

REPORT NUMBER KAR22001-18

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

**HYUNDAI MOTOR COMPANY
2002 HYUNDAI SANTA FE
4WD SUV**

NHTSA NUMBER: M20503

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



JUNE 12, 2002

FINAL REPORT

**PREPARED FOR:
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400 SEVENTH STREET, SW, ROOM 5311
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Date of Acceptance

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Date of Acceptance

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16. Abstract A 35 mph (56.3 km/h) frontal barrier impact was conducted on a 2002 Hyundai Sante Fe 4WD SUV at KARCO Engineering, LLC on 6/12/02. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity is 55.61 km/h. The ambient temperature at the barrier face at the time of impact is 32.8 degrees Celcius. The vehicle's maximum post test static crush is 483 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:																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;">Measurement Description</th> <th style="width: 15%;">Units</th> <th style="width: 15%;">Threshold</th> <th style="width: 15%;">Driver ATD</th> <th style="width: 20%;">Passenger ATD</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td>N/A</td> <td>1000</td> <td>474.9</td> <td>402.7</td> </tr> <tr> <td>Max. Thorax Accel. (3 msec Clip)</td> <td>G's</td> <td>60</td> <td>42.6</td> <td>49.3</td> </tr> <tr> <td>Left Femur force</td> <td>Newtons</td> <td>10000</td> <td>-5951.6</td> <td>-10321.3</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10000</td> <td>-5056.3</td> <td>-5059.7</td> </tr> </tbody> </table>				Measurement Description	Units	Threshold	Driver ATD	Passenger ATD	Head Injury Criteria (HIC)	N/A	1000	474.9	402.7	Max. Thorax Accel. (3 msec Clip)	G's	60	42.6	49.3	Left Femur force	Newtons	10000	-5951.6	-10321.3	Right Femur Force	Newtons	10000	-5056.3	-5059.7
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TABLE OF CONTENTS

Section	Description	Page
1	Purpose and Summary of Test M20503	1
2	Occupant and Vehicle Information/Data Sheets	3

Data Sheet	Description	Page
1	Crash Test Summary	4
2	General Test and Vehicle Parameter Data	5
3	Post Impact Data	7
4	Test Vehicle Information	8
5	Dummy Positioning in Vehicle	10
6	Seatbelt Positioning Data	12
7	Vehicle Accelerometer Location and Data Summary	13
8	Hybrid III ATD Injury Criteria and Sensor Data	14
9	Seatbelt Assessment Test Data	17
10	Summary of FMVSS 212 Data	18
11	Windshield Zone Intrusion FMVSS 219 Data (Partial)	19
12	FMVSS 301 Fuel System Integrity Post Impact Data	20
13	FMVSS 301 Static Rollover Data	21
14	Vehicle Measurements	22
15	Camera Locations	24
16	Photographic Reference Target Locations	25
17	Vehicle Intrusion Measurements	26
18	Fixed Barrier Load Cell Locations	30
19	Accident Investigation Division Data	31
20	Dummy/Vehicle Temperature Stabilization	32

Appendix	Description	Appendix
A	Photographs	A
B	Dummy and Vehicle Response Data Traces	B
C	Load Cell Barrier Data Traces	C
D	Instrumentation and Data Channel Assignments	D
E	Dummy Calibration Data Traces and Tables	E
F	Owners Manual	F
G	Nine Accelerometer Head Array Data	G

SECTION 1
PURPOSE AND SUMMARY OF TEST M20503

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 24 load cells was impacted by a 2002 Hyundai Santa Fe 4WD SUV at a velocity of 55.61 km/h. The test was performed at Karco Engineering, LLC on June 12, 2002. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with nine accelerometer array head, chest and pelvis triaxial accelerometers, chest displacement potentiometers, six-axis upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also placed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 35) and the right-front passenger (position 2) ATD (Serial No. 34) were calibrated prior to this test.

One Hundred and Nine (109) channels of data were recorded using an on-board data acquisition system. 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 owner's manual instructions for the occupant and restraint systems. Appendix G contains the Nine Accelerometer Head Array data.

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 483 mm and both the driver and the passenger side doors remained closed and latched during the impact event and were operable without the aid of tools after the impact.

The driver's visible contact points were as follows: The driver ATD head contacted the airbag and headrest, its chest abdomen contacted the airbag. No contact by the abdomen. Both knees contacted the knee bolster.

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 glove box.

The right front seat shifted approximately 115 mm on the inboard side. The event occurred at approximately 85 msec.

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	474.9	42.6	-29.9	-5951.6	-5056.3	202.4
Passenger	402.7	49.3	-26.7	-10321.3	-5059.7	117.3

SECTION 2
OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

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 ²	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: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	55.61
Test Weight	kg	1968
Impact Angle	degrees	0
Average Rebound	mm	442
Maximum Static Crush	mm	483

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Remained closed & latched, opened w/o the aid of tools	Remained closed & latched, opened w/o the aid of tools
Rear Door Opening	Remained closed & latched, opened w/o the aid of tools	Remained closed & latched, opened w/o the aid of tools
Seat Track Shift (mm)	35	150
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/Headrest	Airbag,Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	None	Airbag
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

16mm MOVIE COVERAGE

High Speed	16
Real Time	1
Total	17

DATA CHANNELS

Driver ATD Sensors	46
Passenger ATD Sensors	46
Belt Assessment Sensors	8
Vehicle Structure Accelerometers	9
Rigid Barrier Load Cells	24
Total	133

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

TEST VEHICLE INFORMATION

Make	Hyundai
Model	Sante Fe
Body Style	4WD SUV
NHTSA No.	M20503
VIN	KM8SC73D32U231781
Color	White
Delivery Date	6/7/02
Odometer Reading (mi.)	73
Dealer	Sunrise Hyundai
Transmission	4 Automatic
Final Drive	4WD
Type/No. Cylinders	V-6
Engine Displacement (L)	2.7
Engine Placement	Transverse
Front Seat Side Airbag	No

TEST VEHICLE OPTIONS

Driver Front Airbag	Yes
Pass. Front Airbag	Yes
Power Windows	Yes
Pre-Tensioners	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Disc Brakes, Front	Yes
Disc Brakes, Rear	Yes
Anti-lock Brakes	No
Head Airbag	No
Load Limiter	Yes
Cruise Control	Yes
Bucket Seats	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company	GVWR (kg)	2377
Date of Manufacture	January-02	GAWR Front (kg)	1200
		GAWR Rear (kg)	1370

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	210	210
Cold Pressure (kPa)	210	210
Recommend Tire Size	P225/70R16	P225/70R16
Tire Size on Vehicle	P225/70R16	P225/70R16
Tire Manufacturer	B. F. Goodrich	B. F. Goodrich

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)				278
Cargo Weight (RCLW) (kg)				59

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	518	375		553	430	
Right	kg	505	366		544	441	
Ratio	%	58.0	42.0		55.7	44.3	
Totals	kg	1023	741	1764	1097	871	1968

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1764
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight (RCLW)	kg	59
Calculated Vehicle Target Weight (TVT _W)	kg	1975

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	806	820	807	811	1103
As Tested	mm	786	792	774	786	1164

Vehicle Wheel base (mm): 2627

Weight of Ballast secured in cargo area (kg): 0

Vehicle Components Removed: _____

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

FUEL SYSTEM DATA

Fuel System Capacity From Owner's Manual (L): 65.1

Usable Capacity Figure Furnished by COTR (L): 60.6

Actual Test Volume with entire fuel System Filled (L): 60.2

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: _____

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

SPEED TRAP DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	55.51 to 57.12	55.61
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	55.64
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	4396	3946	-450
Center	mm	4496	4013	-483
Right Side	mm	4396	3993	-403

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	499
Center	mm	430
Right Side	mm	397
Average	mm	442

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

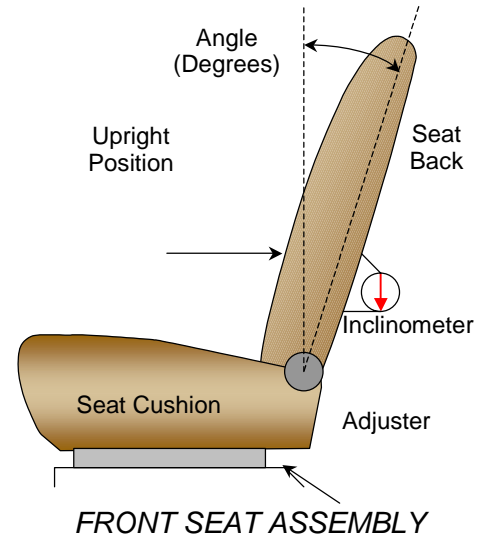
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

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.

Driver seat back angle: 26° with a seated dummy
Passenger seat back angle: 26° with a seated dummy



SEAT FORE/AFT POSITIONS

Both driver and passenger seats have 24 positions or detents. 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 driver and passenger.

Driver seat fore/aft total travel: 24 seating positions or detents
Driver seat fore/aft position: 13th detent from forward most
Passenger seat fore/aft total travel: 24 seating positions or detents
Passenger seat fore/aft position: 13th detent from forward most

SEAT BELT UPPER ANCHORAGE

The test vehicle is equipped with adjustable anchorages for both driver and passenger seat positions. There are 4 positions or detents. Both the driver and the passenger anchorages are placed in the 2nd position from the uppermost.

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

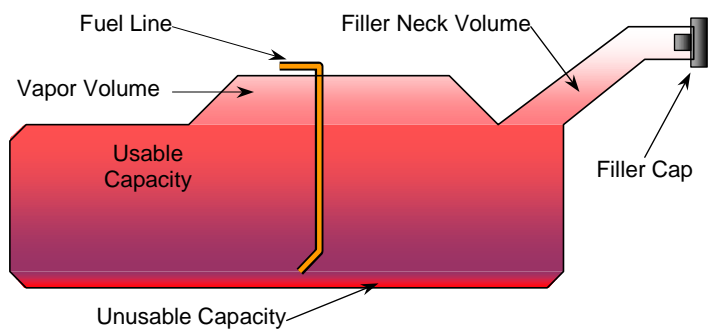
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

FUEL TANK CAPACITY DATA

The "Usable Capacity" of the standard equipment fuel tank is: 65.1 liters
 The "Usable Capacity" of any optional equipment fuel tank is: N/A liters
 "Usable Capacity" used for certification tests FMVSS 301 requirements: 59.8 to 60.9 liters
 Actual amount of Stoddard solvent added to vehicle for certification test: 60.2 liters

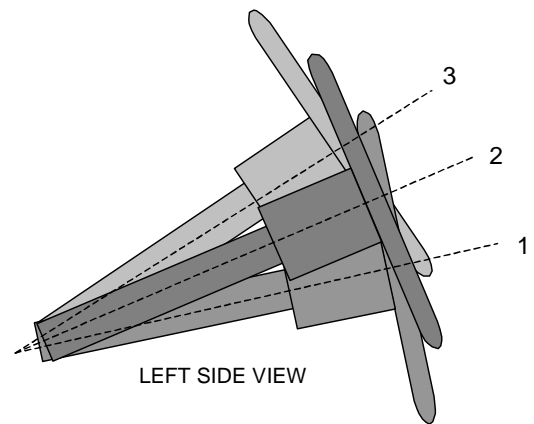
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the area under the rear seat. Fuel lines run inside the frame rail to the engine compartment.



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. The steering column has seven (7) positions or detents and is set in the fourth (4) detent as indicated by the diagram at right and the angle below.



STEERING COLUMN ASSEMBLY

Lowermost; position 1: 16°
 Geometric center; position 2: 22°
 Uppermost position 3: 28°

DATA SHEET NO. 5
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

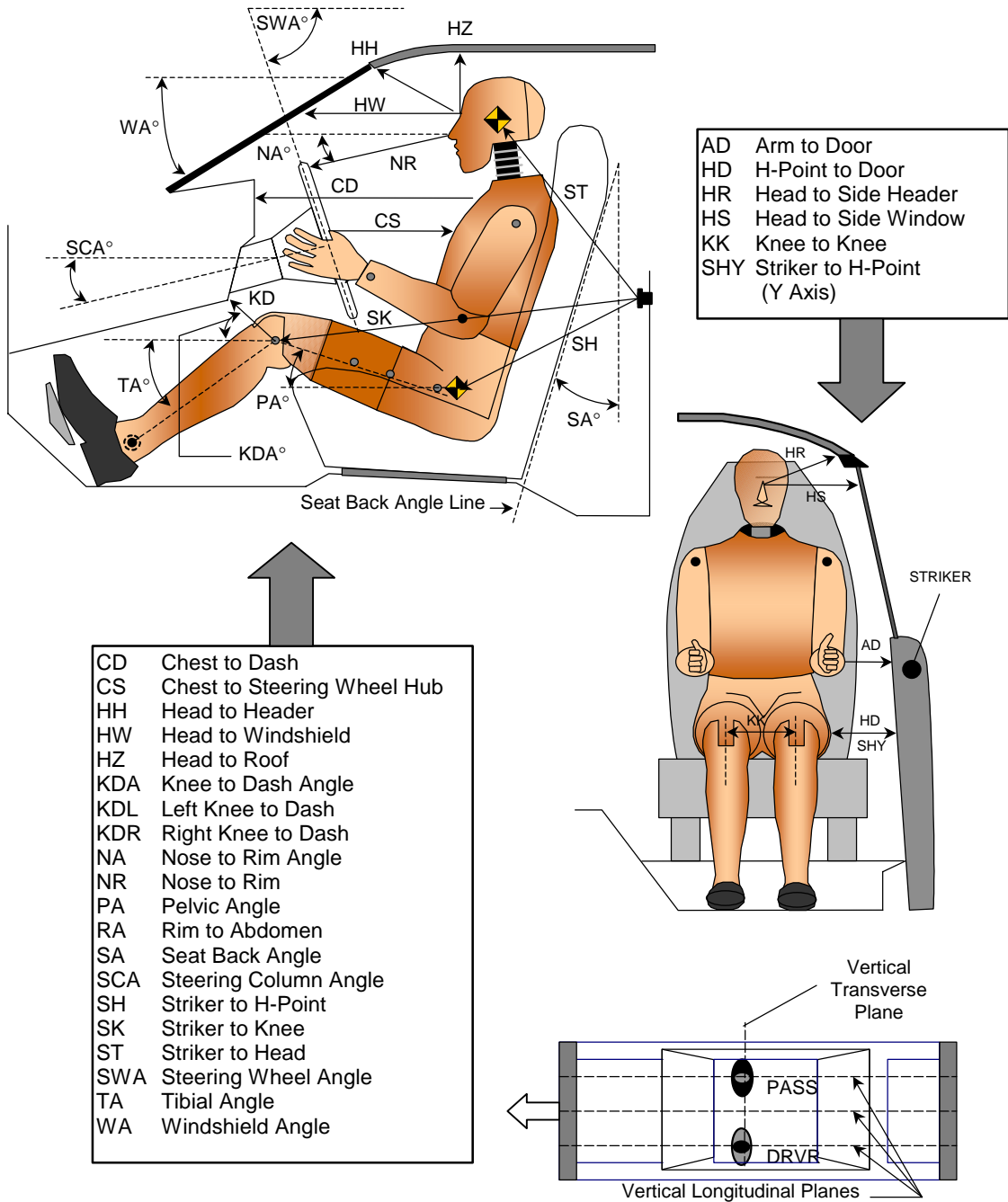
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		31		
SWA	Steering Wheel Angle		68		
SCA	Steering Column Angle		22		
SA	Seat Back Angle		26		26
HZ	Head to Roof (Z)	168	90	158	90
HH	Head to Header	338		314	
HW	Head to Windshield	560		525	
HR	Head to Side Header (Y)	240		230	
NR	Nose to Rim	420	16		
CD	Chest to Dash	525		548	
CS	Chest to Steering Hub	250			
RA	Rim to Abdomen	172			
KDL	Left Knee to Dash	115	21	130	
KDR	Right Knee to Dash	125		125	44
PA	Pelvic Angle		25		25
TA	Tibia Angle		38		49
KK	Knee to Knee (Y)	285		270	
ST	Striker to Head	623	1	644	1
SK	Striker to Knee	590	79	600	77
SH	Striker to H-Point	252	21	235	17
SHY	Striker to H-Point (Y)	228		238	
HS	Head to Side Window	300		298	
HD	H-Point to Door (Y)	172		159	
AD	Arm to Door (Y)	110		35	

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02



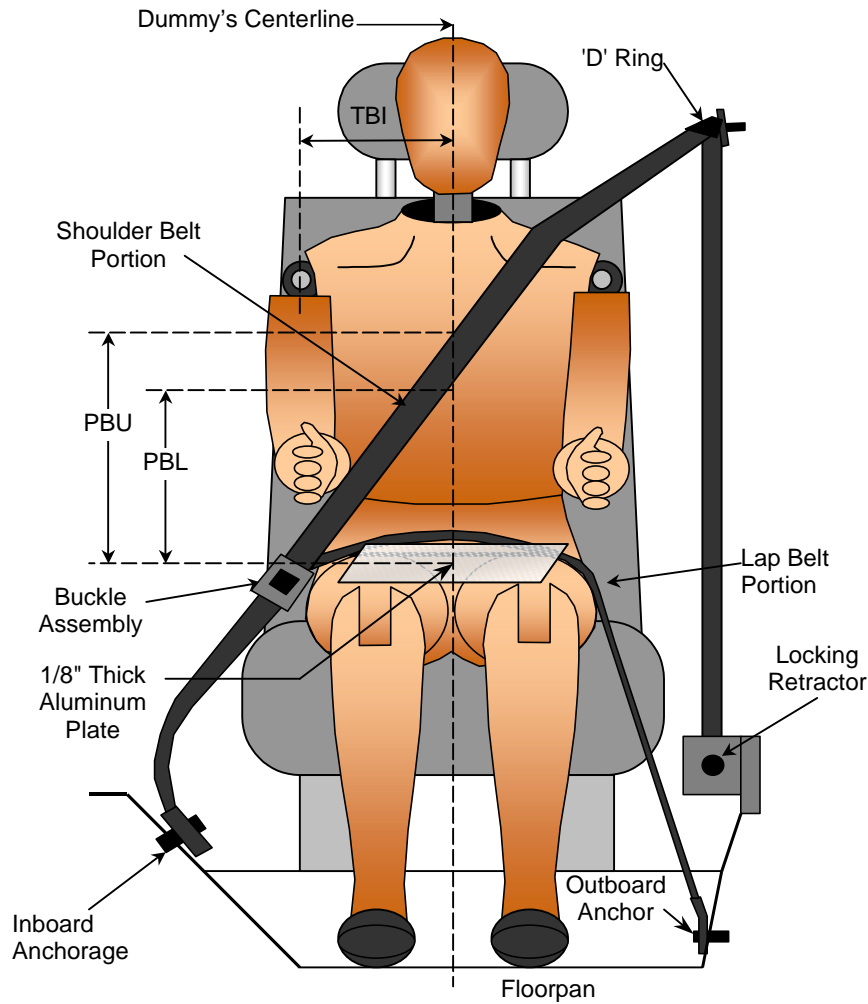
- CD Chest to Dash
- CS Chest to Steering Wheel Hub
- HH Head to Header
- HW Head to Windshield
- HZ Head to Roof
- KDA Knee to Dash Angle
- KDL Left Knee to Dash
- KDR Right Knee to Dash
- NA Nose to Rim Angle
- NR Nose to Rim
- PA Pelvic Angle
- RA Rim to Abdomen
- SA Seat Back Angle
- SCA Steering 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: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	195	200
PBU - Top surface of reference to belt upper edge	mm	305	330
PBL - Top surface of reference to belt lower edge	mm	230	245
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: 2002 Hyundai Santa Fe 4WD SUV

NHTSA No.: M20503

Test Program: 2002 NHTSA 35mph NCAP

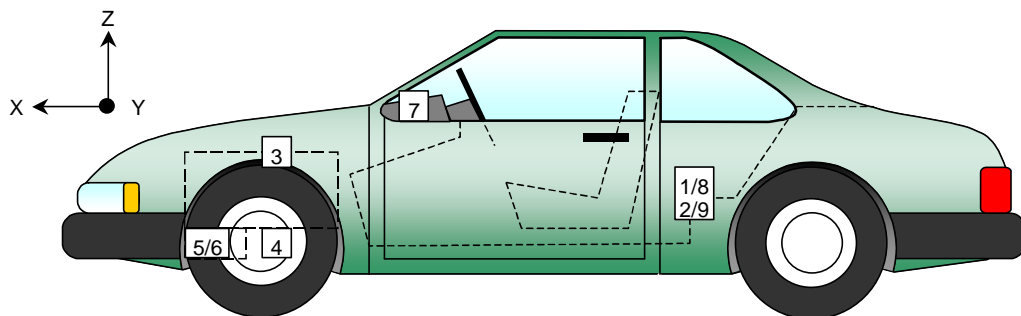
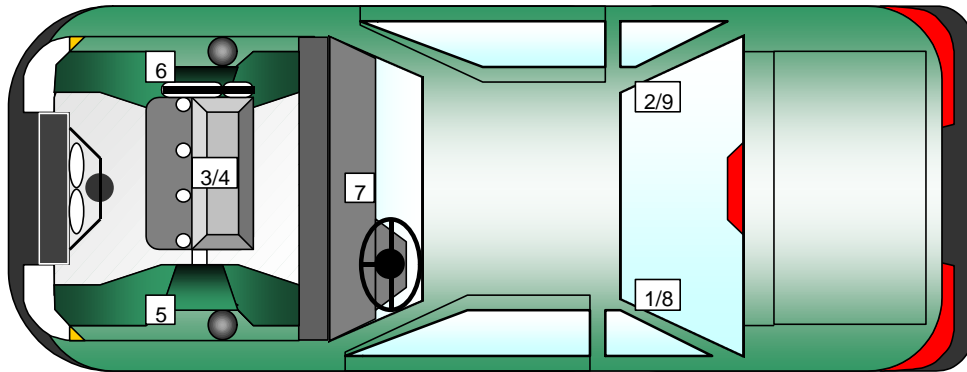
Test Date: 6/12/02

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	1820	-660	460	G's	2.6	106.2	-40.4	35.3
2	Right Rear X-Member	1820	660	460	G's	3.3	105.5	-43.7	38.1
3	Engine Top	3700	80	880	G's	48.8	39.9	-186.8	25.6
4	Engine Bottom	3620	-120	280	G's	24.9	36.3	-148.3	28.9
5	Left Brake Caliper	3710	-710	265	G's	39.4	64.2	-83.0	46.5
6	Right Brake Caliper	3710	710	265	G's	59.6	66.8	-89.0	51.1
7	Instrument Panel	2950	0	1160	G's	7.4	82.0	-49.3	70.4
8	Left Rear X-Member (Z-Axis)	1660	-690	460	G's	6.6	17.9	-4.1	28.0
9	Right Rear X-Member (Z-Axis)	1660	690	460	G's	7.6	45.1	-5.9	51.6

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

1.) Channel failed at 73.6 msec.



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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

NHTSA No.: M20503

Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	23.5	243.0	-52.4	81.2	13.8	244.9	-47.9	73.1
Head CG	Y	G's	15.0	242.5	-10.4	253.9	6.6	46.0	-15.7	98.9
Head CG	Z	G's	18.1	55.5	-10.2	92.9	23.7	74.3	-9.7	95.2
Head CG Resultant	N/A	G's	52.9	82.1			54.2	74.0		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.6	126.7	-44.5	64.4	2.9	149.4	-47.0	73.9
Chest CG	Y	G's	7.6	80.2	-4.0	43.5	6.6	47.0	-6.1	72.3
Chest CG	Z	G's	5.7	246.1	-8.3	96.4	17.9	76.6	-13.8	97.8
Chest CG Resultant	N/A	G's	44.5	64.4			50.1	73.9		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	388.6	27.6	-5951.6	48.9	258.9	290.8	-10321.3	47.5
Right Femur	Z	Newtons	287.7	253.7	-5056.3	48.3	381.6	33.5	-5059.7	54.2

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Shoulder Belt Pullout	N/A	MM	202.4	87.7	-45.3	39.8	117.3	85.3	-42.1	37.8
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	7187.1	53.7	28.2	0.0	4025.5	63.9	-20.1	128.0
Shoulder Belt Force	N/A	Newtons	4450.0	42.8	-37.5	139.9	4213.8	63.4	-33.0	147.0

1.) Not used with pre-tensioner

PRIMARY HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	T ¹	T ²	Avg G	HIC	T ¹	T ²	Avg G
Head CG Primary	474.9	58.3	94.2	44.5	402.7	62.3	98.2	41.7

PRIMARY CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	42.6	63.0	66.0	49.3	72.4	75.4

DATA SHEET NO. 8...(continued)

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

NHTSA No.: M20503

Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	3.4	104.5	-86.9	48.3	5.5	132.6	-64.0	46.7
Pelvis	Y	G's	11.1	83.8	-8.4	47.7	8.6	47.6	-10.2	85.8
Pelvis	Z	G's	5.3	247.7	-24.2	60.9	3.2	157.1	-15.9	59.5
Pelvis Resultant	N/A	G's	87.4	48.3			65.2	45.2		

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	288.9	251.0	-319.8	137.5	593.5	83.1	-537.8	134.5
Neck Force	Y	Newtons	164.5	166.4	-174.5	251.2	290.1	62.8	-358.9	129.6
Neck Force	Z	Newtons	2098.5	65.3	-1363.5	253.9	1838.6	73.2	-337.4	95.4
Neck Force Resultant	N/A	Newtons	2102.5	65.3			1863.6	63.6		
Neck Moment	X	N•m	25.4	254.5	-6.4	92.4	3.2	280.8	-23.4	82.5
Neck Moment	Y	N•m	25.1	133.8	-32.6	80.1	37.9	141.6	-29.6	66.3
Neck Moment	Z	N•m	9.7	255.7	-2.4	90.9	22.5	94.9	-11.2	150.3
Neck Moment Resultant	N/A	N•m	32.7	80.1			42.3	82.7		

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	6.7	81.0	-26.6	31.0	28.0	54.5	-70.2	29.9
Left Foot Aft	Z	G's	3.8	282.8	-48.8	35.0	21.2	58.9	-54.6	38.9
Left Foot Fore	Z	G's	3.1	286.8	-69.0	22.2	33.6	58.9	-78.7	26.6
Right Foot Aft	X	G's	28.4	57.1	-198.2	46.8	18.6	70.7	-63.3	31.7
Right Foot Aft	Z	G's	36.7	57.0	-200.4	46.8	4.0	94.4	-48.5	39.6
Right Foot Fore	Z	G's	79.2	54.8	-220.5	41.3	14.8	20.9	-91.2	30.2

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	53.3	43.6	-12.4	273.4	45.5	38.3	-91.5	64.3
Left Upper Moment	Y	N•m	21.6	110.2	-98.5	51.4	259.9	52.2	-68.2	31.0
Right Upper Moment	X	N•m	52.9	49.0	-33.7	47.1	52.5	58.7	-11.2	142.9
Right Upper Moment	Y	N•m	36.4	79.5	-167.0	51.1	20.5	139.6	-80.4	33.3
Left Lower Moment	X	N•m	18.7	44.1	-15.6	87.5	18.1	30.2	-100.3	64.9
Left Lower Moment	Y	N•m	34.6	80.2	-45.7	51.8	197.3	52.9	-26.4	29.5
Left Lower Force	Z	Newtons	28.8	6.0	-979.6	33.9	138.2	120.8	-2523.7	79.7
Right Lower Moment	X	N•m	83.3	49.4	-33.6	47.4	16.2	39.2	-48.1	41.8
Right Lower Moment	Y	N•m	218.1	58.2	-69.4	47.4	42.6	66.9	-38.9	31.3
Right Lower Force	Z	Newtons	300.8	41.7	-6023.2	49.2	34.4	1.0	-2198.8	41.4

1.) Passenger side failed at 88.5 msec.

DATA SHEET NO. 8...(continued)

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

NHTSA No.: M20503

Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	MM	0.2	8.5	-29.9	67.4	0.4	6.2	-26.7	72.7

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	23.3	243.0	-52.1	81.6	14.3	247.2	-48.4	73.5
Head CG	Y	G's	15.2	242.6	-10.8	254.8	7.3	49.5	-15.7	94.1
Head CG	Z	G's	17.6	60.8	-10.0	85.2	23.1	74.6	-9.8	95.2
Head CG Resultant	N/A	G's	52.5	81.6			54.1	73.5		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.5	126.8	-44.9	64.6	2.9	149.6	-47.5	74.0
Chest CG	Y	G's	6.4	80.1	-3.7	43.7	7.5	47.0	-6.2	72.3
Chest CG	Z	G's	5.4	246.3	-7.9	98.9	17.3	76.3	-13.7	97.8
Chest CG Resultant	N/A	G's	45.0	64.5			50.4	74.0		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	T ¹	T ²	Avg G	HIC	T ¹	T ²	Avg G
Head CG Redundant	472.8	58.3	94.2	44.4	394.8	62.6	98.5	41.3

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Redundant	43.0	63.2	66.2	49.5	72.3	75.3

DATA SHEET NO. 9
SEATBELT ASSESSMENT TEST DATA

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

SEAT BELT PLACEMENT MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	195	200
PBU - Top surface of reference to belt upper edge	mm	305	330
PBL - Top surface of reference to belt lower edge	mm	230	245
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	730	730
Shoulder belt length as measured on ATD	mm	805	845
Lap belt length as measured on ATD	mm	795	805
Remainder of belt on reel	mm	815	755
Total belt length for continuous webbing systems	mm	3145	3135

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	157.0	63.0
As determined electronically	mm	202.4	117.3
As determined by photography	mm	120.7	114.3

BELT STRETCH DATA

Measurement Description	Units	Driver	Passenger
Electronically between shoulder belt load cell and "D" ring	mm/cm	*	*
Mechanically	mm/cm	None	None

*Not used with shoulder belt pre-tensioner systems.

DATA SHEET NO. 10
SUMMARY OF FMVSS 212 DATA

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

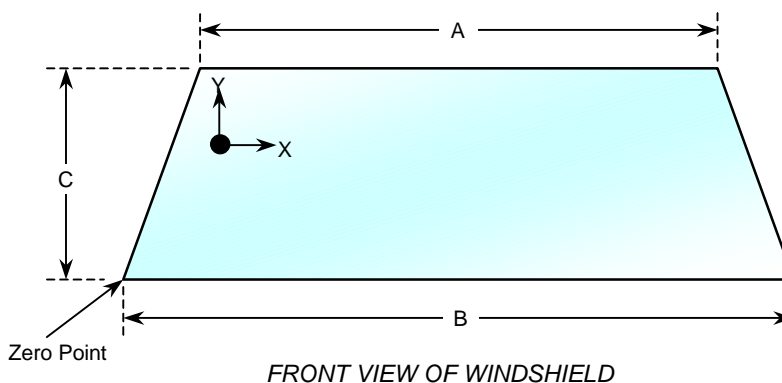
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with a rubber type adhesive. No molding covers the windshield periphery at any point.

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	2118	2118	100
Right Side	2118	2118	100
Total	4235	4235	100



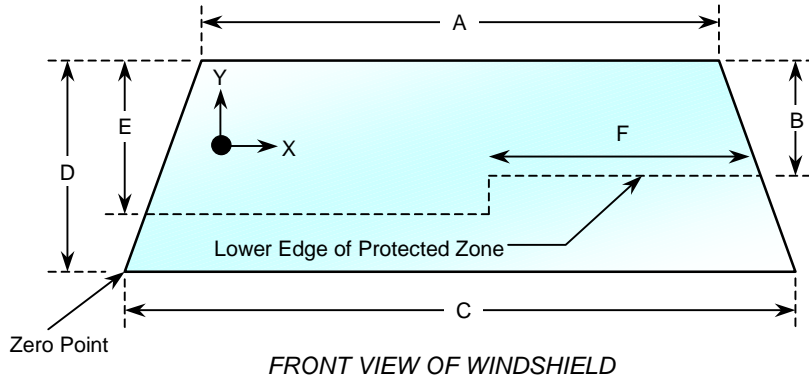
WINDSHIELD DIMENSIONS

Item	Units	Segment Length	Molding Width
A	mm	1140	12
B	mm	1565	10
C	mm	765	12

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02



**WINDSHIELD AND
 PROTECTED ZONE**

Item	Units	Value
A	mm	1140
B	mm	420
C	mm	1565
D	mm	765
E	mm	355
F	mm	536

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: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

Test Time: 12:43 P.M.

Temperature at Time of Impact 32.7 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)

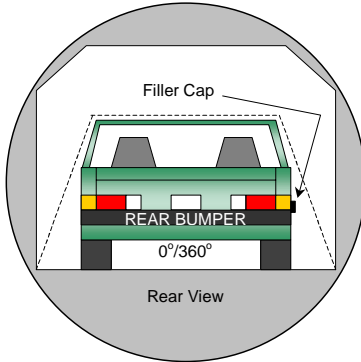
C. For the following 25 minutes: 0.0 oz.
(Maximum Allowable = 1 oz./minute)

D. Spillage Location Details: No leakage occurred

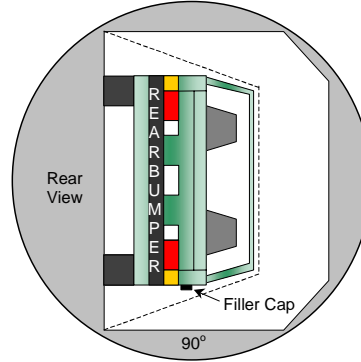
DATA SHEET NO. 13
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

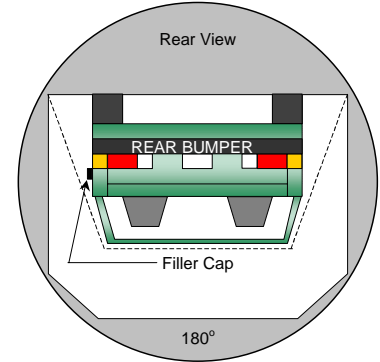
NHTSA No.: M20503
 Test Date: 6/12/02



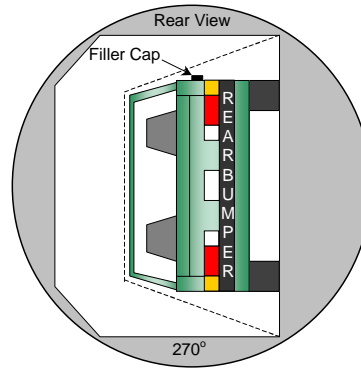
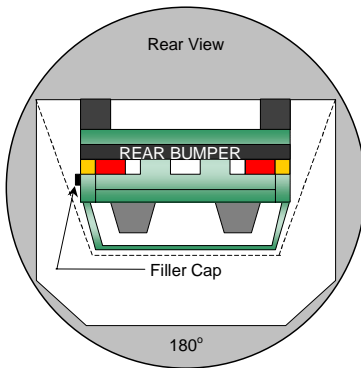
0° to 90°



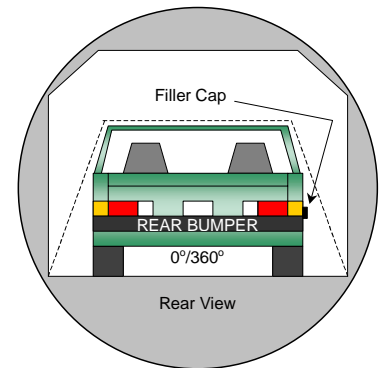
90° to 180°



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.

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	80	300	0
90° to 180°	78	300	0
180° to 270°	80	300	0
270° to 360°	79	300	0

DATA SHEET NO. 14
VEHICLE MEASUREMENTS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

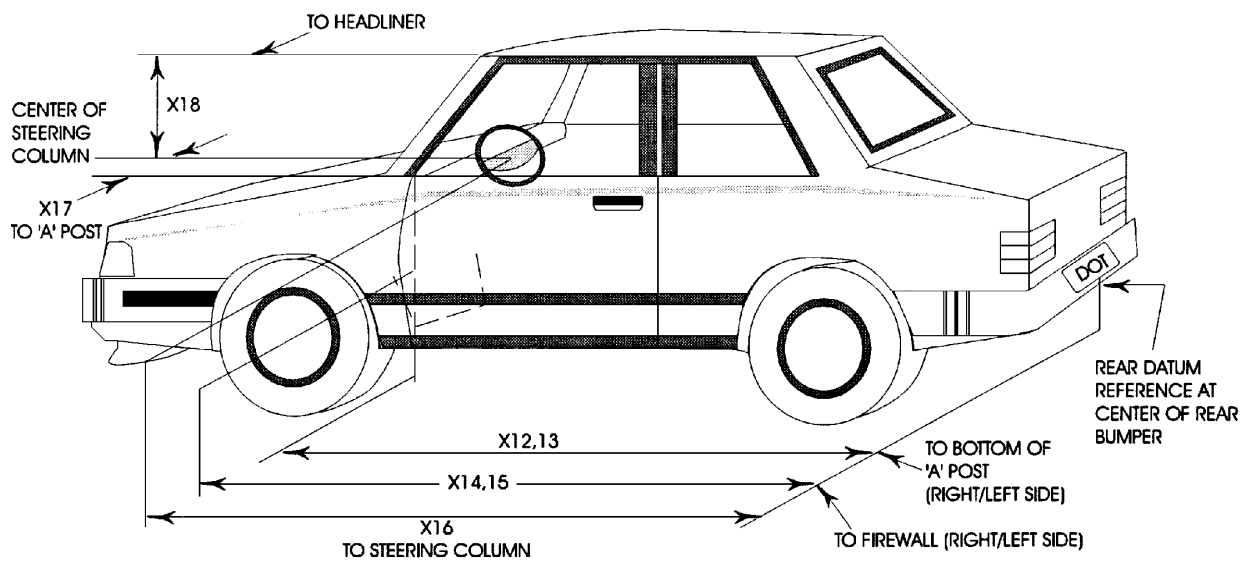
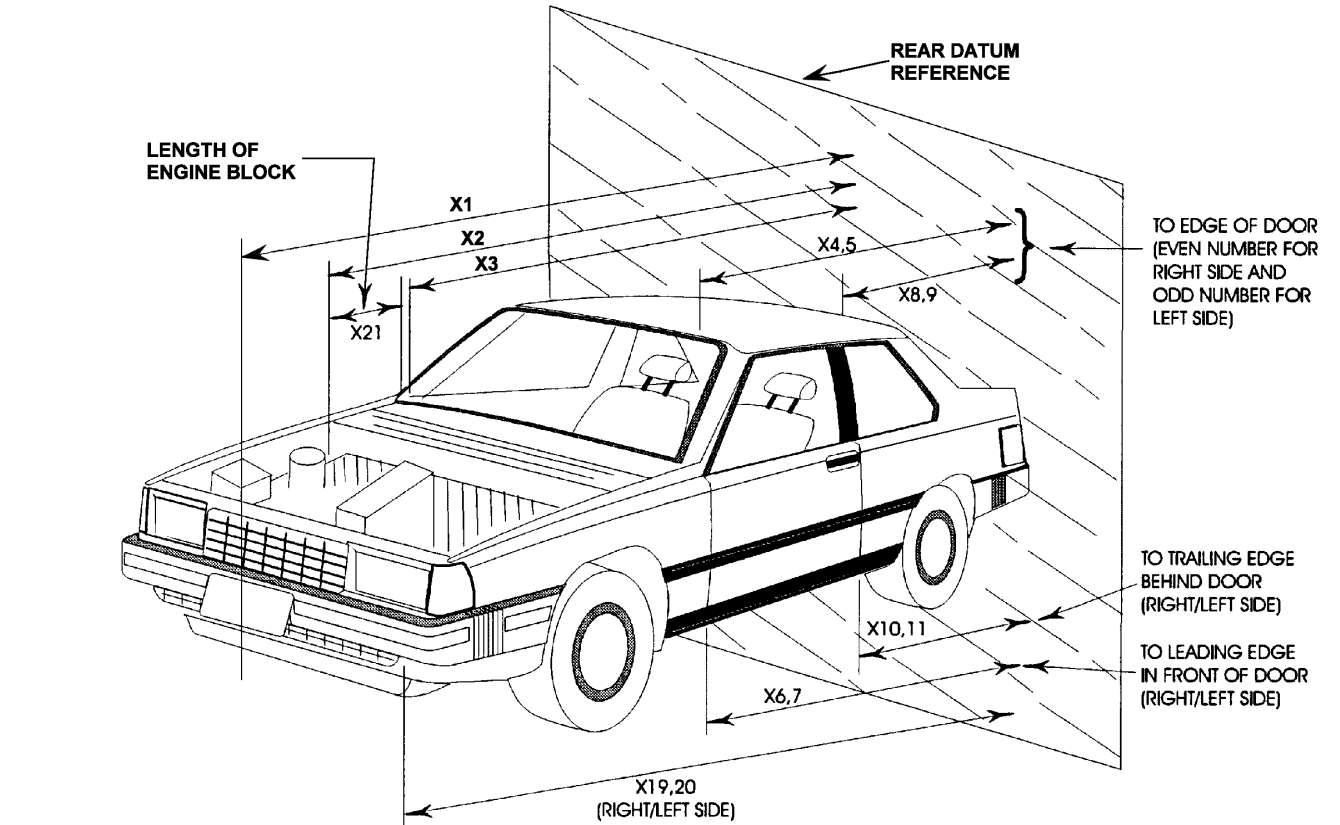
NHTSA No.: M20503
Test Date: 6/12/02

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4496	4013	-483
2	RSOV to front of engine	mm	4046	3826	-220
3	RSOV to firewall centerline	mm	3481	3371	-110
4	RSOV to leading edge of right door	mm	3064	3064	0
5	RSOV to leading edge of left door	mm	3061	3061	0
6	RSOV to lower leading edge of right door	mm	3050	3048	-2
7	RSOV to lower leading edge of left door	mm	3049	3046	-3
8	RSOV to upper trailing edge of right door	mm	2045	2045	0
9	RSOV to upper trailing edge of left door	mm	2045	2044	-1
10	RSOV to lower trailing edge of right door	mm	2051	2043	-8
11	RSOV to lower trailing edge of left door	mm	2041	2043	2
12	RSOV to bottom of right 'A' pillar	mm	3033	3034	1
13	RSOV to bottom of left 'A' pillar	mm	3027	3034	7
14	RSOV to firewall on right side	mm	3434	3336	-98
15	RSOV to firewall of left side	mm	3434	3354	-80
16	RSOV to steering column	mm	2714	2780	66
17	Center of steering column to left 'A' pillar	mm	440	419	-21
18	Center of steering column to headlining	mm	445	395	-50
19	RSOV to right side of front bumper	mm	4396	3993	-403
20	RSOV to left side of front bumper	mm	4396	3946	-450
21	Length of engine block	mm	420	420	0
RD	RSOV to right side of dash panel	mm	2915	2916	1
CD	RSOV to center of dash panel	mm	2795	2790	-5
LD	RSOV to left side of dash panel	mm	2915	2911	-4

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02



DATA SHEET NO. 15
CAMERA LOCATIONS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

No.	Camera View	Location (mm)			Angle (Deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Right Side, Real Time	3454	10973	1245	0	1651	Zoom	24
2	Left Side, No. 1	2000	-8250	1270	0	7885	13	N/A
3	Left Side, No. 2	1060	-6370	1630	-1	6125	25	1010
4	Left Side, No. 3	6500	-10580	4640	-16	11532	65	990
5	Left Side, No. 4	1460	-8250	3340	-17	8164	19	1000
6	Left Side, No. 5	1460	-8250	2970	-16	8082	19	910
7	Right Side, No. 1	2400	8150	1590	-2	7785	19	N/A
8	Right Side, No. 2	1000	7180	1590	0	6929	35	1020
9	Right Side, No. 3	7860	8900	2800	-9	10305	80	970
10	Right Side, No. 4	2750	9600	1520	0	9244	50	1030
11	Overhead Overall	250	0	4460	-86	N/A	13	1020
12	Front View, Driver	2970	-380	1330	-36	N/A	12	810
13	Front View, Passenger	2970	380	1330	-37	N/A	13	980
14	Pit Camera, Engine	650	0	-1360	-90	N/A	10	N/A
15	Pit Camera, Fuel Tank	3760	0	-1820	-55	N/A	10	1160
16	Driver Belt	2970	-240	1350	-11	N/A	13	810
17	Passenger Belt	2970	240	1350	-11	N/A	13	710
18	Left Side Extra	N/A	N/A	N/A	N/A	N/A	N/A	N/A

X - Barrier Face Y - Monorail Centerline Z - Ground

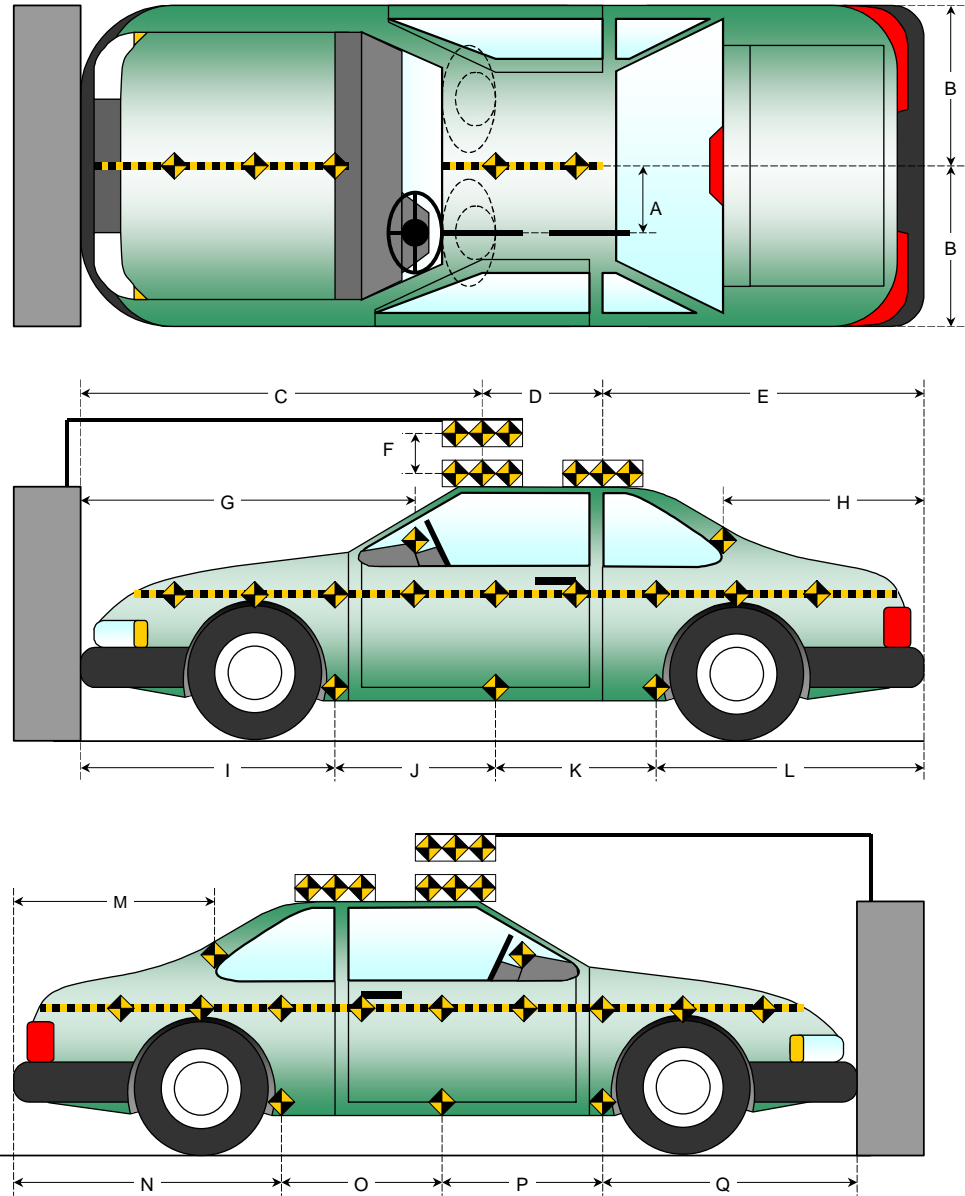
DATA SHEET NO. 16
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

All Dimensions
 in mm

Item	Value
A	386
B	912
C	2205
D	608
E	1690
F	155
G	1696
H	1152
I	1445
J	794
K	794
L	1469
M	1172
N	1470
O	795
P	795
Q	1439



DATA SHEET NO. 17
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

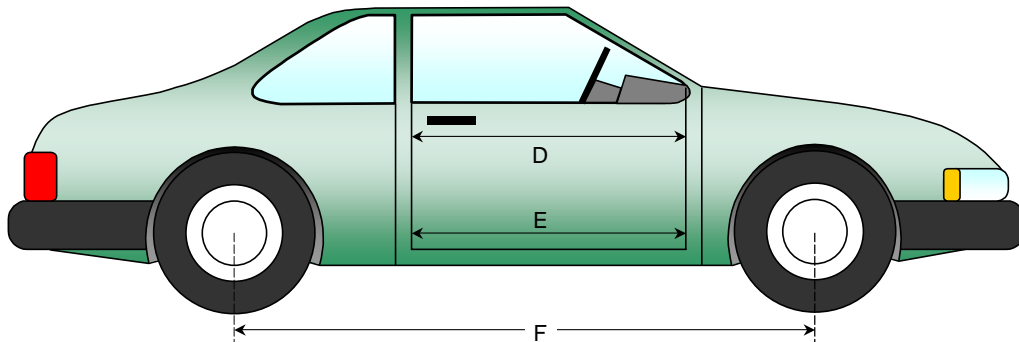
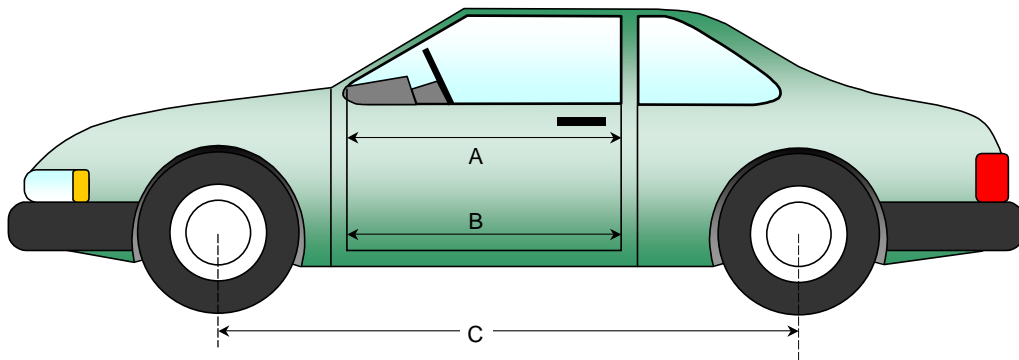
NHTSA No.: M20503
 Test Date: 6/12/02

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	906	906	0
B	Left Side Lower	mm	837	833	-4
D	Right Side Upper	mm	903	901	-2
E	Right Side Lower	mm	835	831	-4

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheel base	mm	2627	2583	-44
F	Right Side Wheel base	mm	2627	2556	-71



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

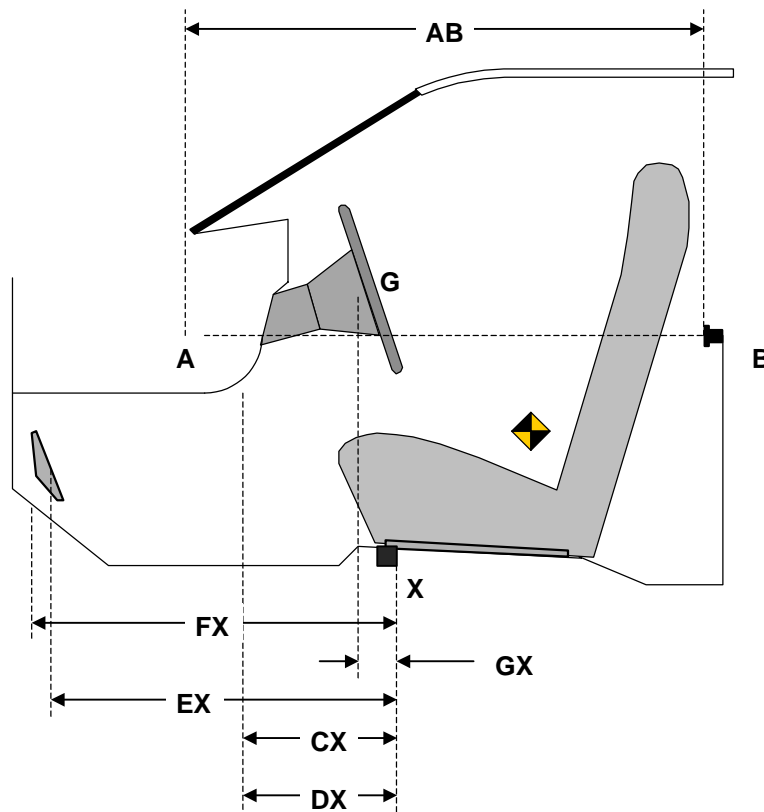
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	906	906	0
CX	Left Knee Bolster to X	mm	273	285	12
DX	Right Knee Bolster to X	mm	275	275	0
EX	Brake Pedal to X	mm	541	515	-26
FX	Foot Rest to X	mm	528	495	-33
GX	Center of Steering Wheel Hub to X	mm	58	155	97

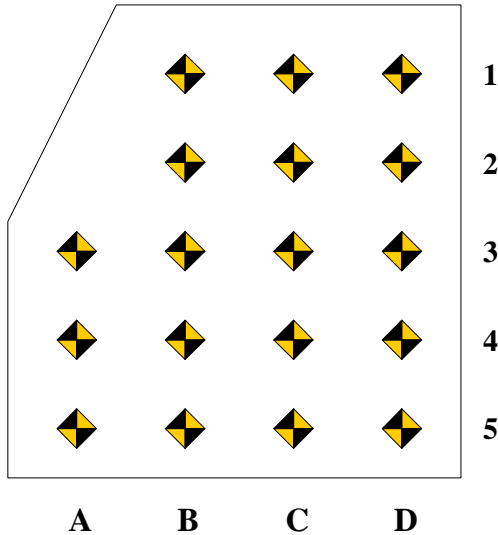
X = Left Front Seat Outboard Anchor Bolt Head



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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02



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		646	632	624		573	577	573		-73	-55	-51
2		549	543	536		517	503	491		-32	-40	-45
3	457	446	439	436	425	413	405	393	-32	-33	-34	-43
4	357	348	341	337	325	315	307	300	-32	-33	-34	-37
5	257	248	236	233	230	220	207	204	-27	-28	-29	-29

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1		-100	-94	-99		-50	-77	-85		50	17	14
2		-121	-121	-131		-120	-127	-100		1	-6	31
3	-124	-120	-125	-124	-122	-110	-126	-110	2	10	-1	14
4	-115	-121	-122	-125	-110	-123	-120	-105	5	-2	2	20
5	-107	-125	-96	-110	-110	-126	-123	-126	-3	-1	-27	-16

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

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

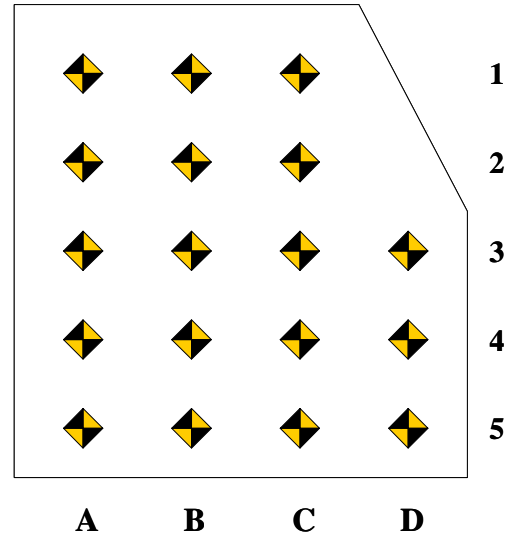
NHTSA No.: M20503
 Test Date: 6/12/02

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	700	710		620	614	631		-74	-86	-79	
2	621	634	637		582	592	581		-39	-42	-56	
3	532	540	543	545	520	532	531	535	-12	-8	-12	-10
4	434	442	445	445	422	432	431	435	-12	-10	-14	-10
5	335	342	345	345	322	327	331	335	-13	-15	-14	-10

PASSENGER FLOOR PAN Z-AXIS

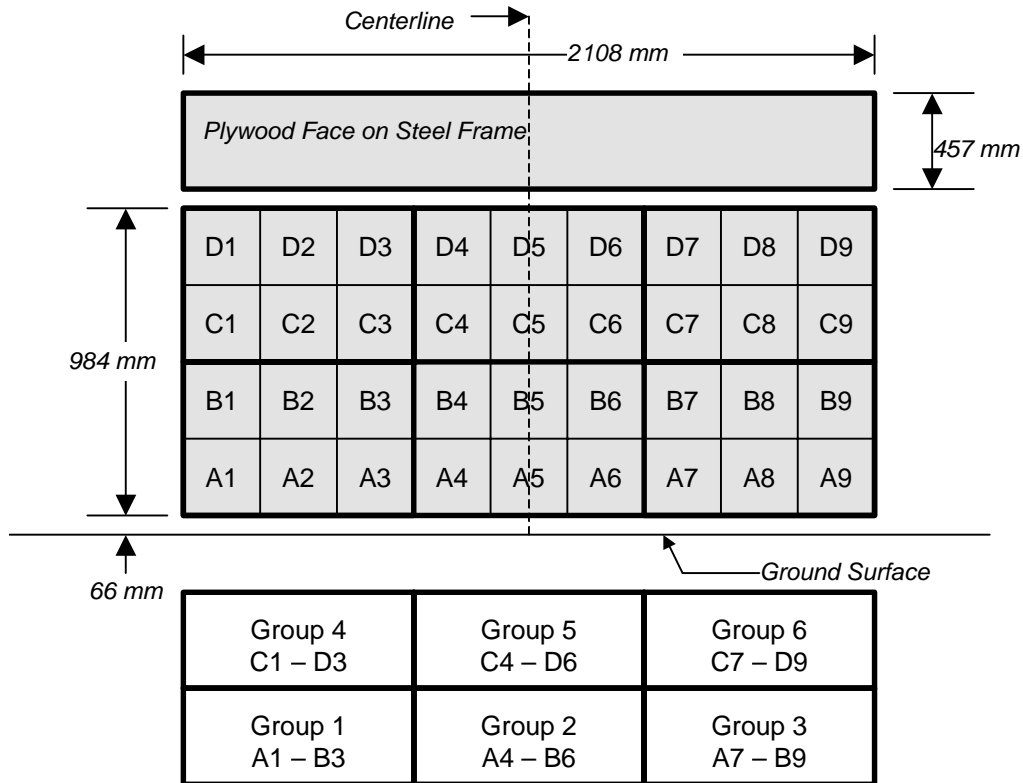
	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	17	14	2		-40	-40	-35		-57	-54	-37	
2	-55	-61	-63		-57	-42	-48		-2	19	15	
3	-107	-110	-110	-115	-110	-118	-122	-108	-3	-8	-12	7
4	-103	-115	-113	-115	-102	-102	-108	-120	1	13	5	-5
5	-105	-115	-118	-120	-95	-113	-115	-115	10	2	3	5

DATA SHEET NO. 18
FIXED BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
 Test Date: 6/12/02

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: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02

VEHICLE INFORMATION

VIN: KM8SC73D32U231781
Vehicle Size Category: 4WD SUV

Wheel base (mm): 2627
Test Weight (kg): 1968

ACCELEROMETER DATA

Accelerometer Location: Left rear floor pan
Cal. Procedure/Interval: 6 months / drop test
Integration Algorithm: NHTSA Standard
Impact Velocity (km/h): 55.61
Velocity Change (km/h): 63.77

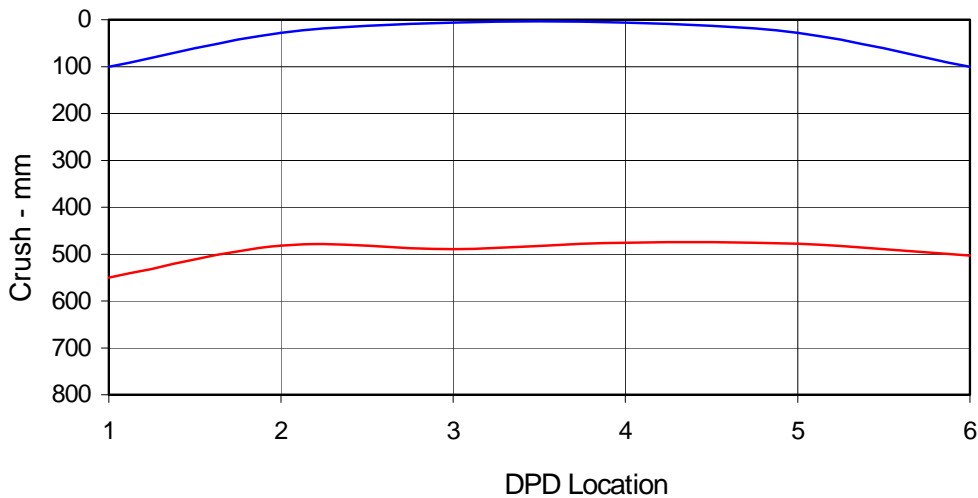
Linearity: Good

Time of Separation (msec): 64.9

CRUSH PROFILE

Collision Deformation Classification: 12FDEW6 Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1358 Impact Mode: Full Frontal

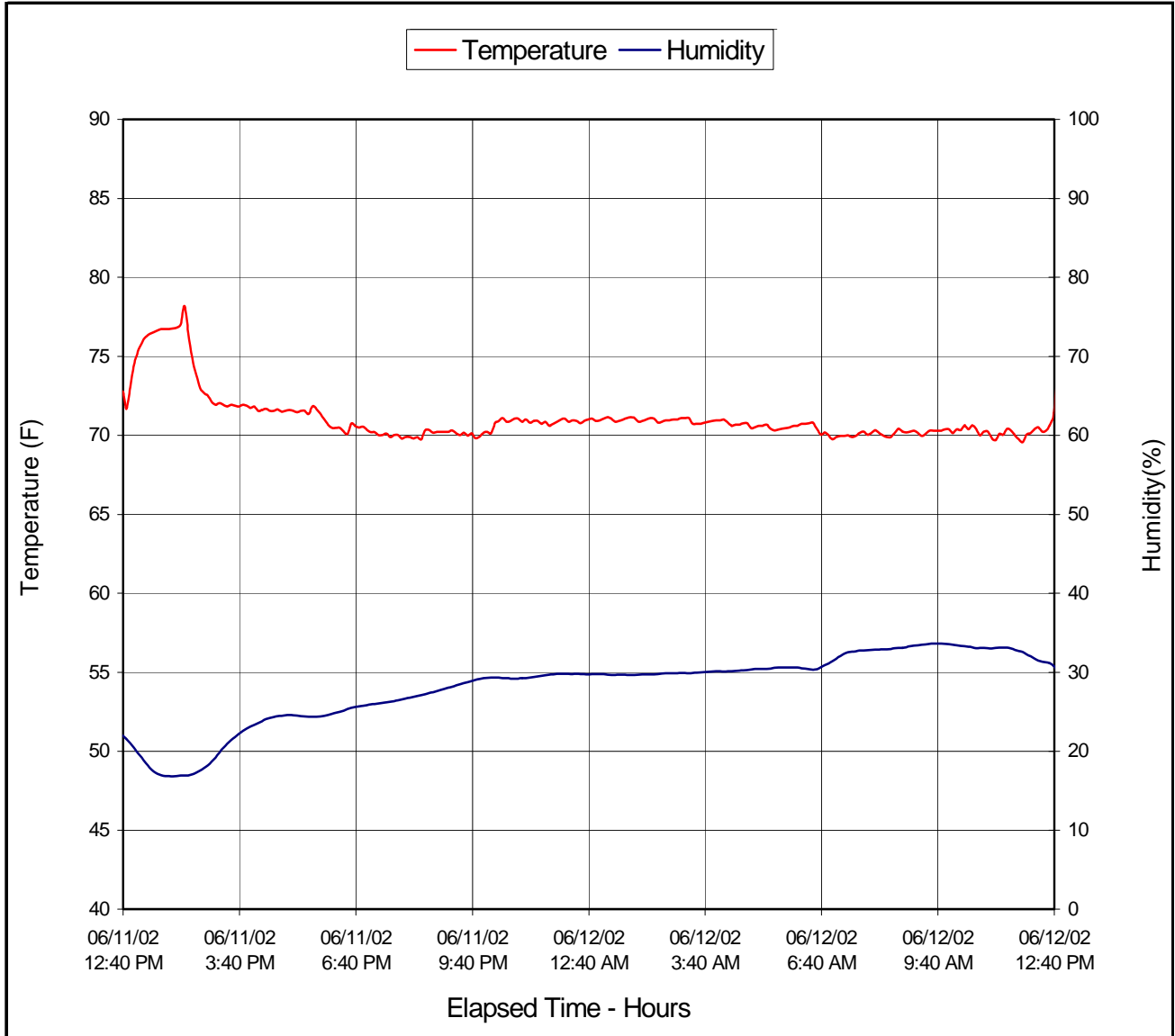
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	100	550	-450
C2	Crush zone 2 on left side	mm	28	482	-454
C3	Crush zone 3 on left side	mm	6	489	-483
C4	Crush zone 4 on right side	mm	6	475	-469
C5	Crush zone 5 on right side	mm	28	478	-450
C6	Crush zone 6 at right side	mm	100	503	-403



DATA SHEET NO. 20
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503
Test Date: 6/12/02



APPENDIX A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

Figure		Page
A-1	Right Front, as Received	A-1
A-2	Left Rear, as Received	A-2
A-3	Vehicle Certification Label	A-3
A-4	Vehicle Tire Label	A-4
A-5	Front View, Pre-Test	A-5
A-6	Front View, Post-Test	A-6
A-7	Left Side View, Pre-Test	A-7
A-8	Left Side View, Post-Test	A-8
A-9	Right Side View, Pre-Test	A-9
A-10	Right Side View, Post-Test	A-10
A-11	Right Front View, Pre-Test	A-11
A-12	Right Front View, Post-Test	A-12
A-13	Left Rear View, Pre-Test	A-13
A-14	Left Rear View, Post-Test	A-14
A-15	Windshield, Pre-Test	A-15
A-16	Windshield, Post-Test	A-16
A-17	Engine Compartment, Pre-Test	A-17
A-18	Engine Compartment, Post-Test	A-18
A-19	Fuel Cap, Pre-Test	A-19
A-20	Fuel Cap, Post-Test	A-20
A-21	Front Underside, Pre-Test	A-21
A-22	Front Underside, Post-Test	A-22
A-23	Rear Underside, Pre-Test	A-23
A-24	Rear Underside, Post-Test	A-24
A-25	Driver Dummy Front View, Pre-Test	A-25
A-26	Driver Dummy Front View, Post-Test	A-26
A-27	Driver Dummy Through Window, Pre-Test	A-27
A-28	Driver Dummy Through Window, Post-Test	A-28
A-29	Driver Dummy Door Open, Pre-Test	A-29
A-30	Driver Dummy Door Open, Post-Test	A-30
A-31	Driver Dummy 90° To Vehicle, Pre-Test	A-31
A-32	Driver Dummy 90° to Vehicle, Post-Test	A-32

LIST OF PHOTOGRAPHS...(Continued)

Figure		Page
A-33	Driver Dummy Feet, Pre-Test	A-33
A-34	Driver Dummy Feet and Knee Contact, Post-Test	A-34
A-35	Driver Side Knee Bolster, Pre-Test	A-35
A-36	Driver Side Knee Bolster, Post-Test	A-36
A-37	Driver Side Floor Pan, Pre-Test	A-37
A-38	Driver Side Floor Pan, Post-Test	A-38
A-39	Driver Dummy Head, Post-Test	A-39
A-40	Driver Dummy Contact, Post-Test	A-40
A-41	Passenger Dummy Front View, Pre-Test	A-41
A-42	Passenger Dummy Front View, Post-Test	A-42
A-43	Passenger Dummy Through Window, Pre-Test	A-43
A-44	Passenger Dummy Through Window, Post-Test	A-44
A-45	Passenger Dummy Door Open, Pre-Test	A-45
A-46	Passenger Dummy Door Open, Post-Test	A-46
A-47	Passenger Dummy 90° to Vehicle, Pre-Test	A-47
A-48	Passenger Dummy 90° to Vehicle, Post-Test	A-48
A-49	Passenger Dummy Feet, Pre-Test	A-49
A-50	Passenger Dummy Feet and Knee Contact, Post-Test	A-50
A-51	Passenger Side Floor Pan, Pre-Test	A-51
A-52	Passenger Side Floor Pan, Post-Test	A-52
A-53	Passenger Side Knee Bolster, Pre-Test	A-53
A-54	Passenger Side Knee Bolster, Post-Test	A-54
A-55	Passenger Head, Post-Test	A-55
A-56	Passenger Dummy Contact, Post-Test	A-56
A-57	³ Left Rear View of Doors After Impact	A-57
A-58	³ Right Rear View of Doors After Impact	A-58
A-59	Vehicle on Rollover Device	A-59
A-60	Vehicle During Impact	A-60
A-61	Right Side Seat Track Movement, Post-Test	A-61
A-62	Right Side Seat Track Damage, Post-Test	A-62



Figure A-1: Right Front, as Received



Figure A-2: Left Rear, as Received



Figure A-3: Vehicle Certification Label

5

TIRE INFLATION PRESSURE
La Pression De Gonflage Des Pneus

VEHICLE CAPACITY WEIGHT, 400kg(880LBS)
Poids en lb de la capacite du vehicule,400(880)
SEATING CAPACITY:TOTAL 5 FRONT 2 REAR 3
Capacite de transport;total 5;2 a l avant
3 a l arriere

TIRE PRESSURES-COLD. KPA(PSI):
Pression de gonflage a froid kPa(lb/po2)

TIRE SIZE Dimension du pneu	UP TO 2 PERSONS Jusqu' a 2 Personnes		UP TO MAX. LOAD Pour charge maximum	
	FRONT Avant	REAR Arriere	FRONT Avant	REAR Arriere
P225/70 R16	207(30)	207(30)	221(32)	221(32)

Figure A-4: Vehicle Tire Label



Figure A-5: Front View, Pre-Test



Figure A-6: Front View, Post-Test (Vehicle Moved)



Figure A-7: Left Side View, Pre-Test



Figure A-8: Left Side View, Post-Test



Figure A-9: Right Side View, Pre-Test



Figure A-10: Right Side View, Post-Test



Figure A-11: Right Front View, Pre-Test



Figure A-12: Right Front View, Post-Test



Figure A-13: Left Rear View, Pre-Test



Figure A-14: Left Rear View, Post-Test

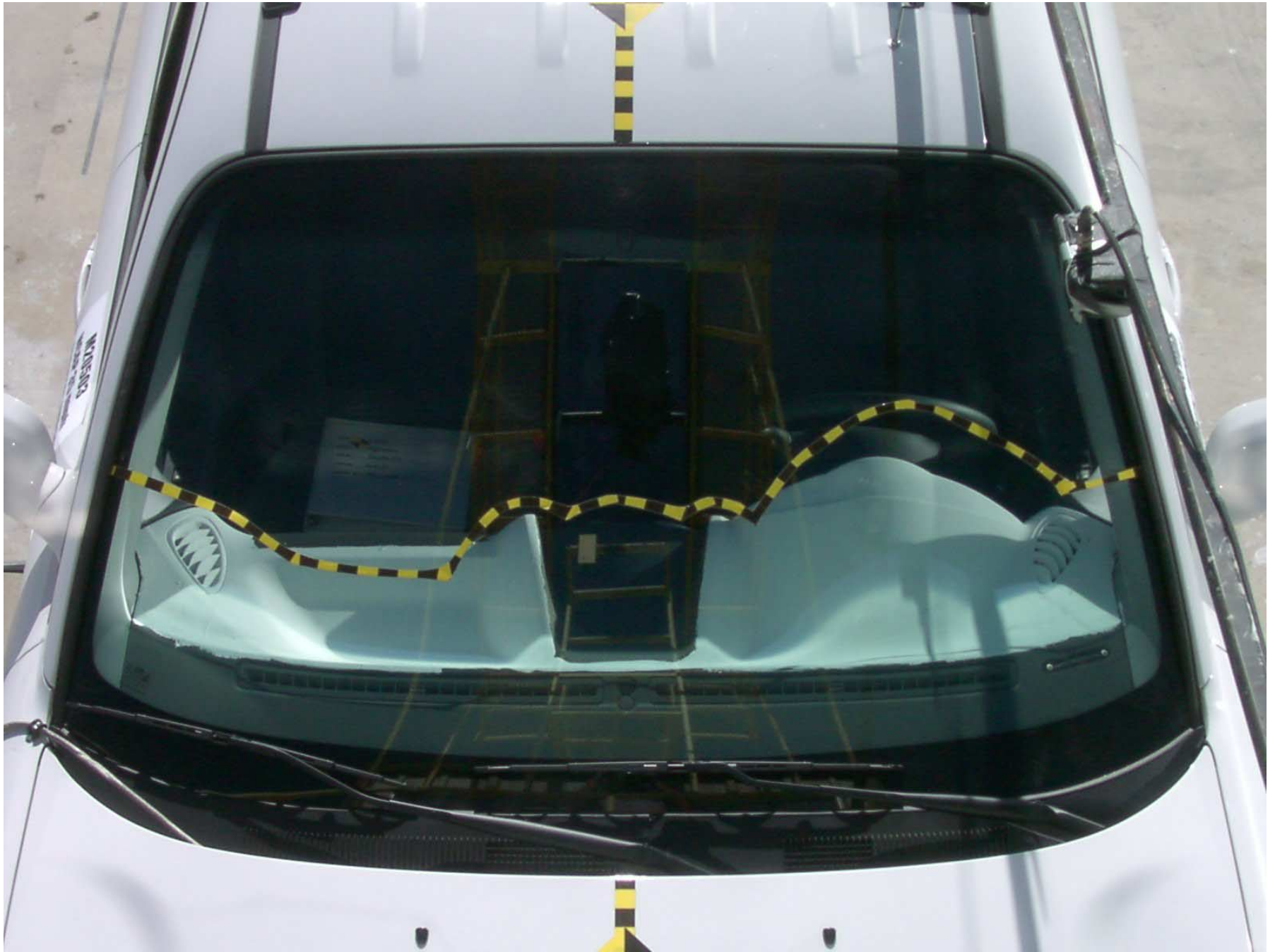


Figure A-15: Windshield, Pre-Test



Figure A-16: Windshield, Post-Test



Figure A-17: Engine Compartment, Pre-Test



Figure A-18: Engine Compartment, Post-Test (Vehicle Moved)



Figure A-19: Fuel Cap, Pre-test



Figure A-20: Fuel Cap, Post-Test

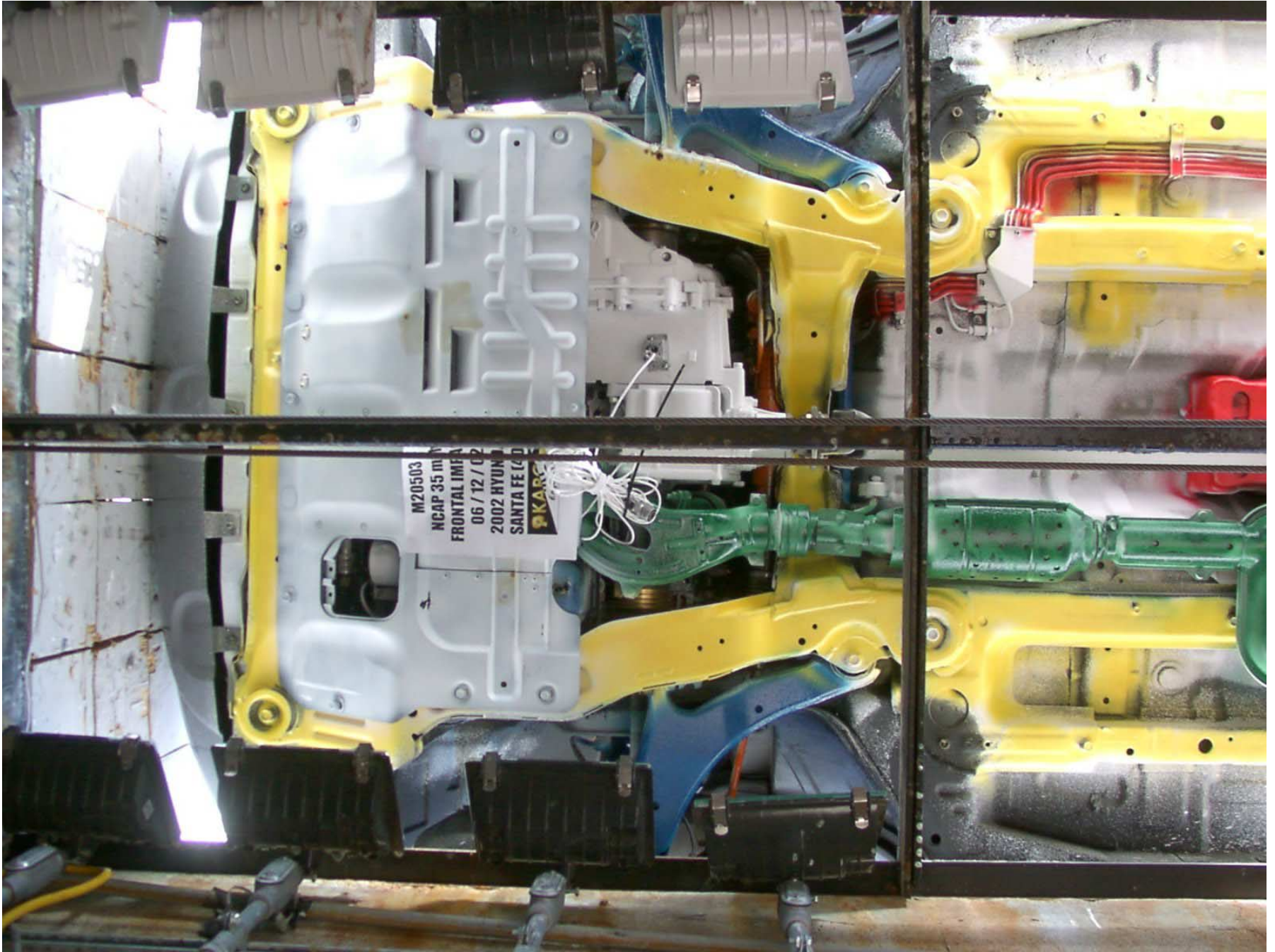


Figure A-21: Front Underside, Pre-Test



Figure A-22: Front Underside, Post-Test (Vehicle Moved)

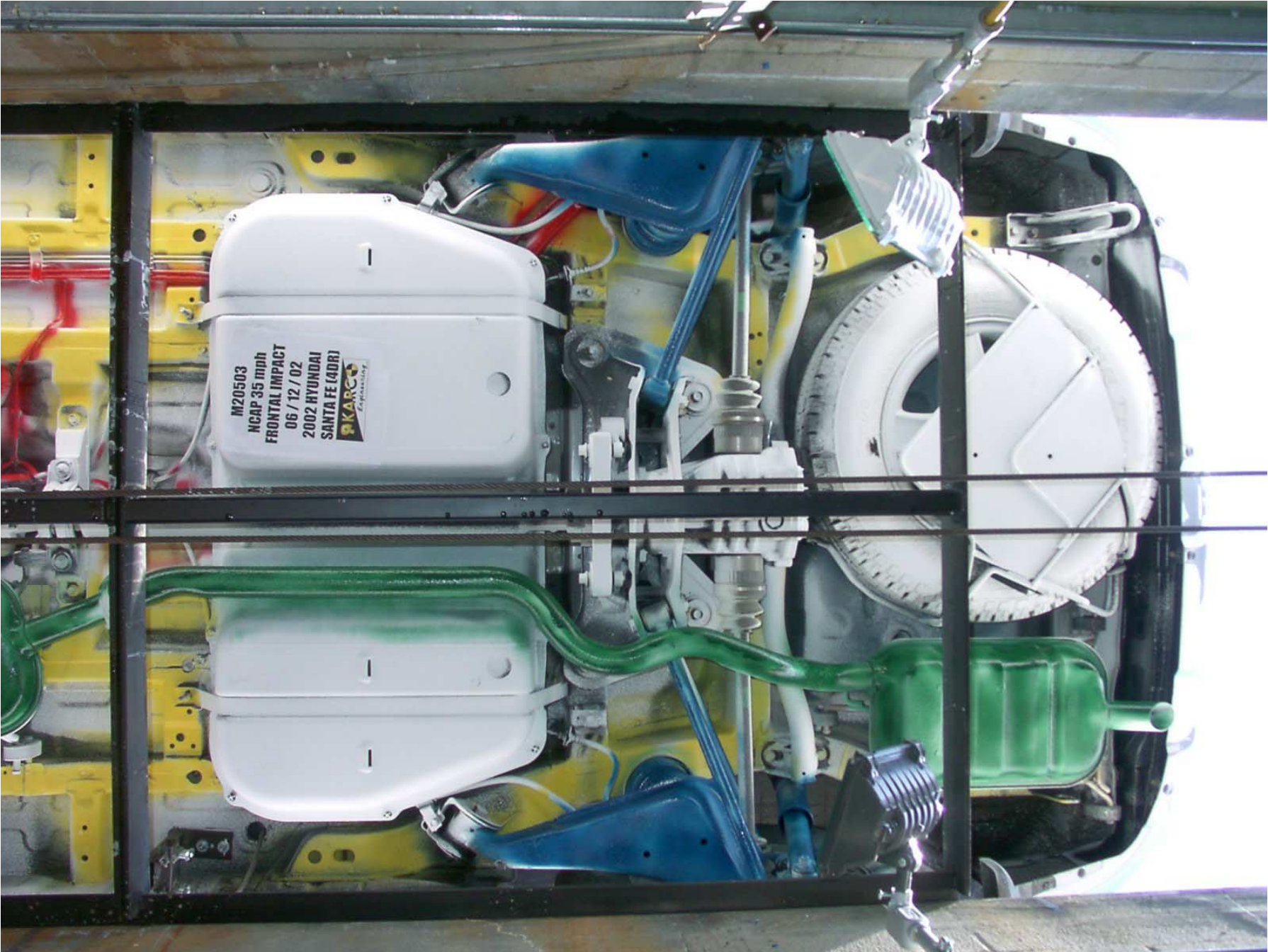


Figure A-23: Rear Underside, Pre-Test

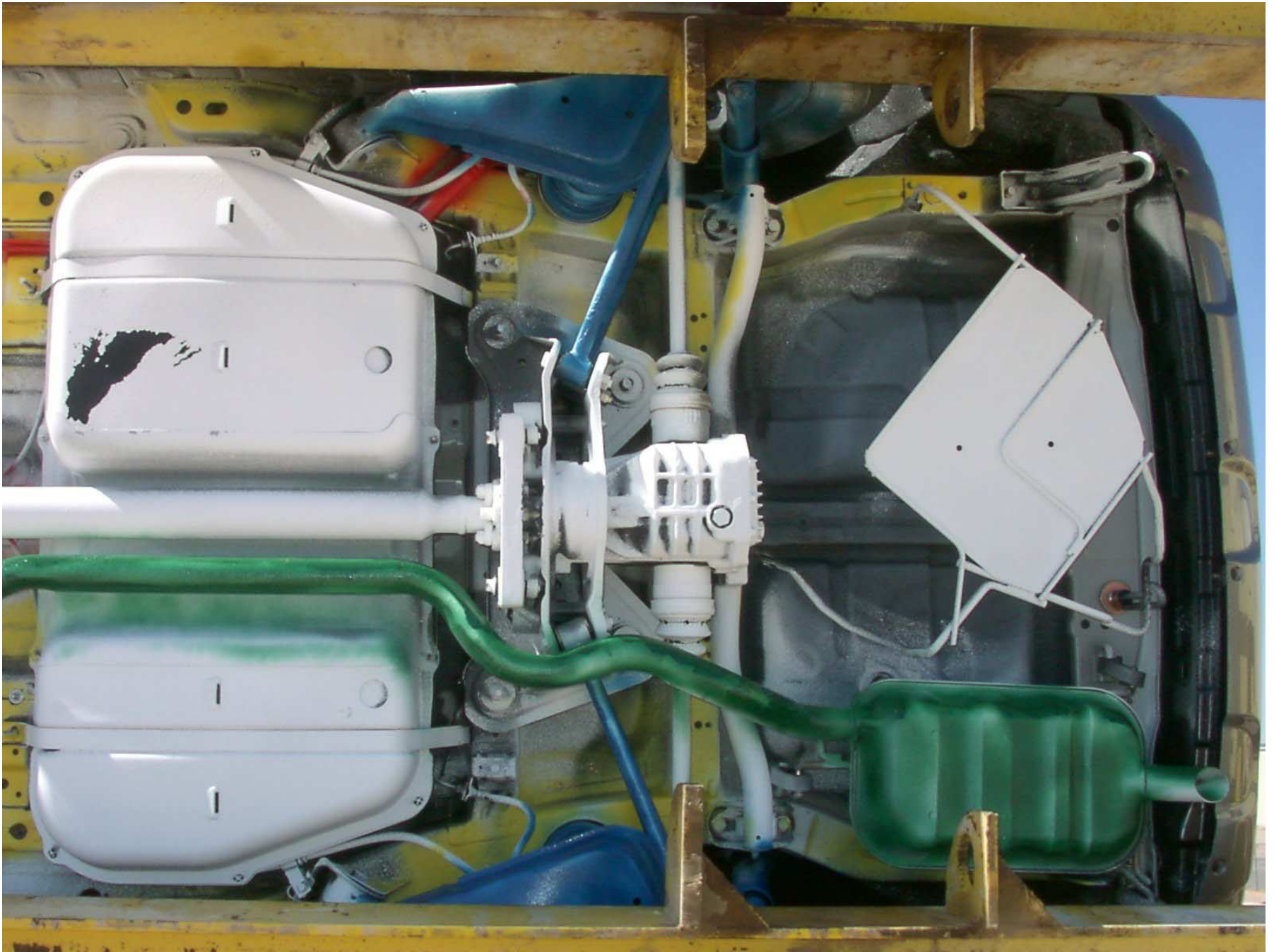


Figure A-24: Rear Underside, Post-Test (Vehicle Moved)



Figure A-25: Driver Dummy Front View, Pre-Test



Figure A-26: Driver Dummy Front View, Post-Test



Figure A-27: Driver Dummy Through Window, Pre-Test



Figure A-28: Driver Dummy Through Window, Post-Test



Figure A-29: Driver Dummy Door Open, Pre-Test



Figure A-30: Driver Dummy Door Open, Post-Test



Figure A-31: Driver Dummy 90° To Vehicle, Pre-Test



Figure A-32: Driver Dummy 90° To Vehicle, Post-Test



Figure A-33: Driver Dummy Feet, Pre-Test

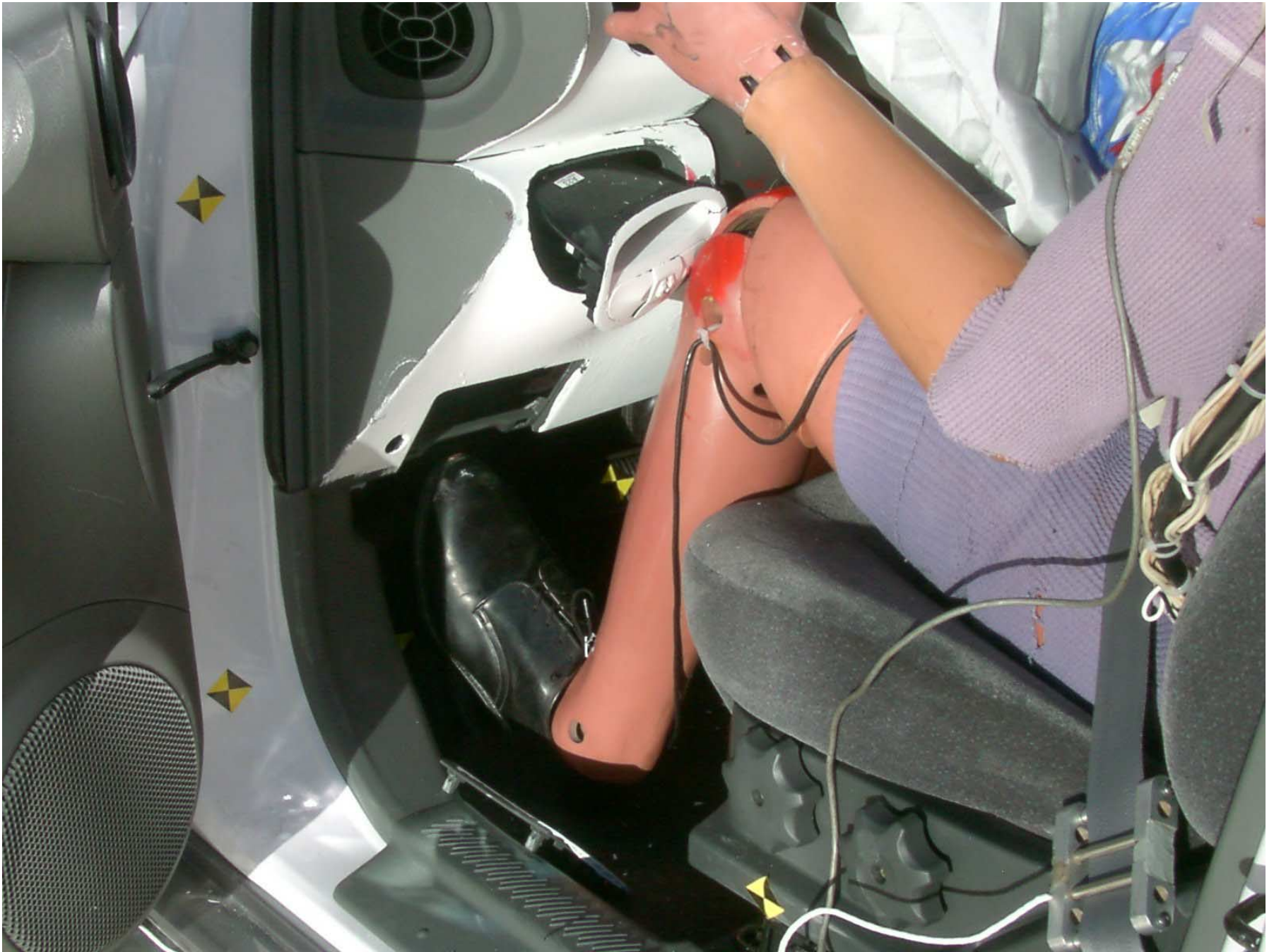


Figure A-34: Driver Dummy Feet and Knee Contact, Post-Test



Figure A-35: Driver Side Knee Bolster, Pre-Test



Figure A-36: Driver Side Knee Bolster, Post-Test

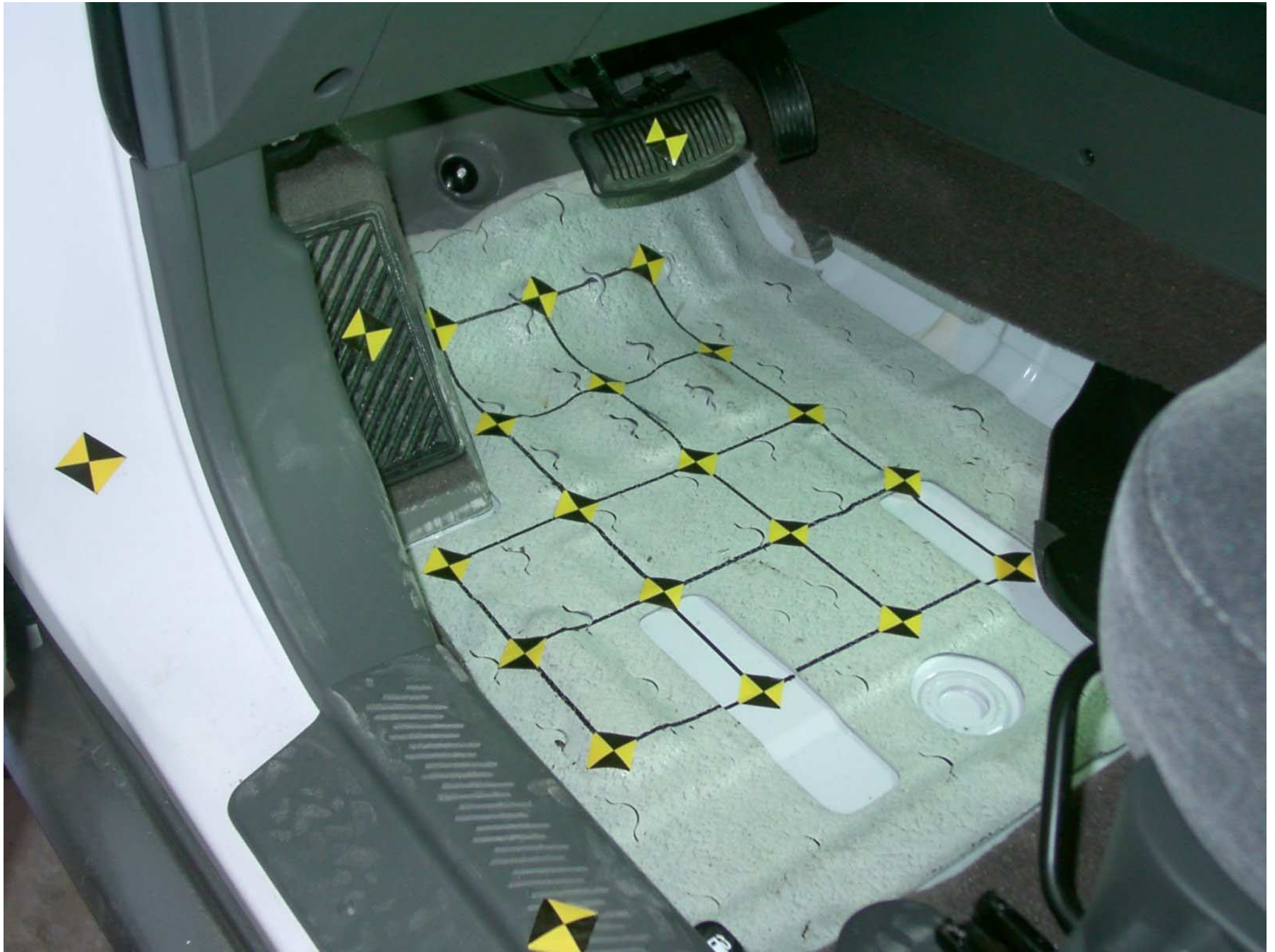


Figure A-37: Driver Side Floor Pan, Pre-Test



Figure A-38: Driver Side Floor Pan, Post-Test

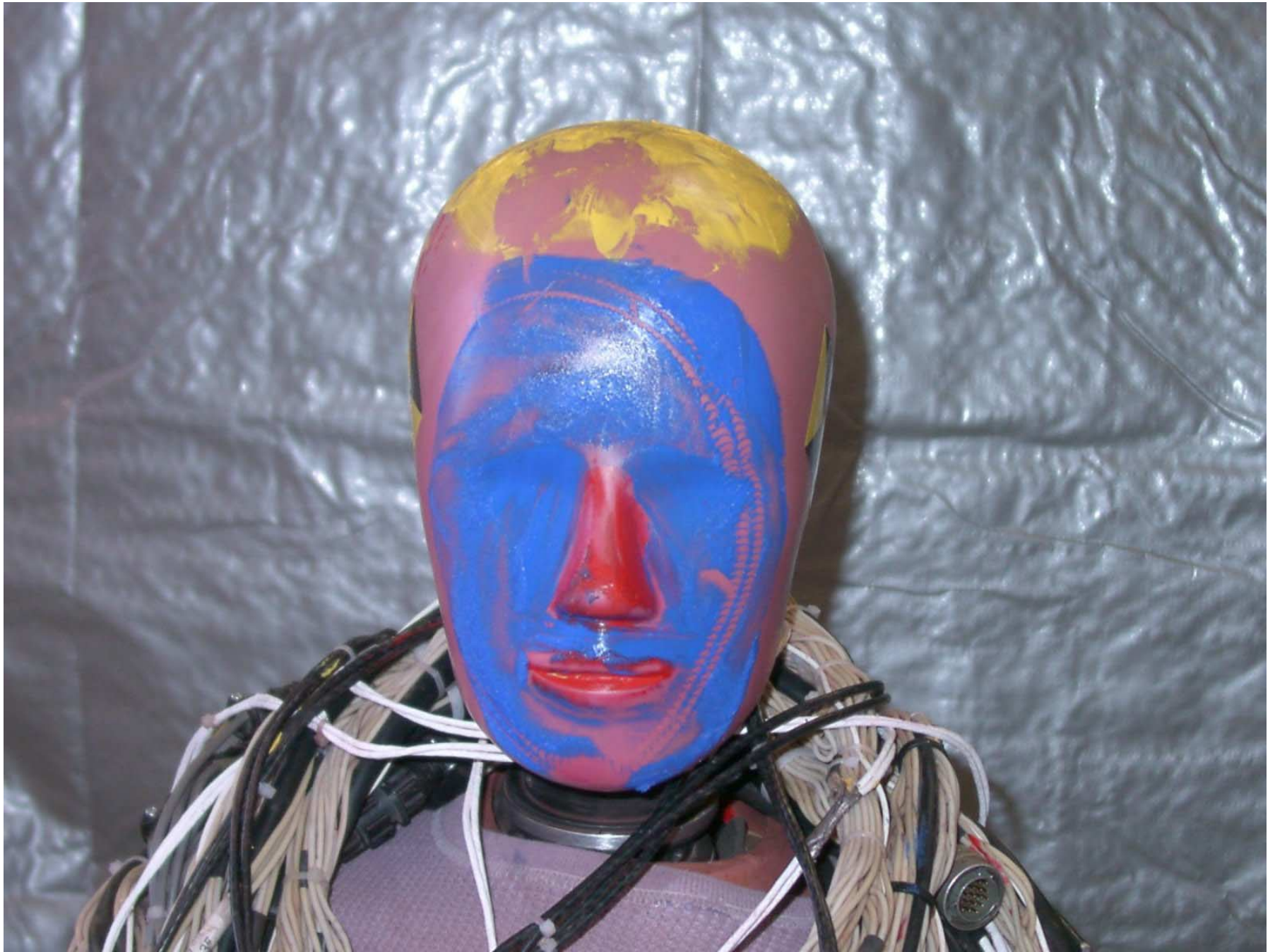


Figure A-39: Driver Dummy Head, Post-Test



Figure A-40: Driver Dummy Contact, Post-Test



Figure A-41: Passenger Dummy Front View, Pre-Test



Figure A-42: Passenger Dummy Front View, Post-Test



Figure A-43: Passenger Dummy Through Window, Pre-Test



Figure A-44: Passenger Dummy Through Window, Post-Test



Figure A-45: Passenger Dummy Door Open, Pre-Test



Figure A-46: Passenger Dummy Door Open, Post-Test



Figure A-47: Passenger Dummy 90° To Vehicle, Pre-Test



Figure A-48: Passenger Dummy 90° To Vehicle, Post-Test



Figure A-49: Passenger Dummy Feet, Pre-Test



Figure A-50: Passenger Dummy Feet and Knee Contact, Post-Test

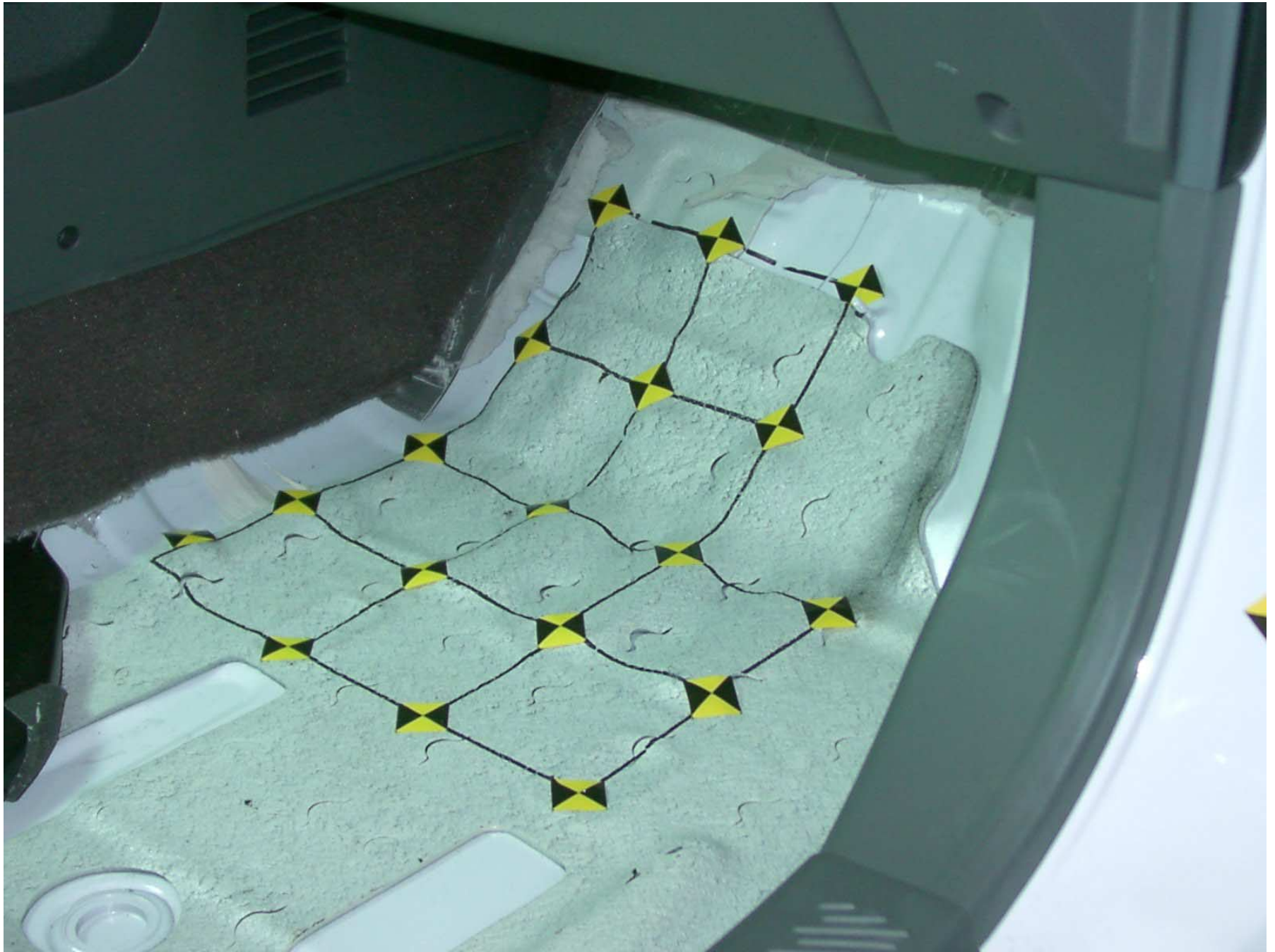


Figure A-51: Passenger Side Floor Pan, Pre-Test

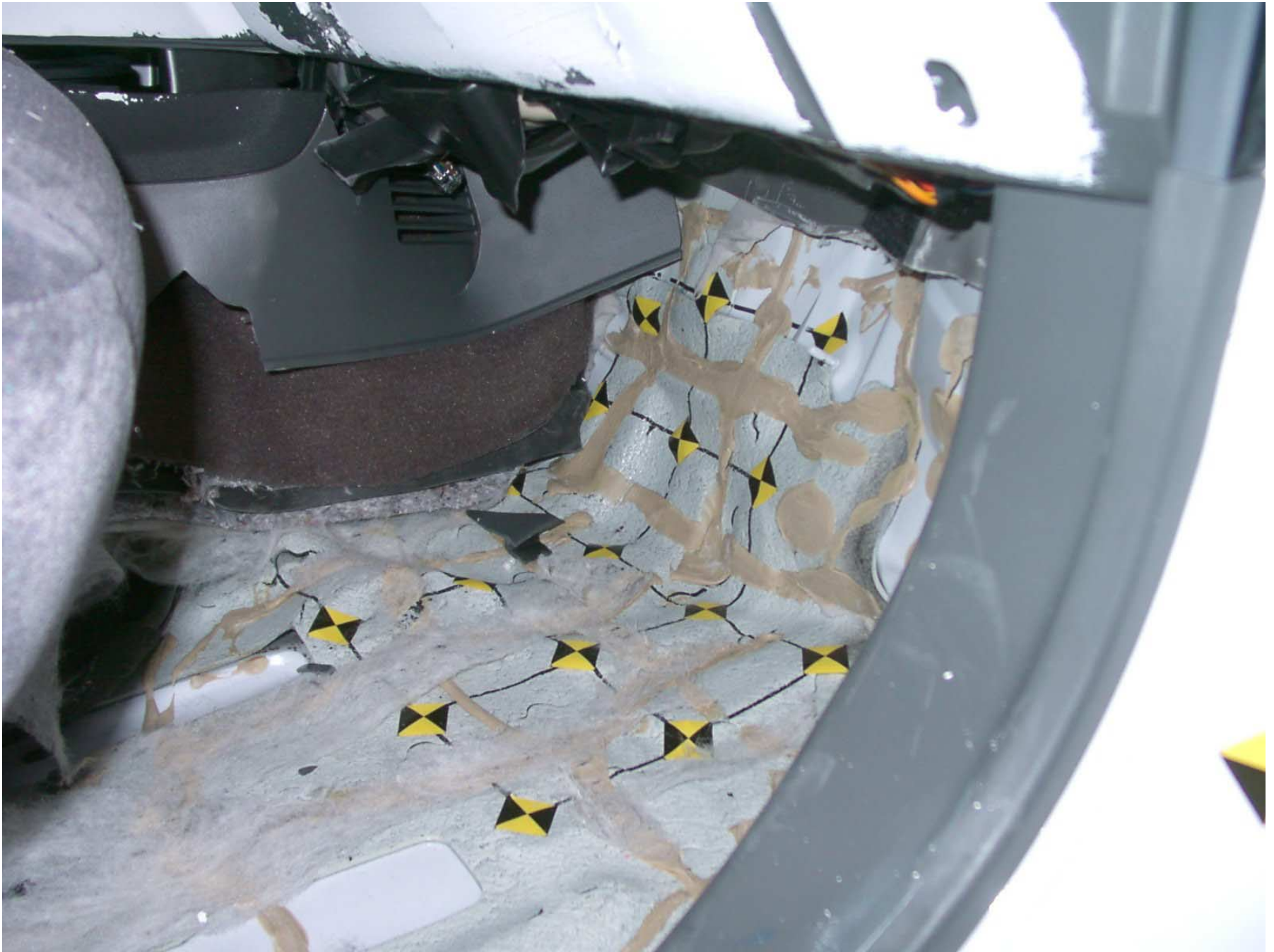


Figure A-52: Passenger Side Floor Pan, Post-Test



Figure A-53: Passenger Side Knee Bolster, Pre-Test



Figure A-54: Passenger Side Knee Bolster, Post-Test



Figure A-55: Passenger Head, Post-Test

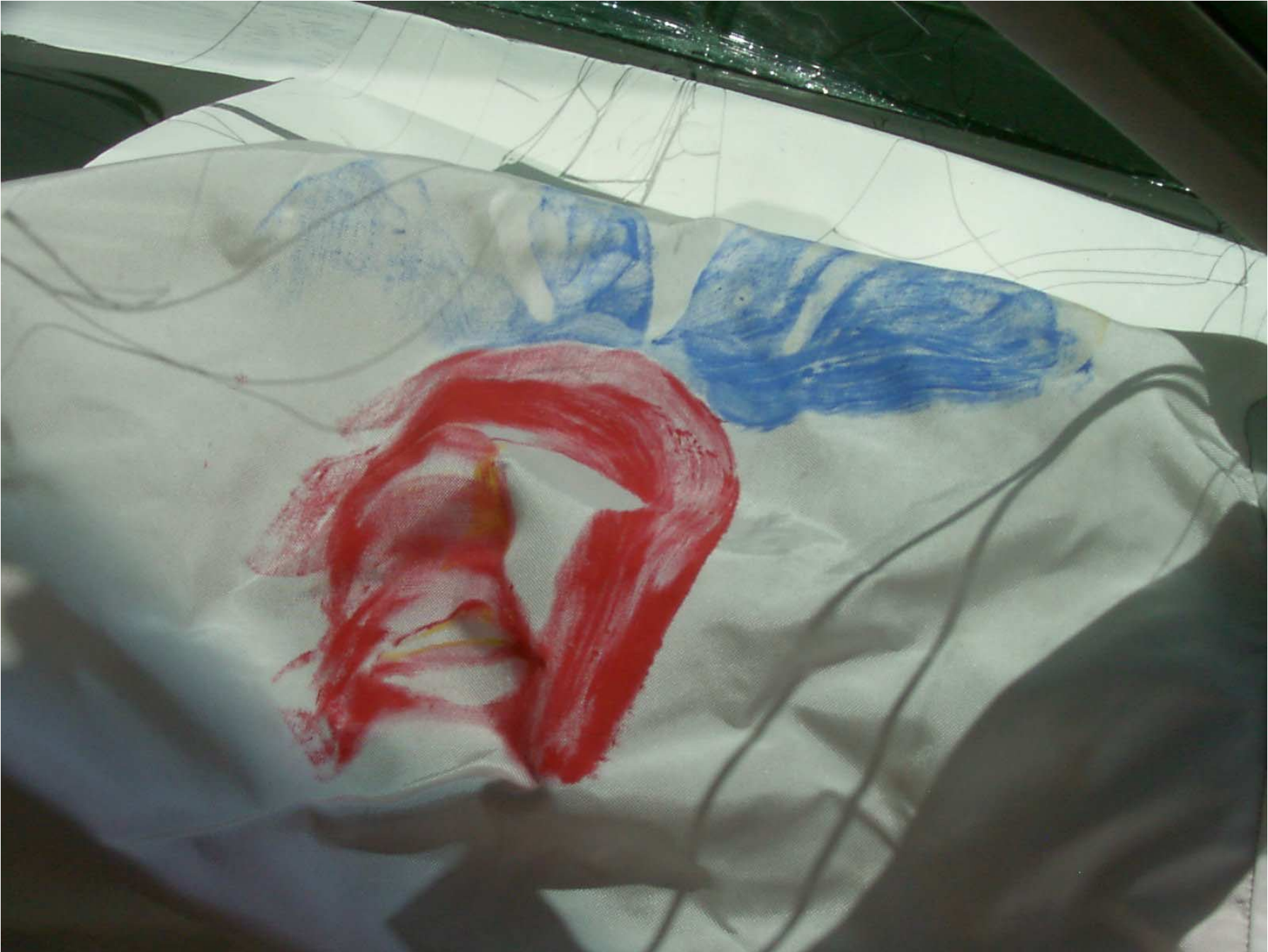


Figure A-56: Passenger Dummy Contact, Post-Test



Figure A-57: Left Rear View of Doors After Impact



Figure A-58: 3/4 Right Rear View of Doors After Impact



Figure A-59: Vehicle on Rollover Device



Figure A-60: Vehicle During Impact



Figure A-61: Right Side Seat Track Movement, Post-Test



Figure A-62: Right Side Seat Track Damage, Post-Test

APPENDIX B

DATA PLOTS

LIST OF DATA PLOTS

Data Plot	Page	
B-1	Driver Head Primary X	B-1
B-2	Driver Head Primary X Velocity	B-2
B-3	Driver Head Primary X Displacement	B-3
B-4	Driver Head Primary Y	B-4
B-5	Driver Head Primary Z	B-5
B-6	Driver Head Resultant Primary	B-6
B-7	Driver Head Redundant X	B-7
B-8	Driver Head Redundant X Velocity	B-8
B-9	Driver Head Redundant X Displacement	B-9
B-10	Driver Head Redundant Y	B-10
B-11	Driver Head Redundant Z	B-11
B-12	Driver Head Resultant Redundant	B-12
B-13	Driver Neck Force X	B-13
B-14	Driver Neck Force Y	B-14
B-15	Driver Neck Force Z	B-15
B-16	Driver Neck Force Resultant	B-16
B-17	Driver Neck Moment X	B-17
B-18	Driver Neck Moment Y	B-18
B-19	Driver Neck Moment Z	B-19
B-20	Driver Neck Moment Resultant	B-20
B-21	Driver Chest Primary X	B-21
B-22	Driver Chest Primary X Velocity	B-22
B-23	Driver Chest Primary X Displacement	B-23
B-24	Driver Chest Primary Y	B-24
B-25	Driver Chest Primary Z	B-25
B-26	Driver Chest Primary Resultant	B-26
B-27	Driver Chest Redundant X	B-27
B-28	Driver Chest Redundant X Velocity	B-28
B-29	Driver Chest Redundant X Displacement	B-29
B-30	Driver Chest Redundant Y	B-30
B-31	Driver Chest Redundant Z	B-31
B-32	Driver Chest Redundant Resultant	B-32
B-33	Driver Chest Displacement X	B-33

LIST OF DATA PLOTS...(Continued)

<u>Data Plot</u>		<u>Page</u>
B-34	Driver Pelvis X	B-34
B-35	Driver Pelvis X Velocity	B-35
B-36	Driver Pelvis X Displacement	B-36
B-37	Driver Pelvis Y	B-37
B-38	Driver Pelvis Z	B-38
B-39	Driver Pelvis Resultant	B-39
B-40	Driver Left Femur Force	B-40
B-41	Driver Right Femur Force	B-41
B-42	Driver Left Upper Tibia Moment X	B-42
B-43	Driver Left Upper Tibia Moment Y	B-43
B-44	Driver Right Upper Tibia Moment X	B-44
B-45	Driver Right Upper Tibia Moment Y	B-45
B-46	Driver Left Lower Tibia Moment X	B-46
B-47	Driver Left Lower Tibia Moment Y	B-47
B-48	Driver Left Lower Tibia Force Z	B-48
B-49	Driver Right Lower Tibia Moment X	B-49
B-50	Driver Right Lower Tibia Moment Y	B-50
B-51	Driver Right Lower Tibia Force Z	B-51
B-52	Driver Left Foot Aft X	B-52
B-53	Driver Left Foot Aft Z	B-53
B-54	Driver Left Foot Fore Z	B-54
B-55	Driver Right Foot Aft X	B-55
B-56	Driver Right Foot Aft Z	B-56
B-57	Driver Right Foot Fore Z	B-57
B-58	Driver Lap Belt Force	B-58
B-59	Driver Shoulder Belt Force	B-59
B-60	Driver Shoulder Belt Pullout	B-60
B-61	Driver Shoulder Belt Elongation	B-61
B-62	Passenger Head Primary X	B-62
B-63	Passenger Head Primary X Velocity	B-63
B-64	Passenger Head Primary X Displacement	B-64
B-65	Passenger Head Primary Y	B-65
B-66	Passenger Head Primary Z	B-66
B-67	Passenger Head Resultant Primary	B-67

LIST OF DATA PLOTS...(Continued)

<u>Data Plot</u>		<u>Page</u>
B-68	Passenger Head Redundant X	B-68
B-69	Passenger Head Redundant X Velocity	B-69
B-70	Passenger Head Redundant X Displacement	B-70
B-71	Passenger Head Redundant Y	B-71
B-72	Passenger Head Redundant Z	B-72
B-73	Passenger Head Resultant Redundant	B-73
B-74	Passenger Neck Force X	B-74
B-75	Passenger Neck Force Y	B-75
B-76	Passenger Neck Force Z	B-76
B-77	Passenger Neck Force Resultant	B-77
B-78	Passenger Neck Moment X	B-78
B-79	Passenger Neck Moment Y	B-79
B-80	Passenger Neck Moment Z	B-80
B-81	Passenger Neck Moment Resultant	B-81
B-82	Passenger Chest Primary X	B-82
B-83	Passenger Chest Primary X Velocity	B-83
B-84	Passenger Chest Primary X Displacement	B-84
B-85	Passenger Chest Primary Y	B-85
B-86	Passenger Chest Primary Z	B-86
B-87	Passenger Chest Primary Resultant	B-87
B-88	Passenger Chest Redundant X	B-88
B-89	Passenger Chest Redundant X Velocity	B-89
B-90	Passenger Chest Redundant X Displacement	B-90
B-91	Passenger Chest Redundant Y	B-91
B-92	Passenger Chest Redundant Z	B-92
B-93	Passenger Chest Redundant Resultant	B-93
B-94	Passenger Chest Displacement X	B-94
B-95	Passenger Pelvis X	B-95
B-96	Passenger Pelvis X Velocity	B-96
B-97	Passenger Pelvis X Displacement	B-97
B-98	Passenger Pelvis Y	B-98
B-99	Passenger Pelvis Z	B-99
B-100	Passenger Pelvis Resultant	B-100
B-101	Passenger Left Femur Force	B-101

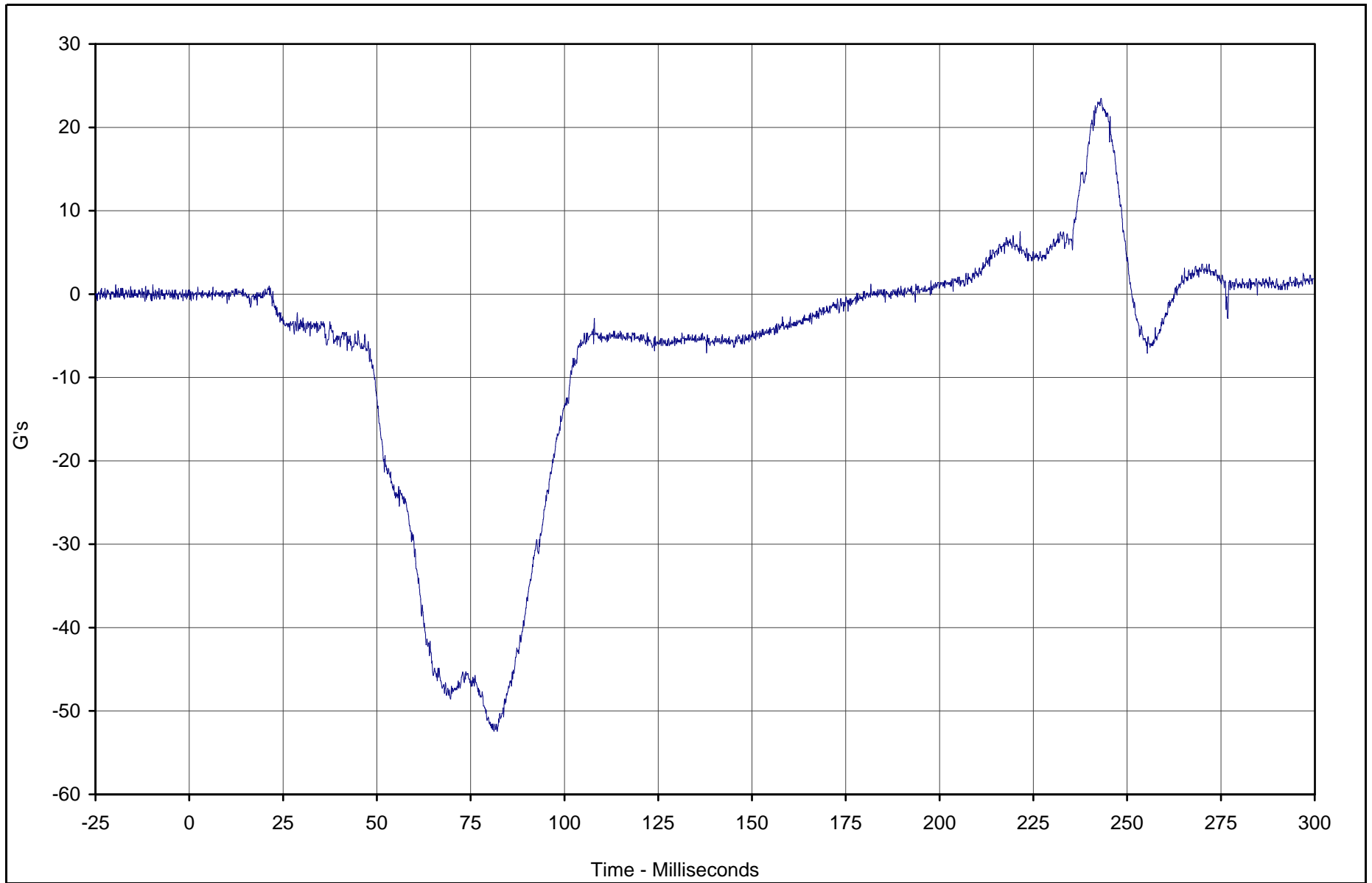
LIST OF DATA PLOTS...(Continued)

<u>Data Plot</u>		<u>Page</u>
B-102	Passenger Right Femur Force	B-102
B-103	Passenger Left Upper Tibia Moment X	B-103
B-104	Passenger Left Upper Tibia Moment Y	B-104
B-105	Passenger Right Upper Tibia Moment X	B-105
B-106	Passenger Right Upper Tibia Moment Y	B-106
B-107	Passenger Left Lower Tibia Moment X	B-107
B-108	Passenger Left Lower Tibia Moment Y	B-108
B-109	Passenger Left Lower Tibia Force Z	B-109
B-110	Passenger Right Lower Tibia Moment X	B-110
B-111	Passenger Right Lower Tibia Moment Y	B-111
B-112	Passenger Right Lower Tibia Force Z	B-112
B-113	Passenger Left Foot Aft X	B-113
B-114	Passenger Left Foot Aft Z	B-114
B-115	Passenger Left Foot Fore Z	B-115
B-116	Passenger Right Foot Aft X	B-116
B-117	Passenger Right Foot Aft Z	B-117
B-118	Passenger Right Foot Fore Z	B-118
B-119	Passenger Lap Belt Force	B-119
B-120	Passenger Shoulder Belt Force	B-120
B-121	Passenger Shoulder Belt Pullout	B-121
B-122	Passenger Shoulder Belt Elongation	B-122
B-123	Vehicle Left Rear X	B-123
B-124	Vehicle Left Rear X Velocity	B-124
B-125	Vehicle Left Rear X Displacement	B-125
B-126	Vehicle Right Rear X	B-126
B-127	Vehicle Right Rear X Velocity	B-127
B-128	Vehicle Right Rear X Displacement	B-128
B-129	Vehicle Engine Top	B-129
B-130	Vehicle Engine Top Velocity	B-130
B-131	Vehicle Engine Top Displacement	B-131
B-132	Vehicle Engine Bottom	B-132
B-133	Vehicle Engine Bottom Velocity	B-133
B-134	Vehicle Engine Bottom Displacement	B-134
B-135	Vehicle Left Brake Caliper	B-135
B-136	Vehicle Left Brake Caliper Velocity	B-136

LIST OF DATA PLOTS...(Continued)

<u>Data Plot</u>		<u>Page</u>
B-137	Vehicle Left Brake Caliper Displacement	B-137
B-138	Vehicle Right Brake Caliper	B-138
B-139	Vehicle Right Brake Caliper Velocity	B-139
B-140	Vehicle Right Brake Caliper Displacement	B-140
B-141	Vehicle Instrument Panel	B-141
B-142	Vehicle Instrument Panel Velocity	B-142
B-143	Vehicle Instrument Panel Displacement	B-143
B-144	Vehicle Left Rear Z	B-144
B-145	Vehicle Left Rear Z Velocity	B-145
B-146	Vehicle Left Rear Z Displacement	B-146
B-147	Vehicle Right Rear Z	B-147
B-148	Vehicle Right Rear Z Velocity	B-148
B-149	Vehicle Right Rear Z Displacement	B-149

B-1



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X	001	FIL	G's	23.5	243.0	-52.4	81.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

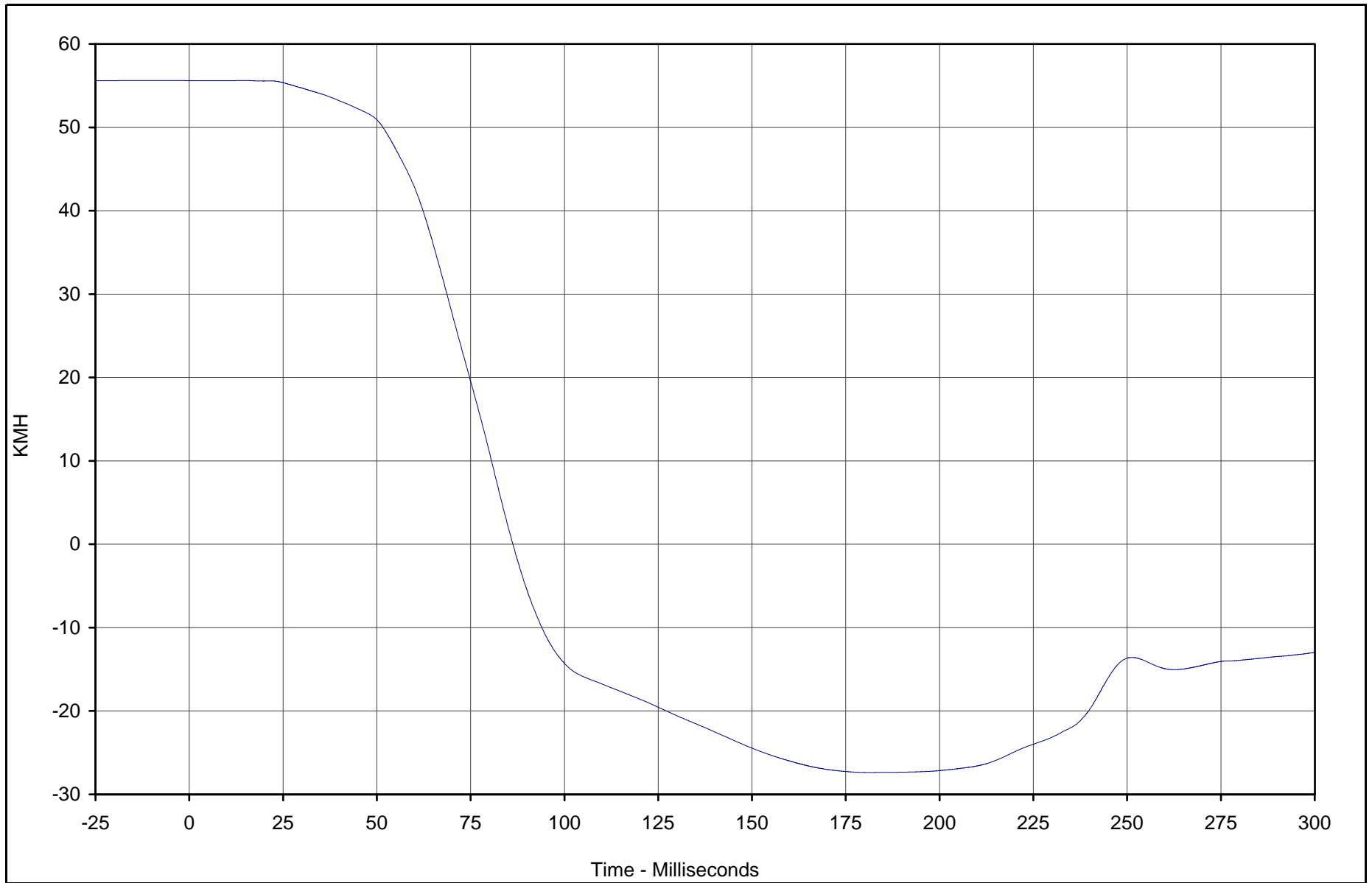
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-2



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X Velocity	001	IN1	KMH	55.6	14.8	-27.4	181.2	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

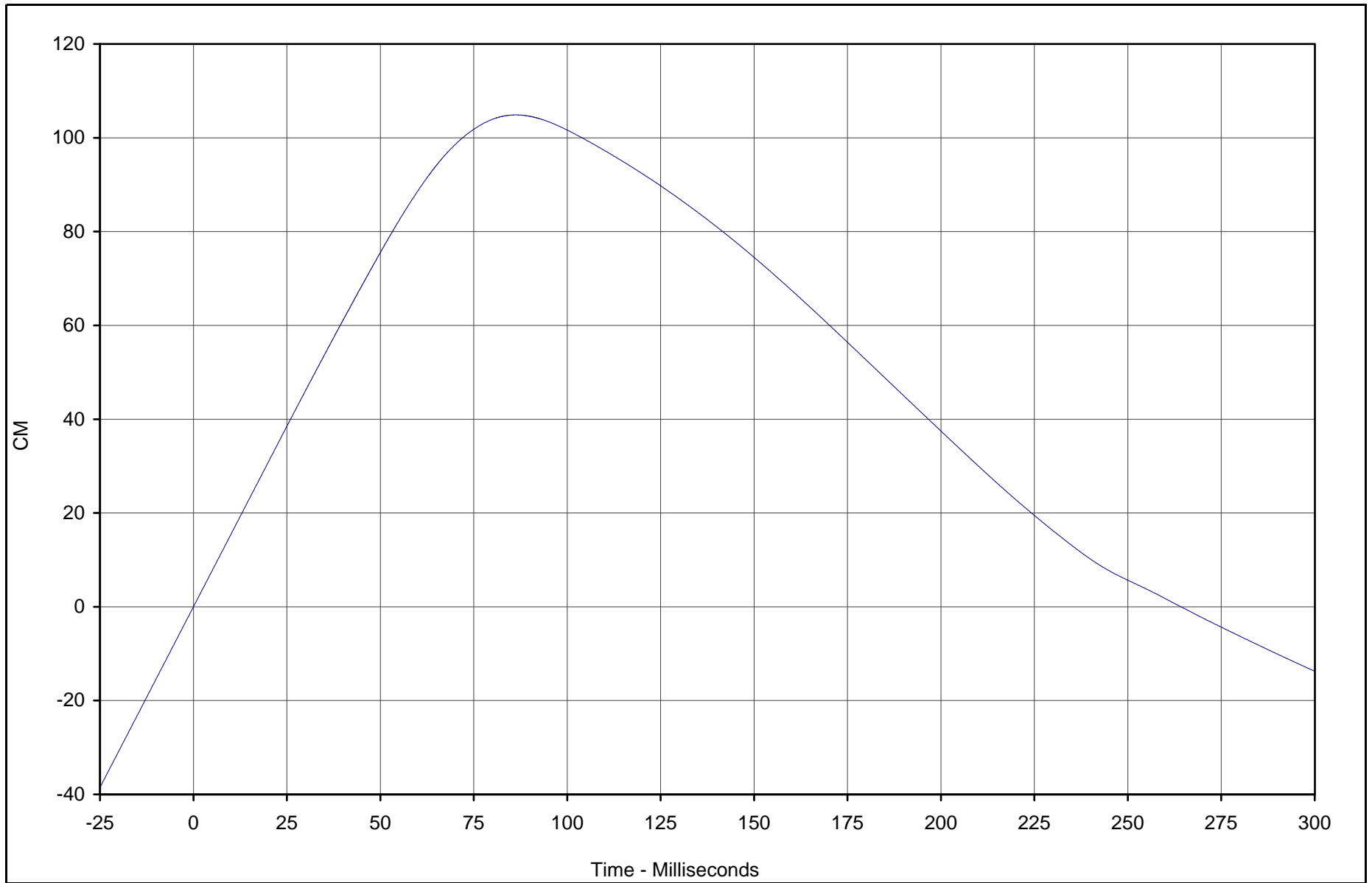
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-3



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary X Displ.	001	IN2	CM	104.9	86.3	-13.7	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

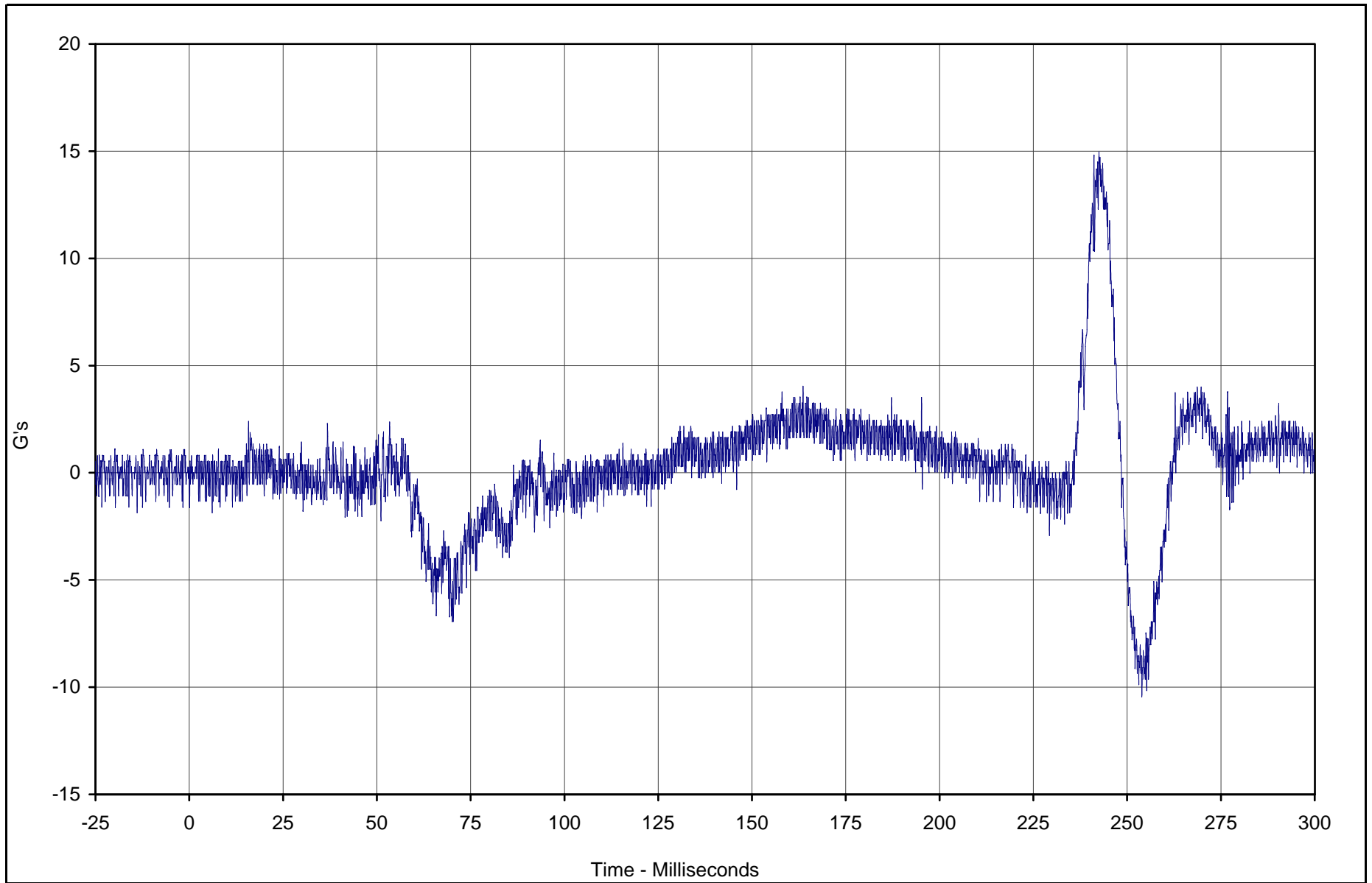
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-4



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary Y	002	FIL	G's	15.0	242.5	-10.4	253.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

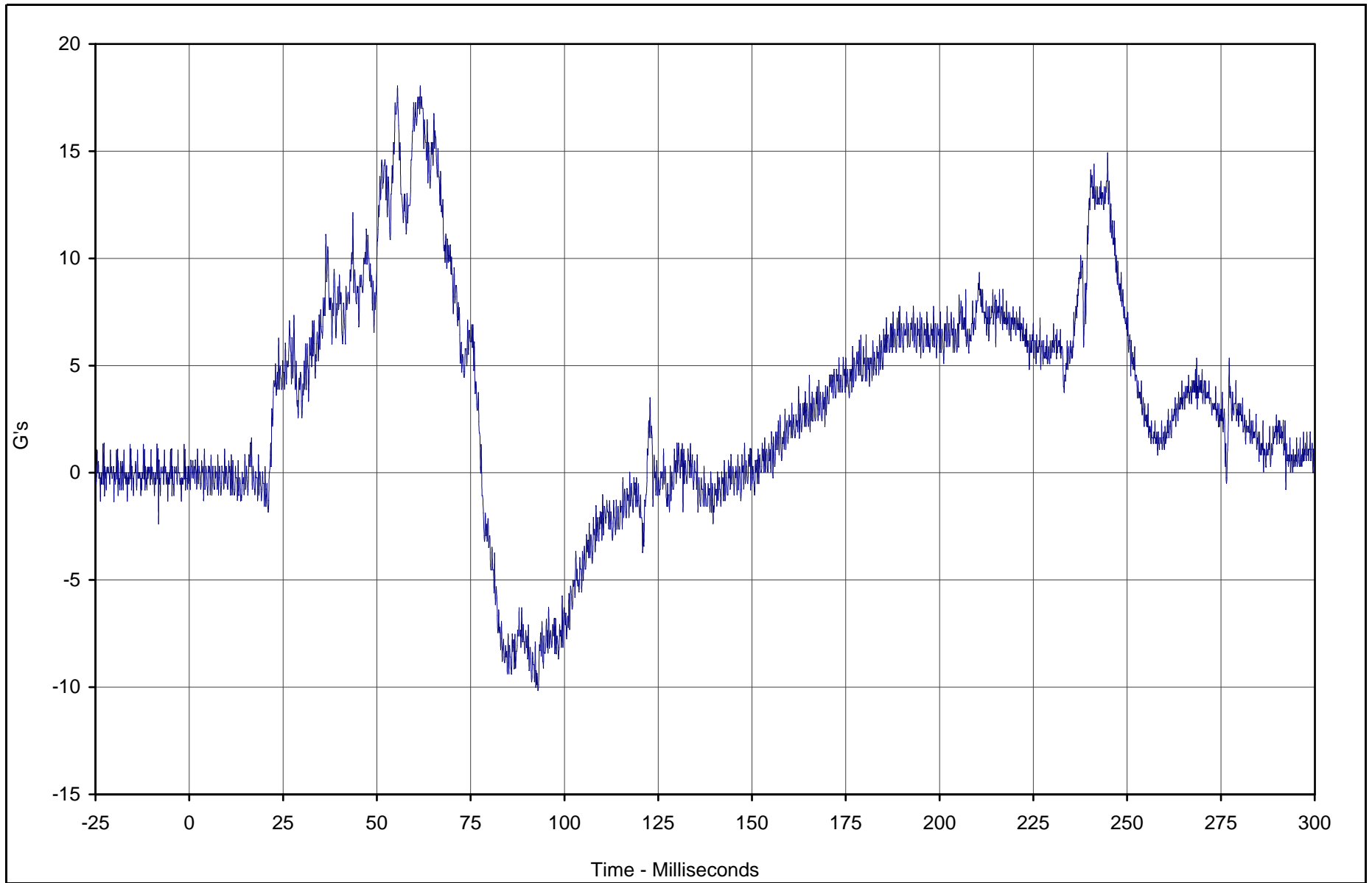
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-5



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary Z	003	FIL	G's	18.1	55.5	-10.2	92.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

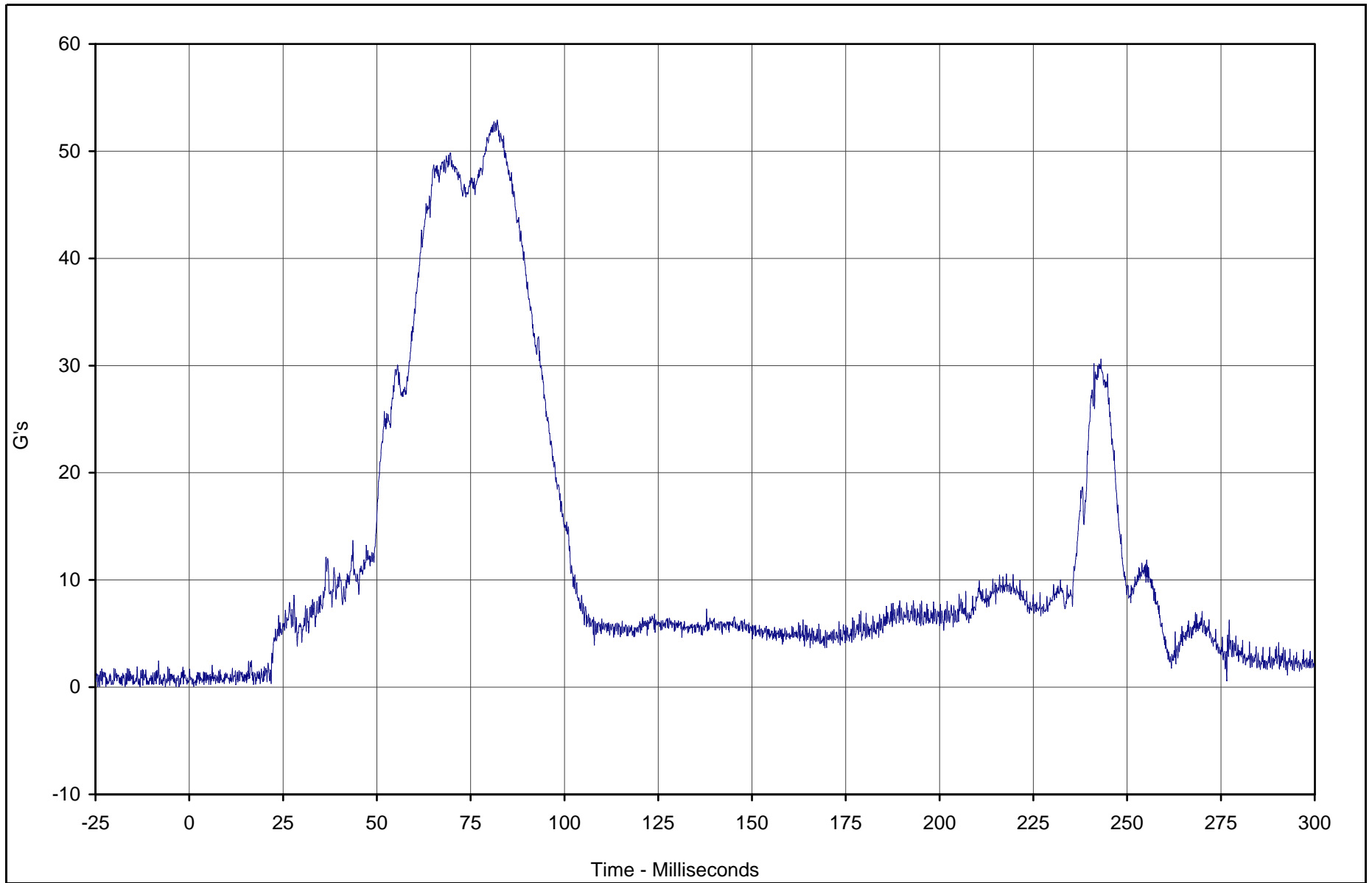
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-6



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Resultant Primary	001	RES	G's	52.9	82.1	0.1	1.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

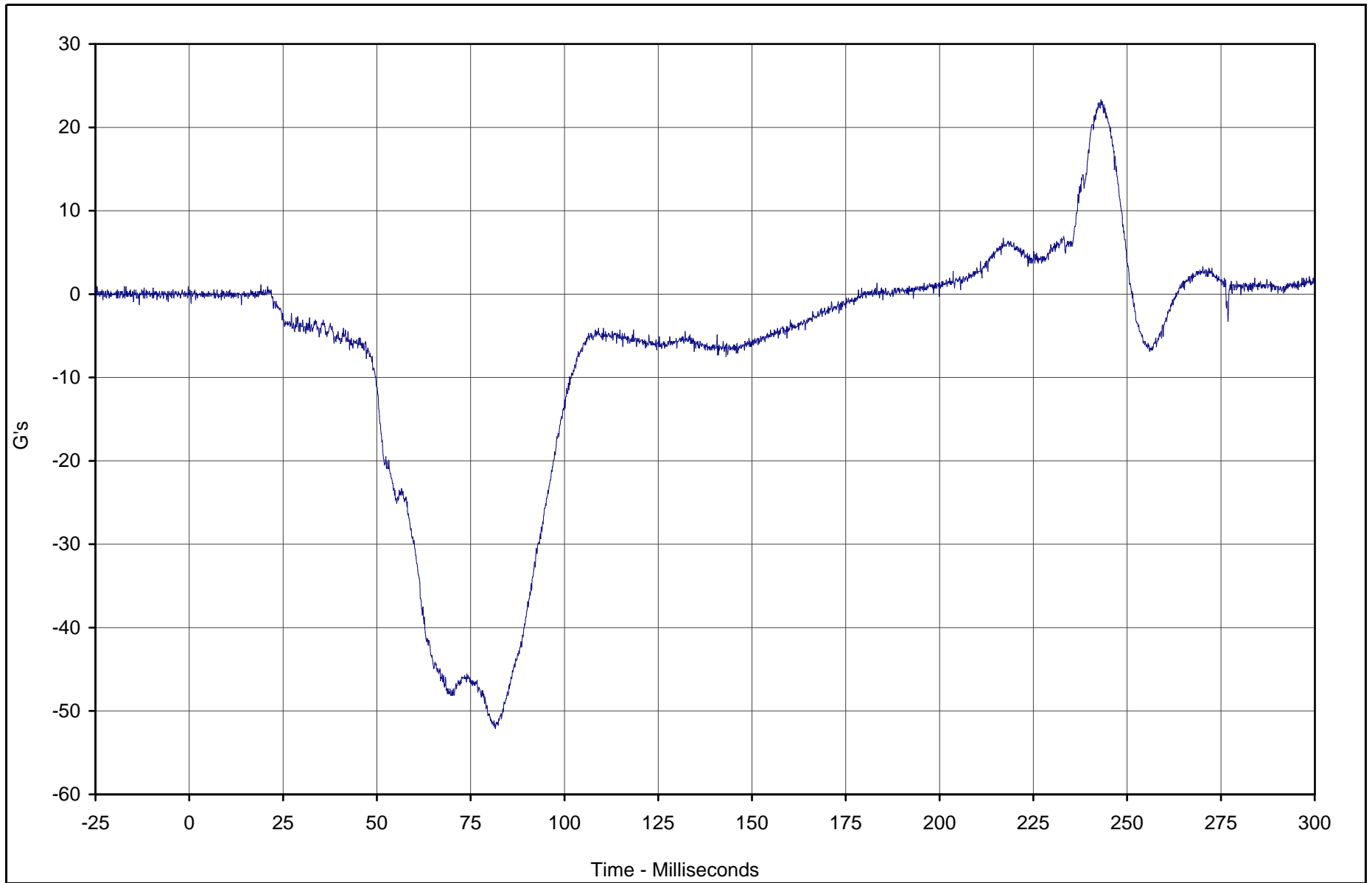
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-7



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X	004	FIL	G's	23.3	243.0	-52.1	81.6	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

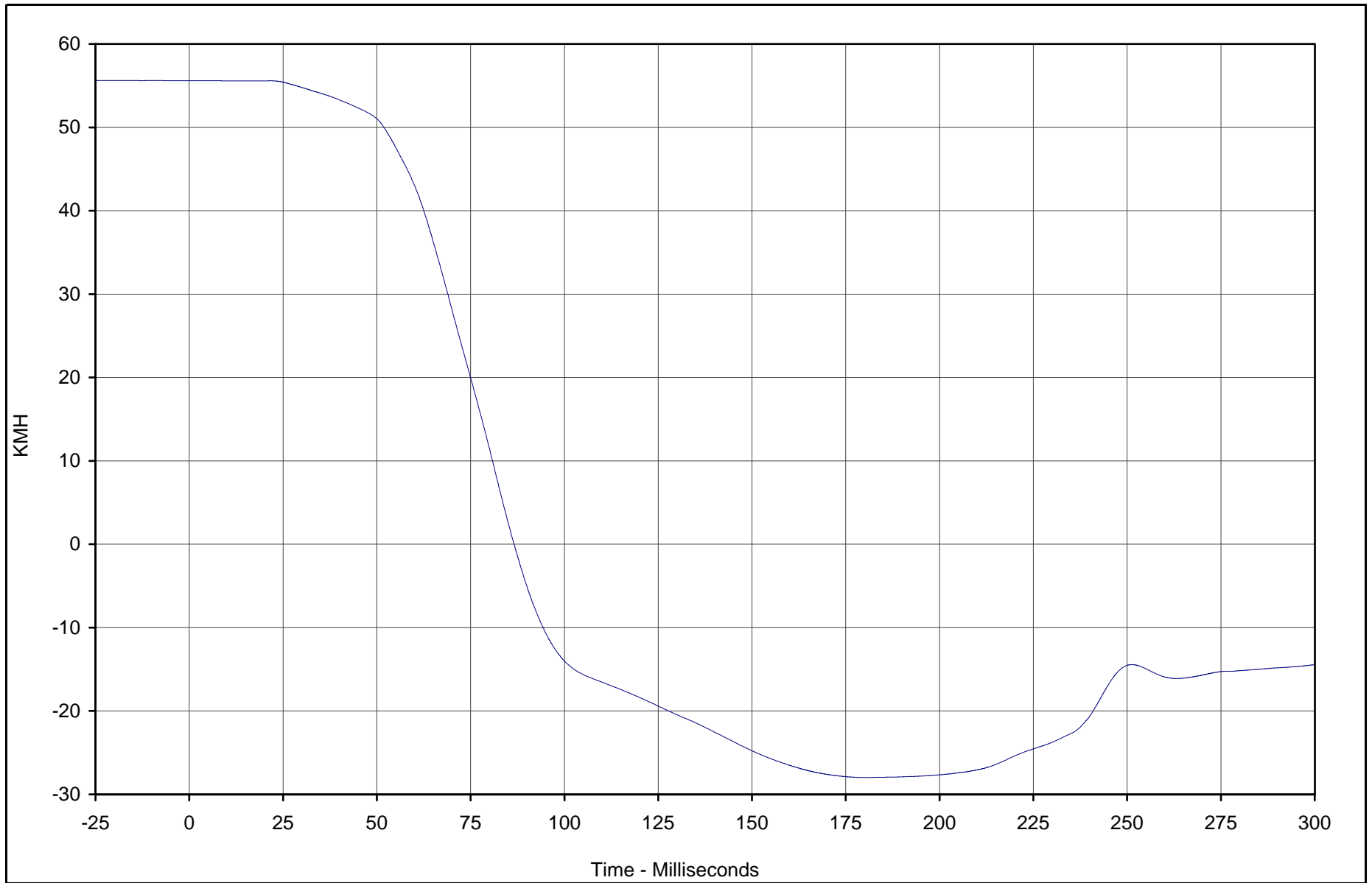
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-8



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X Velocity	004	IN1	KMH	55.6	0.0	-28.0	179.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

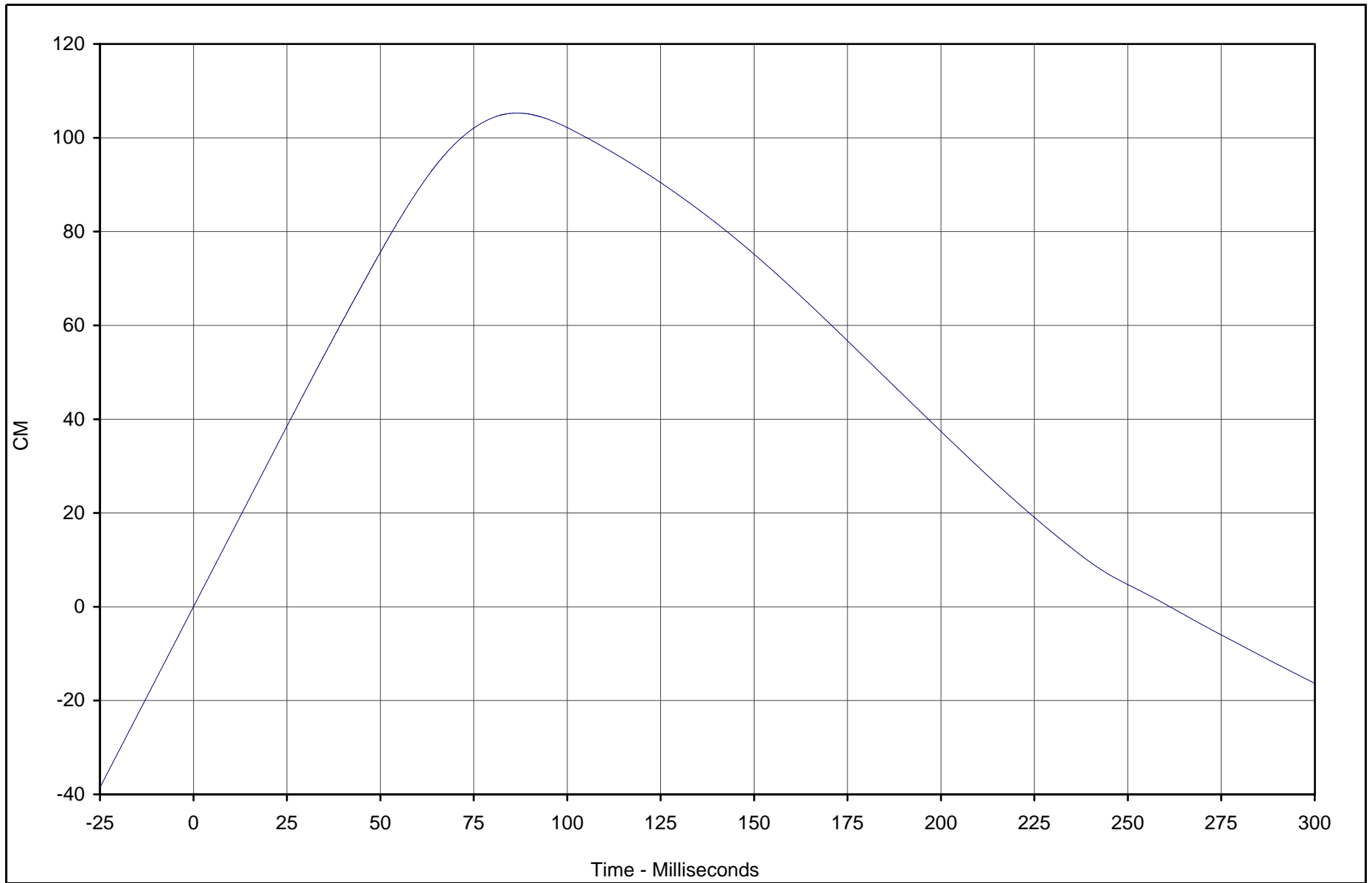
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-9



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant X Displ.	004	IN2	CM	105.3	86.6	-16.3	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

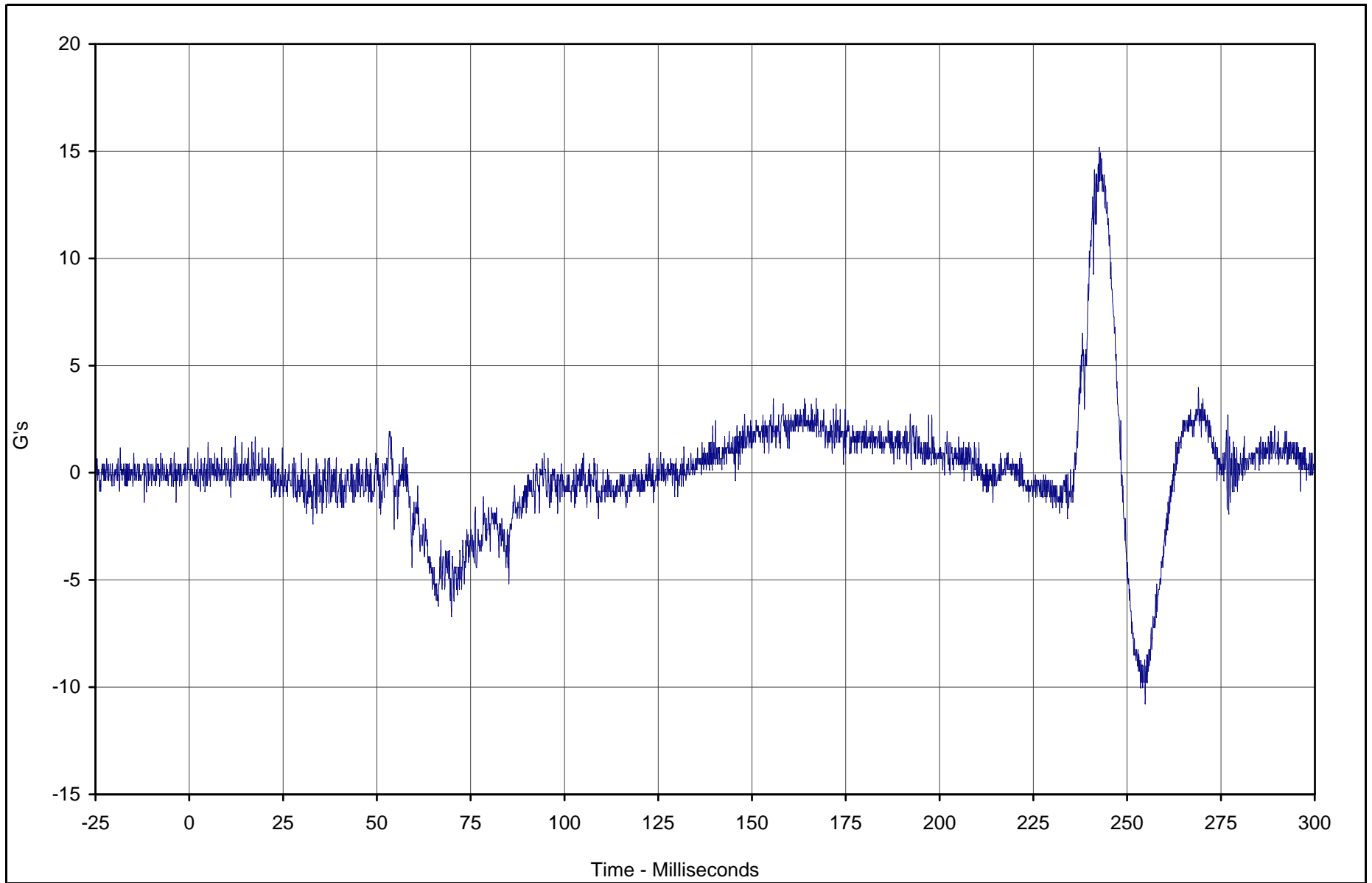
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-10



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant Y	005	FIL	G's	15.2	242.6	-10.8	254.8	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

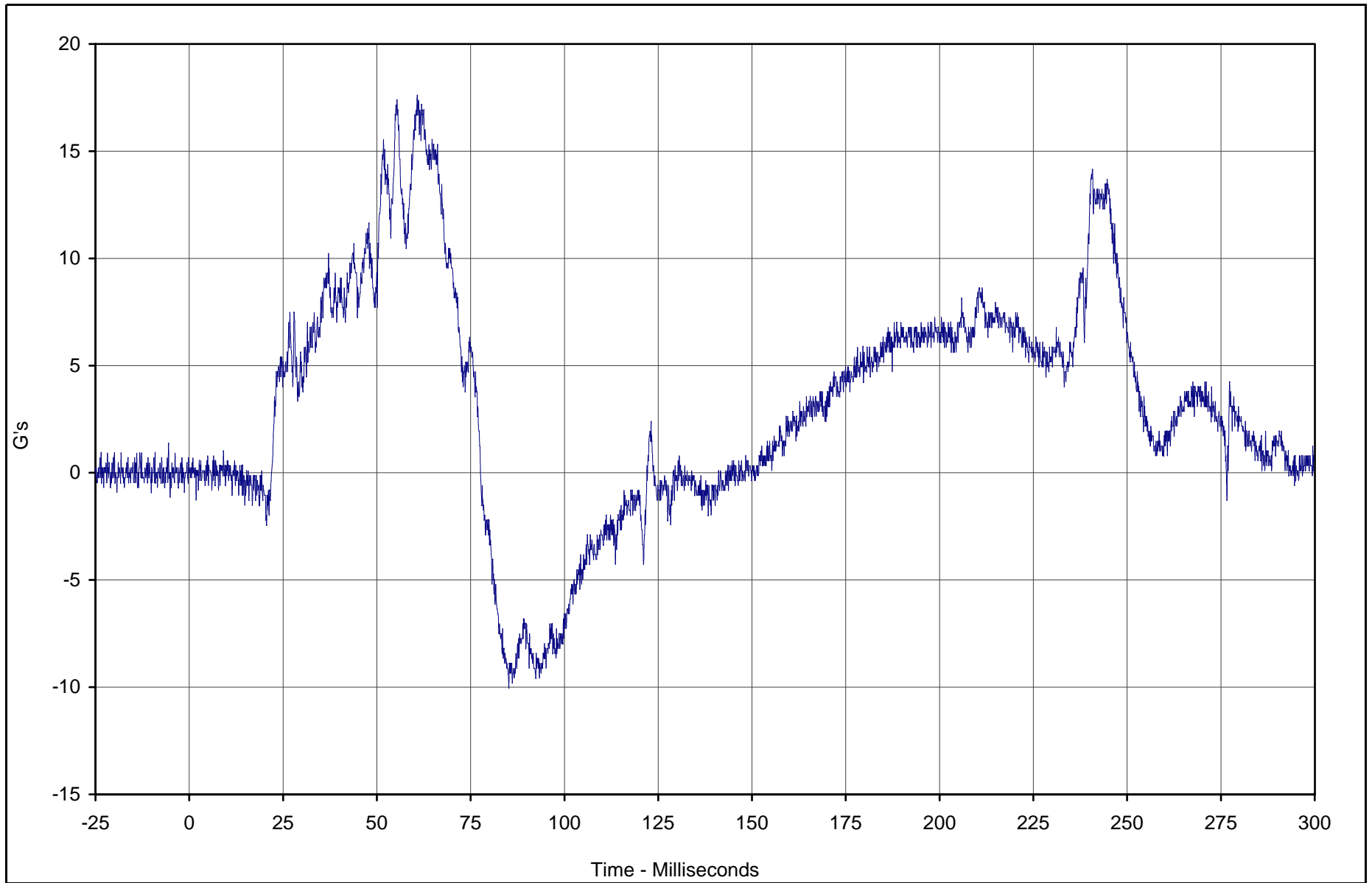
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-11



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Redundant Z	006	FIL	G's	17.6	60.8	-10.0	85.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

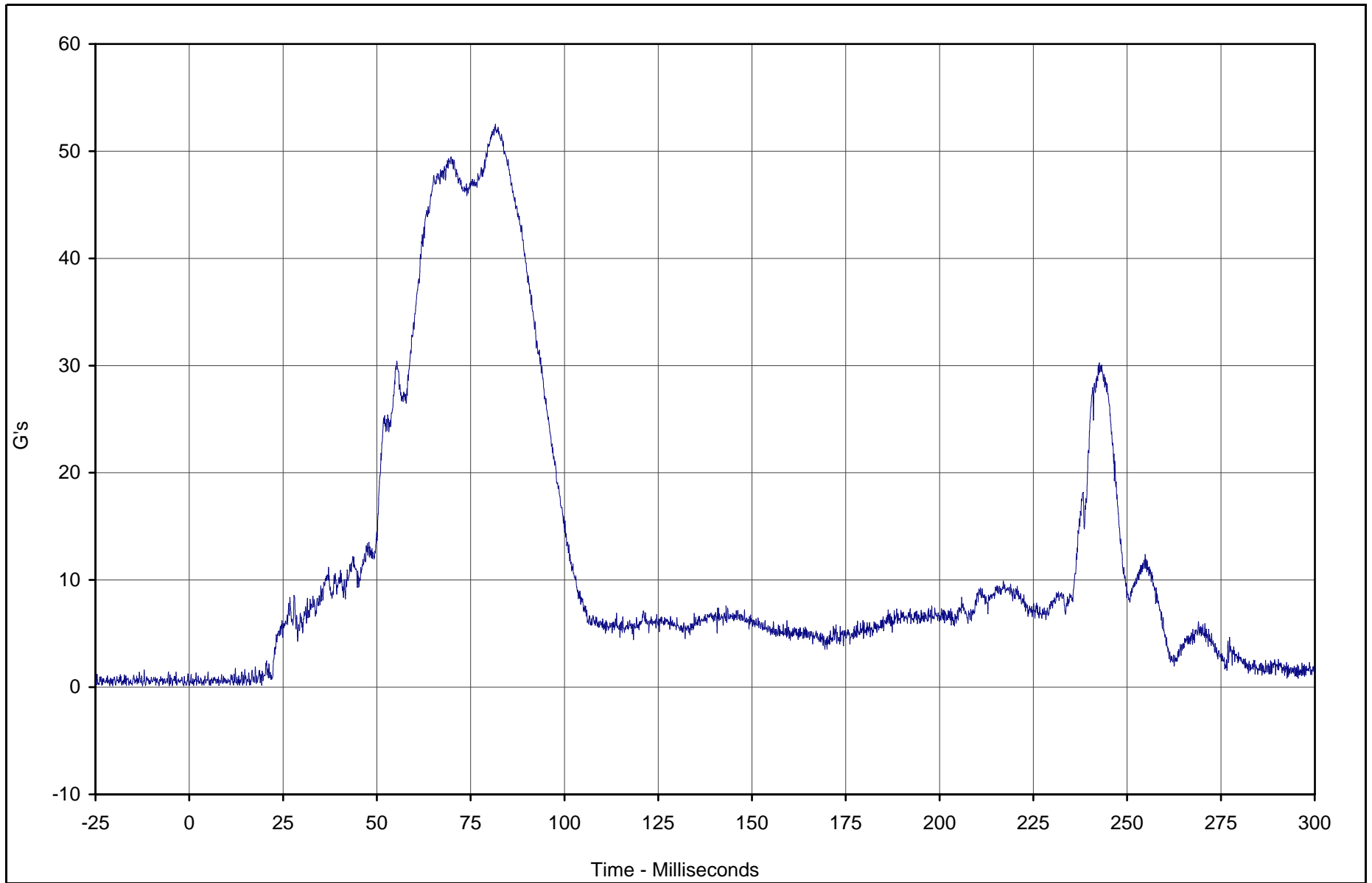
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-12



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Resultant Redundant	004	RES	G's	52.5	81.6	0.2	1.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

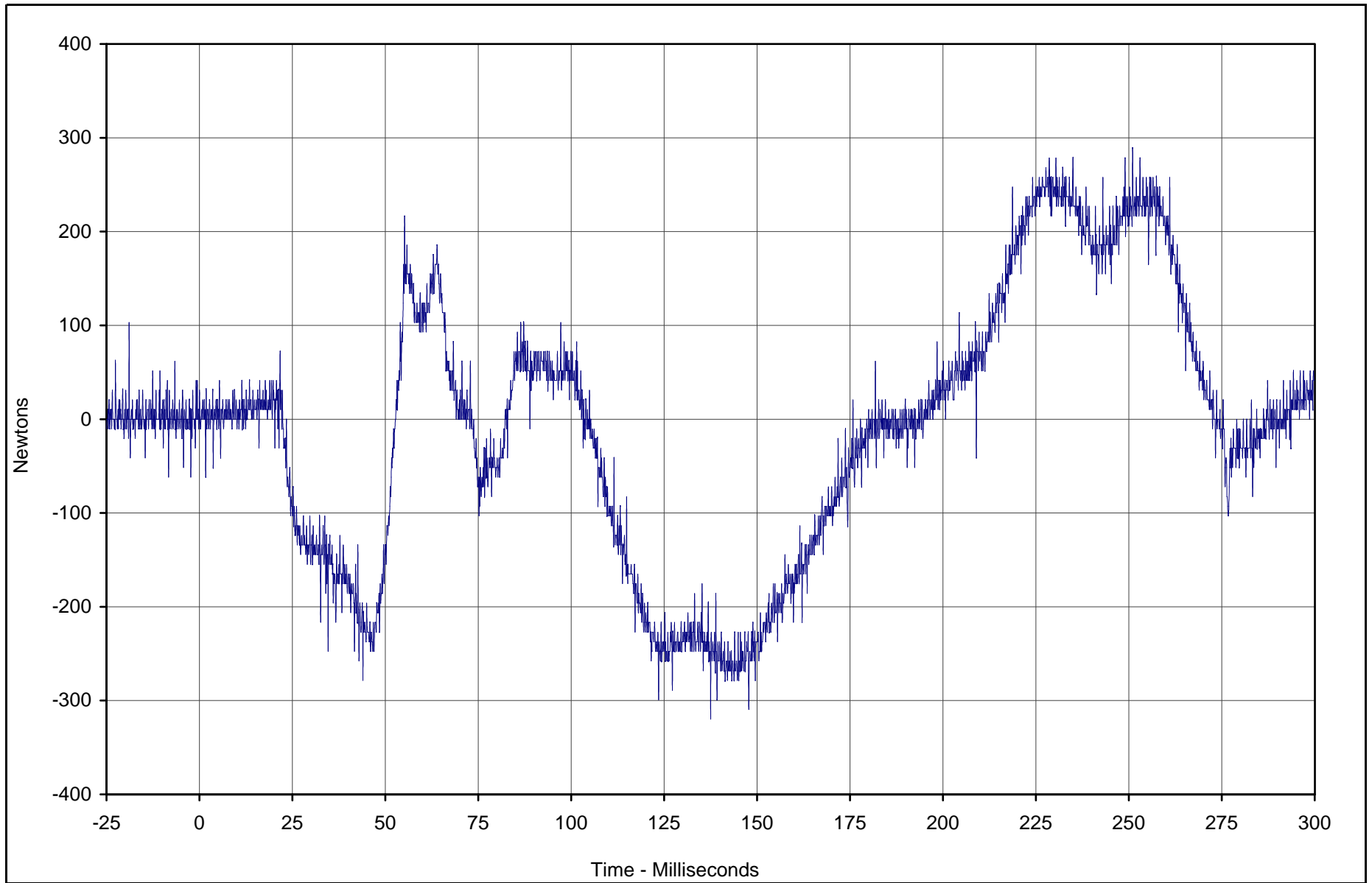
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-13



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force X	007	FIL	Newtons	288.9	251.0	-319.8	137.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

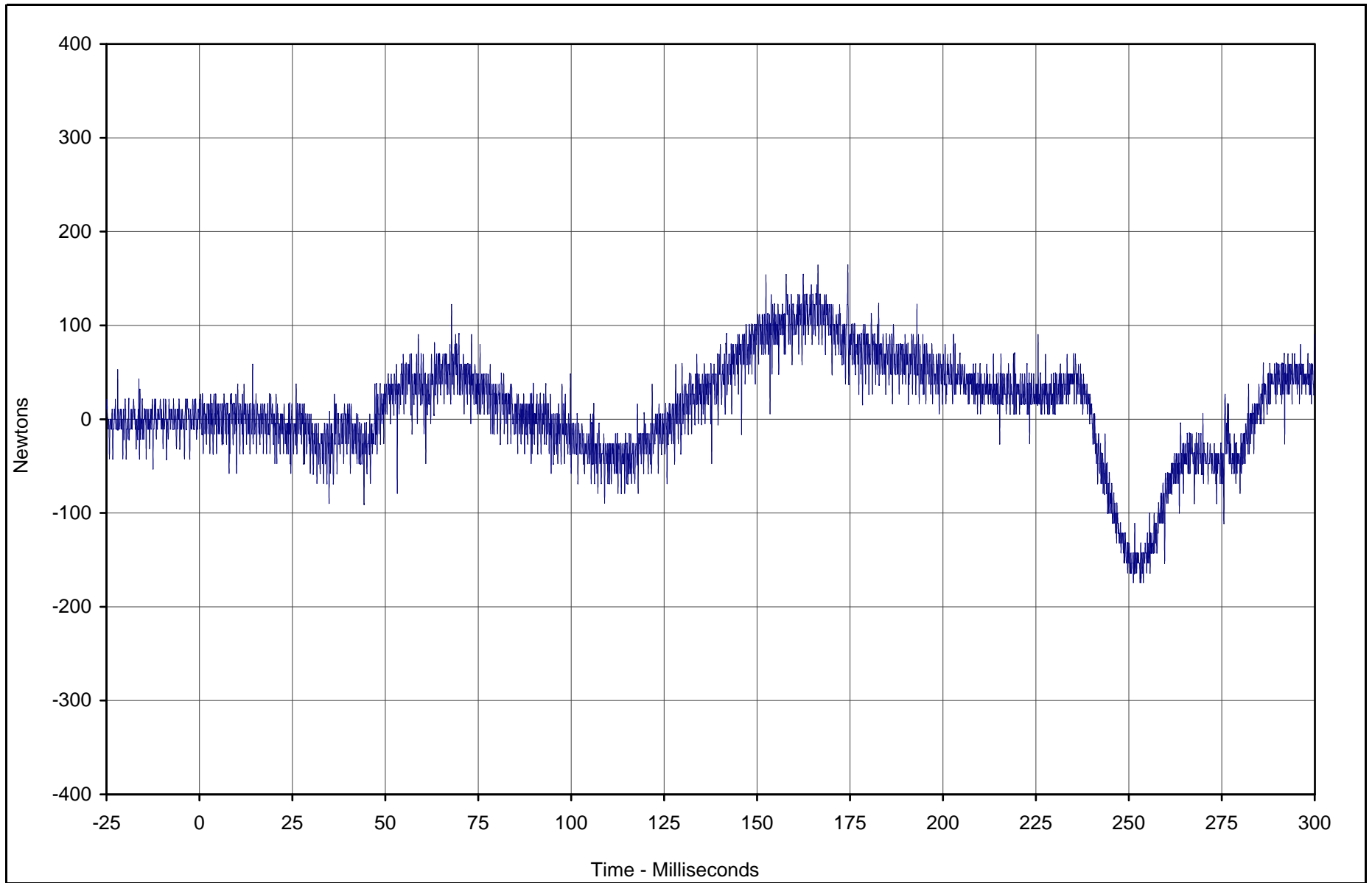
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-14



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Y	008	FIL	Newtons	164.5	166.4	-174.5	251.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

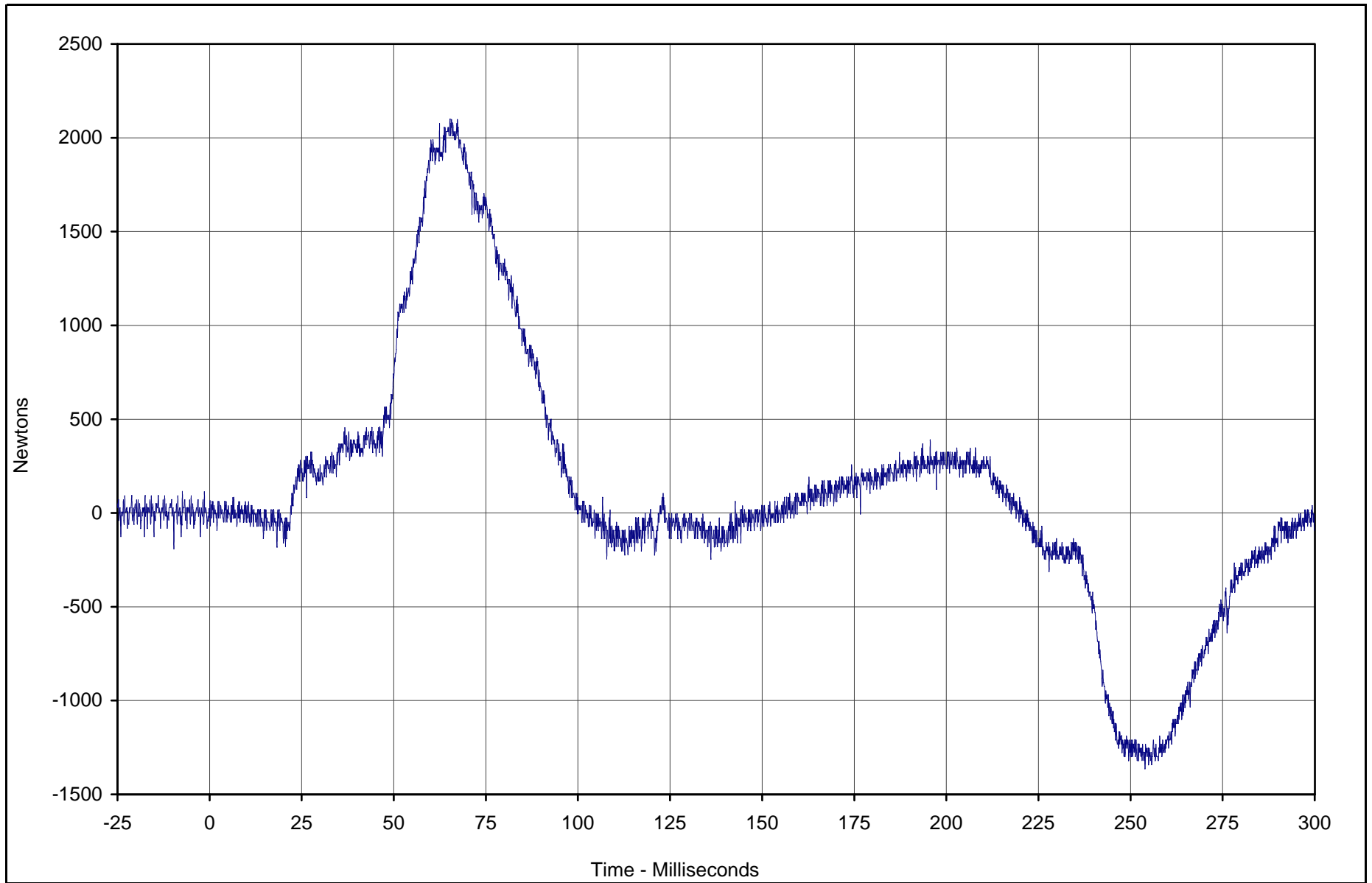
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-15



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Z	009	FIL	Newtons	2098.5	65.3	-1363.5	253.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

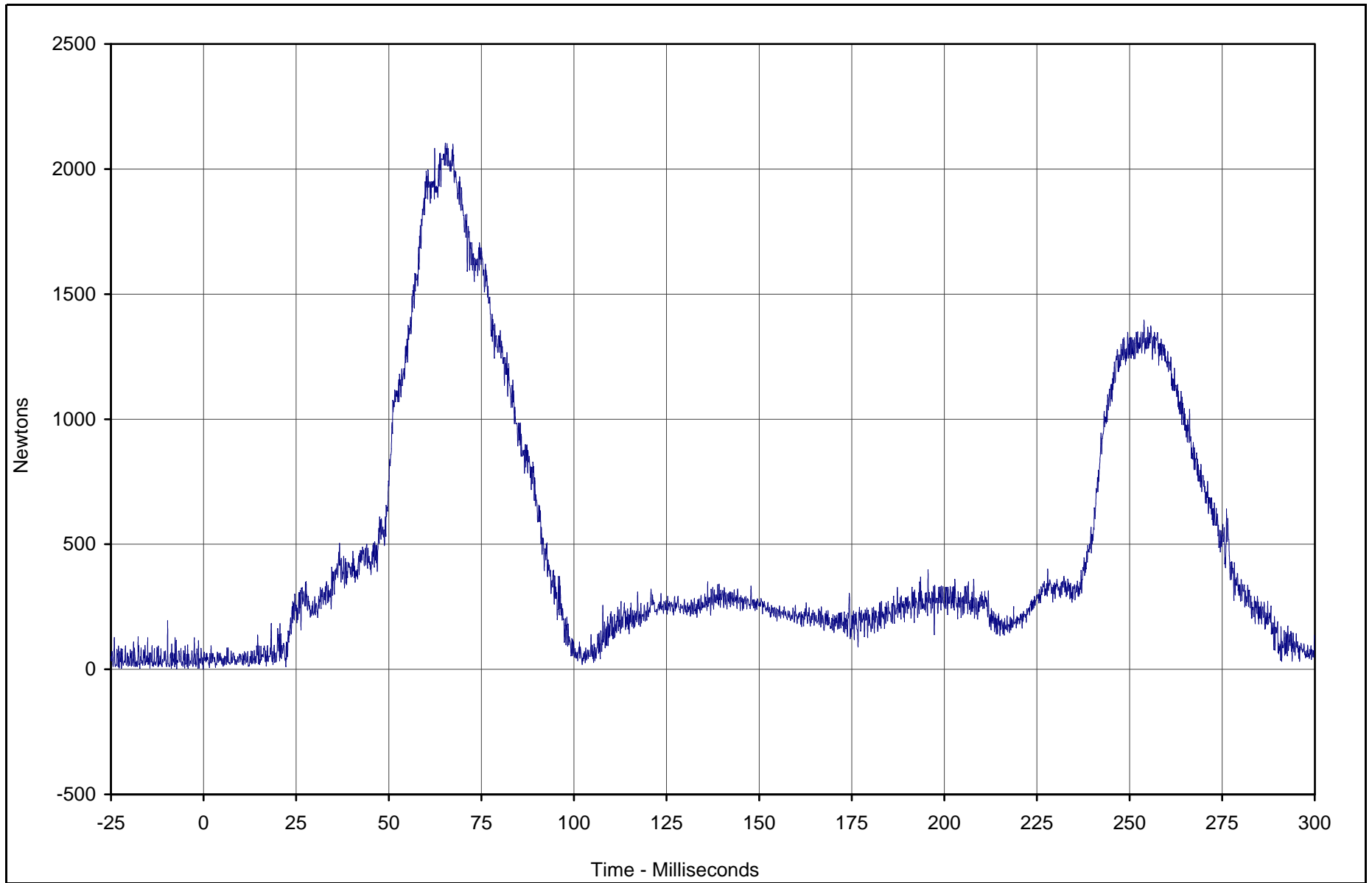
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-16



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Force Resultant	007	RES	Newtons	2102.5	65.3	7.5	1.6	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

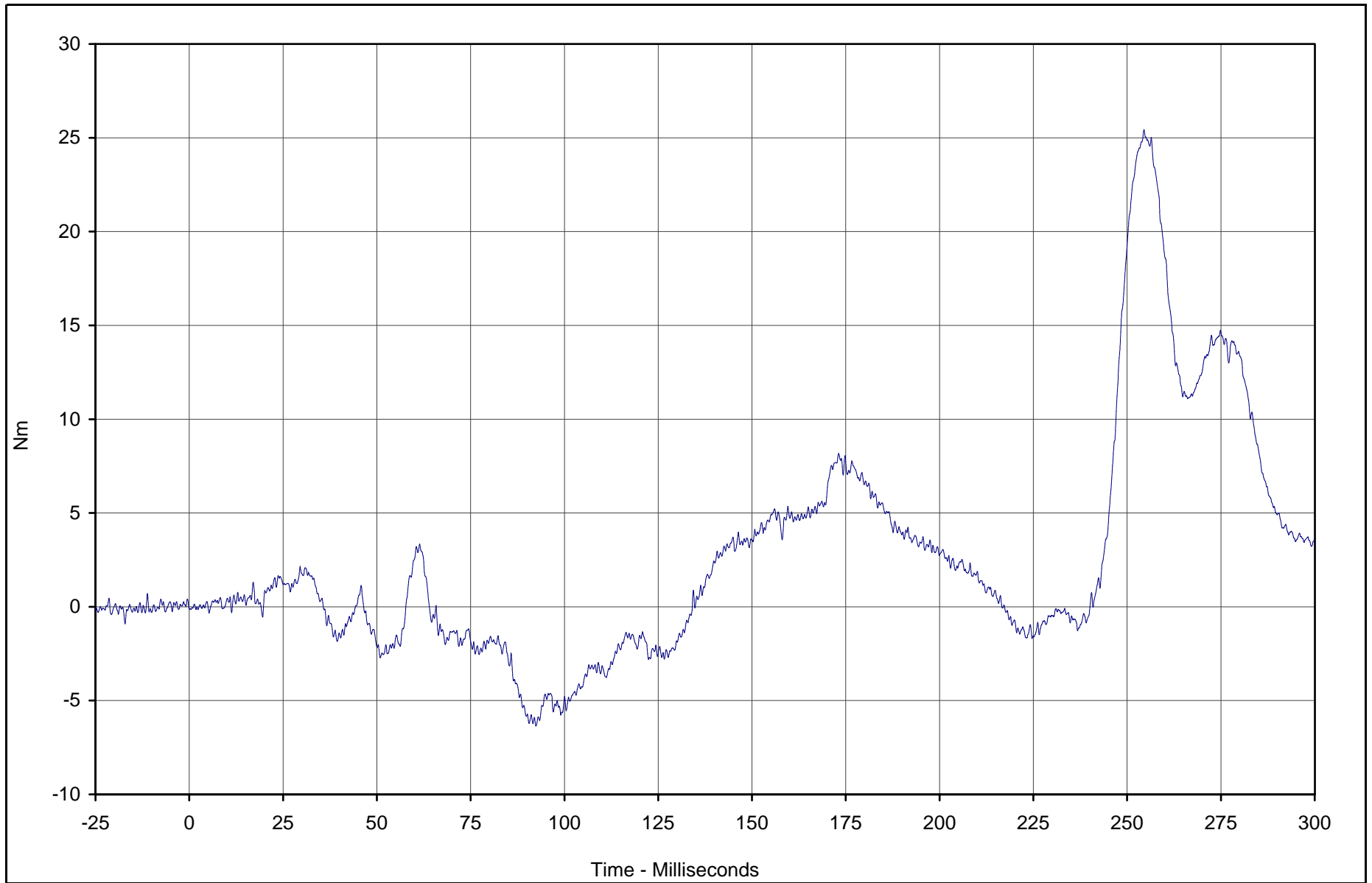
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-17



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment X	010	FIL	Nm	25.4	254.5	-6.4	92.4	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

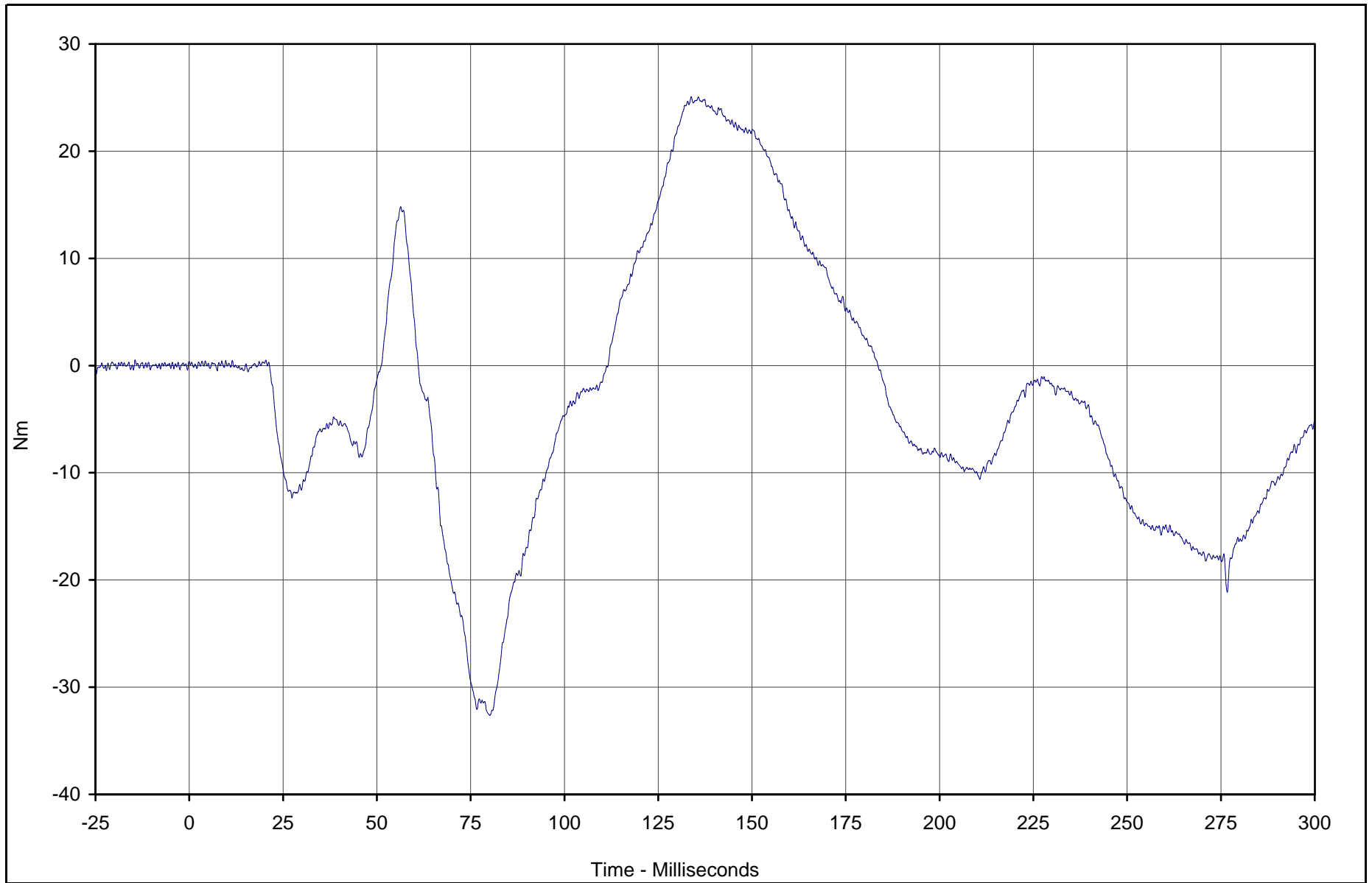
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-18



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Y	011	FIL	Nm	25.1	133.8	-32.6	80.1	600



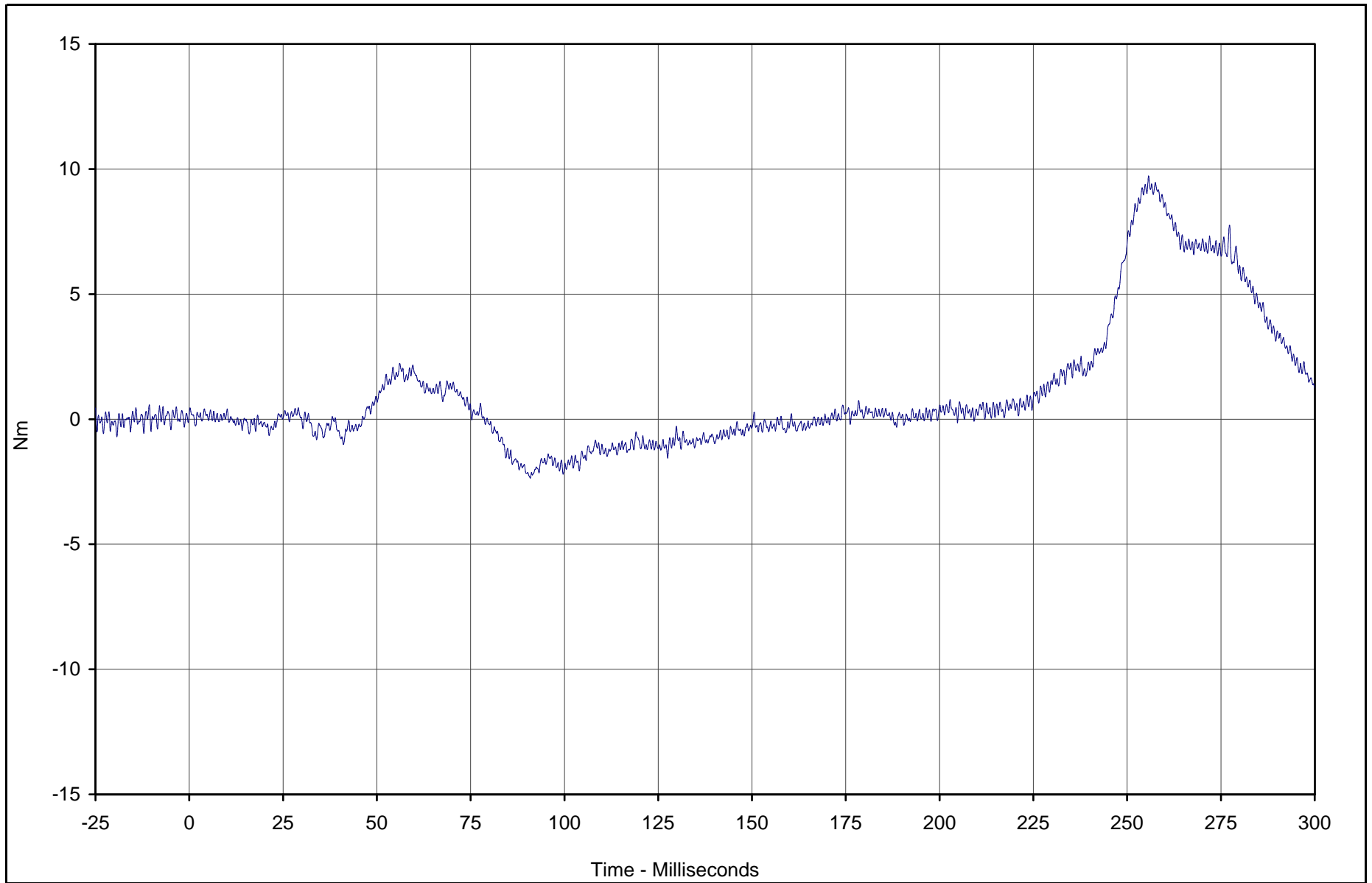
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-19



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Z	012	FIL	Nm	9.7	255.7	-2.4	90.9	600



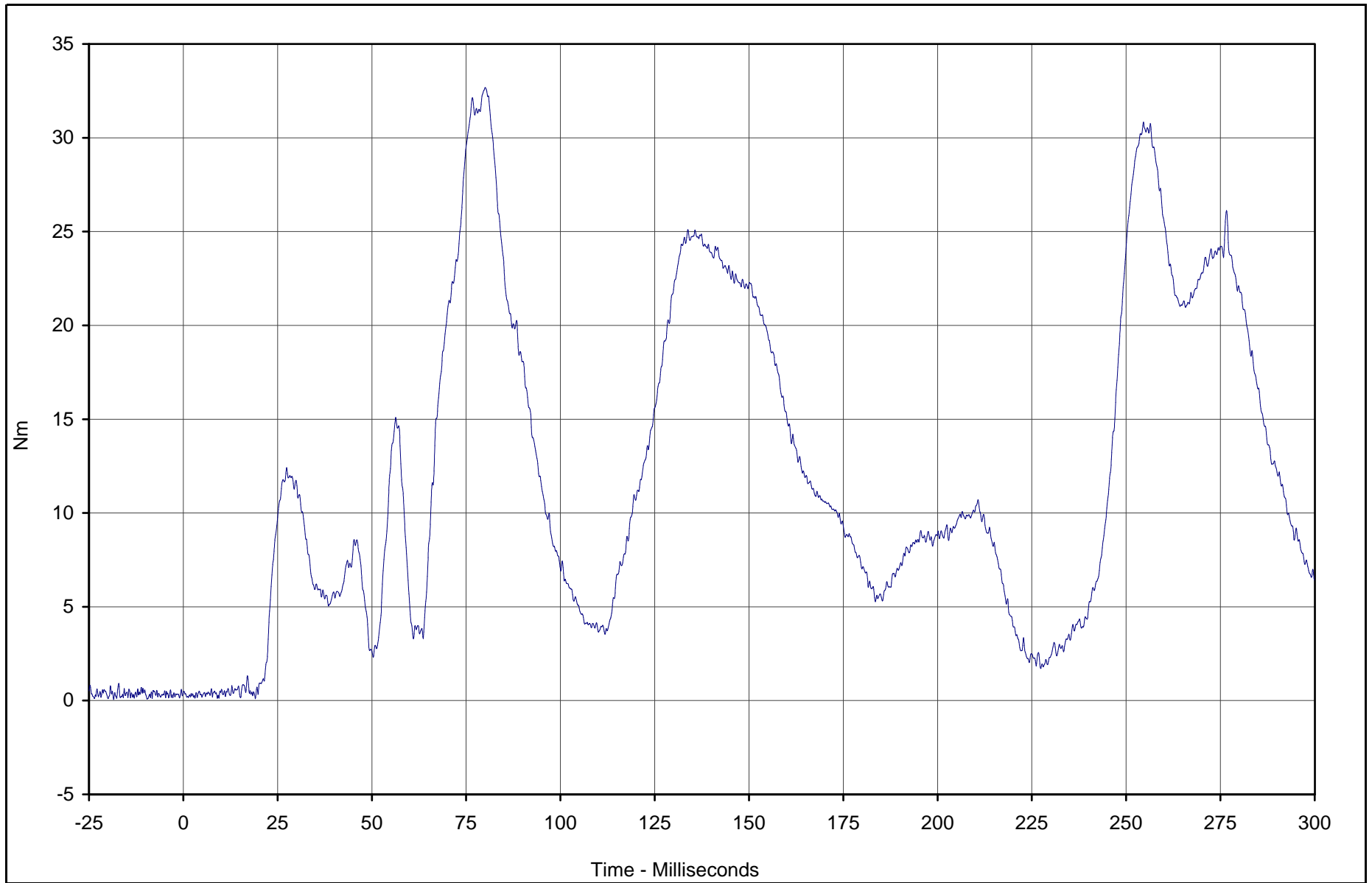
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-20



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Neck Moment Resultant	010	RES	Nm	32.7	80.1	0.1	19.1	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

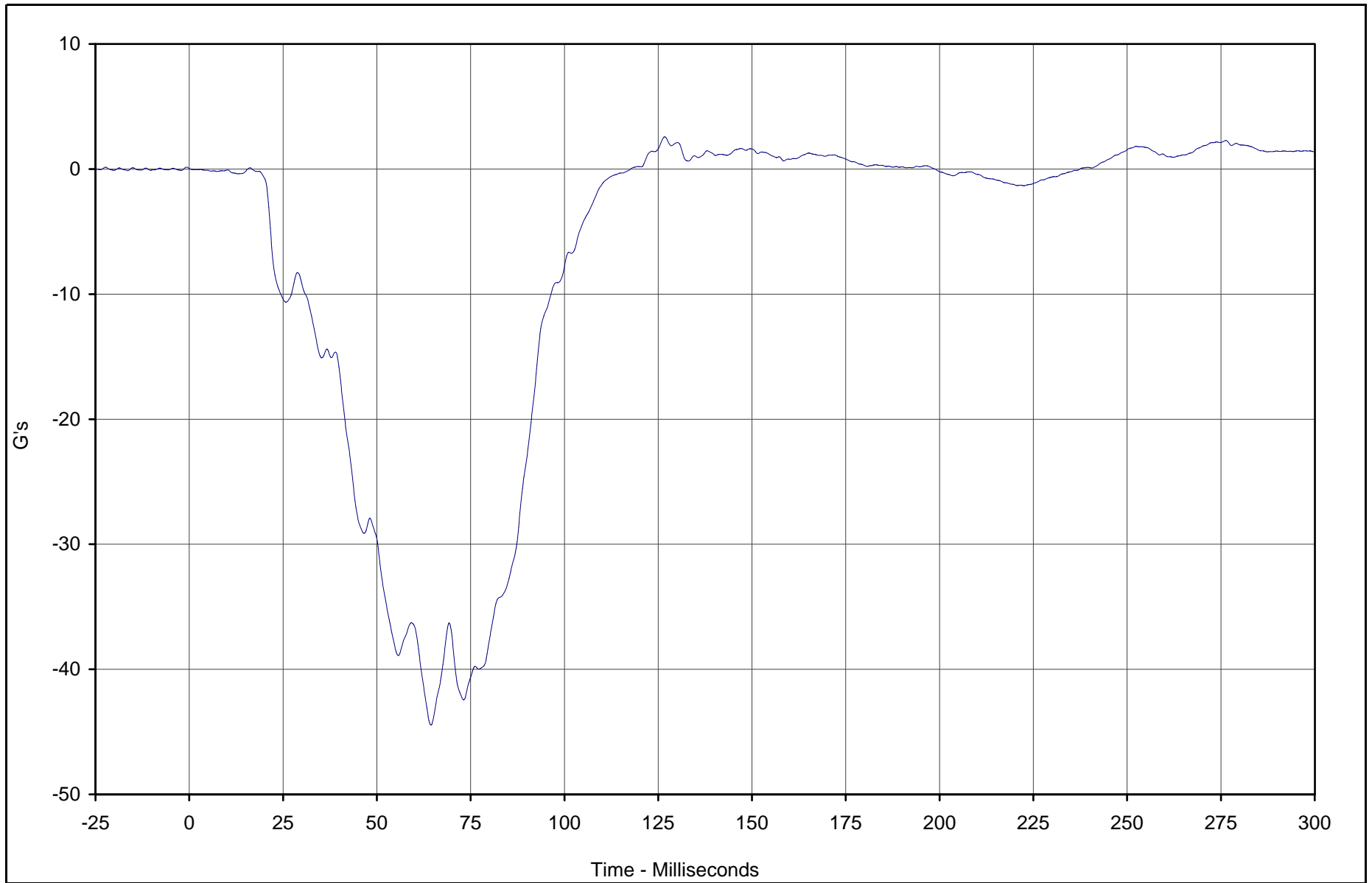
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-21



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X	013	FIL	G's	2.6	126.7	-44.5	64.4	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

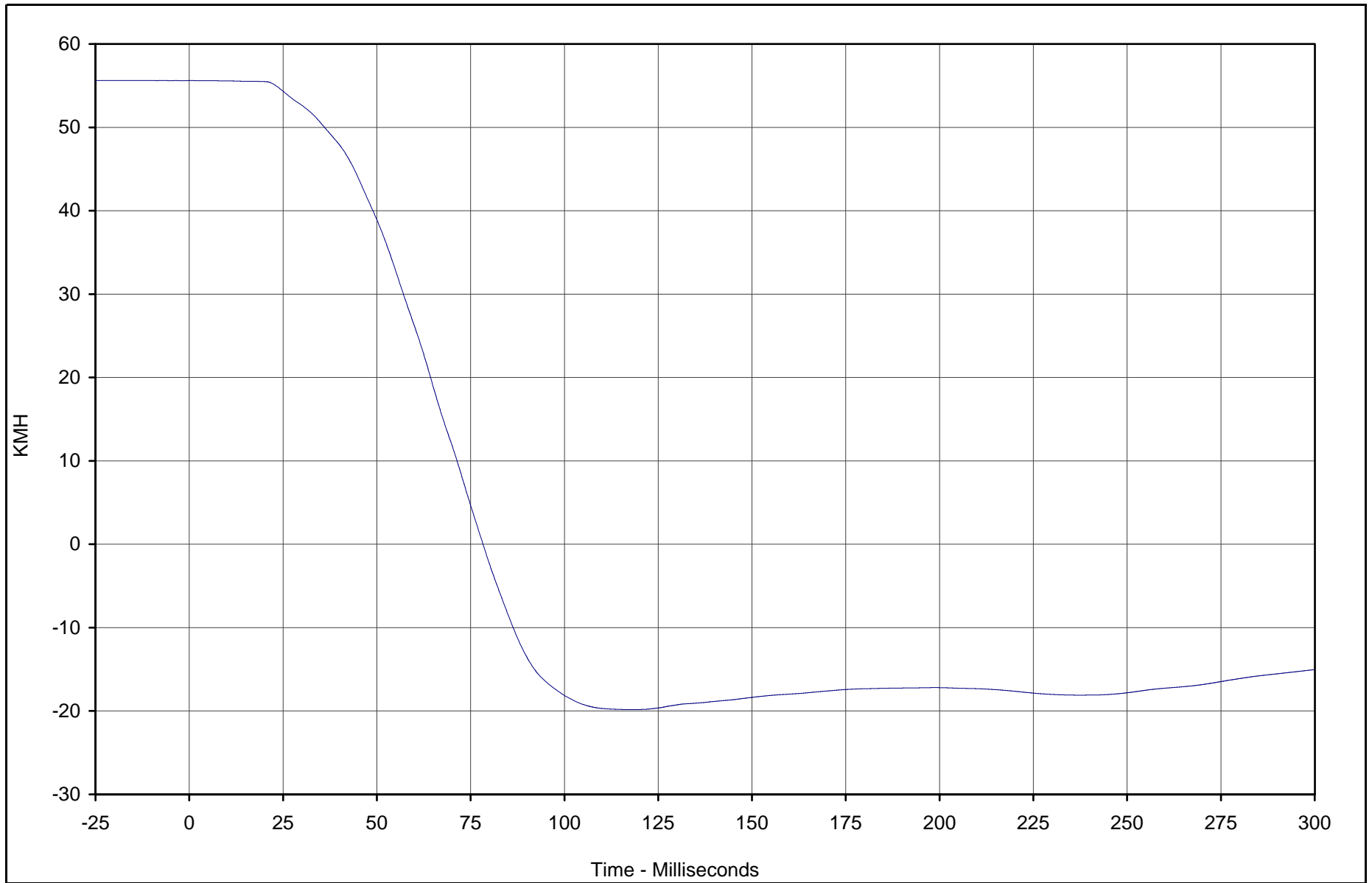
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-22



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X Velocity	013	IN1	KMH	55.6	0.3	-19.8	117.6	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

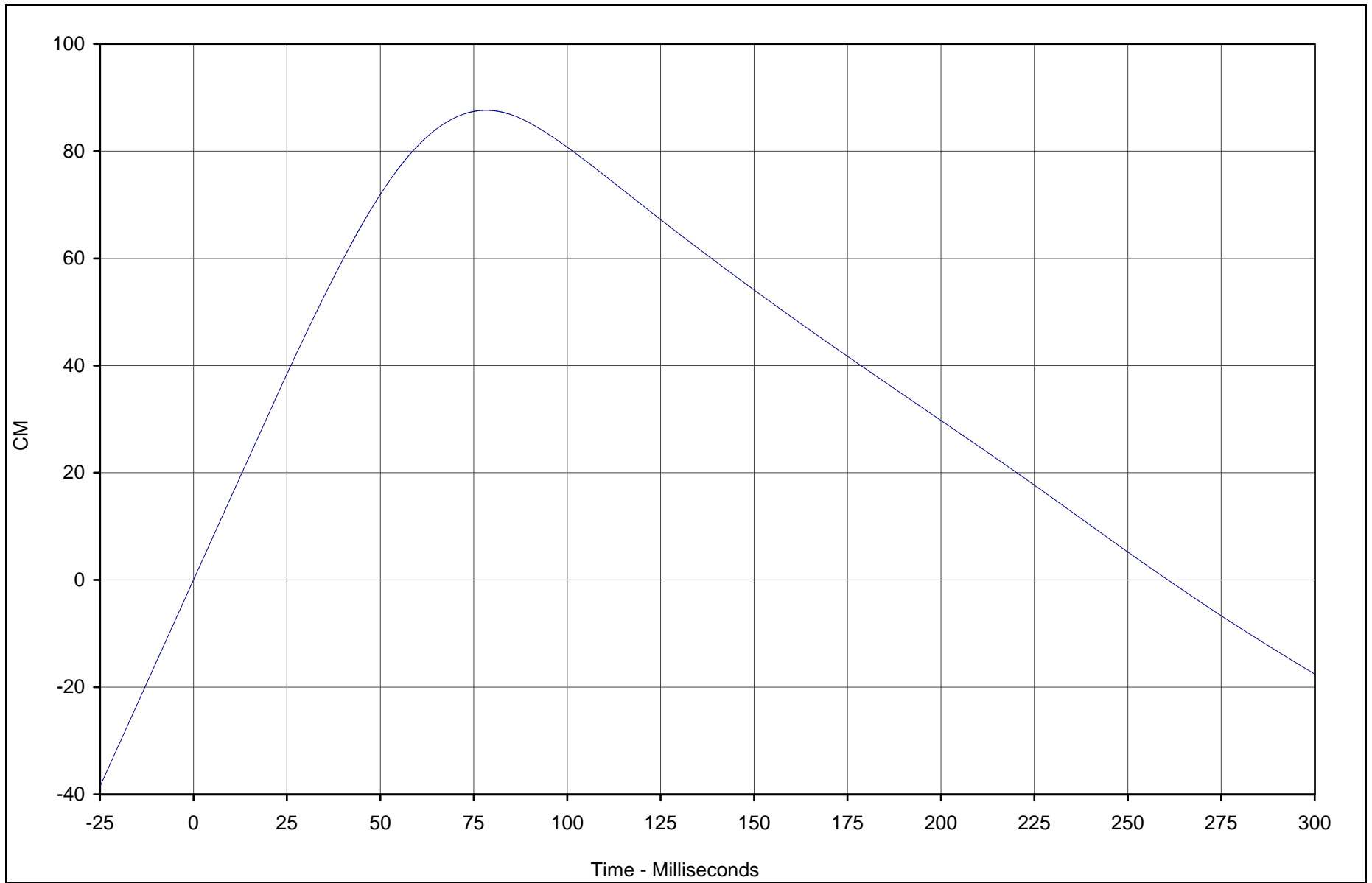
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-23



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary X Displ.	013	IN2	CM	87.6	78.3	-17.5	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

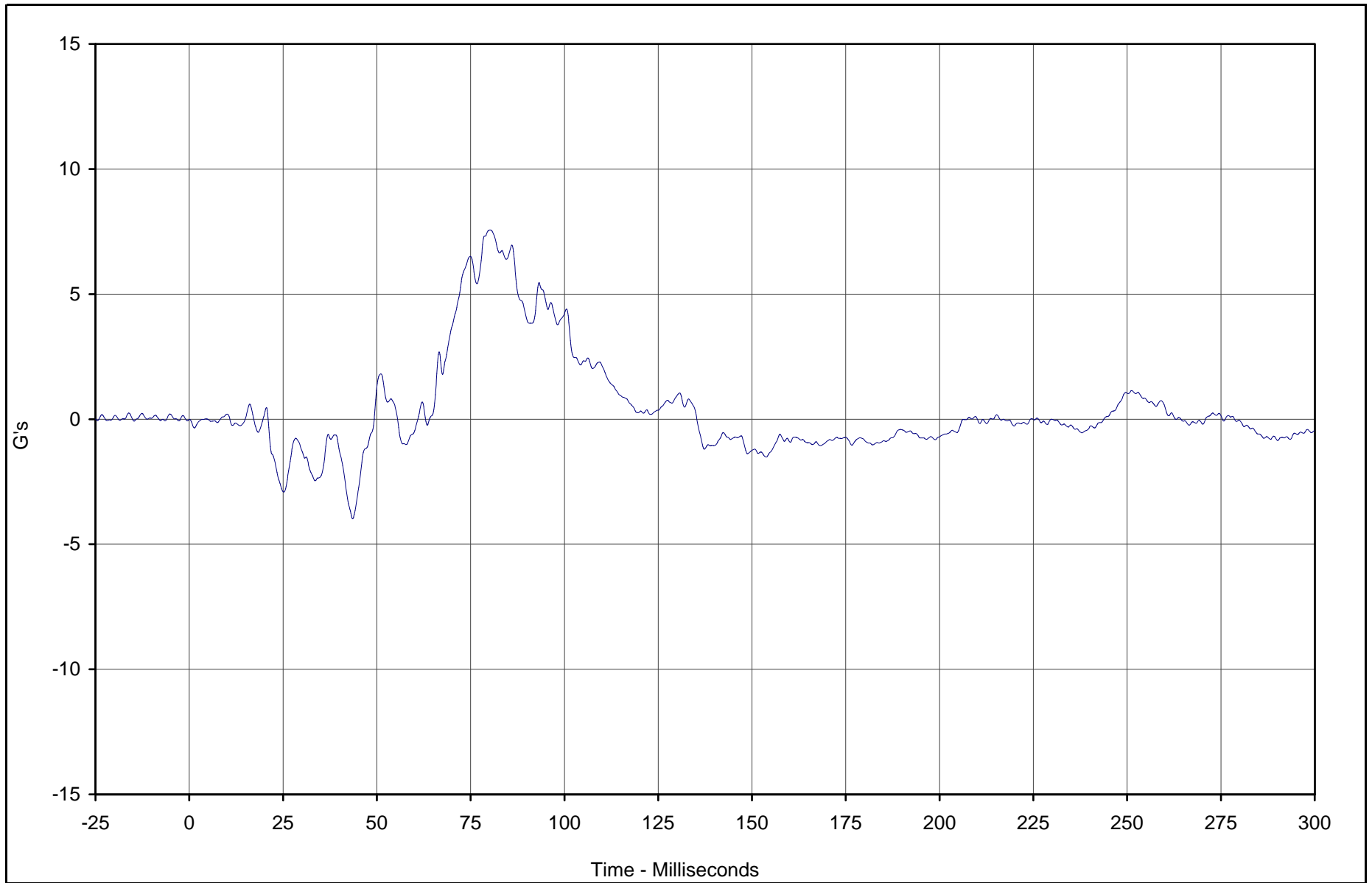
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-24



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary Y	014	FIL	G's	7.6	80.2	-4.0	43.5	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

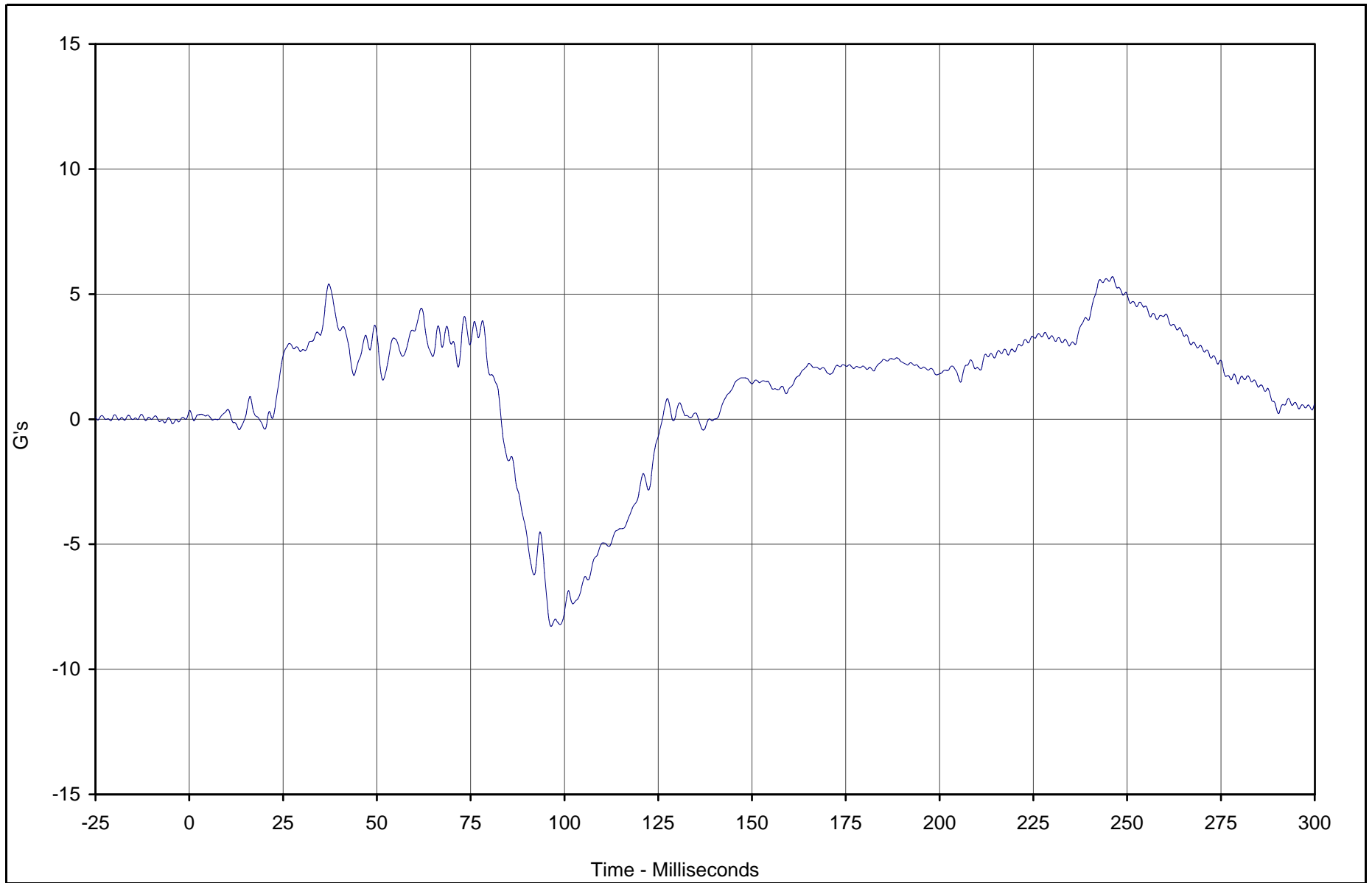
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-25



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Primary Z	015	FIL	G's	5.7	246.1	-8.3	96.4	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

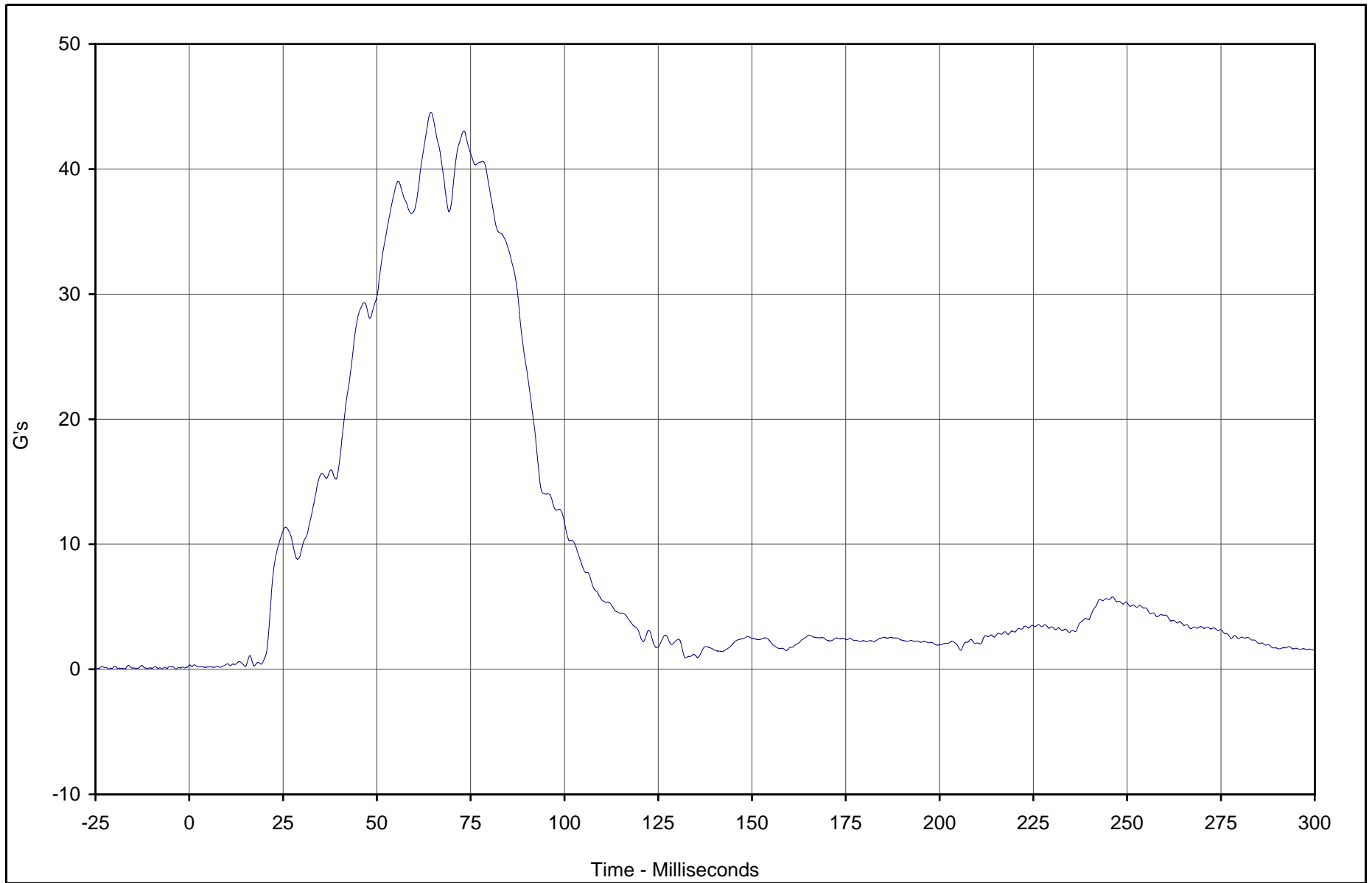
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-26



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Resultant Primary	013	RES	G's	44.5	64.4	0.2	4.3	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

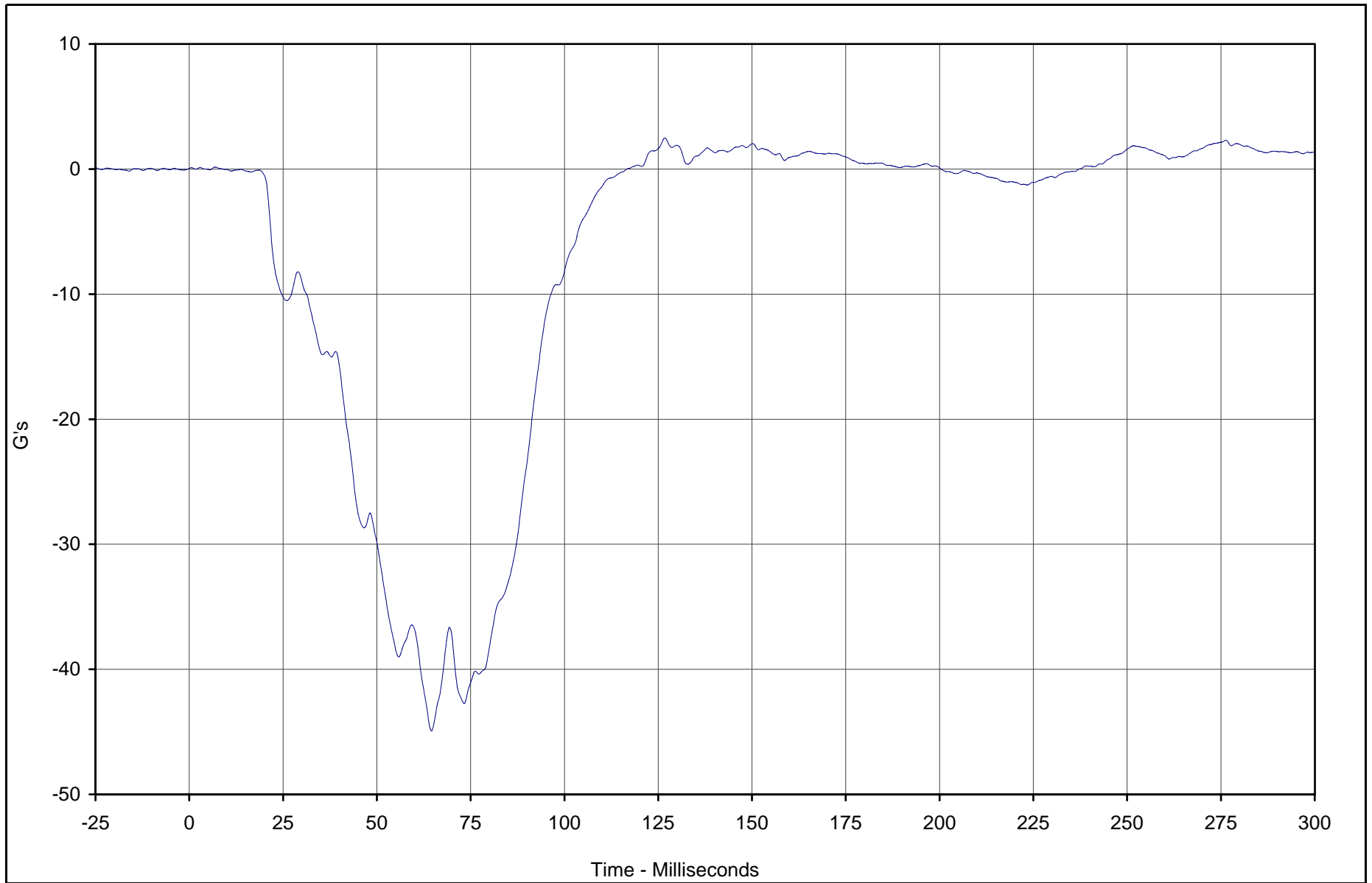
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-27



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X	016	FIL	G's	2.5	126.8	-44.9	64.6	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

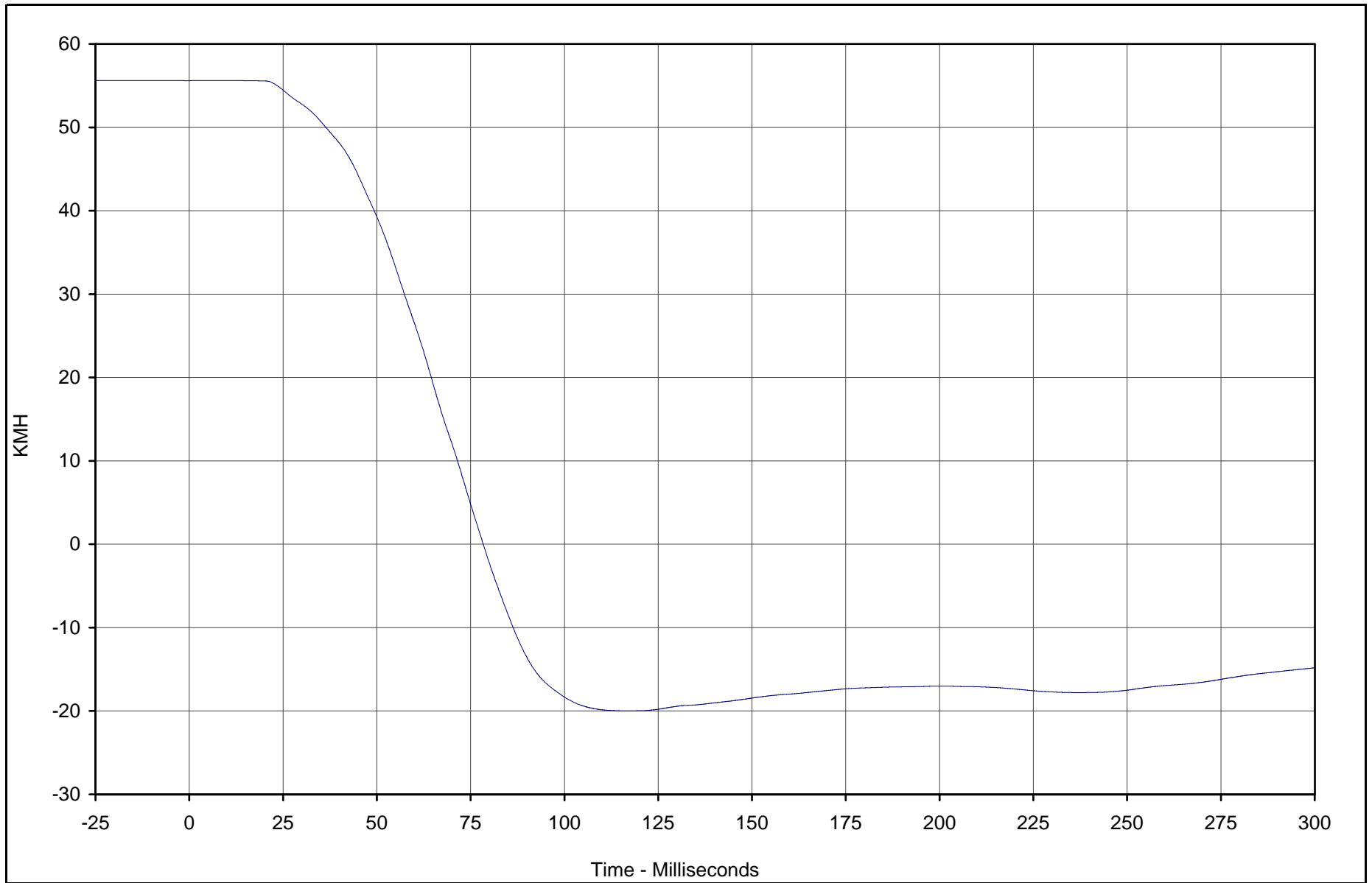
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-28



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X Velocity	016	IN1	KMH	55.6	8.9	-20.0	116.6	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

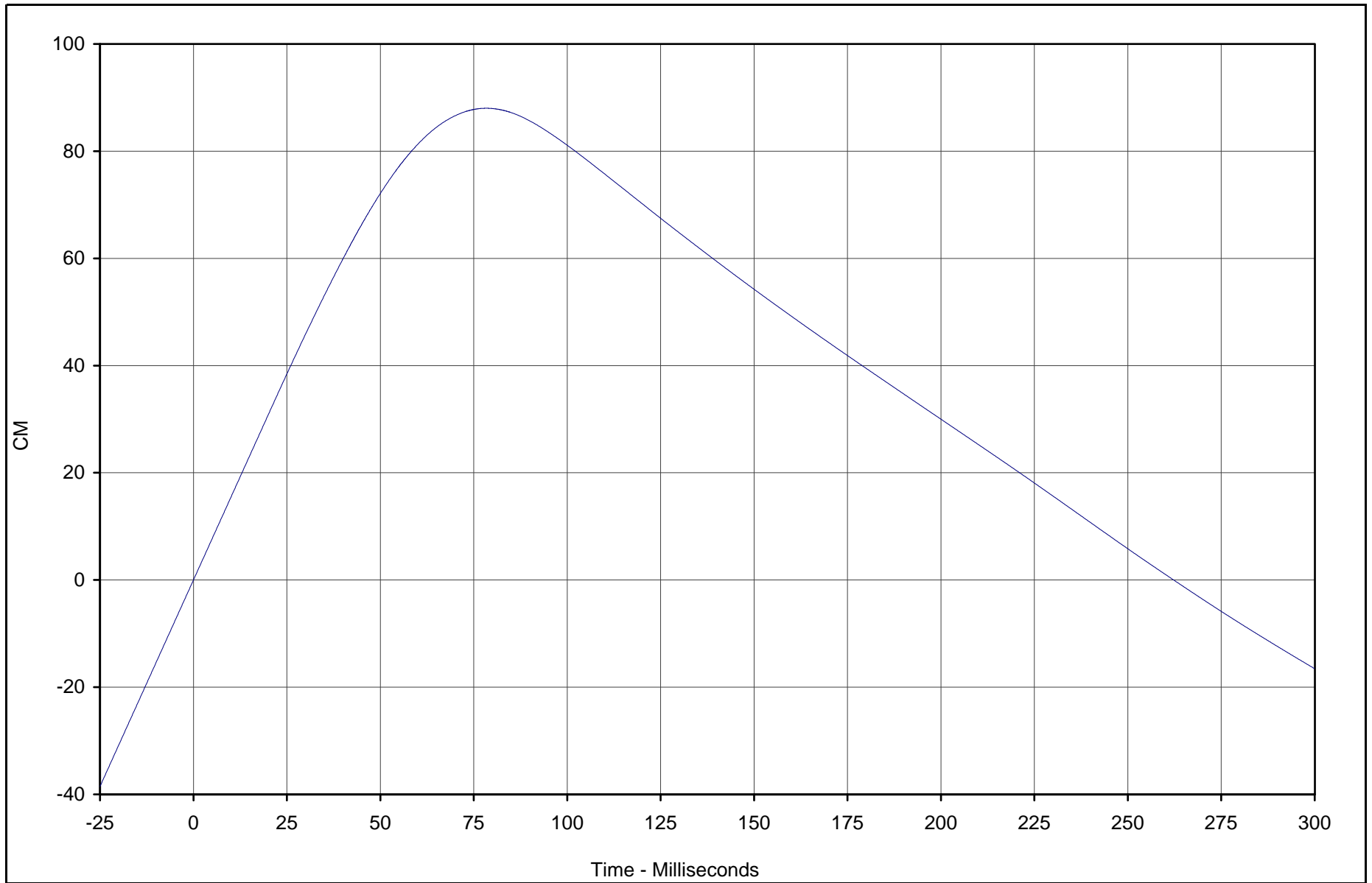
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-29



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant X Displ.	016	IN2	CM	88.0	78.4	-16.5	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

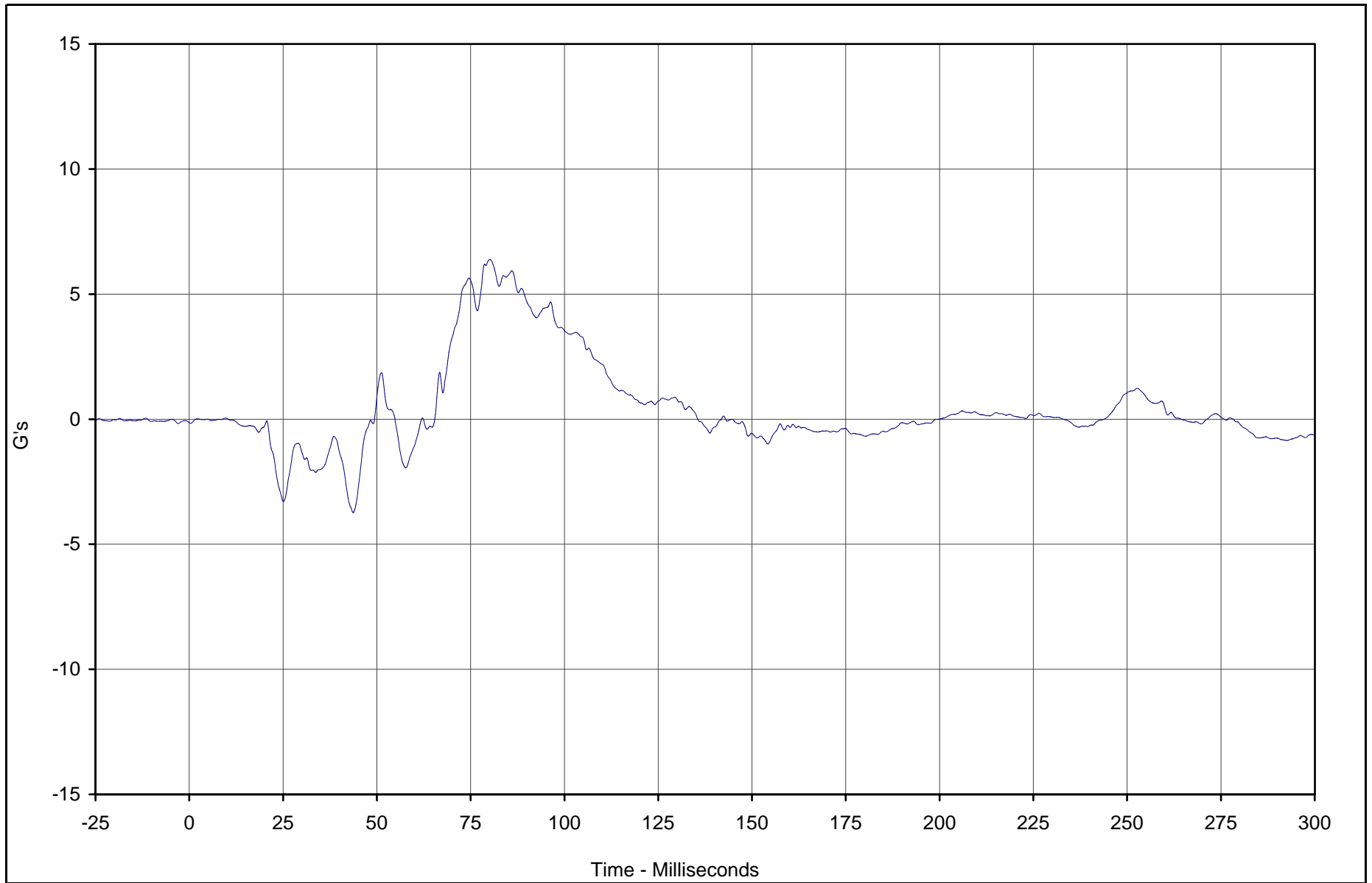
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-30



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant Y	017	FIL	G's	6.4	80.1	-3.7	43.7	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

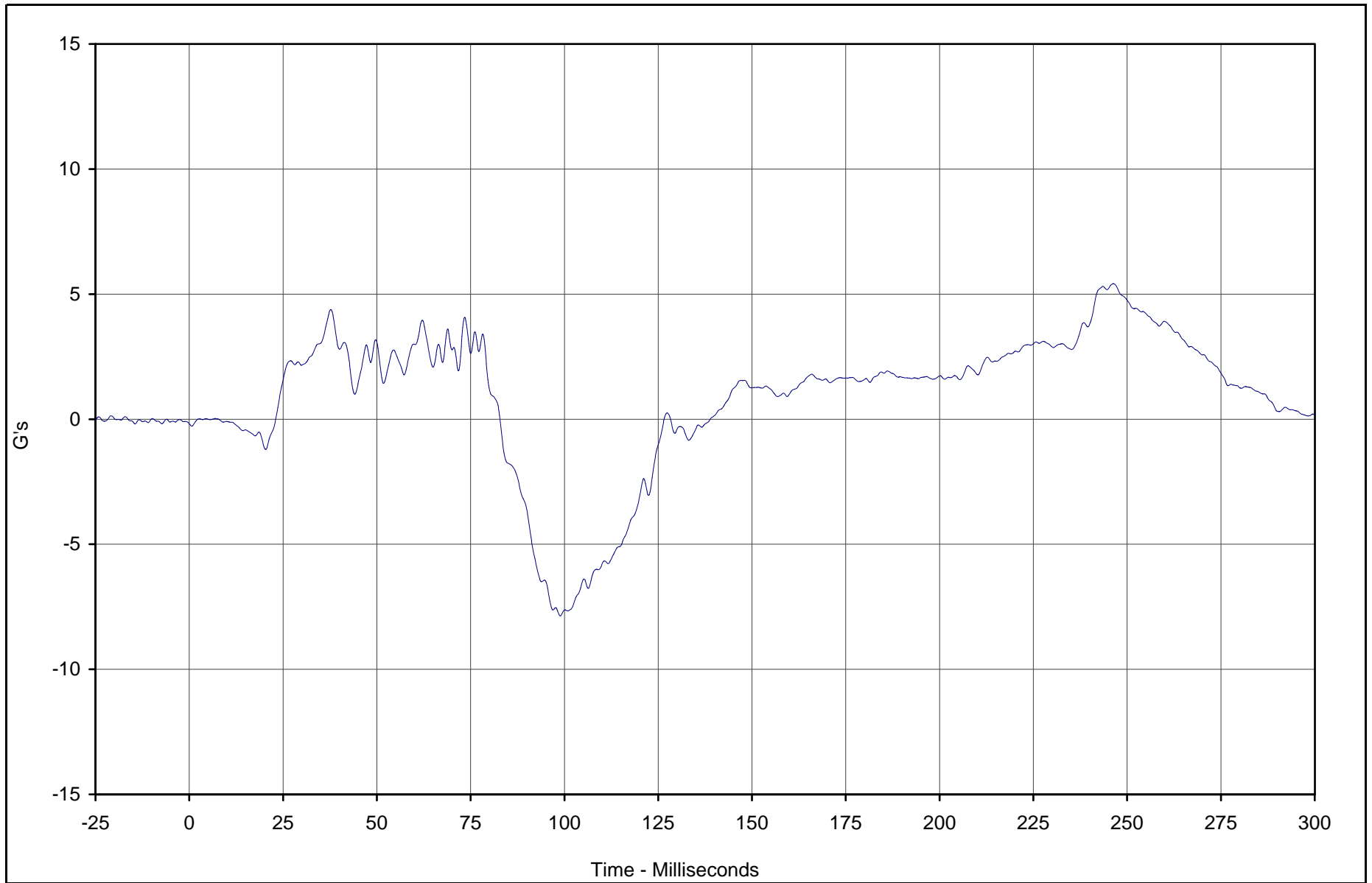
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-31



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Redundant Z	018	FIL	G's	5.4	246.3	-7.9	98.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

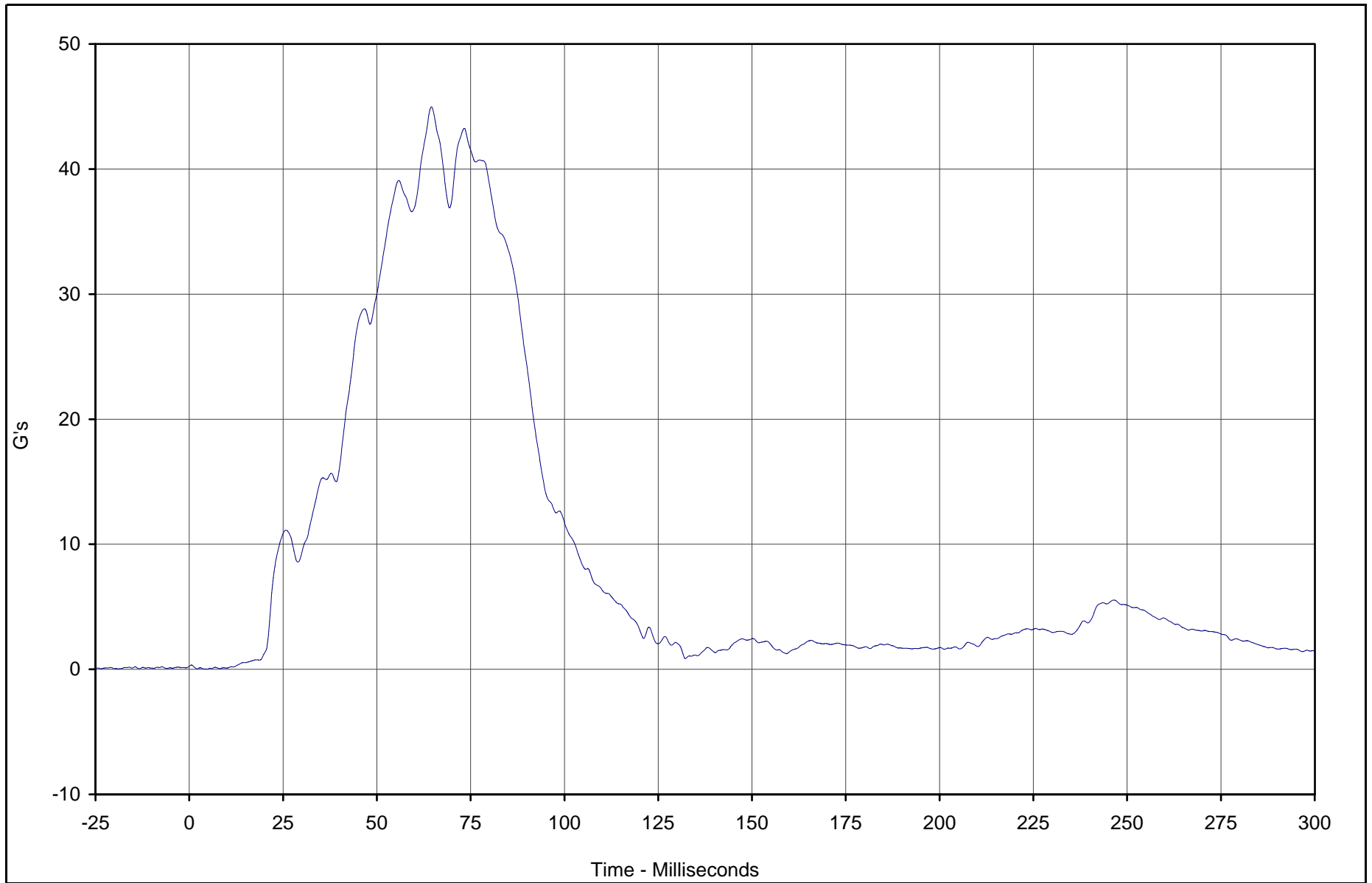
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-32



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Resultant Redundant	016	RES	G's	45.0	64.5	0.0	4.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

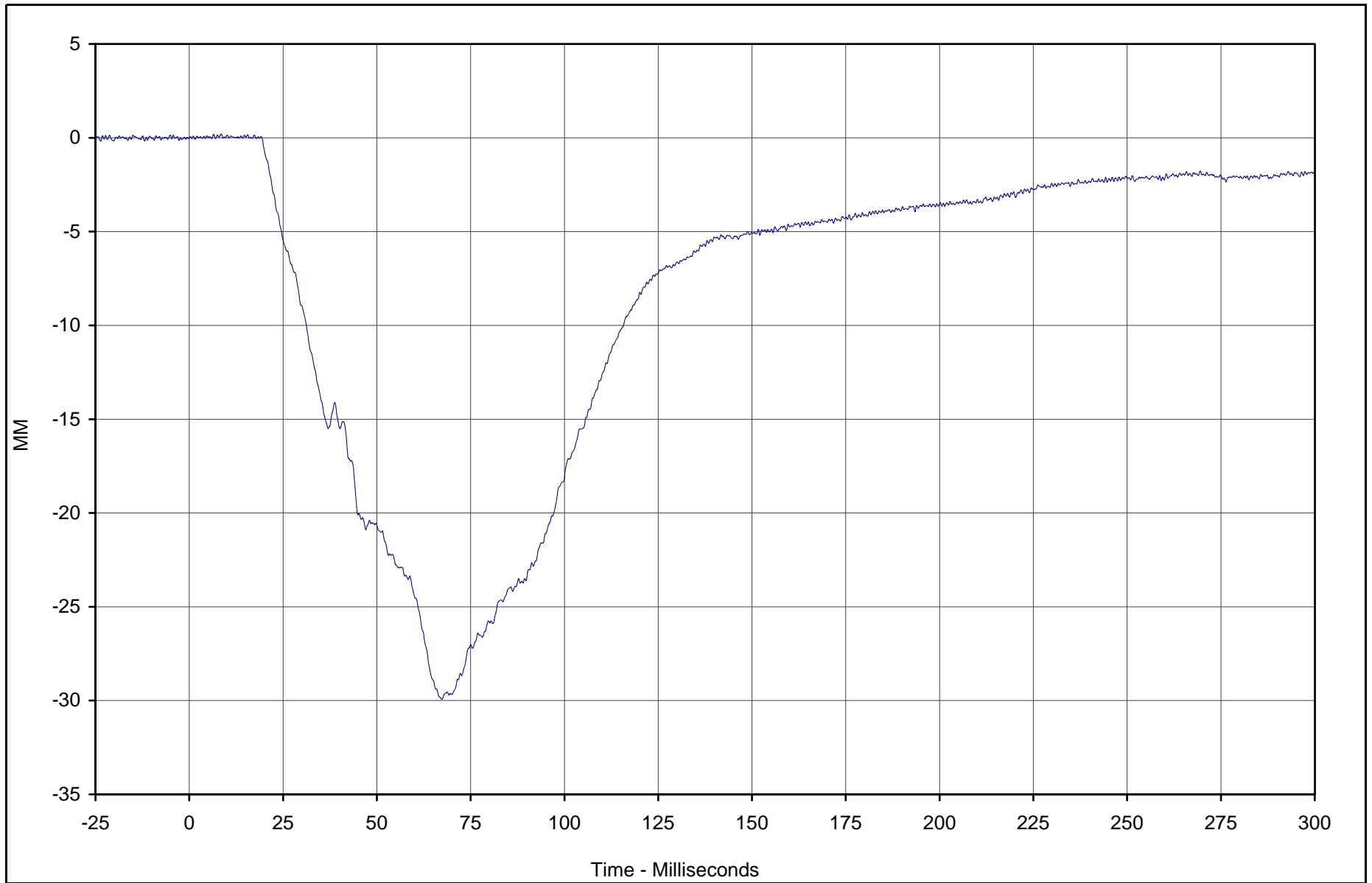
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-33



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Chest Displacement X	019	FIL	MM	0.2	8.5	-29.9	67.4	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

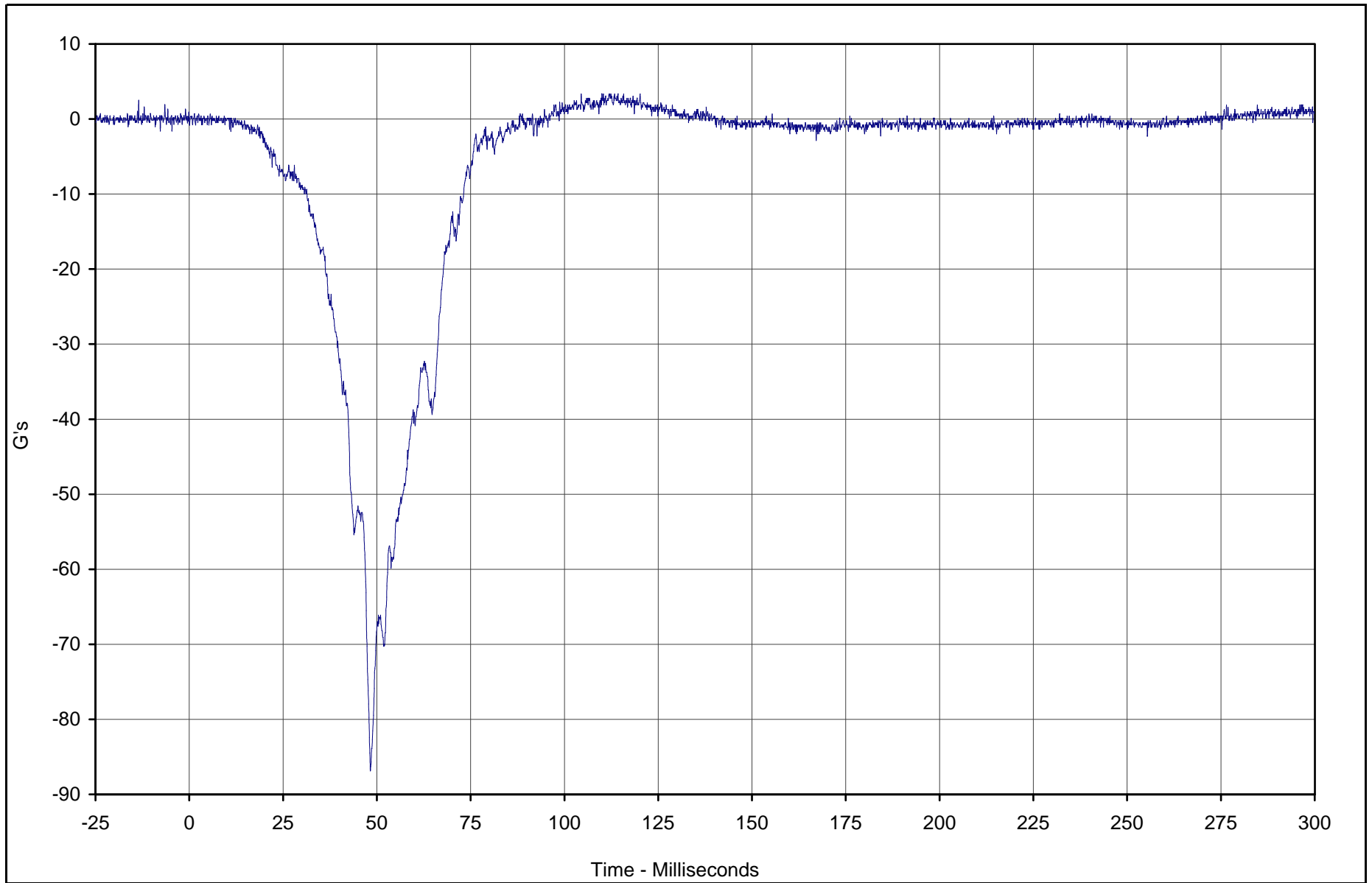
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-34



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X	020	FIL	G's	3.4	104.5	-86.9	48.3	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

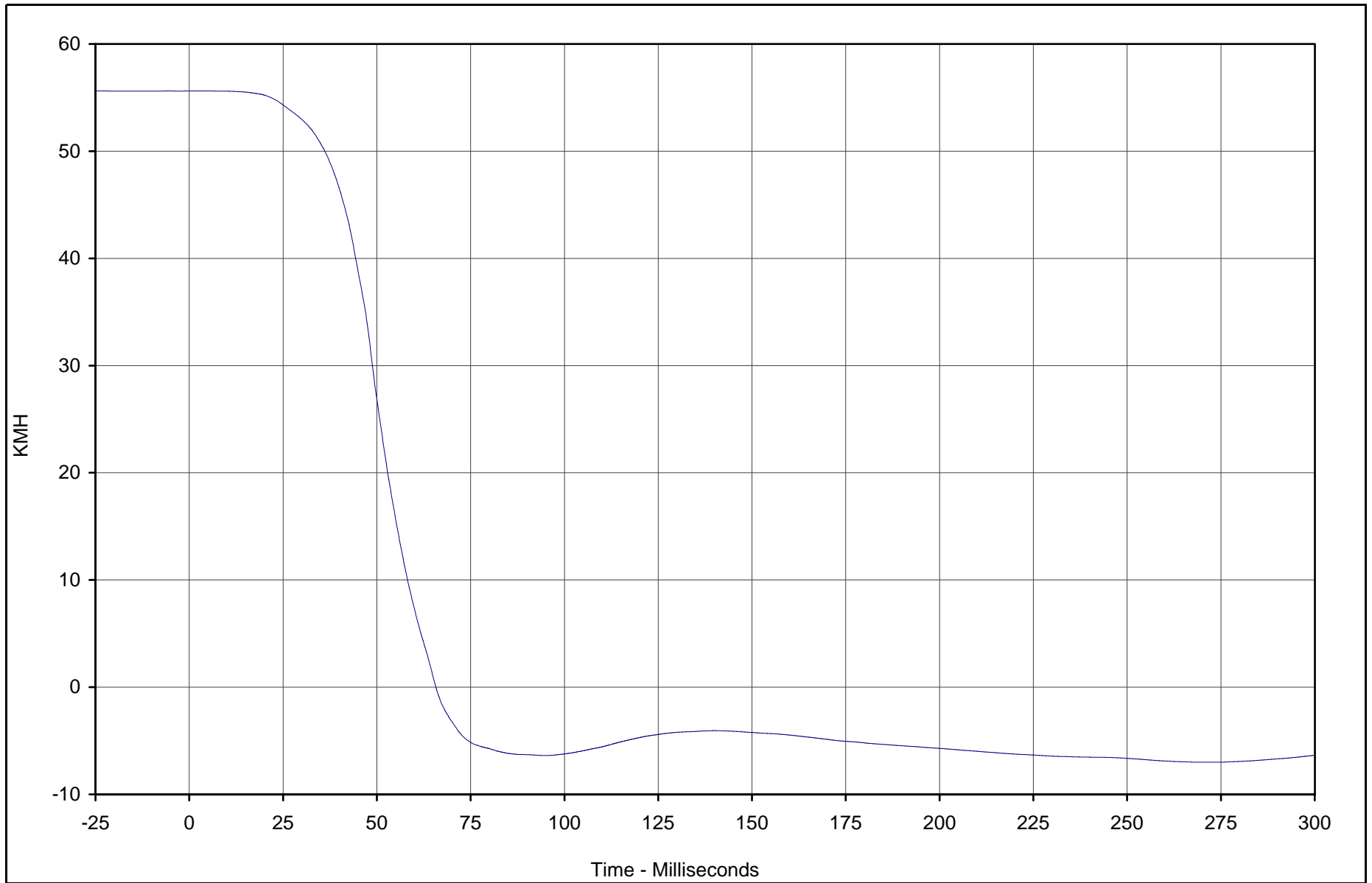
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-35



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X Velocity	020	IN1	KMH	55.6	3.1	-7.0	270.2	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

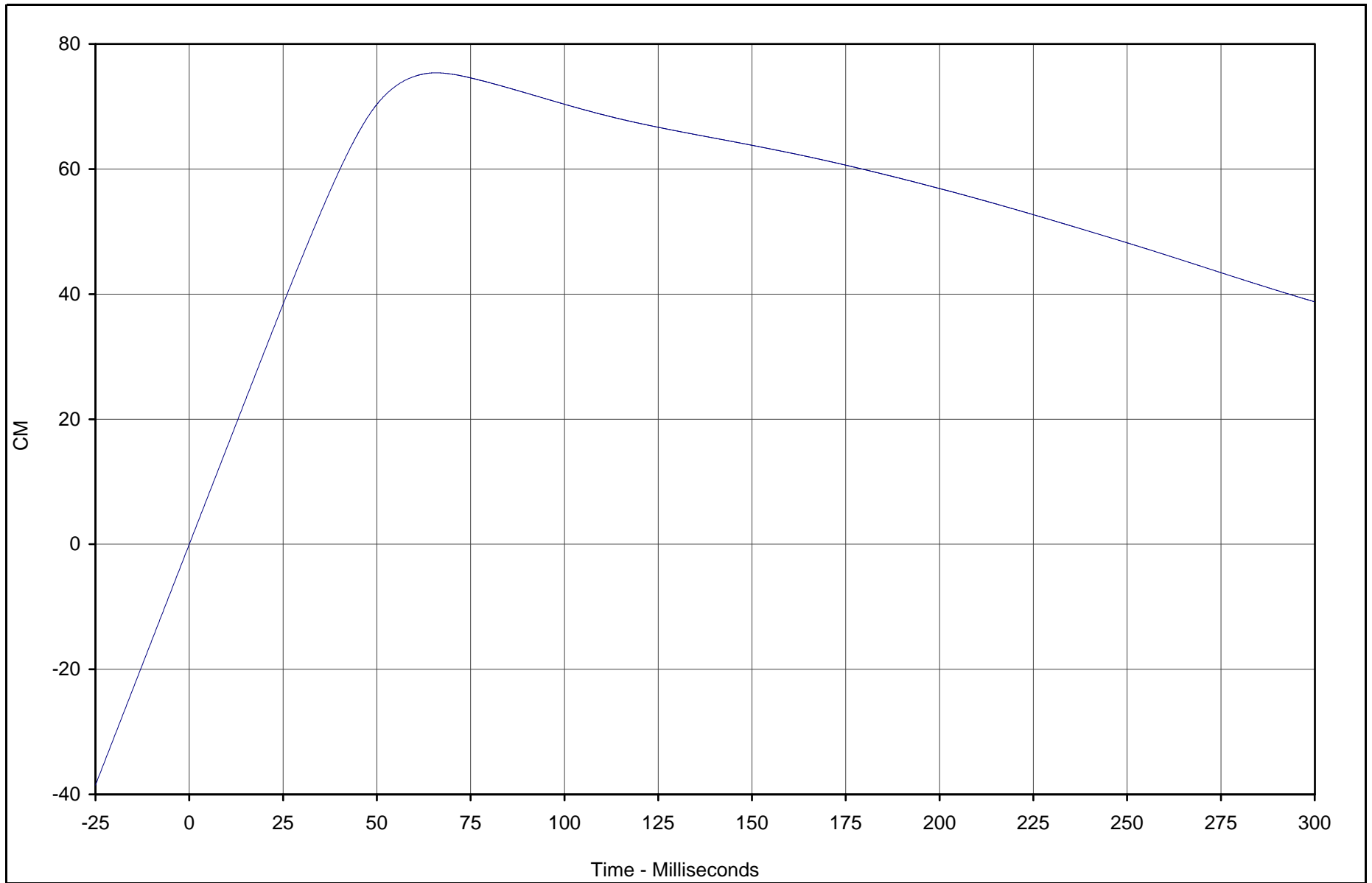
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-36



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis X Displ.	020	IN2	CM	75.4	65.7	0.0	0.0	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

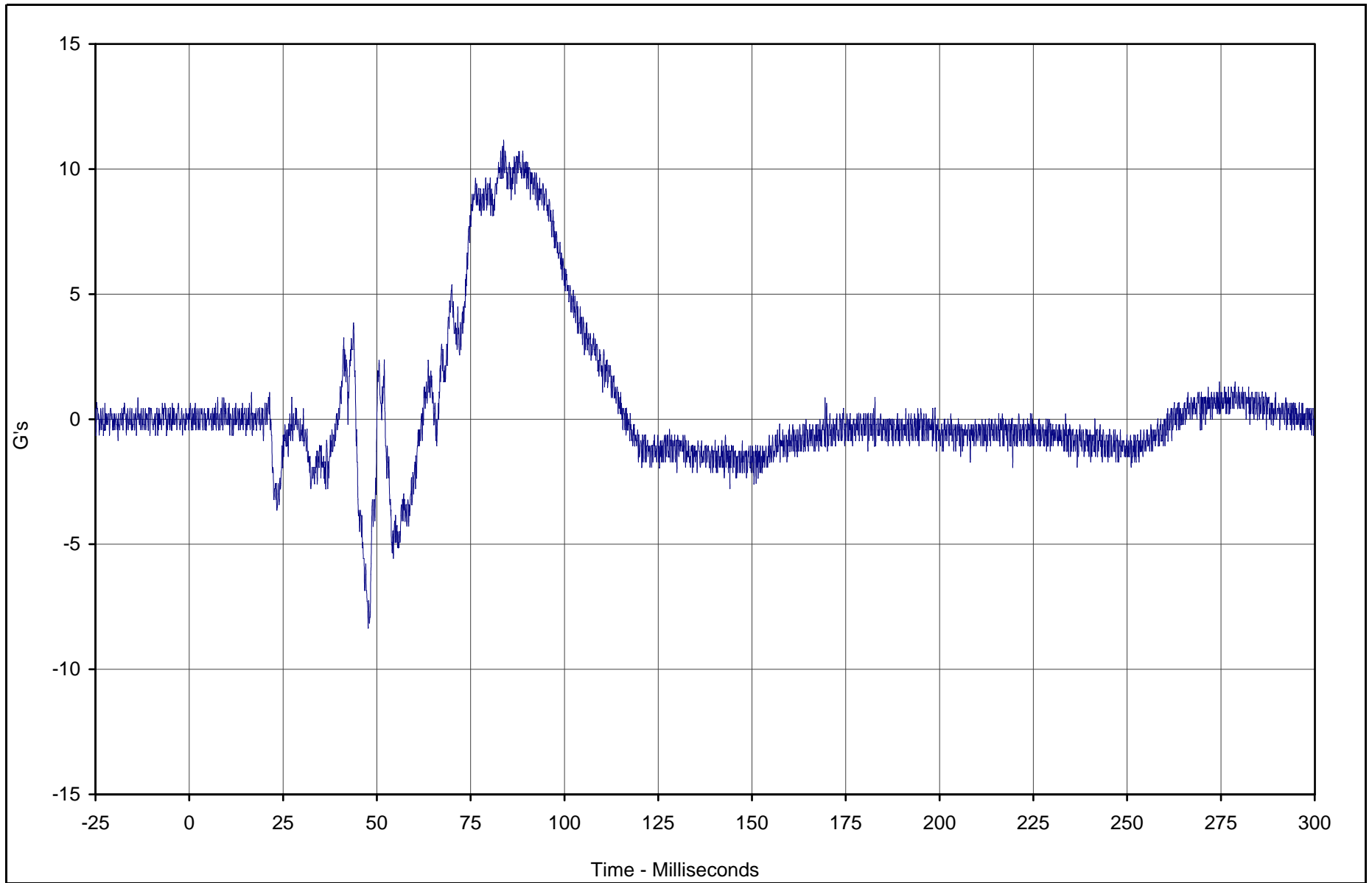
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-37



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Y	021	FIL	G's	11.1	83.8	-8.4	47.7	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

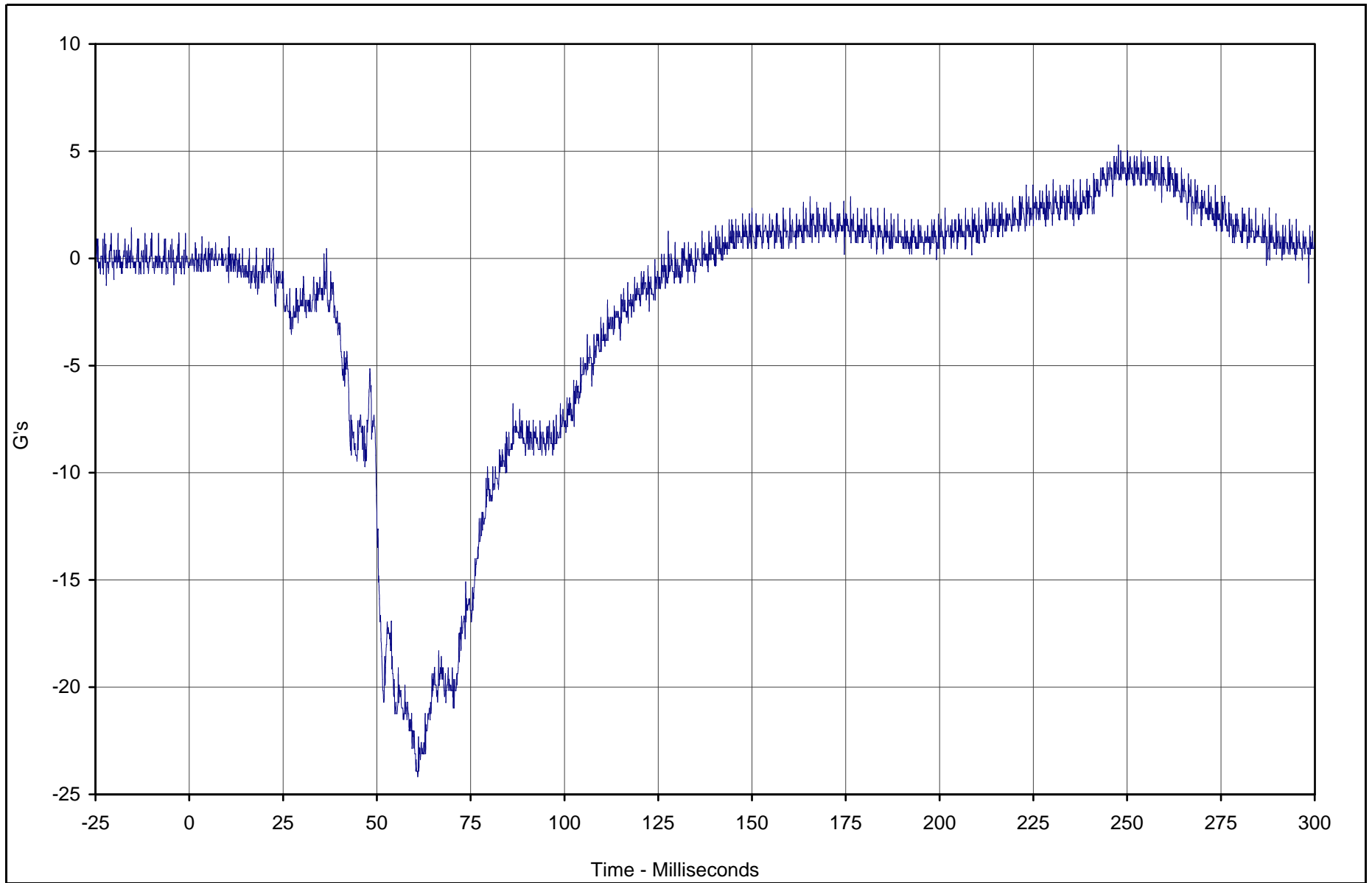
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-38



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Z	022	FIL	G's	5.3	247.7	-24.2	60.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

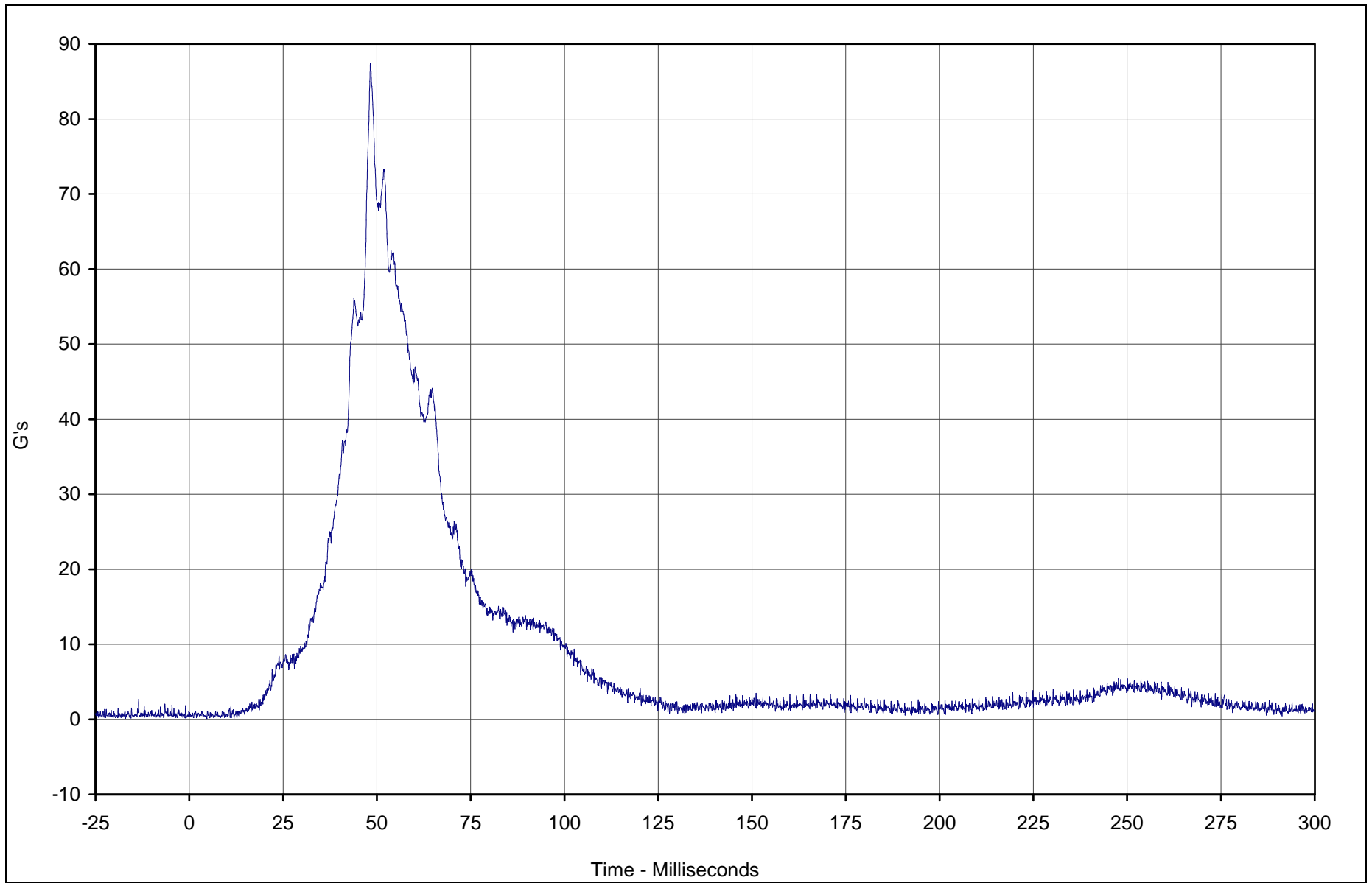
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-39



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Pelvis Resultant	023	RES	G's	87.4	48.3	0.1	4.7	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

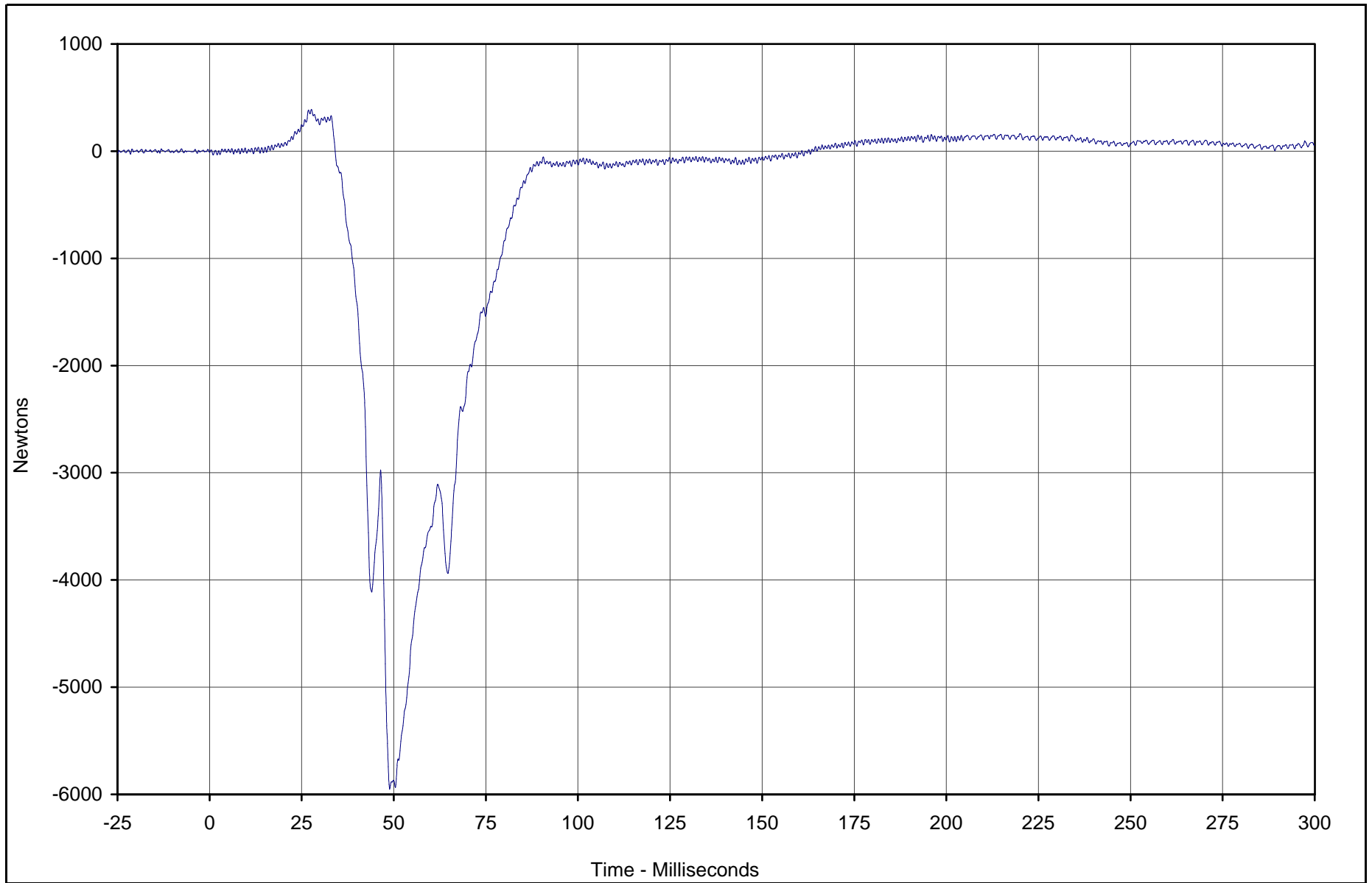
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-40



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Femur Force	023	FIL	Newtons	388.6	27.6	-5951.6	48.9	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

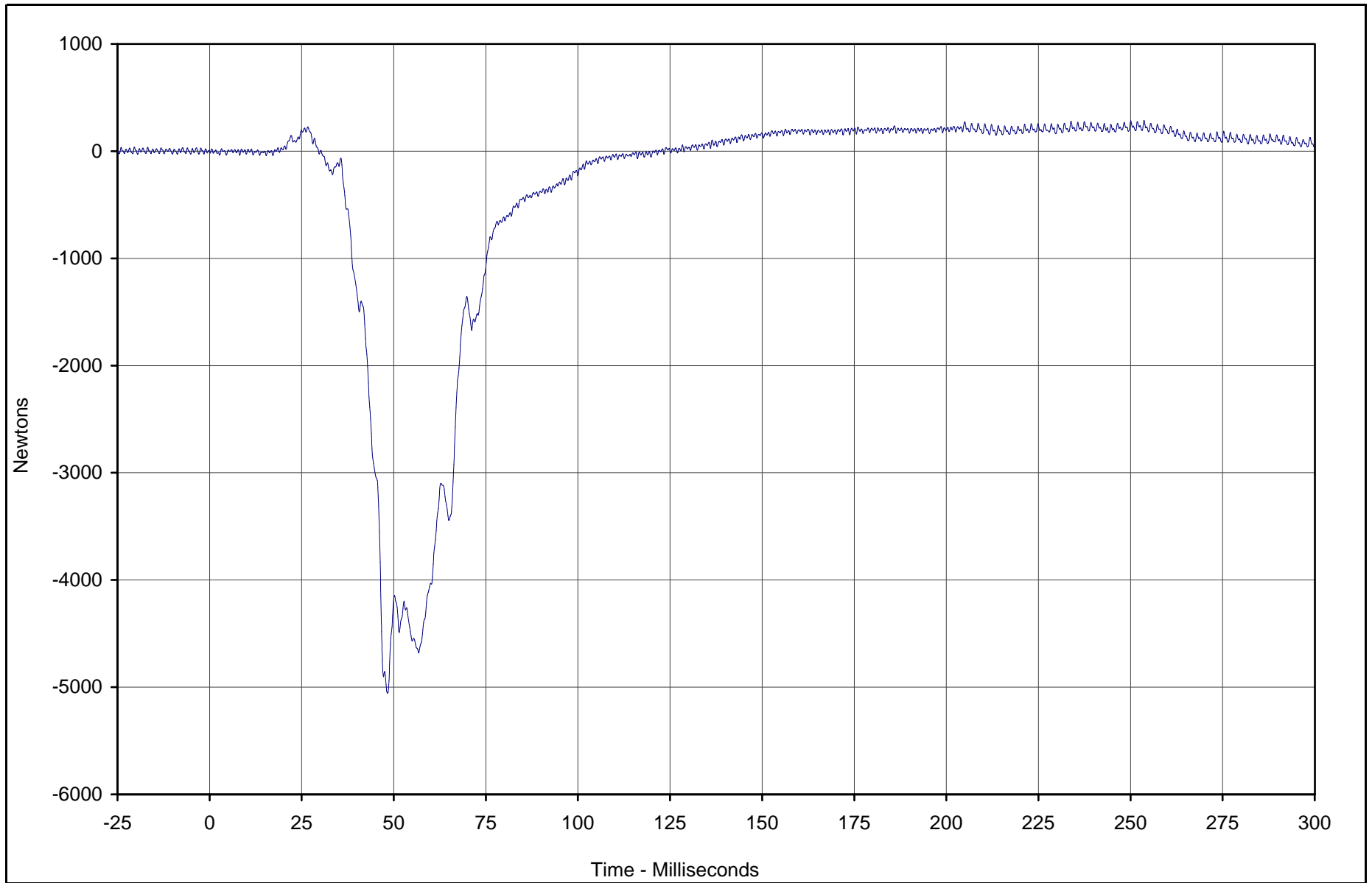
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-41



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Femur Force	024	FIL	Newtons	287.7	253.7	-5056.3	48.3	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

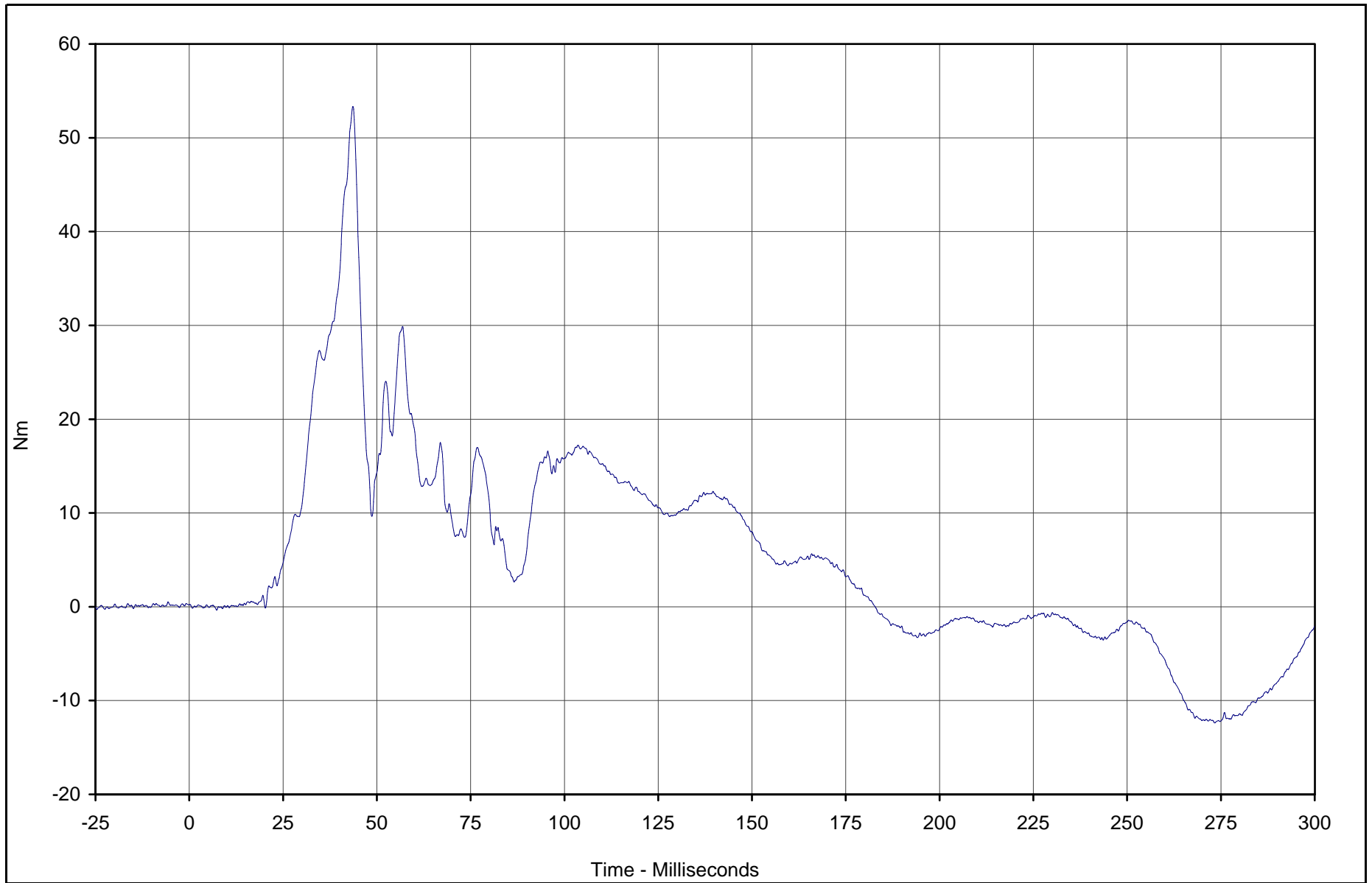
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-42



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Upper Tibia Moment X	025	FIL	Nm	53.3	43.6	-12.4	273.4	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

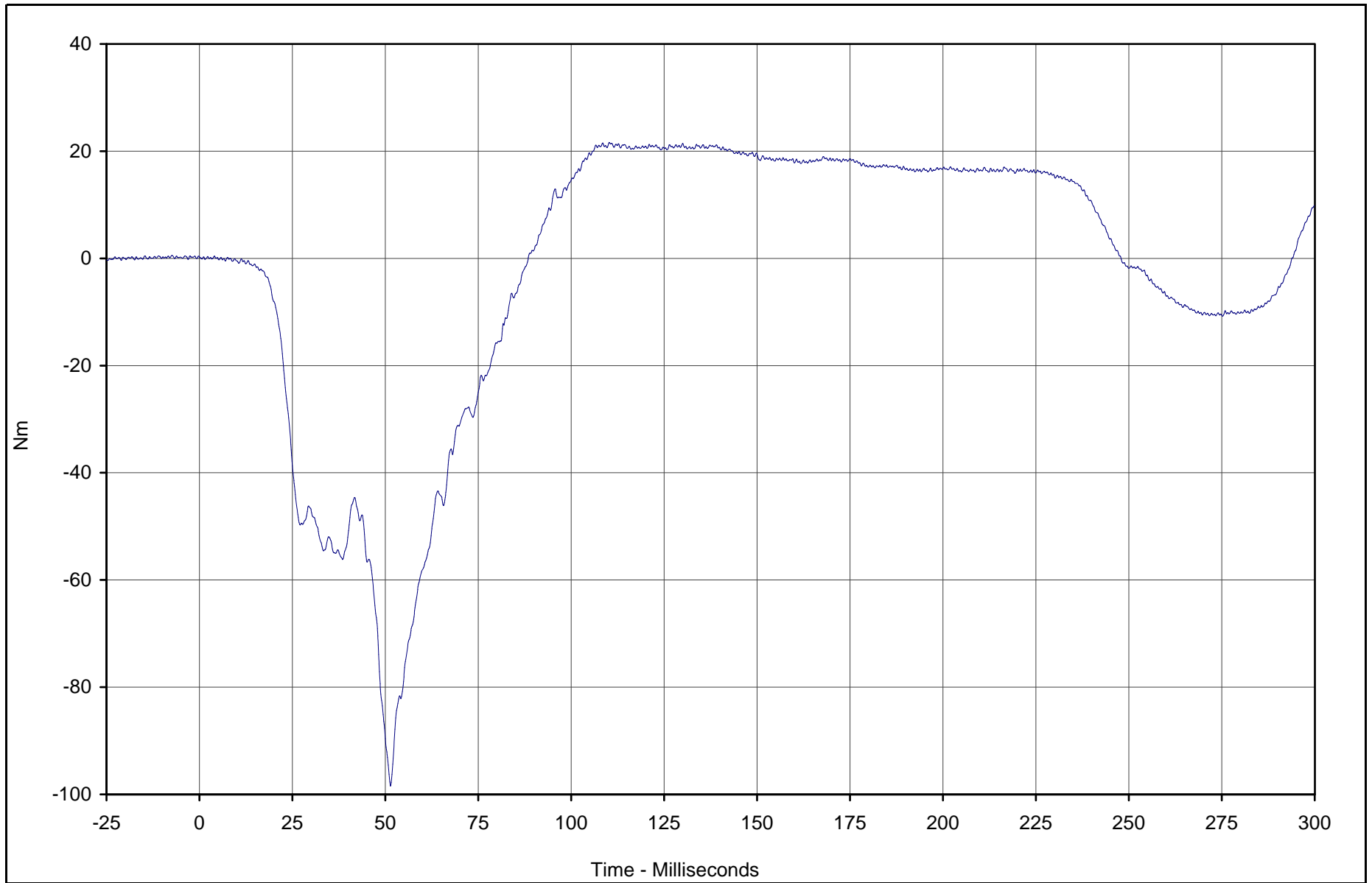
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-43



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Upper Tibia Moment Y	026	FIL	Nm	21.6	110.2	-98.5	51.4	600



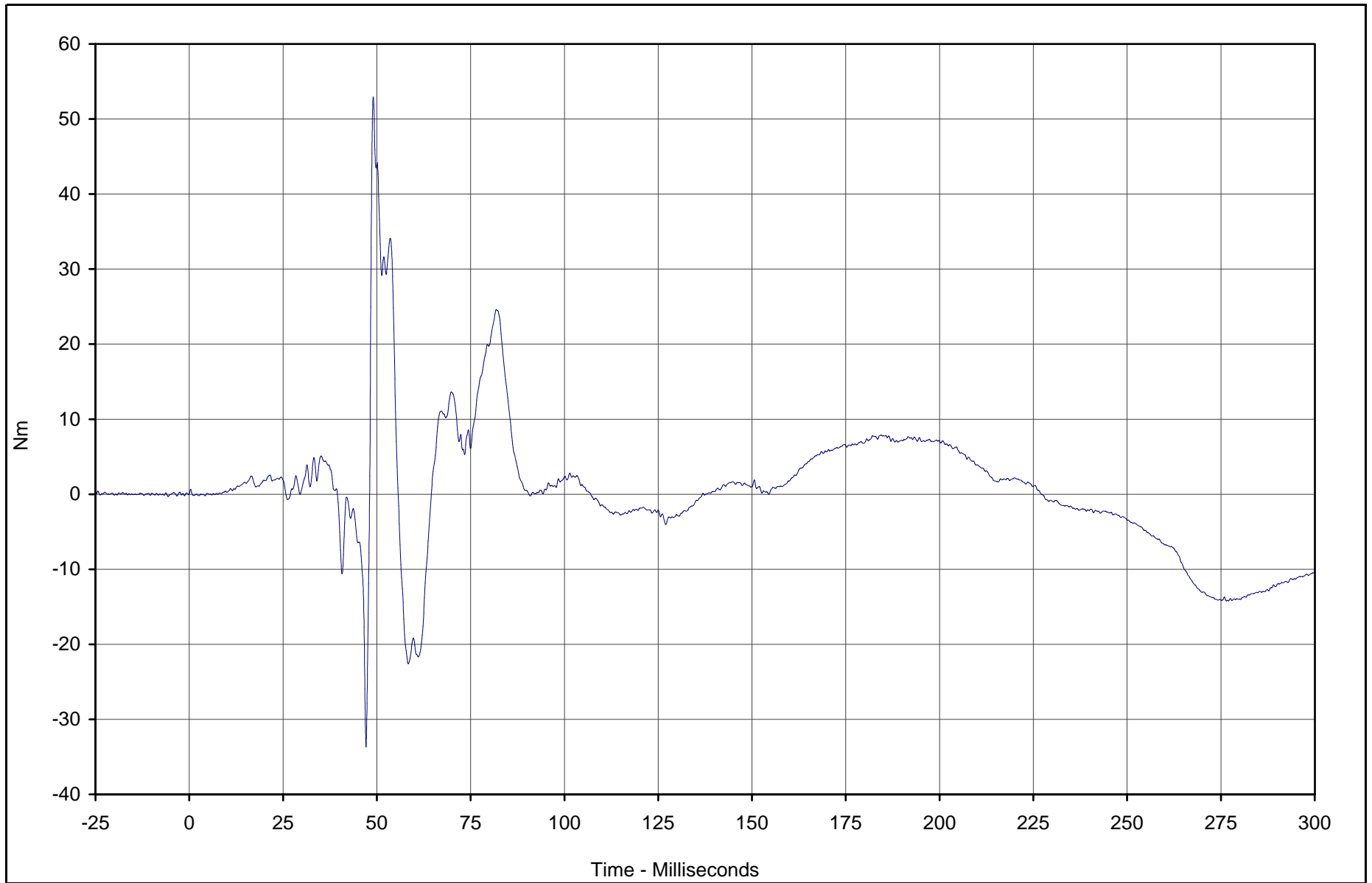
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-44



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Upper Tibia Moment X	027	FIL	Nm	52.9	49.0	-33.7	47.1	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

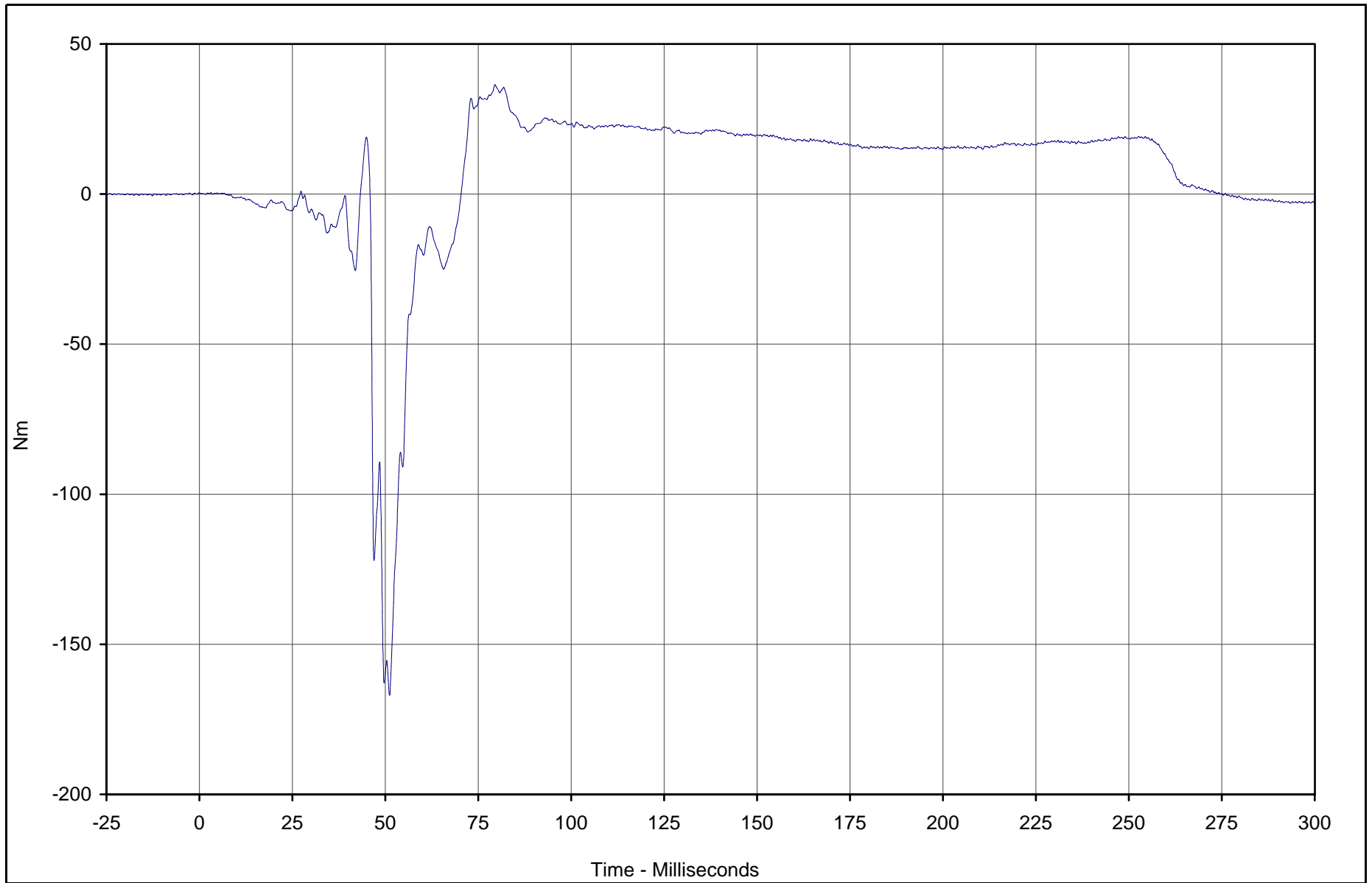
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-45



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Upper Tibia Moment Y	028	FIL	Nm	36.4	79.5	-167.0	51.1	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

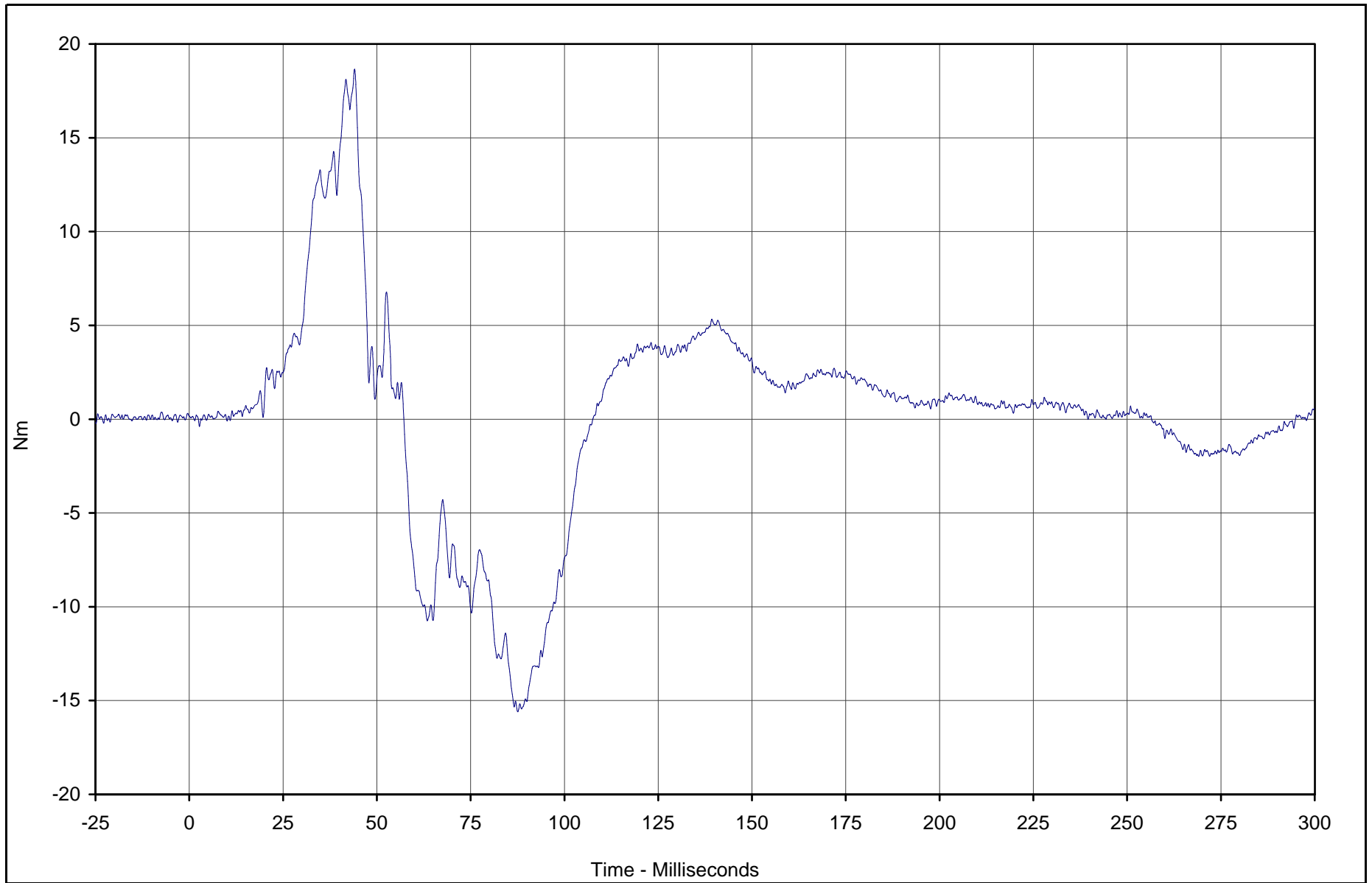
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-46



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Moment X	029	FIL	Nm	18.7	44.1	-15.6	87.5	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

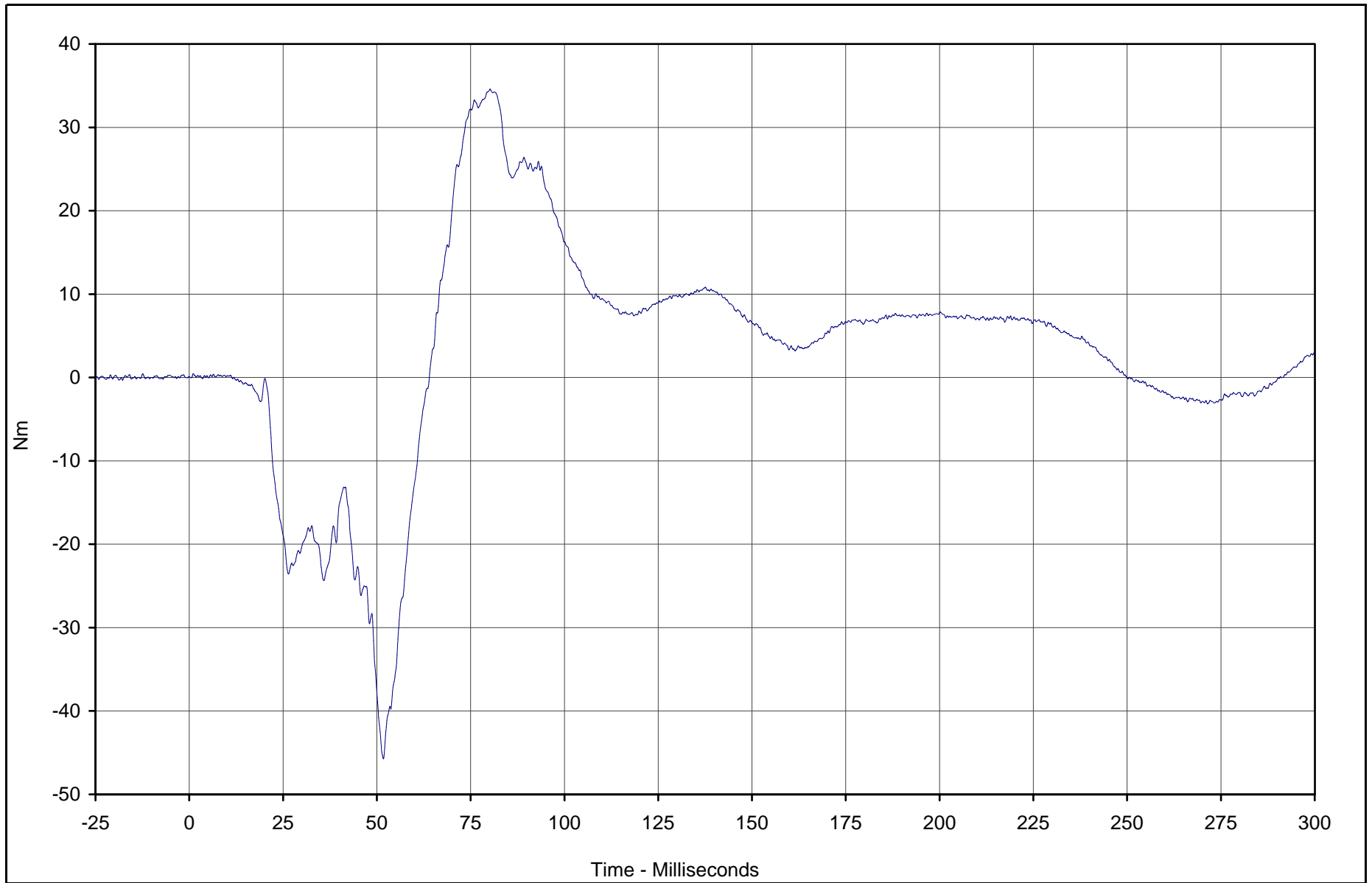
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-47



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Moment Y	030	FIL	Nm	34.6	80.2	-45.7	51.8	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

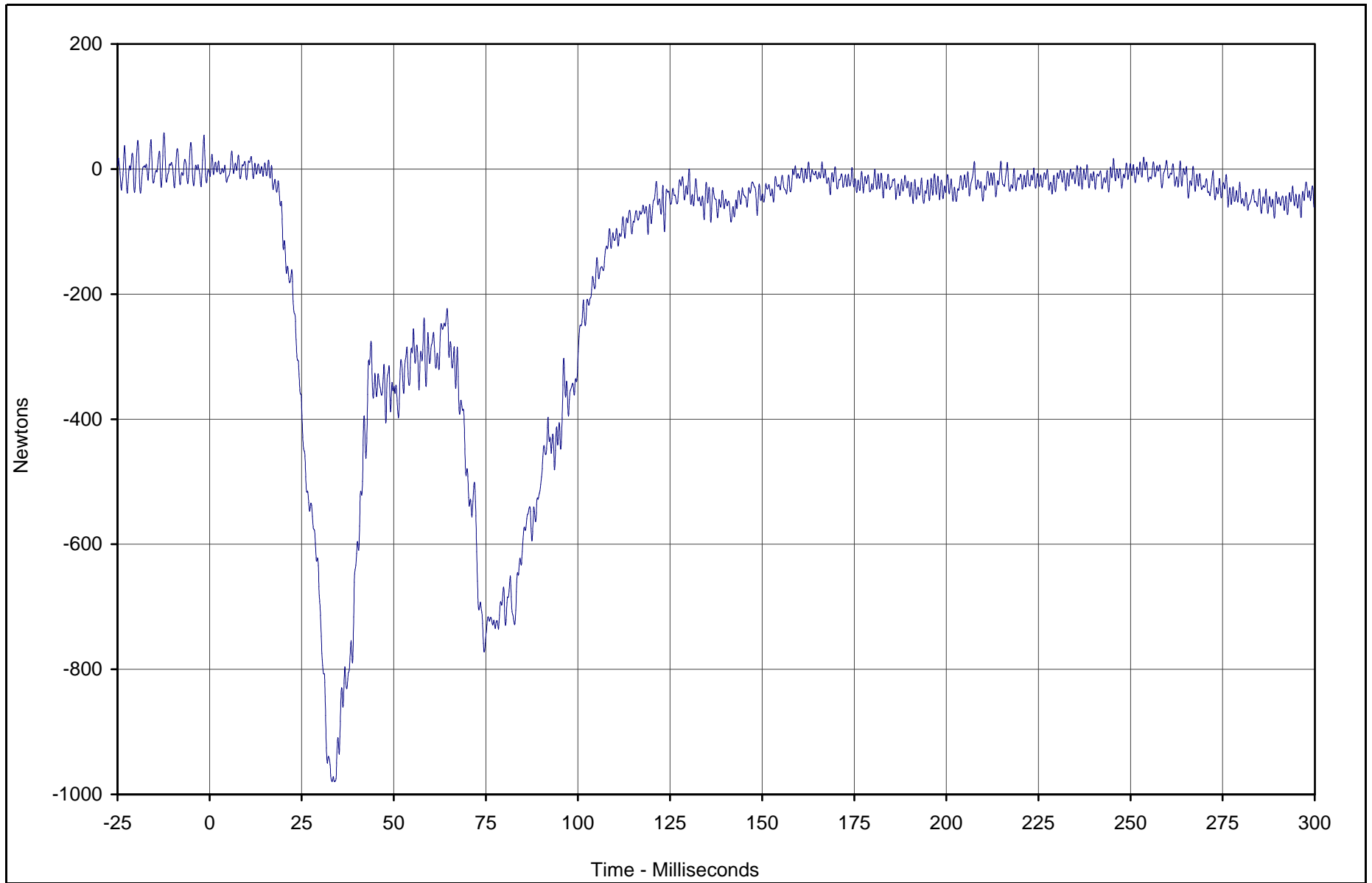
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-48



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Lower Tibia Force Z	031	FIL	Newtons	28.8	6.0	-979.6	33.9	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

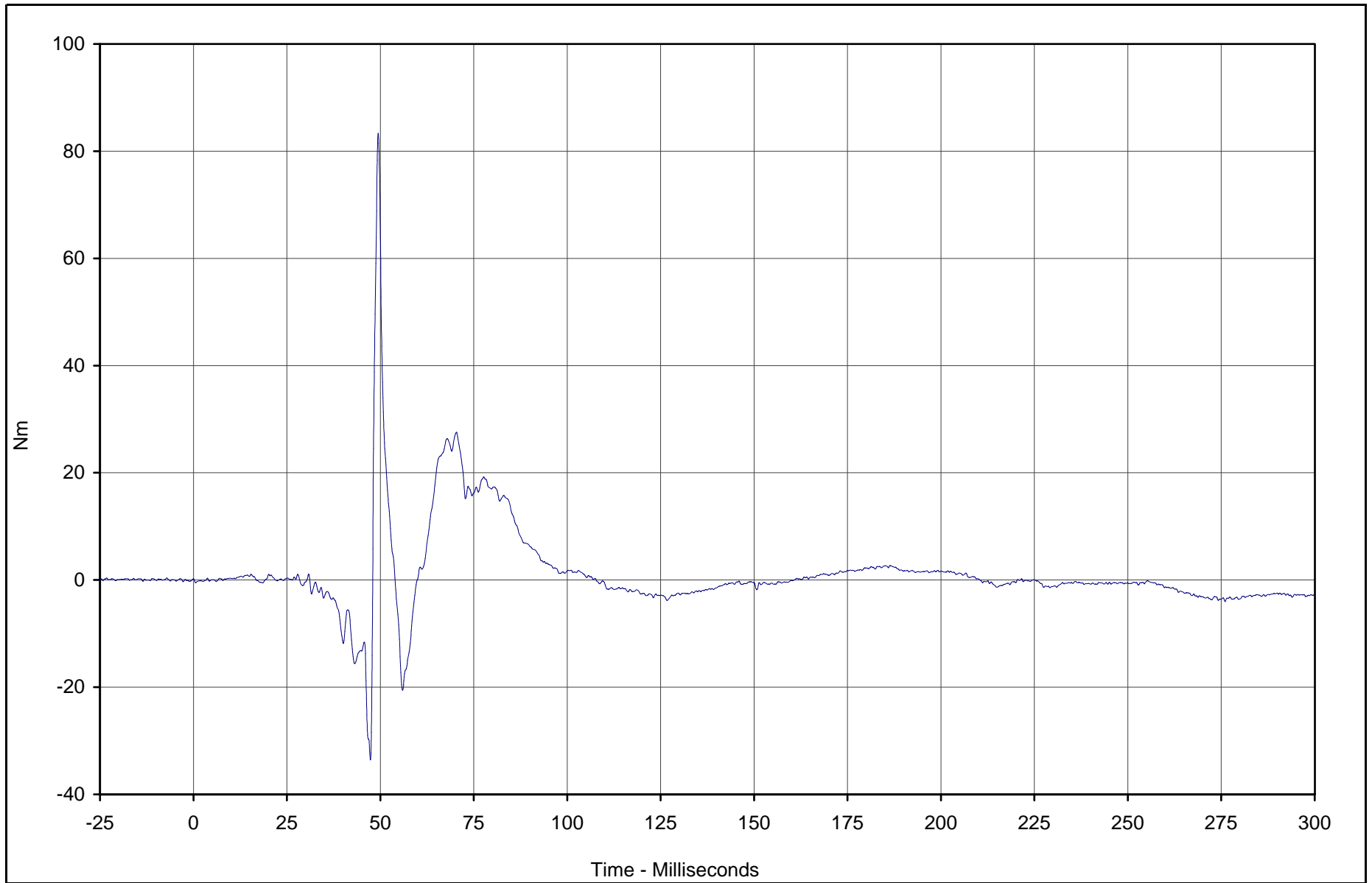
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-49



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Moment X	032	FIL	Nm	83.3	49.4	-33.6	47.4	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

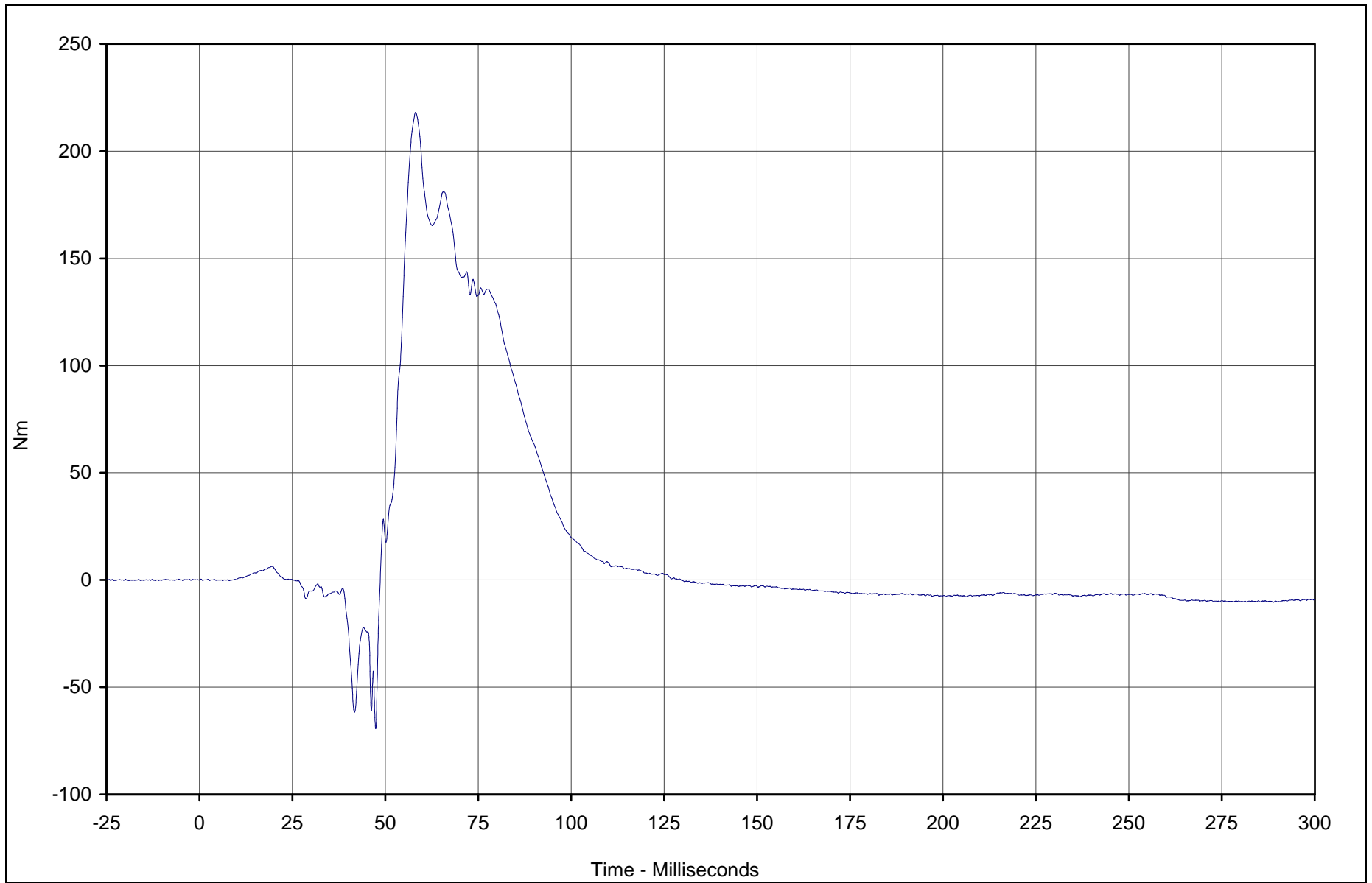
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-50



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Moment Y	033	FIL	Nm	218.1	58.2	-69.4	47.4	600



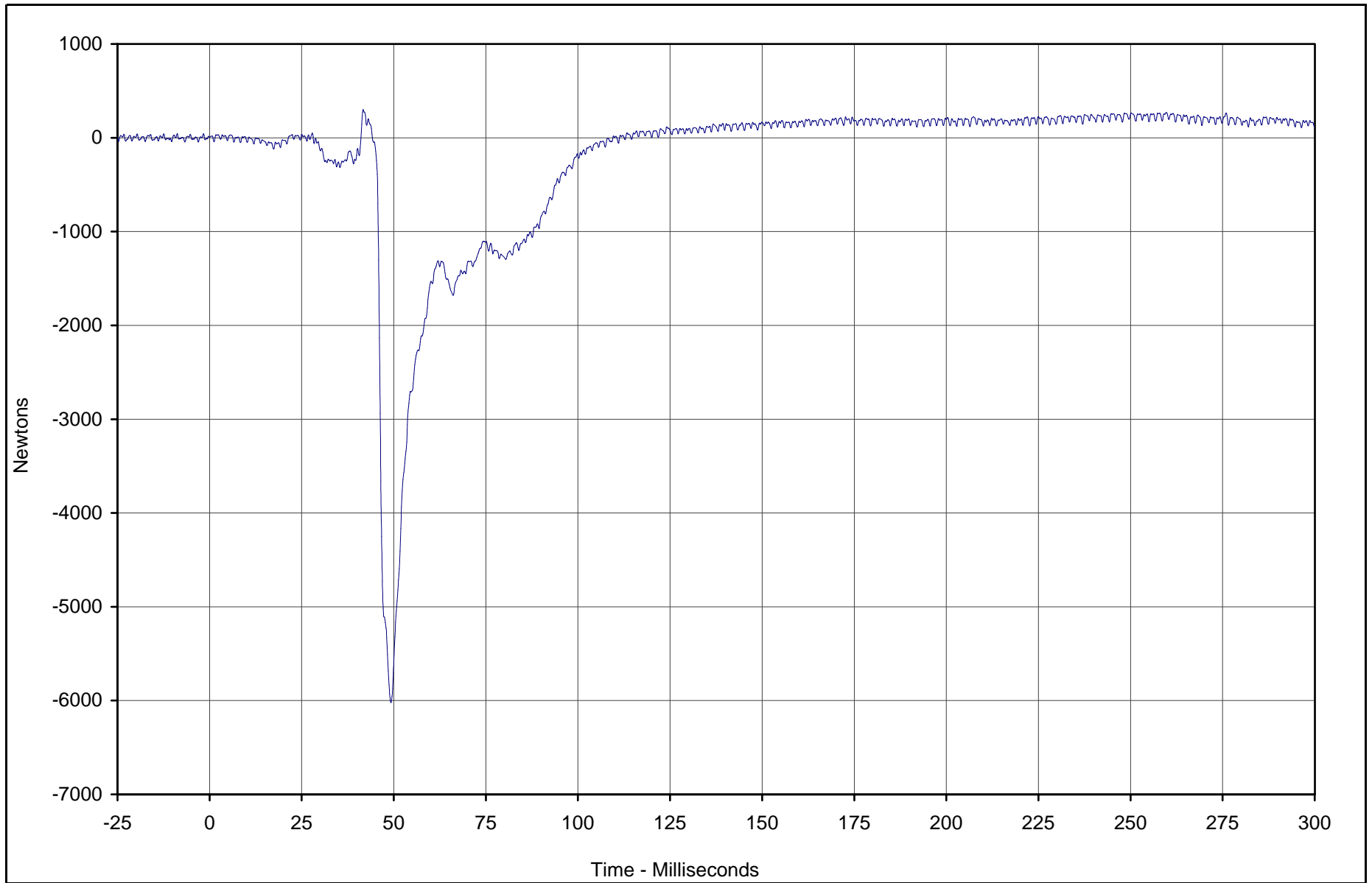
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-51



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Lower Tibia Force Z	034	FIL	Newtons	300.8	41.7	-6023.2	49.2	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

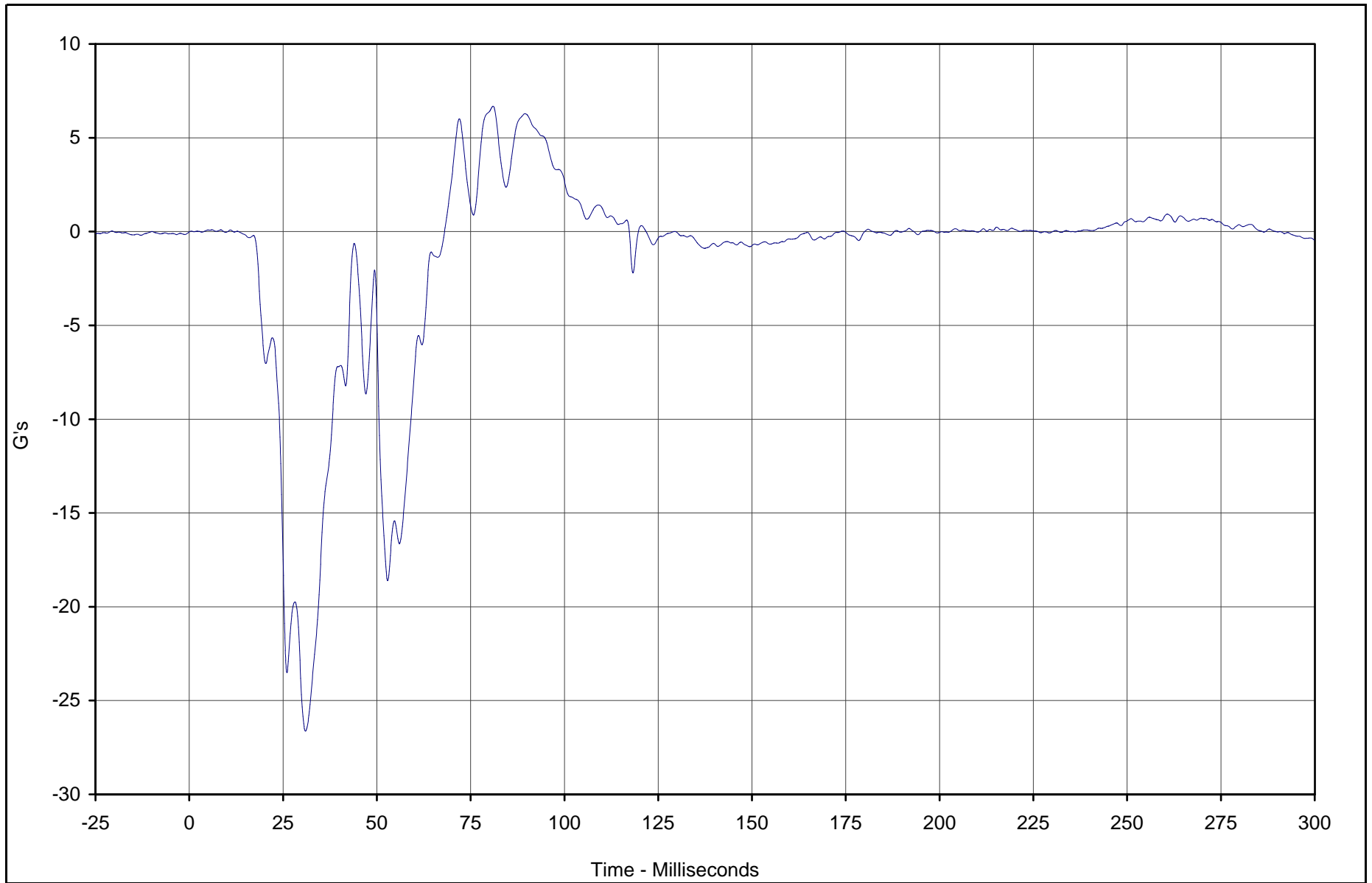
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-52



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Aft X	035	FIL	G's	6.7	81.0	-26.6	31.0	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

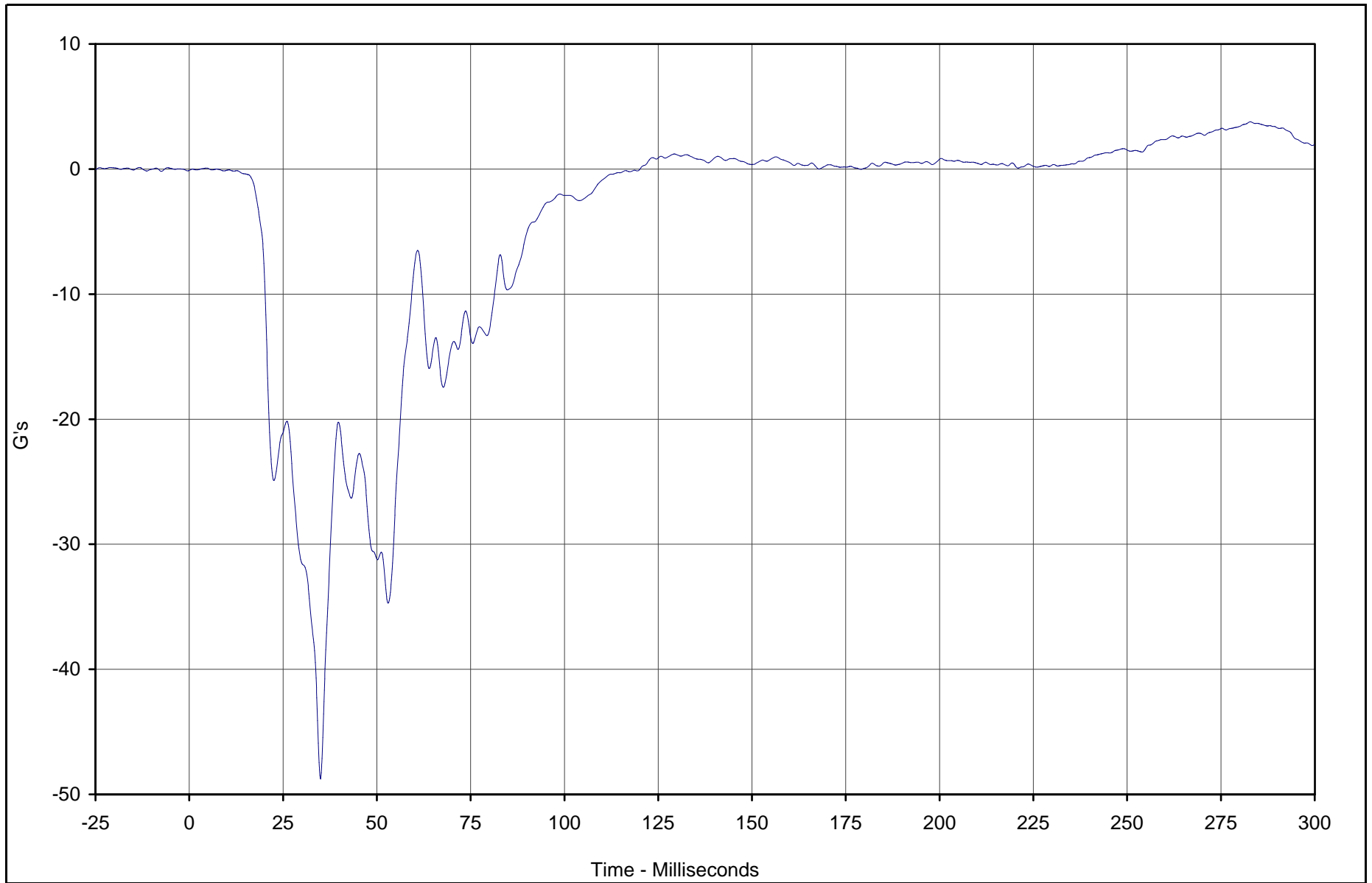
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-53



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Aft Z	036	FIL	G's	3.8	282.8	-48.8	35.0	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

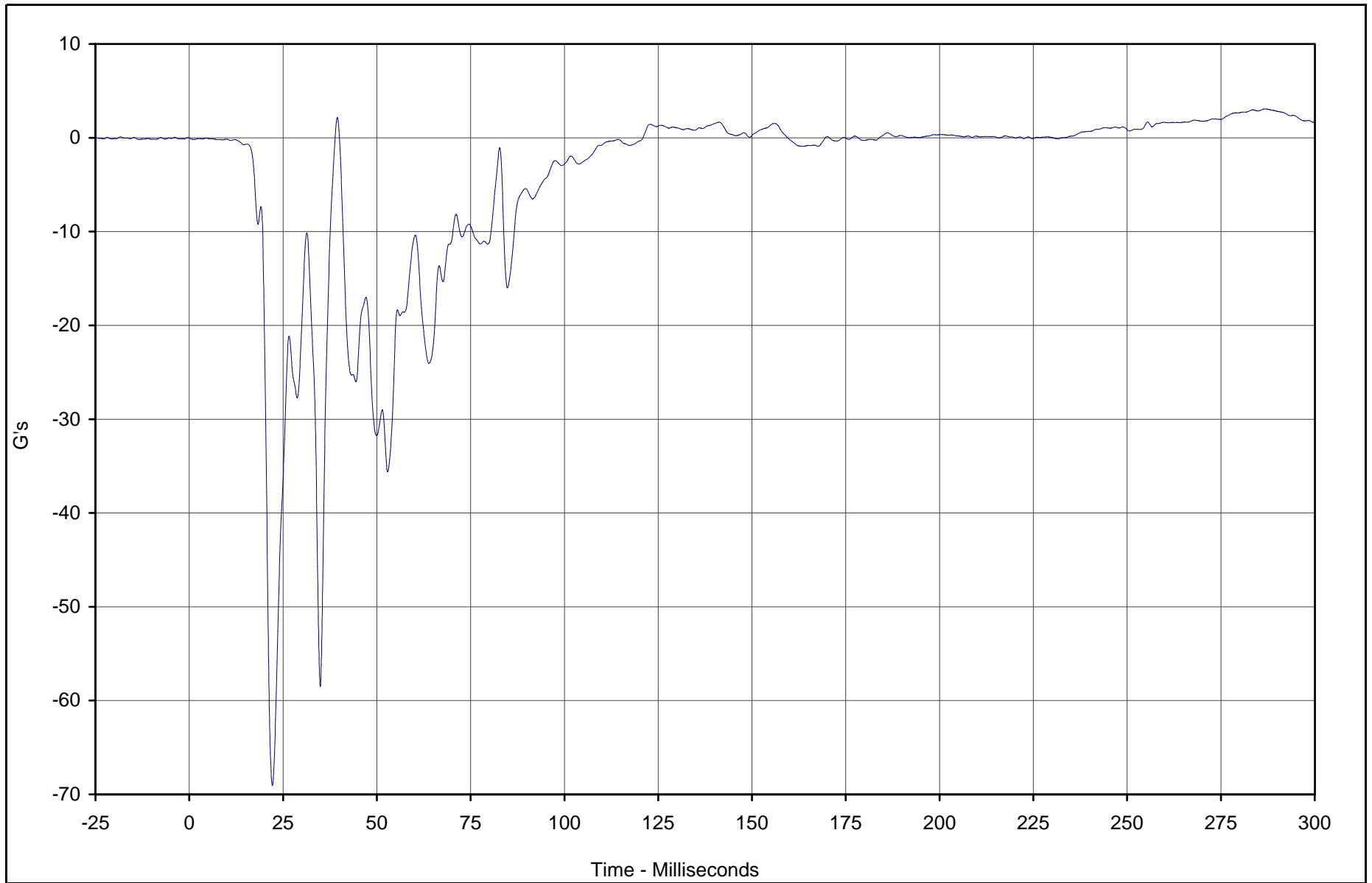
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-54



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Left Foot Fore Z	037	FIL	G's	3.1	286.8	-69.0	22.2	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

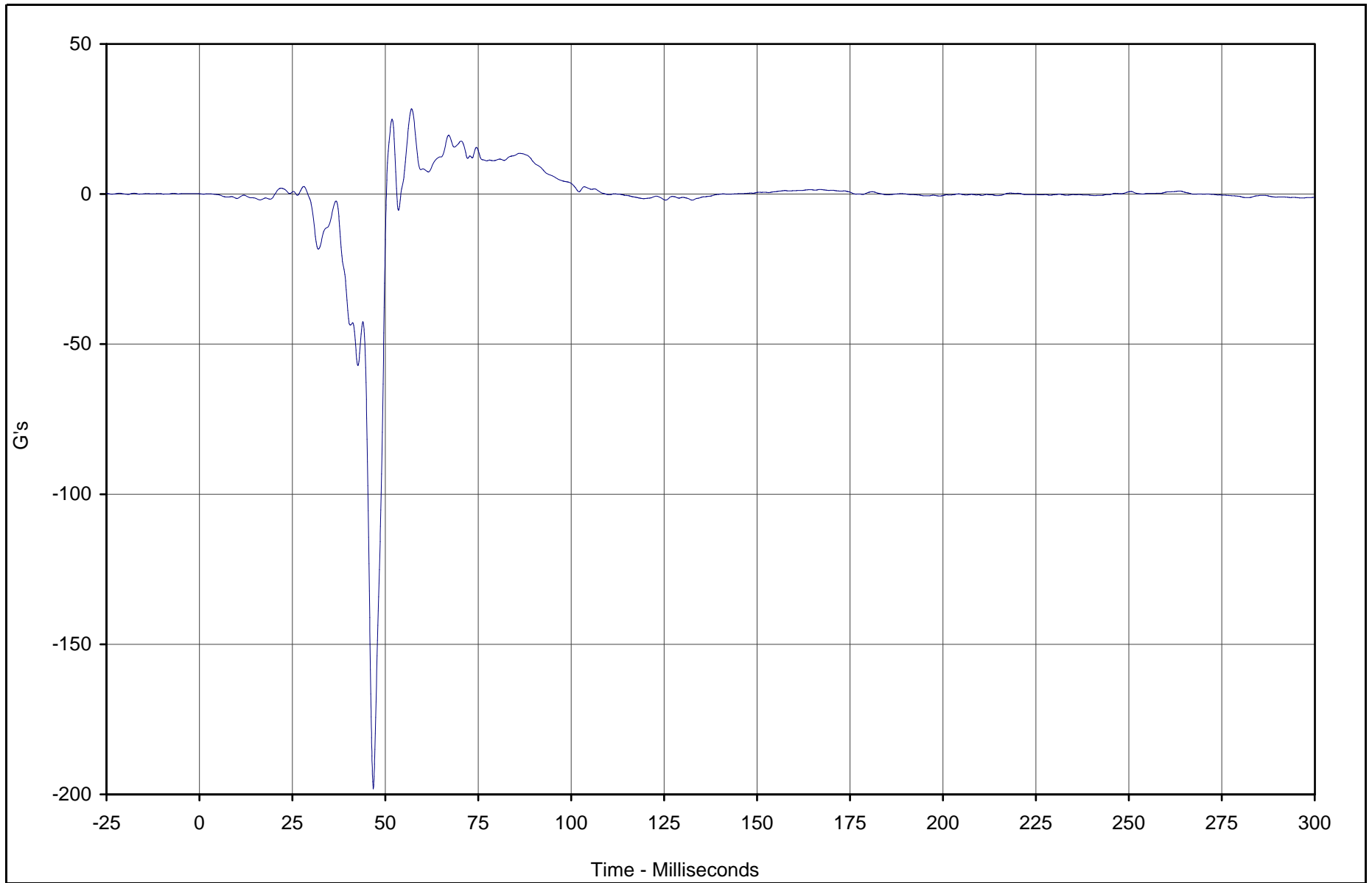
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-55



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Aft X	038	FIL	G's	28.4	57.1	-198.2	46.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

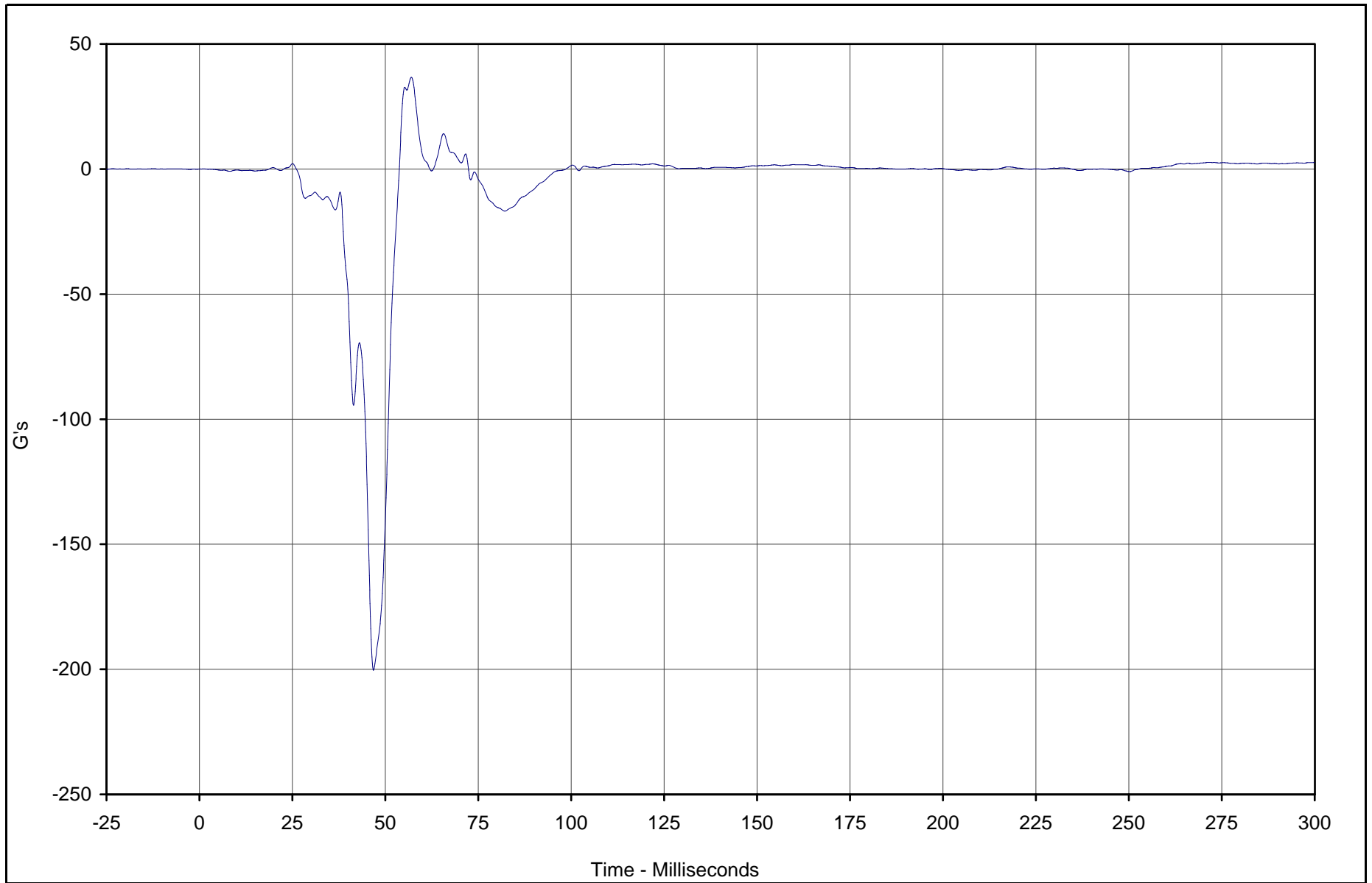
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-56



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Aft Z	039	FIL	G's	36.7	57.0	-200.4	46.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

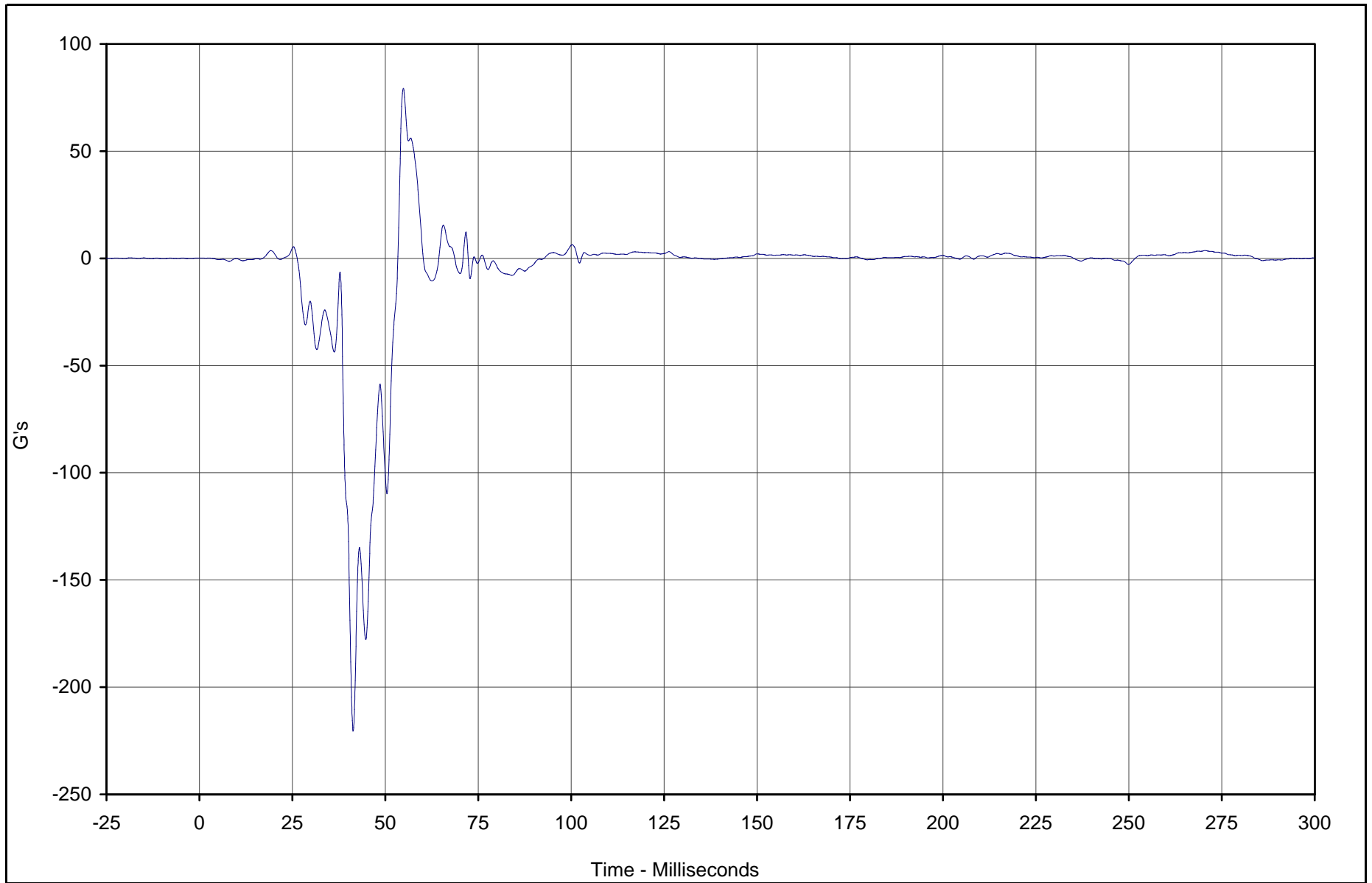
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-57



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Right Foot Fore Z	040	FIL	G's	79.2	54.8	-220.5	41.3	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

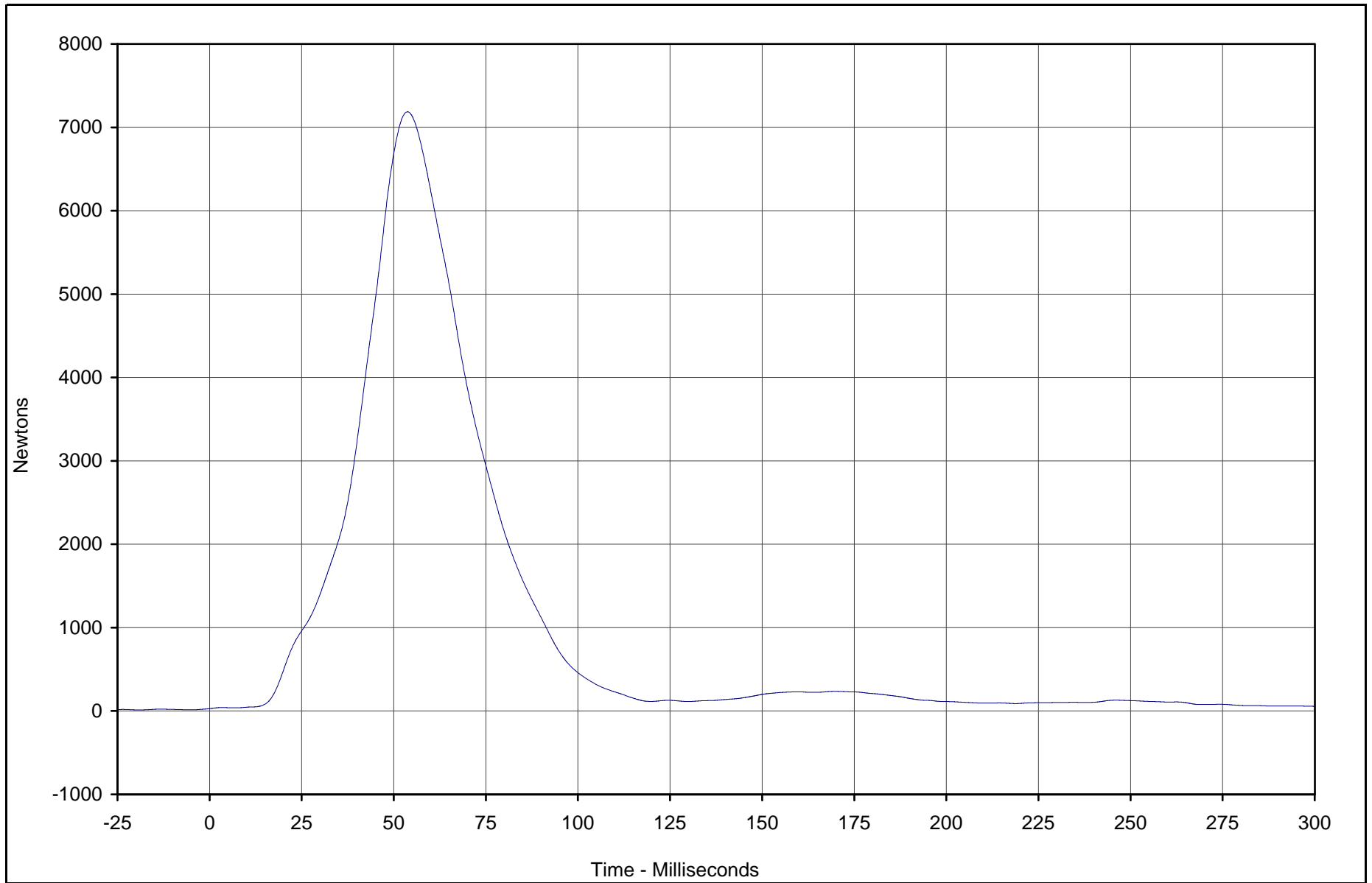
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-58



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Lap Belt Force	041	FIL	Newtons	7187.1	53.7	28.2	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

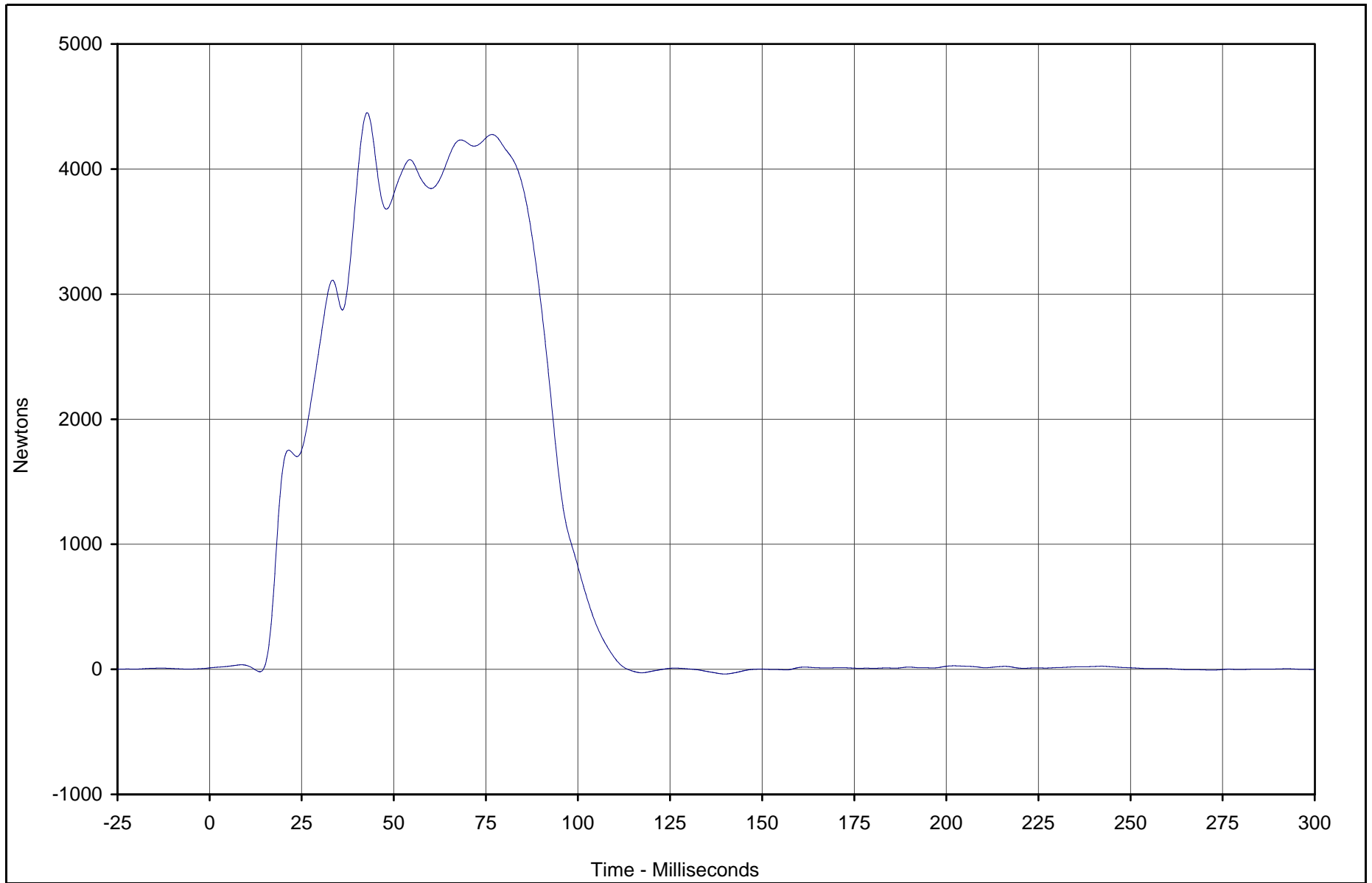
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-59



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Shoulder Belt Force	042	FIL	Newtons	4450.0	42.8	-37.5	139.9	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

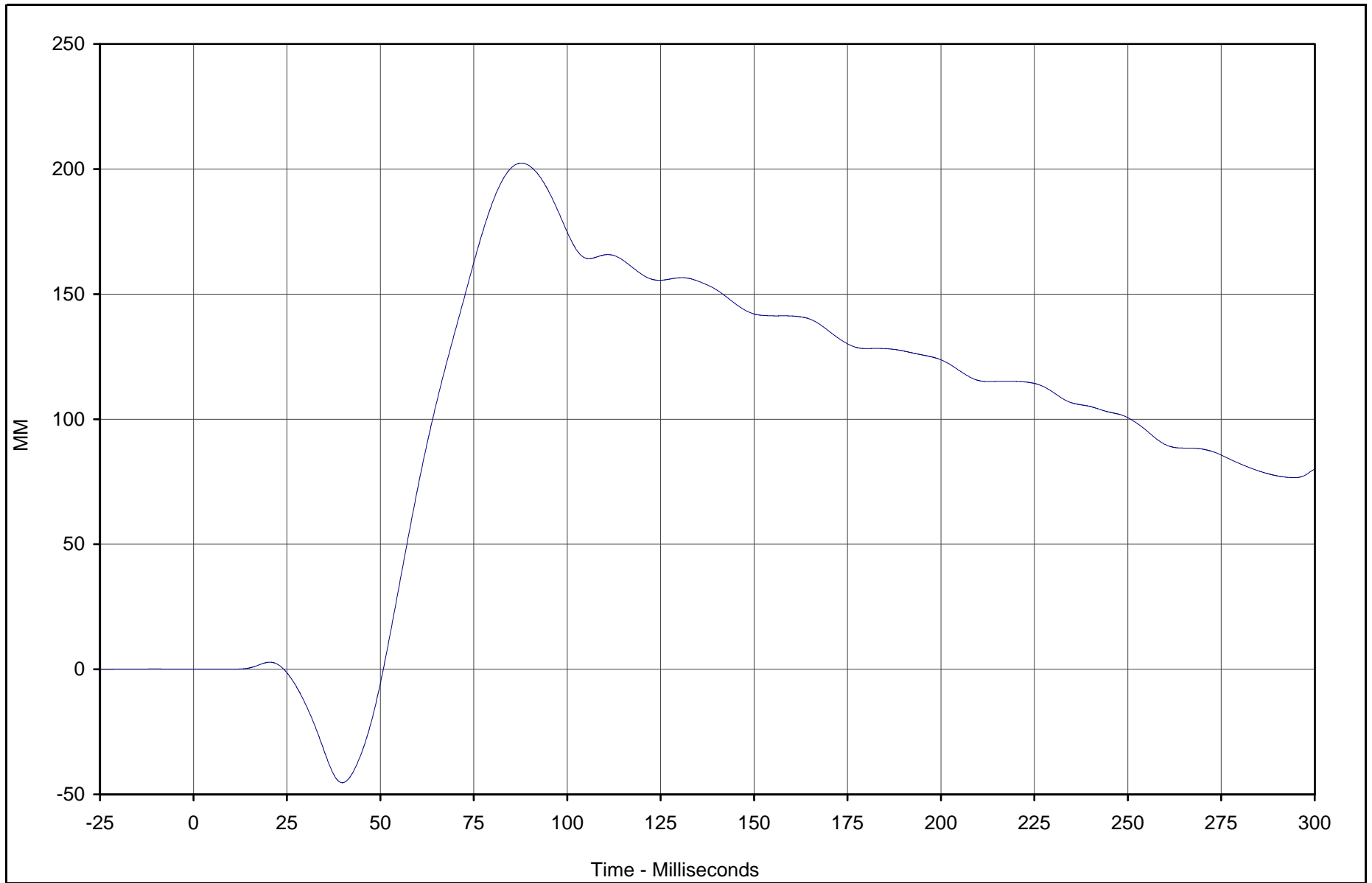
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-60



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Shoulder Belt Pullout	043	FIL	MM	202.4	87.7	-45.3	39.8	60



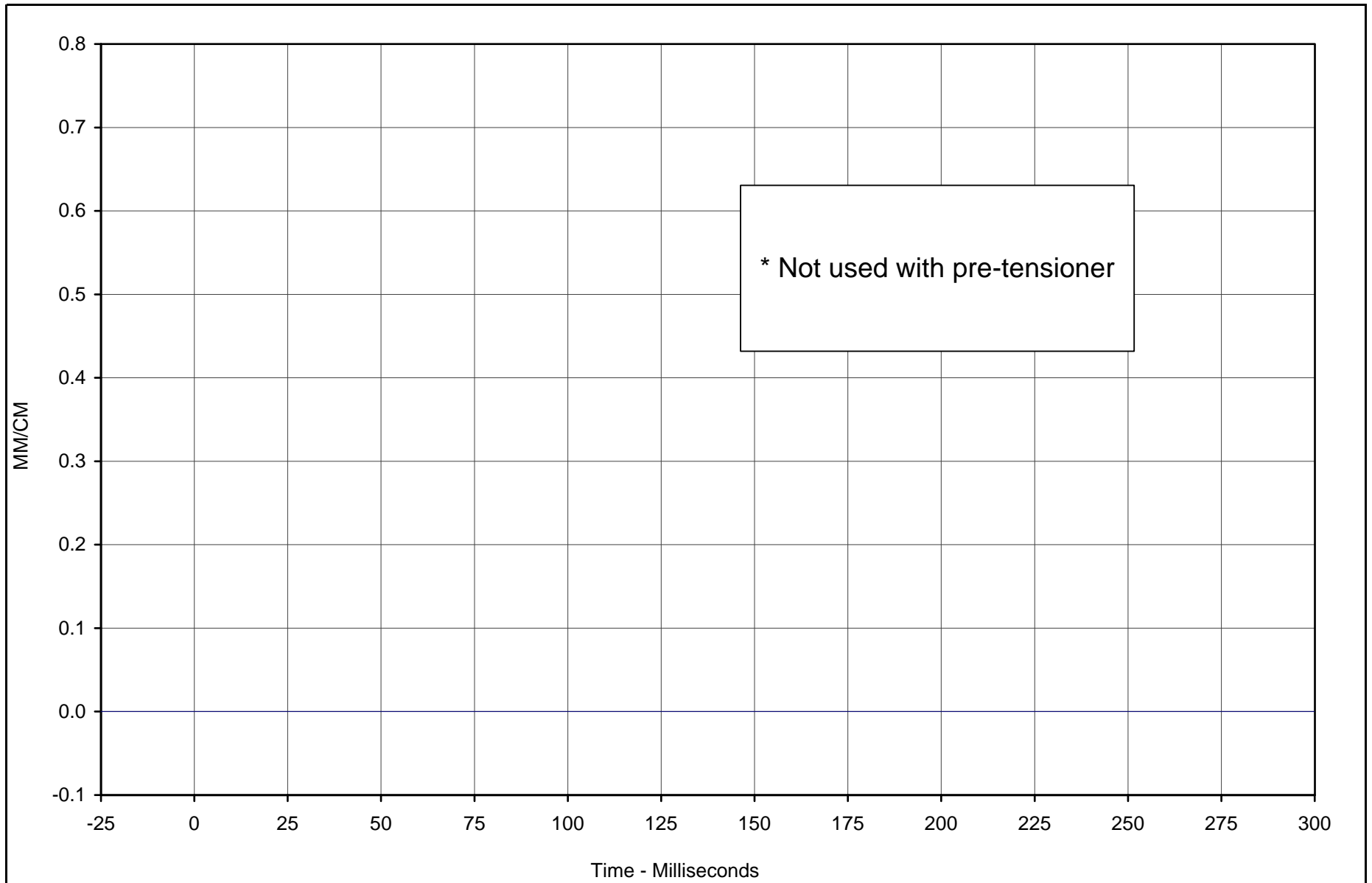
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-61



* 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: 2002 Hyundai Santa Fe 4WD SUV

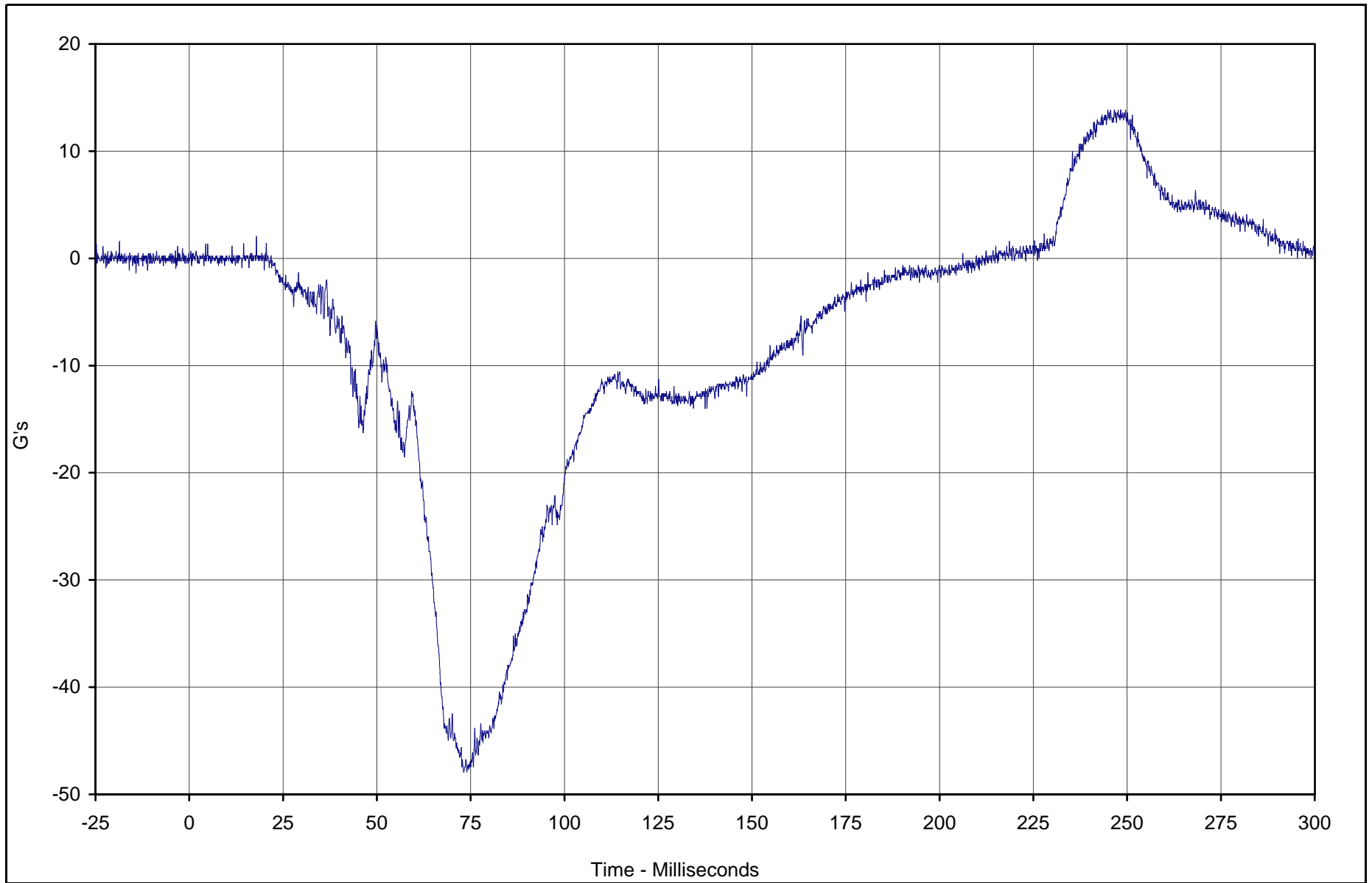
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-62



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X	045	FIL	G's	13.8	244.9	-47.9	73.1	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

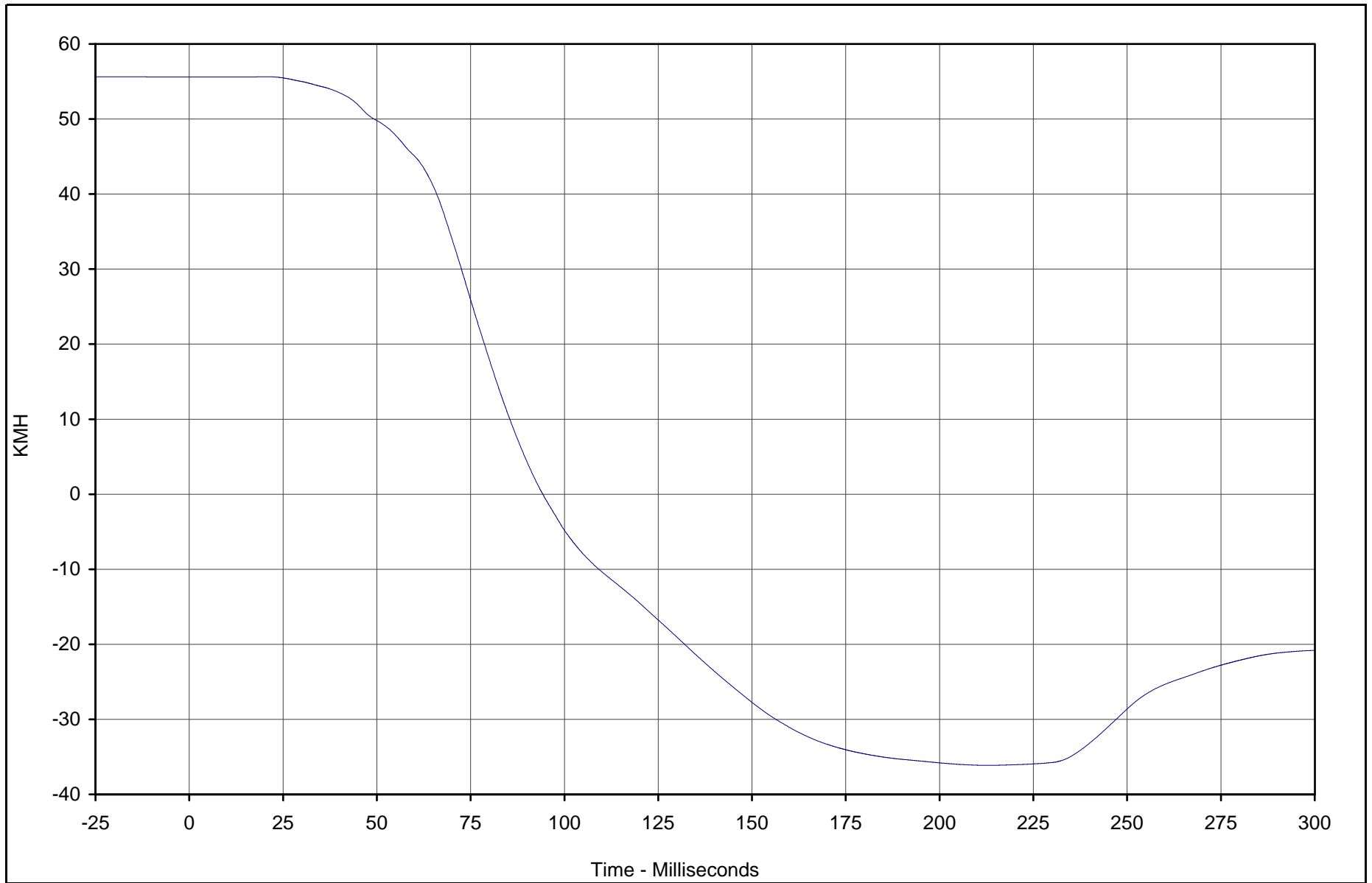
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-63



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X Velocity	045	IN1	KMH	55.6	20.9	-36.1	212.3	180



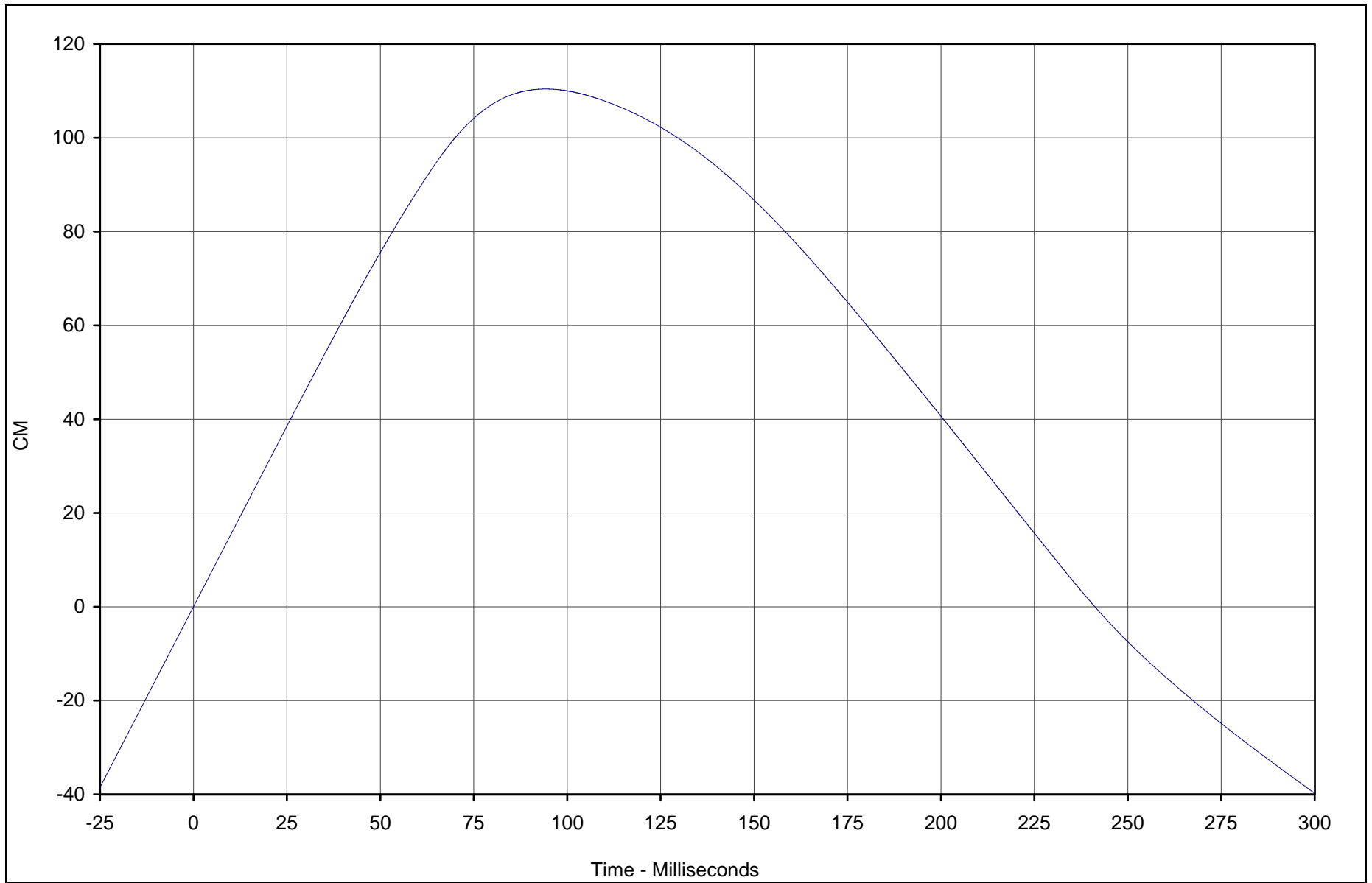
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-64



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X Displ.	045	IN2	CM	110.4	94.2	-39.7	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

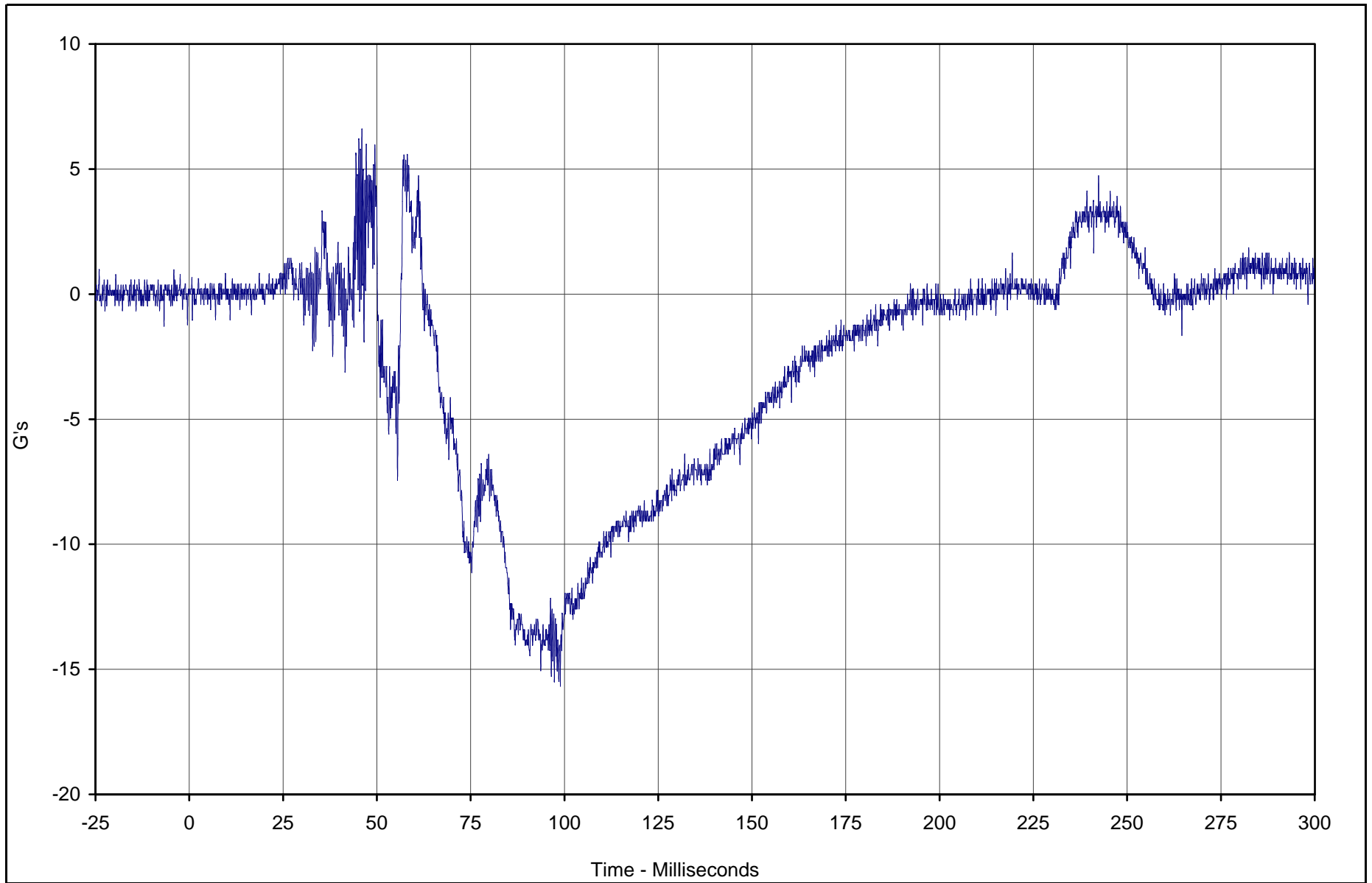
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-65



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Y	046	FIL	G's	6.6	46.0	-15.7	98.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

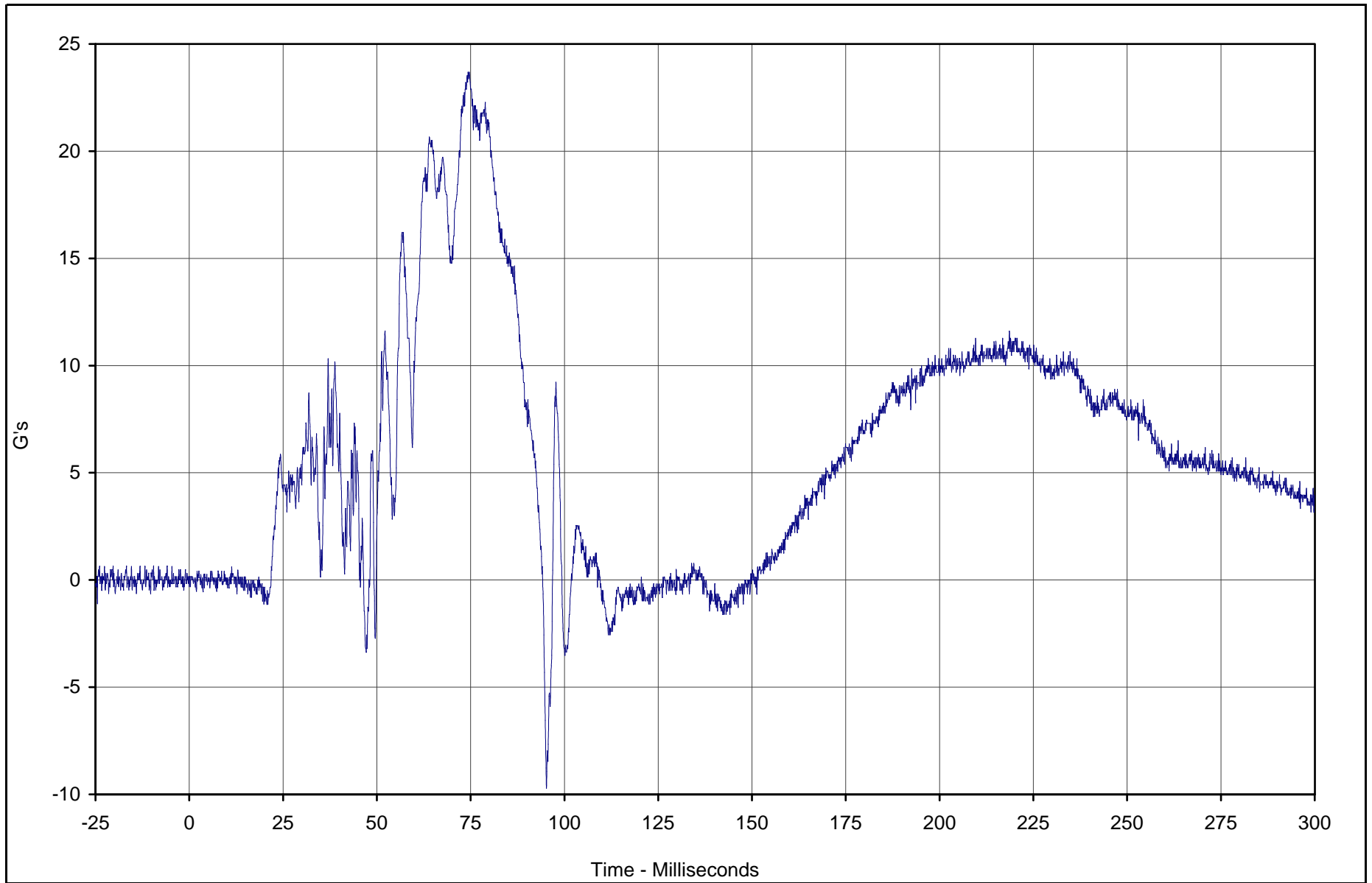
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-66



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Z	047	FIL	G's	23.7	74.3	-9.7	95.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

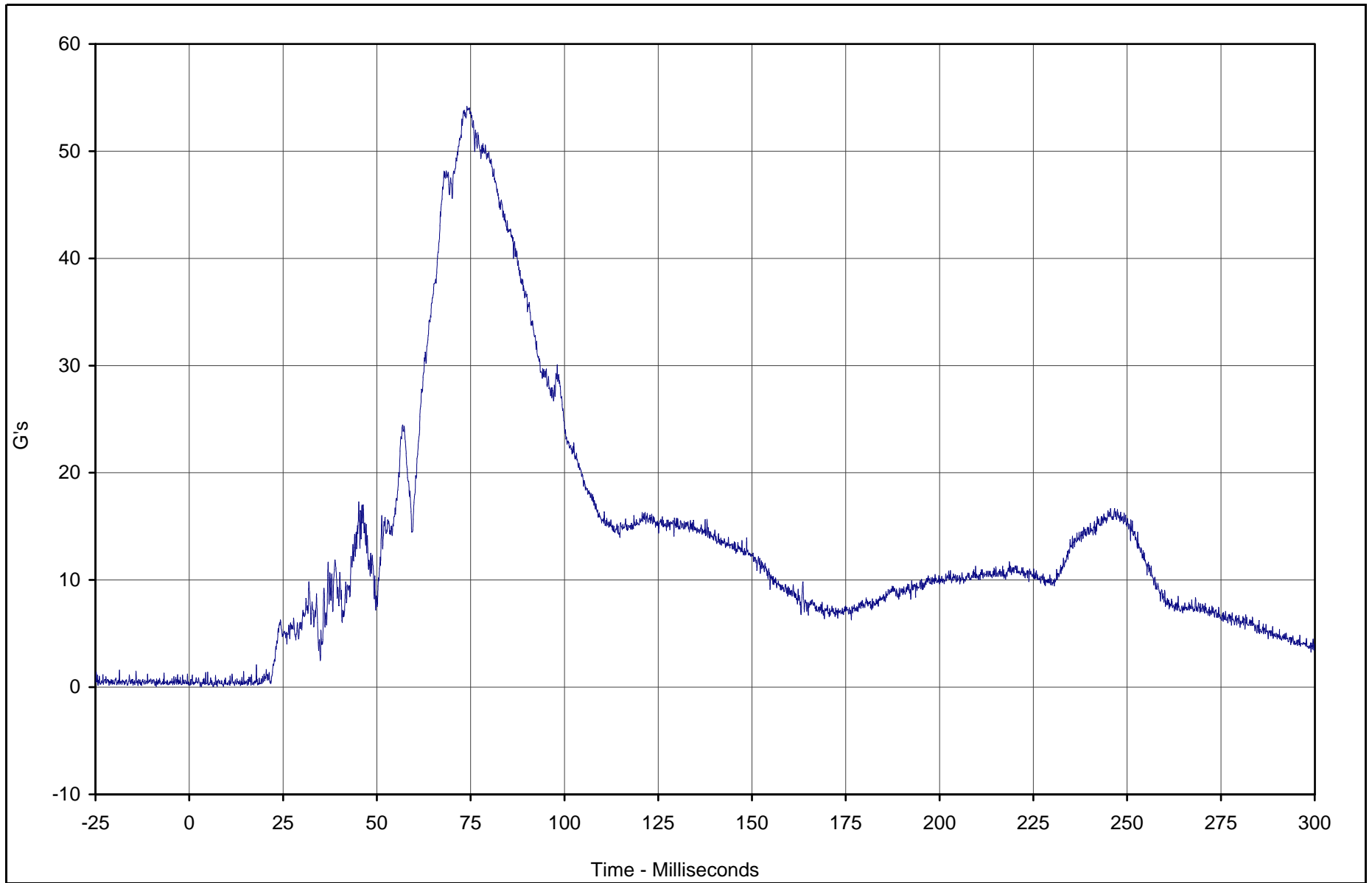
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-67



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Resultant Primary	045	RES	G's	54.2	74.0	0.1	2.9	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

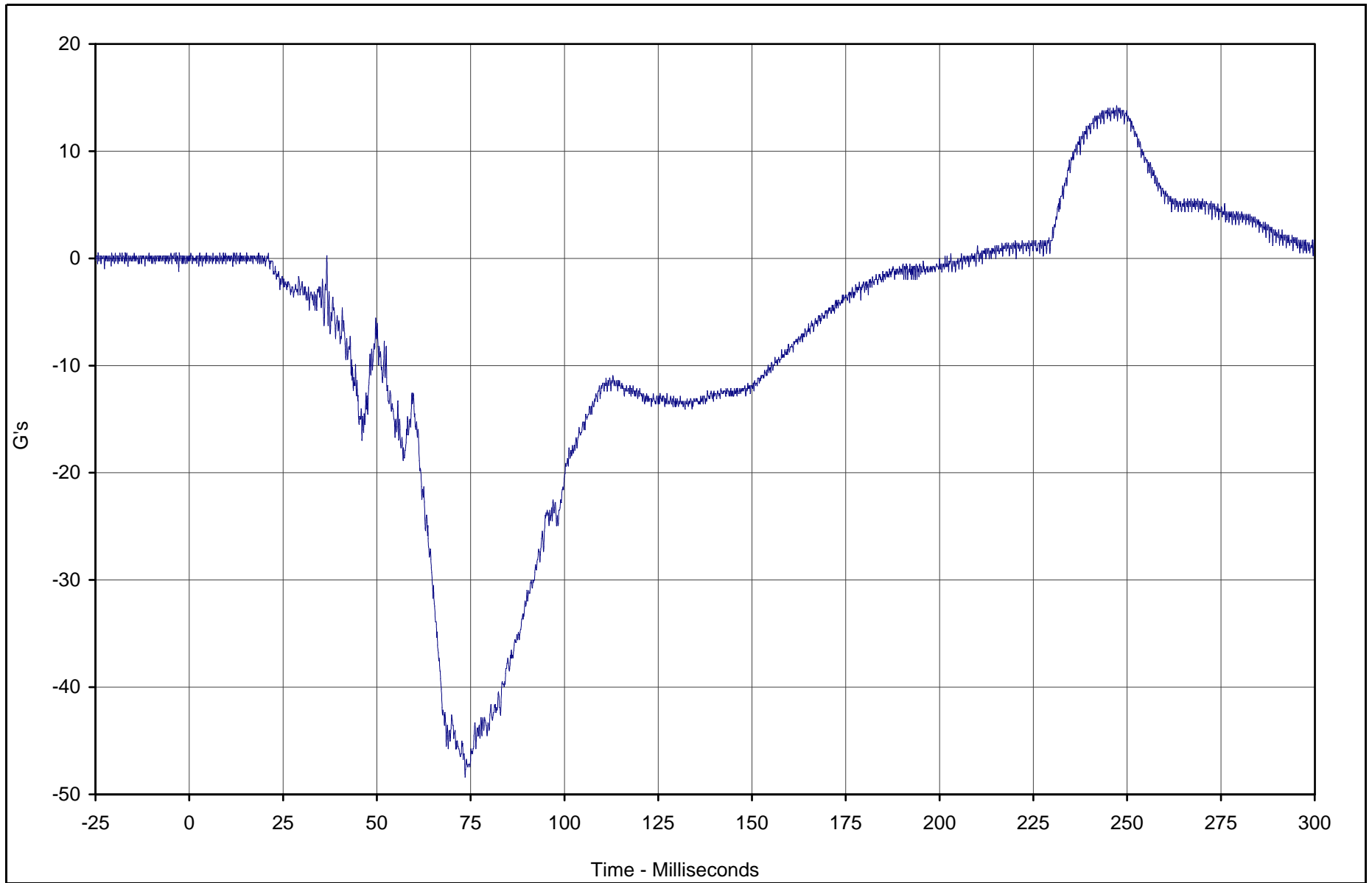
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-68



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X	048	FIL	G's	14.3	247.2	-48.4	73.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

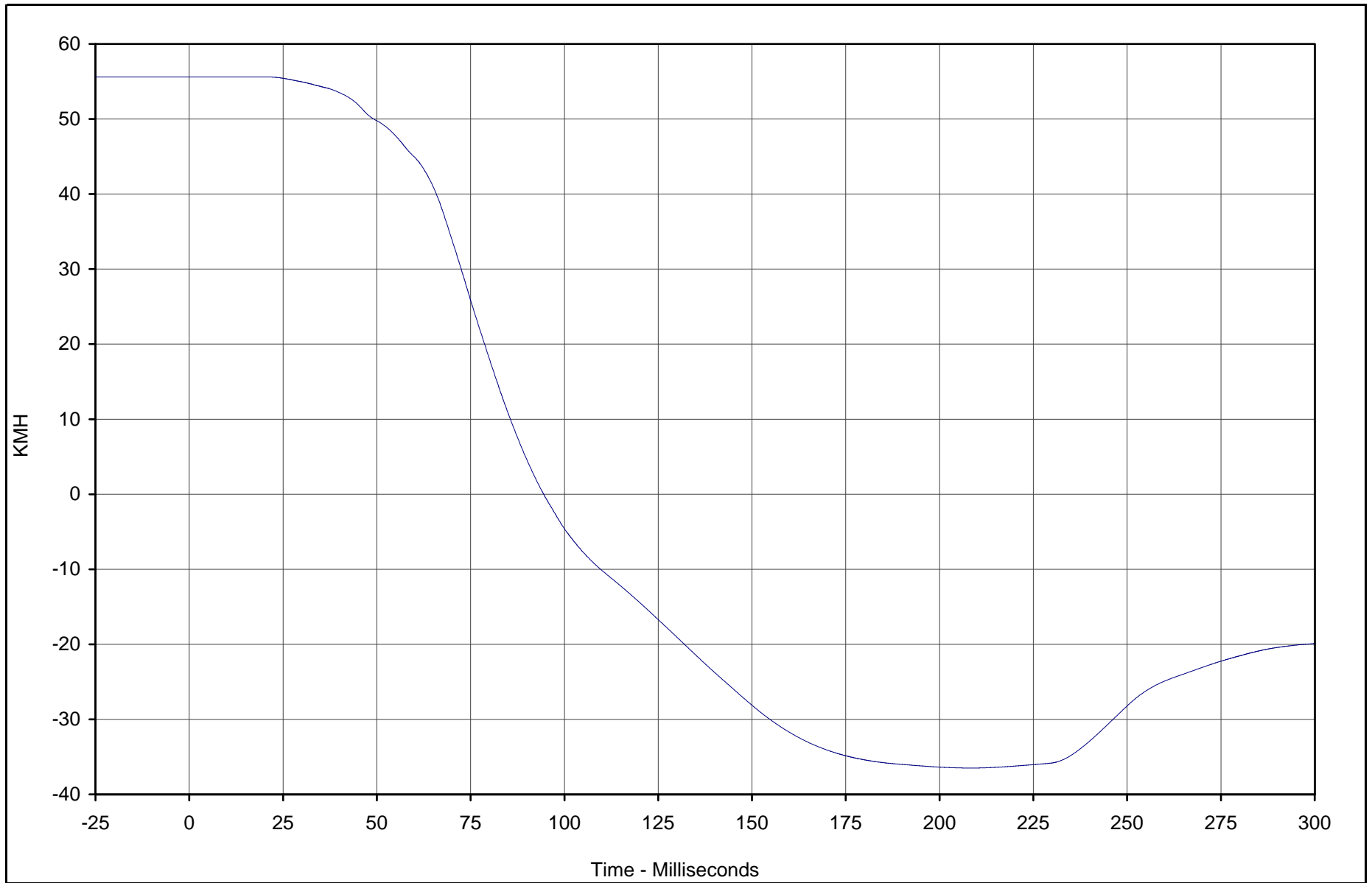
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-69



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X Velocity	048	IN1	KMH	55.6	1.2	-36.5	208.5	180



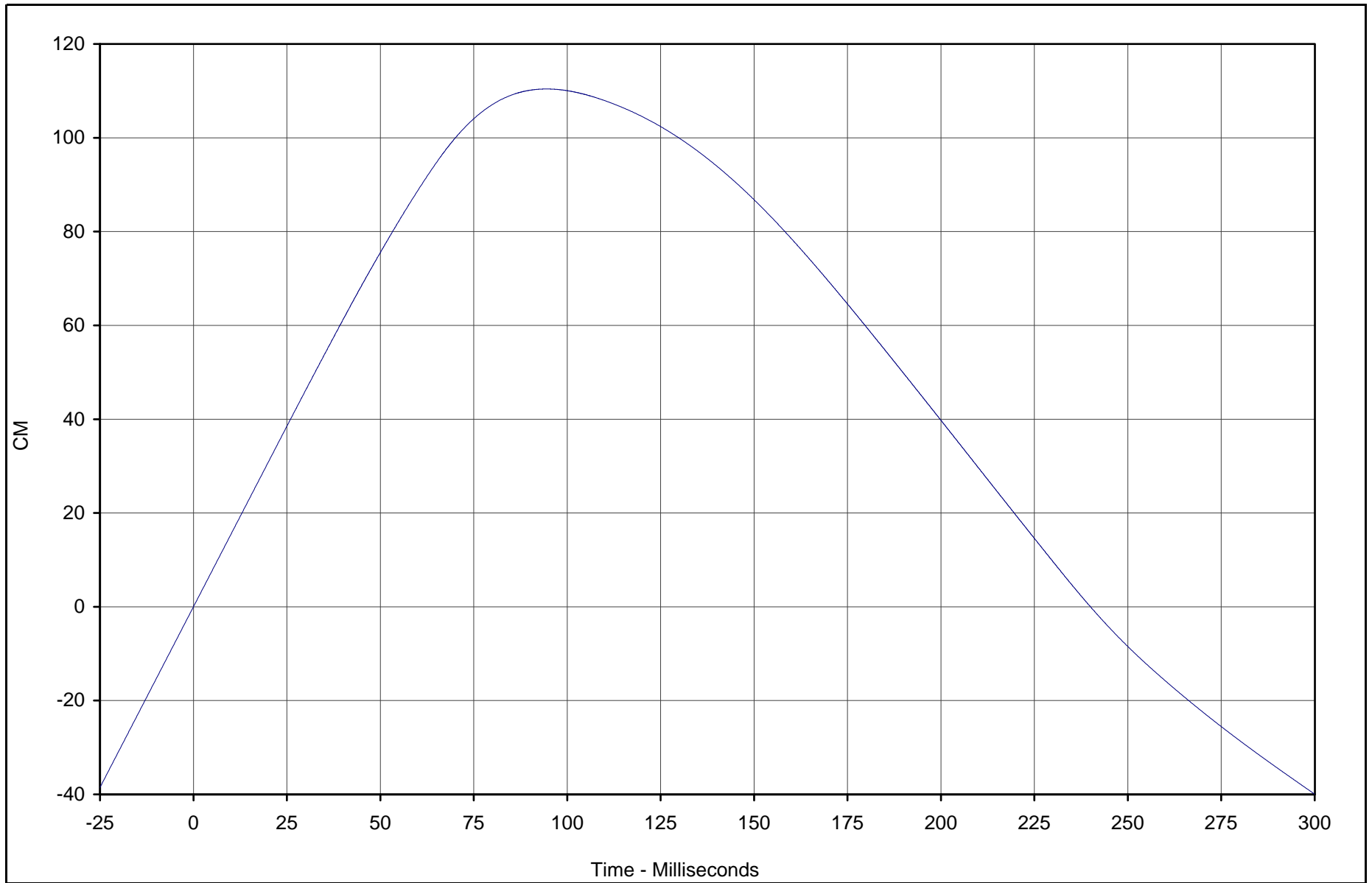
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-70



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant X Displ.	048	IN2	CM	110.4	94.5	-39.9	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

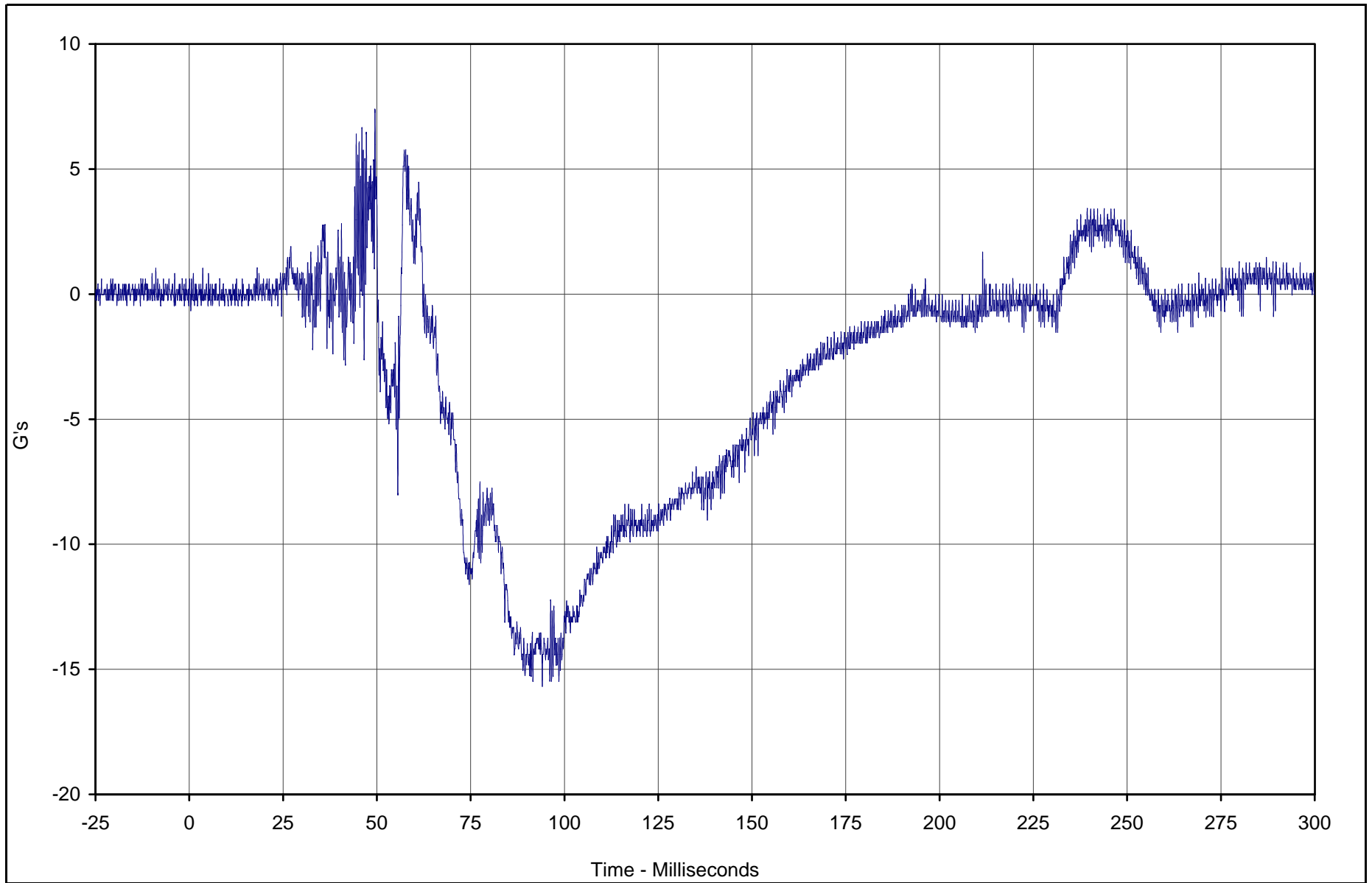
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-71



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant Y	049	FIL	G's	7.3	49.5	-15.7	94.1	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

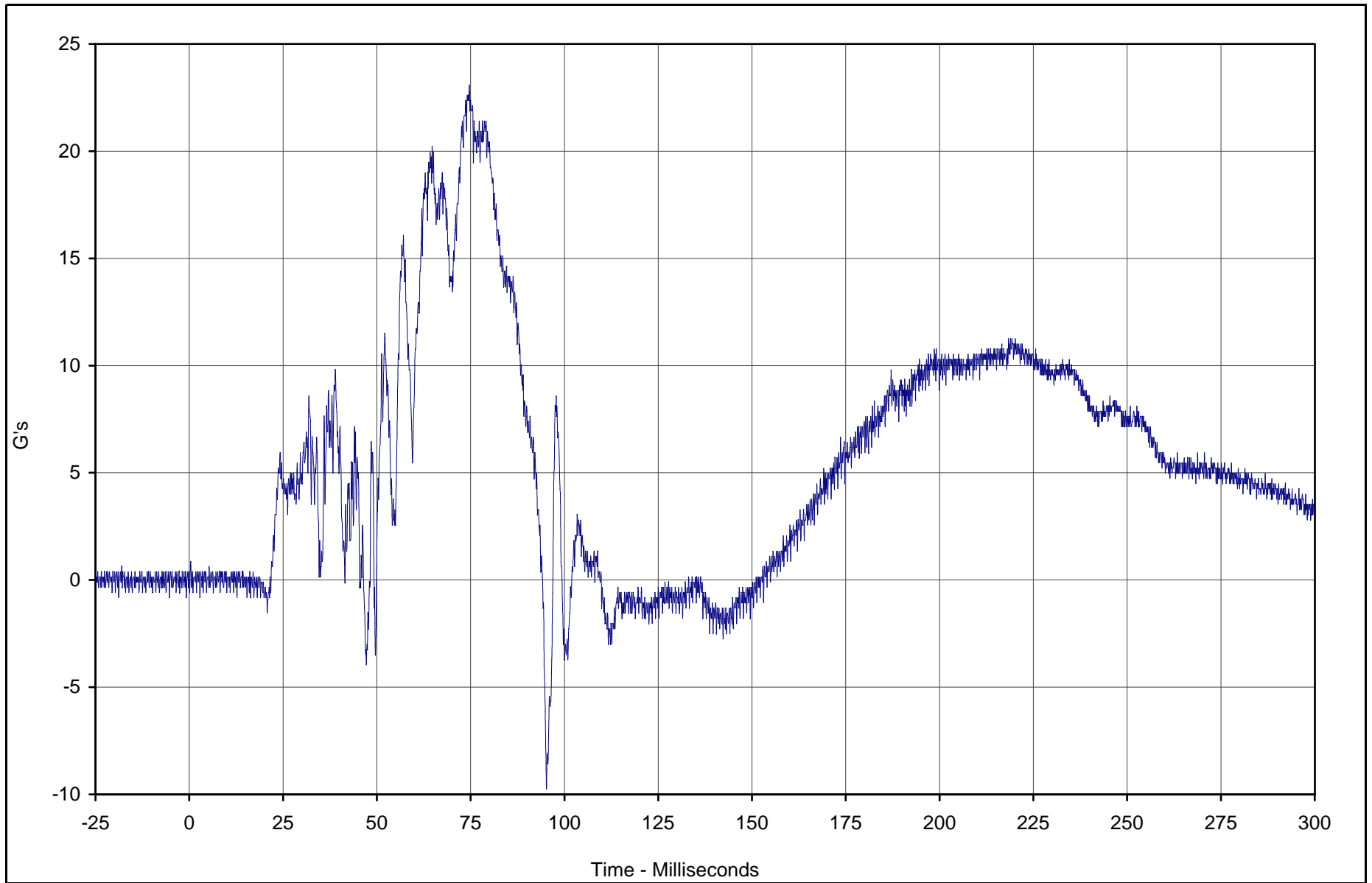
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-72



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Redundant Z	050	FIL	G's	23.1	74.6	-9.8	95.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

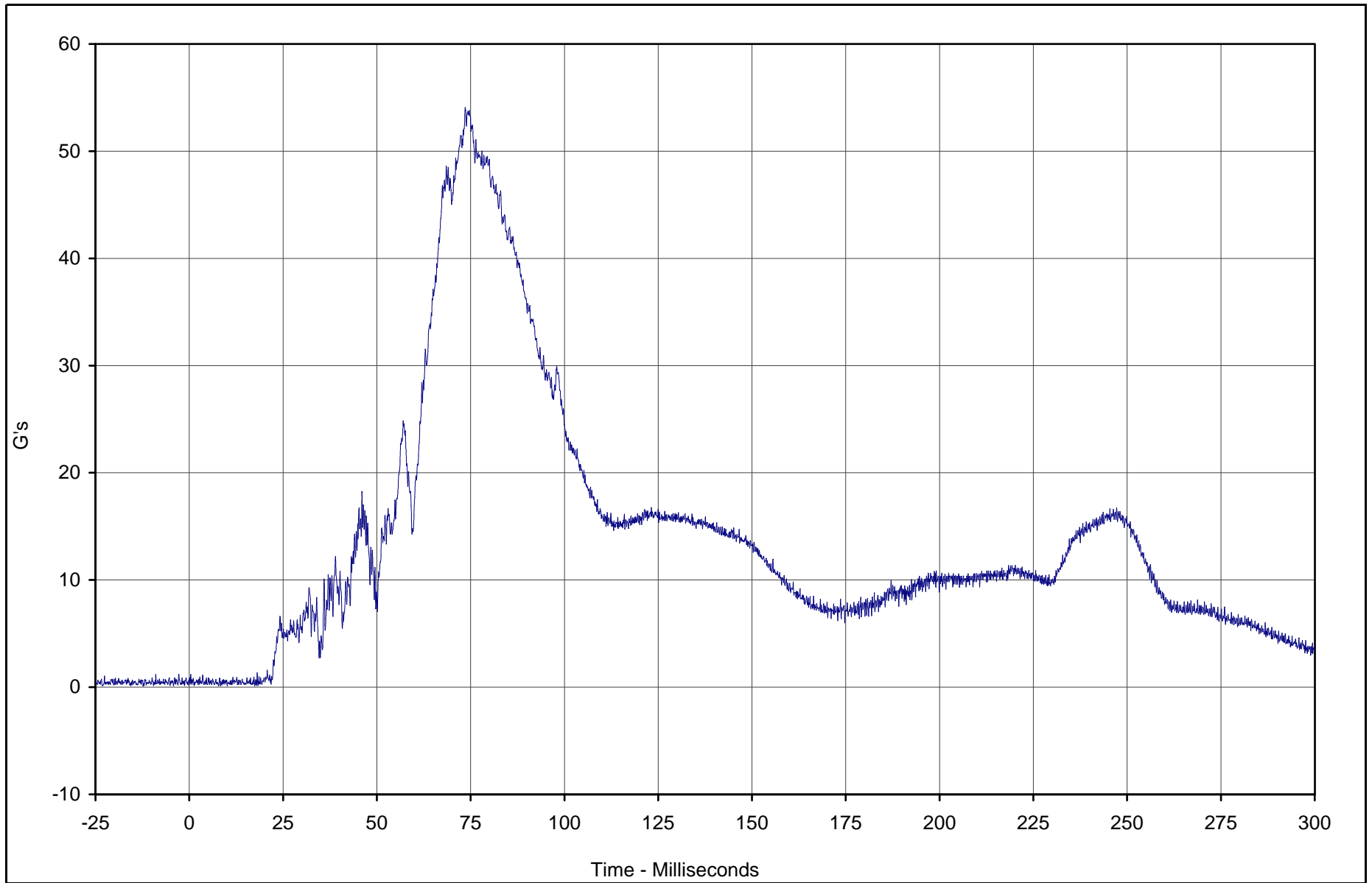
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-73



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Resultant Redundant	048	RES	G's	54.1	73.5	0.1	7.8	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

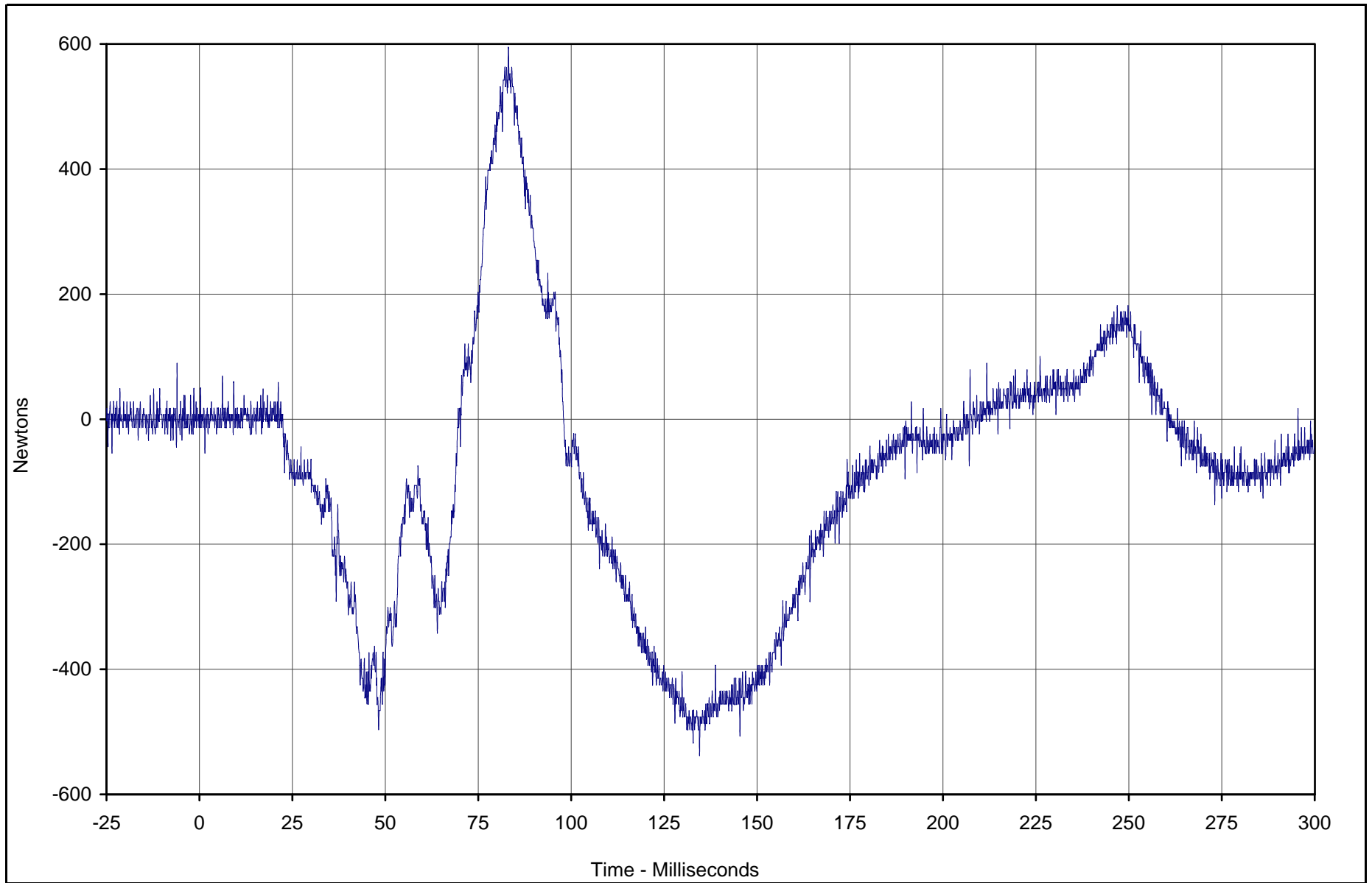
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-74



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force X	051	FIL	Newtons	593.5	83.1	-537.8	134.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

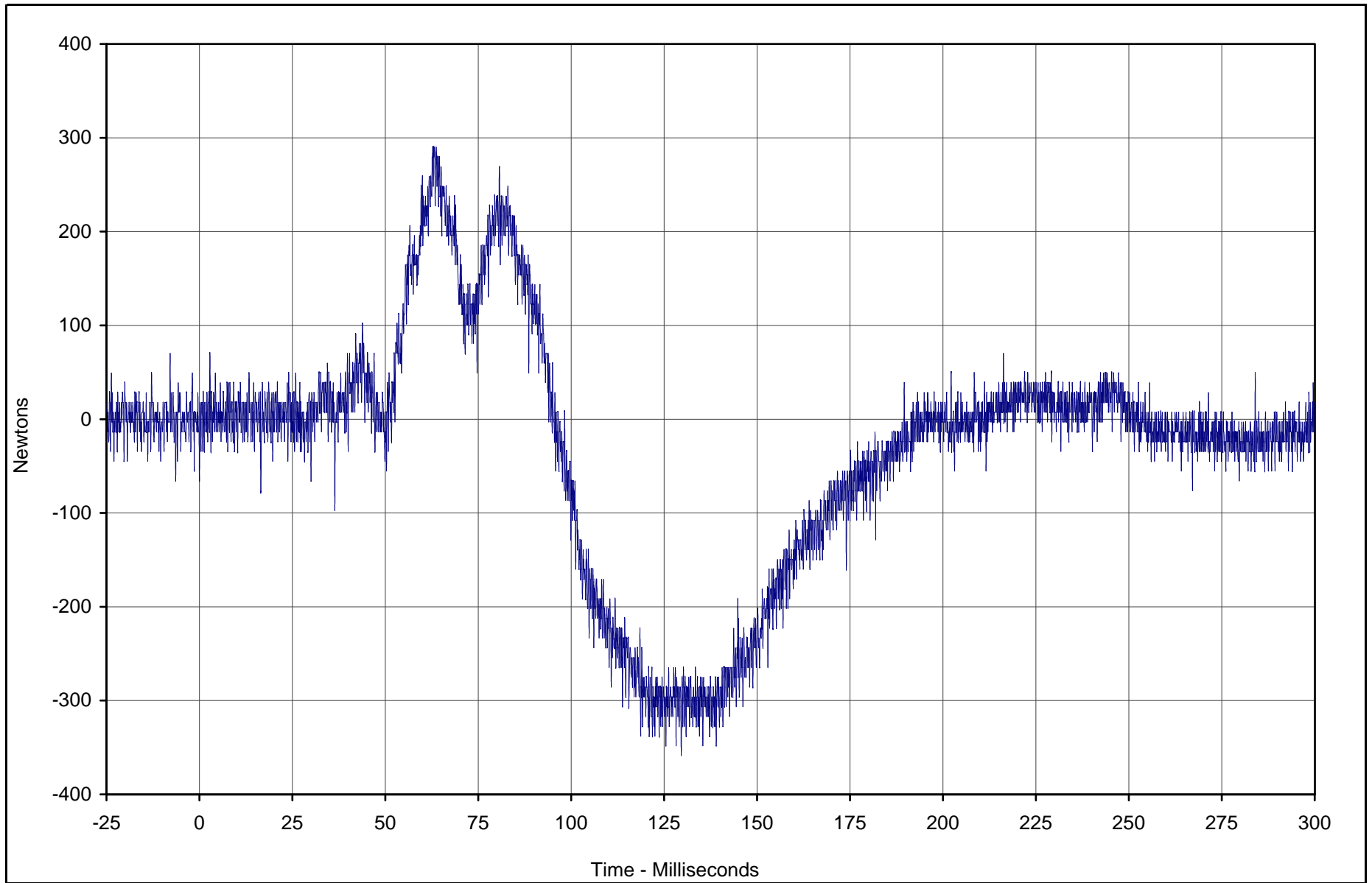
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-75



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Y	052	FIL	Newtons	290.1	62.8	-358.9	129.6	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

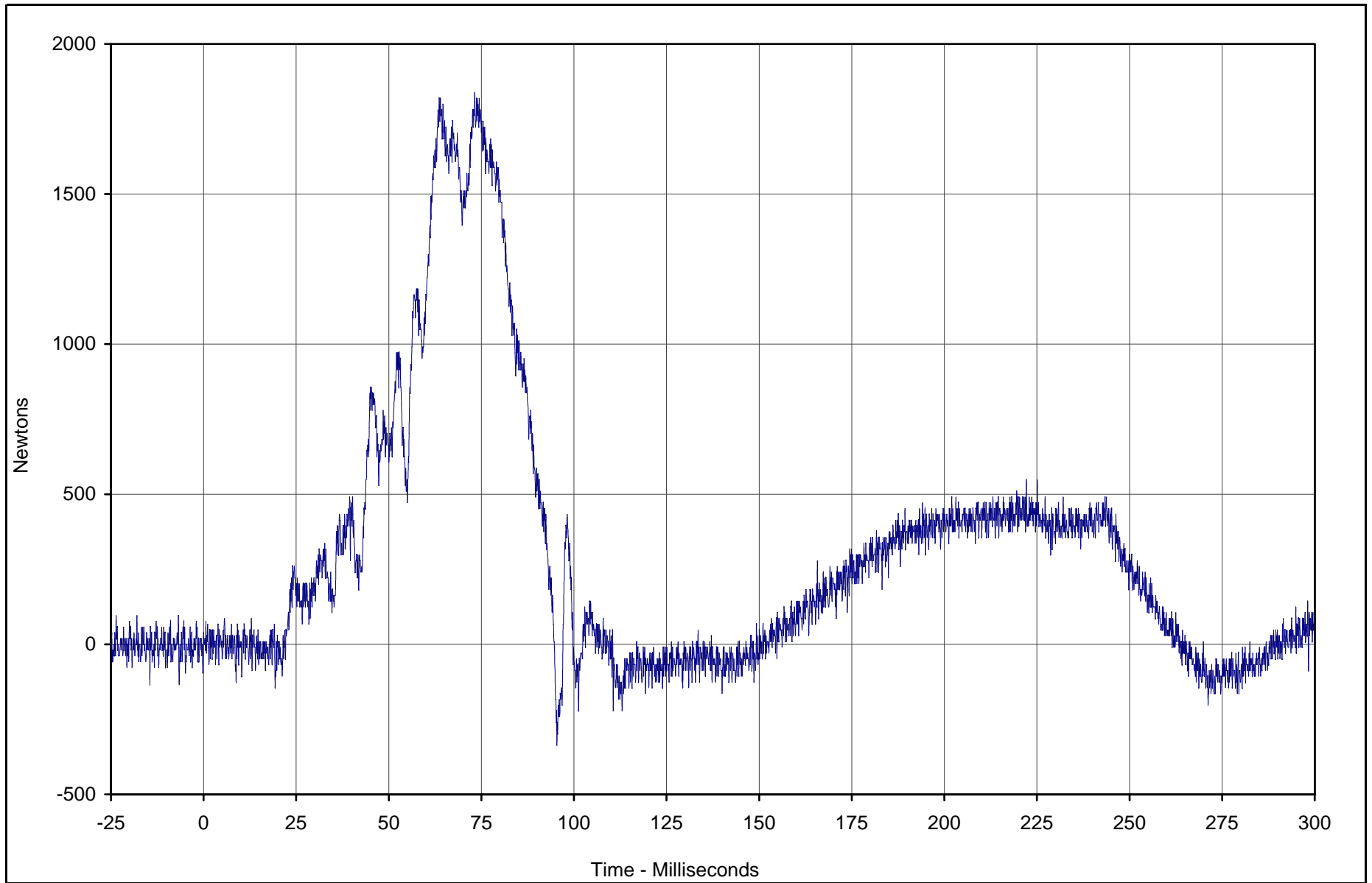
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-76



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Z	053	FIL	Newtons	1838.6	73.2	-337.4	95.4	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

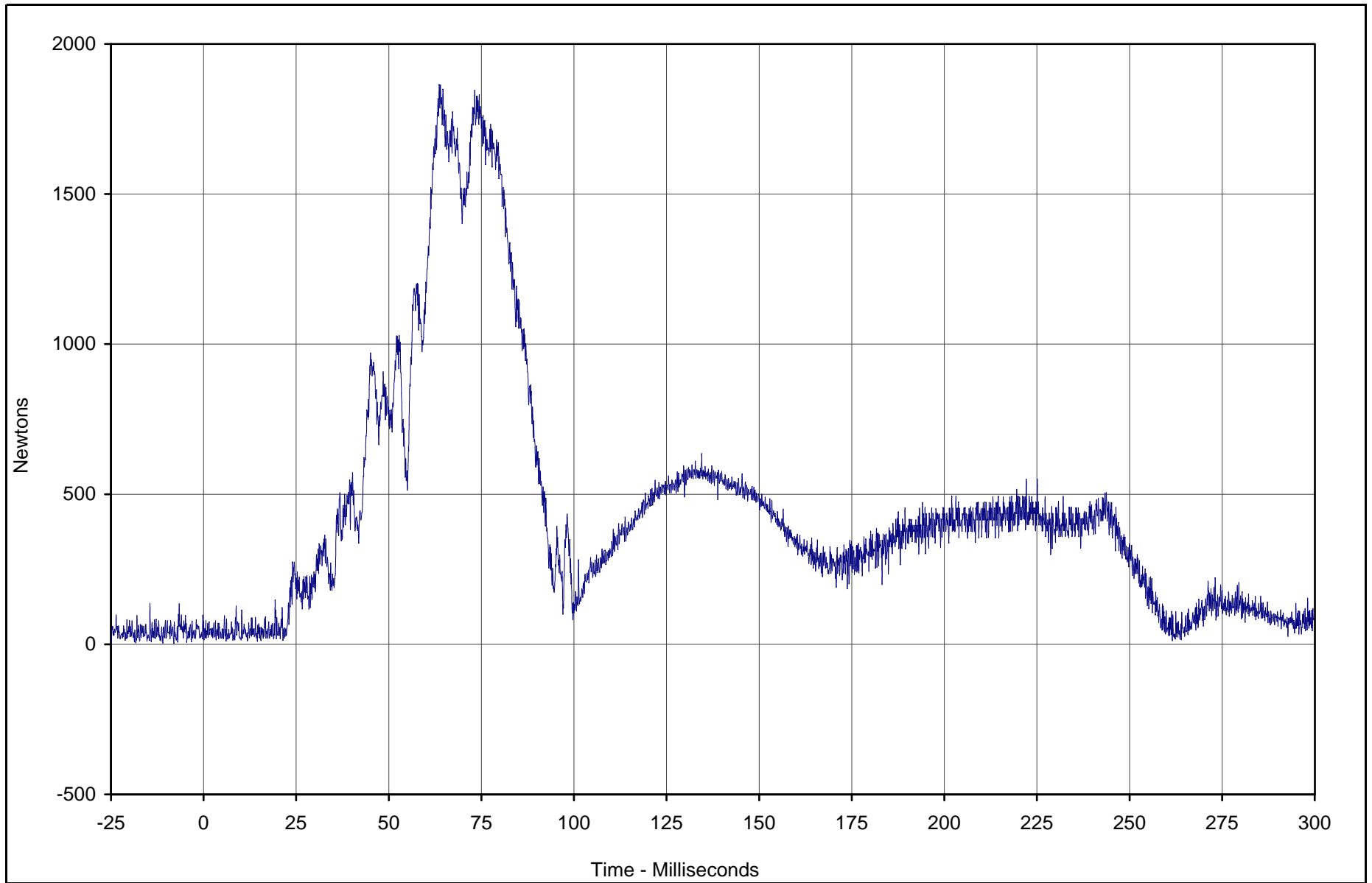
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-77



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Force Resultant	051	RES	Newtons	1863.6	63.6	10.2	14.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

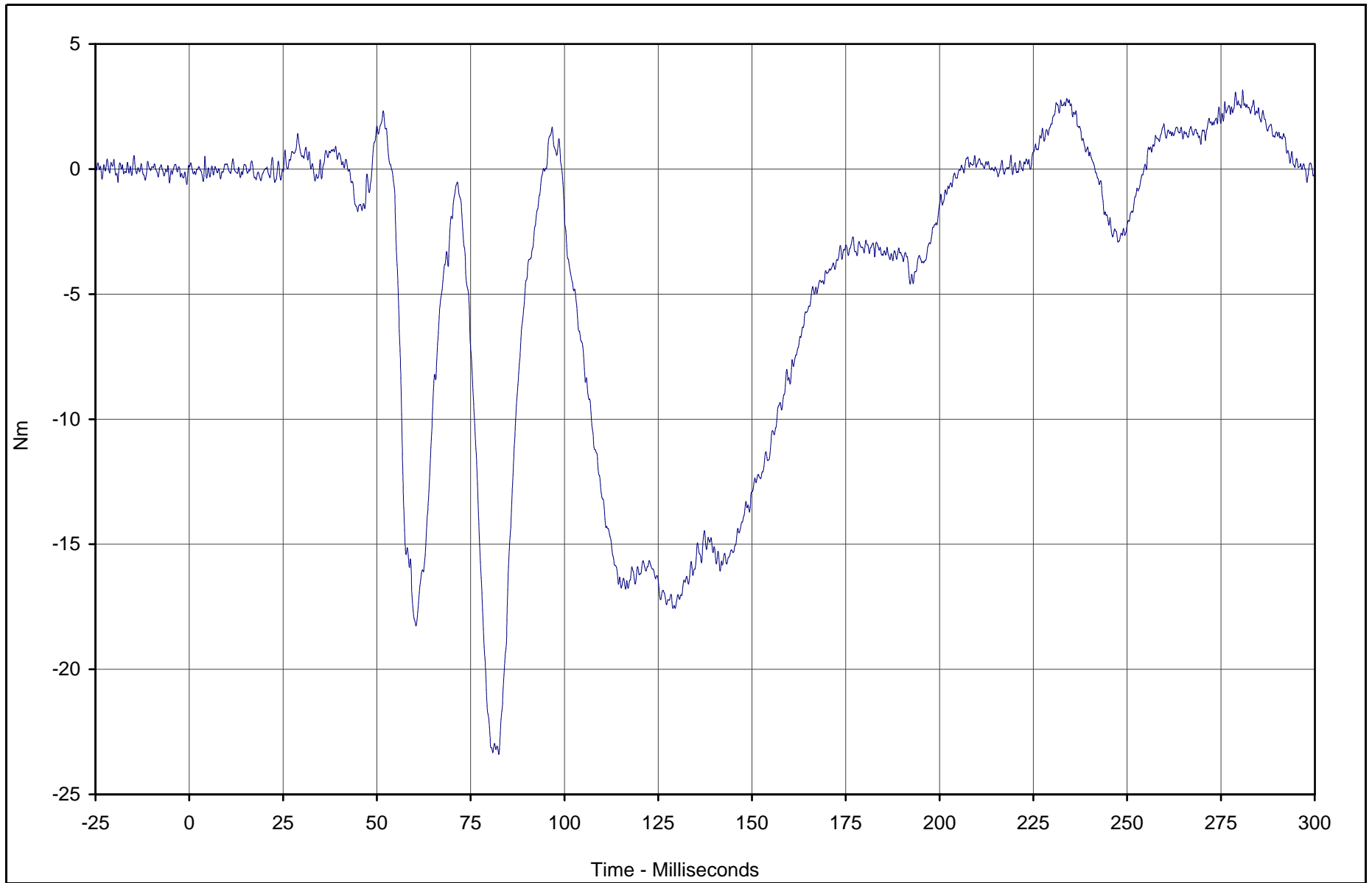
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-78



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment X	054	FIL	Nm	3.2	280.8	-23.4	82.5	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

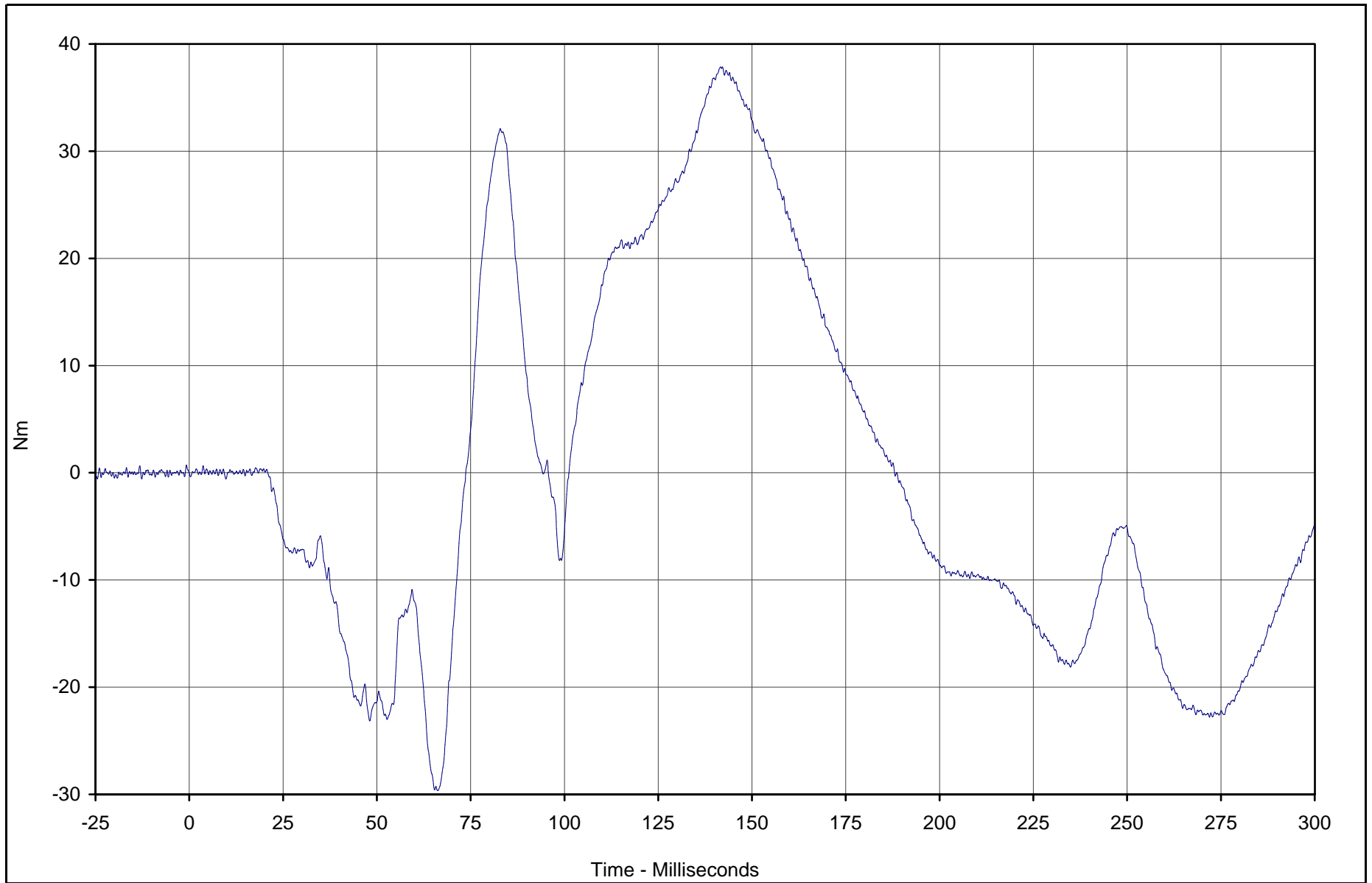
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-79



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Y	055	FIL	Nm	37.9	141.6	-29.6	66.3	600



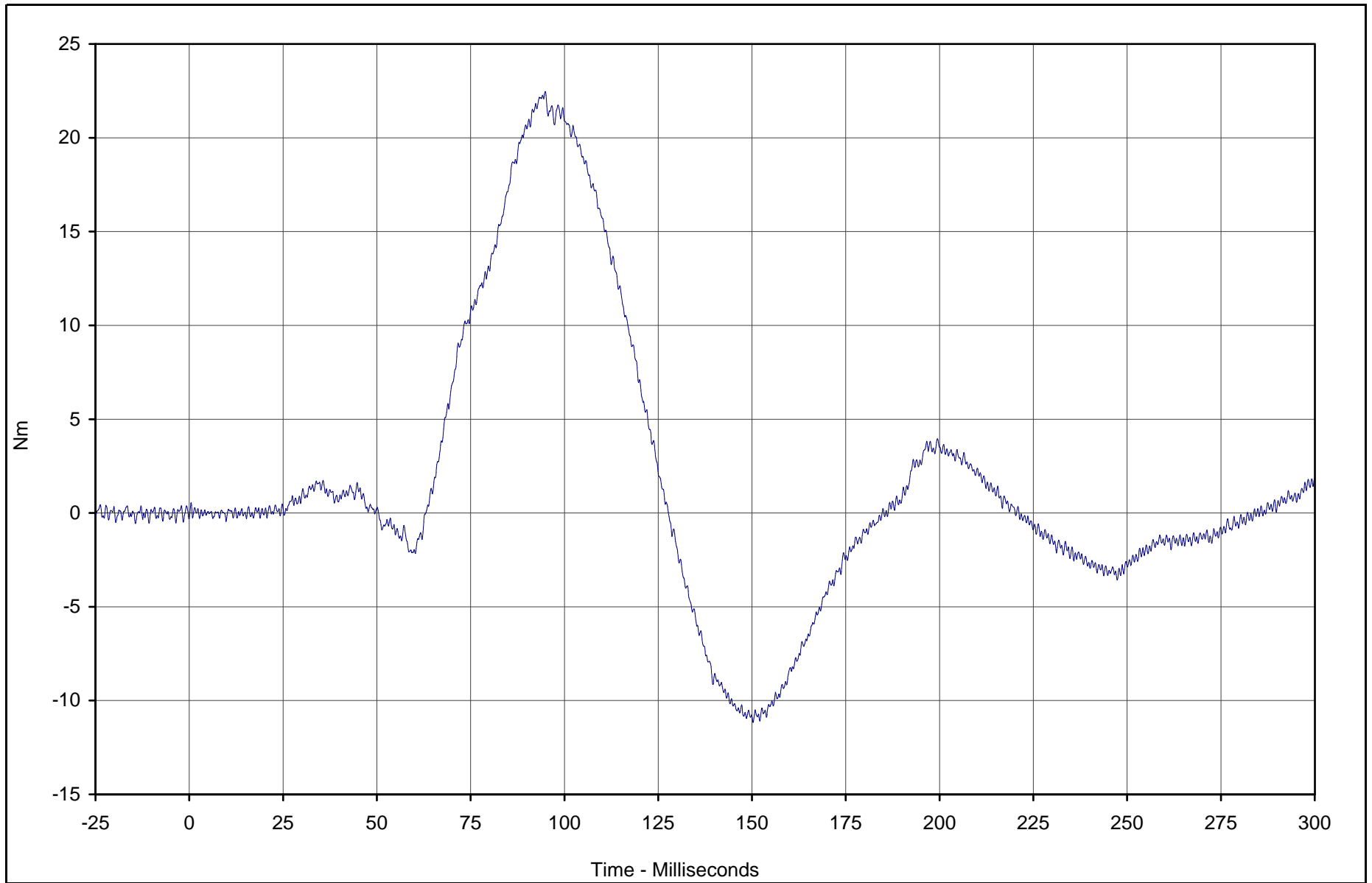
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-80



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Z	056	FIL	Nm	22.5	94.9	-11.2	150.3	600



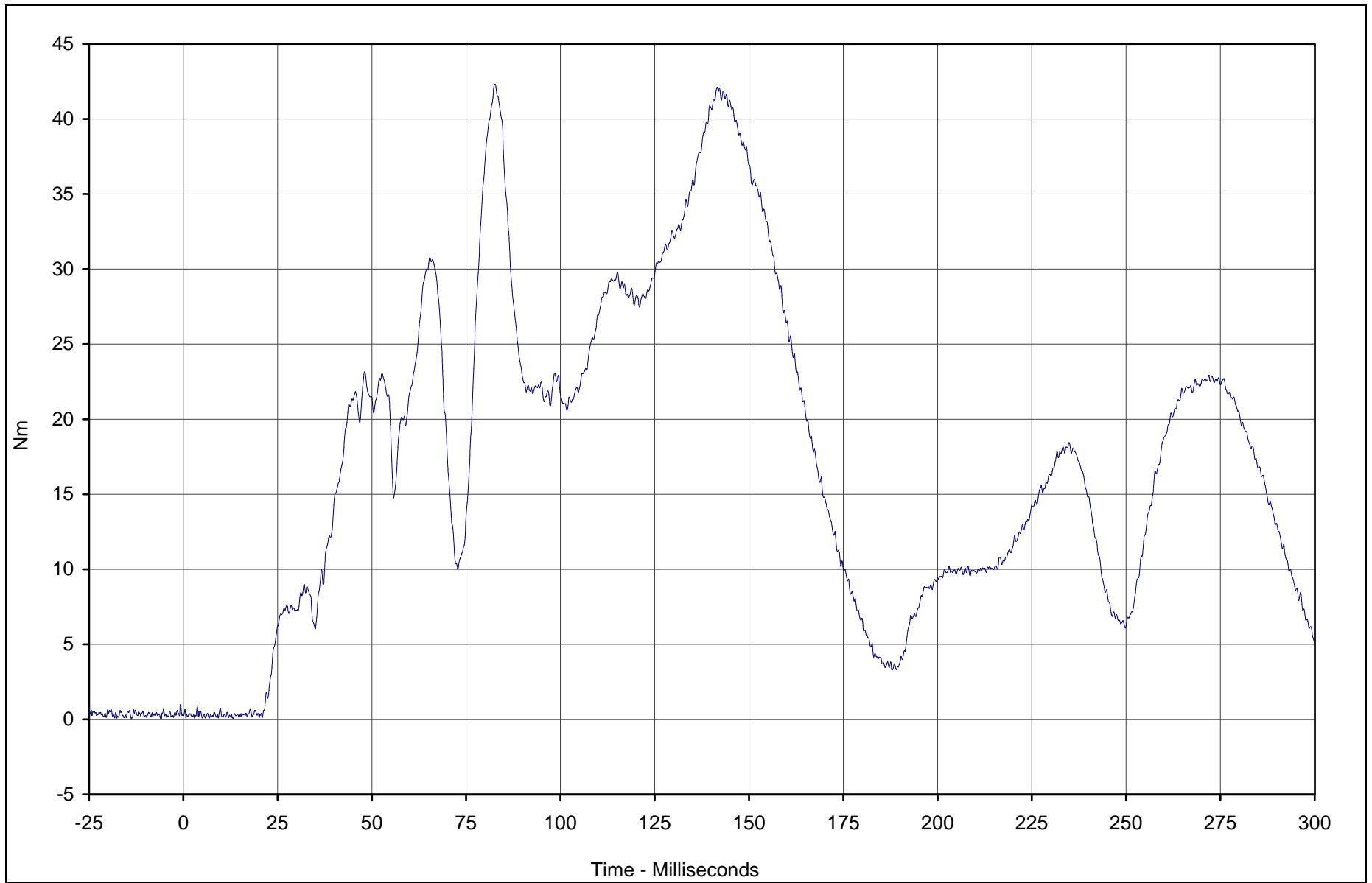
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-81



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Neck Moment Resultant	054	RES	Nm	42.3	82.7	0.1	13.3	600

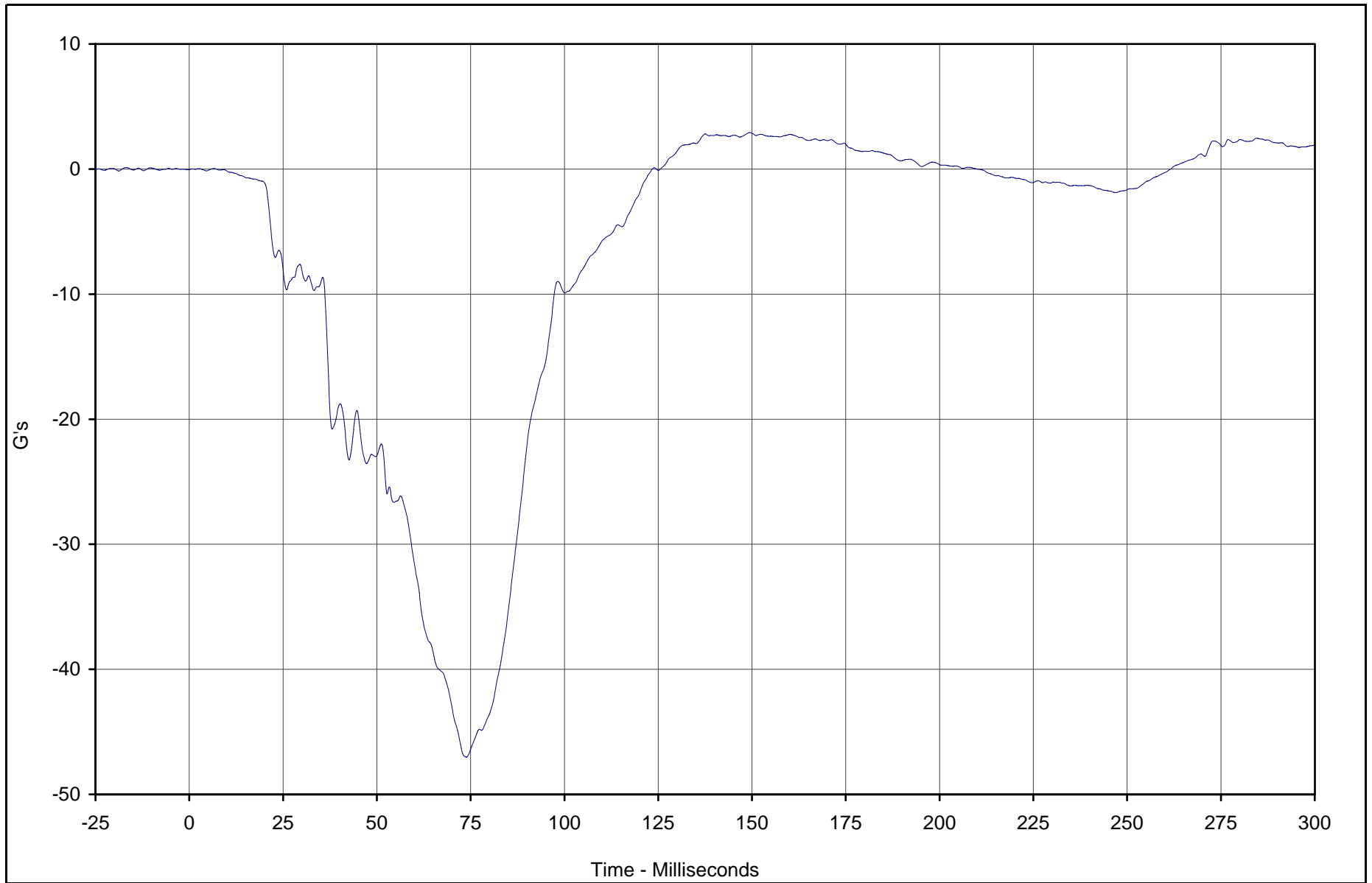


Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02
NHTSA No.: M20503

KAR22001-18

B-82



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X	057	FIL	G's	2.9	149.4	-47.0	73.9	180



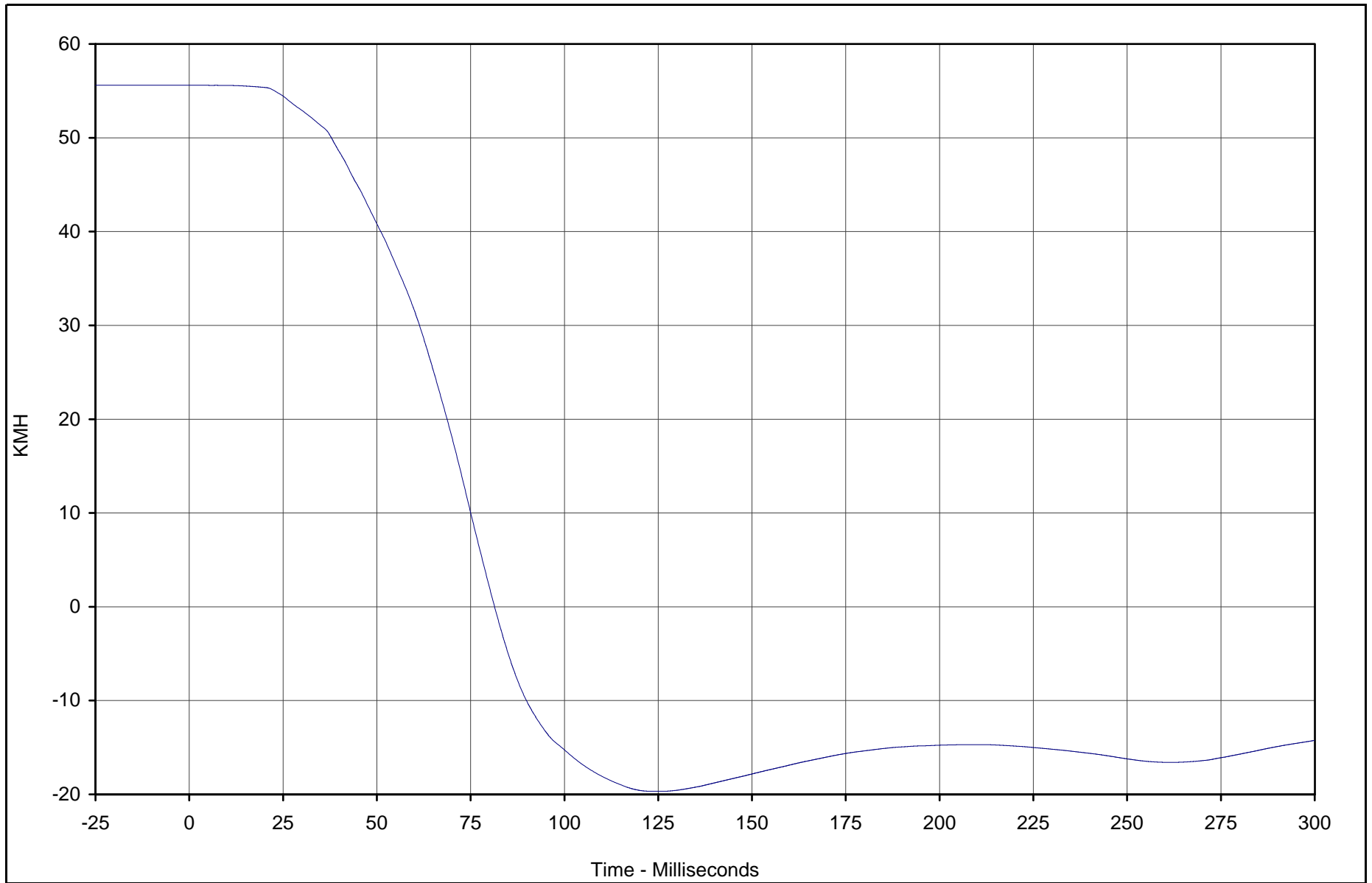
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-83



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X Velocity	057	IN1	KMH	55.6	3.1	-19.7	123.4	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

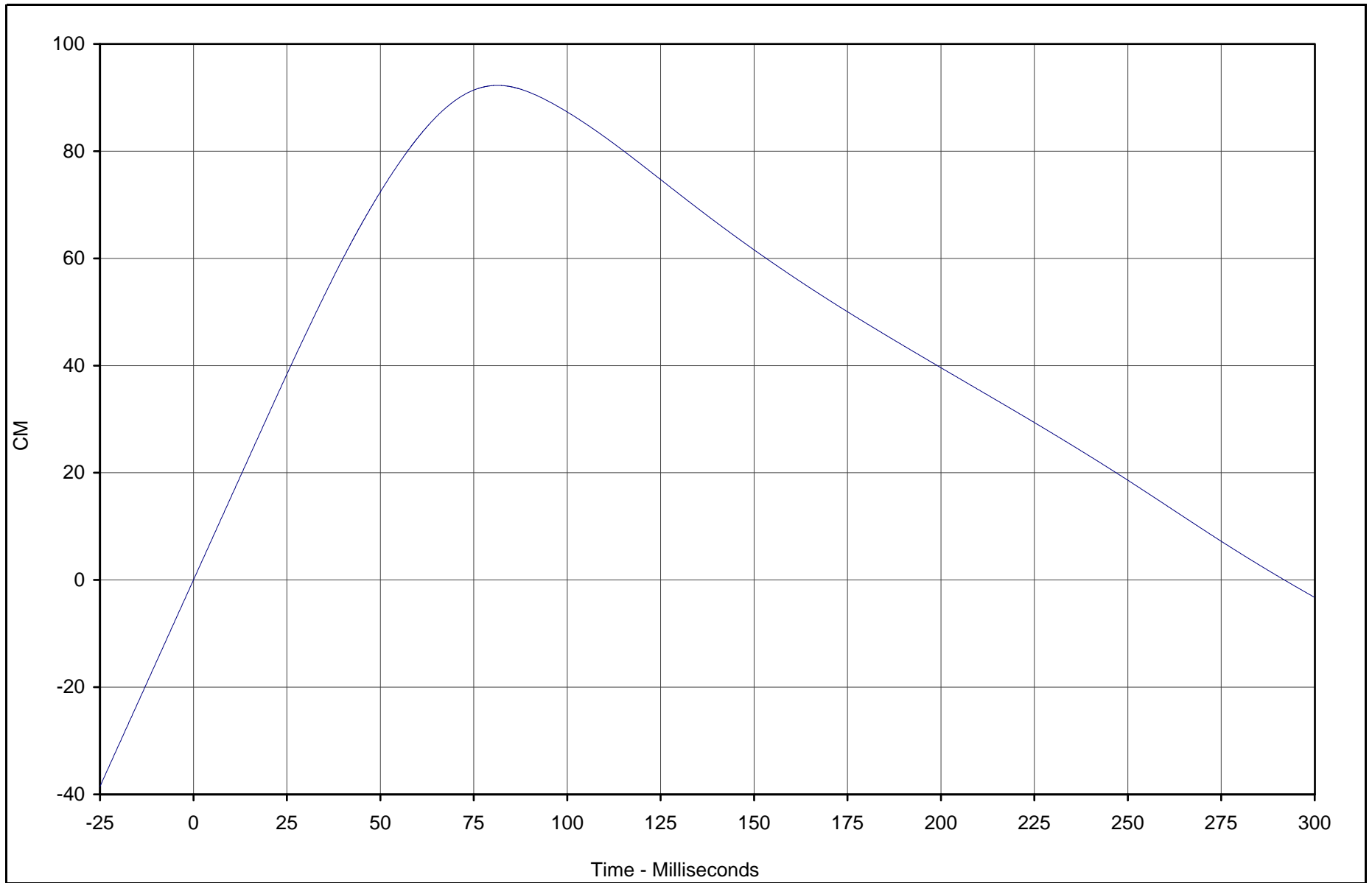
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-84



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary X Displ.	057	IN2	CM	92.3	81.4	-3.2	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

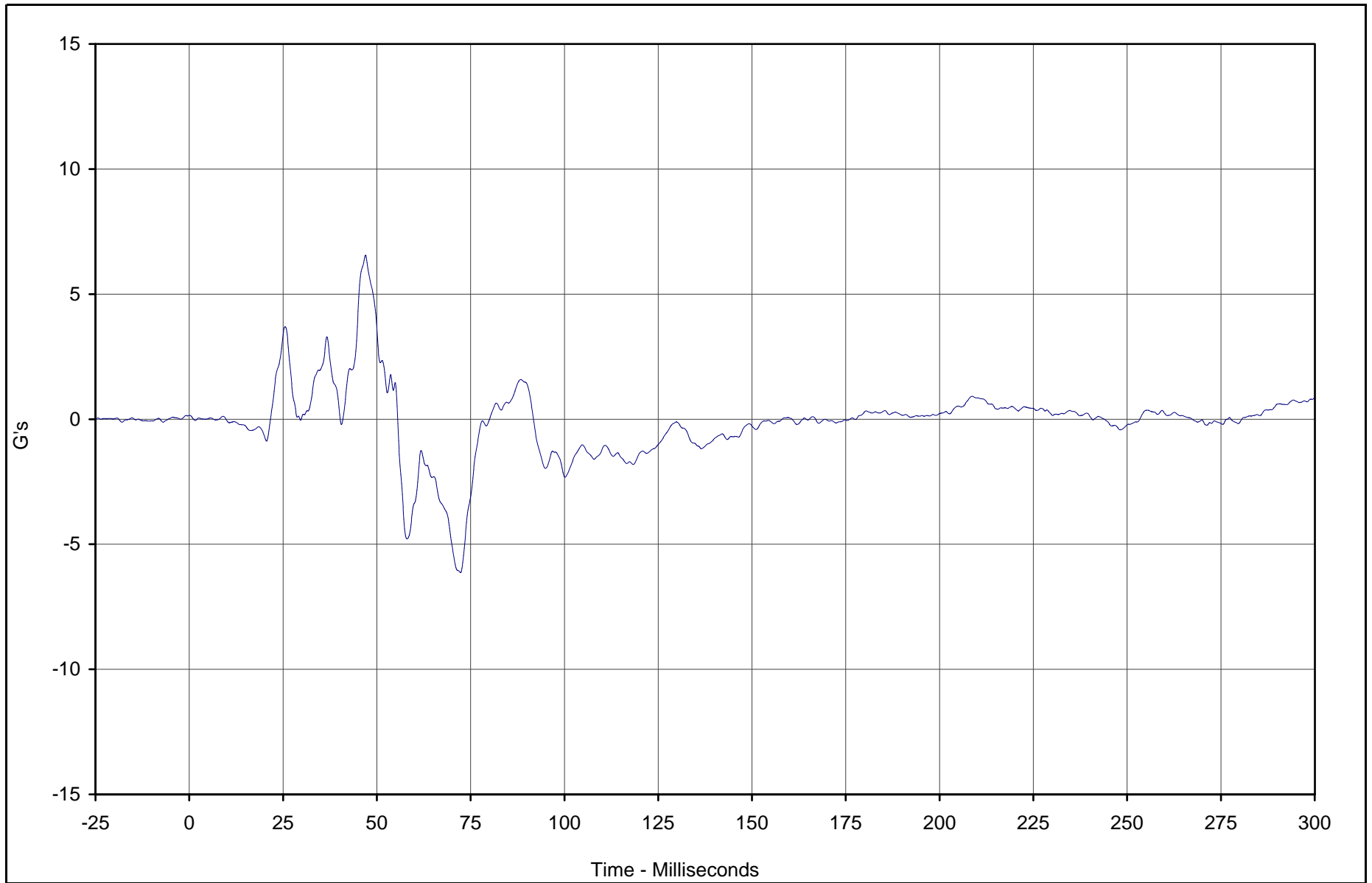
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-85



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary Y	058	FIL	G's	6.6	47.0	-6.1	72.3	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

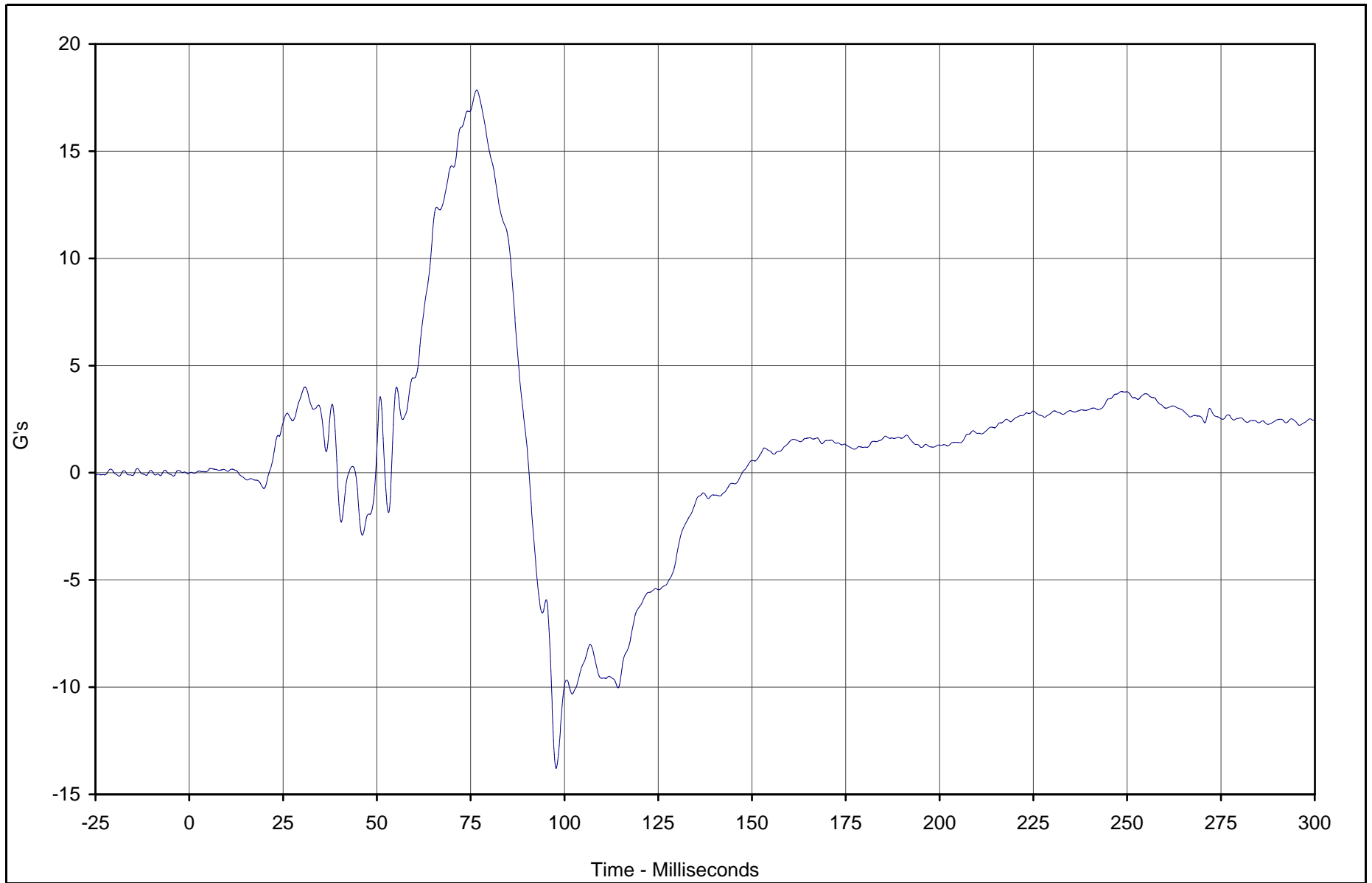
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-86



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Primary Z	059	FIL	G's	17.9	76.6	-13.8	97.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

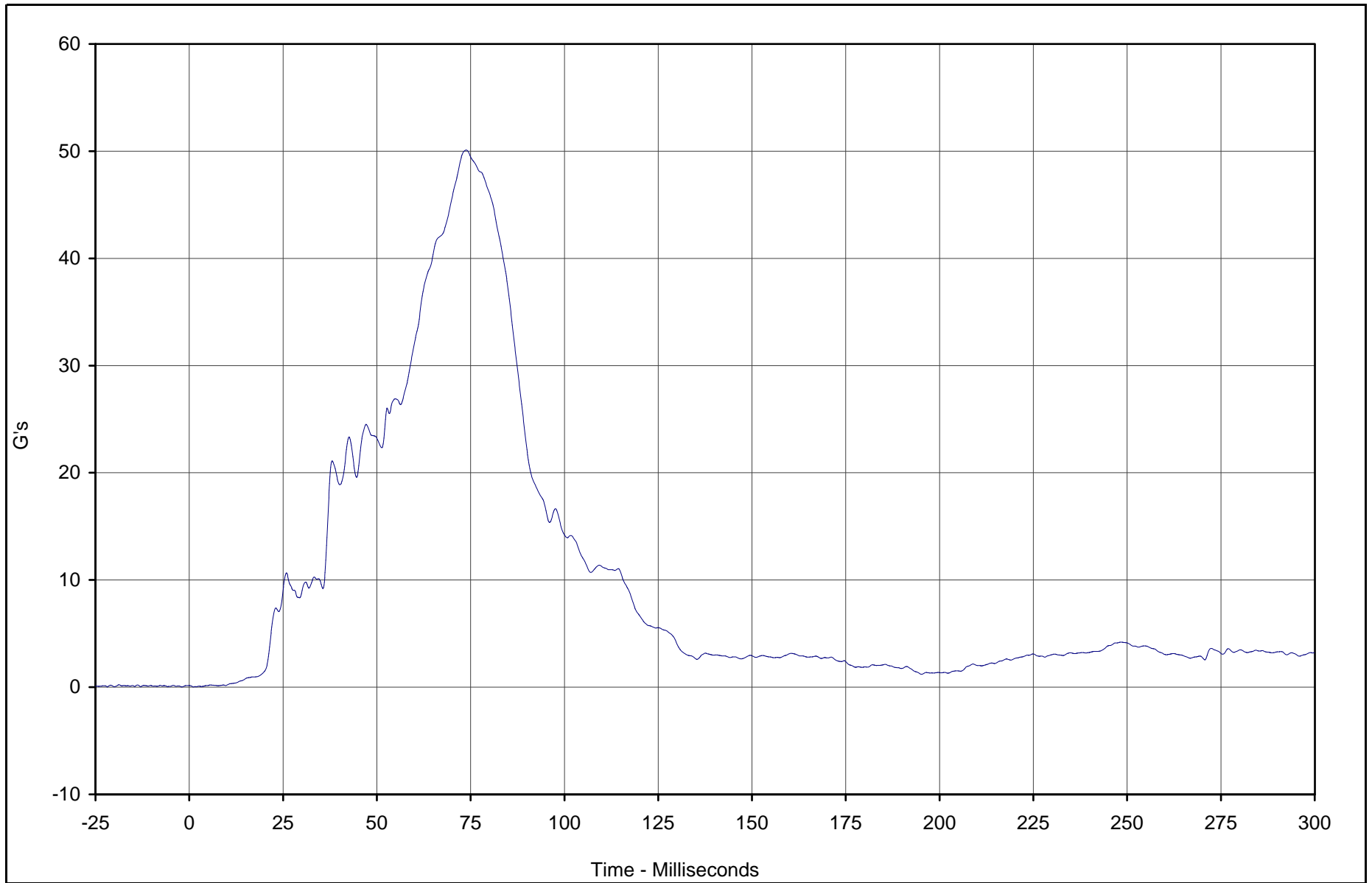
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-87



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Resultant Primary	057	RES	G's	50.1	73.9	0.0	1.1	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

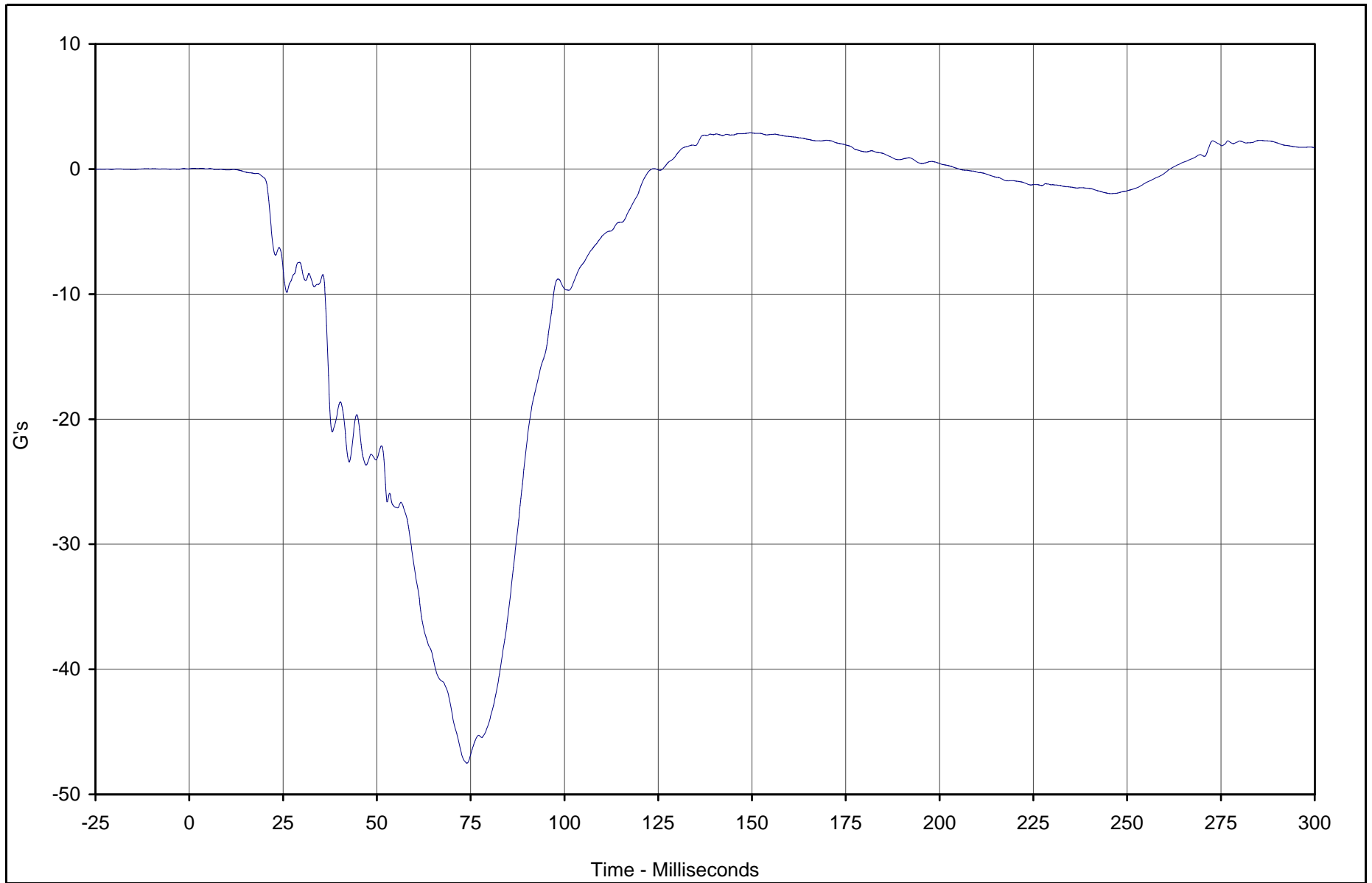
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-88



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X	060	FIL	G's	2.9	149.6	-47.5	74.0	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

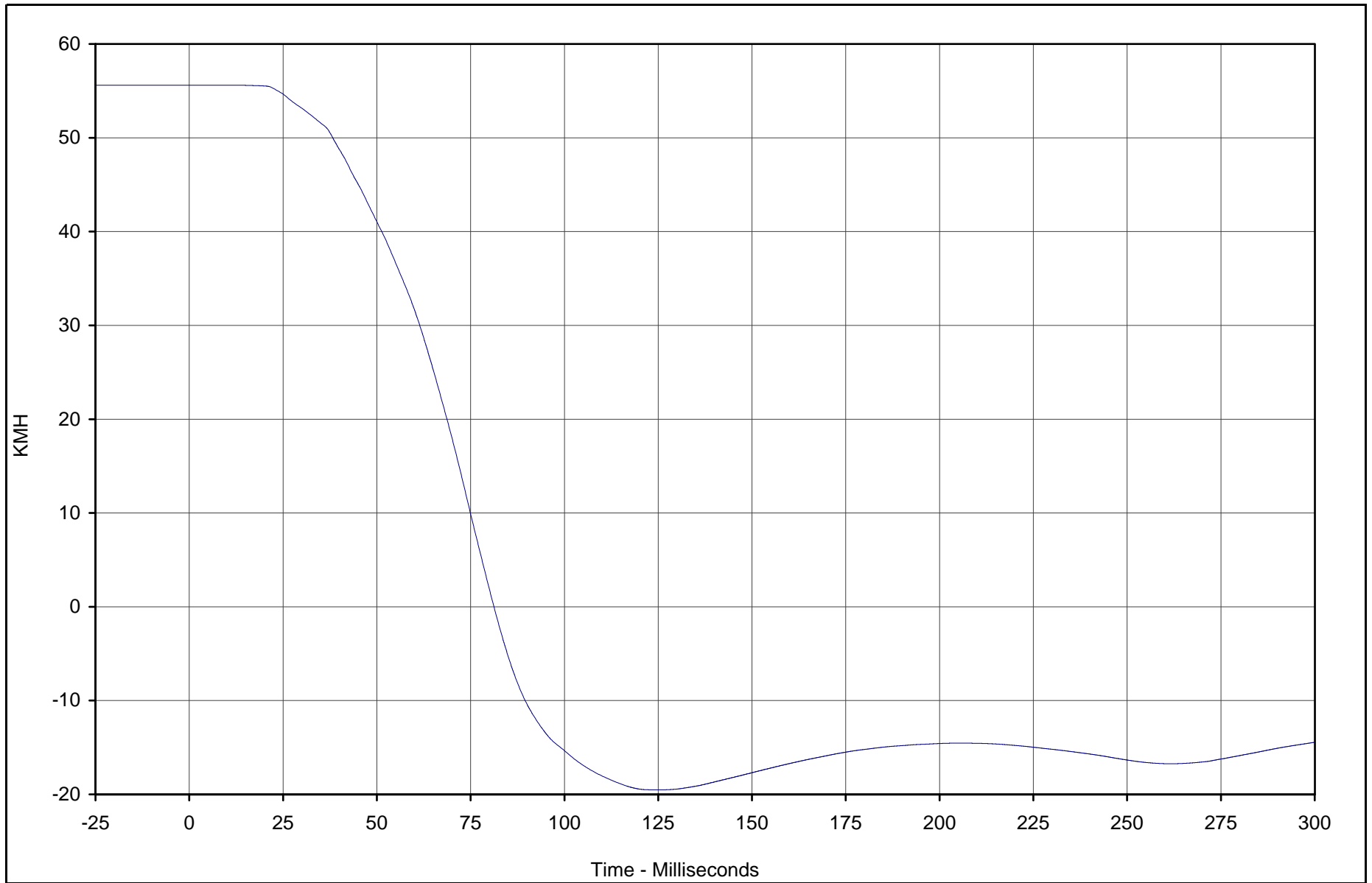
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-89



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X Velocity	060	IN1	KMH	55.6	6.3	-19.5	126.2	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

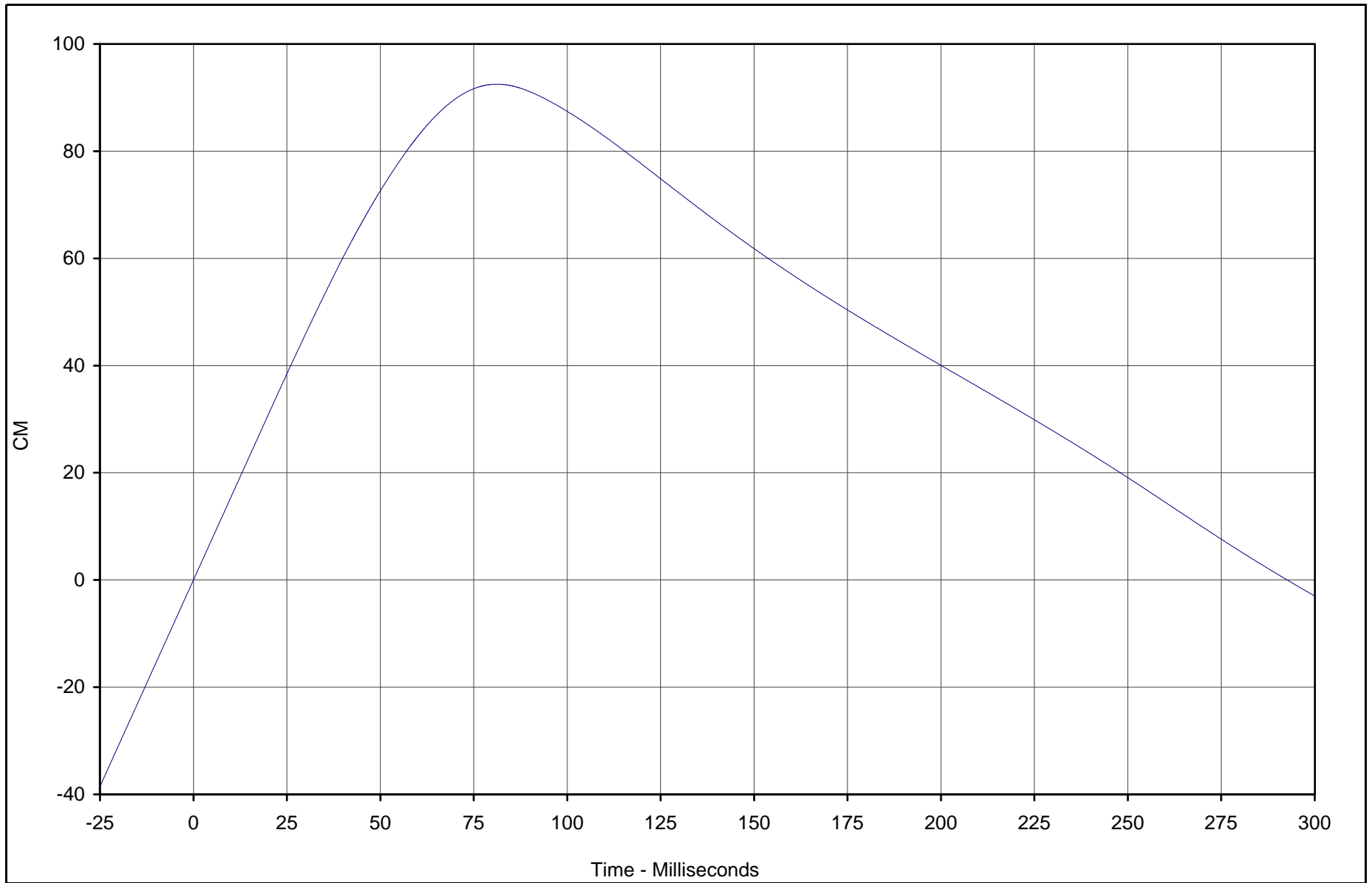
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-90



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant X Displ.	060	IN2	CM	92.5	81.2	-3.0	299.9	180



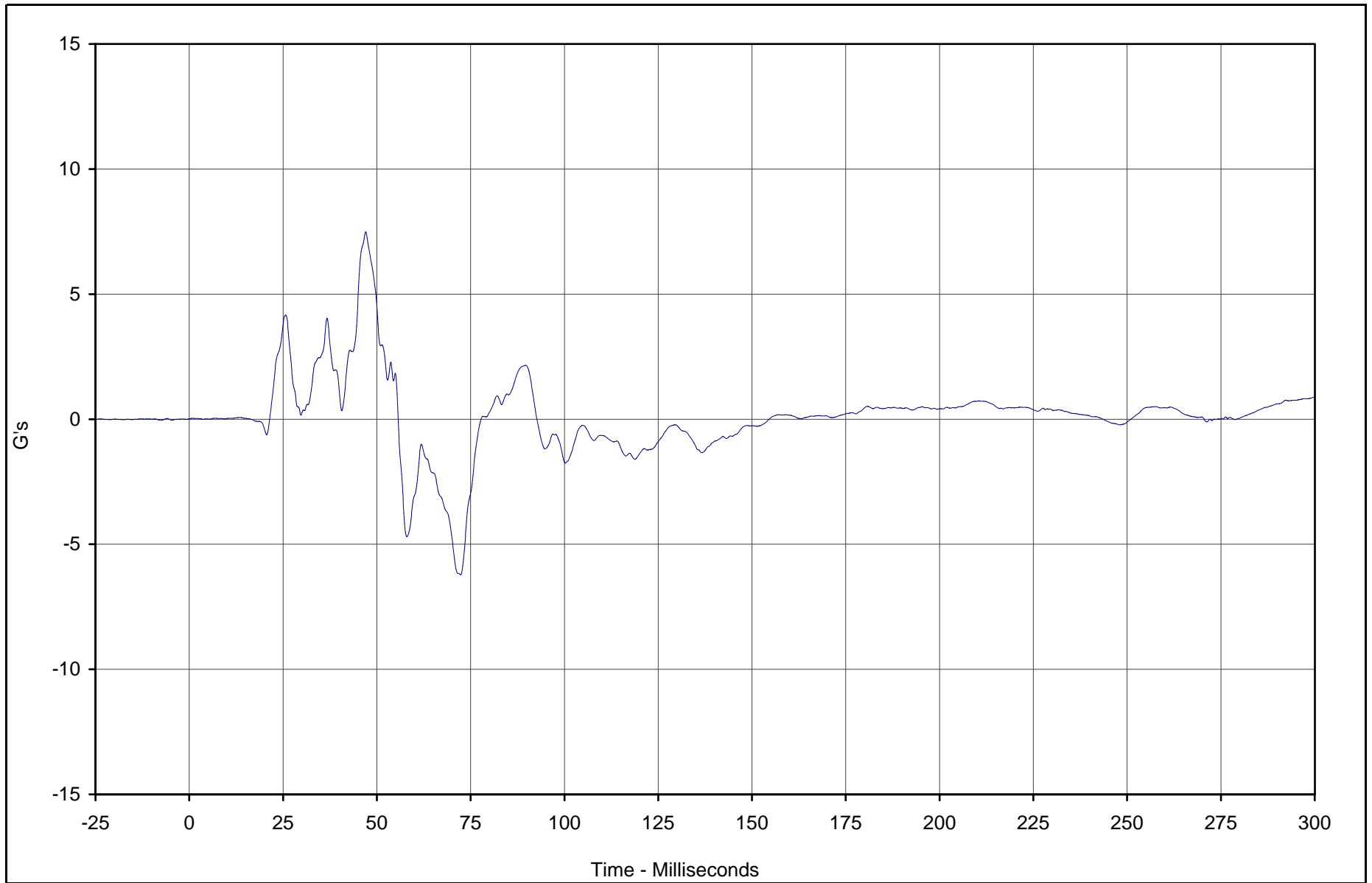
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-91



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant Y	061	FIL	G's	7.5	47.0	-6.2	72.3	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

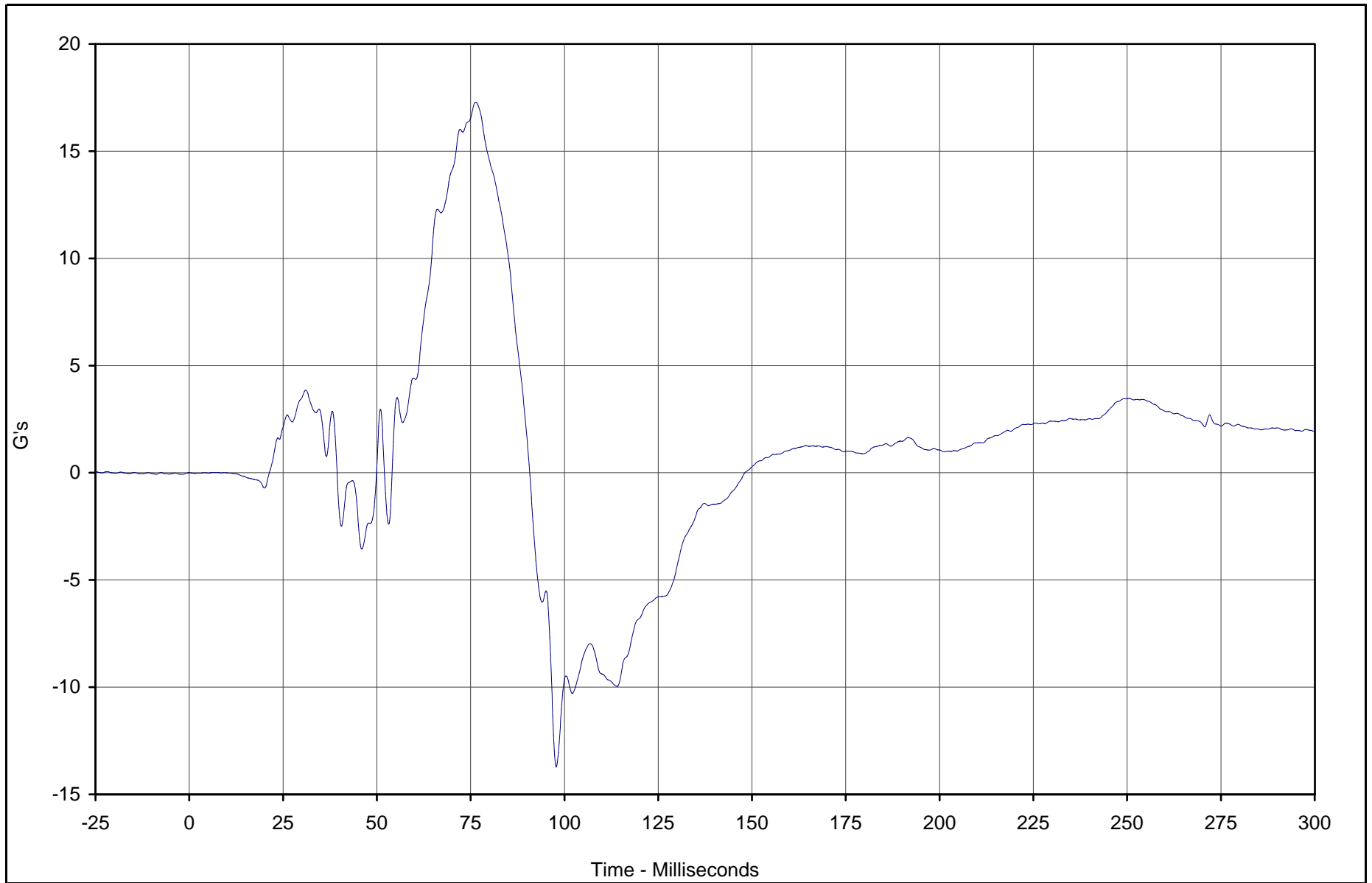
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-92



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Redundant Z	062	FIL	G's	17.3	76.3	-13.7	97.8	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

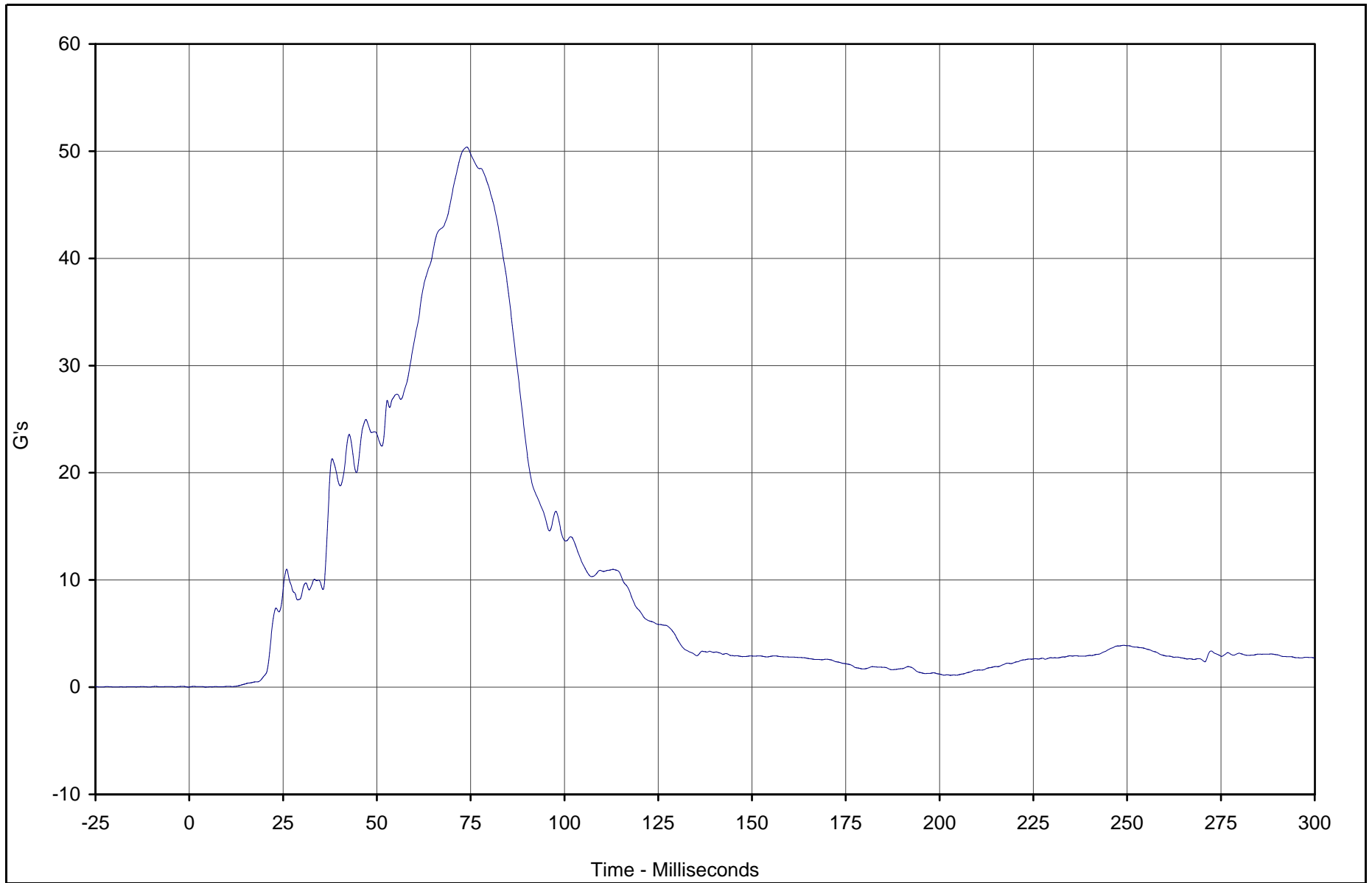
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-93



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Resultant Redundant	060	RES	G's	50.4	74.0	0.0	4.4	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

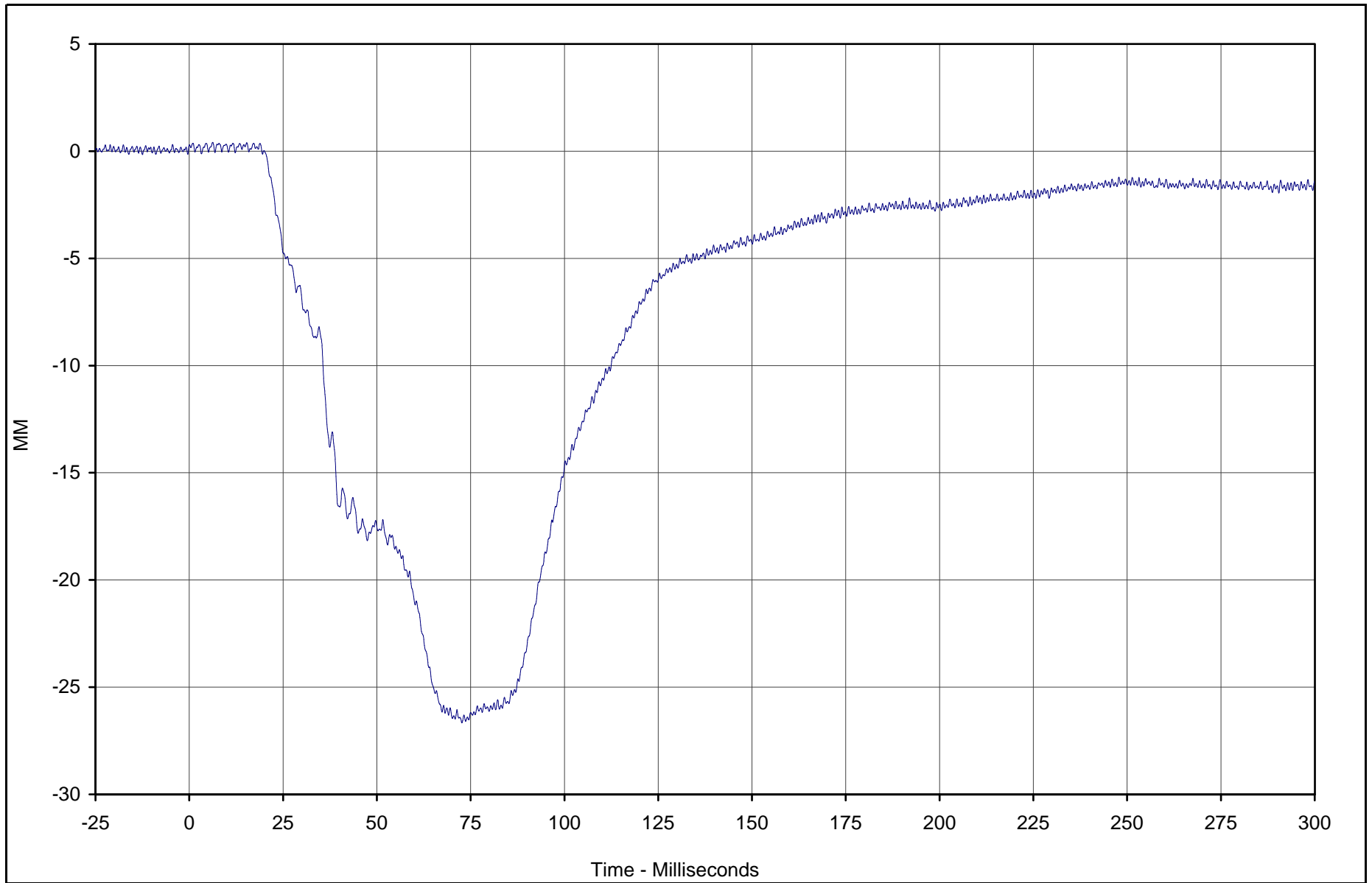
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-94



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Chest Displacement X	063	FIL	MM	0.4	6.2	-26.7	72.7	600



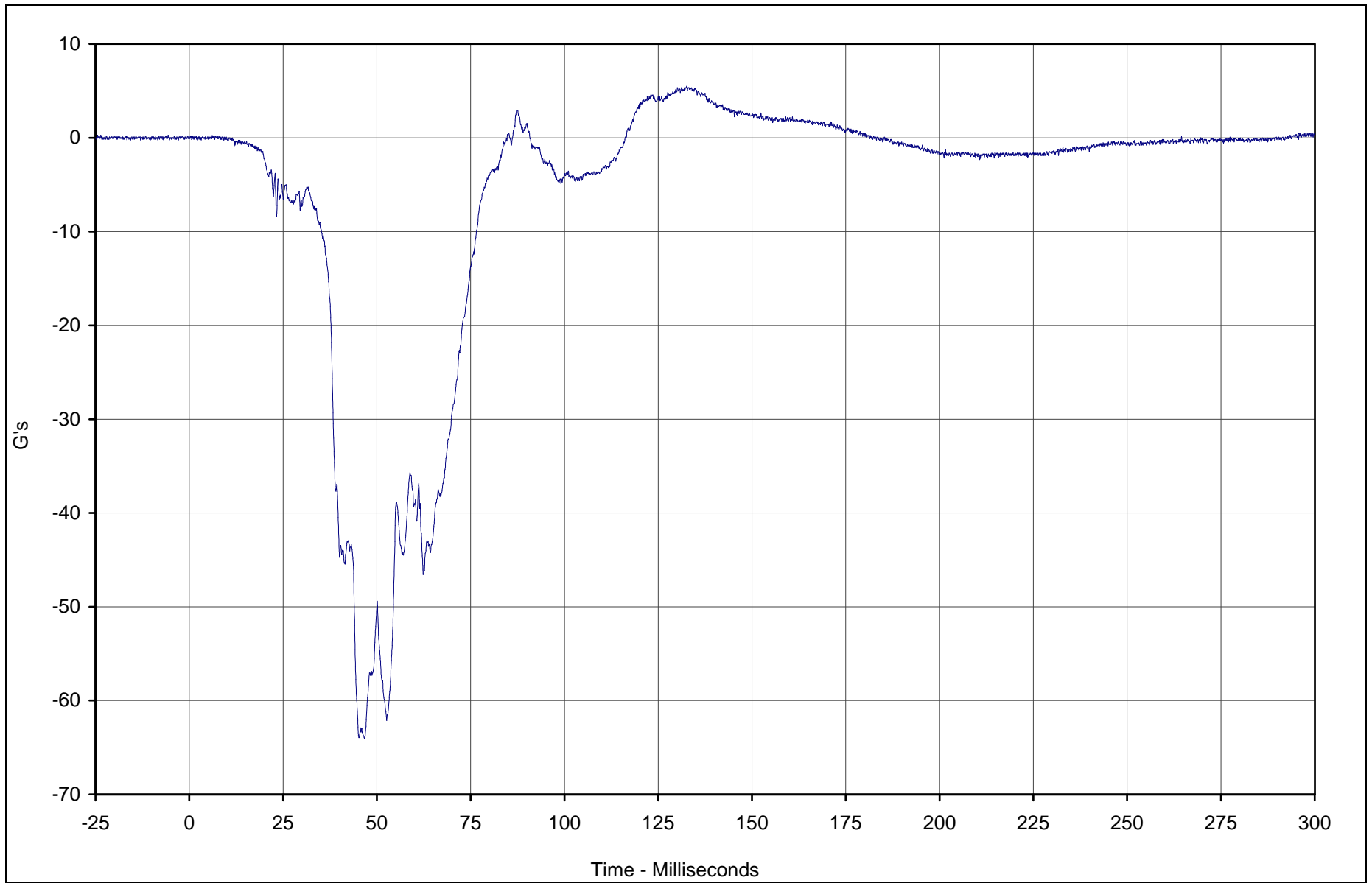
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-95



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X	064	FIL	G's	5.5	132.6	-64.0	46.7	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

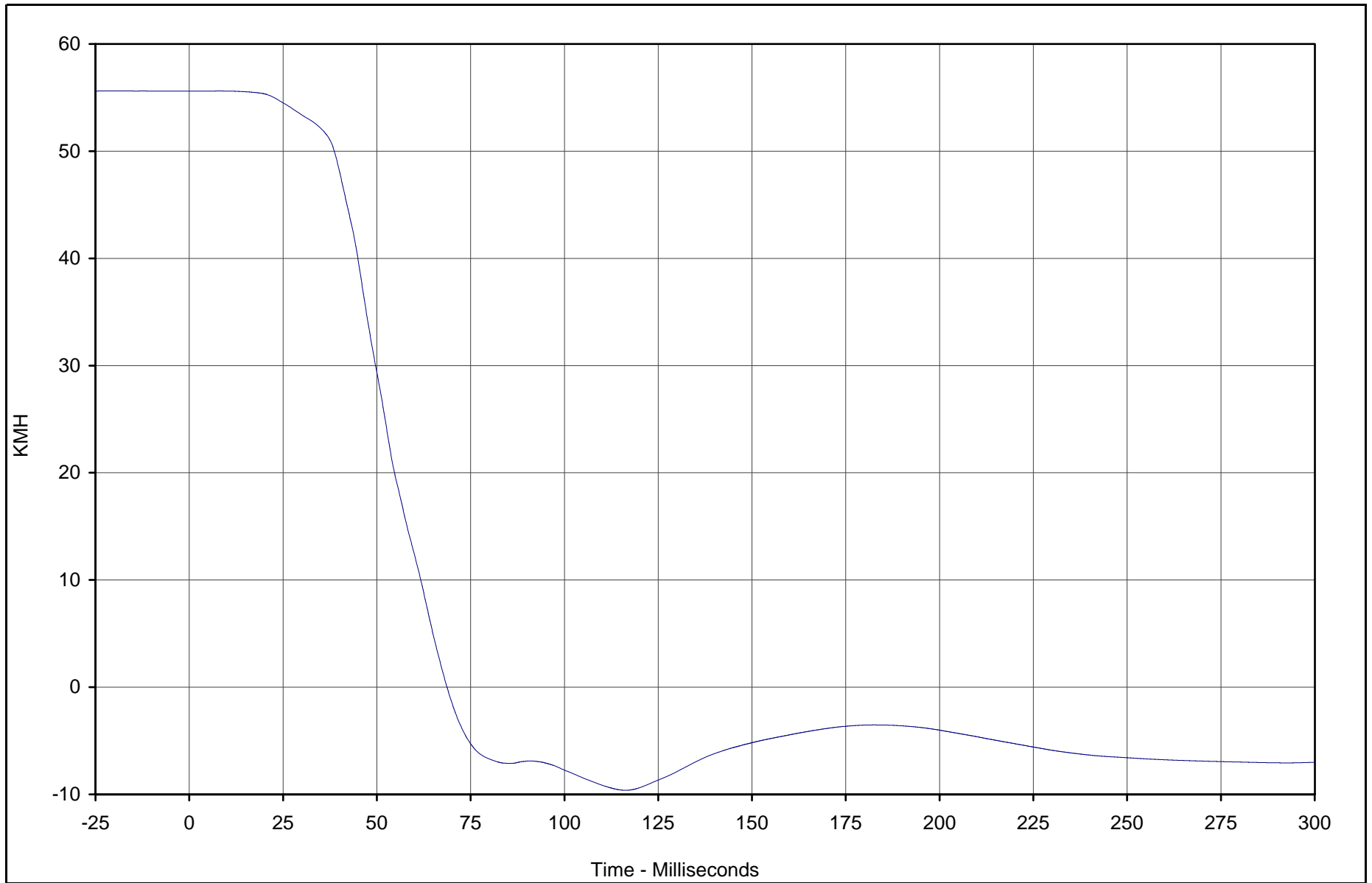
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-96



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X Velocity	064	IN1	KMH	55.6	8.1	-9.6	116.3	180



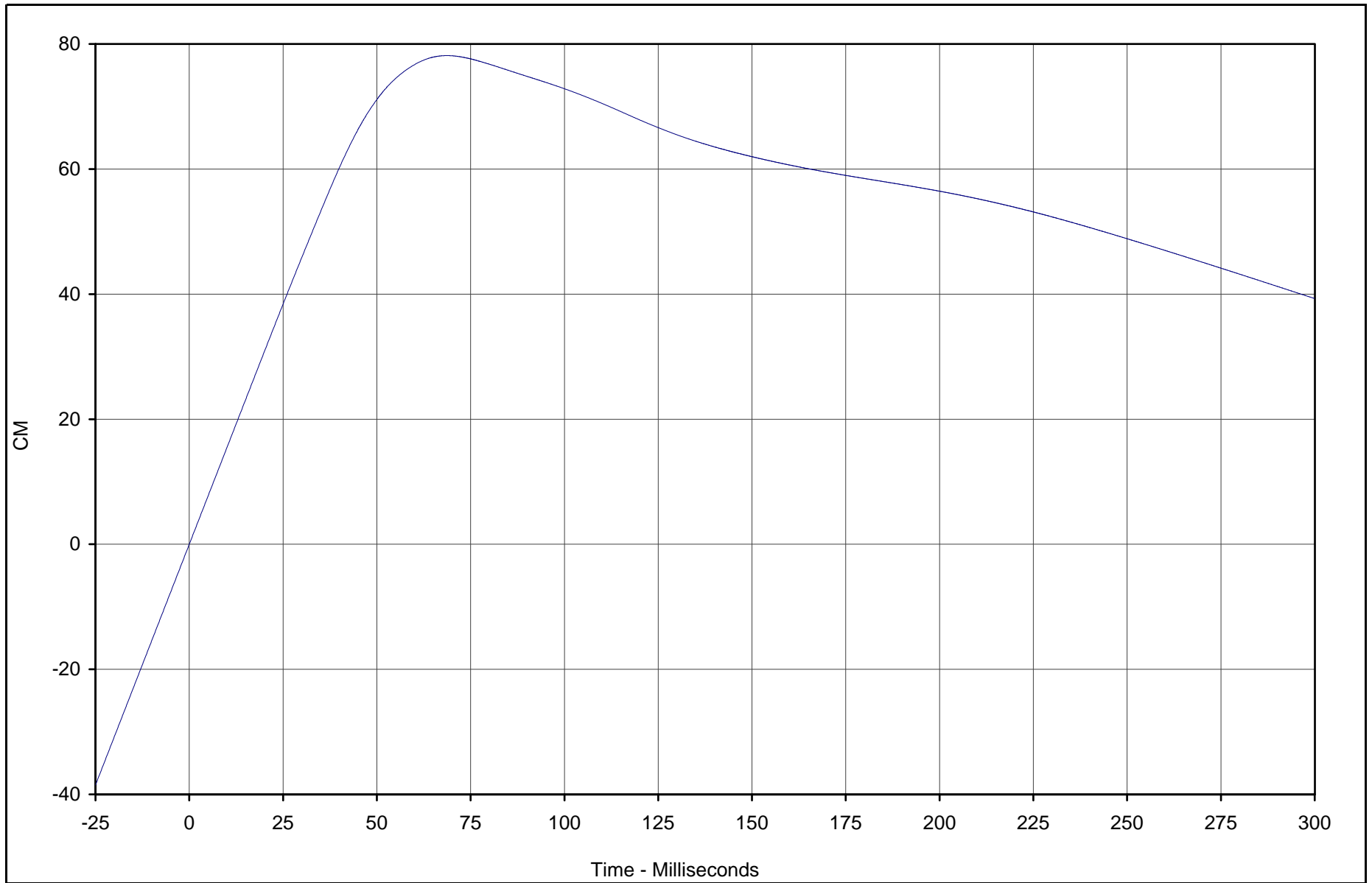
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-97



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis X Displ.	064	IN2	CM	78.1	68.7	0.0	0.0	180



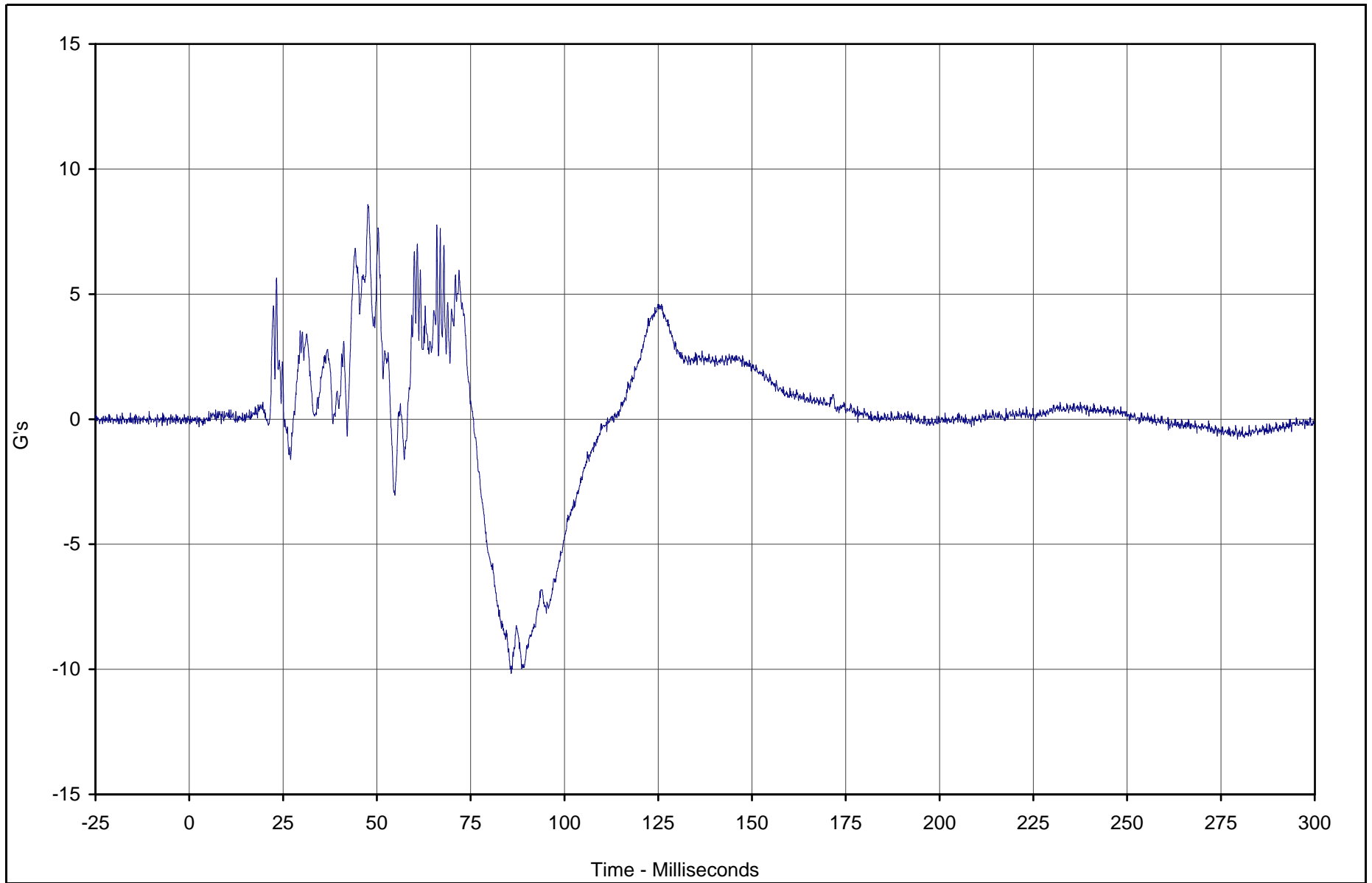
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-98



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Y	065	FIL	G's	8.6	47.6	-10.2	85.8	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

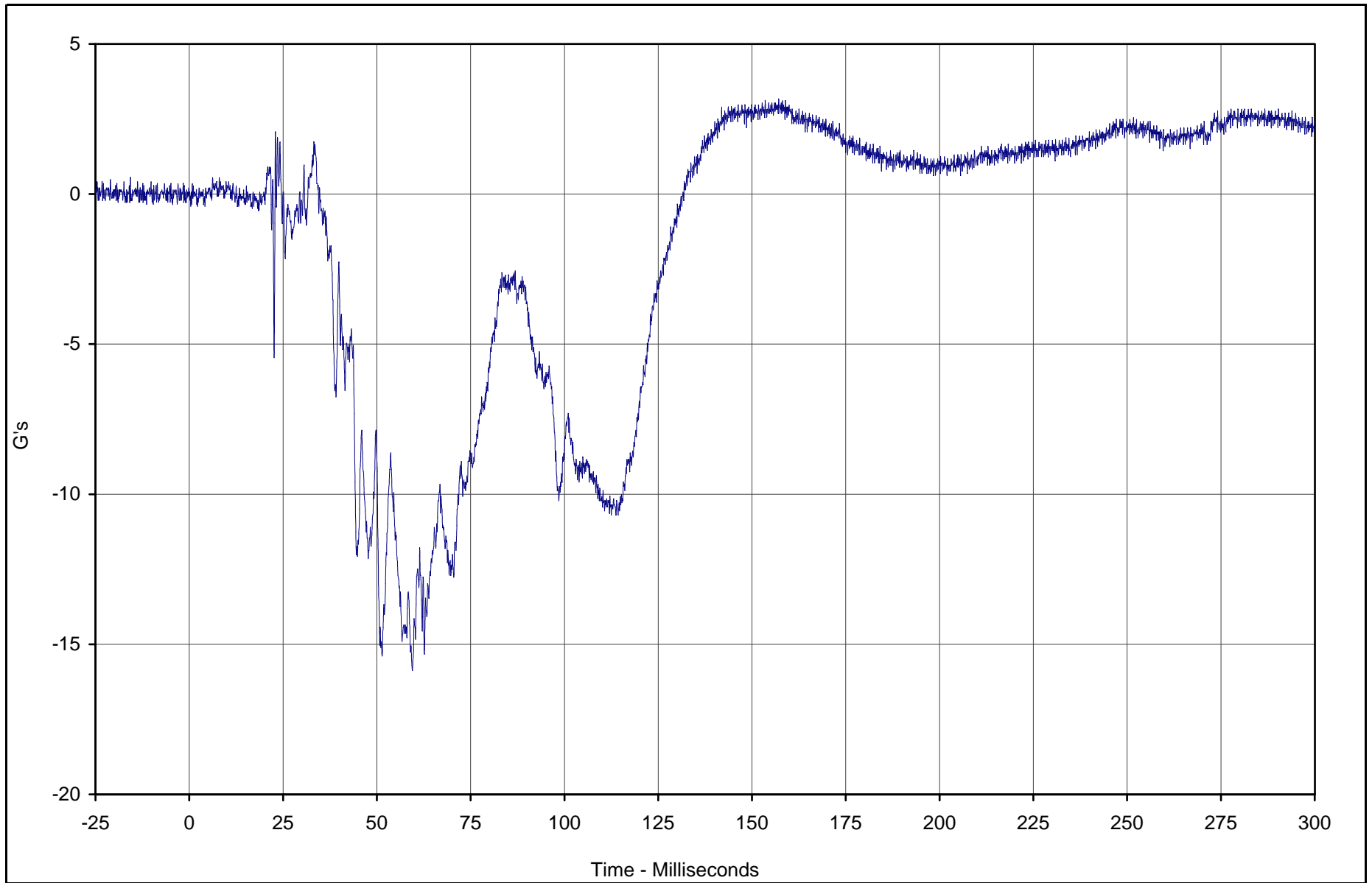
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-99



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Z	066	FIL	G's	3.2	157.1	-15.9	59.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

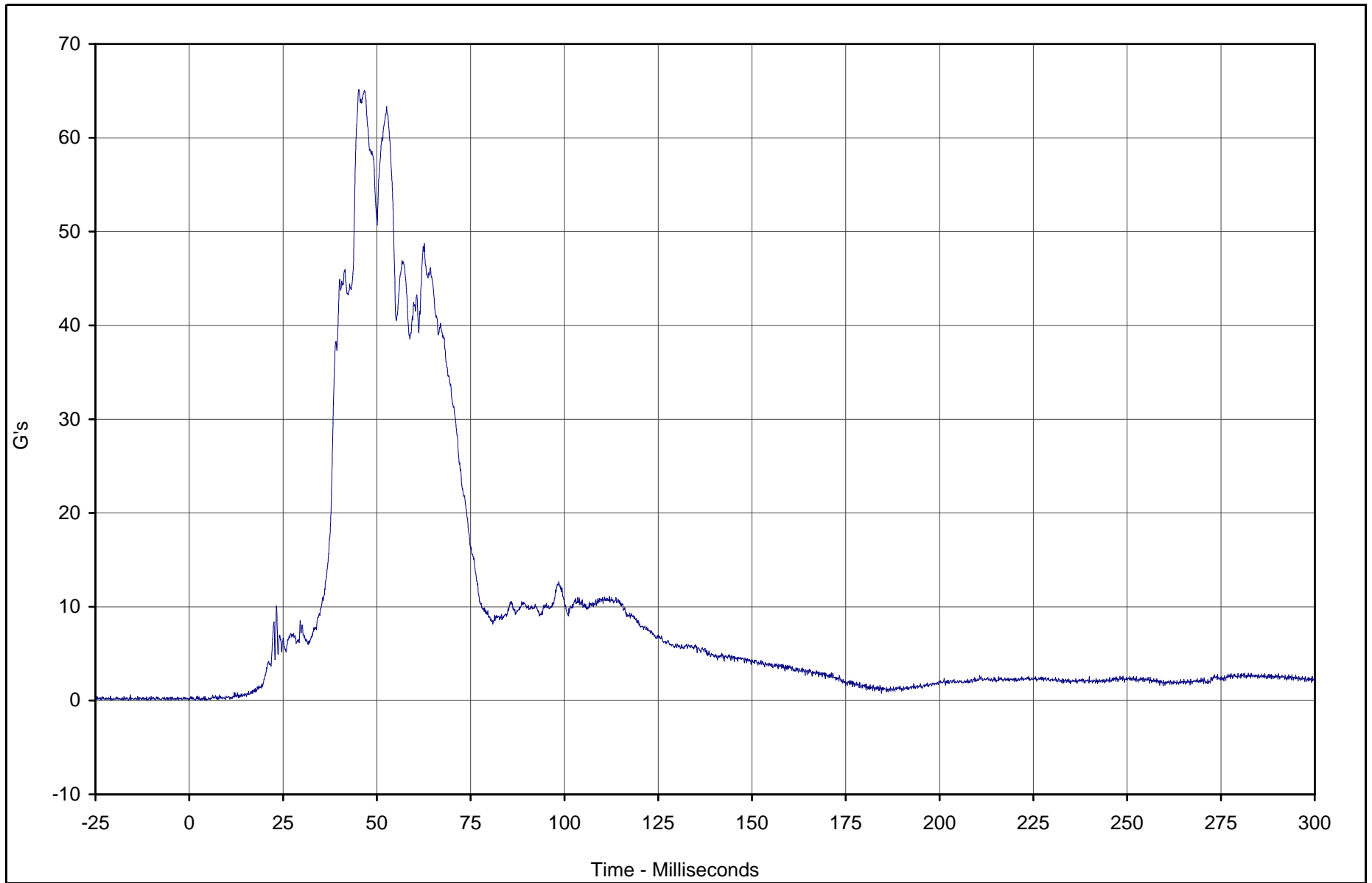
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-100



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Pelvis Resultant	066	RES	G's	65.2	45.2	0.0	1.7	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

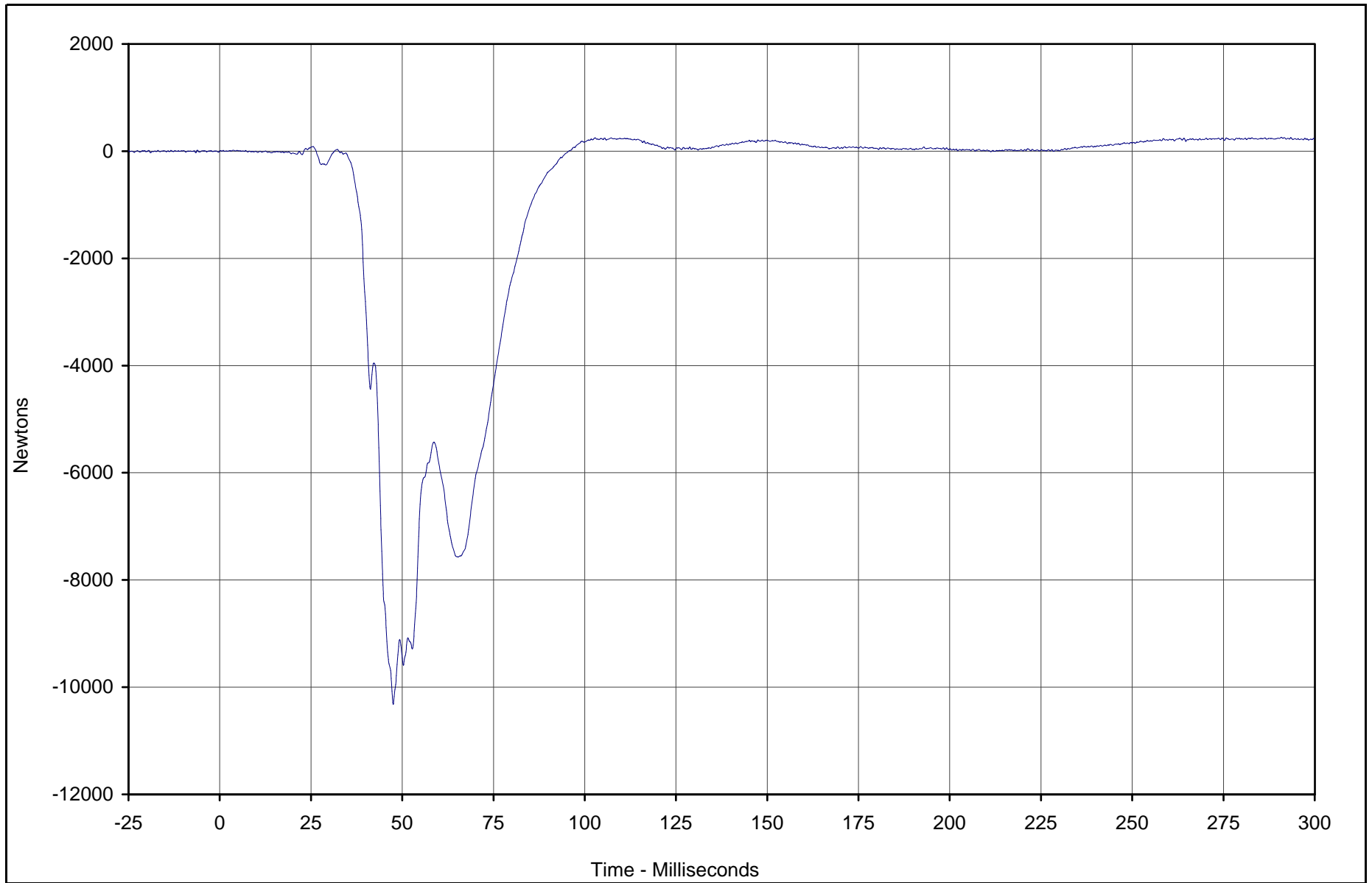
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-101



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Femur Force	067	FIL	Newtons	258.9	290.8	-10321.3	47.5	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

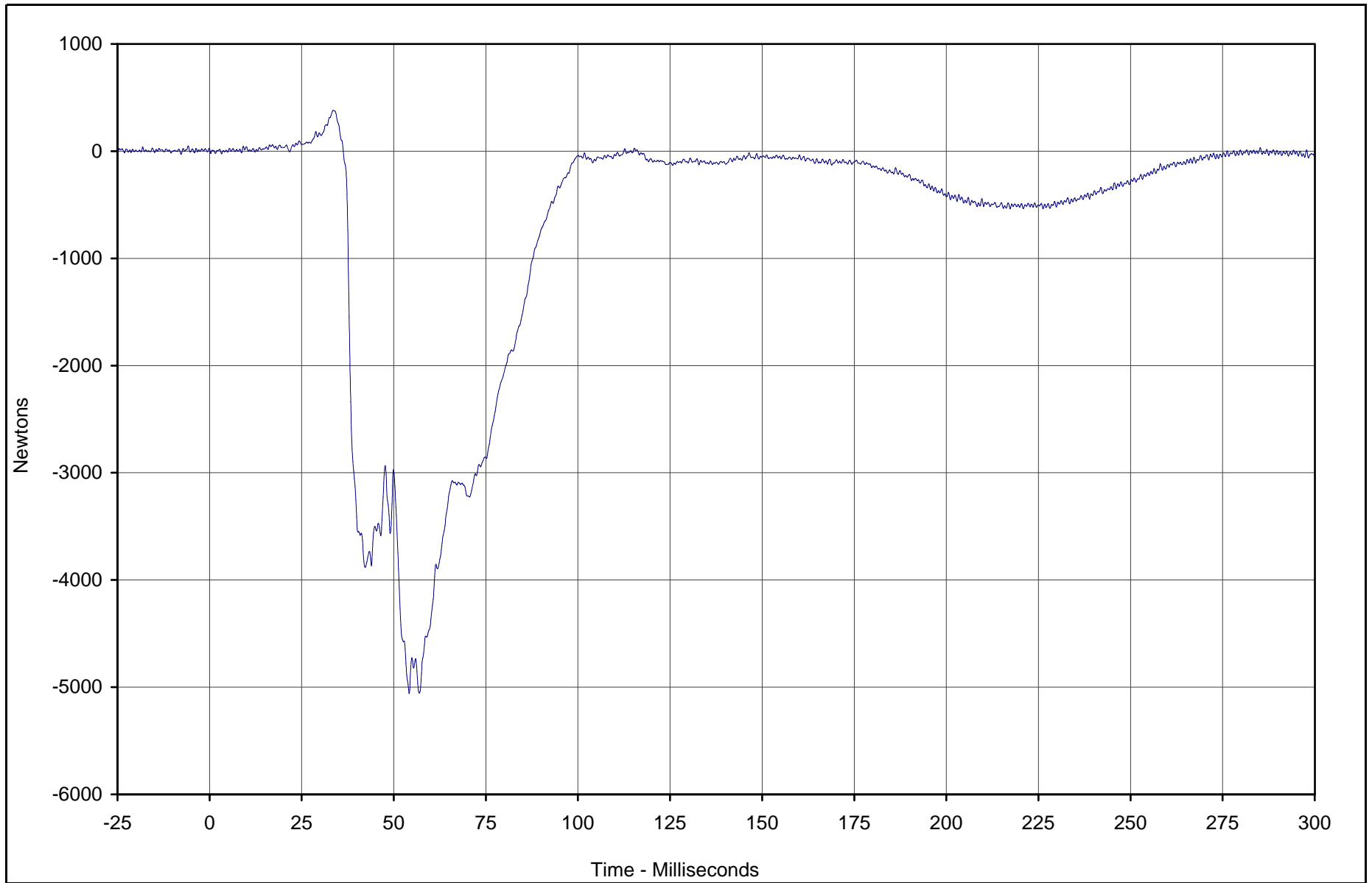
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-102



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Femur Force	068	FIL	Newtons	381.6	33.5	-5059.7	54.2	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

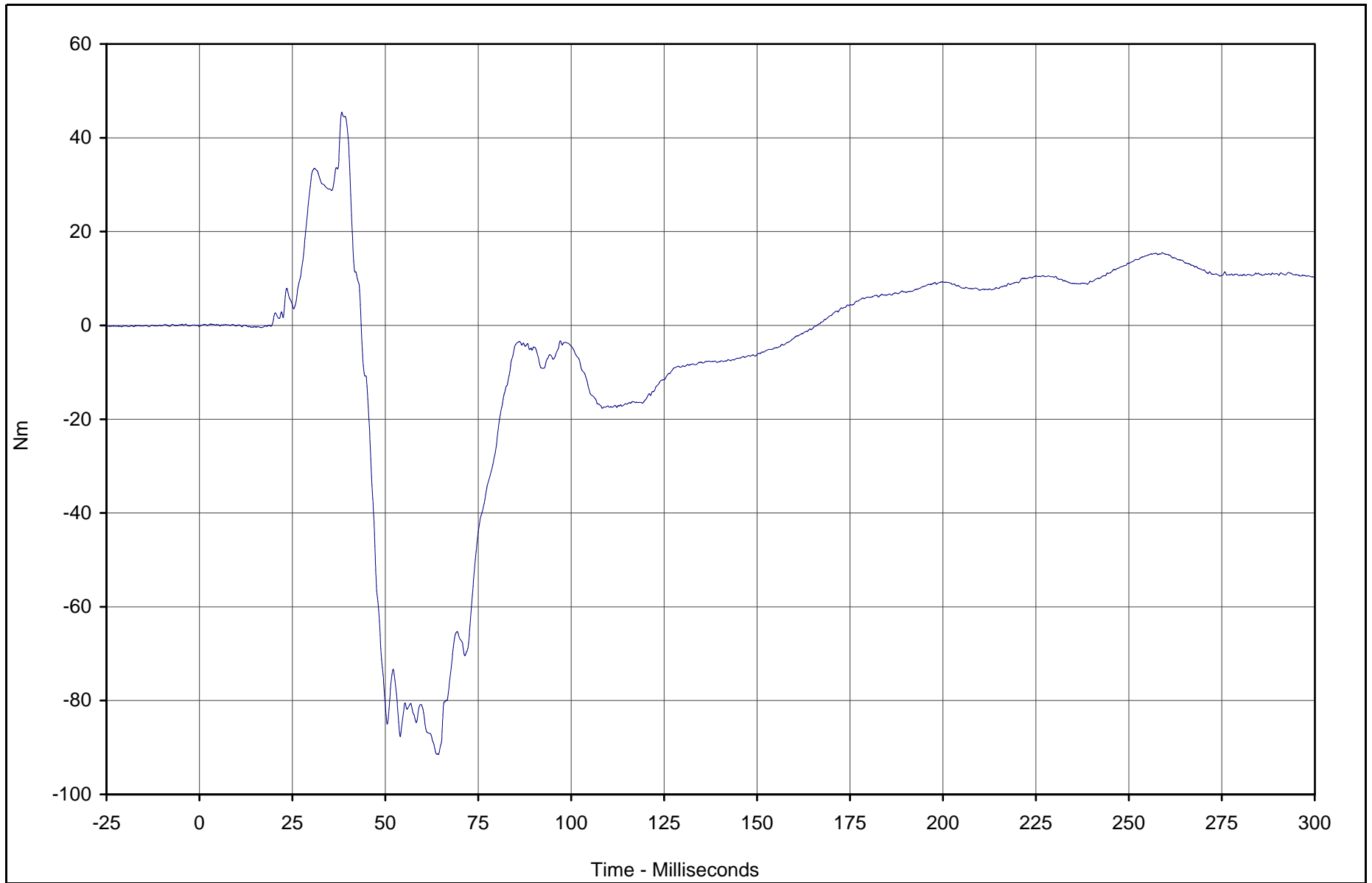
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-103



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Upper Tibia Moment X	069	FIL	Nm	45.5	38.3	-91.5	64.3	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

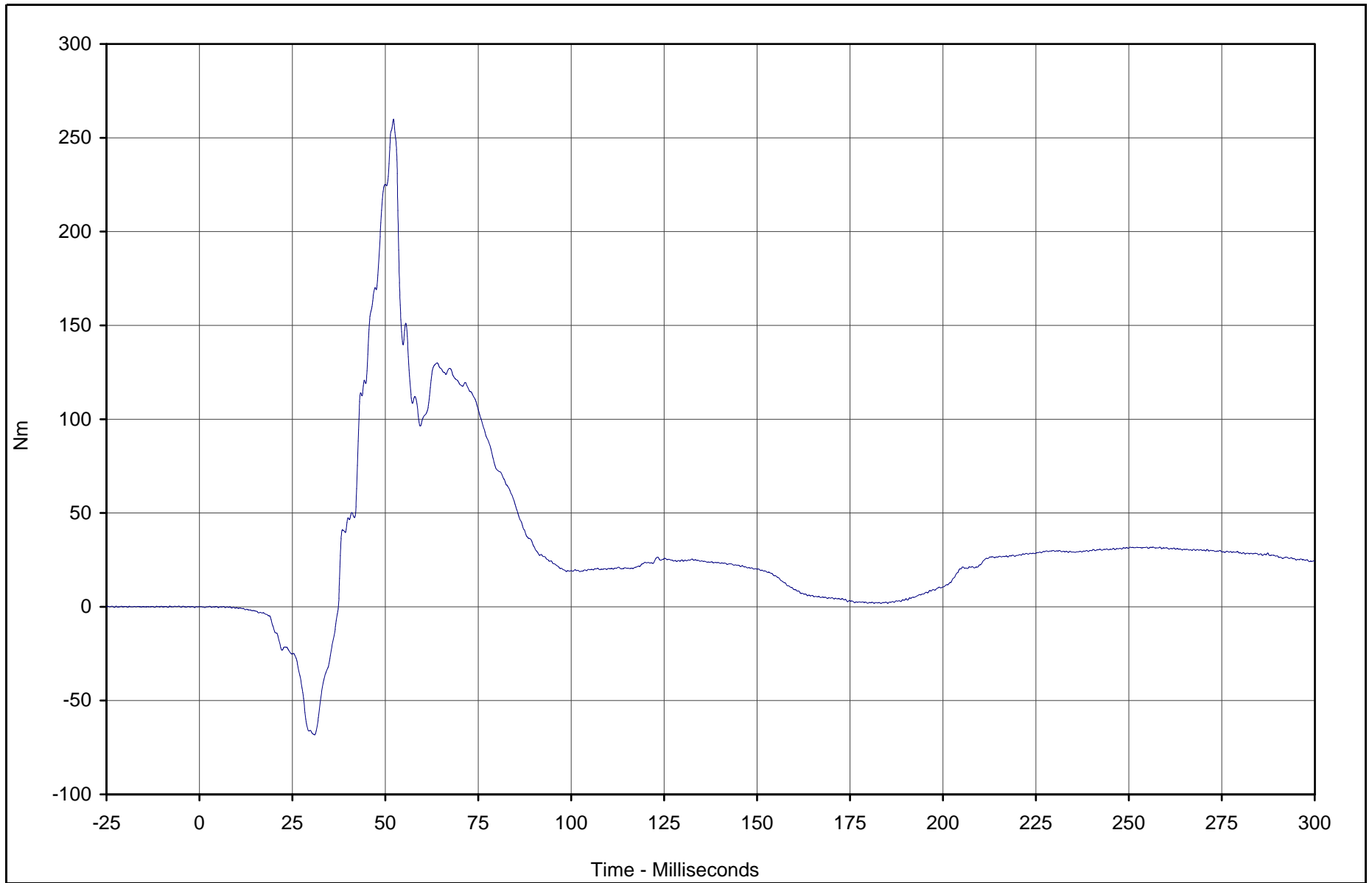
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-104



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Upper Tibia Moment Y	070	FIL	Nm	259.9	52.2	-68.2	31.0	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

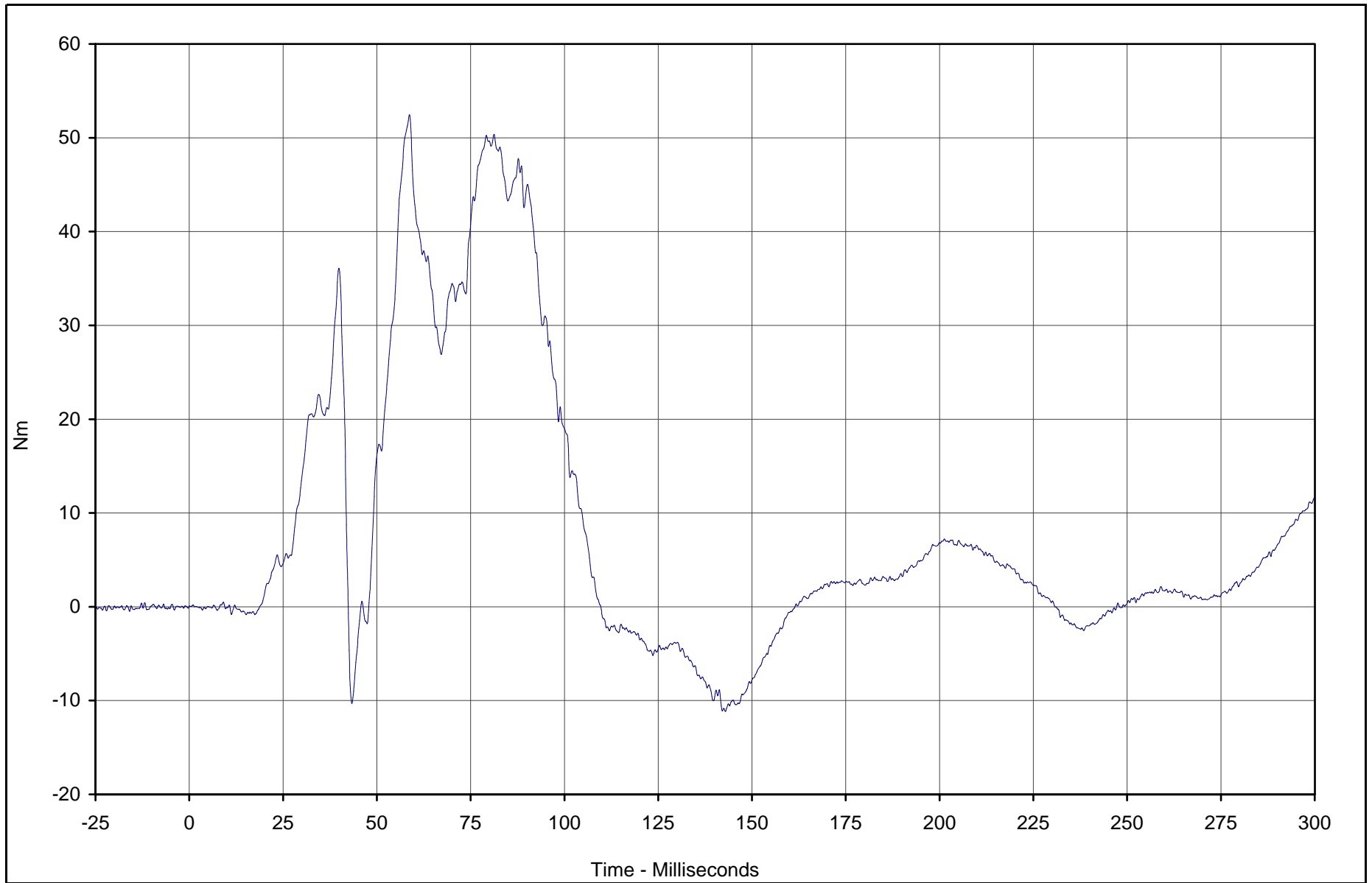
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-105



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Upper Tibia Moment X	071	FIL	Nm	52.5	58.7	-11.2	142.9	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

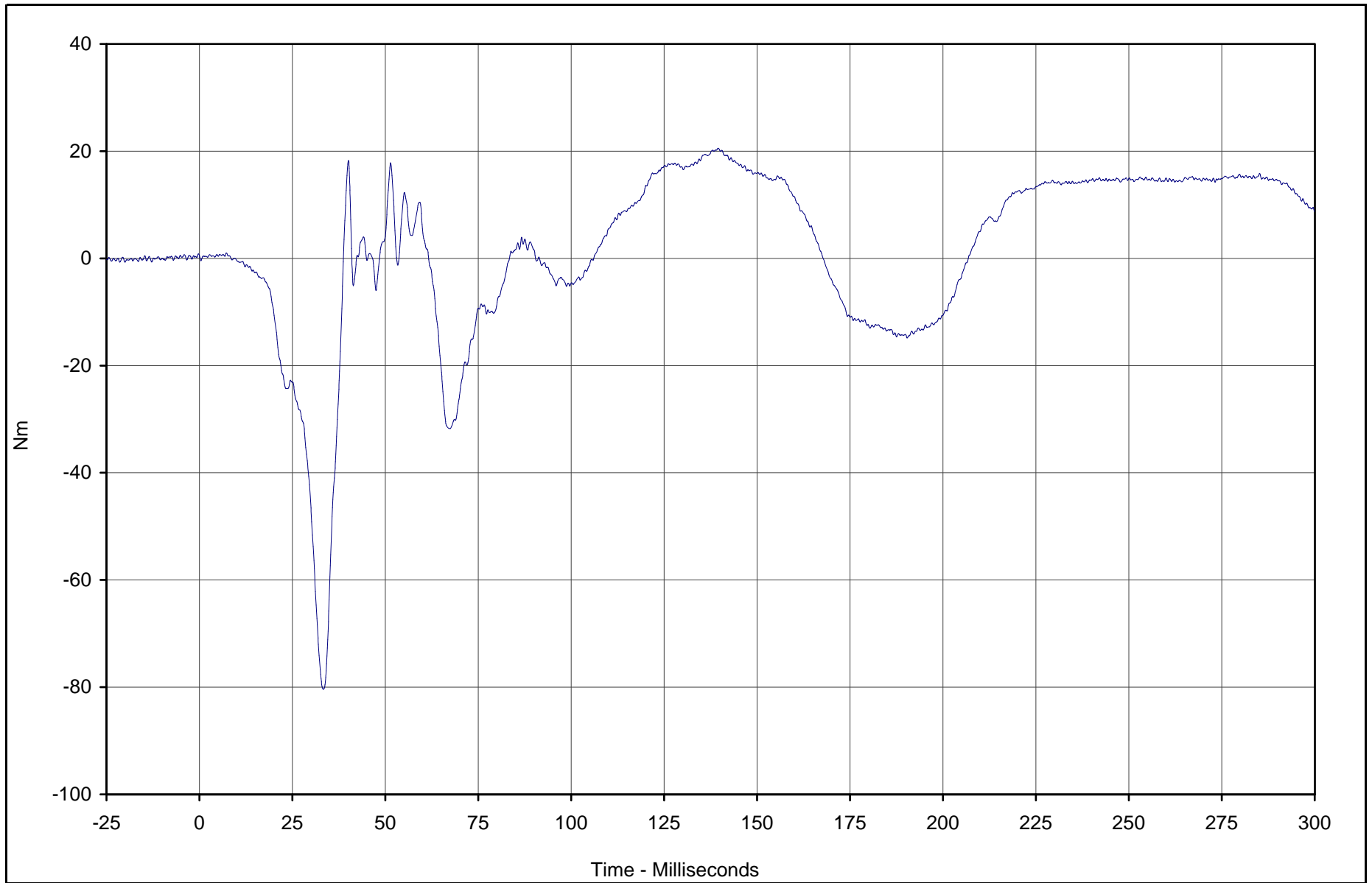
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-106



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Upper Tibia Moment Y	072	FIL	Nm	20.5	139.6	-80.4	33.3	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

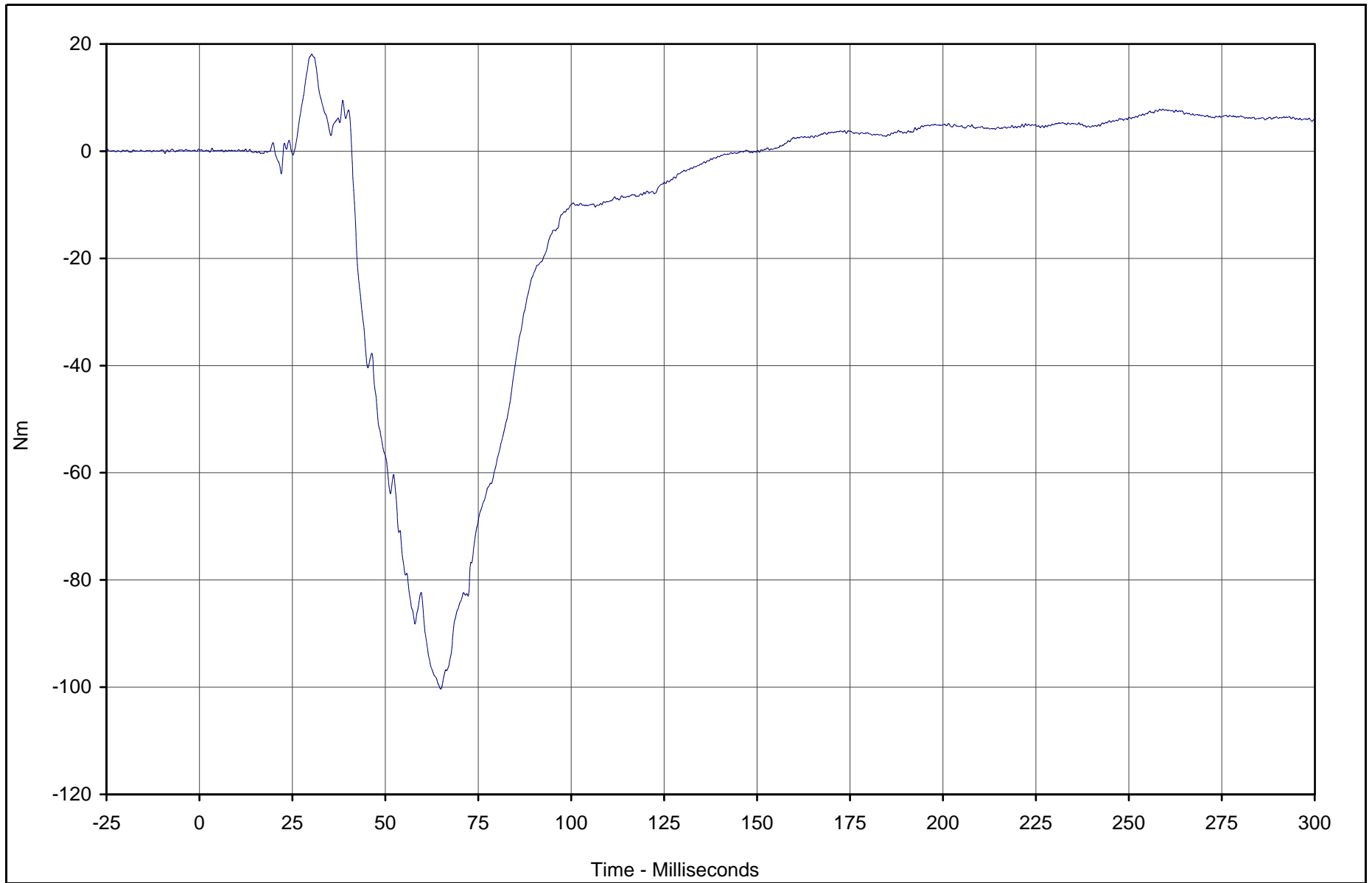
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-107



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Moment X	073	FIL	Nm	18.1	30.2	-100.3	64.9	600



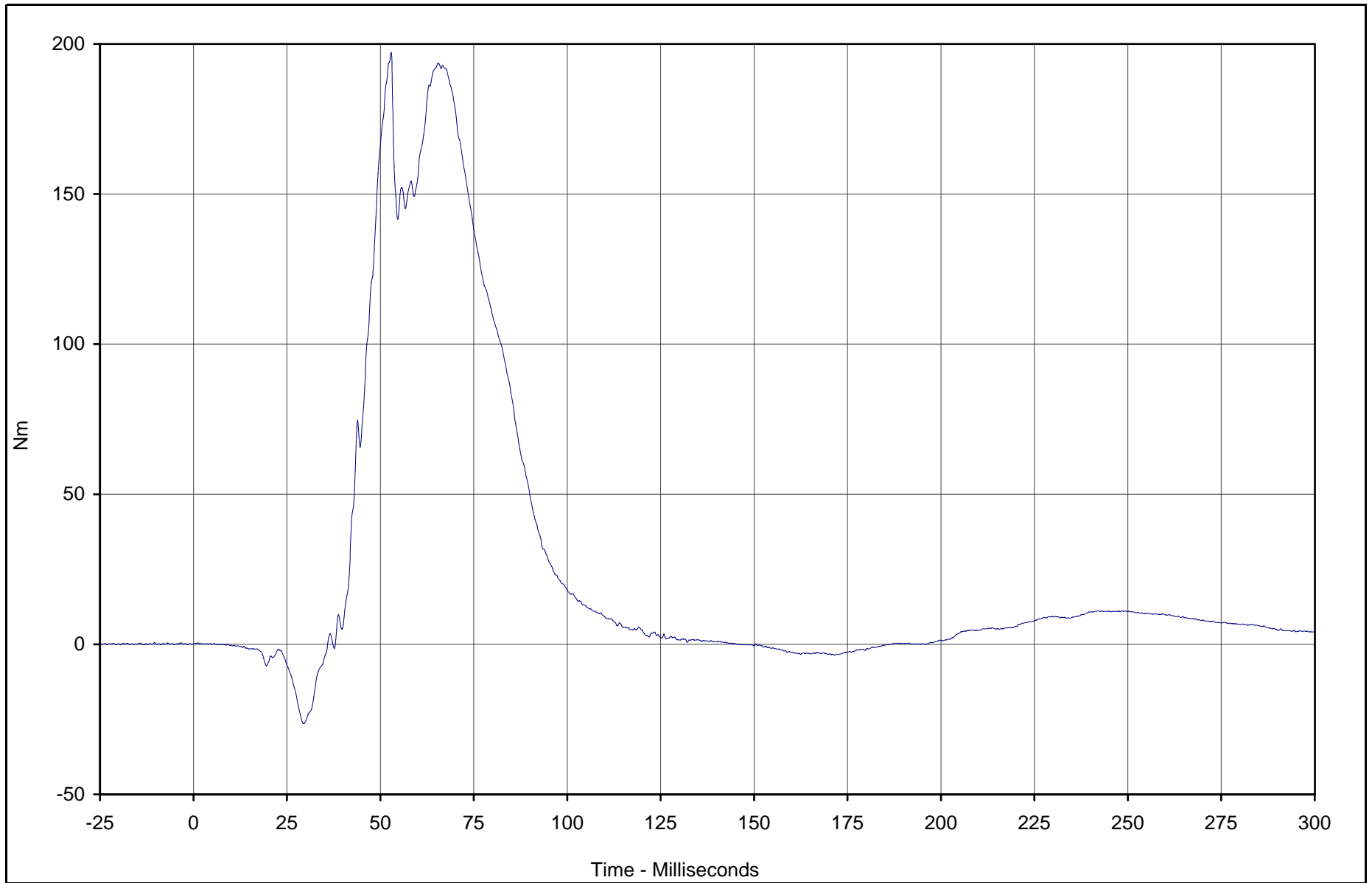
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-108



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Moment Y	074	FIL	Nm	197.3	52.9	-26.4	29.5	600



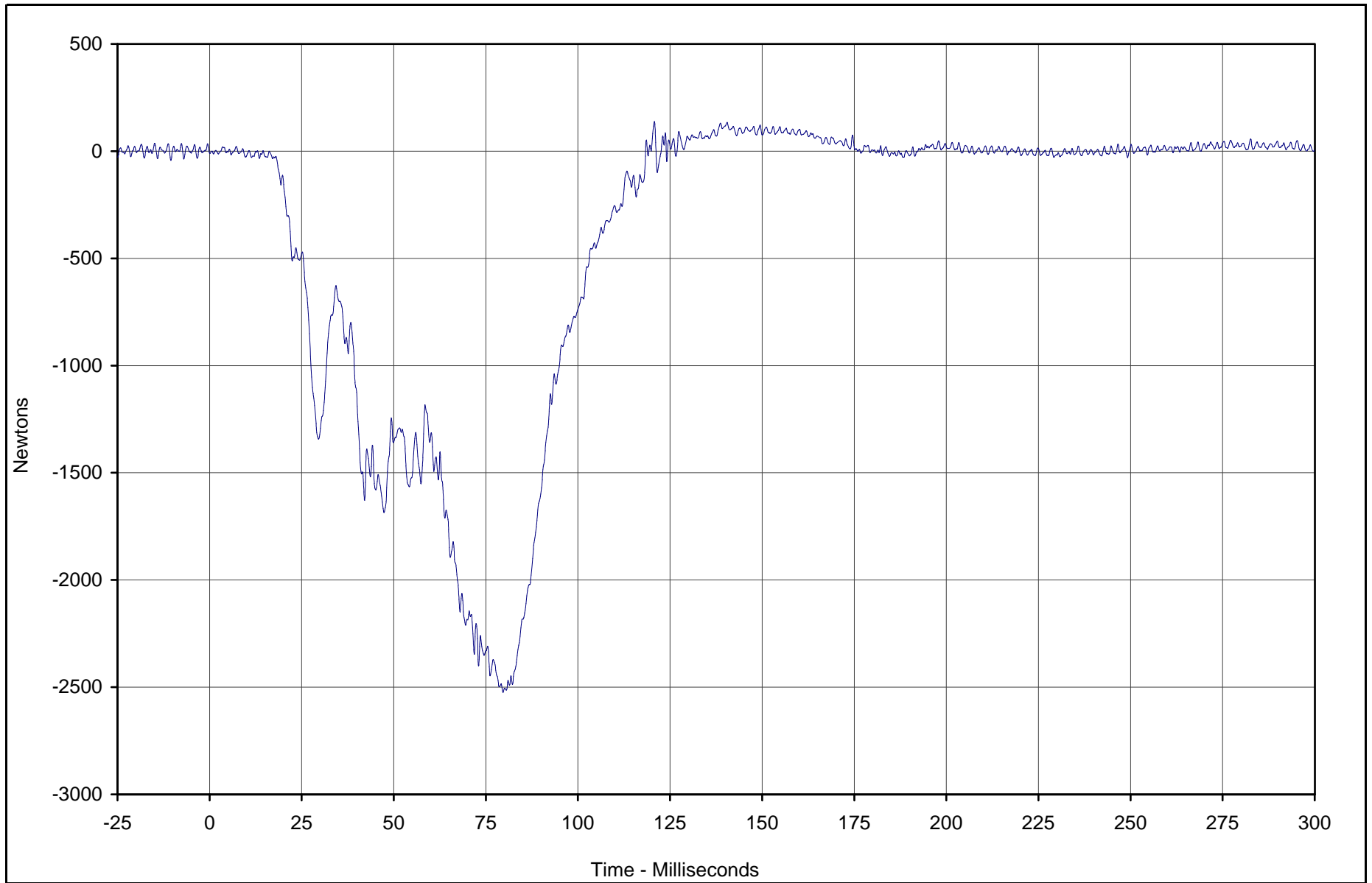
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-109



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Lower Tibia Force Z	075	FIL	Newtons	138.2	120.8	-2523.7	79.7	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

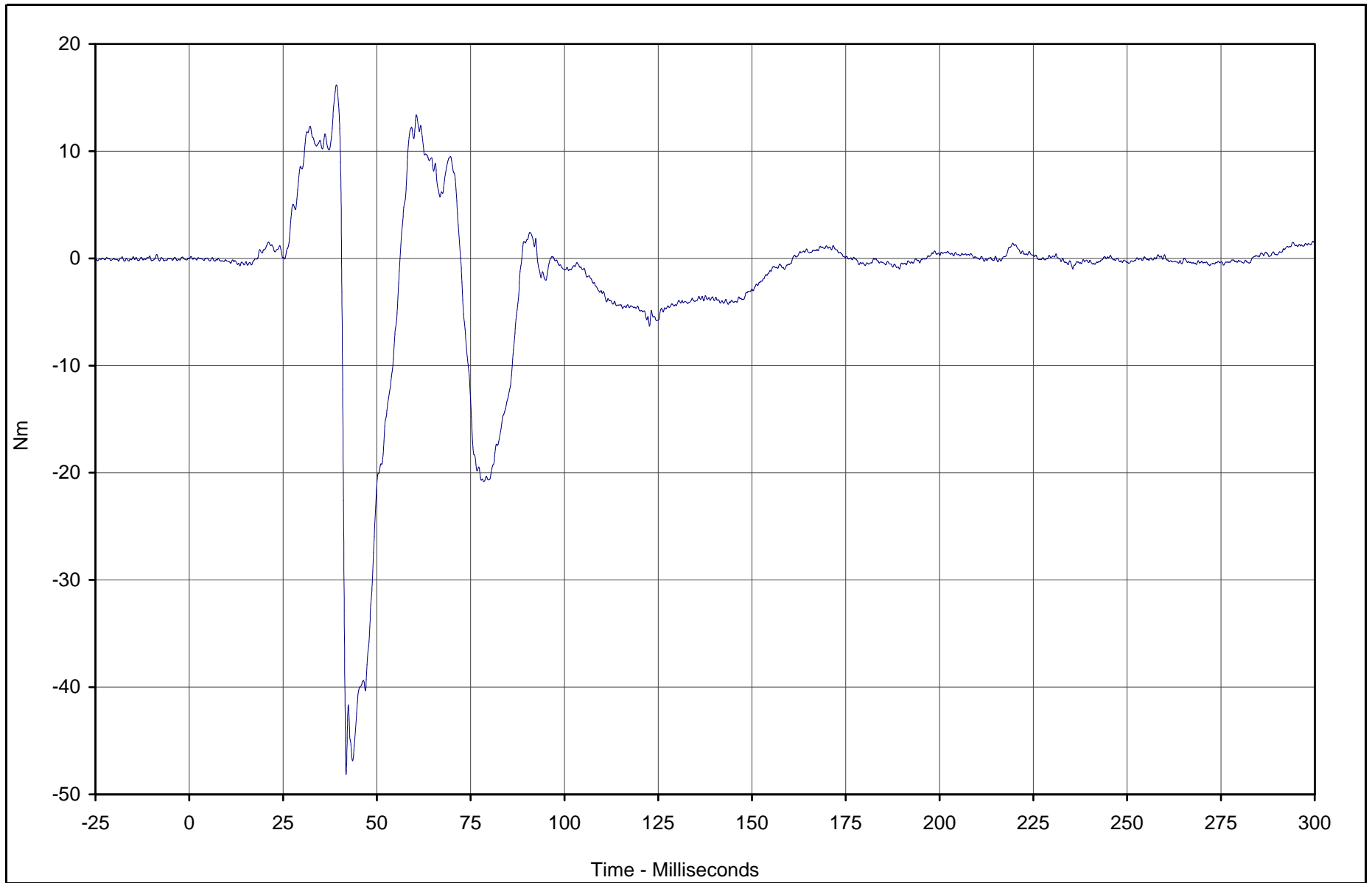
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-110



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Lower Tibia Moment X	076	FIL	Nm	16.2	39.2	-48.1	41.8	600



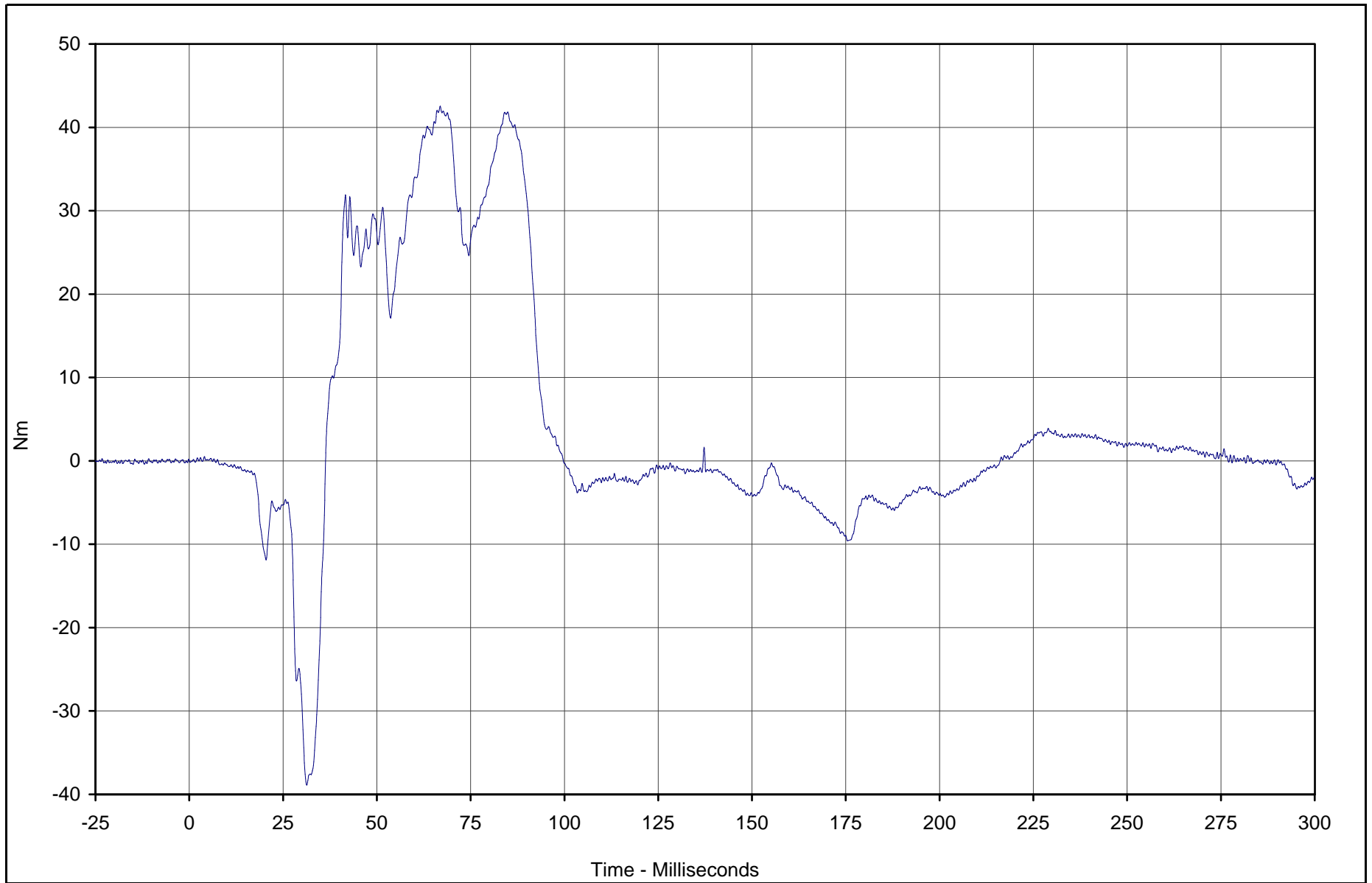
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-111



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Lower Tibia Moment Y	077	FIL	Nm	42.6	66.9	-38.9	31.3	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

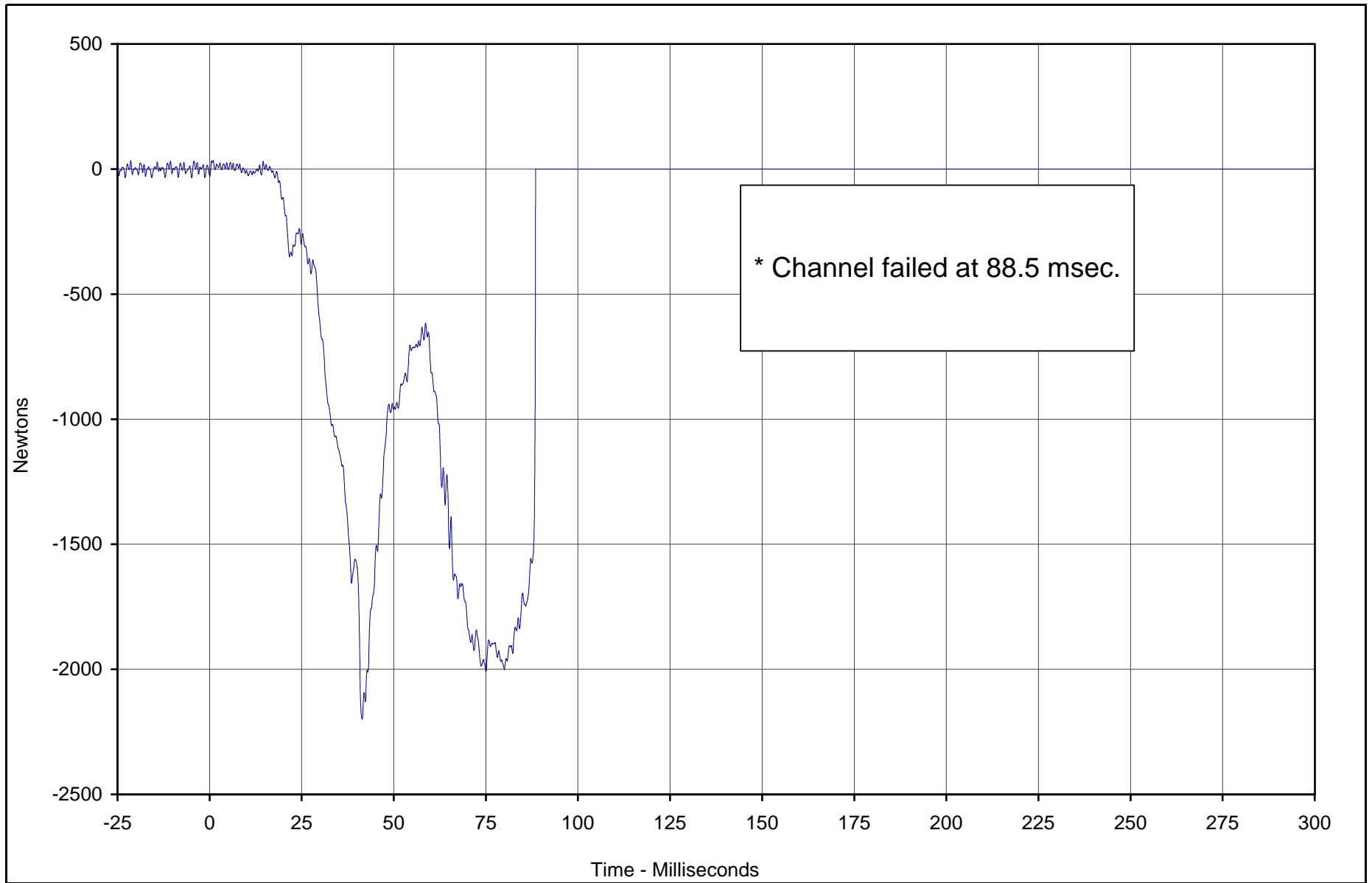
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-112



* Channel failed at 88.5 msec.

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right lower Tibia Force Z	078	FIL	Newtons	34.4	1.0	-2198.8	41.4	600



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

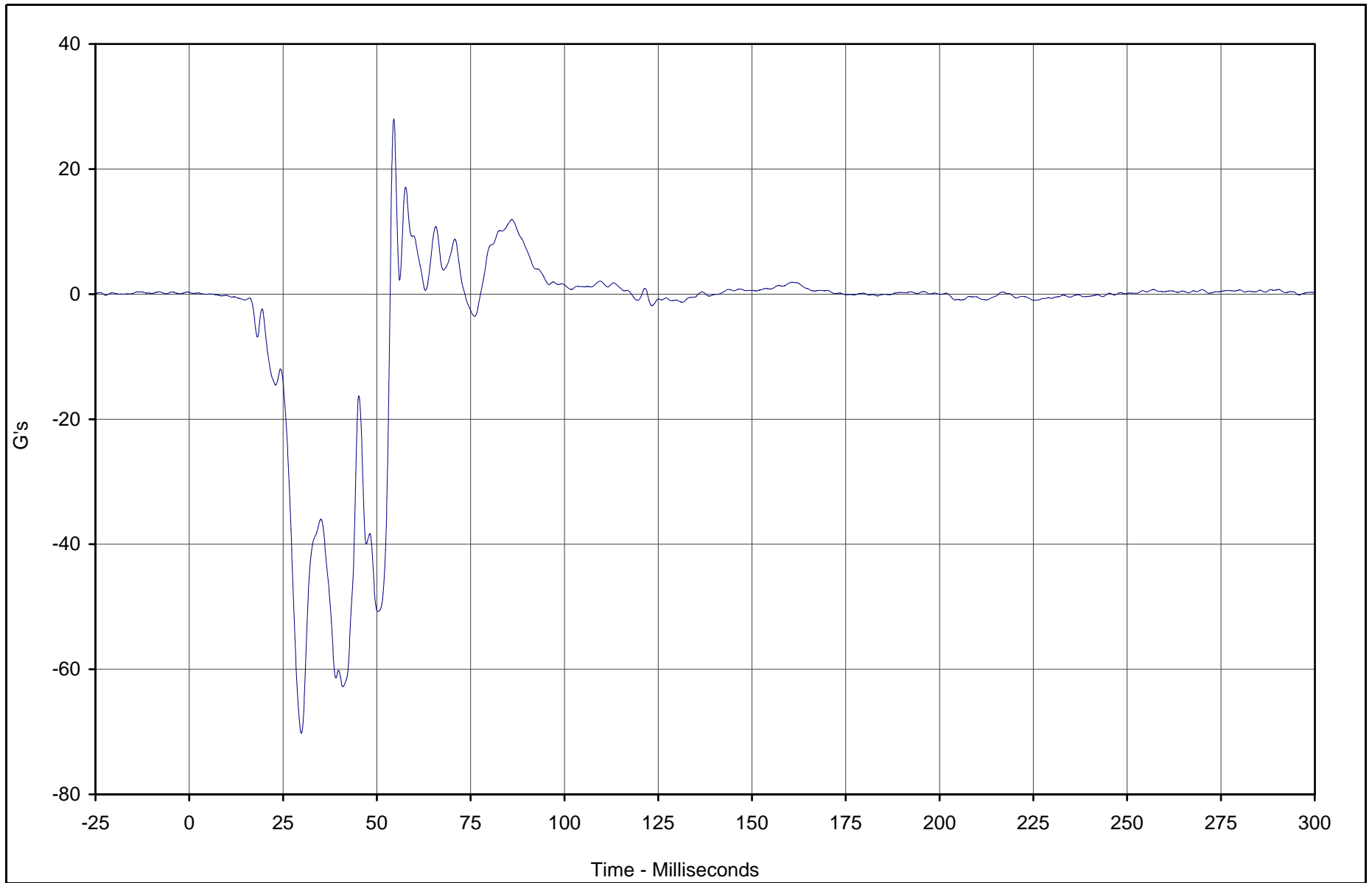
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-113



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Aft X	079	FIL	G's	28.0	54.5	-70.2	29.9	180



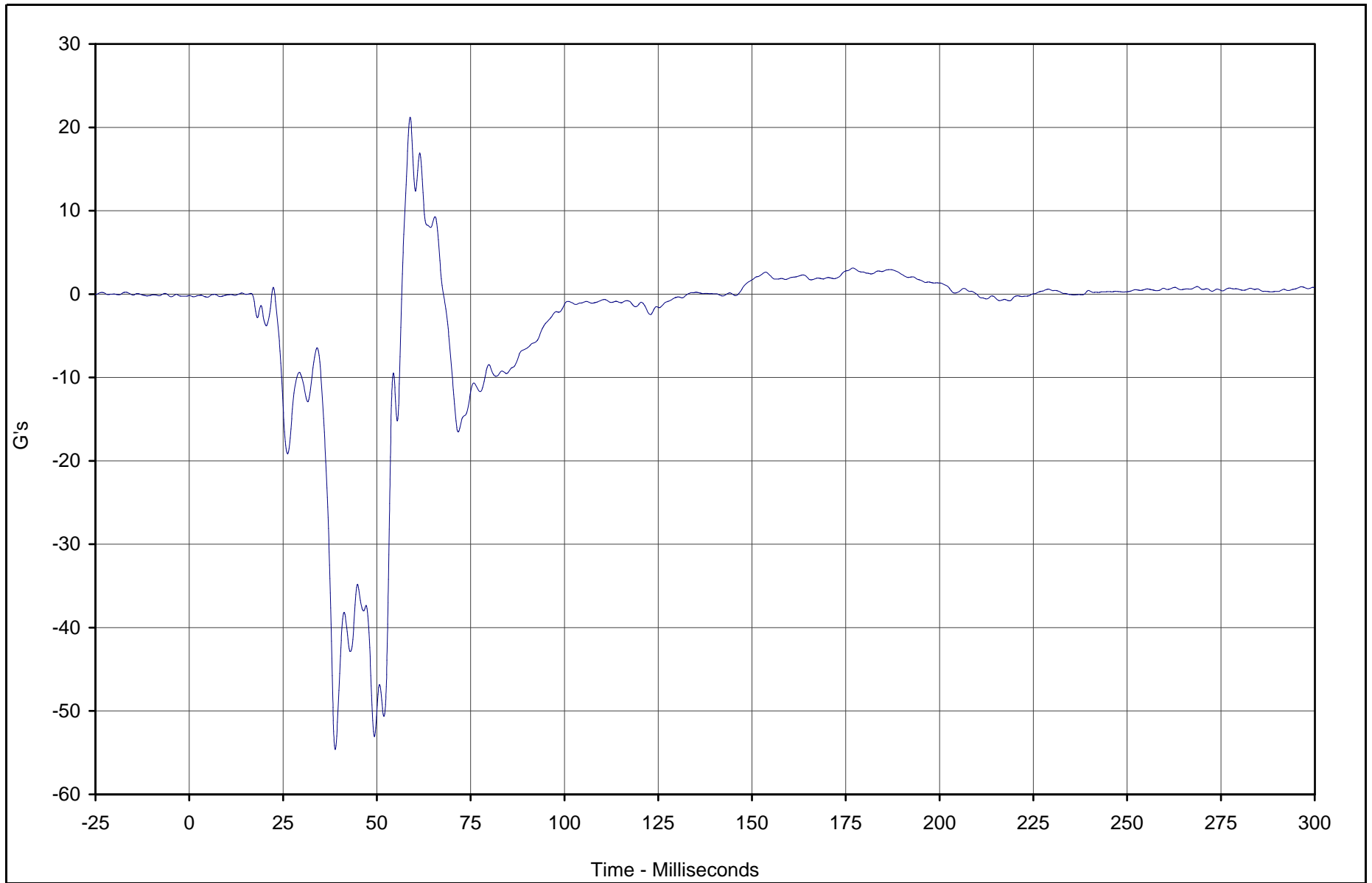
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-114



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Aft Z	080	FIL	G's	21.2	58.9	-54.6	38.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

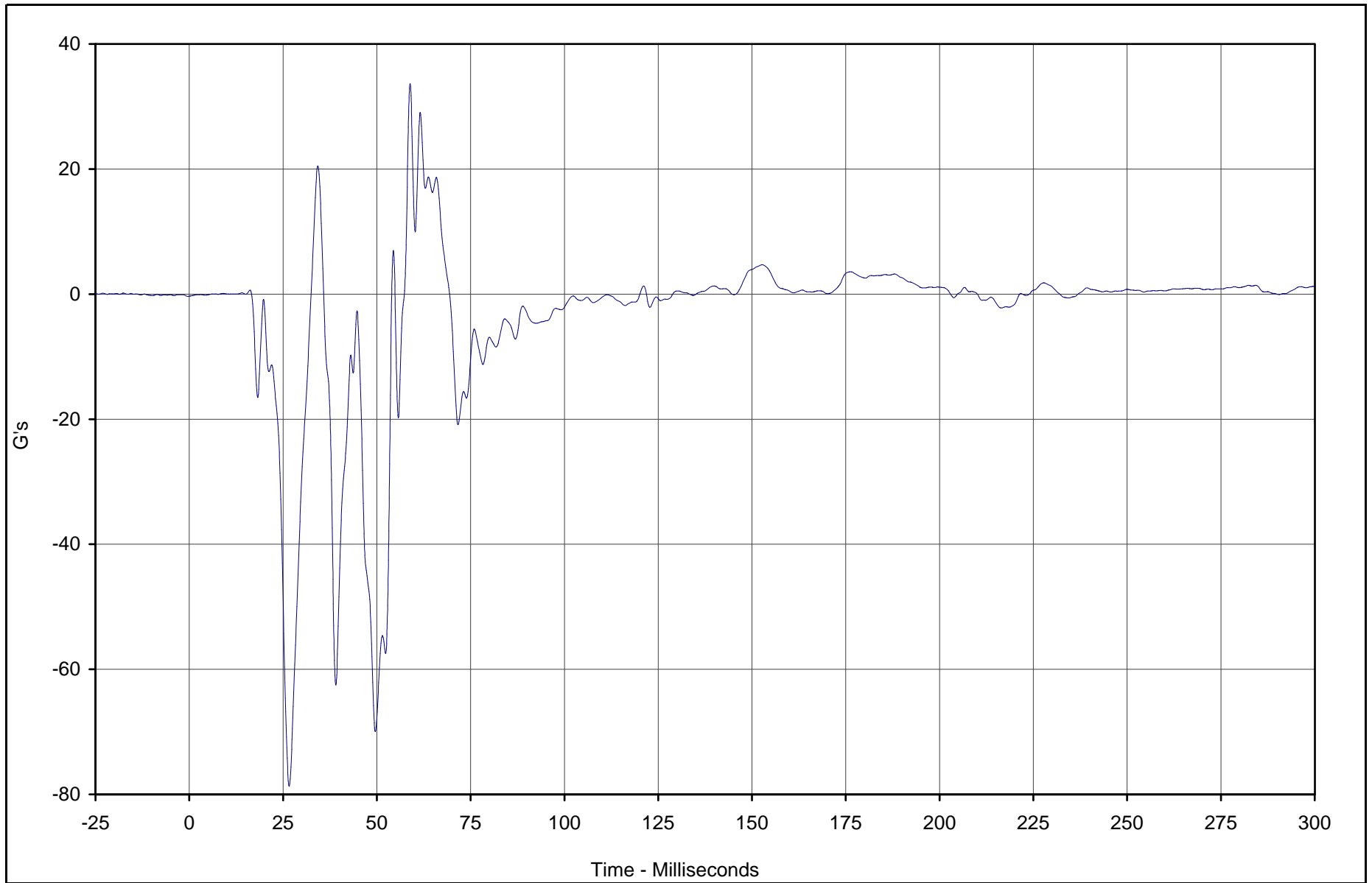
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-115



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Left Foot Fore Z	081	FIL	G's	33.6	58.9	-78.7	26.6	180



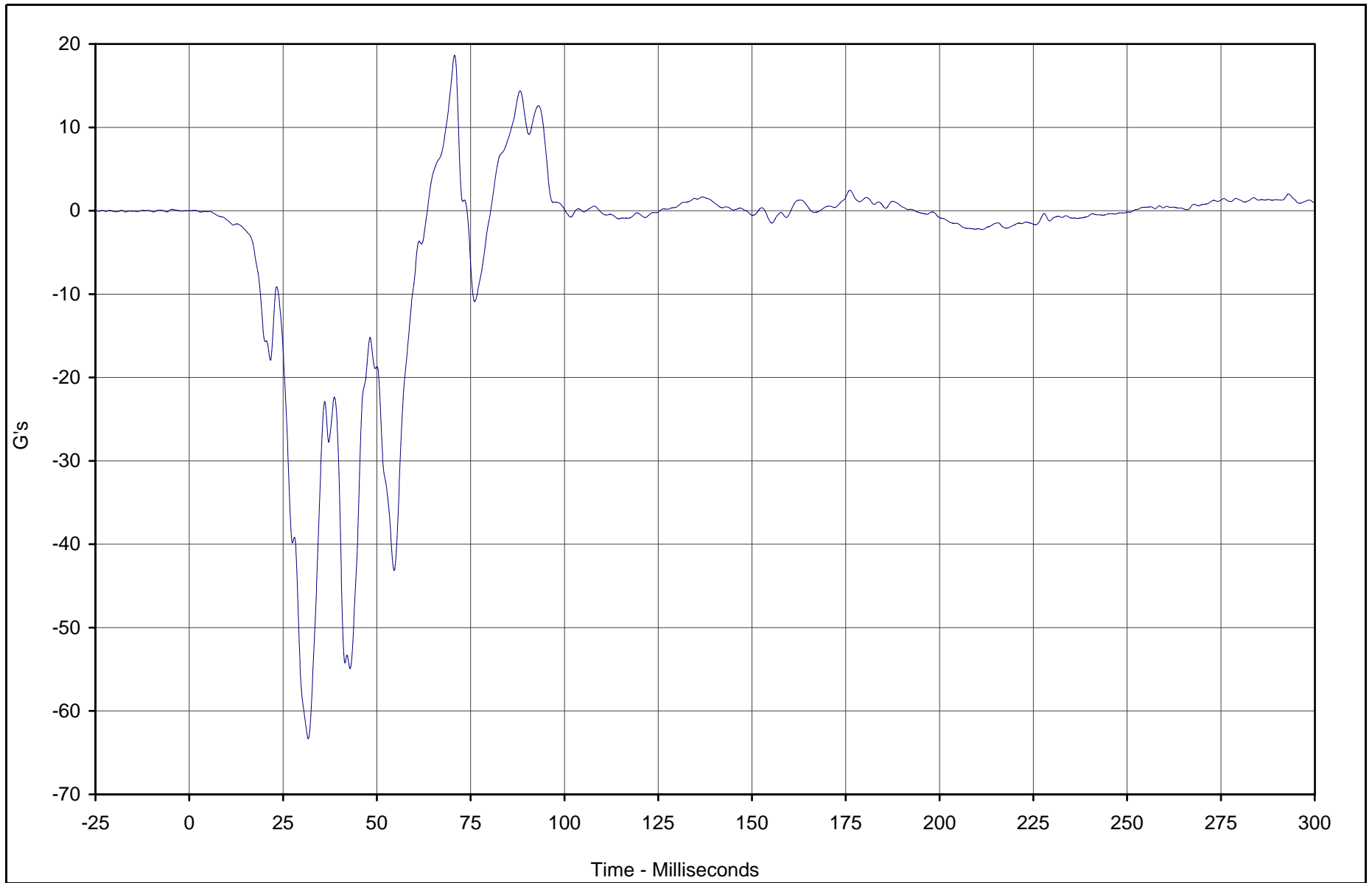
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-116



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Aft X	082	FIL	G's	18.6	70.7	-63.3	31.7	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

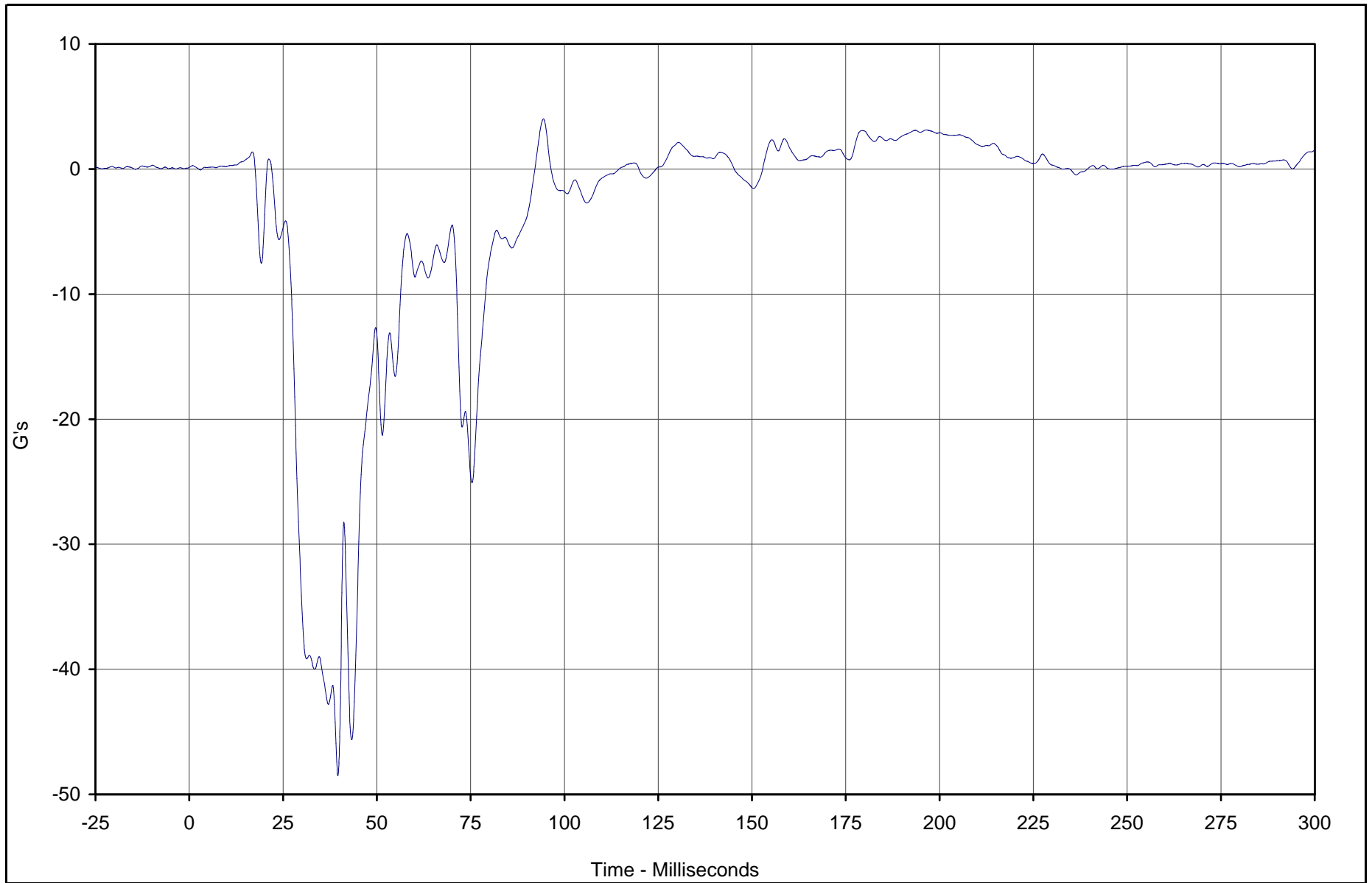
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-117



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Aft Z	083	FIL	G's	4.0	94.4	-48.5	39.6	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

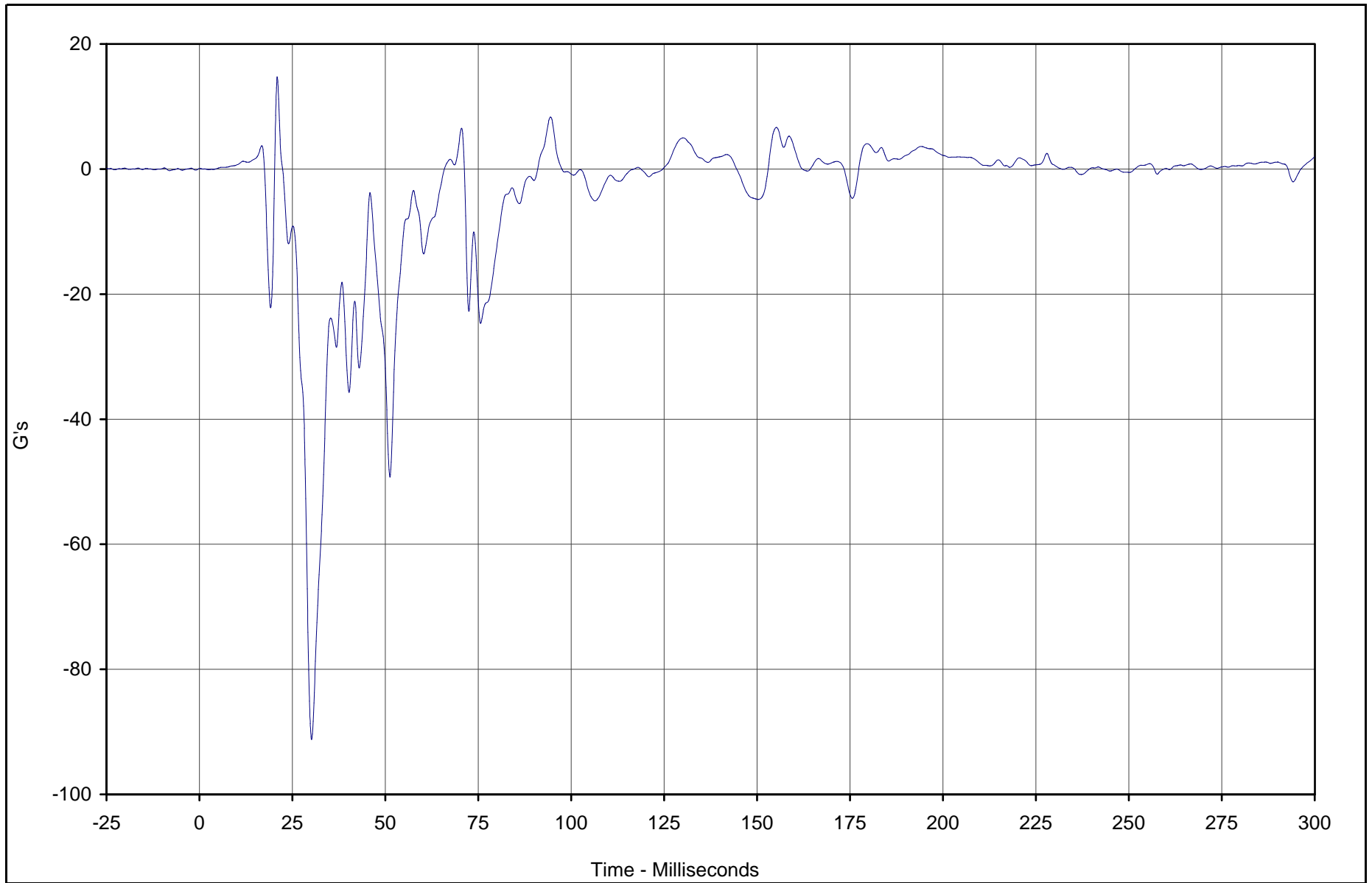
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-118



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Right Foot Fore Z	084	FIL	G's	14.8	20.9	-91.2	30.2	180



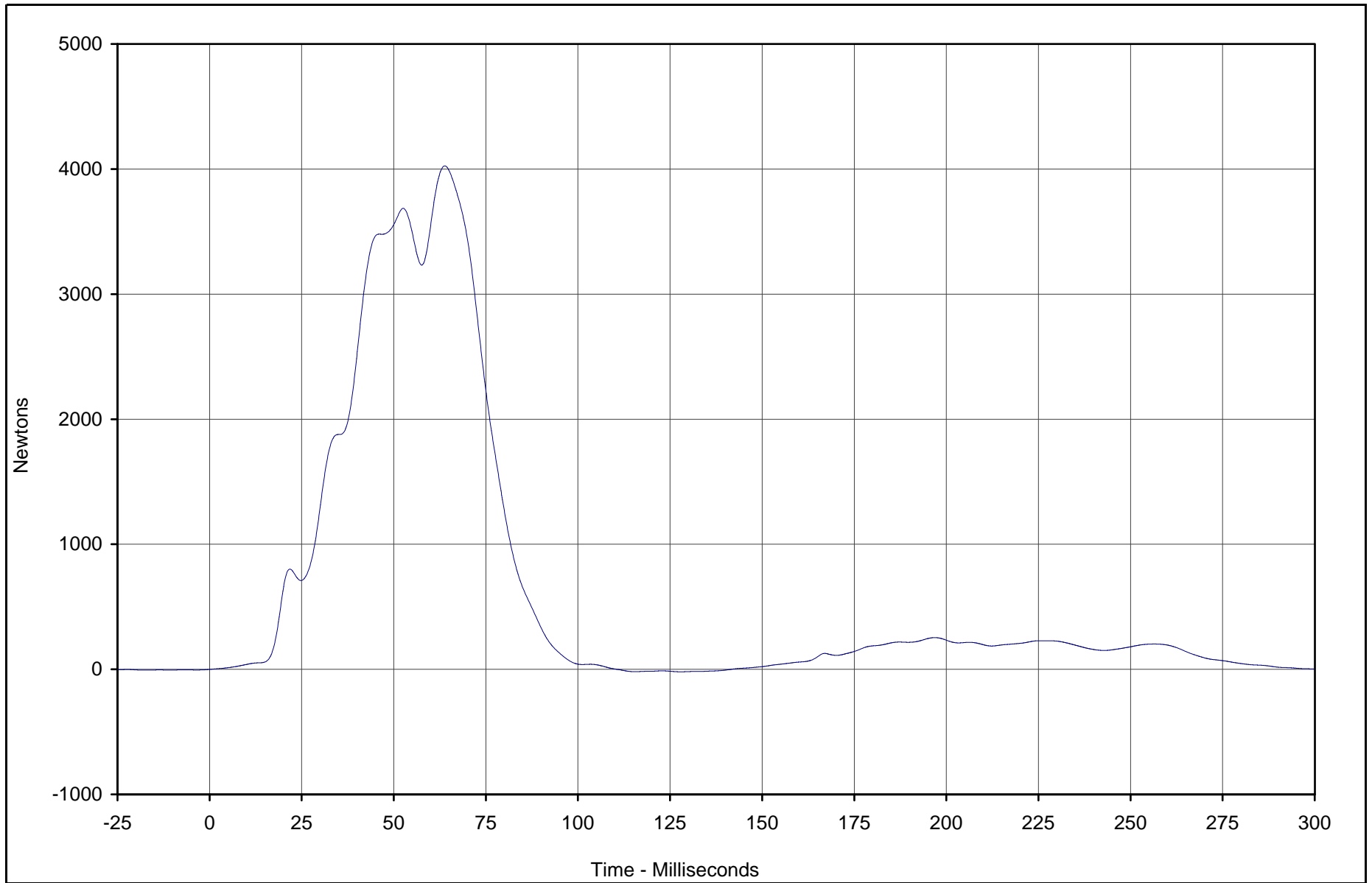
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-119



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Lap Belt Force	085	FIL	Newtons	4025.5	63.9	-20.1	128.0	60



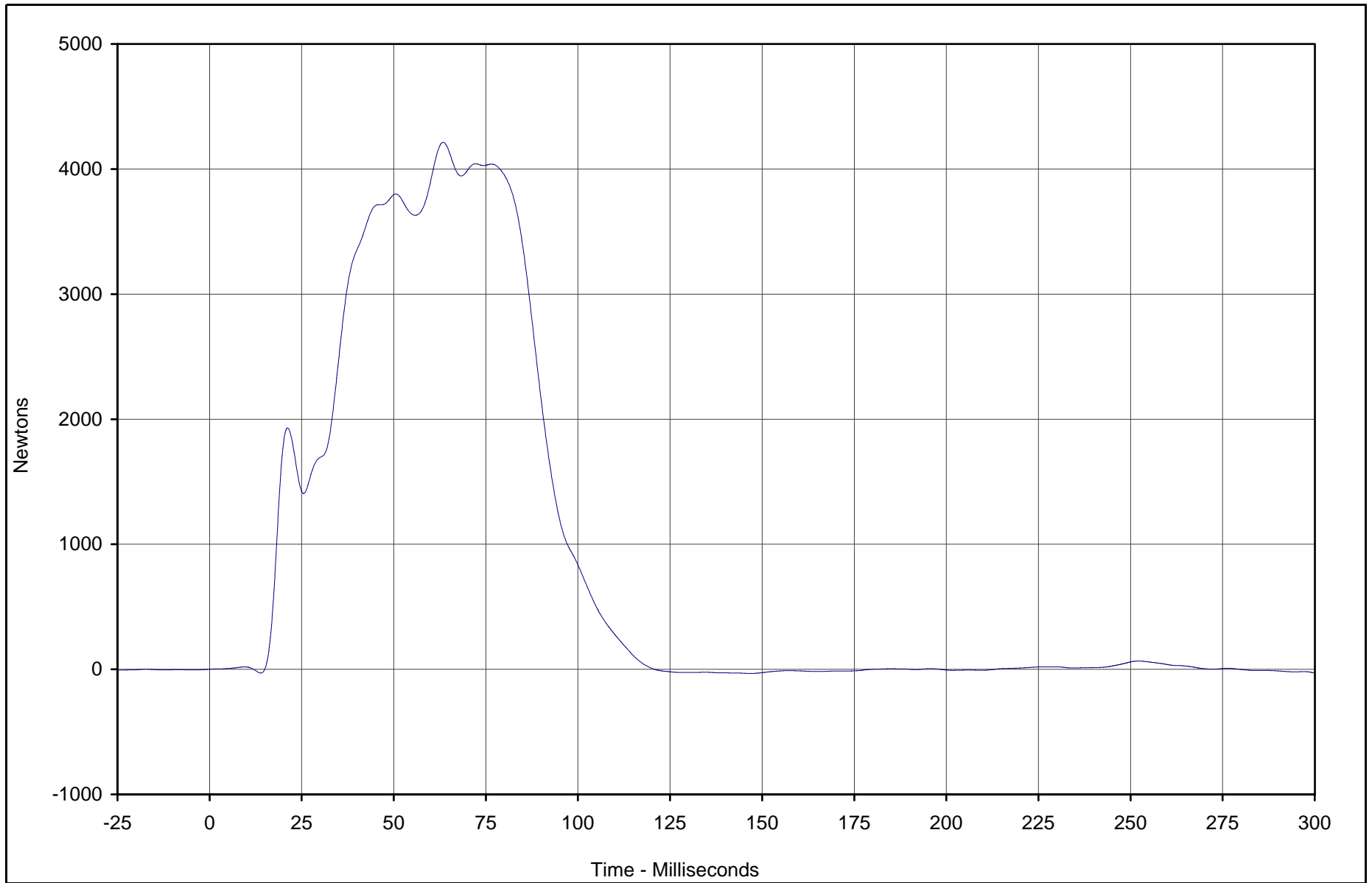
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-120



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Shoulder Belt Force	086	FIL	Newtons	4213.8	63.4	-33.0	147.0	60



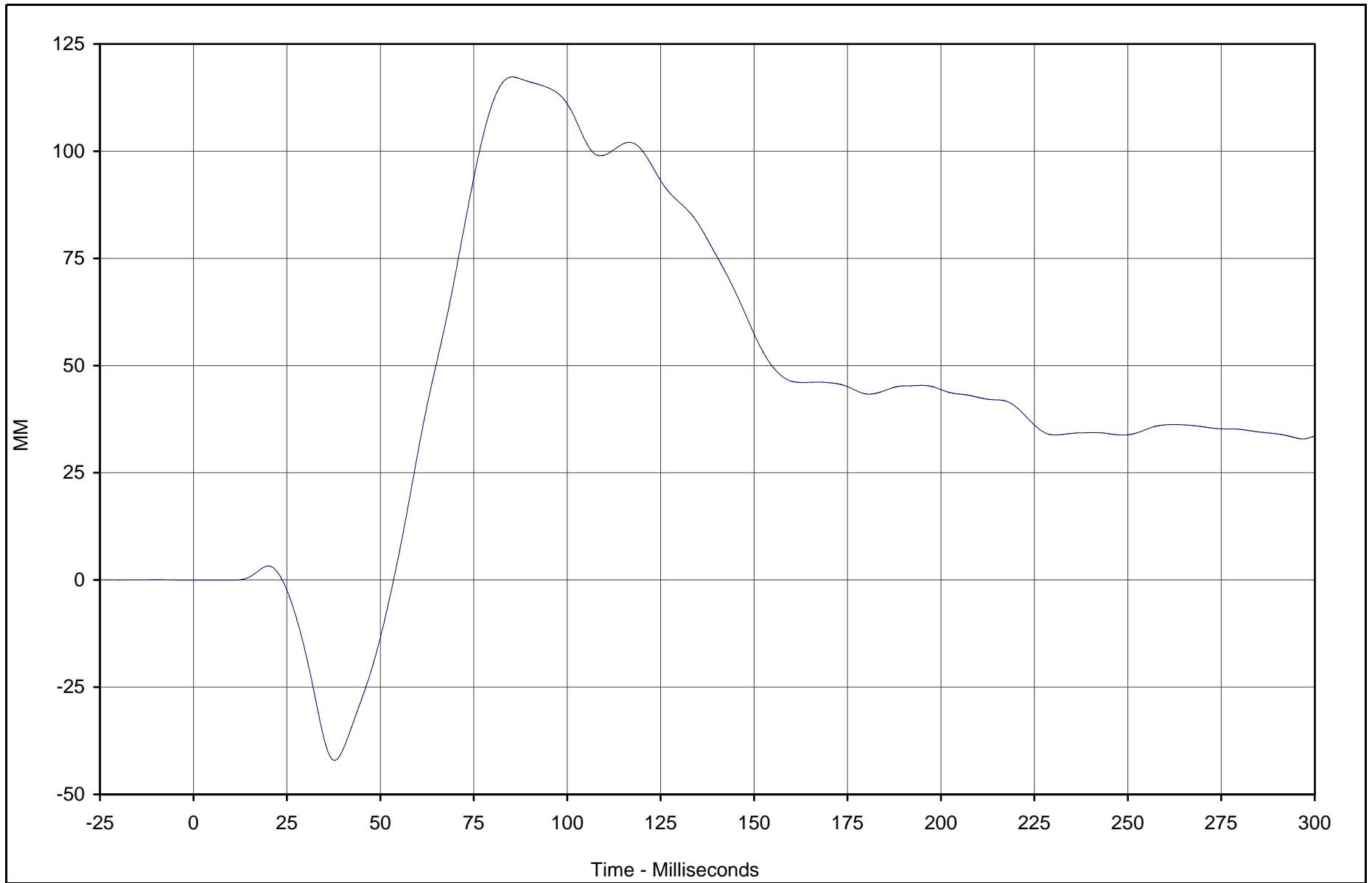
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-121



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Shoulder Belt Pullout	087	FIL	MM	117.3	85.3	-42.1	37.8	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

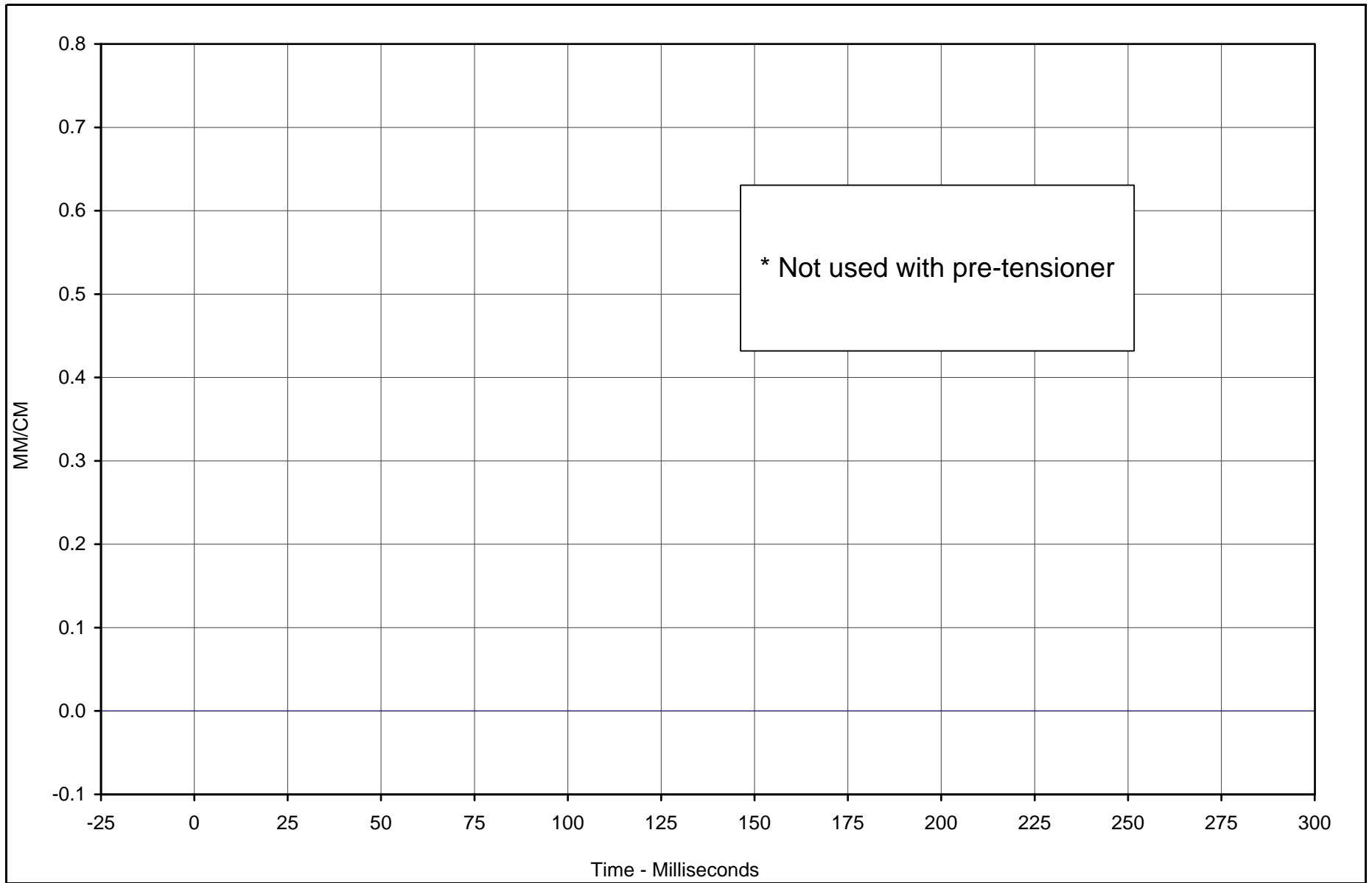
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-122



* 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: 2002 Hyundai Santa Fe 4WD SUV

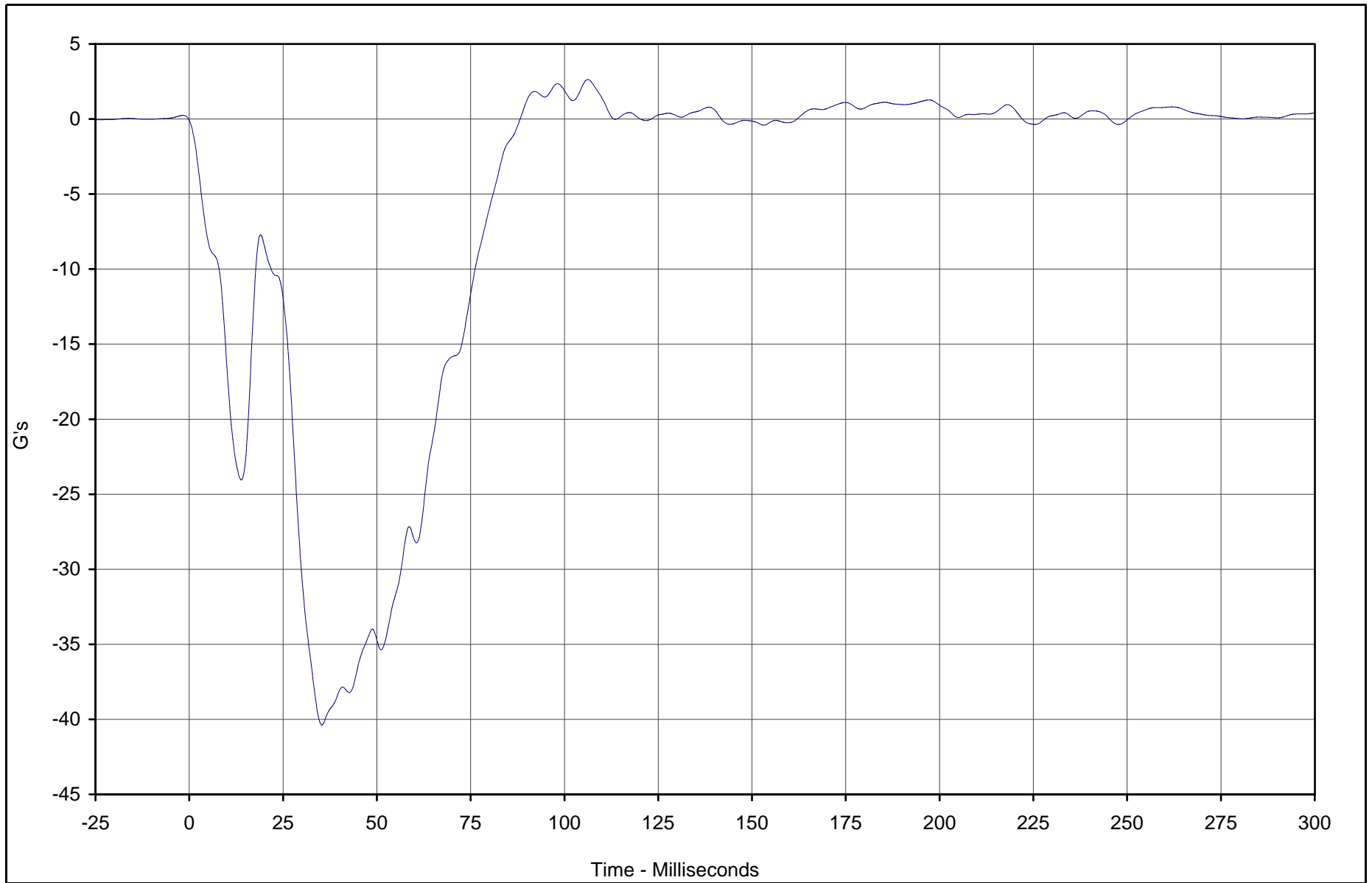
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-123



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X	089	FIL	G's	2.6	106.2	-40.4	35.3	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

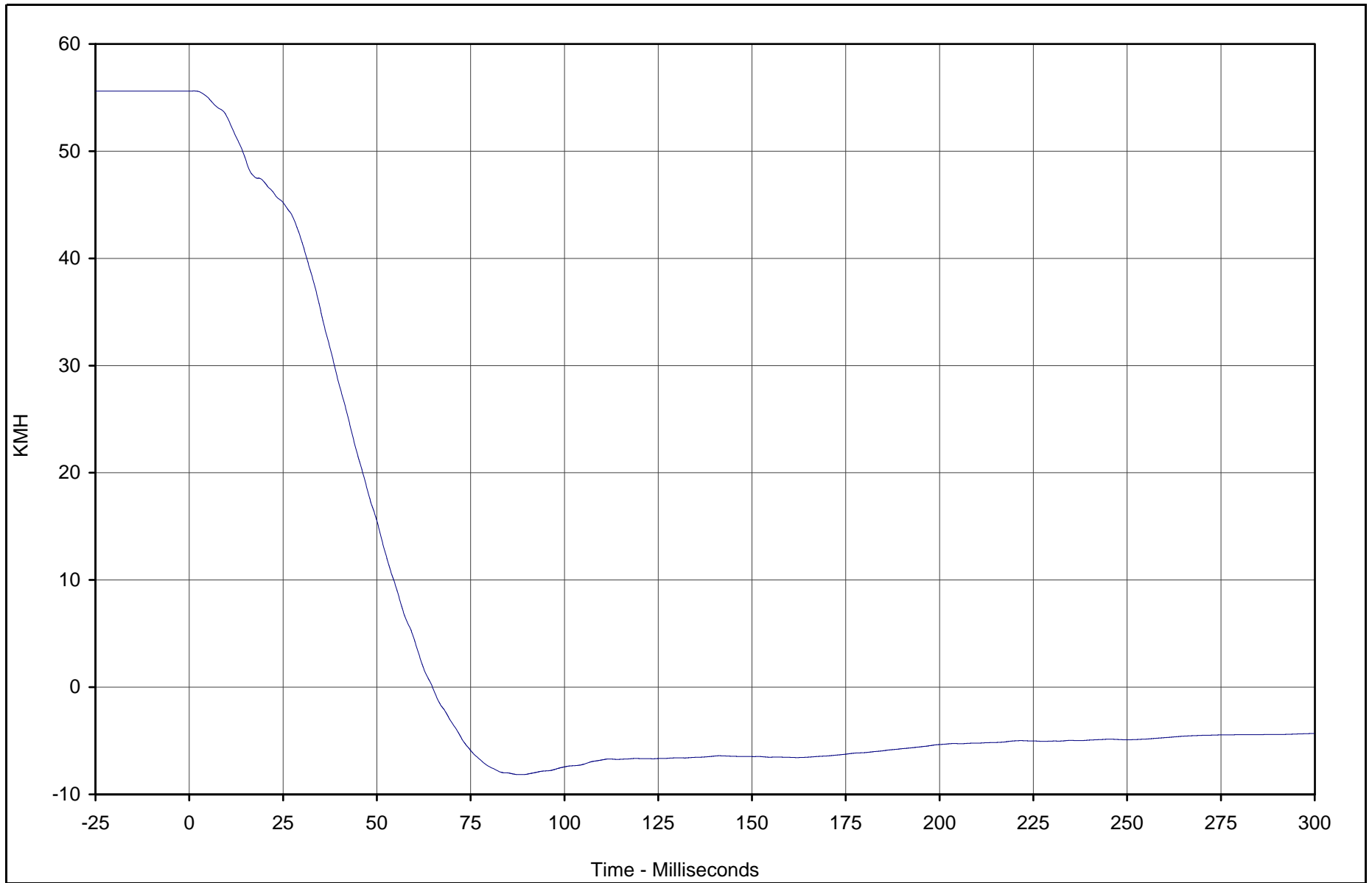
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-124



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X Velocity	089	IN1	KMH	55.6	1.3	-8.2	87.8	180



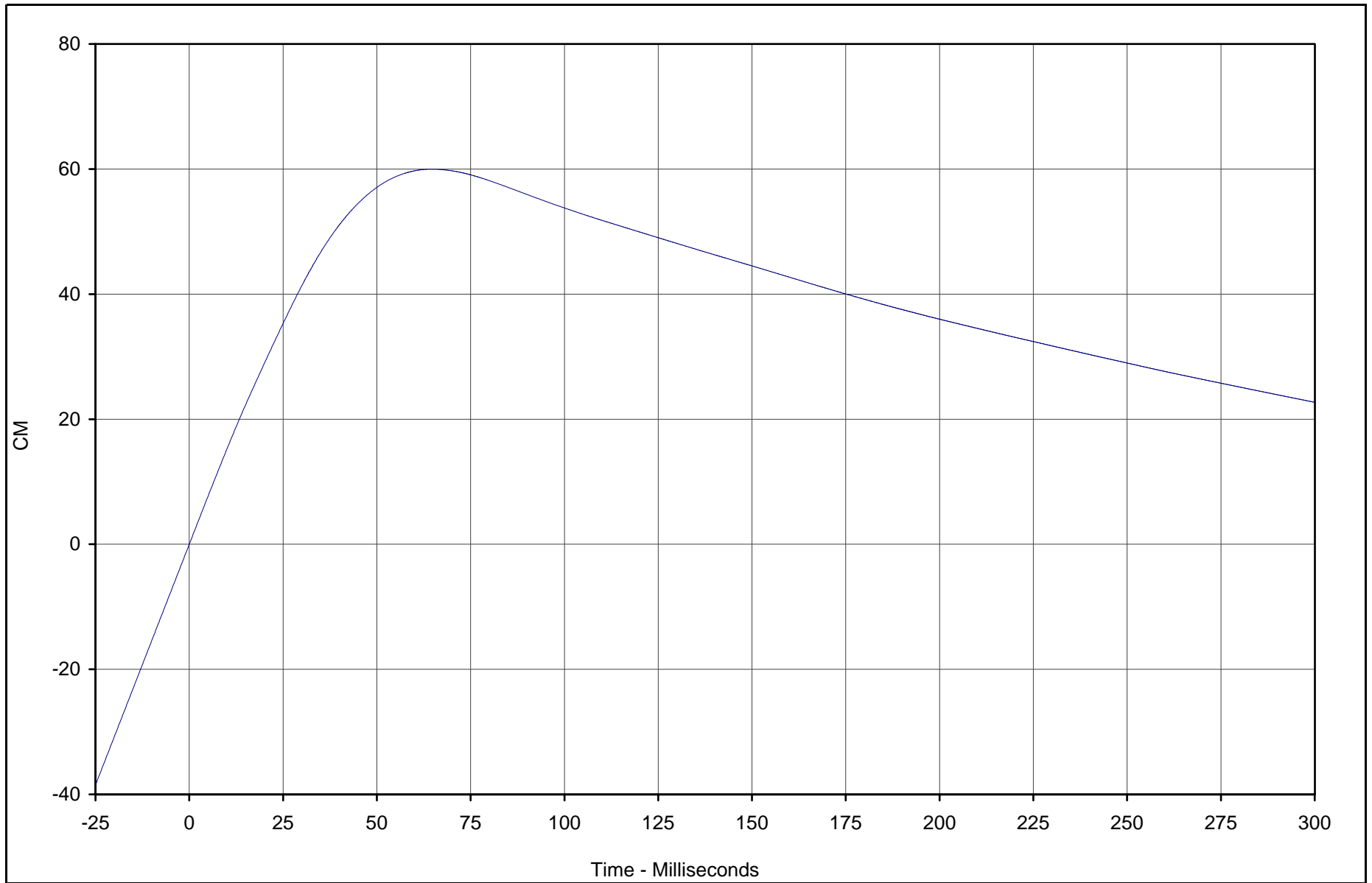
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-125



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear X Displ.	089	IN2	CM	60.0	64.8	0.0	0.0	180



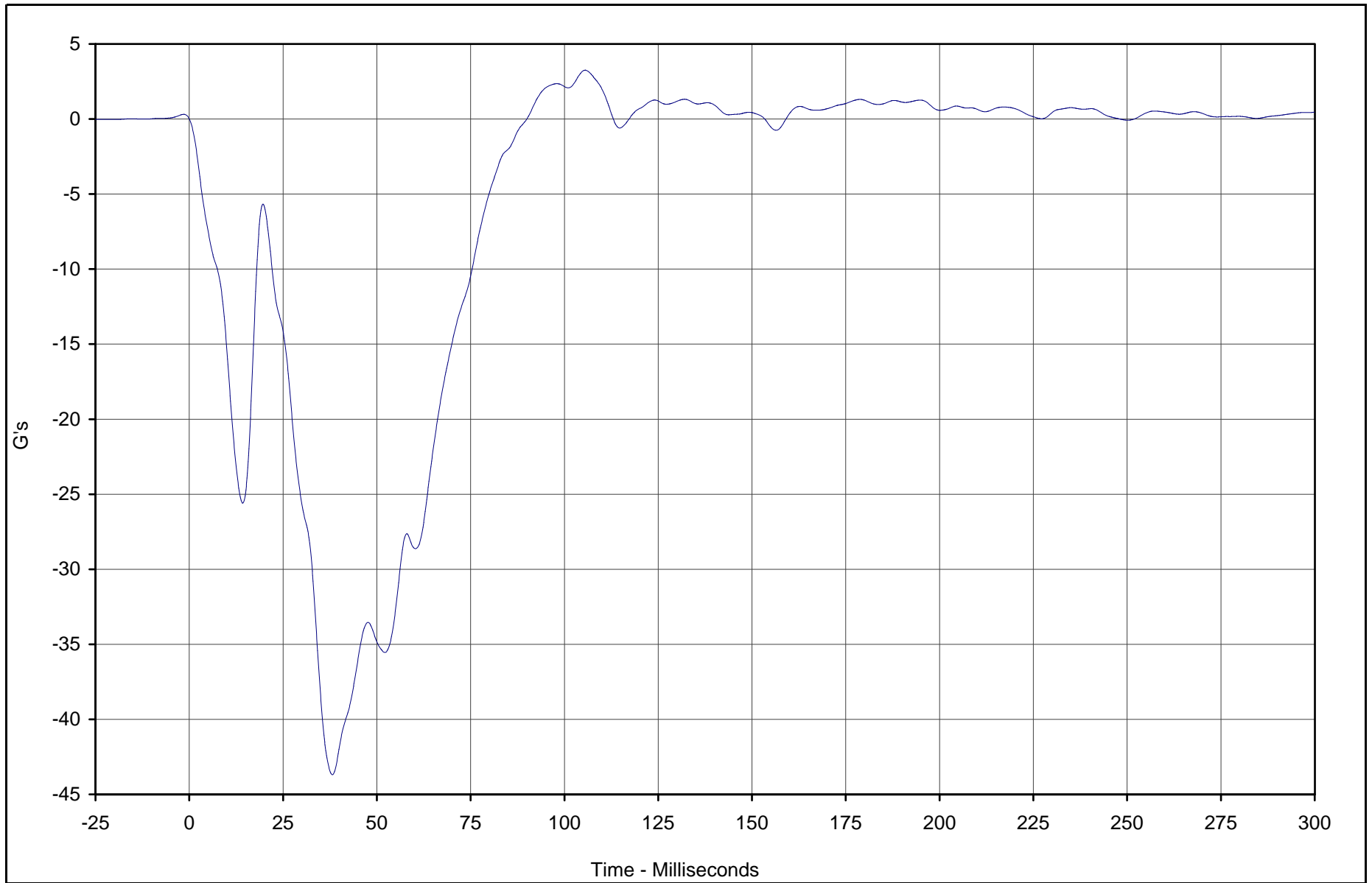
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-126



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X	090	FIL	G's	3.3	105.5	-43.7	38.1	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

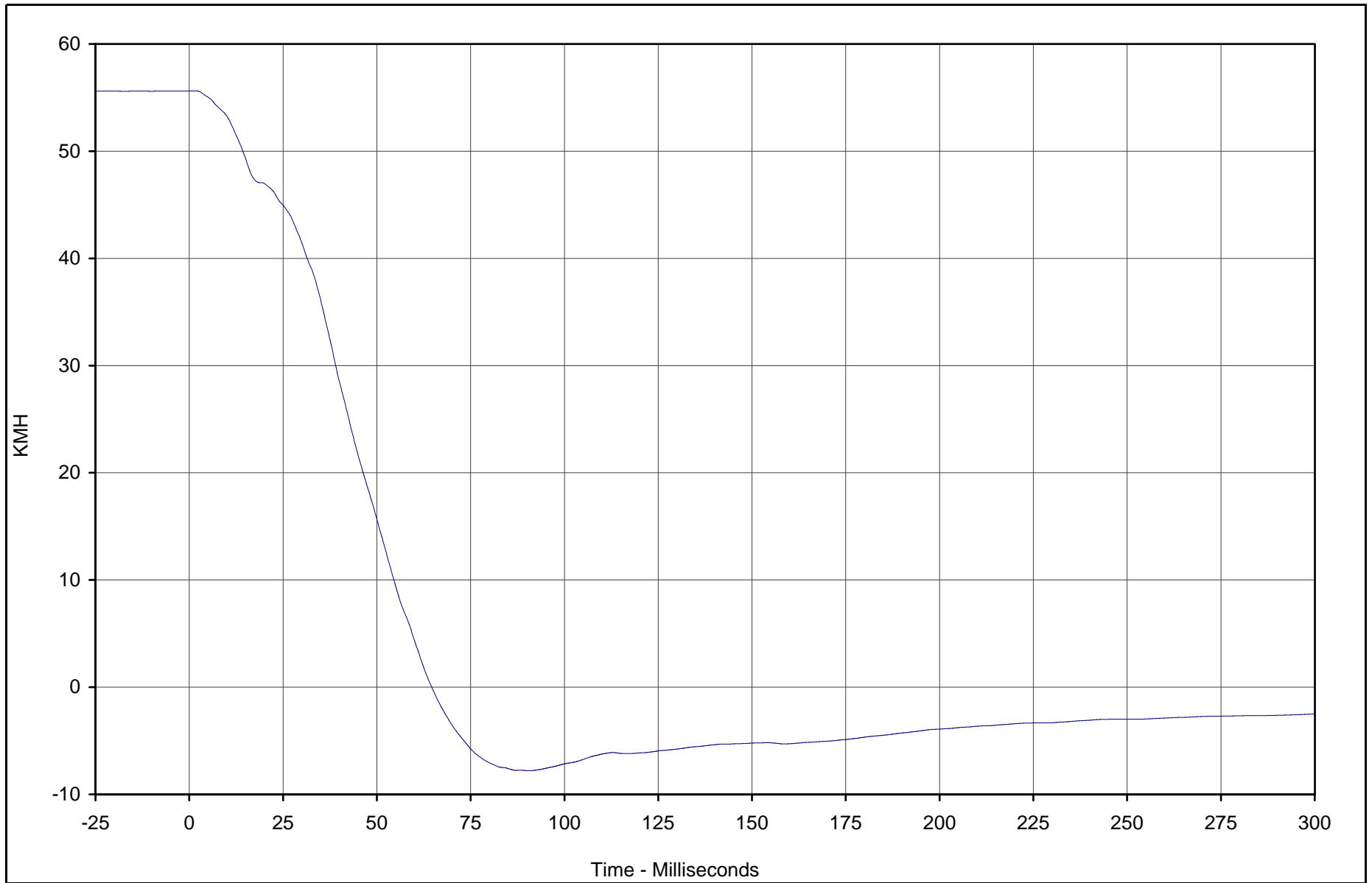
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-127



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X Velocity	090	IN1	KMH	55.6	1.6	-7.8	90.8	180



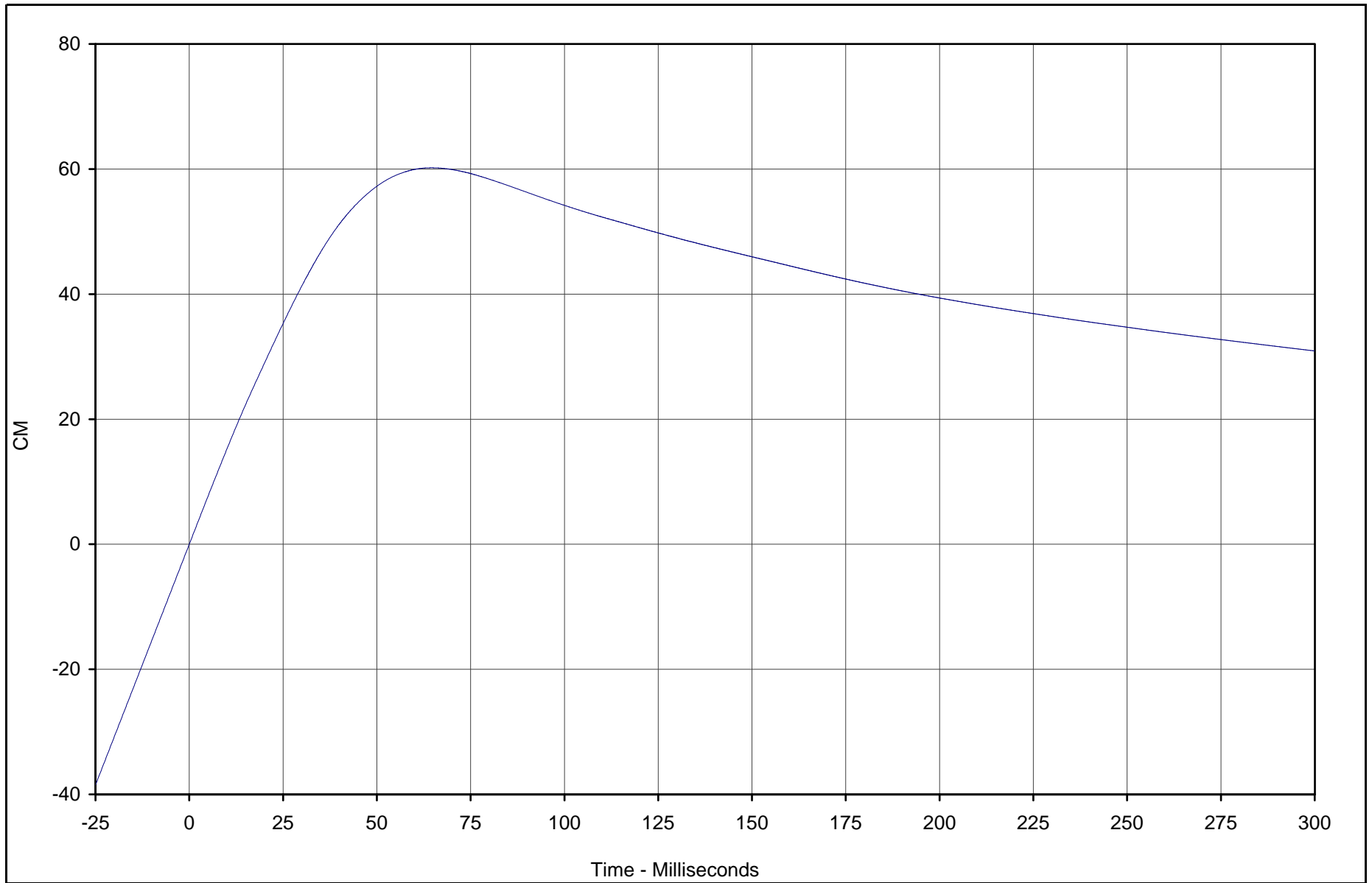
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-128



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear X Displ.	090	IN2	CM	60.2	64.6	0.0	0.0	180



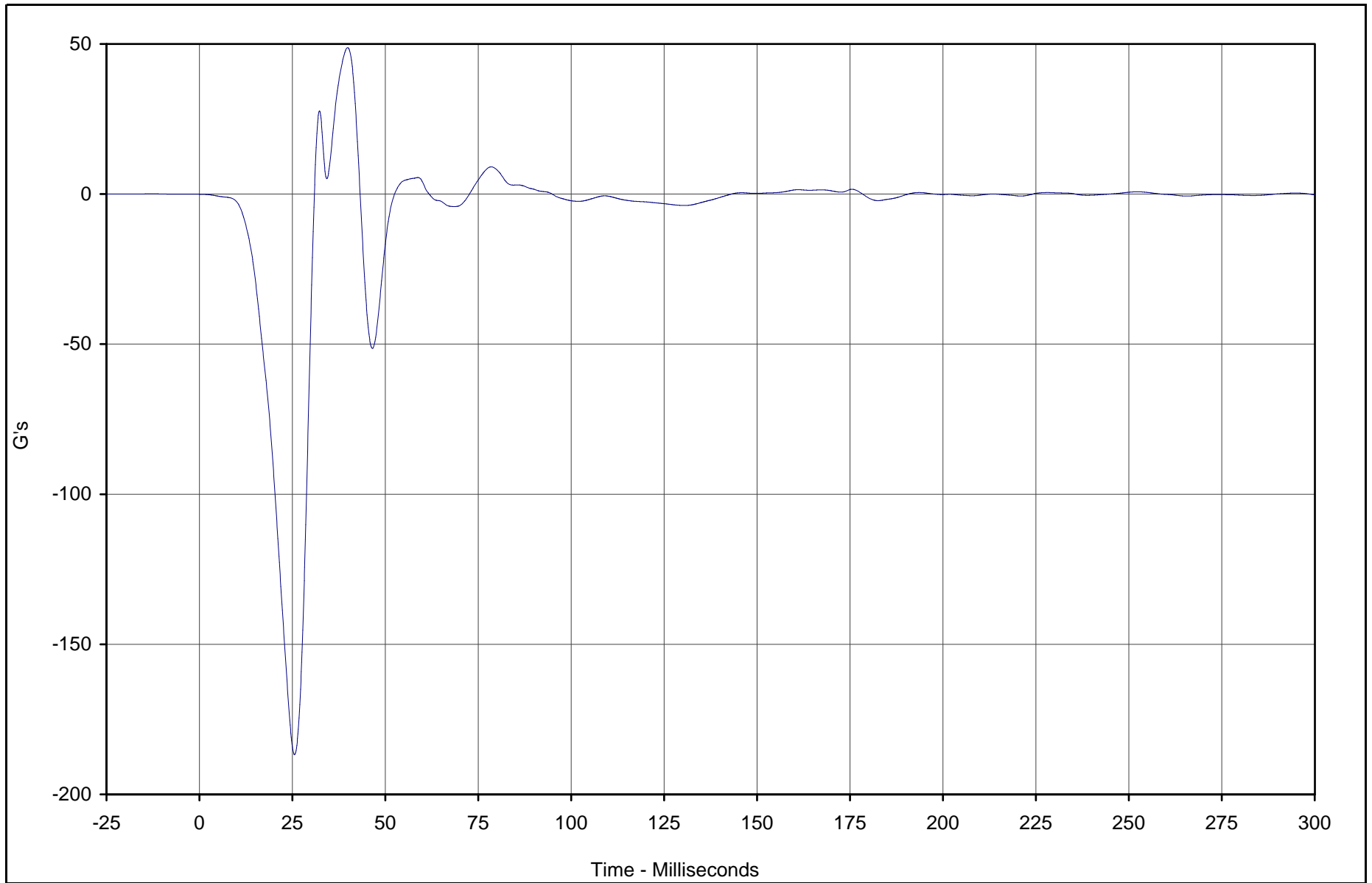
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-129



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top	091	FIL	G's	48.8	39.9	-186.8	25.6	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

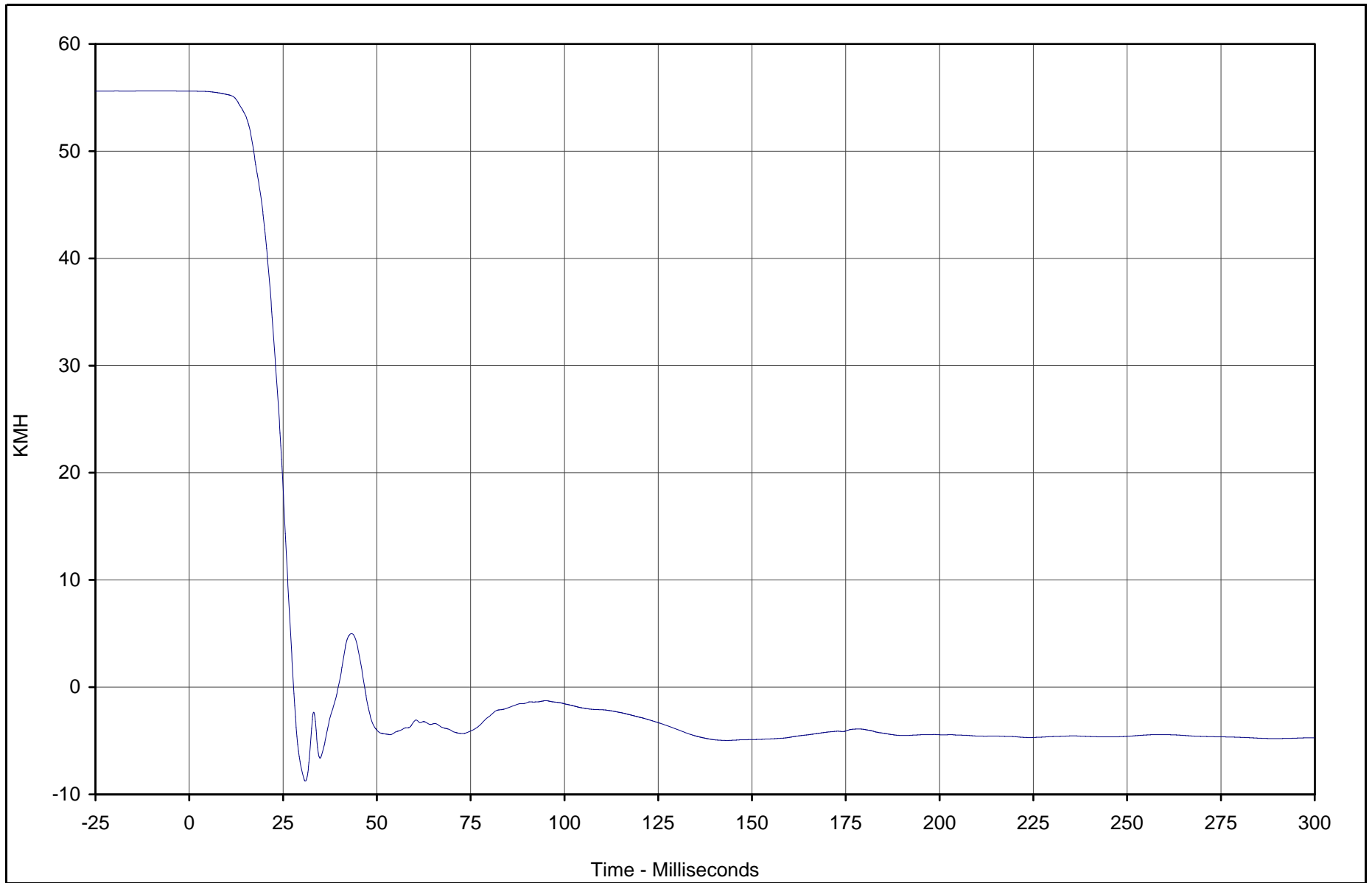
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-130



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top Velocity	091	IN1	KMH	55.6	0.0	-8.8	30.9	180



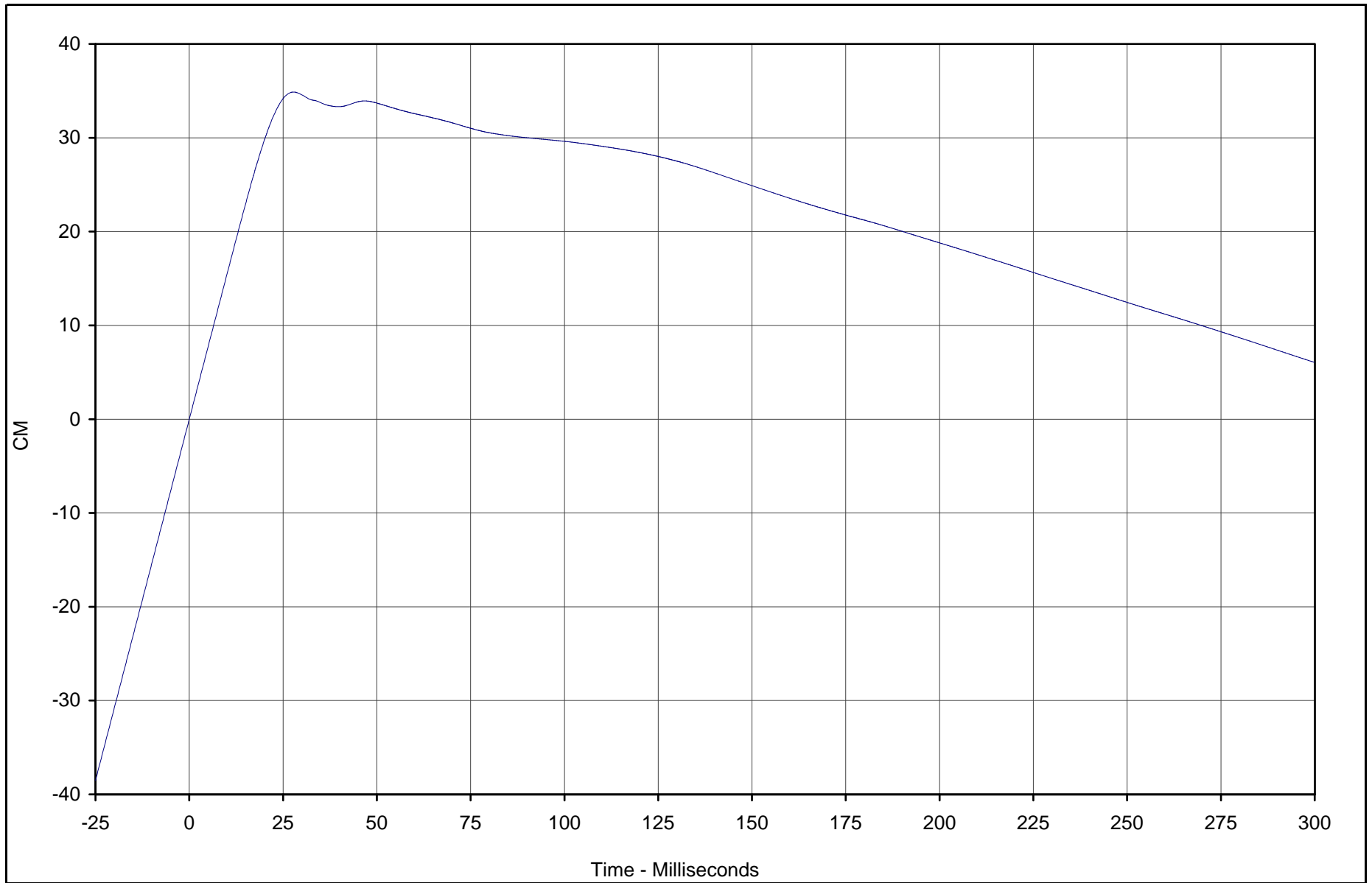
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-131



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Top Displacement	091	IN2	CM	34.9	27.8	0.0	0.0	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

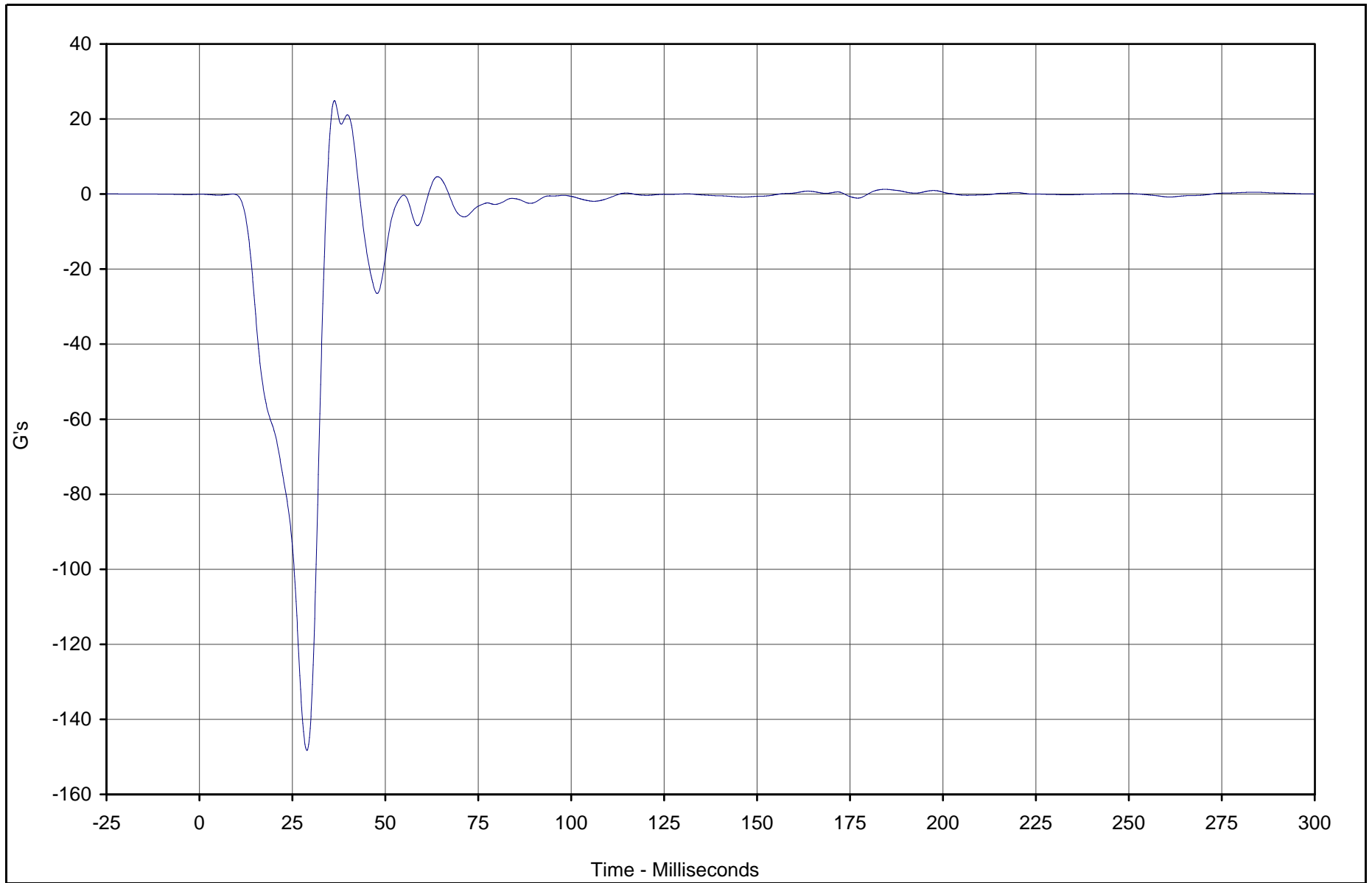
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-132



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom	092	FIL	G's	24.9	36.3	-148.3	28.9	60



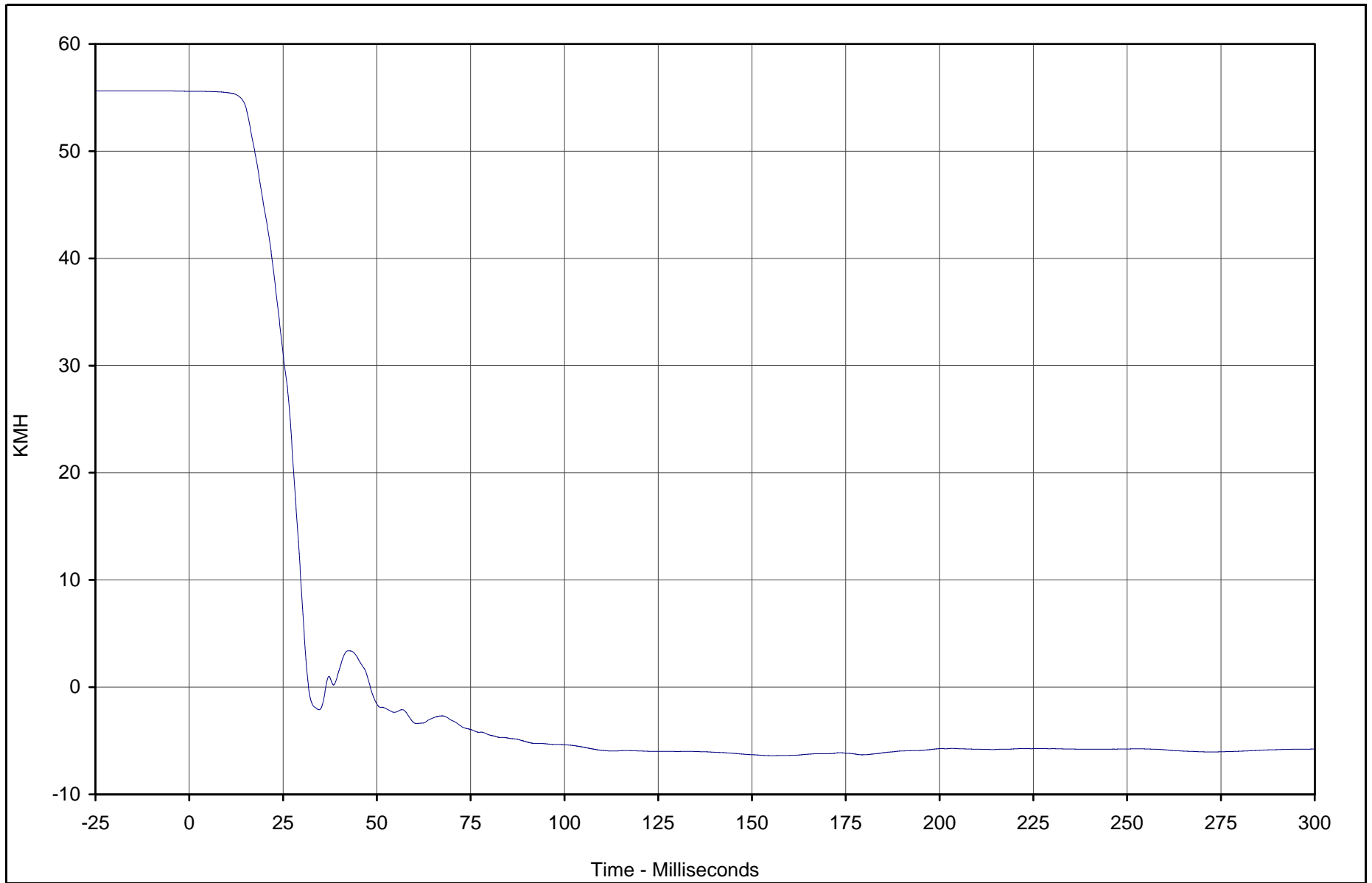
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-133



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom Velocity	092	IN1	KMH	55.6	0.9	-6.4	155.6	180



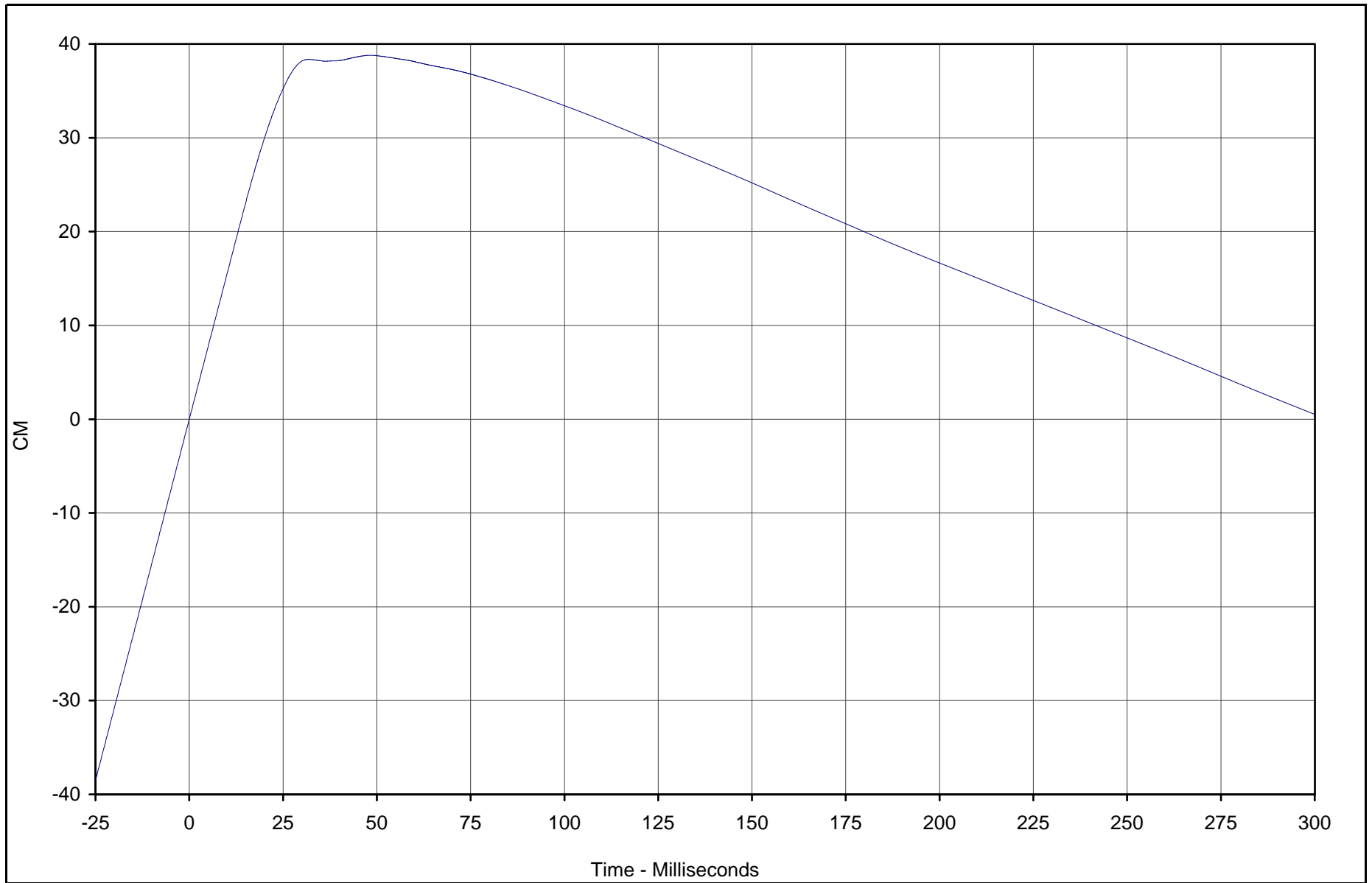
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-134



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Engine Bottom Displacement	092	IN2	CM	38.8	48.3	0.0	0.0	180



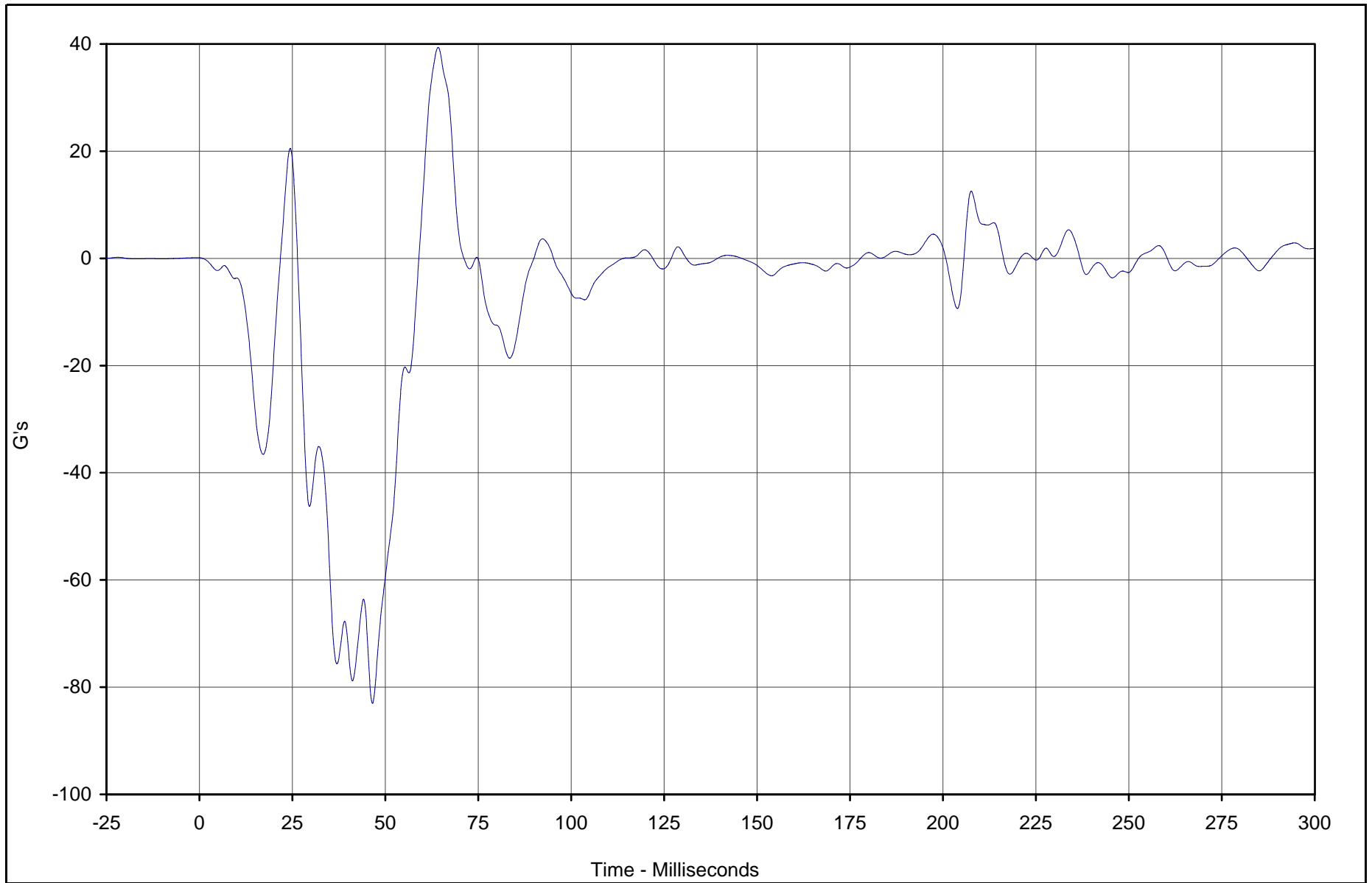
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-135



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper	093	FIL	G's	39.4	64.2	-83.0	46.5	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

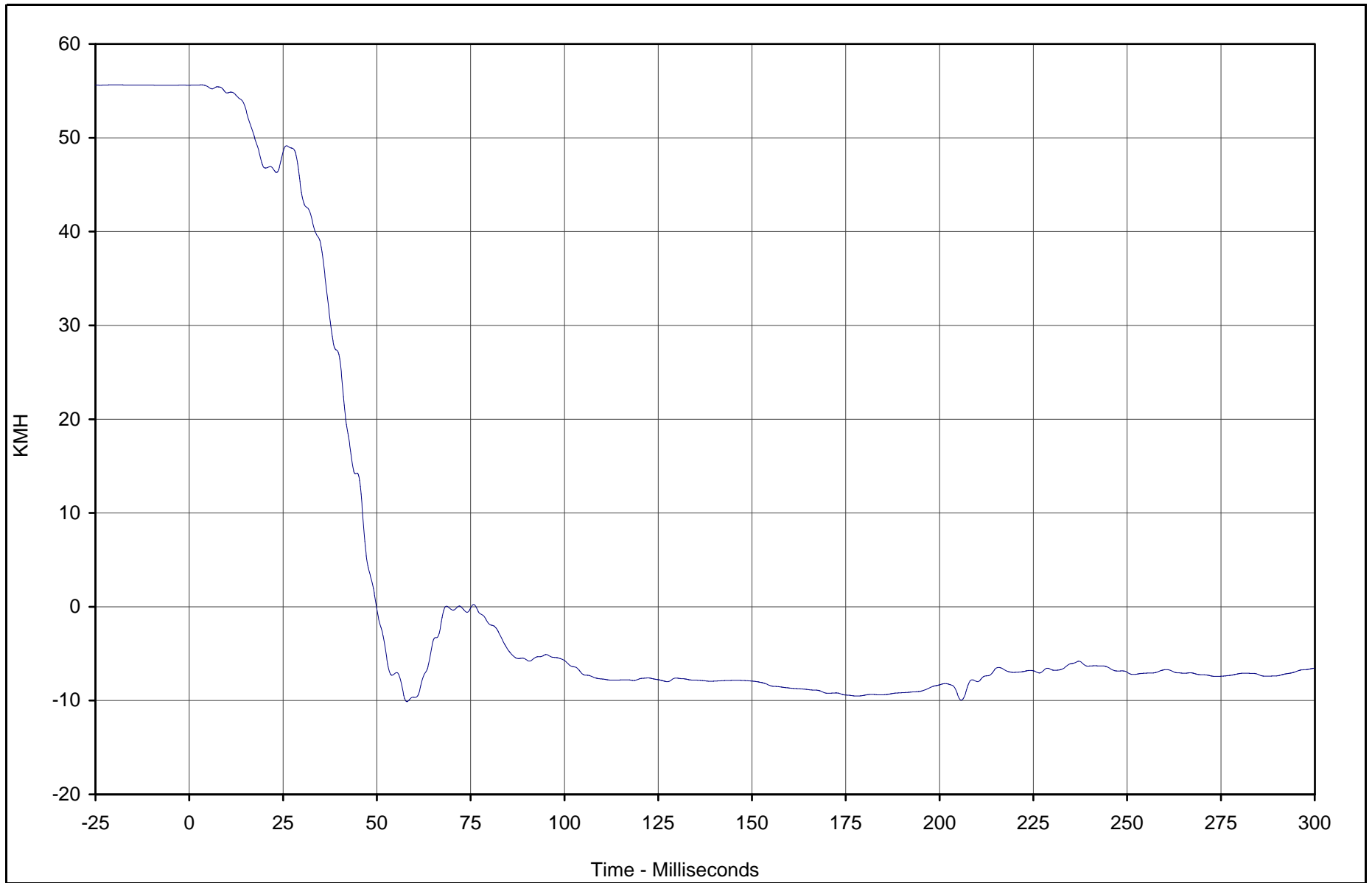
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-136



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper Velocity	093	IN1	KMH	55.6	3.2	-10.1	58.0	180



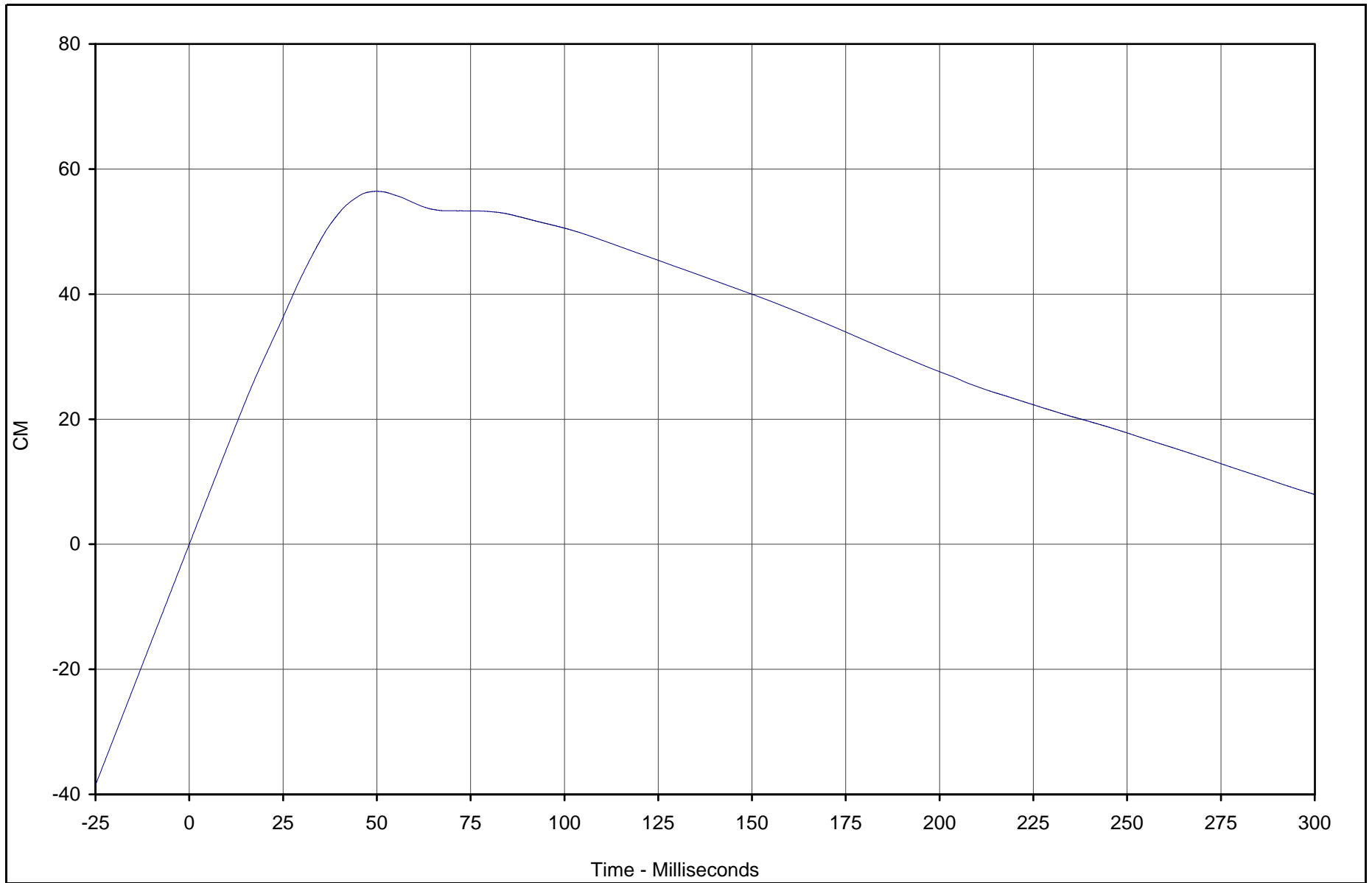
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-137



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Brake Caliper Displ.	093	IN2	CM	56.4	49.9	0.0	0.0	180



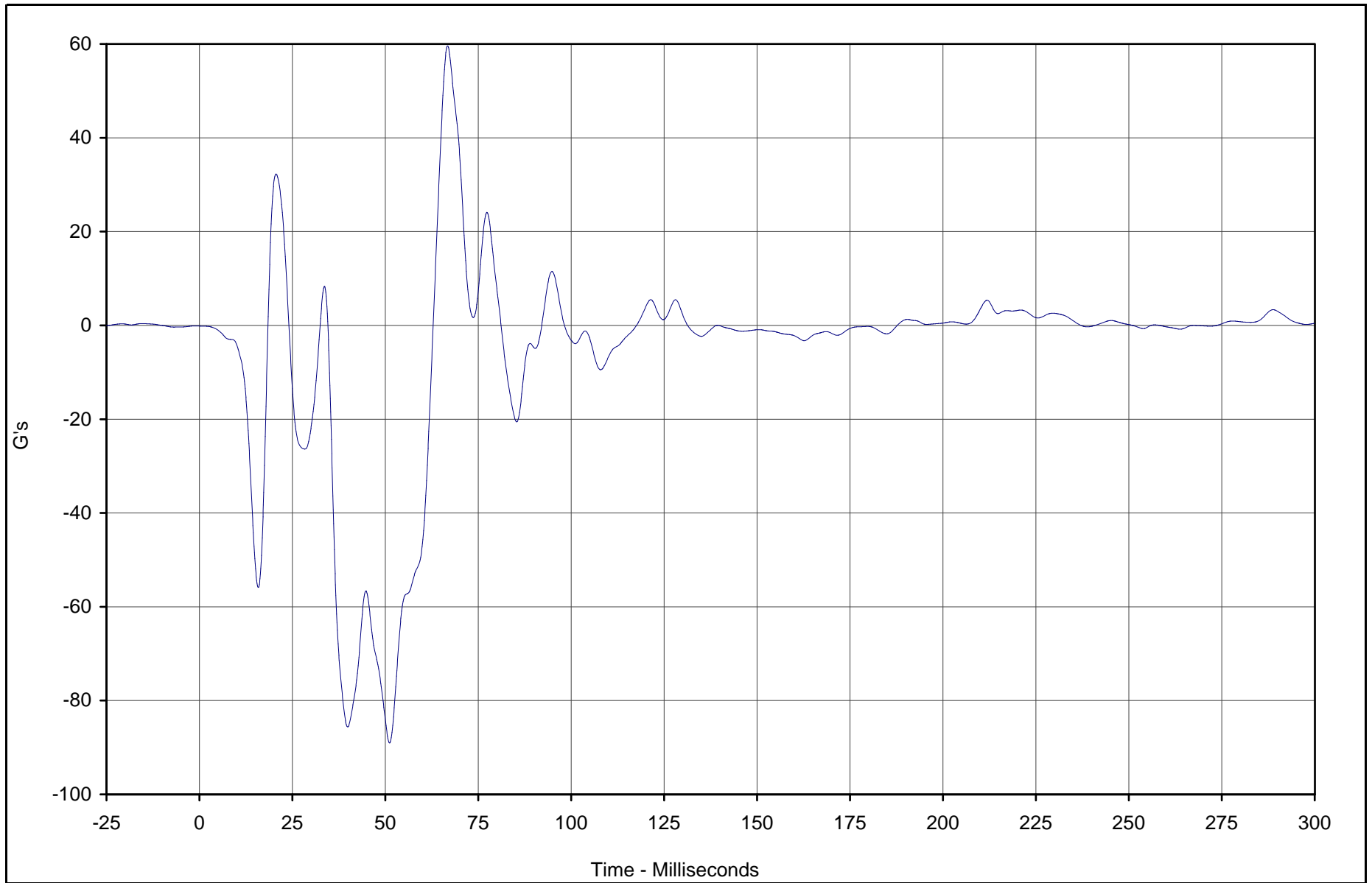
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-138



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper	094	FIL	G's	59.6	66.8	-89.0	51.1	60



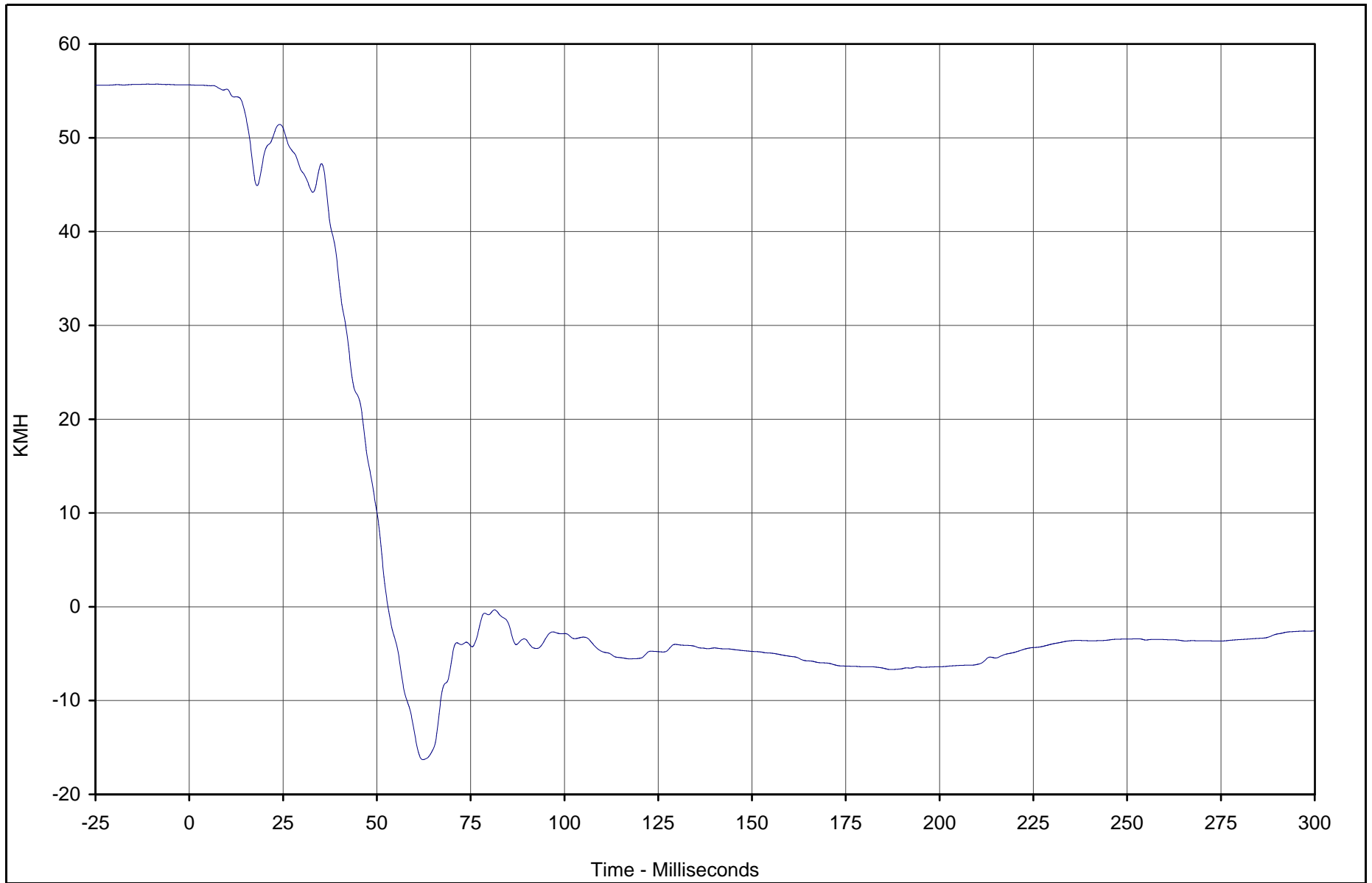
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-139



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper Velocity	094	IN1	KMH	55.6	0.0	-16.3	62.3	180



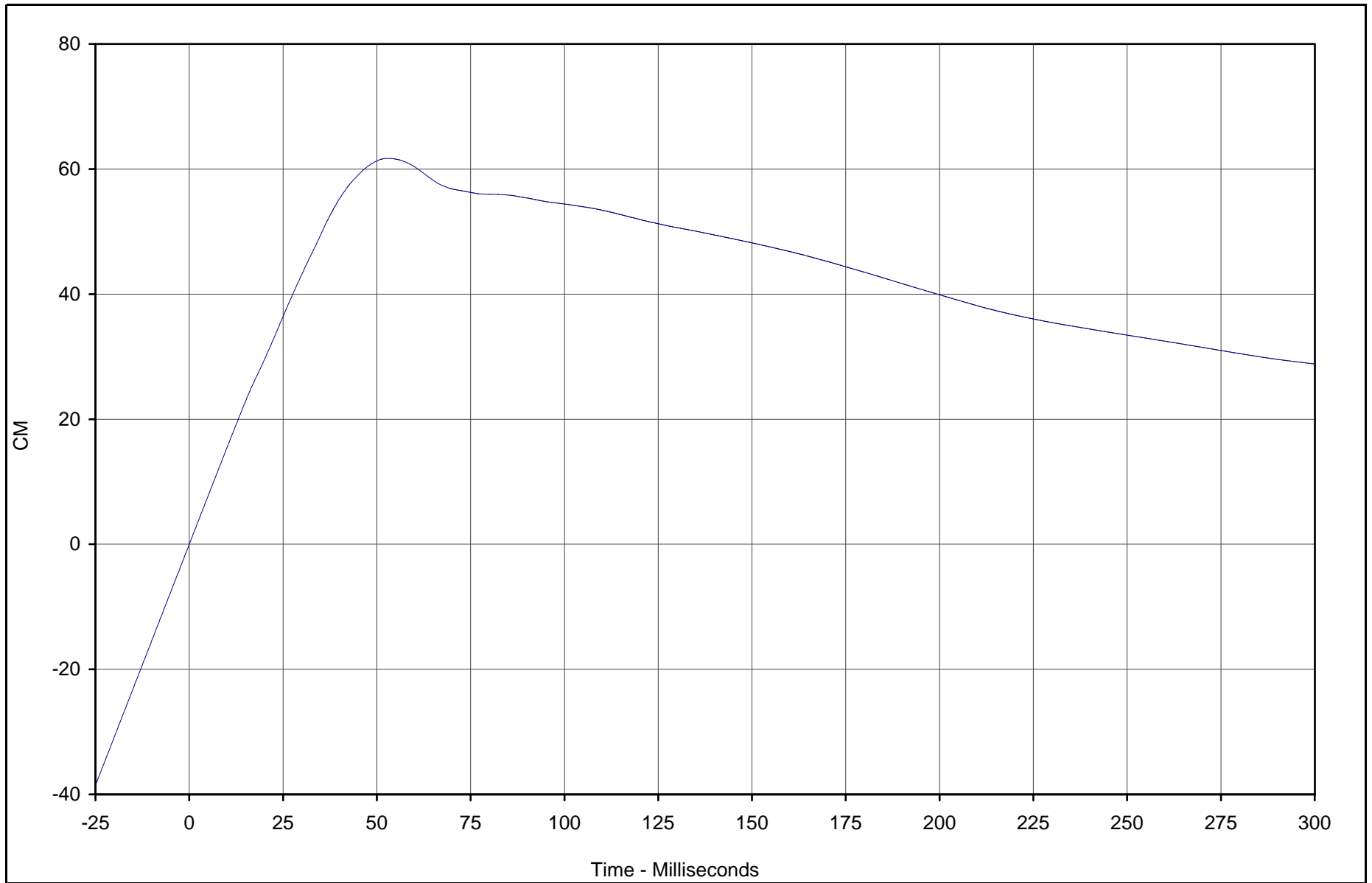
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-140



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Brake Caliper Displ.	094	IN2	CM	61.7	53.0	0.0	0.0	180



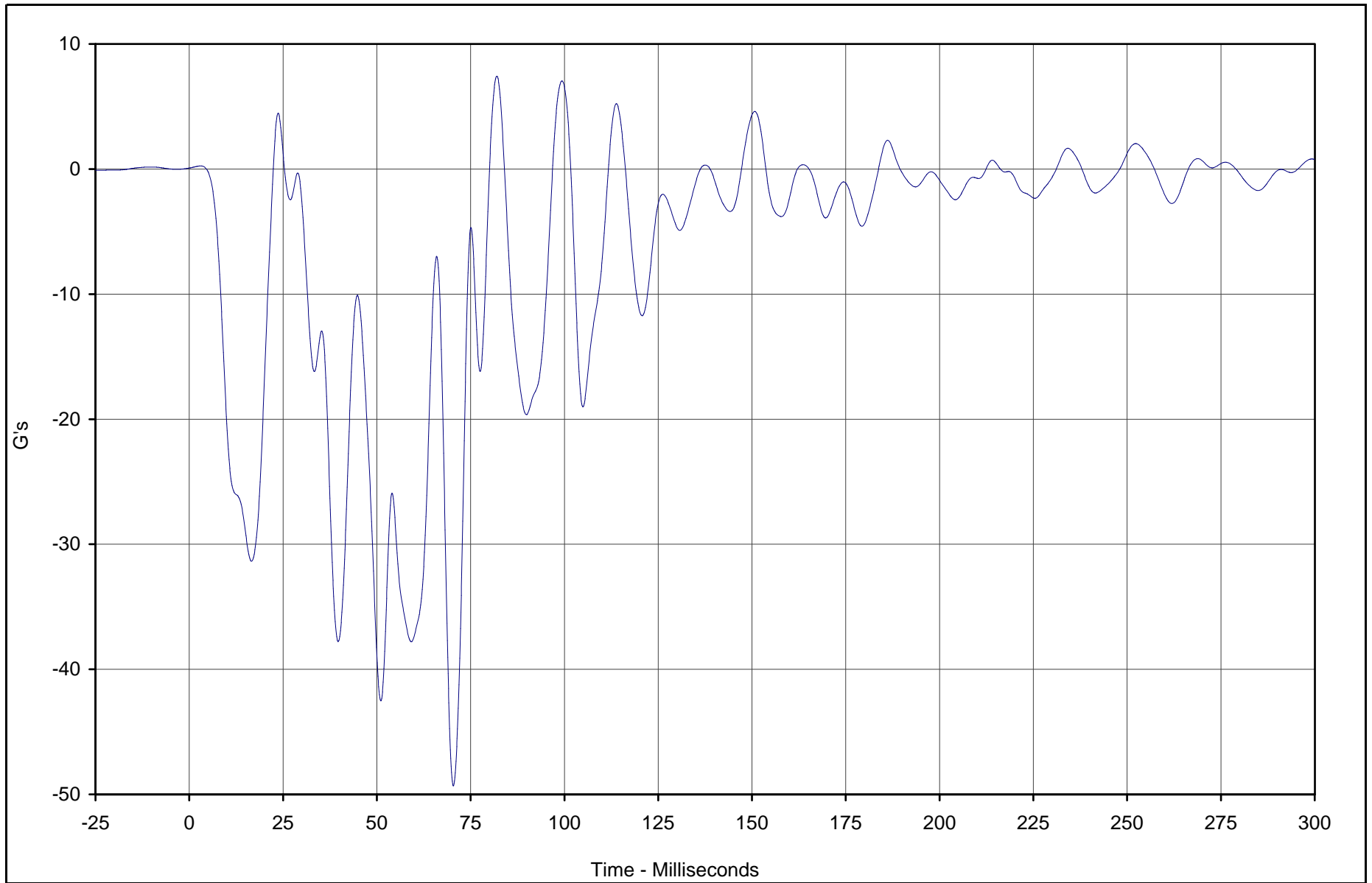
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-141



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel	095	FIL	G's	7.4	82.0	-49.3	70.4	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

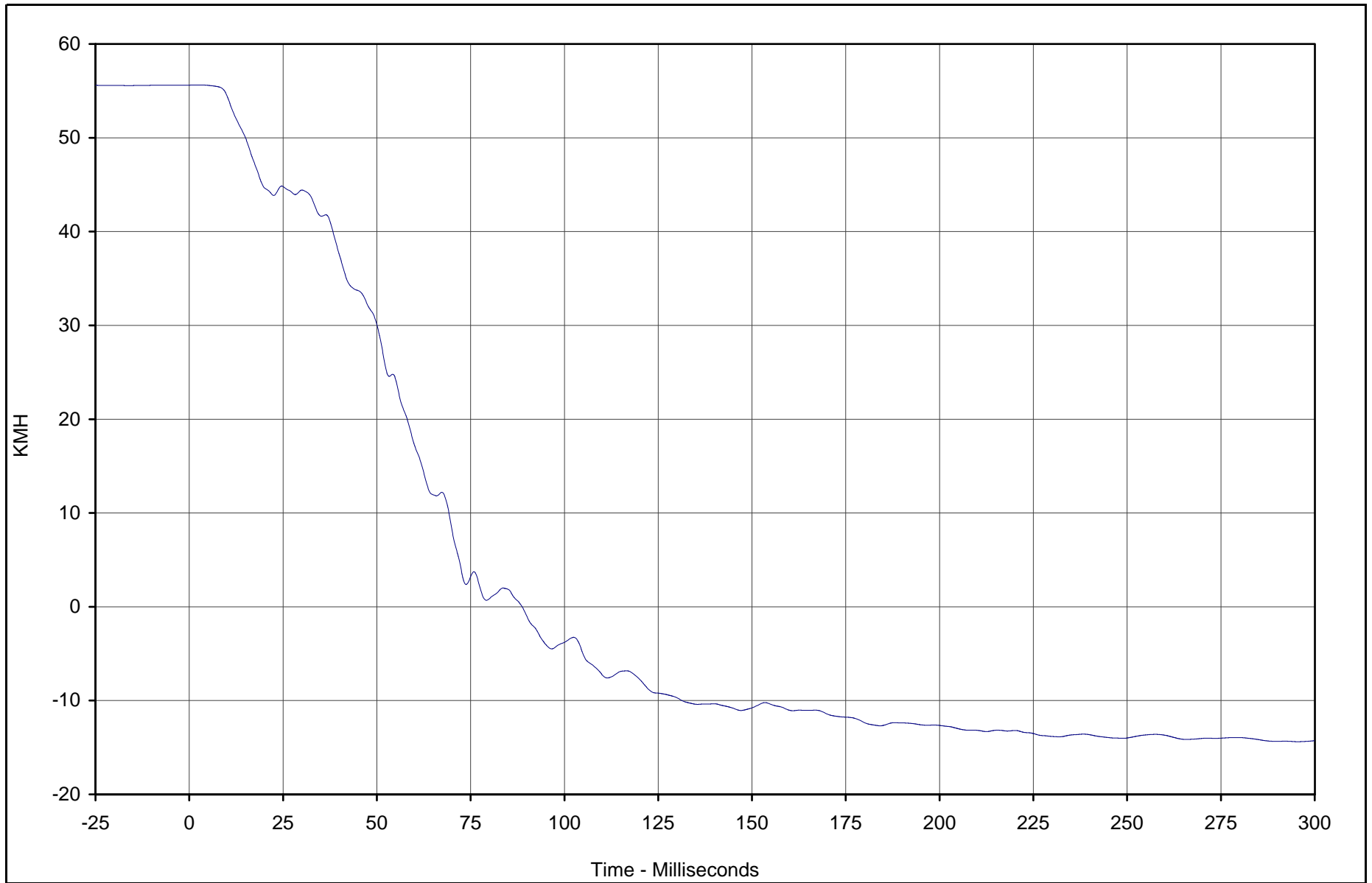
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-142



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel Velocity	095	IN1	KMH	55.6	3.5	-14.4	295.4	180



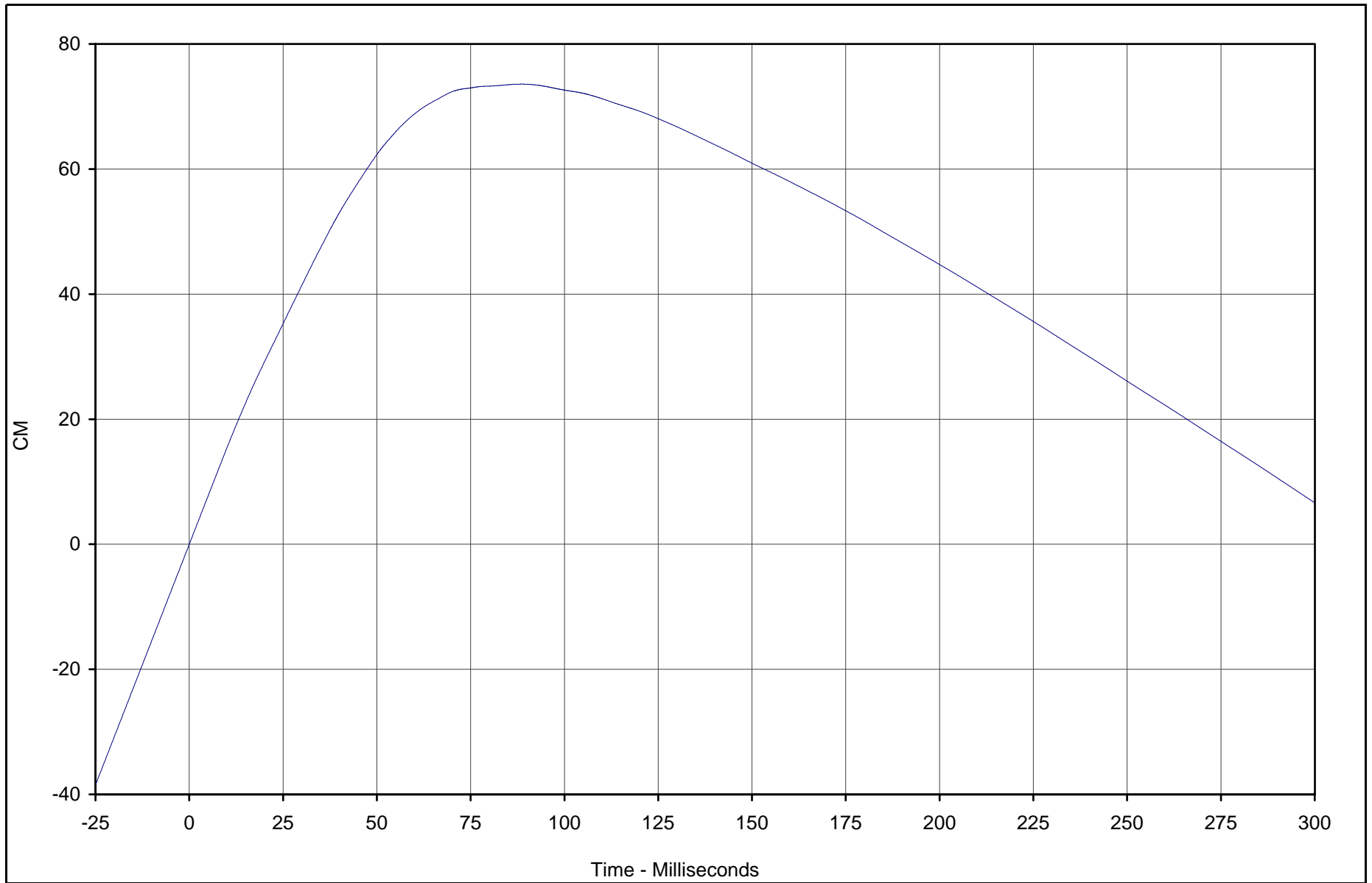
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-143



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Instrument Panel Displacement	095	IN2	CM	73.6	88.7	0.0	0.0	180



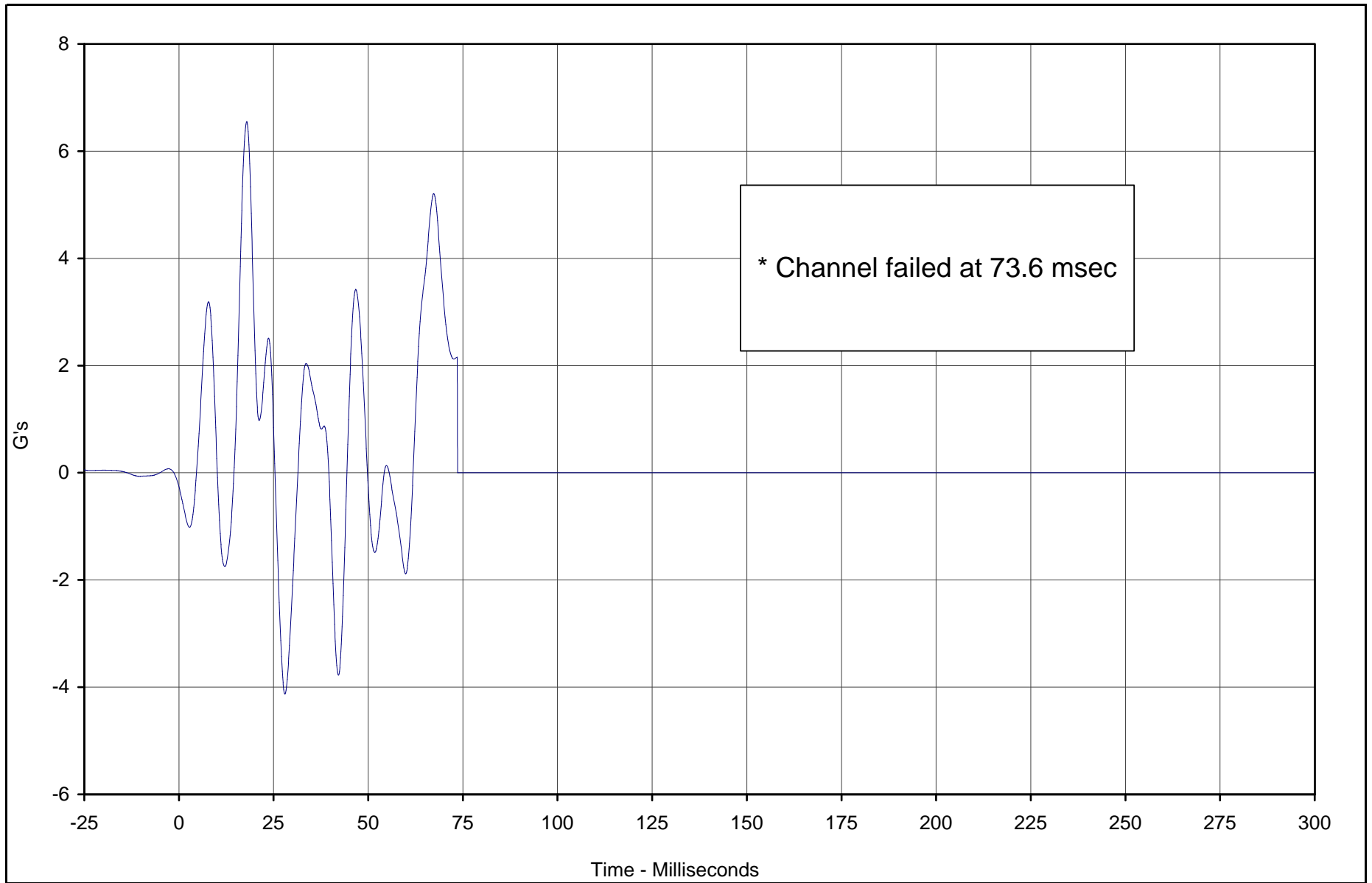
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-144



* Channel failed at 73.6 msec

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z	096	FIL	G's	6.6	17.9	-4.1	28.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

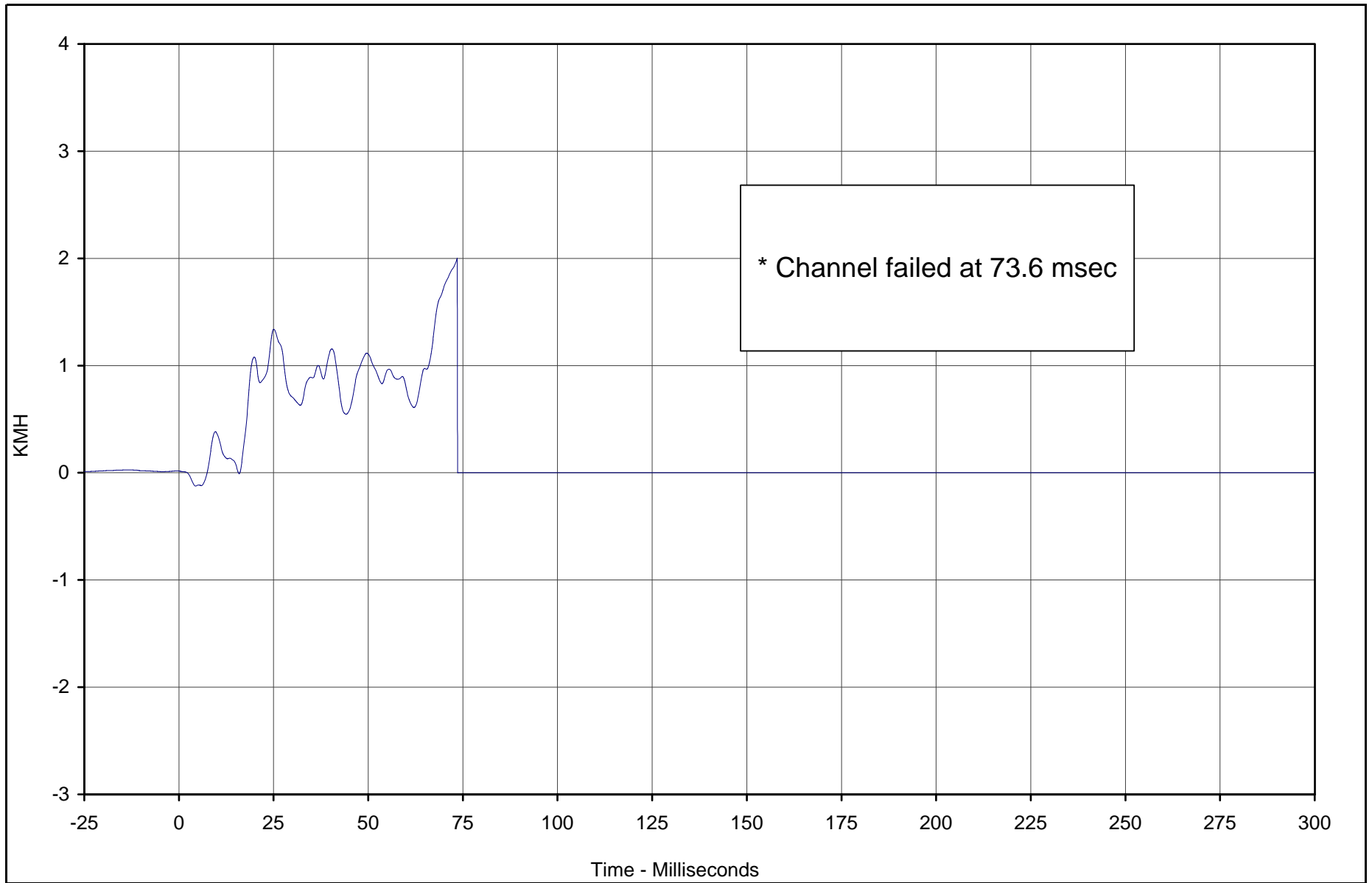
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-145



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z Velocity	096	IN1	KMH	2.0	73.5	-0.1	4.4	180



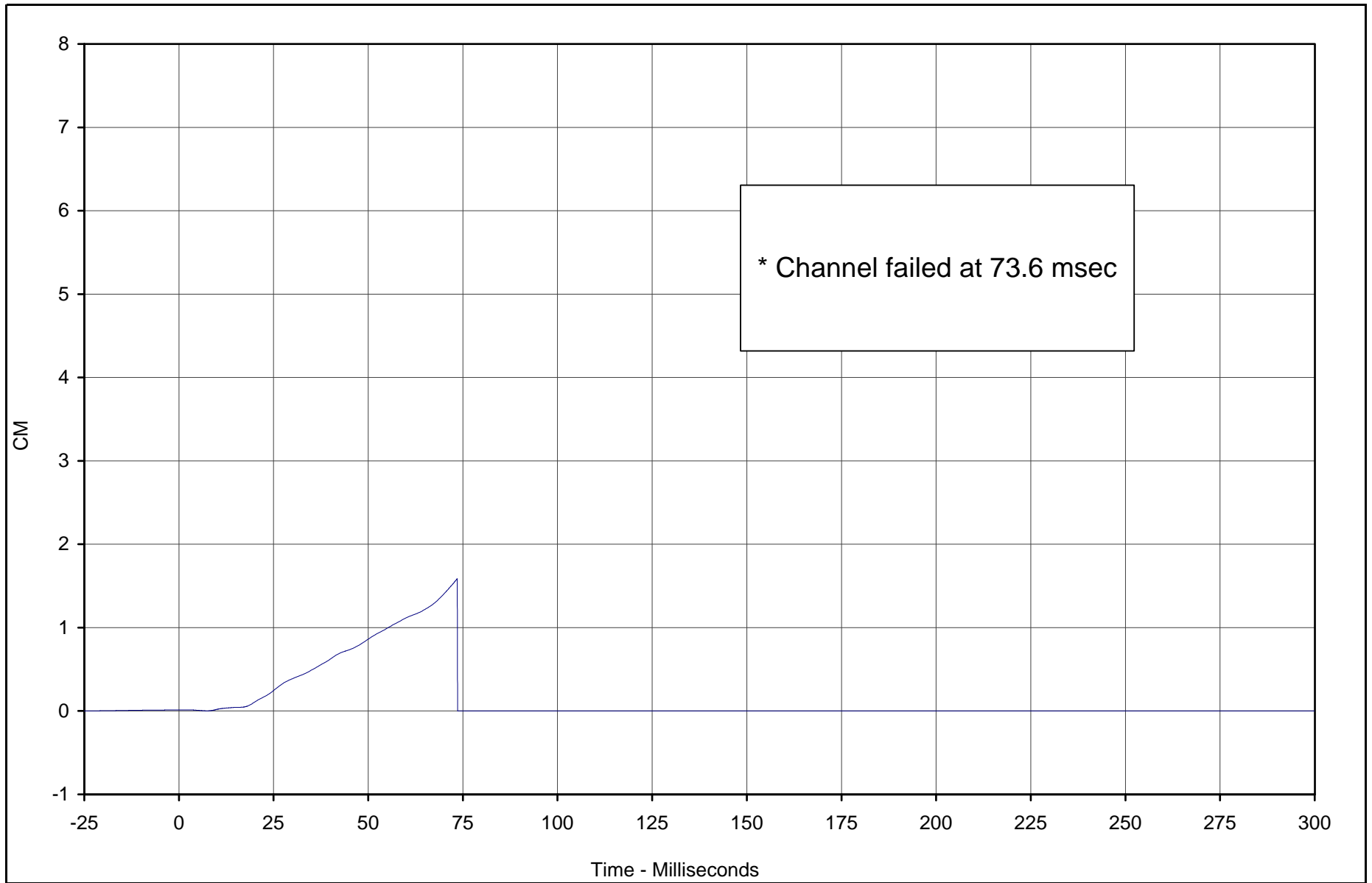
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

B-146



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Left Rear Z Displ.	096	IN2	CM	1.6	73.5	0.0	73.6	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

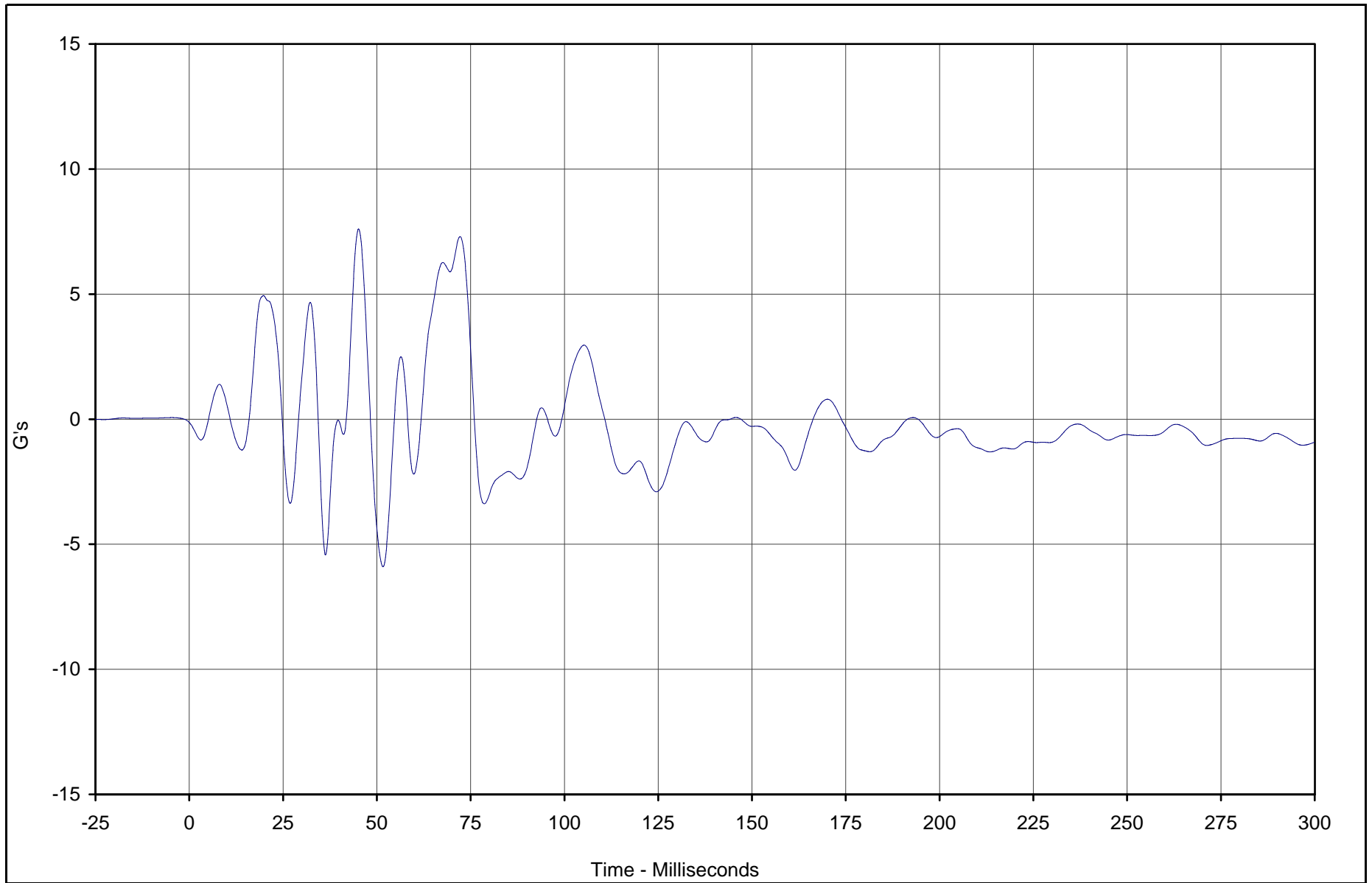
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-147



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z	097	FIL	G's	7.6	45.1	-5.9	51.6	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

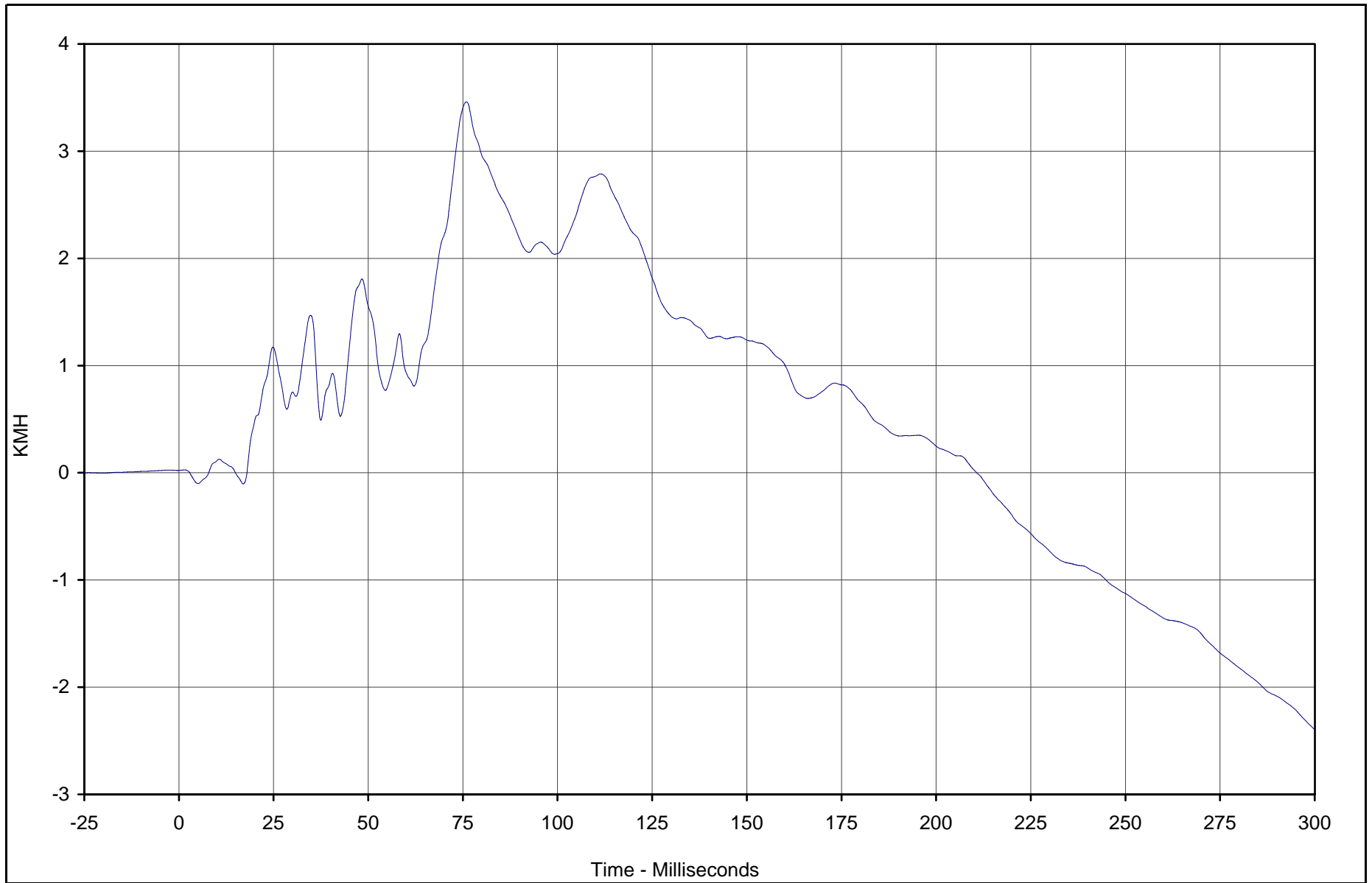
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-148



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z Velocity	097	IN1	KMH	3.5	75.9	-2.4	299.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

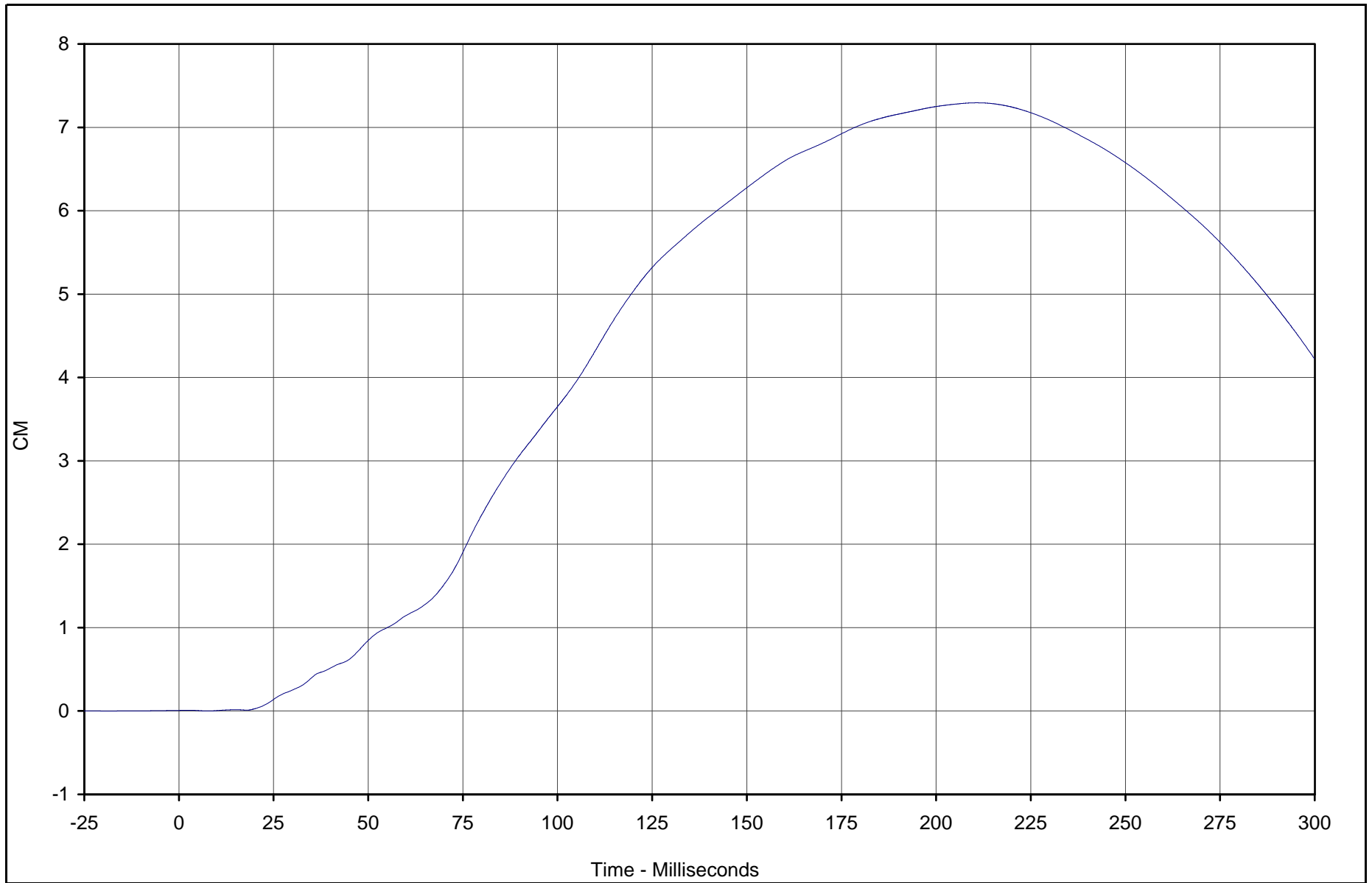
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

B-149



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Vehicle Right Rear Z Displ.	097	IN2	CM	7.3	210.7	0.0	7.9	180



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

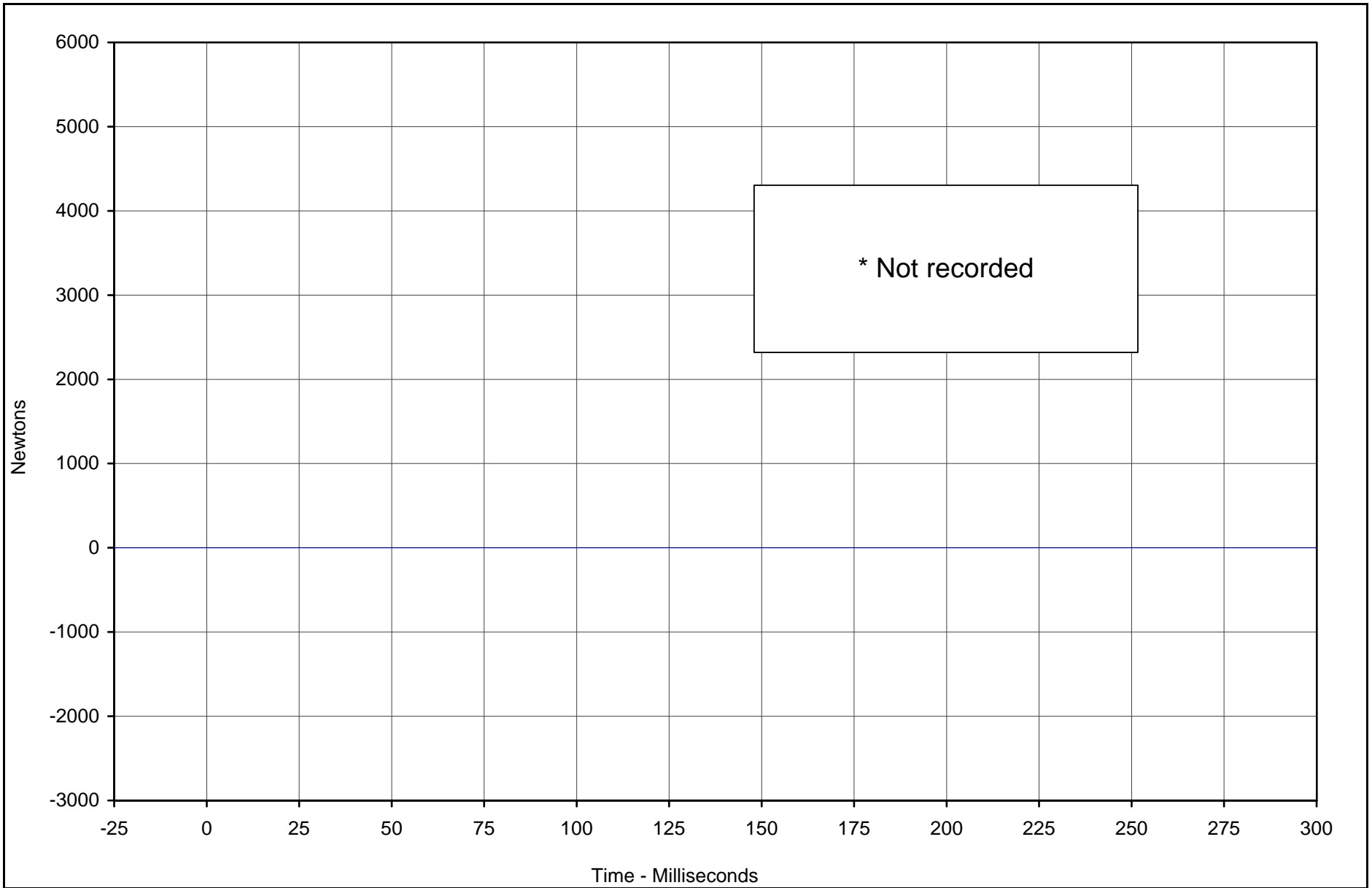
Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

APPENDIX C

LOAD CELL BARRIER DATA PLOTS

C-1



* Not recorded

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A1	098	FIL	Newtons	0.0	0.0	0.0	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

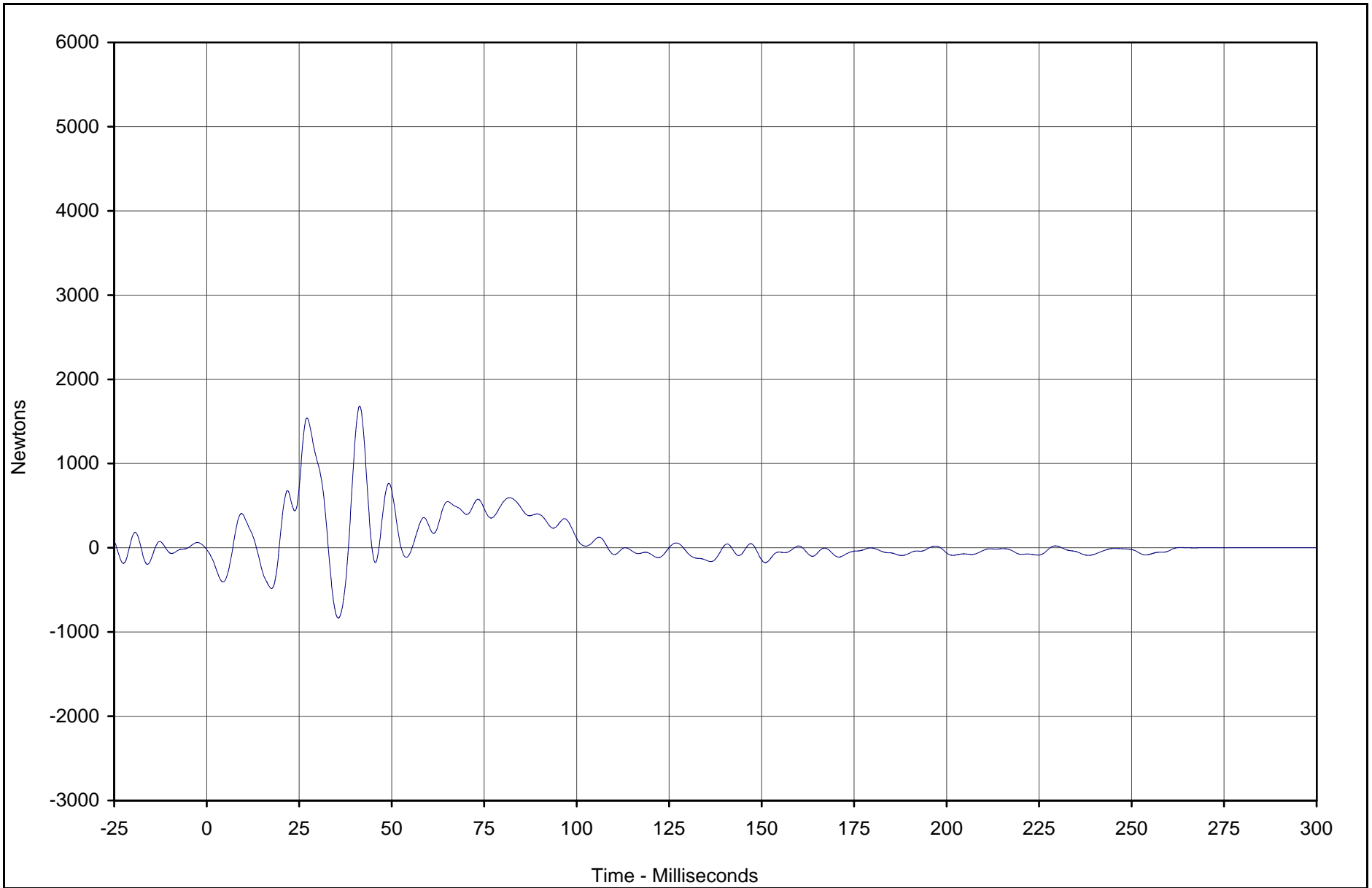
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-2



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A2	099	FIL	Newtons	1680.2	41.3	-833.5	35.6	60



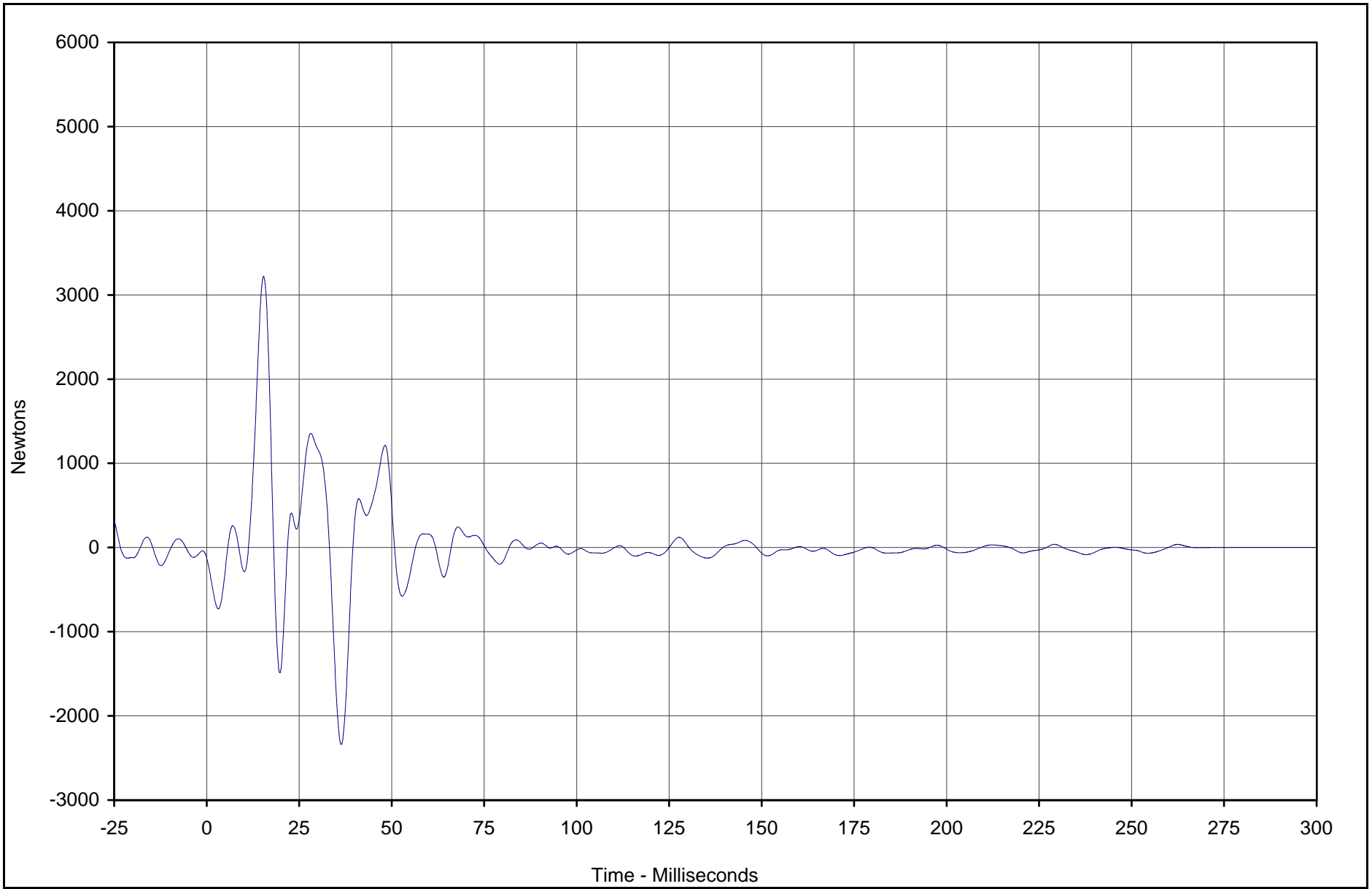
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-3



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A3	100	FIL	Newtons	3222.0	15.4	-2338.7	36.4	60



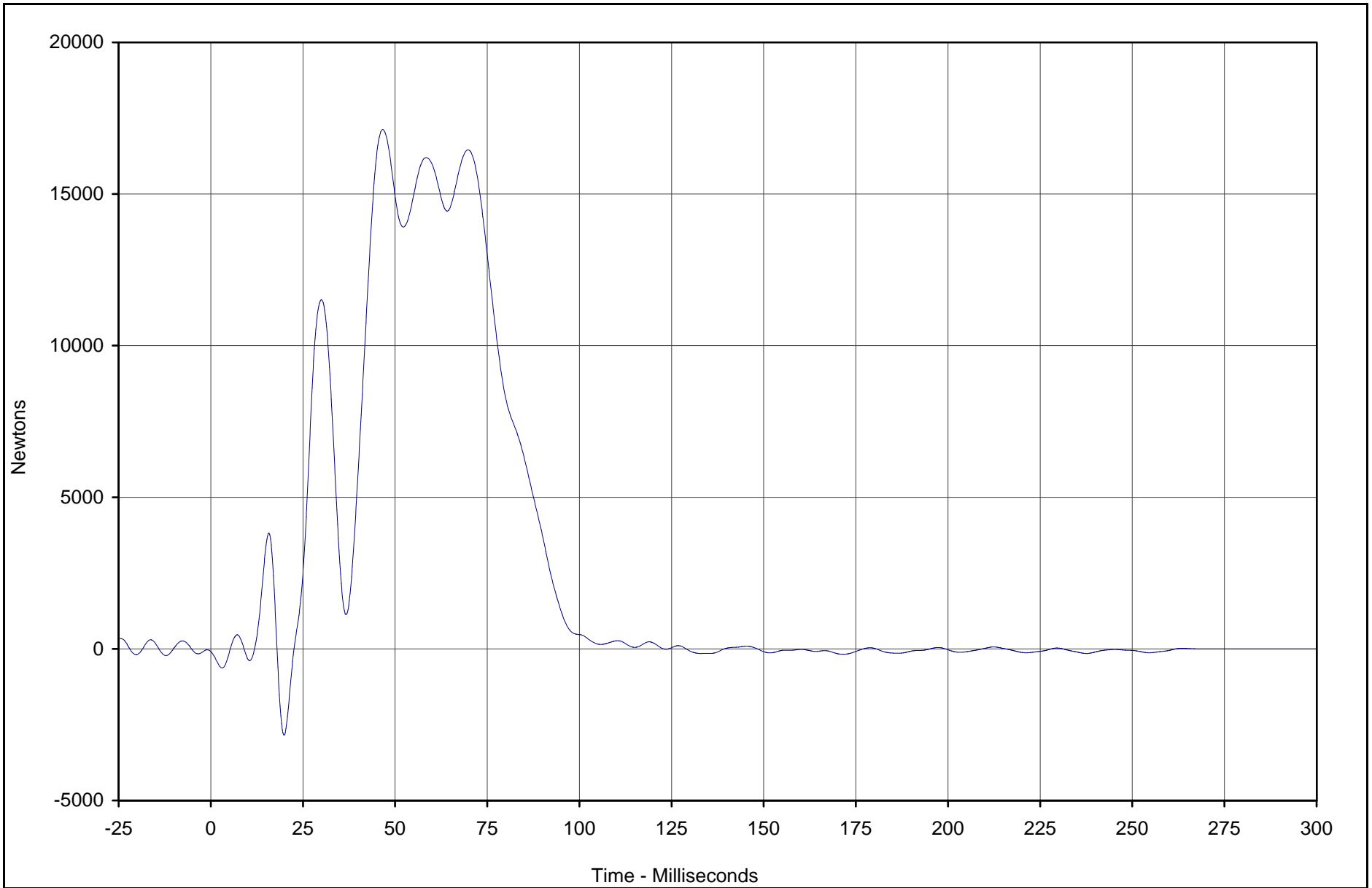
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-4



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A4	101	FIL	Newtons	17124.1	46.6	-2842.2	19.9	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

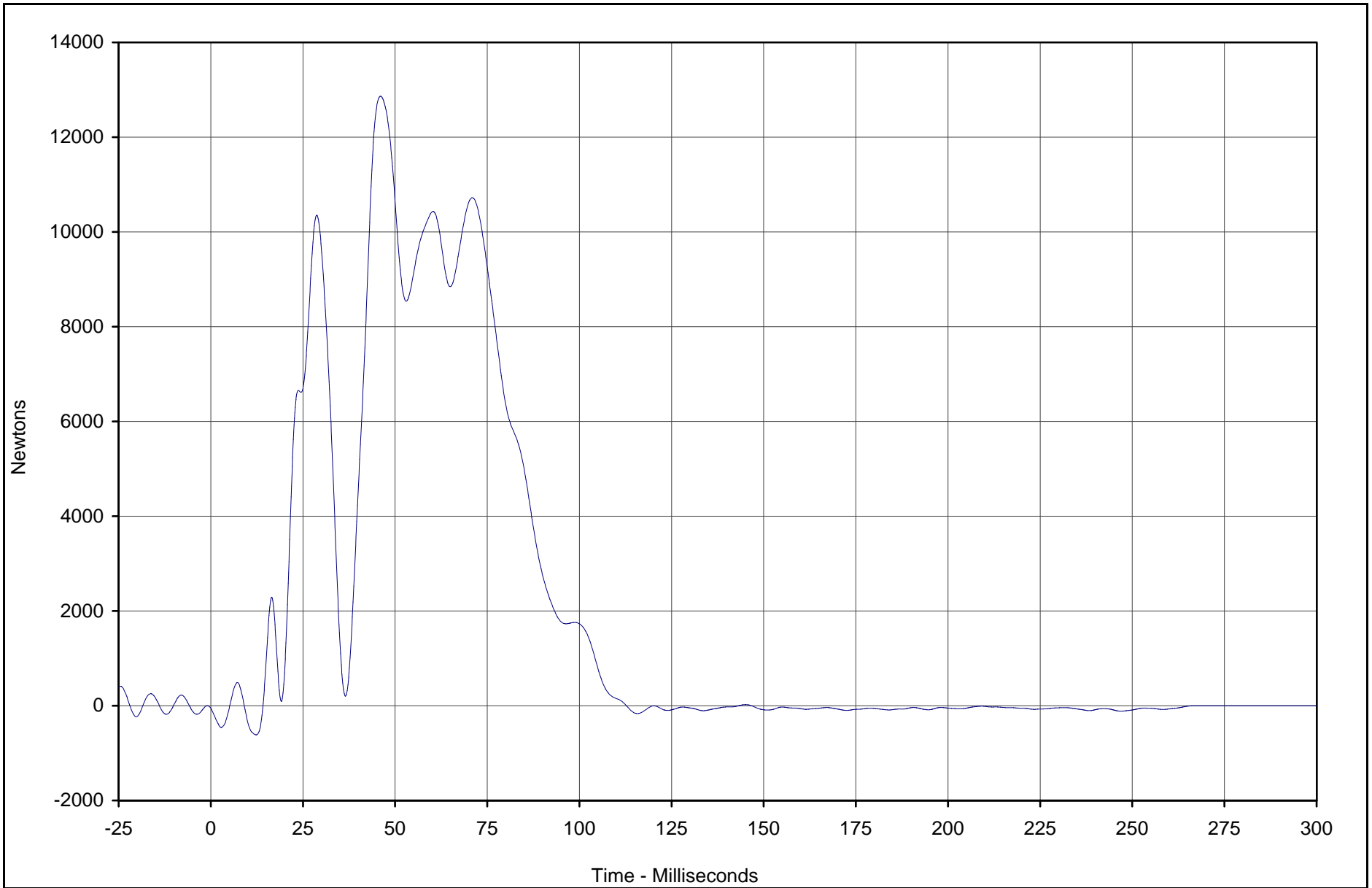
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-5



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A5	102	FIL	Newtons	12864.1	46.0	-614.6	12.3	60



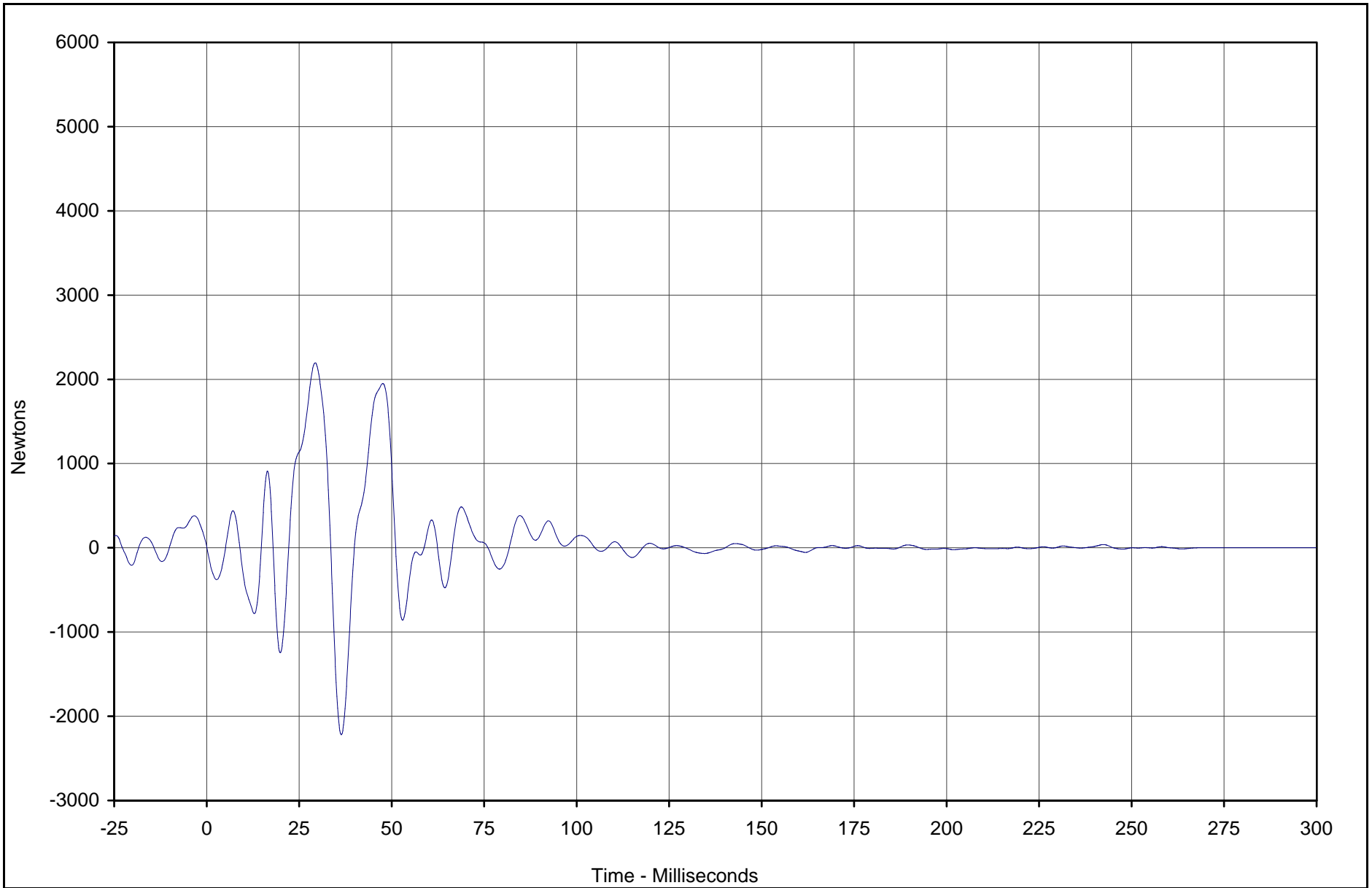
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-6



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A6	103	FIL	Newtons	2196.0	29.3	-2218.9	36.4	60



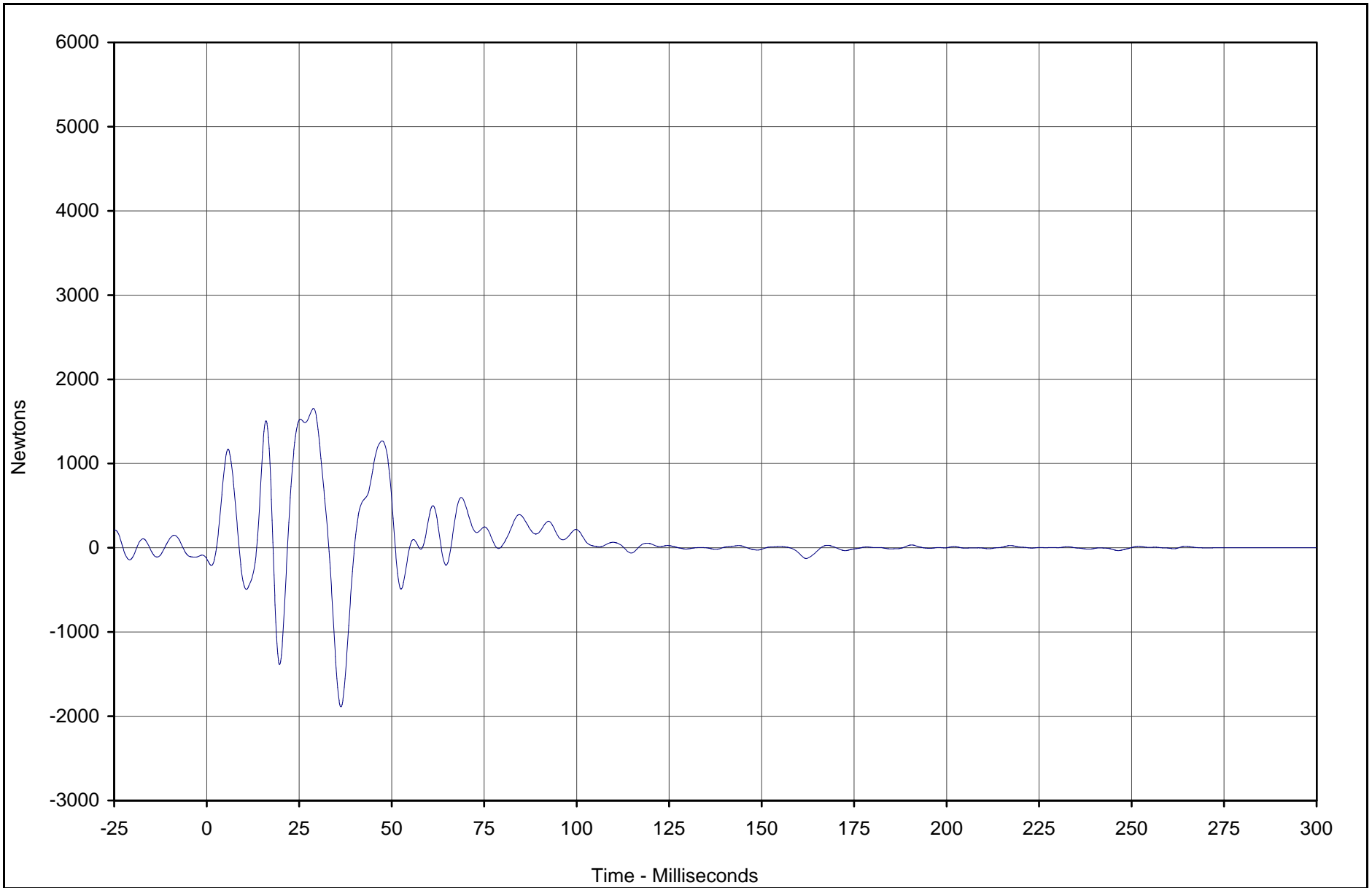
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-7



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A7	104	FIL	Newtons	1654.4	28.9	-1889.6	36.3	60



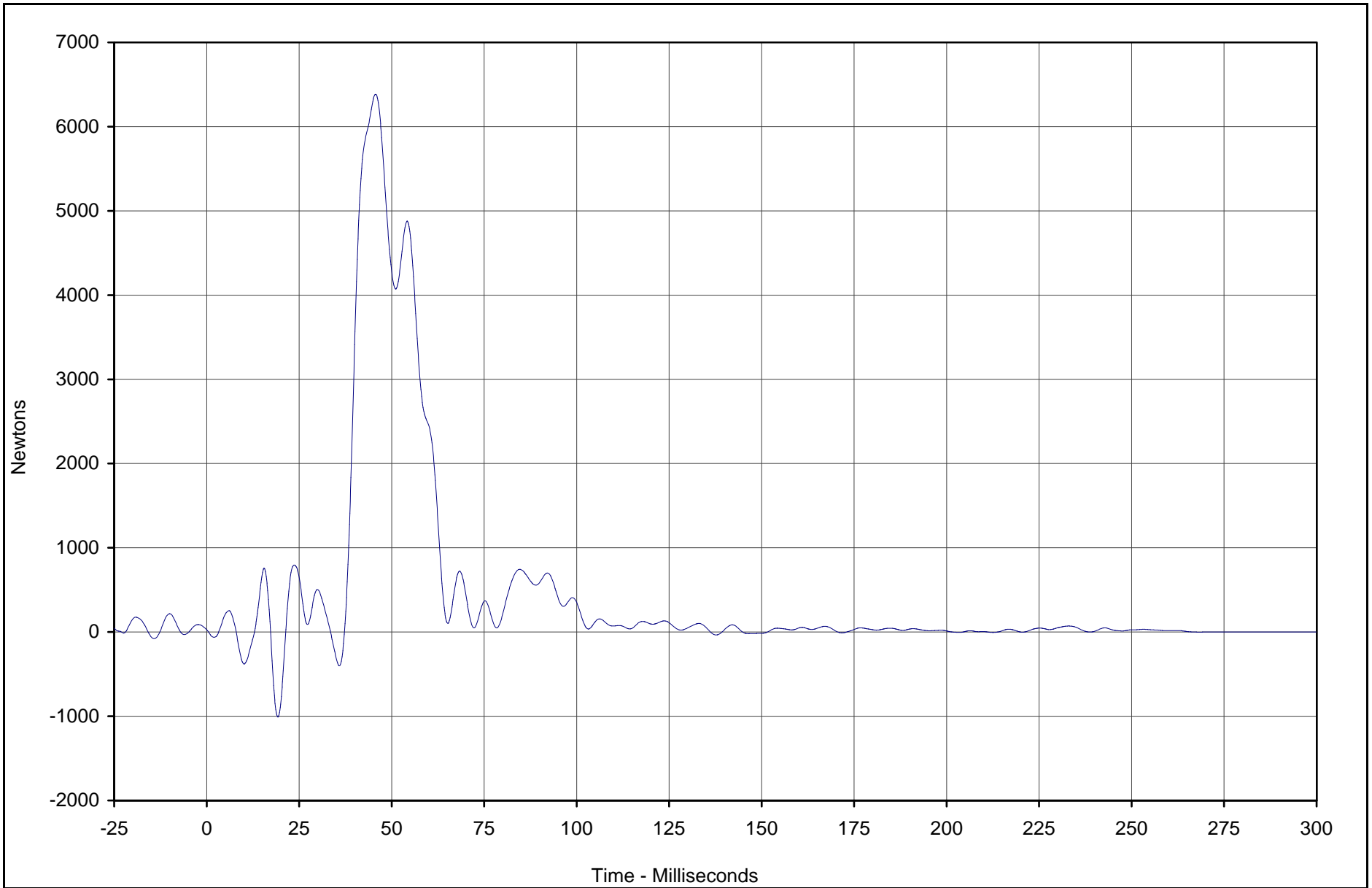
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-8



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A8	105	FIL	Newtons	6384.2	45.6	-1009.1	19.3	60



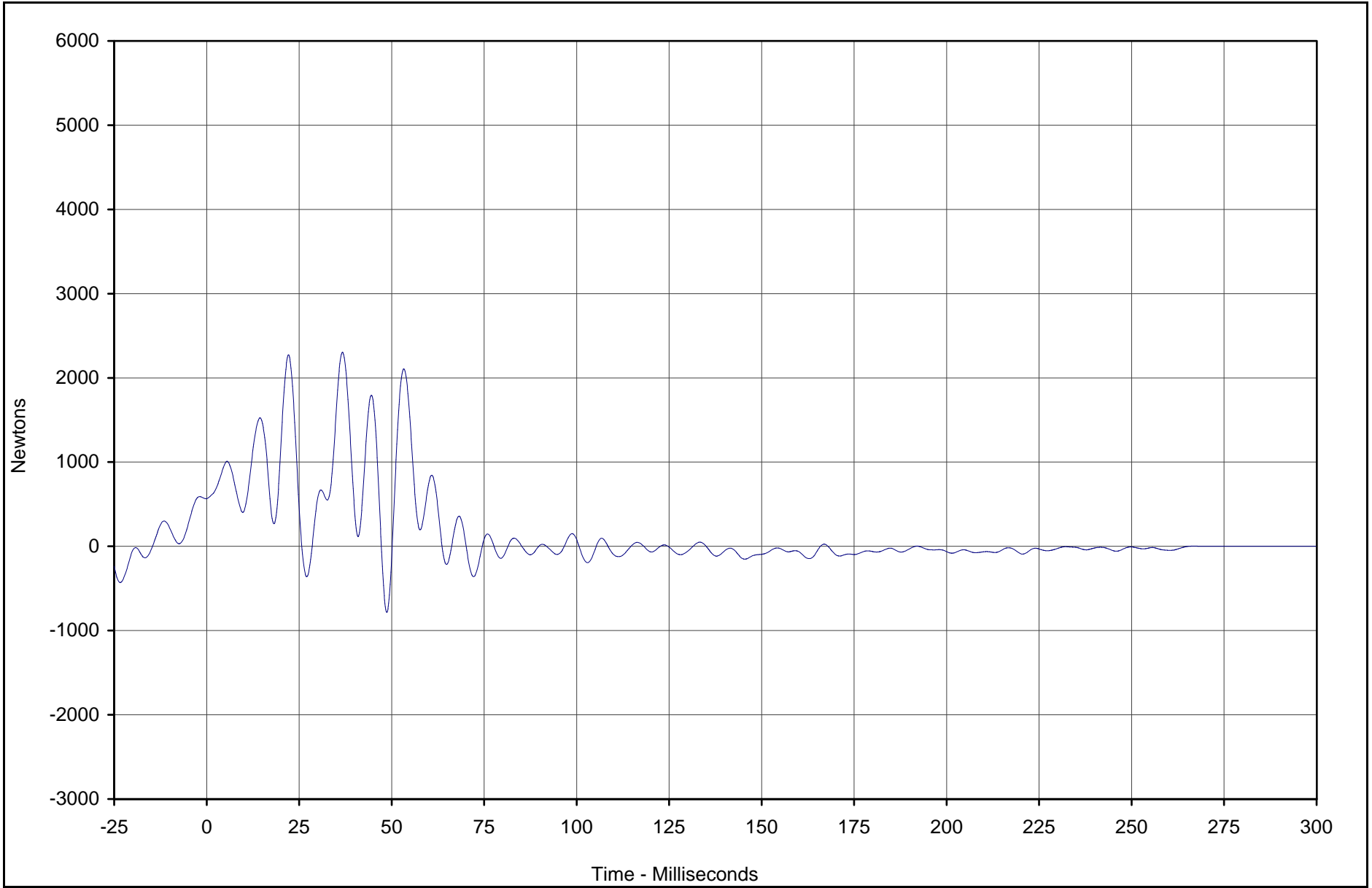
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-9



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force A9	106	FIL	Newtons	2304.3	36.7	-783.6	48.7	60



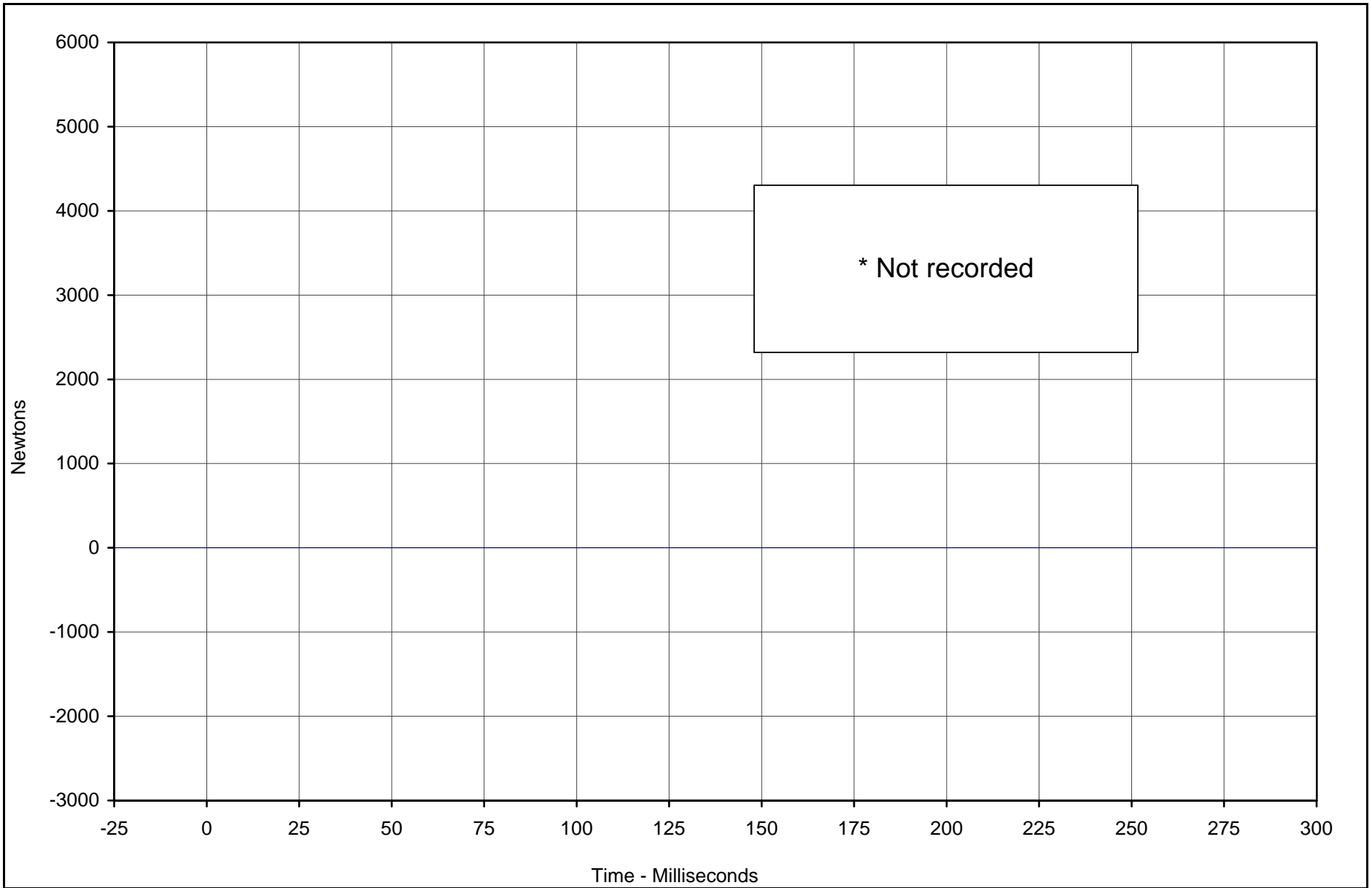
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-10



* Not recorded

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B1	107	FIL	Newtons	0.0	0.0	0.0	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

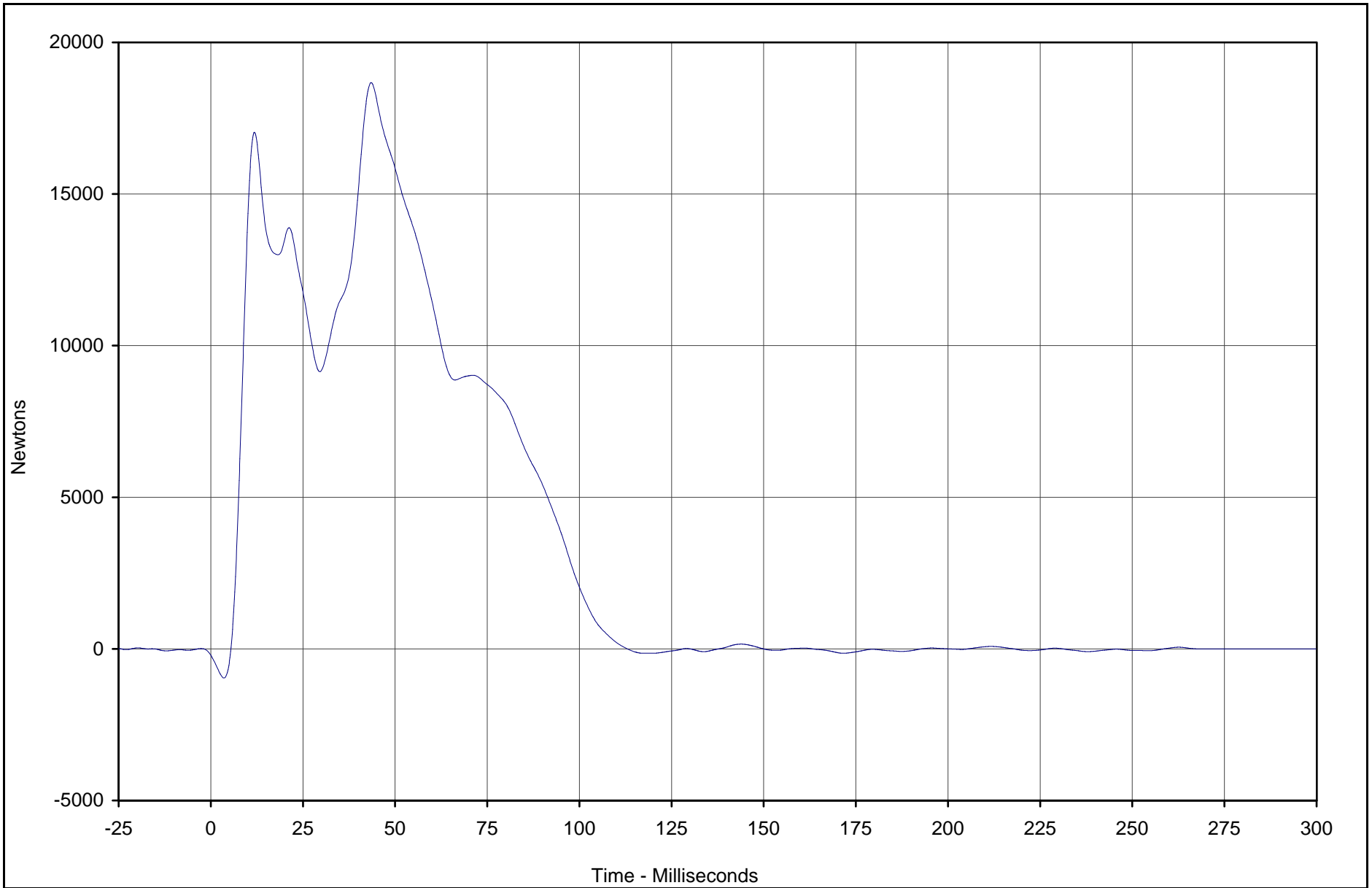
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KARR2001-118

C-11



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B2	108	FIL	Newtons	18672.9	43.5	-960.3	3.6	60



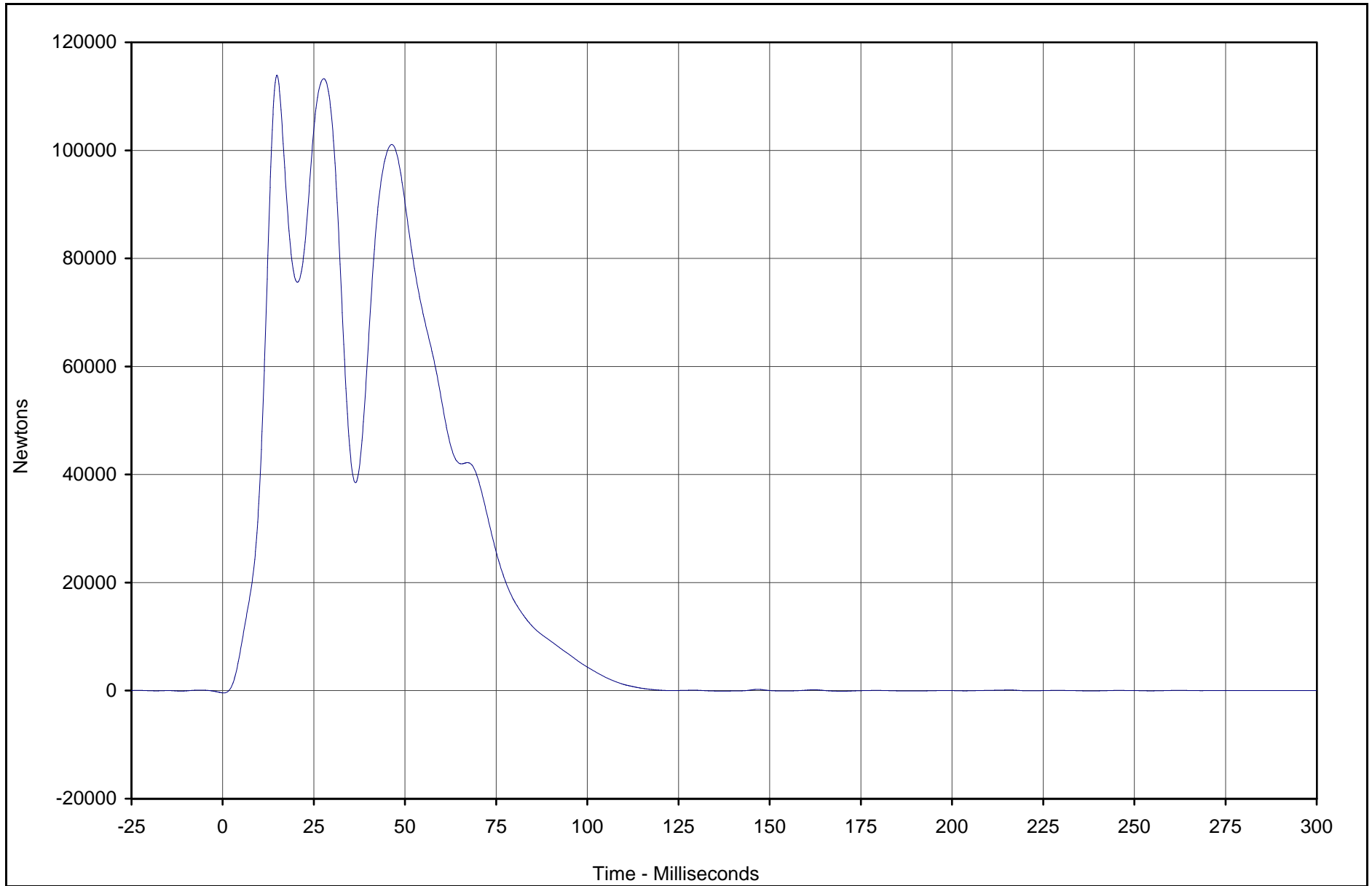
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-12



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B3	109	FIL	Newtons	113915.1	14.9	-426.8	0.3	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

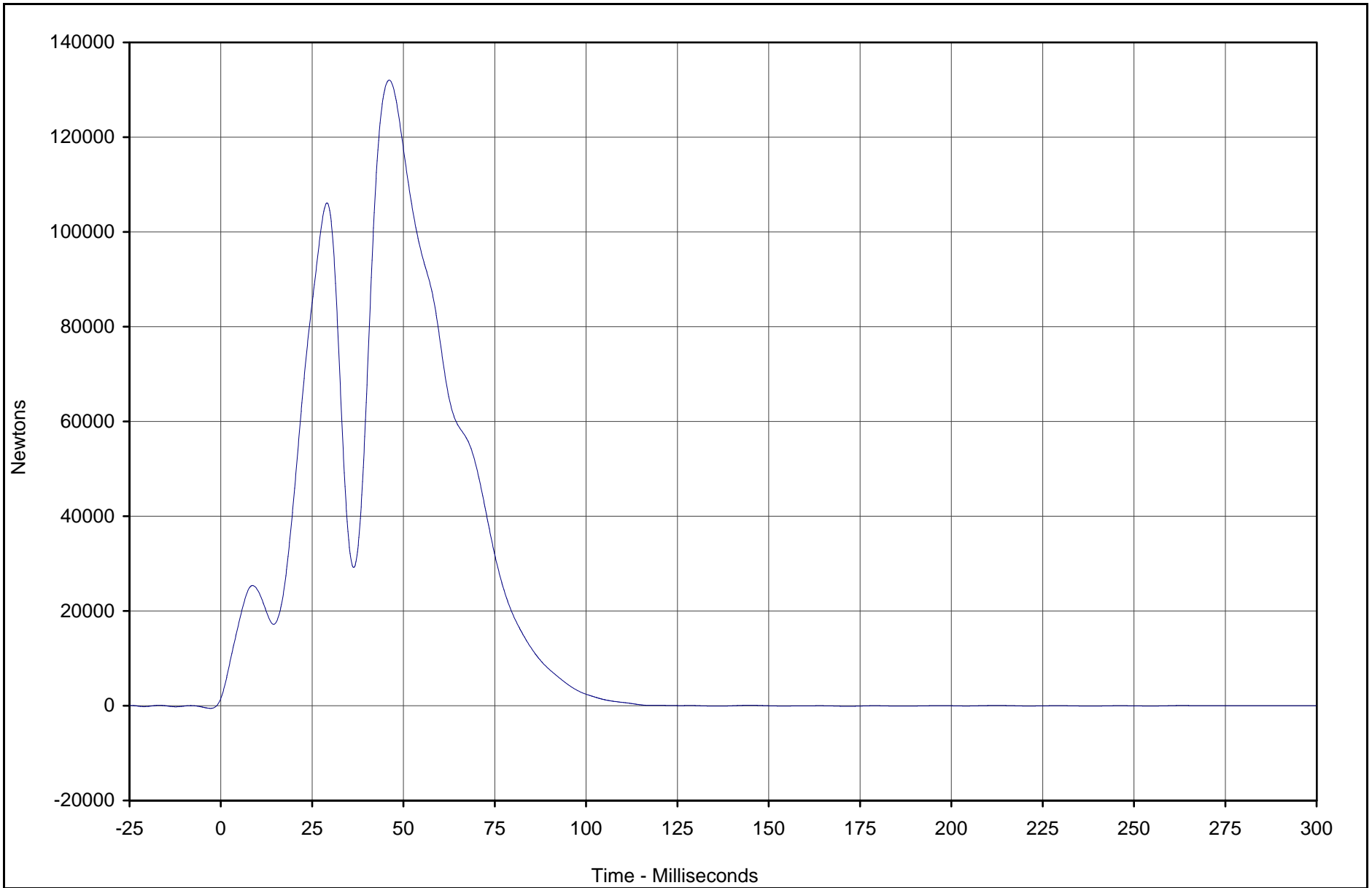
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-13



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B4	110	FIL	Newtons	132041.8	46.1	-126.2	171.5	60



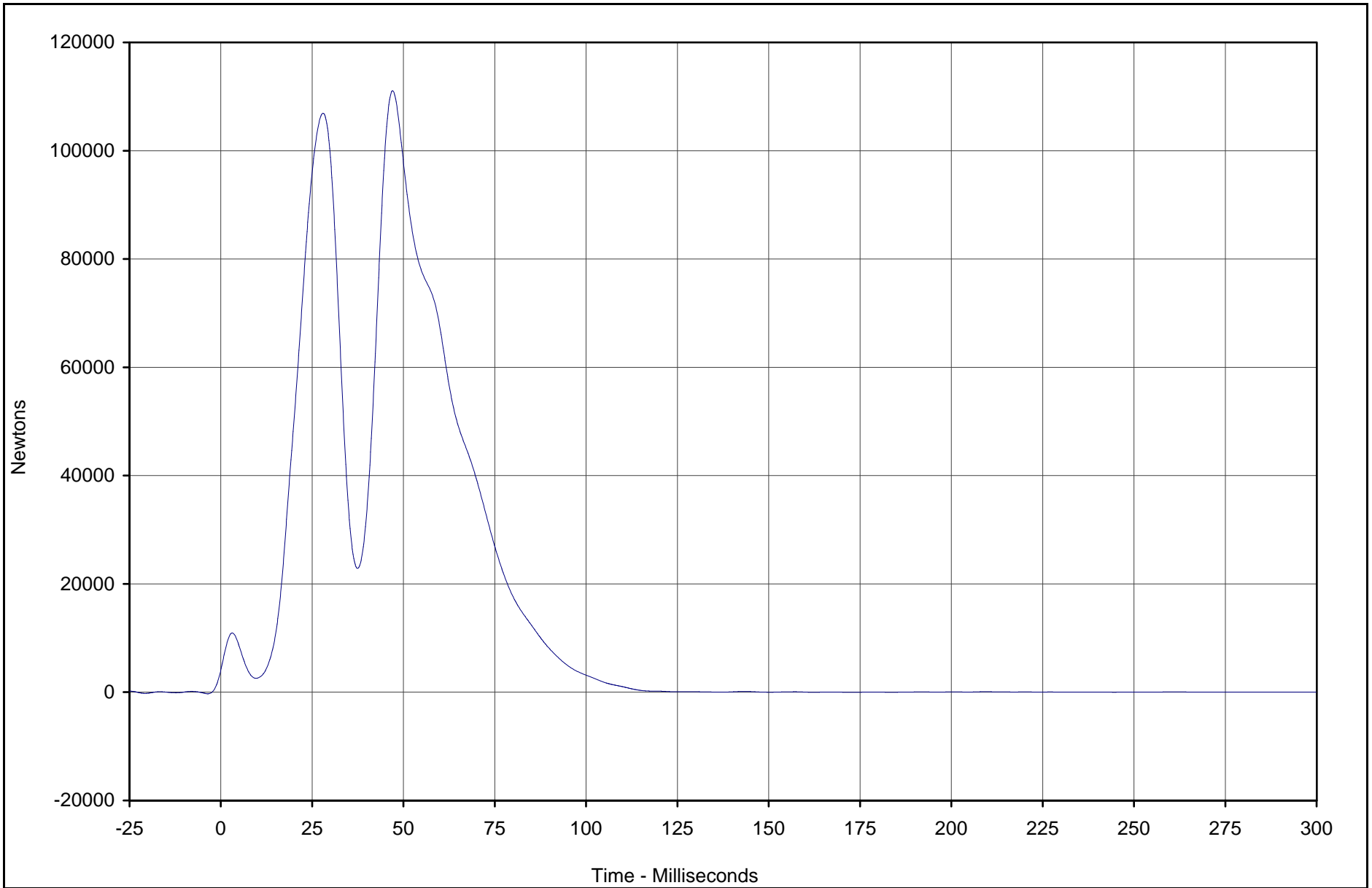
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-14



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B5	111	FIL	Newtons	111070.6	47.0	-33.7	173.1	60



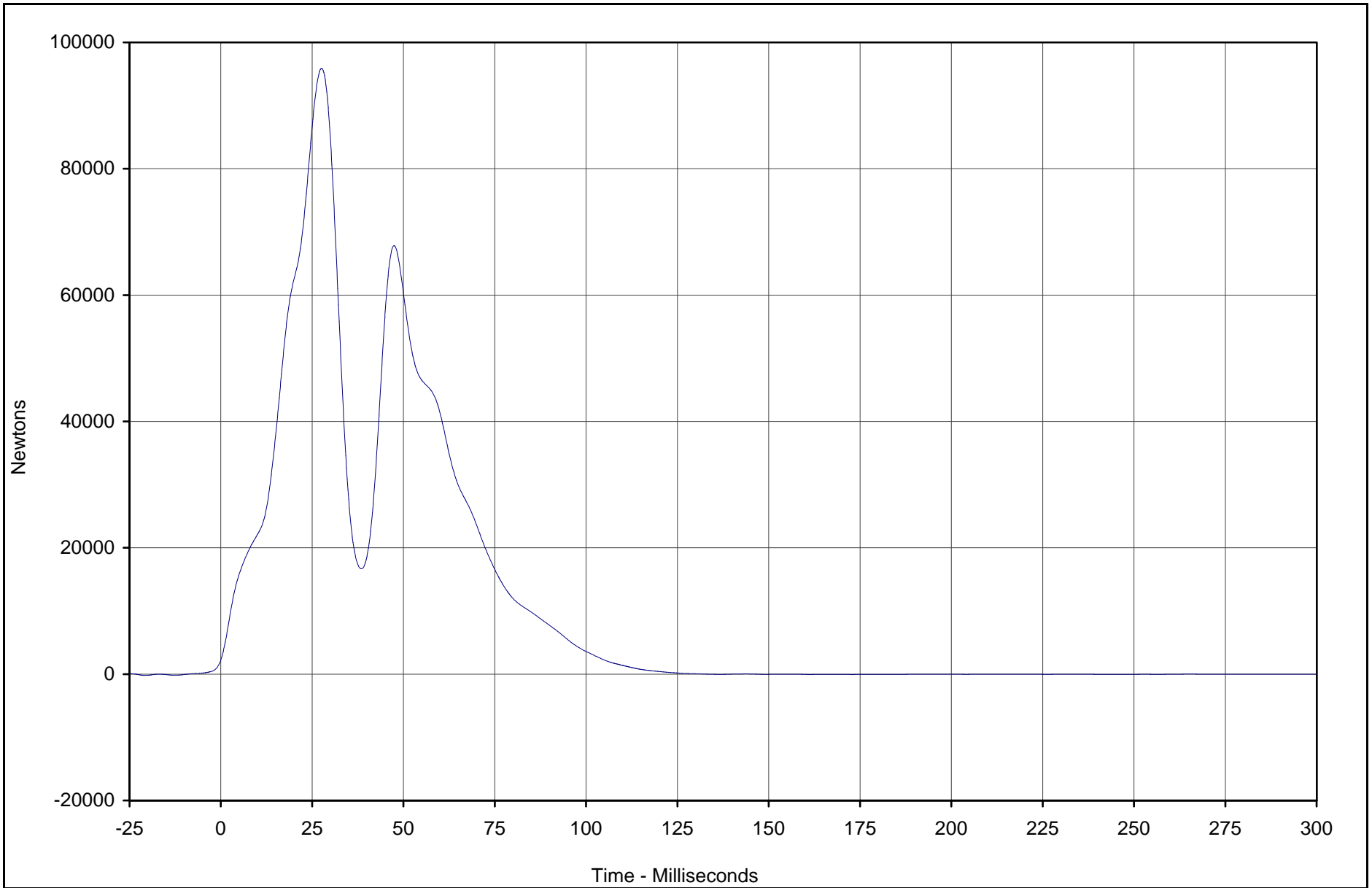
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-15



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B6	112	FIL	Newtons	95888.2	27.6	-62.8	161.3	60



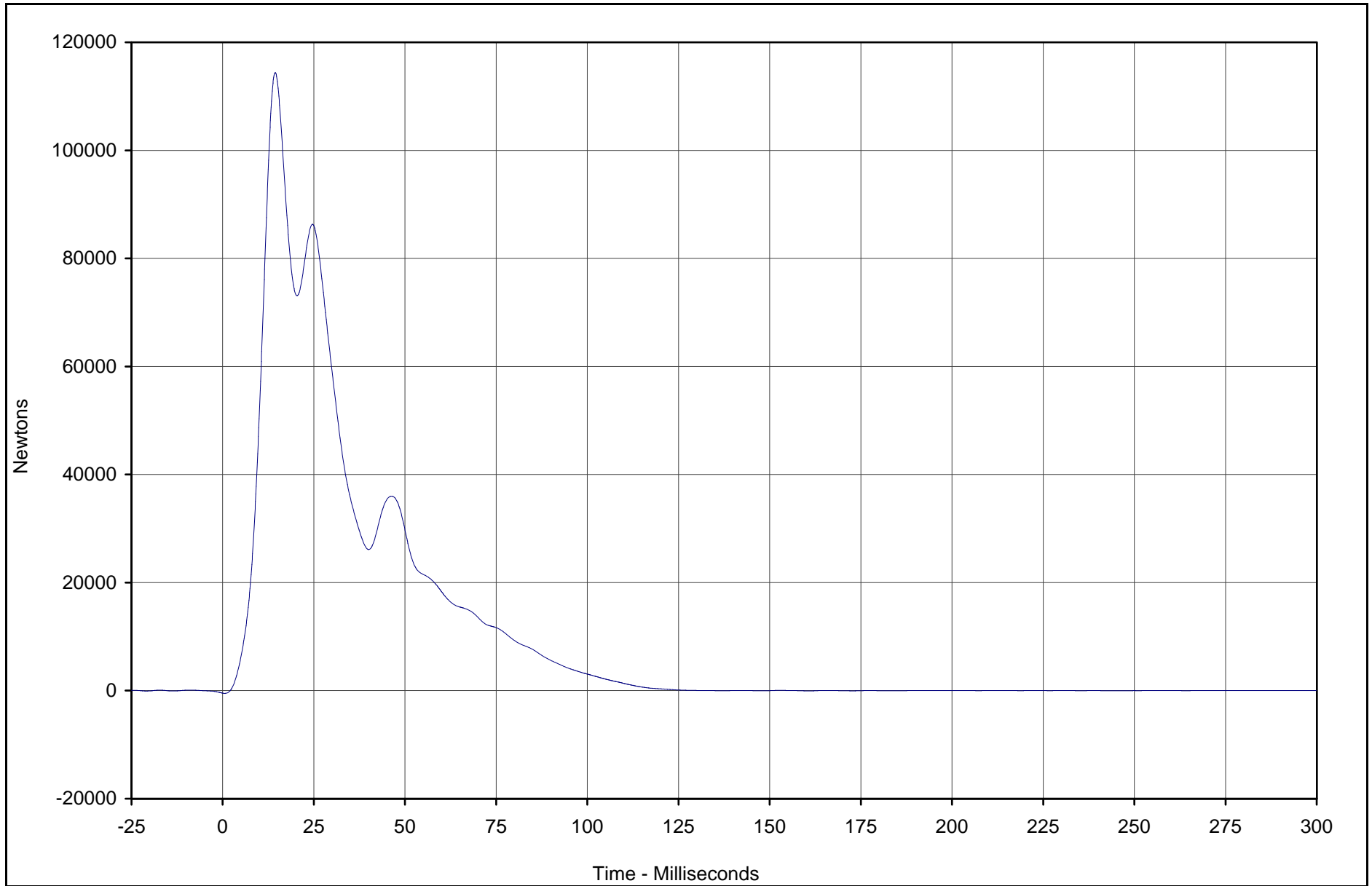
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-16



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B7	113	FIL	Newtons	114398.6	14.4	-512.8	0.6	60



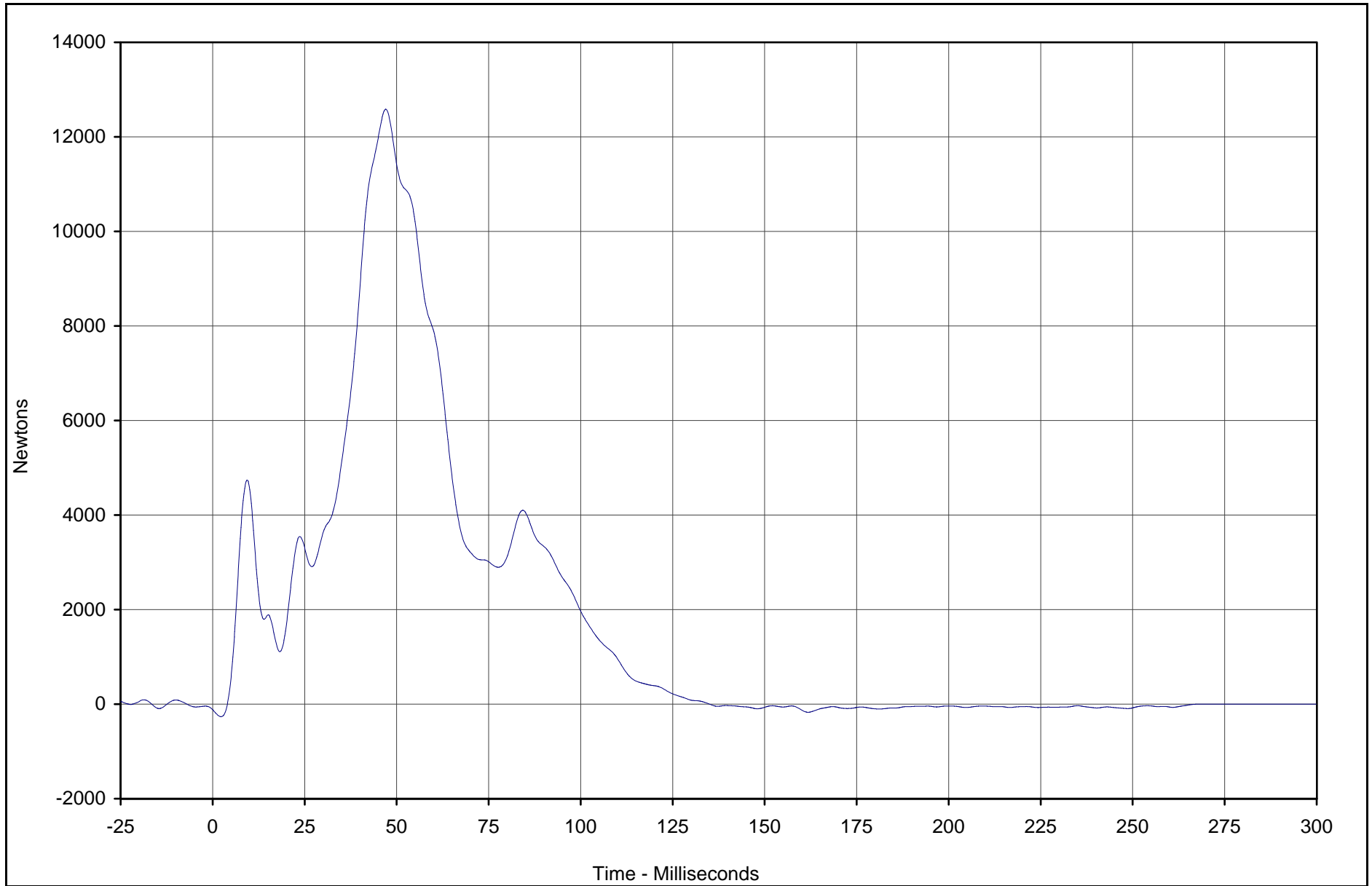
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-17



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B8	114	FIL	Newtons	12586.0	47.0	-265.4	2.3	60



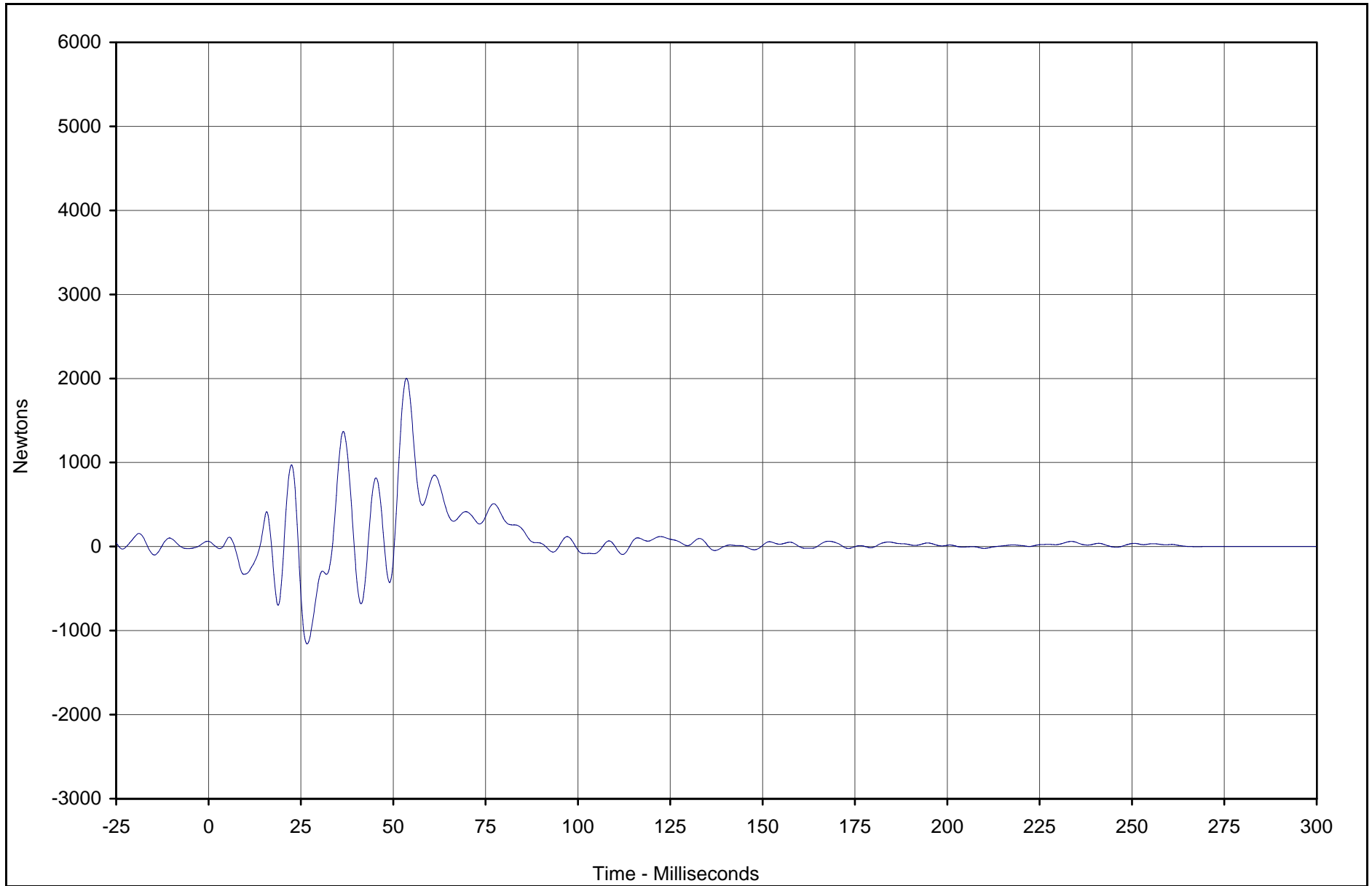
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-18



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force B9	115	FIL	Newtons	2000.6	53.6	-1158.8	26.7	60



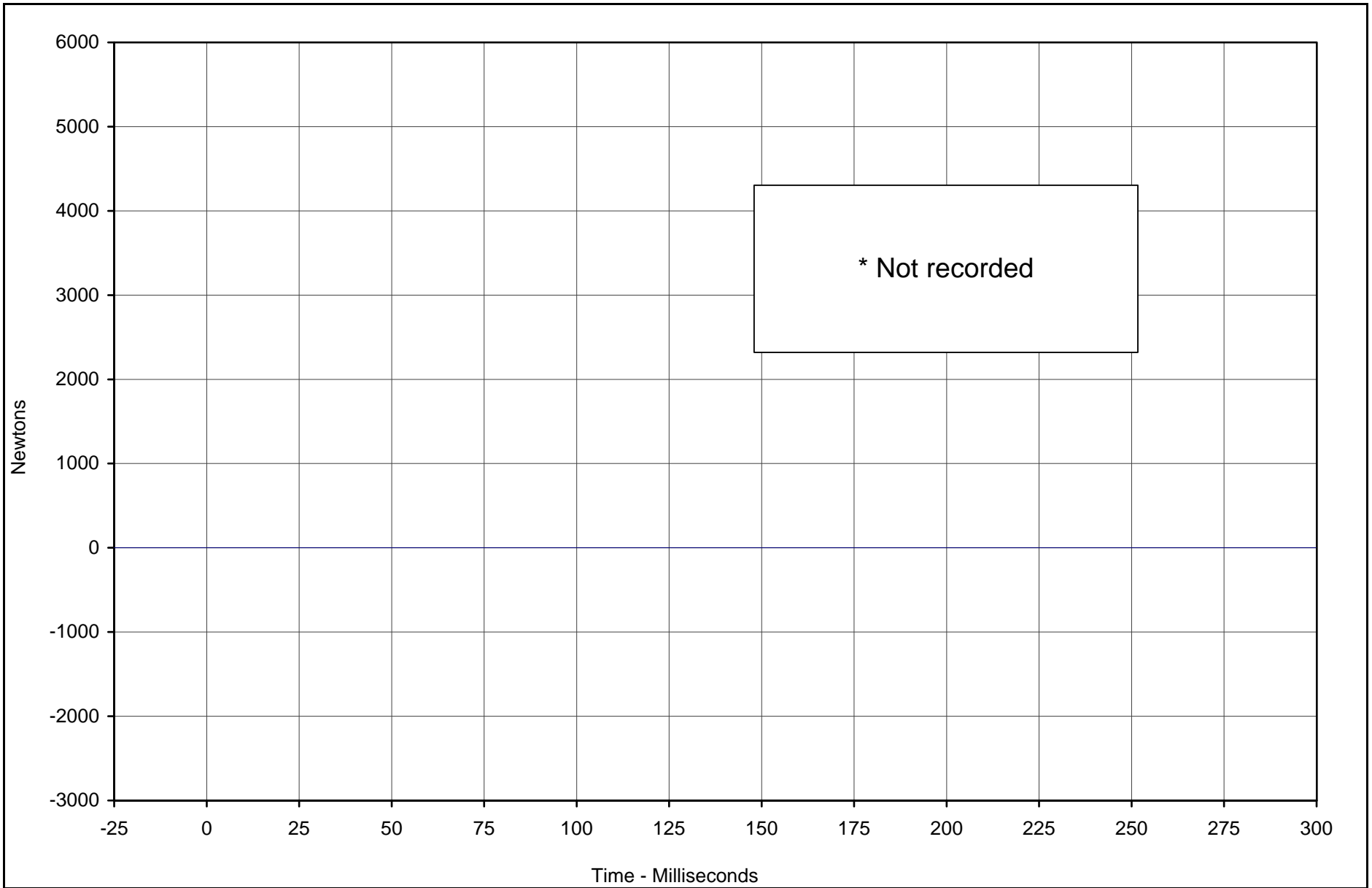
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-19



* Not recorded

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C1	116	FIL	Newtons	0.0	0.0	0.0	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

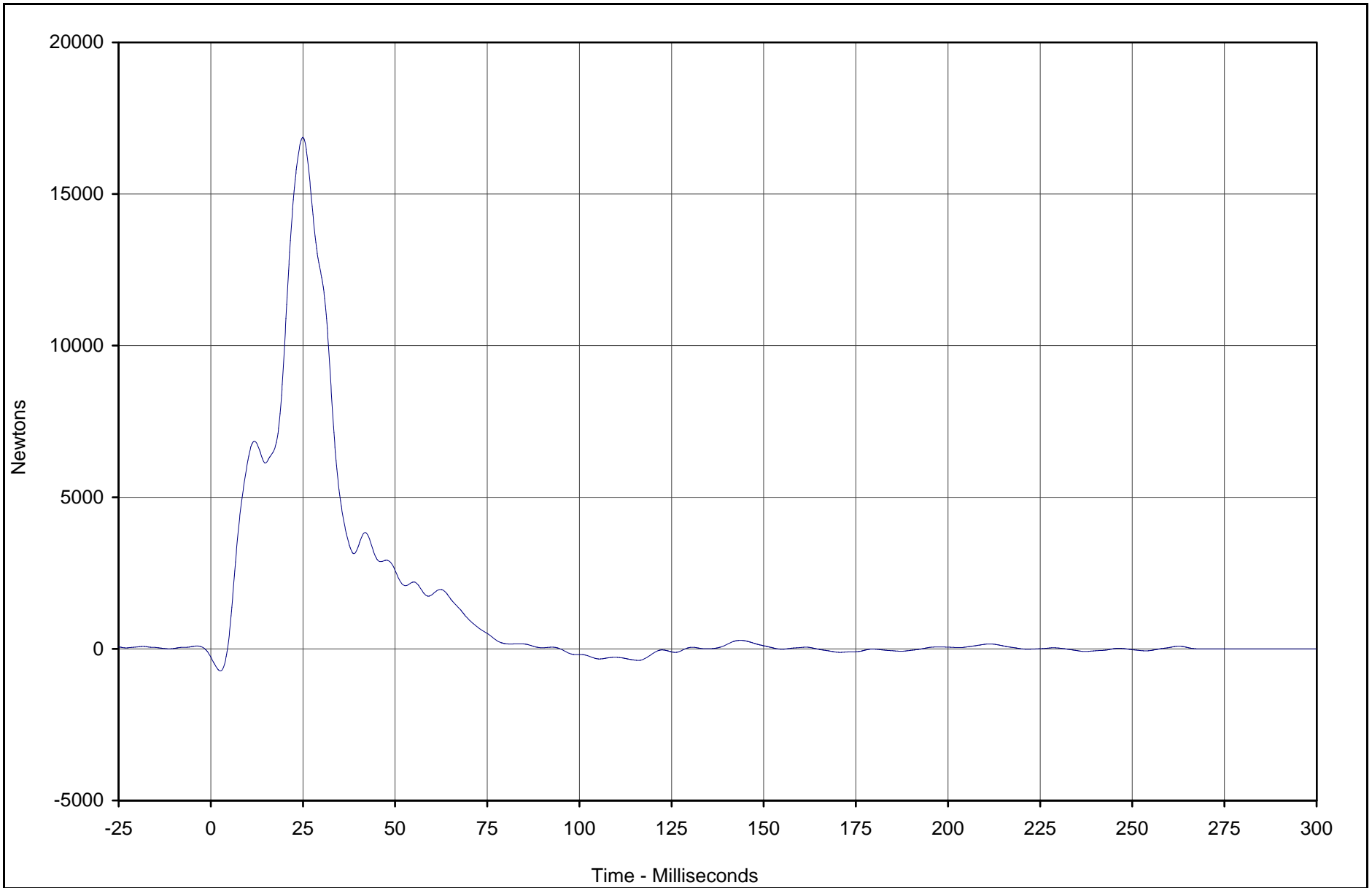
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-20



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C2	117	FIL	Newtons	16871.0	25.0	-727.1	2.6	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

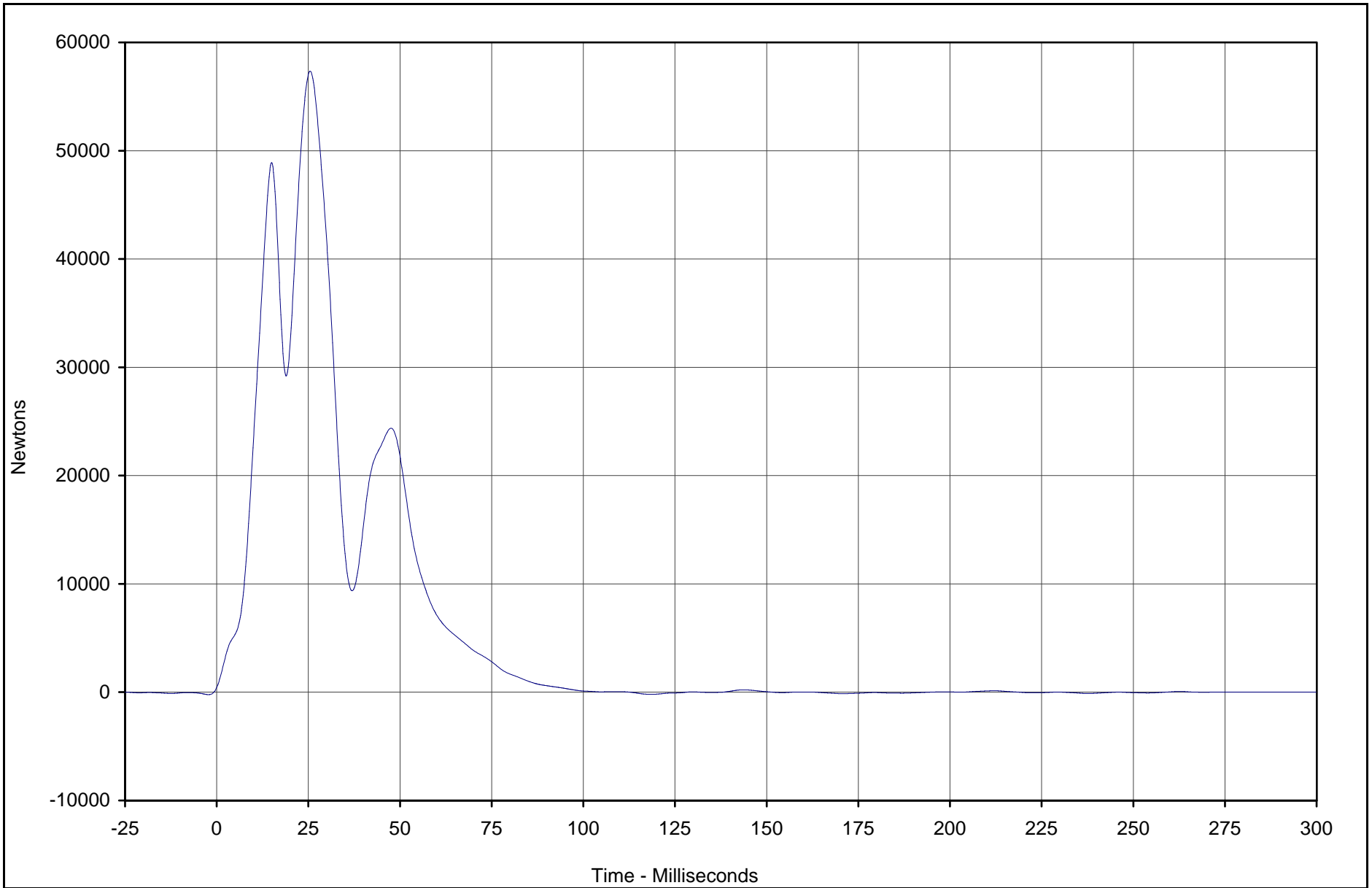
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-21



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C3	118	FIL	Newtons	57342.5	25.5	-193.5	118.5	60



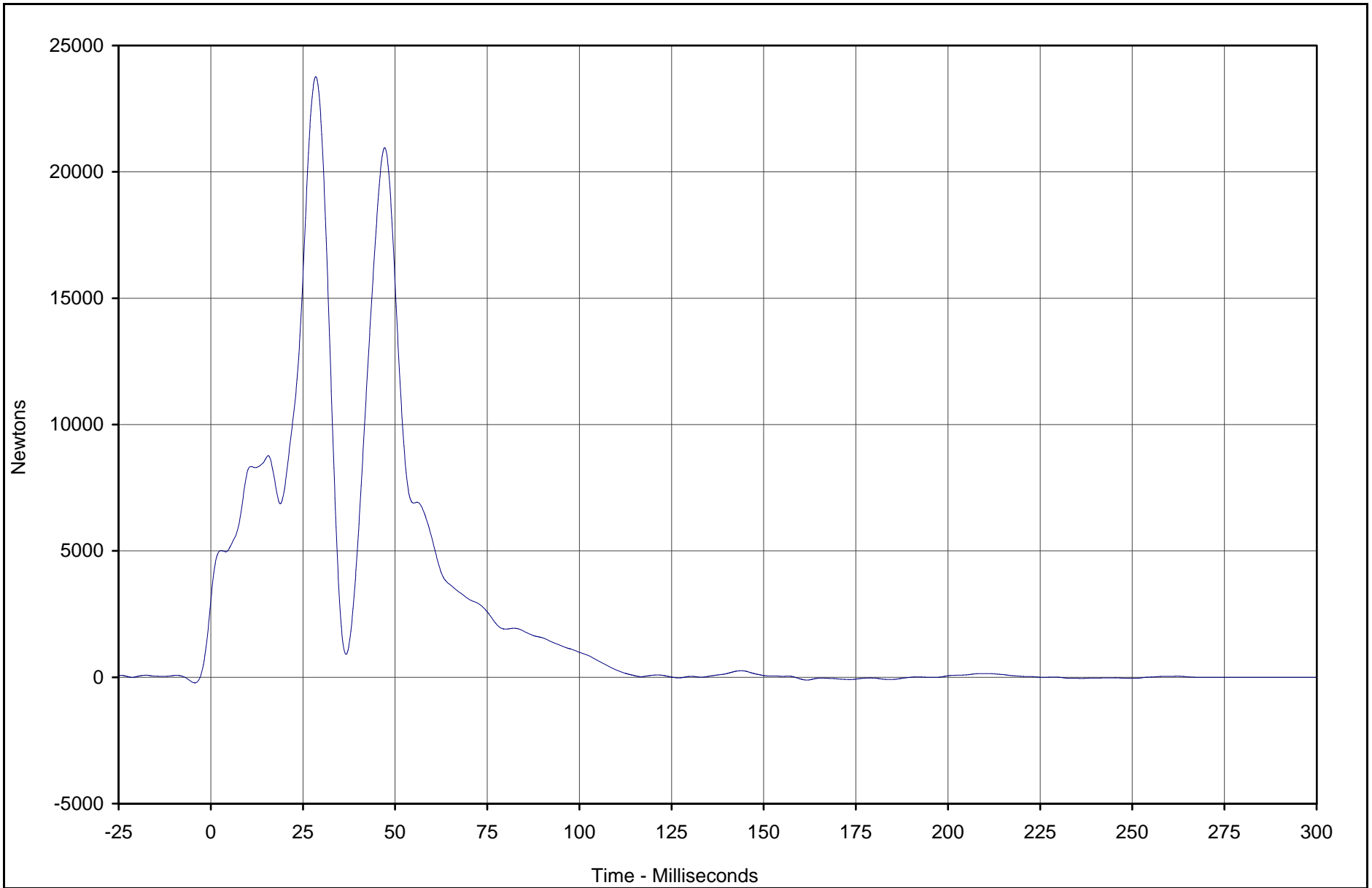
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-22



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C4	119	FIL	Newtons	23764.2	28.5	-113.0	161.8	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

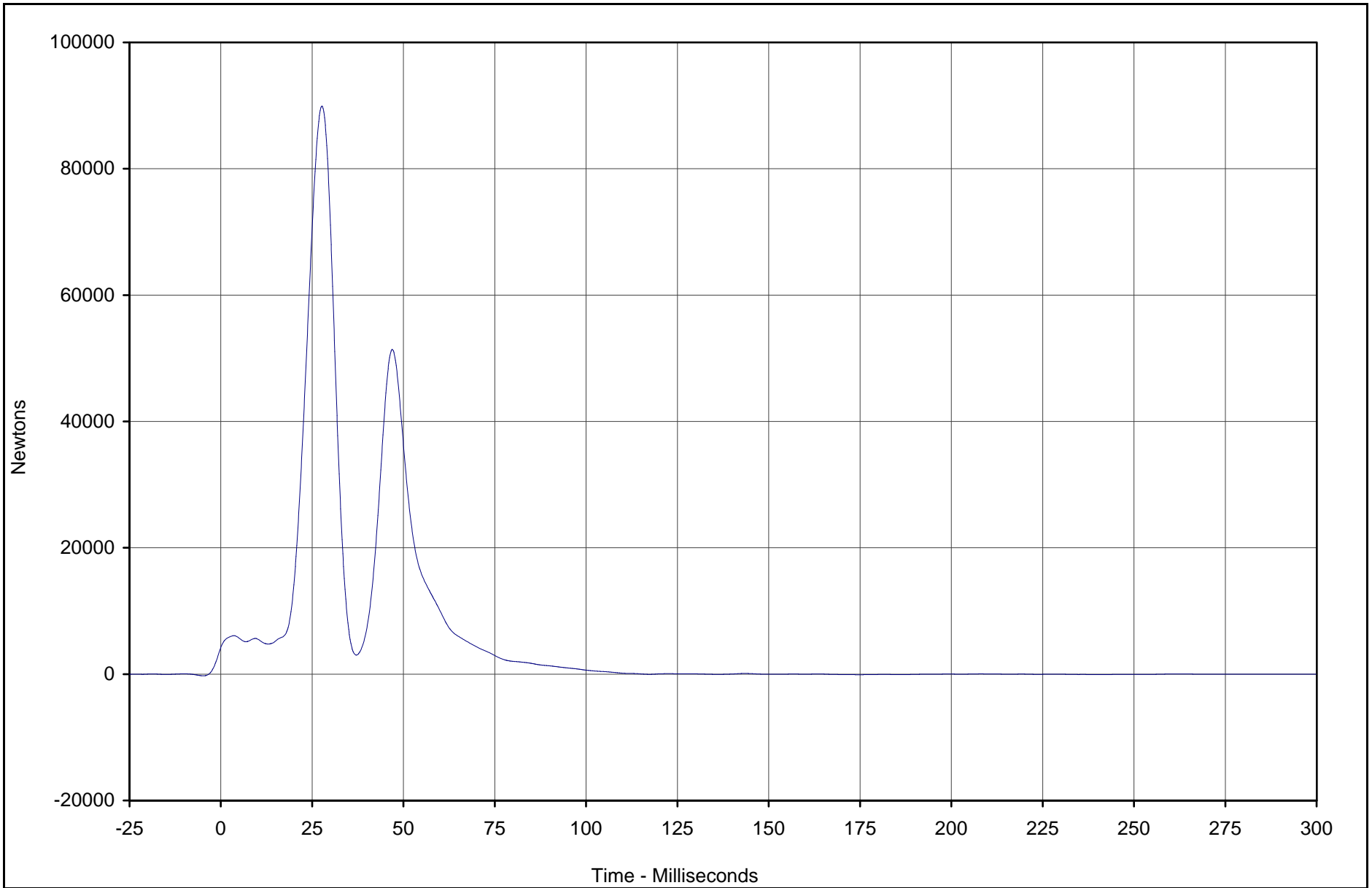
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KARR22001-118

C-23



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C5	120	FIL	Newtons	89926.1	27.7	-88.8	174.3	60



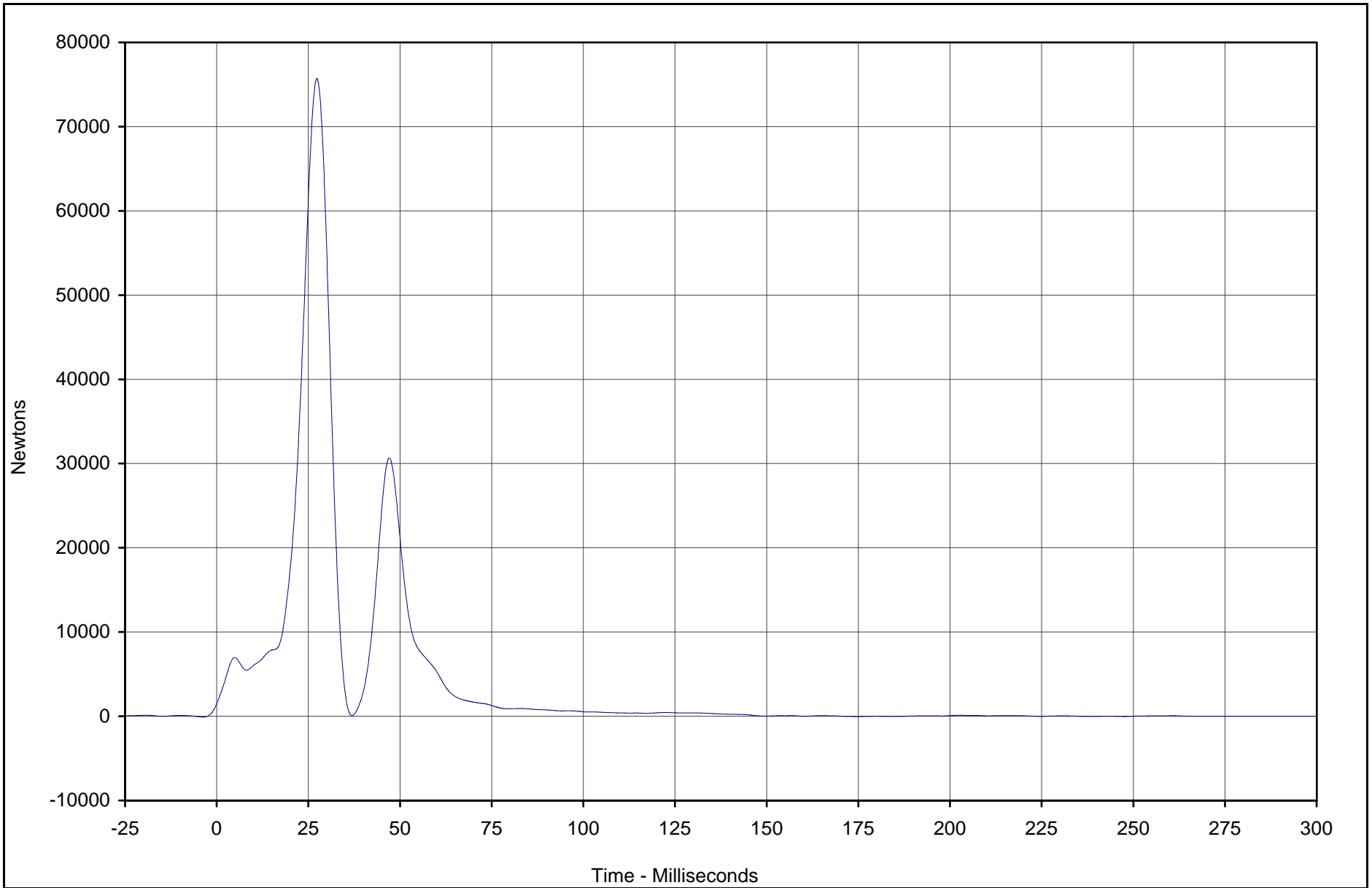
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-24



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C6	121	FIL	Newtons	75721.3	27.3	-39.9	174.8	60



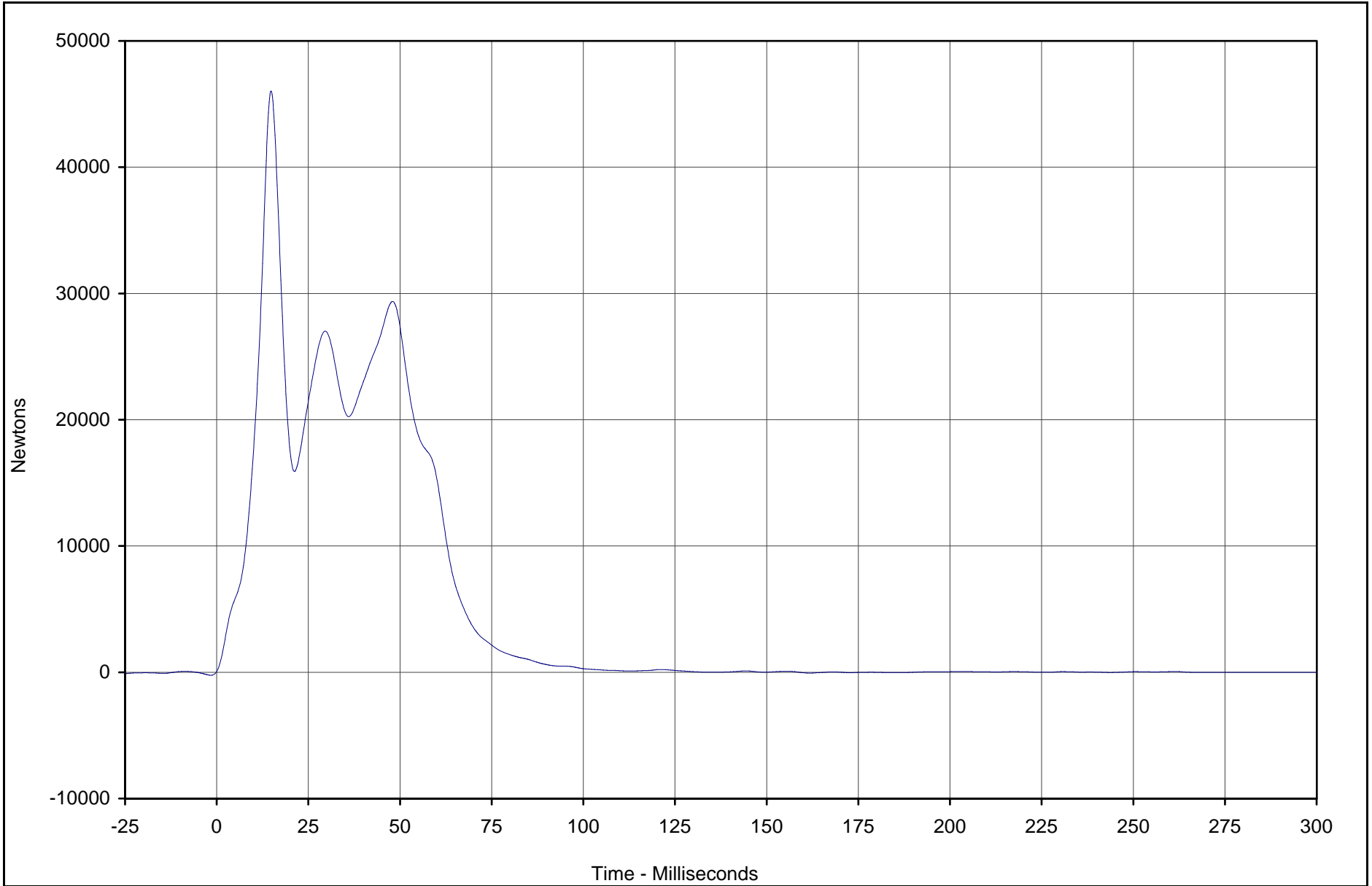
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-25



KARR22001-118

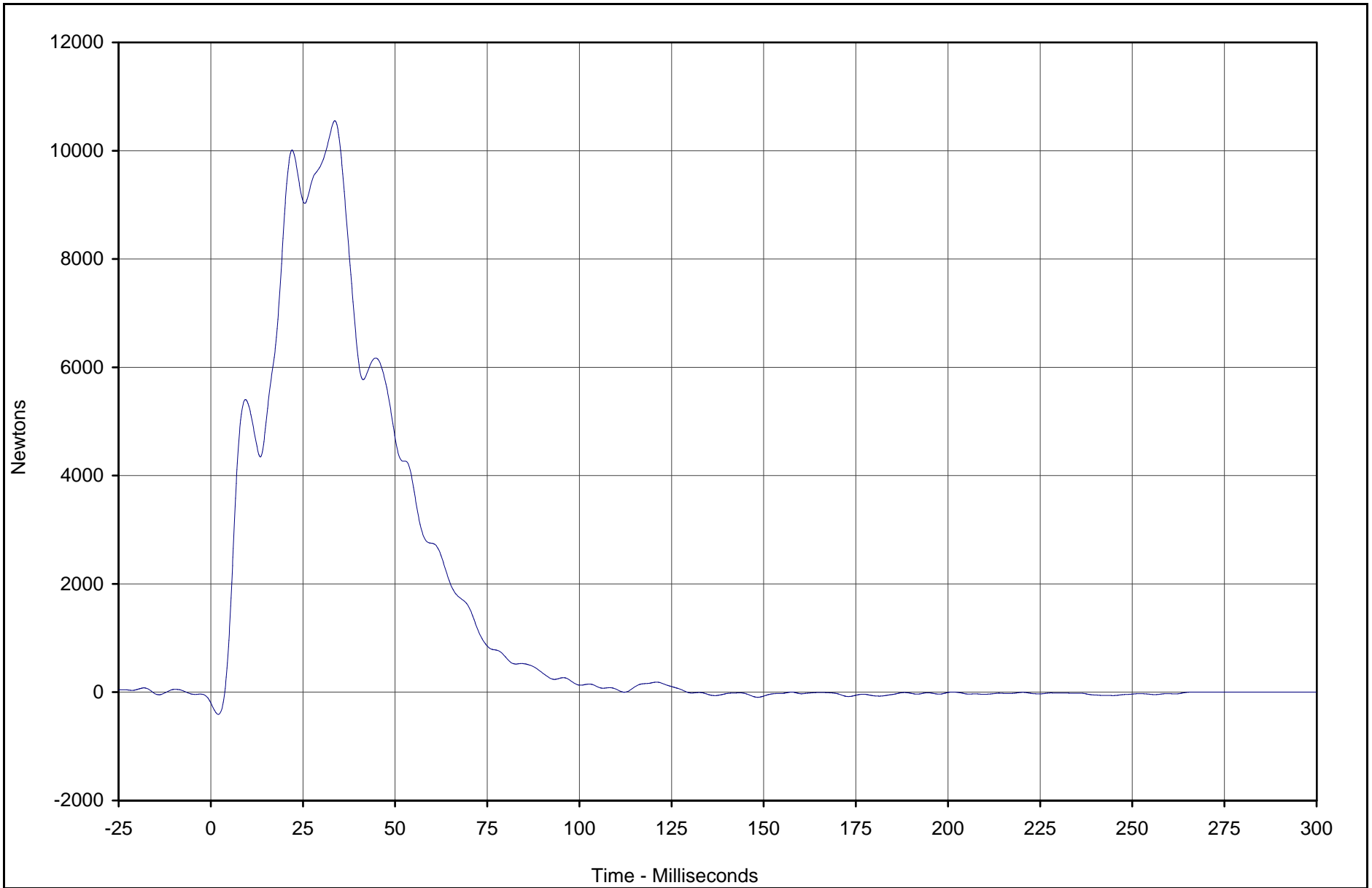
Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C7	122	FIL	Newtons	46030.5	14.8	-68.8	161.8	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV
 Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02
 NHTSA No.: M20503

C-26



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C8	123	FIL	Newtons	10554.7	33.7	-411.5	2.0	60



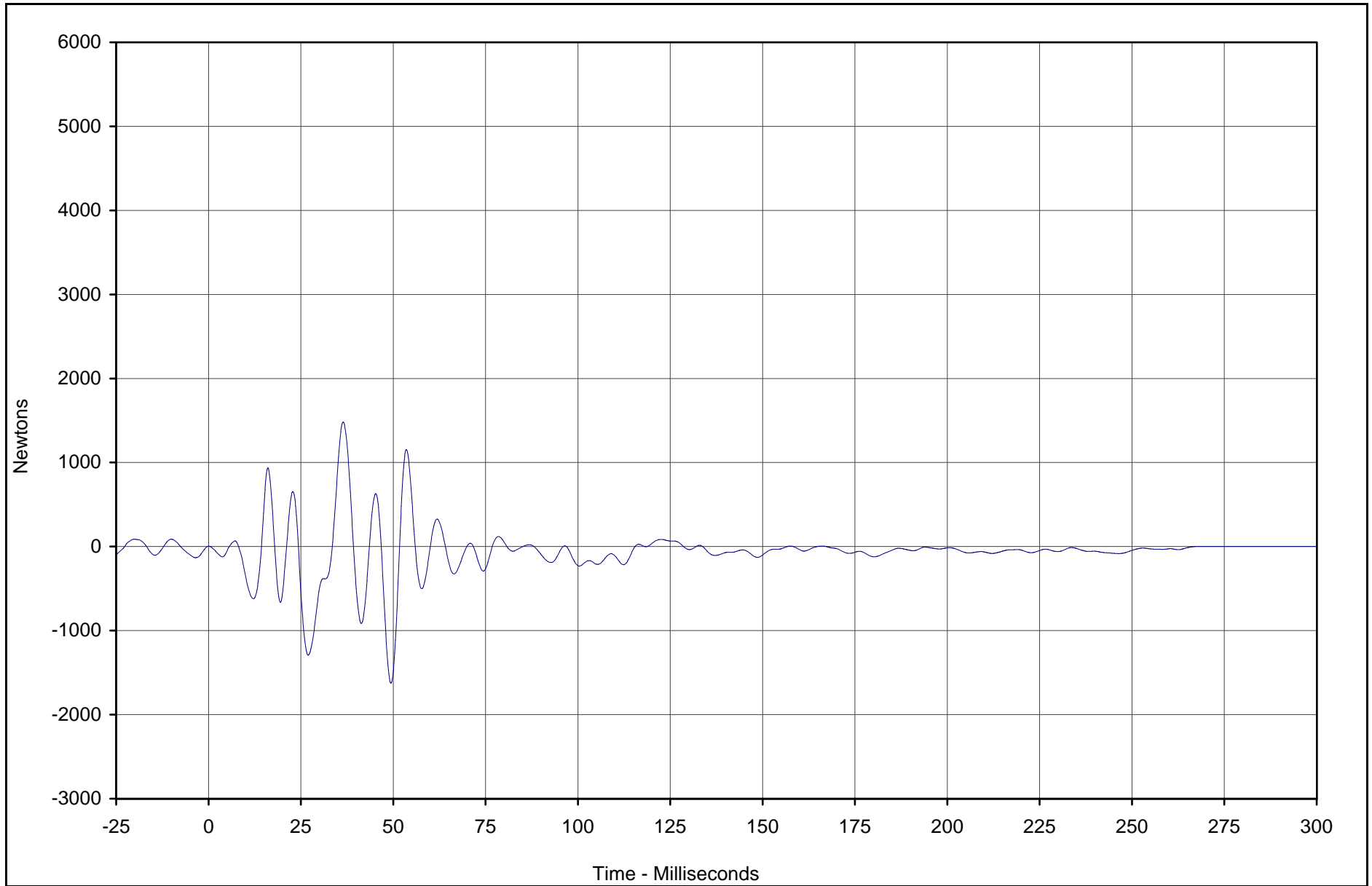
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-27



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force C9	124	FIL	Newtons	1481.4	36.4	-1624.9	49.4	60



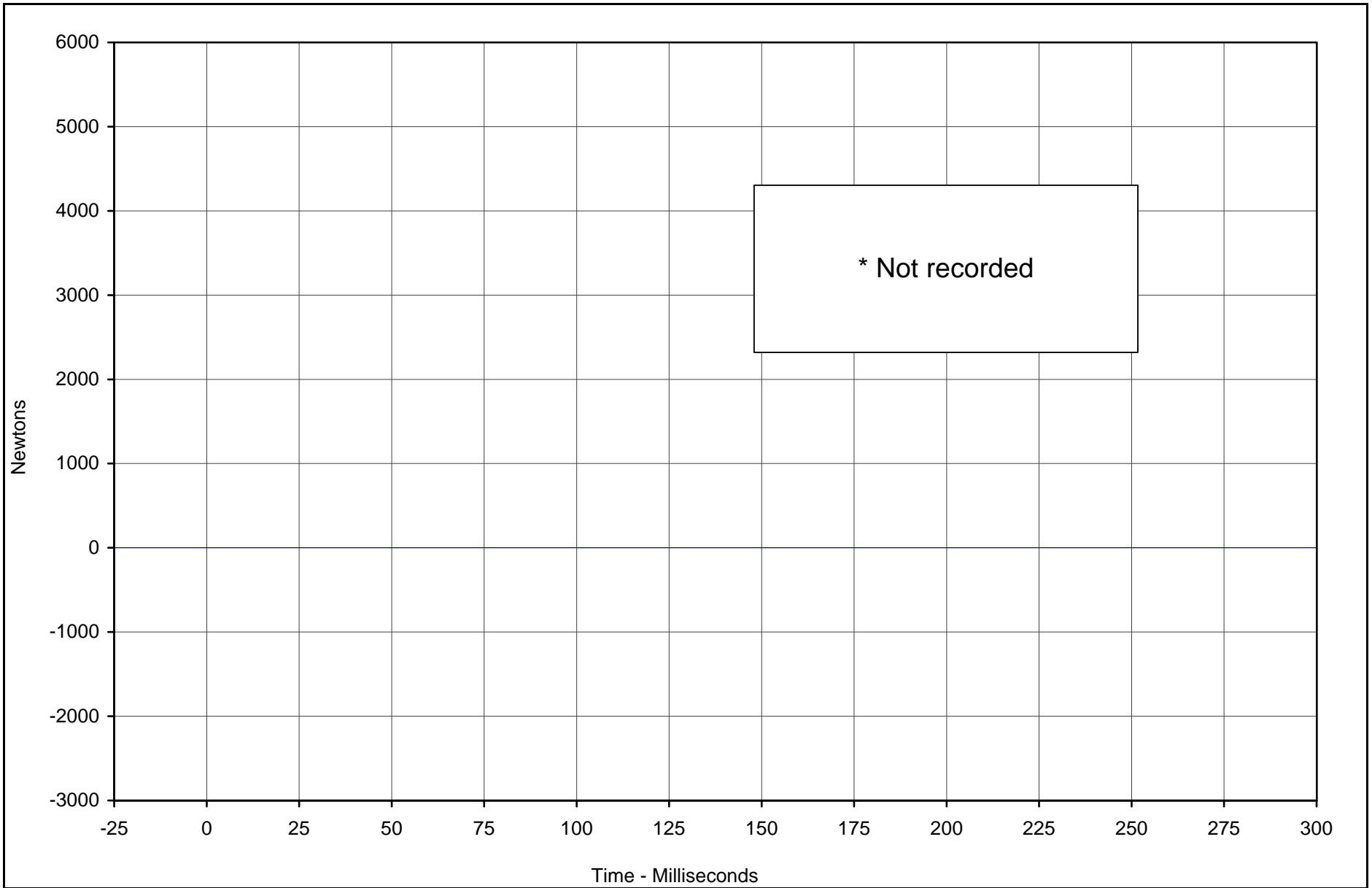
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-28



* Not recorded

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D1	125	FIL	Newtons	0.0	0.0	0.0	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

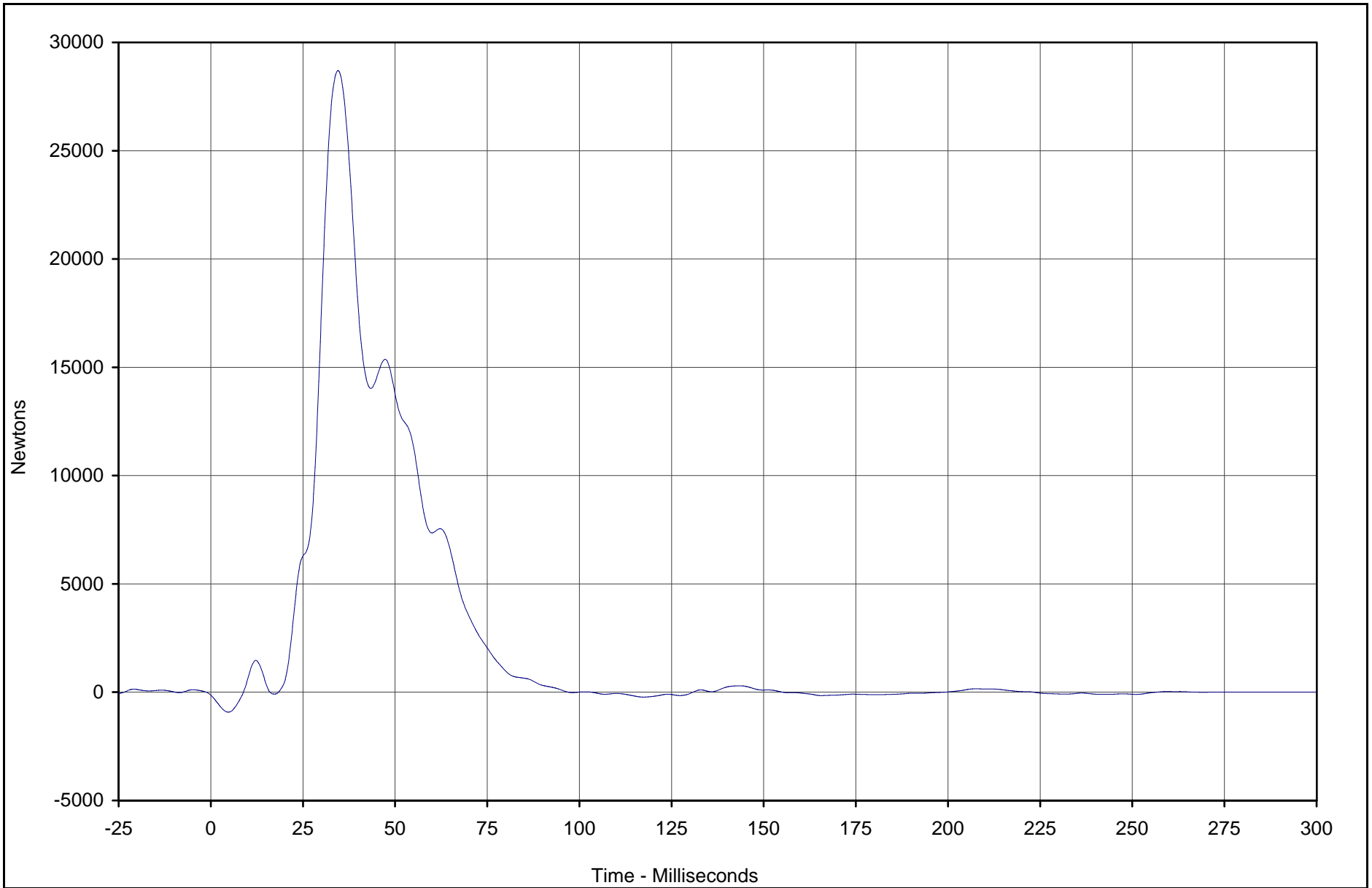
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

C-29



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D2	126	FIL	Newtons	28700.8	34.5	-919.7	4.7	60



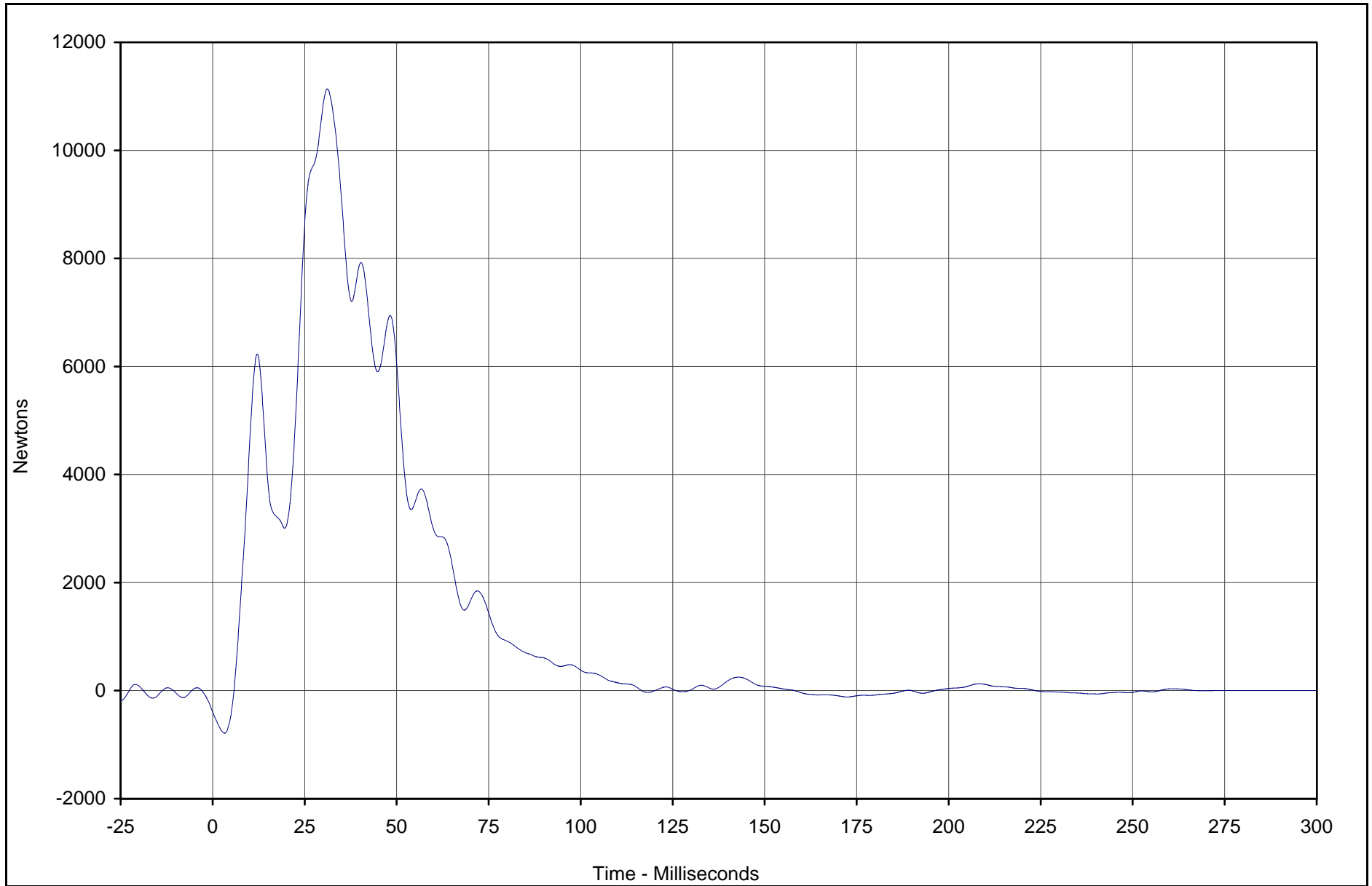
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-30



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D3	127	FIL	Newtons	11136.5	31.2	-787.3	3.3	60



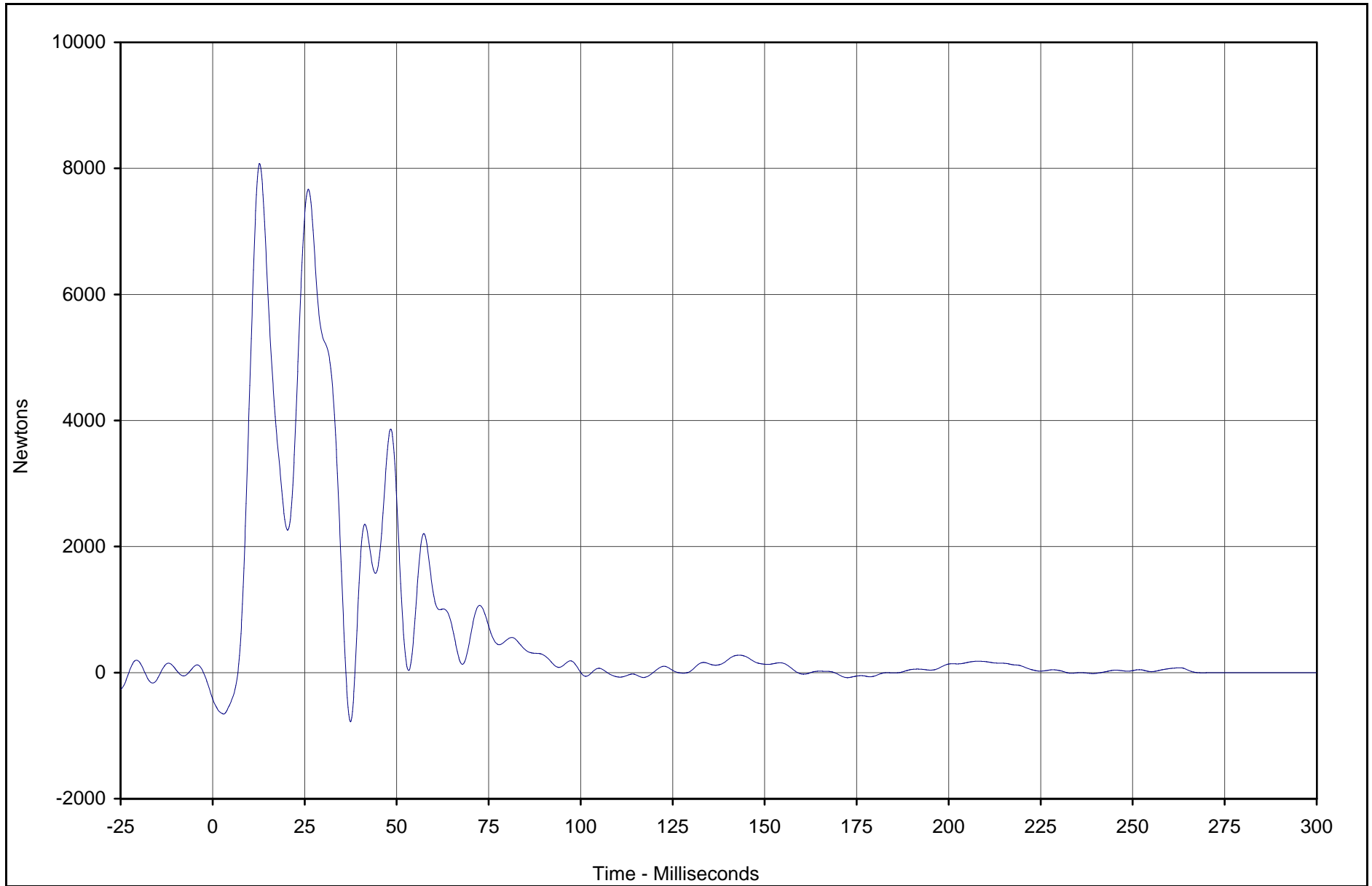
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-31



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D4	128	FIL	Newtons	8076.5	12.7	-779.9	37.5	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

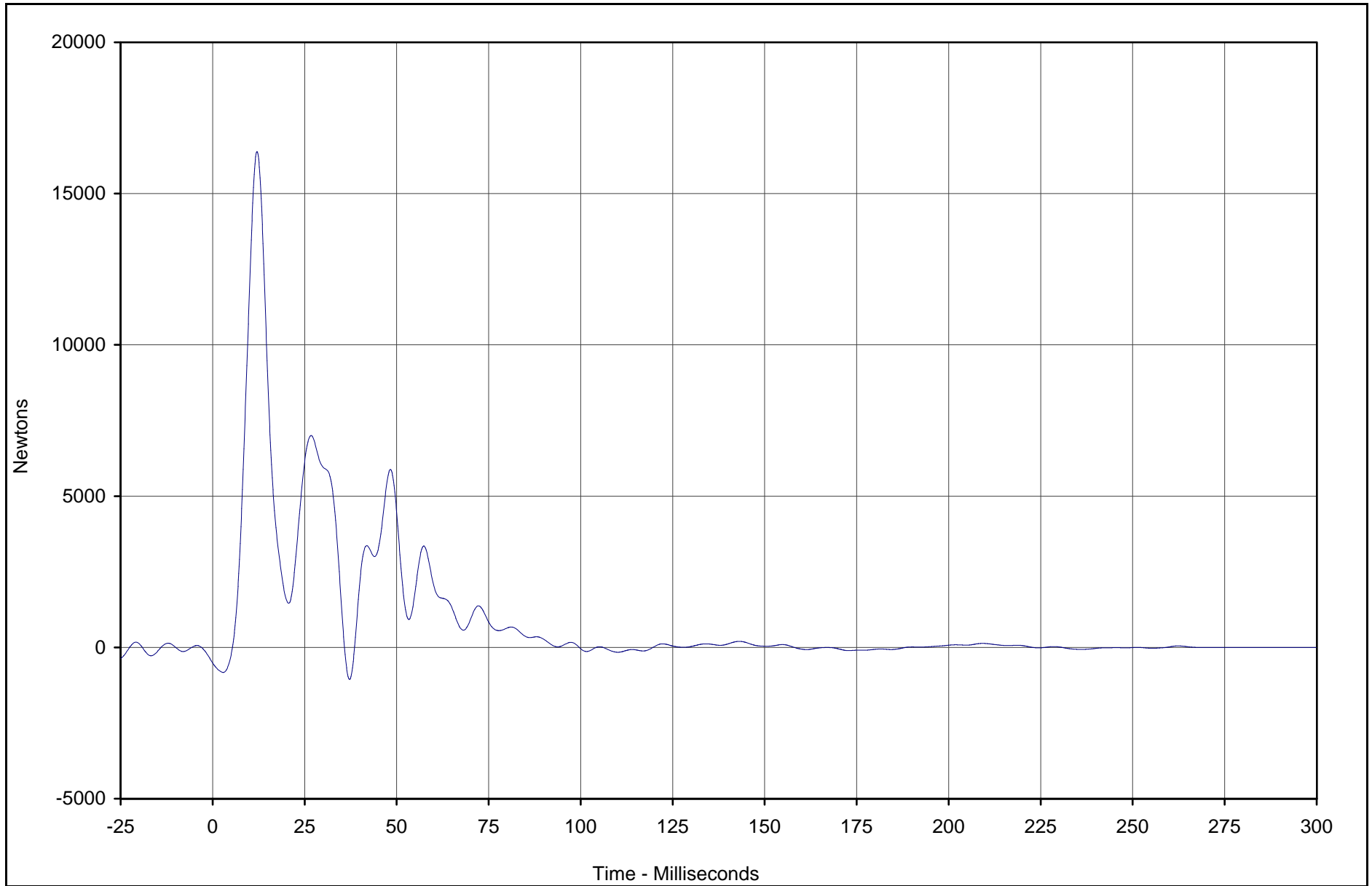
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KARR22001-118

C-32



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D5	129	FIL	Newtons	16386.7	12.1	-1062.1	37.2	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

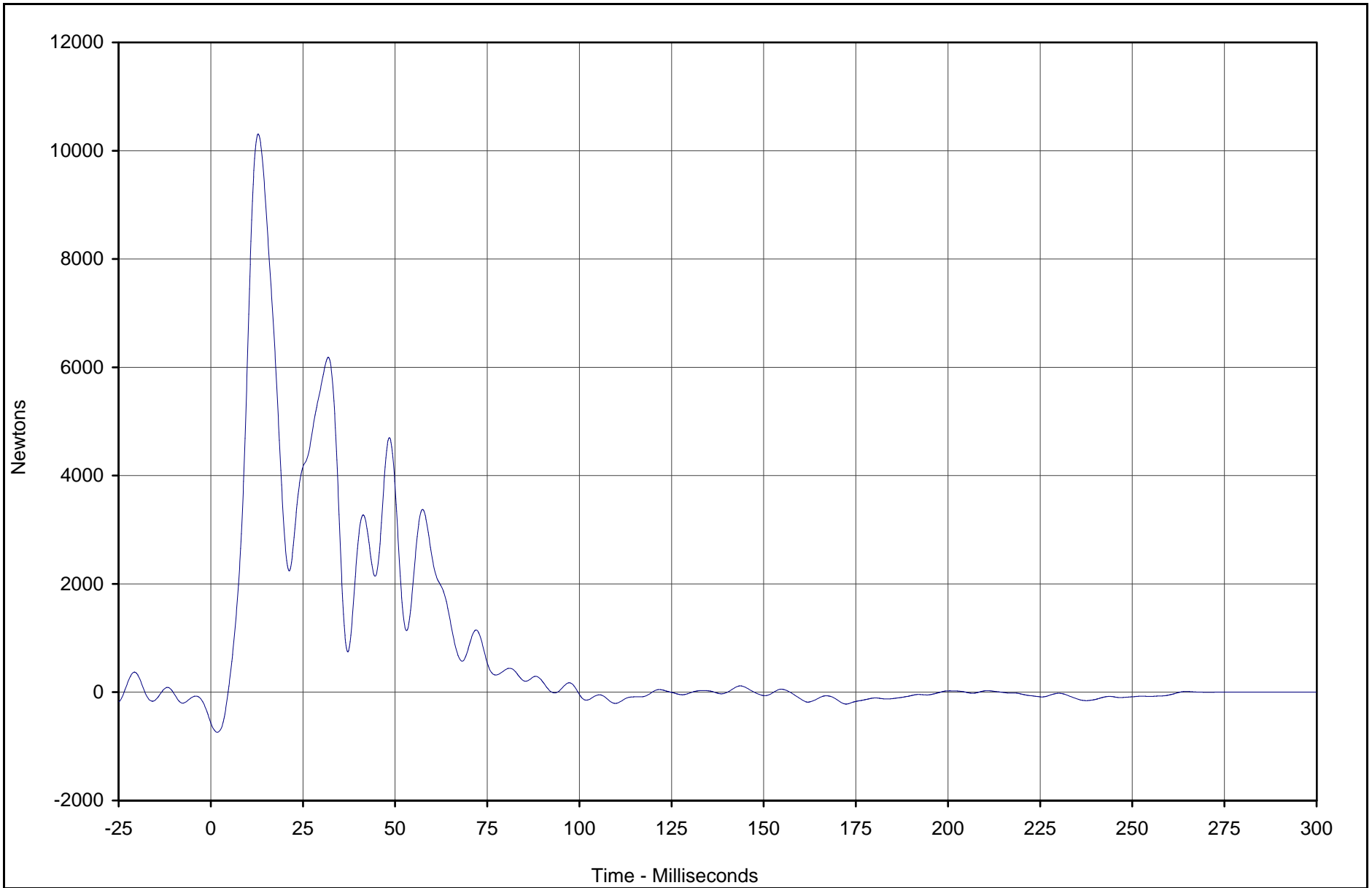
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KARR22001-118

C-33



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D6	130	FIL	Newtons	10306.2	12.8	-740.5	1.8	60



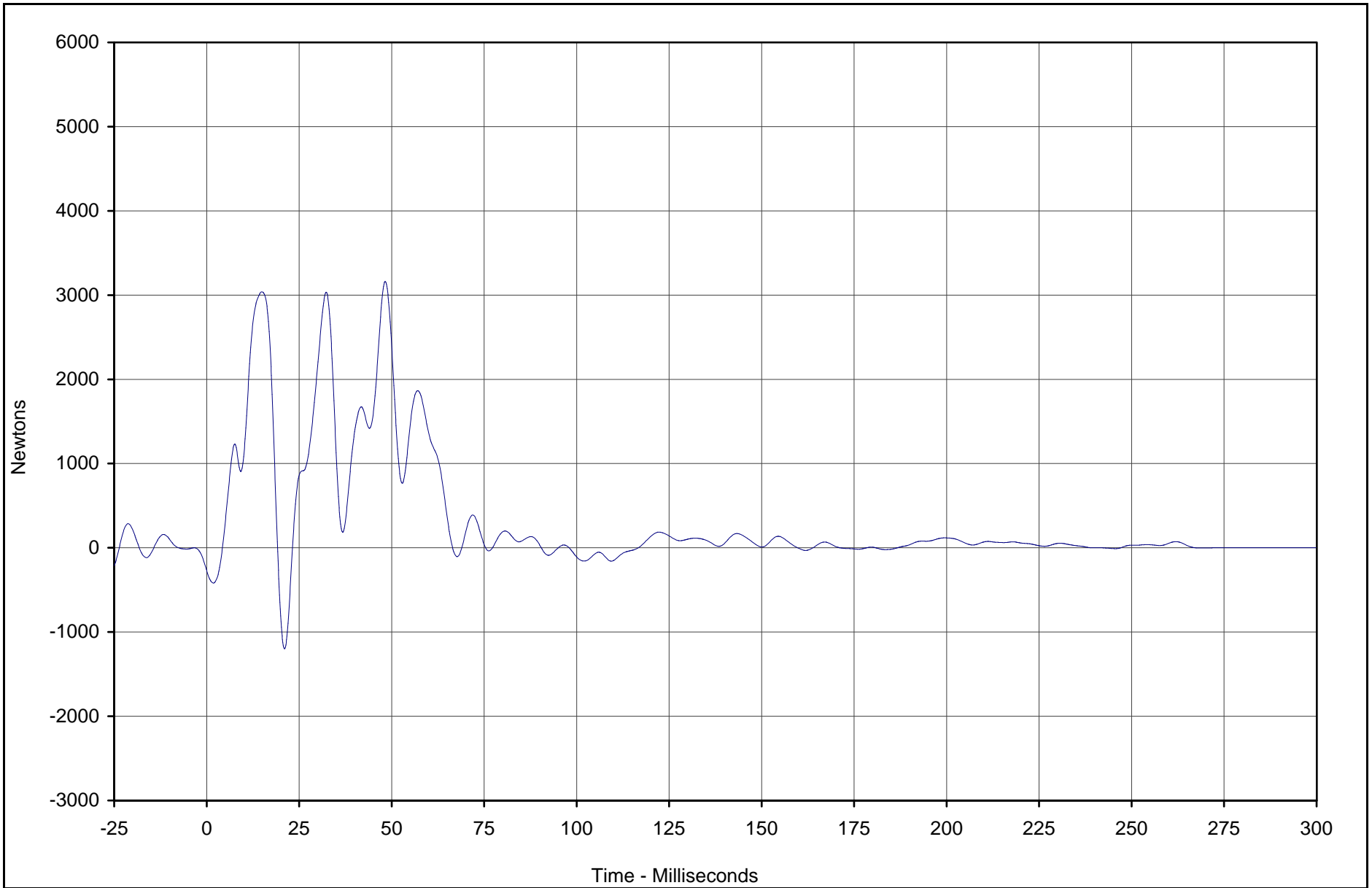
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-34



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D7	131	FIL	Newtons	3161.8	48.3	-1198.1	21.0	60



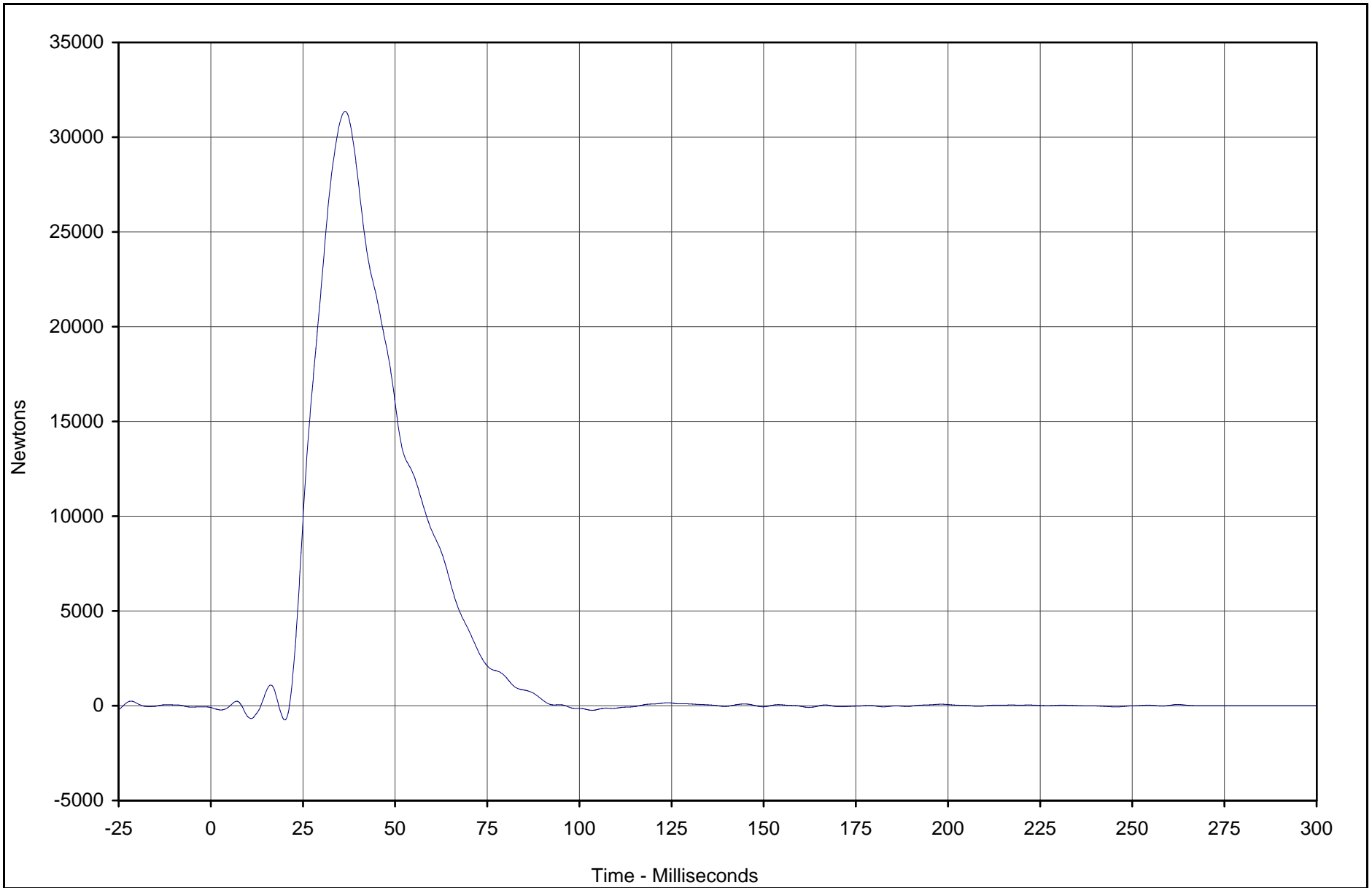
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-35



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D8	132	FIL	Newtons	31361.2	36.5	-754.3	20.1	60



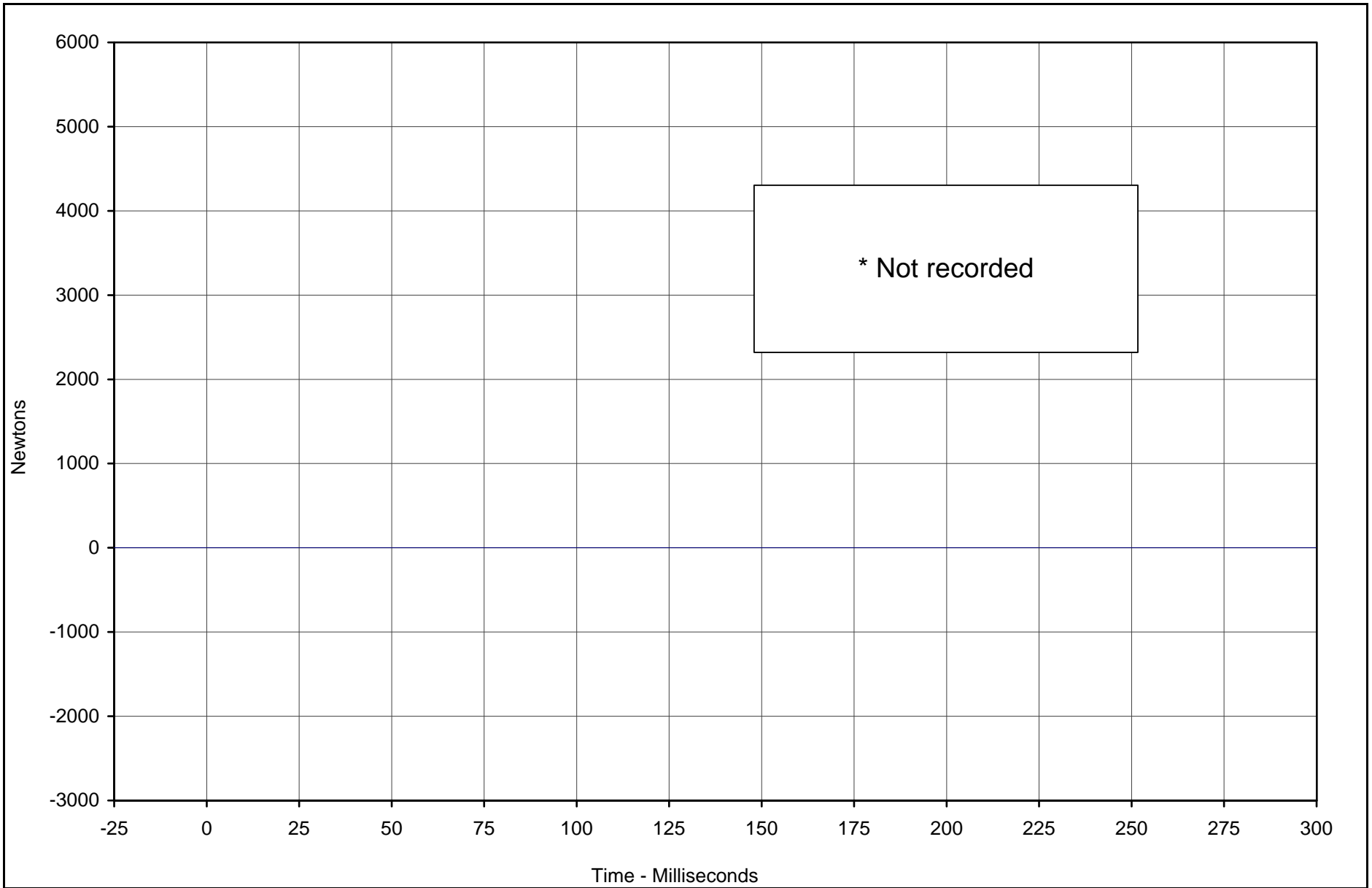
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-36



* Not recorded

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force D9	133	FIL	Newtons	0.0	0.0	0.0	0.0	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

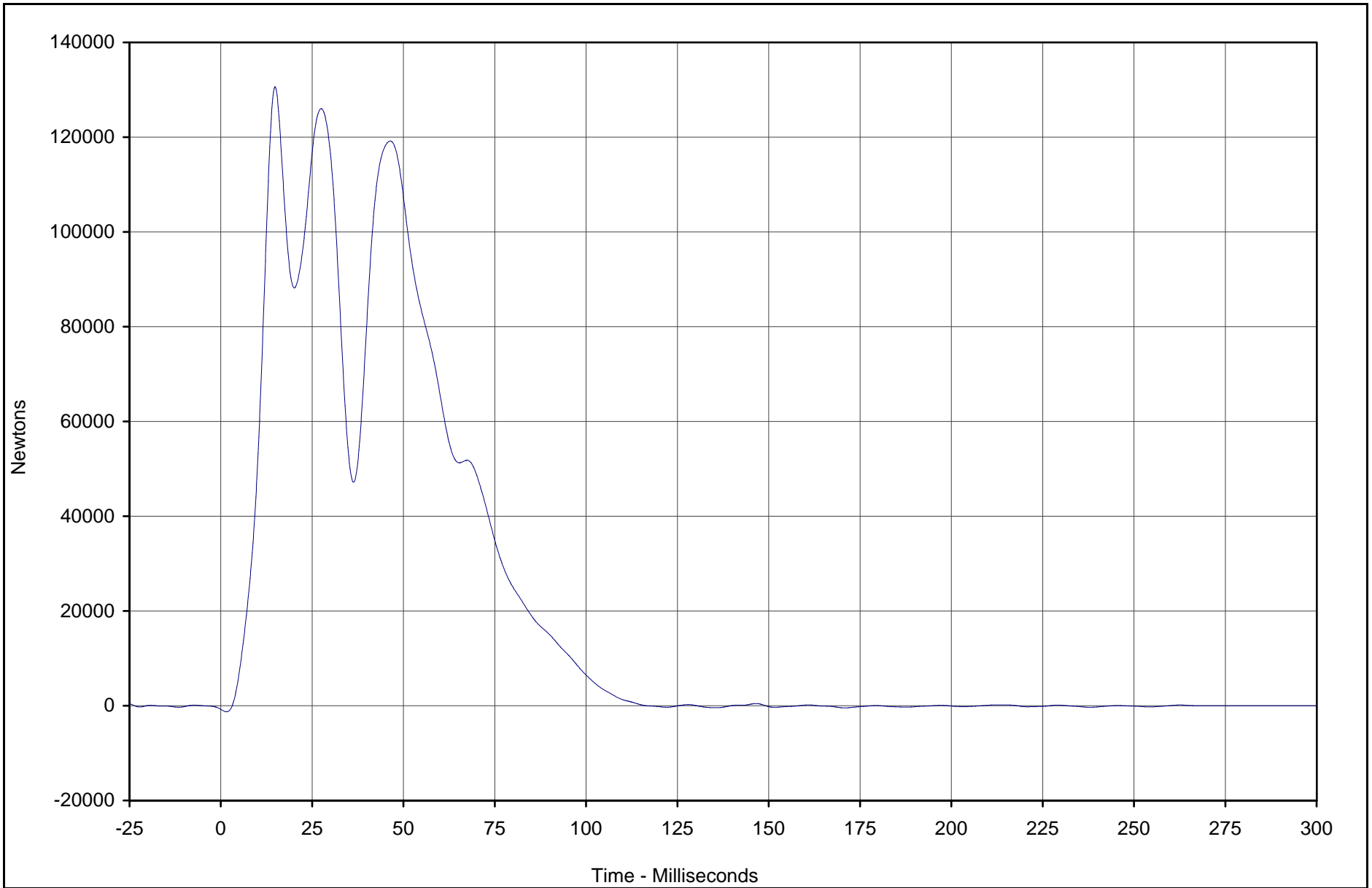
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KARR22001-118

C-37



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 1	001	SUM	Newtons	130654.5	14.8	-1273.5	1.5	60



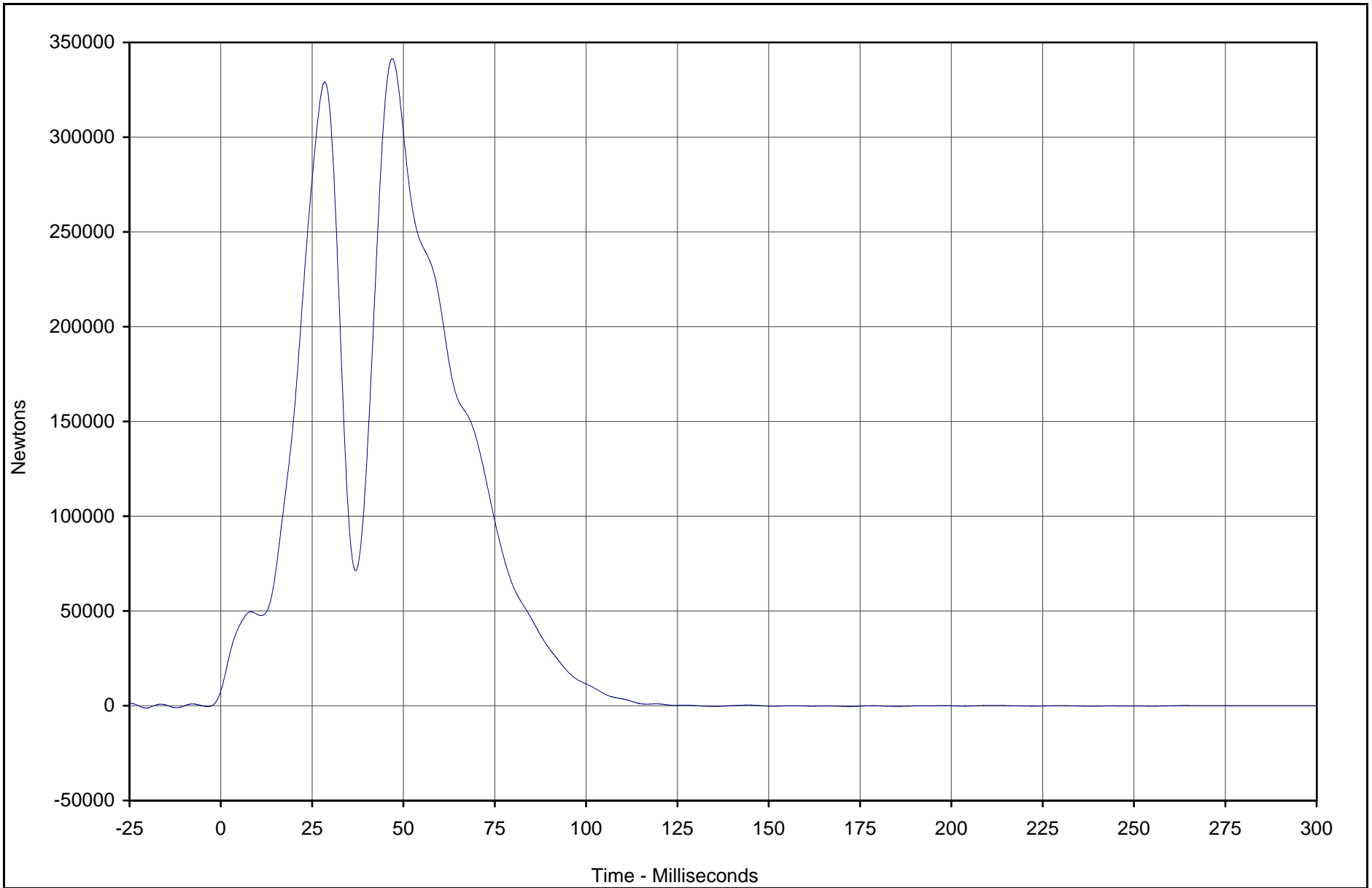
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-38



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 2	002	SUM	Newtons	341402.7	46.9	-486.9	172.3	60



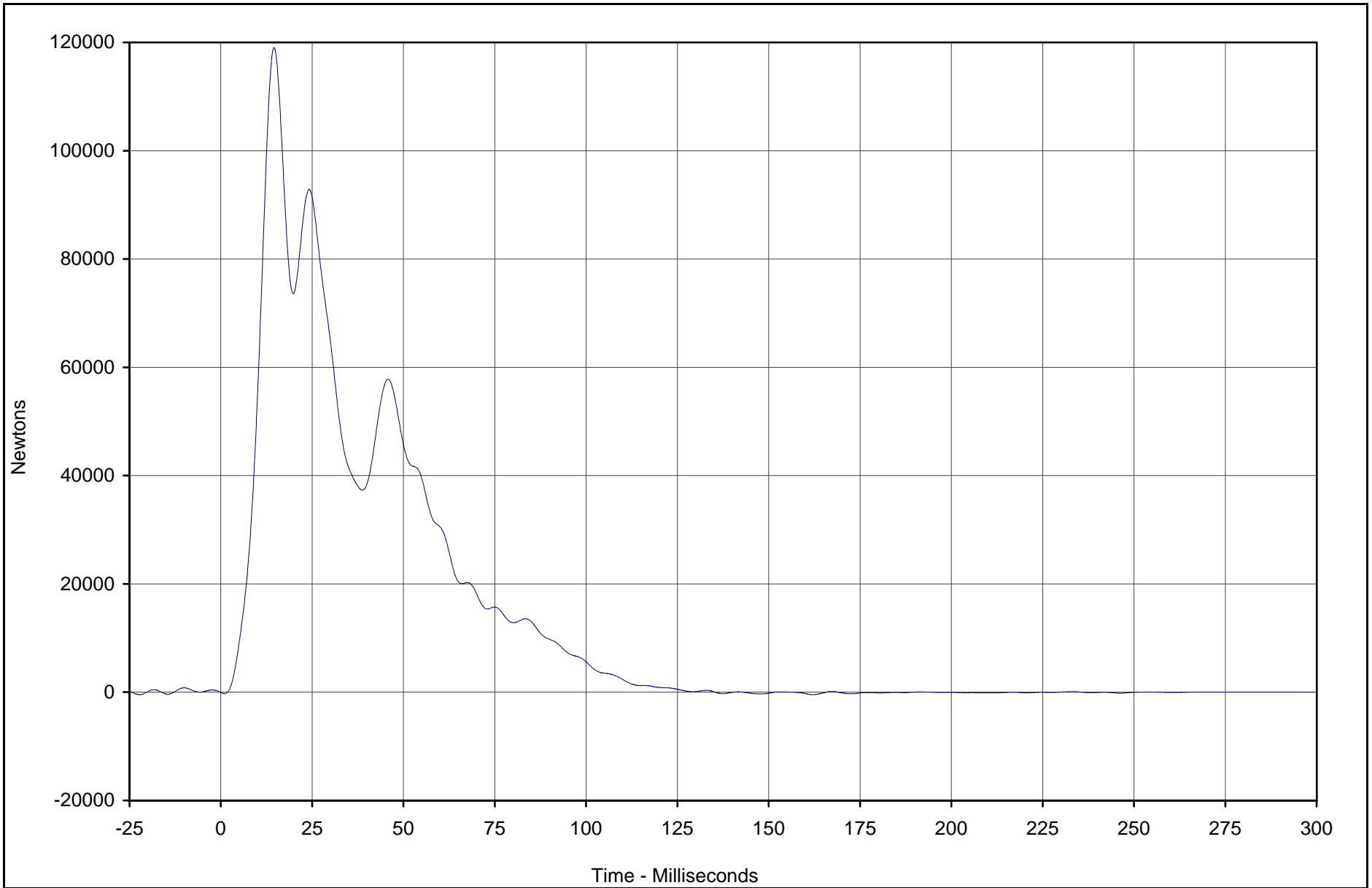
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-39



KAR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 3	003	SUM	Newtons	119041.3	14.6	-453.3	162.0	60



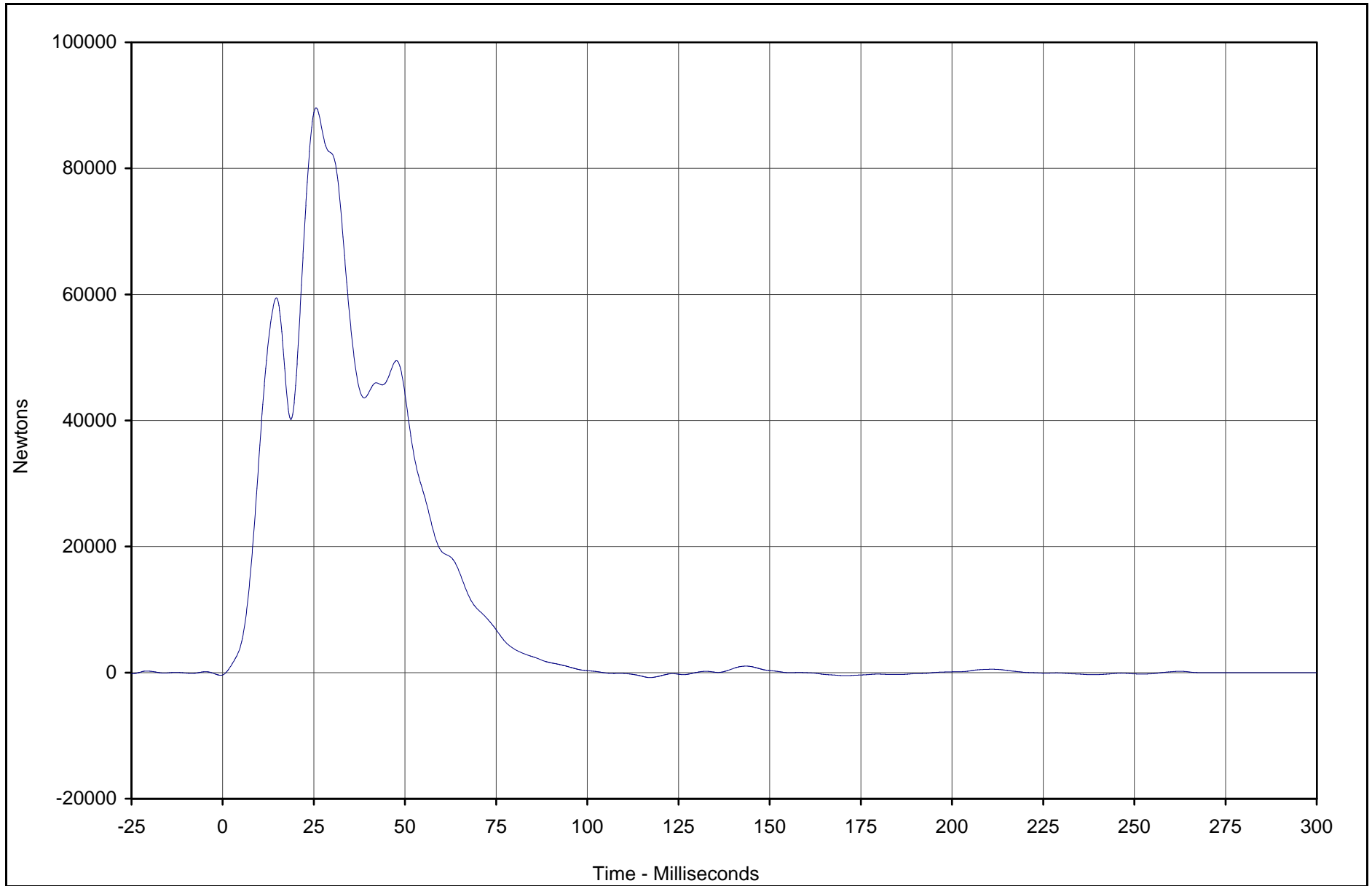
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-40



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 4	004	SUM	Newtons	89601.1	25.6	-782.8	117.2	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

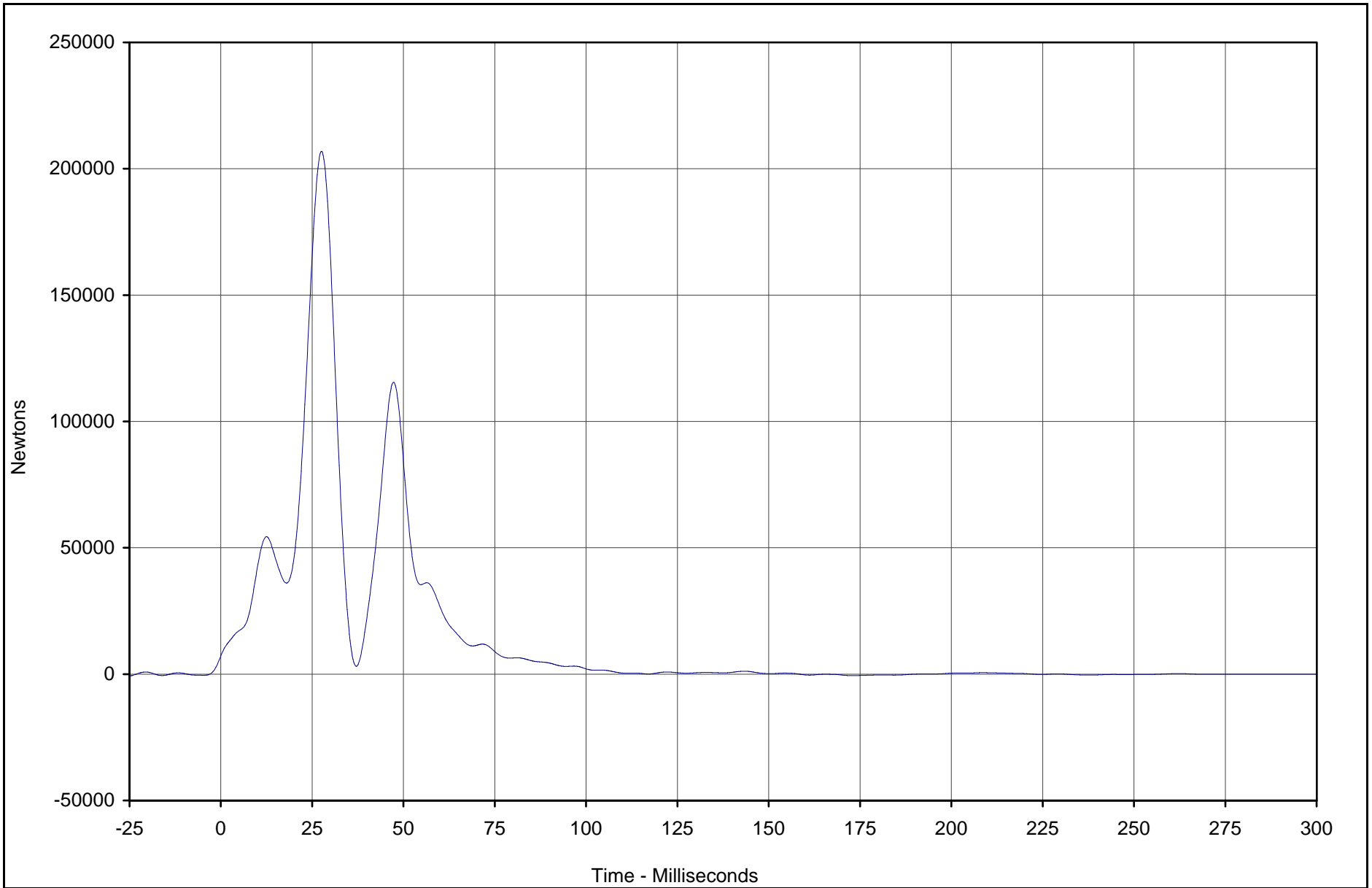
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-118

C-41



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 5	005	SUM	Newtons	206908.9	27.6	-598.2	172.9	60



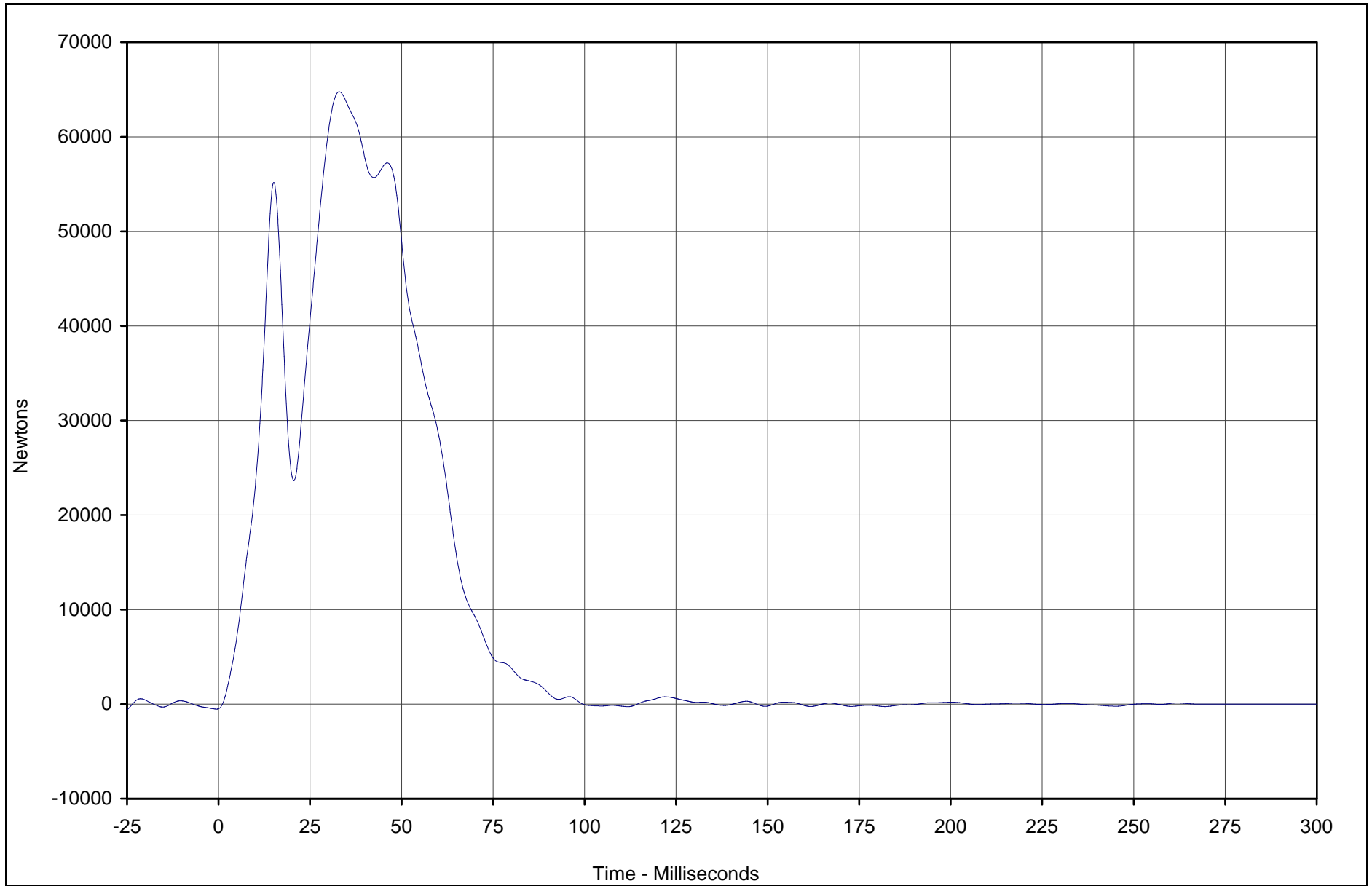
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-42



KARR22001-118

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Sum Group 6	006	SUM	Newtons	64764.9	33.0	-484.7	0.0	60



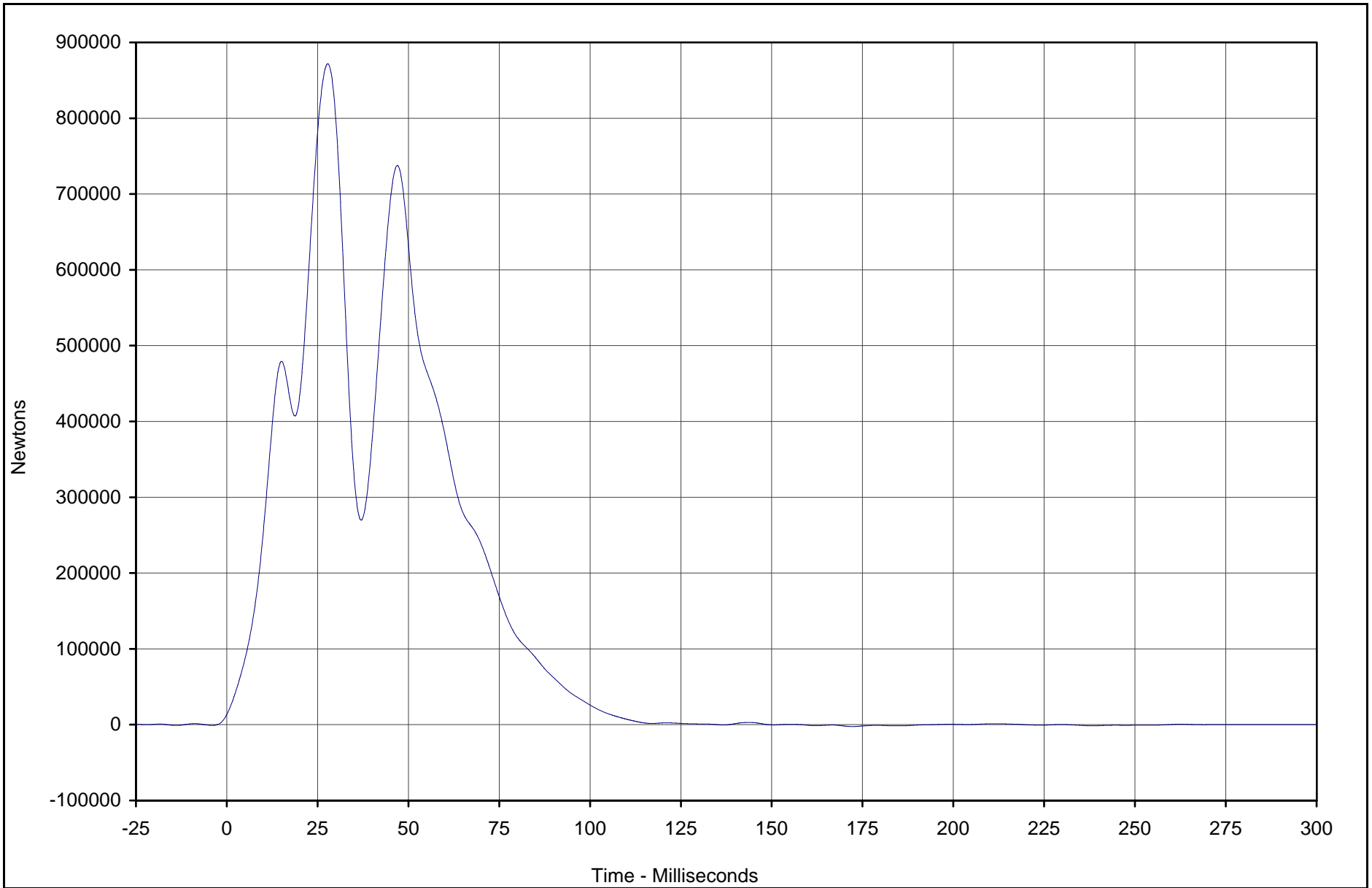
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-43



KAR22001-18

Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Barrier Force Total Sum	007	SUM	Newtons	871797	27.8	-2447.8	172.2	60



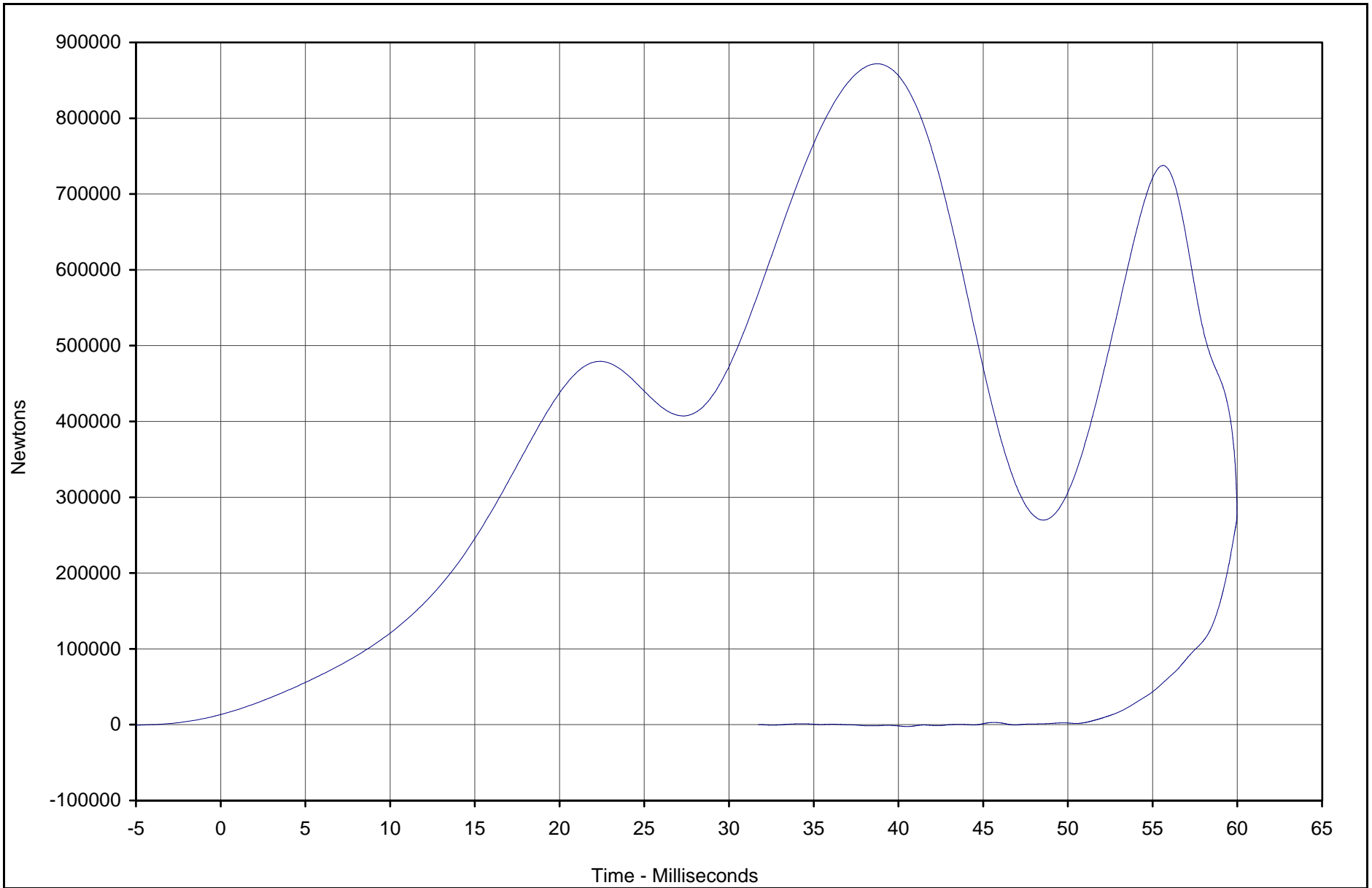
Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

C-44



KAR22001-18

Curve Description	CURNO	Type	Units	Max	CM	Energy (Joules)	SAE Class
Barrier Force Total Sum vs. Displ.	001	XVY	Newtons	871797	38.7	248157	60



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

BARRIER LOAD CELL SUMMARY DATA

Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

NHTSA No.: M20503

Test Program: 2002 NHTSA 35mph NCAP

Test Date: 6/12/02

Location	Units	Max	Time	Min	Time
Barrier Force A1	Newtons	0.0	0.0	0.0	0.0 *
Barrier Force A2	Newtons	1680.2	41.3	-833.5	35.6
Barrier Force A3	Newtons	3222.0	15.4	-2338.7	36.4
Barrier Force A4	Newtons	17124.1	46.6	-2842.2	19.9
Barrier Force A5	Newtons	12864.1	46.0	-614.6	12.3
Barrier Force A6	Newtons	2196.0	29.3	-2218.9	36.4
Barrier Force A7	Newtons	1654.4	28.9	-1889.6	36.3
Barrier Force A8	Newtons	6384.2	45.6	-1009.1	19.3
Barrier Force A9	Newtons	2304.3	36.7	-783.6	48.7
Barrier Force B1	Newtons	0.0	0.0	0.0	0.0 *
Barrier Force B2	Newtons	18672.9	43.5	-960.3	3.6
Barrier Force B3	Newtons	113915.1	14.9	-426.8	0.3
Barrier Force B4	Newtons	132041.8	46.1	-126.2	171.5
Barrier Force B5	Newtons	111070.6	47.0	-33.7	173.1
Barrier Force B6	Newtons	95888.2	27.6	-62.8	161.3
Barrier Force B7	Newtons	114398.6	14.4	-512.8	0.6
Barrier Force B8	Newtons	12586.0	47.0	-265.4	2.3
Barrier Force B9	Newtons	2000.6	53.6	-1158.8	26.7
Barrier Force C1	Newtons	0.0	0.0	0.0	0.0 *
Barrier Force C2	Newtons	16871.0	25.0	-727.1	2.6
Barrier Force C3	Newtons	57342.5	25.5	-193.5	118.5
Barrier Force C4	Newtons	23764.2	28.5	-113.0	161.8
Barrier Force C5	Newtons	89926.1	27.7	-88.8	174.3
Barrier Force C6	Newtons	75721.3	27.3	-39.9	174.8
Barrier Force C7	Newtons	46030.5	14.8	-68.8	161.8
Barrier Force C8	Newtons	10554.7	33.7	-411.5	2.0
Barrier Force C9	Newtons	1481.4	36.4	-1624.9	49.4
Barrier Force D1	Newtons	0.0	0.0	0.0	0.0 *
Barrier Force D2	Newtons	28700.8	34.5	-919.7	4.7
Barrier Force D3	Newtons	11136.5	31.2	-787.3	3.3
Barrier Force D4	Newtons	8076.5	12.7	-779.9	37.5
Barrier Force D5	Newtons	16386.7	12.1	-1062.1	37.2
Barrier Force D6	Newtons	10306.2	12.8	-740.5	1.8
Barrier Force D7	Newtons	3161.8	48.3	-1198.1	21.0
Barrier Force D8	Newtons	31361.2	36.5	-754.3	20.1
Barrier Force D9	Newtons	0.0	0.0	0.0	0.0 *
Barrier Force Sum Group 1	Newtons	130654.5	14.8	-1273.5	1.5
Barrier Force Sum Group 2	Newtons	341402.7	46.9	-486.9	172.3
Barrier Force Sum Group 3	Newtons	119041.3	14.6	-453.3	162.0
Barrier Force Sum Group 4	Newtons	89601.1	25.6	-782.8	117.2
Barrier Force Sum Group 5	Newtons	206908.9	27.6	-598.2	172.9
Barrier Force Sum Group 6	Newtons	64764.9	33.0	-484.7	0.0
Barrier Force Total Sum	Newtons	871797.1	27.8	-2447.8	172.2

* Not recorded, no data

APPENDIX D

INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D. Serial Number 35
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

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

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D. Serial Number 35
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

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	CM
44	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Passenger A.T.D. Serial Number 34
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

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

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Passenger A.T.D. Serial Number 34
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

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	MM
88	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Vehicle Accelerometers
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

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	KEVA008	Accel., Vehicle block	I.C. Sensor	3031-500	G
93	Left Brake Caliper	X	KEVA007	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	KEVA005	Accel., Vehicle block	I.C. Sensor	3031-500	G
97	Right Rear	Z	KEVA010	Accel., Vehicle block	I.C. Sensor	3031-200	G

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Rigid Load Cell Barrier
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
98	BARRIER FORCE A1	X	BARRIER	Not Used	N/A	N/A	N/A
99	BARRIER FORCE A2	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
100	BARRIER FORCE A3	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
101	BARRIER FORCE A4	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
102	BARRIER FORCE A5	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
103	BARRIER FORCE A6	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
104	BARRIER FORCE A7	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
105	BARRIER FORCE A8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
106	BARRIER FORCE A9	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
107	BARRIER FORCE B1	X	BARRIER	Not Used	N/A	N/A	N/A
108	BARRIER FORCE B2	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
109	BARRIER FORCE B3	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
110	BARRIER FORCE B4	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
111	BARRIER FORCE B5	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
112	BARRIER FORCE B6	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
113	BARRIER FORCE B7	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
114	BARRIER FORCE B8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
115	BARRIER FORCE B9	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Rigid Load Cell Barrier
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
116	BARRIER FORCE C1	X	N/A	Not Used	N/A	N/A	N/A
117	BARRIER FORCE C2	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
118	BARRIER FORCE C3	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
119	BARRIER FORCE C4	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
120	BARRIER FORCE C5	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
121	BARRIER FORCE C6	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
122	BARRIER FORCE C7	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
123	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
124	BARRIER FORCE C9	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
125	BARRIER FORCE D1	X	N/A	Not Used	N/A	N/A	N/A
126	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
127	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
128	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
129	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
130	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
131	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
132	BARRIER FORCE C8	X	BARRIER	Load Cell, LCB	Lebow	1220-FS	N
133	BARRIER FORCE D9	X	N/A	Not Used	N/A	N/A	N/A

**2002 NHTSA 35mph NCAP
Instrumentation Data Channel Assignments
Nine Accelerometer Head Array Channels
6/12/02
2002 Hyundai Santa Fe 4WD SUV**

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
134	Driver Head CG	X	KEAC039	Accel., 1/2 bridge	Endevco	7264-2000	G *
135	Driver Head CG	Y	KEAC038	Accel., 1/2 bridge	Endevco	7264-2000	G *
136	Driver Head CG	Z	KEAC027	Accel., 1/2 bridge	Endevco	7264-2000	G *
137	Driver Y-arm	Z	GPAC016	Accel., 1/2 bridge	Endevco	7264-2000	G
138	Driver Y-arm	X	GPAC015	Accel., 1/2 bridge	Endevco	7264-2000	G
139	Driver X-arm	Z	GPAC004	Accel., 1/2 bridge	Endevco	7264-2000	G
140	Driver X-arm	Y	GPAC018	Accel., 1/2 bridge	Endevco	7264-2000	G
141	Driver Z-arm	X	GPAC006	Accel., 1/2 bridge	Endevco	7264-2000	G
142	Driver Z-arm	Y	GPAC007	Accel., 1/2 bridge	Endevco	7264-2000	G
143	Passenger Head CG	X	GPAC027	Accel., 1/2 bridge	Endevco	7264-2000	G *
144	Passenger Head CG	Y	GPAC002	Accel., 1/2 bridge	Endevco	7264-2000	G *
145	Passenger Head CG	Z	GPAC003	Accel., 1/2 bridge	Endevco	7264-2000	G *
146	Passenger Y-arm	Z	GPAC012	Accel., 1/2 bridge	Endevco	7264-2000	G
147	Passenger Y-arm	X	GPAC001	Accel., 1/2 bridge	Endevco	7264-2000	G
148	Passenger X-arm	Z	GPAC036	Accel., 1/2 bridge	Endevco	7264-2000	G
149	Passenger X-arm	Y	GPAC014	Accel., 1/2 bridge	Endevco	7264-2000	G
150	Passenger Z-arm	X	GPAC030	Accel., 1/2 bridge	Endevco	7264-2000	G
151	Passenger Z-arm	Y	GPAC037	Accel., 1/2 bridge	Endevco	7264-2000	G

* Duplicate of Head CG Primary Channels

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.: LK07B

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	5027	Pass
Overall Test Results				Pass

ATD Serial No.: 034

Location: Right Knee

Test I.D.: RK07B

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	5509	Pass
Overall Test Results				Pass

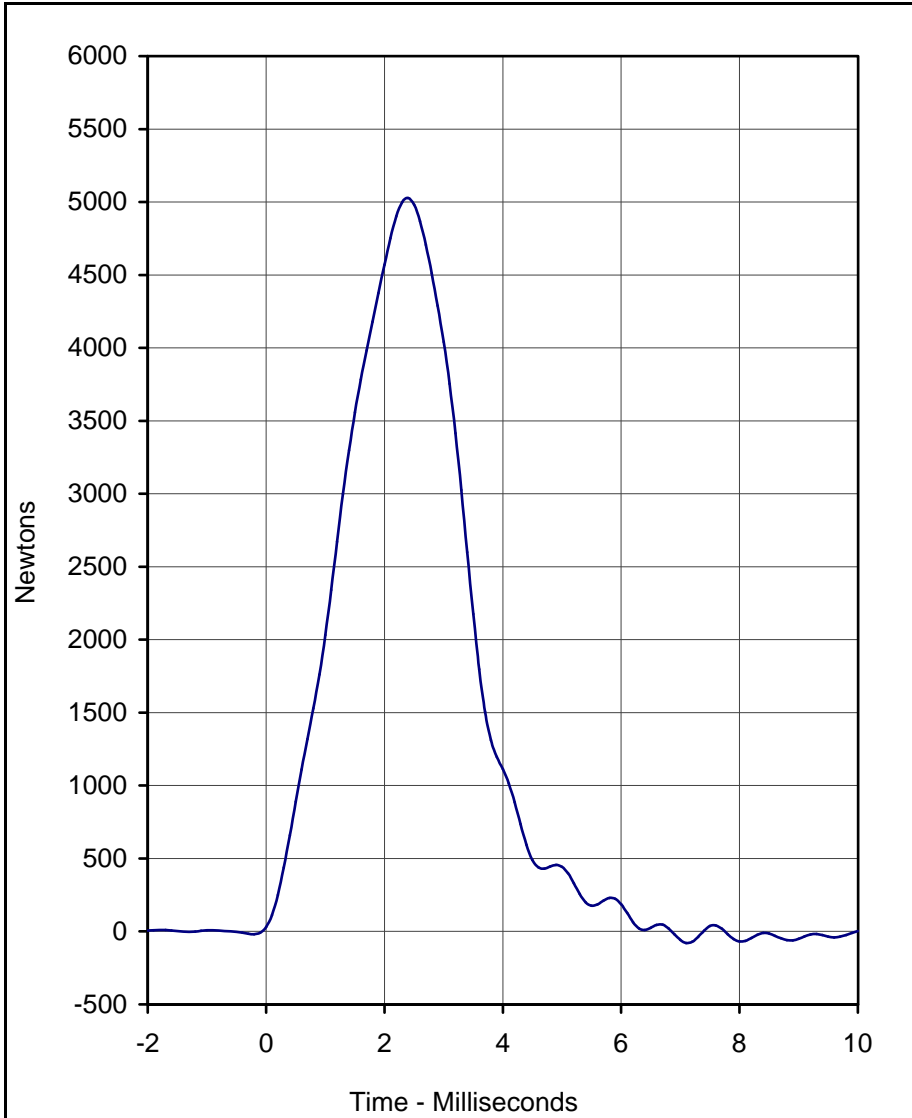
Laboratory Technician

June 11, 2002

Test Date

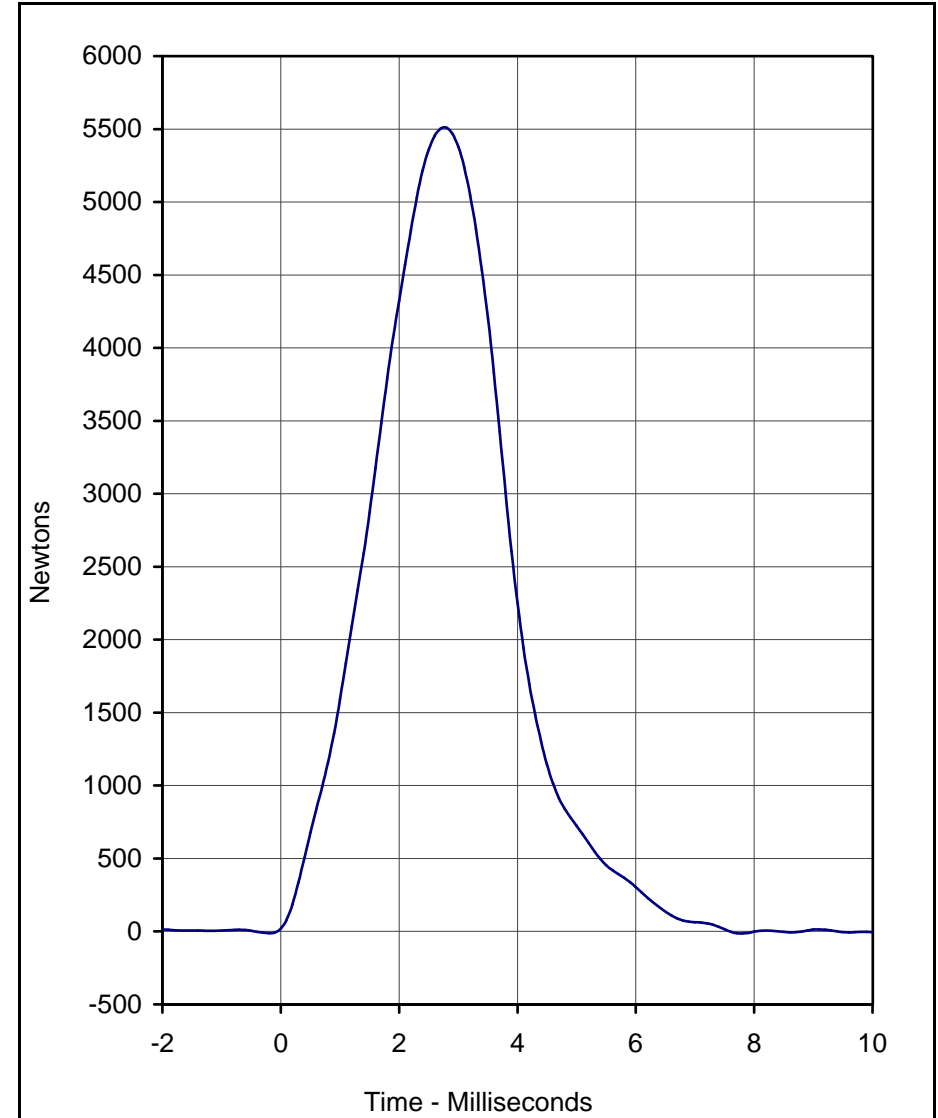
E-1

-KAR22001-18



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Left Knee	LK07B	001	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5027.1	2.4	-79.0	7.1	600



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Right Knee	RK07B	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5509.3	2.8	-14.6	7.8	600

Test Program: Hybrid III 50th Percentile Male Knee Impact Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034





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

ATD Serial No.: 034

Test I.D.: HD07B

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	256.3	Pass
Peak Lateral Acceleration	G's	≤15.0	5.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass

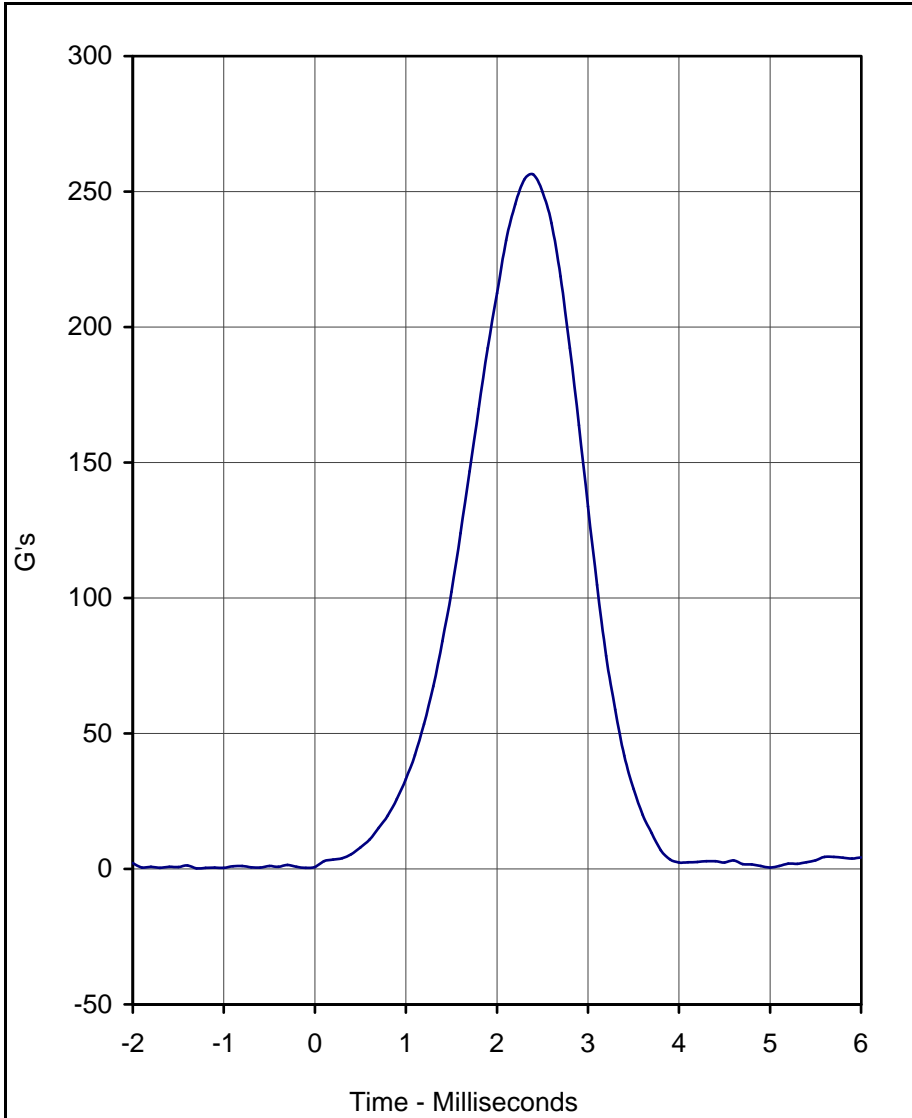
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KAR22001-18

Laboratory Technician

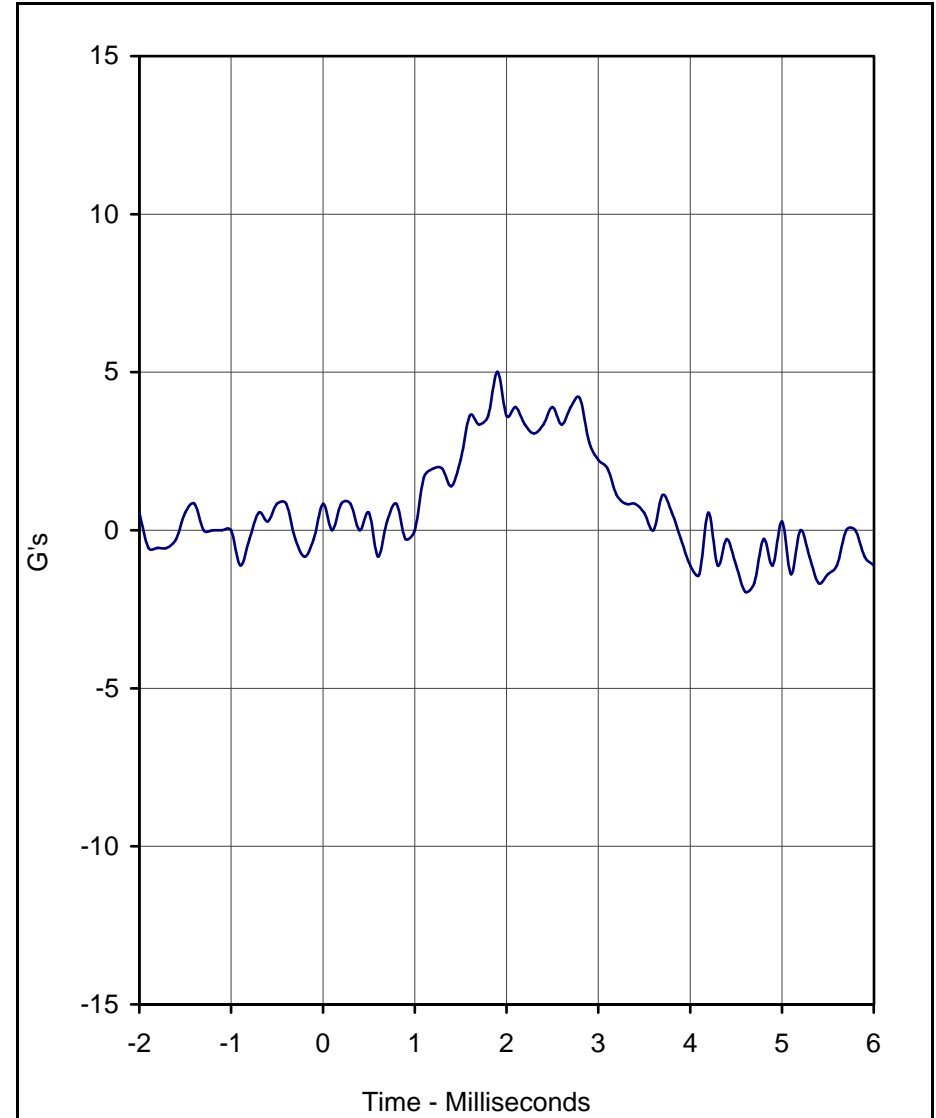
June 11, 2002

Test Date



Curve Description	CURNO	Type
Head Resultant	001	RES

Units	Max	Time	Min	Time	SAE Class
G's	256.3	2.4	0.2	-1.3	1000



Curve Description	CURNO	Type
Head Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	5.0	1.9	-1.9	4.6	1000

Test Program: Hybrid III 50th Percentile Male Head Drop Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034
 Test I.D.: HD07B





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

ATD Serial No.: 034

Test I.D.: CH07B

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	5291	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.71	Pass
Internal Hysteresis	%	69 to 85	78.5	Pass
Overall Test Results				Pass

E-5

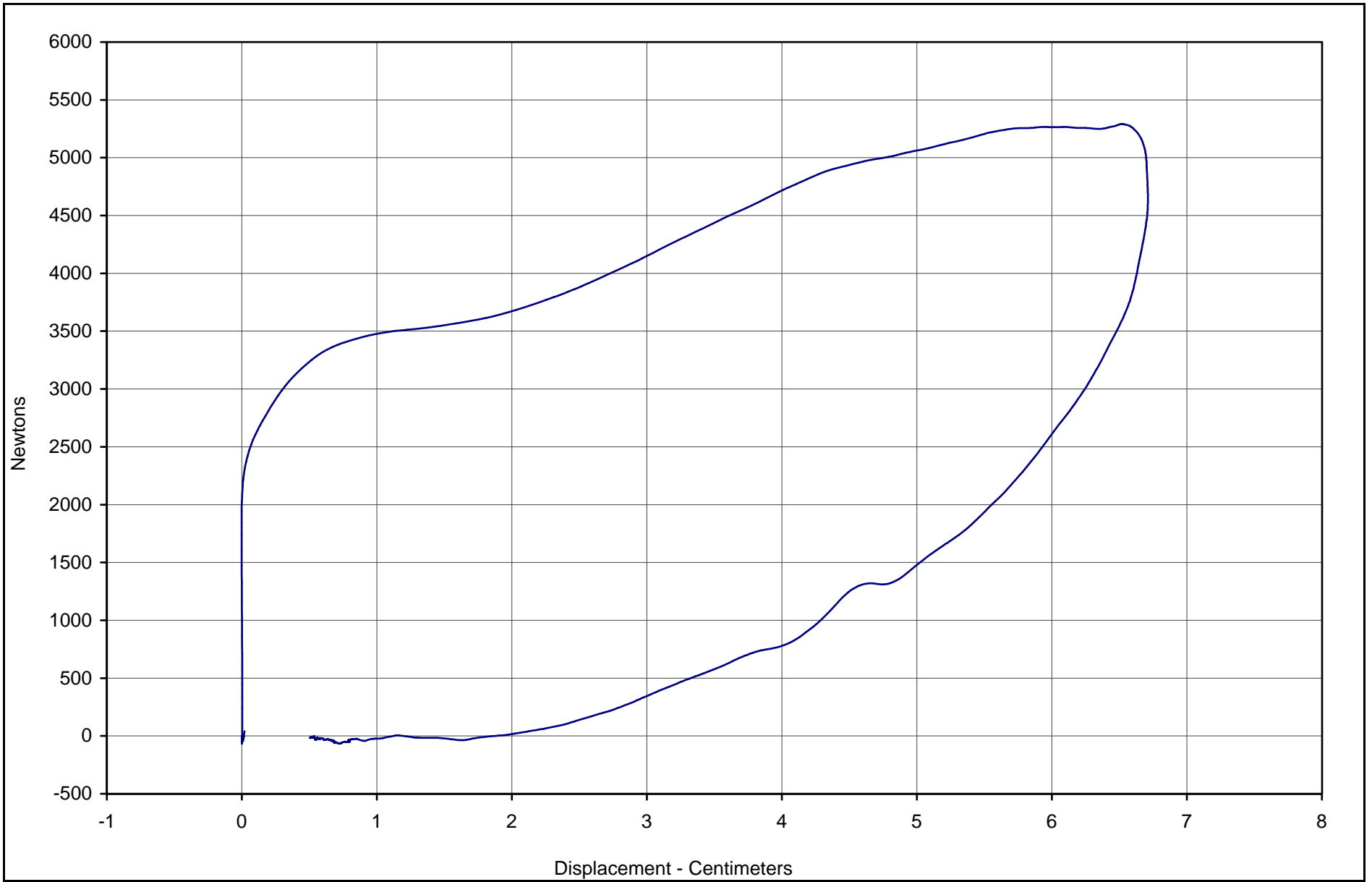
KAR22001-18

Laboratory Technician

June 11, 2002

Test Date

E-6



KAR22001-118

Curve Description	CURNO	Type	Hysteresis	Peak Chest Displ.	Peak Probe Force	SAE Class
Probe Force vs. Chest Displacement	001	FIL	78.5	6.71	5291.5	180



Test Program: Hybrid III 50th Percentile Male Thorax Impact

A.T.D. Serial No.: 034

Test Date: 6/11/02

Test I.D.: CH07B



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

ATD Serial No.: 034

Test I.D.: NF07B

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	6.98	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.5	Pass
	20 Msec.	G's	17.6 to 22.6	20.4	Pass
	30 Msec.	G's	12.5 to 18.5	13.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	13.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	38.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.2	Pass
	Time	Msec.	57.0 to 64.0	63.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	118.3	Pass
Moment About Occipital Condyle	Maximum	Nm	84.1 to 108.5	94.6	Pass
	Time	Msec.	47.0 to 58.0	54.7	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.0	Pass
Overall Test Results					Pass

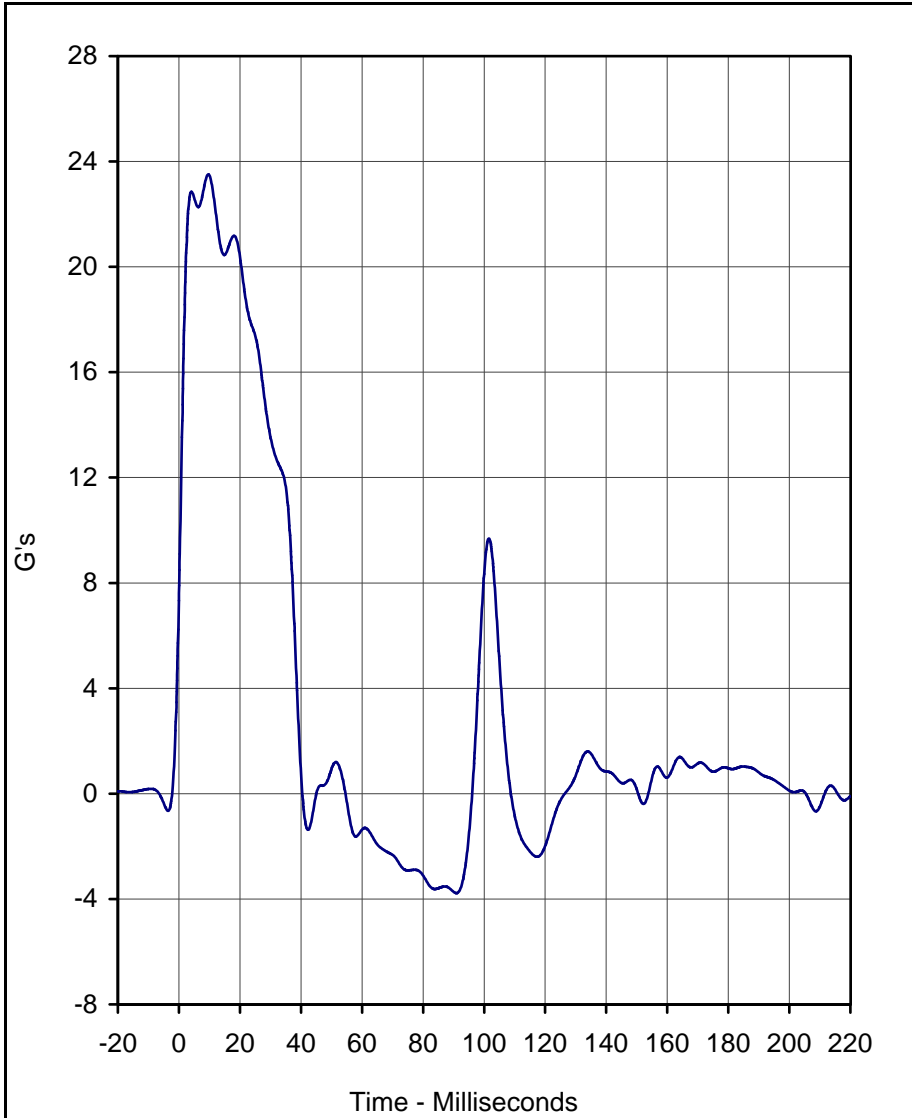
Laboratory Technician

June 11, 2002

Test Date

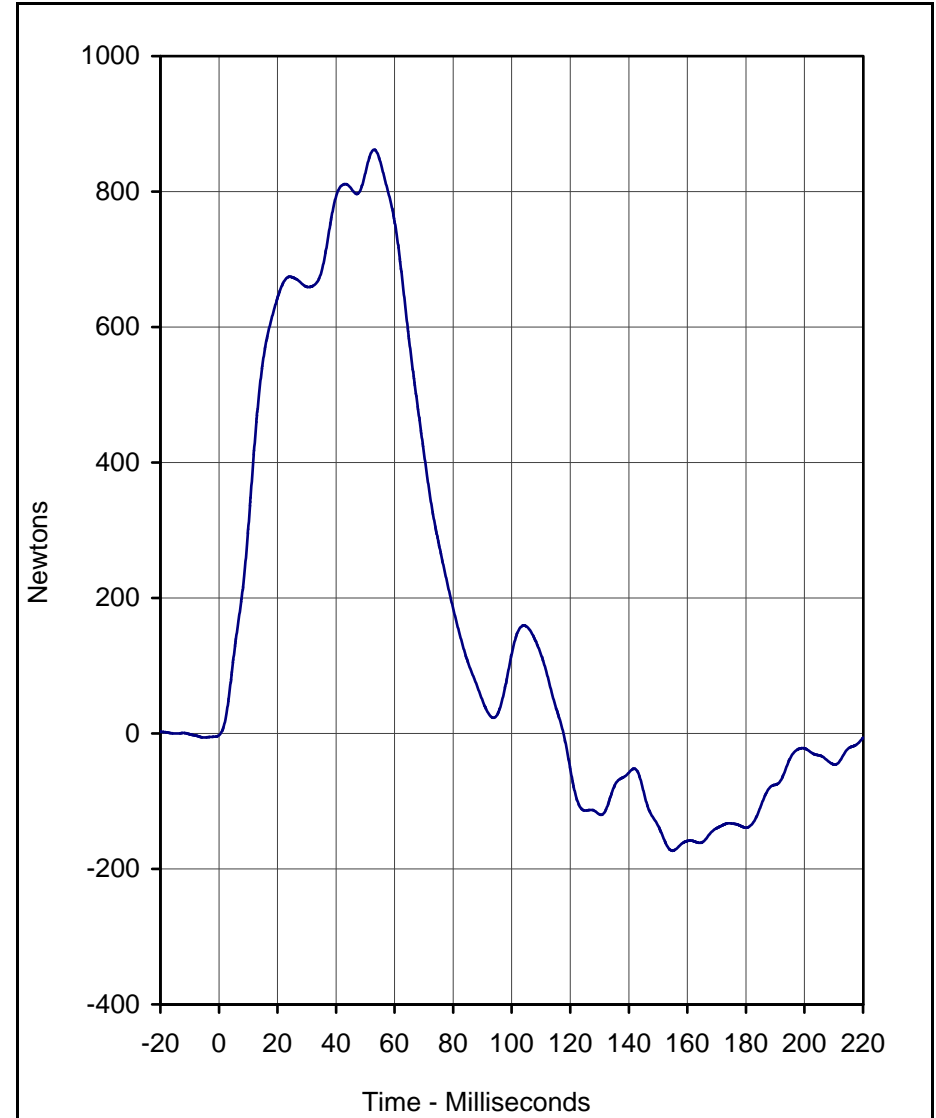
E-7

KAR22001-18



Curve Description	CURNO	Type
Pendulum Deceleration	001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	23.5	9.6	-3.8	90.9	60



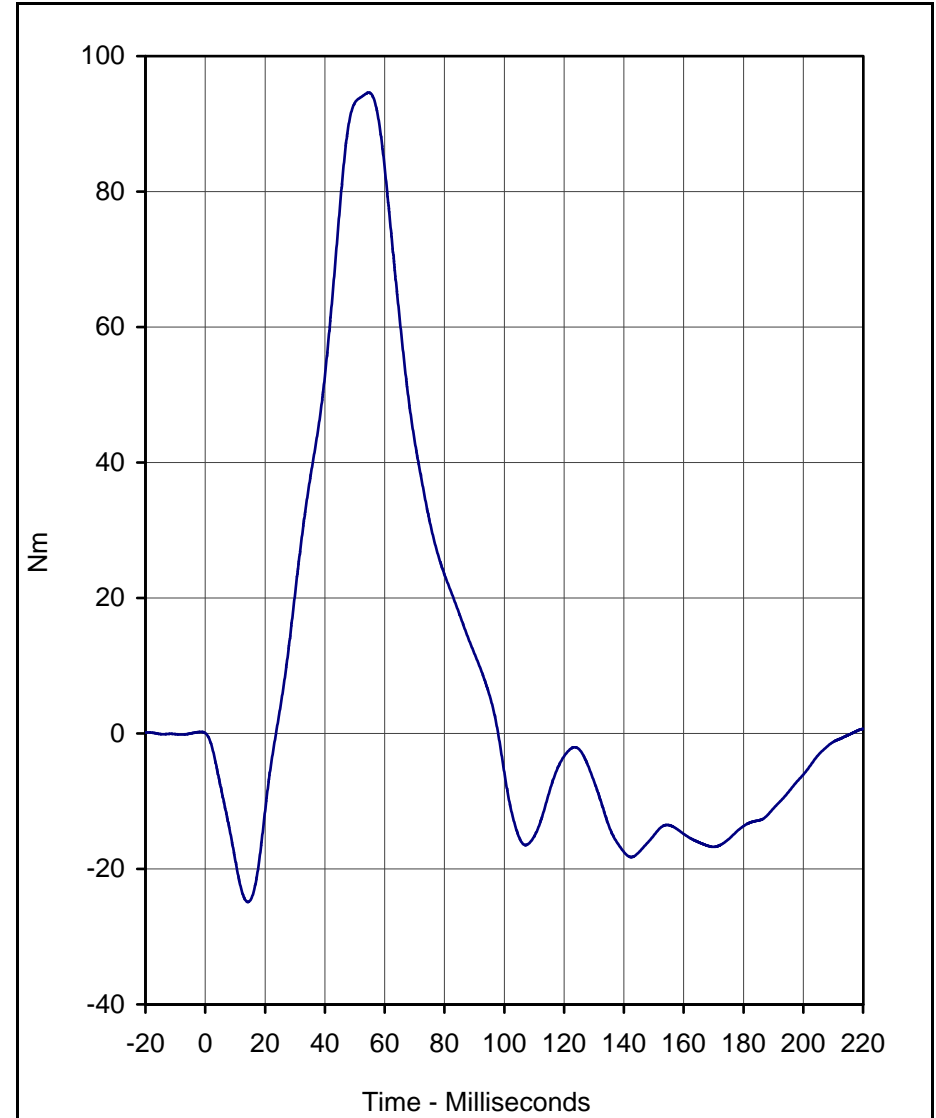
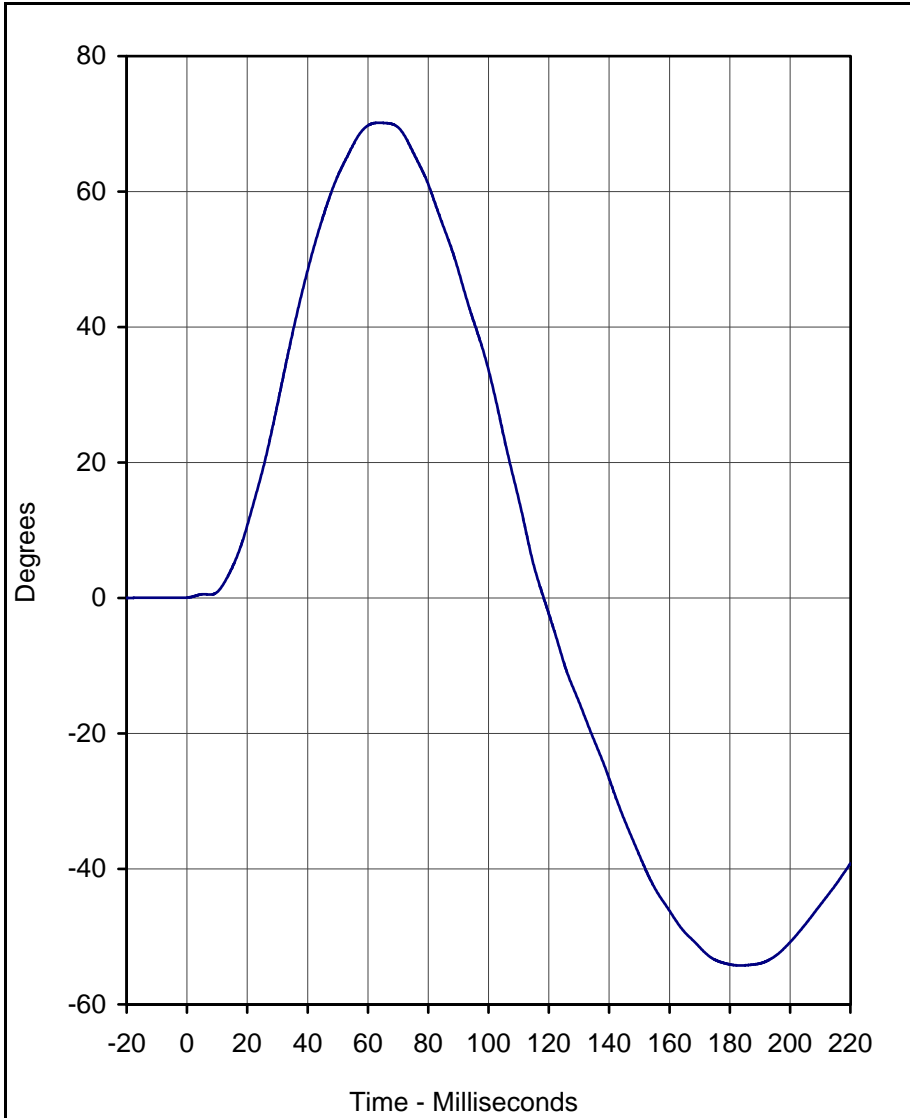
Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	861.9	53.0	-173.1	154.9	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034
 Test I.D.: NF07B





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	70.2	63.6	-54.3	183.6	60

Units	Max	Time	Min	Time	SAE Class
Nm	94.6	54.7	-24.9	14.3	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034
 Test I.D.: NF07B





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

ATD Serial No.: 034

Test I.D.: NE07B

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	6.17	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.3	Pass
	20 Msec.	G's	14.0 to 19.0	17.0	Pass
	30 Msec.	G's	11.0 to 16.0	15.3	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.3	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	44.2	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.5	Pass
	Time	Msec.	72.0 to 82.0	78.7	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	150.2	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to- 79.9	-68.4	Pass
	Time	Msec.	65.0 to 79.0	66.3	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	135.9	Pass
Overall Test Results					Pass

E-10

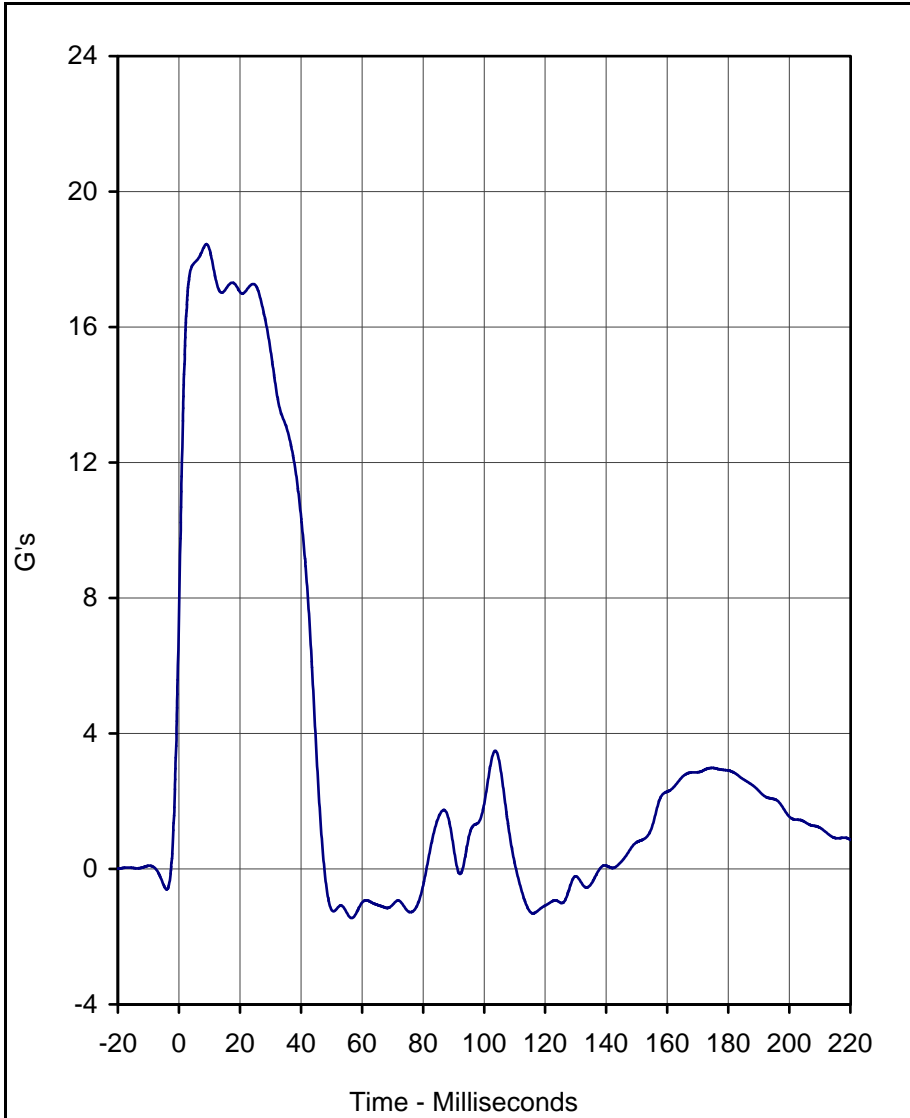
KAR22001-18

Laboratory Technician

June 11, 2002

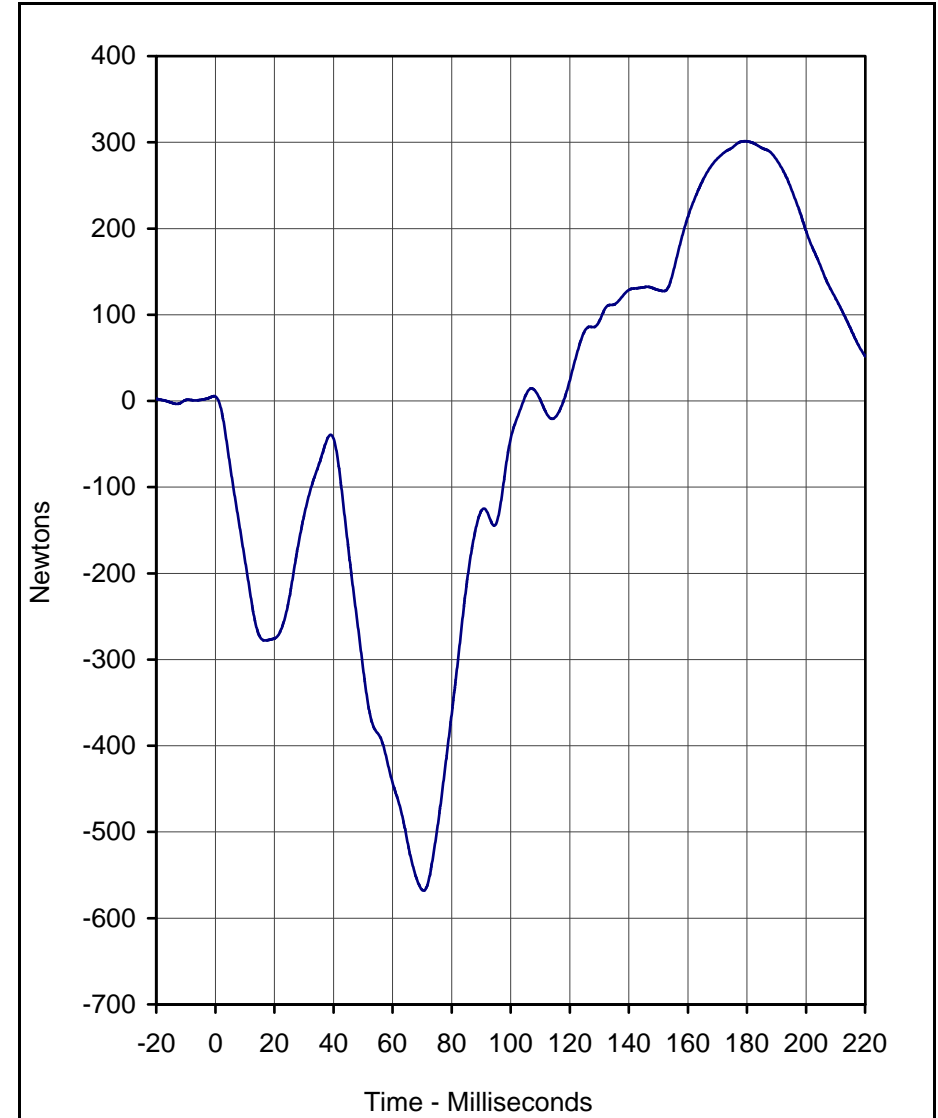
Test Date

E-11



Curve Description	CURNO	Type
Pendulum Deceleration	001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	18.4	9.0	-1.5	56.6	60



Curve Description	CURNO	Type
Neck Force X	002	FIL

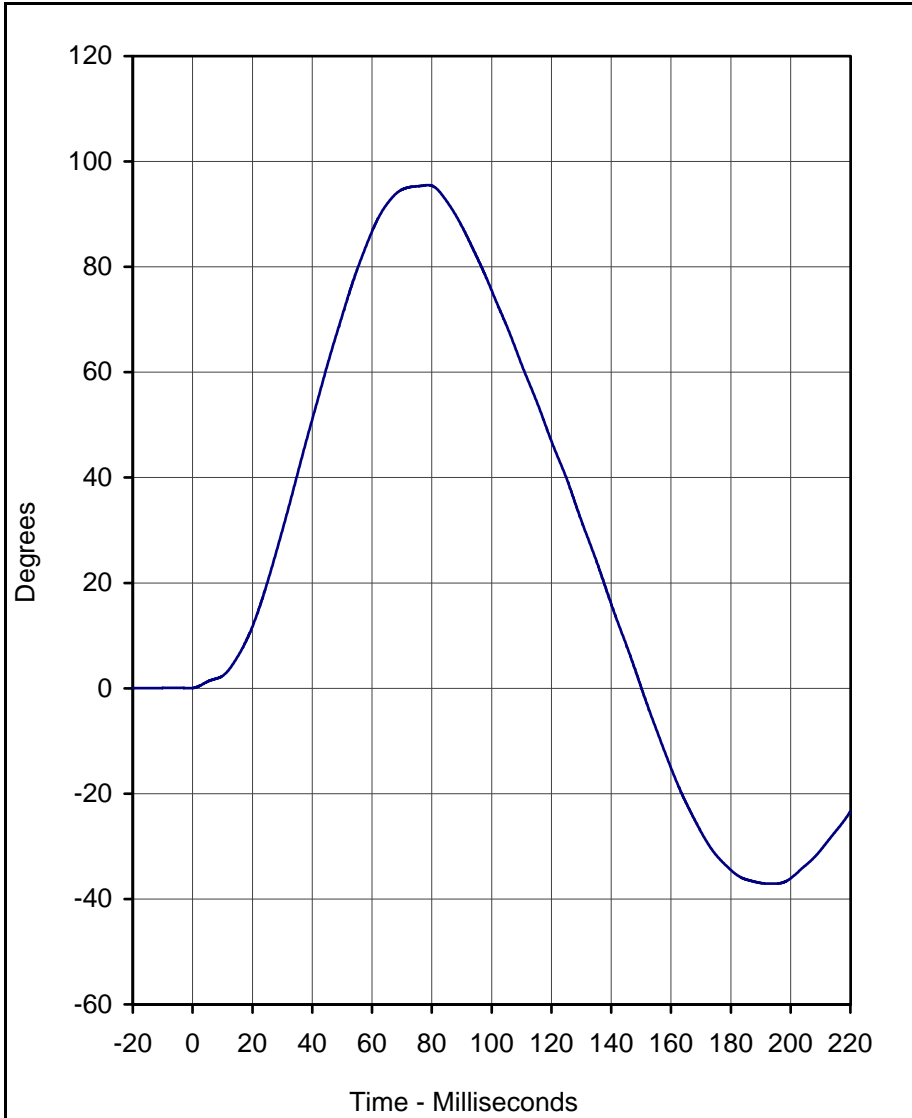
Units	Max	Time	Min	Time	SAE Class
Newtons	301.2	179.4	-568.0	70.5	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034
 Test I.D.: NE07B

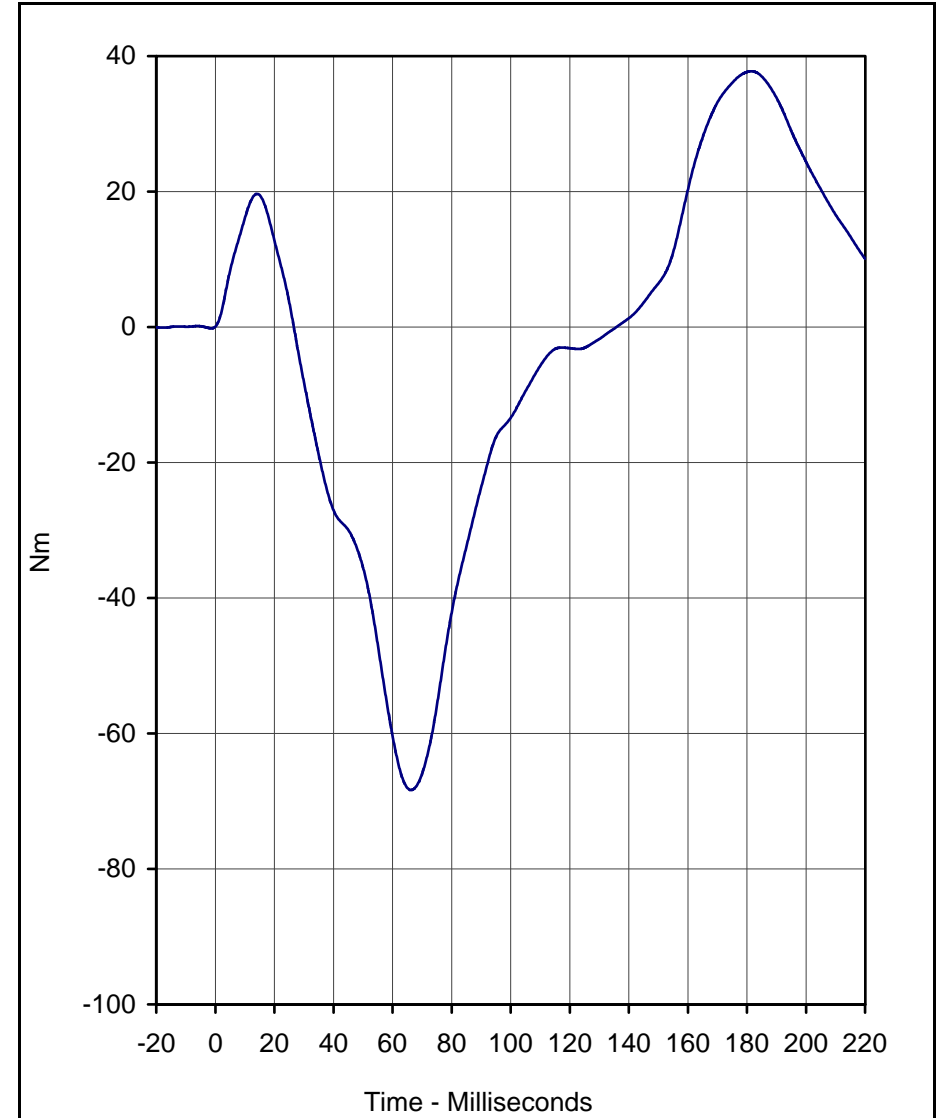


KAR22001-18



Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	95.5	78.7	-37.1	193.5	60



Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	37.8	181.5	-68.4	66.3	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 Test Date: 6/11/02

A.T.D. Serial No.: 034
 Test I.D.: NE07B





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	515	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	195	Pass
K - Buttock to knee length	mm	579 to 604	600	Pass
L - Popliteal length	mm	429 to 455	440	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock popliteal length	mm	452 to 477	475	Pass
O - Chest depth	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	435	Pass
W - Foot breadth	mm	91 to 107	100	Pass
Y - Chest circumference	mm	970 to 1001	985	Pass
Z - Waist circumference	mm	836 to 866	840	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

Laboratory Technician

June 11, 2002

Test Date

E-13

KAR22001-18



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

ATD Serial No.: 035

Location: Left Knee

Test I.D.: LK07A

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	2.08	Pass
Peak Probe Force	N	4715 to 5782	5434	Pass
Overall Test Results				Pass

ATD Serial No.: 035

Location: Right Knee

Test I.D.: RK07A

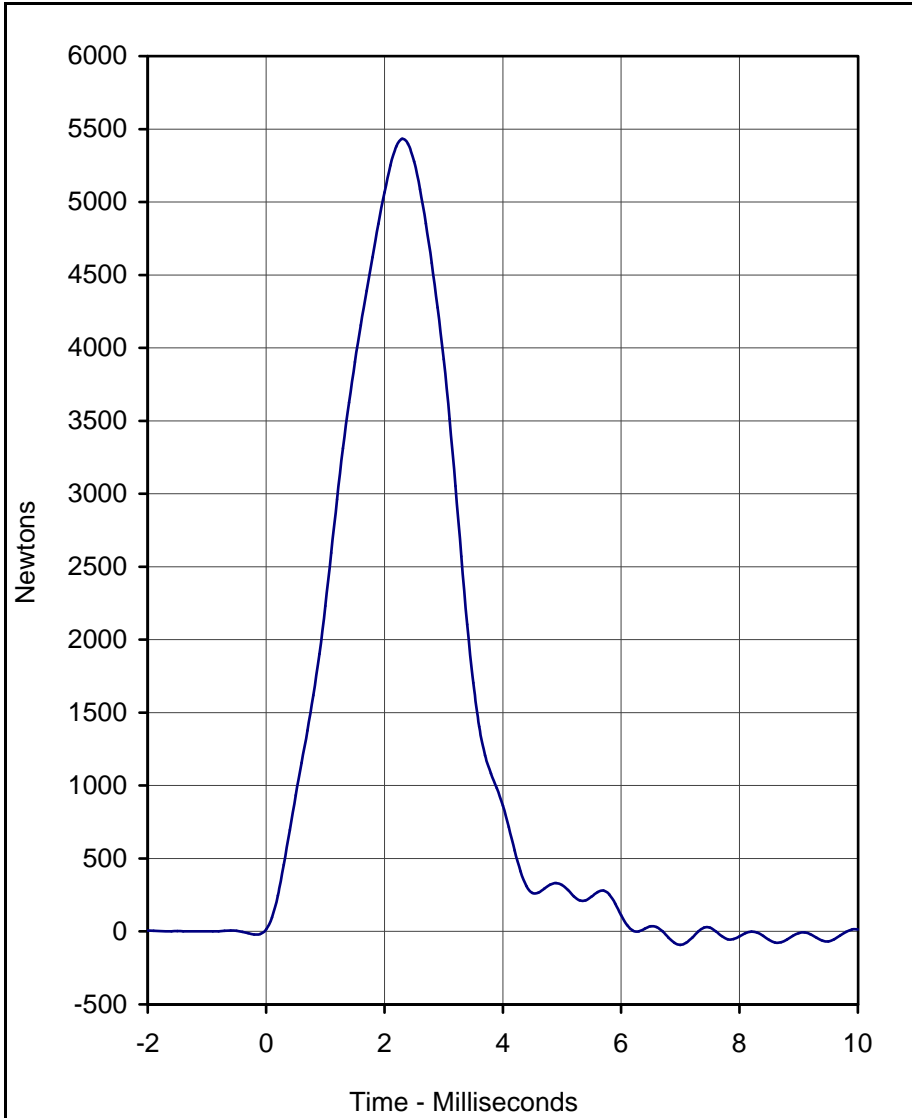
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	N	4715 to 5782	5455	Pass
Overall Test Results				Pass

Laboratory Technician

June 11, 2002

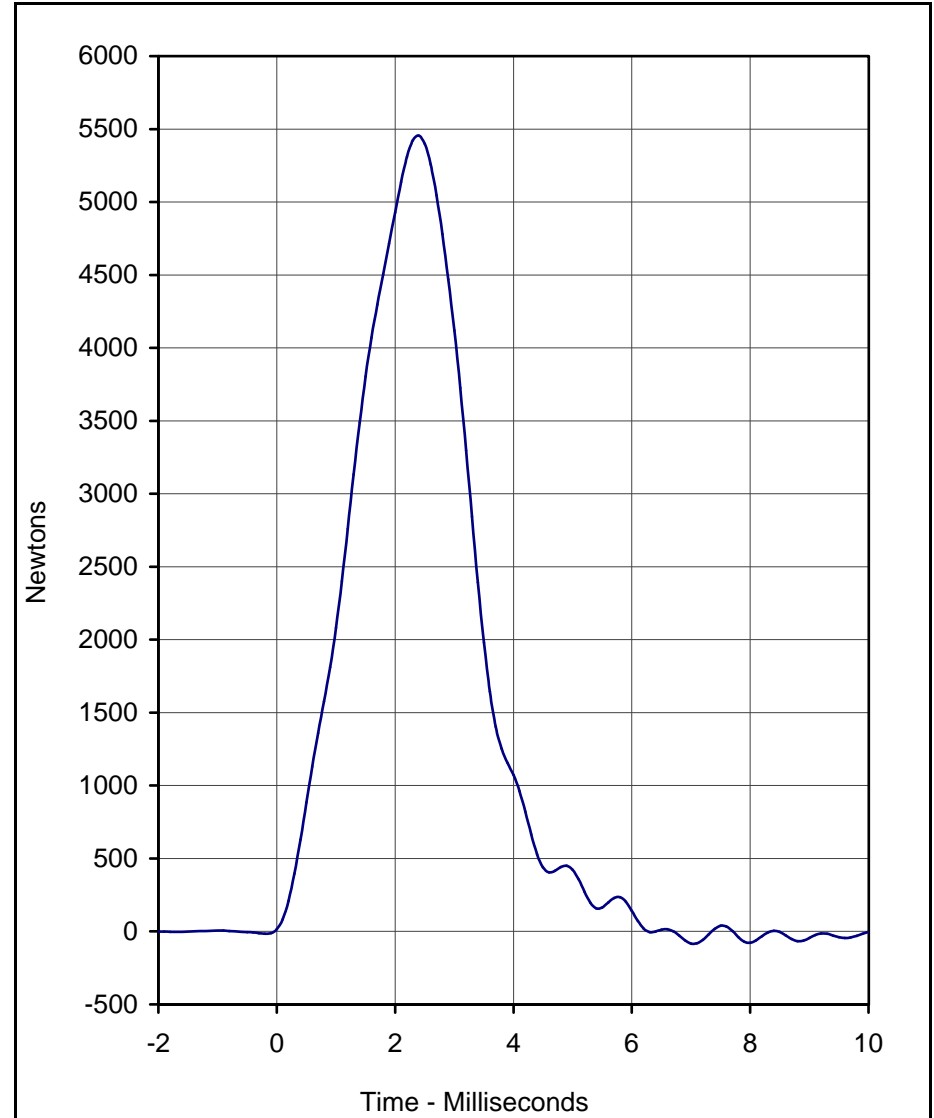
Test Date

E-15



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Left Knee	LK07A	001	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5433.5	2.3	-92.8	7.0	600



Curve Description	Location	Test I.D.	CURNO	Type
Probe Force	Right Knee	RK07A	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	5455.1	2.4	-82.9	7.0	600

Test Program: Hybrid III 50th Percentile Male Knee Impact Test
 Test Date: 6/11/02

A.T.D. Serial No.: 035



KAR22001-18



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

ATD Serial No.: 035

Test I.D.: HD07A

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	234.1	Pass
Peak Lateral Acceleration	G's	≤15.0	3.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass

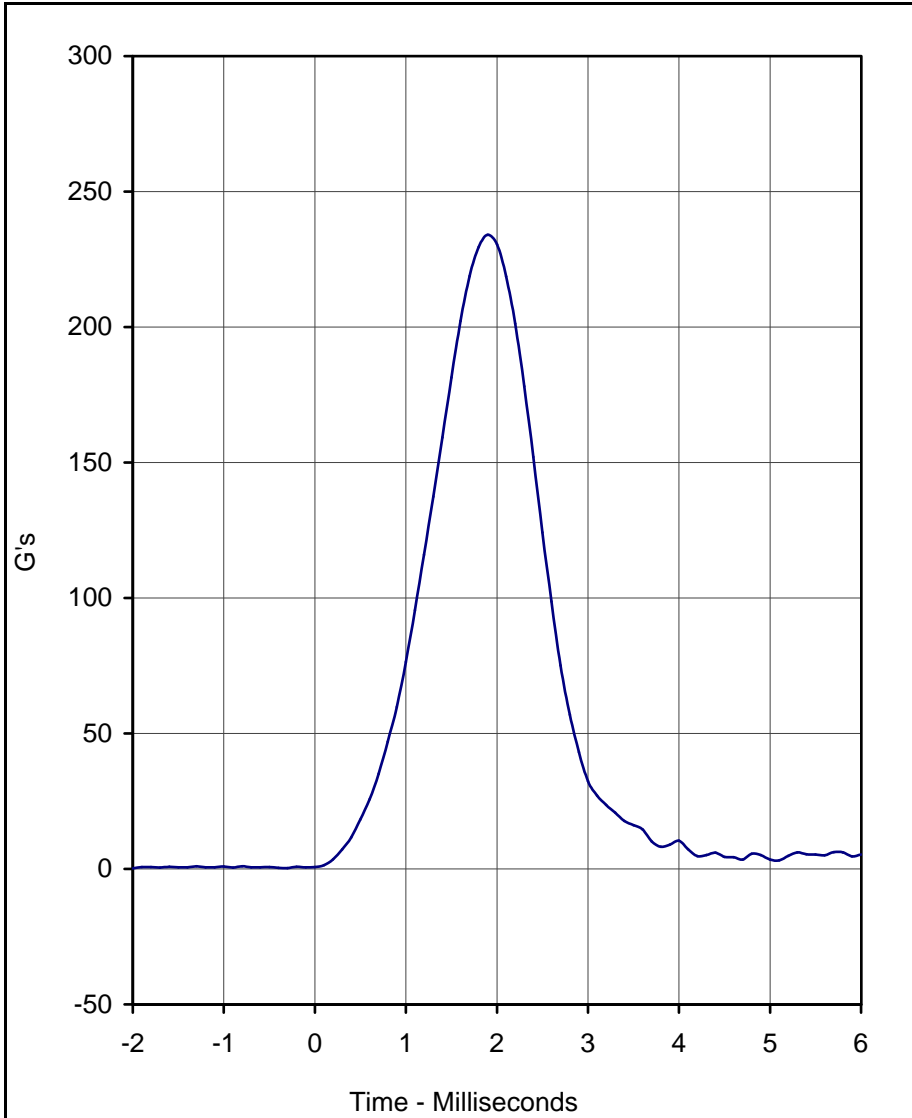
E-16

KAR22001-18

Laboratory Technician

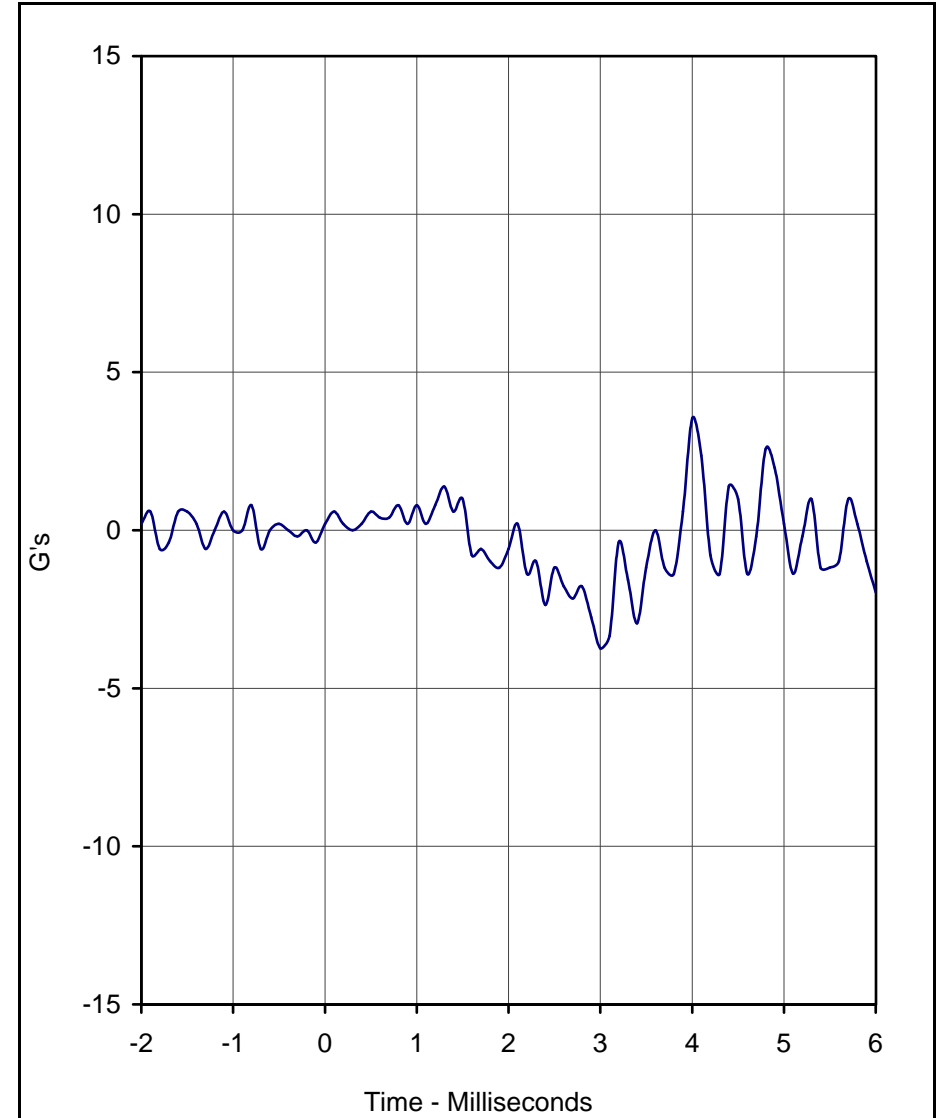
June 11, 2002

Test Date



Curve Description	CURNO	Type
Head Resultant	001	RES

Units	Max	Time	Min	Time	SAE Class
G's	234.1	1.9	0.2	-2.0	1000



Curve Description	CURNO	Type
Head Y	002	FIL

Units	Max	Time	Min	Time	SAE Class
G's	3.5	4.0	-3.7	3.0	1000

Test Program: Hybrid III 50th Percentile Male Head Drop Test
 Test Date: 6/11/02

A.T.D. Serial No.: 035
 Test I.D.: HD07A





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

ATD Serial No.: 035

Test I.D.: CH07A

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	5291	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.82	Pass
Internal Hysteresis	%	69 to 85	74.5	Pass
Overall Test Results				Pass

E-18

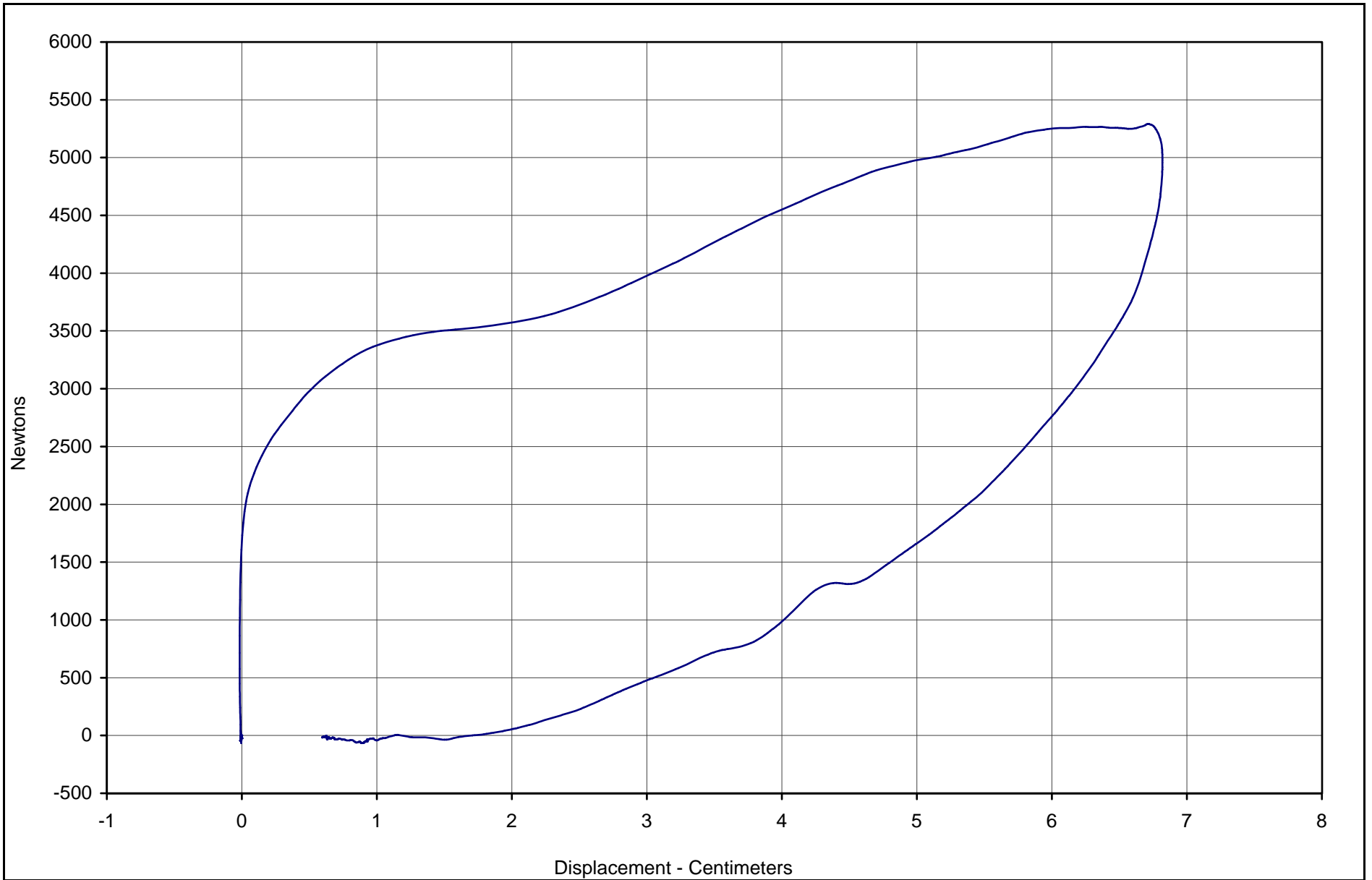
KAR22001-18

Laboratory Technician

June 11, 2002

Test Date

E-19



KAR22001-18

Curve Description	CURNO	Type	Hysteresis	Peak Chest Displ.	Peak Probe Force	SAE Class
Probe Force vs. Chest Displacement	001	FIL	74.5	6.82	5291.5	180



Test Program: Hybrid III 50th Percentile Male Thorax Impact

A.T.D. Serial No.: 035

Test Date: 6/11/02

Test I.D.: CH07A



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

ATD Serial No.: 035

Test I.D.: NF07A

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	7.05	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.8	Pass
	20 Msec.	G's	17.6 to 22.6	20.4	Pass
	30 Msec.	G's	12.5 to 18.5	18.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	18.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	38.4	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	69.0	Pass
	Time	Msec.	57.0 to 64.0	60.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	113.8	Pass
Moment About Occipital Condyle	Maximum	Nm	84.1 to 108.5	88.5	Pass
	Time	Msec.	47.0 to 58.0	57.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	102.8	Pass
Overall Test Results					Pass

Laboratory Technician

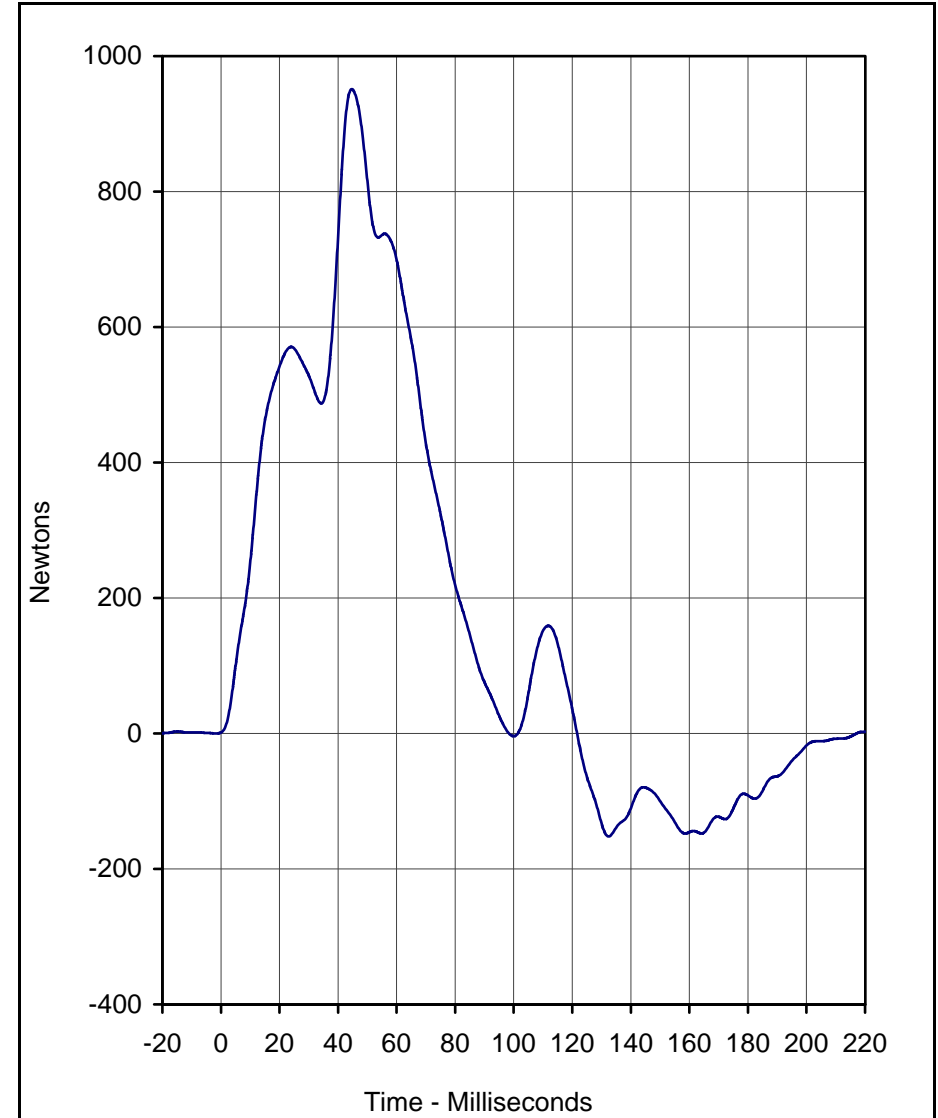
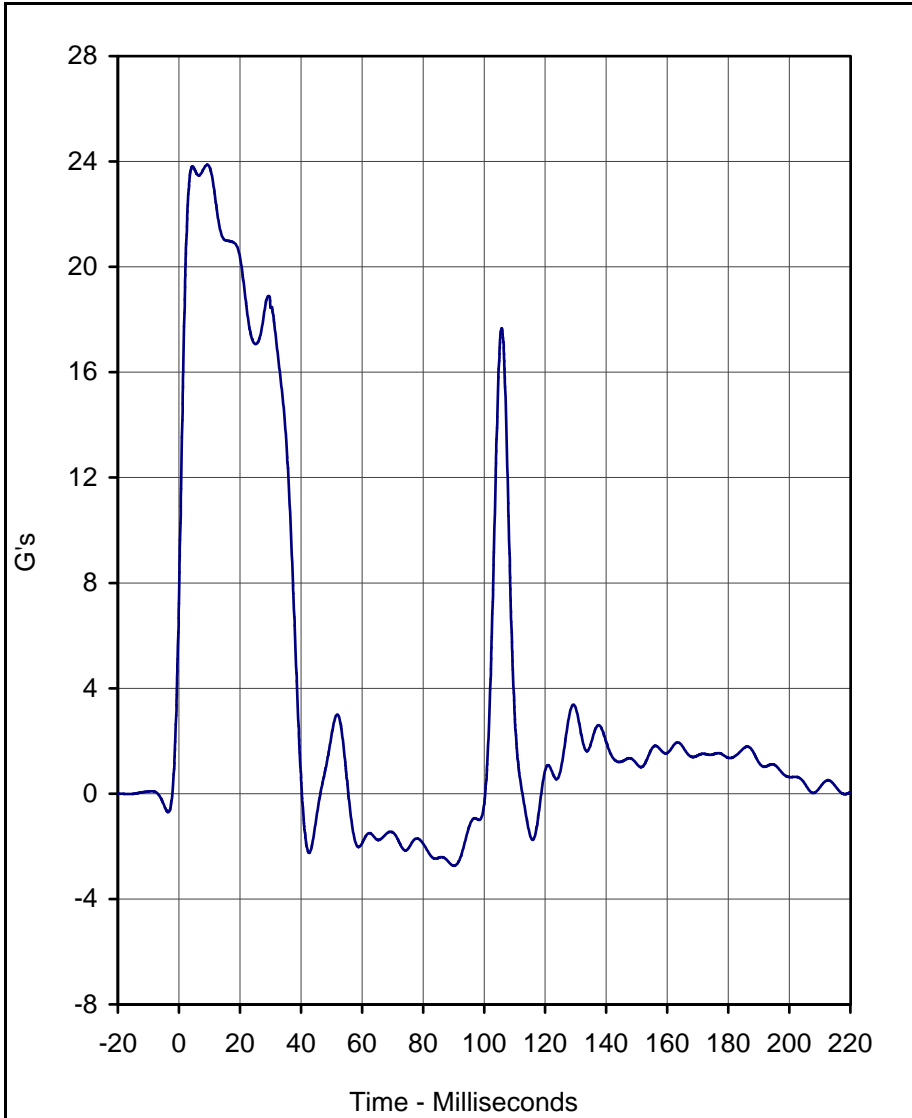
June 11, 2002

Test Date

E-20

KAR22001-18

E-21



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	23.9	9.3	-2.7	90.1	60

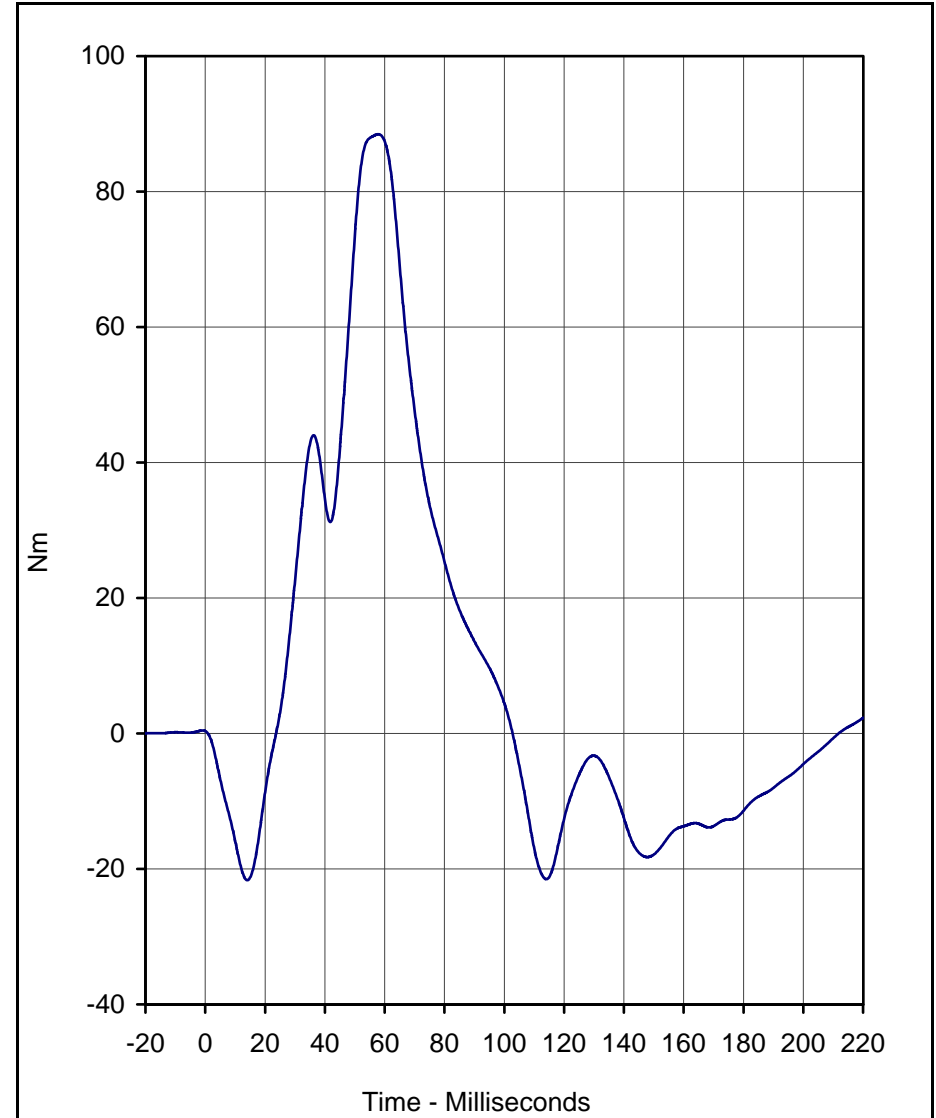
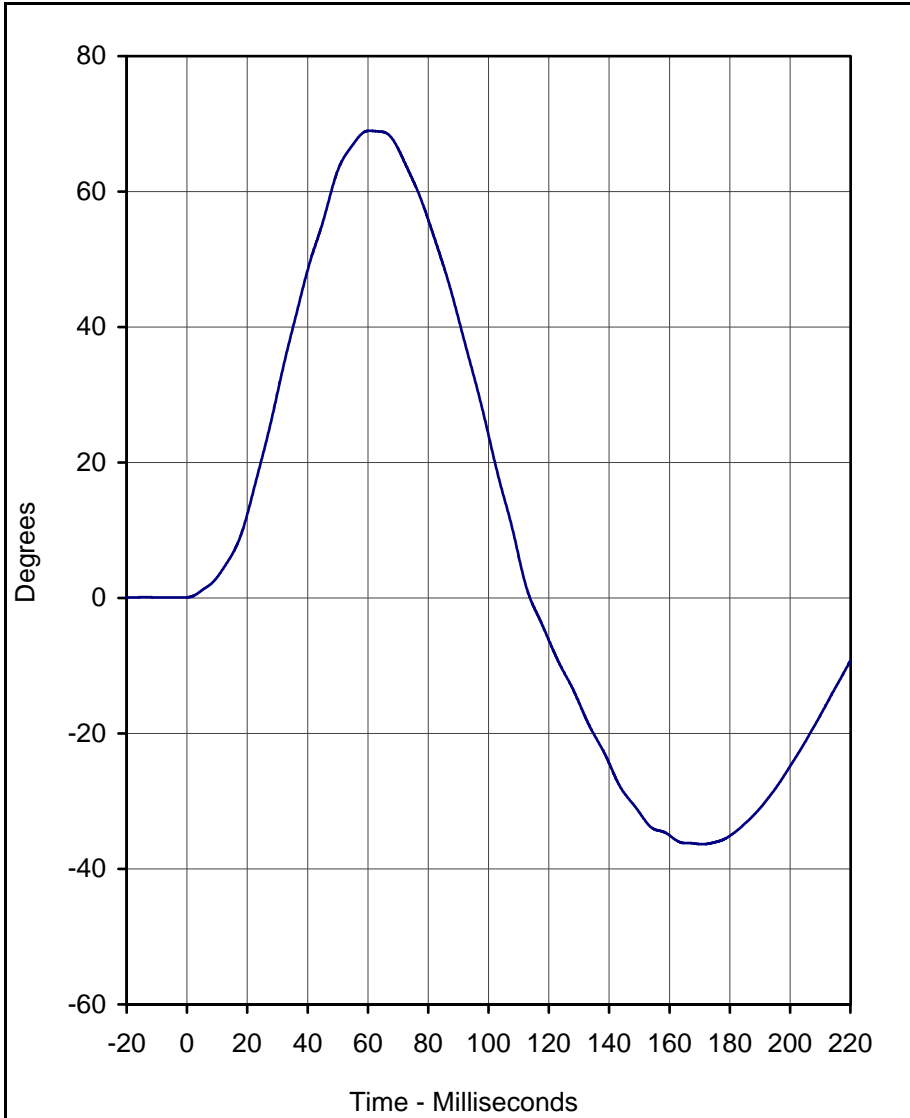
Units	Max	Time	Min	Time	SAE Class
Newtons	951.3	44.7	-152.1	132.4	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 Test Date: 6/11/02

A.T.D. Serial No.: 035
 Test I.D.: NF07A



KAR22001-18



Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	69.0	60.6	-36.4	170.9	60

Units	Max	Time	Min	Time	SAE Class
Nm	88.5	57.9	-21.7	14.1	60

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 Test Date: 6/11/02

A.T.D. Serial No.: 035
 Test I.D.: NF07A





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

ATD Serial No.: 035

Test I.D.: NE07A

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	6.09	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.1	Pass
	20 Msec.	G's	14.0 to 19.0	16.4	Pass
	30 Msec.	G's	11.0 to 16.0	12.0	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	12.0	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	43.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.4	Pass
	Time	Msec.	72.0 to 82.0	81.7	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	156.0	Pass
Moment About Occipital Condyle	Maximum	Nm	-52.9 to- 79.9	-77.8	Pass
	Time	Msec.	65.0 to 79.0	68.4	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	137.6	Pass
Overall Test Results					Pass

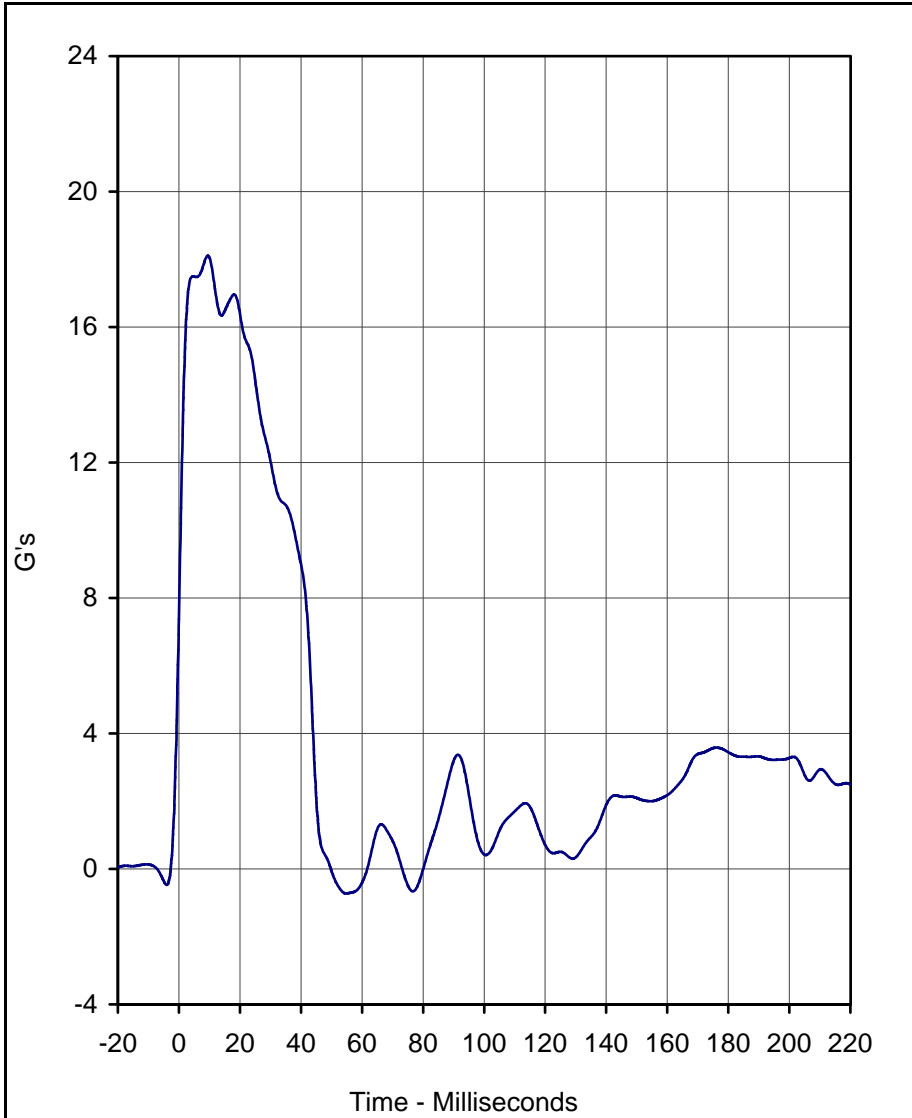
E-23

KAR22001-18

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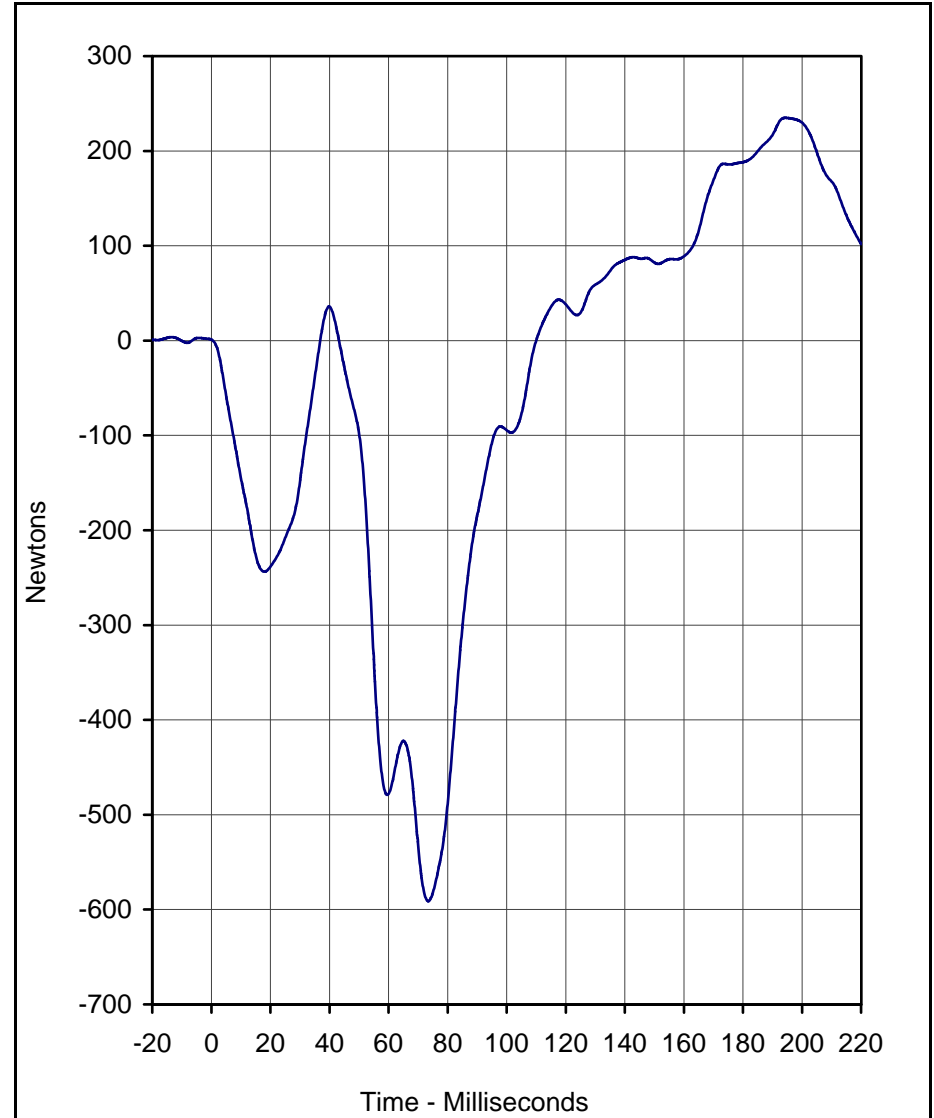
June 11, 2002

Test Date



Curve Description	CURNO	Type
Pendulum Deceleration	001	FIL

Units	Max	Time	Min	Time	SAE Class
G's	18.1	9.5	-0.7	54.8	60



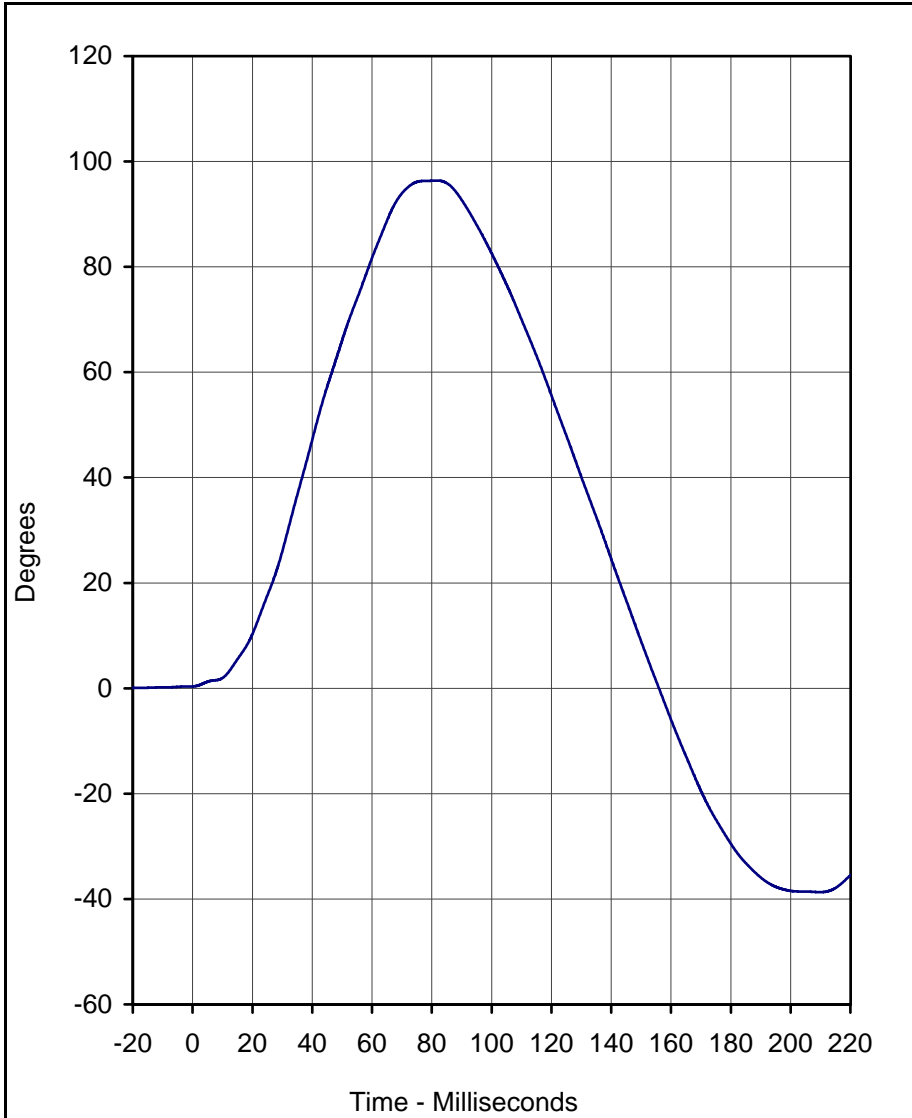
Curve Description	CURNO	Type
Neck Force X	002	FIL

Units	Max	Time	Min	Time	SAE Class
Newtons	234.9	194.4	-591.1	73.4	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 Test Date: 6/11/02

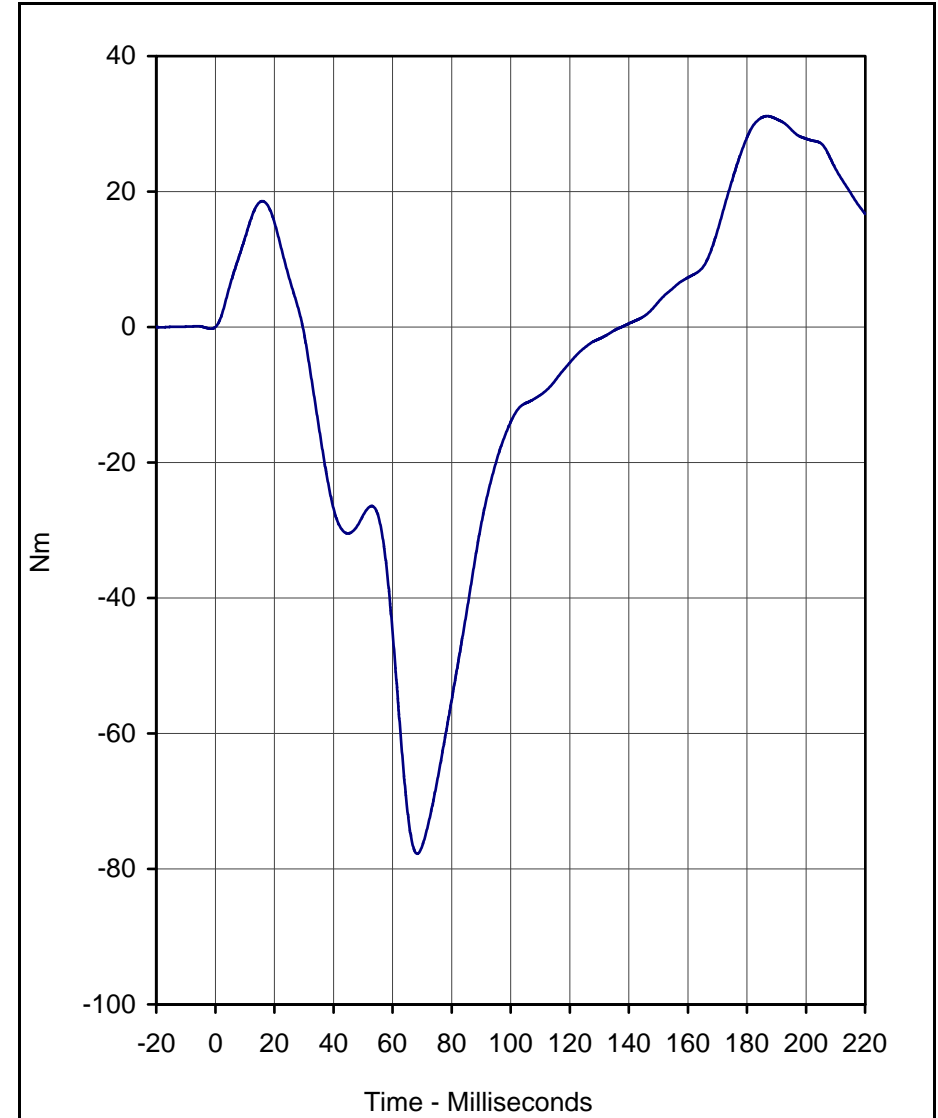
A.T.D. Serial No.: 035
 Test I.D.: NE07A





Curve Description	CURNO	Type
"D" Plane Rotation	003	FIL

Units	Max	Time	Min	Time	SAE Class
Degrees	96.4	81.7	-38.7	209.9	60



Curve Description	CURNO	Type
Moment About Occipital Condyle	004	FIL

Units	Max	Time	Min	Time	SAE Class
Nm	31.1	186.9	-77.8	68.4	60

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 Test Date: 6/11/02

A.T.D. Serial No.: 035
 Test I.D.: NE07A





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	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	85	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	340	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	435	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock popliteal length	mm	452 to 477	470	Pass
O - Chest depth	mm	213 to 229	225	Pass
P - Foot length	mm	251 to 267	265	Pass
V - Shoulder breadth	mm	422 to 437	435	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

Laboratory Technician

June 11, 2002

Test Date

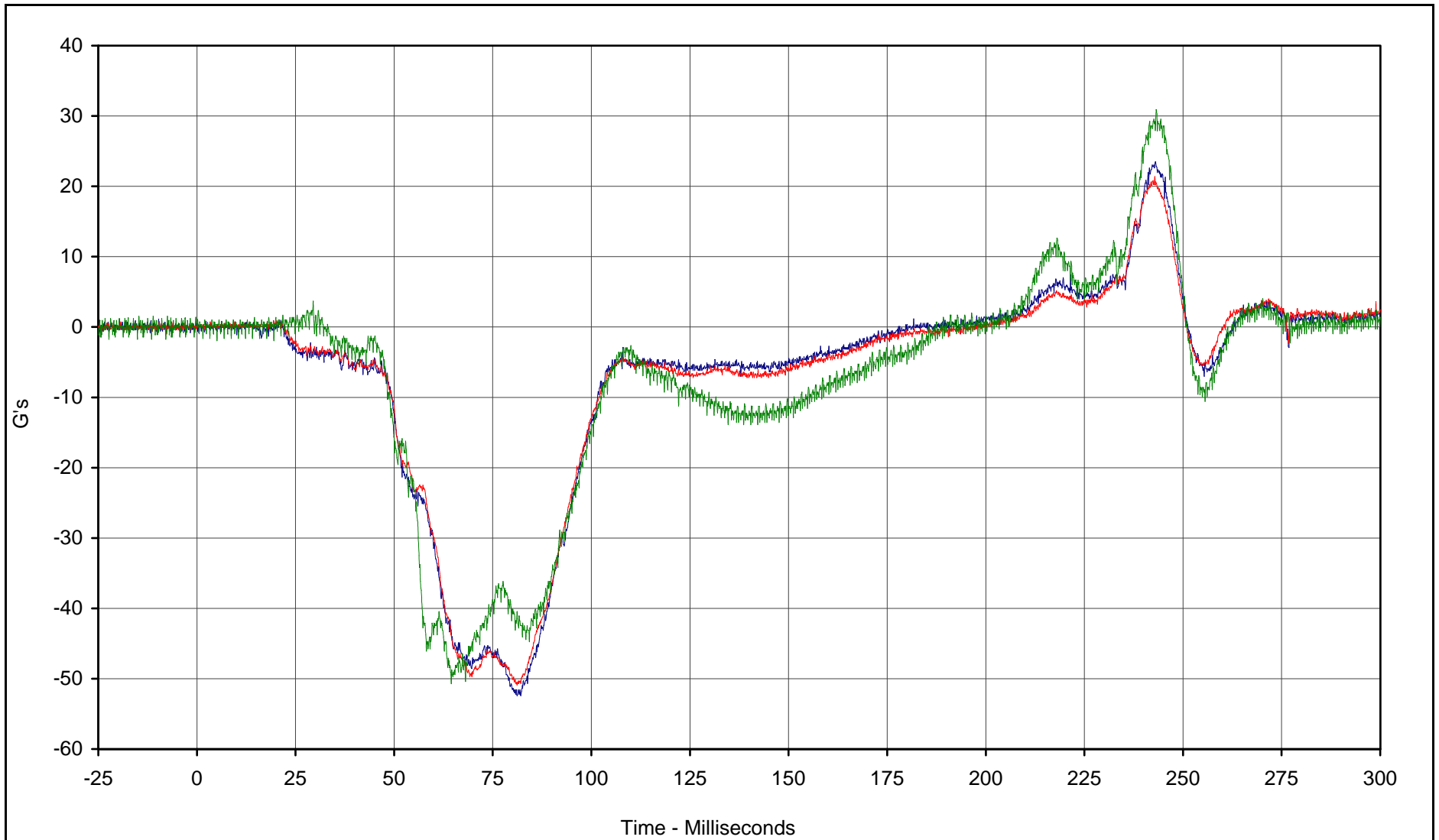
E-26

KAR22001-18

APPENDIX G

NINE ACCELEROMETER HEAD ARRAY DATA

G-1



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver NAHA Yarm-X	134	FIL	G's	23.5	243.0	-52.4	81.2	1000
Driver NAHA Zarm-X	138	FIL	G's	21.4	242.9	-50.9	81.2	1000
Driver NAHA Zarm-X	141	FIL	G's	30.9	243.2	-50.7	64.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

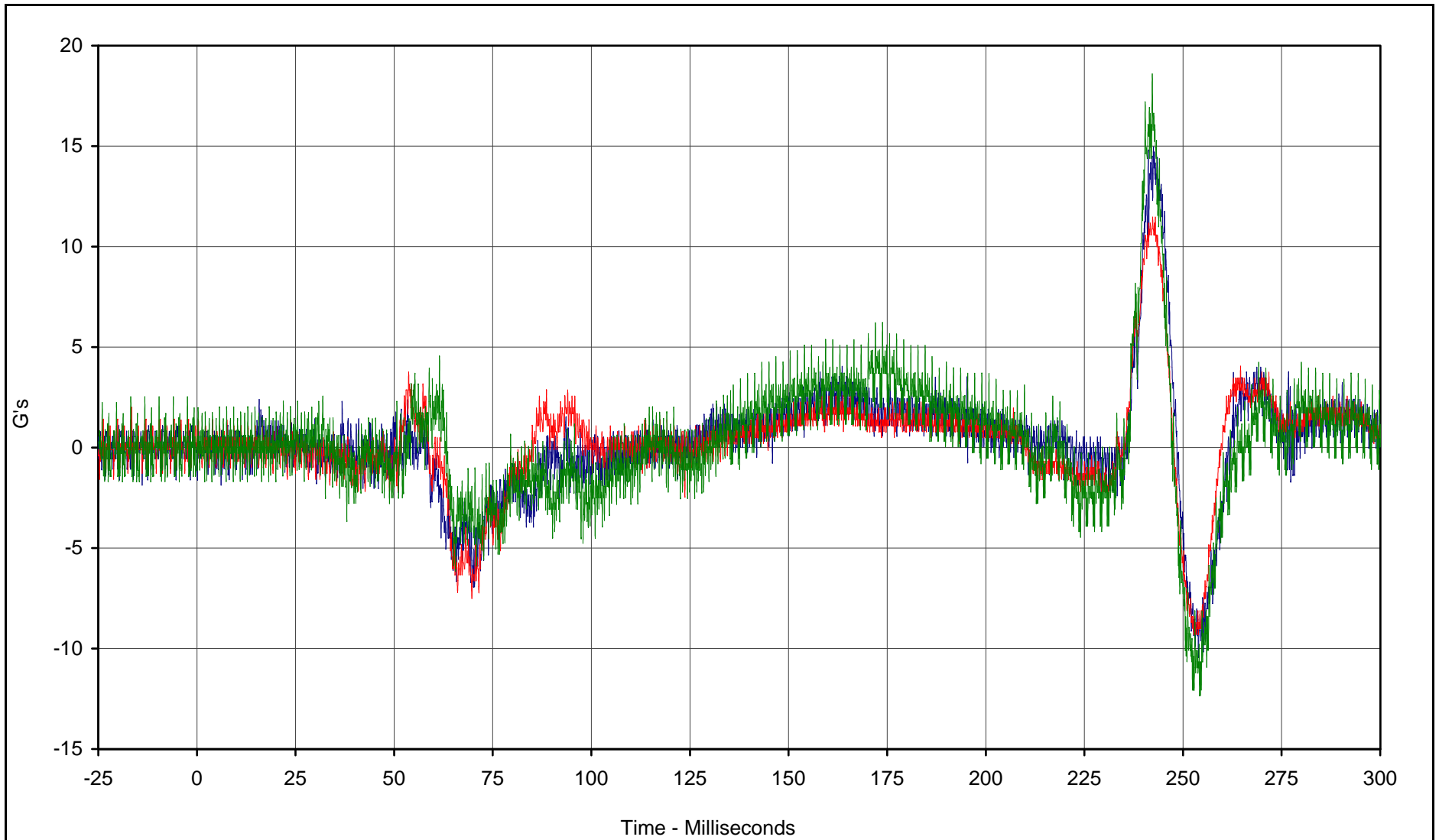
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

G-2



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver Head Primary Y	135	FIL	G's	15.0	242.5	-10.4	253.9	1000
Driver NAHA Xarm-Y	140	FIL	G's	11.5	242.3	-9.3	252.7	1000
Driver NAHA Zarm-Y	142	FIL	G's	18.6	242.2	-12.3	254.2	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

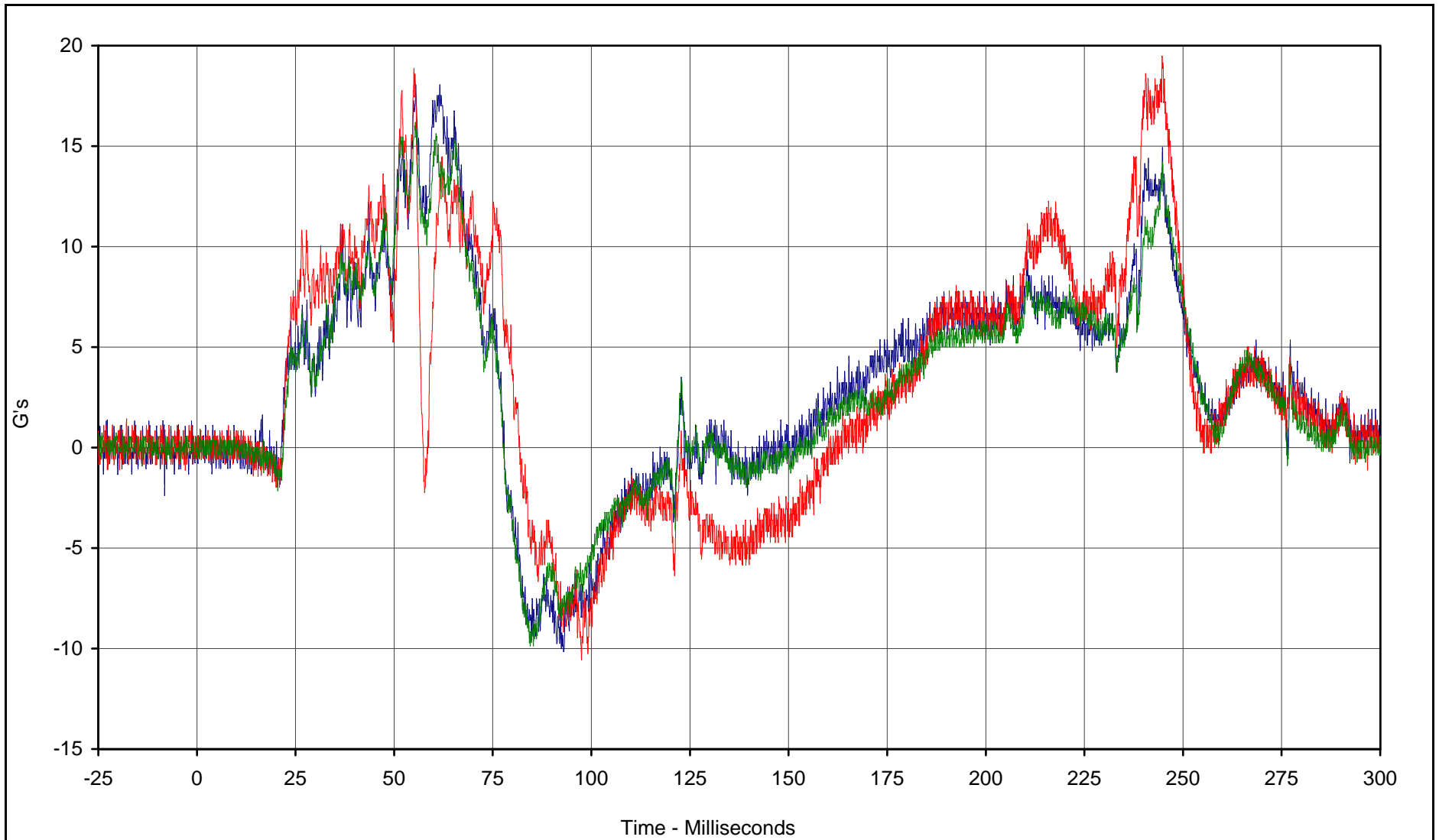
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

G-3



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Driver NAHA Xarm-Z	136	FIL	G's	18.1	55.5	-10.2	92.9	1000
Driver NAHA Yarm-Z	139	FIL	G's	19.4	244.7	-10.5	97.5	1000
Driver NAHA Zarm-Z	137	FIL	G's	16.2	55.4	-9.9	84.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

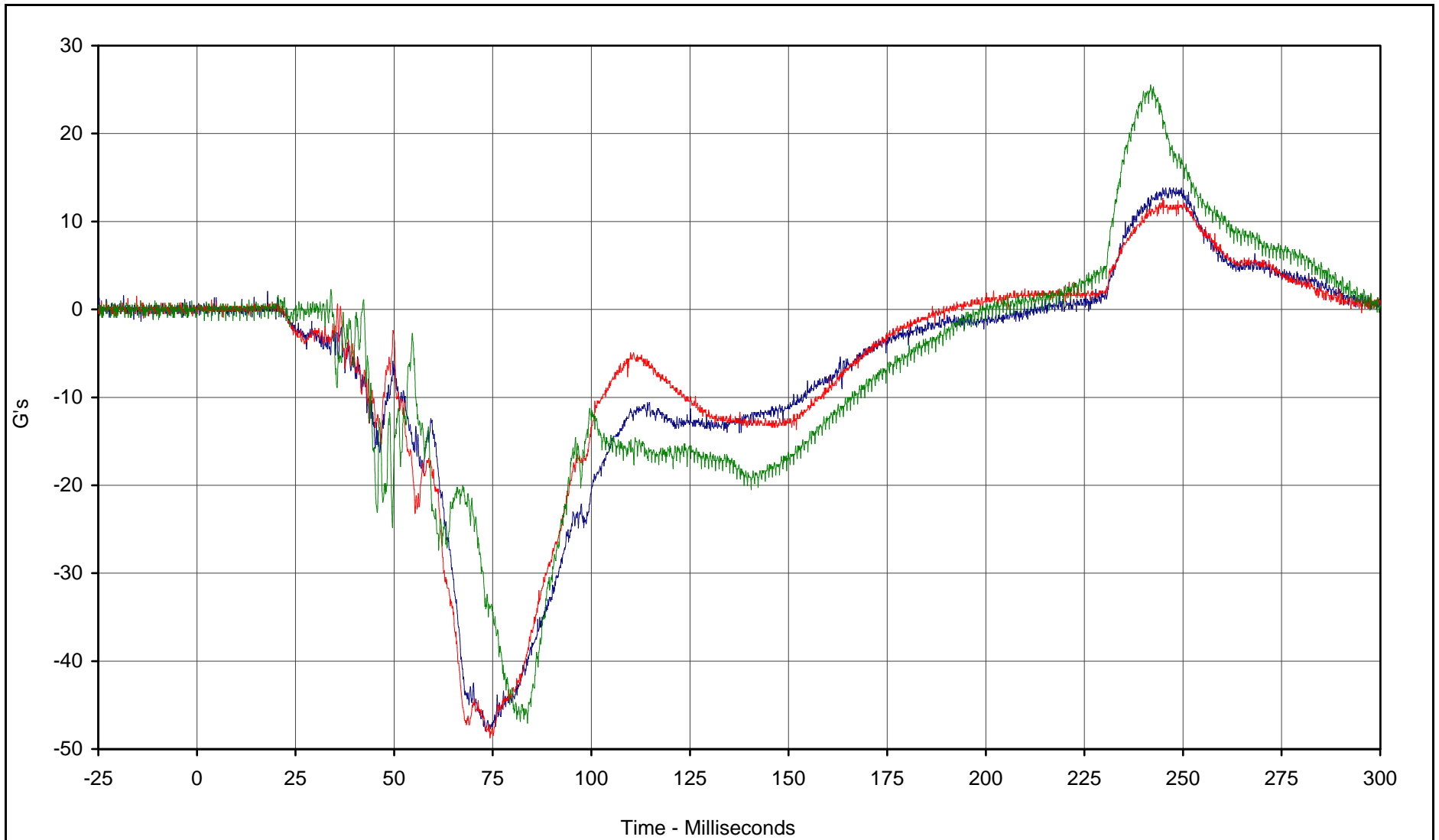
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

G-4



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary X	143	FIL	G's	13.8	244.9	-47.9	73.1	1000
Passenger NAHA Yarm-X	147	FIL	G's	12.6	244.9	-48.8	74.3	1000
Passenger NAHA Zarm-X	150	FIL	G's	25.5	241.8	-47.1	83.8	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

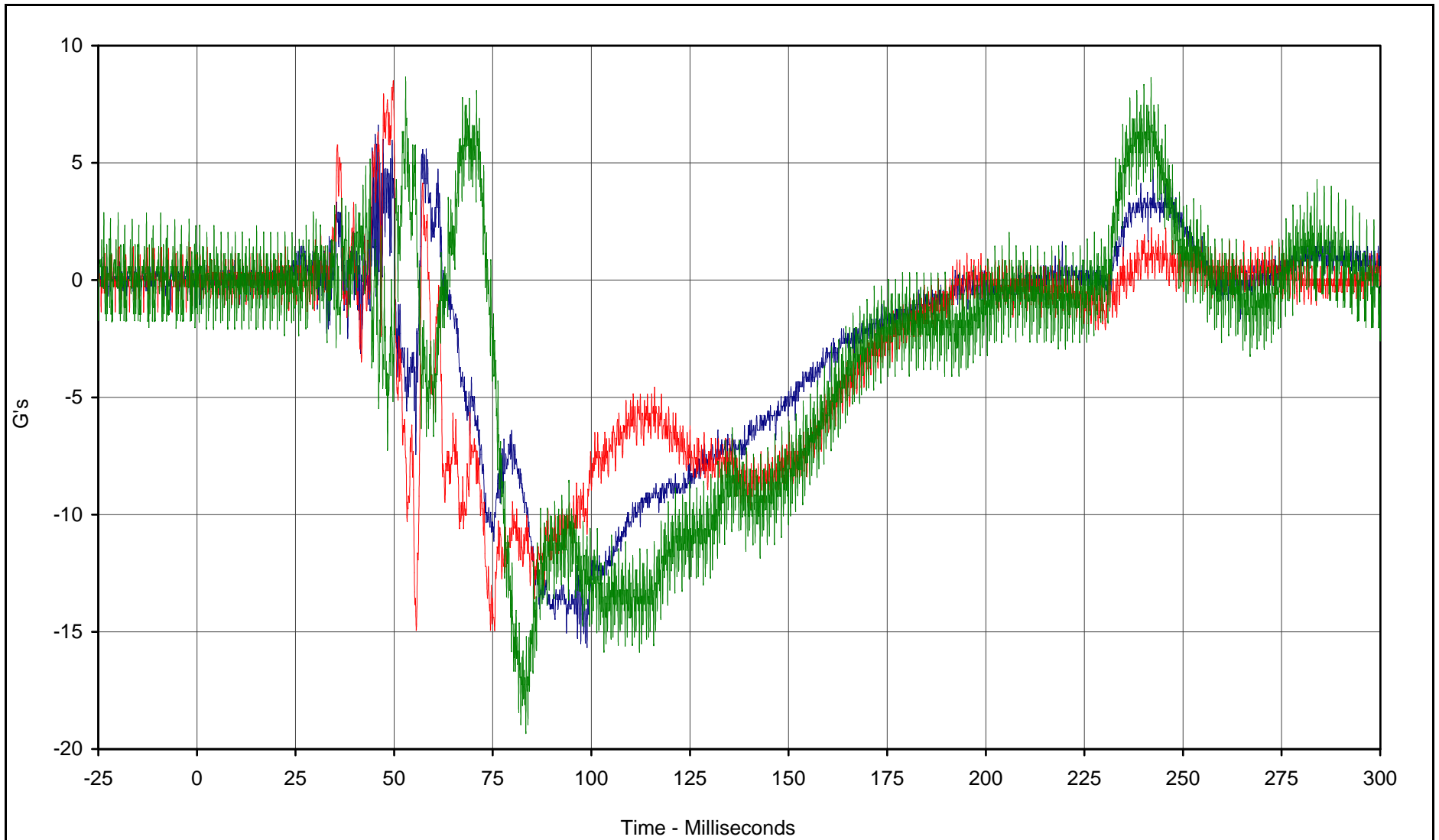
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

G-5



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Y	144	FIL	G's	6.6	46.0	-15.7	98.9	1000
Passenger NAHA Xarm-Y	149	FIL	G's	8.5	49.8	-14.9	55.6	1000
Passenger NAHA Zarm-Y	151	FIL	G's	8.6	52.9	-19.3	83.4	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

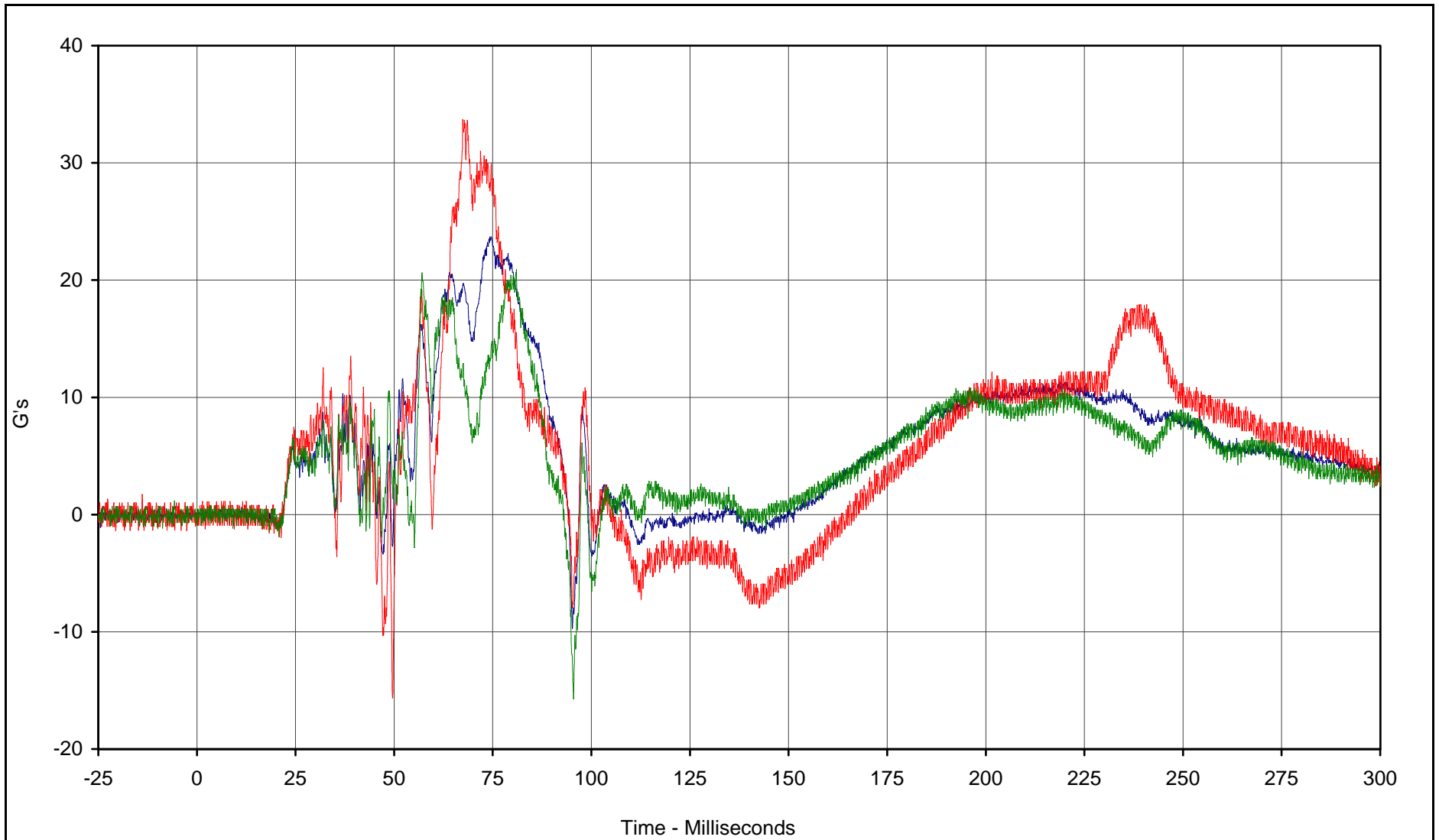
Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18

G-6



Curve Description	CURNO	Type	Units	Max	Time	Min	Time	SAE Class
Passenger Head Primary Z	145	FIL	G's	23.7	74.3	-9.7	95.2	1000
Passenger NAHA Xarm-Z	148	FIL	G's	33.6	67.4	-15.7	49.6	1000
Passenger NAHA Yarm-Z	146	FIL	G's	20.9	81.0	-15.7	95.5	1000



Test Vehicle: 2002 Hyundai Santa Fe 4WD SUV

Test Date: 6/12/02

Test Program: 2002 NHTSA 35mph NCAP

NHTSA No.: M20503

KAR22001-18