

REPORT NUMBER: SNCAP-MCW-11-004

**NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

**KIA MOTORS
2011 KIA FORTE 4-DOOR SEDAN
NHTSA NUMBER: MB 0510**

**PREPARED BY:
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TEST DATE: JANUARY 6, 2011

**REPORT DATE: JANUARY 13, 2011
FINAL REPORT**

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE, SE, ROOM W43-410
WASHINGTON, D.C. 20590**

Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-09-D-00123.

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FINAL REPORT ACCEPTANCE BY OCWS:

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

Technical Report Documentation Page

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		14. Sponsoring Agency Code NVS-111																																				
15. Supplementary Notes																																						
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2011 Kia Forte 4-Door Sedan in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Medical College of Wisconsin (MCW) facilities in Milwaukee, Wisconsin on January 6, 2011. The impact velocity of the Moving Deformable Barrier (MDB) was 61.8 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21 °C. The target vehicle's post test maximum static crush was 270 mm at level 2. The test vehicle's performance is as follows: <table border="1"> <thead> <tr> <th></th> <th><u>Units</u></th> <th><u>Threshold</u></th> <th><u>DRIVER ATD (ES-2re)</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/a</td> <td>1000</td> <td>257.7</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>34.3</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>1601.7</td> </tr> <tr> <td>Public Symphysis Force</td> <td>N</td> <td>6000</td> <td>2785.7</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th></th> <th><u>Units</u></th> <th><u>Threshold</u></th> <th><u>Pass. ATD (SID-IIs)</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/a</td> <td>1000</td> <td>449.7</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td>G's</td> <td>82</td> <td>88.8</td> </tr> <tr> <td>Total Pelvic Force (sum of Acetabular and Iliac forces)</td> <td>N</td> <td>5525</td> <td>2961.7</td> </tr> </tbody> </table>				<u>Units</u>	<u>Threshold</u>	<u>DRIVER ATD (ES-2re)</u>	Head Injury Criteria (HIC ₃₆)	N/a	1000	257.7	Maximum Thorax Rib Deflection	mm	44	34.3	Total Abdominal Force	N	2500	1601.7	Public Symphysis Force	N	6000	2785.7		<u>Units</u>	<u>Threshold</u>	<u>Pass. ATD (SID-IIs)</u>	Head Injury Criteria (HIC ₃₆)	N/a	1000	449.7	Lower Spine Resultant Acceleration	G's	82	88.8	Total Pelvic Force (sum of Acetabular and Iliac forces)	N	5525	2961.7
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The doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event. The lower spine (T12) resultant acceleration exceeded the maximum limit of 82 G's, and the driver's arm rest cracked on impact.																																						

Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011

Technical Report Documentation Page (CONTINUED)

17. Key Words New Car Assessment Program (NCAP) Side impact MDB ES-2re SID-IIs		18. Distribution Statement Copies of this report are available from - National Highway Traffic Safety Administration Technical Reference Division 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590	
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SECTION 1

PURPOSE AND SUMMARY OF THE TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2011 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-09-D-00123. The purpose of this test is to generate comparative side impact performance in a 2011 Kia Forte 4-Door Sedan. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated July 2010.

SUMMARY

A 2011 Kia Forte 4-Door Sedan was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.8 km/h (38.4 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by The Medical College of Wisconsin in Milwaukee, Wisconsin, on January 6, 2011. Pre test and post test photographs of the test vehicle, the MDB, and the dummies (ES-Ilre and SID-IIs) are included in this report. The photo placard was mis-dated as 15 Sept. 2010. The correct date is Jan. 6, 2011.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated July 2010. The side impact event was documented by 10 cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-Ilre)

- Head Accelerometers
- Thorax Rib 1 to Rib 3 Potentiometers
- Abdomen Forward, Middle, and Rear Load Cells
- Lower Spine Accelerometers
- Pubic Load Cell

PASSENGER ATD (SID-IIs)

- Head Accelerometers
- Thorax Upper, Middle, and Lower Rib Potentiometers
- Abdomen Upper and Lower Rib Potentiometers
- Lower Spine Accelerometers
- Iliac Load Cell
- Acetabulum Load Cell

PURPOSE AND SUMMARY OF THE TEST (CONTINUED)

Dummy injury values were recorded as follows:

DRIVER DUMMY INJURY VALUES			
Measurement description	Driver ATD (ES-Ilre)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/a	1000	257.7
Maximum Thorax Rib Deflection	mm	44	34.3
Combined Abdominal Force	N	2500	1601.7
Pubic Symphosis Force	N	6000	2785.7

PASSENGER DUMMY INJURY VALUES			
Measurement description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/a	1000	449.7
Lower Spine (T ₁₂) Resultant Acceleration	G's	82	88.8
Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2961.7

PURPOSE AND SUMMARY OF THE TEST (CONTINUED)

Supplemental restraint information is given below:

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION				
Restraint type	Left front (driver)		Left rear (passenger)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes – Steering wheel	Did not deploy	No	N/a
Knee Airbag	No	N/a	No	N/a
Side Airbag 1 (Curtain Side Airbag)	Yes – Side header	Deployed properly	Yes – Side header	Deployed properly
Side Airbag 2 (Pelvis/Torso Side Airbag)	Yes – Seat back	Deployed properly	No	N/a
Seat Belt Pretensioner	Yes	Deployed properly	No	N/a
Seat Belt Load Limiter	Yes	N/a	No	N/a
Other	No	N/a	No	N/a

GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 270 mm at Level 2, 600 mm rearward of the vertical impact line.

Test summaries, post test observations, vehicle, MDB, camera, and occupant measurements are presented in datasheets 1 – 16. Appendix A contains the still photograph prints, Appendix B contains driver and passenger response data traces. Appendix C contains the ES-Ilre and SID-IIs configuration and performance verification data.

SECTION 2 DATA SHEETS

PRE TEST

Data Sheet No. 1 – General Test and Vehicle Parameter Data
Data Sheet No. 2 – Seat Adjustment, Fuel Systems, and Steering Wheel Data
Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions
Data Sheet No. 4 – Dummy Lateral Clearance Dimensions
Data Sheet No. 5 – Camera Locations and Data
Data Sheet No. 6 – Vehicle Accelerometer Locations
Data Sheet No. 7 – MDB Accelerometer Locations

POST TEST

Data Sheet No. 8 – Test Vehicle Summary of Results
Data Sheet No. 9 – MDB Summary of Results
Data Sheet No. 10 – Post Test Observations
Data Sheet No. 11 – Vehicle Profile Measurements
Data Sheet No. 12 – Vehicle Exterior Crush Measurements
Data Sheet No. 13 – Vehicle Damage Profile Distances
Data Sheet No. 14 – Exterior Static Crush for Impactor Face
Data Sheet No. 15A – FMVSS No. 301 Fuel System Integrity Post-Impact Data
Data Sheet No. 15B – FMVSS no. 305 Propulsion Battery Integrity Post-Impact Data
Data Sheet No. 16 – Dummy/Vehicle Temperature Stabilization

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION	
NHTSA No.	MB 0510
Model Year	2011
Make	Kia
Model	Forte
Body Style	4 – Door Sedan
VIN	KNAFT4A29B5889215
Color	Silver
Delivery Date	December 14, 2010
Odometer Reading (mi)	17
Odometer Reading (km)	27.4
Dealer	Rosen Motors
Transmission	Automatic
Final Drive	Front
Type/No. Cylinders	4
Engine Disp. (L)	2.0
Engine Placement	Lateral
Roof Rack	No
Sunroof/T-Top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

TEST VEHICLE OPTIONS	
Anti-Lock Brakes	Yes
All-Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Pass. Front Airbag	No
Pass. Curtain Airbag	Yes
Pass. Head/Torso Airbag	No
Pass. Torso Airbag	No
Pass. Torso/Pelvis Airbag	No
Pass. Pelvis Airbag	No
Pass. Knee Airbag	No
Pretensioners	Yes
Load Limiters	Yes – front only
Automatic Door Locks	No
Bucket Seats	Yes
Tilt Steering	Yes
Other	No

Does owner's manual provide instructions to turn off automatic door locks?

No

DATA FROM CERTIFICATION LABEL			
Manufacturer	Kia Motors	GVWR (kg)	1730.0
		GAWR Front(kg)	979.8
Date of Manufacture	September 2010	GAWR Rear (kg)	820.1

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION				
	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	0	5
Capacity Weight (VCW) kg				381.9
DSC X 68.04 kg				340.2
Cargo Weight (RCLW) †				41.7

(A)

(B)

(A-B)†

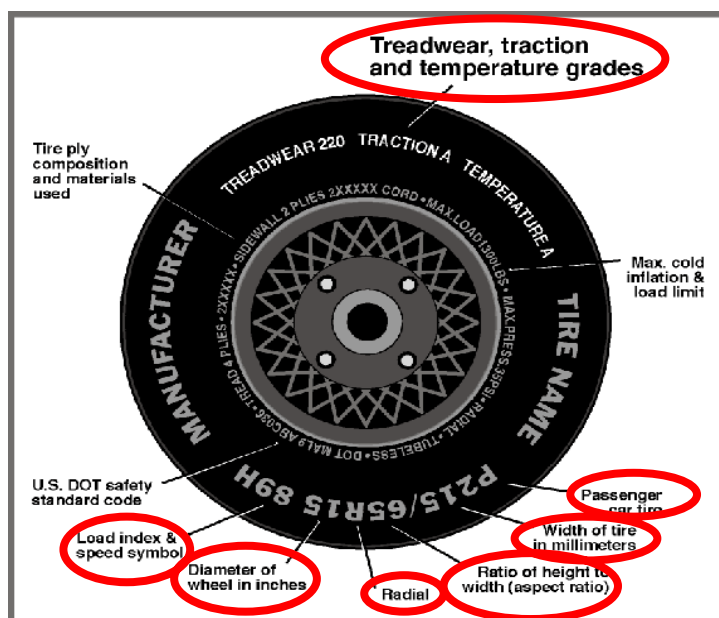
Test Vehicle: 2011 Kia Forte 4-Door Sedan
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DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA (CONTINUED)

VEHICLE SEAT TYPE							
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X					X	
Rear or Second Row Seat			X		X		
Third Row Seat	N/a	N/a	N/a	N/a	N/a	N/a	N/a

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA (CONTINUED)



VEHICLE TIRE INFORMATION		
Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold / Test Pressure (kPa)	220	220
Recommended Tire Size	P195/65R15	P195/65R15
Tire Size on Vehicle	P195/65R15	P195/65R15
Tire Manufacturer	Hankook	Hankook
Tire Model	Optimo	Optimo
Treadware	Not given on tire	Not given on tire
Traction	Not given on tire	Not given on tire
Temperature Grade	Not given on tire	Not given on tire
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index & Speed Symbol	89T	89T
Tire Material	Polyester Cord, Steel Cord, and Nylon Cord	Polyester Cord, Steel Cord, and Nylon Cord
DOT safety code (right)	T7D YDL H	T7D YDL H
DOT safety code (right)	T7D YDL H	T7D YDL H

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA (CONTINUED)

TEST VEHICLE AXLE WEIGHTS										
	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	403.7	255.4		440.9	325.2		449.5	324.8	
Right	kg	407.3	233.2		405.1	288.5		413.2	279.0	
Ratio	%	62.4	37.6		58.0	42.0		58.8	41.2	
Totals	kg	811.0	488.6	1299.6	846.0	613.7	1459.7	862.7	603.8	1466.5

TARGET TEST WEIGHT CALCULATION			
	Units		
Total Delivered Weight (UVW)	kg	1299.6	(A)
Sum of Actual Weight of 2 P572 ATD's Used	kg	125.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	41.9	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1466.5	(A + B + C)

TEST VEHICLE ATTITUDE AND CG						
Measurement description	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	680	689	669	677	1091
As Tested (Fully Loaded +/- 10 mm at each wheel well)	mm	685	691	669	678	1114

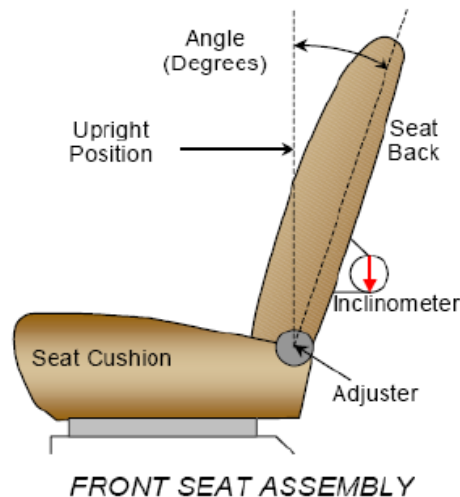
GENERAL TEST VEHICLE DATA		
Measurement description	Units	Value
Total Vehicle Wheel Base	mm	2650
Total Vehicle Length at Left Side	mm	3998
Total Vehicle Length at Centerline	mm	4534
Total Vehicle Length at Right Side	mm	3998
Weight of Ballast in Cargo Area	kg	20.0
Weight of Vehicle Components Removed	kg	34.2
Amt of Stoddard Solvent in Fuel Tank	L	48.4

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA (CONTINUED)

BALLAST INFORMATION	
Mass of Ballast Added (kg)	20.0 kg
Location	Along centerline in trunk
<u>Components removed from test vehicle</u> Non-struck side front and rear door glasses, pass. side mirror, front pass. head rest, spare tire and jack, non-struck side front and rear door interior panels	

TEST VEHICLE VERTICAL IMPACT LINE DATA		
Measured parameter	Units	Value
Target Impact Point Aft of Front Axle	mm	385 mm
Actual Impact Point Aft of Front Axle	mm	379 mm

DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA



Normal Design Riding Position

The driver and passenger seat back is positioned according to the manufacturers designated angle. The procedure is as follows: Each detent of the various seat back angles are recorded and numbered on the side of the seat back. A digital inclinometer is placed at the manufacturer's designated position to record the seat back angle. Full upright = notch 0

SEAT BACK ANGLES	
	Degrees
Driver w/ Seated Dummy	8.9°
Passenger w/ Seated Dummy	Non-adjustable

‡Full upright = notch 0

Seat Fore/Aft Positions

The total seat travel was measured from forward most position to rearmost position, irrespective of vertical seat height in those positions. The seat was set at the longitudinal mid-position with the SCRL set at its mid-angle adjustment, w/ the SCRP at its lowest possible position.

SEAT FORE/AFT POSITIONING		
	Total Fore/Aft Travel	Placed in Position #
Driver Seat	200	Mid-seat track, detent #10
Passenger Seat	Non - adjustable	N/a

‡Full forward = notch 0

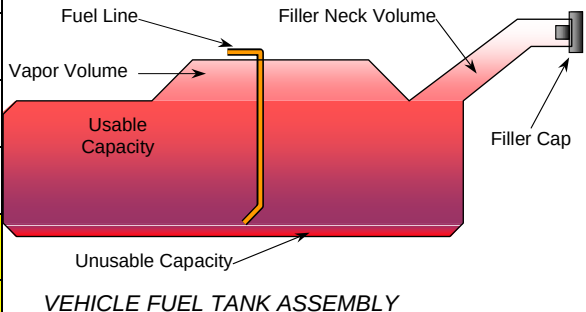
Seat Belt Upper Anchorages

The adjustable anchorage locations are positioned according to the manufacture's specifications.

SEAT BELT UPPER ANCHORAGES		
	Total # of Positions	Placed in Position #
Driver Seat	4	Highest position
Rear Seat	Non-adjustable	As positioned

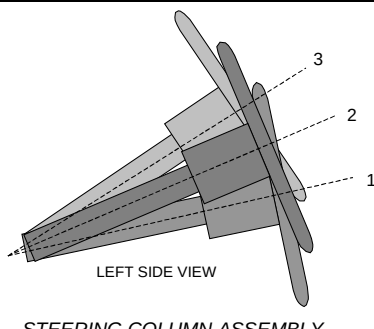
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA (CONTINUED)

Fuel Tank Capacity

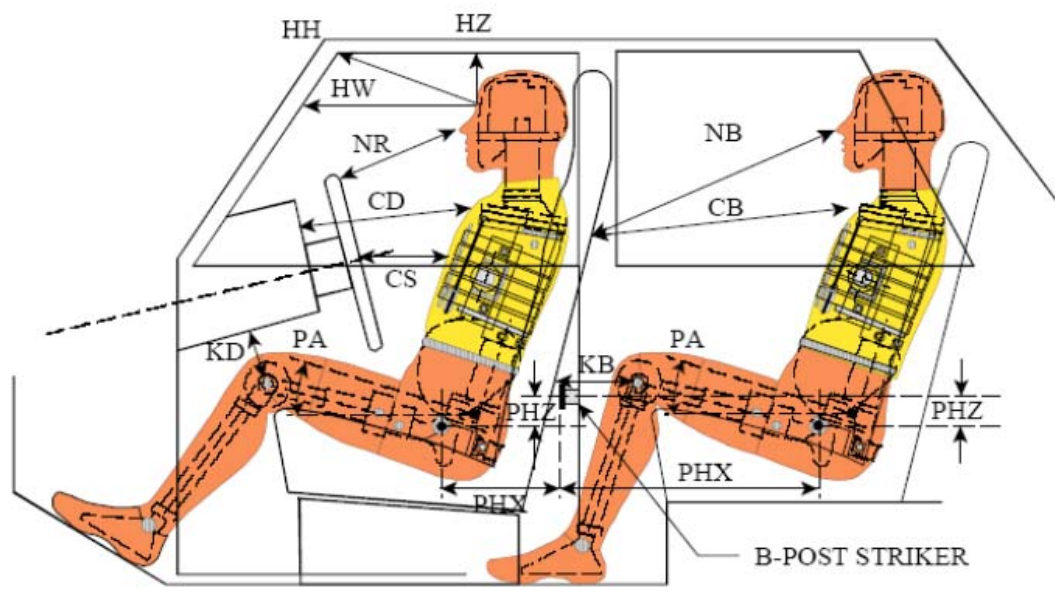
FUEL TANK CAPACITY			
Description	Units	Value	
Usable Capacity of Standard Equipment Fuel Tank	L	52.0	
Usable Capacity of Optional Equipment Fuel Tank	L	0	
Usable Capacity of Vehicle Used for Certification Testing to Requirements	L	52.0	
Amount of Stoddard Added for Test	L	48.4	
% Usable Capacity (92%-94%)	%	93.1	
Operational Instructions	None		
Electric Fuel Pump Present	Yes		
Operating Condition of Test Vehicle for fuel Pump Operation	The fuel pump is activated when the ignition is turned on.		

Steering Column Adjustment

Steering wheel and column adjustments are placed according to the manufacturer's specifications.

STEERING COLUMN POSITIONING			
	Degrees (°)	Fore/aft position (mm)	
Lowermost - Position 1	23.0	Non - telescoping	
Geometric Center - Position 2	25.0	Non – telescoping	
Uppermost - Position 3	27.0	Non – telescoping	
Telescopic Steering Wheel Travel	Non-telescoping	N/a	
Test position	25.0	As positioned	
Steering wheel positioned 25.0 relative to side sill panel. The steering column did not have a telescope adjustment.			

DATA SHEET NUMBER 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

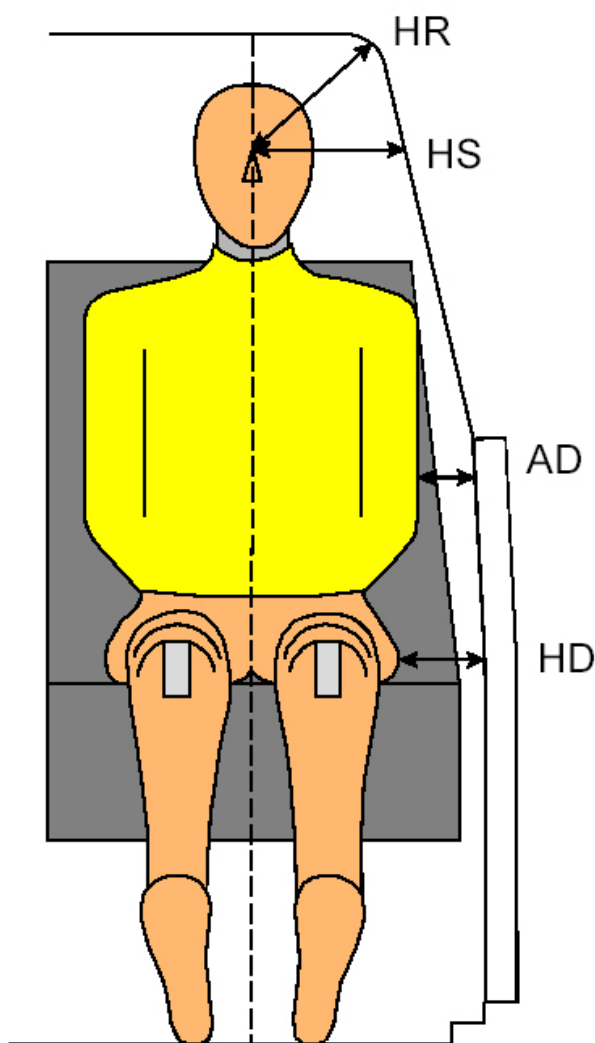


LEFT SIDE VIEW

NOTE: 2-DOOR VEHICLE SHOWN.
REAR DUMMY PHX & PHZ
MEASUREMENTS FOR A 4-DOOR
VEHICLE WOULD USE THE C-POST
STRIKER AS A REFERENCE POINT

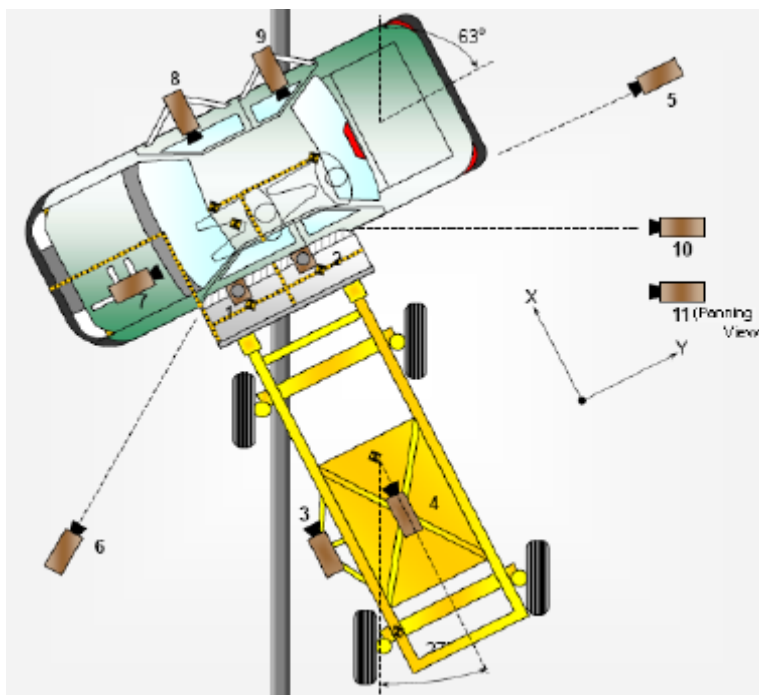
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION						
Driver code	Pass. code	Measurement description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Header to Header	318	17.9		
HW		Header to Windshield	640	0		
HZ	HZ	Head to Roof	165	90	283	90
NR	NB	Nose to Rim/Seat Back	428	-13.7	512	-6.4
CD	CB	Chest to Dash/ Seat Back	542	6.9	542	17.2
CS		Chest to Steering Wheel	335	-18.5		
KDL	KBL	Left knee to Dash/ Seat Back	201	8.6	252	14.6
KDR	KBR	Right knee to Dash/ Seat Back	193	19.0	255	10.8
PA	PA	Pelvic Angle		17.0		21.8
PHX	PHX	H-point to Striker (X - axis)	236		263	
PHZ	PHZ	H-point to Striker (Z - axis)	214		181	
SA	SA	Seat Back Angle		8.9		As positioned

DATA SHEET NUMBER 4
DUMMY LATERAL CLEARANCE DIMENSIONS



DUMMY LATERAL CLEARANCE DIMENSION INFORMATION				
Code	Description	Units	Driver	Passenger
HR	Head to Side Header	mm	212	259
HS	Head to Side Window	mm	353	363
AD	Arm to Door (upper)	mm	134	168
AD	Arm to Door (lower)	mm	178	198
HD	H - Point to Door	mm	167 – w/o insert	258 – w/o inser

DATA SHEET 5 **CAMERA LOCATIONS AND DATA**

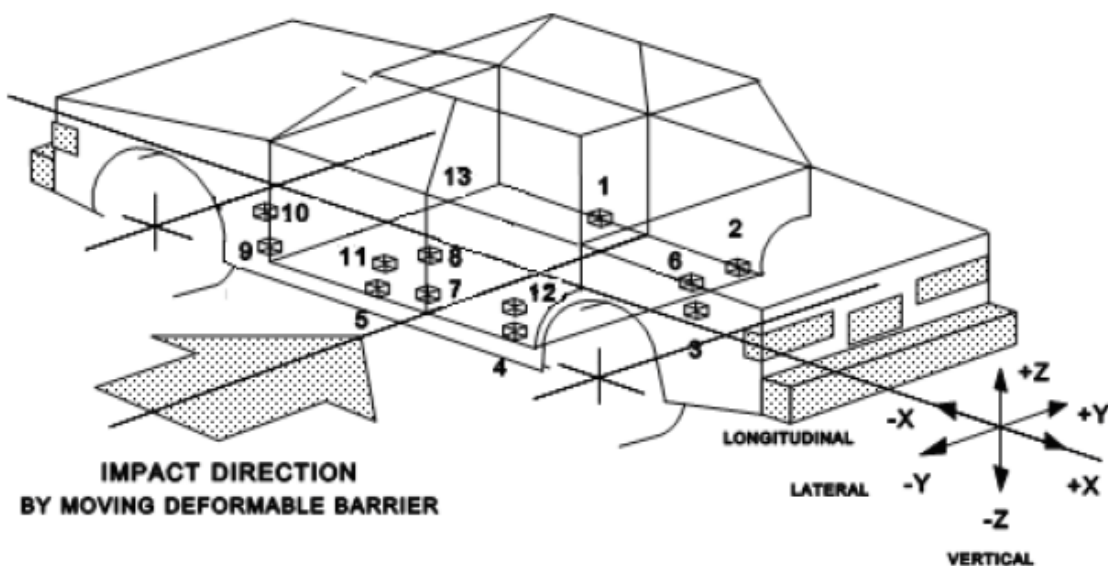


CAMERA LOCATIONS AND DATA							
No.	Camera View	Location			Angle °	Lens mm	Rate fps
		X	Y	Z			
		mm	mm	mm			
1	Overhead Overall	1716	2039	-3908	90	8	1000
2	Overhead Impact	1025	804	-3994	90	12.5	1000
3	Left Impact Point (MDB)*	-2280	76	-43	0.6	35	1000
4	Side Overall (MDB)	-2136	826	-555	3.7	13	1000
5	Rear	4377	10900	-410	2.1	50	1000
6	Left Front	-4100	-2528	-460	8.7	25	1000
7	Driver Front (OB)	485	-63	-432	6.4	25	1000
8	Driver Side (OB)	1734	1172	-259	9.1	12.5	1000
9	Passenger Side (OB)	1674	2043	-326	14.0	12.5	1000
10	Real – Time Left Rear	-	-	-	-	-	1000

* Camera failed to fire at impact

Reference: Impact point projected to ground
+X = to front of MDB, +Y to right of MDB, +Z = down
*All measurements accurate to +/- 6 mm

DATA SHEET 6
VEHICLE ACCELEROMETER LOCATIONS

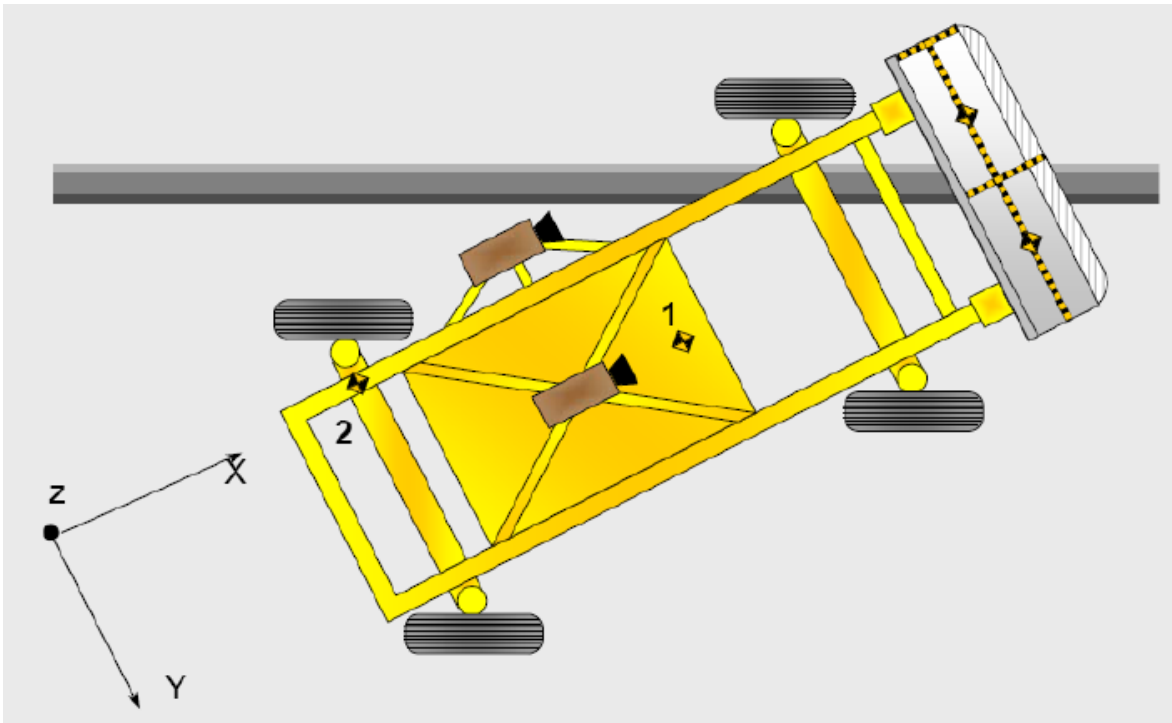


VEHICLE ACCELEROMETER PRE-TEST LOCATIONS				
Loc. no.	Accelerometer location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2627.8	675.2	281.5
2	Right Sill at Rear Seat	1655.4	693.1	271.6
3	Rear Floor Pan Above Axle	1032.5	-47.1	-23.2
4	Left Sill at Rear Door	1642.8	-720.9	286.6
5	Left Sill at Front Door	2609.6	-724.3	303.4
6	Right Rear Occupant Compartment	1783.8	296.4	147.4
7	B - Post Lower	2144.9	-808.8	16.8
8	B - Post Middle	2095.9	-809.0	-224.2
9	A - Post Lower	3154.1	-828.7	-10.5
10	A - Post Middle	3152.1	-816.7	-252.2
11	Front Seat Track	2557.0	-601.8	181.7
12	Rear Seat Structure	1790.4	-424.6	140.2
13	Vehicle CG	2541.5	12.1	64.7

Reference:

X - Rear surface of Vehicle (+ Forward)
Y - Vehicle Centerline (+ Right)
Z - Ground Plane (+ Down)

DATA SHEET 7
MDB ACCELEROMETER LOCATIONS



MDB ACCELEROMETER LOCATIONS			
Location no.	Measurements (mm)		
	X	Y	Z
1	1113	-1	311
2	2812	-614	585

Reference

X - Face of MDB (+ Forward)
Y - MDB Ccenterline (+ Right)
Z - Ground Plane (+ Down)

DATA SHEET NUMBER 8
TEST VEHICLE SUMMARY OF RESULTS

MAXIMUM EXTERIOR STATIC CRUSH				
Level	Measured parameter	Units	Maximum crush	Above ground
1	Sill Top Height	mm	88	263
2	Occupant H - Point	mm	270	494
3	Mid Door	mm	246	620
4	Window Sill	mm	168	930
5	Window Top	mm	31	1362
	Maximum Penetration	mm	270	

INSTRUMENTATION	
Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structural Accelerometers	21
MDB Accelerometers	6
Total No. of Contact Switches	8
Total	70

CAMERA COVERAGE	
High - Speed Vehicle Onboard	3
High - Speed Offboard	4
High - Speed MDB Onboard	2
Real - Time Panning	1
Total	10

**DATA SHEET NUMBER 9
 MOVING DEFORMABLE BARRIER (MDB) SUMMARY OF RESULTS**

MDB SPECIFICATIONS	
Measurement description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Frame	4116
Wheel Base of Framework Carriage	2578
CG Location of Front Axle	1112

MDB WEIGHTS				
	Units	Front Axle	Rear Axle	Total
Left	kg	431.4	247.2	678.6
Right	kg	328.4	351.5	679.9
Ratio	%	55.9	44.1	100.0
Totals	kg	759.8	598.7	1358.5

SPEED AND IMPACT DATA			
Measured parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	61.8
Trap No. 2 Velocity (Secondary)	km/h	61.1 to 62.7	*
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90

*Velocity lost due to no picture taken

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE					
Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Left	178
B	Top of Bumper	560	800	Left	76
C	Mid – Level	685	800	Right	90
D	Top of Stack	810	800	Right	141

MDB INSTRUMENTATION	
Accelerometers	6
Contact Switches	2

**DATA SHEET NUMBER 10
 POST TEST OBSERVATIONS**

TEST DUMMY INFORMATION AND CONTACT POINTS		
Description	Left Front Seat	Left Rear Seat
Dummy Type / Serial No.	ES-IIre/F038	SID-IIs/298
Head Contact	To roof rail and side curtain airbag	To roof rail and side curtain airbag
Upper Torso Contact	To torso airbag	To left interior door panel ~145 mm below window sill
Lower Torso Contact	To torso airbag	To left interior door panel ~330 mm below window sill
Left Knee Contact	To interior door panel ~370 mm below window sill	To left interior door panel ~400 mm below window sill
Right Knee Contact	To left knee	To left knee

POST TEST DOOR OPENING AND SEAT TRACK INFORMATION		
Description	Front	Rear
Left Side Doors	Closed/latched/inoperable	Closed/latched/inoperable
Right Side Doors	Closed/latched/operable	Closed/latched/operable
Hatch and Other Door Opening	N/a	N/a
Seat Movement	~ 50 mm of seat crush	~ 28 mm of seat crush
Seat Back Failure	None	None

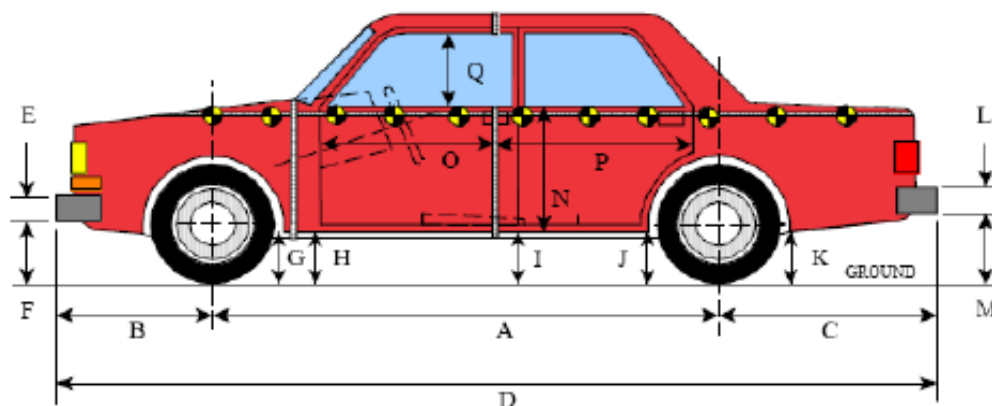
POST TEST STRUCTURAL OBSERVATIONS	
Critical Areas of Performance	Observations/Conclusions
Pillar Performance	No damage
Sill Separation	Max. separation of 98 mm @ C-pillar
Windshield Damage	No damage
Window Damage	Front and rear windows shattered at impact
Other Notable Effects	Driver's armrest cracked at impact

**DATA SHEET NUMBER 10
 POST TEST OBSERVATIONS (CONTINUED)**

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION				
Restraint type	Left front (driver)		Left rear (passenger)	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes – Steering wheel	Did not deploy		
Knee Airbag	No	N/a	No	N/a
Side Airbag 1 (Curtain Side Airbag)	Yes – Side header	Deployed properly	Yes – Side header	Deployed properly
Side Airbag 2 (Pelvis/Torso Side Airbag)	Yes – Seat back	Deployed properly	No	N/a
Seat Belt Pretensioner	Yes	Deployed properly	Yes	Deployed properly
Seat Belt Load Limiter	Yes	N/a	No	N/a
Other	No	N/a	No	N/a

MDB LEFT EDGE IMPACT DATA			
Measured parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	6 mm forward
Vertical Offset	mm	+/- 50	3 mm below

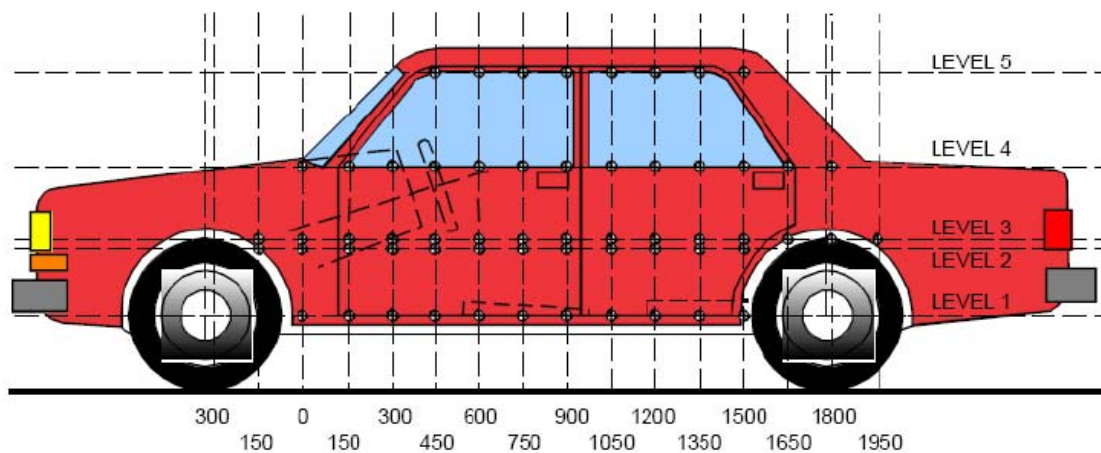
DATA SHEET NUMBER 11
VEHICLE PROFILE MEASUREMENTS



LEFT SIDE VIEW
 All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3 mm

VEHICLE PRE - AND POST - TEST MEASUREMENT INFORMATION				
Code	Description	Pre test	Post test	Difference
		mm	mm	mm
A	Wheelbase	2650	2655	5
B	Front Axle to FSOV	568	565	-3
C	Rear Axle to RSOV	780	766	-14
D	Total Length at Centerline	4534	4534	0
E	Front Bumper Thickness	277	277	0
F	Front Bumper Bottom to Ground	250	257	7
G	Sill Height at Front Wheel Well	250	227	-23
H	Sill Height at Front Door Leading Edge	251	286	35
I	Sill Height at B-Pillar	259	302	43
J1	Pinch Weld Height at Rear Wheel Well	182	180	-2
J2	Sill Height at Rear Wheel Well	262	285	23
K	Sill Height Aft of Rear Wheel Well	343	318	-25
L	Rear Bumper Thickness	147	147	0
M	Rear Bumper Bottom to Ground	466	450	-16
N	Sill Height to Window Bottom Sill	740	642	-98
O	Front Door Leading Edge to Impact C/L	1083	1020	-63
P	Rear Door Trailing Edge to Impact C/L	865	830	-35
Q	Front Window Opening	450	430	-20
R	Right Side Length	3998	4003	5
S	Left Side Length	3998	3986	-12
T	Vehicle Width at B-Post	1755	1535	-220

DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS



LEFT SIDE VIEW

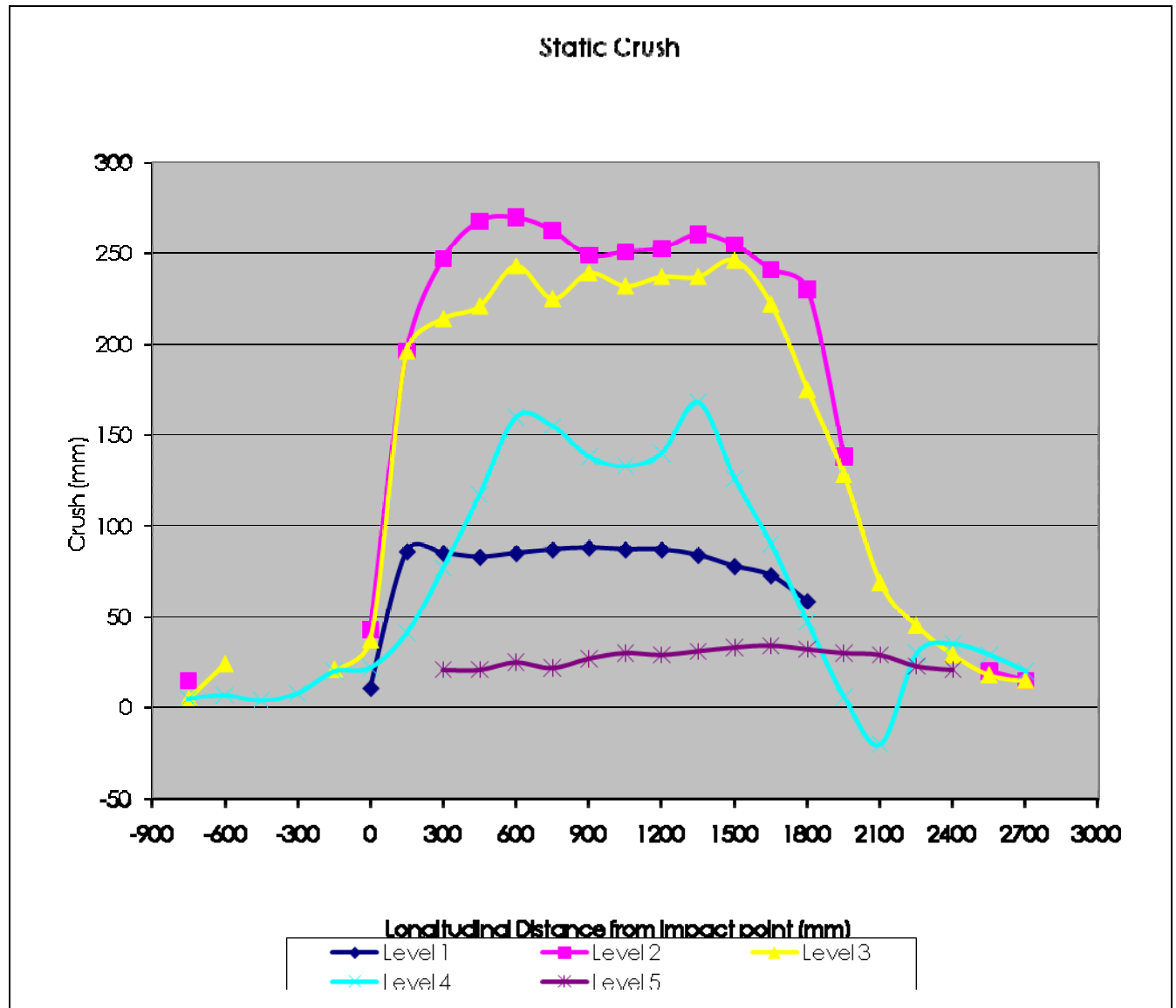
LEFT SIDE VIEW		
Level	Measurement description	Height above ground (mm)
1	Sill top	263
2	Occupant H - Point	494
3	Mid - Door	620
4	Window Sill	930
5	Window Top	1362

MAXIMUM CRUSH DATA					
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	88	270	246	168	31
Distance From Impact (mm)	900	600	1500	1350	1350

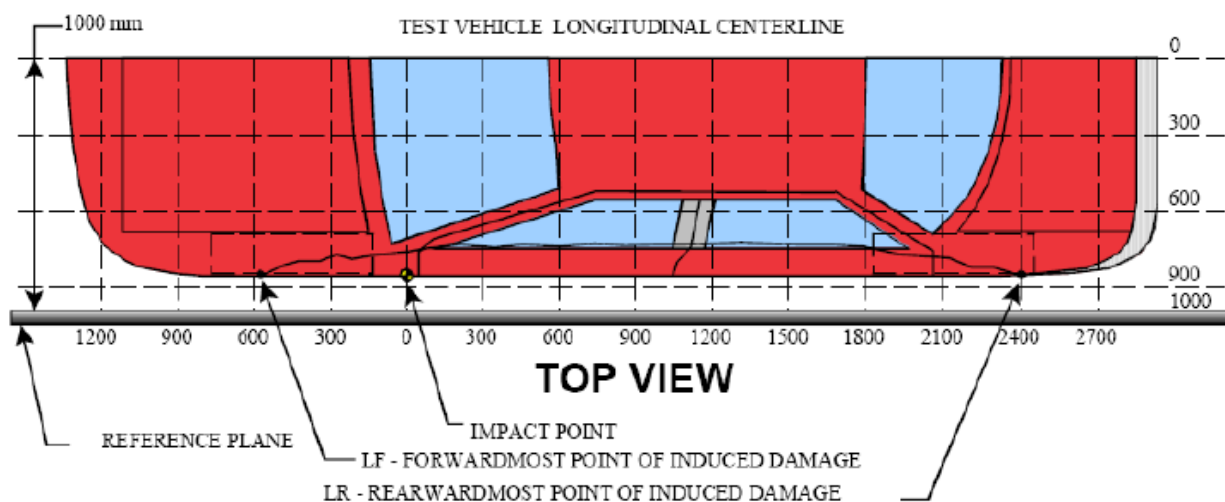
DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

TEST VEHICLE STATIC CRUSH																
Level		1			2			3			4			5		
		Pre	Post	Crush	Pre	Post	Crush	Pre	Post	Crush	Pre	Post	Crush	Pre	Post	Crush
DISTANCE IN MILLIMETERS (mm) FROM IMPACT POINT	-1050															
	-900															
	-750				302	317	15	335	340	5	485	490	5			
	-600							285	309	24	450	457	7			
	-450										422	426	4			
	-300										394	402	8			
	-150							275	296	21	370	390	20			
	0	324	335	11	286	329	43	288	325	37	353	375	22			
	150	326	412	86	292	488	196	290	486	196	345	386	41			
	300	327	412	85	290	537	247	288	502	214	356	433	77	483	504	21
	450	327	410	83	287	555	268	286	507	221	360	477	117	506	527	21
	600	327	412	85	287	557	270	284	527	243	362	522	160	534	559	25
	750	327	414	87	285	548	263	283	508	225	359	514	155	560	582	22
	900	327	415	88	284	533	249	280	519	239	358	496	138	575	602	27
	1050	328	415	87	283	534	251	279	511	232	359	492	133	587	617	30
	1200	328	415	87	283	536	253	280	517	237	364	504	138	595	624	29
	1350	328	412	84	283	544	261	280	517	237	368	536	168	597	628	31
	1500	328	406	78	283	538	255	282	528	246	373	499	126	595	628	33
	1650	328	401	73	285	526	241	283	505	222	379	469	90	594	628	34
	1800	328	387	59	285	515	230	285	460	175	388	435	47	591	623	31
	1950				279	417	138	284	412	128	394	400	6	587	617	30
	2100							276	345	69	402	382	-20	580	609	29
	2250							275	320	45	413	443	30	573	596	23
	2400							276	305	29	425	460	35	565	586	21
	2550				282	302	20	295	313	18	441	470	29			
	2700				312	327	15	325	340	15	460	480	20			
	2850															
	3000															
	3150															
	3330															

DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

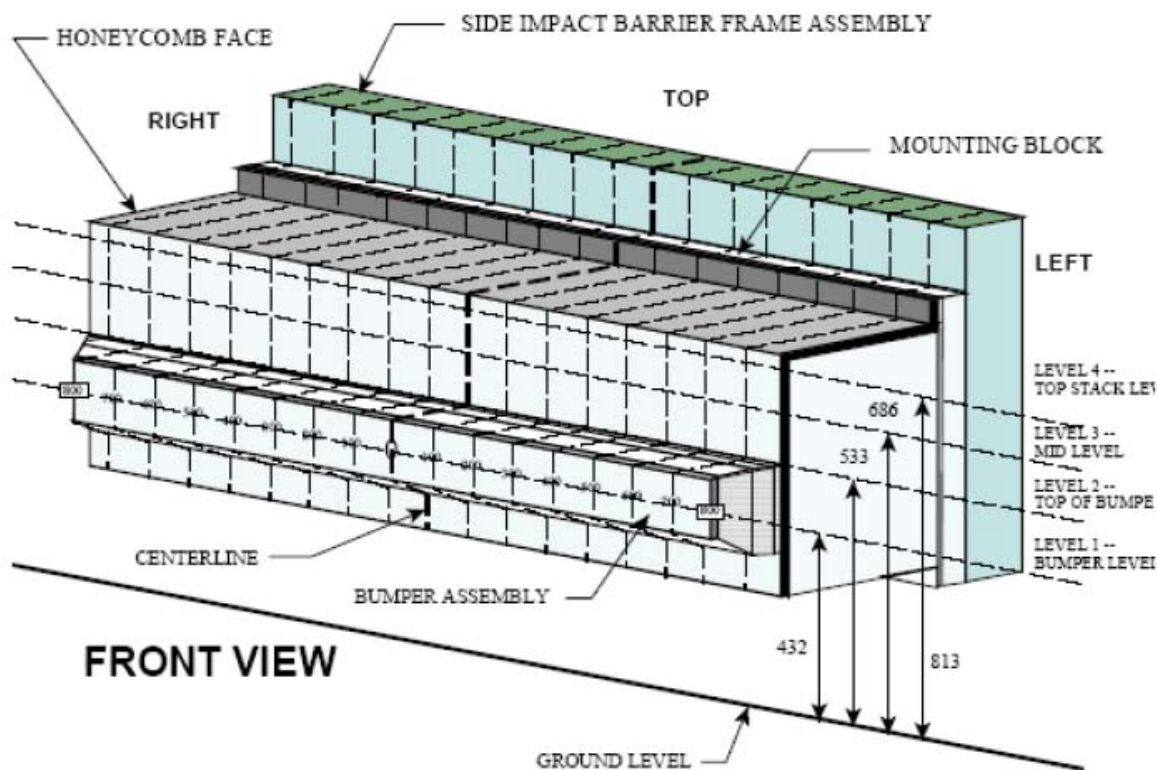


DATA SHEET NUMBER 13
VEHICLE DAMAGE PROFILE DISTANCES



DAMAGE PROFILE DISTANCES					
DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Maximum Static Crush (mm)
1	-150	2	296	296	0
2	360	2	296	549	253
3	870	2	296	534	248
4	1380	2	296	543	244
5	1890	2	296	416	120
6	2400	2	296	296	0

DATA SHEET NUMBER 14
EXTERIOR STATIC CRUSH FOR IMPACTOR FACE



NOTE: Dimensions are shown in millimeters, mm.

DEFORMABLE BARRIER STATIC CRUSH

	Distance Right of Center								C.L.	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	178	168	155	148	146	148	142	138	131	127	118	118	114	114	116	132	153
2	76	81	74	68	60	53	51	60	59	53	53	51	49	46	47	43	64
3	89	63	40	19	16	19	28	35	15	12	11	12	12	15	25	49	90
4	69	31	10	5	15	39	65	54	32	16	8	9	8	22	57	93	141

DATA SHEET 15A
FMVSS 301 FUEL SYSTEM INTEGRITY POST - IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 3:25 pm

STODDARD SOLVENT SPILLAGE MEASUREMENTS				
Period	Description	Maximum Allowable Spillage	Spillage	
			Amount	Location
A	From impact until vehicle motion ceases	1 oz	0	N/a
B	5 minutes after vehicle motion ceases	5 oz	0	N/a
C	Next 25 minutes	1 oz/minute	0	N/a
D	Spillage details			

FMVSS 301 STATIC ROLLOVER



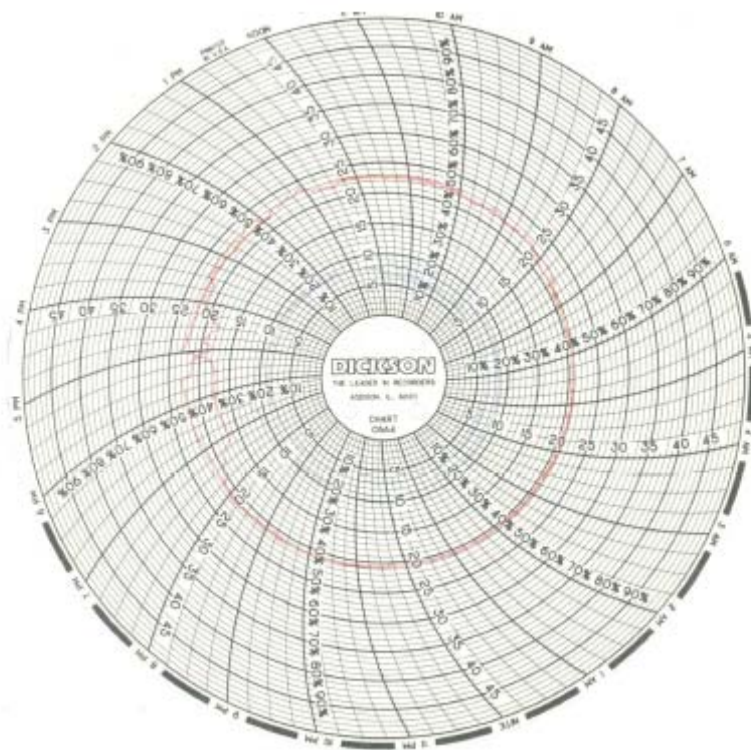
ROLLOVER SOLVENT COLLECTION TIME TABLE			
Test phase	Rotation Time (sec.)	Hold Time (sec.)	Total Time (sec.)
Tolerance	60-180	>= 300	-
0° to 90°	62	300	362
90° to 180°	63	300	363
180° to 270°	61	300	361
270° to 360°	64	300	364

DATA SHEET 15A
FMVSS 301 FUEL SYSTEM INTEGRITY POST - IMPACT DATA (CONTINUED)

FMVSS301 STATIC ROLLOVER - SPILLAGE				
	First Five Minutes (oz)	Sixth Minute (oz)	Seventh Minute (oz)	Eighth Minute (oz)
Max Allowable Leakage	5.0	1.0	1.0	1.0
0° to 90°	0	0	0	N/a
90° to 180°	0	0	0	N/a
180° to 270°	0	0	0	N/a
270° to 360°	0	0	0	N/a

SPILLAGE LOCATION(s)	
0° to 90°	N/a
90° to 180°	N/a
180° to 270°	N/a
270° to 360°	N/a

DATA SHEET 16
DUMMY/VEHICLE TEMPERATURE STABILIZATION



Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011

APPENDIX A
PHOTOGRAPHS

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Figure A-1: As-Delivered Right Front Three Quarter View of Test Vehicle



Figure A-2: As-Delivered Left Rear Three Quarter View of Test Vehicle



Figure A-3: Pre-Test Frontal View of the Test Vehicle

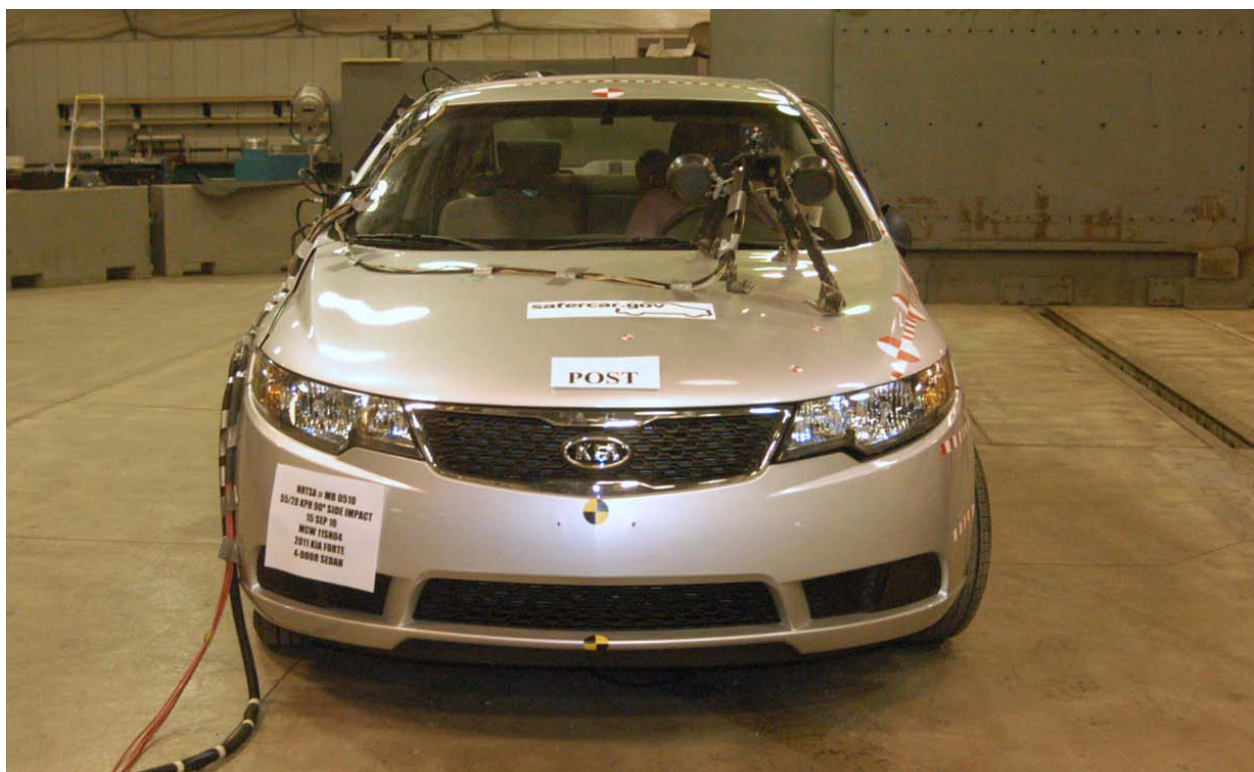


Figure A-4: Post-Test Frontal View of Test Vehicle



Figure A-5: Pre-Test Left Front Three-Quarter View of Test Vehicle



Figure A-6: Post-Test Left Front Three-Quarter View of Test Vehicle



Figure A-7: Pre-Test Left Side View of Test Vehicle



Figure A-8: Post-Test Left Side View of Test Vehicle



Figure A-9: Pre-Test Left Rear Three-Quarter View of Test Vehicle



Figure A-10: Post-test Left Rear Three-Quarter View of Impact Zone



Figure A-11: Pre-Test Rear View of Test Vehicle

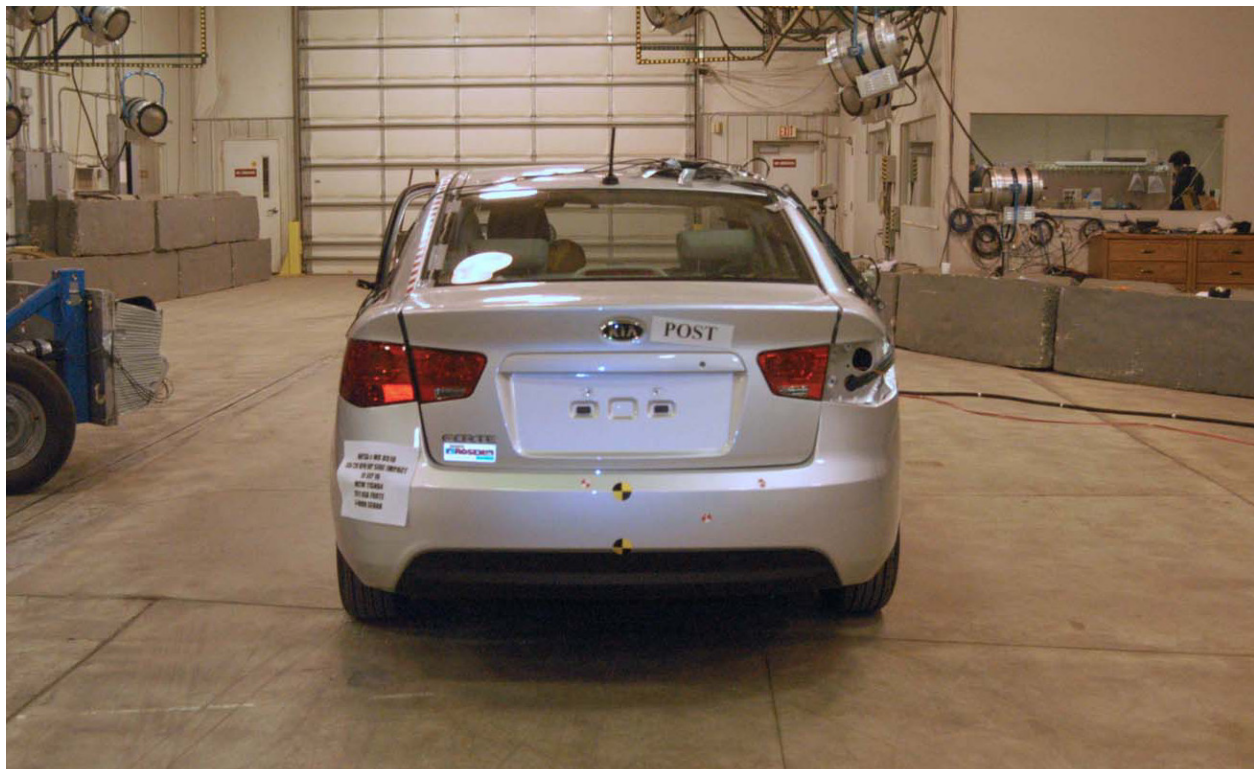


Figure A-12: Post-Test Rear View of Test Vehicle



Figure A-13: Pre-Test Right Side View of Test Vehicle



Figure A-14: Post-Test Right Side View of Test Vehicle

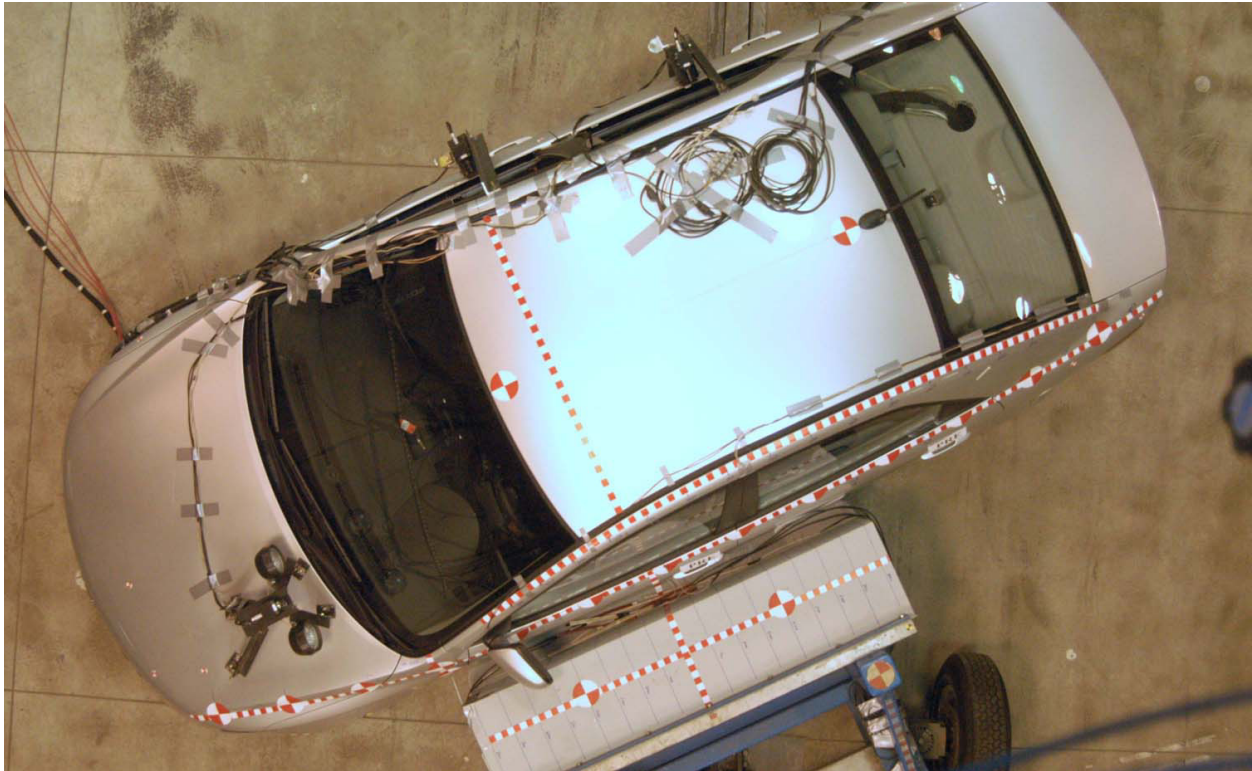


Figure A-15: Pre-Test Overhead View of Test Vehicle with MDB Positioned Against Side of Target



Figure A-16: Post-Test Overhead View of Test Vehicle and MDB



Figure A-17: Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Figure A-18: Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Figure A-19: Pre-Test Close-Up View of Impact Point Target



Figure A-20: Post-Test Close-Up View of Impact Point Target

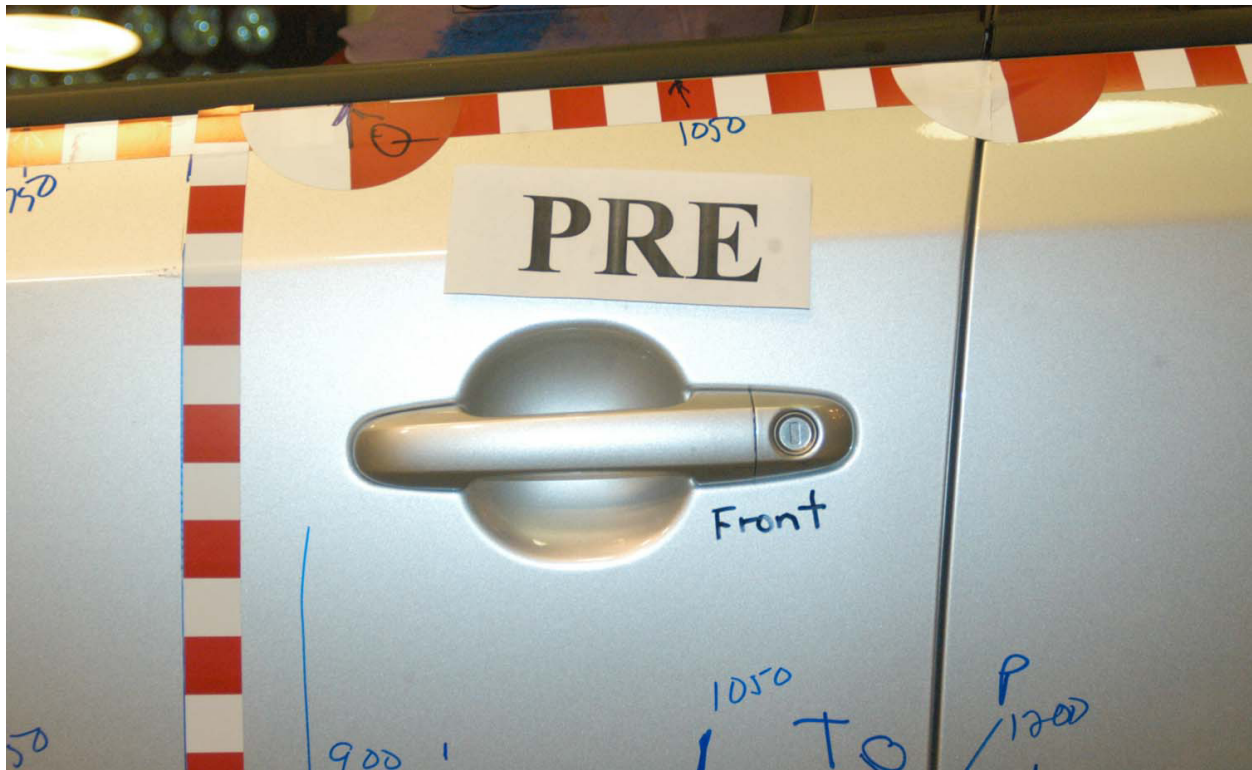


Figure A-21: Pre-Test Left Front Door Latch Close-Up



Figure A-22: Post-Test Left Front Door Latch Close-Up



Figure A-23: Pre-Test Left Rear Door Latch Close-Up



Figure A-24: Post-Test Left Rear Door Latch Close-Up



Figure A-25: Pre-Test Front Close-Up View of Driver Dummy



Figure A-26: Post-Test Front Close-Up View of Driver Dummy



Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt, Chalking, and Contact Switches



Figure A-28: Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-29: Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head



Figure A-32: Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



Figure A-33: Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Figure A-34: Pre-Test Placement of Driver Dummy's Feet



Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy

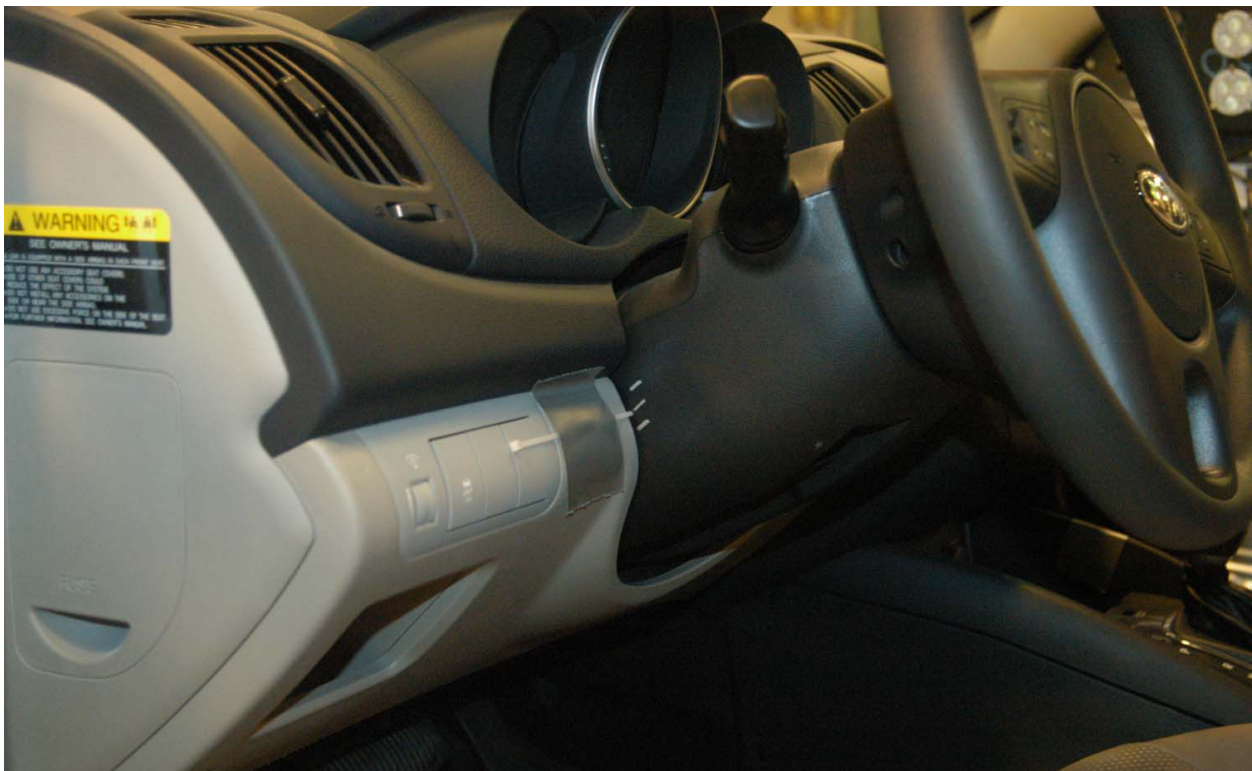


Figure A-36: Pre-Test Left Side View of Steering Wheel



Figure A-37: Pre-Test View of Parking Brake



Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Track



Figure A-39: Pre-Test Close-Up Left Side View of Driver Seat Back



Figure A-40: Pre-Test Close-Up View of Head Restraint



Figure A-41: Pre-Test Driver Dummy and Door Clearance View



Figure A-42: Post-Test Driver Dummy and Door Clearance View



Figure A-43: Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-44: Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Figure A-45: Pre-Test Driver Inner Door Panel View

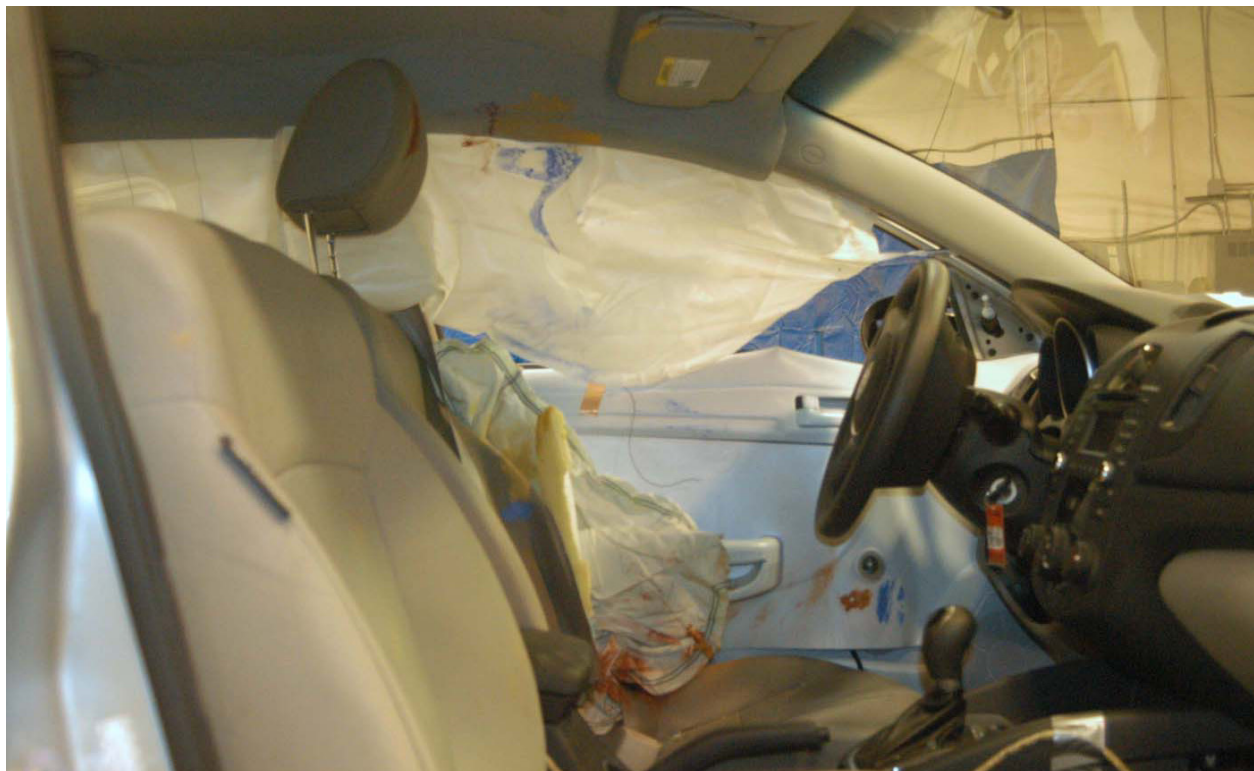


Figure A-46: Post-Test Driver Inner Door Panel Showing Driver Dummy Contact Locations



Figure A-47: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Side Air Bag View



Figure A-49: Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



Figure A-50: Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



Figure A-51: Post-Test Driver Dummy Close-Up Pelvis Contact View



Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact With Side Airbag View



Figure A-53: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt, Chalking, and Contact Switches



Figure A-54: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-55: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Figure A-56: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Figure A-57: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

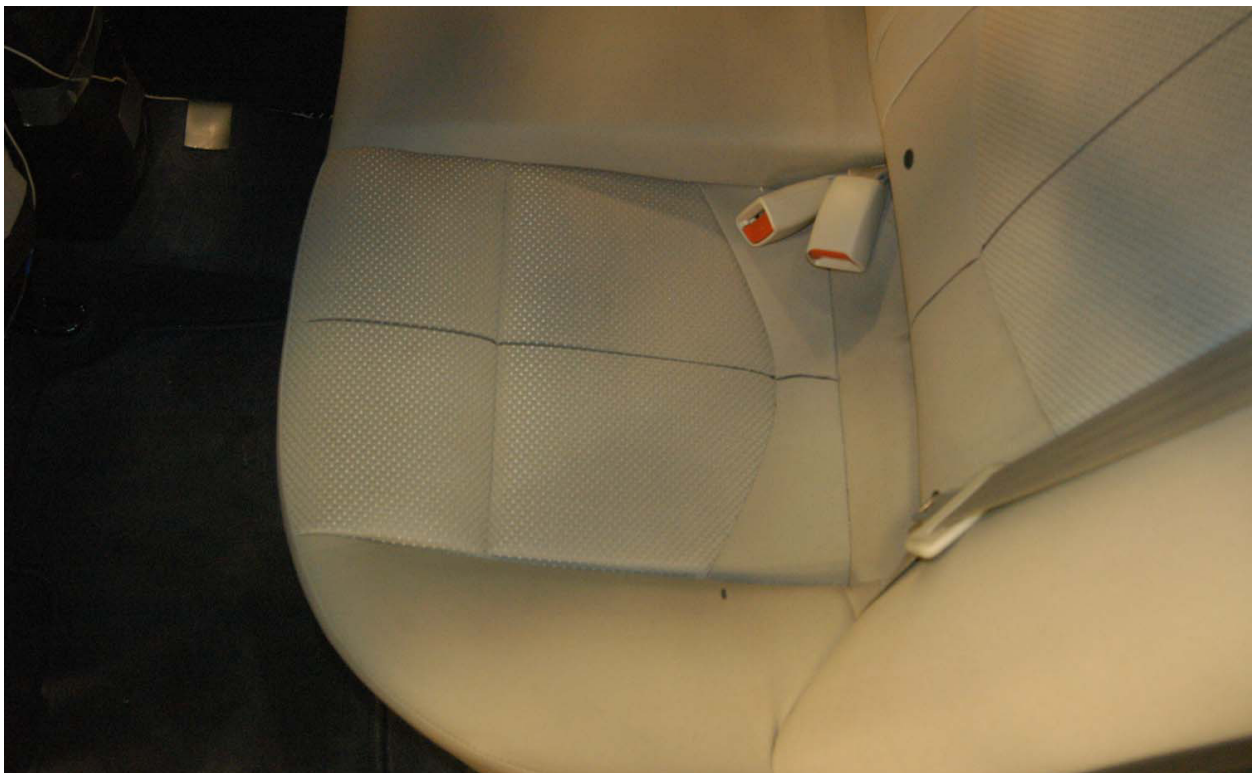


Figure A-58: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Figure A-59: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

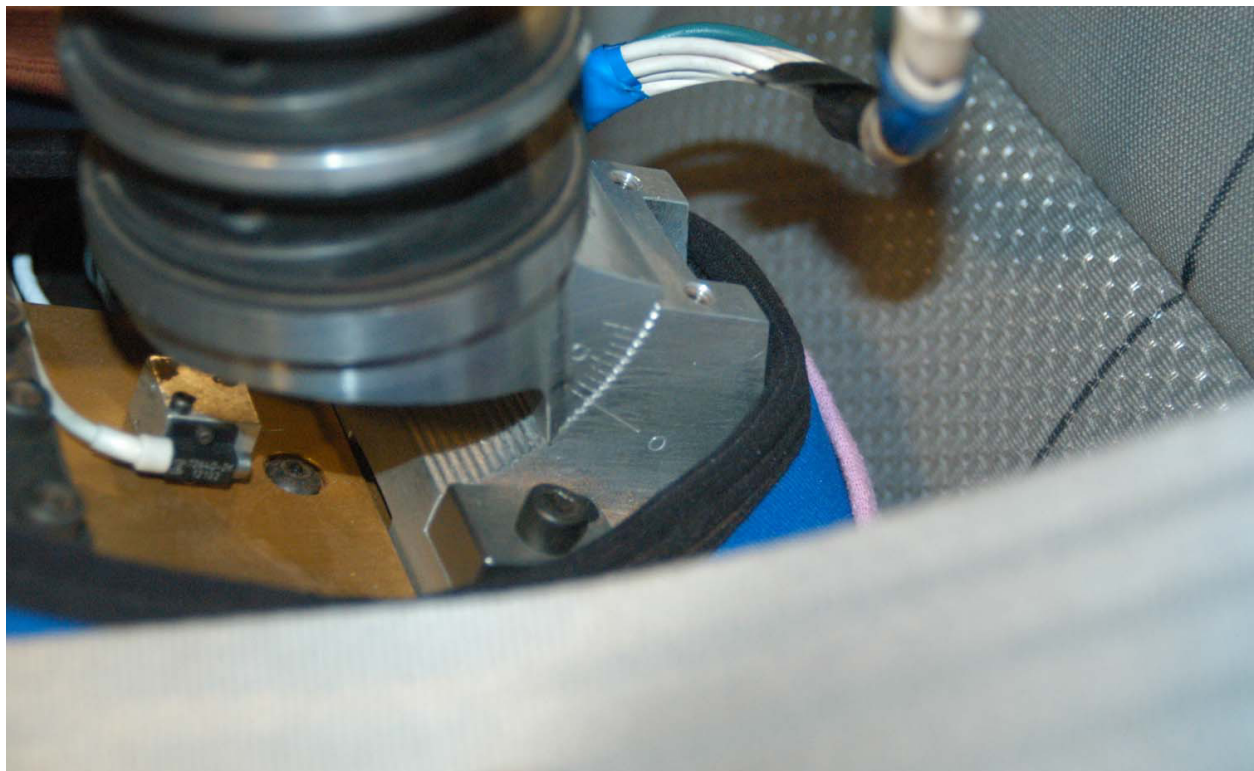


Figure A-60: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Figure A-61: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Figure A-62: Pre-Test Placement of Rear Passenger Dummy's Feet



Figure A-63: Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Figure A-64: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track



Figure A-65: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Figure A-66: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



Figure A-67: Pre-Test Rear Passenger Dummy and Door Clearance View



Figure A-68: Post-Test Rear Passenger Dummy and Door Clearance View

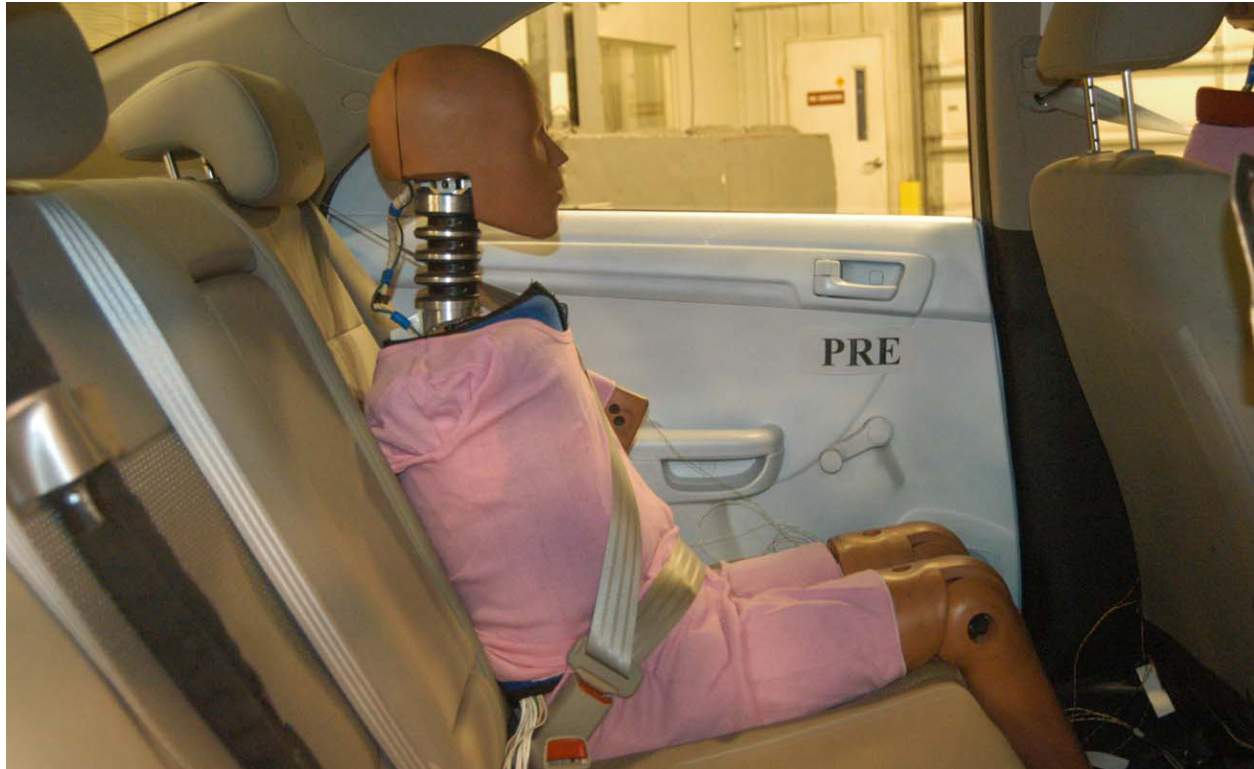


Figure A-69: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-70: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Figure A-71: Pre-Test Rear Passenger Inner Door Panel View



Figure A-72: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Dummy Contact Locations



Figure A-73: Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View



Figure A-74: Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View



Figure A-75: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle View

Not Applicable

Figure A-76: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View



Figure A-77: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View

Not Applicable

Figure A-78: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View



Figure A-79: Pre-Test View of Fuel Filler Cap



Figure A-80: Post-Test View of Fuel Filler Cap



Figure A-81: Pre-Test Front View of MDB Impactor Face



Figure A-82: Post-Test Front View of MDB Impactor Face

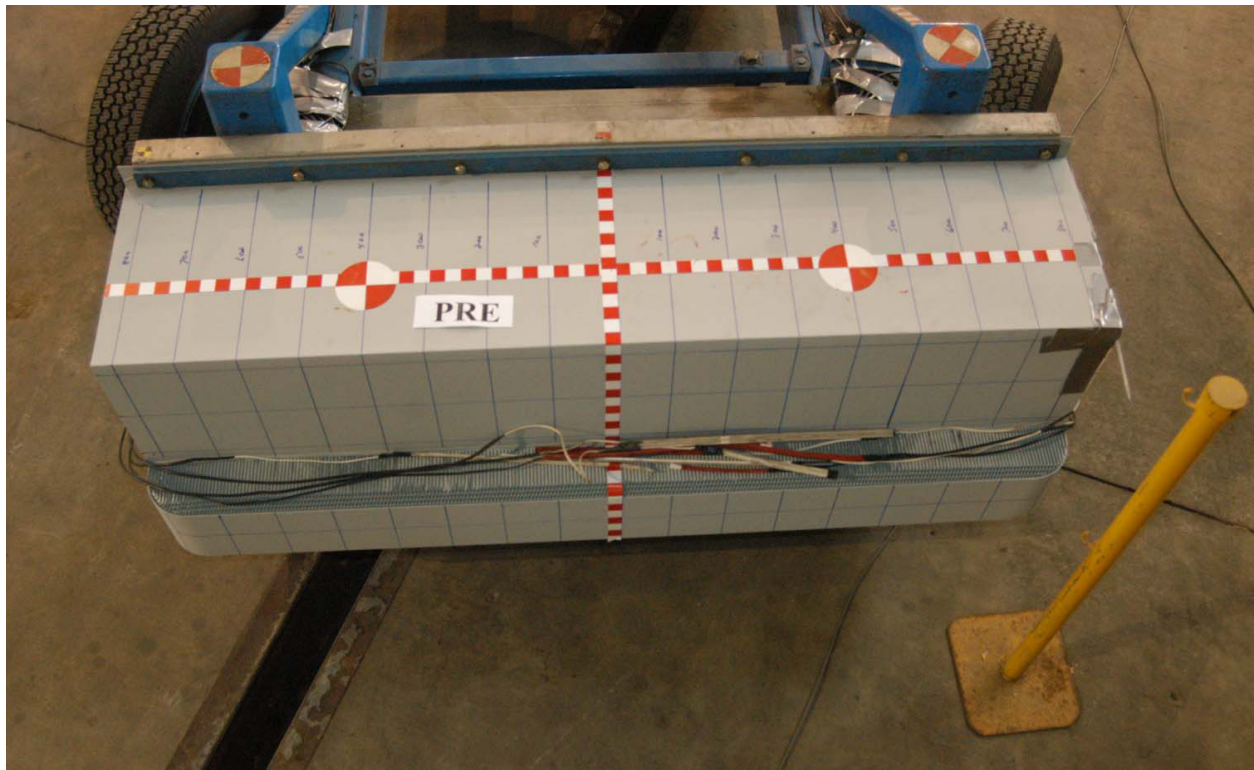


Figure A-83: Pre-Test Top View of MDB Impactor Face

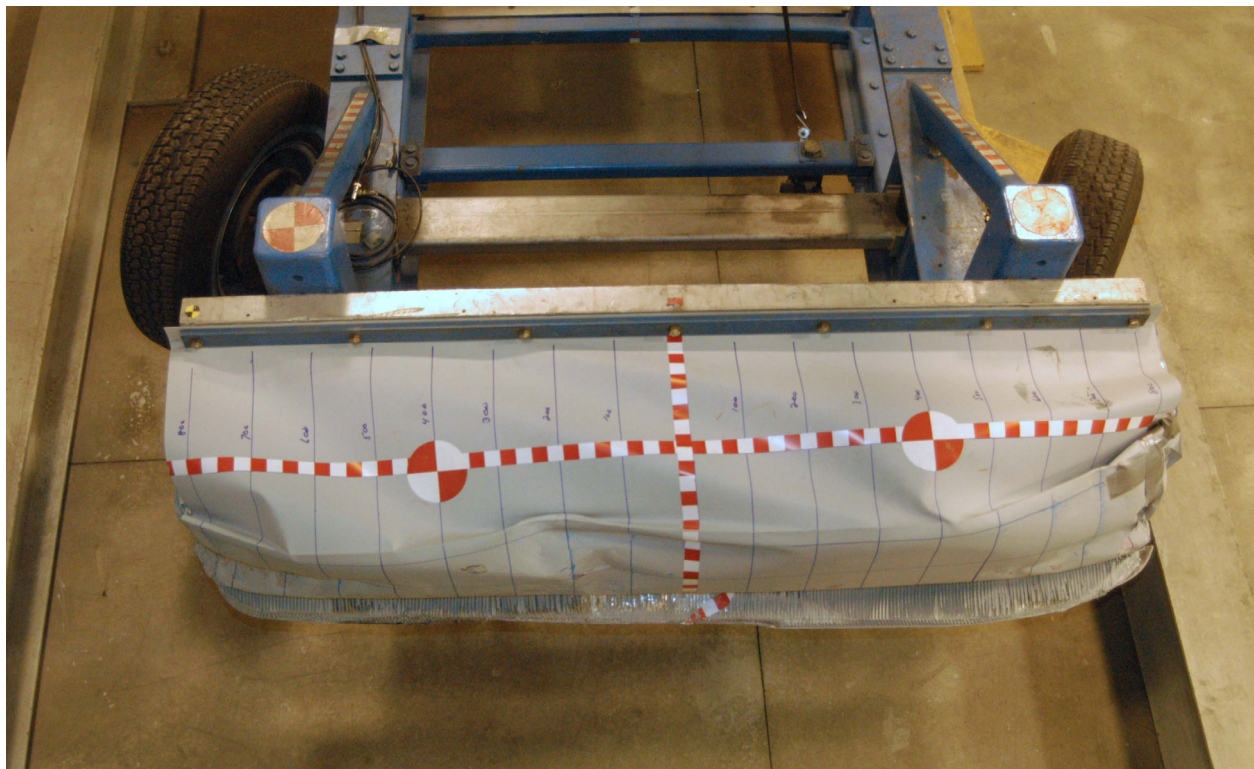


Figure A-84: Post-Test Top View of MDB Impactor Face



Figure A-85: Pre-Test Left Side View of MDB Impactor Face



Figure A-86: Post-Test Left Side View of MDB Impactor Face



Figure A-87: Pre-Test Right Side View of MDB Impactor Face

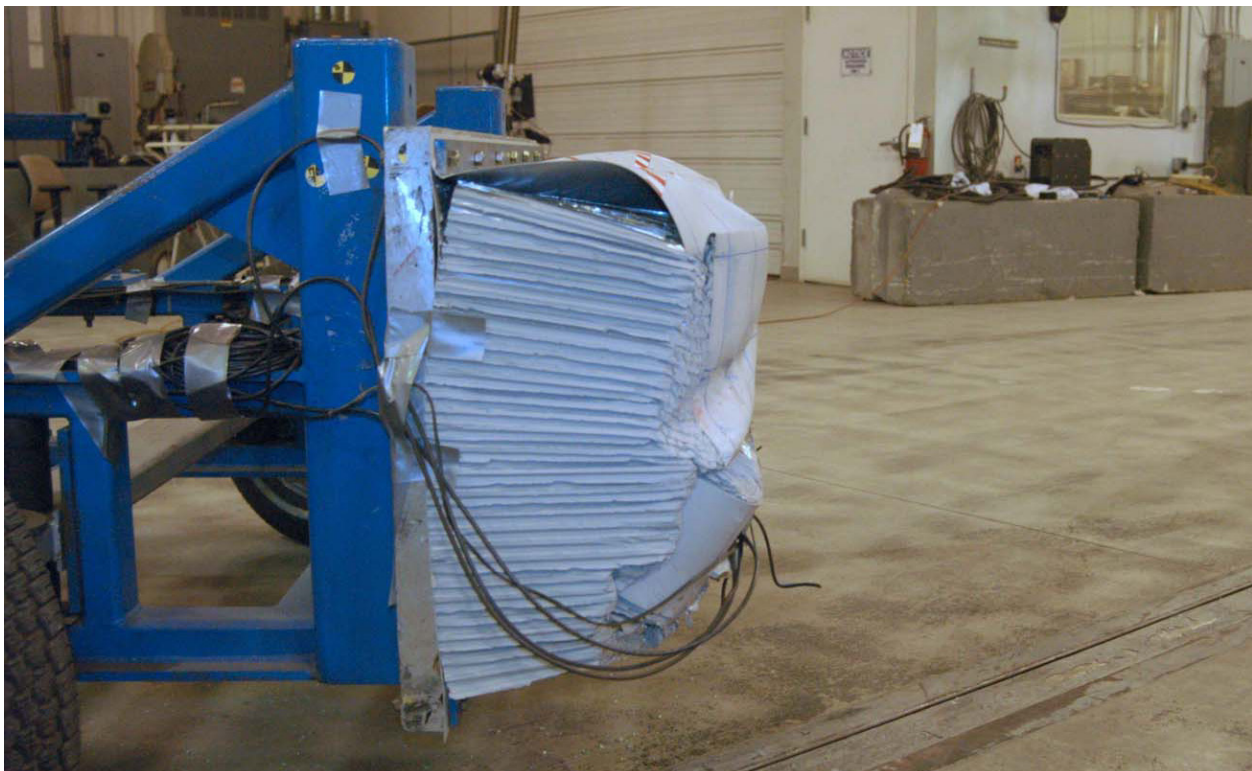


Figure A-88: Post-Test Right Side View of MDB Impactor Face



Figure A-89: Close-Up View of Vehicle's Certification Label



Figure A-90: Close-Up View of Vehicle's Tire Information Label



Figure A-91: Pre-Test Ballast View

Figure A-92: Post-Test Primary and Redundant Speed Trap Read-Out (Not Taken)



Figure A-93: FMVSS No. 301/305 Rollover 0°

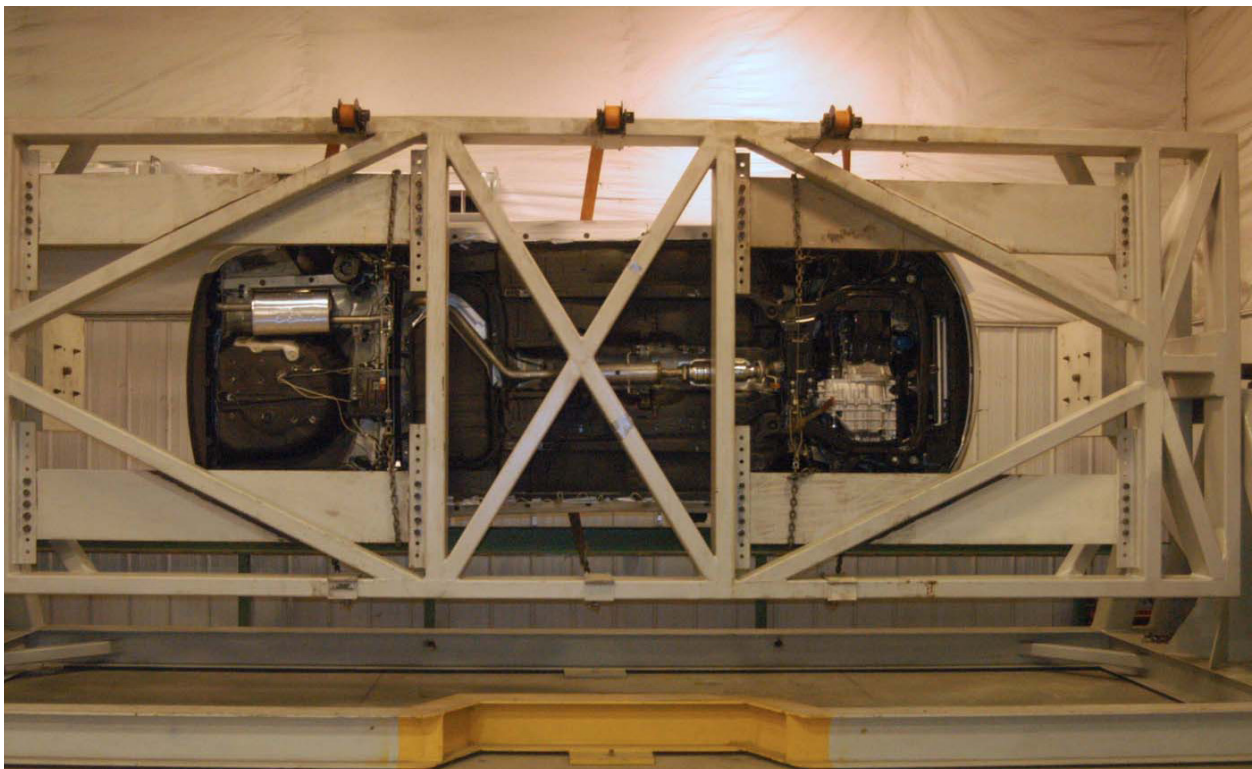


Figure A-94: FMVSS No. 301/305 Rollover 90°

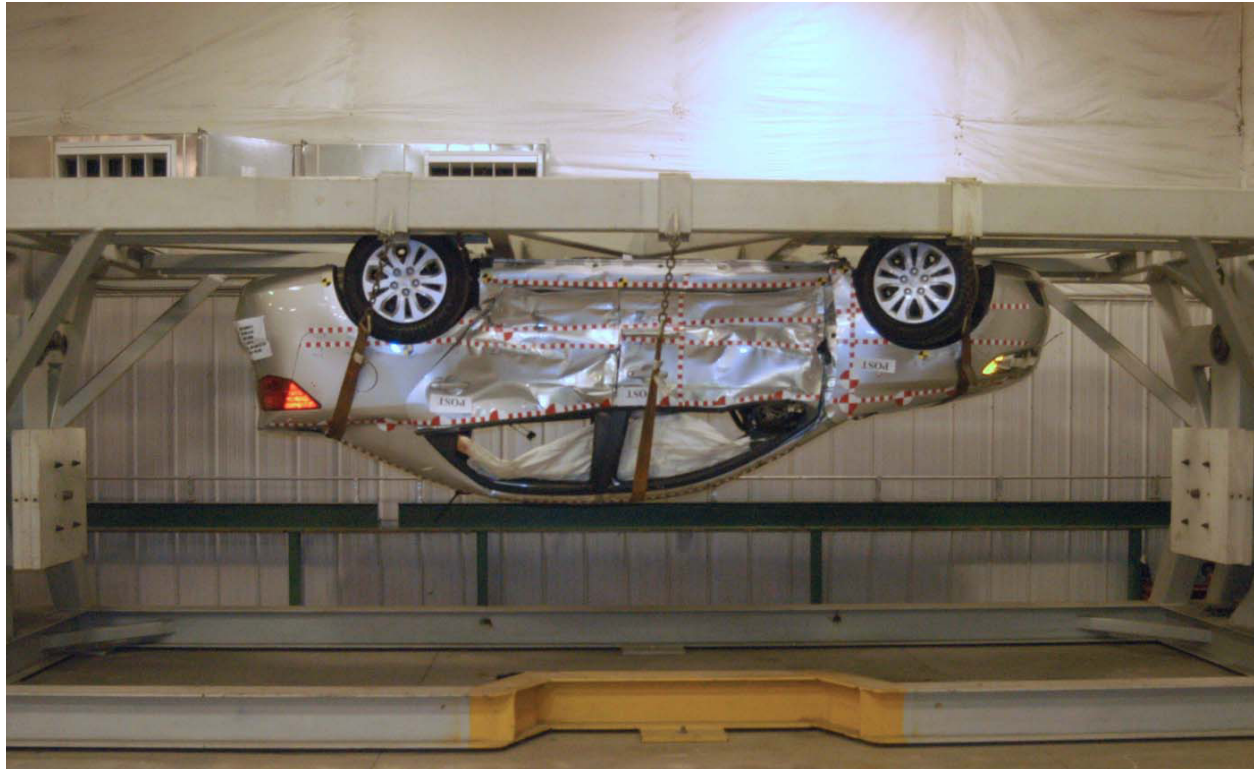


Figure A-95: FMVSS No. 301/305 Rollover 180°

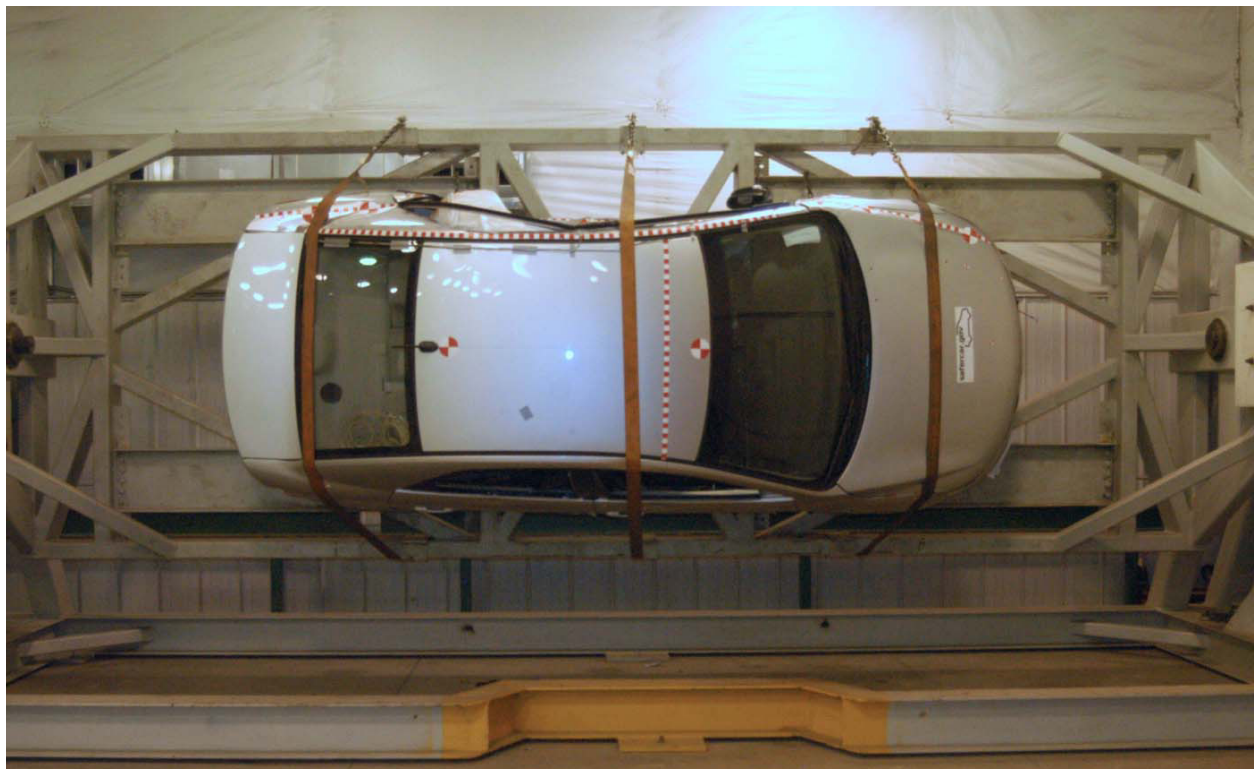


Figure A-96: FMVSS No. 301/305 Rollover 270°



Figure A-97: FMVSS No. 301/305 Rollover 360°



Figure A-98: Impact Event

Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011



Figure A-99: Monroney Label

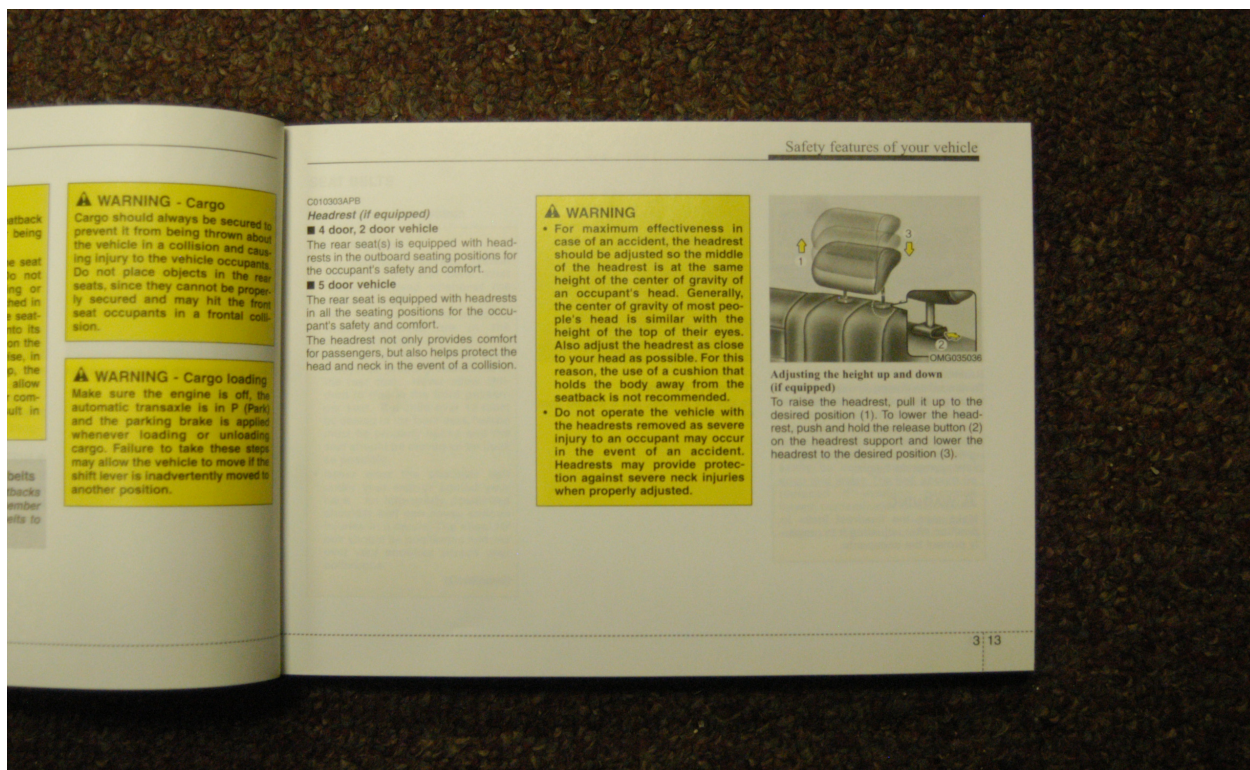


Figure A-100: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Figure A-101: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011

APPENDIX B

ATD, VEHICLE AND MDB RESPONSE DATA

The following plots are provided in the test report

Data Plot	Description	Page
1	Driver Head Acceleration (X) Primary vs. Time	B-4
2	Driver Head Acceleration (Y) Primary vs. Time	B-5
3	Driver Head Acceleration (Z) Primary vs. Time	B-6
4	Driver Head Resultant Acceleration Primary vs. Time	B-7
5	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-8
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-9
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-10
8	Driver Thorax Rib Deflection Maximum vs. Time	B-11
9	Driver Anterior Abdominal Force (Y) vs. Time	B-12
10	Driver Middle Abdominal Force (Y) vs. Time	B-13
11	Driver Posterior Abdominal Force (Y) vs. Time	B-14
12	Driver Total Abdominal Force (Y) vs. Time	B-15
13	Driver Pubic Symphysis Force (Y) vs. Time	B-16
14	Passenger Head Acceleration (X) Primary vs. Time	B-17
15	Passenger Head Acceleration (Y) Primary vs. Time	B-18
16	Passenger Head Acceleration (Z) Primary vs. Time	B-19
17	Passenger Head Resultant Acceleration Primary vs. Time	B-20
18	Passenger Lower Spine T ₁₂ Acceleration (X) vs. Time	B-21
19	Passenger Lower Spine T ₁₂ Acceleration (Y) vs. Time	B-22
20	Passenger Lower Spine T ₁₂ Acceleration (Z) vs. Time	B-23
21	Passenger Lower Spine T ₁₂ Resultant Acceleration vs. Time	B-24
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-25
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-26
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-27

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T₁₂ Acceleration (X)
Driver Lower Spine T₁₂ Acceleration (Y)
Driver Lower Spine T₁₂ Acceleration (Z)
Passenger Upper Thorax Rib Deflection
Passenger Middle Thorax Rib Deflection
Passenger Lower Thorax Rib Deflection
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Shoulder Contact Switch
Driver Torso Contact Switch
Driver Pelvis Contact Switch
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)
Passenger Shoulder Contact Switch
Passenger Torso Contact Switch
Passenger Pelvis Contact Switch

Vehicle Instrumentation Data

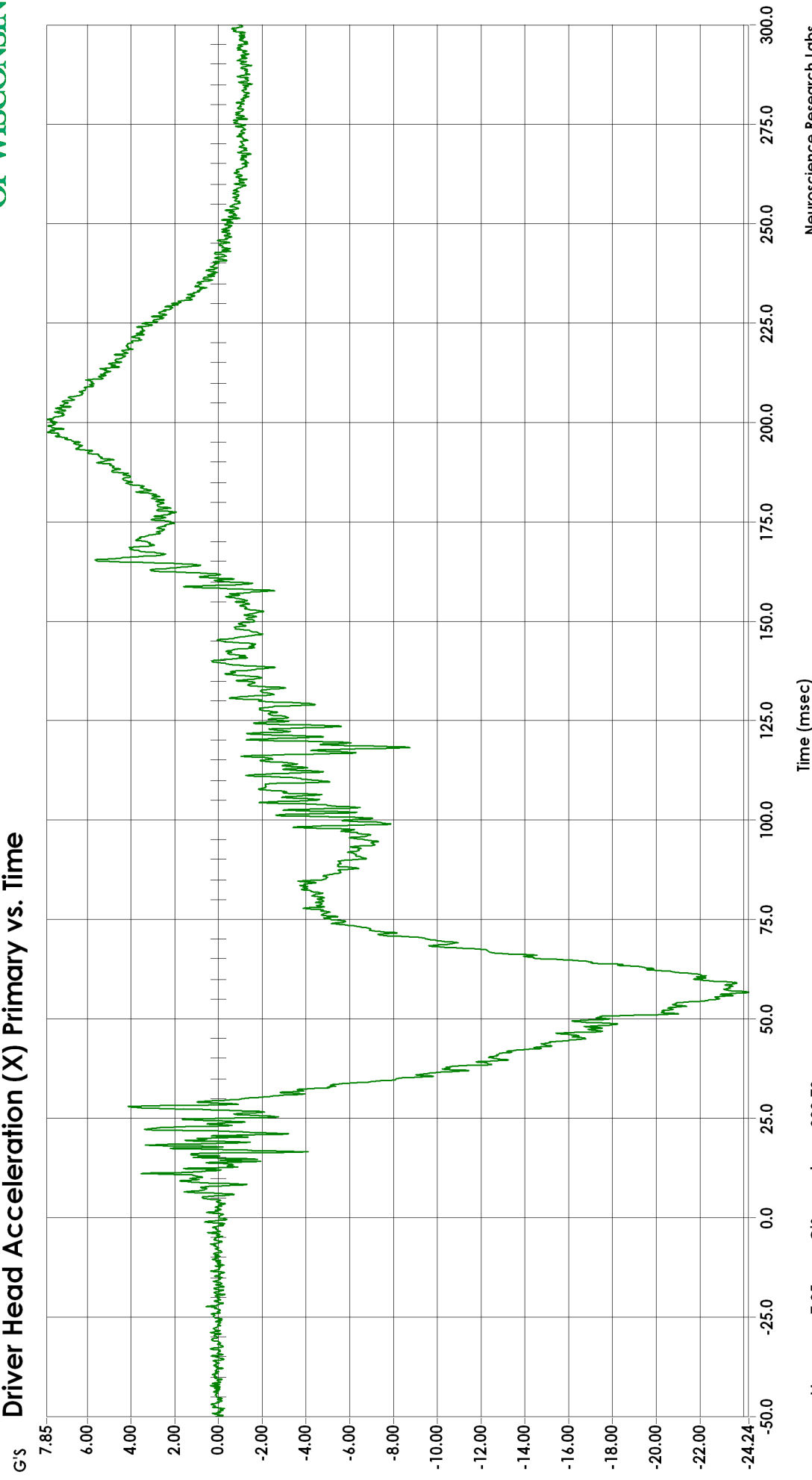
Driver Side Airbag Timing
Driver Side Curtain Airbag Timing
Passenger Side Airbag Timing
Passenger Side Curtain Airbag Timing
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Lower A-post Acceleration (Y)
Upper A-post Acceleration (Y)
Lower B-post Acceleration (Y)
Upper B-post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Track Acceleration (Y)
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
MDB Rear Acceleration (Z)
Left MDB Contact Switch
Right MDB Contact Switch

Test ID	11SN04	Filter	CFC1000
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000TZ
		Serial Number	J43494

Driver Head Acceleration (X) Primary vs. Time

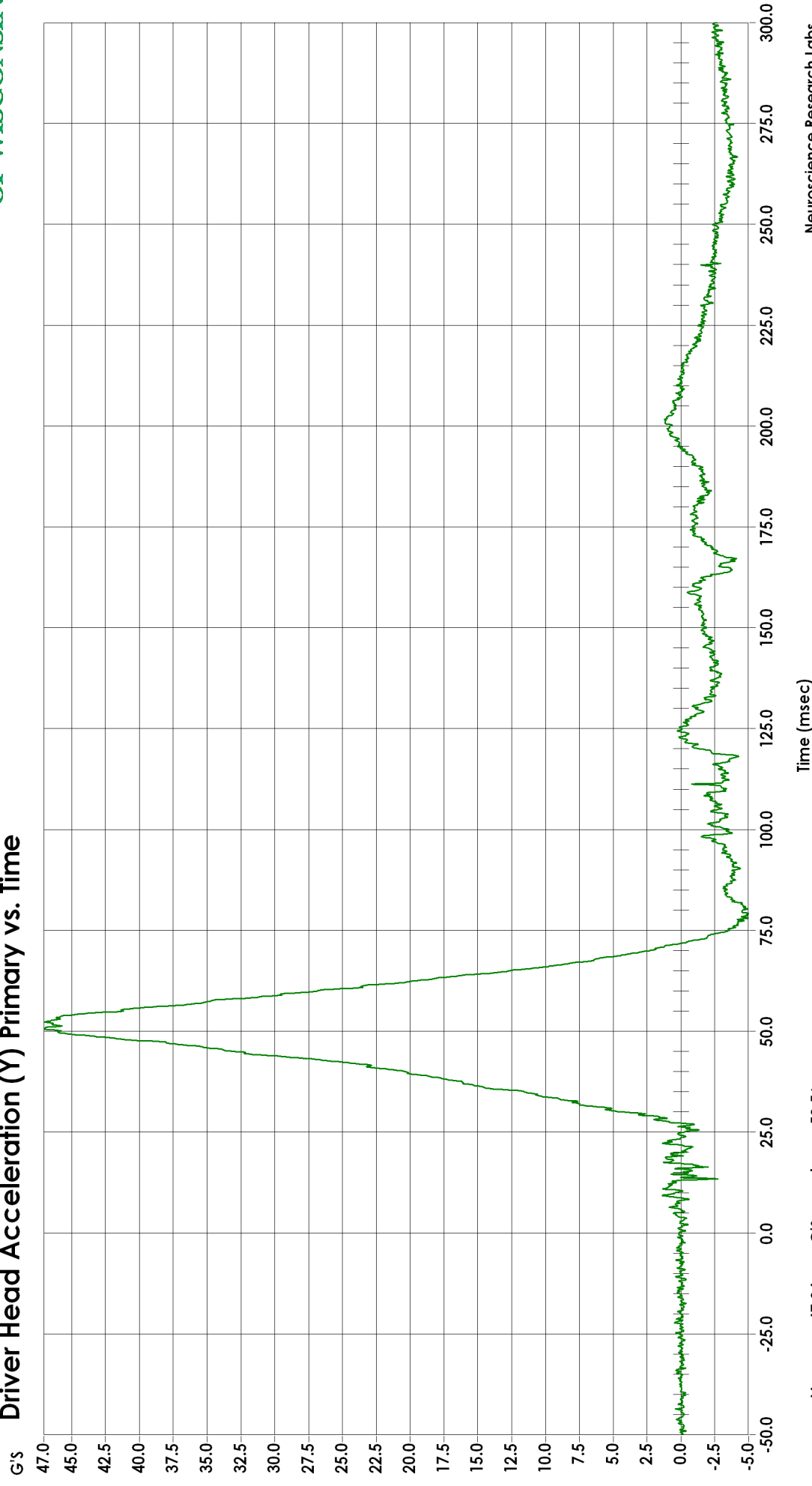


Max	7.85	G's	at	200.72	msec
Min	-24.24	G's	at	56.72	msec

11SN04 Plot 001

Test ID	11SN04	Filter	CFC1000
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000TZ
		Serial Number	J43475

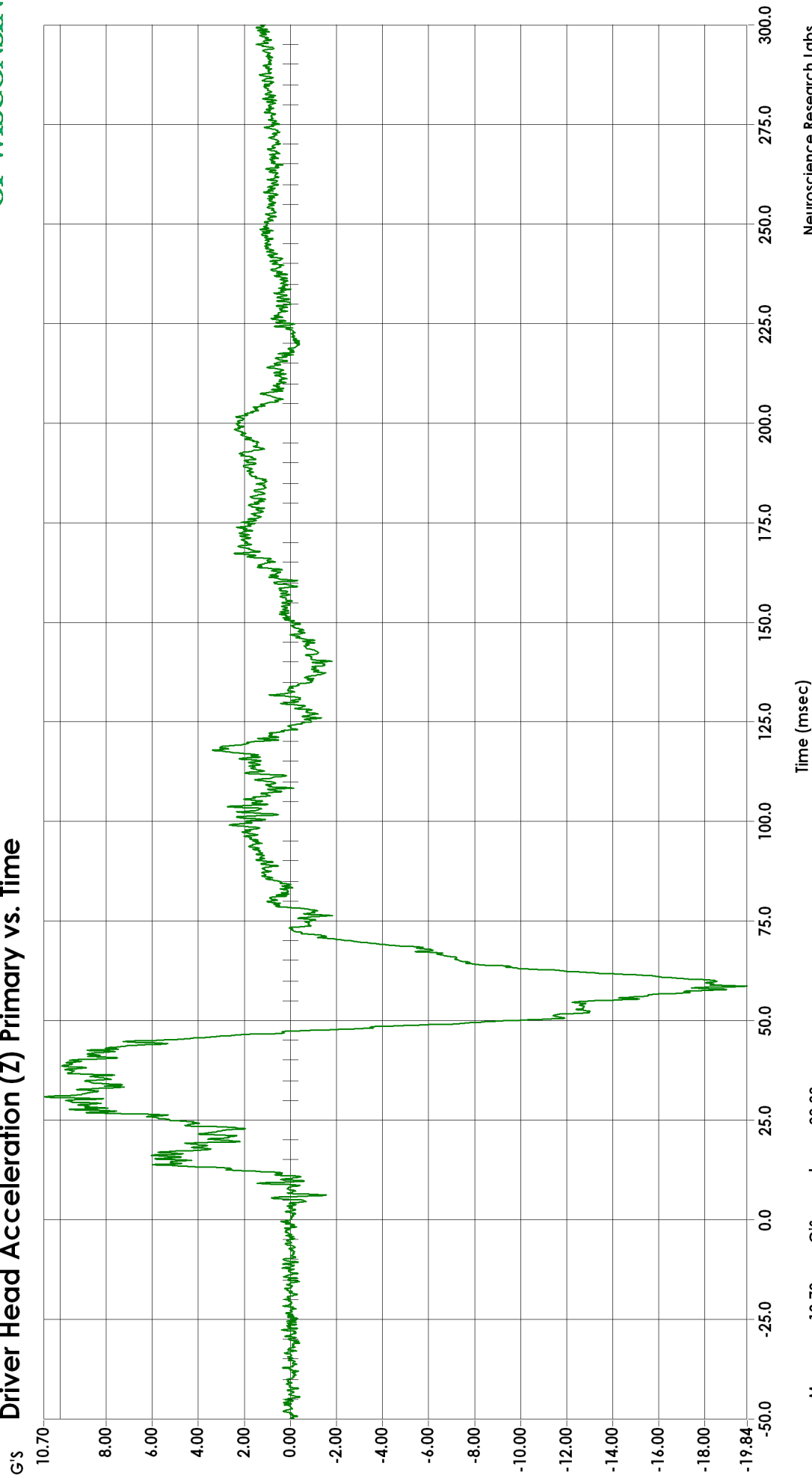
Driver Head Acceleration (Y) Primary vs. Time



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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC1000
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000
		Serial Number	J43779

Driver Head Acceleration (Z) Primary vs. Time

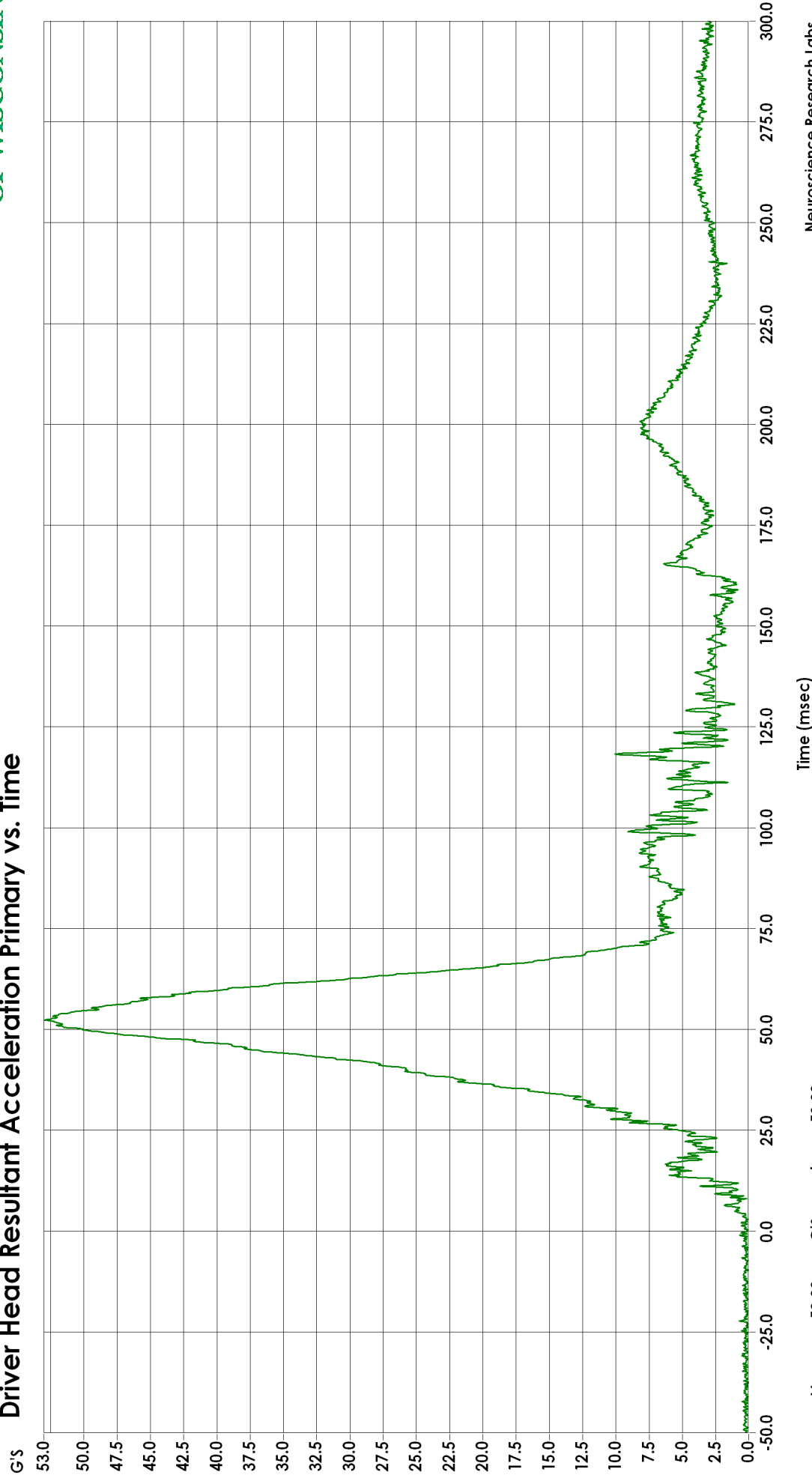


Max	10.70	G's	at	30.88	msec
Min	-19.84	G's	at	58.64	msec

11SN04 Plot 003

Test ID	11SN04	Filter	CFC1000	Sensor Location
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info
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		Pretrigger Points	1250	

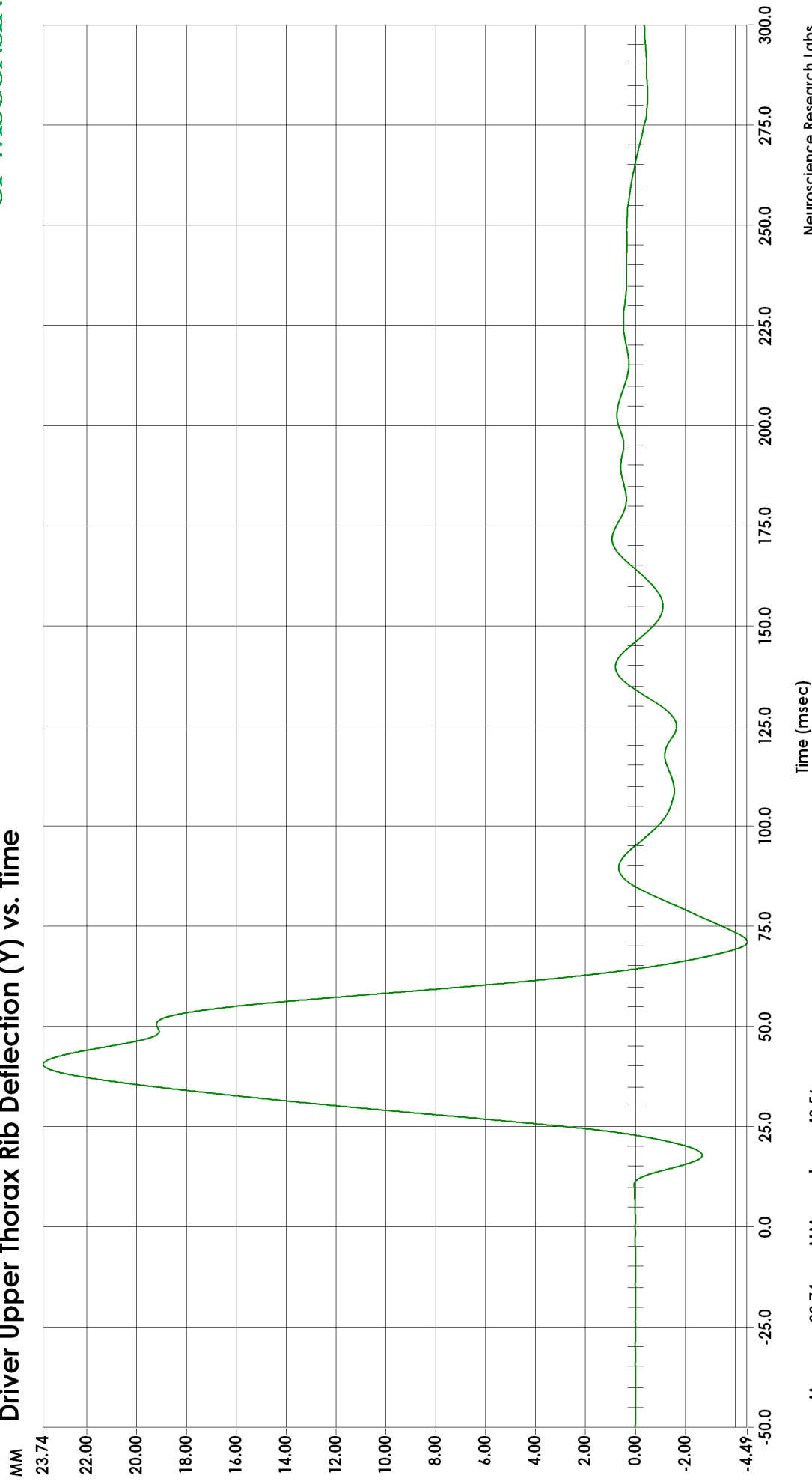
Driver Head Resultant Acceleration Primary vs. Time



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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC180
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBLU
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_433

Driver Upper Thorax Rib Deflection (Y) vs. Time

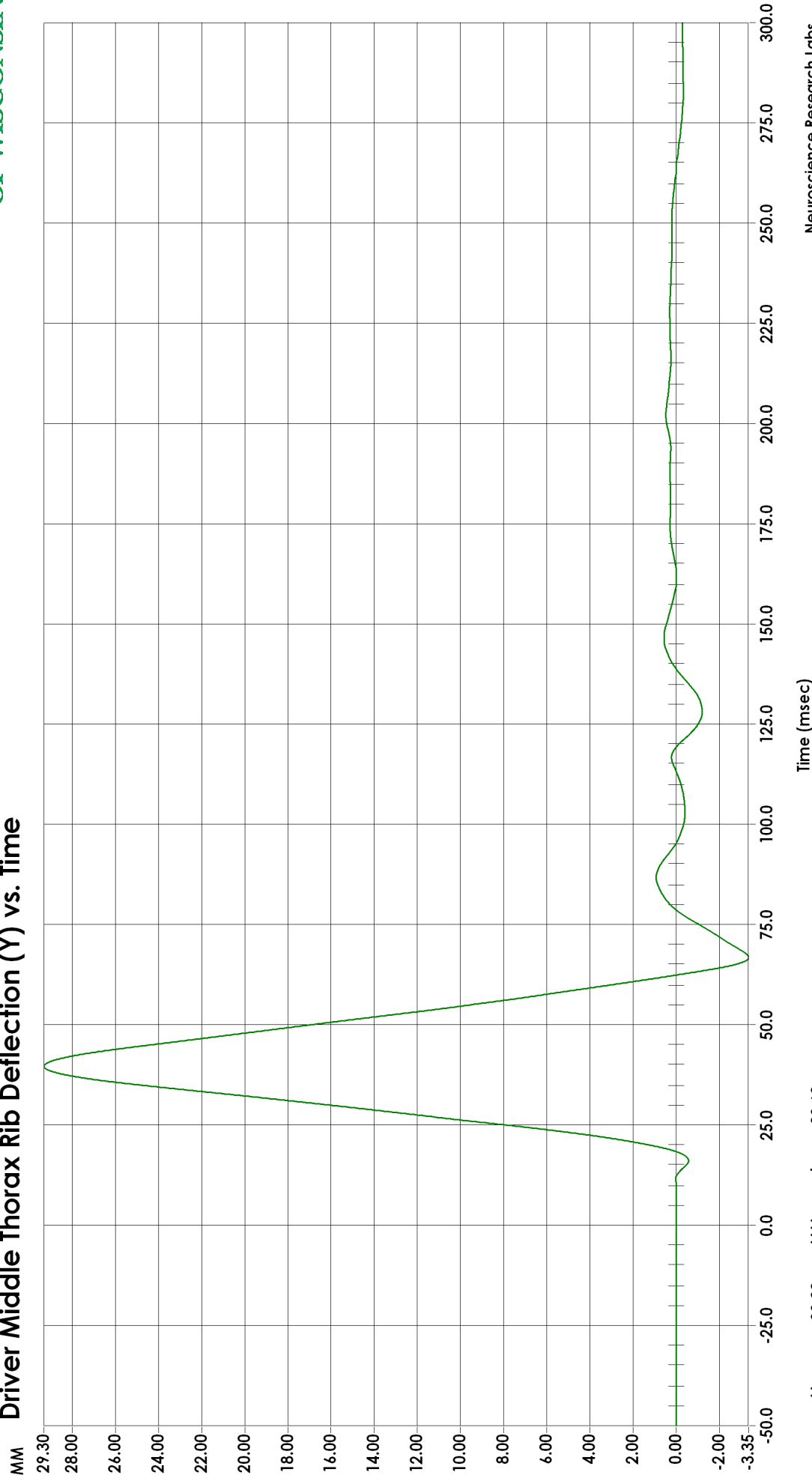


Max	23.74	MM	at	40.56	msec
Min	-4.49	MM	at	71.12	msec

11SN04 Plot 007

Test ID	11SN04	Filter	CFC180
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBLM
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_193

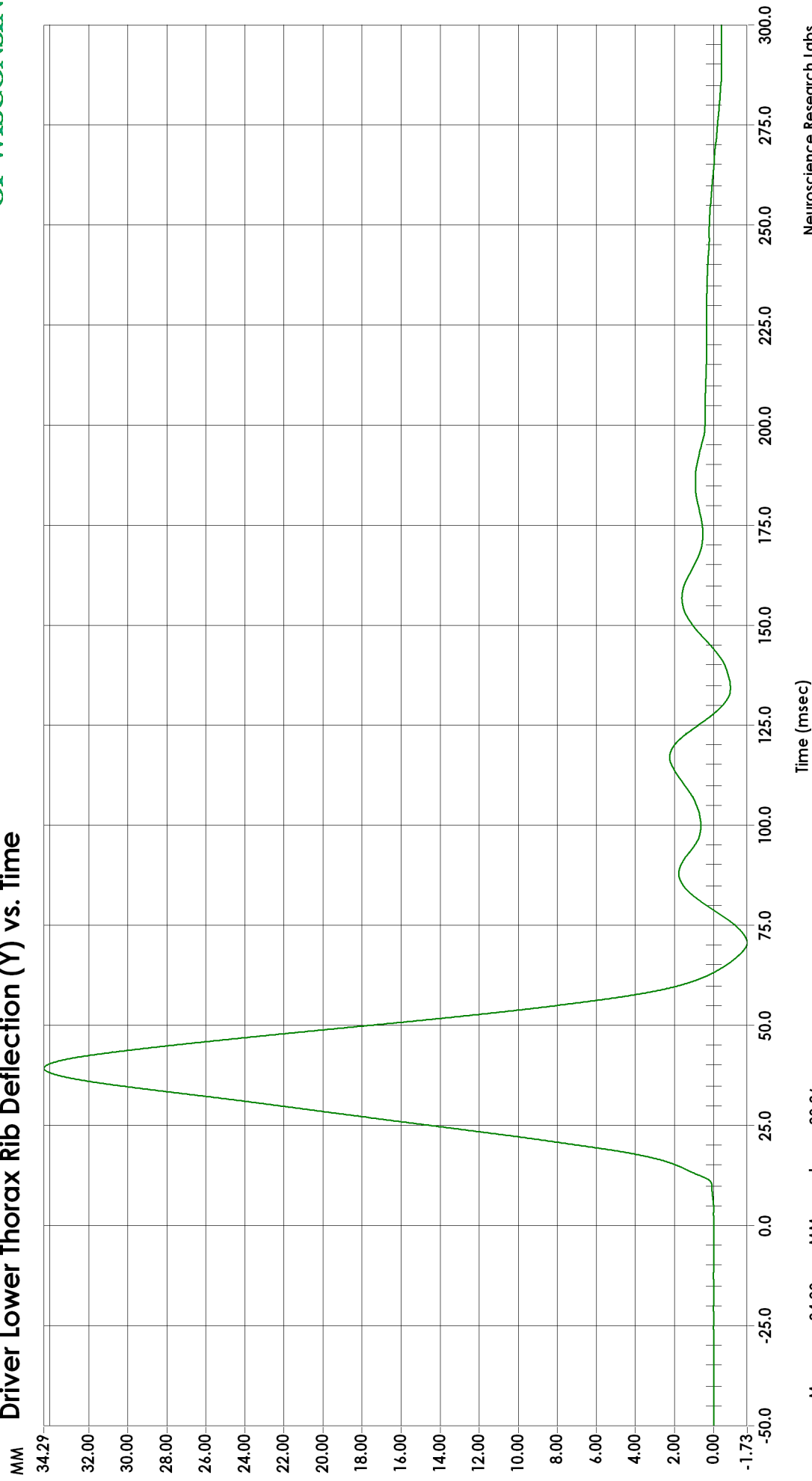
Driver Middle Thorax Rib Deflection (Y) vs. Time



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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC180
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBL
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_191

Driver Lower Thorax Rib Deflection (Y) vs. Time

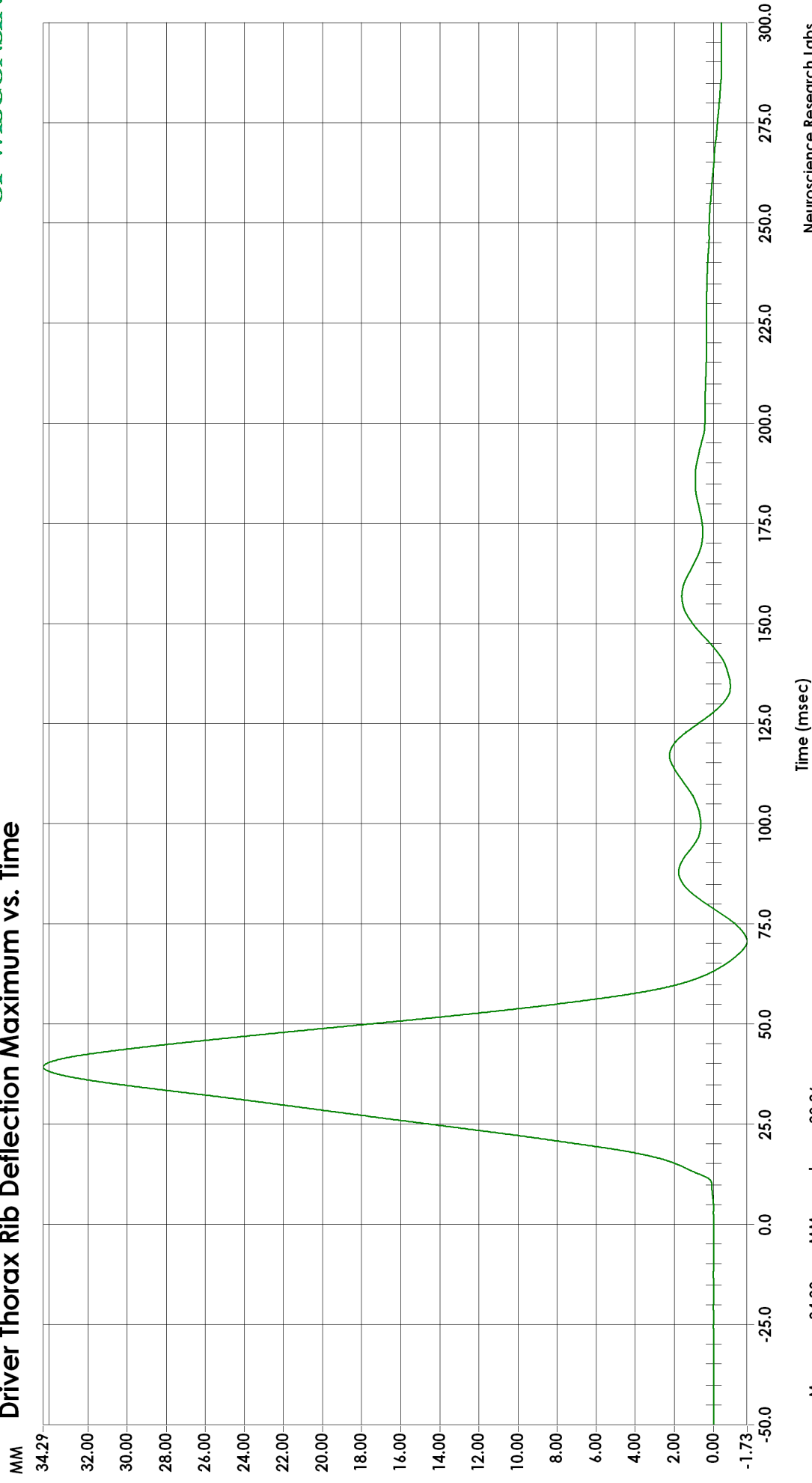


Max	34.29	MM	at	39.36	msec
Min	-1.73	MM	at	70.72	msec

11SN04 Plot 009

Test ID	11SN04	Filter	CFC180
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBL
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_191

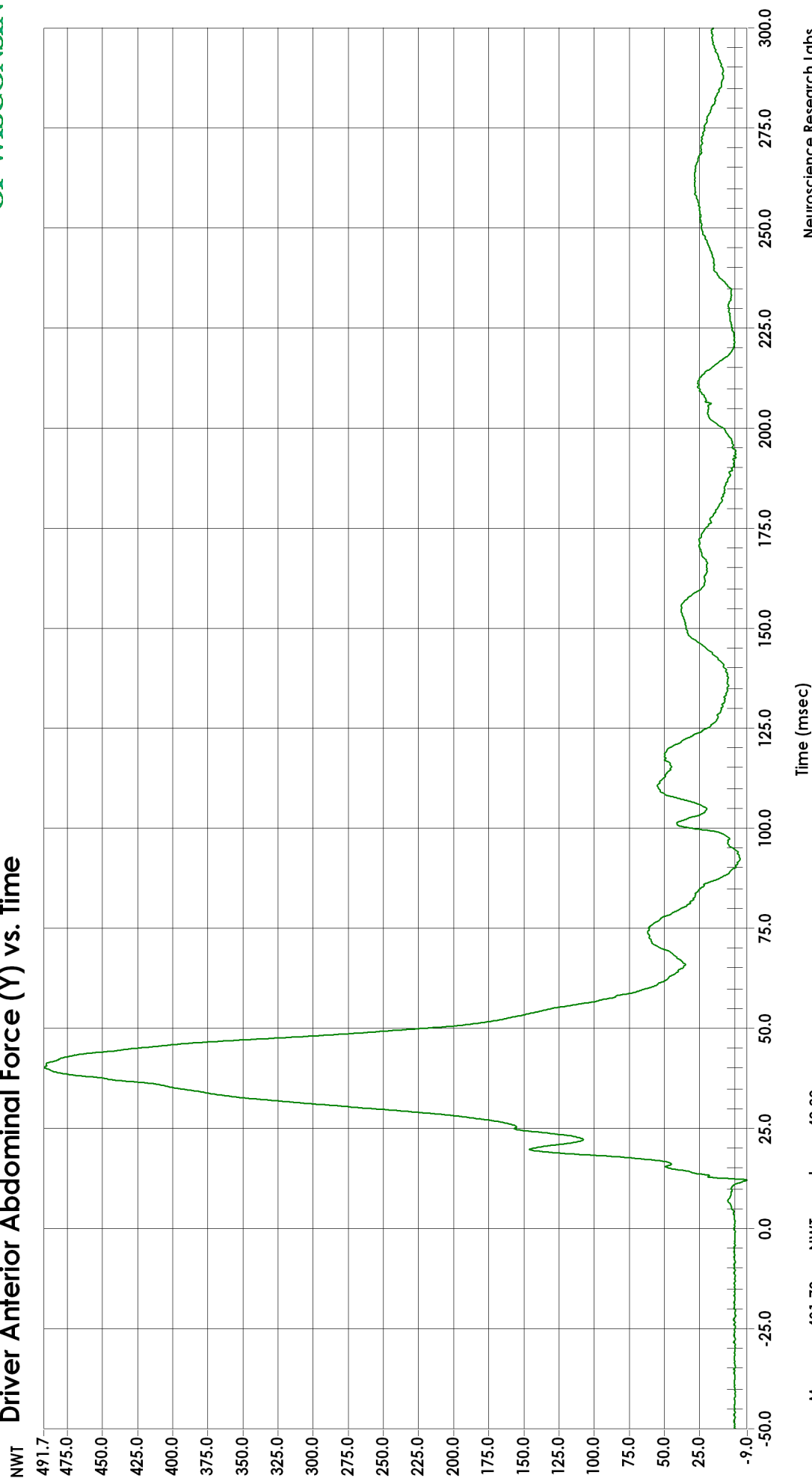
Driver Thorax Rib Deflection Maximum vs. Time



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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC600
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAF
		Sensor Info	Denton 2631
		Serial Number	2631_1502

Driver Anterior Abdominal Force (Y) vs. Time

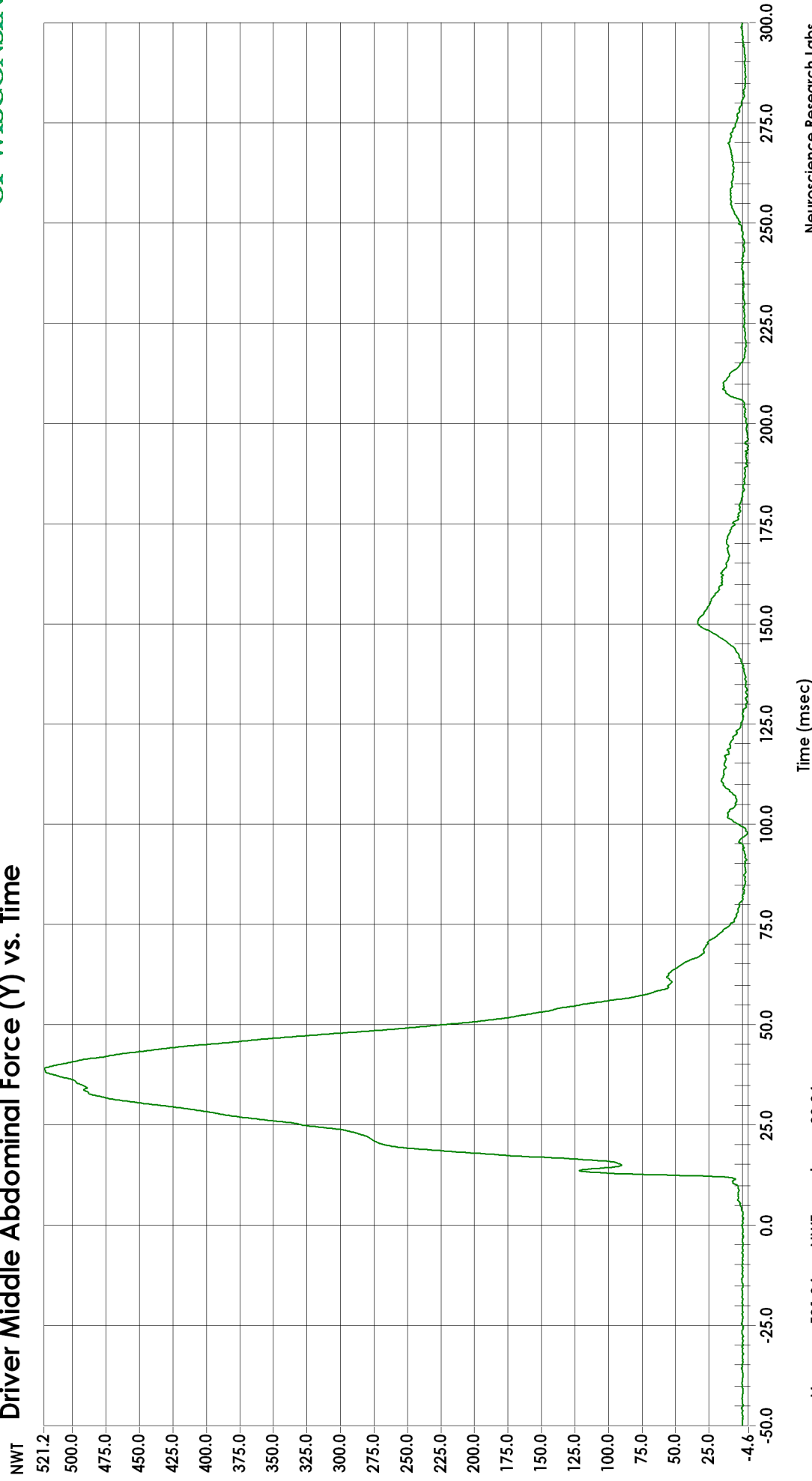


Max	491.70	NWT	at	40.32	msec
Min	-9.00	NWT	at	12.16	msec

11SN04 Plot 010

Test ID	11SN04	Filter	CFC600
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAM
		Sensor Info	Denton 2631
		Serial Number	2631_1511

Driver Middle Abdominal Force (Y) vs. Time



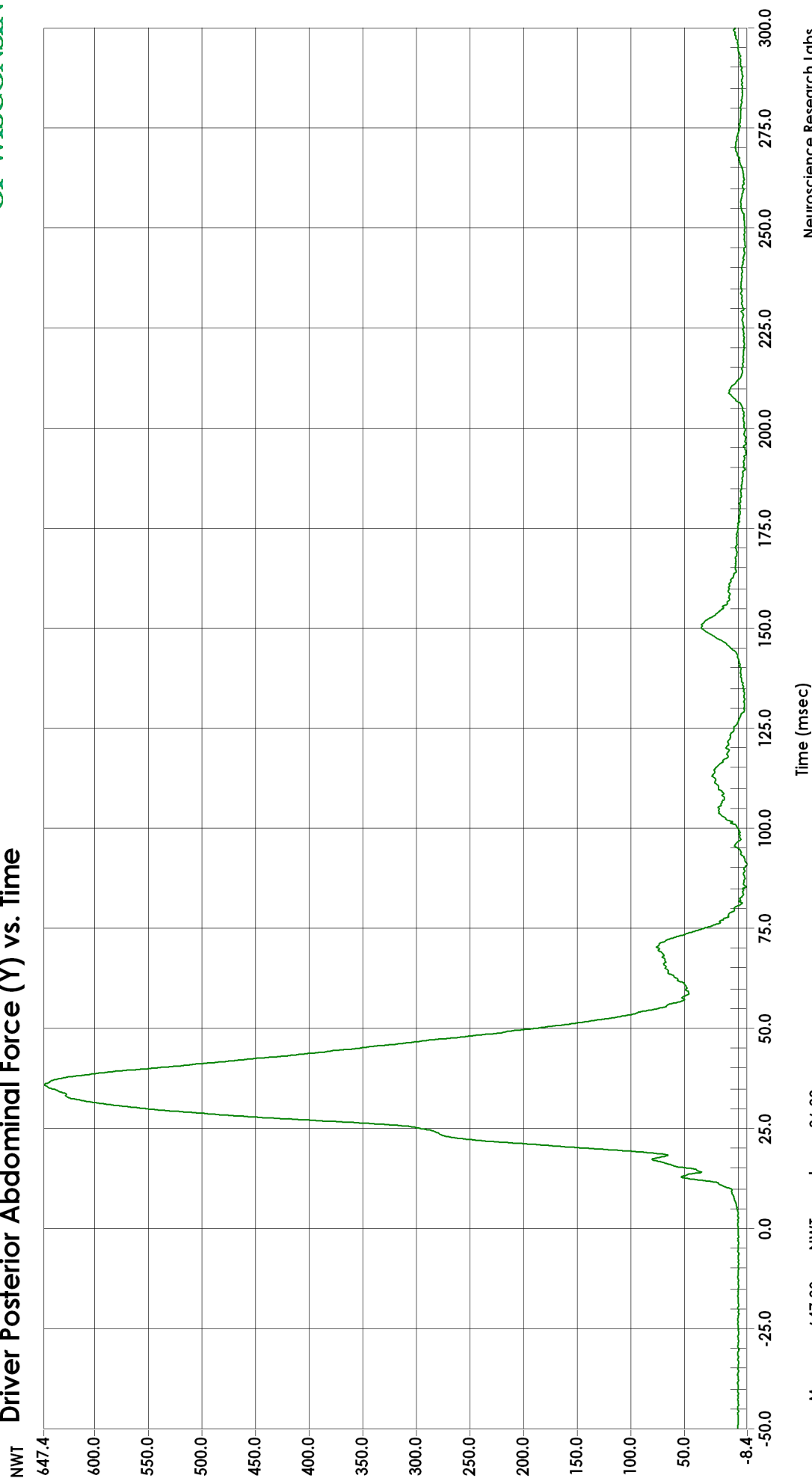
Max	521.24	NWT	at	39.04	msec
Min	-4.62	NWT	at	194.40	msec

11SN04 Plot 011

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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC600
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAR
		Sensor Info	Denton 2631
		Serial Number	2631_1537

Driver Posterior Abdominal Force (Y) vs. Time

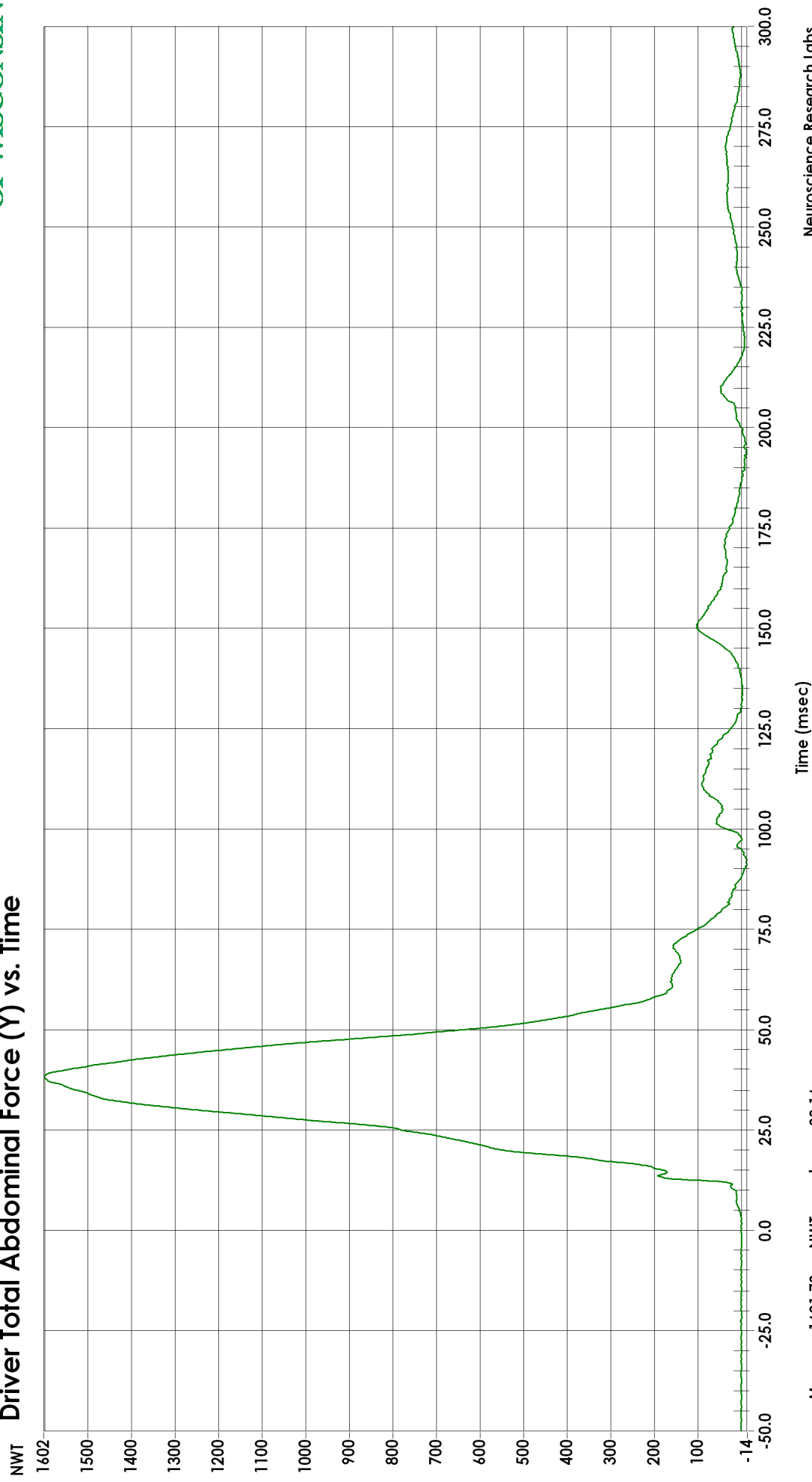


Max	647.39	NWT	at	36.00	msec
Min	-8.43	NWT	at	91.04	msec

11SN04 Plot 012

Test ID	11SN04	Filter	CFC600	Sensor Location
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Driver Total Abdominal Force (Y) vs. Time

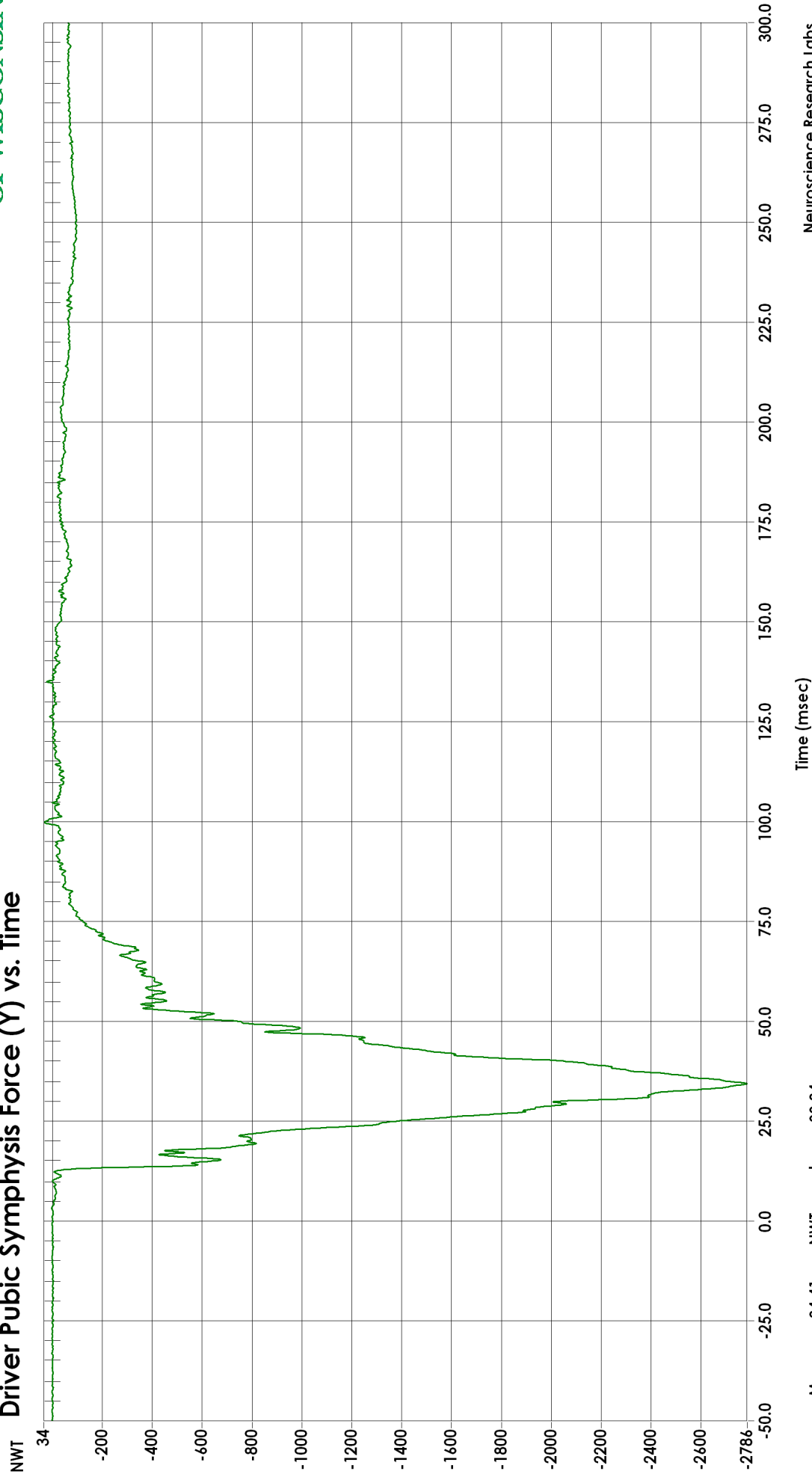


Max	1601.70	NWT	at	38.16	msec
Min	-13.71	NWT	at	91.12	msec

11SN04 Plot 072

Test ID	11SN04	Filter	CFC600	Sensor Location	PVPS
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info	Denton 30%JFL
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Serial Number	3096JFL_465
		Pretrigger Points	1250		

Driver Pubic Symphysis Force (Y) vs. Time



Max	34.41	NWT	at	99.84	msec
Min	-2785.73	NWT	at	34.40	msec

11SN04 Plot 016

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Milwaukee, WI 53295

Test ID

11SN04

Date

01-06-2011

Description

2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST

Filter

CFC1000

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

HDCG

Sensor Info

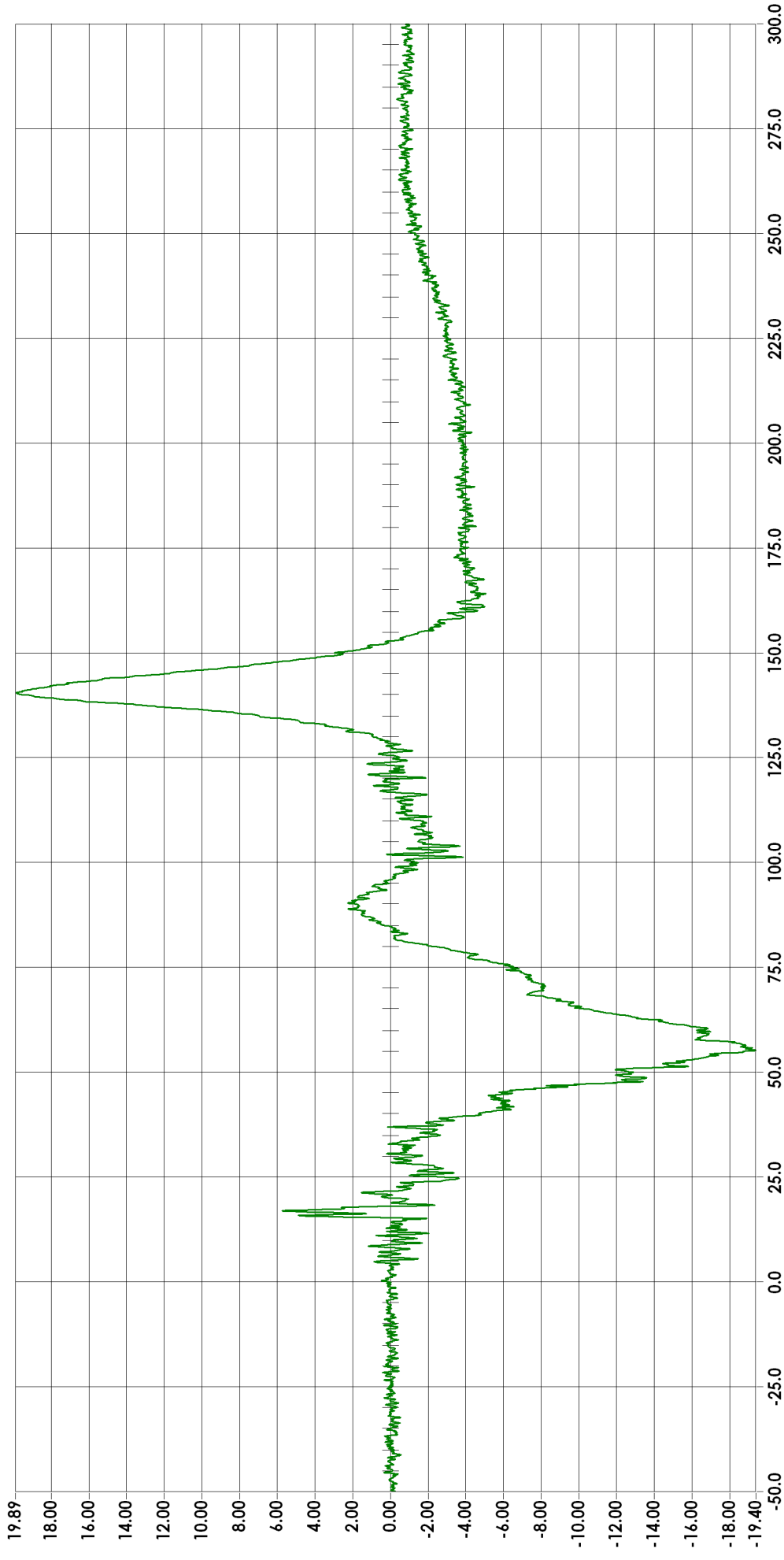
ENDEVCO 7264C-2KTZ-2-240

Serial Number

P22041



Passenger Head Acceleration (X) Primary vs. Time



Time (msec)

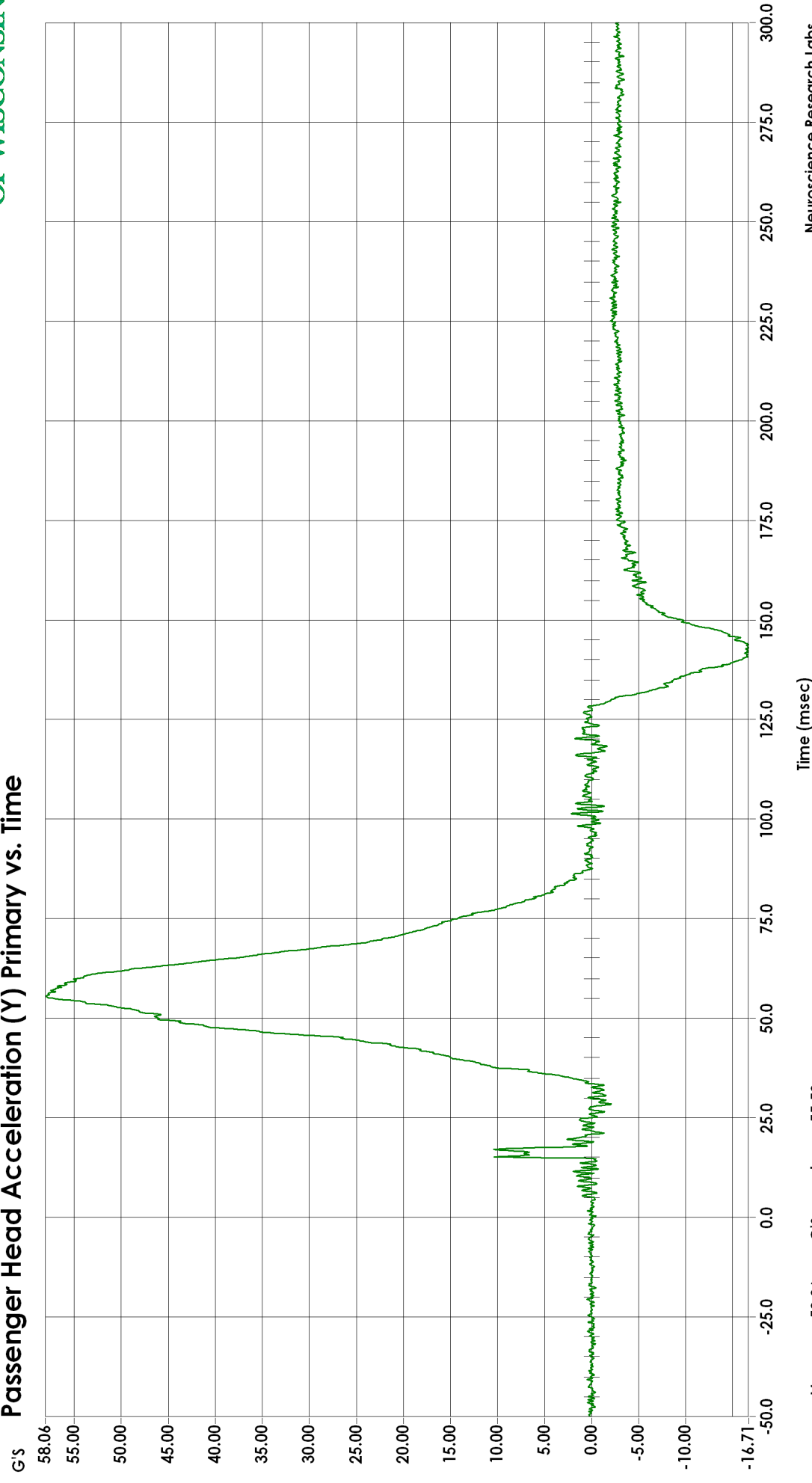
Max	19.89	G's	at	140.48	msec
Min	-19.40	G's	at	55.20	msec

11SN04 Plot 020

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Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC1000
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264C-2KTZ-2-240
		Serial Number	P24562

Passenger Head Acceleration (Y) Primary vs. Time



Max	58.06	G's	at	55.52	msec
Min	-16.71	G's	at	143.84	msec

11SN04 Plot 021

Test ID

11SN04

Date

01-06-2011

Description

2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST

Filter

CFC1000

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

HDCG

Sensor Info

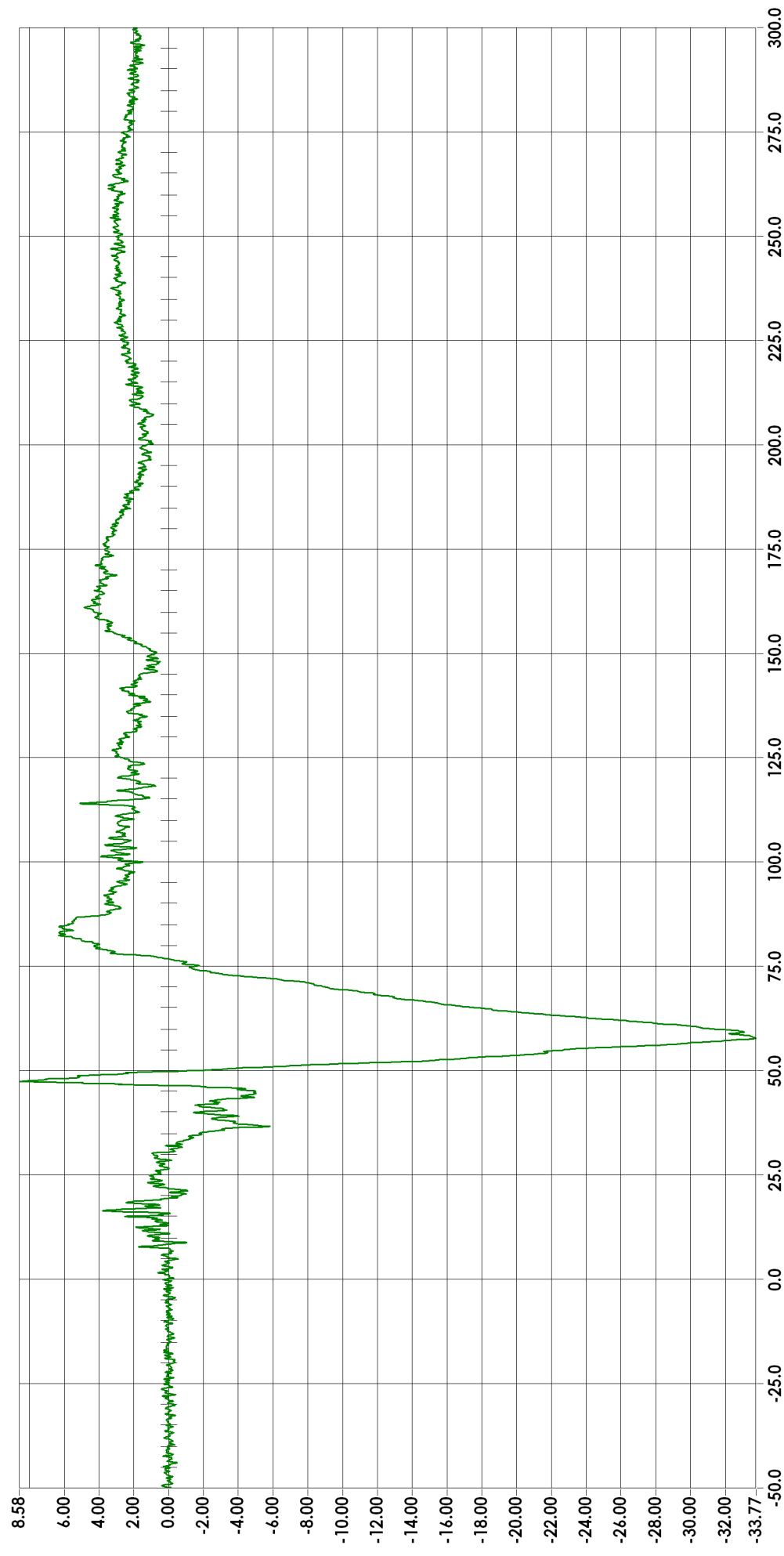
ENDEVCO 7264C-2KTZ-2-300

Serial Number

P22322



Passenger Head Acceleration (Z) Primary vs. Time



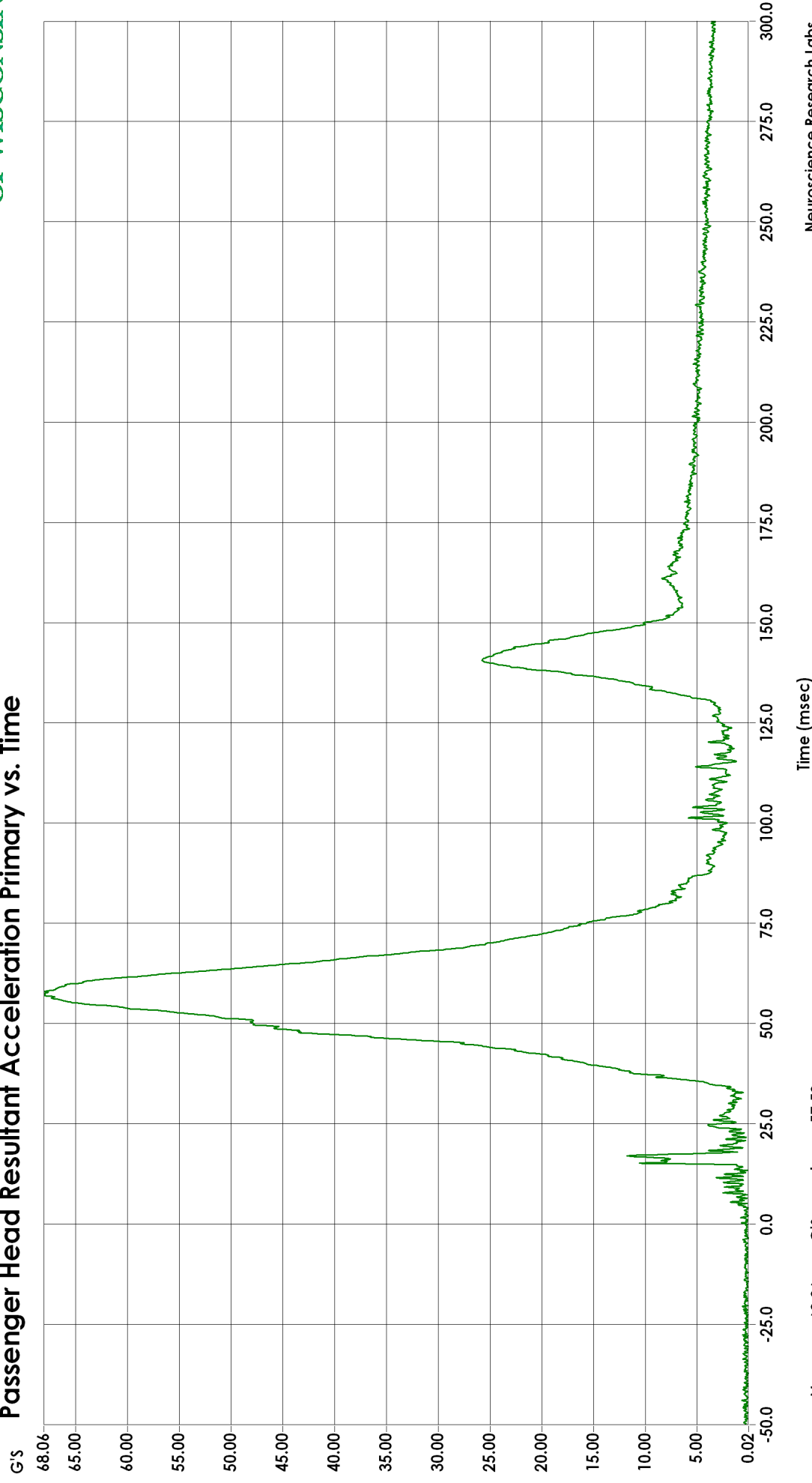
Max	8.58	G's	at	47.44	msec
Min	-33.77	G's	at	57.76	msec

11SN04 Plot 022

Neuroscience Research Labs
5000 West National Ave
Research 151
Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC1000	Sensor Location
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Passenger Head Resultant Acceleration Primary vs. Time



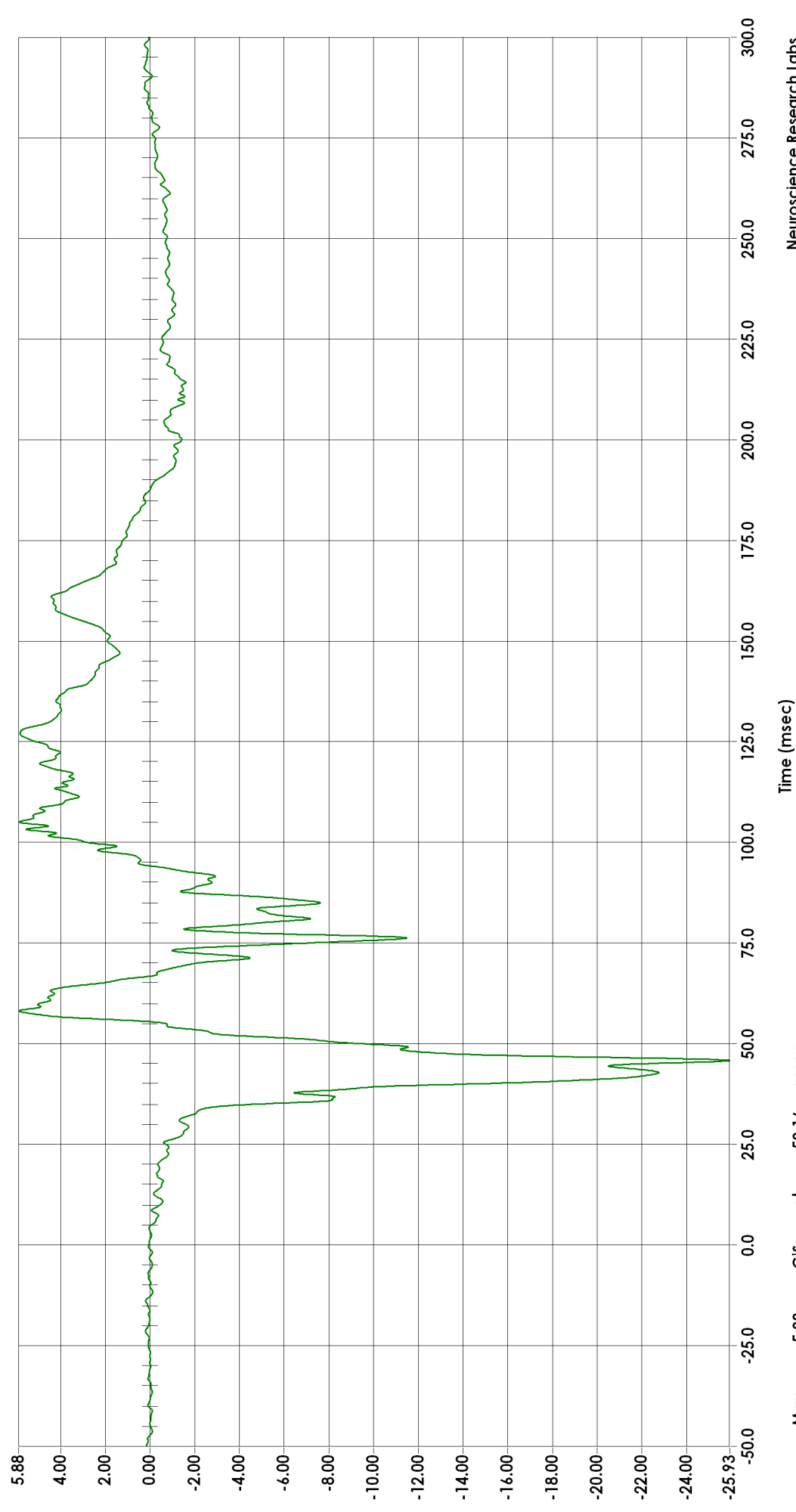
Max	68.06	G's	at	57.52	msec
Min	0.02	G's	at	-12.08	msec

11SN04 Plot 076

Test ID	11SN04	Filter	CFC180	SPNL	
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Location	
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Sensor Info	ENDEVCO 7264C-2KTZ-2-240
		Pretrigger Points	1250	Serial Number	P21661



Passenger Lower Spine T12 Acceleration (X) vs. Time



Max	5.88	G's	at	58.16	msec
Min	-25.93	G's	at	45.84	msec

11SN04 Plot 031

Neuroscience Research Labs
5000 West National Ave
Research 151
Milwaukee, WI 53295

Test ID

11SN04

Date

01-06-2011

Description

2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST

Filter

CFC180

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

SPNL

Sensor Info

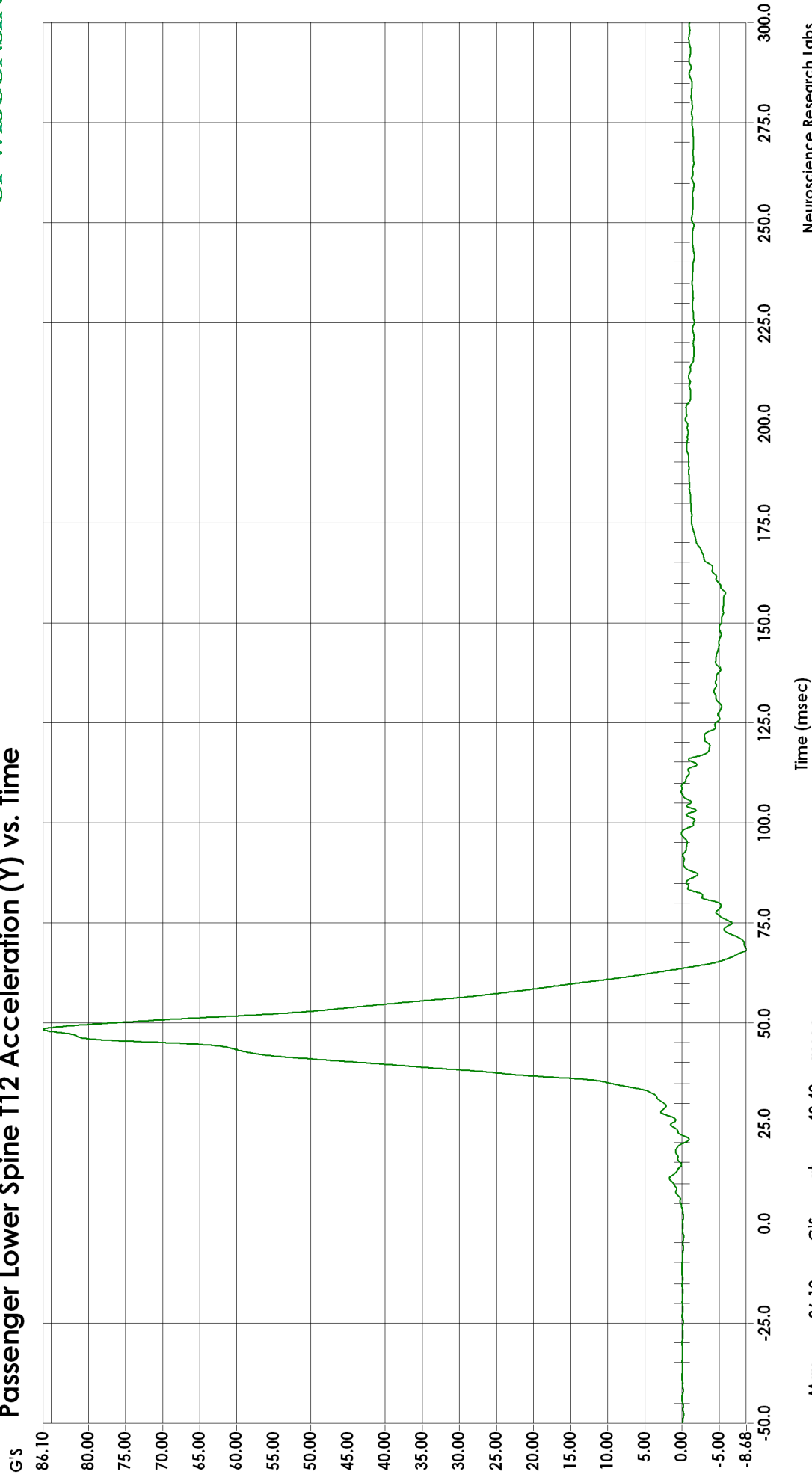
ENDEVCO 7264C-2KTZ-2-240

Serial Number

P24682



Passenger Lower Spine T12 Acceleration (Y) vs. Time



Max

86.10

G's

at

48.40

msec

Min

-8.68

G's

at

68.48

msec

Test ID

11SN04

Date

01-06-2011

Description

2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST

Filter

CFC180

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

SPNL

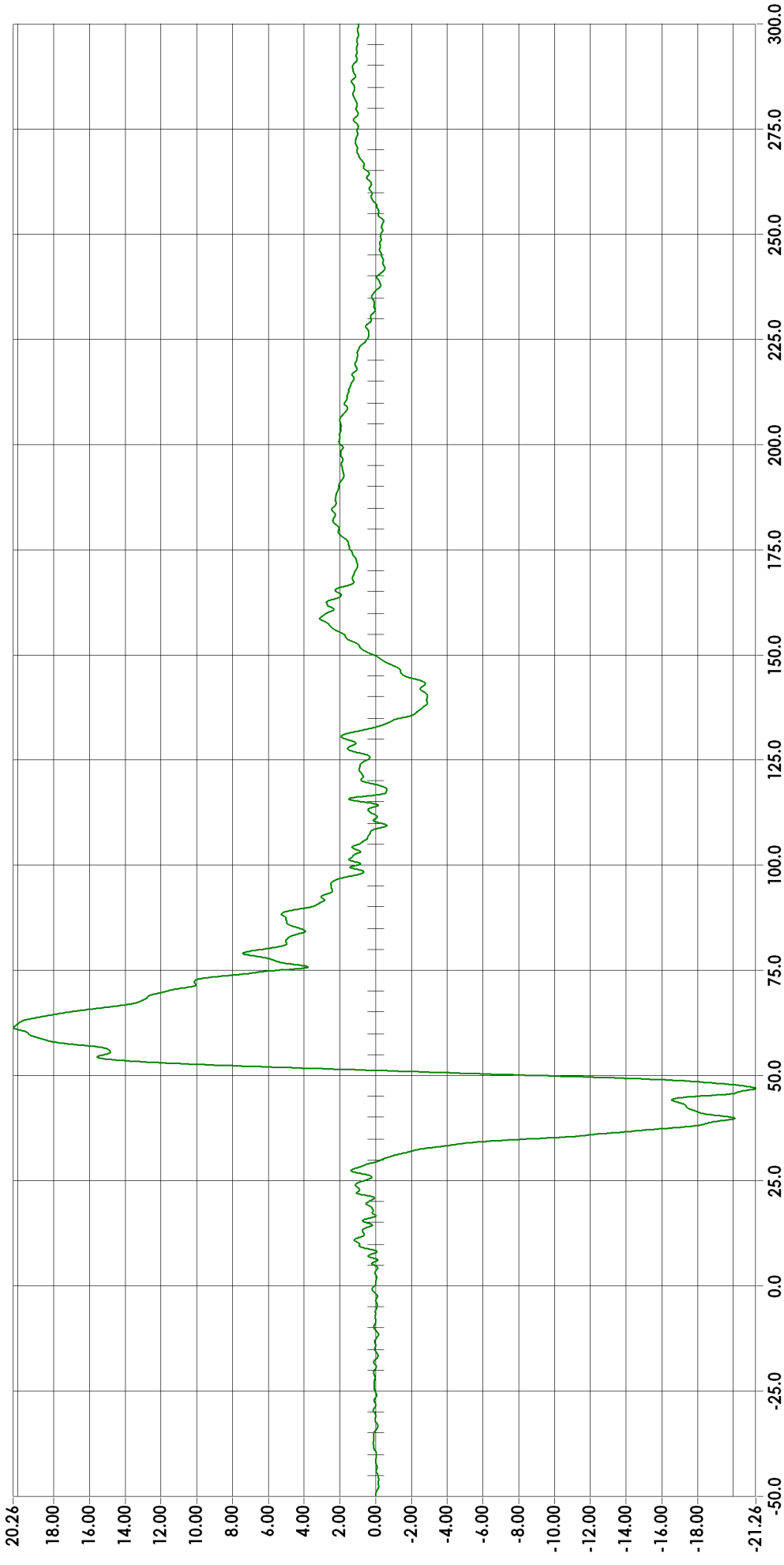
Sensor Info

ENDEVCO 7264C-2KTZ-2-240

Serial Number

P21788

Passenger Lower Spine T12 Acceleration (Z) vs. Time



Max

20.26

G's

at

61.44

msec

Min

-21.26

G's

at

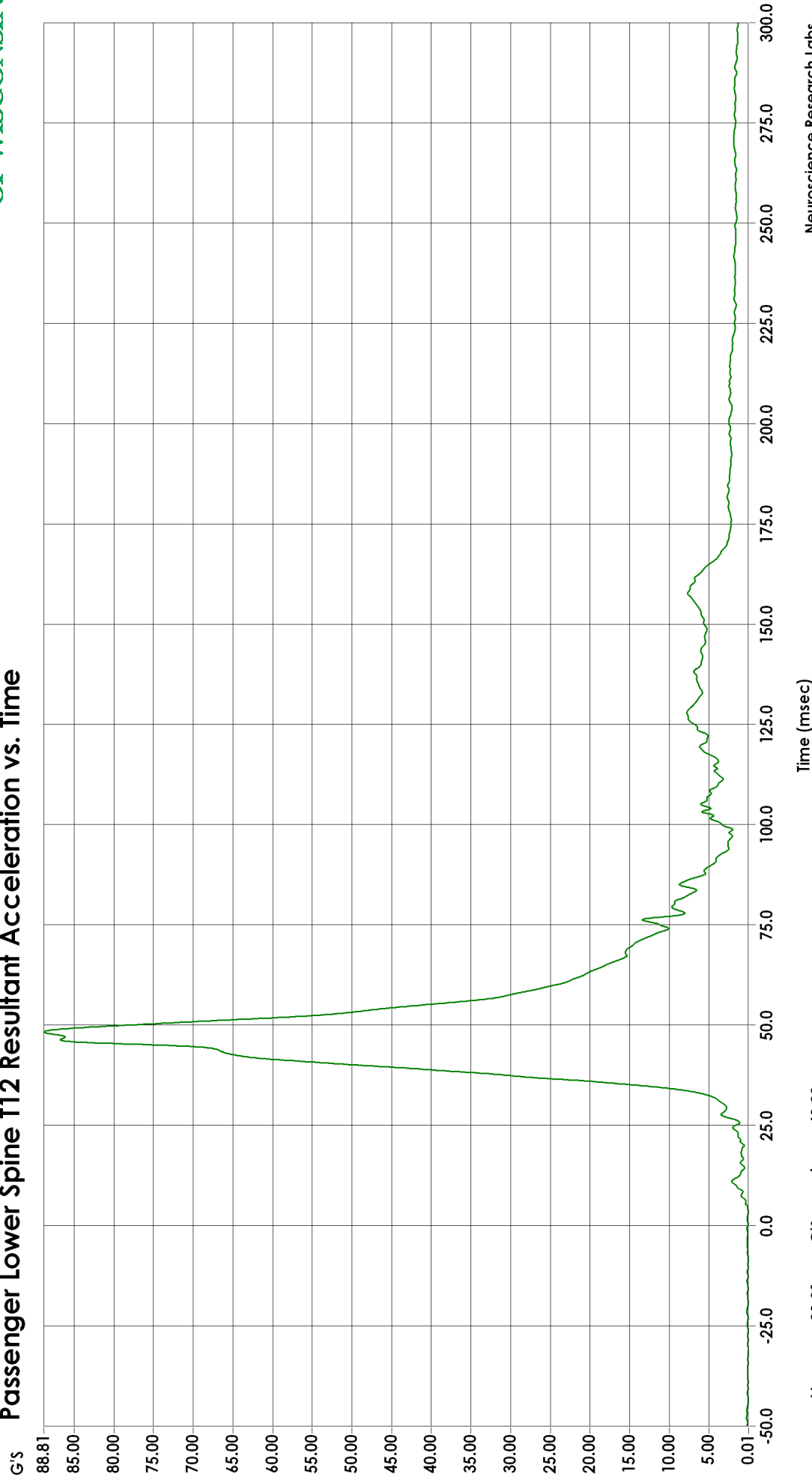
46.96

msec



Test ID	11SN04	Filter	CFC180	Sensor Location
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Passenger Lower Spine T12 Resultant Acceleration vs. Time



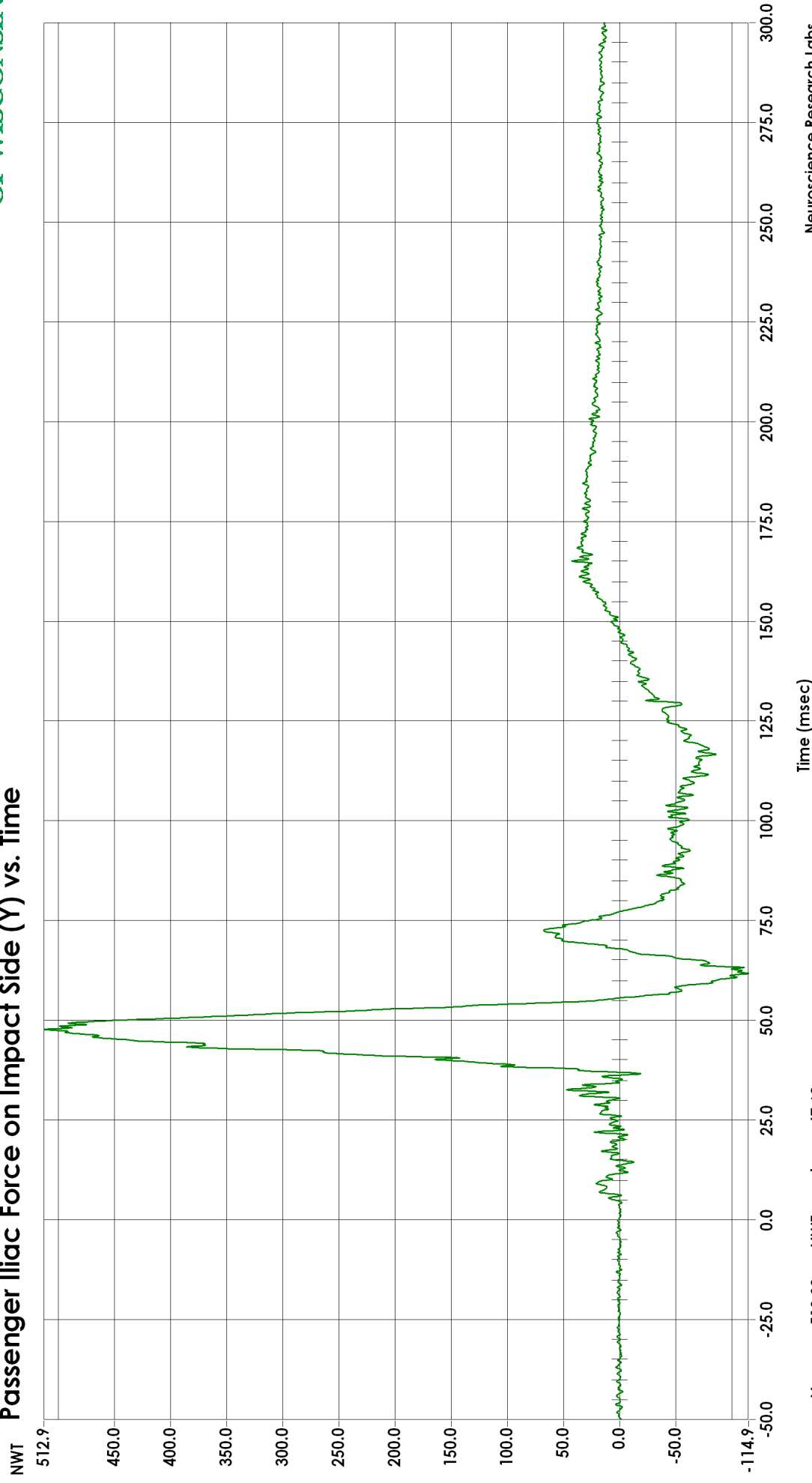
Max	88.81	G's	at	48.32	msec
Min	0.01	G's	at	-30.56	msec

11SN04 Plot 073

Neuroscience Research Labs
5000 West National Ave
Research 151
Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC600
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	PVIL
		Sensor Info	Denton 3228J
		Serial Number	3228J_283

Passenger Iliac Force on Impact Side (Y) vs. Time

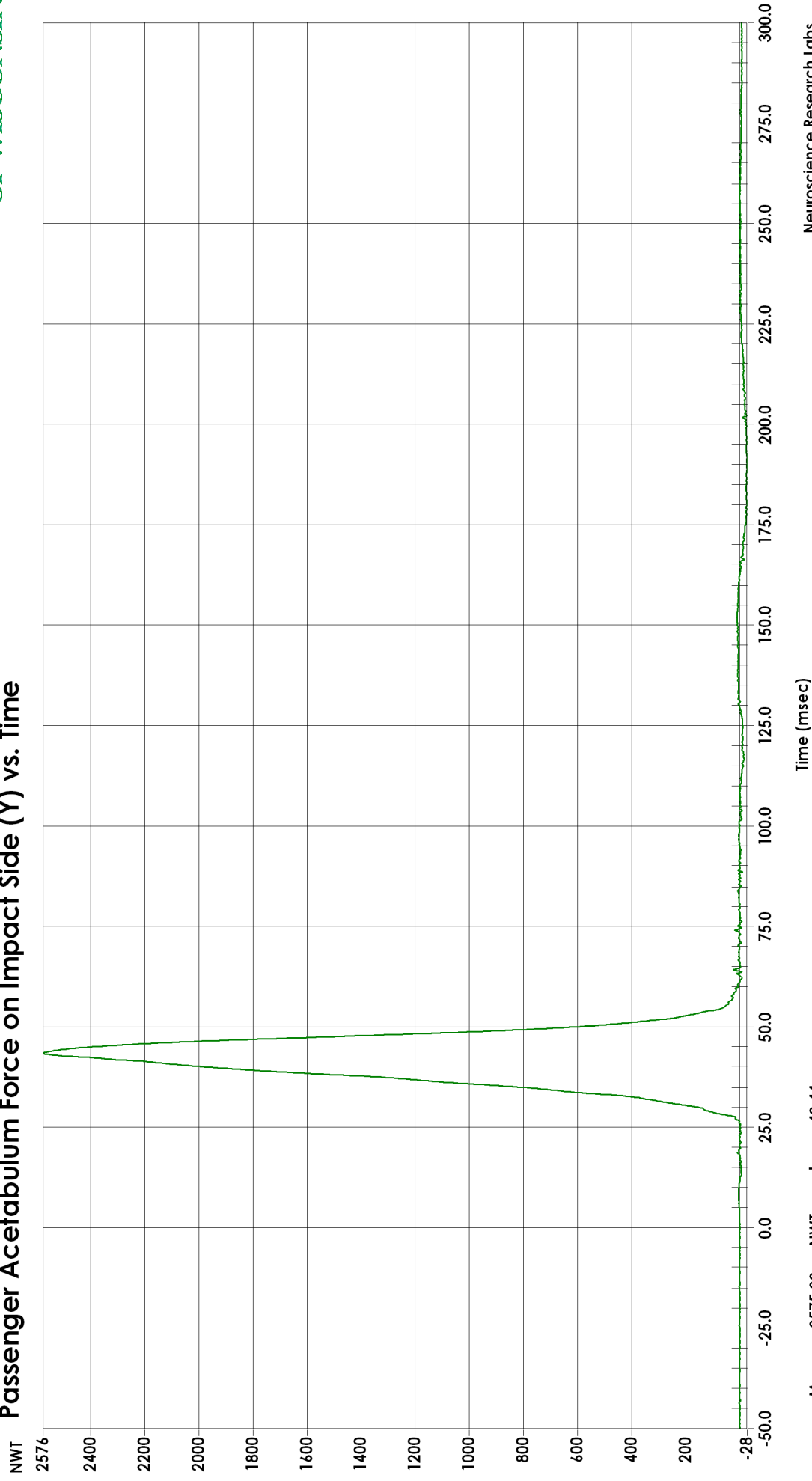


Max	512.92	NWT	at	47.68	msec
Min	-114.87	NWT	at	61.76	msec

11SN04 Plot 034

Test ID	11SN04	Filter	CFC600
Date	01-06-2011	Sampling Rate (Hz)	12500
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	PVHP
		Sensor Info	Denton 3249J
		Serial Number	3249J_270

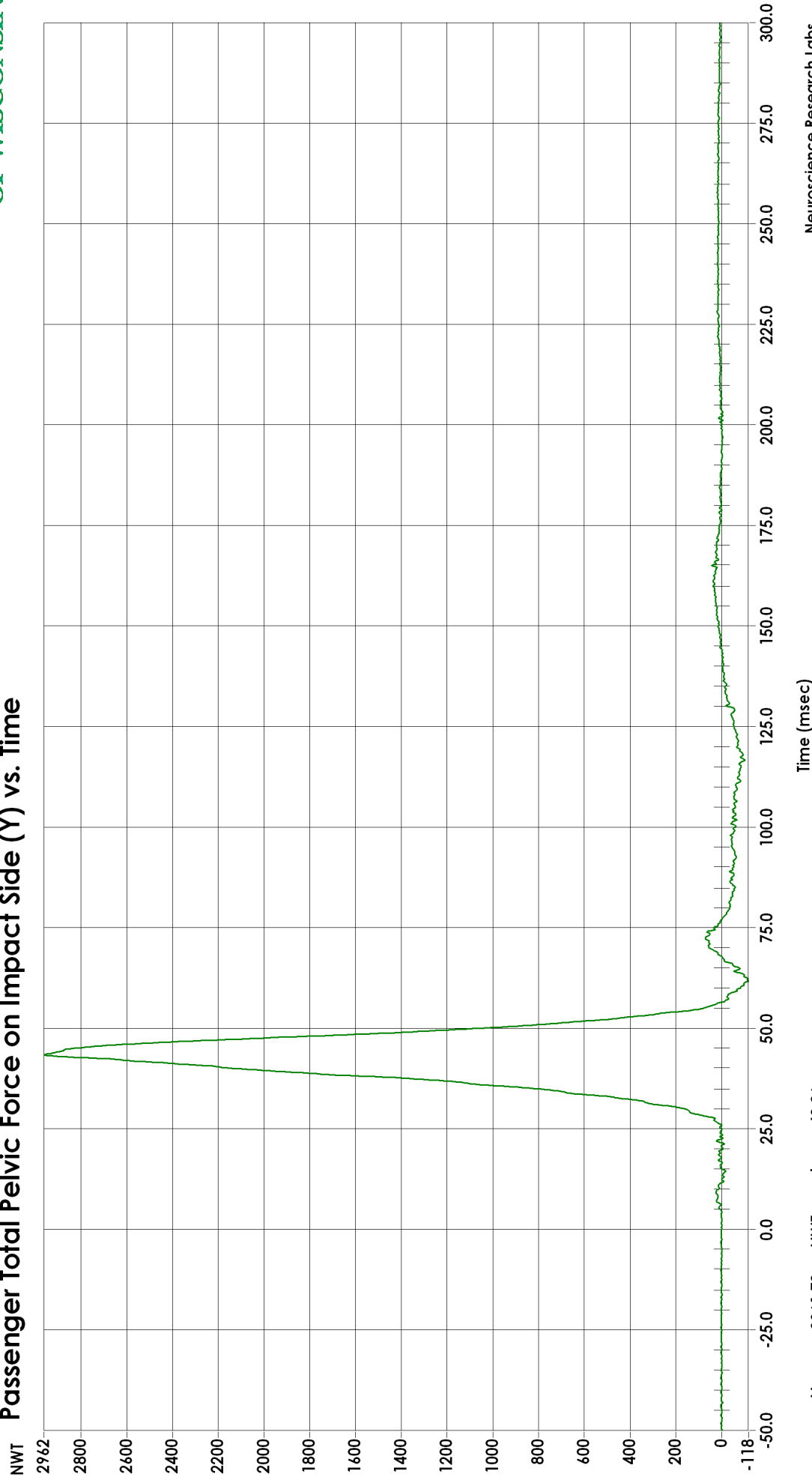
Passenger Acetabulum Force on Impact Side (Y) vs. Time



Neuroscience Research Labs
5000 West National Ave
Research 151
Milwaukee, WI 53295

Test ID	11SN04	Filter	CFC600	Sensor Location
Date	01-06-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 KIA FORTE 4 DOOR SEDAN SIDE NCAP MDB TEST	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Passenger Total Pelvic Force on Impact Side (Y) vs. Time



Max	2961.72	NWT	at	43.36	msec
Min	-118.41	NWT	at	61.76	msec

11SN04 Plot 074

Test Vehicle: 2011 Kia Forte 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0510
Test Date: January 6, 2011

APPENDIX C
ATD CALIBRATION DATA

**VERIFICATION TEST RESULTS SUMMARY
 PRE AND POST TEST**

CONFIGURED FOR LEFT SIDE IMPACT

ATD Serial Number 298

Test Sequences 4 & 5

TEST	PRE		POST	
SIDIIs ATD	COMMENTS	BY	COMMENTS	BY
EXTERNAL DIMENSIONS	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL THORAX WITH ARM IMPACT	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL THORAX WITHOUT ARM IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL PELVIS ACETABULUM IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL PELVIS ILIAC IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL SHOULDER IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL ABDOMEN IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
SIDIIs LATERAL NECK TEST	Pass	Mike Rawski	Pass	Mike Rawski
SIDIIs LATERAL HEAD DROP	Pass	Mike Rawski	Pass	Mike Rawski

**VERIFICATION TEST RESULTS SUMMARY
 PRE AND POST TEST (CONTINUED)**

CONFIGURED FOR LEFT SIDE IMPACT

ATD Serial Number F038 Test Sequences 3 & 4

TEST	PRE		POST	
ESIIre ATD	COMMENTS	BY	COMMENTS	BY
EXTERNAL DIMENSIONS	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL FULL BODY THORAX IMPACT	Pass	Mike Rawski	Pass	Mike Rawski
INDIVIDUAL RIB DROP TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL SPINE TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL PELVIS IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
LATERAL SHOULDER IMPACT TEST	Pass	Mike Rawski	Pass	Mike Rawski
ABDOMEN IMPACT	Pass	Mike Rawski	Pass	Mike Rawski
ESIIre LATERAL NECK TEST	Pass	Mike Rawski	Pass	Mike Rawski
ESIIre LATERAL HEAD DROP	Pass	Mike Rawski	Pass	Mike Rawski

SUMMARY
SIDIIs AND ESIIre PRE AND POST VERIFICATION

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs LATERAL PELVIS ILIAC IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-13-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	22.1	21.0
Relative Humidity (%)	10-70	29.6	25.6
Pendulum Speed (m/s)	4.2-4.4	4.20	4.23
Peak Impactor Acceleration (G)	36-45	43.6	42.2
Max Lateral Pelvis Acceleration (G)	28-39	35.9	35.1
Max Iliac Force (N)	4.10-5.10	5.08	4.80

SIDIIs LATERAL PELVIS ACETABULUM IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-13-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	22.2	21.4
Relative Humidity (%)	10-70	29.9	23.7
Pendulum Speed (m/s)	6.6-6.8	6.73	6.73
Peak Impactor Acceleration (G)	38-47	46.0	46.5
Peak Lateral Pelvis Acceleration (G)	N/A	-	-
Peak Lateral Pelvis Acceleration after 6ms (G)	34-42	40.3	39.7
Peak Acetabulum Force (kN)	3.60-4.30	4.13	4.27

SIDIIs LATERAL THORAX WITHOUT ARM IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-12-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.6	21.2
Relative Humidity (%)	10-70	30.7	30.2
Pendulum Speed (m/s)	4.2-4.4	4.25	4.25
Peak Upper Rib Deflection (mm)	32-40	34.4	36.0
Peak Middle Rib Deflection (mm)	39-45	41.1	39.9
Peak Lower Rib Deflection (mm)	35-43	41.2	37.4
Peak Upper Spine Acceleration (G)	13-17	16.4	16.0
Peak Lower Spine Acceleration (G)	7-11	10.5	9.00
Peak Impactor Acceleration (G)	14-18	17.0	16.0

SUMMARY
SIDIIs PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs LATERAL THORAX WITH ARM IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-12-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.3	21.6
Relative Humidity (%)	10-70	31.1	30.3
Pendulum Speed (m/s)	6.6-6.8	6.70	6.70
Peak Shoulder Deflection (mm)	31-40	31.3	35.7
Peak Upper Rib Deflection (mm)	25-32	27.0	28.9
Peak Middle Rib Deflection (mm)	30-36	32.2	31.2
Peak Lower Rib Deflection (mm)	32-38	35.8	32.3
Peak Upper Spine Acceleration (G)	34-43	40.6	38.8
Peak Lower Spine Acceleration (G)	29-37	34.0	35.7
Peak Impactor Acceleration after 5 ms (G)	30-36	34.3	33.8

SIDIIs LATERAL ABDOMINAL IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-13-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.9	21.5
Relative Humidity (%)	10-70	30.4	29.2
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Upper Rib Deflection (mm)	36-47	40.1	37.9
Peak Lower Rib Deflection (mm)	33-44	39.4	34.9
Peak Lower Spine Acceleration (G)	9-14	11.5	11.8
Peak Impactor Acceleration (G)	12-16	15.0	15.1

SIDIIs LATERAL SHOULDER IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-7-10	1-12-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.3	21.0
Relative Humidity (%)	10-70	29.2	33.7
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Shoulder Deflection (mm)	28-37	33.6	31.1
Peak Upper Spine Lateral Acceleration (G)	17-22	19.6	20.0
Peak Impactor Acceleration (G)	13-18	16.4	16.3

SUMMARY
SIDIIs PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs LATERAL NECK

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-7-10	1-12-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.3	21.3
Relative Humidity (%)	10-70	29.8	27.2
Pendulum Speed (m/s)	5.51-5.63	5.57	5.58
Pendulum Pulse 10ms (m/s)	2.20-2.80	2.50	2.22
Pendulum Pulse 15ms (m/s)	3.30-4.10	3.80	3.75
Pendulum Pulse 20ms (m/s)	4.40-5.40	5.18	5.12
Pendulum Pulse 25ms (m/s)	5.40-6.10	5.86	5.87
Pendulum Pulse between 25ms and 100ms (m/s)	5.50-6.20	5.88	5.91
Max D-Plane rotation (deg)	71-81	71.9	77.1
Time of Max D-Plane Rotation (ms)	50-70	66.0	69.9
Max OC Moment during Rotation (Nm)	36-44	41.2	41.3
Time of Moment Decay from Peak to 0 Nm (ms)	102-126	126.0	116.0

SIDIIs LATERAL HEAD DROP

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-28-10	1-11-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	20.7	21.6
Relative Humidity (%)	10-70	30.3	18.1
Resultant Max (G)	115-137	117.6	117.6
Longitudinal Max (G)	<15	0.92	2.45

SUMMARY
SIDIIs PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs MEASUREMENTS

TEST PARAMETER	SPEC	PRE	POST
Date	-	10-8-10	1-13-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.8	21.0
Relative Humidity (%)	10-70	29.7	28.9
Sitting Height	780 ±8.0	774	773
Shoulder Pivot Height	445 ±8.0	445	445
H-Point Height	84 ±5.0	86	85
H-Point from Seat Back	146 ±5.0	150	145
Shoulder Pivot from Backline	102 ±5.0	100	104
Thigh Clearance	127 ±8.0	120	125
Head Breadth	144 ±4.0	142	144
Head Back from Backline	43 ±3.0	45	45
Head Depth	183 ±5.0	179	181
Head Circumference	546 ±5.0	545	547
Buttock to Knee Length	527 ±13.0	521	520
Popliteal Height	356 ±13.0	355	355
Knee Pivot to Floor Height	401 ±8.0	398	395
Buttock Popliteal Length	429 ±13.0	430	429
Chest Depth w/o Jacket	203 ±8.0	201	205
Foot Length	224 ±8.0	221	225
Hip Breadth	318 ±5.0	320	320
Arm Length	254 ±5.0	253	254
Knee Joint to Seat Back	458 ±8.0	461	454
Shoulder Width	349 ±8.0	348	349
Foot Width	86 ±8.0	85	85
Chest Circumference w/Jacket	866 ±15.0	860	856
Waist Circumference	776 ±15.0	781	780

SUMMARY
ESIIre PRE AND POST VERIFICATION

CONFIGURED FOR LEFT SIDE IMPACT

ESIIre LATERAL HEAD DROP

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-7-10	1-11-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	20.6	21.5
Relative Humidity (%)	10-70	48.1	18.1
Resultant Max (G)	125-155	152.6	152.6
Longitudinal Max (G)	<15	5.14	5.14

ESIIre LATERAL NECK TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-10-10	1-11-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	22.1	21.6
Relative Humidity (%)	10-70	32.5	33.2
Pendulum Speed (m/s)	3.3-3.5	3.46	3.35
Pendulum Pulse 0-1.0 ms (m/s)	(-0.05)-0.00	-0.001	-0.05
Pendulum Pulse 2.5-3.0 ms (m/s)	(-0.375) - (-0.25)	-0.26	-0.33
Pendulum Pulse 13.5-14.0 ms (m/s)	(-3.7) - (-3.20)	-3.20	-3.42
Pendulum Pulse 17 ms (m/s)	-3.7	-3.62	-3.64
Max D-Plane rotation (deg)	49-59	52.5	50.5
Time of Max D-Plane Rotation (ms)	54-66	62.0	60.2
Time of Moment Decay from Peak to 0 Nm (ms)	53-88	58.0	58.0

ESIIre INDIVIDUAL RIB DROP TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-7-10	1-11-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	22.2	21.6
Relative Humidity (%)	10-70	40.8	18.1
Drop Height 459 mm	36-40	U-37.2 M-37.6 L-39.1	U-36.6 M-37.1 L-38.7
Drop Height 815 mm	46-51	U-49.6 M-49.6 L-50.2	U-49.1 M-49.6 L-50.2

ESIIre FULL BODY THORAX IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-20-10	1-13-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	20.8	22.2
Relative Humidity (%)	10-70	47.1	33.7
Pendulum Speed (m/s)	5.4-5.6	5.40	5.40
Upper Rib Deflection (mm)	34-41	37.8	36.8
Middle Rib Deflection (mm)	37-45	42.2	41.6
Lower Rib Deflection (mm)	37-44	41.3	41.0
Peak Impactor Force after 6ms (N)	5100-6200	5316.2	5452.3

SUMMARY
ESIIre PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

ESIIre LATERAL ABDOMEN IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-30-10	1-14-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	20.5	22.1
Relative Humidity (%)	10-70	38.6	25.0
Pendulum Speed (m/s)	3.9-4.1	4.04	3.95
Max Sum of 3 Abdominal Loadcells (N)	2200-2700	2526.8	2491.9
Time of Max Sum of 3 Abdominal Loadcells from T-Zero (ms)	10-12.3	11.8	11.6
Peak Lateral Impactor Force (N)	4000-4800	4602.9	4349.0
Time of Peak Lateral Impactor Force from T-Zero (ms)	10.6-13.0	11.8	10.6

ESIIre LATERAL SPINE TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-28-10	1-12-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	21.9	21.8
Relative Humidity (%)	10-70	31.3	21.5
Pendulum Speed (m/s)	5.95-6.15	6.14	6.09
Pendulum Pulse 0-1.0 ms (m/s)	(-0.05)-0.00	-0.04	-0.04
Pendulum Pulse 2.7-3.7 ms (m/s)	(-0.425)-(-0.24)	-0.49	-0.48
Pendulum Pulse 24.5-27.0 ms (m/s)	(-6.5)-(-5.8)	-6.44	-6.44
Pendulum Pulse 30 ms (m/s)	-6.5	-6.43	-6.42
Max D-Plane rotation (deg)	45-55	46.2	46.9
Time of Max D-Plane Rotation (ms)	39-53	44.6	44.8
Time of Moment Decay from Peak to 0 Nm (ms)	37-57	38.6	38.1

ESIIre LATERAL PELVIS IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-20-10	1-14-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	22.1	22.1
Relative Humidity (%)	10-70	34.7	25.0
Pendulum Speed (m/s)	4.2-4.4	4.35	4.30
Peak Lateral Impactor Force (N)	4700 – 5400	4975.6	5063.4
Time of Peak Lateral Impactor Force from T-Zero (ms)	11.8-16.1	12.5	14.0
Peak Pubic Symphysis Force (N)	1230-1590	1391.6	1391.3
Time of Peak Pubic Symphysis Force (ms)	12.2-17.0	13.5	14.7

SUMMARY
ESIlre PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

ESIlre LATERAL SHOULDER IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-20-10	1-13-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	22.1	22.2
Relative Humidity (%)	10-70	47.2	33.7
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Lateral Acceleration of Impactor (G)	7.5-10.5	7.77	8.30

ESIlre MEASUREMENTS

TEST PARAMETER	SPEC	PRE	POST
Date	-	9-30-10	1-14-11
Sequential Test Number	-	3	4
Temperature (°C)	20.6-22.2	22.1	22.1
Relative Humidity (%)	10-70	38.6	26.0
Sitting Height	909 ±9	903	905
Seat to Shoulder Joint	565 ±7	566	560
Seat to Lower Face of Thoracic Spine Box	351 ±5	355	350
Seat to Hip Joint (center of bolt)	100 ±3	100	100
Sole to Seat, Sitting	442 ±9	443	440
Head Width	155 ±3	153	156
Shoulder/Arm Width	470 ±9	476	475
Thorax Width	327 ±5	324	323
Abdomen Width	280 ±7	283	281
Pelvis Lap Width	366 ±7	362	360
Head Depth	201 ±5	201	201
Thorax Depth	267 ±5	270	268
Abdomen Depth	199 ±5	200	199
Pelvis Depth	240 ±5	237	238
Back of Buttocks to Hip Joint (center of bolt)	155 ±5	152	153
Back of Buttocks to Front Knee	606 ±9	601	601

**ATD INSPECTION LIST
PRE AND POST TEST**

CONFIGURED FOR LEFT SIDE IMPACT

		SIDIs		ESIRE	
		PRE	POST	PRE	POST
	Date	12-29-10	1-10-11	12-29-10	1-10-11
	Performed By	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
PART	INSPECTION	RESULT	RESULT	RESULT	RESULT
Skin	Visual	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Head	Visual, Ballast, Accelerometer Mount	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Neck	Visual and Palpated, Cable Torque	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Spine Box	Visual, Ballast, Weldment, Accelerometer Mount	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Rib Cage	Visual, Palpated, Measured, Stiffness	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Sternum	Visual	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Lumbar Spine	Visual	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Abdomen	Visual	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Pelvis	Visual, Palpated, Accelerometer Mount	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Upper Legs	Visual	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Knees	Visual, Stops, Inserts	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Lower Legs	Visual, Range of Motion	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Ankles	Visual, Range of Motion	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Feet	Visual, Range of Motion	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Joints	1 to 2 G Range	Mike Rawski	Mike Rawski	Mike Rawski	Mike Rawski
Other	-	-	-	-	-

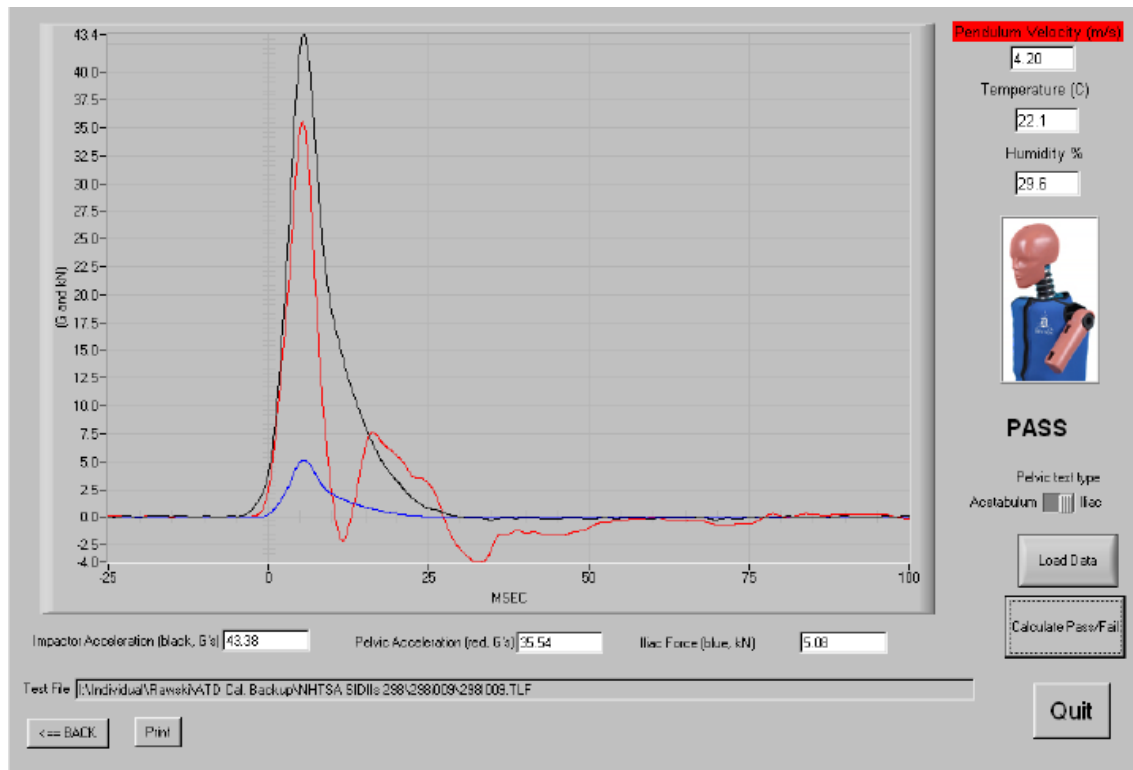


Figure C-1: SIDII Lateral Pelvis Iliac Impact Pre-Test

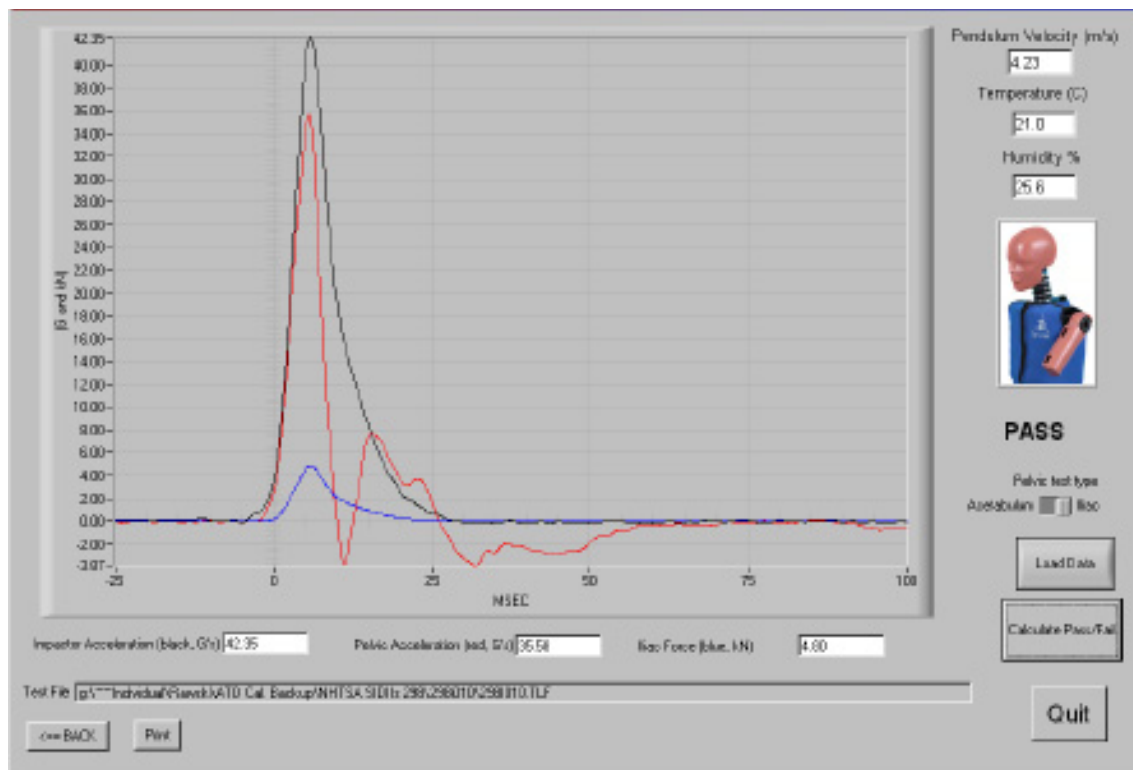


Figure C-2: SIDII Lateral Pelvis Iliac Impact Post-Test

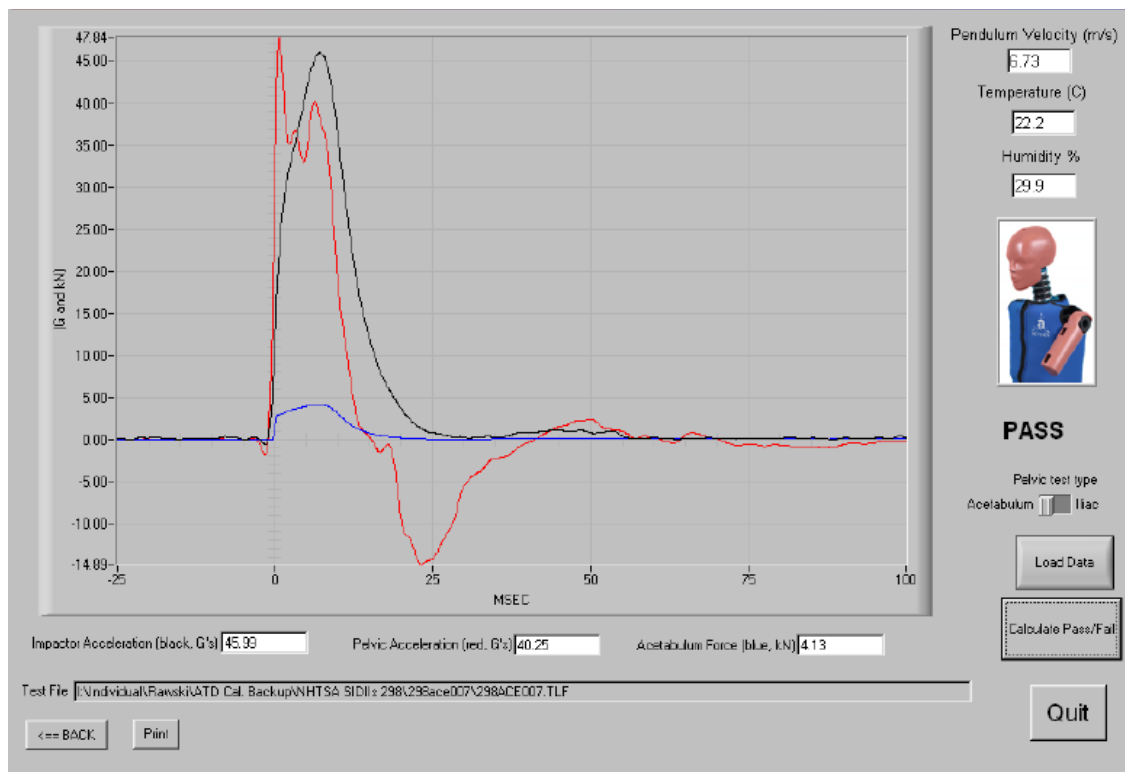


Figure C-3: SIDII Lateral Pelvis Acetabulum Impact Pre-Test

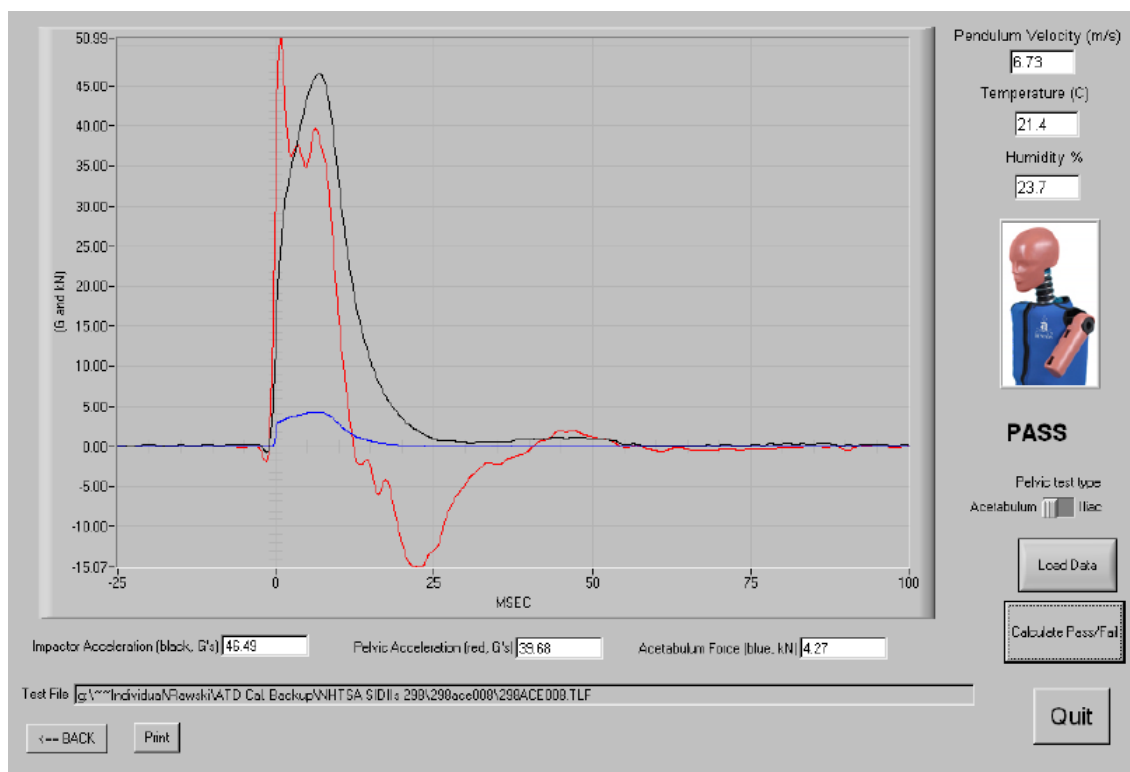


Figure C-4: SIDII Lateral Pelvis Acetabulum Impact Post-Test

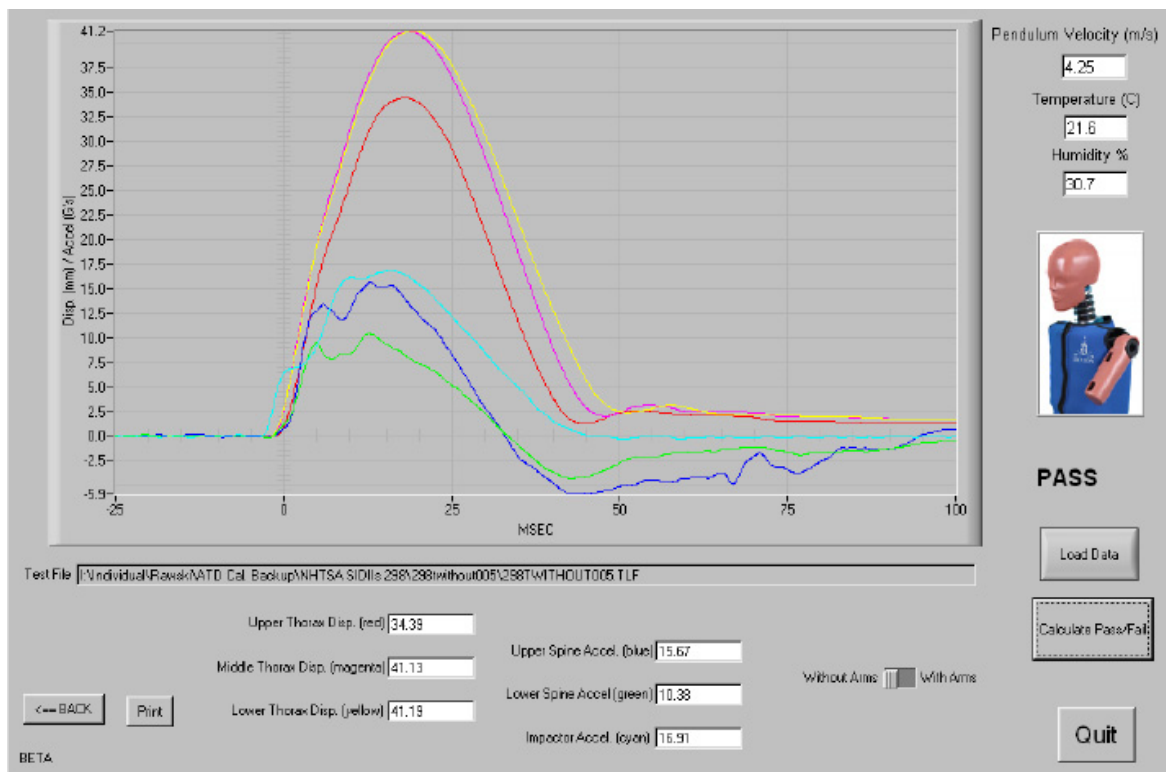


Figure C-5: SIDIIS Lateral Thorax Without Arm Impact Pre-Test

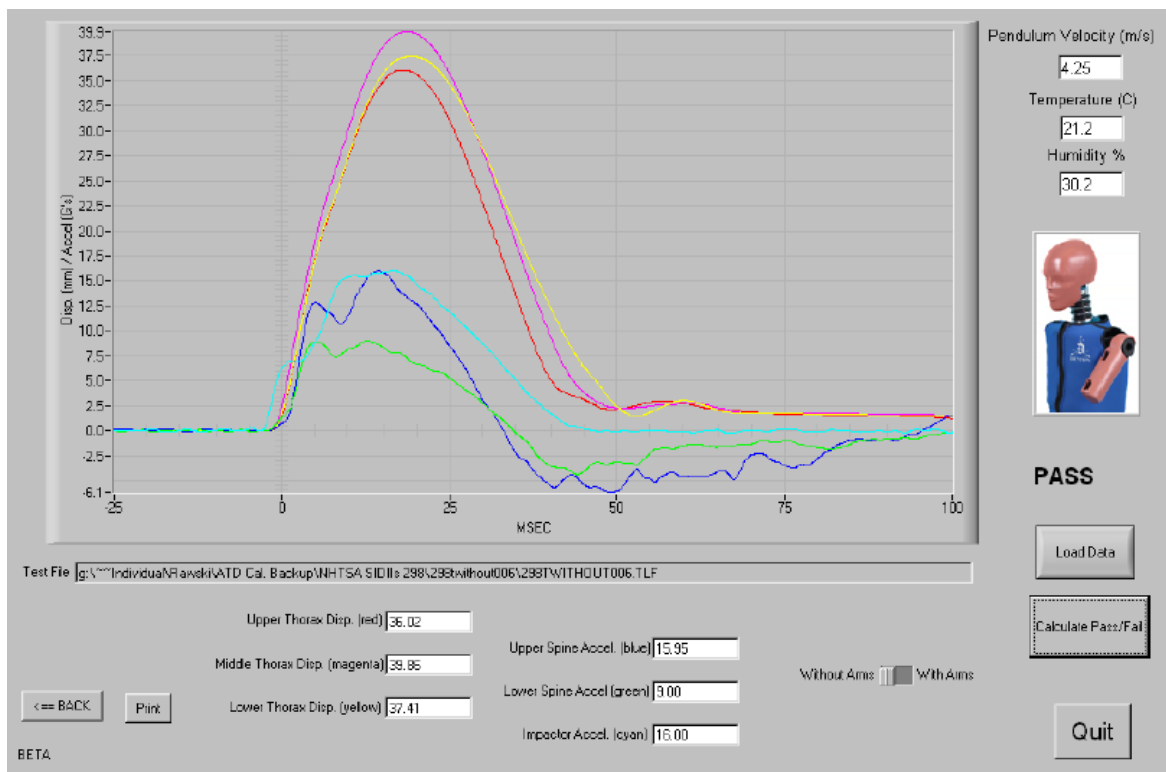


Figure C-6: SIDIIS Lateral Thorax Without Arm Impact Post-Test

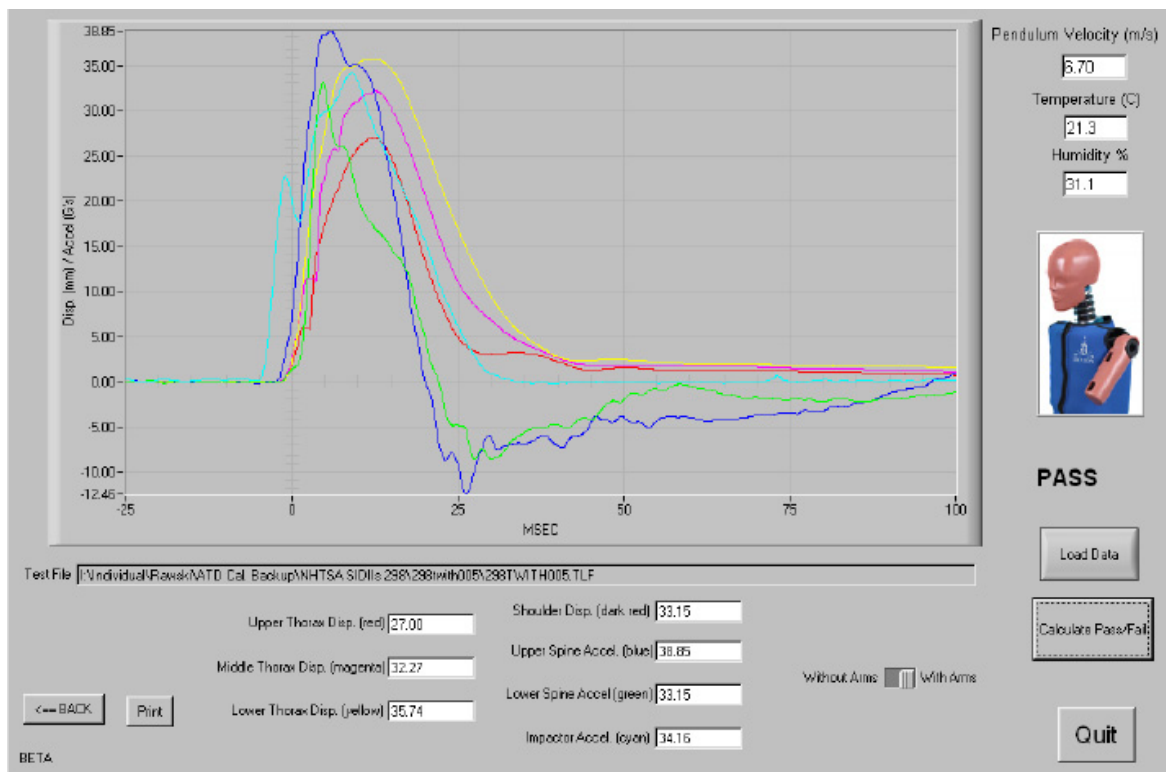


Figure C-7: SIDIIS Lateral Thorax With Arm Impact Pre-Test

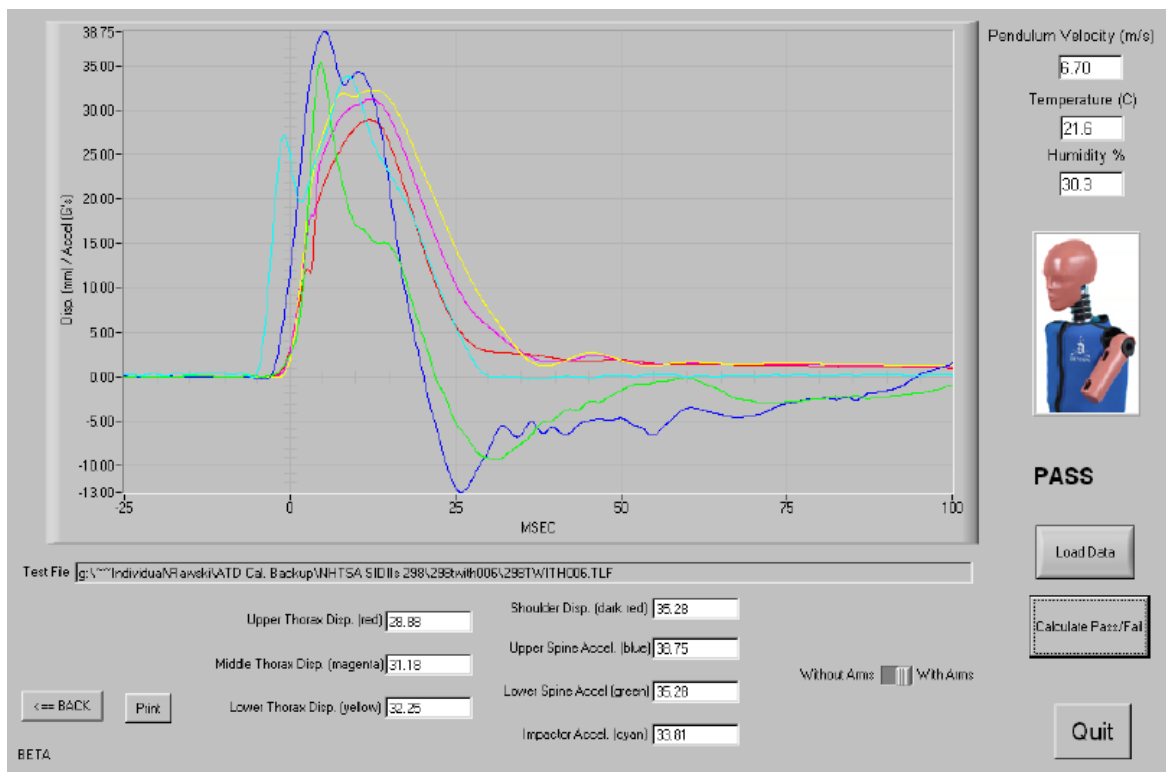


Figure C-8: SIDIIS Lateral Thorax With Arm Impact Post-Test

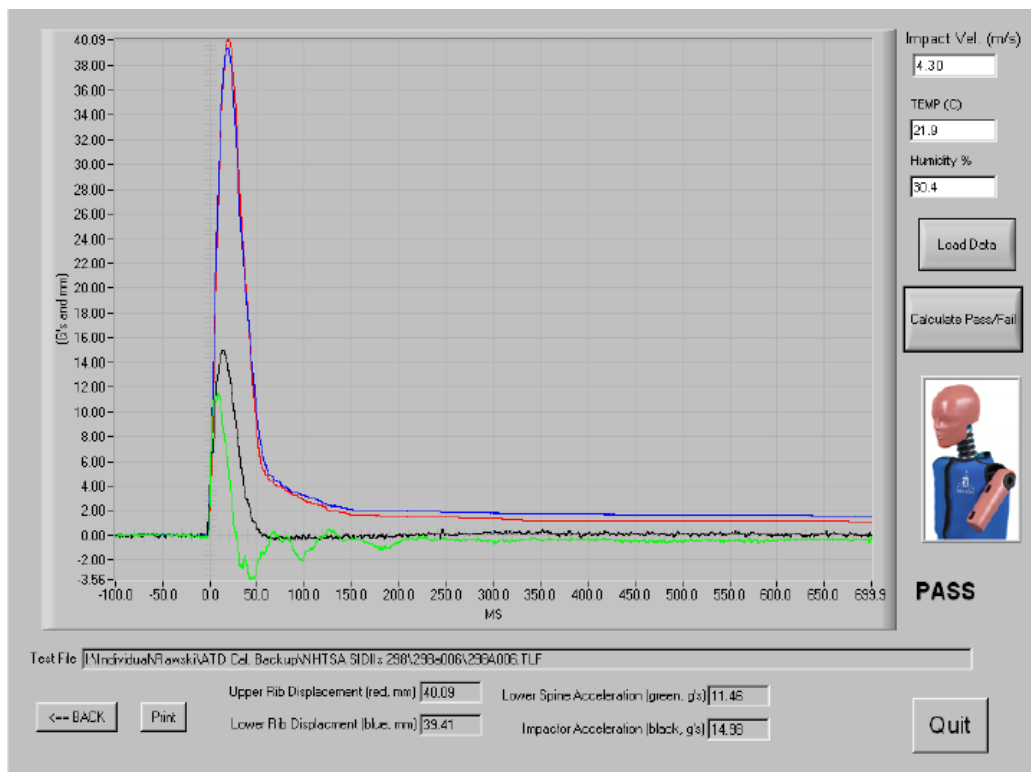


Figure C-9: SIDII Lateral Abdominal Impact Pre-Test

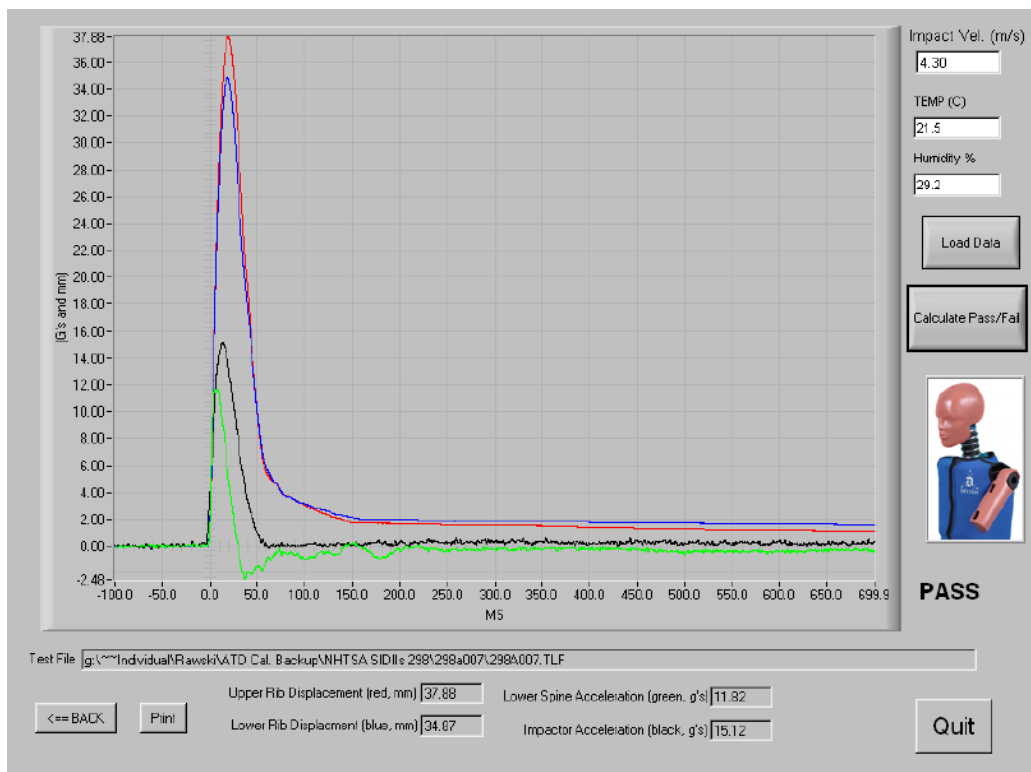


Figure C-10: SIDII Lateral Abdominal Impact Post-Test

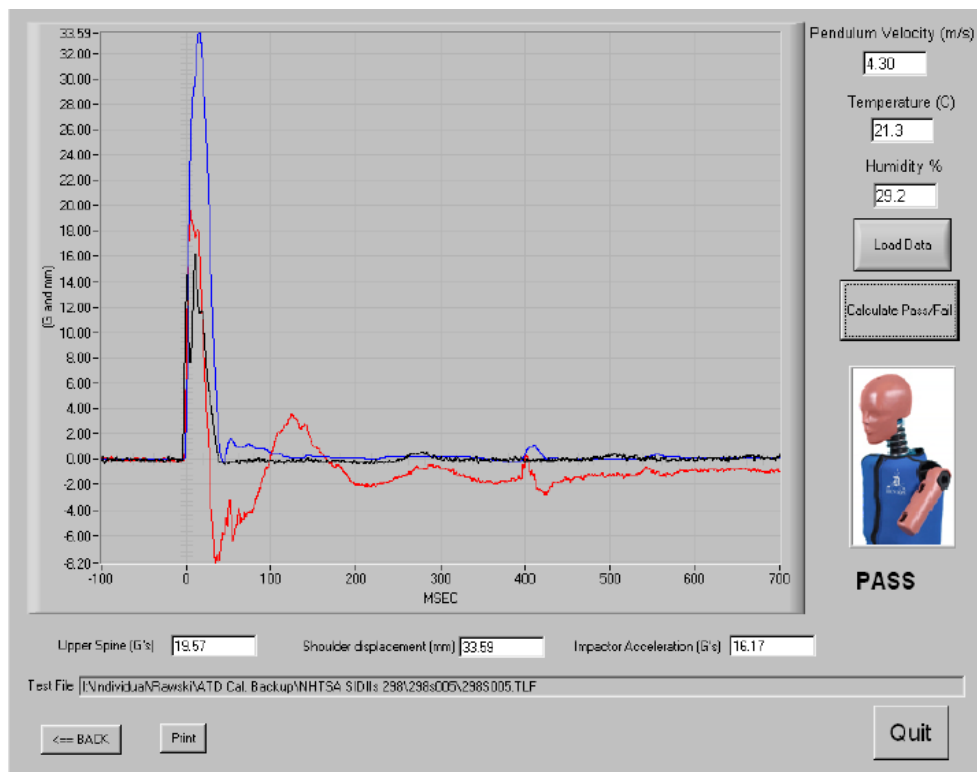


Figure C-11: SIDII's Lateral Shoulder Impact Pre-Test

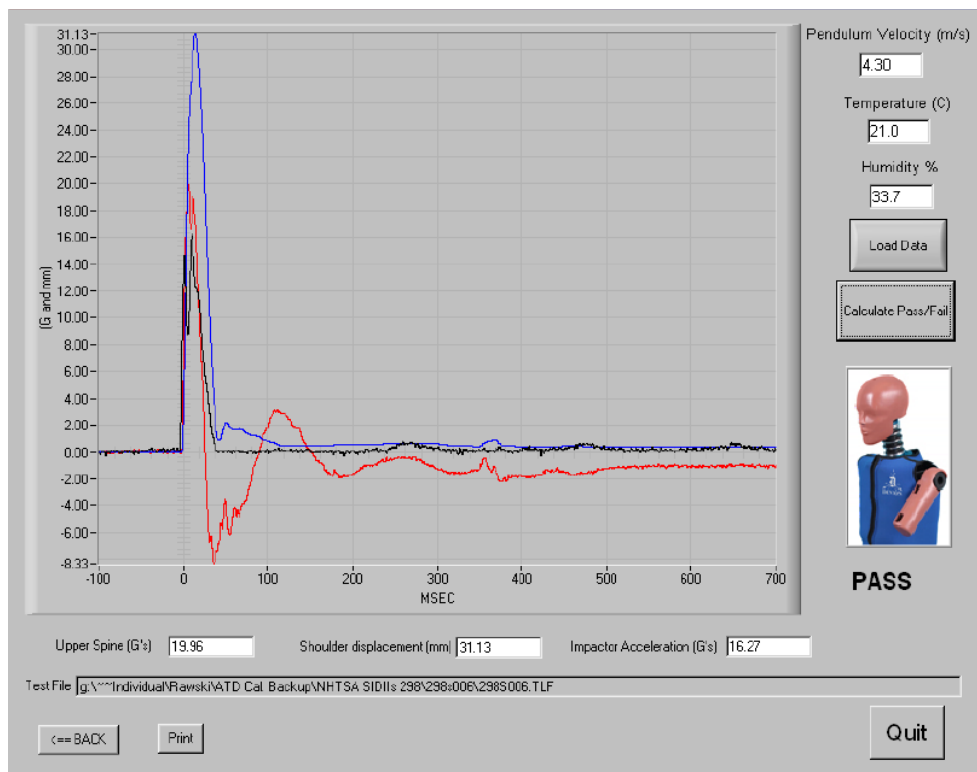


Figure C-12: SIDII's Lateral Shoulder Impact Post-Test

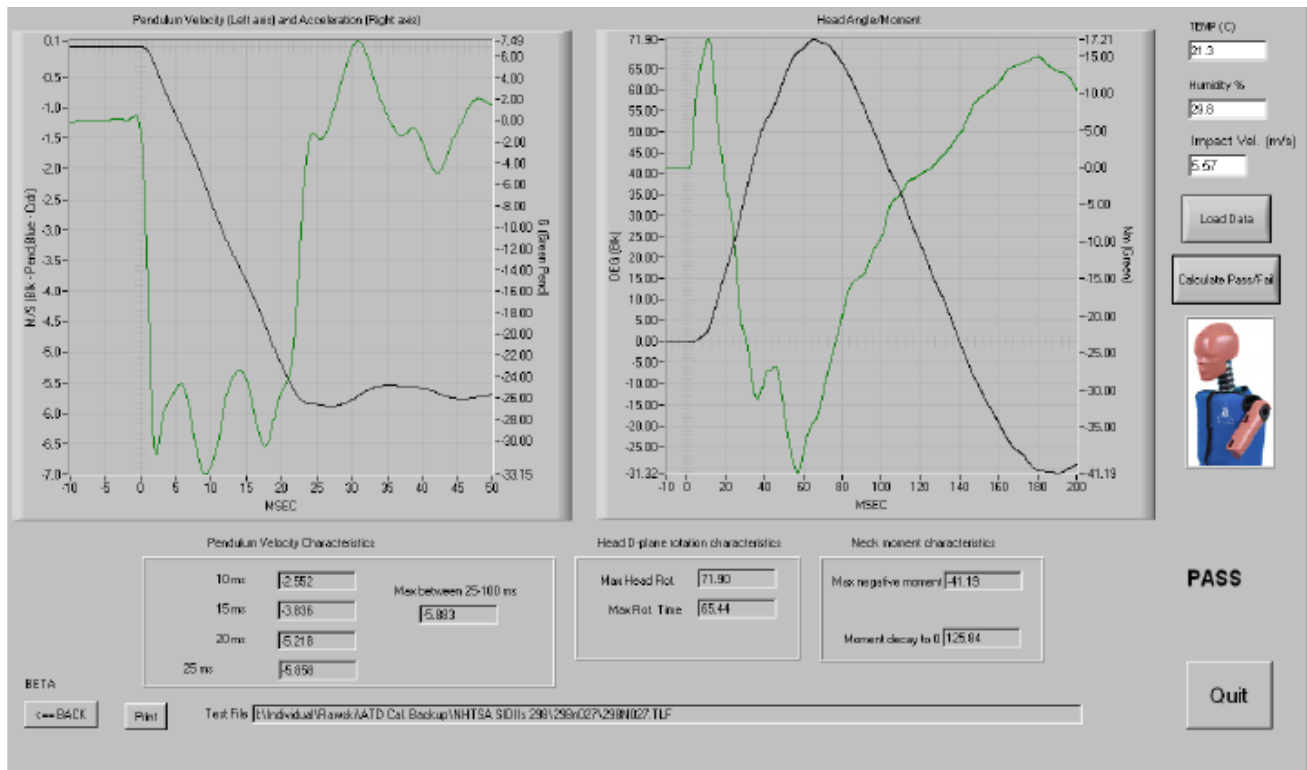


Figure C-13: SIDII Lateral Neck Pre-Test

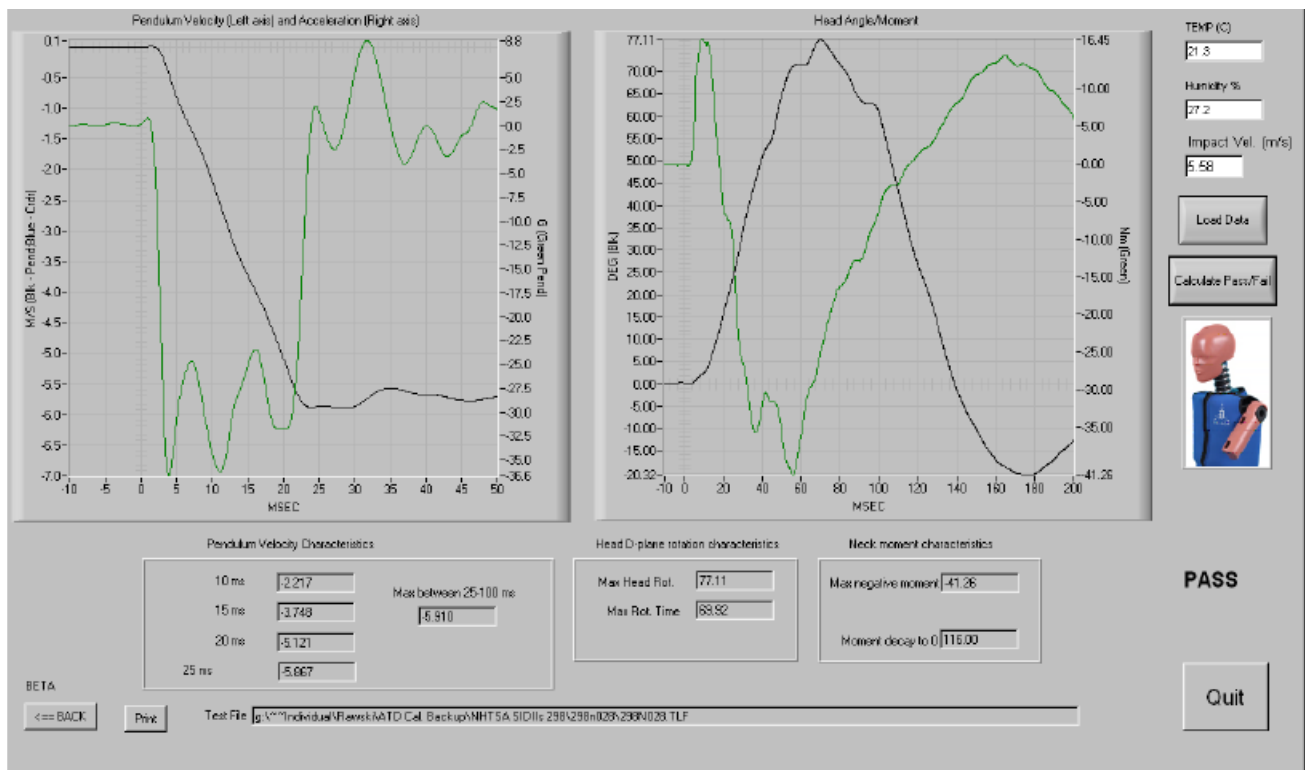


Figure C-14: SIDII Lateral Neck Post-Test

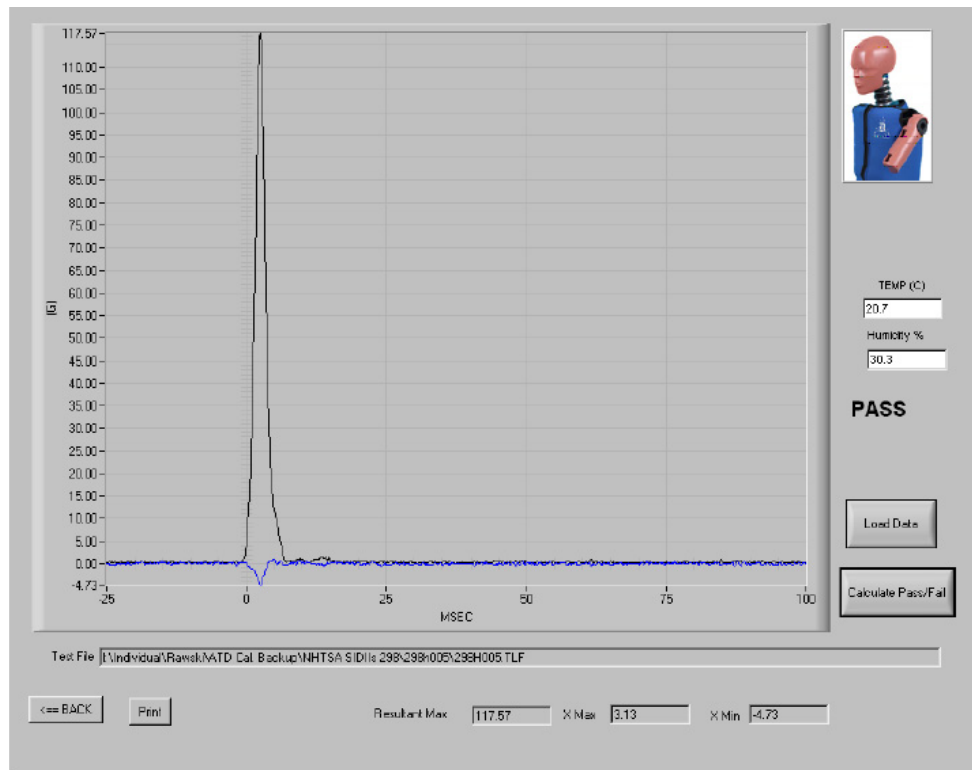


Figure C-15: SIDII Lateral Head Drop Pre-Test

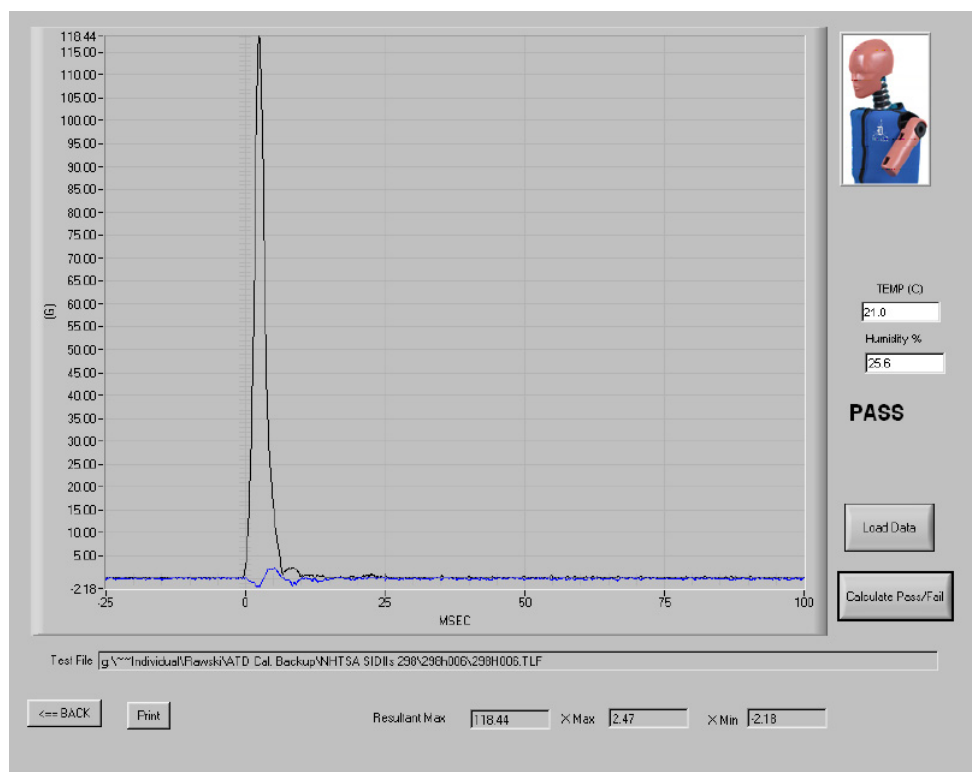


Figure C-16: SIDII Lateral Head Drop Post-Test

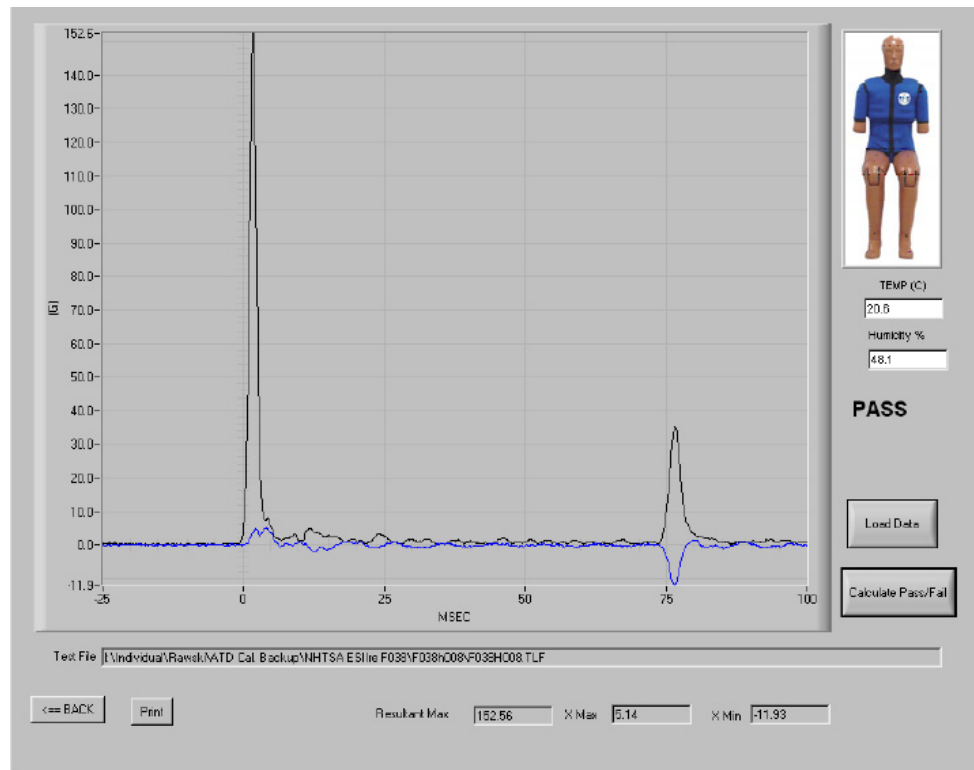


Figure C-17: ESIIre Lateral Head Drop Pre-Test

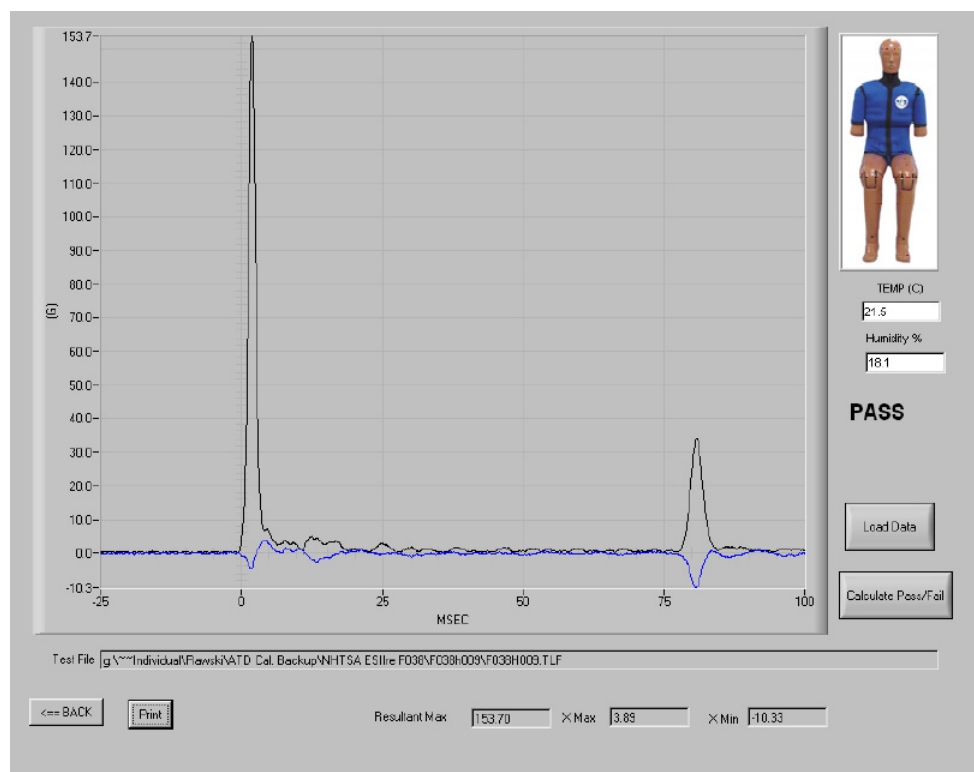


Figure C-18: ESIIre Lateral Head Drop Post-Test

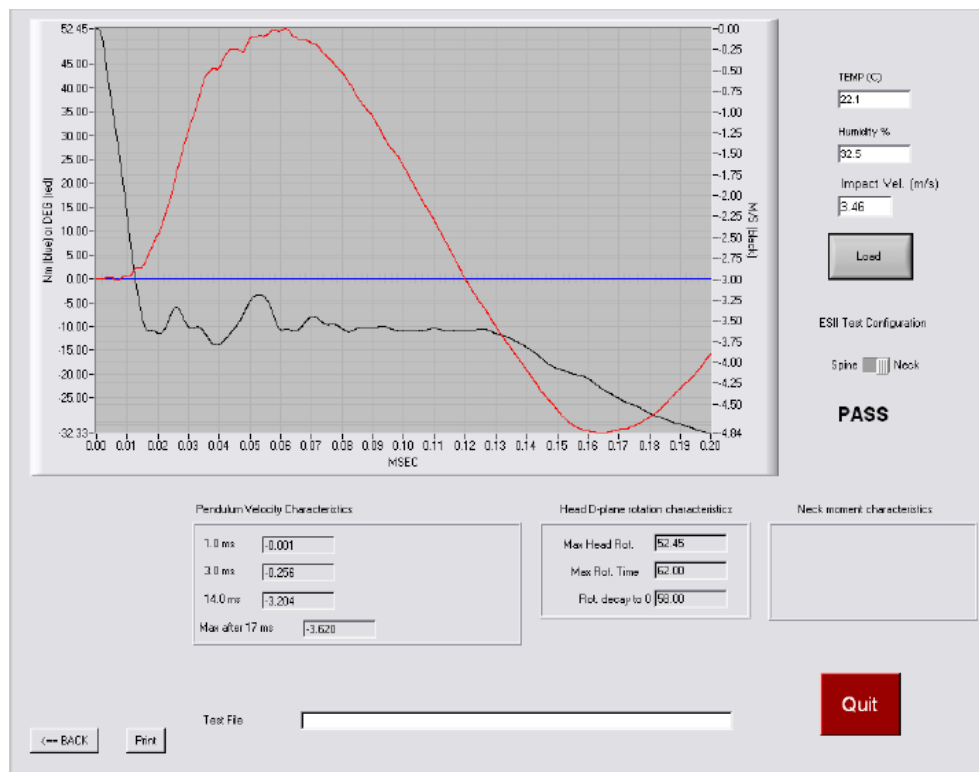


Figure C-19: ESIIre Lateral Neck Pre-Test

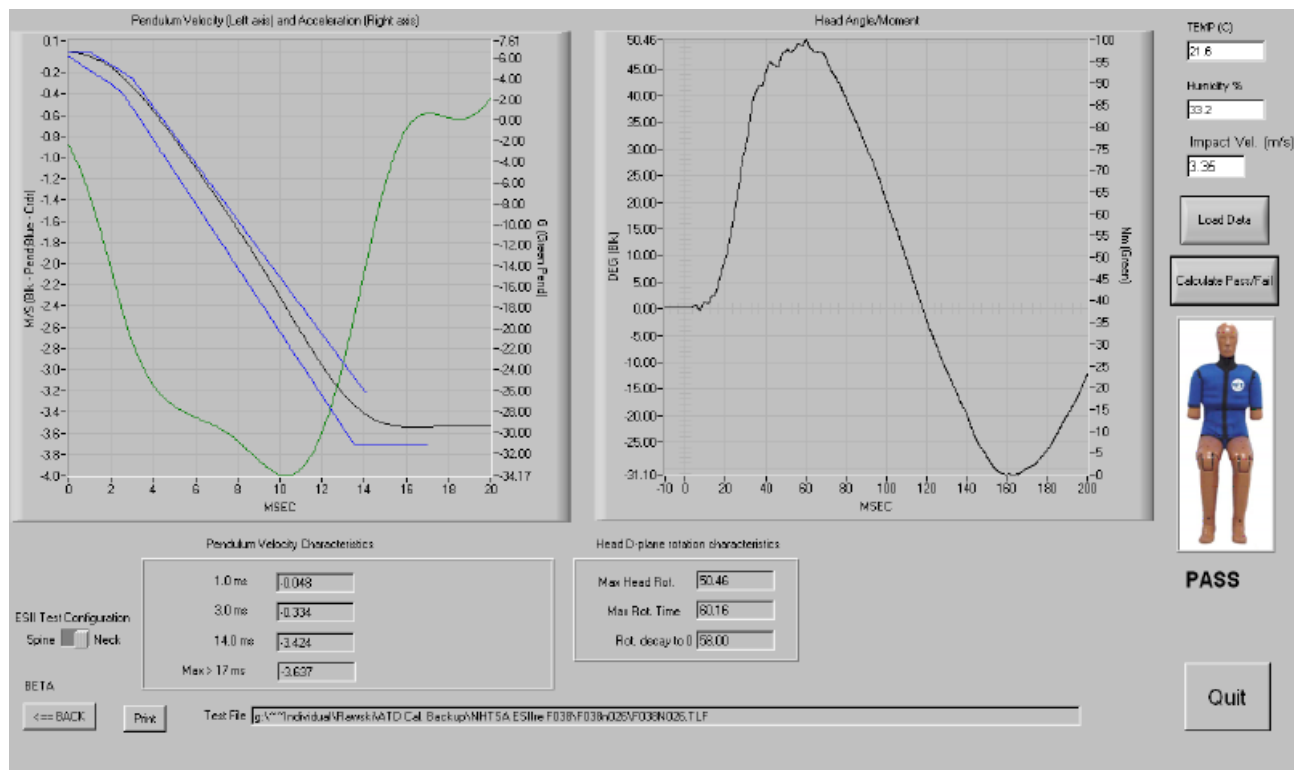


Figure C-20: ESIIre Lateral Neck Post-Test

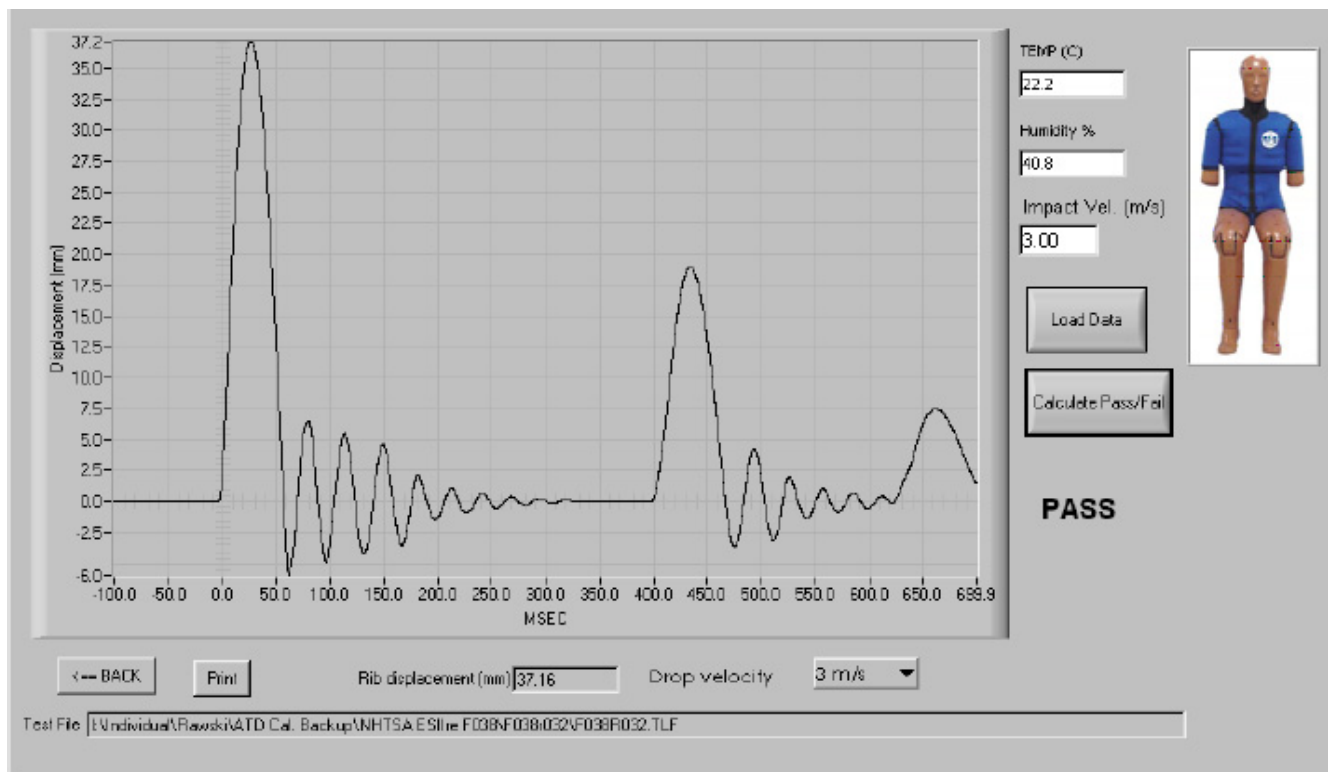


Figure C-21: ESIIre 3.00 m/s Upper Rib Drop Pre-Test

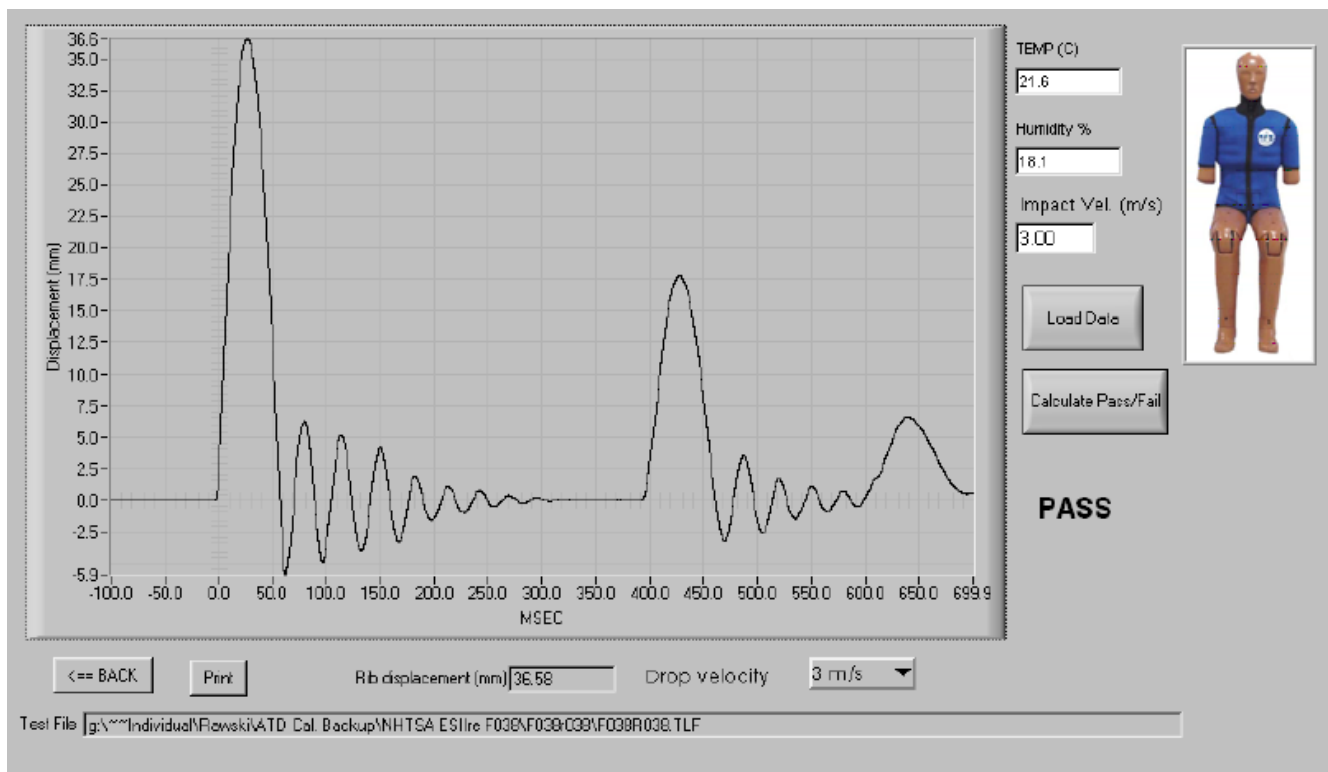


Figure C-22: ESIIre 3.00 m/s Upper Rib Drop Post-Test

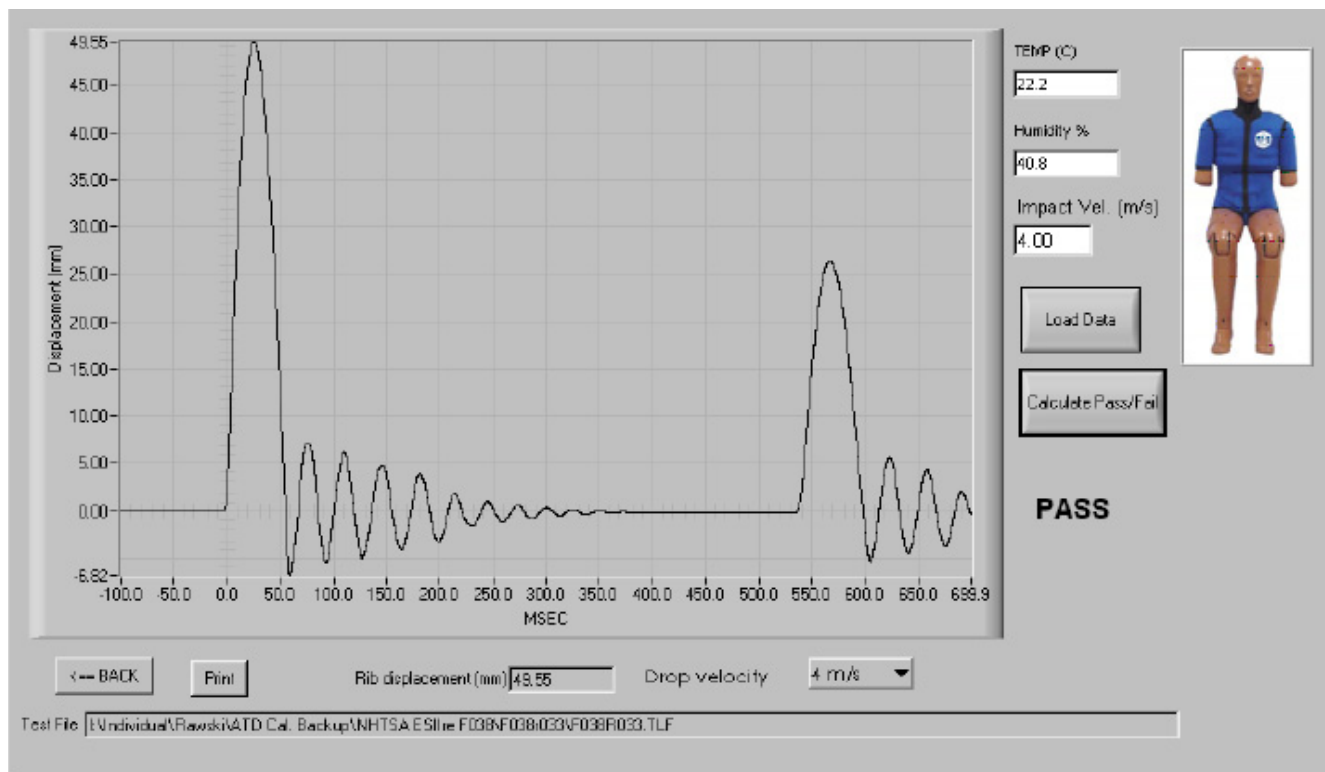


Figure C-23: ESIIre 4.00 m/s Upper Rib Drop Pre-Test

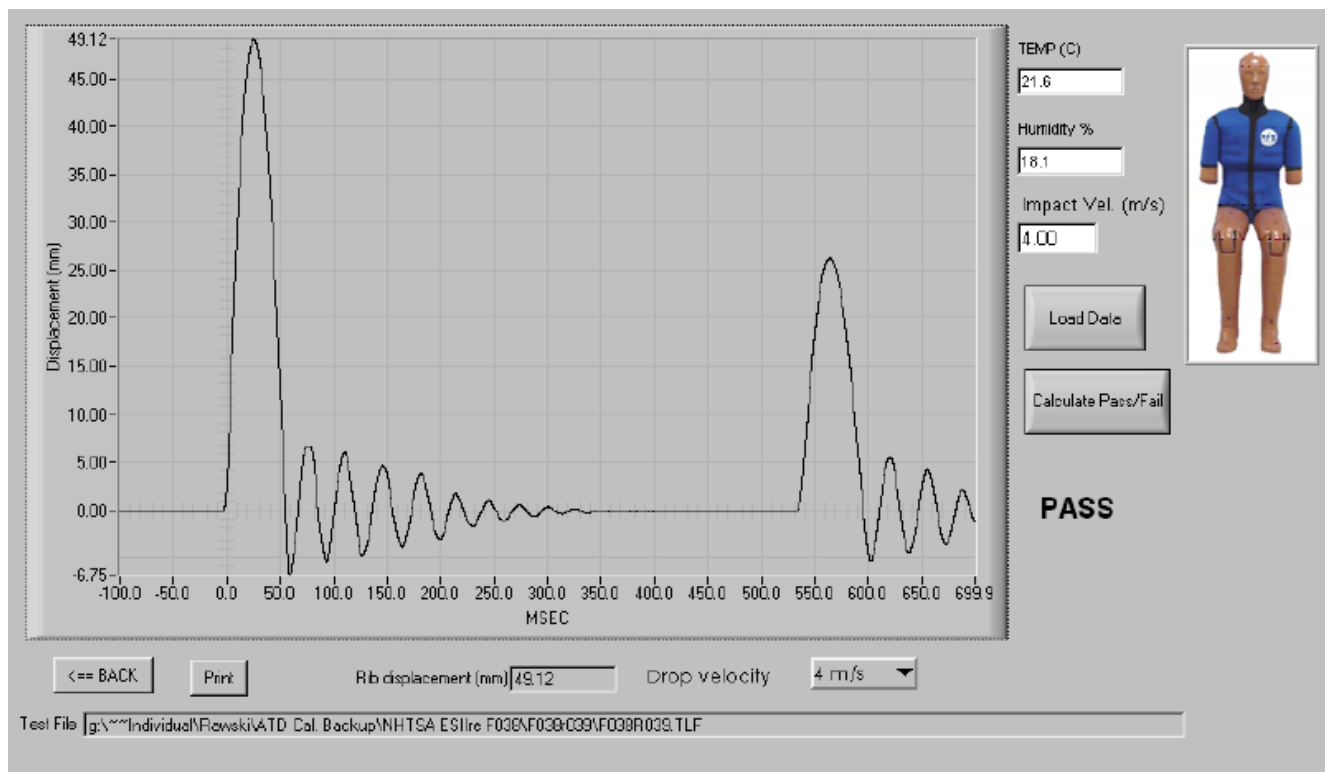


Figure C-24: ESIIre 4.00 m/s Upper Rib Drop Post-Test

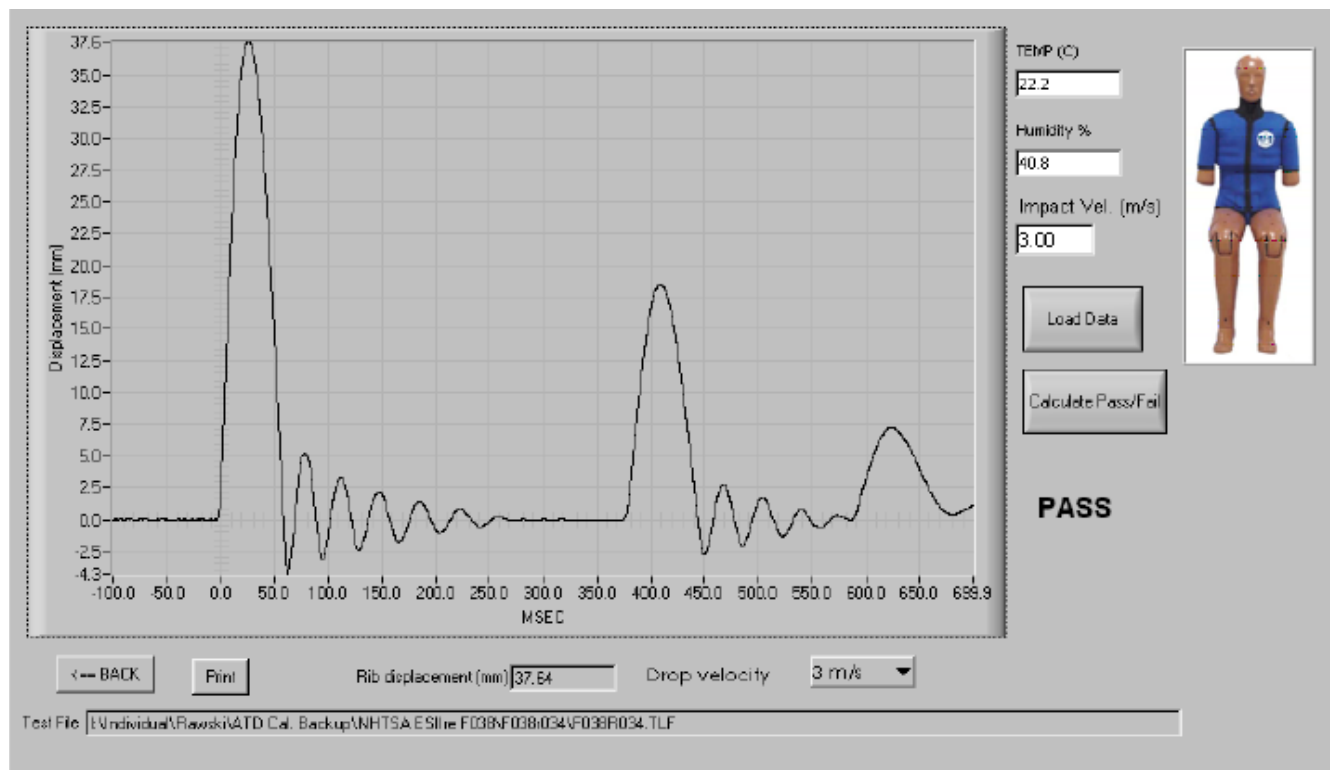


Figure C-25: ESIIre 3.00 m/s Middle Rib Drop Pre-Test

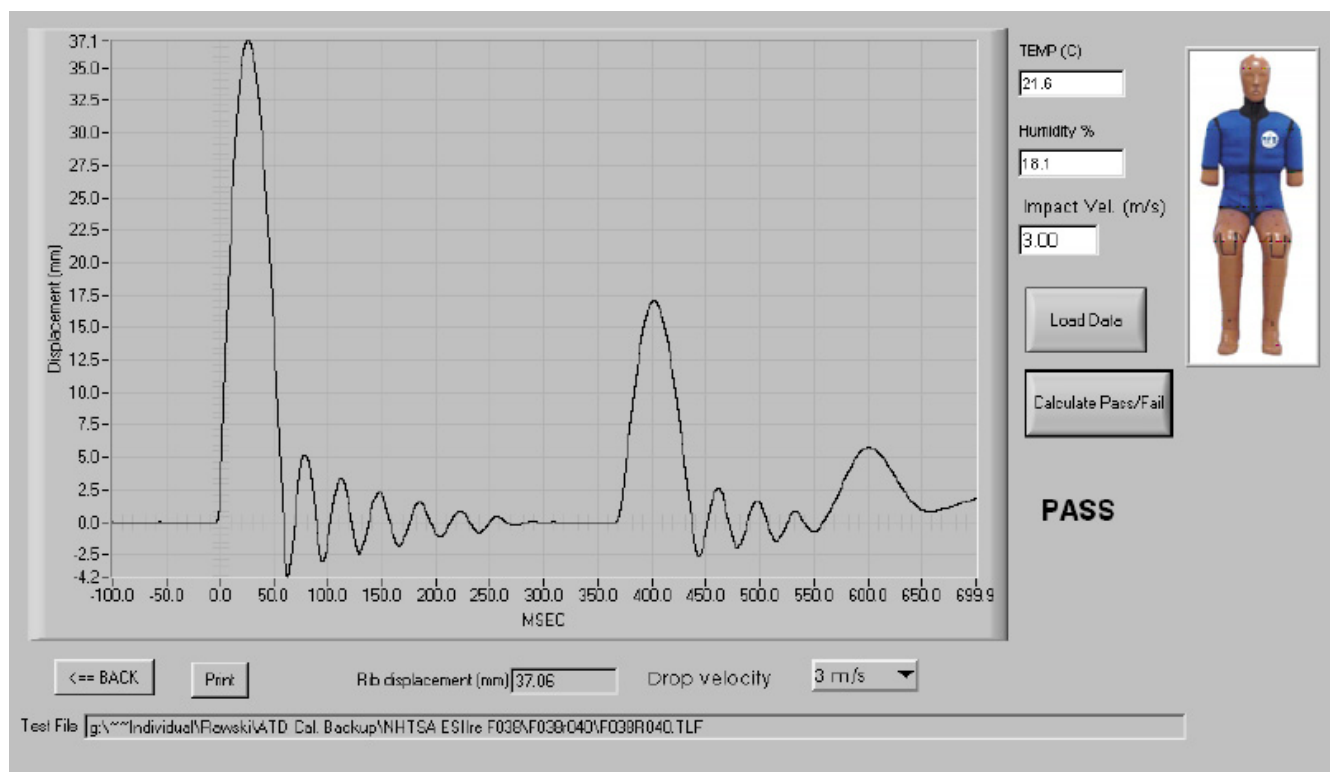


Figure C-26: ESIIre 3.00 m/s Middle Rib Drop Post-Test

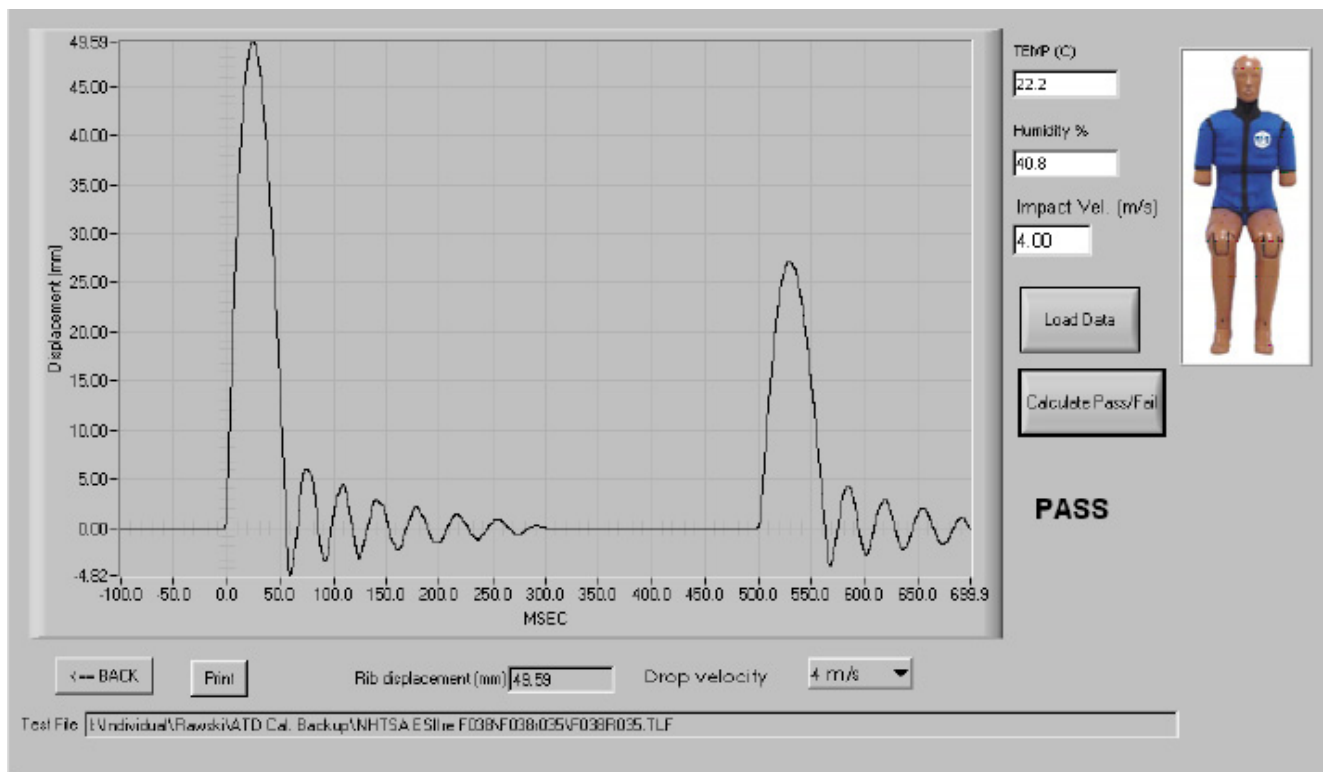


Figure C-27: ESIIre 4.00 m/s Middle Rib Drop Pre-Test

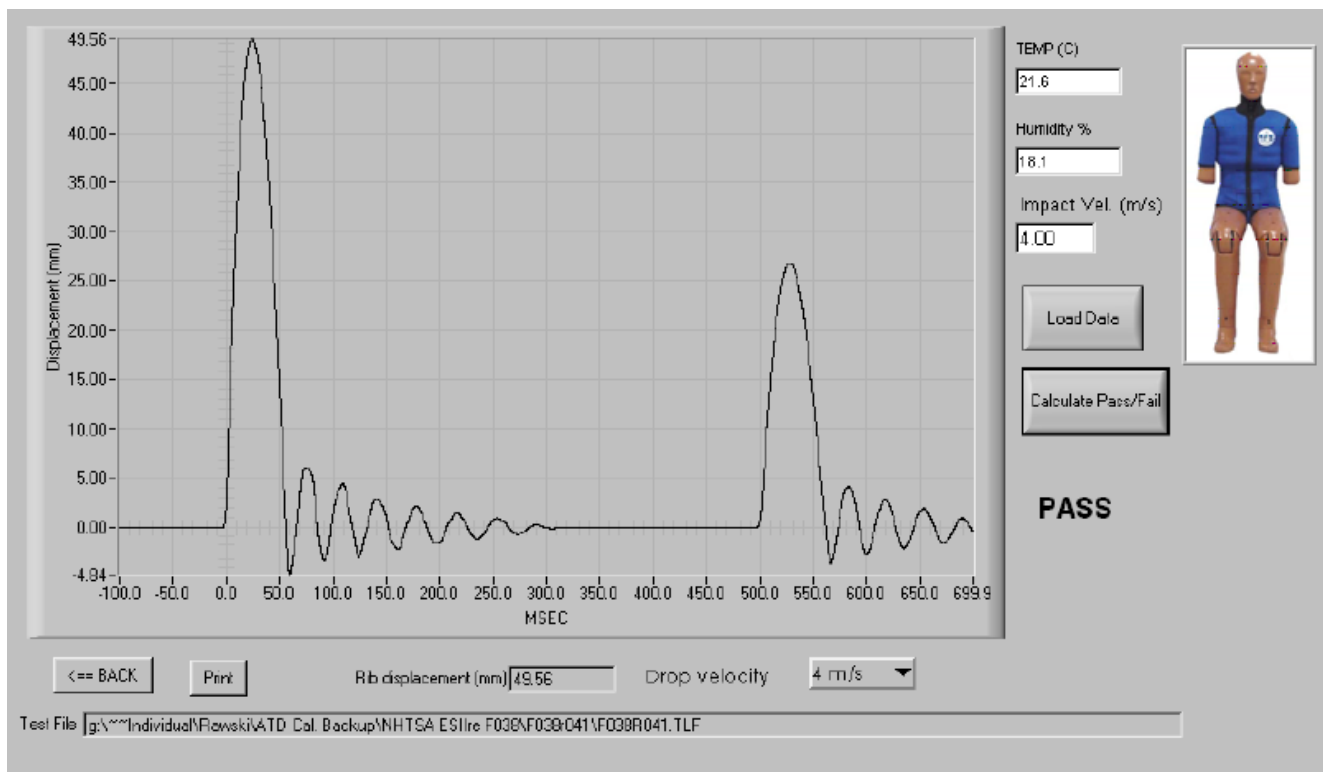


Figure C-28: ESIIre 4.00 m/s Middle Rib Drop Post-Test

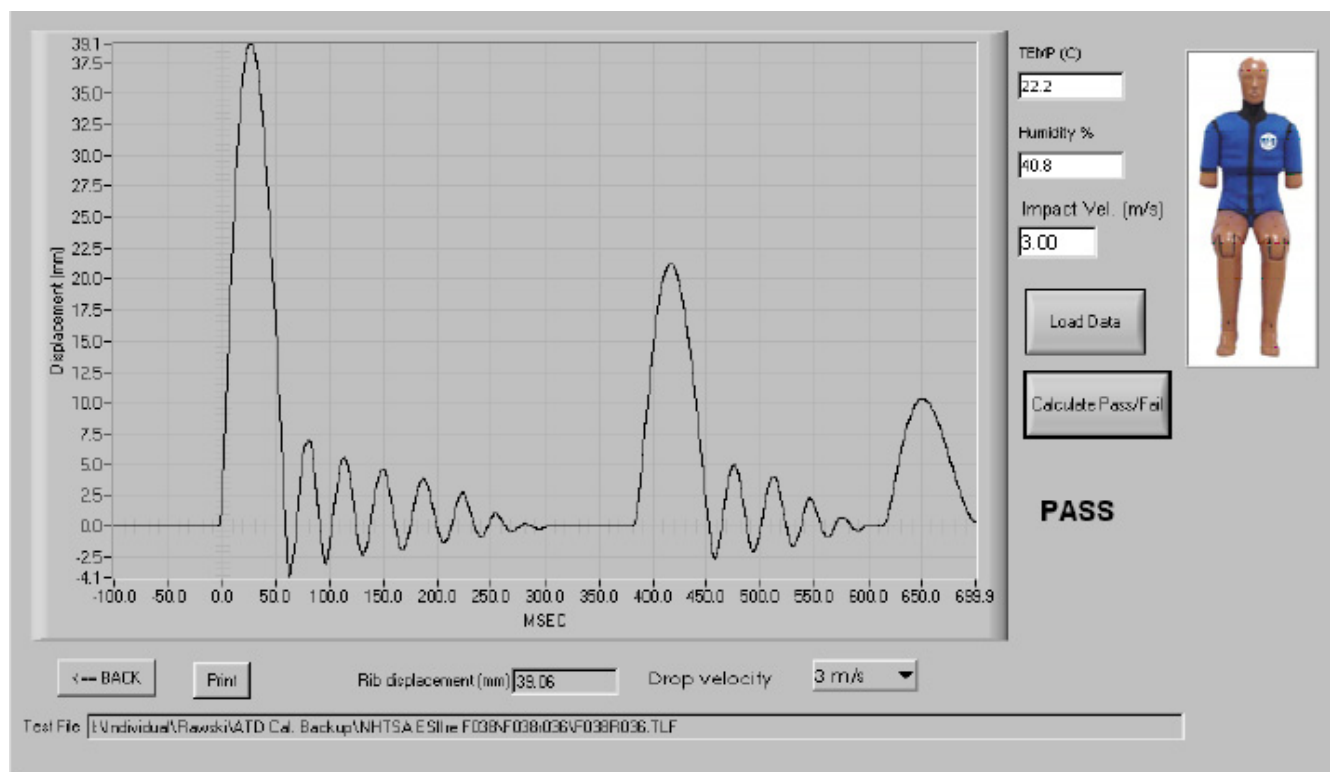


Figure C-29: ESIIre 3.00 m/s Lower Rib Drop Pre-Test

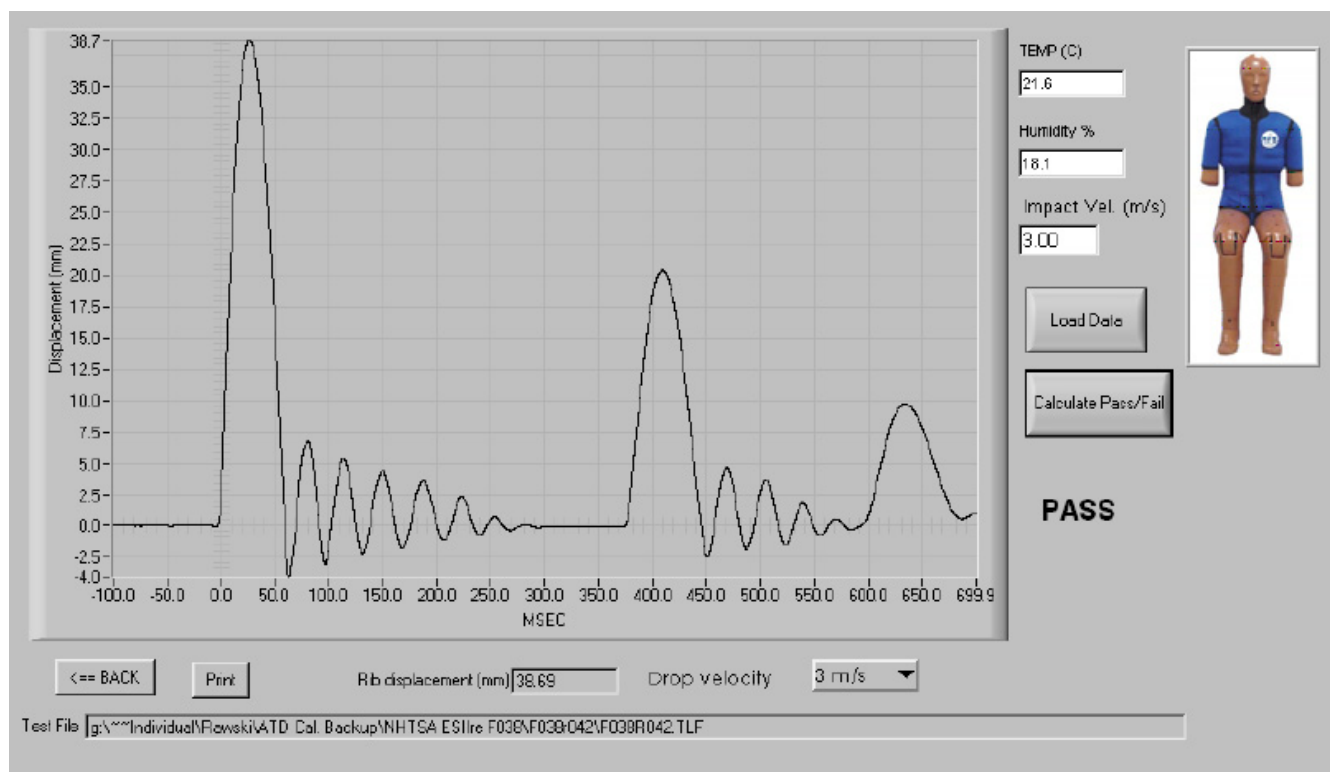


Figure C-30: ESIIre 3.00 m/s Lower Rib Drop Post-Test

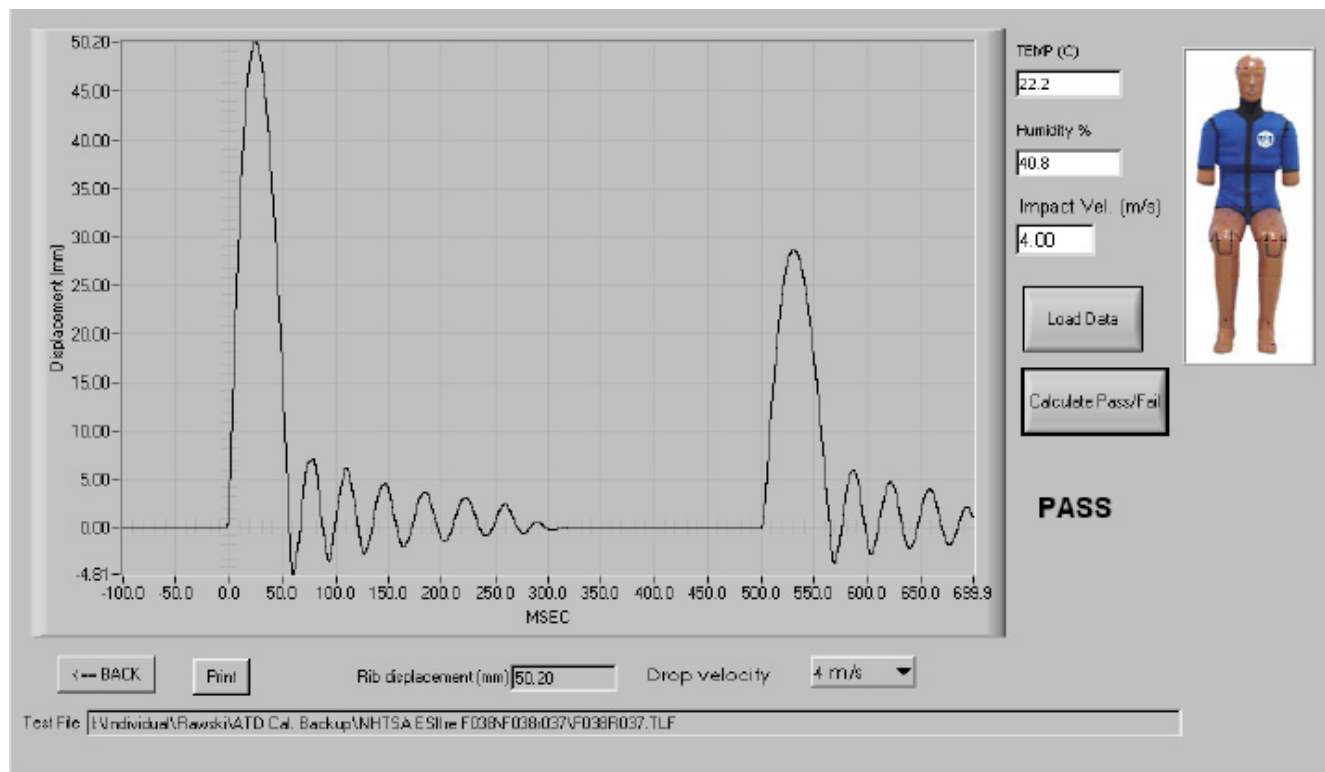


Figure C-31: ESIIre 4.00 m/s Lower Rib Drop Pre-Test

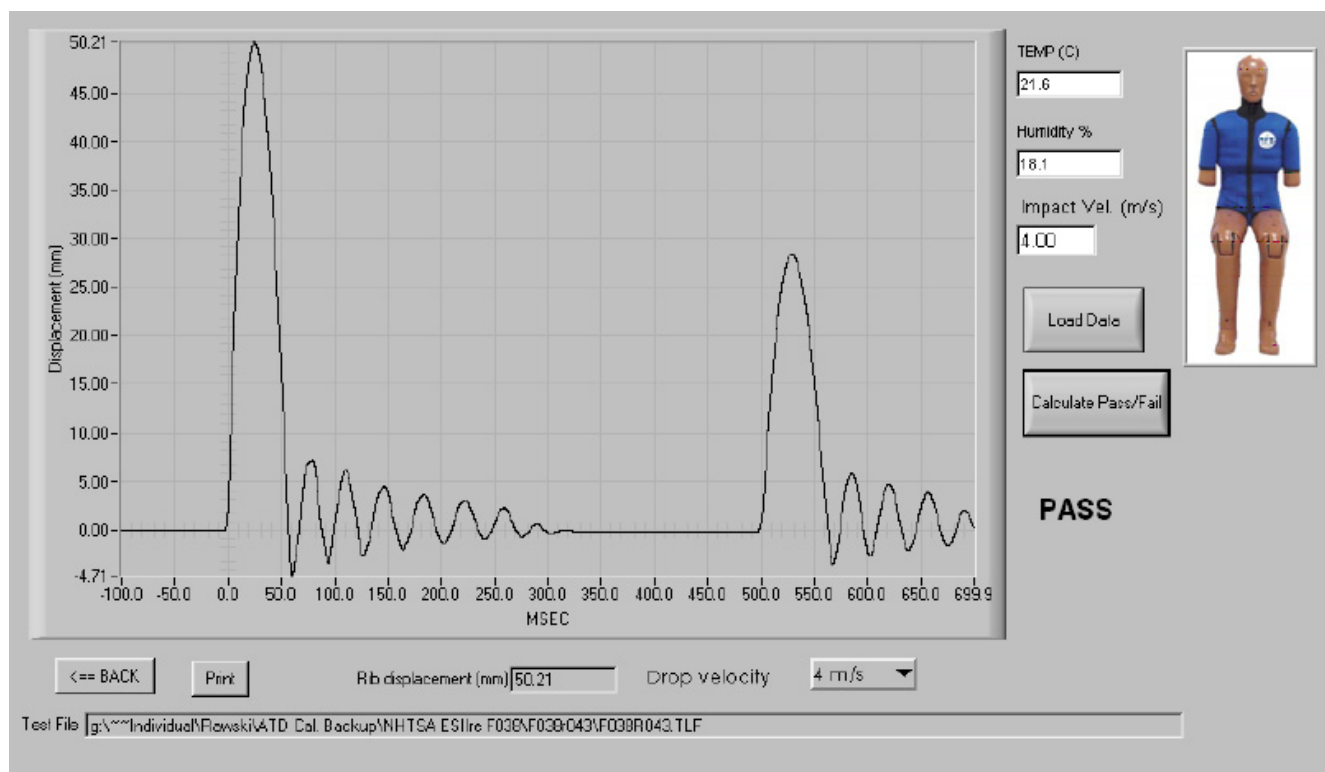


Figure C-32: ESIIre 4.00 m/s Lower Rib Drop Post-Test

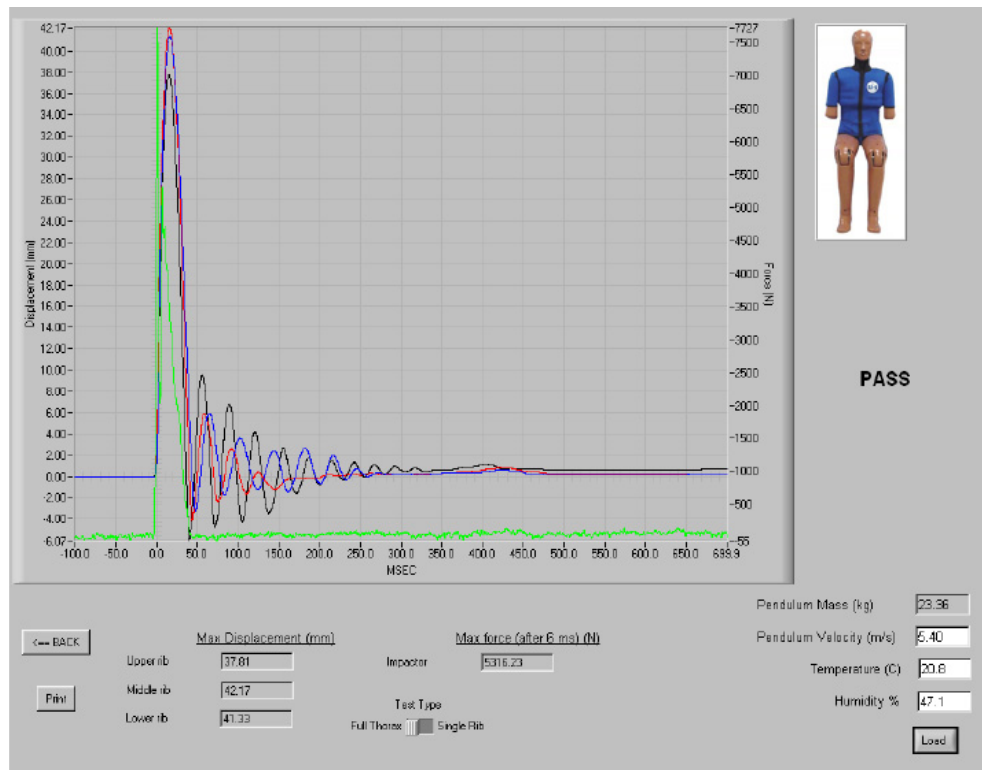


Figure C-33: ESIre Full Body Thorax Impact Pre-Test

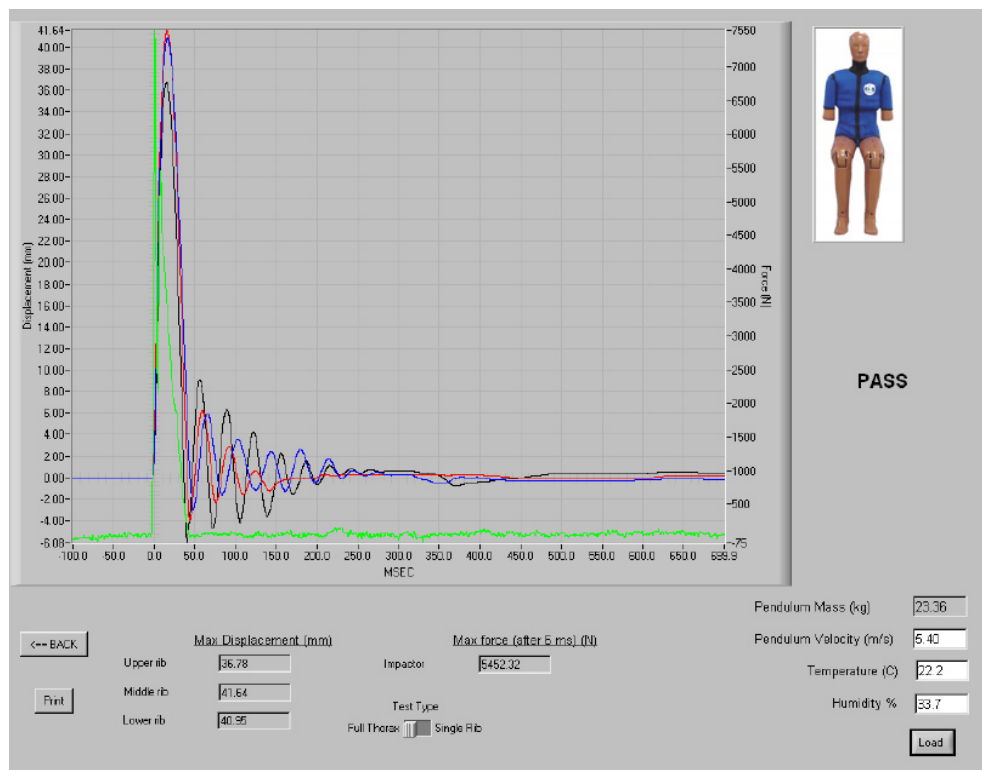


Figure C-34: ESIre Full Body Thorax Impact Post-Test

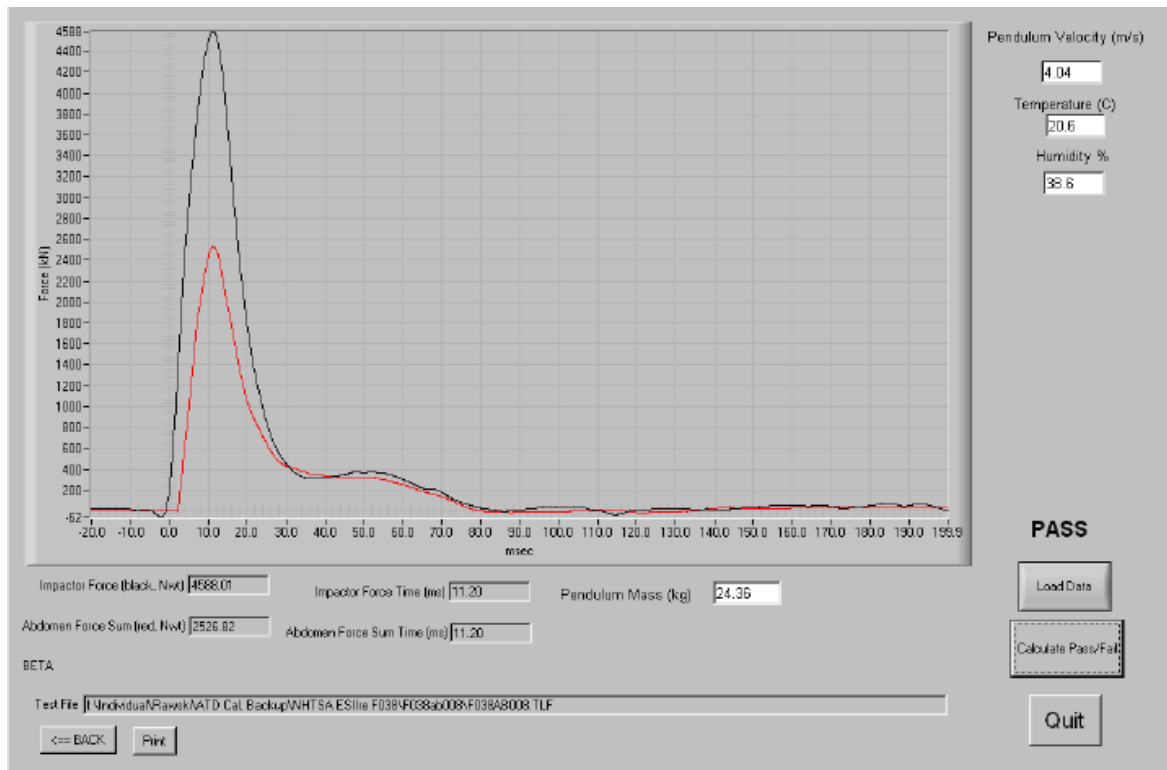


Figure C-35: ESIIre Lateral Abdomen Impact Pre-Test

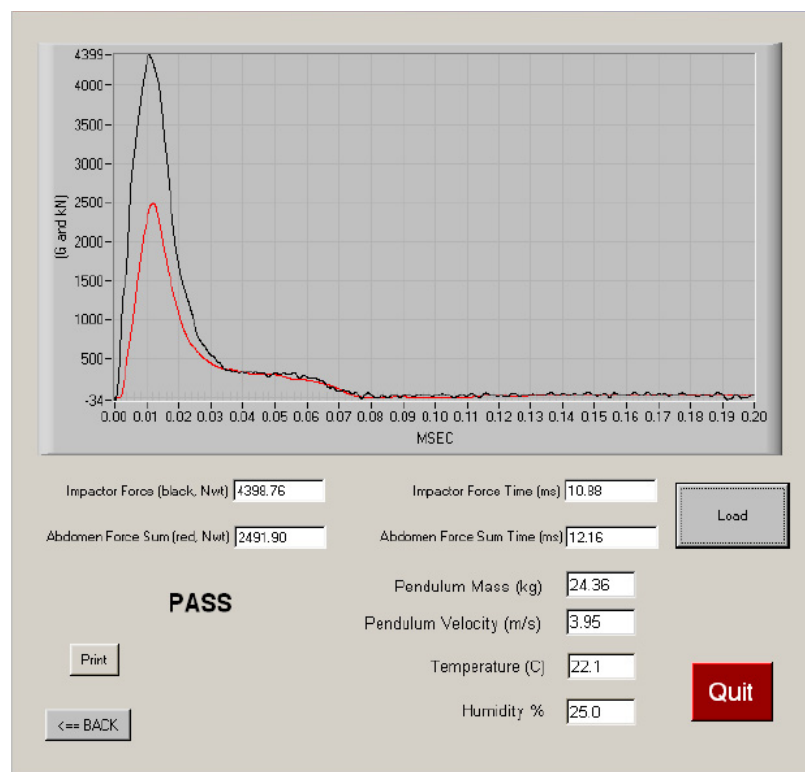


Figure C-36: ESIIre Lateral Abdomen Impact Post-Test

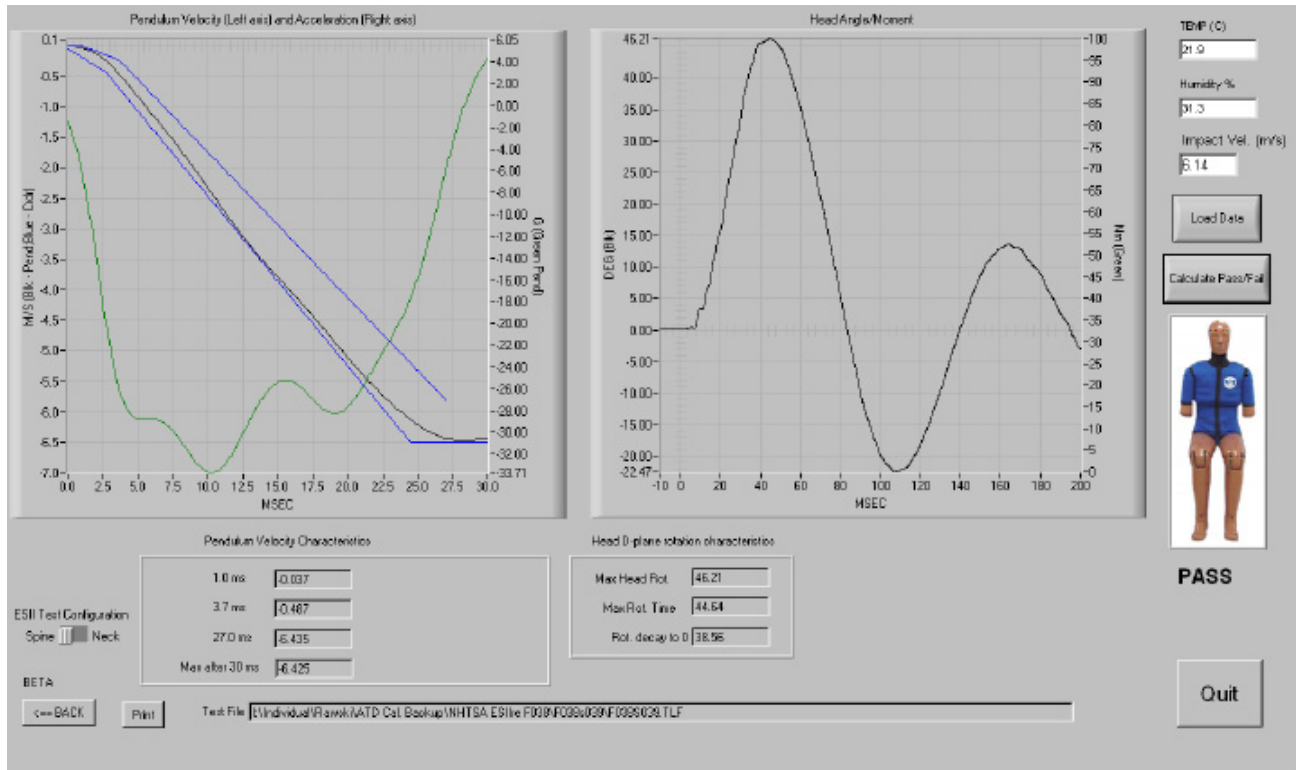


Figure C-37: ESIIre Lateral Spine Pre-Test

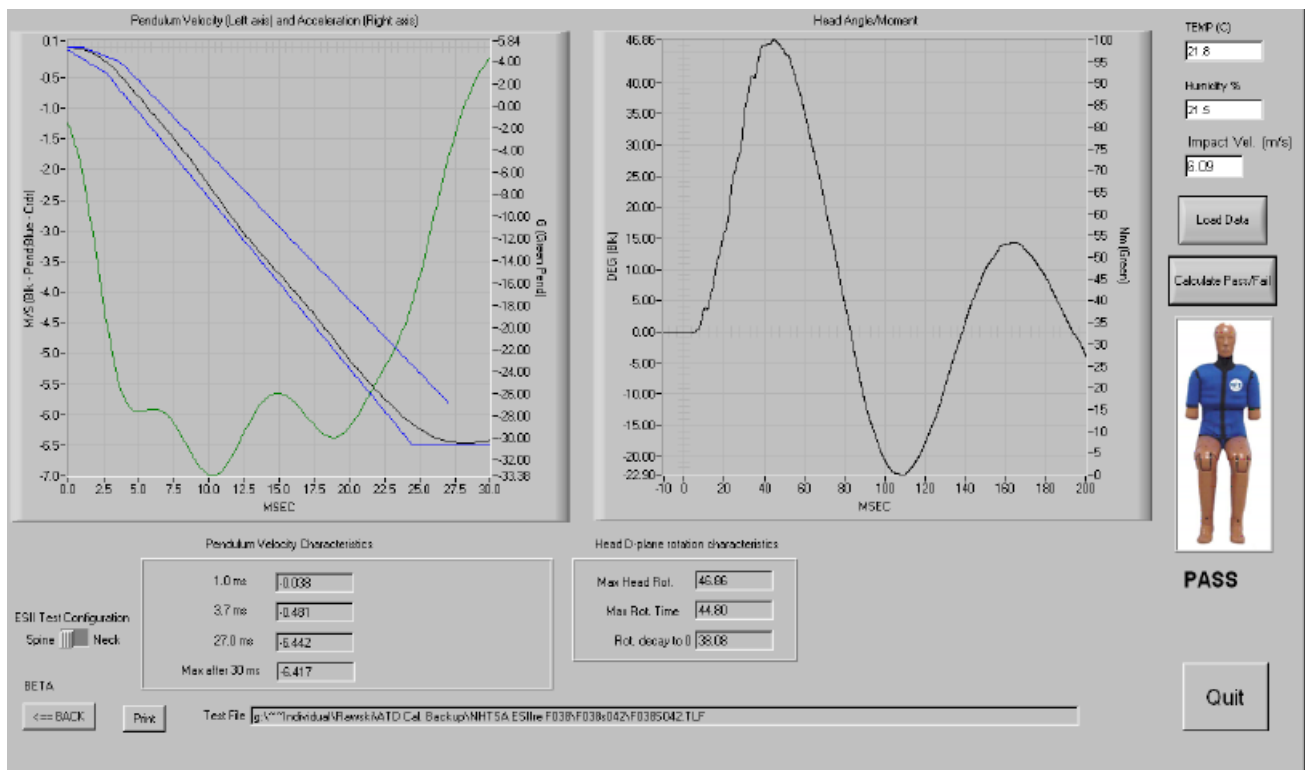


Figure C-38: ESIIre Lateral Spine Post-Test

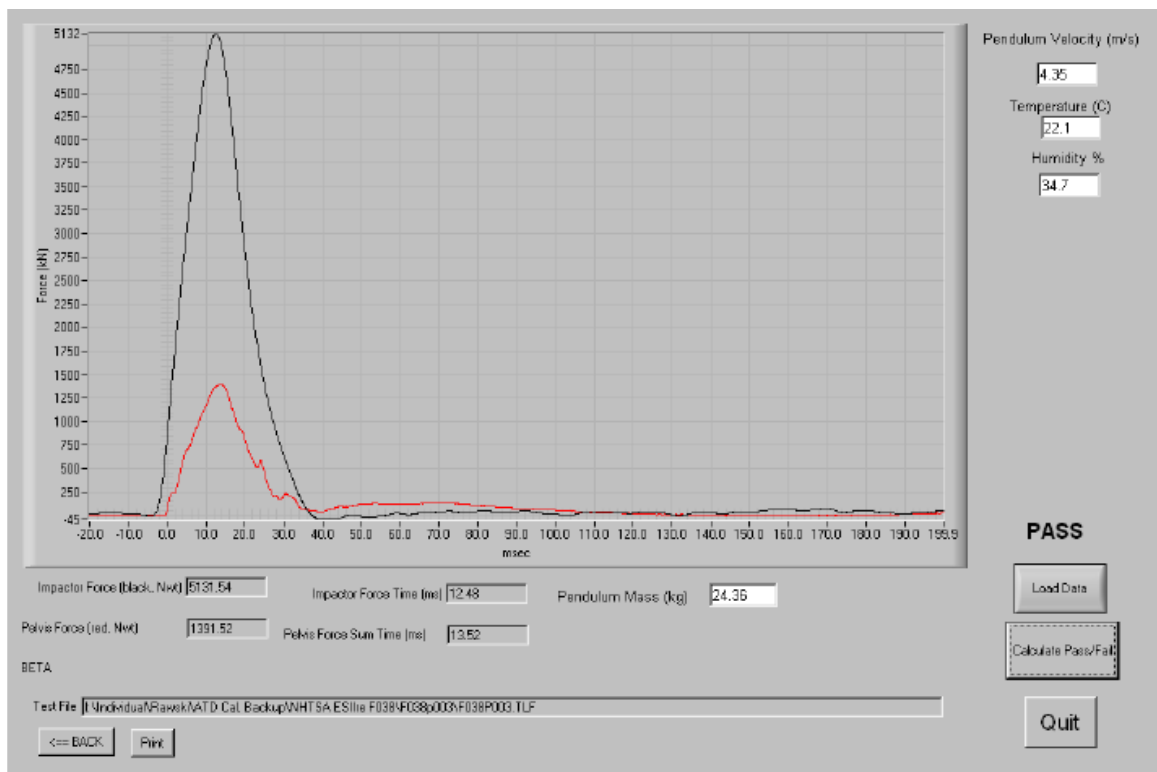


Figure C-39: ESIIre Lateral Pelvis Pre-Test

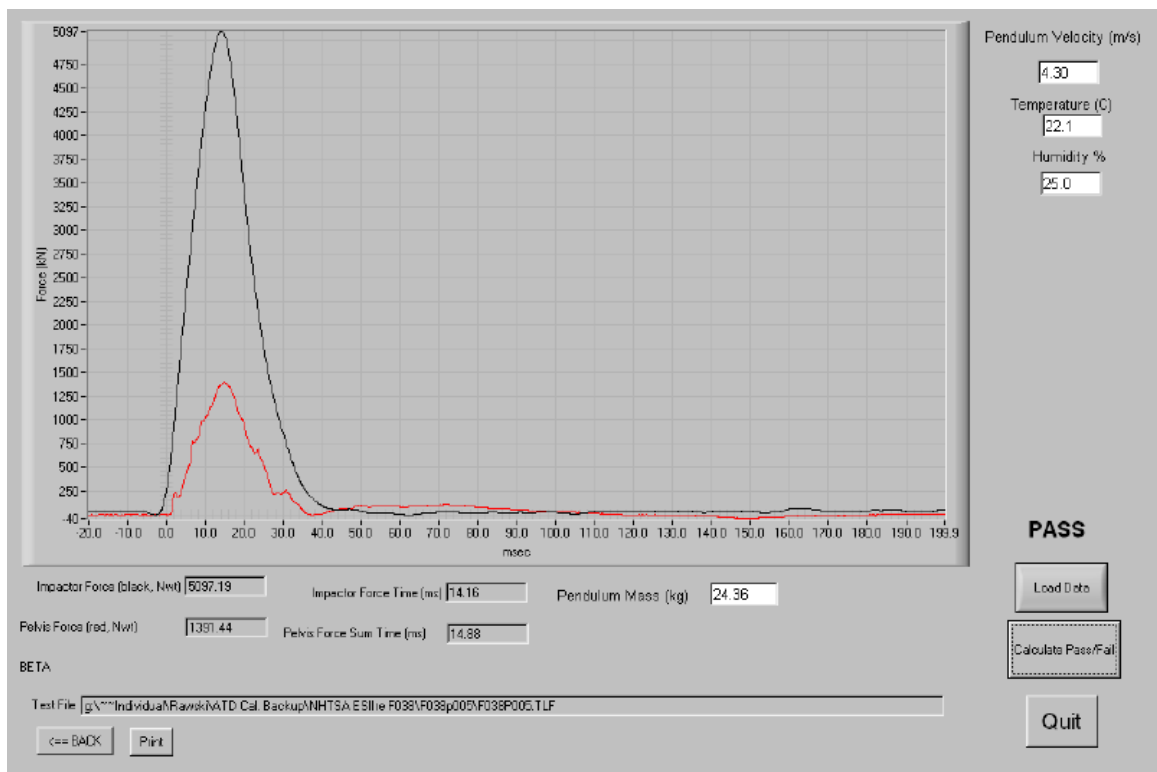


Figure C-40: ESIIre Lateral Pelvis Post-Test