REPORT NUMBER: SINCAP-MCW-13-04

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

CHRYSLER GROUP, LLC
2013 RAM 1500 4-DOOR QUAD CAB PICKUP
NHTSA NUMBER: MD 0316

PREPARED BY:
MEDICAL COLLEGE OF WISCONSIN
5000 WEST NATIONAL AVENUE
RESEARCH 151
MILWAUKEE, WISCONSIN 53295

TEST DATE: 12 DECEMBER 2012

REPORT DATE: 20 DECEMBER 2012

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NVS-111
1200 NEW JERSEY AVE, SE, ROOM W43-410
WASHINGTON, D.C. 20590

Prepared by: Mark Meyer

Date: 3/6/13

Approved by: [signature]

Date: 6 MAR 2013

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

1. Report No. SINCAP-MCW-13-04	*2. Government Accession No.*	*3. Recipient's Catalog No.*
4. Title and Subtitle Final report of New Car Assessment Program SINCAP Test of a 2013 Ram 1500 4-Door Quad Cab Pickup NHTSA No. MD 0316		*5. Report Date* December 20, 2012 *6. Performing Organization Code* MCW
7. Author(s) Frank A. Pintar, Ph. D, Project Manager Mark Meyer, Project Engineer		*8. Performing Organization Report No.* MCW-DOT-13SN04
9. Performing Organization Name and Address Medical College of Wisconsin 5000 W. National Ave. Research 151 Milwaukee, WI 53295		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-09-D-00123
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NVS-111) 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590		*13. Type of Report and Period Covered:* Final Test Report Dec. 12 to Dec. 20, 2012 *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 2013 Ram 1500 4-Door Quad Cab Pickup 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) facility in Milwaukee, Wisconsin on 12 December 2012.

The impact velocity of the Moving Deformable Barrier (MDB) was 62.20 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 19°C. The target vehicle's post test maximum static crush was 365 mm at level 1. The test vehicle's performance is as follows:

	Units	IARV	DRIVER ATD (ES-2re)
Head Injury Criteria (HIC_{36})	N/a	1000	16
Maximum Thoracic Rib Deflection	mm	44	25
Total Abdominal Force	N	2500	652
Pubic Symphysis Force	N	6000	852

	Units	IARV	Pass. ATD (SID-IIs)
Head Injury Criteria (HIC_{36})	N/a	1000	30
Lower Spine Resultant Acceleration	G's	82	25
Total Pelvic Force (sum of Acetabular and Iliac forces)	N	5525	696
Maximum Thoracic Rib Deflection	mm	38	5
Maximum Abdominal Rib Deflection	mm	45	0.1

The two 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.

Technical Report Documentation Page (CONTINUED)

<table>
<tr><td colspan="2">17. Key Words
New Car Assessment Program (NCAP)
Side impact
MDB
ES-2re
SID-IIs</td><td colspan="2">18. Distribution Statement
Copies of this report are available from :
National Highway Traffic Safety Administration
Technical Information Service Division, NPO-411
1200 New Jersey Ave, SE
Washington, D.C. 20590
e-mail: tis@nhtsa.dot.gov
FAX: 202-493-2833</td></tr>
<tr><td>19. Security Classif. (of this report)
Unclassified</td><td>20. Security Classif. (of this page)
Unclassified</td><td>21. No. of Pages
165</td><td>22. Price</td></tr>
</table>

Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2013 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 2013 Ram 1500 4-Door Quad Cab Pickup. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated September 2012.

SECTION 2
SUMMARY OF TEST RESULTS

A 2013 Ram 1500 4-Door Quad Cab Pickup 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 62.20 km/h (38.60 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 December 12, 2012. Pre test and post test photographs of the test vehicle, the MDB, and the dummies (ES-2re 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 September 2012. The side impact event was documented by 11 cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)

- Primary and Redundant Head CG Tri-Axial Accelerometers
- Chest, Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Forward, Middle, and Rear Y-Axis Load Cells
- Lower Spine (T_{12}) Tri-Axial Accelerometers
- Pubic Symphysis Y-Axis Load Cell

PASSENGER ATD (SID-IIs)

- Primary and Redundant Head CG Tri-Axial Accelerometers
- Chest, Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Upper Rib and Lower Rib Y-Axis Displacement Potentiometers
- Lower Spine (T_{12}) Tri-Axial Accelerometers
- Acetabulum and Iliac Wing Y-Axis Load Cells

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	No	No	N/a
Knee Airbag	No	N/a	No	N/a
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/a
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	N/a	No	N/a
Other	N/a	N/a	N/a	N/a

SECTION 2
SUMMARY OF TEST RESULTS (CONTINUED)

Dummy injury values were recorded as follows:

DRIVER DUMMY INJURY VALUES			
Measurement Description	**Driver ATD (ES-2re)**		
	Units	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/a	1000	16
Maximum Thorax Rib Deflection	mm	44	25
Combined Abdominal Force	N	2500	652
Pubic Symphysis Force	N	6000	852

PASSENGER DUMMY INJURY VALUES			
Measurement Description	**Passenger ATD (SID-IIs)**		
	Units	**Threshold**	**Result**
Head Injury Criteria (HIC_{36})	N/a	1000	30
Lower Spine (T_{12}) Resultant Acceleration	G's	82	25
Total Pelvic Force (Sum of Acetabular and Iliac Forces)	N	5525	696
Maximum Thoracic Rib Deflection	mm	38*	5
Maximum Abdominal Rib Deflection	mm	45*	0.1

**Proposed IARV*

GENERAL COMMENTS
All placards say "Dodge" Ram 1500, and should say Ram 1500

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

PRE TEST

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat, Seat Belt, Steering Wheel Adjustment and Fuel System Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and Instrumentation Data

Data Sheet No. 6 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

POST TEST

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

Data Sheet No. 13 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 14 – Dummy/Vehicle Temperature and Humidity Stabilization Data

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

VEHICLE INFORMATION	
NHTSA No.	MD 0316
Model Year	2013
Make	Ram
Model	1500
Body Style	Quad Cab Pickup
VIN	1C6RR6FT8DS513340
Body Color	Mineral Gray
Odometer Reading (km/mi)	7 mi
Engine Displacement (L)	5.7
Type/No. of Cylinders	8
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	RWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

VEHICLE OPTIONS	
Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	No
Other Optional Features	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
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	None Noted

Does owner's manual provide instructions to turn off automatic door locks? No

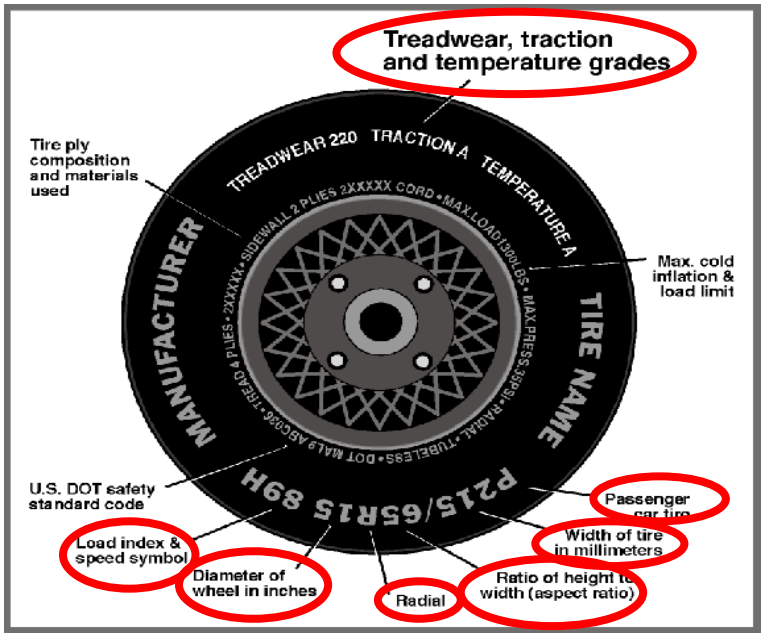
DATA FROM CERTIFICATION LABEL			
Manufactured By	Chrysler Group, LLC	GVWR (kg)	3040
Date of Manufacture	October 2012	GAWR Front(kg)	1679
Vehicle Type	Pickup	GAWR Rear (kg)	1770

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION					
	Front	**Rear**	**Third**	**Total**	
Designated Seating Capacity (DSC)	3	3	0	6	
Capacity Weight (VCW) (kg)				709	(A)
DSC X 68.04 (kg)				408.2	(B)
Cargo Weight (RCLW) (kg)				300.8	(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					X	
Rear or Second Row Seat			X	X	X	N/a	
Third Row Seat							

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



VEHICLE TIRE INFORMATION		
Measured Parameter	**Front**	**Rear**
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	270	270
Recommended Tire Size	275/70R20	275/70R20
Tire Size on Vehicle	275/70R20	275/70R20
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Wrangler SR-A	Wrangler SR-A
Treadware	500	500
Traction	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index/Speed Symbol	114S	114S
Tire Material	Polyester & Steel	Polyester & Steel
DOT Safety Code Left	M6YN JDIR 3712	M6YN JDIR 3712
DOT Safety Code Right	M6YN JDIR 3712	M6YN JDIR 3712

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

TIRE PRESSURES					
	Units	**LF**	**RF**	**LR**	**RR**
As Delivered	kPa	296.3	289.8	285.1	285.7
Tire Placard	kPa	270	270	270	270
Owner's Manual	kPa	270	270	270	270
As Tested	kPa	270	270	270	270

MDB TIRE SPECIFICATIONS						
	Units	**Requirement**	**LF**	**RF**	**LR**	**RR**
Tire Size		205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 +/- 21	200	200	200	200

TEST VEHICLE AXLE WEIGHTS										
	Units	**As Delivered (UVW)**			**As Tested (ATW)**			**Fully Loaded**		
		Front	**Rear**	**Total**	**Front**	**Rear**	**Total**	**Front**	**Rear**	**Total**
Left	kg	670.4	513.0		719.9	612.8		743.7	608.2	
Right	kg	657.7	488.1		673.6	577.9		671.7	566.9	
Ratio	%	57.0	43.0		53.9	46.1		54.6	45.4	
Totals	kg	1328.1	1001.1	2329.2	1393.5	1190.7	2584.2	1415.6	1175.1	2590.5

TARGET TEST WEIGHT CALCULATION			
	Units		
Total Delivered Weight (UVW)	kg	2329.2	(A)
Sum of Actual Weight of 2 P572 ATDs used	kg	125.2	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	136.1	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	2590.5	(A + B + C)

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? Yes

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

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW	
Ballast	**Weight (kg)**
Removed non-struck side windows & door panels to achieve calculated "As Tested" weight.	16.0

TEST VEHICLE ATTITUDE AND CG				
Measurement description	**Units**	**Fully Loaded**	**As Tested**	**Meets Requirement*** **
LF	mm	949	955	Yes
RF	mm	963	959	Yes
RR	mm	1000	992	Yes
LR	mm	998	991	Yes
Vehicle CG (Aft of Front Axle)	mm	1619.4	1644.9	
Vehicle CG (Left(+))/Right(-) from Longitudinal Centerline)	mm	44.1	31.7	

***The "As Tested" vehicle attitude measurements must be equal to or within +/- 10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. "Yes" or "No" is indicated.

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

SCRL ANGLE RANGE			
Seat	**SCRL (°)**		
	Max	**Min**	**Mid**
Driver Seat	0.0**	0.0**	0.0**
Front Passenger Seat	0.0**	0.0**	0.0**
Front Center Seat*			
Struck Side Rear Seat	N/a	N/a	N/a
Non-Struck Side Rear Seat**	N/a	N/a	N/a
Rear Center Seat*			

*If applicable
**Seat pan non-adjustable

SCRL ANGLE RANGE						
Seat	**As Tested SCRL Angle (Mid) (°)**	**As Tested SCRP Height (mm)**	**SCRP Height Position**	**SCRP Height (mm)**		
				Rearmost	**Mid-Fore/Aft**	**Forward-Most**
Driver's Seat	N/a**	N/a**	Max	N/a**	N/a**	N/a**
	0.0	-325.0	Mid	-316.1	-325.0	-333.5
	N/a**	N/a**	Min	N/a**	N/a**	N/a**
Front Passenger Seat	N/a**	N/a**	Max	N/a**	N/a**	N/a**
	0.0	-319.2	Mid	-311.4	-319.2	-327.8
	N/a**	N/a**	Min	N/a**	N/a**	N/a**
Front Center Seat*			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
	Fixed	Fixed	Mid	Fixed	Fixed	Fixed
	Fixed	Fixed	Min	Fixed	Fixed	Fixed
Rear Center Seat*			Max			
			Mid			
			Min			

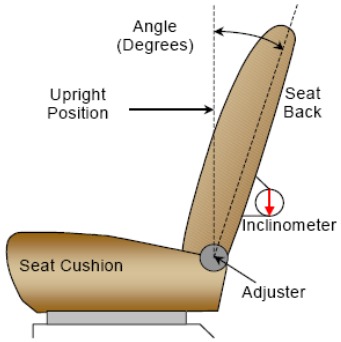
*If applicable
** Seat pan non-adjustable

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

SEAT FORE/AFT TRAVEL				
Seat	**Total Fore/Aft Travel**		**Test Position from Forward-most Position**	
	mm	**Detents***	**mm**	**Detents***
Driver Seat	230	24	115	12
Front Passenger Seat	230	24	115	12
Front Center Seat*				
Struck Side Rear Seat	Fixed	N/a	Fixed	N/a
Non-Struck Side Rear Seat	Fixed	N/a	Fixed	N/a
Rear Center Seat*				

*If applicable

Seat Back Angle Adjustment
The driver's seat back is positioned to the manufacturer's designated design angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.



FRONT SEAT ASSEMBLY

SEAT BACK ANGLE ADJUSTMENT				
Seat	**Total Seat Back Angle Range**		**Test Position from Most Upright**	
	Degrees	**Detents***	**Degrees**	**Detents***
Driver Seat w/ Seated Dummy	56.0	29	4.8**	9
Front Passenger Seat	56.1	29	4.9**	9
Front Center Seat*				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat*				

*If applicable
**Measured at Head Rest Post

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

Seat Belt Anchorage Adjustment
Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

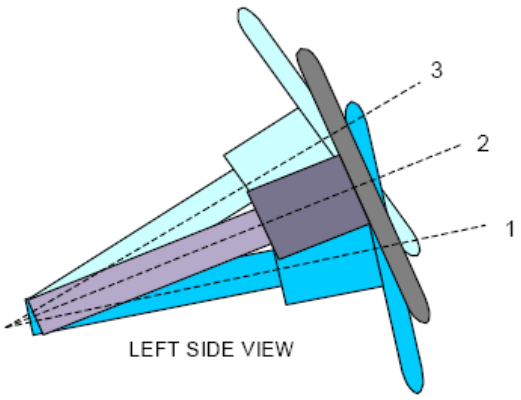
SEAT BELT ANCHORAGE ADJUSTMENT		
	Total No. of Positions	**Placed in Position No.**
Driver Seat	5	H
Rear Seat	Fixed	As Positioned

Head Restraint Adjustment
The driver's head restraint is adjusted to the highest and most forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

HEAD RESTRAINT ADJUSTMENT		
	Total No. of Positions	**Placement**
Driver Seat	3	Highest Position
Rear Seat	1	Lowest Position

Steering Column Adjustment
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

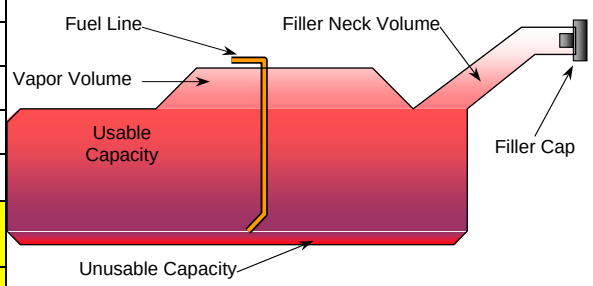
STEERING COLUMN ADJUSTMENT			
	Degrees	**Fore/Aft Position (mm)**	
Lowermost, Pos. No. 1	14.8	Non-Adjustable	
Geometric Center, Pos. No. 2	23.2	Non-Adjustable	
Uppermost, Pos. No. 3	31.6	Non-Adjustable	
Telescoping Steering Wheel Travel	N/a	N/a	
Test Position	22.2	As Positioned	



STEERING COLUMN ASSEMBLY

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

FUEL TANK CAPACITY DATA			
Description	**Units**	**Value**	
Usable Capacity of "Standard Tank"	L	98.4	
Usable Capacity of "Optional Tank"	L	N/a	
Usable Capacity of Standard Tank	L	98.4	
Usable Capacity of Optional Tank	L	N/a	
93% of Usable Capacity	%	91.5	
Actual Amount of Solvent Used in Test	L	91.5	
1/3 of Usable Capacity	32.8		

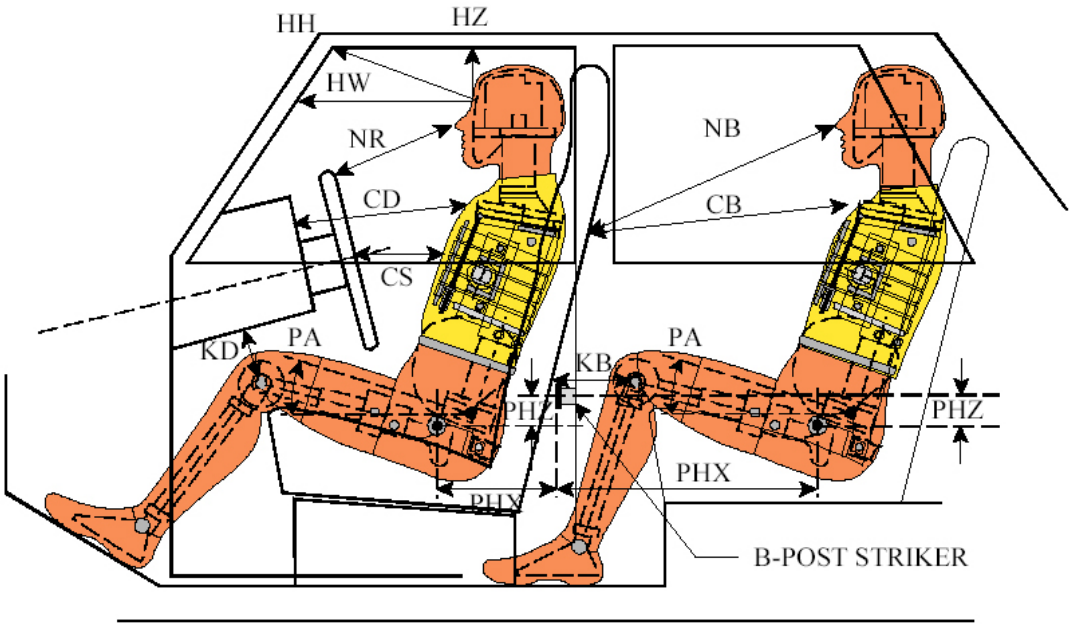


VEHICLE FUEL TANK ASSEMBLY

Fuel Pump
The vehicle is equipped with an electronic fuel pump. Key is "ON" position. The fuel pump is on the left side.

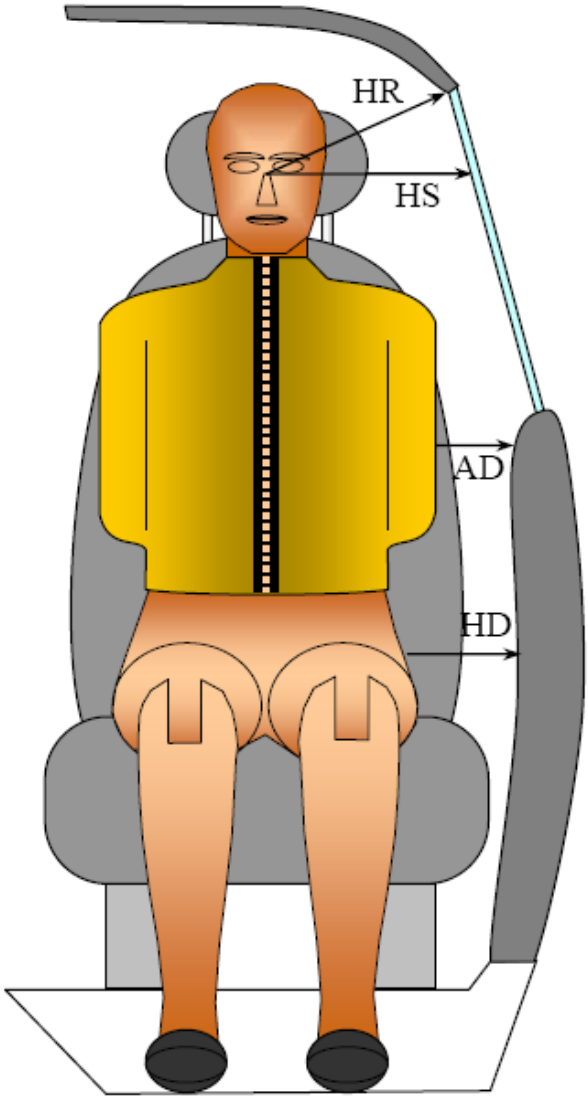
Is the Actual Amount of Solvent Used in the test equal to 93% +/- 1% of the Usable Capacity stated in on Form No. 1? Yes

DATA SHEET NUMBER 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS



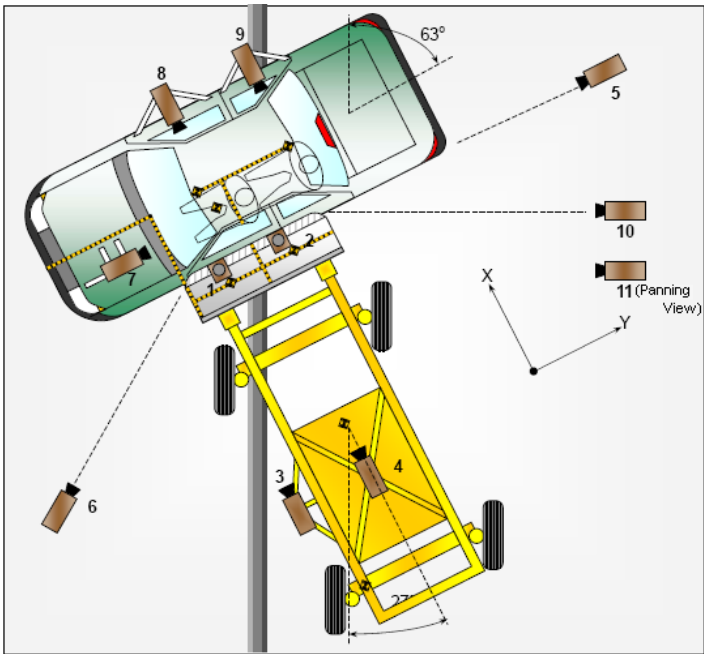
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION						
Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	465			
HW		Header to Windshield	698			
HZ	HZ	Head to Roof	216		277	
NR	NB	Nose to Rim/Seat Back	469		435	
CD	CB	Chest to Dash/Seat Back	630		394	
CS		Chest to Steering Wheel	406			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	175	11.2	179	20.6
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	148	13.6	181	21.5
PAX°	PAX°	Pelvic Tilt Angle X		0.0		0.0
	PAY°	Pelvic Tilt Angle Y		18.3		19.1
PHX	PHX	Hip Point to Striker (X-Axis)	171.8		165.7	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	-21.2		-36.1	

DATA SHEET NUMBER 4
DUMMY LATERAL CLEARANCE DIMENSIONS



DUMMY LATERAL CLEARANCE MEASUREMENTS INFORMATION				
Code	**Description**	**Units**	**Driver**	**Passenger**
HR	Head to Side Header	mm	179	244
HS	Head to Side Window	mm	292	348
AD	Arm to Door	mm	191	195
HD	Hip Point to Door	mm	158	162

DATA SHEET 5
CAMERA AND INSTRUMENTATION DATA



	View	Coordinates †			Lens Length	Operating Frame Rate
		X	Y	Z		
		mm	mm	mm	mm	fps
1	Overhead Overall	-320	-637	-4862	10	1000
2	Overhead Close-up	-535	-159	-4804	25	1000
3	Left Impact Point (MDB)	-2204	-75	-69	25	1000
4	Side Overall (MDB)	-2308	851	-645	12.5	1000
5	Rear	-715	11964	-515	35	1000
6	Left Front	-1744	-4212	-891	25	1000
7	Driver Front (OB)				12.5	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-Time Left Rear				N/a	30
11	Real-Time In-Run				N/a	30

Origin		Orientation	
X	Impact Point	X	+(X) To Front of MDB
Y	Impact Point	Y	+(Y) To Right of MDB
Z	Ground	Z	+(Z) Down

**All measurements accurate to +/- 6 mm*

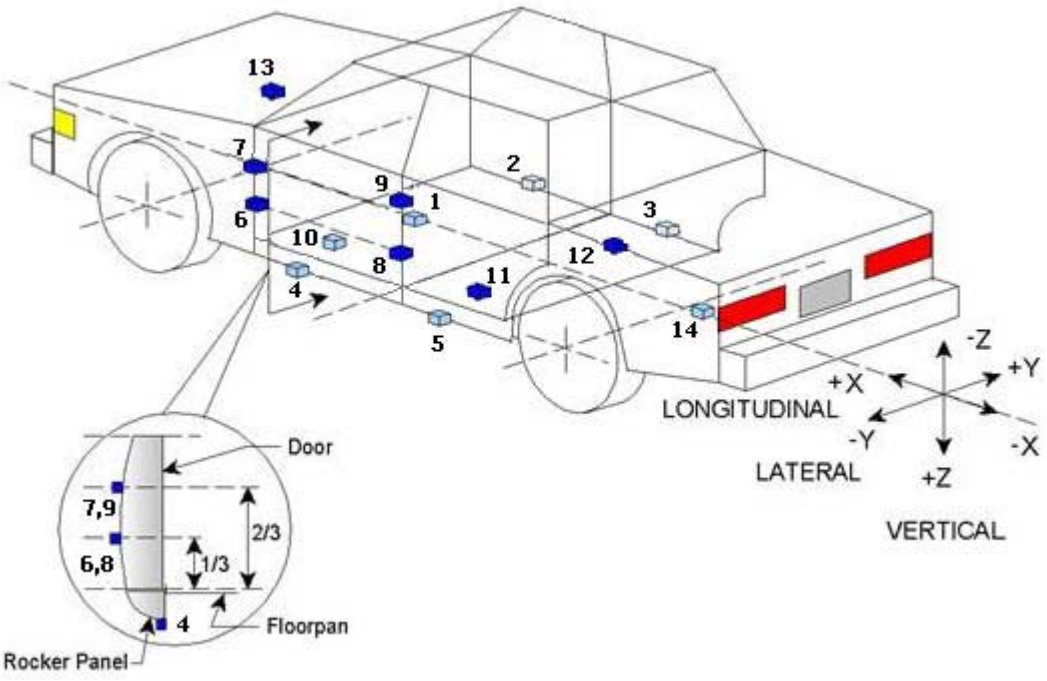
DATA SHEET 5
CAMERA AND INSTRUMENTATION DATA (CONTINUED)

Why did the cameras not operate?

_____

INSTRUMENTATION	
Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	5
Total	60

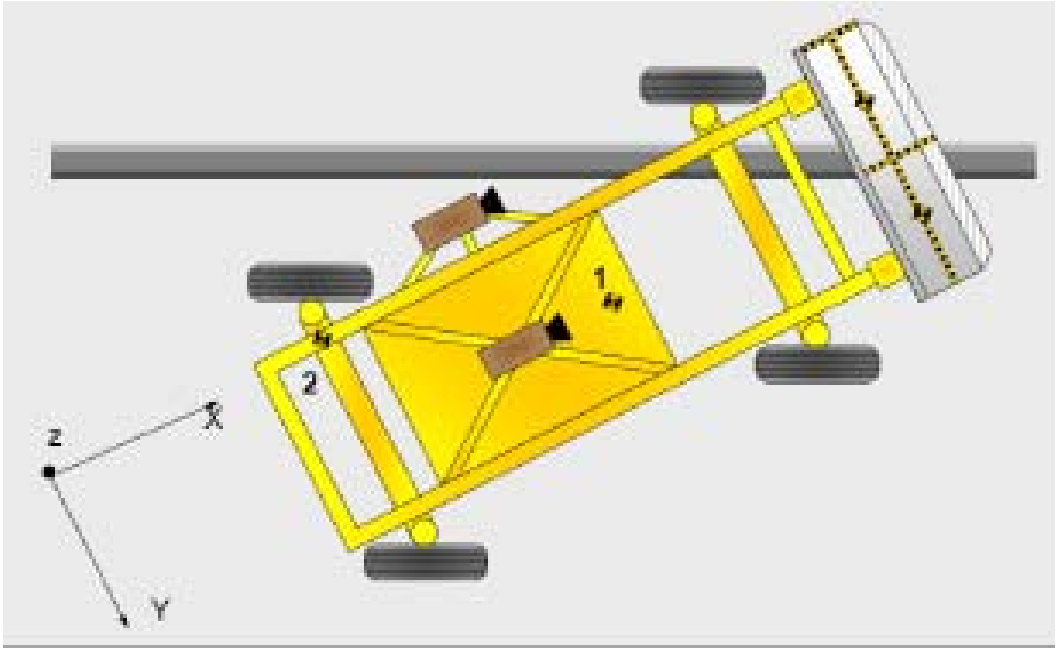
DATA SHEET 6
TEST VEHICLE ACCELEROMETER LOCATIONS



TEST VEHICLE ACCELEROMETER LOCATIONS				
Loc. No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Vehicle CG	3800.1	184.5	-125.2
2	Right Sill at Front Seat	3612.3	791.8	181.8
3	Right Sill at Rear Seat	2744.6	792.8	172.2
4	Left Sill at Front Door	3633.3	-847.0	217.8
5	Left Sill at Rear Door	2723.2	-844.1	204.6
6	A-Post Lower	4200.6	-895.2	-218.5
7	A-Post Middle	4209.6	-887.6	-354.0
8	B-Post Lower	3086.5	-902.7	-242.8
9	B-Post Middle	3085.6	-895.8	-498.2
10	Front Seat Track	3391.3	-645.8	-129.1
11	Rear Seat Structure	2547.6	-743.8	-308.2
12	Rt. Rear Occ. Compartment	2581.8	748.0	-299.9
13	Engine Block	5059.4	88.6	-508.8
14	Rear Above Axle	1260.0	9.8	-256.0

Reference:
X - Rear surface of vehicle (+ forward)
Y - Vehicle centerline (+ right)
Z - Ground plane (+ down)

DATA SHEET 7
MDB ACCELEROMETER LOCATIONS



MDB ACCELEROMETER LOCATIONS				
Loc No.	Accelerometer Locations	Coordinates (mm)		
		X	Y	Z
1	MDB CG	1113	-1	311
2	MDB Rear	2812	-614	585

Reference
X - Face of MDB (+ forward)
Y - MDB centerline (+ to right)
Z - Ground plane (+ down)

DATA SHEET NUMBER 8
POST-TEST OBSERVATIONS

TEST DUMMY INFORMATION AND CONTACT POINTS		
Dummy Body Part	**Front Seat Dummy (ES-2re)**	**Rear Seat Dummy (SID-IIs)**
Face	To Side Curtain Airbag	To Side Header & Curtain Airbag
Top of Head	To Side Curtain Airbag & Roof Rail	To Side Curtain Airbag & Roof Rail
Left Side of Head	To Side Curtain Airbag	To Side Header & Curtain Airbag
Back of Head	Along Head Rest to the Side Curtain Airbag	To Side Header & Curtain Airbag
Left Shoulder	To Side Curtain Airbag & Top of Torso/Pelvis Bag	To Interior Door Panel
Upper Torso	To Torso/Pelvis Airbag	To Interior Door Panel
Lower Torso	To Torso/Pelvis Airbag	To Interior Door Panel
Left Hip	To Torso/Pelvis Airbag	To Interior Door Panel
Left Knee	To Interior Door Panel	To Interior Door Panel

POST TEST DOOR PERFORMANCE					
Description	**Struck Side**		**Non-Struck Side**		**Rear Hatch/ Other Door**
	Front	**Rear**	**Front**	**Rear**	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges of Latches	No	No	No	No	No
Latch of Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	N/a	N/a	N/a	N/a	N/a

POST TEST SEAT PERFORMANCE				
Description	**Struck Side**		**Non-Struck Side**	
	Front	**Rear**	**Front**	**Rear**
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

DATA SHEET NUMBER 8
POST-TEST OBSERVATIONS (CONTINUED)

POST TEST STRUCTURAL OBSERVATIONS	
Critical Areas of Performance	**Observations/Conclusions**
Pillar Performance	No Damage
Sill Separation	Max Sill Separation of ~125 mm at C-Post
Windshield Damage	No Damage
Window Damage	No Damage to Struck Side Windows
Other Notable Effects	None Noted

SUPPLEMENTAL RESTRAINT INFORMATION				
Restraint Type	**Struck Side Driver**		**Struck Side Rear Passenger**	
	Mounted	**Deployed**	**Mounted**	**Deployed**
Frontal Airbag	Yes	No		
Knee Airbag	No	N/a		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/a
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	N/a	No	N/a
Other	No	N/a	No	N/a

IMPACT POINT LOCATION DATA			
Measured Parameter	**Units**	**Tolerance**	**Value**
Vehicle Wheel Base	mm		3570
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		508
Actual Impact Point (Aft of Front Axle)	mm		493
Horizontal Offset (+ forward / - rear)	mm	+/- 50 of Intended Impact Point	15
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	12

DATA SHEET NUMBER 9
MDB SUMMARY OF RESULTS

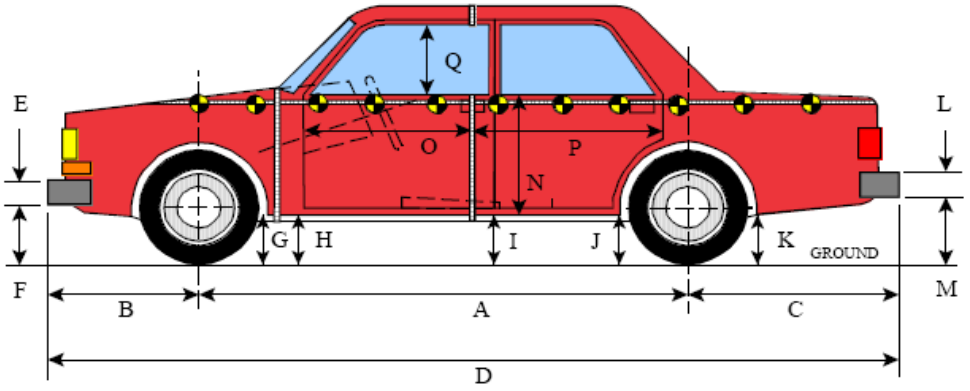
MDB SPECIFICATIONS	
Measurement Description	**Length (mm)**
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Frame	4116
Wheel Base of Framework Carriage	2578
CG Location of Front Axle	1112

MDB WEIGHTS				
	Units	**Front Axle**	**Rear Axle**	**Total**
Left	kg	451.3	231.3	682.6
Right	kg	308.9	370.6	679.5
Ratio	%	55.8	44.2	100
Totals	kg	760.2	601.9	1362.1

SPEED AND ANGLE AT IMPACT DATA			
Measured parameter	**Units**	**Requirement**	**Value**
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.20
Trap No. 2 Velocity (Secondary)	km/h	61.1 to 62.7	62.17
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90
MDB Forward Line of Motion to Target Vehicle	degrees	62.5 to 63.5	63.0
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	27.0

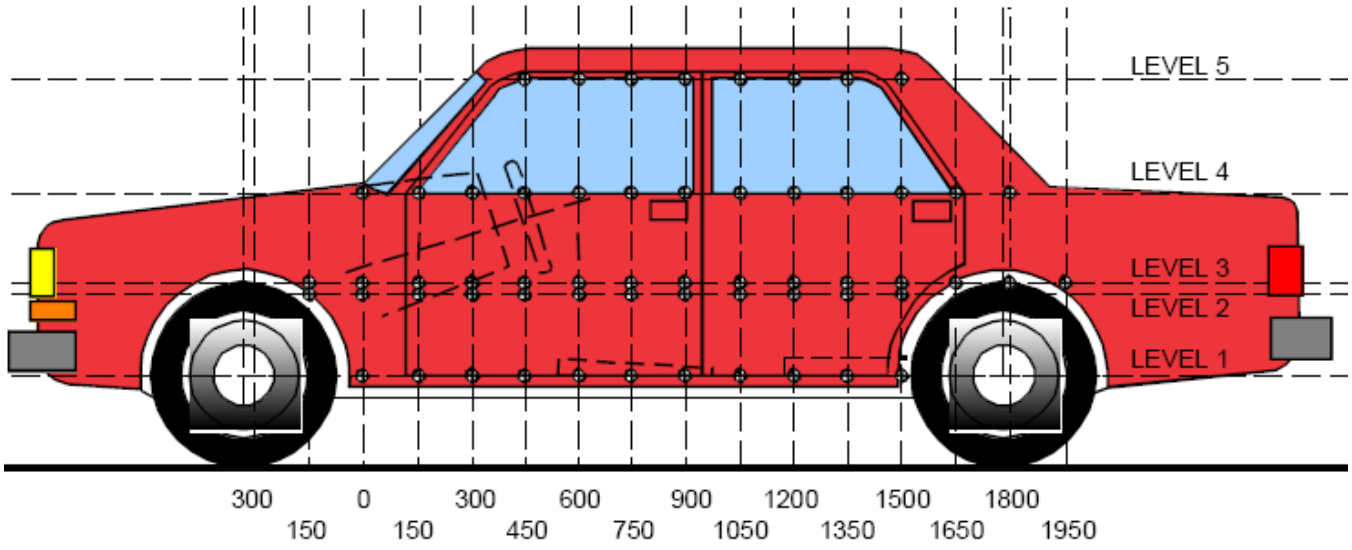
MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE					
Vertical Location			**From Centerline**		**Maximum Crush**
Row	**Description**	**Height**	**Distance**	**Direction**	
A	Bottom of Barrier	279	800	Left	84
B	Bottom of Bumper	330	800	Left	90
C	Top of Bumper	530	800	Right	153
D	Top of Barrier	839	800	Right	223

DATA SHEET NUMBER 10
TEST VEHICLE PROFILE MEASUREMENTS



VEHICLE PRE – AND POST – TEST MEASUREMENT INFORMATION				
Code	**Description**	**Pre test**	**Post test**	**Difference**
		mm	**mm**	**mm**
A	Wheelbase	3570	3503	-67
B	Front Axle to FSOV	787	806	19
C	Rear Axle to RSOV	1138	1156	18
D	Total Length at Centerline	5820	5818	-2
E	Front Bumper Thickness	303	303	0
F	Front Bumper Bottom to Ground	404	400	-4
G	Sill Height at Front Wheel Well	427	414	-13
H	Sill Height at Front Door Leading Edge	412	398	-14
I	Sill Height at B-Pillar	426	409	-17
J1	Sill Height at Rear Wheel Well	397	364	-33
J2	Pinch Weld Height at Rear Wheel Well	433	397	-36
K	Sill Height Aft of Rear Wheel Well	527	487	-40
L	Rear Bumper Thickness	50	50	0
M	Rear Bumper Bottom to Ground	565	517	-48
N	Sill Height to Bottom of Front Window Sill	868	825	-43
O	Front Door Leading Edge to Impact C/L	1115	1110	-5
P	Rear Door Trailing Edge to Impact C/L	808	798	-5
Q	Front Window Opening	480	480	0
R	Right Side Length	5495	5511	16
S	Left Side Length	5495	5465	-30
T	Maximum Vehicle Width	2017	1886	-131

DATA SHEET NUMBER 11
VEHICLE EXTERIOR CRUSH MEASUREMENTS



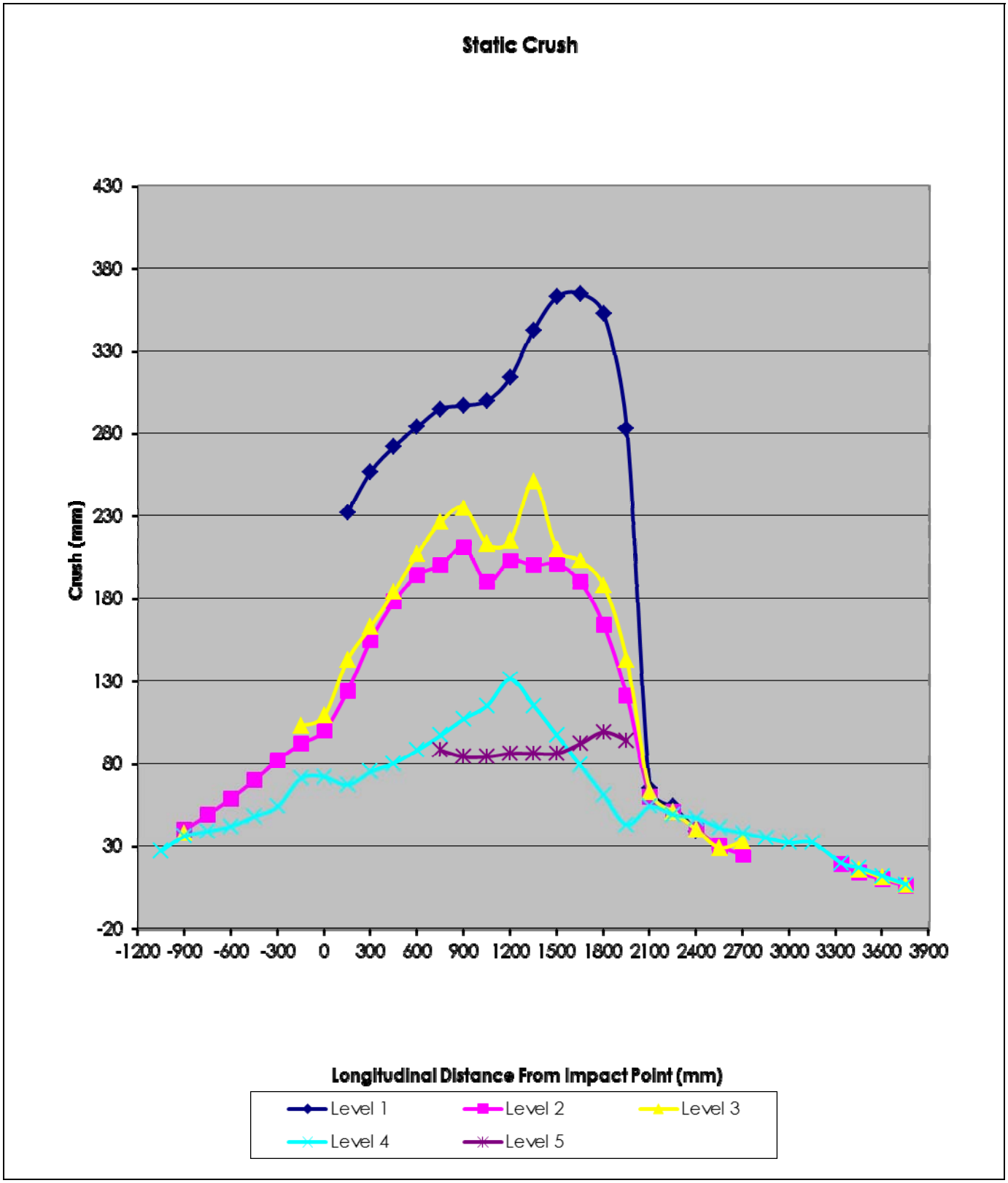
LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS				
Level	**Measurement Description**	**Height Above Ground**	**Maximum Exterior Static Crush**	**Distance from Impact**
1	Sill Top	450	365	1650
2	Occupant Hip Point	942	211	900
3	Mid-Door	862	251	1350
4	Window Sill	1293	131	1200
5	Window Top	1835	99	1800

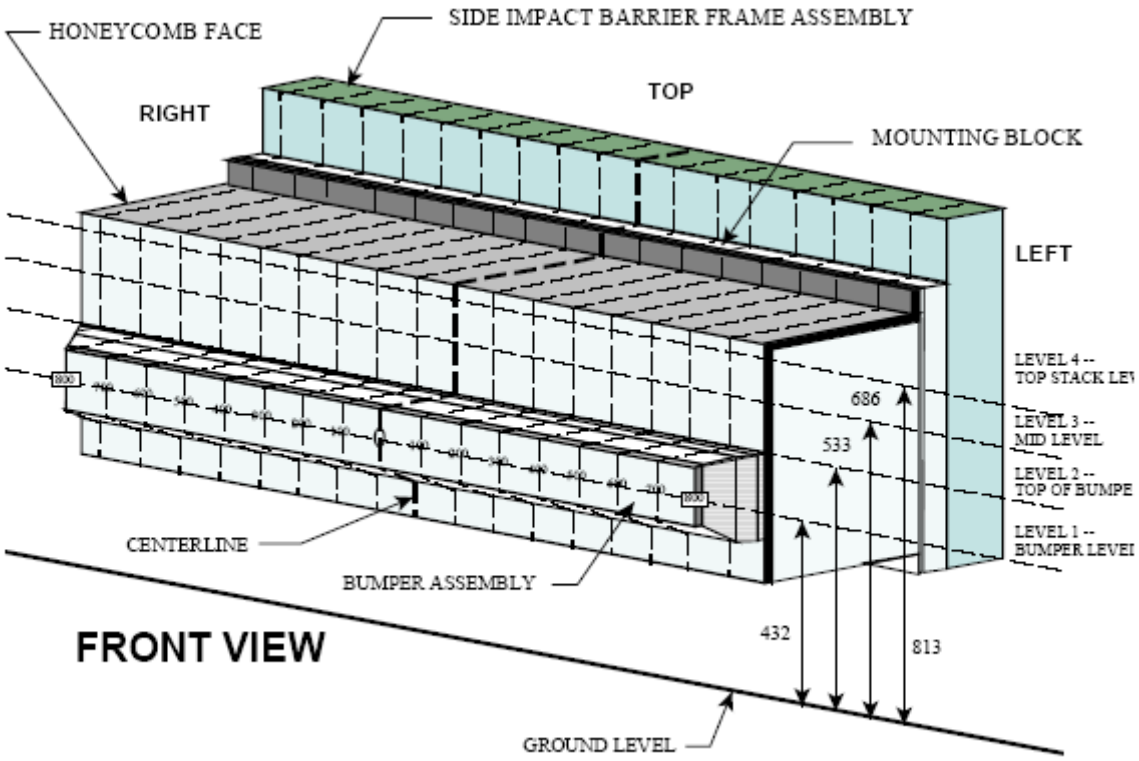
DATA SHEET NUMBER 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL																
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										515	542	27			
	-900				275	315	40	272	310	38	475	511	36			
	-750				265	314	49				445	484	39			
	-600				260	319	59				419	461	42			
	-450				257	327	70				398	446	48			
	-300				252	334	82				378	432	54			
	-150				248	340	92	252	355	103	365	436	71			
	0				248	348	100	251	360	109	355	427	72			
	150	322	554	232	245	369	124	254	397	143	347	414	67			
	300	320	577	257	248	403	155	255	418	163	342	417	75			
	450	319	591	272	257	435	178	256	440	184	340	420	80			
	600	318	602	284	256	450	194	257	464	207	335	423	88			
	750	315	610	295	257	457	200	256	482	226	330	427	97	547	635	88
	900	315	612	297	255	466	211	255	490	235	325	432	107	545	629	84
	1050	314	614	300	254	444	190	254	467	213	322	437	115	545	629	84
	1200	314	628	314	254	457	203	253	468	215	319	450	131	543	629	86
	1350	314	657	343	254	454	200	253	504	251	317	432	115	542	628	86
	1500	314	677	363	253	454	201	253	463	210	315	412	97	542	628	86
	1650	320	685	365	253	443	190	254	457	203	314	393	79	540	632	92
	1800	322	675	353	254	418	164	255	443	188	312	373	61	540	639	99
	1950	327	610	283	256	377	121	257	400	143	312	355	43	545	639	94
	2100	337	402	65	269	329	60	270	333	63	320	374	54			
	2250	340	394	54	263	314	51	265	316	51	318	367	49			
	2400	343	382	39	259	299	40	262	302	40	315	362	47			
	2550				257	287	30	259	288	29	314	355	41			
	2700				255	280	25	260	293	33	312	350	38			
	2850										310	345	35			
	3000										310	342	32			
	3150										310	342	32			
	3330				264	283	19				314	334	20			
	3450				265	279	14	268	284	16	316	333	17			
	3600				270	280	10	273	284	11	320	332	12			
	3750				278	284	6	280	287	7	325	332	7			

DATA SHEET NUMBER 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS (CONTINUED)



DATA SHEET NUMBER 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS



NOTE: Dimensions are shown in millimeters, mm

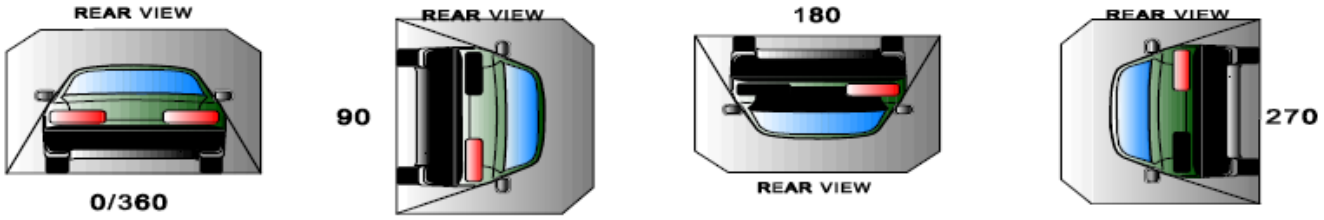
DEFORMABLE BARRIER STATIC CRUSH																	
	Distance Left of Center								C_L	Distance Right of Center							
	800	**700**	**600**	**500**	**400**	**300**	**200**	**100**	**0**	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**
1	84	79	76	73	68	62	59	57	58	55	51	47	43	40	35	35	44
2	90	85	77	69	65	58	51	45	42	35	30	30	34	38	44	53	64
3	105	94	86	76	73	69	67	74	69	68	58	51	55	64	86	101	153
4	139	123	121	121	122	124	132	133	129	136	128	108	130	141	155	185	223

FMVSS 301 STATIC ROLLOVER RESULTS

Temperature at Time of Impact: 19.5° C Test Time: 1:15 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**	**Hold Time**	**Total Time**
0° to 90°	65	300	365
90° to 180°	64	300	364
180° to 270°	66	300	366
270° to 360°	64	300	364

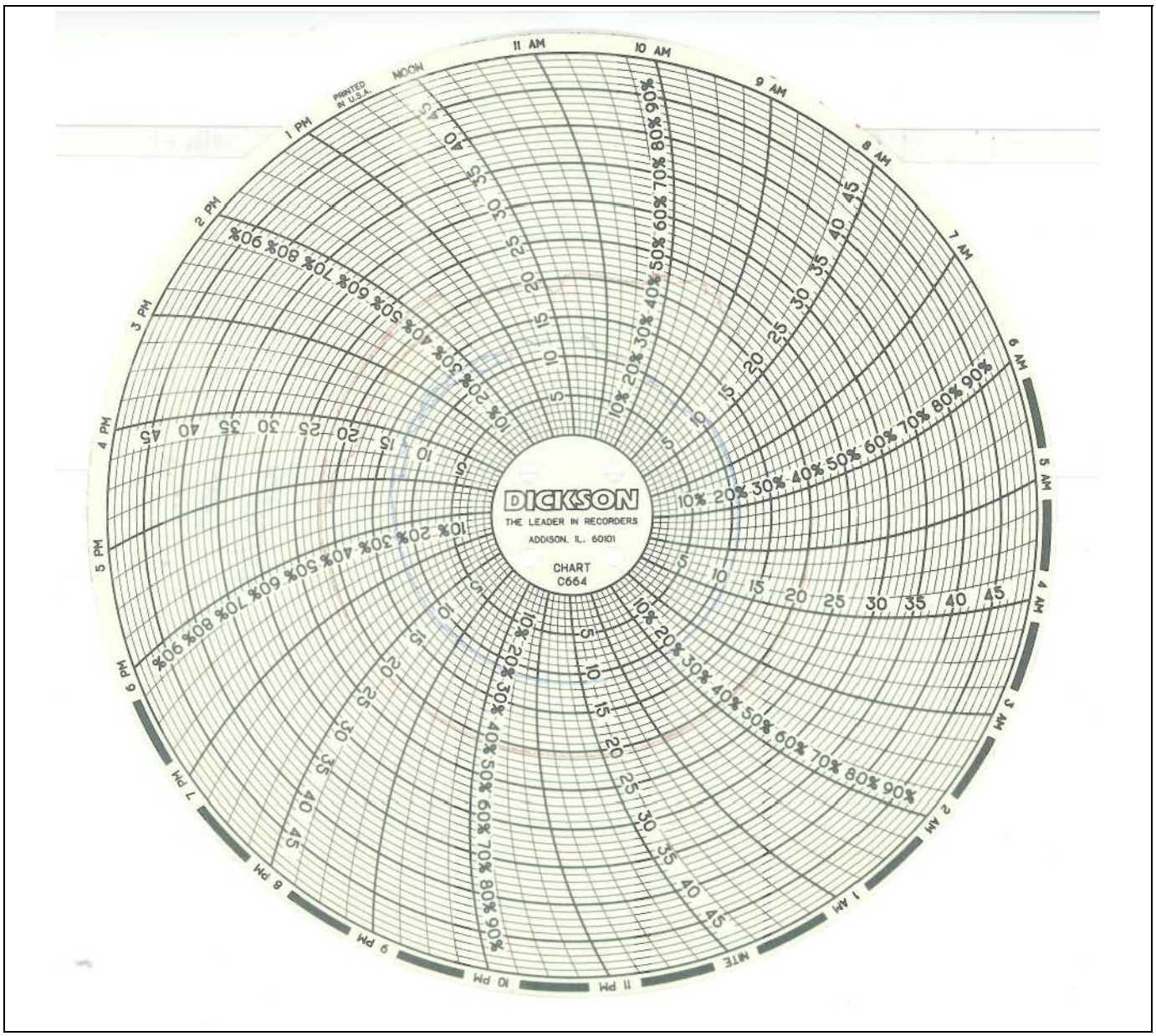
FMVSS 301 STATIC ROLLOVER RESULTS (CONTINUED)

FMVSS No. 301 Rollover Spillage Table				
	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
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

FMVSS No. 301 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

Rollover Solvent Spillage Location Table	
Test Phase	Spillage Location
0° to 90°	N/a
90° to 180°	N/a
180° to 270°	N/a
270° to 360°	N/a

DATA SHEET 14
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA



APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

Figure A-1: As-Delivered Right Front 3-4 View of Test Vehicle

Figure A-2: As-Delivered Left Rear 3-4 View of Test Vehicle

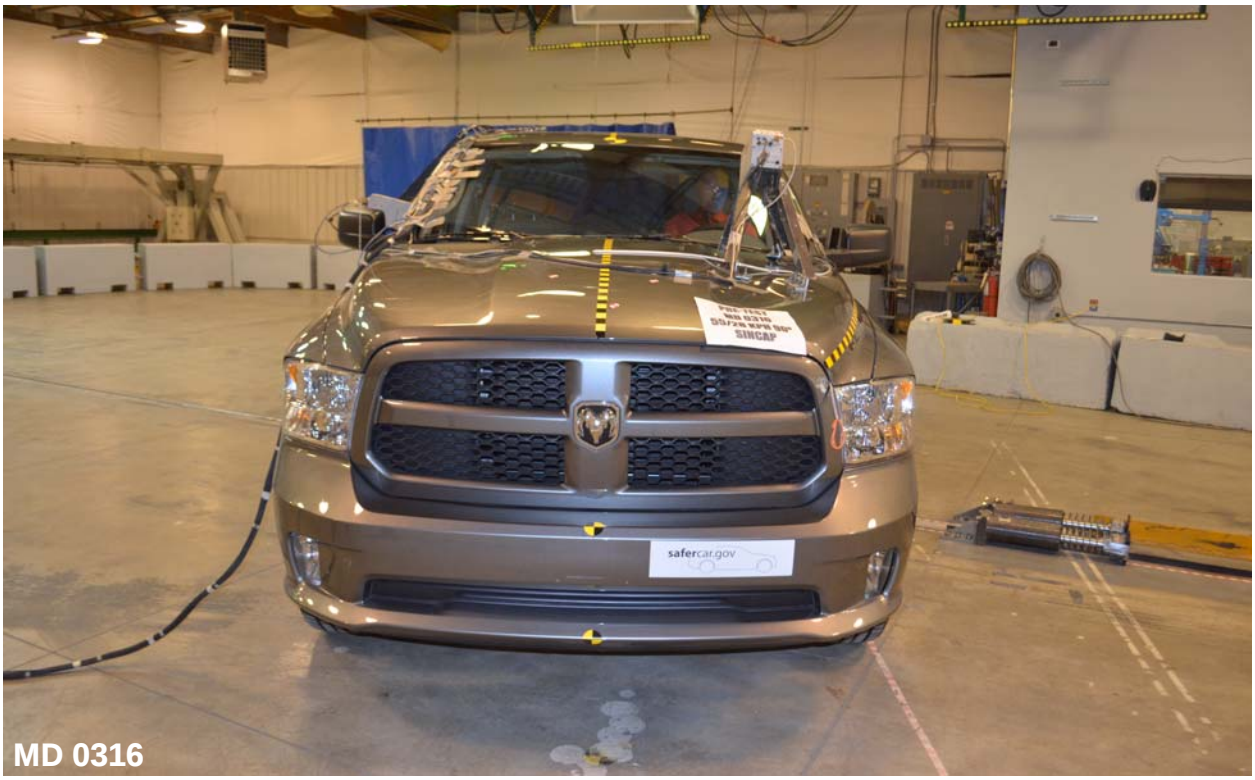


Figure A-3: Pre-Test Frontal View of the Test Vehicle

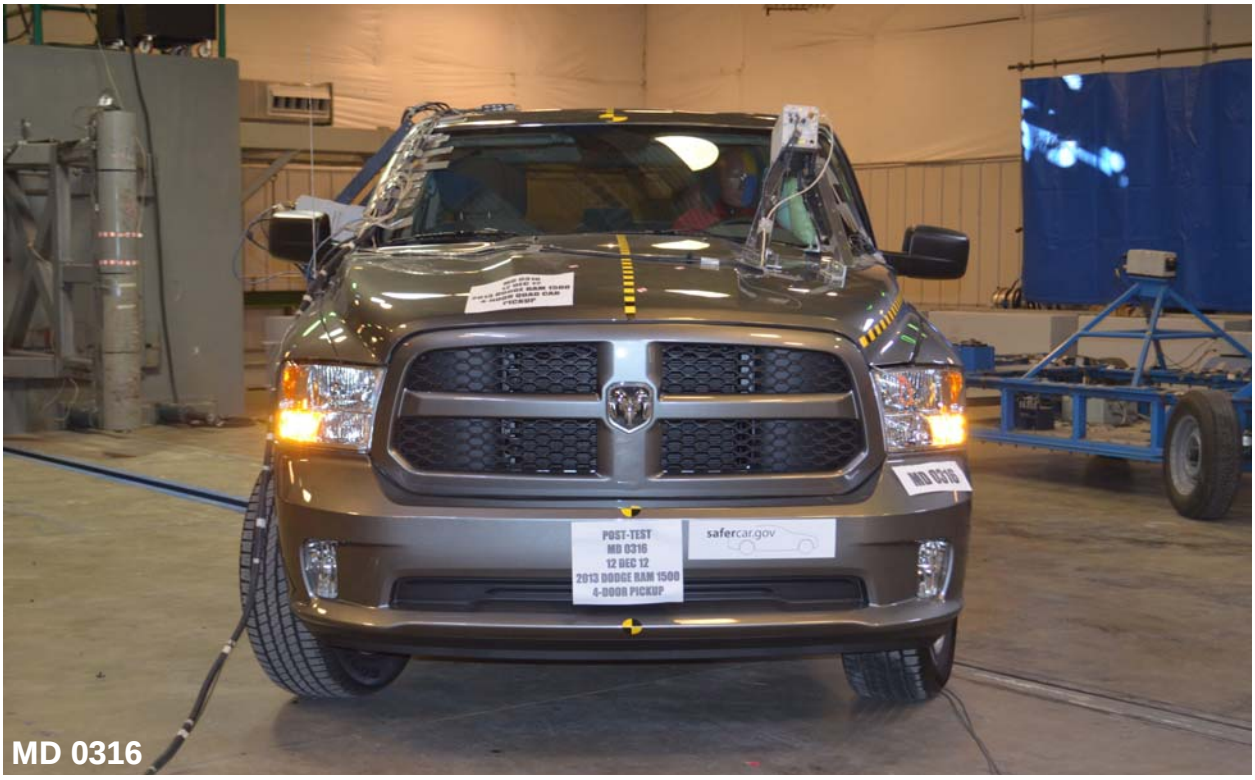


Figure A-4: Post-Test Frontal View of Test Vehicle

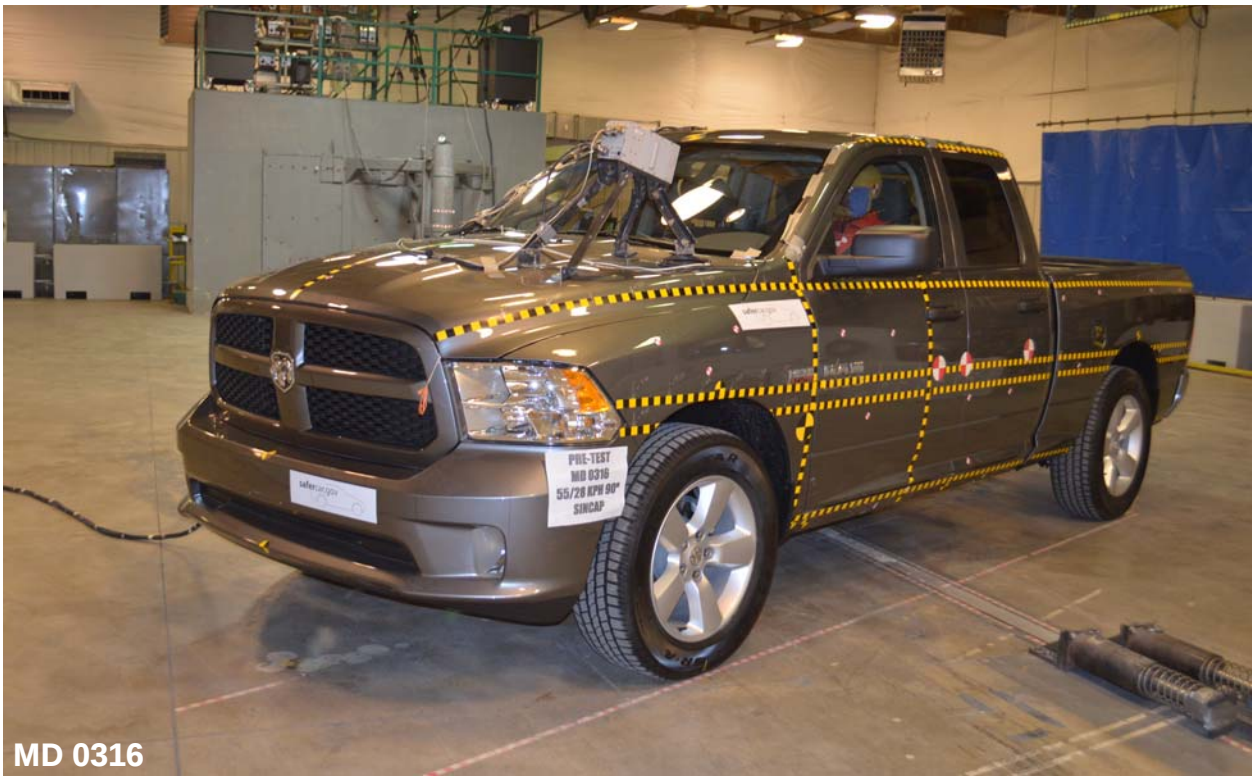


Figure A-5: Pre-Test Left Front 3-4 View of Test Vehicle

Figure A-6: Post-Test Left Front 3-4 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 3-4 View of Test Vehicle

Figure A-10: Post-Test Left Rear 3-4 View of Test Vehicle

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

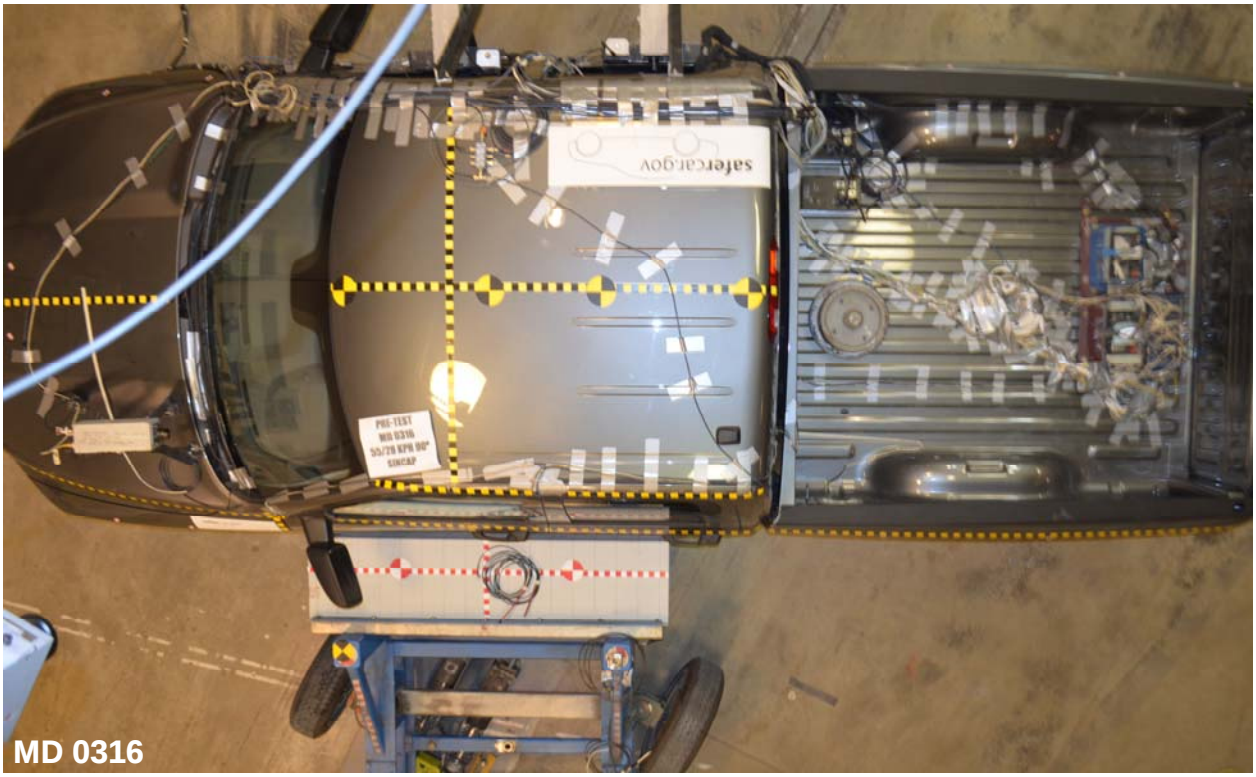


Figure A-15: Pre-Test Overhead View of Test Area

Figure A-16: Post-Test Overhead View of Test Area

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 and Chalking

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 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

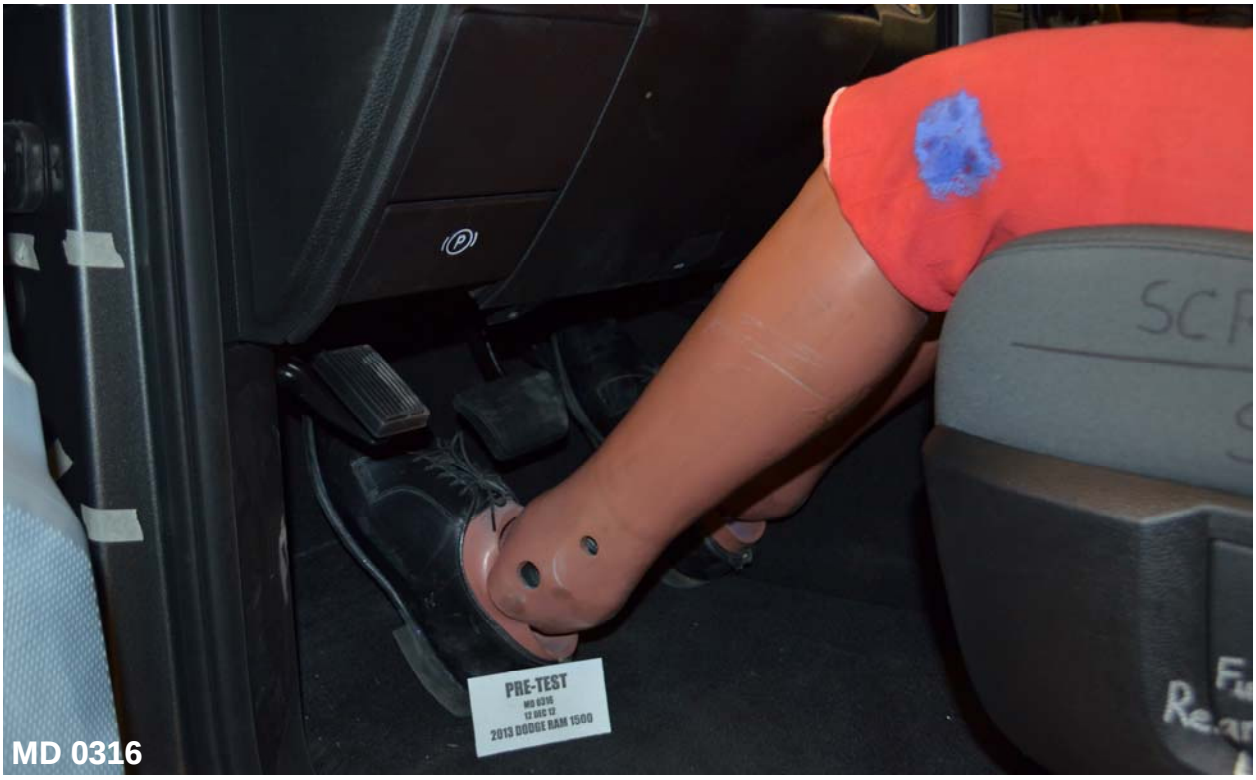


Figure A-34: Pre-Test Placement of Driver Dummy's Feet

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

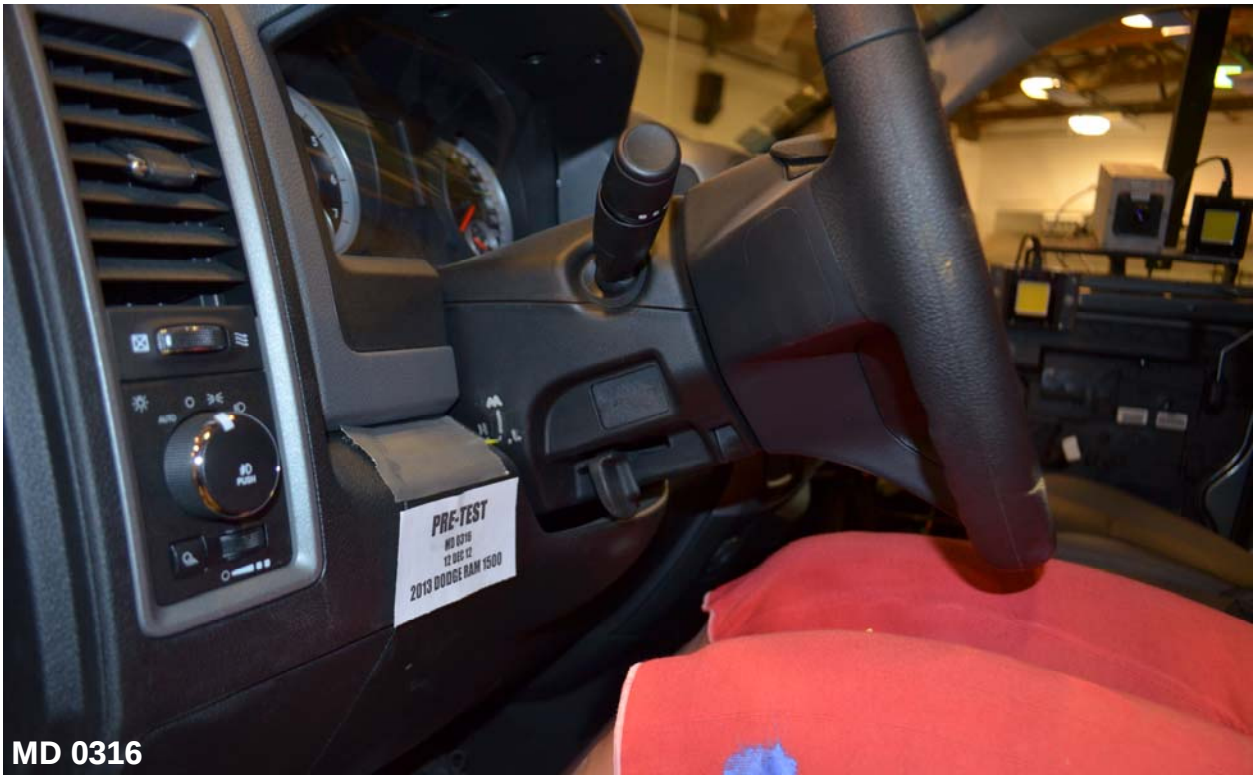


Figure A-36: Pre-Test Left Side View of Steering Wheel

Figure A-37: View of Disengaged Parking Brake

Figure A-38: Pre-Test View of Parking Brake

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

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

Figure A-41: Pre-Test Close-Up View of Driver Seat Back or Head Restraint

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

Figure A-43: Post-Test Driver Dummy and Door Clearance View

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

Figure A-45: Post-Test Right Side View of Driver Dummy and Front Seat Occupant Compartment

Figure A-46: Pre-Test Driver Inner Door Panel View

Figure A-47: Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations

Figure A-48: Post-Test Driver Dummy Close-Up Head Contact With Vehicle Interior View

Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View

Figure A-50: Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View

Figure A-51: Post-Test Driver Dummy Close-Up Torso Contact with Side Air Bag View

Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact With Vehicle Interior View

Figure A-53: Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View

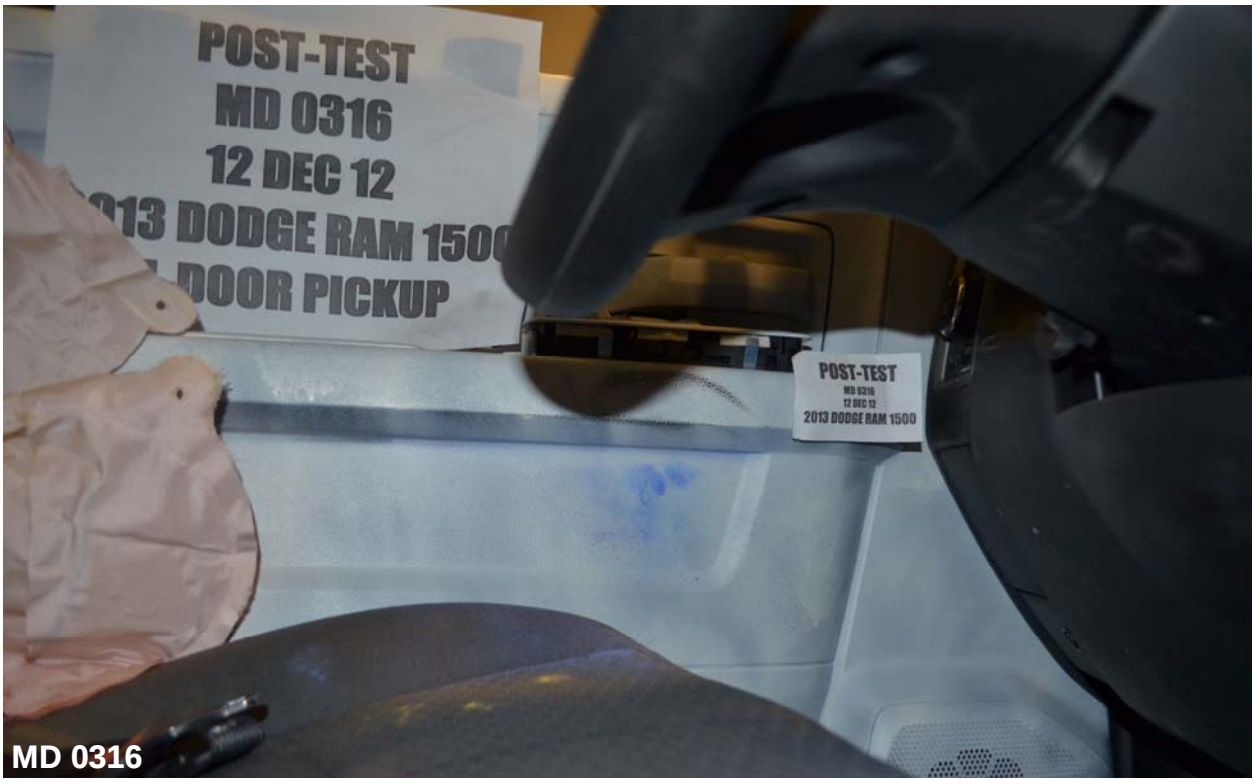


Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View

Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking

Figure A-56: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

Figure A-57: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

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

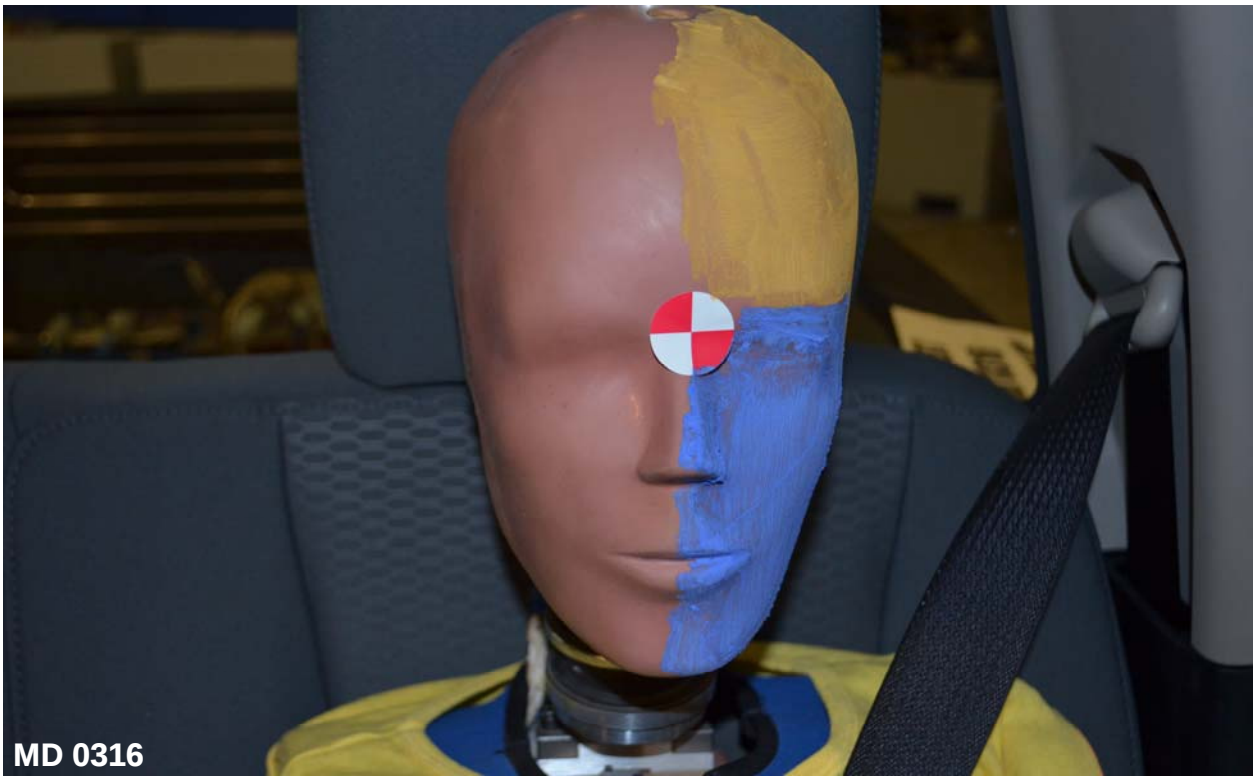


Figure A-59 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning

Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

Figure A-64: Pre-Test Placement of Rear Passenger Dummy's Feet

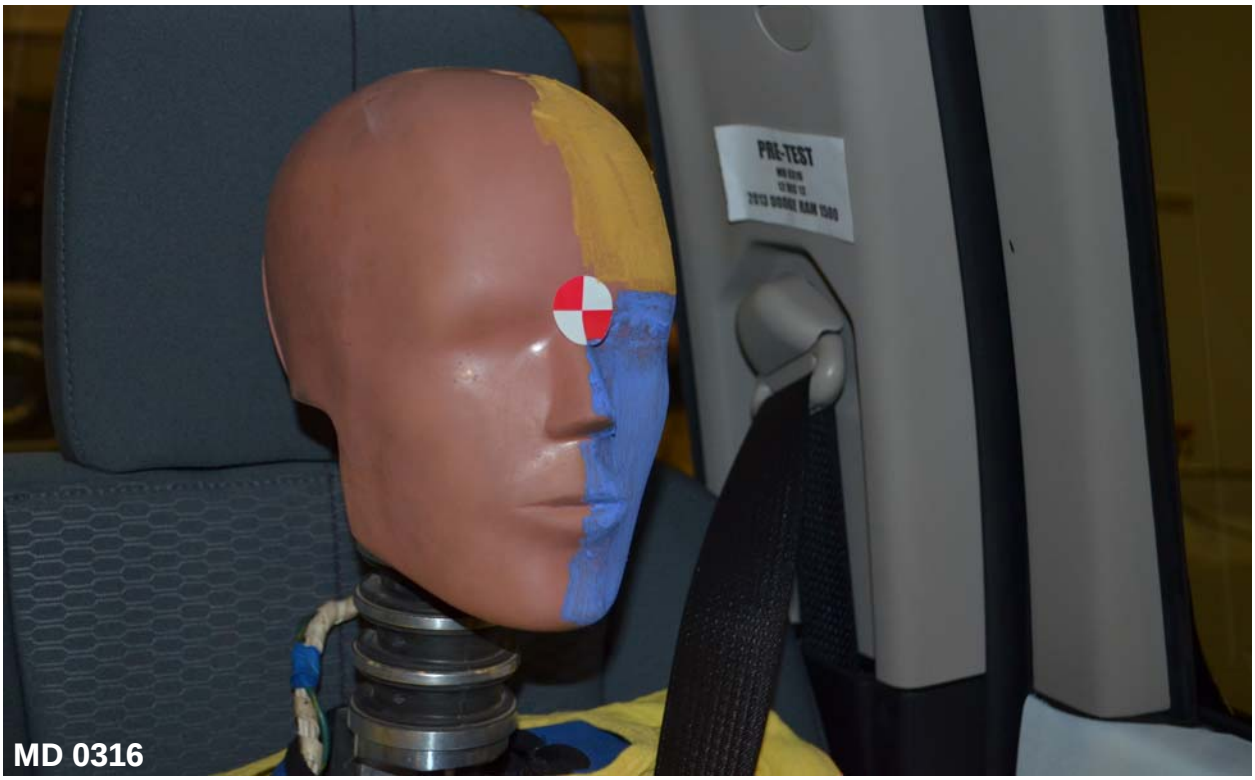


Figure A-65: Pre-Test View of Belt Anchorage for Rear Passenger Dummy

Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

Figure A-67: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

Figure A-69: Pre-Test Rear Passenger Dummy and Door Clearance View

Figure A-70: Post-Test Rear Passenger Dummy and Door Clearance View

Figure A-71: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

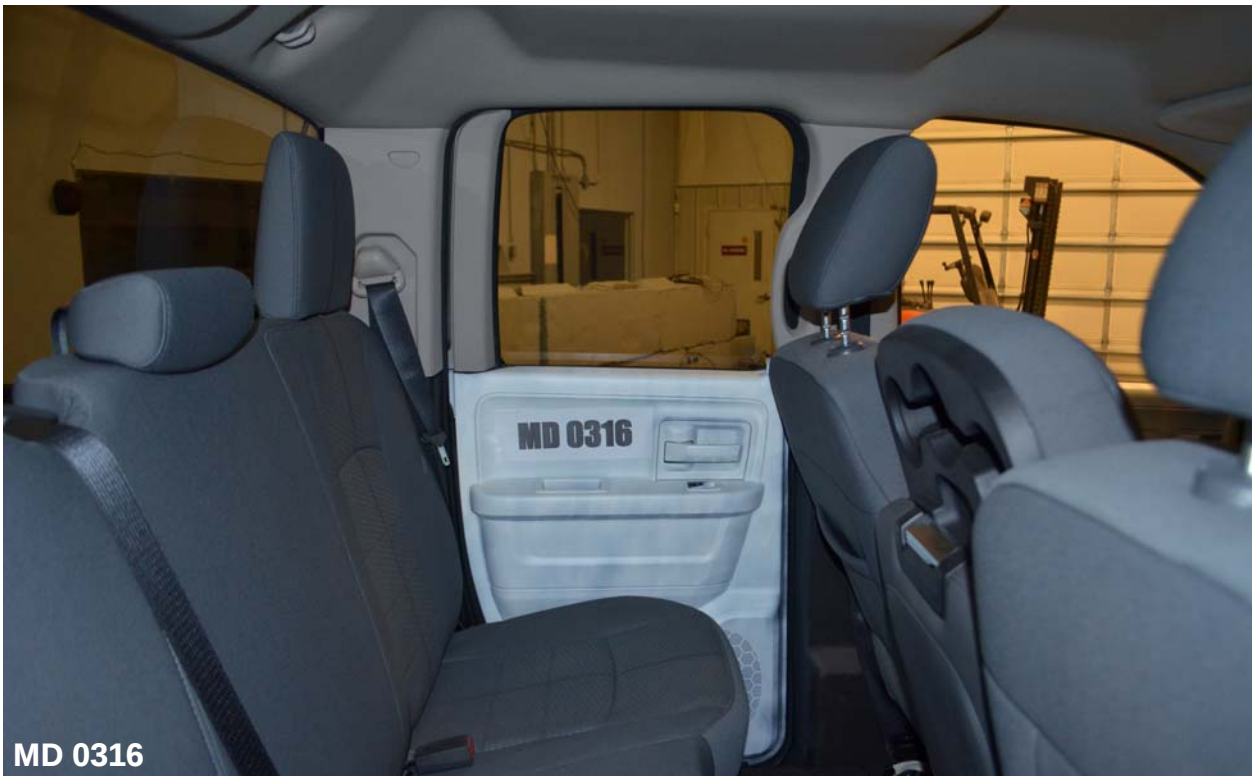


Figure A-73: Pre-Test Rear Passenger Inner Door Panel View

Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Dummy Contact Locations

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

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

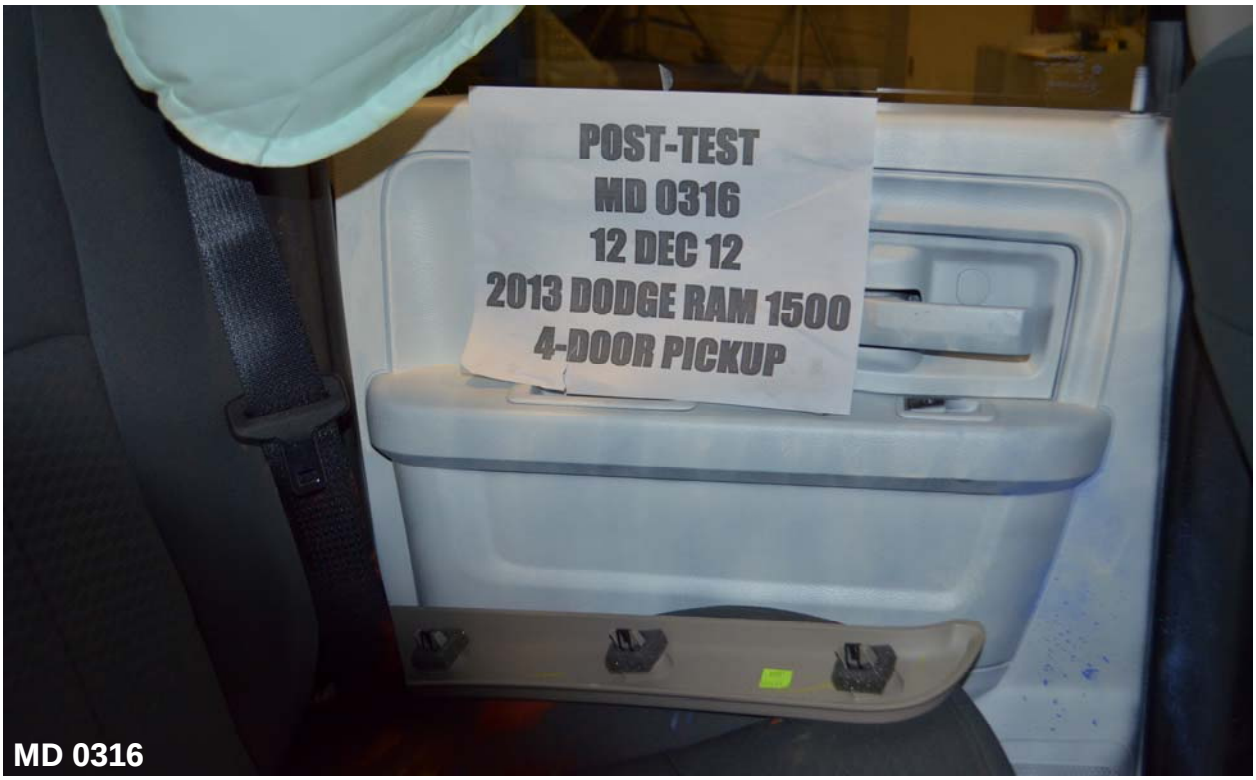


Figure A-77: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View

Not Applicable

MD 0316

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

Figure A-79: Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View

Not Applicable

MD 0316

Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View

Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Figure A-82: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-84: Pre-Test Front View of MDB Impactor Face

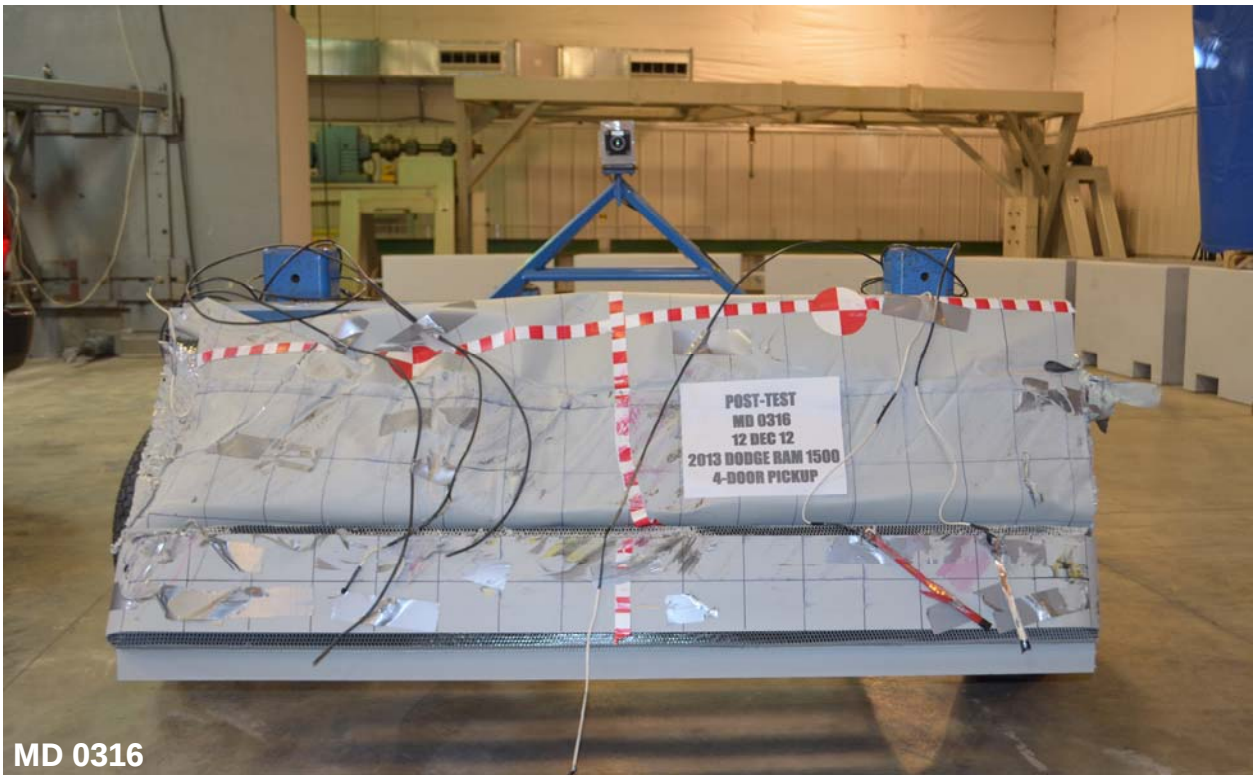


Figure A-85: Post-Test Front View of MDB Impactor Face

Figure A-86: Pre-Test Top View of MDB Impactor Face

Figure A-87: Post-Test Top View of MDB Impactor Face

Figure A-88: Pre-Test Left Side View of MDB Impactor Face

Figure A-89: Post-Test Left Side View of MDB Impactor Face

Figure A-90: Pre-Test Right Side View of MDB Impactor Face

Figure A-91: Post-Test Right Side View of MDB Impactor Face

Figure A-92: Close-Up View of Vehicle's Certification Label

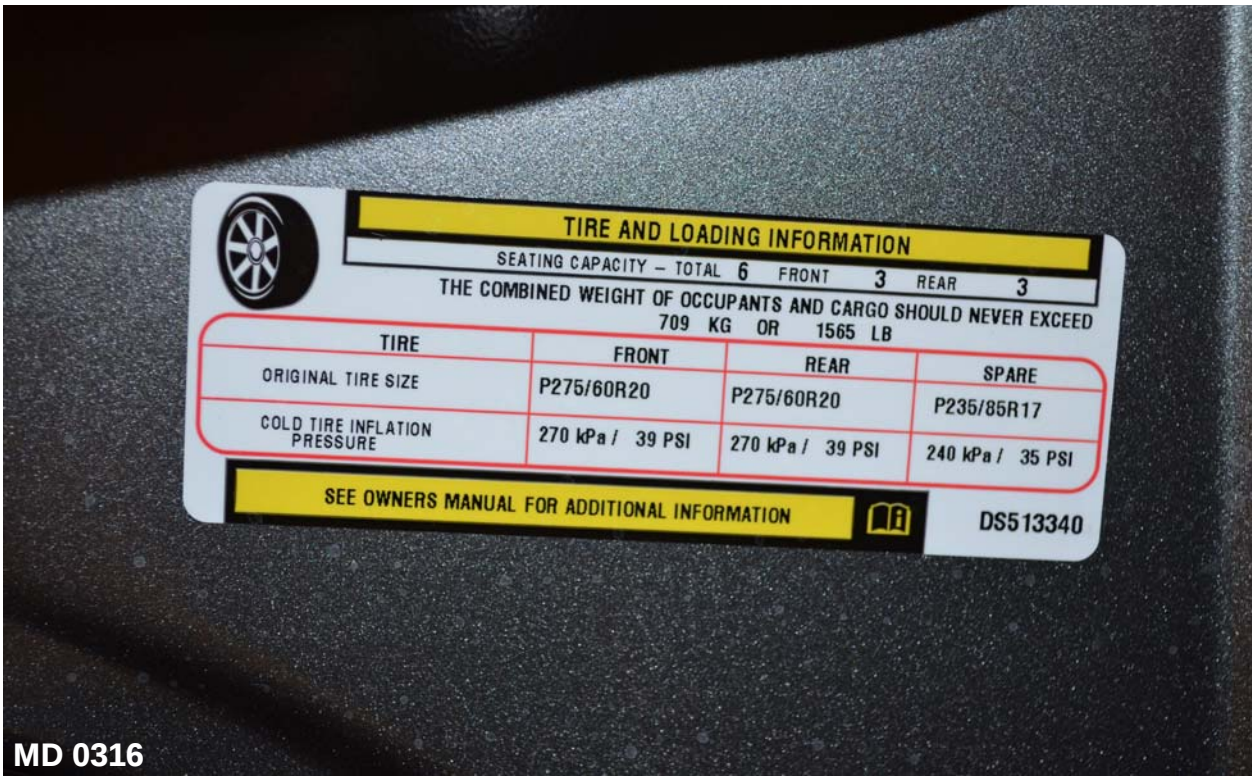


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

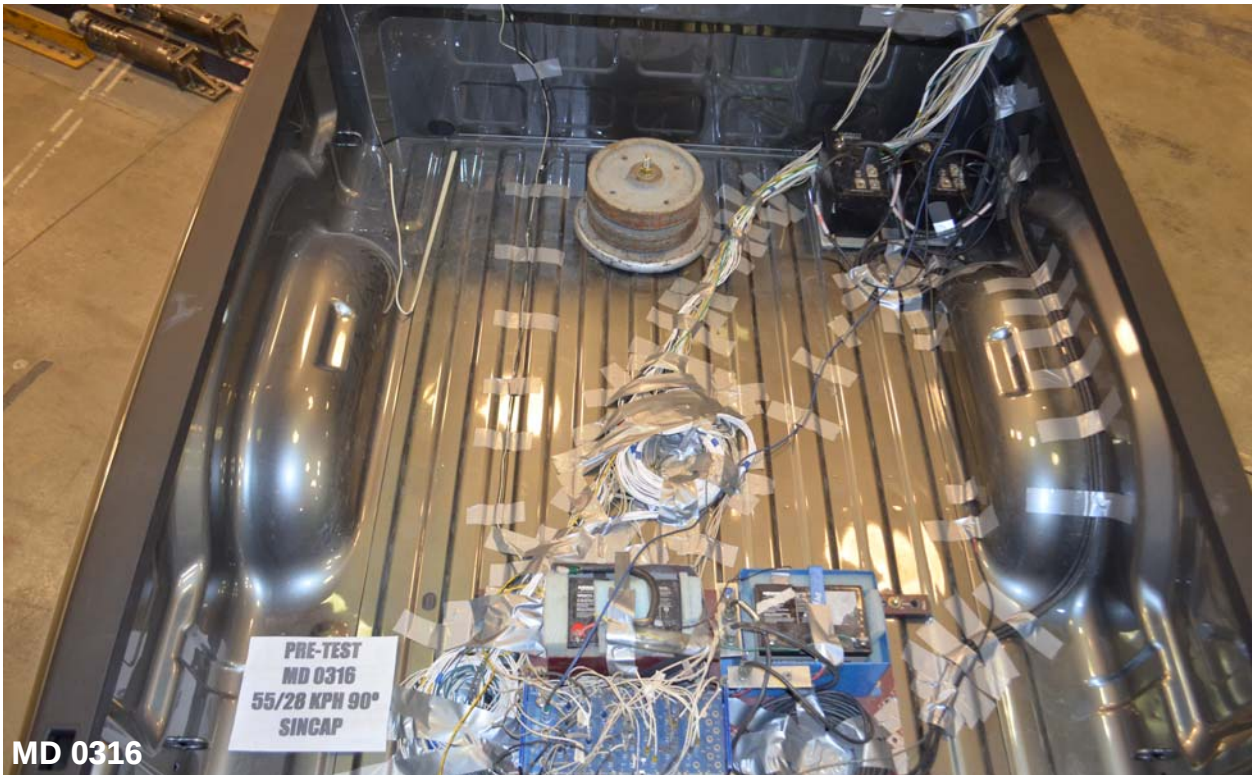


Figure A-94: Pre-Test Ballast View N/a (No Ballast Added)

Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out

Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

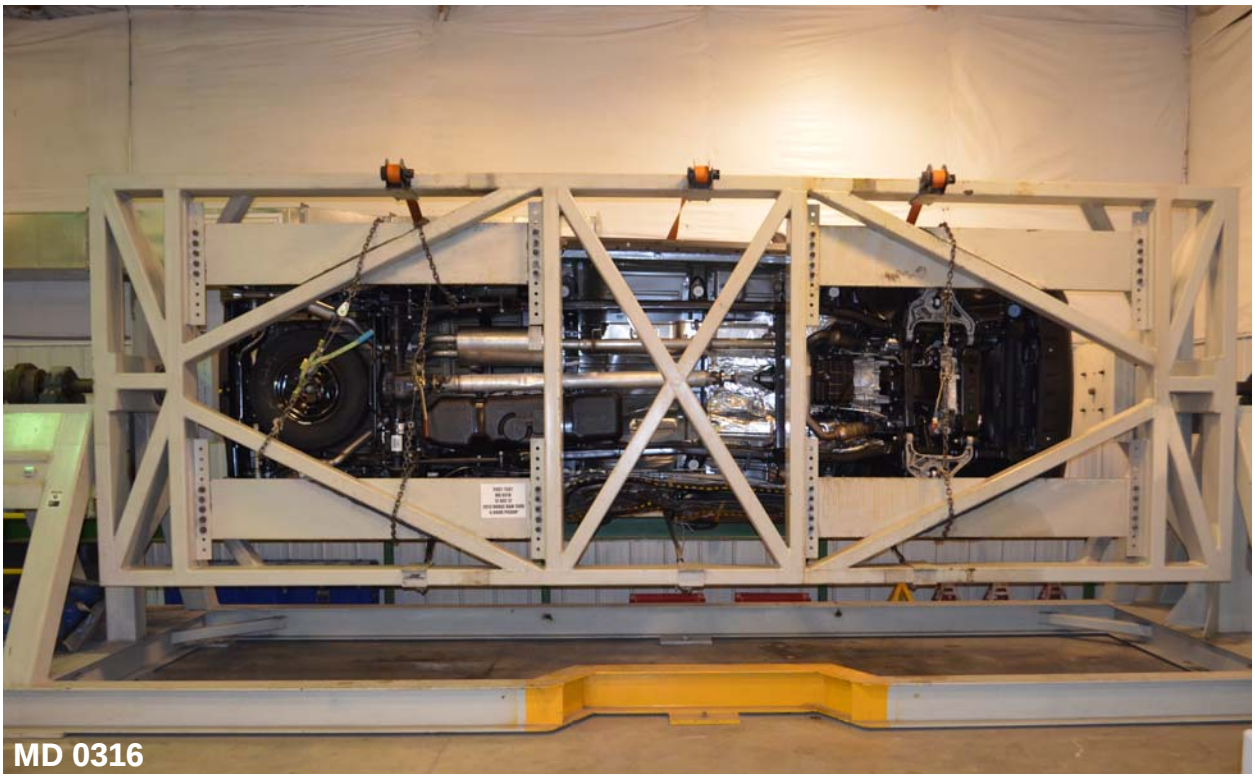


Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees

Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-101: Impact Event

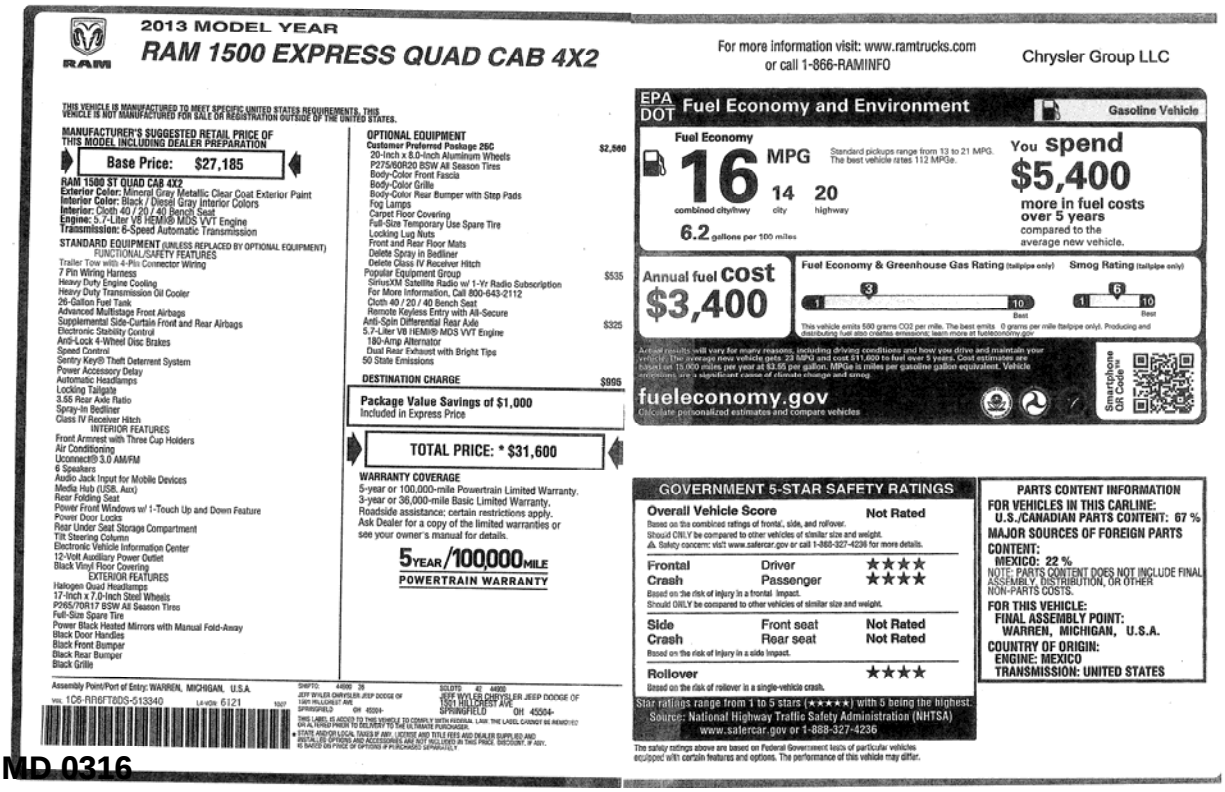


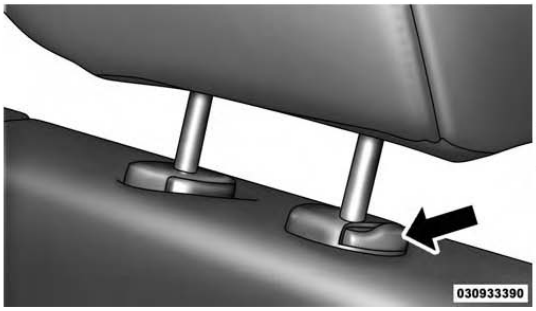
Figure A-102: Monroney Label

WARNING!

The head restraints for all occupants must be properly adjusted prior to operating the vehicle or occupying a seat. Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Front Head Restraints

To raise the head restraint, pull upward on the head restraint. To lower the head restraint, press the adjustment button, located on the base of the head restraint, and push downward on the head restraint.



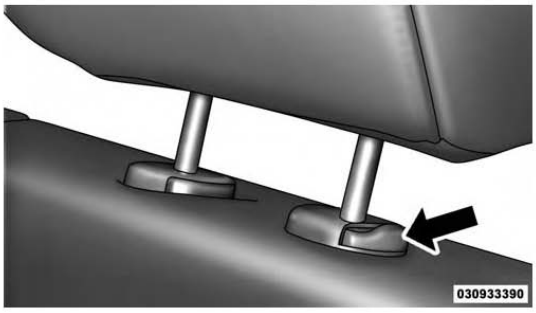
Adjustment Button

MD 0316

Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Rear Head Restraints

The rear seats are equipped with adjustable head restraints. To raise the head restraint, pull upward on the head restraint. To lower the head restraint, press the adjustment button, located on the base of the head restraint, and push downward on the head restraint.



Adjustment Button

NOTE:

- The rear center head restraint (Crew Cab and Quad Cab) has only one adjustment position that is used to aid in the routing of a tether. Refer to "Occupant Restraints" in "Things to Know Before Starting Your Vehicle" for further information.
- The head restraints should only be removed by qualified technicians, for service purposes only. If either of the head restraints require removal, see your authorized dealer.

MD 0316

Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
DRIVER & PASSENGER DUMMY INSTRUMENTATION PLOTS

The following plots are provided in the test report

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.

Additional Driver & Passenger Dummy Instrumentation Data
Driver Lower Spine T_{12} Acceleration (X)
Driver Lower Spine T_{12} Acceleration (Y)
Driver Lower Spine T_{12} Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
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)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
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)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

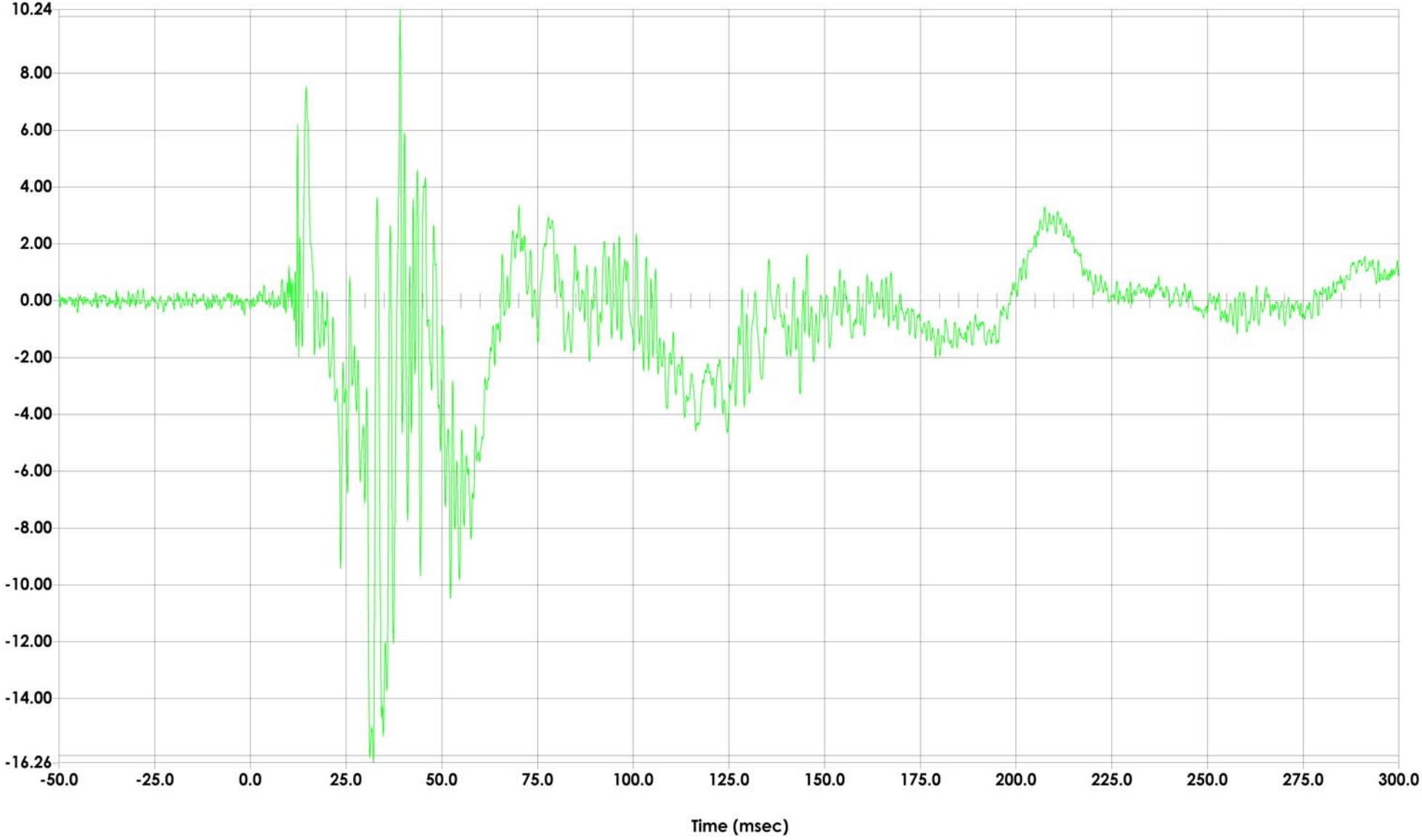
MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch

Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	001
Units	G'S

Max	10.24	G'S
	39.12	msec
Min	-16.26	G'S
	32.16	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Head Acceleration (X) Primary vs. Time

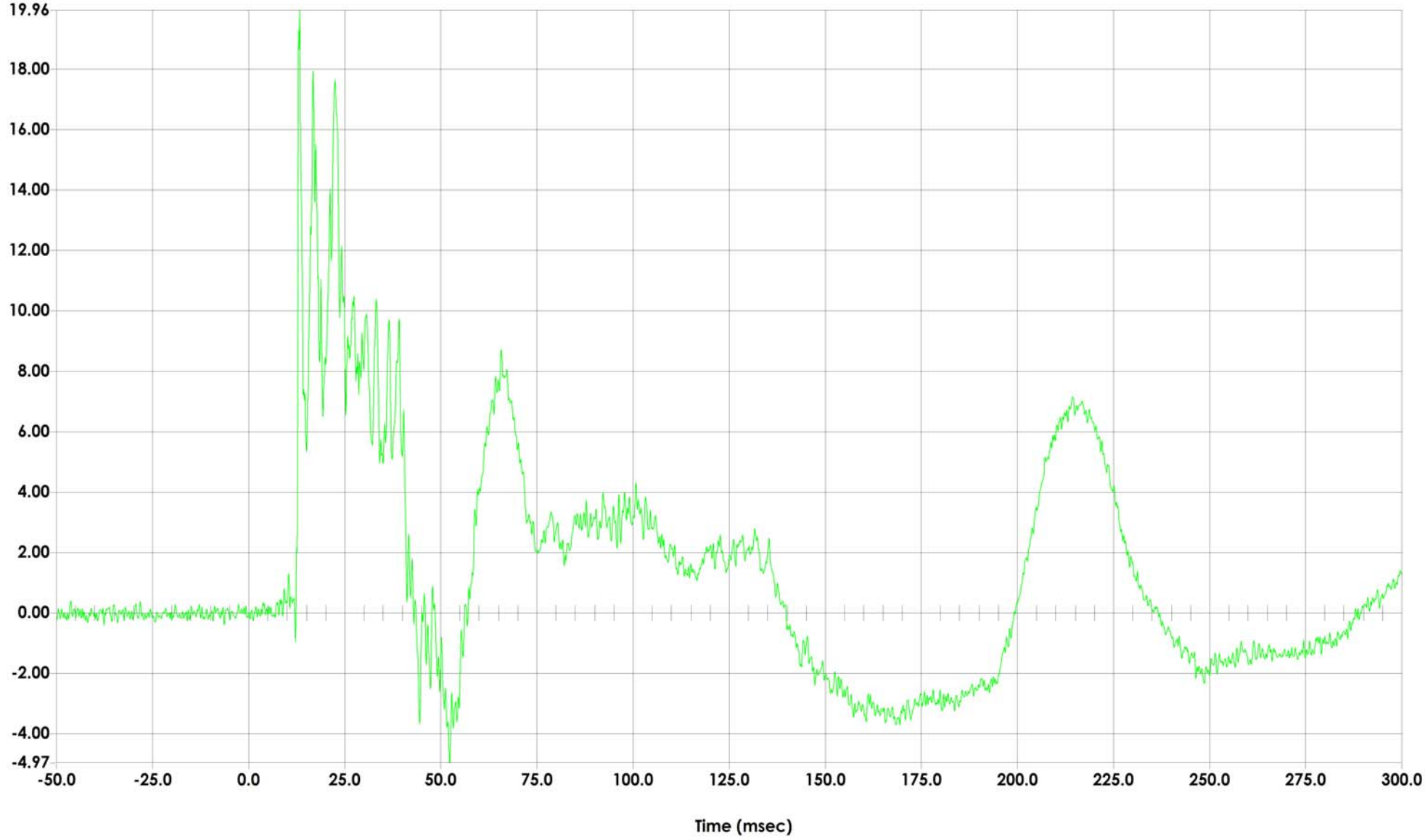


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	002
Units	G'S

Max	19.96	G'S
	13.28	msec
Min	-4.97	G'S
	52.24	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Head Acceleration (Y) Primary vs. Time

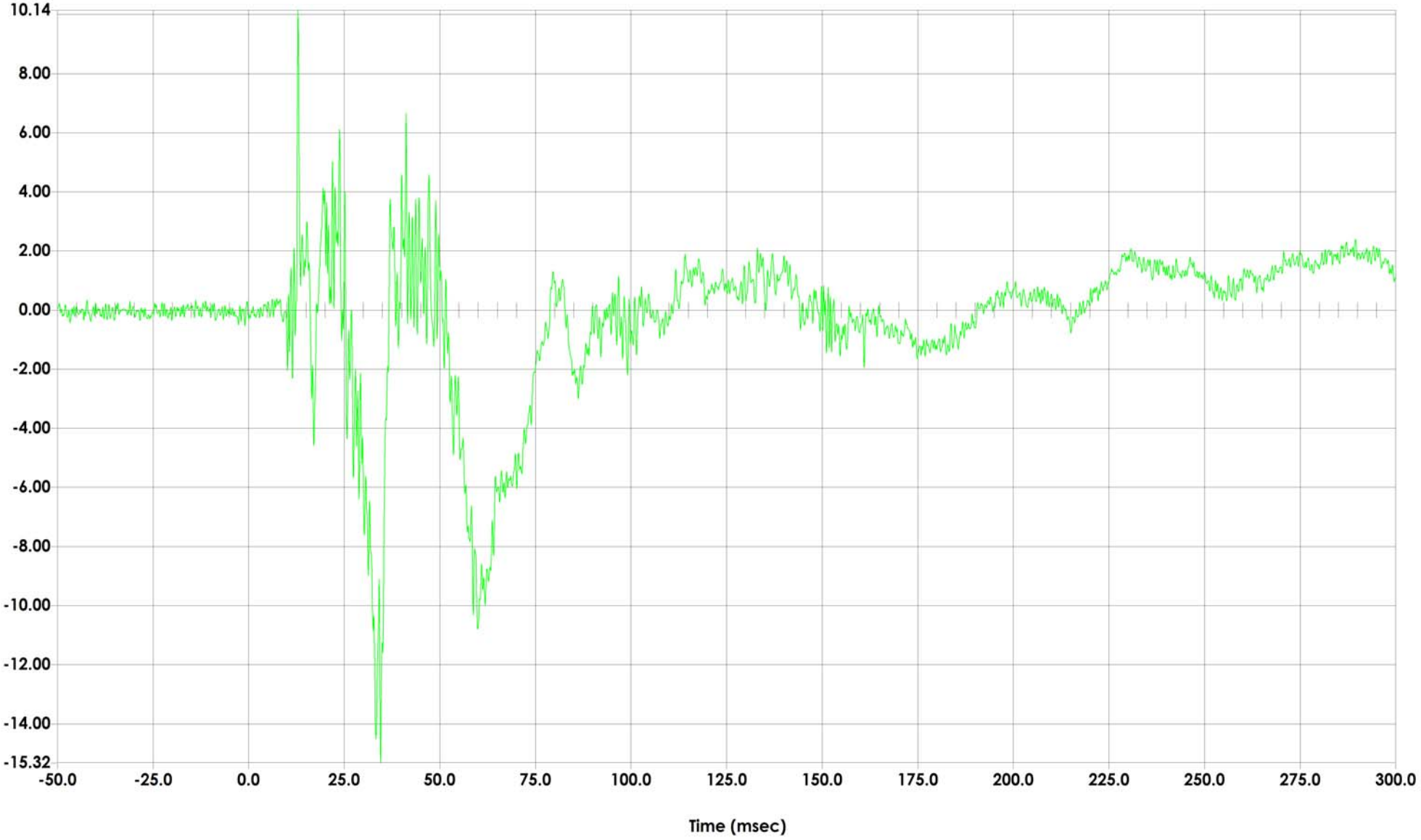


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	003
Units	G'S

Max	10.14	G'S
	12.96	msec
Min	-15.32	G'S
	34.48	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Head Acceleration (Z) Primary vs. Time

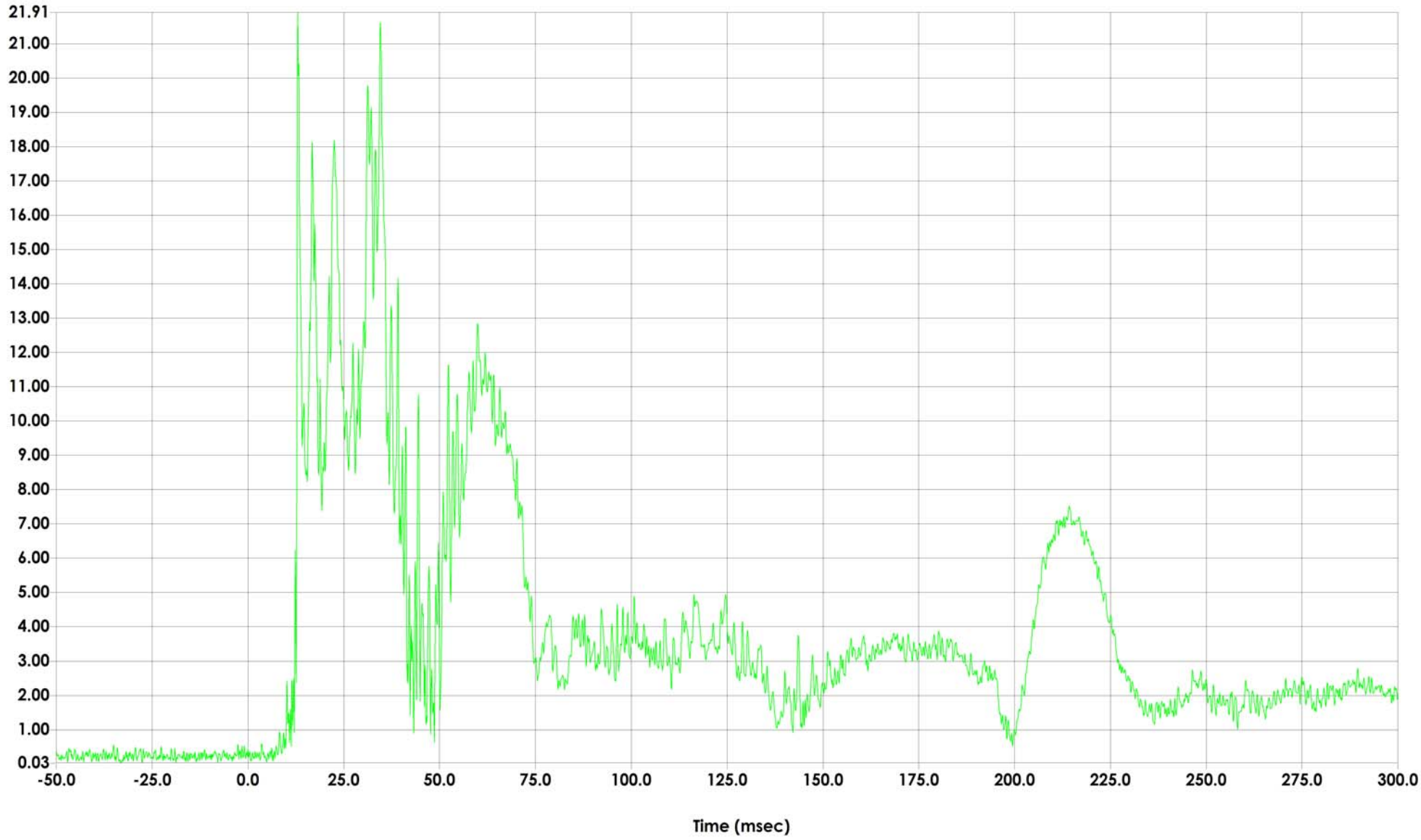


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	063
Units	G'S

Max	21.91	G'S
	12.96	msec
Min	0.03	G'S
	-18.80	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Head Resultant Acceleration Primary vs. Time

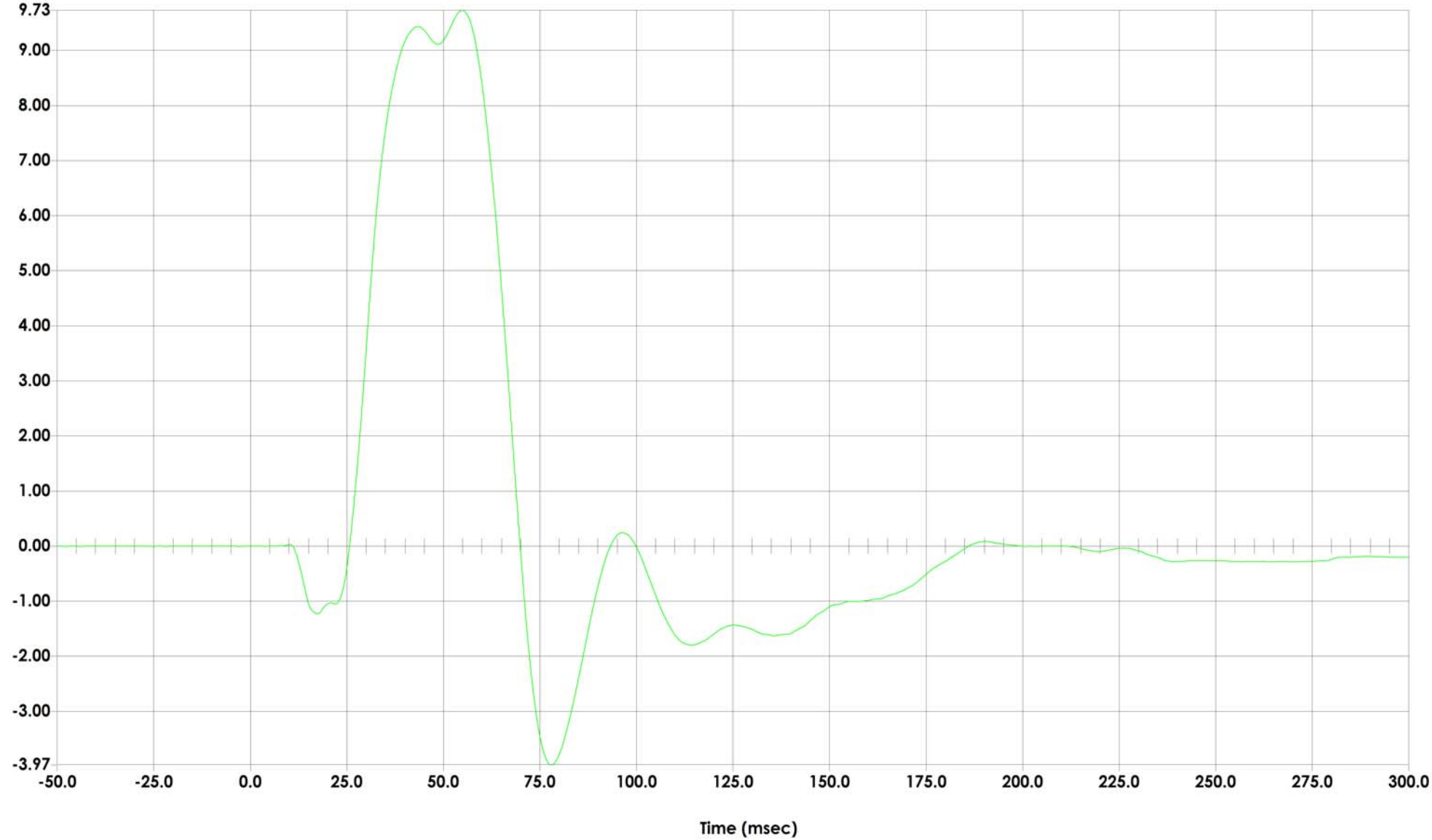


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	007
Units	MM

Max	9.73	MM
	54.88	msec
Min	-3.97	MM
	77.92	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Upper Thorax Rib Deflection (Y) vs. Time

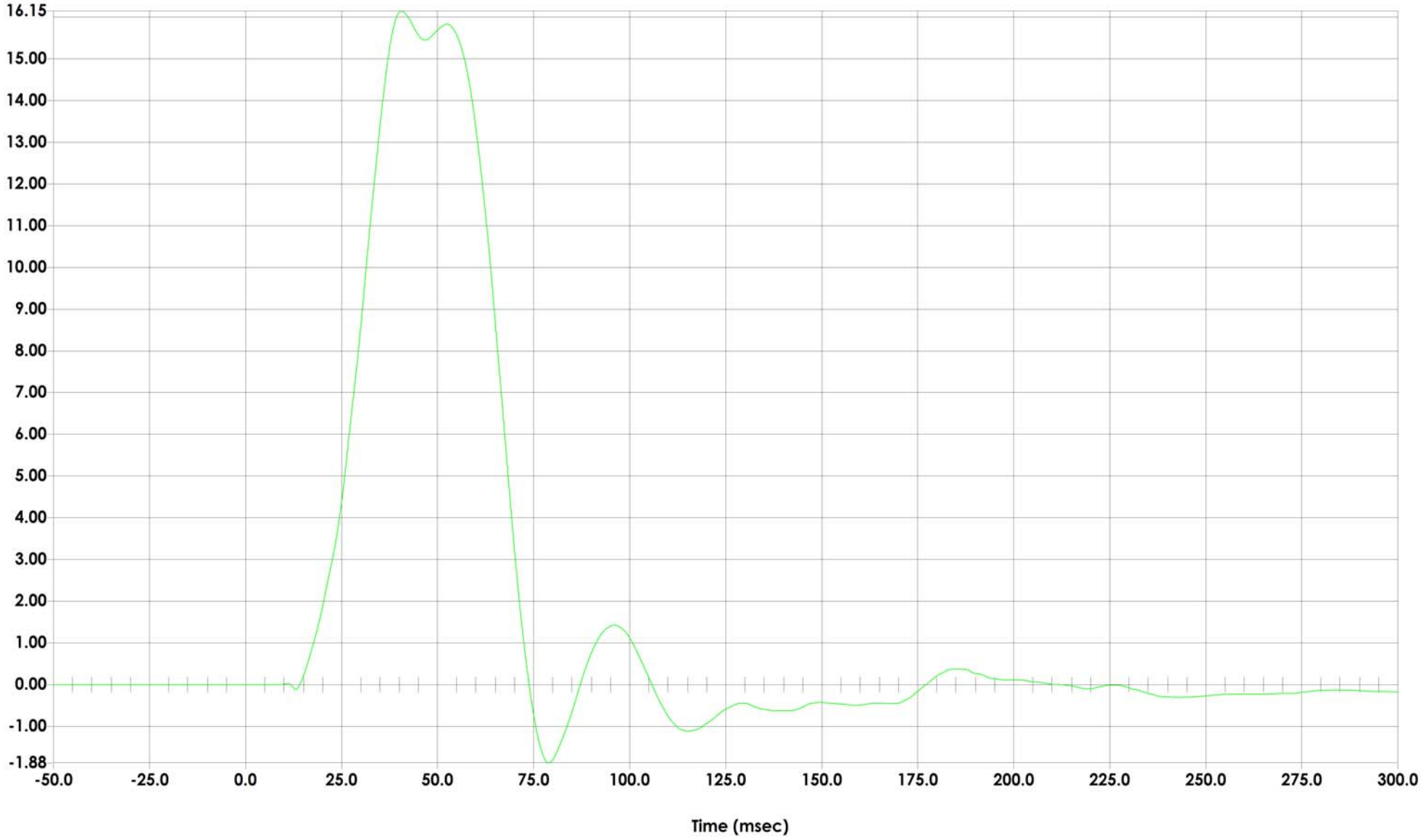


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	008
Units	MM

Max	16.15	MM
	40.64	msec
Min	-1.88	MM
	78.88	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Middle Thorax Rib Deflection (Y) vs. Time

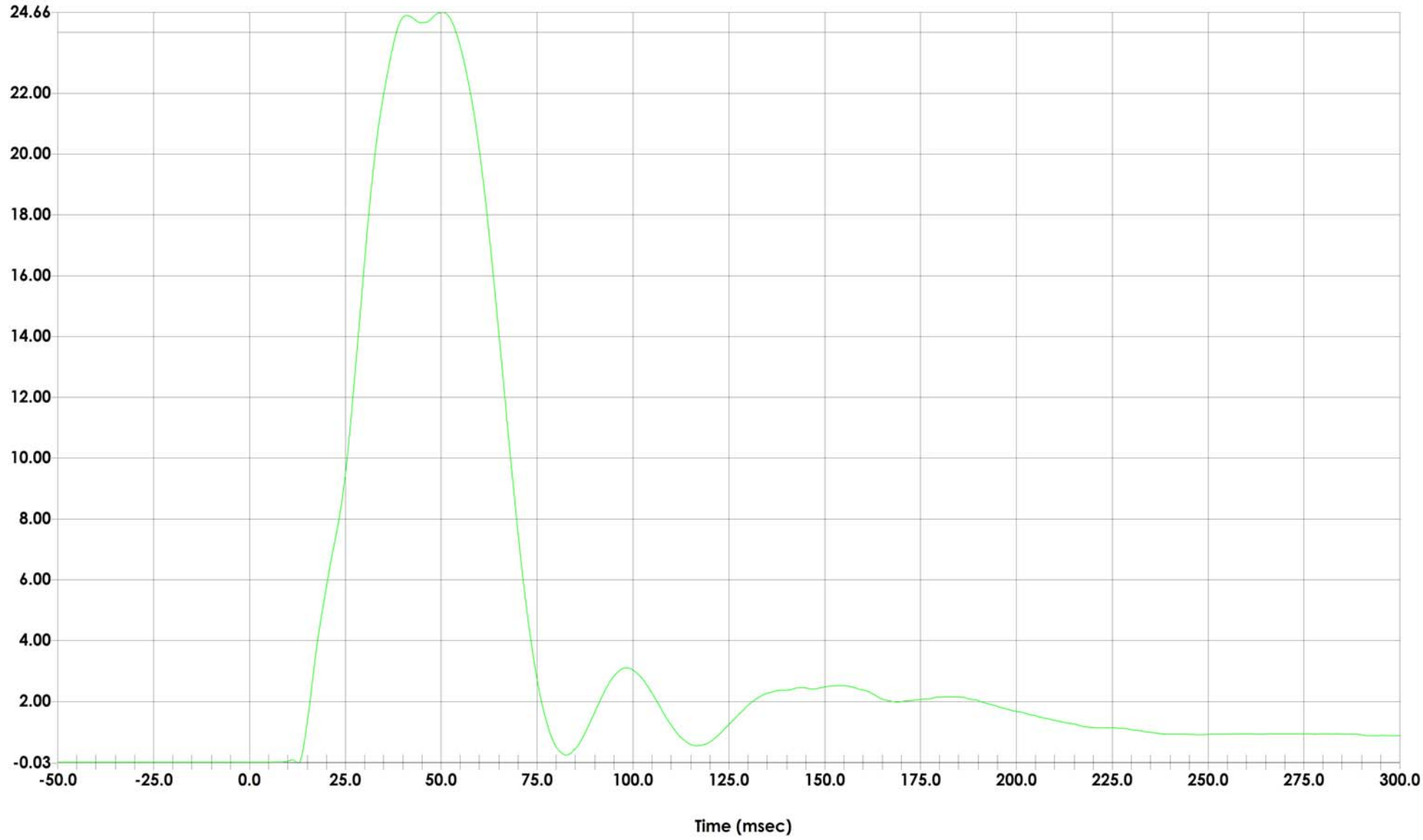


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	009
Units	MM

Max	24.66	MM
	50.32	msec
Min	-0.03	MM
	12.64	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Lower Thorax Rib Deflection (Y) vs. Time

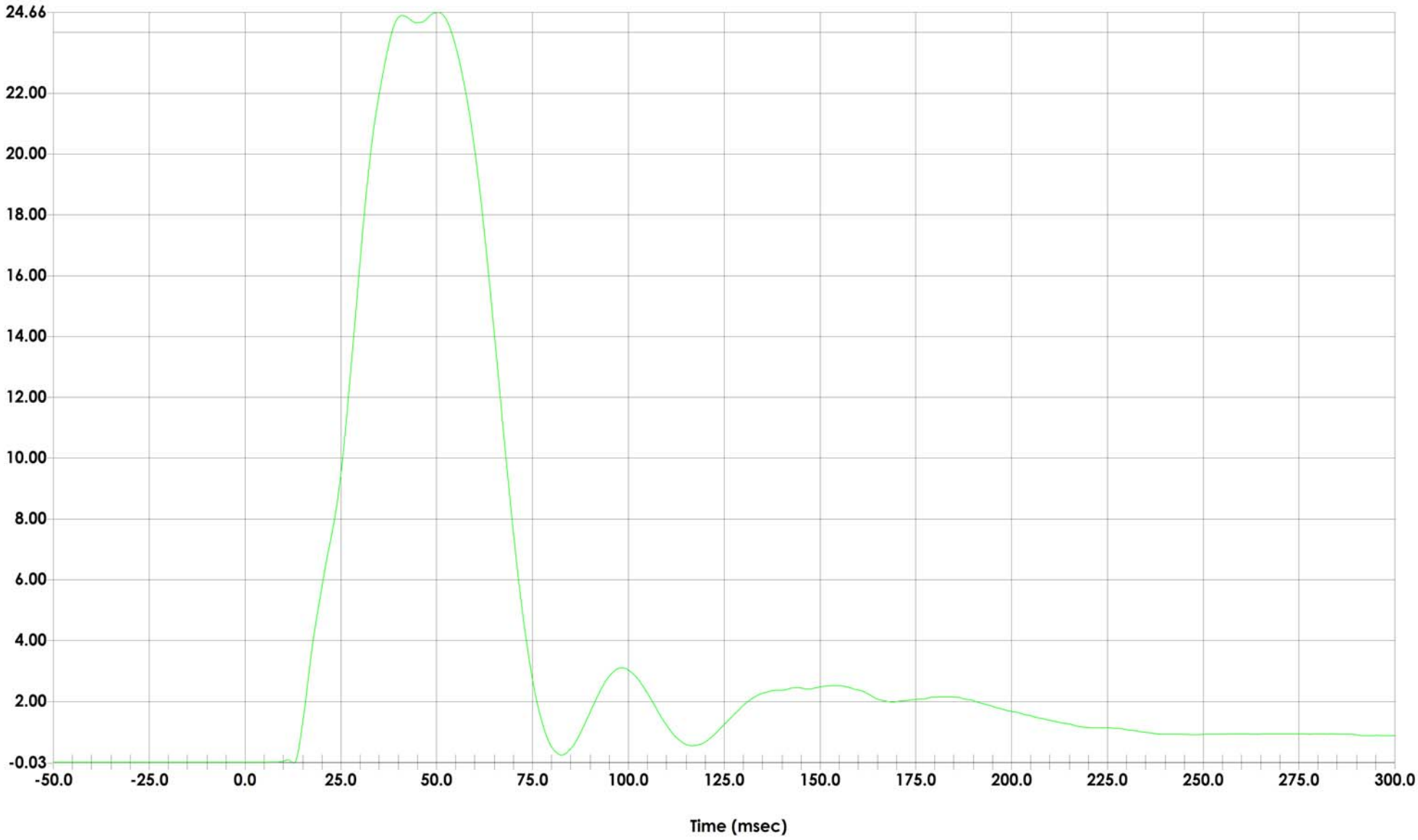


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	009
Units	MM

Max	24.66	MM
	50.32	msec
Min	-0.03	MM
	12.64	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Thorax Rib Deflection Maximum vs. Time

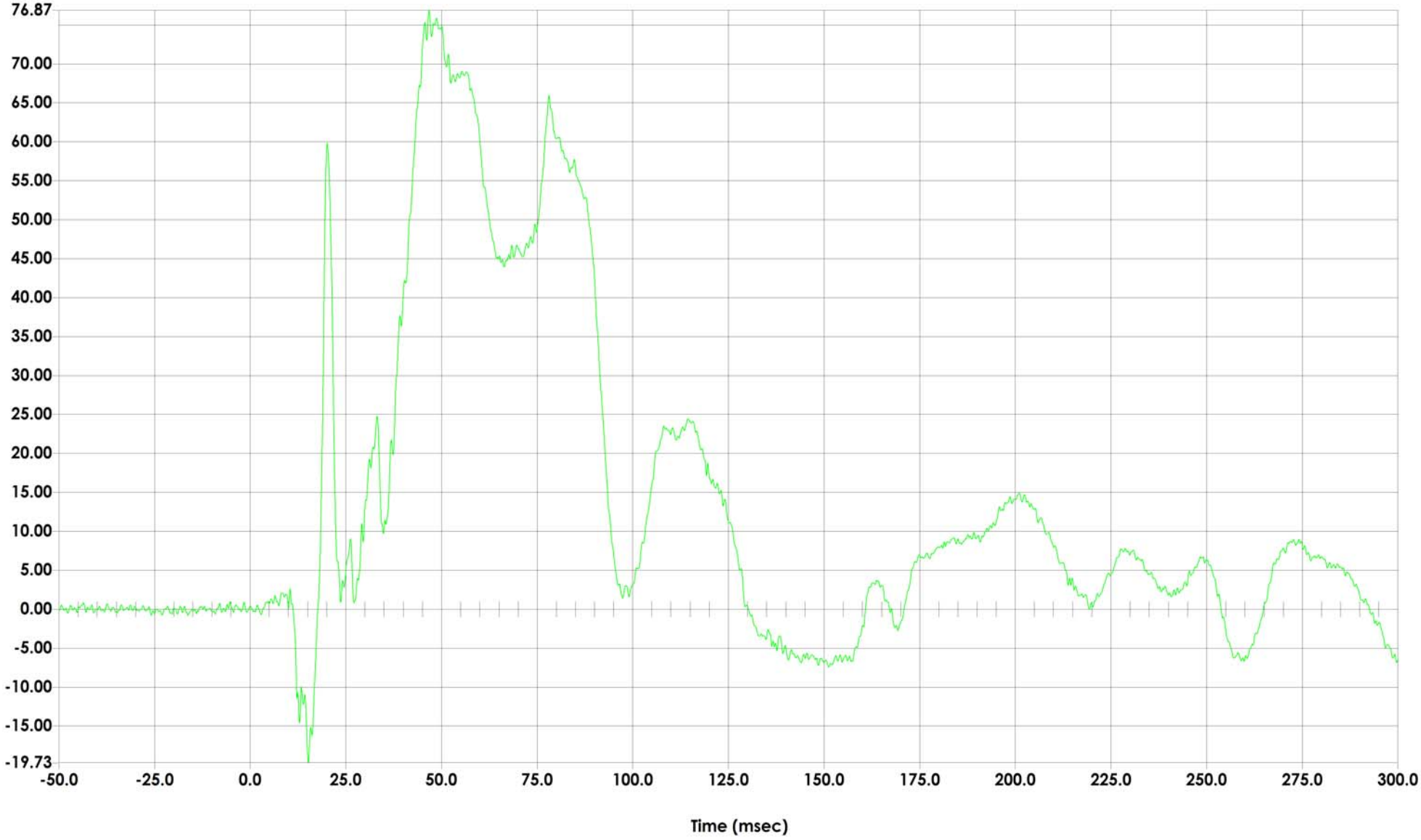


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	010
Units	NWT

Max	76.87	NWT
	46.72	msec
Min	-19.73	NWT
	15.20	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Anterior Abdominal Force (Y) vs. Time

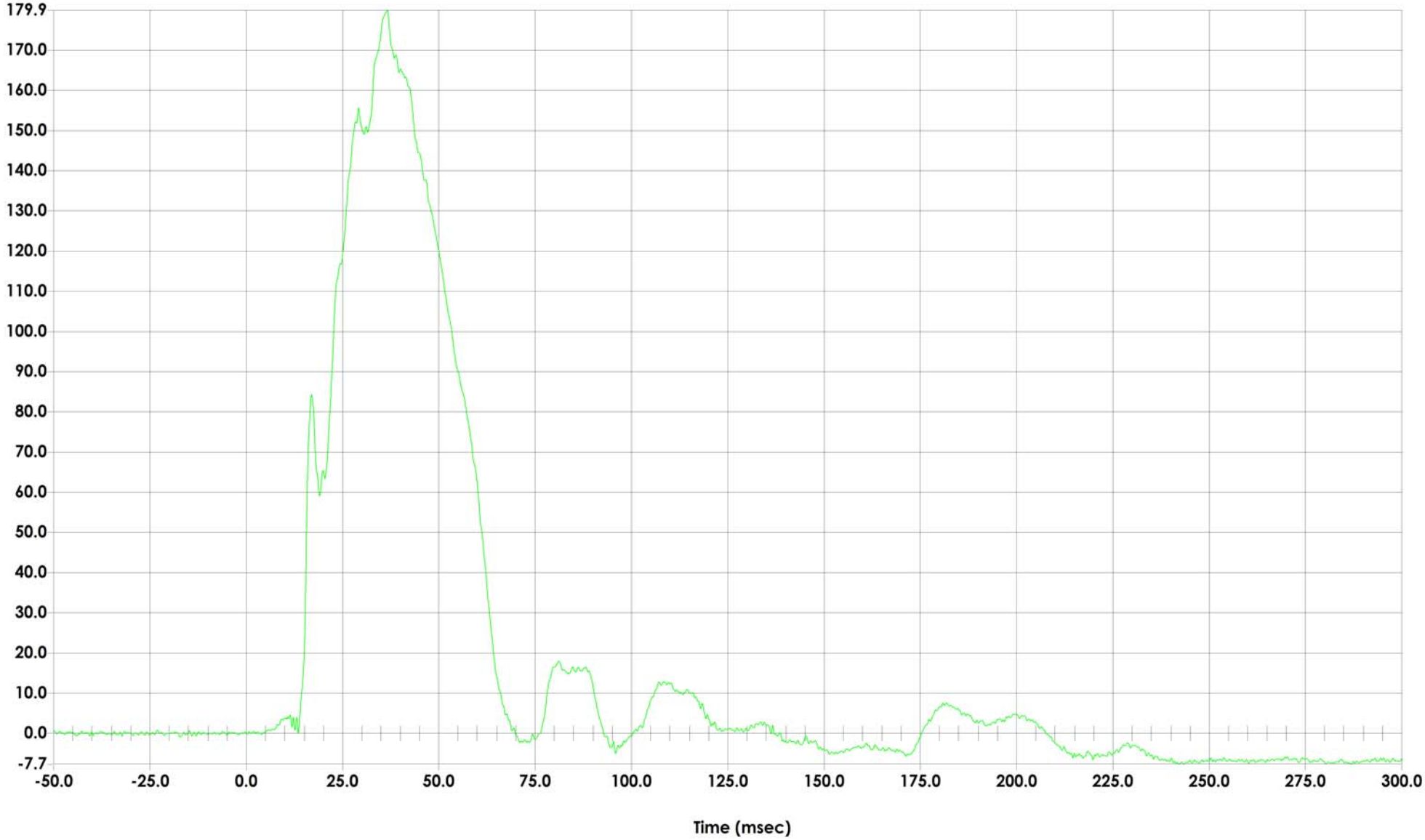


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	011
Units	NWT

Max	179.90	NWT
	36.64	msec
Min	-7.67	NWT
	243.36	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Middle Abdominal Force (Y) vs. Time

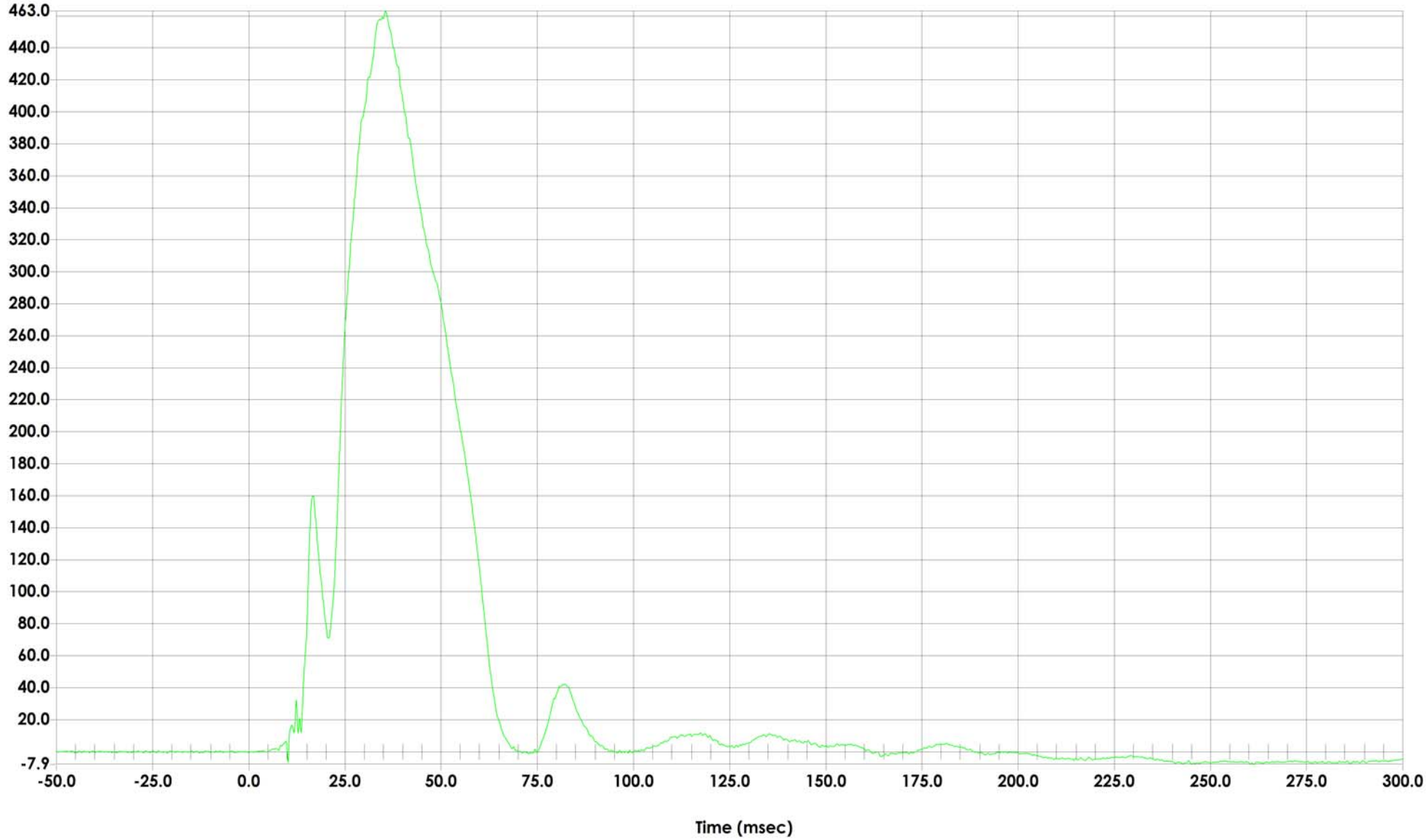


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	012
Units	NWT

Max	462.99	NWT
	35.52	msec
Min	-7.89	NWT
	261.36	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Posterior Abdominal Force (Y) vs. Time

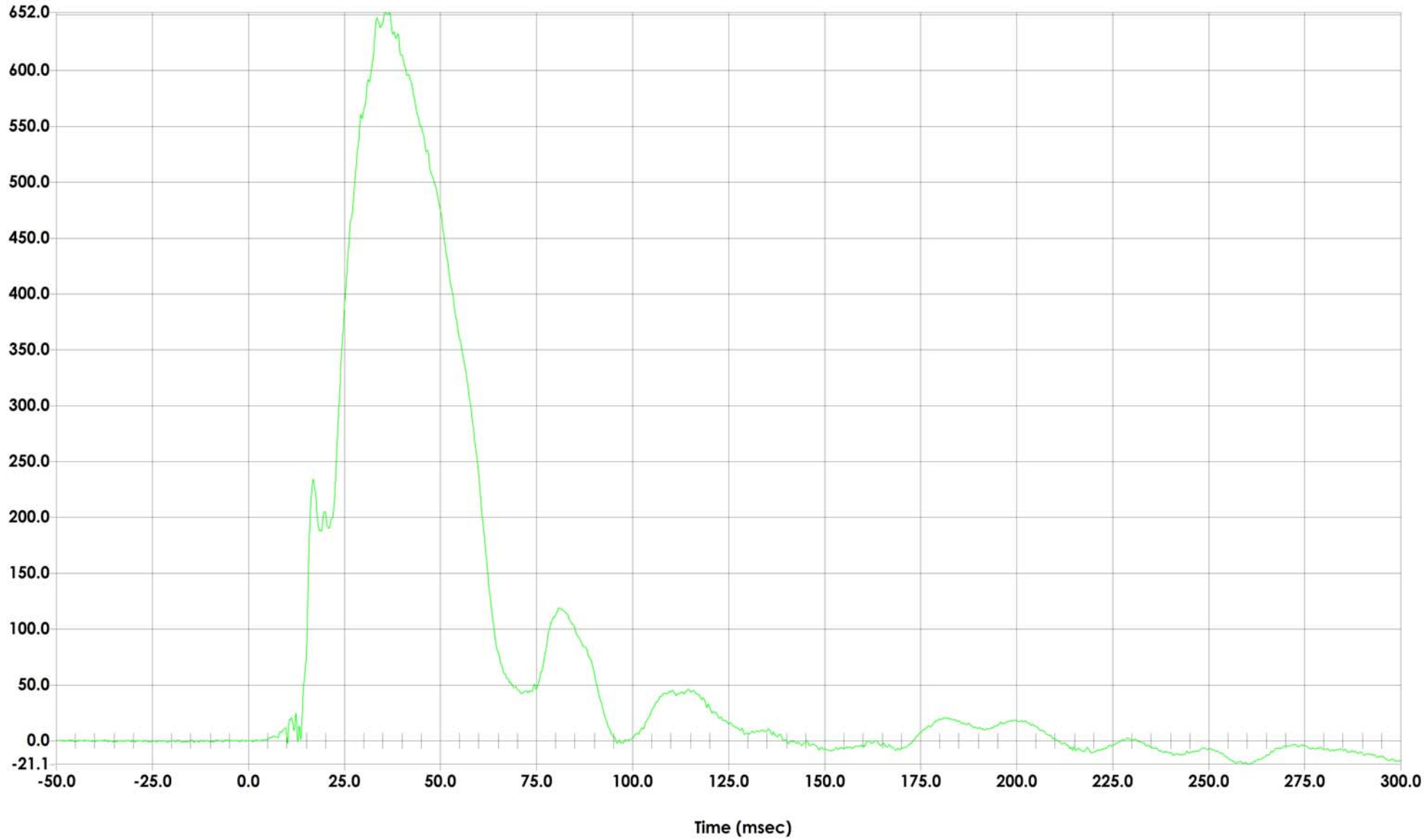


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	064
Units	NWT

Max	651.98	NWT
	35.60	msec
Min	-21.10	NWT
	260.32	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Total Abdominal Force (Y) vs. Time

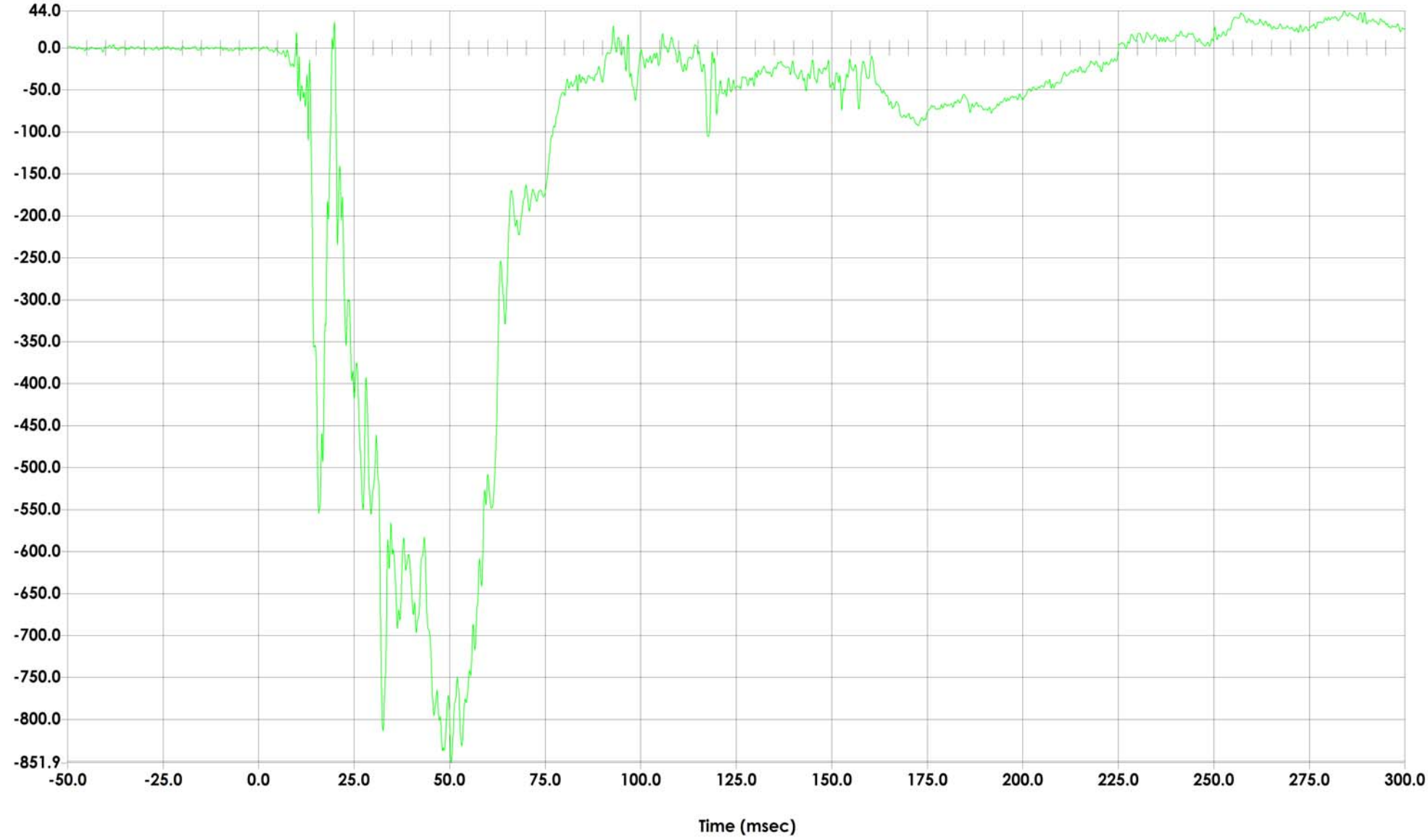


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	016
Units	NWT

Max	44.03	NWT
	284.16	msec
Min	-851.89	NWT
	50.40	msec

MEDICAL COLLEGE OF WISCONSIN

Driver Pubic Symphysis Force (Y) vs. Time

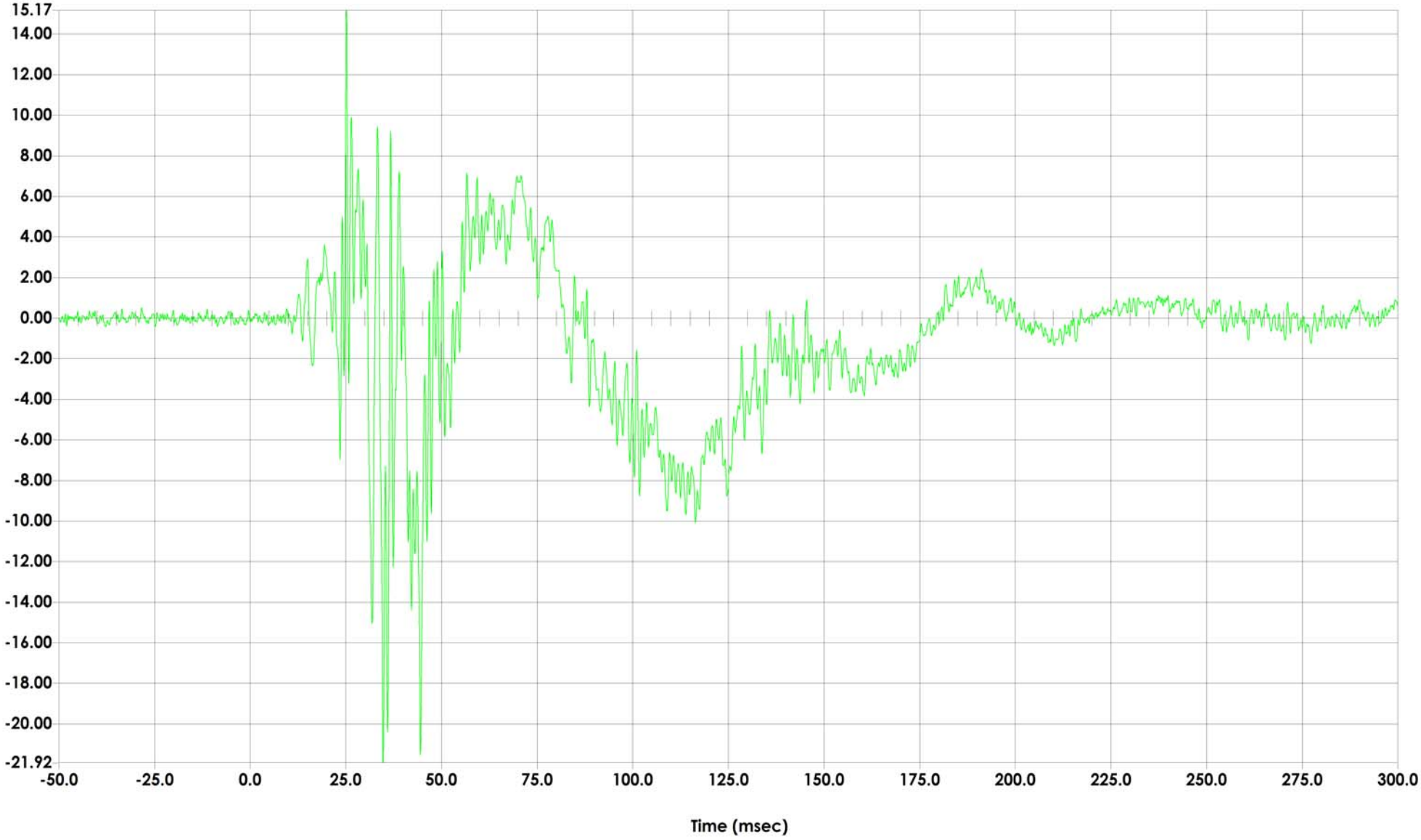


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	017
Units	G'S

Max	15.17	G'S
	25.20	msec
Min	-21.92	G'S
	34.80	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Head Acceleration (X) Primary vs. Time

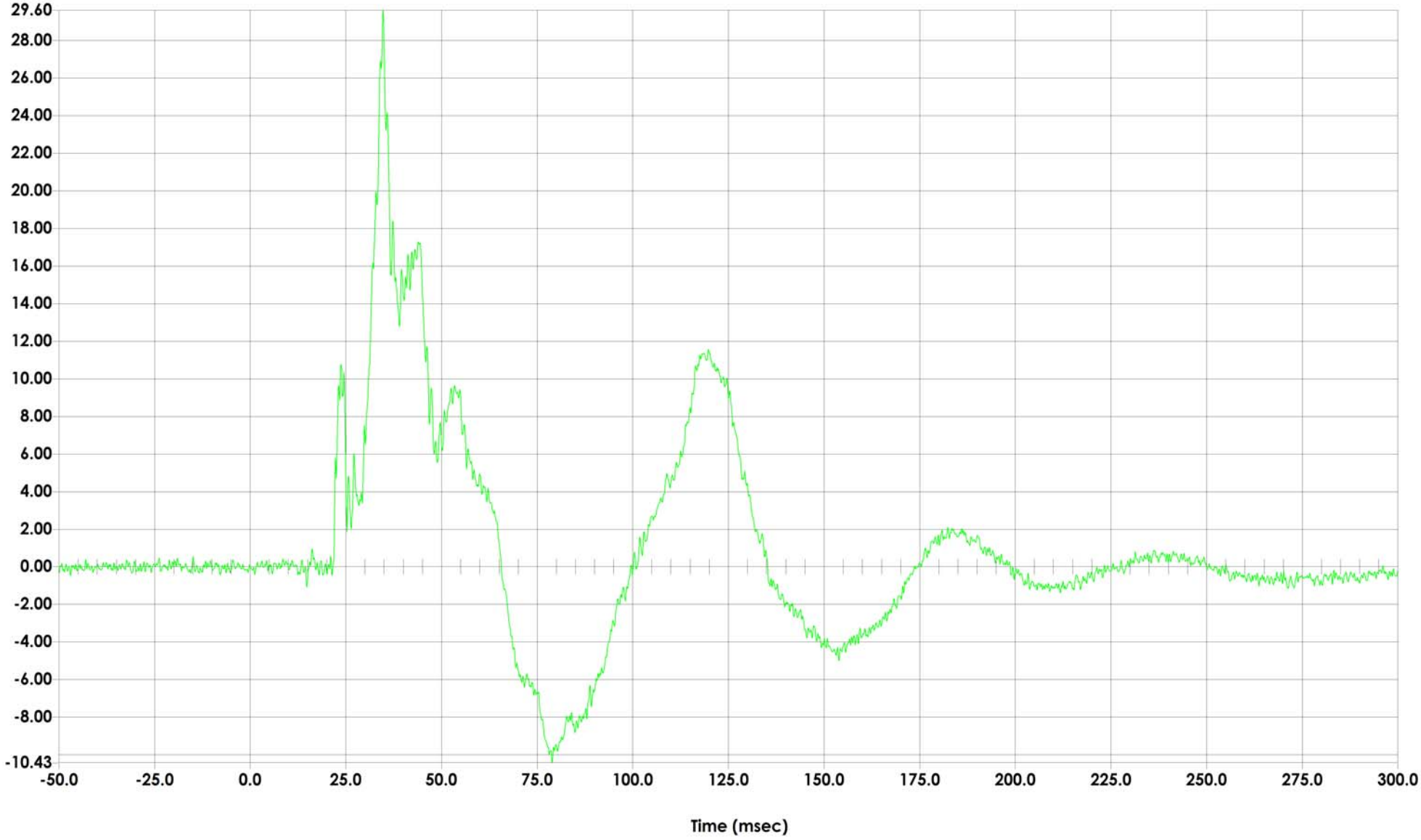


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	018
Units	G'S

Max	29.60	G'S
	34.72	msec
Min	-10.43	G'S
	78.96	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Head Acceleration (Y) Primary vs. Time

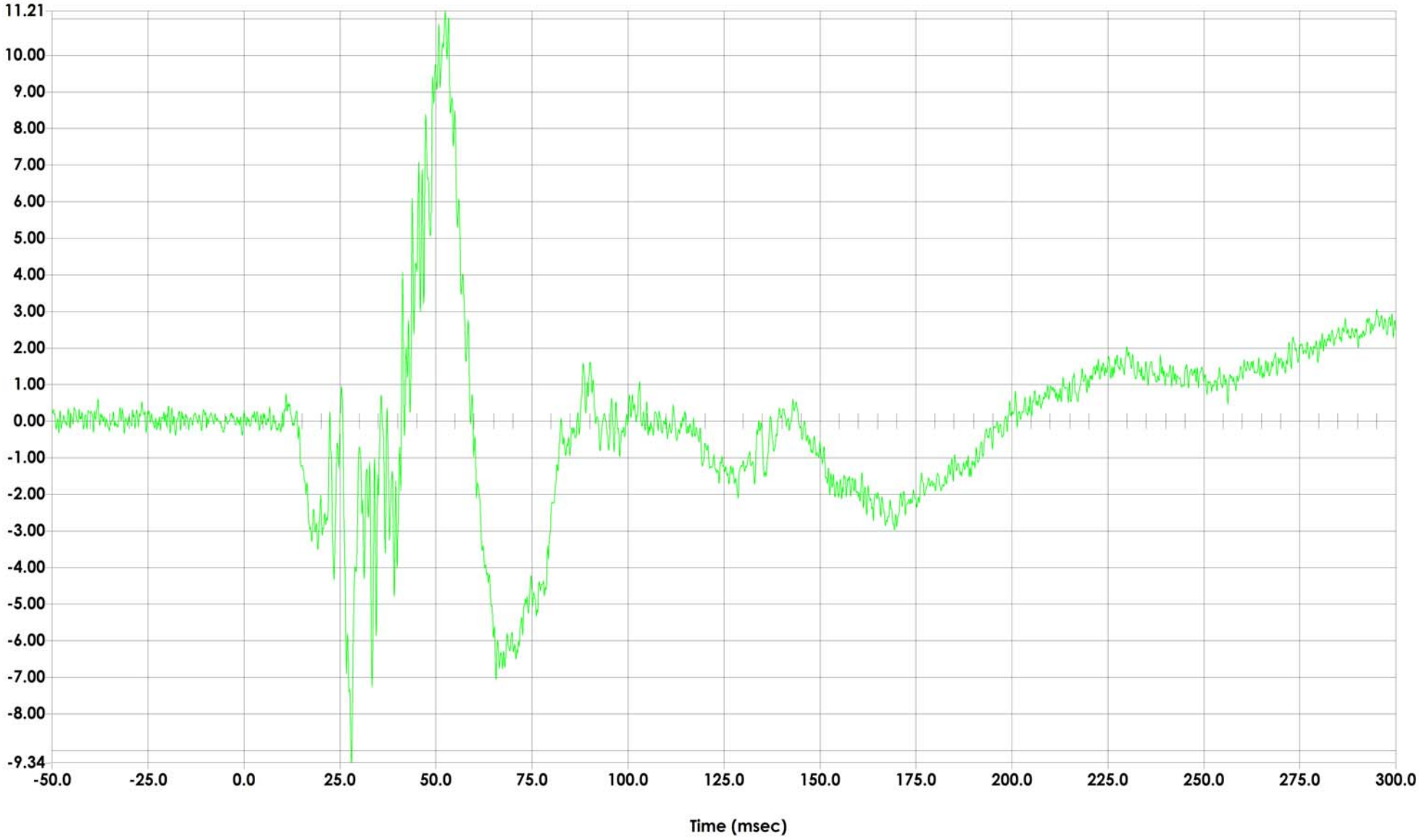


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	019
Units	G'S

Max	11.21	G'S
	52.40	msec
Min	-9.34	G'S
	28.00	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Head Acceleration (Z) Primary vs. Time

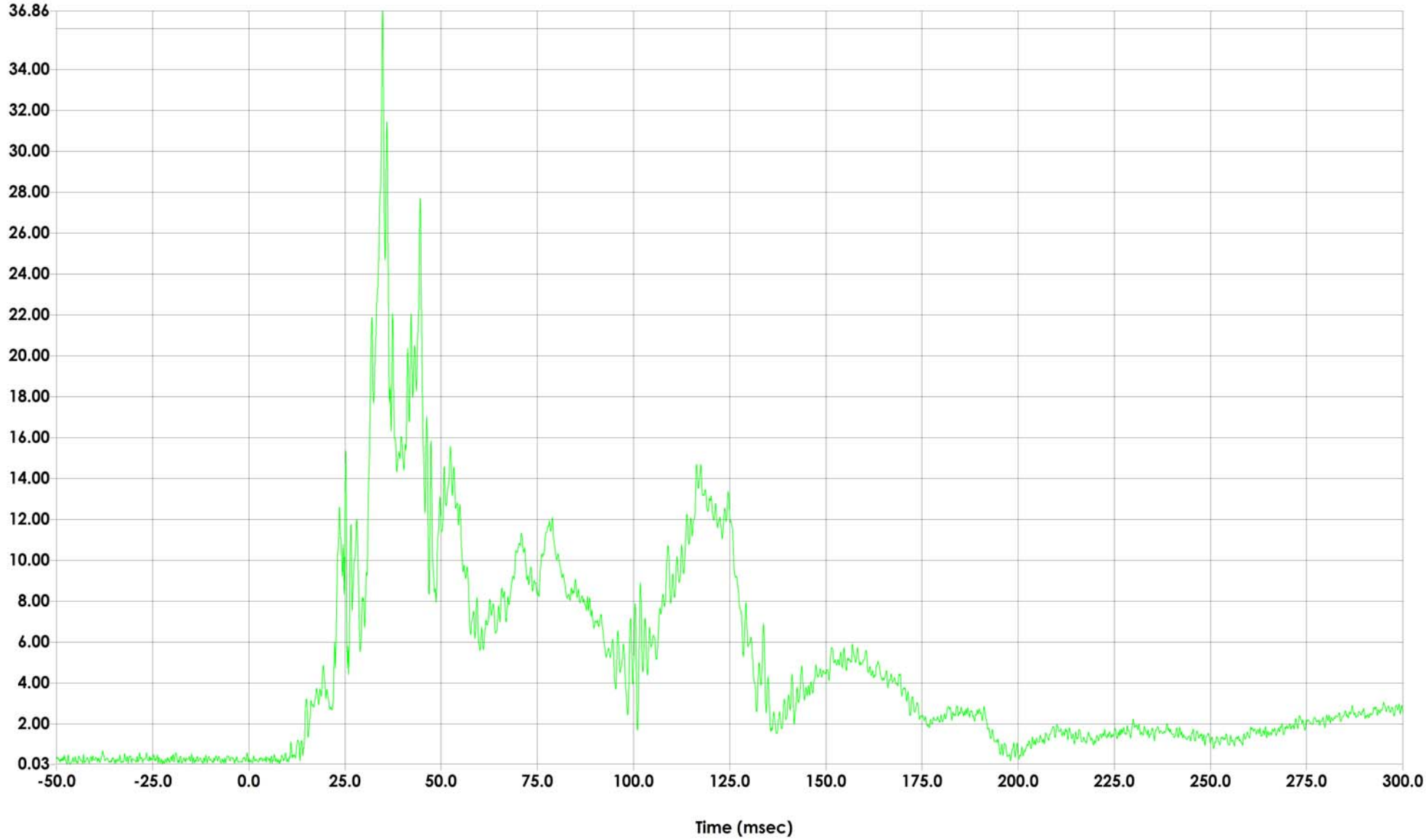


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC1000
Plot number	067
Units	G'S

Max	36.86	G'S
	34.72	msec
Min	0.03	G'S
	-47.28	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Head Resultant Acceleration Primary vs. Time

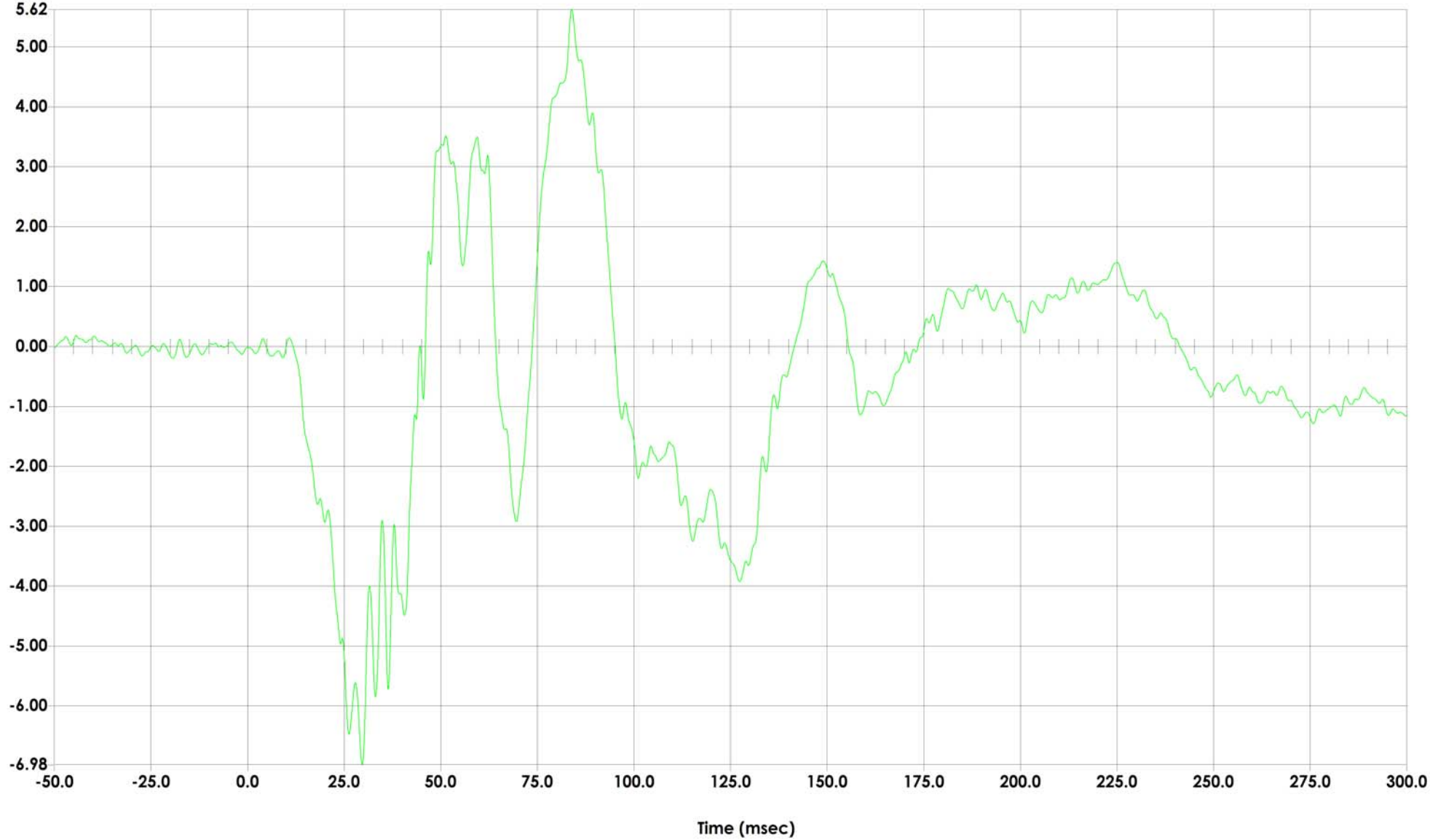


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	028
Units	G'S

Max	5.62	G'S
	83.84	msec
Min	-6.98	G'S
	29.68	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Lower Spine T12 Acceleration (X) vs. Time

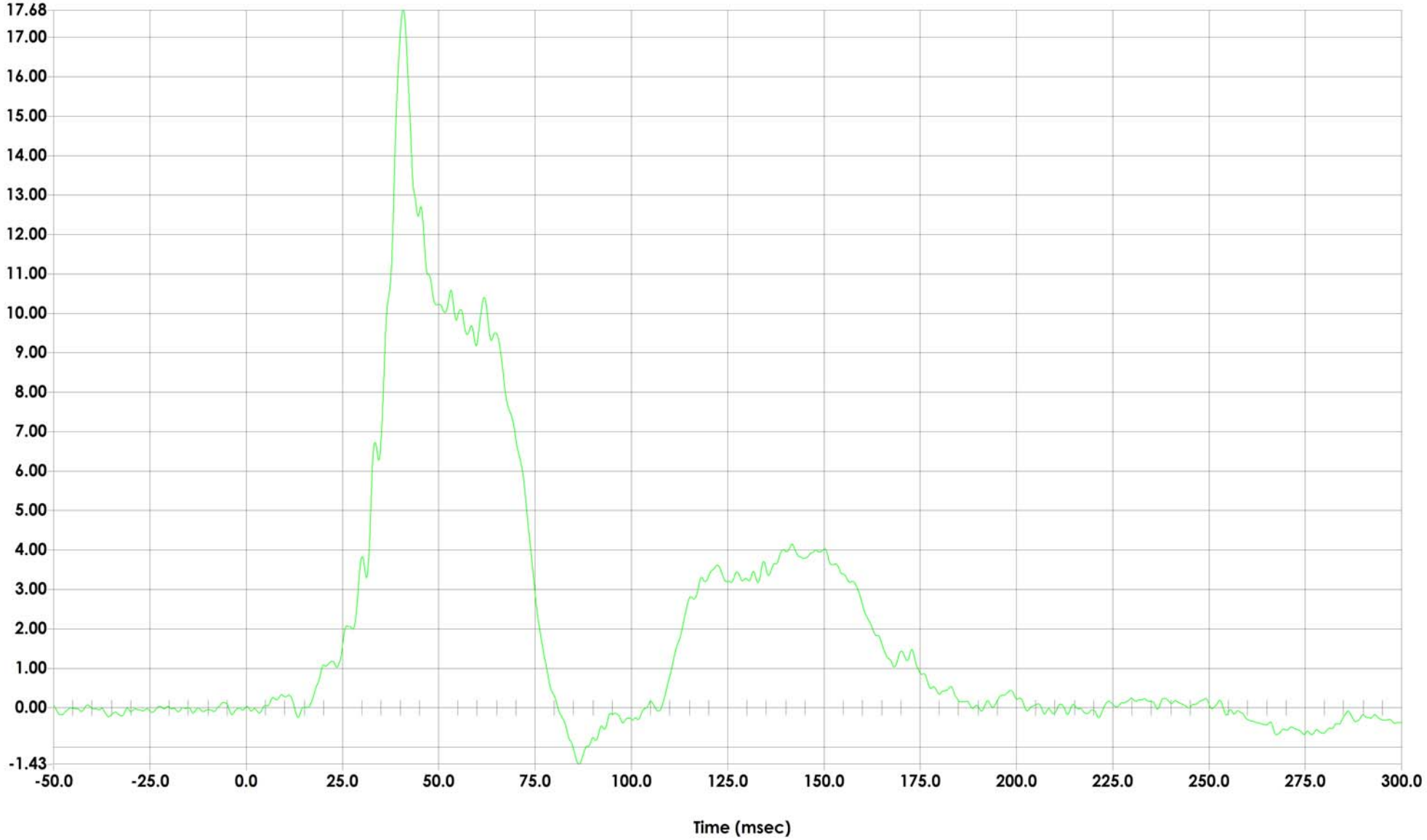


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	029
Units	G'S

Max	17.68	G'S
	40.72	msec
Min	-1.43	G'S
	86.40	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Lower Spine T12 Acceleration (Y) vs. Time

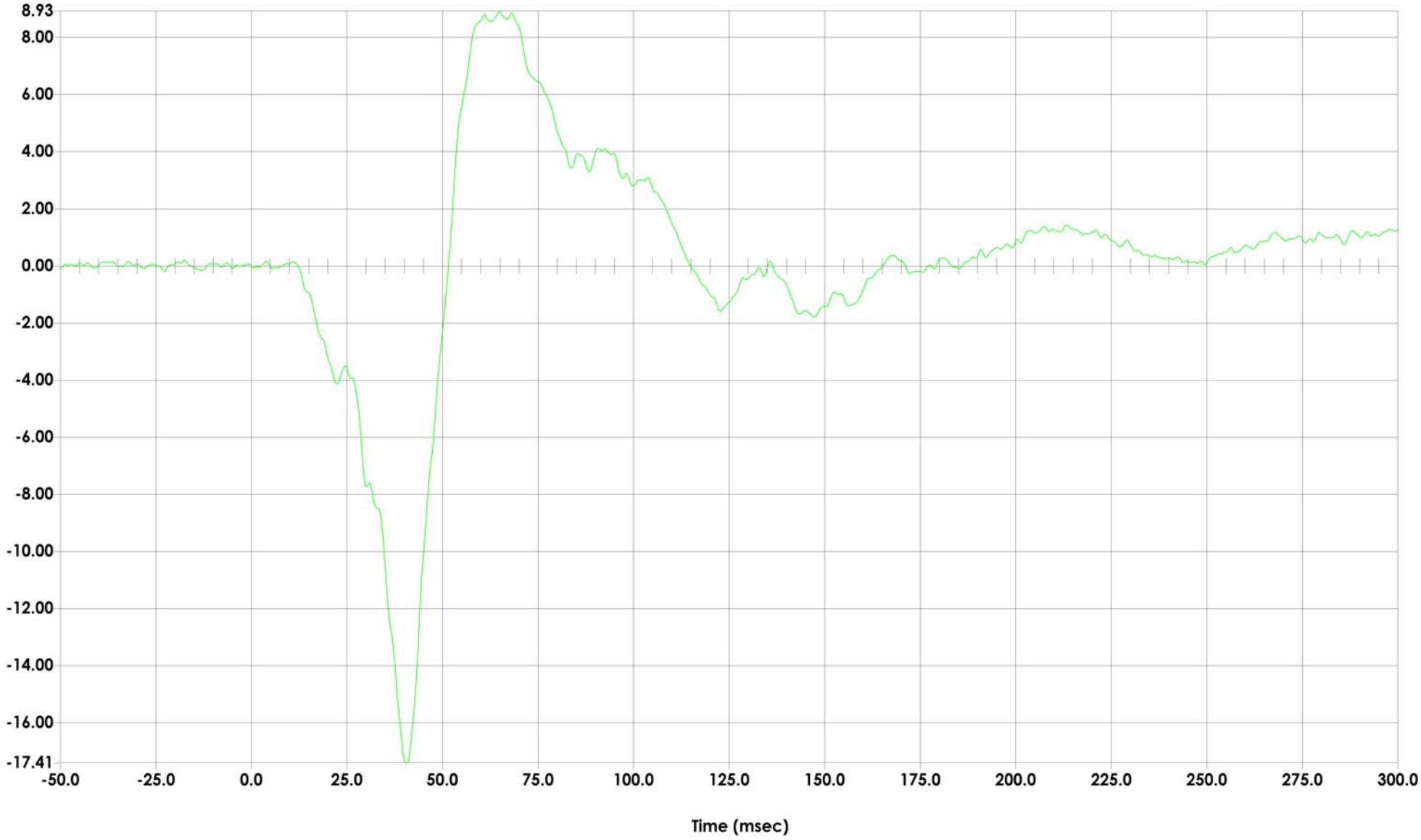


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	030
Units	G'S

Max	8.93	G'S
	64.96	msec
Min	-17.41	G'S
	40.56	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Lower Spine T12 Acceleration (Z) vs. Time

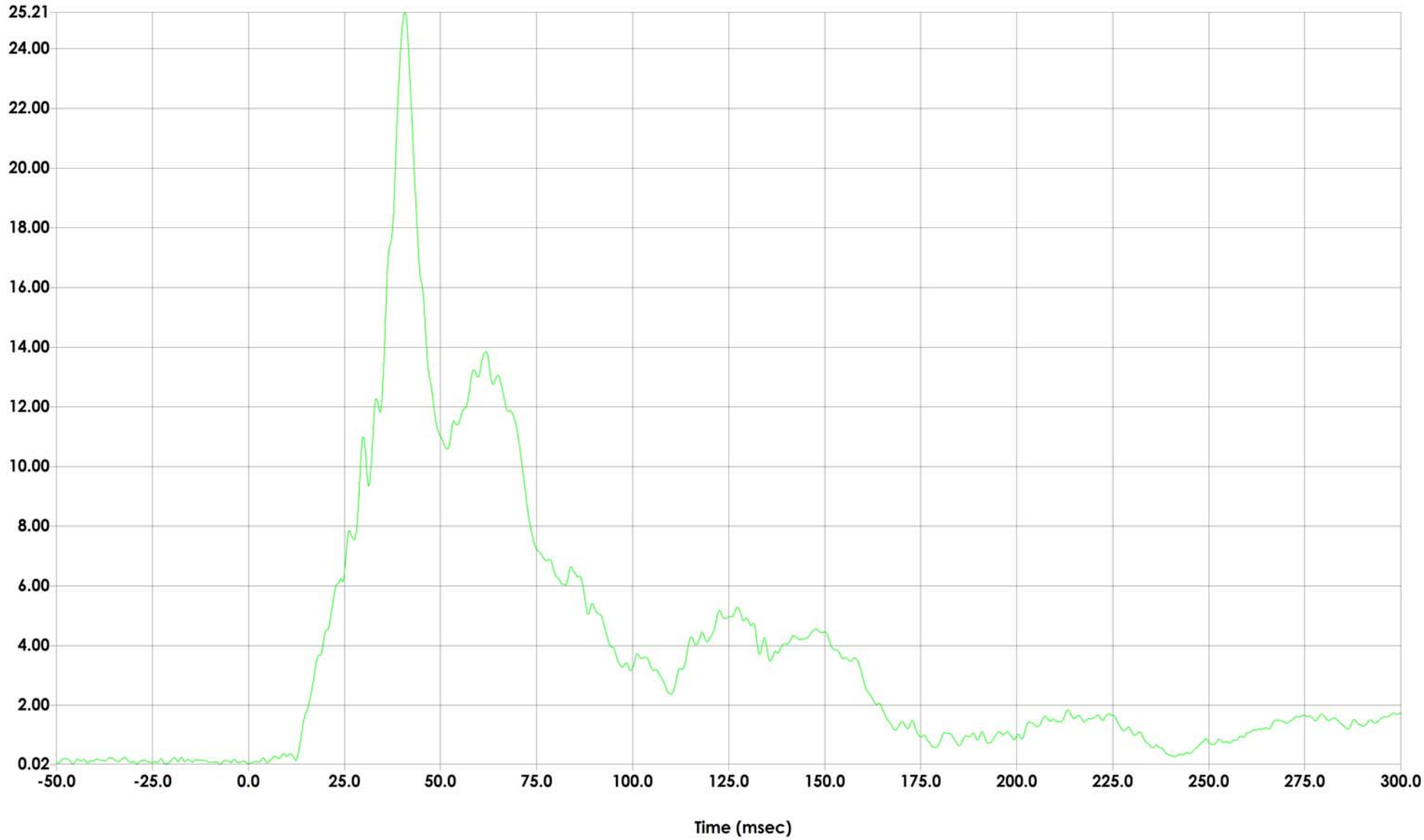


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC180
Plot number	065
Units	G'S

Max	25.21	G'S
	40.72	msec
Min	0.02	G'S
	-7.28	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Lower Spine T12 Resultant Acceleration vs. Time

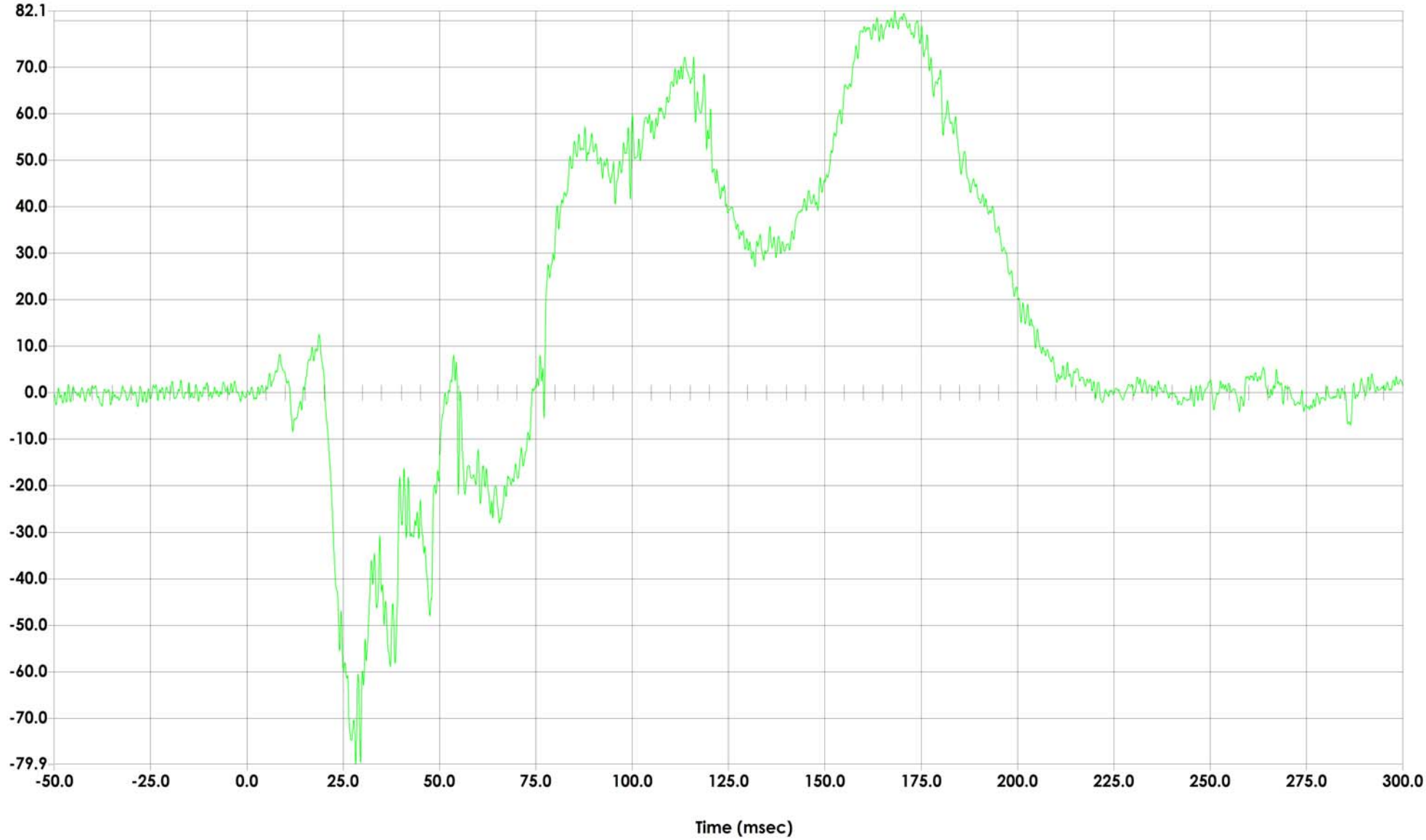


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	031
Units	NWT

Max	82.07	NWT
	168.16	msec
Min	-79.90	NWT
	28.24	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Iliac Force on Impact Side vs. Time

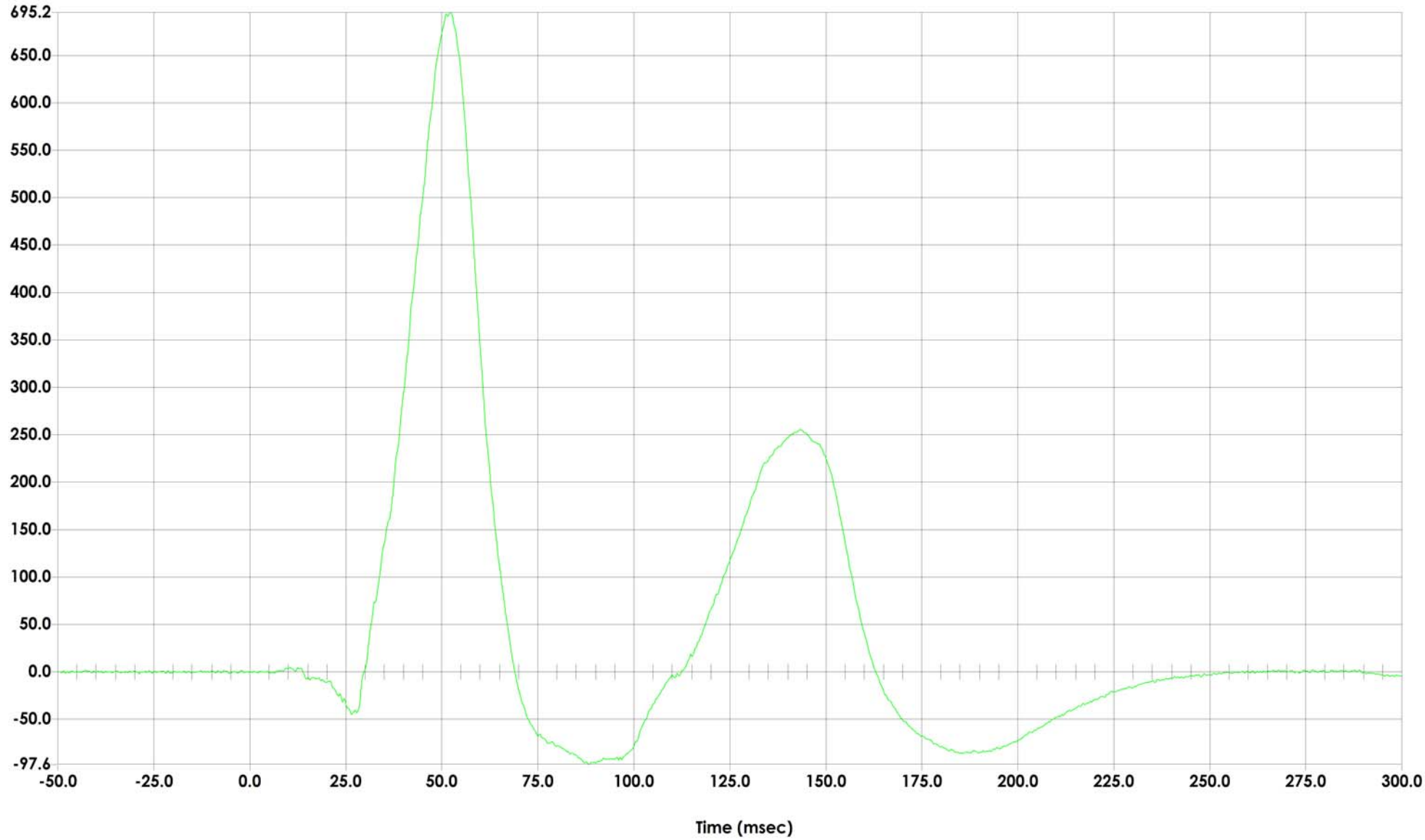


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	032
Units	NWT

Max	695.22	NWT
	52.24	msec
Min	-97.65	NWT
	88.32	msec

MEDICAL COLLEGE OF WISCONSIN

Passenger Acetabulum Force on Impact Side vs. Time

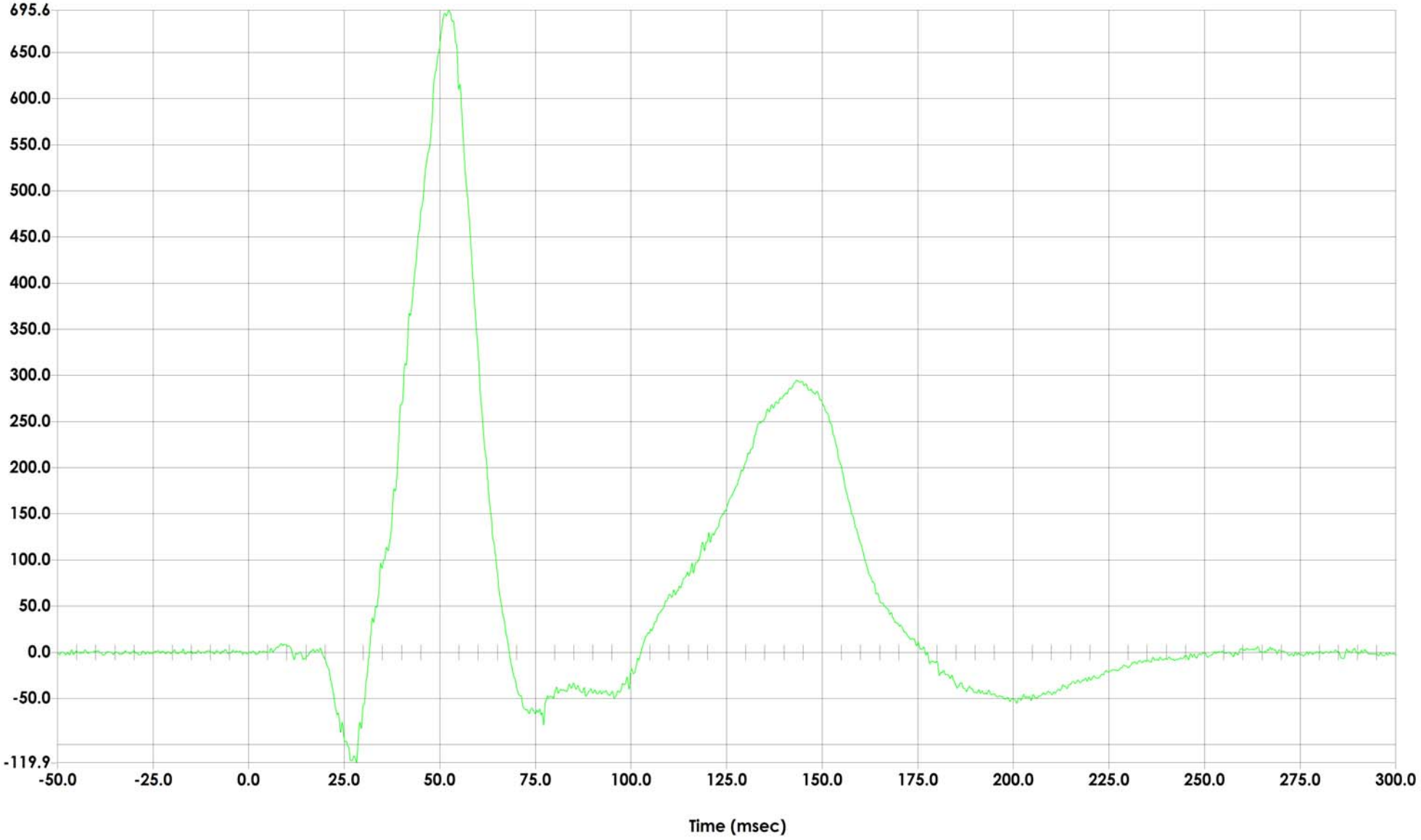


Test ID	MD 0316
Sampling Rate (Hz)	12500
Filter	CFC600
Plot number	066
Units	NWT

Max	695.58	NWT
	52.32	msec
Min	-119.87	NWT
	28.24	msec

MEDICAL COLLEGE OF WISCONSIN

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



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE DATA

TABLE 1
EXTERNAL MEASUREMENTS (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER	SPEC.	PRE		POST	
Date	-	12-4-12		12-18-12	
Sequential Test Number	-	3		4	
		Result	**Pass/Fail**	**Result**	**Pass/Fail**
Temperature (°C)	**20.6-22.2**	22.0	Pass	21.3	Pass
Relative Humidity (%)	**10-70**	34.9	Pass	27.8	Pass
Sitting Height	**900 - 918**	907	Pass	908	Pass
Seat to Shoulder Joint	**558 -572**	563	Pass	568	Pass
Seat to Lower Face of Thoracic Spine Box	**346 -356**	351	Pass	351	Pass
Seat to Hip Joint (Center of Bolt)	**97 - 103**	101	Pass	100	Pass
Sole to Seat, Sitting	**433 - 451**	440	Pass	439	Pass
Head Width	**152 -158**	155	Pass	156	Pass
Shoulder/Arm Width	**461 - 479**	474	Pass	472	Pass
Thorax Width	**322 - 332**	327	Pass	324	Pass
Abdomen Width	**273 - 287**	283	Pass	282	Pass
Pelvis/Lap Width	**359 - 373**	365	Pass	365	Pass
Head Depth	**196 - 206**	202	Pass	202	Pass
Thorax Depth	**262 - 272**	268	Pass	270	Pass
Abdomen Depth	**194 - 204**	200	Pass	202	Pass
Pelvis Depth	**235 - 245**	239	Pass	239	Pass
Back of Buttocks to Hip Joint (Center of Bolt)	**150 - 160**	154	Pass	155	Pass
Back of Buttocks to Front Knee	**597 - 615**	605	Pass	605	Pass

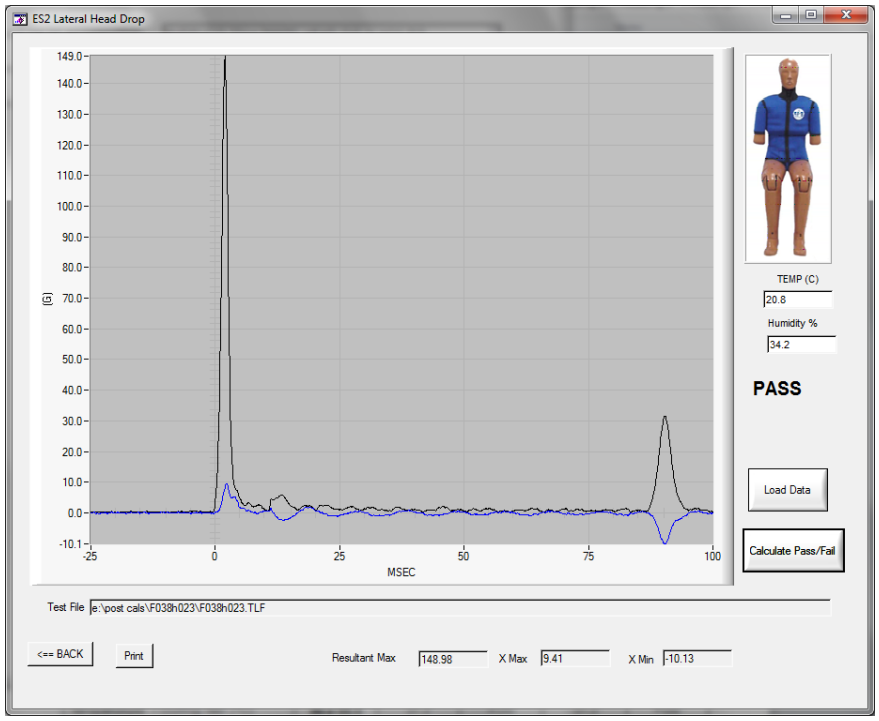
TABLE 2
HEAD DROP TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Head Assembly Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.8	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.2	Pass	35.7	Pass
Peak Head Resultant Acceleration (G)		**125-155**	148.9	Pass	149.9	Pass
Peak Head X Acceleration (G)		**<15**	9.4	Pass	3.9	Pass
Unimodal (Oscillation) (Yes/No)		**<15%**	Yes	Pass	Yes	Pass

TABLE 2
HEAD DROP TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

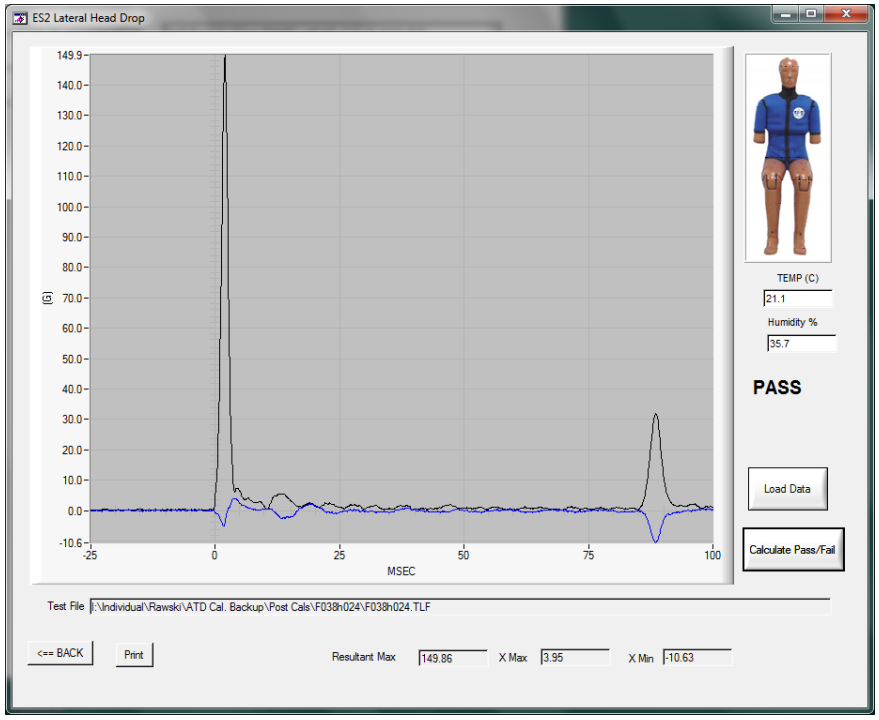


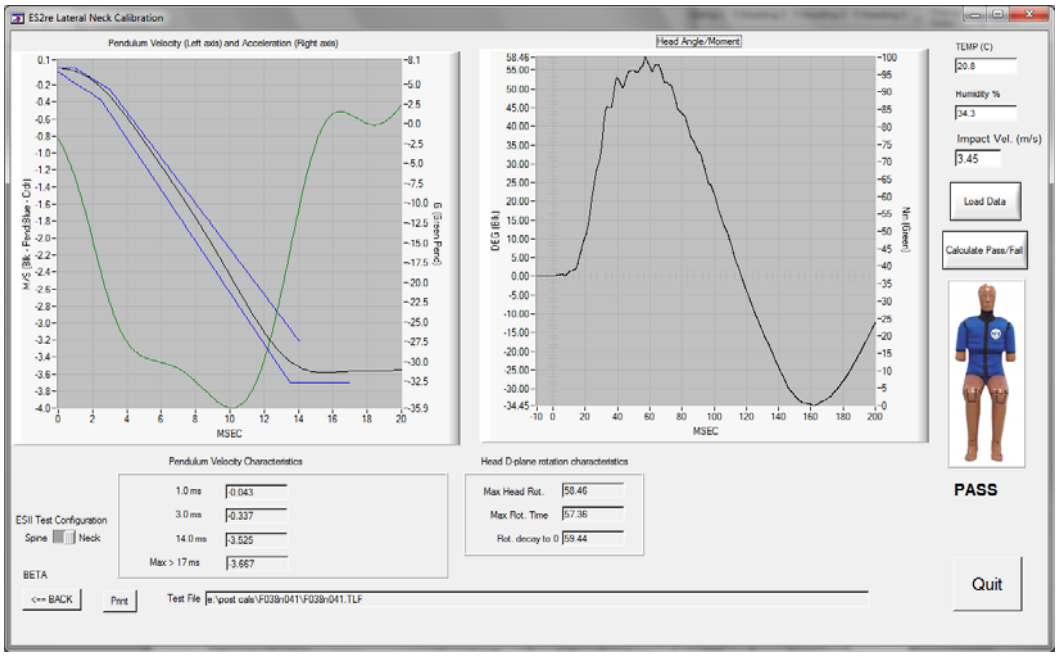
TABLE 3
NECK PENDULUM TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Neck Assembly Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.8	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
Pendulum Velocity (m/s)		**3.3-3.5**	3.45	Pass	3.45	Pass
Pendulum Velocity Corridors (m/s)	0-1.0 ms	**(-0.05)-0.00**	-0.04	Pass	-0.05	Pass
	2.5-3.0 ms	**(-0.375) - (-0.25)**	-0.34	Pass	-0.34	Pass
	13.5-14.0 ms	**(-3.7) - (-3.20)**	-3.53	Pass	-3.52	Pass
	Max > 17 ms	**-3.7**	-3.67	Pass	-3.67	Pass
Max D-Plane rotation (deg)		**49-59**	58.5	Pass	57.1	Pass
Time of Max D-Plane Rotation (ms)		**54-66**	57.4	Pass	57.6	Pass
Time of Moment Decay from Peak to 0 Nm (ms)		**53-88**	59.4	Pass	59.8	Pass

TABLE 3
NECK PENDULUM TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

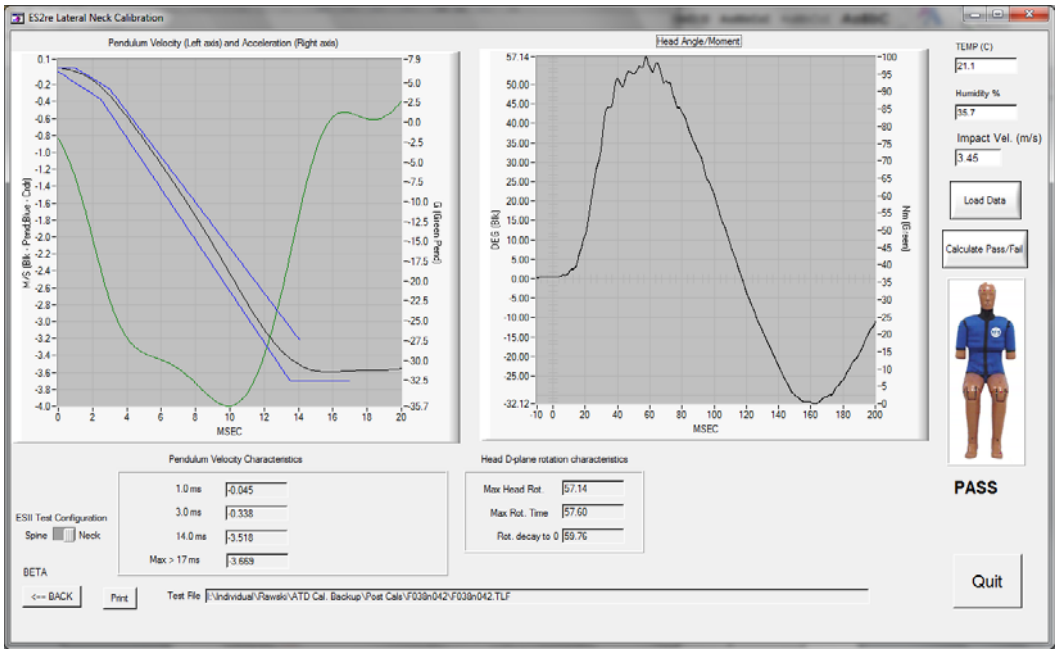


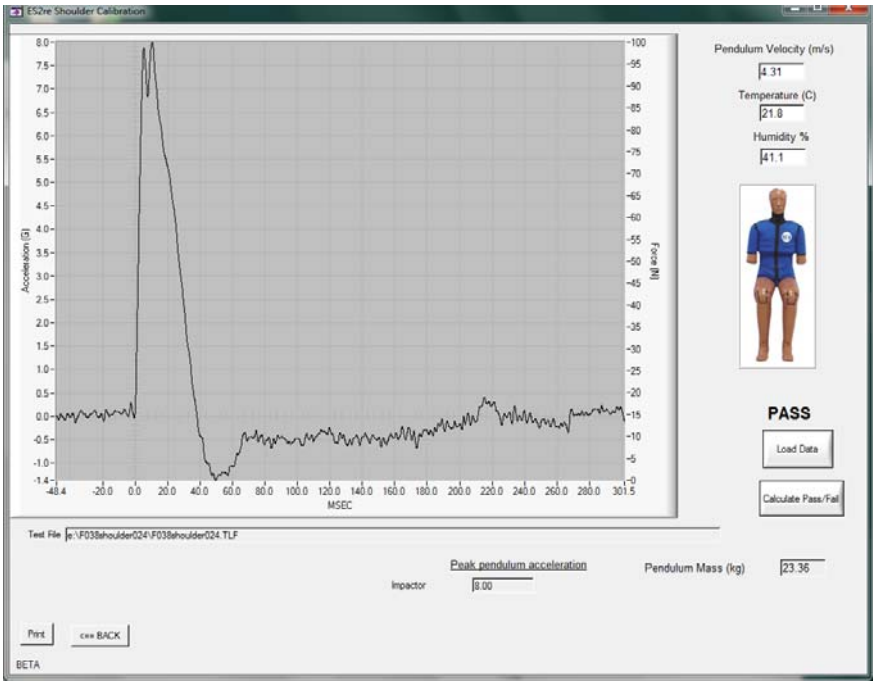
TABLE 4
SHOULDER IMPACT TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-4-12		12-18-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	21.9	Pass	20.9	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	42.3	Pass	26.8	Pass
	Min		41.4	Pass	25.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.8	Pass	20.8	Pass
Humidity – During Test (%)		**10-70**	41.1	Pass	26.8	Pass
Pendulum Velocity (m/s)		**4.2-4.4**	4.31	Pass	4.31	Pass
Peak Impactor Acceleration (G)		**7.5-10.5**	8.00	Pass	8.4	Pass

TABLE 4
SHOULDER IMPACT TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

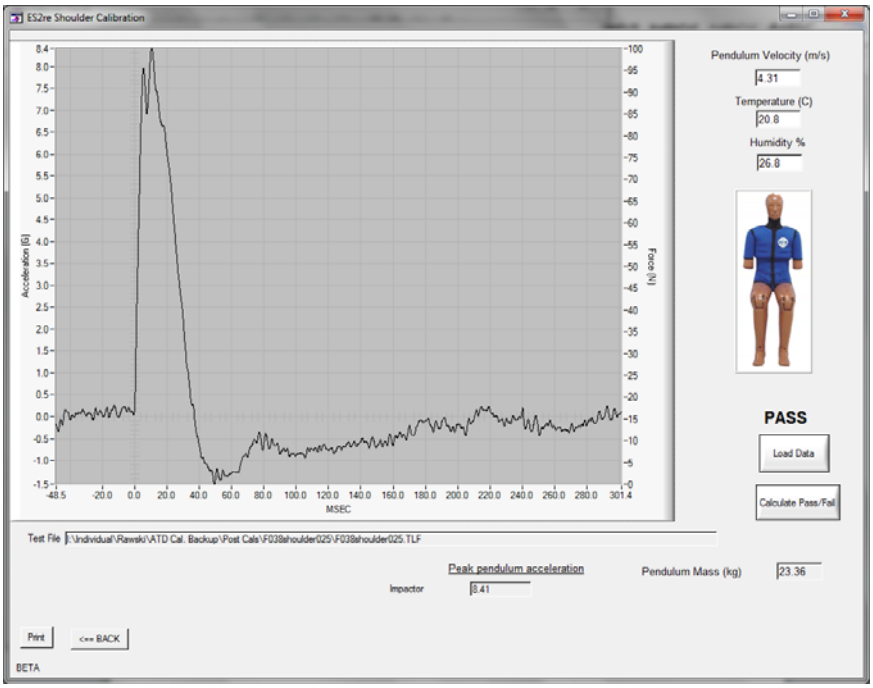


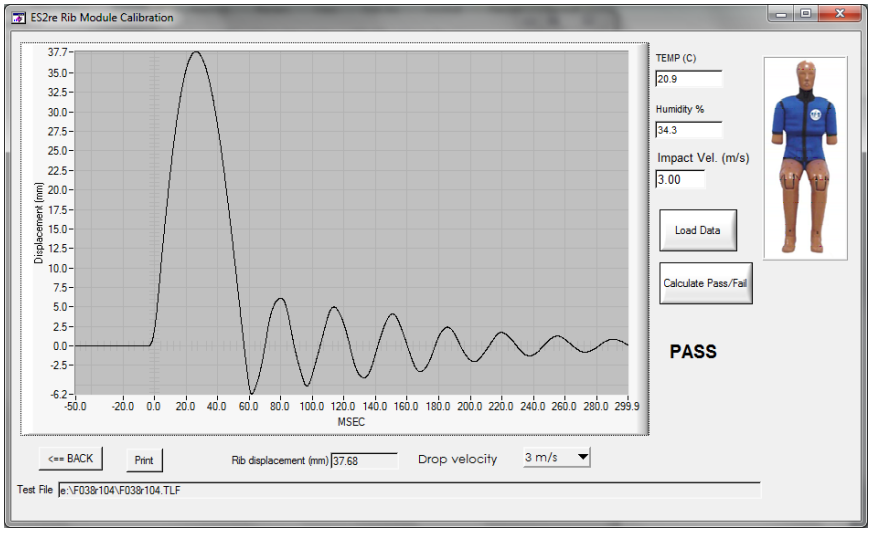
TABLE 5
THORAX – UPPER RIB DROP TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Upper Rib Drop Module Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
1st Test - Drop Height 459 ± 5 mm		**36-40**	37.7	Pass	38.3	Pass
2nd Test - Drop Height 815 ± 5 mm		**46-51**	49.2	Pass	49.5	Pass

TABLE 5
THORAX – UPPER RIB DROP TEST (ES-IIre) (CONTINUED)
3.00 m/s

PRE-TEST



POST-TEST

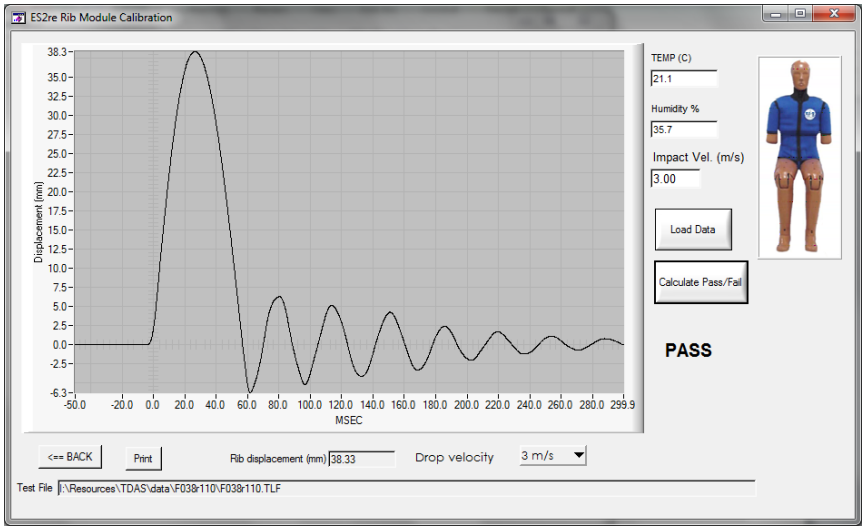
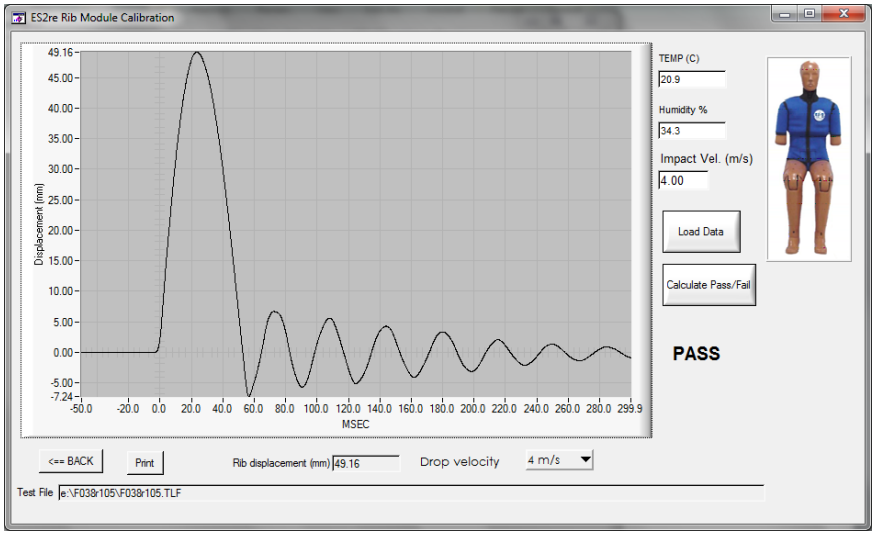


TABLE 5
THORAX – UPPER RIB DROP TEST (ES-IIre) (CONTINUED)
4.00 m/s

PRE-TEST



POST-TEST

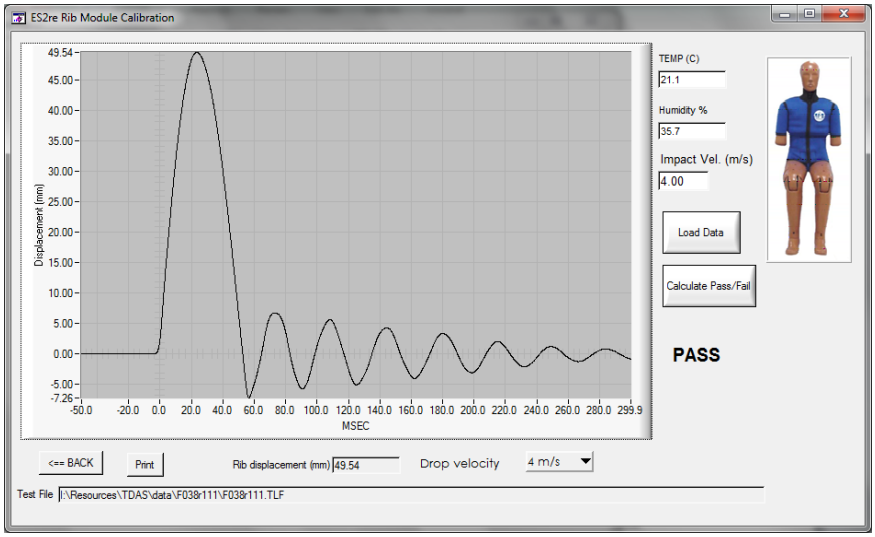


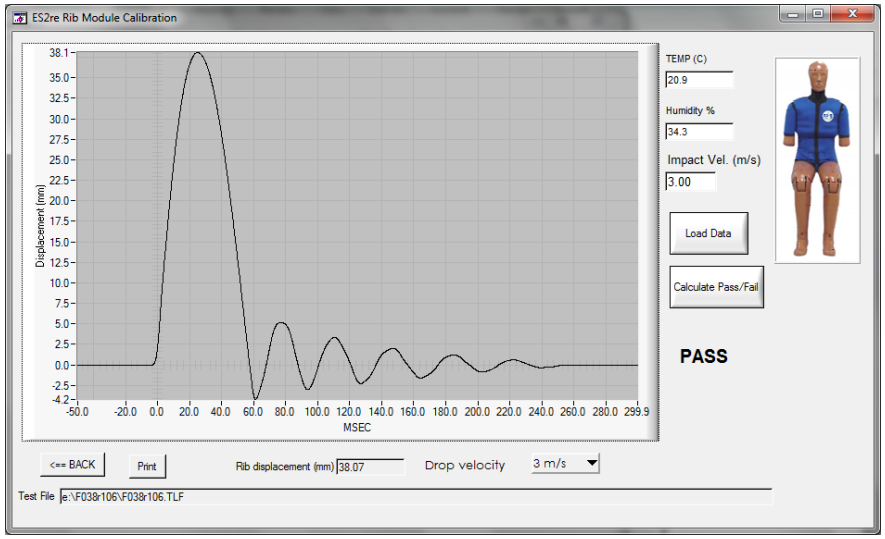
TABLE 6
THORAX – MIDDLE RIB DROP TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Middle Rib Drop Module Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
1st Test - Drop Height 459 ± 5 mm		**36-40**	38.1	Pass	38.4	Pass
2nd Test - Drop Height 815 ± 5 mm		**46-51**	49.9	Pass	49.8	Pass

TABLE 6
THORAX – MIDDLE RIB DROP TEST (ES-IIre) (CONTINUED)
3.00 m/s

PRE-TEST



POST-TEST

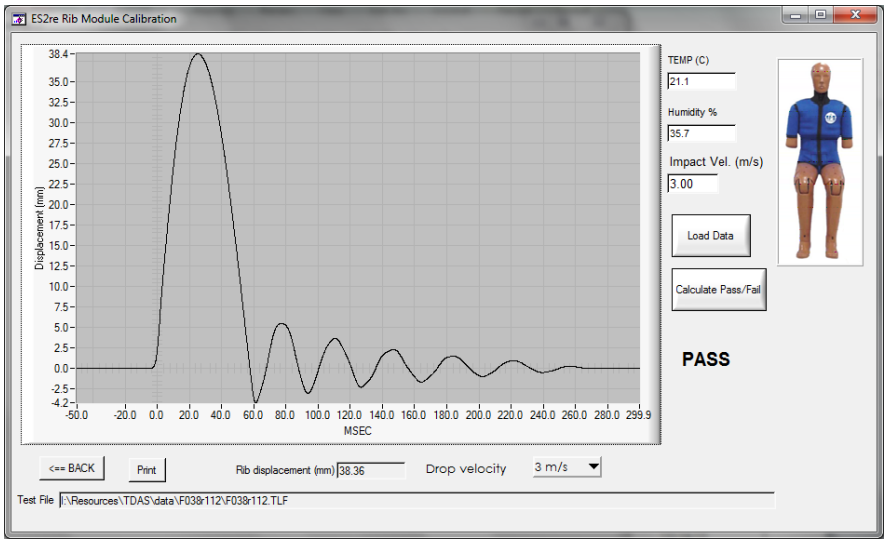
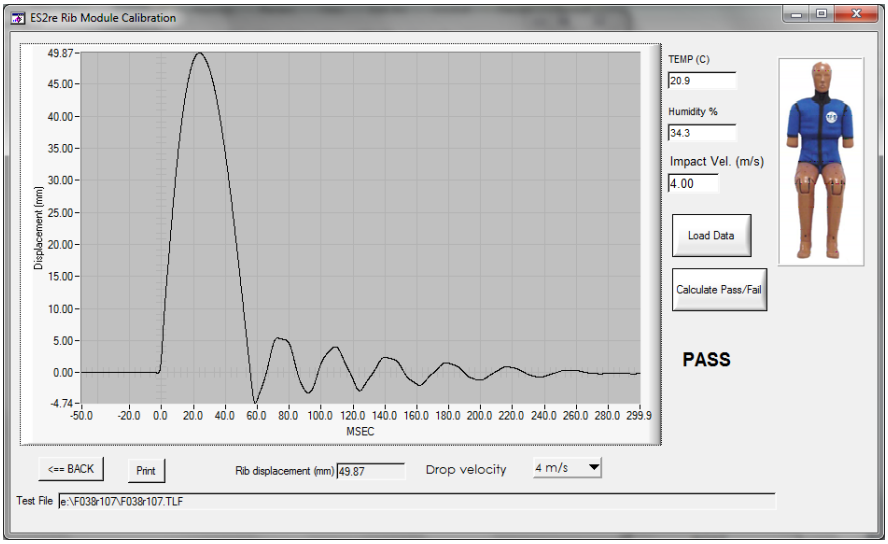


TABLE 6
THORAX – MIDDLE RIB DROP TEST (ES-IIre) (CONTINUED)
4.00 m/s

PRE-TEST



POST-TEST

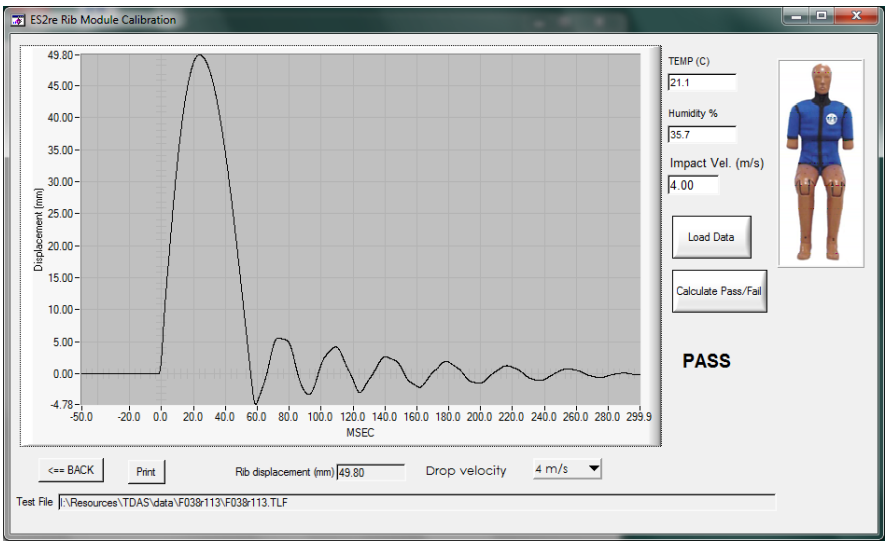


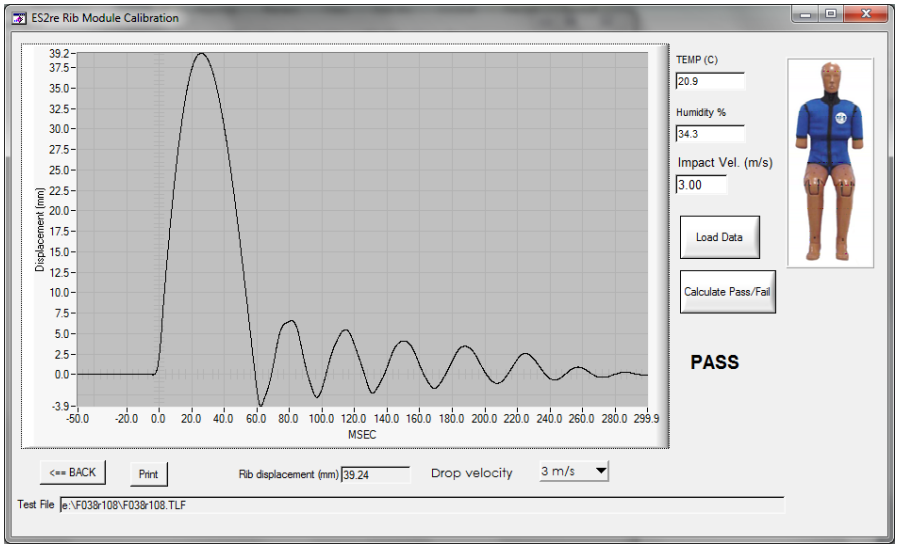
TABLE 7
THORAX – LOWER RIB DROP TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Lower Rib Drop Module Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		20.6-22.2	20.9	Pass	21.1	Pass
Humidity – During Test (%)		10-70	34.3	Pass	35.7	Pass
1st Test - Drop Height 459 ± 5 mm		36-40	39.2	Pass	39.8	Pass
2nd Test - Drop Height 815 ± 5 mm		46-51	49.9	Pass	50.2	Pass

TABLE 7
THORAX – LOWER RIB DROP TEST (ES-IIre) (CONTINUED)
3.00 m/s

PRE-TEST



POST-TEST

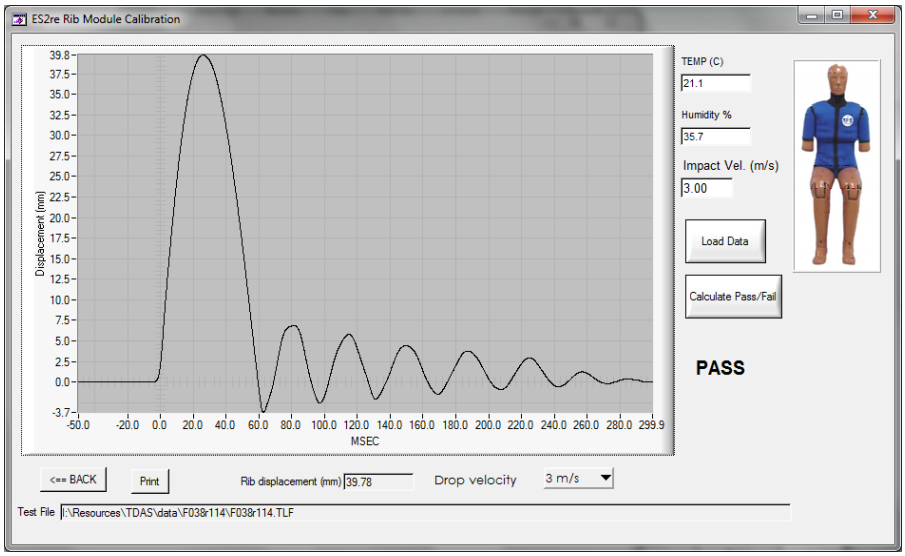
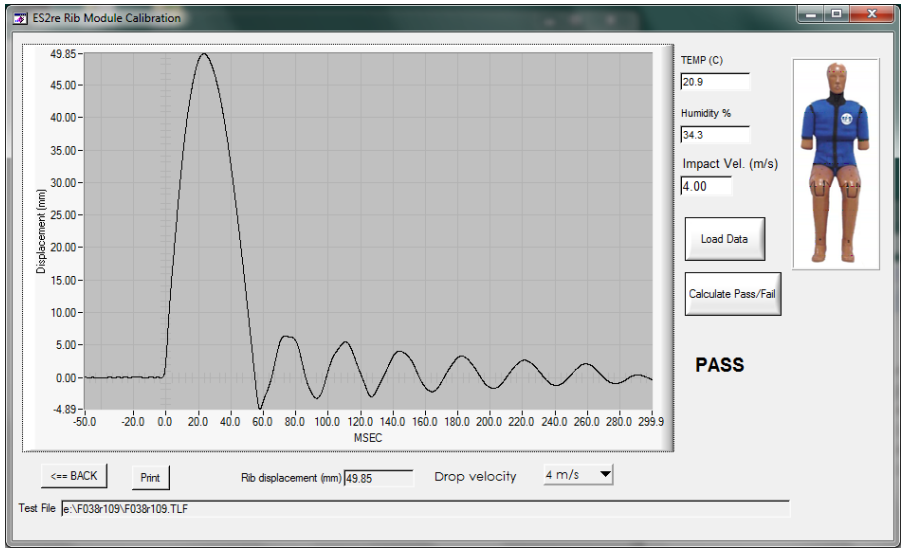


TABLE 7
THORAX – LOWER RIB DROP TEST (ES-IIre) (CONTINUED)
4.00 m/s

PRE-TEST



POST-TEST

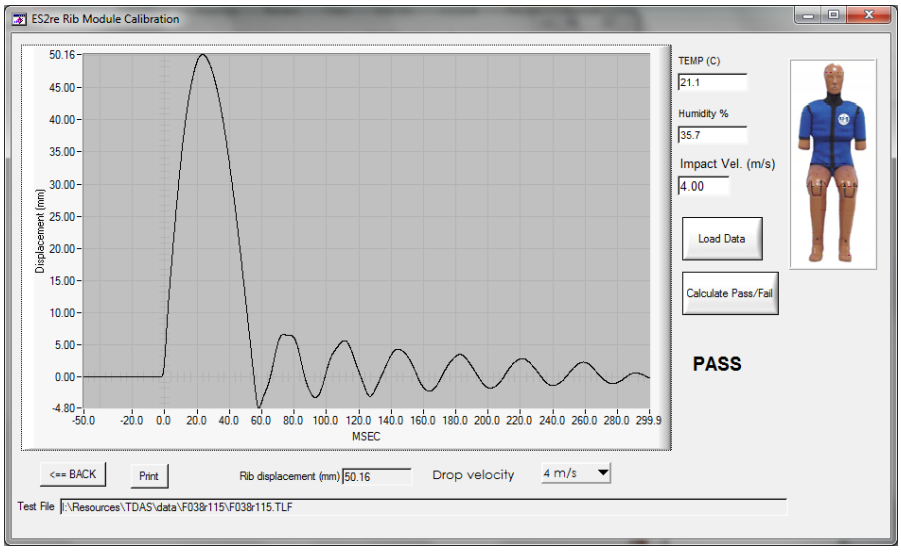


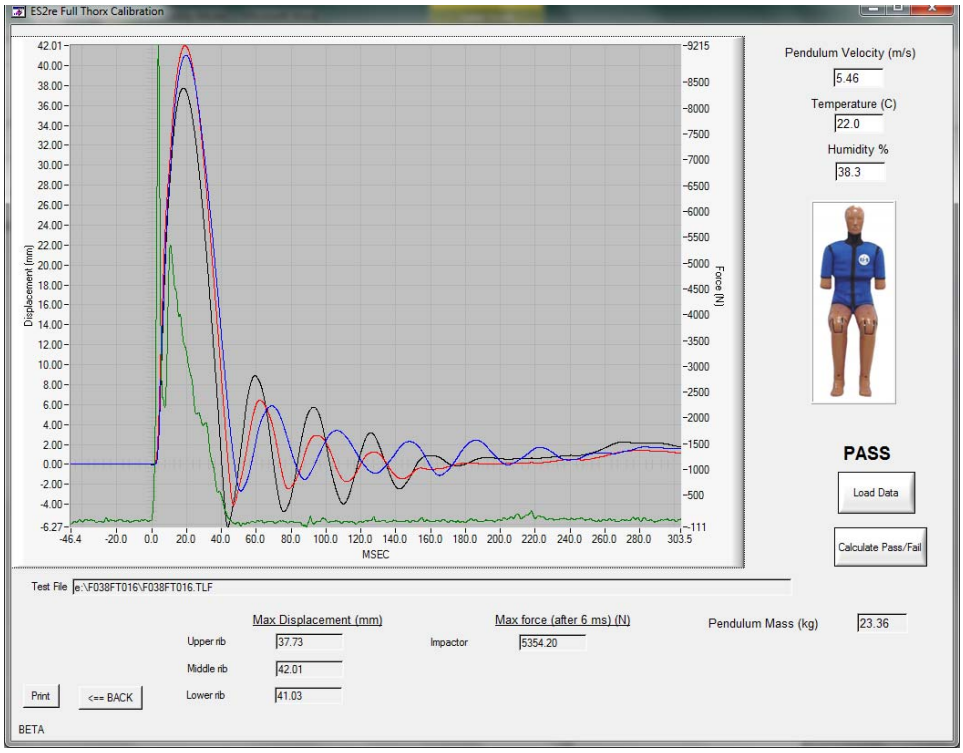
TABLE 8
THORAX – FULL BODY IMPACT TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-4-12		12-18-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	22.0	Pass	21.0	Pass
	Min		21.4	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	41.4	Pass	27.0	Pass
	Min		35.2	Pass	25.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	22.0	Pass	21.0	Pass
Humidity – During Test (%)		**10-70**	38.3	Pass	27.0	Pass
Peak Impactor Velocity (m/s)		**5.4-5.6**	5.46	Pass	5.46	Pass
Peak Upper Rib Deflection (mm)		**34-41**	37.7	Pass	37.2	Pass
Peak Middle Rib Deflection (mm)		**37-45**	42.0	Pass	41.9	Pass
Peak Lower Rib Deflection (mm)		**37-44**	41.0	Pass	41.6	Pass
Peak Impactor Force (>6ms) (kN)		**5.1-6.2**	5.4	Pass	5.7	Pass

TABLE 8
THORAX – FULL BODY IMPACT TEST (ES-IIre)

PRE-TEST



POST-TEST

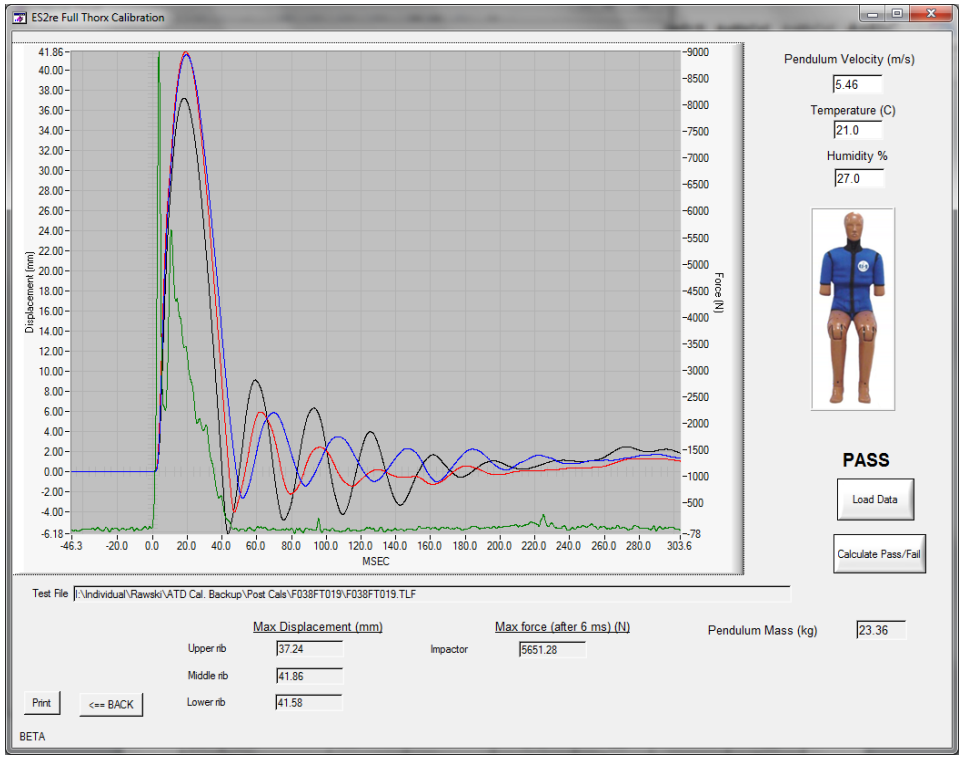


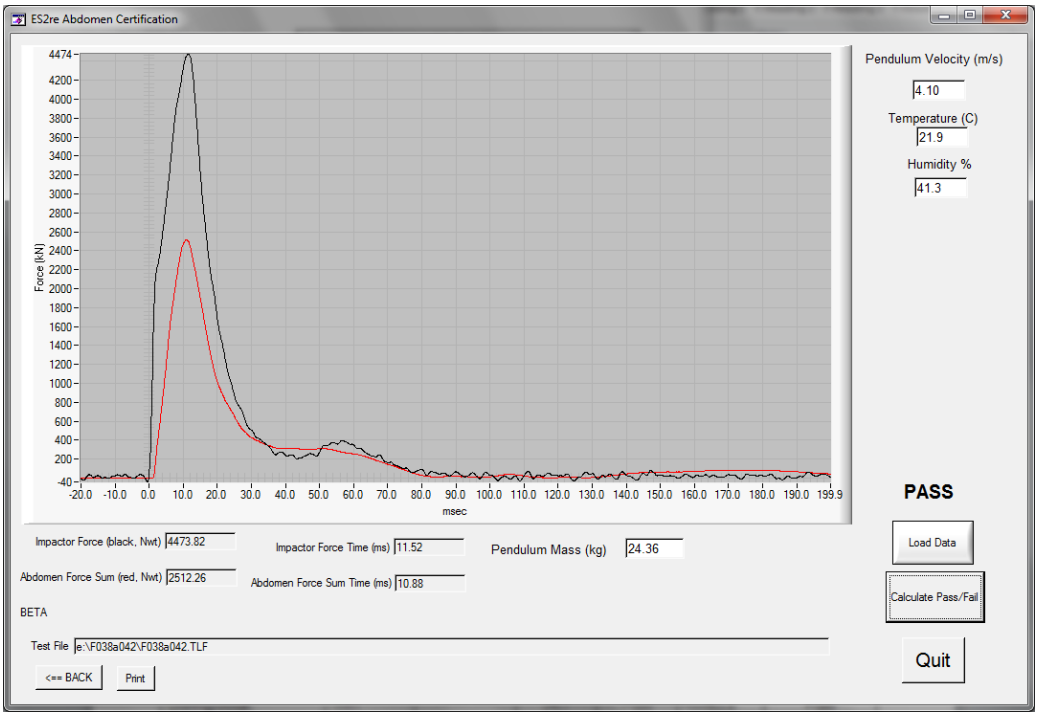
TABLE 9
ABDOMEN IMPACT TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-4-12		12-18-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	22.0	Pass	21.1	Pass
	Min		21.4	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	41.4	Pass	27.3	Pass
	Min		35.2	Pass	25.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	41.3	Pass	27.3	Pass
Peak Impactor Velocity (m/s)		**3.9-4.1**	4.1	Pass	4.1	Pass
Sum of Abdominal Forces (kN)		**2.2-2.7**	2.5	Pass	2.6	Pass
Time of Abdominal Forces (ms)		**10-12.3**	10.9	Pass	10.7	Pass
Peak Impactor Force (kN)		**4.0-4.8**	4.5	Pass	4.5	Pass
Time of Peak Impactor Force (ms)		**10.6-13.0**	11.5	Pass	10.8	Pass

TABLE 9
ABDOMEN IMPACT TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

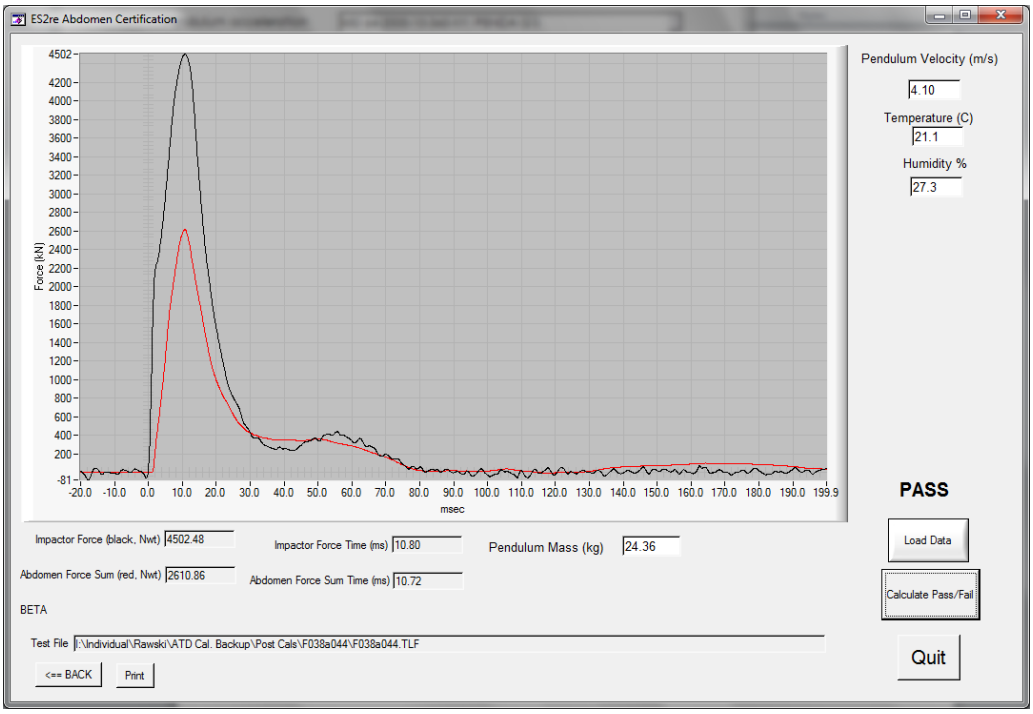


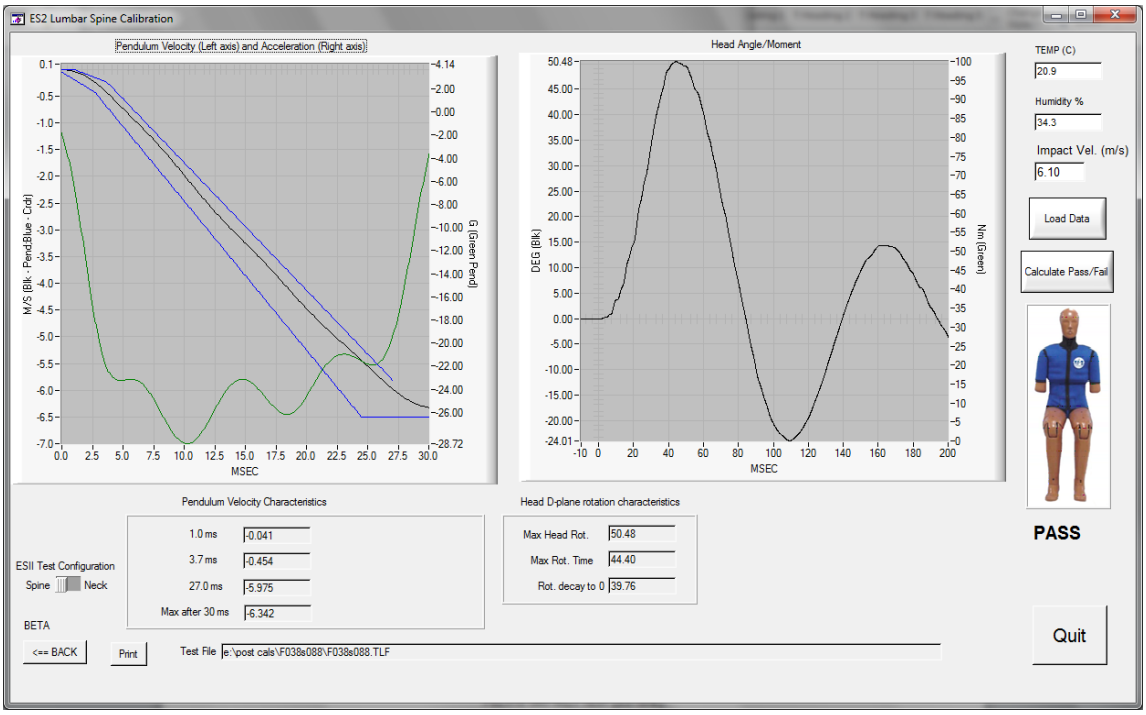
TABLE 10
LUMBAR SPINE FLEXION TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Lumbar Spine Assembly Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	31.2	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
Pendulum Velocity (m/s)		**5.95-6.15**	6.10	Pass	6.10	Pass
Pendulum Velocity Corridors (m/s)	0-1.0 ms	**(-0.05)-0.00**	-0.04	Pass	-0.04	Pass
	2.7-3.7 ms	**(-0.425) - (-0.24)**	-0.45	Pass	-0.47	Pass
	24.5-27.0 ms	**(-6.50) - (-5.80)**	-5.9	Pass	-6.2	Pass
	Max after 30 ms	**-6.50**	-6.3	Pass	-6.4	Pass
Maximum Headform Flexion Angle (deg)		**45-55**	50.5	Pass	47.4	Pass
Time at Maximum Flexion Angel (ms)		**39-53**	44.4	Pass	44.9	Pass
Time of Decay to Zero Angle from Peak (ms)		**37-57**	39.8	Pass	37.7	Pass

TABLE 10
LUMBAR SPINE FLEXION TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

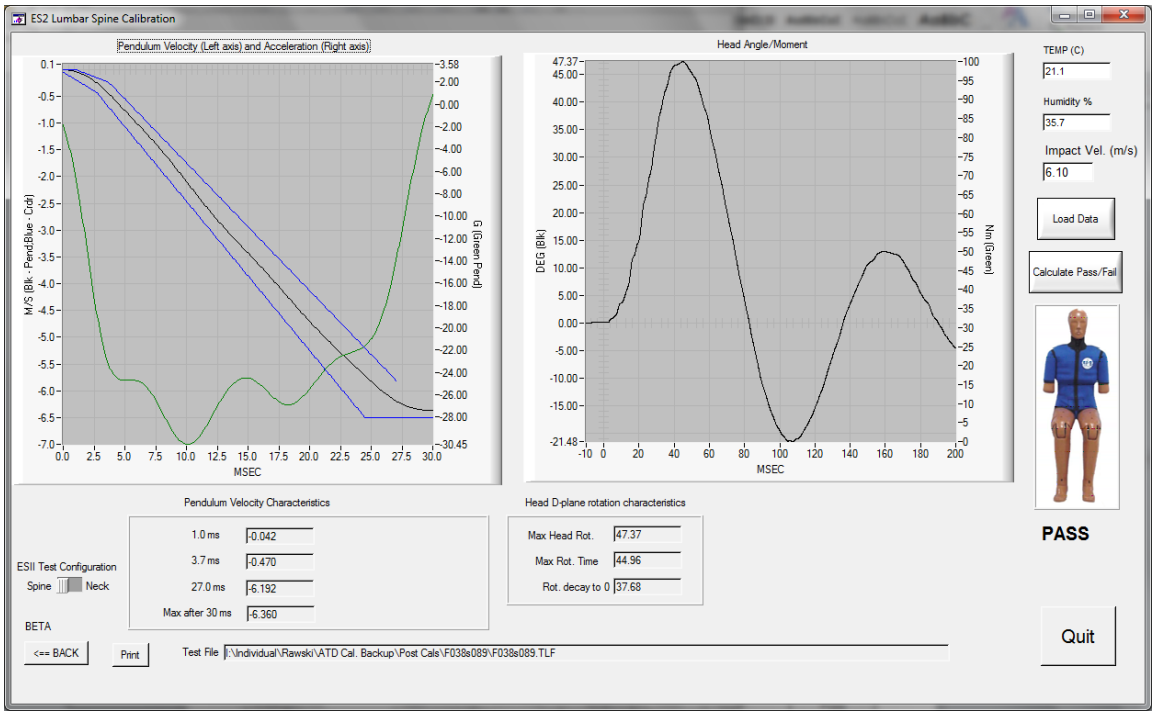


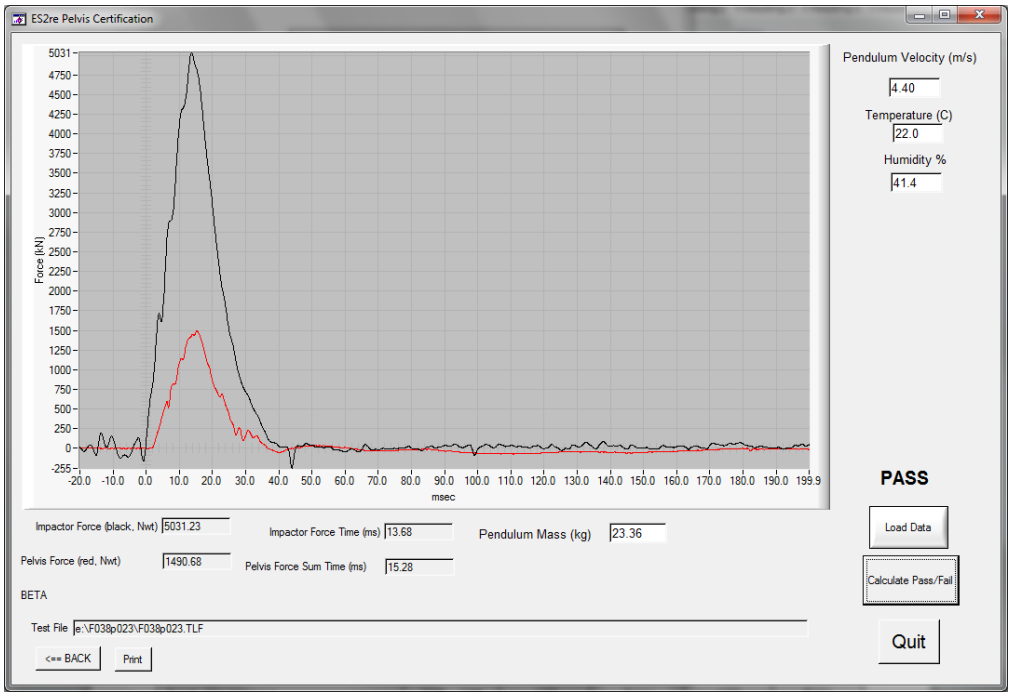
TABLE 11
PELVIS IMPACT TEST (ES-IIre)

ES-IIre Serial Number F038 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-4-12		12-18-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature (°C) – During Soak	Max	**20.6-22.2**	22.0	Pass	21.3	Pass
	Min		21.4	Pass	20.8	Pass
Humidity (%) – During Soak	Max	**10.0-70.0**	41.4	Pass	27.8	Pass
	Min		35.2	Pass	25.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	22.0	Pass	21.3	Pass
Humidity – During Test (%)		**10-70**	41.4	Pass	27.8	Pass
Pendulum Velocity (m/s)		**4.2-4.4**	4.4	Pass	4.4	Pass
Peak Impactor Force (kN)		**4.7 – 5.4**	5.0	Pass	4.9	Pass
Time at Peak Force (ms)		**11.8-16.1**	13.7	Pass	14.6	Pass
Peak Pubic Symphysis Force (kN)		**1.23-1.59**	1.5	Pass	1.5	Pass
Time at Peak Force (ms)		**12.2-17.0**	15.3	Pass	15.9	Pass

TABLE 11
PELVIS IMPACT TEST (ES-IIre) (CONTINUED)

PRE-TEST



POST-TEST

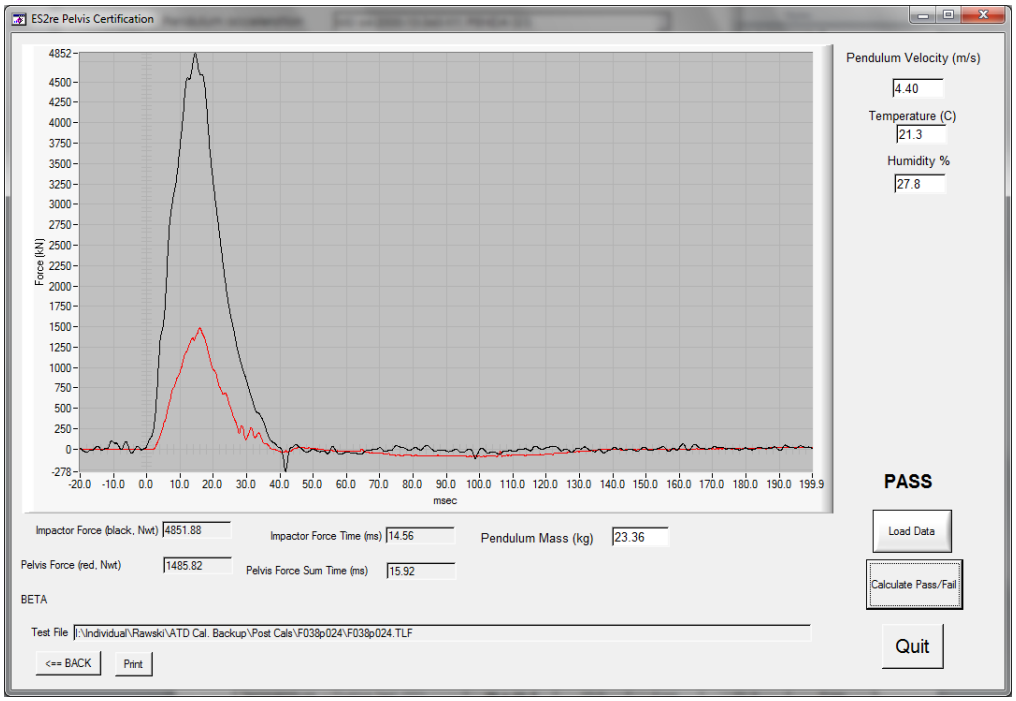


TABLE 1
EXTERNAL MEASUREMENTS (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER	SPEC.	PRE		POST	
Date	-	12-4-12		12-17-12	
Sequential Test Number	-	3		4	
		Result	**Pass/Fail**	**Result**	**Pass/Fail**
Temperature (°C)	**20.6-22.2**	22.0	Pass	20.9	Pass
Relative Humidity (%)	**10-70**	35.2	Pass	39.1	Pass
Sitting Height	**772 – 788**	776	Pass	778	Pass
Shoulder Pivot Height	**437 – 453**	444	Pass	444	Pass
H-Point Height	**79 – 89**	85	Pass	87	Pass
H-Point from Seat Back	**141 – 151**	148	Pass	145	Pass
Shoulder Pivot from Backline	**97 – 107**	103	Pass	103	Pass
Thigh Clearance	**119 – 135**	125	Pass	123	Pass
Head Breadth	**140 – 148**	144	Pass	146	Pass
Head Back from Backline	**40 – 46**	42	Pass	45	Pass
Head Depth	**178 – 188**	183	Pass	181	Pass
Head Circumference	**541 – 551**	543	Pass	543	Pass
Buttock to Knee Length	**514 – 540**	523	Pass	527	Pass
Popliteal Height	**343 – 369**	351	Pass	345	Pass
Knee Pivot to Floor Height	**392 – 409**	405	Pass	403	Pass
Buttock Popliteal Length	**416 – 442**	427	Pass	425	Pass
Chest Depth w/o Jacket	**195 – 211**	208	Pass	205	Pass
Foot Length	**216 – 232**	222	Pass	221	Pass
Hip Breadth	**313 – 323**	320	Pass	320	Pass
Arm Length	**249 – 259**	256	Pass	252	Pass
Knee Joint to Seat Back	**477 – 493**	485	Pass	485	Pass
Shoulder Width	**341 – 357**	352	Pass	351	Pass
Foot Width	**78 – 94**	84	Pass	83	Pass
Chest Circumference w/Jacket	**851 – 881**	876	Pass	875	Pass
Waist Circumference	**761 – 791**	784	Pass	787	Pass

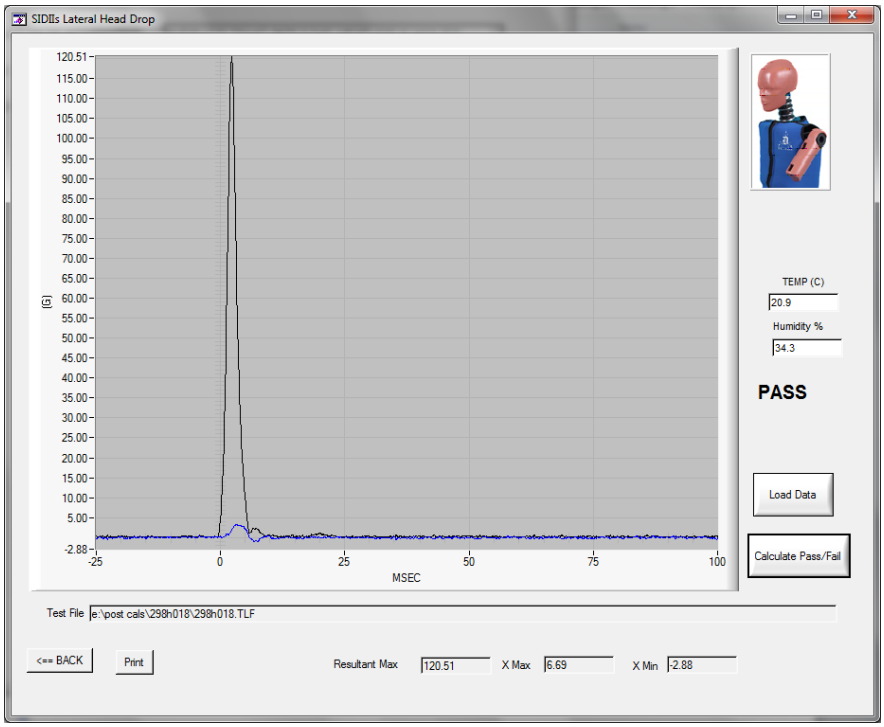
TABLE 2
HEAD DROP TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Head Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	34.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
Peak Head Resultant Acceleration (G)		**115-137**	120.5	Pass	120.8	Pass
Peak Head X Acceleration (G)		**<15**	6.7	Pass	3.9	Pass
Unimodal (Oscillation) (Yes/No)		**<15%**	Yes	Pass	Yes	Pass

TABLE 2
HEAD DROP TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

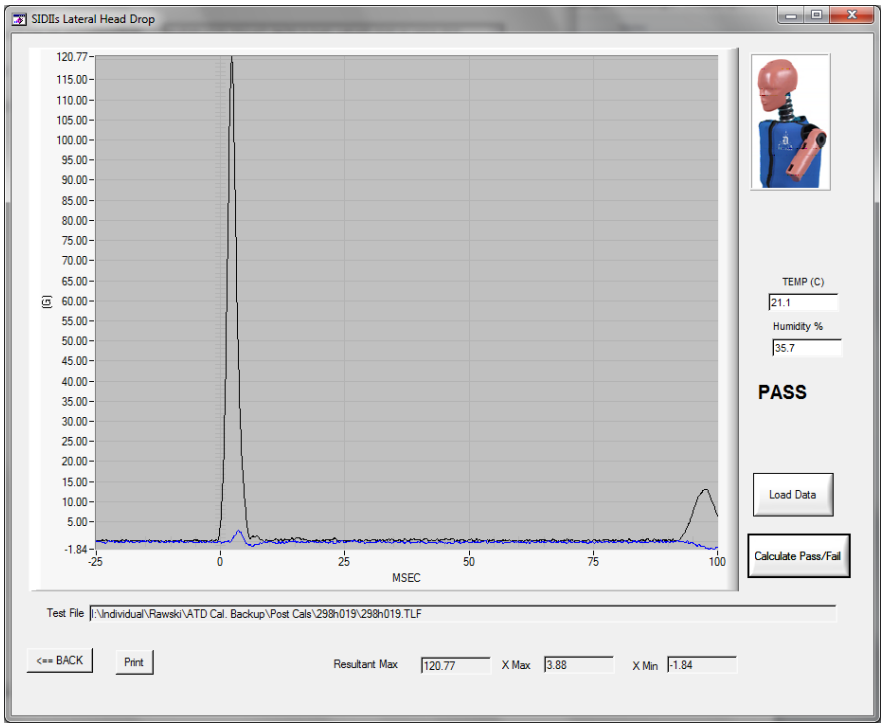


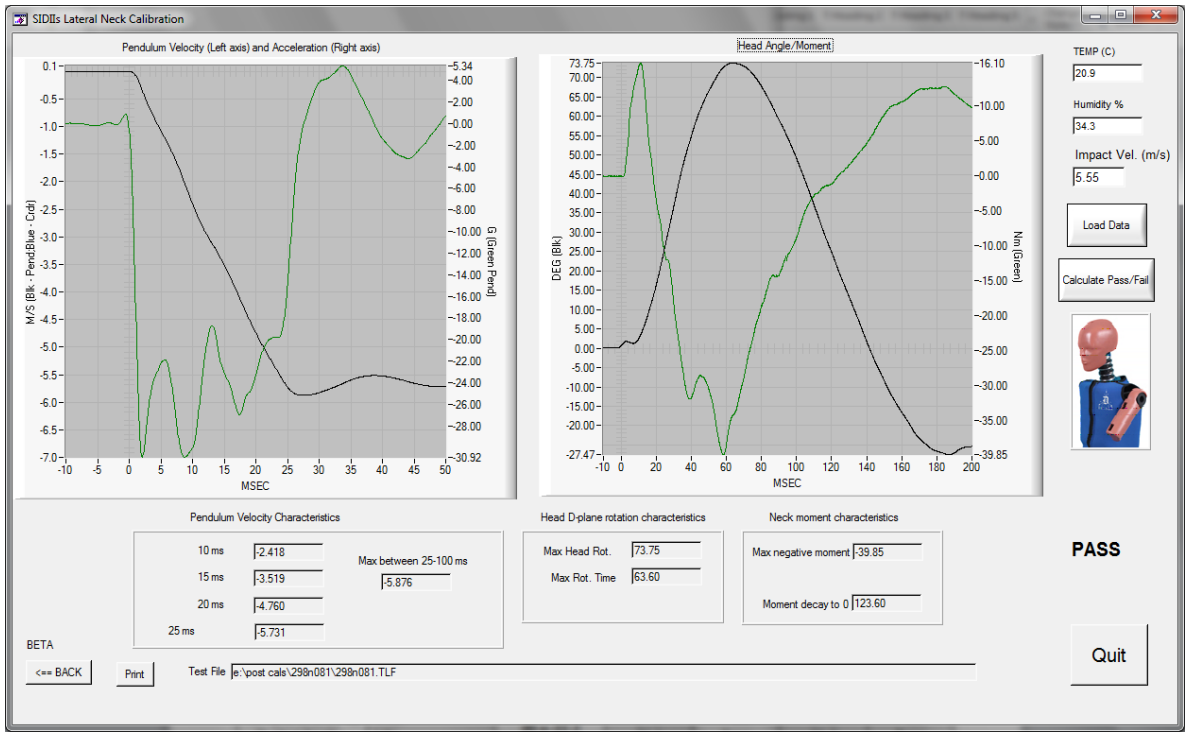
TABLE 3
LATERAL NECK PENDULUM TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-1-12		12-14-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Neck Assembly Soak Time (min)		**≥ 240**	240	Pass	240	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	20.9	Pass	21.1	Pass
	Min		20.8	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	34.3	Pass	35.7	Pass
	Min		34.2	Pass	34.1	Pass
Temperature – During Test (°C)		**20.6-22.2**	20.9	Pass	21.1	Pass
Humidity – During Test (%)		**10-70**	34.3	Pass	35.7	Pass
Pendulum Velocity (m/s)		**5.51-5.63**	5.55	Pass	5.55	Pass
Pendulum Deceleration (G)	10 ms	**2.20-2.80**	2.42	Pass	2.42	Pass
	15 ms	**3.30-4.10**	3.52	Pass	3.61	Pass
	20 ms	**4.40-5.40**	4.76	Pass	4.91	Pass
	25 ms	**5.40-6.10**	5.73	Pass	5.79	Pass
	25-100 ms	**5.50-6.20**	5.88	Pass	5.85	Pass
Maximum D-Plane rotation (deg)		**71-81**	73.8	Pass	73.5	Pass
Time of Maximum D-Plane Rotation (ms)		**50-70**	63.6	Pass	65.2	Pass
Peak Occ. Condyle Moment (Nm)		**36-44**	39.9	Pass	39.8	Pass
Time of Moment Decay (ms)		**102-126**	123.6	Pass	122.5	Pass

TABLE 3
LATERAL NECK PENDULUM TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

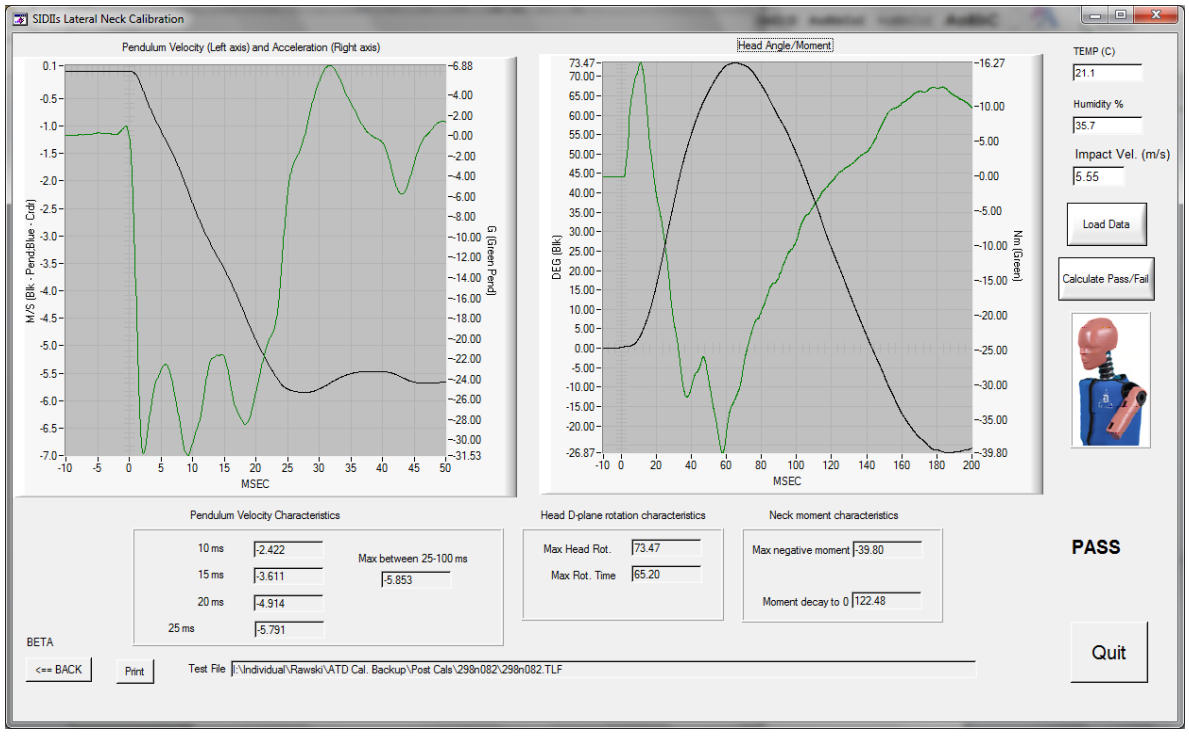


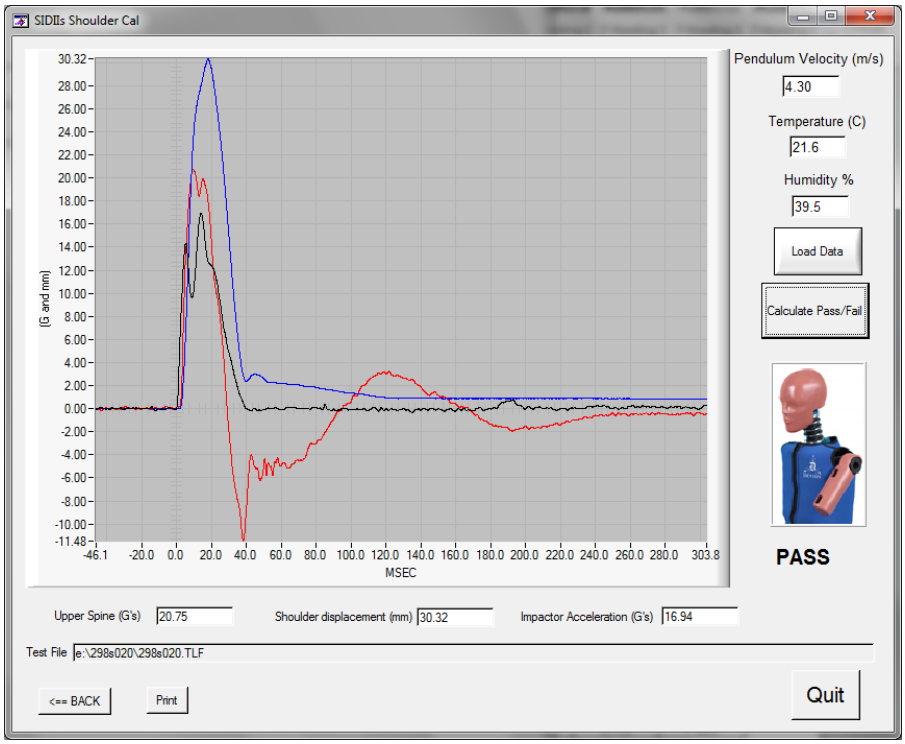
TABLE 4
SHOULDER IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.6	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	39.5	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.6	Pass	21.3	Pass
Relative Humidity – During Test (%)		**10-70**	39.5	Pass	28.1	Pass
Impactor Velocity (m/s)		**4.2-4.4**	4.30	Pass	4.30	Pass
Peak Shoulder Deflection (mm)		**28-37**	30.3	Pass	31.7	Pass
Peak Lateral Spine (T1) Acceleration Y (G)		**17-22**	20.8	Pass	20.9	Pass
Peak Impactor Acceleration (G)		**13-18**	16.9	Pass	17.4	Pass

TABLE 4
SHOULDER IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

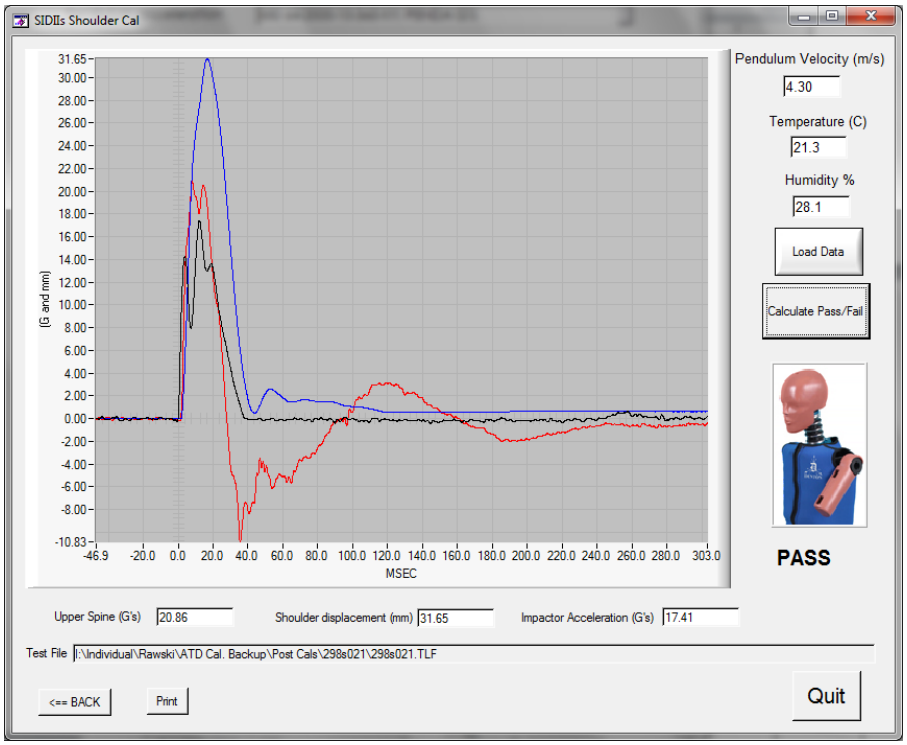


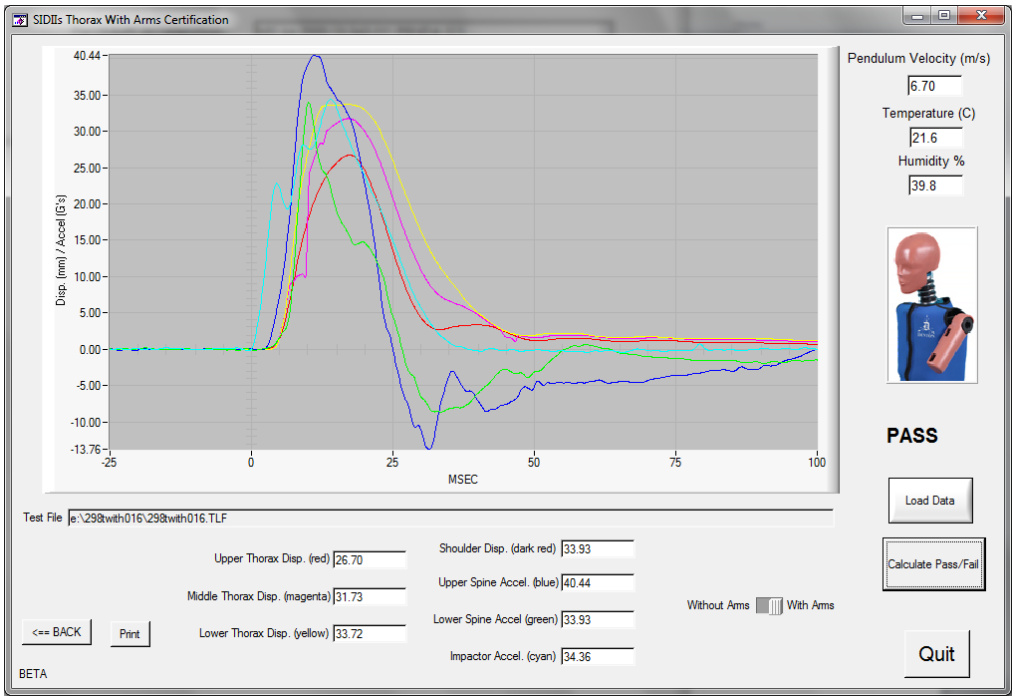
TABLE 5
THORAX (WITH ARM) IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.6	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	39.8	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.6	Pass	21.3	Pass
Relative Humidity – During Test (%)		**10-70**	39.8	Pass	28.1	Pass
Impactor Velocity (m/s)		**6.6-6.8**	6.70	Pass	6.7	Pass
Peak Shoulder Deflection (mm)		**31-40**	33.9	Pass	35.6	Pass
Peak Upper Rib Deflection (mm)		**25-32**	26.7	Pass	28.0	Pass
Peak Middle Rib Deflection (mm)		**30-36**	31.7	Pass	31.4	Pass
Peak Lower Rib Deflection (mm)		**32-38**	33.7	Pass	32.5	Pass
Peak Upper Spine (T1) Acceleration Y (G)		**34-43**	40.4	Pass	40.1	Pass
Peak Lower Spine (T12) Acceleration Y (G)		**29-37**	33.9	Pass	35.6	Pass
Peak Impactor Acceleration (G)		**30-36**	34.4	Pass	35.3	Pass

TABLE 5
THORAX (WITH ARM) IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

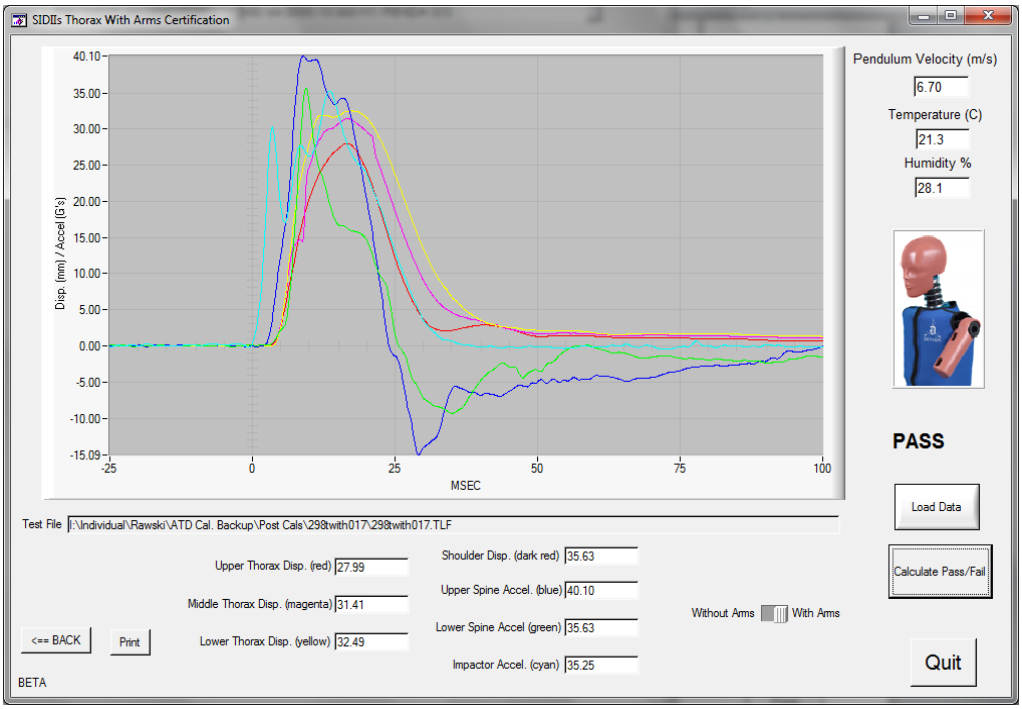


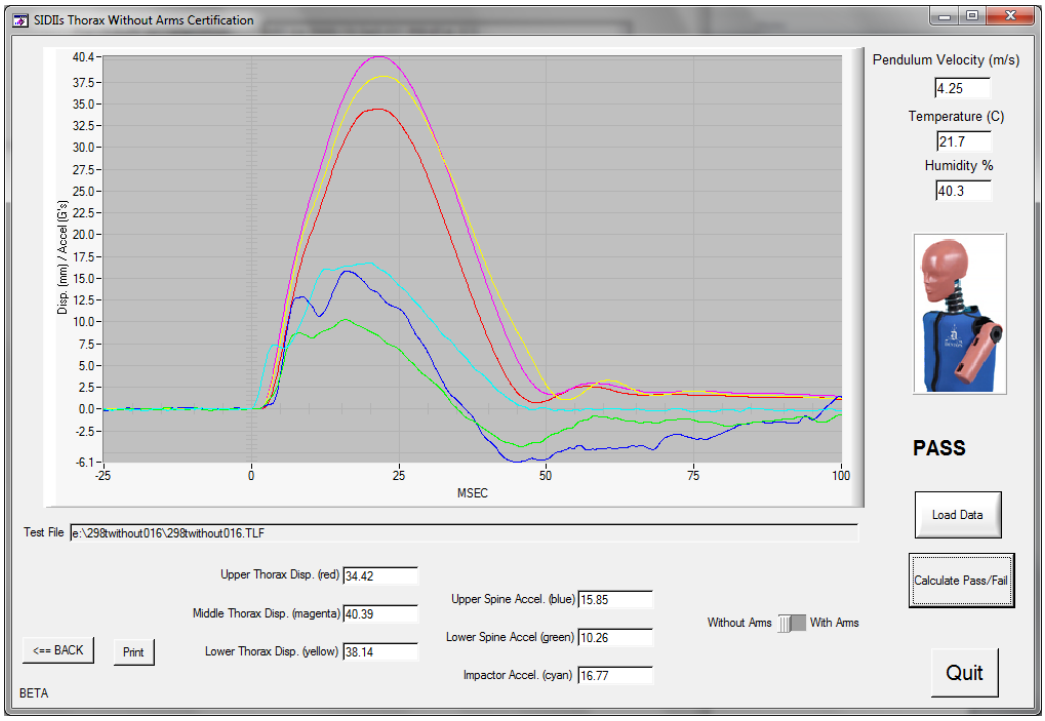
TABLE 6
THORAX (WITHOUT ARM) IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 2 & 3

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.7	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	40.3	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.7	Pass	21.3	Pass
Relative Humidity – During Test (%)		**10-70**	40.3	Pass	28.1	Pass
Impactor Velocity (m/s)		**4.2-4.4**	4.25	Pass	4.25	Pass
Peak Upper Rib Deflection (mm)		**32-40**	34.4	Pass	35.6	Pass
Peak Middle Rib Deflection (mm)		**39-45**	40.4	Pass	40.1	Pass
Peak Lower Rib Deflection (mm)		**35-43**	38.1	Pass	37.0	Pass
Peak Upper Spine (T1) Acceleration Y (G)		**13-17**	15.9	Pass	15.9	Pass
Peak Lower Spine (T12) Acceleration Y (G)		**7-11**	10.3	Pass	9.7	Pass
Peak Impactor Acceleration (G)		**14-18**	16.8	Pass	16.7	Pass

TABLE 6
THORAX (WITHOUT ARM) IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

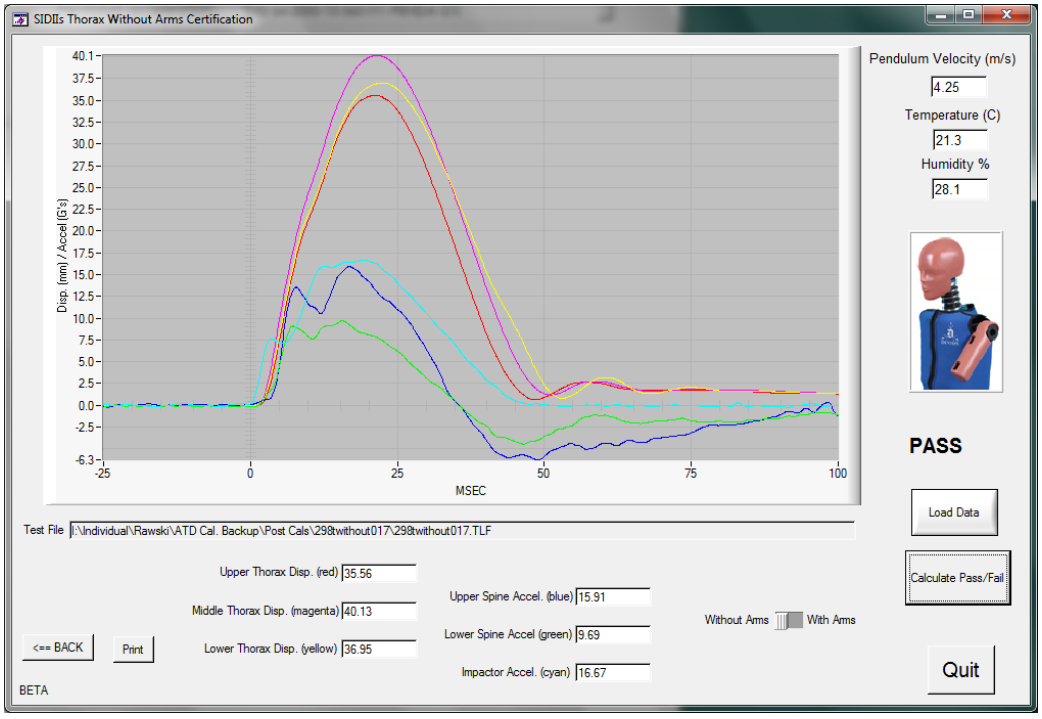


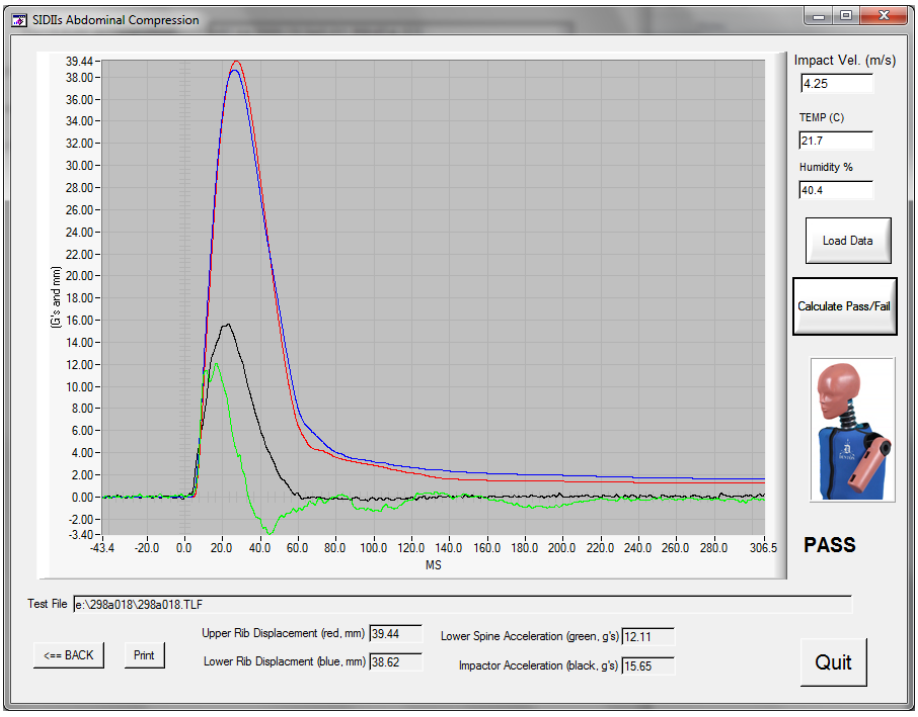
TABLE 7
ABDOMEN IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.7	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	40.4	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.7	Pass	21.3	Pass
Relative Humidity – During Test (%)		**10-70**	40.3	Pass	28.1	Pass
Impactor Velocity (m/s)		**4.2-4.4**	4.25	Pass	4.25	Pass
Peak Upper Abdominal Rib Deflection (mm)		**36-47**	39.4	Pass	37.4	Pass
Peak Lower Abdominal Rib Deflection (mm)		**33-44**	38.6	Pass	39.1	Pass
Peak Lower Spine (T12) Acceleration Y (G)		**9-14**	12.1	Pass	12.0	Pass
Peak Impactor Acceleration (G)		**12-16**	15.7	Pass	15.5	Pass

TABLE 7
ABDOMEN IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

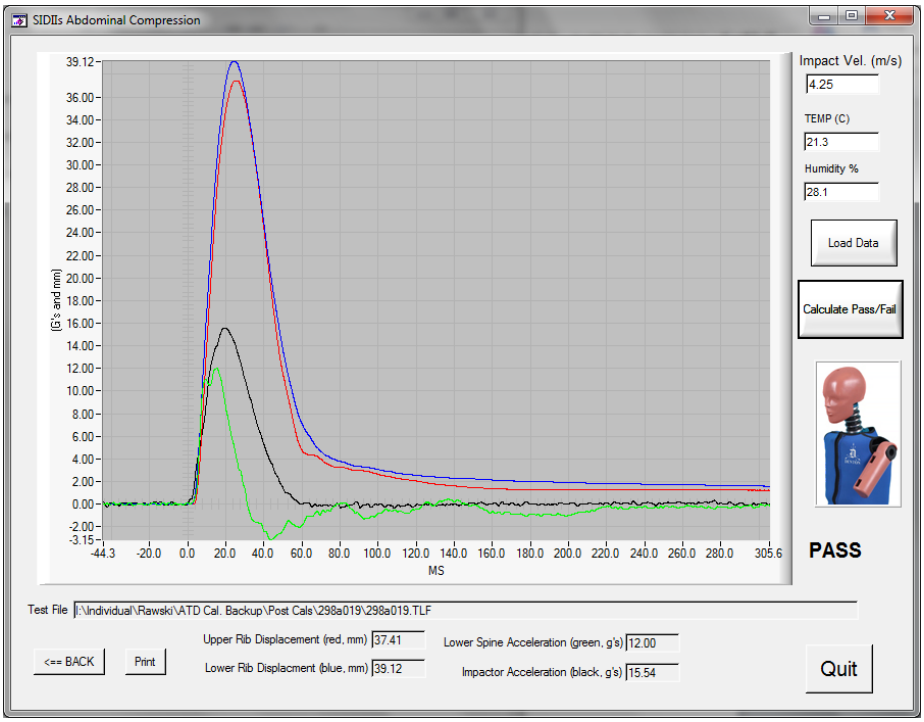
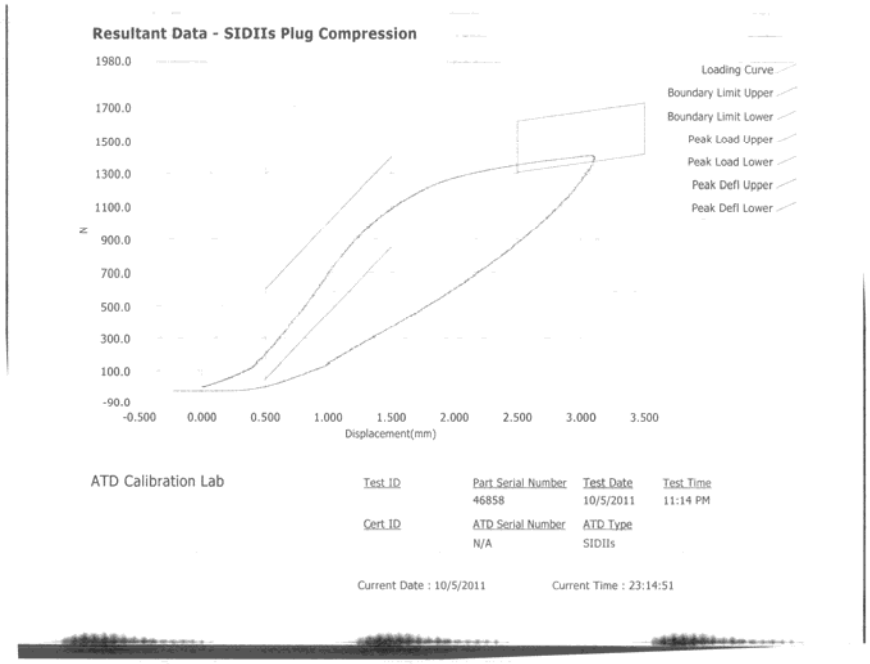


TABLE 8
PELVIS PLUG QUASI-STATIC TEST (SID-IIs)

PRE-Test



POST-TEST

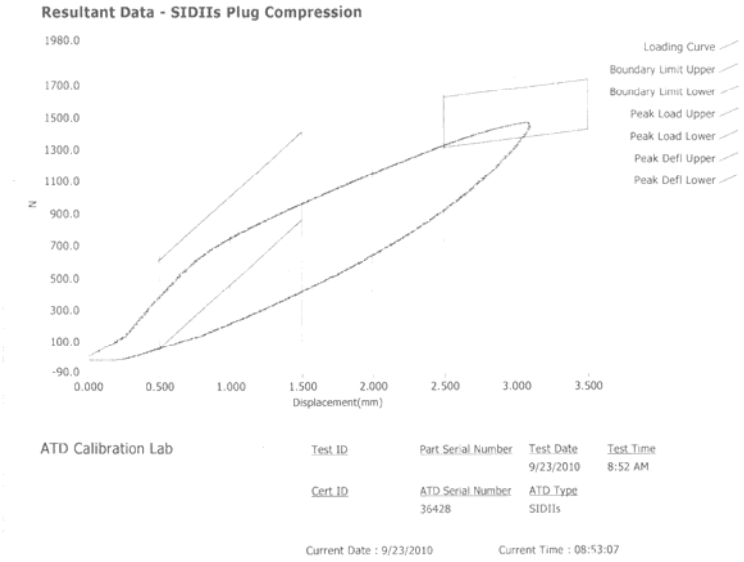


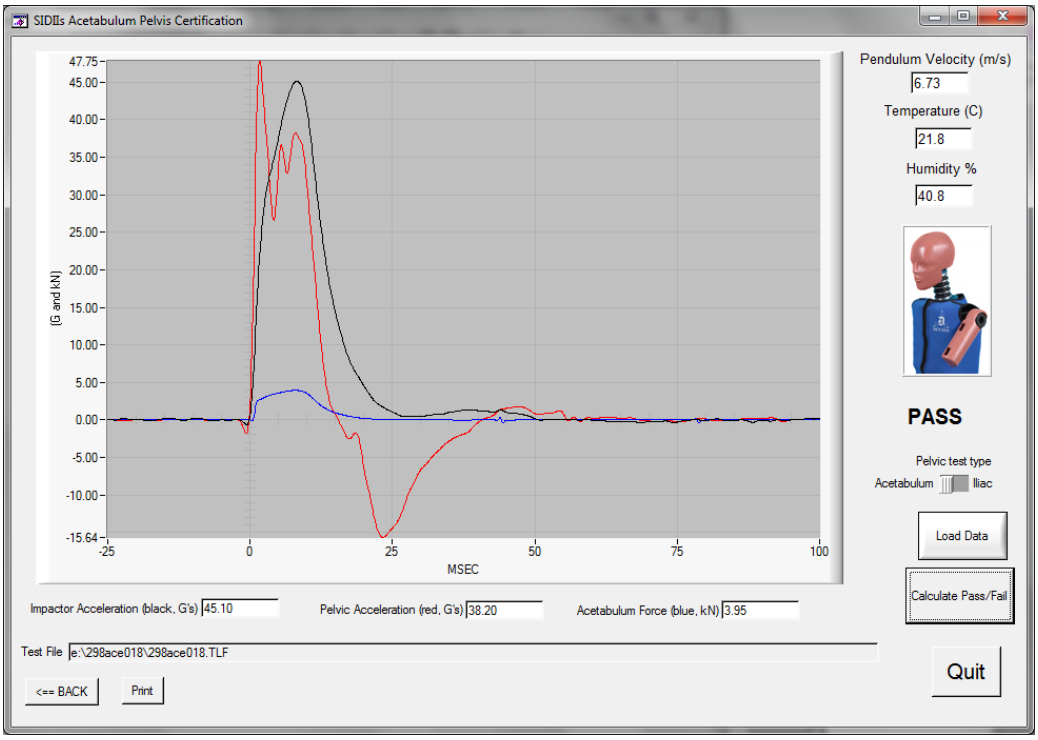
TABLE 9
PELVIS ACETABULUM IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Results**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.8	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	40.8	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.8	Pass	21.3	Pass
Humidity – During Test (%)		**10-70**	40.8	Pass	28.1	Pass
Impactor Velocity (m/s)		**6.6-6.8**	6.73	Pass	6.73	Pass
Peak Impactor Acceleration (G)		**38-47**	45.1	Pass	46.4	Pass
Pelvis Acceleration Y after 6ms (G)		**34-42**	38.2	Pass	41.1	Pass
Peak Acetabulum Force (kN)		**3.60-4.30**	3.9	Pass	3.9	Pass
Pelvis Plug Serial No. 46858 (Pre) No. 36428 (Post)						

TABLE 9
PELVIS ACETABULUM IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST

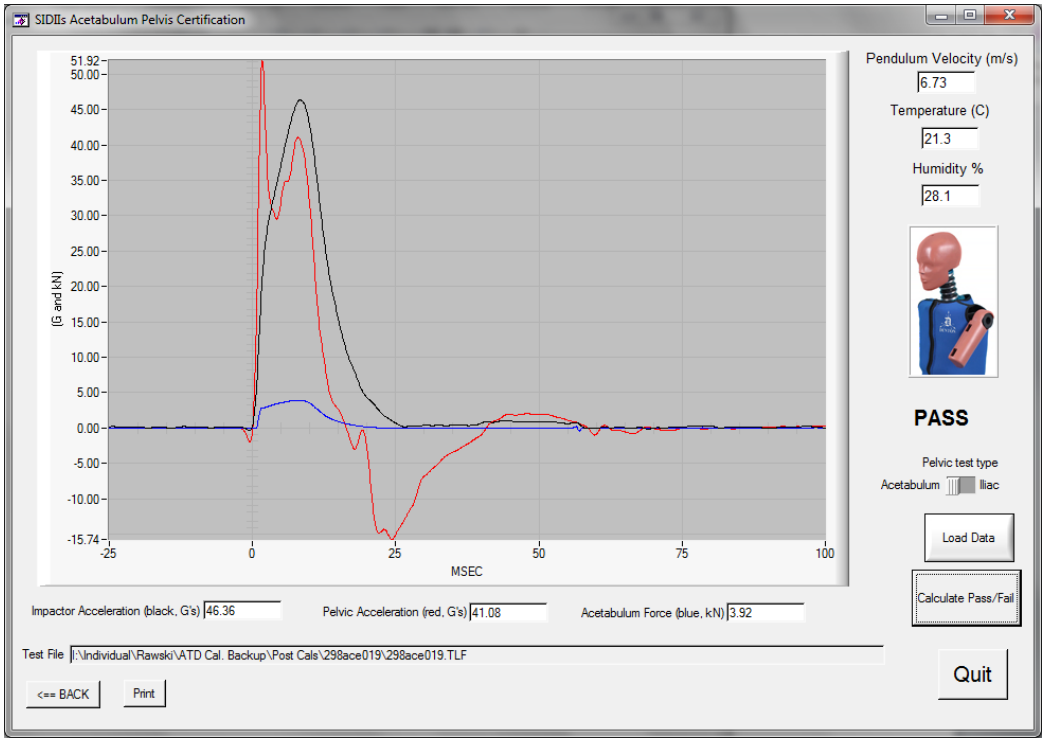


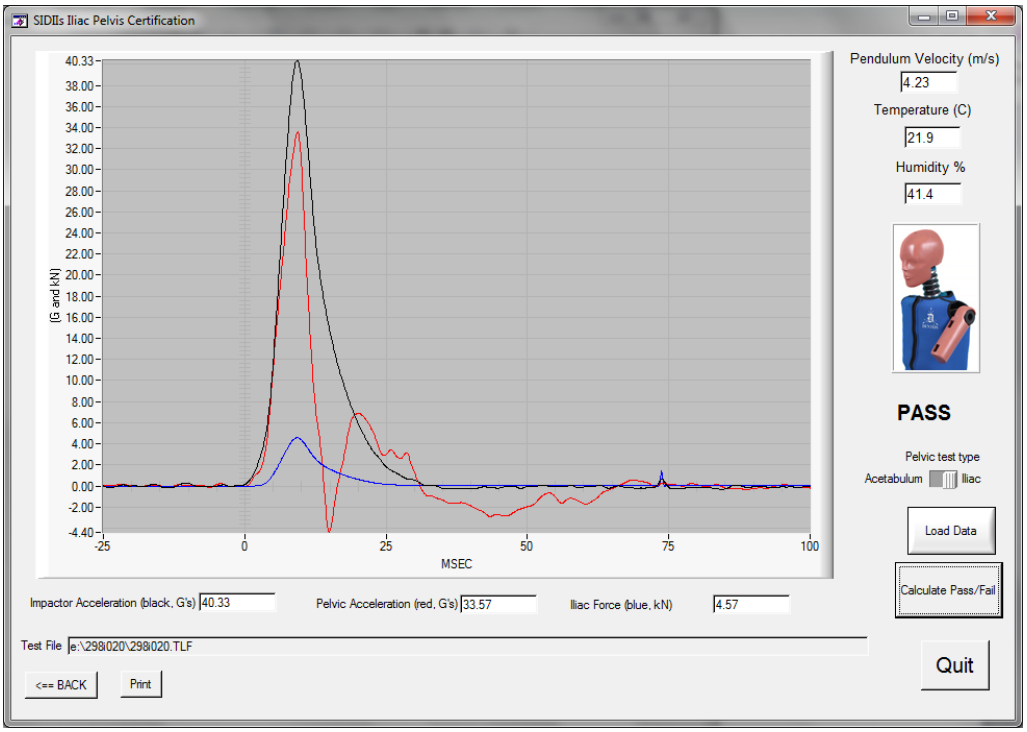
TABLE 10
PELVIS ILIAC IMPACT TEST (SID-IIs)

SIDIIs Serial Number 298 Test Sequences 3 & 4

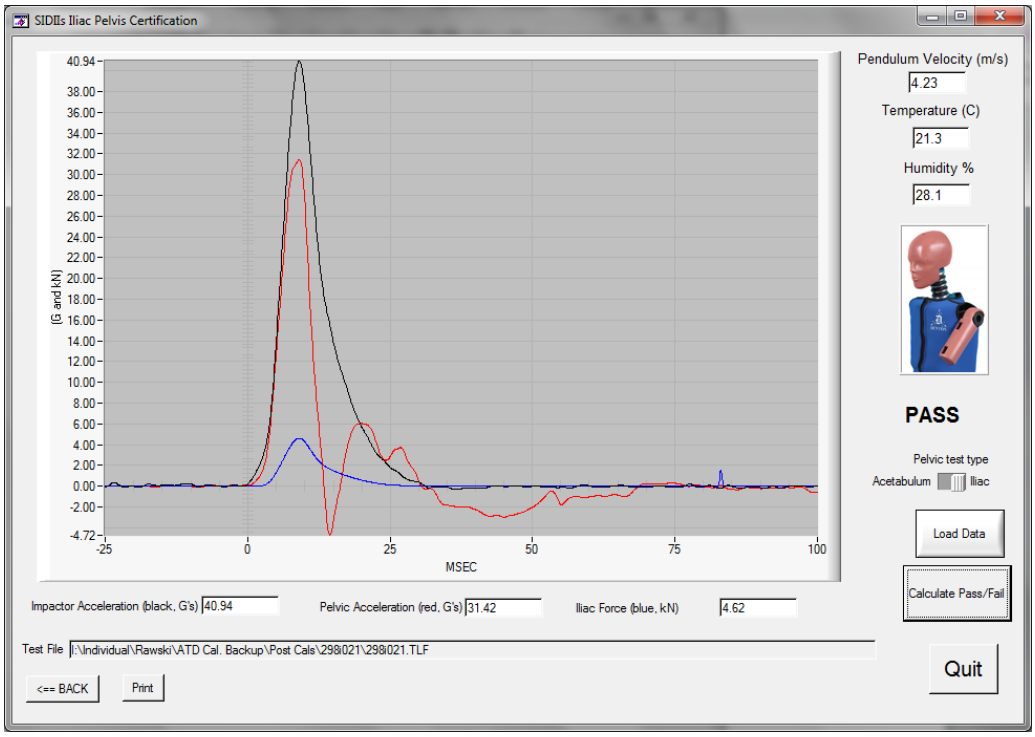
TEST PARAMETER		SPEC.	PRE		POST	
Date		-	12-3-12		12-17-12	
Sequential Test Number		-	3		4	
			Result	**Pass/Fail**	**Result**	**Pass/Fail**
Dummy Soak Time (min)		**≥ 180**	180	Pass	180	Pass
Temperature(°C) – During Soak	Max	**20.6-22.2**	21.9	Pass	21.3	Pass
	Min		21.0	Pass	20.8	Pass
Humidity(%) – During Soak	Max	**10.0-70.0**	41.4	Pass	28.1	Pass
	Min		34.2	Pass	24.3	Pass
Temperature – During Test (°C)		**20.6-22.2**	21.9	Pass	21.3	Pass
Humidity – During Test (%)		**10-70**	41.4	Pass	28.1	Pass
Pendulum Velocity (m/s)		**4.2-4.4**	4.23	Pass	4.23	Pass
Peak Impactor Acceleration (G)		**36-46**	40.3	Pass	40.9	Pass
Pelvis Acceleration Y (G)		**29-39**	33.6	Pass	31.4	Pass
Peak Iliac Force Y (N)		**4.00-5.20**	4.6	Pass	4.6	Pass
Pelvis Plug Serial No. 46858 (Pre) No. 36428 (Post)						

TABLE 10
PELVIS ILIAC IMPACT TEST (SID-IIs) (CONTINUED)

PRE-TEST



POST-TEST



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 - DUMMY INSTRUMENTATION – ES-IIRE

			ES-IIre S/N: F038		
			Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers		X	J43494	Endevco	15/June/2012
		Y	J43475	Endevco	15/June/2012
		Z	J43779	Endevco	15/June/2012
		X_R	J21551	Endevco	15/June/2012
		Y_R	J43432	Endevco	15/June/2012
		Z_R	12104	Endevco	15/June/2012
Thoracic Rib Displacement Potentiometers	Upper	Y	433	Denton	15/June/2012
	Middle	Y	193	Denton	15/June/2012
	Lower	Y	191	Denton	15/June/2012
Abdomen Load Cells	Forward	Y	1502	Denton	19/April/2012
	Middle	Y	1511	Denton	20/April/2012
	Rear	Y	1537	Denton	20/April/2012
Lower Spine Accelerometers (T_{12})		X	12112	Endevco	15/June/2012
		Y	P21586	Endevco	15/June/2012
		Z	P21580	Endevco	15/June/2012
Pubic Symphosis Load Cell		Y	460	Denton	19/April/2012

TABLE 2 - DUMMY INSTRUMENTATION – SID-IIS

				SID-IIs S/N: 298		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers			X	P22041	Endevco	15/June/2012
			Y	P24562	Endevco	15/June/2012
			Z	P22322	Endevco	15/June/2012
			X_R	P24124	Endevco	15/June/2012
			Y_R	P21575	Endevco	15/June/2012
			Z_R	12132	Endevco	15/June/2012
Displacement Potentiometers	Shoulder		Y	1095	FTSS	16/April/2012
	Thoracic Rib	Upper	Y	1181	Denton	16/April/2012
		Middle	Y	1203	Denton	16/April/2012
		Lower	Y	1215	Denton	16/April/2012
	Abdominal Rib	Upper	Y	717	Denton	16/April/2012
		Lower	Y	486	Denton	16/April/2012
Lower Spine Accelerometers (T_{12})			X	P21661	Endevco	15/June/2012
			Y	P24682	Endevco	15/June/2012
			Z	P21788	Endevco	15/June/2012
Acetabulum Load Cell			Y	114	Denton	19/April/2012
Iliac Wing Load Cell			Y	283	Denton	20/April/2012
Pelvis Plug (Struck-Side)				46859	FTSS	07/Sept/2012
Pelvis Plug (Non-Struck-Side)				12889	FTSS	07/Sept/2012

TABLE 3 - VEHICLE INSTRUMENTATION

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	P25041	Endevco	15/Oct/2012
	Vehicle Center of Gravity	Y	P24138	Endevco	15/Oct/2012
	Vehicle Center of Gravity	Z	P21689	Endevco	15/Oct/2012
2	Right Sill at Front Seat	X	12127	MSI	15/Oct/2012
	Right Sill at Front Seat	Y	12148	MSI	15/Oct/2012
	Right Sill at Front Seat	Z	12134	MSI	15/Oct/2012
3	Right Sill at Rear Seat	X	P22965	Endevco	15/Oct/2012
	Right Sill at Rear Seat	Y	P23020	Endevco	15/Oct/2012
	Right Sill at Rear Seat	Z	P22993	Endevco	15/Oct/2012
4	Left Sill at Front Door	Y	12074	MSI	15/Oct/2012
5	Left Sill at Rear Door	Y	J44022	Endevco	15/Oct/2012
6	Left A-Post Lower	Y	98B98A26-D05	Endevco	15/Oct/2012
7	Left A-Post Middle	Y	A086987	Endevco	15/Oct/2012
8	Left B-Post Lower	Y	A086976	Endevco	15/Oct/2012
9	Left B-Post Middle	Y	A086969	Endevco	15/Oct/2012
10	Front Seat Track	Y	A011644	Endevco	15/Oct/2012
11	Rear Seat Track or Structure	Y	A002042	Endevco	15/Oct/2012
12	Right Rear Occ. Compartment	Y	04A04A07-J13	Endevco	15/Oct/2012
13	Engine Block	X	P12746	Endevco	15/Oct/2012
	Engine Block	Y	P13835	Endevco	15/Oct/2012
14	Rear Floorpan Above Axle	X	98G98E11-K02	Endevco	15/Oct/2012
	Rear Floorpan Above Axle	Y	98L98H31-Z05	Endevco	15/Oct/2012
	Rear Floorpan Above Axle	Z	98G98D22-Z15	Endevco	15/Oct/2012

TABLE 4 - MDB INSTRUMENTATION

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	12115	Endevco	22/Oct/2012
MDB Center of Gravity	Y	12149	Endevco	22/Oct/2012
MDB Center of Gravity	Z	P21898	Endevco	22/Oct/2012
Left Frame at Rear Axle Centerline	X	P22339	Endevco	22/Oct/2012
Left Frame at Rear Axle Centerline	Y	P22539	Endevco	22/Oct/2012