

REPORT NUMBER: SNCAP-MCW-11-005

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

**KIA MOTORS
2011 KIA OPTIMA 4-DOOR SEDAN
NHTSA NUMBER: MB 0513**

**PREPARED BY:
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TEST DATE: FEBRUARY 4, 2011

**REPORT DATE: FEBRUARY 10, 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 Optima 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0513
Test Date: February 4, 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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Date: 2/25/11

Reviewed by: J. M. [Signature]

Date: 25 FEB 2011

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 Optima 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 February 4, 2011. The impact velocity of the Moving Deformable Barrier (MDB) was 62.3 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 24 °C. The target vehicle's post test maximum static crush was 241 mm at level 3. 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>204.9</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>35.0</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>1521.5</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>3075.6</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>261.7</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td>G's</td> <td>82</td> <td>68.1</td> </tr> <tr> <td>Total Pelvic Force (sum of Acetabular and Iliac forces)</td> <td>N</td> <td>5525</td> <td>2210.6</td> </tr> </tbody> </table>				<u>Units</u>	<u>Threshold</u>	<u>DRIVER ATD (ES-2re)</u>	Head Injury Criteria (HIC ₃₆)	N/a	1000	204.9	Maximum Thorax Rib Deflection	mm	44	35.0	Total Abdominal Force	N	2500	1521.5	Pubic Symphysis Force	N	6000	3075.6		<u>Units</u>	<u>Threshold</u>	<u>Pass. ATD (SID-IIs)</u>	Head Injury Criteria (HIC ₃₆)	N/a	1000	261.7	Lower Spine Resultant Acceleration	G's	82	68.1	Total Pelvic Force (sum of Acetabular and Iliac forces)	N	5525	2210.6
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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.																																						

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

NHTSA Number: MB 0513
Test Date: February 4, 2011

Technical Report Documentation Page (CONTINUED)

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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 Optima 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 Optima 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 62.3 km/h (38.7 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 February 4, 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.

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	204.9
Maximum Thorax Rib Deflection	mm	44	35.0
Combined Abdominal Force	N	2500	1521.5
Pubic Symphosis Force	N	6000	3075.6

PASSENGER DUMMY INJURY VALUES			
Measurement description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/a	1000	261.7
Lower Spine (T ₁₂) Resultant Acceleration	G's	82	68.1
Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	2210.6

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	Yes	Deployed properly
Seat Belt Load Limiter	Yes	N/a	Yes	N/a
Other	No	N/a	No	N/a

GENERAL COMMENTS

The test vehicle sustained a maximum static crush of 241 mm at Level 3, 1650 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 0513
Model Year	2011
Make	Kia
Model	Optima
Body Style	4 – Door Sedan
VIN	KNAGM4A73B5068110
Color	Platinum Graphite
Delivery Date	January 24, 2011
Odometer Reading (mi)	41
Odometer Reading (km)	66.0
Dealer	Boucher Fleet Grp
Transmission	Manual
Final Drive	FWD
Type/No. Cylinders	4
Engine Disp. (L)	2.4
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
Automatic Door Locks	Yes
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)	1950.0
		GAWR Front(kg)	1100.0
Date of Manufacture	November, 2010	GAWR Rear (kg)	959.8

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION				
	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	0	5
Capacity Weight (VCW) kg				410.0
DSC X 68.04 kg				340.2
Cargo Weight (RCLW) †				69.8

(A)

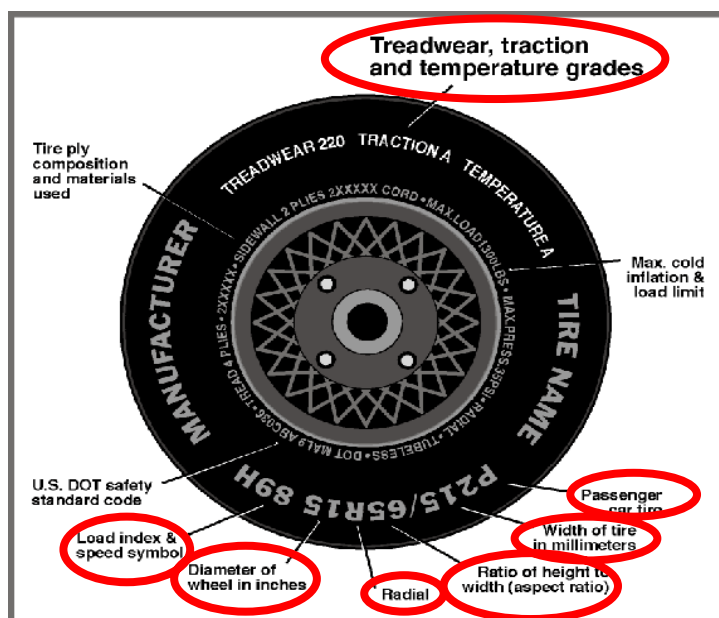
(B)

(A-B)†

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					Yes	
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)	225	225
Recommended Tire Size	P205/65R16	P205/65R16
Tire Size on Vehicle	P205/65R16	P205/65R16
Tire Manufacturer	Nexen	Nexen
Tire Model	Classe Premiere	Classe Premiere
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	94H	94H
Tire Material	Polyester, Steel, and Nylon	Polyester, Steel, and Nylon
DOT safety code (right)	8EHE	8EHE
DOT safety code (right)	8EHE	8EHE

**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	431.4	308.0		460.4	397.4		475.4	390.1	
Right	kg	431.8	294.8		433.2	363.3		440.9	354.7	
Ratio	%	58.9	41.1		54.0	46.0		55.2	44.8	
Totals	kg	863.2	602.8	1466.0	893.6	760.7	1654.3	916.3	744.8	1661.1

TARGET TEST WEIGHT CALCULATION			
	Units		
Total Delivered Weight (UVW)	kg	1466.0	(A)
Sum of Actual Weight of 2 P572 ATD's Used	kg	125.3	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	69.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1661.1	(A + B + C)

TEST VEHICLE ATTITUDE AND CG						
Measurement description	Units	LF	RF	LR	RR	CG (aft of front axle)
Fully Loaded	mm	722	728	688	697	1255
As Tested (Fully Loaded +/- 10 mm at each wheel well)	mm	724	729	693	703	1288

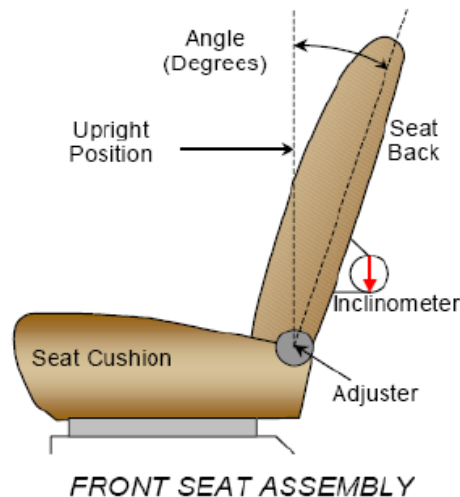
GENERAL TEST VEHICLE DATA		
Measurement description	Units	Value
Total Vehicle Wheel Base	mm	2800
Total Vehicle Length at Left Side	mm	4530
Total Vehicle Length at Centerline	mm	4845
Total Vehicle Length at Right Side	mm	4530
Weight of Ballast in Cargo Area	kg	46.7
Weight of Vehicle Components Removed	kg	41.1
Amt of Stoddard Solvent in Fuel Tank	L	65.2

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

BALLAST INFORMATION	
Mass of Ballast Added (kg)	46.7 kg
Location	Trunk
<u>Components removed from test vehicle</u> Non-struck side front and rear door glasses, non-struck side door panels, spare tire and jack, pass. head restraint	

TEST VEHICLE VERTICAL IMPACT LINE DATA		
Measured parameter	Units	Value
Target Impact Point Aft of Front Axle	mm	460 mm
Actual Impact Point Aft of Front Axle	mm	435 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	6.2°
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	240	12
Passenger Seat	Non - adjustable	N/a

‡Full forward = notch 0

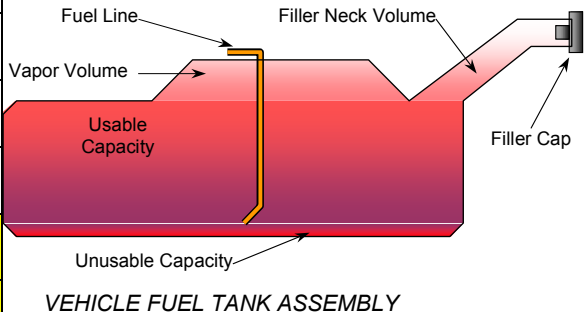
Seat Belt Upper Anchorages

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

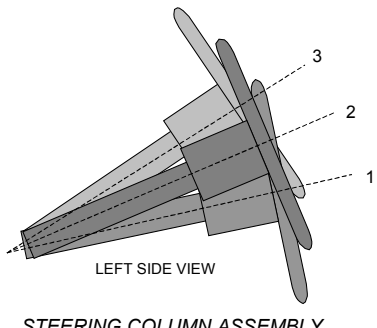
DATA SHEET NO. 2
SEAT ADJUSTMENT, FUEL SYSTEMS, AND STEERING WHEEL DATA (CONTINUED)

Fuel Tank Capacity

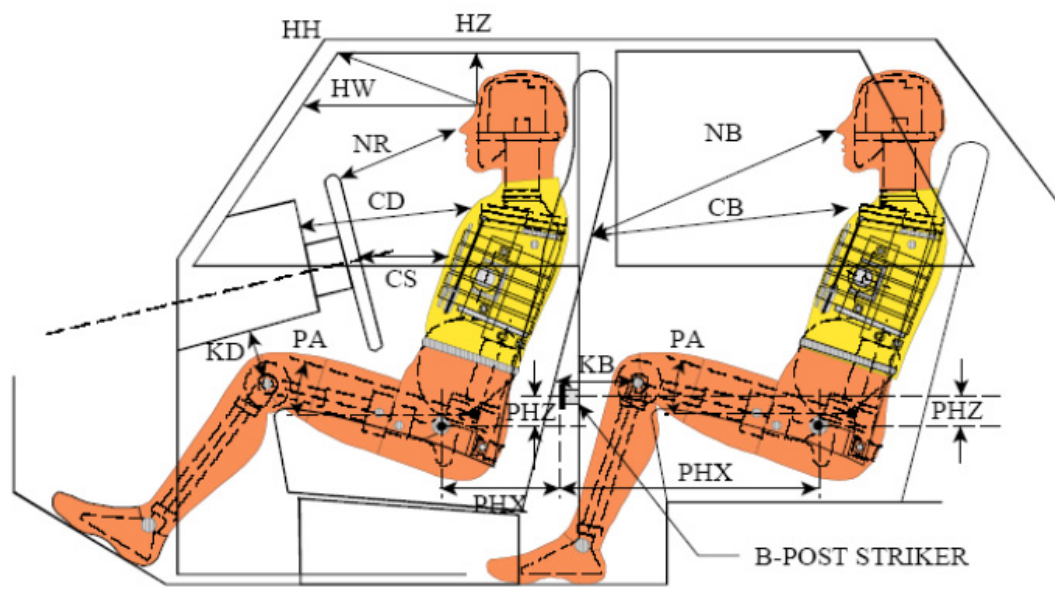
FUEL TANK CAPACITY			
Description	Units	Value	
Usable Capacity of Standard Equipment Fuel Tank	L	70.0	
Usable Capacity of Optional Equipment Fuel Tank	L	0	
Usable Capacity of Vehicle Used for Certification Testing to Requirements	L	70.0	
Amount of Stoddard Added for Test	L	65.2	
% Usable Capacity (92%-94%)	%	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	21.4	19	
Geometric Center - Position 2	24.0	19	
Uppermost - Position 3	26.6	19	
Telescopic Steering Wheel Travel	N/a	38	
Test position	24.0	19	
Steering wheel positioned 24.0° relative to side sill panel. The steering column was set at mid-telescope adjustment.			

DATA SHEET NUMBER 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

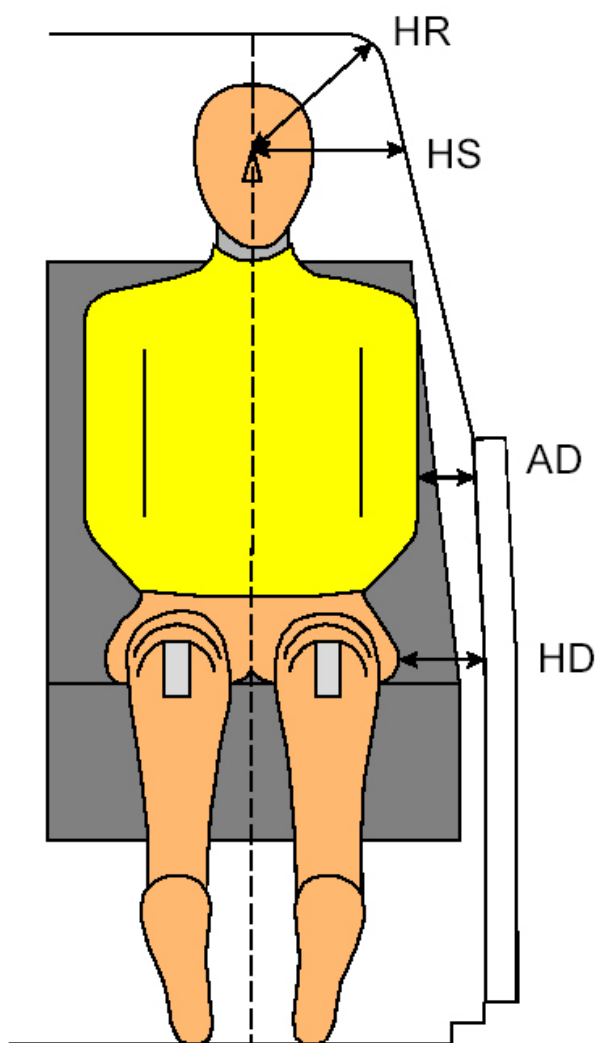


LEFT SIDE VIEW

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

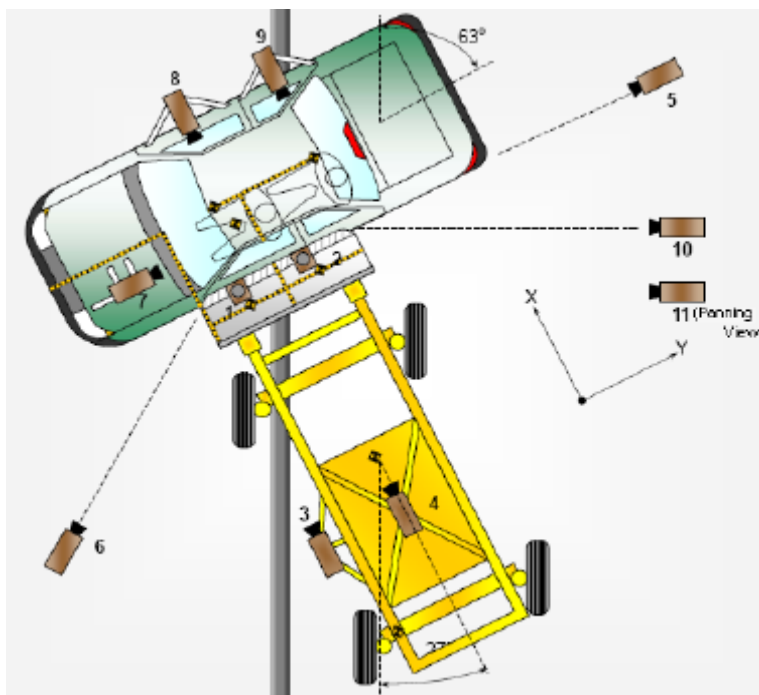
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION						
Driver code	Pass. code	Measurement description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Header to Header	374	12.3		
HW		Header to Windshield	643	0.00		
HZ	HZ	Head to Roof	163	90.0	283	0.00
NR	NB	Nose to Rim/Seat Back	503	-11.0	587	-16.1
CD	CB	Chest to Dash/ Seat Back	590	5.80	560	0.00
CS		Chest to Steering Wheel	384	-15.5		
KDL	KBL	Left knee to Dash/ Seat Back	197	24.4	337	20.4
KDR	KBR	Right knee to Dash/ Seat Back	215	10.9	325	20.2
PA	PA	Pelvic Angle		19.7		20.4
PHX	PHX	H-point to Striker (X - axis)	194		217	
PHZ	PHZ	H-point to Striker (Z - axis)	273		289	
SA	SA	Seat Back Angle		6.20		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	186	256
HS	Head to Side Window	mm	317	374
AD	Arm to Door (upper)	mm	195	224
AD	Arm to Door (lower)	mm	207	244
HD	H - Point to Door	mm	160	186 – w/o inset

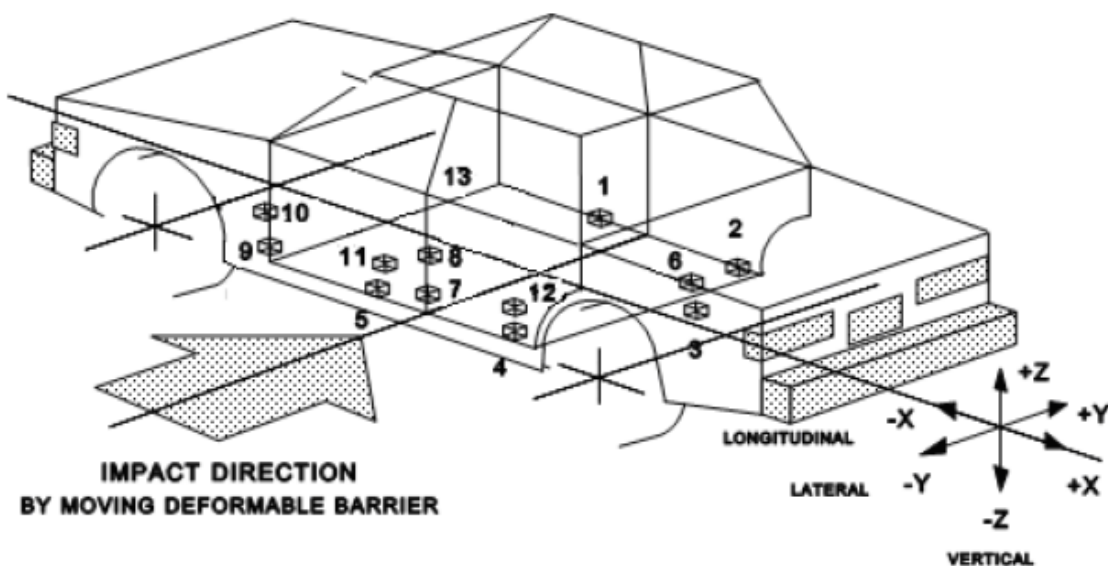
DATA SHEET 5 **CAMERA LOCATIONS AND DATA**



CAMERA LOCATIONS AND DATA							
No.	Camera View	Location			Angle °	Lens mm	Rate fps
		X	Y	Z			
		mm	mm	mm			
1	Overhead Overall	1724	2041	-3934	90	8	1000
2	Overhead Impact	962	814	-4020	90	12.5	1000
3	Left Impact Point (MDB)	-2284	-151	-69	0.2	35	1000
4	Side Overall (MDB)	-2141	901	-581	4.1	13	1000
5	Rear	4642	10815	-447	2.1	50	1000
6	Left Front	-4046	-2604	-362	6.8	25	1000
7	Driver Front (OB)	497	-240	-444	7.0	25	1000
8	Driver Side (OB)	1806	784	-290	10.2	12.5	1000
9	Passenger Side (OB)	1860	1655	-430	11.6	12.5	1000
10	Real – Time Left Rear	-	-	-	-	-	1000

*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**

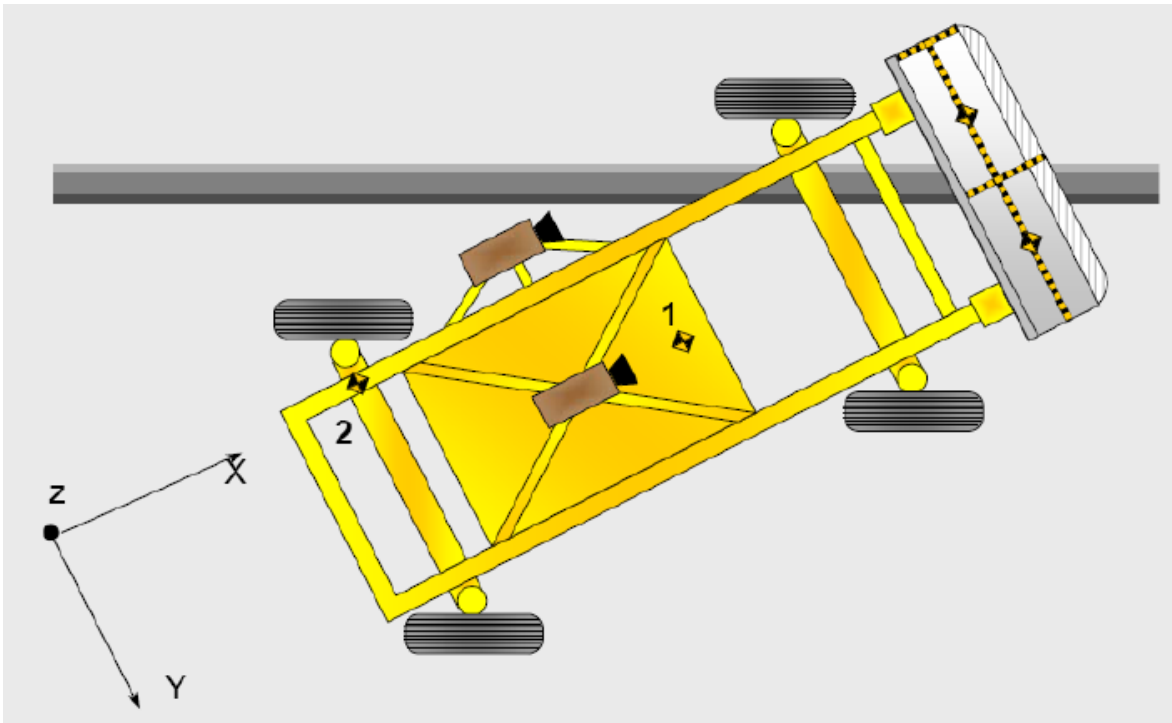


VEHICLE ACCELEROMETER PRE-TEST LOCATIONS				
Loc. no.	Accelerometer location	Measurements (mm)		
		X	Y	Z
1	Right Sill at Front Seat	2818.8	643.3	310.5
2	Right Sill at Rear Seat	1727.6	667.7	291.5
3	Rear Floor Pan Above Axle	1101.2	-58.4	-29.5
4	Left Sill at Rear Door	1703.6	-761.4	291.9
5	Left Sill at Front Door	2770.9	-788.4	315.9
6	Right Rear Occupant Compartment	1897.4	387.9	197.2
7	B - Post Lower	2219.5	-868.5	-92.1
8	B - Post Middle	2200.7	-857.1	-315.4
9	A - Post Lower	3315.4	-896.6	-97.3
10	A - Post Middle	3328.3	-885.6	-244.6
11	Front Seat Track	2606.1	-710.8	193.3
12	Rear Seat Structure	1892.4	-563.4	165.4
13	Vehicle CG	2774.3	37.8	0.07

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 Centerline (+ 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	99	278
2	Occupant H - Point	mm	239	515
3	Mid Door	mm	241	628
4	Window Sill	mm	130	973
5	Window Top	mm	31	1325
	Maximum Penetration	mm	241	628

INSTRUMENTATION	
Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structural Accelerometers	21
MDB Accelerometers	5
Total No. of Contact Switches	8
Total	66

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	436.8	241.8	678.6
Right	kg	323.0	355.6	678.6
Ratio	%	56.0	44.0	100.0
Totals	kg	759.8	597.4	1357.2

SPEED AND IMPACT DATA			
Measured parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.3
Trap No. 2 Velocity (Secondary)	km/h	61.1 to 62.7	62.3
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE					
Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	278	800	Left	151
B	Top of Bumper	329	800	Left	90
C	Mid – Level	530	800	Left	108
D	Top of Stack	836	800	Left	137

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	Shoulder to curtain airbag	Shoulder to curtain airbag
Lower Torso Contact	To torso airbag; pelvis to bottom of seatback wing	To left interior door; pelvis to bottom of seatback wing
Left Knee Contact	To interior door panel	To interior door panel
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	~ 48 mm of seat crush	~ 105 mm of seat crush
Seat Back Failure	None	None

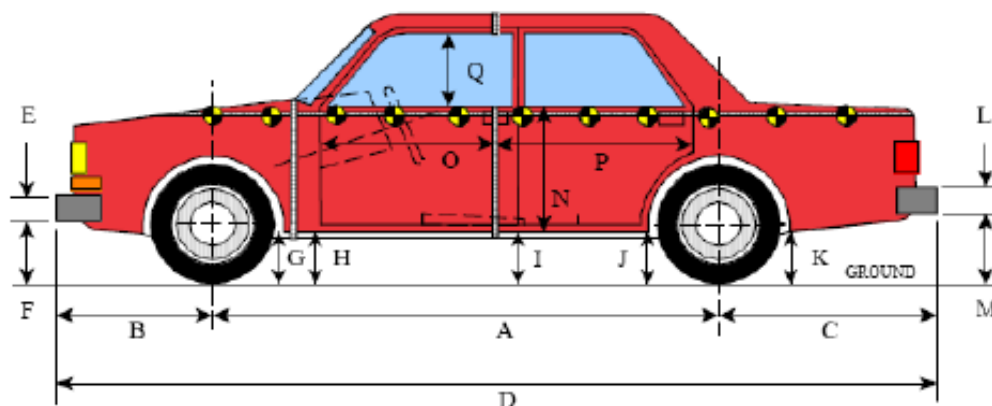
POST TEST STRUCTURAL OBSERVATIONS	
Critical Areas of Performance	Observations/Conclusions
Pillar Performance	No damage
Sill Separation	Max. separation of 80 mm @ C-pillar
Windshield Damage	No damage
Window Damage	No damage
Other Notable Effects	None noted

**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	Yes	N/a
Other	No	N/a	No	N/a

MDB LEFT EDGE IMPACT DATA			
Measured parameter	Units	Requirement	Value
Horizontal Offset	mm	+/- 50	25 mm forward
Vertical Offset	mm	+/- 50	10 mm below

DATA SHEET NUMBER 11
VEHICLE PROFILE MEASUREMENTS

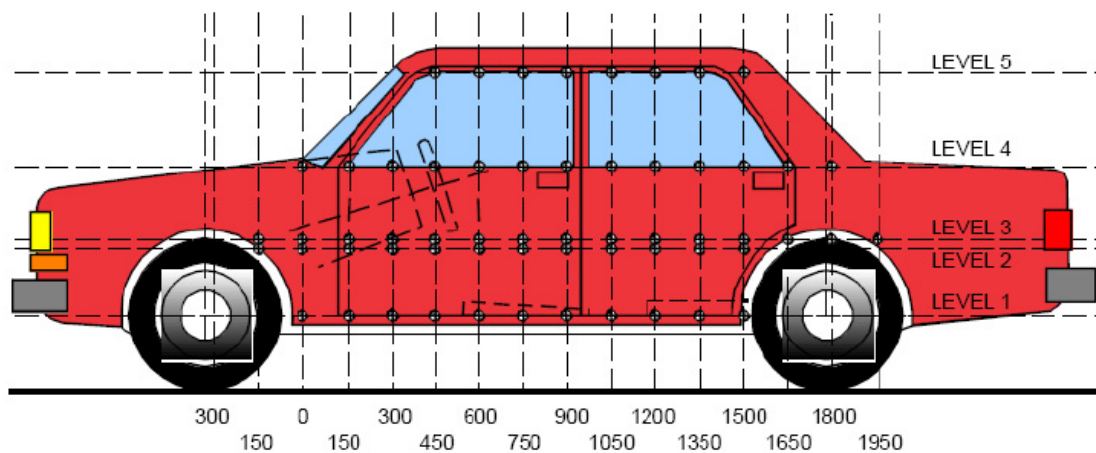


LEFT SIDE VIEW

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	2800	2760	-40
B	Front Axle to FSOV	790	805	15
C	Rear Axle to RSOV	940	945	5
D	Total Length at Centerline	4845	4838	-7
E	Front Bumper Thickness	263	263	0
F	Front Bumper Bottom to Ground	290	307	17
G	Sill Height at Front Wheel Well	245	247	2
H	Sill Height at Front Door Leading Edge	254	238	-16
I	Sill Height at B-Pillar	283	141	-142
J1	Pinch Weld Height at Rear Wheel Well	190	160	-30
J2	Sill Height at Rear Wheel Well	287	260	-27
K	Sill Height Aft of Rear Wheel Well	327	298	-29
L	Rear Bumper Thickness	172	172	0
M	Rear Bumper Bottom to Ground	450	417	-33
N	Sill Height to Window Bottom Sill	753	669	-84
O	Front Door Leading Edge to Impact C/L	1110	1086	-24
P	Rear Door Trailing Edge to Impact C/L	898	833	-65
Q	Front Window Opening	399	382	-17
R	Right Side Length	4530	4533	3
S	Left Side Length	4530	4510	-20
T	Vehicle Width at B-Post	1795	1611	-184

DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS



LEFT SIDE VIEW

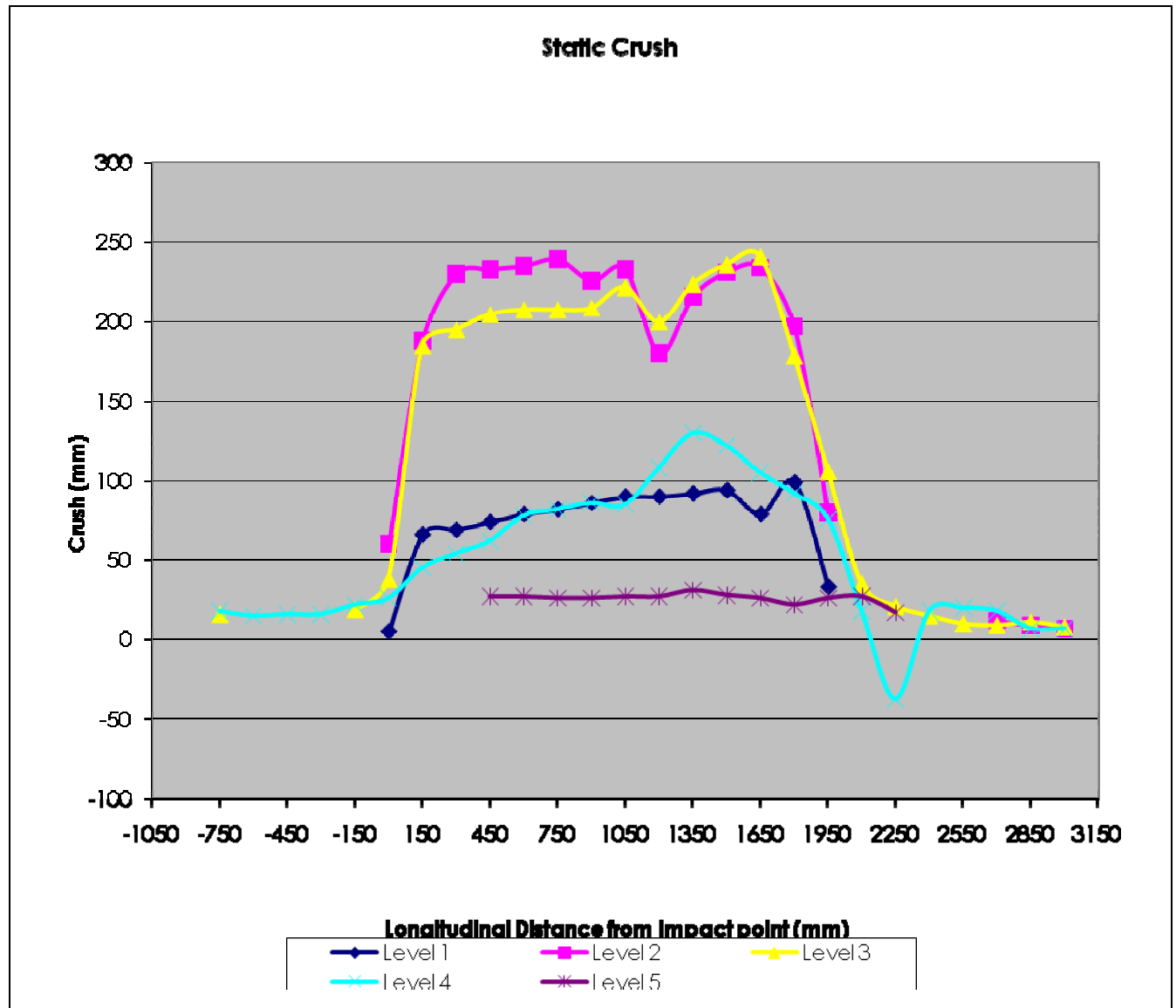
LEFT SIDE VIEW		
Level	Measurement description	Height above ground (mm)
1	Sill top	278
2	Occupant H - Point	515
3	Mid - Door	628
4	Window Sill	973
5	Window Top	1325

MAXIMUM CRUSH DATA					
	Level 1	Level 2	Level 3	Level 4	Level 5
Maximum Crush (mm)	99	239	241	130	31
Distance From Impact (mm)	1800	750	1650	1350	1350

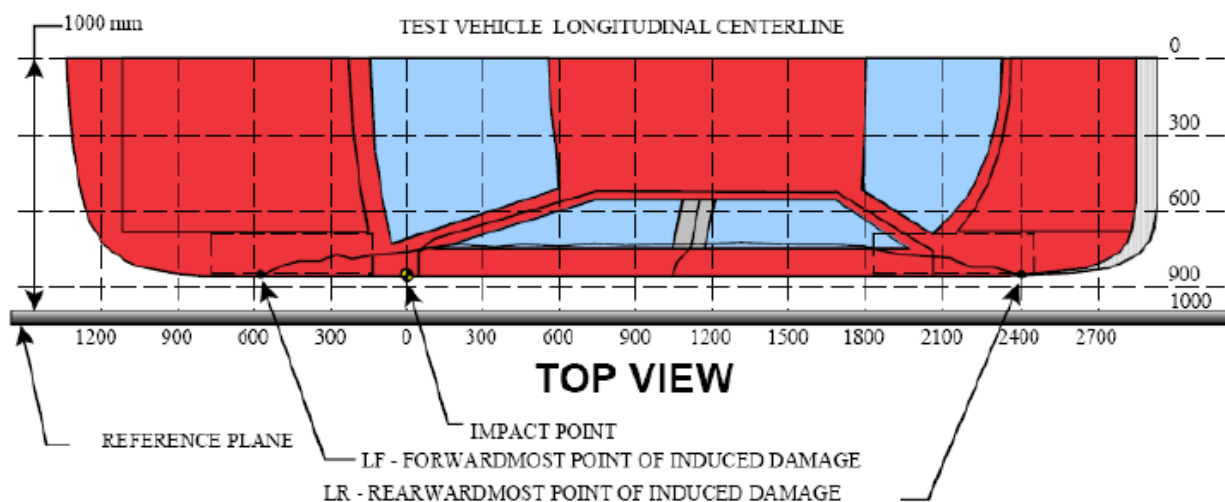
DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

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							248	264	16	418	436	18			
	-600										404	419	15			
	-450										392	408	16			
	-300										380	396	16			
	-150							243	262	19	370	392	22			
	0	282	287	5	262	322	60	263	301	38	360	386	26			
	150	291	357	66	272	460	188	265	450	185	354	399	45			
	300	289	358	69	271	501	230	265	460	195	348	402	54			
	450	285	359	74	270	503	233	263	468	205	352	414	62	454	481	27
	600	282	361	79	269	504	235	261	469	208	348	426	78	485	512	27
	750	280	362	82	268	507	239	260	468	208	351	433	82	508	534	26
	900	277	363	86	267	493	226	259	468	209	350	436	86	525	551	26
	1050	275	365	90	267	500	233	258	480	222	356	441	85	537	564	27
	1200	275	365	90	268	448	180	260	460	200	356	464	108	546	573	27
	1350	275	367	92	269	485	216	261	485	224	360	490	130	548	579	31
	1500	276	370	94	270	501	231	263	499	236	368	490	122	550	578	28
	1650	281	360	79	272	506	234	265	506	241	370	475	105	549	575	26
	1800	286	385	99	273	470	197	267	446	179	375	467	92	549	571	22
	1950	277	310	33	260	340	80	265	371	106	384	460	76	546	572	26
	2100							250	285	35	392	410	18	540	567	27
	2250							245	266	21	399	362	-37	536	553	17
	2400							245	260	15	408	426	18			
	2550							255	265	10	420	440	20			
	2700				260	272	12	290	299	9	434	452	18			
	2850				307	316	9	320	331	11	452	459	7			
	3000				346	353	7	345	353	8	472	479	7			
	3150															
	3330															

DATA SHEET NUMBER 12
VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

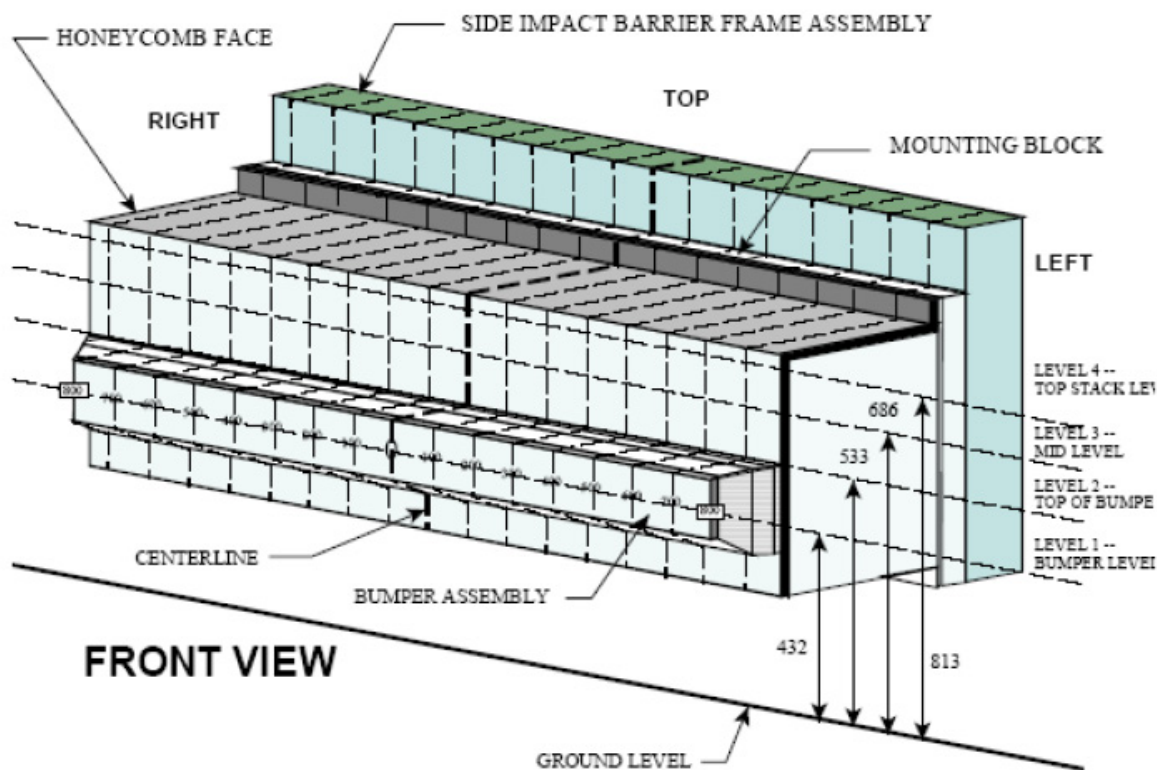


DATA SHEET NUMBER 13
VEHICLE DAMAGE PROFILE DISTANCES



DAMAGE PROFILE DISTANCES					
DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Maximum Static Crush (mm)
1	-150	3	260	263	0
2	330	3	260	460	200
3	810	3	260	471	251
4	1290	3	260	469	209
5	1770	3	263	459	196
6	2250	3	267	263	0

DATA SHEET NUMBER 14
EXTERIOR STATIC CRUSH FOR IMPACTOR FACE



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

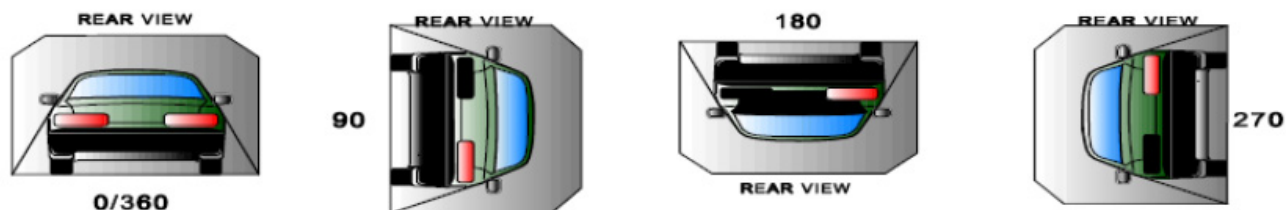
	Distance Right of Center								C.L.	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	151	139	135	129	126	123	124	128	132	136	135	140	135	131	127	126	141
2	90	80	75	68	63	56	55	55	57	62	60	59	57	60	64	66	67
3	108	70	48	34	28	26	23	21	21	25	38	41	31	26	17	15	60
4	137	83	70	62	48	41	36	38	43	54	75	72	33	19	15	15	45

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

Temperature at Time of Impact: 24° C Test Time: 2:35 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



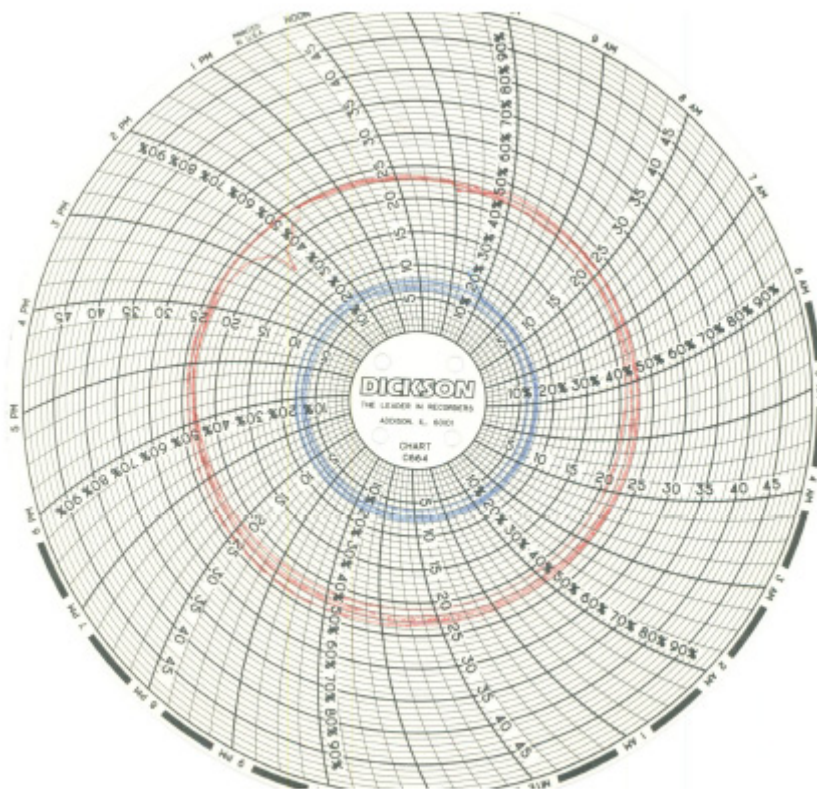
ROLLOVER SOLVENT COLLECTION TIME TABLE			
Test phase	Rotation Time (sec.)	Hold Time (sec.)	Total Time (sec.)
Tolerance	60-180	>= 300	-
0° to 90°	63	300	363
90° to 180°	65	300	365
180° to 270°	65	300	365
270° to 360°	64	300	364

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 Optima 4-Door Sedan
Test Program: SNCAP

NHTSA Number: MB 0513
Test Date: February 4, 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

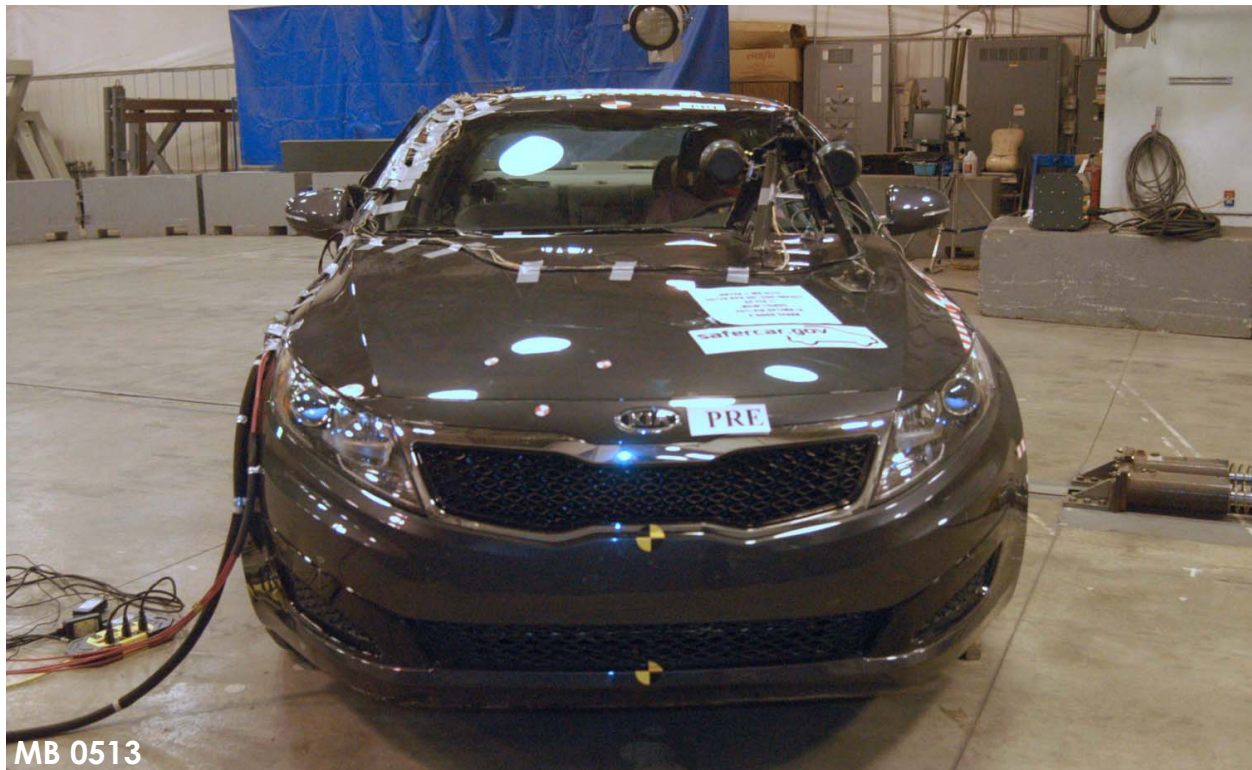


Figure A-3: Pre-Test Frontal View of the Test Vehicle

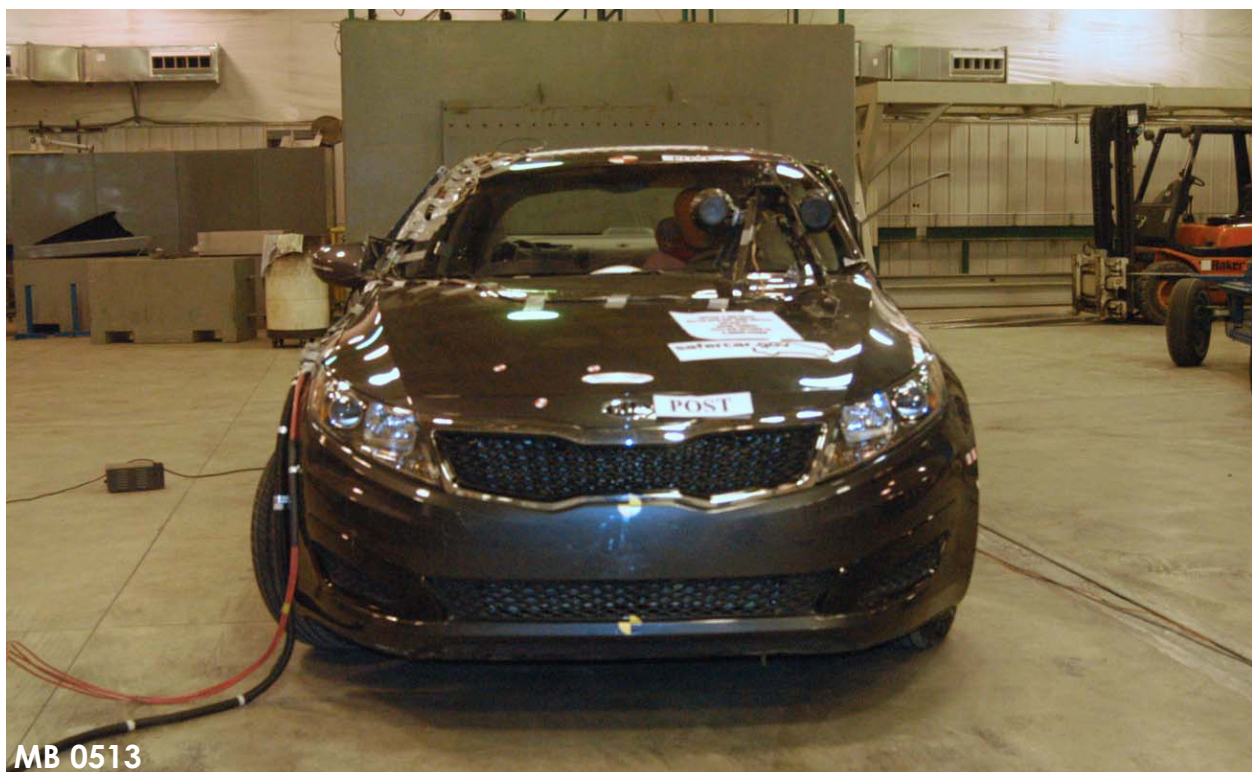


Figure A-4: Post-Test Frontal View of Test Vehicle



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

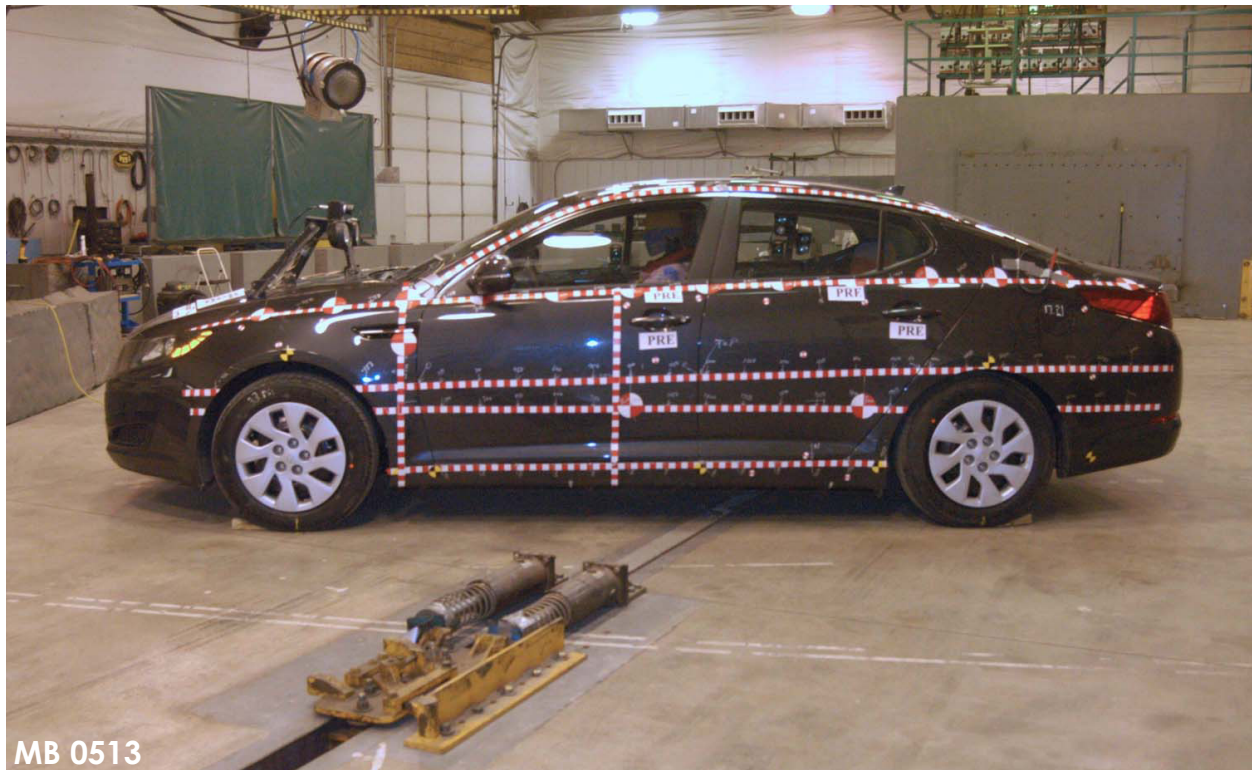


Figure A-7: Pre-Test Left Side View of Test Vehicle



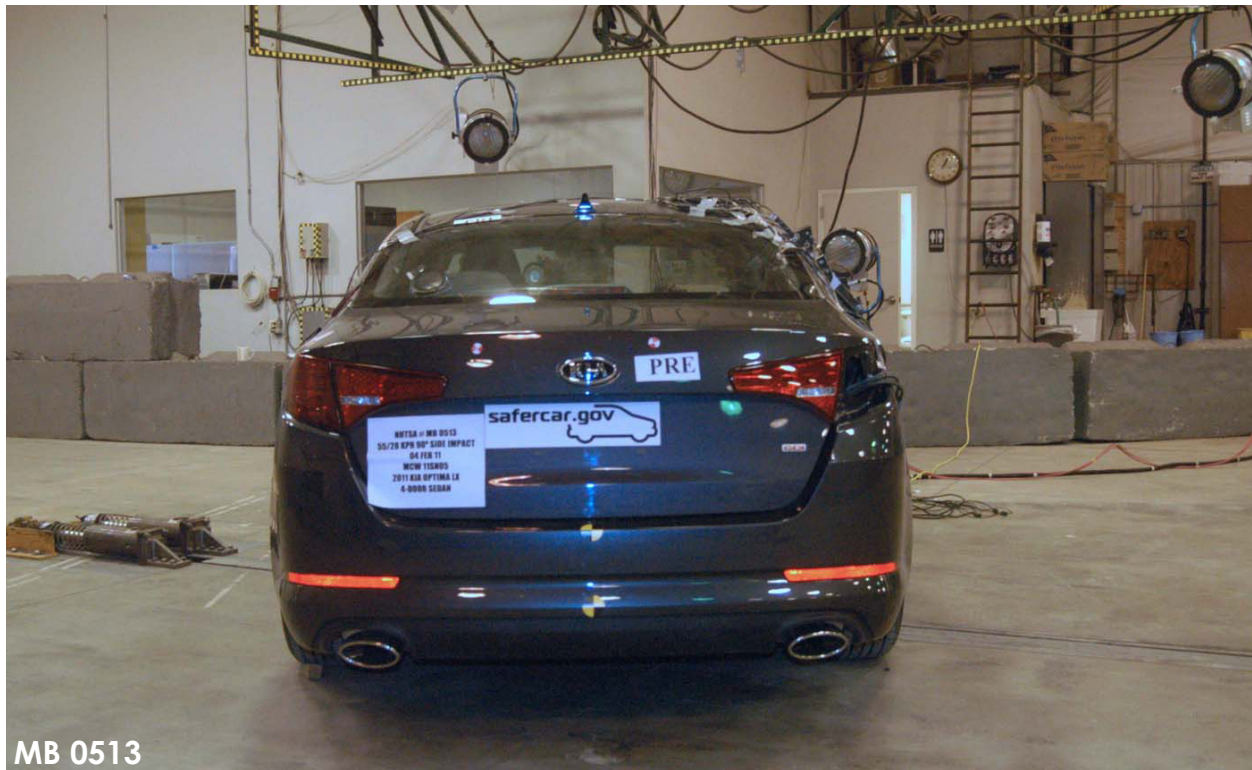
Figure A-8: Post-Test Left Side View of Test Vehicle



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



MB 0513

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



MB 0513

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

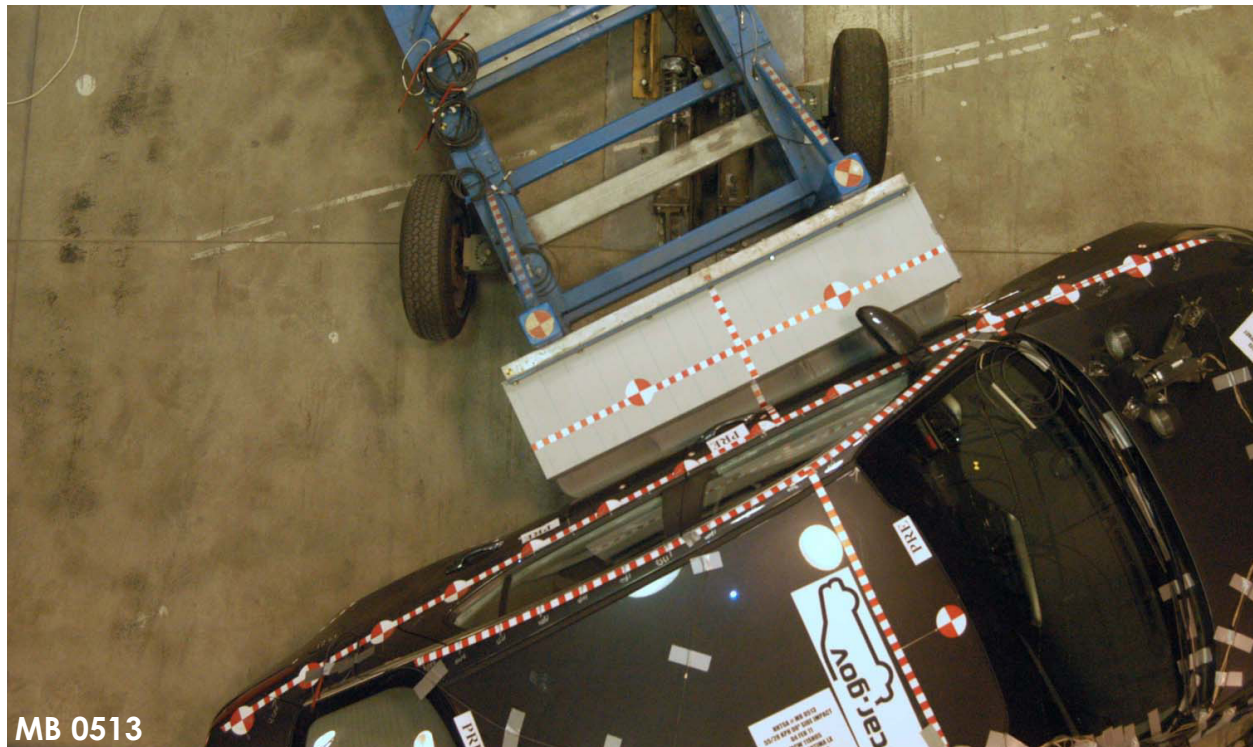


Figure A-15: Pre-Test Overhead View of Test Vehicle with MDB Positioned Against Side of Target

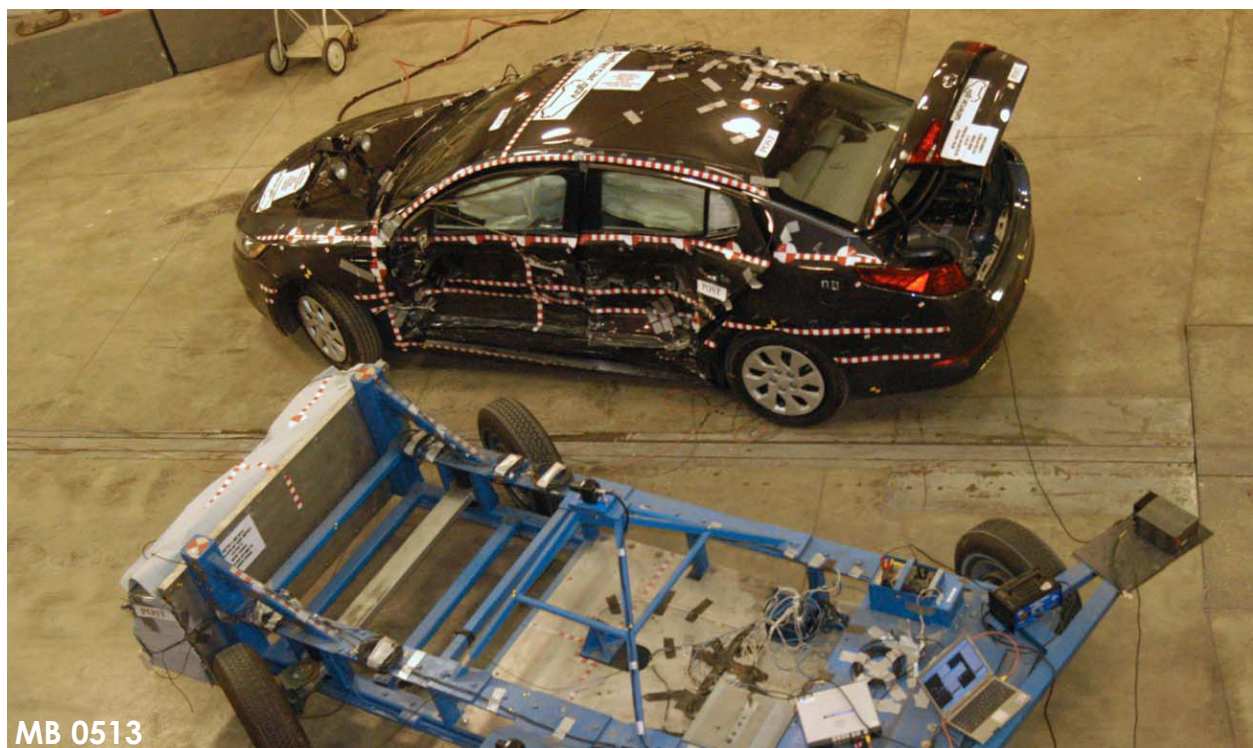


Figure A-16: Post-Test Overhead View of Test Vehicle and MDB



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: Pos-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 Restraint



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

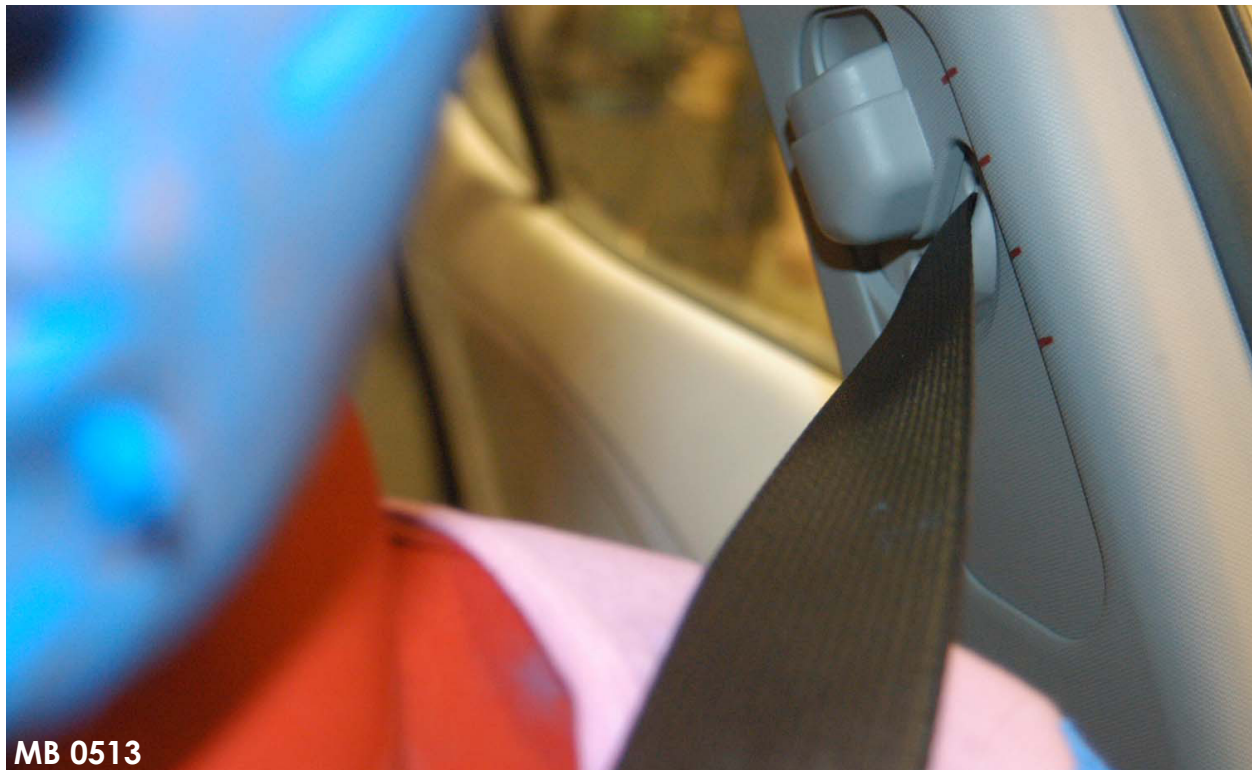


Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy



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

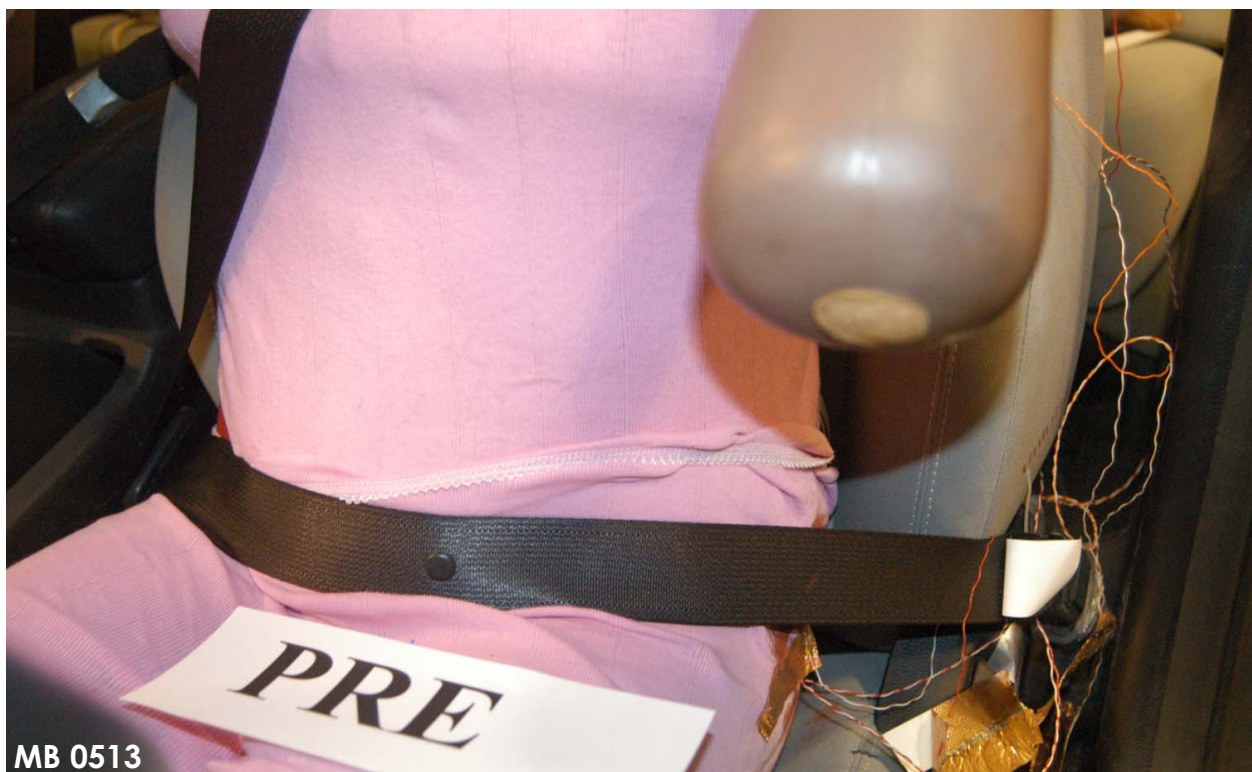


Figure A-40: Pre-Test Close-Up View of Driver Seat Back



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

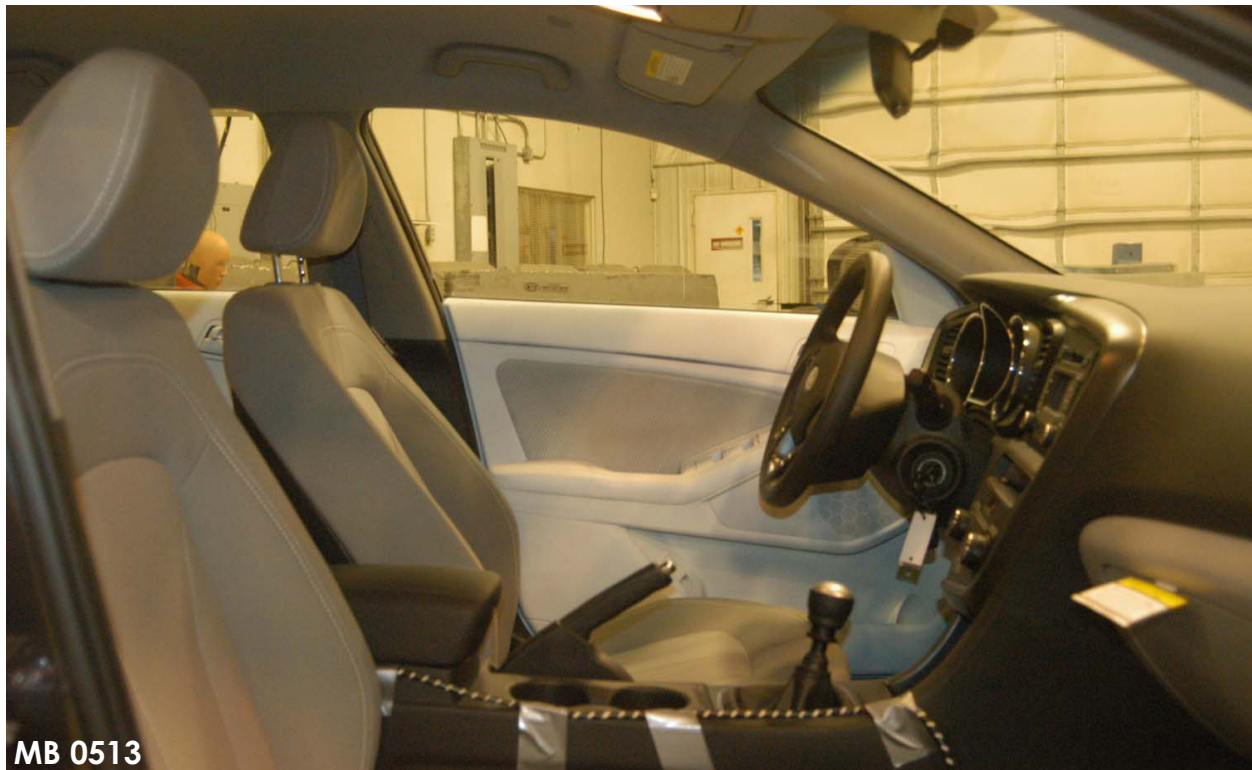


Figure A-45: Pre-Test Driver Inner Door Panel View



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

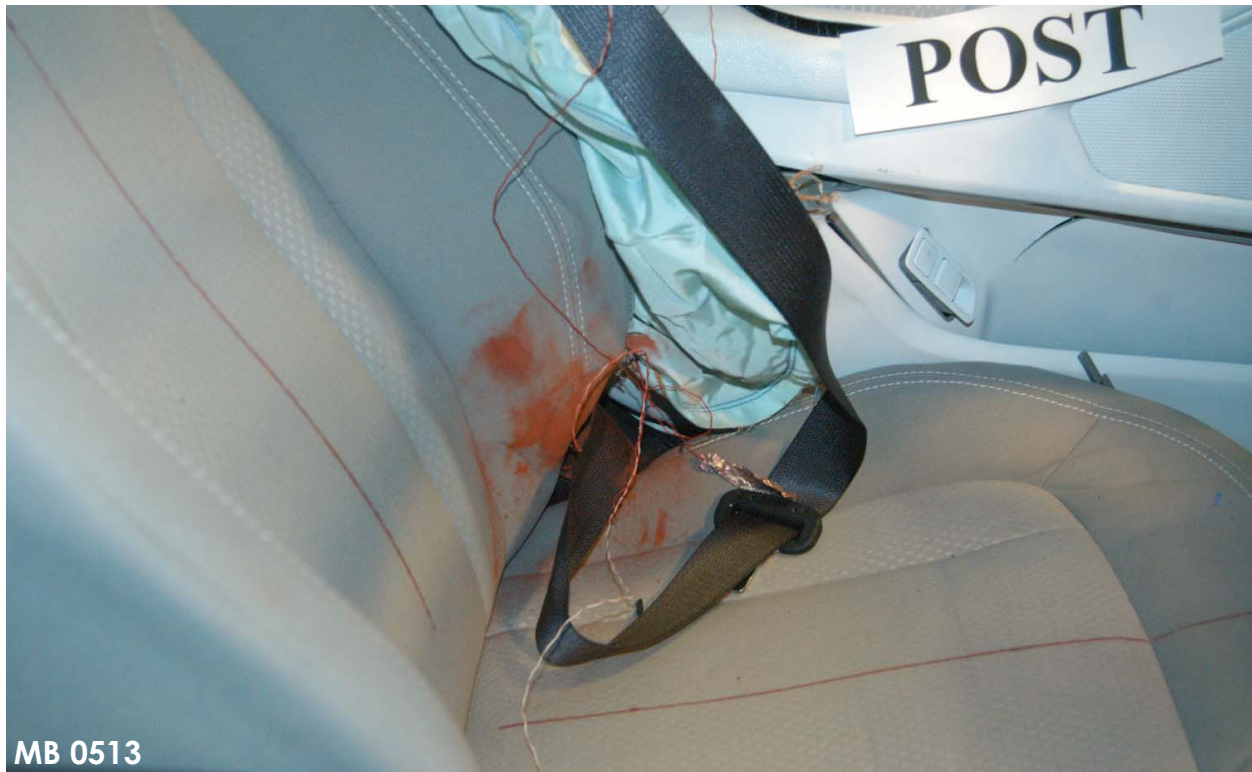


Figure A-51: Post-Test Driver Dummy Close-Up Pelvis Contact View



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

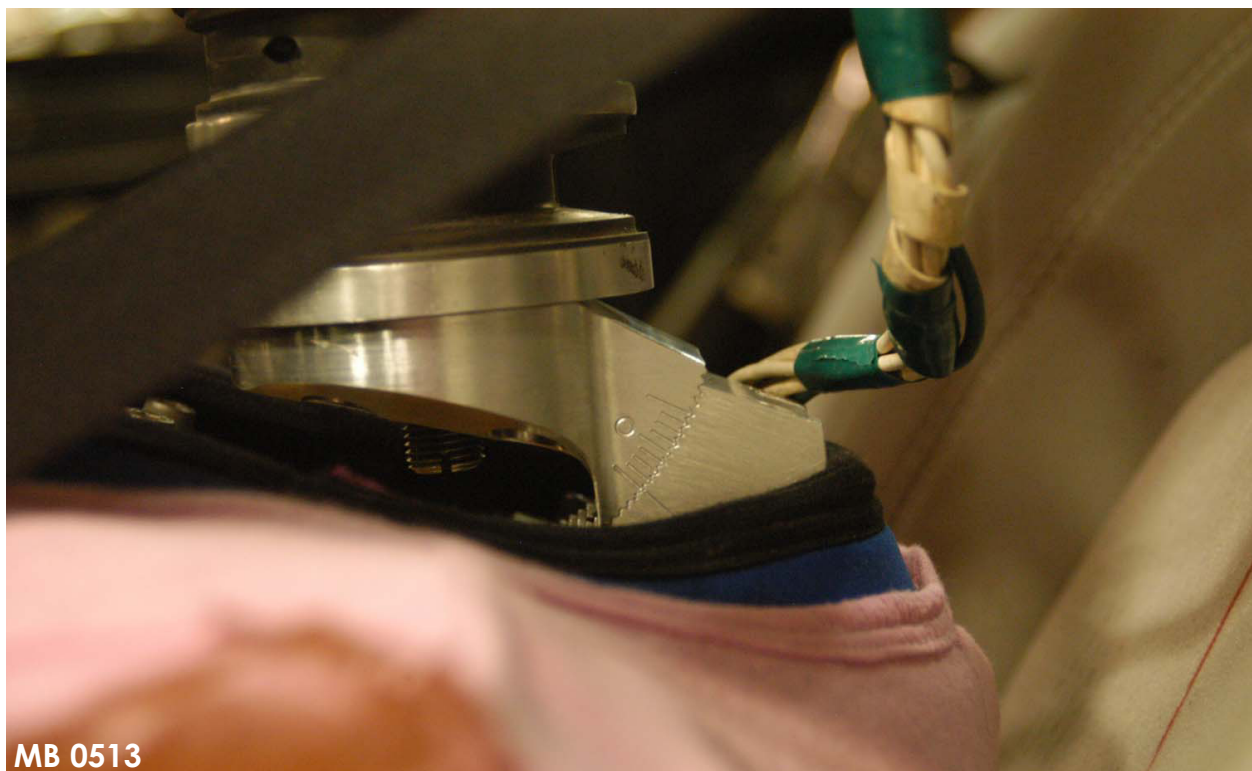


Figure A-60: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

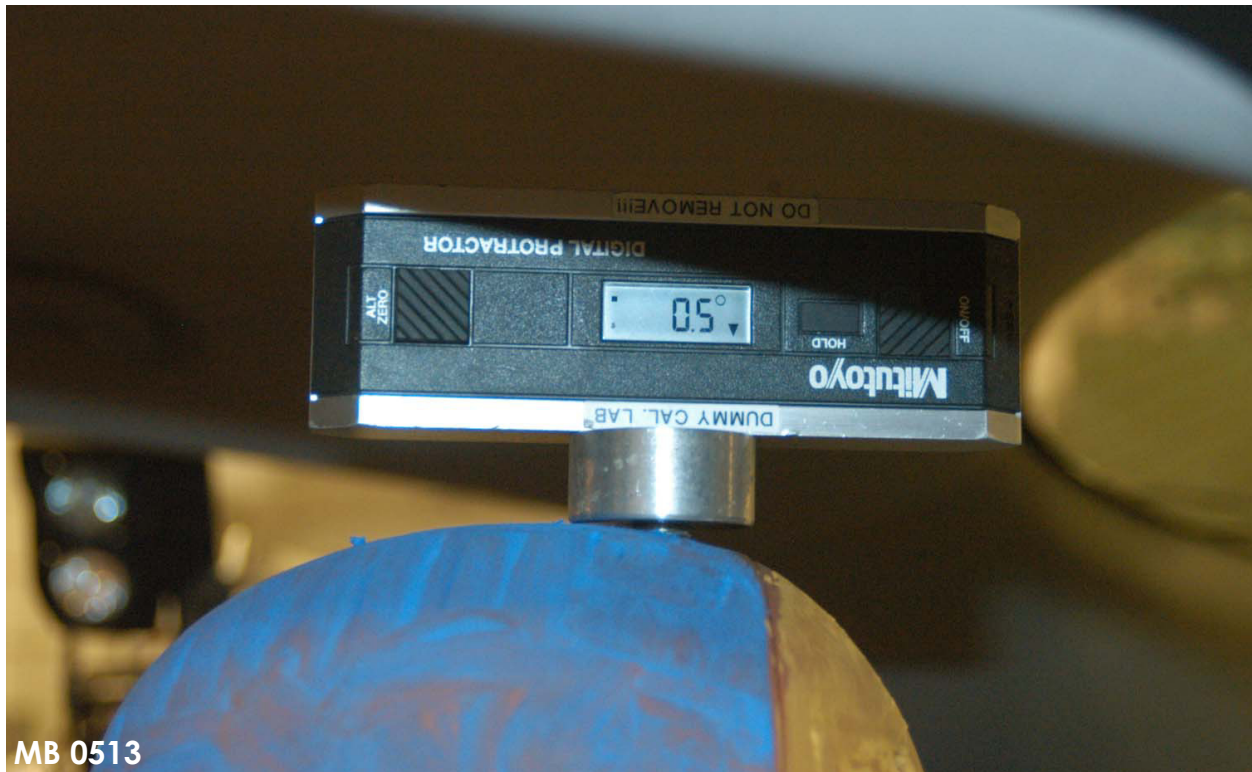


Figure A-61: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



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

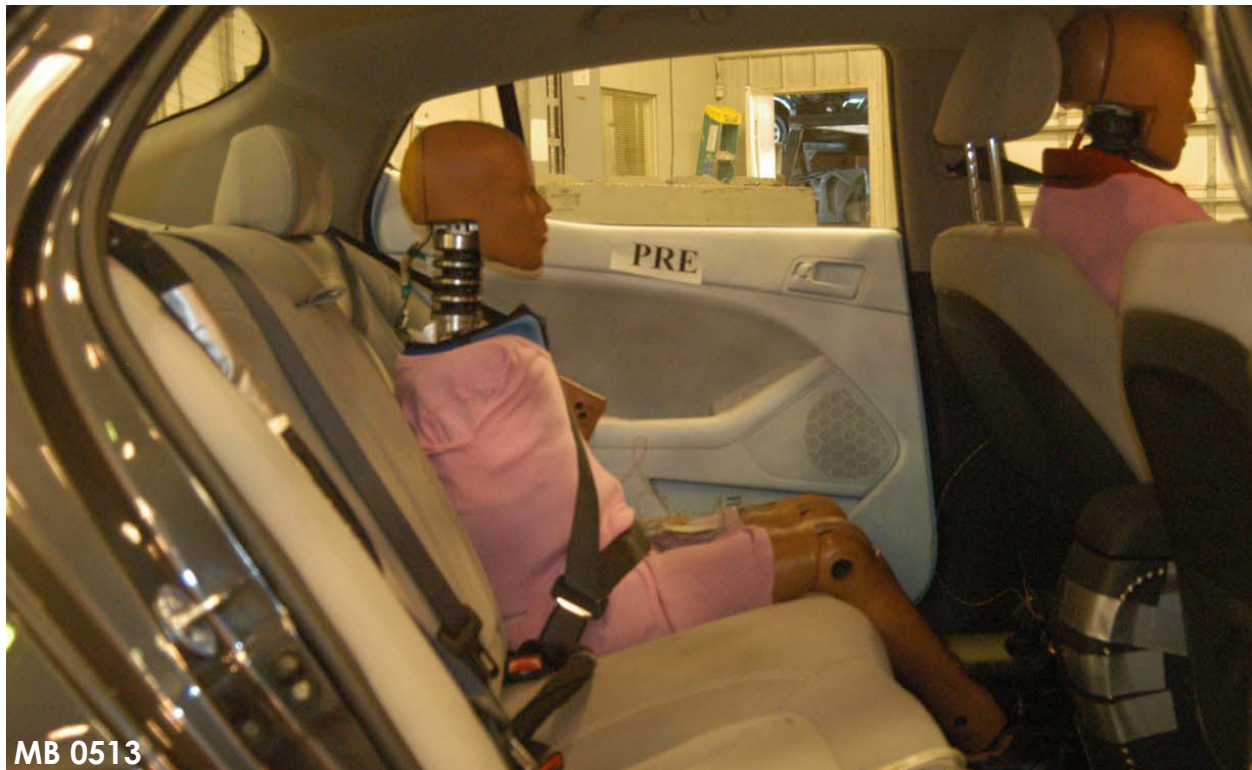


Figure A-69: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



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

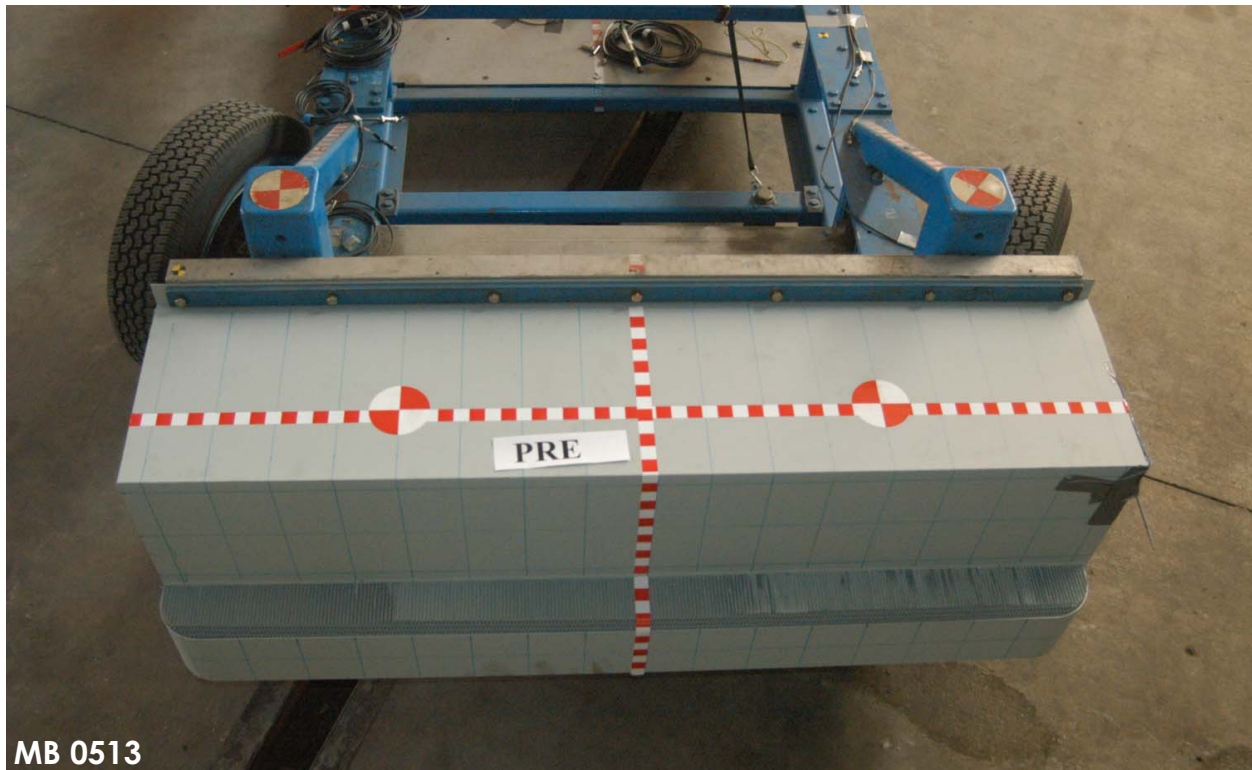


Figure A-83: Pre-Test Top View of MDB Impactor Face



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



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

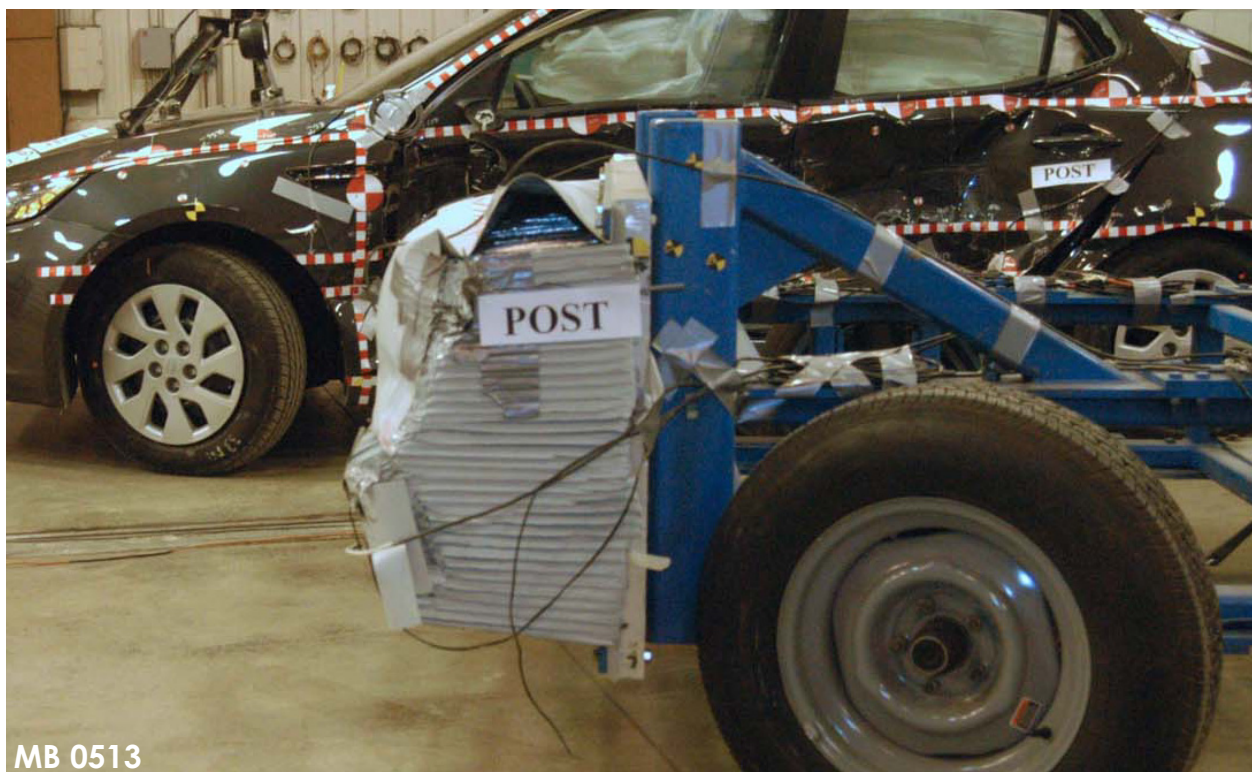


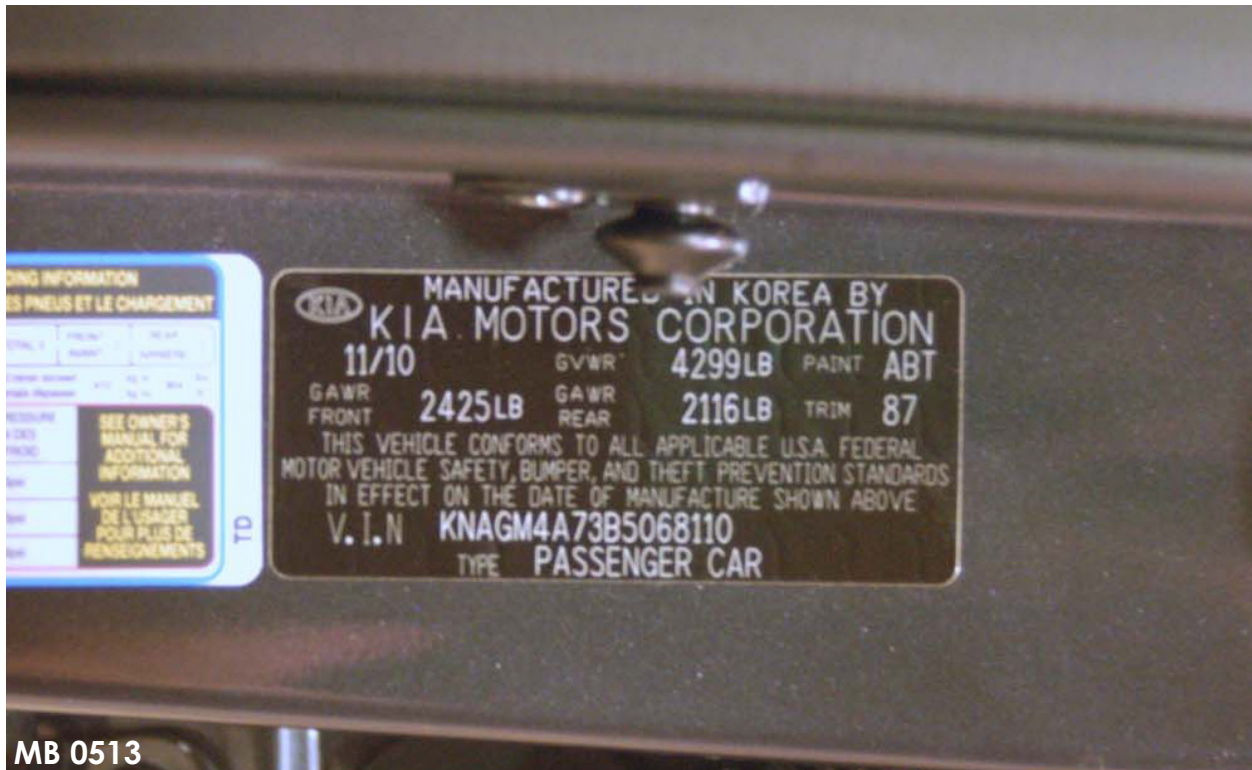
Figure A-86: Post-Test Left Side View of MDB Impactor Face



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

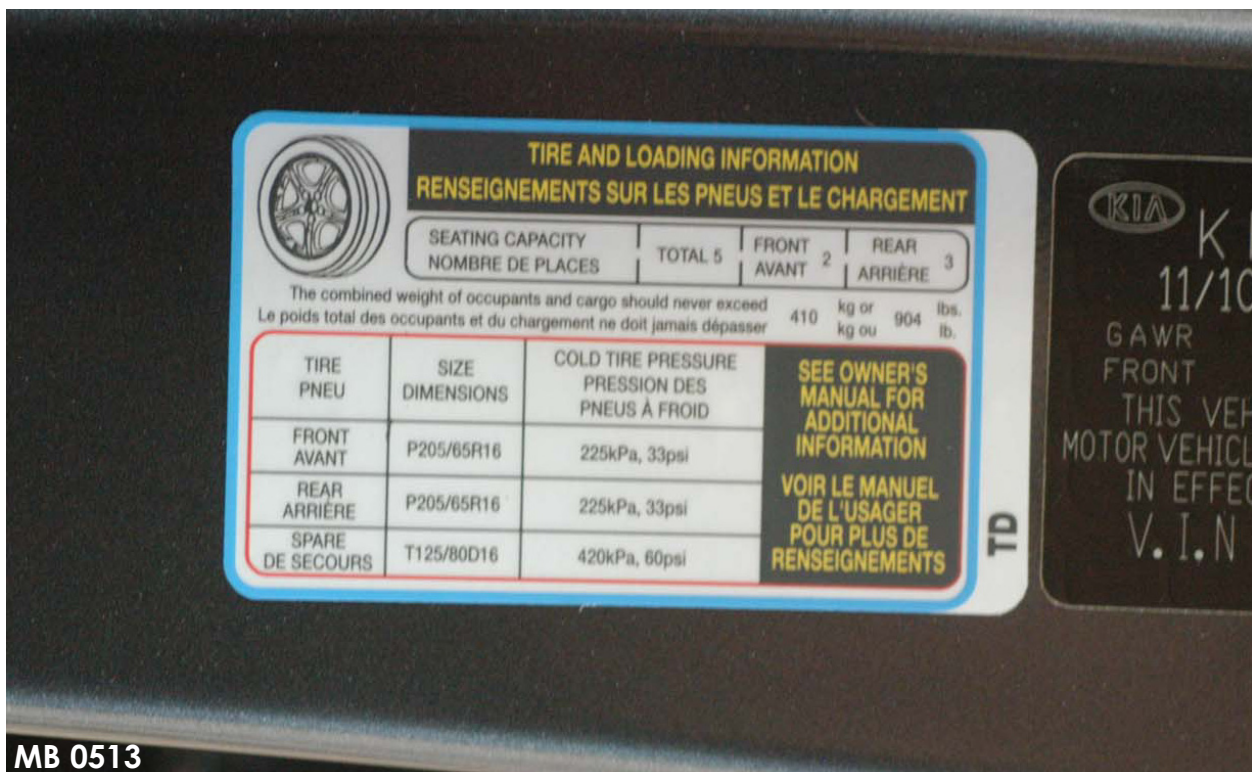


Figure A-88: Post-Test Right Side View of MDB Impactor Face



MB 0513

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



MB 0513

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

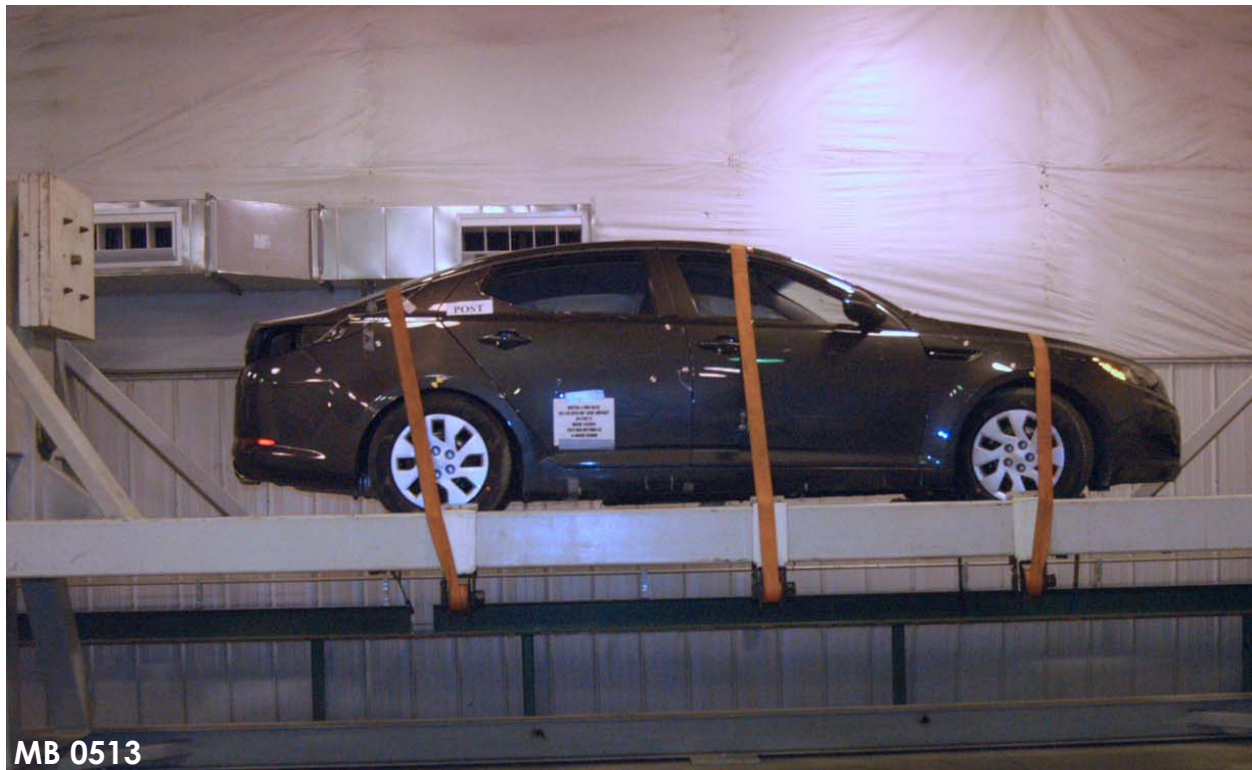


Figure A-93: FMVSS No. 301/305 Rollover 0°

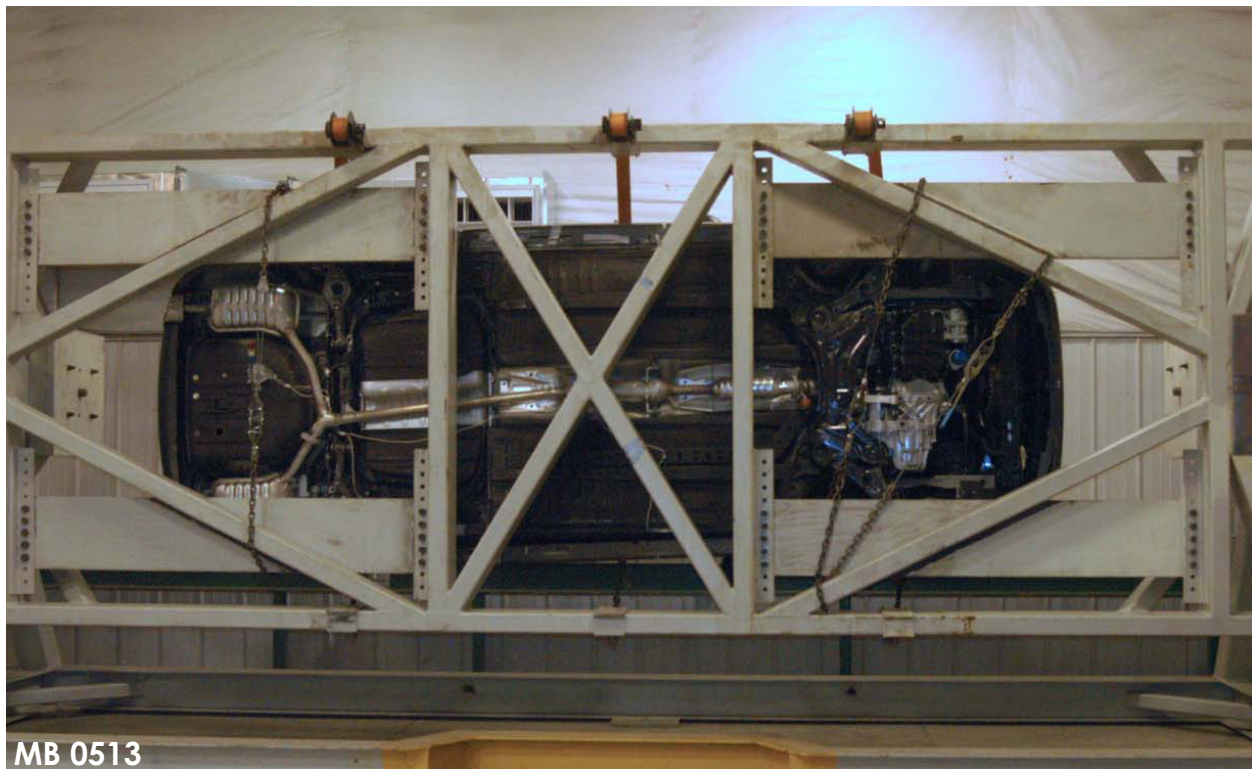


Figure A-94: FMVSS No. 301/305 Rollover 90°

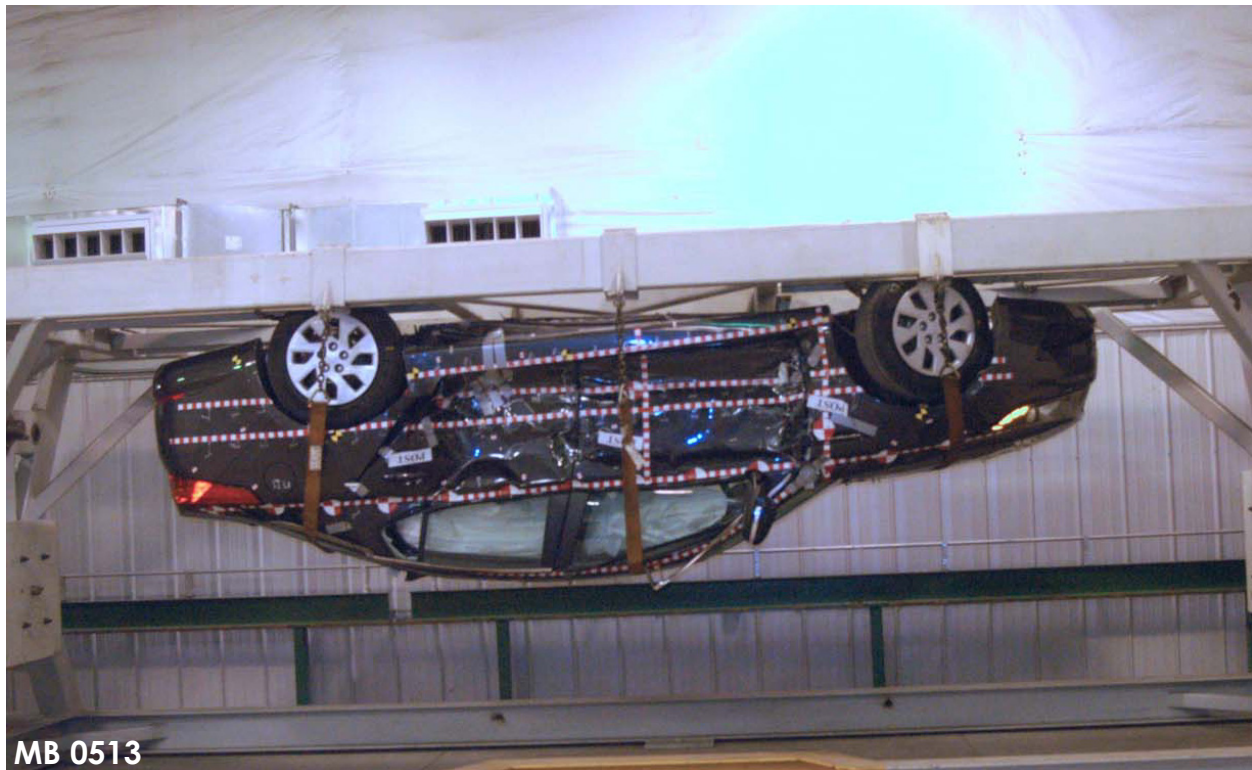


Figure A-95: FMVSS No. 301/305 Rollover 180°

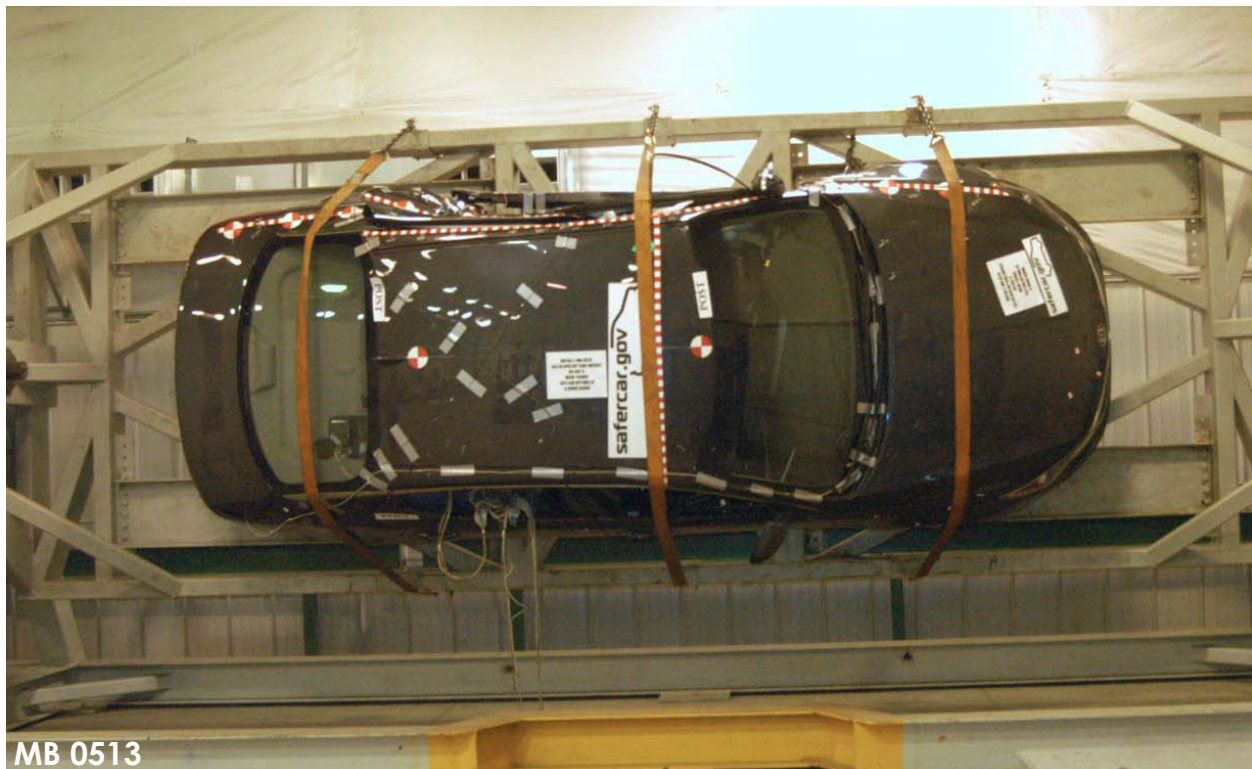


Figure A-96: FMVSS No. 301/305 Rollover 270°



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



Figure A-98: Impact Event

2011 KIA OPTIMA LX
MODEL YEAR: 2011
PLATINUM GRAPHITE/GRAY
EXTENSION: INTERIOR COLOR: G4KJAH01
VIN: KNAJMAA738068110
TACOMA TRUCK
SOLD TO: W006
FRANK BOUCHER KIA
9601 WASHINGTON AVE.
P.O. BOX 085690
RACINE WI 53407

STANDARD FEATURES
MECHANICAL
2.4L Gas Direct Injection 4-cyl Engine
6-Speed Manual Transmission
Electric Power Steering
16" Tires with Wheel Covers
SAFETY
Dual Front Advanced Airbags
Front Side Mounted Side Airbags
Full-Length Side Curtain Airbags
3-Point Seatbelts for All Seating Positions
Front Active Headrests
Lower Anchors and Tethers for Children (LATCH)
Anti-Lock Brake System (ABS)
Traction Control System (TCS)
Electronic Stability Control (ESC)
Downhill Brake/Hill-start Assist Control (DHCAC)
Tire Pressure Monitoring System (TPMS)
INTERIOR
Air Conditioning
AM/FM/CD/MP3 Audio w/6 Speakers
SIRIUS Satellite Radio w/ a 3-month complimentary subscription included**
USB and Auxiliary Input Jacks
BLUETOOTH Wireless Technology
Cloth Seat Trim
Driver Seat Power Lumbar Support
Power Windows, Door Locks, & Outside Mirrors
Keyless Entry and Alarm System
Tilt & Telescopic Steering Column
Steering Wheel Controls
Trip Computer
Cooling Glove Box
Front/Rear Cup Holders
EXTERIOR
Outside Mirrors w/ Turn Signal Indicators
Solar Glass
Dual Exhausts with Chrome Tips

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance
**Ask dealer for details

ADDITIONAL INSTALLED EQUIPMENT:
(In addition to or in place of standard features)
Carpeted Floor Mats \$95.00

MANUFACTURER'S SUGGESTED RETAIL PRICE \$18,995.00

MSRP INCLUDING OPTIONS \$19,090.00

TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE \$19,785.00

EPA Fuel Economy Estimates
CITY MPG: 24
HIGHWAY MPG: 35
Estimated Annual Fuel Cost: \$1607.00
based on 15,000 miles at \$2.00 per gallon
Expected range for most drivers: 19 to 29 mpg
Combined Fuel Economy: 28 mpg
ALL MIDDLE CARS

GOVERNMENT SAFETY RATINGS
This vehicle has not been rated by the government for frontal crash, side crash or rollover risk.
Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

Environmental Performance
Protect the environment, choose vehicles with higher scores:
Global Warming Score: 8 (Cleanest)
Smog Score: 5 (Cleanest)

PARTS CONTENT INFORMATION
FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 4%
MAJOR SOURCES OF FOREIGN PARTS: KOREA: 89%
NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.
FOR THIS VEHICLE FINAL ASSEMBLY POINT: KOREA
COUNTRY OF ORIGIN ENGINE: KOREA
TRANSMISSION: KOREA

TOTAL ADDITIONAL WEIGHT: 10.5

MB 0513

Figure A-99: Monroney Label

Forward and backward adjustment
The headrest may be adjusted forward to 3 different positions by pulling the headrest forward to the desired detent. To adjust the headrest to its furthest backwards position, pull it fully forward to the farthest position and release it. Adjust the headrest so that it properly supports the head and neck.

Adjusting the height up and down
To raise the headrest, pull it up to the desired position (1). To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

Removal
To remove the headrest, raise it as far as it can go then press the release button (1) while pulling the headrest upward (2). To reinstall the headrest, put the headrest poles (3) into the holes while pressing the release button (1). Then adjust it to the appropriate height.

Seat warmer (if equipped)
The seat warmer is provided on front seats during cold weather when the engine is running, plus switches to warm the driver and front passenger's seat. During mild weather or when the operation of the seat warmer is not needed, keep the OFF position.

MB 0513

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

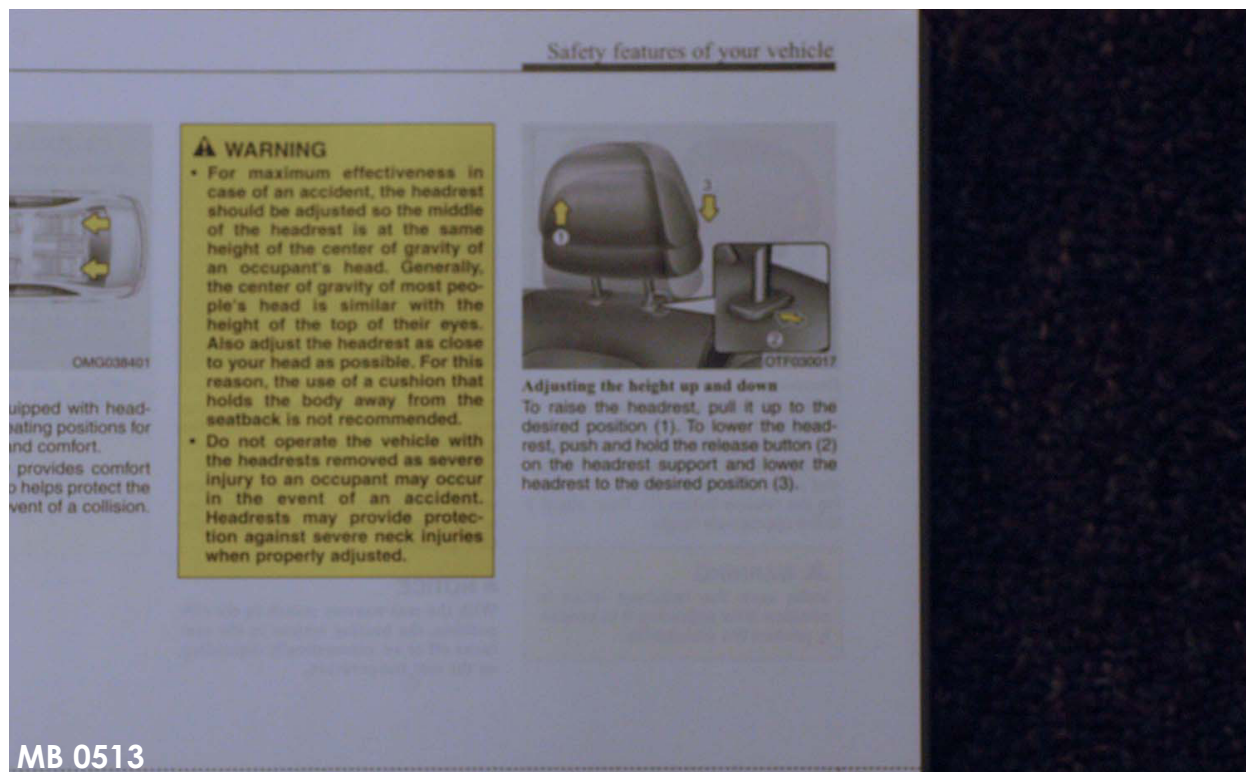


Figure A-101: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

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

NHTSA Number: MB 0513
Test Date: February 4, 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

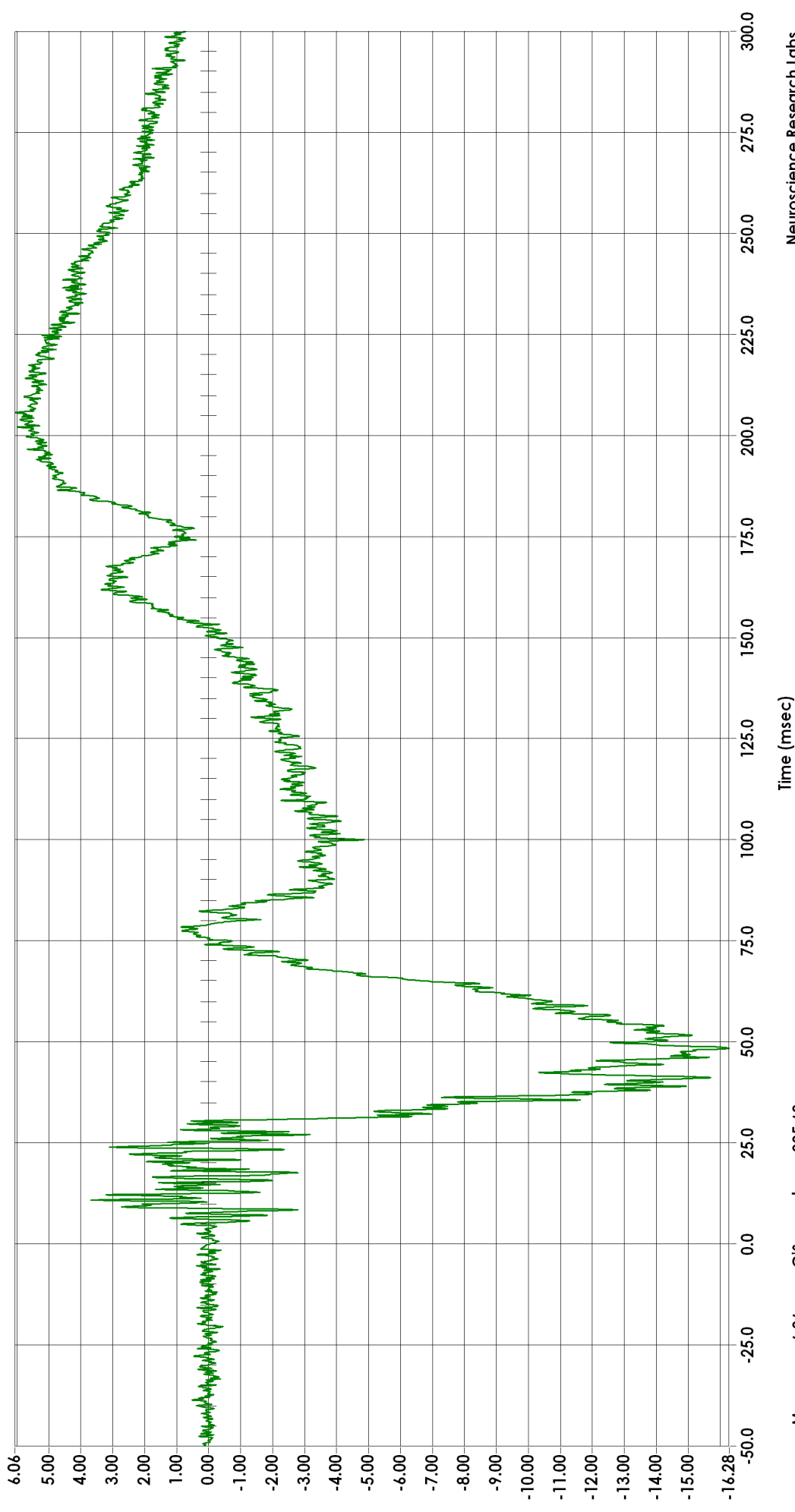
Driver Side Airbag Timing
Driver Side Curtain Airbag Timing
Passenger Side Airbag Timing
Passenger Side Curtain Airbag Timing
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (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	11SN05	Filter	CFC1000
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000TZ
		Serial Number	J43494

Driver Head Acceleration (X) Primary

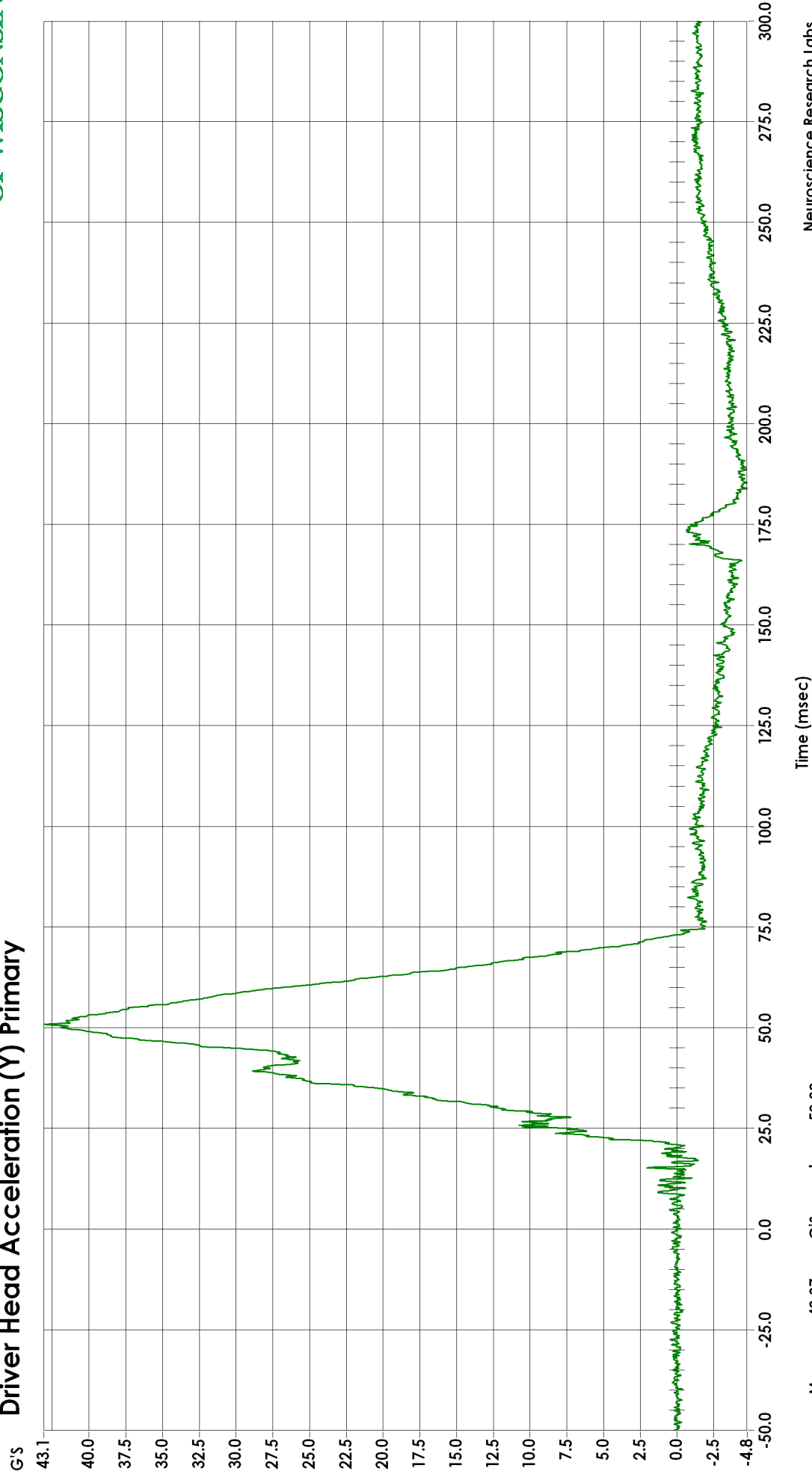


Max	6.06	G's	at	205.68	msec
Min	-16.28	G's	at	48.40	msec

11SN05 Plot 001

Test ID	11SN05	Filter	CFC1000
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000TZ
		Serial Number	J43475

Driver Head Acceleration (Y) Primary

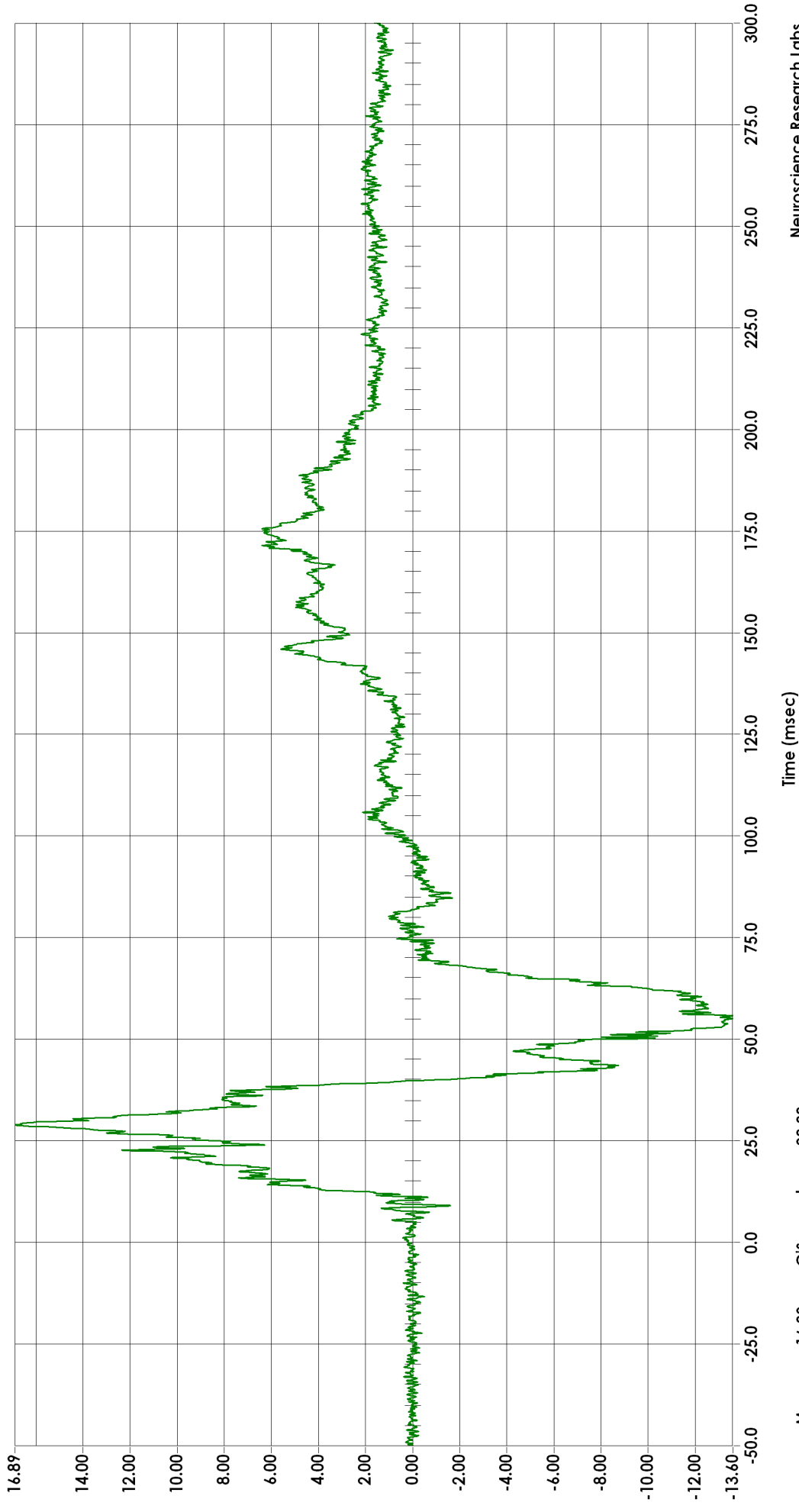


Max	43.07	G's	at	50.80	msec
Min	-4.77	G's	at	185.36	msec

11SN05 Plot 002

Test ID	11SN05	Filter	CFC1000
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	HDCG
		Sensor Info	ENDEVCO 7264-2000
		Serial Number	J43779

Driver Head Acceleration (Z) Primary

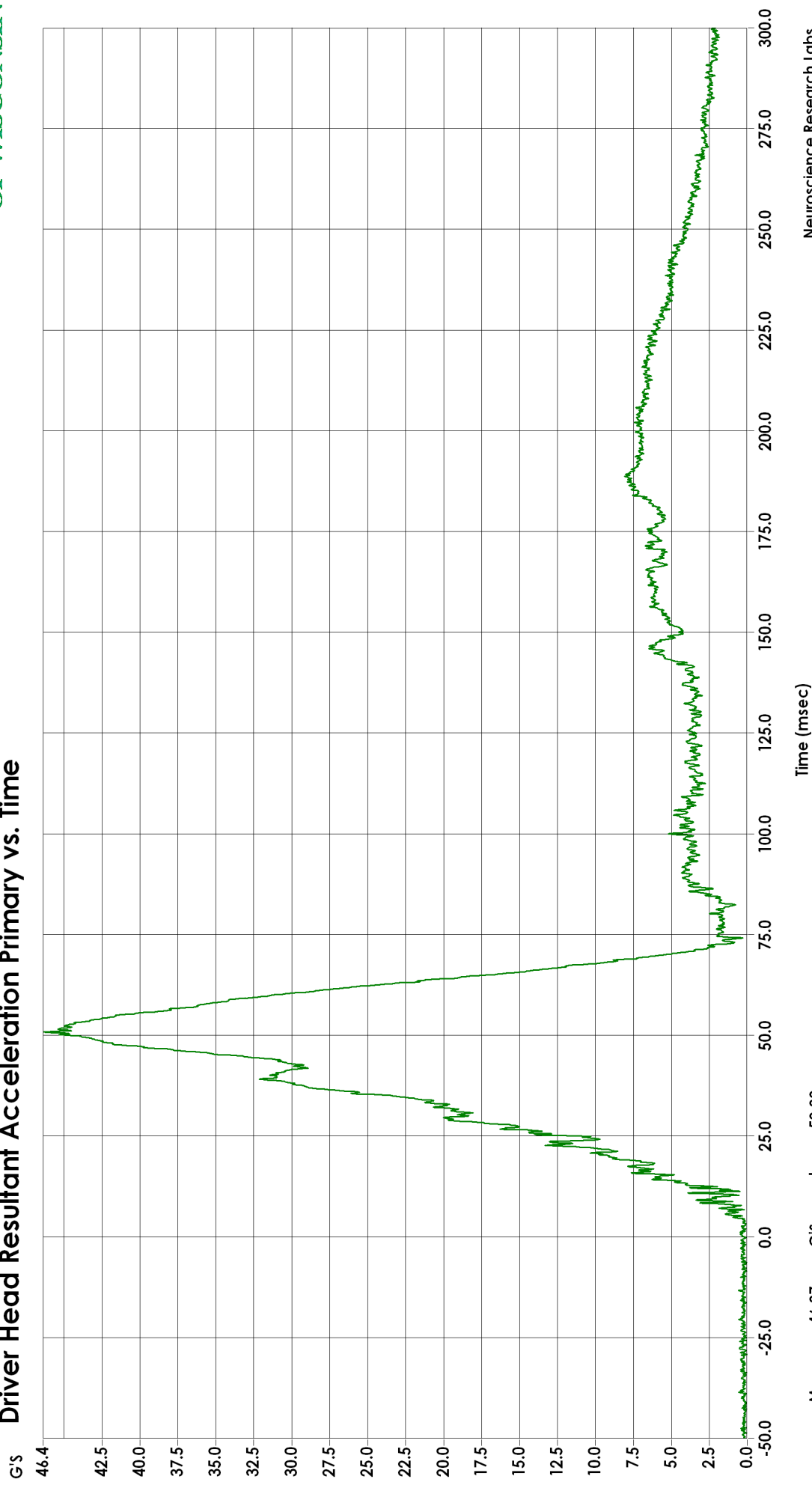


Max	16.89	G's	at	28.88	msec
Min	-13.60	G's	at	55.76	msec

11SN05 Plot 003

Test ID	11SN05	Filter	CFC1000	Sensor Location
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Driver Head Resultant Acceleration Primary vs. Time

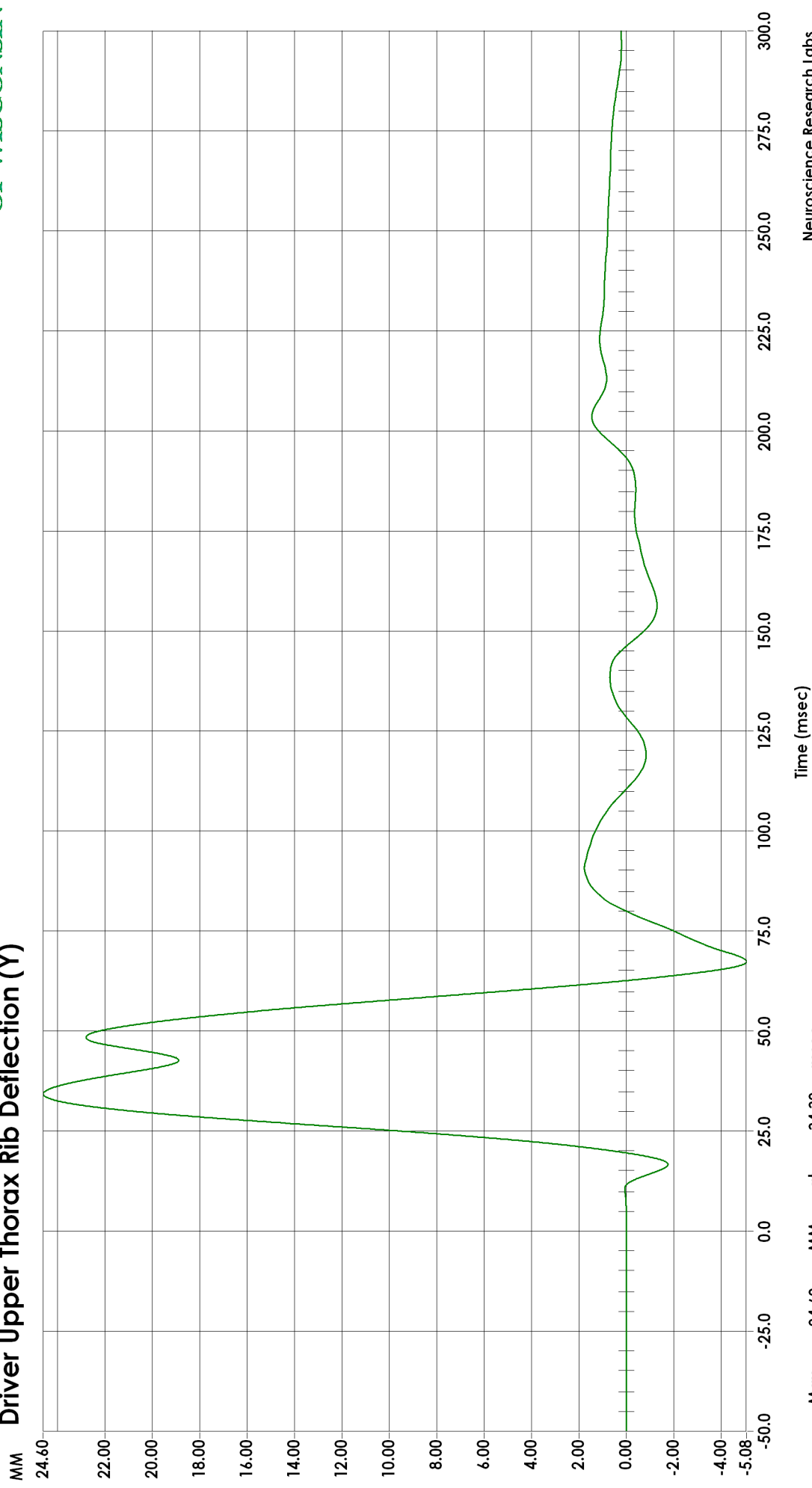


Max	46.37	G's	at	50.80	msec
Min	0.01	G's	at	-29.20	msec

11SN05 Plot 075

Test ID	11SN05	Filter	CFC180
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Prefrigger Points	1250
		Sensor Location	RBLU
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_433

Driver Upper Thorax Rib Deflection (Y)

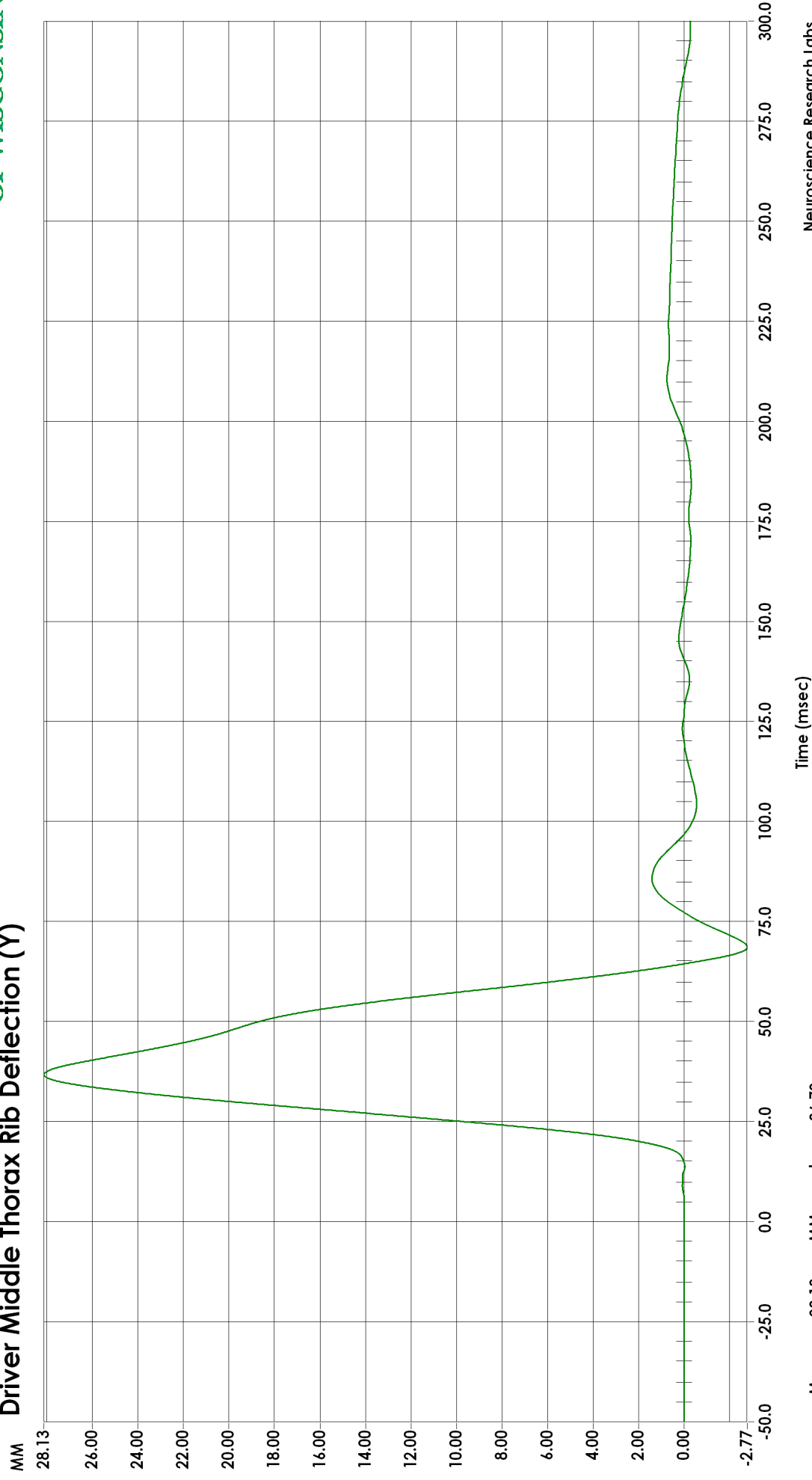


Max	24.60	MM	at	34.32	msec
Min	-5.08	MM	at	67.44	msec

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

Test ID	11SN05	Filter	CFC180
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBLM
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_193

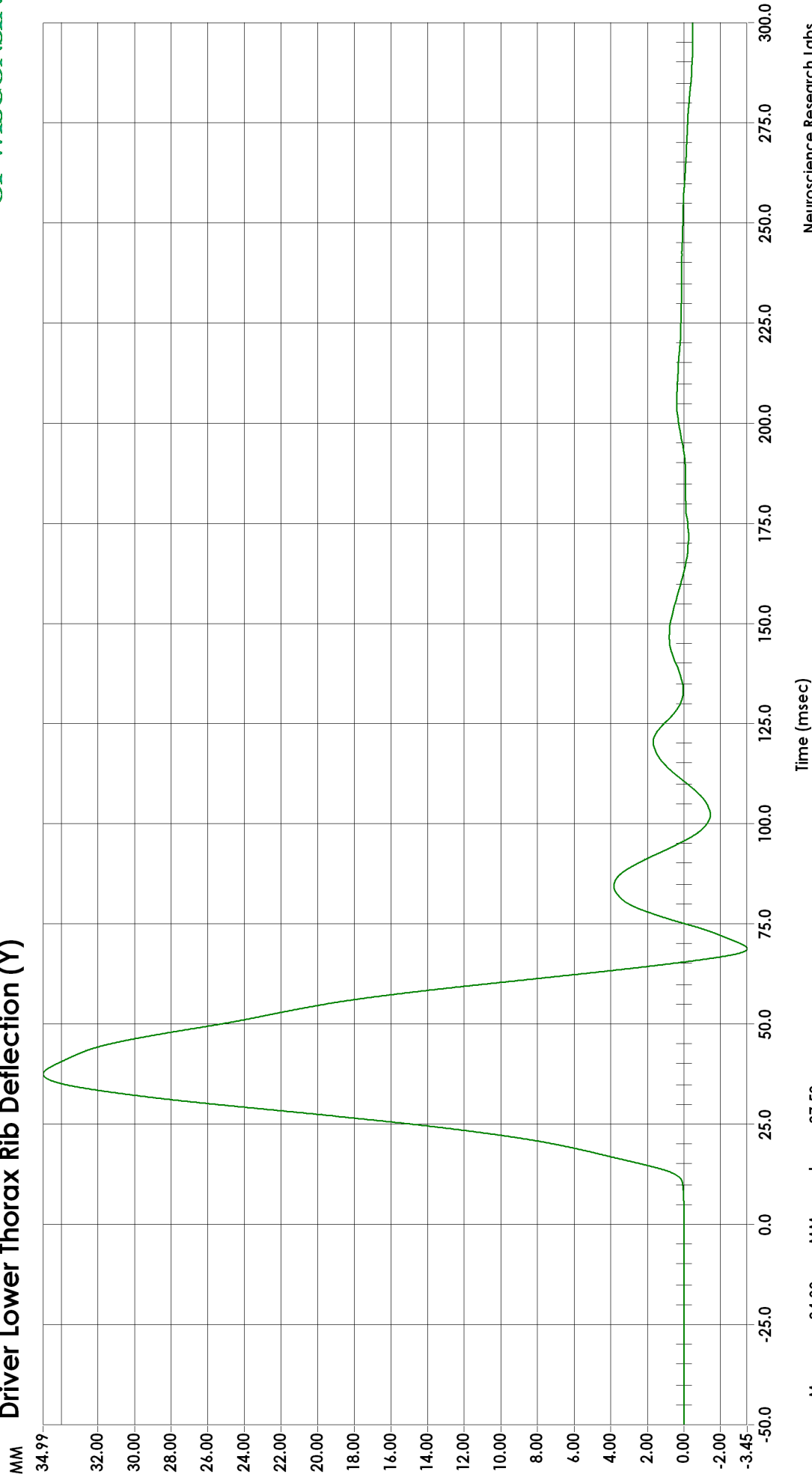
Driver Middle Thorax Rib Deflection (Y)



Max	28.13	MM	at	36.72	msec
Min	-2.77	MM	at	68.64	msec

Test ID	11SN05	Filter	CFC180
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	RBL1
		Sensor Info	Honeywell MLT-38000203
		Serial Number	MLT-38000203_191

Driver Lower Thorax Rib Deflection (Y)

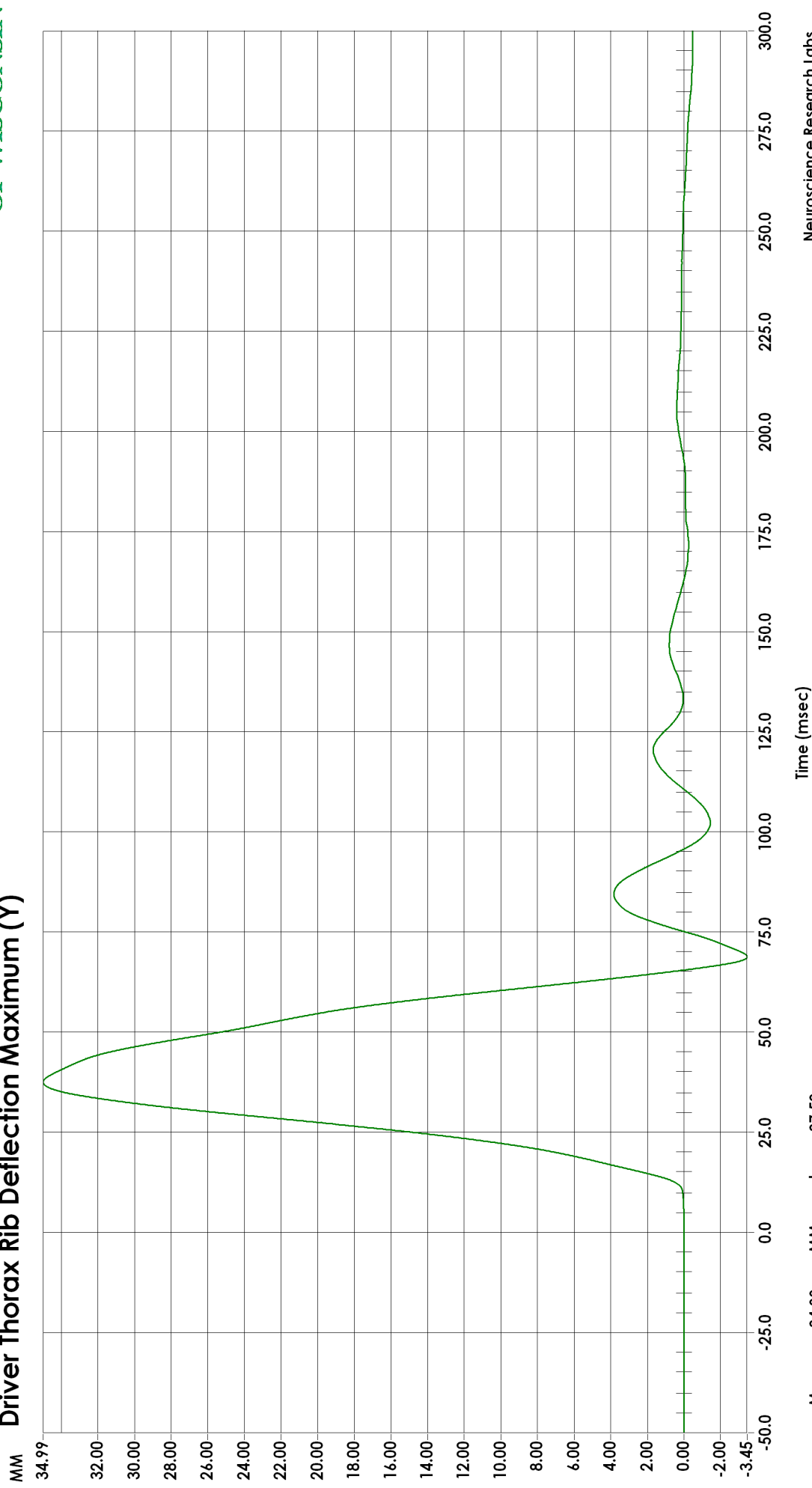


Max	34.99	MM	at	37.52	msec
Min	-3.45	MM	at	68.80	msec

11SN05 Plot 009

Test ID	11SN05	Filter	CFC180	Sensor Location	RBL
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info	Honeywell MLT-38000203
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number	MLT-38000203_191
		Pretrigger Points	1250		

Driver Thorax Rib Deflection Maximum (Y)

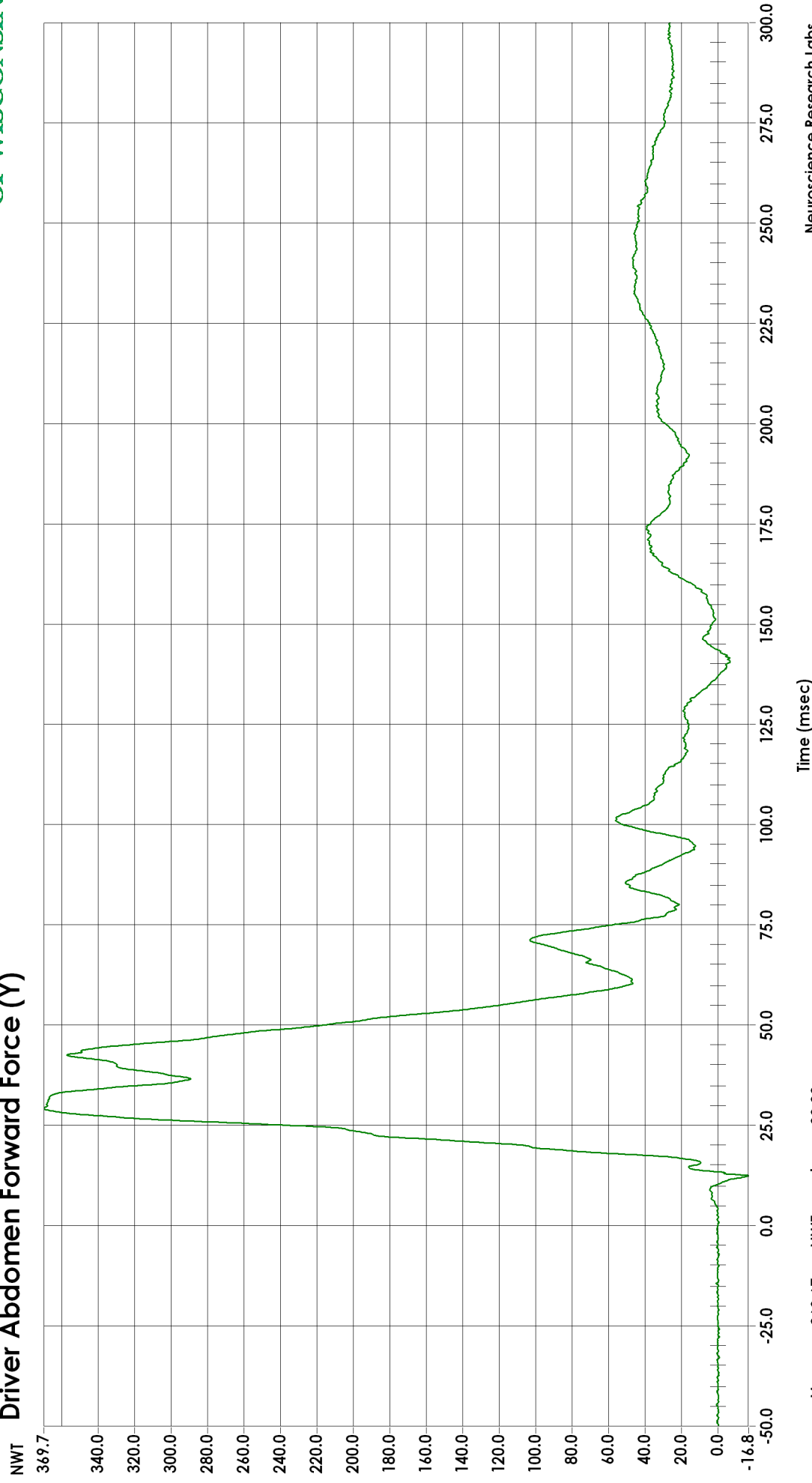


Neuroscience Research Labs
5000 West National Ave
Research 151
Milwaukee, WI 53295

Max	34.99	MM	at	37.52	msec
Min	-3.45	MM	at	68.80	msec

Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAF
		Sensor Info	Denton 2631
		Serial Number	2631_1502

Driver Abdomen Forward Force (Y)



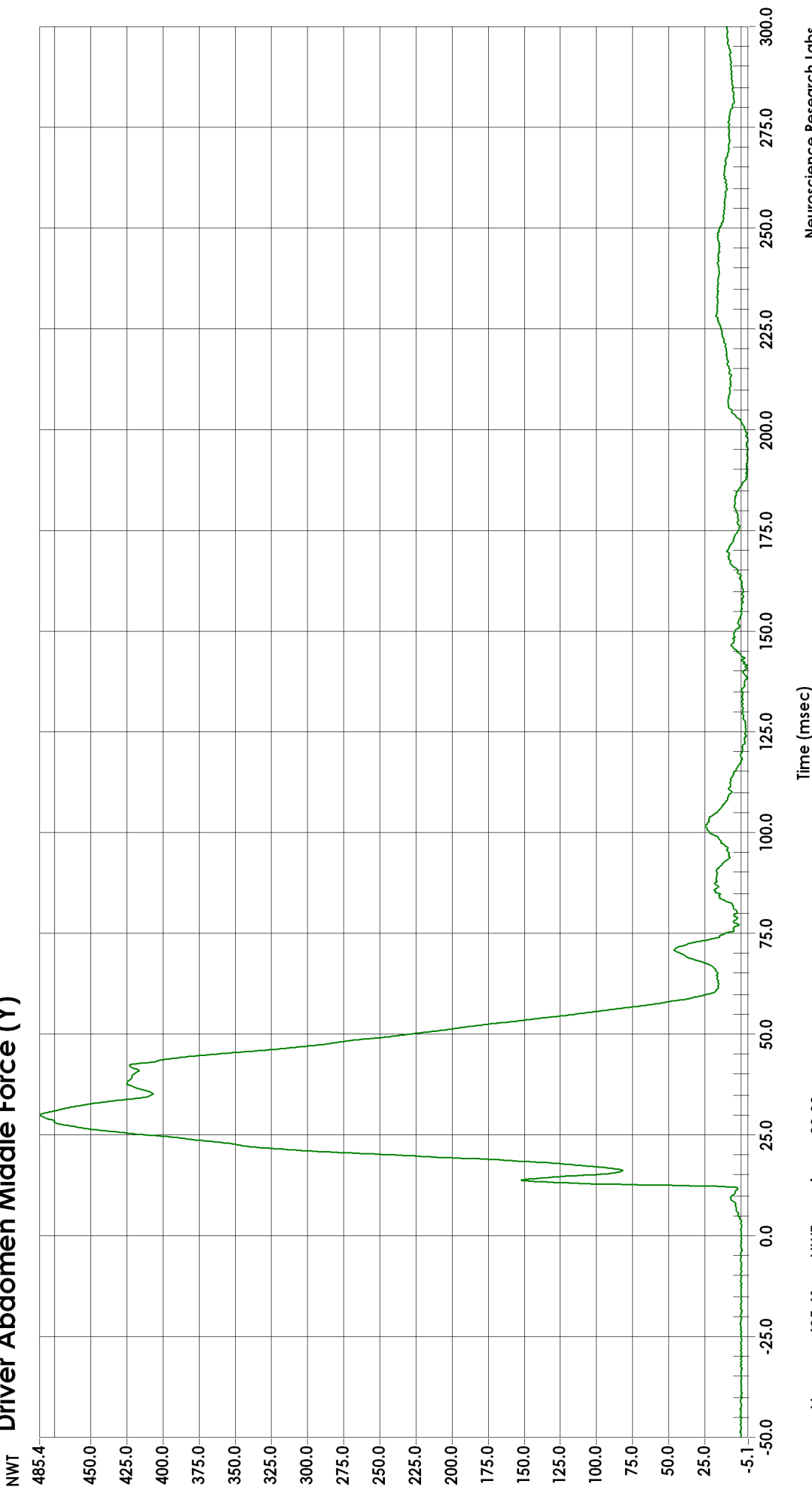
Max	369.67	NWT	at	29.20	msec
Min	-16.84	NWT	at	12.40	msec

11SN05 Plot 010



Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAM
		Sensor Info	Denton 2631
		Serial Number	2631_1511

Driver Abdomen Middle Force (Y)



Max	485.41	NWT	at	29.92	msec
Min	-5.08	NWT	at	197.60	msec

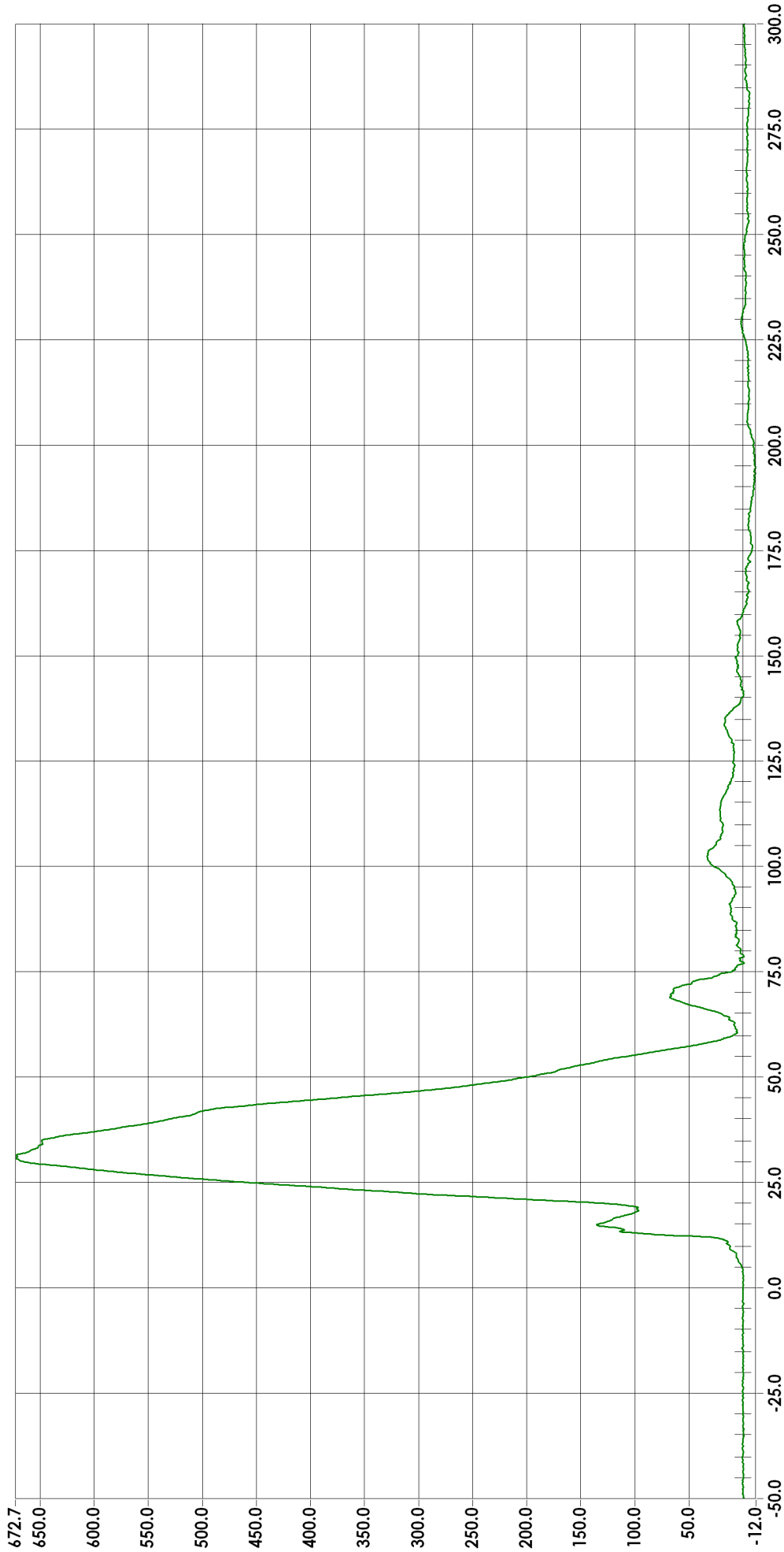
11SN05 Plot 011

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Milwaukee, WI 53295



Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	ESAR
		Sensor Info	Denton 2631
		Serial Number	2631_1537

Driver Abdomen Rear Force (Y)



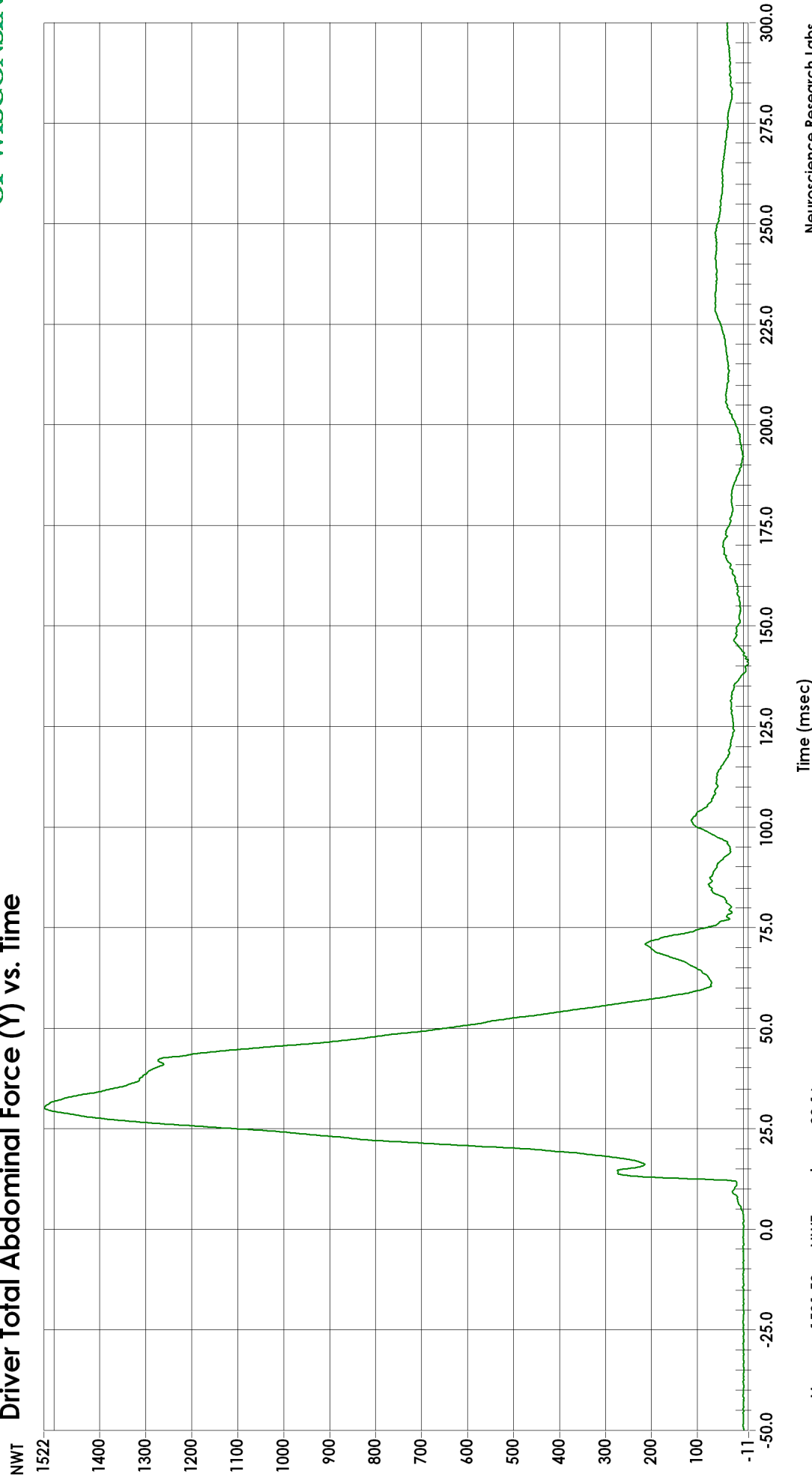
Time (msec)

Max	672.72	NWT	at	30.80	msec
Min	-12.04	NWT	at	194.80	msec

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Research 151
Milwaukee, WI 53295

Test ID	11SN05	Filter	CFC600	Sensor Location
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

Driver Total Abdominal Force (Y) vs. Time

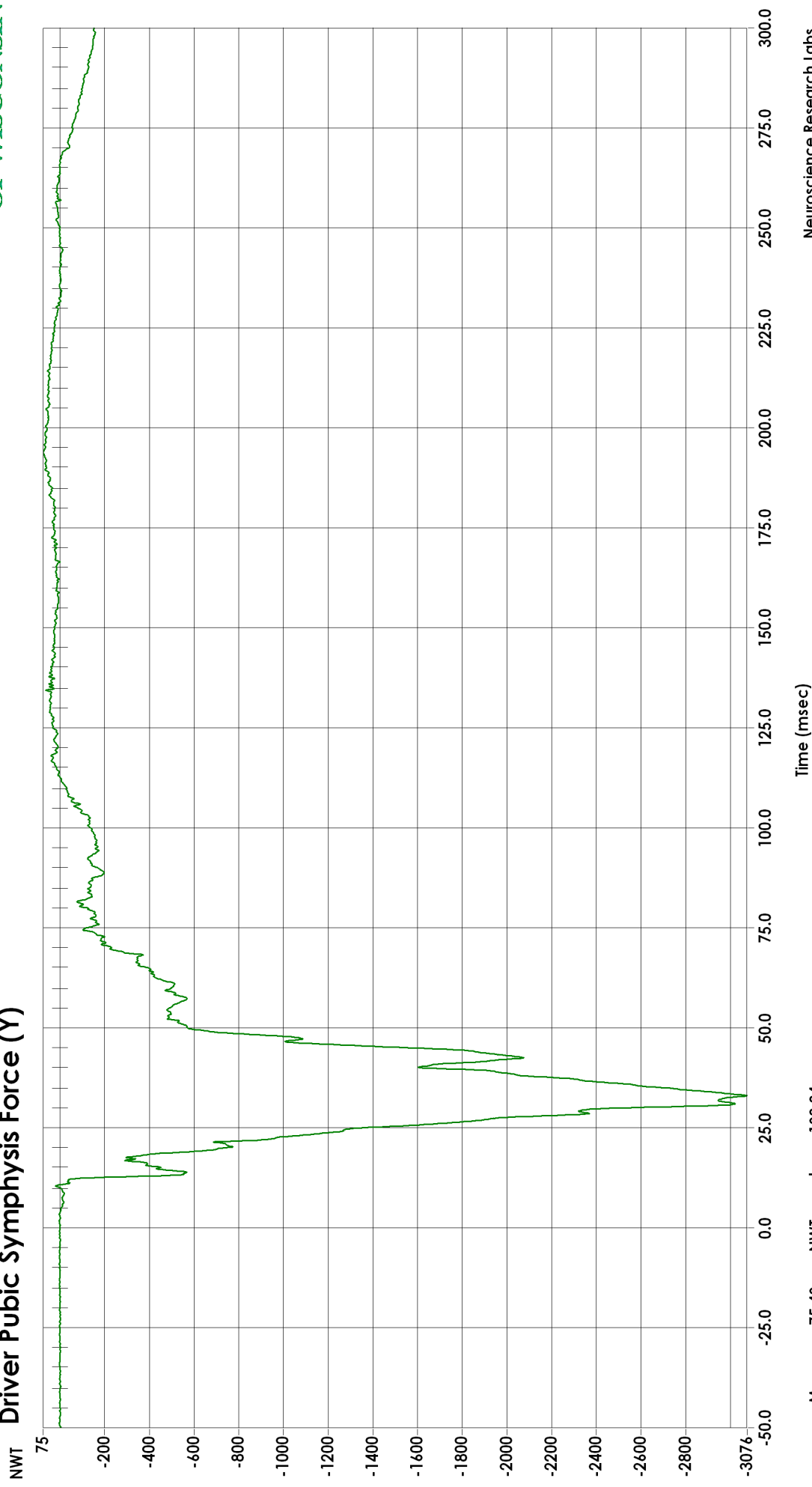


Max	1521.52	NWT	at	30.16	msec
Min	-11.44	NWT	at	141.52	msec

11SN05 Plot 072

Test ID	11SN05	Filter	CFC600	Sensor Location	PVPS
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info	Denton 30%JFL
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number	3096JFL_465
		Pretrigger Points	1250		

Driver Pubic Symphysis Force (Y)



Max	75.49	NWT	at	193.84	msec
Min	-3075.60	NWT	at	33.04	msec

11SN05 Plot 016

Test ID

11SN05

Date

02-04-2011

Description

2011 Kia Optima 4 Door Sedan Side NCAP Test

Filter

CFC1000

Sampling Rate (Hz)

12500

Number of Points

10000

Prefrigger Points

1250

Sensor Location

HDCG

Sensor Info

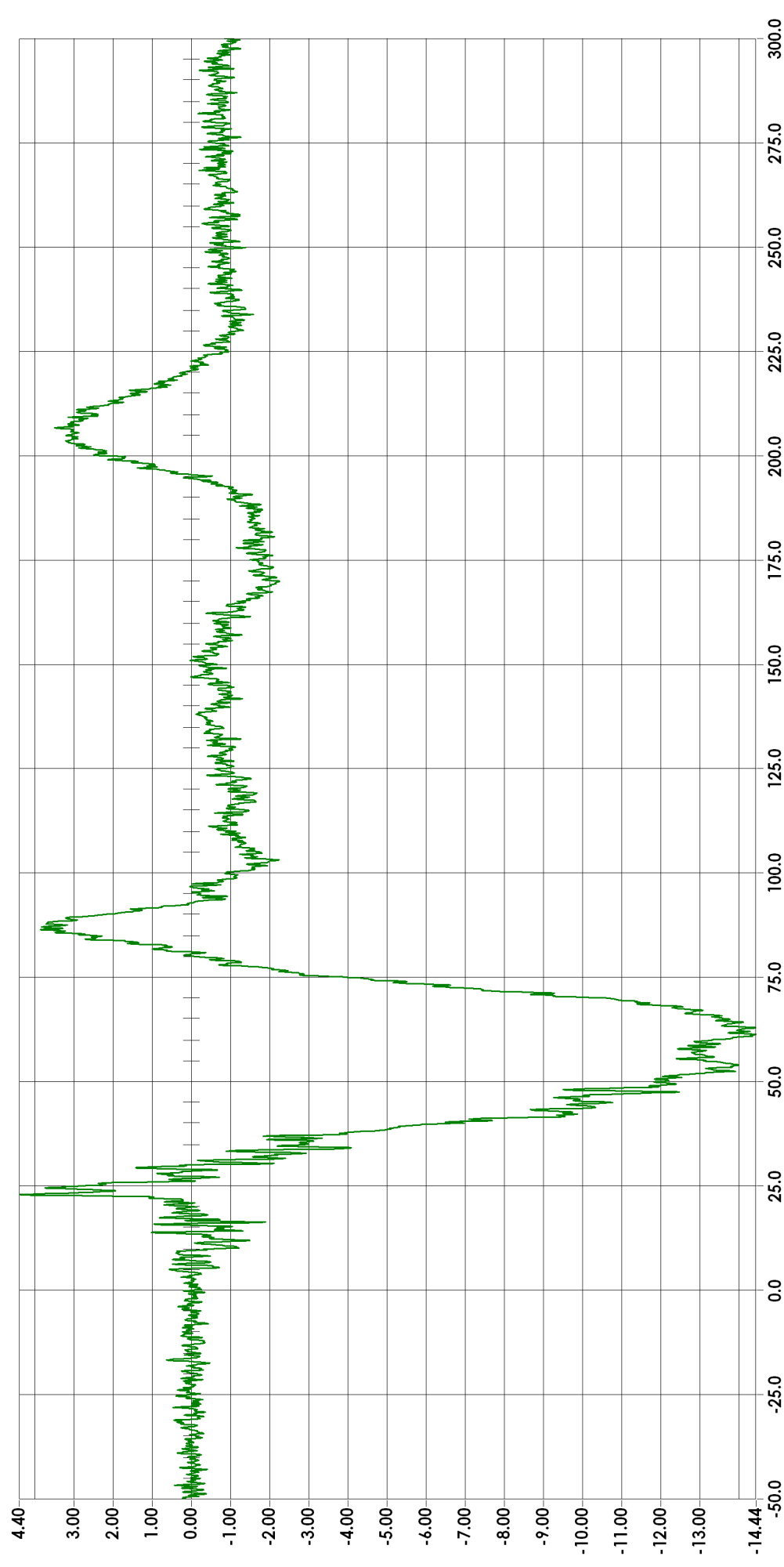
ENDEVCO 7264C-2KTZ-2-240

Serial Number

P22041



Passenger Head Acceleration (X) Primary



Max

4.40

G'S

at

22.96

msec

Min

-14.44

G'S

at

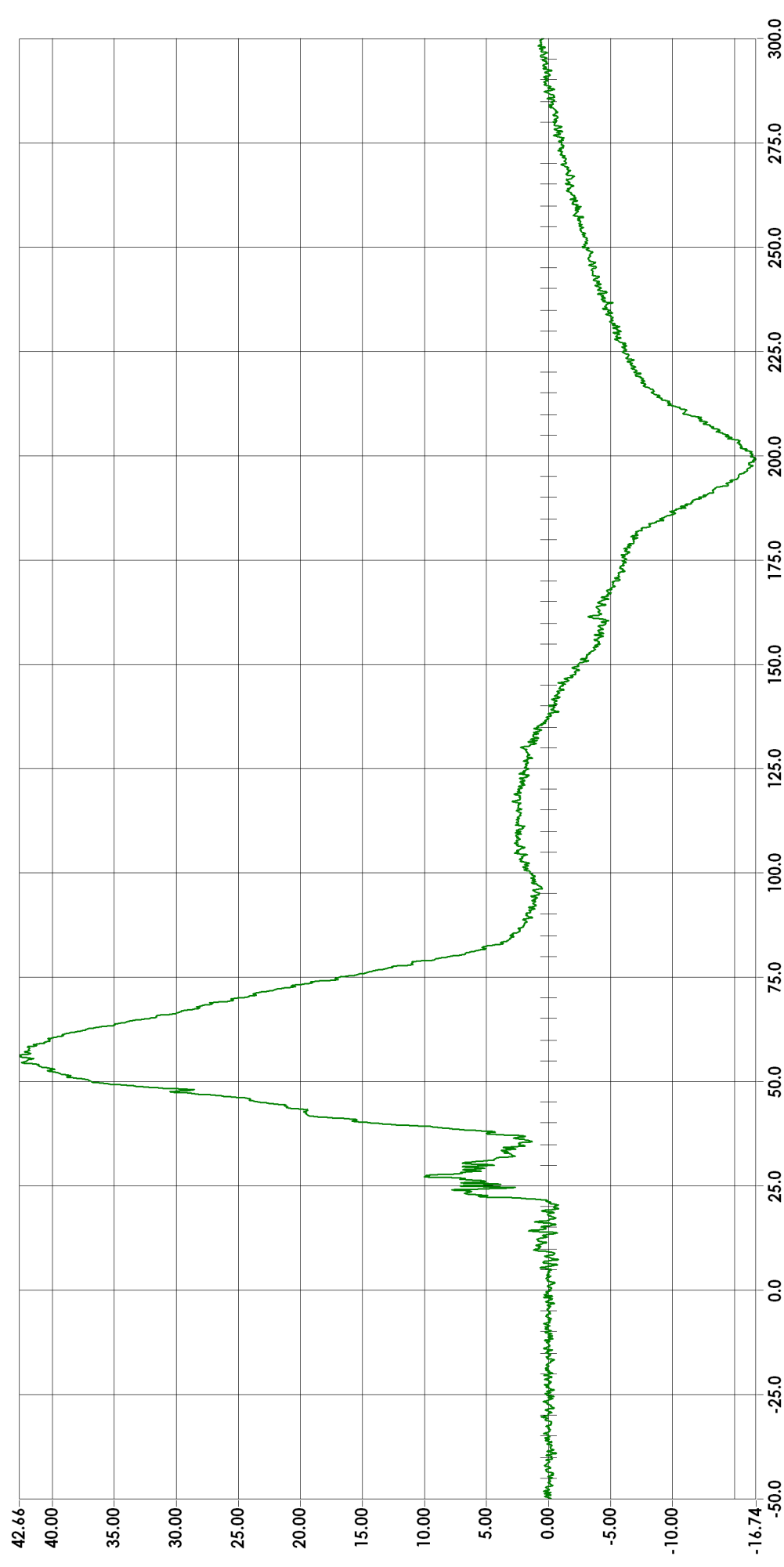
61.28

msec

Test ID	11SN05	Filter	CFC1000	Sensor Location	HDCG
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info	ENDEVCO 7264C-2KTZ-2-240
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number	P24562
		Pretrigger Points	1250		



Passenger Head Acceleration (Y) Primary



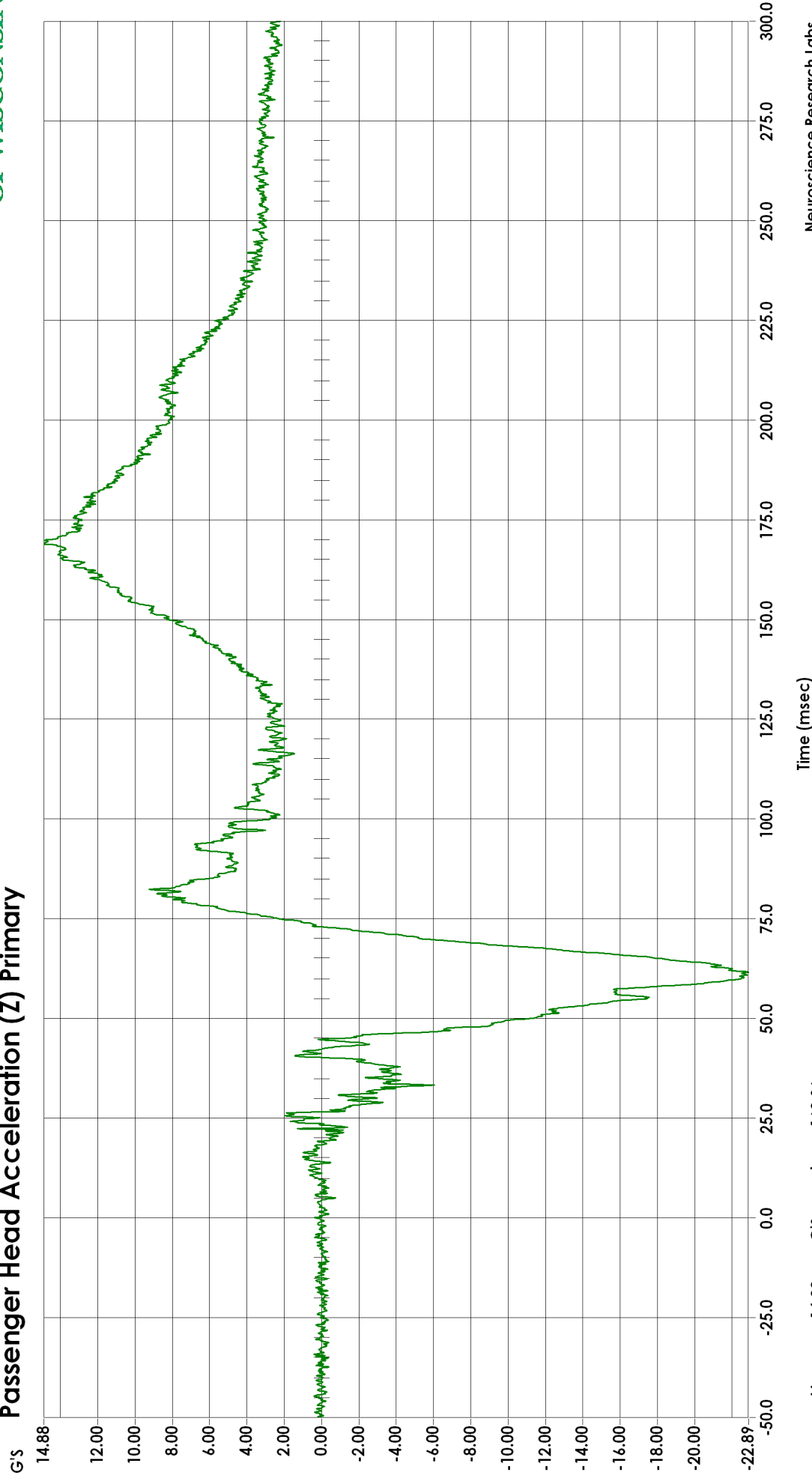
Max	42.66	G's	at	56.32	msec
Min	-16.74	G's	at	199.12	msec

Time (msec)

Test ID	11SN05	Filter	CFC1000	Sensor Location	HDCG
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info	ENDEVCO 7264C-2KTZ-2-300
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number	P22322
		Prefrigger Points	1250		



Passenger Head Acceleration (Z) Primary



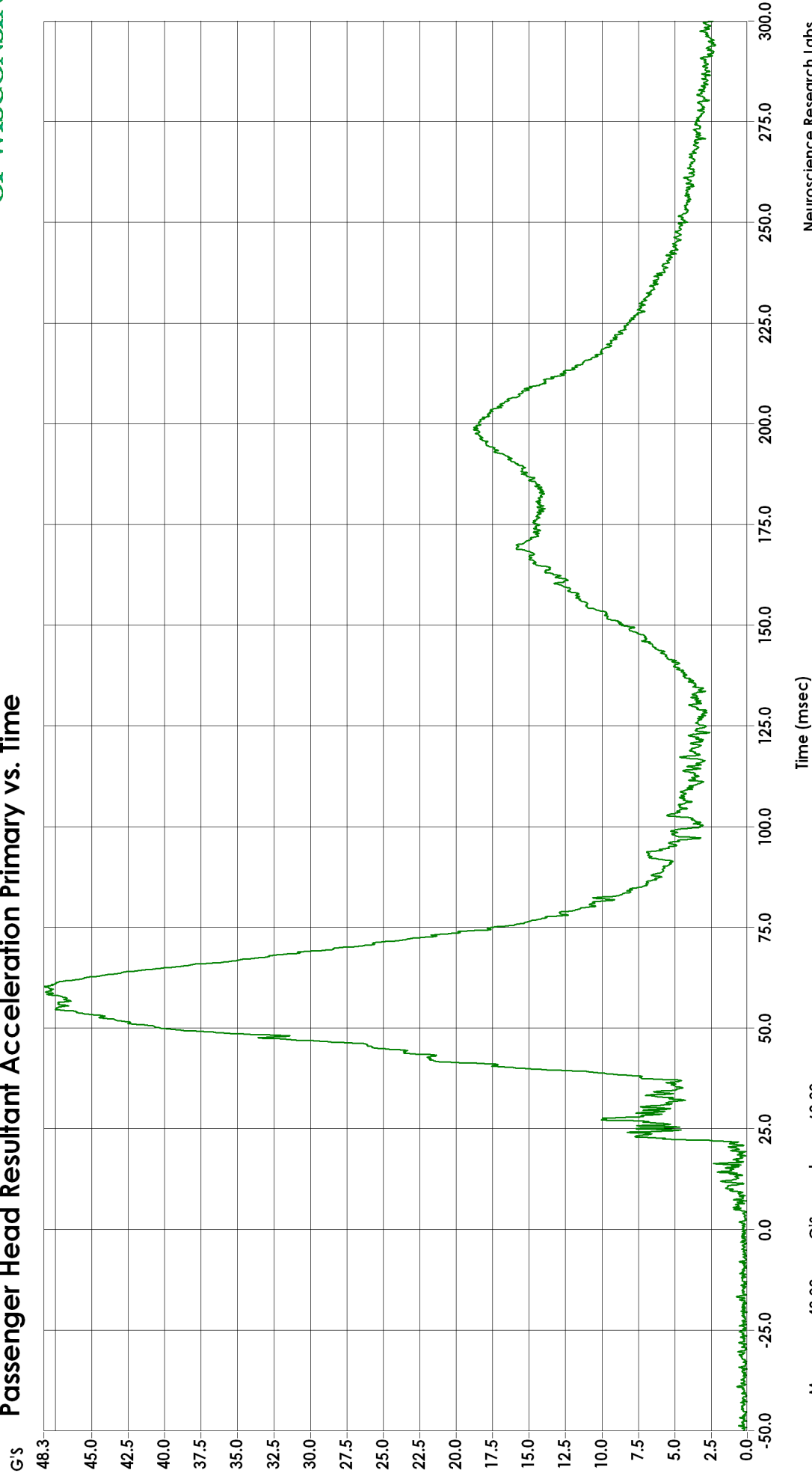
Max	14.88	G's	at	61.60	msec
Min	-22.89	G's	at	168.96	msec

11SN05 Plot 022

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Test ID	11SN05	Filter	CFC1000	Sensor Location
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

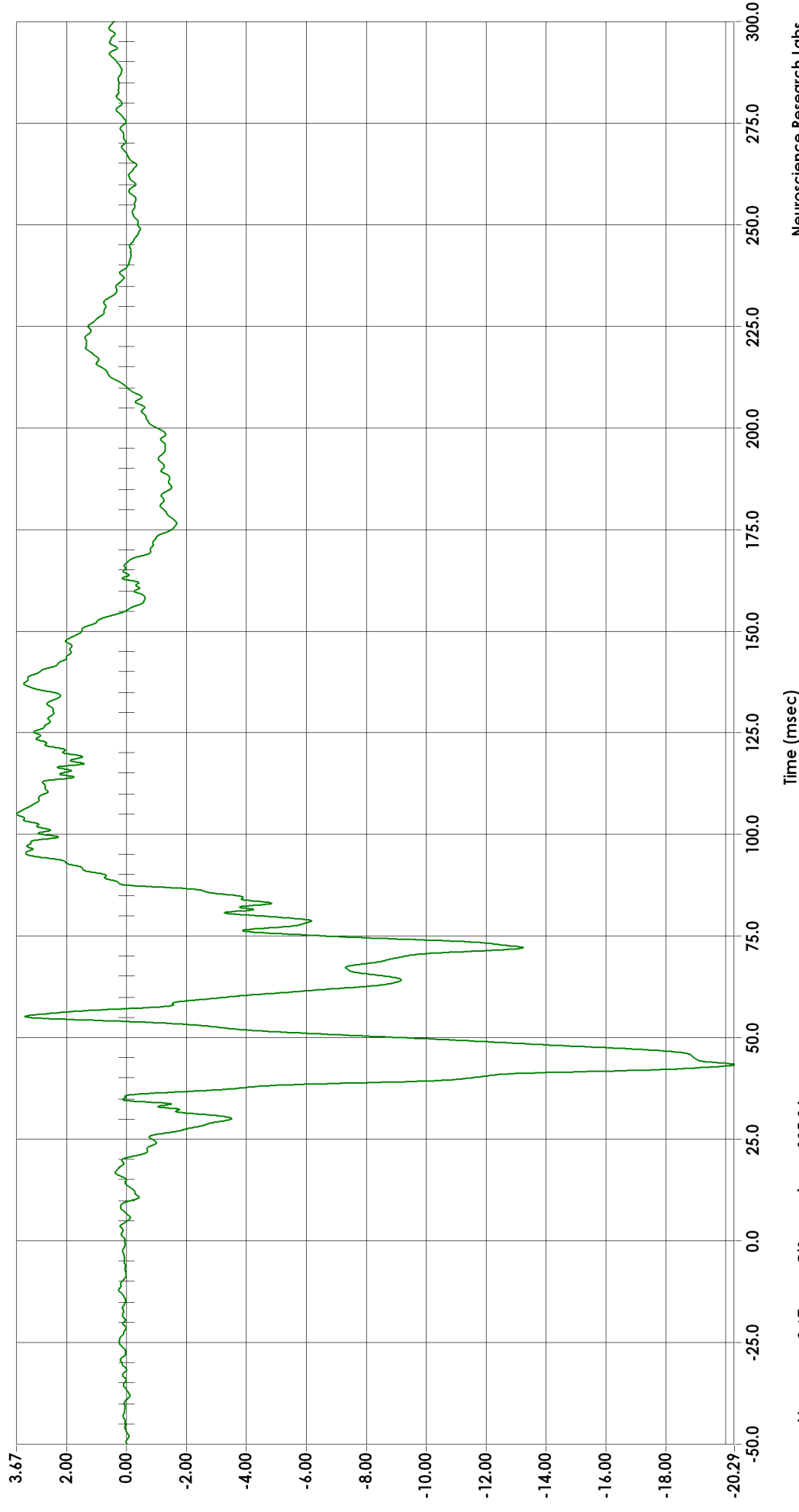
Passenger Head Resultant Acceleration Primary vs. Time



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Test ID	11SN05	Filter	CFC180
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	SPNL
		Sensor Info	ENDEVCO 7264C-2KTZ-2-240
		Serial Number	P21661

Passenger Lower Spine T12 Acceleration (X)



Max	3.67	G's	at	105.04	msec
Min	-20.29	G's	at	43.36	msec

11SN05 Plot 031

Test ID

11SN05

Date

02-04-2011

Description

2011 Kia Optima 4 Door Sedan Side NCAP Test

Filter

CFC180

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

SPNL

Sensor Info

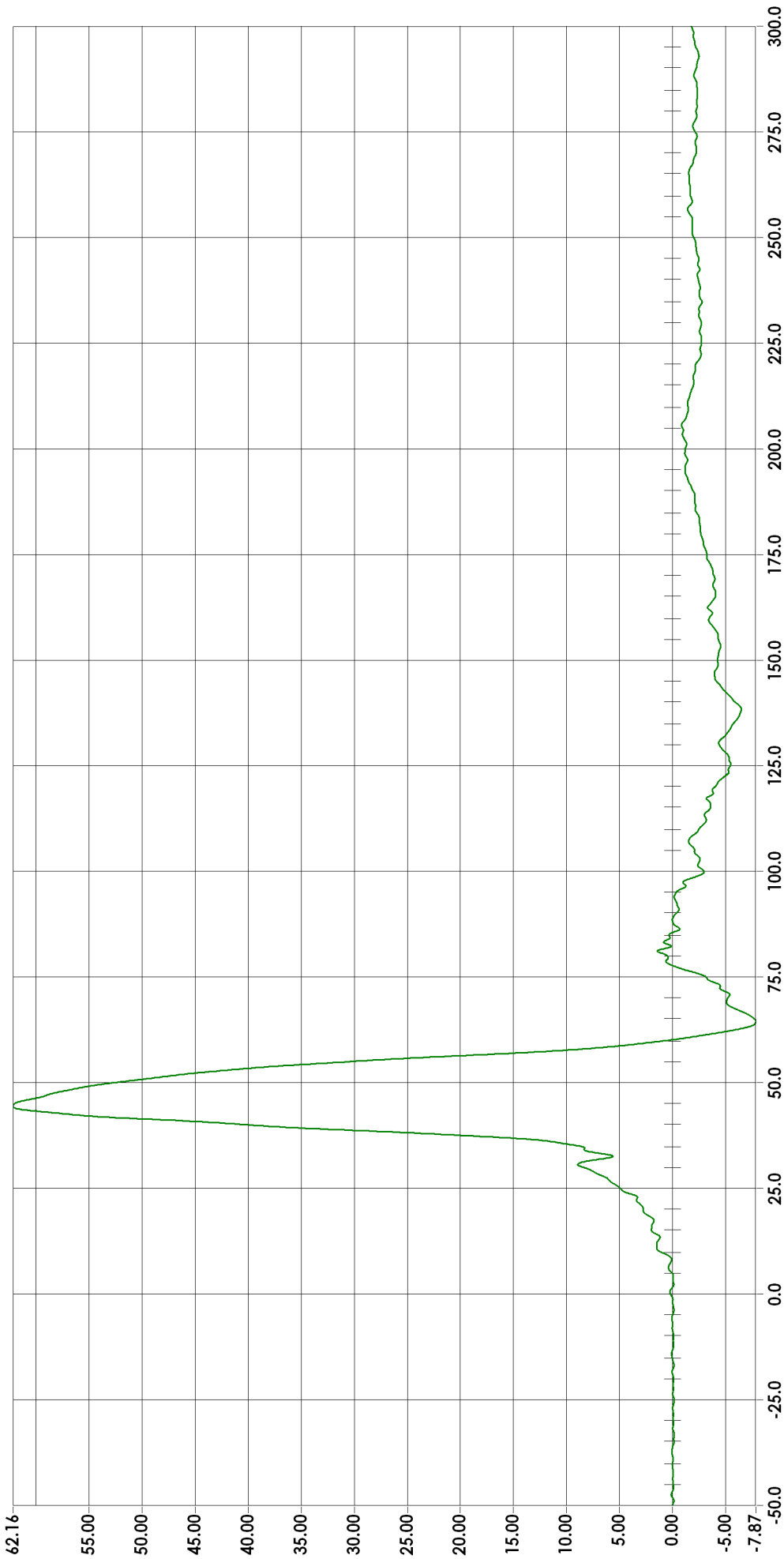
ENDEVCO 7264C-2KTZ-2-240

Serial Number

P24682



Passenger Lower Spine T12 Acceleration (Y)



Time (msec)

Max 62.16 G's at 44.40 msec
Min -7.87 G's at 64.56 msec

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Test ID

11SN05

Date

02-04-2011

Description

2011 Kia Optima 4 Door Sedan Side NCAP Test

Filter

CFC180

Sampling Rate (Hz)

12500

Number of Points

10000

Pretrigger Points

1250

Sensor Location

SPNL

Sensor Info

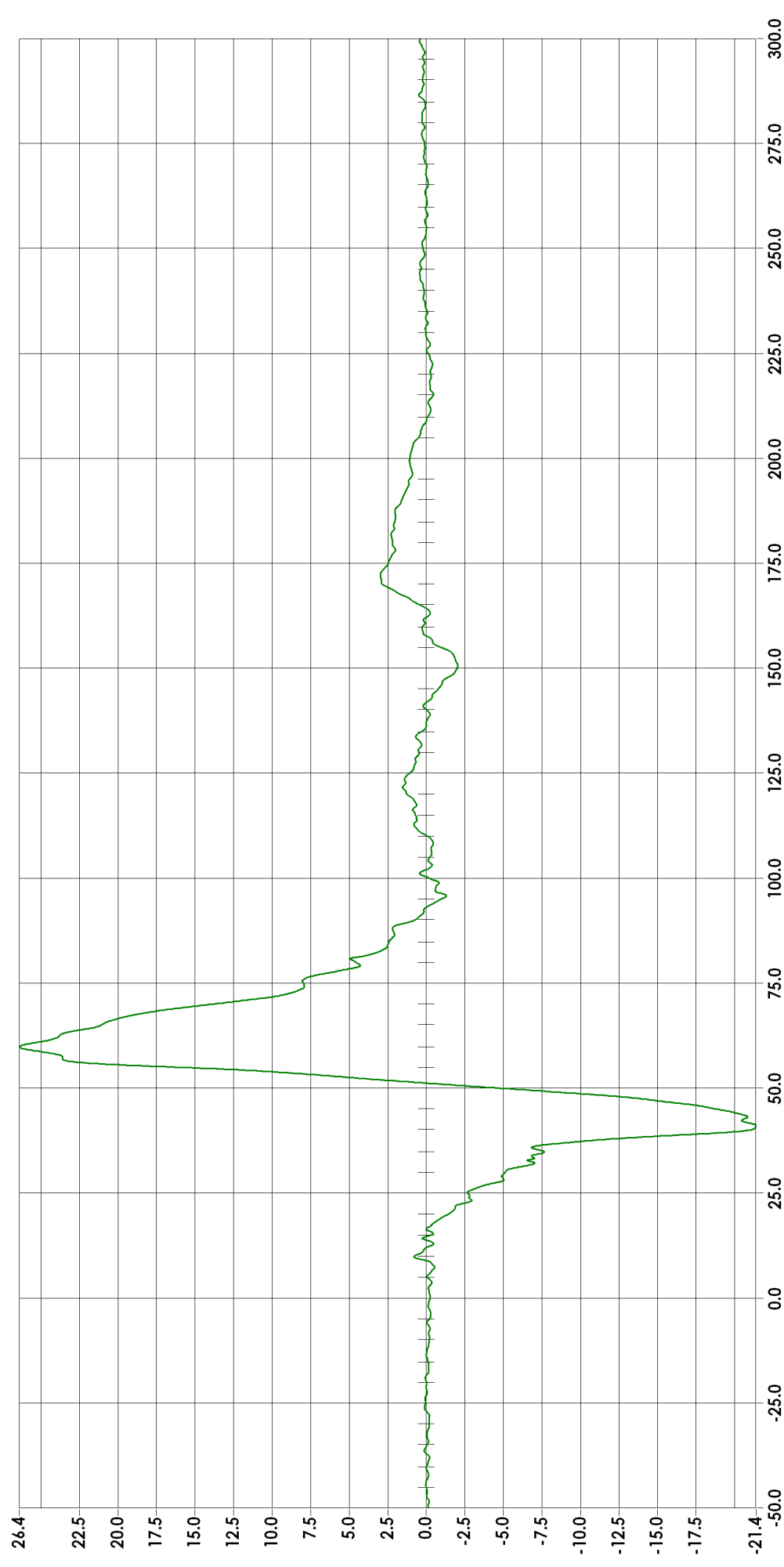
ENDEVCO 7264C-2KTZ-2-240

Serial Number

P21788



Passenger Lower Spine T12 Acceleration (Z)



Max

26.40

G's

at

59.84

msec

Min

-21.39

G's

at

41.12

msec

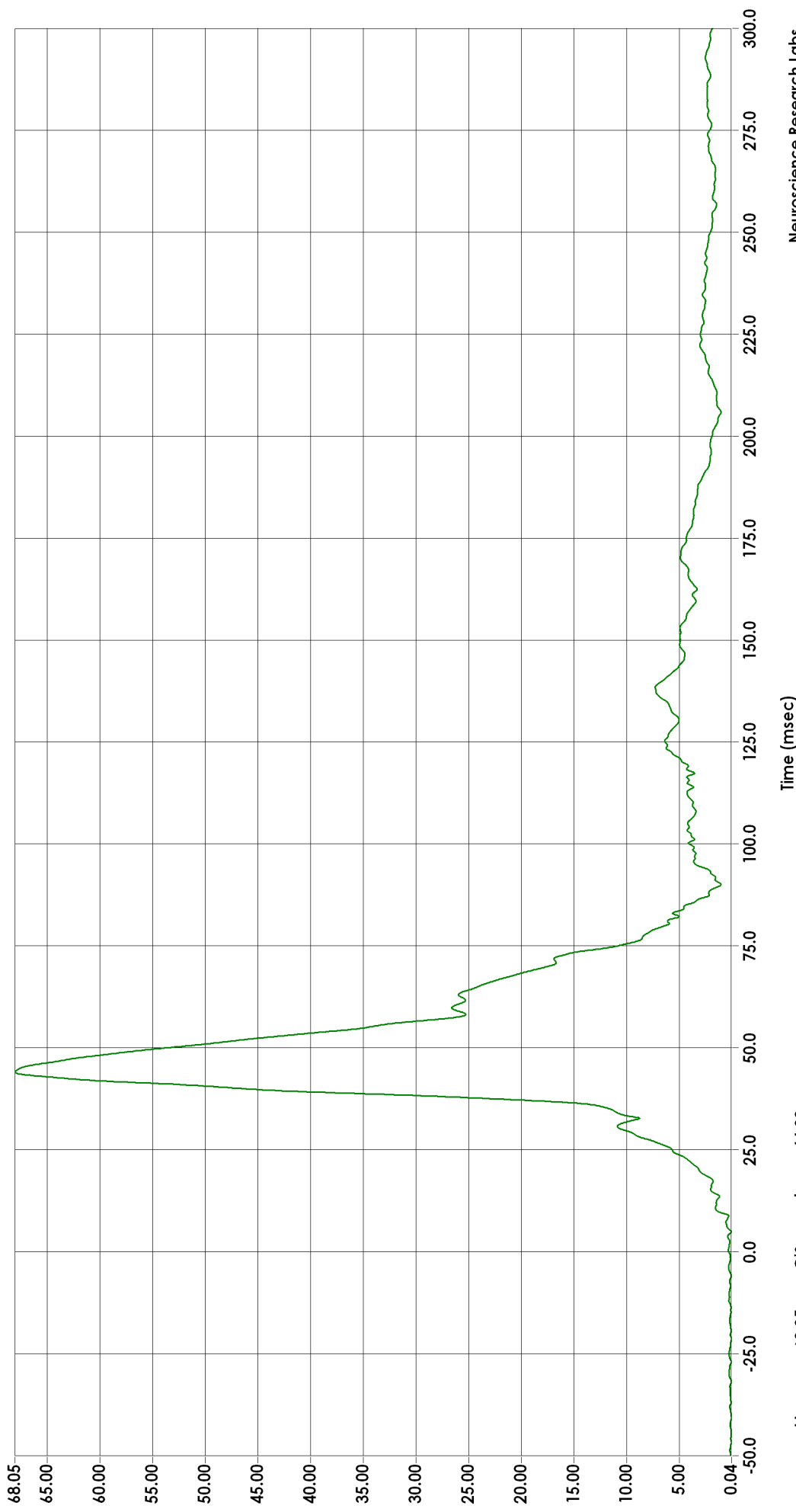
Time (msec)

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Test ID	11SN05	Filter	CFC180	Sensor Location
Date	02-04-2011	Sampling Rate (Hz)	12500	Sensor Info
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000	Serial Number
		Pretrigger Points	1250	

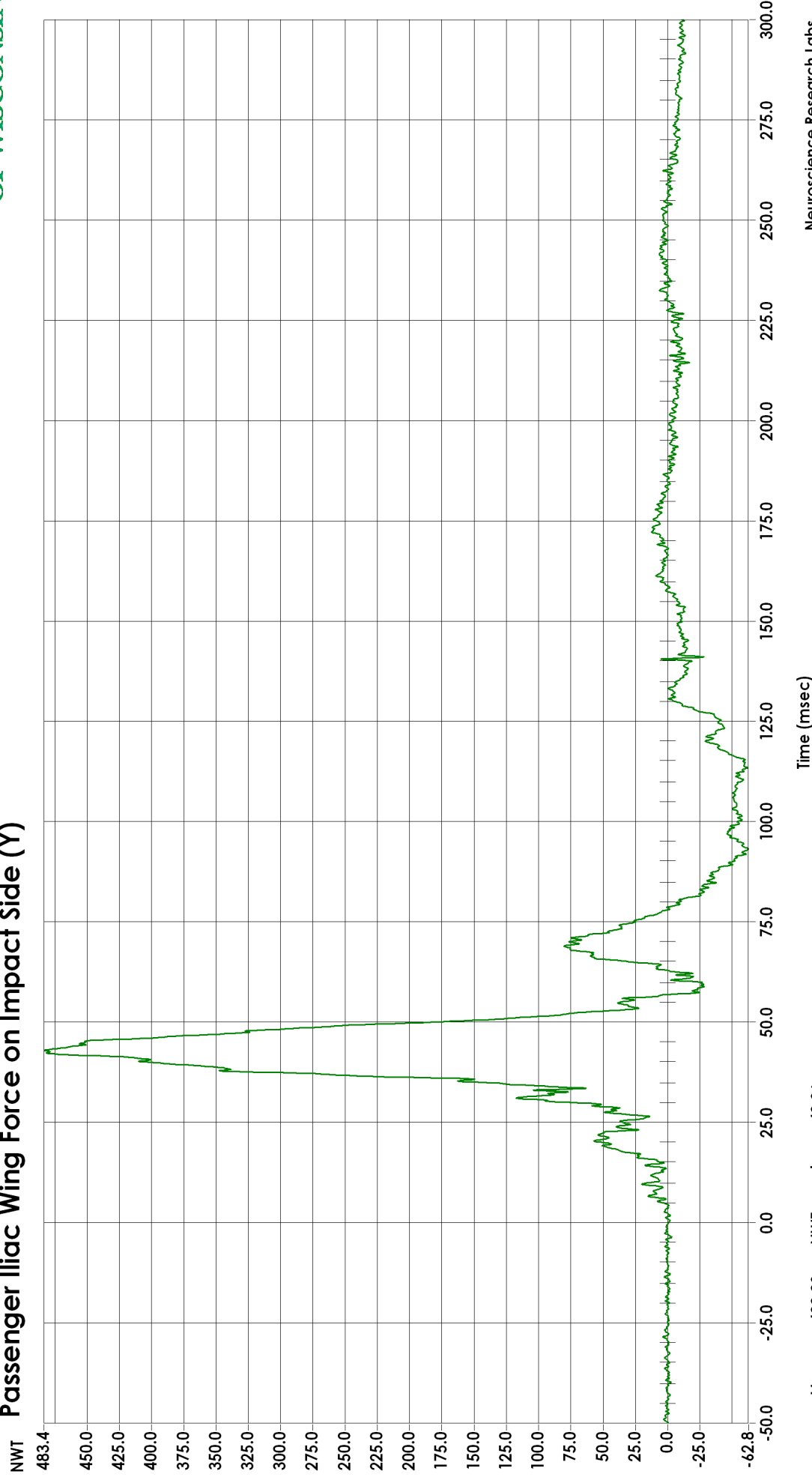
Passenger Lower Spine T12 Resultant Acceleration vs. Time



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Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Pretrigger Points	1250
		Sensor Location	PVIL
		Sensor Info	Denton 3228J
		Serial Number	3228J_283

Passenger Iliac Wing Force on Impact Side (Y)

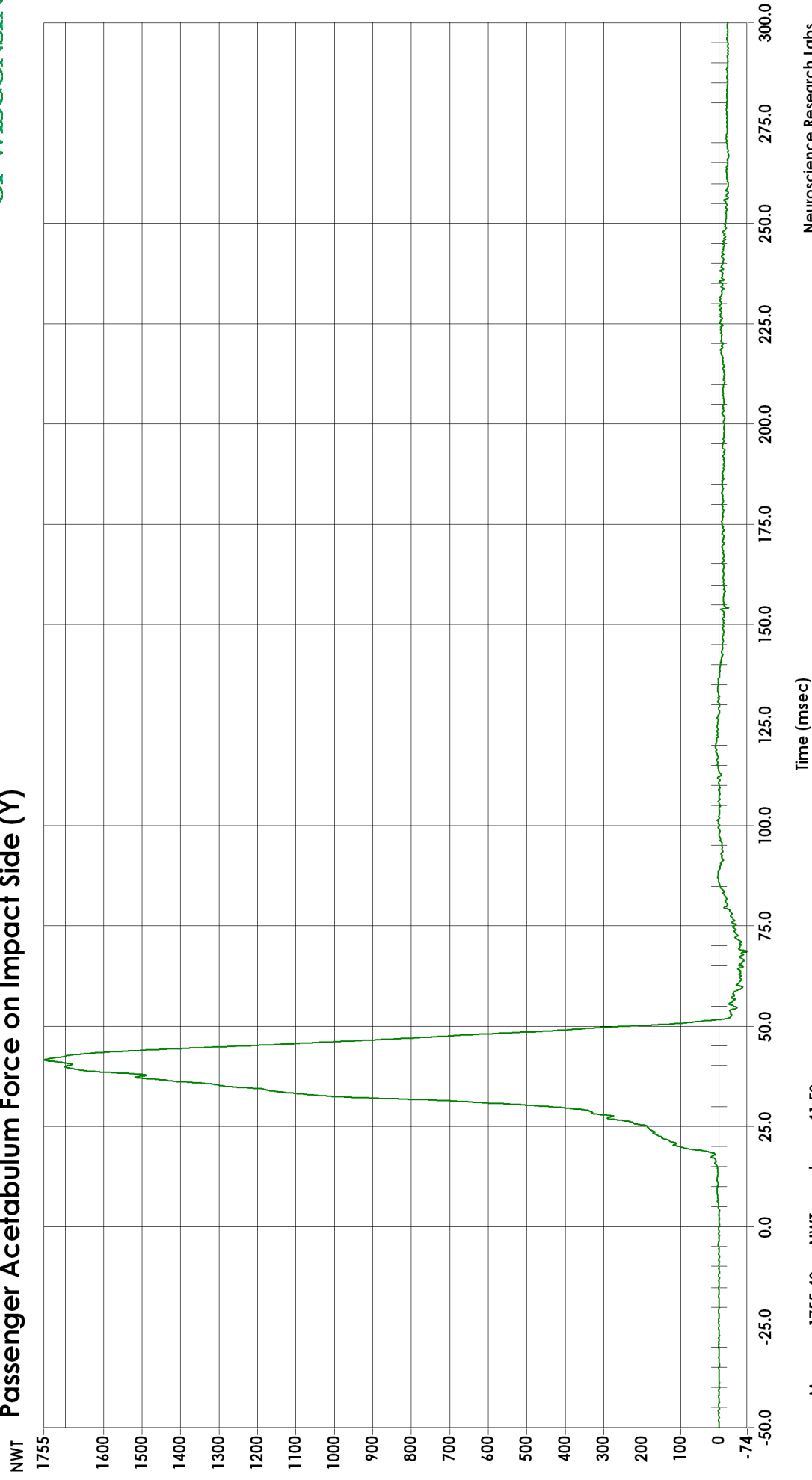


Max	483.39	NWT	at	42.96	msec
Min	-62.83	NWT	at	93.20	msec

11SN05 Plot 034

Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP 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)



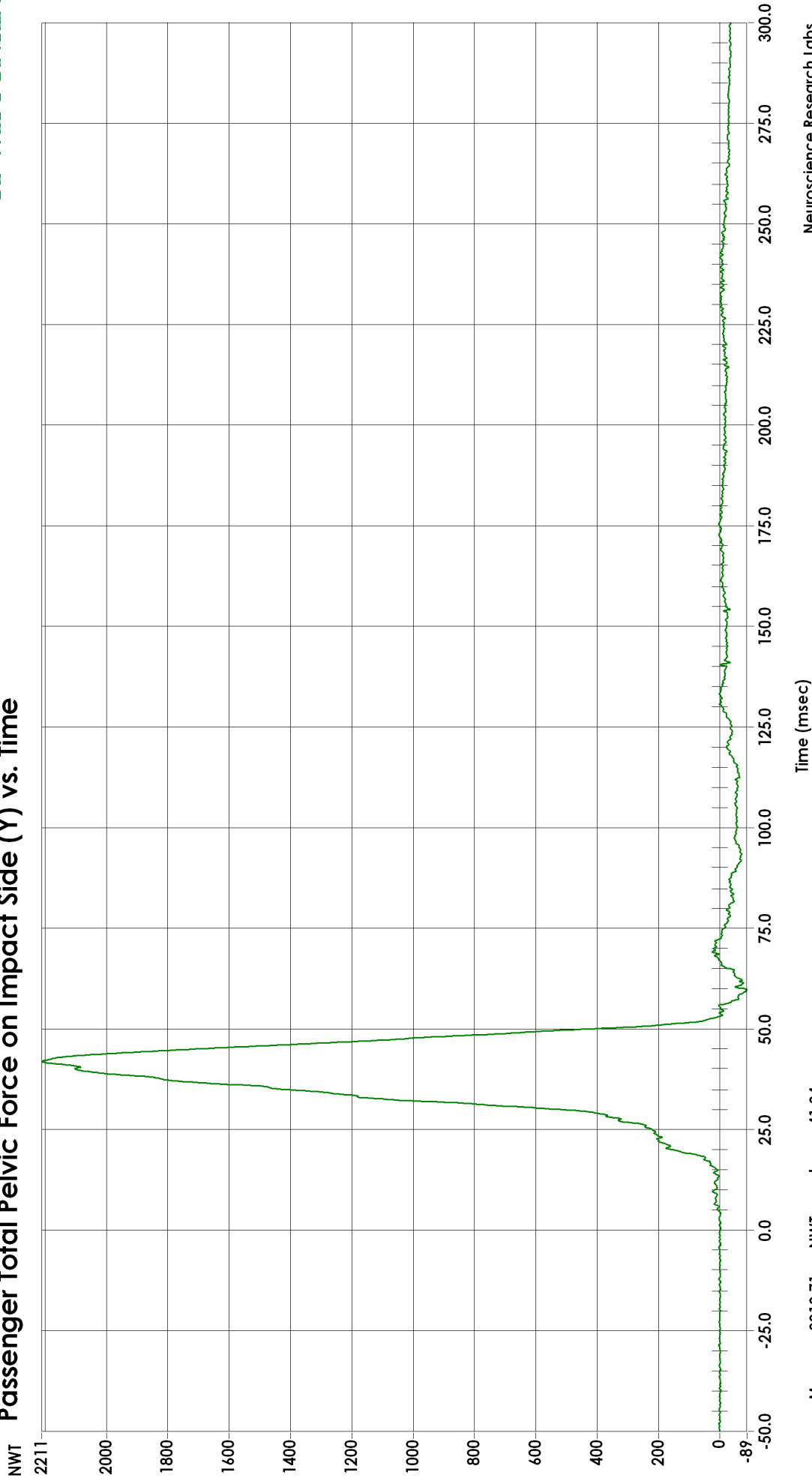
Max	1755.49	NWT	at	41.52	msec
Min	-73.65	NWT	at	68.64	msec

11SN05 Plot 035



Test ID	11SN05	Filter	CFC600
Date	02-04-2011	Sampling Rate (Hz)	12500
Description	2011 Kia Optima 4 Door Sedan Side NCAP Test	Number of Points	10000
		Prefrigger Points	1250
		Sensor Location	
		Sensor Info	
		Serial Number	

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



Max	2210.71	NWT	at	41.84	msec
Min	-88.60	NWT	at	59.76	msec

11SN05 Plot 074

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Milwaukee, WI 53295

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

NHTSA Number: MB 0513
Test Date: February 4, 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 5 & 6

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 4 & 5

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	-	1-13-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.0	21.6
Relative Humidity (%)	10-70	25.6	30.2
Pendulum Speed (m/s)	4.2-4.4	4.23	4.23
Peak Impactor Acceleration (G)	36-45	42.2	41.0
Max Lateral Pelvis Acceleration (G)	28-39	35.1	33.6
Max Iliac Force (N)	4.10-5.10	4.80	4.62

SIDIIs LATERAL PELVIS ACETABULUM IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-13-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.4	21.7
Relative Humidity (%)	10-70	23.7	29.0
Pendulum Speed (m/s)	6.6-6.8	6.73	6.73
Peak Impactor Acceleration (G)	38-47	46.5	45.6
Peak Lateral Pelvis Acceleration (G)	N/A	-	-
Peak Lateral Pelvis Acceleration after 6ms (G)	34-42	39.7	39.9
Peak Acetabulum Force (kN)	3.60-4.30	4.27	4.21

SIDIIs LATERAL THORAX WITHOUT ARM IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-12-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.2	22.2
Relative Humidity (%)	10-70	30.2	27.2
Pendulum Speed (m/s)	4.2-4.4	4.25	4.25
Peak Upper Rib Deflection (mm)	32-40	36.0	39.1
Peak Middle Rib Deflection (mm)	39-45	39.9	41.1
Peak Lower Rib Deflection (mm)	35-43	37.4	36.3
Peak Upper Spine Acceleration (G)	13-17	16.0	16.0
Peak Lower Spine Acceleration (G)	7-11	9.00	8.89
Peak Impactor Acceleration (G)	14-18	16.0	15.7

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	-	1-12-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.6	22.1
Relative Humidity (%)	10-70	30.3	26.1
Pendulum Speed (m/s)	6.6-6.8	6.70	6.70
Peak Shoulder Deflection (mm)	31-40	35.7	34.0
Peak Upper Rib Deflection (mm)	25-32	28.9	29.3
Peak Middle Rib Deflection (mm)	30-36	31.2	32.7
Peak Lower Rib Deflection (mm)	32-38	32.3	34.8
Peak Upper Spine Acceleration (G)	34-43	38.8	38.8
Peak Lower Spine Acceleration (G)	29-37	35.7	34.0
Peak Impactor Acceleration after 5 ms (G)	30-36	33.8	32.6

SIDIIs LATERAL ABDOMINAL IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-13-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.5	21.8
Relative Humidity (%)	10-70	29.2	28.2
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Upper Rib Deflection (mm)	36-47	37.9	40.0
Peak Lower Rib Deflection (mm)	33-44	34.9	33.3
Peak Lower Spine Acceleration (G)	9-14	11.8	11.9
Peak Impactor Acceleration (G)	12-16	15.1	14.7

SIDIIs LATERAL SHOULDER IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-12-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.0	22.1
Relative Humidity (%)	10-70	33.7	25.4
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Shoulder Deflection (mm)	28-37	31.1	32.7
Peak Upper Spine Lateral Acceleration (G)	17-22	20.0	20.8
Peak Impactor Acceleration (G)	13-18	16.3	16.5

SUMMARY
SIDIIs PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs LATERAL NECK

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-12-11	2-14-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.3	22.1
Relative Humidity (%)	10-70	27.2	31.2
Pendulum Speed (m/s)	5.51-5.63	5.58	5.60
Pendulum Pulse 10ms (m/s)	2.20-2.80	2.22	2.28
Pendulum Pulse 15ms (m/s)	3.30-4.10	3.75	3.61
Pendulum Pulse 20ms (m/s)	4.40-5.40	5.12	4.88
Pendulum Pulse 25ms (m/s)	5.40-6.10	5.87	5.84
Pendulum Pulse between 25ms and 100ms (m/s)	5.50-6.20	5.91	5.95
Max D-Plane rotation (deg)	71-81	77.1	74.7
Time of Max D-Plane Rotation (ms)	50-70	69.9	63.8
Max OC Moment during Rotation (Nm)	36-44	41.3	43.6
Time of Moment Decay from Peak to 0 Nm (ms)	102-126	116.0	120.2

SIDIIs LATERAL HEAD DROP

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-11-11	2-10-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.6	22.0
Relative Humidity (%)	10-70	18.1	25.2
Resultant Max (G)	115-137	117.6	122.7
Longitudinal Max (G)	<15	2.45	4.69

SUMMARY
SIDIIs PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

SIDIIs MEASUREMENTS

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-13-11	2-15-11
Sequential Test Number	-	5	6
Temperature (°C)	20.6-22.2	21.0	21.7
Relative Humidity (%)	10-70	28.9	31.7
Sitting Height	780 ±8.0	773	773
Shoulder Pivot Height	445 ±8.0	445	445
H-Point Height	84 ±5.0	85	85
H-Point from Seat Back	146 ±5.0	145	145
Shoulder Pivot from Backline	102 ±5.0	104	100
Thigh Clearance	127 ±8.0	125	123
Head Breadth	144 ±4.0	144	145
Head Back from Backline	43 ±3.0	45	45
Head Depth	183 ±5.0	181	181
Head Circumference	546 ±5.0	547	547
Buttock to Knee Length	527 ±13.0	520	528
Popliteal Height	356 ±13.0	355	355
Knee Pivot to Floor Height	401 ±8.0	395	398
Buttock Popliteal Length	429 ±13.0	429	430
Chest Depth w/o Jacket	203 ±8.0	205	202
Foot Length	224 ±8.0	225	230
Hip Breadth	318 ±5.0	320	319
Arm Length	254 ±5.0	254	255
Knee Joint to Seat Back	458 ±8.0	454	456
Shoulder Width	349 ±8.0	349	348
Foot Width	86 ±8.0	85	85
Chest Circumference w/Jacket	866 ±15.0	856	856
Waist Circumference	776 ±15.0	780	770

SUMMARY
ESIIre PRE AND POST VERIFICATION

CONFIGURED FOR LEFT SIDE IMPACT

ESIIre LATERAL HEAD DROP

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-11-11	2-9-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.5	21.6
Relative Humidity (%)	10-70	18.1	18.0
Resultant Max (G)	125-155	152.6	151.3
Longitudinal Max (G)	<15	5.14	4.07

ESIIre LATERAL NECK TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-11-11	2-9-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.6	22.1
Relative Humidity (%)	10-70	33.2	23.5
Pendulum Speed (m/s)	3.3-3.5	3.35	3.35
Pendulum Pulse 0-1.0 ms (m/s)	(-0.05)-0.00	-0.05	-0.05
Pendulum Pulse 2.5-3.0 ms (m/s)	(-0.375) - (-0.25)	-0.33	-0.33
Pendulum Pulse 13.5-14.0 ms (m/s)	(-3.7) - (-3.20)	-3.42	-3.41
Pendulum Pulse 17 ms (m/s)	-3.7	-3.64	-3.57
Max D-Plane rotation (deg)	49-59	50.5	50.5
Time of Max D-Plane Rotation (ms)	54-66	60.2	59.1
Time of Moment Decay from Peak to 0 Nm (ms)	53-88	58.0	58.8

ESIIre INDIVIDUAL RIB DROP TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-11-11	2-9-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.6	21.2
Relative Humidity (%)	10-70	18.1	13.0
Drop Height 459 mm	36-40	U-36.6 M-37.1 L-38.7	U-36.1 M-37.9 L-38.9
Drop Height 815 mm	46-51	U-49.1 M-49.6 L-50.2	U-48.8 M-49.2 L-50.0

ESIIre FULL BODY THORAX IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-13-11	2-11-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	22.2	21.3
Relative Humidity (%)	10-70	33.7	15.3
Pendulum Speed (m/s)	5.4-5.6	5.40	5.40
Upper Rib Deflection (mm)	34-41	36.8	38.0
Middle Rib Deflection (mm)	37-45	41.6	42.8
Lower Rib Deflection (mm)	37-44	41.0	41.6
Peak Impactor Force after 6ms (N)	5100-6200	5452.3	5181.2

SUMMARY
ESIIre PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

ESIIre LATERAL ABDOMEN IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-14-11	2-14-11
Sequential Test Number	-	4	6
Temperature (°C)	20.6-22.2	22.1	21.9
Relative Humidity (%)	10-70	25.0	21.8
Pendulum Speed (m/s)	3.9-4.1	3.95	4.00
Max Sum of 3 Abdominal Loadcells (N)	2200-2700	2491.9	2574.2
Time of Max Sum of 3 Abdominal Loadcells from T-Zero (ms)	10-12.3	12.2	10.8
Peak Lateral Impactor Force (N)	4000-4800	4398.8	4361.9
Time of Peak Lateral Impactor Force from T-Zero (ms)	10.6-13.0	10.9	10.6

ESIIre LATERAL SPINE TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-12-11	2-9-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	21.8	22.1
Relative Humidity (%)	10-70	21.5	23.7
Pendulum Speed (m/s)	5.95-6.15	6.09	6.15
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)	-0.48	-0.47
Pendulum Pulse 24.5-27.0 ms (m/s)	(-6.5)-(-5.8)	-6.44	-6.24
Pendulum Pulse 30 ms (m/s)	-6.5	-6.42	-6.46
Max D-Plane rotation (deg)	45-55	46.9	46.5
Time of Max D-Plane Rotation (ms)	39-53	44.8	45.6
Time of Moment Decay from Peak to 0 Nm (ms)	37-57	38.1	38.3

ESIIre LATERAL PELVIS IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-14-11	2-14-11
Sequential Test Number	-	4	6
Temperature (°C)	20.6-22.2	22.1	21.7
Relative Humidity (%)	10-70	25.0	22.9
Pendulum Speed (m/s)	4.2-4.4	4.30	4.29
Peak Lateral Impactor Force (N)	4700 – 5400	5063.4	4710.8
Time of Peak Lateral Impactor Force from T-Zero (ms)	11.8-16.1	14.0	11.9
Peak Pubic Symphysis Force (N)	1230-1590	1391.3	1364.5
Time of Peak Pubic Symphysis Force (ms)	12.2-17.0	14.7	12.9

SUMMARY
ESIlre PRE AND POST VERIFICATION (CONTINUED)

CONFIGURED FOR LEFT SIDE IMPACT

ESIlre LATERAL SHOULDER IMPACT TEST

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-13-11	2-11-11
Sequential Test Number	-	4	5
Temperature (°C)	20.6-22.2	22.2	21.3
Relative Humidity (%)	10-70	33.7	13.5
Pendulum Speed (m/s)	4.2-4.4	4.30	4.30
Peak Lateral Acceleration of Impactor (G)	7.5-10.5	8.30	8.40

ESIlre MEASUREMENTS

TEST PARAMETER	SPEC	PRE	POST
Date	-	1-14-11	2-14-11
Sequential Test Number	-	4	6
Temperature (°C)	20.6-22.2	22.1	21.9
Relative Humidity (%)	10-70	26.0	23.9
Sitting Height	909 ±9	905	908
Seat to Shoulder Joint	565 ±7	560	568
Seat to Lower Face of Thoracic Spine Box	351 ±5	350	353
Seat to Hip Joint (center of bolt)	100 ±3	100	99
Sole to Seat, Sitting	442 ±9	440	450
Head Width	155 ±3	156	156
Shoulder/Arm Width	470 ±9	475	472
Thorax Width	327 ±5	323	327
Abdomen Width	280 ±7	281	282
Pelvis Lap Width	366 ±7	360	364
Head Depth	201 ±5	201	199
Thorax Depth	267 ±5	268	267
Abdomen Depth	199 ±5	199	202
Pelvis Depth	240 ±5	238	240
Back of Buttocks to Hip Joint (center of bolt)	155 ±5	153	158
Back of Buttocks to Front Knee	606 ±9	601	603

**ATD INSPECTION LIST
 PRE AND POST TEST**

CONFIGURED FOR LEFT SIDE IMPACT

		SIDIs		ESIRE	
		PRE	POST	PRE	POST
	Date	2-2-11	2-4-11	2-2-11	2-4-11
	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	-	-	-	-	-

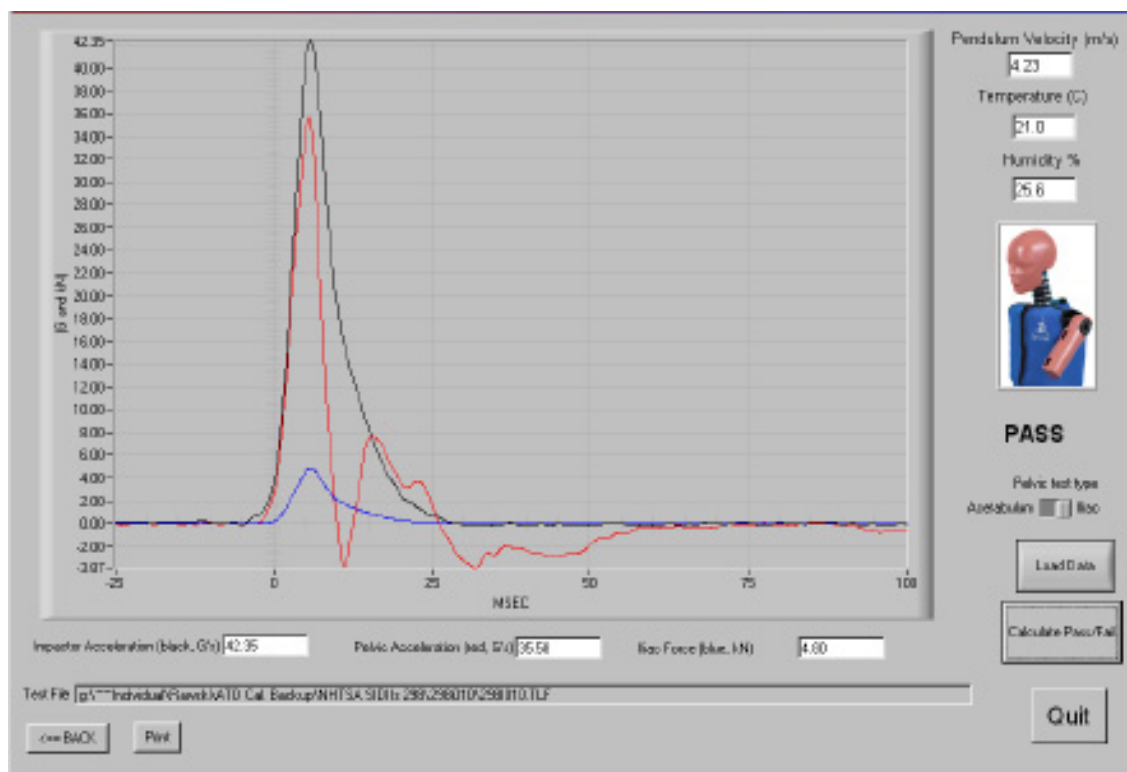


Figure C-1: SIDIIs Lateral Pelvis Iliac Impact Pre-Test

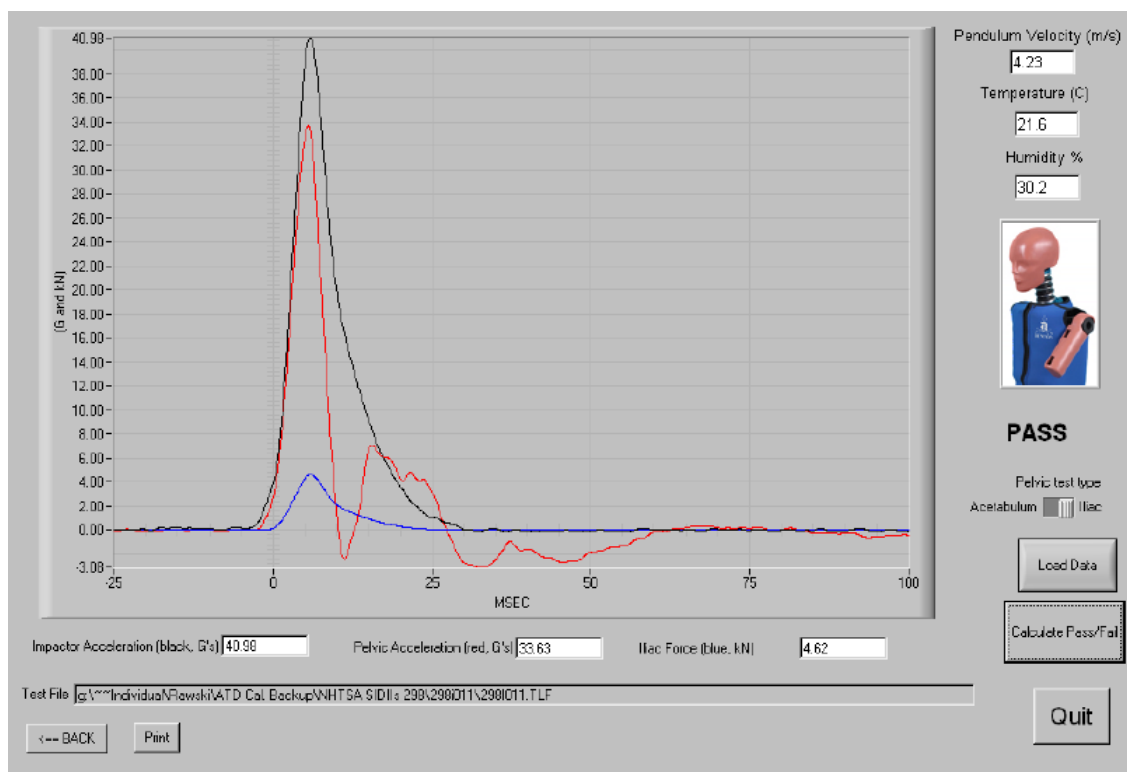


Figure C-2: SIDIIs Lateral Pelvis Iliac Impact Post-Test

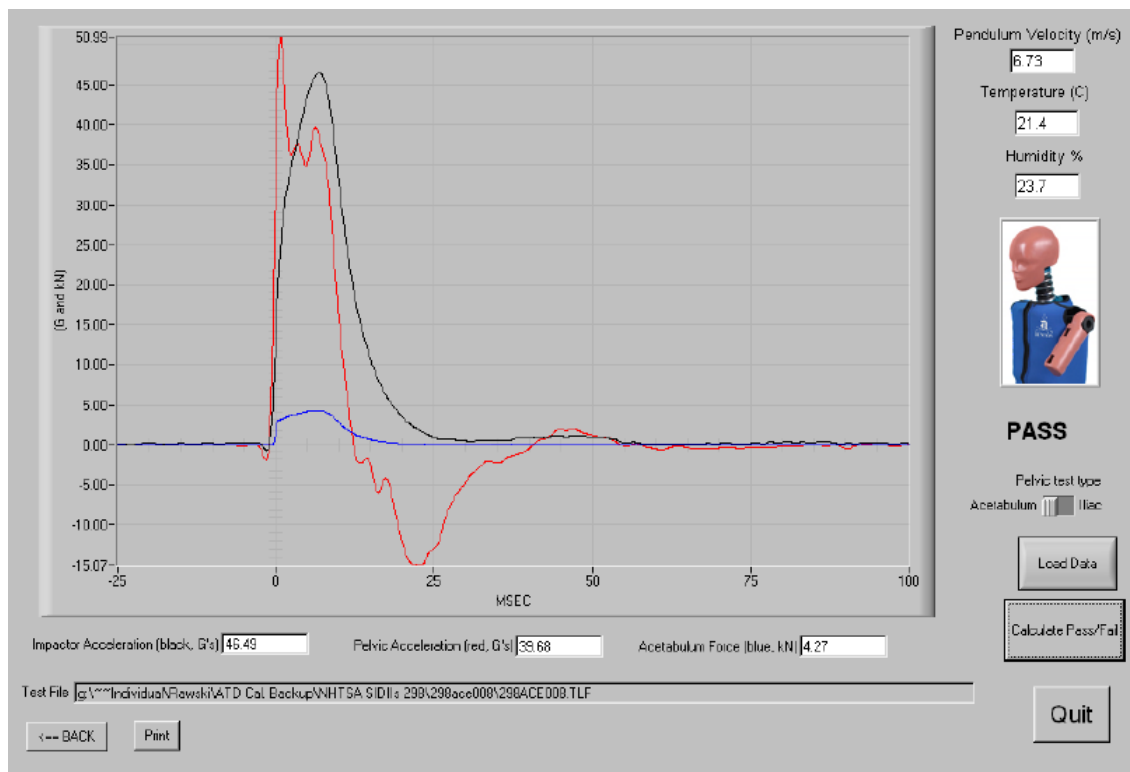


Figure C-3: SIDII Lateral Pelvis Acetabulum Impact Pre-Test

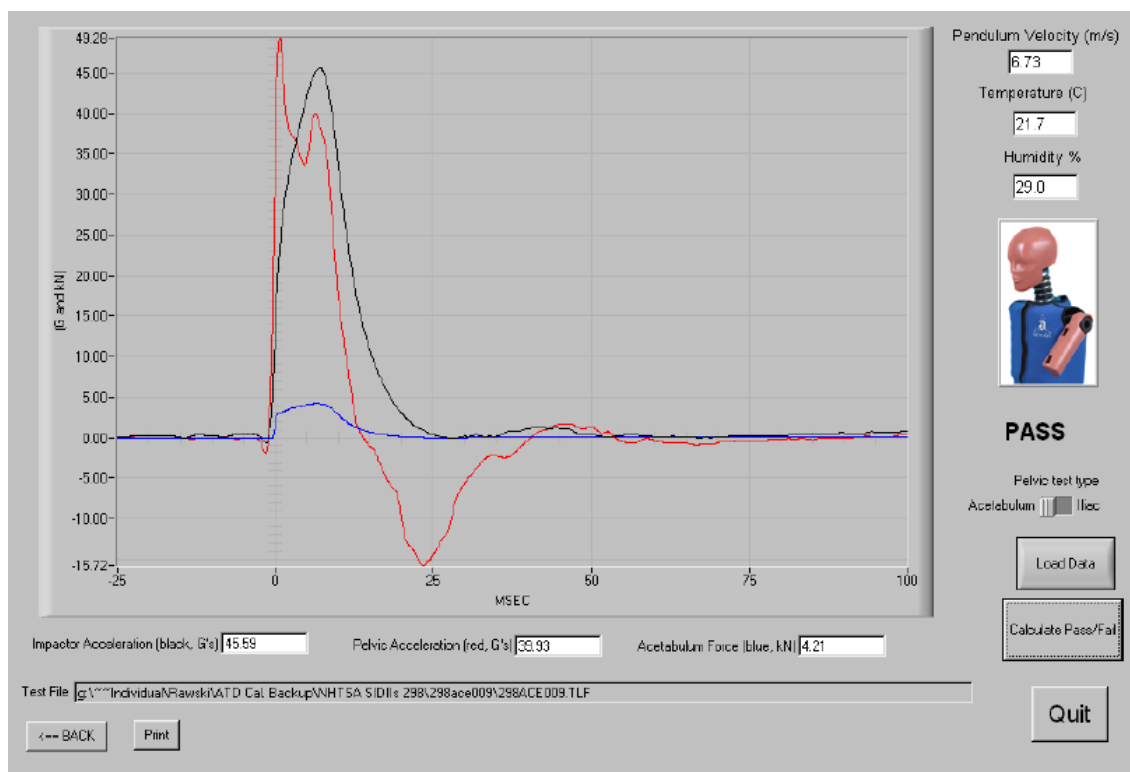


Figure C-4: SIDII Lateral Pelvis Acetabulum Impact Post-Test

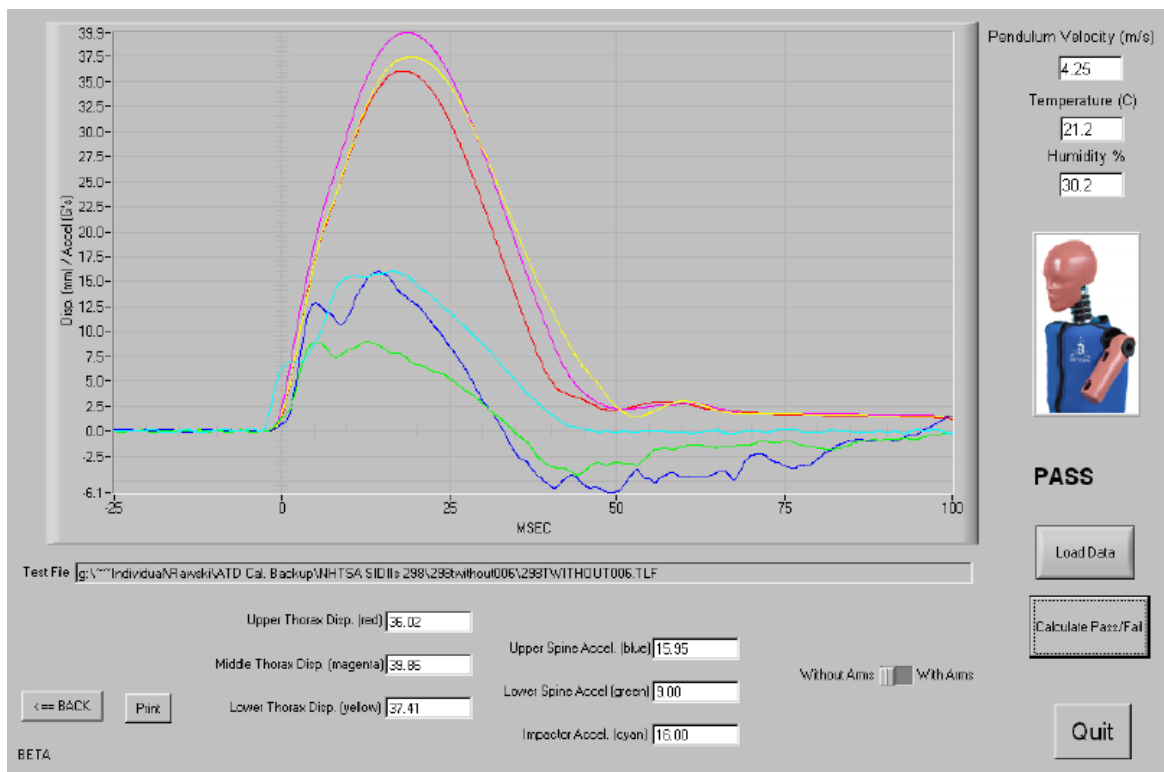


Figure C-5: SIDIIS Lateral Thorax Without Arm Impact Pre-Test

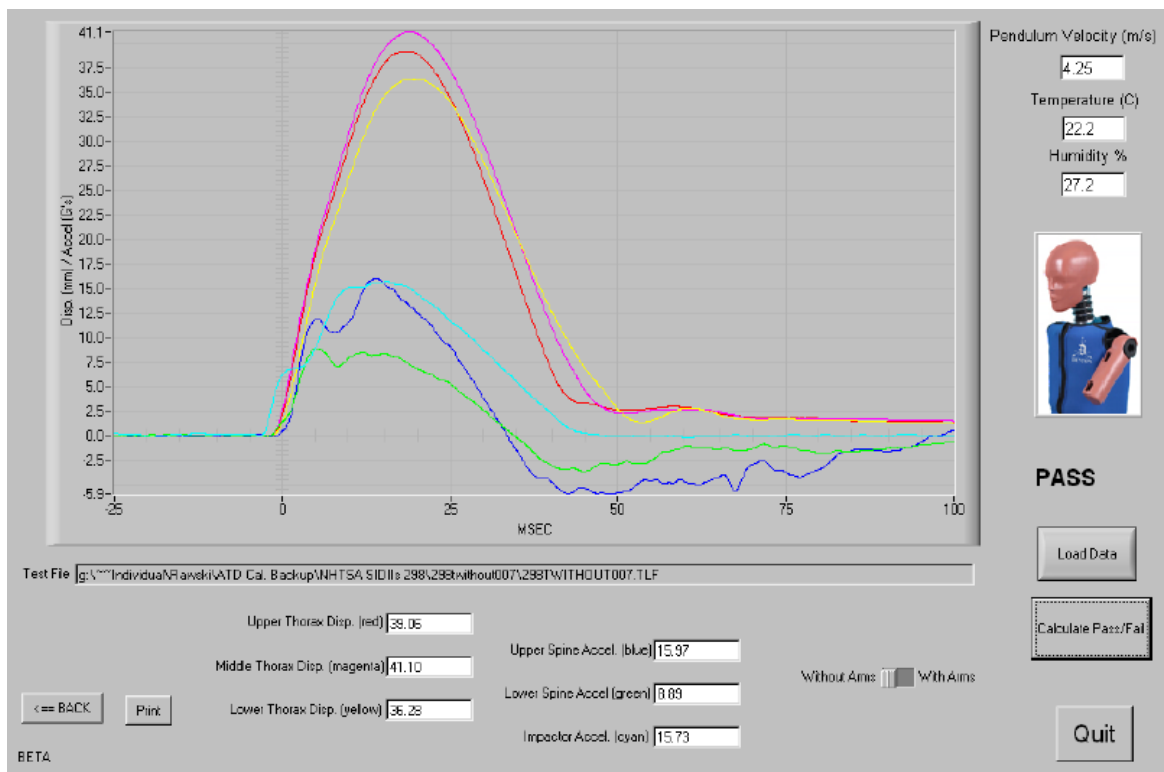


Figure C-6: SIDIIS Lateral Thorax Without Arm Impact Post-Test

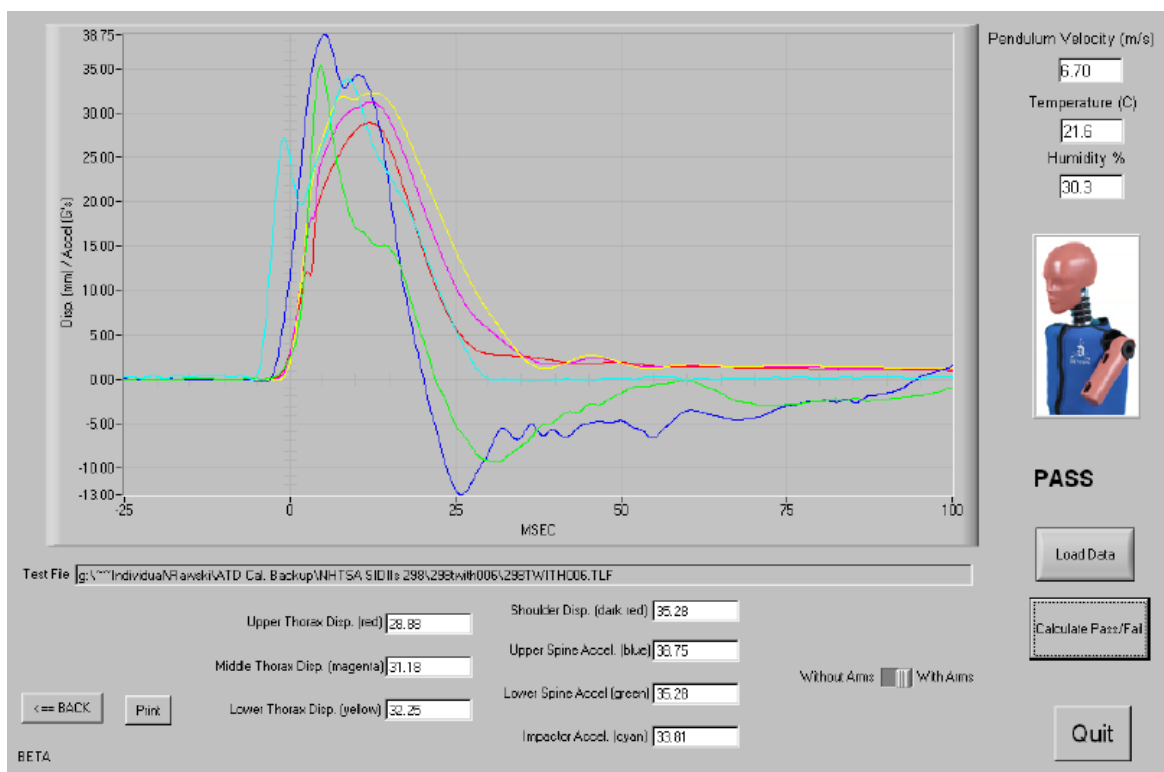


Figure C-7: SIDIIS Lateral Thorax With Arm Impact Pre-Test

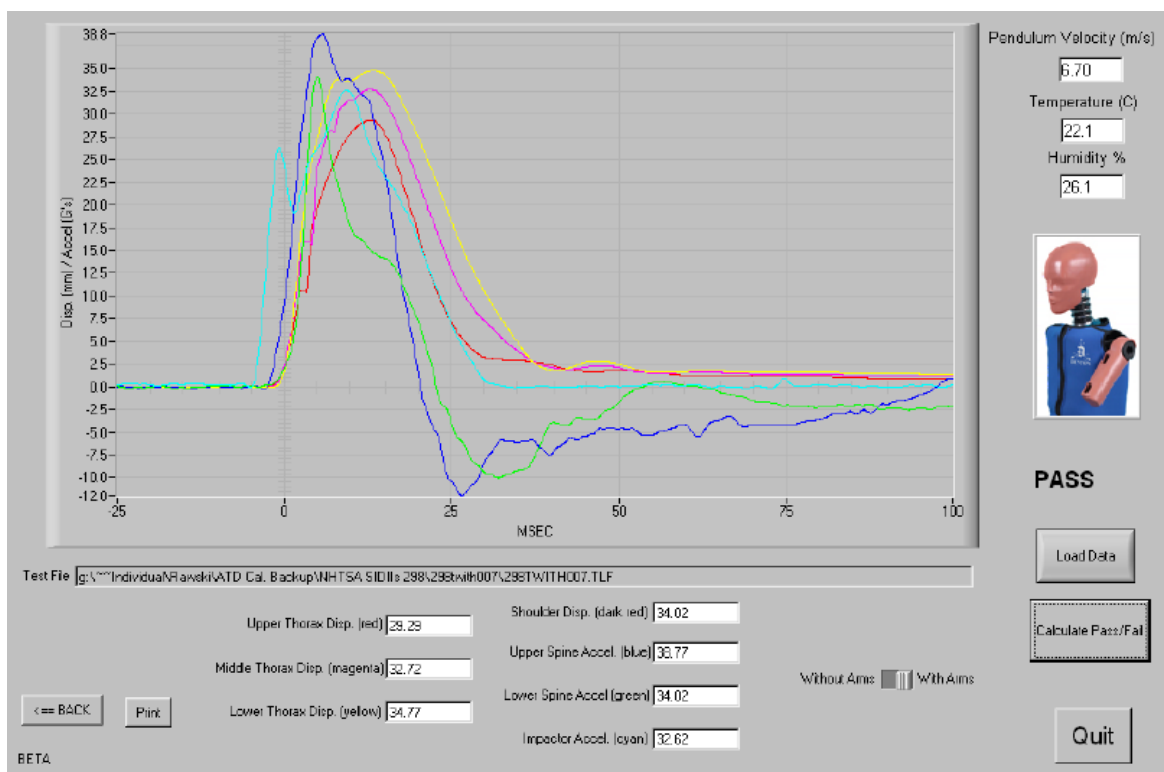


Figure C-8: SIDIIS Lateral Thorax With Arm Impact Post-Test

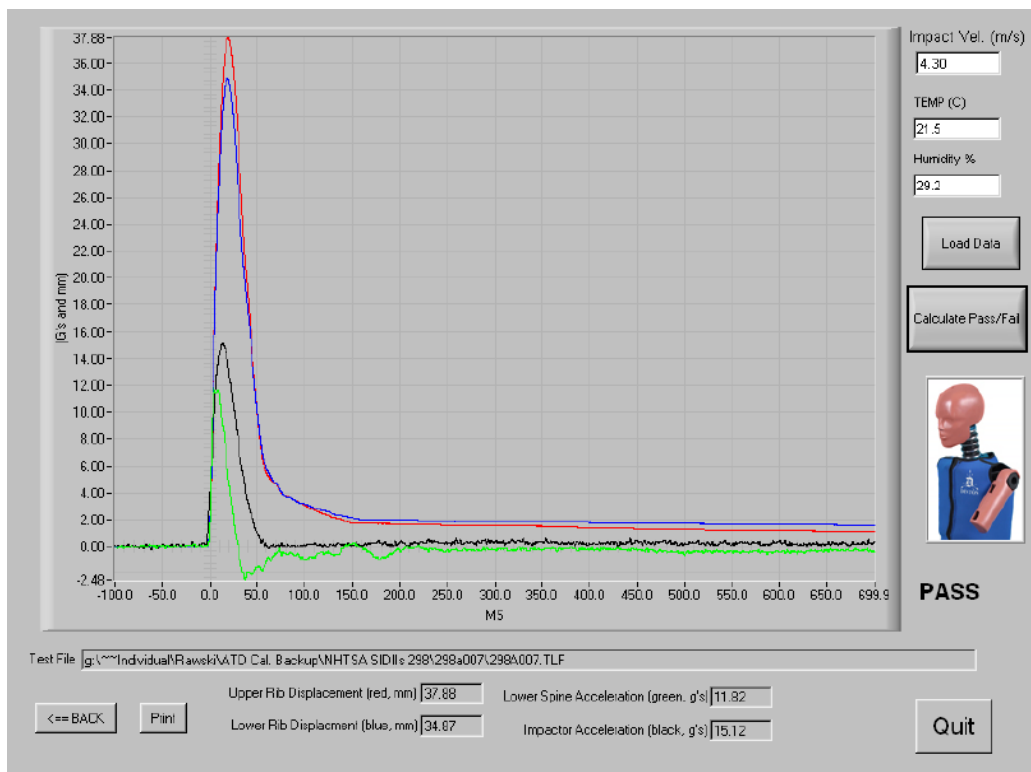


Figure C-9: SIDII Lateral Abdominal Impact Pre-Test

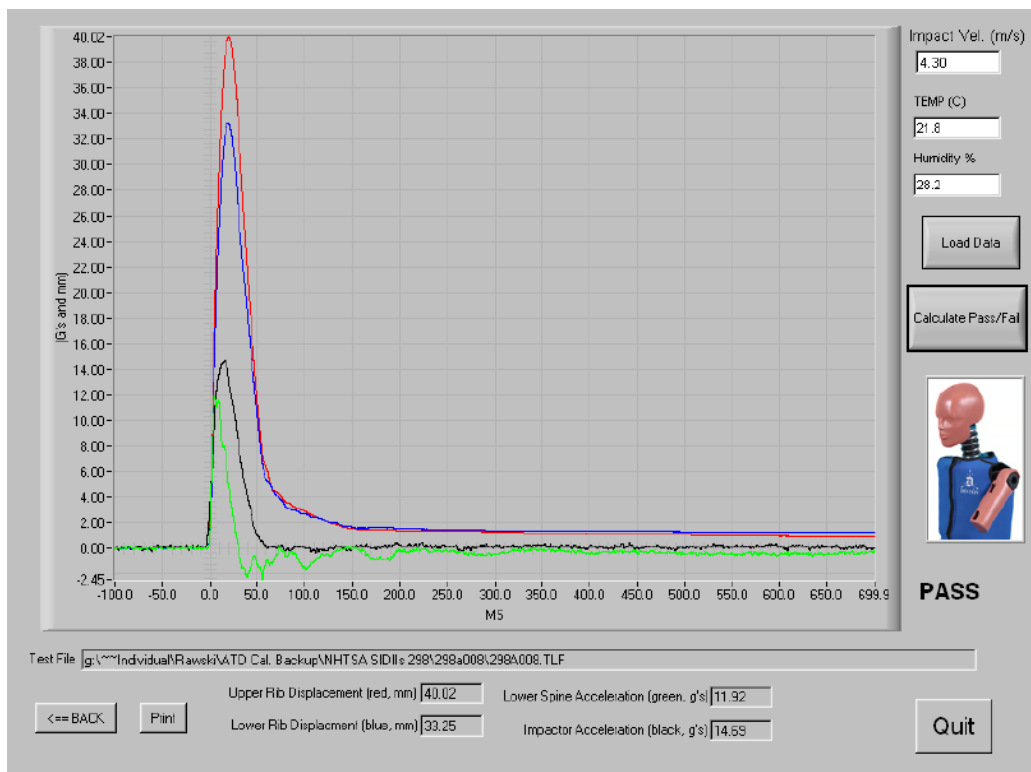


Figure C-10: SIDII Lateral Abdominal Impact Post-Test

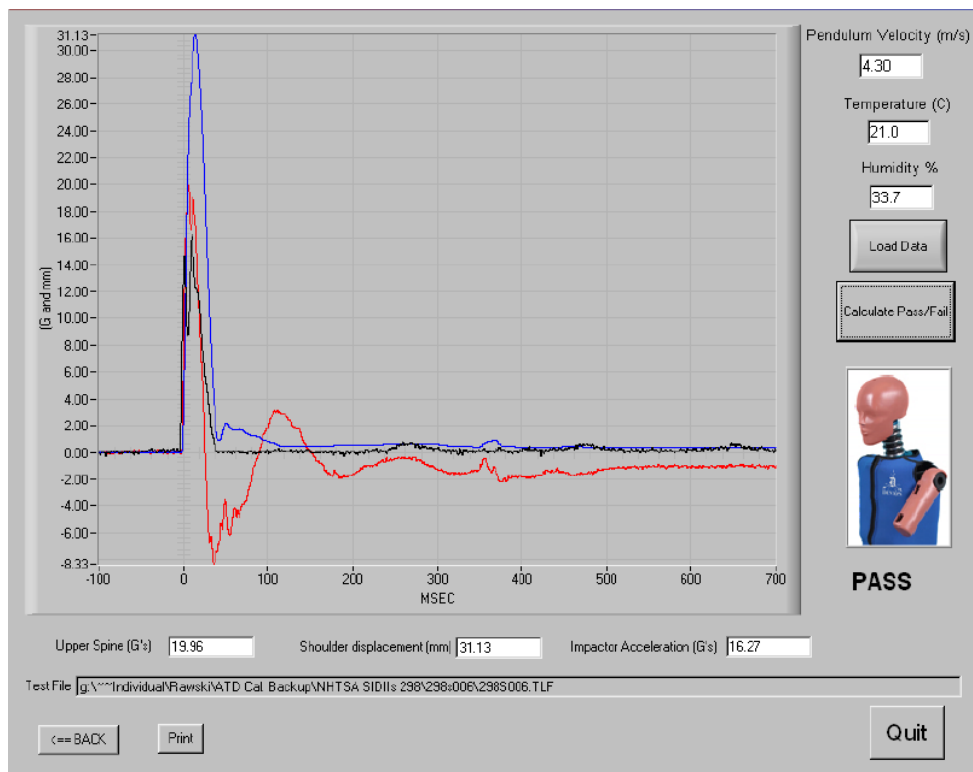


Figure C-11: SIDII's Lateral Shoulder Impact Pre-Test

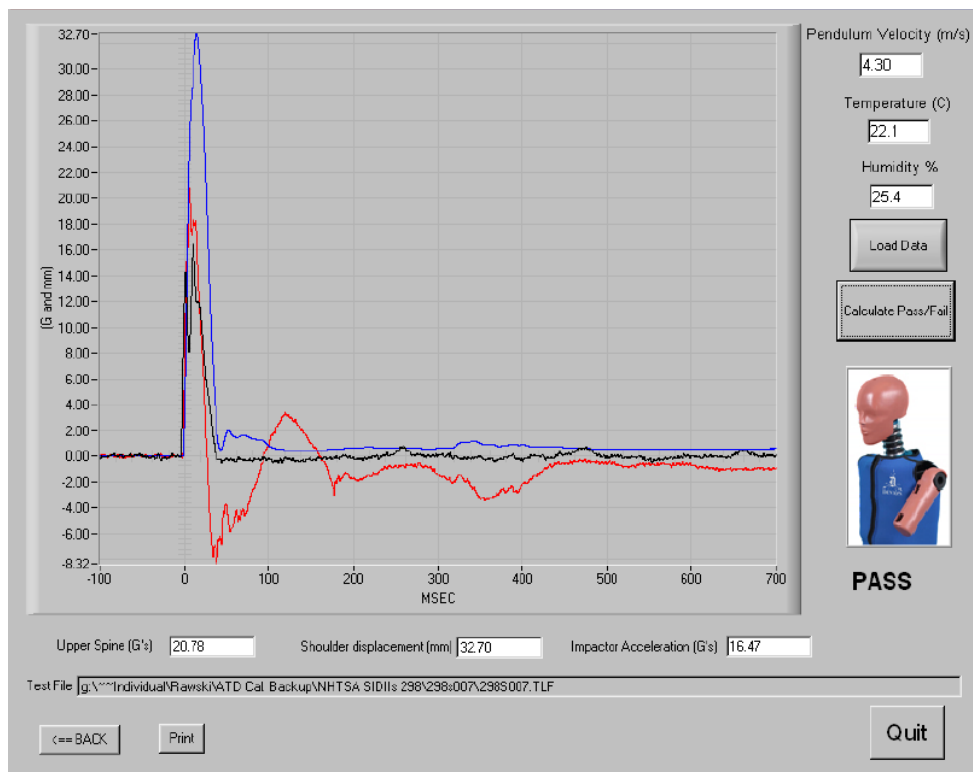


Figure C-12: SIDII's Lateral Shoulder Impact Post-Test

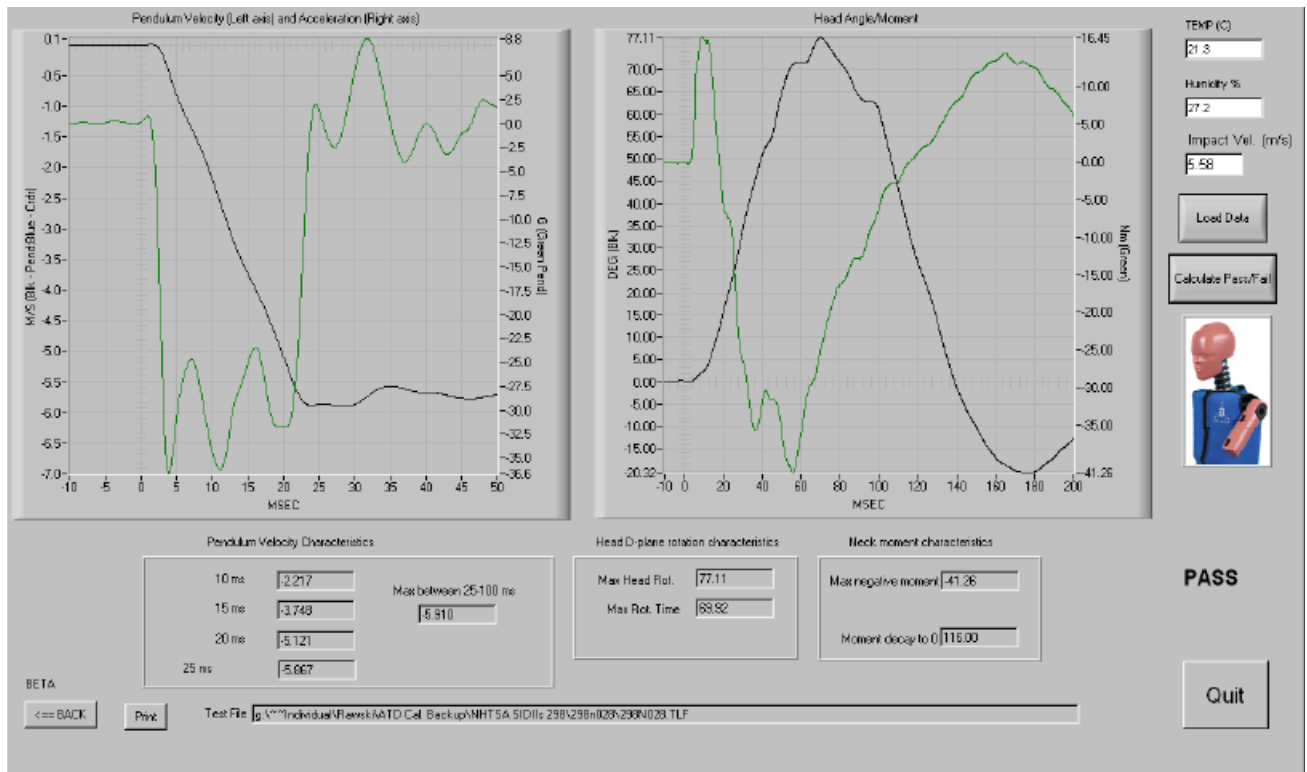


Figure C-13: SIDII Lateral Neck Pre-Test

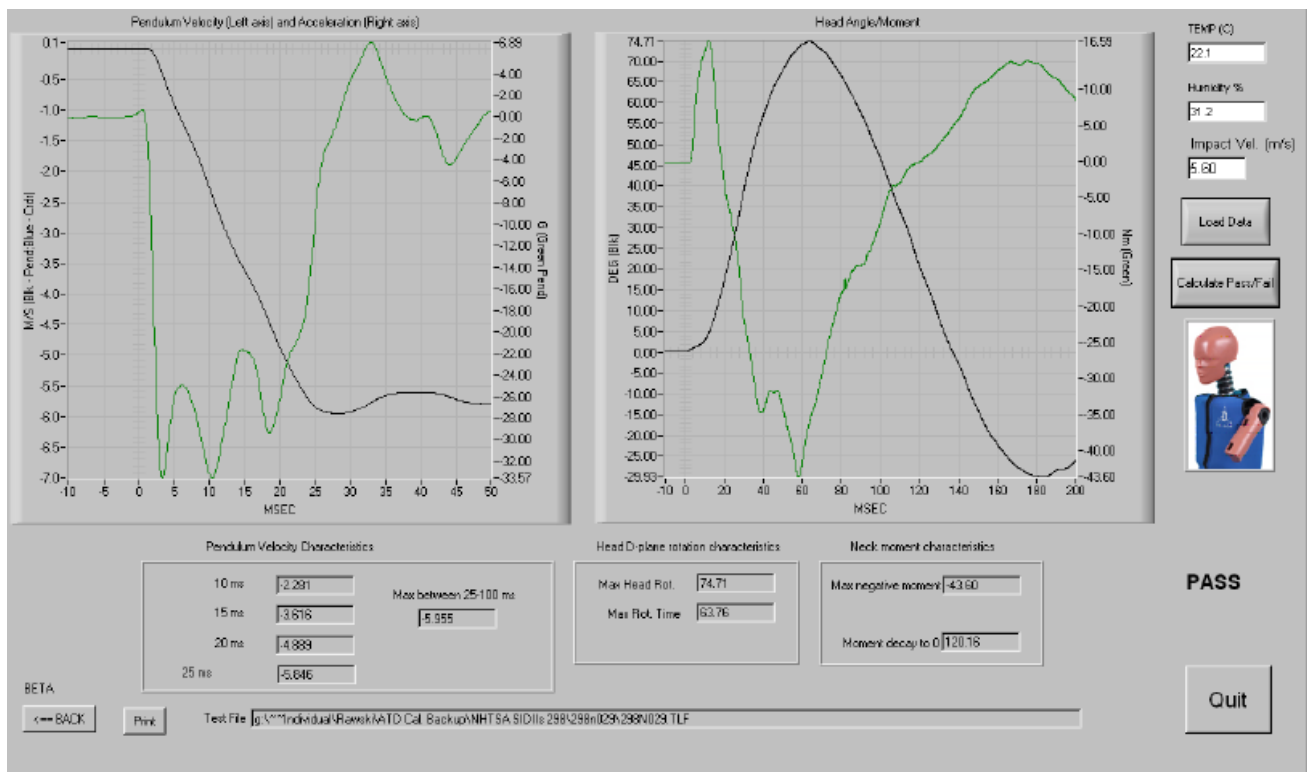


Figure C-14: SIDII Lateral Neck Post-Test

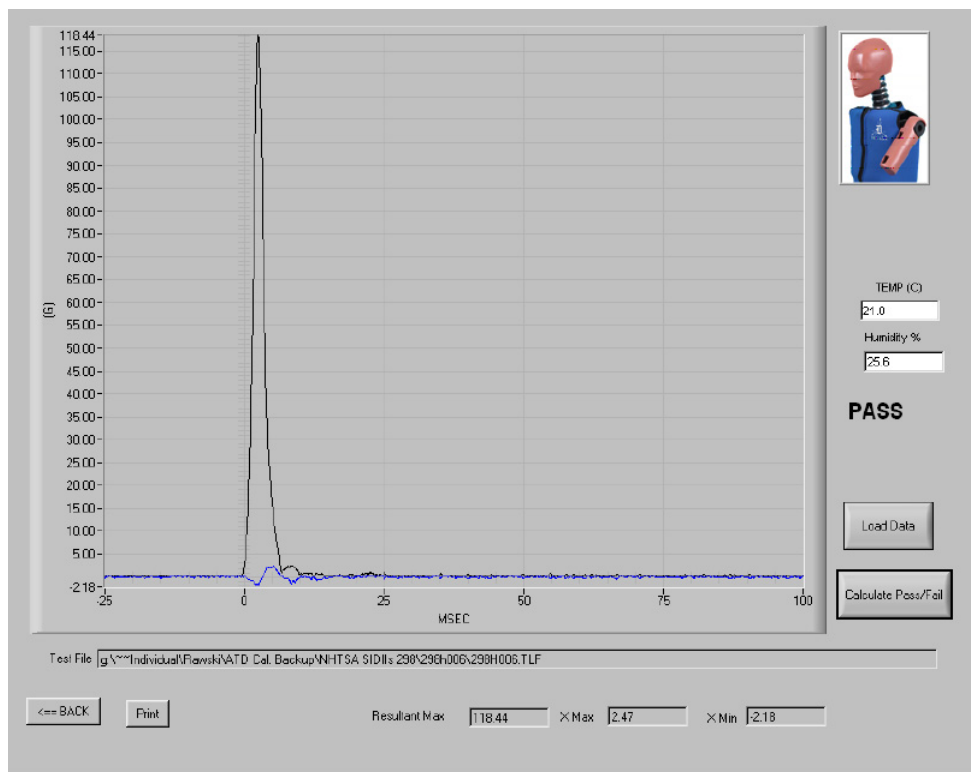


Figure C-15: SIDII Lateral Head Drop Pre-Test

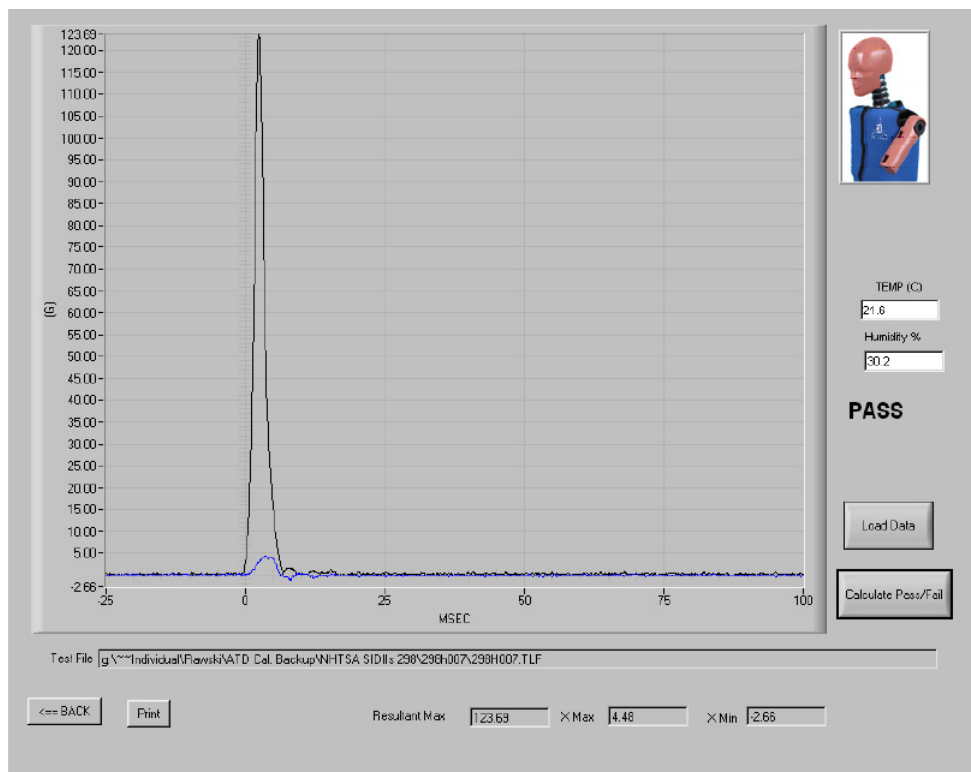


Figure C-16: SIDII Lateral Head Drop Post-Test

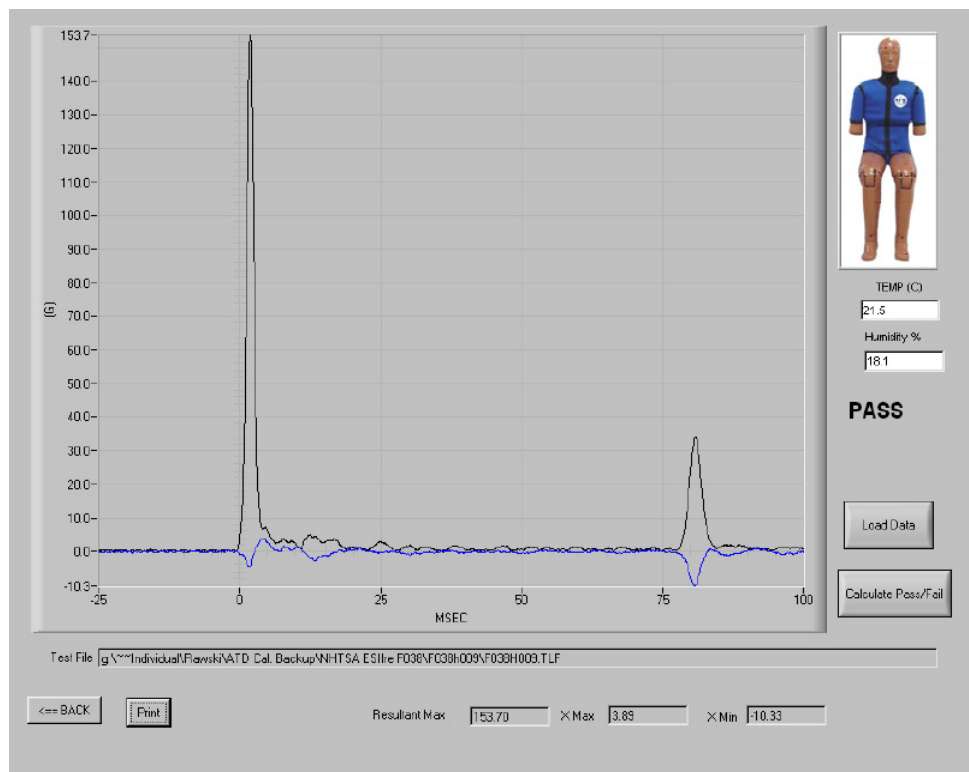


Figure C-17: ESIIre Lateral Head Drop Pre-Test

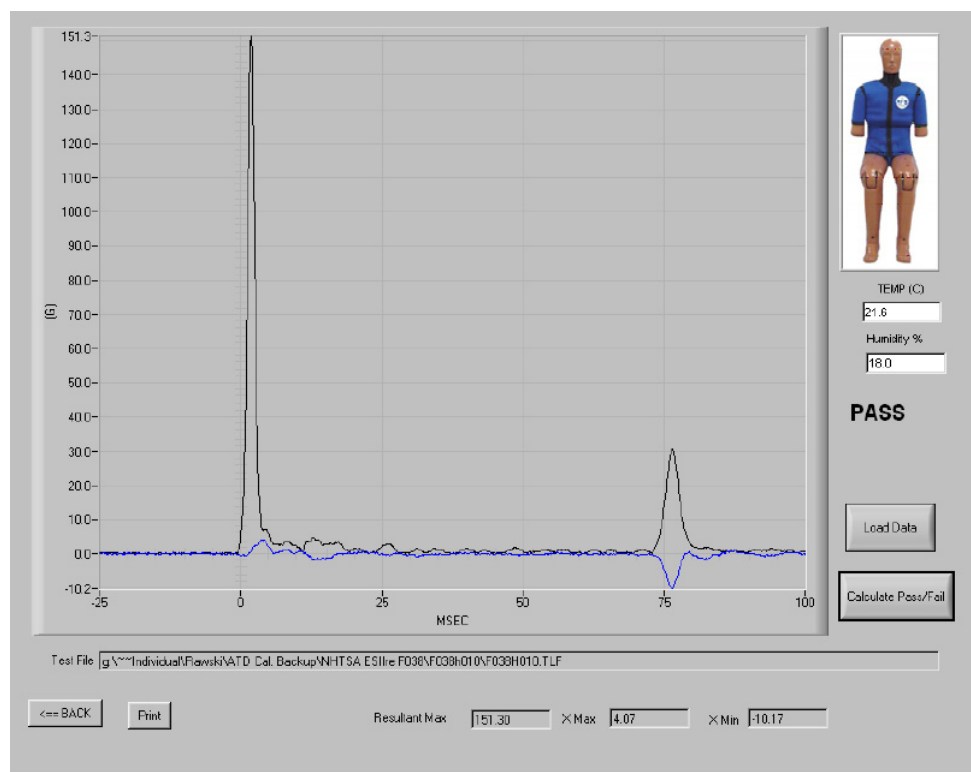


Figure C-18: ESIIre Lateral Head Drop Post-Test

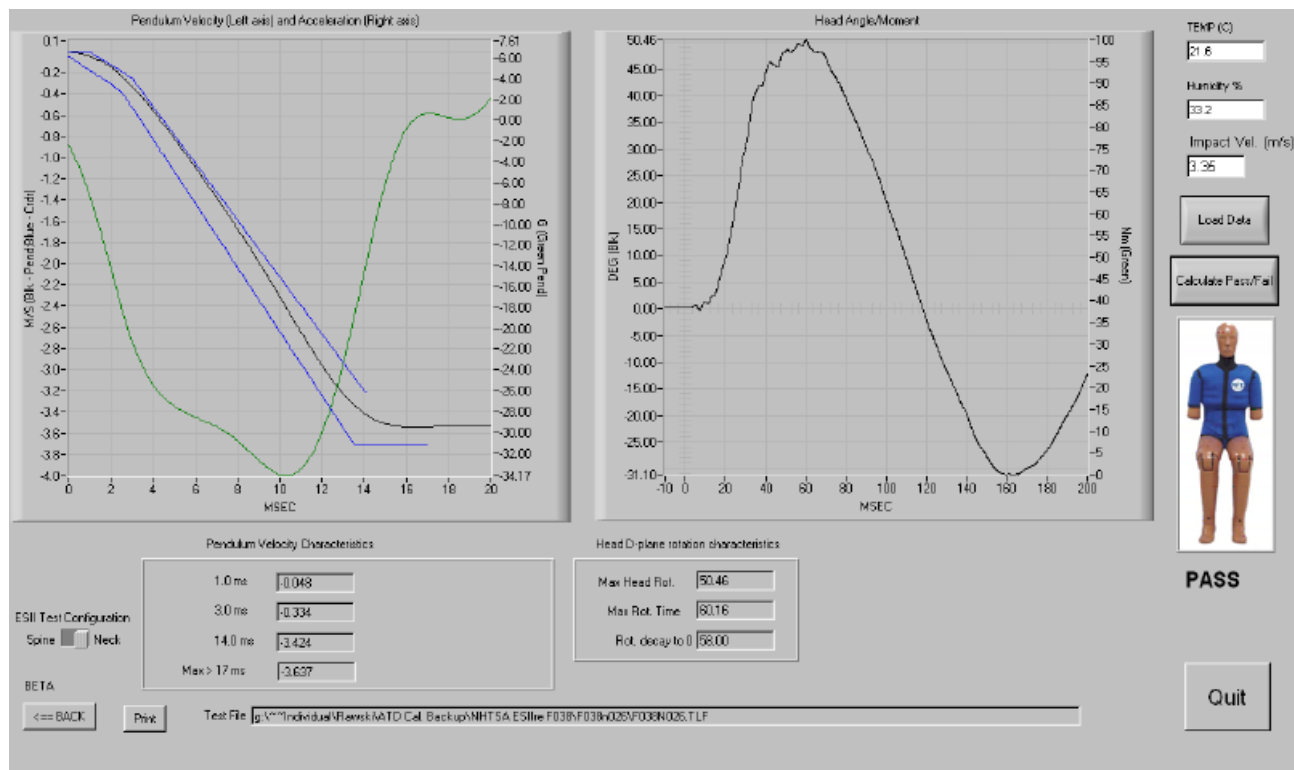


Figure C-19: ESIIre Lateral Neck Pre-Test

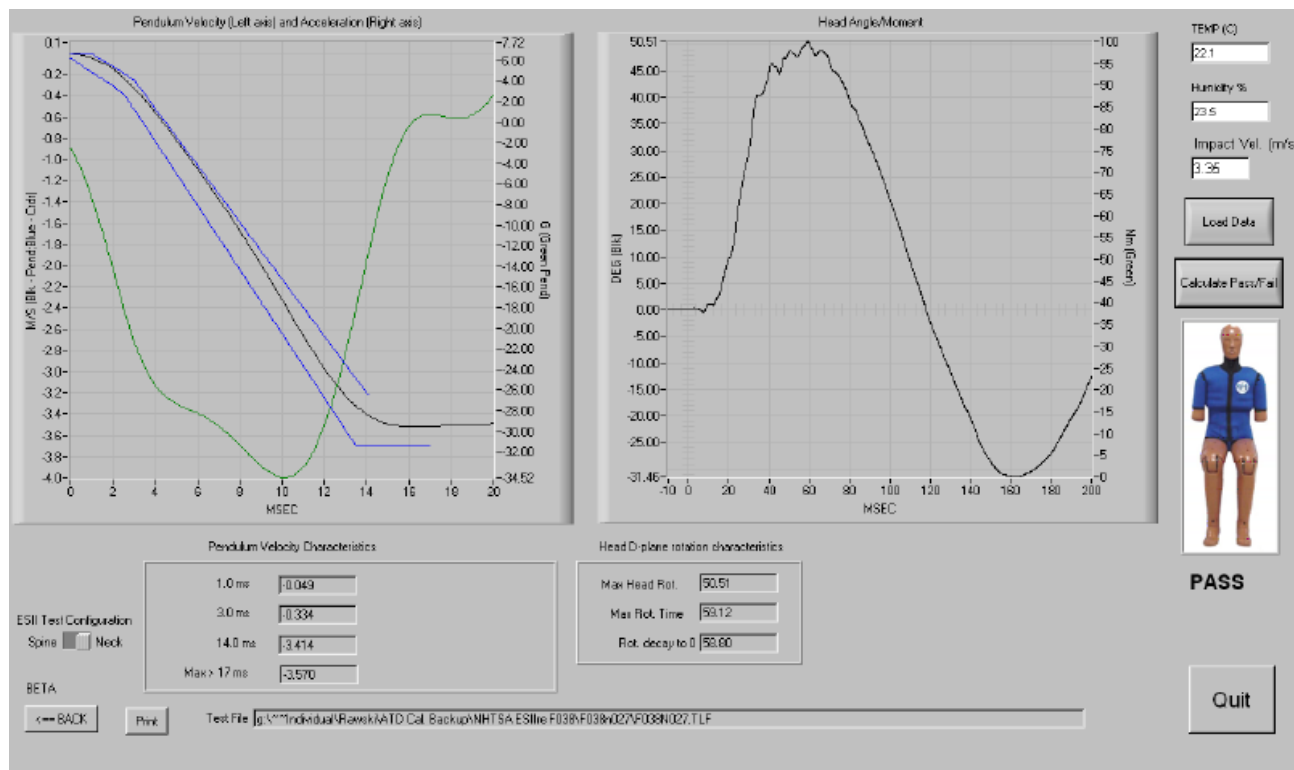


Figure C-20: ESIIre Lateral Neck Post-Test

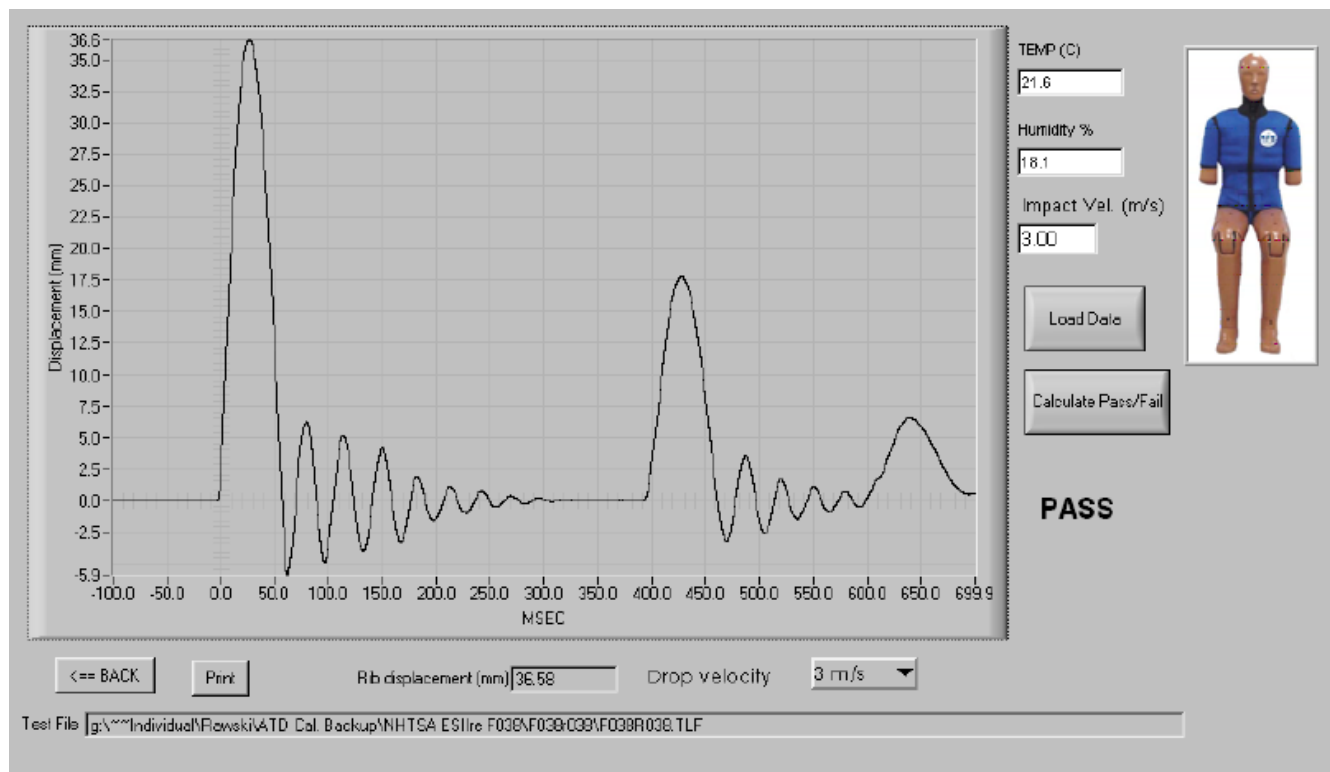


Figure C-21: ESIIre 3.00 m/s Upper Rib Drop Pre-Test

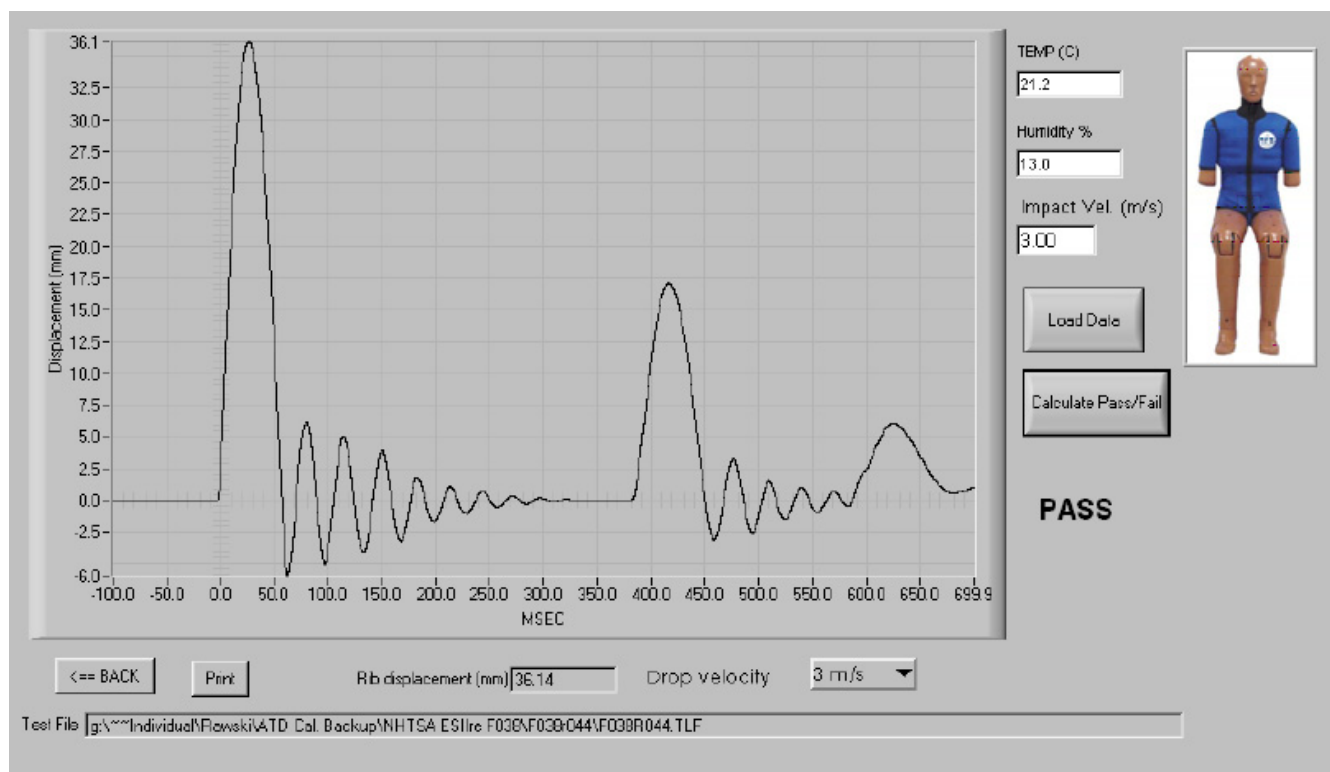


Figure C-22: ESIIre 3.00 m/s Upper Rib Drop Post-Test

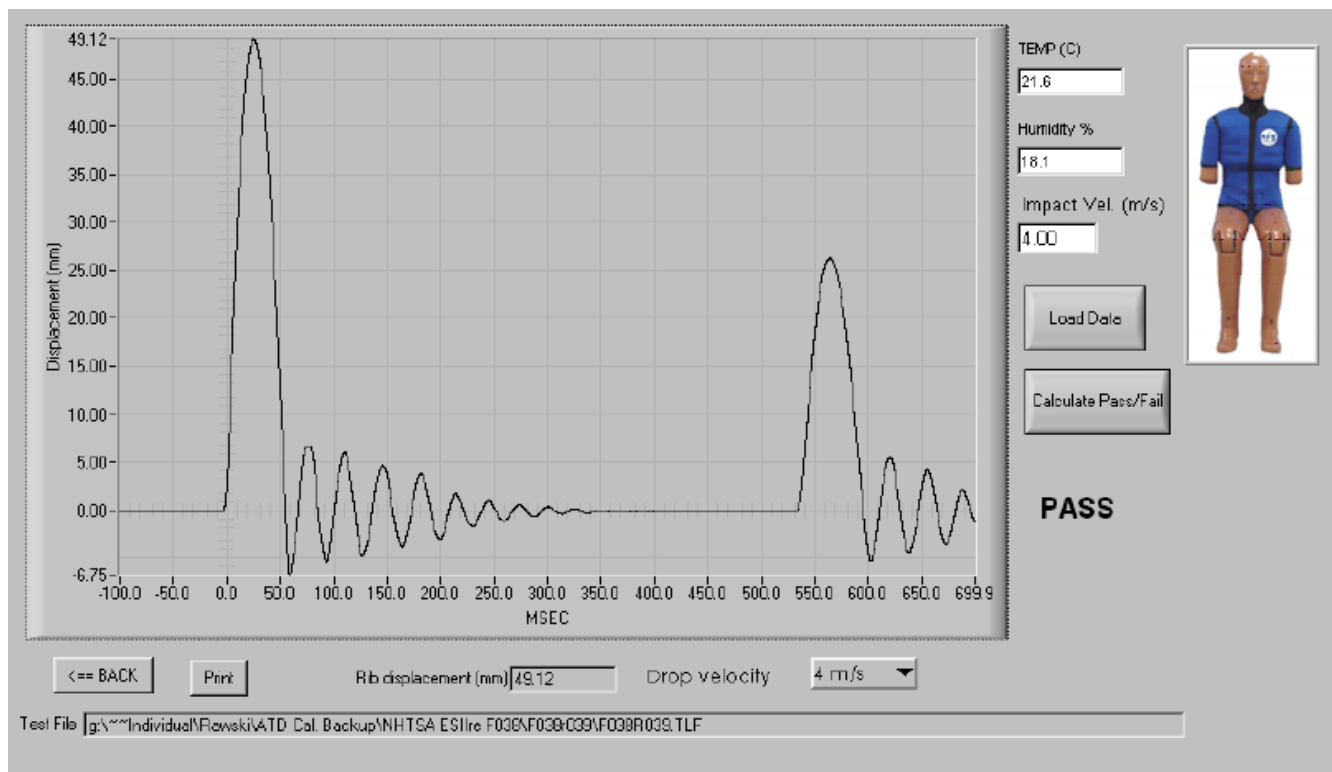


Figure C-23: ESIIre 4.00 m/s Upper Rib Drop Pre-Test

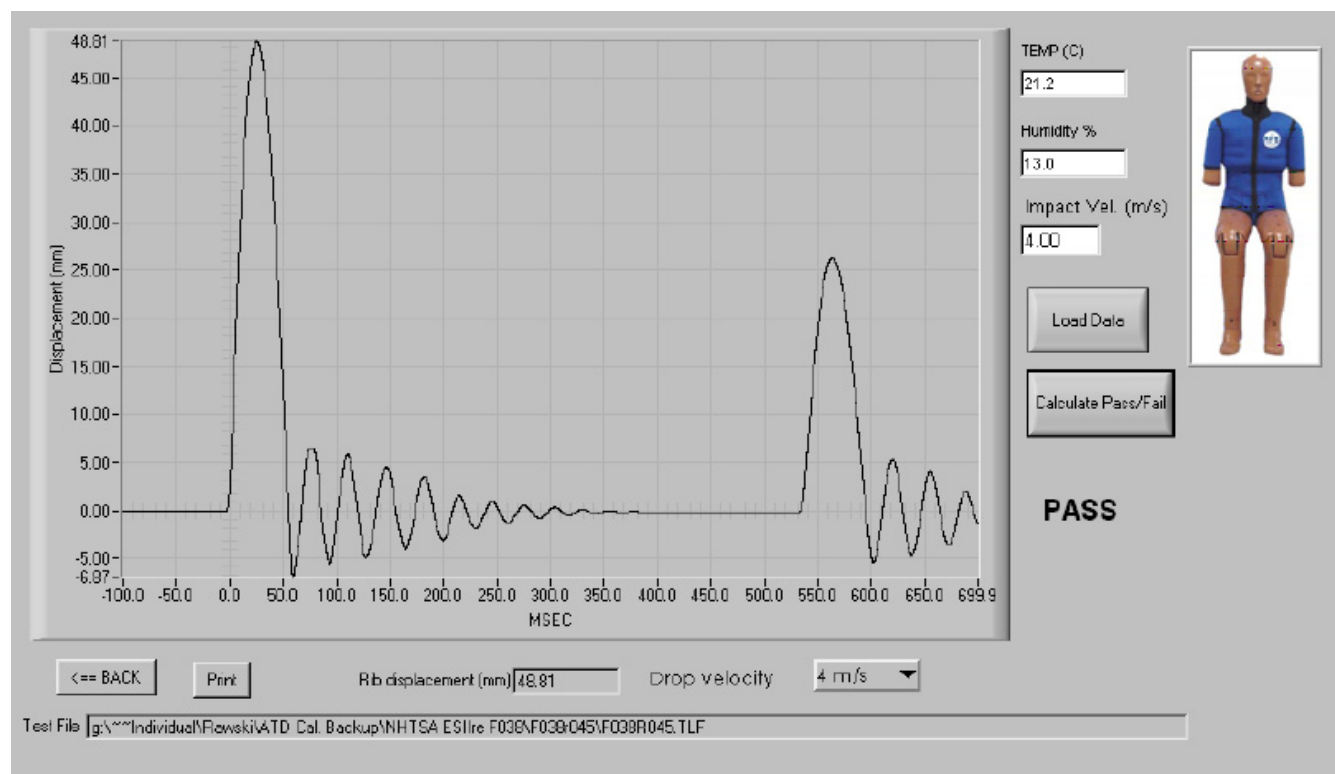


Figure C-24: ESIIre 4.00 m/s Upper Rib Drop Post-Test

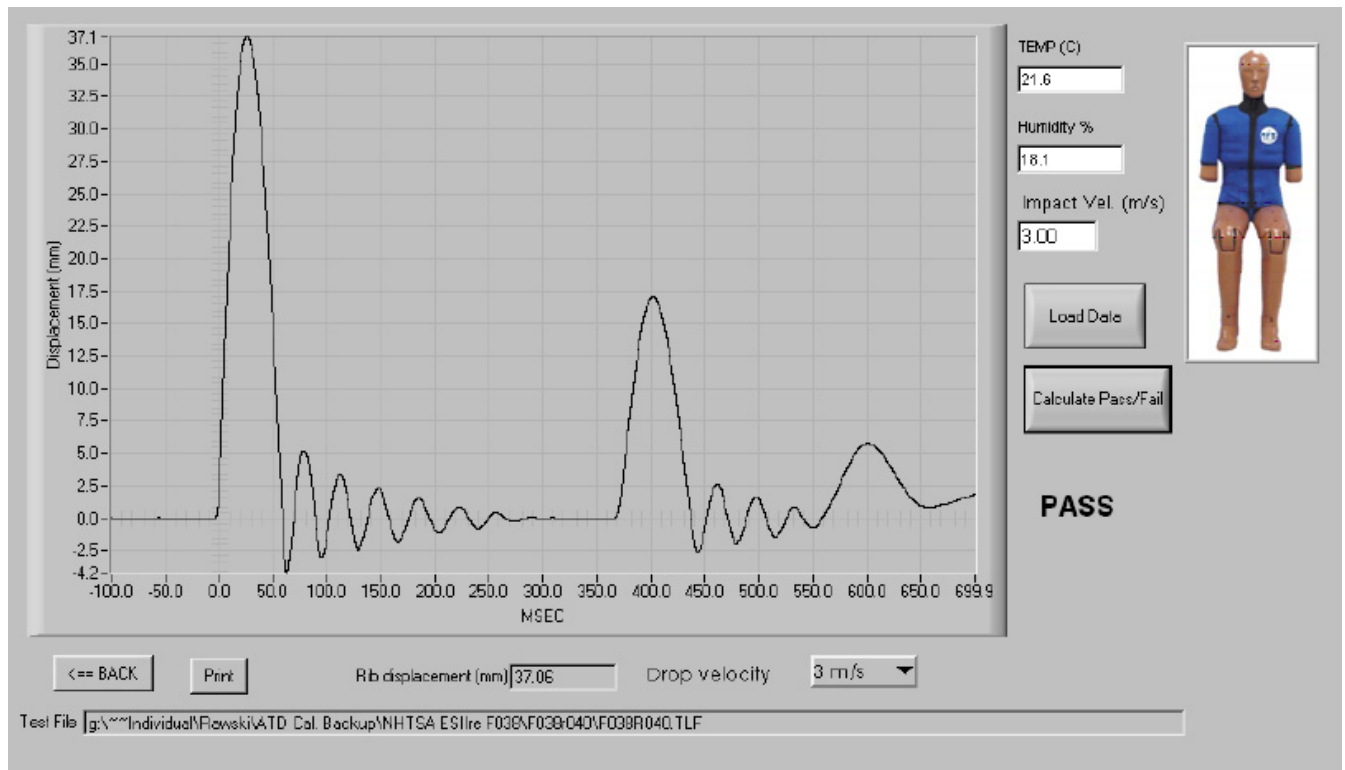


Figure C-25: ESIIre 3.00 m/s Middle Rib Drop Pre-Test

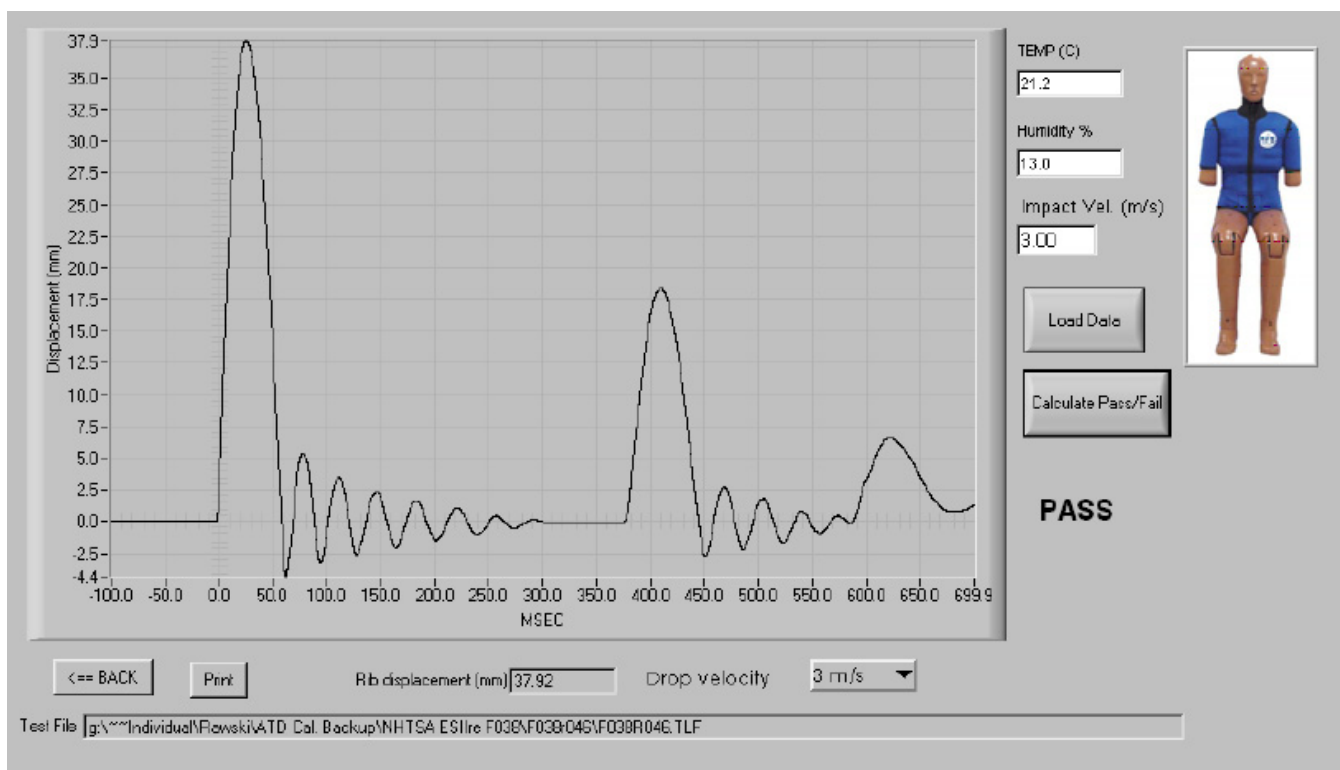


Figure C-26: ESIIre 3.00 m/s Middle Rib Drop Post-Test

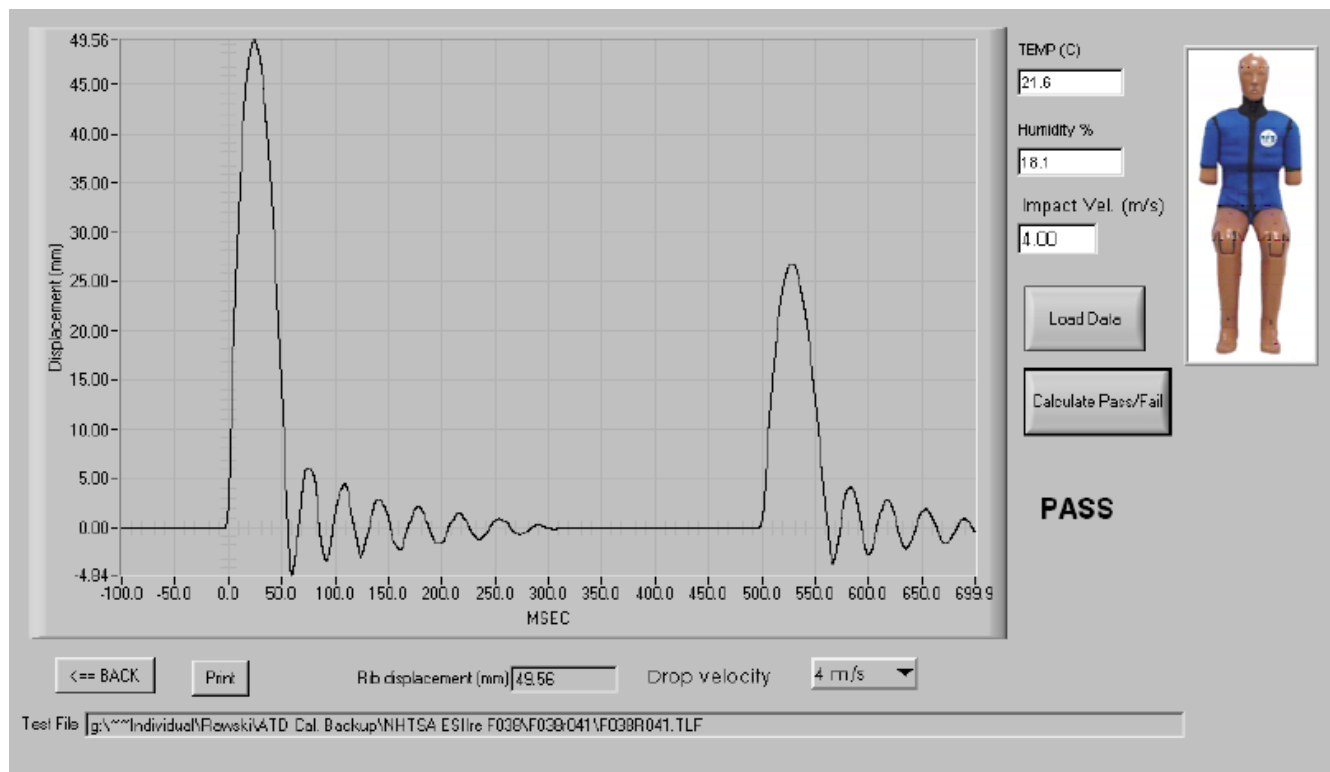


Figure C-27: ESIIre 4.00 m/s Middle Rib Drop Pre-Test

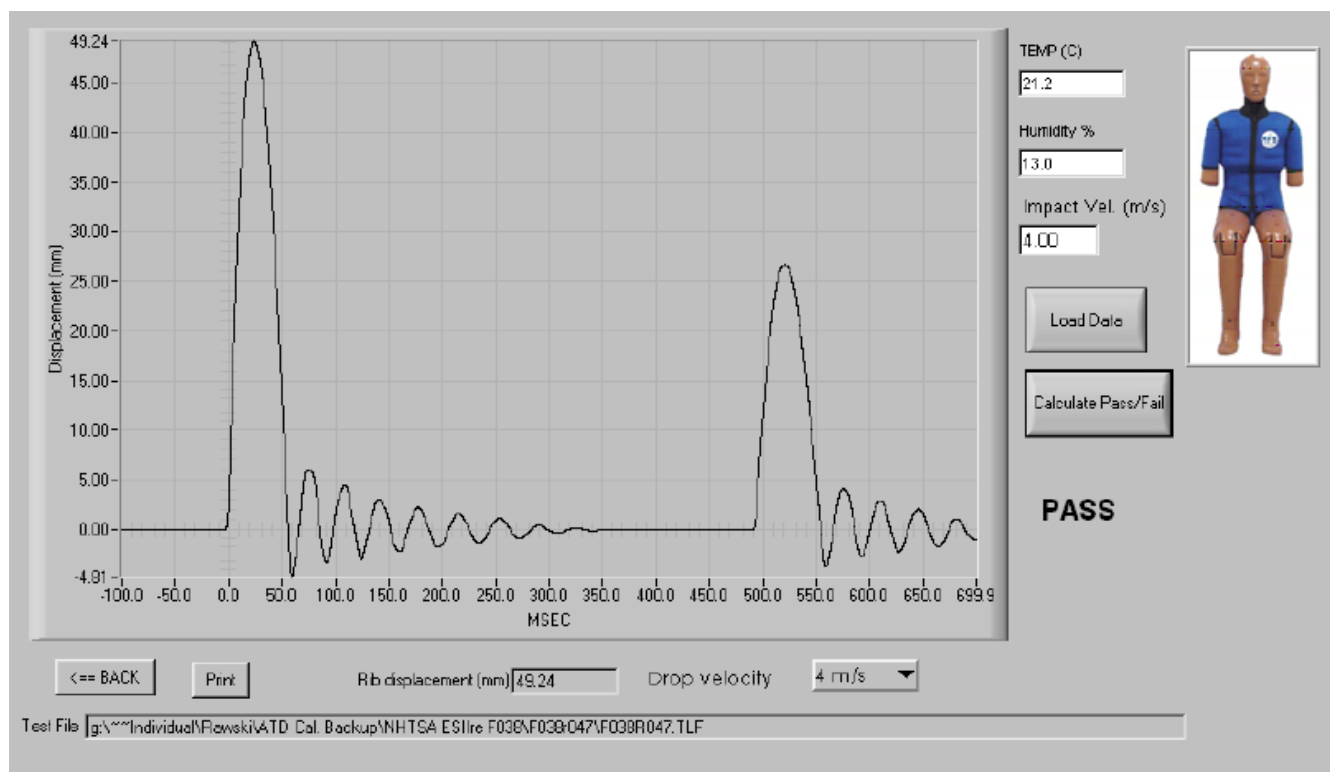


Figure C-28: ESIIre 4.00 m/s Middle Rib Drop Post-Test

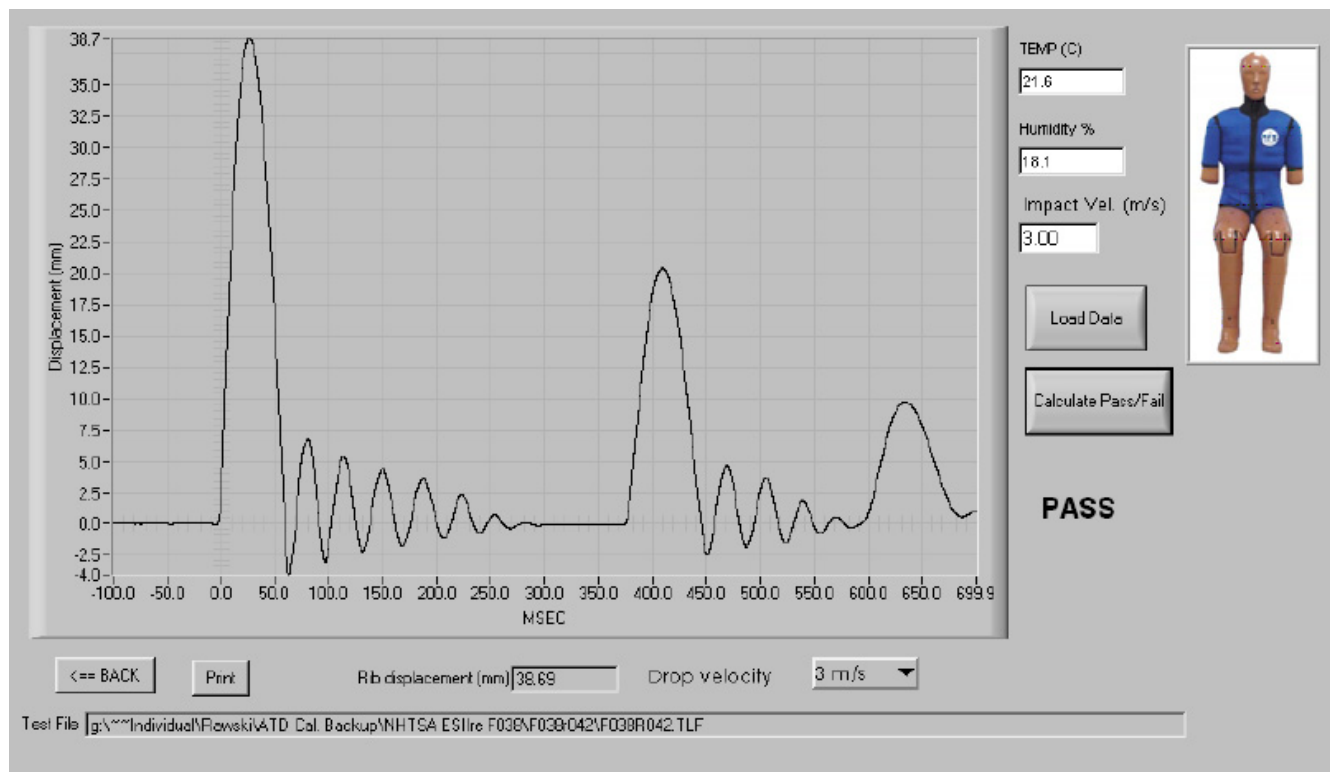


Figure C-29: ESIIre 3.00 m/s Lower Rib Drop Pre-Test

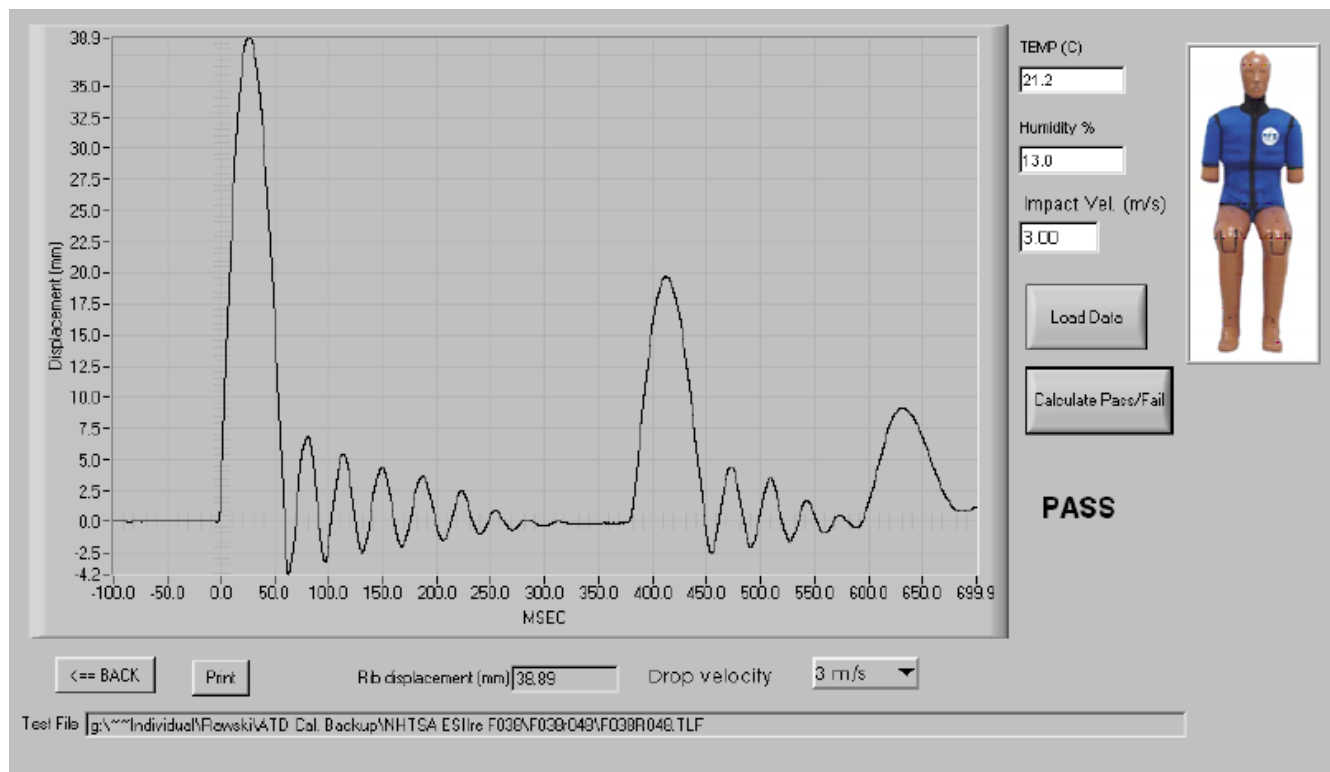


Figure C-30: ESIIre 3.00 m/s Lower Rib Drop Post-Test

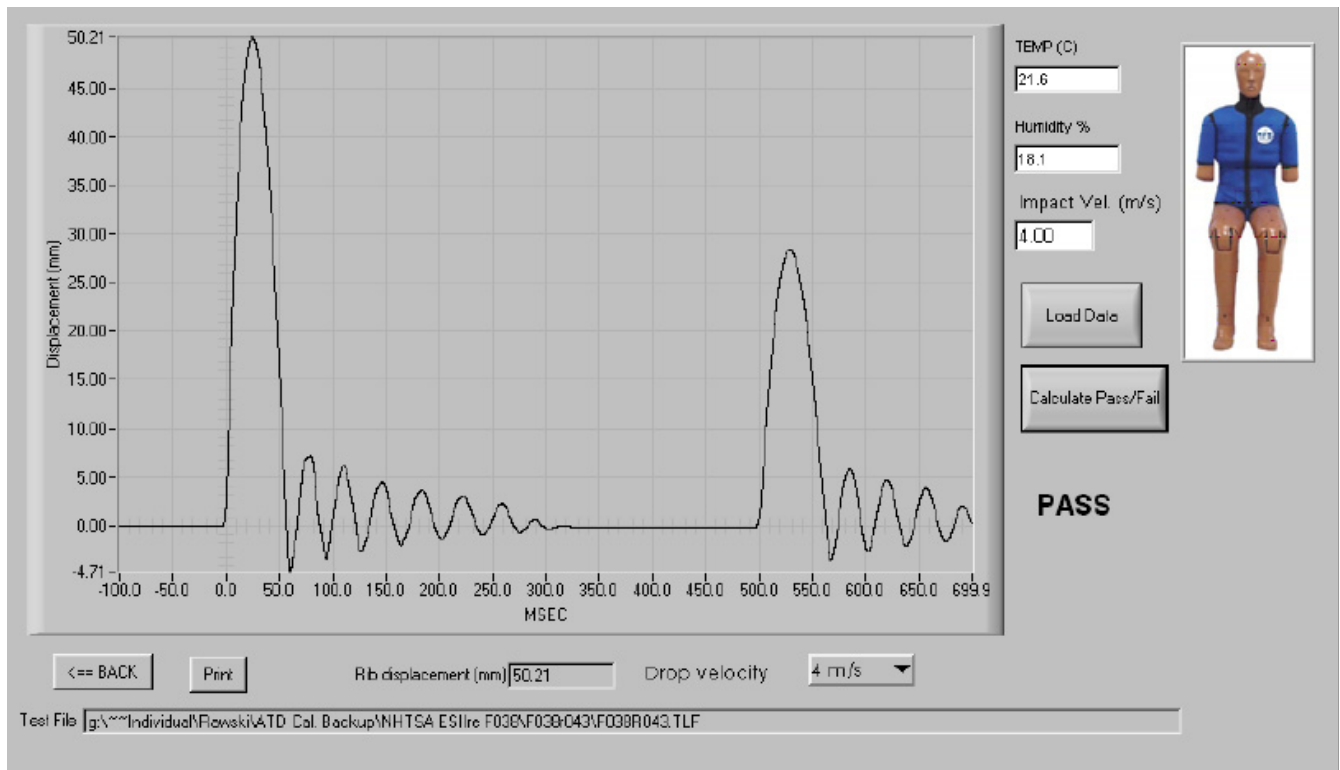


Figure C-31: ESIIre 4.00 m/s Lower Rib Drop Pre-Test

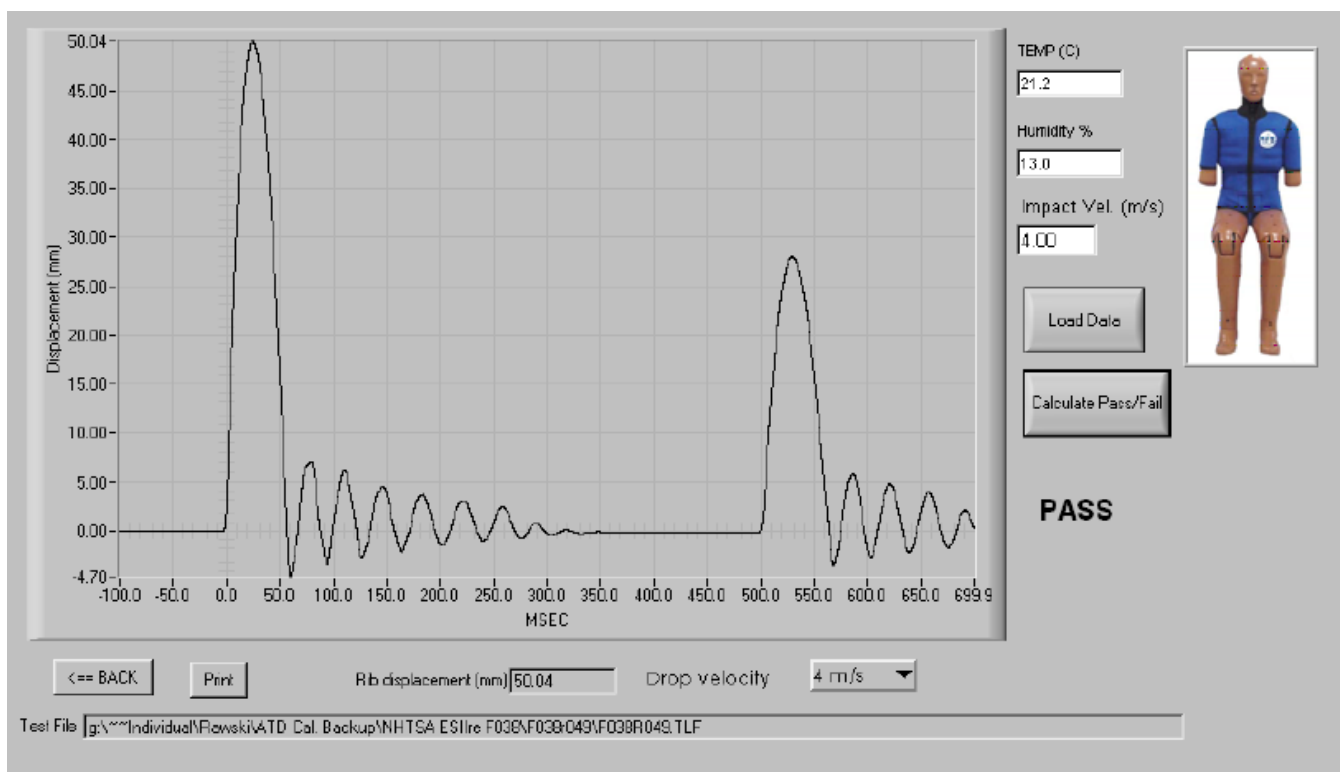


Figure C-32: ESIIre 4.00 m/s Lower Rib Drop Post-Test

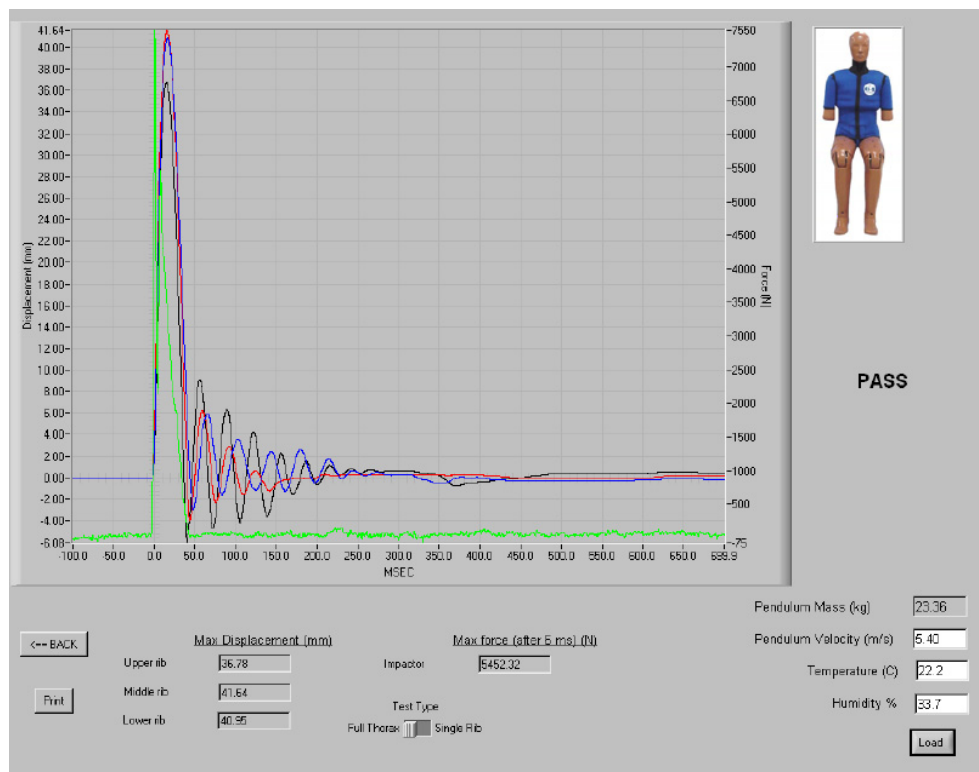


Figure C-33: ESIre Full Body Thorax Impact Pre-Test

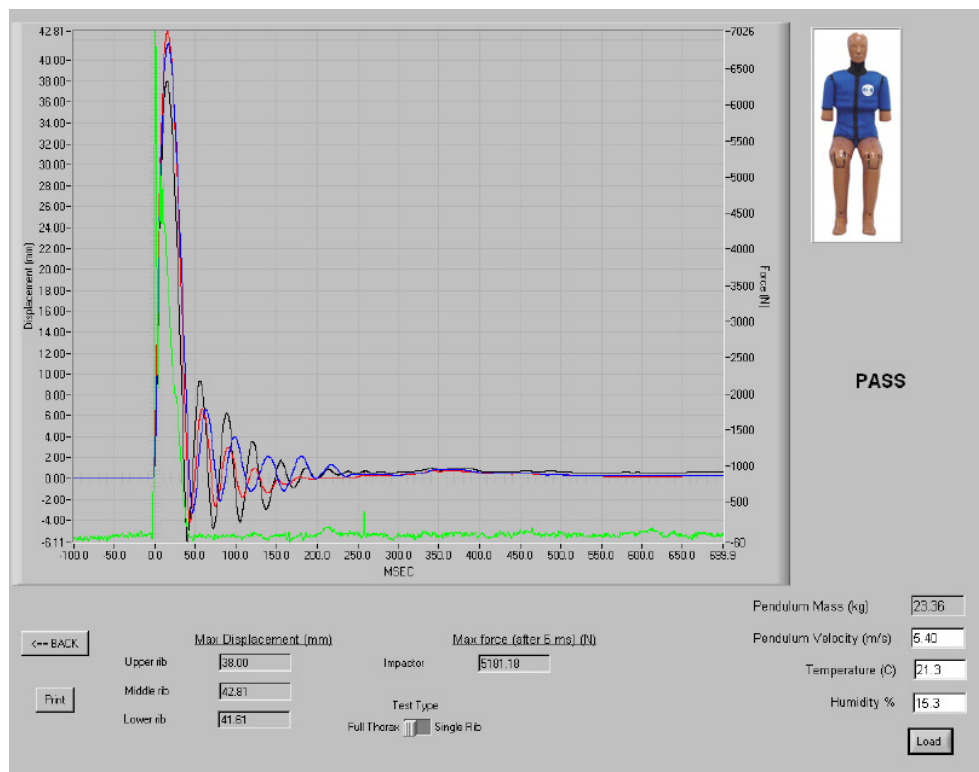


Figure C-34: ESIre Full Body Thorax Impact Post-Test

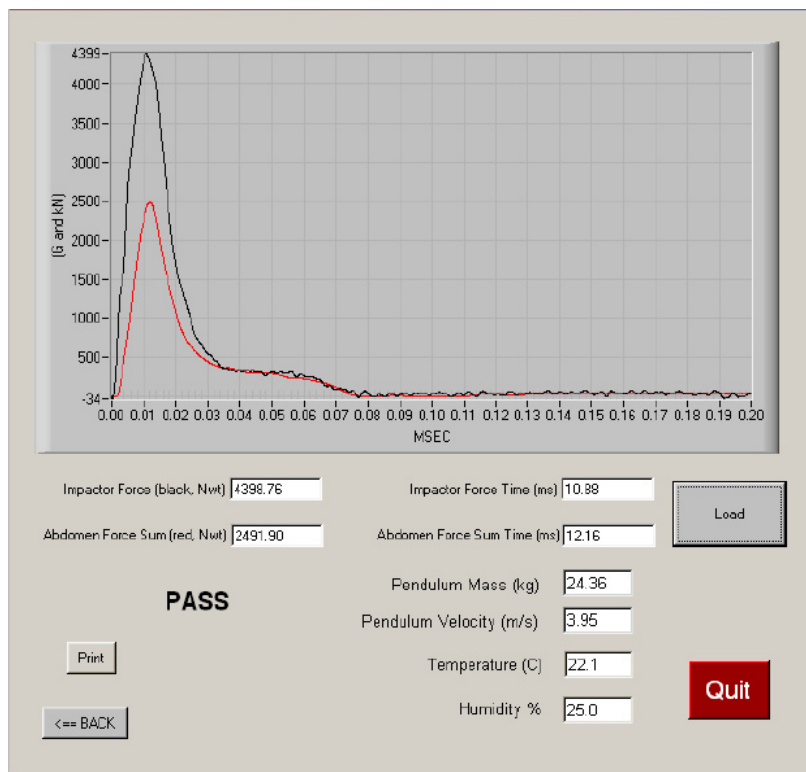


Figure C-35: ESIIre Lateral Abdomen Impact Pre-Test

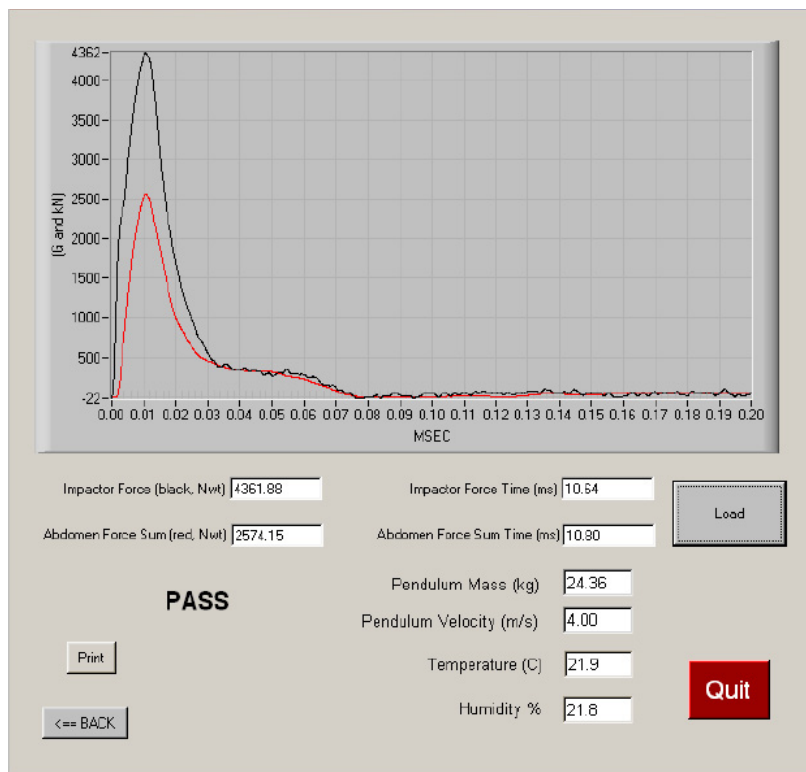


Figure C-36: ESIIre Lateral Abdomen Impact Post-Test

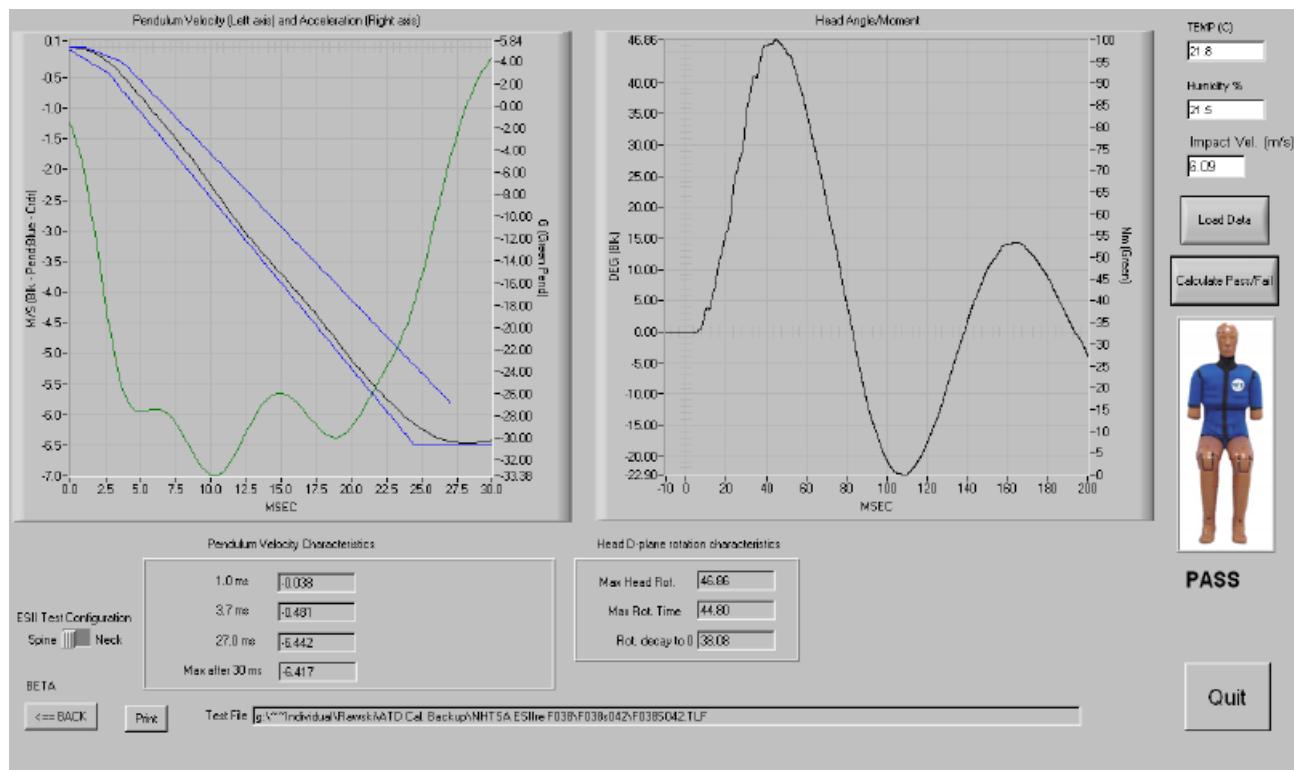


Figure C-37: ESIIre Lateral Spine Pre-Test

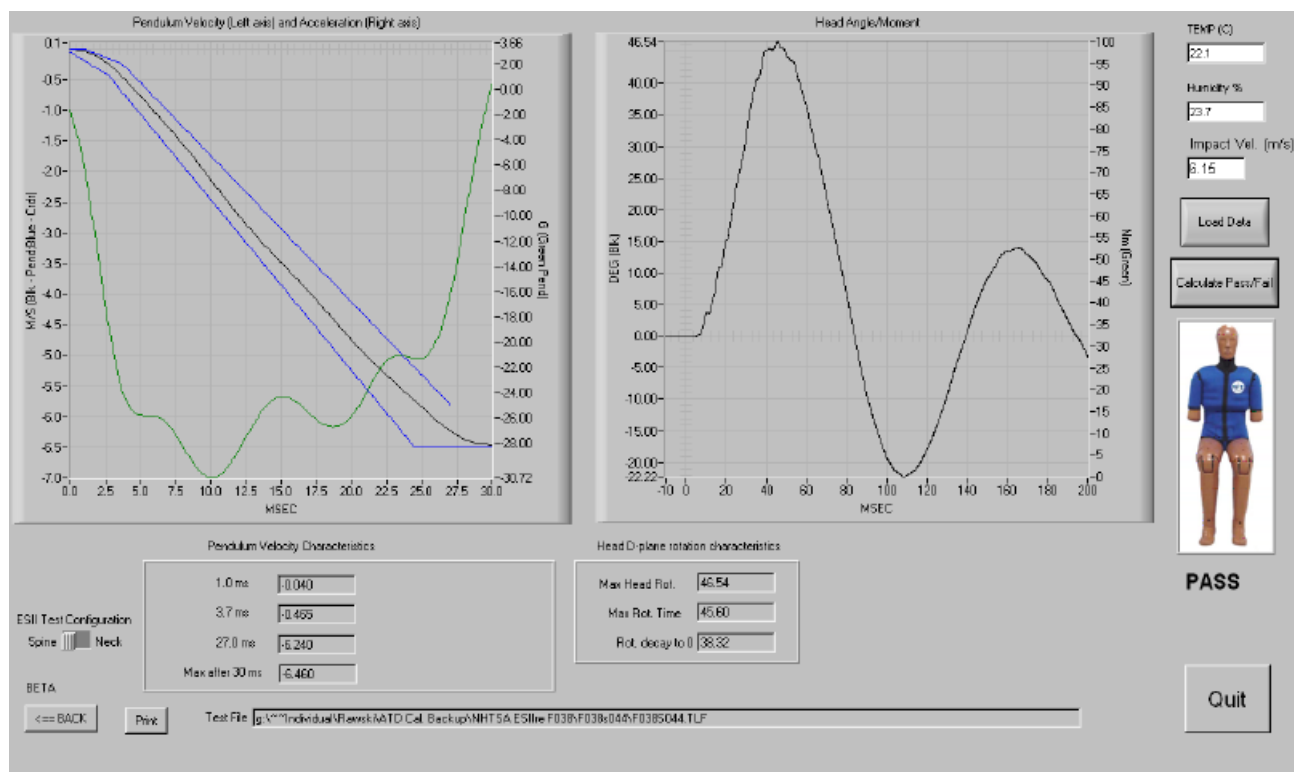


Figure C-38: ESIIre Lateral Spine Post-Test

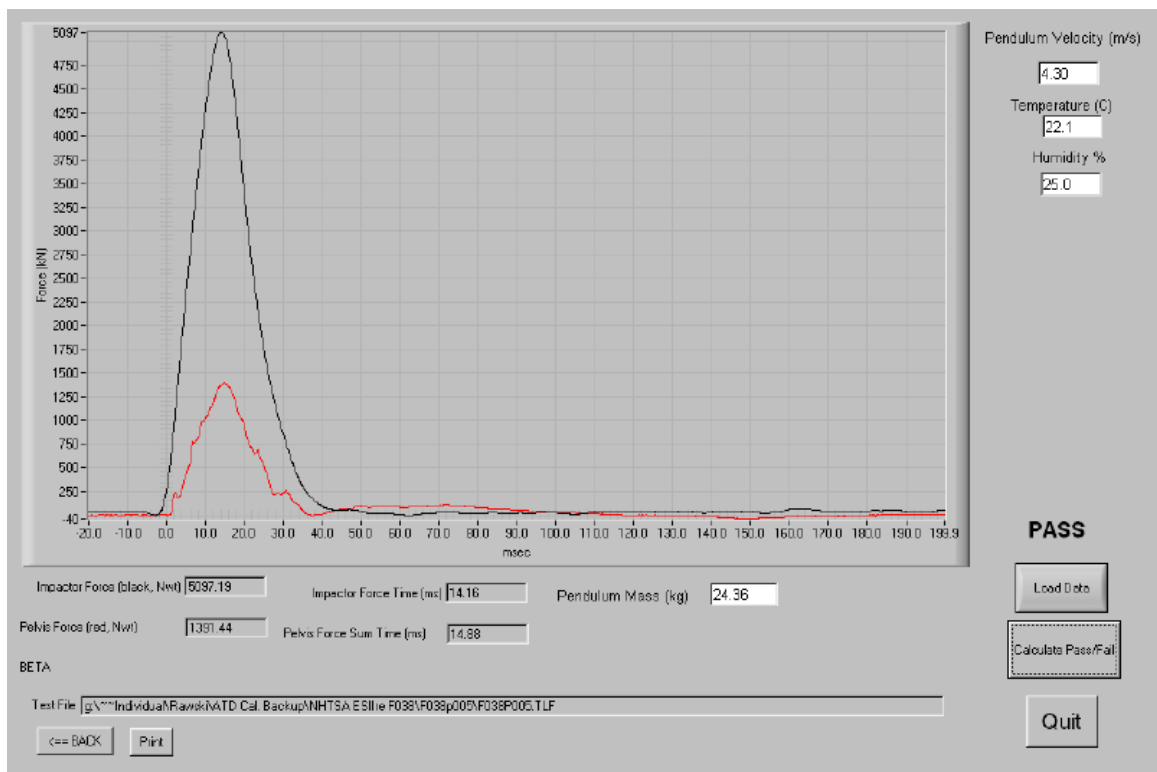


Figure C-39: ESIIre Lateral Pelvis Pre-Test

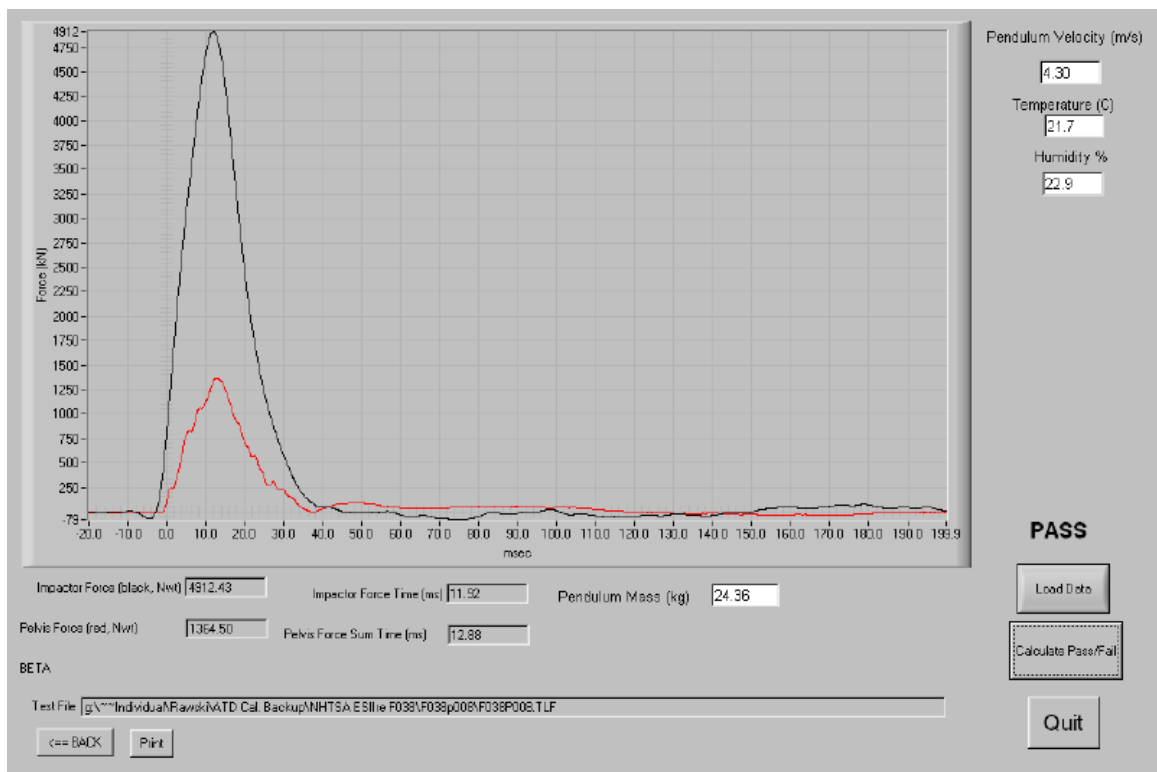


Figure C-40: ESIIre Lateral Pelvis Post-Test