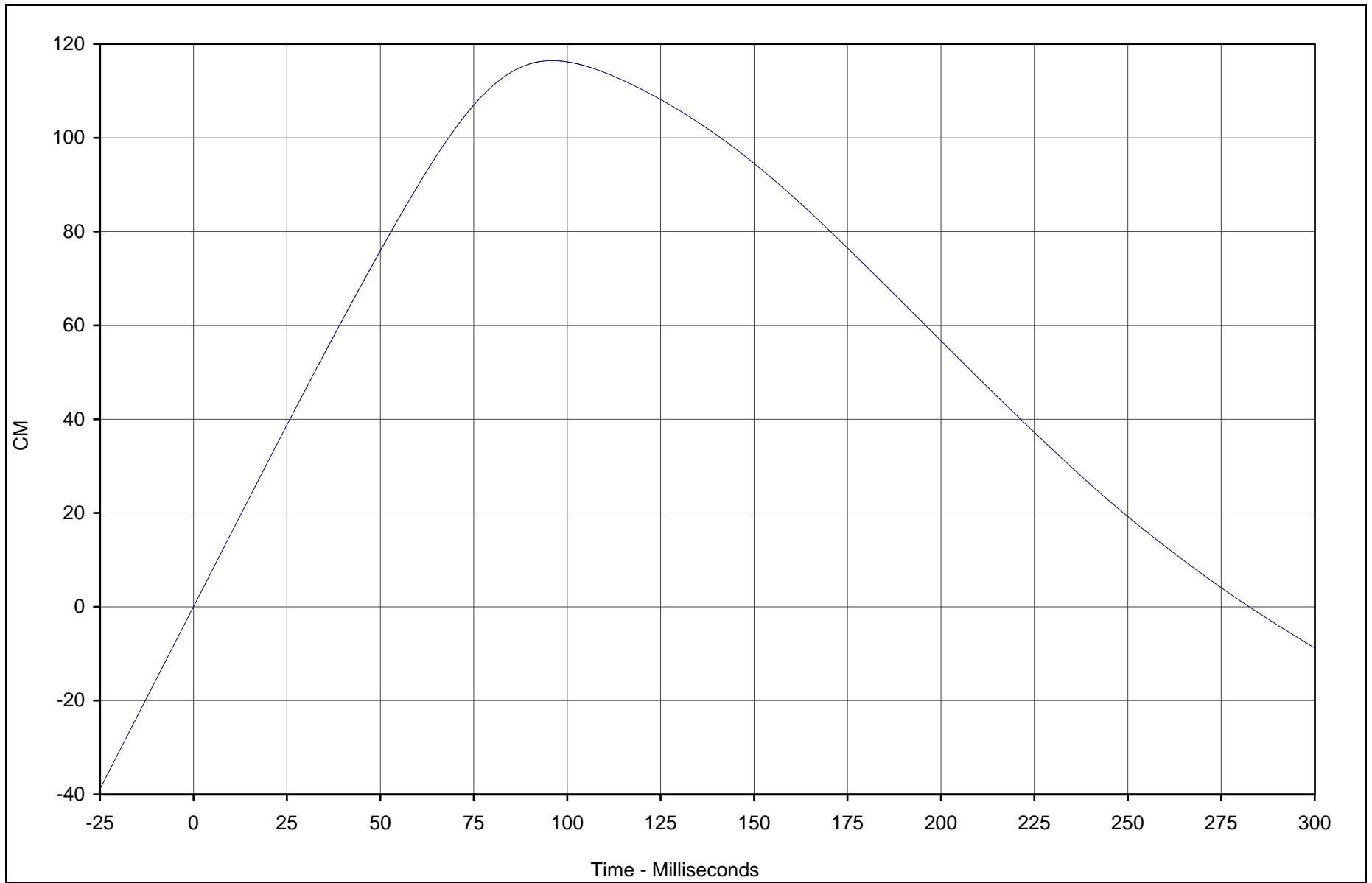


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X Displ.	001	IN2	CM	116.4	96.0	-8.7	299.9	180

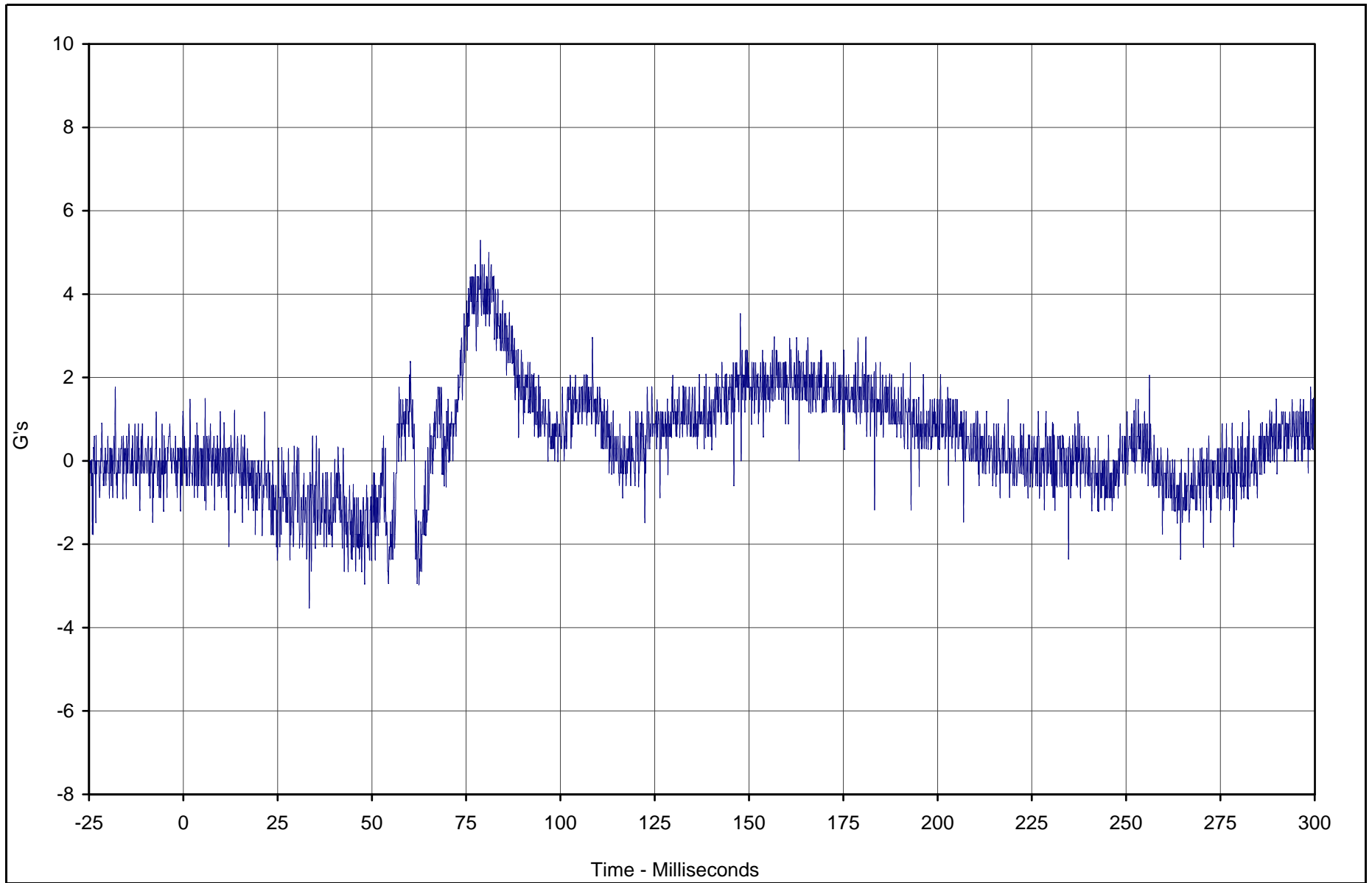


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary Y	002	FIL	G's	5.3	78.8	-3.5	33.4	1000

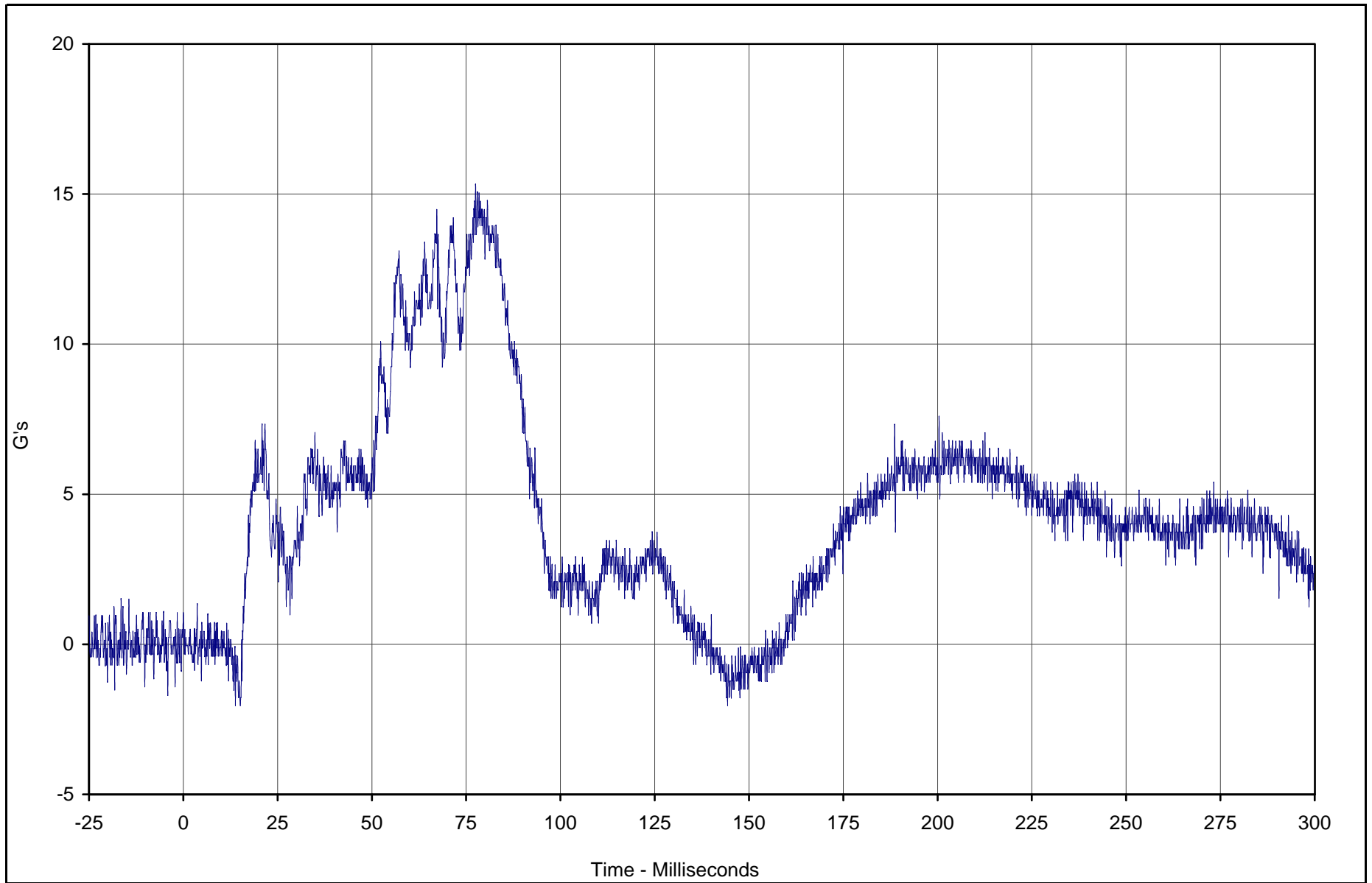


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary Z	003	FIL	G's	15.3	77.5	-2.1	13.8	1000

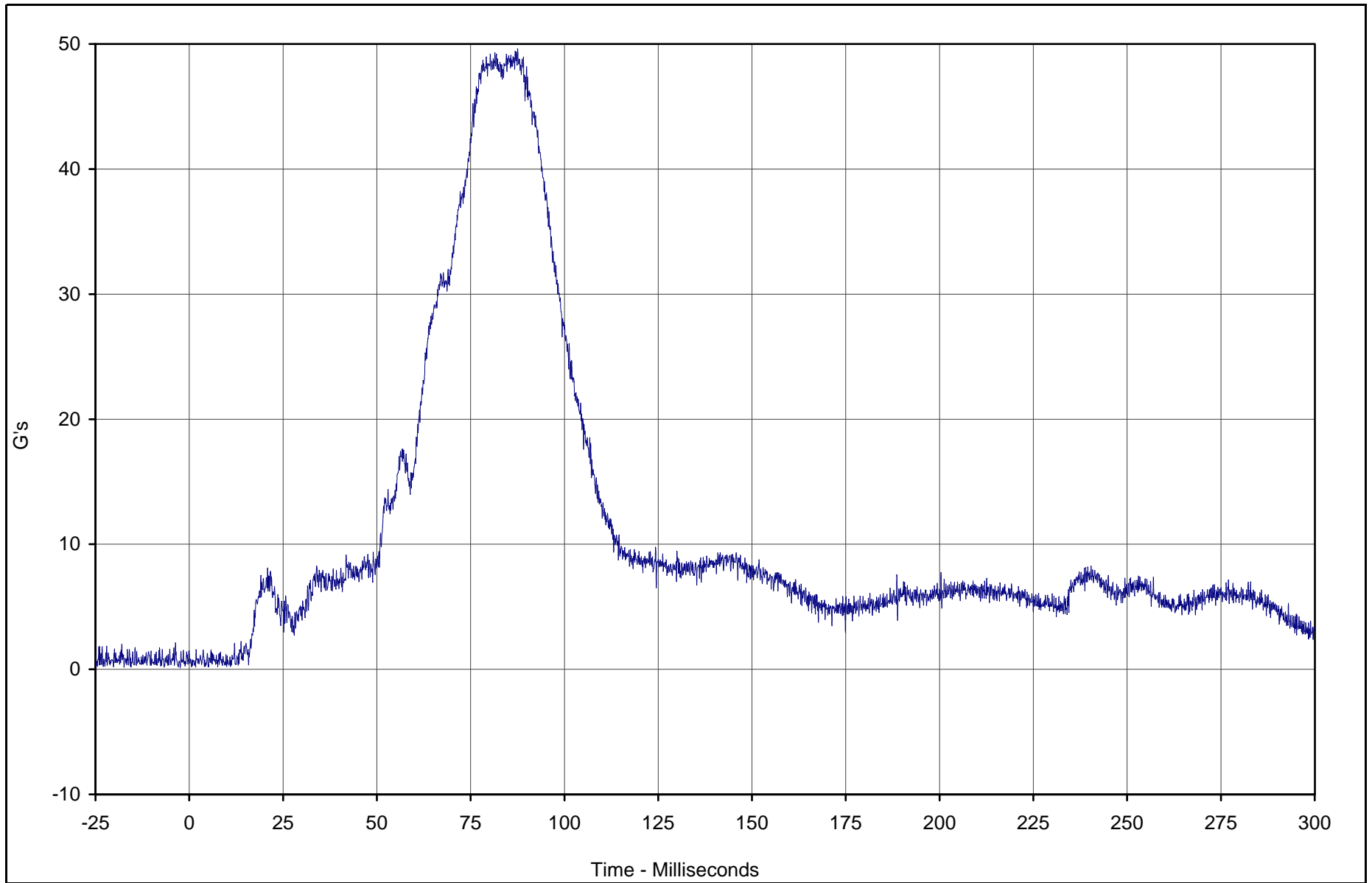


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Resultant Primary	001	RES	G's	49.6	87.5	0.2	7.6	1000

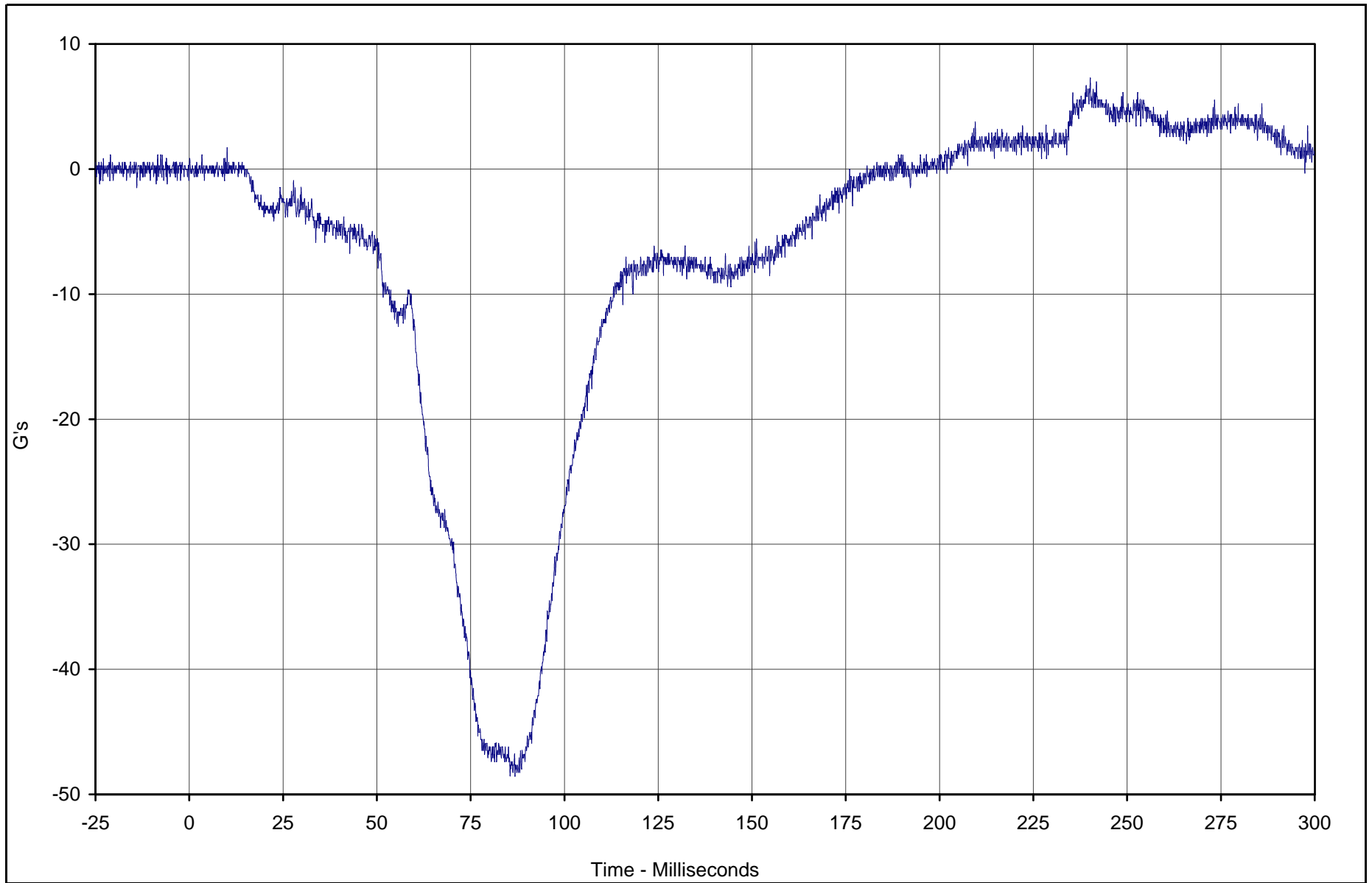


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X	004	FIL	G's	7.3	240.2	-48.5	85.5	1000

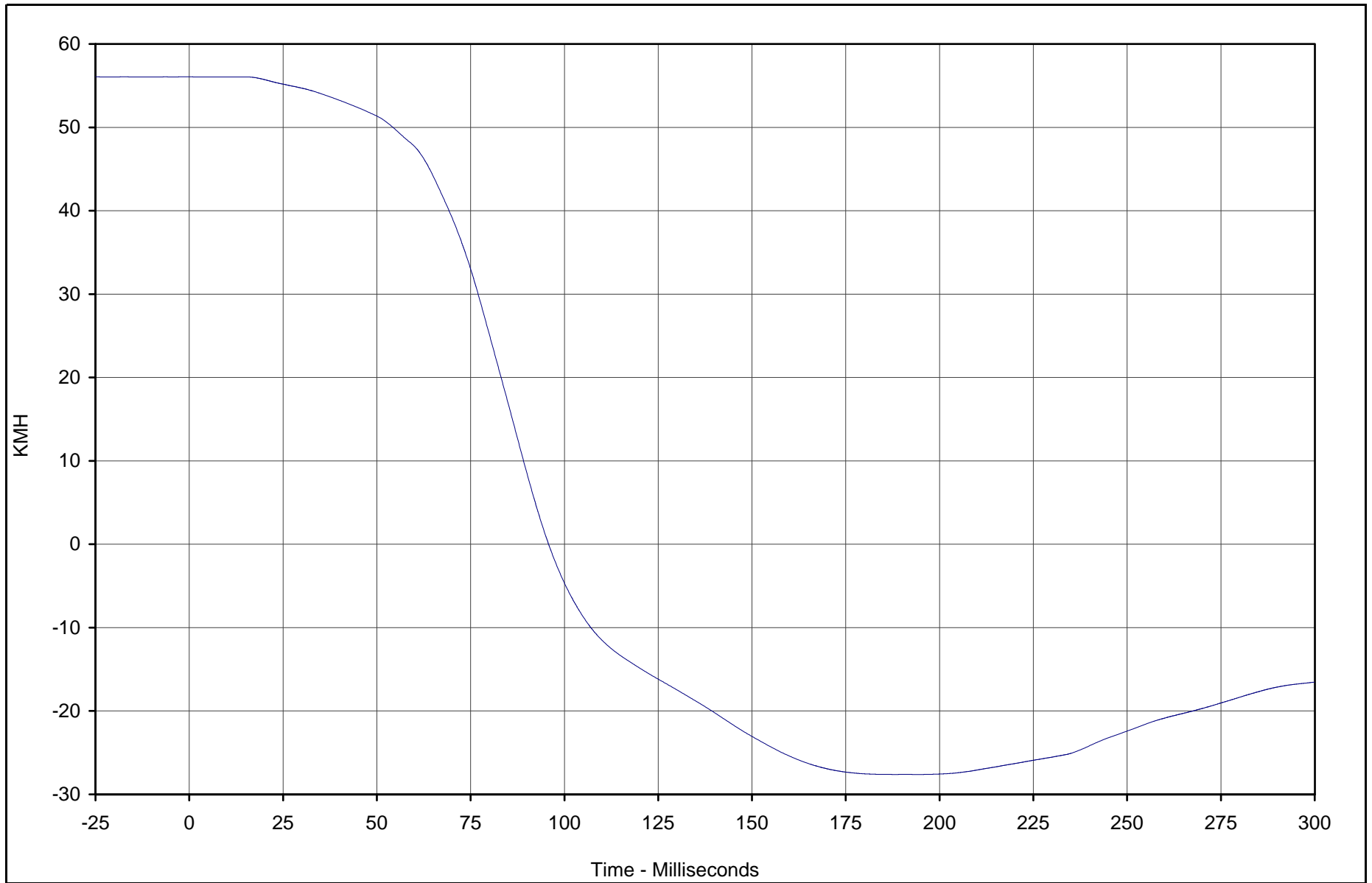


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X Velocity	004	IN1	KMH	56.1	0.0	-27.6	194.5	180

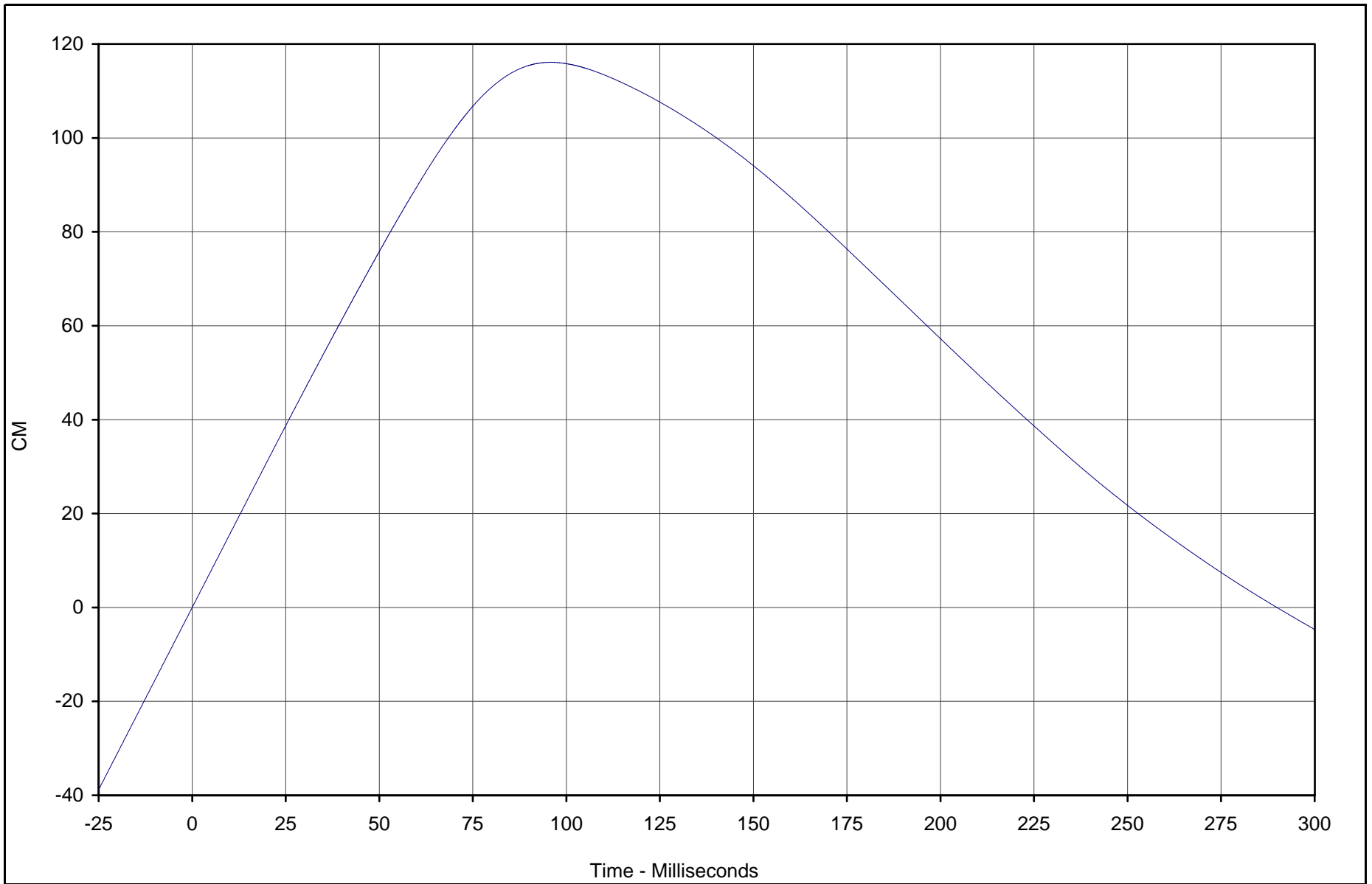


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X Displ.	004	IN2	CM	116.1	95.8	-4.7	299.9	180

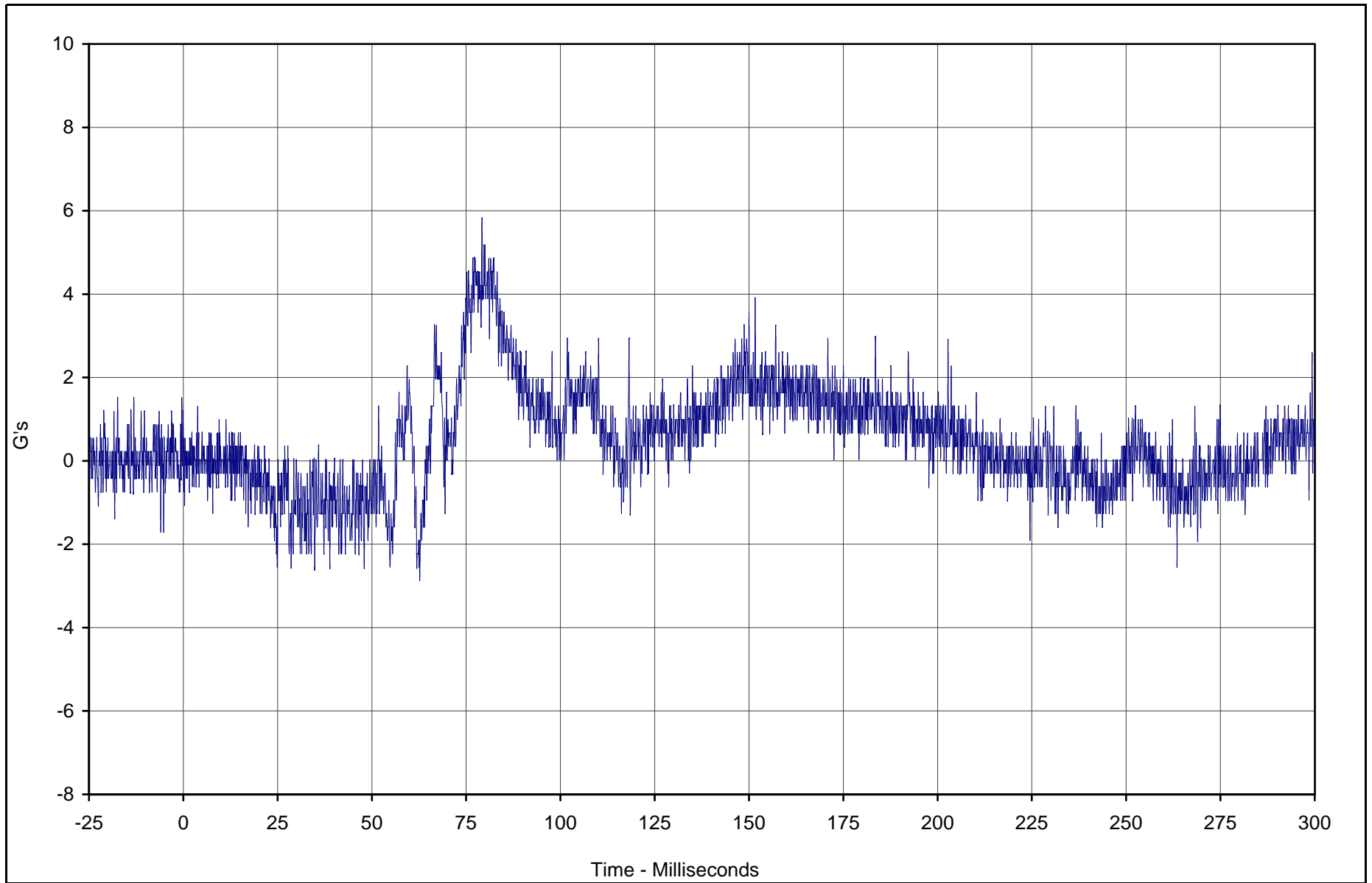


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant Y	005	FIL	G's	5.8	79.2	-2.9	62.7	1000

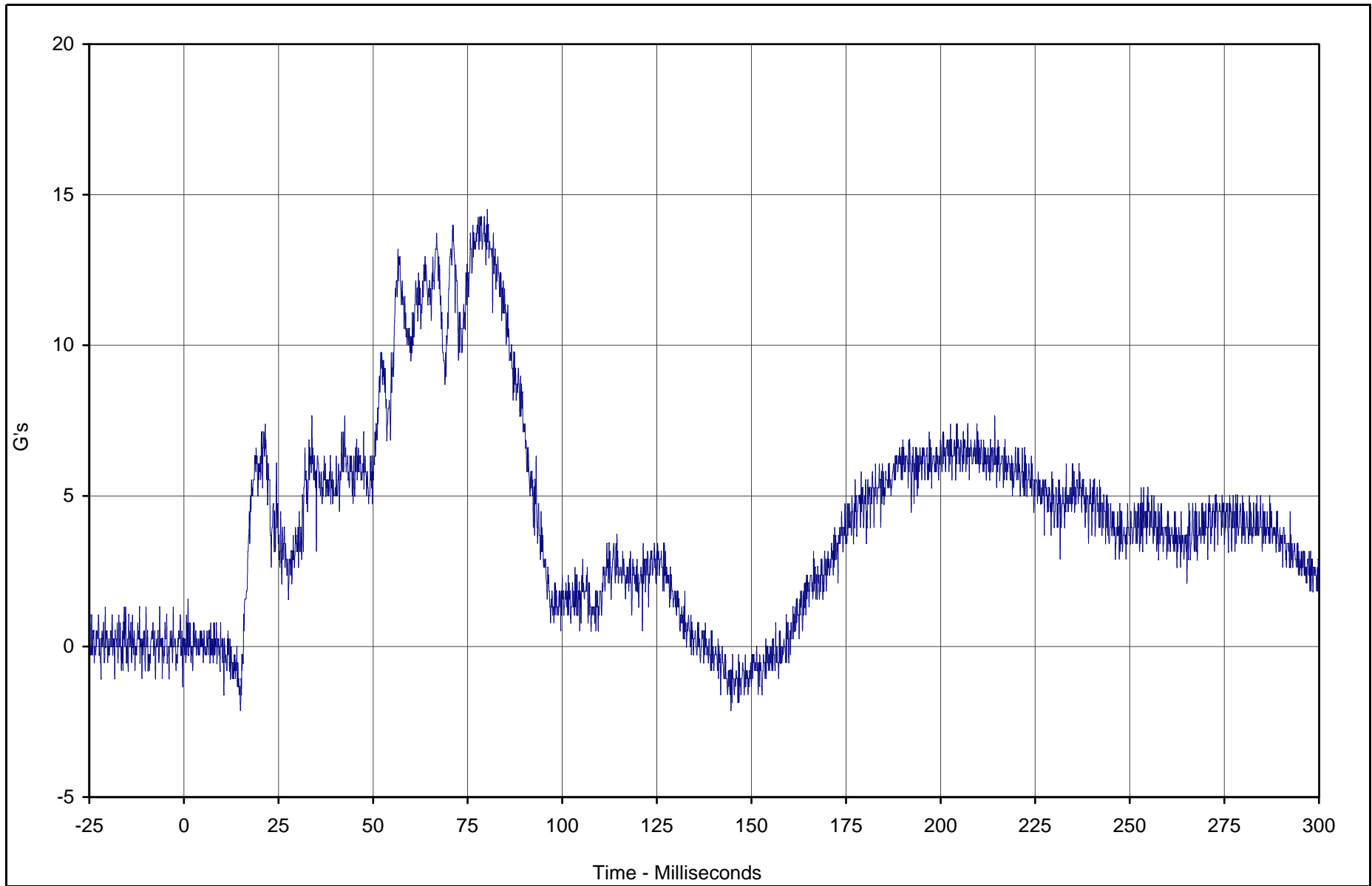


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant Z	006	FIL	G's	14.5	80.2	-2.1	14.9	1000

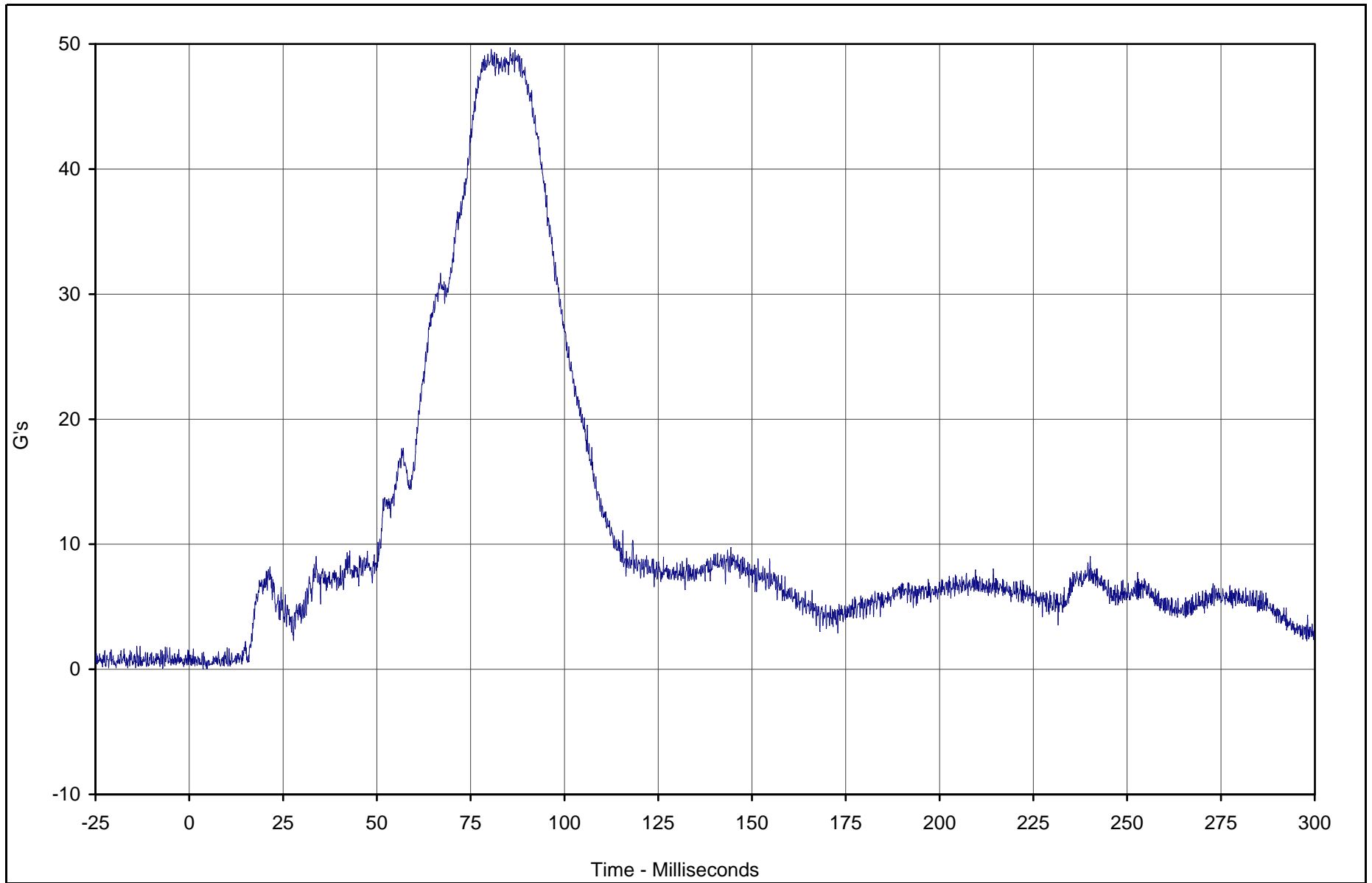


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Resultant Redundant	004	RES	G's	49.7	85.5	0.0	3.7	1000

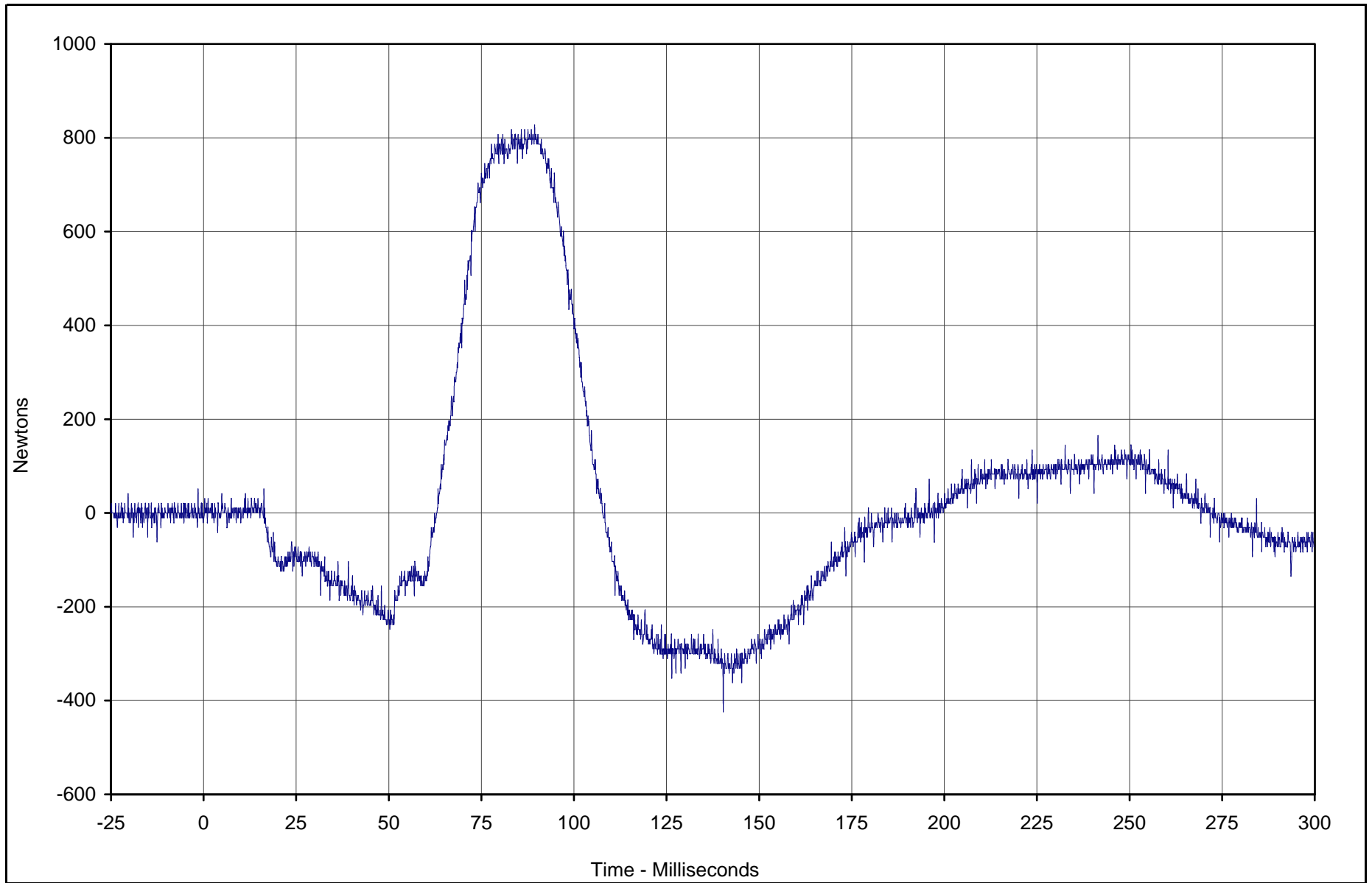


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force X	007	FIL	Newtons	828.0	89.4	-424.4	140.3	1000

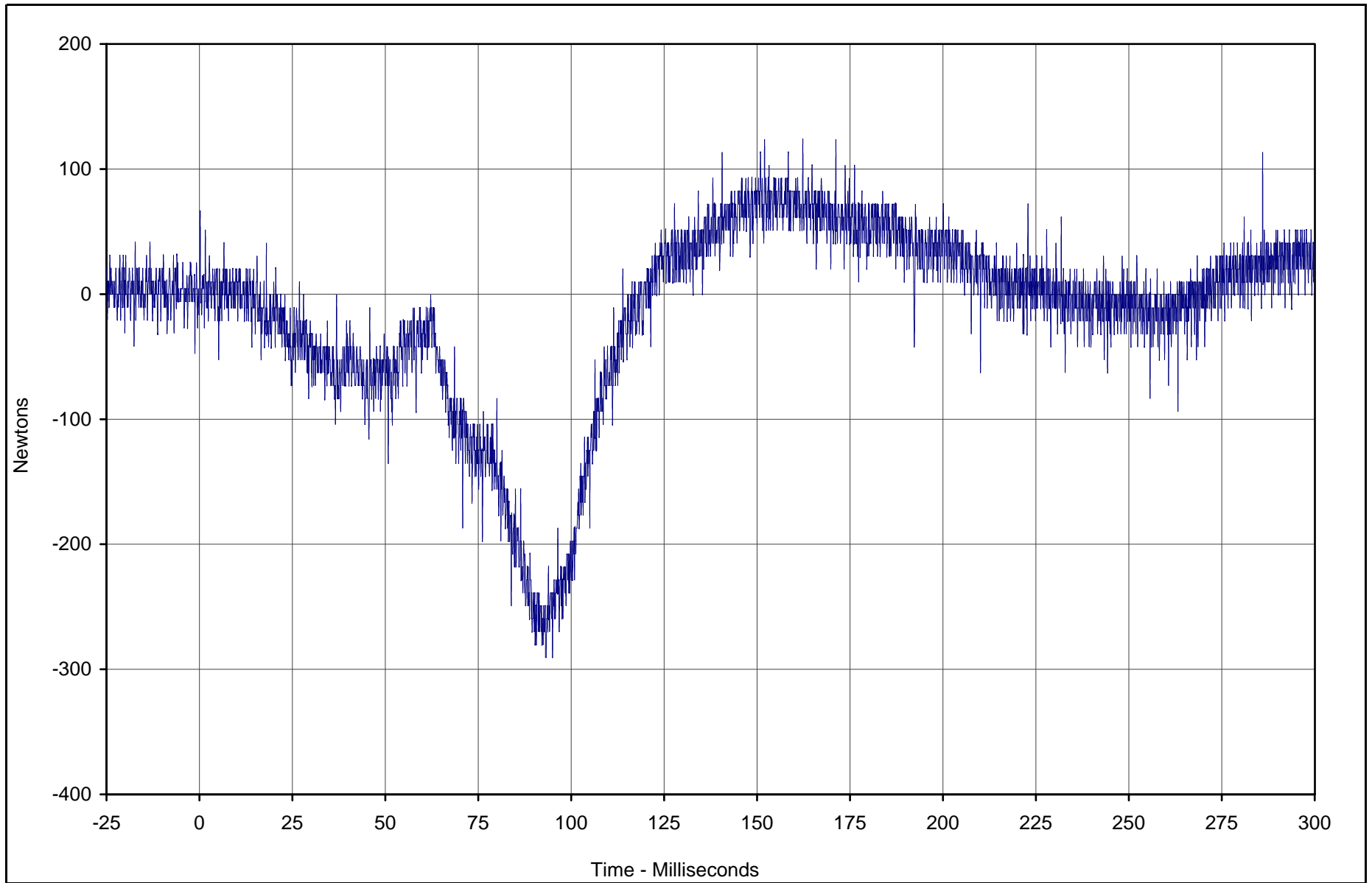


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Y	008	FIL	Newtons	123.6	152.0	-290.6	93.1	1000

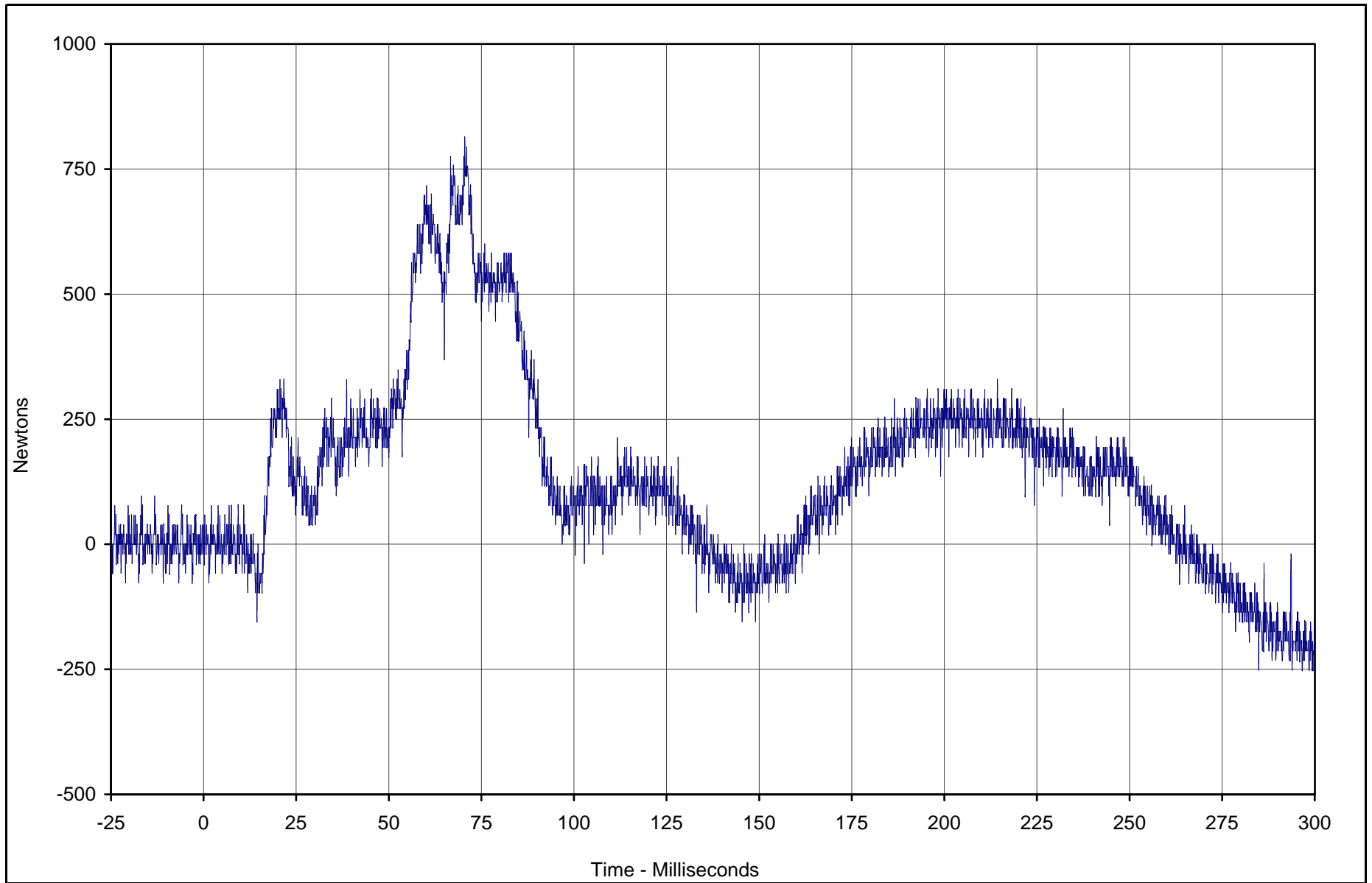


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Z	009	FIL	Newtons	813.9	70.5	-251.9	284.9	1000

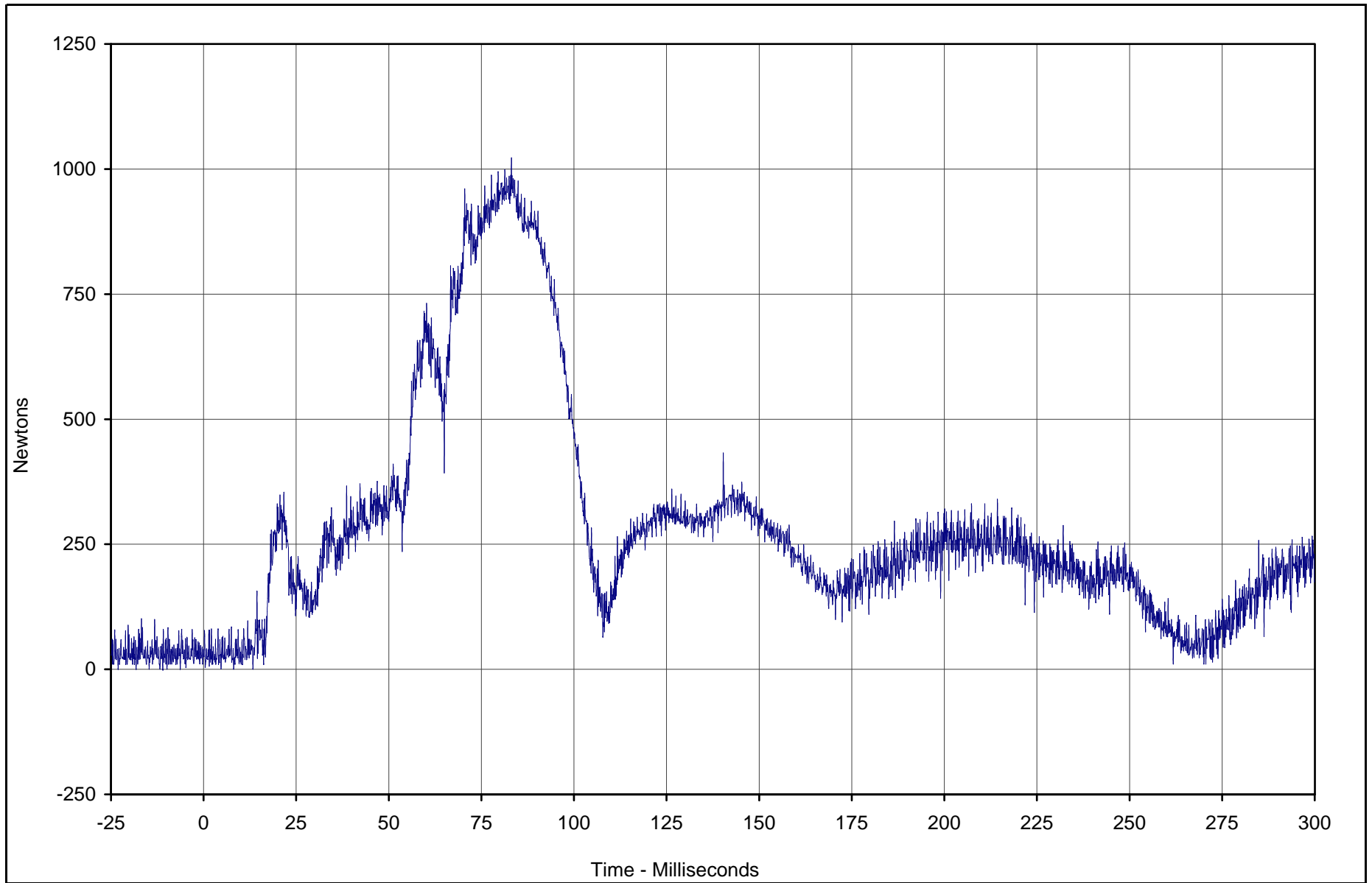


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Resultant	007	RES	Newtons	1022.5	83.1	0.6	4.7	1000

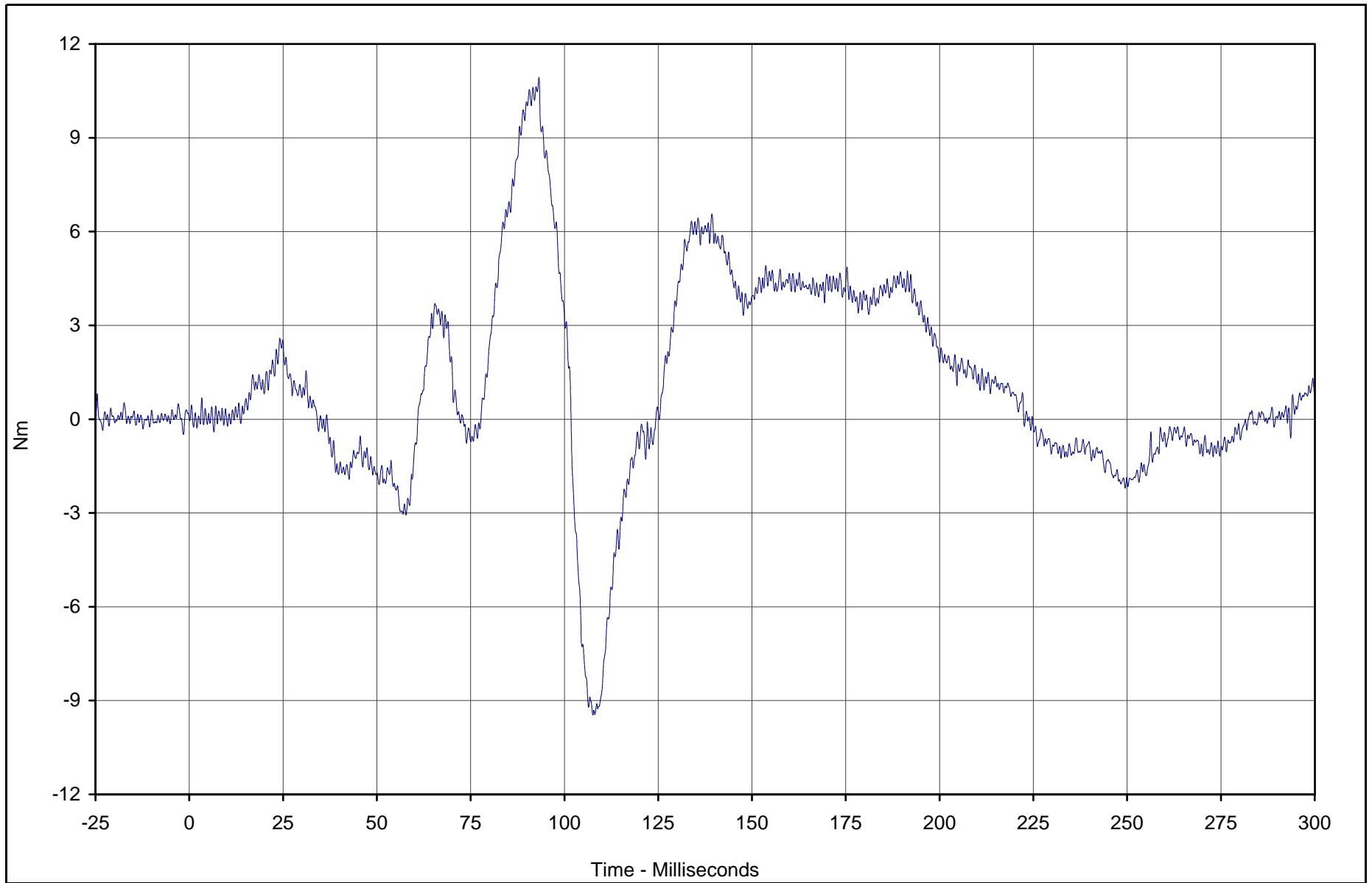


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment X	010	FIL	Nm	10.9	93.2	-9.5	107.5	600

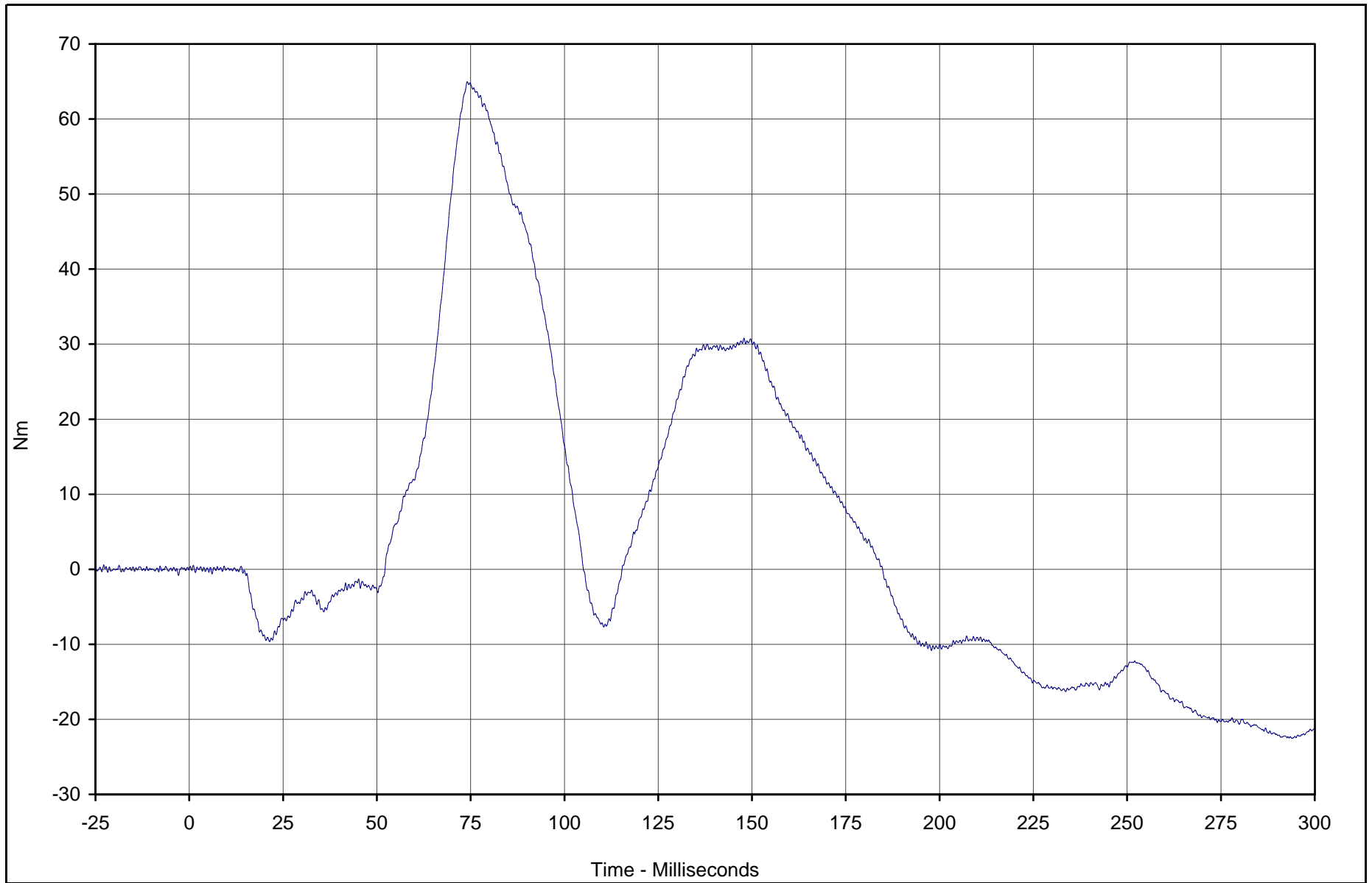


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Y	011	FIL	Nm	65.0	74.1	-22.6	293.9	600

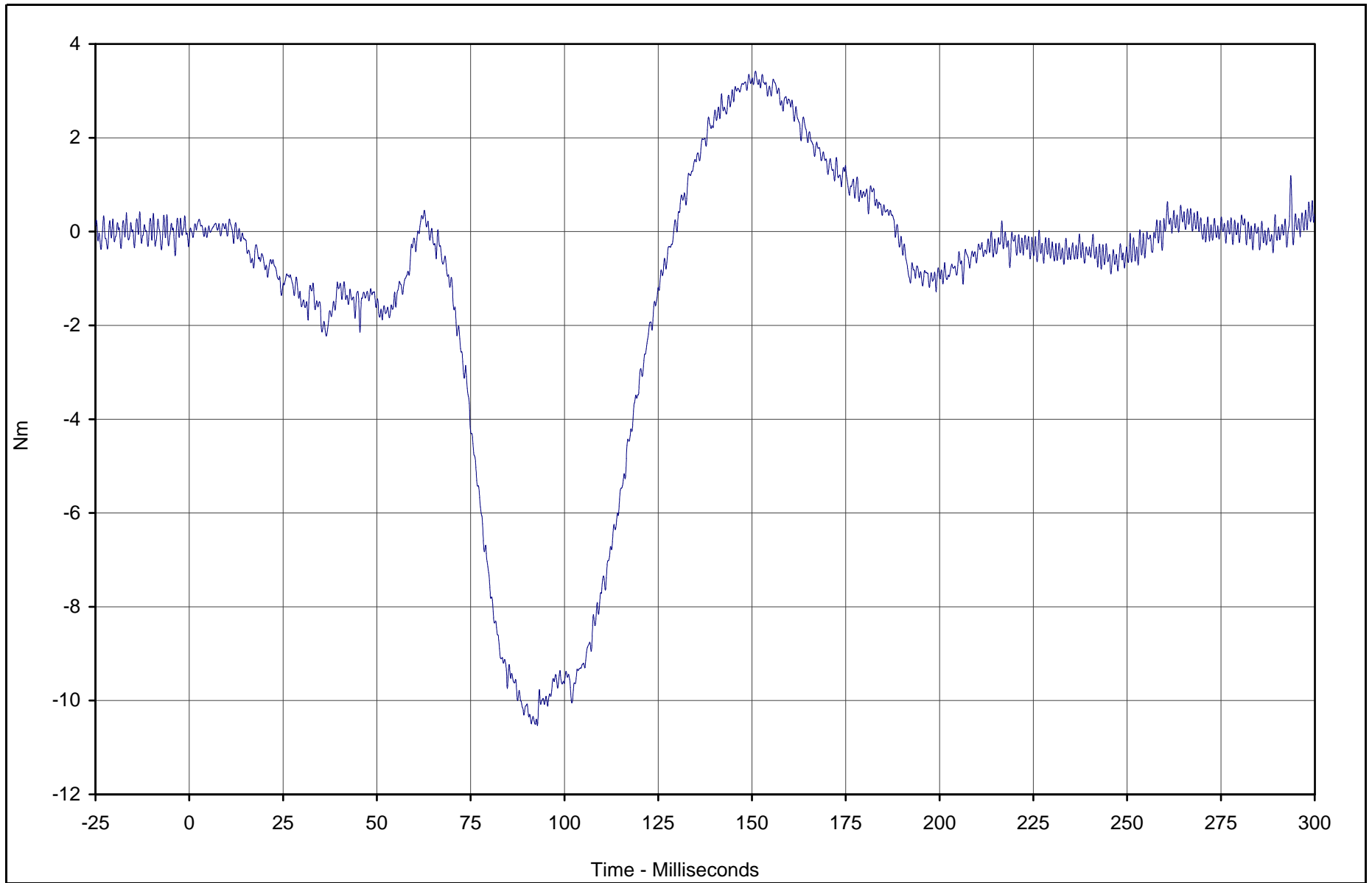


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Z	012	FIL	Nm	3.4	151.0	-10.5	92.8	600



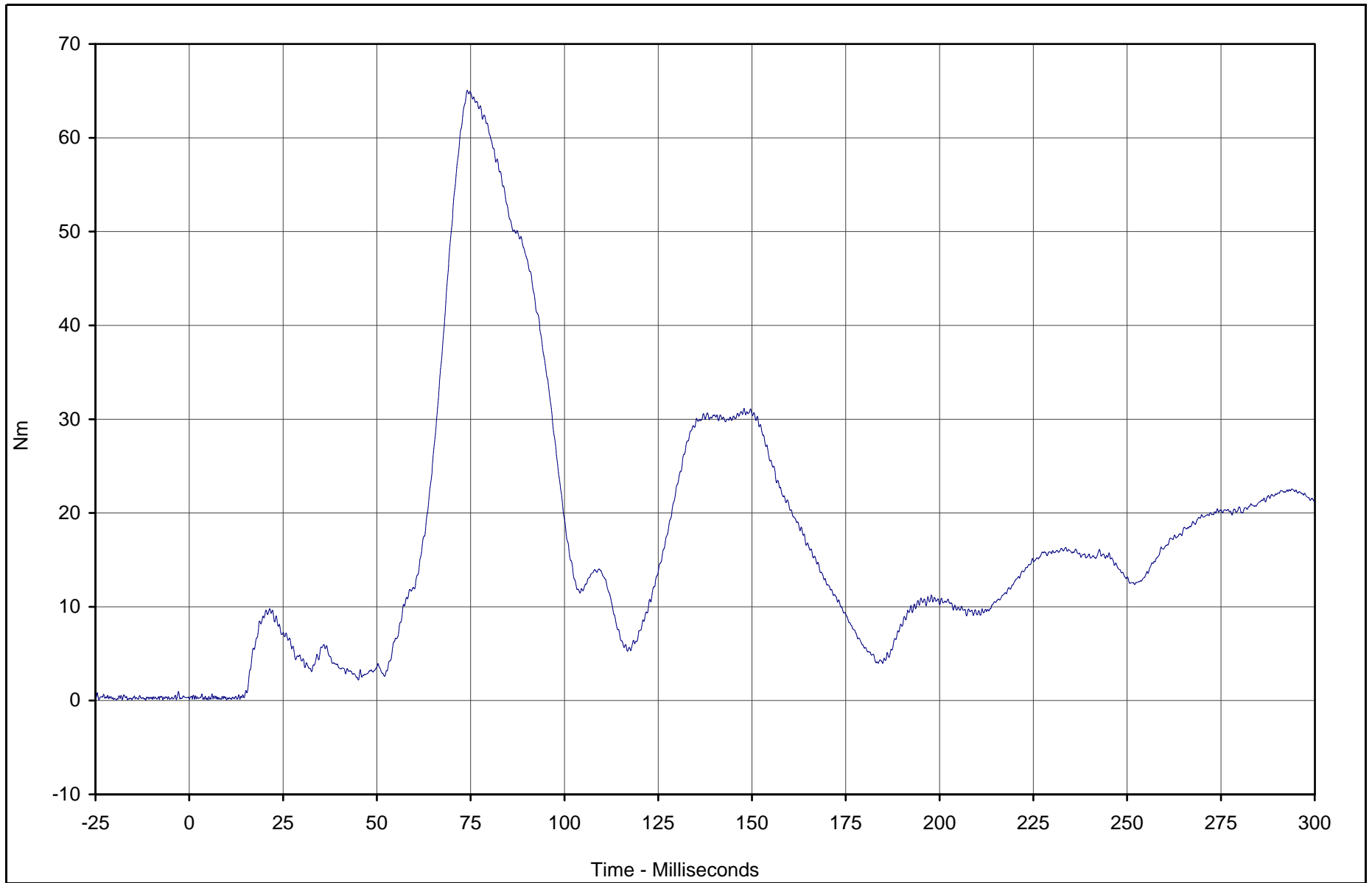
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Resultant	010	RES	Nm	65.1	74.1	0.1	10.0	600



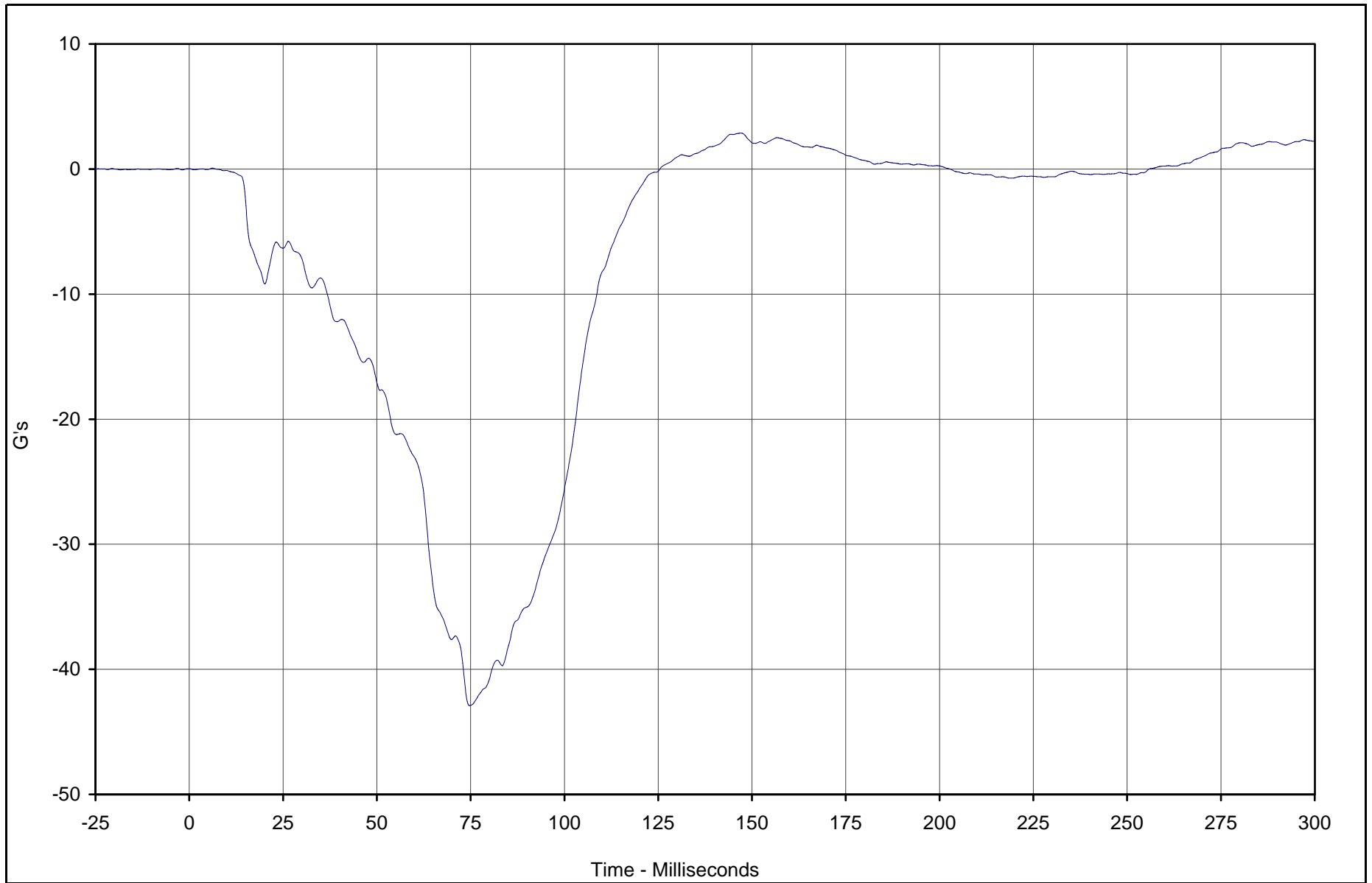
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X	013	FIL	G's	2.9	147.0	-42.9	74.7	180

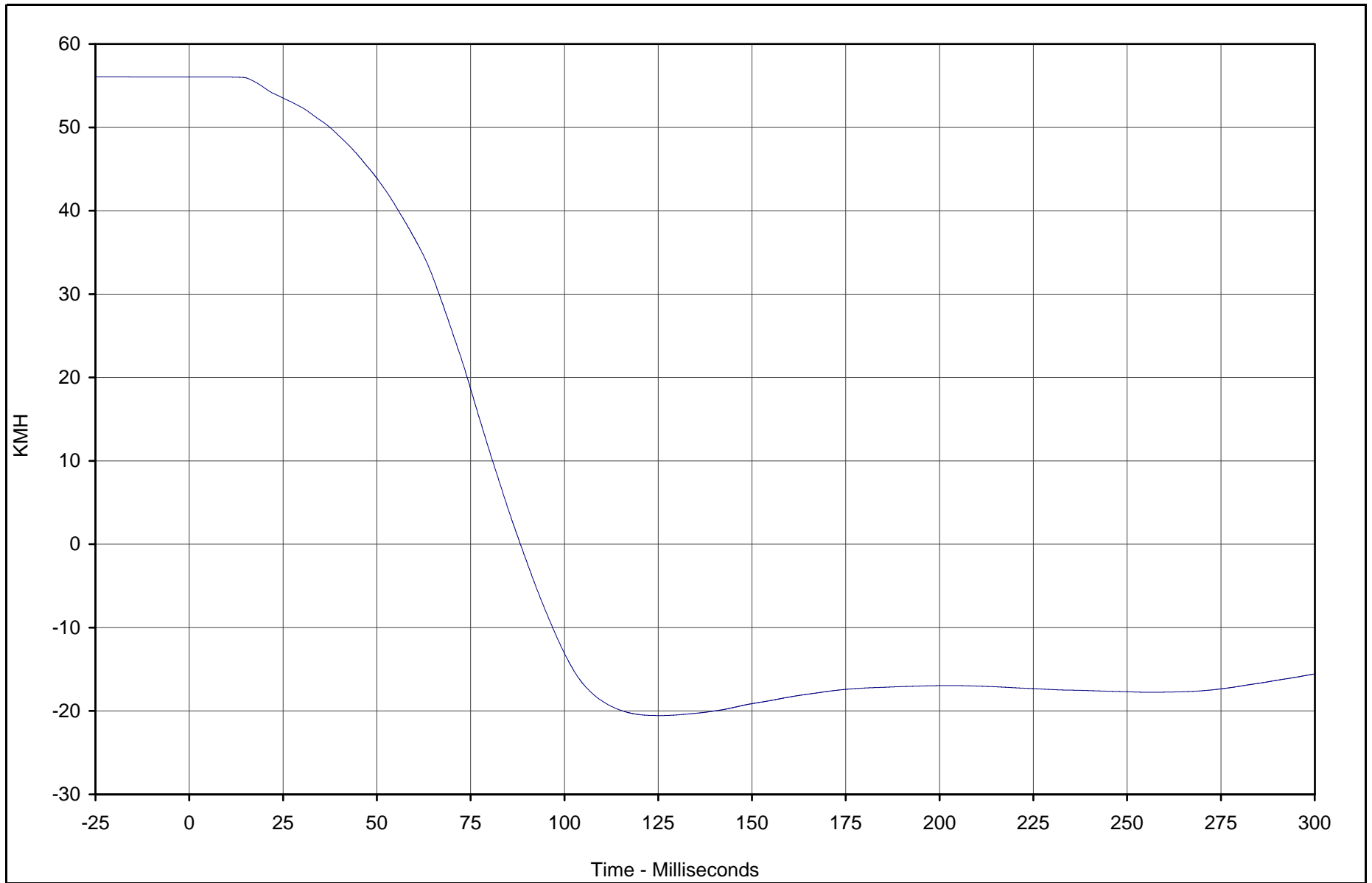


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X Velocity	013	IN1	KMH	56.0	0.5	-20.6	125.5	180

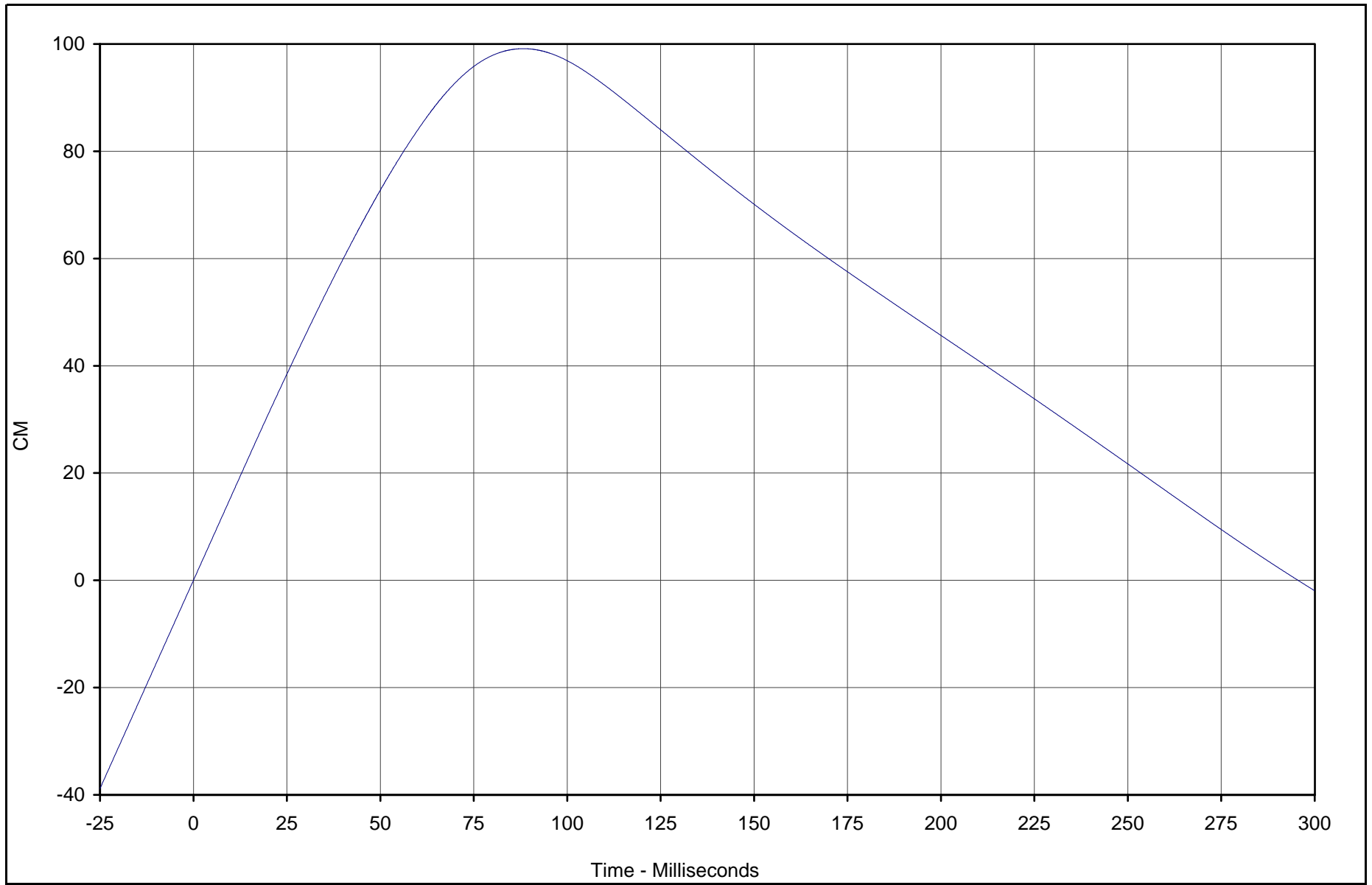


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X Displ.	013	IN2	CM	99.1	88.3	-1.9	299.9	180



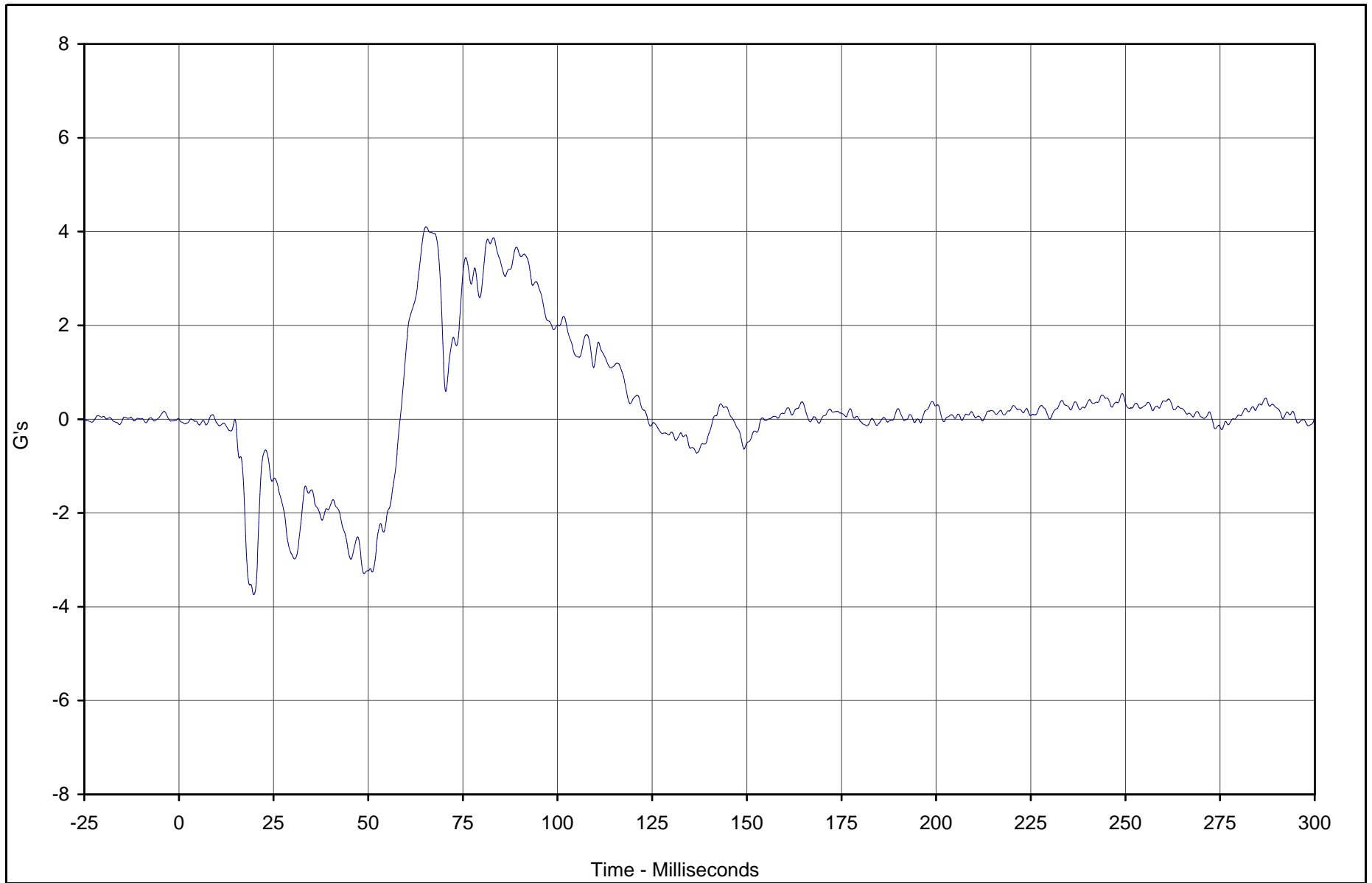
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary Y	014	FIL	G's	4.1	65.3	-3.7	19.8	180



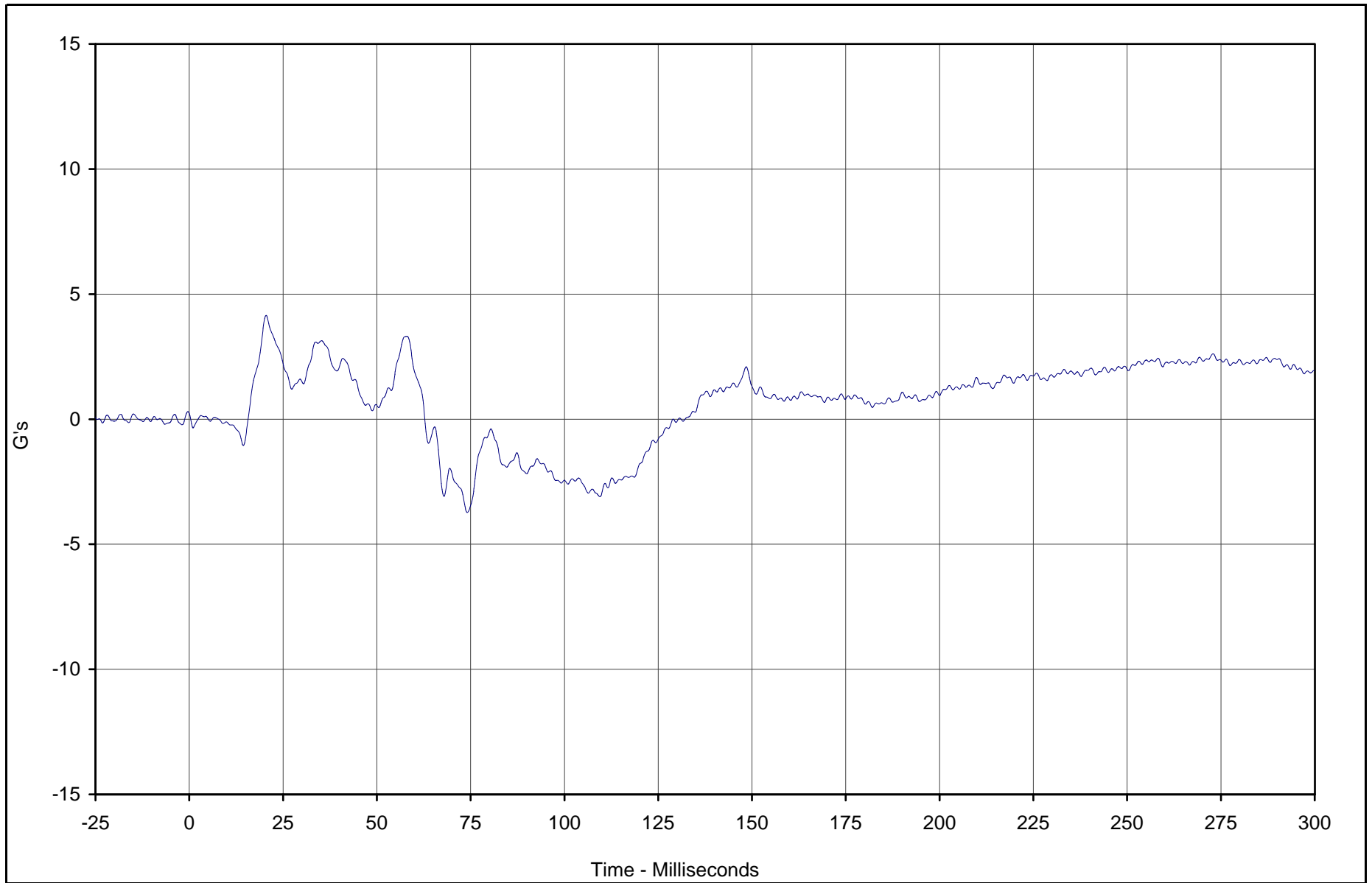
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary Z	015	FIL	G's	4.1	20.5	-3.7	74.1	180

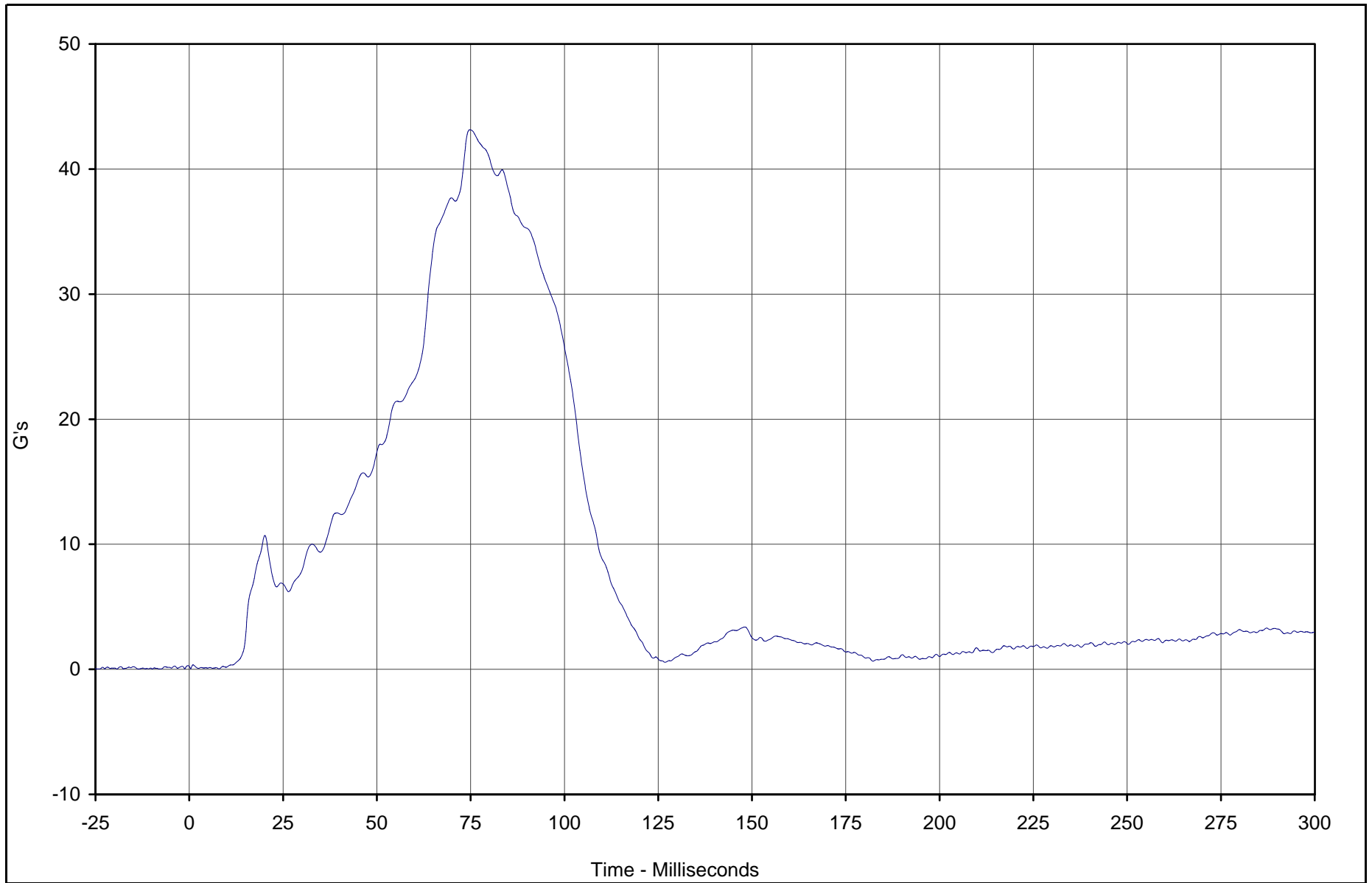


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Resultant Primary	013	RES	G's	43.1	74.8	0.0	8.0	180



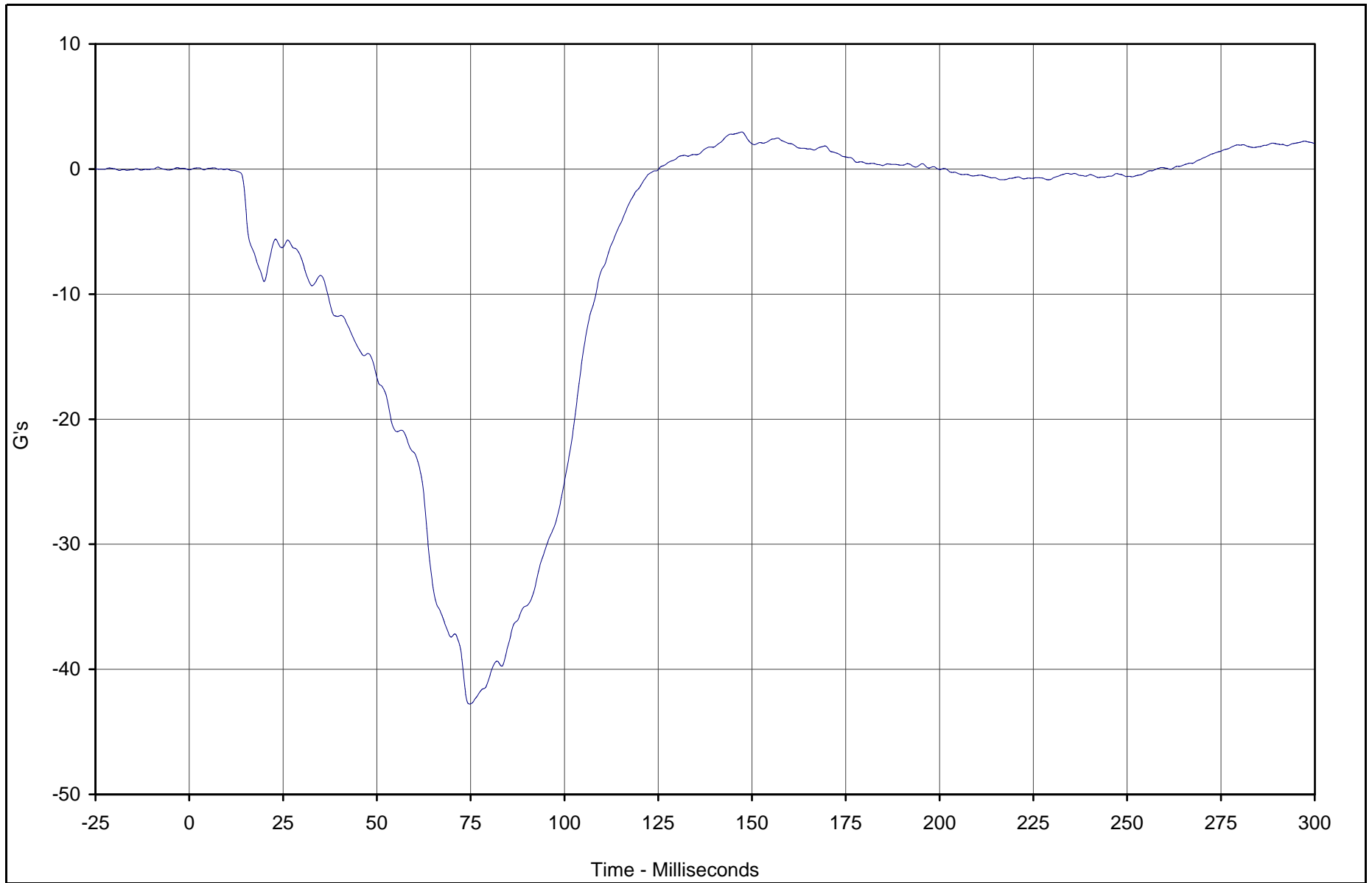
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X	016	FIL	G's	3.0	147.3	-42.8	74.7	180



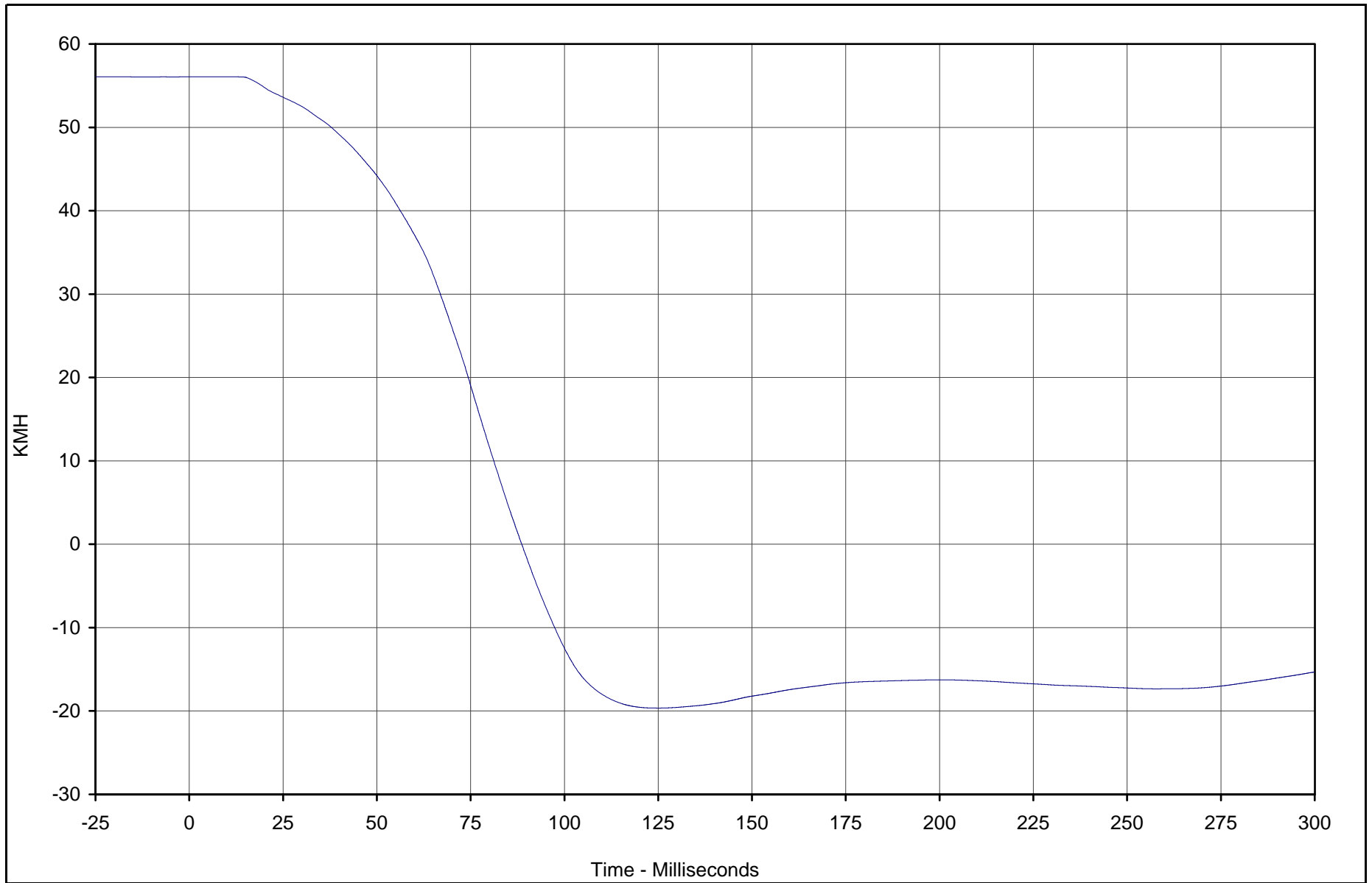
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X Velocity	016	IN1	KMH	56.1	8.7	-19.7	125.1	180

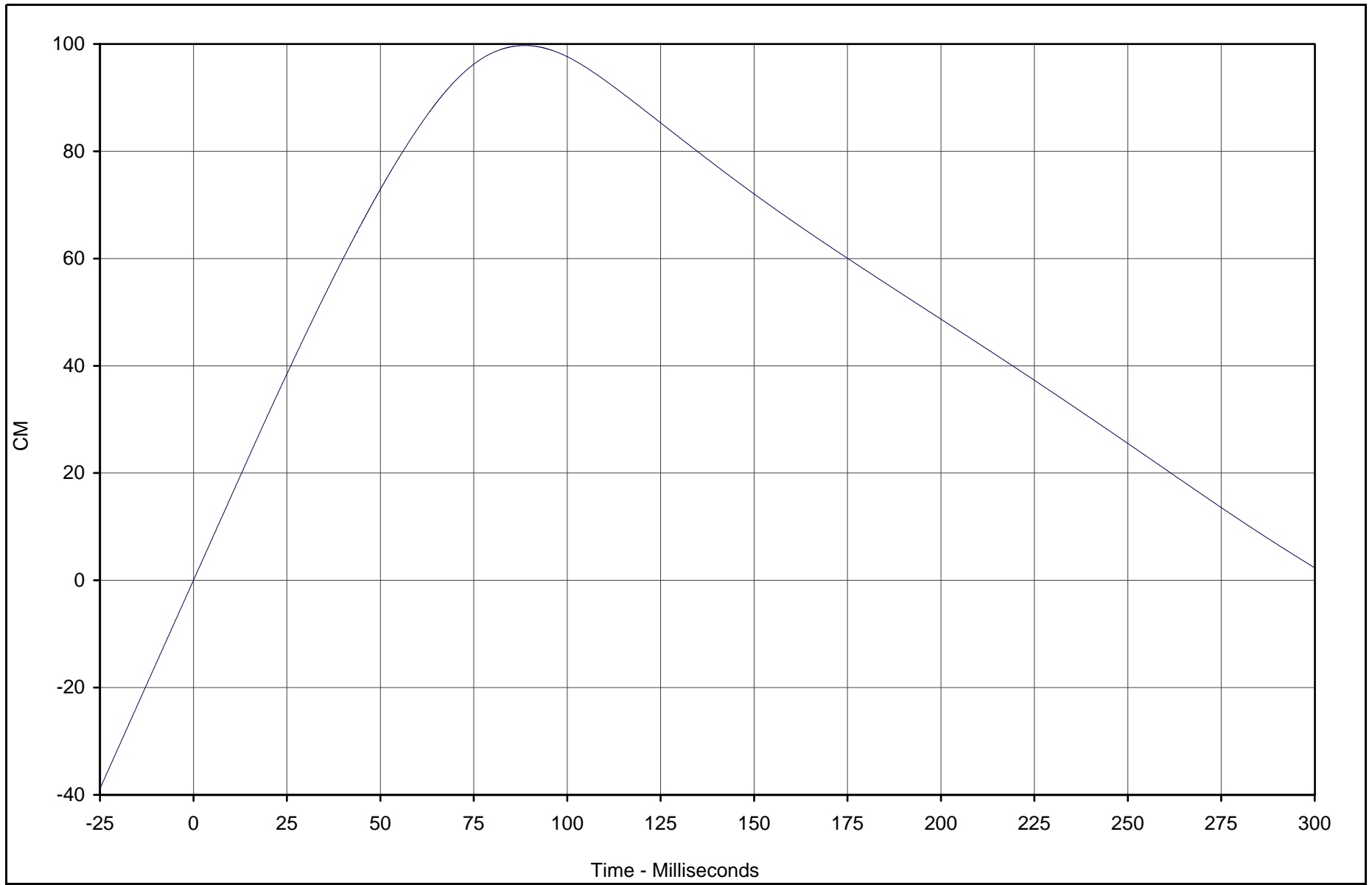


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X Displ.	016	IN2	CM	99.7	88.6	0.0	0.0	180



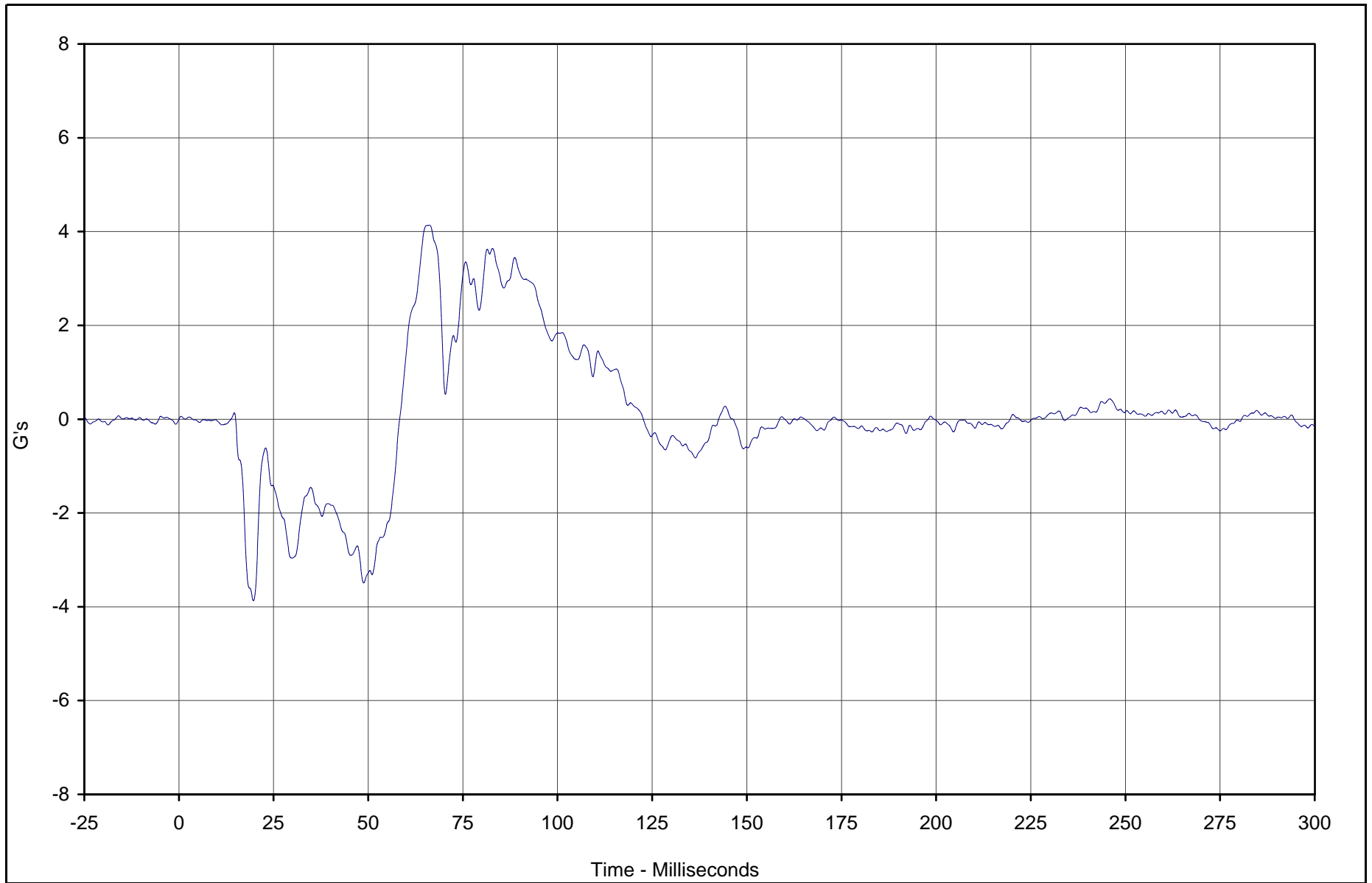
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant Y	017	FIL	G's	4.1	66.2	-3.9	19.7	180



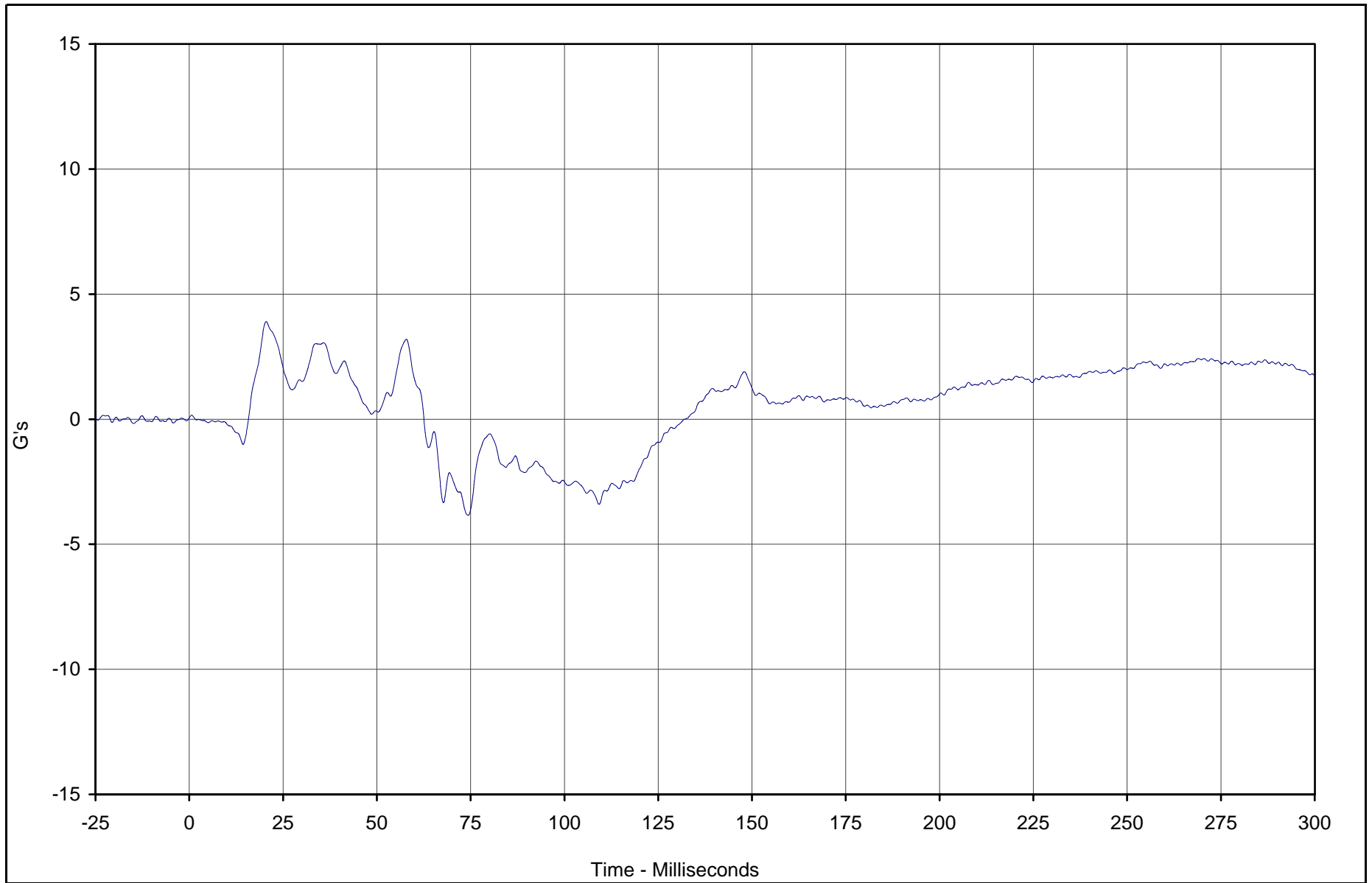
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant Z	018	FIL	G's	3.9	20.5	-3.8	74.3	180

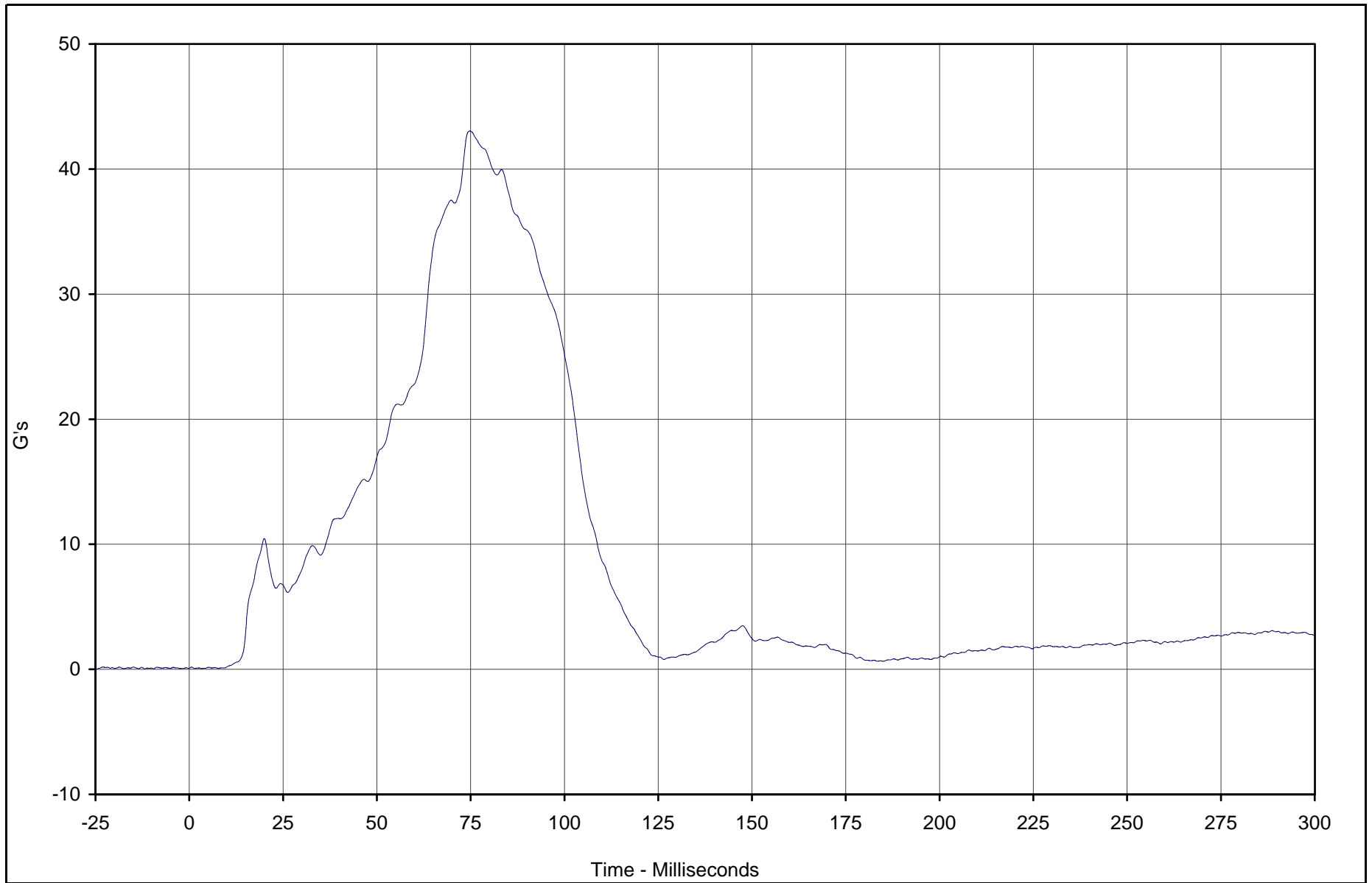


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Resultant Redundant	016	RES	G's	43.0	74.8	0.1	3.3	180

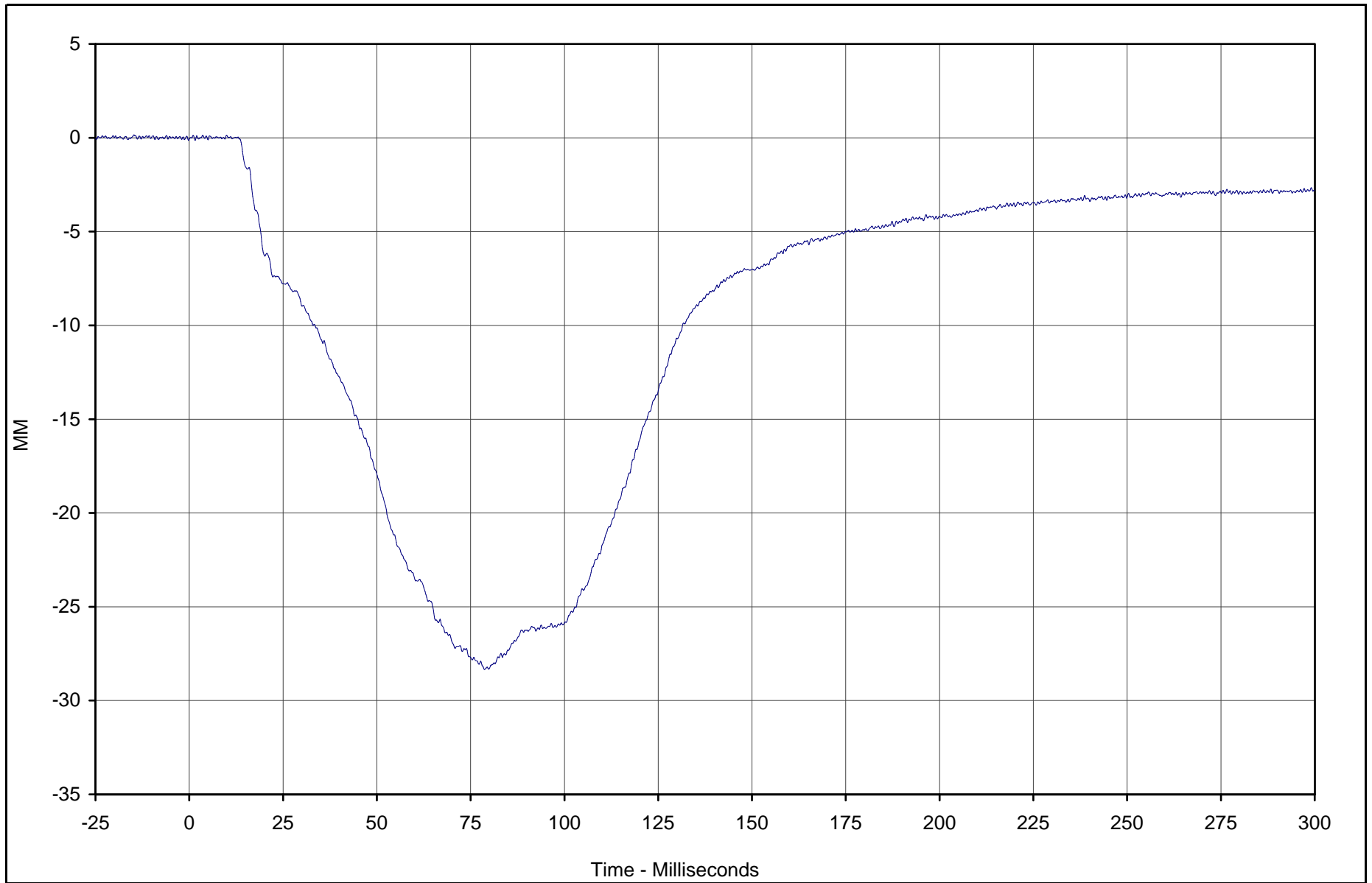


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Displacement X	019	FIL	MM	0.1	3.6	-28.3	78.7	600

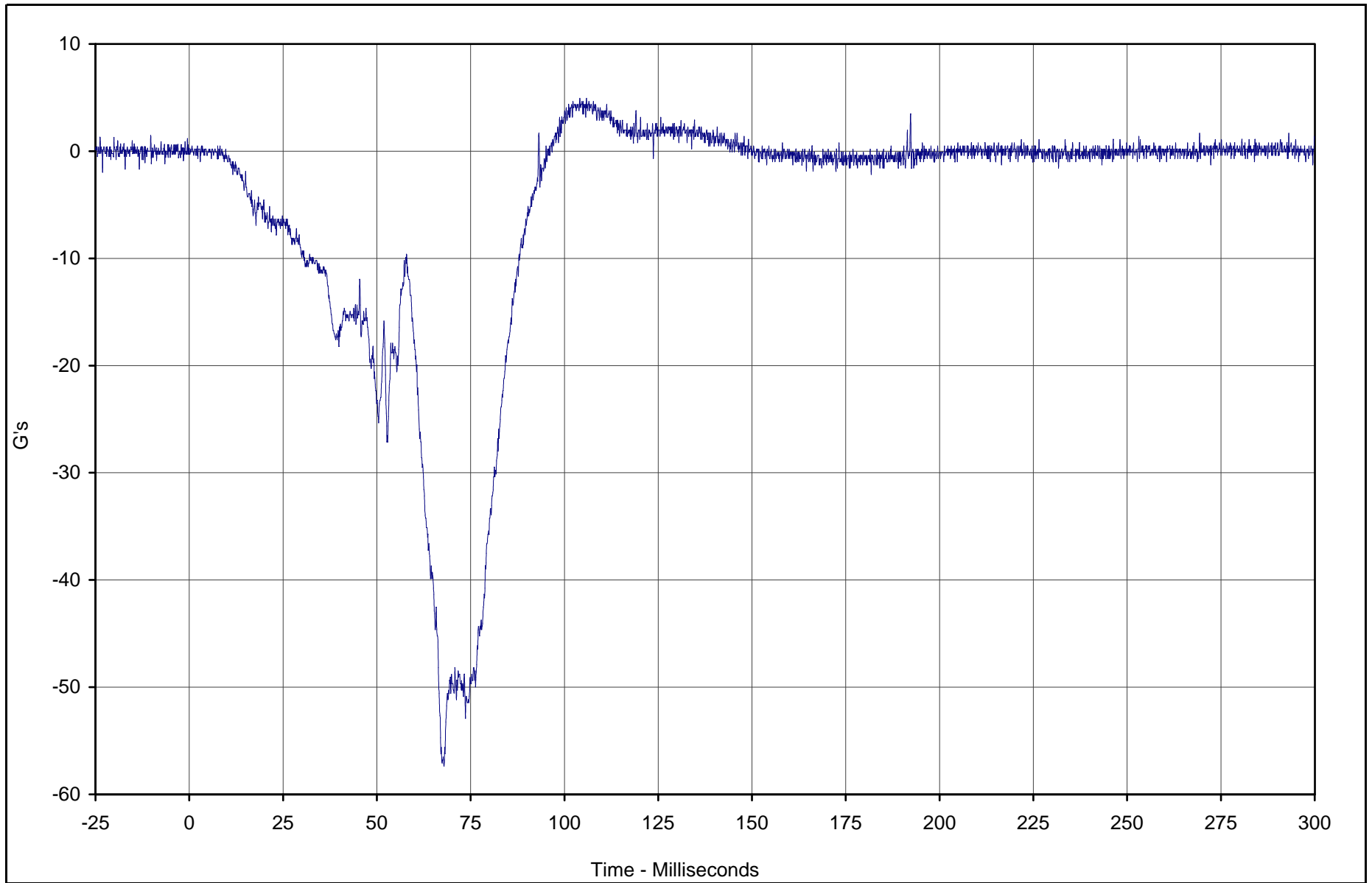


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X	020	FIL	G's	4.9	104.1	-57.4	67.9	1000



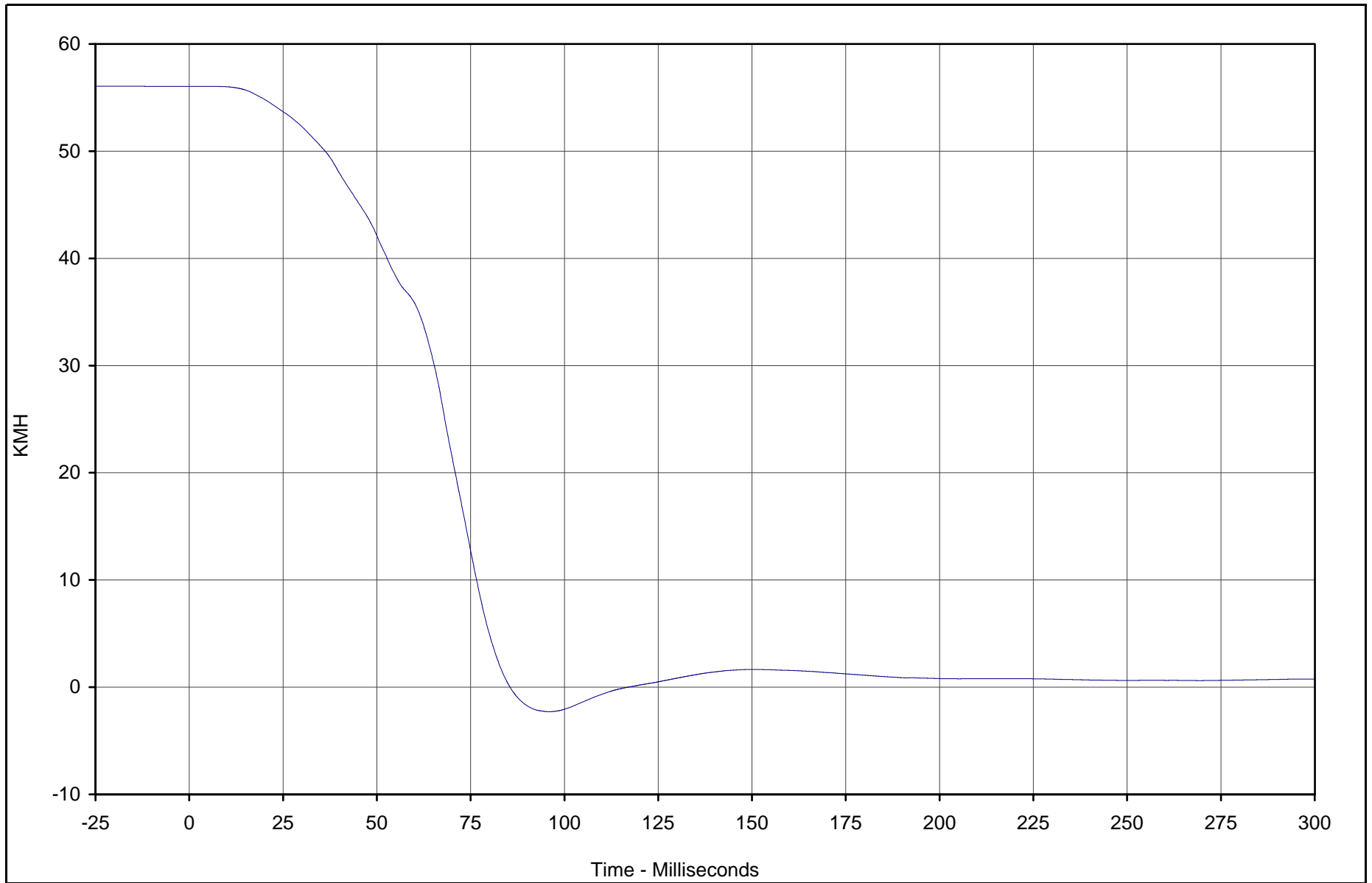
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X Velocity	020	IN1	KMH	56.0	1.5	-2.3	95.9	180



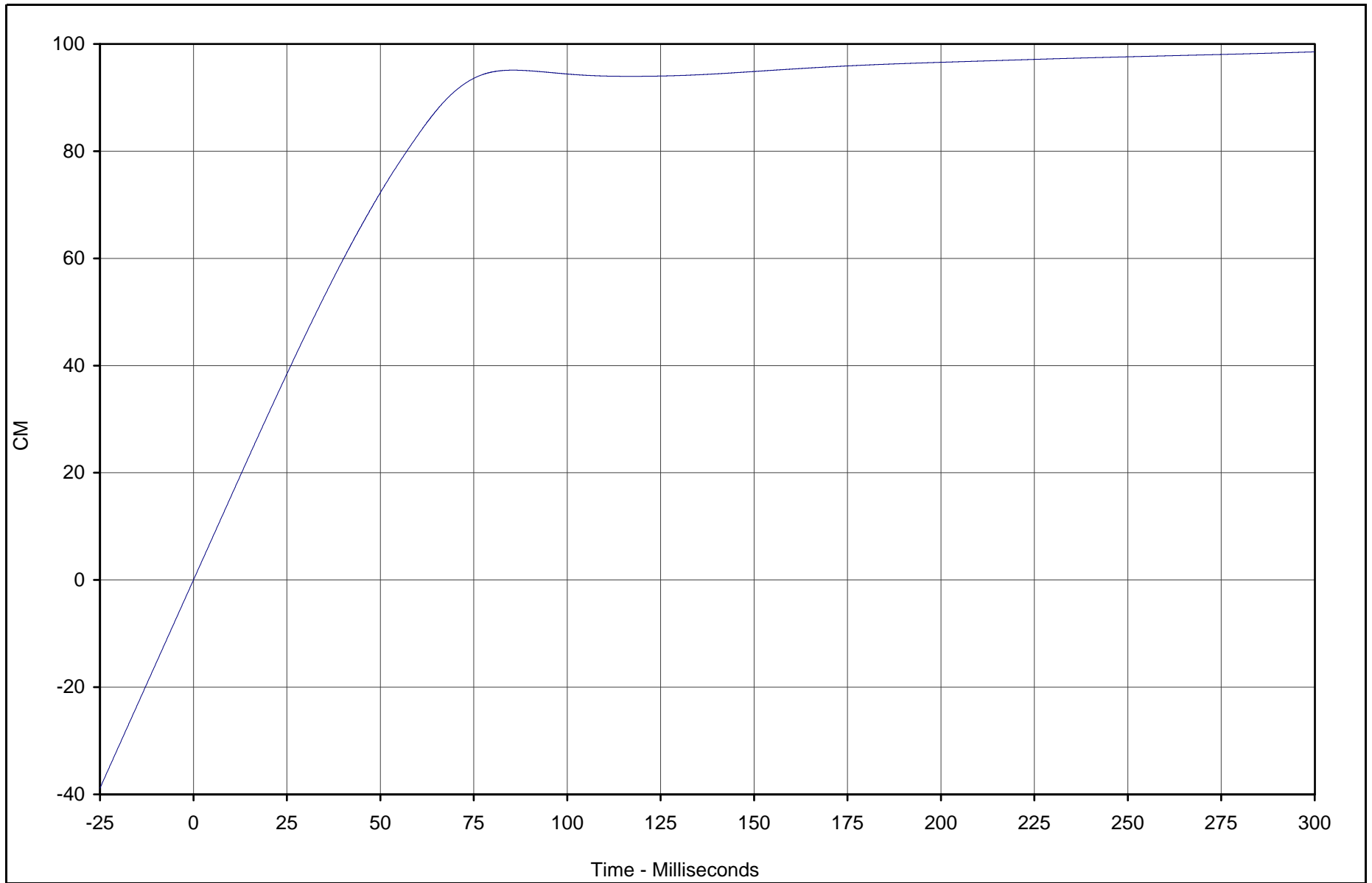
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X Displ.	020	IN2	CM	98.5	299.9	0.0	0.0	180

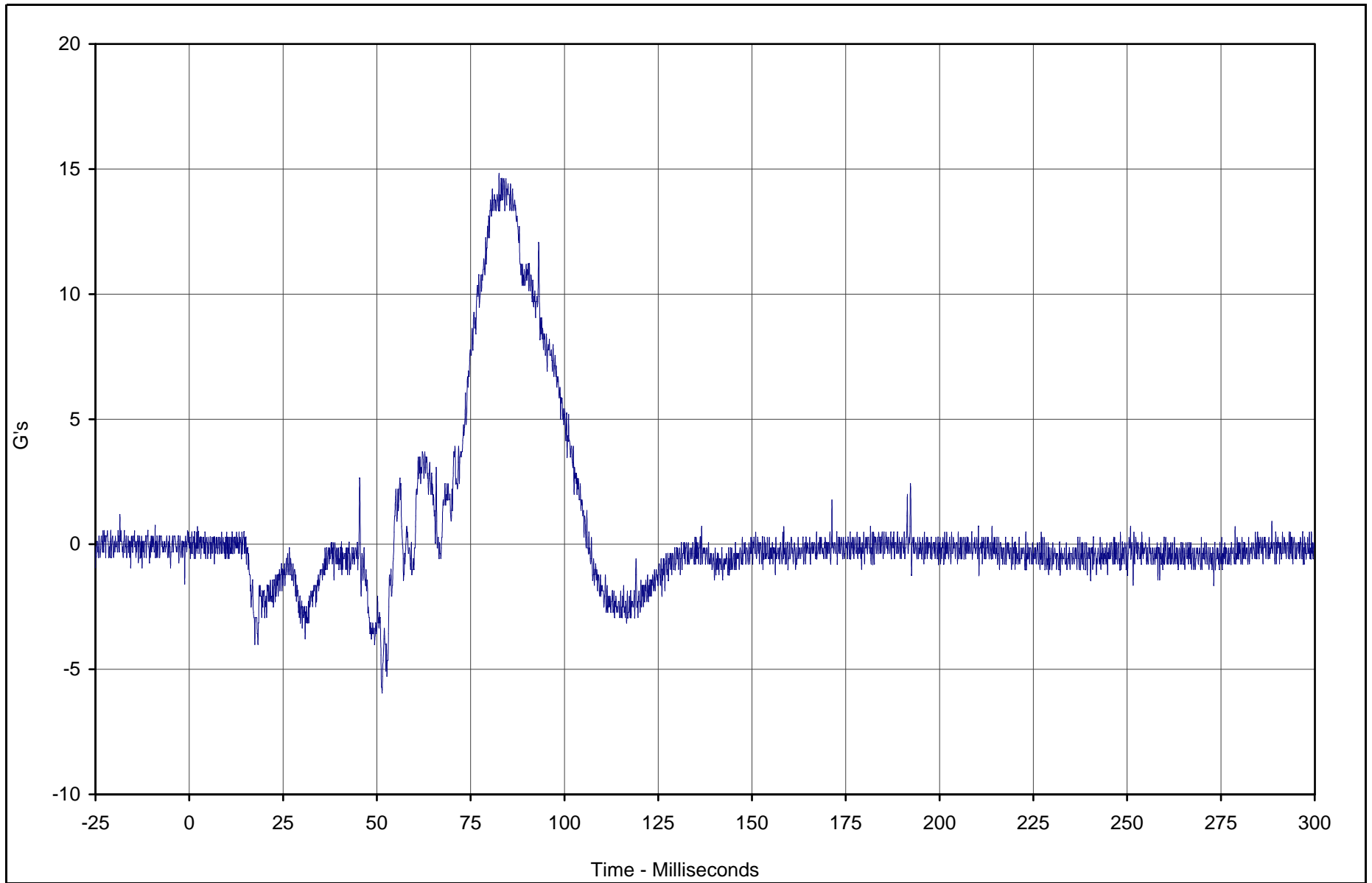


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Y	021	FIL	G's	14.8	82.6	-5.9	51.4	1000

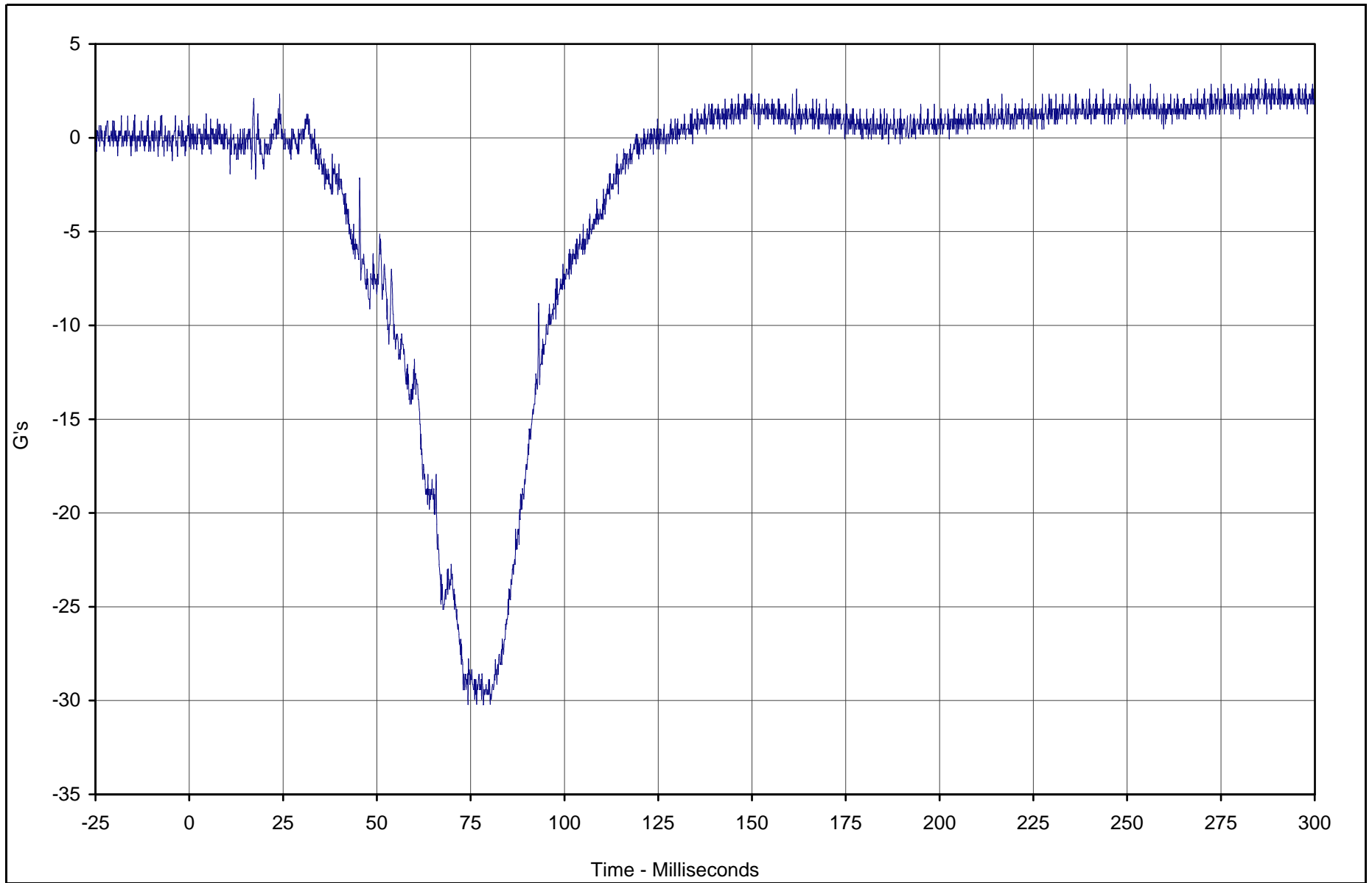


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Z	022	FIL	G's	3.1	285.0	-30.2	74.3	1000

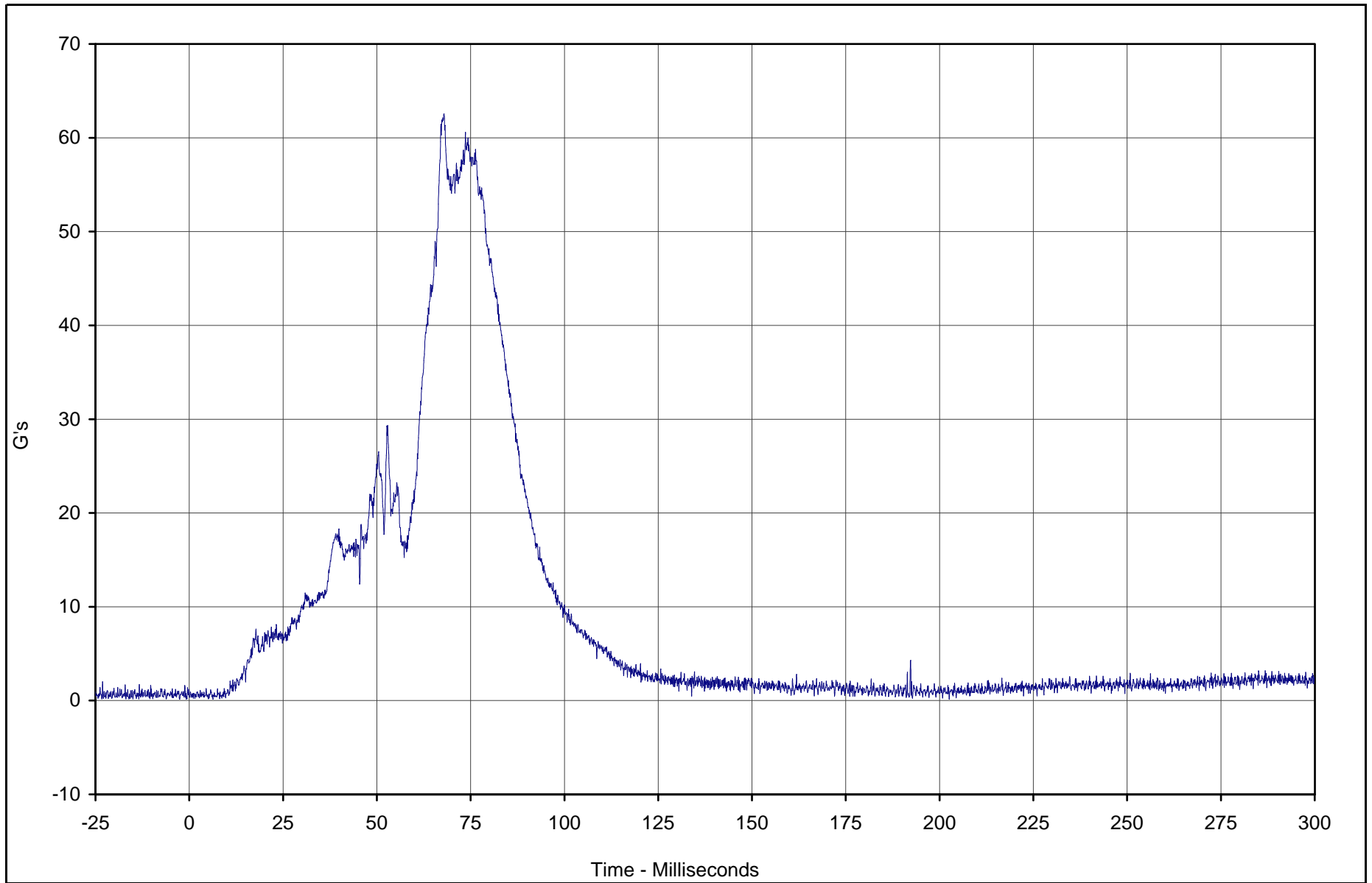


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Resultant	023	RES	G's	62.6	67.9	0.1	6.3	1000



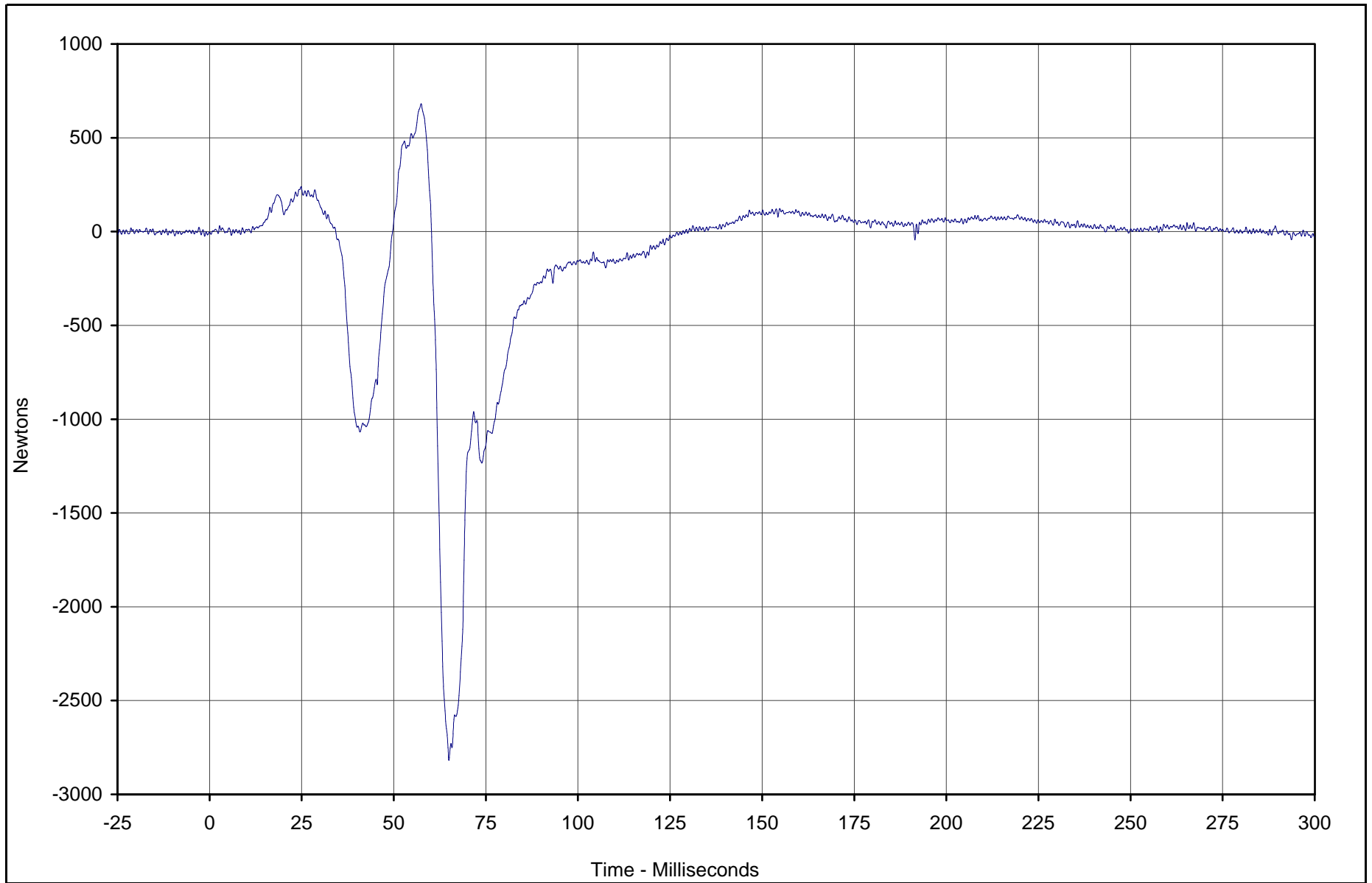
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Femur Force	023	FIL	Newtons	681.3	57.4	-2818.5	65.0	600



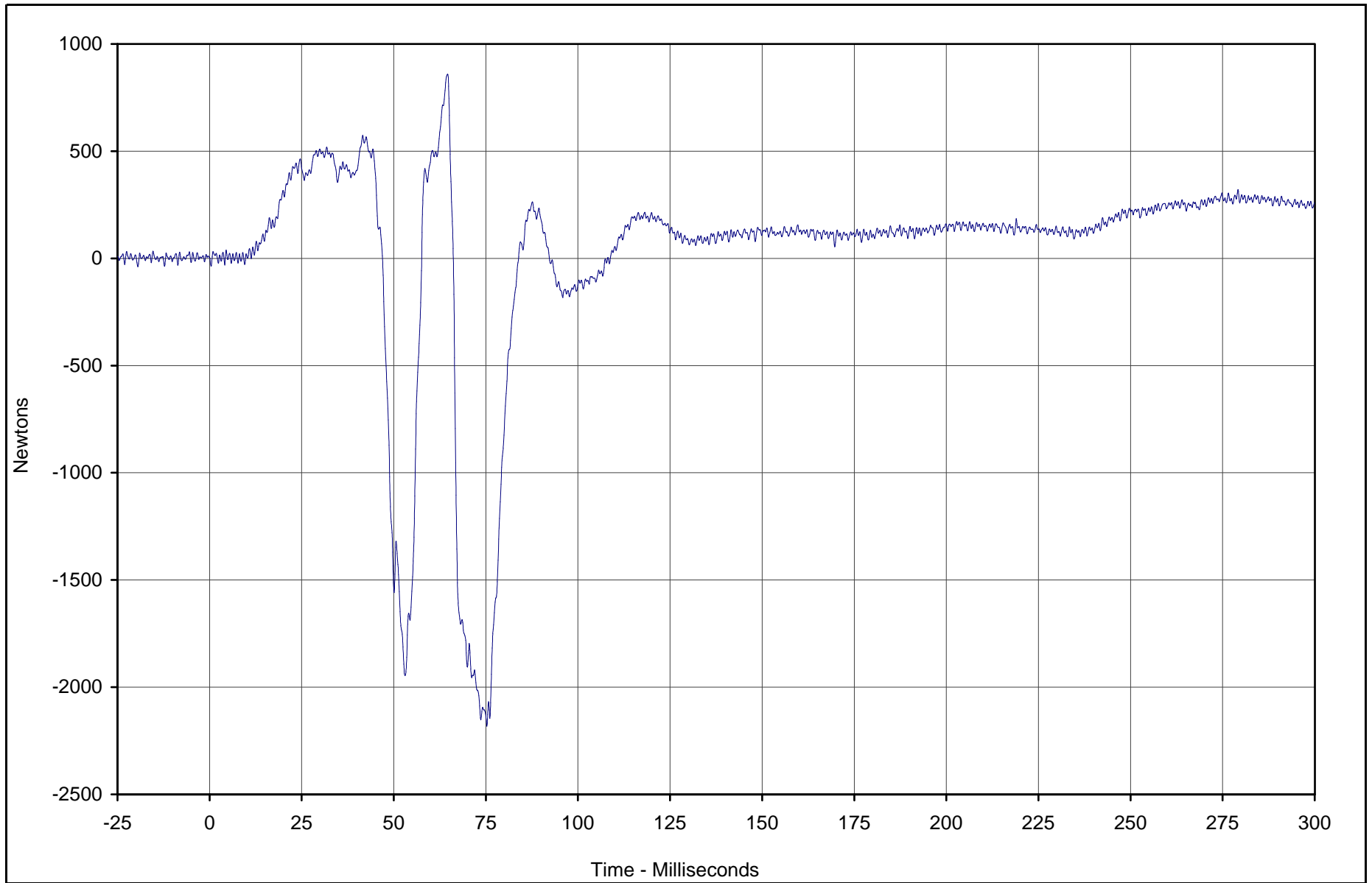
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Femur Force	024	FIL	Newtons	859.6	64.6	-2182.3	75.3	600

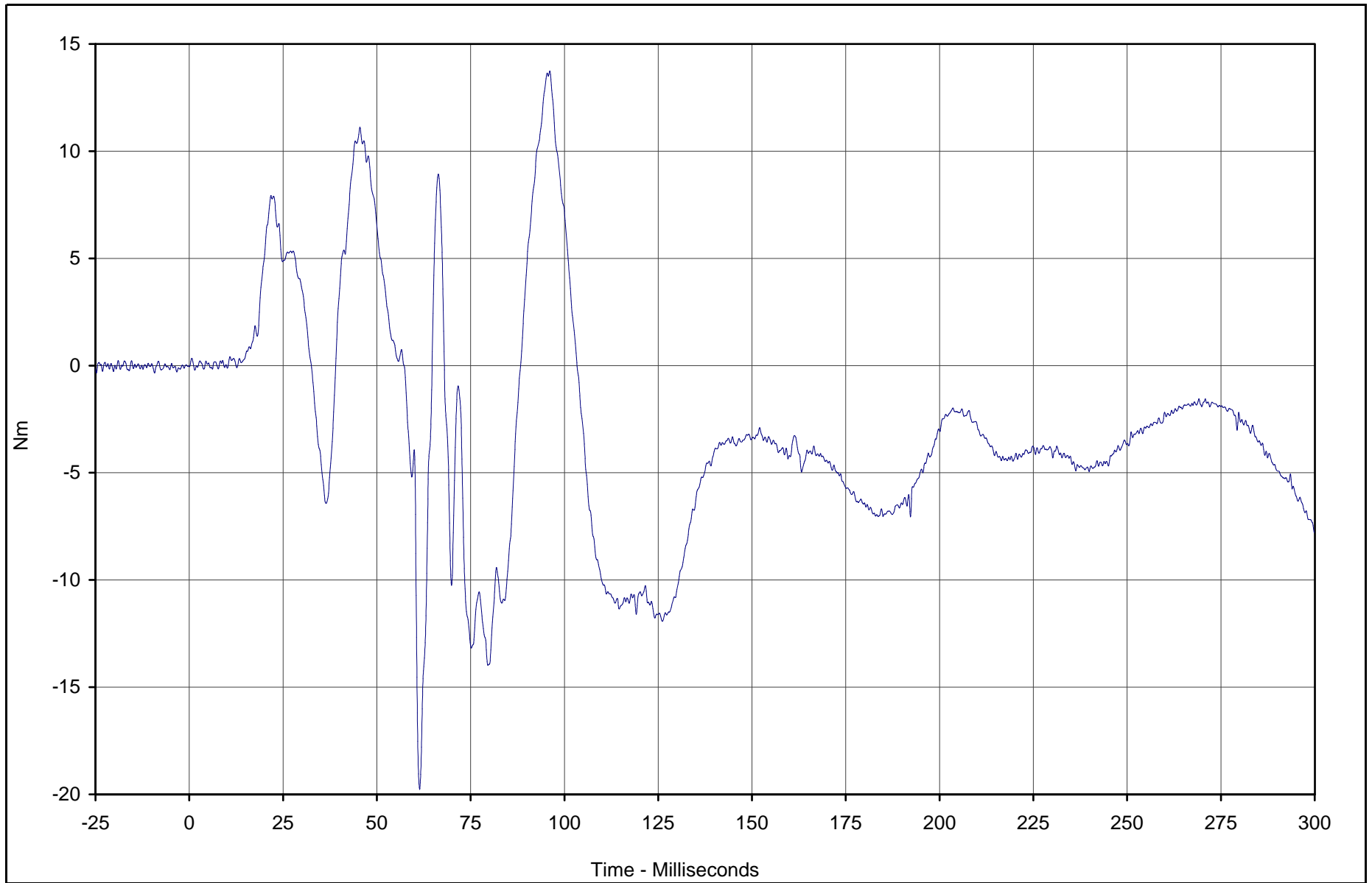


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Upper Tibia Moment X	025	FIL	Nm	13.7	96.1	-19.8	61.4	600

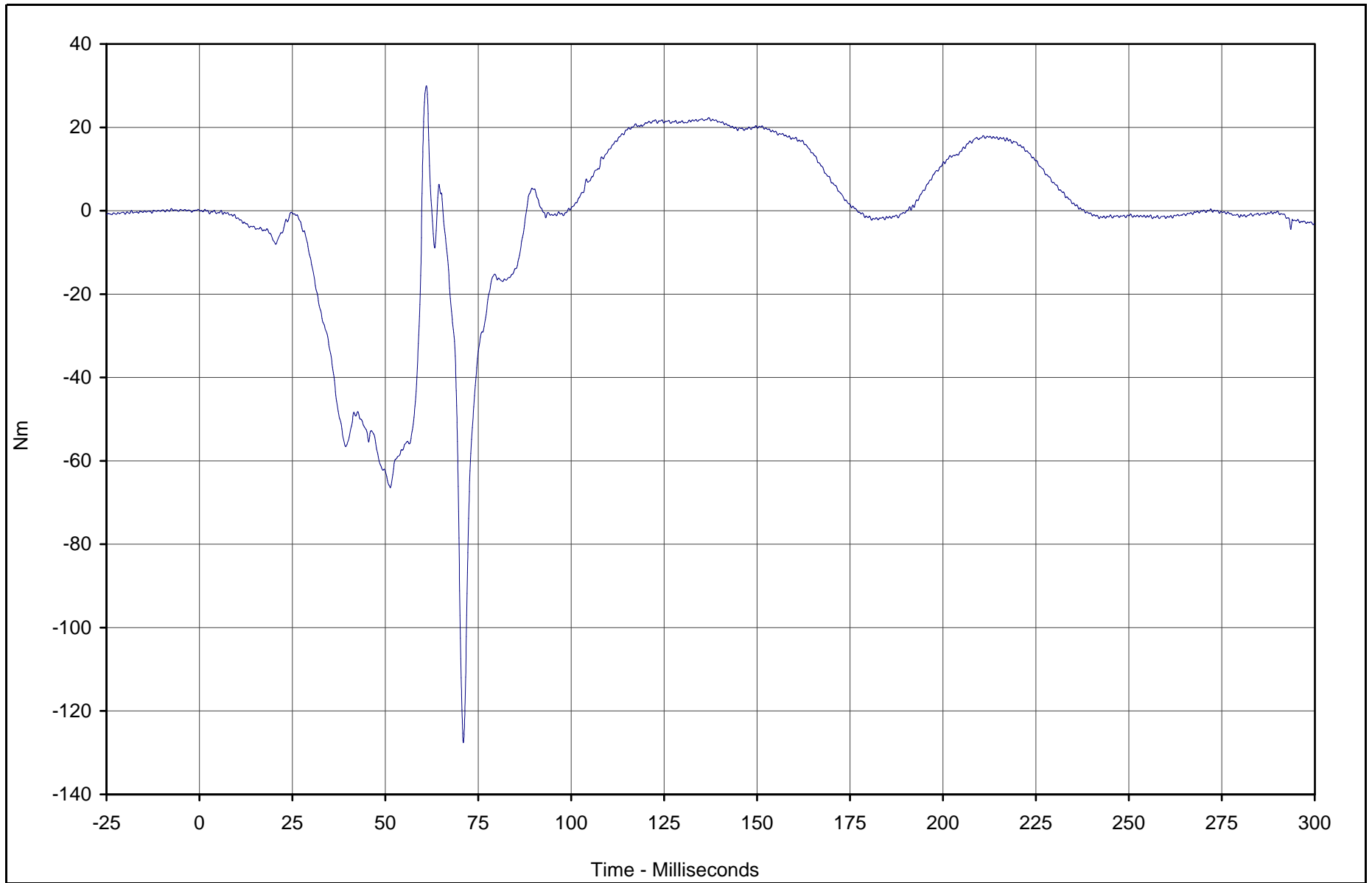


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Upper Tibia Moment Y	026	FIL	Nm	30.0	61.0	-127.6	71.0	600

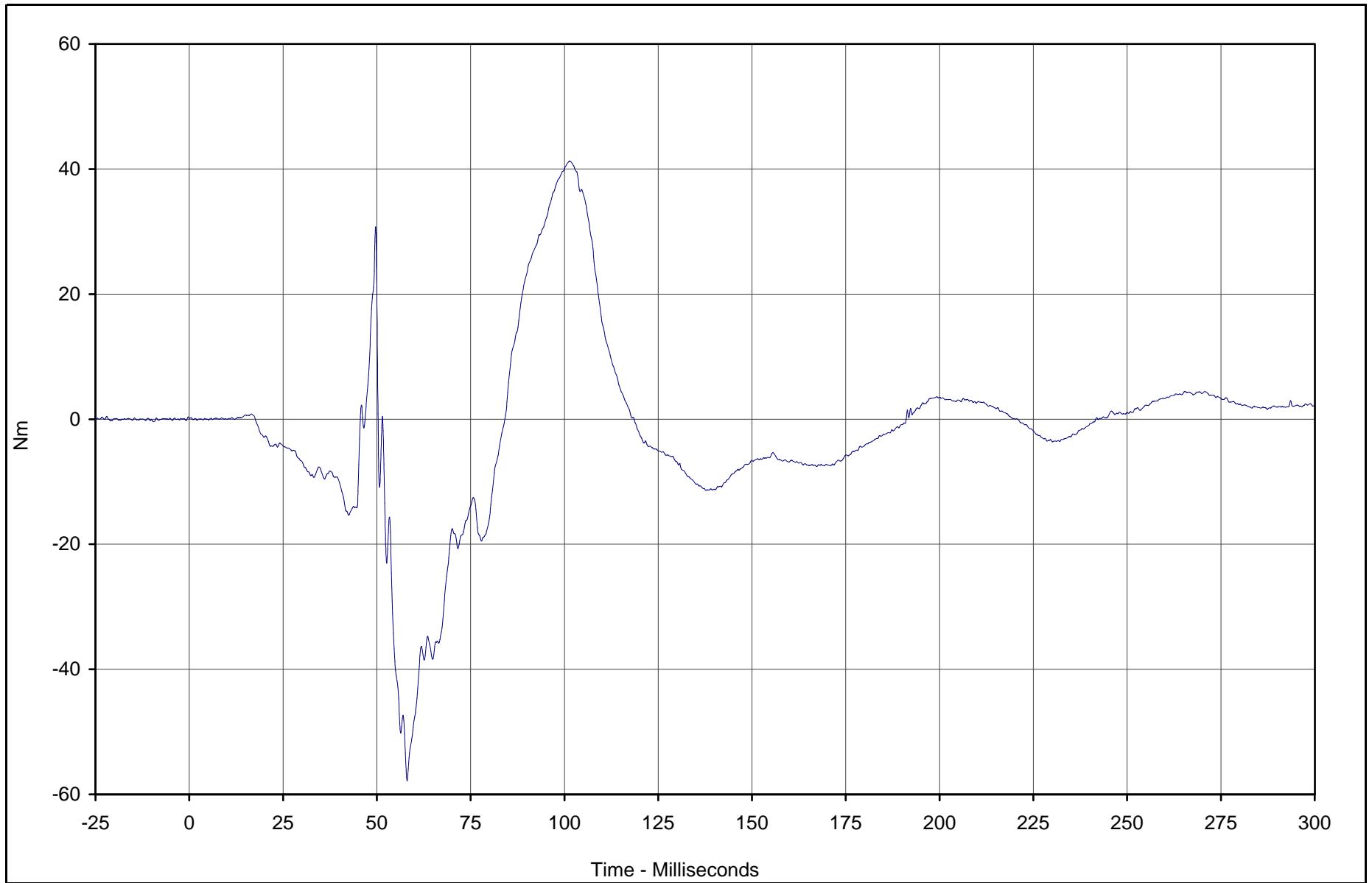


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Upper Tibia Moment X	027	FIL	Nm	41.3	101.4	-57.8	58.1	600



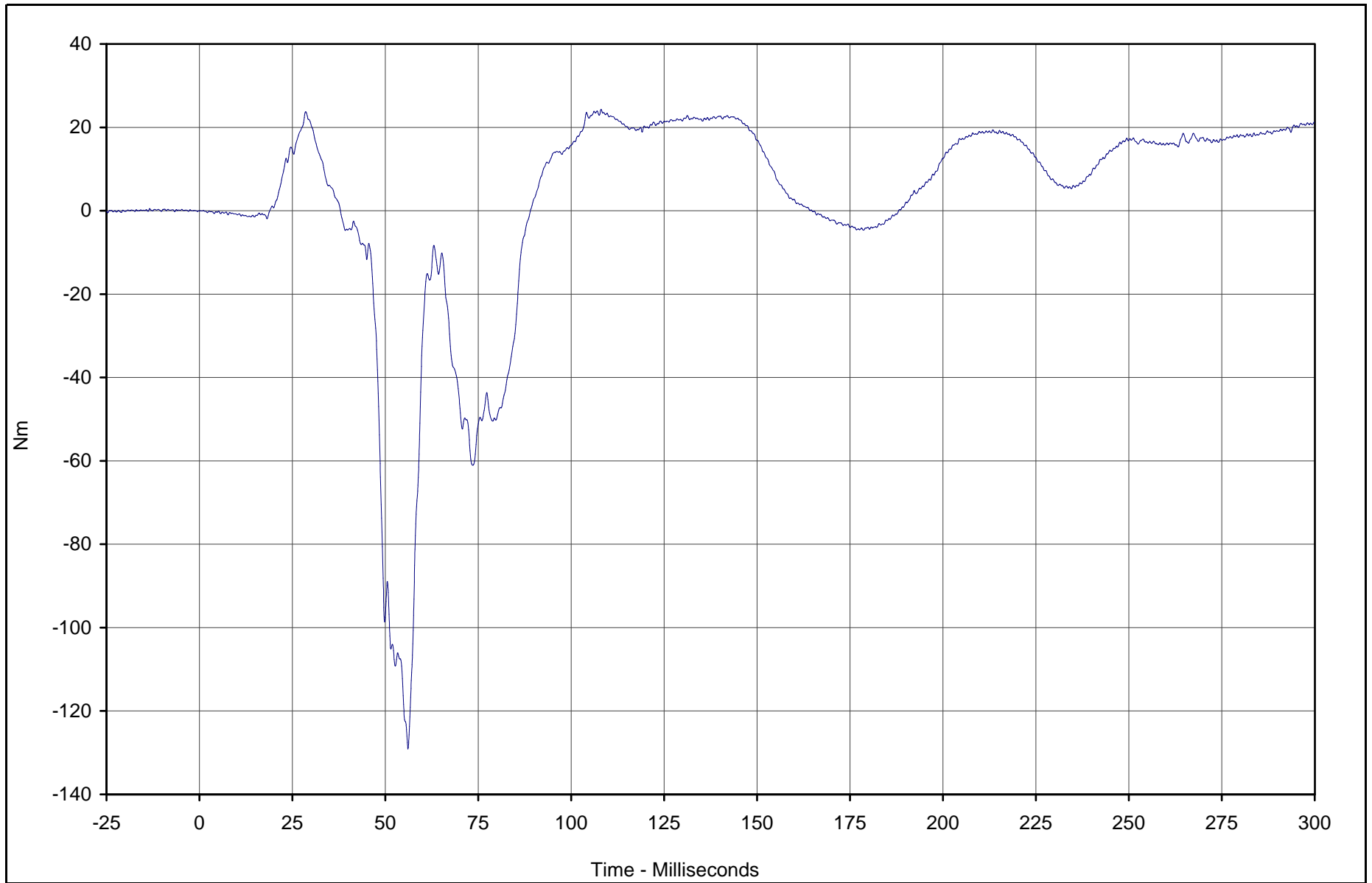
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Upper Tibia Moment Y	028	FIL	Nm	24.3	108.1	-129.1	56.1	600



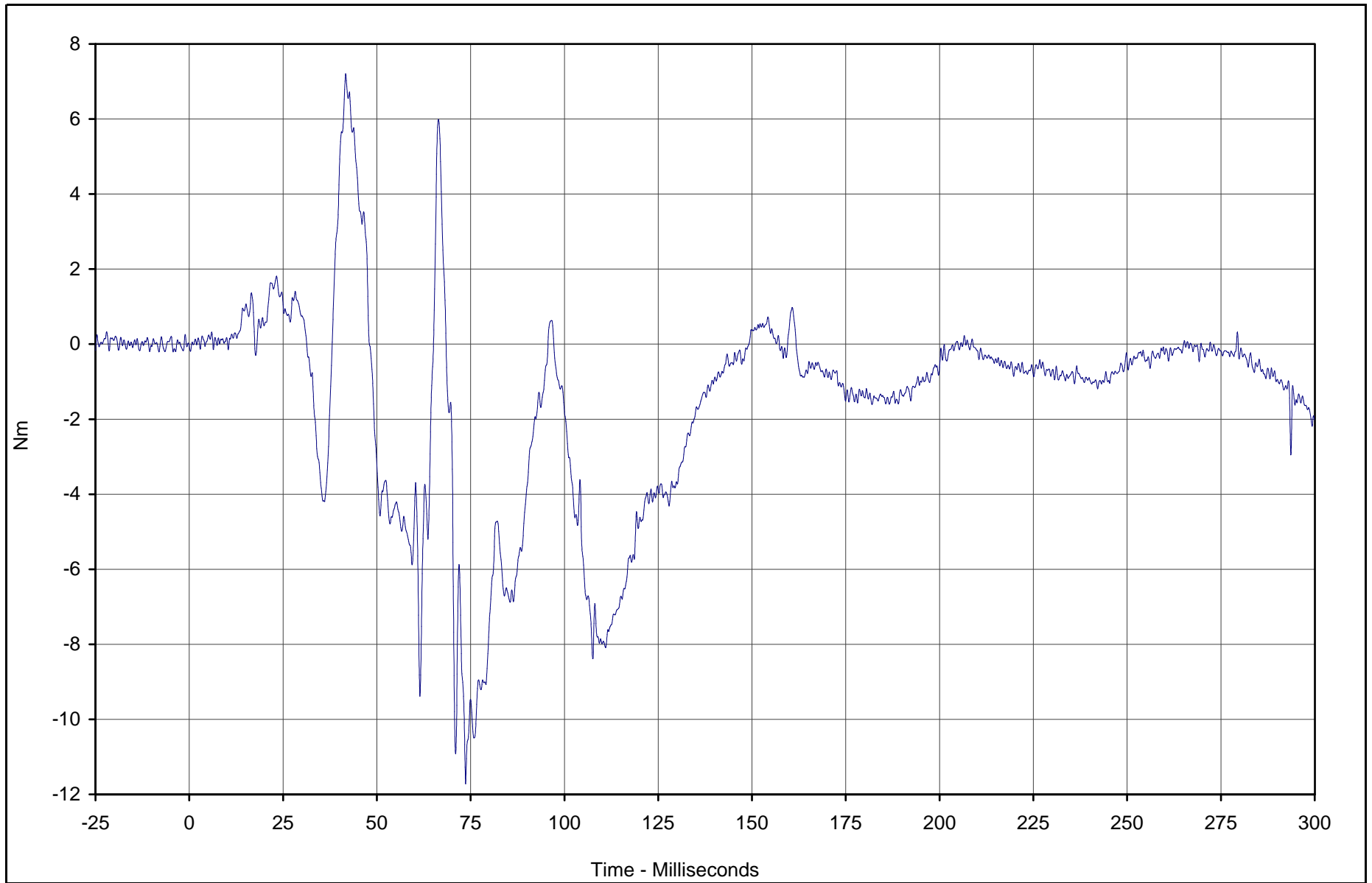
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Moment X	029	FIL	Nm	7.2	41.7	-11.7	73.7	600



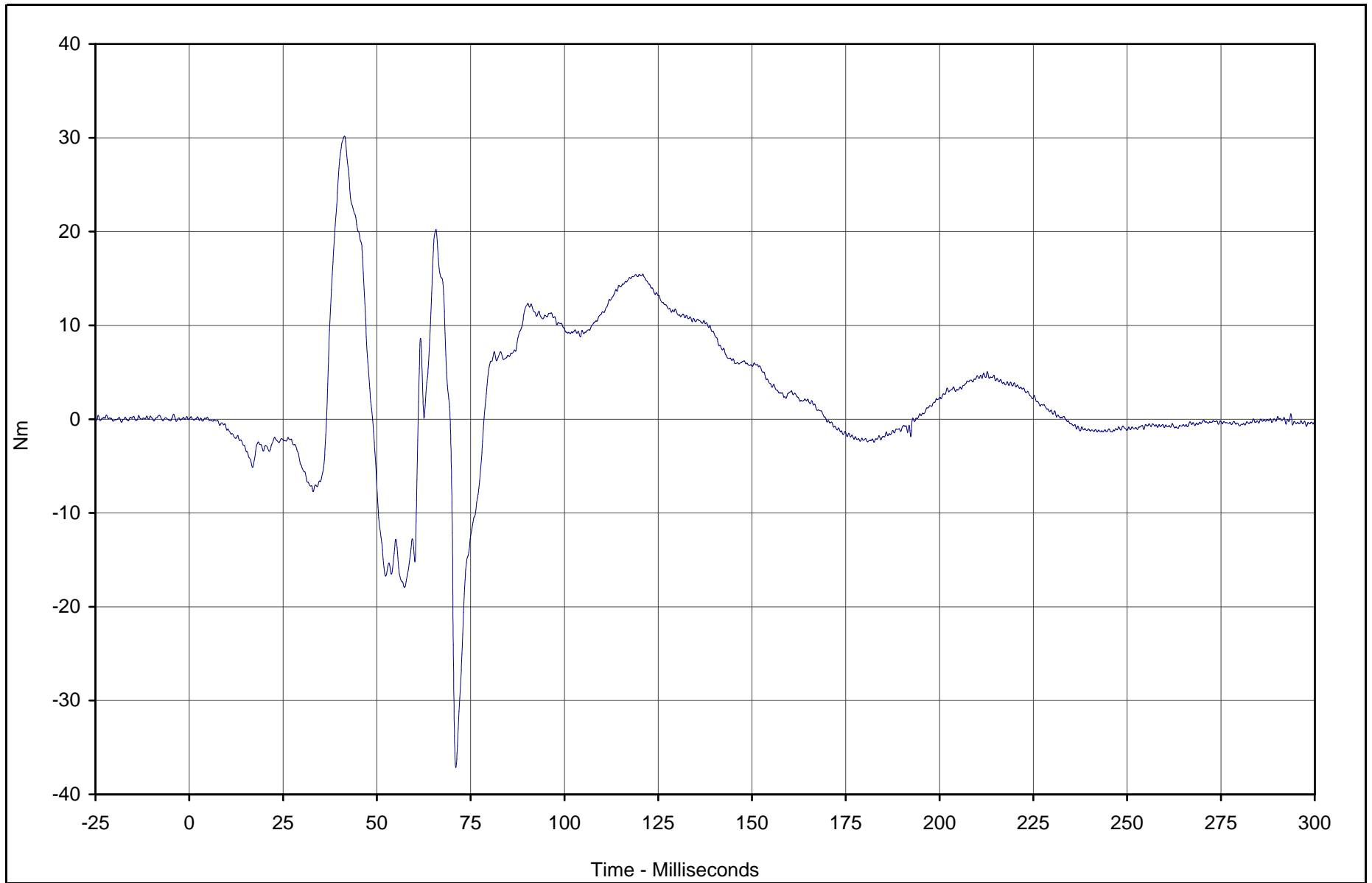
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Moment Y	030	FIL	Nm	30.2	41.4	-37.1	71.0	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

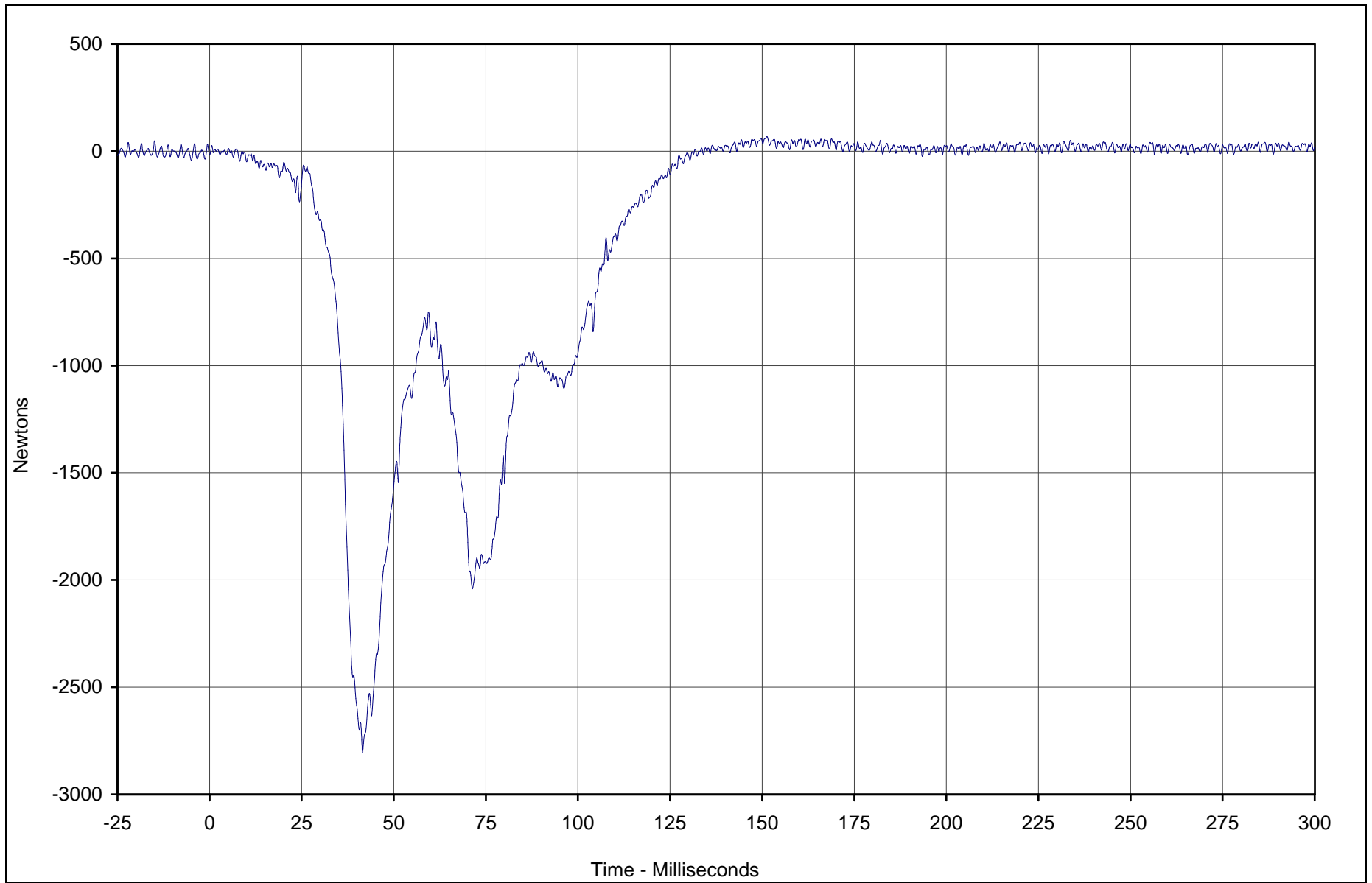
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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B-48



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Force Z	031	FIL	Newtons	68.0	151.3	-2804.3	41.5	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

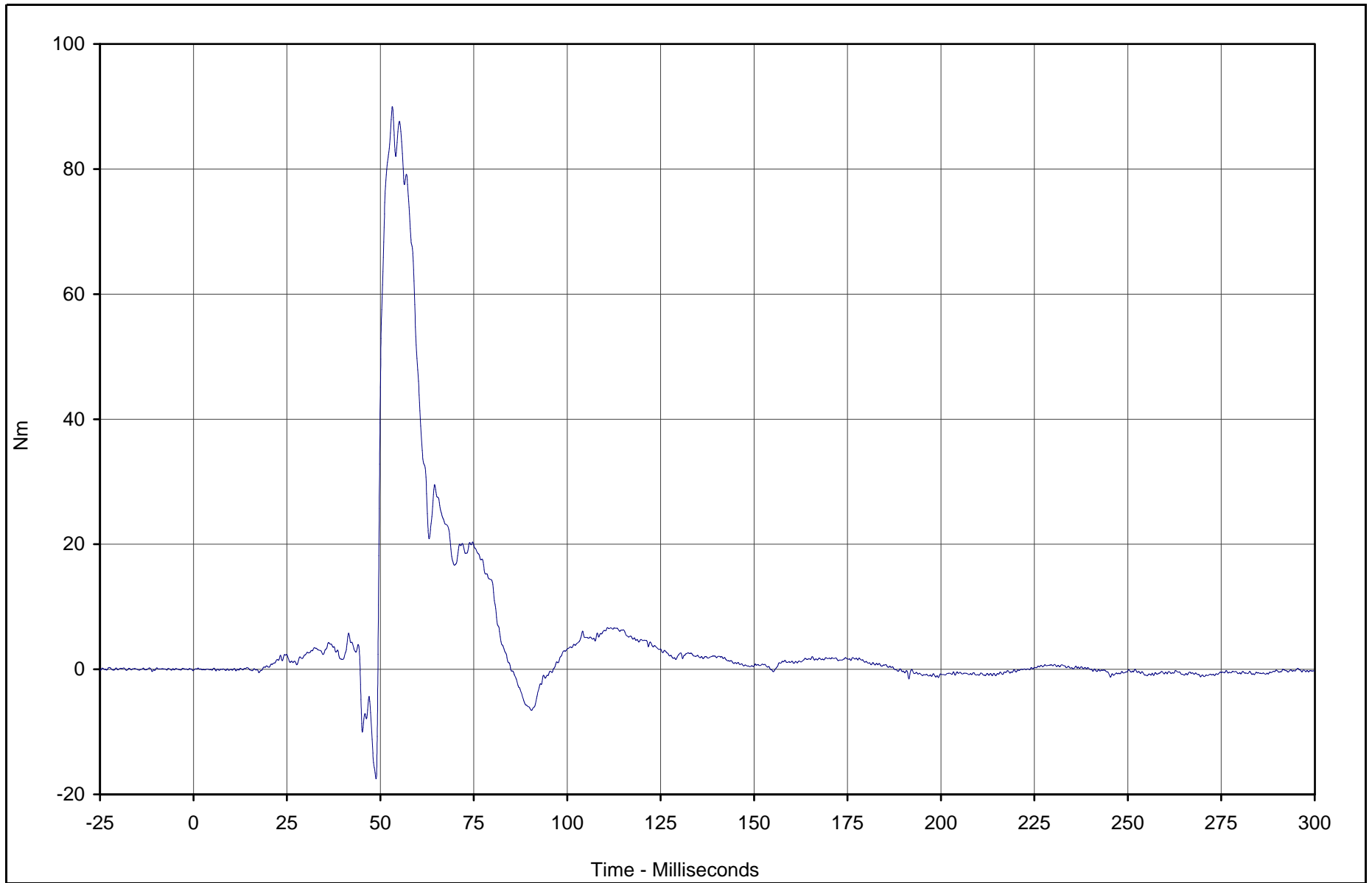
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Moment X	032	FIL	Nm	90.0	53.2	-17.5	48.9	600



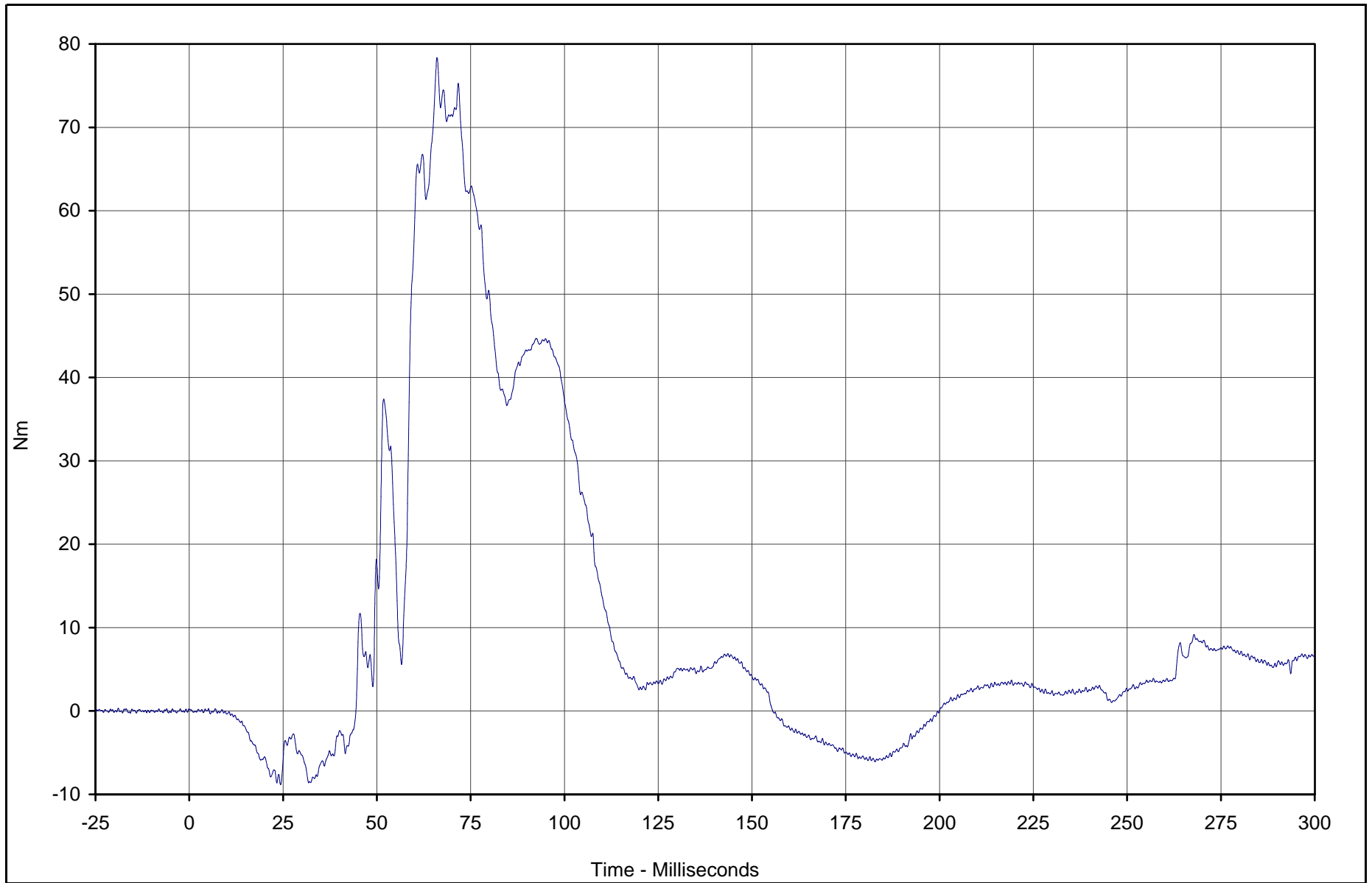
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Moment Y	033	FIL	Nm	78.4	66.1	-8.8	24.4	600



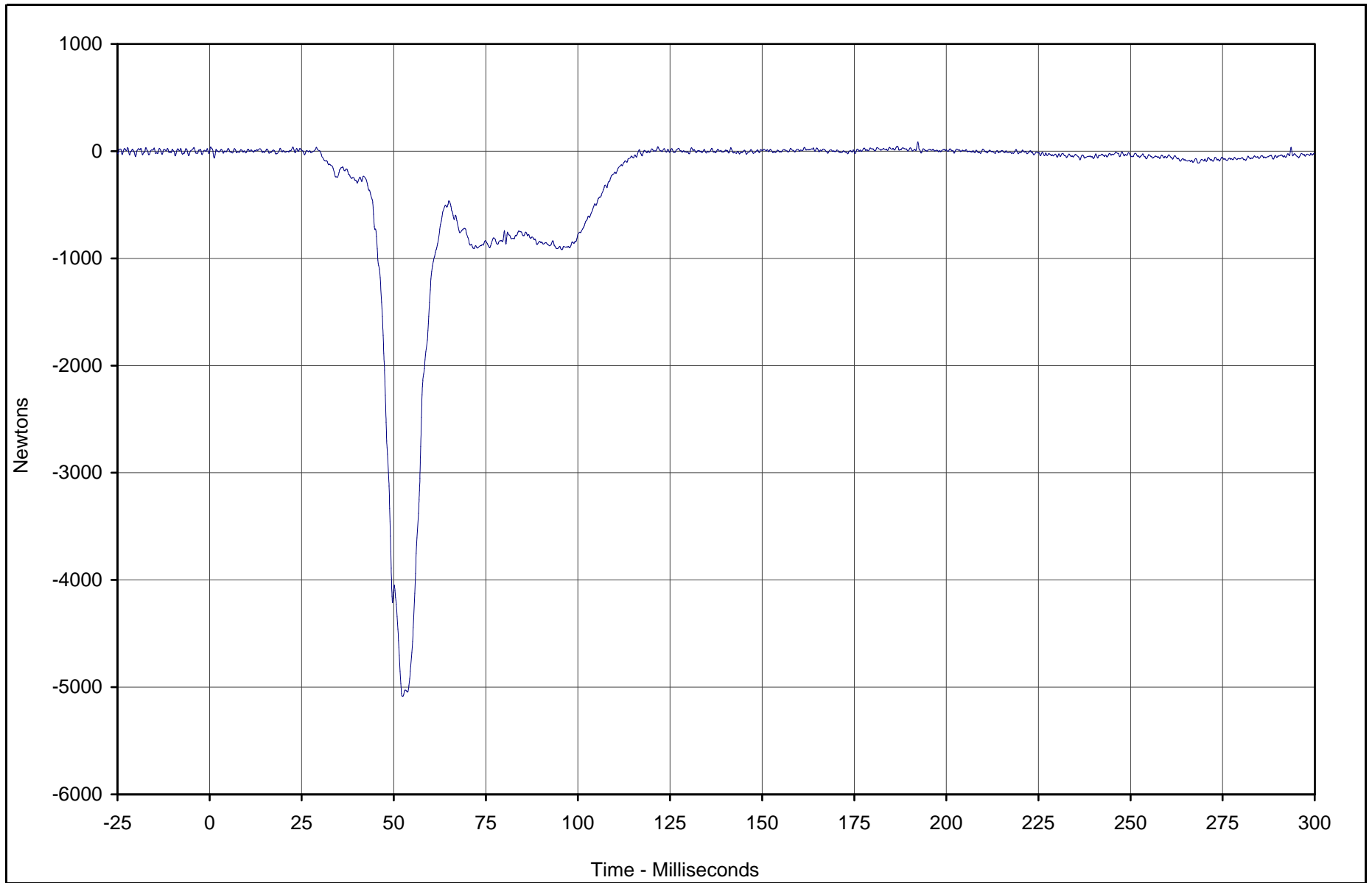
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Force Z	034	FIL	Newtons	85.2	192.3	-5084.3	52.4	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

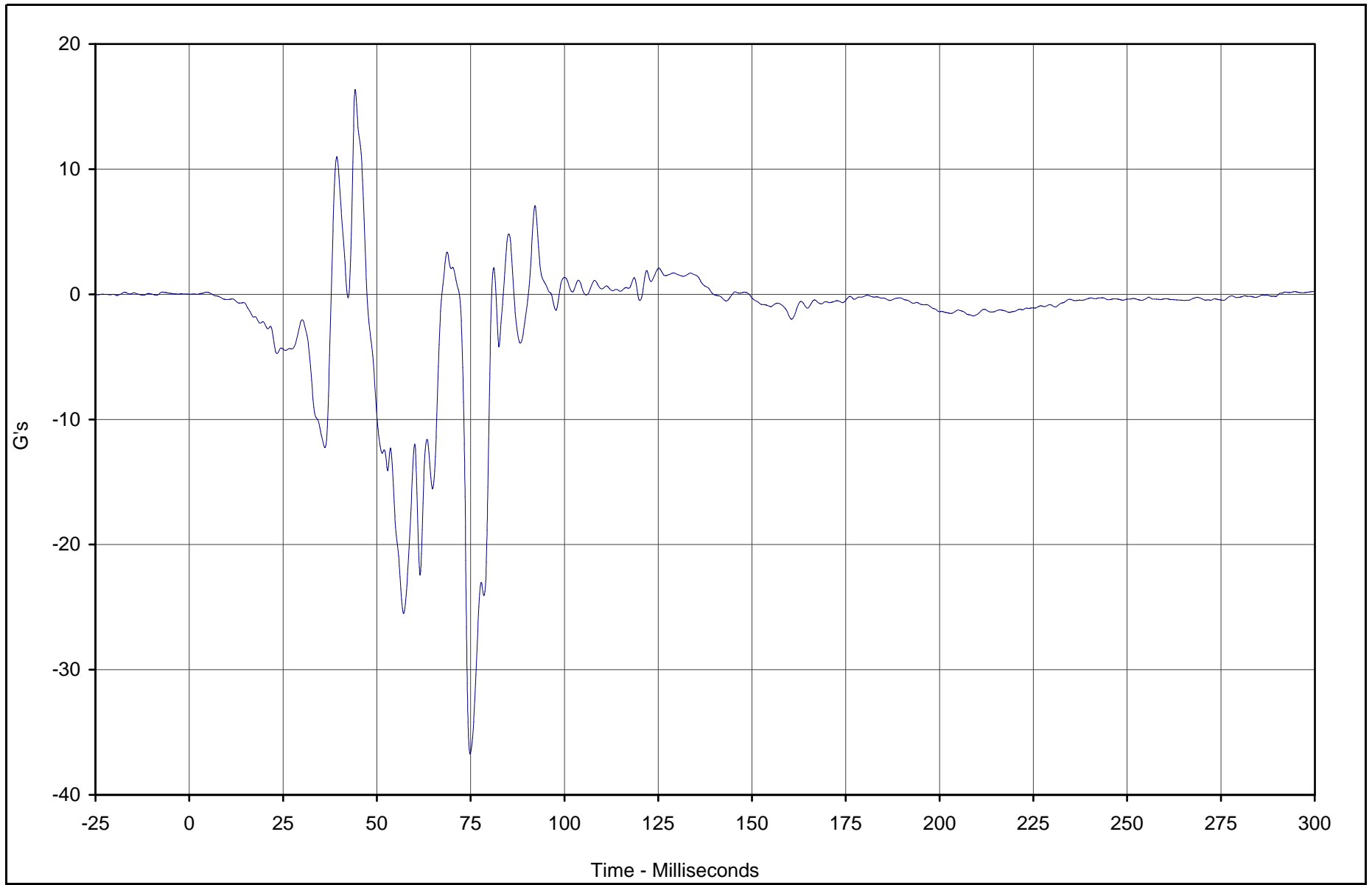
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Aft X	035	FIL	G's	16.4	44.2	-36.7	74.8	180

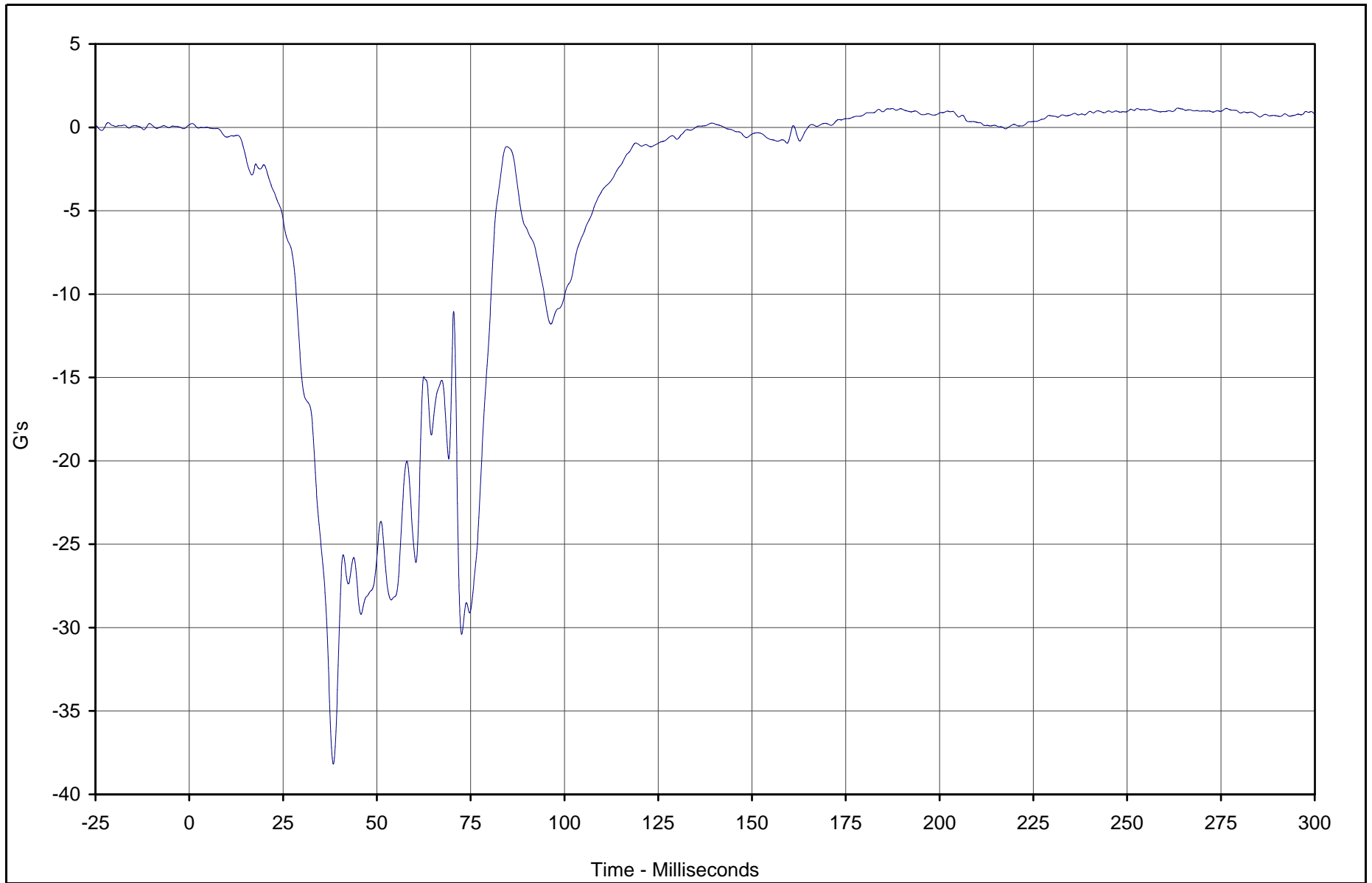


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Aft Z	036	FIL	G's	1.2	263.5	-38.2	38.4	180

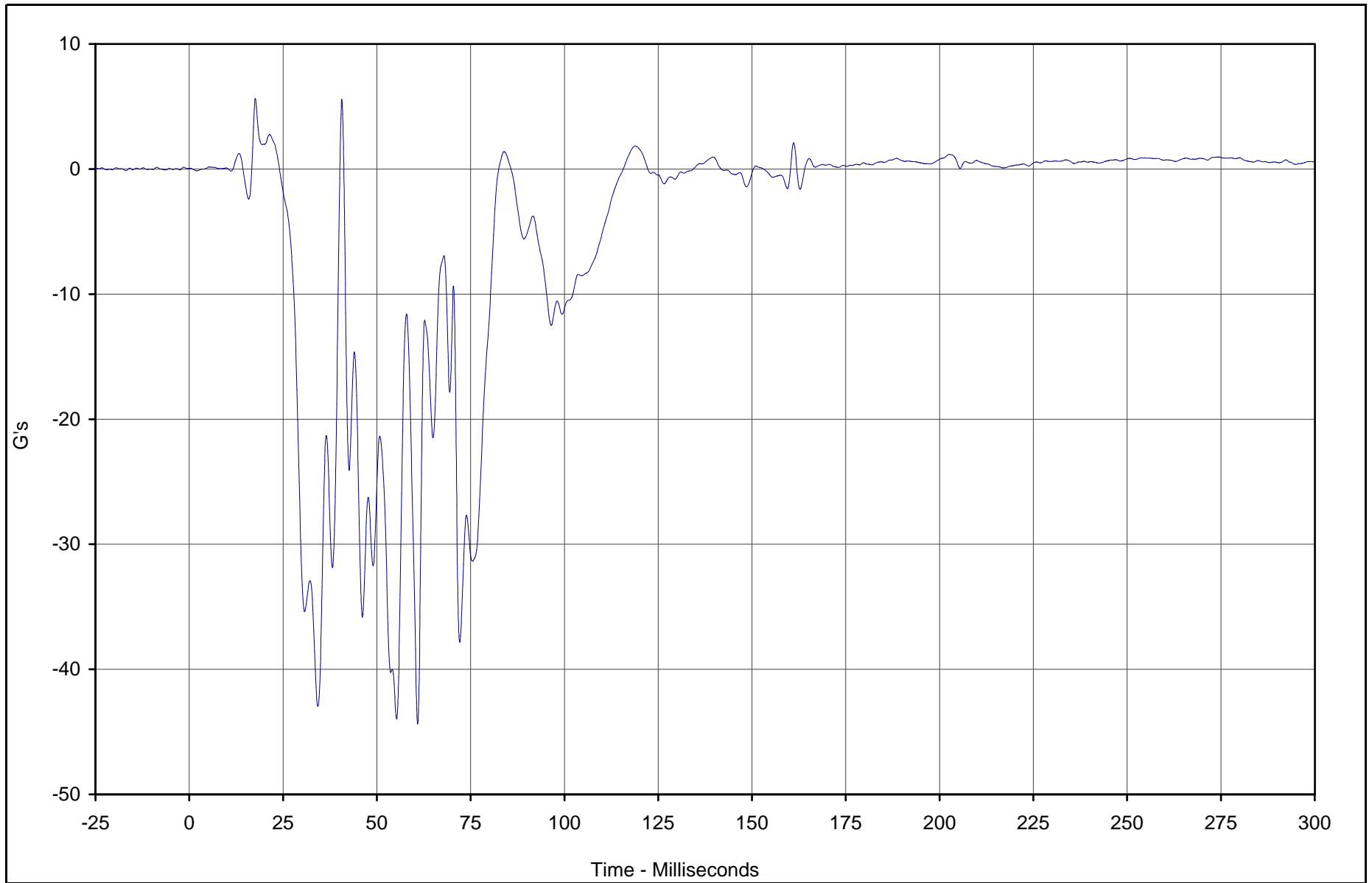


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Fore Z	037	FIL	G's	5.7	17.6	-44.4	60.9	180

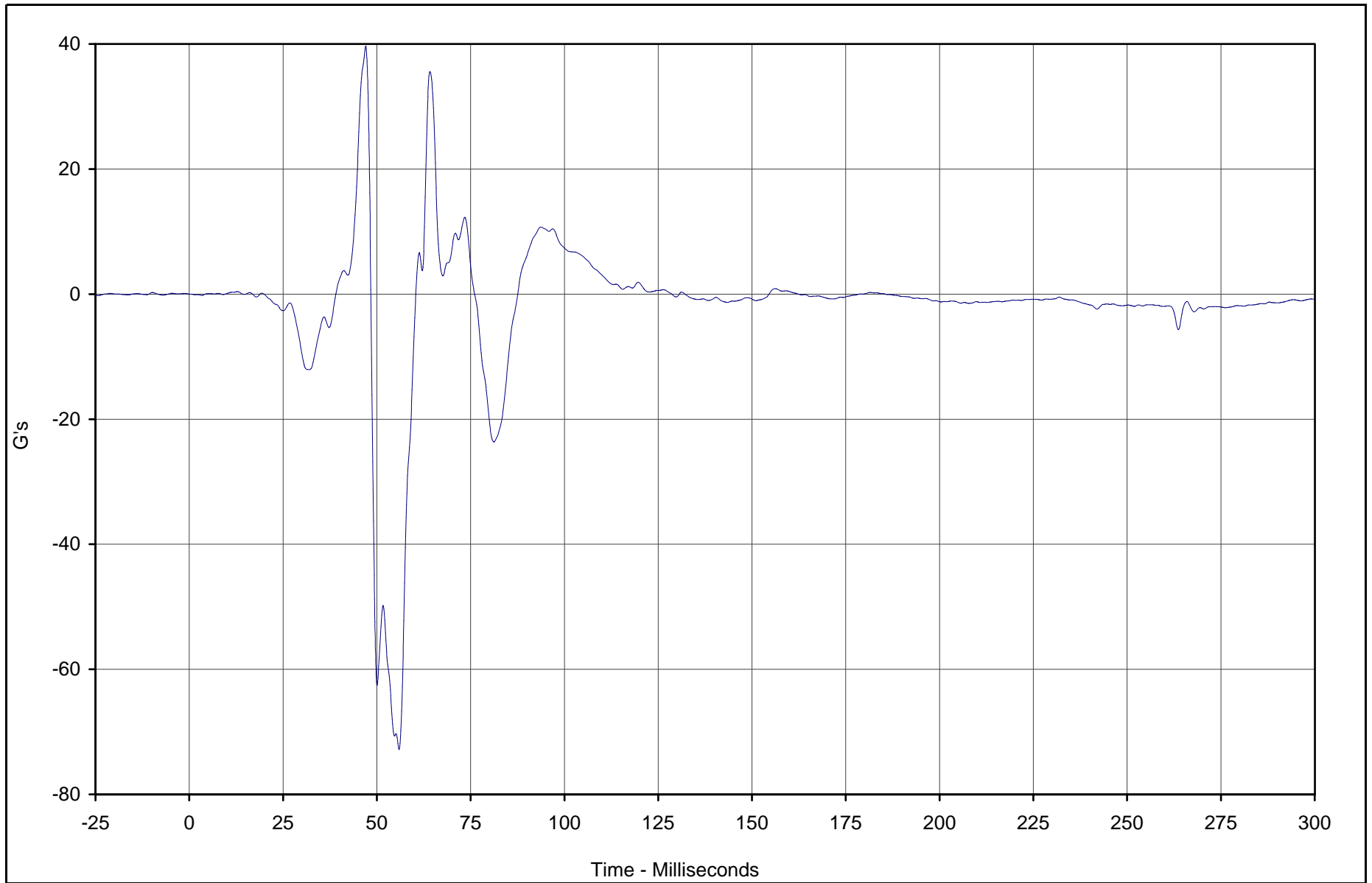


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Aft X	038	FIL	G's	39.7	47.0	-72.8	55.9	180

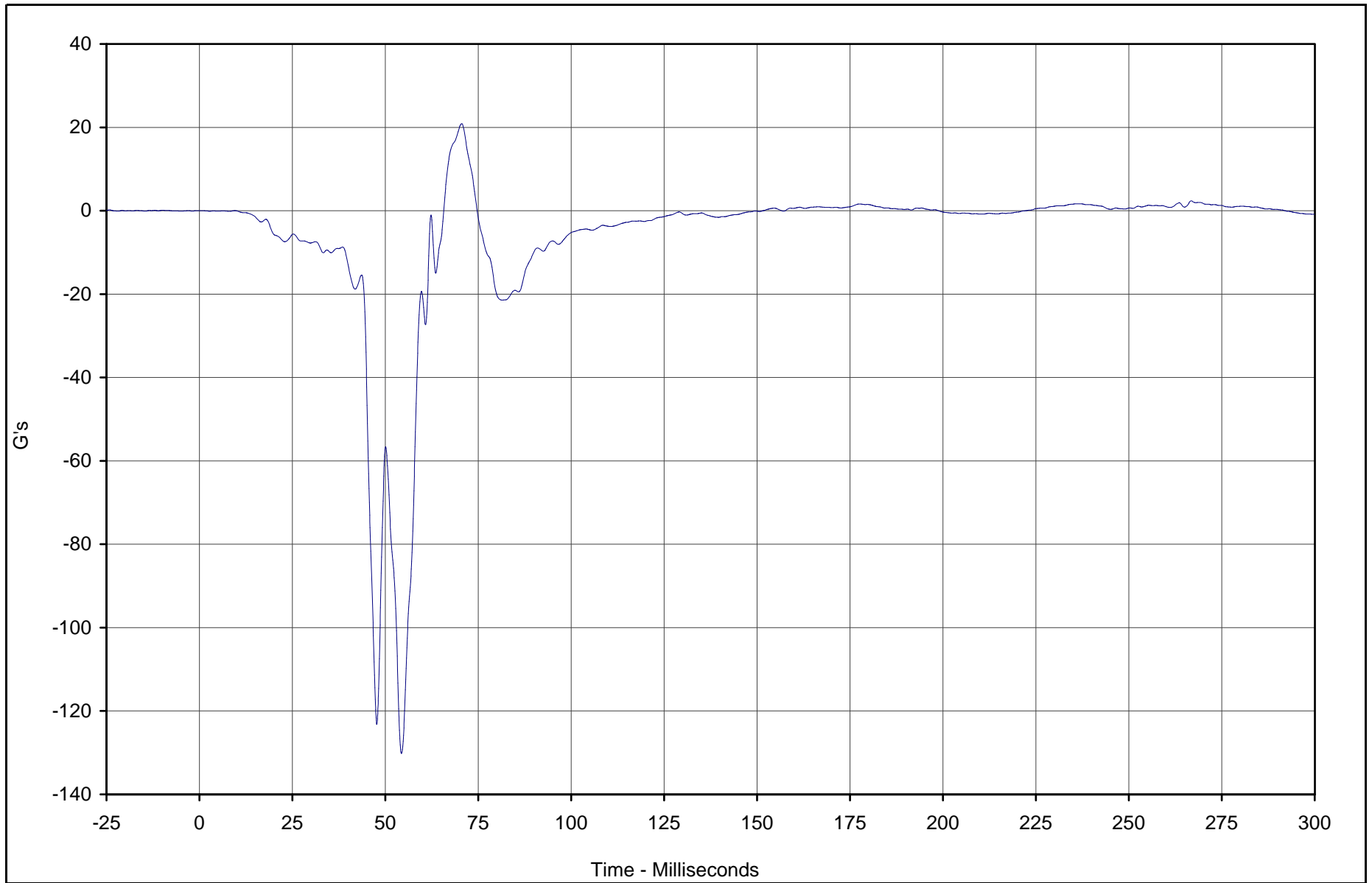


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Aft Z	039	FIL	G's	20.9	70.5	-130.1	54.3	180



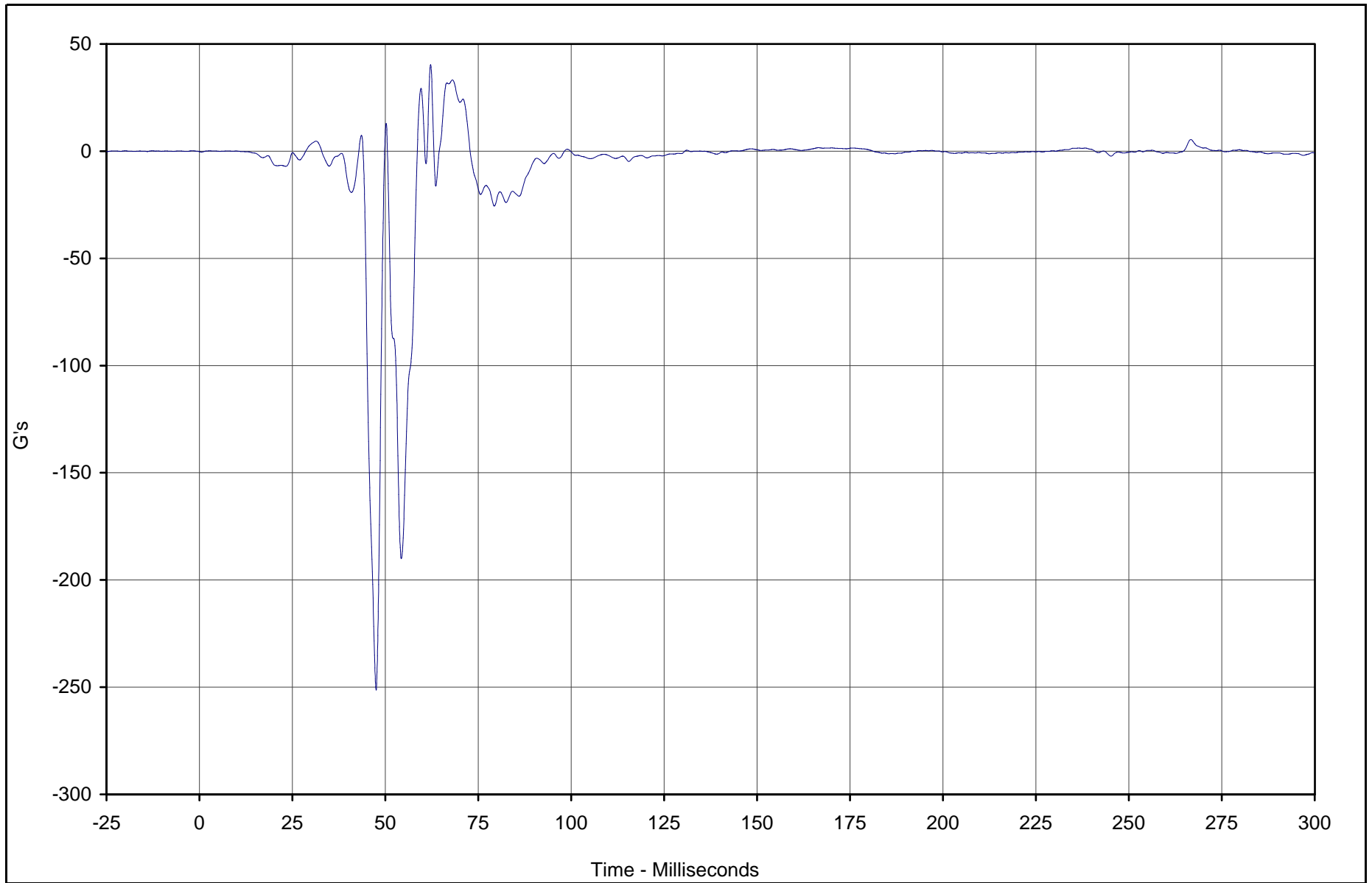
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Fore Z	040	FIL	G's	40.4	62.2	-251.4	47.5	180

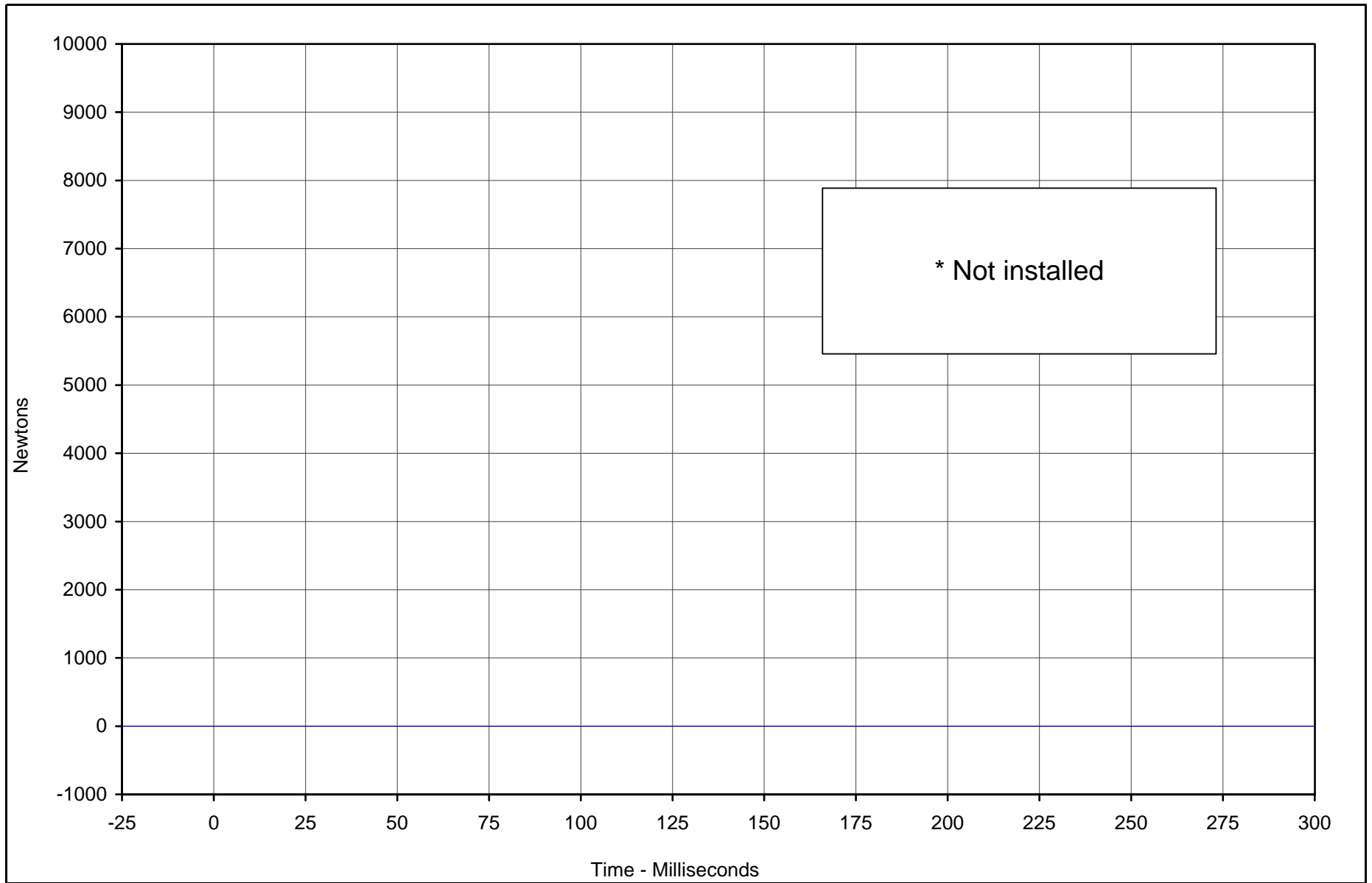


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Lap Belt Force	041	FIL	Newtons	0.0	0.0	0.0	0.0	60

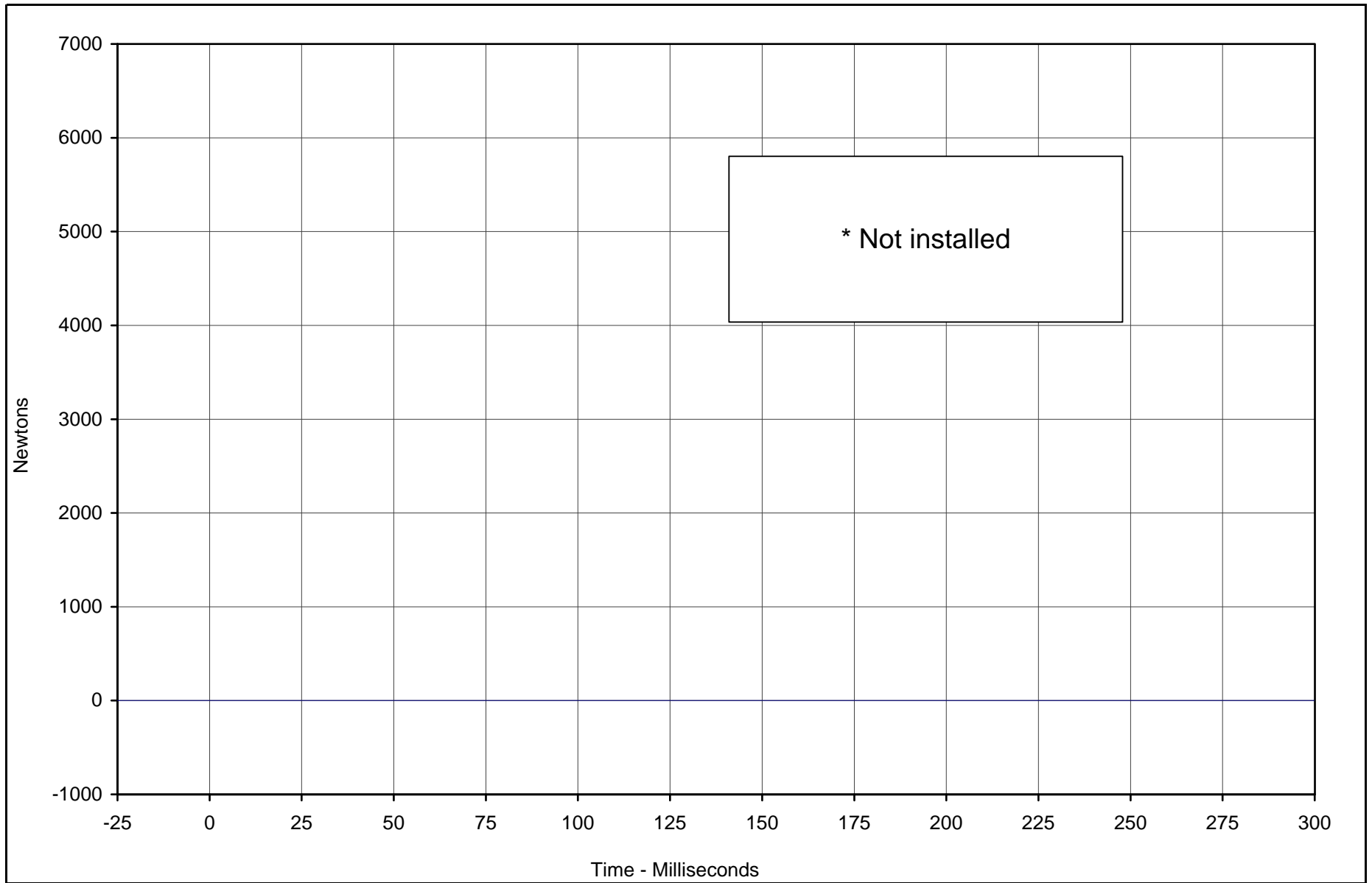


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Shoulder Belt Force	042	FIL	Newtons	0.0	0.0	0.0	0.0	60



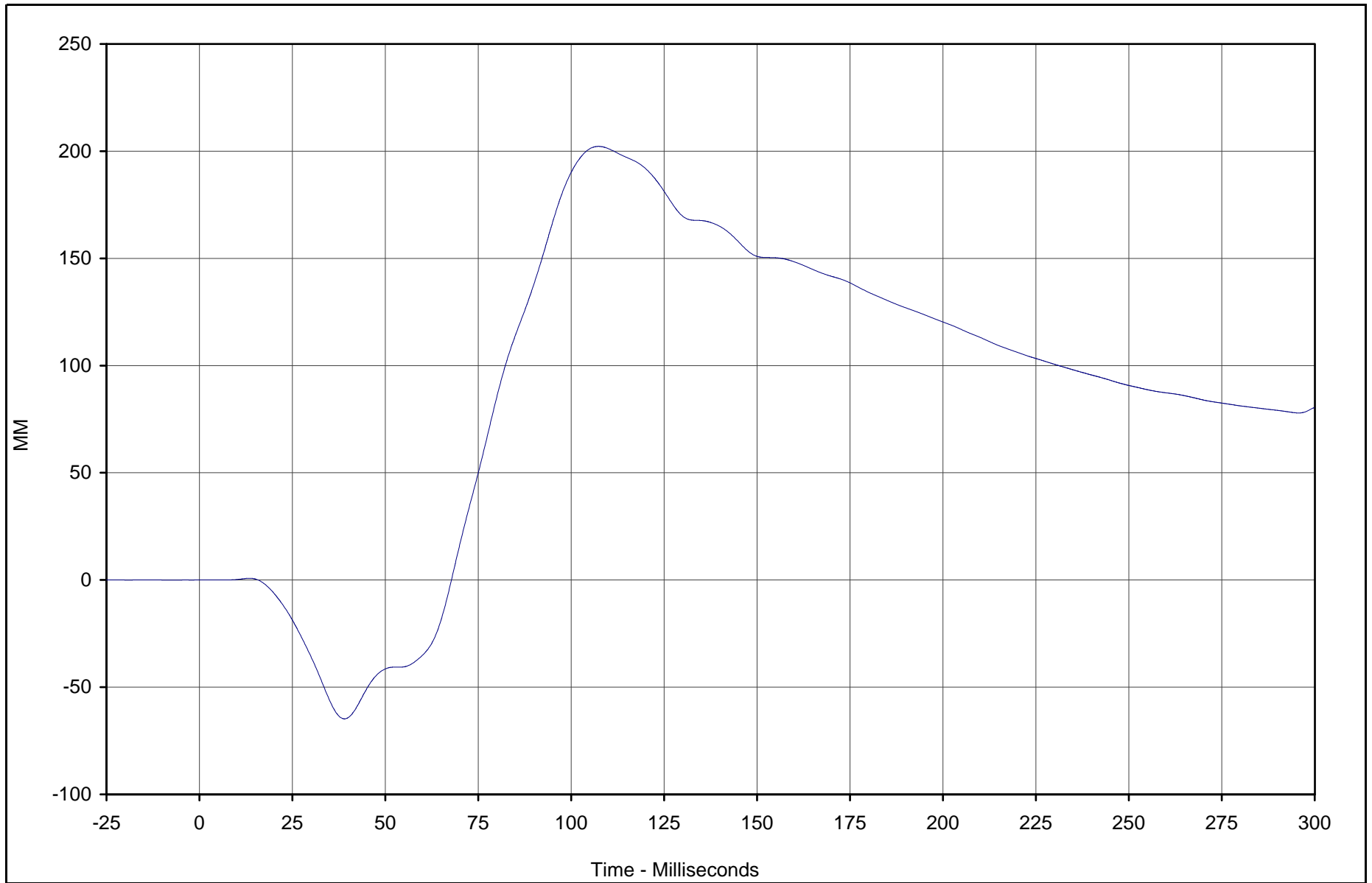
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Shoulder Belt Pullout	043	FIL	MM	202.2	107.3	-64.8	39.0	60



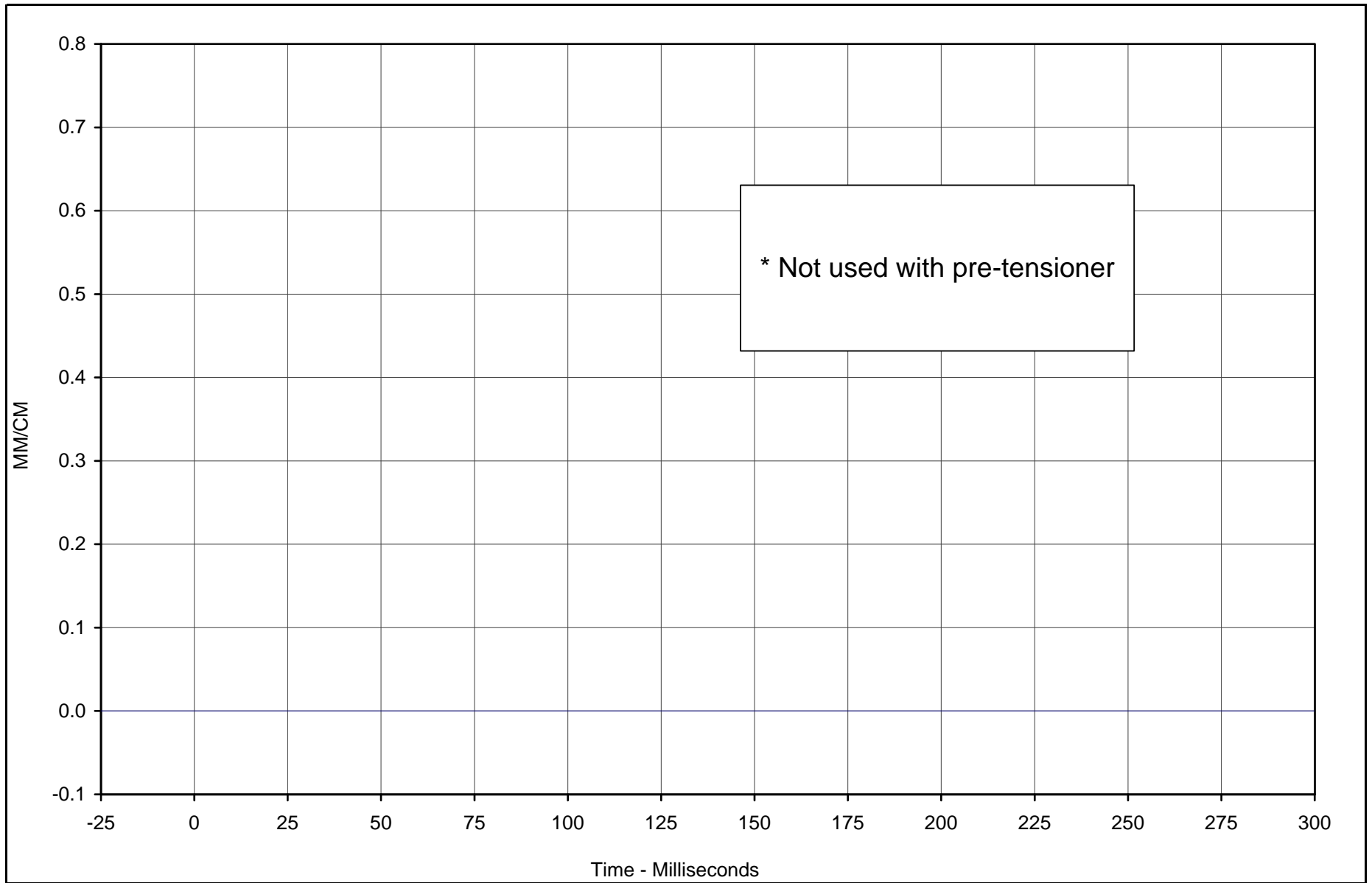
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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\* Not used with pre-tensioner

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Shoulder Belt Elongation	044	FIL	MM/CM	0.00	0.0	0.00	0.0	60

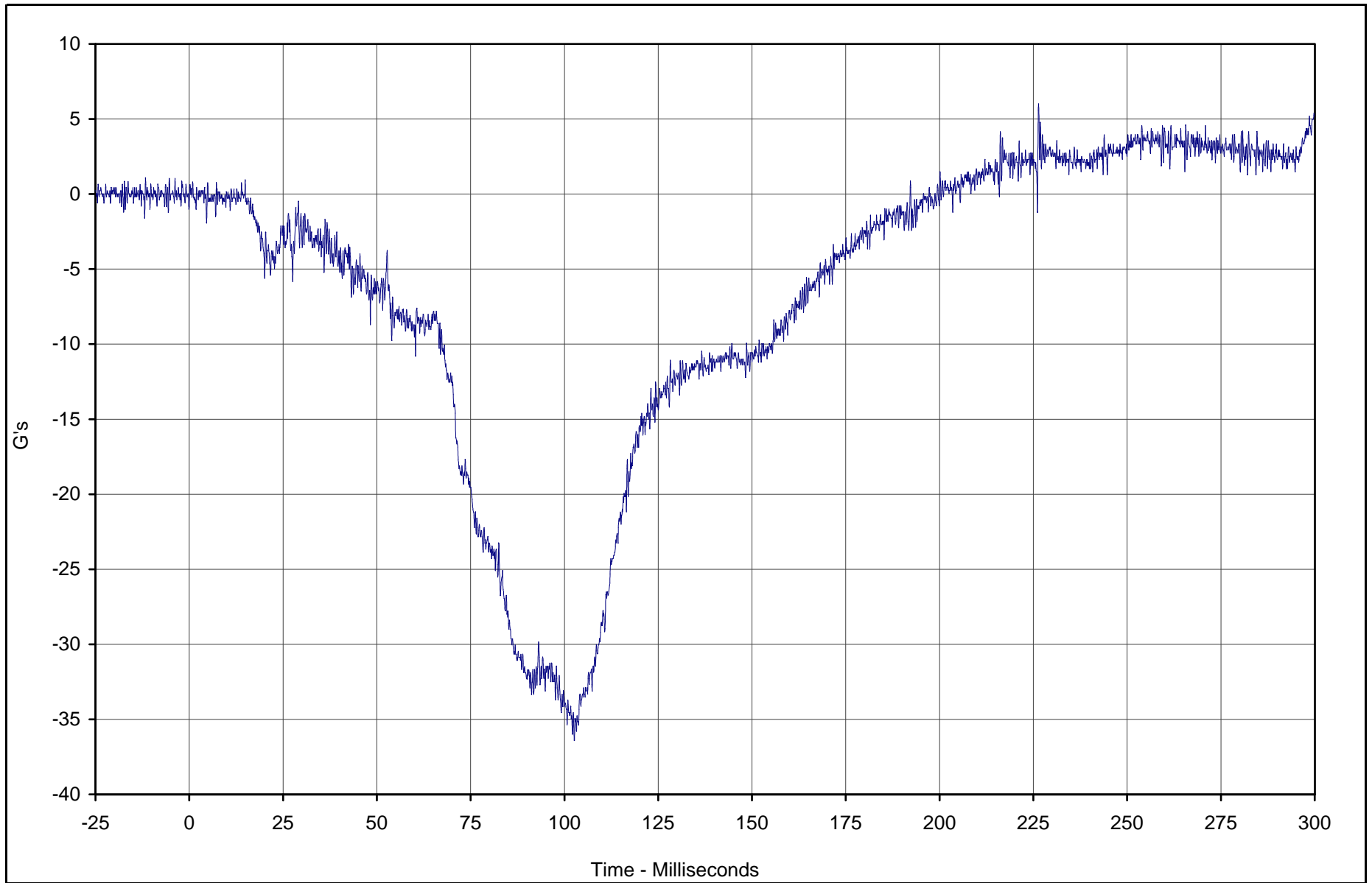


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X	045	FIL	G's	6.0	226.4	-36.4	102.6	1000

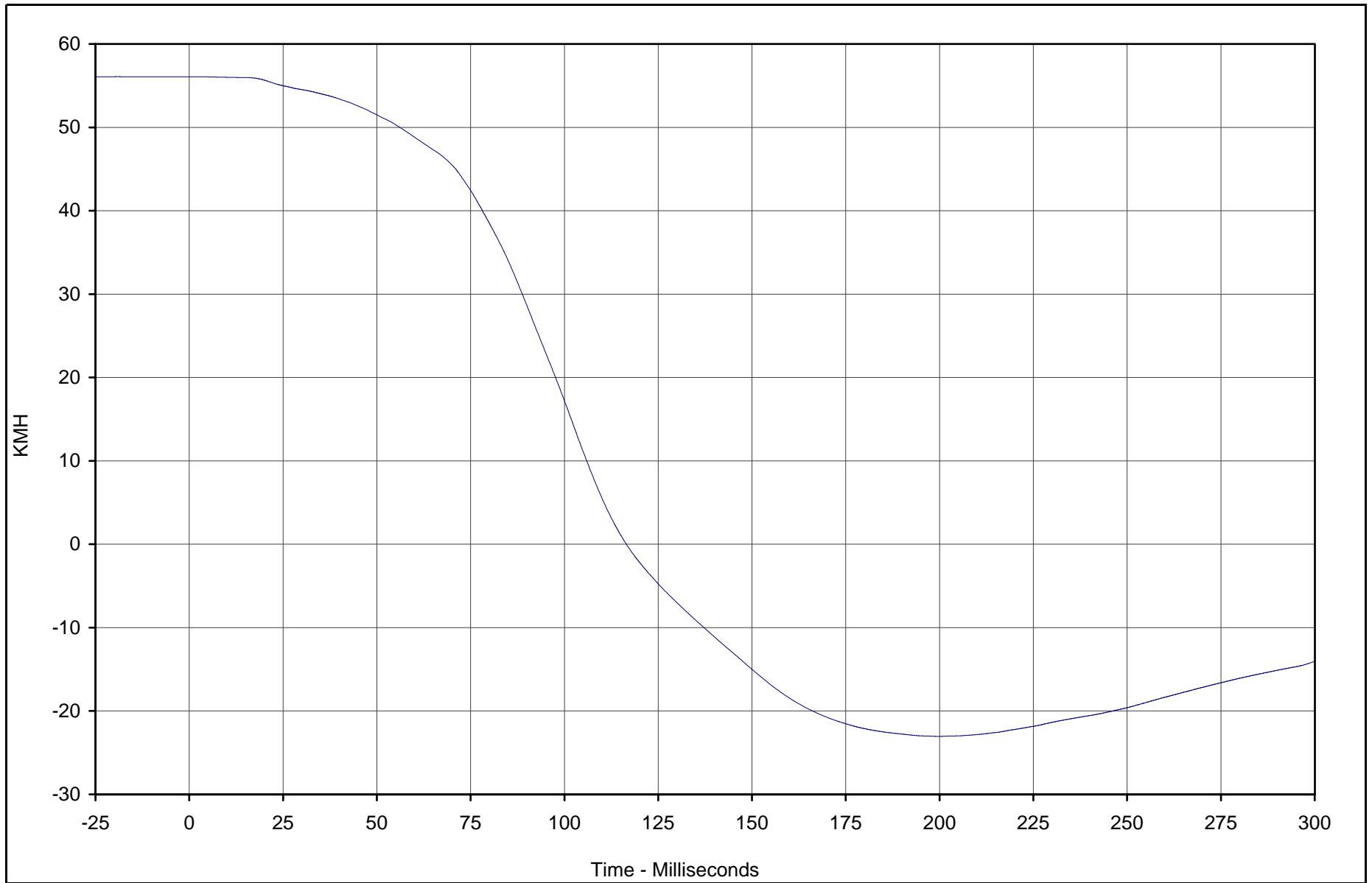


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X Velocity	045	IN1	KMH	56.1	1.1	-23.0	199.7	180



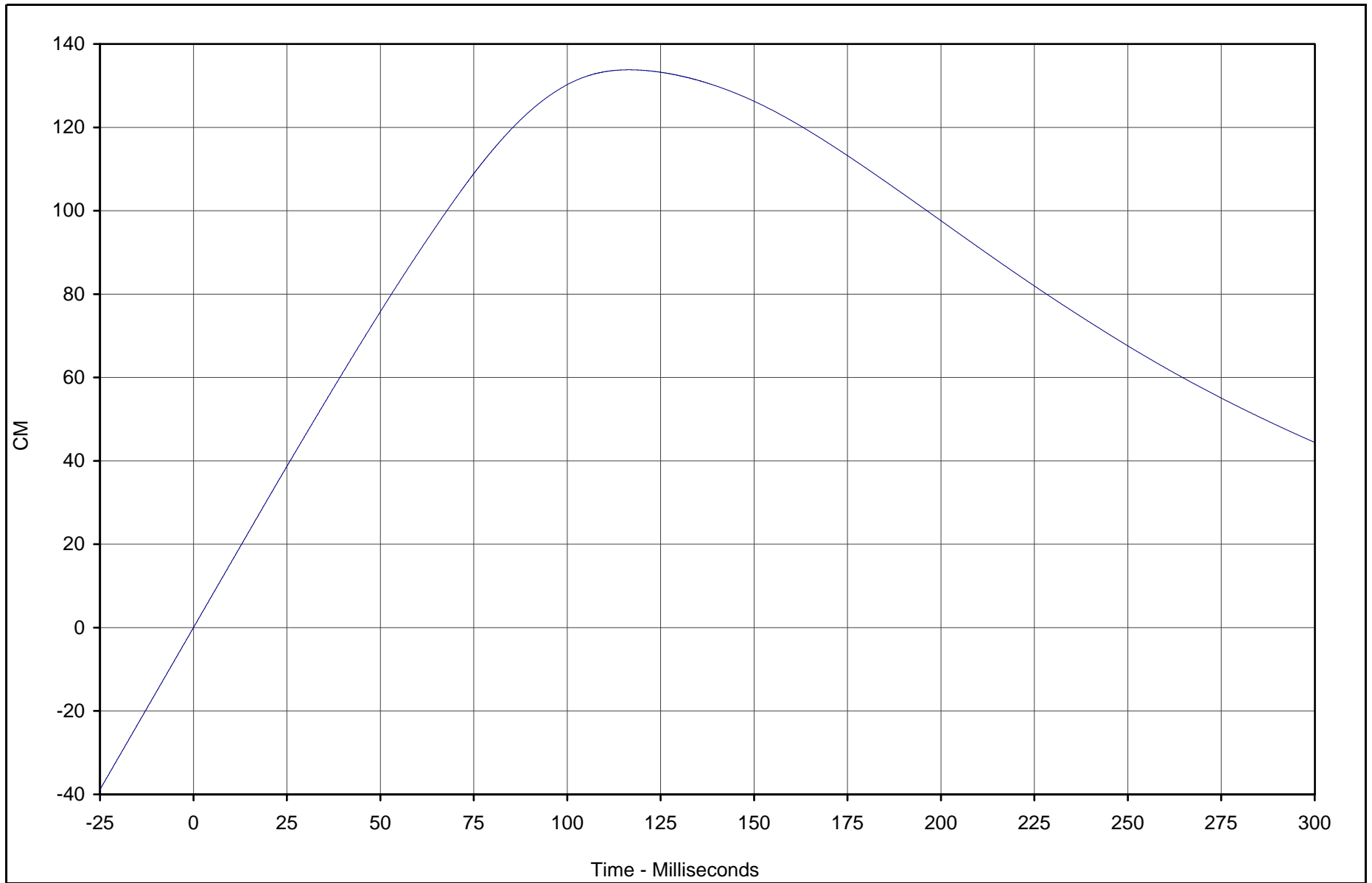
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-64



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X Displ.	045	IN2	CM	133.8	116.5	0.0	0.0	180



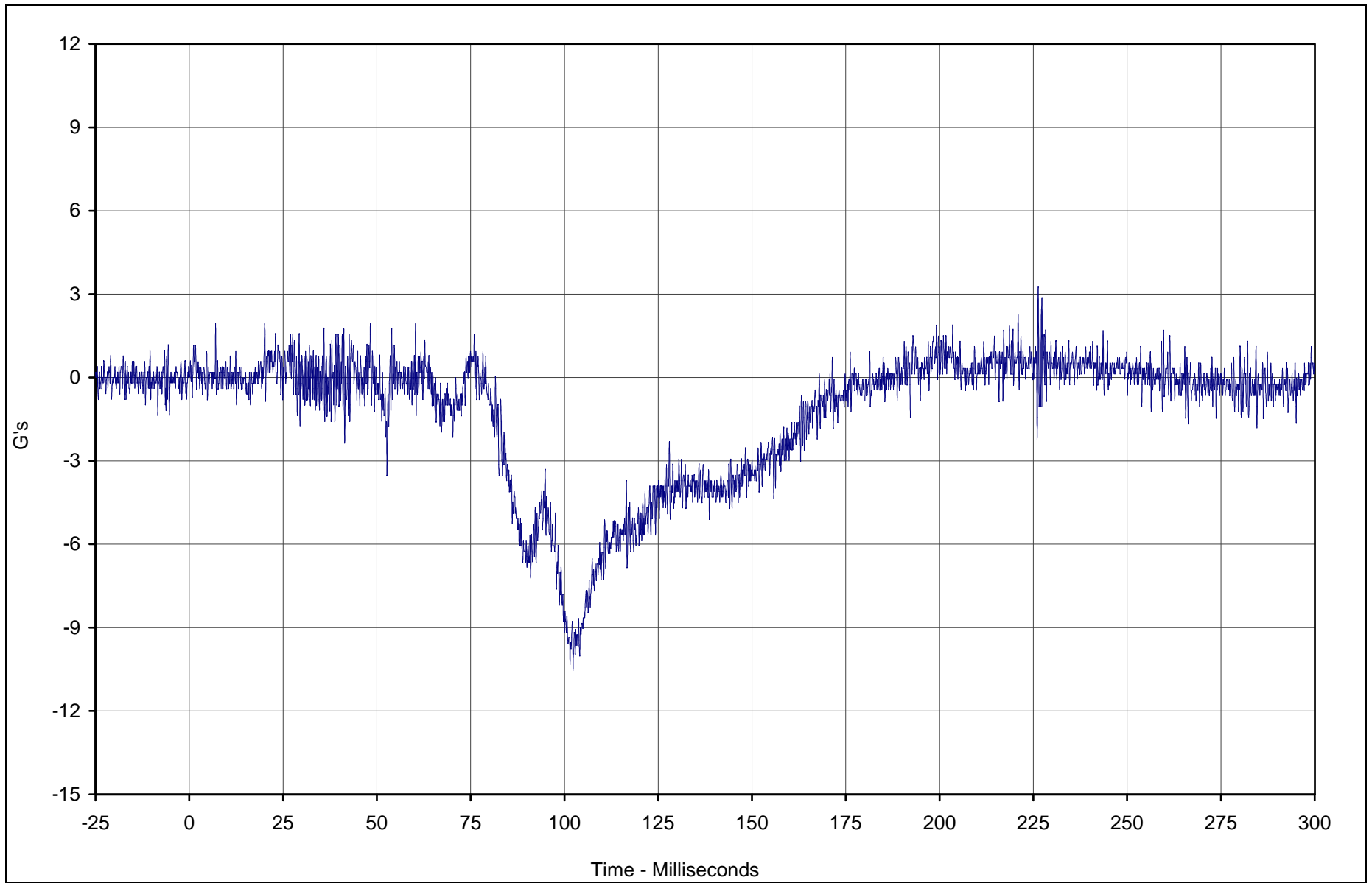
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Y	046	FIL	G's	3.2	226.3	-10.5	102.3	1000



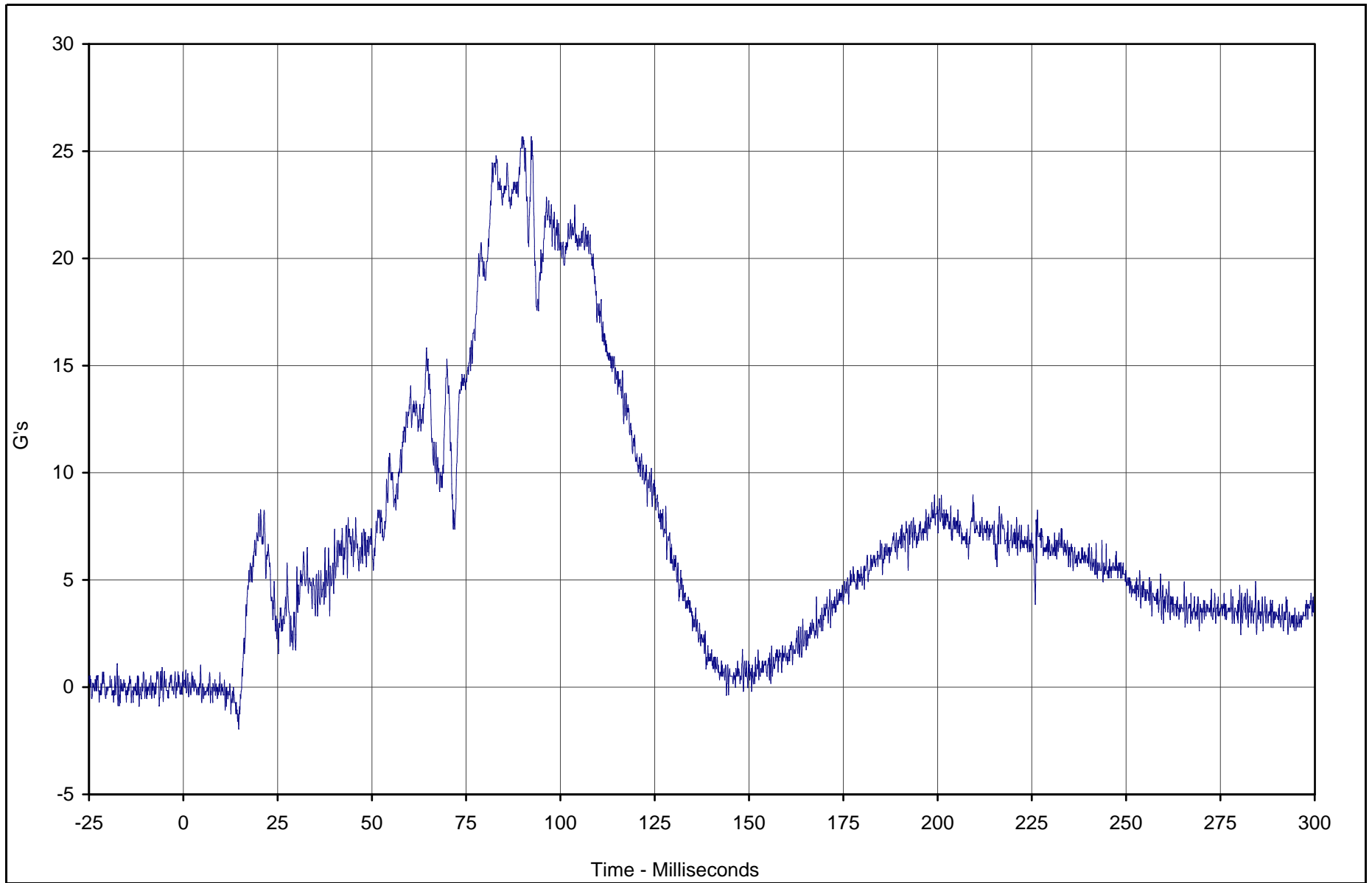
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-66



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Z	047	FIL	G's	25.7	89.8	-1.9	14.7	1000



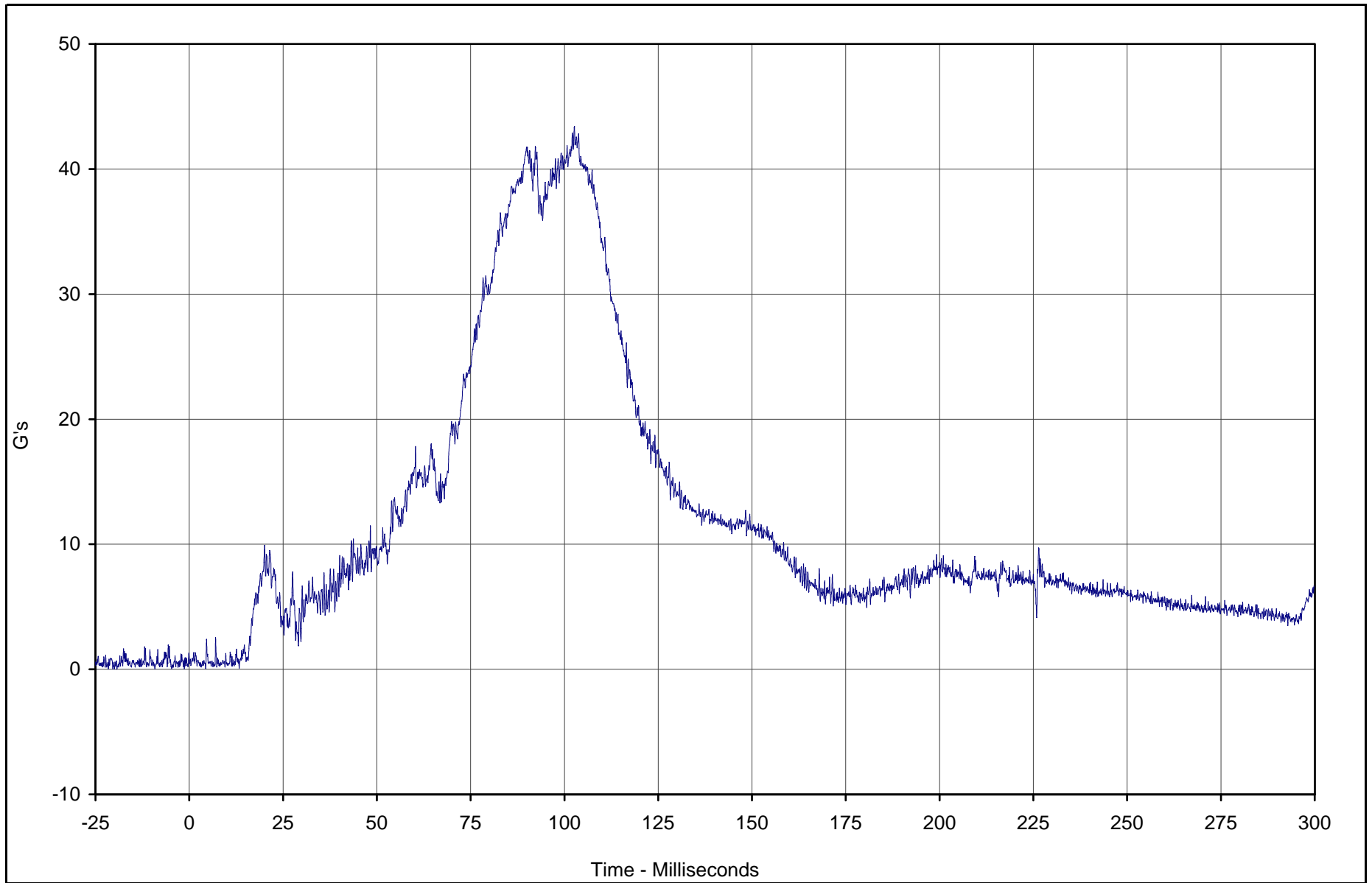
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Resultant Primary	045	RES	G's	43.4	102.7	0.1	13.3	1000



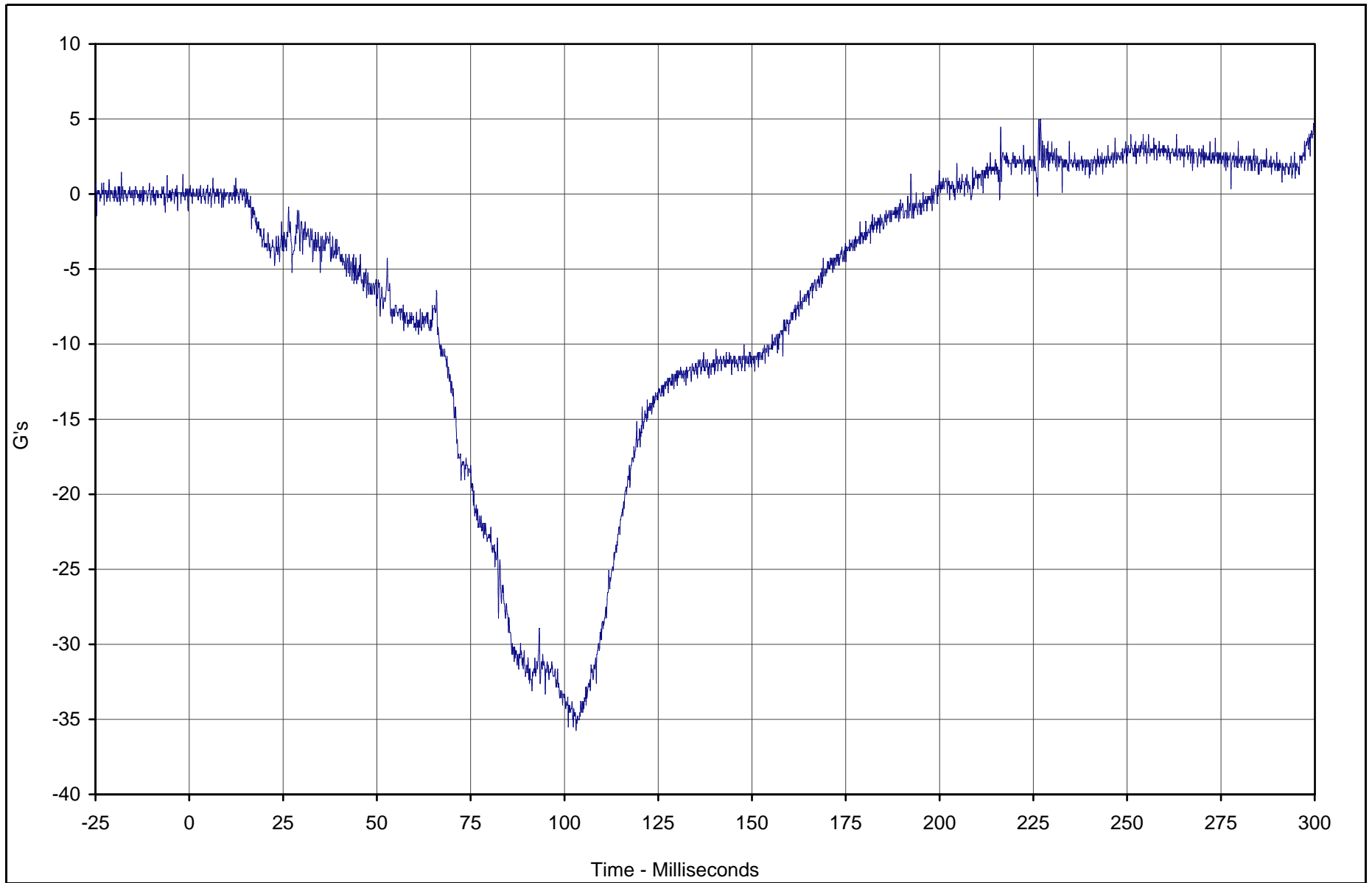
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-68



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X	048	FIL	G's	4.9	226.4	-35.8	103.1	1000



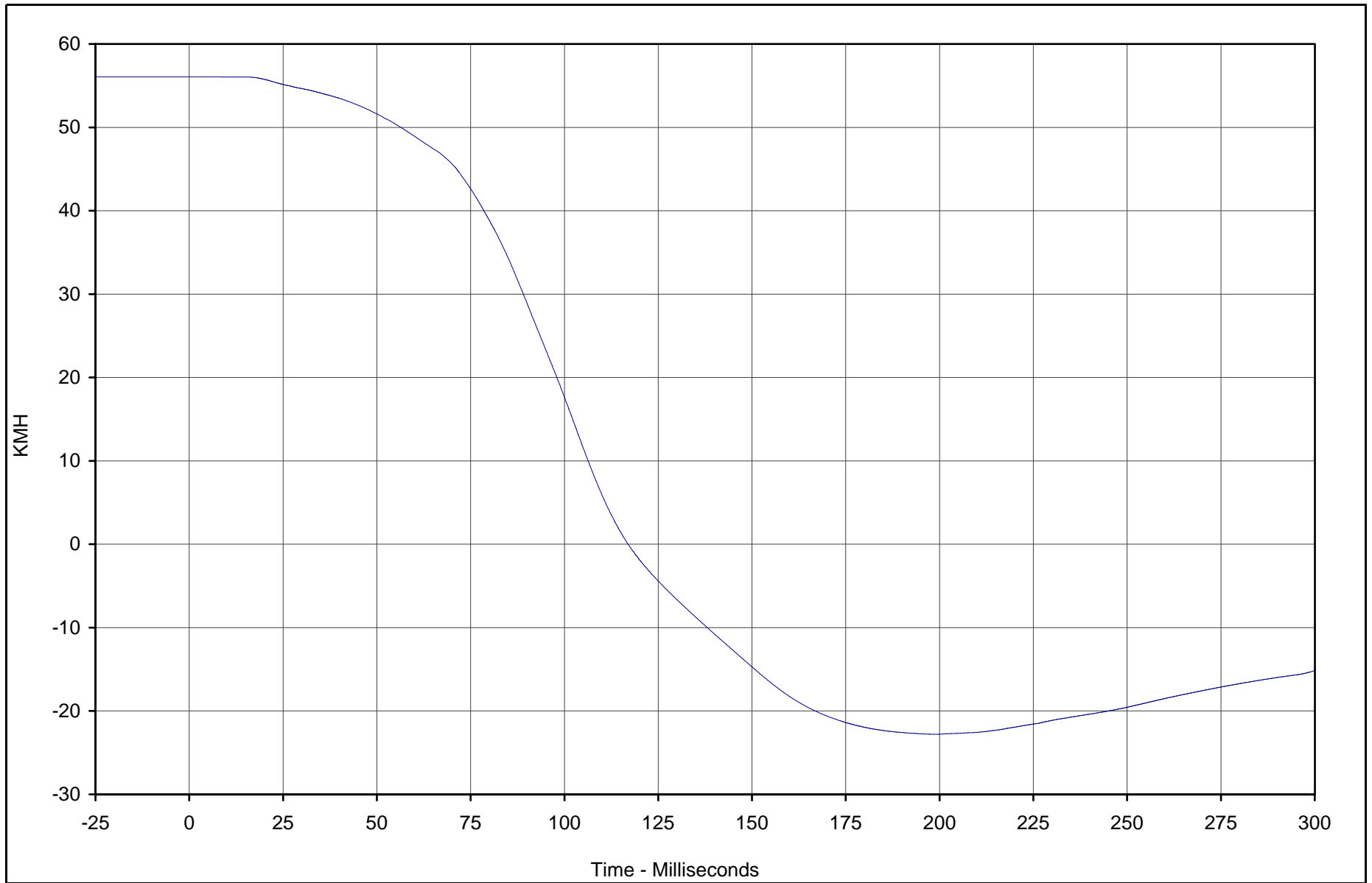
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X Velocity	048	IN1	KMH	56.1	1.4	-22.8	198.6	180



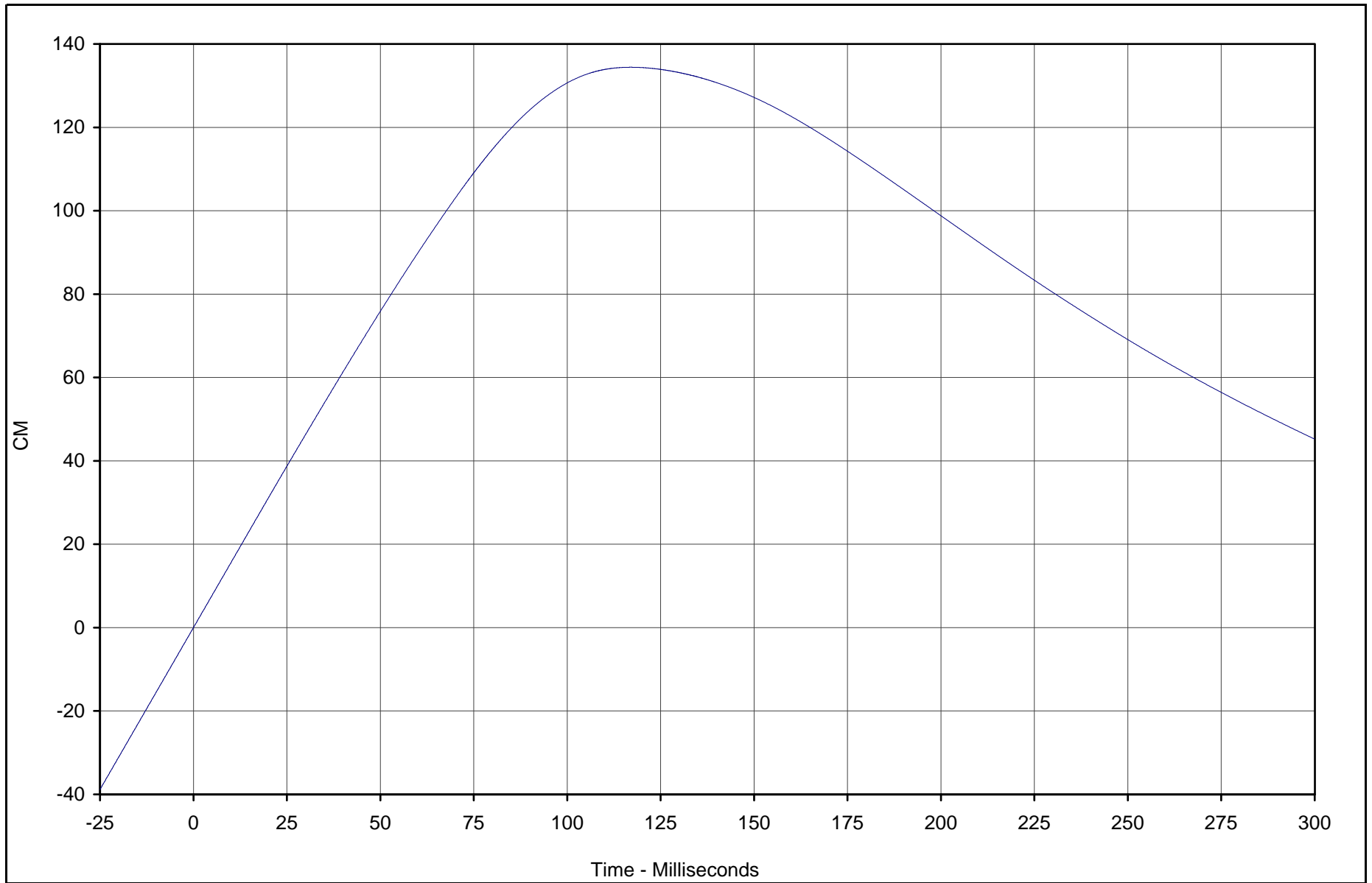
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X Displ.	048	IN2	CM	134.4	117.0	0.0	0.0	180



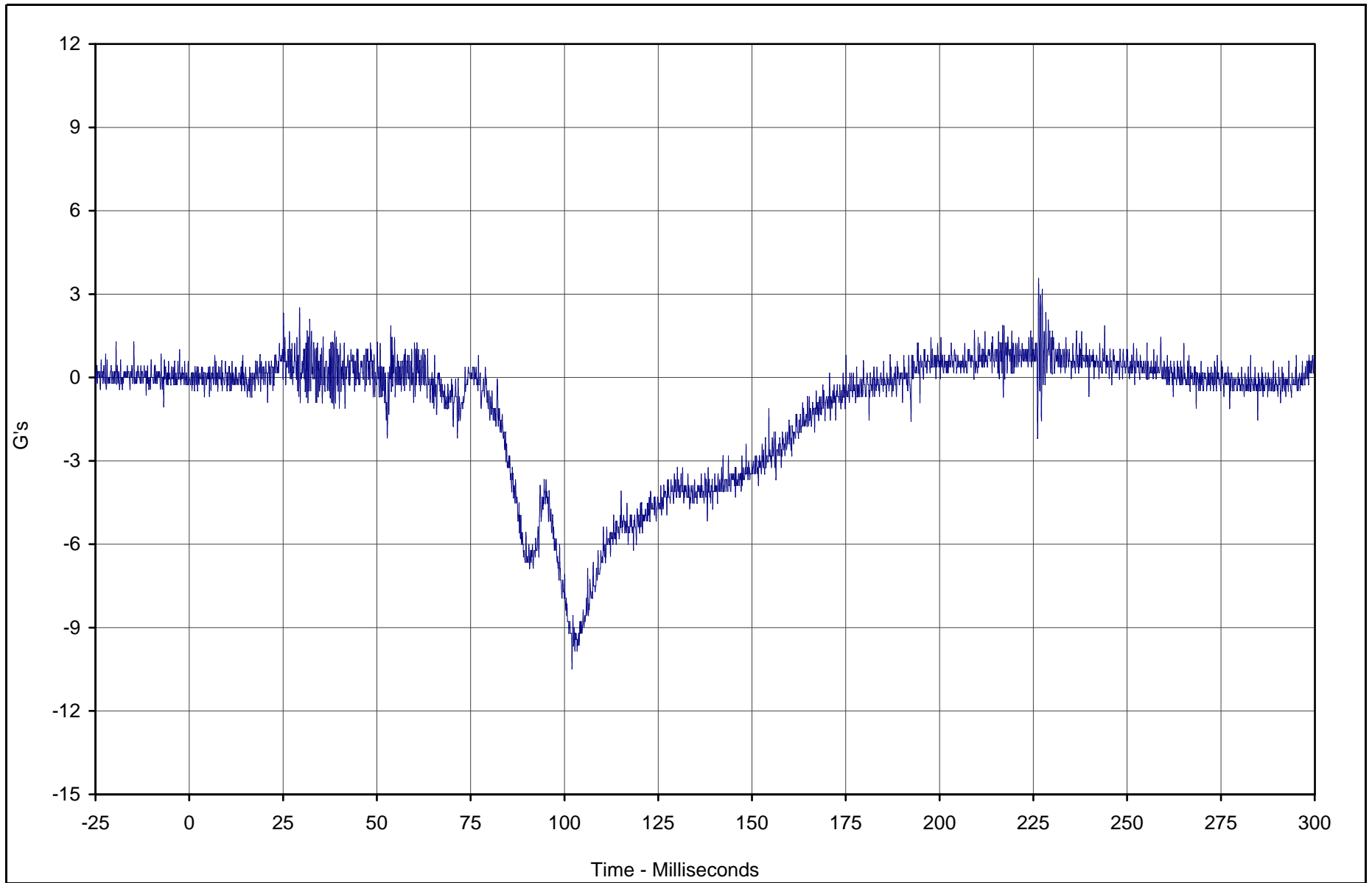
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-71



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant Y	049	FIL	G's	3.6	226.4	-10.5	102.0	1000



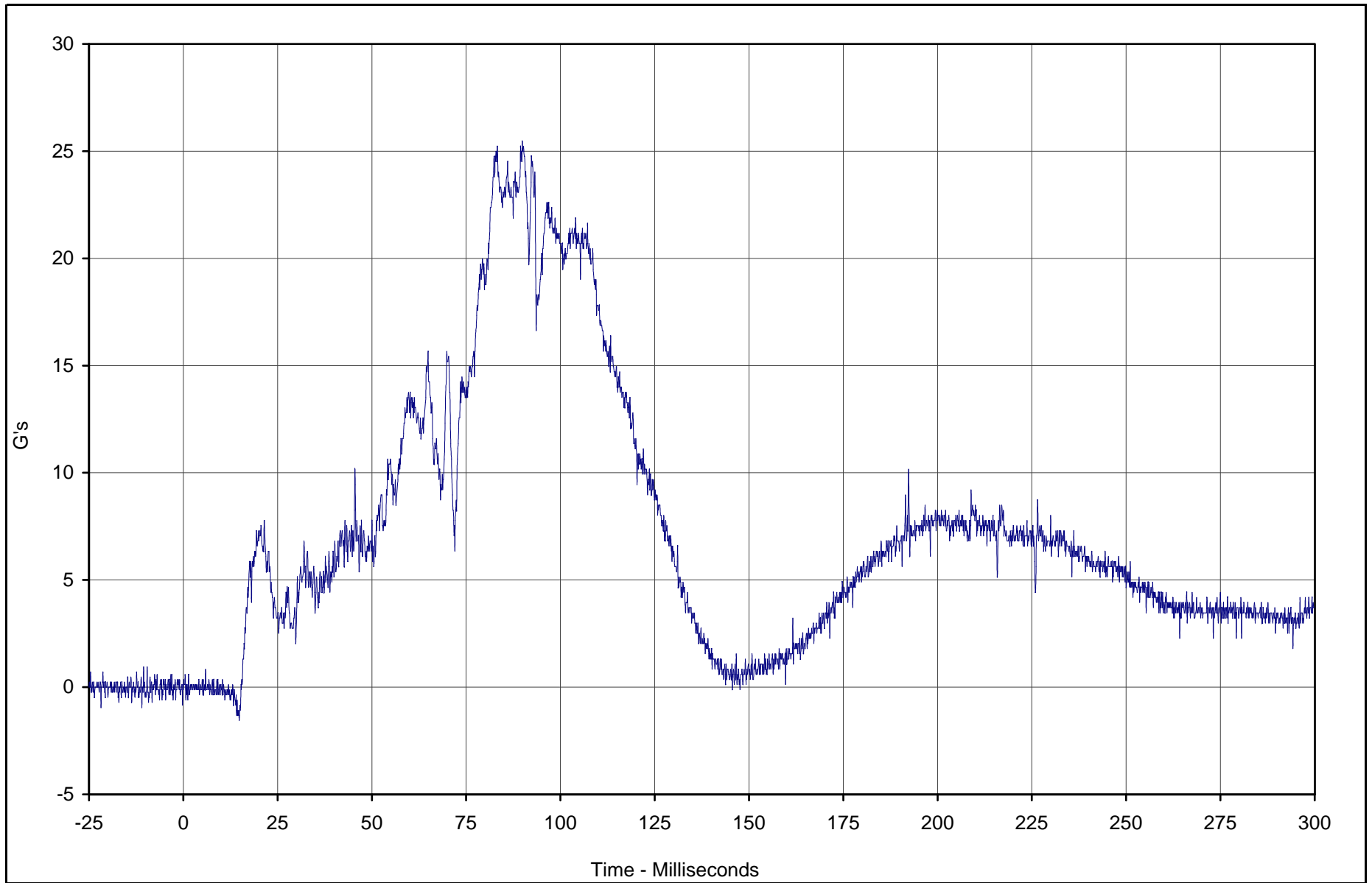
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant Z	050	FIL	G's	25.5	89.9	-1.6	14.8	1000

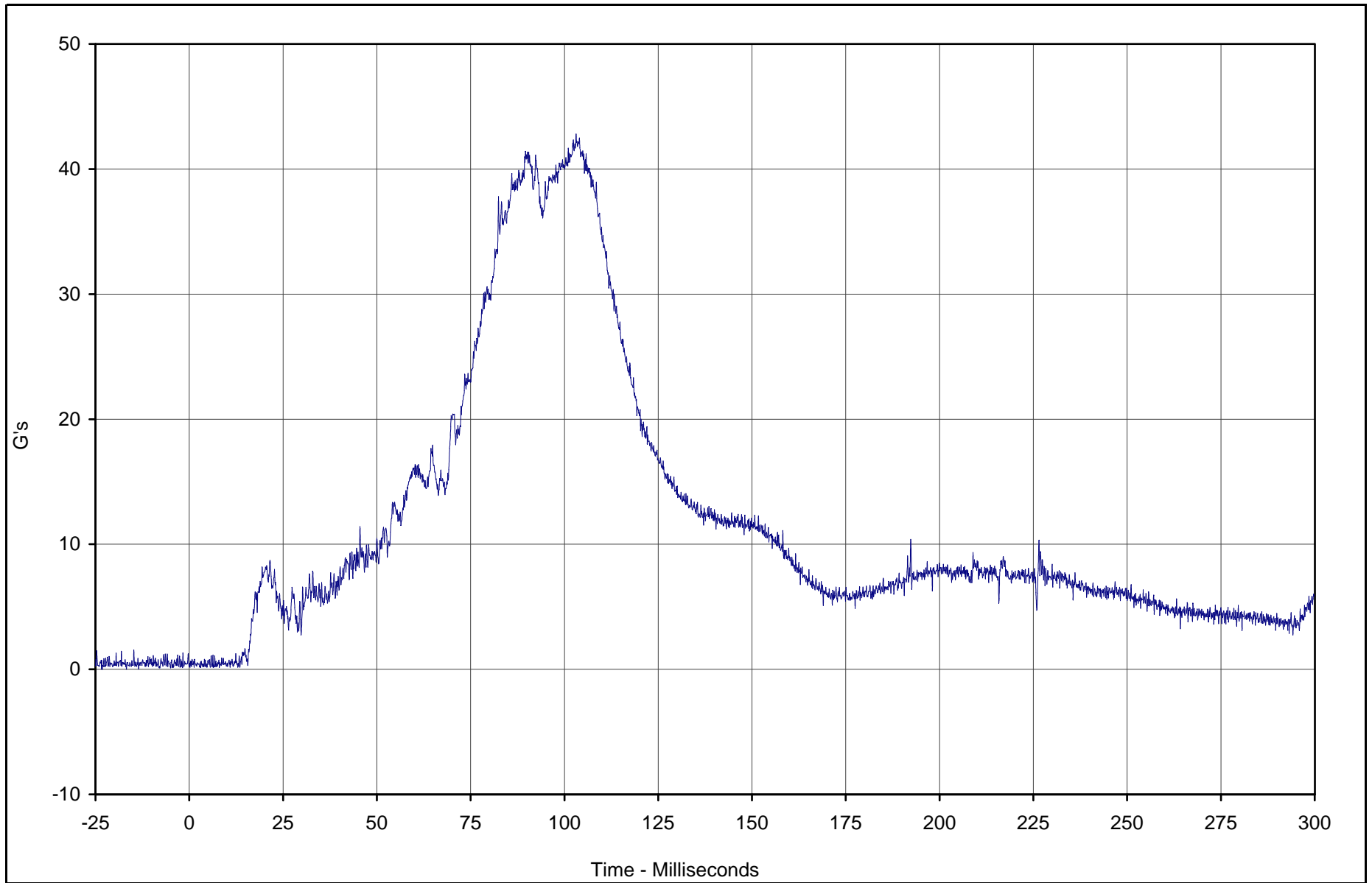


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Resultant Redundant	048	RES	G's	42.8	103.1	0.2	0.2	1000



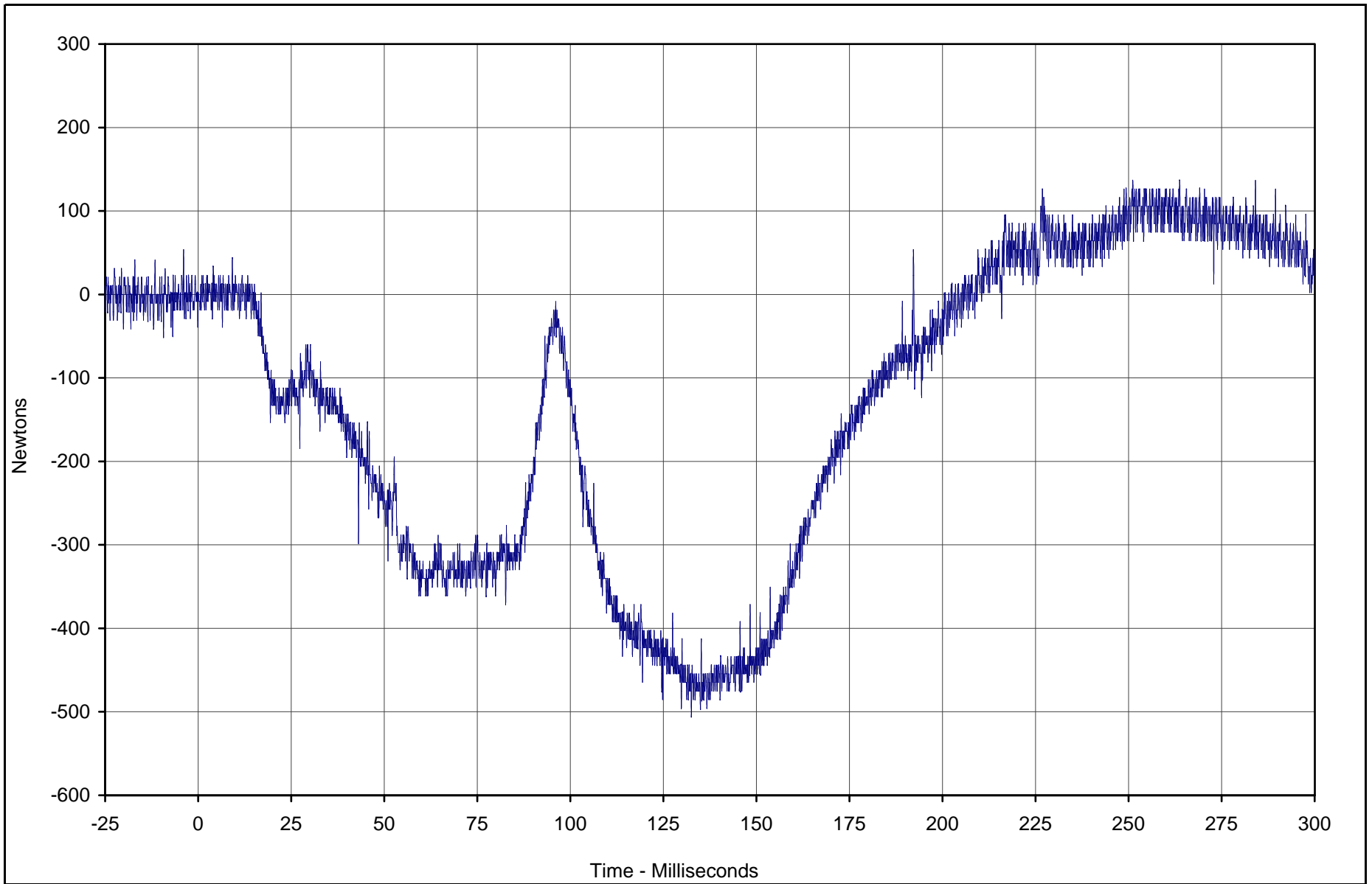
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force X	051	FIL	Newtons	136.8	251.1	-506.2	132.5	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

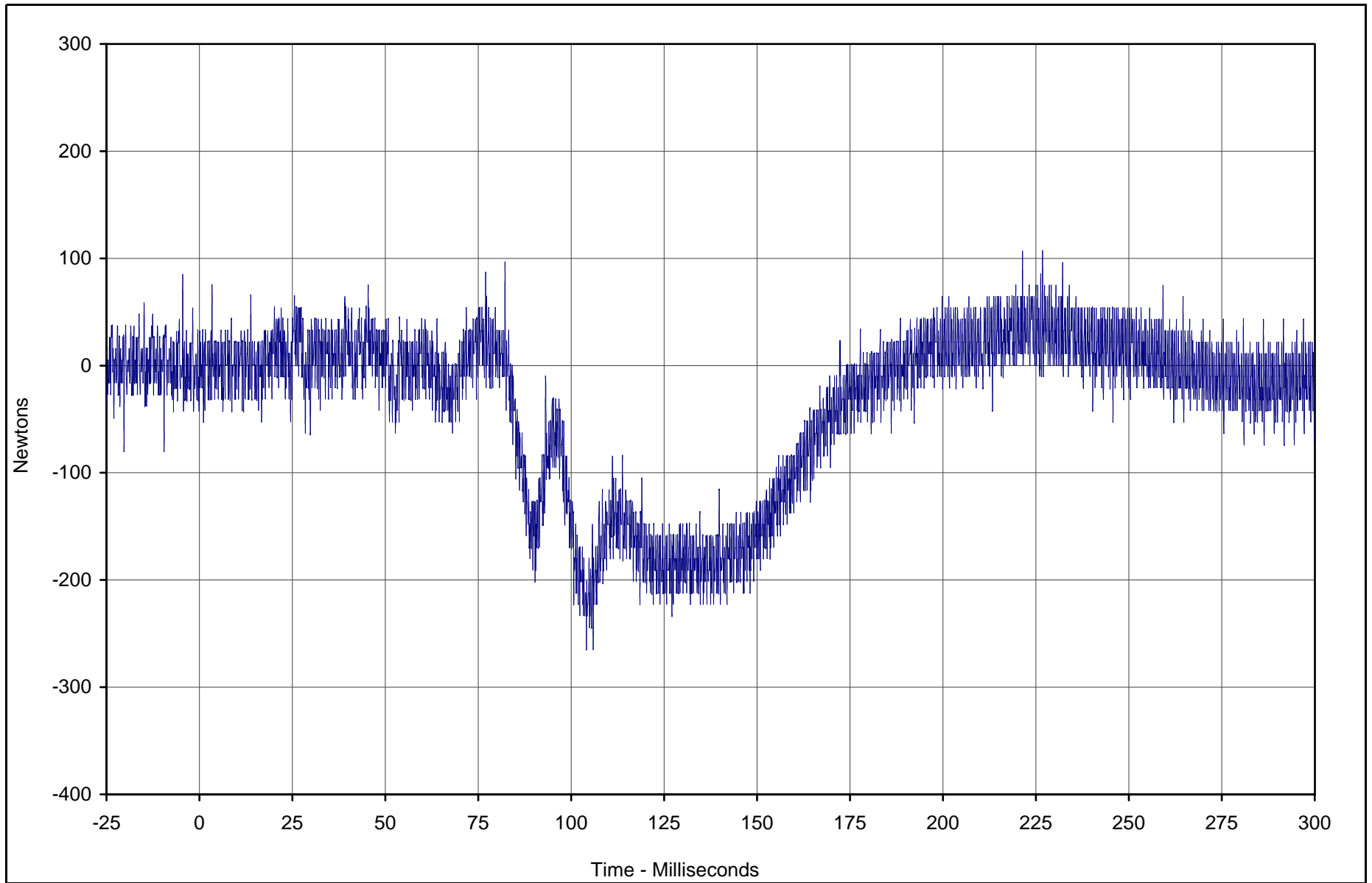
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-75



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Y	052	FIL	Newtons	106.9	221.4	-265.1	104.1	1000



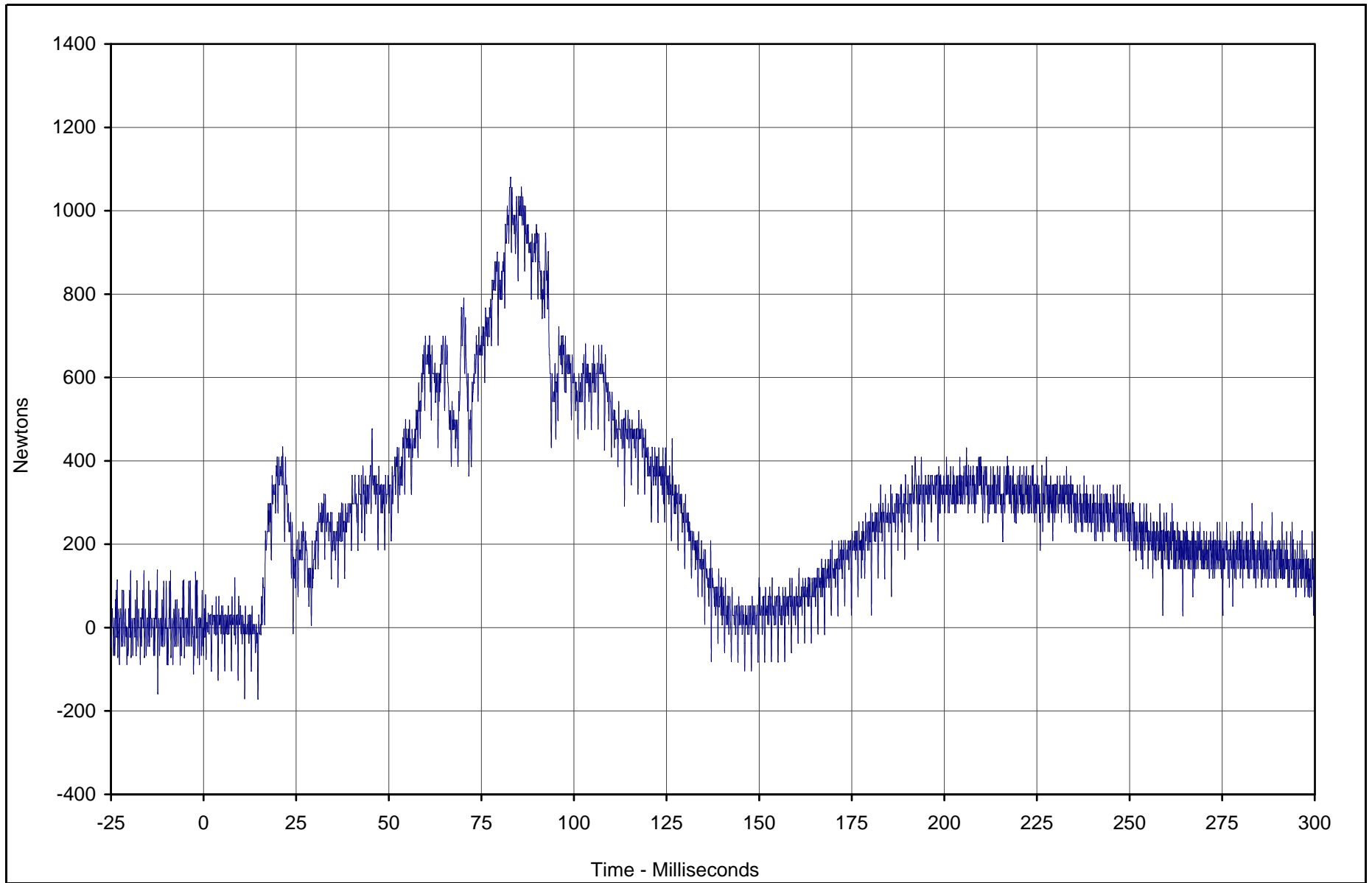
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Z	053	FIL	Newtons	1078.3	82.9	-171.2	11.1	1000

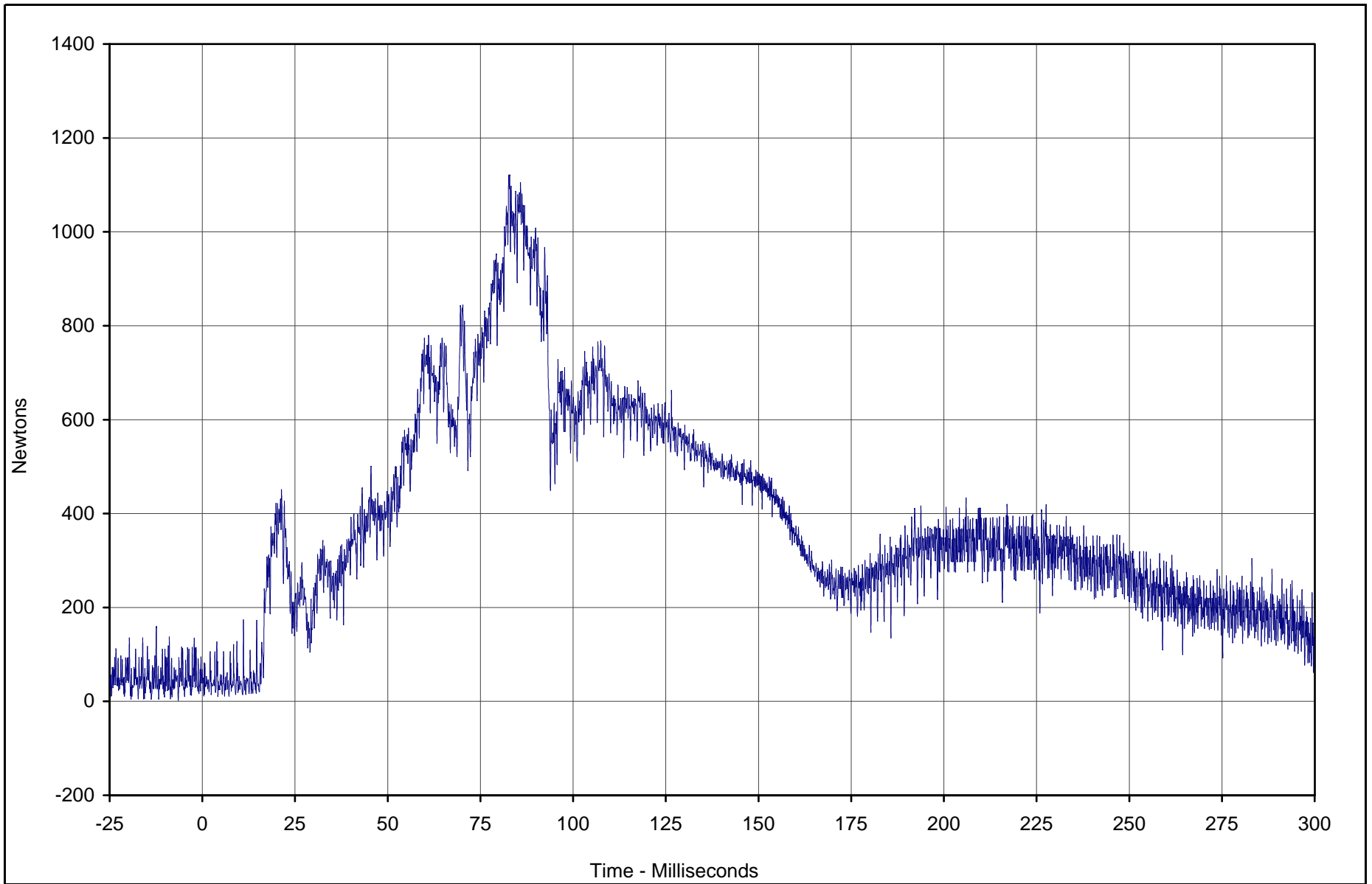


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Resultant	051	RES	Newtons	1119.6	82.6	11.1	4.2	1000

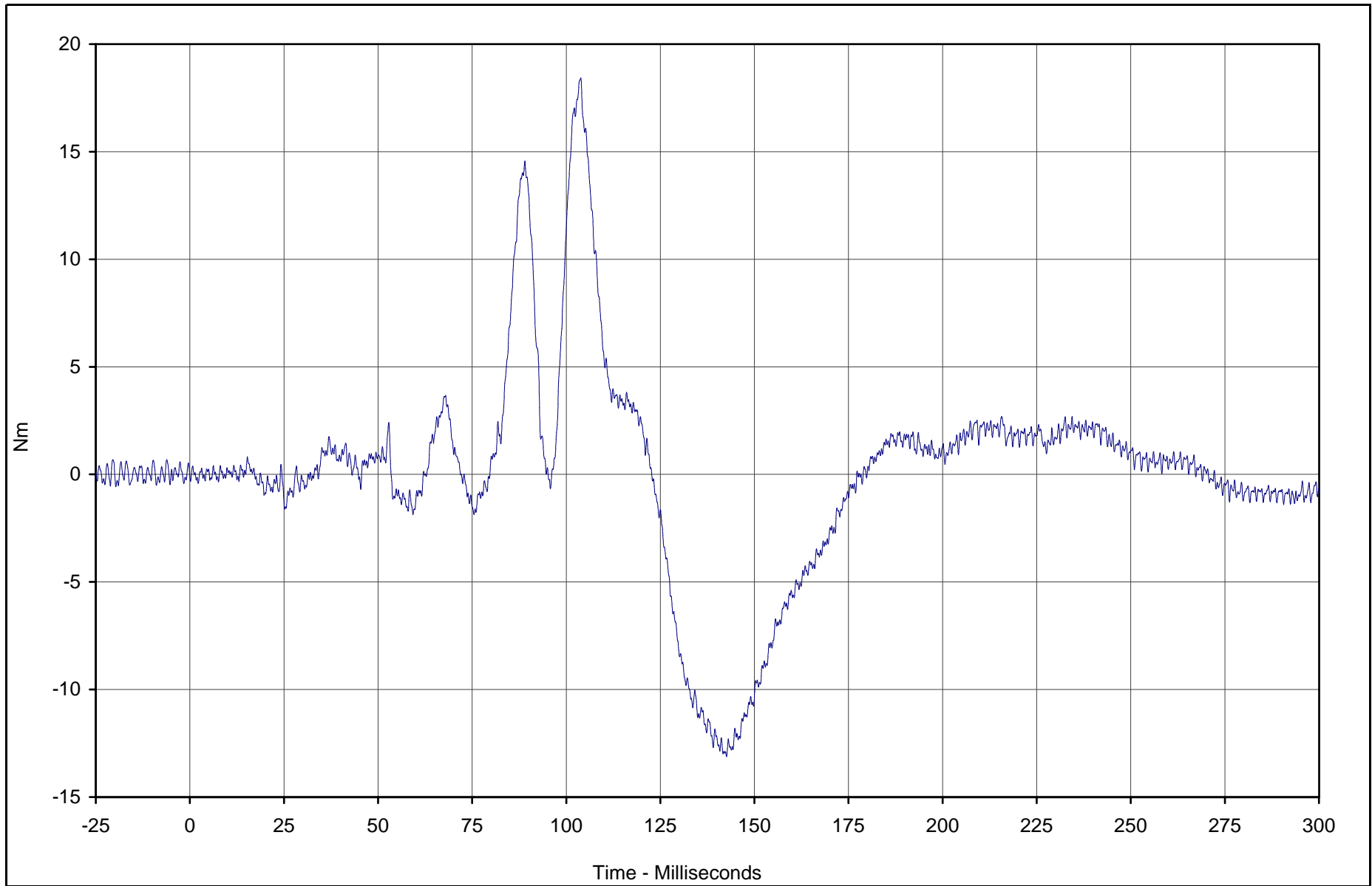


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment X	054	FIL	Nm	18.4	103.9	-13.1	142.6	600

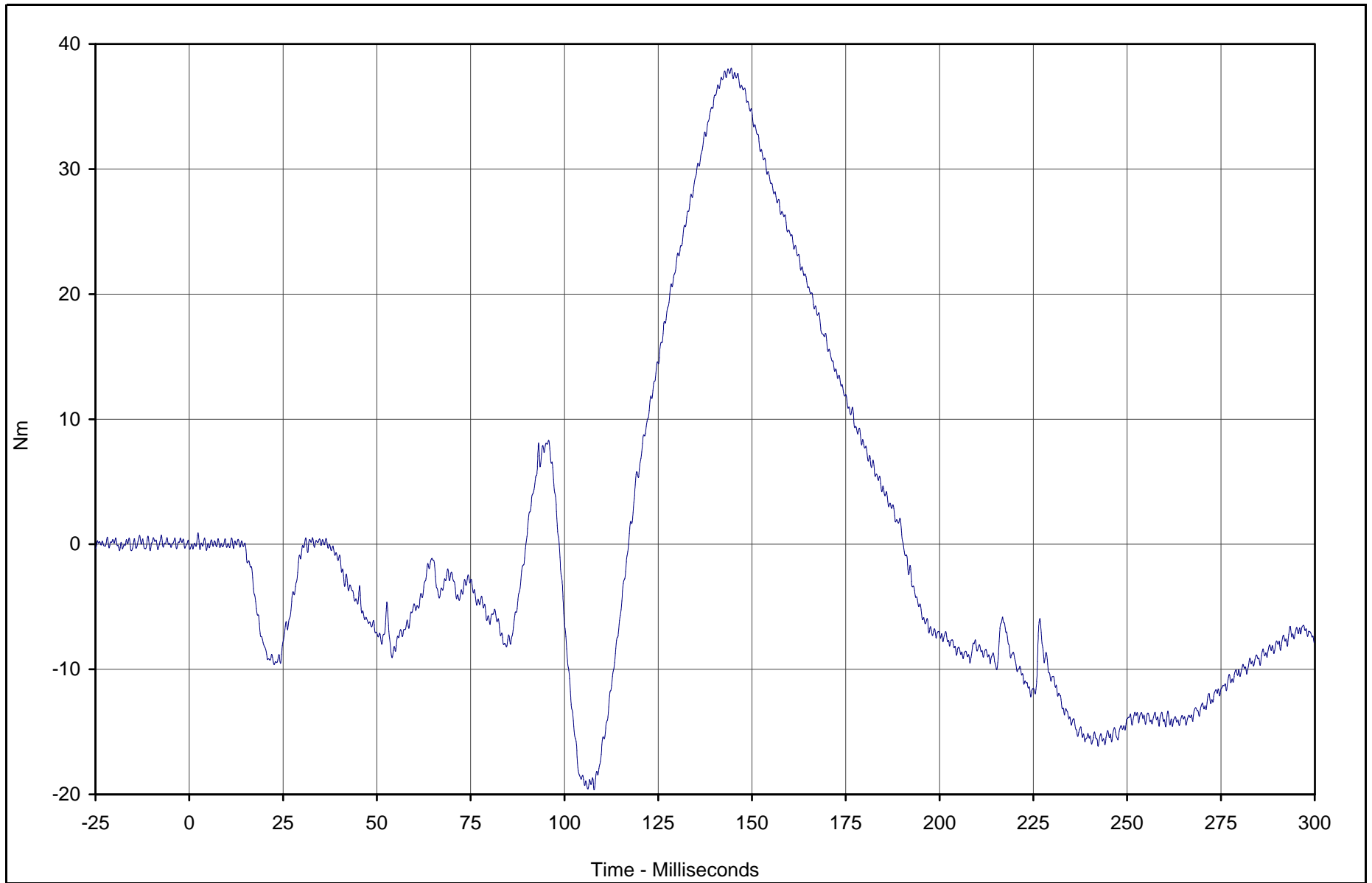


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Y	055	FIL	Nm	38.1	144.5	-19.6	107.9	600



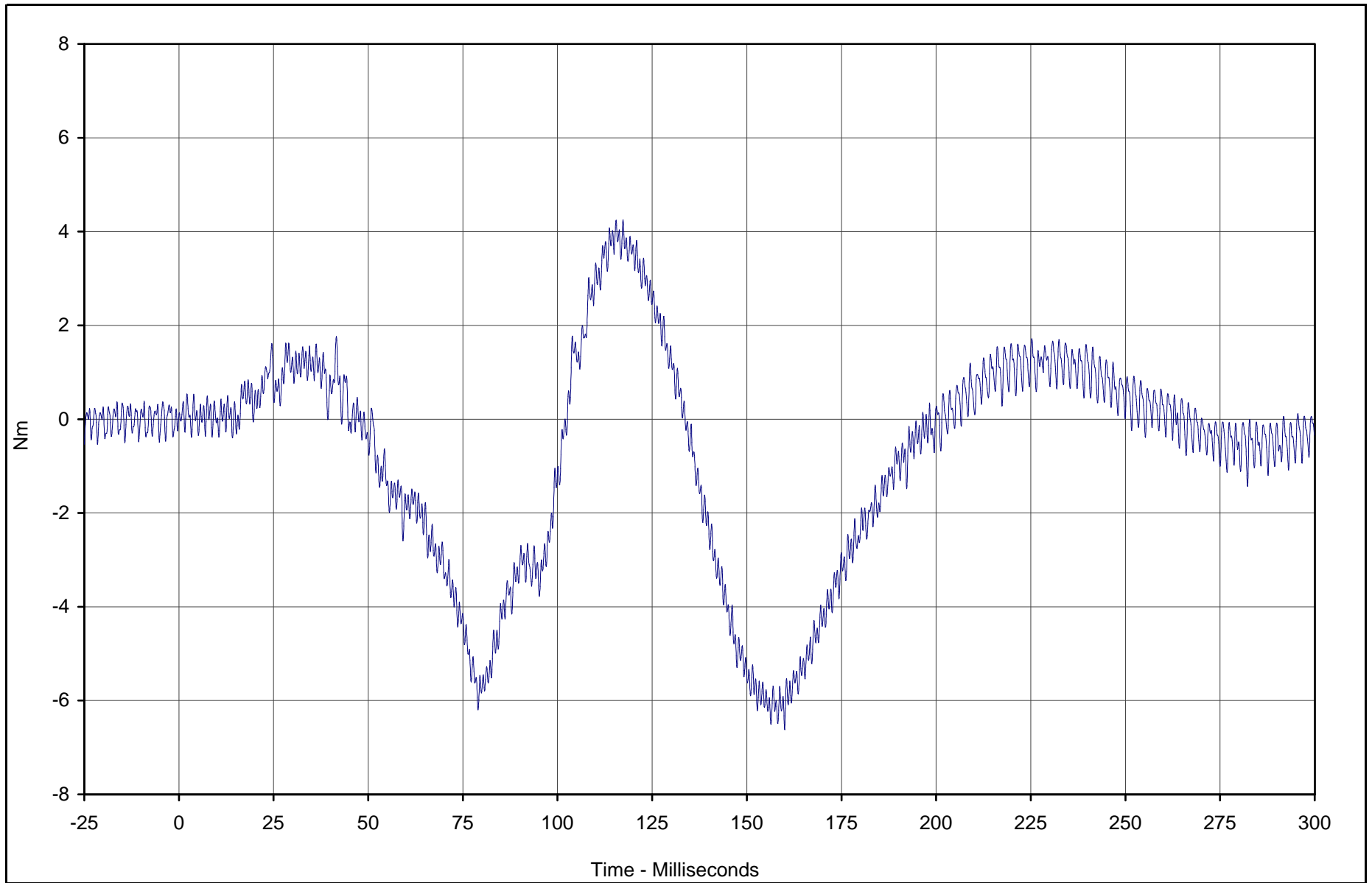
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-80



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Z	056	FIL	Nm	4.3	117.3	-6.6	160.0	600



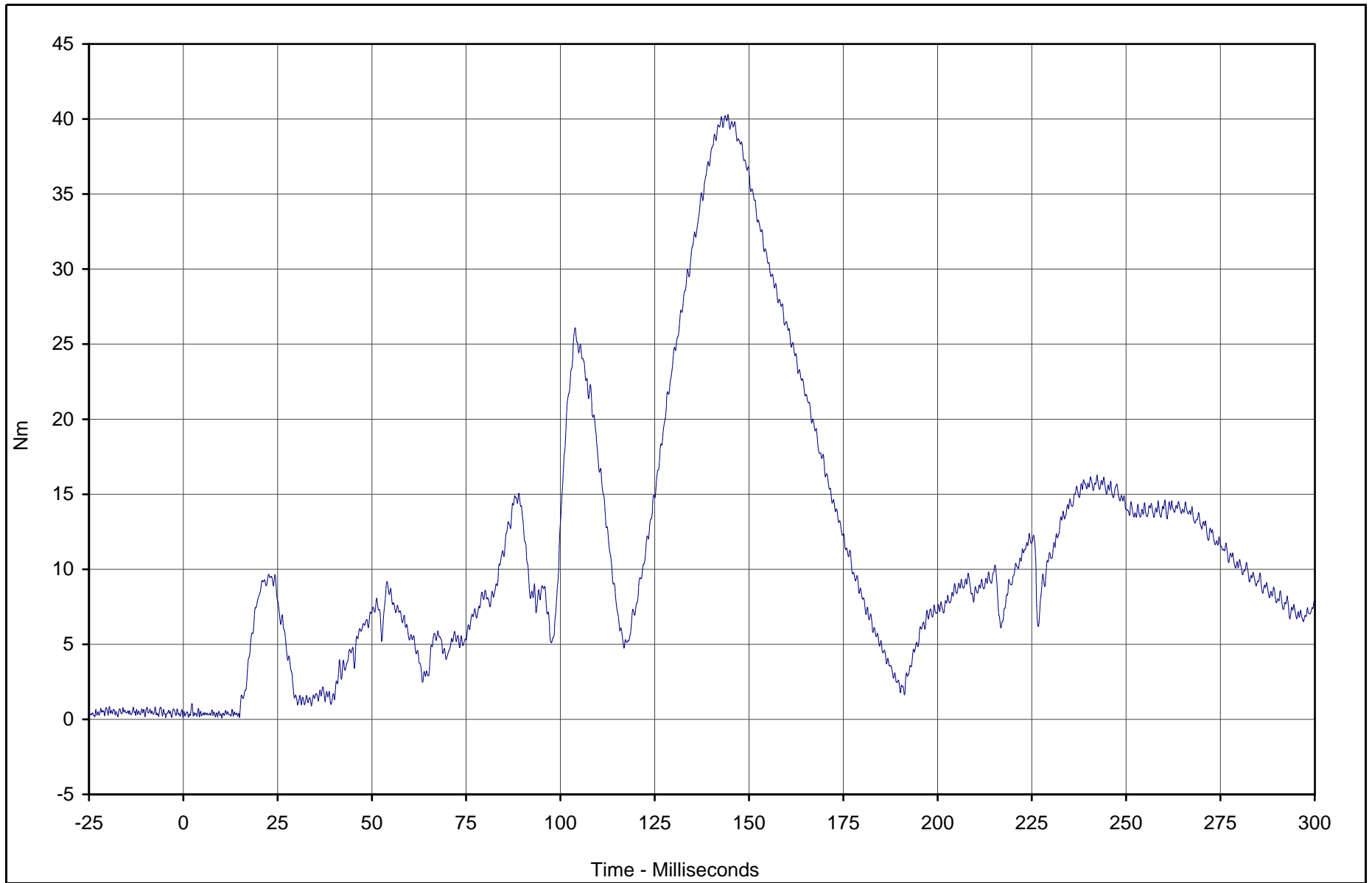
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Resultant	054	RES	Nm	40.3	144.4	0.1	10.2	600

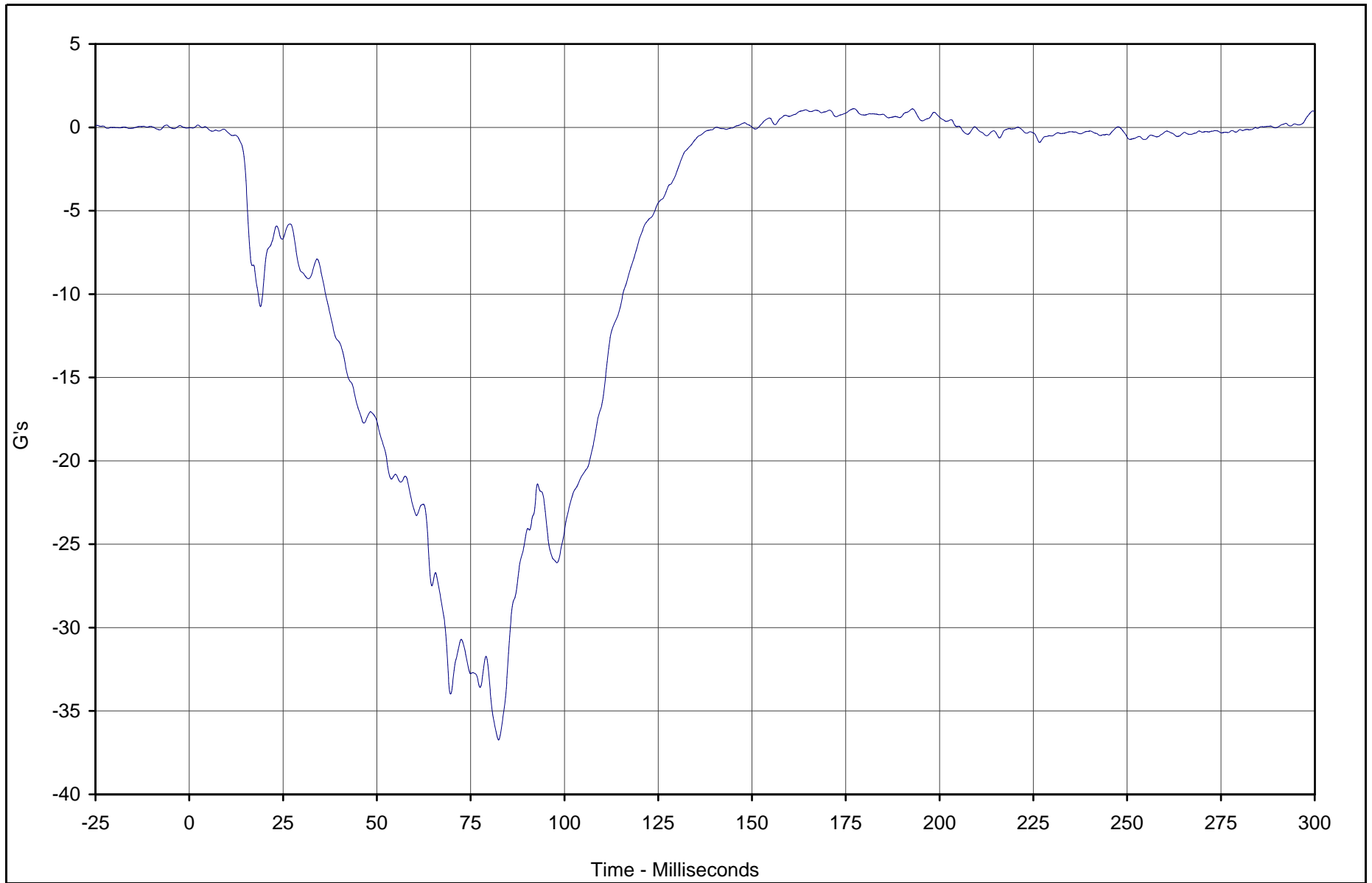


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X	057	FIL	G's	1.1	177.1	-36.7	82.5	180

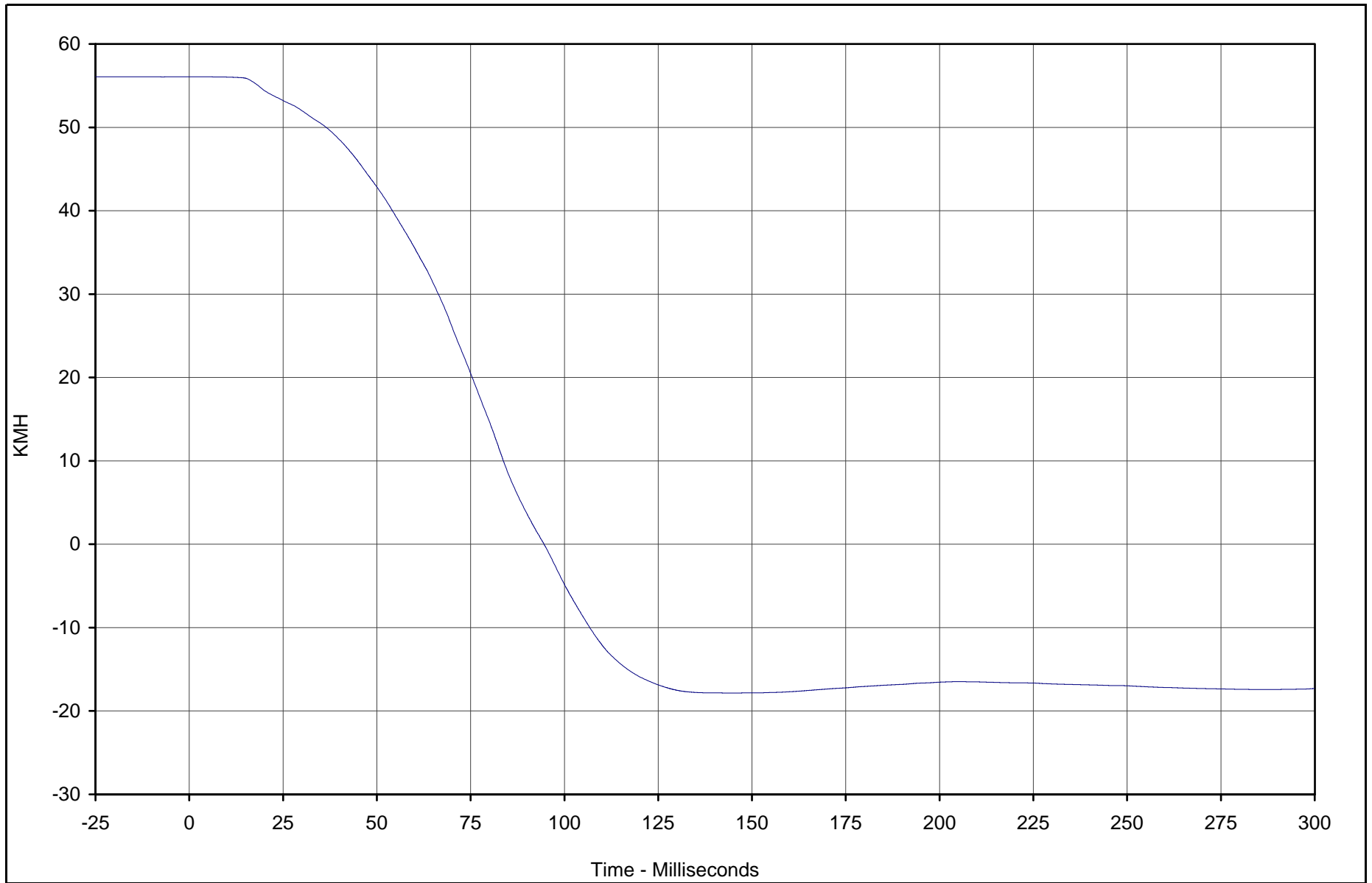


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X Velocity	057	IN1	KMH	56.1	4.6	-17.8	145.1	180



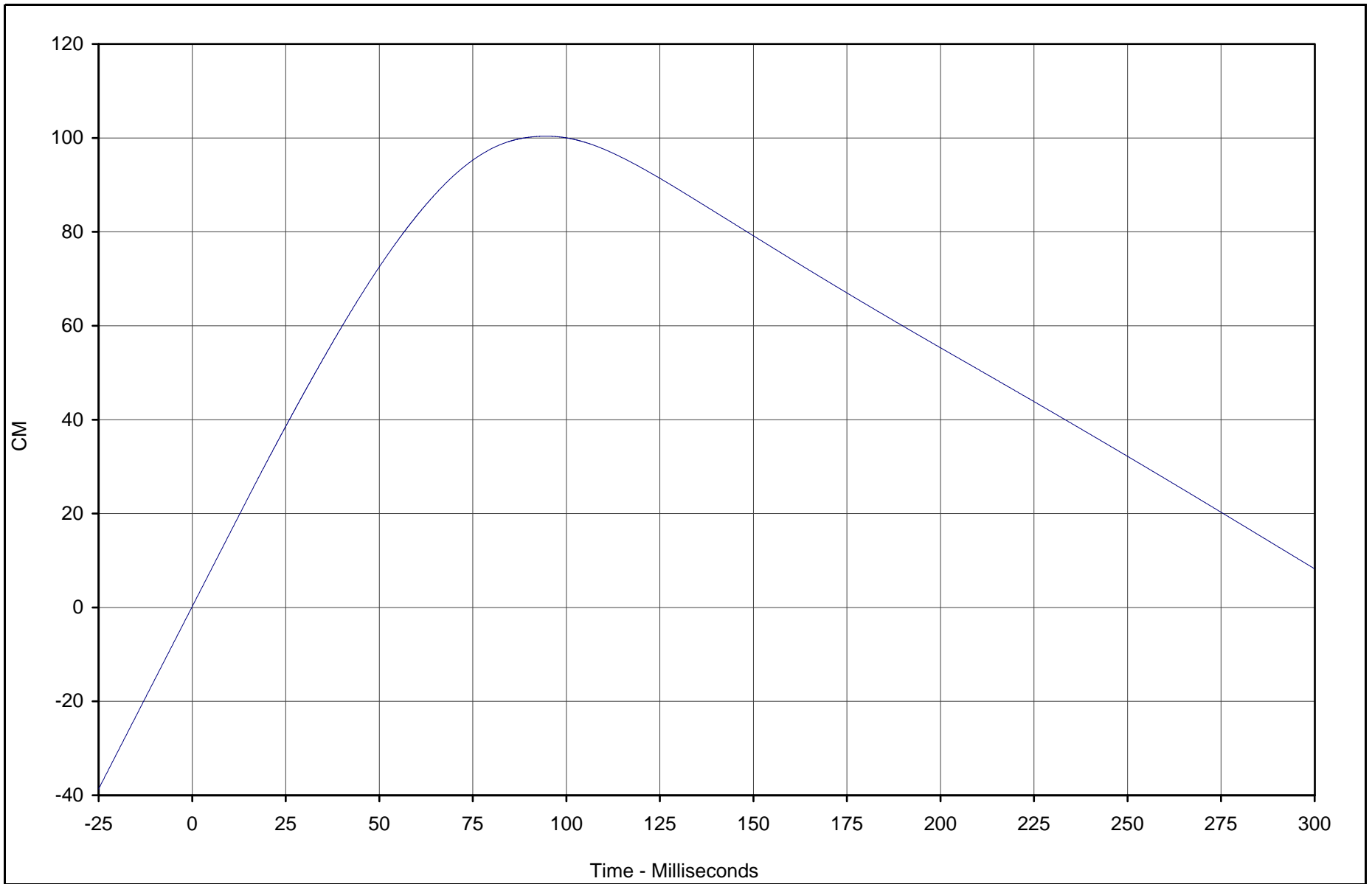
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-84



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X Displ.	057	IN2	CM	100.4	94.6	0.2	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

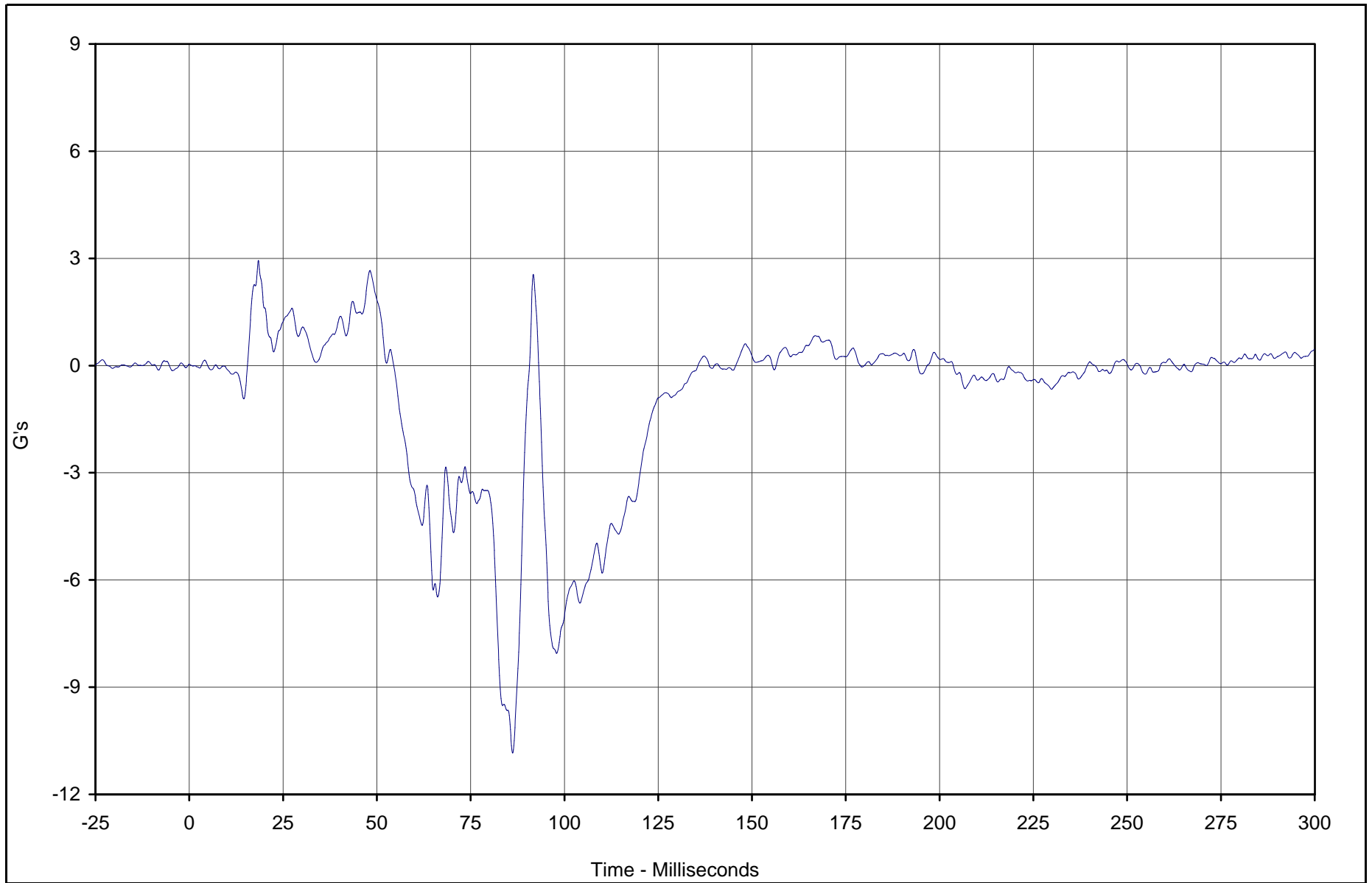
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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B-85

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary Y	058	FIL	G's	2.9	18.4	-10.8	86.2	180

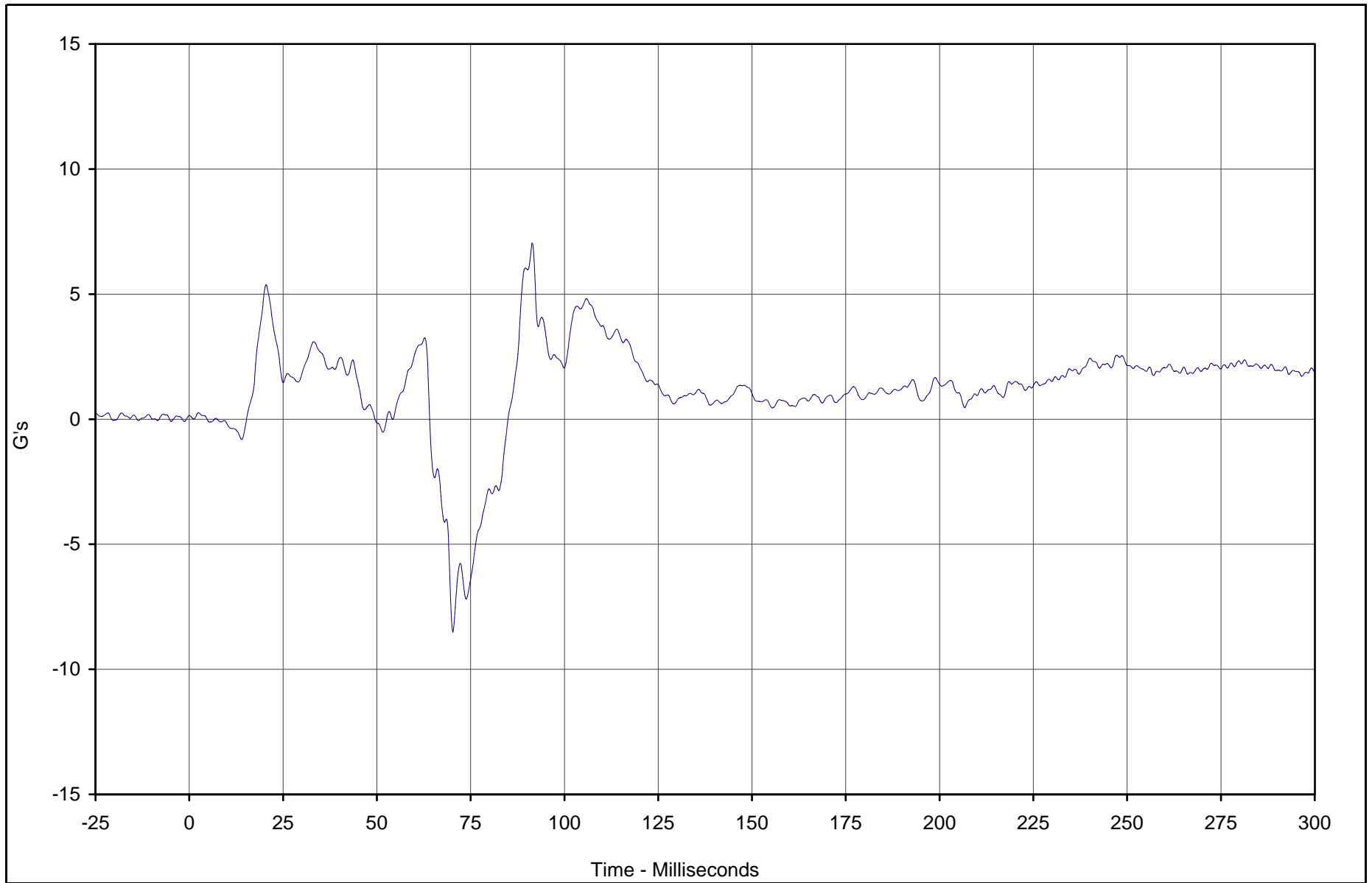


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary Z	059	FIL	G's	7.0	91.4	-8.5	70.3	180

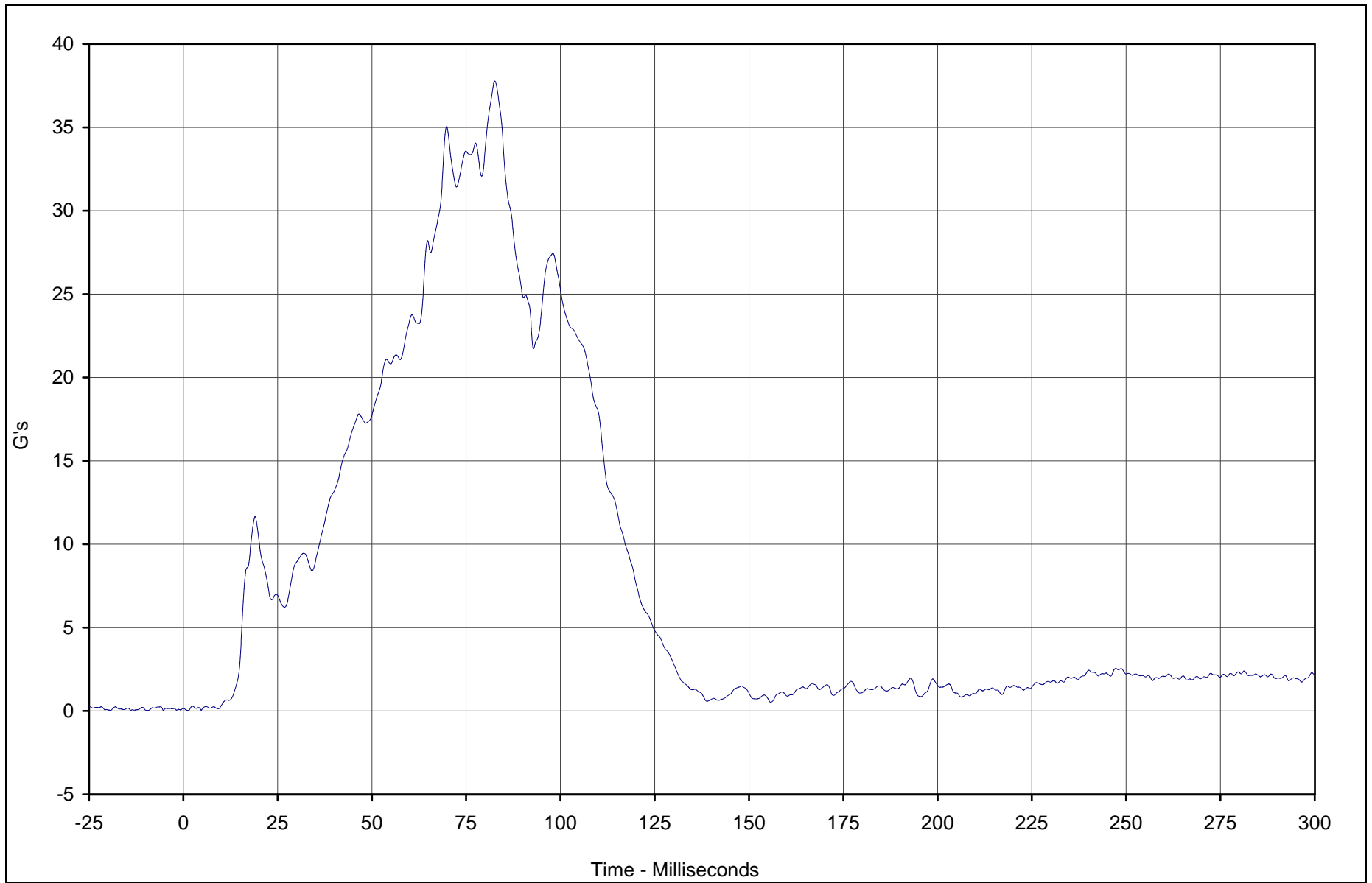


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Resultant Primary	057	RES	G's	37.8	82.6	0.0	1.4	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

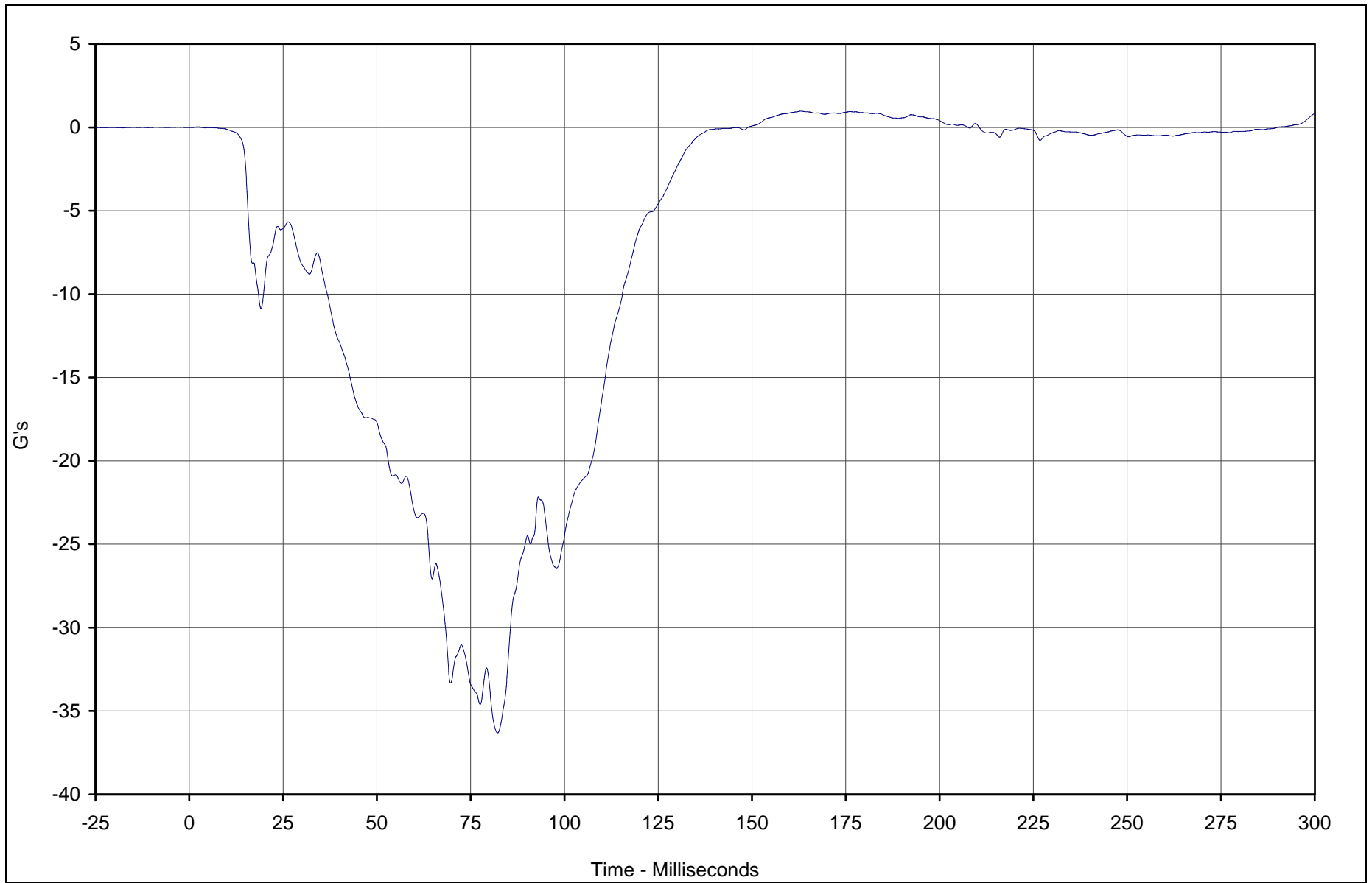
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-88

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X	060	FIL	G's	1.0	163.0	-36.3	82.2	180

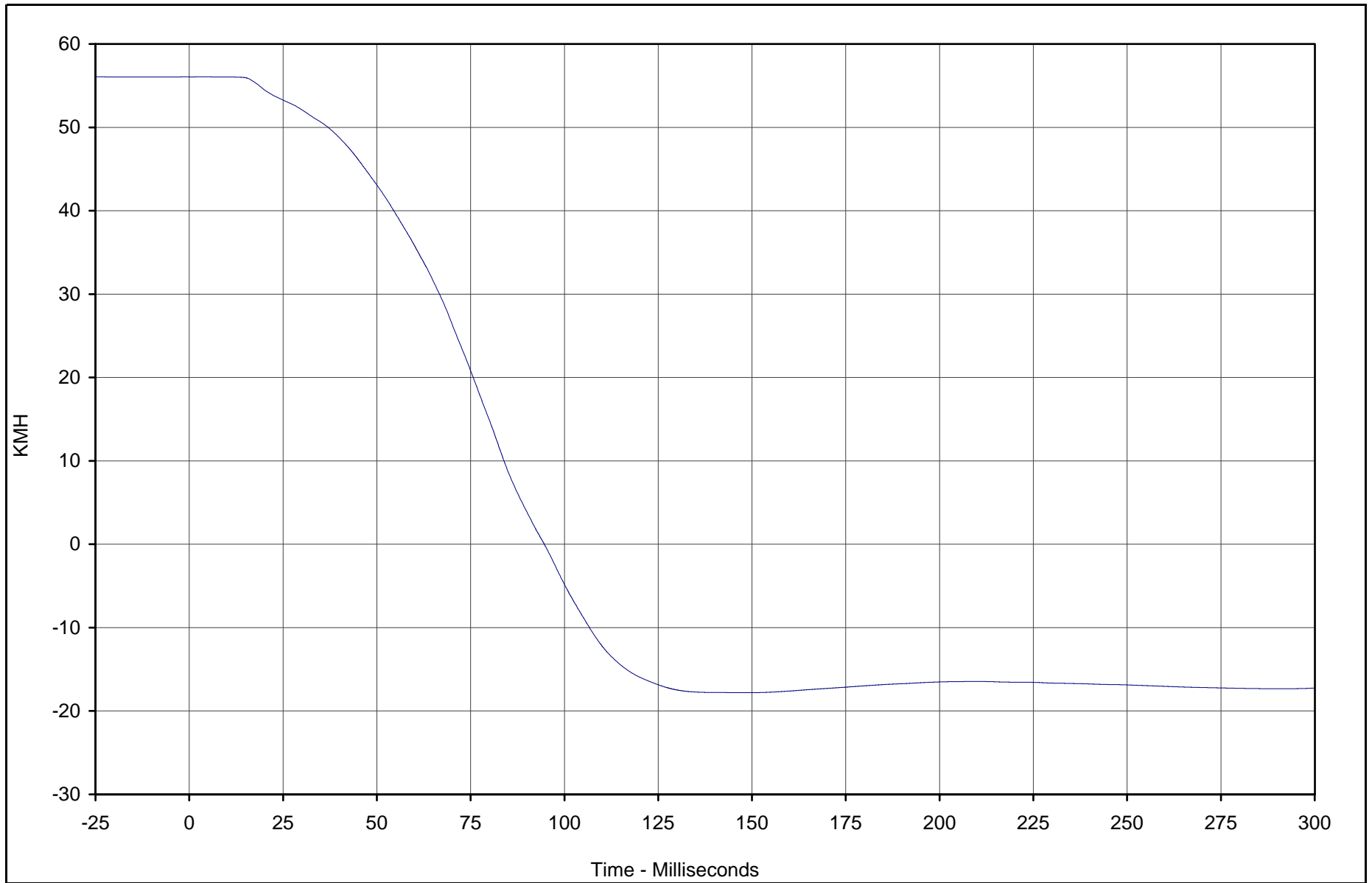


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X Velocity	060	IN1	KMH	56.1	3.4	-17.8	148.9	180



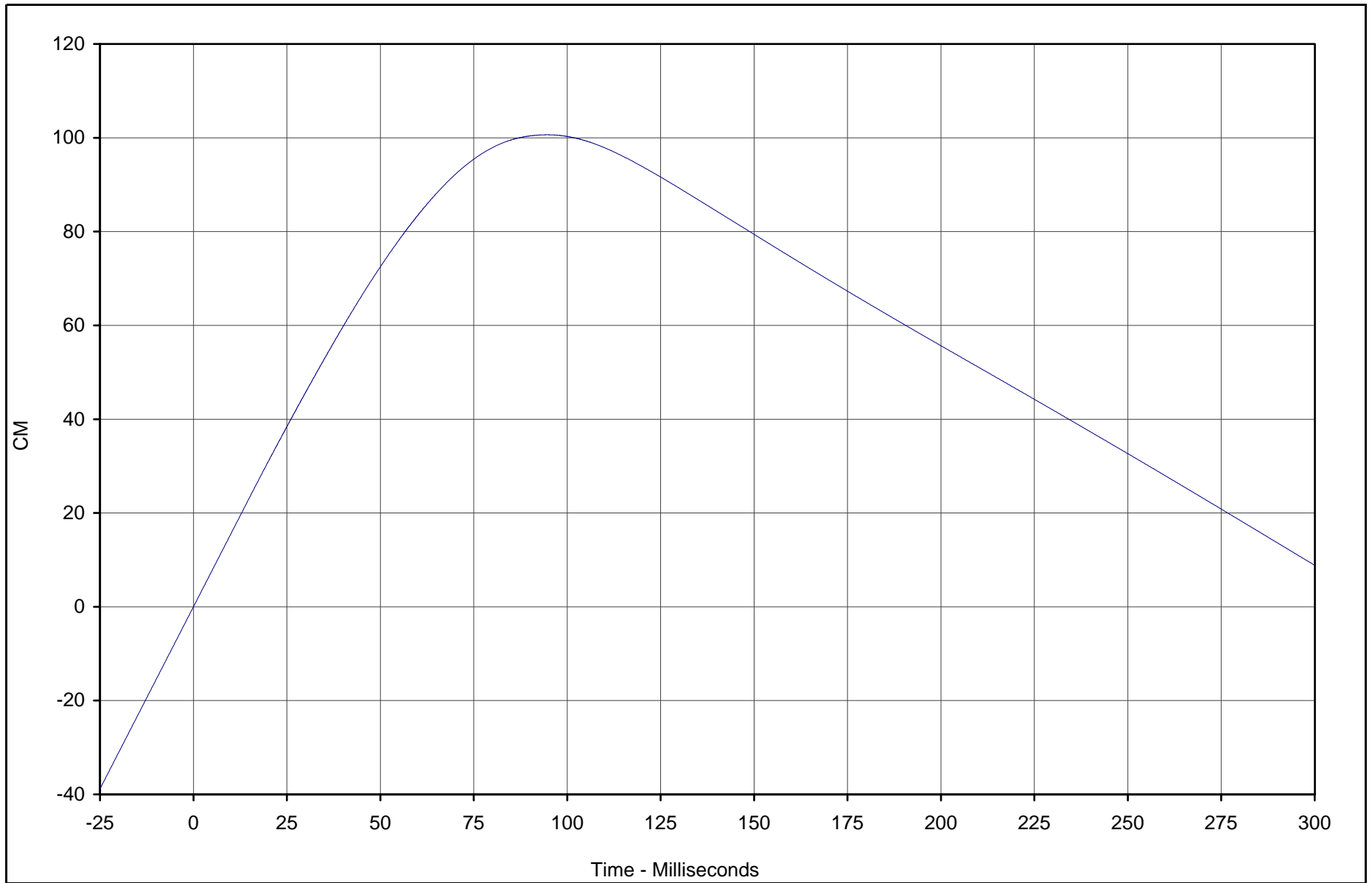
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-90



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X Displ.	060	IN2	CM	100.6	94.6	0.0	0.0	180



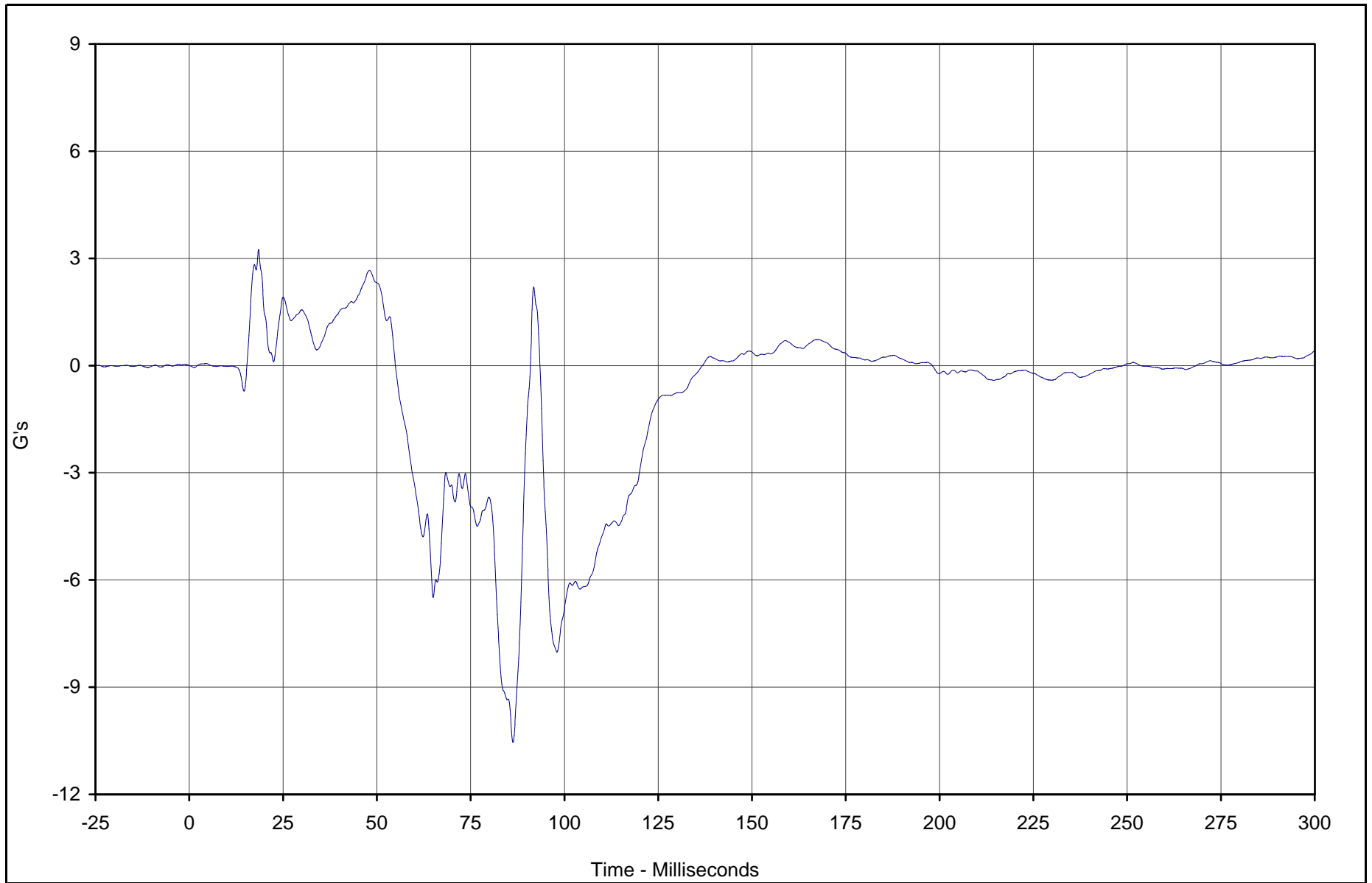
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant Y	061	FIL	G's	3.3	18.5	-10.5	86.3	180

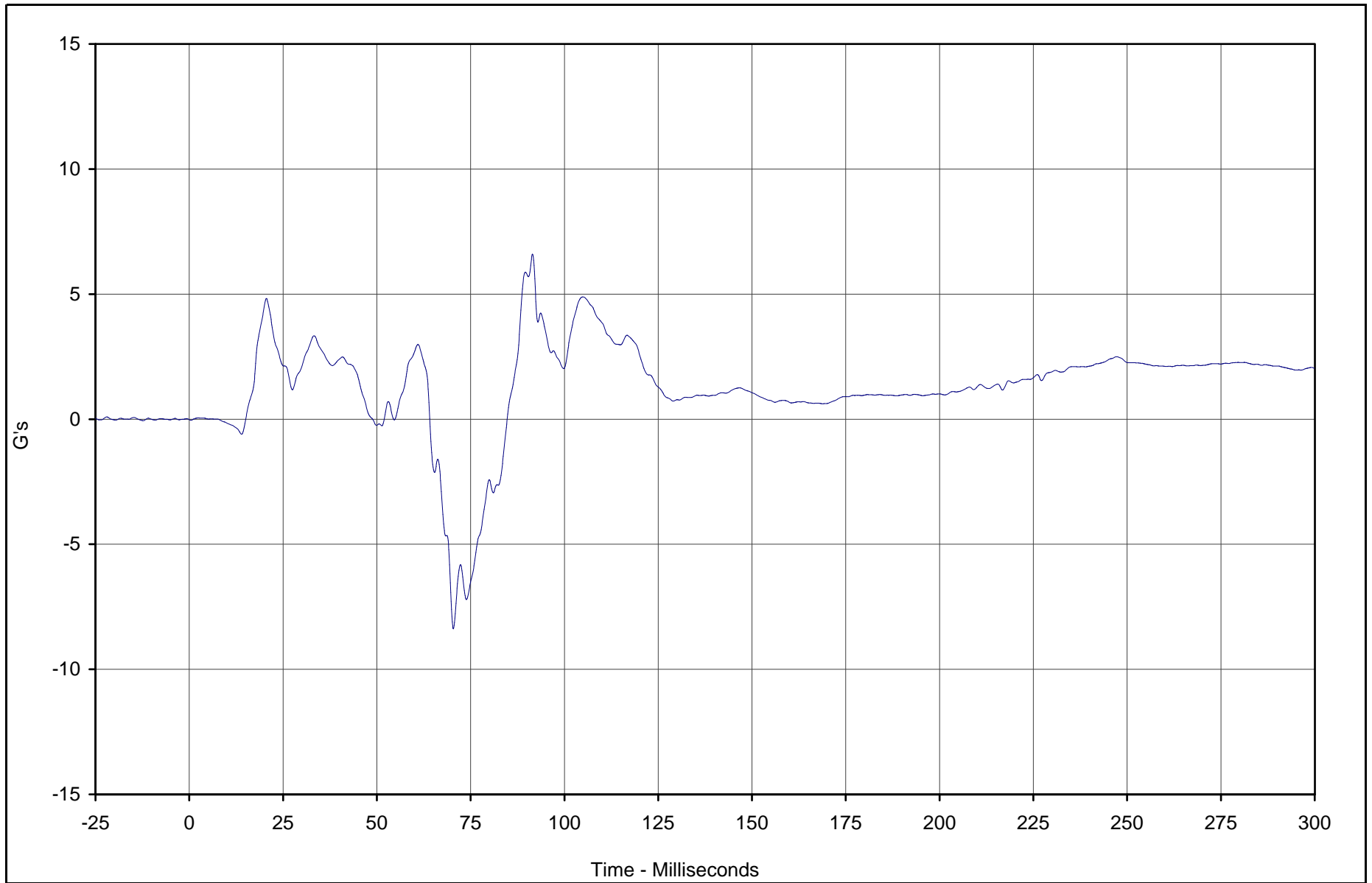


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant Z	062	FIL	G's	6.6	91.5	-8.4	70.4	180



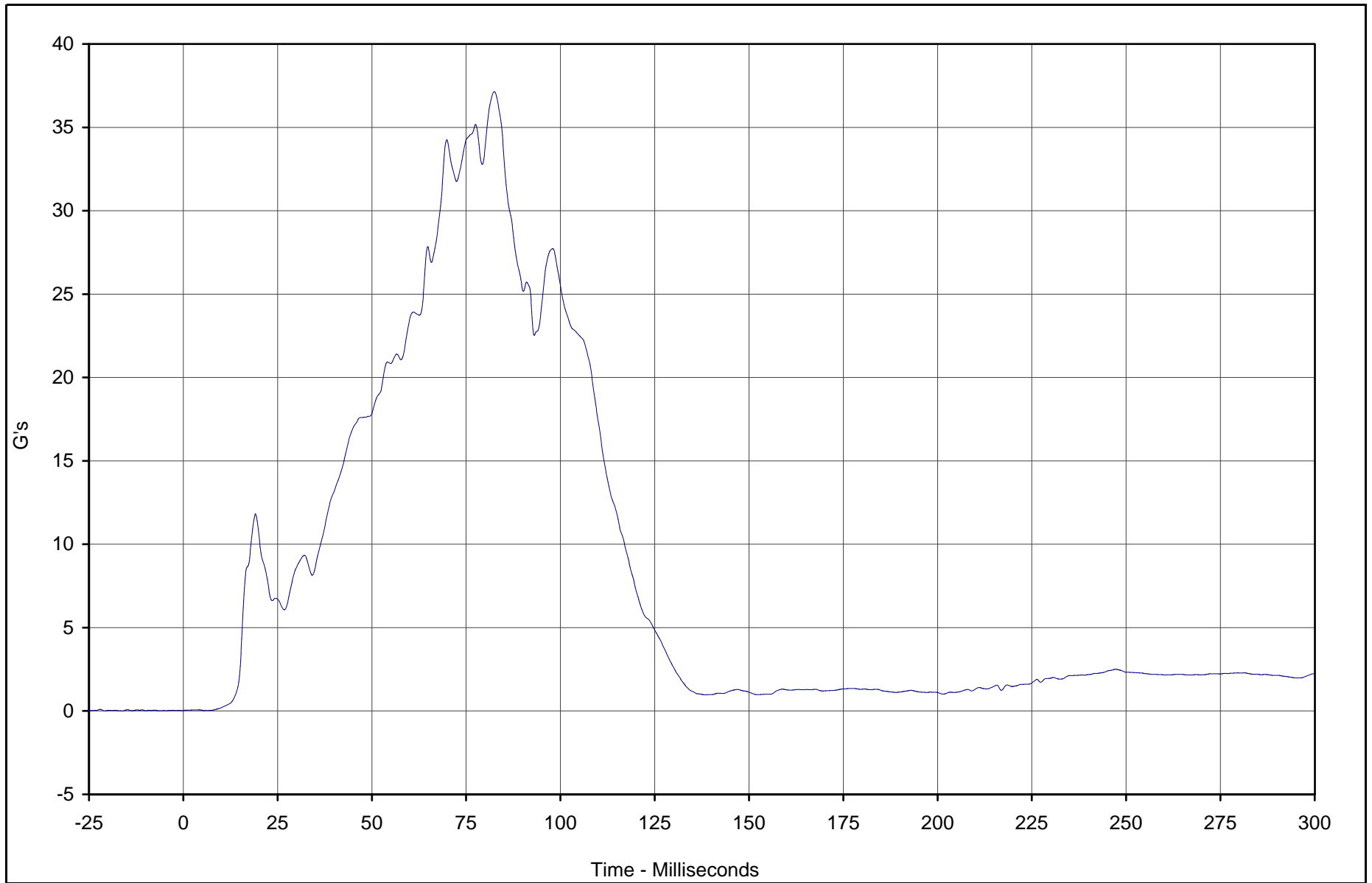
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-93



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Resultant Redundant	060	RES	G's	37.1	82.4	0.0	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

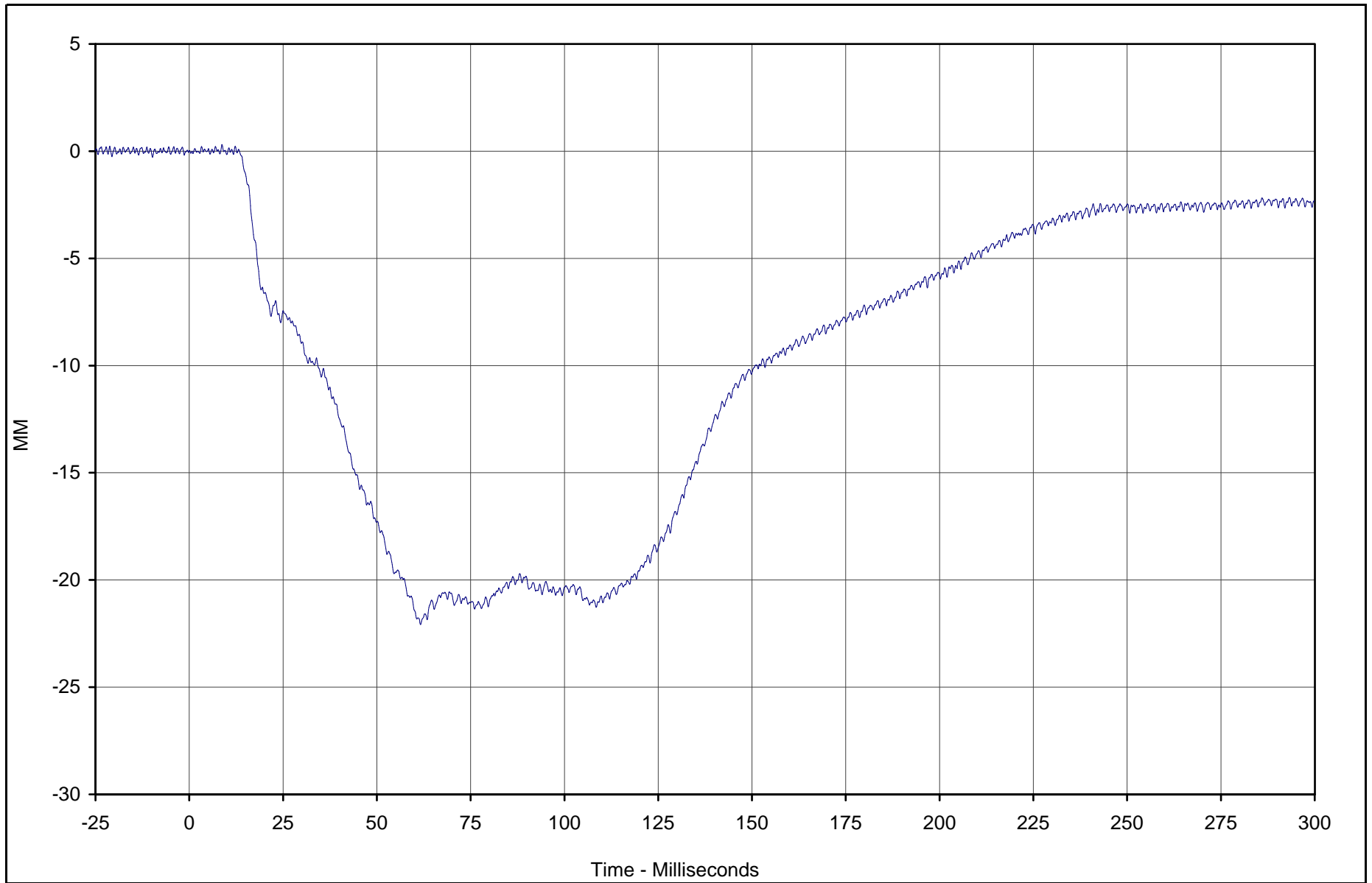
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-94



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Displacement X	063	FIL	MM	0.3	8.7	-22.1	61.7	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

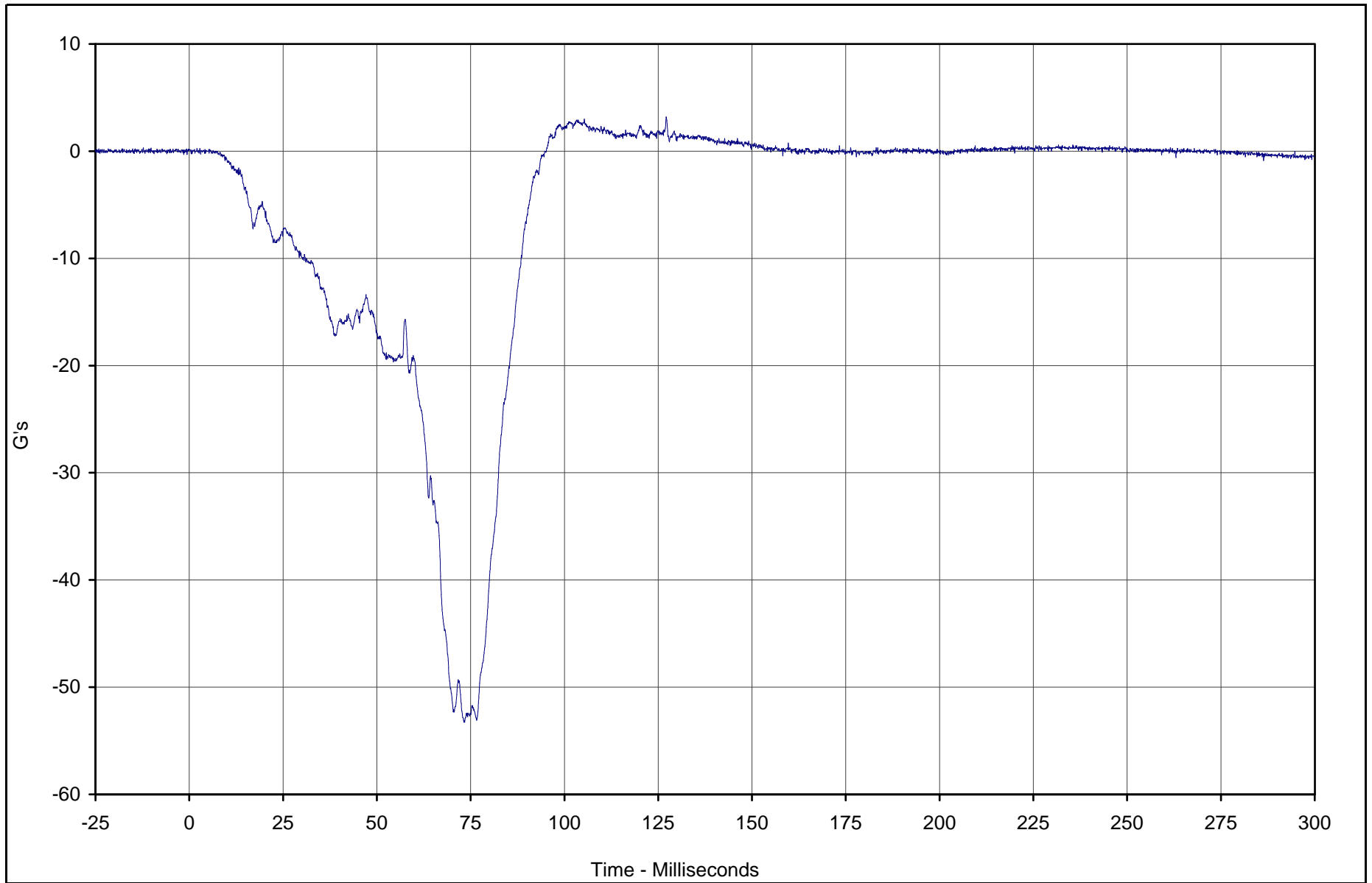
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-95

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X	064	FIL	G's	3.2	127.1	-53.3	73.2	1000

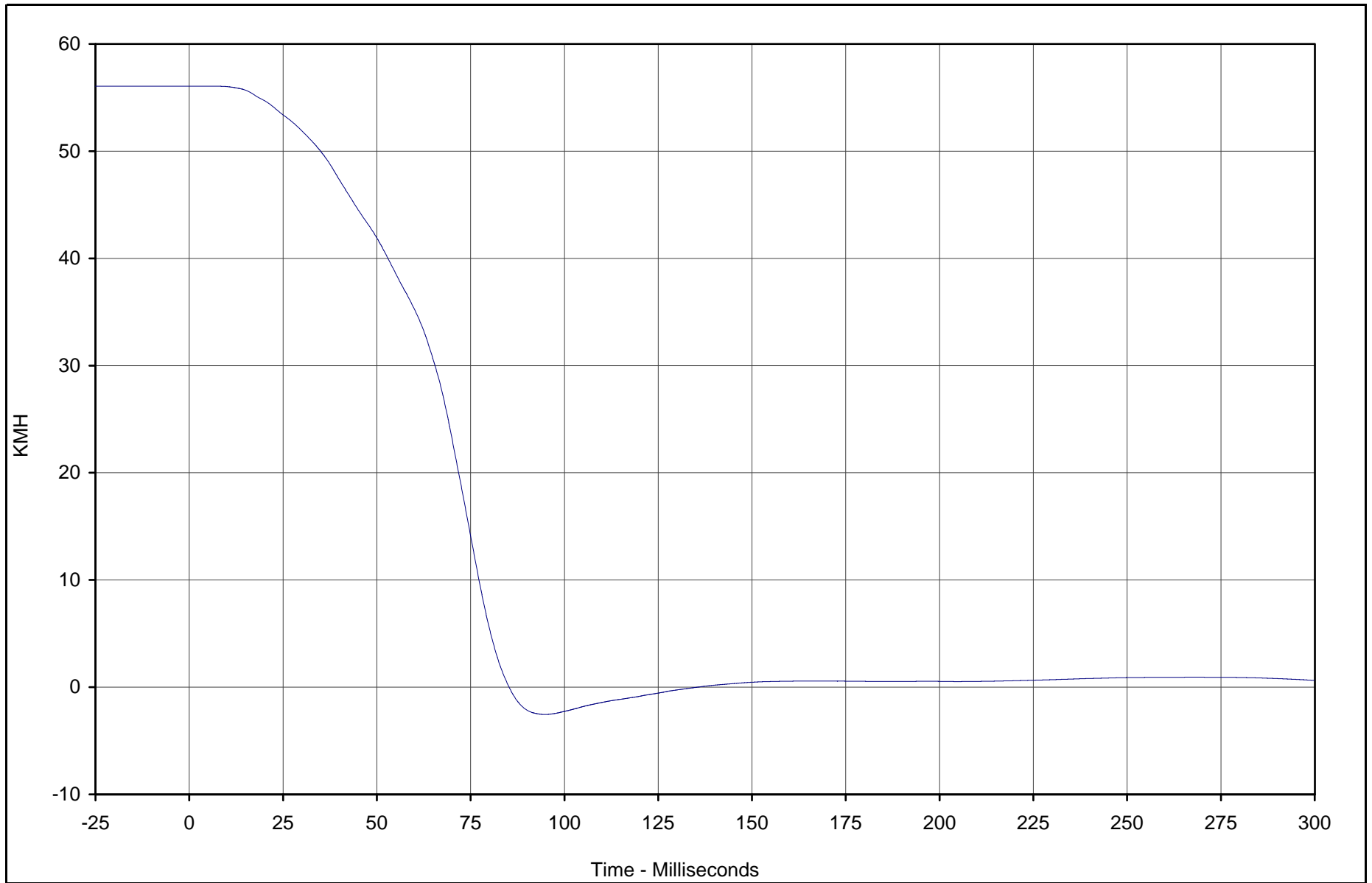


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X Velocity	064	IN1	KMH	56.1	2.5	-2.5	94.9	180



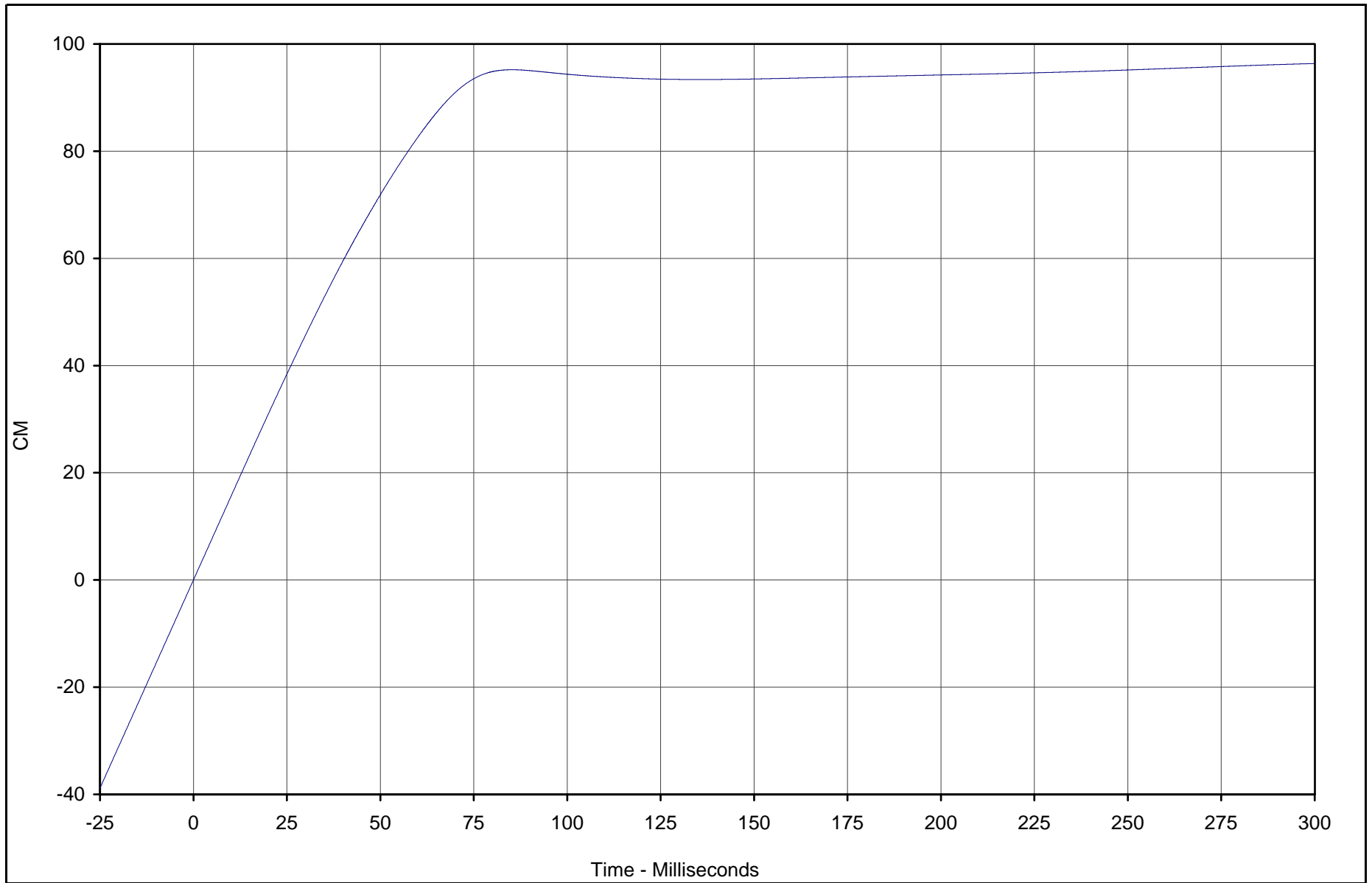
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-97



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X Displ.	064	IN2	CM	96.4	299.9	0.0	0.0	180



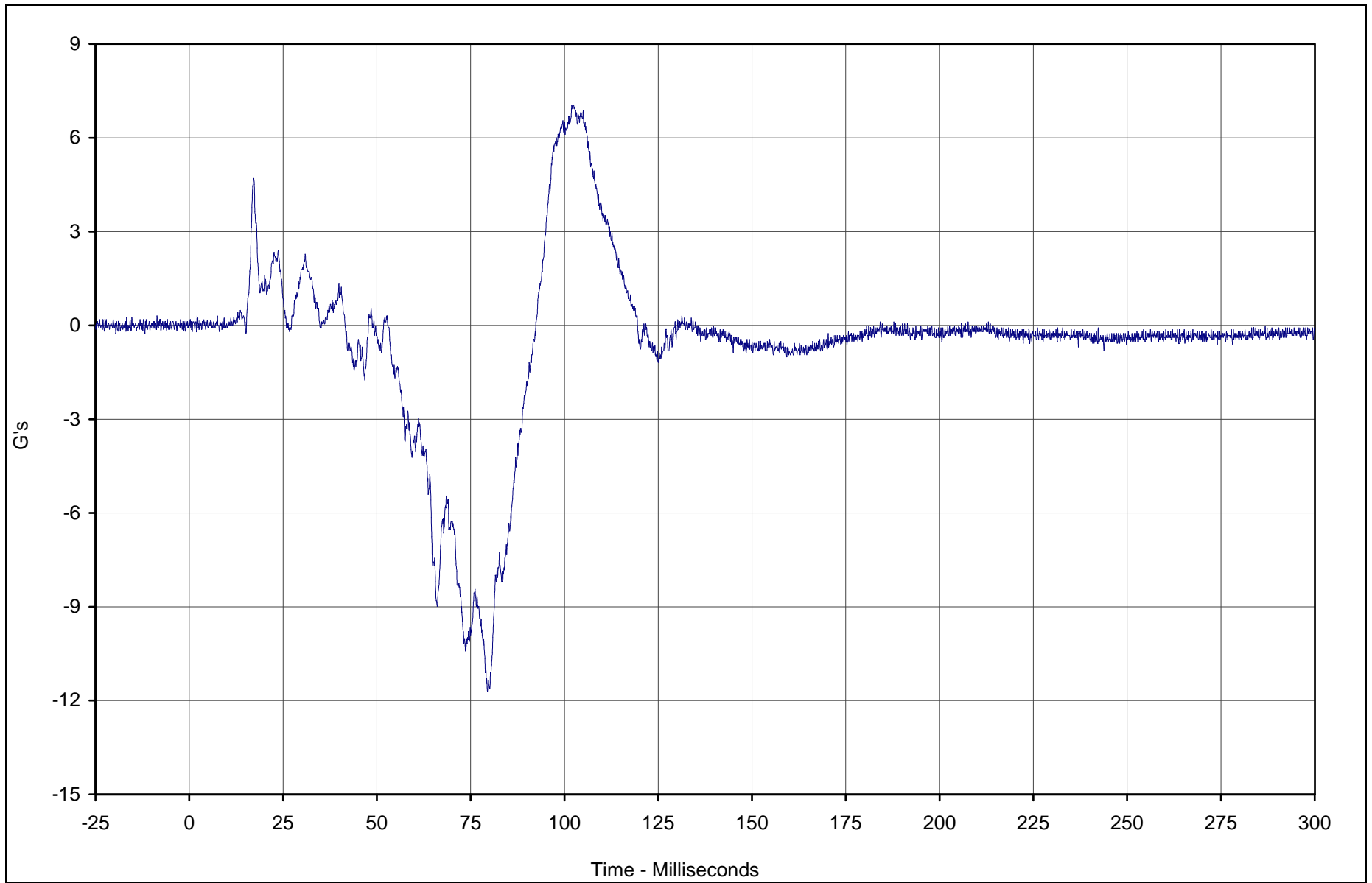
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Y	065	FIL	G's	7.0	101.9	-11.7	79.5	1000

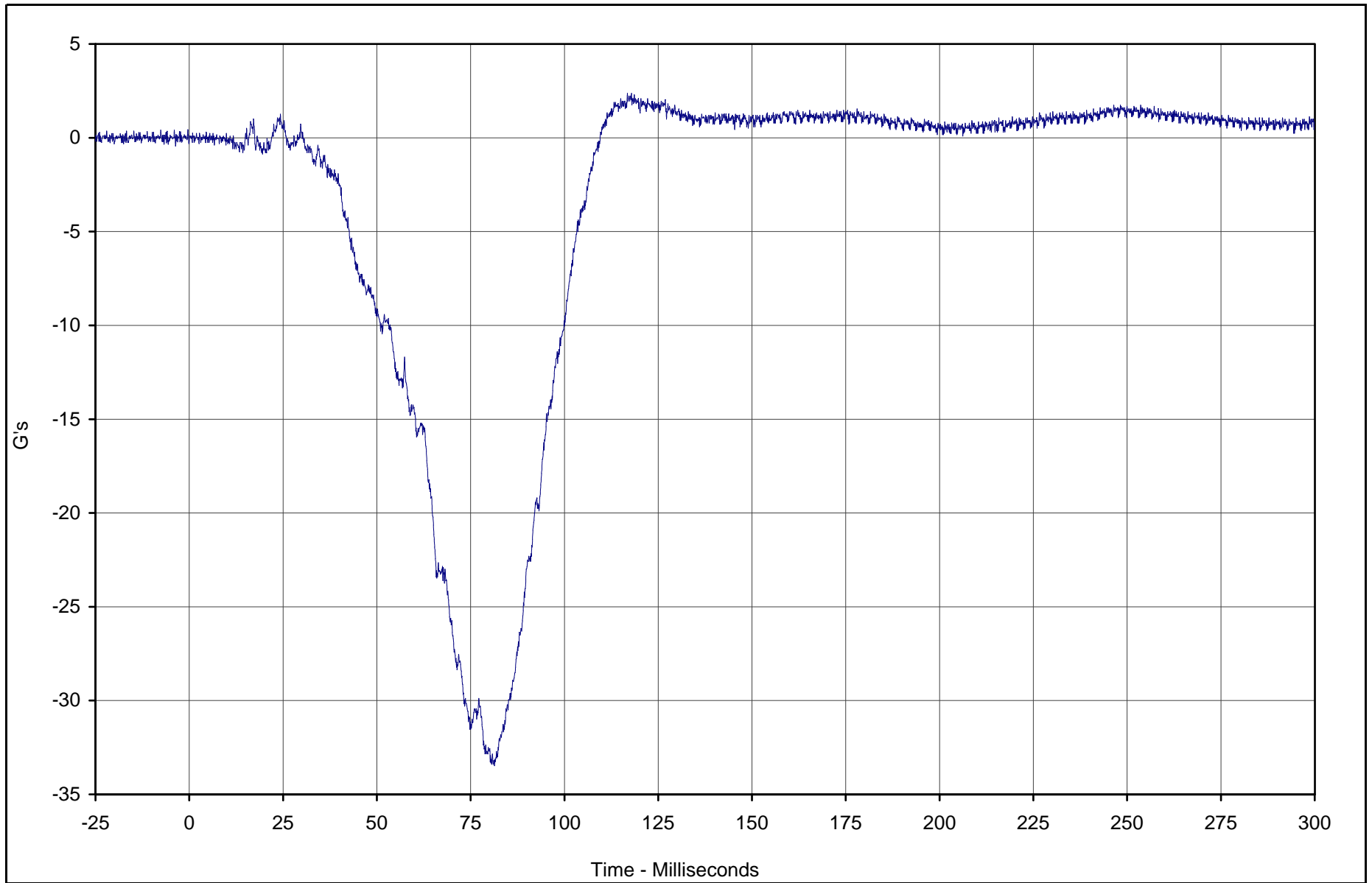


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Z	066	FIL	G's	2.4	116.8	-33.5	81.3	1000



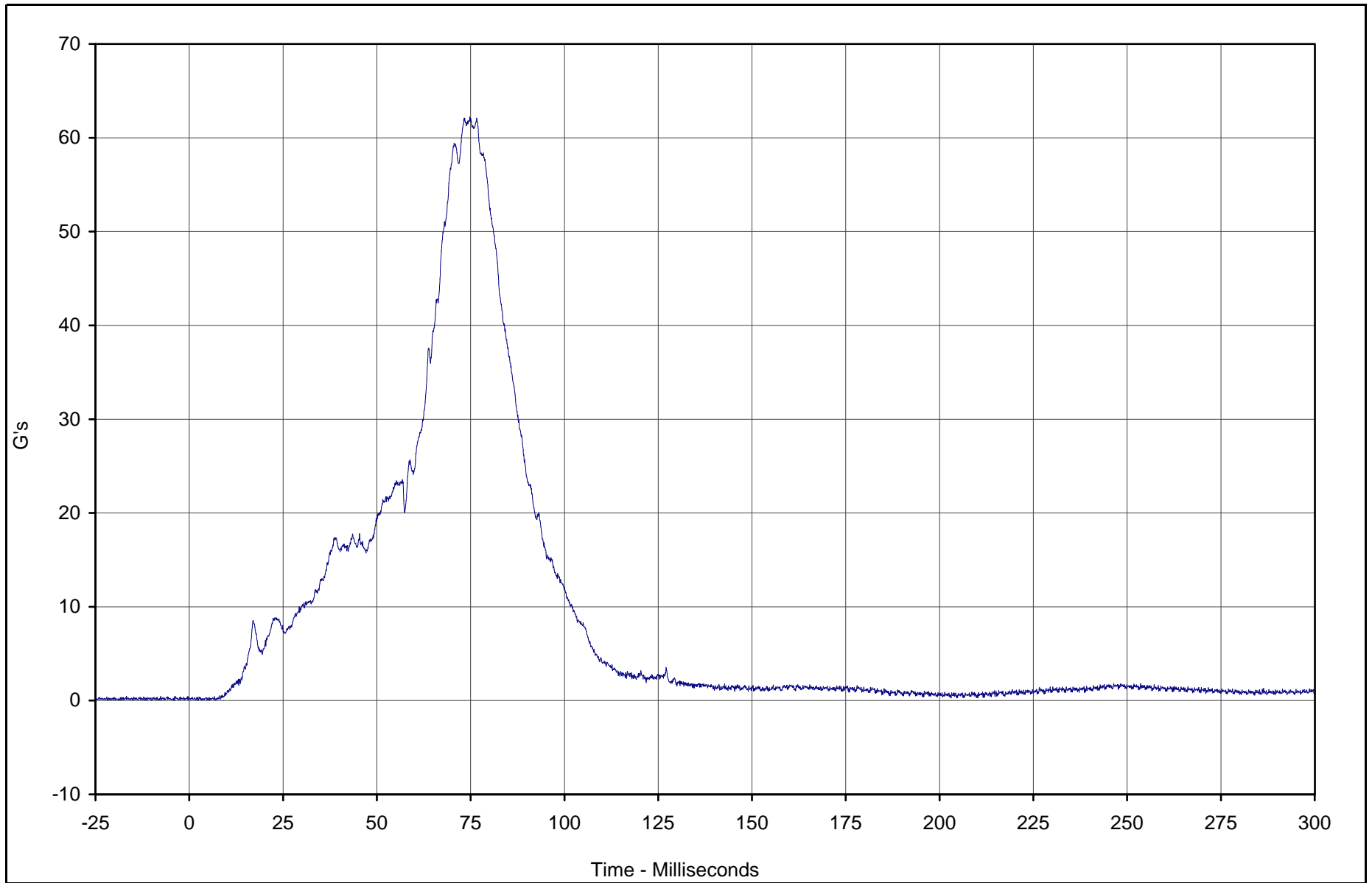
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-100



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Resultant	066	RES	G's	62.2	74.8	0.0	4.7	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

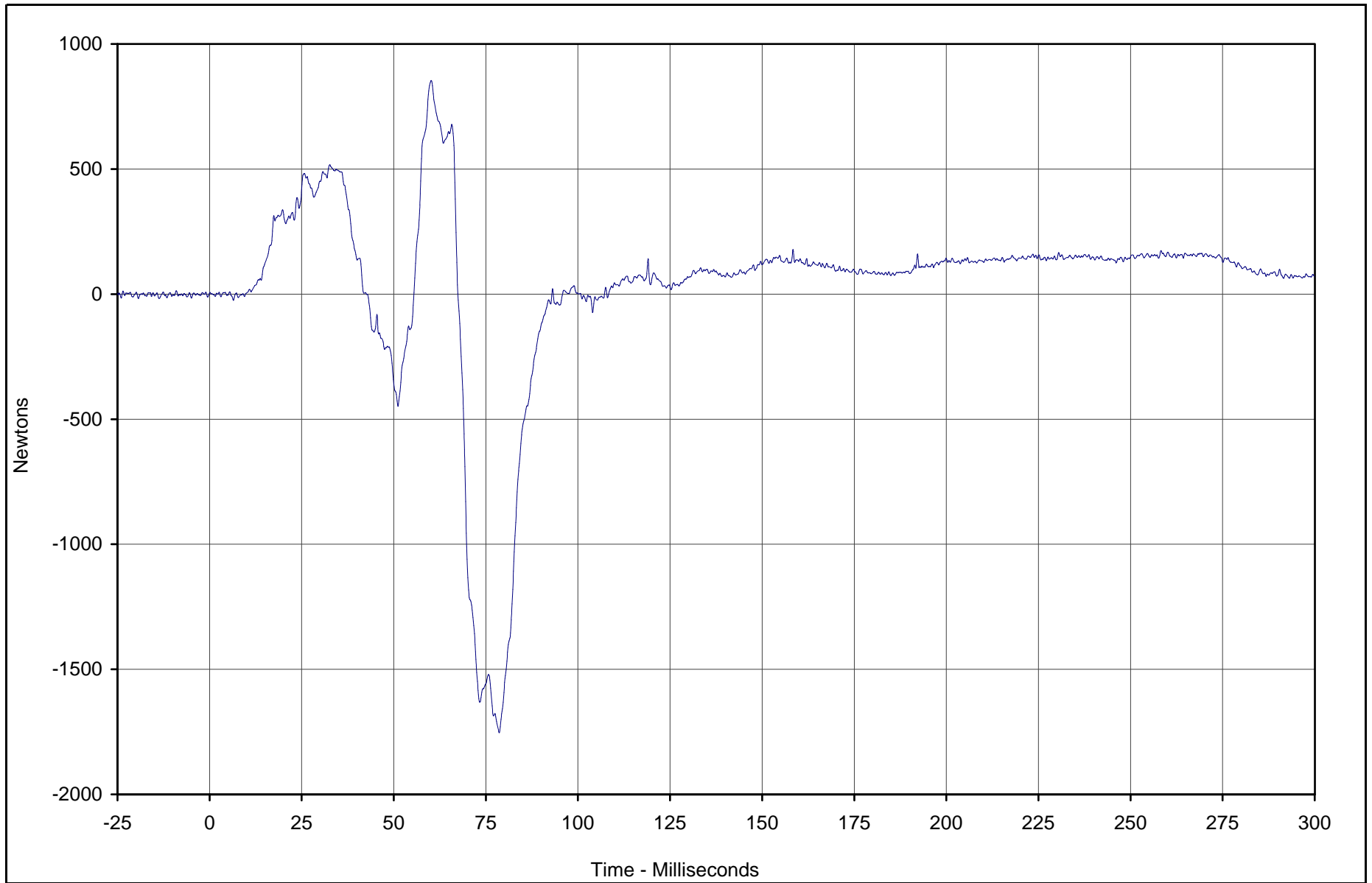
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-101



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Femur Force	067	FIL	Newtons	853.8	60.2	-1753.6	78.6	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

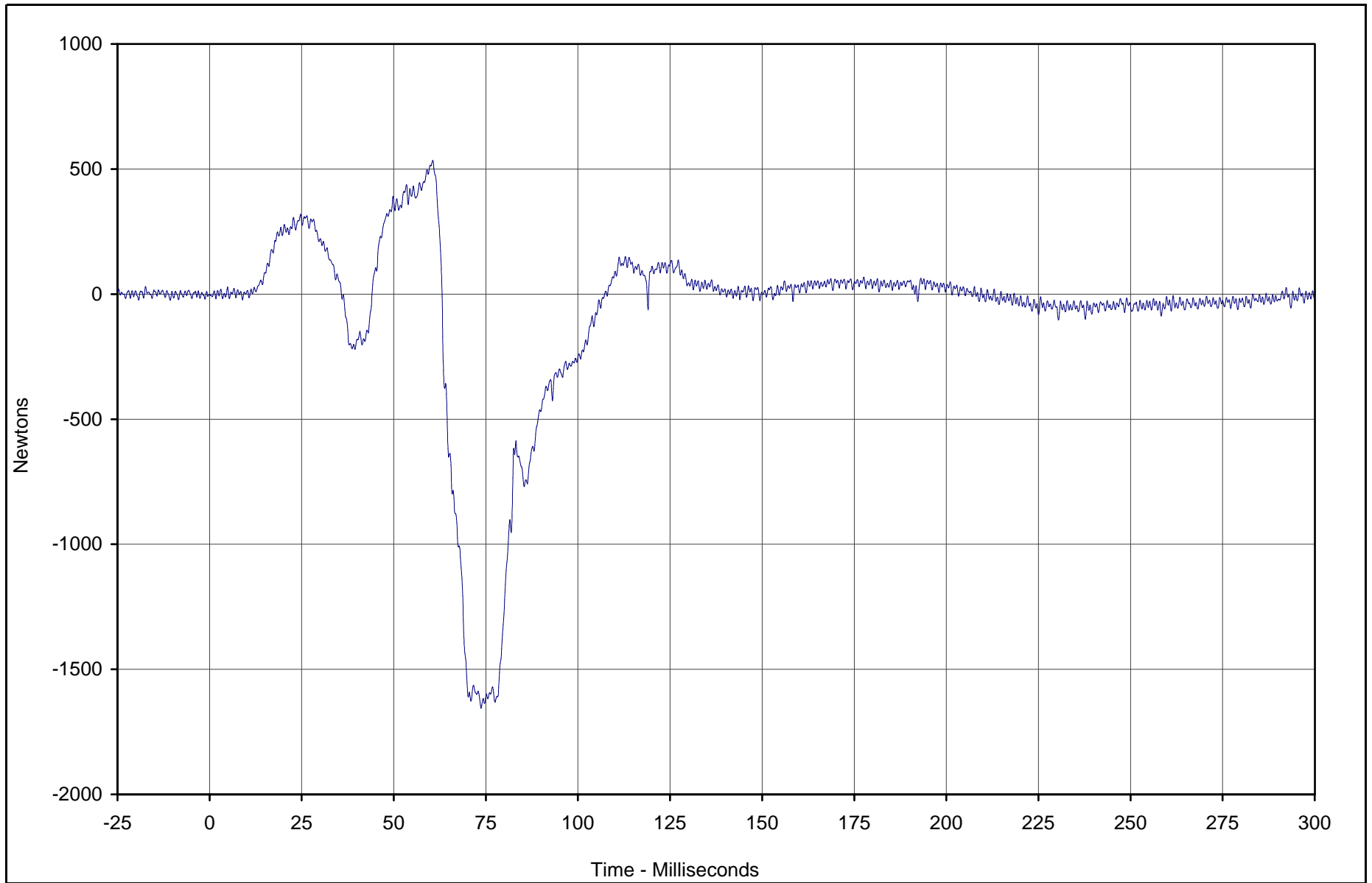
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-102



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Femur Force	068	FIL	Newtons	534.8	60.6	-1656.1	73.7	600



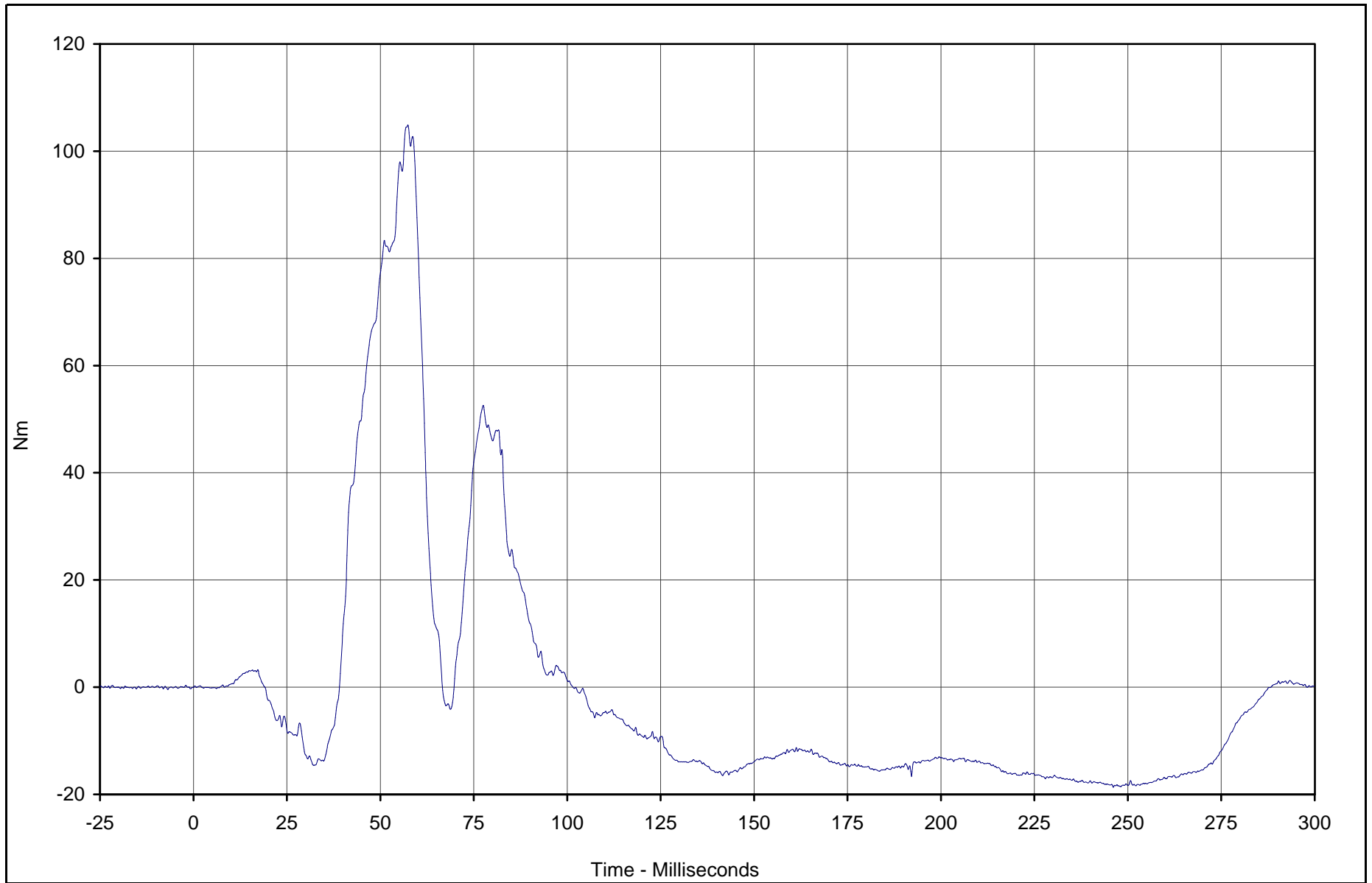
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Upper Tibia Moment X	069	FIL	Nm	104.9	57.4	-18.7	246.1	600



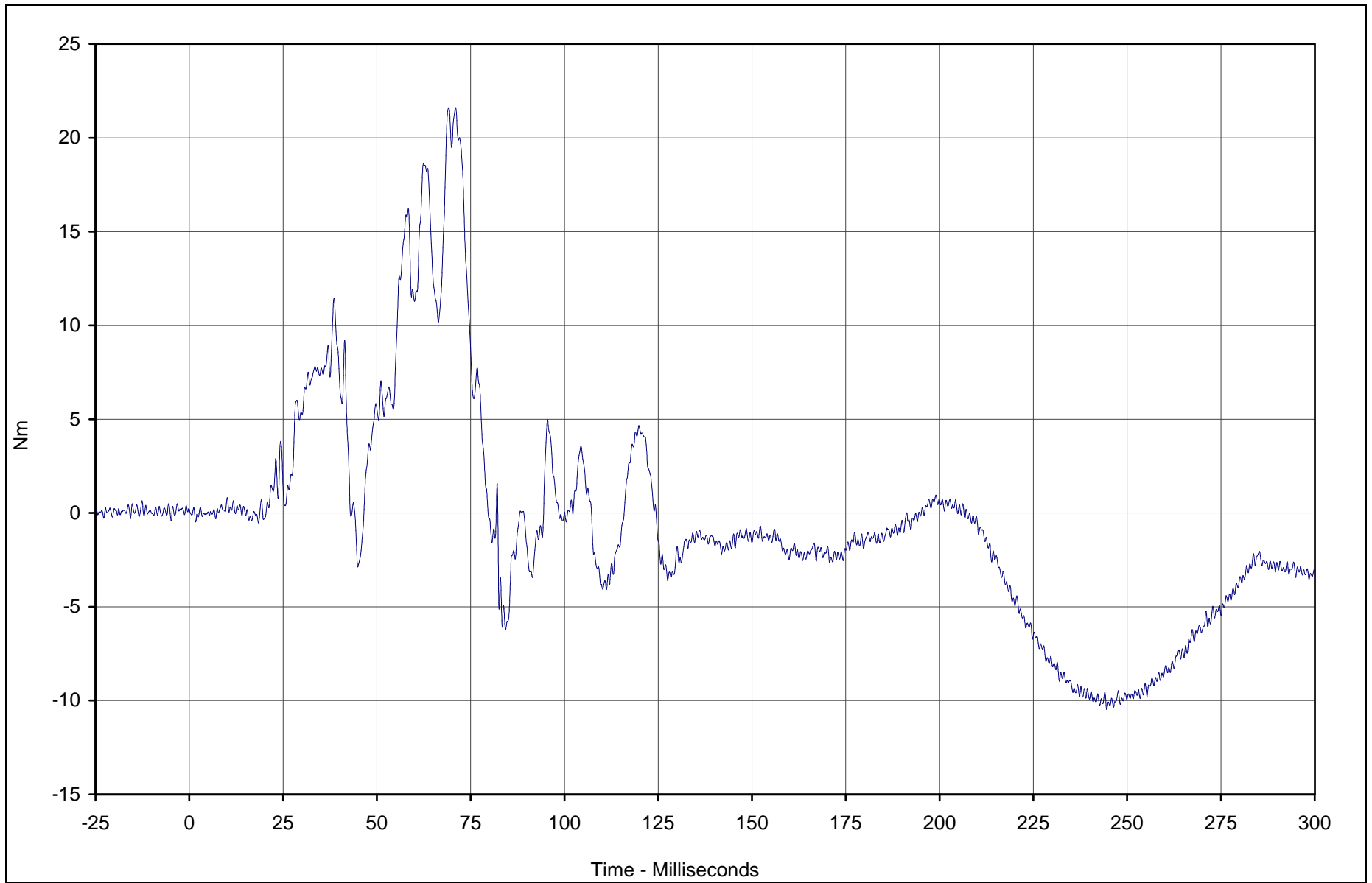
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-104



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Upper Tibia Moment Y	070	FIL	Nm	21.6	69.2	-10.5	244.6	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

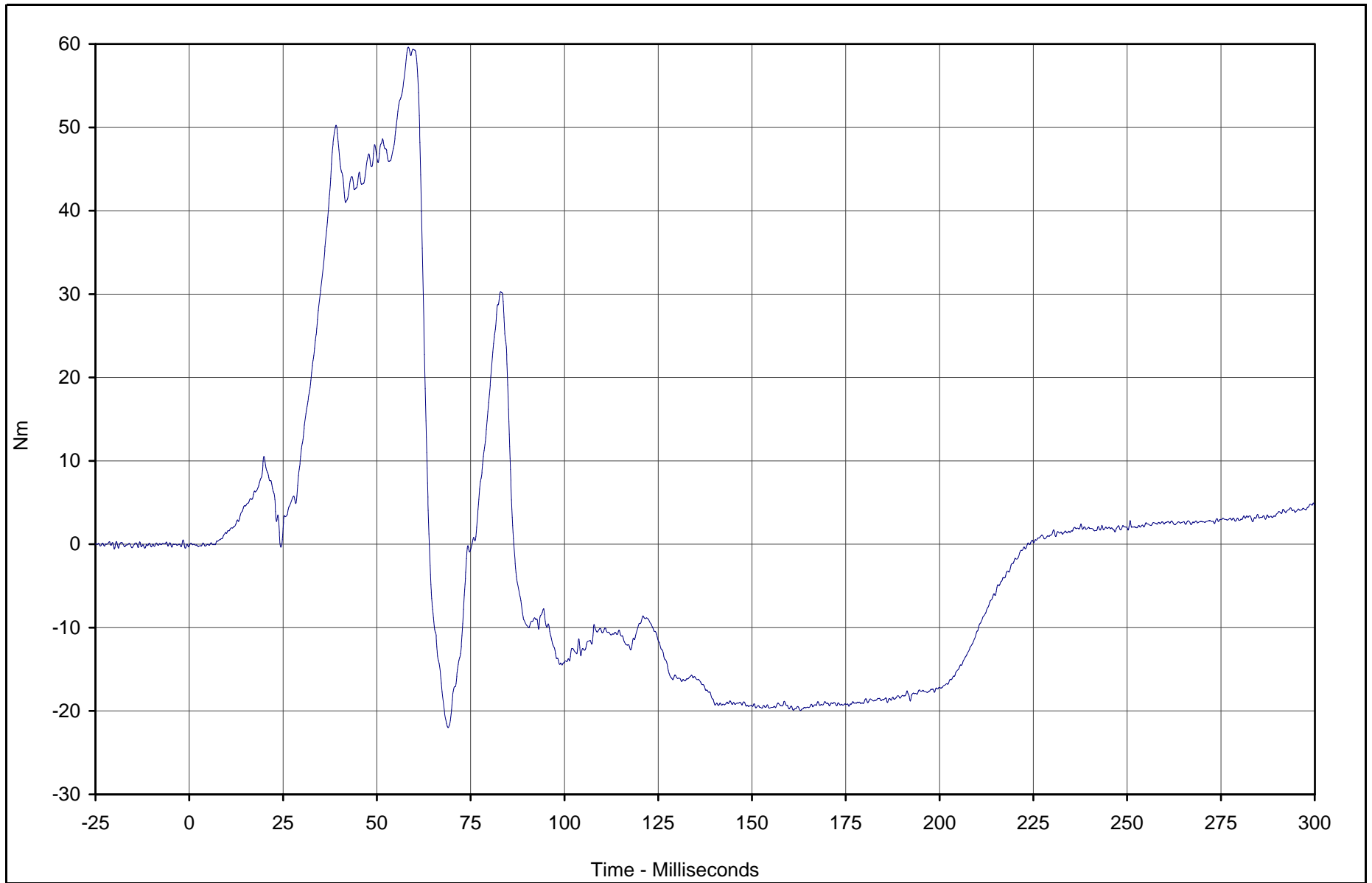
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-105



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Upper Tibia Moment X	071	FIL	Nm	59.6	58.4	-22.0	69.0	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

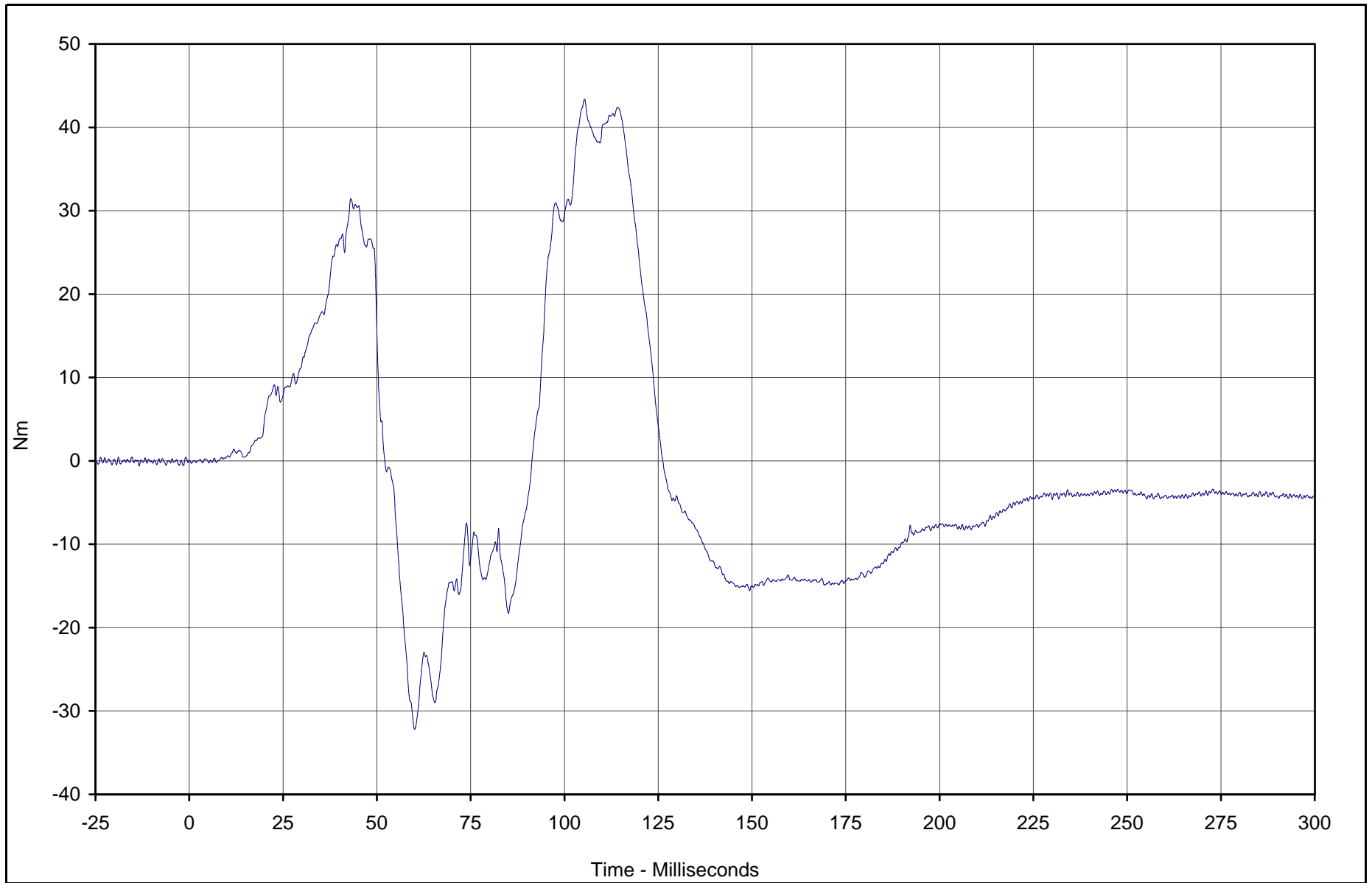
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-106



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Upper Tibia Moment Y	072	FIL	Nm	43.4	105.4	-32.2	60.1	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

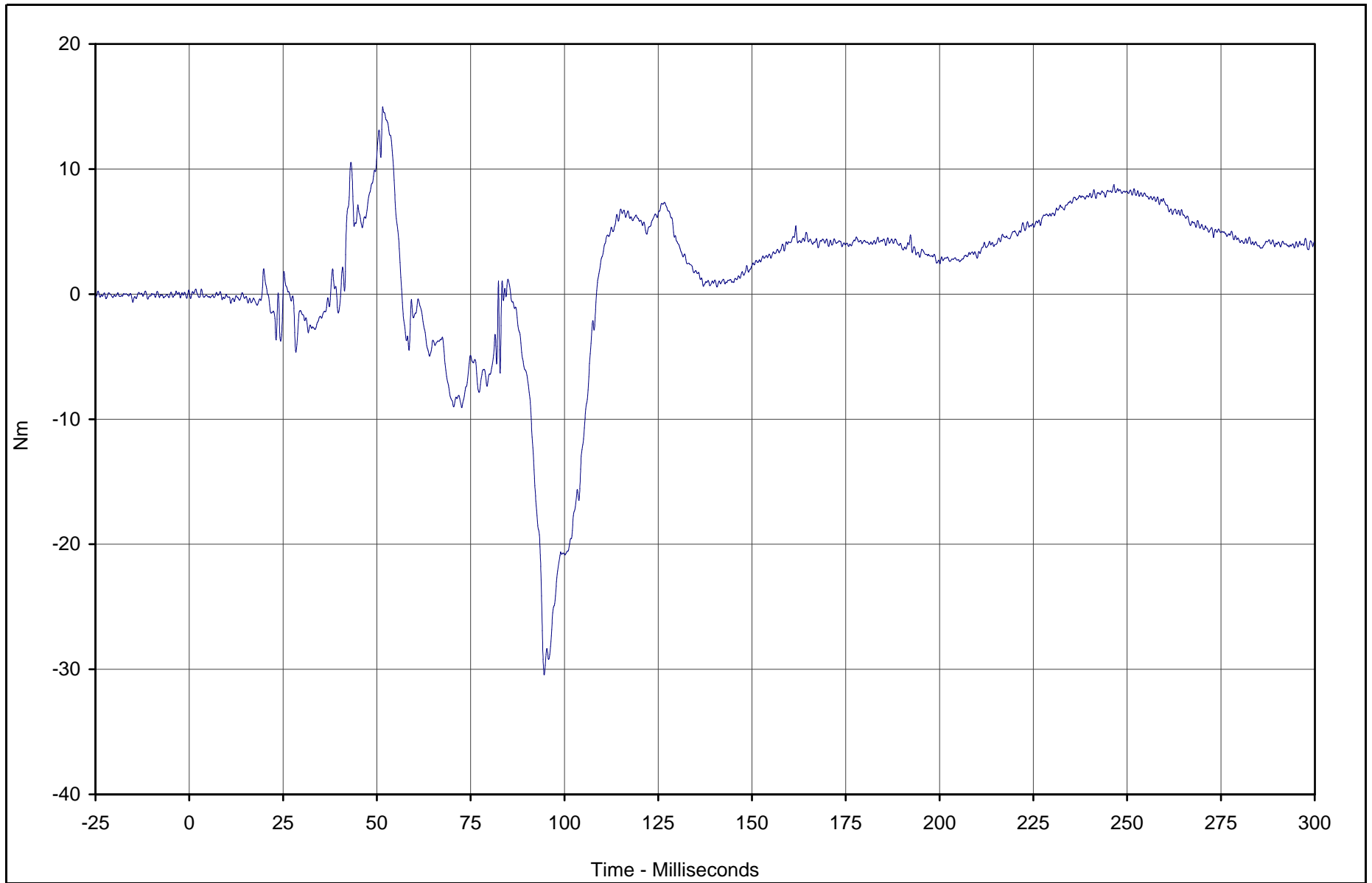
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-107



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Moment X	073	FIL	Nm	15.0	51.6	-30.5	94.6	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

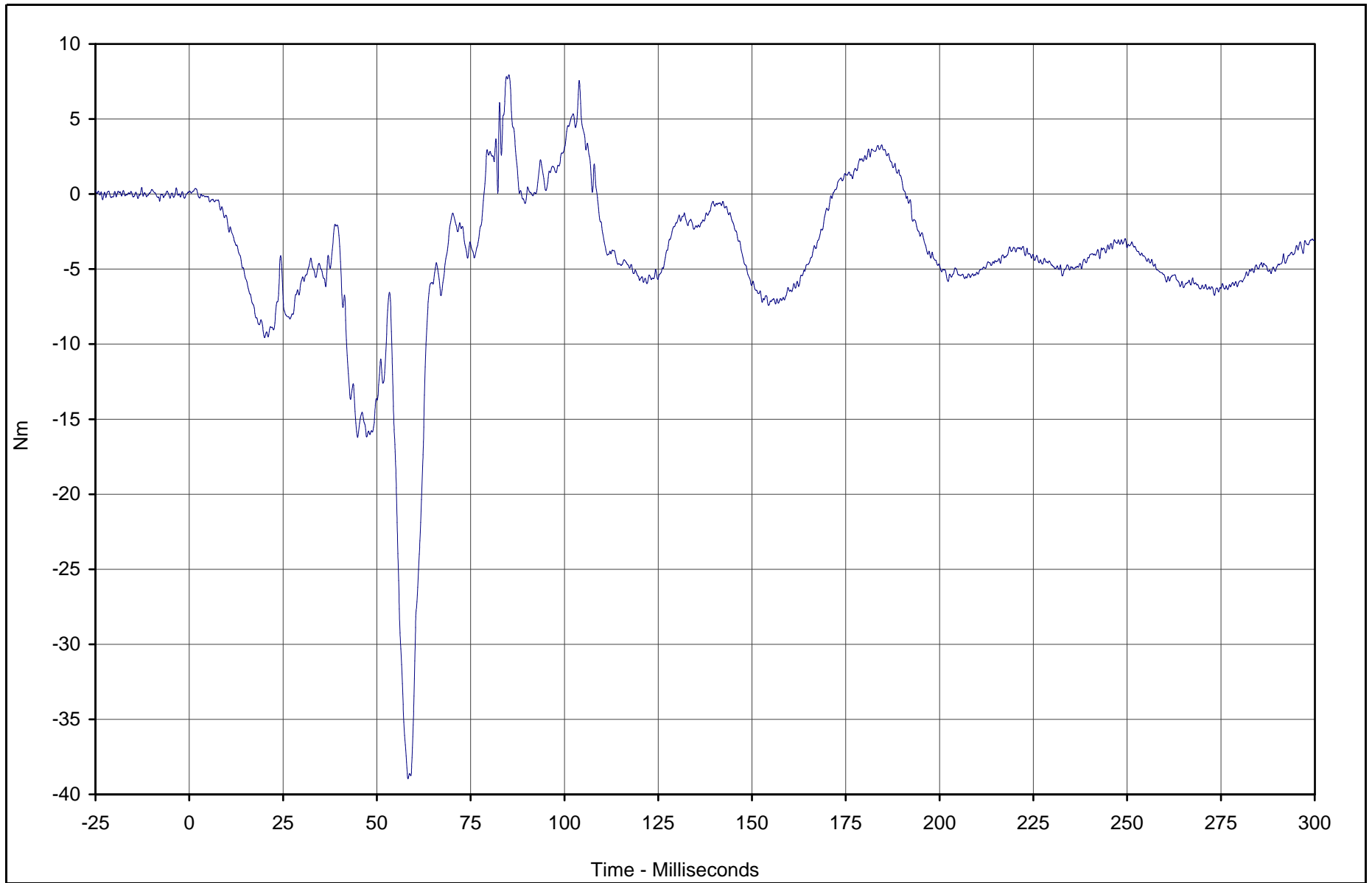
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-108



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Moment Y	074	FIL	Nm	8.0	85.2	-39.0	58.3	600



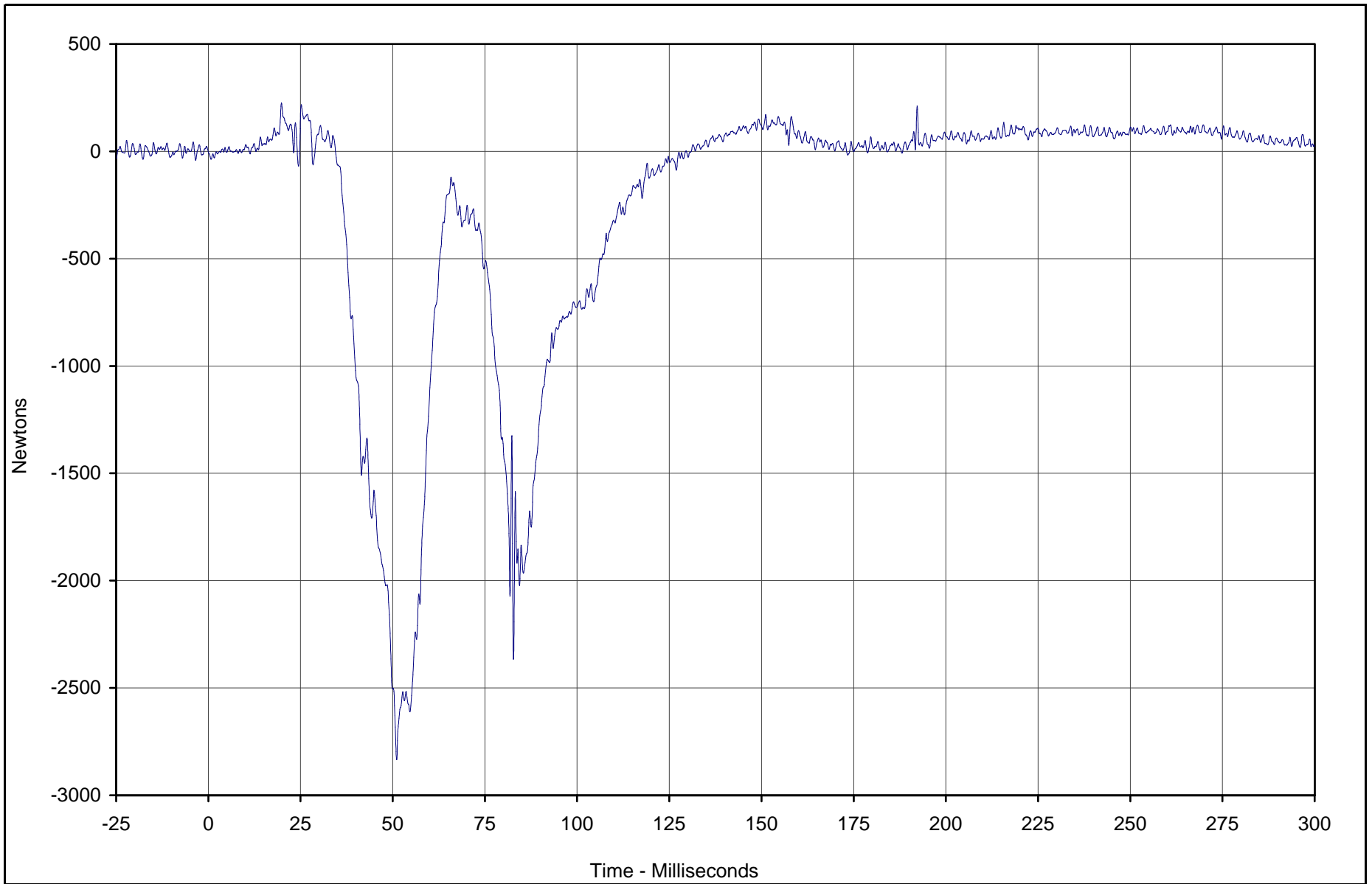
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Force Z	075	FIL	Newtons	225.9	19.8	-2833.8	51.1	600



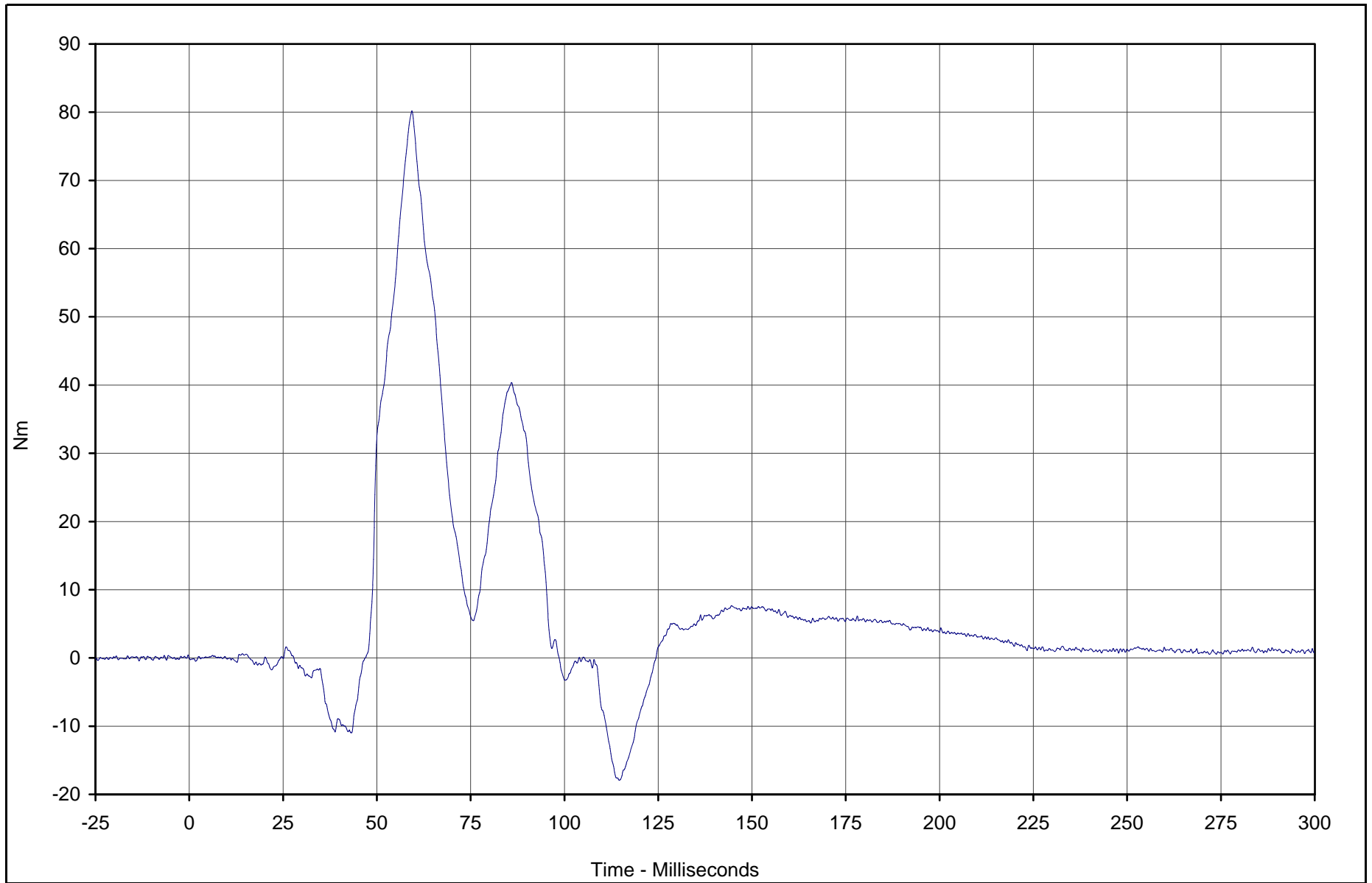
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-110



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Lower Tibia Moment X	076	FIL	Nm	80.2	59.4	-17.9	114.6	600



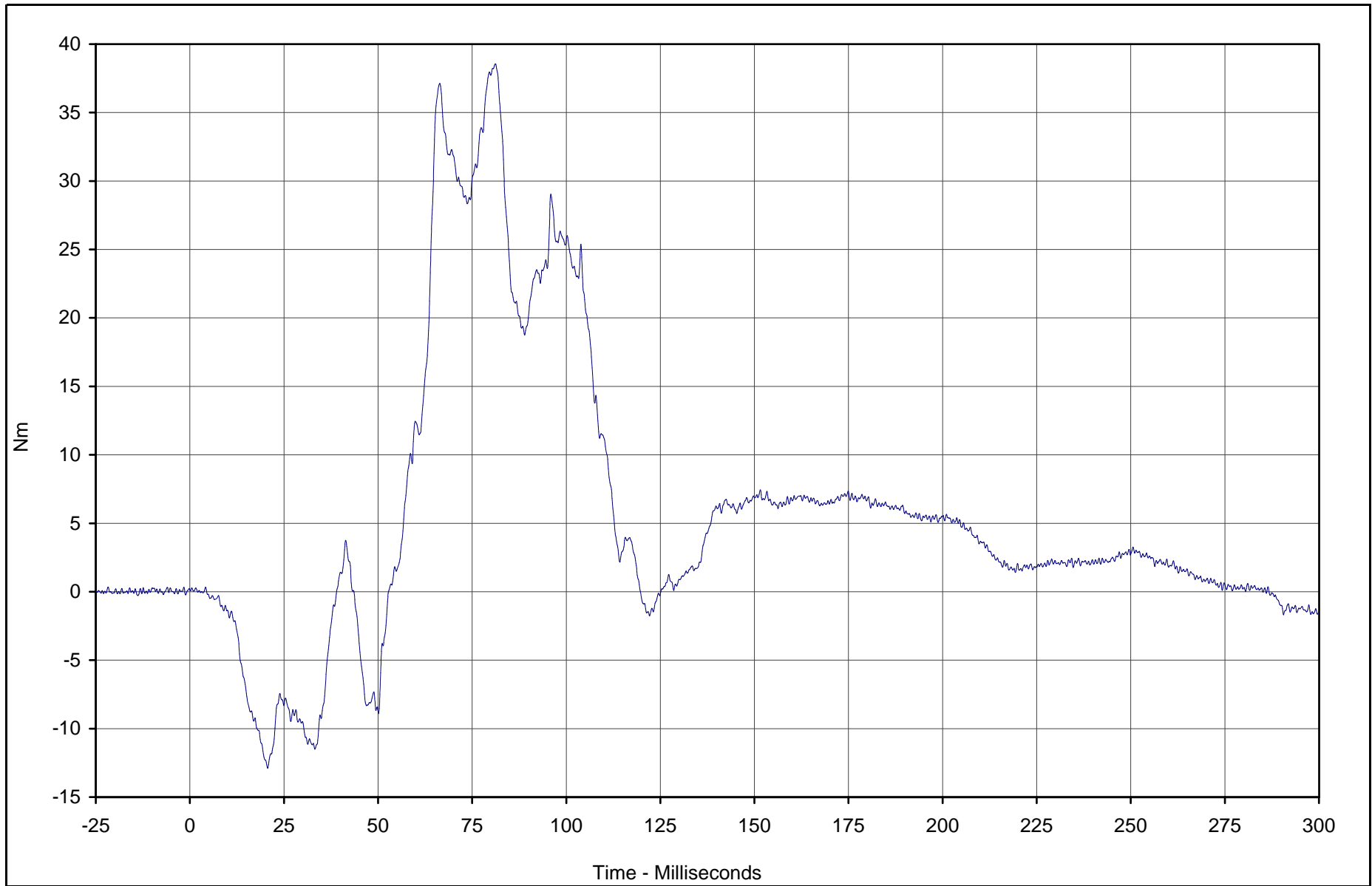
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-111



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Lower Tibia Moment Y	077	FIL	Nm	38.6	81.2	-12.9	20.7	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

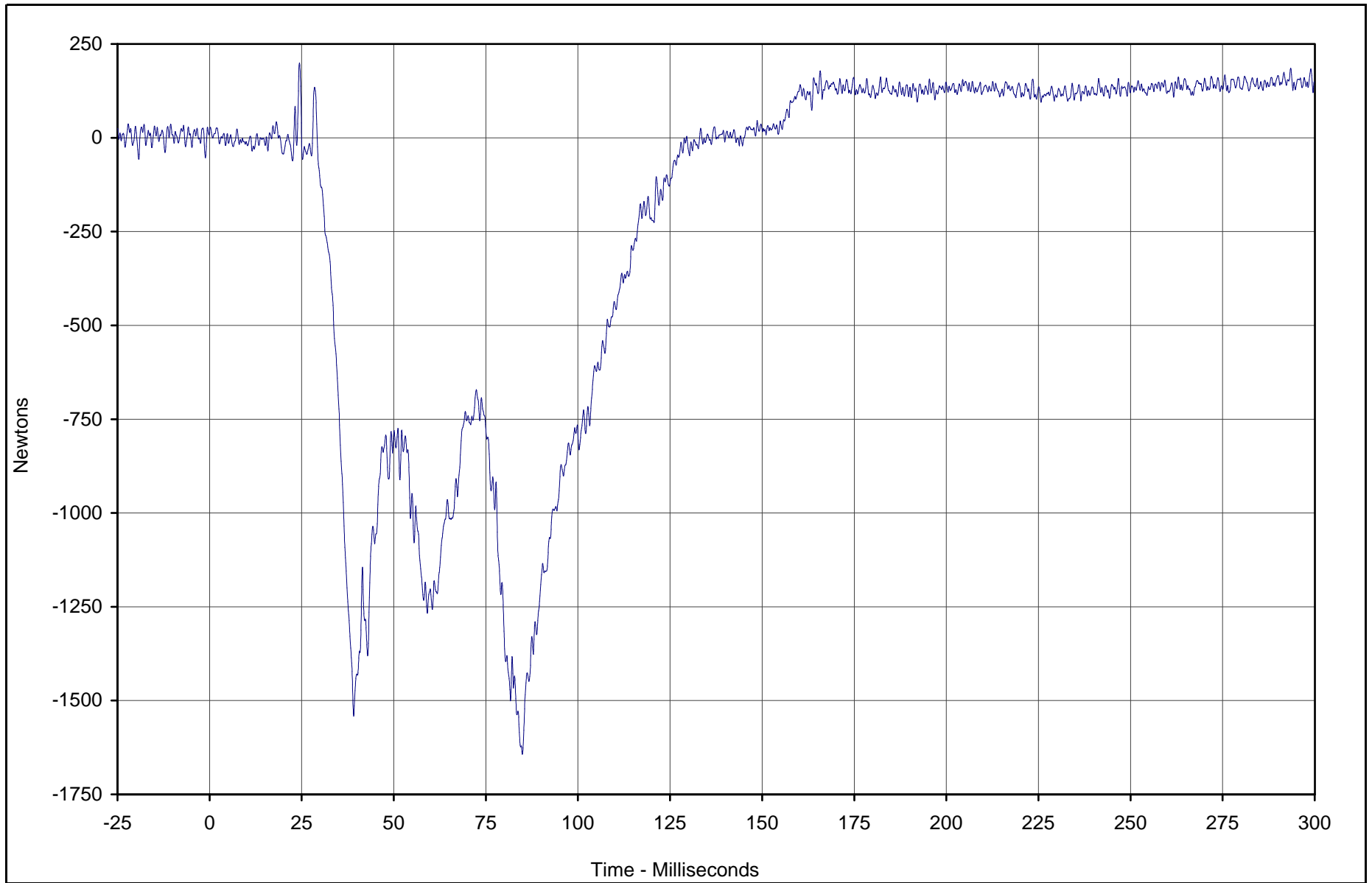
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right lower Tibia Force Z	078	FIL	Newtons	199.9	24.4	-1643.4	84.9	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

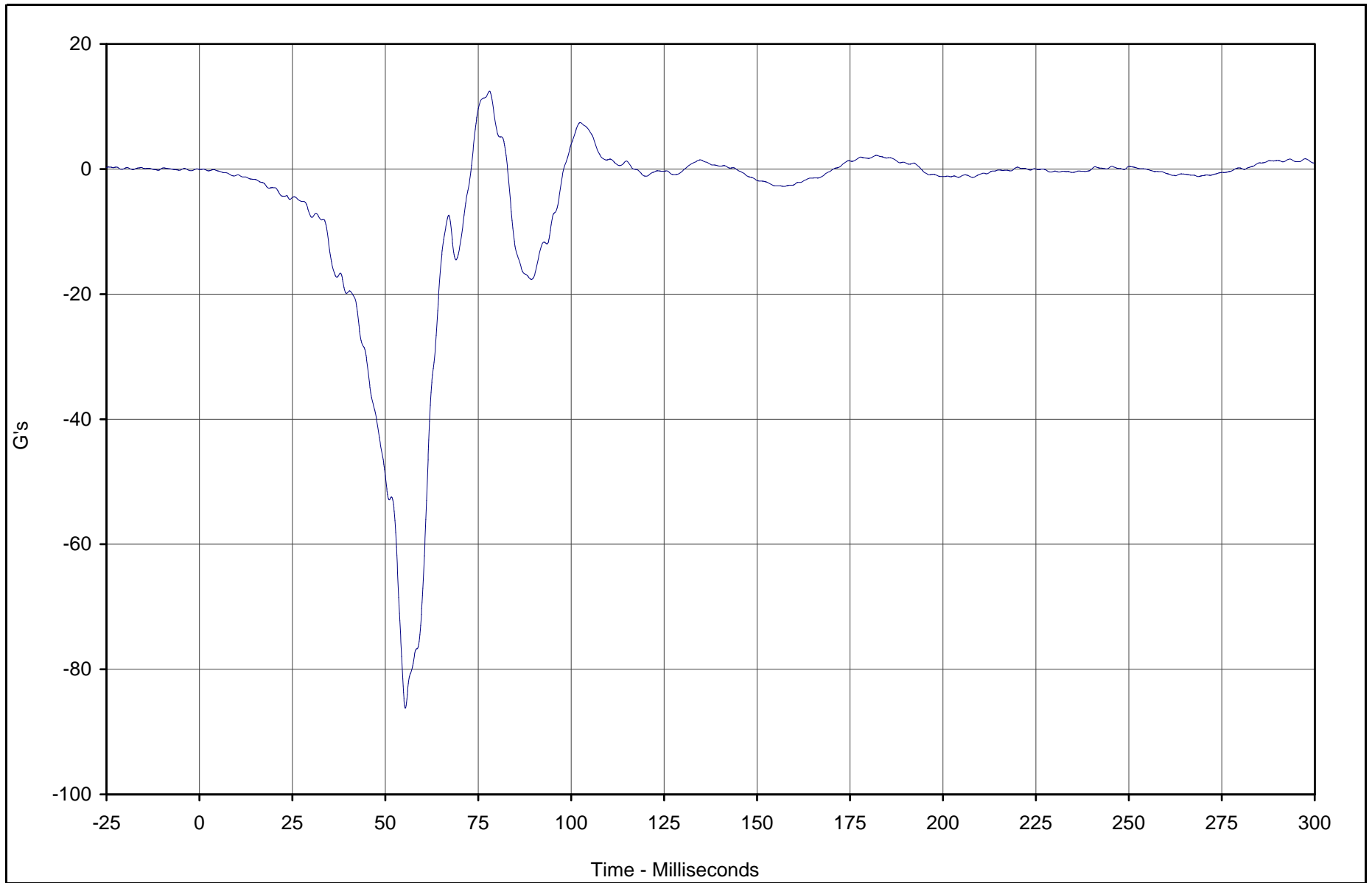
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-113



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Aft X	079	FIL	G's	12.4	78.0	-86.2	55.4	180



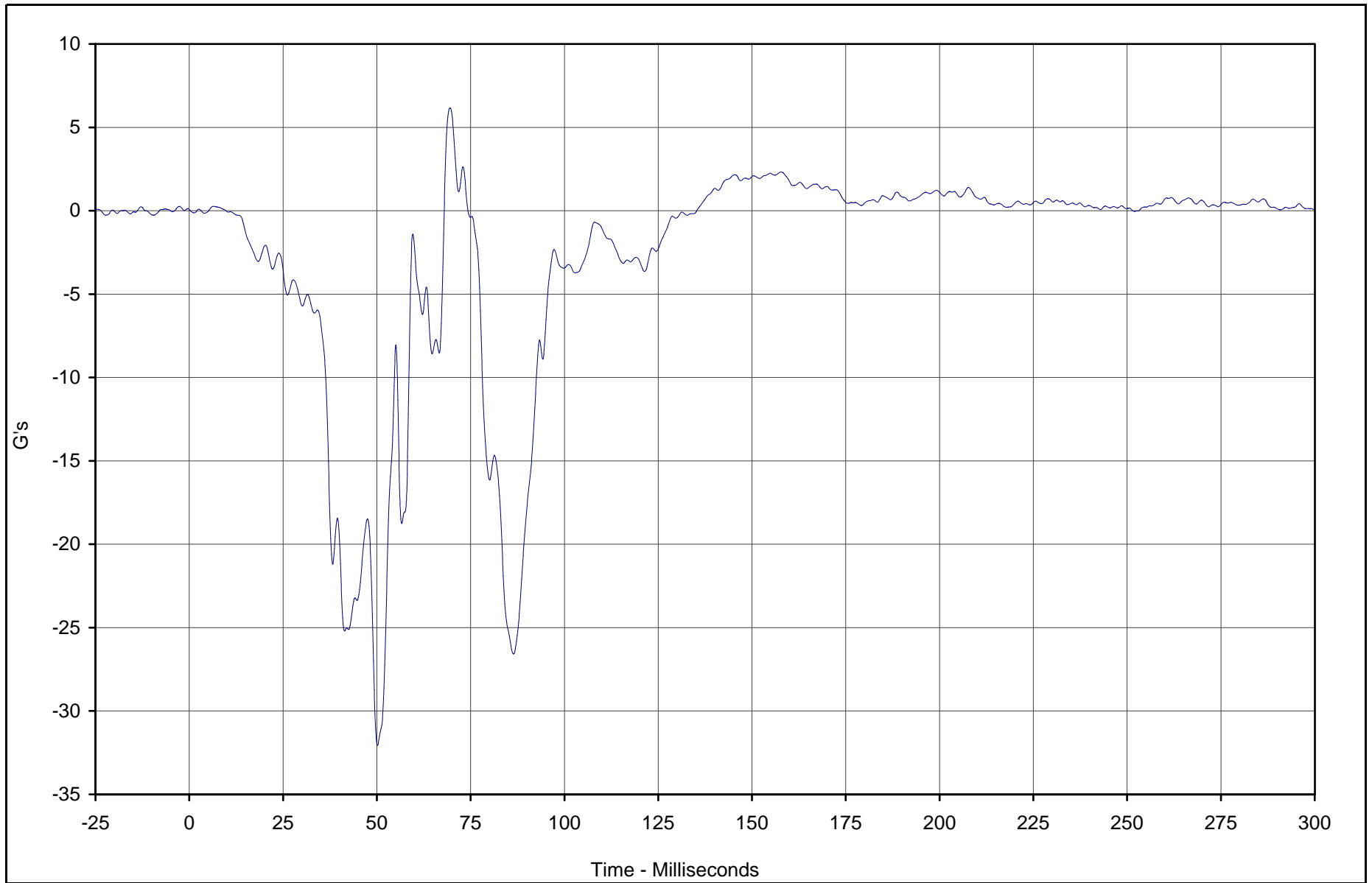
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Aft Z	080	FIL	G's	6.2	69.5	-32.1	50.2	180

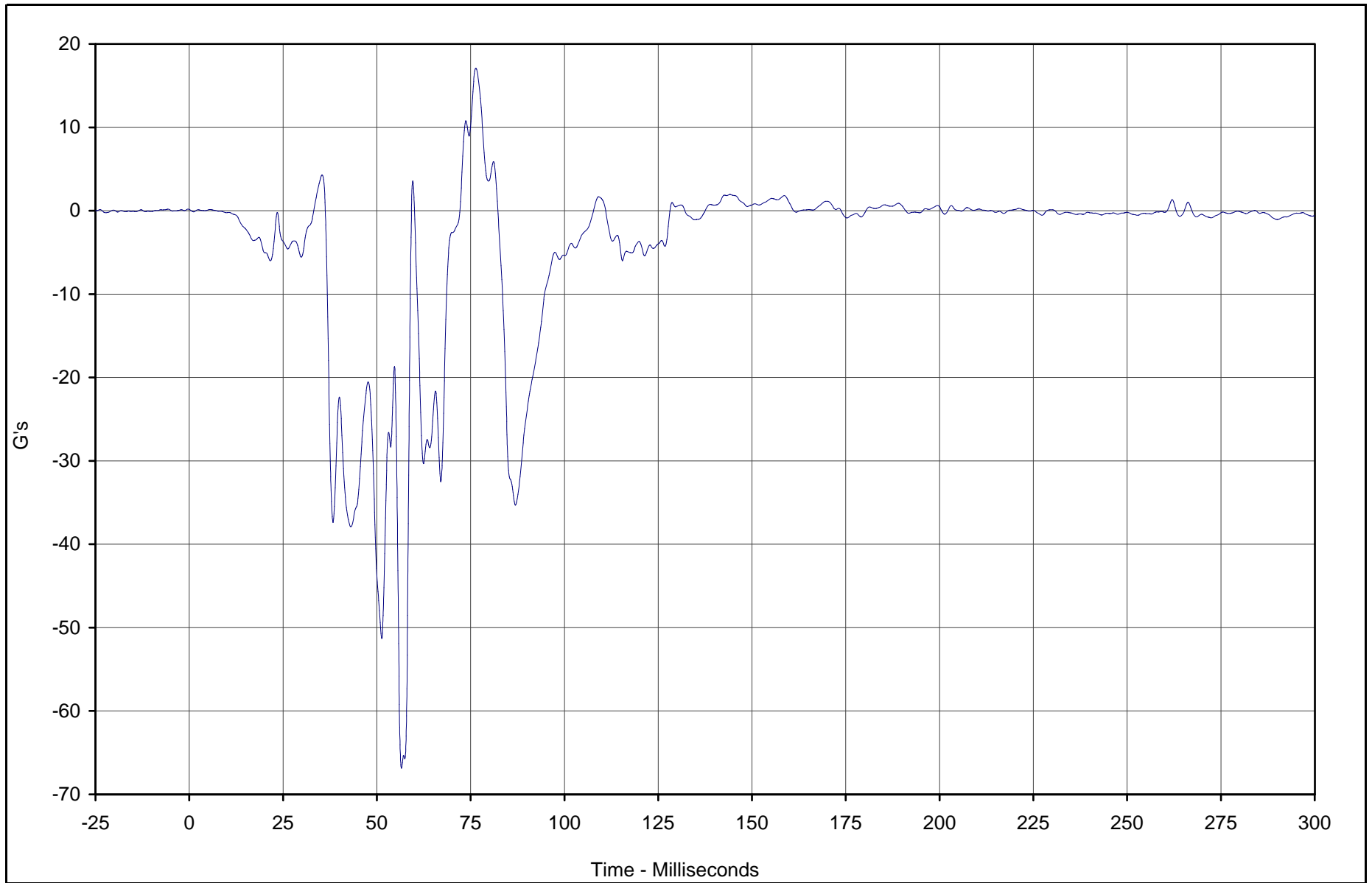


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Fore Z	081	FIL	G's	17.1	76.4	-66.9	56.6	180

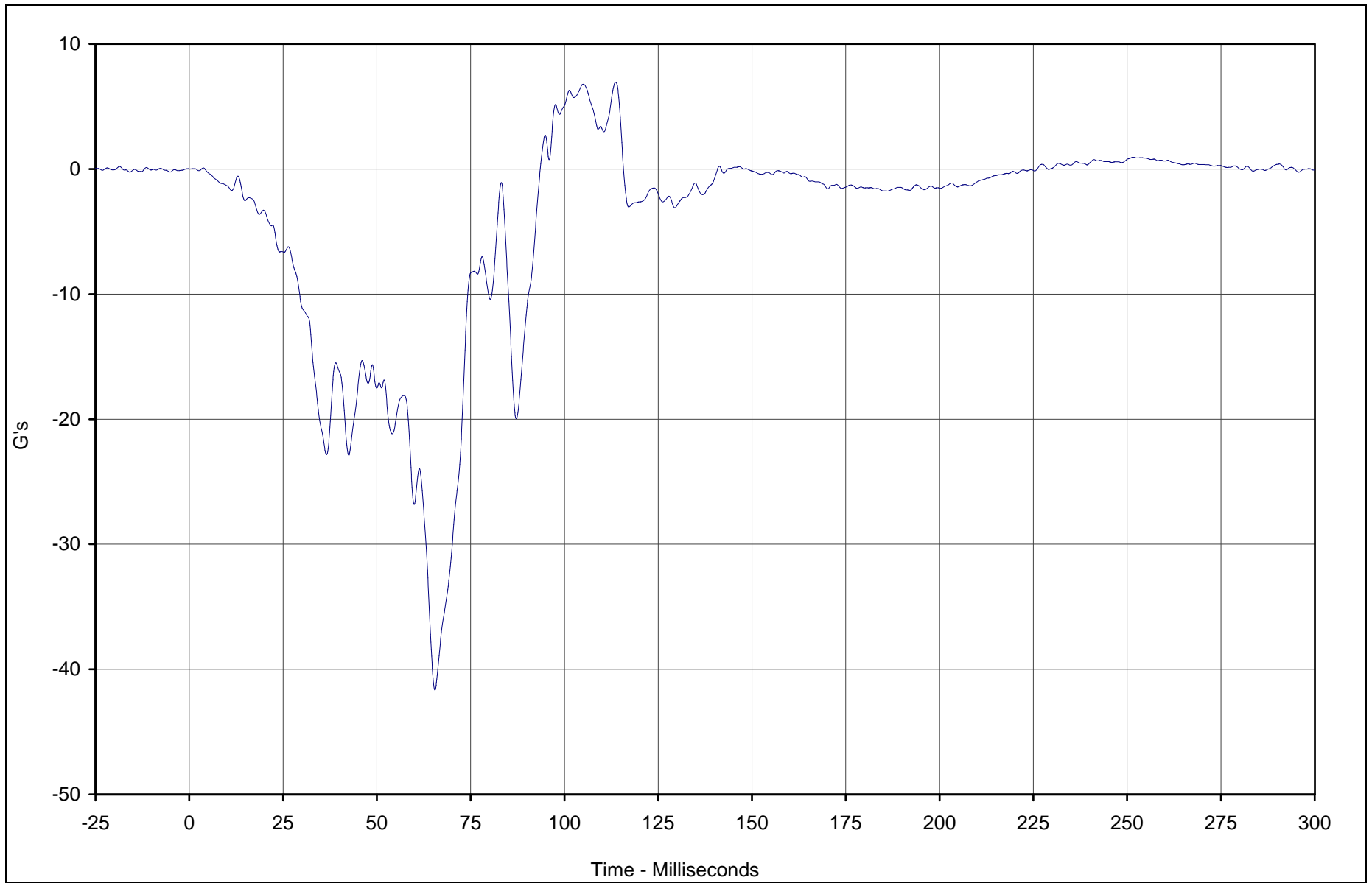


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Aft X	082	FIL	G's	6.9	113.7	-41.7	65.5	180



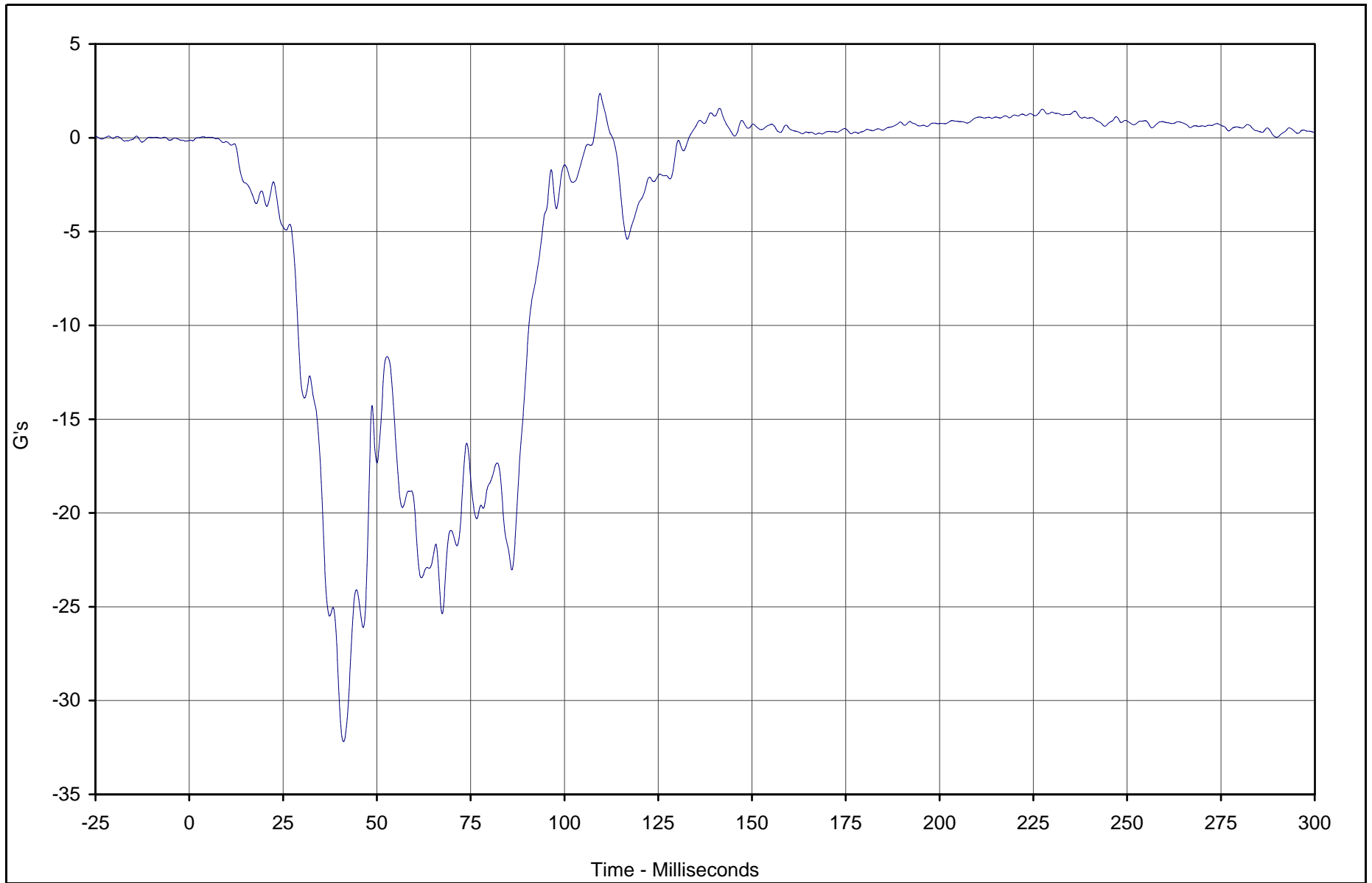
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-117



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Aft Z	083	FIL	G's	2.4	109.5	-32.2	41.1	180



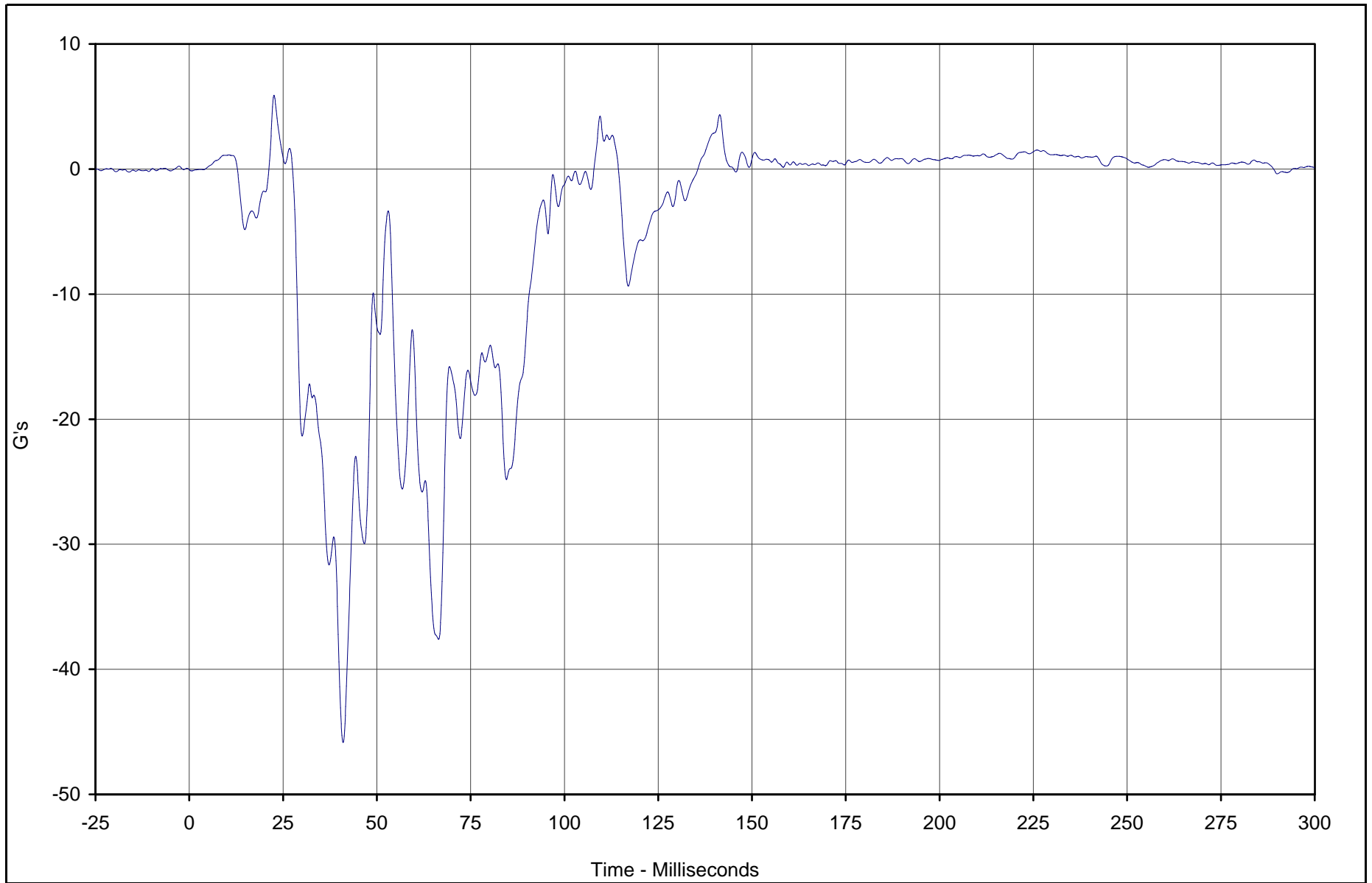
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Fore Z	084	FIL	G's	5.9	22.6	-45.9	41.0	180

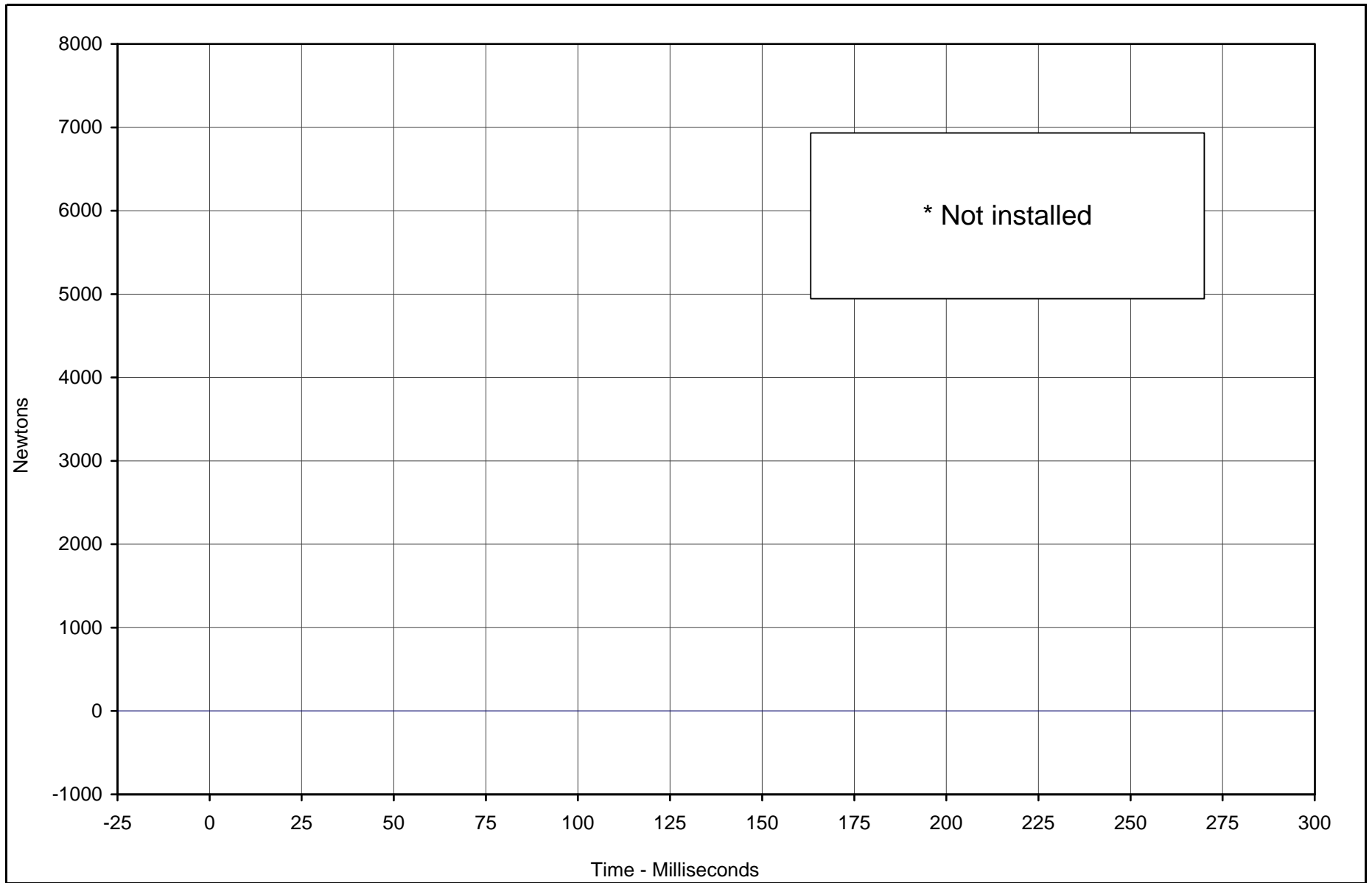


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Lap Belt Force	085	FIL	Newtons	0.0	0.0	0.0	0.0	60

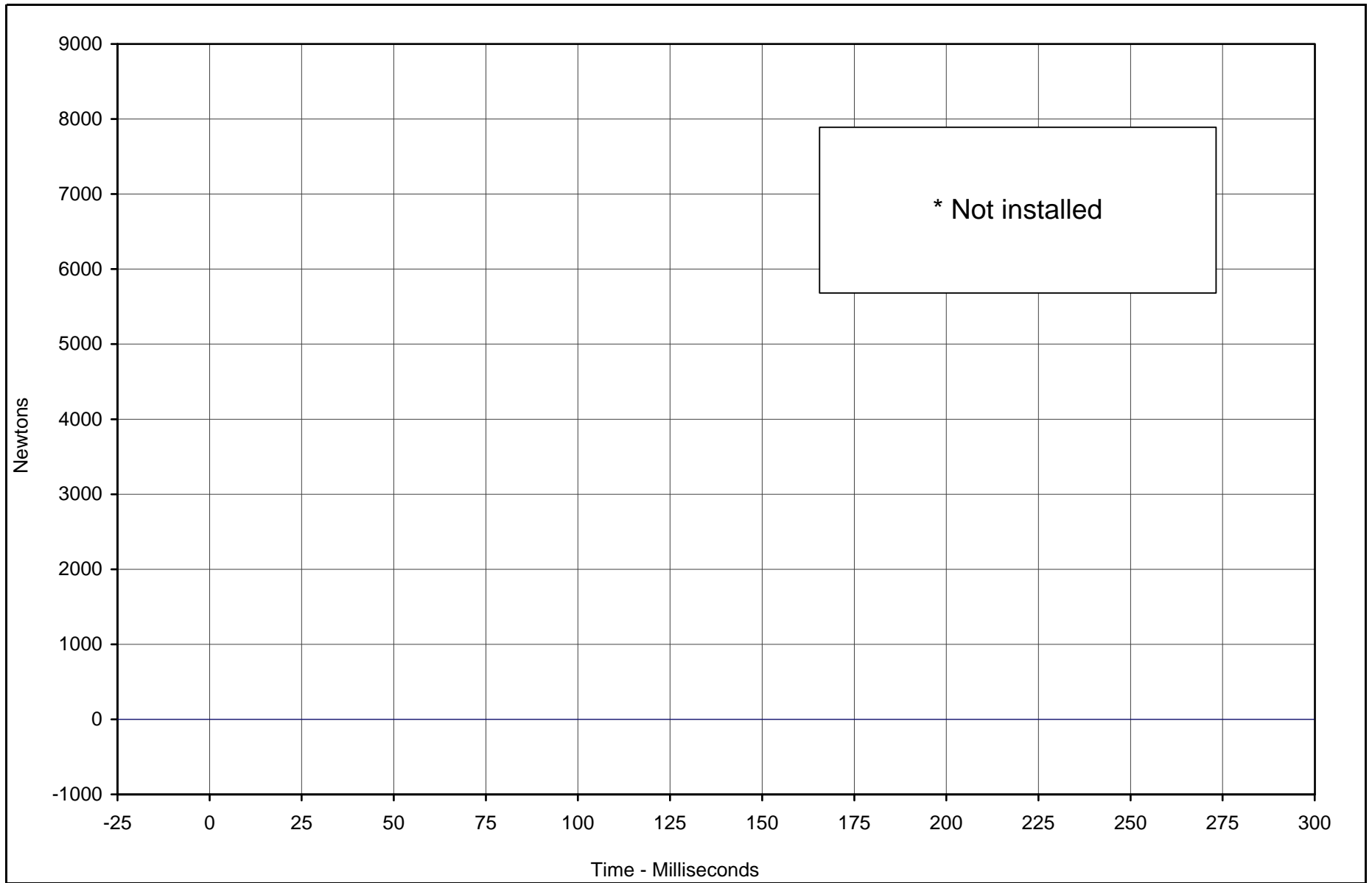


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Shoulder Belt Force	086	FIL	Newtons	0.0	0.0	0.0	0.0	60



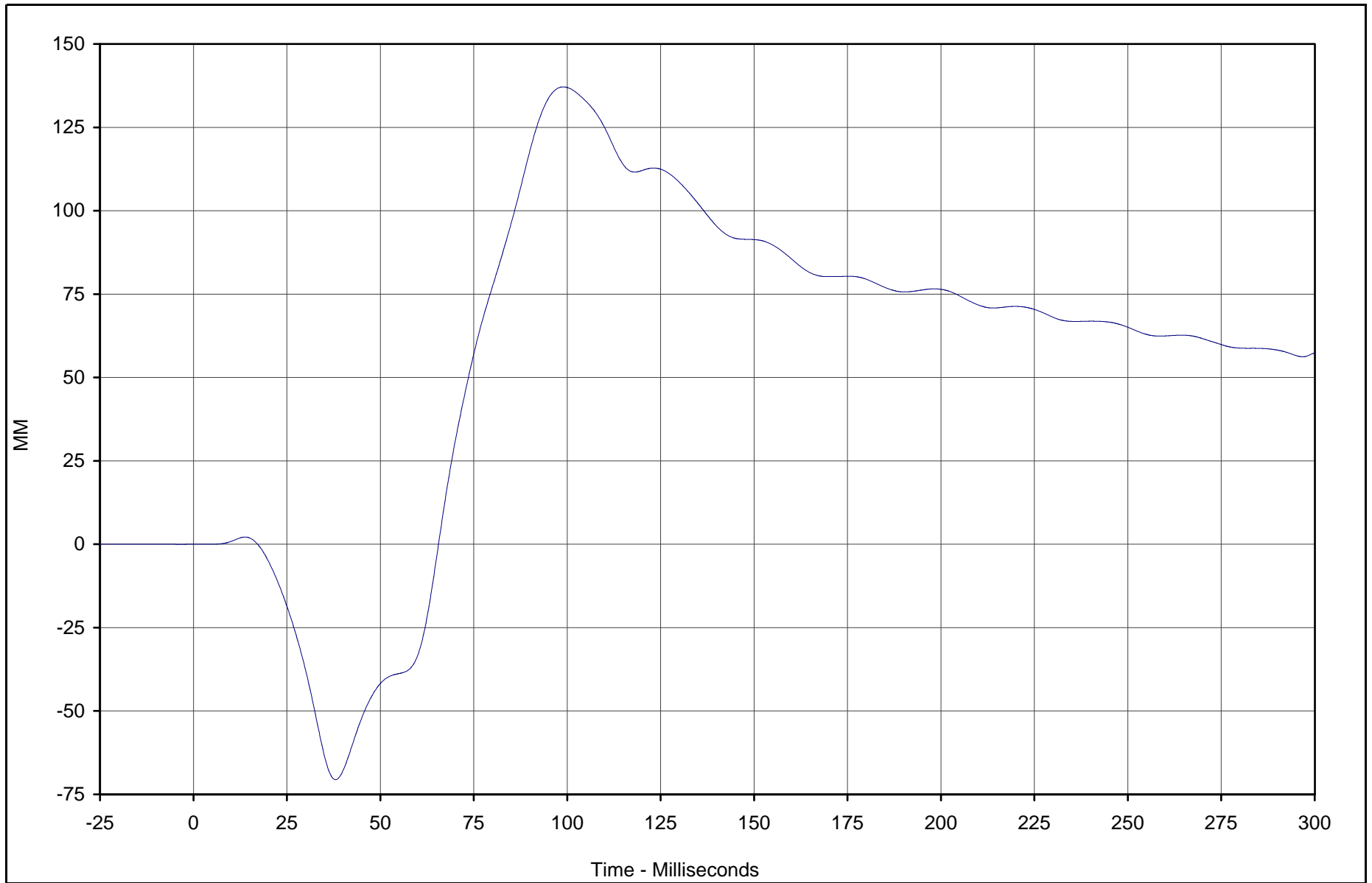
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-121



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Shoulder Belt Pullout	087	FIL	MM	137.1	98.9	-70.6	38.0	60



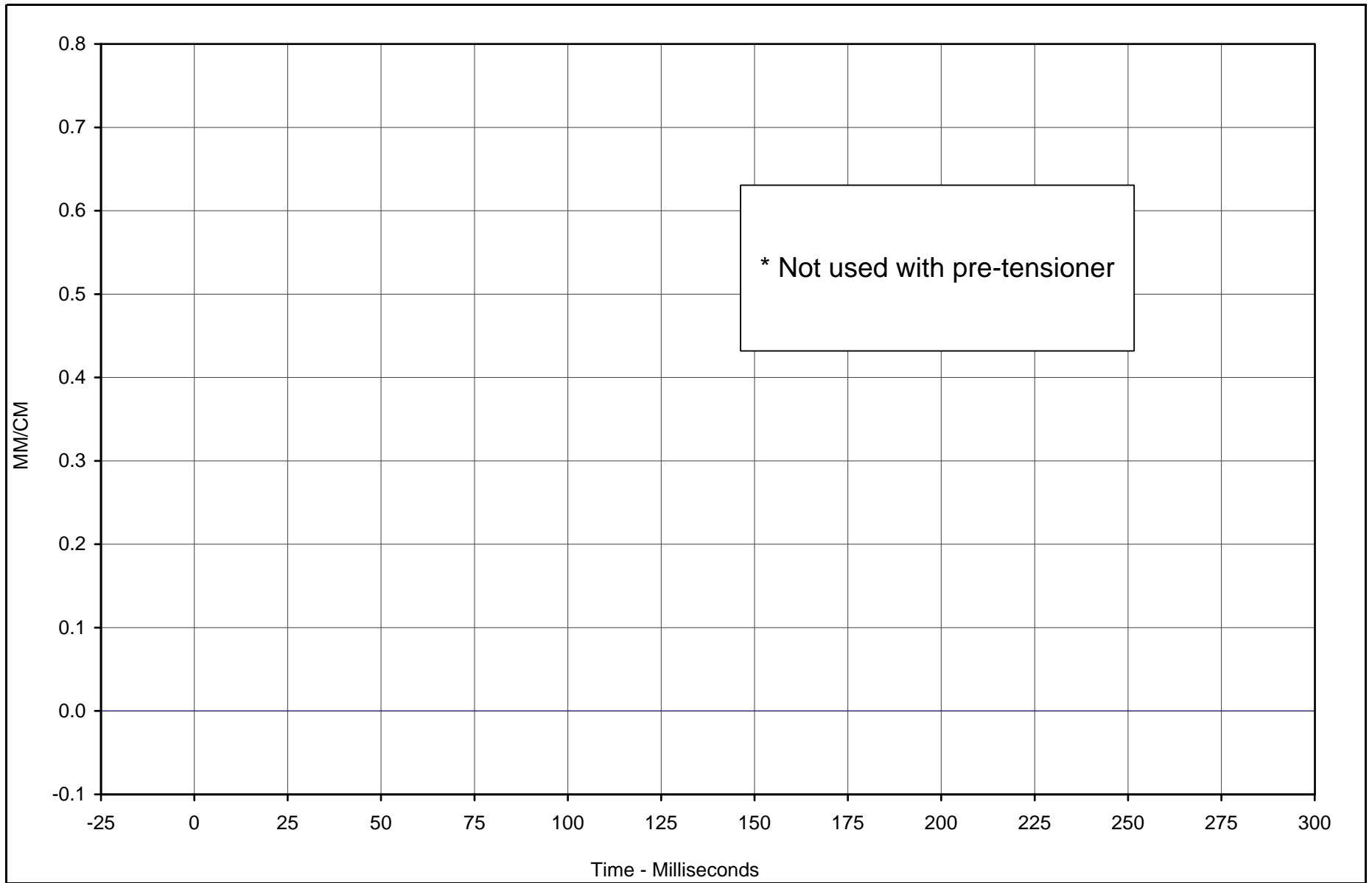
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



\* Not used with pre-tensioner

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Shoulder Belt Elongation	088	FIL	MM/CM	0.00	0.0	0.00	0.0	60



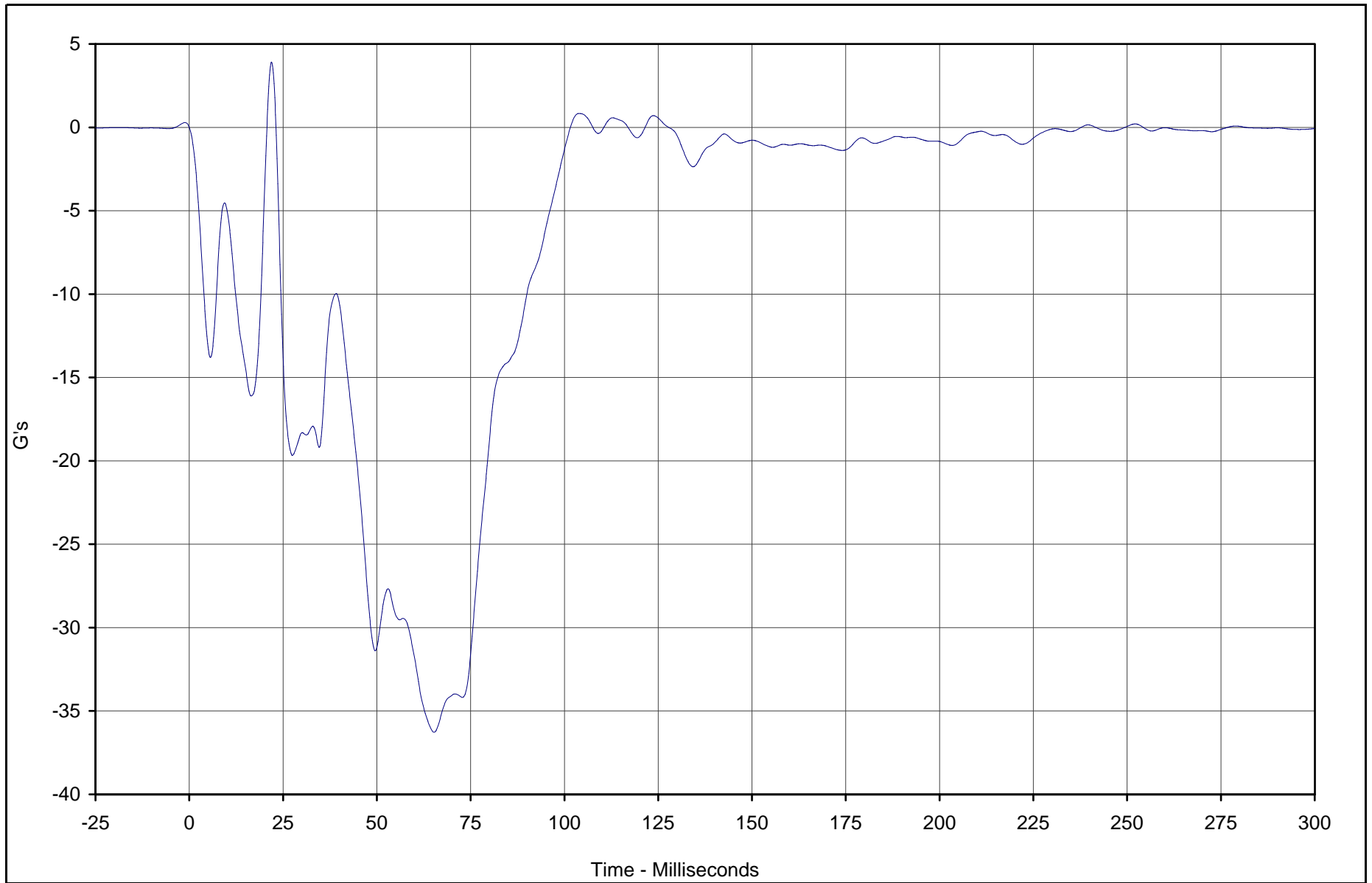
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-123



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X	089	FIL	G's	3.9	21.9	-36.3	65.2	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

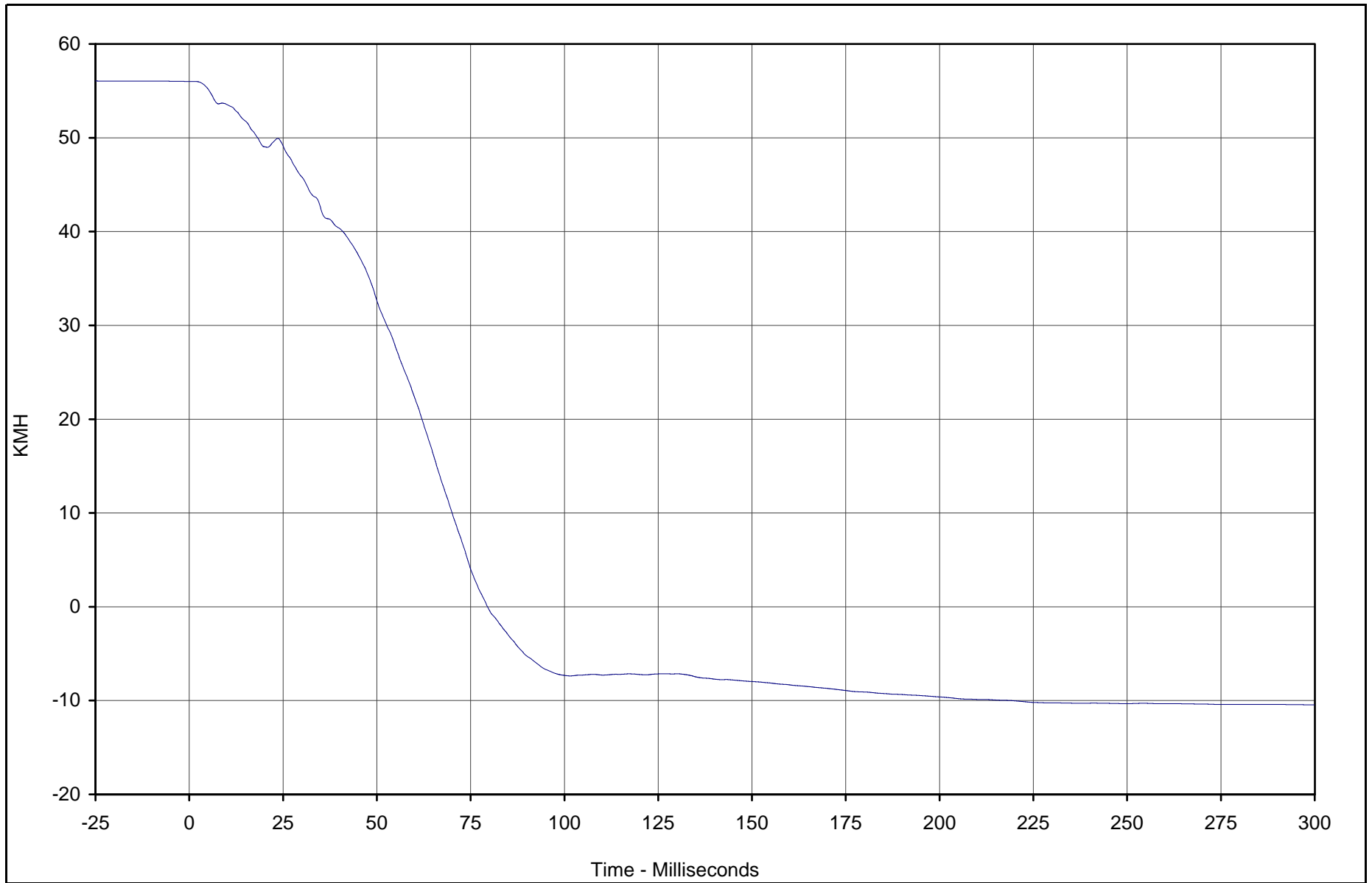
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-124



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X Velocity	089	IN1	KMH	56.0	1.3	-10.5	299.9	180



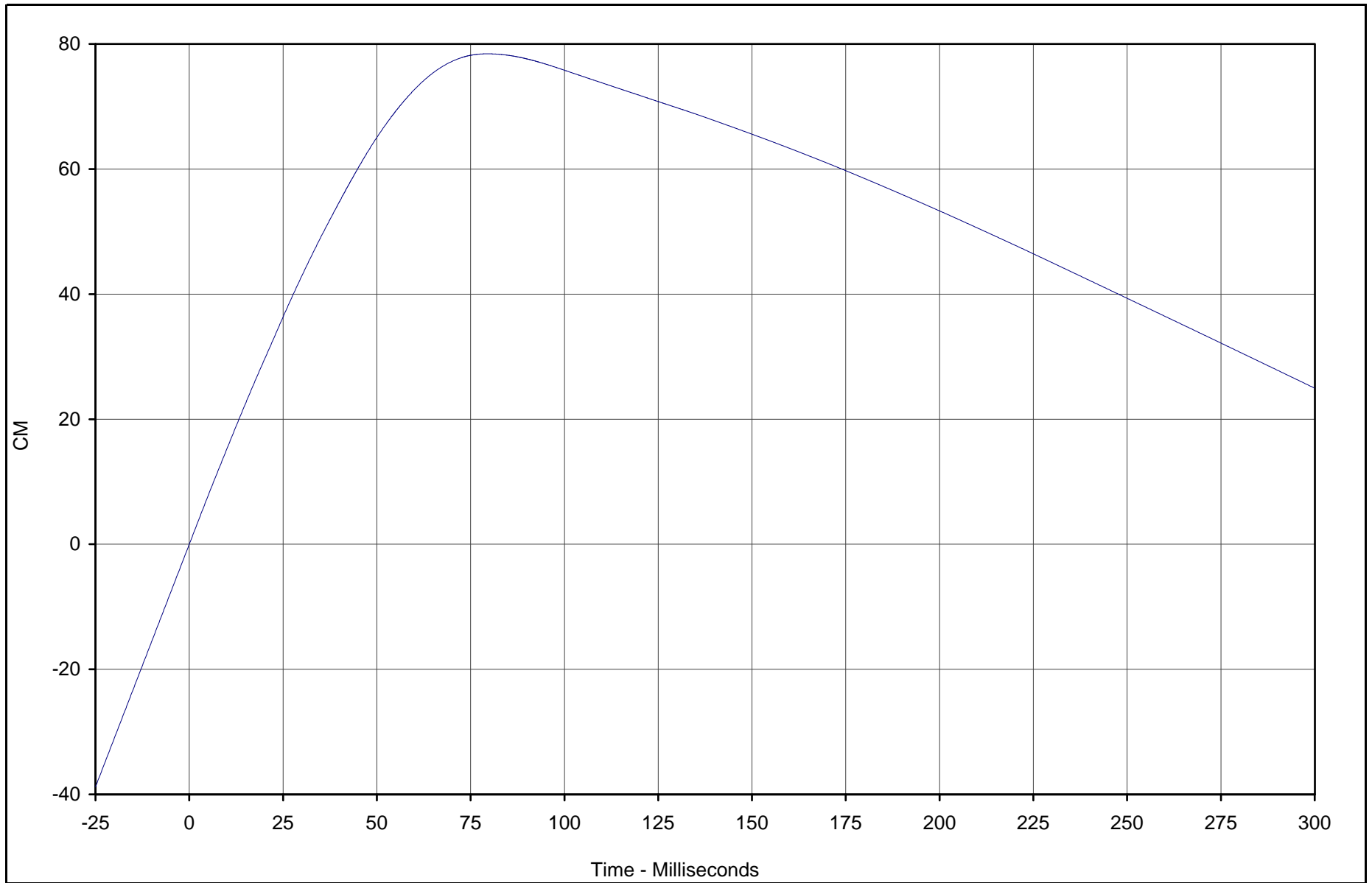
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-125



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X Displ.	089	IN2	CM	78.4	79.5	0.0	0.0	180



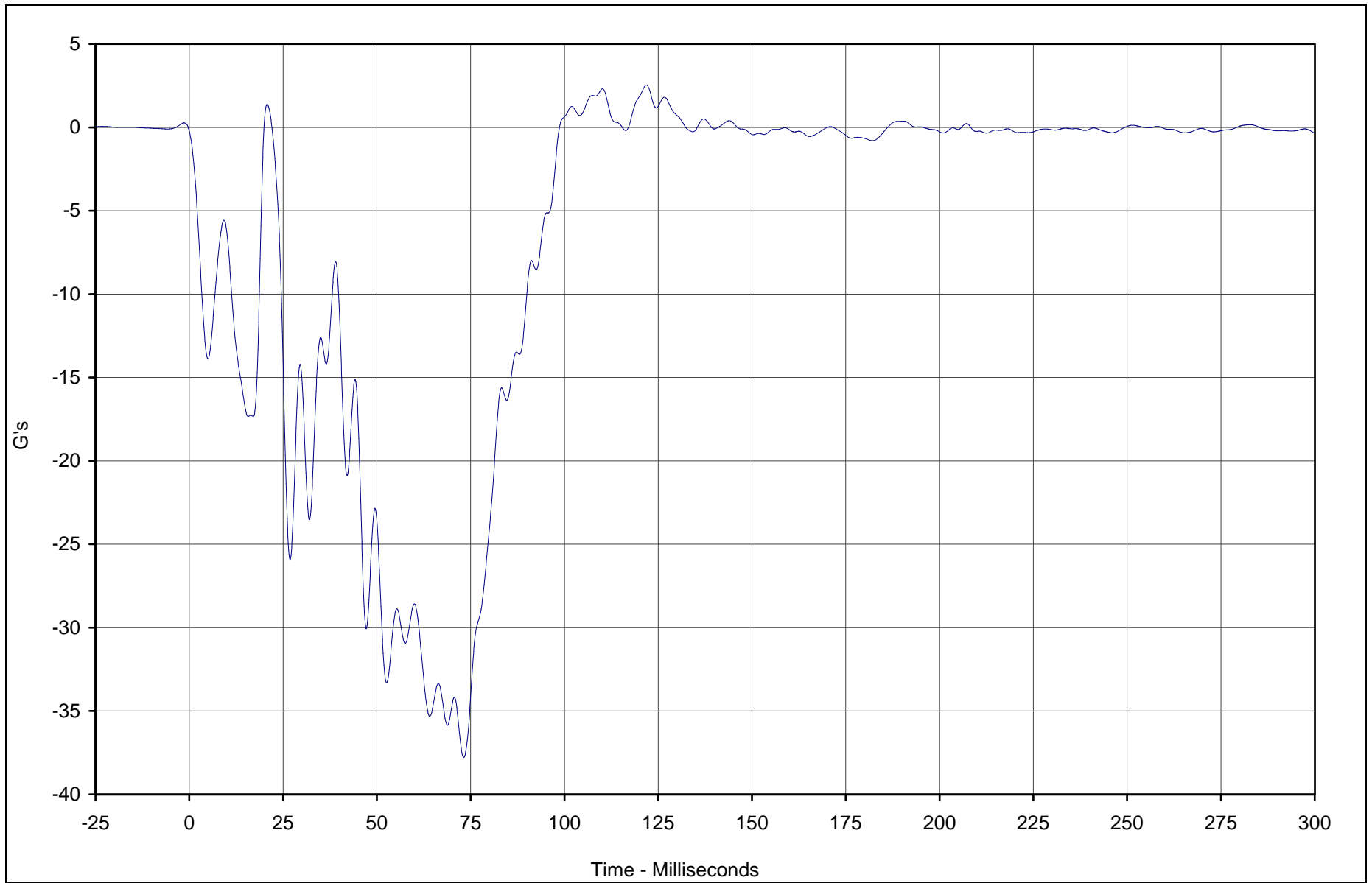
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X	090	FIL	G's	2.5	121.9	-37.8	73.2	60



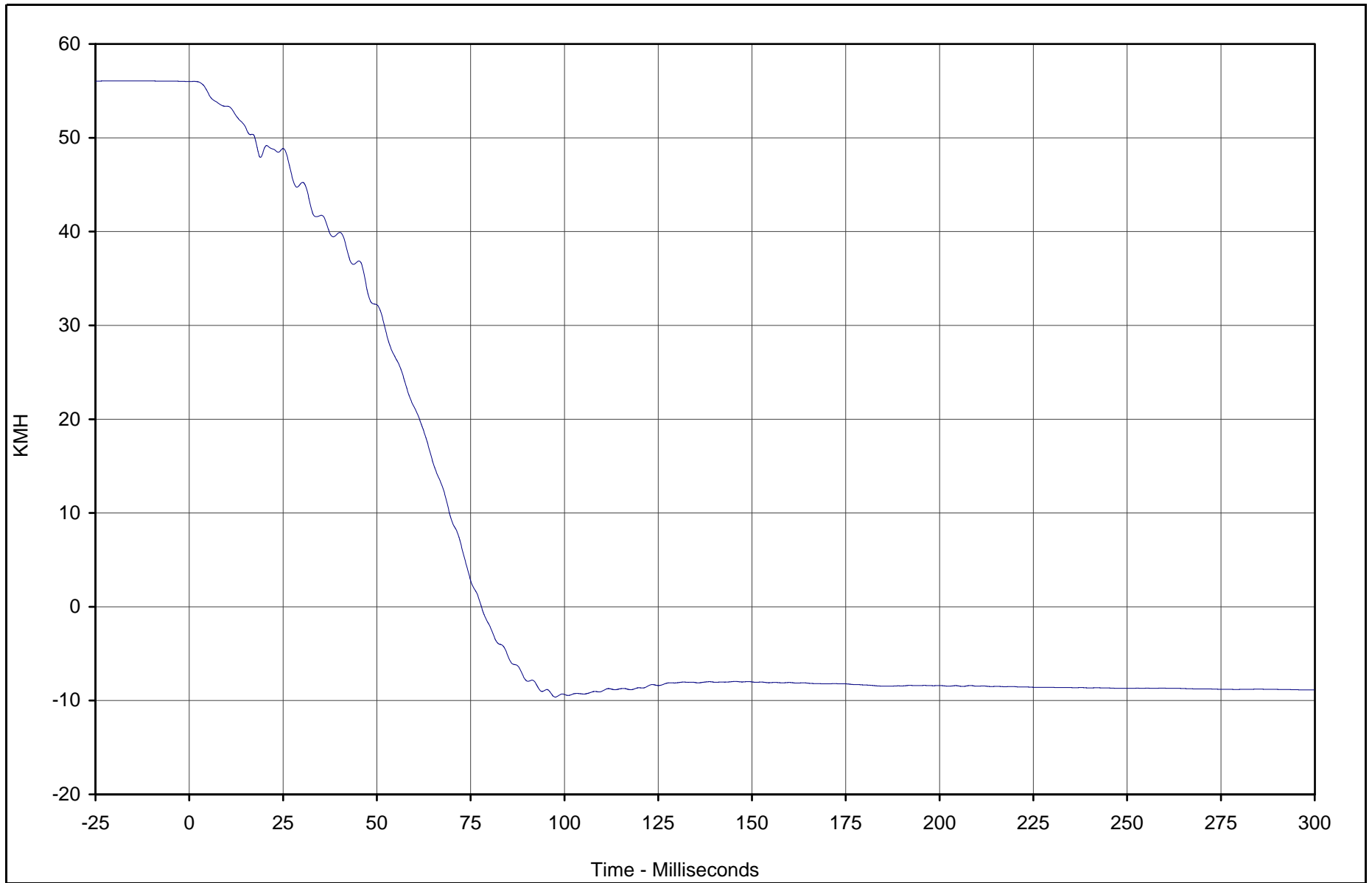
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-127



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X Velocity	090	IN1	KMH	56.0	1.3	-9.6	97.6	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

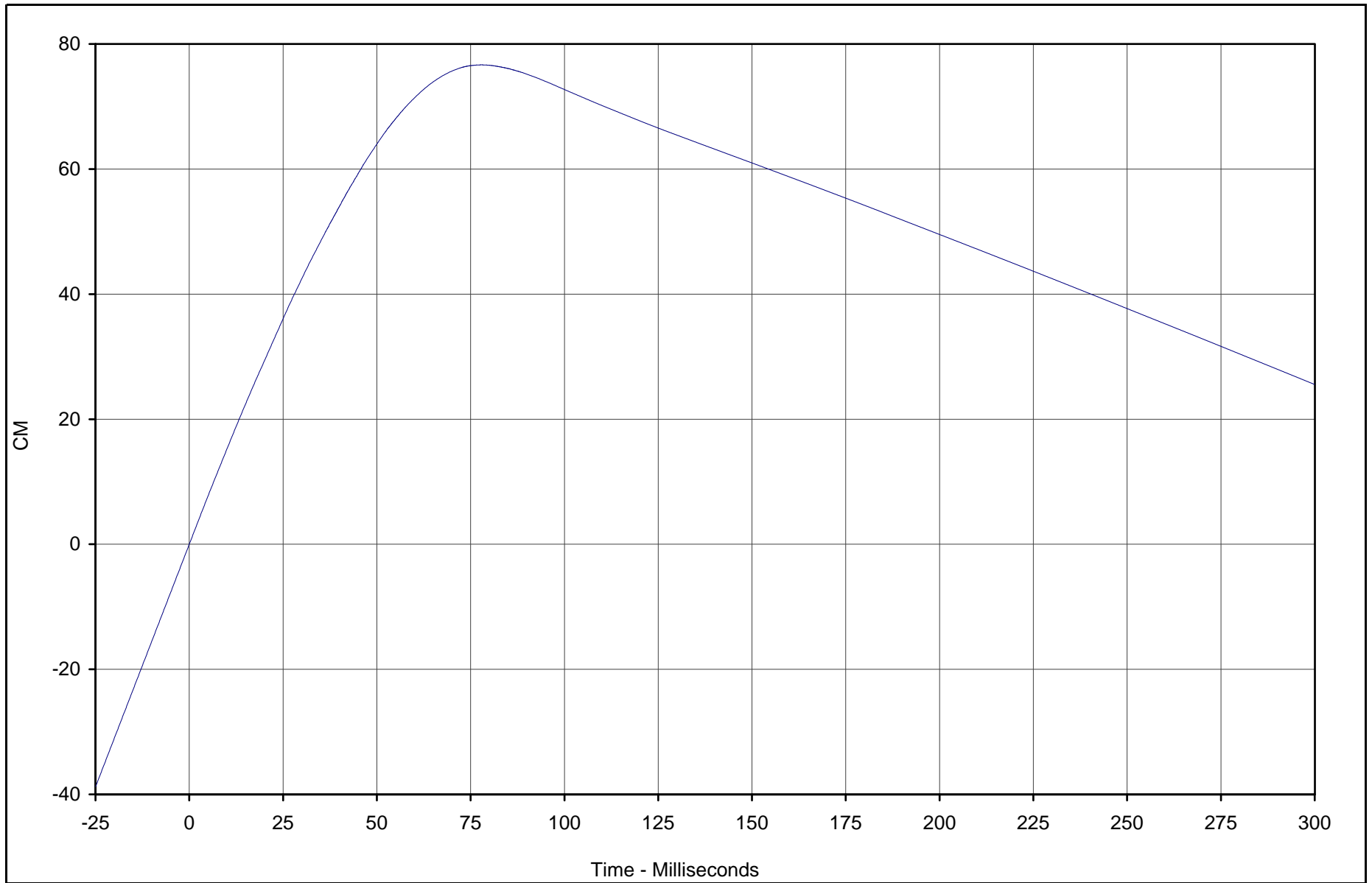
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-128



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X Displ.	090	IN2	CM	76.7	77.9	0.0	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

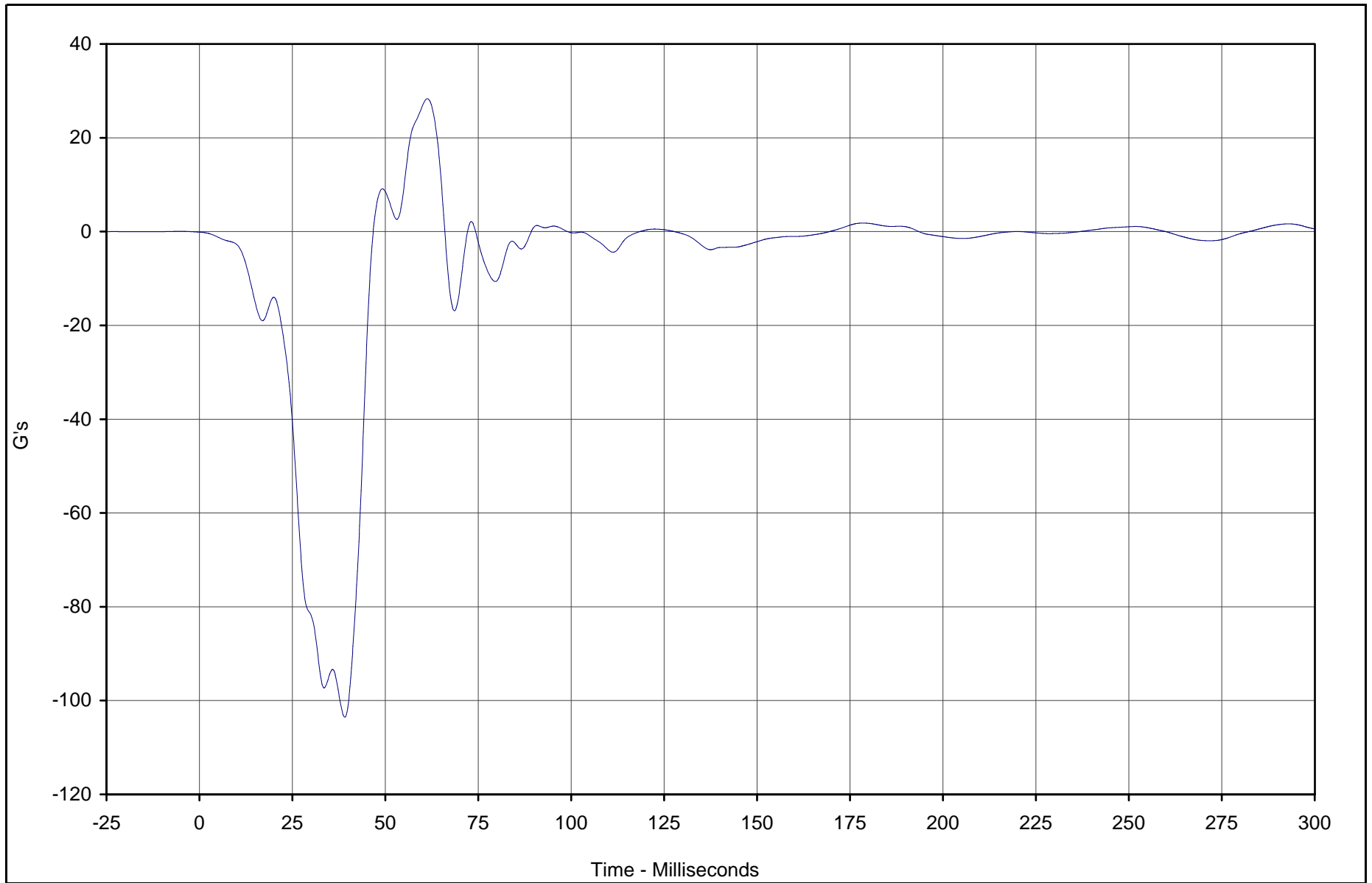
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-129



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top	091	FIL	G's	28.3	61.3	-103.6	39.1	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

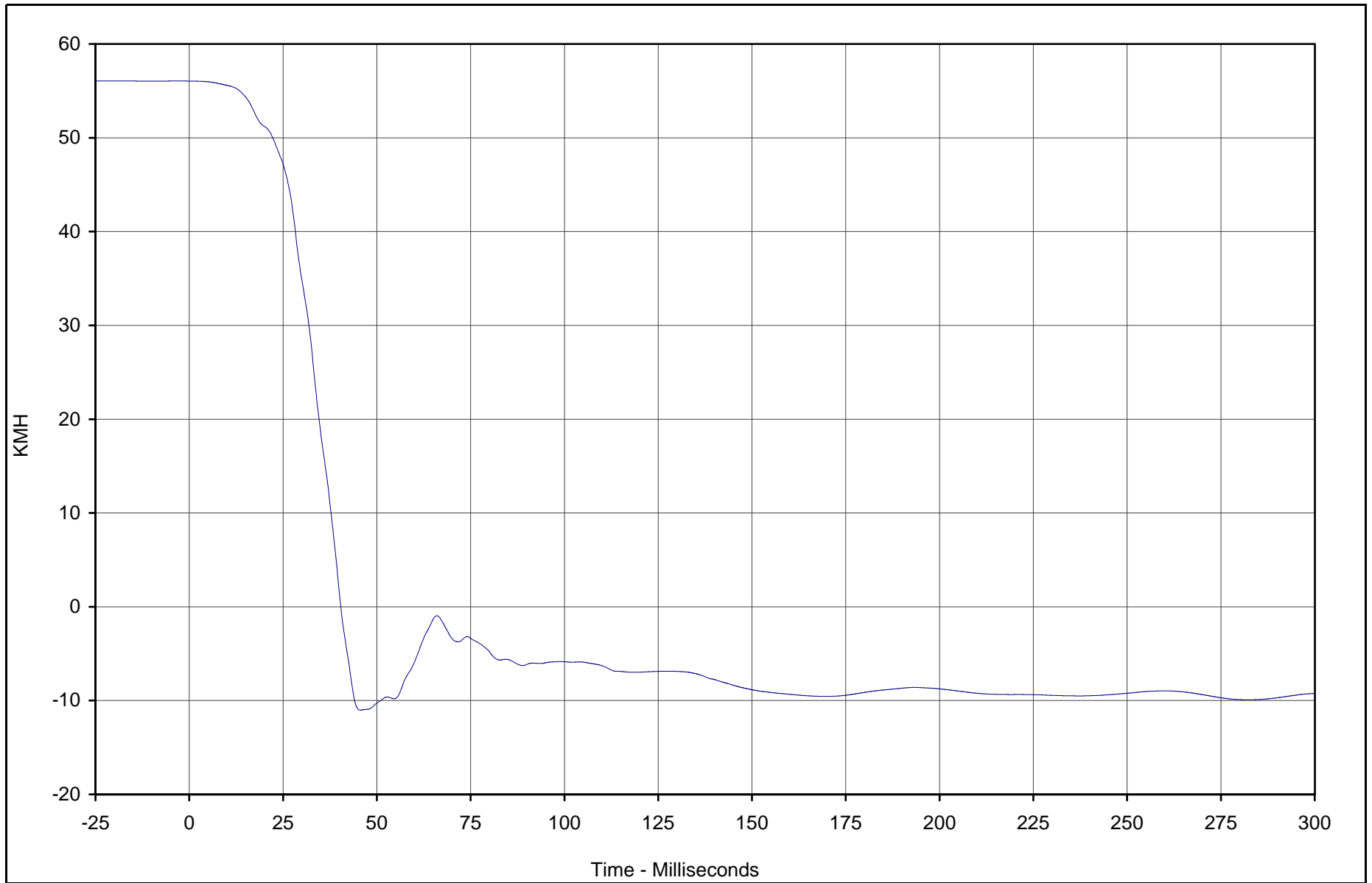
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-130



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top Velocity	091	IN1	KMH	56.0	0.0	-11.0	45.6	180



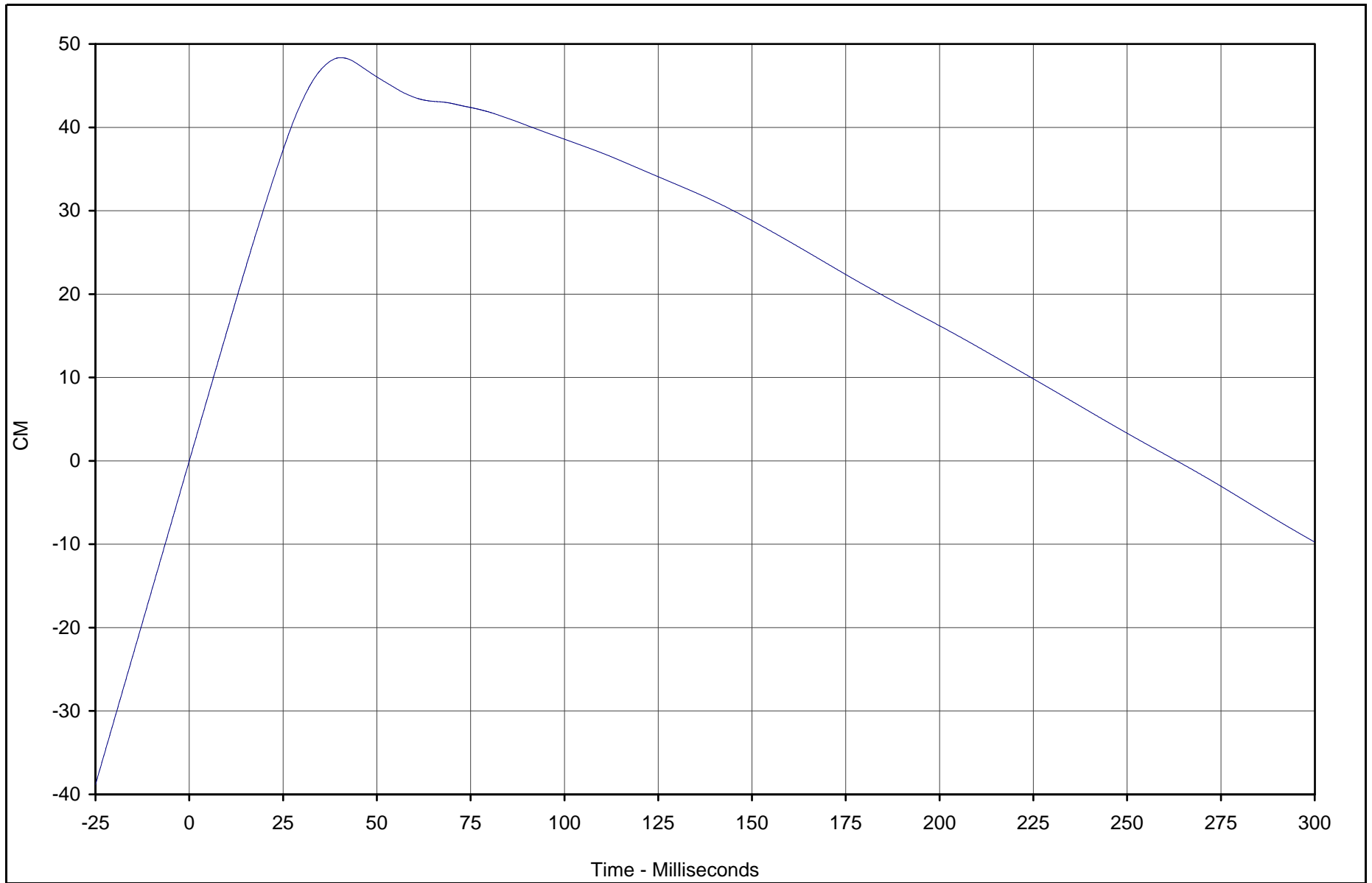
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-131



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top Displacement	091	IN2	CM	48.4	40.4	-9.7	299.9	180



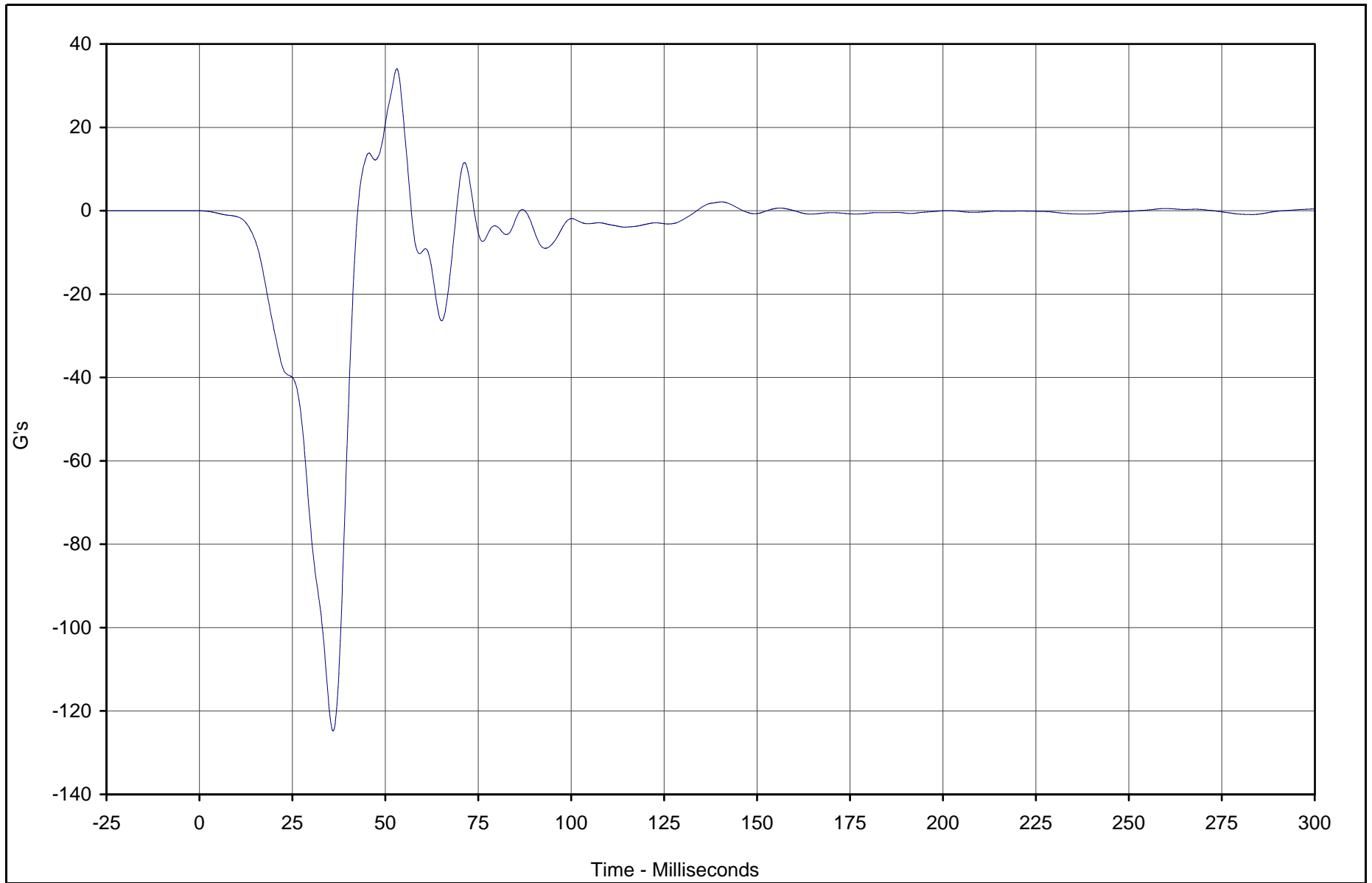
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-132



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom	092	FIL	G's	34.1	53.1	-124.8	36.0	60



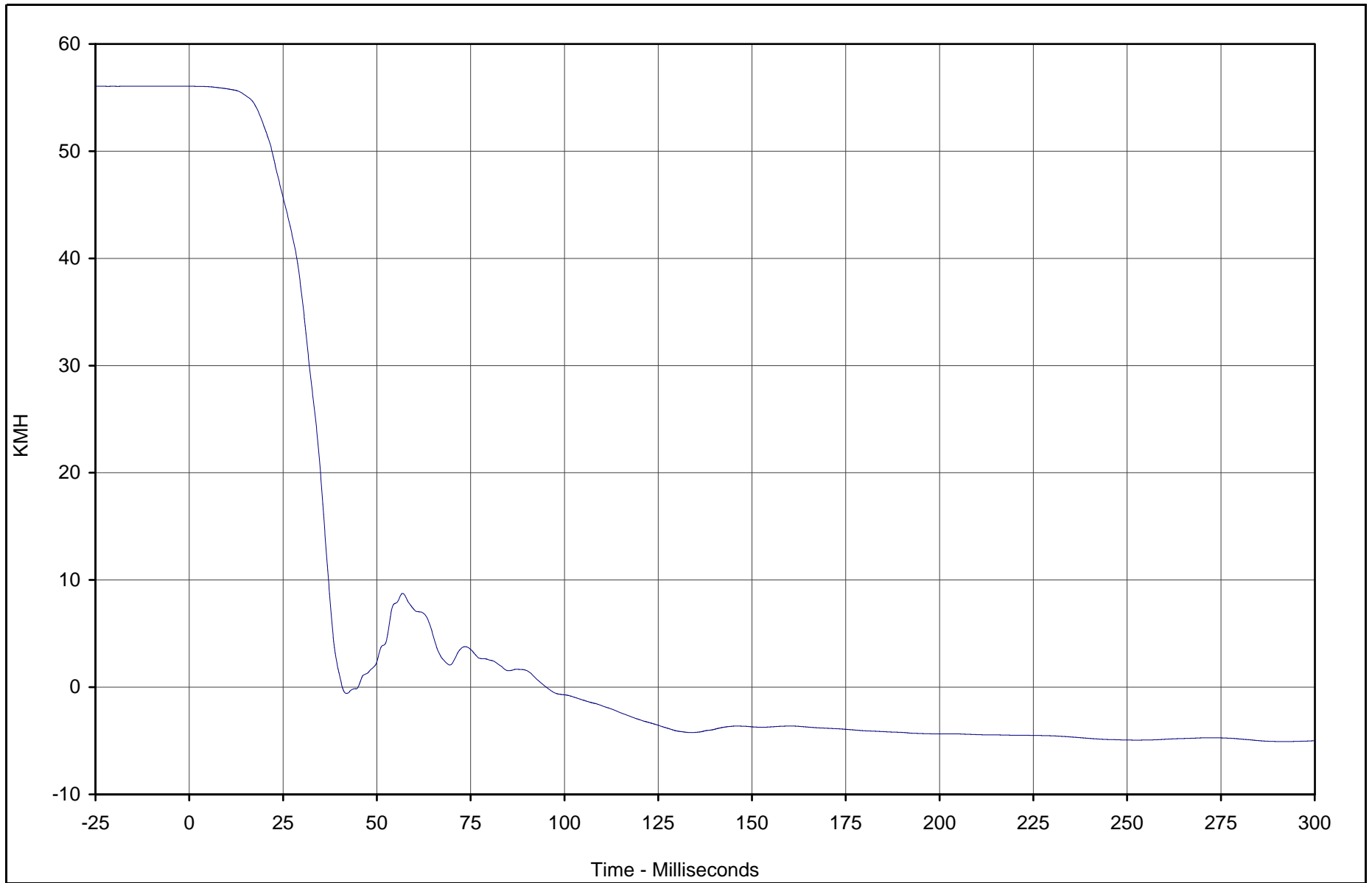
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-133



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom Velocity	092	IN1	KMH	56.1	0.3	-5.1	292.9	180



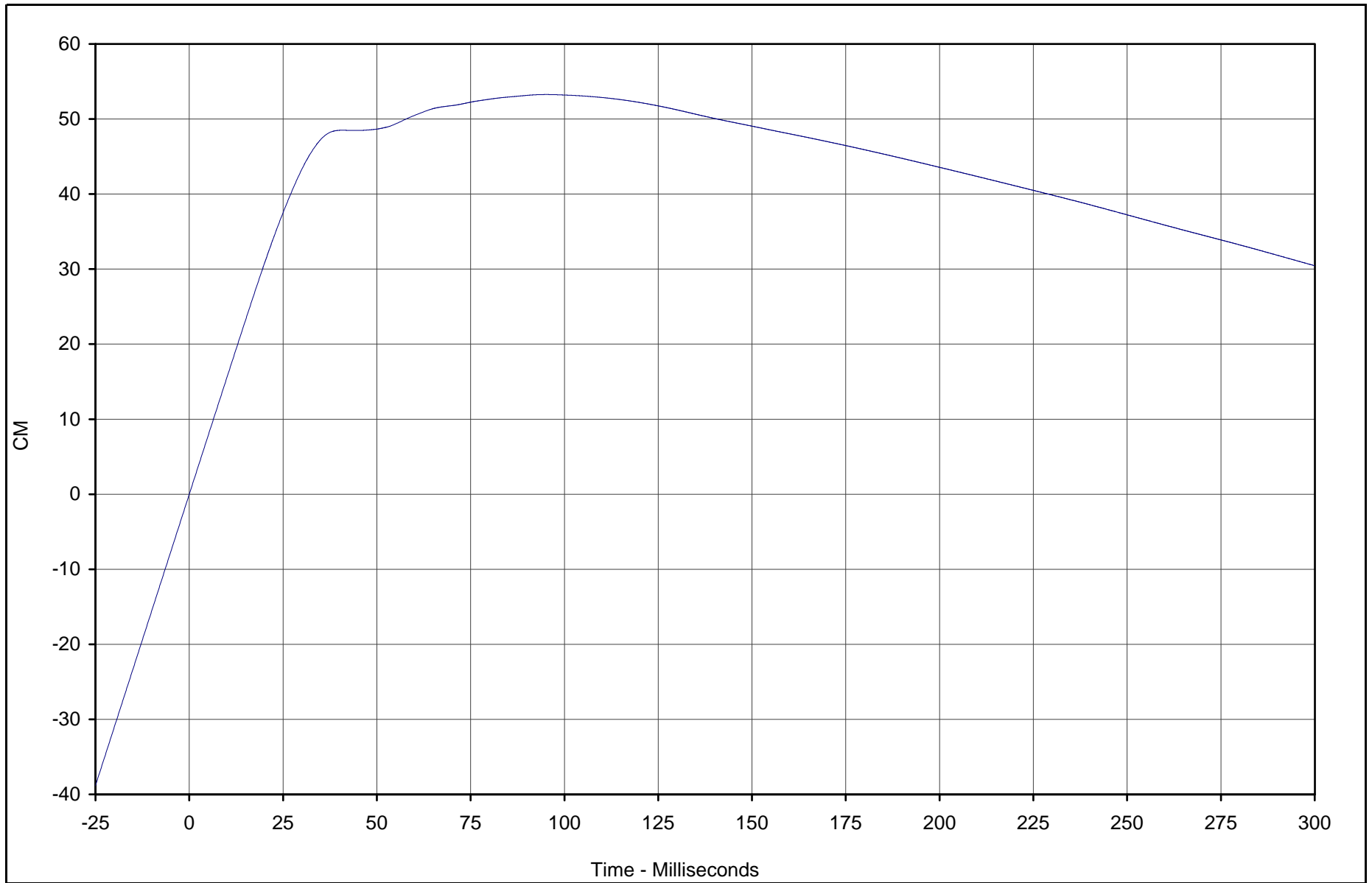
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-134



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom Displacement	092	IN2	CM	53.3	95.2	0.0	0.0	180

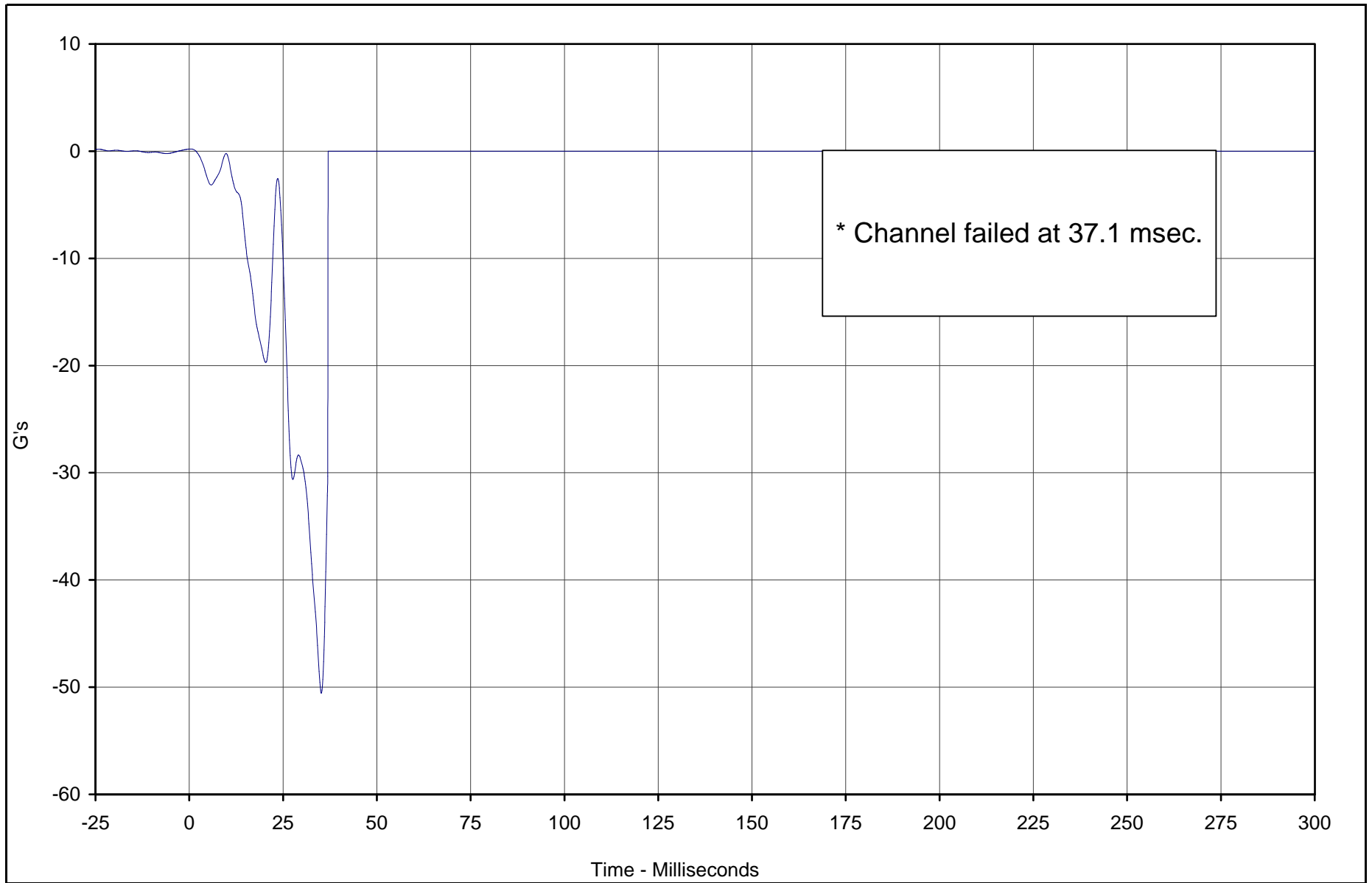


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed at 37.1 msec.

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper	093	FIL	G's	0.2	0.4	-50.6	35.2	60

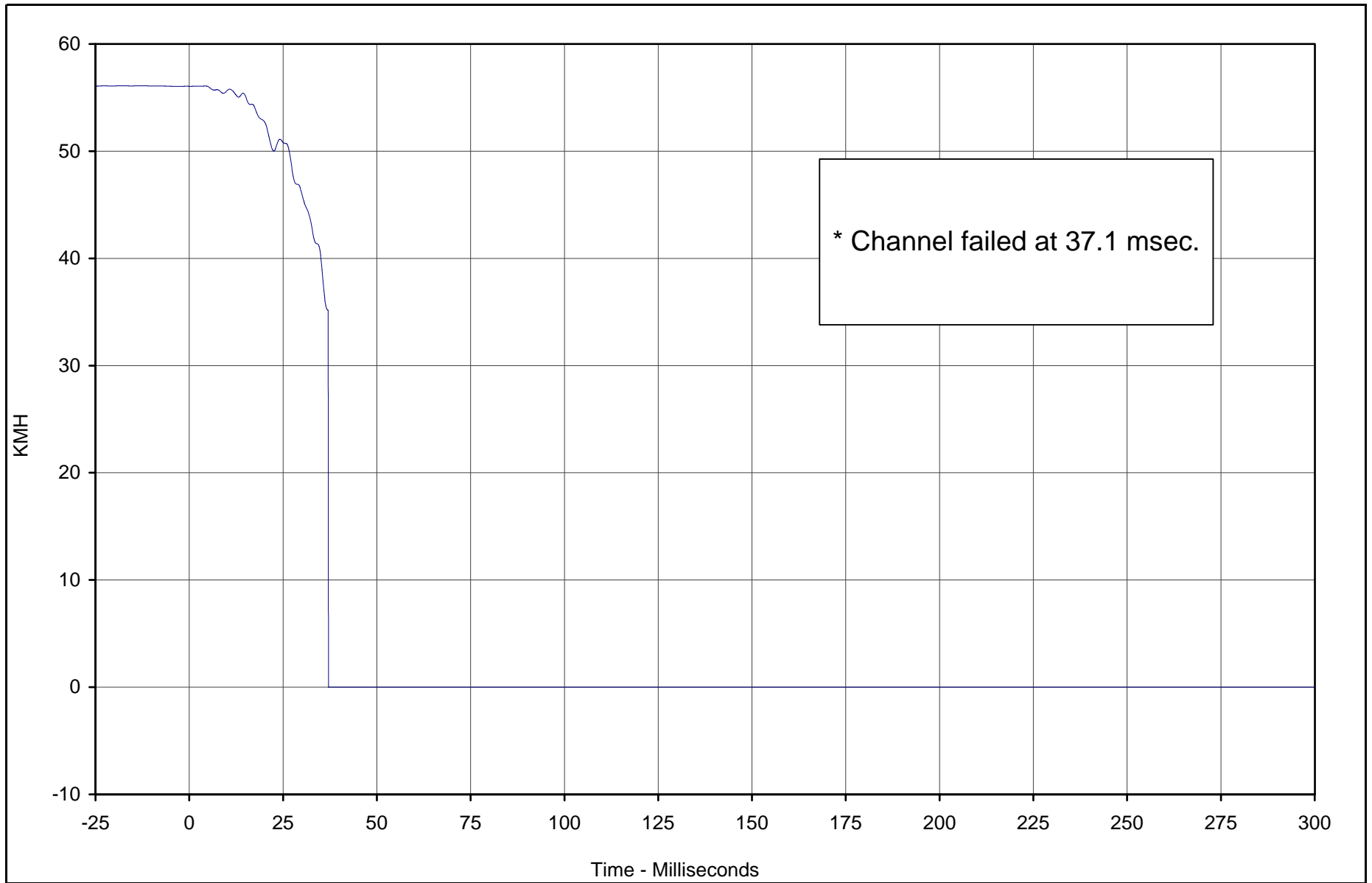


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed at 37.1 msec.

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper Velocity	093	IN1	KMH	56.1	4.3	0.0	37.1	180

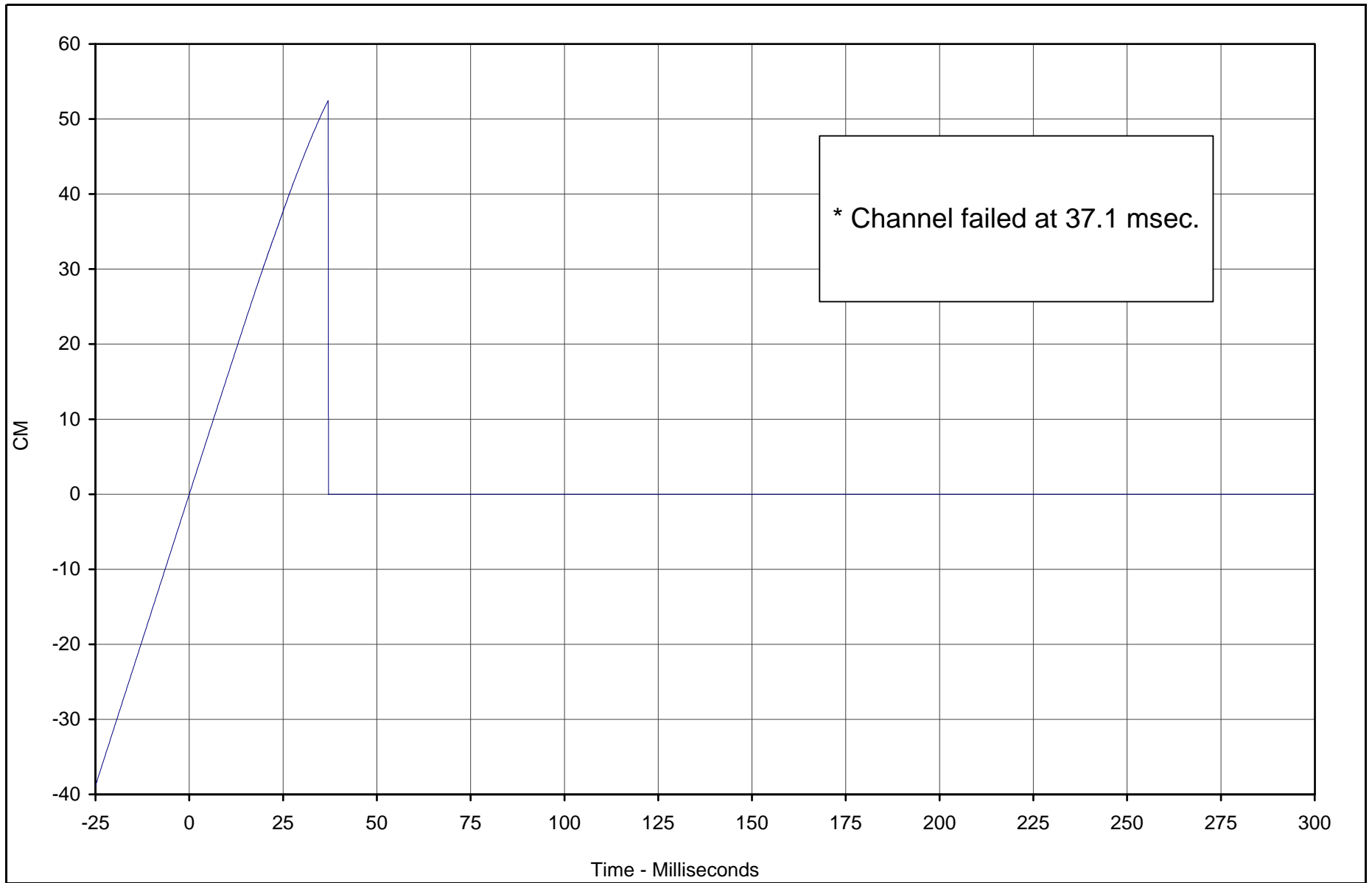


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed at 37.1 msec.

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper Displ.	093	IN2	CM	52.4	37.0	0.0	37.1	180



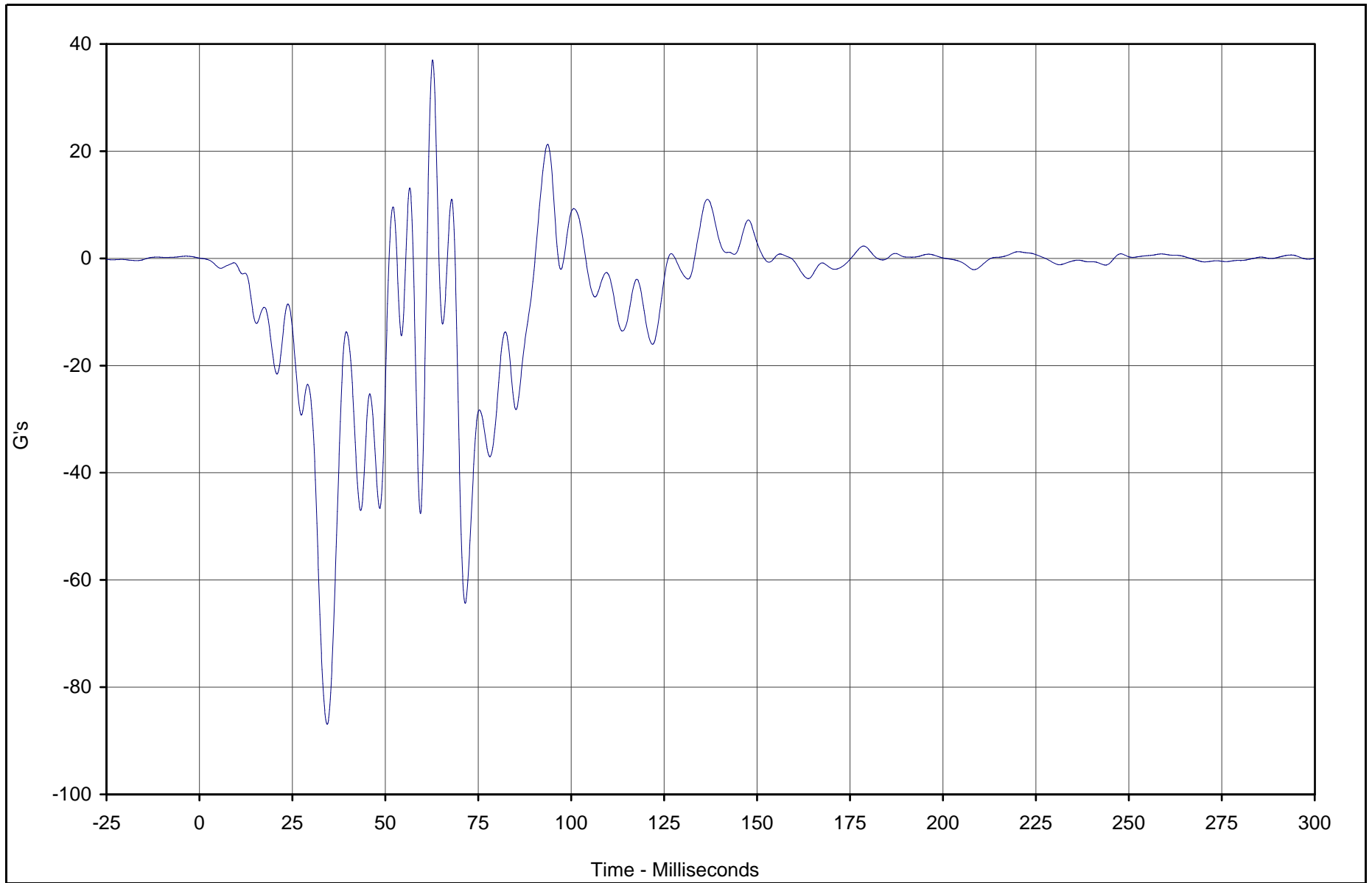
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-138



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper	094	FIL	G's	37.0	62.7	-86.9	34.4	60



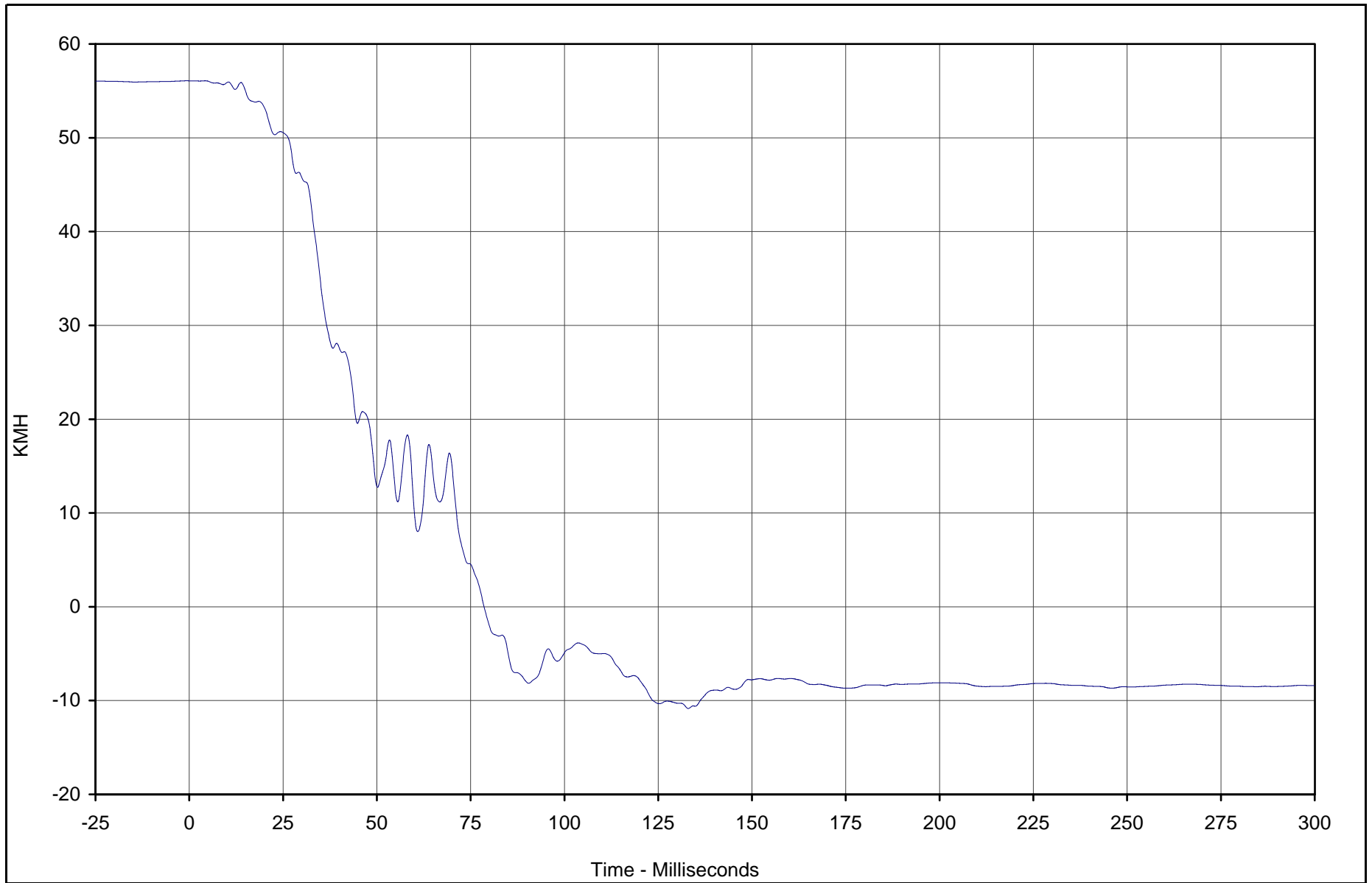
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-139



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper Velocity	094	IN1	KMH	56.1	4.2	-10.8	133.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

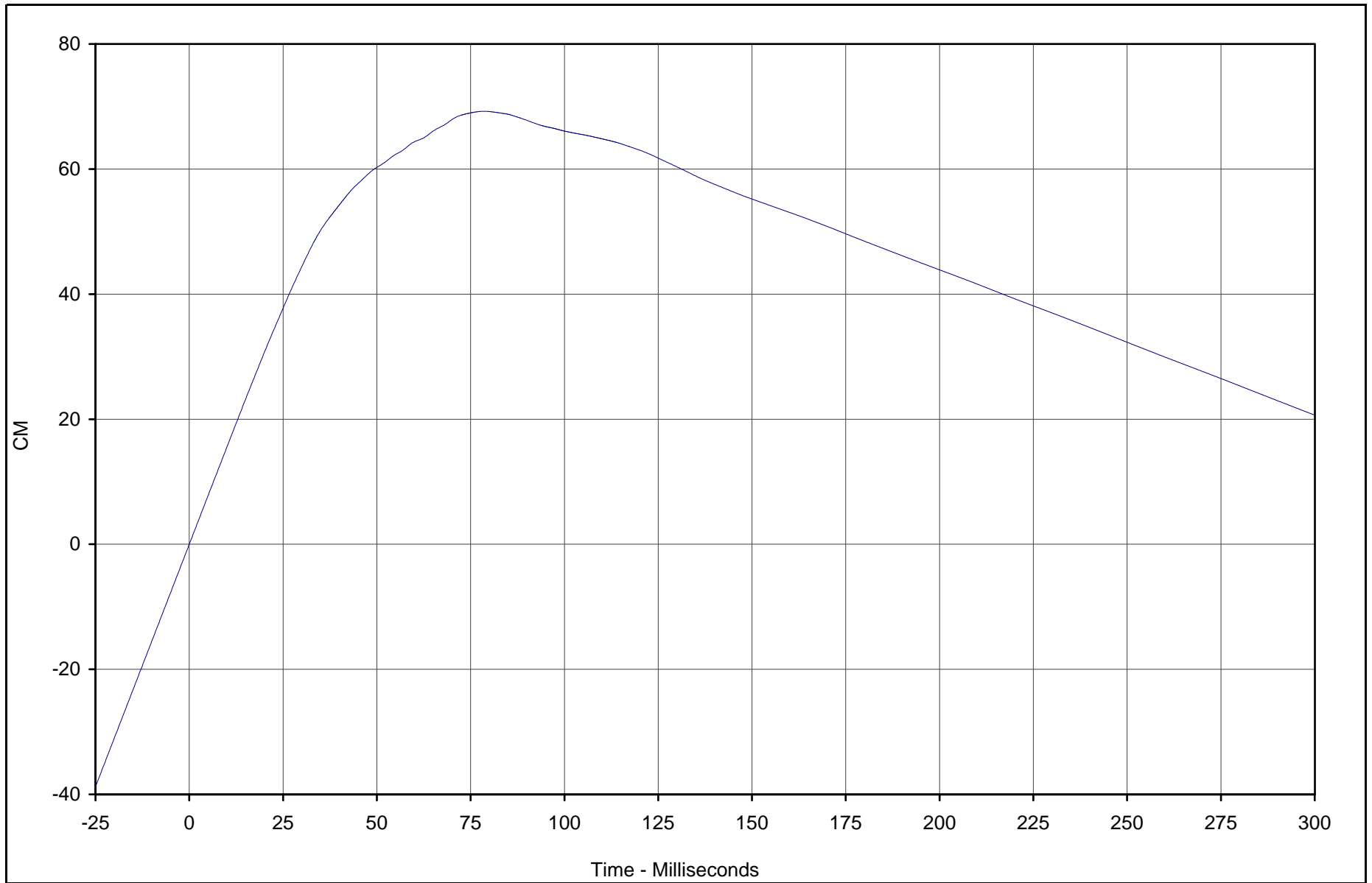
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-140



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper Displ.	094	IN2	CM	69.2	78.6	0.0	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

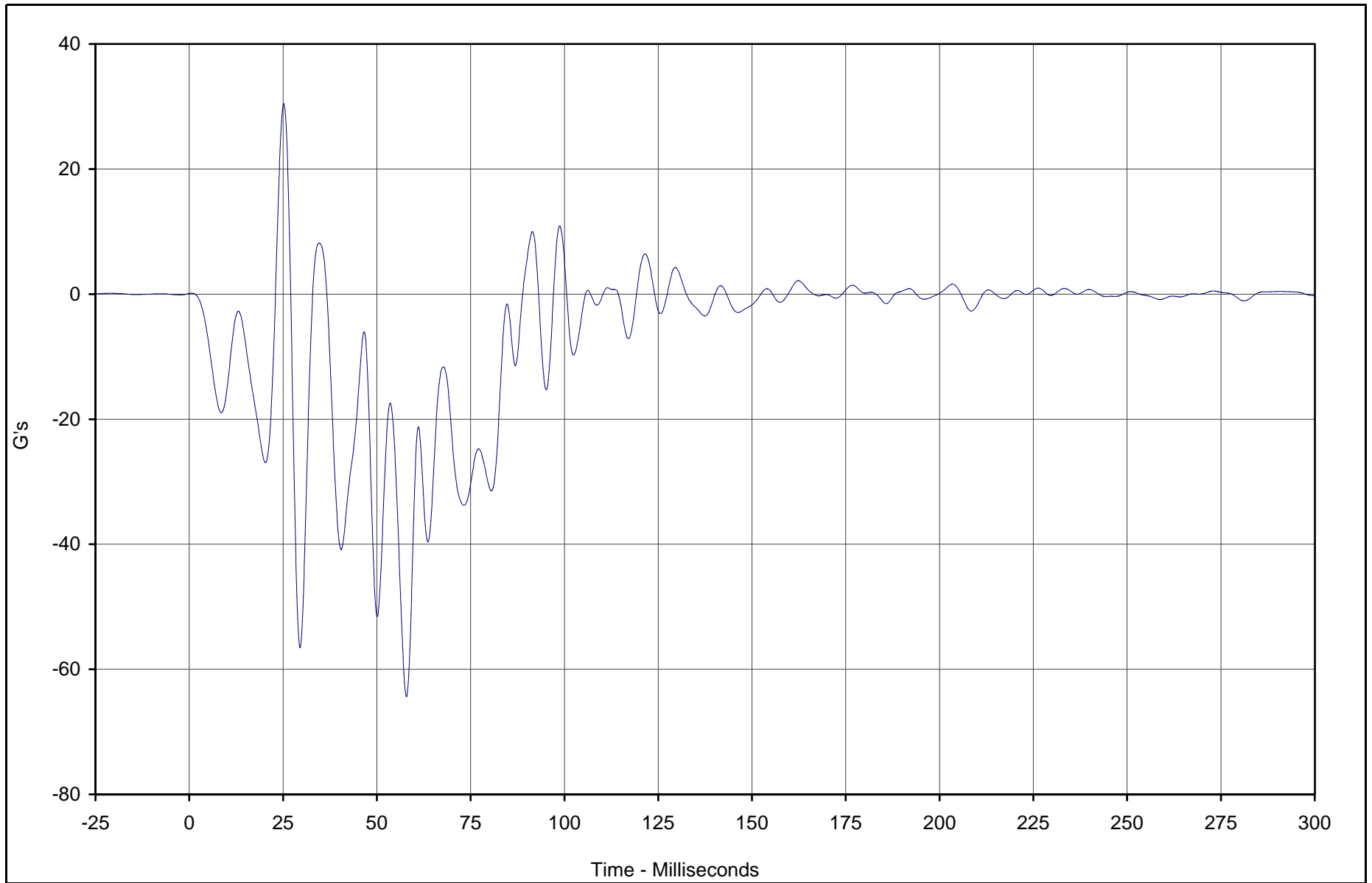
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-141



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel	095	FIL	G's	30.5	25.2	-64.4	57.9	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

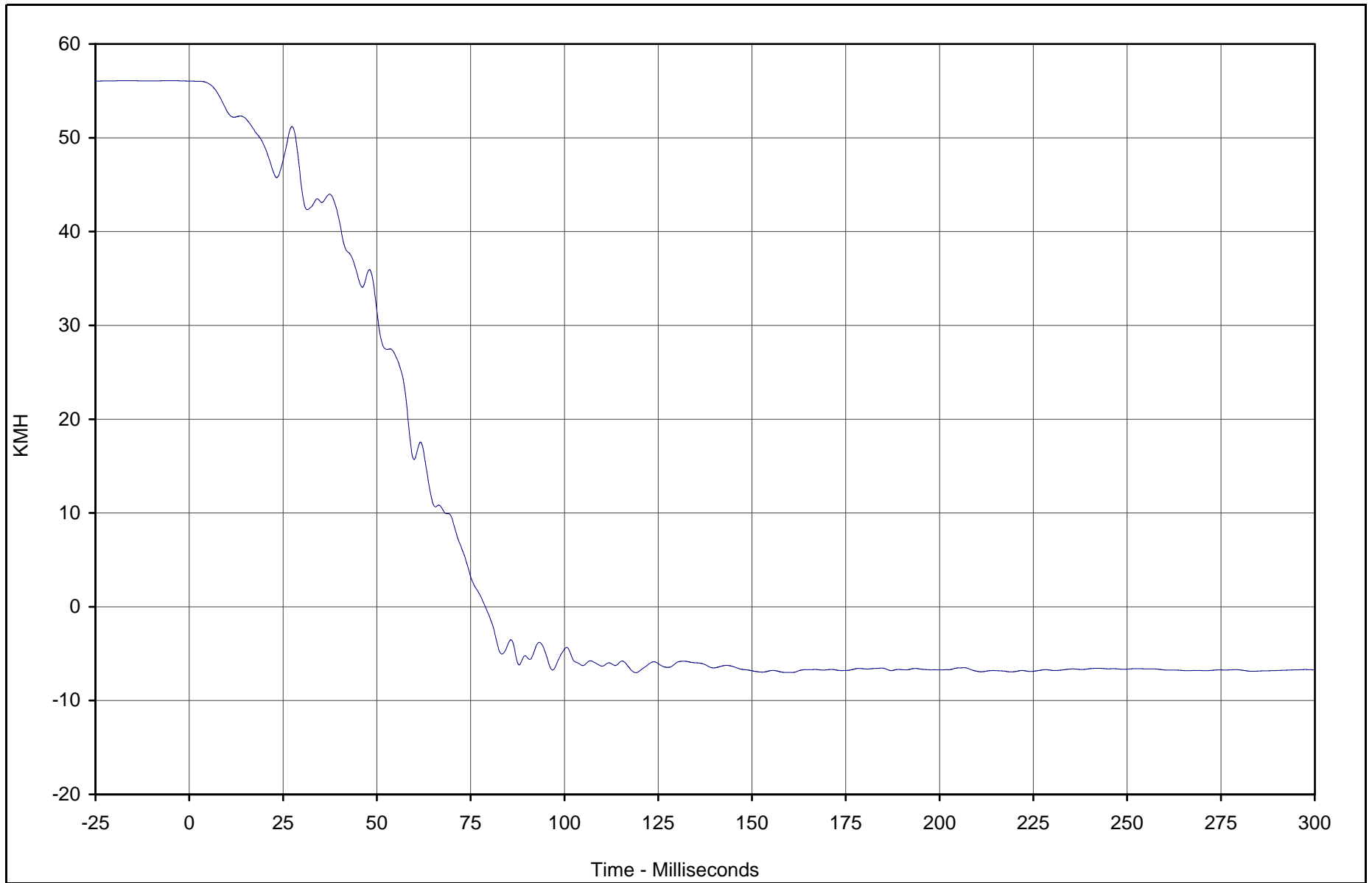
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-142



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel Velocity	095	IN1	KMH	56.0	0.0	-7.0	119.0	180



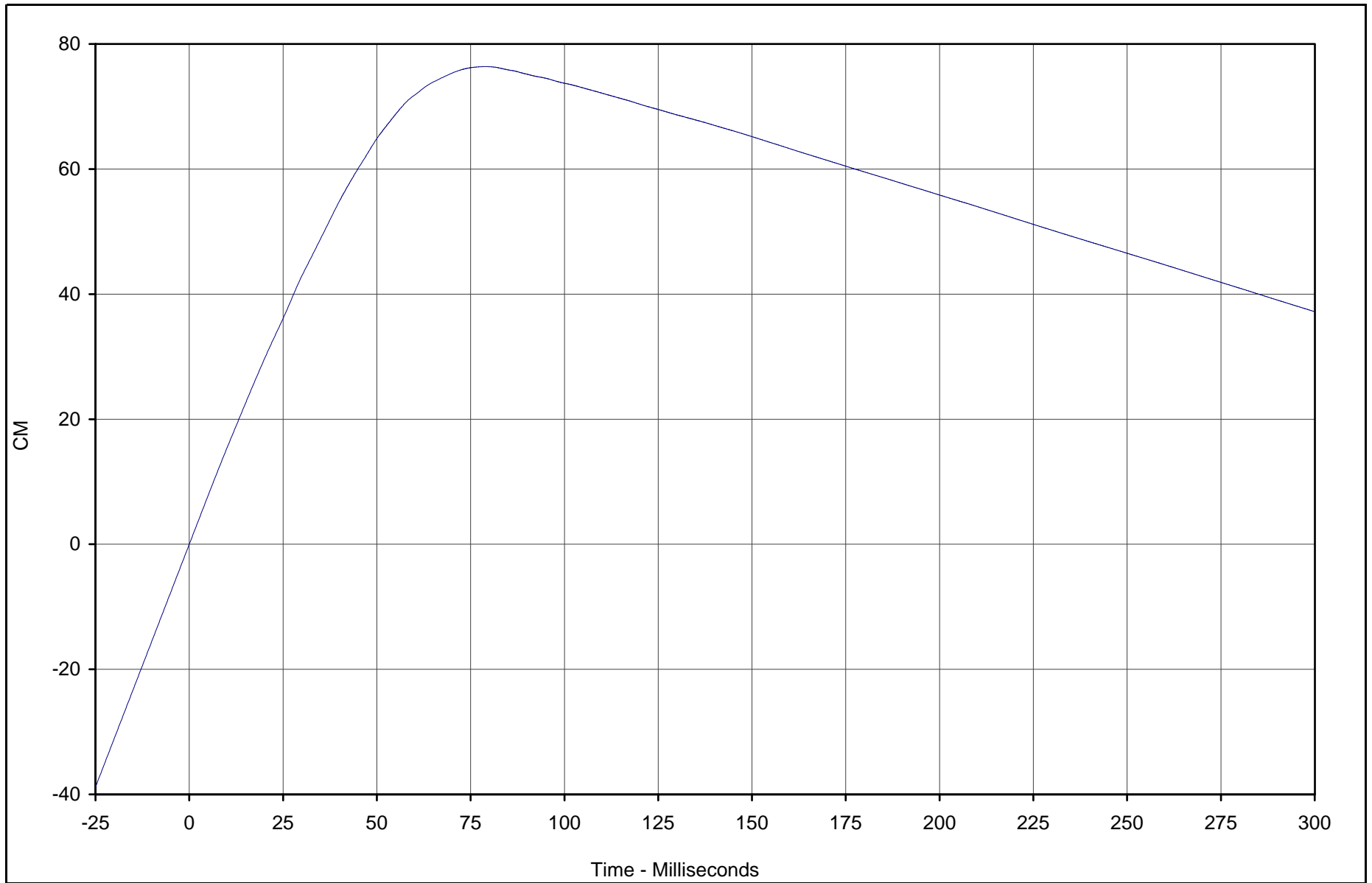
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-143



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel Displacement	095	IN2	CM	76.4	78.9	0.0	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

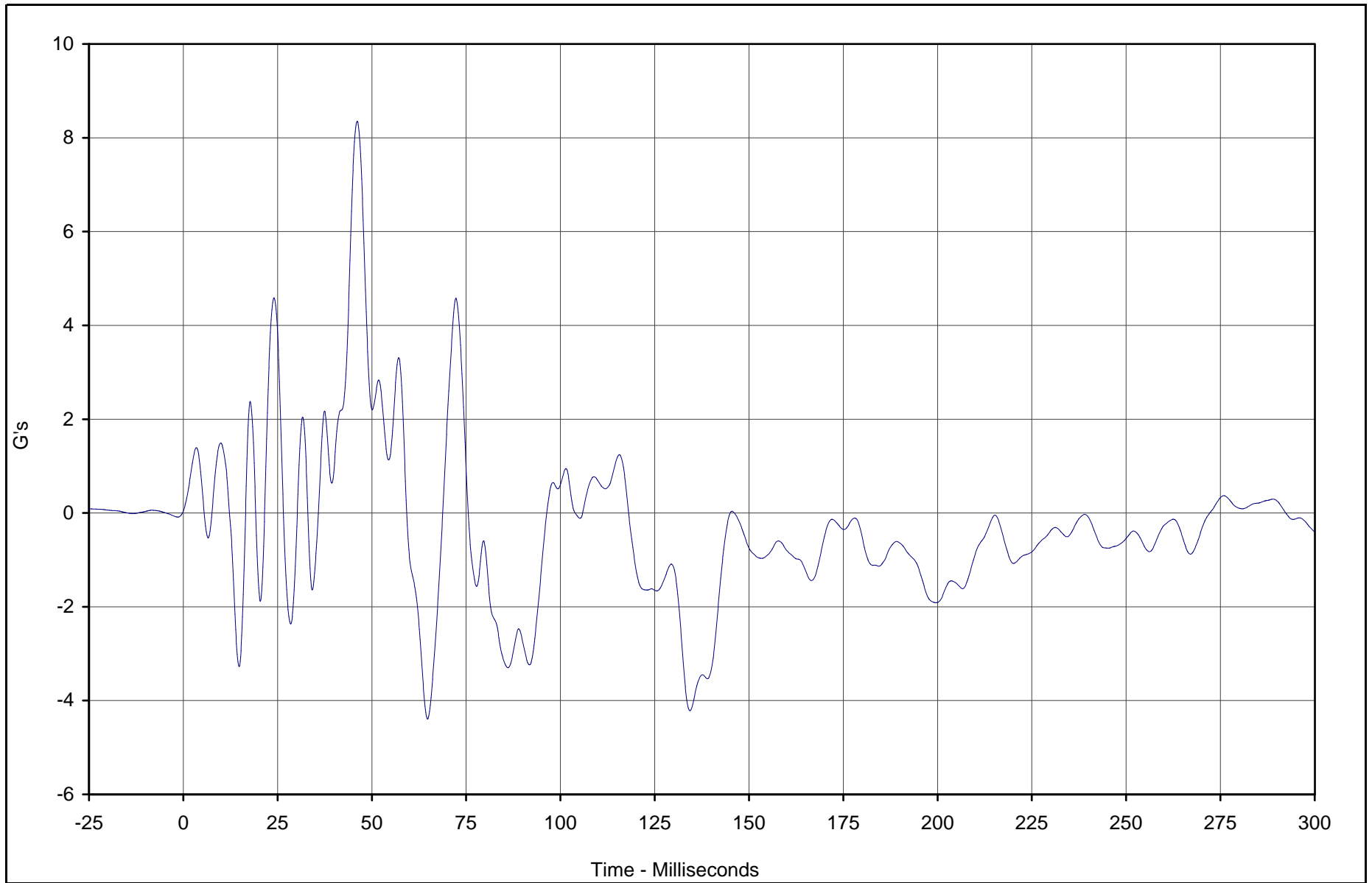
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-144



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z	096	FIL	G's	8.4	46.1	-4.4	64.8	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

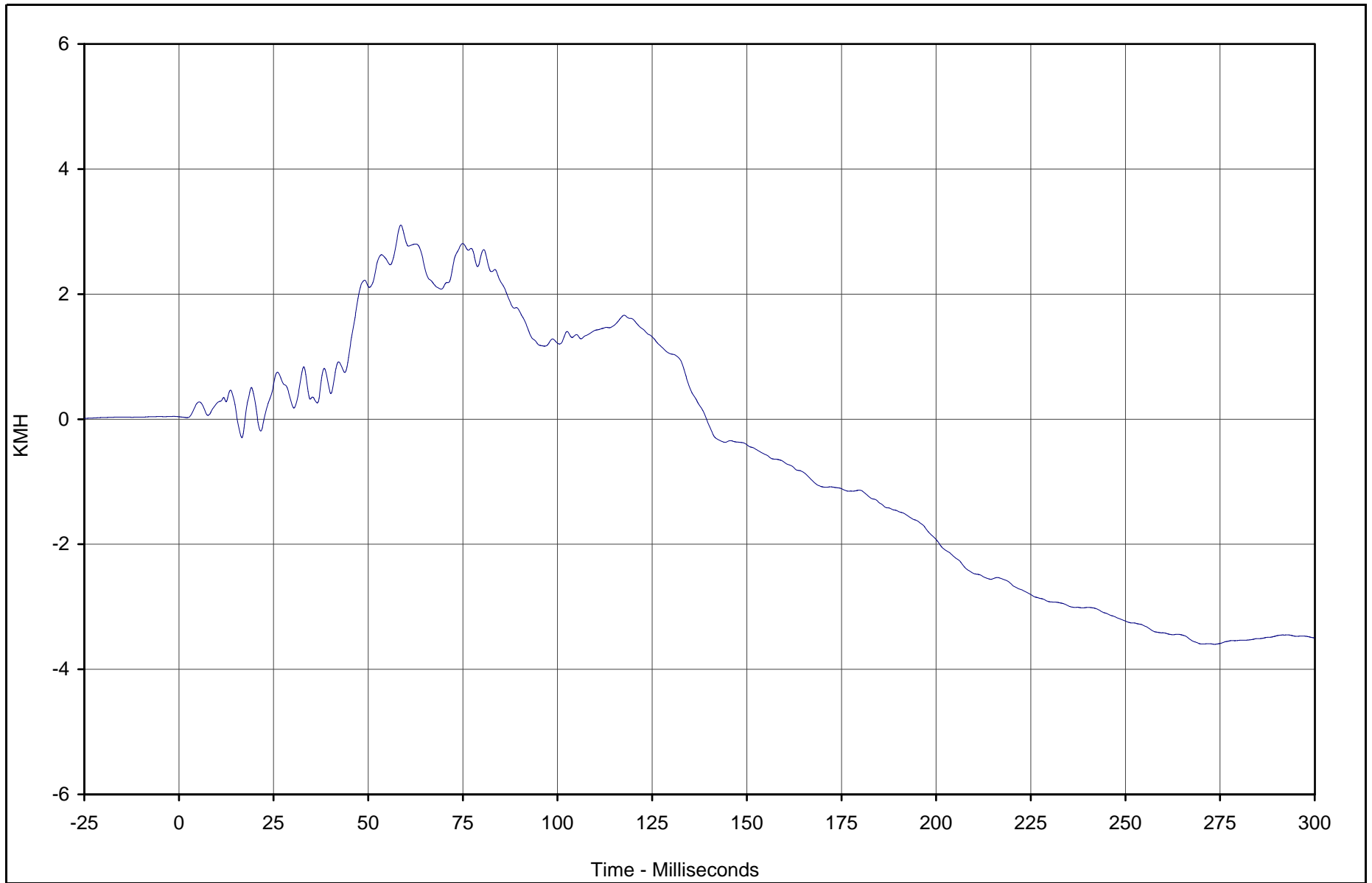
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-145



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z Velocity	096	IN1	KMH	3.1	58.6	-3.6	273.5	180



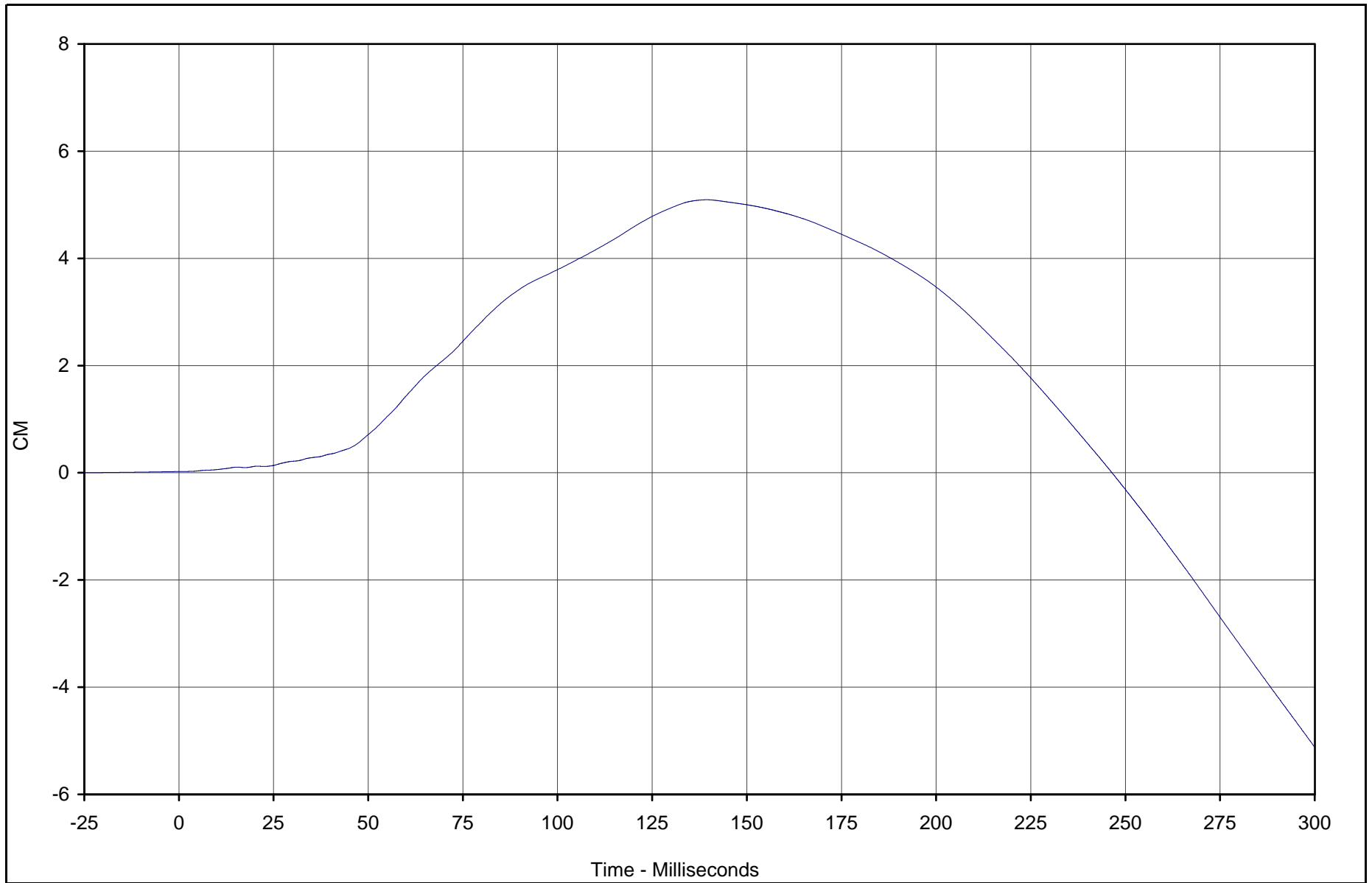
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z Displ.	096	IN2	CM	5.1	139.4	-5.1	299.9	180



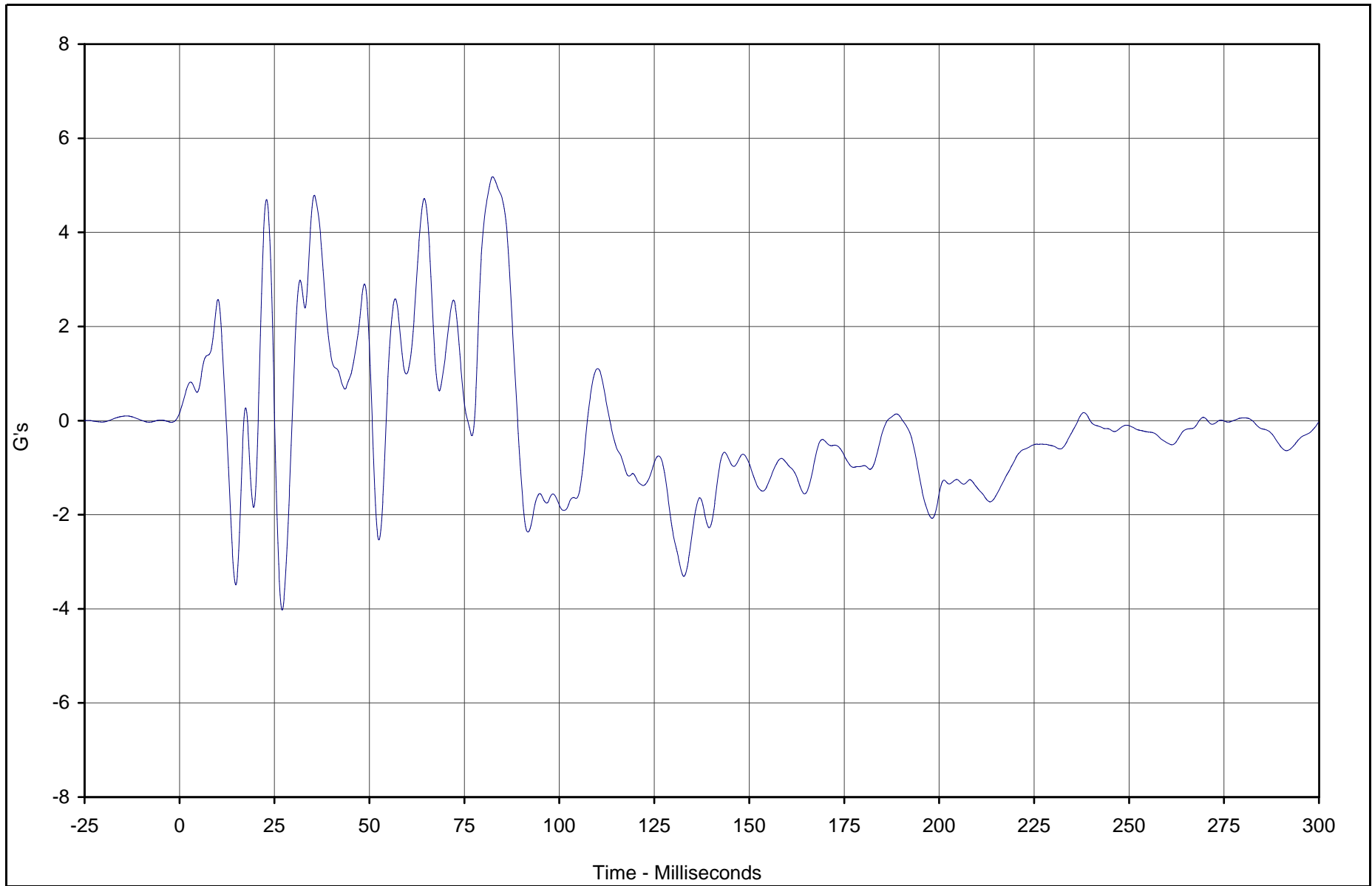
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-147



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z	097	FIL	G's	5.2	82.4	-4.0	27.0	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

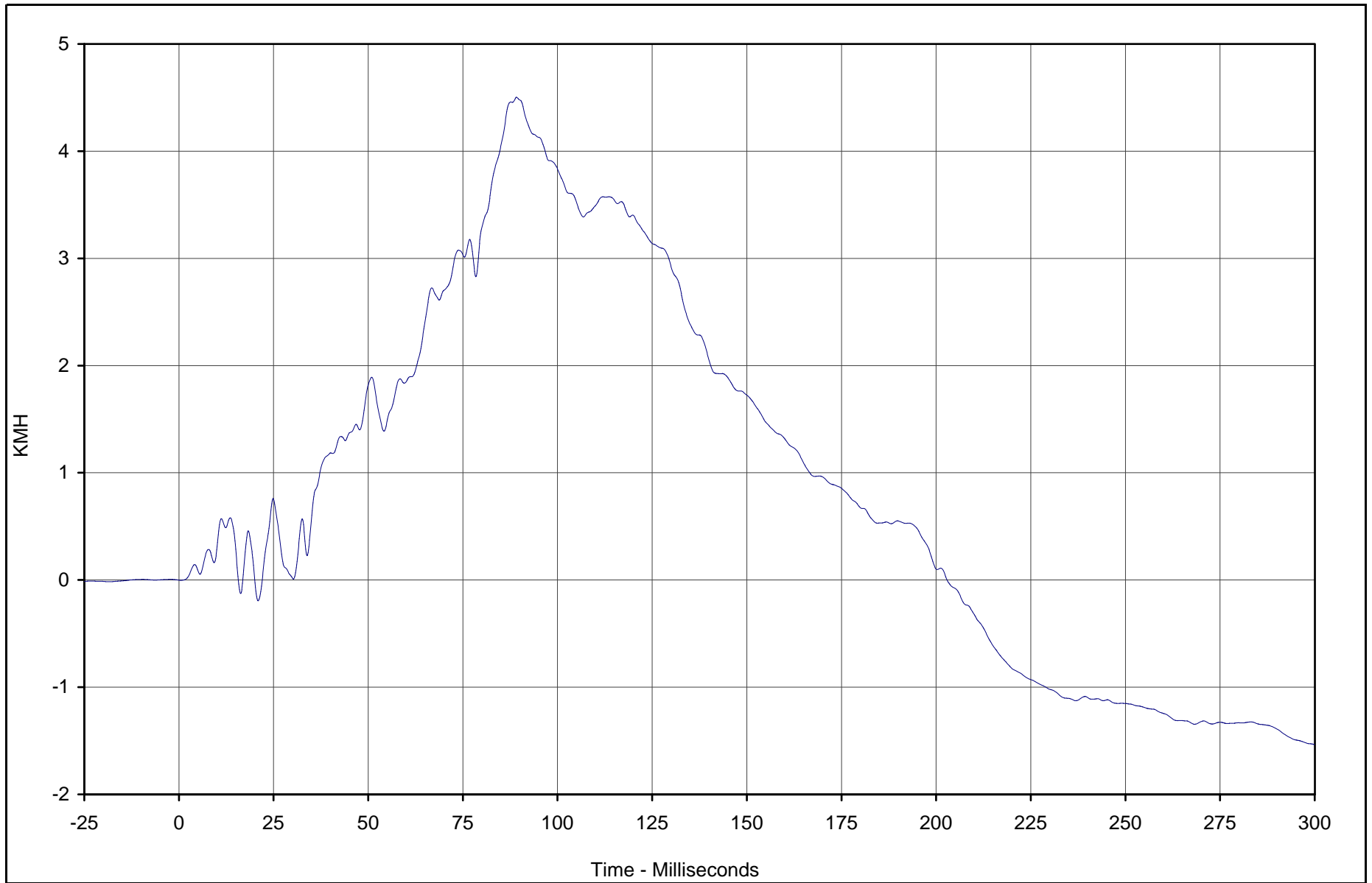
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

B-148



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z Velocity	097	IN1	KMH	4.5	89.2	-1.5	299.9	180



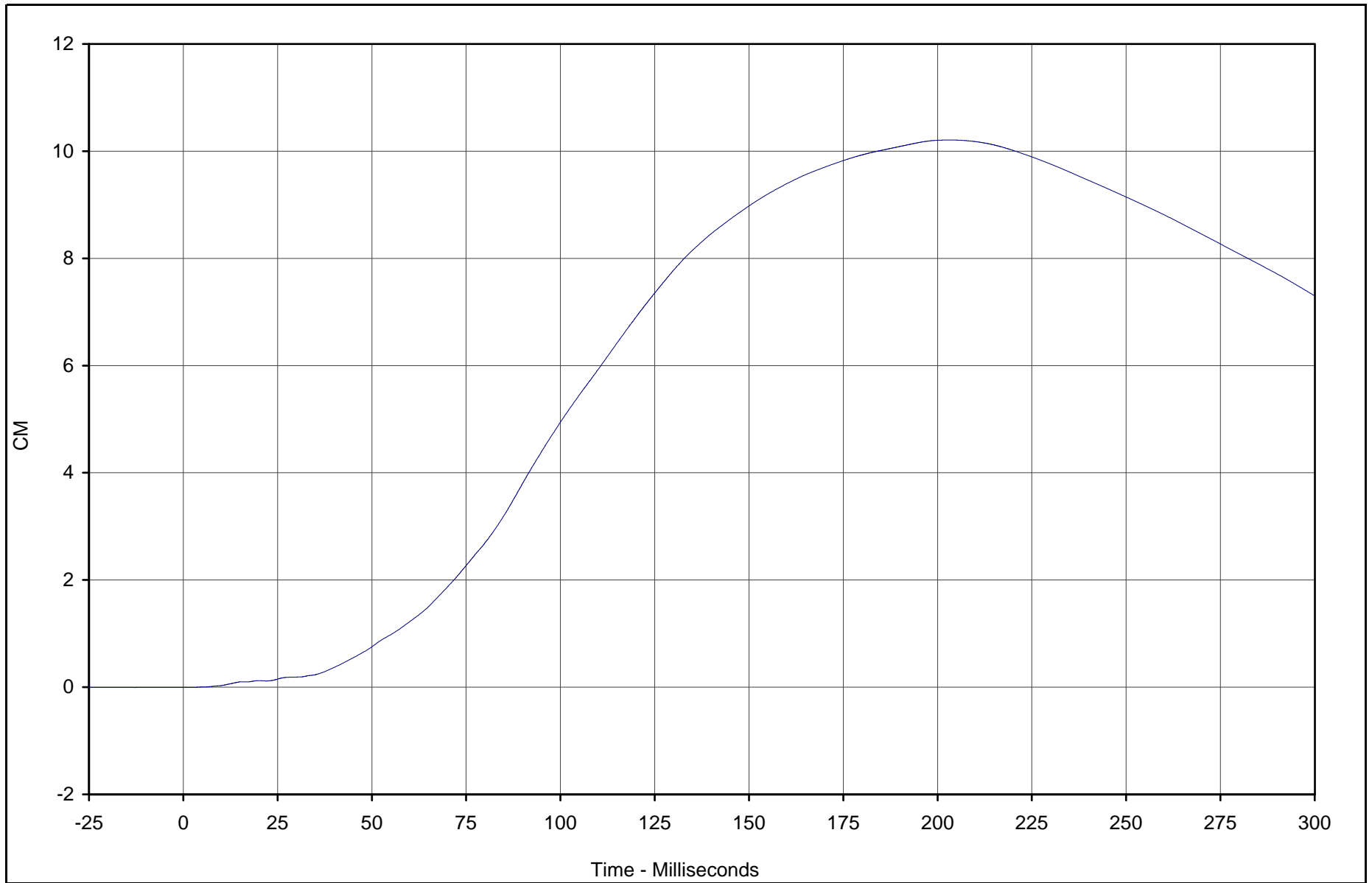
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

B-149



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z Displ.	097	IN2	CM	10.2	202.9	0.0	1.3	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

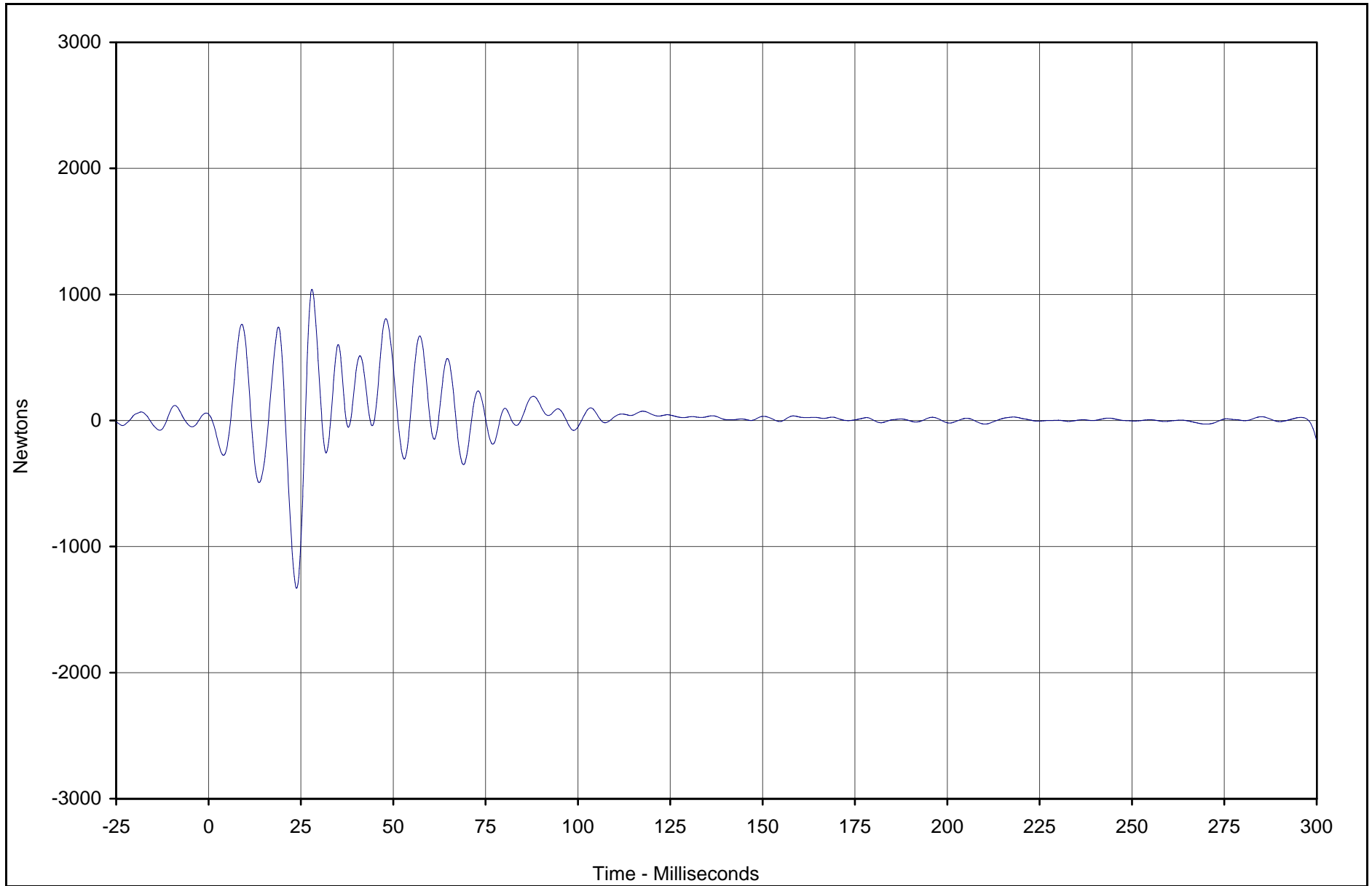
Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

## **APPENDIX C**

### **LOAD CELL BARRIER DATA PLOTS**

C-1



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A1	098	FIL	Newtons	1041.1	28.0	-1330.2	23.8	60



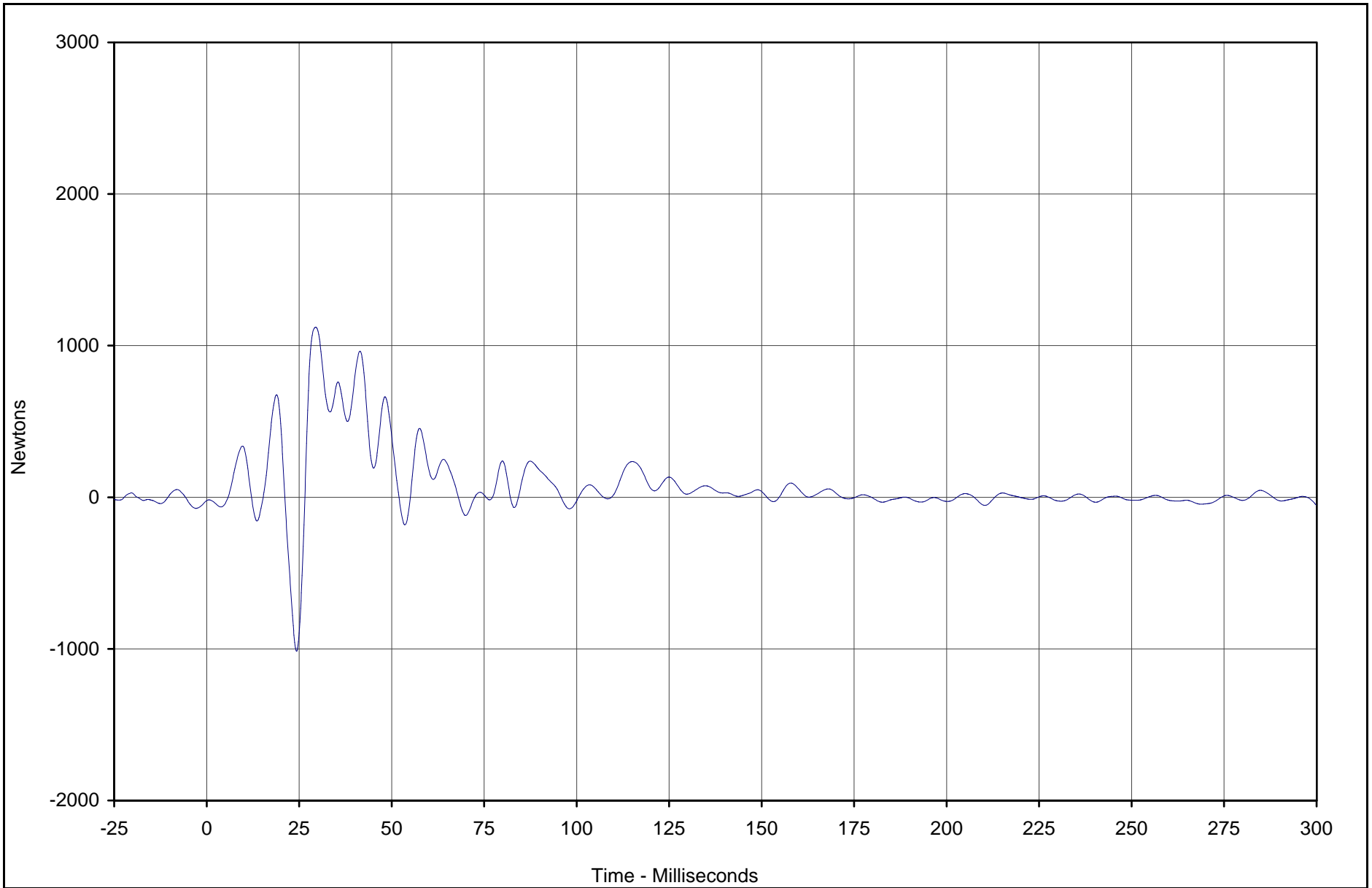
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-2



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A2	099	FIL	Newtons	1122.1	29.5	-1015.7	24.3	60

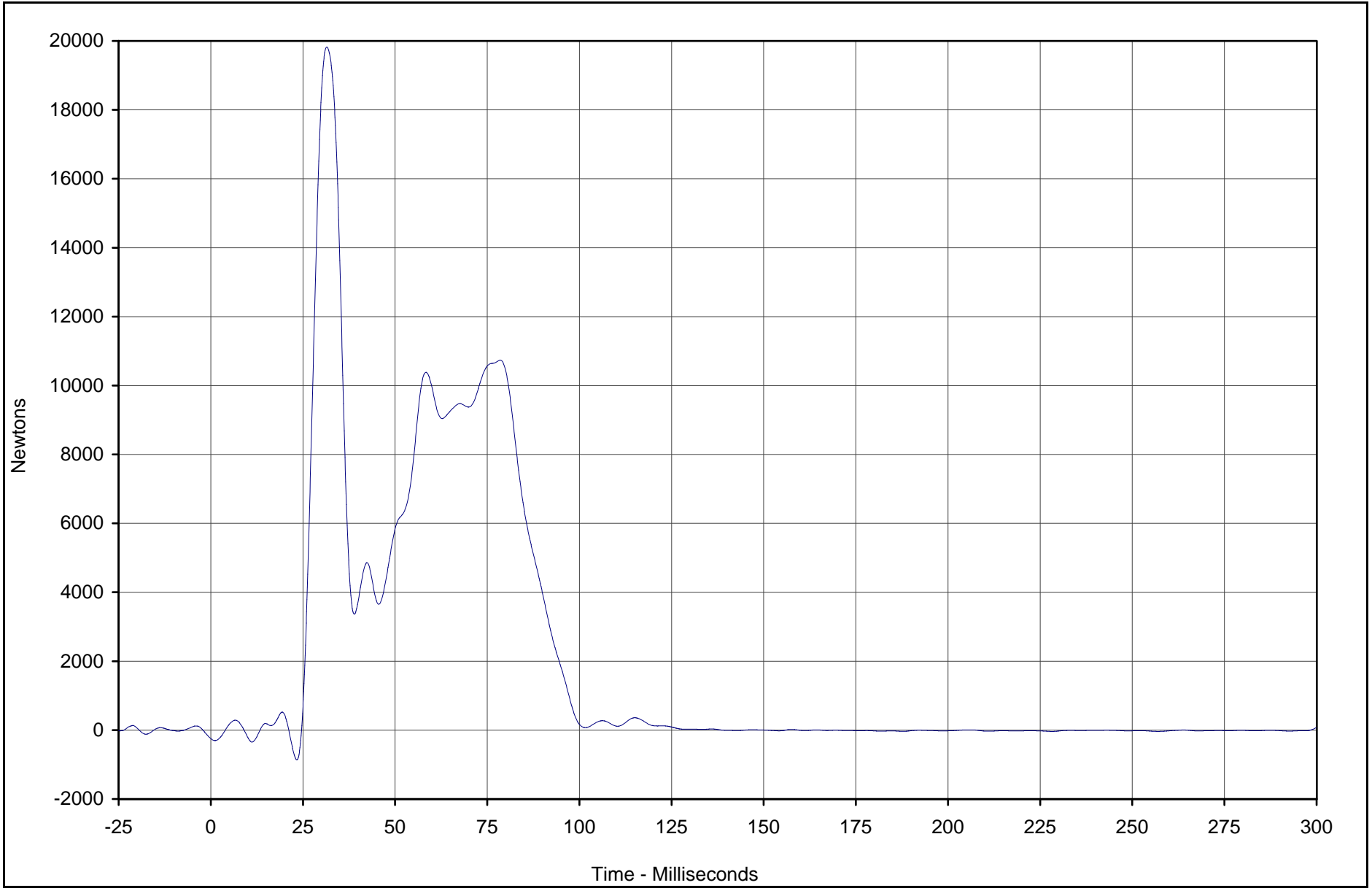


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



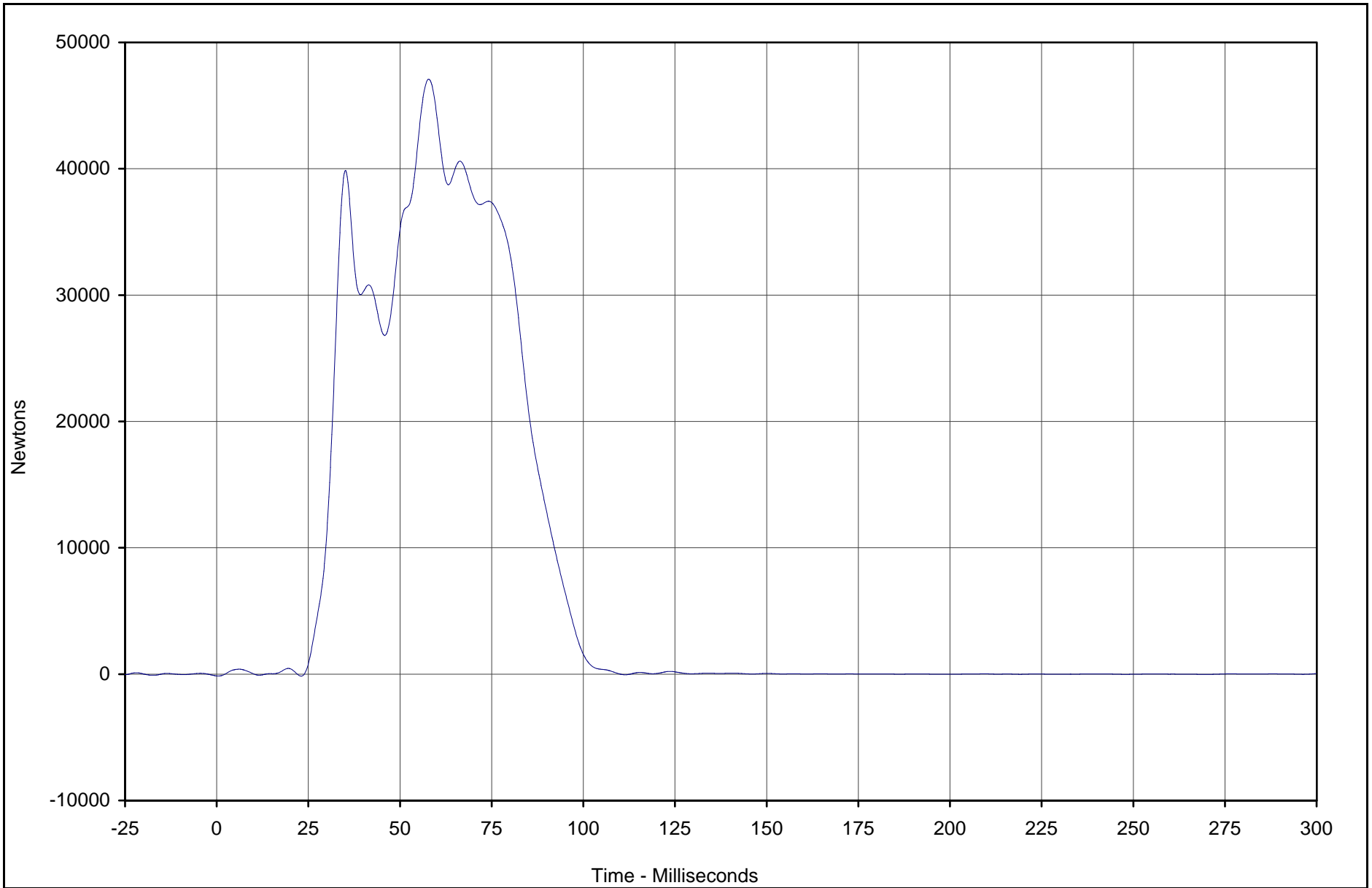
Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A3	100	FIL	Newtons	19827.8	31.5	-865.8	23.3	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03  
 NHTSA No.: M30112

C-4



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A4	101	FIL	Newtons	47094.2	57.8	-156.0	23.1	60



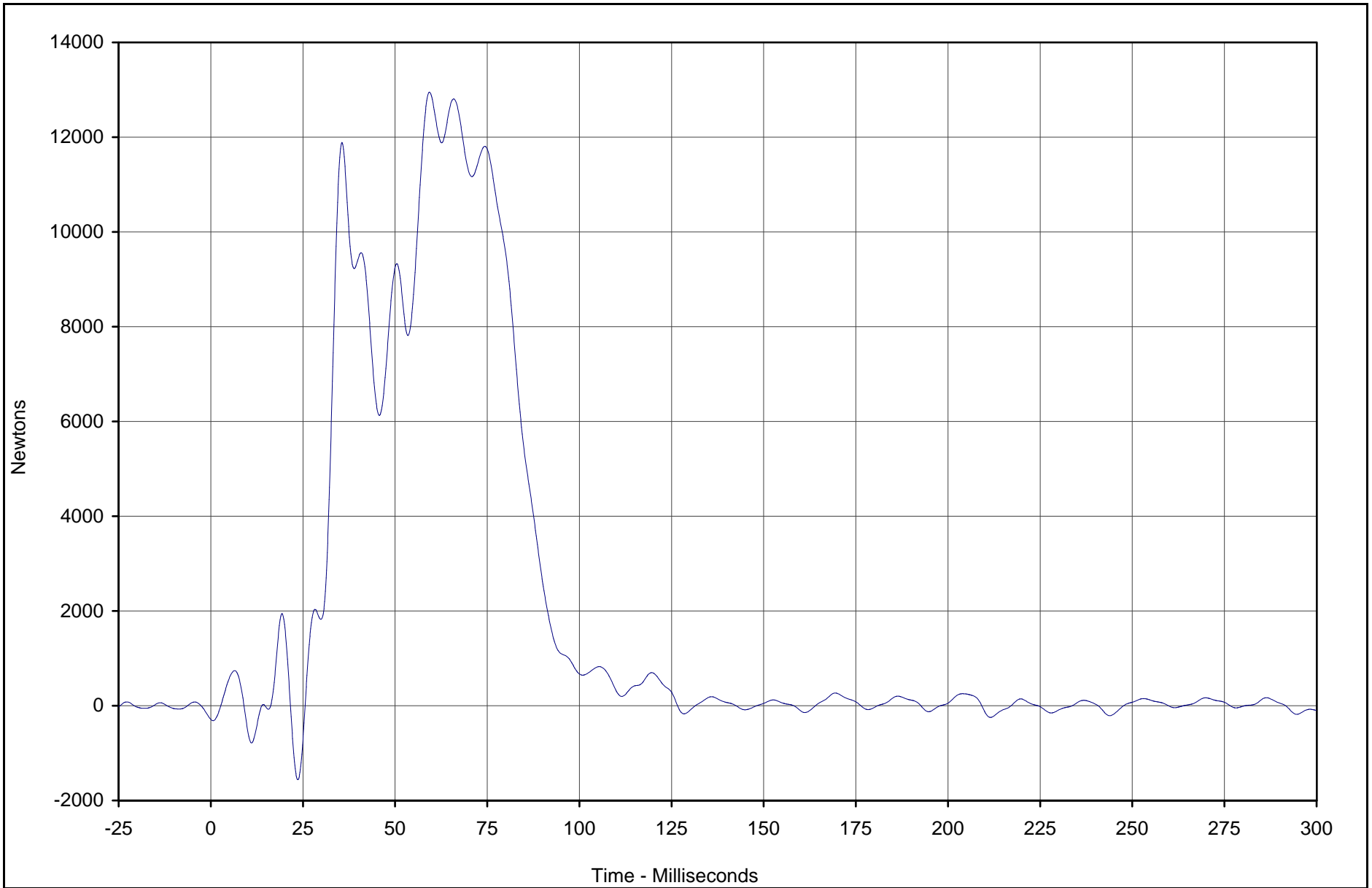
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A5	102	FIL	Newtons	12951.7	59.3	-1562.1	23.6	60



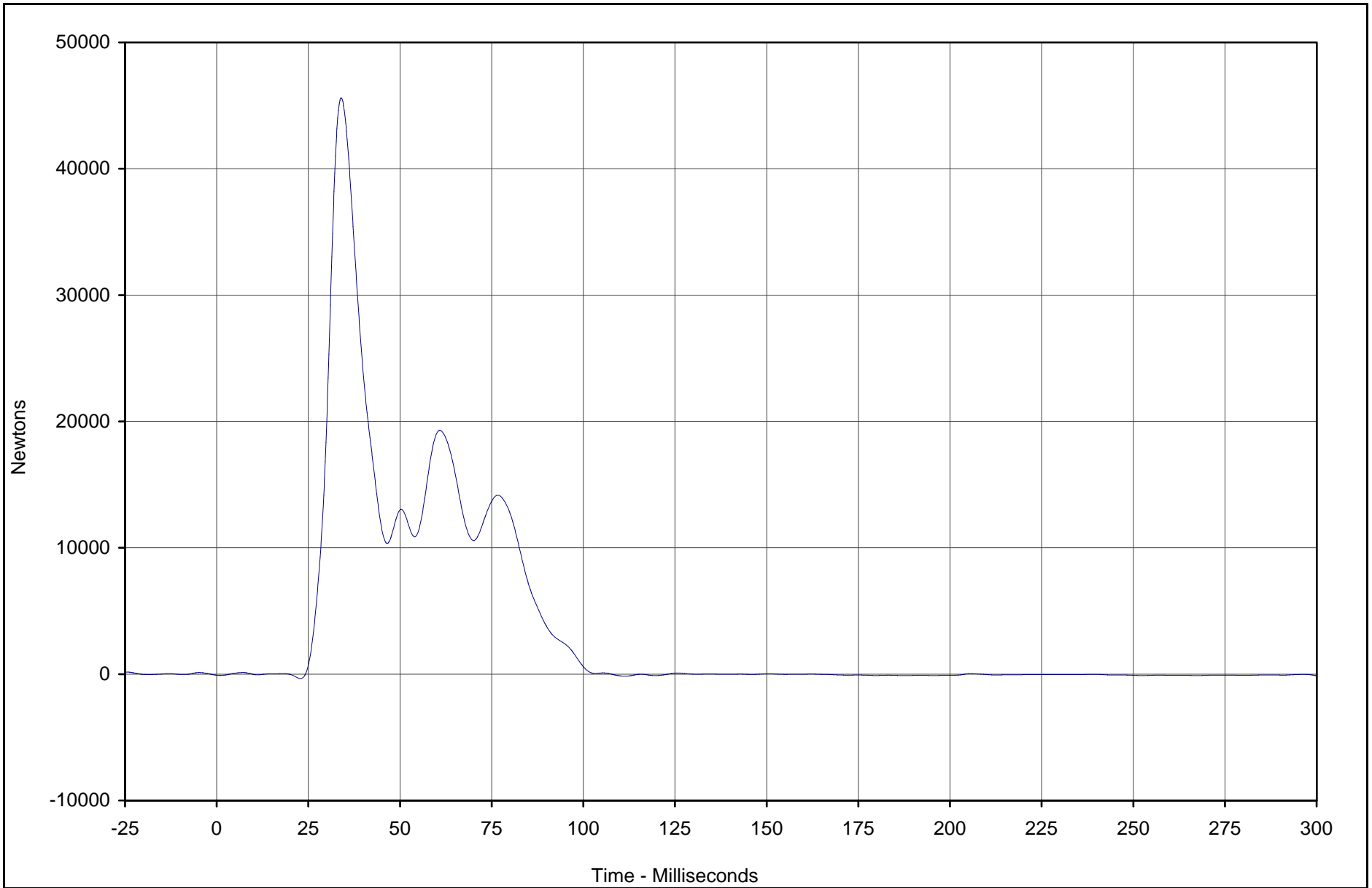
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-6



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A6	103	FIL	Newtons	45607.6	33.9	-350.4	22.8	60

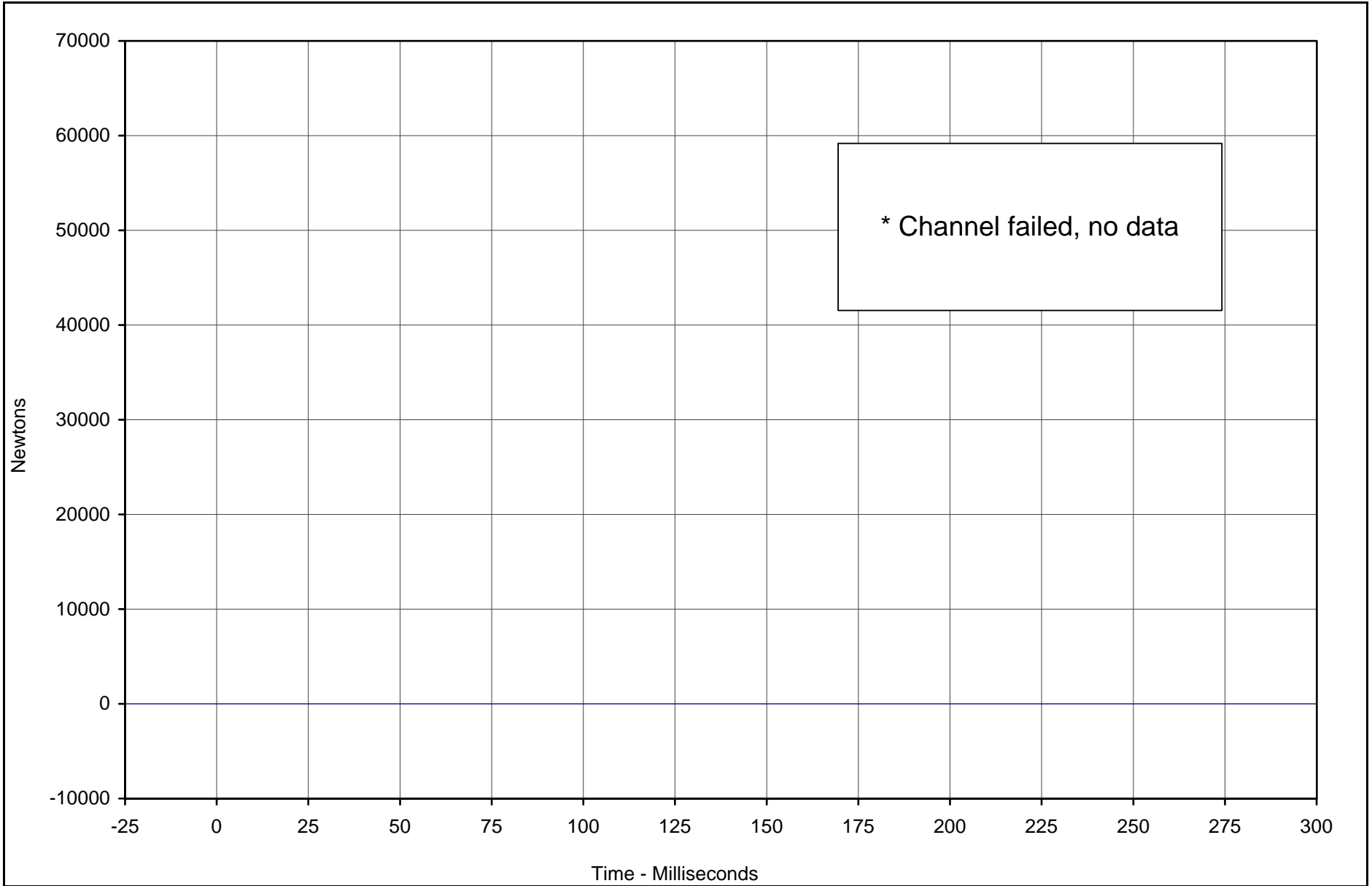


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed, no data

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A7	104	FIL	Newtons	0.0	0.0	0.0	0.0	60

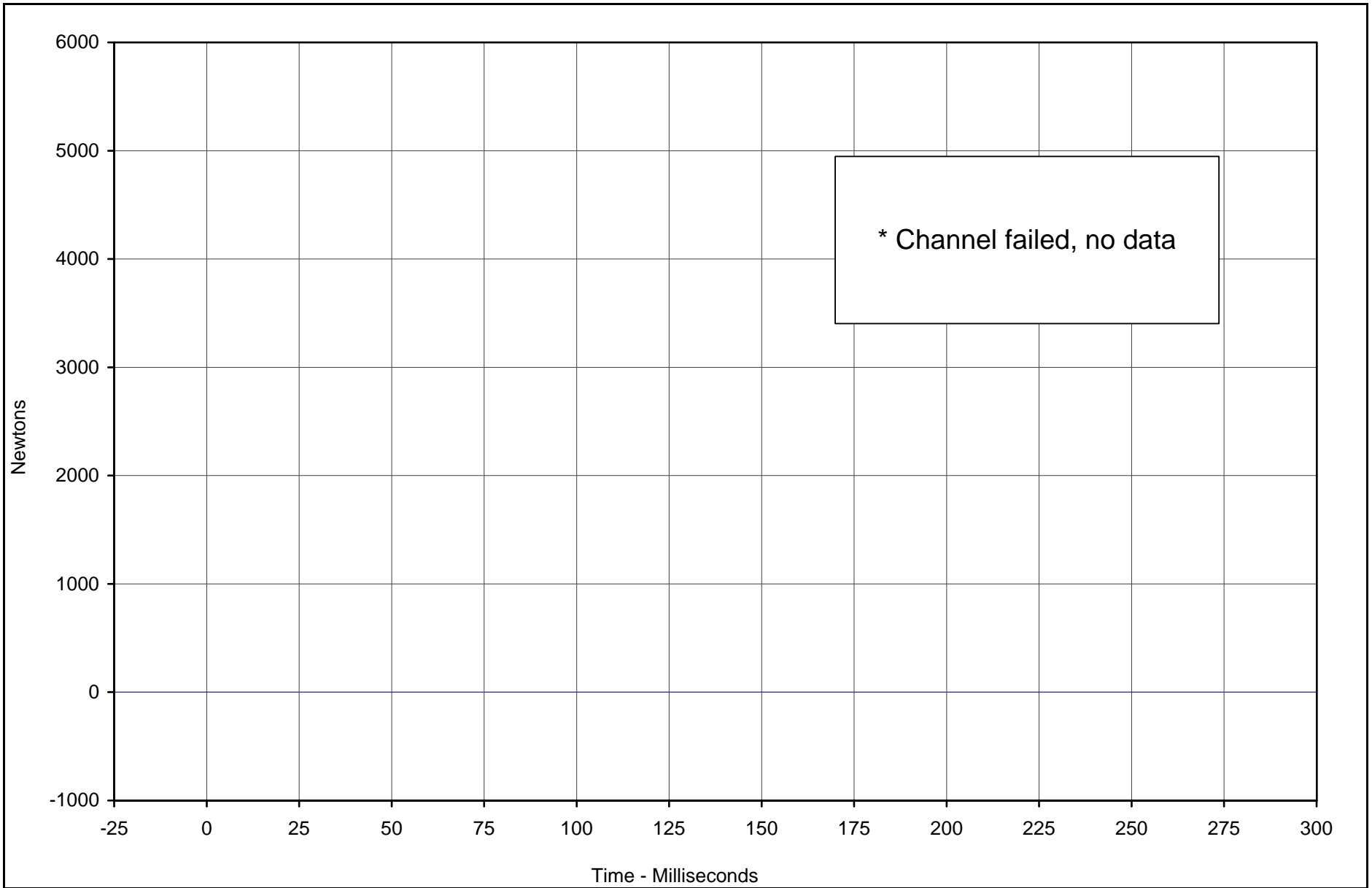


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed, no data

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A8	105	FIL	Newtons	0.0	0.0	0.0	0.0	60

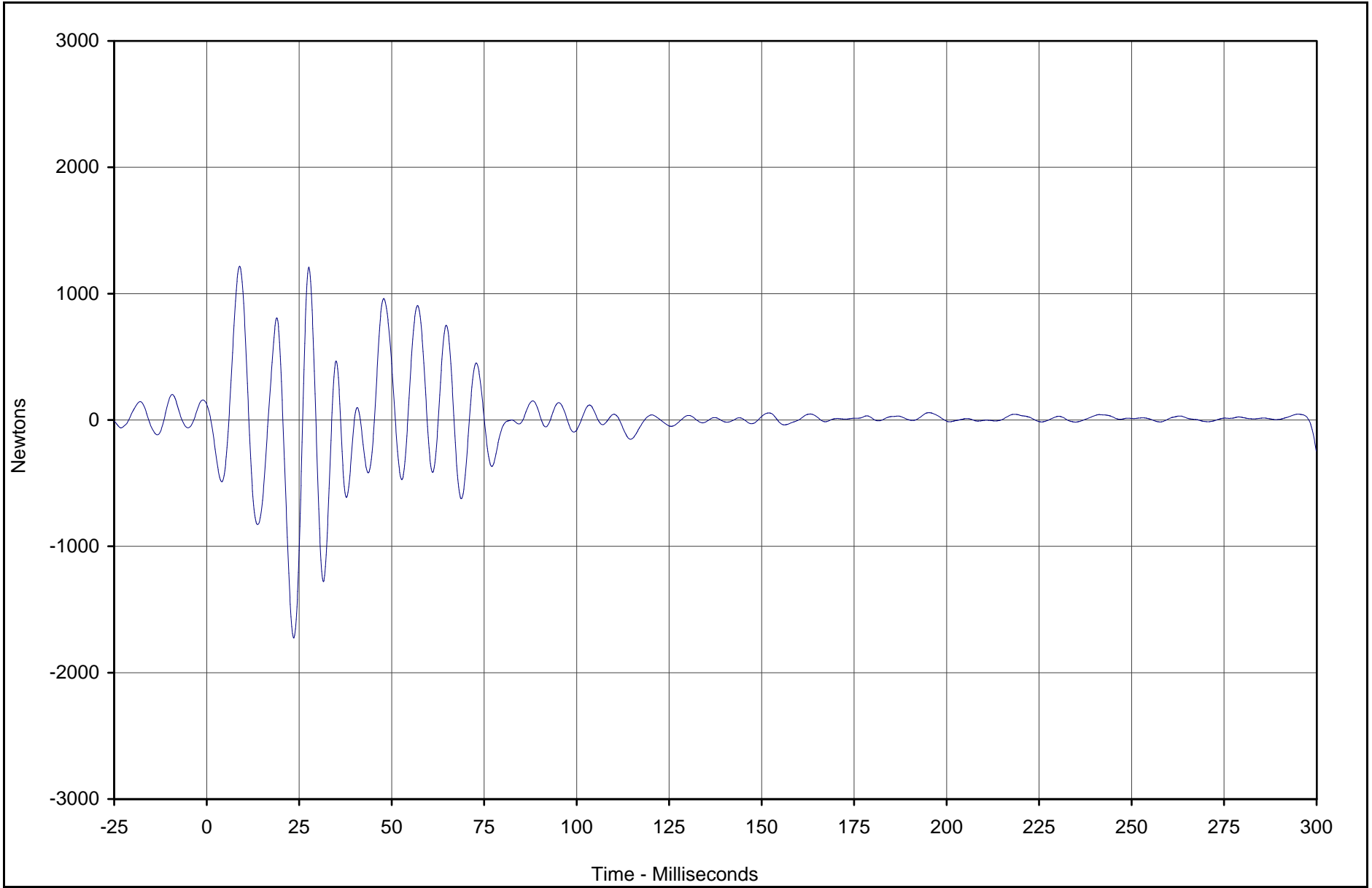


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A9	106	FIL	Newtons	1216.5	8.9	-1725.5	23.5	60



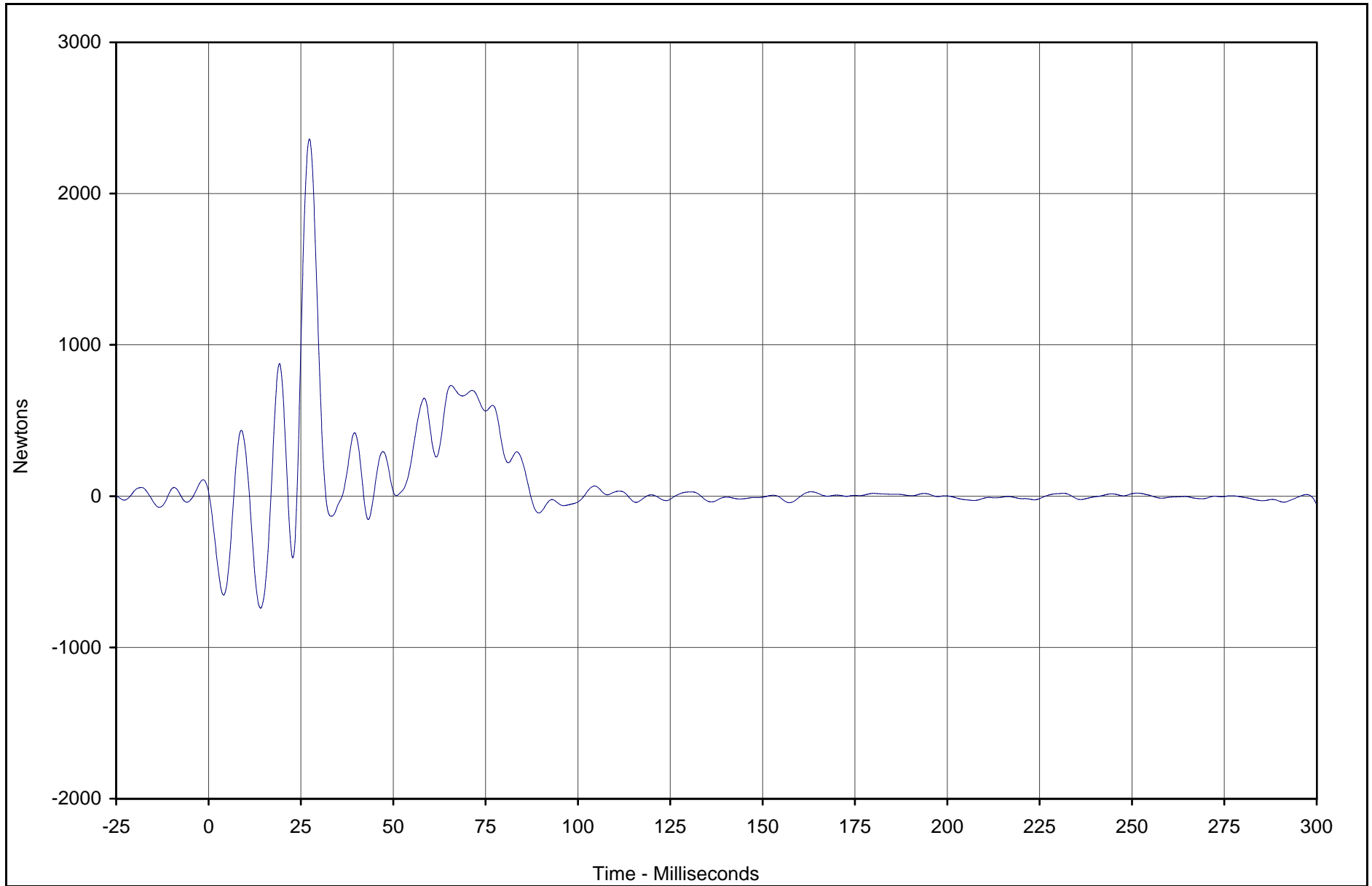
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-10



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B1	107	FIL	Newtons	2360.3	27.3	-740.1	14.1	60

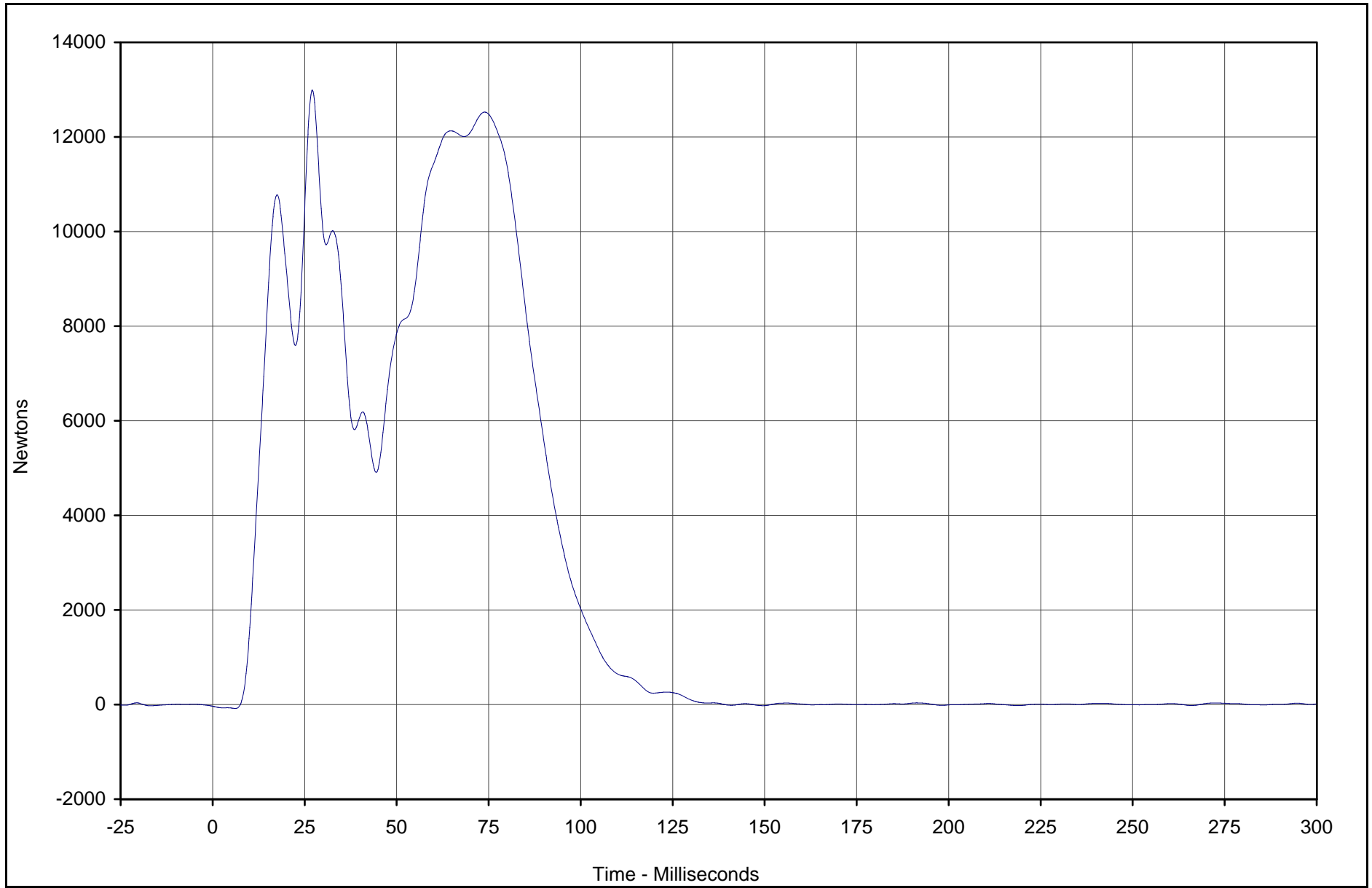


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B2	108	FIL	Newtons	12992.6	27.1	-82.7	6.2	60

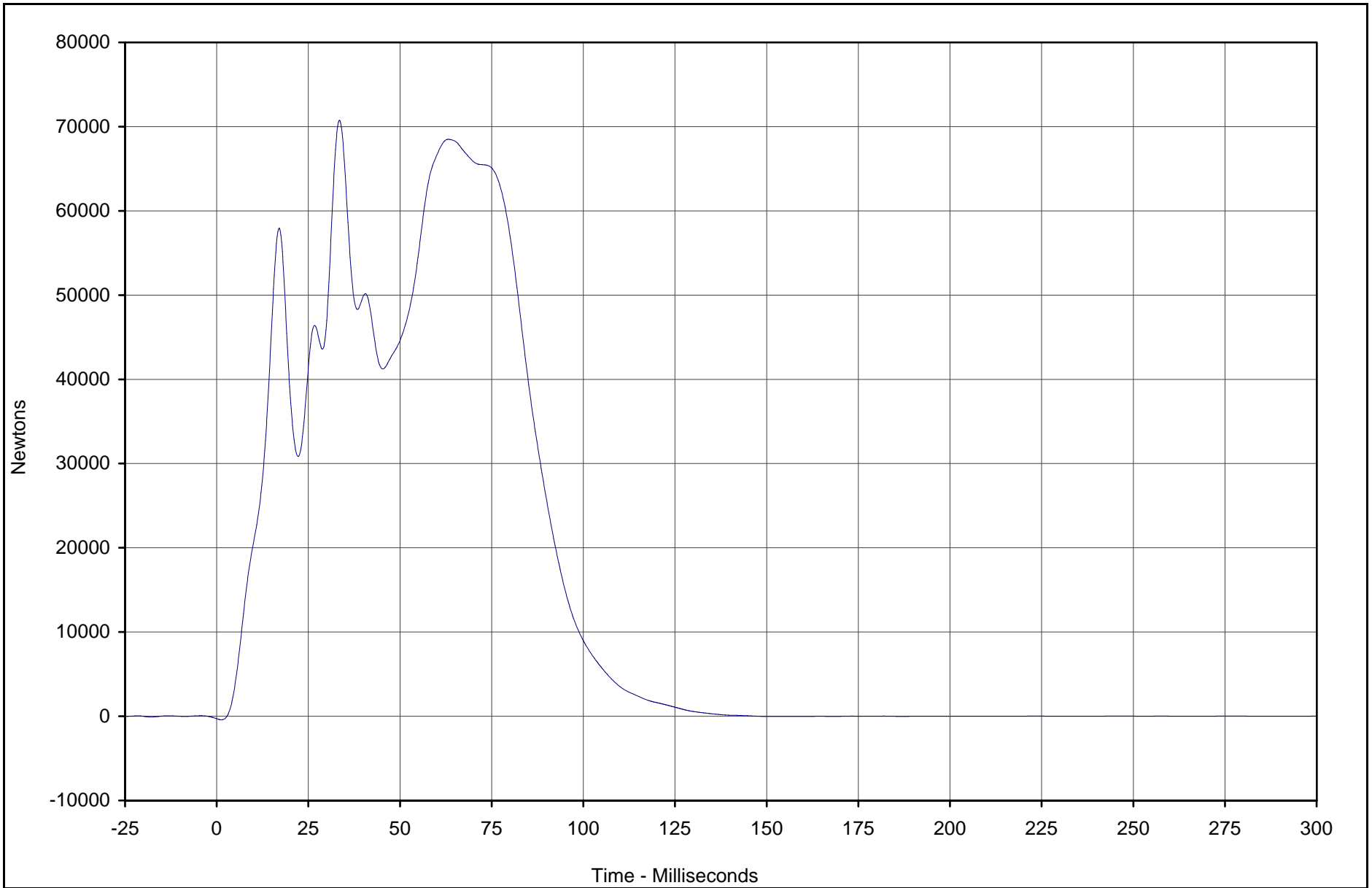


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B3	109	FIL	Newtons	70761.0	33.5	-419.4	1.3	60

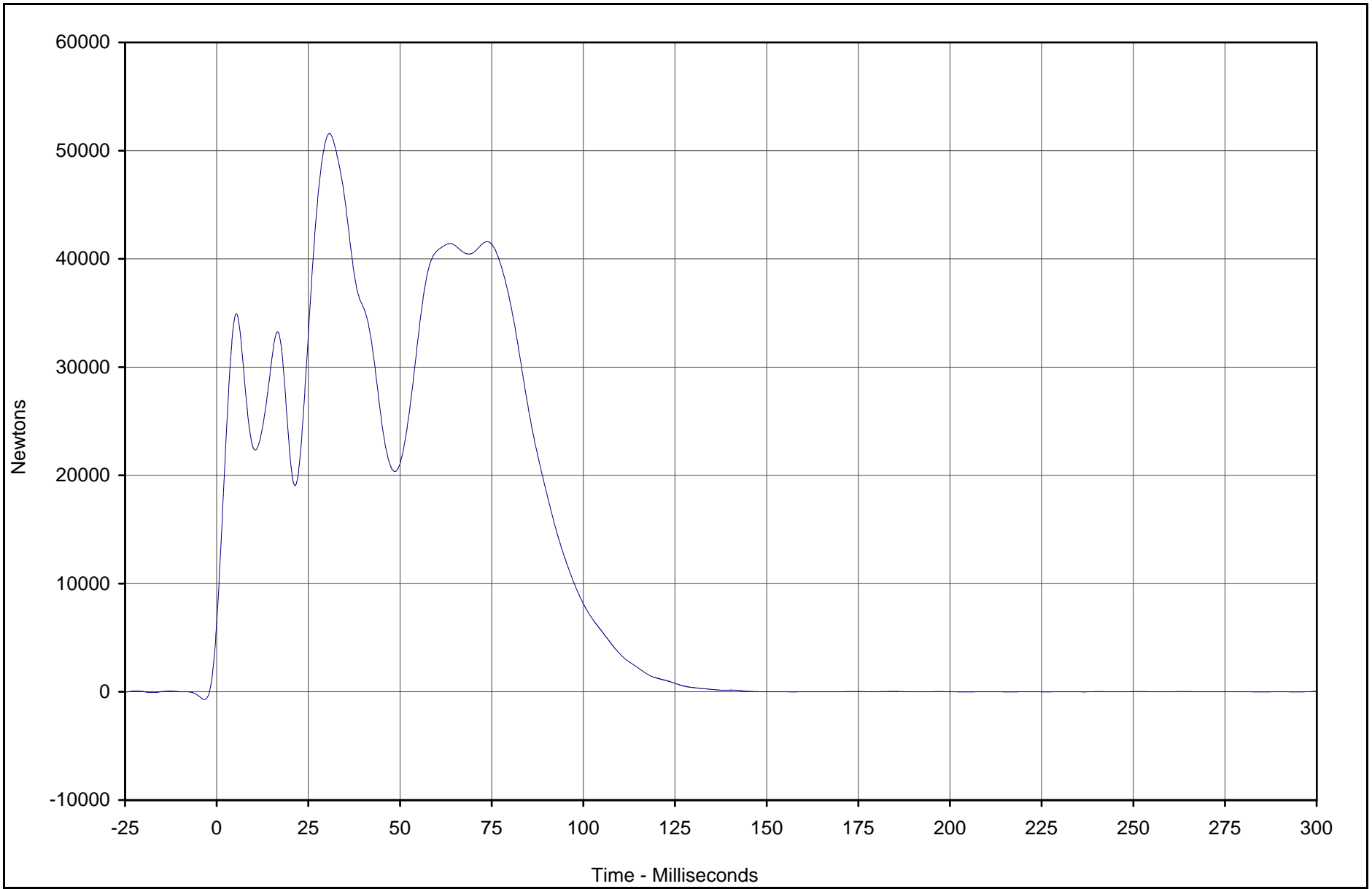


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B4	110	FIL	Newtons	51581.0	30.7	-11.4	204.4	60



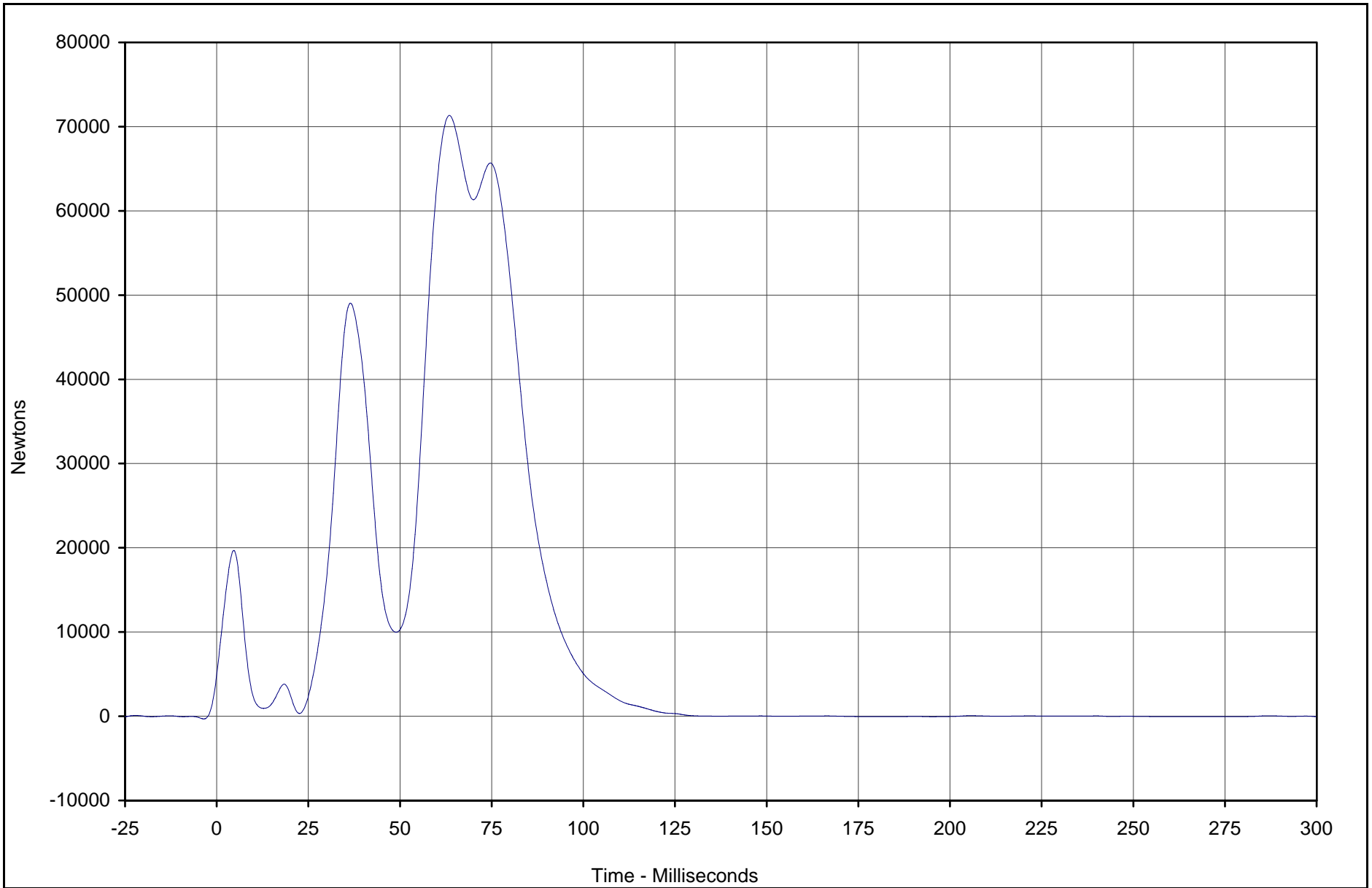
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-14



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B5	111	FIL	Newtons	71335.2	63.5	-59.7	299.9	60



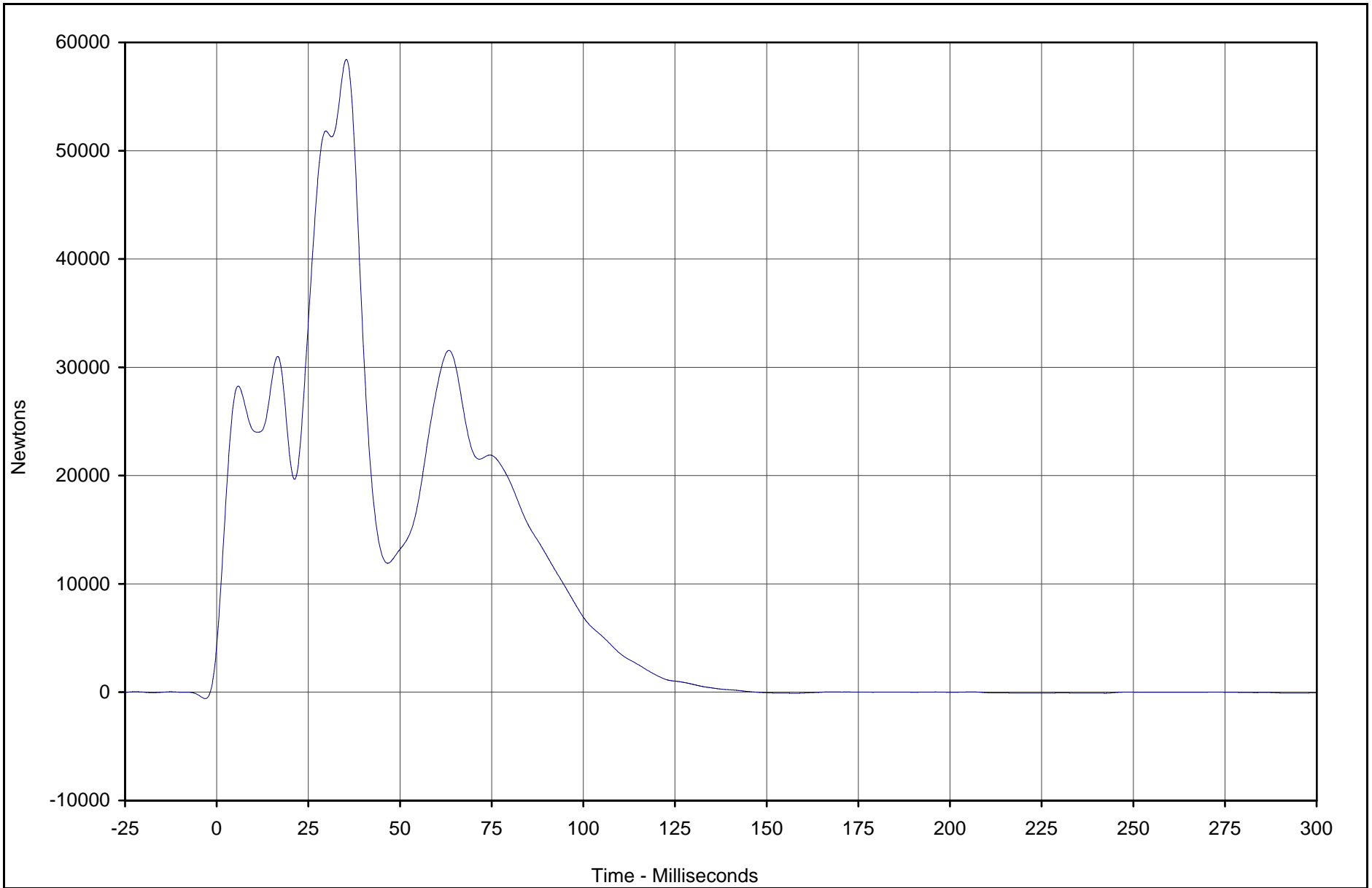
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B6	112	FIL	Newtons	58437.2	35.4	-99.2	157.7	60

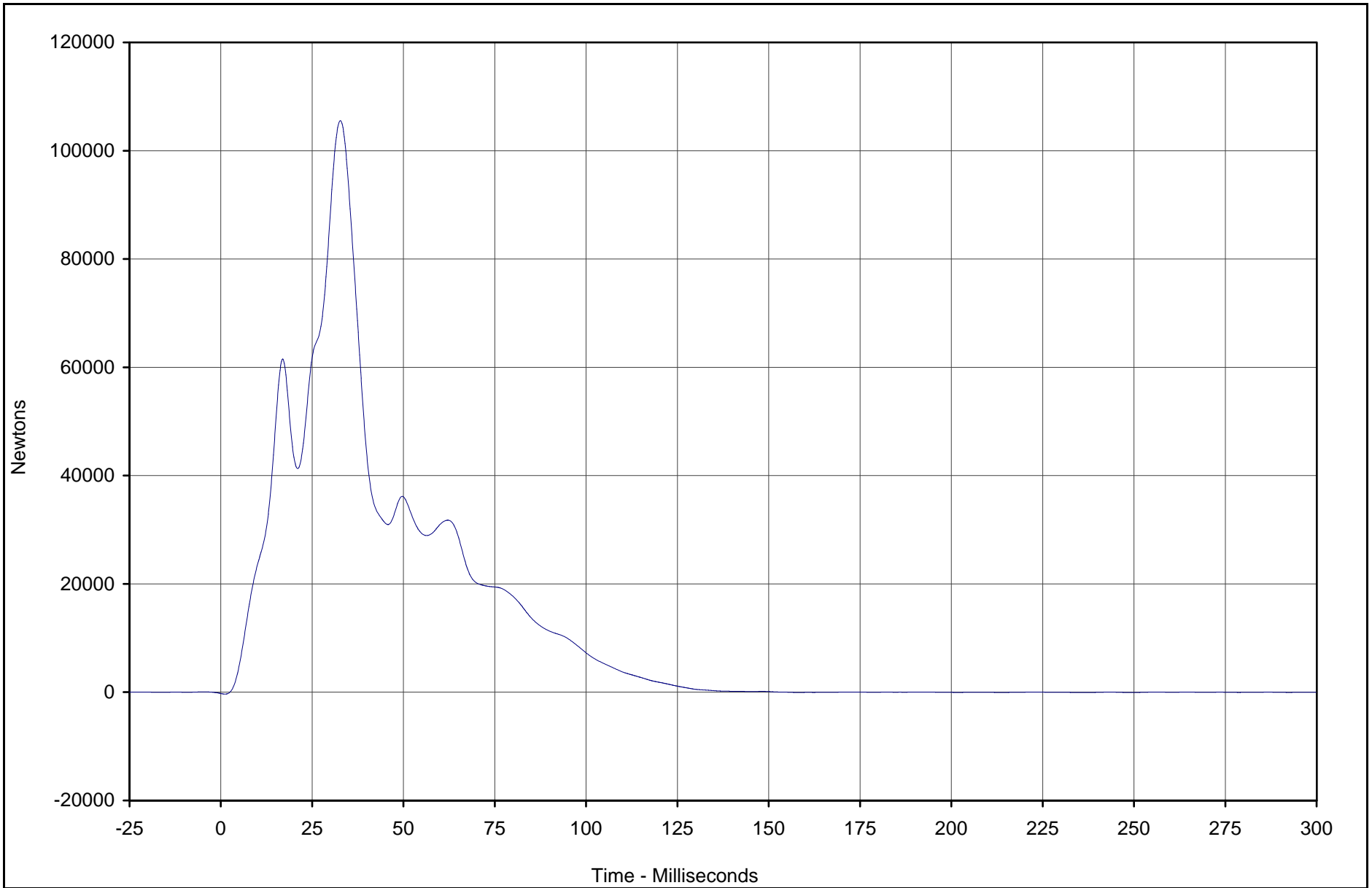


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B7	113	FIL	Newtons	105555.5	32.7	-350.5	1.2	60

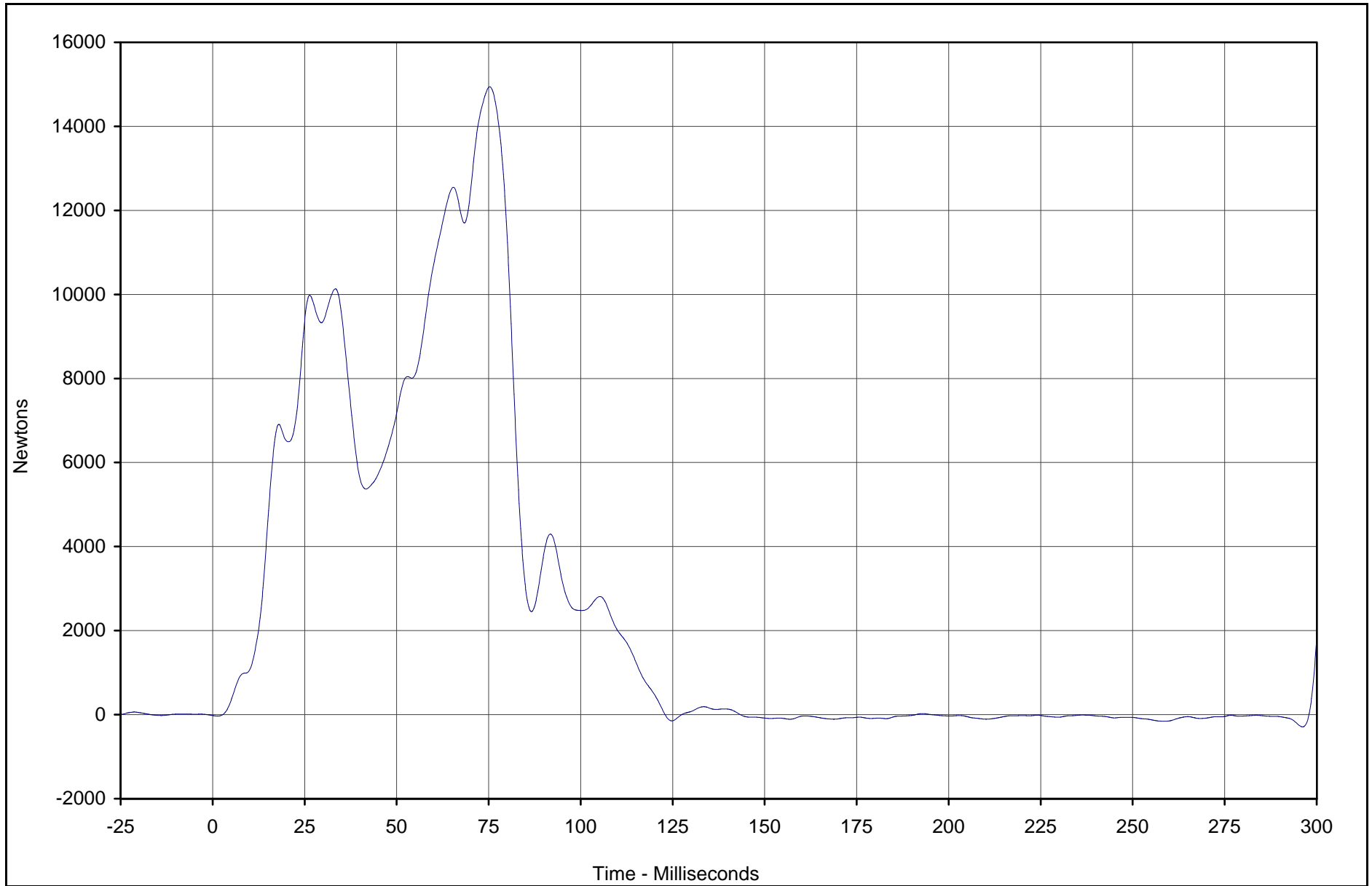


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B8	114	FIL	Newtons	14942.1	75.3	-290.5	296.2	60

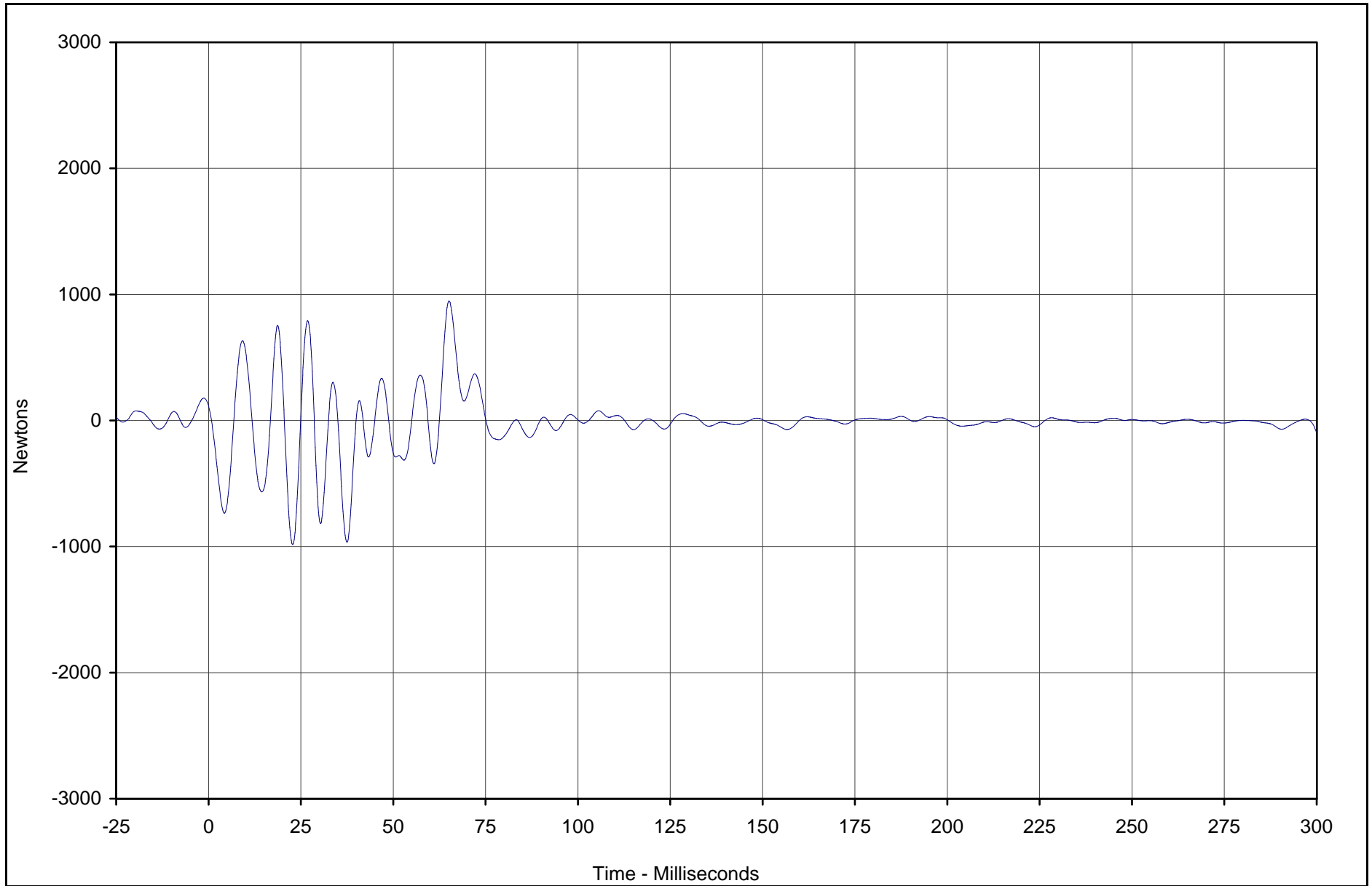


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B9	115	FIL	Newtons	949.0	65.1	-984.4	22.8	60

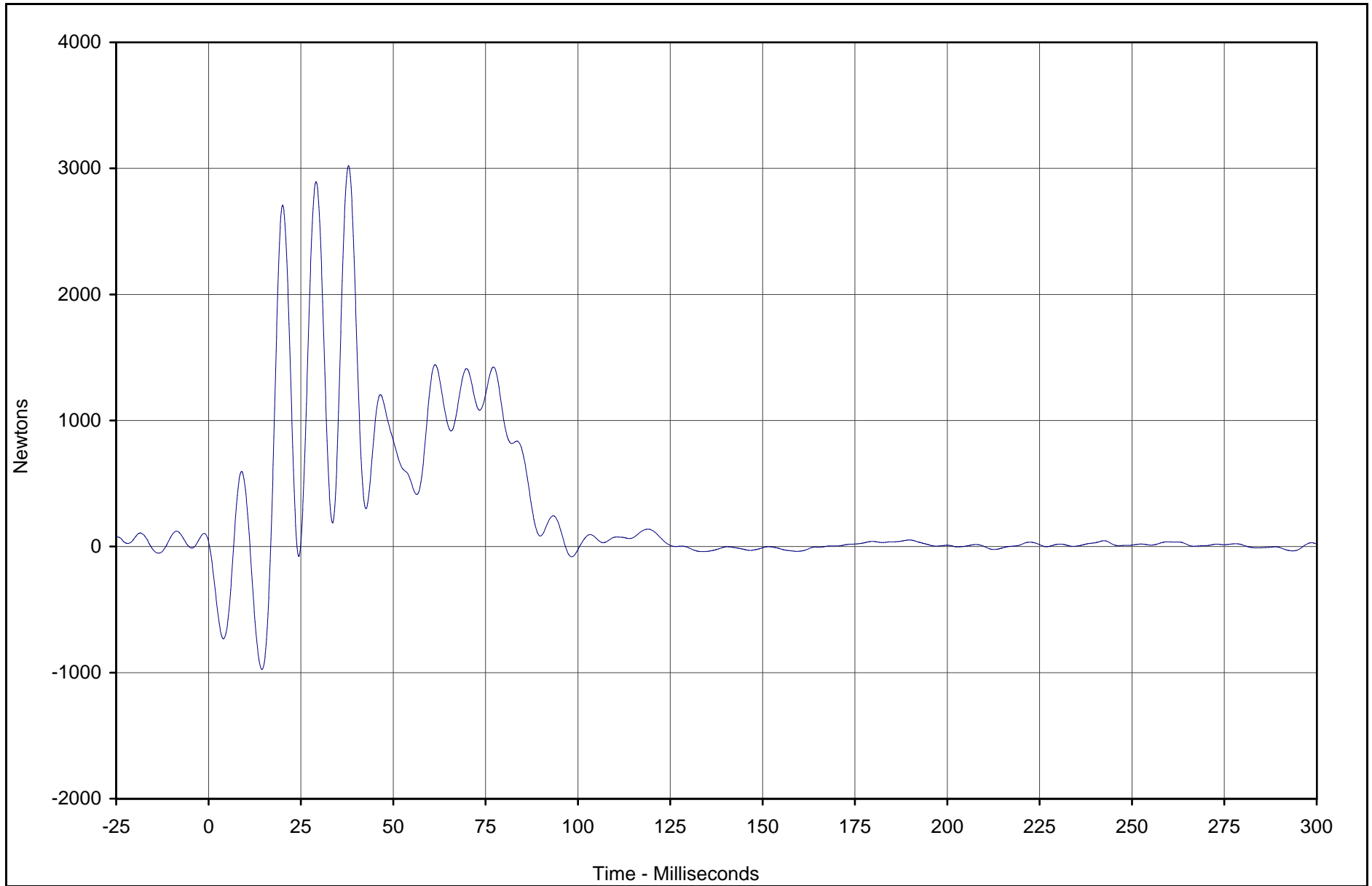


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C1	116	FIL	Newtons	3022.5	37.9	-975.7	14.5	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

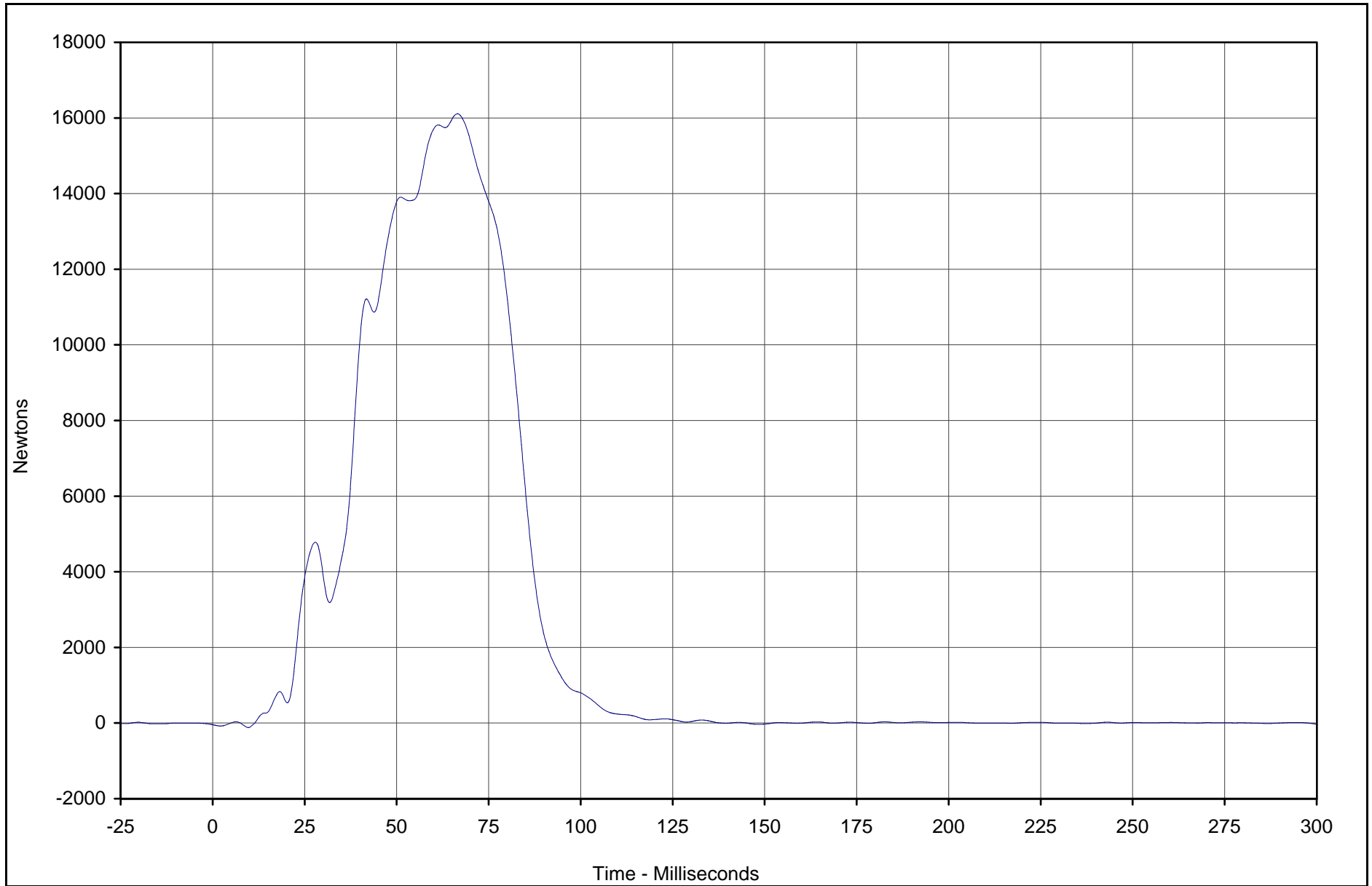
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C2	117	FIL	Newtons	16108.9	66.5	-119.4	9.7	60

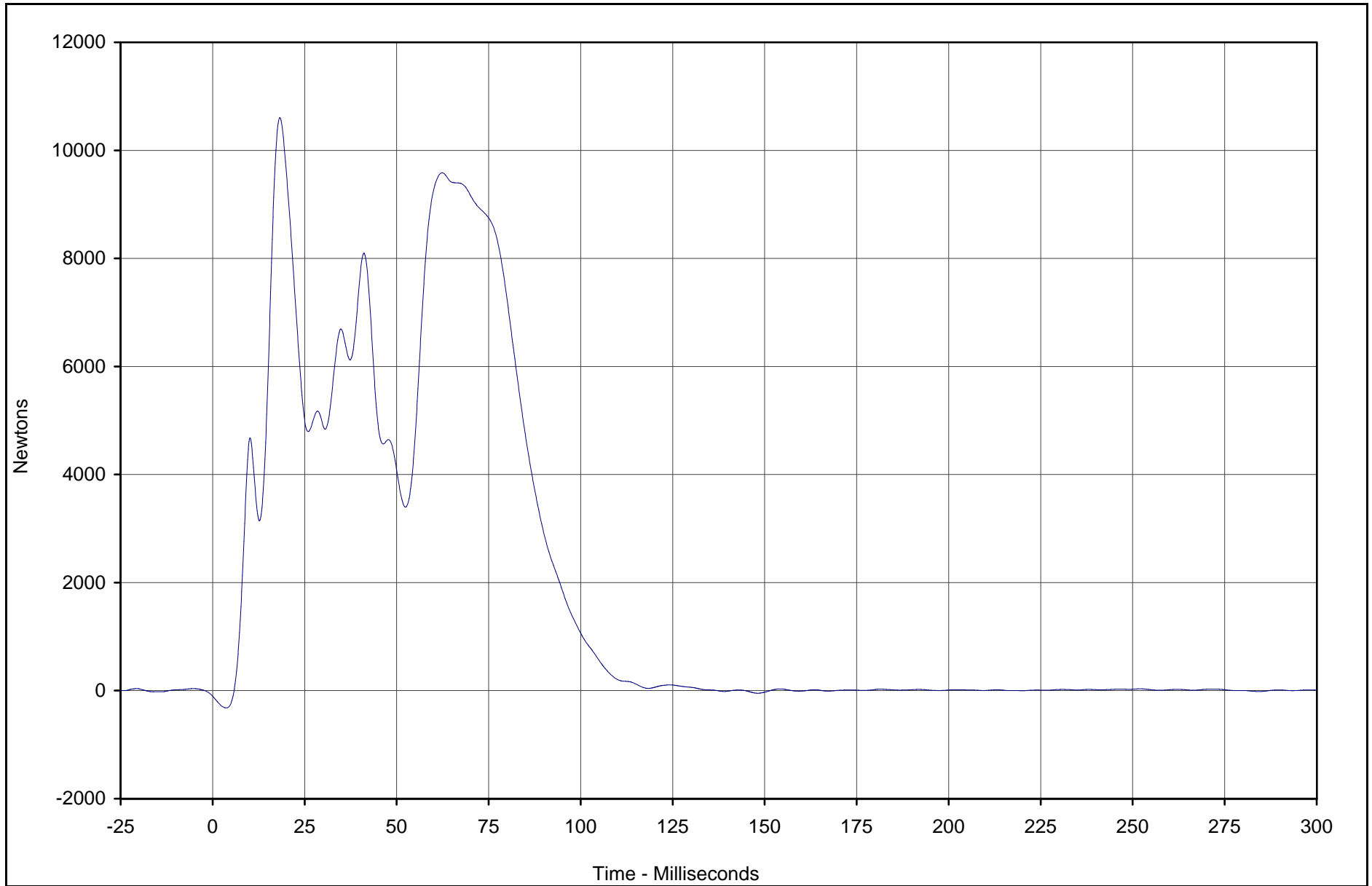


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C3	118	FIL	Newtons	10607.3	18.3	-319.8	3.7	60



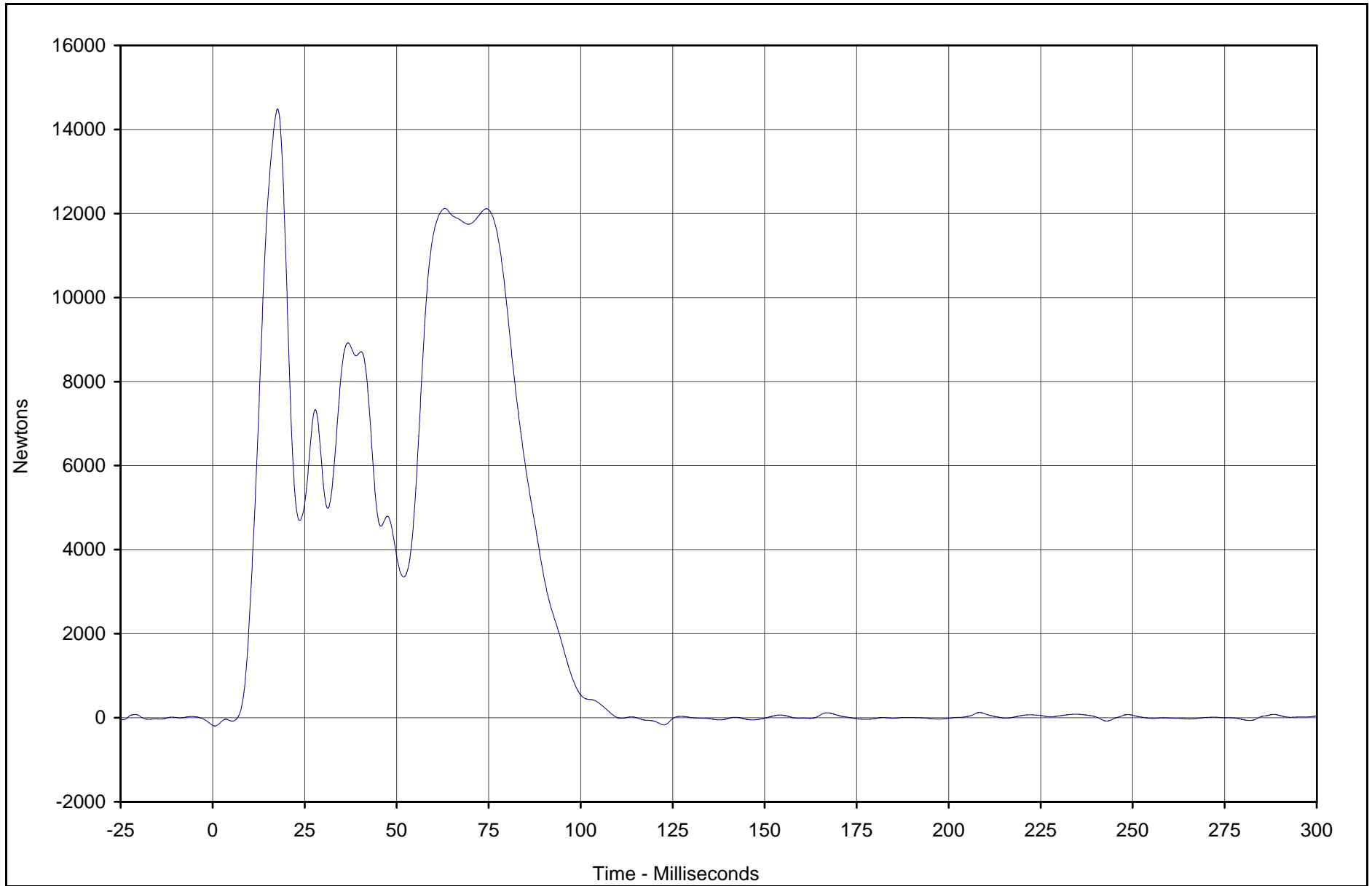
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C4	119	FIL	Newtons	14485.3	17.6	-196.1	0.6	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

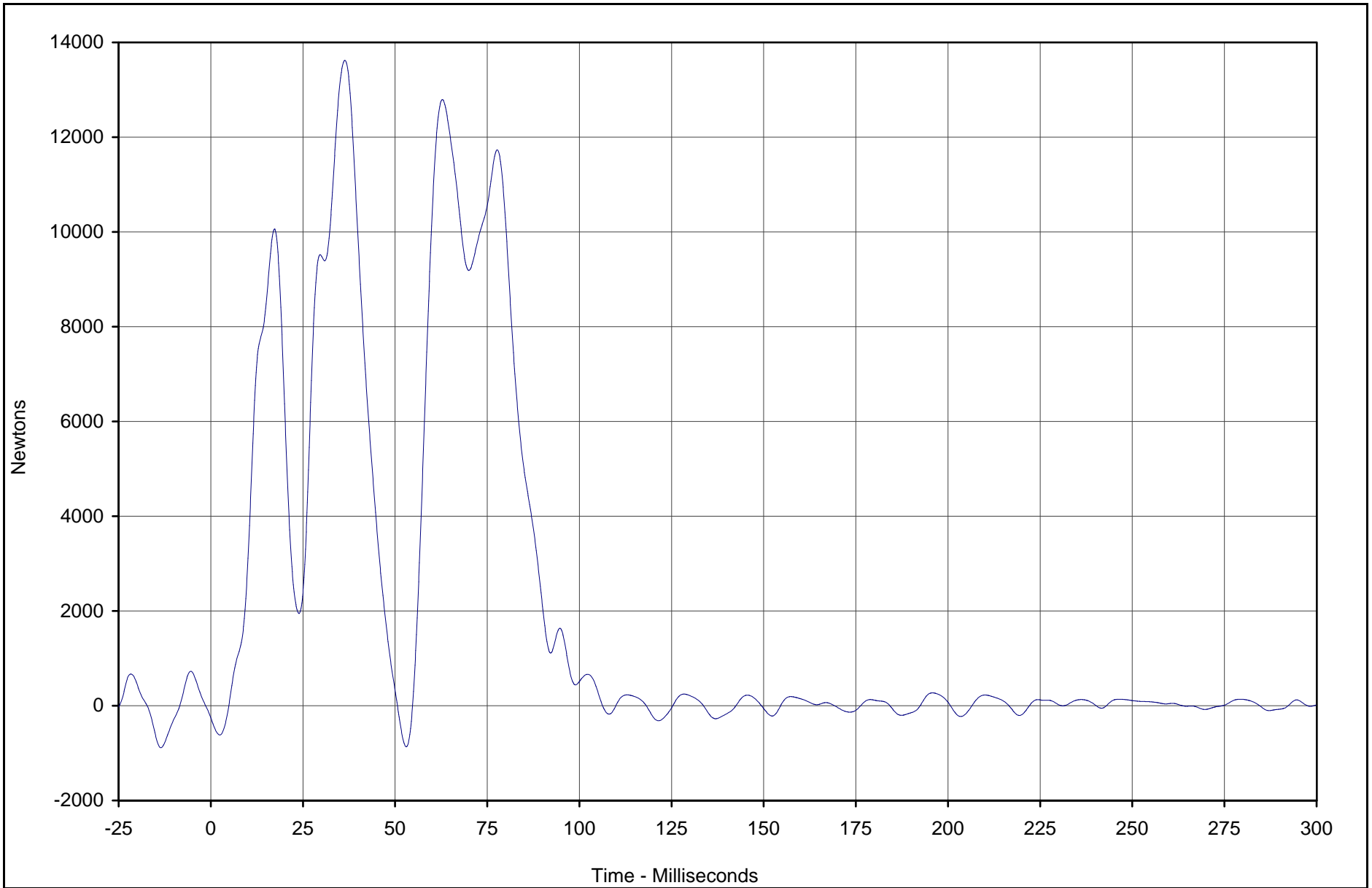
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C5	120	FIL	Newtons	13623.6	36.4	-864.9	53.0	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

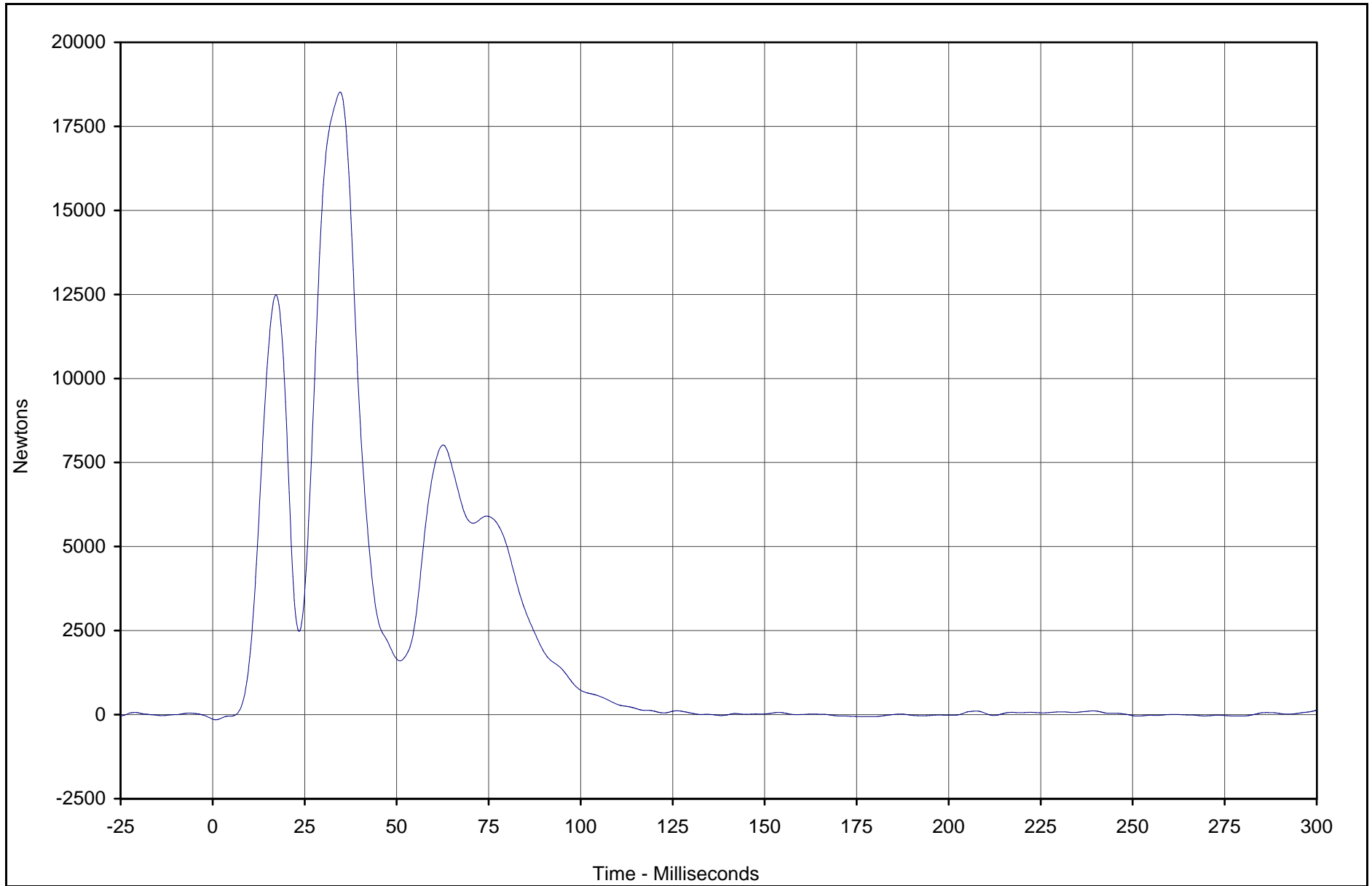
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-24

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C6	121	FIL	Newtons	18521.9	34.6	-152.7	0.8	60



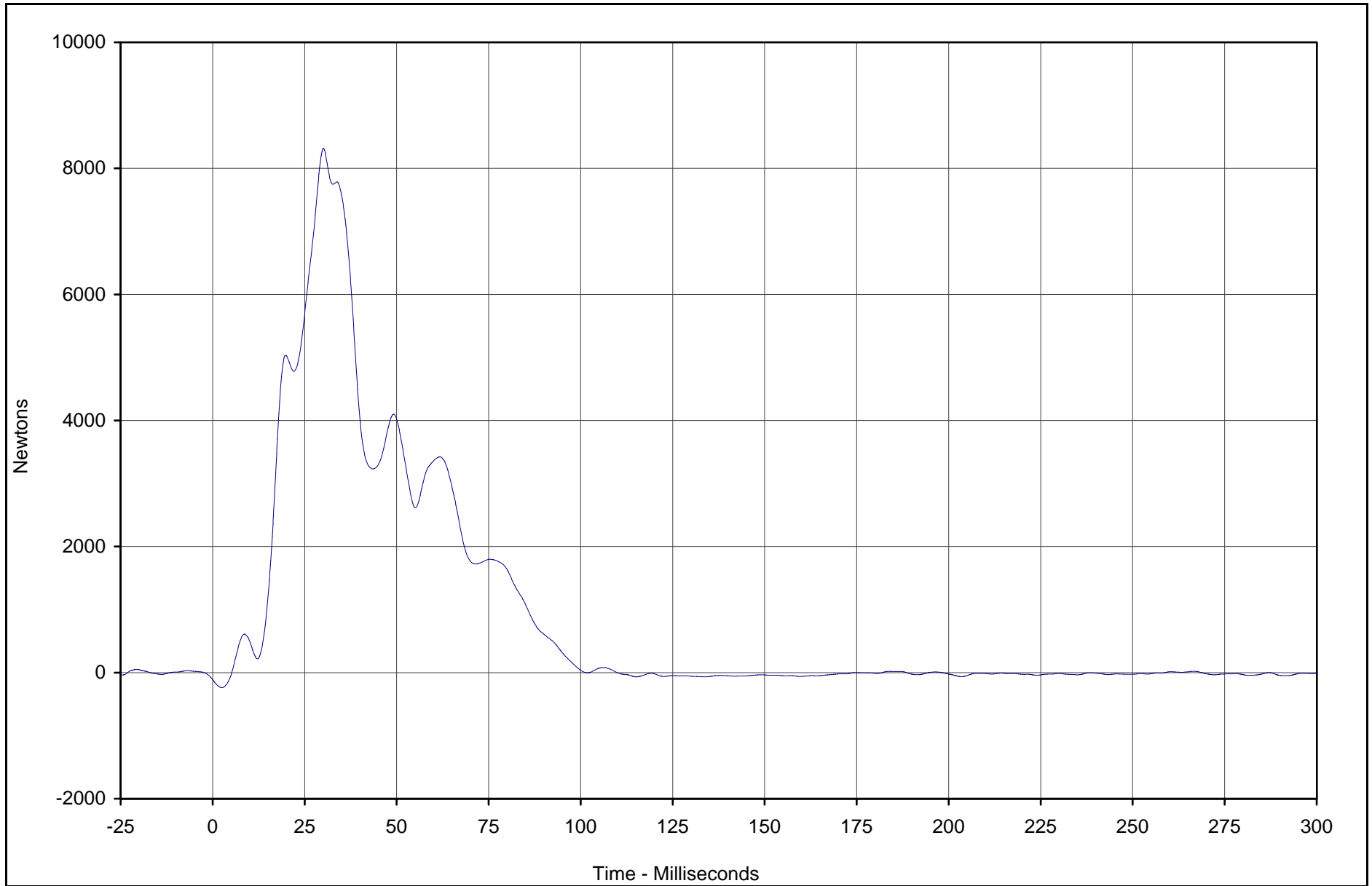
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C7	122	FIL	Newtons	8319.1	30.1	-238.2	2.5	60

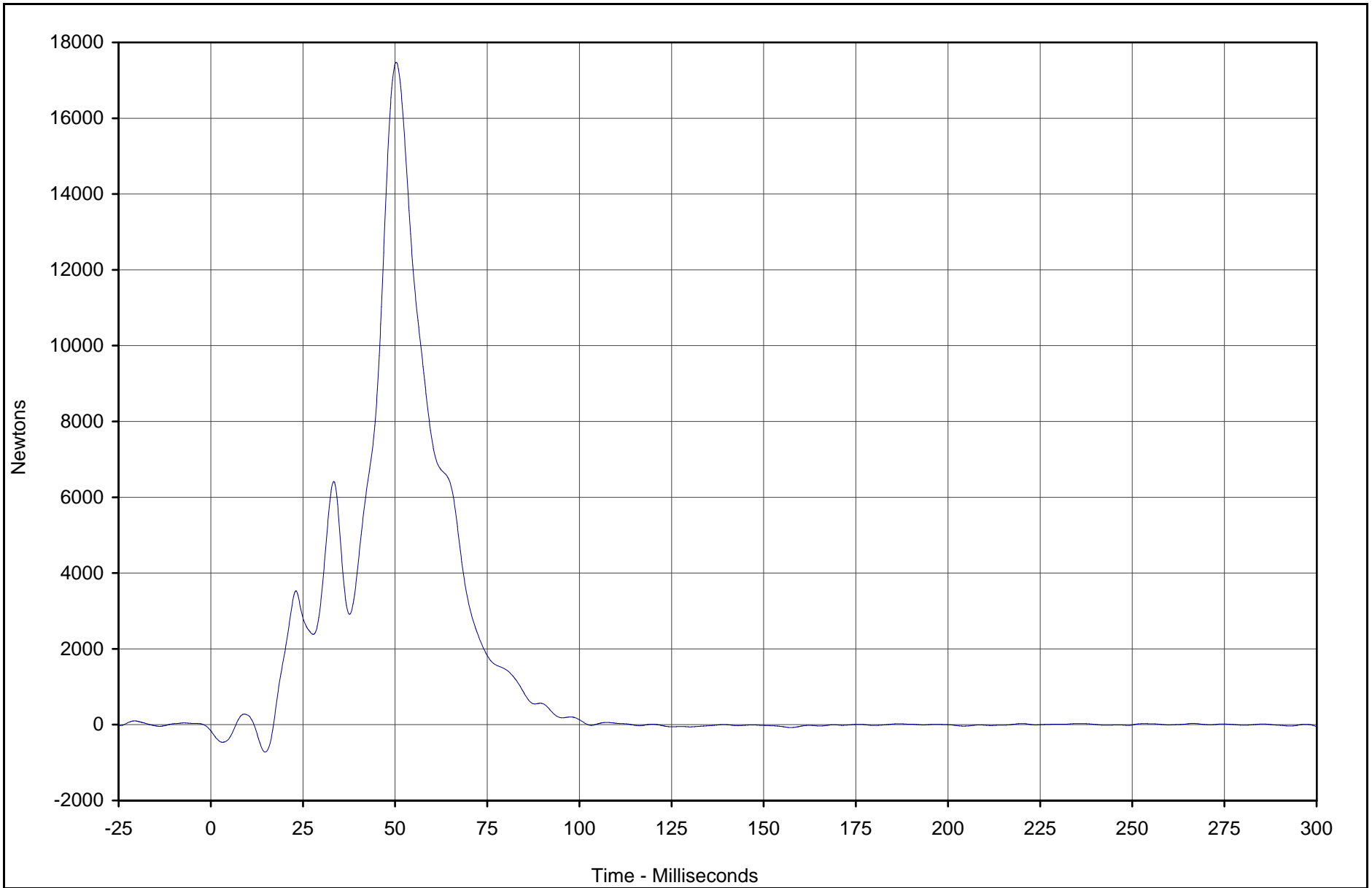


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C8	123	FIL	Newtons	17475.5	50.3	-723.4	14.7	60

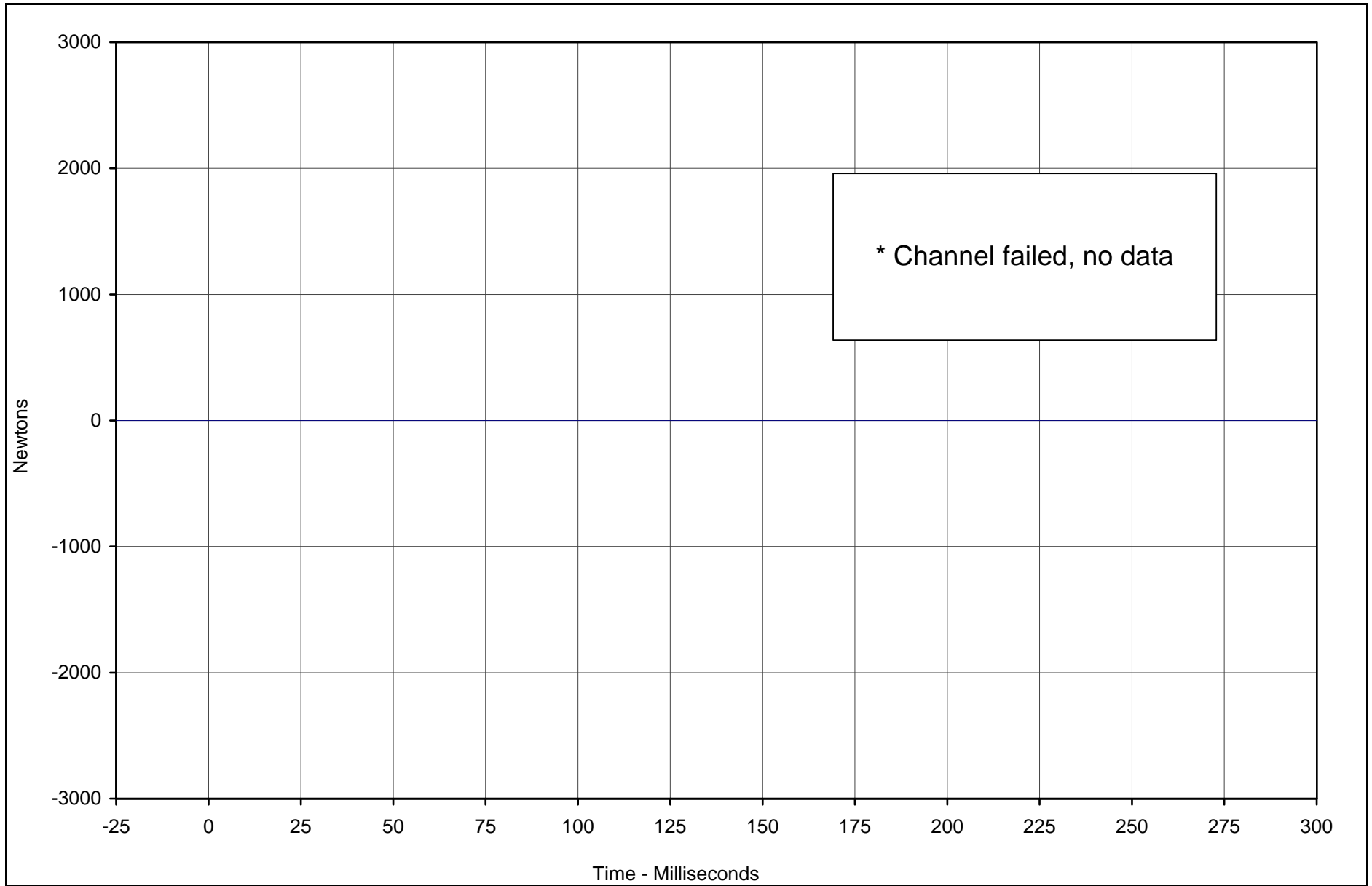


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed, no data

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C9	124	FIL	Newtons	0.0	0.0	0.0	0.0	60

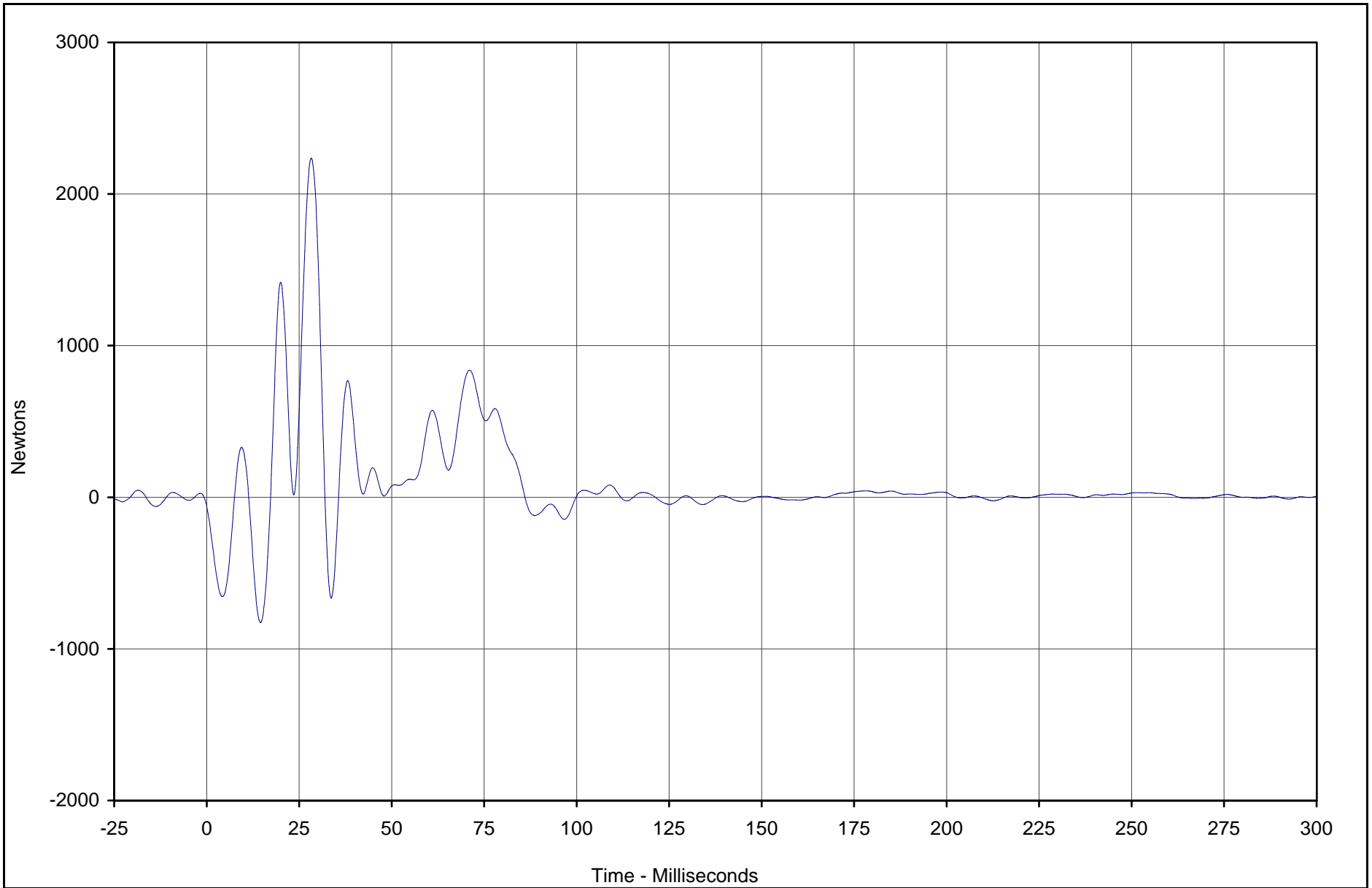


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D1	125	FIL	Newtons	2236.4	28.3	-827.4	14.6	60

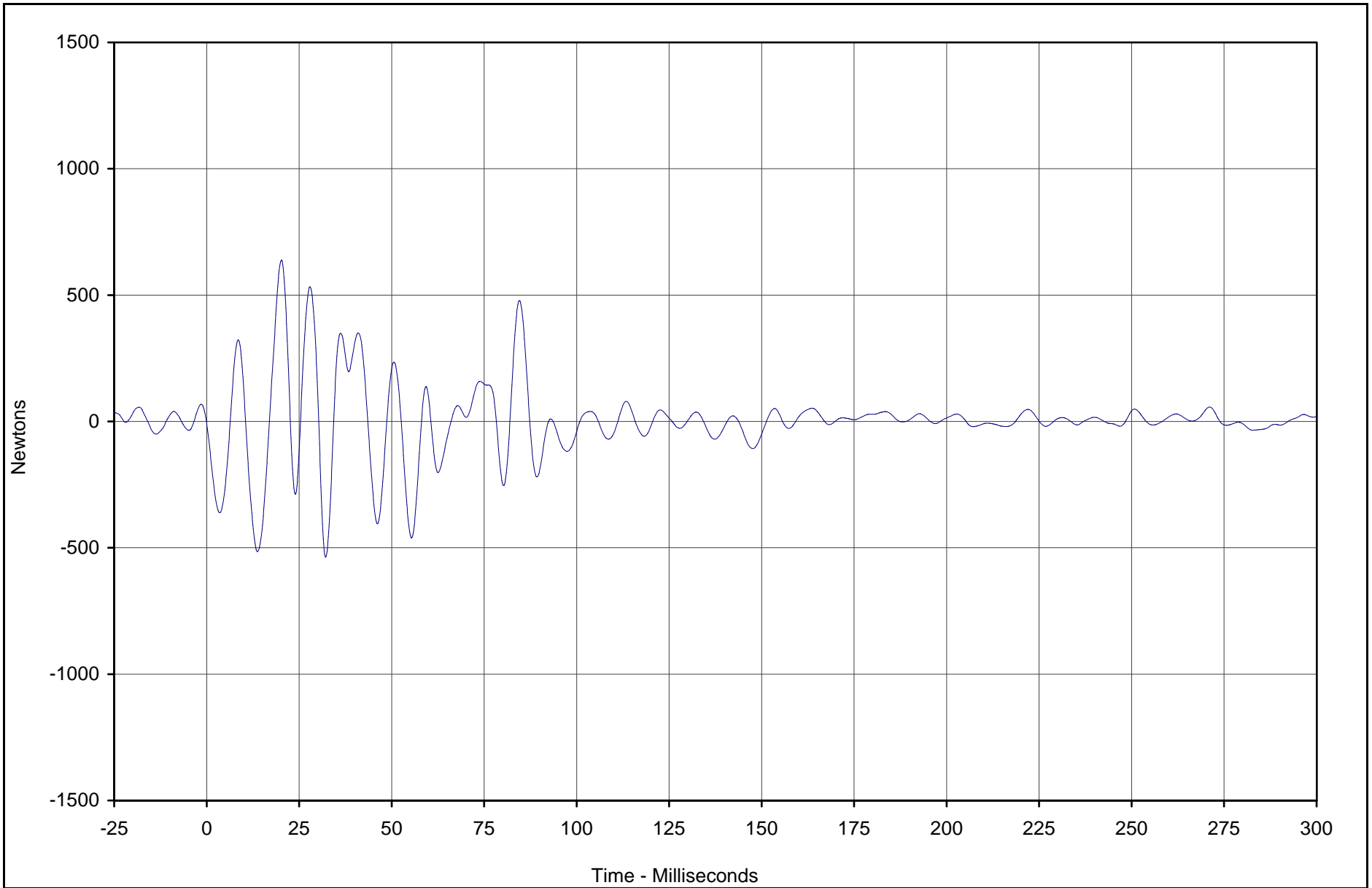


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D2	126	FIL	Newtons	639.2	20.2	-536.4	32.1	60



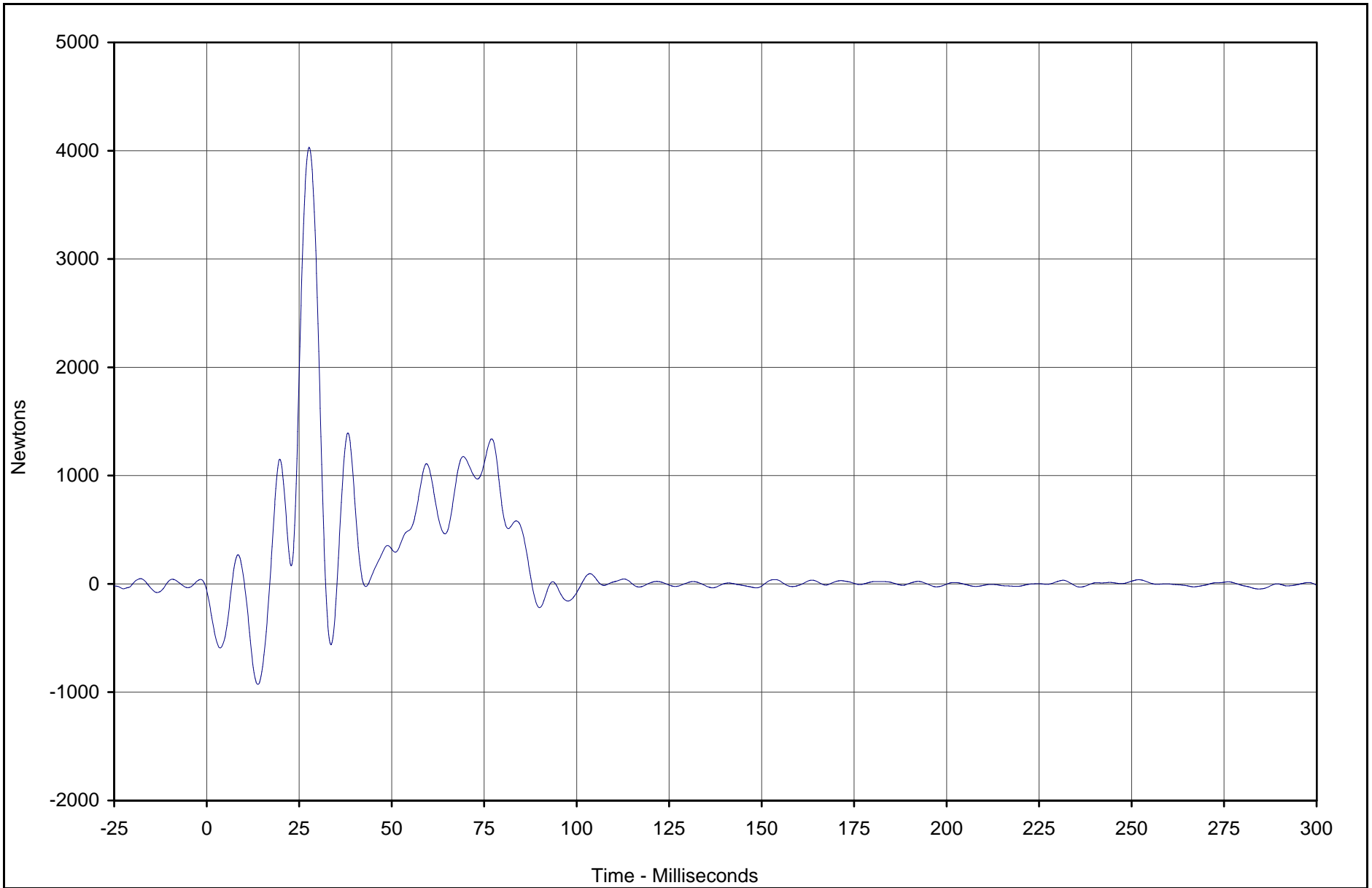
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D3	127	FIL	Newtons	4032.0	27.7	-927.5	13.9	60

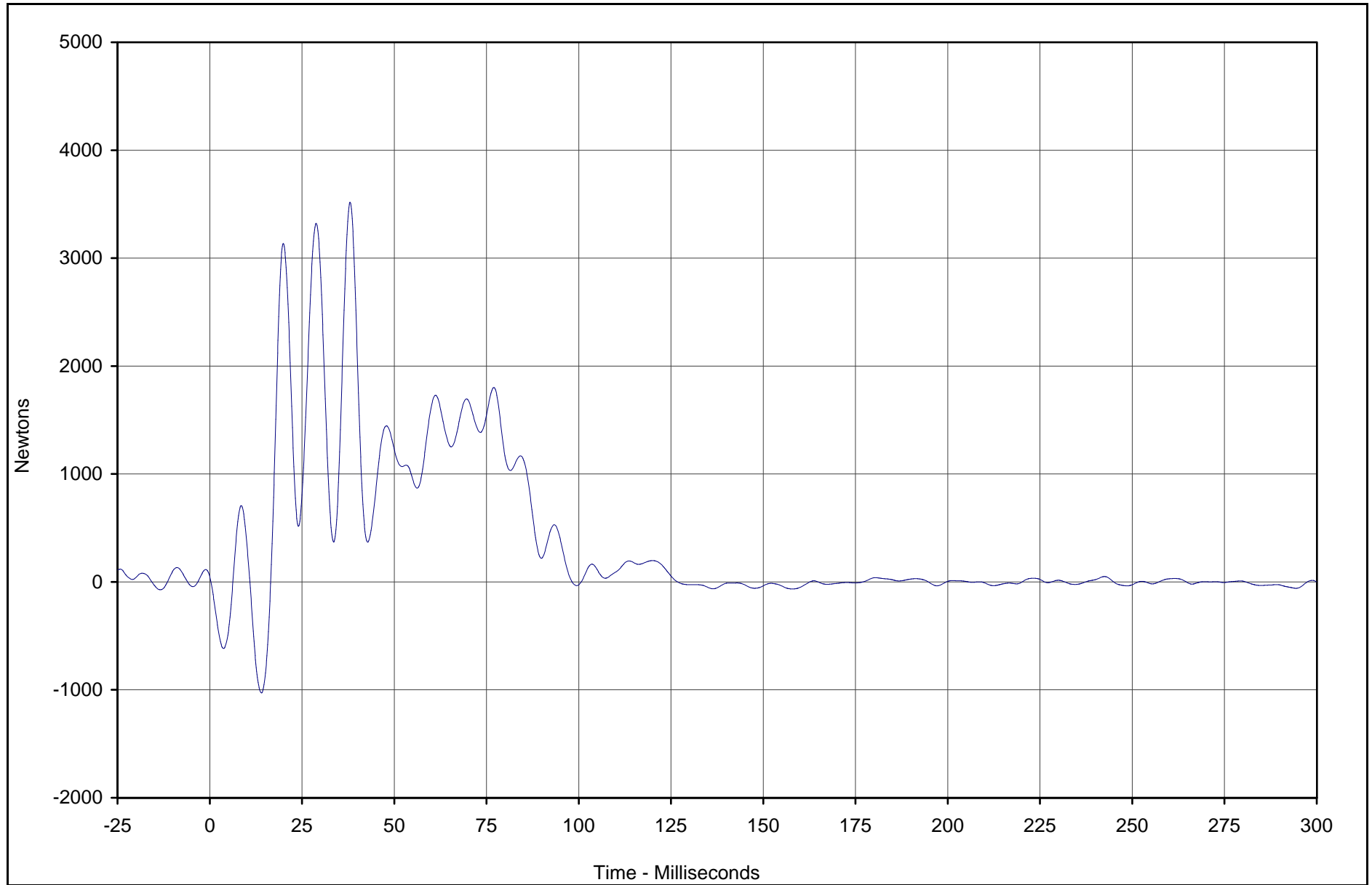


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D4	128	FIL	Newtons	3518.2	38.0	-1028.7	14.0	60

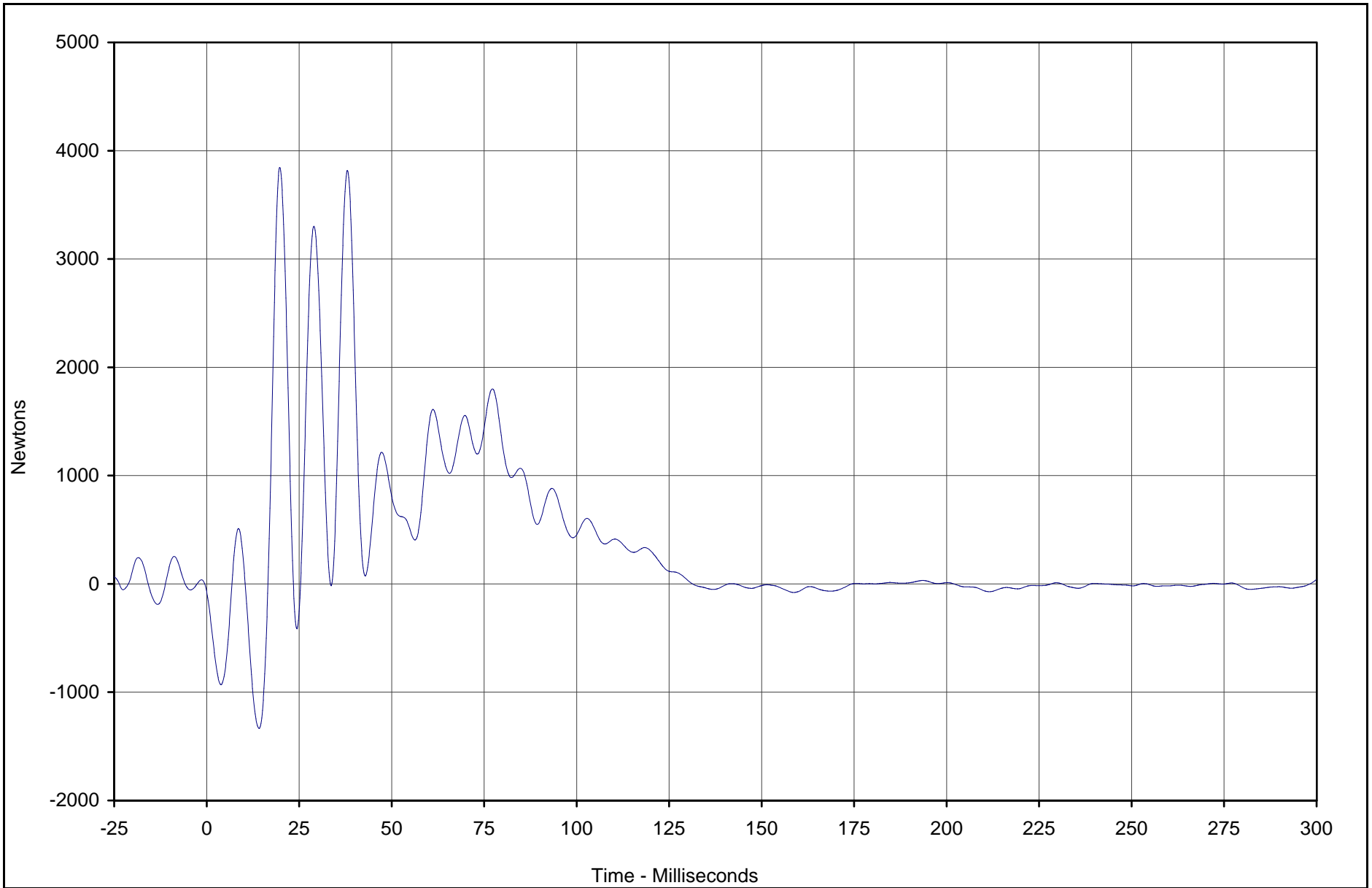


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D5	129	FIL	Newtons	3845.4	19.8	-1334.6	14.2	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

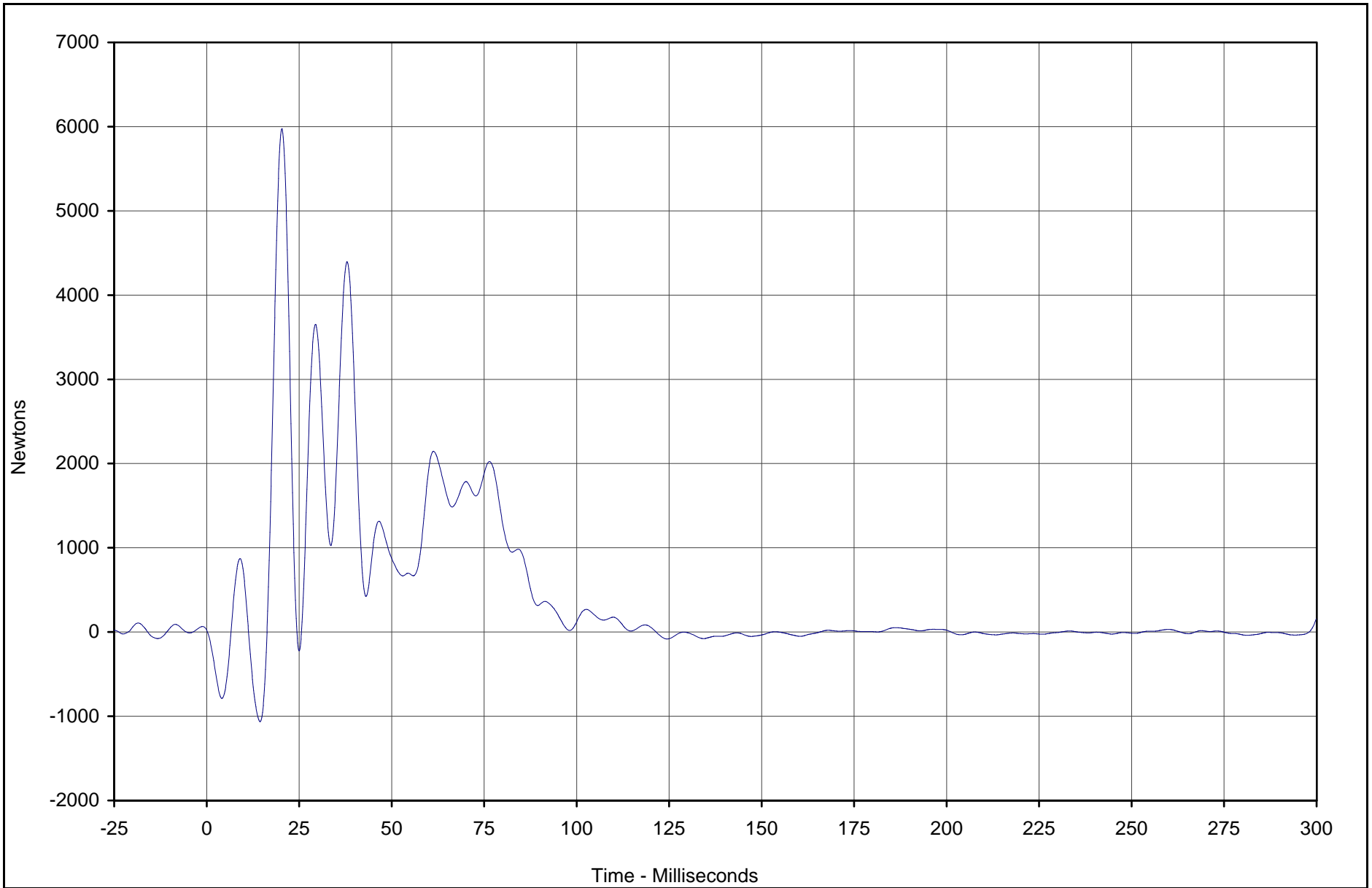
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-33

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D6	130	FIL	Newtons	5975.8	20.3	-1064.2	14.4	60



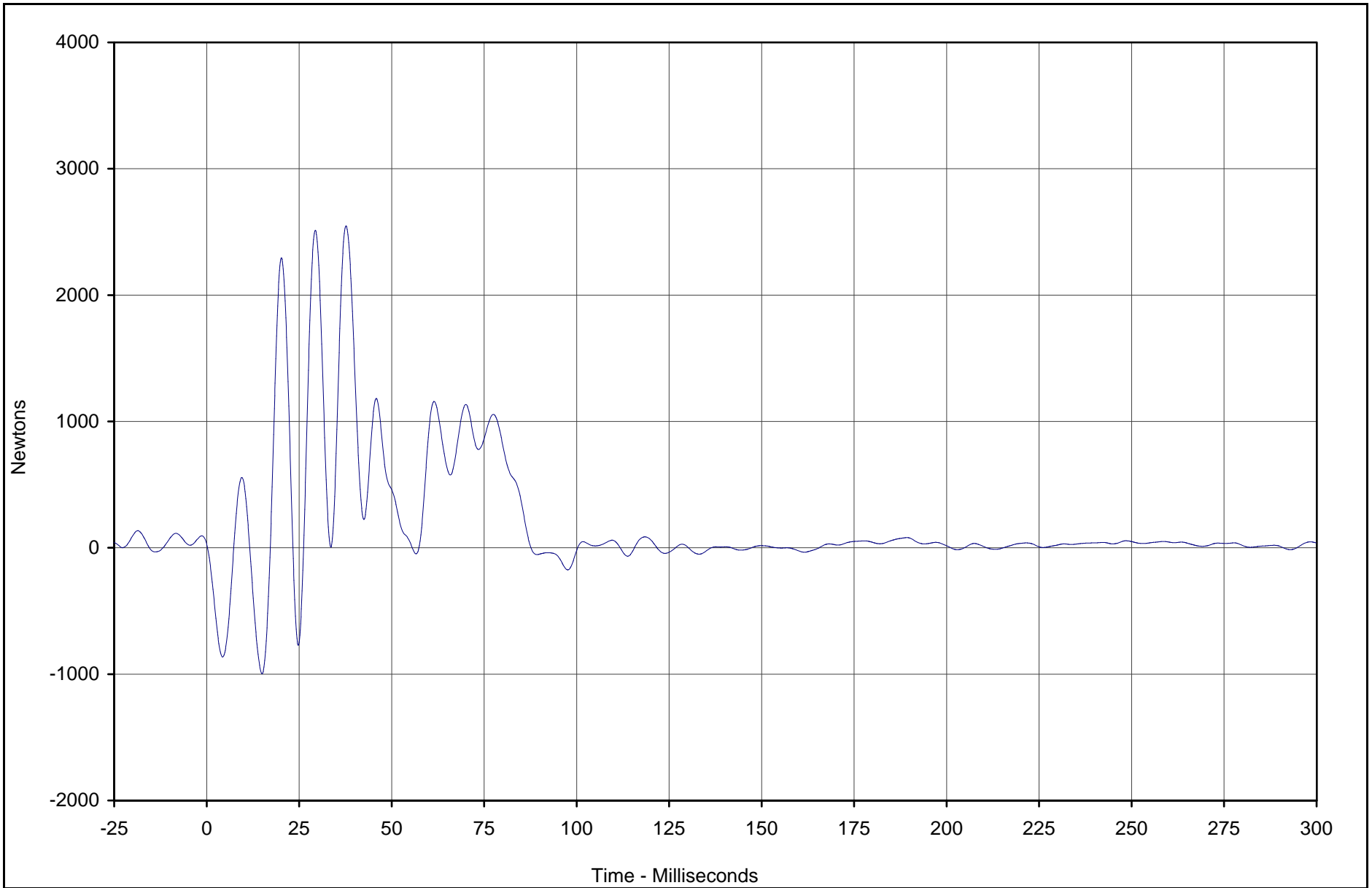
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-34



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D7	131	FIL	Newtons	2547.9	37.7	-996.2	15.0	60

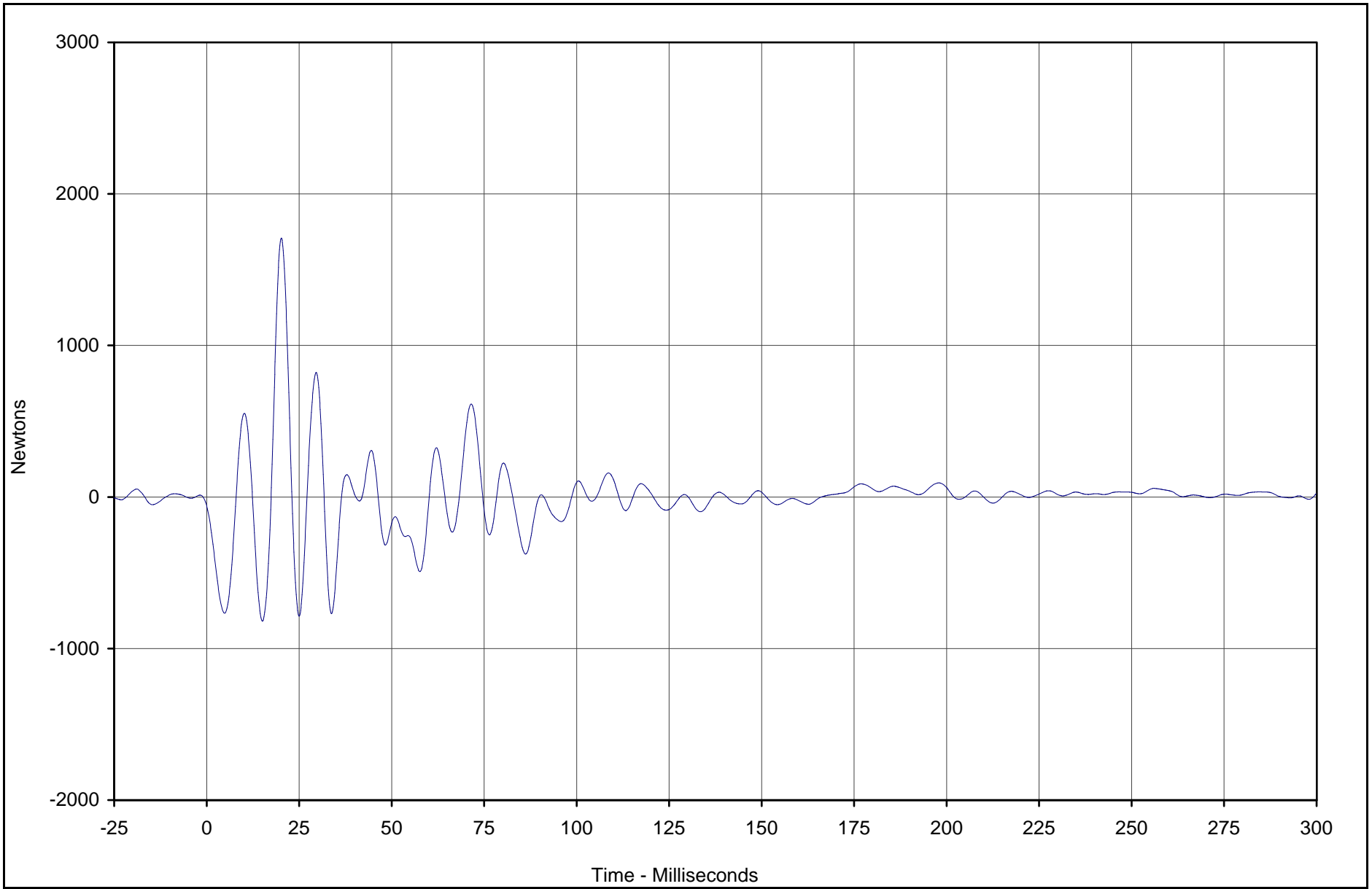


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D8	132	FIL	Newtons	1709.2	20.2	-819.5	15.1	60

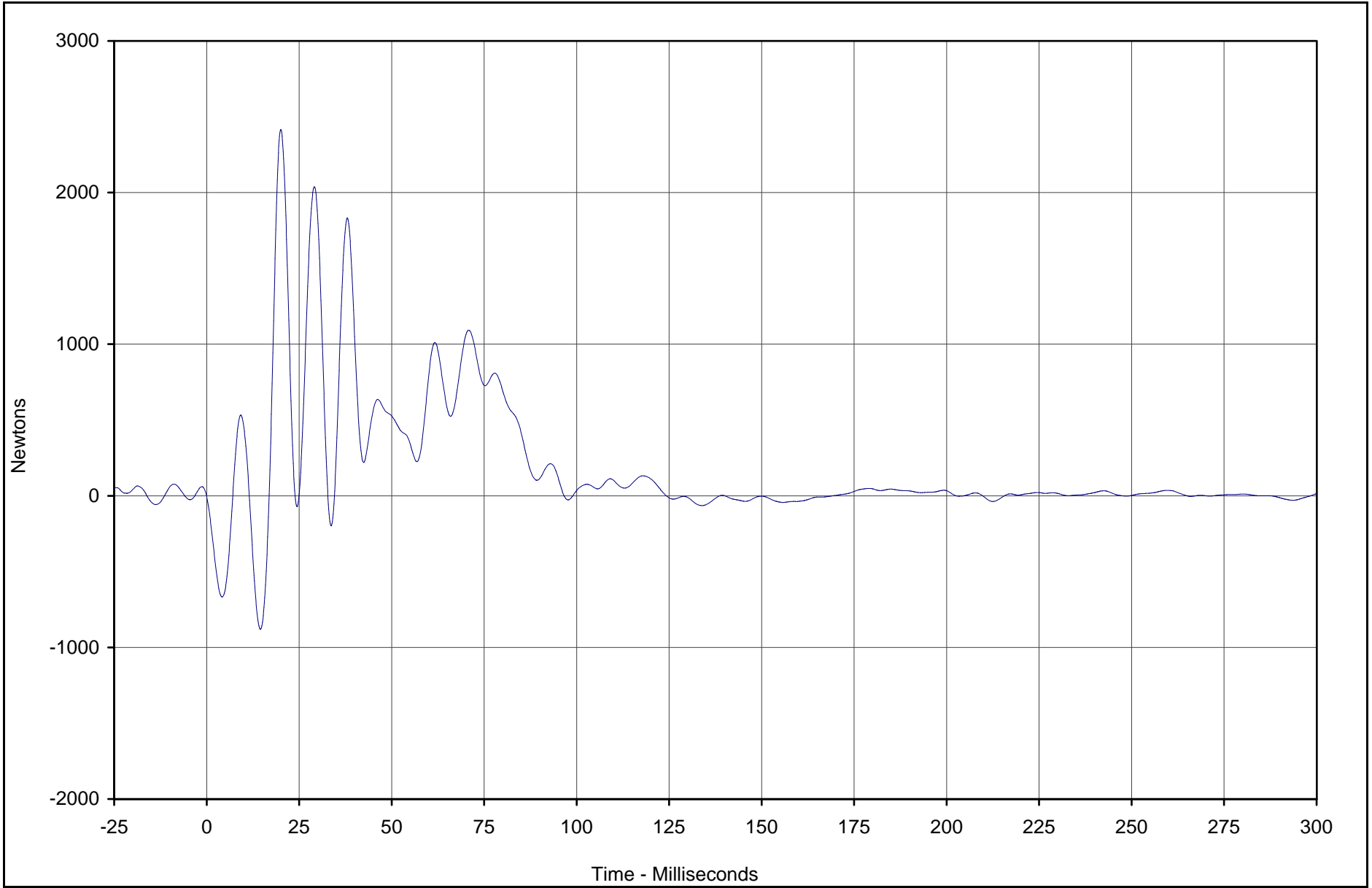


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

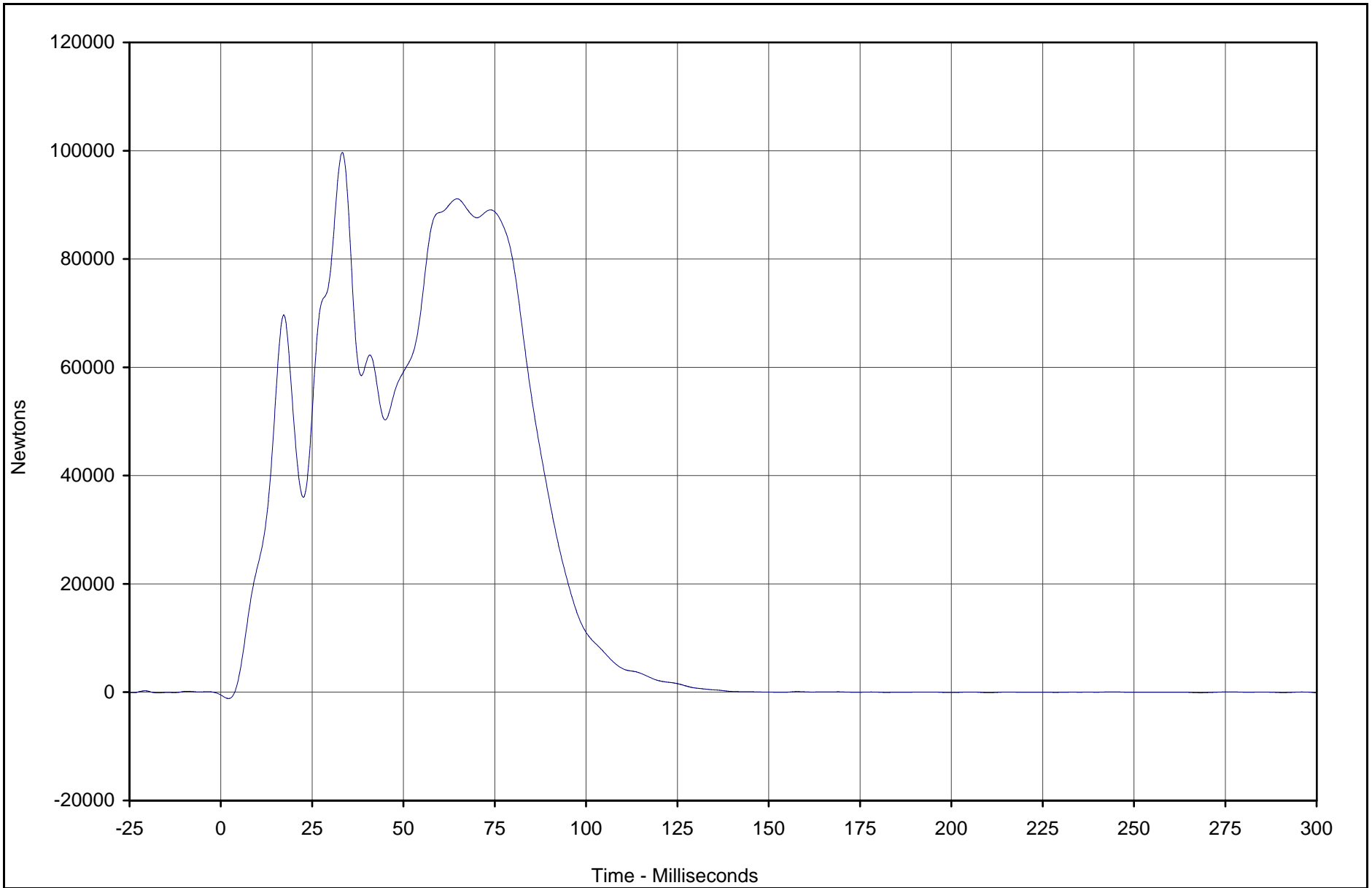


Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D9	133	FIL	Newtons	2415.5	20.0	-880.0	14.5	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03  
 NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 1	001	SUM	Newtons	99657.1	33.2	-1169.7	2.1	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

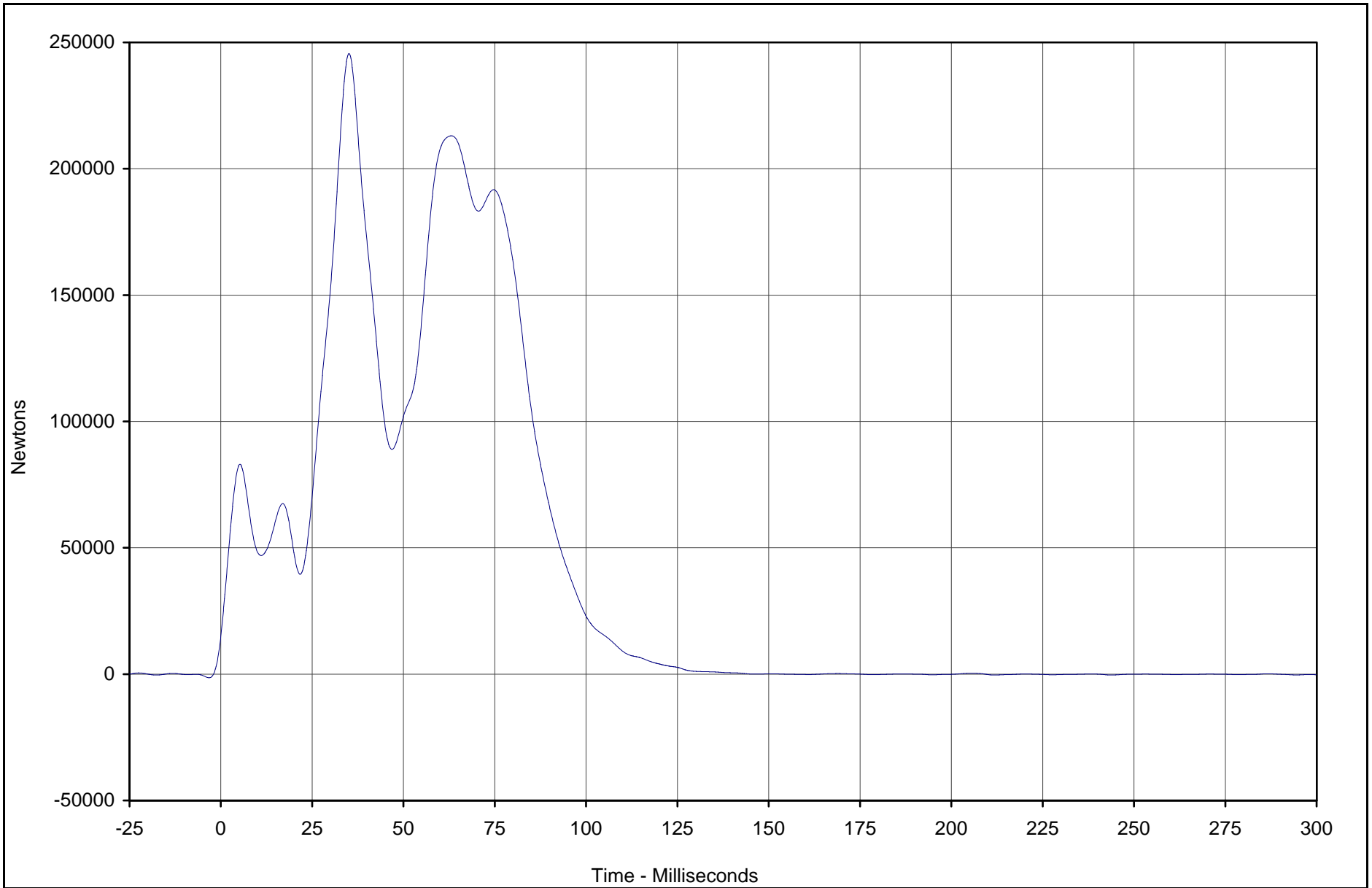
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 2	002	SUM	Newtons	245595.7	35.1	-359.3	243.8	60

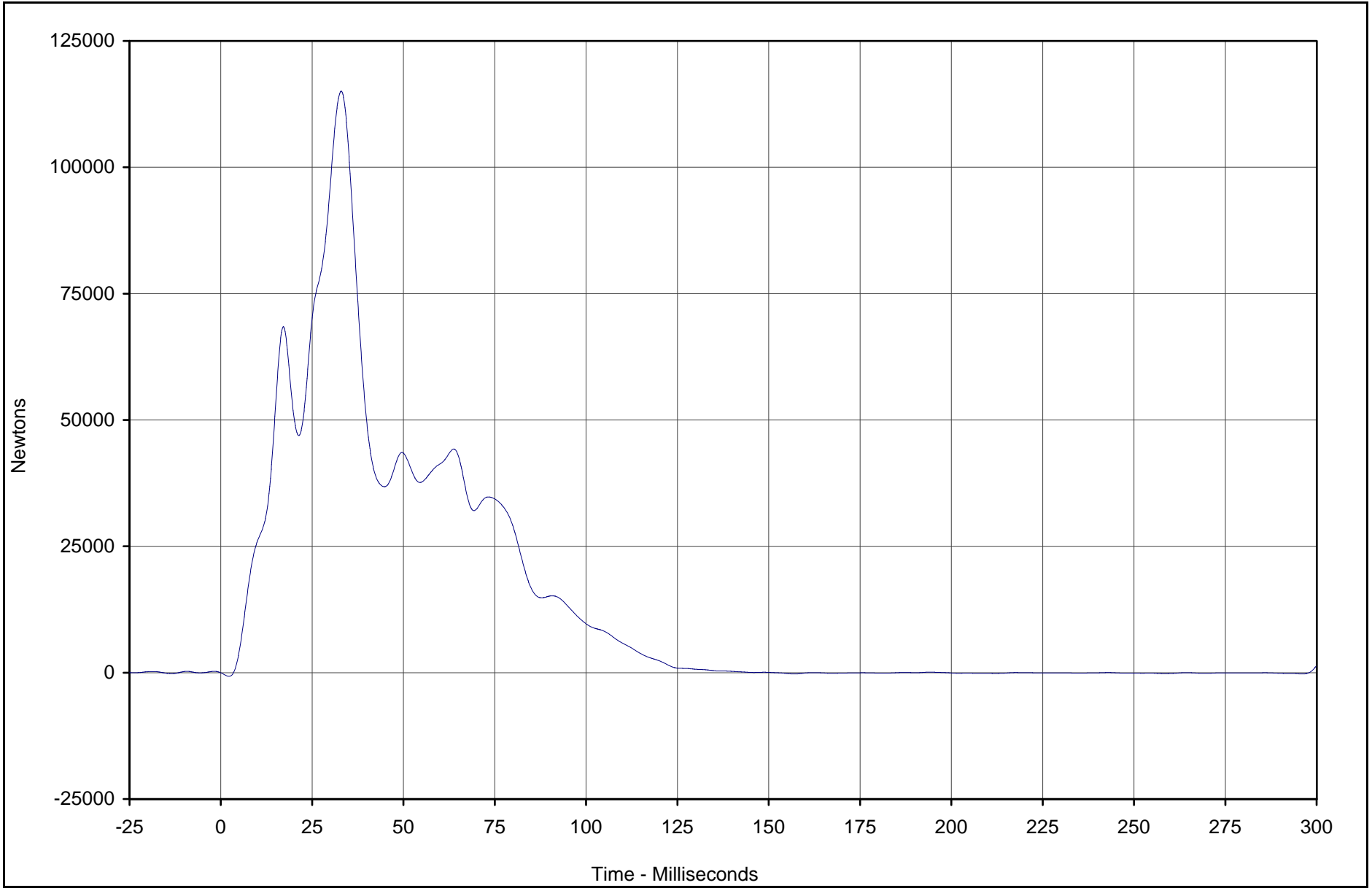


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



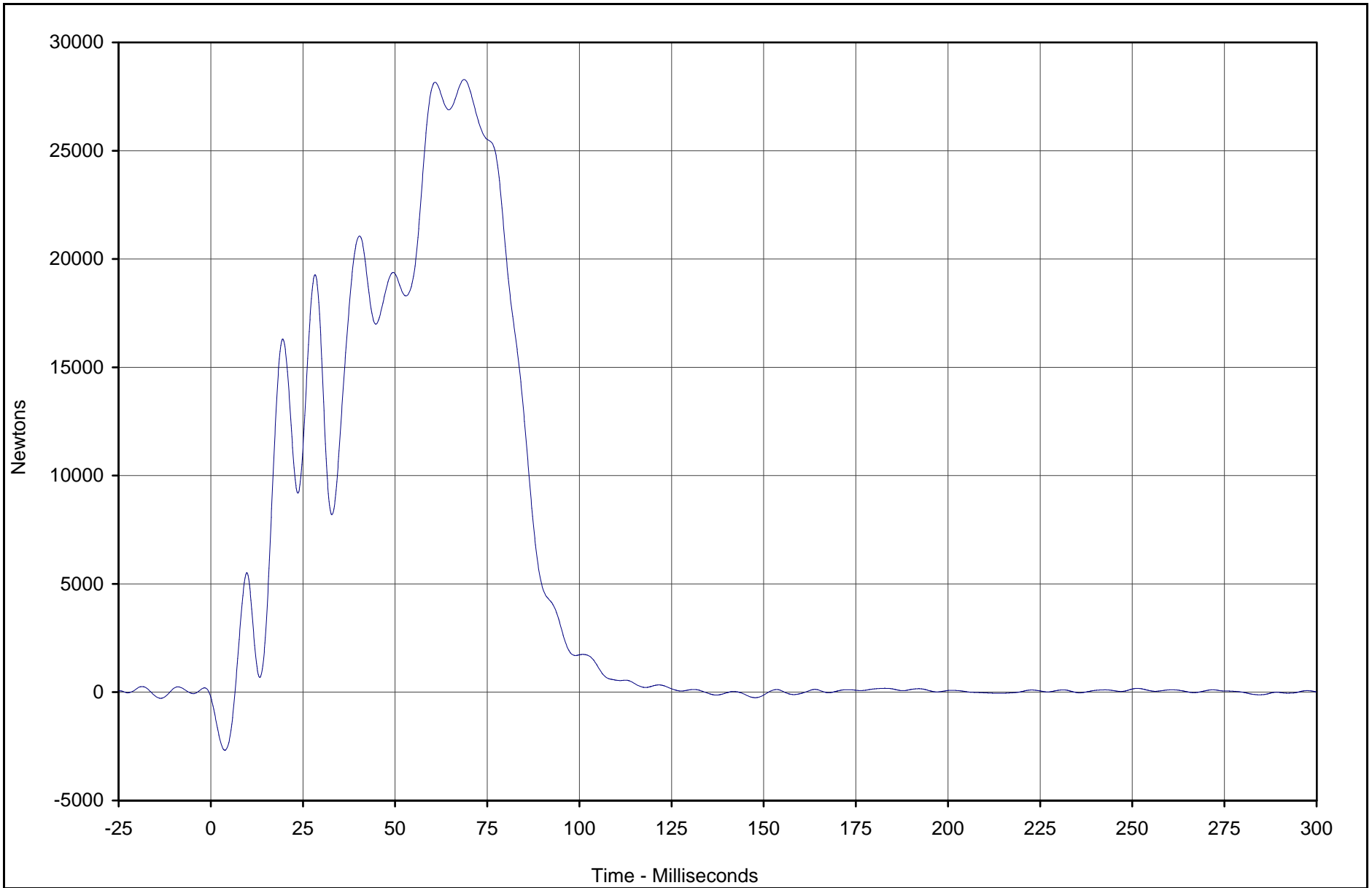
Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 3	003	SUM	Newtons	115057.2	32.9	-724.1	2.2	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03  
 NHTSA No.: M30112

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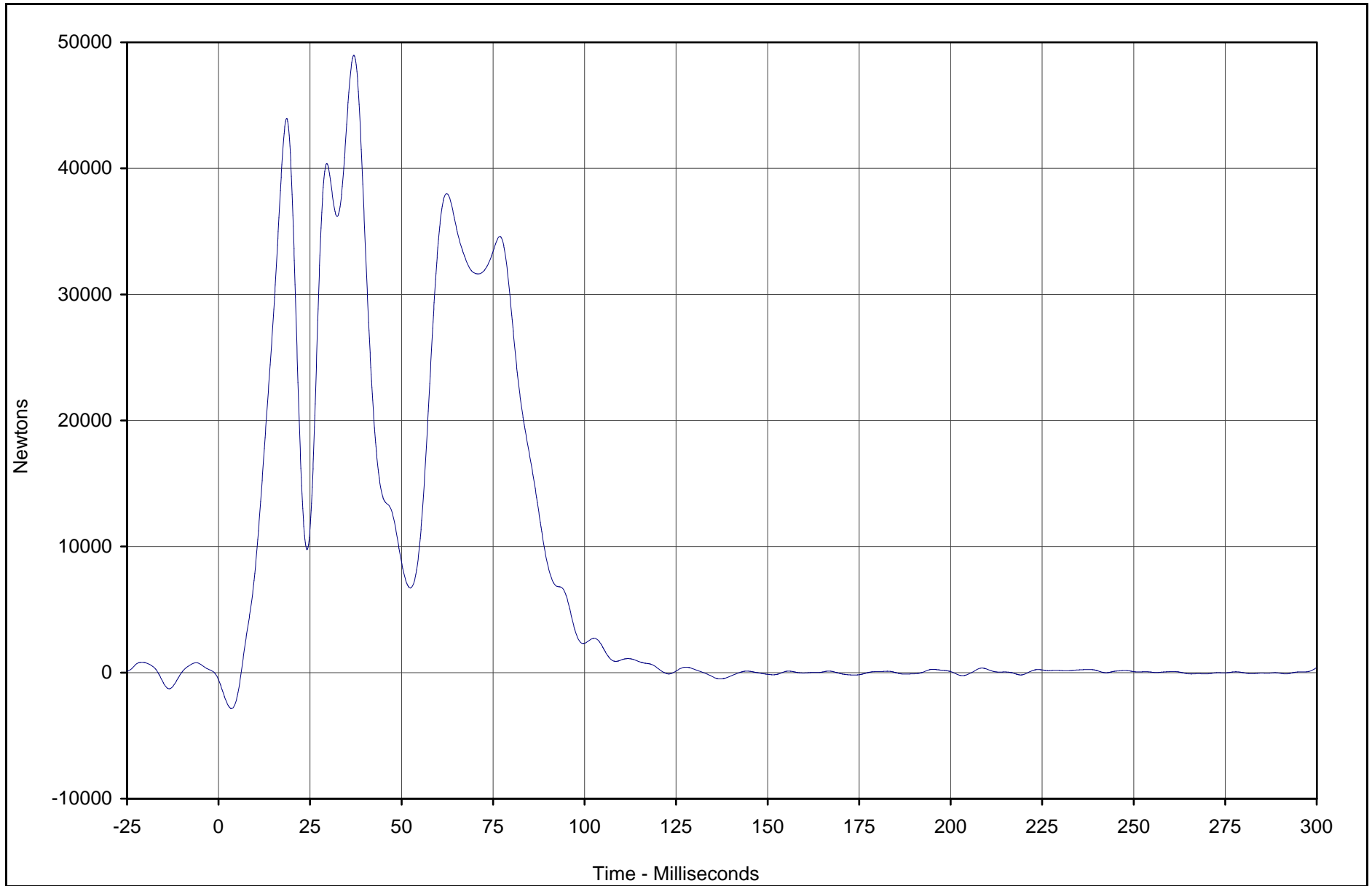
Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 4	004	SUM	Newtons	28288.5	68.7	-2680.2	3.8	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03  
 NHTSA No.: M30112

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 5	005	SUM	Newtons	48969.7	37.0	-2851.5	3.5	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

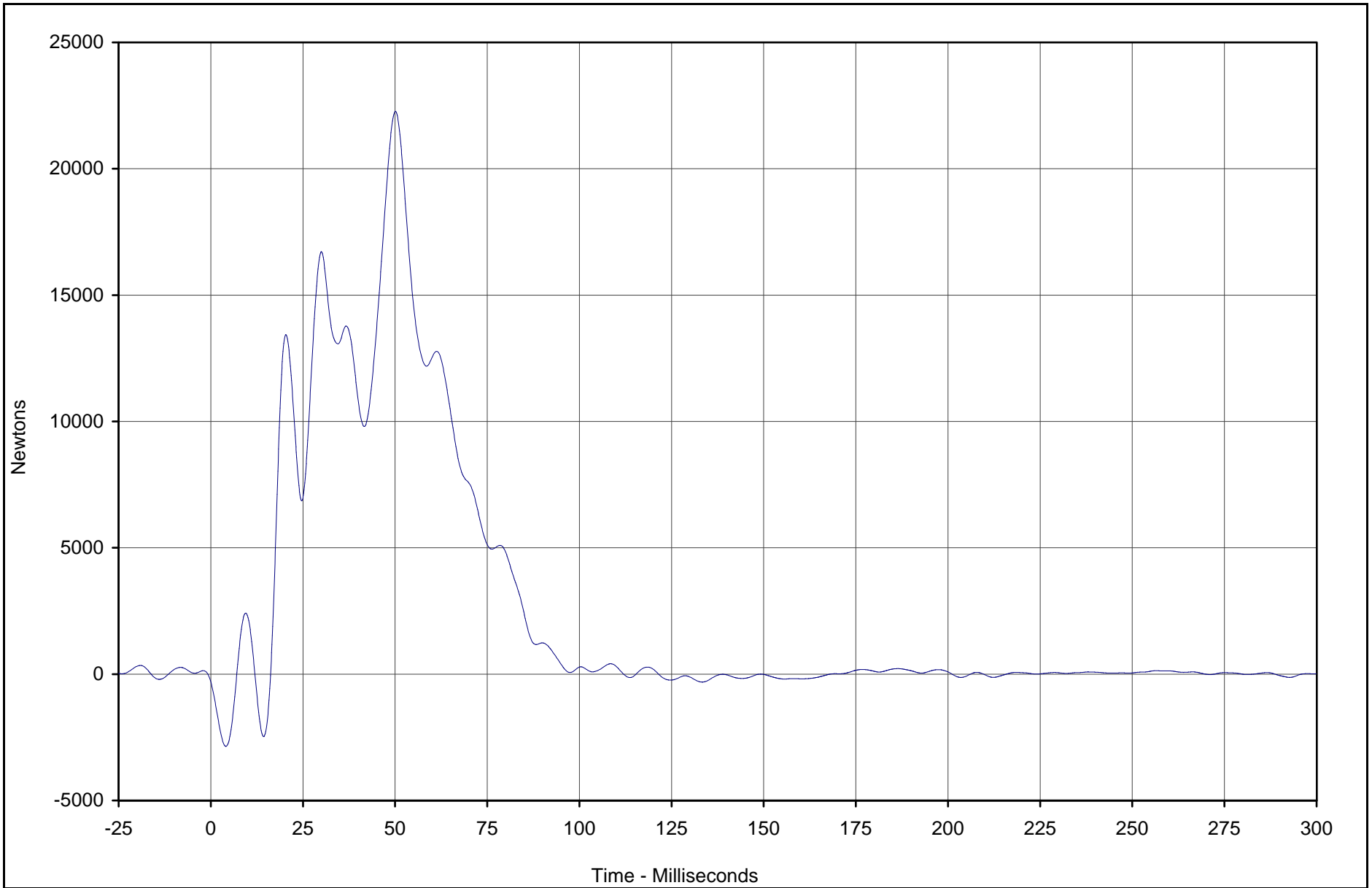
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

C-42



TR-P23001-08-NC

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 6	006	SUM	Newtons	22273.6	50.1	-2856.0	4.1	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

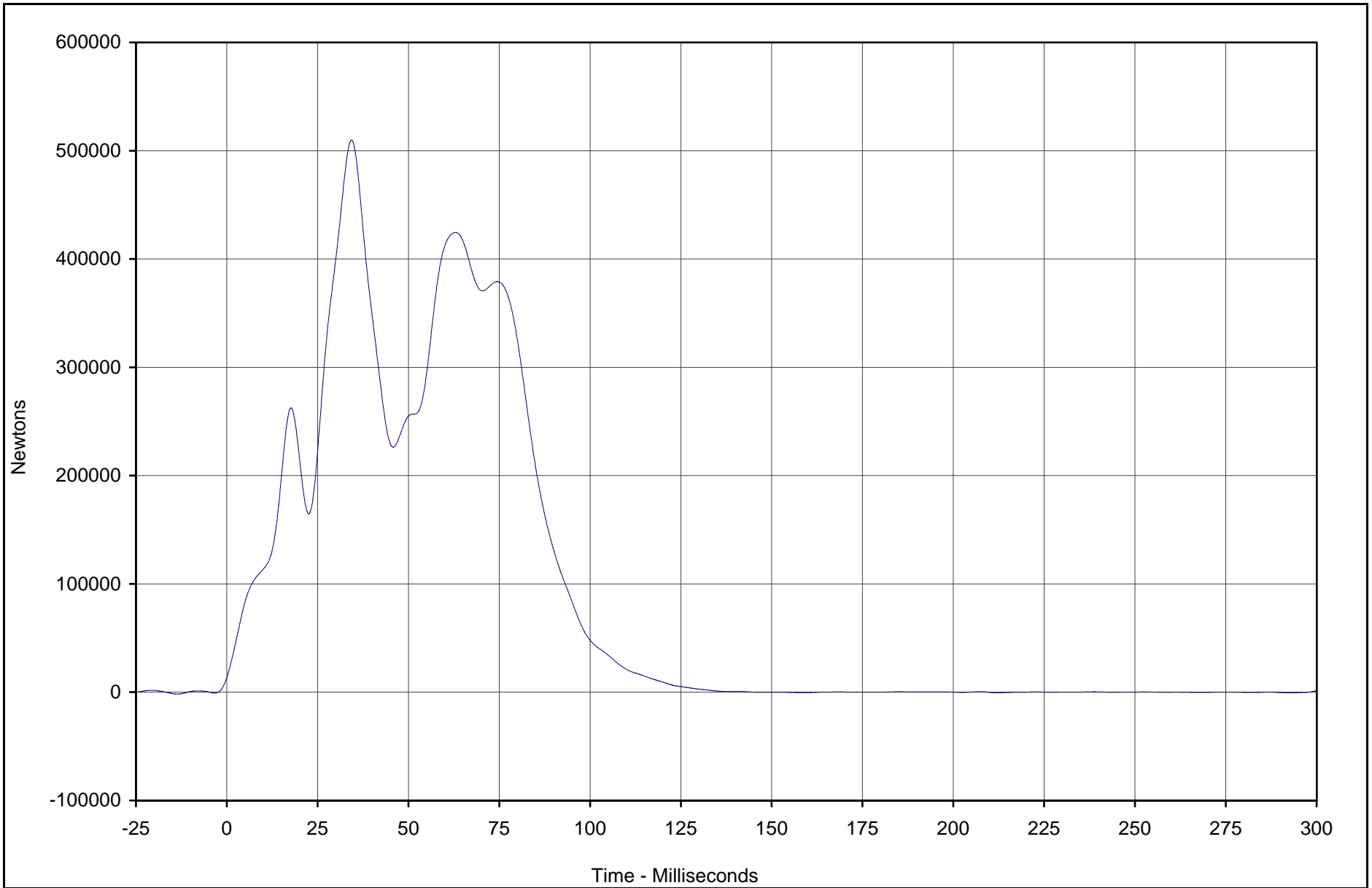
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-43

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Total Sum	007	SUM	Newtons	509826	34.3	-671.1	292.6	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

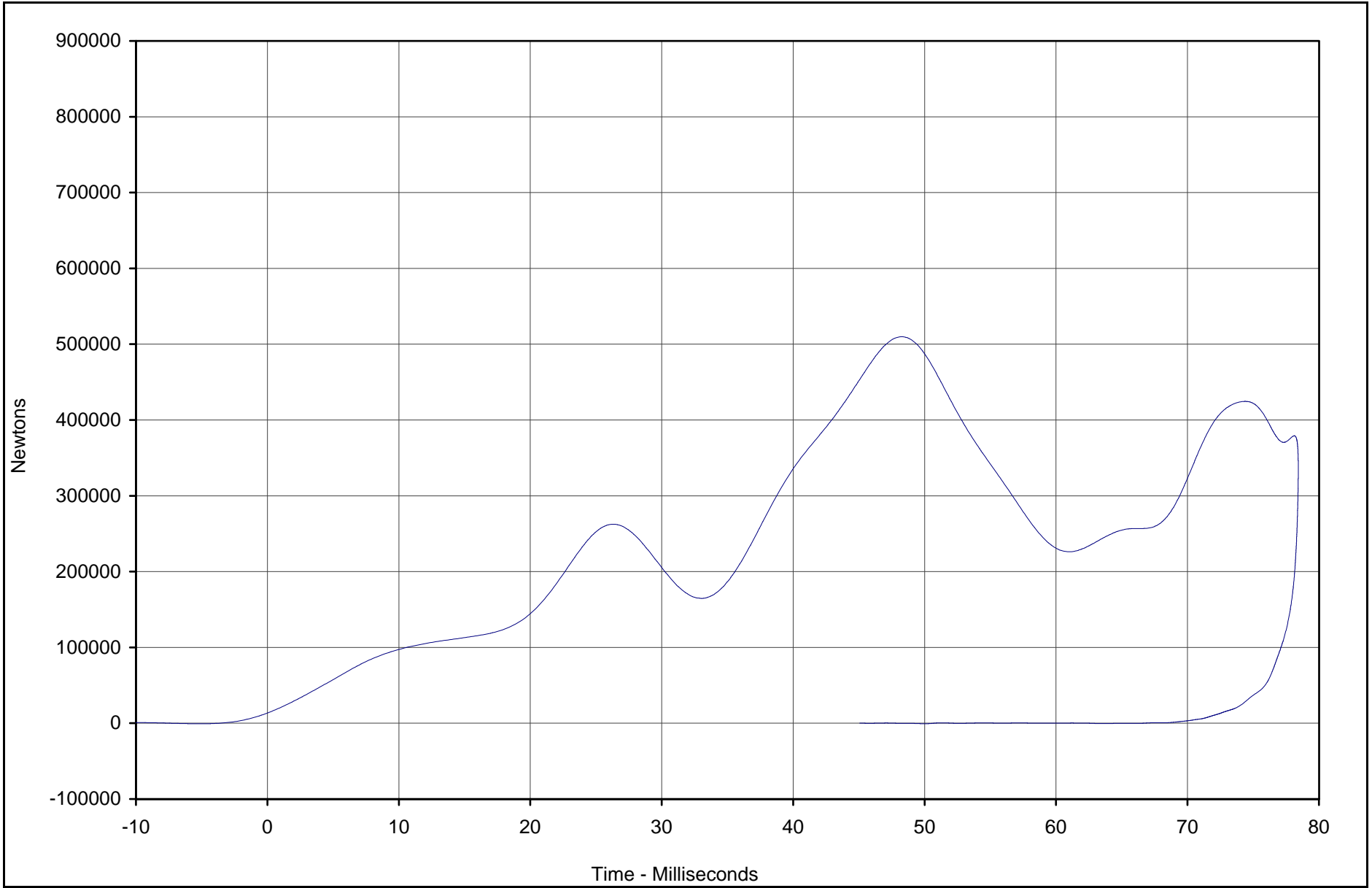
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

C-44

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	CM	Energy (Joules)	SAE Class
Barrier Force Total Sum vs. Displ.	001	XVY	Newtons	509826	48.2	194435	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

## BARRIER LOAD CELL SUMMARY DATA

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

Location	Units	Max	Time	Min	Time
Barrier Force A1	Newtons	1041.1	28.0	-1330.2	23.8
Barrier Force A2	Newtons	1122.1	29.5	-1015.7	24.3
Barrier Force A3	Newtons	19827.8	31.5	-865.8	23.3
Barrier Force A4	Newtons	47094.2	57.8	-156.0	23.1
Barrier Force A5	Newtons	12951.7	59.3	-1562.1	23.6
Barrier Force A6	Newtons	45607.6	33.9	-350.4	22.8
Barrier Force A7	Newtons	0.0	0.0	0.0	0.0
Barrier Force A8	Newtons	0.0	0.0	0.0	0.0
Barrier Force A9	Newtons	1216.5	8.9	-1725.5	23.5
Barrier Force B1	Newtons	2360.3	27.3	-740.1	14.1
Barrier Force B2	Newtons	12992.6	27.1	-82.7	6.2
Barrier Force B3	Newtons	70761.0	33.5	-419.4	1.3
Barrier Force B4	Newtons	51581.0	30.7	-11.4	204.4
Barrier Force B5	Newtons	71335.2	63.5	-59.7	299.9
Barrier Force B6	Newtons	58437.2	35.4	-99.2	157.7
Barrier Force B7	Newtons	105555.5	32.7	-350.5	1.2
Barrier Force B8	Newtons	14942.1	75.3	-290.5	296.2
Barrier Force B9	Newtons	949.0	65.1	-984.4	22.8
Barrier Force C1	Newtons	3022.5	37.9	-975.7	14.5
Barrier Force C2	Newtons	16108.9	66.5	-119.4	9.7
Barrier Force C3	Newtons	10607.3	18.3	-319.8	3.7
Barrier Force C4	Newtons	14485.3	17.6	-196.1	0.6
Barrier Force C5	Newtons	13623.6	36.4	-864.9	53.0
Barrier Force C6	Newtons	18521.9	34.6	-152.7	0.8
Barrier Force C7	Newtons	8319.1	30.1	-238.2	2.5
Barrier Force C8	Newtons	17475.5	50.3	-723.4	14.7
Barrier Force C9	Newtons	0.0	0.0	0.0	0.0
Barrier Force D1	Newtons	2236.4	28.3	-827.4	14.6
Barrier Force D2	Newtons	639.2	20.2	-536.4	32.1
Barrier Force D3	Newtons	4032.0	27.7	-927.5	13.9
Barrier Force D4	Newtons	3518.2	38.0	-1028.7	14.0
Barrier Force D5	Newtons	3845.4	19.8	-1334.6	14.2
Barrier Force D6	Newtons	5975.8	20.3	-1064.2	14.4
Barrier Force D7	Newtons	2547.9	37.7	-996.2	15.0
Barrier Force D8	Newtons	1709.2	20.2	-819.5	15.1
Barrier Force D9	Newtons	2415.5	20.0	-880.0	14.5
Barrier Force Sum Group 1	Newtons	99657.1	33.2	-1169.7	2.1
Barrier Force Sum Group 2	Newtons	245595.7	35.1	-359.3	243.8
Barrier Force Sum Group 3	Newtons	115057.2	32.9	-724.1	2.2
Barrier Force Sum Group 4	Newtons	28288.5	68.7	-2680.2	3.8
Barrier Force Sum Group 5	Newtons	48969.7	37.0	-2851.5	3.5
Barrier Force Sum Group 6	Newtons	22273.6	50.1	-2856.0	4.1
Barrier Force Total Sum	Newtons	509826.4	34.3	-671.1	292.6

\* Channel failed, no data

## **APPENDIX D**

### **INSTRUMENTATION DATA CHANNEL ASSIGNMENTS**

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Driver A.T.D. Serial Number 35  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD, PRIMARY	X	GPAC027	Accel., 1/2 bridge	Endevco	7264-2000	G
2	HEAD, PRIMARY	Y	GPAC002	Accel., 1/2 bridge	Endevco	7264-2000	G
3	HEAD, PRIMARY	Z	GPAC003	Accel., 1/2 bridge	Endevco	7264-2000	G
4	HEAD, REDUNDANT	X	GPAC032	Accel., 1/2 bridge	Endevco	7264-2000	G
5	HEAD, REDUNDANT	Y	GPAC021	Accel., 1/2 bridge	Endevco	7264-2000	G
6	HEAD, REDUNDANT	Z	GPAC026	Accel., 1/2 bridge	Endevco	7264-2000	G
7	NECK FORCE	X	GPUN01FX	Load cell, six axis neck	R. A. Denton	1716A	N
8	NECK FORCE	Y	GPUN01FY	Load cell, six axis neck	R. A. Denton	1716A	N
9	NECK FORCE	Z	GPUN01FZ	Load cell, six axis neck	R. A. Denton	1716A	N
10	NECK MOMENT	X	GPUN01MX	Load cell, six axis neck	R. A. Denton	1716A	Nm
11	NECK MOMENT	Y	GPUN01MY	Load cell, six axis neck	R. A. Denton	1716A	Nm
12	NECK MOMENT	Z	GPUN01MZ	Load cell, six axis neck	R. A. Denton	1716A	Nm
13	CHEST , PRIMARY	X	GPAC005	Accel., 1/2 bridge	Endevco	7264-2000	G
14	CHEST , PRIMARY	Y	GPAC011	Accel., 1/2 bridge	Endevco	7264-2000	G
15	CHEST , PRIMARY	Z	GPAC010	Accel., 1/2 bridge	Endevco	7264-2000	G
16	CHEST , REDUNDANT	X	GPAC034	Accel., 1/2 bridge	Endevco	7264-2000	G
17	CHEST , REDUNDANT	Y	GPAC023	Accel., 1/2 bridge	Endevco	7264-2000	G
18	CHEST , REDUNDANT	Z	GPAC020	Accel., 1/2 bridge	Endevco	7264-2000	G
19	CHEST DISPLACEMENT	X	GPCP002	Rotary Pot Chest	Servo	14CBI	MM
20	PELVIS, PRIMARY	X	GPAC025	Accel., 1/2 bridge	Endevco	7264-2000	G
21	PELVIS, PRIMARY	Y	GPAC022	Accel., 1/2 bridge	Endevco	7264-2000	G
22	PELVIS, PRIMARY	Z	GPAC019	Accel., 1/2 bridge	Endevco	7264-2000	G
23	LEFT FEMUR FORCE	Z	KEFF003	Load cell, Femur	R.A. Denton	2121	N
24	RIGHT FEMUR FORCE	Z	KEFF004	Load cell, Femur	R.A. Denton	2121	N

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**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Driver A.T.D. Serial Number 35  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
25	UP. TIBIA LEFT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
26	UP. TIBIA LEFT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
27	UP. TIBIA RIGHT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
28	UP. TIBIA RIGHT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
29	LWR. TIBIA LEFT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
30	LWR. TIBIA LEFT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
31	LWR. TIBIA LEFT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
32	LWR. TIBIA RIGHT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
33	LWR. TIBIA RIGHT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
34	LWR. TIBIA RIGHT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
35	FOOT LEFT, AFT	X	KEIC002X	Accel., Foot Triax	I.C. Sensor	3031-500	G
36	FOOT LEFT, AFT	Z	KEIC002Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
37	FOOT LEFT, FORE	Z	KEIC002Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
38	FOOT RIGHT, AFT	X	KEIC001X	Accel., Foot Triax	I.C. Sensor	3031-500	G
39	FOOT RIGHT, AFT	Z	KEIC001Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
40	FOOT RIGHT, FORE	Z	KEIC001Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
41	LAP BELT FORCE	X	KELC001	Load cell, Seat belt	Lebow	3371	N
42	SHOULDER BELT FORCE	X	KELC002	Load cell, Seat belt	Lebow	3371	N
43	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
44	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

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TR-P23001-08-NC

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Passenger A.T.D. Serial Number 34  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
45	HEAD, PRIMARY	X	KEAC039	Accel.,1/2 bridge	Endevco	7264-2000	G
46	HEAD, PRIMARY	Y	KEAC038	Accel.,1/2 bridge	Endevco	7264-2000	G
47	HEAD, PRIMARY	Z	KEAC027	Accel.,1/2 bridge	Endevco	7264-2000	G
48	HEAD, REDUNDANT	X	KEAC031	Accel.,1/2 bridge	Endevco	7264-2000	G
49	HEAD, REDUNDANT	Y	KEAC032	Accel.,1/2 bridge	Endevco	7264-2000	G
50	HEAD, REDUNDANT	Z	KEAC026	Accel.,1/2 bridge	Endevco	7264-2000	G
51	NECK FORCE	X	GPUN02FX	Load cell, six axis neck	R. A. Denton	1716A	N
52	NECK FORCE	Y	GPUN02FY	Load cell, six axis neck	R. A. Denton	1716A	N
53	NECK FORCE	Z	GPUN02FZ	Load cell, six axis neck	R. A. Denton	1716A	N
54	NECK MOMENT	X	GPUN02MX	Load cell, six axis neck	R. A. Denton	1716A	Nm
55	NECK MOMENT	Y	GPUN02MY	Load cell, six axis neck	R. A. Denton	1716A	Nm
56	NECK MOMENT	Z	GPUN02MZ	Load cell, six axis neck	R. A. Denton	1716A	Nm
57	CHEST , PRIMARY	X	GPAC031	Accel., 1/2 bridge	Endevco	7264-2000	G
58	CHEST , PRIMARY	Y	GPAC024	Accel., 1/2 bridge	Endevco	7264-2000	G
59	CHEST , PRIMARY	Z	GPAC029	Accel., 1/2 bridge	Endevco	7264-2000	G
60	CHEST , REDUNDANT	X	KEAC023	Accel.,1/2 bridge	Endevco	7264-200	G
61	CHEST , REDUNDANT	Y	KEAC022	Accel.,1/2 bridge	Endevco	7264-200	G
62	CHEST , REDUNDANT	Z	KEAC024	Accel.,1/2 bridge	Endevco	7264-200	G
63	CHEST DISPLACEMENT	X	GPCP001	Rotary Pot Chest	Servo	14CBI	MM
64	PELVIS, PRIMARY	X	KEAC019	Accel.,1/2 bridge	Endevco	7264-200	G
65	PELVIS, PRIMARY	Y	KEAC020	Accel.,1/2 bridge	Endevco	7264-200	G
66	PELVIS, PRIMARY	Z	KEAC021	Accel.,1/2 bridge	Endevco	7264-200	G
67	LEFT FEMUR FORCE	Z	KEFF001	Load cell, Femur	R.A. Denton	2121	N
68	RIGHT FEMUR FORCE	Z	KEFF002	Load cell, Femur	R.A. Denton	2121	N

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Passenger A.T.D. Serial Number 34  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
69	UP. TIBIA LEFT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
70	UP. TIBIA LEFT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
71	UP. TIBIA RIGHT MOM.	X	GPUT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
72	UP. TIBIA RIGHT MOM.	Y	GPUT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	Nm
73	LWR. TIBIA LEFT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
74	LWR. TIBIA LEFT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
75	LWR. TIBIA LEFT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
76	LWR. TIBIA RIGHT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	Nm
77	LWR. TIBIA RIGHT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	Nm
78	LWR. TIBIA RIGHT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
79	FOOT LEFT, AFT	X	KEIC003X	Accel., Foot Triax	I.C. Sensor	3031-500	G
80	FOOT LEFT, AFT	Z	KEIC003Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
81	FOOT LEFT, FORE	Z	KEIC003Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
82	FOOT RIGHT, AFT	X	KEIC004X	Accel., Foot Triax	I.C. Sensor	3031-500	G
83	FOOT RIGHT, AFT	Z	KEIC004Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
84	FOOT RIGHT, FORE	Z	KEIC004Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
85	LAP BELT FORCE	X	KELC003	Load cell, Seat belt	Lebow	3371	N
86	SHOULDER BELT FORCE	X	KELC004	Load cell, Seat belt	Lebow	3371	N
87	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	CM
88	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Vehicle Accelerometers  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
89	Left Rear	X	KEVA002	Accel., Pre-Amp	I.C.S/Karco	3031-500	G
90	Right Rear	X	KEVA006	Accel., Vehicle block	I.C. Sensor	3031-200	G
91	Engine Top	X	KEVA009	Accel., Vehicle block	I.C. Sensor	3031-500	G
92	Engine Bottom	X	KEVA007	Accel., Vehicle block	I.C. Sensor	3031-500	G
93	Left Brake Caliper	X	KEVA008	Accel., Vehicle block	I.C. Sensor	3031-500	G
94	Right Brake Caliper	X	KEVA012	Accel., Vehicle block	I.C. Sensor	3031-500	G
95	Instrument Panel	X	KEVA011	Accel., Vehicle block	I.C. Sensor	3031-200	G
96	Left Rear	Z	KEVA001	Accel., Vehicle block	I.C. Sensor	3031-500	G
97	Right Rear	Z	KEVA010	Accel., Vehicle block	I.C. Sensor	3031-200	G

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Rigid Load Cell Barrier  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
98	BARRIER FORCE A1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
99	BARRIER FORCE A2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
100	BARRIER FORCE A3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
101	BARRIER FORCE A4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
102	BARRIER FORCE A5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
103	BARRIER FORCE A6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
104	BARRIER FORCE A7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
105	BARRIER FORCE A8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
106	BARRIER FORCE A9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
107	BARRIER FORCE B1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
108	BARRIER FORCE B2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
109	BARRIER FORCE B3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
110	BARRIER FORCE B4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
111	BARRIER FORCE B5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
112	BARRIER FORCE B6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
113	BARRIER FORCE B7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
114	BARRIER FORCE B8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
115	BARRIER FORCE B9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Rigid Load Cell Barrier  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
116	BARRIER FORCE C1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
117	BARRIER FORCE C2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
118	BARRIER FORCE C3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
119	BARRIER FORCE C4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
120	BARRIER FORCE C5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
121	BARRIER FORCE C6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
122	BARRIER FORCE C7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
123	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
124	BARRIER FORCE C9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
125	BARRIER FORCE D1	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
126	BARRIER FORCE D2	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
127	BARRIER FORCE D3	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
128	BARRIER FORCE D4	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
129	BARRIER FORCE D5	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
130	BARRIER FORCE D6	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
131	BARRIER FORCE D7	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
132	BARRIER FORCE D8	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N
133	BARRIER FORCE D9	X	BARRIER	Load Cell, LCB	Interface	1220-FS	N

## **APPENDIX E**

### **DUMMY CALIBRATION DATA**



## Calibration Data Sheet Hybrid III 50th Percentile Male Knee Impact Test

ATD Serial No.: 034

Location: Left Knee

Test I.D.: LK01A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5149	Pass
Overall Test Results				Pass

ATD Serial No.: 034

Location: Right Knee

Test I.D.: RK01A

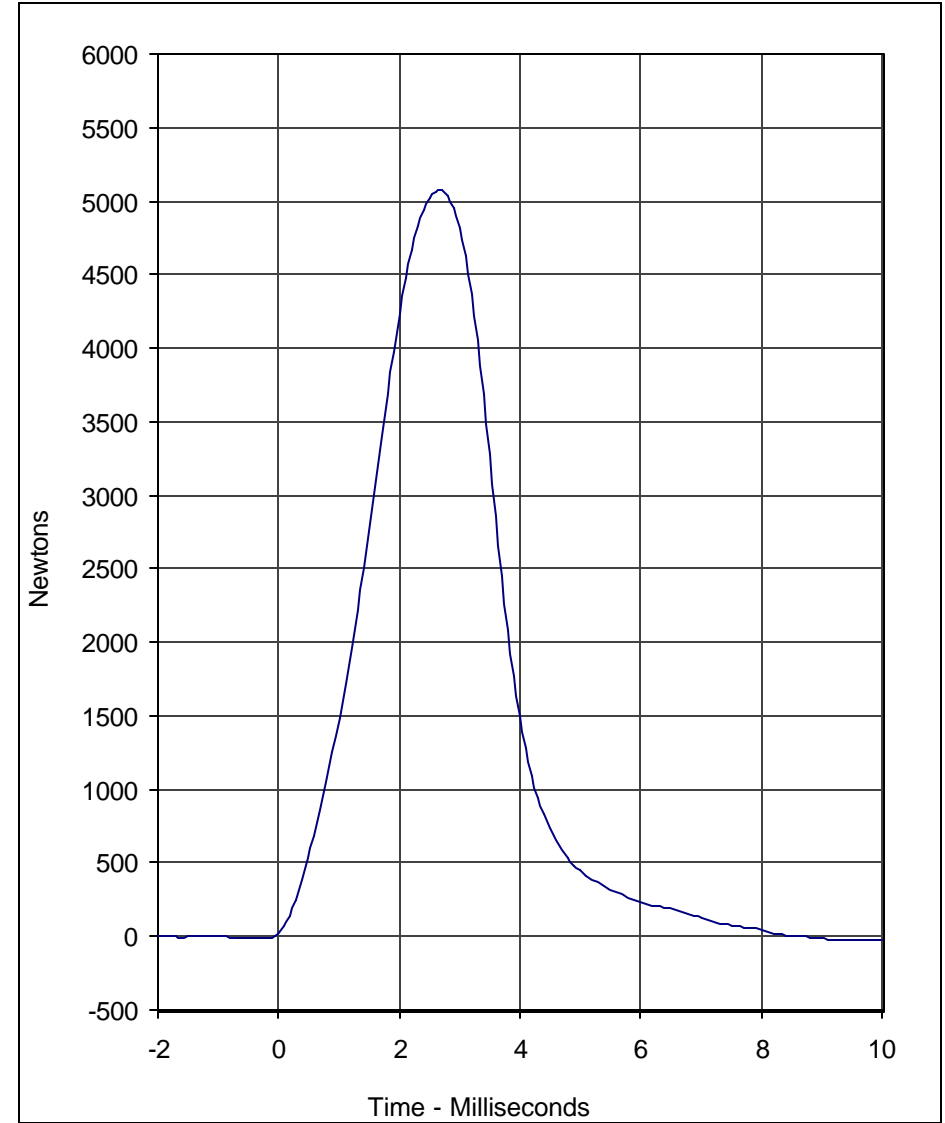
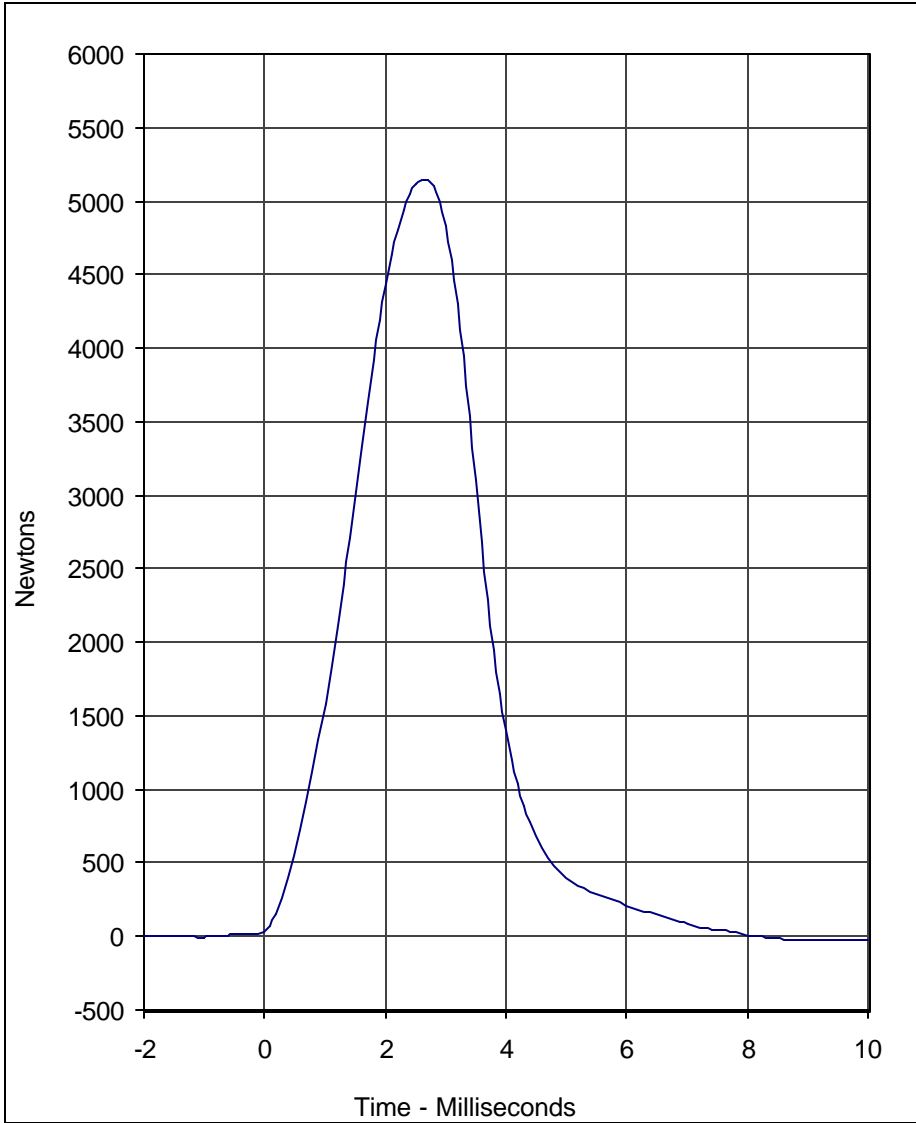
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	N	4715 to 5782	5069	Pass
Overall Test Results				Pass

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TR-P23001-08-NC

\_\_\_\_\_  
Laboratory Technician

January 20, 2003  
\_\_\_\_\_  
Test Date



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Left Knee	LK01A	001	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5149.0	2.6	-29.6	8.9	600

Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Right Knee	RK01A	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5069.4	2.7	-26.6	9.3	600

Test Program: Hybrid III 50th Percentile Male Knee Impact Test  
 Test Date: 1/20/03

A.T.D. Serial No.: 034





## Calibration Data Sheet Hybrid III 50th Percentile Male Head Drop Test

ATD Serial No.: 034

Test I.D.: HD01A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	236.4	Pass
Peak Lateral Acceleration	G's	≤15.0	12.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass

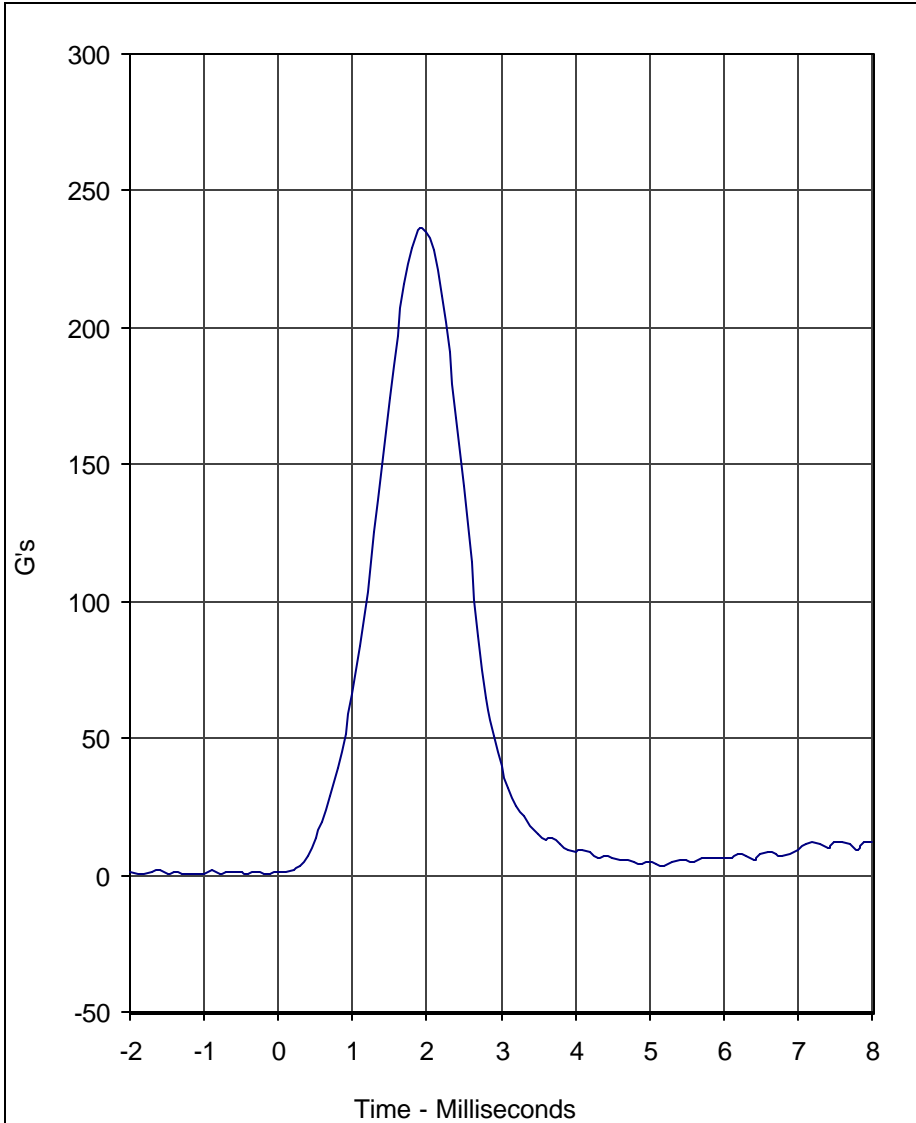
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\_\_\_\_\_  
Laboratory Technician

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January 20, 2003

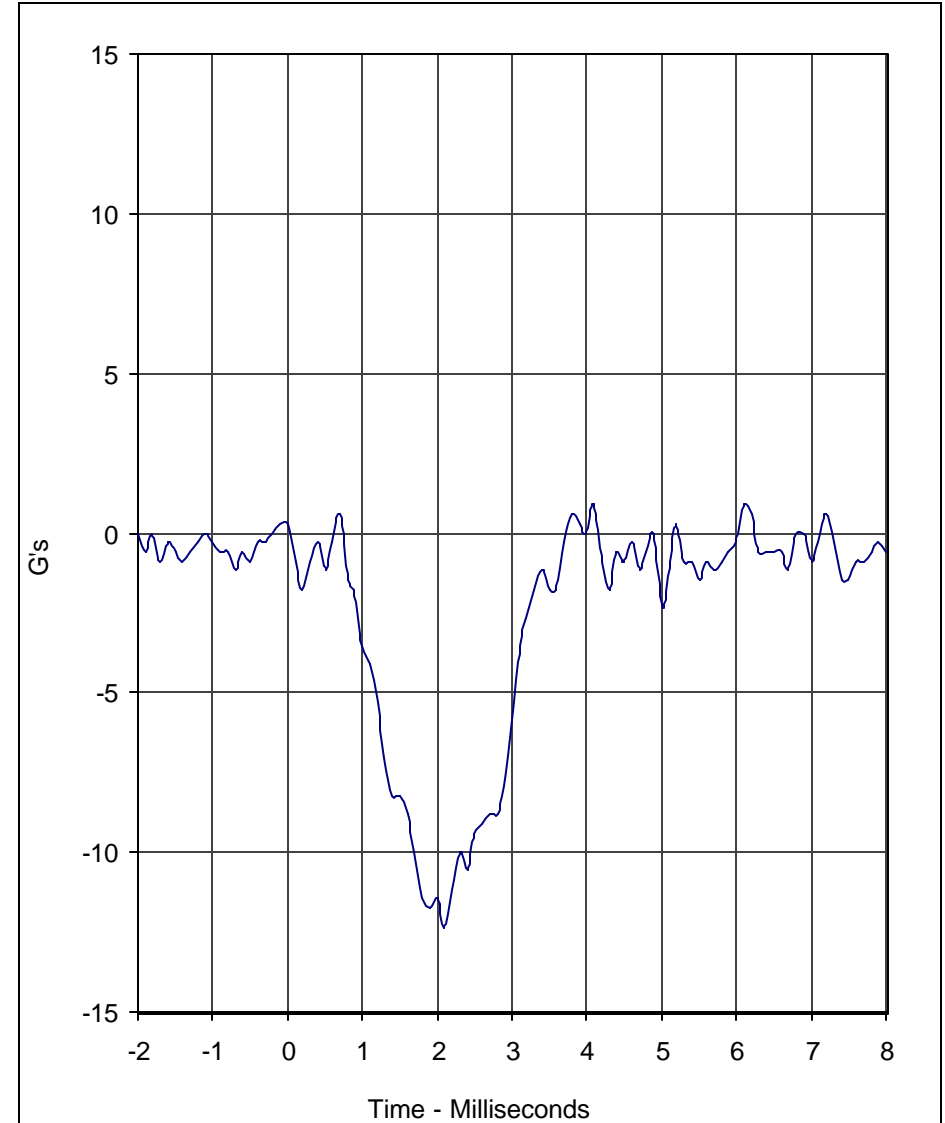
Test Date



Curve Description	CURNO	Type
Head Resultant	001	RES

Units	Max	Time	Min	Time	SAE Class
G's	236.4	1.9	0.4	-0.2	1000

Test Program: Hybrid III 50th Percentile Male Head Drop Test  
 Test Date: 1/20/03



Curve Description	CURNO	Type
Head Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	0.9	4.1	-12.3	2.1	1000

A.T.D. Serial No.: 034  
 Test I.D.: HD01A





## Calibration Data Sheet Hybrid III 50th Percentile Male Thorax Impact Test

ATD Serial No.: 034

Test I.D.: CH01A

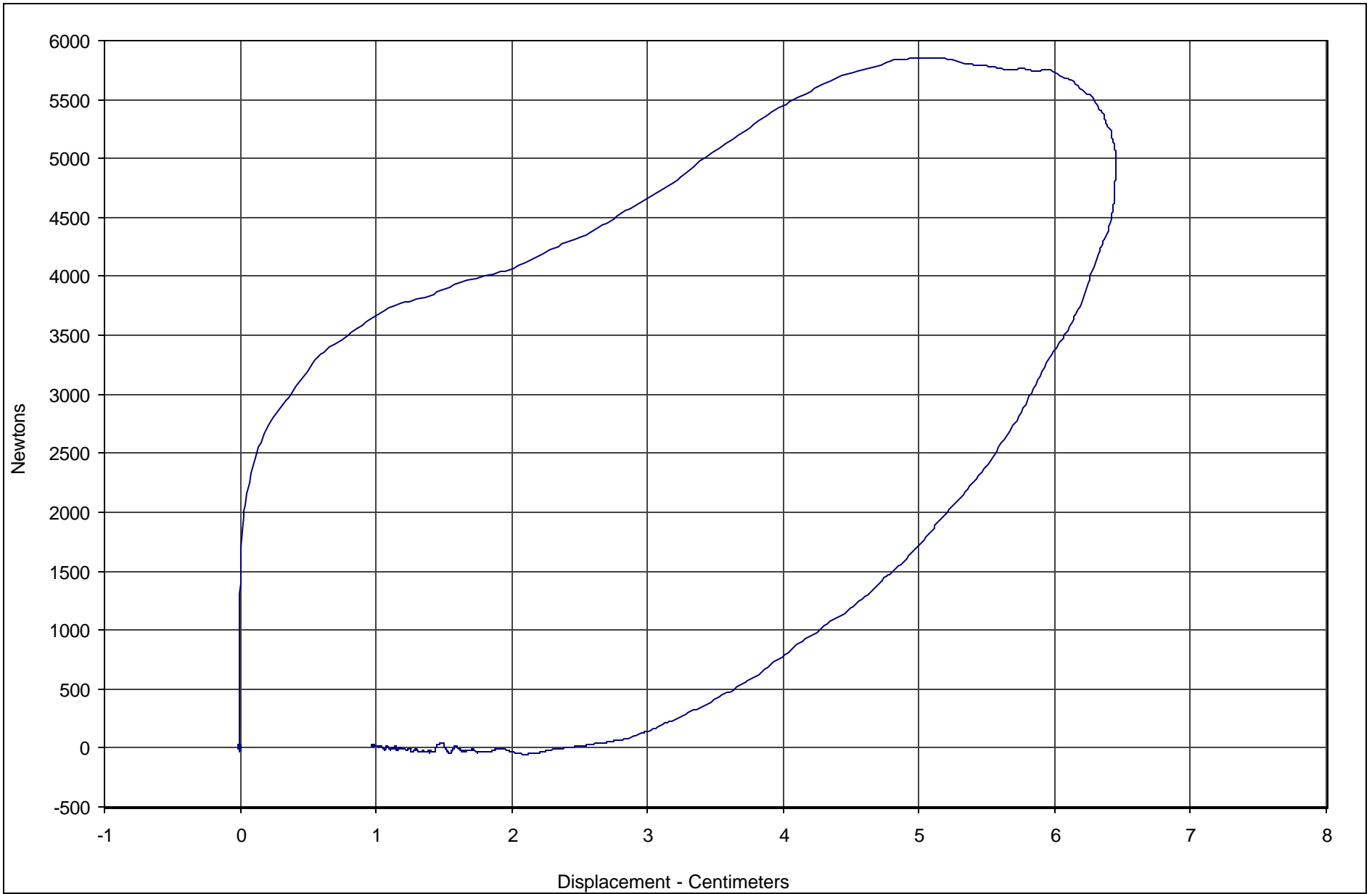
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.74	Pass
Peak Probe Force	Newtons	5159 to 5893	5850	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.45	Pass
Internal Hysteresis	%	69 to 85	80.6	Pass
Overall Test Results				Pass

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\_\_\_\_\_  
Laboratory Technician

January 21, 2003  
\_\_\_\_\_  
Test Date



Curve Description	CURNO	Type	Hysteresis	Peak Chest Displ.	Peak Probe Force	SAE Class
Probe Force vs. Chest Displacement	001	FIL	80.6	6.45	5849.6	180



Test Program: Hybrid III 50th Percentile Male Thorax Impact

A.T.D. Serial No.: 034

Test Date: 1/21/03

Test I.D.: CH01A



## Calibration Data Sheet Hybrid III 50th Percentile Male Neck Flexion Test

ATD Serial No.: 034

Test I.D.: NF01A

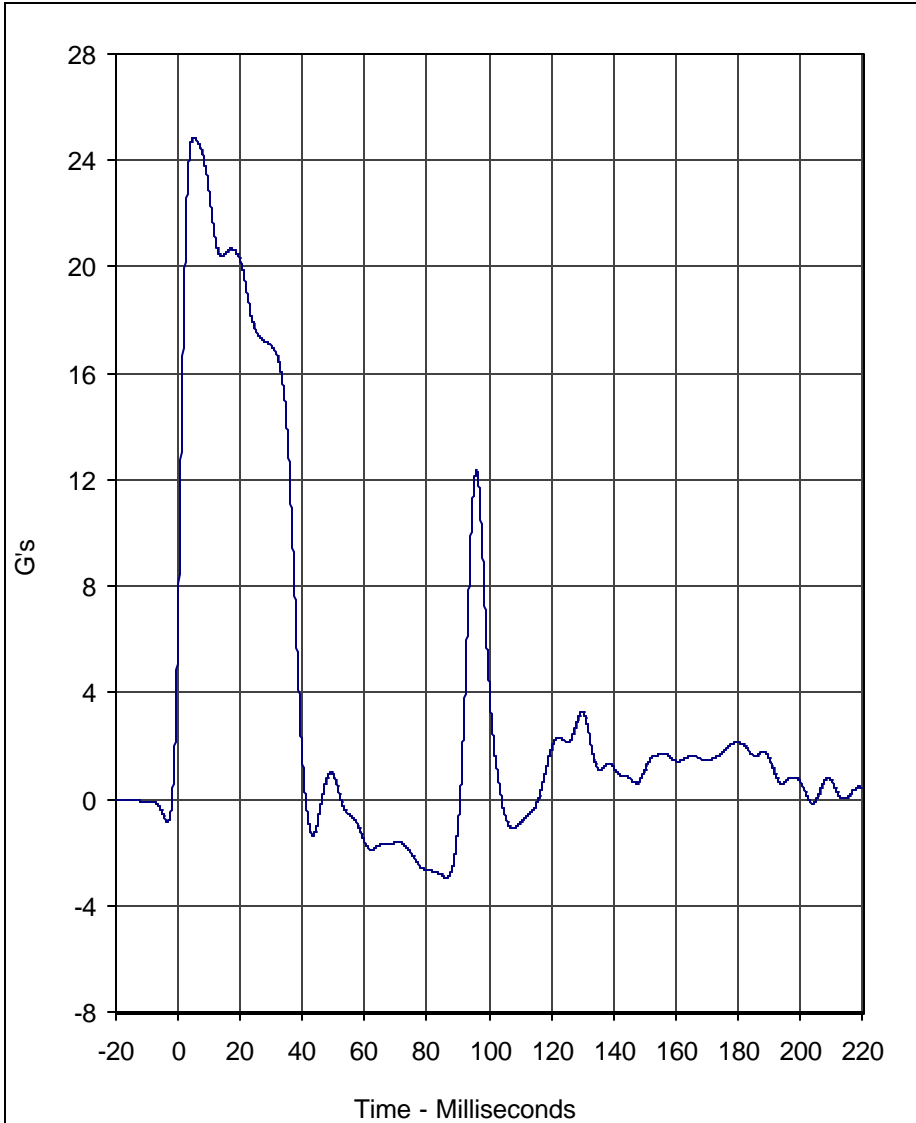
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.92	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.8	Pass
	20 Msec.	G's	17.6 to 22.6	20.2	Pass
	30 Msec.	G's	12.5 to 18.5	17.0	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.0	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	66.2	Pass
	Time	Msec.	57.0 to 64.0	59.2	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	116.0	Pass
Moment About Occipital Condyle	Maximum	Nm	84.1 to 108.5	92.9	Pass
	Time	Msec.	47.0 to 58.0	55.3	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.6	Pass
Overall Test Results					Pass

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Laboratory Technician

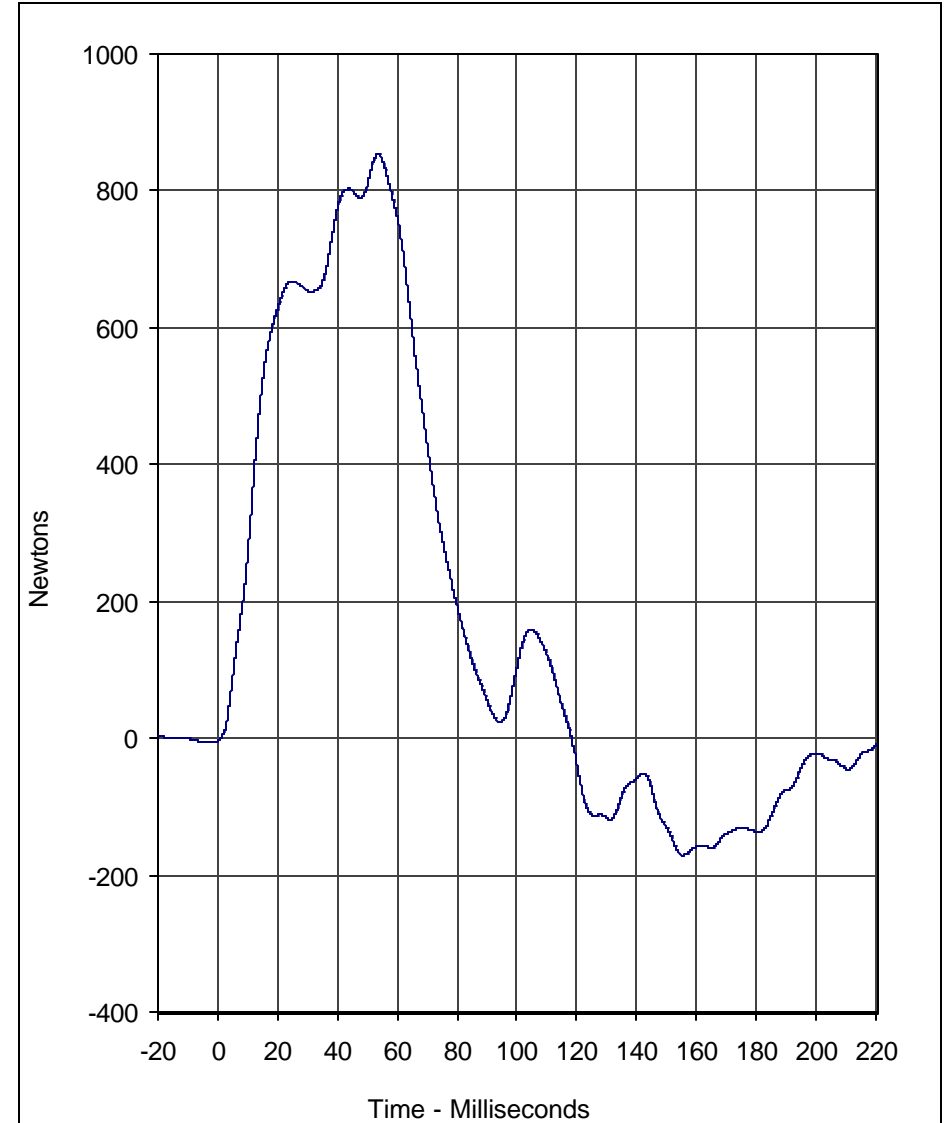
January 21, 2003  
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Test Date



Curve Description				CURNO	Type
Pendulum Deceleration				001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	24.8	5.0	-3.0	86.4	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test  
 Test Date: 1/21/03

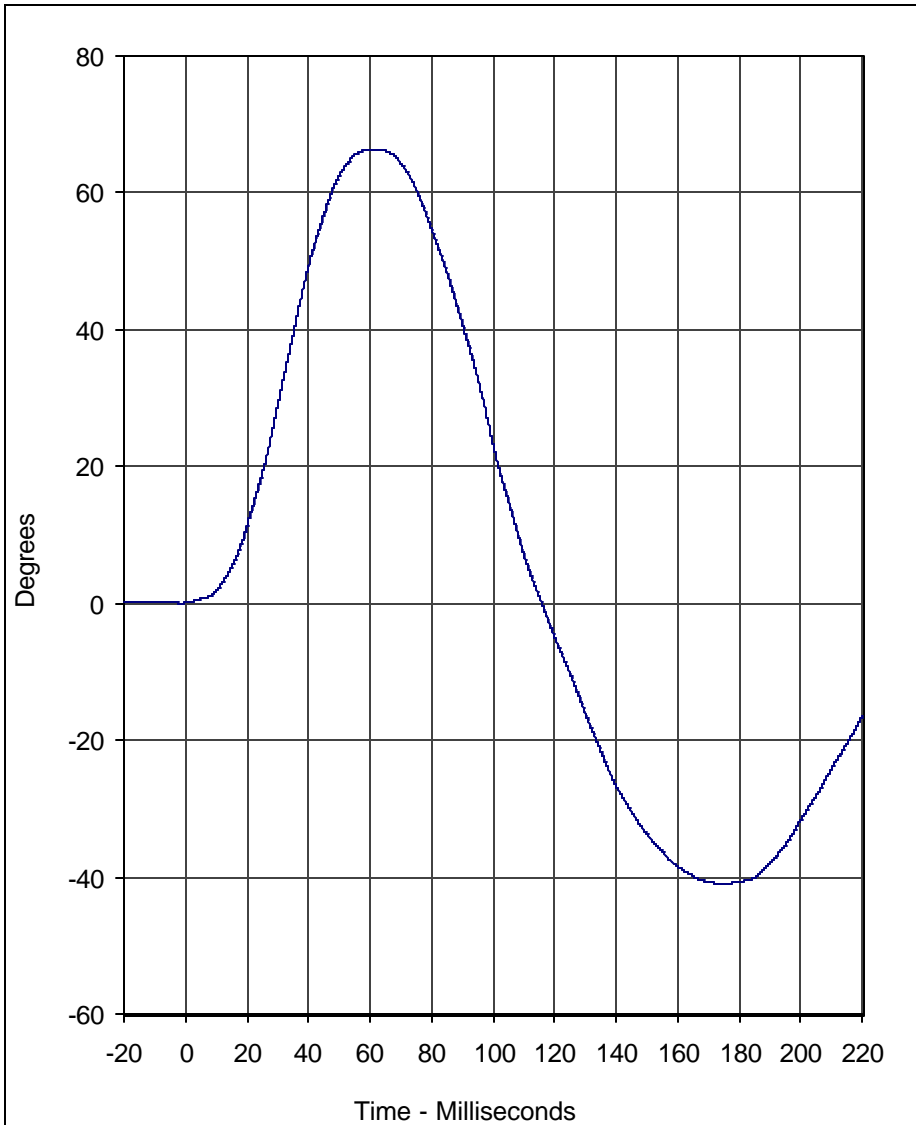


Curve Description				CURNO	Type
Neck Force X				002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	853.4	53.6	-171.4	155.5	60

A.T.D. Serial No.: 034  
 Test I.D.: NF01A

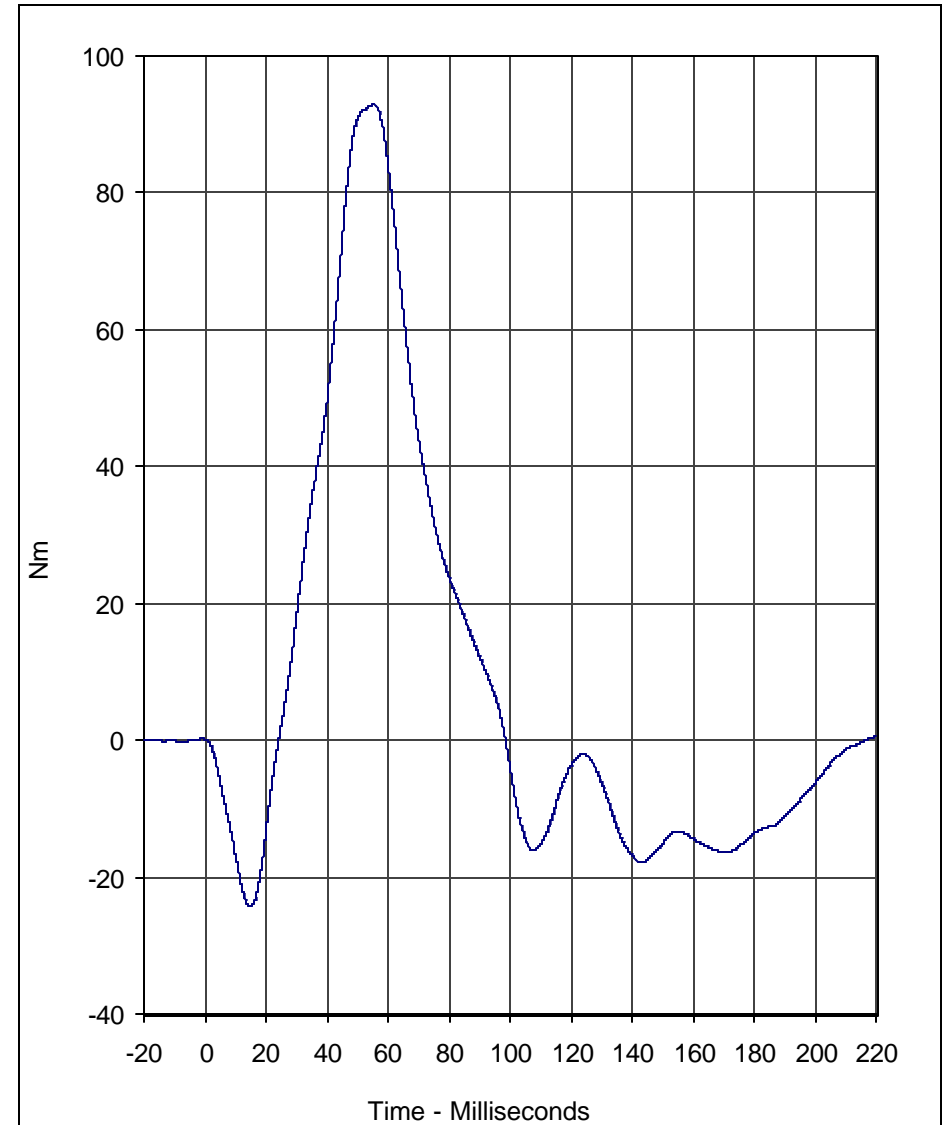




Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	66.2	59.2	-40.9	175.3	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test  
 Test Date: 1/21/03



Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	92.9	55.3	-24.3	14.9	60

A.T.D. Serial No.: 034  
 Test I.D.: NF01A





## Calibration Data Sheet Hybrid III 50th Percentile Male Neck Extension Test

ATD Serial No.: 034

Test I.D.: NE01A

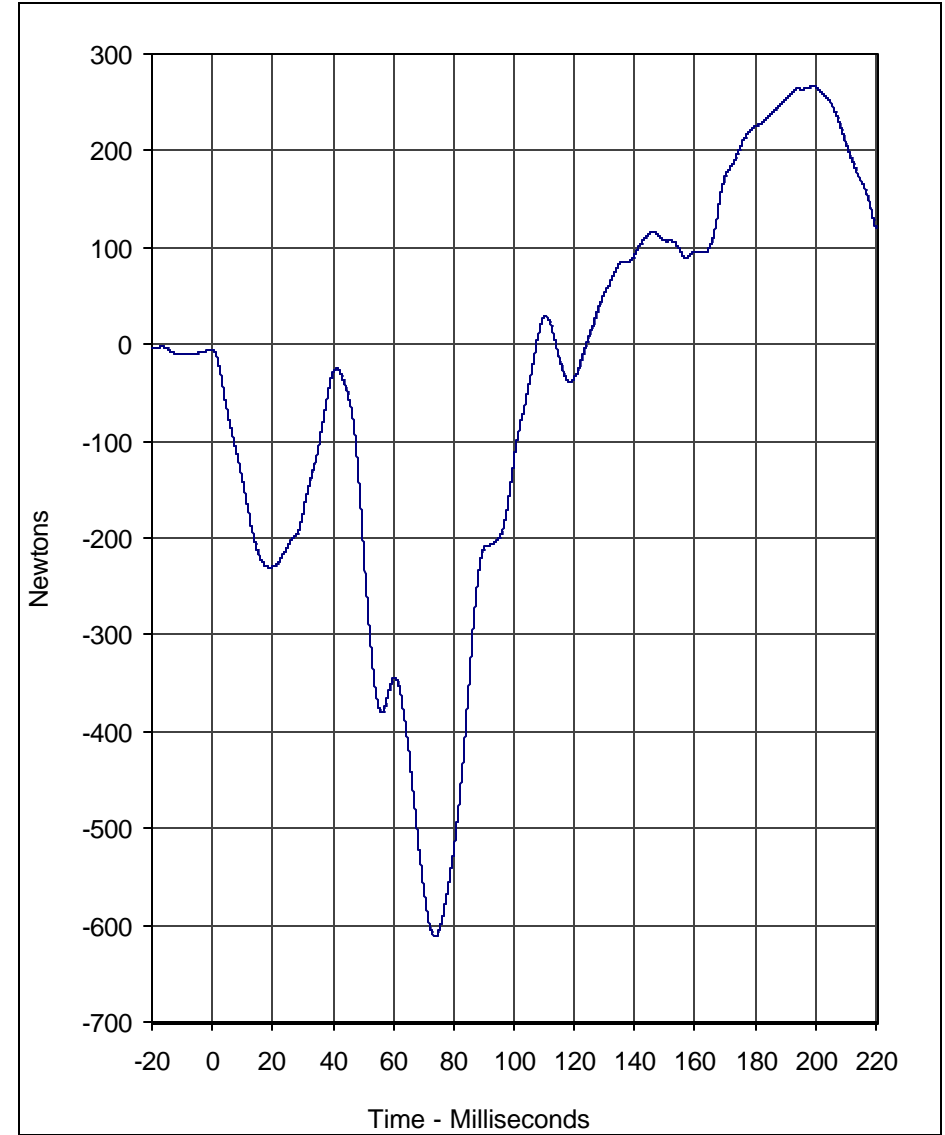
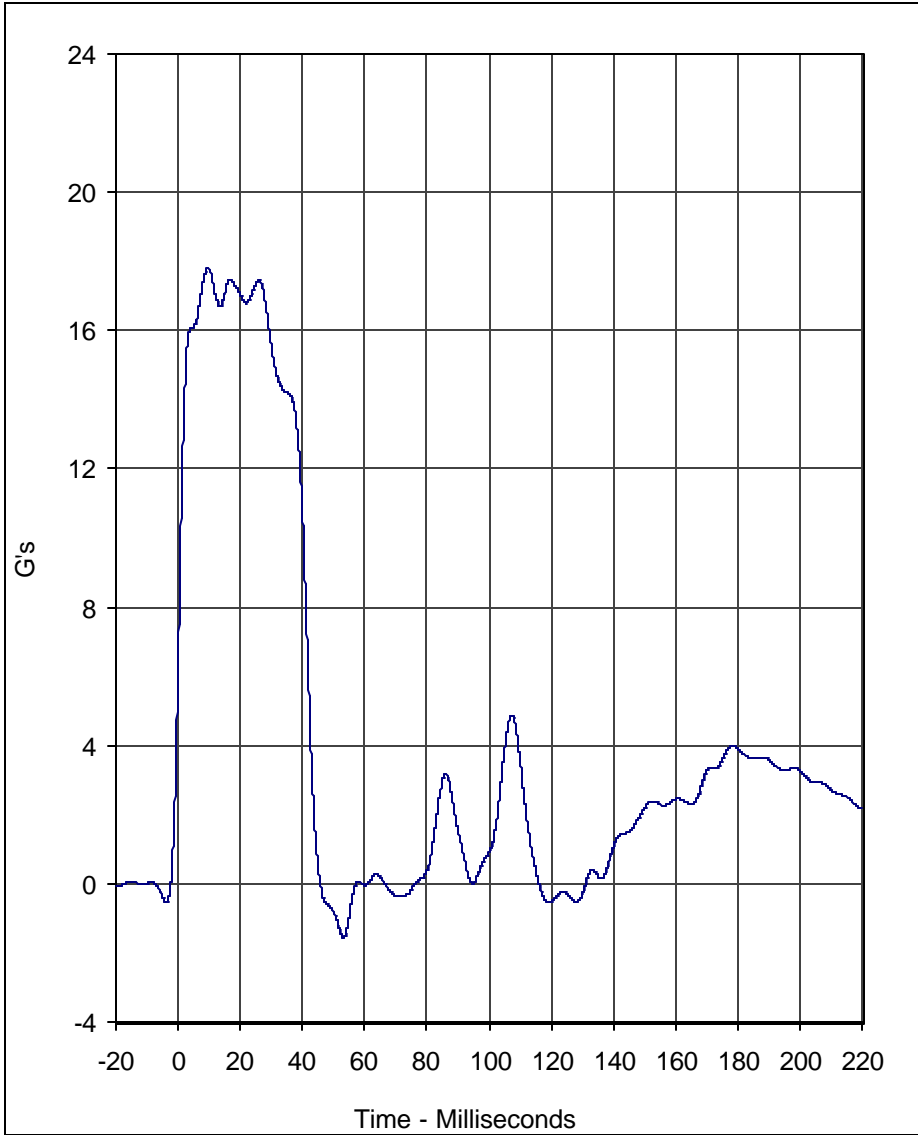
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.8	Pass
	20 Msec.	G's	14.0 to 19.0	17.1	Pass
	30 Msec.	G's	11.0 to 16.0	15.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	42.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	97.3	Pass
	Time	Msec.	72.0 to 82.0	79.4	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	159.5	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to- 79.9	-68.7	Pass
	Time	Msec.	65.0 to 79.0	70.3	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	145.1	Pass
Overall Test Results					Pass

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Laboratory Technician

January 21, 2003  
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Test Date



Curve Description				CURNO	Type
Pendulum Deceleration				001	FIL

Curve Description				CURNO	Type
Neck Force X				002	FIL

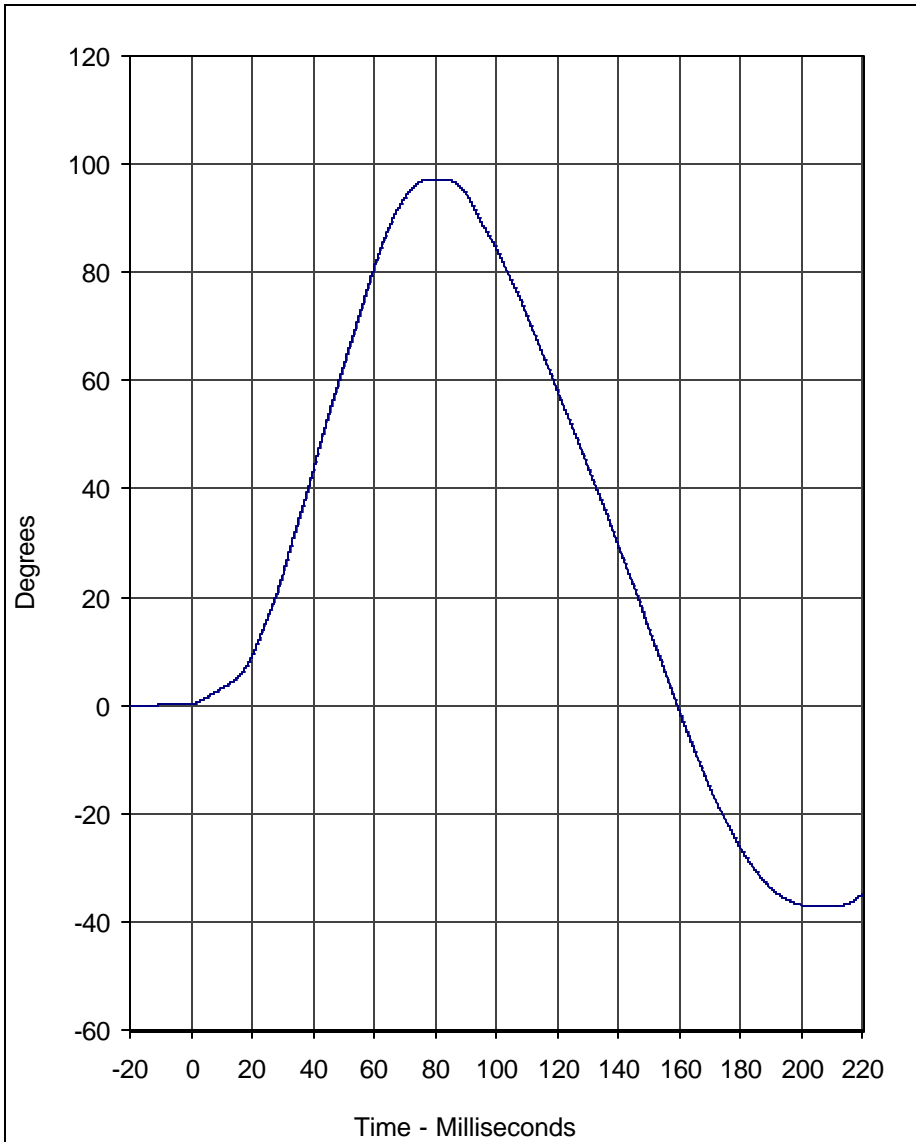
Units	Max	Time	Min	Time	SAE Class
G's	17.8	9.6	-1.6	53.2	60

Units	Max	Time	Min	Time	SAE Class
Newtons	266.6	198.9	-611.7	73.8	60

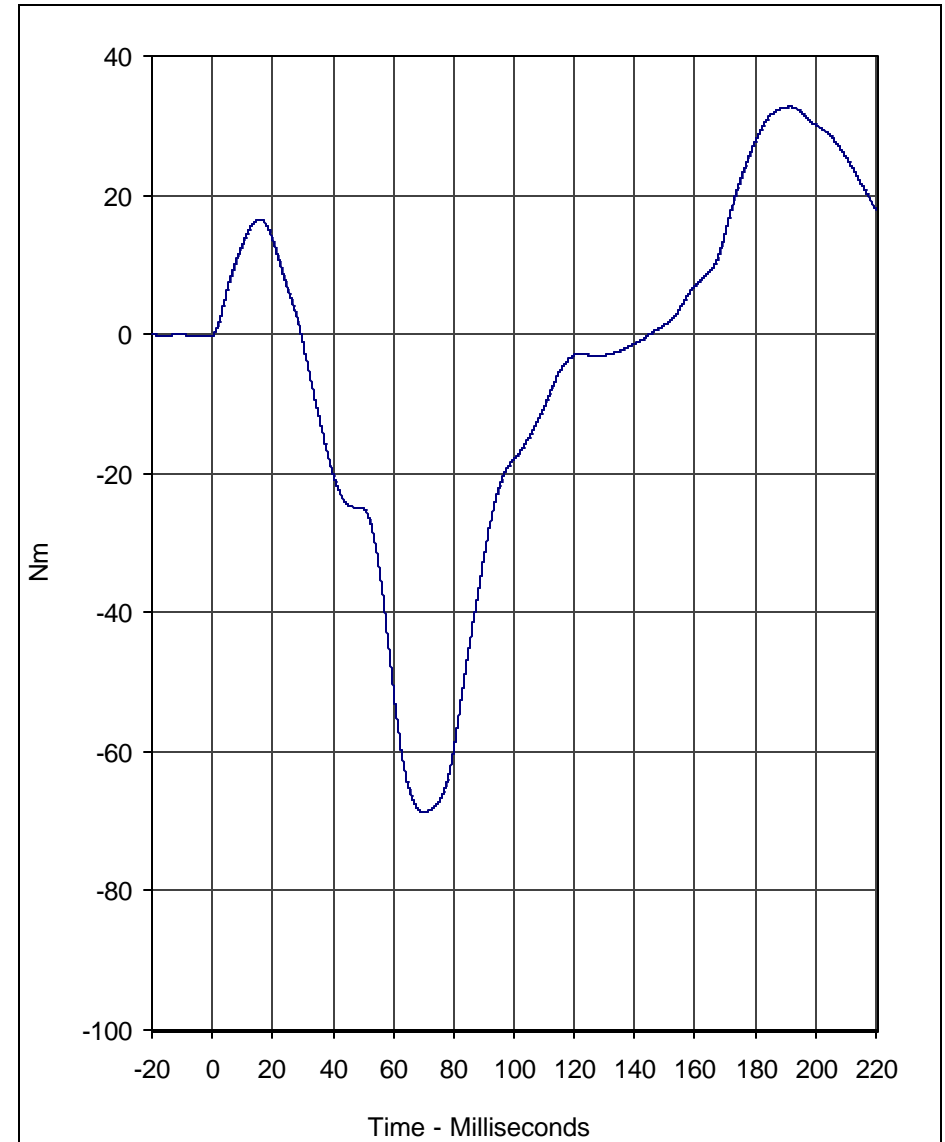
Test Program: Hybrid III 50th Percentile Male Neck Extension Test  
 Test Date: 1/21/03

A.T.D. Serial No.: 034  
 Test I.D.: NE01A





Curve Description				CURNO	Type
"D" Plane Rotation				003	FIL
Units	Max	Time	Min	Time	SAE Class
Degrees	97.3	79.4	-37.1	206.5	60



Curve Description				CURNO	Type
Moment About Occipital Condyle				004	FIL
Units	Max	Time	Min	Time	SAE Class
Nm	32.7	191.5	-68.7	70.3	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test  
 Test Date: 1/21/03

A.T.D. Serial No.: 034  
 Test I.D.: NE01A





## Calibration Data Sheet Hybrid III 50th Percentile Male External Measurements

ATD Serial No.: 034

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	885	Pass
B - Shoulder pivot height	mm	505 to 521	510	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	135	Pass
E - Shoulder pivot from back	mm	84 to 94	90	Pass
F - Thigh clearance	mm	140 to 155	150	Pass
G - Elbow back to wrist pivot	mm	290 to 305	295	Pass
H - Skull cap to back line	mm	41 to 46	45	Pass
I - Shoulder to elbow length	mm	330 to 345	340	Pass
J - Elbow rest height	mm	190 to 211	210	Pass
K - Buttock to knee length	mm	579 to 604	600	Pass
L - Popliteal length	mm	429 to 455	445	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock popliteal length	mm	452 to 477	460	Pass
O - Chest depth	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	255	Pass
V - Shoulder breadth	mm	422 to 437	430	Pass
W - Foot breadth	mm	91 to 107	105	Pass
Y - Chest circumference	mm	970 to 1001	1000	Pass
Z - Waist circumference	mm	836 to 866	850	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
			Overall Test Results	Pass

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Laboratory Technician

January 21, 2003  
\_\_\_\_\_  
Test Date



## Calibration Data Sheet Hybrid III 50th Percentile Male Knee Impact Test

ATD Serial No.: 035

Location: Left Knee

Test I.D.: RK01B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5242	Pass
Overall Test Results				Pass

ATD Serial No.: 035

Location: Right Knee

Test I.D.: RK01B

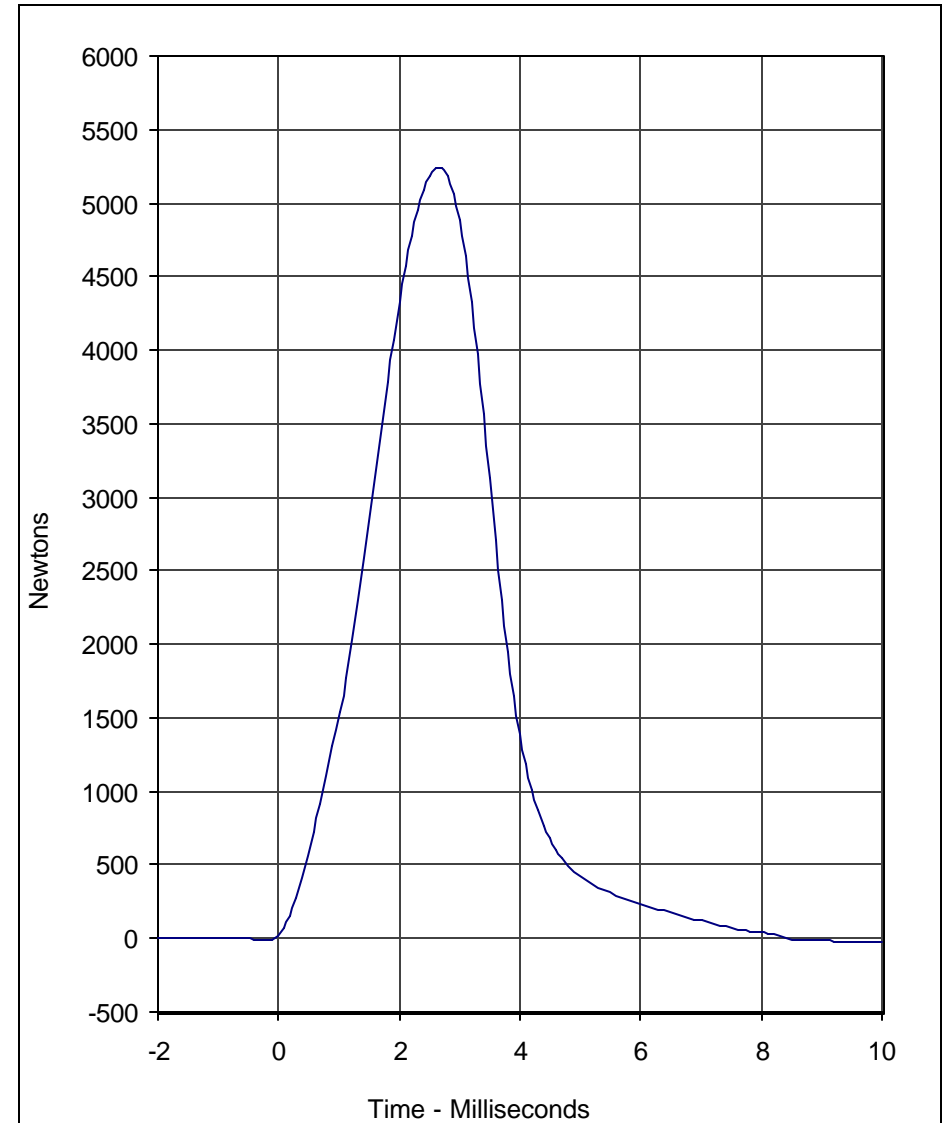
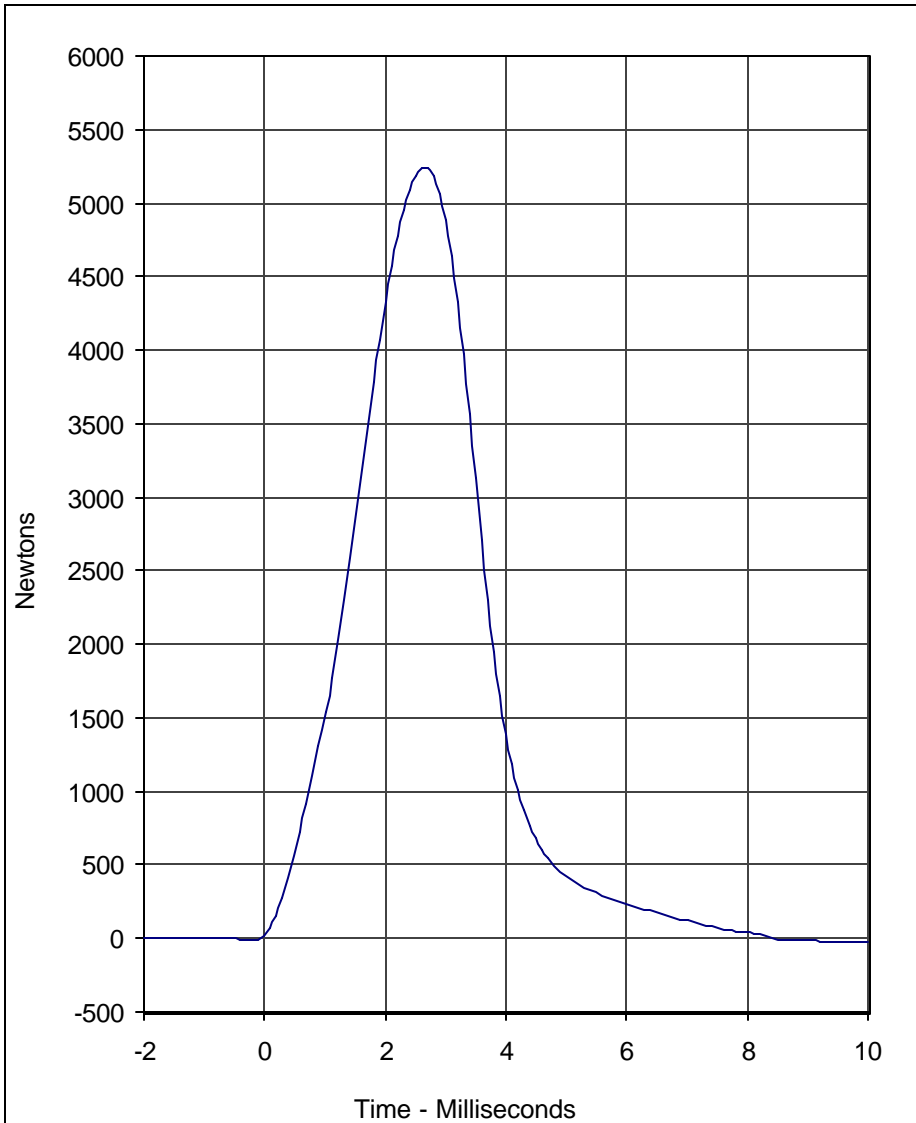
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	N	4715 to 5782	5242	Pass
Overall Test Results				Pass

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Test Date



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Left Knee	RK01B	001	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5241.7	2.7	-27.1	9.6	600

Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Right Knee	RK01B	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5241.7	2.7	-27.1	9.6	600

Test Program: Hybrid III 50th Percentile Male Knee Impact Test  
 Test Date: 1/20/03

A.T.D. Serial No.: 035





## Calibration Data Sheet Hybrid III 50th Percentile Male Head Drop Test

ATD Serial No.: 035

Test I.D.: HD01B

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	241.7	Pass
Peak Lateral Acceleration	G's	≤15.0	8.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass

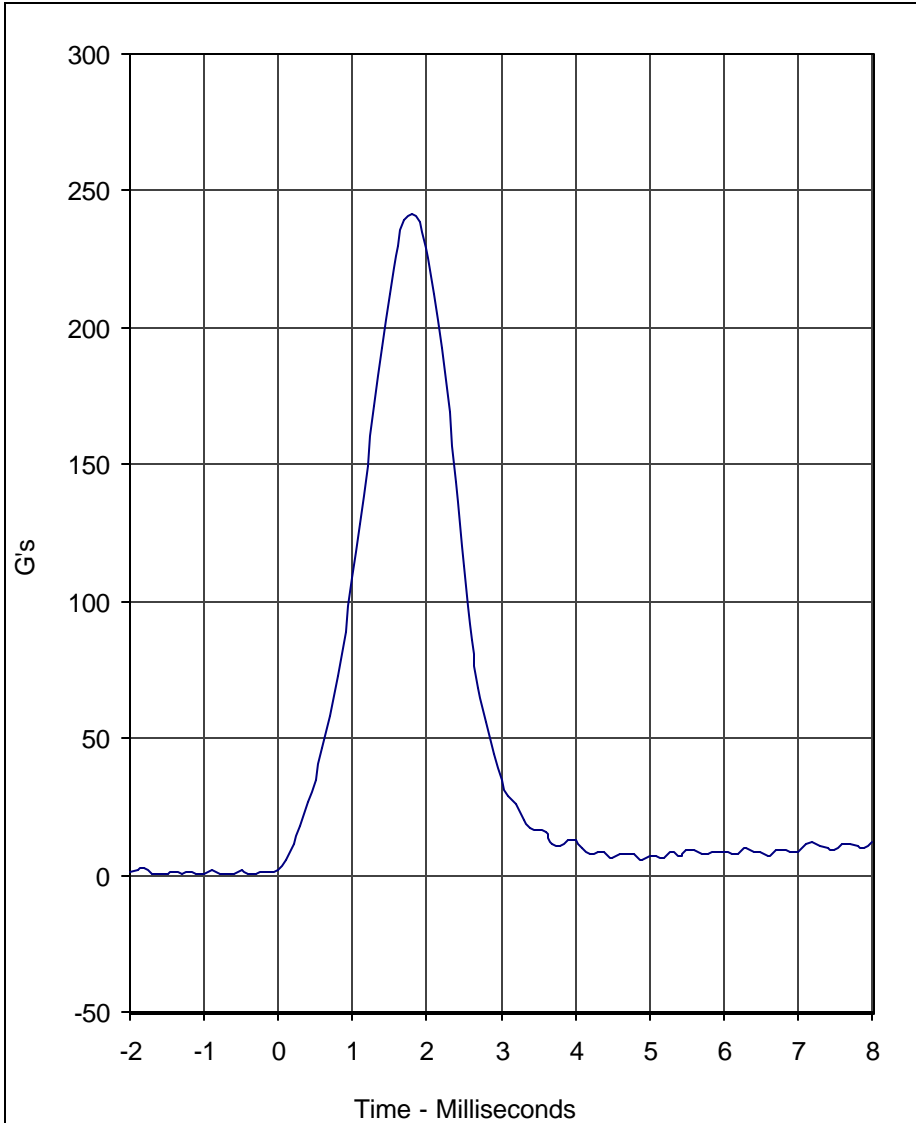
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January 20, 2003

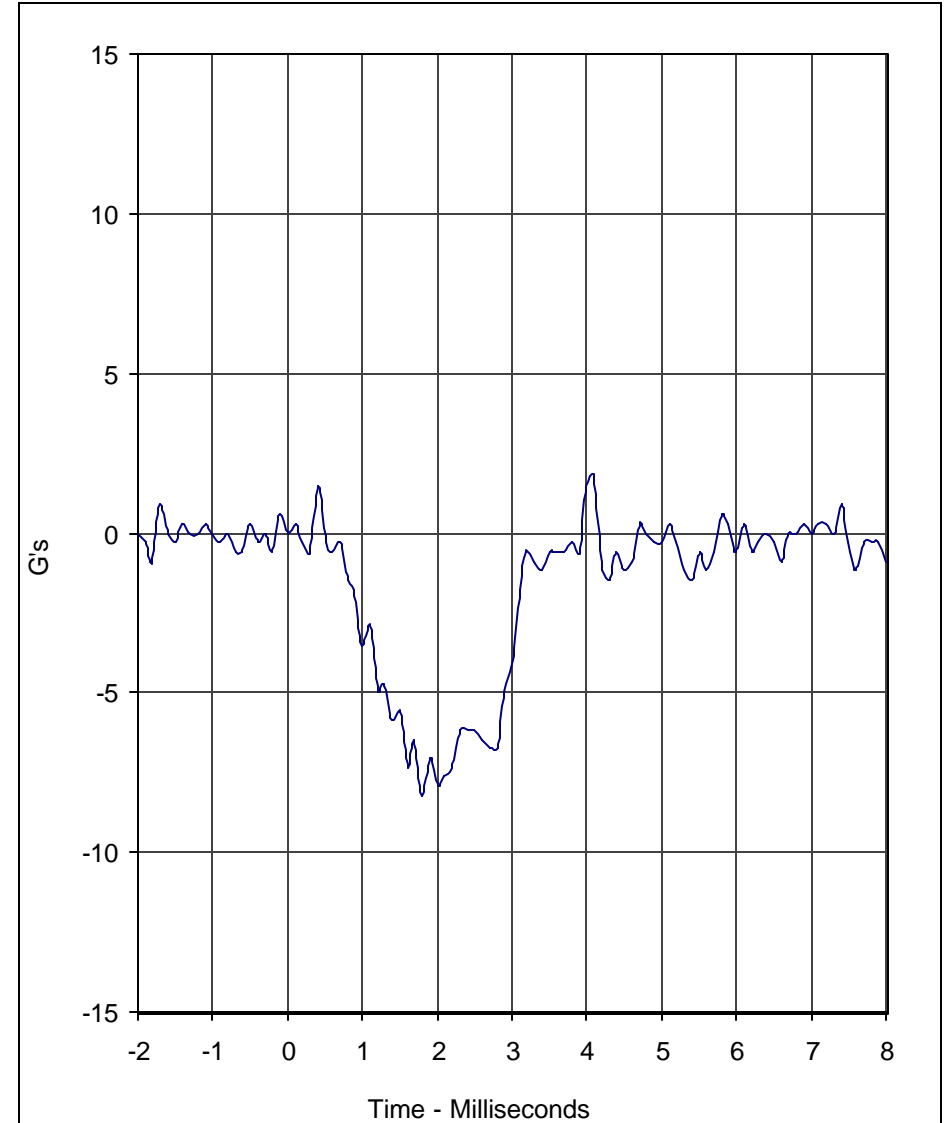
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Test Date



Curve Description	CURNO	Type
Head Resultant	001	RES

Units	Max	Time	Min	Time	SAE Class
G's	241.7	1.8	0.5	-1.1	1000

Test Program: Hybrid III 50th Percentile Male Head Drop Test  
 Test Date: 1/20/03



Curve Description	CURNO	Type
Head Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	1.8	4.1	-8.2	1.8	1000

A.T.D. Serial No.: 035  
 Test I.D.: HD01B





# Calibration Data Sheet

## Hybrid III 50th Percentile Male

### Thorax Impact Test

ATD Serial No.: 035

Test I.D.: CH01B

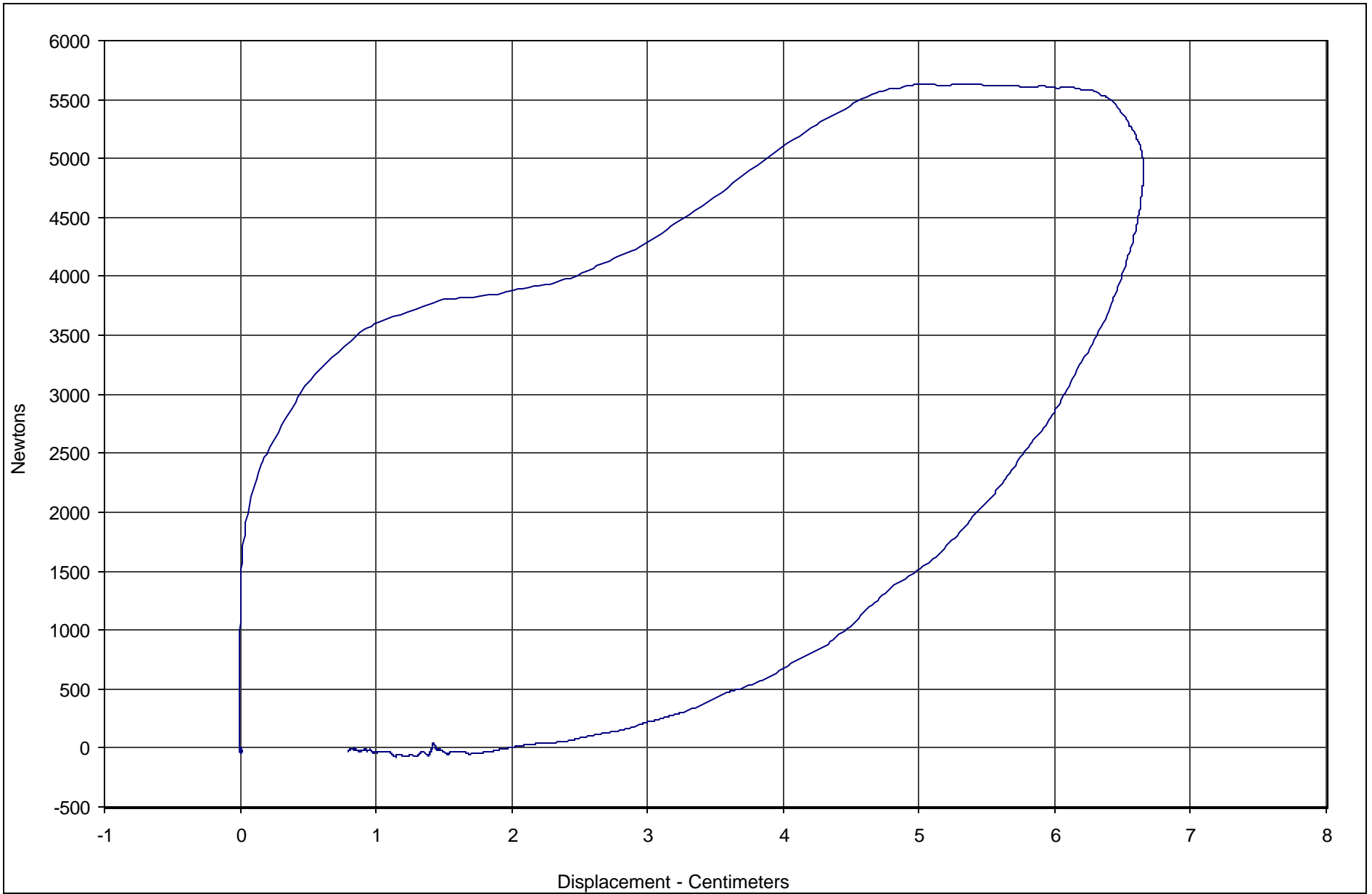
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.64	Pass
Peak Probe Force	Newtons	5159 to 5893	5633	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.66	Pass
Internal Hysteresis	%	69 to 85	79.8	Pass
Overall Test Results				Pass

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\_\_\_\_\_  
Test Date



Curve Description	CURNO	Type	Hysteresis	Peak Chest Displ.	Peak Probe Force	SAE Class
Probe Force vs. Chest Displacement	001	FIL	79.8	6.66	5632.7	180



Test Program: Hybrid III 50th Percentile Male Thorax Impact

A.T.D. Serial No.: 035

Test Date: 1/21/03

Test I.D.: CH01B



## Calibration Data Sheet Hybrid III 50th Percentile Male Neck Flexion Test

ATD Serial No.: 035

Test I.D.: NF02A

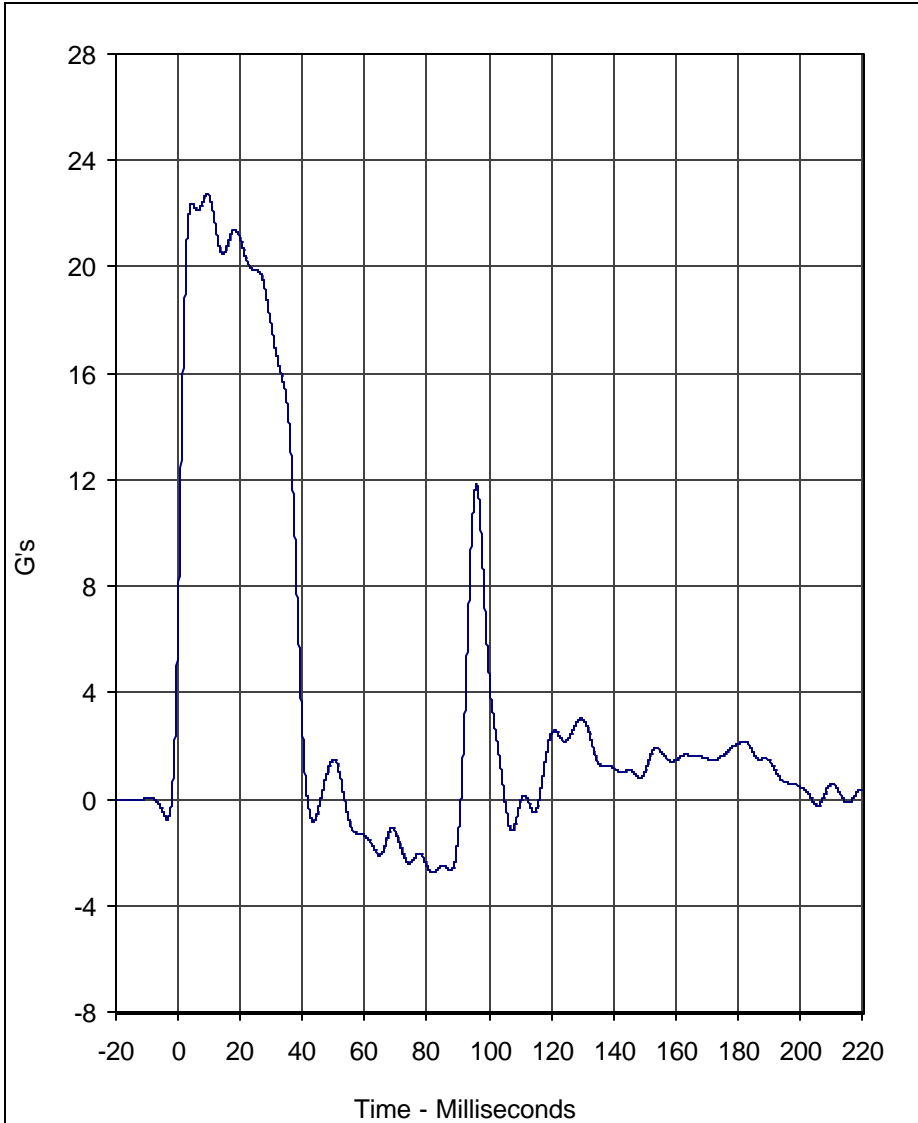
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.10	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.7	Pass
	20 Msec.	G's	17.6 to 22.6	21.1	Pass
	30 Msec.	G's	12.5 to 18.5	17.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	39.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.0	Pass
	Time	Msec.	57.0 to 64.0	60.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	115.2	Pass
Moment About Occipital Condyle	Maximum	Nm	84.1 to 108.5	88.4	Pass
	Time	Msec.	47.0 to 58.0	51.7	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	97.9	Pass
Overall Test Results					Pass

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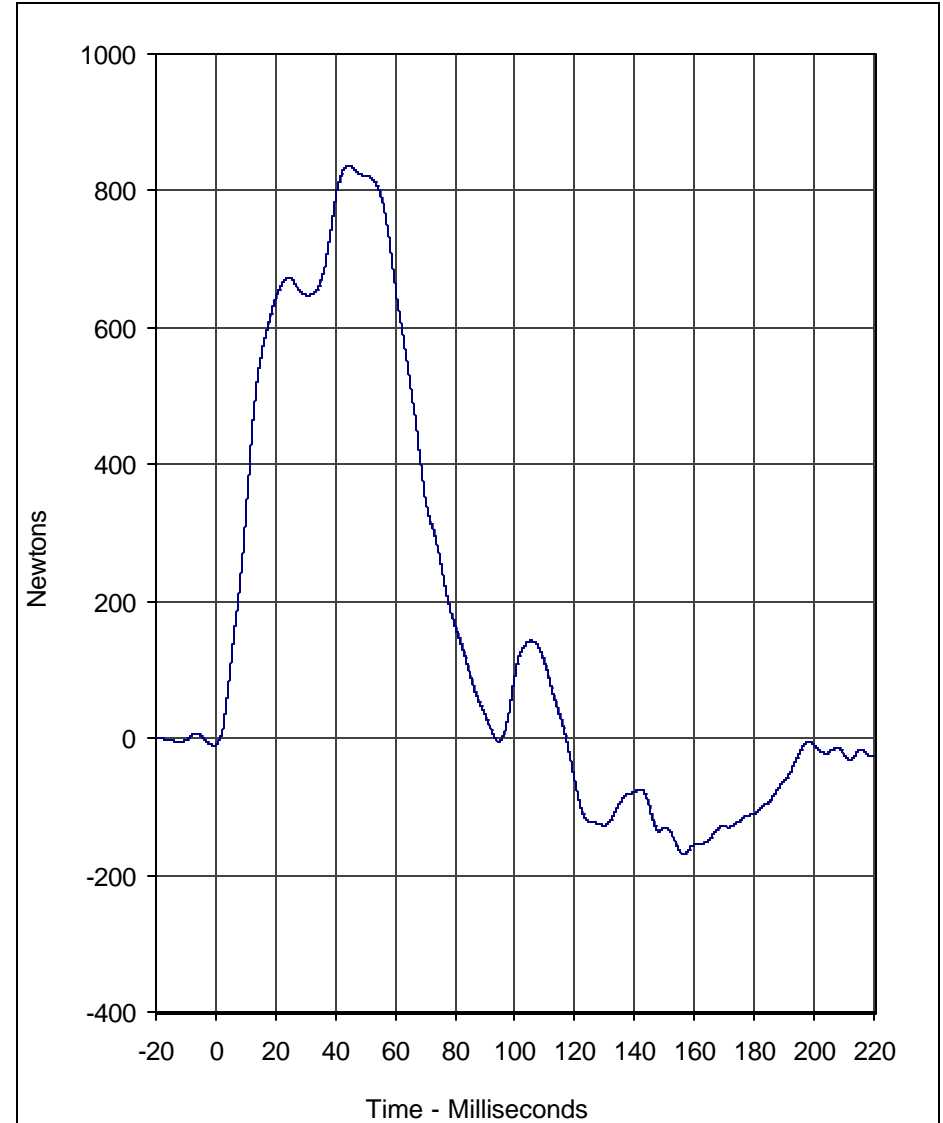
January 21, 2003  
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Test Date



Curve Description	CURNO	Type
Pendulum Deceleration	001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	22.8	9.5	-2.8	81.8	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test  
 Test Date: 1/21/03

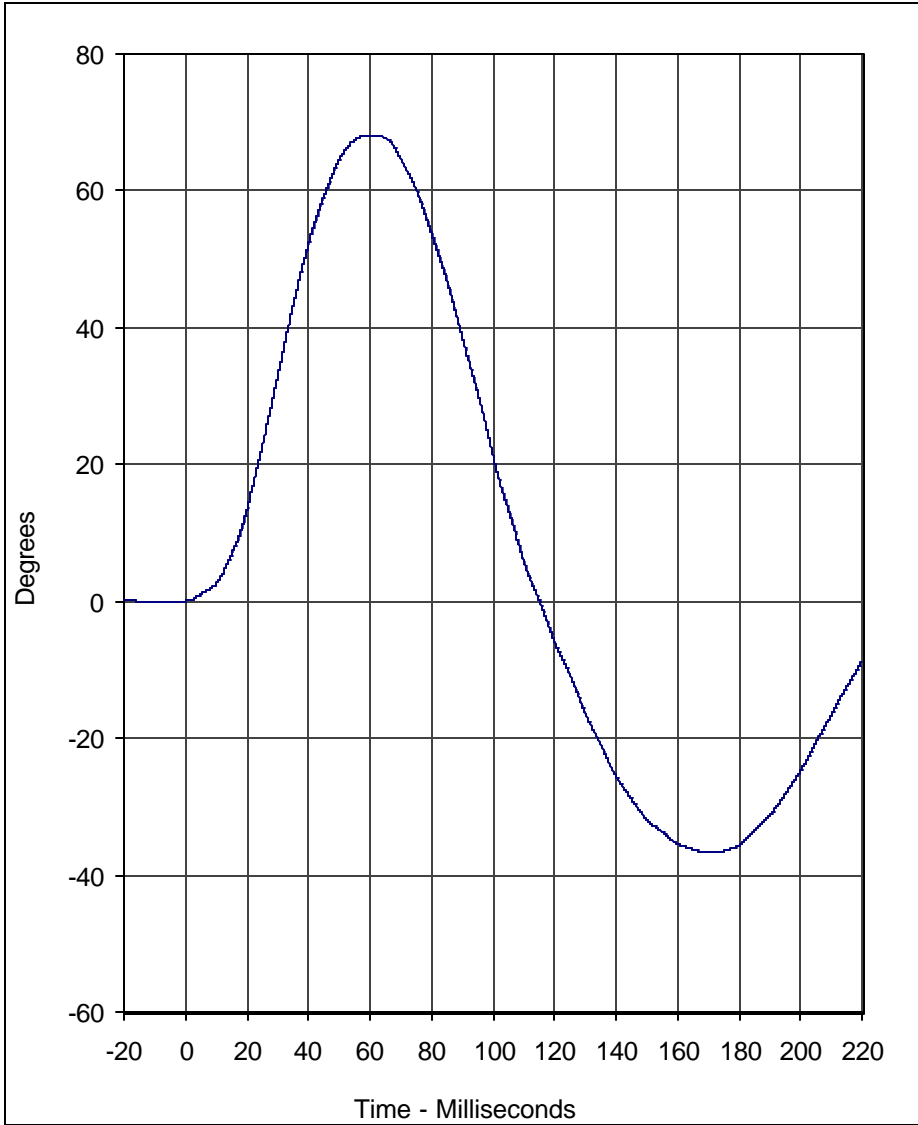


Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	836.7	44.5	-169.3	156.3	60

A.T.D. Serial No.: 035  
 Test I.D.: NF02A

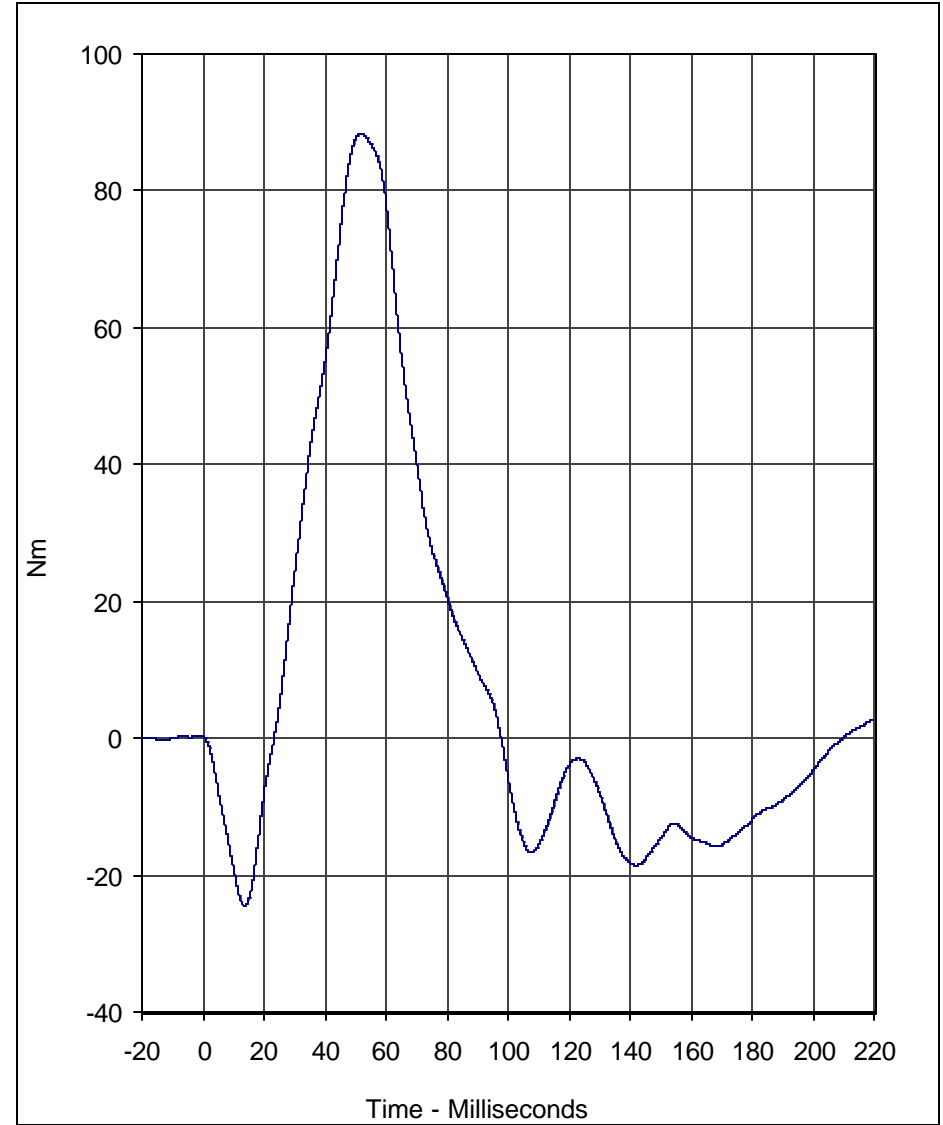




Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	68.0	60.3	-36.7	170.1	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test  
 Test Date: 1/21/03



Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	88.4	51.7	-24.5	13.7	60

A.T.D. Serial No.: 035  
 Test I.D.: NF02A





## Calibration Data Sheet Hybrid III 50th Percentile Male Neck Extension Test

ATD Serial No.: 035

Test I.D.: NE02A

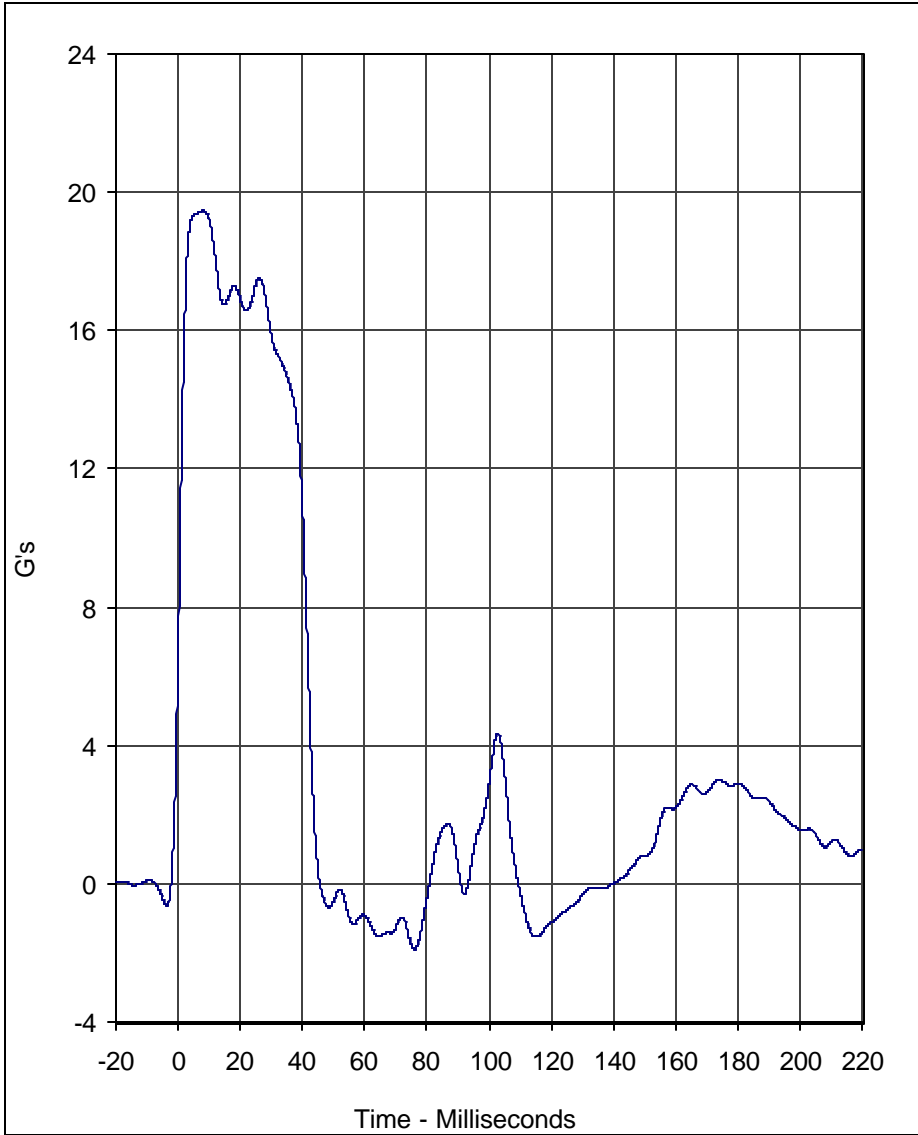
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.02	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.2	Pass
	20 Msec.	G's	14.0 to 19.0	16.9	Pass
	30 Msec.	G's	11.0 to 16.0	15.9	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.9	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	42.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.7	Pass
	Time	Msec.	72.0 to 82.0	78.9	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	148.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to- 79.9	-76.8	Pass
	Time	Msec.	65.0 to 79.0	68.0	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	137.8	Pass
Overall Test Results					Pass

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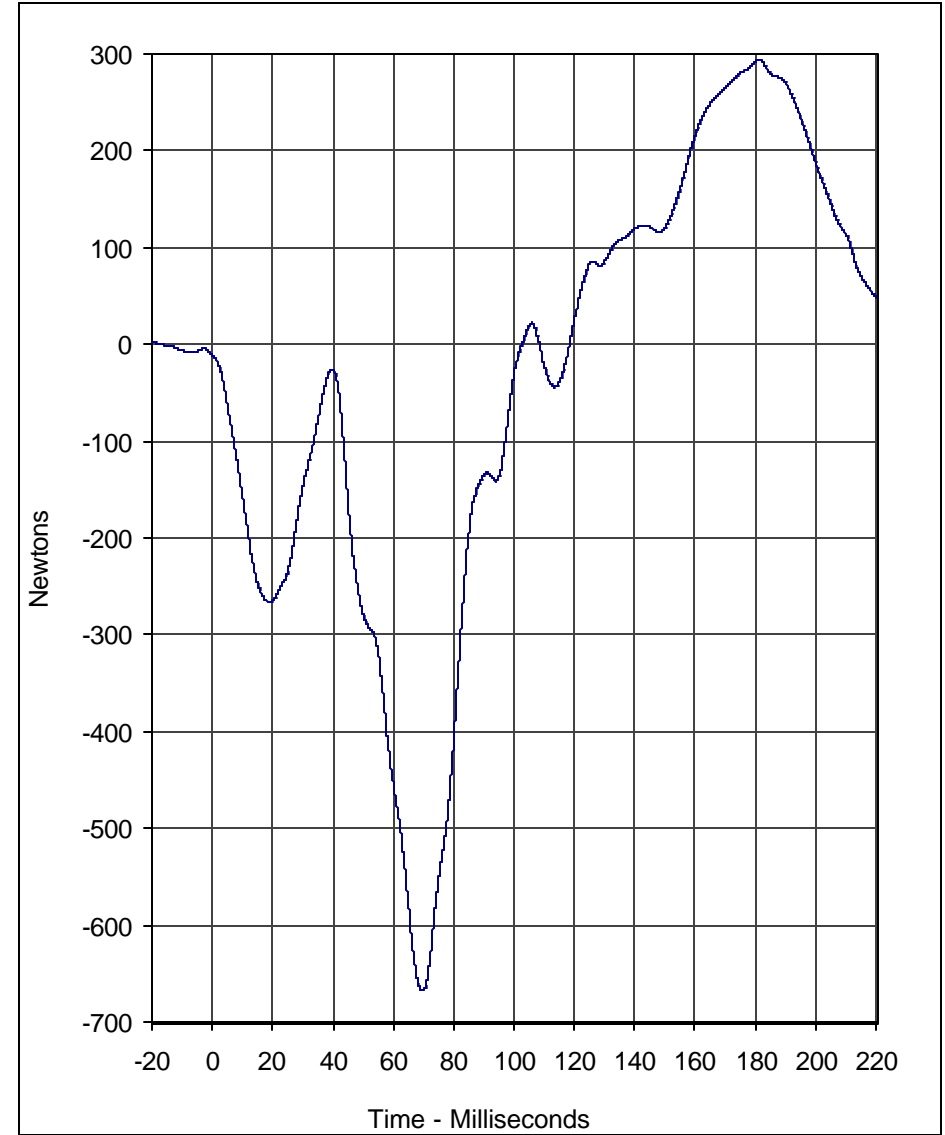
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Laboratory Technician

January 21, 2003  
\_\_\_\_\_  
Test Date



Curve Description				CURNO	Type
Pendulum Deceleration				001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	19.5	8.2	-1.9	76.0	60



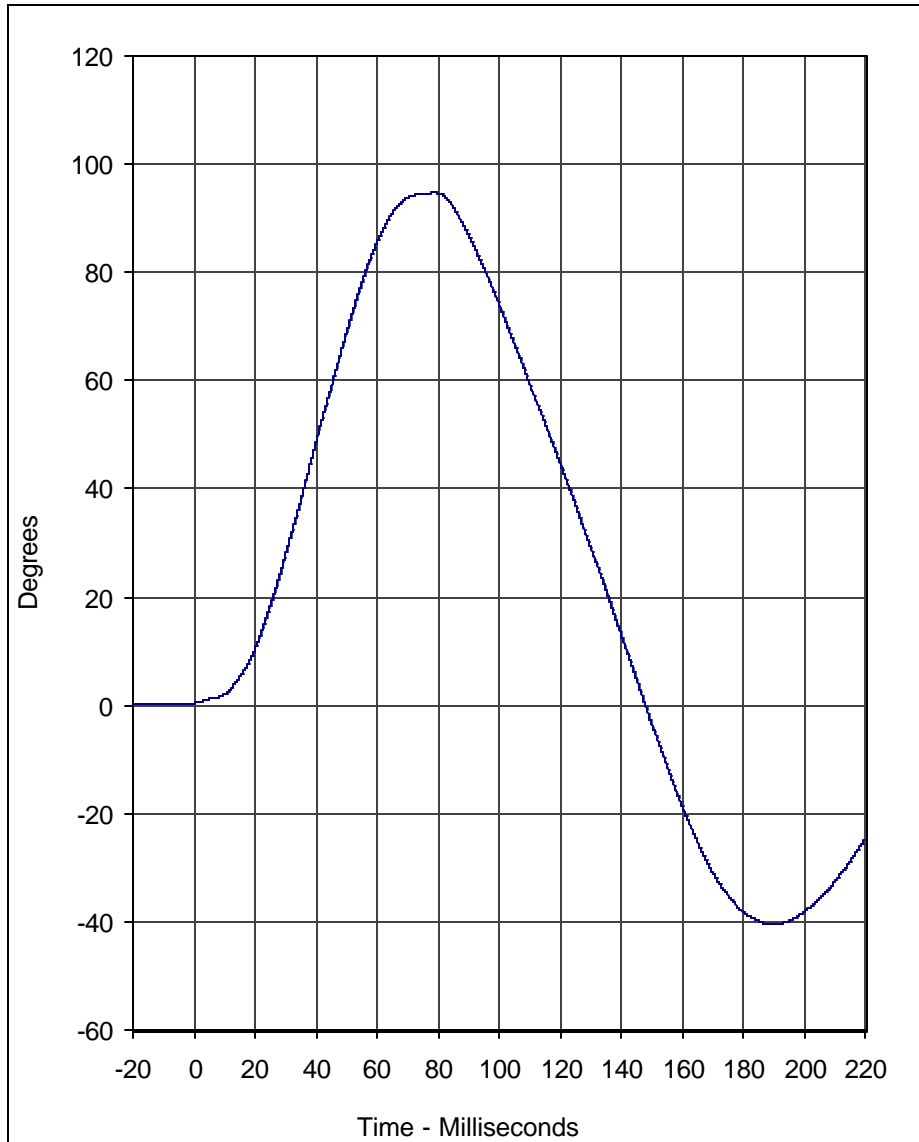
Curve Description				CURNO	Type
Neck Force X				002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	294.2	181.3	-667.8	69.7	60

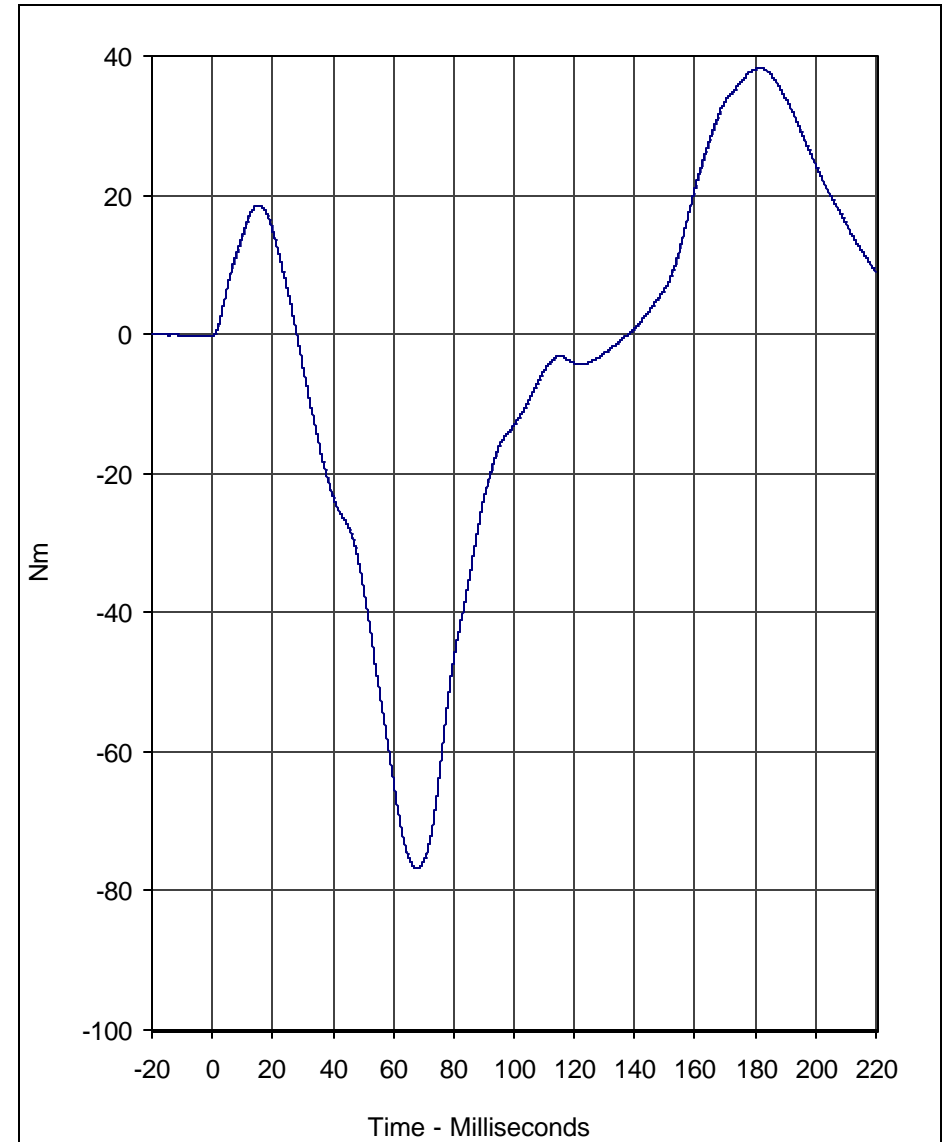
Test Program: Hybrid III 50th Percentile Male Neck Extension Test  
 Test Date: 1/21/03

A.T.D. Serial No.: 035  
 Test I.D.: NE02A





Curve Description				CURNO	Type
"D" Plane Rotation				003	FIL
Units	Max	Time	Min	Time	SAE Class
Degrees	94.7	78.9	-40.5	189.7	60



Curve Description				CURNO	Type
Moment About Occipital Condyle				004	FIL
Units	Max	Time	Min	Time	SAE Class
Nm	38.3	181.5	-76.8	68.0	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test  
 Test Date: 1/21/03

A.T.D. Serial No.: 035  
 Test I.D.: NE02A





# Calibration Data Sheet

## Hybrid III 50th Percentile Male

### External Measurements

ATD Serial No.: 035

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	880	Pass
B - Shoulder pivot height	mm	505 to 521	510	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	135	Pass
E - Shoulder pivot from back	mm	84 to 94	90	Pass
F - Thigh clearance	mm	140 to 155	145	Pass
G - Elbow back to wrist pivot	mm	290 to 305	300	Pass
H - Skull cap to back line	mm	41 to 46	45	Pass
I - Shoulder to elbow length	mm	330 to 345	335	Pass
J - Elbow rest height	mm	190 to 211	195	Pass
K - Buttock to knee length	mm	579 to 604	595	Pass
L - Popliteal length	mm	429 to 455	450	Pass
M - Knee pivot height	mm	485 to 500	500	Pass
N - Buttock popliteal length	mm	452 to 477	465	Pass
O - Chest depth	mm	213 to 229	215	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	430	Pass
W - Foot breadth	mm	91 to 107	95	Pass
Y - Chest circumference	mm	970 to 1001	1000	Pass
Z - Waist circumference	mm	836 to 866	860	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	230	Pass
Overall Test Results				Pass

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Laboratory Technician

January 21, 2003

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Test Date

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**APPENDIX F**

**CHILD RESTRAINT SYSYTEM**

**REPORT NUMBER TR-P23001-08-NC**

**NEW CAR ASSESSMENT PROGRAM  
FRONTAL BARRIER IMPACT TEST**

**SATURN CORPORATION  
2003 SATURN ION  
4 DOOR SEDAN**

**NHTSA NUMBER: M30112**

**PREPARED BY:  
KARCO ENGINEERING, LLC  
9270 HOLLY ROAD  
ADELANTO, CALIFORNIA 92301**



**FEBRUARY 11, 2003**

**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 5311  
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-01-D-02005.

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Prepared by: \_\_\_\_\_  
Mr. James E. Gorth, Project Engineer  
KARCO Engineering, LLC

Date: February 22, 2003

Reviewed by: \_\_\_\_\_  
Mr. Jerry L. Kratzke, Director of Operations  
KARCO Engineering, LLC

Date: February 22, 2003

Approved by: \_\_\_\_\_  
Mr. Frank D. Richardson, Program Manager  
KARCO Engineering, LLC

Date: February 22, 2003

FINAL REPORT ACCEPTED BY:

\_\_\_\_\_  
Manager, New Car Assessment Program

\_\_\_\_\_  
Date of Acceptance

\_\_\_\_\_  
COTR, NCAP Frontal Impact Program

\_\_\_\_\_  
Date of Acceptance

## Technical Report Documentation Page

<b>1. Report No.</b> TR-P23001-08-NC	<b>2. Government Accession No.</b>	<b>3. Recipients Catalog No.</b>			
<b>4. Title and Subtitle</b> Final Report of Evenflo Vanguard 5 Convertible Final Report of Graco My Cargo NHTSA No. M30112		<b>5. Report Date</b> February 28, 2003			
		<b>6. Performing Organization Code</b> KAR			
<b>7. Authors</b> Mr. James E. Gorth, Project Engineer, Karco Mr. Frank Richardson, Project Manager, Karco		<b>8. Performing Organization Report No.</b> TR-P23001-08-NC			
		<b>9. Performing Organization Name and Address</b> KARCO Engineering, LLC 9270 Holly Road Adelanto, CA 92301		<b>10. Work Unit No.</b>	
<b>12. Sponsoring Agency Name and Address</b> U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking Office of Crashworthiness Standards Mail Code: NVS-111 400 Seventh Street, SW, Room 5311 Washington, D.C 20590		<b>11. Contract or Grant No.</b> DTNH22-01-D-02005			
		<b>13. Type of Report and Period Covered</b> Final Test Report Option Year 2			
<b>15. Supplementary Notes</b>		<b>14. Sponsoring Agency Code</b>  DOT/NHTSA/NRM/OCS/NVS 111			
		<b>16. Abstract</b>  A frontal load cell barrier test was conducted on the subject CRS's Evenflo Vanguard 5 Convertible and a Graco My Cargo in conjunction with frontal NCAP testing on a 2003 Saturn Ion 4 Door Sedan and in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the determination of CRS crashworthiness. This test was conducted at Karco Engineering, LLC on February 11, 2003			
<b>Measurement Description</b>		<b>Units</b>	<b>Left Rear</b>	<b>Right Rear</b>	
Head Injury Criteria (HIC) 36		N/A	1346.1	920.7	
Head Injury Criteria (HIC) 15		G's	927.1	513.8	
3 M sec. Chest Clip		Newtons	56.5	46.5	
Peak Chest Displacement		Newtons	-35.2	-16.4	
<b>17. Key Words</b>  56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2003 Saturn Ion 4 Door Sedan NHTSA No. M30112			<b>18. Distribution Statement</b>  Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 400 Seventh St., SW, Room 5108 Washington, D.C. 20590		
<b>19. Security Classification (this report)</b>		<b>20. Security Classification (this page)</b>		<b>21. No. Pages</b>	<b>22. Price</b>
Unclassified		Unclassified		130	

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## SECTION F-1

### PURPOSE AND SUMMARY OF TEST M30112

The purpose of this test is to obtain CRS performance data during an NCAP (35mph) frontal impact test.

The 56.06 km/h NCAP frontal impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) NCAP Laboratory Test Procedure.

#### SUMMARY

Both the three year old and six year old child dummies were instrumented with head, chest and pelvic triaxial accelerometers. In addition, chest displacement and upper and lower six axial neck force and moment load cell sensors were utilized. Triaxial accelerometers were installed on the CRS and a load cell on the upper tether.

The right rear (Position 3) 3yr. old child dummy (Serial No. 082) was calibrated prior to this test. . The left rear (Position 4) 6yr. Old child dummy (Serial No. 090) was calibrated prior to this test. Child dummy certification information is found in Section F-5.

During the post-test inspection, we found the vehicle seat belt at position 4 to be unlatched. The seating position contained a booster secured with the vehicle seat belt. We inspected the belt/buckle and latch plate and found them to be fully functional. No physical damage was found on the child seat. Both data and film analysis revealed that the vehicle belt was unlatched at about 120 msec. This happened after the head and chest reached the peak acceleration, and had no effect on the dummy HIC and chest G calculations.

#### CHILD DUMMY VALUES

	HIC36 Values	HIC15 Values	3 Msec Chest Clip	Peak Chest Disp.
Left Rear Child	1346.1	927.1	56.5	-35.2
Right Rear Child	920.7	513.8	46.5	-16.4

**SECTION F-1**

**DATA SHEET NO.1.....CRASH TEST SUMMARY**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**TEST DUMMY INFORMATION**

Description	Position #3 CRS	Position # 4 CRS
Manufacturer	Evenflo	Graco
Model Name	Vanguard 5	My Cargo
Serial No.	3691261 P1	8481
Type	Convertible	Belt Positioning Booster
Forward/Rearward	Forward	Forward

**VISIBLE DUMMY CONTACT POINTS**

Description	Position #3 CRS	Position # 4 CRS
Head Contact	CRS	Side Header/ Booster
Chest Contact	Harness	Belt
Abdomen Contact	Harness	Belt
Left Knee Contact	None	CRS
Right Knee Contact	None	None
Left Toe contact	None	Seatback
Right Toe Contact	Seatback	Seatback

**POST TEST DOOR OPENING**

Description	Front	Rear
Left Side Doors	Remained closed, opened w/o tools	Remained closed, opened w/o tools
Right Side Doors	Remained closed, opened w/o tools	Remained closed, opened w/o tools
Hatch/Other Door	None	None

**POST TEST SEAT DATA**

Location	Seat Movement (mm)	Seat Back Failure
Left Front	None	None
Right Front	None	None
Left Rear	None	None
Right Rear	None	None

**CAMERA COVERAGE**

High Speed	4
Real Time	0
Total	4

**SECTION F-1**

**DATA SHEET NO. 2.....CRS PARAMETER DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**TEST VEHICLE WEIGHTS**

	Units	As Delivered			As Tested		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	368	250		412	317	
Right	kg	368	246		411	304	
Ratio	%	59.7	40.3		57.0	43.0	
Totals	kg	736	496	1232	823	621	1444

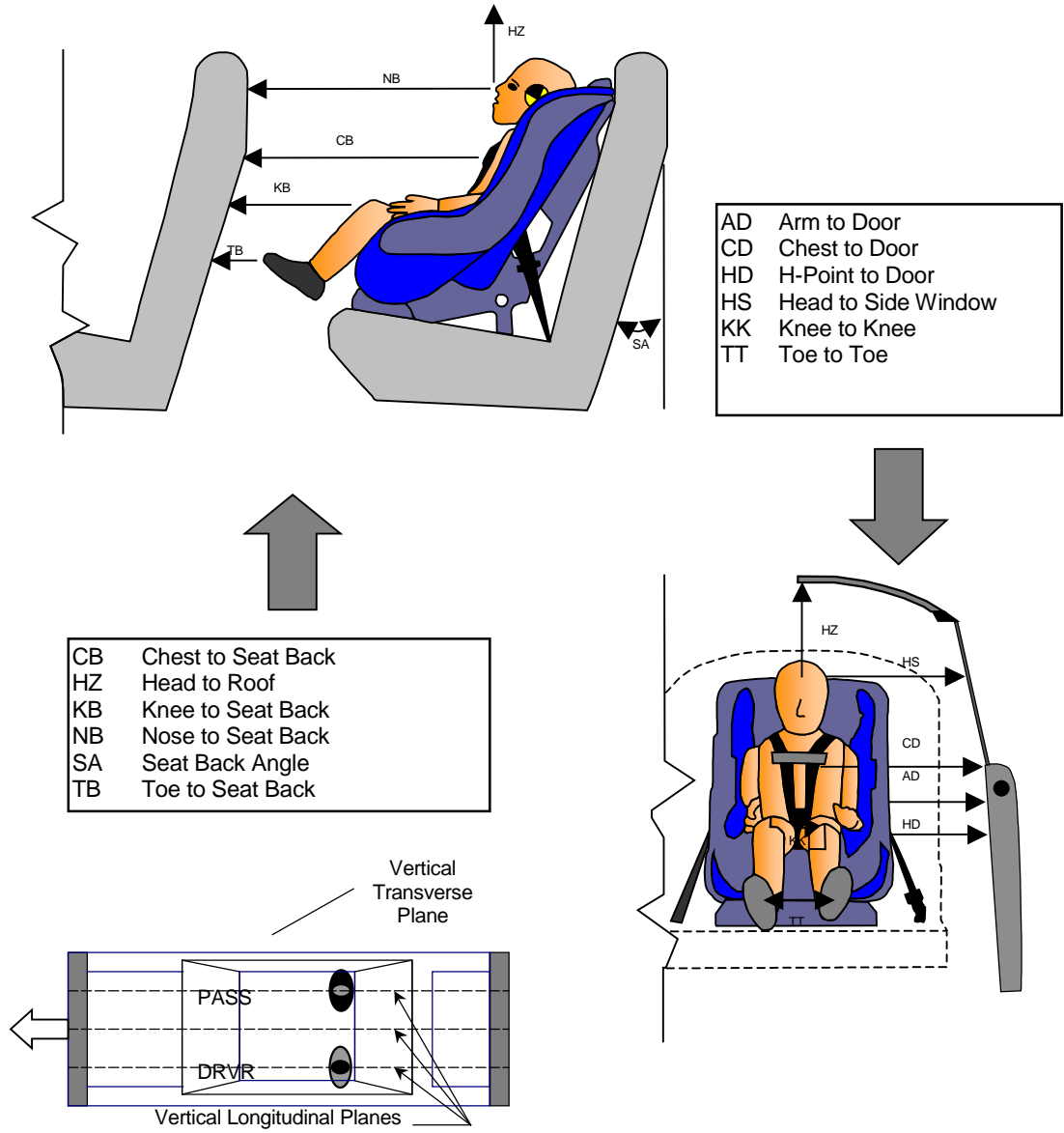
**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value
Total Delivered Weight ( <i>UW</i> )	kg	1232
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight ( <i>RCLW</i> )	kg	68
Calculated Vehicle Target Weight ( <i>TVTW</i> )	kg	1452

# DATA SHEET NO. 3 .....CHILD DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03



## DUMMY MEASUREMENTS FOR REAR SEAT OCCUPANTS

### SECTION F-1

**DATA SHEET NO. 3 .....CHILD DUMMY POSITIONING IN VEHICLE...(continued)**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**CHILD DUMMY POSITION MEASUREMENTS**

Code	Measurement	P3 CRS (082)		P4 CRS (090)	
		Pre-Test	Post-test	Pre-Test	Post-test
SA	Seat Back Angle	24		24	
HZ	Head to Roof (Z)	370	385	415	325
CD	Chest to Dash	325	325	350	280
KK	Knee to Knee (Y)	168	190	205	130
HS	Head to Side Window	225	242	170	185
HD	H-Point to Door (Y)	340	335	325	335
AD	Arm to Door (Y)	500	475	528	515
NB	Nose to Seat Back	490	485	385	440
CB	Chest to Seat Back	175	190	170	145
FF	Foot to Foot	168	230	150	165
KB-LEFT	Knee to Seat Back	310	320	250	148
KB-RIGHT	Knee to Seat Back	310	320	250	172
TB-LEFT	Toe to Seat Back	60	65	60	70
TB-RIGHT	Toe to Seat Back	50	0	65	70

**DATA SHEET NO. 4 - 3 YEAR OLD HYBRID III ATD INJURY CRITERIA AND SENSOR DATA**

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

**HEAD PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	8.7	52.7	-66.0	93.0	18.9	263.9	-33.0	117.0
Head CG	Y	G's	8.1	215.3	-8.6	108.0	5.9	128.3	-7.0	113.7
Head CG	Z	G's	26.2	107.6	-33.1	216.7	85.7	93.0	-0.9	35.0
Head CG Resultant	N/A	G's	68.4	93.0			88.6	93.0		

**PRIMARY HEAD INJURY CRITERAS (HIC)**

Location	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G	HIC	T <sup>1</sup>	T <sup>2</sup>	Avg G
Head CG Primary (HIC36)	920.7	76.1	112.1	57.9	1346.1	77.3	108.1	71.7
Head CG Primary (HIC15)	513.8	87.1	102.1	65.1	927.1	85.4	100.4	82.4

**CHEST PRIMARY PEAK ACCELERATIONS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	12.6	227.5	-42.1	76.3	3.3	185.5	-50.5	81.8
Chest CG	Y	G's	4.2	110.2	-3.8	77.0	10.4	87.6	-10.1	75.4
Chest CG	Z	G's	12.2	101.4	-23.1	76.4	15.0	265.3	-28.7	81.0
Chest CG Resultant	N/A	G's	48.1	76.3			58.2	81.3		

**PRIMARY CHEST CLIP (3MSEC)**

Location	Right Rear (3 Yr.)			Left Rear (6 Yr.)		
	CLIP	T <sup>1</sup>	T <sup>2</sup>	CLIP	T <sup>1</sup>	T <sup>2</sup>
Chest CG Primary	46.5	74.4	77.4	56.5	80.0	83.0

**CHEST PEAK DISPLACEMENTS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	MM	0.2	34.2	-16.4	119.0	1.0	271.7	-35.2	93.7

**PELVIC PEAK ACCELERATIONS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	10.6	134.9	-54.3	80.2	16.0	127.8	-48.8	73.7
Pelvis	Y	G's	12.9	84.5	-4.2	142.7	11.2	98.4	-13.2	72.0
Pelvis	Z	G's	10.2	217.1	-23.4	72.5	16.4	266.3	-56.7	81.8
Pelvis Resultant	N/A	G's	58.4	80.2			72.2	81.7		

**DATA SHEET NO. 4...(continued)**

Test Vehicle: 2003 Saturn ION 4 Door Sedan

NHTSA No.: M30112

Test Program: 2003 NHTSA 35mph NCAP

Test Date: 2/11/03

**UPPER NECK PEAK FORCES AND MOMENTS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	77.2	41.3	-749.7	114.3	357.2	264.4	-701.3	85.3
Neck Force	Y	Newtons	40.4	107.8	-70.1	222.3	153.6	108.3	-117.1	262.8
Neck Force	Z	Newtons	1783.3	93.8	-327.7	222.2	2760.4	93.1	-1799.7	266.9
Neck Force Resultant	N/A	Newtons	1863.2	93.9			2831.6	93.1		
Neck Moment	X	Nm	2.9	177.4	-3.8	90.3	3.9	74.8	-7.6	268.6
Neck Moment	Y	Nm	2.7	84.0	-21.0	226.9	39.4	267.0	-23.3	75.6
Neck Moment	Z	Nm	1.5	92.7	-2.0	162.2	9.6	266.1	-3.9	72.7
Neck Moment Resultant	N/A	Nm	21.1	226.9			41.2	267.0		

**LOWER NECK PEAK FORCES AND MOMENTS**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	129.5	206.6	-642.3	101.0				
Neck Force	Y	Newtons	72.5	104.0	-57.4	223.0				
Neck Force	Z	Newtons	1136.0	93.7	-322.5	51.3				
Neck Force Resultant	N/A	Newtons	1270.5	93.7						
Neck Moment	X	Nm	4.9	169.2	-10.9	86.2				
Neck Moment	Y	Nm	97.0	112.8	-10.9	206.7				
Neck Moment	Z	Nm	2.1	104.4	-5.7	86.0				
Neck Moment Resultant	N/A	Nm	97.0	112.8						

**CHILD SEAT TETHER BELT SENSOR PEAK VALUES**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Tether Belt Force	N/A	Newtons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1.) Not installed

**CHILD SEAT ACCELEROMETER PEAK VALUES**

Location	Axis	Units	Right Rear (3 Yr.)				Left Rear (6 Yr.)			
			Max	Time	Min	Time	Max	Time	Min	Time
Child Seat	X	G's	6.3	147.0	-51.1	70.5	21.2	113.6	-60.6	71.0
Child Seat	Y	G's	5.5	79.7	-6.8	158.5	44.9	123.1	-57.2	128.8
Child Seat	Z	G's	0.0	0.0	0.0	0.0	33.7	144.7	-40.7	135.3
Child Seat Resultant	N/A	G's	51.1	70.5			64.6	70.3		

1.) Channel failed, no data

**SECTION F-1**

**DATA SHEET NO. 5.....CRS PERFORMANCE DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

**CRS PERFORMANCE DATA**

Location	Serial # Position # 3		Serial # Position # 4	
	Damage	Remarks	Damage	Remarks
Upper Tether Strap	No	None	No	None
Upper Tether Buckle	No	None	No	None
Upper Tether Hook	No	None	No	None
Veh. Upper Tether Anchor	No	None	No	None
Lower Anchor Strap	No	None	No	None
Lower Anchor Buckle	No	None	No	None
Lower Anchor Hooks	No	None	No	None
Veh. Lower CRS Anchors	No	None	No	None
5 Point Harness Connections	No	None	No	None
Cracks on CRS	No	None	No	None
Fabric Tears on CRS	No	None	No	None
Vehicle Seat Structure	No	None	No	None
Vehicle Seat Fabric Tears	No	None	No	None
Child Dummy	No	None	No	None

Note: Vehicle seatbelt came unbuckled, data indicates it occurred on rebound.

**SECTION F-1**

**DATA SHEET NO. 6.....CRS CAMERA DATA**

Test Vehicle: 2003 Saturn Ion 4 Door Sedan  
 Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112  
 Test Date: 2/11/03

No.	Camera View	Location (mm)			Angle (Deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Driver Side Child	2642	8230	2286	15	7871	35	1010
2	Driver Side Child	2642	6096	1524	1	5673	25	510
3	Passenger Side Child	2438	-9144	2032	10	8785	25	720
4	Passenger Side Child	2743	-8331	1524	1	7920	25	510

X - Barrier Face    Y - Monorail Centerline    Z - Ground

**SECTION F-2**

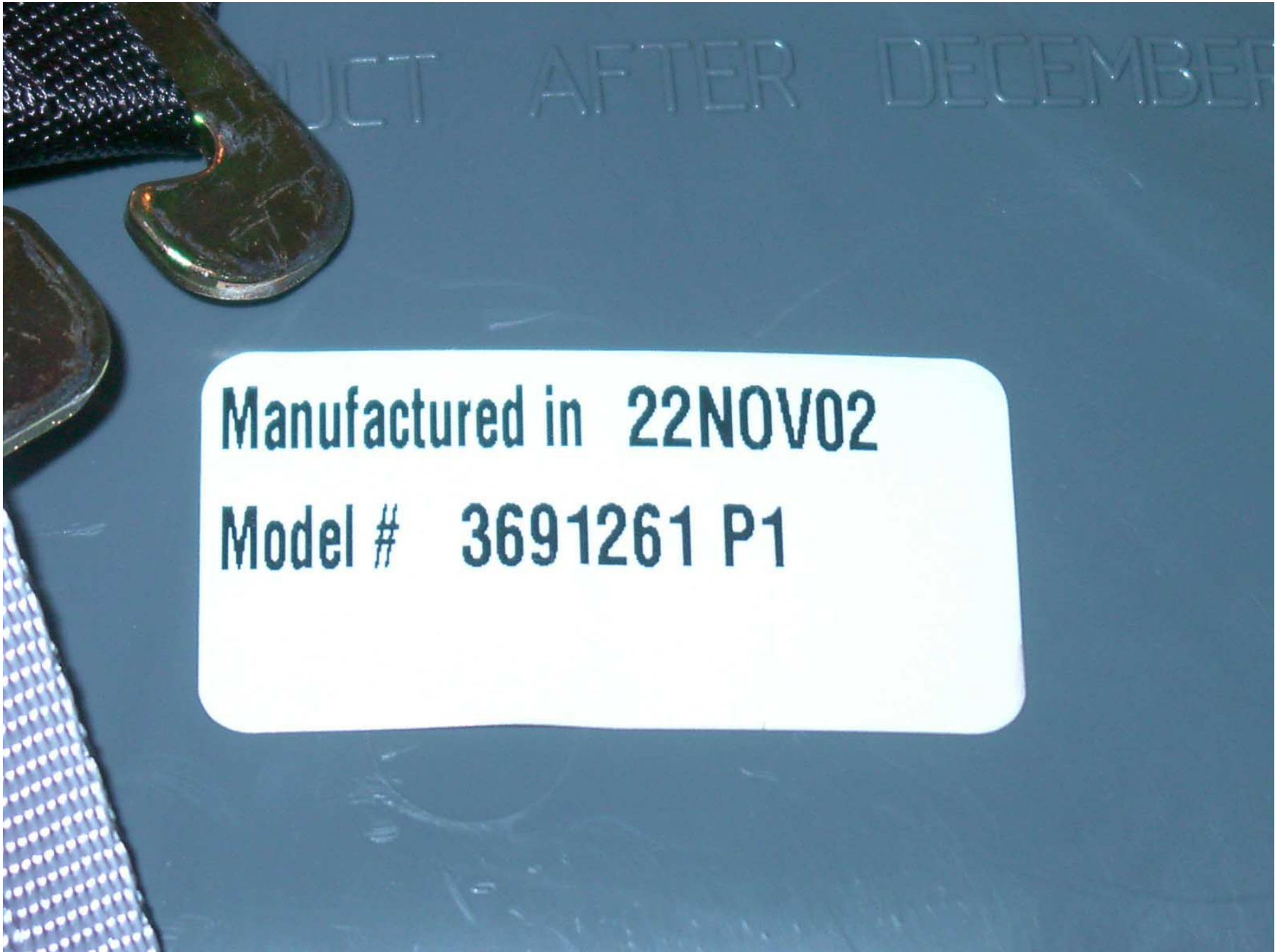
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**Manufactured in 22NOV02**

**Model # 3691261 P1**

Figure F-1: Close-up View Position 3 CRS Label



Figure F-2: Pre-Test Frontal View of Position 3 CRS



Figure F-3: Post-Test Frontal View of Position 3 CRS



Figure F-4: Pre-Test Rear View of Position 3 CRS



Figure F-5: Post-Test Rear View of Position 3 CRS



Figure F-6: Pre-Test Left Side View of Position 3 CRS



Figure F-7: Post-Test Left Side View of Position 3 CRS



Figure F-8: Pre-Test Right Side View of Position 3 CRS



Figure F-9: Post-Test Right Side View of Position 3 CRS



Figure F-10: Pre-Test Position 3 Front View



Figure F-11: Post-Test Position 3 Front View



Figure F-12: Pre-Test Position 3 Left Side View



Figure F-13: Post-Test Position 3 Left Side View



Figure F-14: Pre-Test Position 3 Right Side View



Figure F-16: Post-Test Position 3 Right Side View

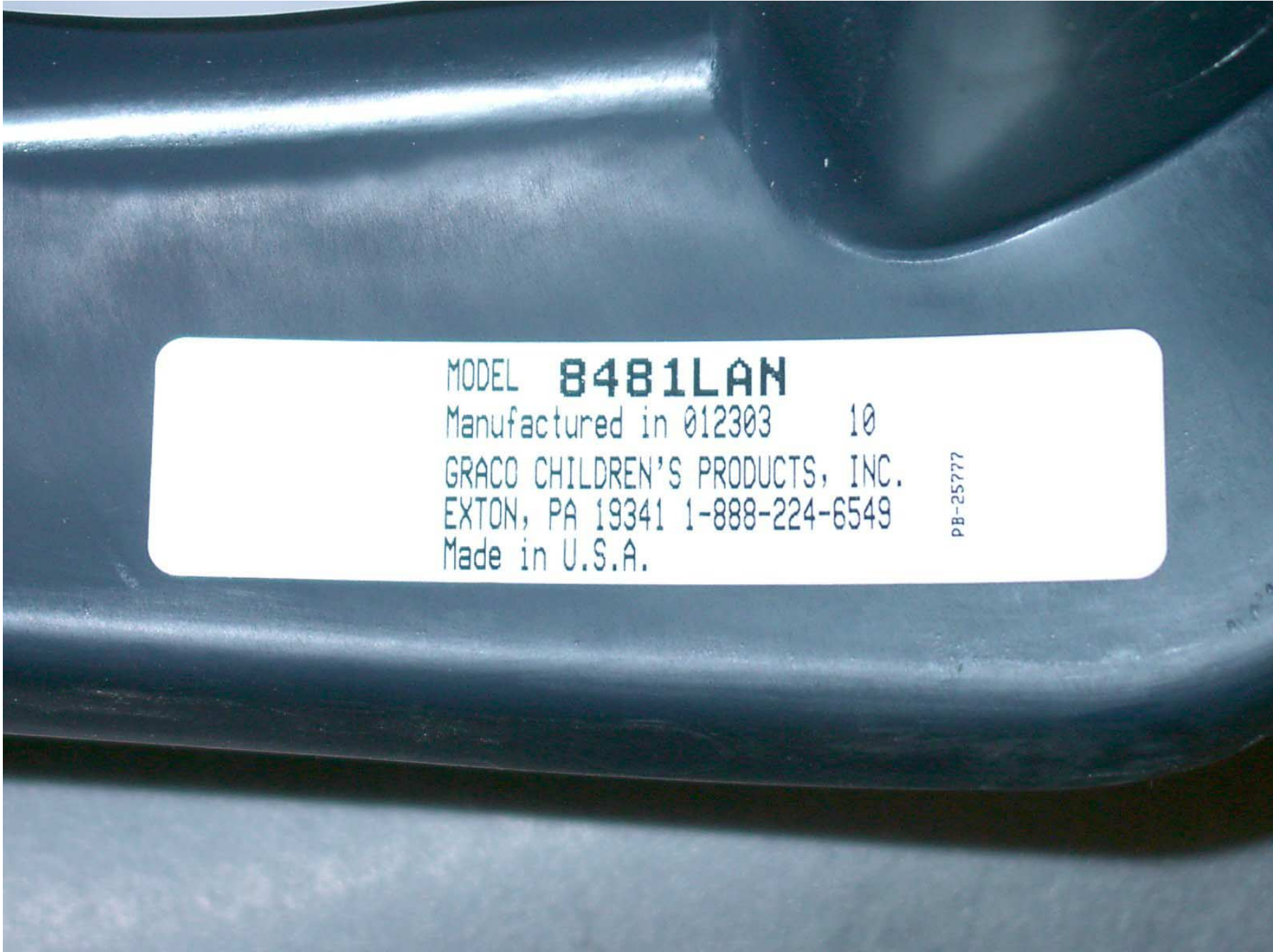


Figure F-16: Close-up View Position 4 CRS Label



Figure F-17: Pre-Test Frontal View of Position 4 CRS



Figure F-18: Post-Test Frontal View of Position 4 CRS



Figure F-19: Pre-Test Rear View of Position 4 CRS



Figure F-20: Post-Test Rear View of Position 4 CRS



Figure F-21: Pre-Test Left Side View of Position 4 CRS



Figure F-22: Post-Test Left Side View of Position 4 CRS



Figure F-23: Pre-Test Right Side View of Position 4 CRS



Figure F-24: Post-Test Right Side View of Position 4 CRS



Figure F-25: Pre-Test Position 4 Front View



Figure F-26: Post-Test Position 4 Front View



Figure F-27: Pre-Test Position 4 Left Side View



Figure F-28: Post-Test Position 4 Left Side View



Figure F-29: Pre-Test Position 4 Right Side View



Figure F-30: Post-Test Position 4 Right Side View



Figure F-31: Post-Test Position 4 Child Seat Belt Buckle



Figure F-32: Post-Test Position 4 Child Seat Belt Latch

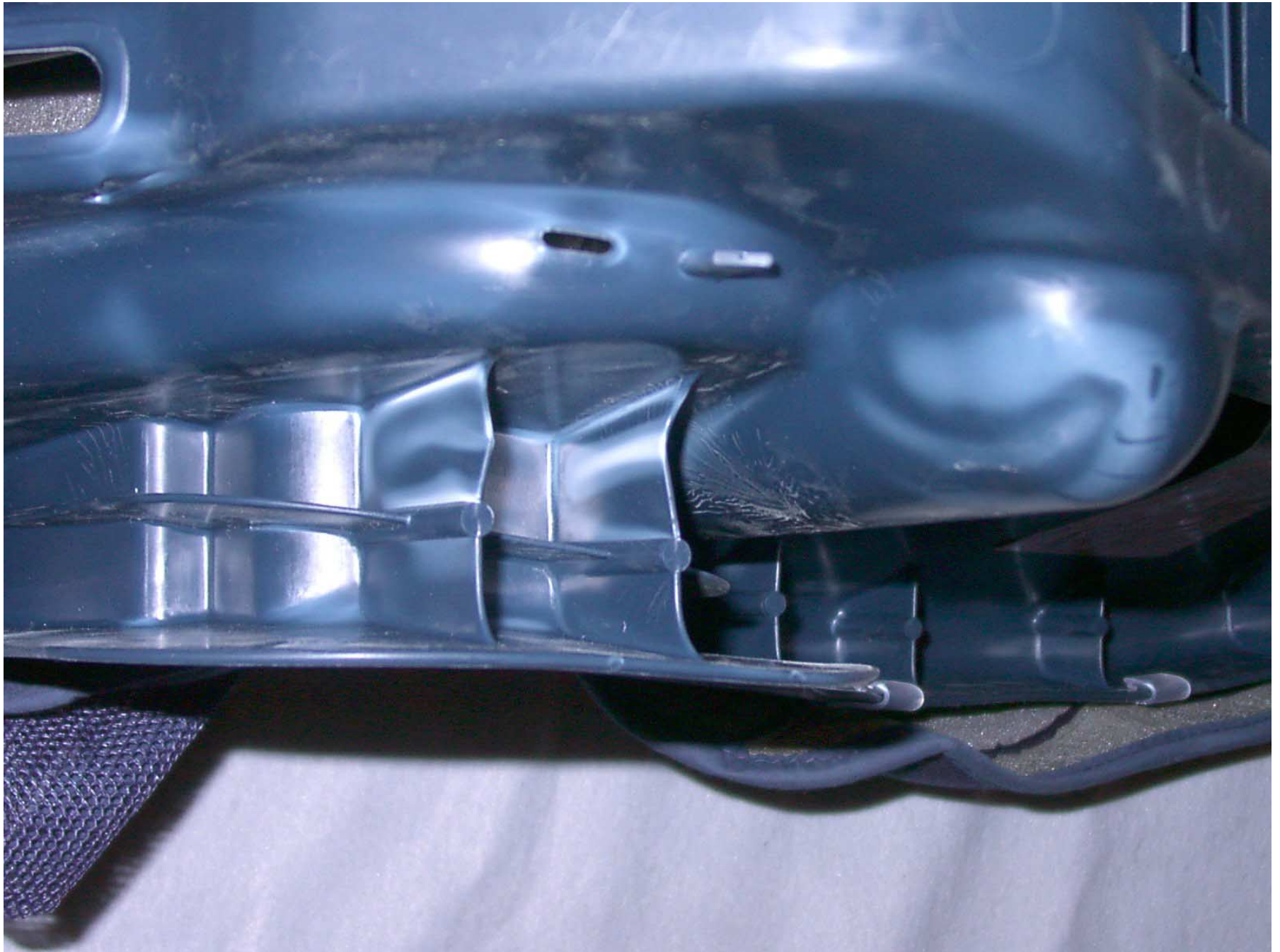


Figure F-33: Post-Test Position 4 Child Seat, Damage to Left Side (Underside View)



Figure F-34: Post-Test Position 4 Child Seat, Damage to Right Side (Underside View)

**SECTION F-3**

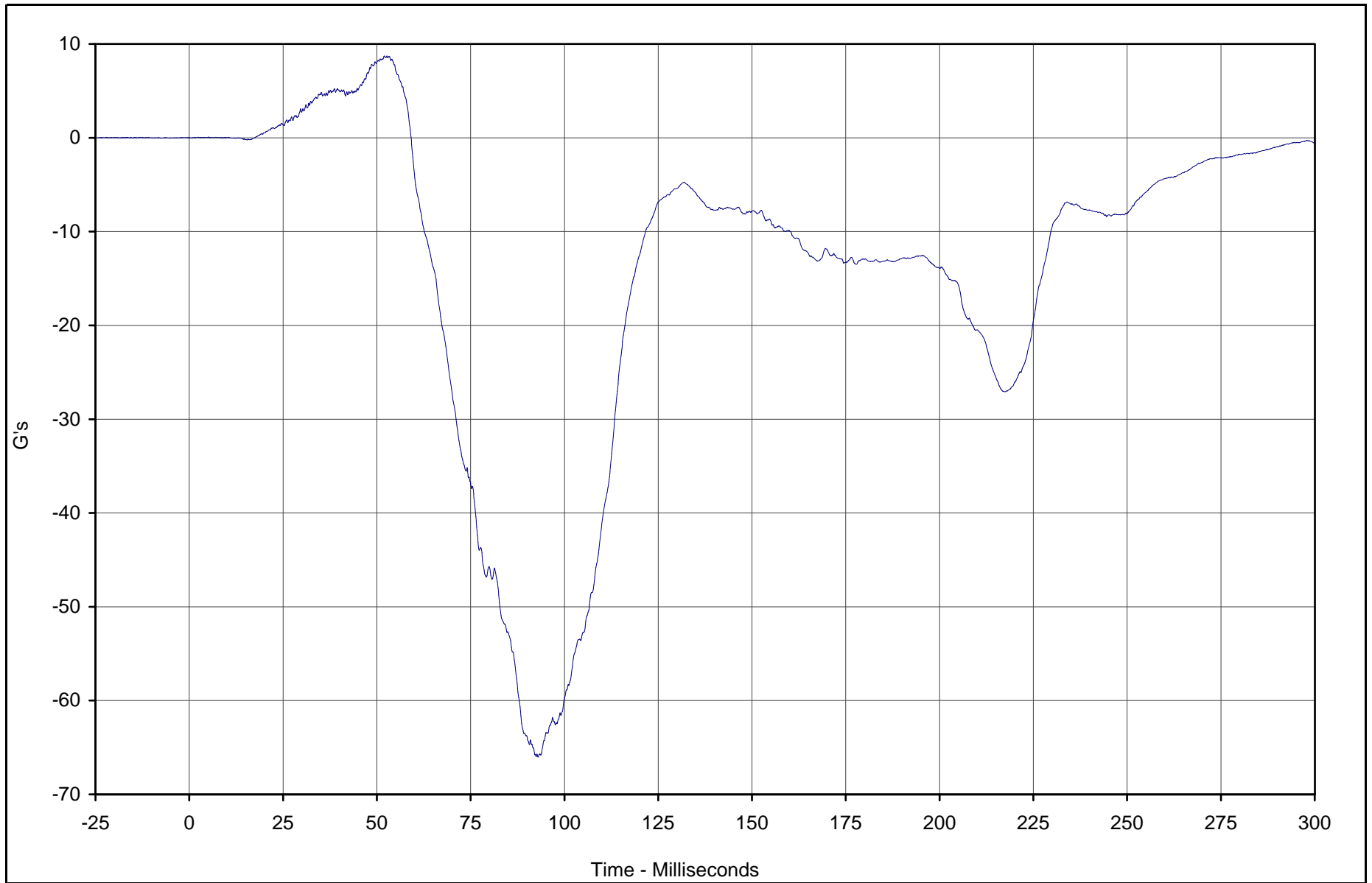
**CHILD DUMMY RESPONSE AND CRS DATA TRACES**

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Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Head X	134	FIL	G's	8.7	52.7	-66.0	93.0	1000

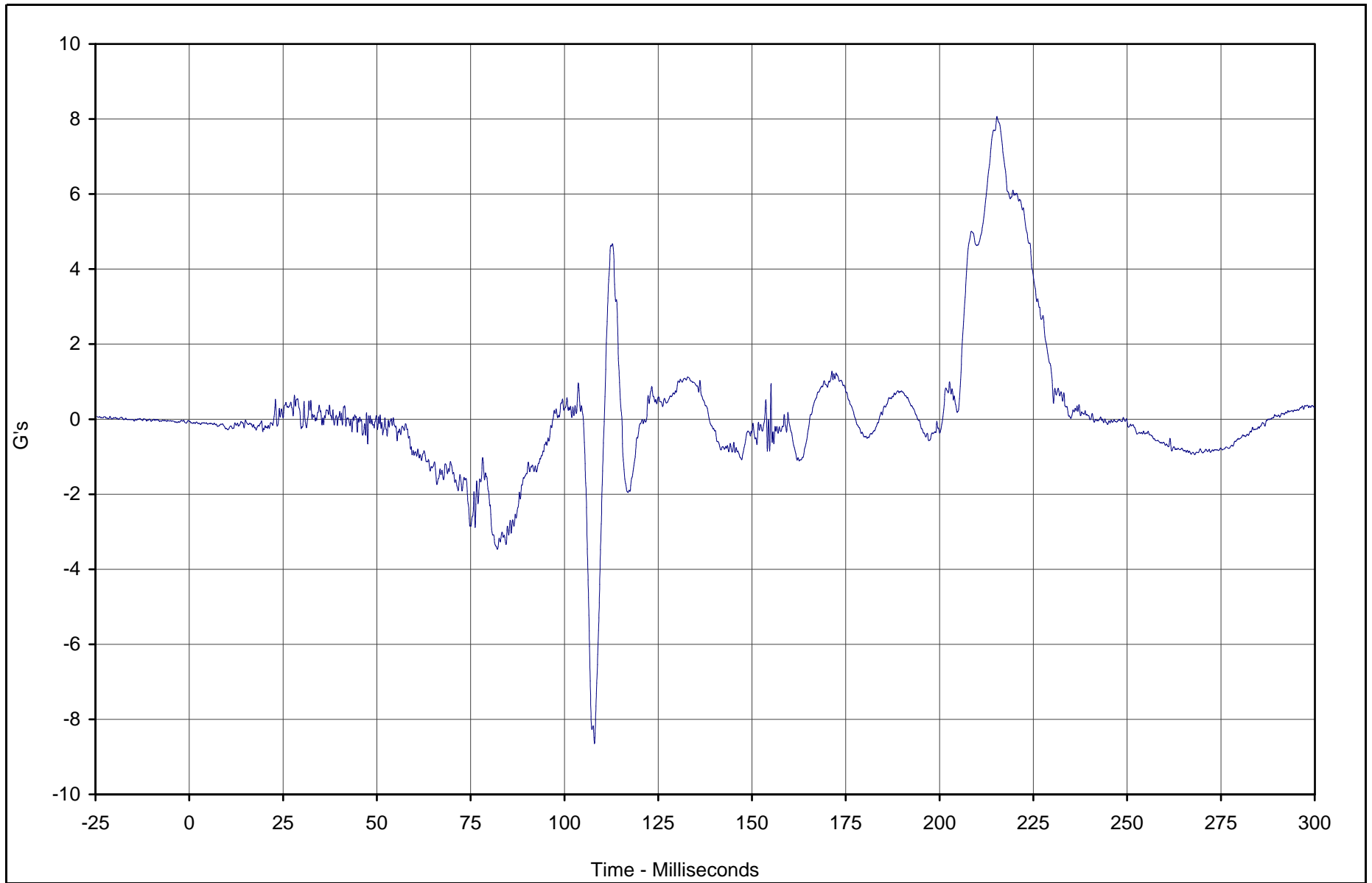


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Head Y	135	FIL	G's	8.1	215.3	-8.6	108.0	1000

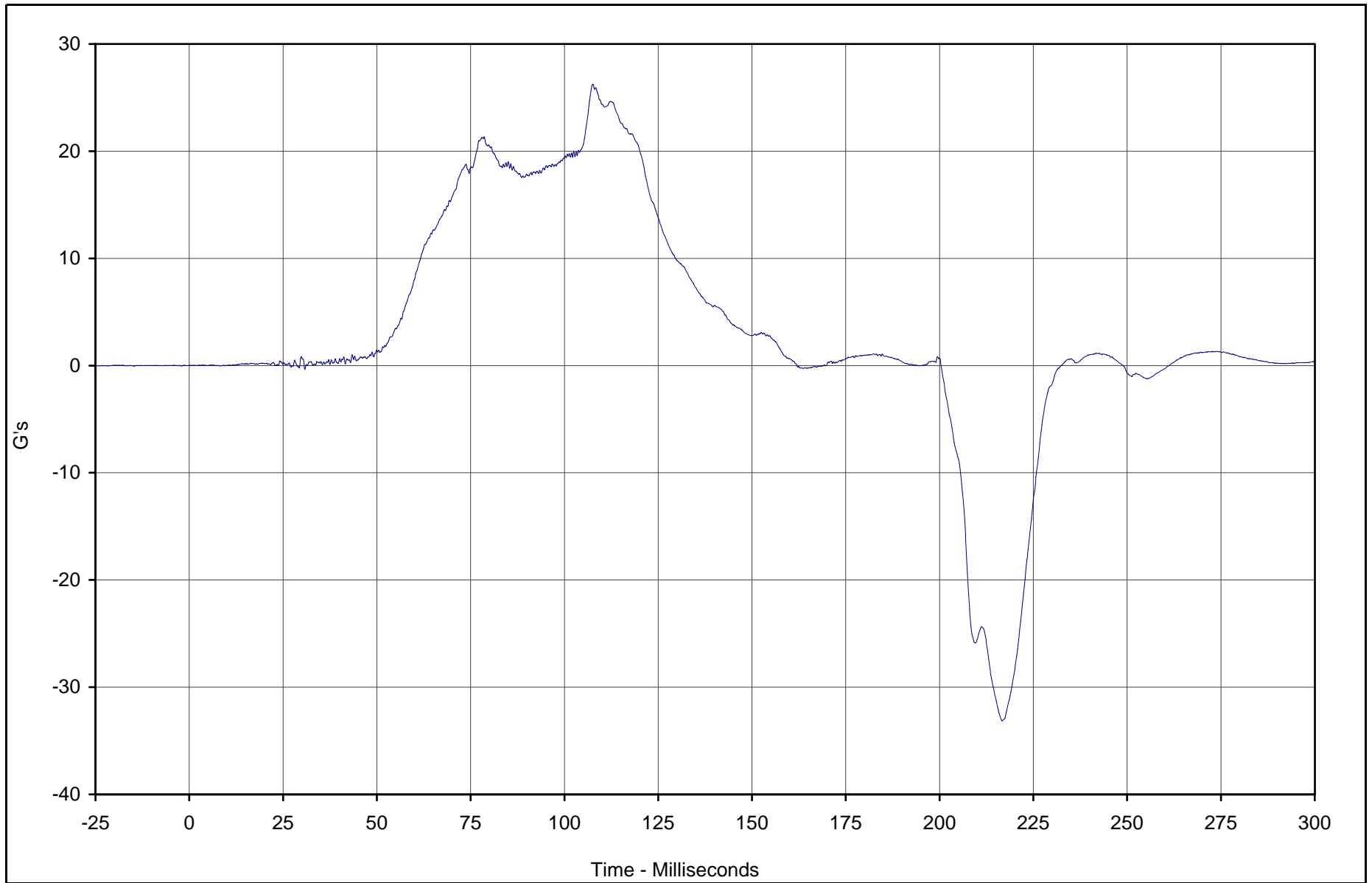


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Head Z	136	FIL	G's	26.2	107.6	-33.1	216.7	1000



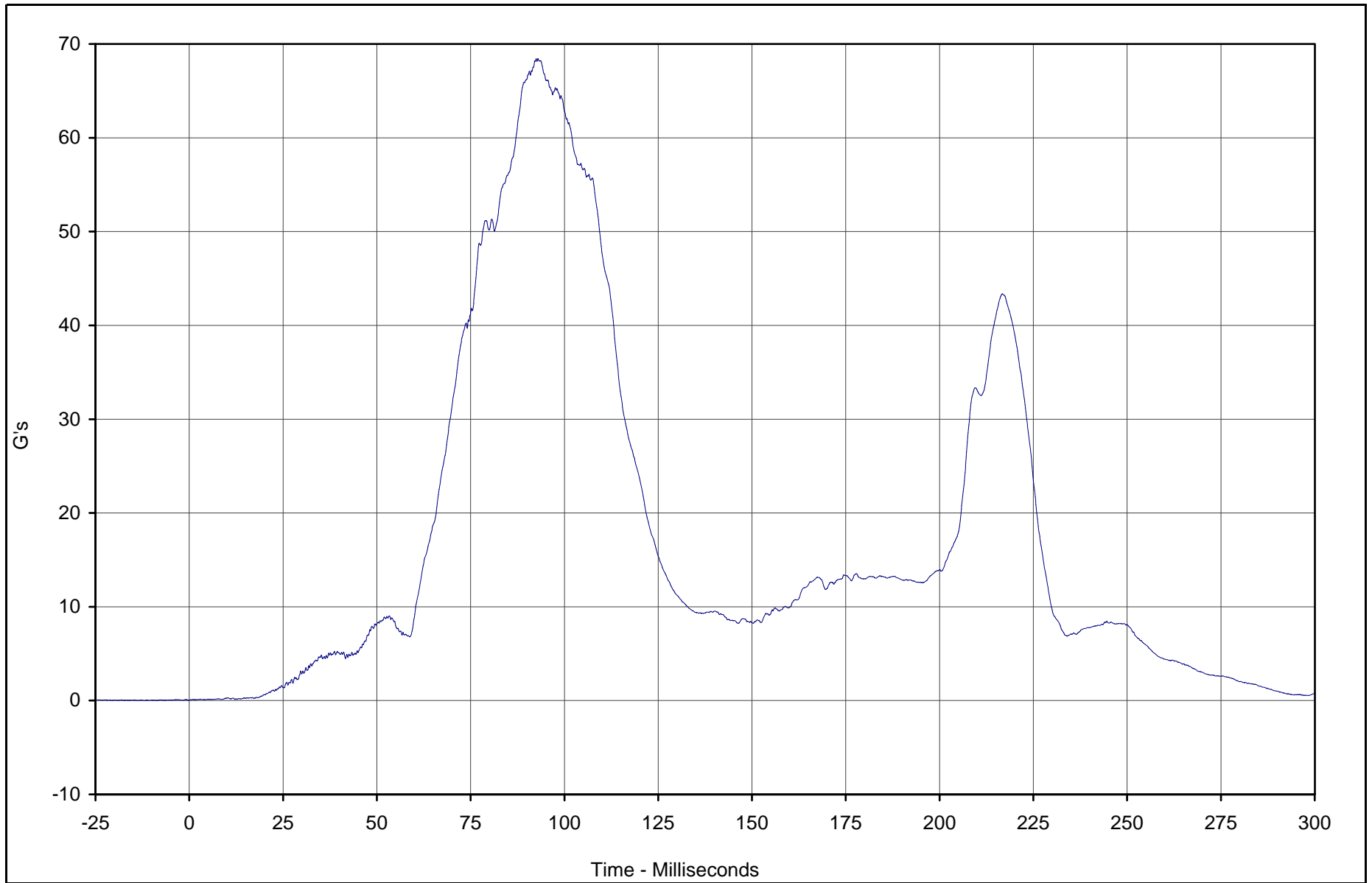
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-4



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Head Resultant	134	RES	G's	68.4	93.0	0.1	0.0	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

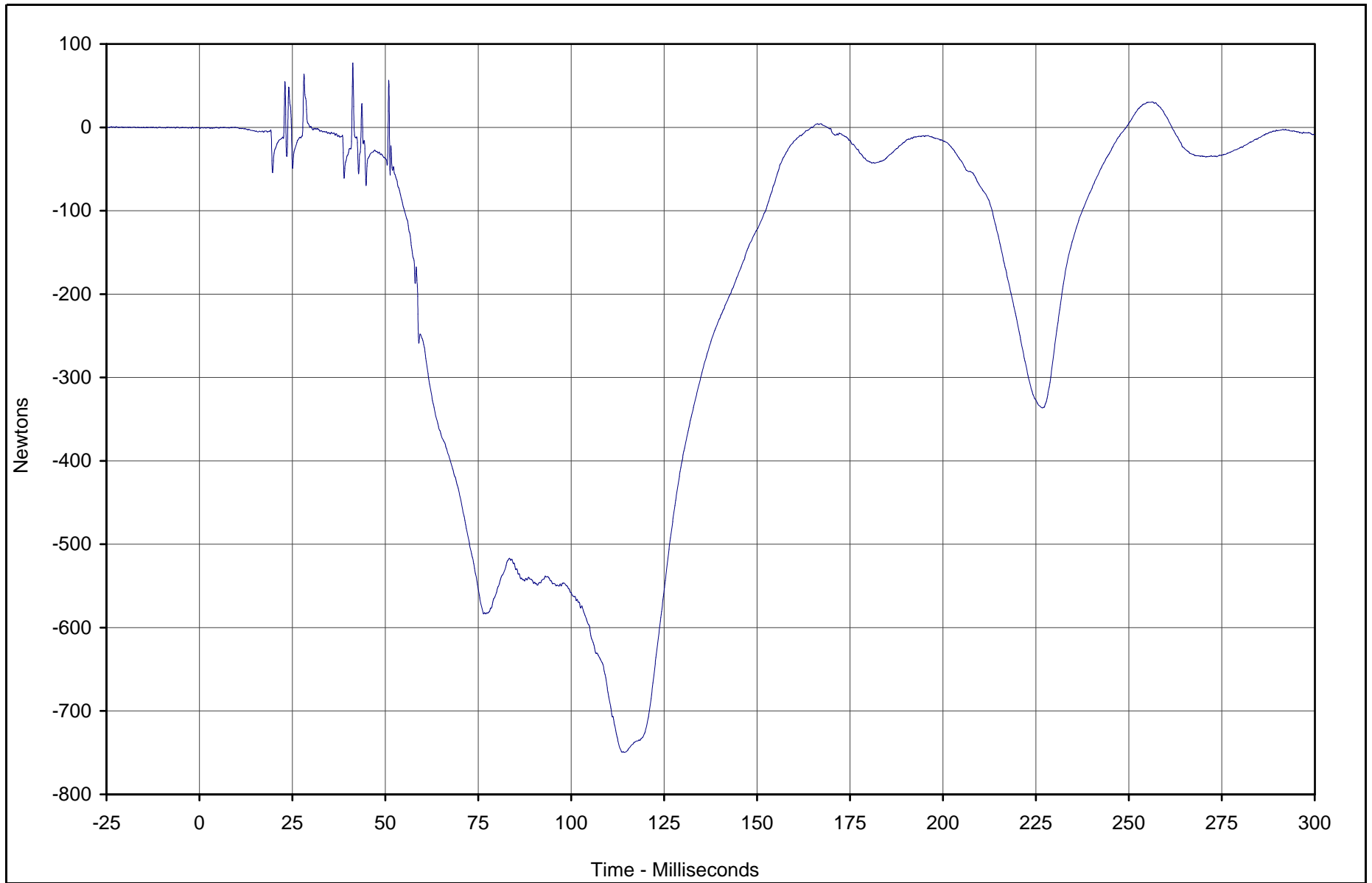
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-5



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Force X	137	FIL	Newtons	77.2	41.3	-749.7	114.3	1000



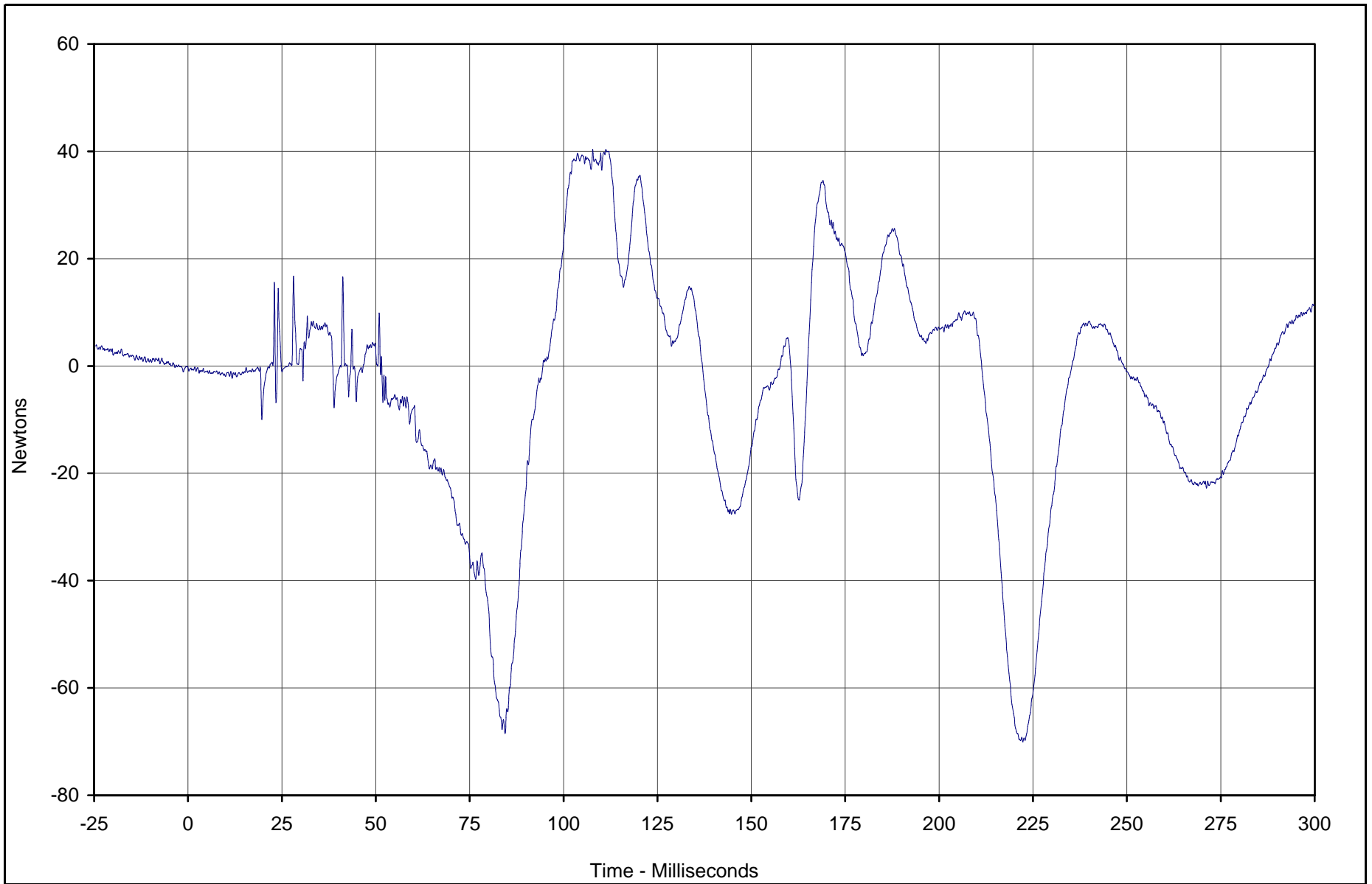
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Force Y	138	FIL	Newtons	40.4	107.8	-70.1	222.3	1000

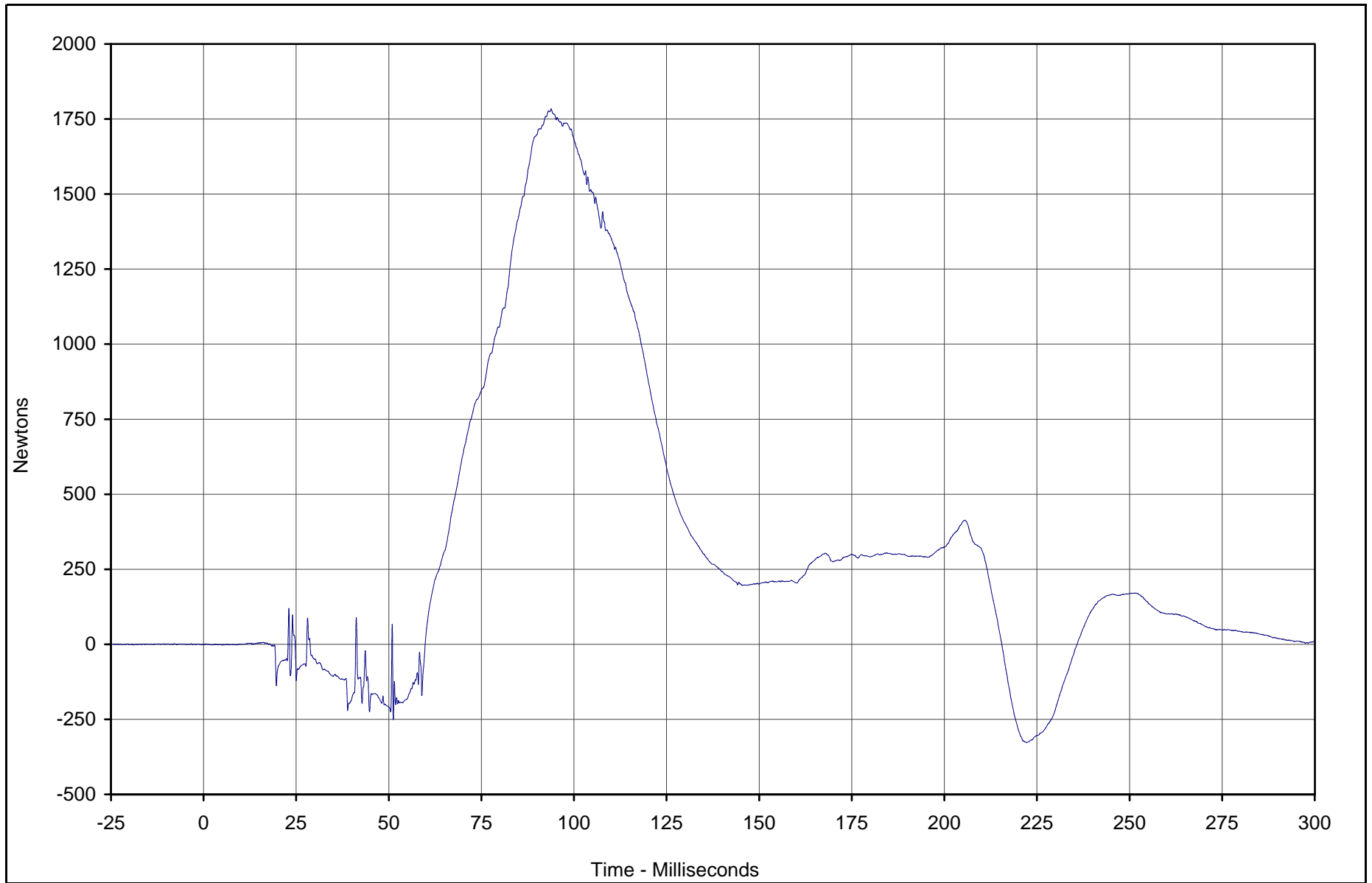


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Force Z	139	FIL	Newtons	1783.3	93.8	-327.7	222.2	1000

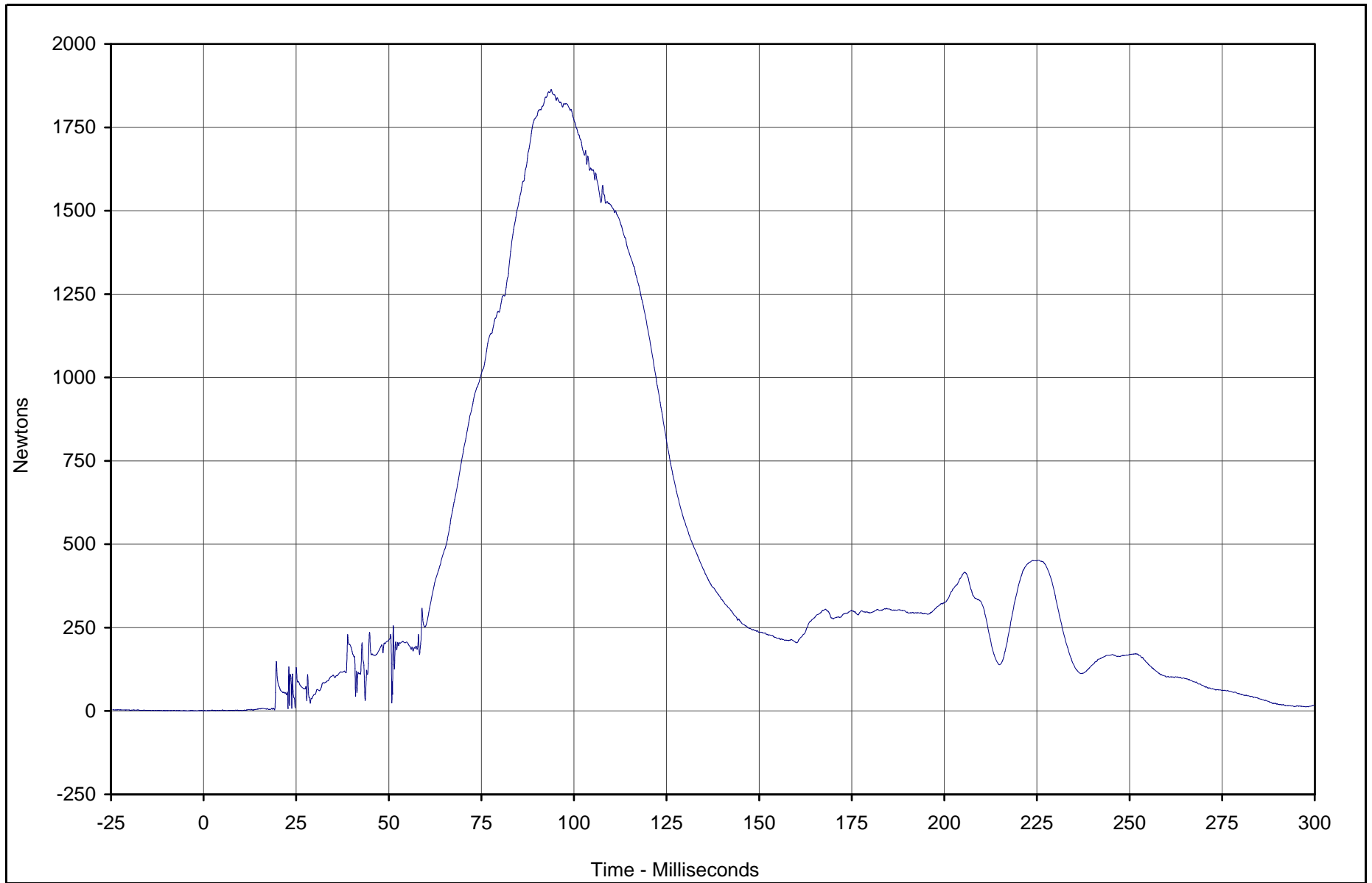


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Force Res.	137	RES	Newtons	1863.2	93.9	0.6	0.6	1000

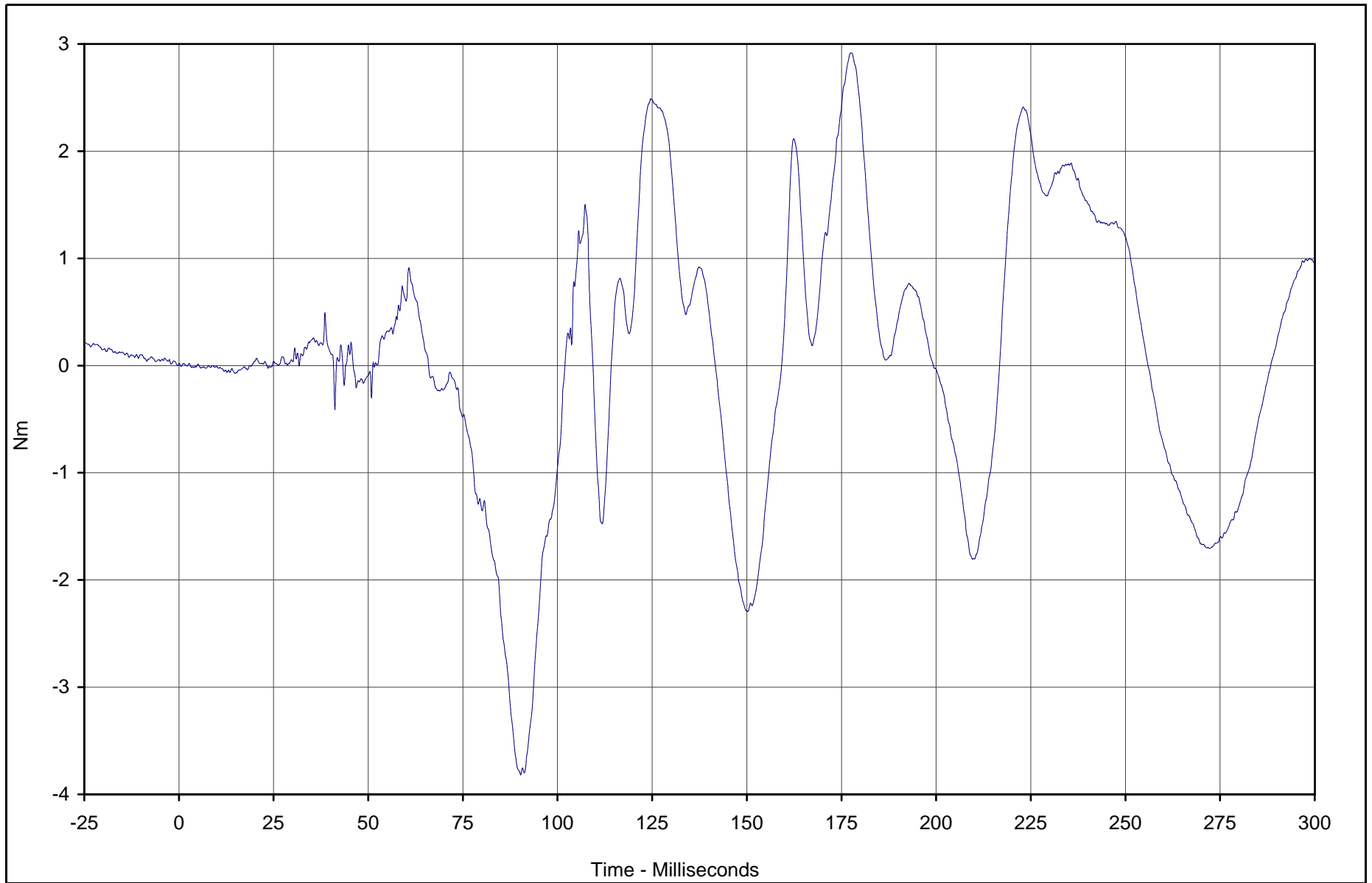


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Moment X	140	FIL	Nm	2.9	177.4	-3.8	90.3	600



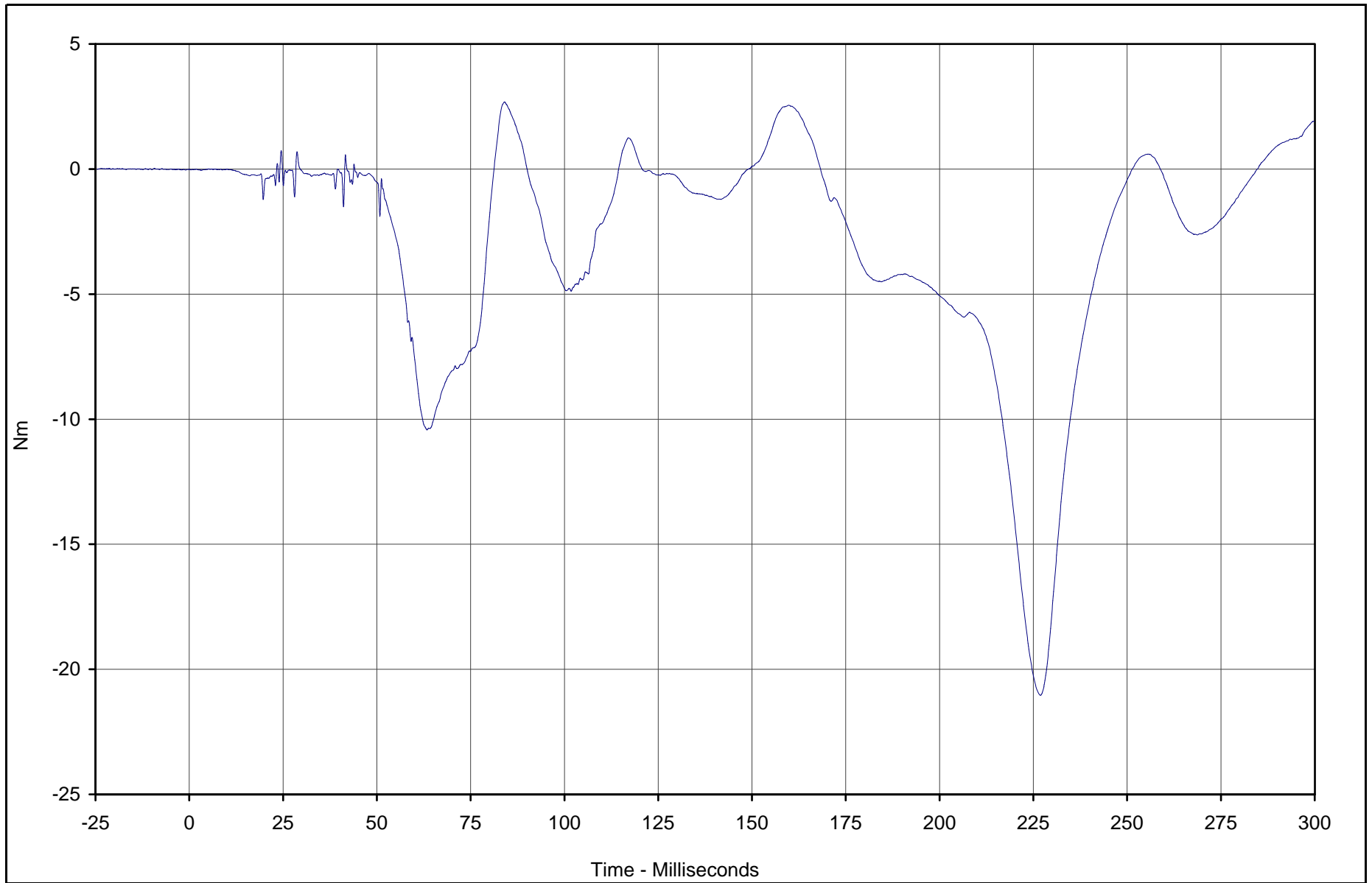
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-10



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Moment Y	141	FIL	Nm	2.7	84.0	-21.0	226.9	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

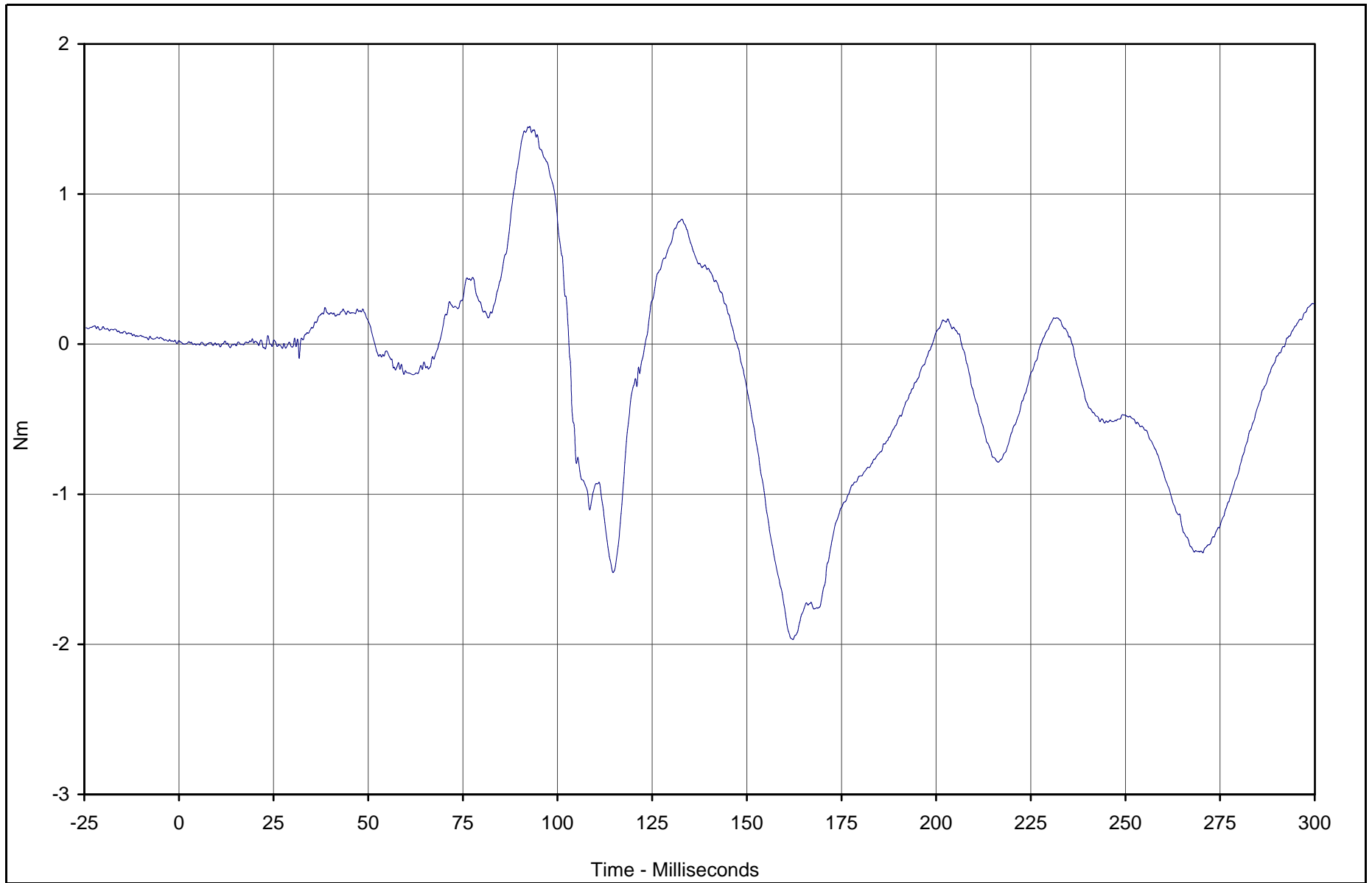
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-11



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Moment Z	142	FIL	Nm	1.5	92.7	-2.0	162.2	600



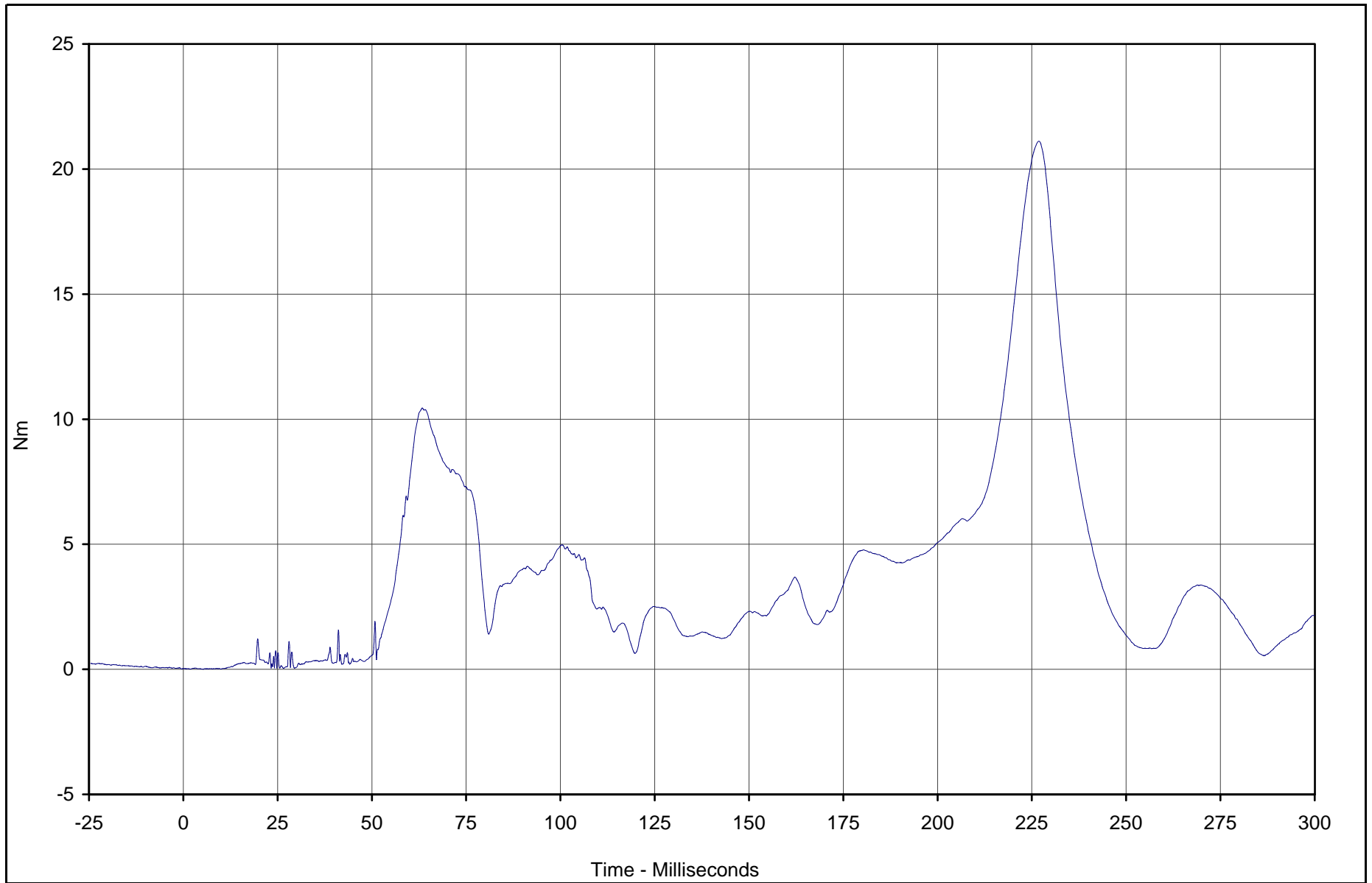
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Upper Neck Mom Res.	140	RES	Nm	21.1	226.9	0.0	5.3	600

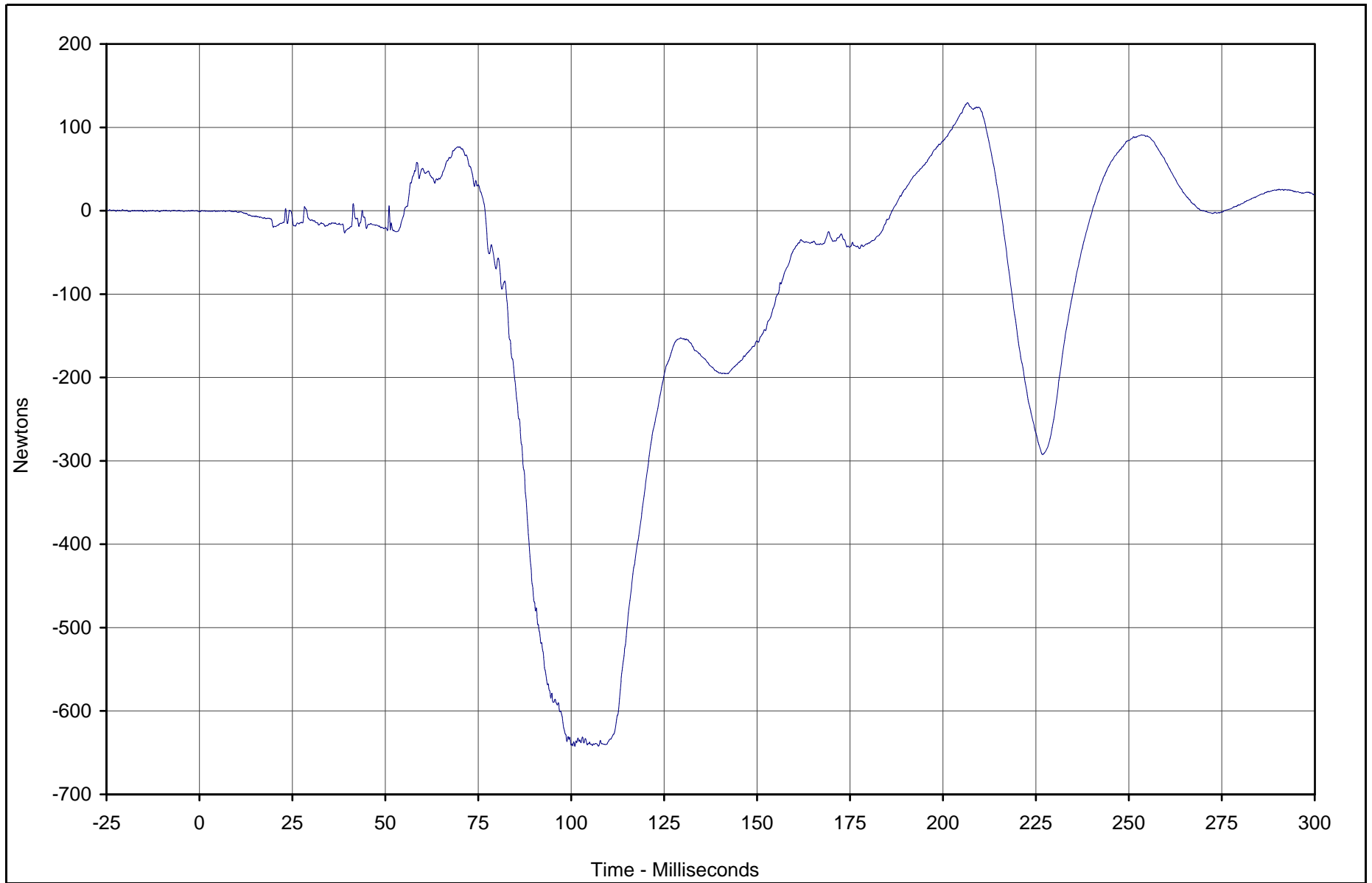


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Force X	143	FIL	Newtons	129.5	206.6	-642.3	101.0	1000

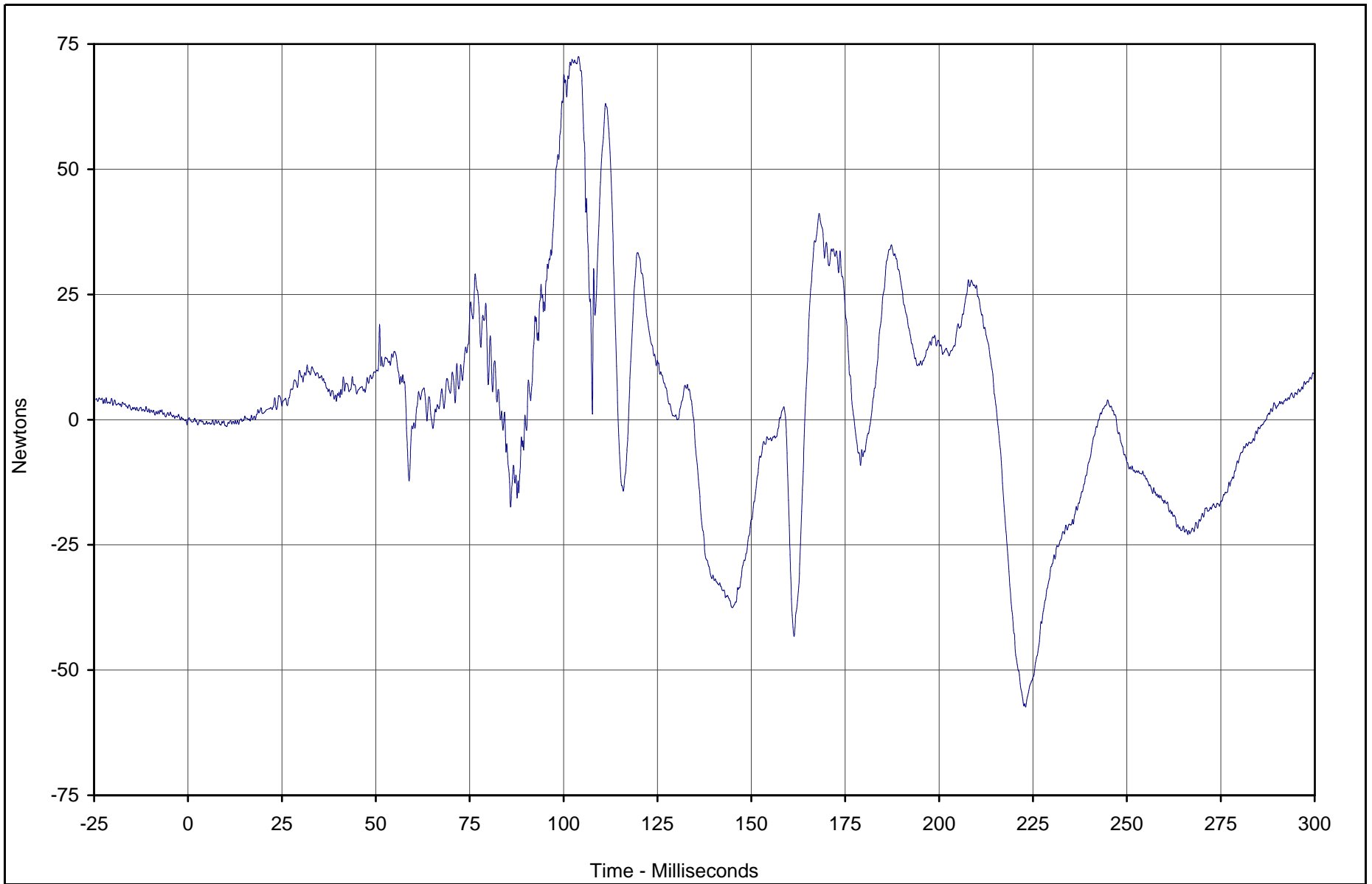


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Force Y	144	FIL	Newtons	72.5	104.0	-57.4	223.0	1000

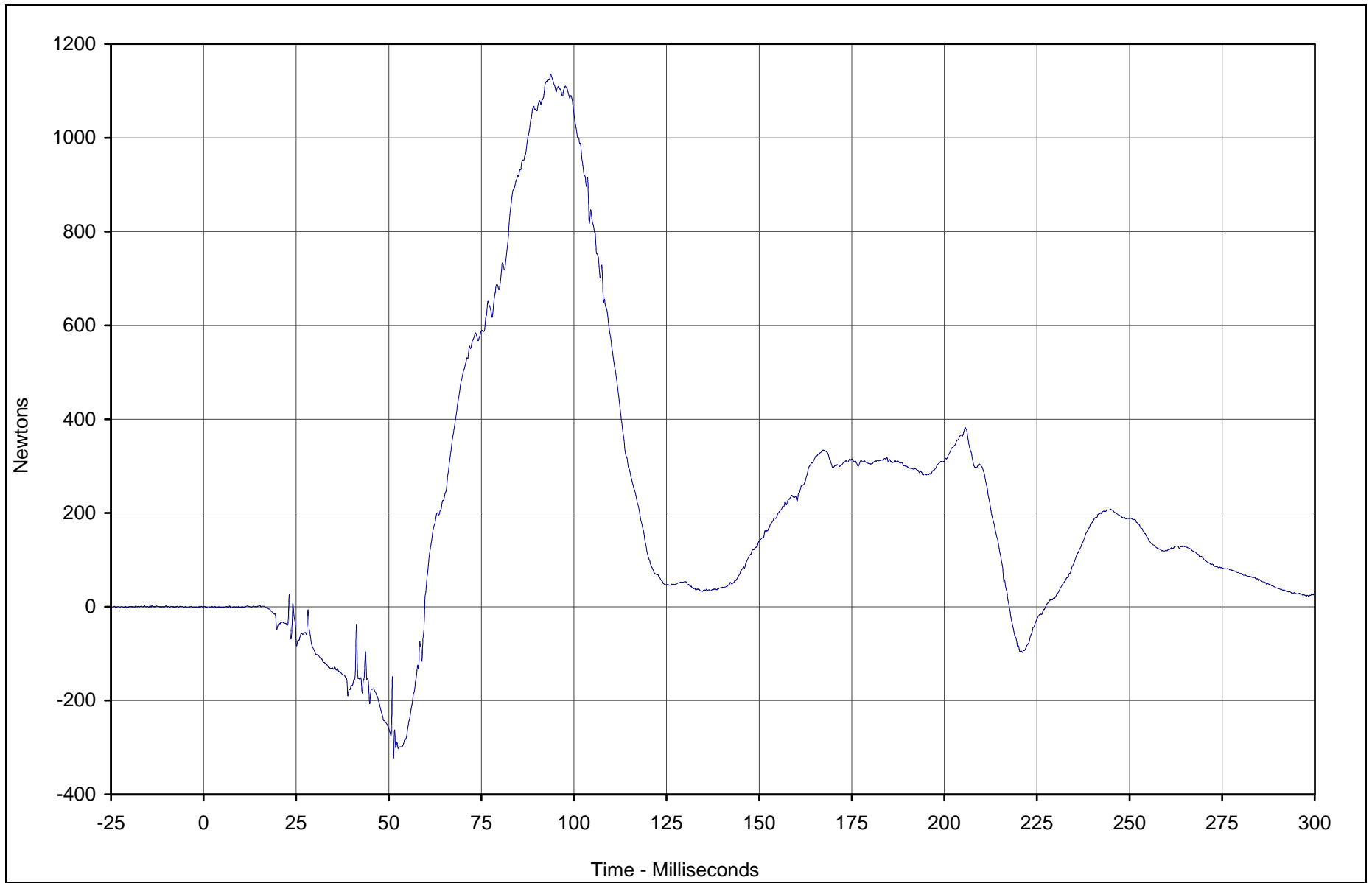


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Force Z	145	FIL	Newtons	1136.0	93.7	-322.5	51.3	1000

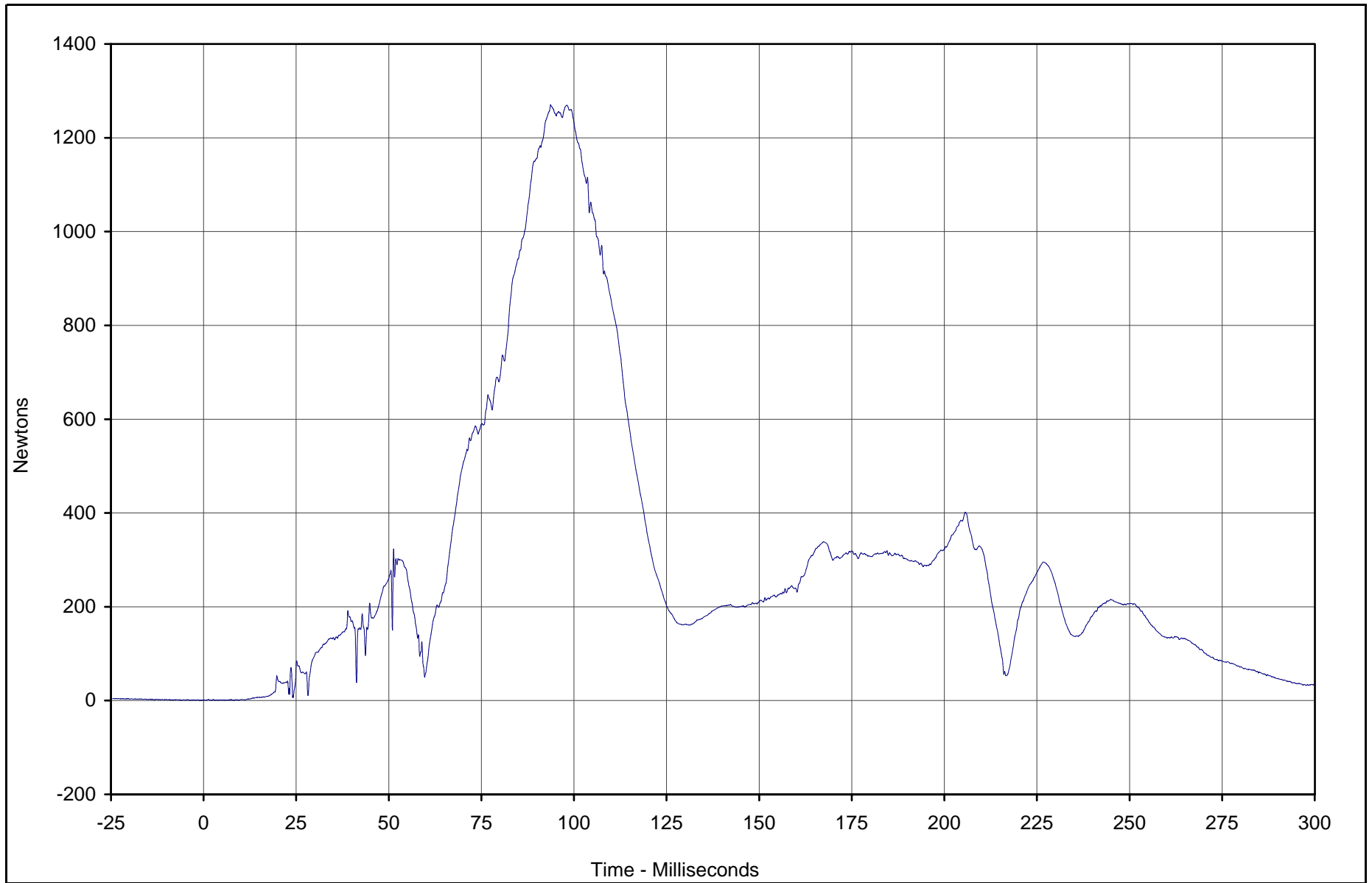


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Force Res.	143	RES	Newtons	1270.5	93.7	0.4	8.2	1000

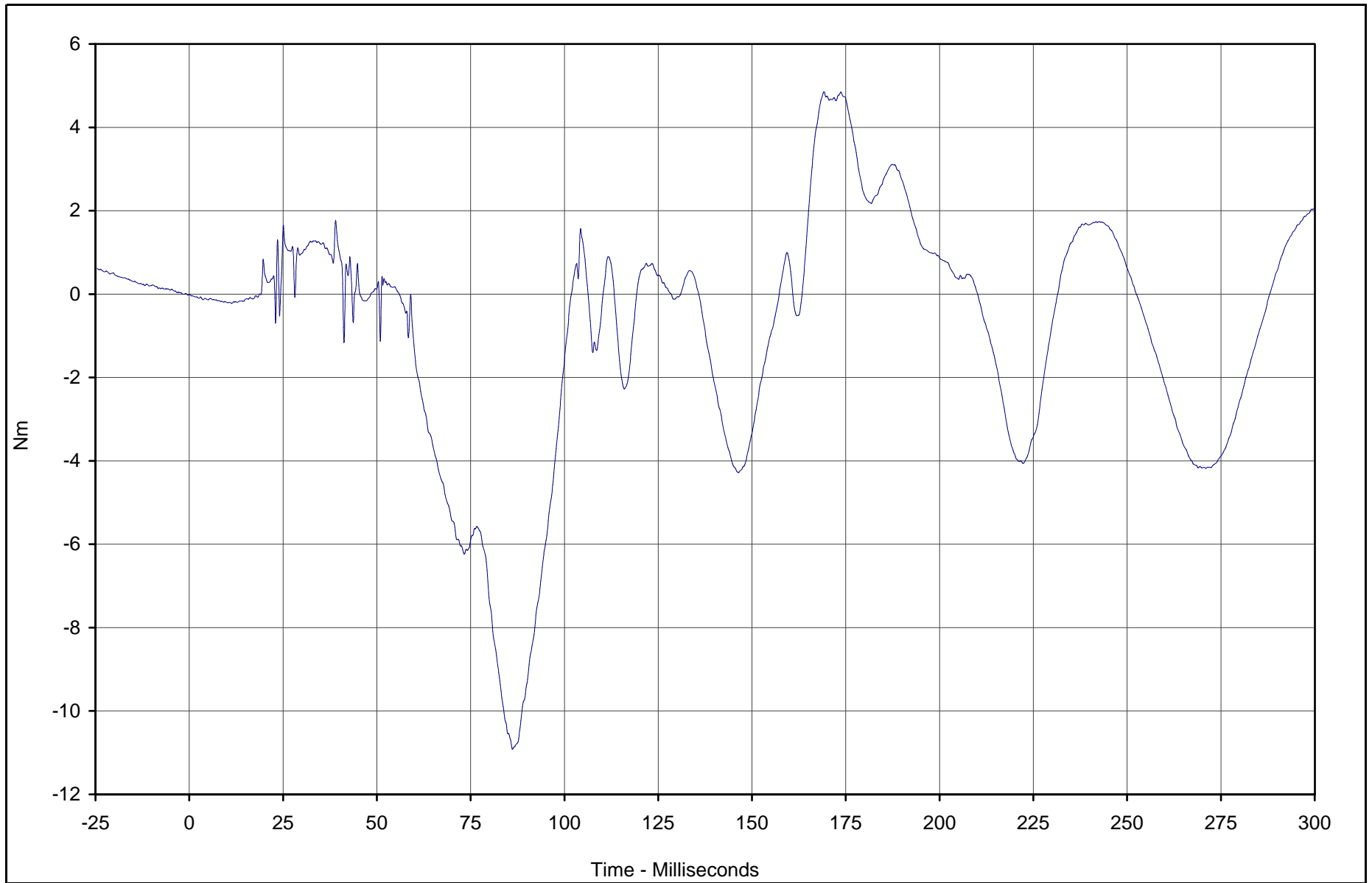


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Moment X	146	FIL	Nm	4.9	169.2	-10.9	86.2	600



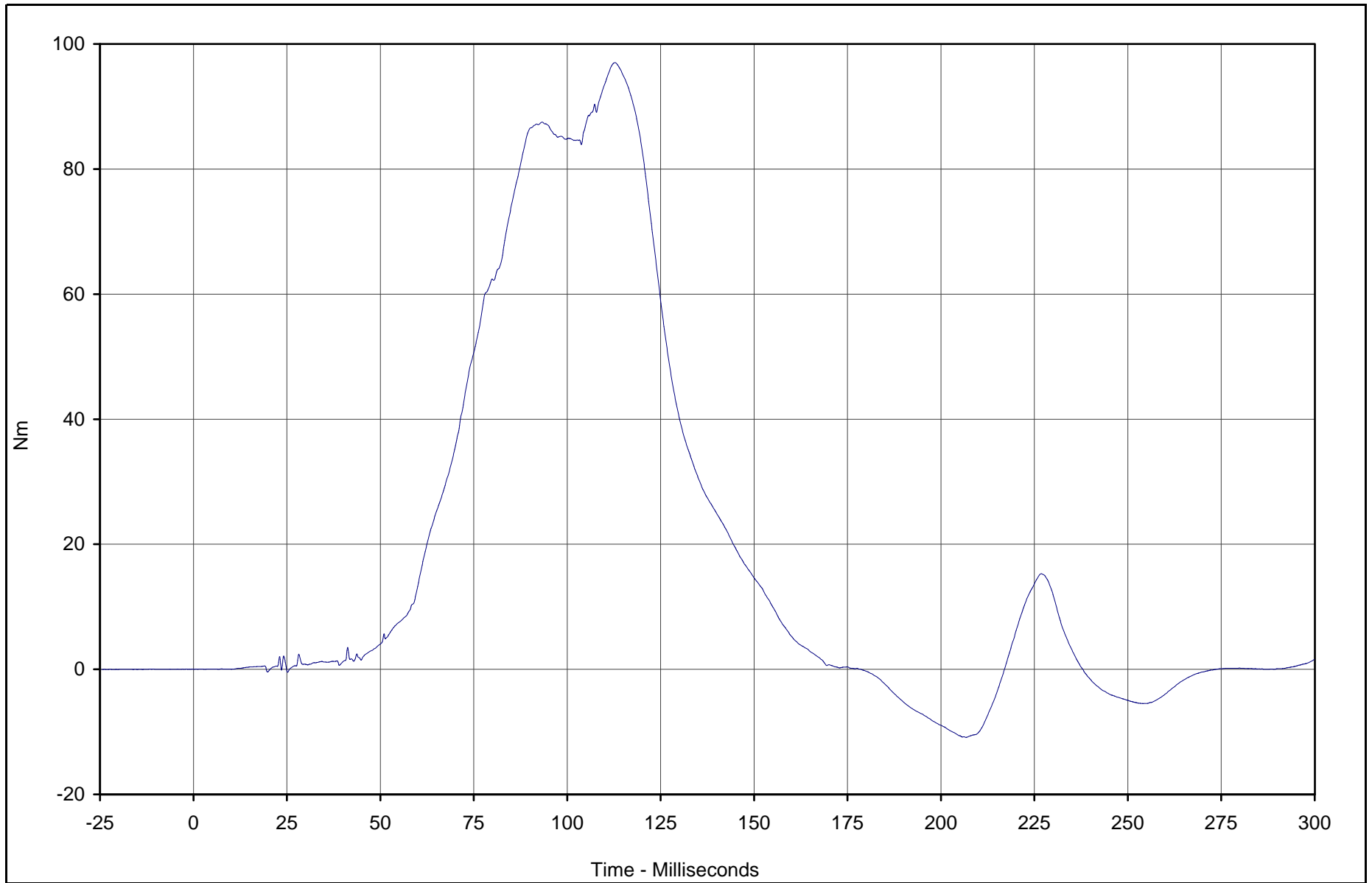
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-18



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Moment Y	147	FIL	Nm	97.0	112.8	-10.9	206.7	600



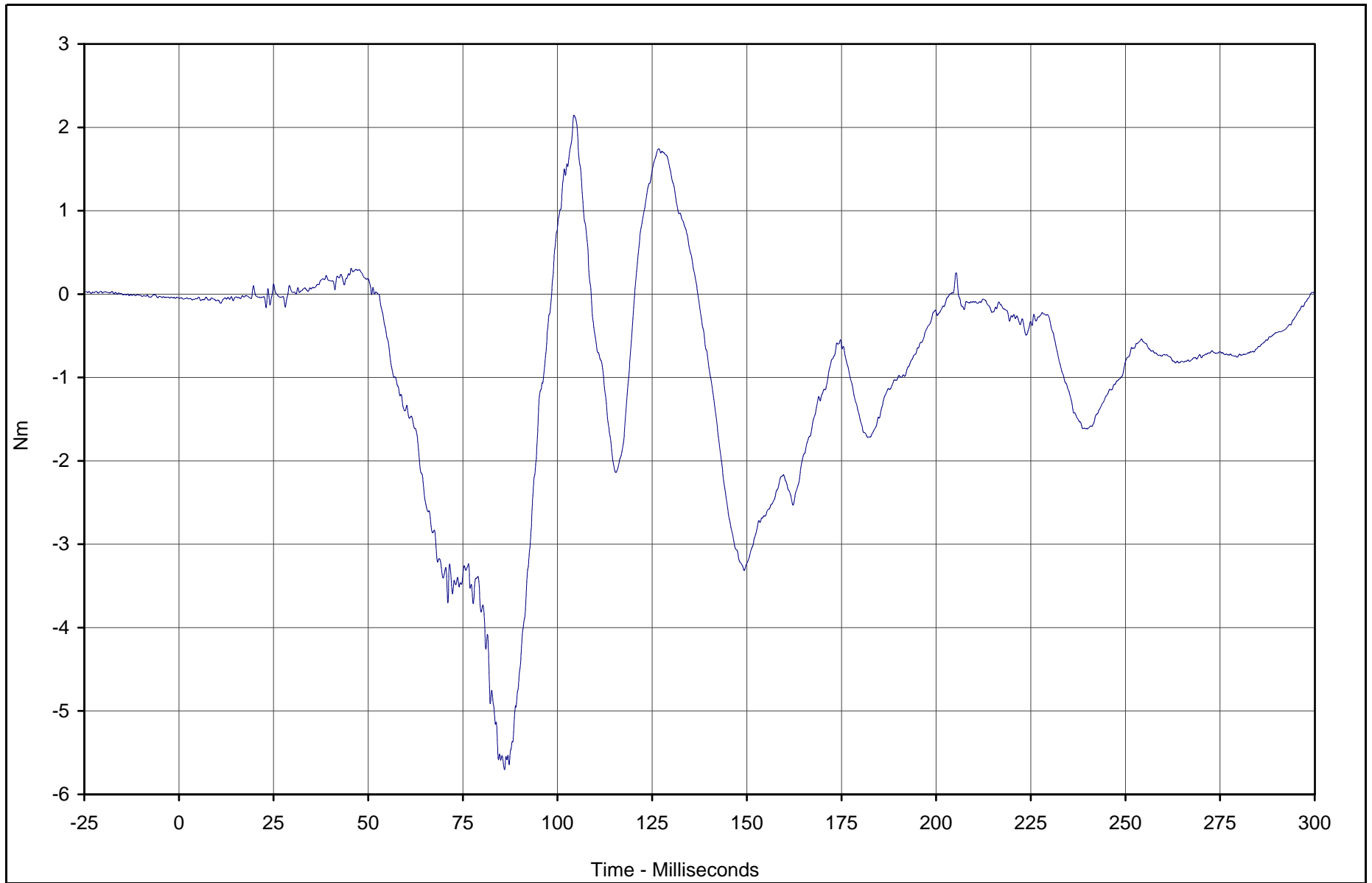
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Moment Z	148	FIL	Nm	2.1	104.4	-5.7	86.0	600



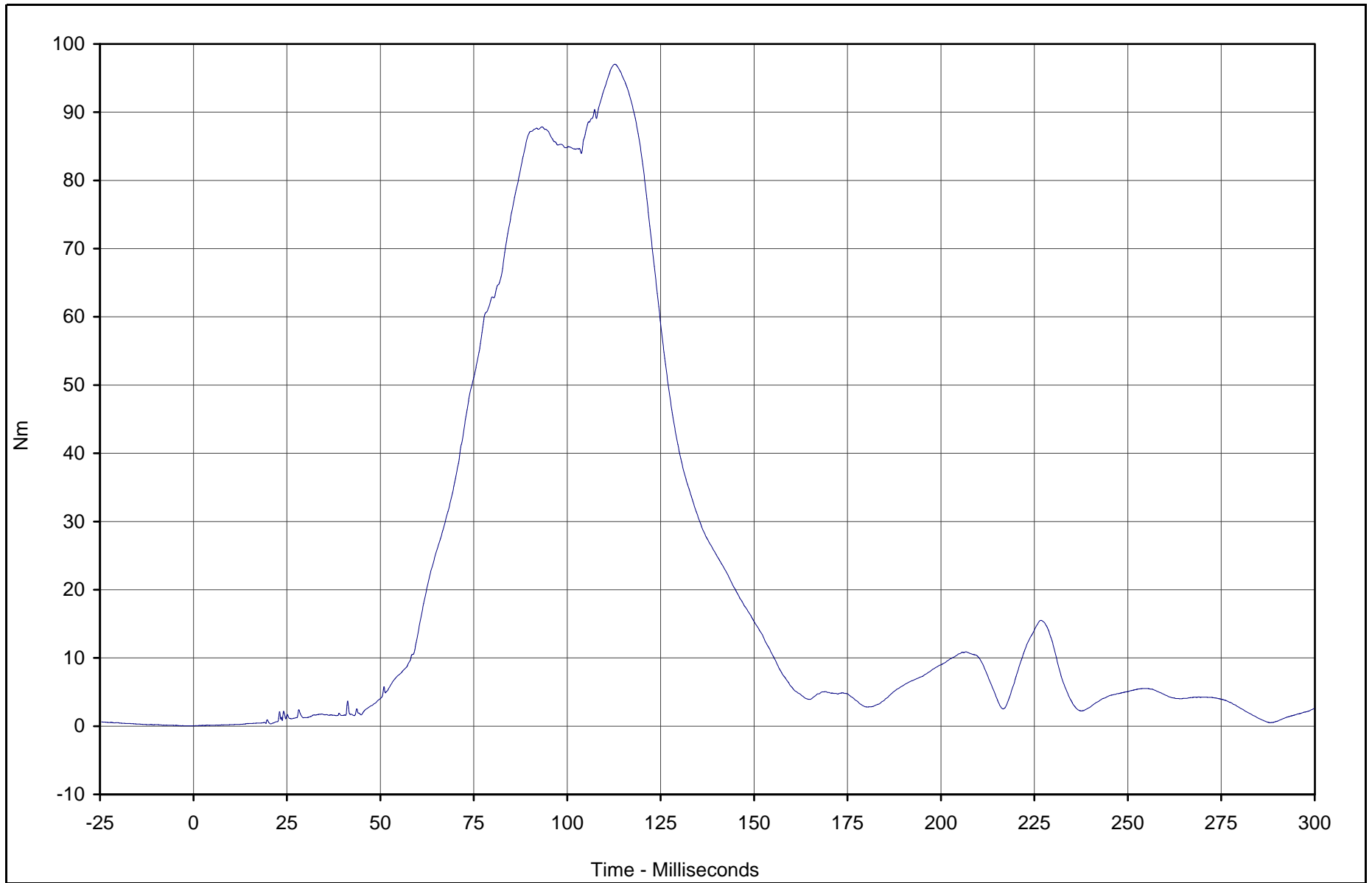
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-20



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Lower Neck Mom Res.	146	RES	Nm	97.0	112.8	0.0	0.0	600



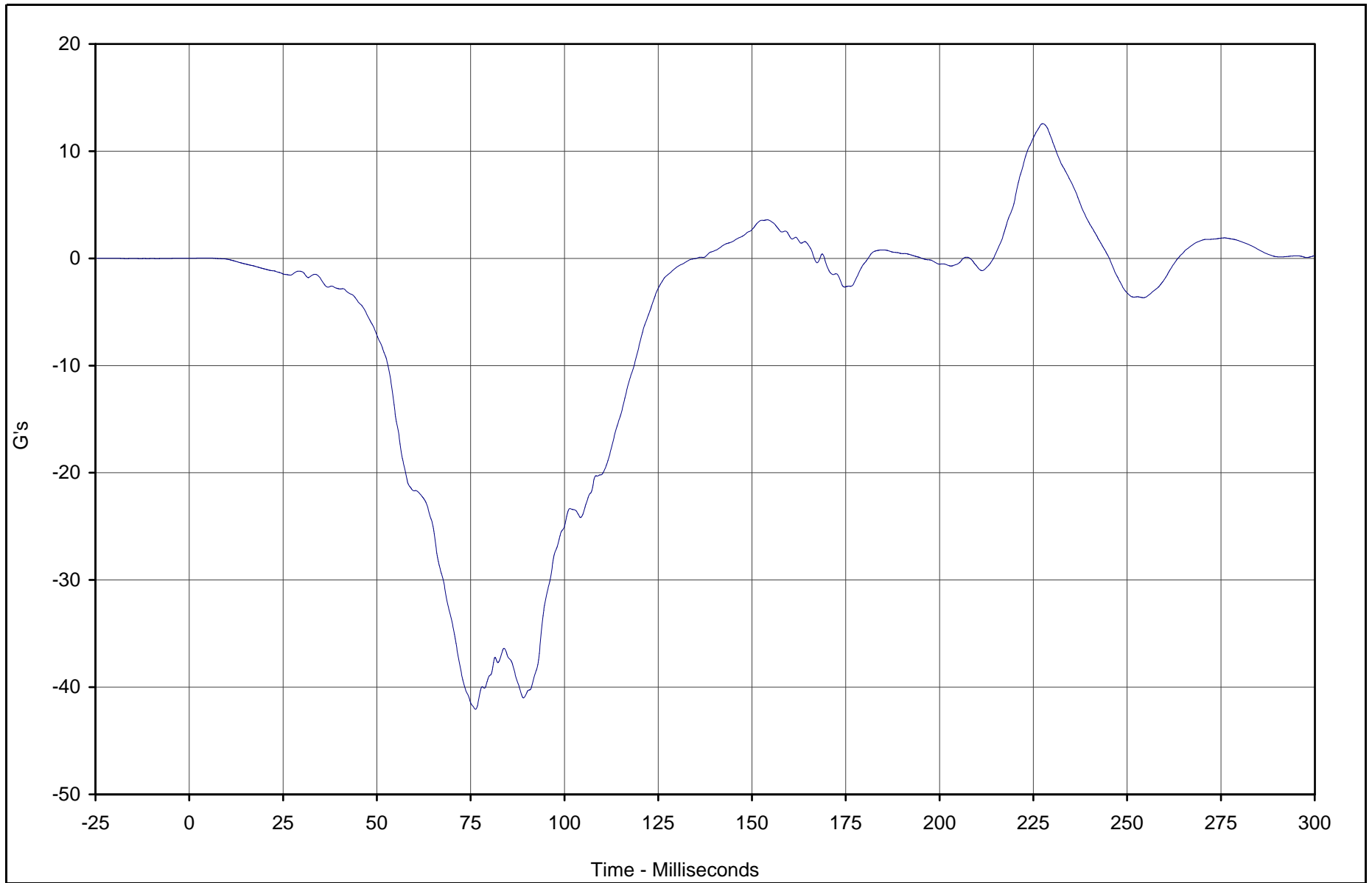
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Chest X	149	FIL	G's	12.6	227.5	-42.1	76.3	180



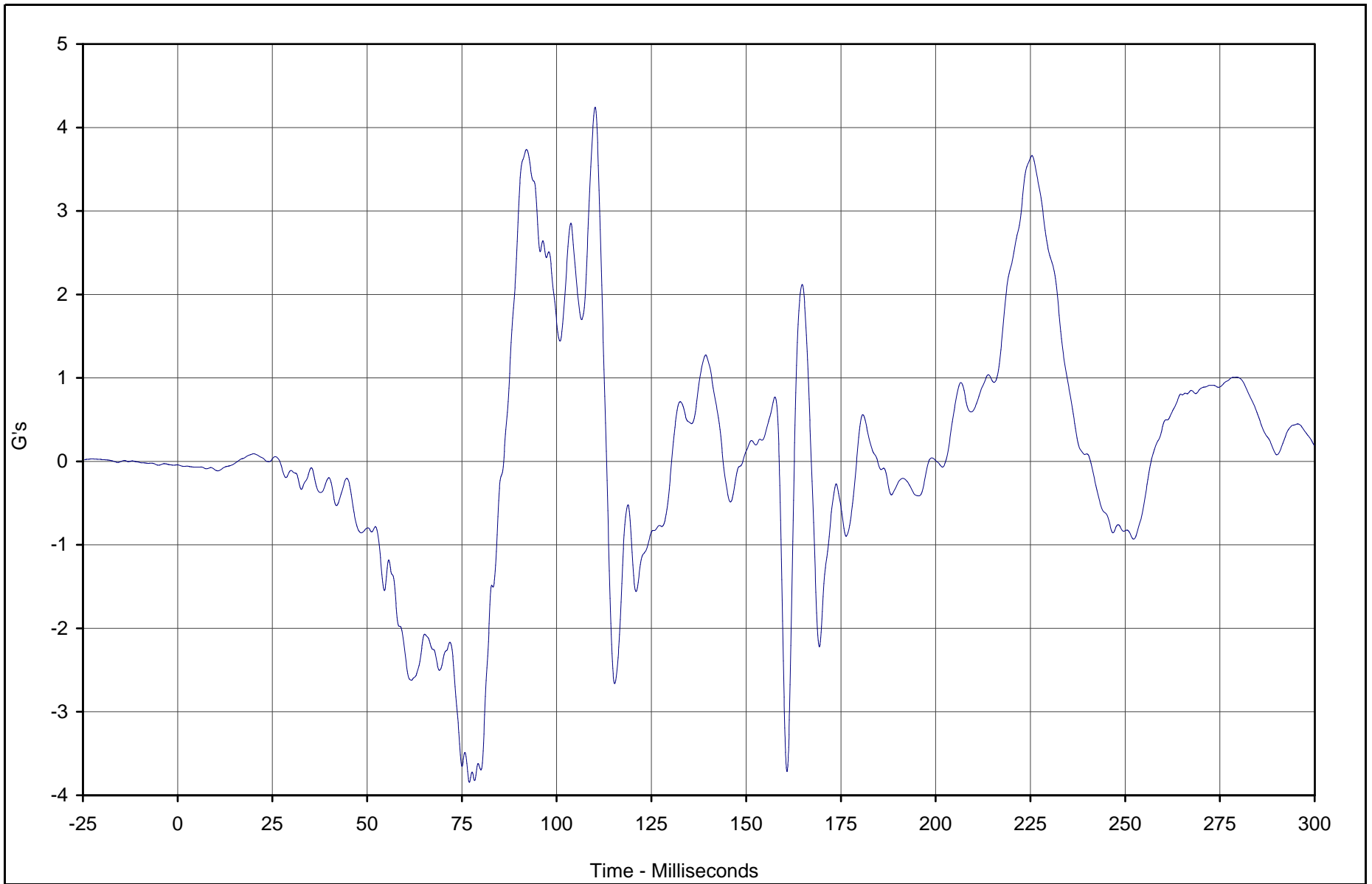
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-22



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Chest Y	150	FIL	G's	4.2	110.2	-3.8	77.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

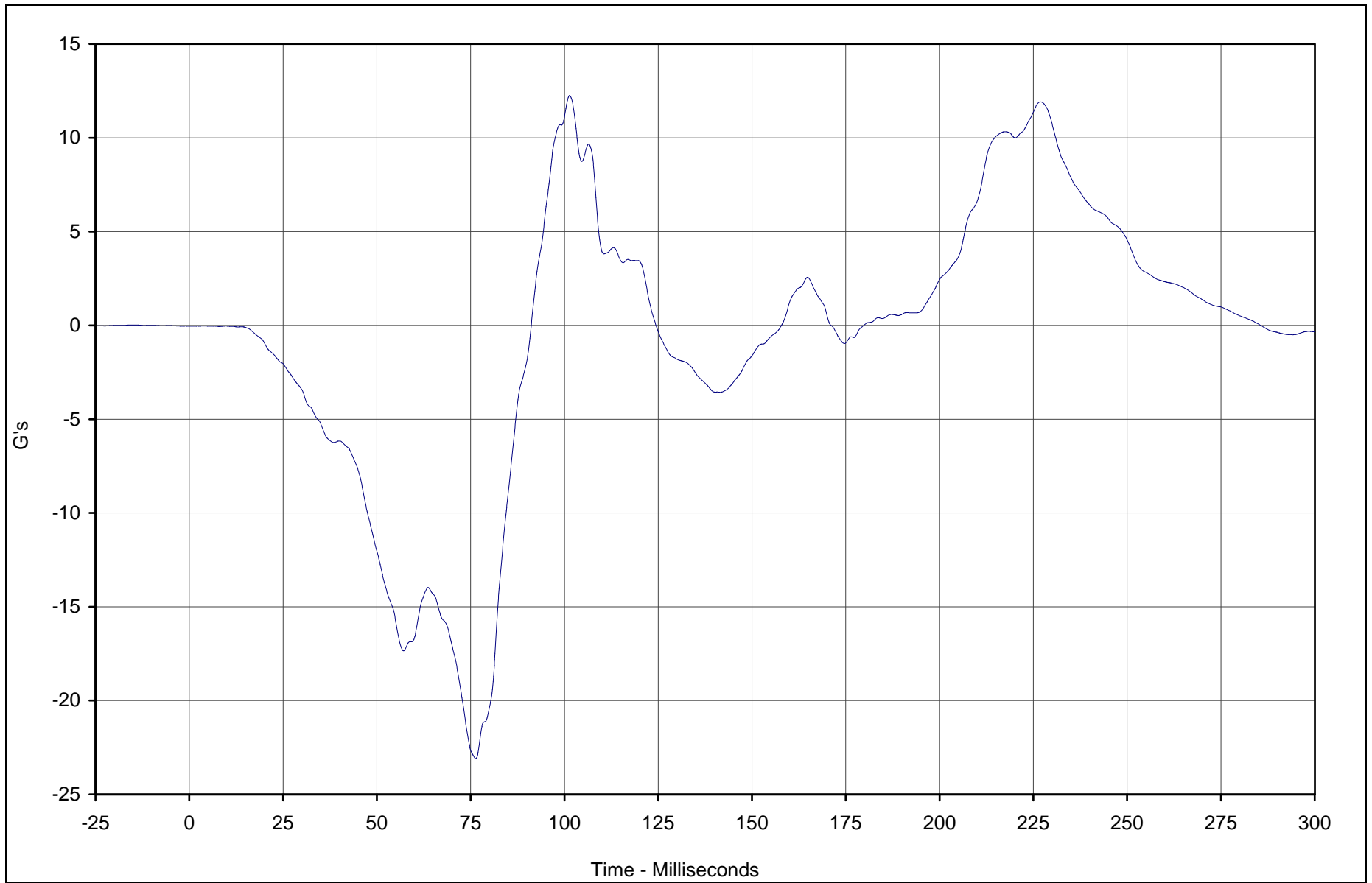
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-23



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Chest Z	151	FIL	G's	12.2	101.4	-23.1	76.4	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

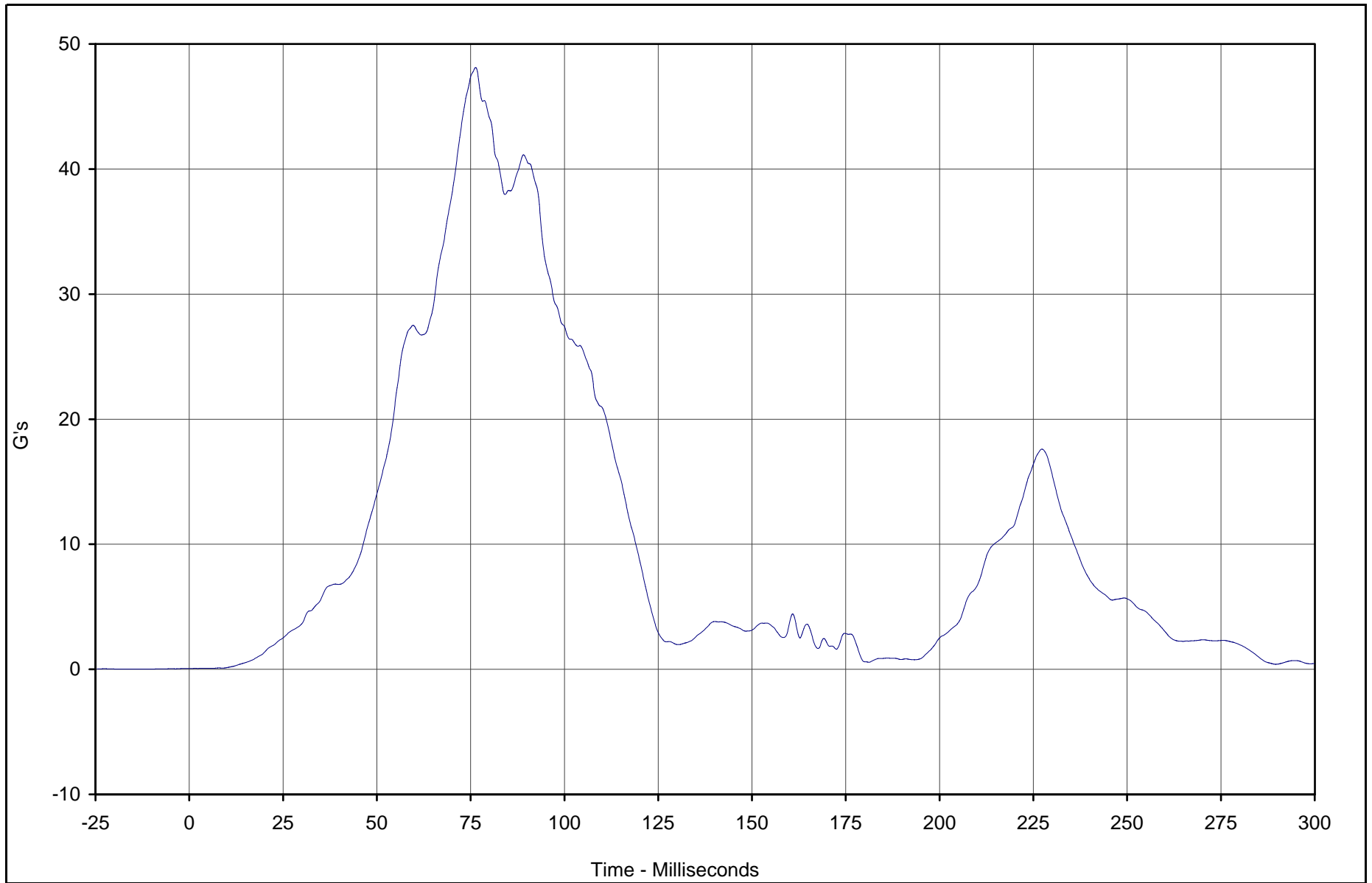
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-24



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Chest Resultant	149	RES	G's	48.1	76.3	0.1	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

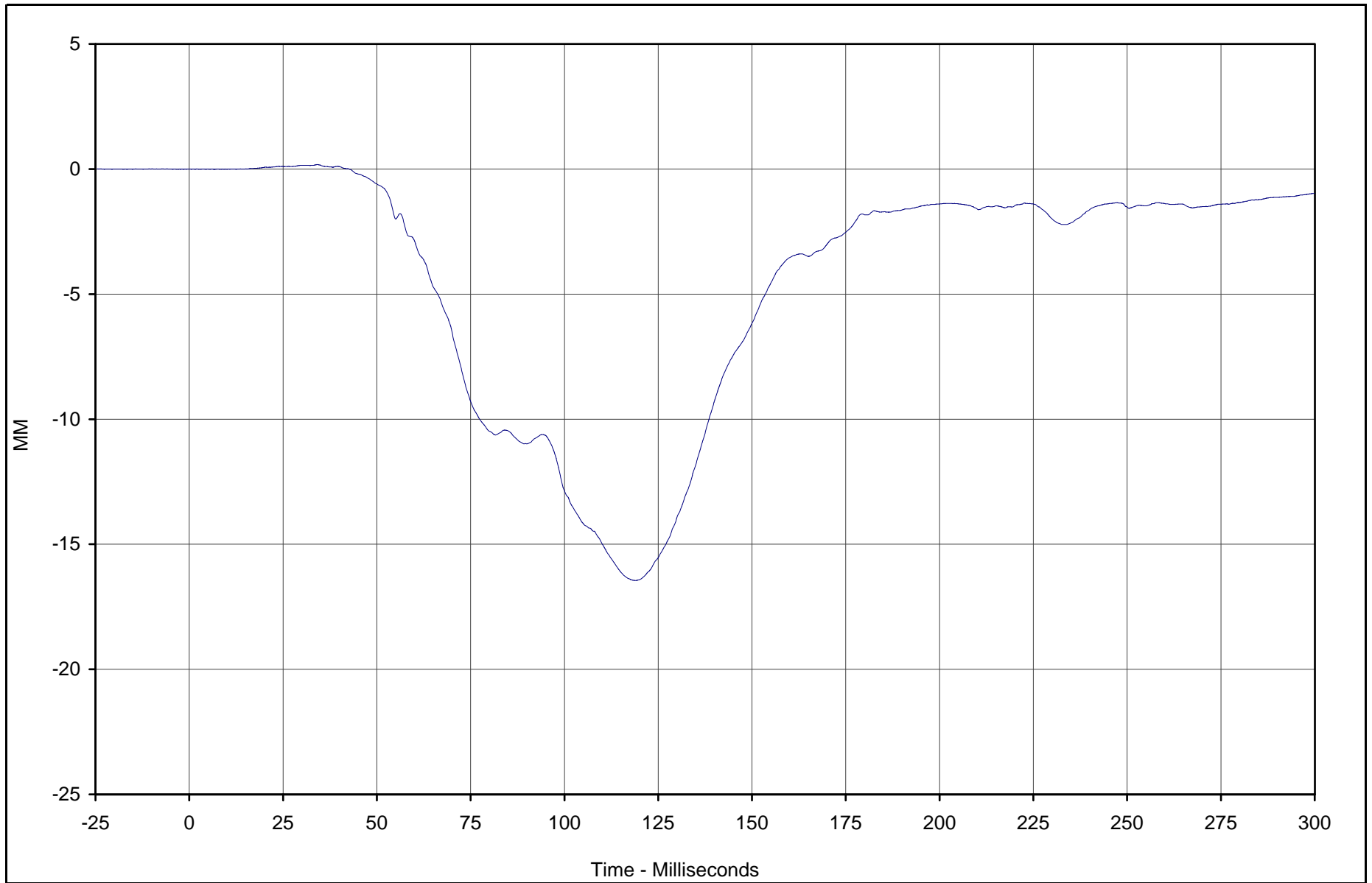
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-25



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Chest Deflection	152	FIL	MM	0.2	34.2	-16.4	119.0	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

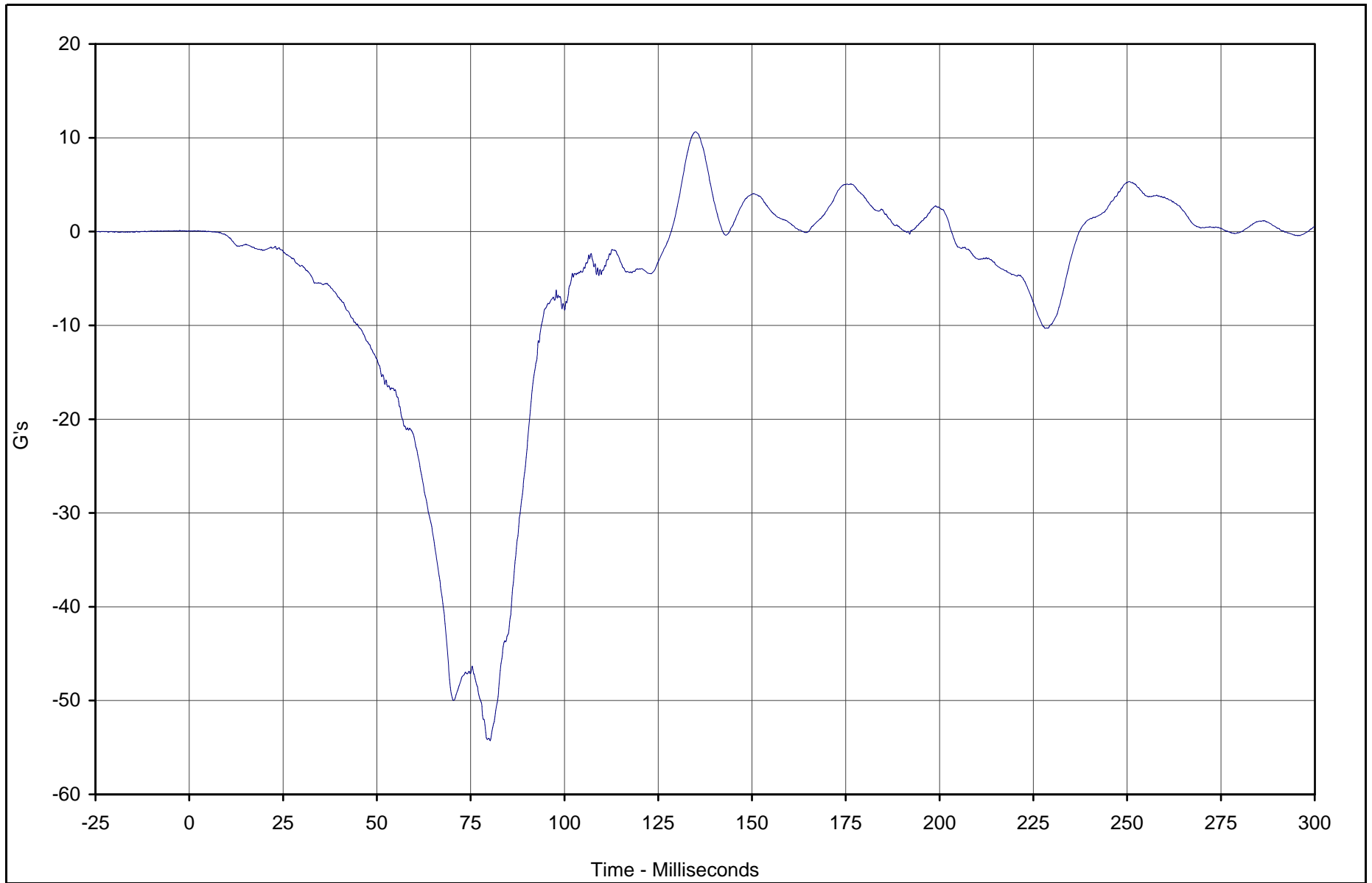
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-26



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Pelvis X	153	FIL	G's	10.6	134.9	-54.3	80.2	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

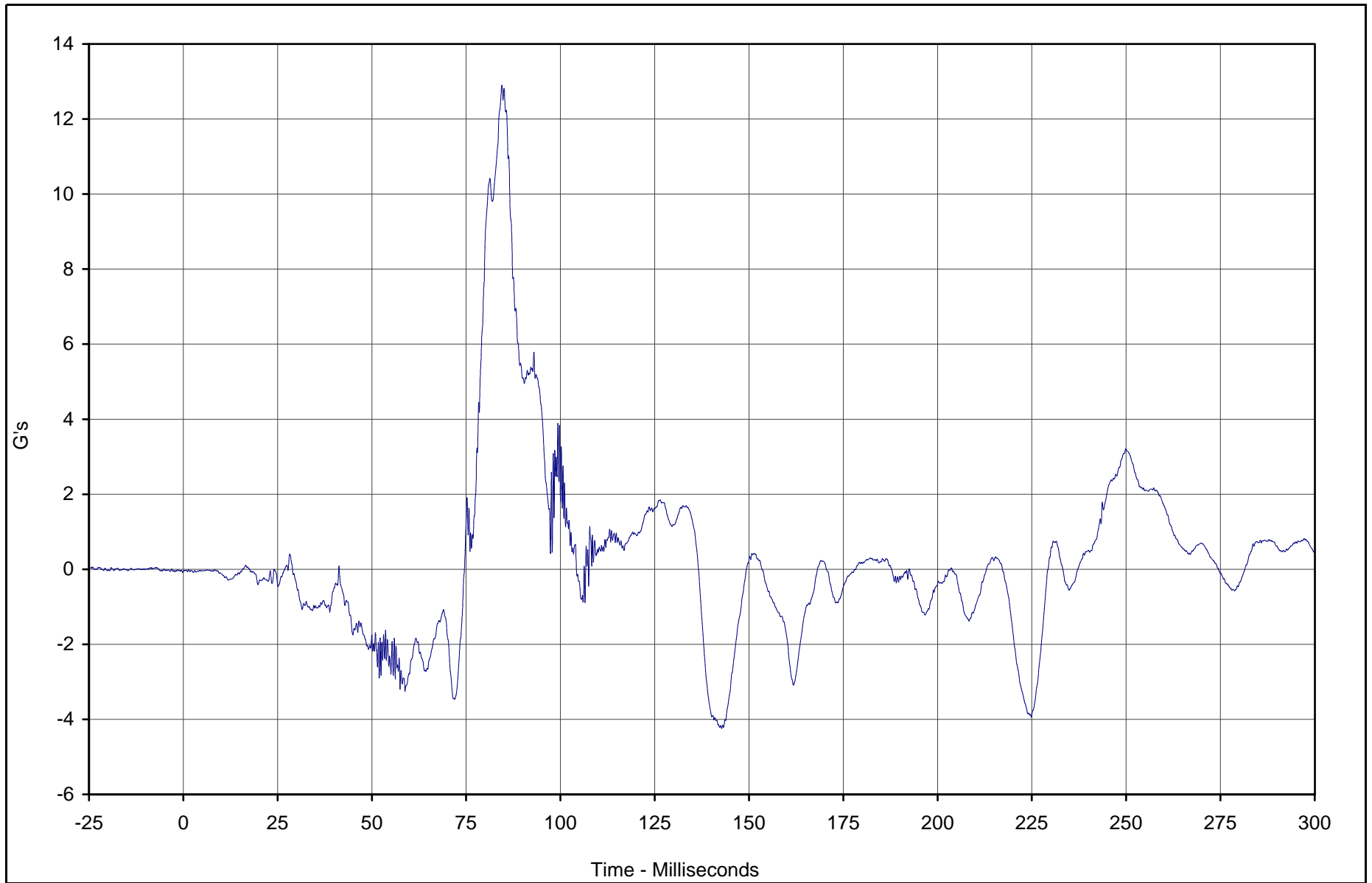
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-27



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Pelvis Y	154	FIL	G's	12.9	84.5	-4.2	142.7	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

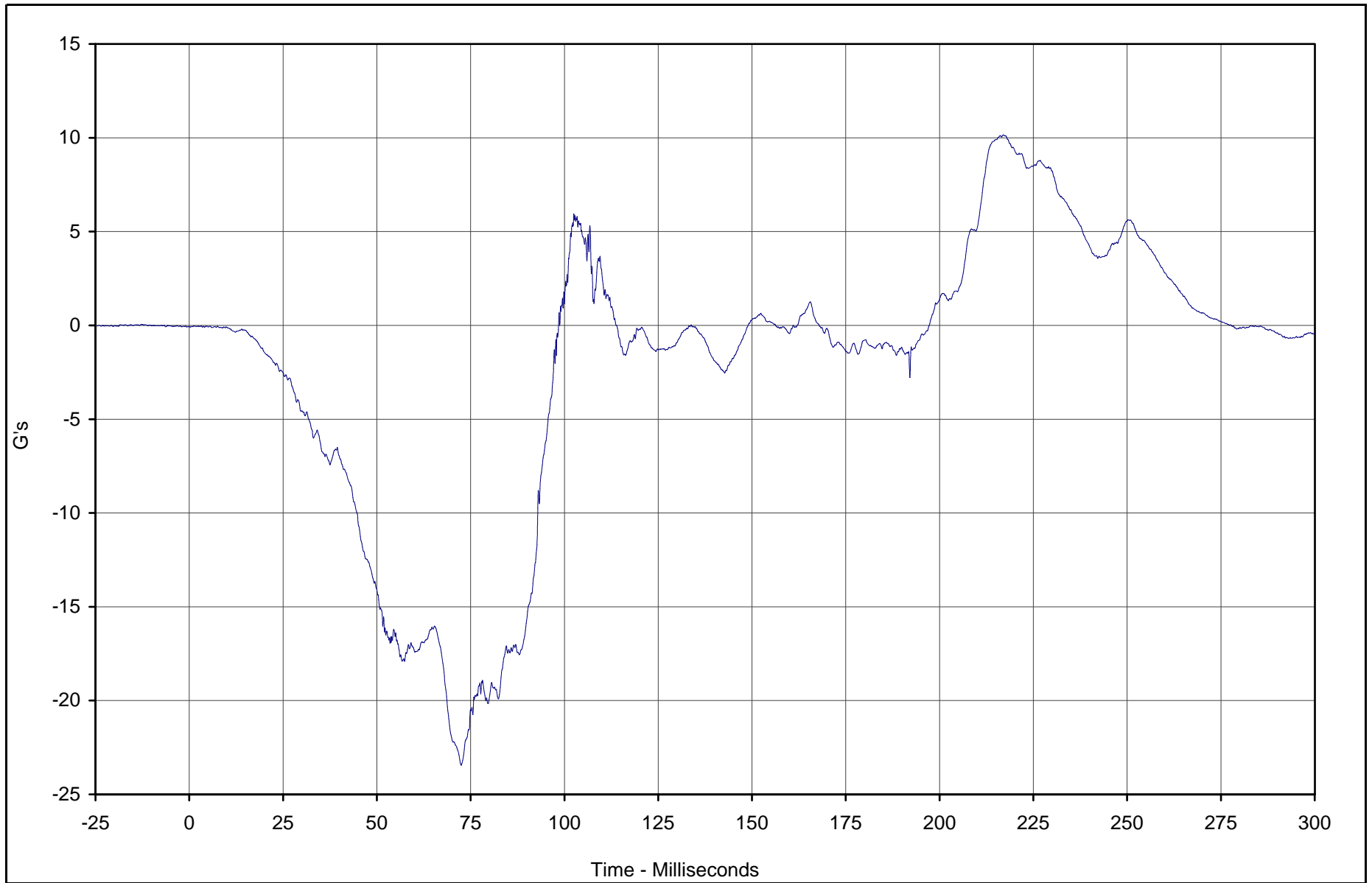
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-28



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Pelvis Z	155	FIL	G's	10.2	217.1	-23.4	72.5	1000



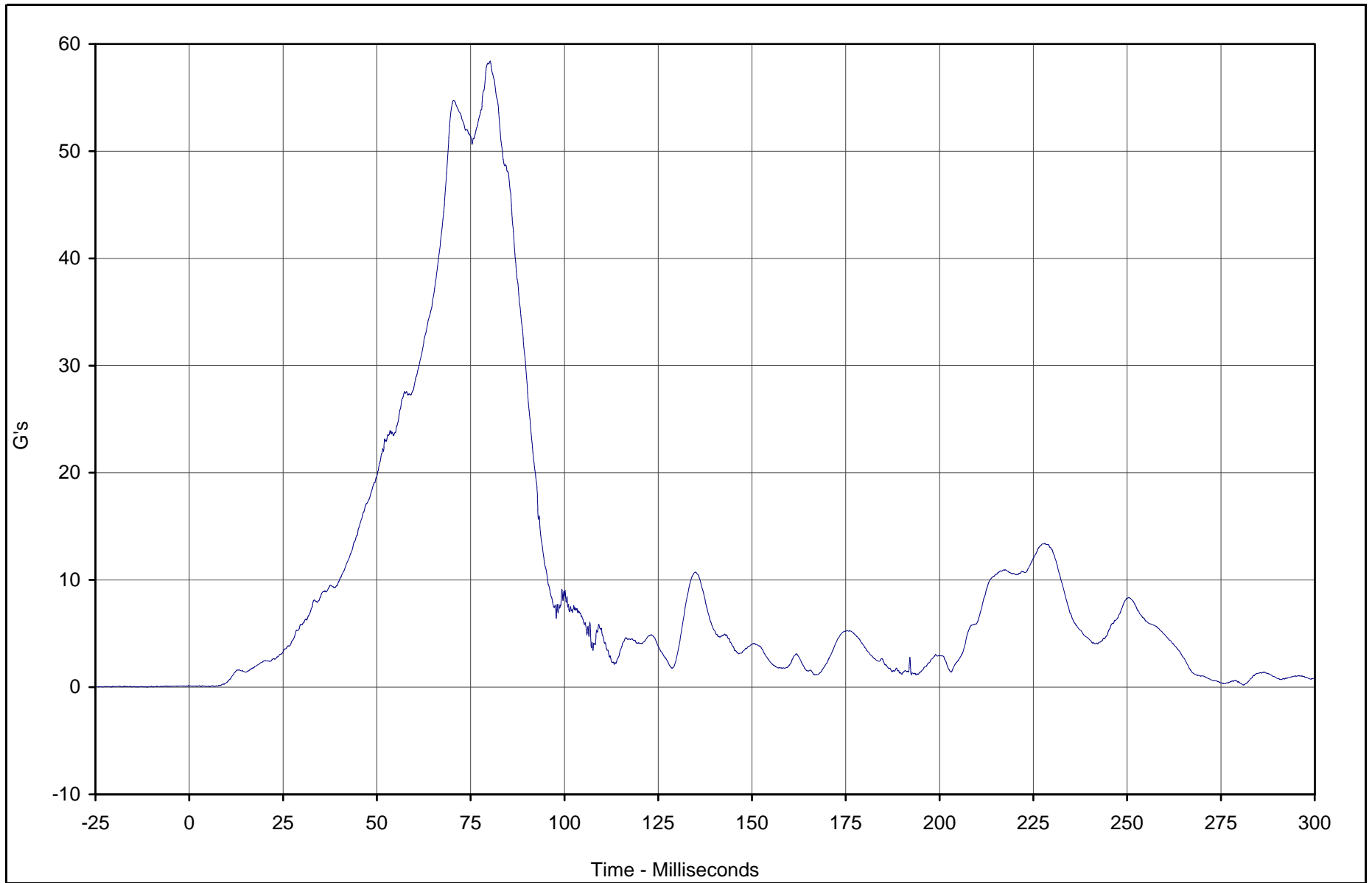
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Pelvis Resultant	153	RES	G's	58.4	80.2	0.1	4.7	1000

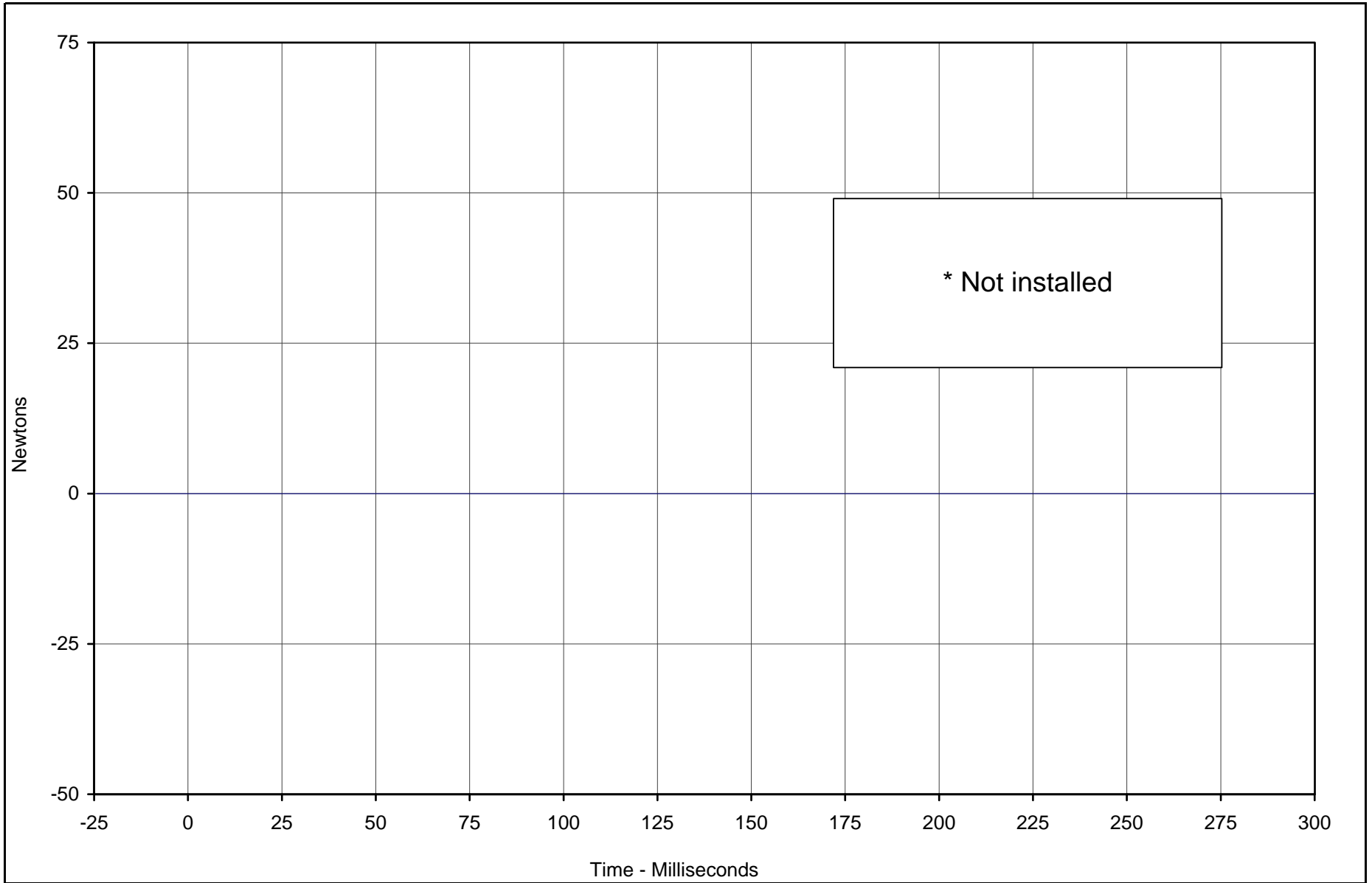


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Seat Tether Load	156	FIL	Newtons	0.0	0.0	0.0	0.0	60

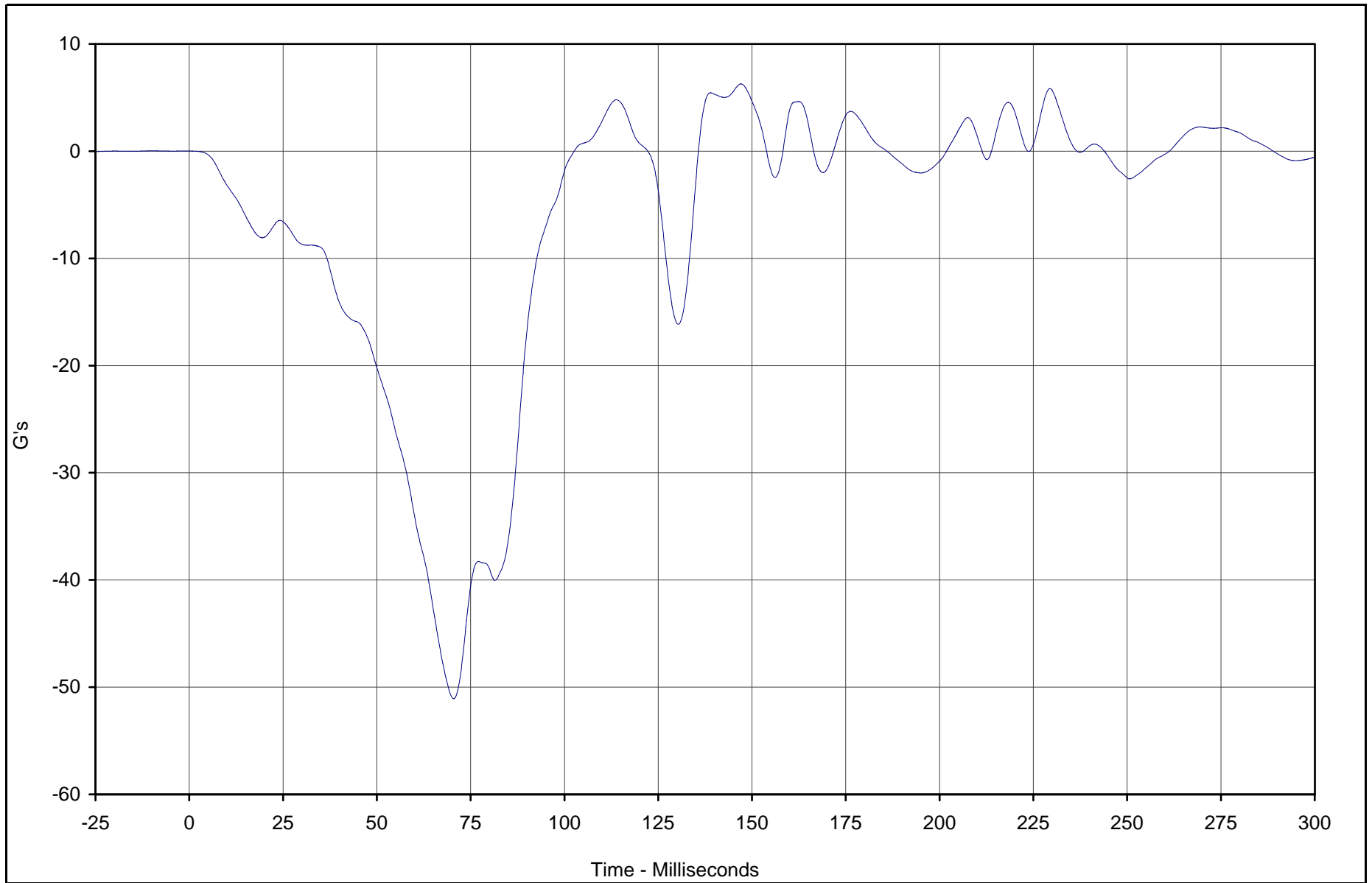


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Car Seat X	157	FIL	G's	6.3	147.0	-51.1	70.5	60

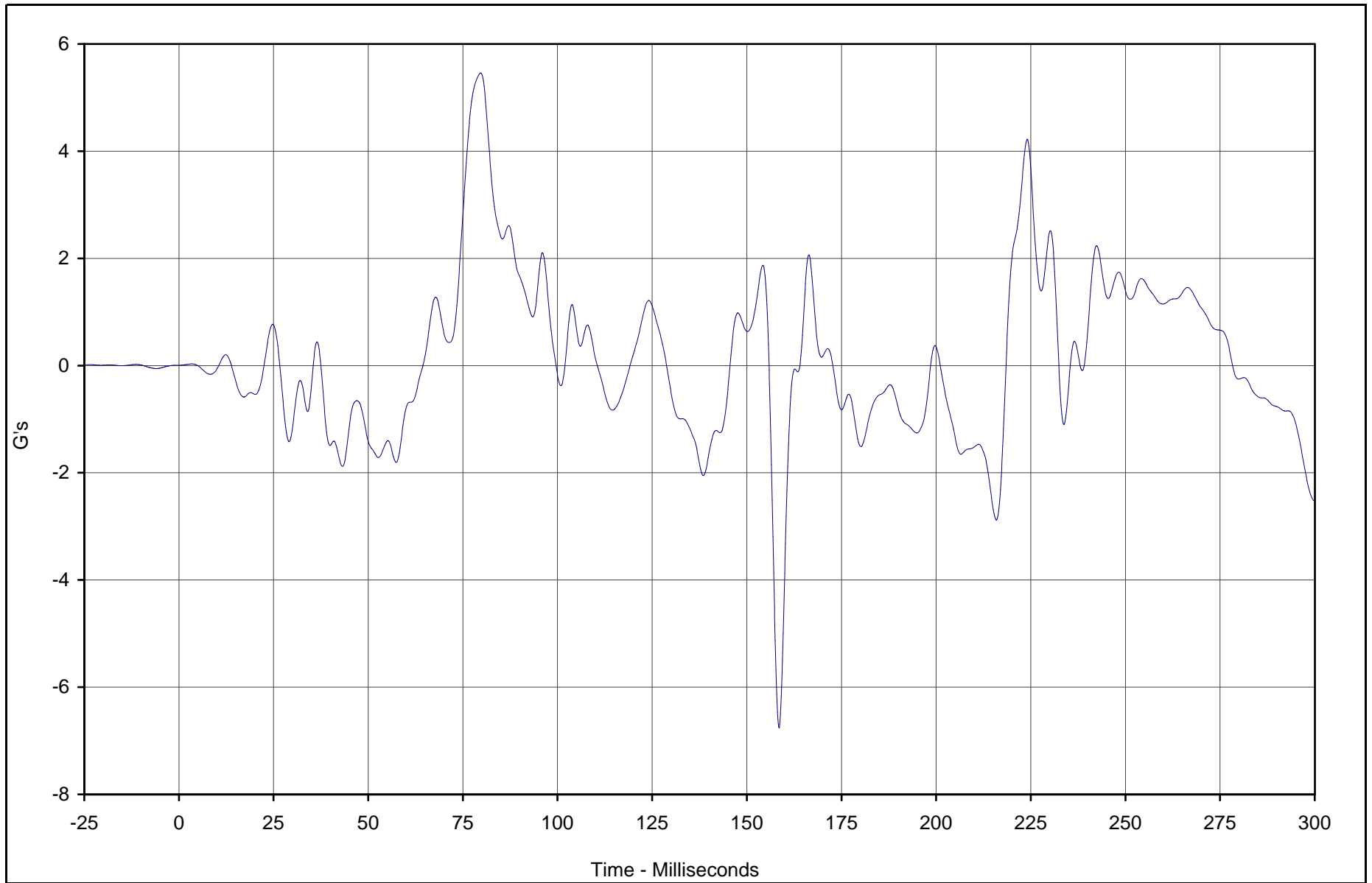


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Car Seat Y	158	FIL	G's	5.5	79.7	-6.8	158.5	60

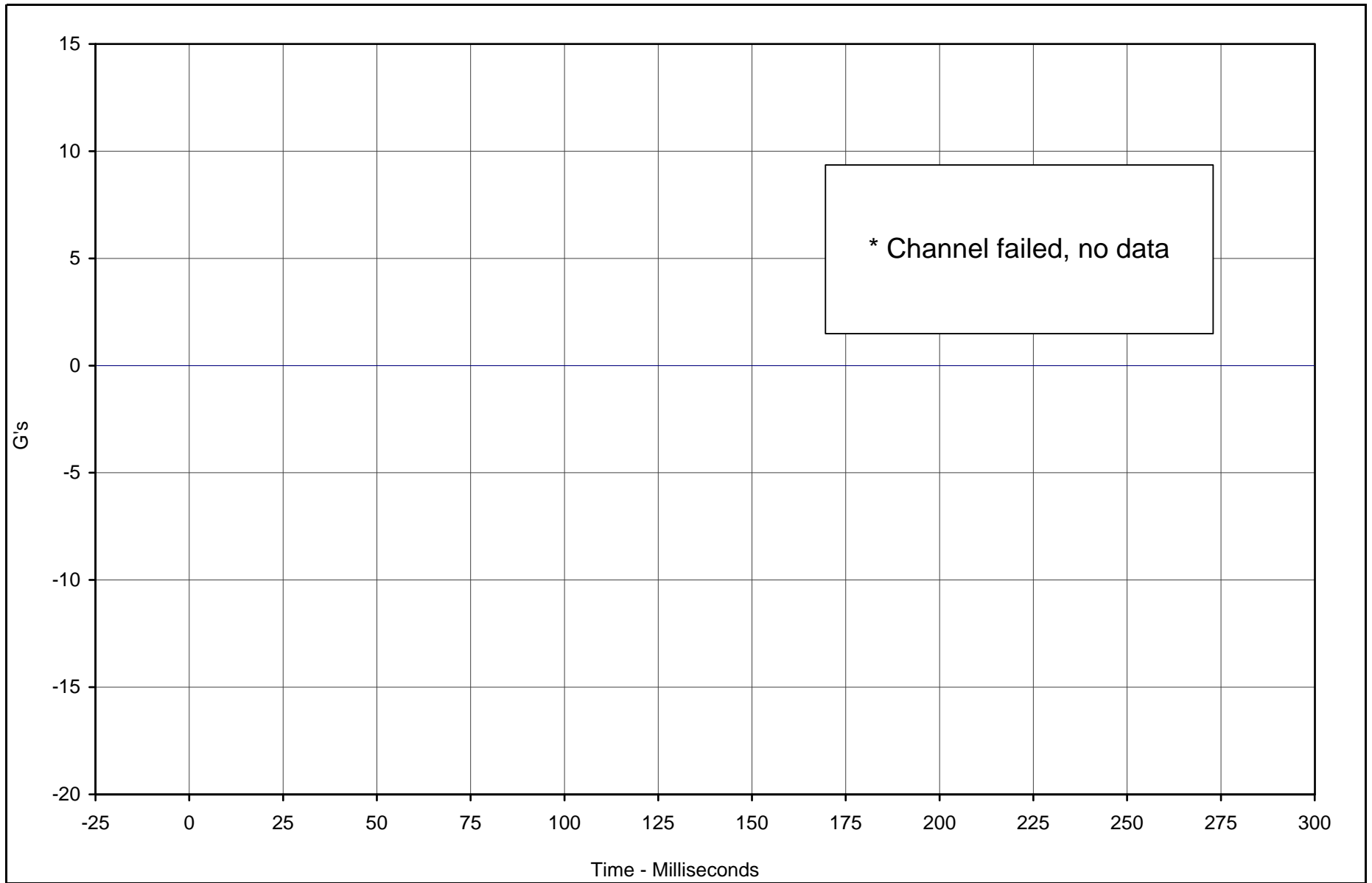


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Channel failed, no data

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Car Seat Z	159	FIL	G's	0.0	0.0	0.0	0.0	60

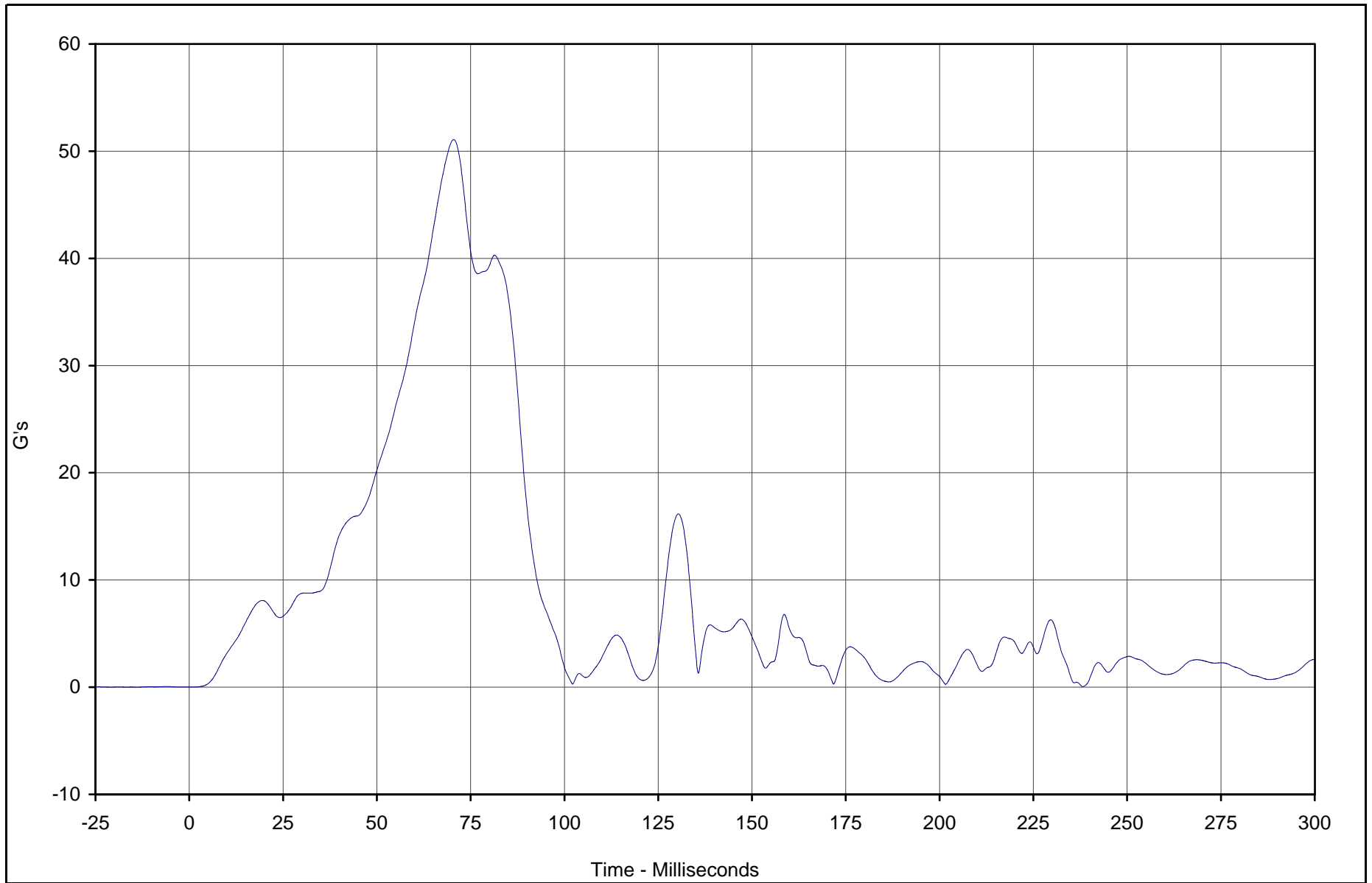


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Right Rear (3 Yr.) Car Seat Resultant	157	RES	G's	51.1	70.5	0.0	1.0	60



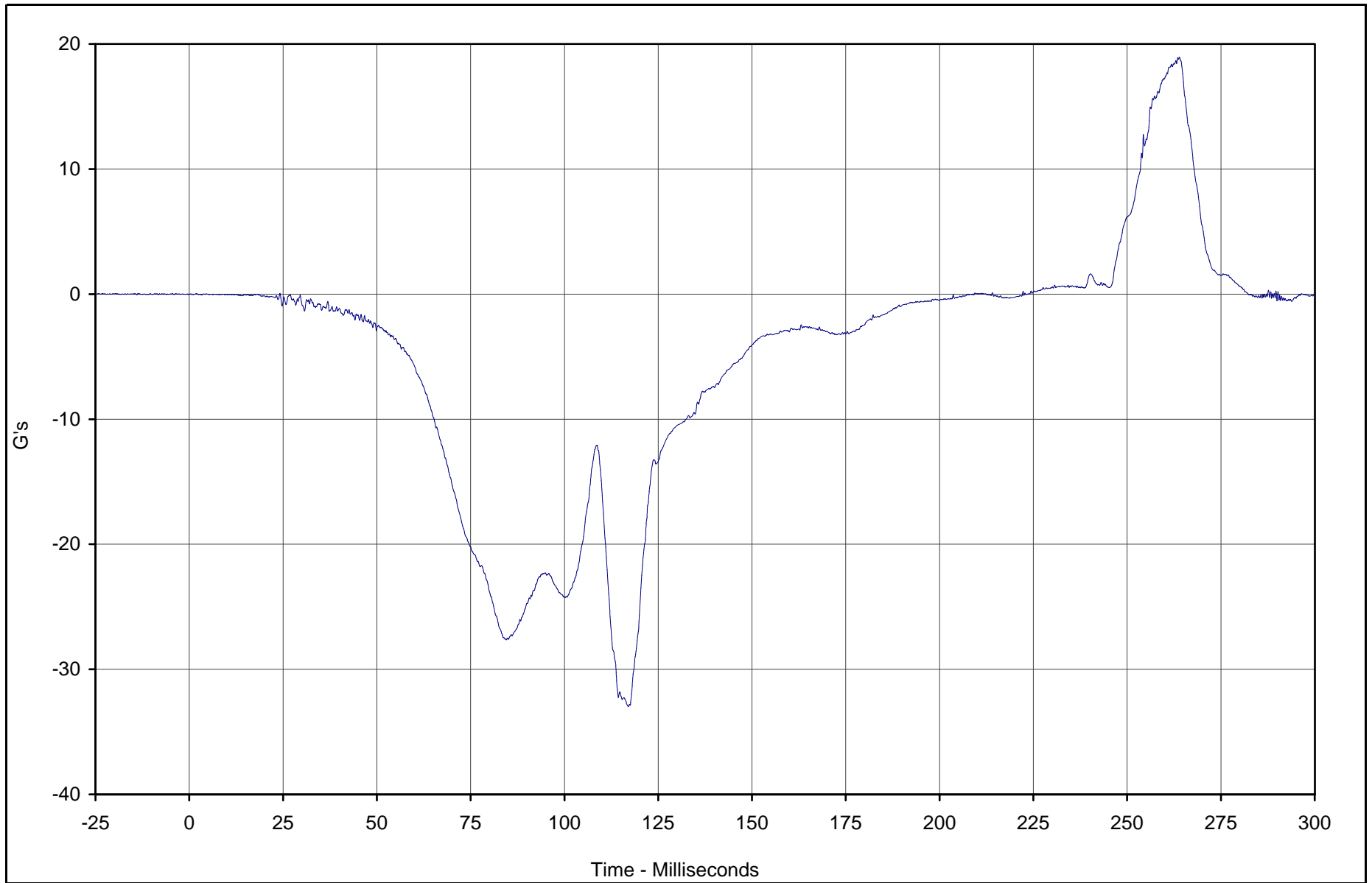
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-35



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Head X	160	FIL	G's	18.9	263.9	-33.0	117.0	1000



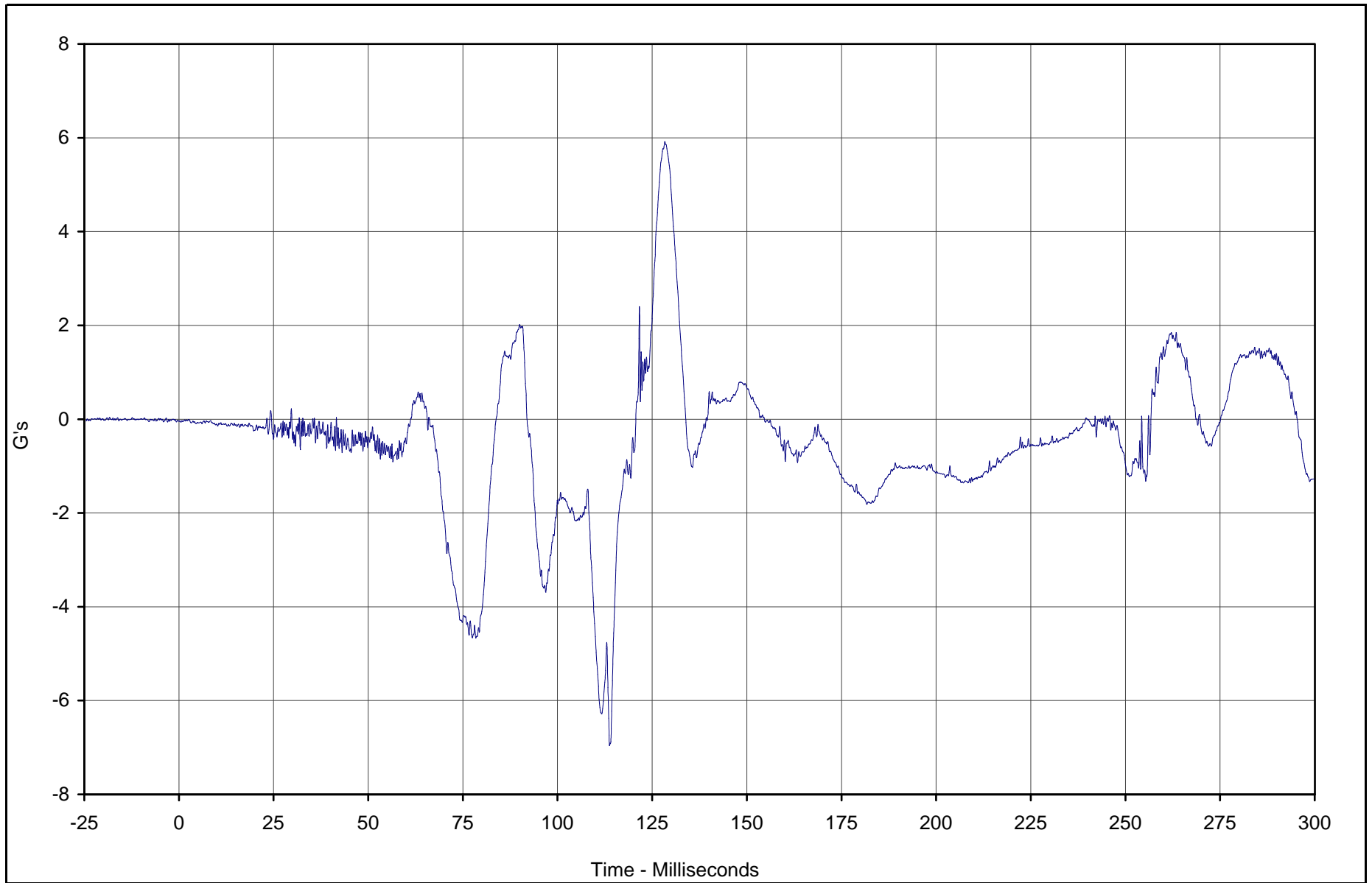
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Head Y	161	FIL	G's	5.9	128.3	-7.0	113.7	1000

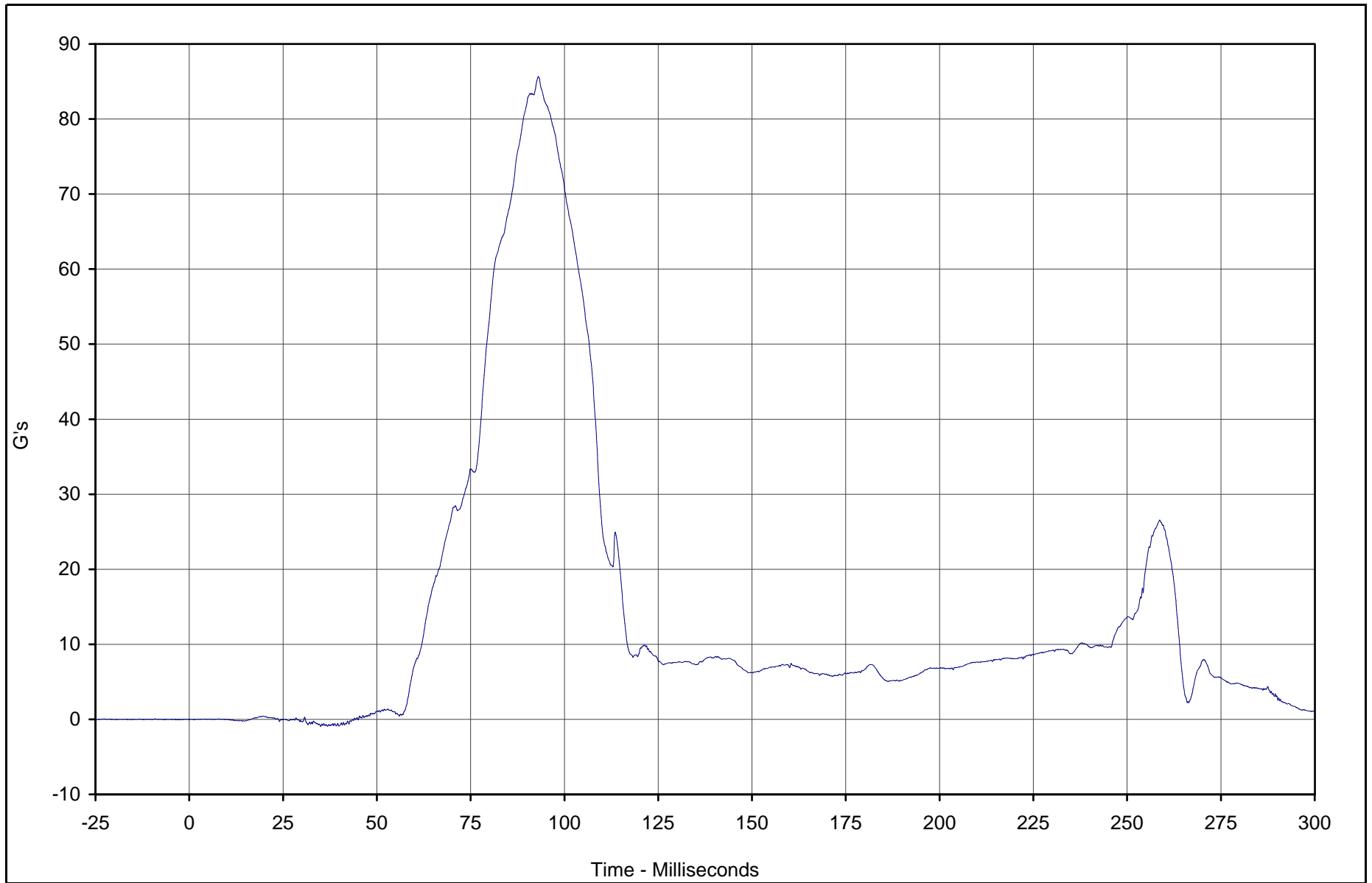


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Head Z	162	FIL	G's	85.7	93.0	-0.9	35.0	1000

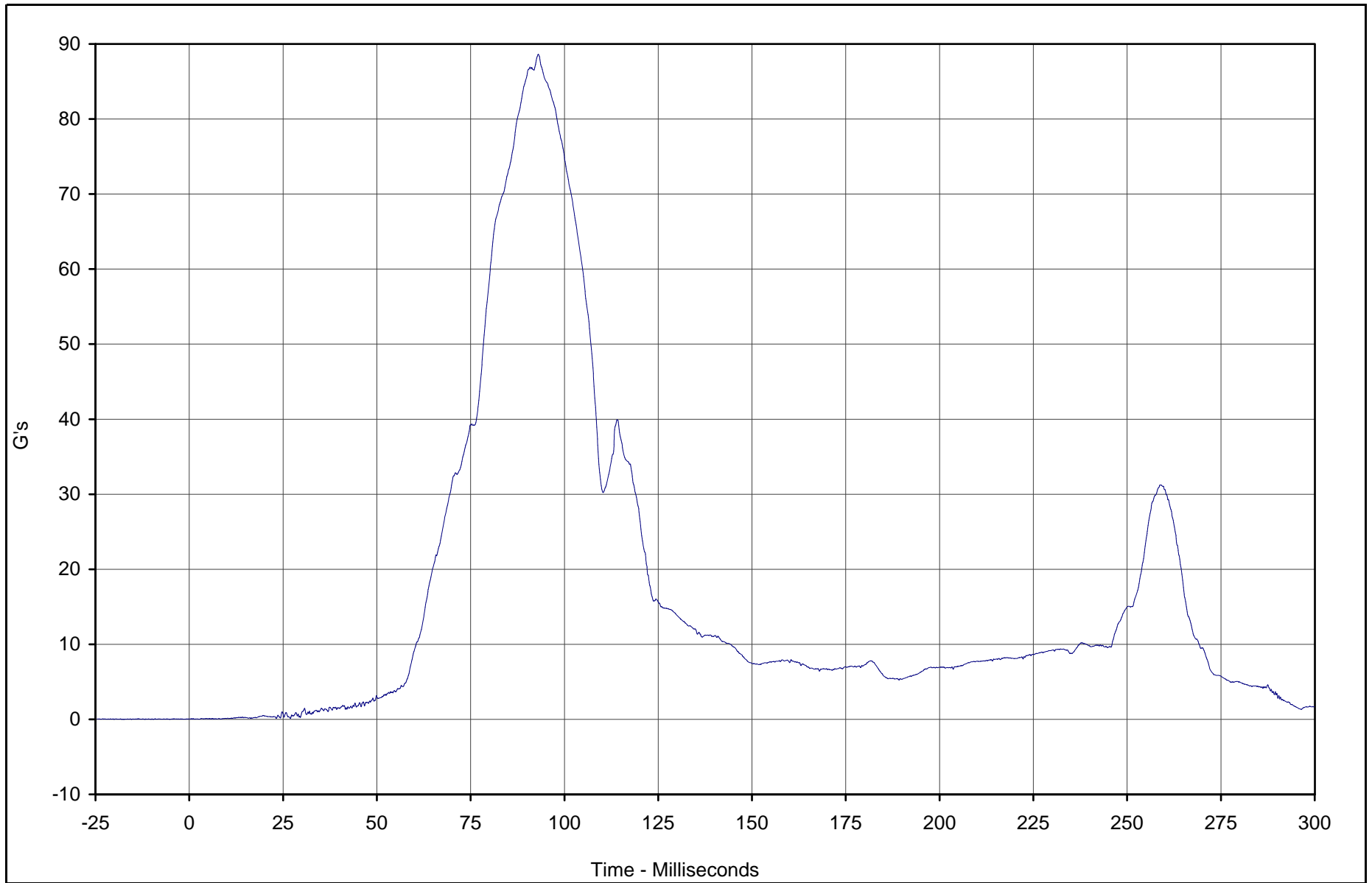


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Head Resultant	160	RES	G's	88.6	93.0	0.0	2.8	1000

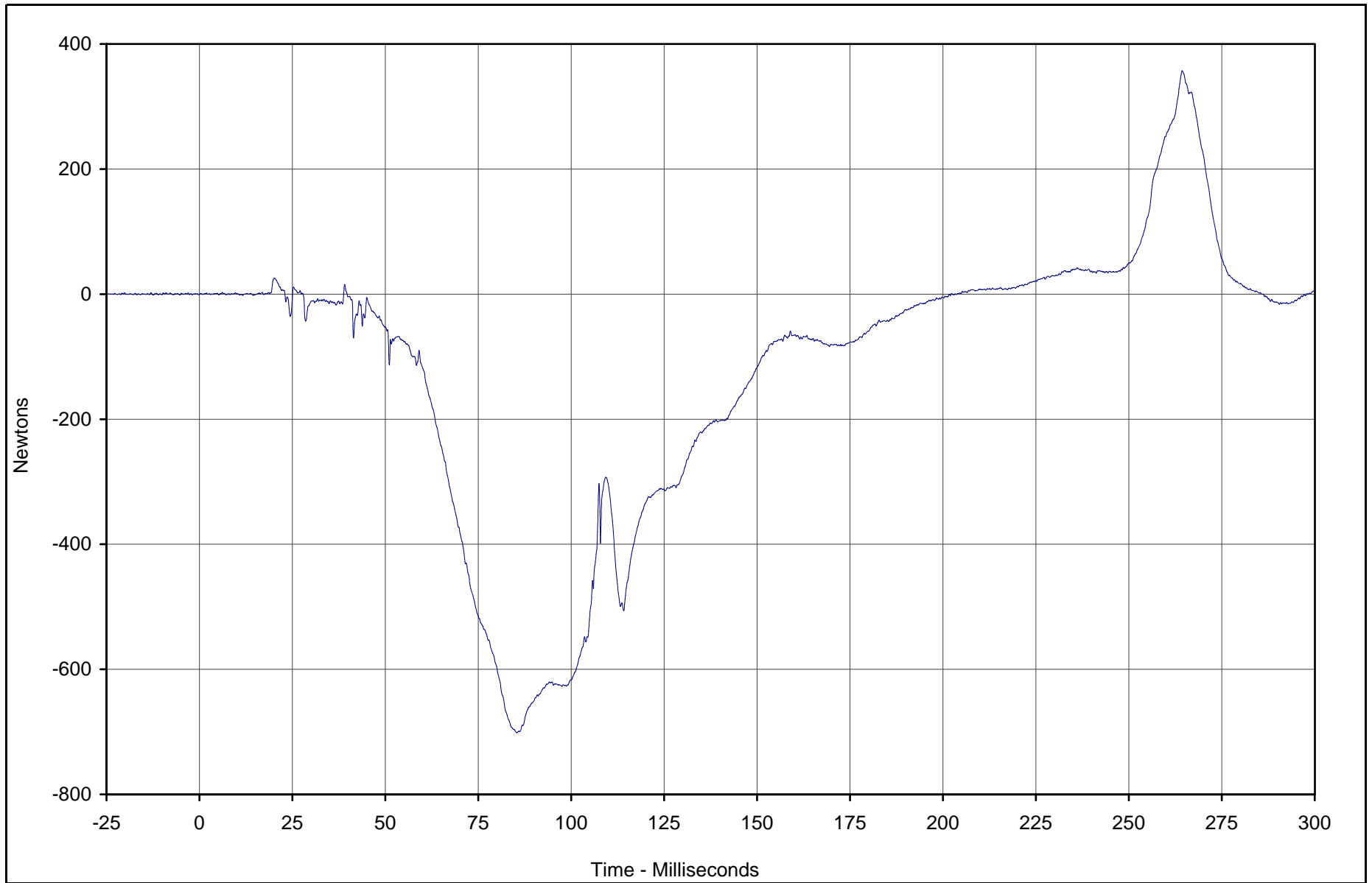


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Force X	163	FIL	Newtons	357.2	264.4	-701.3	85.3	1000



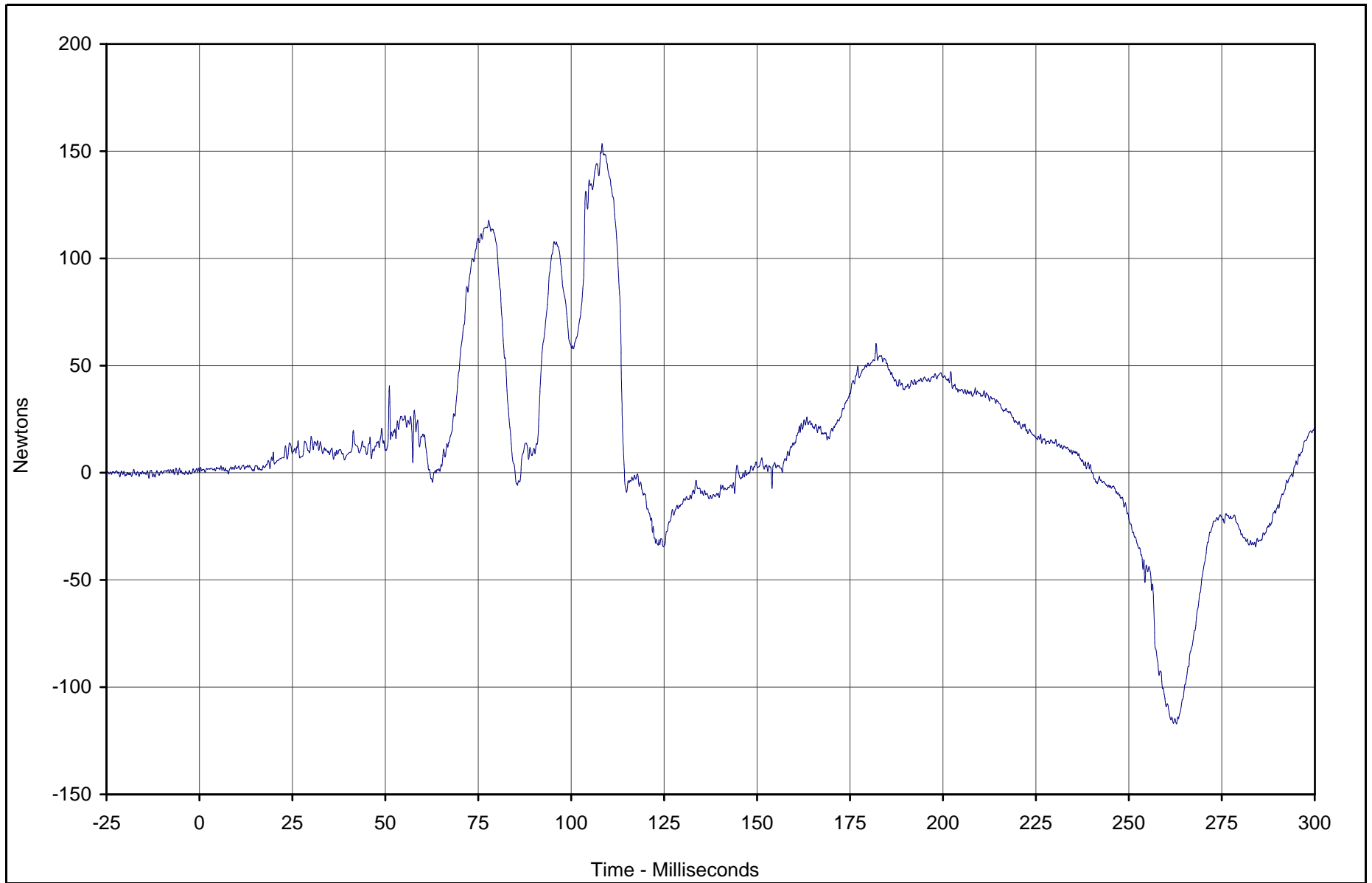
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-40



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Force Y	164	FIL	Newtons	153.6	108.3	-117.1	262.8	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

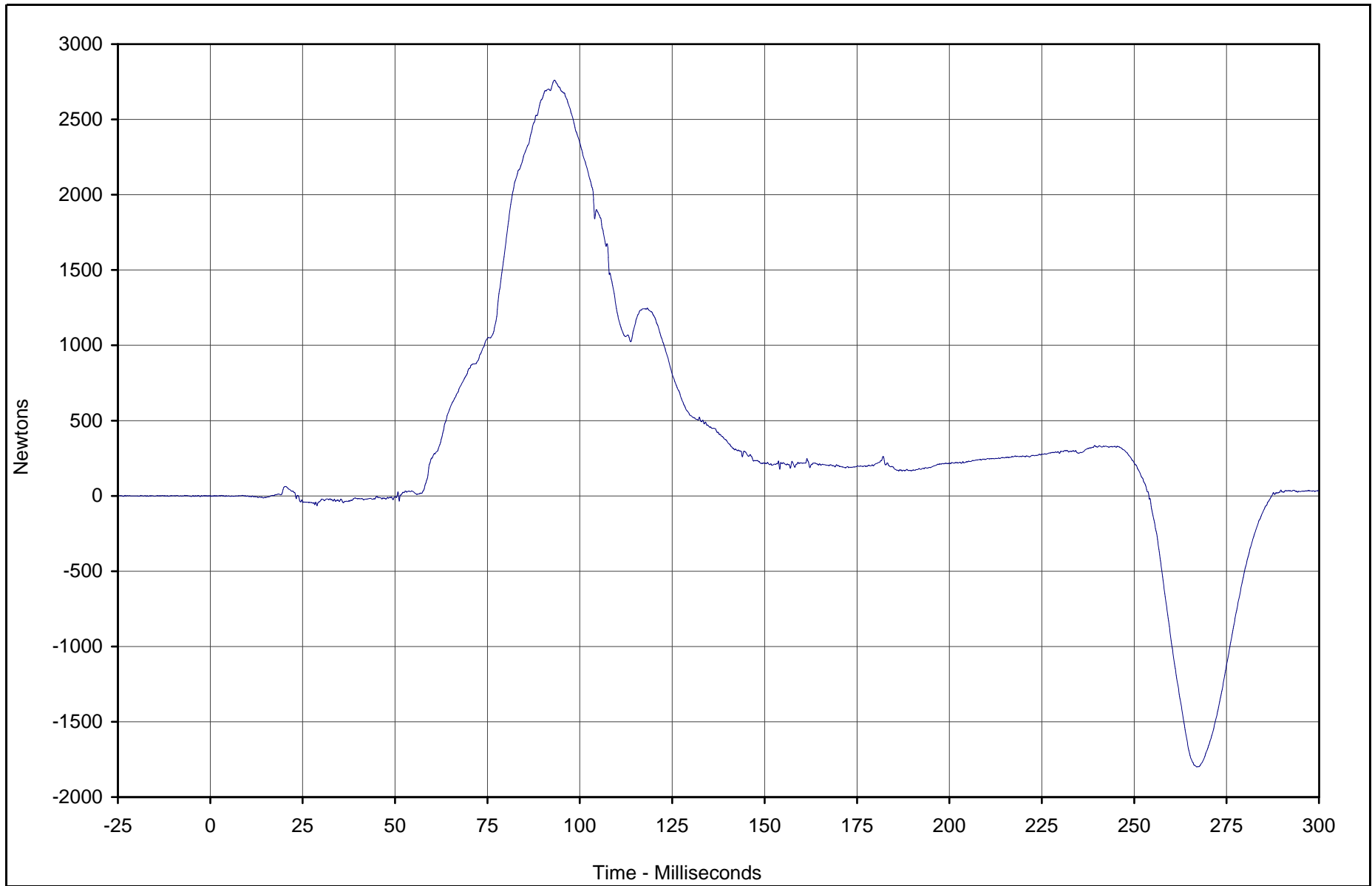
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-41



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Force Z	165	FIL	Newtons	2760.4	93.1	-1799.7	266.9	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

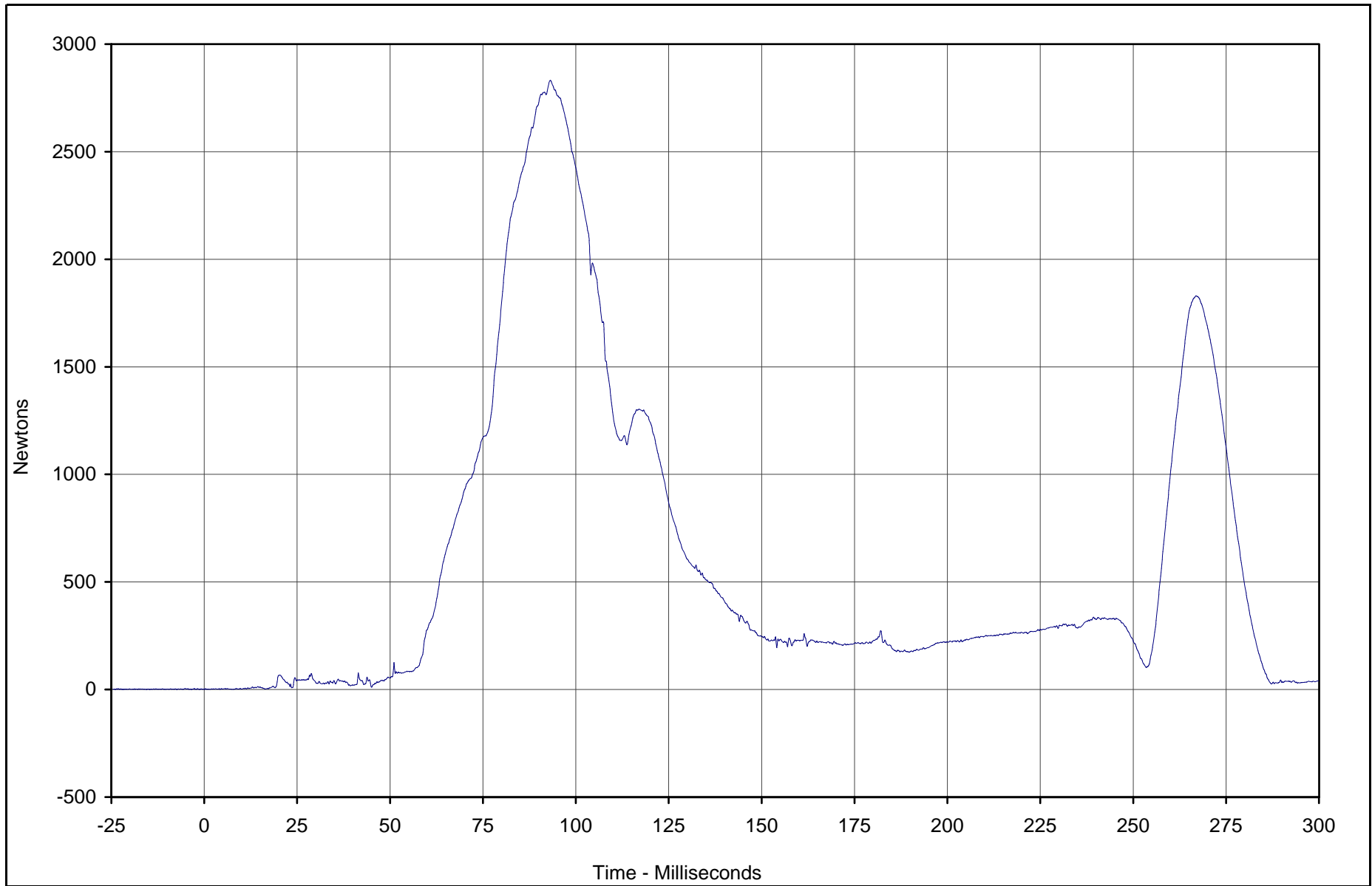
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-42



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Force Res.	163	RES	Newtons	2831.6	93.1	0.4	0.1	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

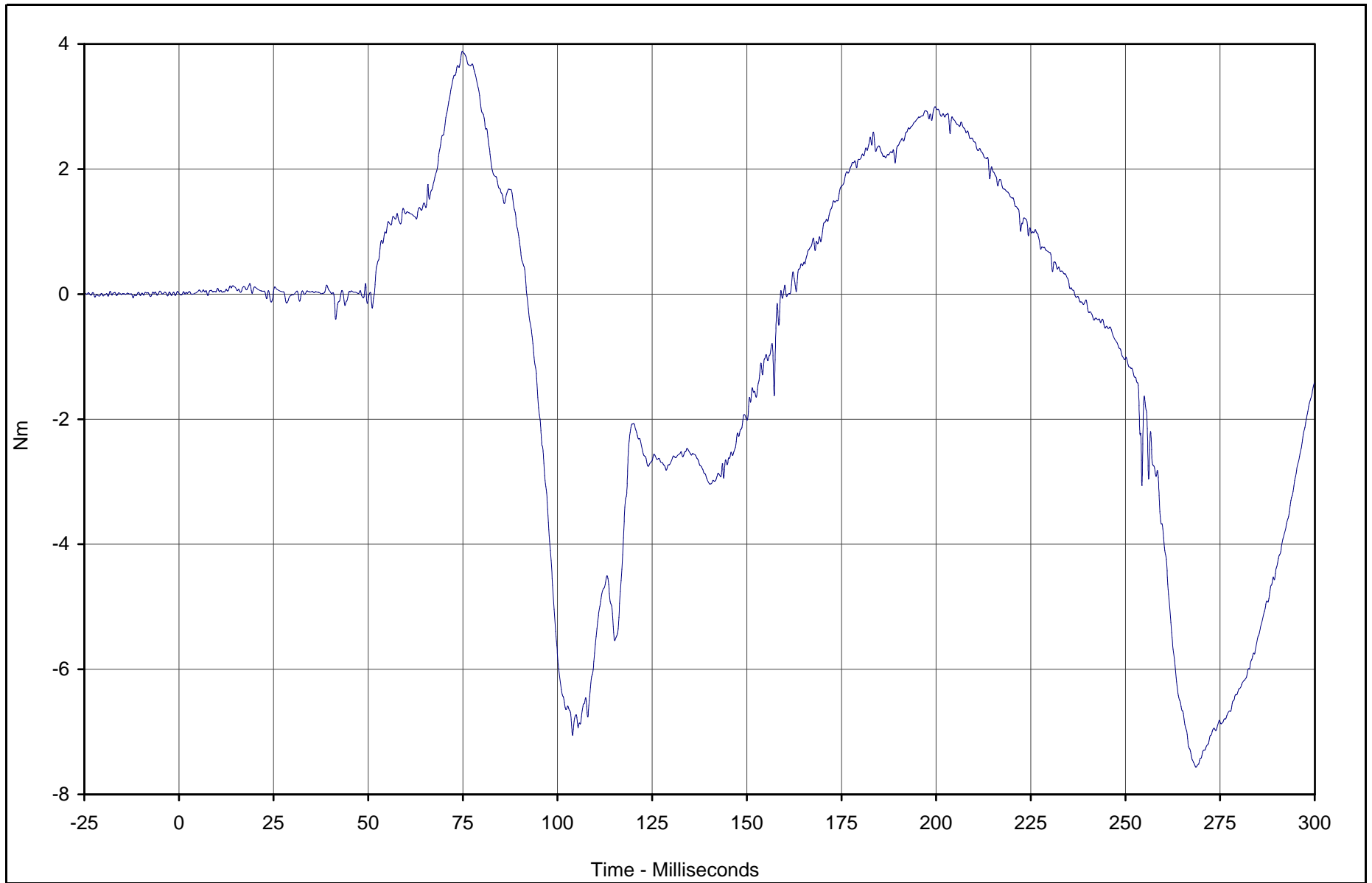
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-43



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Moment X	166	FIL	Nm	3.9	74.8	-7.6	268.6	600



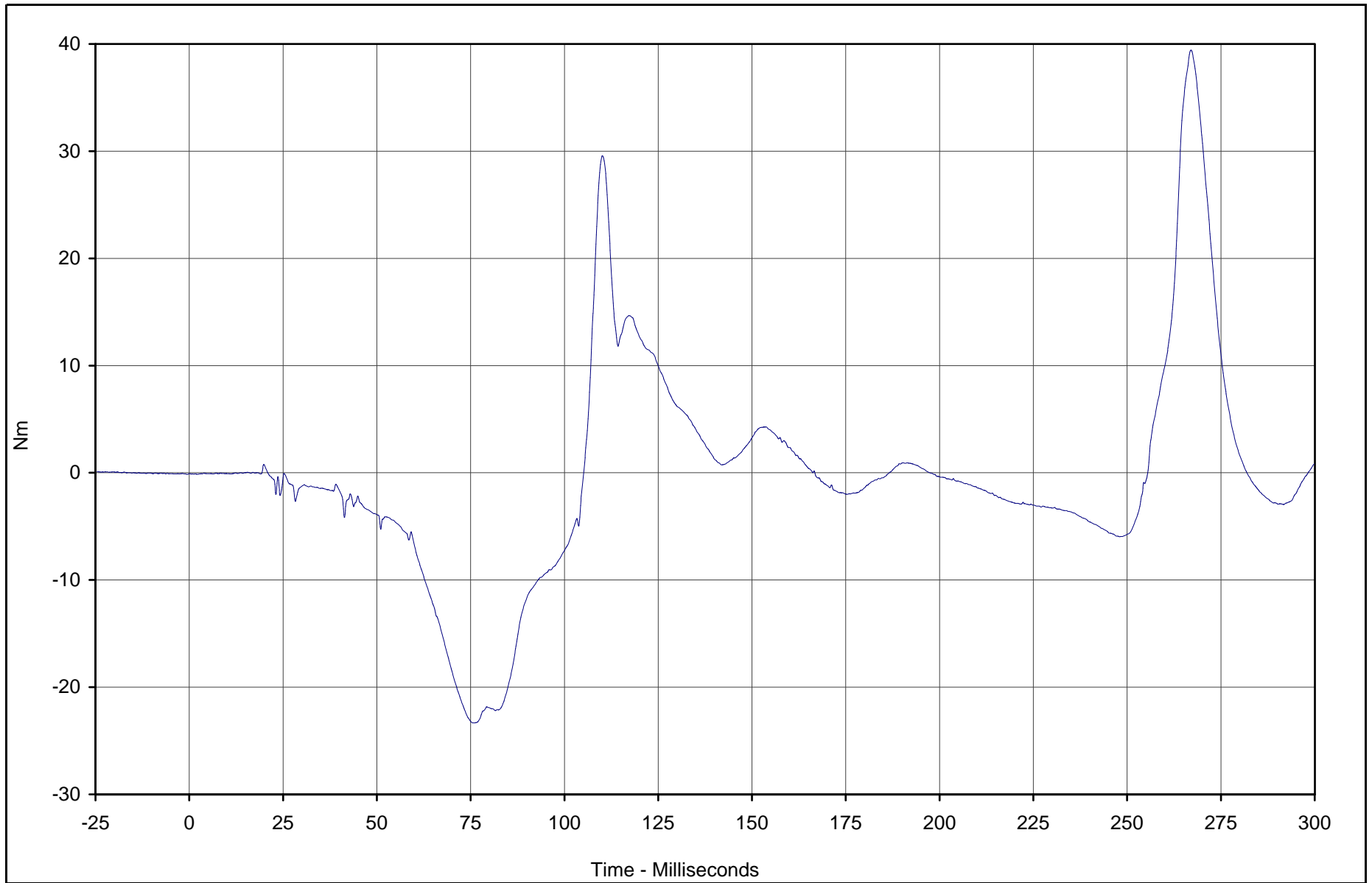
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Moment Y	167	FIL	Nm	39.4	267.0	-23.3	75.6	600

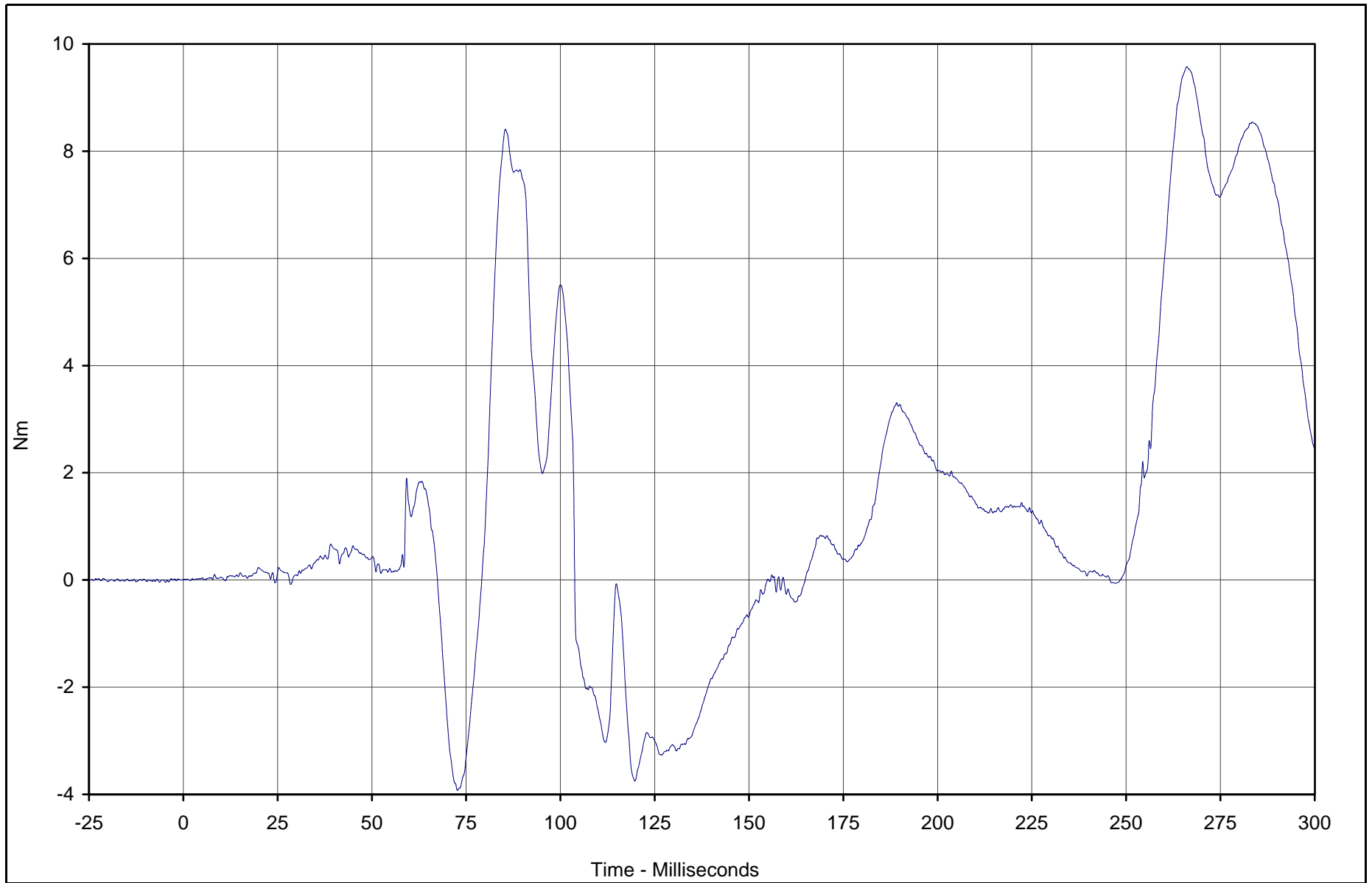


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Moment Z	168	FIL	Nm	9.6	266.1	-3.9	72.7	600

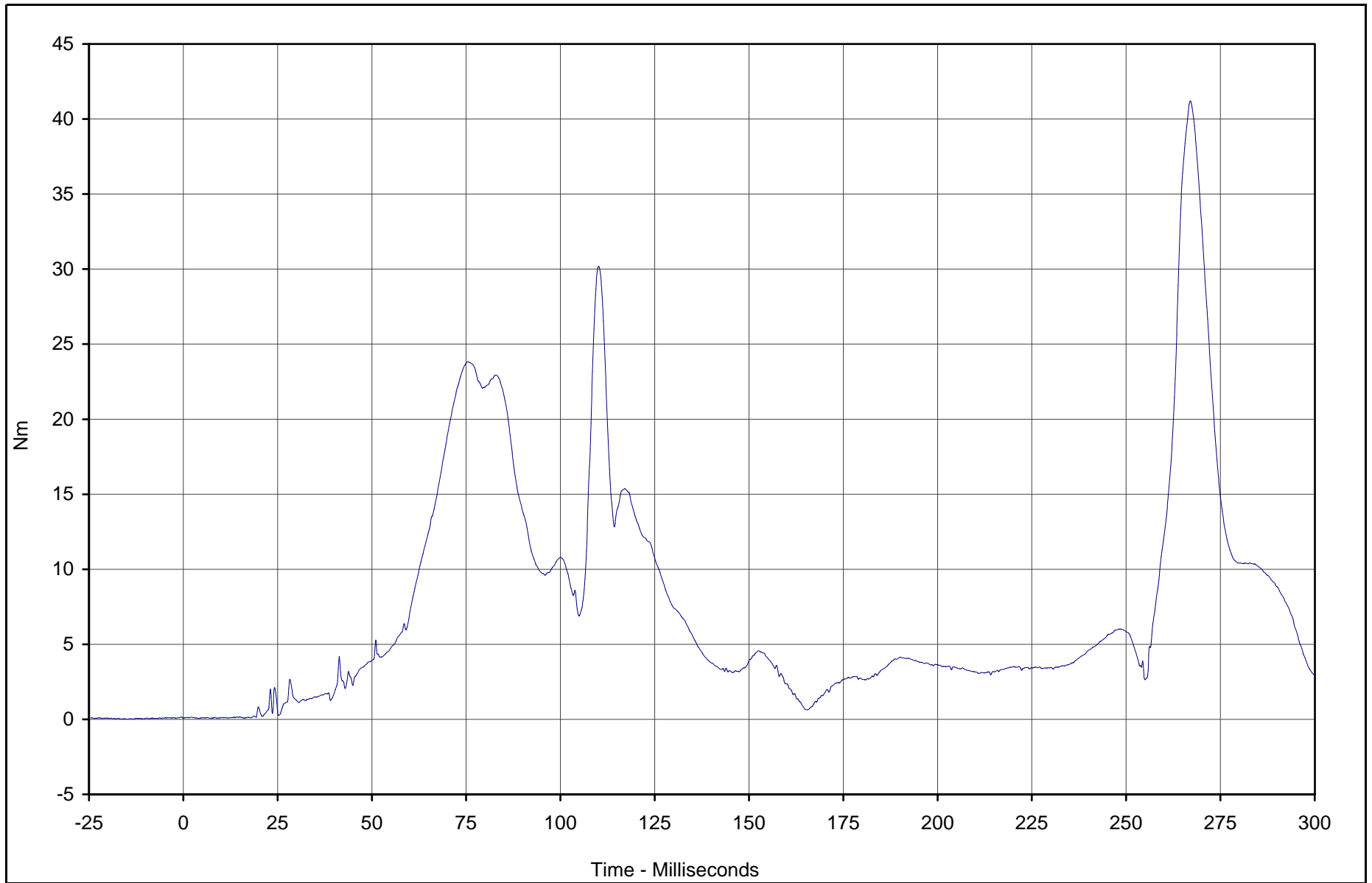


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Upper Neck Mom Res.	166	RES	Nm	41.2	267.0	0.1	3.9	600

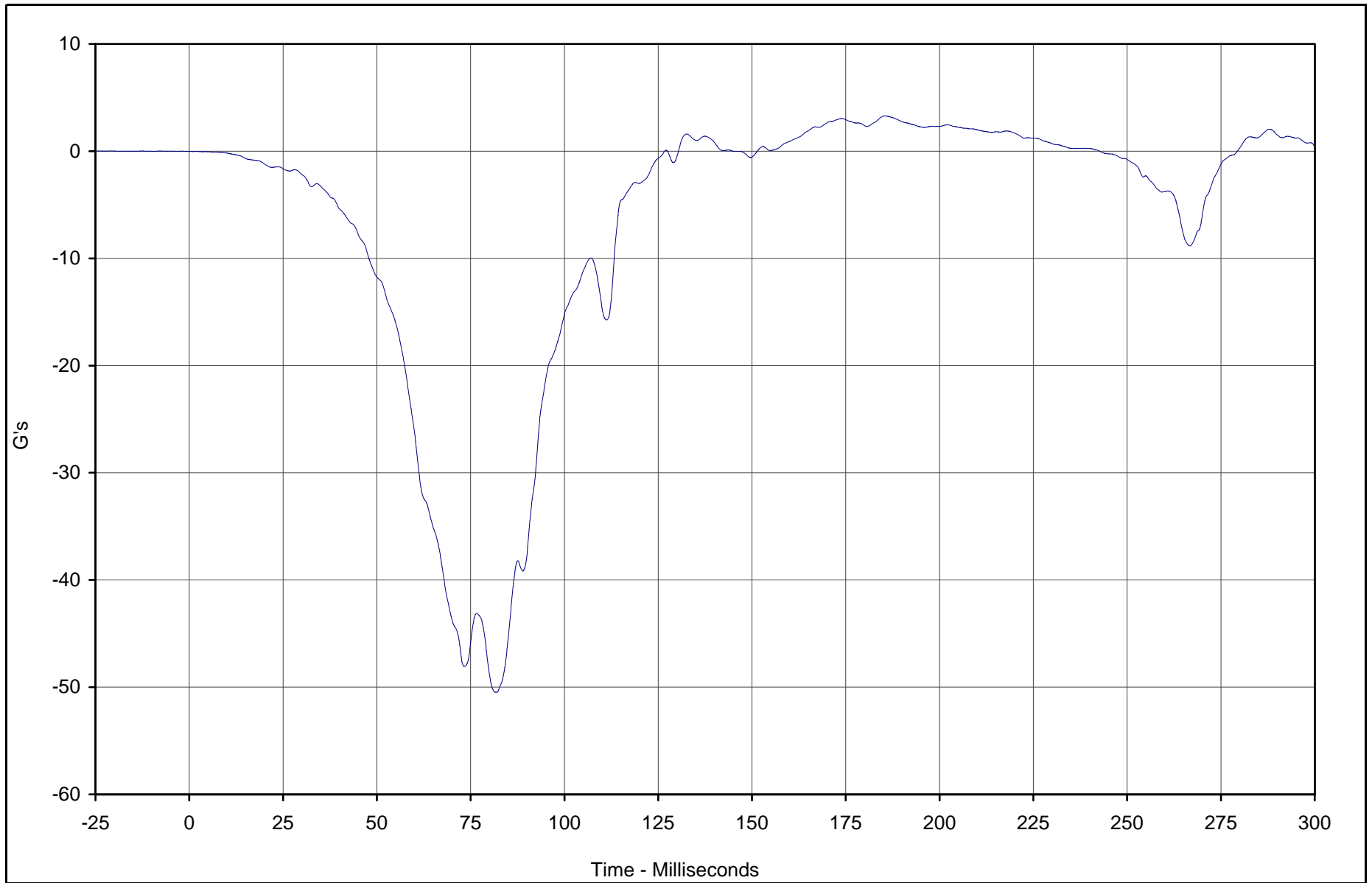


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Chest X	169	FIL	G's	3.3	185.5	-50.5	81.8	180



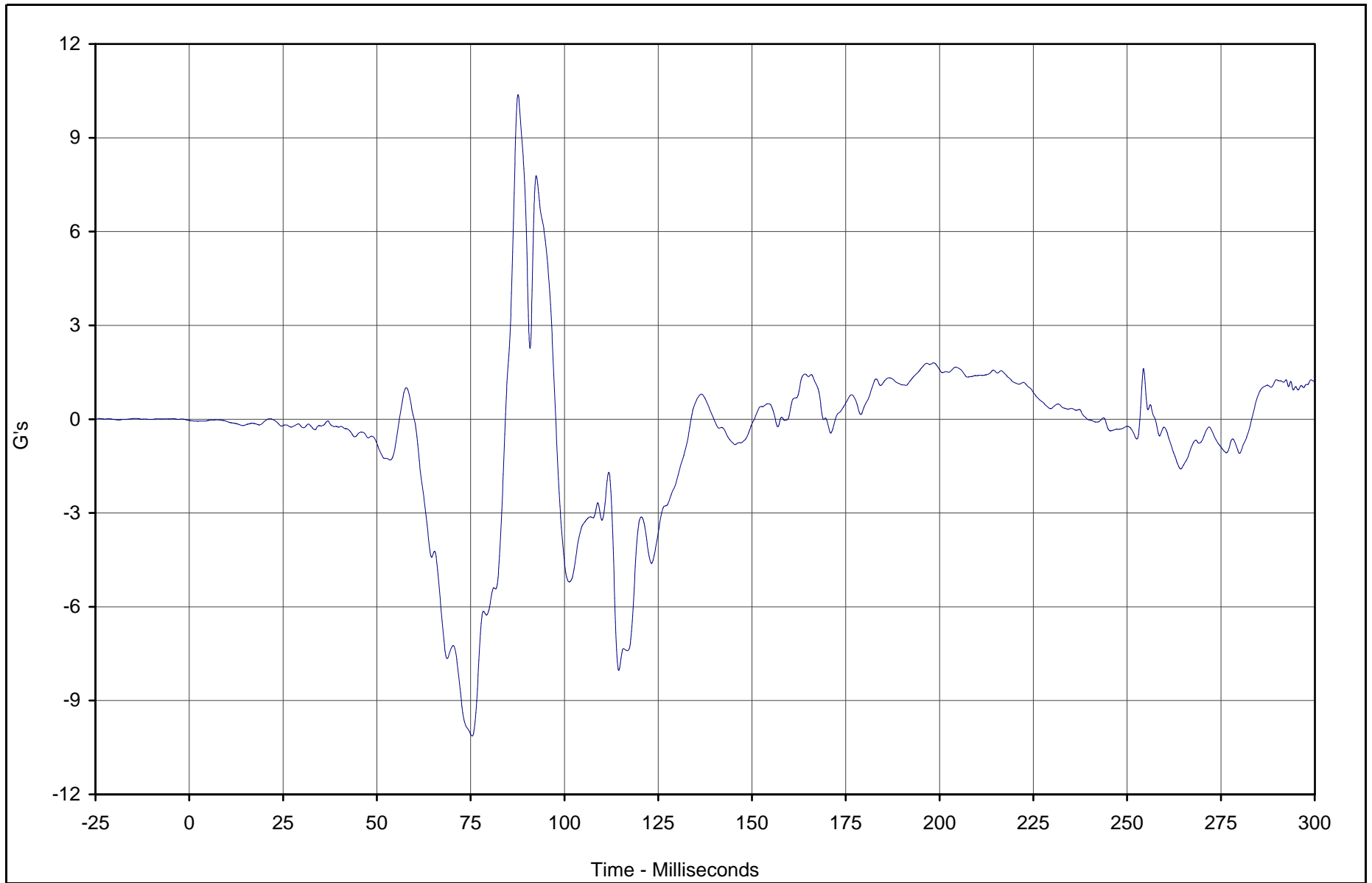
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-48



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Chest Y	170	FIL	G's	10.4	87.6	-10.1	75.4	180



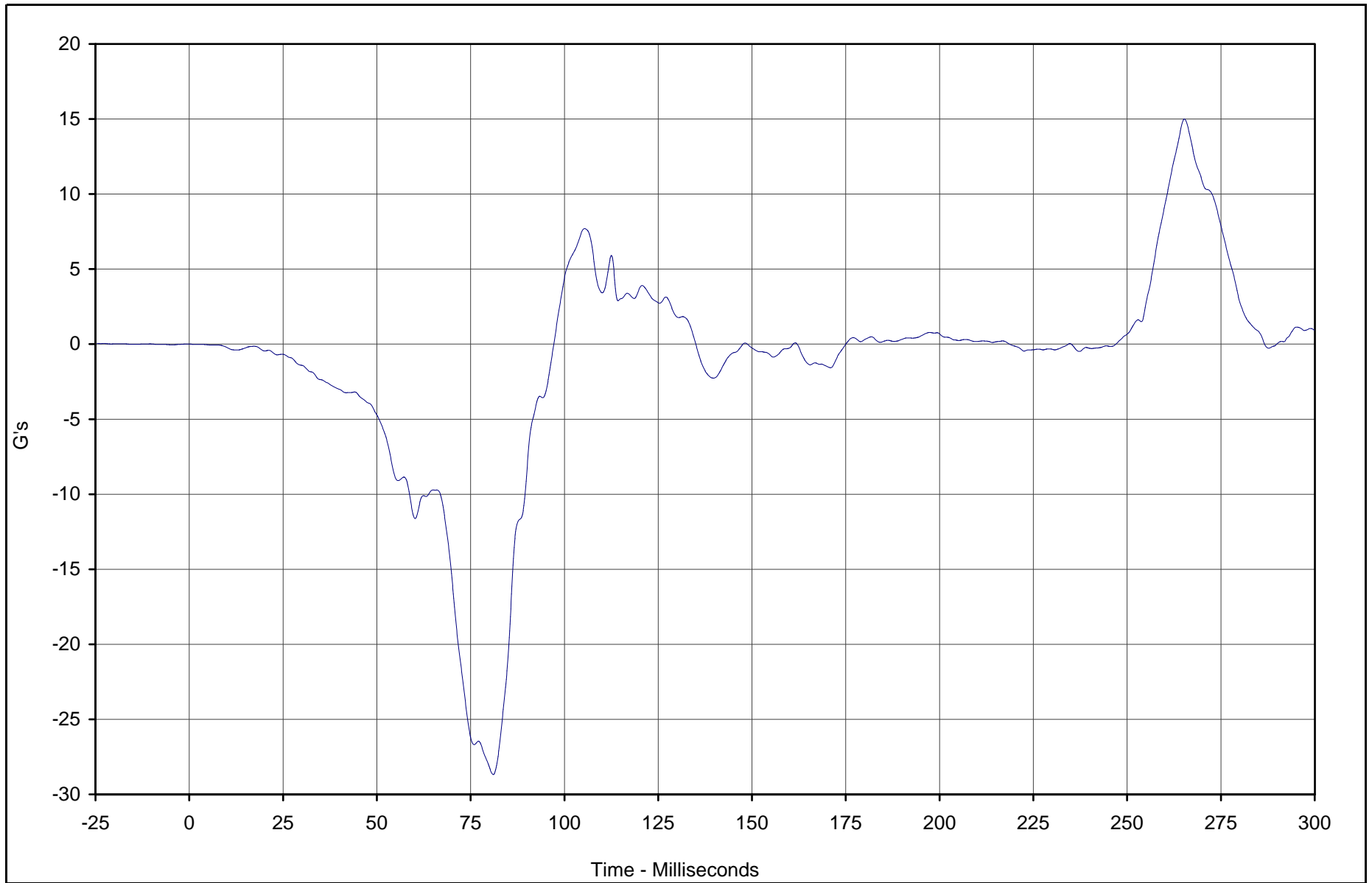
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Chest Z	171	FIL	G's	15.0	265.3	-28.7	81.0	180



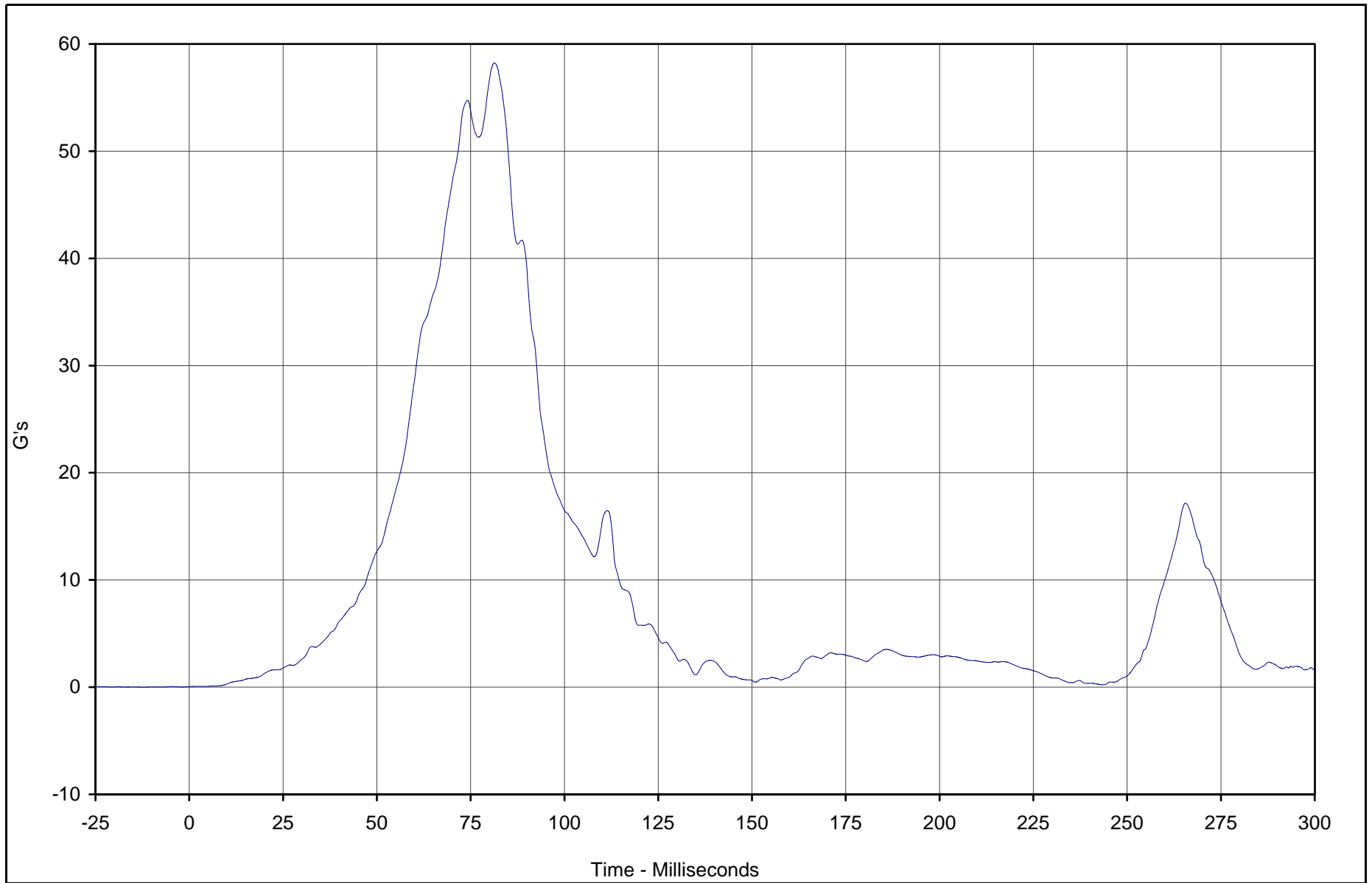
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-50



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Chest Resultant	169	RES	G's	58.2	81.3	0.0	0.0	180



Test Vehicle: 2003 Saturn ION 4 Door Sedan

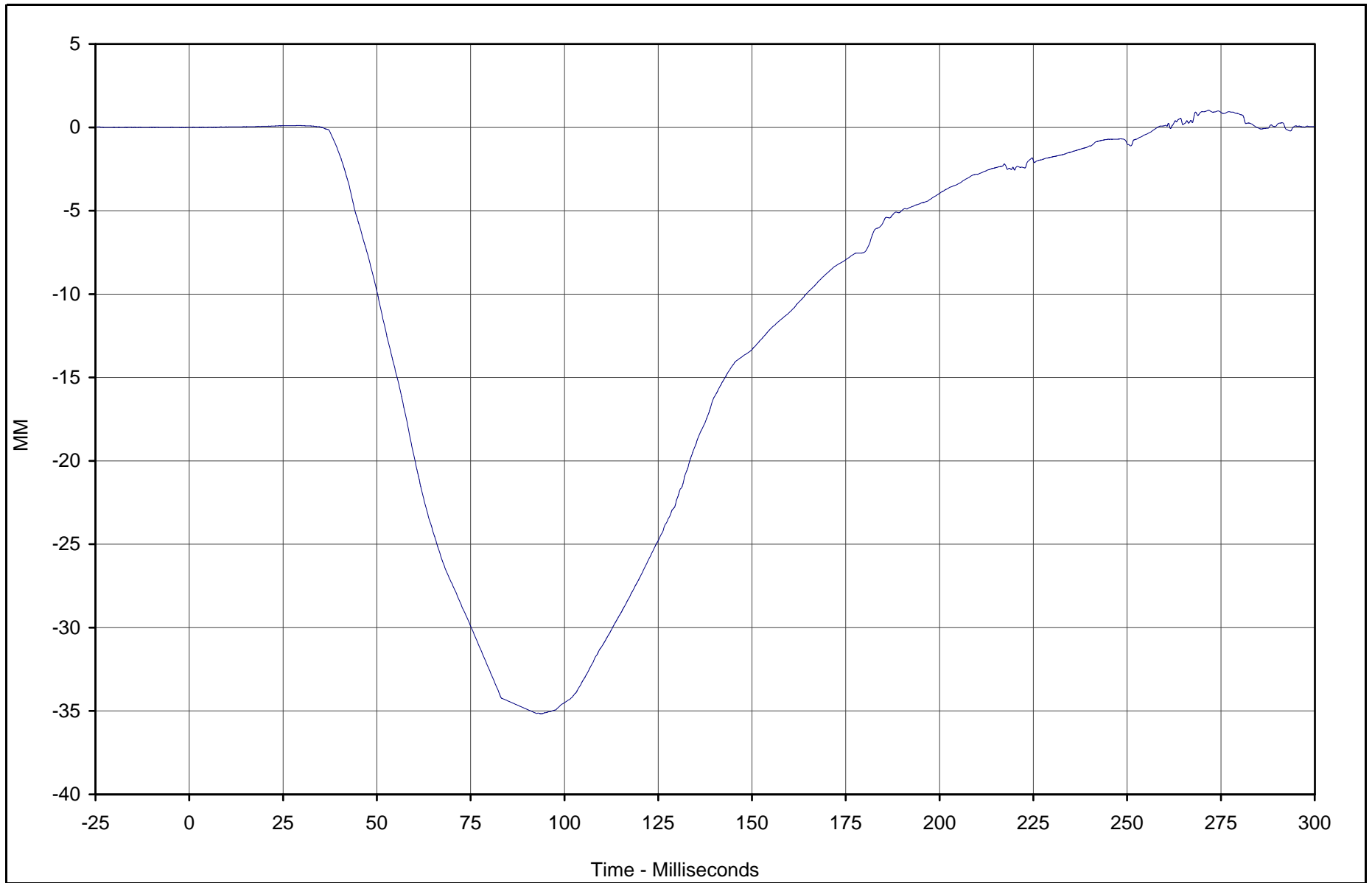
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-51



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Chest Deflection	172	FIL	MM	1.0	271.7	-35.2	93.7	600



Test Vehicle: 2003 Saturn ION 4 Door Sedan

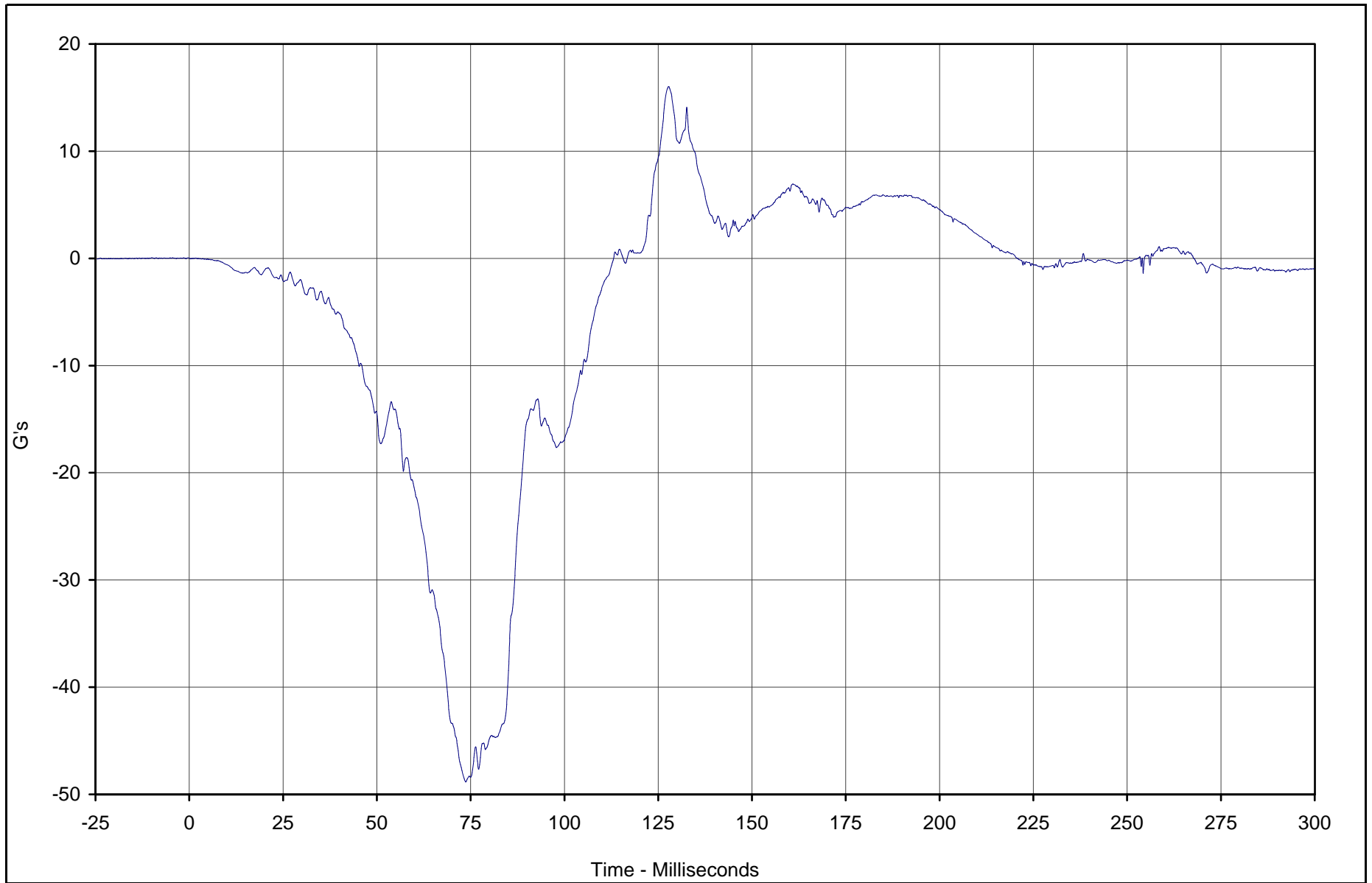
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-52



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Pelvis X	173	FIL	G's	16.0	127.8	-48.8	73.7	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

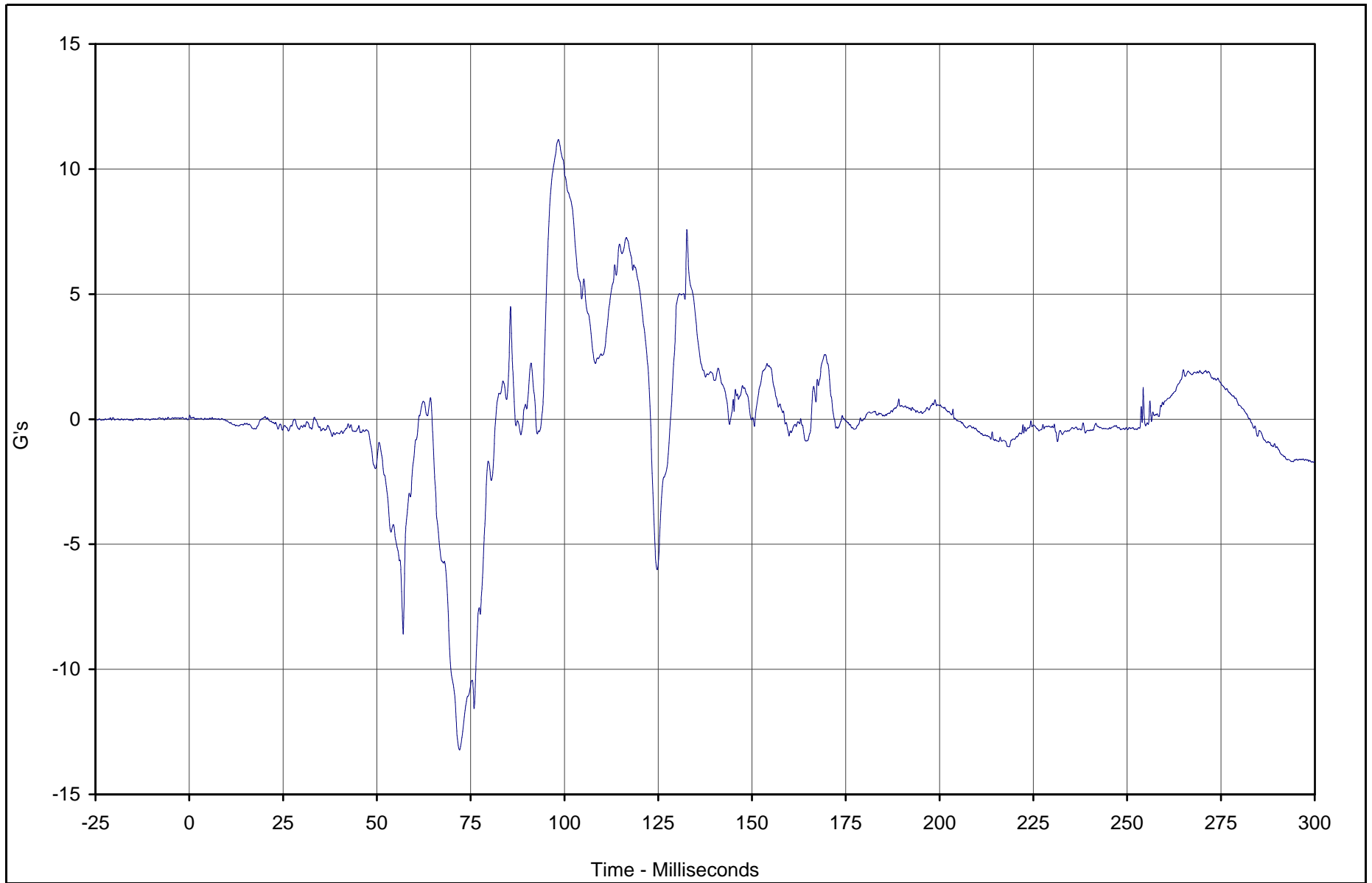
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-53



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Pelvis Y	174	FIL	G's	11.2	98.4	-13.2	72.0	1000



Test Vehicle: 2003 Saturn ION 4 Door Sedan

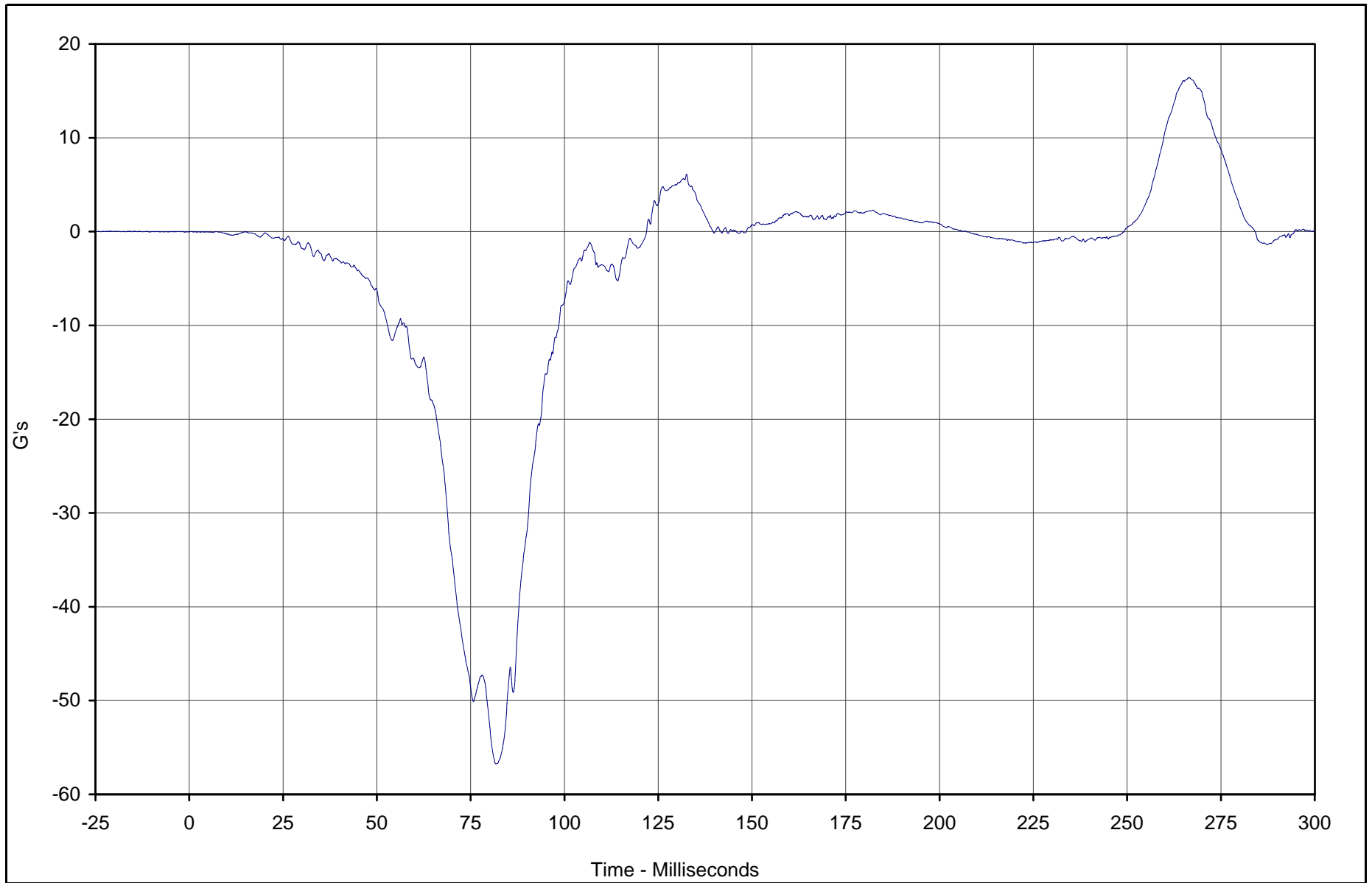
Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC

F3-54



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Pelvis Z	175	FIL	G's	16.4	266.3	-56.7	81.8	1000



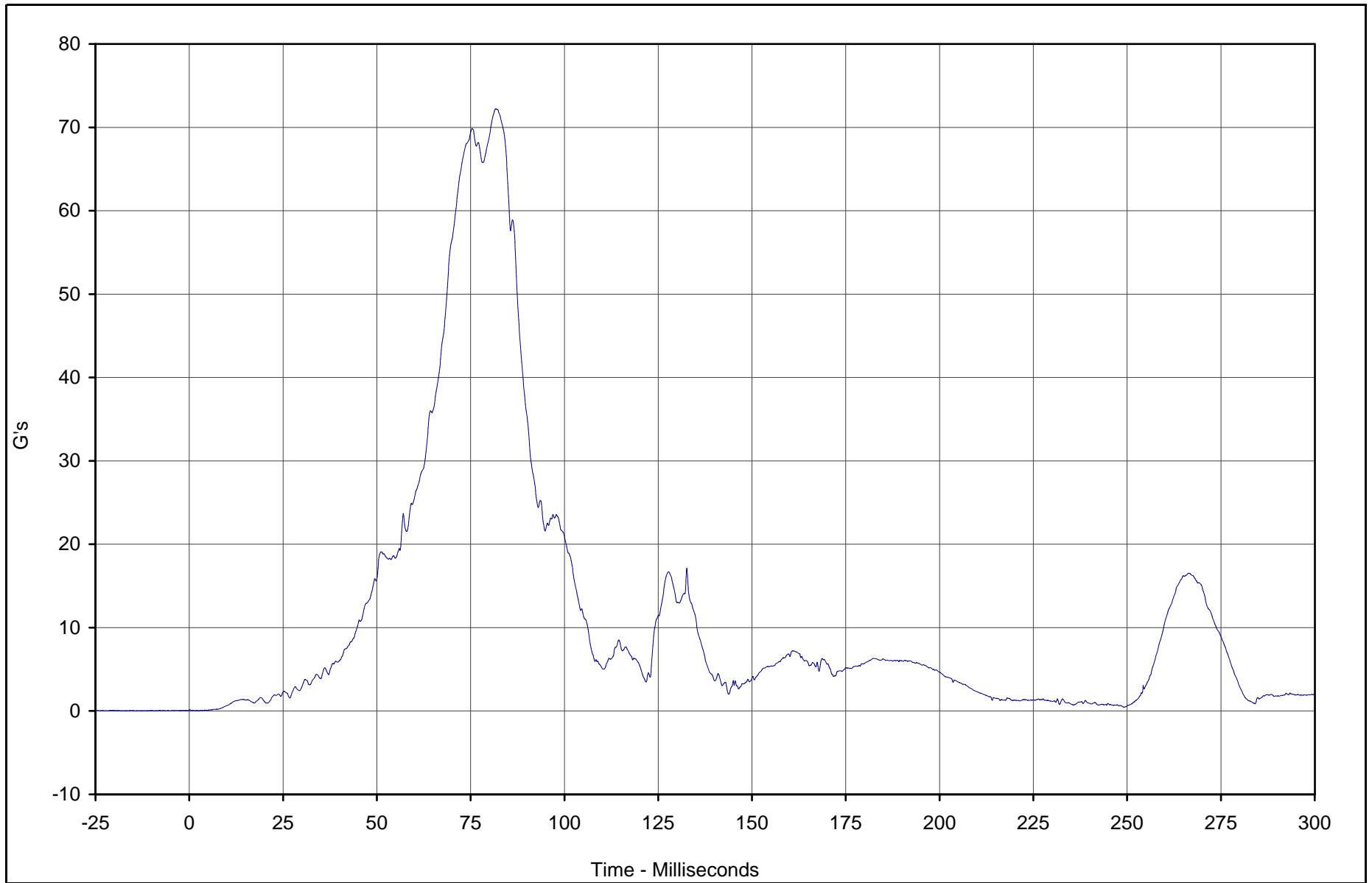
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Pelvis Resultant	173	RES	G's	72.2	81.7	0.0	2.6	1000

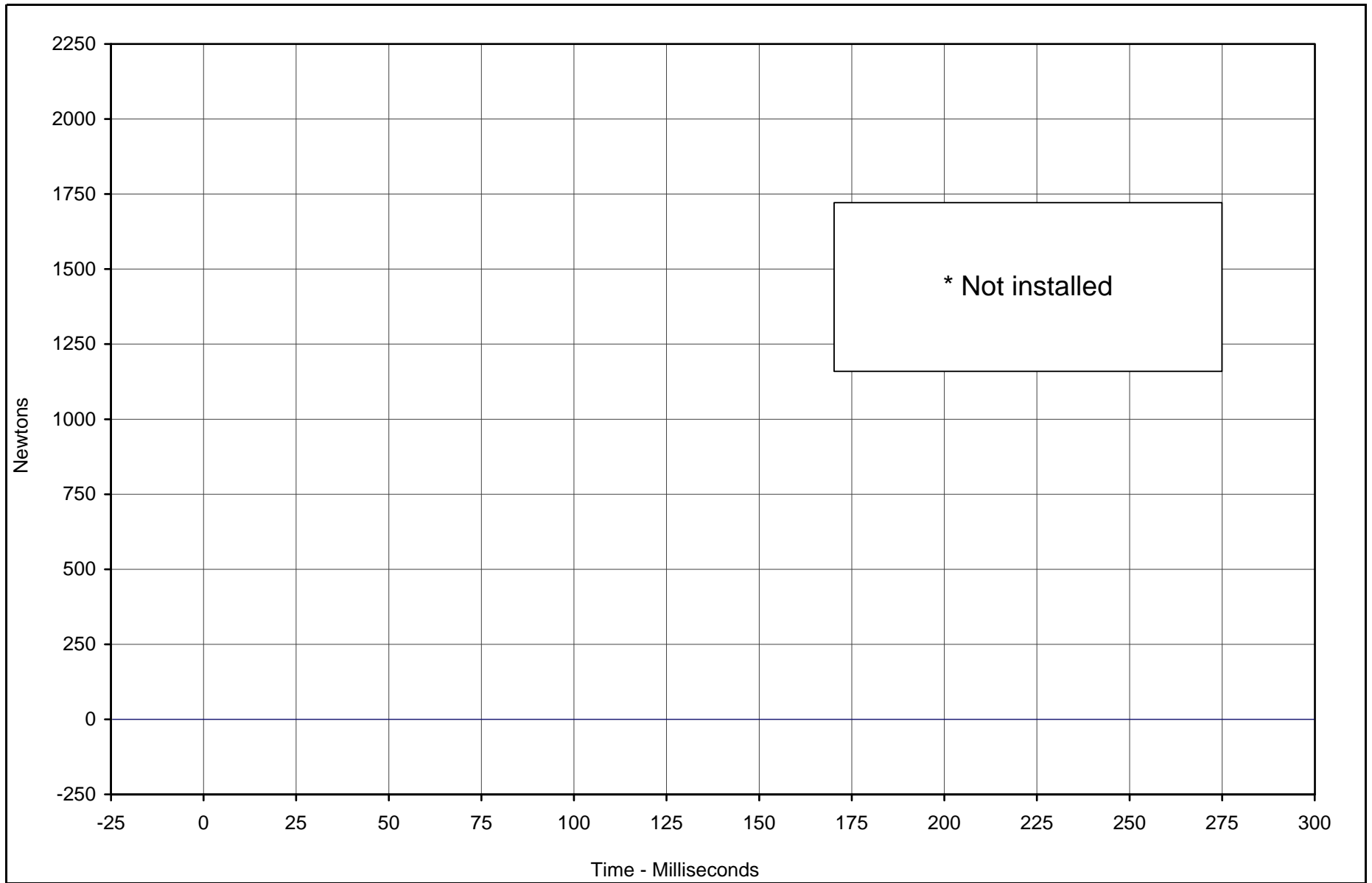


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



\* Not installed

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Seat Tether Load	176	FIL	Newtons	0.0	0.0	0.0	0.0	60

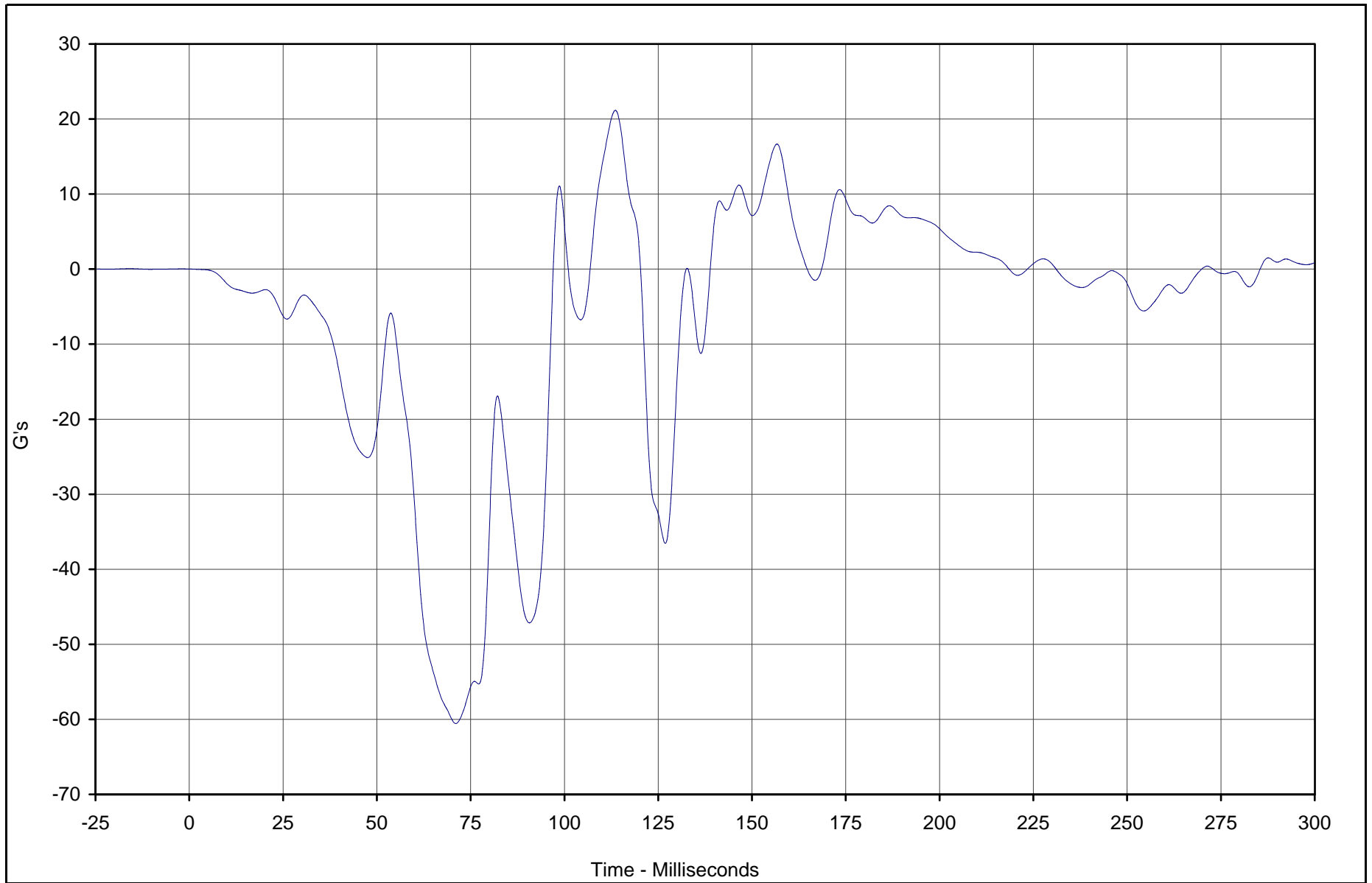


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Car Seat X	177	FIL	G's	21.2	113.6	-60.6	71.0	60



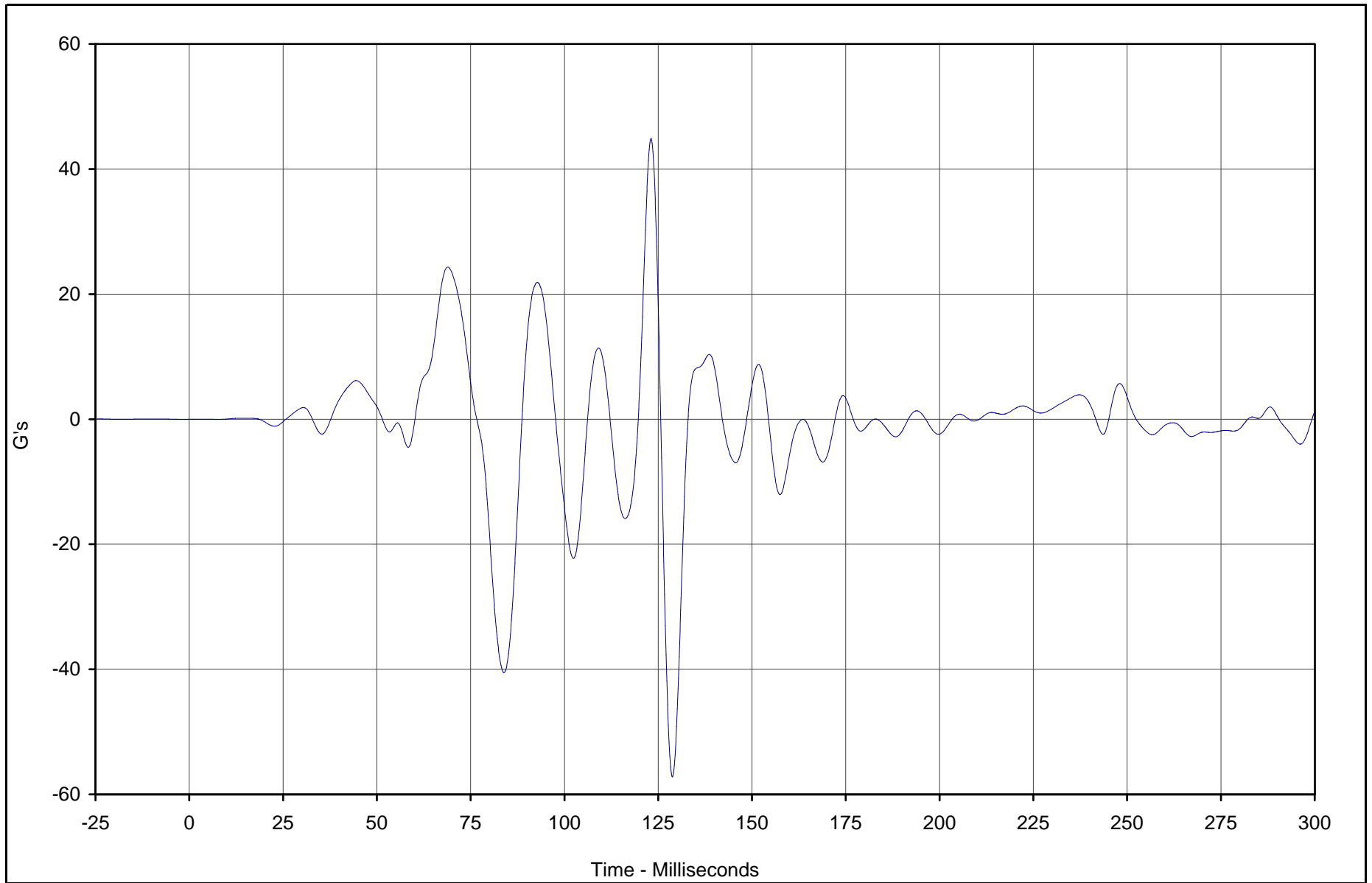
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

F3-58



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Car Seat Y	178	FIL	G's	44.9	123.1	-57.2	128.8	60



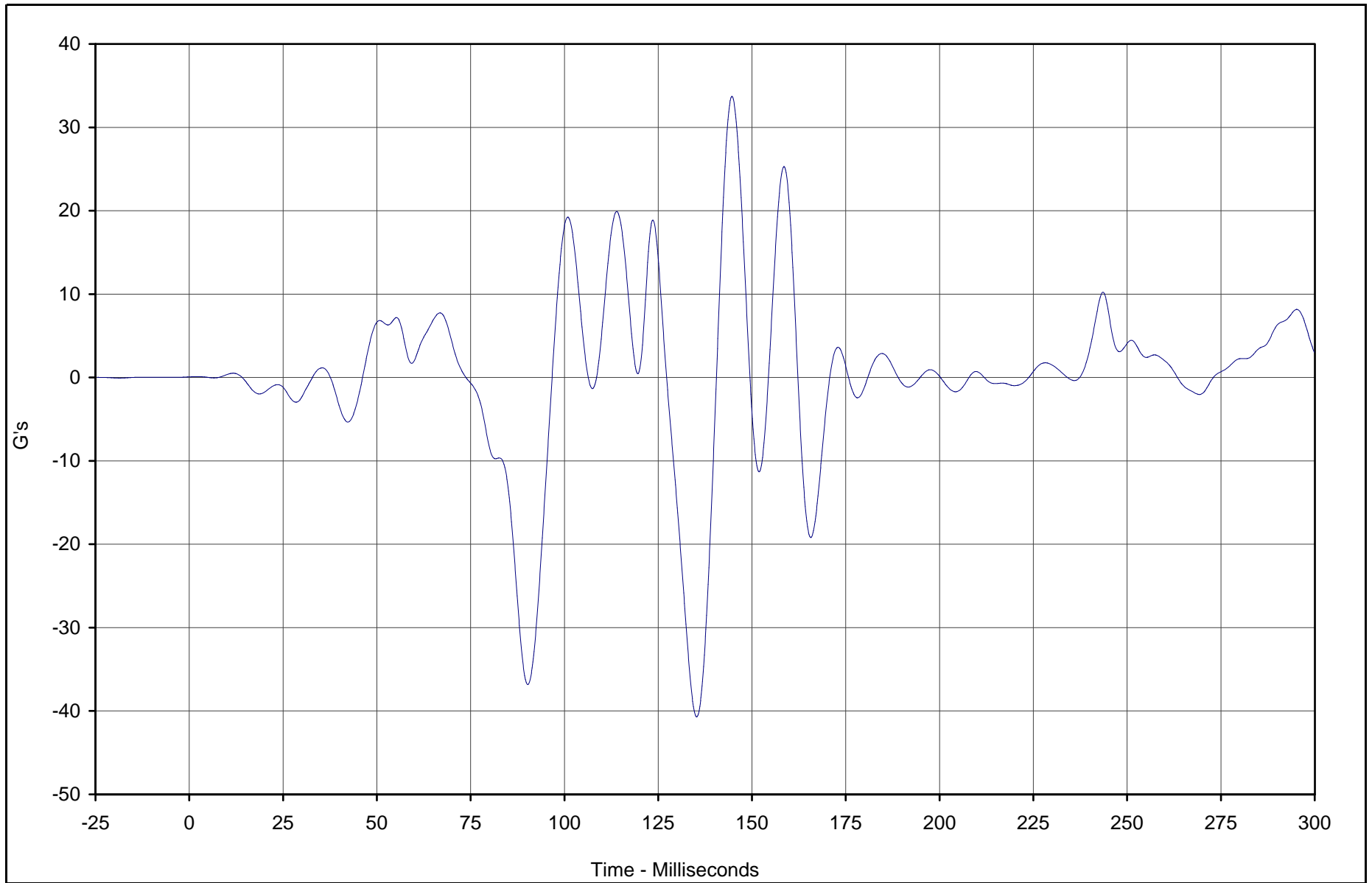
Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

TR-P23001-08-NC



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Car Seat Z	179	FIL	G's	33.7	144.7	-40.7	135.3	60

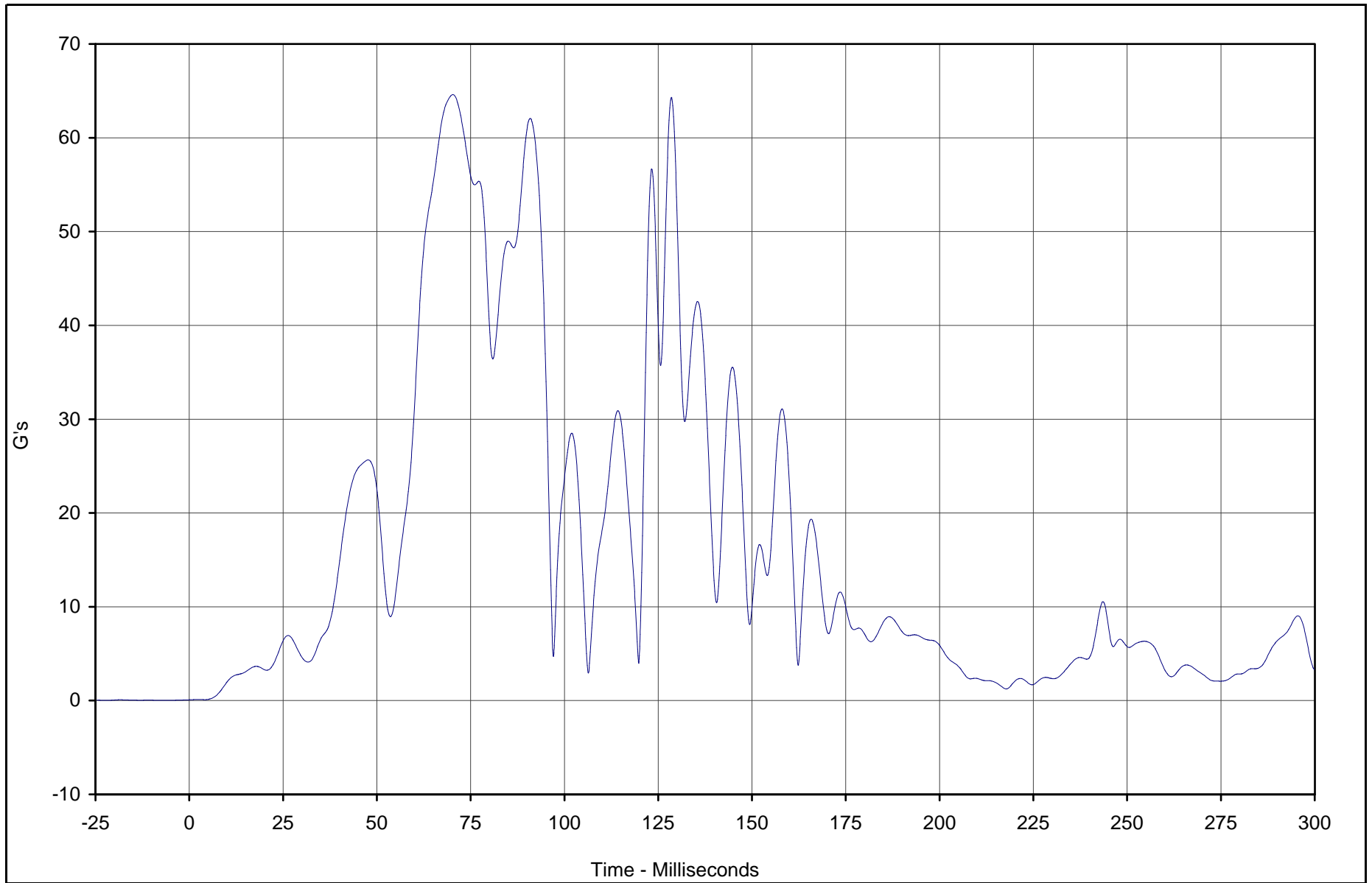


Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Left Rear (6 Yr.) Car Seat Resultant	177	RES	G's	64.6	70.3	0.1	0.0	60



Test Vehicle: 2003 Saturn ION 4 Door Sedan

Test Date: 2/11/03

Test Program: 2003 NHTSA 35mph NCAP

NHTSA No.: M30112

**SECTION F-4**

**CHILD DUMMY INSTRUMENTATION INFORMATION**

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Right Rear Child A.T.D. Serial Number 082  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
134	HEAD, PRIMARY	X	GPAC050	Accel.,1/2 bridge	Endevco	7264-2000	G
135	HEAD, PRIMARY	Y	GPAC051	Accel.,1/2 bridge	Endevco	7264-2000	G
136	HEAD, PRIMARY	Z	GPAC052	Accel.,1/2 bridge	Endevco	7264-2000	G
137	UPPER NECK FORCE	X	082UNFX	Load cell, six axis neck	R. A. Denton	IF-234	N
138	UPPER NECK FORCE	Y	082UNFY	Load cell, six axis neck	R. A. Denton	IF-234	N
139	UPPER NECK FORCE	Z	082UNFZ	Load cell, six axis neck	R. A. Denton	IF-234	N
140	UPPER NECK MOMENT	X	082UNMX	Load cell, six axis neck	R. A. Denton	IF-234	Nm
141	UPPER NECK MOMENT	Y	082UNMY	Load cell, six axis neck	R. A. Denton	IF-234	Nm
142	UPPER NECK MOMENT	Z	082UNMZ	Load cell, six axis neck	R. A. Denton	IF-234	Nm
143	LOWER NECK FORCE	X	082LNFX	Load cell, six axis neck	R. A. Denton	3303	N
144	LOWER NECK FORCE	Y	082LNFY	Load cell, six axis neck	R. A. Denton	3303	N
145	LOWER NECK FORCE	Z	082LNFZ	Load cell, six axis neck	R. A. Denton	3303	N
146	LOWER NECK MOMENT	X	082LNMX	Load cell, six axis neck	R. A. Denton	3303	Nm
147	LOWER NECK MOMENT	Y	082LNMY	Load cell, six axis neck	R. A. Denton	3303	Nm
148	LOWER NECK MOMENT	Z	082LNMZ	Load cell, six axis neck	R. A. Denton	3303	Nm
149	CHEST , PRIMARY	X	2116-A11	Accel., Full Bridge	Entran	2000JF	G
150	CHEST , PRIMARY	Y	2116-A14	Accel., Full Bridge	Entran	2000JF	G
151	CHEST , PRIMARY	Z	2116-A23	Accel., Full Bridge	Entran	2000JF	G
152	CHEST DISPLACEMENT	X	082CP	Rotary Pot Chest	Servo	14CBI	MM
153	PELVIS, PRIMARY	X	2116-A12	Accel., Full Bridge	Entran	2000JF	G
154	PELVIS, PRIMARY	Y	2116-A19	Accel., Full Bridge	Entran	2000JF	G
155	PELVIS, PRIMARY	Z	2116-A17	Accel., Full Bridge	Entran	2000JF	G
156	CAR SEAT TETHER	X	BL112	Load cell, Seat belt	FGP	FN4060	N
157	CAR SEAT	X	KETX1A	Accel.,1/2 bridge	I.C. Sensor	7264-200	G
158	CAR SEAT	Y	KETX1B	Accel.,1/2 bridge	I.C. Sensor	7264-200	G
159	CAR SEAT	Z	KETX1C	Accel.,1/2 bridge	I.C. Sensor	7264-200	G

E4-1

TR-P23001-08-NC

**2003 NHTSA 35mph NCAP  
Instrumentation Data Channel Assignments  
Left Rear Child A.T.D. Serial Number 027  
2/11/03  
2003 Saturn ION 4 Door Sedan**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
160	HEAD, PRIMARY	X	GPAC047	Accel.,1/2 bridge	Endevco	7264-2000	G
161	HEAD, PRIMARY	Y	GPAC048	Accel.,1/2 bridge	Endevco	7264-2000	G
162	HEAD, PRIMARY	Z	GPAC049	Accel.,1/2 bridge	Endevco	7264-2000	G
163	UPPER NECK FORCE	X	027UNFX	Load cell, six axis neck	R. A. Denton	IF-234	N
164	UPPER NECK FORCE	Y	027UNFY	Load cell, six axis neck	R. A. Denton	IF-234	N
165	UPPER NECK FORCE	Z	027UNFZ	Load cell, six axis neck	R. A. Denton	IF-234	N
166	UPPER NECK MOMENT	X	027UNMX	Load cell, six axis neck	R. A. Denton	IF-234	Nm
167	UPPER NECK MOMENT	Y	027UNMY	Load cell, six axis neck	R. A. Denton	IF-234	Nm
168	UPPER NECK MOMENT	Z	027UNMZ	Load cell, six axis neck	R. A. Denton	IF-234	Nm
169	CHEST , PRIMARY	X	2116-A01	Accel., Full Bridge	Entran	2000JF	G
170	CHEST , PRIMARY	Y	2116-A06	Accel., Full Bridge	Entran	2000JF	G
171	CHEST , PRIMARY	Z	2116-A07	Accel., Full Bridge	Entran	2000JF	G
172	CHEST DISPLACEMENT	X	027CP	Rotary Pot Chest	Servo	14CBI	MM
173	PELVIS, PRIMARY	X	2116-N07	Accel., Full Bridge	Entran	2000JF	G
174	PELVIS, PRIMARY	Y	2116-A03	Accel., Full Bridge	Entran	2000JF	G
175	PELVIS, PRIMARY	Z	2116-A17	Accel., Full Bridge	Entran	2000JF	G
176	CAR SEAT TETHER	X	BL113	Load cell, Seat belt	FGP	FN4060	N
177	CAR SEAT	X	KETX4A	Accel.,1/2 bridge	I.C. Sensor	7264-200	G
178	CAR SEAT	Y	KETX4B	Accel.,1/2 bridge	I.C. Sensor	7264-200	G
179	CAR SEAT	Z	KETX4C	Accel.,1/2 bridge	I.C. Sensor	7264-200	G

**SECTION F-5**

**CHILD DUMMY CALIBRATION INFORMATION**



## Calibration Data Sheet Hybrid III 3 Year Old Head Drop Test

ATD Serial No.: 082

Test I.D.: 3HD03

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	250.0 to 280.0	277.1	Pass
Peak Lateral Acceleration	G's	≤15.0	6.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Oscillations After Main Pulse	%	<10	2.7	Pass
Overall Test Results				Pass

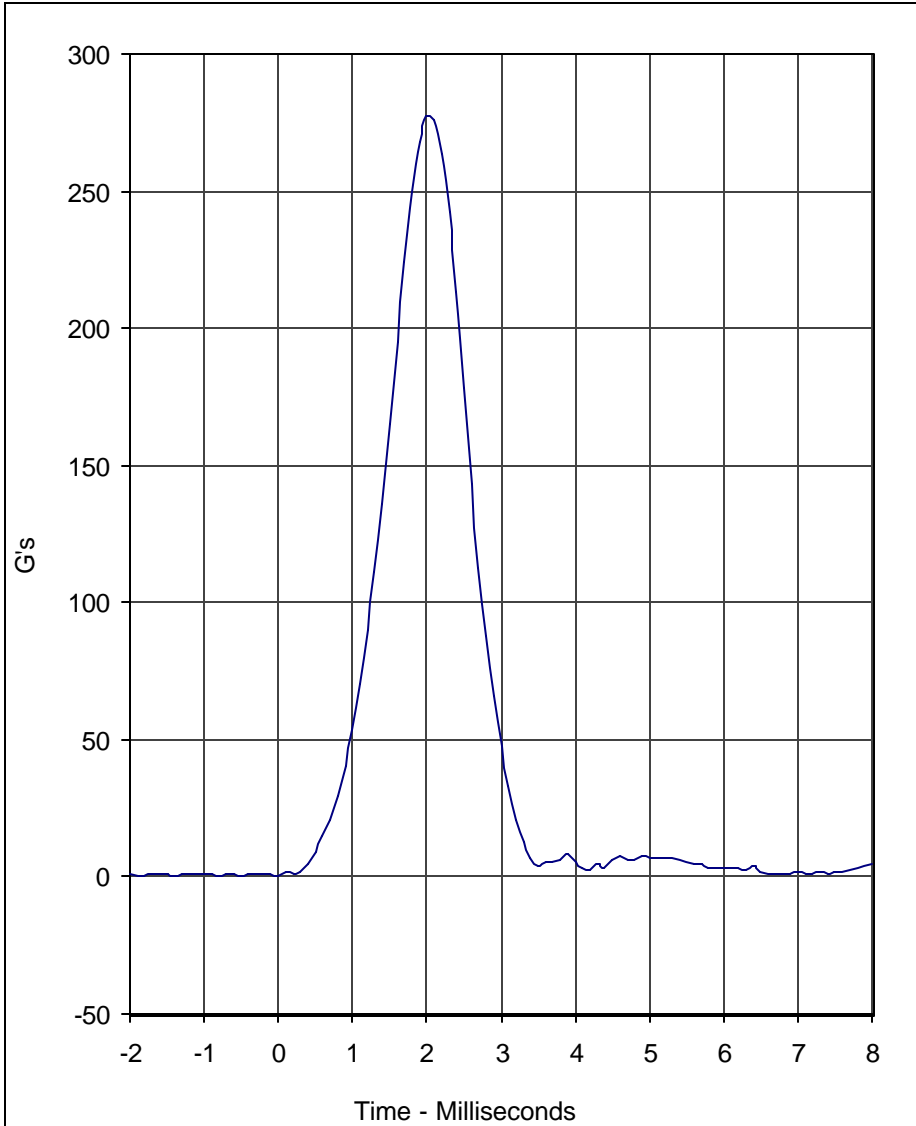
F5-1

TR-P23001-08-NC

\_\_\_\_\_  
Laboratory Technician

\_\_\_\_\_  
January 22, 2003

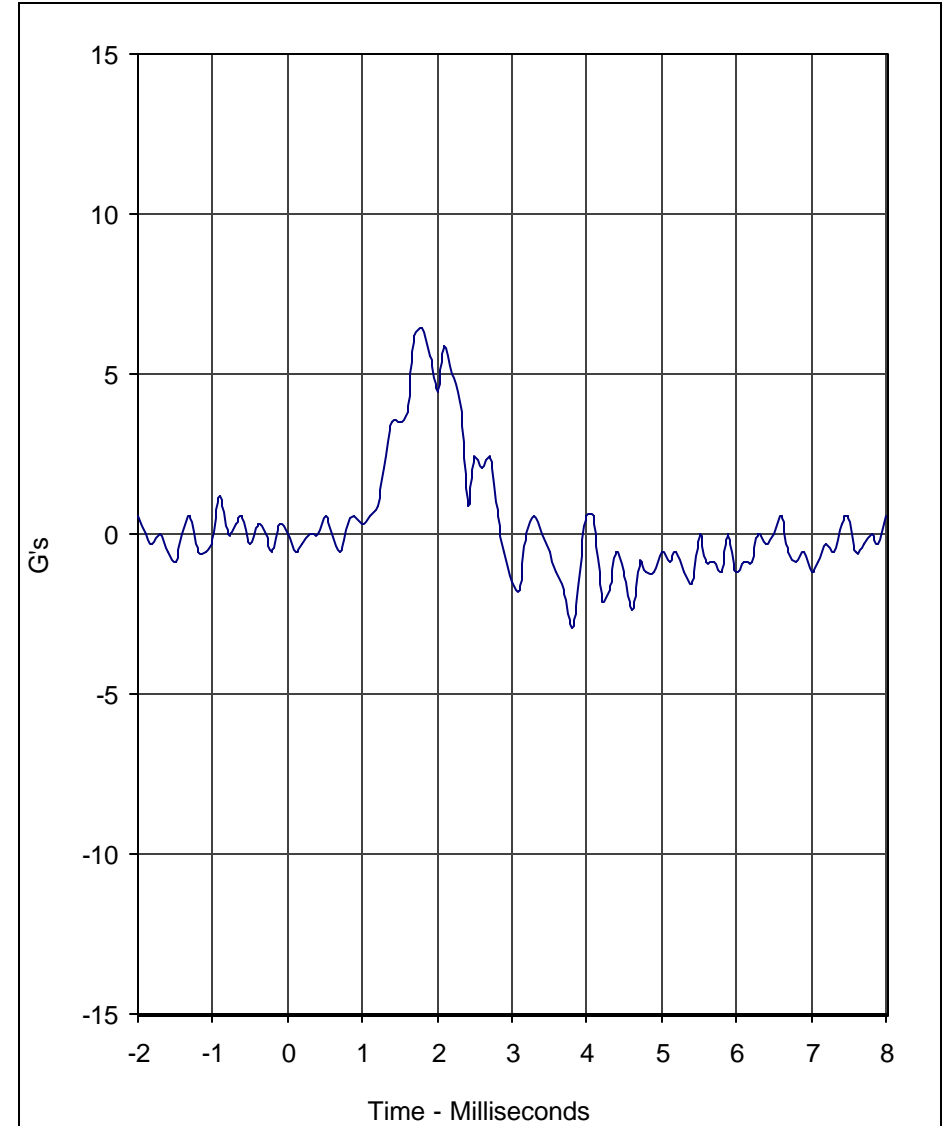
Test Date



Curve Description				CURNO	Type
Head Resultant				001	RES

Units	Max	Time	Min	Time	SAE Class
G's	277.1	2.0	0.3	-1.4	1000

Test Program: Hybrid III 3 Year Old Head Drop Test  
 Test Date: 1/22/03



Curve Description				CURNO	Type
Head Y				002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	6.5	1.8	-2.9	3.8	1000

A.T.D. Serial No.: 082  
 Test I.D.: 3HD03





# Calibration Data Sheet

## Hybrid III 3 Year Old

### Thorax Impact Test

ATD Serial No.: 082

Test I.D.: CH017

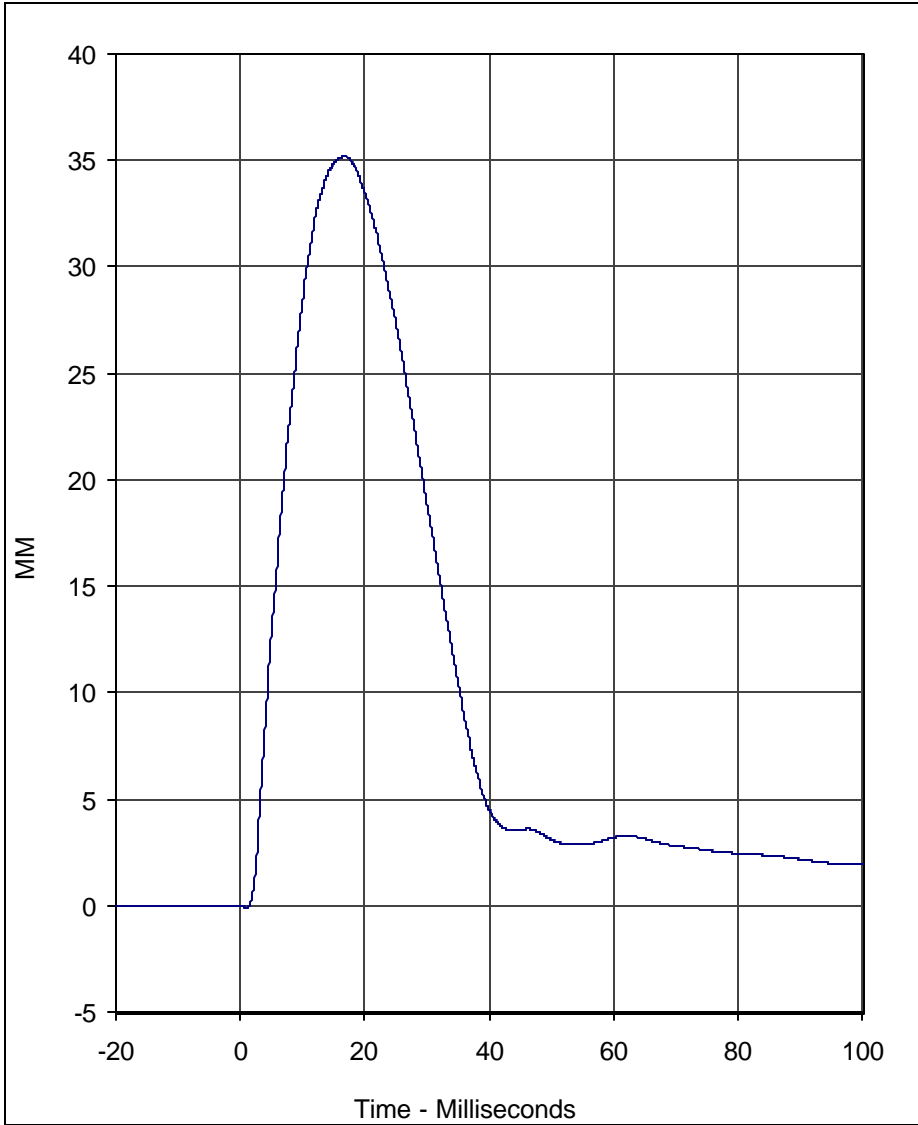
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	5.9 to 6.1	6.06	Pass
Peak Chest Compression	MM	32 to 38	35.2	Pass
Peak Probe Force Between 32 and 38 MM	Newtons	680 to 810	751.7	Pass
Peak Probe Force Between 12.5 and 32 MM	Newtons	≤860	743.9	Pass
Internal Hysteresis	%	65 to 85	70.1	Pass
Overall Test Results				Pass

F5-3

TR-P23001-08-NC

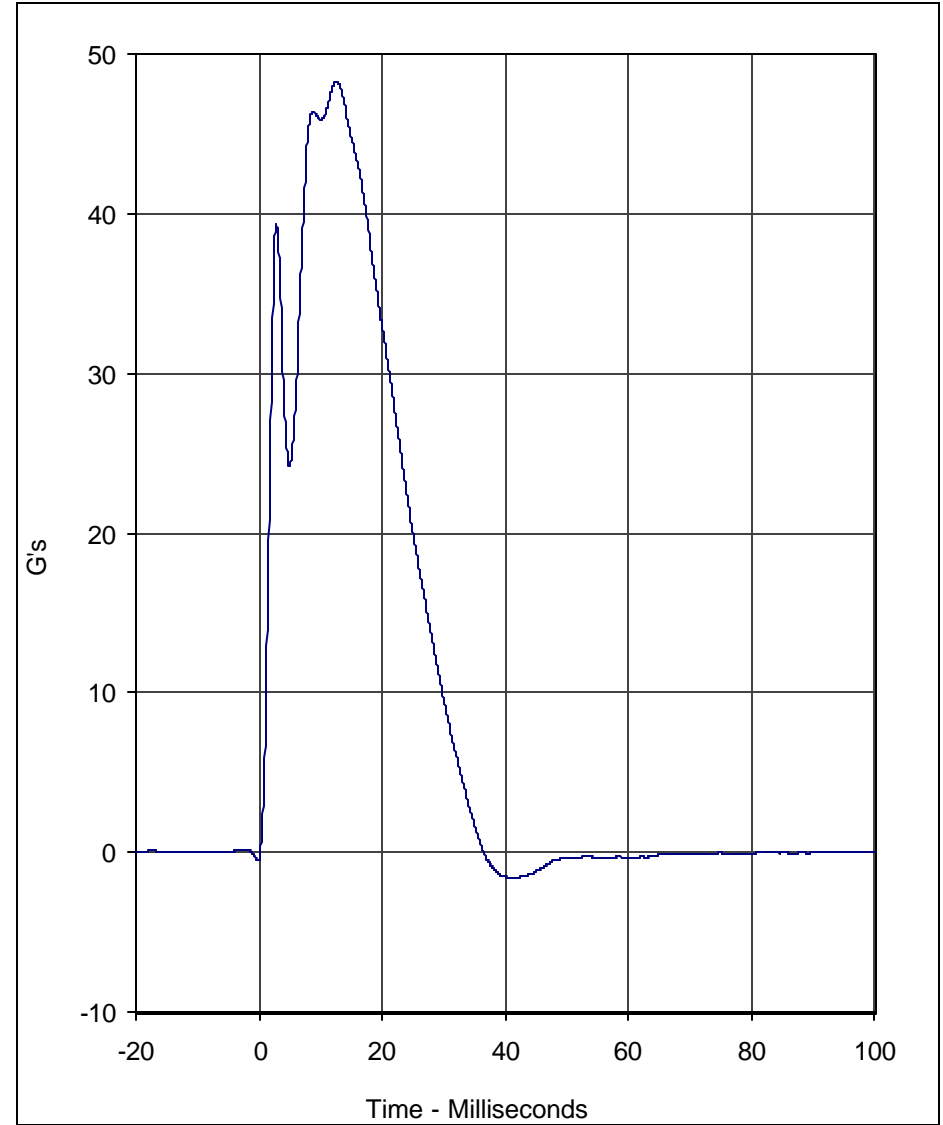
\_\_\_\_\_  
Laboratory Technician

\_\_\_\_\_  
January 22, 2003  
Test Date



Curve Description	CURNO	Type
Chest Compression	001	FIL

Units	Max	Time	Min	Time	SAE Class
MM	35.2	16.7	-0.1	1.0	180



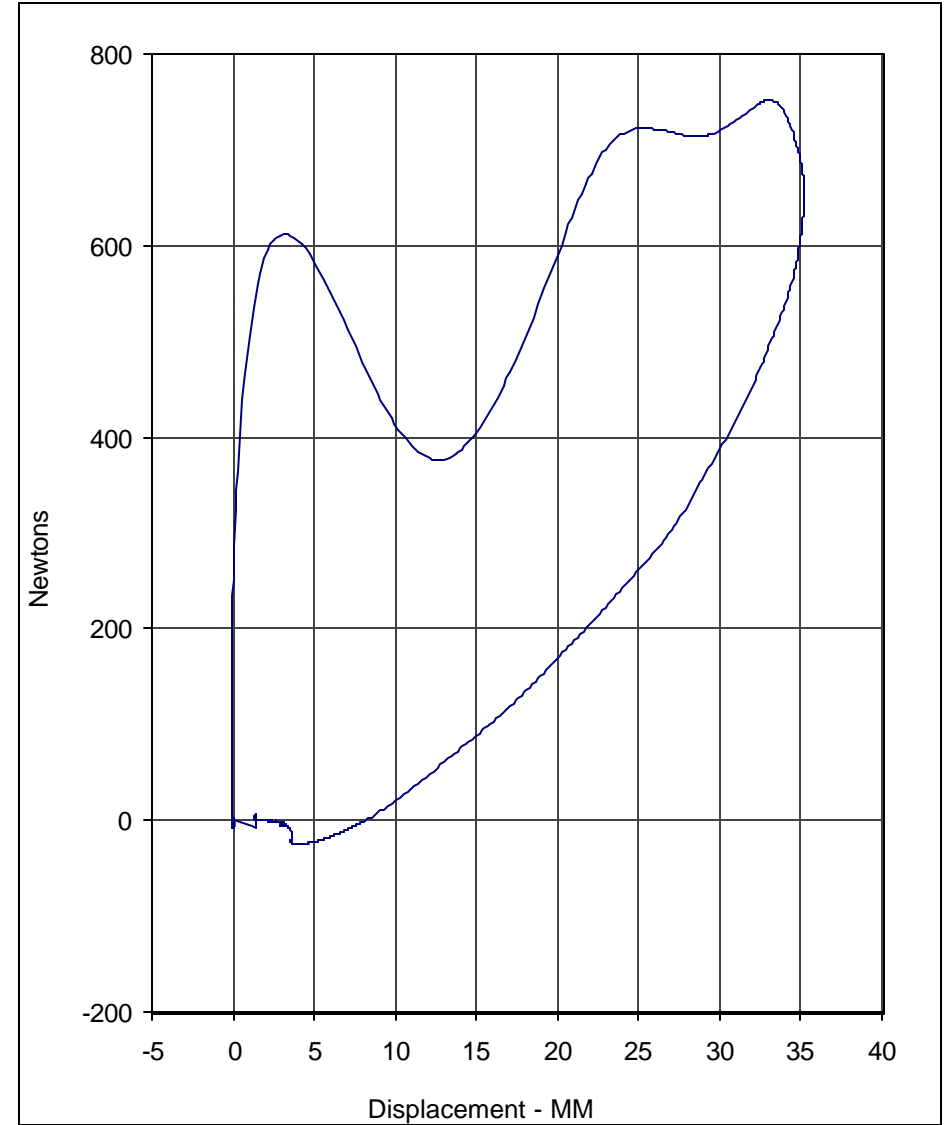
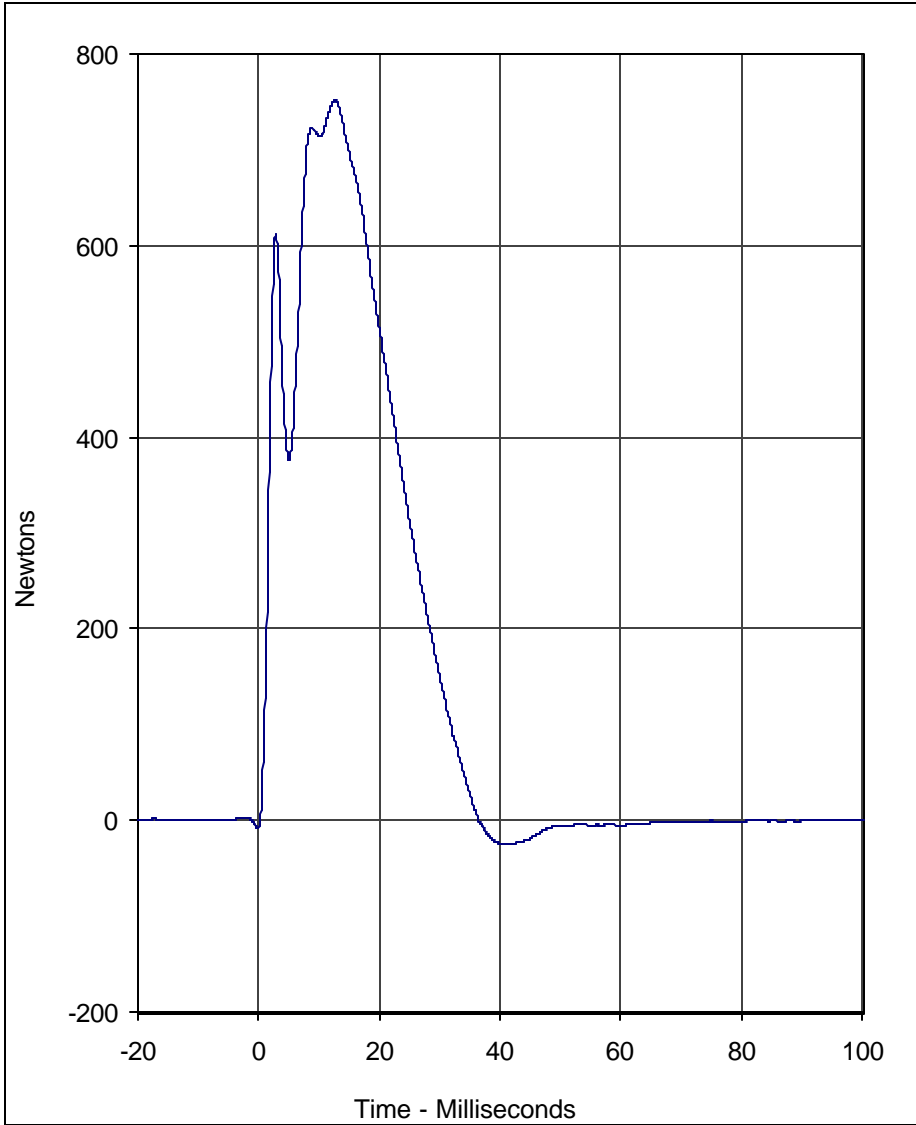
Curve Description	CURNO	Type
Probe Acceleration	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	48.3	12.7	-1.6	42.0	180

Test Program: Hybrid III 3 Year Old Thorax Impact  
 Test Date: 1/22/03

A.T.D. Serial No.: 082  
 Test I.D.: CH017





Curve Description	CURNO	Type
Probe Force	003	FIL

Curve Description	CURNO	Type
Probe Force vs. Chest Displacement	004	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	751.7	12.7	-24.6	42.0	180

Units	Hysteresis	SAE Class
%	70.3	180

Test Program: Hybrid III 3 Year Old Thorax Impact  
 Test Date: 1/22/03

A.T.D. Serial No.: 082  
 Test I.D.: CH017





# Calibration Data Sheet

## Hybrid III 3 Year Old Neck Flexion Test

ATD Serial No.: 082

Test I.D.: 3C09A

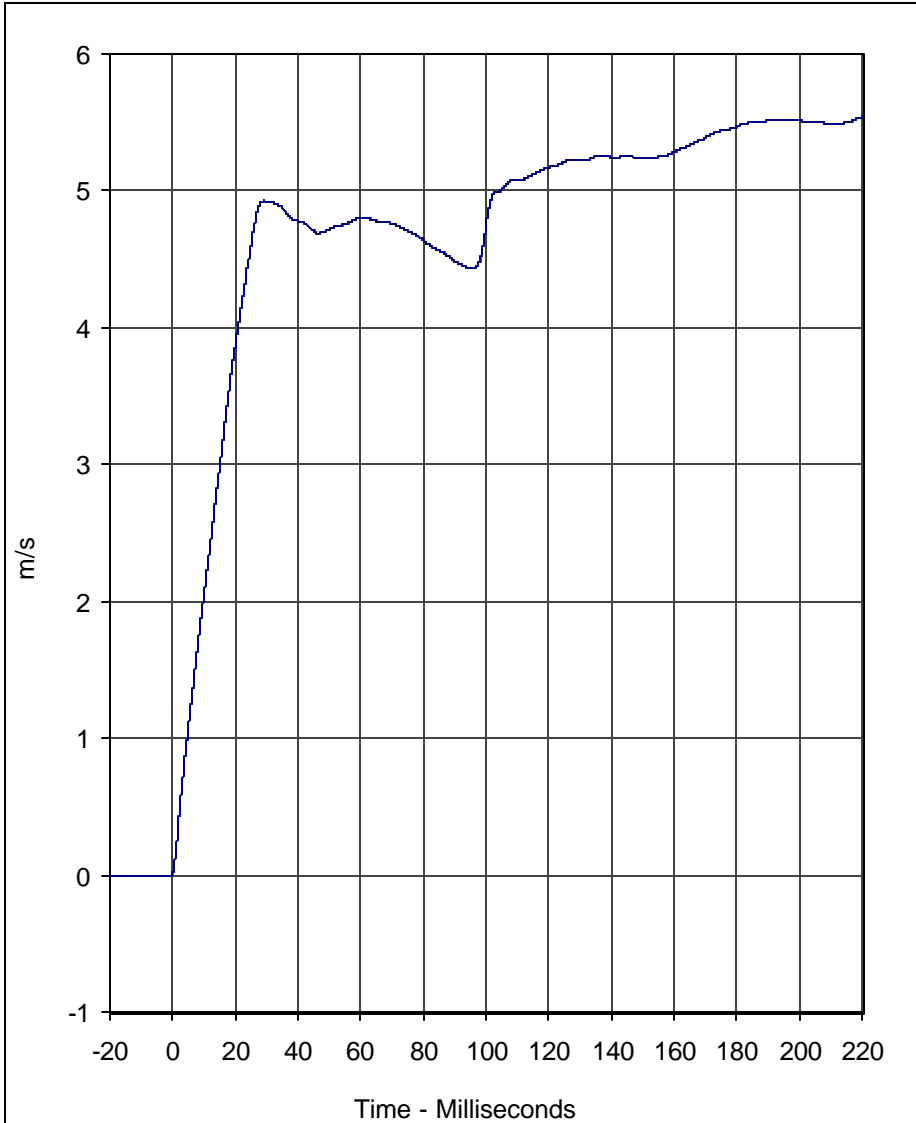
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.40 to 5.60	5.43	Pass
Pendulum Deceleration	10 Msec.	m/s	2.0 to 2.7	2.0	Pass
	20 Msec.	m/s	3.0 to 4.0	3.9	Pass
	30 Msec.	m/s	4.0 to 5.1	4.9	Pass
"D" Plane Rotation	Maximum	Degrees	70.0 to 82.0	75.4	Pass
Peak Moment in Rotation	Maximum	Nm	42.0 to 53.0	50.8	Pass
Positive Moment Decay, Time to 10Nm		Msec.	60.0 to 80.0	75.3	Pass
Overall Test Results					Pass

F5-6

TR-P23001-08-NC

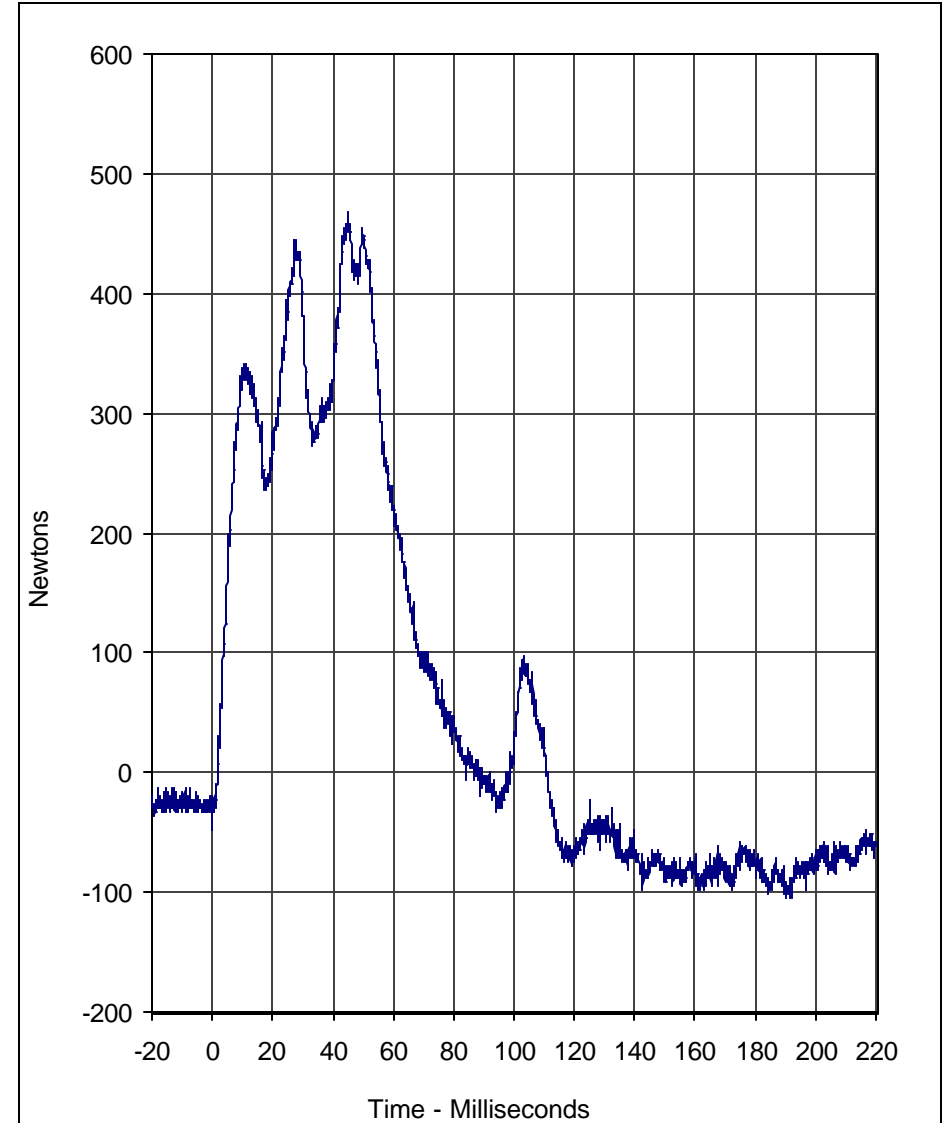
\_\_\_\_\_  
Laboratory Technician

January 24, 2003  
\_\_\_\_\_  
Test Date



Curve Description	CURNO	Type
Pendulum Velocity	001	FIL

Units	Max	Time	Min	Time	SAE Class
m/s	5.5	220.0	0.0	-0.9	180



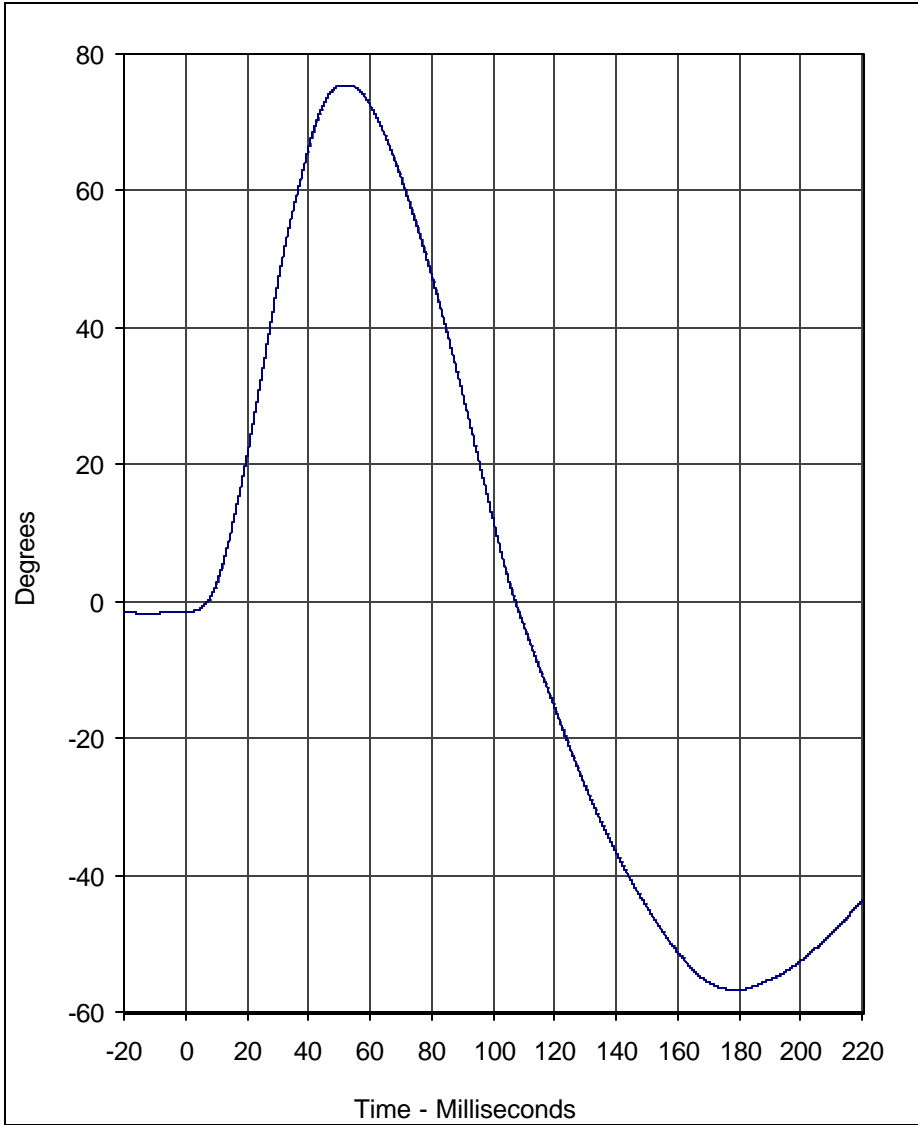
Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	468.5	45.0	-104.5	190.1	1000

Test Program: 3 Year Old Hybrid III Neck Flexion Test  
 Test Date: 1/24/03

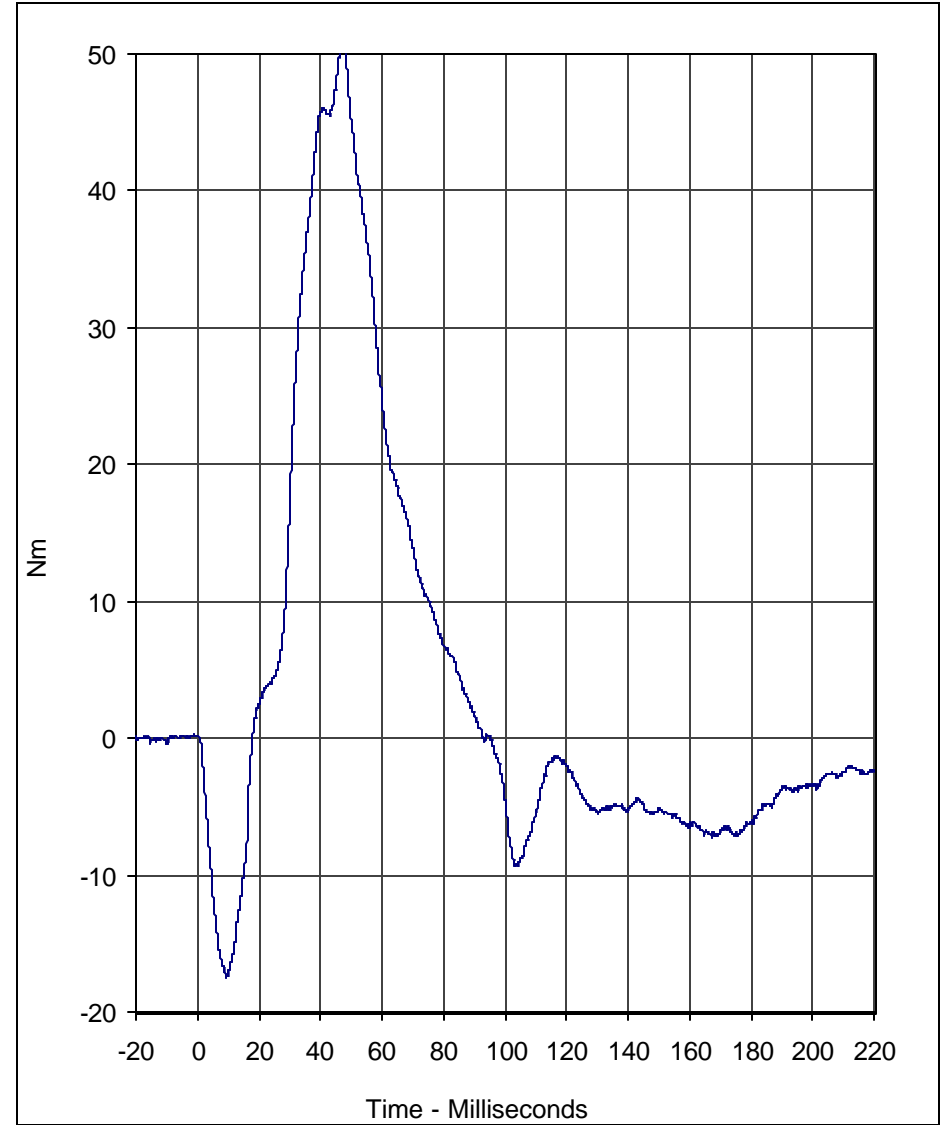
A.T.D. Serial No.: 082  
 Test I.D.: 3C09A





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	75.4	52.4	-56.8	179.3	60



Curve Description	CURNO	Type
Neck Moment Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	50.8	47.1	-17.4	9.3	600

Test Program: 3 Year Old Hybrid III Neck Flexion Test  
 Test Date: 1/24/03

A.T.D. Serial No.: 082  
 Test I.D.: 3C09A





# Calibration Data Sheet

## Hybrid III 3 Year Old Neck Extension Test

ATD Serial No.: 082

Test I.D.: 3C067

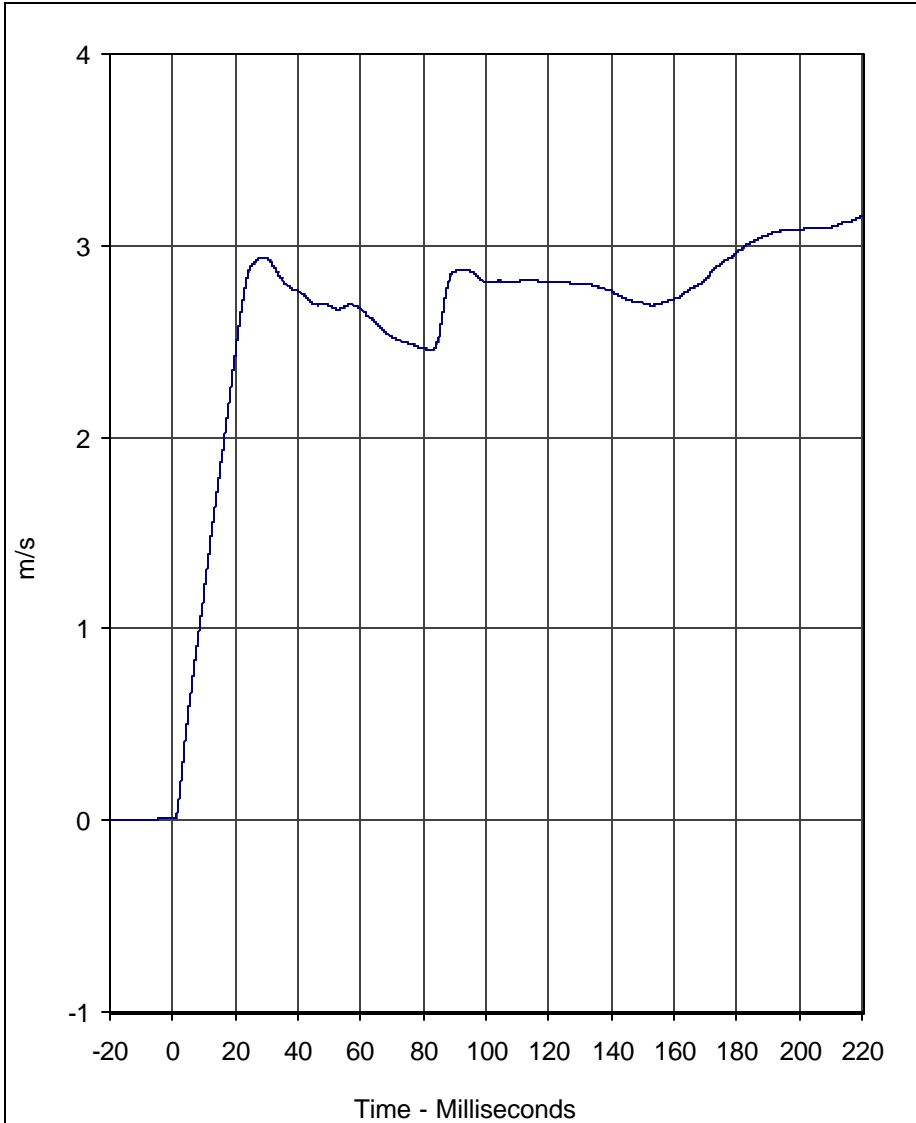
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	3.55 to 3.75	3.72	Pass
Pendulum Deceleration	10 Msec.	m/s	1.0 to 1.4	1.2	Pass
	20 Msec.	m/s	1.9 to 2.5	2.4	Pass
	30 Msec.	m/s	2.8 to 3.5	2.9	Pass
"D" Plane Rotation	Maximum	Degrees	83.0 to 93.0	91.7	Pass
Peak Moment in Rotation	Maximum	Nm	-43.7 to -53.3	-51.6	Pass
Positive Moment Decay, Time to 10Nm		Msec.	60.0 to 80.0	68.8	Pass
Overall Test Results					Pass

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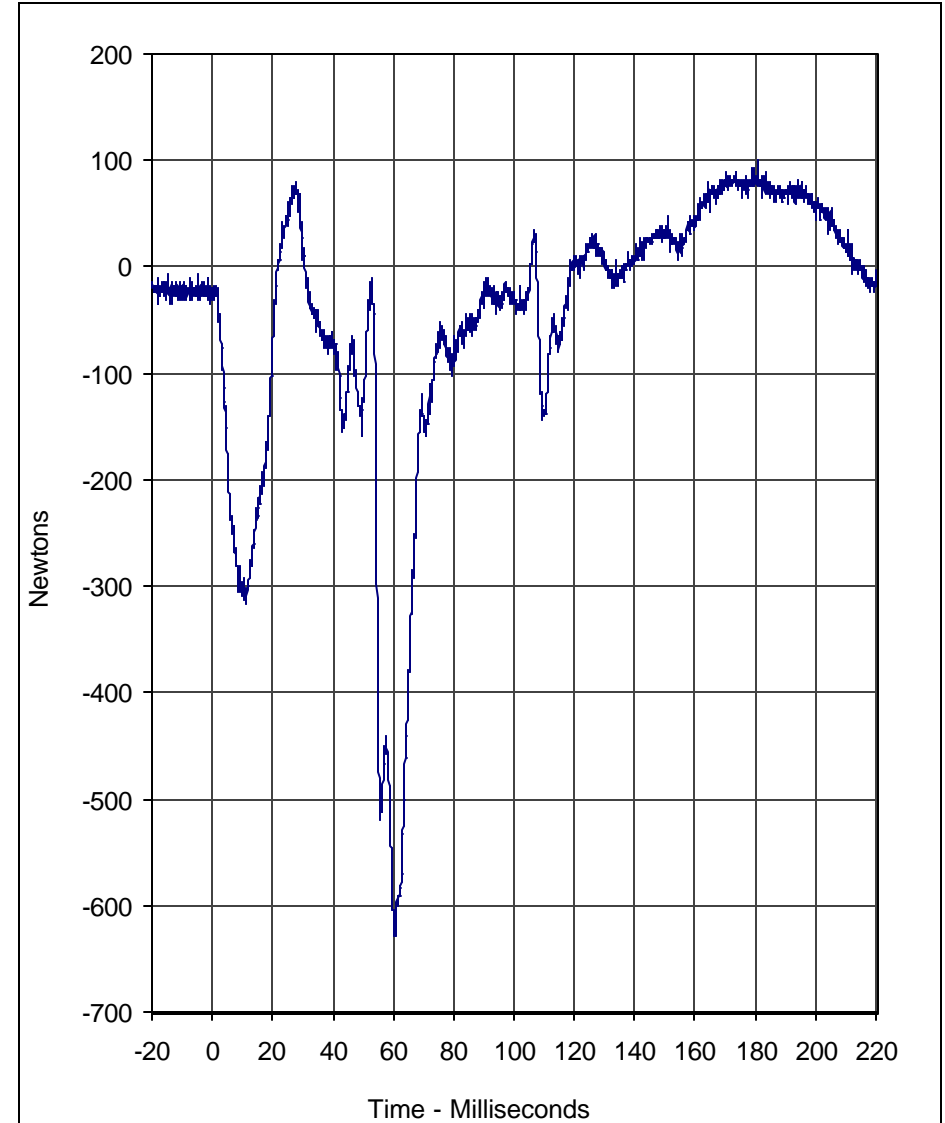
\_\_\_\_\_  
Laboratory Technician

January 23, 2003  
\_\_\_\_\_  
Test Date



Curve Description	CURNO	Type
Pendulum Velocity	001	FIL

Units	Max	Time	Min	Time	SAE Class
m/s	3.2	220.0	0.0	-20.0	180



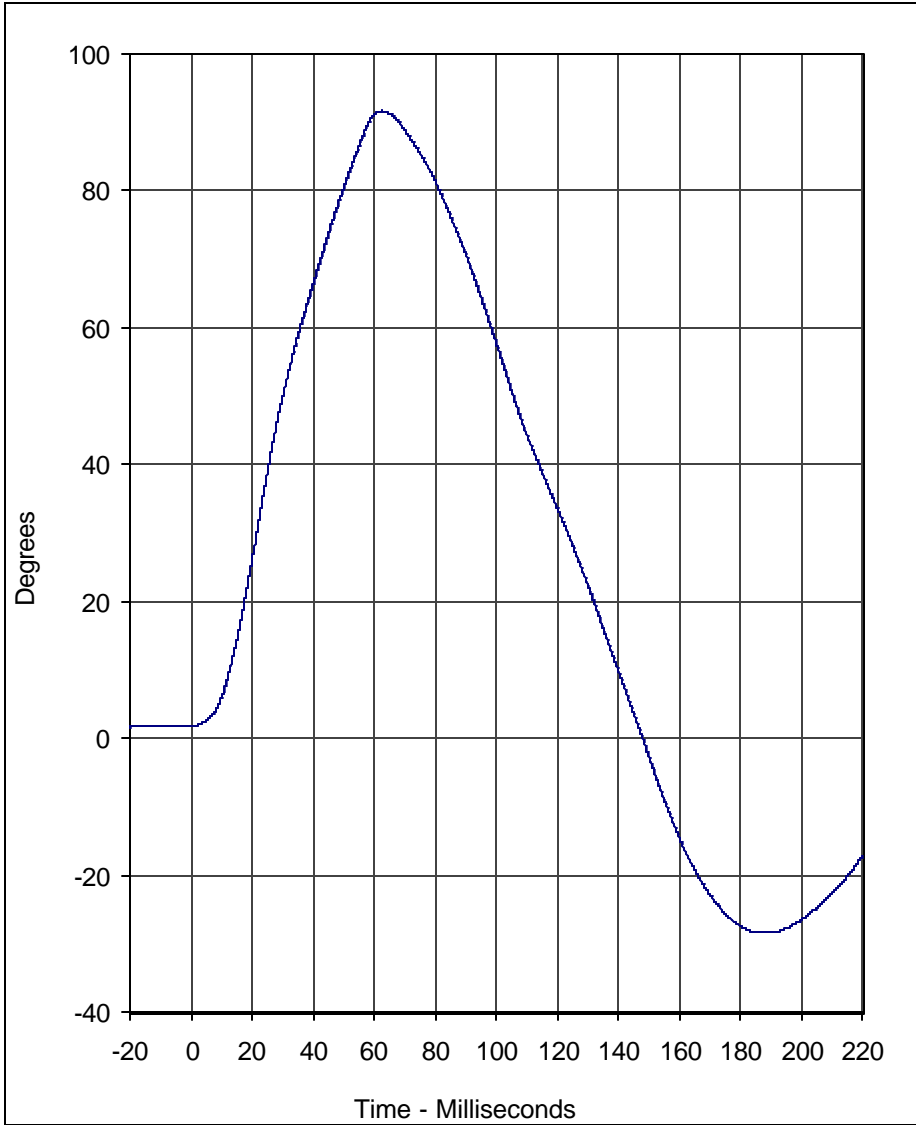
Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	99.7	180.9	-628.8	60.5	1000

Test Program: 3 Year Old Hybrid III Neck Extension Test  
 Test Date: 1/23/03

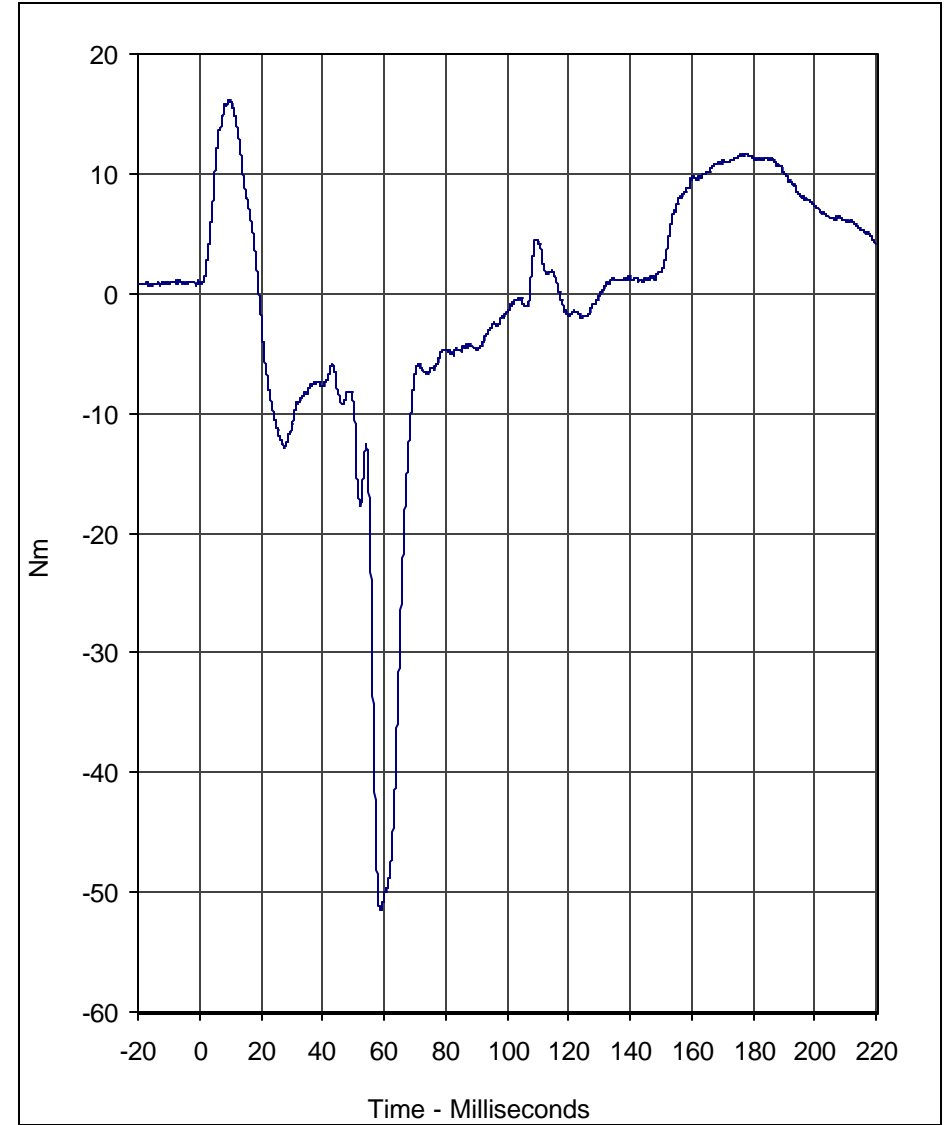
A.T.D. Serial No.: 082  
 Test I.D.: 3C067





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	91.7	62.6	-28.4	188.3	60



Curve Description	CURNO	Type
Neck Moment Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	16.1	9.4	-51.6	59.0	600

Test Program: 3 Year Old Hybrid III Neck Extension Test  
 Test Date: 1/23/03

A.T.D. Serial No.: 082  
 Test I.D.: 3C067





# Calibration Data Sheet

## Hybrid III 3 Year Old

### Torso Flexion Test

ATD Serial No.: 082

Test I.D.: TF091

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Initial reference plane angle	Degrees	≤15.0	5.2	Pass
Peak Force at 45 +/-0.5 degrees	Newtons	130.0 to 180.0	165.7	Pass
Torso rotation rate	deg/sec	0.5 to 1.5	0.7	Pass
Final reference plane angle	Degrees	+/-10	5.1	Pass
Overall Test Results				Pass

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\_\_\_\_\_  
Laboratory Technician

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January 24, 2003

Test Date



# Calibration Data Sheet Hybrid III 3 Year Old External Measurements

ATD Serial No.: 082

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	539 to 554	550	Pass
B - Shoulder pivot height	mm	307 to 323	320	Pass
C - "H" point height	mm	34 to 45	40	Pass
D - "H" point from backline	mm	57 to 67	65	Pass
E - Shoulder pivot from back	mm	61 to 71	65	Pass
F - Thigh clearance	mm	81 to 91	85	Pass
G - Elbow back to wrist pivot	mm	247 to 263	255	Pass
H - Skull cap to back line	mm	48 to 58	55	Pass
I - Shoulder to elbow length	mm	185 to 201	200	Pass
J - Elbow rest height	mm	134 to 149	140	Pass
K - Buttock to knee length	mm	285 to 300	300	Pass
L - Popliteal length	mm	219 to 234	225	Pass
M - Knee pivot height	mm	242 to 257	255	Pass
N - Buttock popliteal length	mm	218 to 233	220	Pass
O - Chest depth with jacket	mm	139 to 154	145	Pass
P - Foot length	mm	138 to 148	145	Pass
R - Buttock to knee pivot length	mm	251 to 262	255	Pass
S - Head Breadth	mm	128 to 144	140	Pass
T - Head Depth	mm	167 to 183	170	Pass
U - Hip breadth	mm	201 to 216	205	Pass
V - Shoulder breadth	mm	237 to 252	250	Pass
W - Foot breadth	mm	54 to 64	60	Pass
X - Head circumference	mm	500 to 516	515	Pass
Y - Chest circumference with jacket	mm	527 to 553	535	Pass
Z - Waist circumference	mm	527 to 553	550	Pass
AA - Location for chest circumference	mm	249 to 259	255	Pass
BB - Location for waist circumference	mm	160 to 170	165	Pass
Overall Test Results				Pass

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\_\_\_\_\_  
Laboratory Technician

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January 24, 2003  
Test Date

**HYBRID III 6 YEAR OLD S/N 027 CALIBRATED BY VRTC PRIOR TO TEST PROGRAM**