

REPORT NUMBER: SideNCAPMDB-MGA-24-016

**NEW CAR ASSESSMENT PROGRAM (NCAP)
Moving Deformable Barrier Side Impact Test**

**VOLVO CAR CORPORATION
2024 Volvo XC60 Recharge AWD Core 5-Door SUV
NHTSA No.: O20245902**

**MGA RESEARCH CORPORATION
5000 Warren Road
Burlington, WI 53105**



Test Date: June 19, 2024

Final Report Date: December 31, 2024

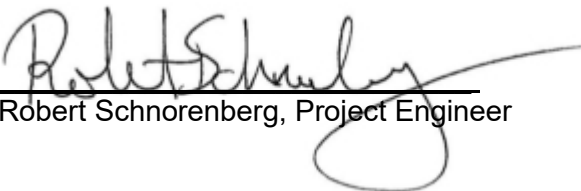
FINAL REPORT

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
Mail Code: NRM-100
1200 New Jersey Ave, SE
Washington, DC 20590**

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof.

If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement.

Prepared by: 
Ben Fischer, Program Manager

Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: December 31, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SideNCAPMDB-MGA-24-016	2. Government Accession No.	3. Recipient's Catalog No.																																																					
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing and FMVSS No. 305 Indicant Testing of 2024 Volvo XC60 Recharge AWD Core 5-Door SUV, NHTSA No.: O20245902		5. Report Date December 31, 2024																																																					
7. Author(s) Ben Fischer, Program Manager		6. Performing Organization Code MGA																																																					
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		8. Performing Organization Report No. SideNCAPMDB-MGA-24-016																																																					
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-100) 1200 New Jersey Ave, SE Washington, D.C. 20590		10. Work Unit No.																																																					
		11. Contract or Grant No. 693JJ920D000017																																																					
		13. Type of Report and Period Covered: Final Test Report June 19, 2024 to December 31, 2024																																																					
15. Supplementary Notes		14. Sponsoring Agency Code NRM-100																																																					
16. Abstract A 55/28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2024 Volvo XC60 Recharge AWD Core 5-Door SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP MDB Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the MGA Research Corporation facility in Burlington, Wisconsin on June 19, 2024. The impact velocity of the Moving Deformable Barrier (MDB) was 62.26 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.7°C. The target vehicle post-test maximum crush was 224 mm at level 2. The test vehicle's performance was as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (ES-2re)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>77.103</td> </tr> <tr> <td>Maximum Thorax Rib Deflection</td> <td>mm</td> <td>44</td> <td>18.260</td> </tr> <tr> <td>Total Abdominal Force</td> <td>N</td> <td>2500</td> <td>463.385</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>6000</td> <td>885.467</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82*</td> <td>17.862</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>140.968</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>g</td> <td>82</td> <td>44.872</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2481.824</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38*</td> <td>14.376</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45*</td> <td>14.996</td> </tr> </tbody> </table> *Proposed IARV The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite door(s) did not open during the side impact event.				Measurement Description	Units	Driver ATD (ES-2re)		Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	77.103	Maximum Thorax Rib Deflection	mm	44	18.260	Total Abdominal Force	N	2500	463.385	Pubic Symphysis Force	N	6000	885.467	Resultant Lower Spine Acceleration	g	82*	17.862	Measurement Description	Units	Passenger ATD (SID-IIs)		Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	140.968	Resultant Lower Spine Acceleration	g	82	44.872	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2481.824	Maximum Thoracic Rib Deflection	mm	38*	14.376	Maximum Abdomen Rib Deflection	mm	45*	14.996
Measurement Description	Units	Driver ATD (ES-2re)																																																					
		Threshold	Result																																																				
Head Injury Criteria (HIC ₃₆)		1000	77.103																																																				
Maximum Thorax Rib Deflection	mm	44	18.260																																																				
Total Abdominal Force	N	2500	463.385																																																				
Pubic Symphysis Force	N	6000	885.467																																																				
Resultant Lower Spine Acceleration	g	82*	17.862																																																				
Measurement Description	Units	Passenger ATD (SID-IIs)																																																					
		Threshold	Result																																																				
Head Injury Criteria (HIC ₃₆)		1000	140.968																																																				
Resultant Lower Spine Acceleration	g	82	44.872																																																				
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2481.824																																																				
Maximum Thoracic Rib Deflection	mm	38*	14.376																																																				
Maximum Abdomen Rib Deflection	mm	45*	14.996																																																				
17. Key Words New Car Assessment Program (NCAP) Side Impact MDB ES-2re SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590																																																					
19. Security Classification of Report Unclassified	20. Security Classification of Page Unclassified	21. No. of Pages 255	22. Price																																																				

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3
 <u>Data Sheet No.</u>		 <u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat, Seat Belt, Steering Wheel Adjustment and Fuel System Data	8
3	Dummy Longitudinal Clearance Dimensions	12
4	Dummy Lateral Clearance Dimensions	13
5	Camera and Instrumentation Data	14
6	Test Vehicle Accelerometer Locations	15
7	MDB Accelerometer Locations	16
8	Post-Test Observations	17
9	MDB Summary of Results	19
10	Test Vehicle Profile Measurements	20
11	Test Vehicle Exterior Crush Measurements	21
12	MDB Exterior Static Crush Measurements	24
13	Vehicle and MDB Damage Profile Distances	25
14	FMVSS No. 301 Static Rollover Results	26
15	Dummy/Vehicle Temperature and Humidity Stabilization Data	27
305-1	General Test and Vehicle Parameter Data for Indicant FMVSS No. 305 Testing	28
305-2	Pre-Impact Data for Indicant FMVSS No. 305 Testing	29
305-3	Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing	30
305-4	Post-Impact Data for Indicant FMVSS No. 305 Testing	32
305-5	Static Rollover Test Data for Indicant FMVSS No. 305 Testing	35
 <u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data Plots	B
C	Dummy Qualification and Performance Verification	C
D	Test Equipment and Instrumentation Calibration	D

SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This moving deformable barrier side impact test is part of the MY 2024 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000017. The purpose of this test is to generate comparative side impact performance in a 2024 Volvo XC60 Recharge AWD Core 5-Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Laboratory Test Procedure dated March 2020.

SUMMARY

A 2024 Volvo XC60 Recharge AWD Core 5-Door SUV 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 62.26 km/h. 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 MGA Research Corporation in Burlington, Wisconsin on June 19, 2024. 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 NCAP Side Laboratory Test Procedure dated March 2020. The side impact event was documented by eleven (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 Triaxial Accelerometers
- Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Forward, Middle, and Rear Y-Axis Load Cells
- Lower Spine (T12) Triaxial Accelerometers
- Pubic Symphysis Y-Axis Load Cell

PASSENGER ATD (SID-IIs)

- Primary and Redundant Head CG Triaxial Accelerometers
- Head Triaxial Angular Rate Sensors
- Chest Upper Rib, Middle Rib, and Lower Rib Y-Axis Displacement Potentiometers
- Abdomen Upper Rib and Lower Rib Y-Axis Displacement Potentiometers
- Lower Spine (T12) Triaxial Accelerometers
- Acetabulum and Iliac Wing Y-Axis Load Cells

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D contains the test equipment and instrumentation calibration data.

Dummy Injury readings were recorded as follows:

DUMMY INJURY VALUES

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	77.103
Maximum Thorax Rib Deflection	mm	44	18.260
Total Abdominal Force	N	2500	463.385
Pubic Symphysis Force	N	6000	885.467
Resultant Lower Spine Acceleration	g	82*	17.862

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	140.968
Resultant Lower Spine Acceleration	g	82	44.872
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2481.824
Maximum Thoracic Rib Deflection	mm	38*	14.376
Maximum Abdomen Rib Deflection	mm	45*	14.996

*Proposed IARV

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:				

The test data can be found on the NHTSA website at www.nhtsa.gov

GENERAL COMMENTS

None.

MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20245902	Traction Control System (TCS)	Yes
Model Year	2024	Auto-Leveling System	No
Make	Volvo	Automatic Door Locks (ADL)	Yes
Model	XC60 Recharge AWD Core	Power Window Auto-Reverse	Yes
Body Style	5-Door SUV	Other Optional Feature	No
VIN	YV4H60DK3R1917600	Driver Front Airbag	Yes
Body Color	Denim Blue	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	6 km / 4 mi	Driver Head/Torso Airbag	No
Engine Displacement (L)	2	Driver Torso Airbag	No
Type/No. Cylinders	PHEV/Inline 4	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Lateral	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	Yes
Transmission Speeds	8	Rear Pass. Curtain Airbag	Yes
Overdrive	Yes	Rear Pass. Head/Torso Airbag	No
Final Drive	AWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	Yes	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	Yes
Power Seats	Driver	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. Load Limiter	Yes
		Other Safety Restraint	N/A

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

DATA FROM CERTIFICATION LABEL

Manufactured By	VOLVO CAR CORPORATION	GVWR (kg)	2658
Date of Manufacture	03/24	GAWR Front (kg)	1320
Vehicle Type	MPV	GAWR Rear (kg)	1420

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3		5	
Capacity Weight (VCW) (kg)				430	(A)
DSC x 68 kg				340	(B)
Rated Cargo and Luggage Weight (RCLW) (kg)				90	(A-B)

VEHICLE SEAT TYPE

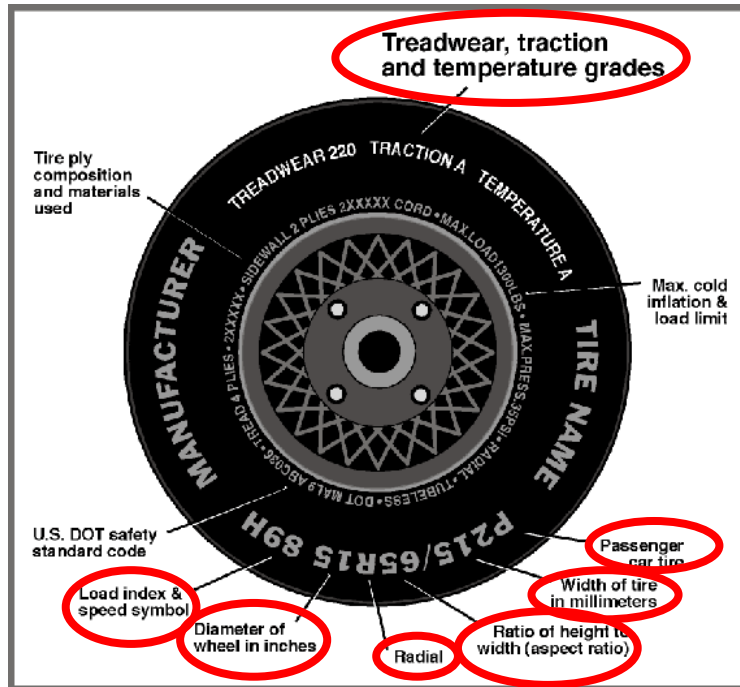
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	X					X	
Rear or Second Row				X	X		
Third Row Seat							

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

VEHICLE TIRE INFORMATION



Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	235/55R19	235/55R19
Tire Size on Vehicle	235/55R19	235/55R19
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion Zero	Scorpion Zero
Treadwear	500	500
Traction	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 1 Polyamide	2 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	105V	105V
Tire Material	Rubber	Rubber
DOT Safety Code Left	1XB 08580P 0524	1XB 08580P 0524
DOT Safety Code Right	1XB 08580P 0524	1XB 08580P 0524

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

TEST VEHICLE TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	290	290	290	290
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

MDB TIRE SPECIFICATIONS

	Requirement	Units	LF	RF	LR	RR
Tire Size	P205/75R15	N/A	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	200 + 21	kPa	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	582.0	484.0		616.0	578.0		609.5	591.0	
Right	kg	545.0	507.0		558.5	578.5		542.0	594.5	
Ratio	%	53.2%	46.8%		50.4%	49.6%		49.3%	50.7%	
Totals	kg	1127.0	991.0	2118.0	1174.5	1156.5	2331.0	1151.5	1185.5	2337.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2118.0	(A)
Sum of Actual Weight of 2 P572 ATDs Used	kg	129	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	90	(C)
Calculated Test Vehicle Target Weight (TVTW)	kg	2337.0	(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**

TEST VEHICLE ATTITUDES AND CG

	Units	Fully Loaded	As Tested	Meets Requirement*
Left Front	mm	805	799	Yes
Right Front	mm	801	798	Yes
Right Rear	mm	807	812	Yes
Left Rear	mm	804	805	Yes
Vehicle CG (Aft of Front Axle)	mm	1453	1421	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	22	20	

* ND=Nose Down (-), NU=Nose Up (+) ** LD=Left Down (-), LU=Left Up (+)

*** 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.

Test height adjustable suspension setting, if applicable:	Not Applicable
---	----------------

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Units	Weight
Weight of Ballast Added	kg	29
Components Removed: none	kg	

TEST SURFACE MARKINGS

	Units	Distance from 63° Impact Angle Line
Fore 25 mm Target	mm	940
Aft 25 mm Target	mm	945
Pre-Impact Angle Line	mm	100

Parallel Track Target	Units	X Location	Y Location
A	mm	0	0
B	mm	1520	3085
C	mm		
D	mm	3500	0

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the mid-track, lowest, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	29.4	14.7	22.1
Front Passenger Seat	28.5	12.8	20.7
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As-Tested SCRL Angle (Mid) (°)	As-Tested SCR Height (mm)	SCR Height Position	SCR Height (mm)		
				Rear-Most	Mid	Forward-Most
Driver Seat	22.1	0	Max	64	64	64
			Mid	32	32	32
			Min	0	0	0
Front Passenger Seat	20.7	0	Max	62	62	62
			Mid	31	31	31
			Min	0	0	0
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

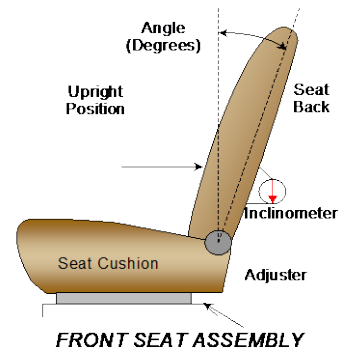
NHTSA No.: O20245902
Test Date: 6/19/2024

SEAT FORE/AFT POSITIONS

Seat	Total Fore/Aft Travel		Test Position from Forward-Most Position	
	mm	Detents (1 st as 1)	mm	Detent (1 st as 0)
Driver Seat	266		133	
Front Passenger Seat	266		133	
Front Center Seat				
Struck Side Rear Seat	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

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.



Seat	Total Seat Back Angle Range		Test Position from Vertical	
	Degrees	Detents (1 st as 1)	Degrees	Detent (1 st as 0)
Driver Seat	64.8		22.0	
Front Passenger Seat	73.2		22.0	
Front Center Seat				
Struck Side Rear Seat	Fixed		27.5	
Non-Struck Side Rear Seat	Fixed		27.5	
Rear Center Seat	Fixed		27.5	

Seat back angles measured on seat back.

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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on S1 - Vehicle Setup Information.

	Total # of Positions	Placed in Position #
Driver Seat	4	0 (Uppermost as 0)
Rear Seat	Fixed	

HEAD RESTRAINT ADJUSTMENT

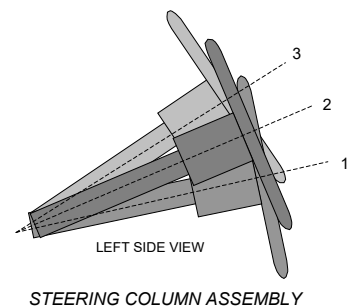
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	
Rear Seat	Fixed	

STEERING COLUMN ADJUSTMENT

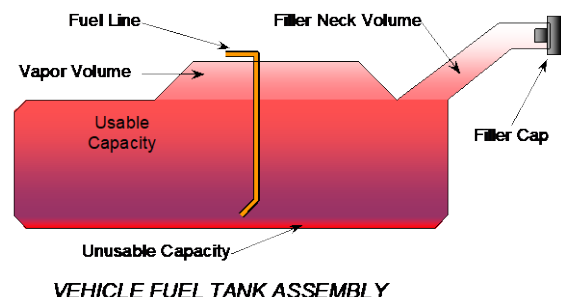
Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

	Wheel Angle (°)	Fore/Aft Position (mm)
Lowermost, Position 1	69.3	
Geometric Center, Position 2	66.4	
Uppermost, Position 3	63.5	
Telescoping Steering Wheel Travel		53
Test Position	66.4	27



FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump will run when the engine is running. The pump will also normally operate when the vehicle's electrical system is activated. The filler neck is located on the passenger's side.



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

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

FUEL TANK CAPACITY DATA

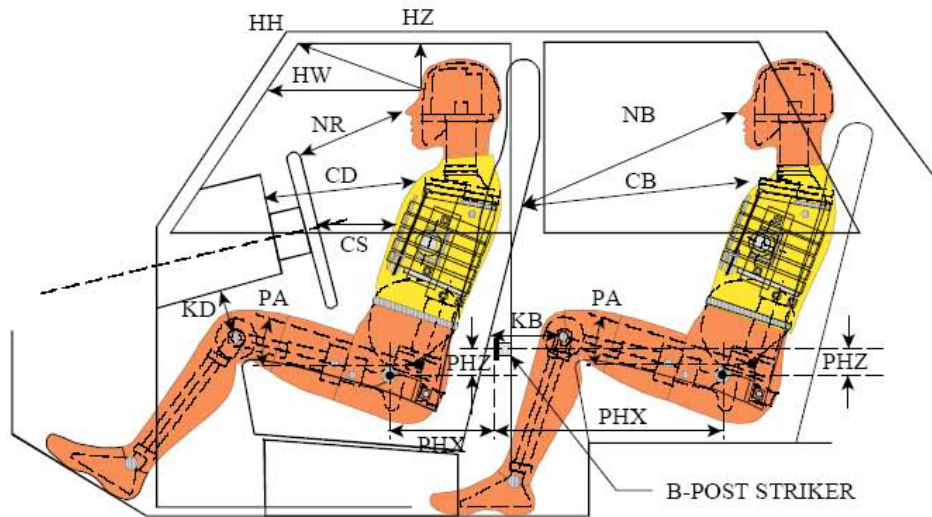
	Liters
Usable Capacity of Standard Tank (see S1 - Vehicle Setup Information)	71.2
Usable Capacity of Optional Tank (see S1 - Vehicle Setup Information)	
Usable Capacity of Standard Tank as Specified in Owner's Manual	71.2
Usable Capacity of Optional Tank as Specified in Owner's Manual	
93% of Usable Capacity	66.2
Actual Amount of Solvent Used	66.2
1/3 of Usable Capacity	23.7

Is the actual amount of solvent used in the test equal to $93\% \pm 1\%$
 of the Usable Capacity stated in S1 - Vehicle Setup Information? **YES**

DATA SHEET NO. 3 DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024



LEFT SIDE VIEW

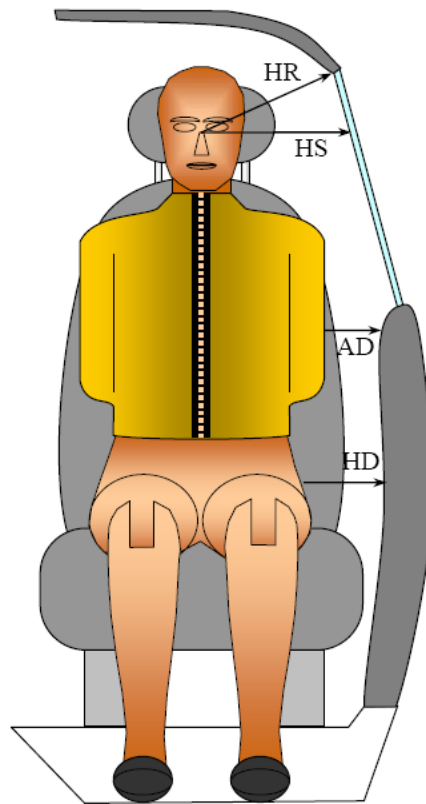
NOTE: 2-DOOR VEHICLE SHOWN.
REAR DUMMY PHX & PHZ
MEASUREMENTS FOR A 4-DOOR
VEHICLE WOULD USE THE C-POST
STRIKER AS A REFERENCE POINT

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	424	20.2		
HW		Head to Windshield	715	0		
HZ	HZ	Head to Roof Liner	214	90	275	90
NR	NB	Nose to Rim/Seat Back	485	11.2	517	16.0
CD	CB	Chest to Dashboard/Seat Back	595	29.7	503	4.9
CS		Chest to Steering Wheel	354	25.9		
KDL	KBL	Left Knee to Dash/Seat Back	206	52.6	270	30.7
KDR	KBR	Right Knee to Dash/Seat Back	224	52.6	282	25.3
PAX	PAX	Pelvic Tilt Angle X		25.8		25.7
PAY	PAY	Pelvic Tilt Angle Y		-0.7		-0.6
PHX	PHX	Hip Point to Striker (X-Axis)	128		183	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	144		241	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

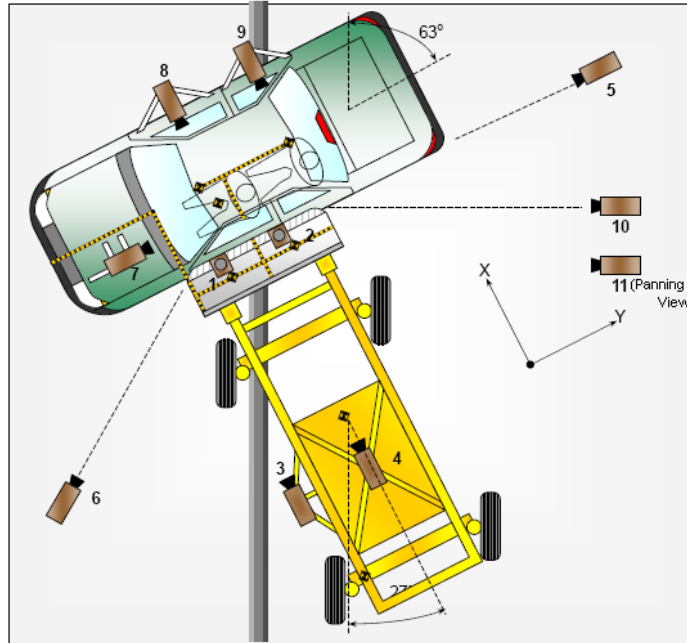


Code	Measurement Description	Driver	Passenger
		Length (mm)	
HR	Head to Side Header	196	276
HS	Head to Side Window	317	361
AD	Arm to Door	107	163
HD	Hip Point to Door	194	212

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates* (mm)			Lens (mm)	Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	730	1265	-4995	8.5	1000
2	Overhead Close-Up	325	820	-4895	20	1000
3	Left Impact Point (MDB)				50	1000
4	Side Overall (MDB)				16	1000
5	Rear	55	6870	-1460	24	1000
6	Left Front	-1680	-6200	-1535	24	1000
7	Driver Front (OB)				16	1000
8	Driver Side (OB)				8	1000
9	Passenger Side (OB)				8	1000
10	Real Time Left Rear					30
11	Real Time Inrun					30

Reference: Impact Point projected to Ground; +X = To Front of MDB, + Y = To Right of MDB, +Z = Down

*All measurements accurate to ± 6 mm

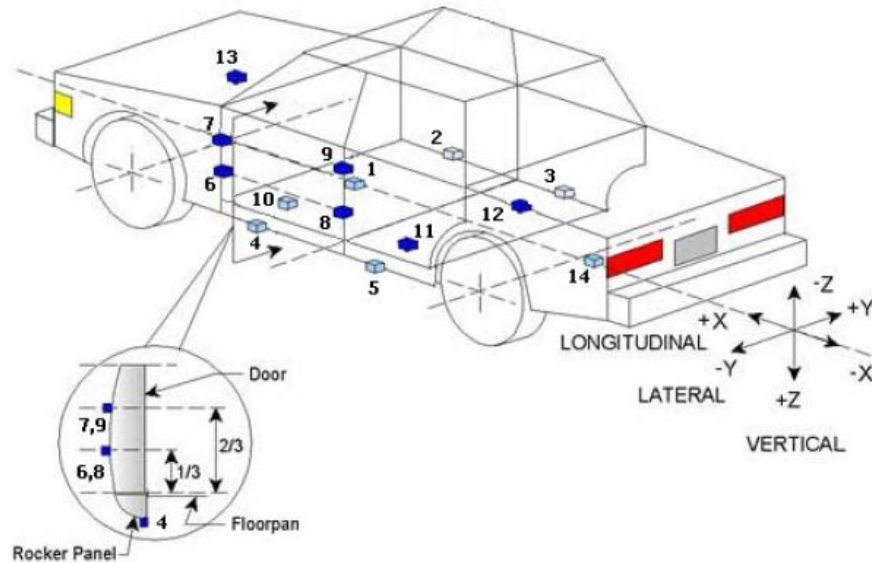
INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Passenger Dummy	19
Vehicle Structure	21
MDB Accelerometers	5
Total	61

DATA SHEET NO. 6 **TEST VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024



TEST VEHICLE ACCELEROMETER LOCATIONS

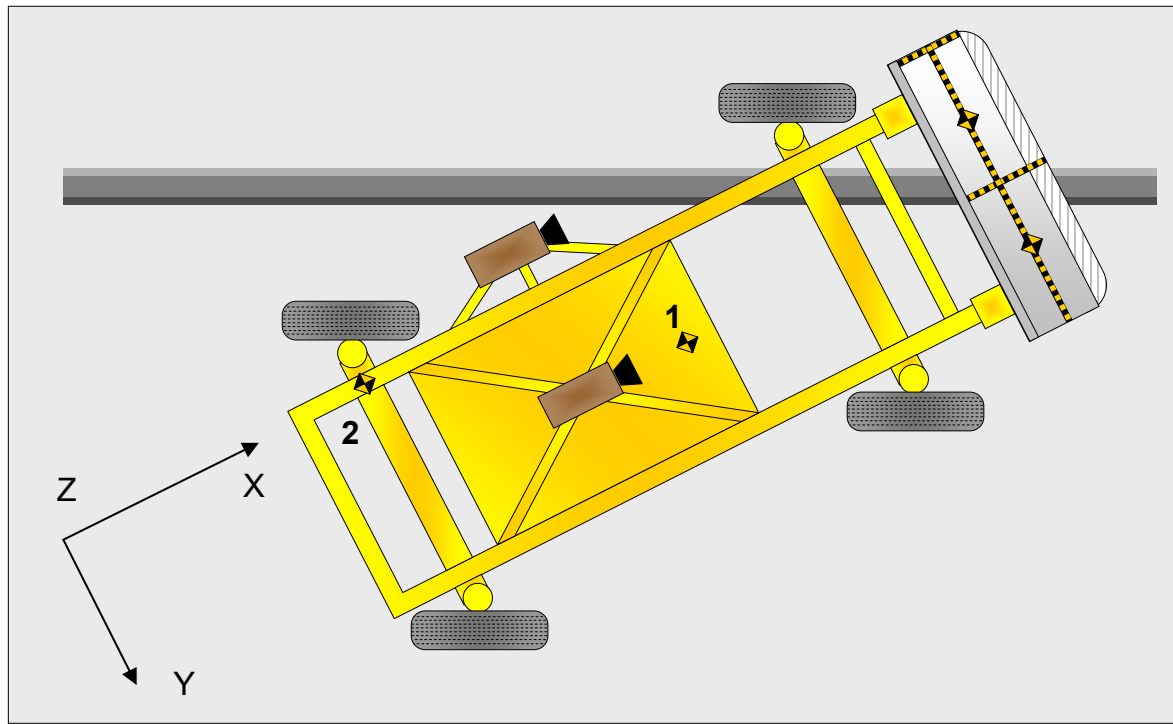
No.	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2376	206	-229
2	Right Sill at Front Seat	2664	740	-251
3	Right Sill at Rear Seat	1801	741	-261
4	Left Sill at Front Door	2647	-747	-254
5	Left Sill at Rear Door	1791	-747	-257
6	Left Lower A-Post	3175	-851	-462
7	Left Middle A-Post	3156	-852	-698
8	Left Lower B-Post			
9	Left Middle B-Post			
10	Front Seat Track	2193	-362	-324
11	Rear Seat Structure	1837	-336	-398
12	Rt. Rear Occ. Compartment	1834	317	-368
13	Engine Block	4047	261	-859
14	Rear Above Axle	1002	19	-605

Reference: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-1105	0	-330
2	MDB Rear	-2580	-650	-625

Reference: X – MDB Face (+ forward)
 Y – MDB Centerline (+ to right)
 Z – Ground Plane (+ down)

Width between left and right MDB contact switches	mm	1399
---	----	------

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	None	None
Top of Head	Curtain Airbag, Headliner	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Headrest	Curtain Airbag, Seat Back
Left Shoulder	None	Seat Back, Door Panel
Upper Torso	Side Torso/Pelvis Airbag, Seat Back	Seat Back
Lower Torso	Side Torso/Pelvis Airbag, Seat Back	Seat Back
Left Hip	Side Torso/Pelvis Airbag, Seat Cushion	Seat Back, Seat Cushion
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or 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)					

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	No
Sill Separation	No
Windshield Damage	No
Side Window Damage	None
Other Notable Effects	None

DATA SHEET NO. 8 (CONTINUED)
POST-TEST OBSERVATIONS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Left Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	
Side Airbag (Other)				
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes		Yes	
Other:				

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		2864
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		492
Actual Impact Point (Aft of Front Axle)	mm		498
Horizontal Offset (+forward / -rearward)	mm	+/- 50 of intended impact point	-6
Vertical Offset (+down / -up)	mm	+/- 20 of intended impact point	5

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length Including Honeycomb Face	4119
Wheelbase of Framework Carriage	2591
CG Location aft of Front Axle	1127

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	368.2	320.6	
Right	kg	400.7	271.4	
Ratio	%	56.5	43.5	
Totals	kg	768.9	592.0	1360.9

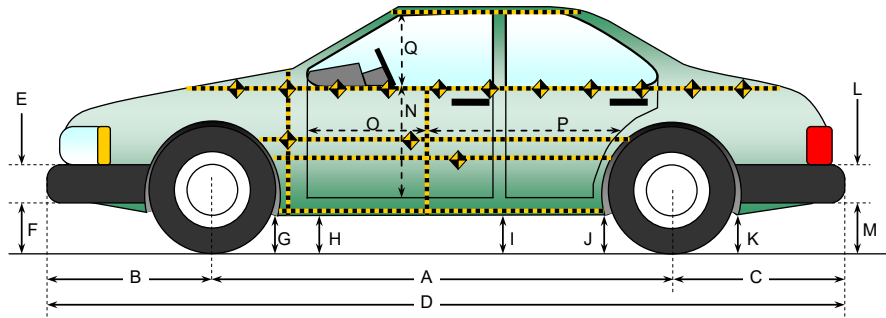
SPEED AND ANGLE AT IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.26
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.45
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.9
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26 to 28	26.8

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024



All measurements in (mm) with tolerance of ± 3 mm

LEFT SIDE VIEW

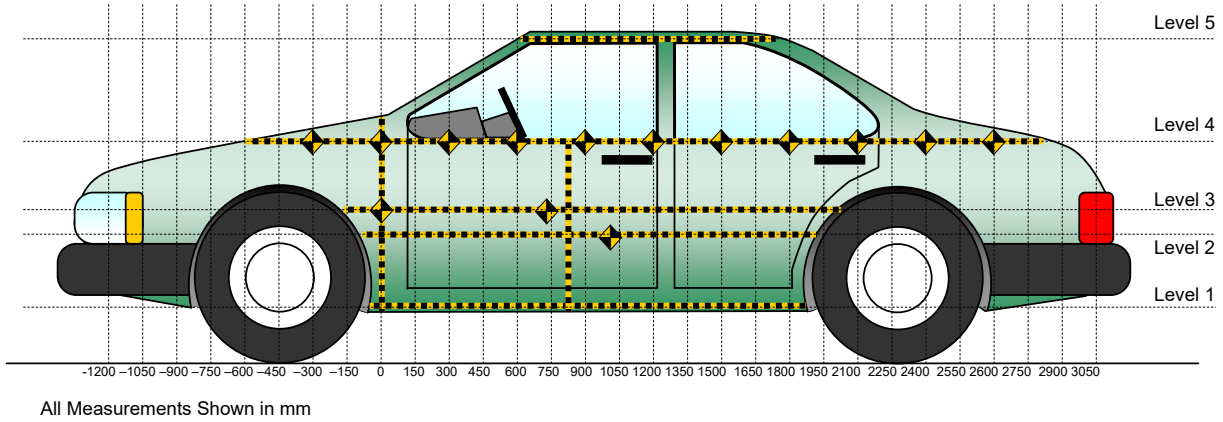
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2864	2862	-2
B	Front Axle to FSOV	876	877	1
C	Rear Axle to RSOV	961	962	1
D	Total Length at Centerline	4701	4700	-1
E	Front Bumper Thickness	112	110	-2
F	Front Bumper Bottom to Ground	505	515	10
G	Sill Height at Front Wheel Well	216	216	0
H	Sill Height at Front Door Leading Edge	229	231	2
I	Sill Height at B Pillar	232	218	-14
J1	Sill Height at Rear Wheel Well	228	222	-6
J2	Pinch Weld Height at Rear Wheel Well	204	197	-7
K	Sill Height Aft of Rear Wheel Well	285	294	9
L	Rear Bumper Thickness	103	103	0
M	Rear Bumper Bottom to Ground	446	448	2
N	Sill Height to Window Bottom Sill	678	637	-41
O	Front Door Leading Edge to Impact CL	837	688	-149
P	Rear Door Trailing Edge to Impact CL	1174	1198	24
Q	Front Window Opening	408	430	22
R	Right Side Length	4016	4016	0
S	Left Side Length	4018	4007	-11
T	Vehicle Width at B Post	1880	1590	-290
U	Front Wheel Track Width	1636		
V	Rear Wheel Track Width	1630		

DATA SHEET NO. 11 **TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEAUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	462	192	1500
2	Occupant H-Point	657	224	1650
3	Mid Door	720	222	1650
4	Window Sill	1050	39	1350
5	Window Top	1574	1	1200

Note: The measurements are taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

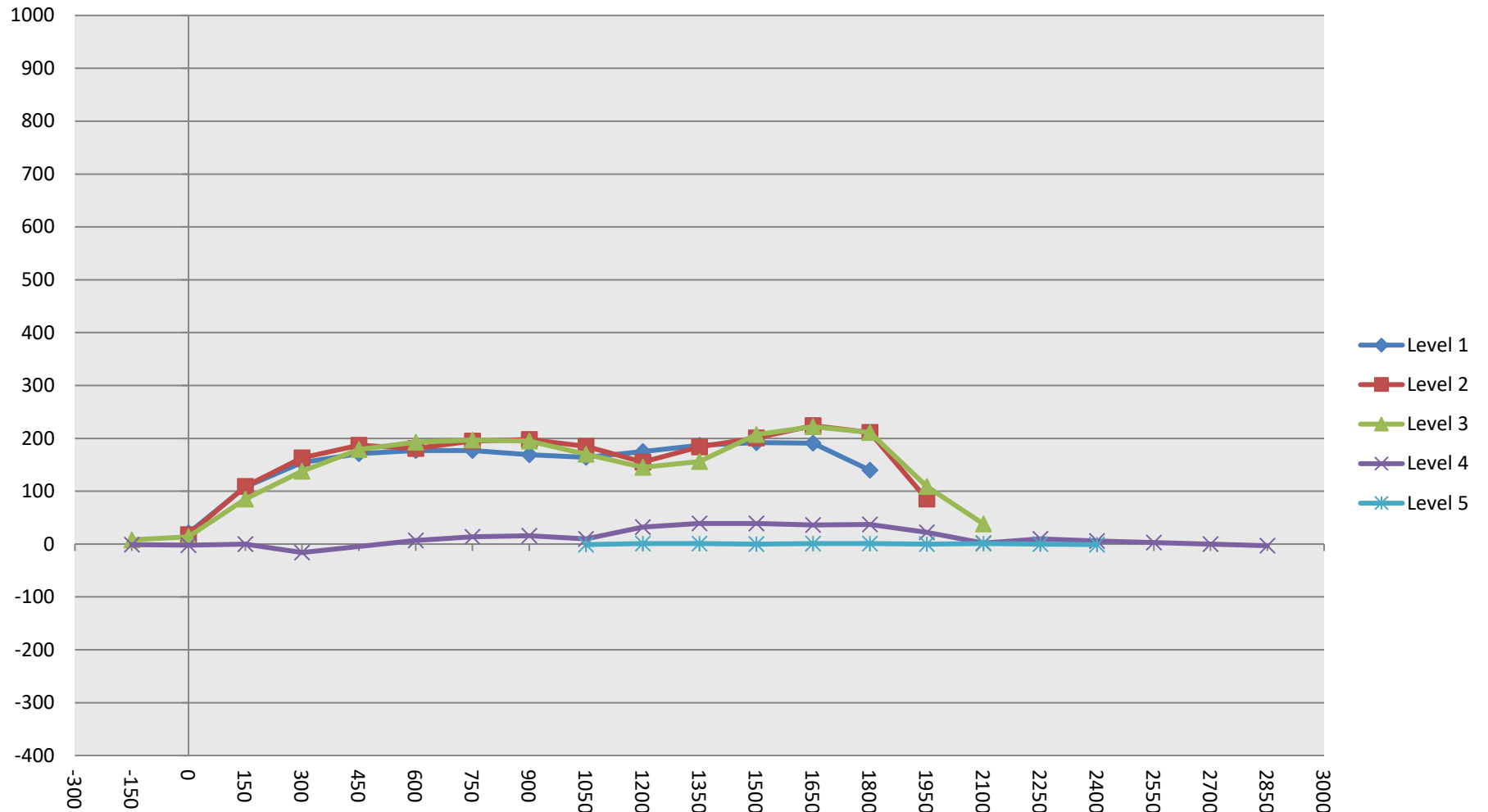
	Pre-Test					Post-Test					Exterior Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-2100															
-1950															
-1800															
-1650															
-1500															
-1350															
-1200															
-1050															
-900															
-750															
-600															
-450															
-300															
-150			956	837				948	838				8	-1	
0	935	946	947	845		914	928	933	847		21	18	14	-2	
150	934	941	943	852		826	832	858	852		108	109	85	0	
300	938	941	943	859		784	778	805	875		154	163	138	-16	
450	942	941	943			771	754	764			171	187	179		
600	944	941	943	869		767	760	750	862		177	181	193	7	
750	945	941	943	875		768	746	746	861		177	195	197	14	
900	945	940	942	879		776	742	747	863		169	198	195	16	
1050	944	938	941	881	601	780	753	771	871	602	164	185	170	10	-1
1200	941	935	940	884	610	766	780	795	852	609	175	155	145	32	1
1350	938	933	938	884	613	751	749	782	845	612	187	184	156	39	1
1500	933	929	934	886	614	741	728	727	847	614	192	201	207	39	0
1650	928	929	931	888	614	737	705	709	852	613	191	224	222	36	1
1800	924	933	935	892	609	784	722	724	855	608	140	211	211	37	1
1950		944	944	892	605		859	835	870	605		85	109	22	0
2100			950	891	598			912	889	597			38	2	1
2250				887	585				877	585				10	0
2400				882	560				876	561				6	-1
2550				875					872					3	
2700				866					866					0	
2850				852					855					-3	
3000															
3150															
3300															
3450															
3600															
3750															
3900															

NOTE: Pre-test measurements are taken when the vehicle is in the "As Tested" weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

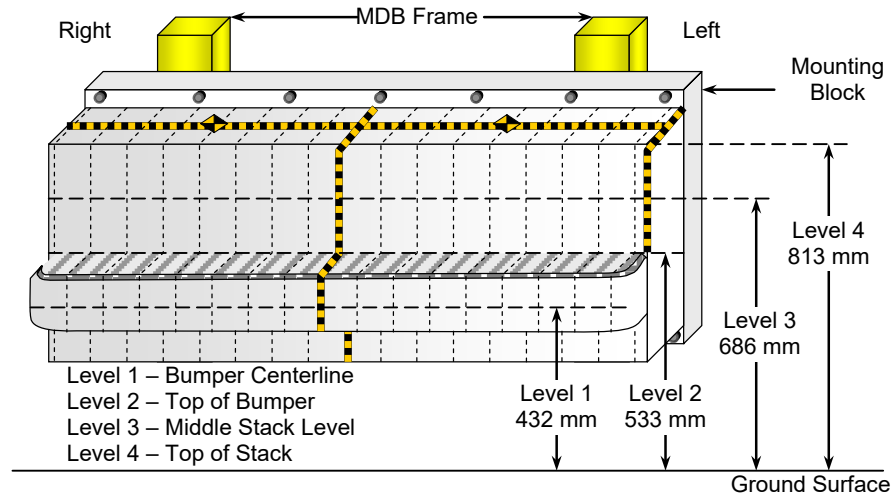
NHTSA No.: O20245902
Test Date: 6/19/2024



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024



FRONT VIEW

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	236
B	Top of Bumper	533	800	Left	158
C	Mid-Level	686	800	Left	159
D	Top of Stack	813	800	Left	239

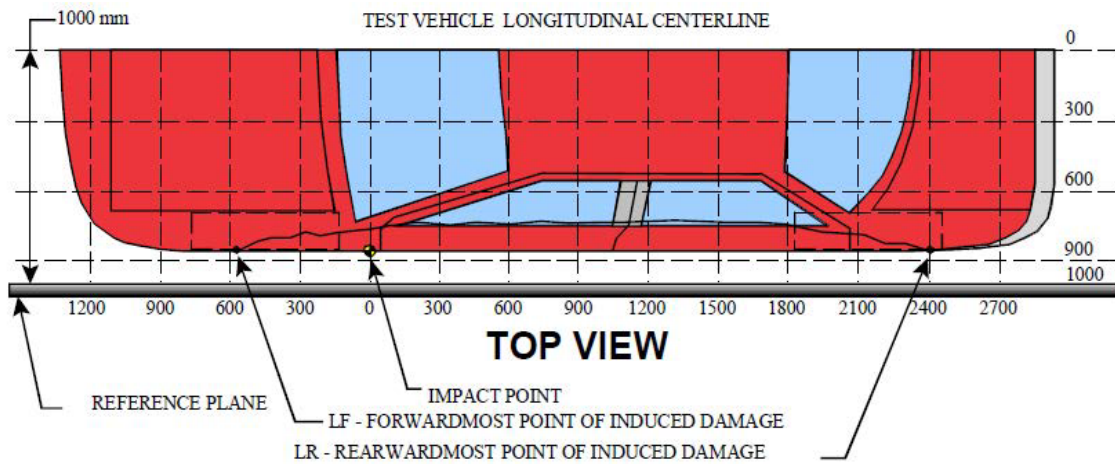
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center (mm)								C _L	Distance Left of Center (mm)							
	800	700	600	500	400	300	200	100		100	200	300	400	500	600	700	800
4	93	83	84	101	129	157	164	121	97	101	107	125	140	145	165	200	239
3	68	58	65	82	84	91	100	71	53	53	57	64	70	73	87	111	159
2	138	138	142	138	142	150	138	135	138	140	137	136	137	138	138	142	158
1	230	226	225	227	225	225	225	226	225	224	223	224	225	225	227	232	236

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	2100	3	88	50	38
2	1642	3	291	69	222
3	1271	3	207	61	146
4	906	3	253	58	195
5	541	3	248	57	191
6	150	3	142	57	85

MDB DAMAGE PROFILE DISTANCES

DPD	Distance from Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Max. Static Crush (mm)
1	800 mm right of center	1	706	476	230
2	480 mm right of center	1	691	463	228
3	160 mm right of center	1	686	463	223
4	160 mm left of center	1	684	463	221
5	480 mm left of center	1	692	463	229
6	800 mm left of center	1	712	476	236

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

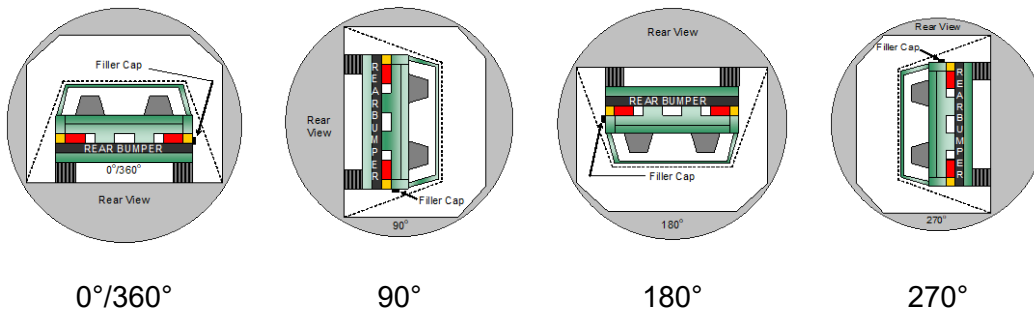
NHTSA No.: O20245902
 Test Date: 6/19/2024

Test Time: 12:00 pm

Temperature: 21.7°C

- A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.
 B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) 0.0 oz.
 C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) None
 D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	110	300	410
90° to 180°	107	300	407
180° to 270°	109	300	409
270° to 360°	111	300	411

FMVSS 301 ROLLOVER SPILLAGE TABLE (UNITS IN OUNCES)

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0.0	0.0	0.0	
90° to 180°	0.0	0.0	0.0	
180° to 270°	0.0	0.0	0.0	
270° to 360°	0.0	0.0	0.0	

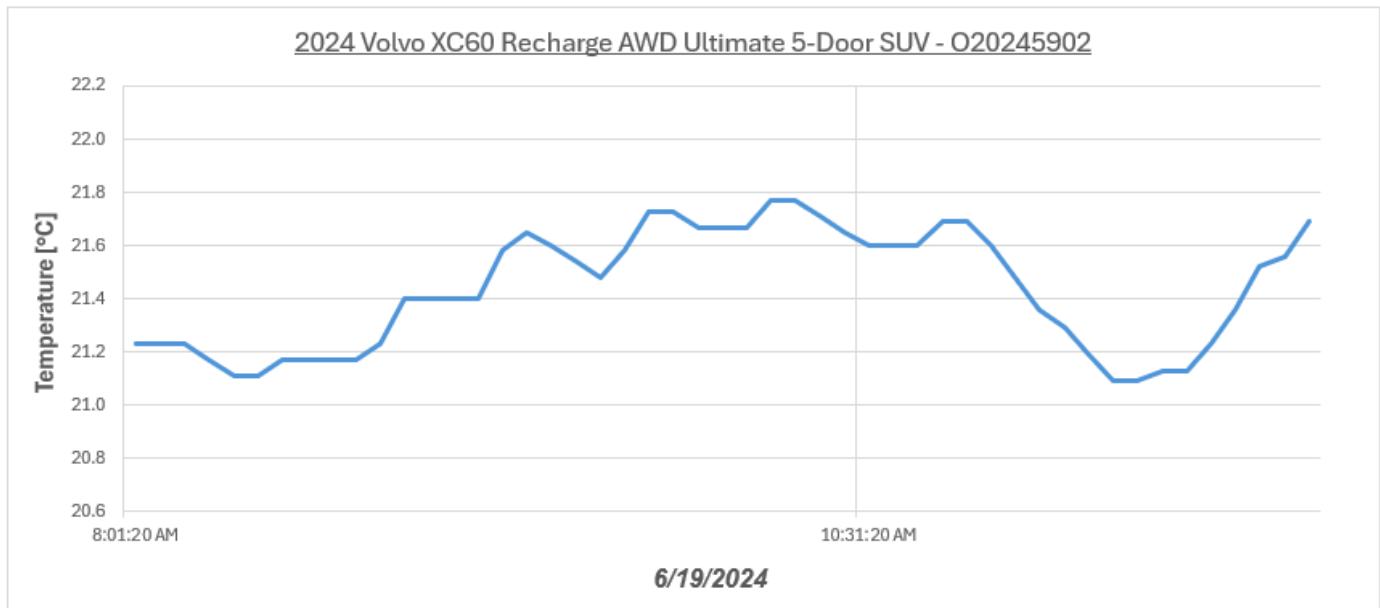
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	
90° to 180°	
180° to 270°	
270° to 360°	

DATA SHEET NO. 15
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024



Serial #	Description	Maximum	Average	Minimum	Units
21282027	VSC North Hall	21.8	21.4	21.1	°C

DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

ELECTRIC VEHICLE PROPULSION SYSTEM

	Units	Observations and Conclusions
Type of Electric Vehicle		Gas-Electric Hybrid
Propulsion Battery Type		Lithium Ion cells
Nominal Voltage	V	369
Physical Location of Automatic Propulsion Battery Disconnect		Inside the Battery Distribution Unit
Auxiliary Battery Type		12 V Lead

PROPULSION BATTERY SYSTEM DATA

	Units	Observations and Conclusions
Electrolyte Fluid Type		Dry Cells
Electrolyte Fluid Specific Gravity		
Electrolyte Fluid Kinematic Viscosity		
Electrolyte Fluid Color		Neutral
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable)		Glycol, Green
Location of Battery Modules		Inside Passenger Compartment
	X	Outside Passenger Compartment
		The high-voltage battery is in the tunnel under the vehicle.

PROPULSION BATTERY STATE OF CHARGE

<i>For all battery types:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	285.6 V
Maximum State of Charge	426.36 V
95% of Maximum State of Charge	405.0 V
Test Voltage - No less than 95% of maximum State of Charge	416.3 V
<i>For batteries that are rechargeable ONLY by an energy source on the vehicle:</i>	
Voltage range corresponding to useable energy of the battery:	
Minimum State of Charge	
Maximum State of Charge	
Test Voltage – Maximum practicable State of Charge within Normal Operating Range	

**DATA SHEET NO. 305-2
PRE-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

Details of Vehicle Chassis Ground Point(s) & Location(s)	Cargo area ground attachment point
---	------------------------------------

PROPULSION BATTERY SYSTEM

Details of Electric Energy Storage/Conversion System Test Points	Connected at + and – terminal ends of propulsion system via HV battery breakout box.
Additional Comments	None

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

PROPULSION BATTERY VOLTAGE

Measurement shall be made with Energy Storage/Conversion System connected to the vehicle propulsion system, and the vehicle in the “ready-to-drive” (propulsion system energized) position.
NOTE: If voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

Vb	V	416.3
----	---	-------

ELECTRIC ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) determined and supplied to contractor by COR.
--

V1	V	8.2
V2	V	394.7

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance Ro (in ohms) should be approximately 500 times the normal operating voltage of the vehicle (in volts) per SAE J1766.

Ro	Ω	226,100
----	---	---------

V1' Pre-Impact	V	3.3
V2' Pre-Impact	V	162.8

DATA SHEET NO. 305-3 (CONTINUED)
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$		
Ri1 Pre-Impact	Ω	16,495,524
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$		
Ri2 Pre-Impact	Ω	328,759
$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$		
Ri Pre-Impact	Ω	328,759
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$		
Ri / Vb Pre-Impact	Ω/V	790

NOTE: The minimum Electrical Isolation Value is 500 Ω/V .

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

**DATA SHEET NO. 305-4
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING**

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.0
----------------	---	-----

V1 Post-Impact	V	0.06	Impact Time	1	Minutes	42	Seconds
V2 Post-Impact	V	0.04		1	Minutes	46	Seconds
V1' Post-Impact	V	0.00		1	Minutes	58	Seconds
V2' Post-Impact	V	0.00		1	Minutes	52	Seconds

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
 This "zero voltage" condition is considered as being compliant.

$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$							
Ri1 Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	58	Seconds
$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$							
Ri2 Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	52	Seconds
$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$							
Ri Post-Impact	Ω	Zero Volts	Impact Time	1	Minutes	52	Seconds
$R_i / V_b = \text{Electrical Isolation Value} / \text{Nominal Battery Voltage}$							
Ri / Vb Post-Impact	Ω/V	Zero Volts	Impact Time	1	Minutes	52	Seconds

NOTE: The minimum Electrical Isolation Value is 500 Ω/V.

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

DATA SHEET NO. 305-4 (CONTINUED)
POST-IMPACT DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment [Supply photographs as appropriate]:
Not Applicable

	Yes (Fail)	No
Has the Propulsion Battery Module moved within the passenger compartment?		X

Describe intrusion of an outside Propulsion Battery Component into the passenger compartment [Supply photographs as appropriate]:
No Intrusion

	Yes (Fail)	No
Has an outside Propulsion Battery Component intruded into the passenger compartment?		X

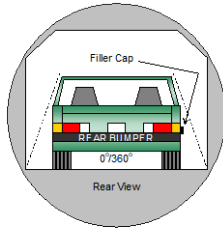
	Yes (Fail)	No
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

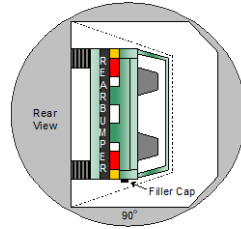
Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

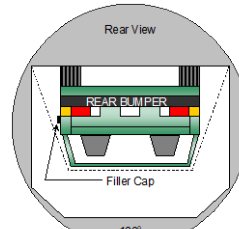
PROPULSION BATTERY SYSTEM COMPONENTS



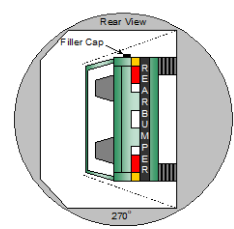
0°/360°



90°



180°



270°

PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0° - 90°	1	min	50	sec	5	min	6	min	50	sec	7	min
90° - 180°	1	min	47	sec	5	min	6	min	47	sec	7	min
180° - 270°	1	min	49	sec	5	min	6	min	49	sec	7	min
270° - 360°	1	min	51	sec	5	min	6	min	51	sec	7	min

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

NOTE: The maximum allowable Propulsion Battery Electrolyte Spillage is 5.0 Liters.

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0° to 90°	0	Not Applicable
90° to 180°	0	Not Applicable
180° to 270°	0	Not Applicable
270° to 360°	0	Not Applicable
Total Spillage	0	

	Yes (Fail)	No
Is the total Propulsion Battery Electrolyte Spillage greater than 5.0 Liters?		X
Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?		X

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
 Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
 Test Date: 6/19/2024

VOLTMETER INFORMATION

	Units	Observations and Conclusions
Make		Fluke
Model		177
Serial Number		62100018
Internal Impedance Value	MΩ	> 10 MΩ < 100 pF
Resolution	V	0.001
Last Calibration Date		7/14/2023

ELECTRICAL ISOLATION MEASUREMENTS

Vb Post-Impact	V	0.05
----------------	---	------

Record V1, V2, V1', V2' voltage measurements at the start of each successive increment of 90°, 180°, 270°, and 360° of the static rollover test.

	Voltage	Units	Test Phase	Time			
V1	0.02	V	0°	min		sec	
	0.02		90°		12		
	0.02		180°		16		
	0.02		270°		24		
	0.02		360°		45		
V2	0.02	V	0°	min		sec	
	0.02		90°		16		
	0.02		180°		20		
	0.02		270°		28		
	0.02		360°		49		
V1'	0.00	V	0°	min		sec	
	0.00		90°		26		
	0.00		180°		31		
	0.00		270°		38		
	0.00		360°		2		
V2'	0.00	V	0°	min		sec	
	0.00		90°		20		
	0.00		180°		24		
	0.00		270°		32		
	0.00		360°		54		

DATA SHEET NO. 305-5 (CONTINUED)
STATIC ROLLOVER TEST DATA
FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2024 Volvo XC60 Recharge AWD Core 5-Door SUV
Test Program: NCAP Side MDB Impact Test

NHTSA No.: O20245902
Test Date: 6/19/2024

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts".
This "zero voltage" condition is considered as being compliant.

	Voltage	Units	Test Phase	Time			
Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']							
Ri1	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		26	
	Zero Volts		180°	3		31	
	Zero Volts		270°	3		38	
	Zero Volts		360°	3		2	
Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']							
Ri2	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		20	
	Zero Volts		180°	3		24	
	Zero Volts		270°	3		32	
	Zero Volts		360°	2		54	
Ri = The lesser of Ri1 and Ri2							
Ri	Zero Volts	Ω	0°		min		sec
	Zero Volts		90°	3		20	
	Zero Volts		180°	3		24	
	Zero Volts		270°	3		32	
	Zero Volts		360°	2		54	
Ri / Vb = Electrical Isolation Value / Nominal Battery Voltage							
Ri / Vb	Zero Volts	Ω/V	0°		min		sec
	Zero Volts		90°	3		20	
	Zero Volts		180°	3		24	
	Zero Volts		270°	3		32	
	Zero Volts		360°	2		54	

NOTE: The minimum Electrical Isolation Value is 500 Ω/V .

	Yes	No (Fail)
Is the measured Electrical Isolation Value $\geq 500 \Omega/V$?	X	
Additional Comments	None	

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 001	As Delivered Right Front Three-Quarter View of Test Vehicle	A-1
Photo No. 002	As Delivered Left Rear Three-Quarter View of Test Vehicle	A-1
Photo No. 003	Pre-Test Frontal View of Test Vehicle	A-2
Photo No. 004	Post-Test Frontal View of Test Vehicle	A-2
Photo No. 005	Pre-Test Left Front Three-Quarter View of Test Vehicle	A-3
Photo No. 006	Post-Test Left Front Three-Quarter View of Test Vehicle	A-3
Photo No. 007	Pre-Test Left Side View of Test Vehicle	A-4
Photo No. 008	Post-Test Left Side View of Test Vehicle	A-4
Photo No. 009	Pre-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 010	Post-Test Left Three-Quarter Rear View of Test Vehicle	A-5
Photo No. 011	Pre-Test Rear View of Test Vehicle	A-6
Photo No. 012	Post-Test Rear View of Test Vehicle	A-6
Photo No. 013	Pre-Test Right Side View of Test Vehicle	A-7
Photo No. 014	Post-Test Right Side View of Test Vehicle	A-7
Photo No. 015	Pre-Test Overhead View of Test Area	A-8
Photo No. 016	Post-Test Overhead View of Test Area	A-8
Photo No. 017	Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 018	Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle	A-9
Photo No. 019	Pre-Test Close-Up View of Impact Point Target	A-10
Photo No. 020	Post-Test Close-Up View of Impact Point Target	A-10
Photo No. 021	Pre-Test Left Front Door Latch Close-Up	A-11
Photo No. 022	Post-Test Left Front Door Latch Close-Up	A-11
Photo No. 023	Pre-Test Left Rear Door Latch Close-Up	A-12
Photo No. 024	Post-Test Left Rear Door Latch Close-Up	A-12
Photo No. 025	Pre-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 026	Post-Test Front Close-Up View of Driver Dummy	A-13
Photo No. 027	Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking	A-14
Photo No. 028	Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-14
Photo No. 029	Post-Test Left Side View of Driver Dummy Shoulder and Door Top View	A-15
Photo No. 030	Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning	A-15

		<u>Page No.</u>
Photo No. 031	Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint	A-16
Photo No. 032	Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning	A-16
Photo No. 033	Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan	A-17
Photo No. 034	Pre-Test Placement of Driver Dummy's Feet	A-17
Photo No. 035	Pre-Test View of Belt Anchorage for Driver Dummy	A-18
Photo No. 036	Pre-Test Left Side View of Steering Wheel	A-18
Photo No. 037	Pre-Test View of Disengaged Parking Brake	A-19
Photo No. 038	Pre-Test View of Parking Brake	A-19
Photo No. 039	Pre-Test Close-Up Left Side View of Driver Seat Track	A-20
Photo No. 040	Pre-Test Close-Up Left Side View of Driver Seat Back	A-20
Photo No. 041	Pre-Test Close-Up View of Driver Seat Back or Head Restraint	A-21
Photo No. 042	Pre-Test Driver Dummy and Door Clearance View	A-21
Photo No. 043	Post-Test Driver Dummy and Door Clearance View	A-22
Photo No. 044	Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	A-22
Photo No. 045	Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment	A-23
Photo No. 046	Pre-Test Driver Inner Door Panel View	A-23
Photo No. 047	Post-Test Driver Inner Door Panel View	A-24
Photo No. 048	Post-Test Driver Dummy Close-up Head Contact with Vehicle Interior View	A-24
Photo No. 049	Post-Test Driver Dummy Close-up Head Contact with Side Airbag View	A-25
Photo No. 050	Post-Test Driver Dummy Close-up Torso Contact with Vehicle Interior View	A-25
Photo No. 051	Post-Test Driver Dummy Close-up Torso Contact with Side Airbag View	A-26
Photo No. 052	Post-Test Driver Dummy Close-up Pelvis Contact with Vehicle Interior View	A-26
Photo No. 053	Post-Test Driver Dummy Close-up Pelvis Contact with Side Airbag View	A-27
Photo No. 054	Post-Test Driver Dummy Close-up Knee Contact View	A-27
Photo No. 055	Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking	A-28
Photo No. 056	Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-28
Photo No. 057	Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View	A-29

		<u>Page No.</u>
Photo No. 058	Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning	A-29
Photo No. 059	Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint	A-30
Photo No. 060	Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning	A-30
Photo No. 061	Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan	A-31
Photo No. 062	Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket	A-31
Photo No. 063	Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level	A-32
Photo No. 064	Pre-Test Placement of Rear Passenger Dummy's Feet	A-32
Photo No. 065	Pre-Test View of Belt Anchorage for Rear Passenger Dummy	A-33
Photo No. 066	Pre-Test Close-Up Left Side View of Rear Passenger Seat Track	A-33
Photo No. 067	Pre-Test Close-Up Left Side View of Rear Passenger Seat Back	A-34
Photo No. 068	Pre-Test Close-up View of Rear Passenger Seat Back or Head Restraint	A-34
Photo No. 069	Pre-Test Rear Passenger Dummy and Door Clearance View	A-35
Photo No. 070	Post-Test Rear Passenger Dummy and Door Clearance View	A-35
Photo No. 071	Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	A-36
Photo No. 072	Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment	A-36
Photo No. 073	Pre-Test Rear Passenger Inner Door Panel View	A-37
Photo No. 074	Post-Test Rear Passenger Inner Door Panel View	A-37
Photo No. 075	Post-Test Rear Passenger Dummy Close-up Head Contact with Vehicle Interior View	A-38
Photo No. 076	Post-Test Rear Passenger Dummy Close-up Head Contact with Side Airbag View	A-38
Photo No. 077	Post-Test Rear Passenger Dummy Close-up Torso Contact with Vehicle Interior View	A-39
Photo No. 078	Post-Test Rear Passenger Dummy Close-up Torso Contact with Side Airbag View	A-39
Photo No. 079	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Vehicle Interior View	A-40
Photo No. 080	Post-Test Rear Passenger Dummy Close-up Pelvis Contact with Side Airbag View	A-40
Photo No. 081	Post-Test Rear Passenger Dummy Close-up Knee Contact View	A-41
Photo No. 082	Pre-Test View of Fuel Filler Cap or Fuel Filler Neck	A-41
Photo No. 083	Post-Test View of Fuel Filler Cap or Fuel Filler Neck	A-42

		<u>Page No.</u>
Photo No. 084	Pre-Test Front View of MDB Impactor Face	A-42
Photo No. 085	Post-Test Front View of MDB Impactor Face	A-43
Photo No. 086	Pre-Test Top View of MDB Impactor Face	A-43
Photo No. 087	Post-Test Top View of MDB Impactor Face	A-44
Photo No. 088	Pre-Test Left Side View of MDB Impactor Face	A-44
Photo No. 089	Post-Test Left Side View of MDB Impactor Face	A-45
Photo No. 090	Pre-Test Right Side View of MDB Impactor Face	A-45
Photo No. 091	Post-Test Right Side View of MDB Impactor Face	A-46
Photo No. 092	Close-Up View of Vehicle's Certification Label	A-46
Photo No. 093	Close-Up View of Vehicle's Tire Information Placard or Label	A-47
Photo No. 094	Pre-Test Ballast View	A-47
Photo No. 095	Post-Test Primary and Redundant Speed Trap Read-Out	A-48
Photo No. 096	FMVSS No. 301 Static Rollover 0 Degrees	A-48
Photo No. 097	FMVSS No. 301 Static Rollover 90 Degrees	A-49
Photo No. 098	FMVSS No. 301 Static Rollover 180 Degrees	A-49
Photo No. 099	FMVSS No. 301 Static Rollover 270 Degrees	A-50
Photo No. 100	FMVSS No. 301 Static Rollover 360 Degrees	A-50
Photo No. 101	Impact Event	A-51
Photo No. 102	Monroney Label	A-51
Photo No. 103	Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52
Photo No. 104	Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual	A-52
Photo No. 305-01	Auxiliary Power Module Warning Label	A-53
Photo No. 305-02	Power Inverter Warning Label	A-53
Photo No. 305-03	First Responder Warning Label	A-54
Photo No. 305-04	First Responder Warning Location	A-54
Photo No. 305-05	Other Vehicle Label(s) Related to Electrical Propulsion System	A-55
Photo No. 305-06	Manual High Voltage Service Disconnect in Place	A-55
Photo No. 305-07	Manual High Voltage Service Disconnect Removed	A-56
Photo No. 305-08	Manual High Voltage Service Disconnect Removed	A-56
Photo No. 305-09	Pre-Impact View of Propulsion Battery	A-57

		<u>Page No.</u>
Photo No. 305-10	Post-Impact Front View of Propulsion Battery	A-57
Photo No. 305-11	Post-Impact Rear View of Propulsion Battery	A-58
Photo No. 305-12	Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-58
Photo No. 305-13	Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules	A-59
Photo No. 305-14	Pre-Impact View of Propulsion Battery Module(s)	A-59
Photo No. 305-15	Post-Impact View of Propulsion Battery Module(s)	A-60
Photo No. 305-16	Pre-Impact View of Electric Propulsion Drive	A-60
Photo No. 305-17	Post-Impact View of Electric Propulsion Drive	A-61
Photo No. 305-18	Pre-Impact View of High Voltage Interconnect(s)	A-61
Photo No. 305-19	Pre-Impact View Propulsion Battery Venting System(s)	A-62
Photo No. 305-20	Pre-Impact View of Other Visible Electric Propulsion Components	A-62
Photo No. 305-21	Pre-Impact View of Ground Lead Attached	A-63
Photo No. 305-22	Pre-Impact View of High Voltage Leads Attached	A-63
Photo No. 305-23	Pre-Impact Close-Up View of High Voltage Leads Attached	A-64
Photo No. 305-24	Pre-Impact View of Installed Test Interface Port	A-64
Photo No. 305-25	Post-Impact View of Installed Test Interface Port	A-65
Photo No. 305-26	Pre-Impact View of Other Test Devices	A-65
Photo No. 305-27	Post-Impact View of Other Test Devices	A-66
Photo No. 305-28	FMVSS No. 305 Static Rollover at 90 Degrees	A-66
Photo No. 305-29	FMVSS No. 305 Static Rollover at 180 Degrees	A-67
Photo No. 305-30	FMVSS No. 305 Static Rollover at 270 Degrees	A-67
Photo No. 305-31	FMVSS No. 305 Static Rollover at 360 Degrees	A-68
Photo No. 305-32	Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-68
Photo No. 305-33	Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery	A-69
Photo No. 305-34	Post-Impact Propulsion Battery System Mounting and/or Intrusion Failure(s)	A-69
Photo No. 305-35	Post-Impact View of Battery Component Intrusion	A-70
Photo No. 305-36	Post-Impact View of Battery Module Movement or Retention Loss	A-70
Photo No. 305-37	Post-Impact View of Propulsion Battery Electrolyte Spillage Location	A-71
Photo No. 305-38	Post-Test View of Propulsion Battery Electrolyte Spillage Location	A-71



Photo No. 001 - As Delivered Right Front Three-Quarter View of Test Vehicle



Photo No. 002 - As Delivered Left Rear Three-Quarter View of Test Vehicle



Photo No. 003 - Pre-Test Frontal View of Test Vehicle



Photo No. 004 - Post-Test Frontal View of Test Vehicle



Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle



Photo No. 007 - Pre-Test Left Side View of Test Vehicle



Photo No. 008 - Post-Test Left Side View of Test Vehicle



Photo No. 009 - Pre-Test Left Three-Quarter Rear View of Test Vehicle

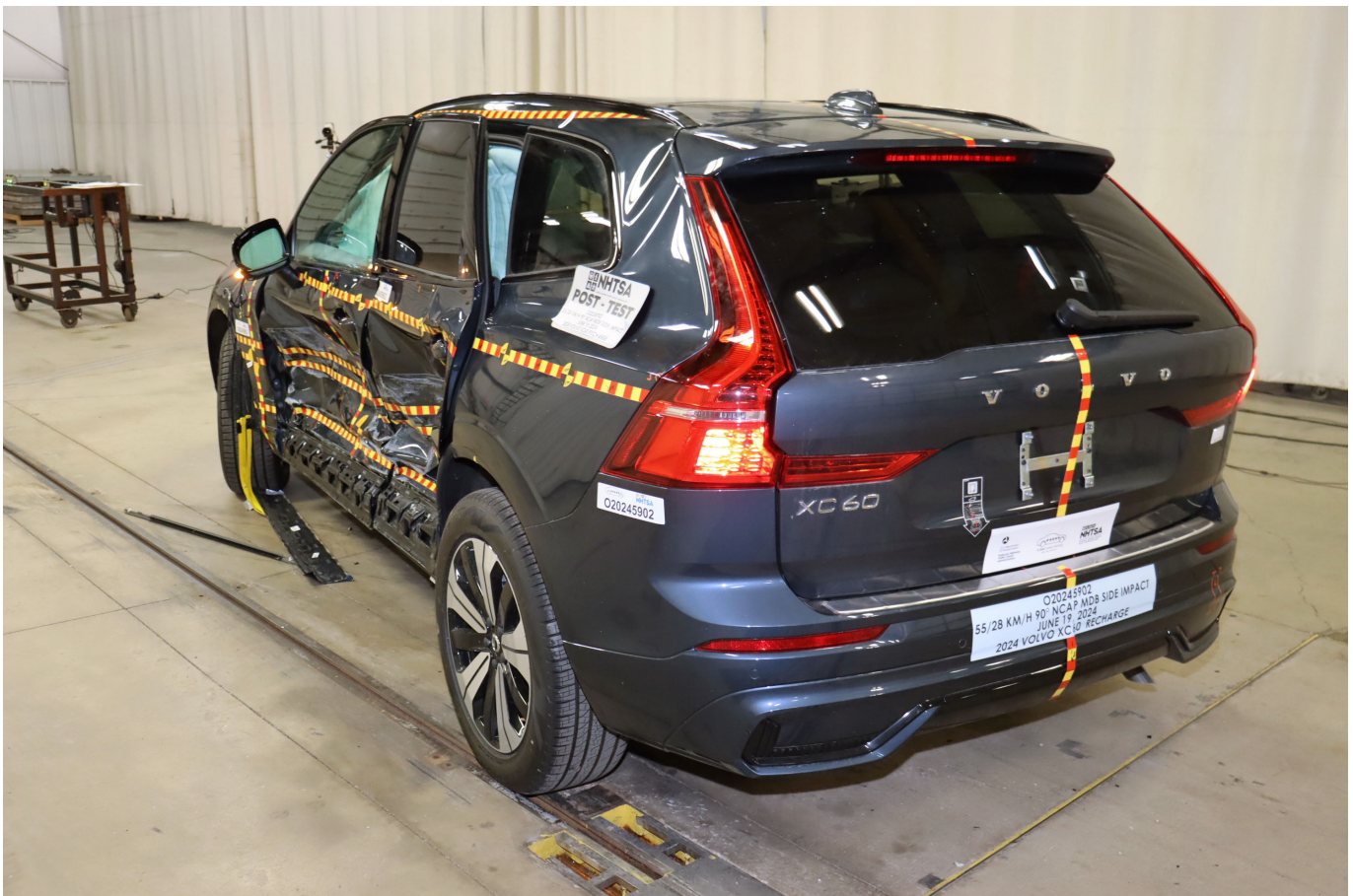


Photo No. 010 - Post-Test Left Three-Quarter Rear View of Test Vehicle



Photo No. 011 - Pre-Test Rear View of Test Vehicle

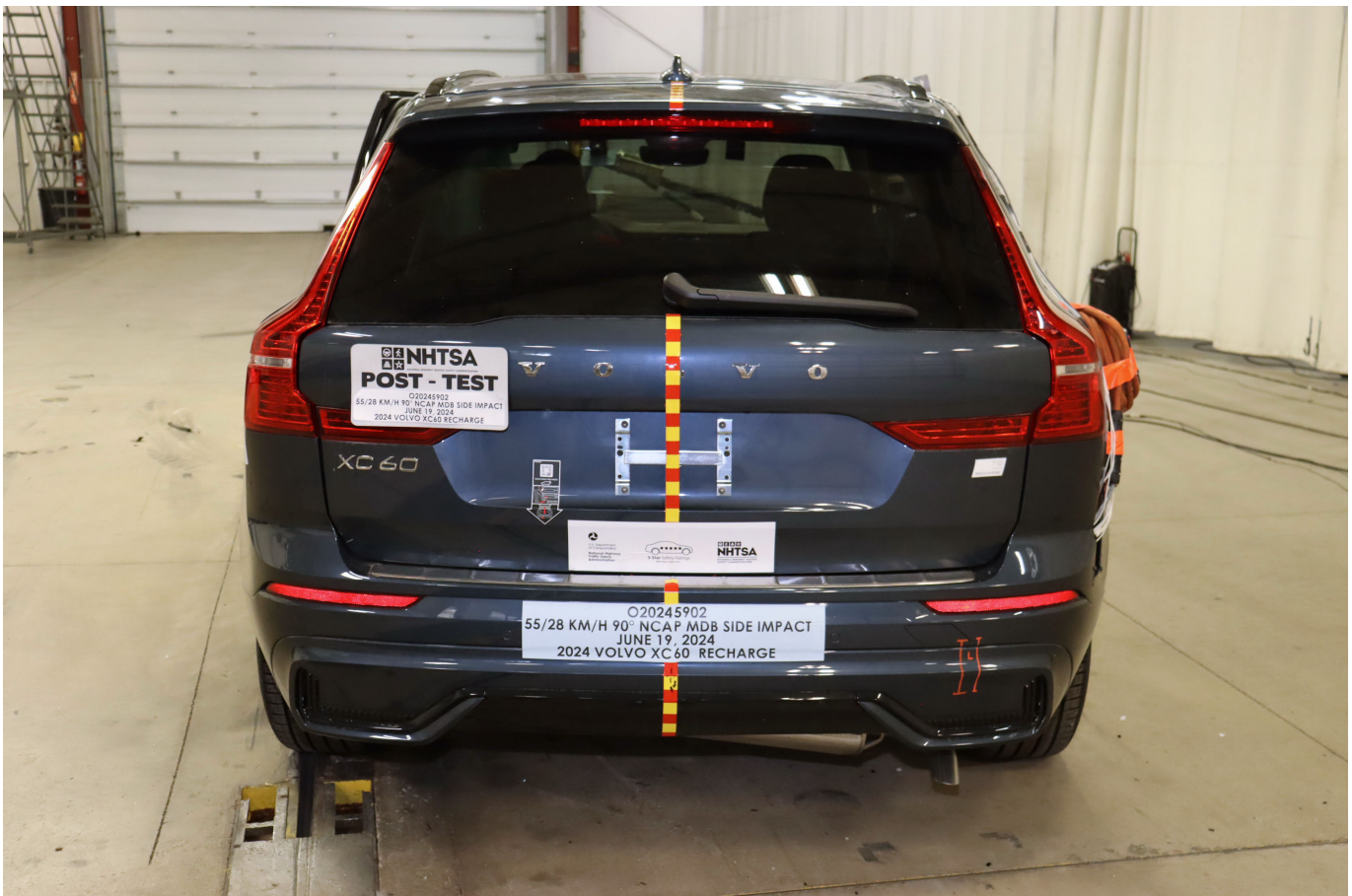


Photo No. 012 - Post-Test Rear View of Test Vehicle



Photo No. 013 - Pre-Test Right Side View of Test Vehicle



Photo No. 014 - Post-Test Right Side View of Test Vehicle

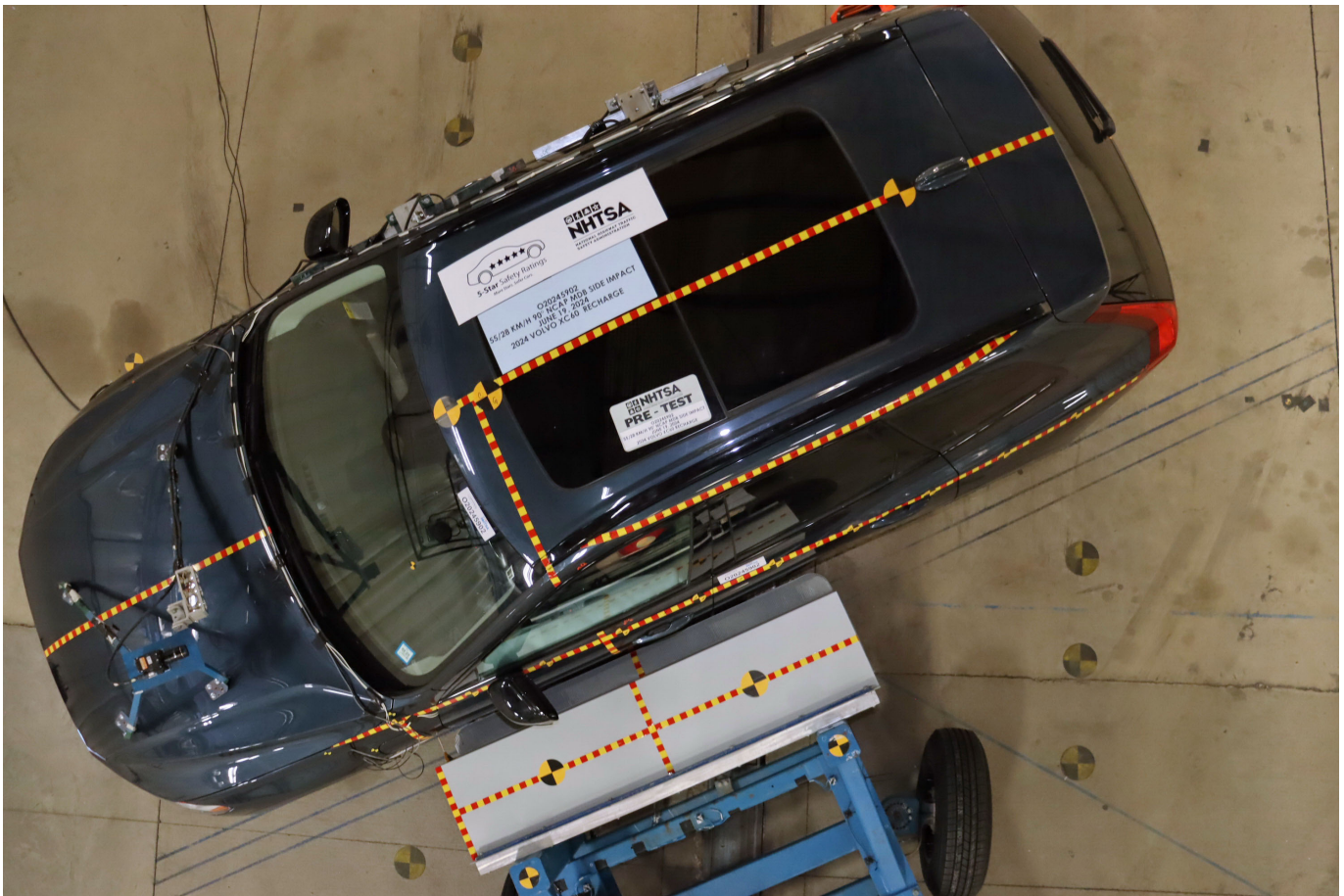


Photo No. 015 - Pre-Test Overhead View of Test Area

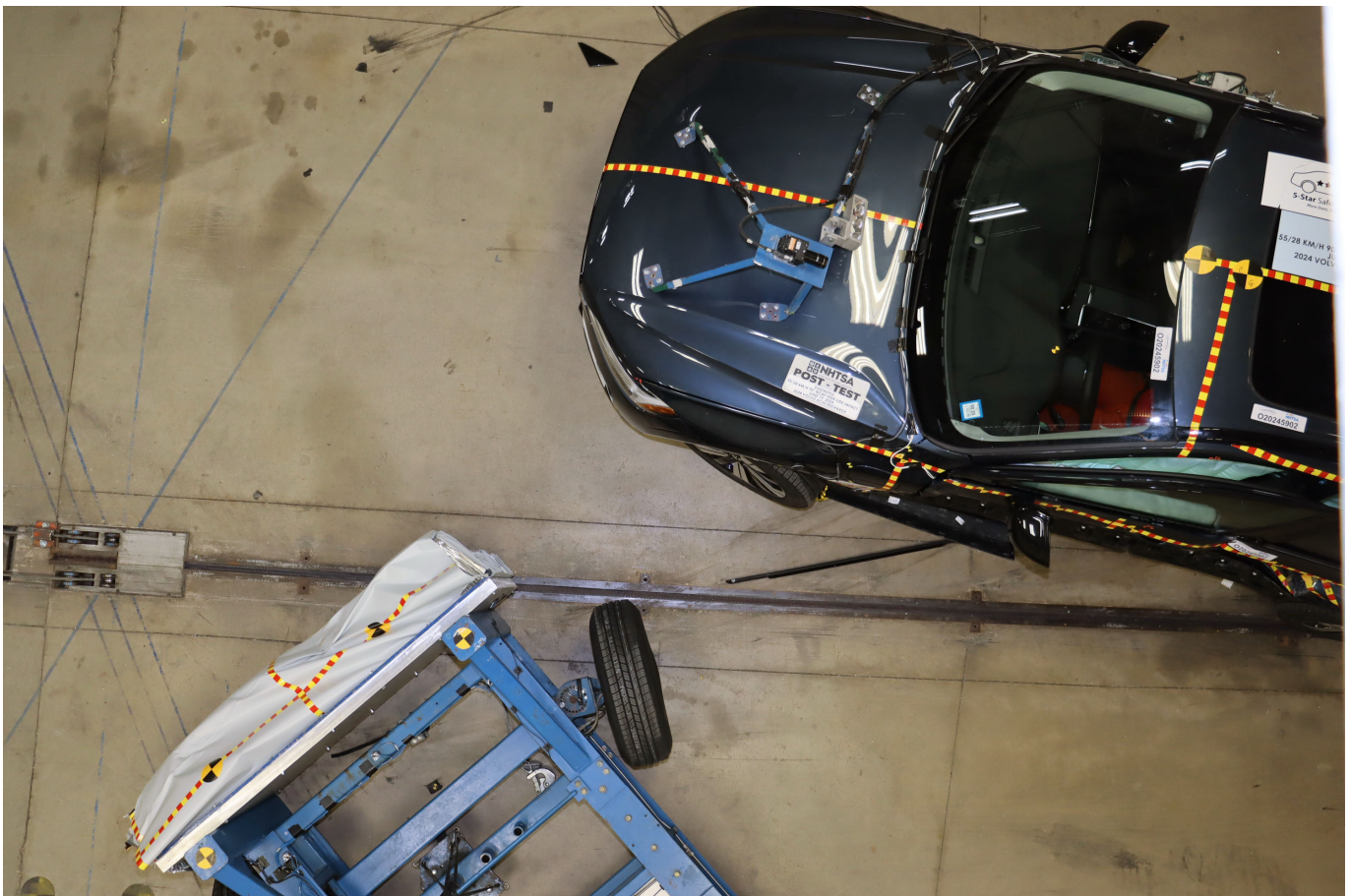


Photo No. 016 - Post-Test Overhead View of Test Area



Photo No. 017 - Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 018 - Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle



Photo No. 019 - Pre-Test Close-Up View of Impact Point Target



Photo No. 020 - Post-Test Close-Up View of Impact Point Target



Photo No. 021 - Pre-Test Left Front Door Latch Close-Up



Photo No. 022 - Post-Test Left Front Door Latch Close-Up



Photo No. 023 - Pre-Test Left Rear Door Latch Close-Up



Photo No. 024 - Post-Test Left Rear Door Latch Close-Up



Photo No. 025 - Pre-Test Front Close-Up View of Driver Dummy



Photo No. 026 - Post-Test Front Close-Up View of Driver Dummy



Photo No. 027 - Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking



Photo No. 028 - Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 029 - Post-Test Left Side View of Driver Dummy Shoulder and Door Top View



Photo No. 030 - Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning



Photo No. 031 - Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 032 - Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning



Photo No. 033 - Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan



Photo No. 034 - Pre-Test Placement of Driver Dummy's Feet

PHOTOGRAPH NOT AVAILABLE

Photo No. 035 - Pre-Test View of Belt Anchorage for Driver Dummy



Photo No. 036 - Pre-Test Left Side View of Steering Wheel



Photo No. 037 - Pre-Test View of Disengaged Parking Brake



Photo No. 038 - Pre-Test View of Parking Brake



Photo No. 039 - Pre-Test Close-Up Left Side View of Driver Seat Track



Photo No. 040 - Pre-Test Close-Up Left Side View of Driver Seat Back



Photo No. 041 - Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Photo No. 042 - Pre-Test Driver Dummy and Door Clearance View



Photo No. 043 - Post-Test Driver Dummy and Door Clearance View



Photo No. 044 - Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Photo No. 045 - Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment



Photo No. 046 - Pre-Test Driver Inner Door Panel View



Photo No. 047 - Post-Test Driver Inner Door Panel View



Photo No. 048 - Post-Test Driver Dummy Close-Up Head Contact with Vehicle Interior View



Photo No. 049 - Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View



Photo No. 050 - Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



Photo No. 051 - Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



Photo No. 052 - Post-Test Driver Dummy Close-Up Pelvis Contact with Vehicle Interior View



Photo No. 053 - Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View



Photo No. 054 - Post-Test Driver Dummy Close-Up Knee Contact View



Photo No. 055 - Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking



Photo No. 056 - Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 057 - Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View



Photo No. 058 - Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning



Photo No. 059 - Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint



Photo No. 060 - Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning



Photo No. 061 - Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan



Photo No. 062 - Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



Photo No. 063 - Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level



Photo No. 064 - Pre-Test Placement of Rear Passenger Dummy's Feet



Photo No. 065 - Pre-Test View of Belt Anchorage for Rear Passenger Dummy



Photo No. 066 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

PHOTOGRAPH NOT APPLICABLE

Photo No. 067 - Pre-Test Close-Up Left Side View of Rear Passenger Seat Back



Photo No. 068 - Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint



Photo No. 069 - Pre-Test Rear Passenger Dummy and Door Clearance View



Photo No. 070 - Post-Test Rear Passenger Dummy and Door Clearance View



Photo No. 071 - Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 072 - Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



Photo No. 073 - Pre-Test Rear Passenger Inner Door Panel View



Photo No. 074 - Post-Test Rear Passenger Inner Door Panel View



Photo No. 075 - Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle Interior View



Photo No. 076 - Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View



Photo No. 077 - Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 078 - Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View



Photo No. 079 - Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Vehicle Interior View

PHOTOGRAPH NOT APPLICABLE

Photo No. 080 - Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View



Photo No. 081 - Post-Test Rear Passenger Dummy Close-Up Knee Contact View



Photo No. 082 - Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 083 - Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Photo No. 084 - Pre-Test Front View of MDB Impactor Face



Photo No. 085 - Post-Test Front View of MDB Impactor Face



Photo No. 086 - Pre-Test Top View of MDB Impactor Face

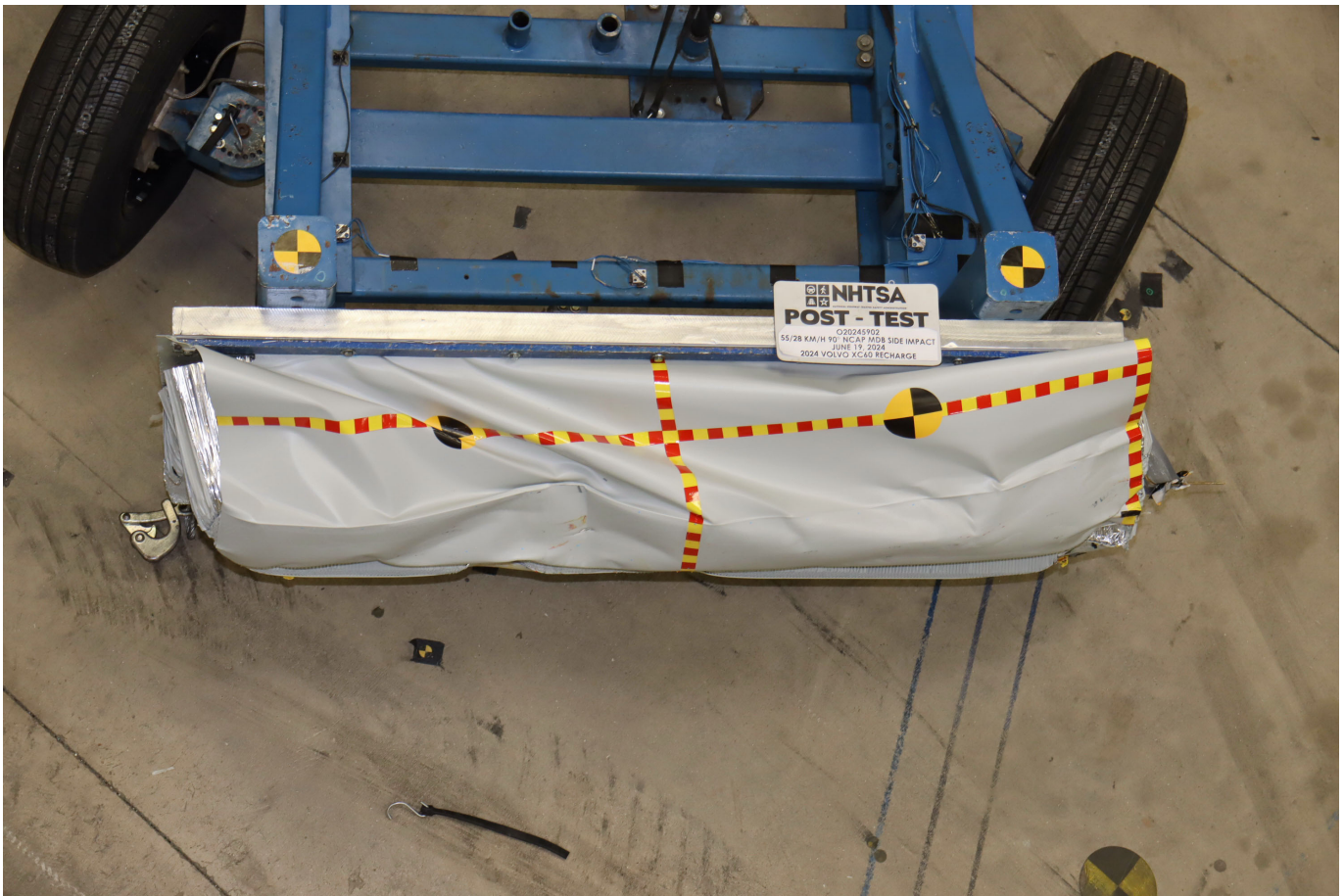


Photo No. 087 - Post-Test Top View of MDB Impactor Face



Photo No. 088 - Pre-Test Left Side View of MDB Impactor Face



Photo No. 089 - Post-Test Left Side View of MDB Impactor Face



Photo No. 090 - Pre-Test Right Side View of MDB Impactor Face



Photo No. 091 - Post-Test Right Side View of MDB Impactor Face



Photo No. 092 - Close-Up View of Vehicle's Certification Label



Photo No. 093 - Close-Up View of Vehicle's Tire Information Placard or Label

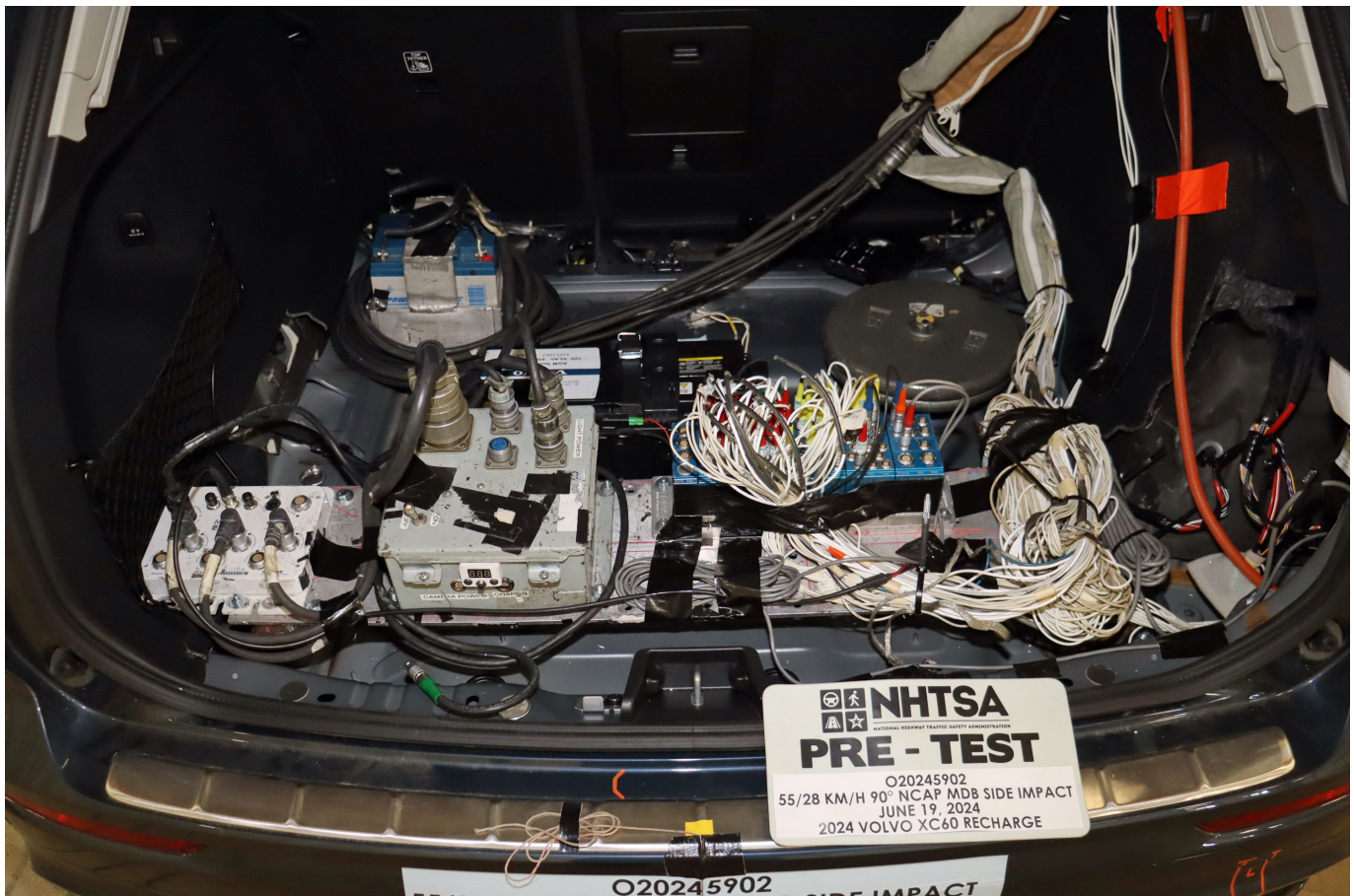


Photo No. 094 - Pre-Test Ballast View



Photo No. 095 - Post-Test Primary and Redundant Speed Trap Read-Out



Photo No. 096 - FMVSS Photo No. 301 Static Rollover 0 Degrees

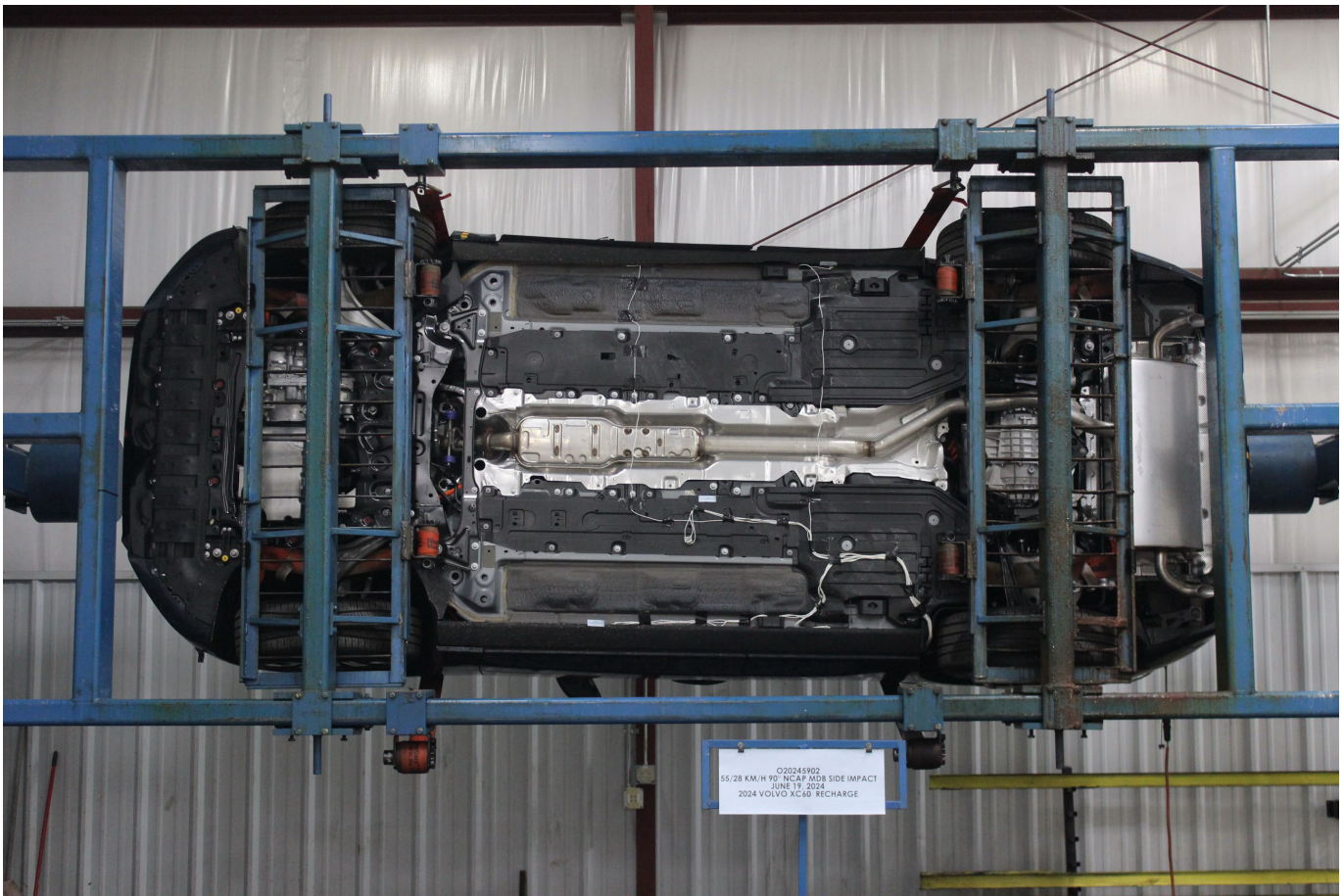


Photo No. 097 - FMVSS Photo No. 301 Static Rollover 90 Degrees



Photo No. 098 - FMVSS Photo No. 301 Static Rollover 180 Degrees



Photo No. 099 - FMVSS Photo No. 301 Static Rollover 270 Degrees



Photo No. 100 - FMVSS Photo No. 301 Static Rollover 360 Degrees



Photo No. 101 - Impact Event

2024 VOLVO

XC60 RECHARGE AWD CORE

DARK THEME

PERFORMANCE

2.0L Turbo-Charged, Direct Inject Engine with Electric Motor
18.8 kWh High Voltage Battery
Dual Voltage Charging Cable
8-Speed Geartronic Automatic Trans w/ Start-Stop
Combined 455 HP and 523 lb-ft Torque (312 HP Direct Injected w/ 143 HP Electric Motor)
Anti-Lock Braking System (ABS)
Advanced Electronic Stability Control (ESC)
18" Diamond Cut Alloy Wheel with All Season Tires

AUDIO & TECHNOLOGY

12.3" Digital Driver Display
USB-C Ports, 2 Front + 2 Rear
Bluetooth Connectivity
Digital Services Package 4-Yr Subscription includes:
Google built-in with Google Maps, Google Play Store & Google Assistant
Volvo Cars Remote App Services
Remote Start and Remote Lock/Unlock
Road Sign Information
Over the Air Updates
Apple CarPlay
SiriusXM Radio with Trial Subscription
High Performance Sound

SAFETY & SECURITY

LED Headlights with DRL, AHB, and ABL
BLIS Blind Spot Information System with Steer Assist and Cross Traffic Alert
Collision Avoidance featuring:
Low & High Speed Collision Mitigation
Detects Vehicle/Pedestrian/Cyclist/Large Animal
Oncoming Mitigation by Braking
Driver Alert Control
Front, Side & Curtain Airbags with Driver Side Knee Airbag
Whiplash Protection System (WHIPS) in Front Seats
Cruise Control
Ready to Drive Notification
Automatic Unlocking after Collision
Lane Keeping Aid
Forward Collision Warning
Post Impact Braking
Tire Repair Kit

LUXURY & CONVENIENCE

Laminated Panoramic Sunroof with Power Sunshade
Leatherette or City Weave Textile Seating Surfaces
Keyless Entry and Drive
Heated Front Seats
High-Gloss Black Mesh Grille and Lower Outer Grille
High-Gloss Black Window Trim, Mirror Caps & Grill Frame
Fully color adapted sills and bumpers
Glossy Black Integrated Roof Rails
Retractable Rear View Mirrors
2-Way Power Lumbar Support, Front Seats
Power Front Seats with Driver Seat Memory
2-Zone Automatic Climate Control
CleanZone
Auto-Dimming Interior and Exterior Mirrors
Tinted Windows Rear Side Doors & Cargo Area
Iron One Inlays

AUTHORIZED RETAILER

MAGUIRE VOLVO 3725
370 ELMIRA RD
ITHACA, NY US 14850

WARRANTY

48 Month/50,000 Mile Limited Warranty Coverage 144 Month Corrosion Protection "Unlimited Mileage" Refer to Warranty Info Book for Specific Limitations
VOLVO On-Call Roadside Assistance
Volvo Increased Protection: Ask Your Volvo Retailer About an Extended Service Contract

MAINTENANCE

Complimentary Factory Scheduled Maintenance for the First 3 Years or 36,000 Miles, for your first three full diagnostic checks of all Passive and a comprehensive assessment of your vehicle and regularly scheduled maintenance services. Includes Active Safety Systems by our factory-trained technicians

ACCESSORIES

Enhance the driving pleasure with Volvo accessories. Enrich the styling, integrate technology, boost performance, or simply carry more cargo - from function to fun, there's something for everyone.
To view full accessory product line - Scan this Smartphone QR code or visit <https://accessories.volvocars.com/en-us>

JOIN THE CONVERSATION

See what our fans are saying about Volvo and join in!
Have a question?
Instagram: @VolvoCarUSA
Facebook: Volvo Car USA
YouTube: Volvo Car USA

PRICING

Manufacturer's Suggested Retail Price:
\$57,900.00

Climate Package 750.00
Heated Rear Seats
Heated Steering Wheel
Headlamp Cleaners
Protection Package 795.00
Power Operated Tailgate 200.00
Luggage Cover* 385.00
18" 5-Double Spoke Black Diamond Cut Alloy Wheels 800.00
Destination Charge 1,295.00
Total Suggested Retail Price: **\$62,125.00**

Volvo Cars USA LLC

www.volvocars.com/us

Volvo

EPA DOT

Fuel Economy and Environment

Plug-In Hybrid Vehicle
Electricity-Gasoline

Fuel Economy

Small SUV 4WD range from 14 to 123 MPG. The best vehicle rates 140 MPGe.

Electricity

Charge Time: 5 Hours (240V)
63 MPGe
0.1 gallons per 100 miles
50 kWh per 100 miles
Combined city/highway

Gasoline Only

28 MPG
3.6 gallons per 100 miles
Combined city/highway

You Save

\$2,000
in fuel costs over 5 years
compared to the average new vehicle.

Driving Range

Electricity + Gasoline
All Electric range = 0 to 35 miles

Annual Fuel Cost

\$1,550

Fuel Economy & Greenhouse Gas Rating

MPG 8
CO₂ 9
This vehicle emits 122 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at fuelconomy.gov.

Smog Rating

7
Best
This vehicle emits 122 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 26 MPG and costs \$9,750 to fuel over 5 years. Cost estimates are based on 15000 miles per year at \$4.30 per gallon and \$0.15 per kWhr. This is a dual fueled automobile. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov

Calculate personalized estimates and compare vehicles

Smartphone QR Code

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE: XC60 RECHARGE
U.S./CANADIAN PARTS CONTENT: 0%
MAJOR SOURCES OF FOREIGN PARTS CONTENT:
SWEDEN: 30%
FINLAND: 20%
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: TORSLANDA, SWEDEN
COUNTRY OF ORIGIN: ENGINE PARTS: SWEDEN
TRANSMISSION PARTS: JAPAN

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, or rollover risk
Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest
Source: National Highway Traffic Safety Administration (NHTSA) | www.safercar.gov or 1-888-327-4236

VEHICLE IDENTIFICATION

Type & Chassis: 246 917600
Model Year: 2024
Exterior: Denim Blue
Interior: Charcoal Leatherette
VIN: YV4H60DK3R1917600

Port of Importation: NEWARK, NJ, NEW JERSEY
Delivered By: Truck
DELIVERY ADDRESS
MAGUIRE VOLVO 3725
370 ELMIRA RD
ITHACA, NY US 14850

Barcode

YV4H60DK3R1917600

The price shown does not include License and Title Fees, State and Local Taxes and Dealer Installed Options and Accessories. The factory reserves the right to modify price, designs and equipment without previous notice.

Note: Parts contents does not include final assembly, distribution, or other non-parts costs.

Photo No. 102 - Monroney Label

A-51

PHOTOGRAPH NOT APPLICABLE

Photo No. 103 - Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

PHOTOGRAPH NOT APPLICABLE

Photo No. 104 - Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Photo No. 305-01 - Auxiliary Power Module Warning Label



Photo No. 305-02 - Power Inverter Warning Label

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-03 - First Responder Warning Label

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-04 - First Responder Warning Location



Photo No. 305-05 - Other Vehicle Label(s) Related to Electrical Propulsion System



Photo No. 305-06 - Manual High Voltage Service Disconnect in Place



Photo No. 305-07 - Manual High Voltage Service Disconnect Removed



Photo No. 305-08 - Manual High Voltage Service Disconnect Removed

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-09 - Pre-Impact View of Propulsion Battery

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-10 - Post-Impact Front View of Propulsion Battery

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-11 - Post-Impact Rear View of Propulsion Battery

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-12 - Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-13 - Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-14 - Pre-Impact View of Propulsion Battery Module(s)

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-15 - Post-Impact View of Propulsion Battery Module(s)

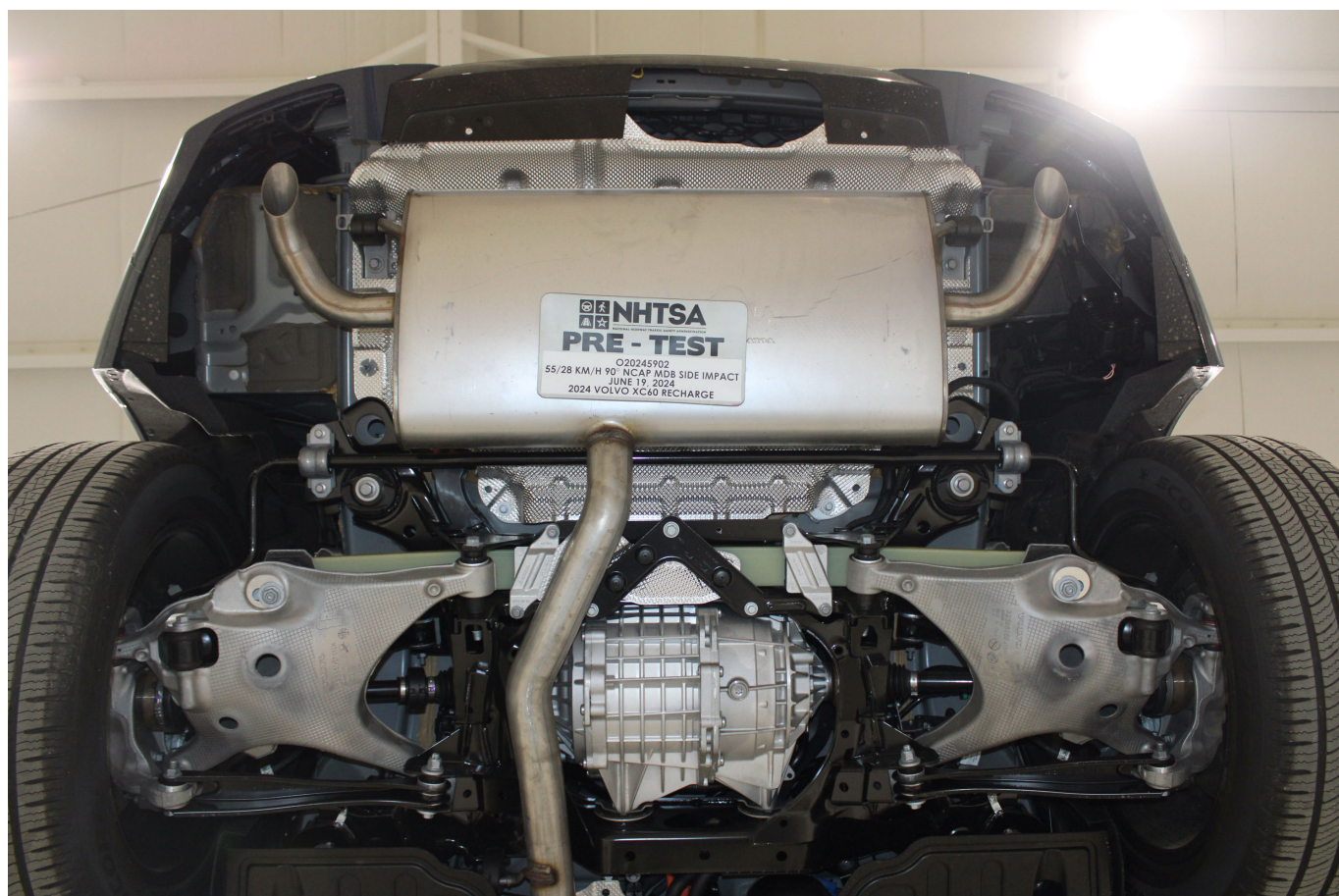


Photo No. 305-16 - Pre-Impact View of Electric Propulsion Drive

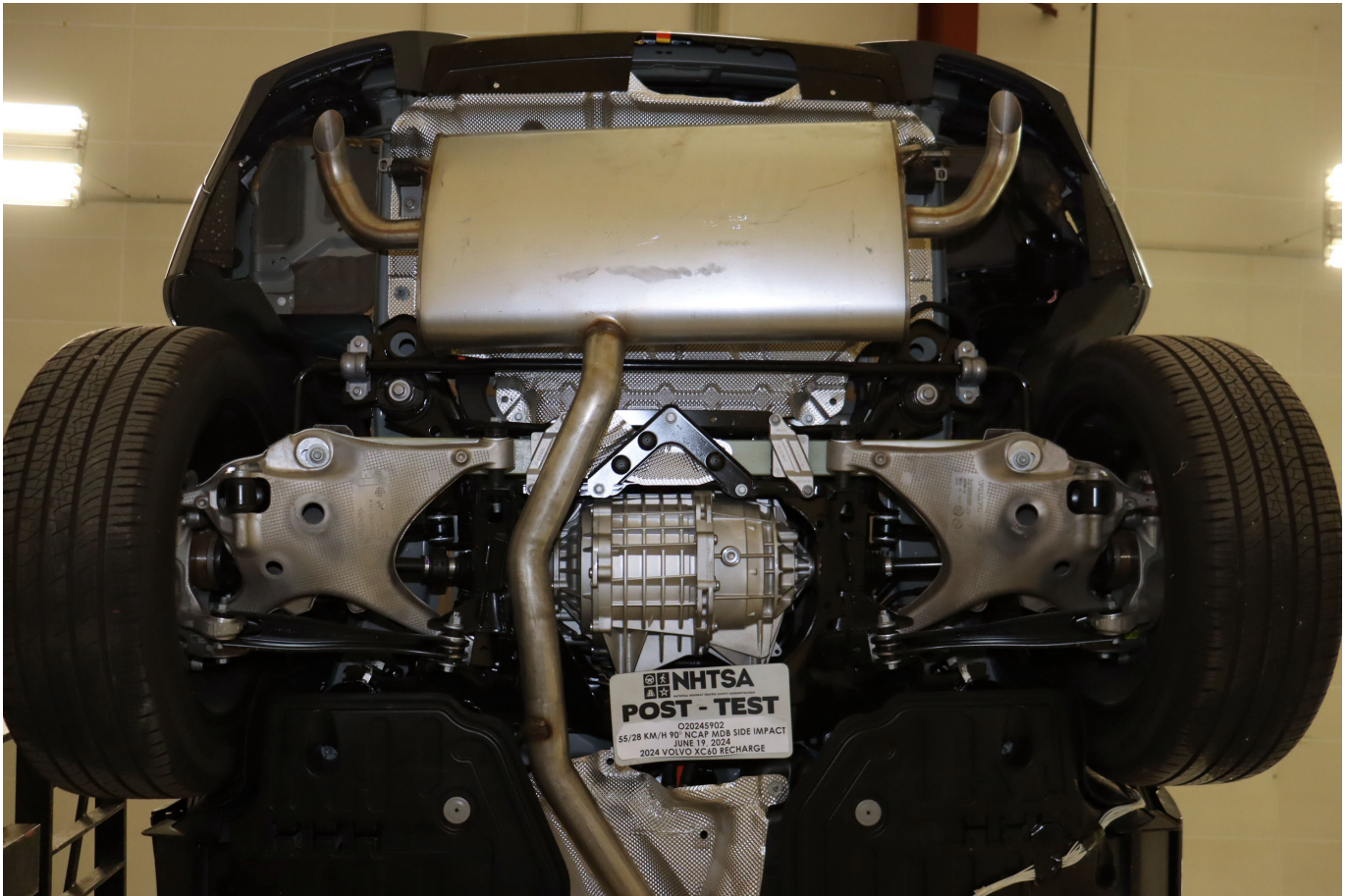


Photo No. 305-17 - Post-Impact View of Electric Propulsion Drive

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-18 - Pre-Impact View of High Voltage Interconnect(s)

PHOTOGRAPH NOT AVAILABLE

Photo No. 305-19 - Pre-Impact View Propulsion Battery Venting System(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-20 - Pre-Impact View of Other Visible Electric Propulsion Components



Photo No. 305-21 - Pre-Impact View of Ground Lead Attached



Photo No. 305-22 - Pre-Impact View of High Voltage Leads Attached



Photo No. 305-23 - Pre-Impact Close-Up View of High Voltage Leads Attached



Photo No. 305-24 - Pre-Impact View of Installed Test Interface Port



Photo No. 305-25 - Post-Impact View of Installed Test Interface Port



Photo No. 305-26 - Pre-Impact View of Other Test Devices



Photo No. 305-27 - Post-Impact View of Other Test Devices

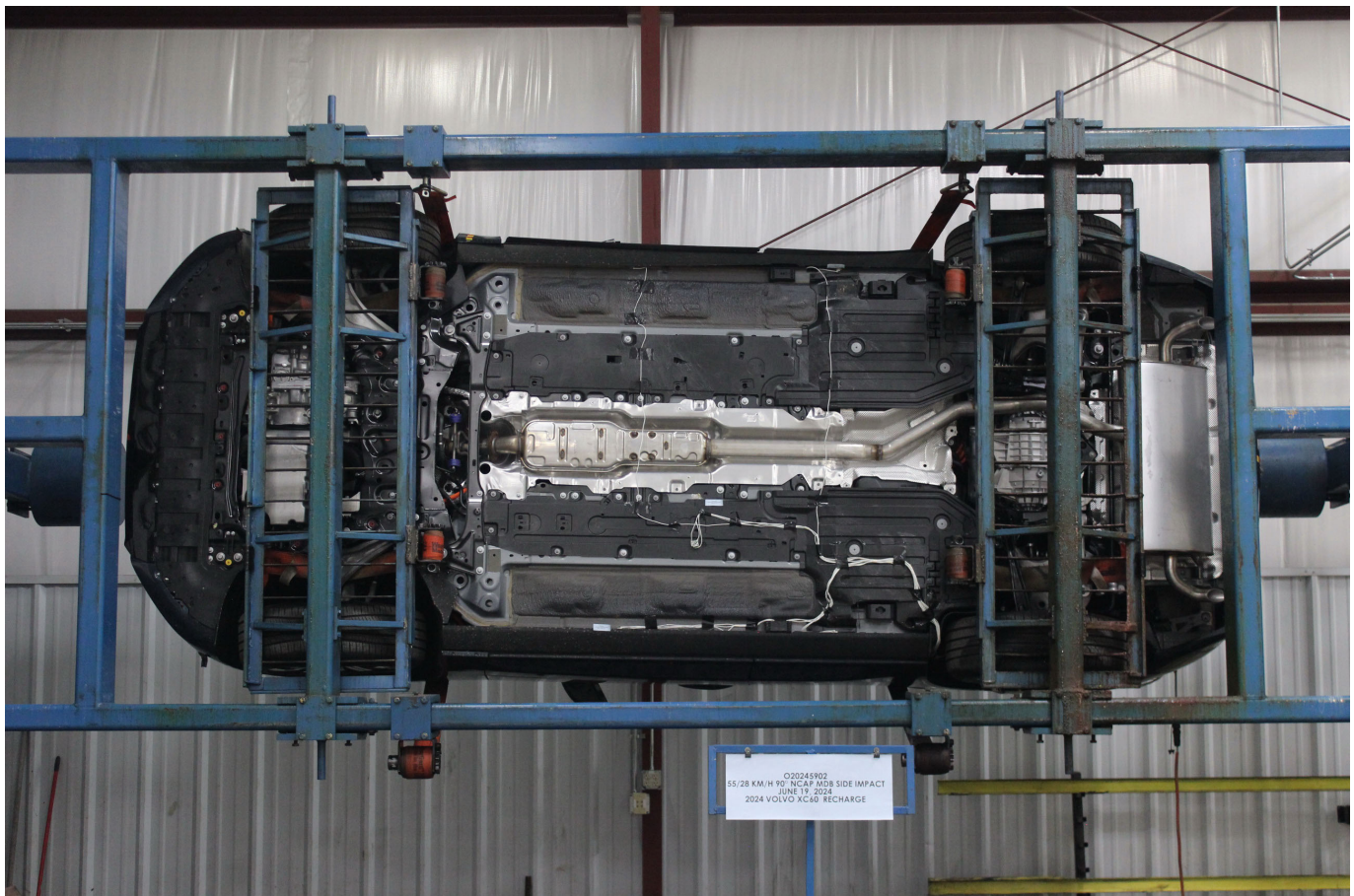


Photo No. 305-28 - FMVSS No. 305 Static Rollover at 90 Degrees



Photo No. 305-29 - FMVSS No. 305 Static Rollover at 180 Degrees



Photo No. 305-30 - FMVSS No. 305 Static Rollover at 270 Degrees



Photo No. 305-31 - FMVSS No. 305 Static Rollover at 360 Degrees



Photo No. 305-32 - Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery



Photo No. 305-33 - Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-34 - Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-35 - Post-Impact View of Battery Component Intrusion

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-36 - Post-Impact View of Battery Module Movement or Retention Loss

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-37 - Post-Impact View of Propulsion Battery Electrolyte Spillage Location

PHOTOGRAPH NOT APPLICABLE

Photo No. 305-38 - Post-Test View of Propulsion Battery Electrolyte Spillage Location

APPENDIX B
DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS
Driver Dummy Instrumentation Plots

<u>No.</u>	<u>Description</u>	<u>Page No.</u>
Figure No. 1.	Driver Head Acceleration (X) Primary vs. Time	B-1
Figure No. 2.	Driver Head Acceleration (Y) Primary vs. Time	B-1
Figure No. 3.	Driver Head Acceleration (Z) Primary vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration Primary vs. Time	B-1
Figure No. 5.	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 6.	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 7.	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-2
Figure No. 8.	Driver Thorax Rib Deflection Maximum vs. Time	B-2
Figure No. 9.	Driver Anterior Abdomen Force (Y) vs. Time	B-3
Figure No. 10.	Driver Middle Abdomen Force (Y) vs. Time	B-3
Figure No. 11.	Driver Posterior Abdomen Force (Y) vs. Time	B-3
Figure No. 12.	Driver Total Abdominal Force (Y) vs. Time	B-3
Figure No. 13.	Driver Pubic Symphysis Force (Y) vs. Time	B-4
Figure No. 14.	Passenger Head Acceleration (X) Primary vs. Time	B-5
Figure No. 15.	Passenger Head Acceleration (Y) Primary vs. Time	B-5
Figure No. 16.	Passenger Head Acceleration (Z) Primary vs. Time	B-5
Figure No. 17.	Passenger Head Resultant Acceleration Primary vs. Time	B-5
Figure No. 18.	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-6
Figure No. 19.	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-6
Figure No. 20.	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-6
Figure No. 21.	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-6
Figure No. 22.	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
Figure No. 23.	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
Figure No. 24.	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

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.gov

Additional Driver & Passenger Dummy Instrumentation Data

Passenger Head Angular Velocity (X)
Passenger Head Angular Velocity (Y)
Passenger Head Angular Velocity (Z)
Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 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 Track 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)

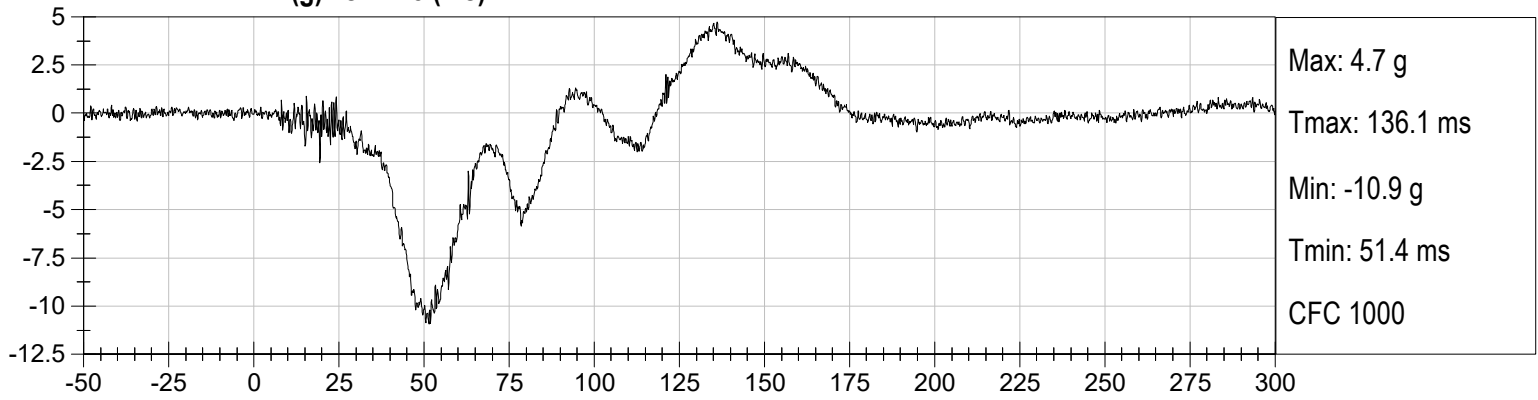
MDB Rear Acceleration (X)

MDB Rear Acceleration (Y)

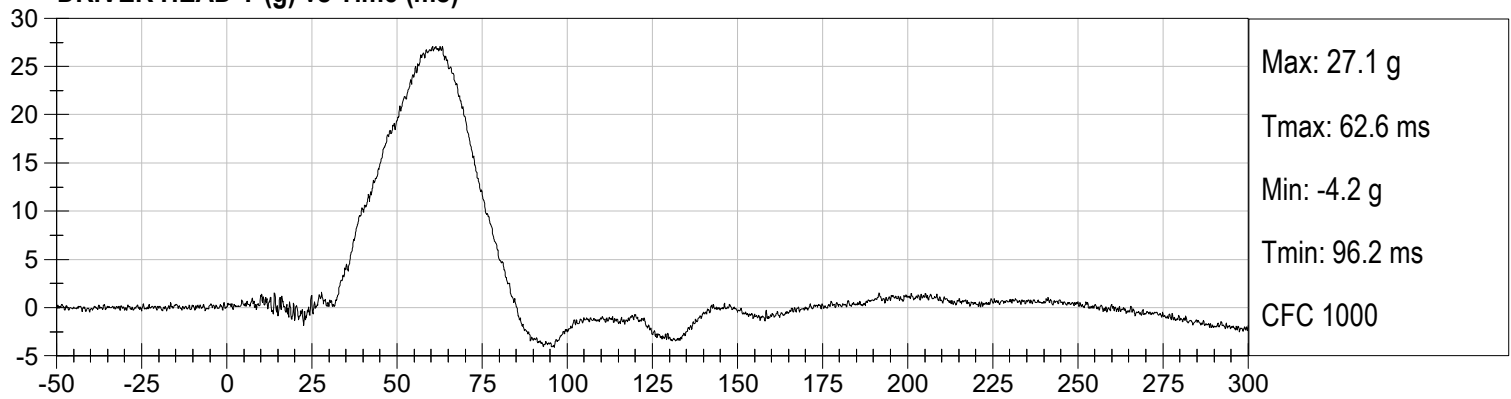
Left MDB Contact Switch

Right MDB Contact Switch

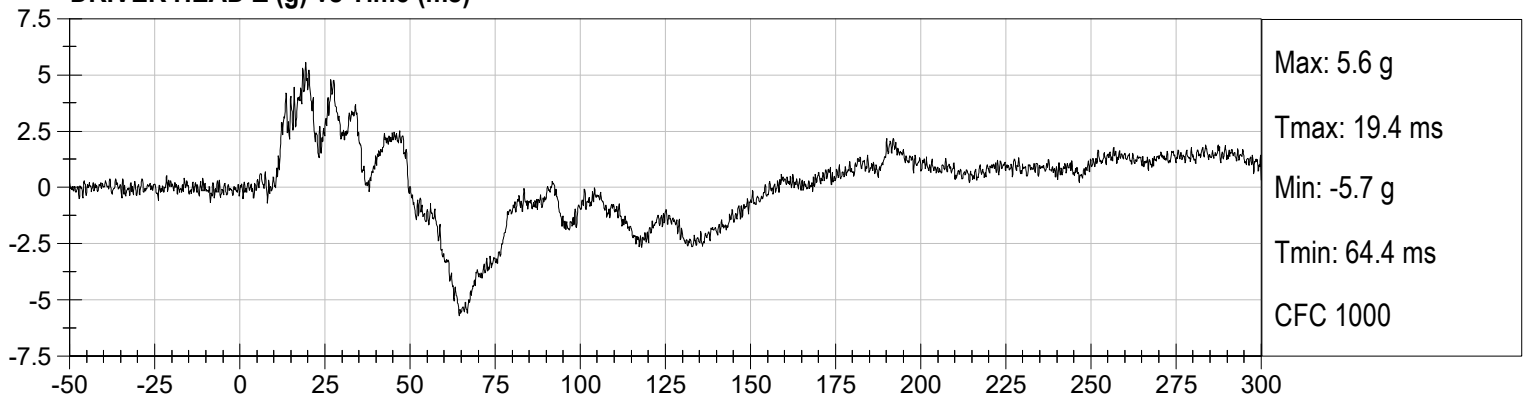
DRIVER HEAD X (g) vs Time (ms)



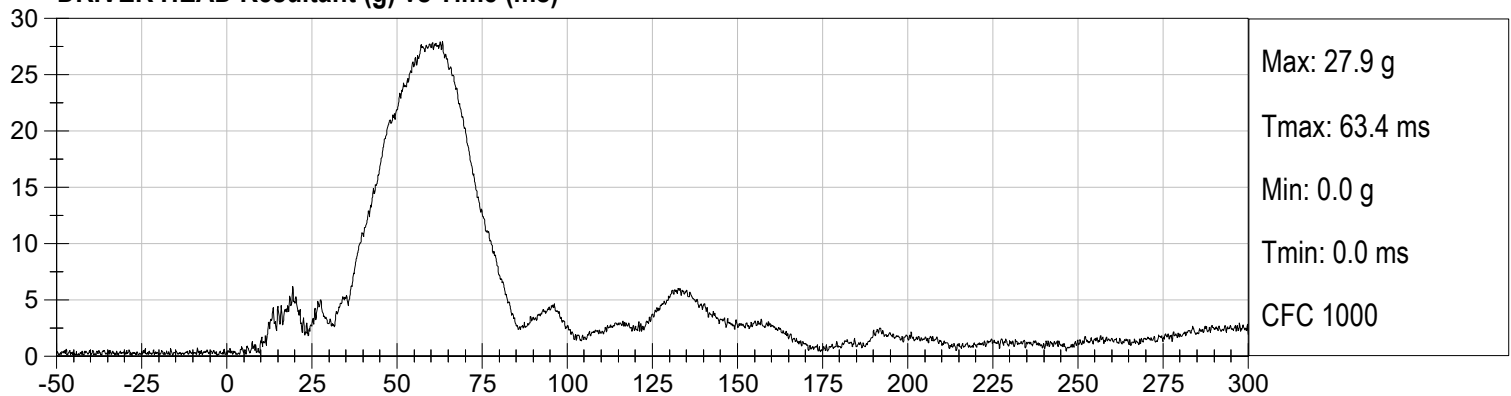
DRIVER HEAD Y (g) vs Time (ms)



DRIVER HEAD Z (g) vs Time (ms)



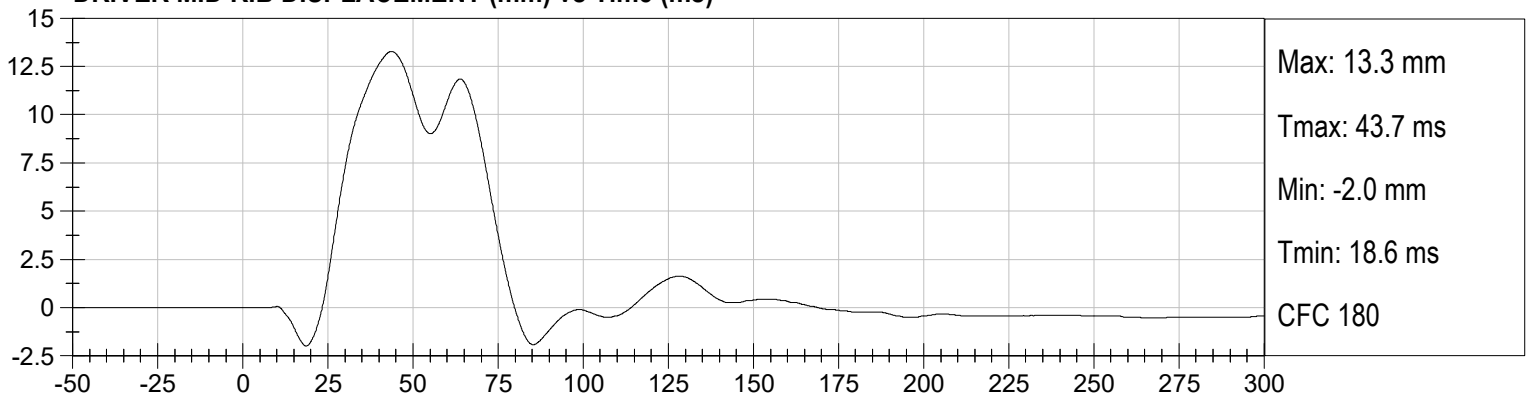
DRIVER HEAD Resultant (g) vs Time (ms)



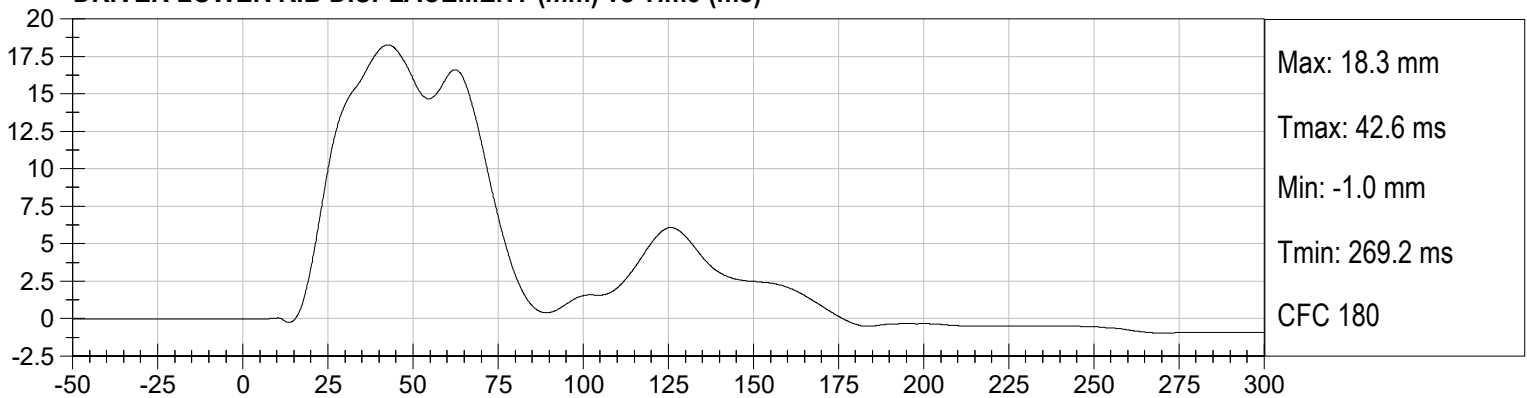
DRIVER UPPER RIB DISPLACEMENT (mm) vs Time (ms)



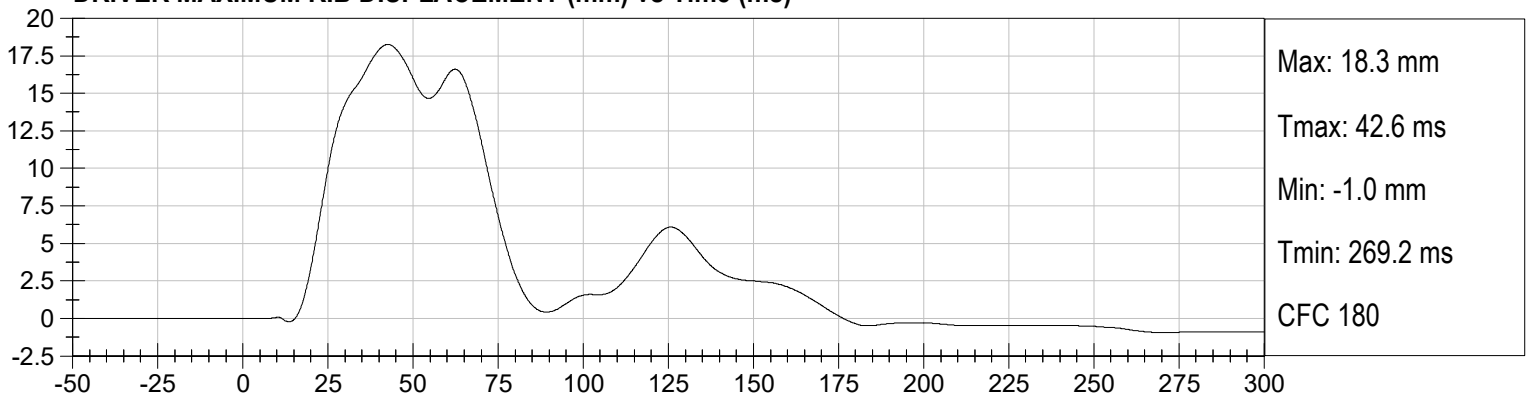
DRIVER MID RIB DISPLACEMENT (mm) vs Time (ms)



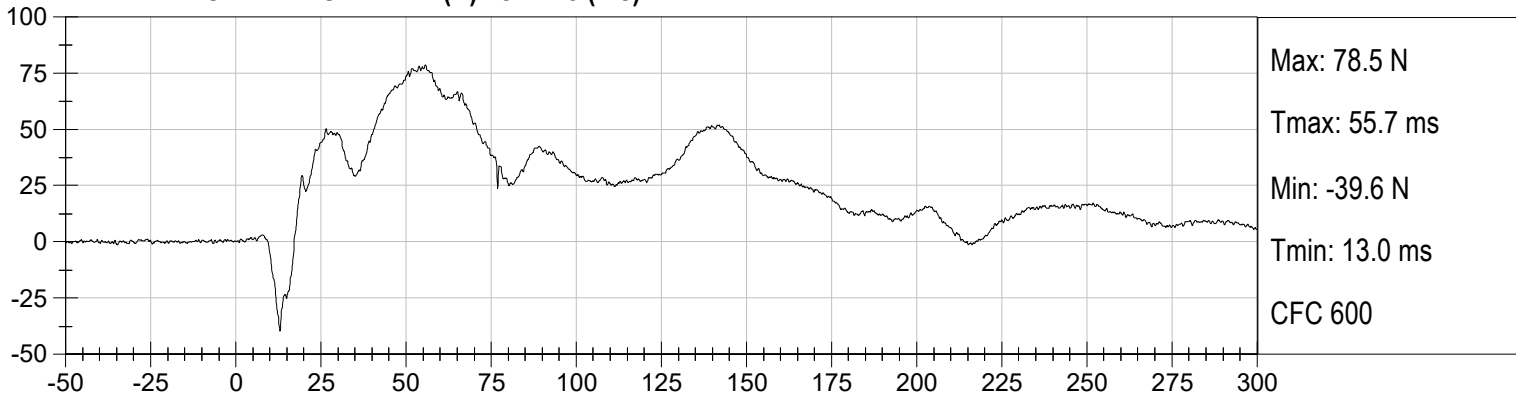
DRIVER LOWER RIB DISPLACEMENT (mm) vs Time (ms)



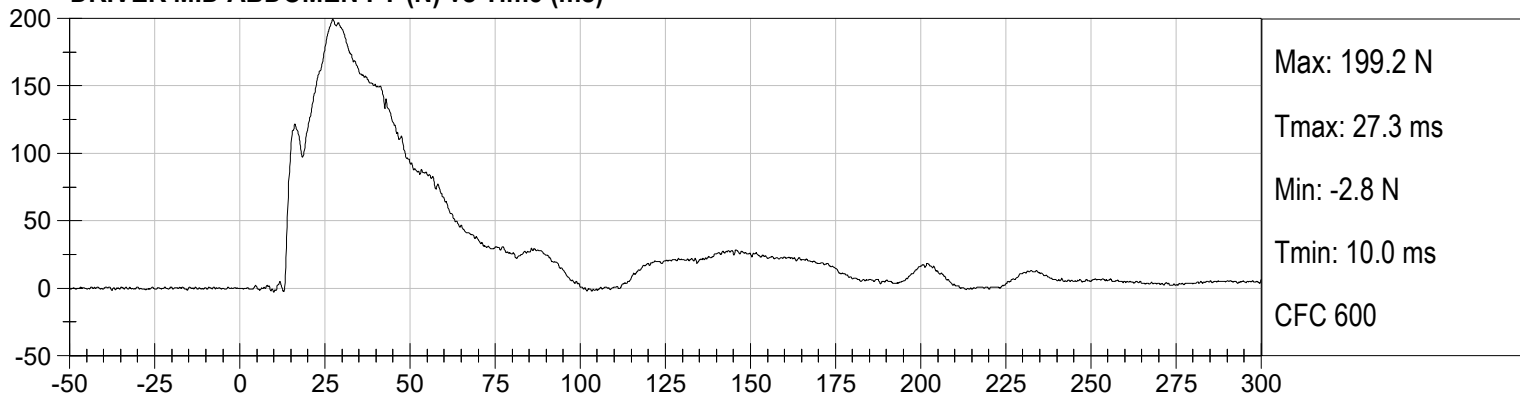
DRIVER MAXIMUM RIB DISPLACEMENT (mm) vs Time (ms)



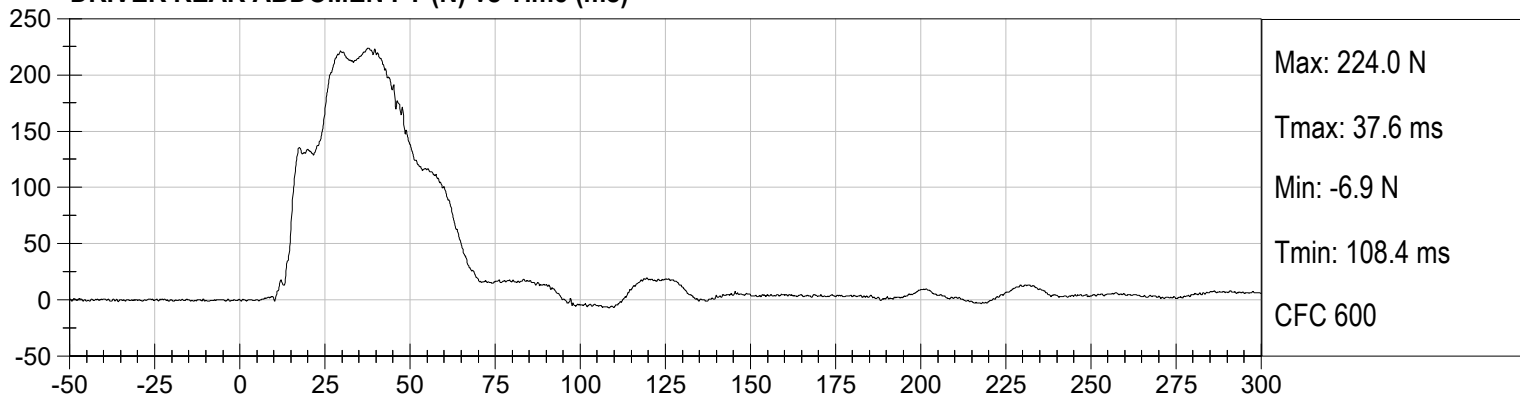
DRIVER FRONT ABDOMEN FY (N) vs Time (ms)



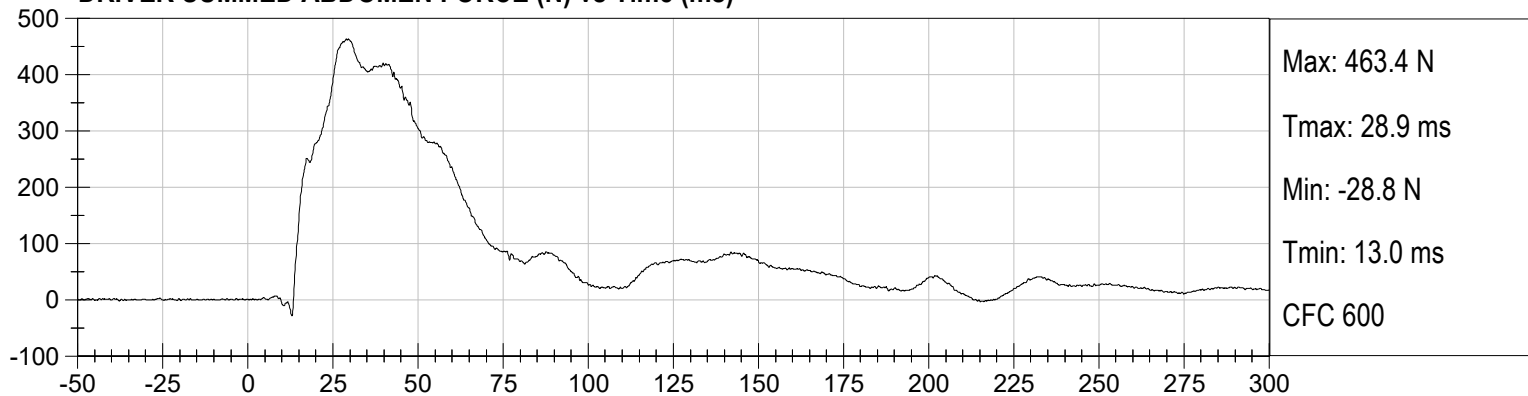
DRIVER MID ABDOMEN FY (N) vs Time (ms)

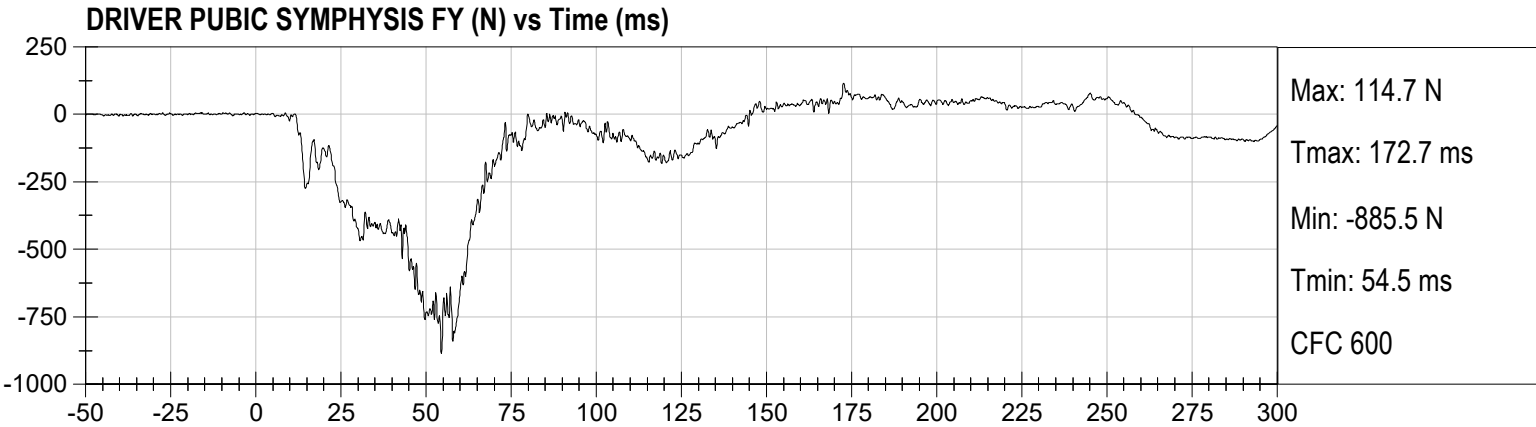


DRIVER REAR ABDOMEN FY (N) vs Time (ms)

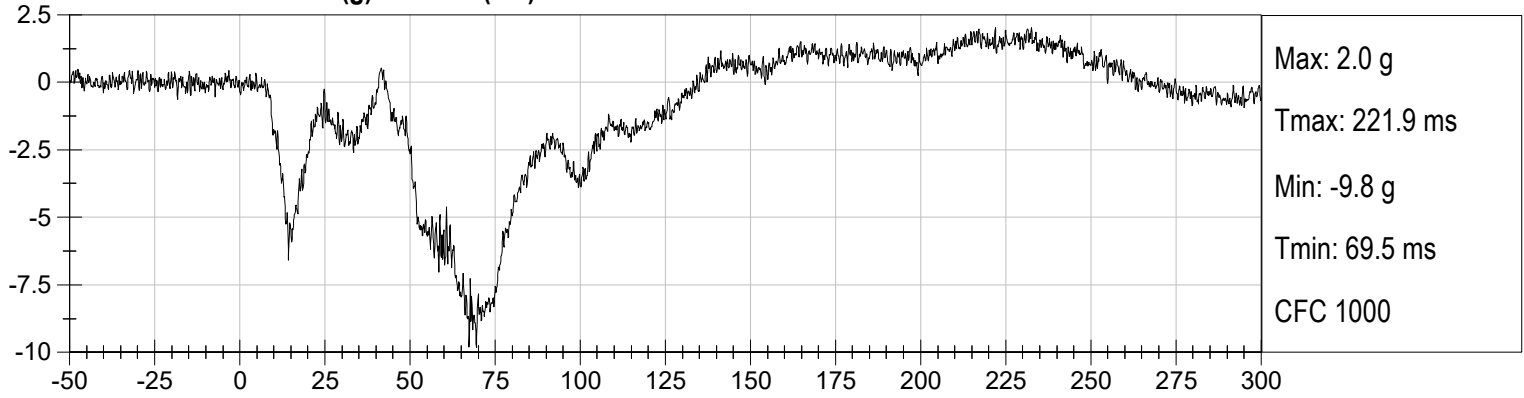


DRIVER SUMMED ABDOMEN FORCE (N) vs Time (ms)

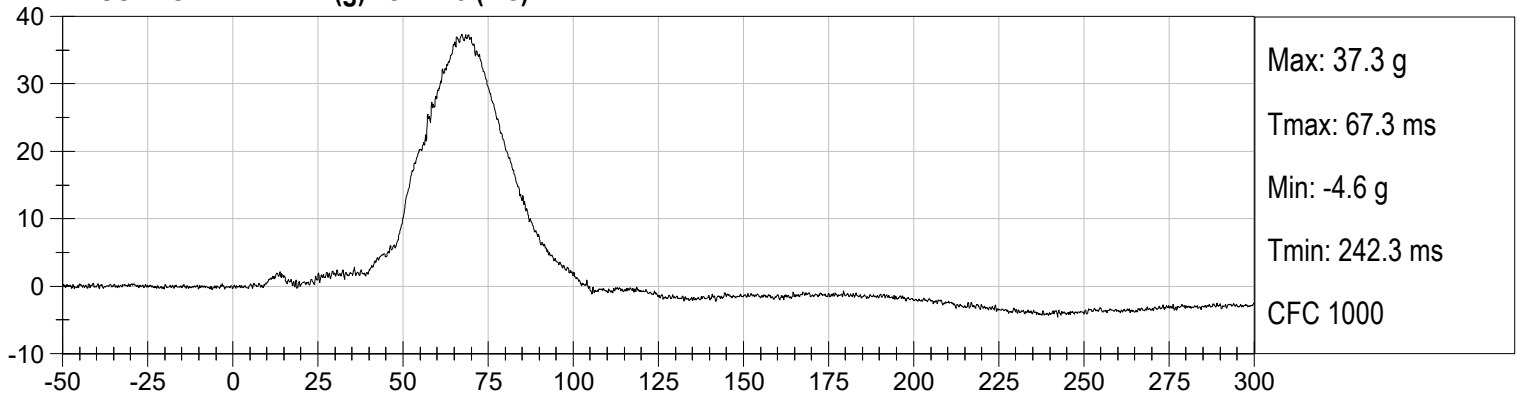




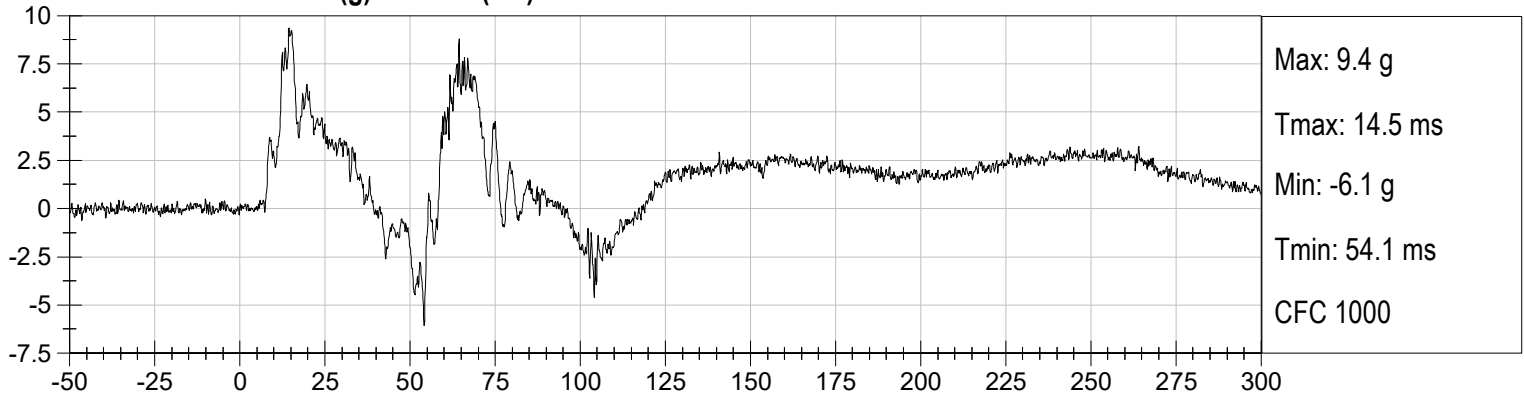
PASSENGER HEAD X (g) vs Time (ms)



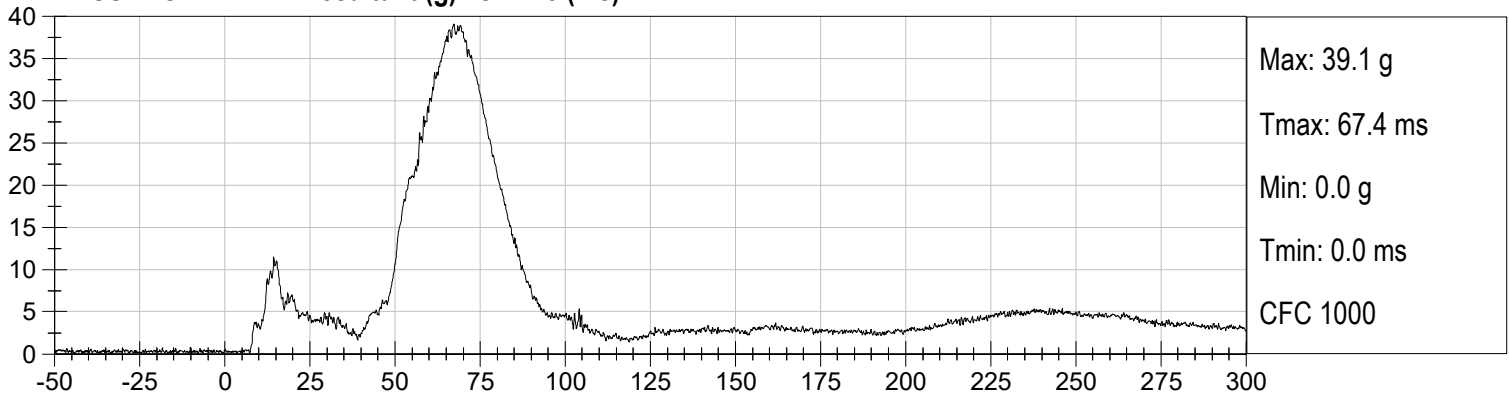
PASSENGER HEAD Y (g) vs Time (ms)



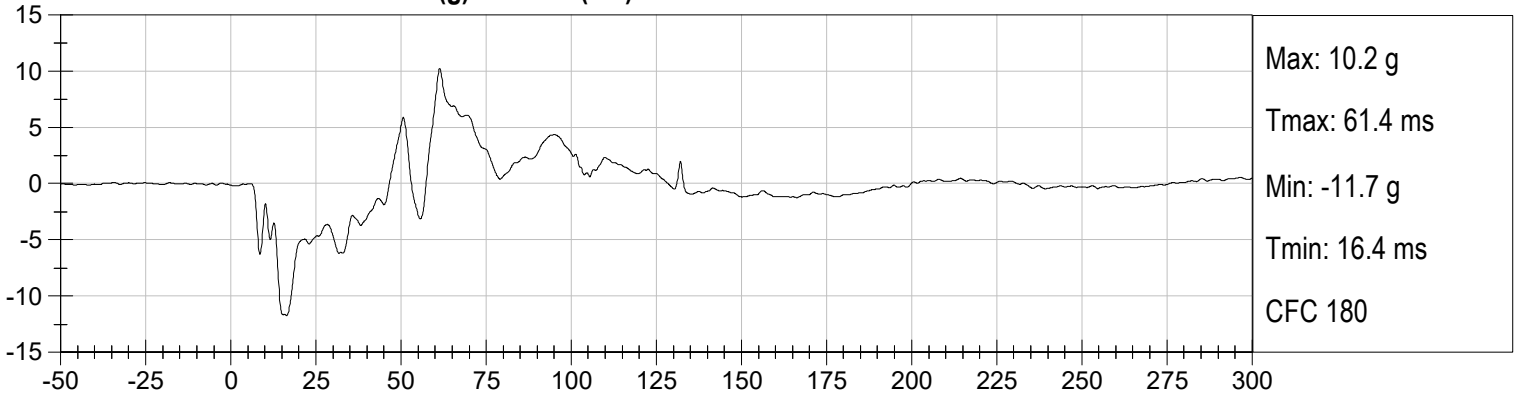
PASSENGER HEAD Z (g) vs Time (ms)



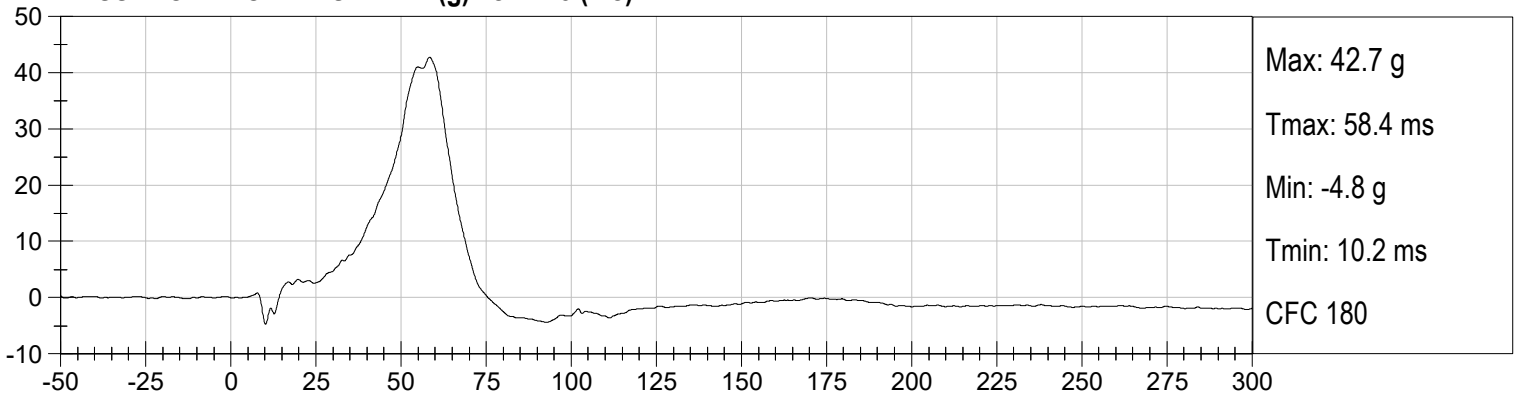
PASSENGER HEAD Resultant (g) vs Time (ms)



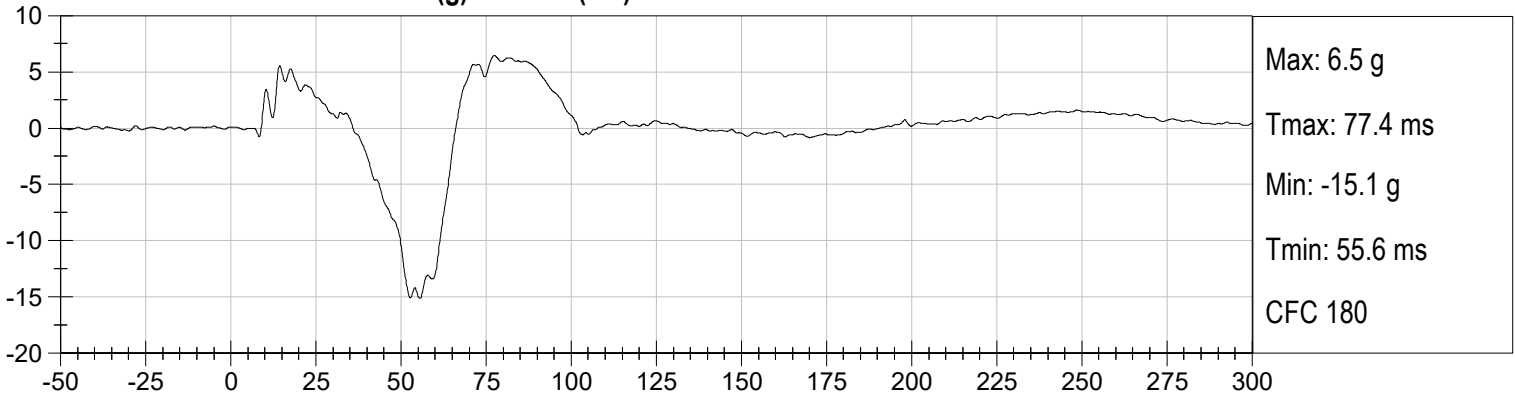
PASSENGER LOWER SPINE X (g) vs Time (ms)



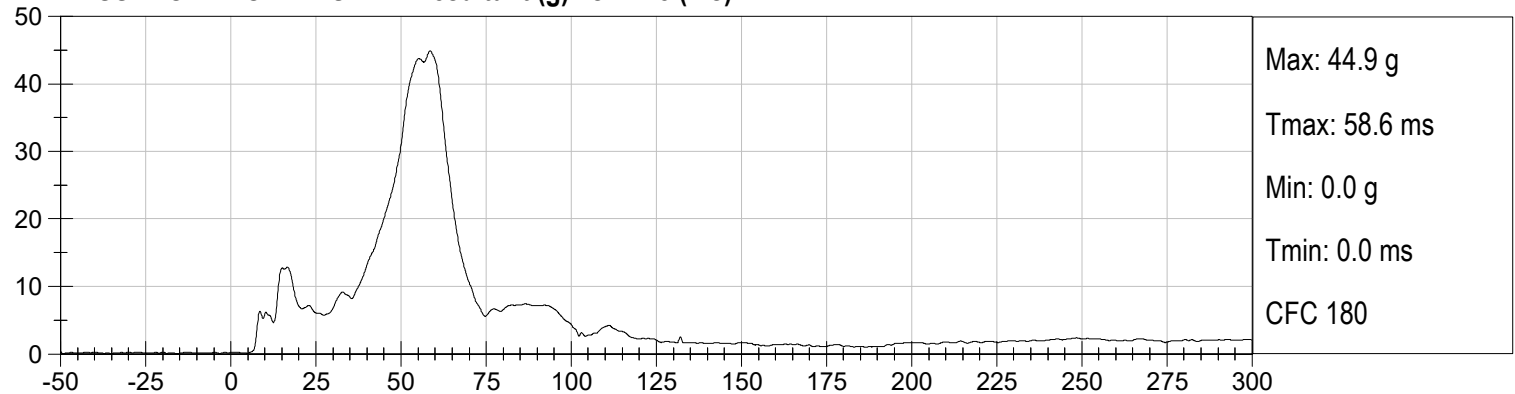
PASSENGER LOWER SPINE Y (g) vs Time (ms)



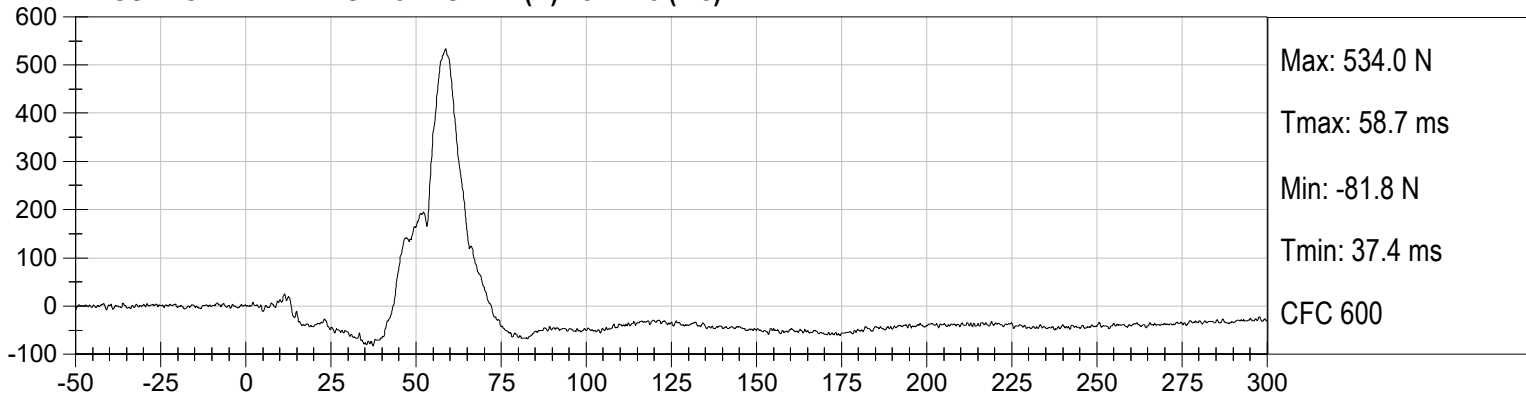
PASSENGER LOWER SPINE Z (g) vs Time (ms)



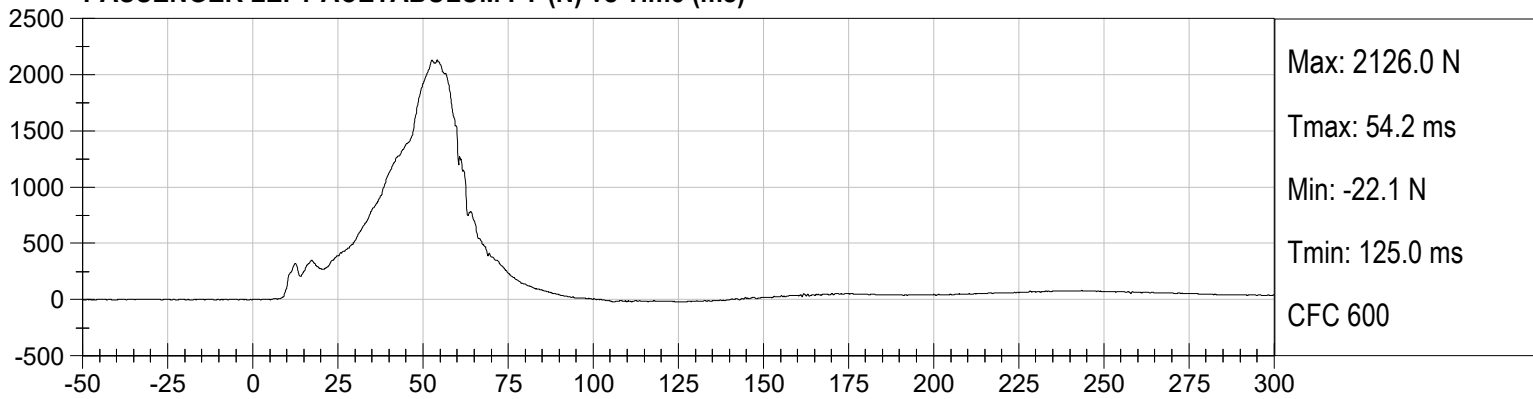
PASSENGER LOWER SPINE Resultant (g) vs Time (ms)



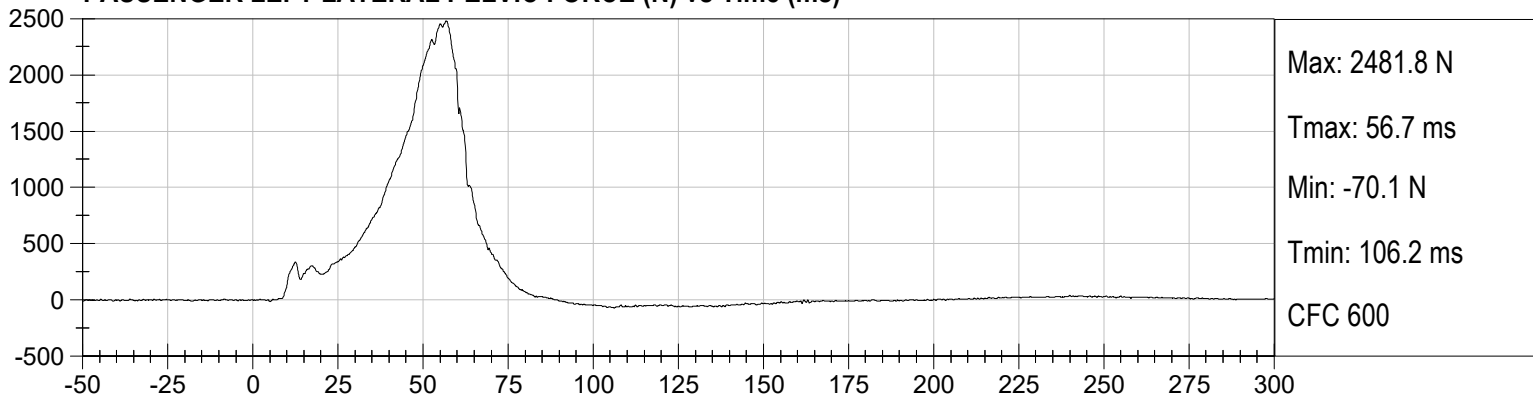
PASSENGER LEFT ILIUM CREST FY (N) vs Time (ms)



PASSENGER LEFT ACETABULUM FY (N) vs Time (ms)



PASSENGER LEFT LATERAL PELVIC FORCE (N) vs Time (ms)



APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

QUALIFICATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	Pass
7	Shoulder/Arm Width	461 - 479	464	Pass
8	Thorax Width	322 - 332	323	Pass
9	Abdomen Width	273 - 287	281	Pass
10	Pelvis Lap Width	359 - 373	370	Pass
11	Head Depth	196 - 206	203	Pass
12	Thorax Depth	262 - 272	264	Pass
13	Abdomen Depth	194 - 204	196	Pass
14	Pelvis Depth	235 - 245	236	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150 - 160	151	Pass
16	Back of Buttocks to Front Knee	597 - 615	607	Pass

MGA RESEARCH CORPORATION

HEAD DROP TEST

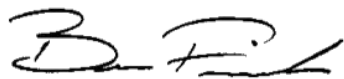
ES-2re DUMMY

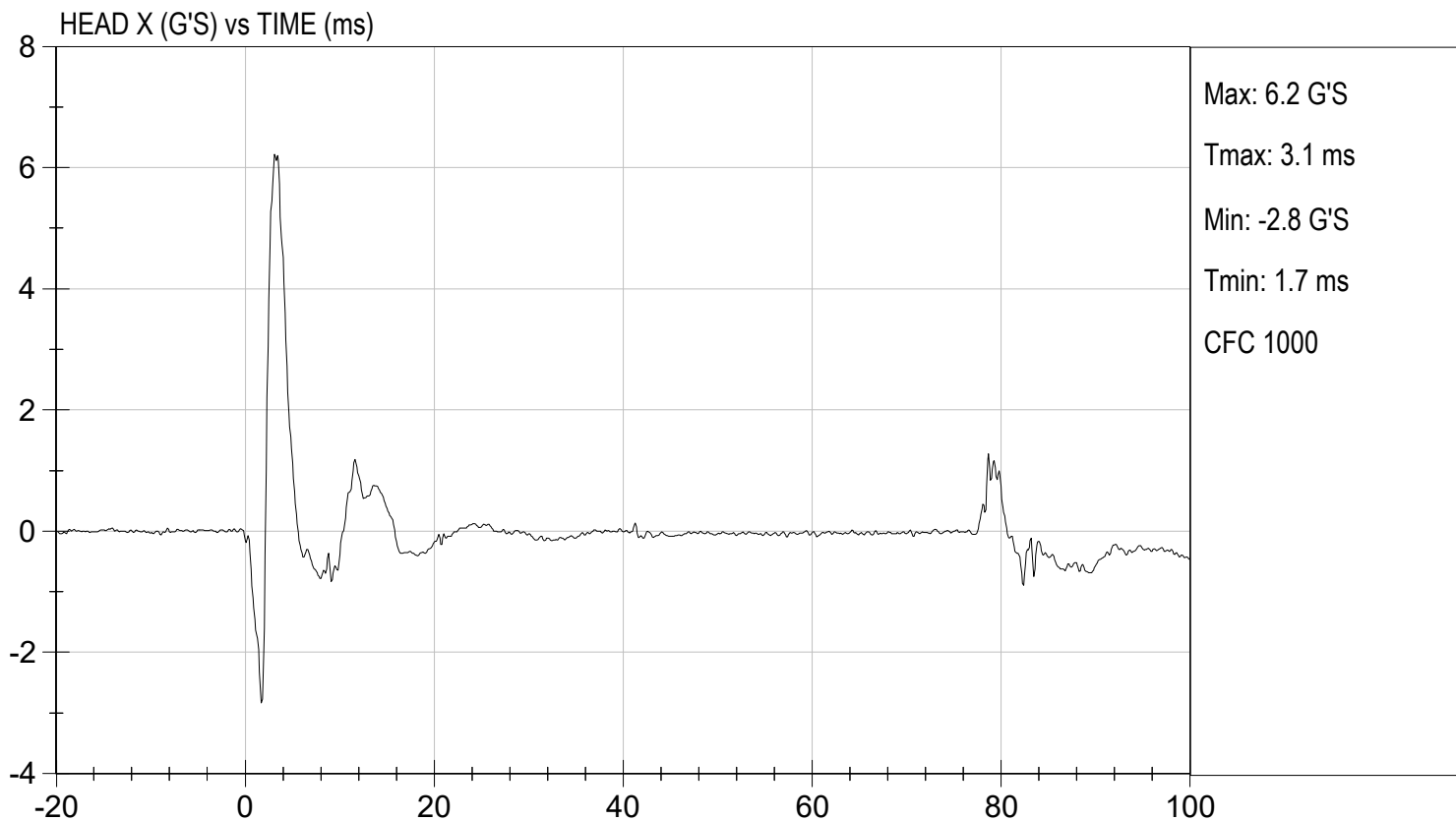
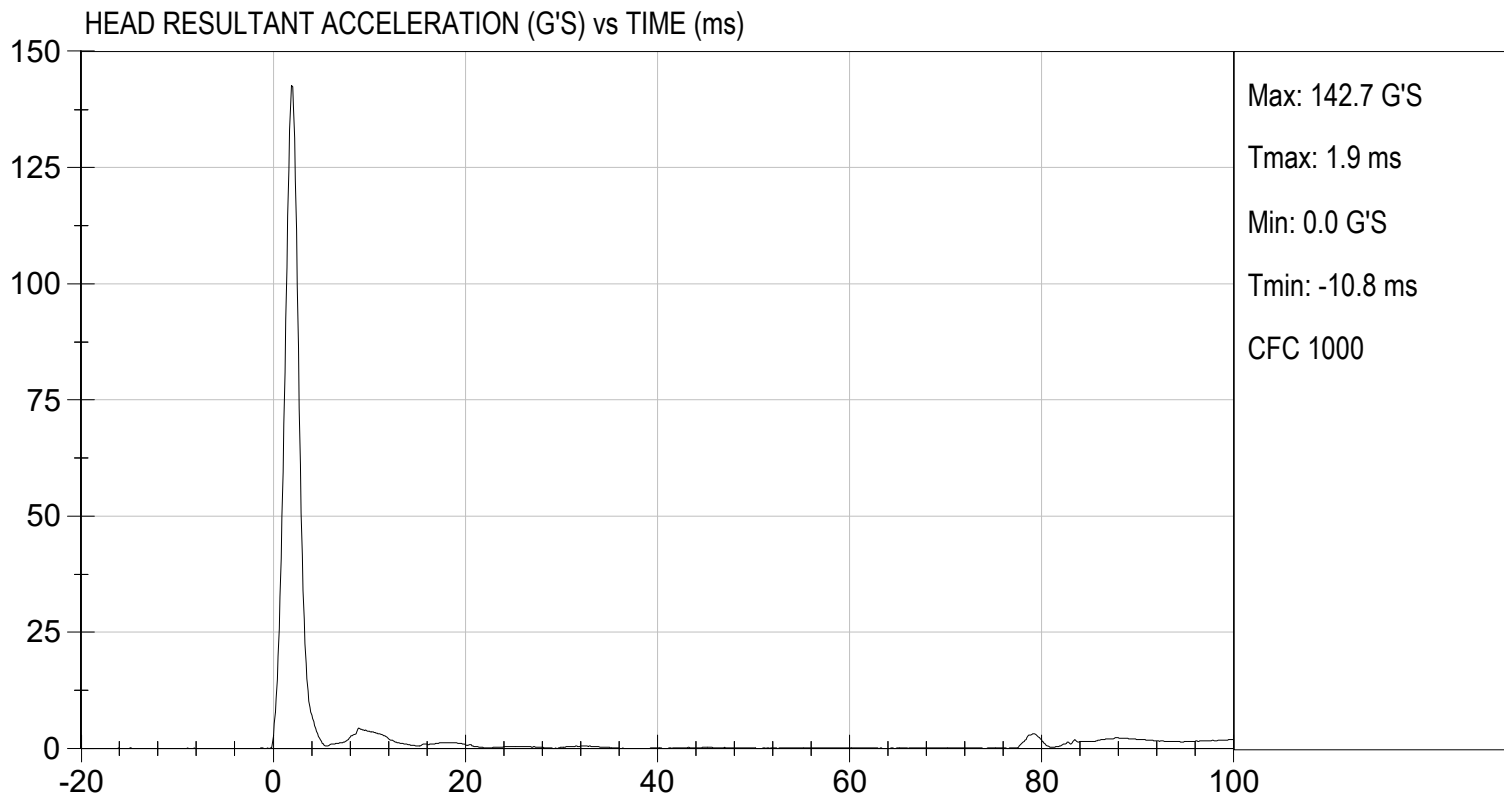
ATD Serial No: F032Test ID: D241391

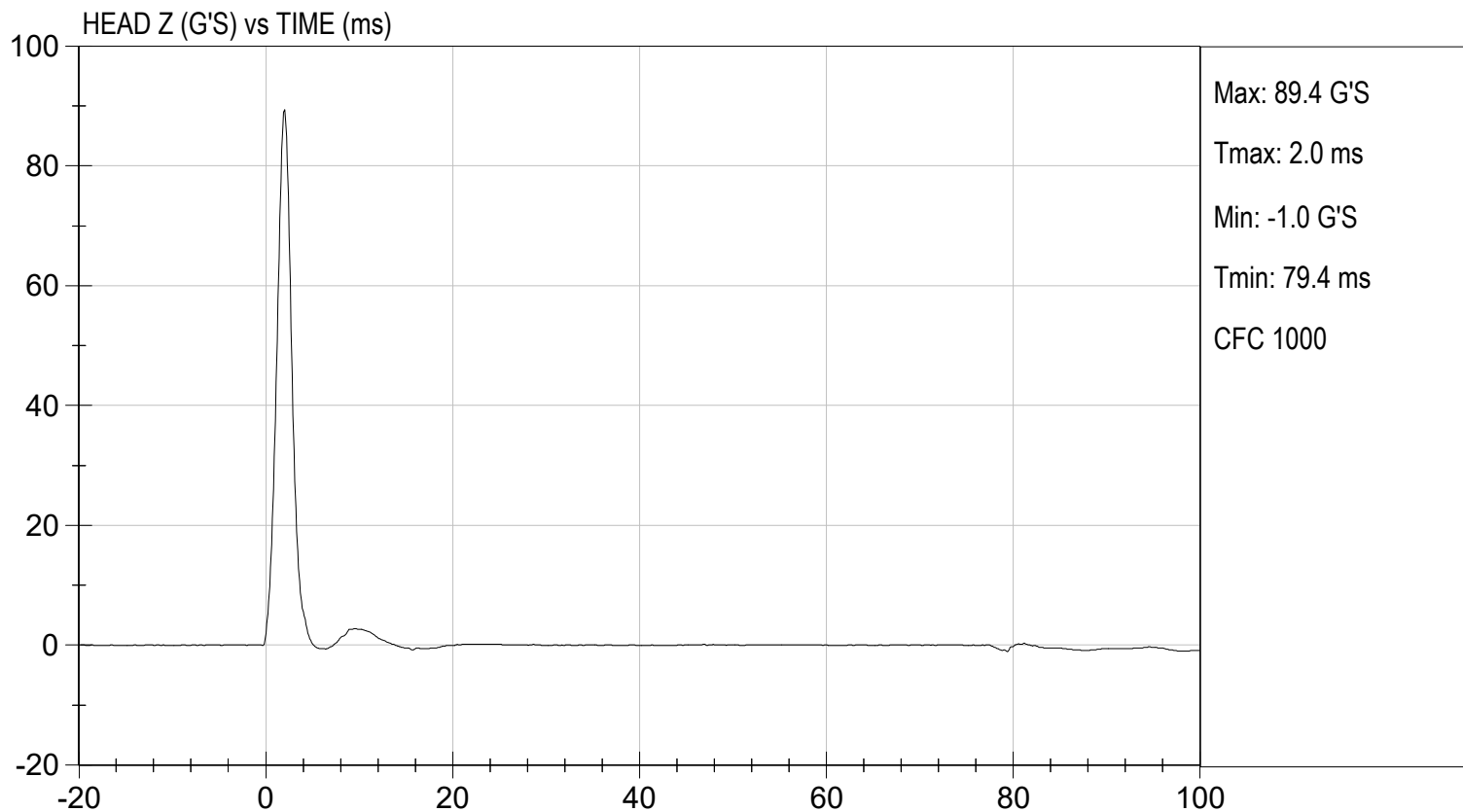
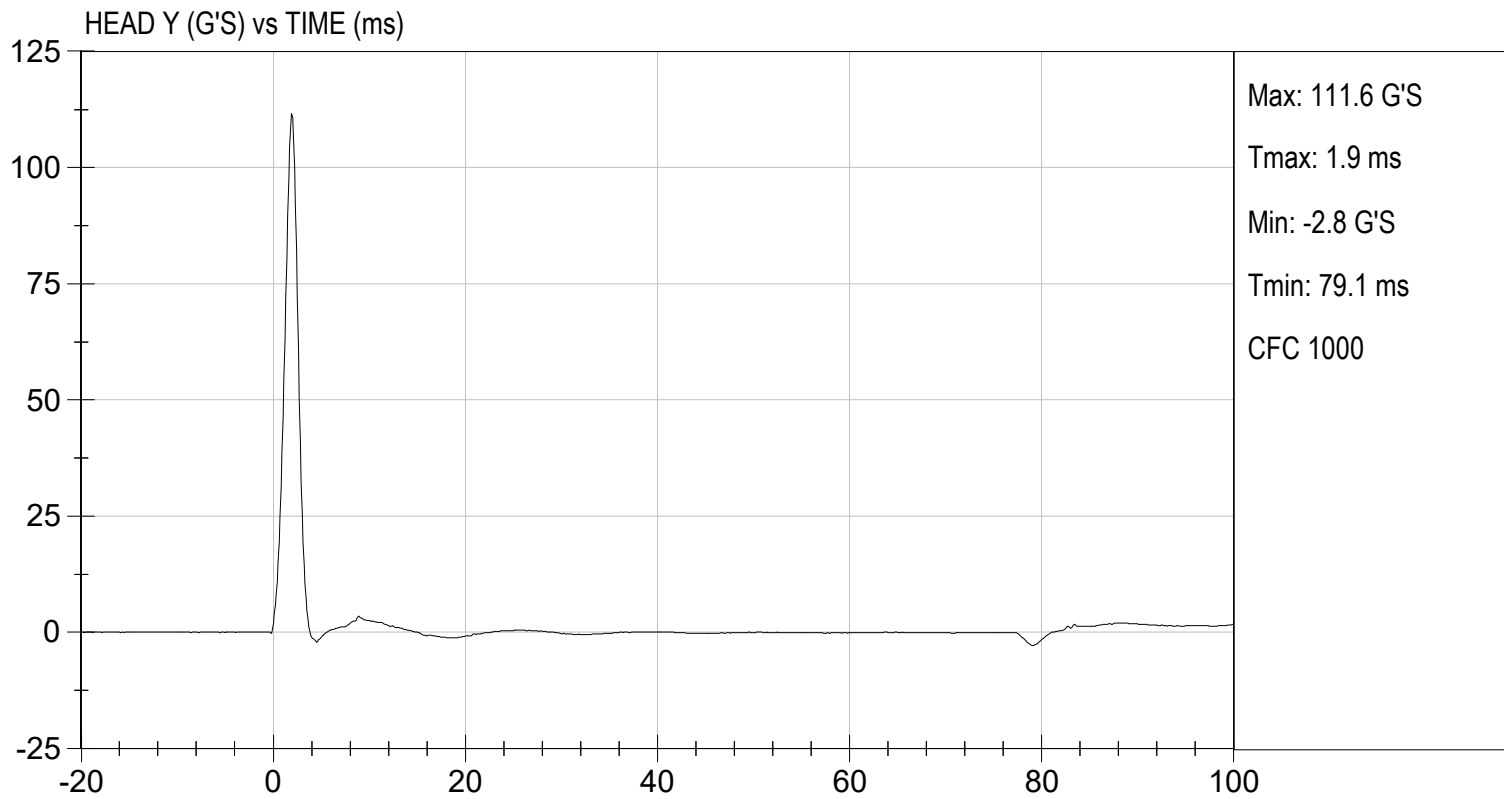
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Peak Resultant Acceleration	G's	125 to 155	143	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	6.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/07/2024
Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

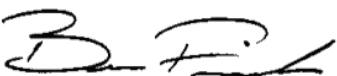
ATD Serial No: F032

Test I.D: D241392

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.59	Pass
	17 ms	m/s	>= -3.70	-3.65	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	50.9	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	60.1	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	60.4	Pass
Overall Results				Pass	

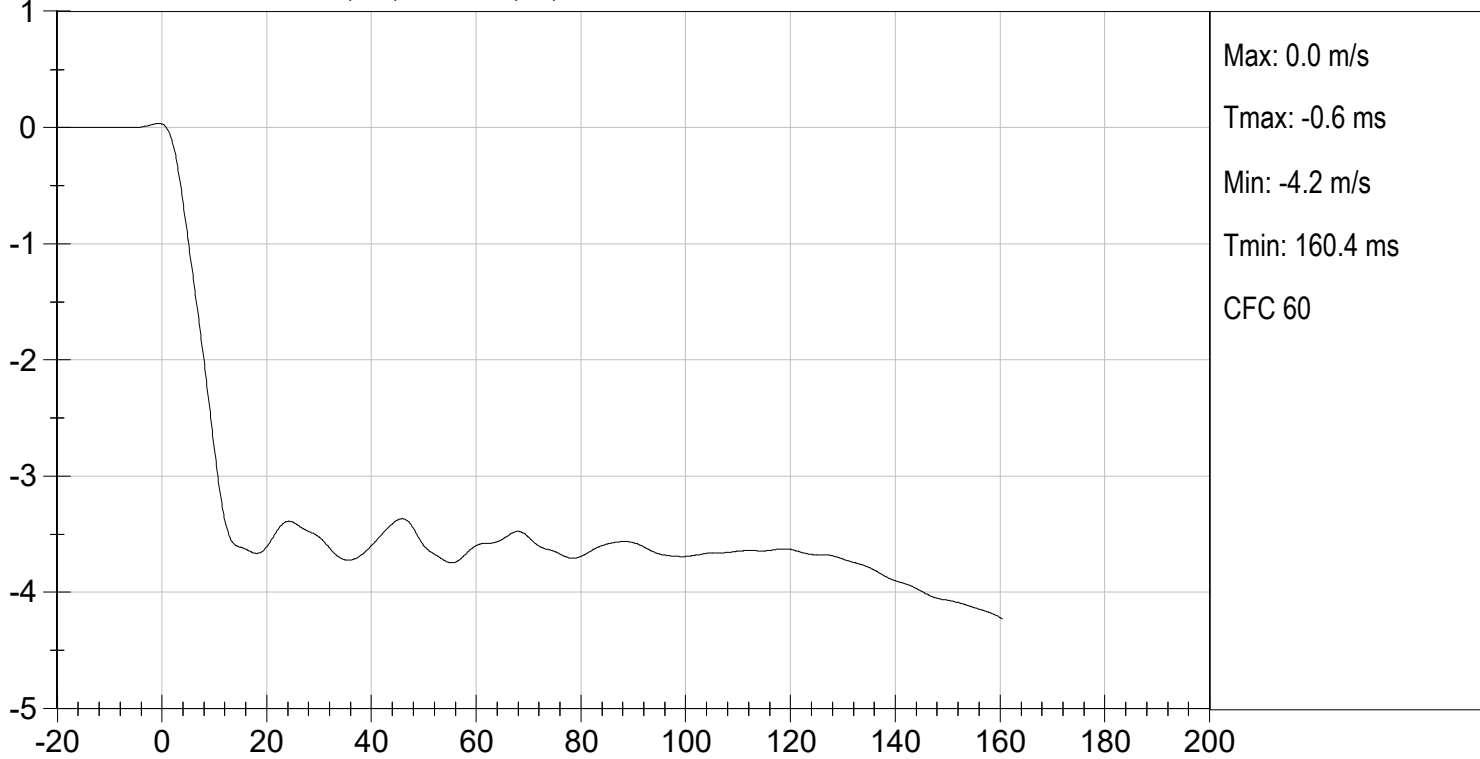

 Laboratory Technician

06/07/2024
 Test Date

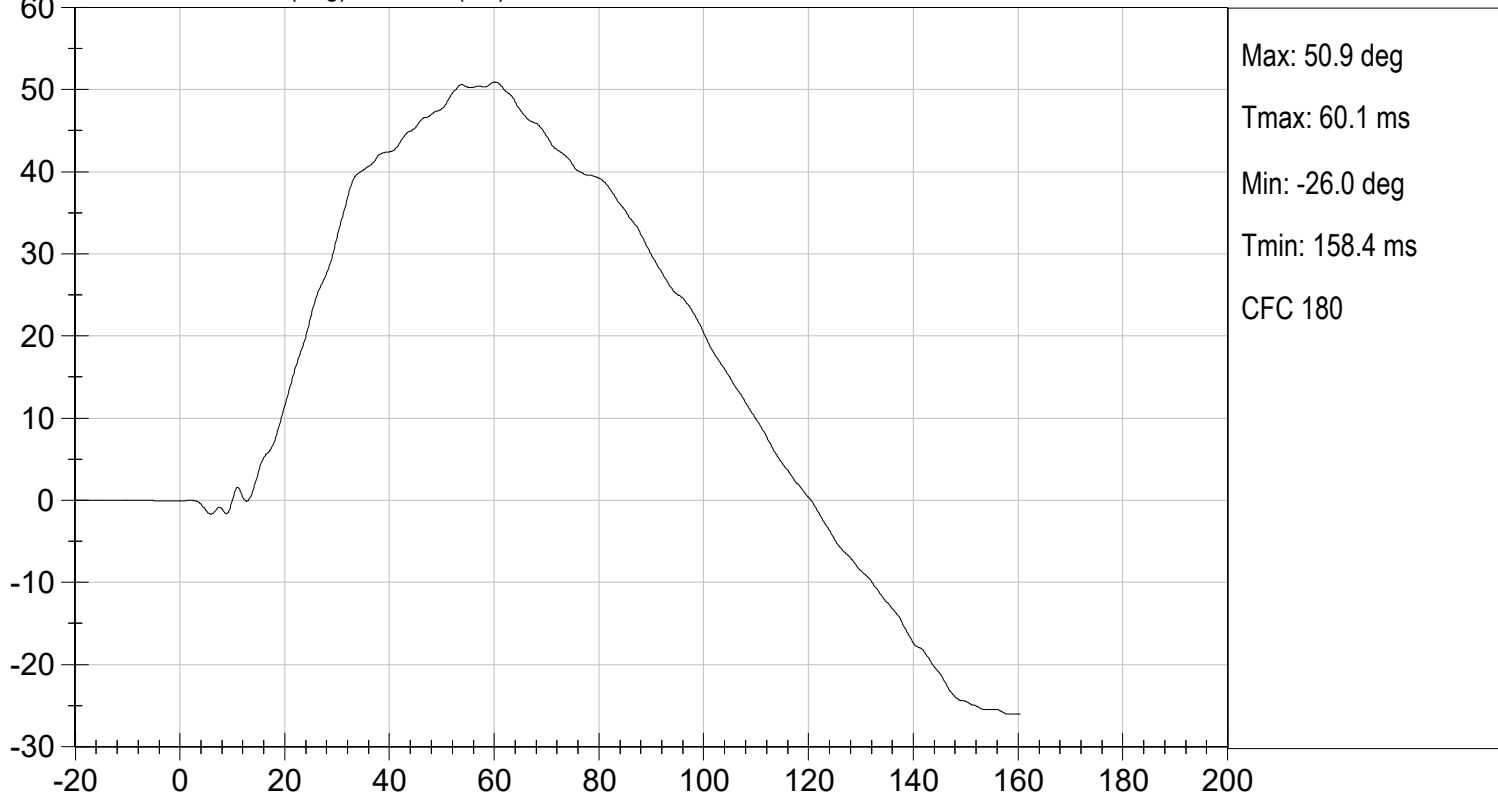

 Approved By



PENDULUM VELOCITY (m/s) vs TIME (ms)



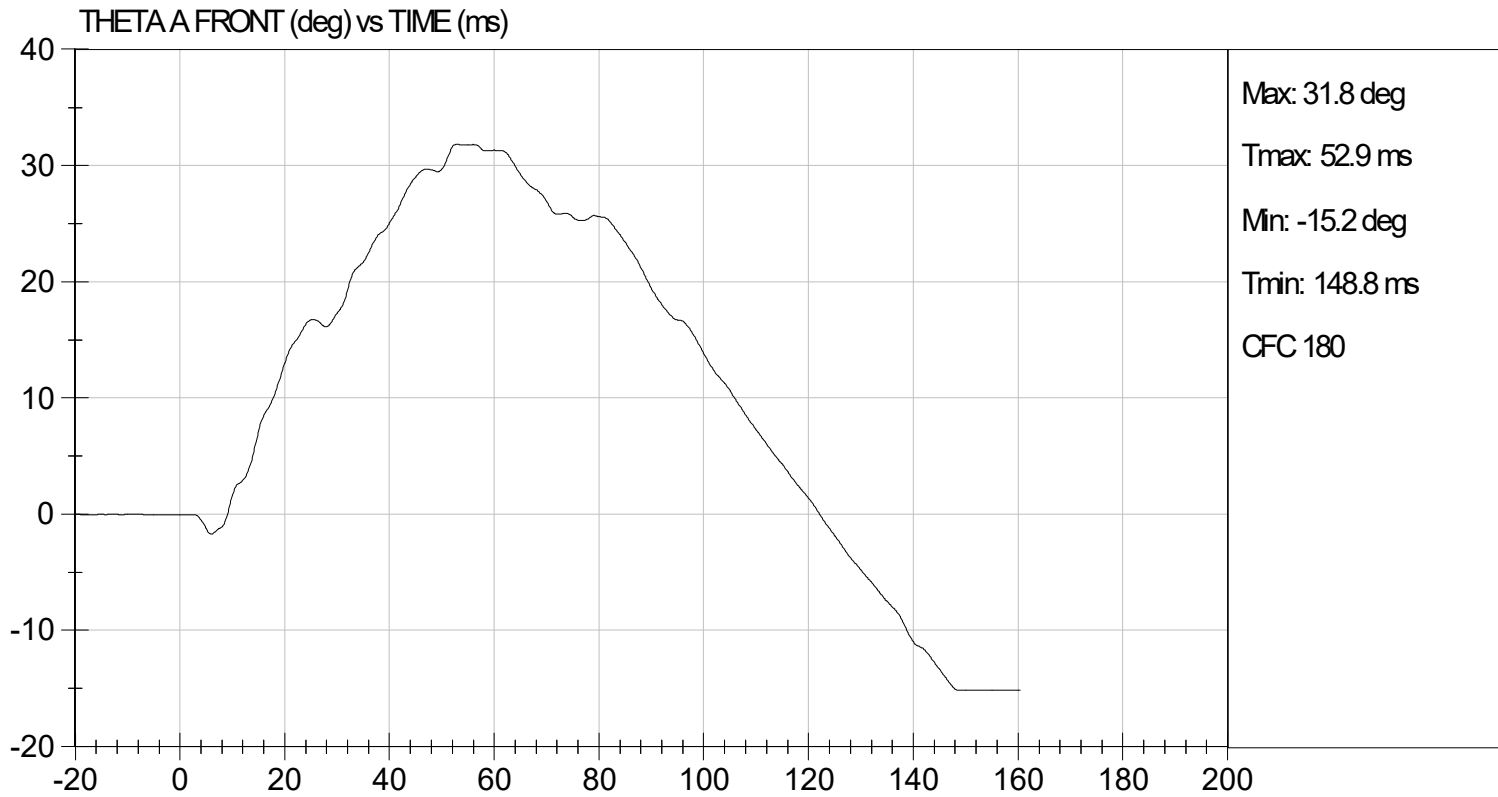
FLEXION ANGLE (deg) vs TIME (ms)





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

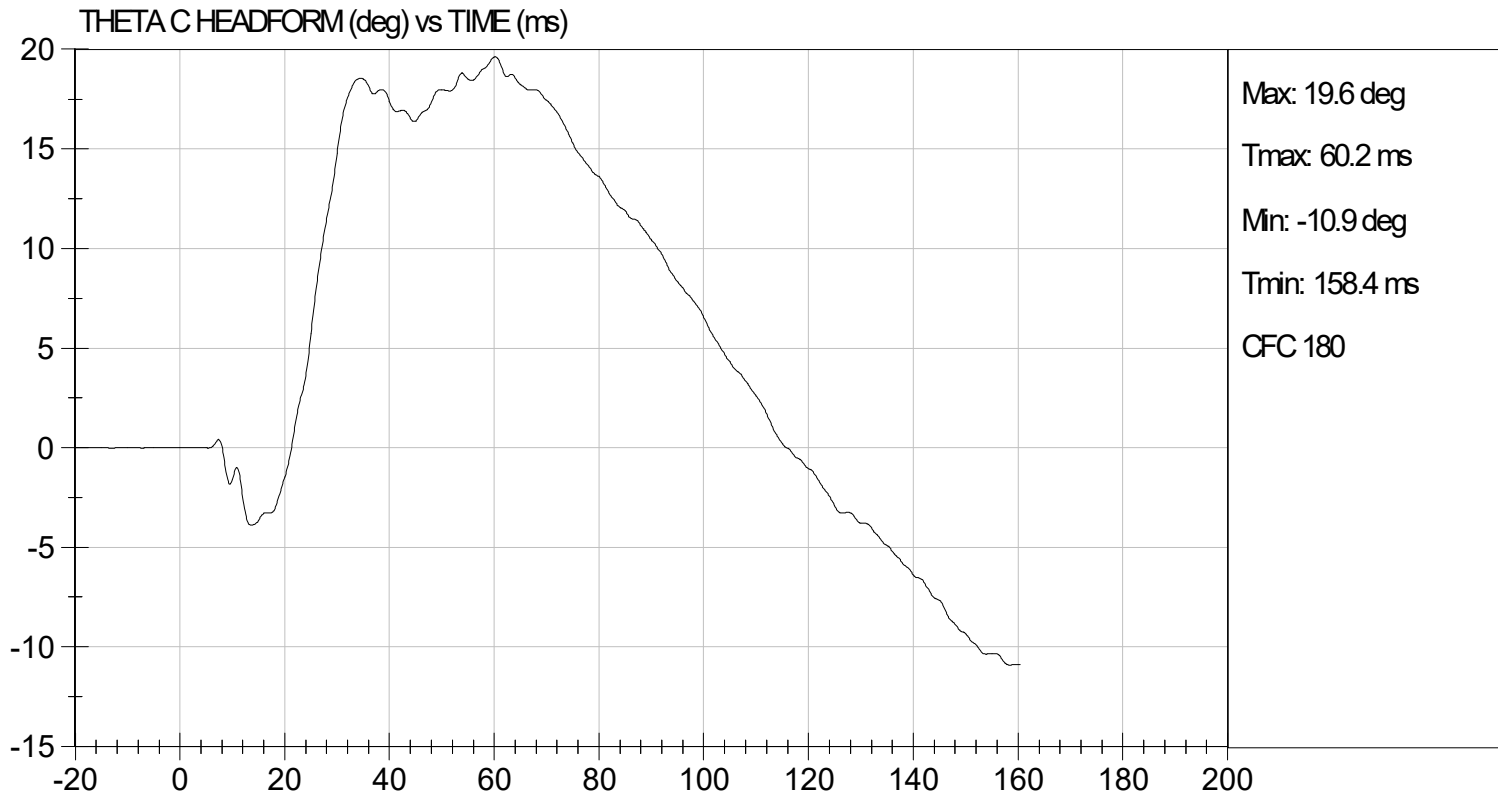
TEST DATE: 06/07/2024
TEST #: D241392





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 06/07/2024
TEST #: D241392



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

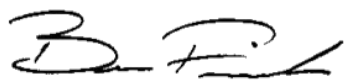
ATD Serial No: F032

Test I.D: D241393

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	8.5	Pass
Overall Test Results			Pass	


Laboratory Technician

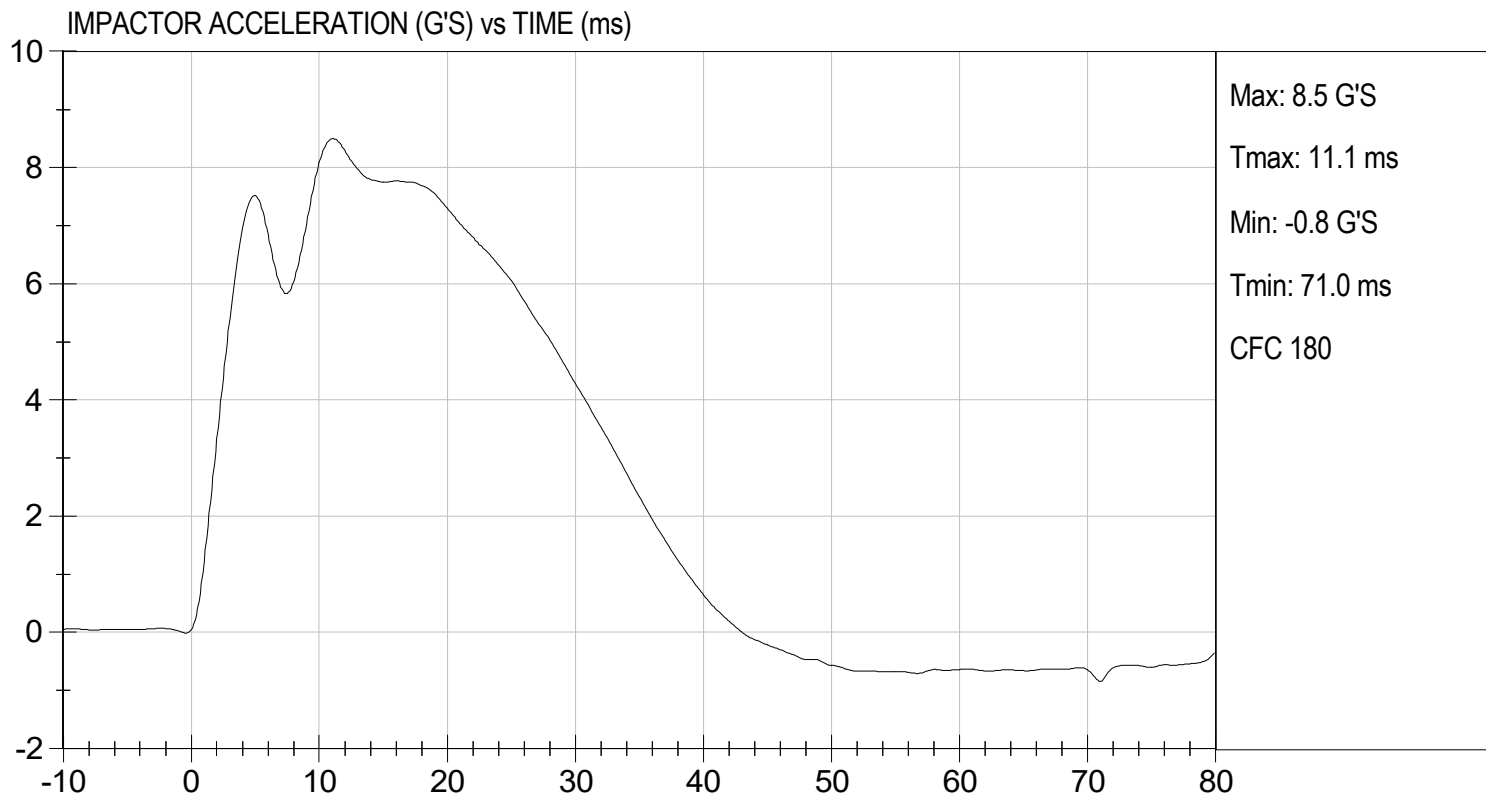
06/07/2024
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 13.77 ft/s, 4.2 m/s

TEST DATE: 06/07/2024
TEST #: D241393



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

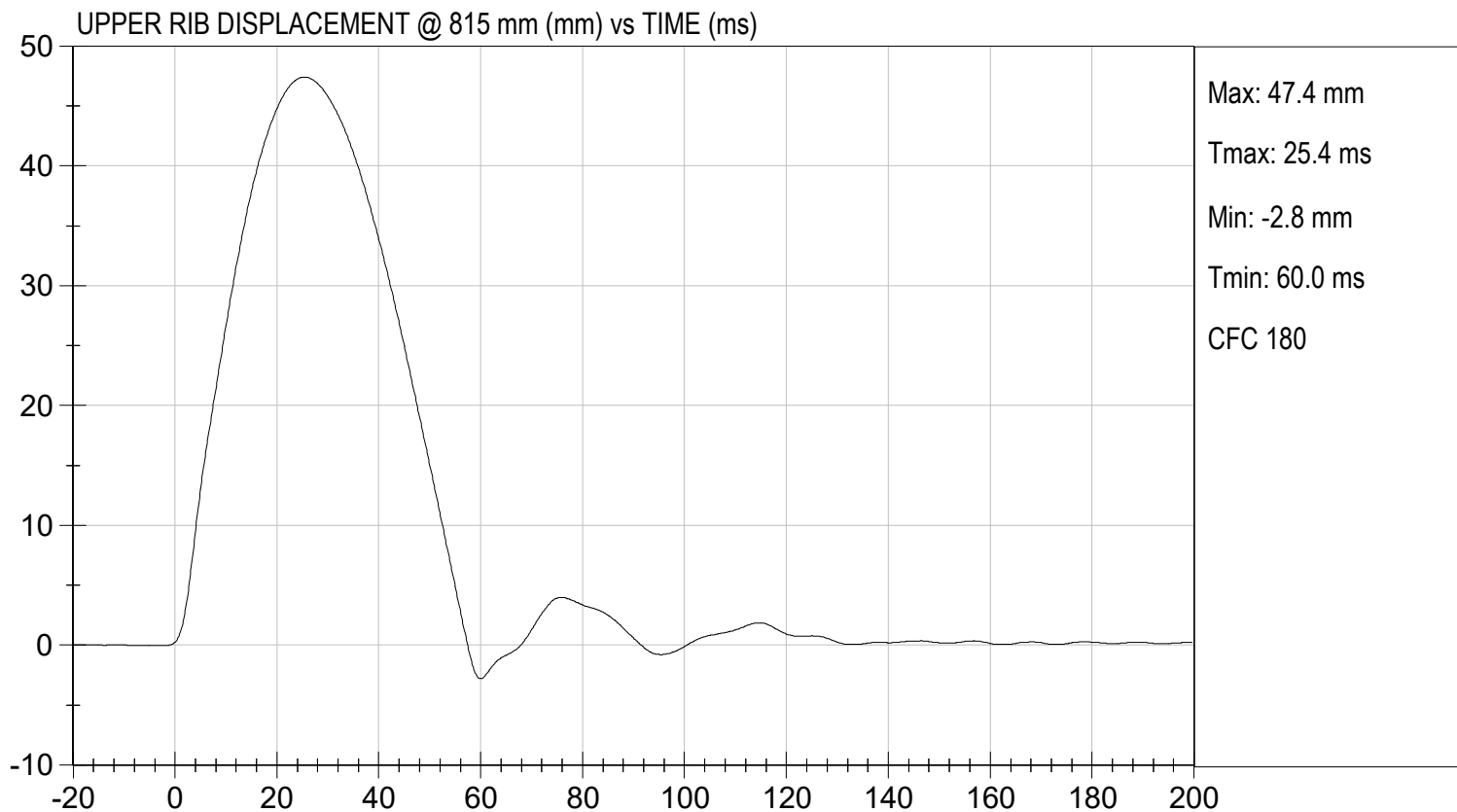
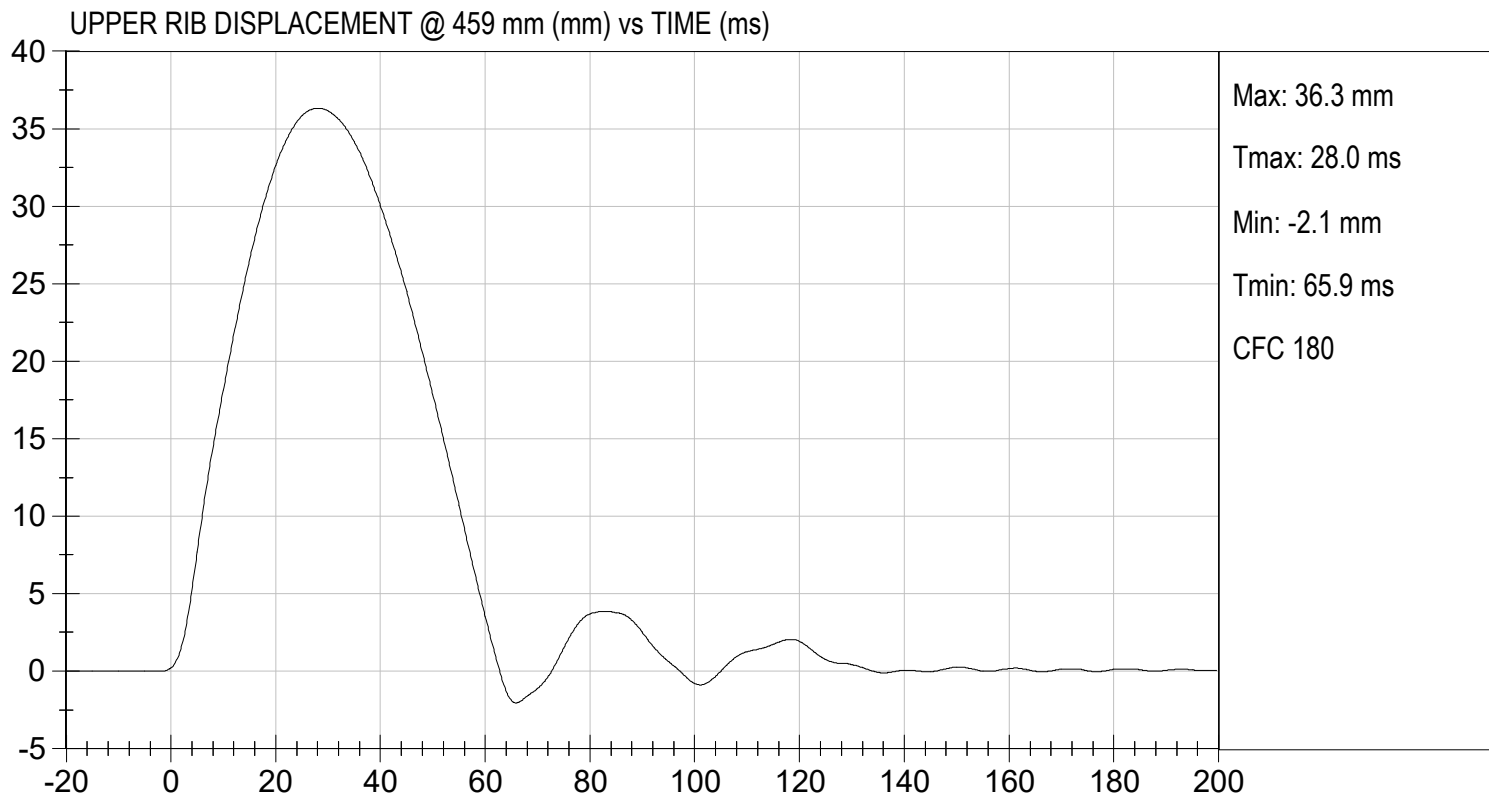
Test I.D: D241394

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	36.3	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.4	Pass
Overall Test Results			Pass	


Laboratory Technician

06/07/2024
Test Date


Approved By



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

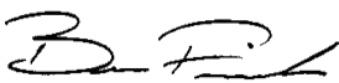
ATD Serial No: F032

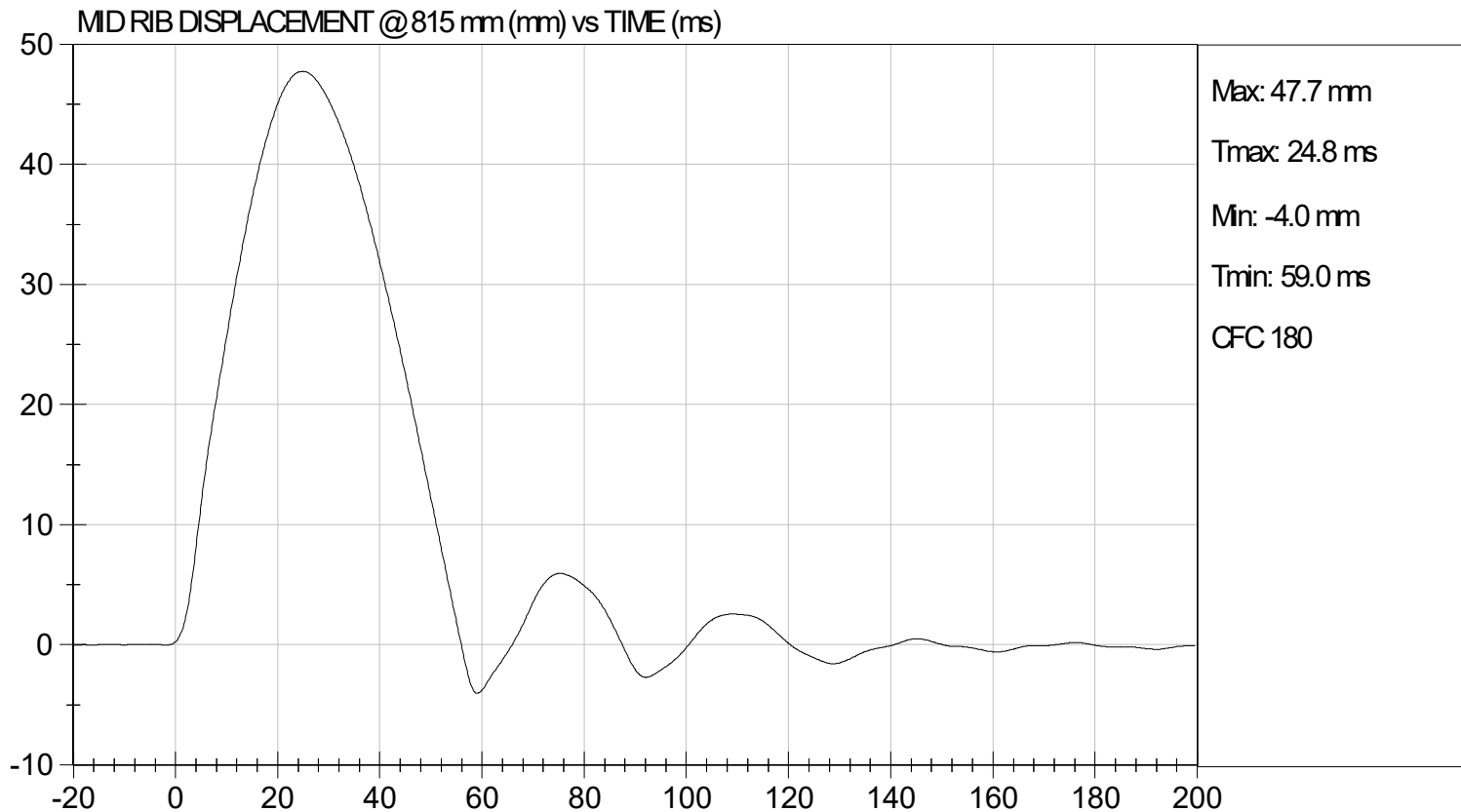
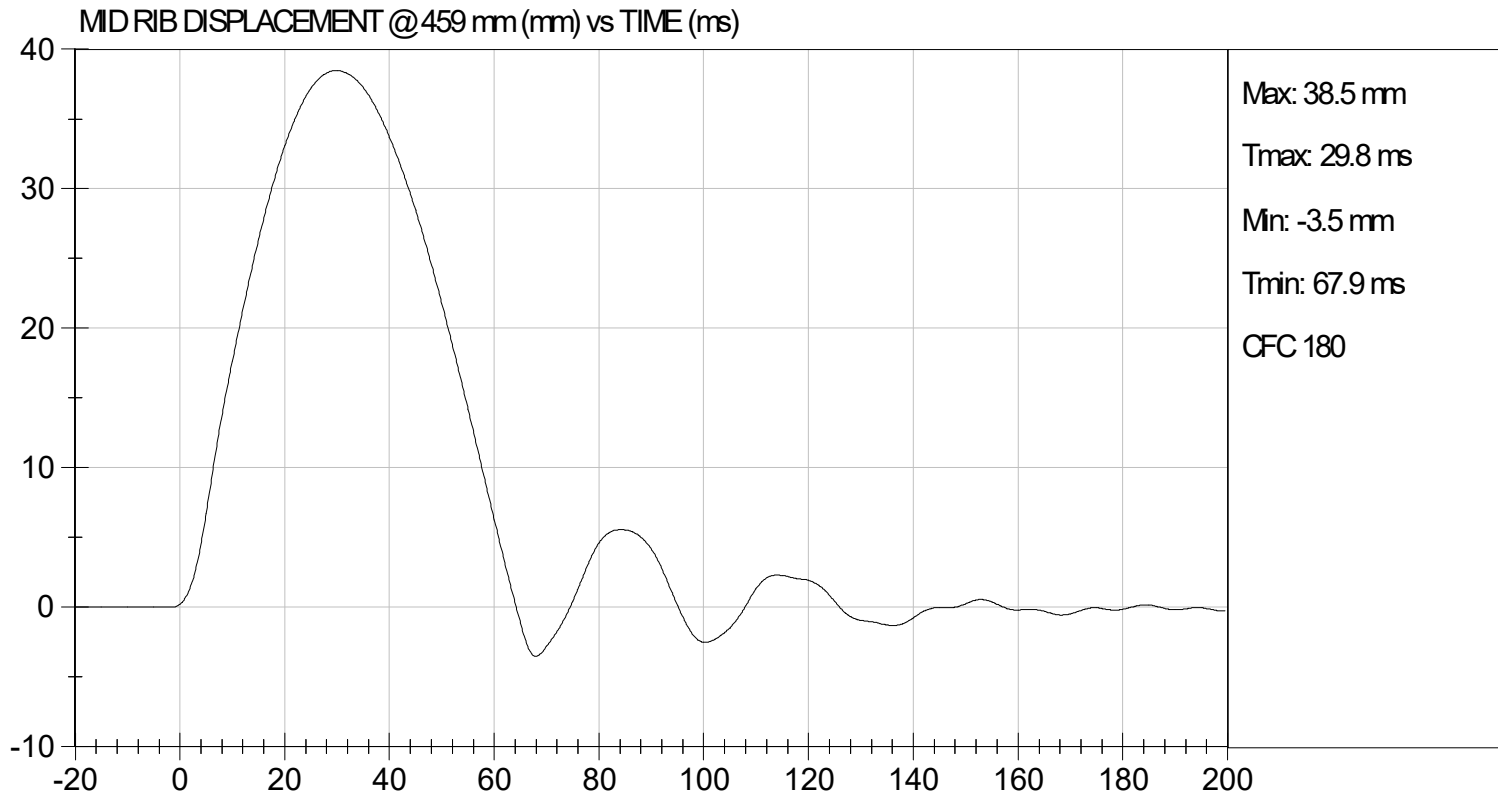
Test I.D: D241395

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.5	Pass
Displacement at 815 mm	mm	46.0 to 51.0	47.8	Pass
Overall Test Results			Pass	


Laboratory Technician

06/07/2024
Test Date


Approved By



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

ATD Serial No: F032

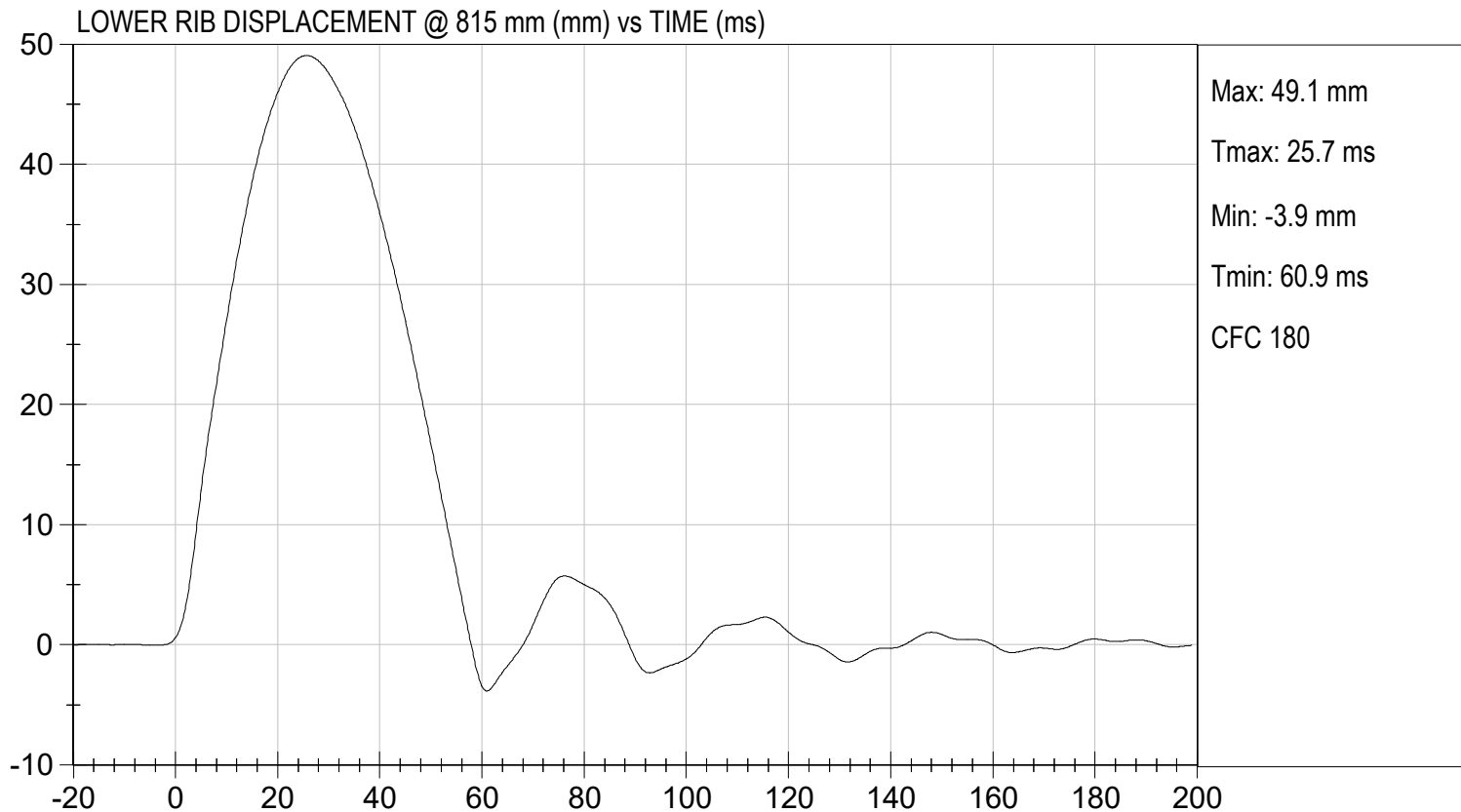
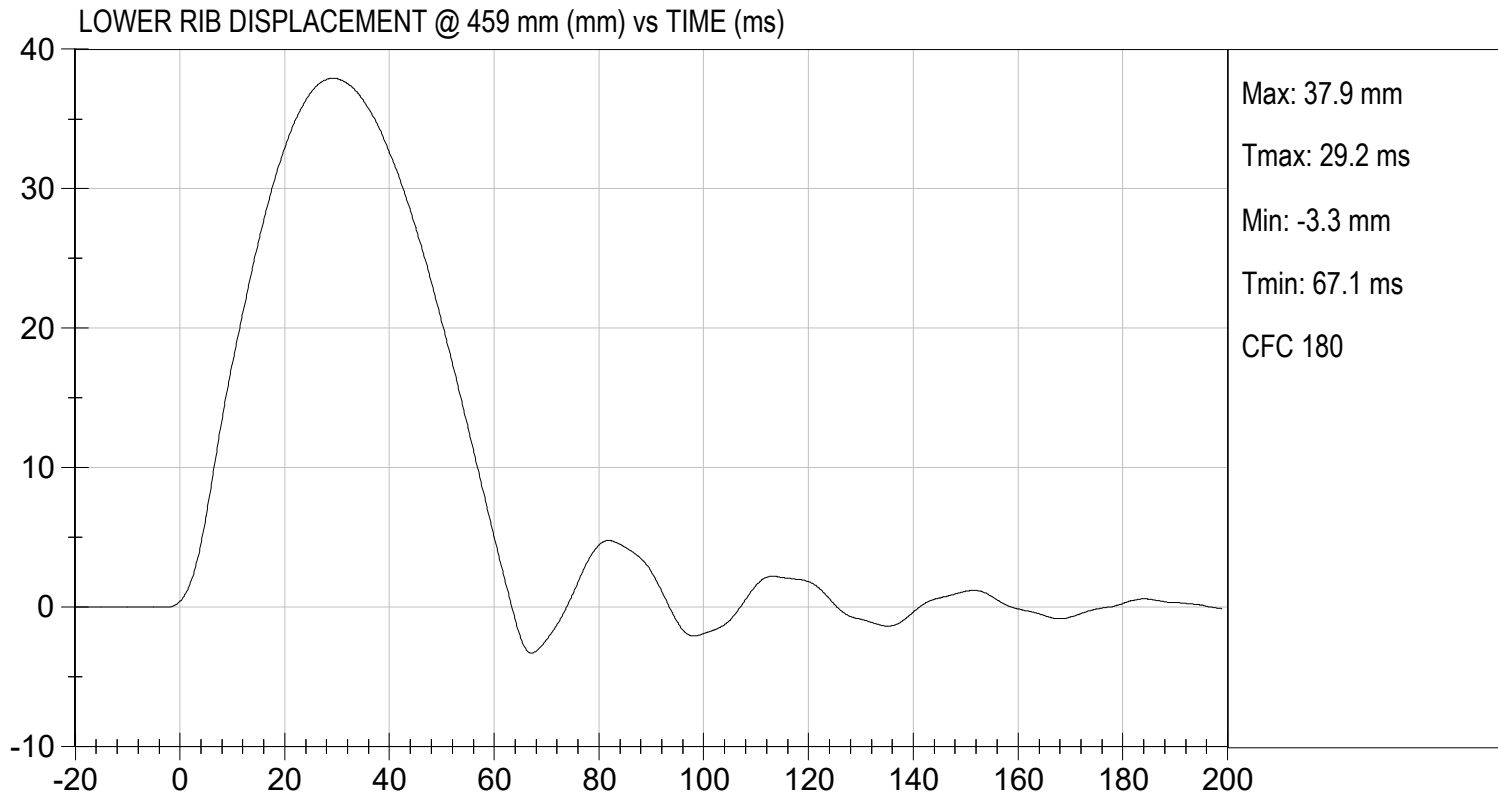
Test I.D: D241396

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.1	Pass
Overall Test Results			Pass	


Laboratory Technician

06/07/2024
Test Date


Approved By



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

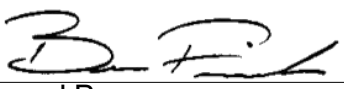
ATD Serial No: F032

Test I.D: D241397

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	3.90 to 4.10	4.10	Pass
Maximum Impactor Force	N	4000 to 4800	4316	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.2	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2380	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.0	Pass
Overall Test Results				Pass


Laboratory Technician

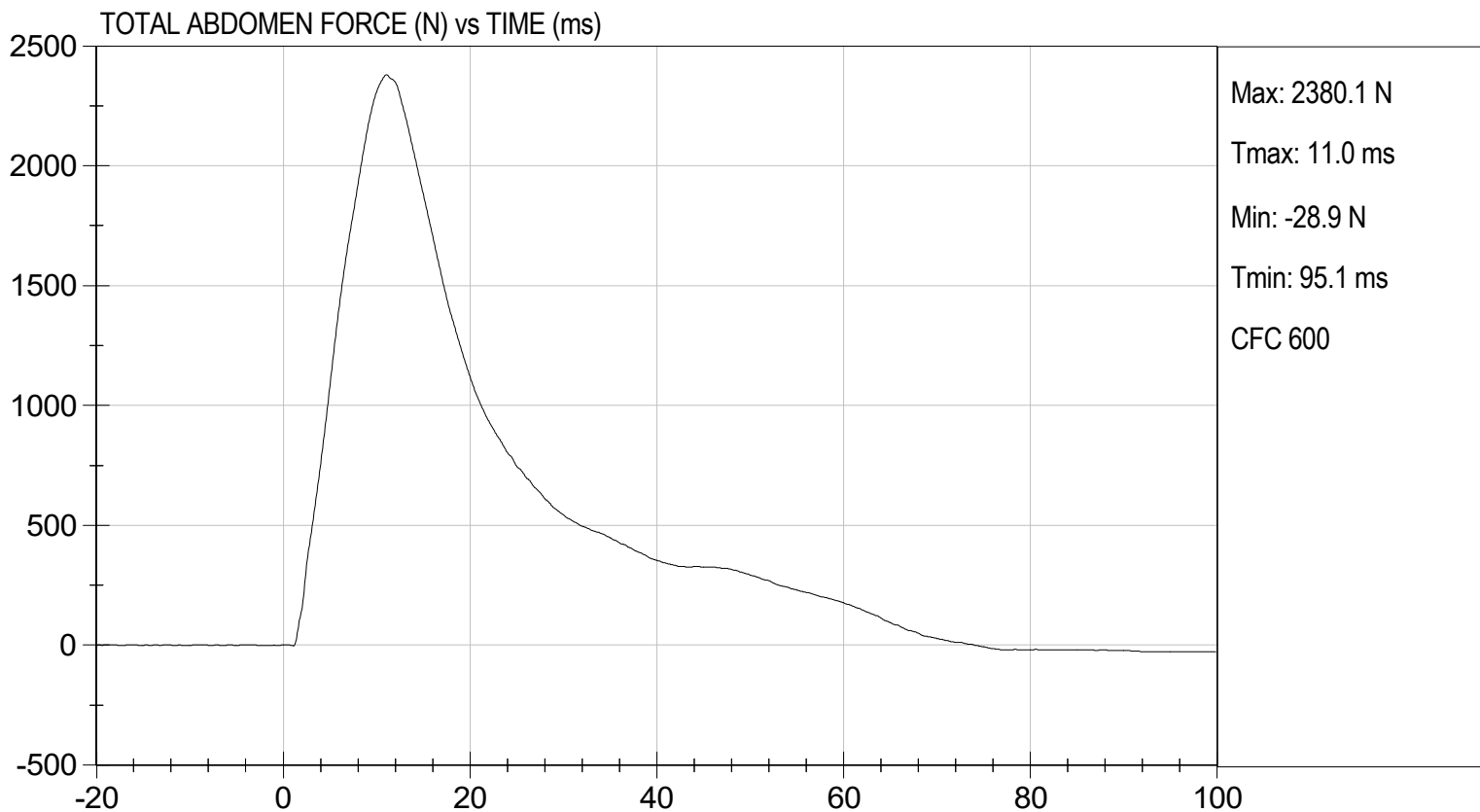
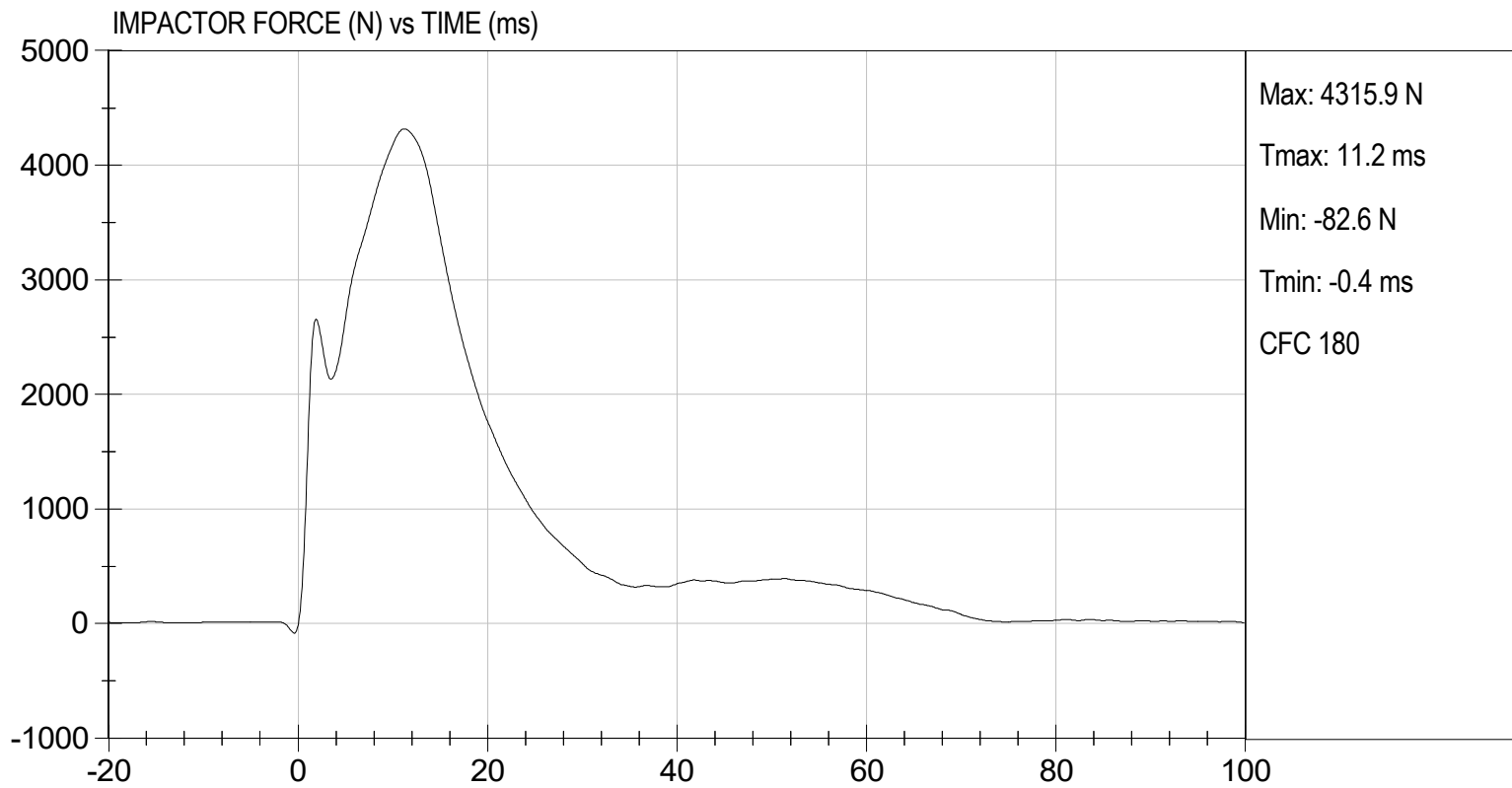
06/07/2024
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.45 ft/s, 4.10 m/s

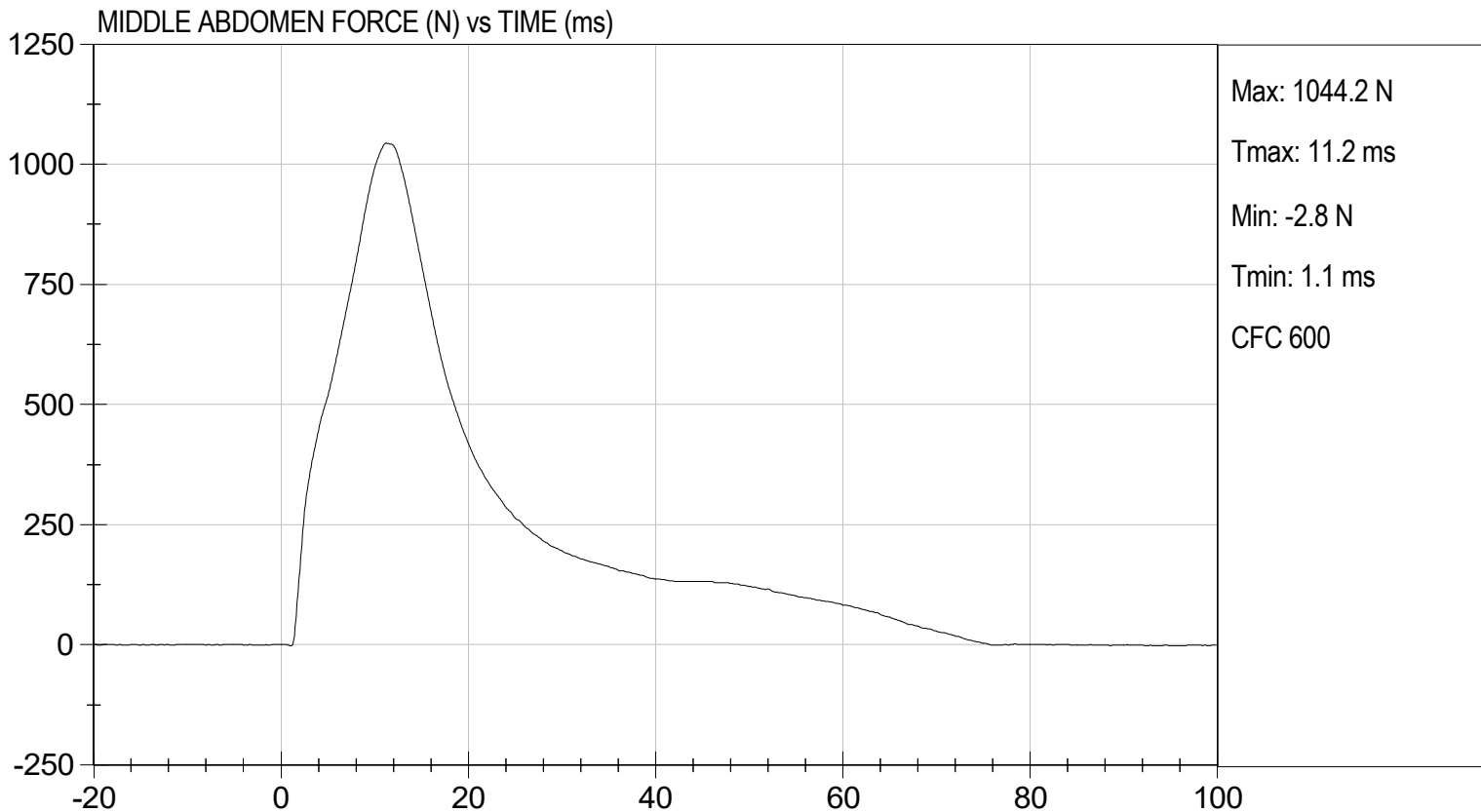
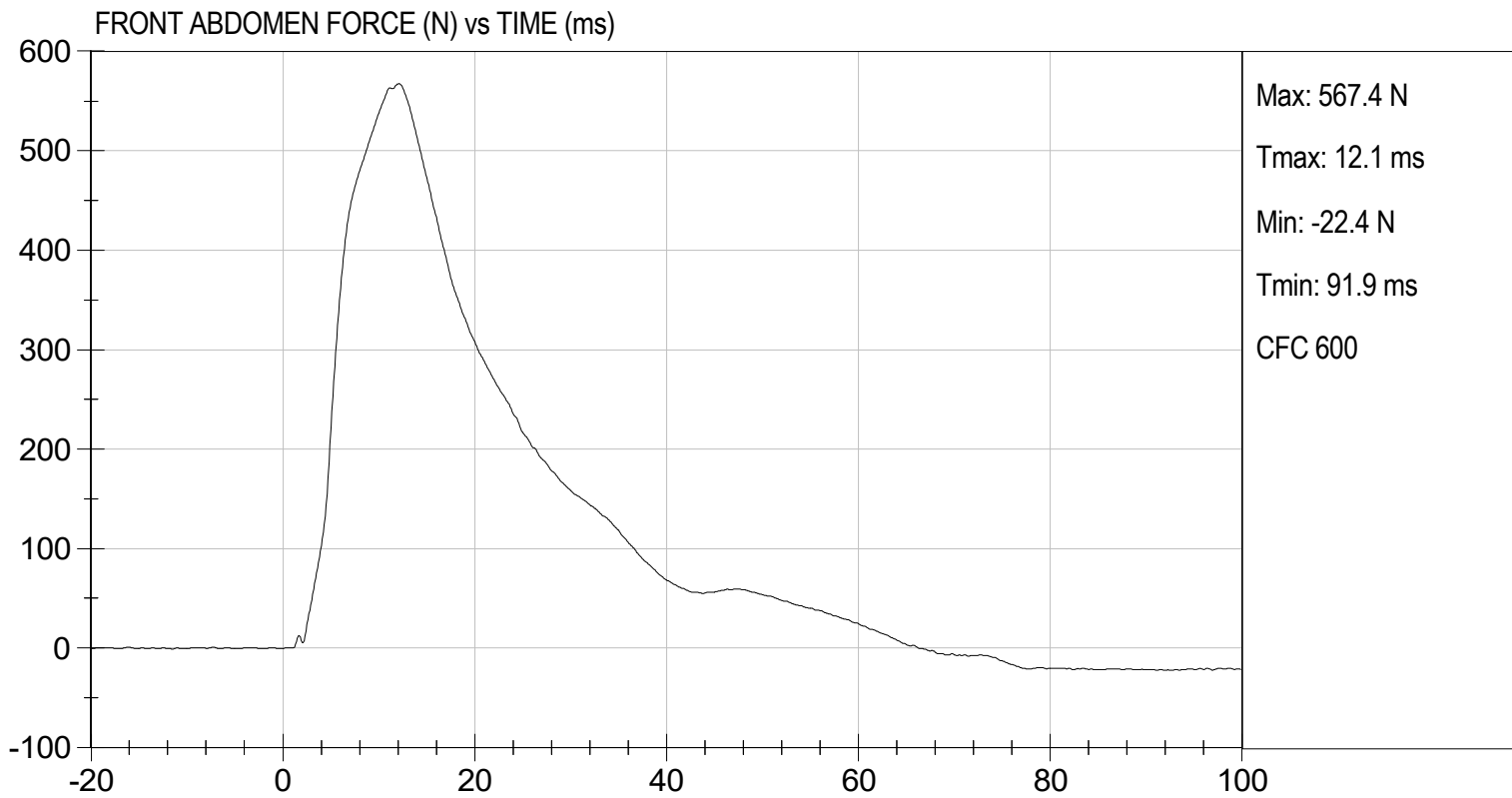
TEST DATE: 06/07/2024
TEST #: D241397





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.45 ft/s, 4.10 m/s

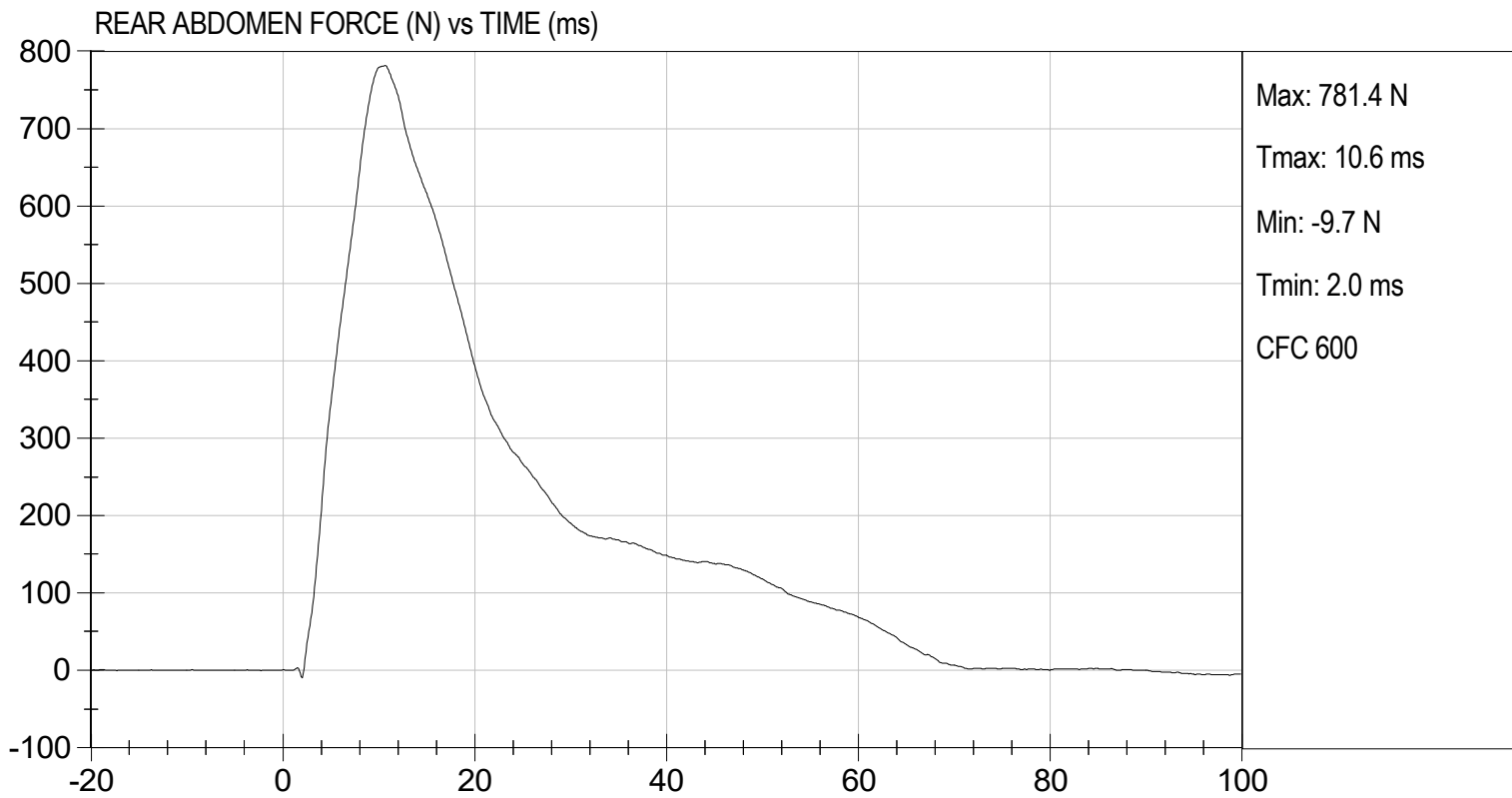
TEST DATE: 06/07/2024
TEST #: D241397





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.45 ft/s, 4.10 m/s

TEST DATE: 06/07/2024
TEST #: D241397



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: F032

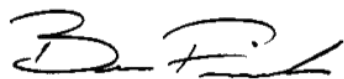
Test I.D: D241398

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	41	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.420	Pass
	27 ms	m/s	-6.50 to -5.80	-6.12	Pass
	30 ms	m/s	>= -6.50	-6.32	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	49.7	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	45.9	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	41	Pass
Overall Results				Pass	


 Laboratory Technician

06/07/2024

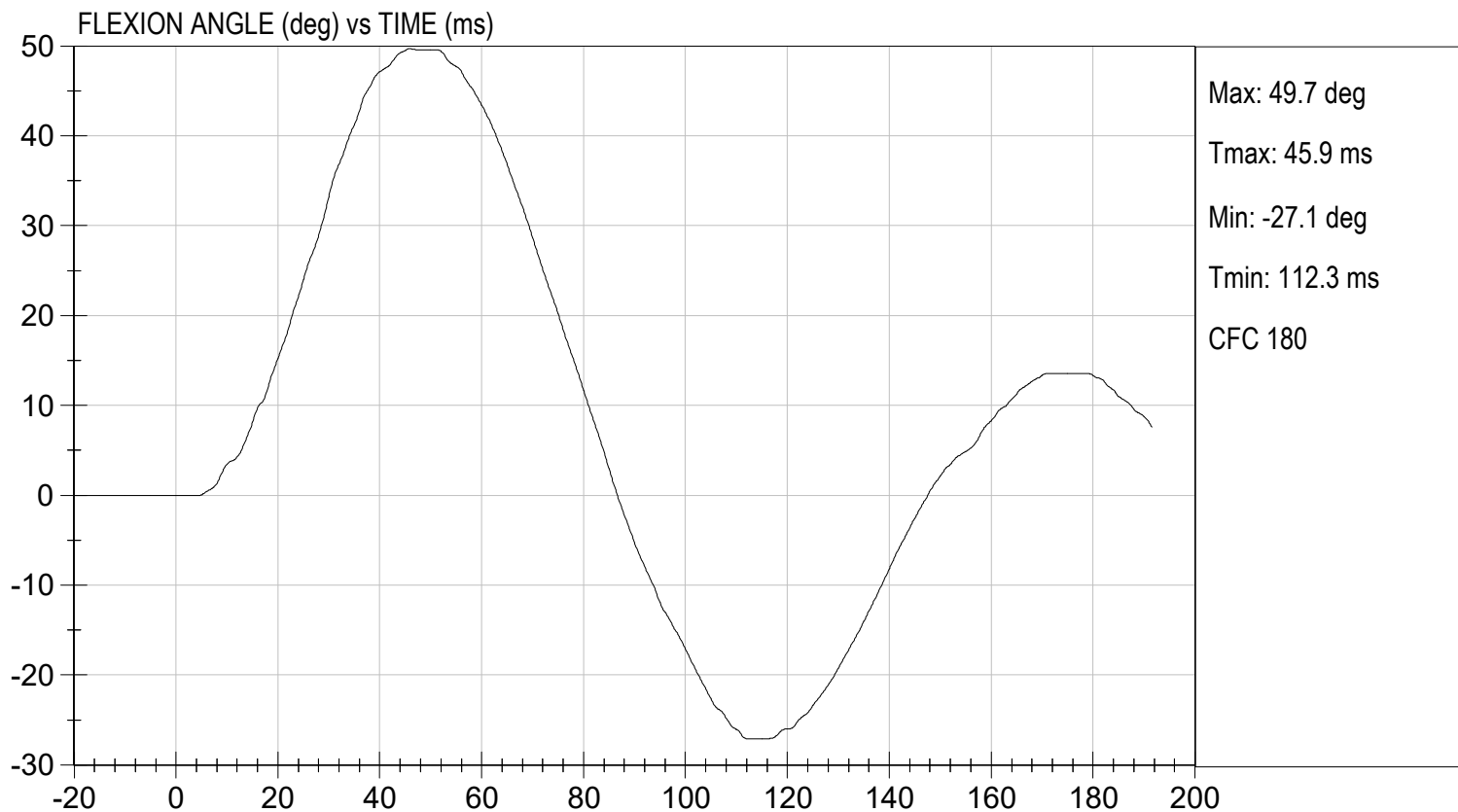
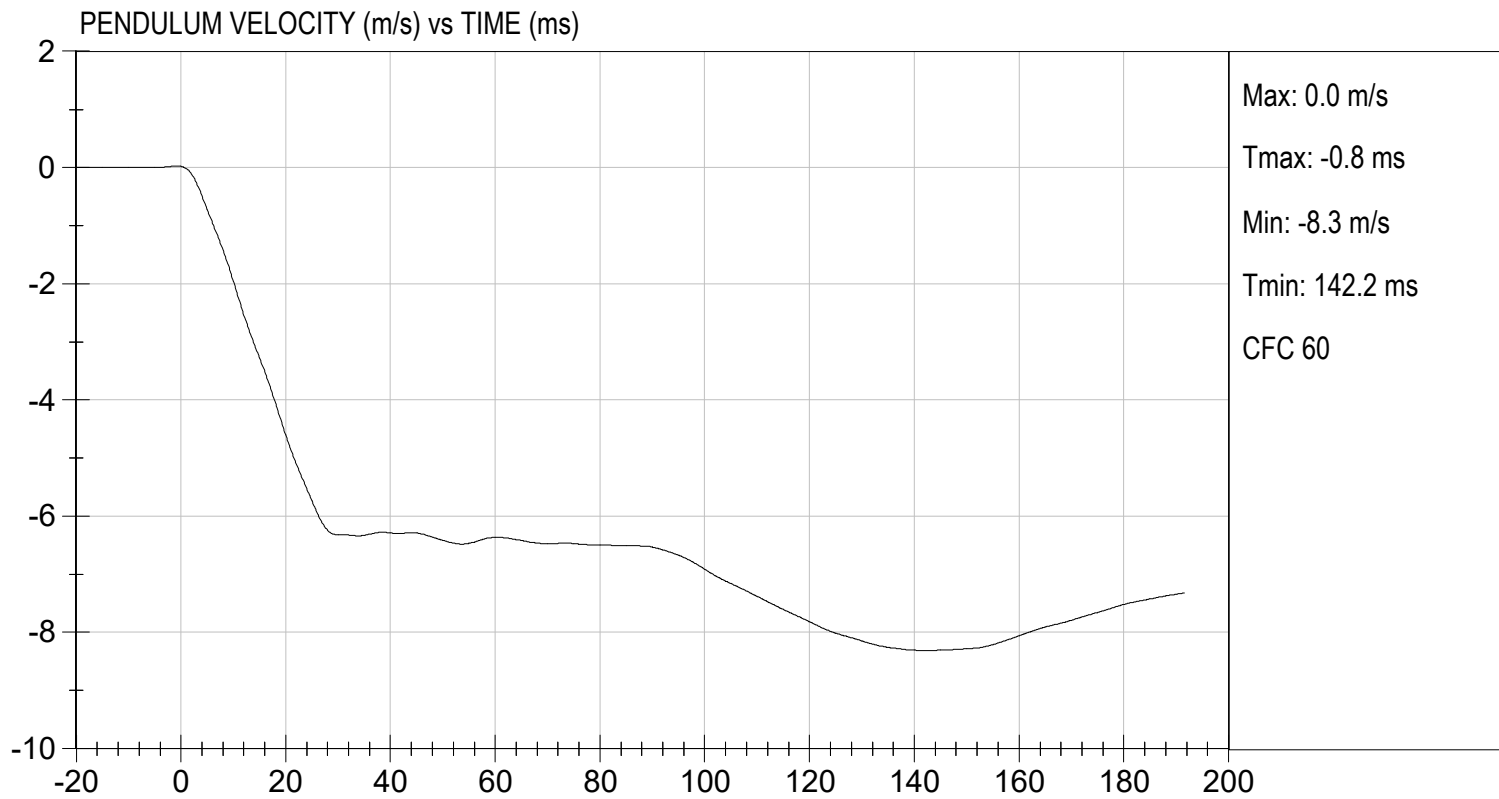
Test Date


 Approved By



TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

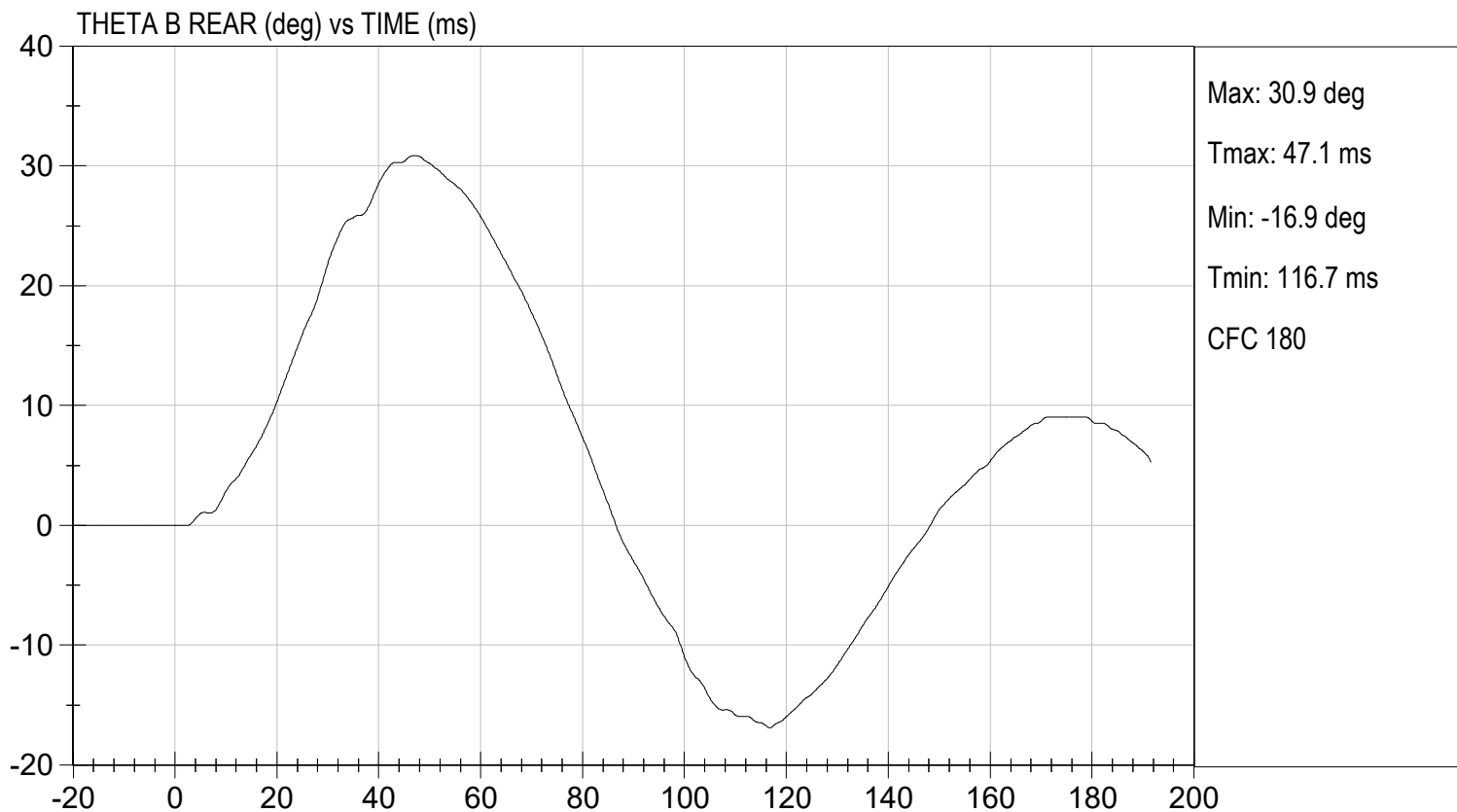
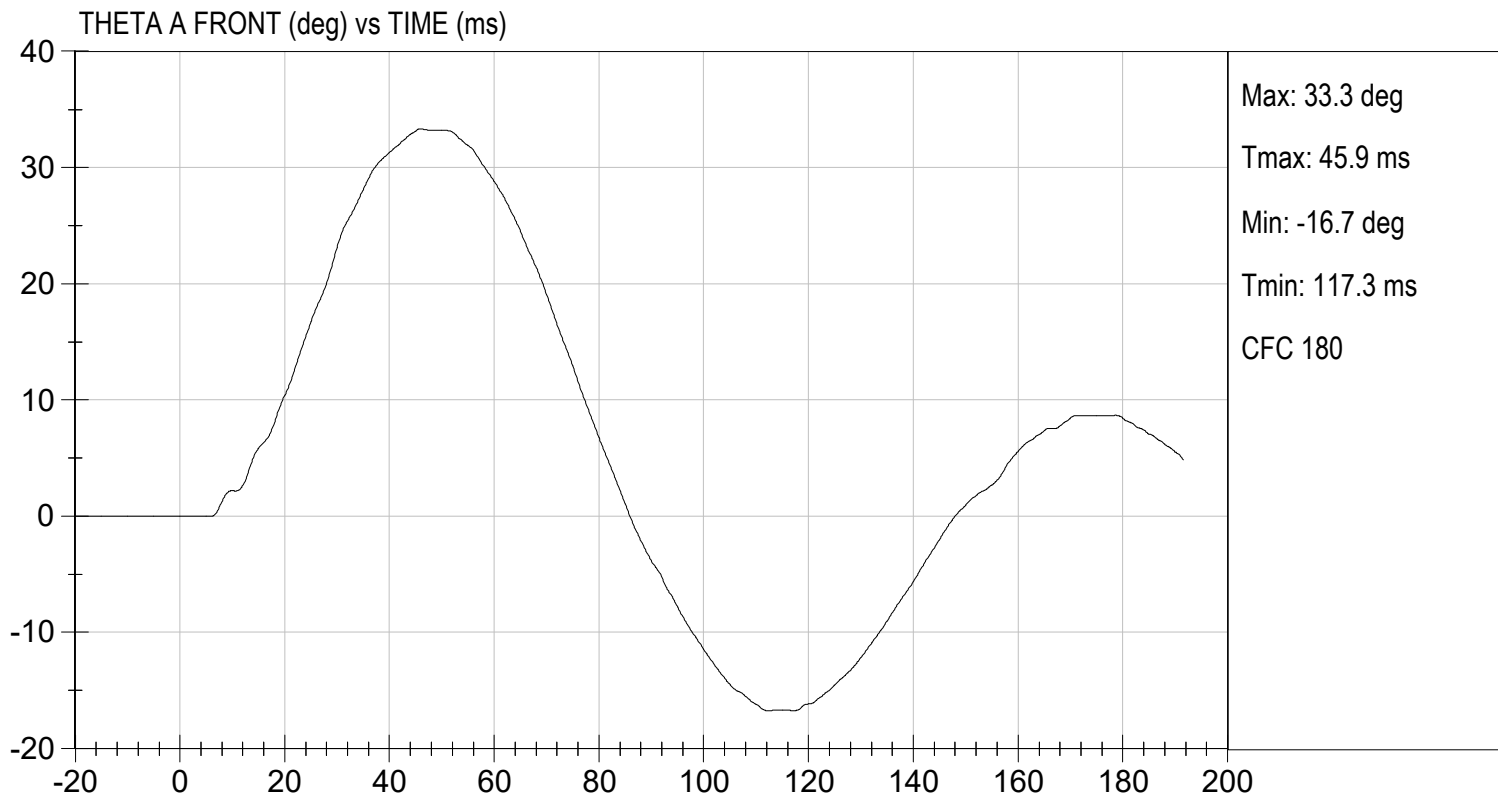
TEST DATE: 06/07/2024
TEST #: D241398





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

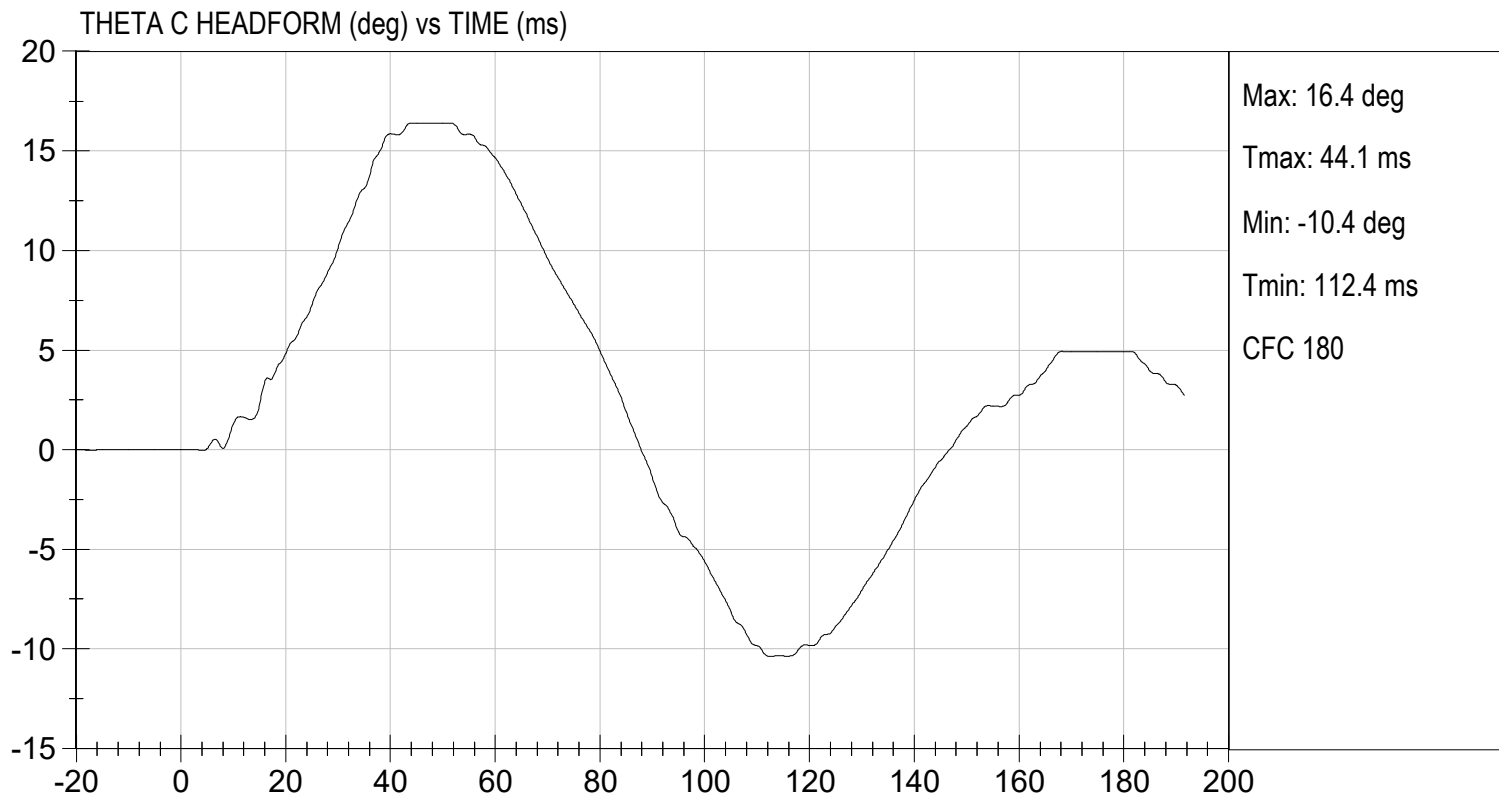
TEST DATE: 06/07/2024
TEST #: D241398





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 06/07/2024
TEST #: D241398



MGA RESEARCH CORPORATION

PELVIS TEST

ES-2re DUMMY

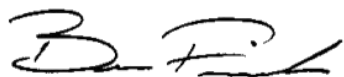
ATD Serial No: F032

Test I.D: D241399

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	N	4700 to 5400	4955	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.1	Pass
Maximum Pubic Force	N	1230 to 1590	1267	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	13.6	Pass
Overall Test Results			Pass	


Laboratory Technician

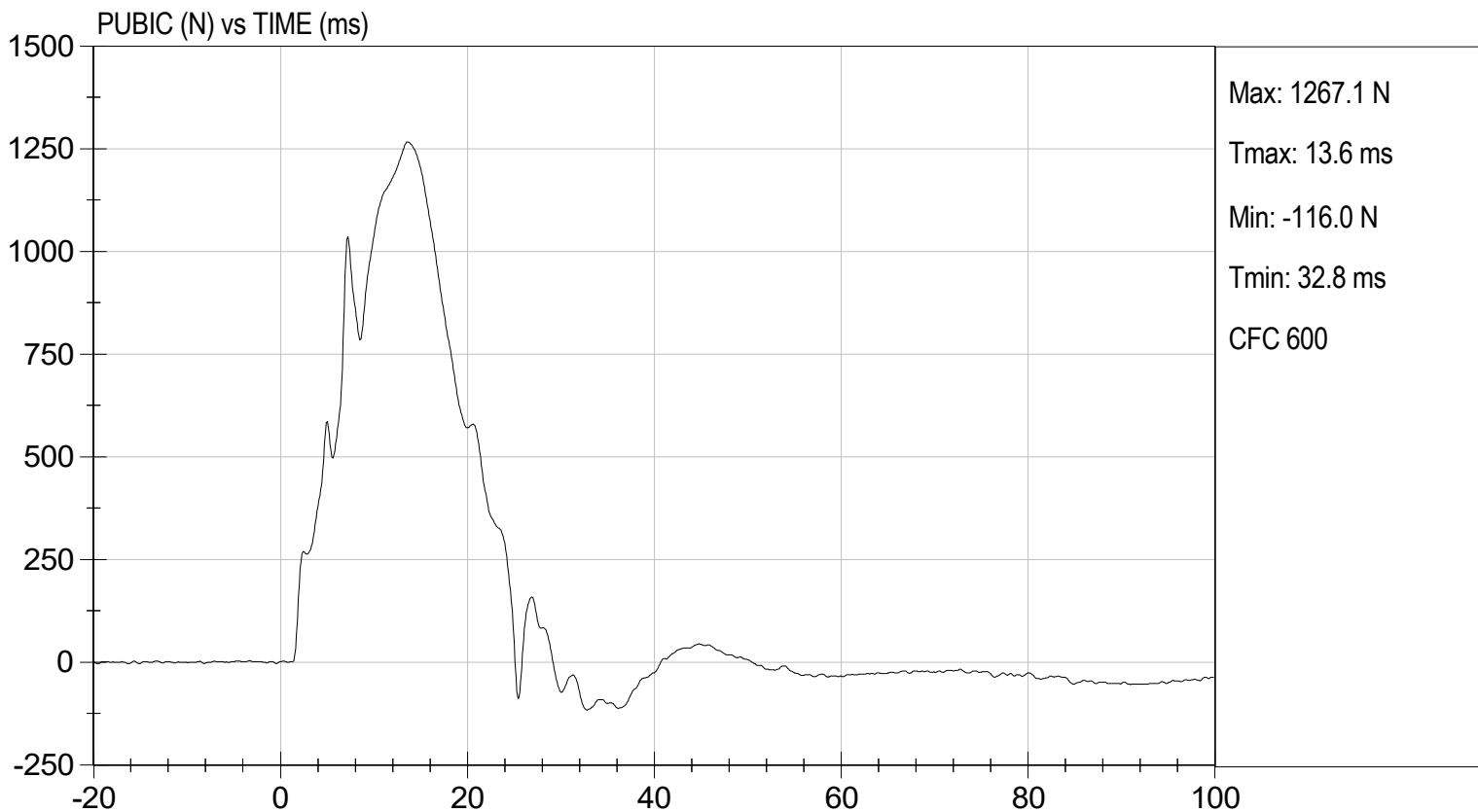
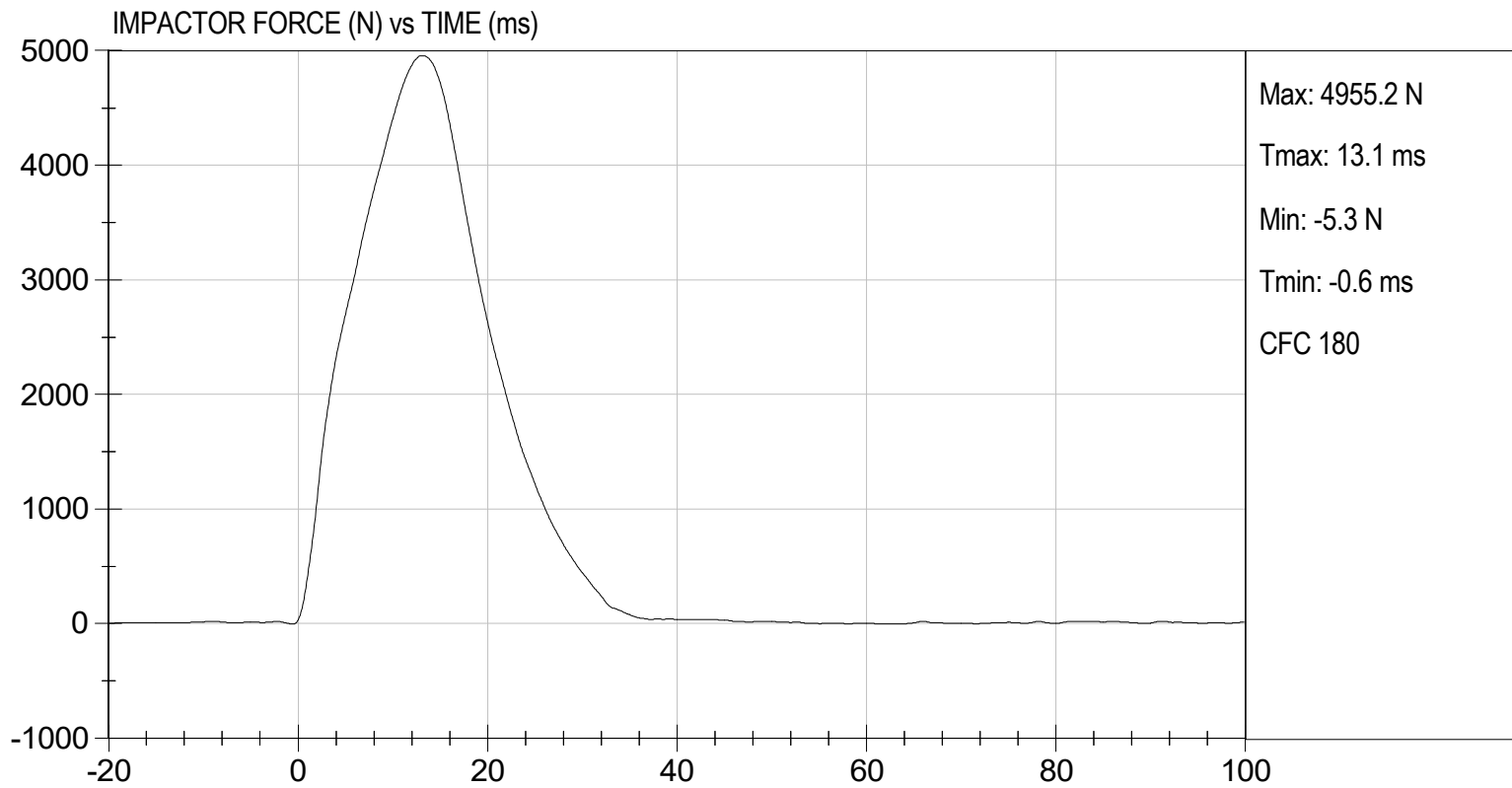
06/07/2024
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 06/07/2024
TEST #: D241399

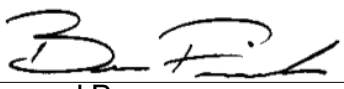


MGA RESEARCH CORPORATION**THORAX IMPACT TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D241390

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	39	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	5555	Pass
Upper Rib Displacement	mm	34.0 to 41.0	38.3	Pass
Middle Rib Displacement	mm	37.0 to 45.0	40.0	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.3	Pass
Overall Test Results			Pass	


Laboratory Technician

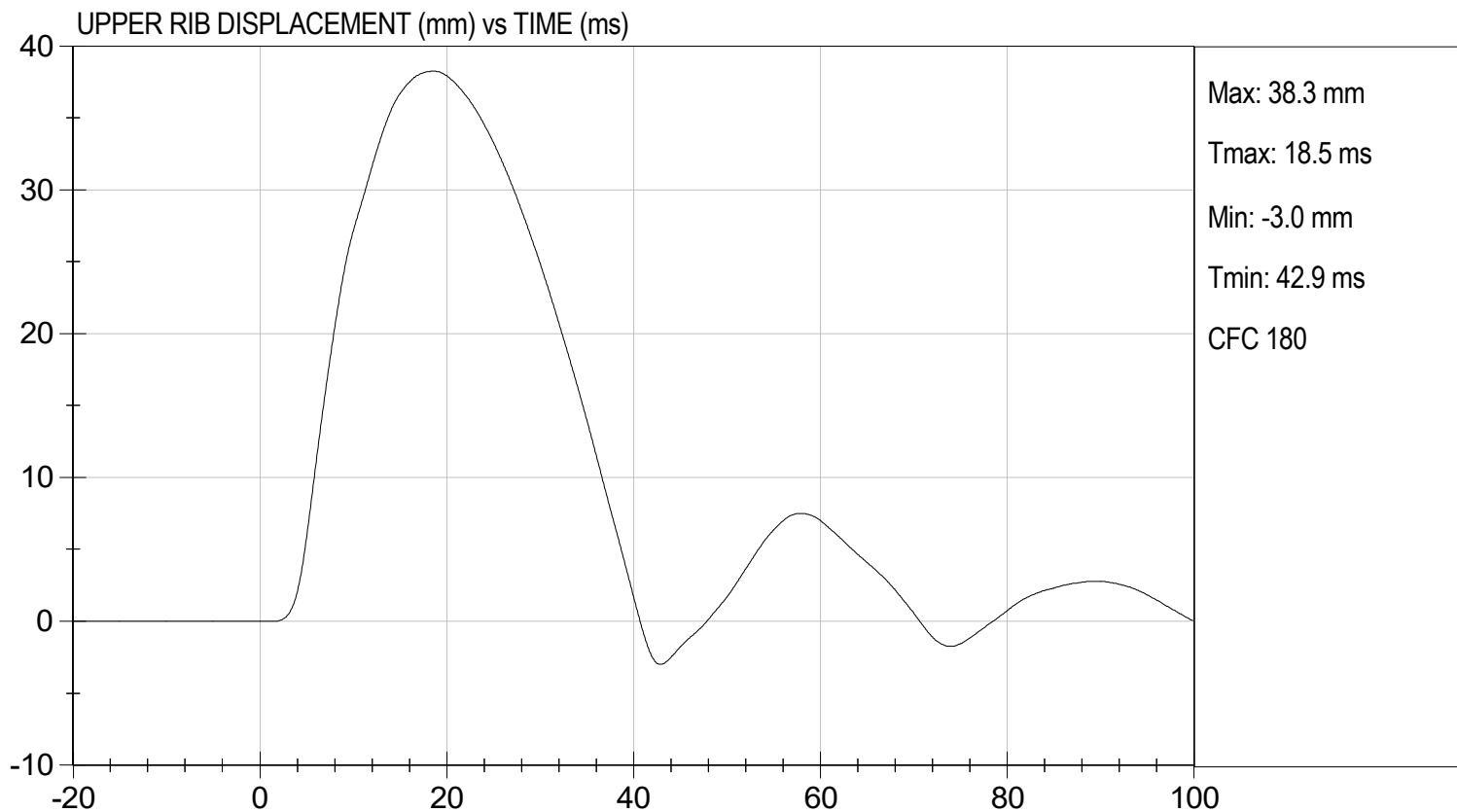
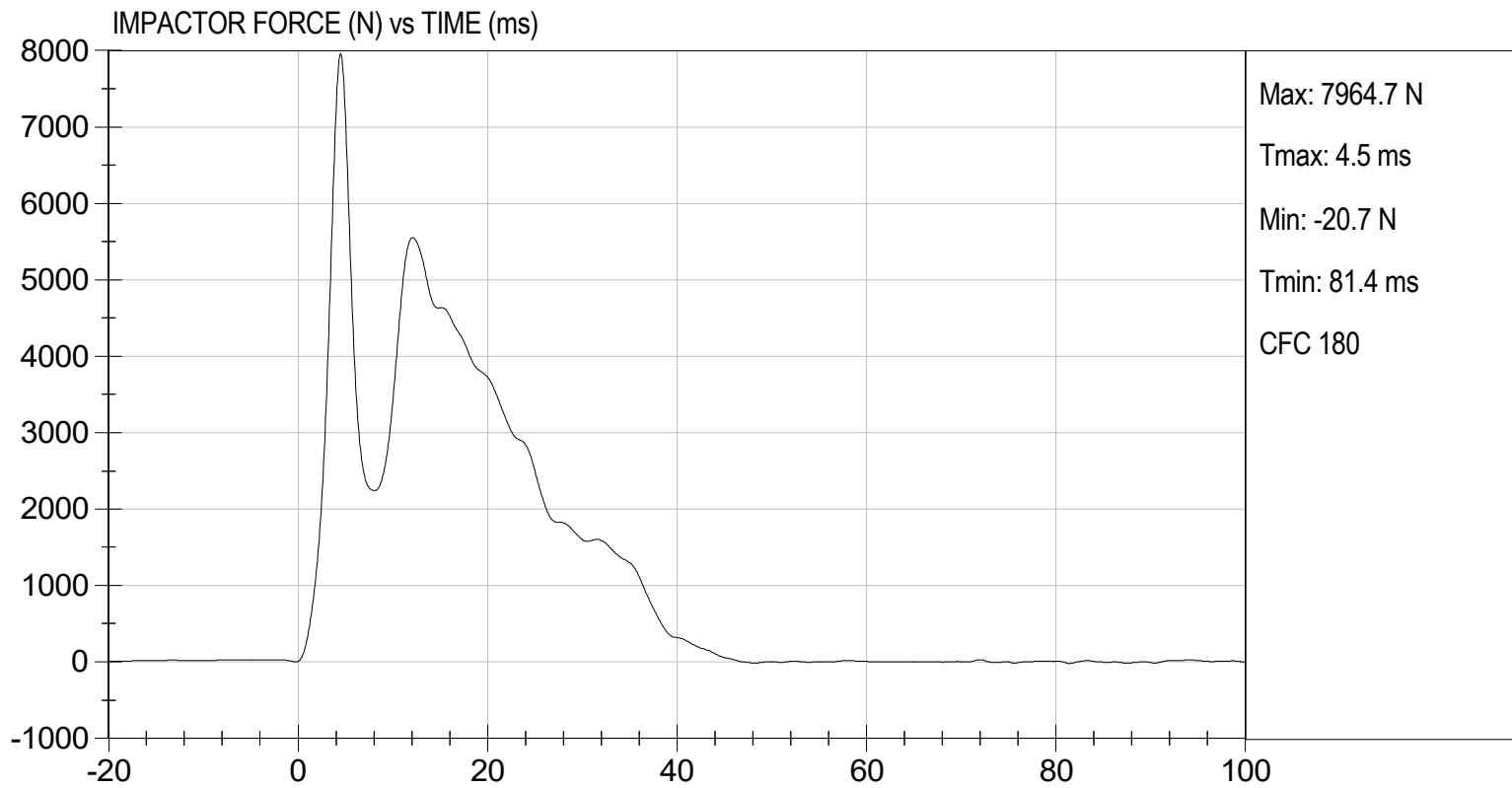
06/07/2024
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

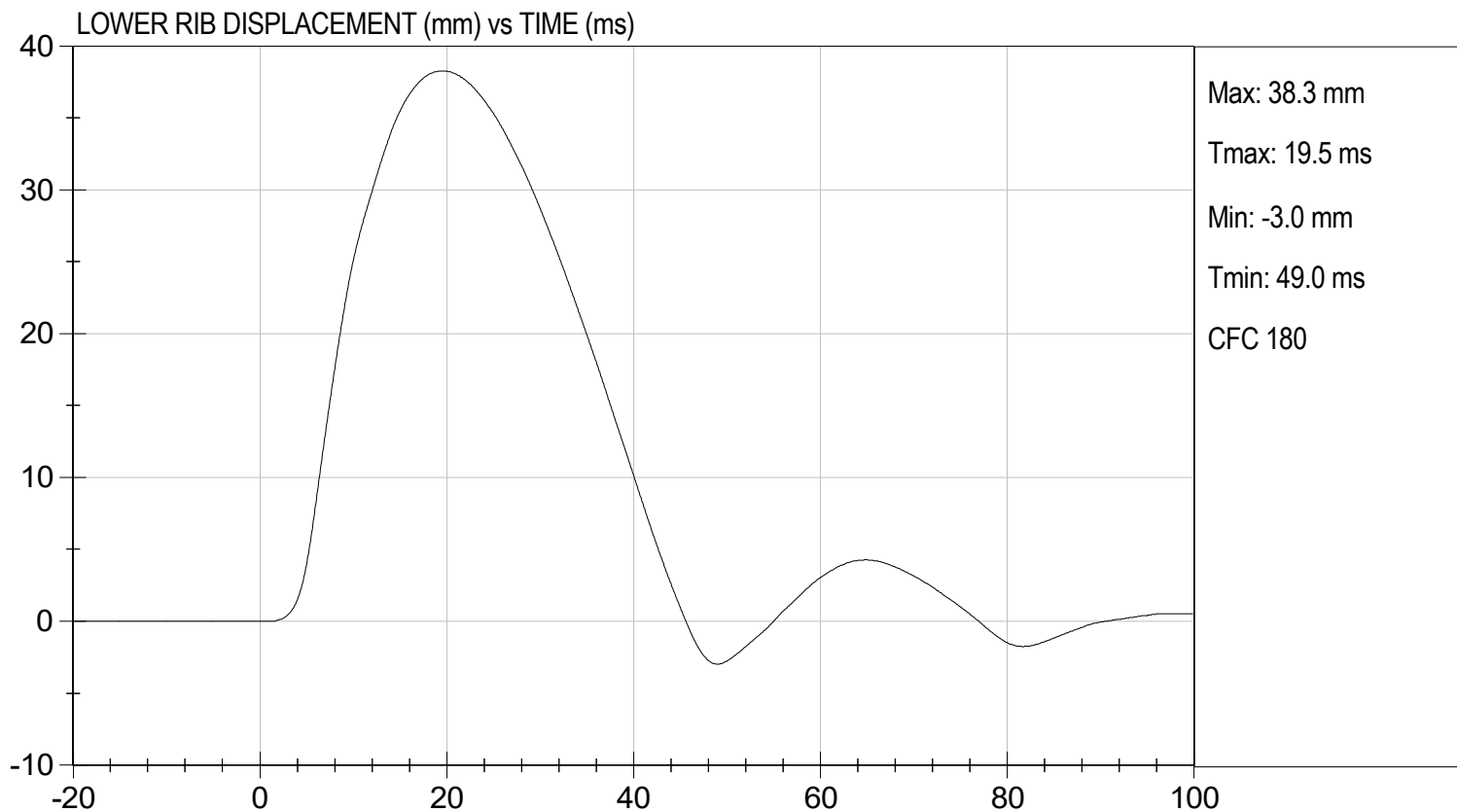
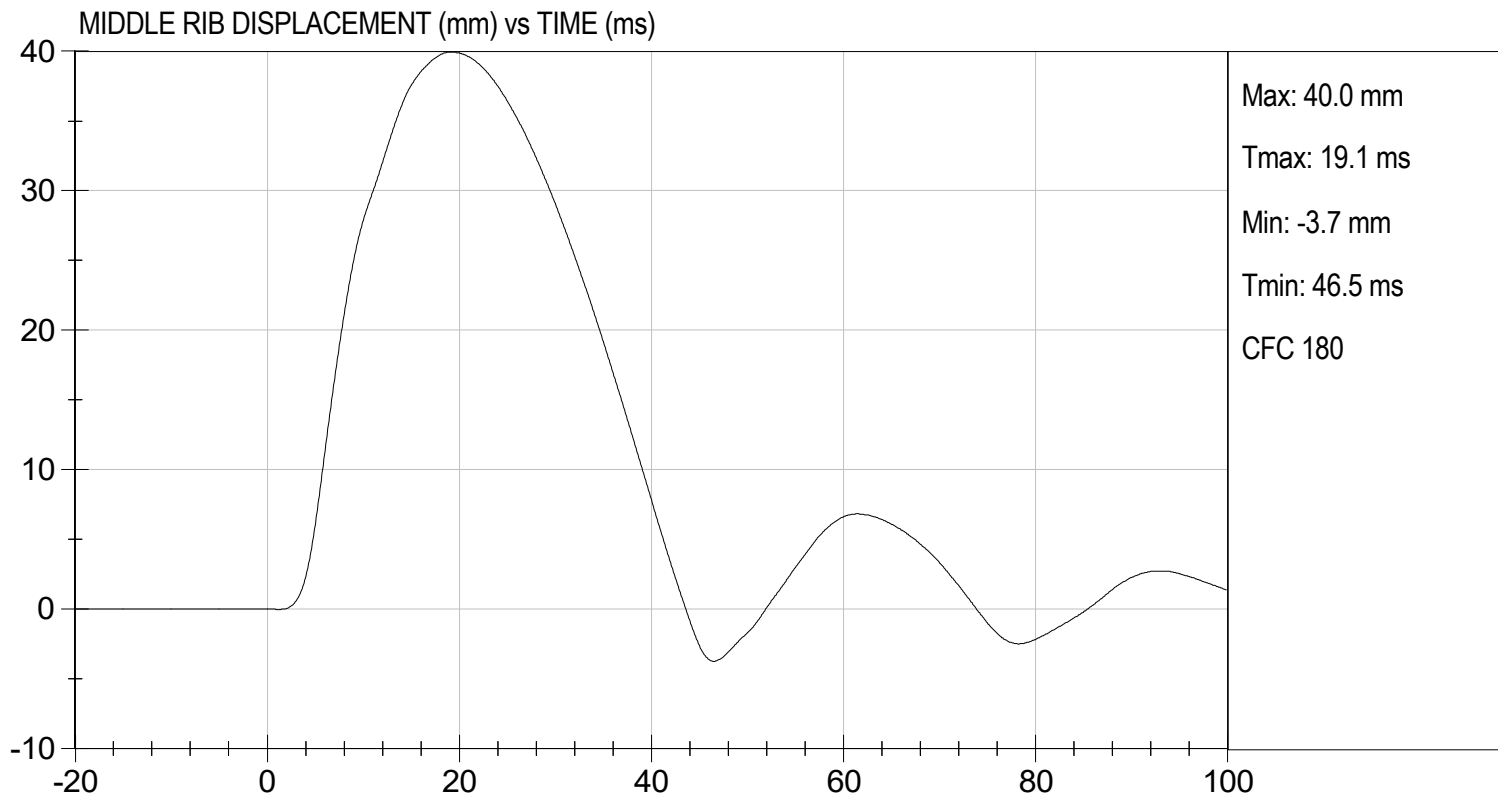
TEST DATE: 06/07/2024
TEST #: D241390





TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

TEST DATE: 06/07/2024
TEST #: D241390



QUALIFICATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

ES-2re External Measurements
SN: F032

No.	Name	Spec. (mm)	Result	Pass/Fail
1	Sitting Height	900 - 918	915	Pass
2	Seat to Shoulder Joint	558 - 572	568	Pass
3	Seat to Lower Face of Thoracic Spine Box	346 - 356	355	Pass
4	Seat to Hip Joint (center of bolt)	97 - 103	98	Pass
5	Sole to Seat, Sitting	333 - 451	440	Pass
6	Head Width	152 - 158	157	Pass
7	Shoulder/Arm Width	461 - 479	464	Pass
8	Thorax Width	322 - 332	323	Pass
9	Abdomen Width	273 - 287	281	Pass
10	Pelvis Lap Width	359 - 373	370	Pass
11	Head Depth	196 - 206	203	Pass
12	Thorax Depth	262 - 272	264	Pass
13	Abdomen Depth	194 - 204	196	Pass
14	Pelvis Depth	235 - 245	236	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150 - 160	151	Pass
16	Back of Buttocks to Front Knee	597 - 615	607	Pass

MGA RESEARCH CORPORATION

HEAD DROP TEST

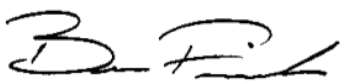
ES-2re DUMMY

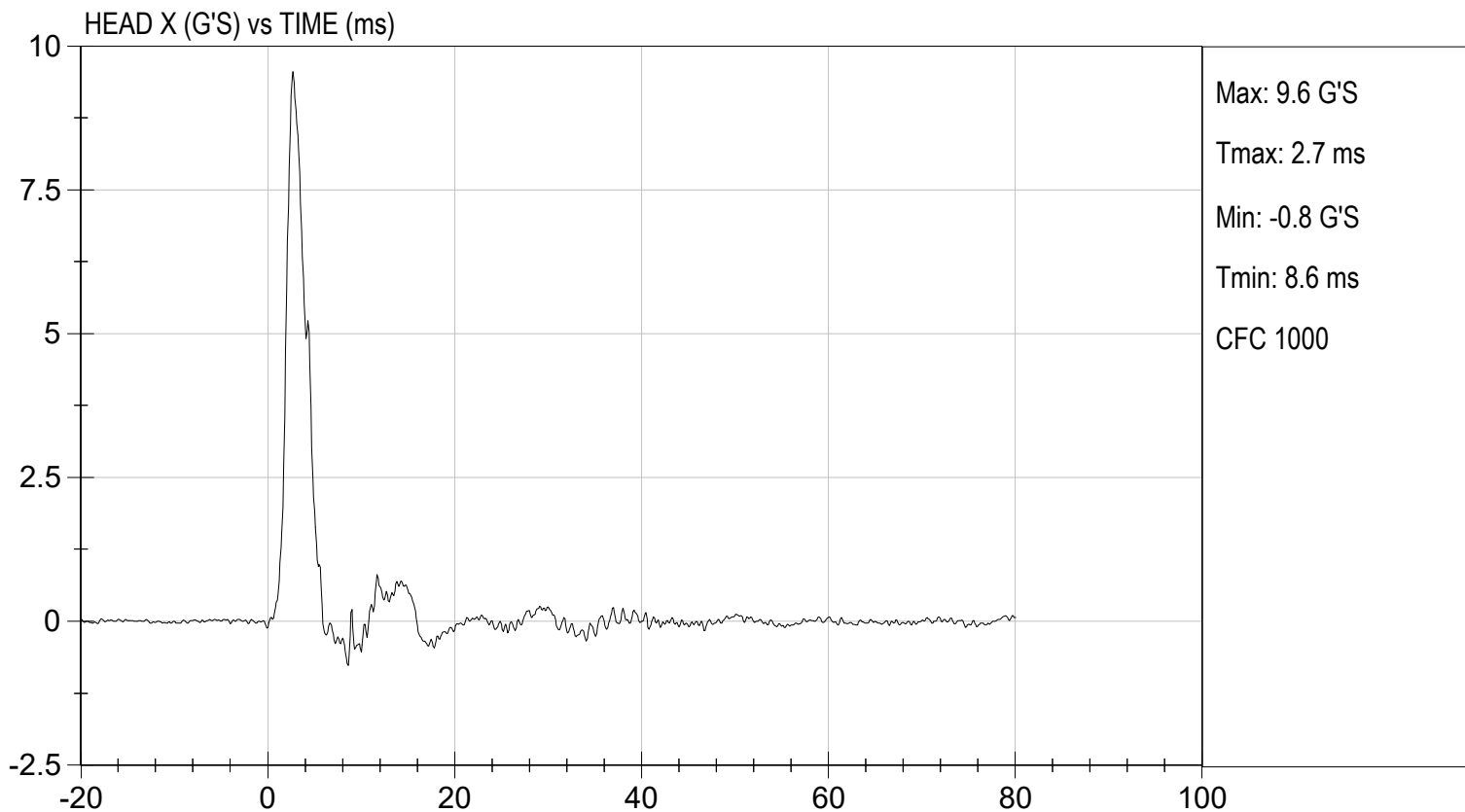
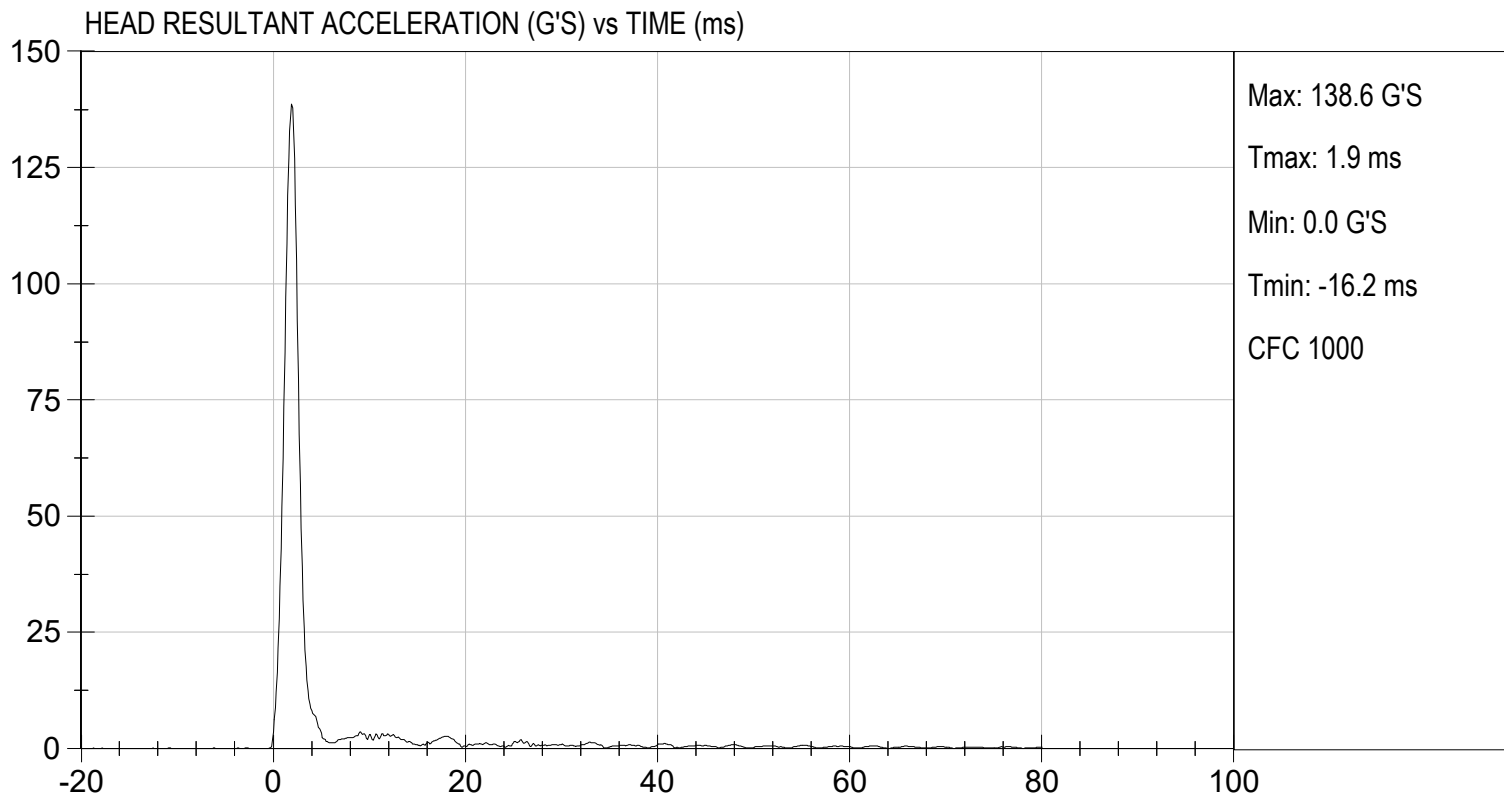
ATD Serial No: F032Test ID: D241501

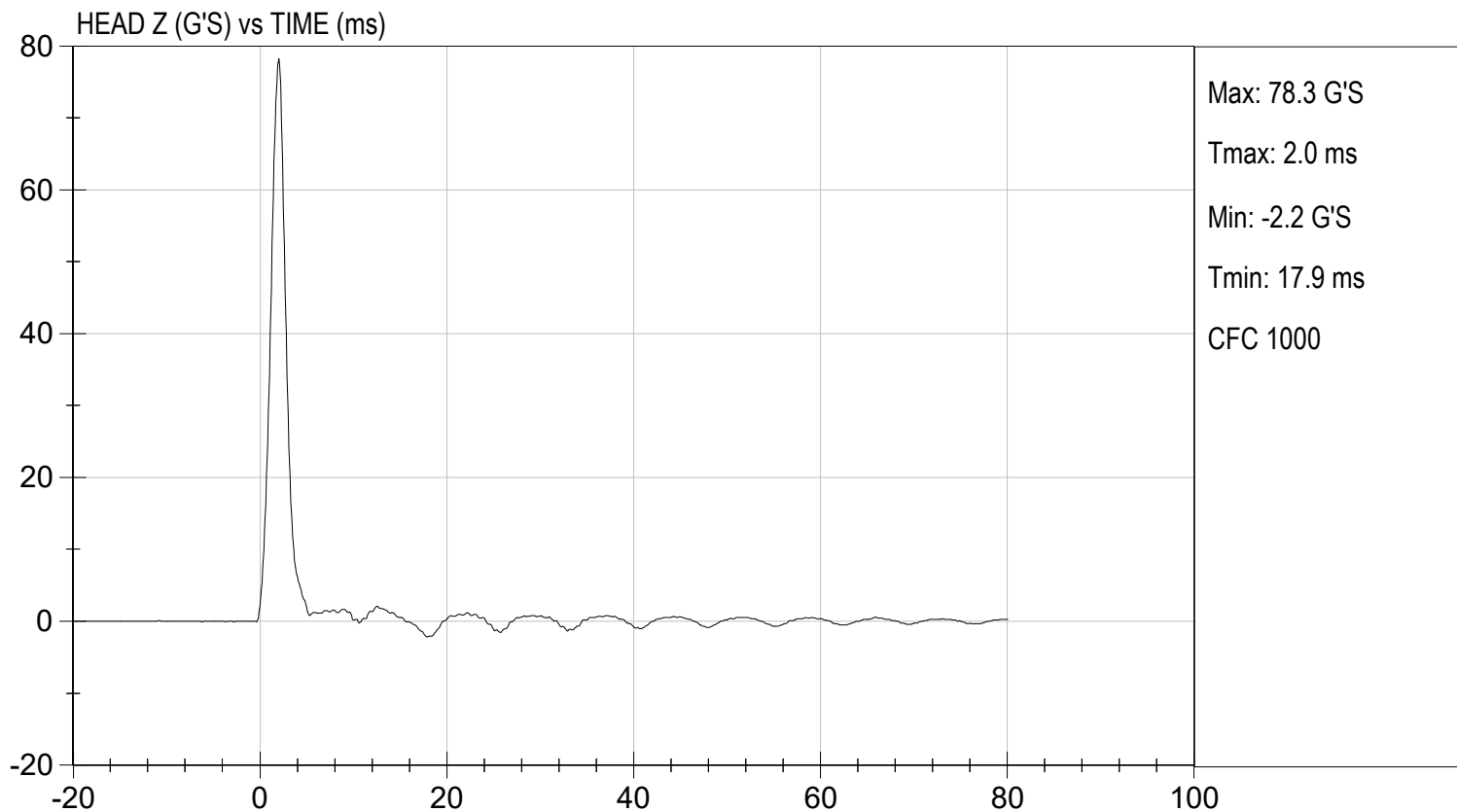
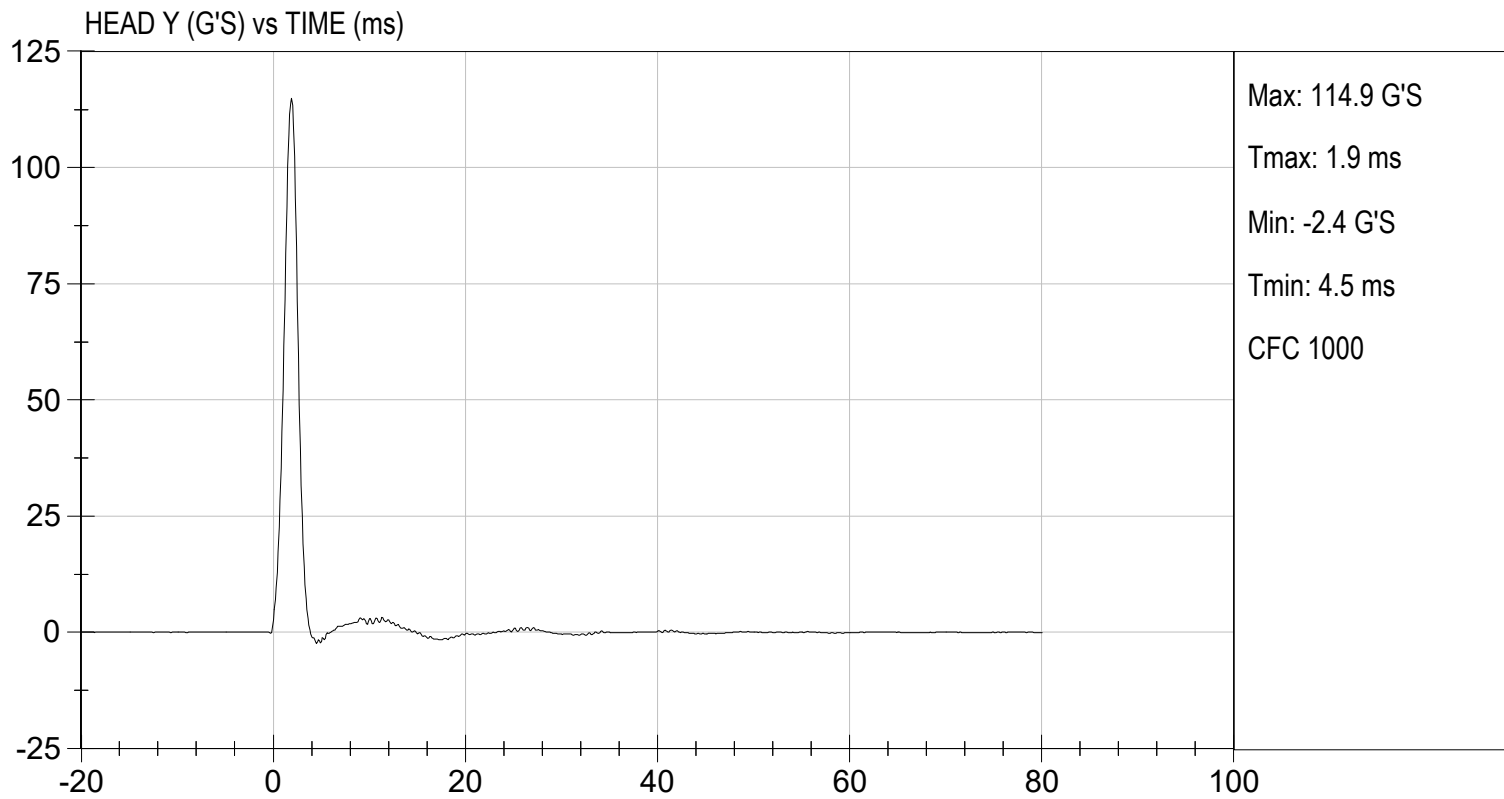
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	125 to 155	139	Pass
Peak Longitudinal Acceleration	G's	<= +/- 15.0	9.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 15% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/20/2024
Test Date


Approved By





MGA RESEARCH CORPORATION
NECK PENDULUM TEST
ES-2re DUMMY

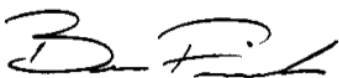
ATD Serial No: F032

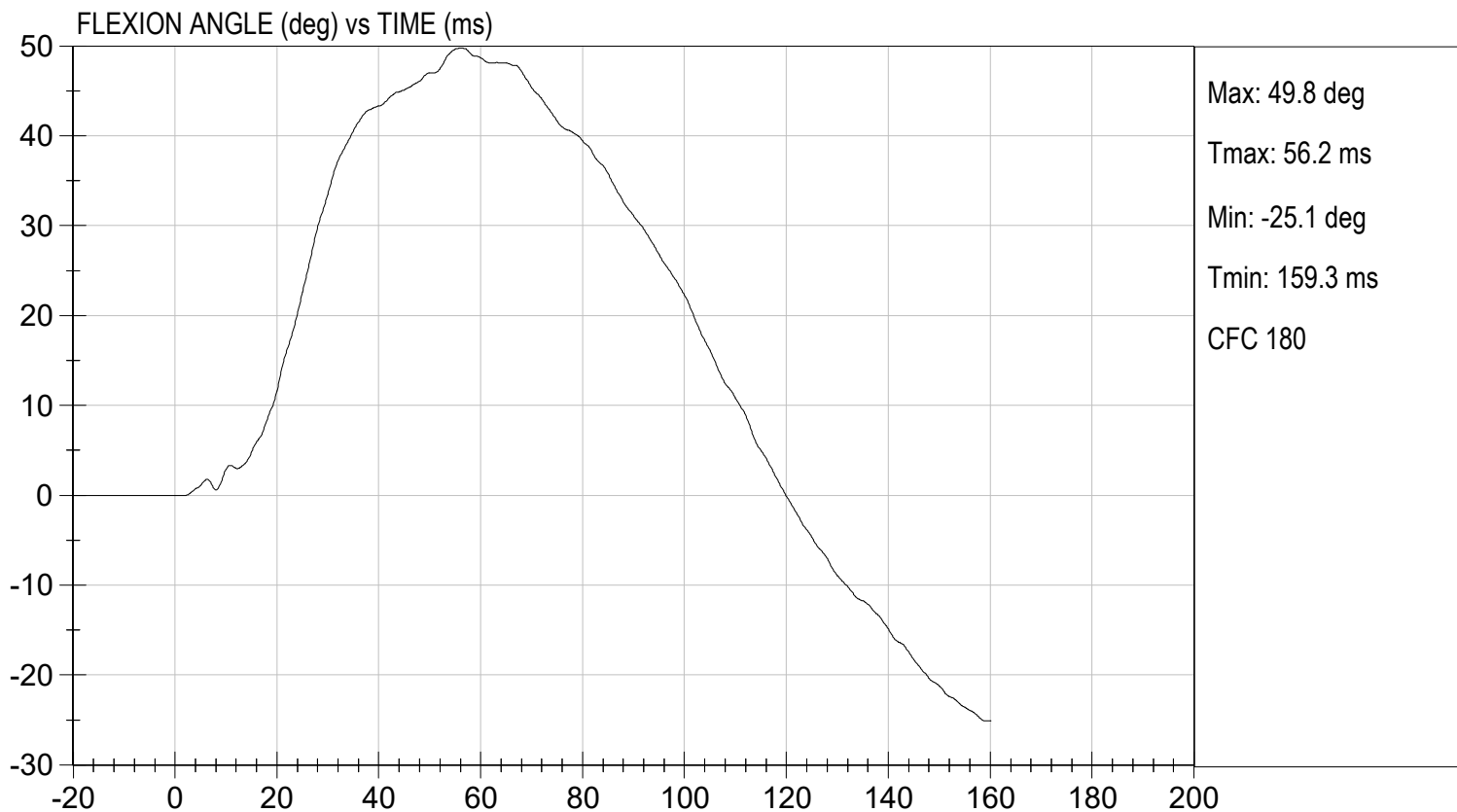
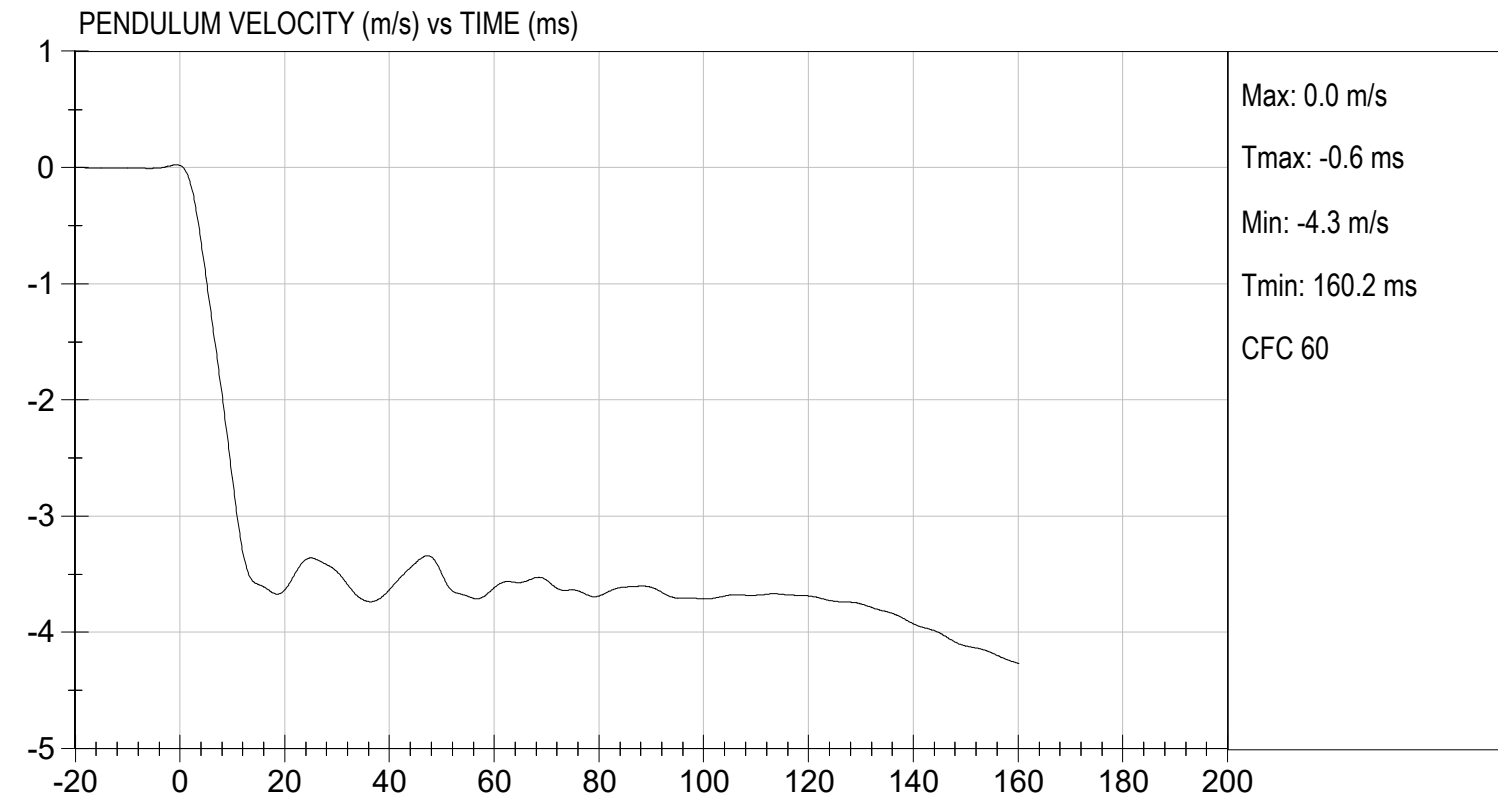
Test I.D: D241502

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	3.30 to 3.50	3.46	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.02	Pass
	3 ms	m/s	-0.25 to -0.375	-0.34	Pass
	14 ms	m/s	-3.20 to -3.70	-3.56	Pass
	17 ms	m/s	>= -3.70	-3.64	Pass
Maximum Flexion Angle		deg	49.0 to 59.0	49.8	Pass
Time of Maximum Flexion Angle		ms	54.0 to 66.0	56.2	Pass
Head Rotation Decay Time to 0 Degree		ms	53.0 to 88.0	63.8	Pass
Overall Results				Pass	


 Laboratory Technician

06/20/2024
 Test Date

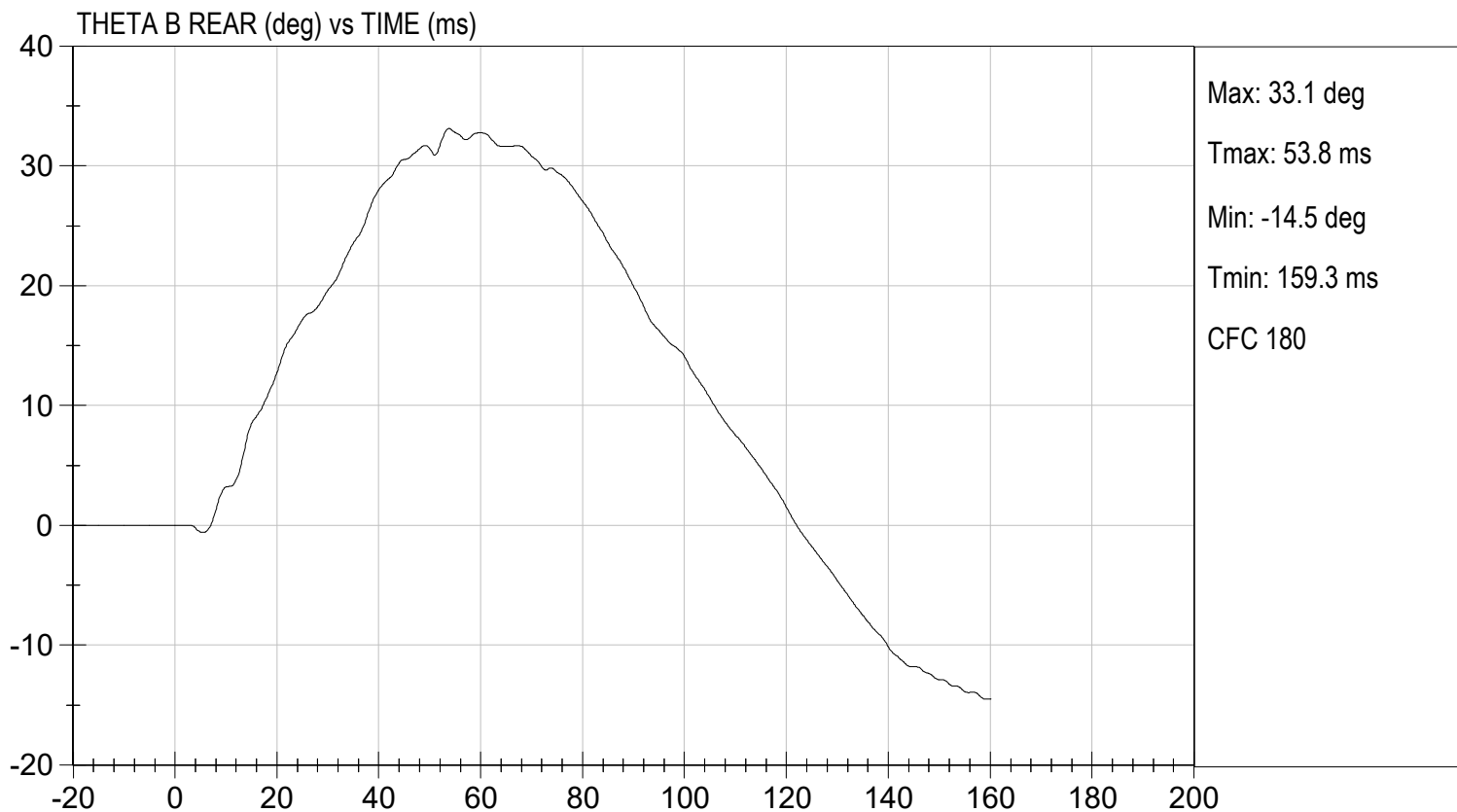
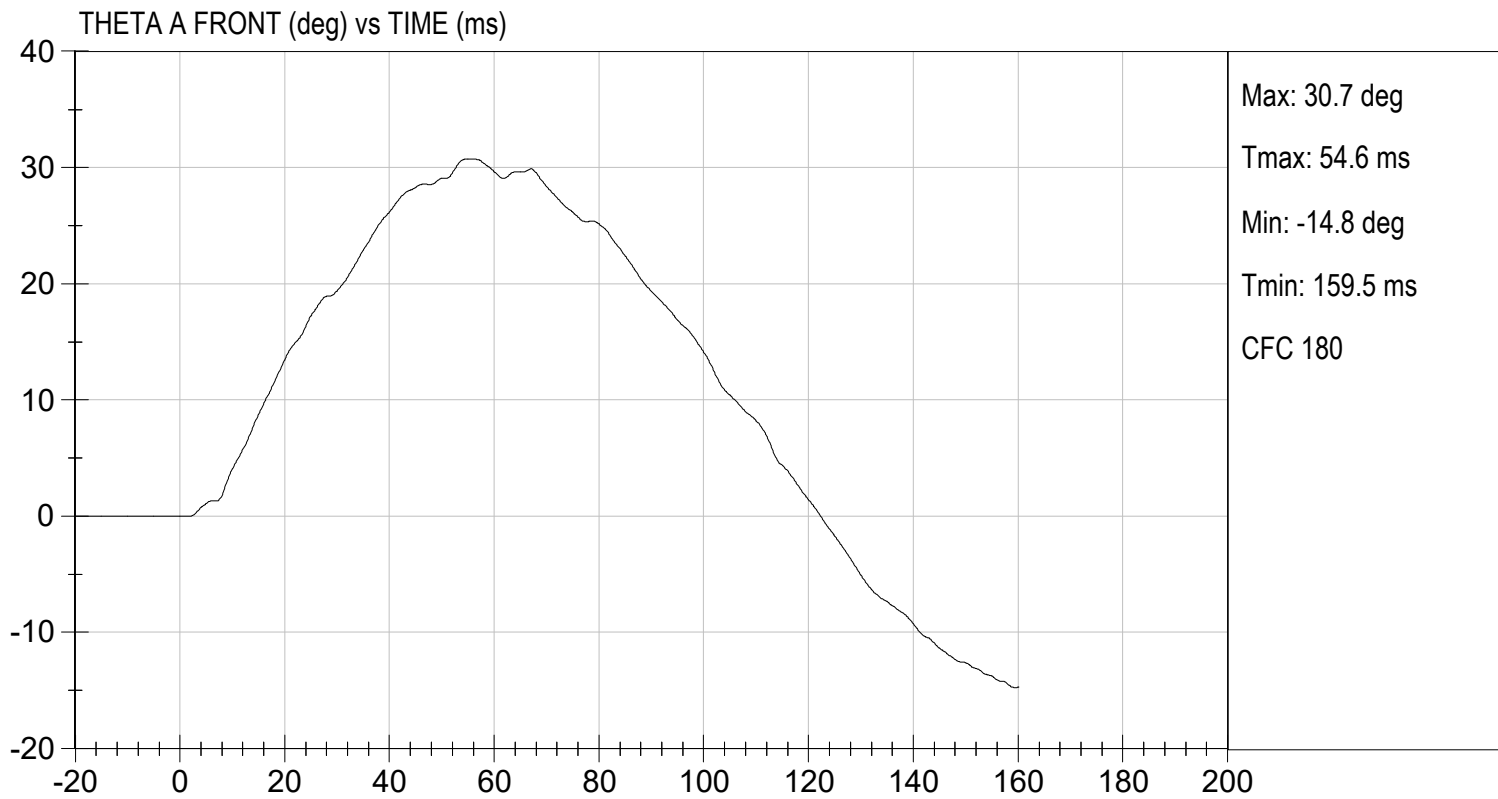

 Approved By





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

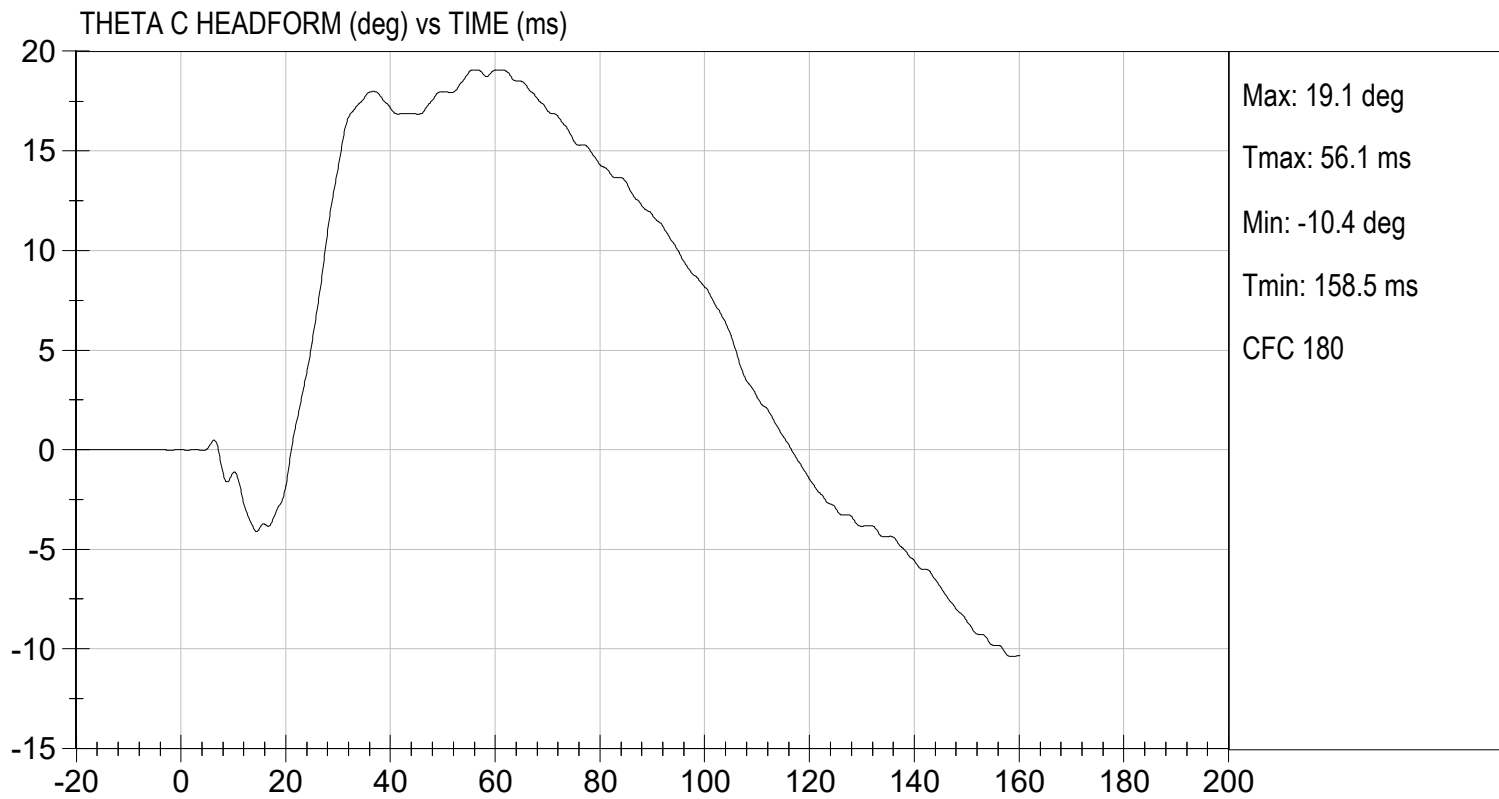
TEST DATE: 06/20/2024
TEST #: D241502





TEST DESC: NECK BENDING
VELOCITY: 11.34 ft/s, 3.46 m/s

TEST DATE: 06/20/2024
TEST #: D241502



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

ES-2re DUMMY

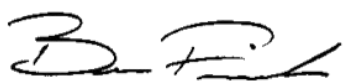
ATD Serial No: F032

Test I.D: D241503

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Pendulum Speed	m/s	4.20 to 4.40	4.2	Pass
Peak Impactor Acceleration	G's	7.5 to 10.5	9.3	Pass
Overall Test Results			Pass	


Laboratory Technician

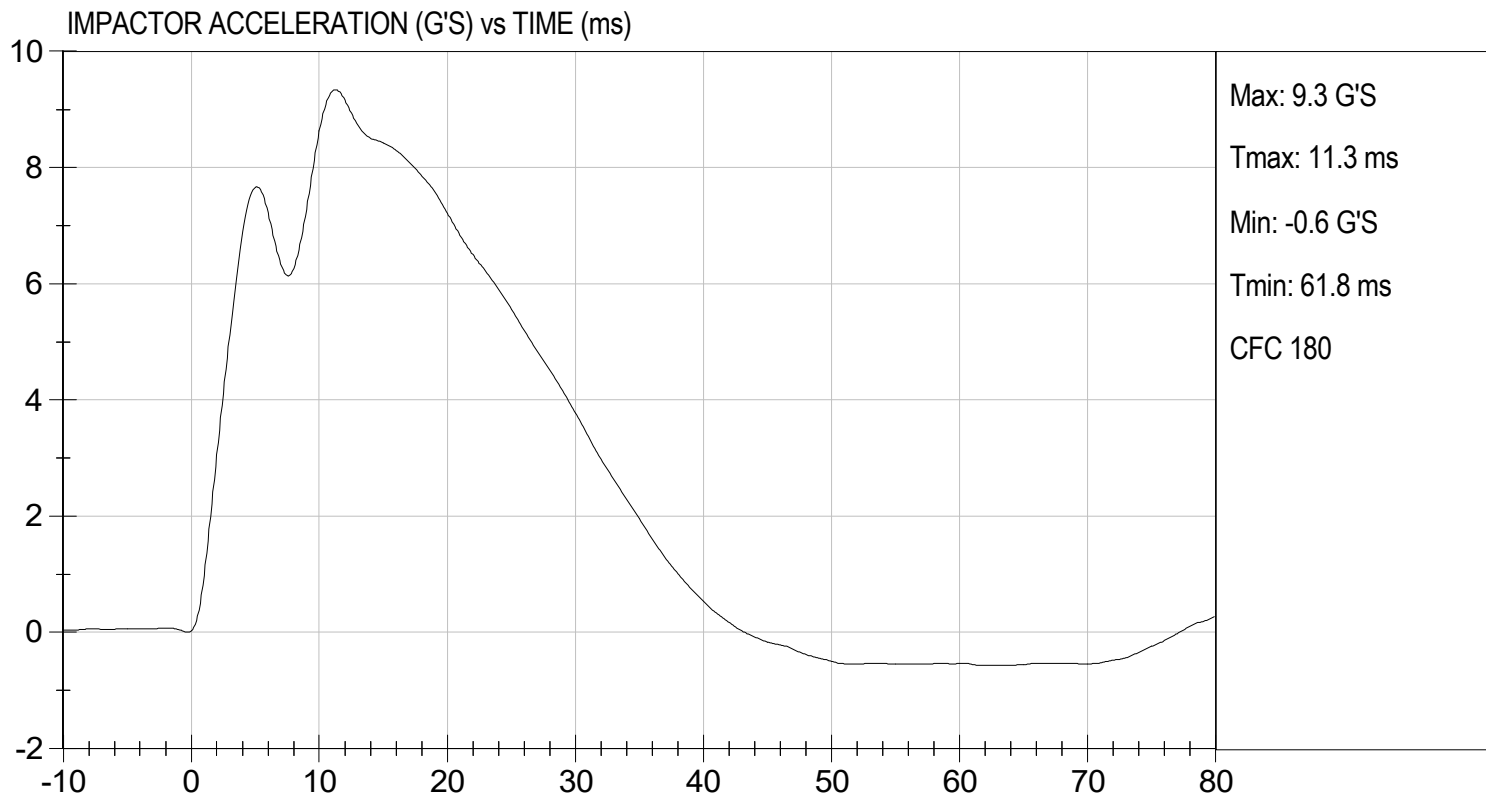
06/20/2024
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 13.77 ft/s, 4.2 m/s

TEST DATE: 06/20/2024
TEST #: D241503



MGA RESEARCH CORPORATION

UPPER RIB TEST

ES-2re DUMMY

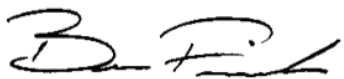
ATD Serial No: F032

Test I.D: D241504

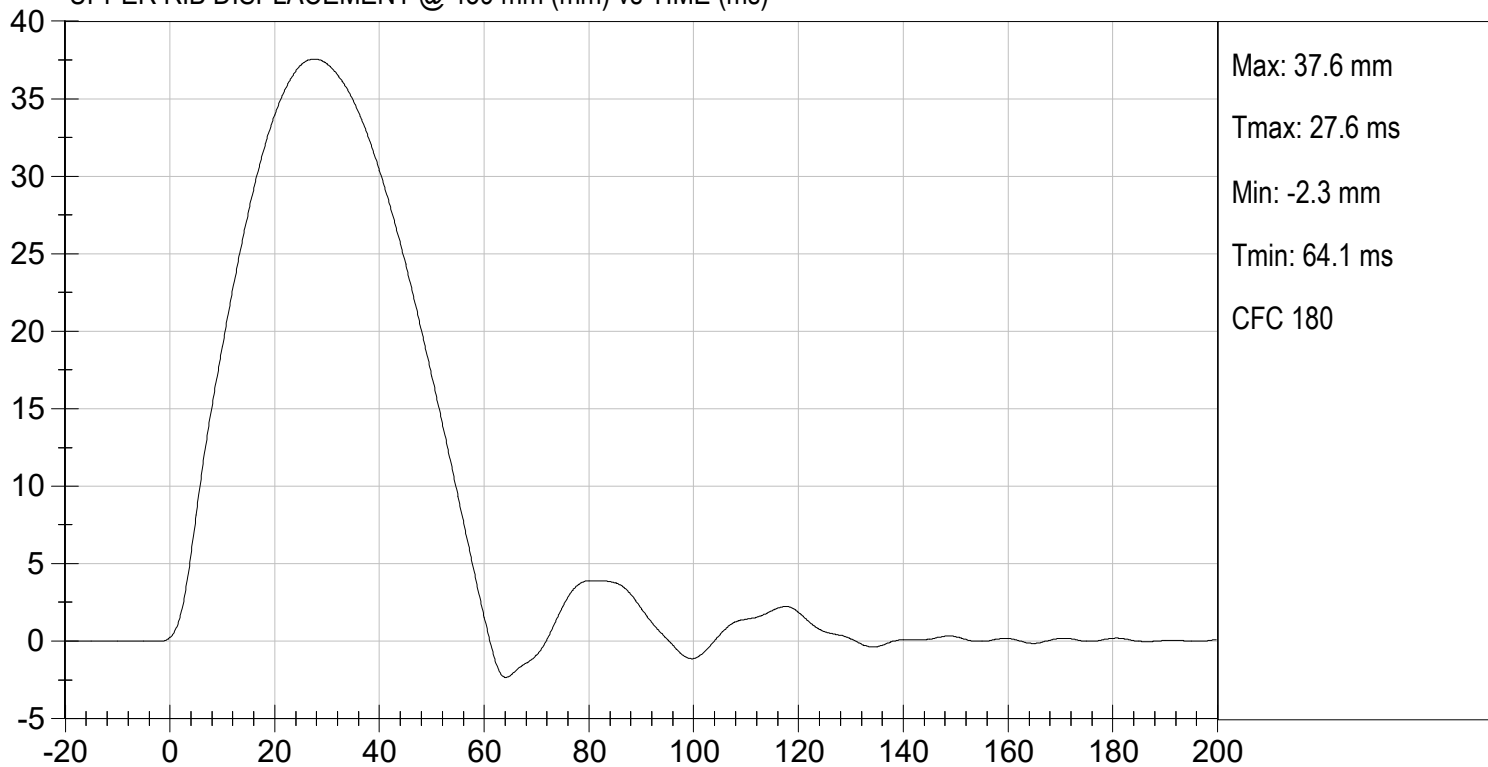
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	37.6	Pass
Displacement at 815 mm	mm	46.0 to 51.0	48.3	Pass
			Overall Test Results	Pass


Laboratory Technician

06/20/2024
Test Date


Approved By

UPPER RIB DISPLACEMENT @ 459 mm (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT @ 815 mm (mm) vs TIME (ms)



MGA RESEARCH CORPORATION

MID RIB TEST

ES-2re DUMMY

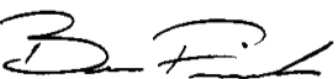
ATD Serial No: F032

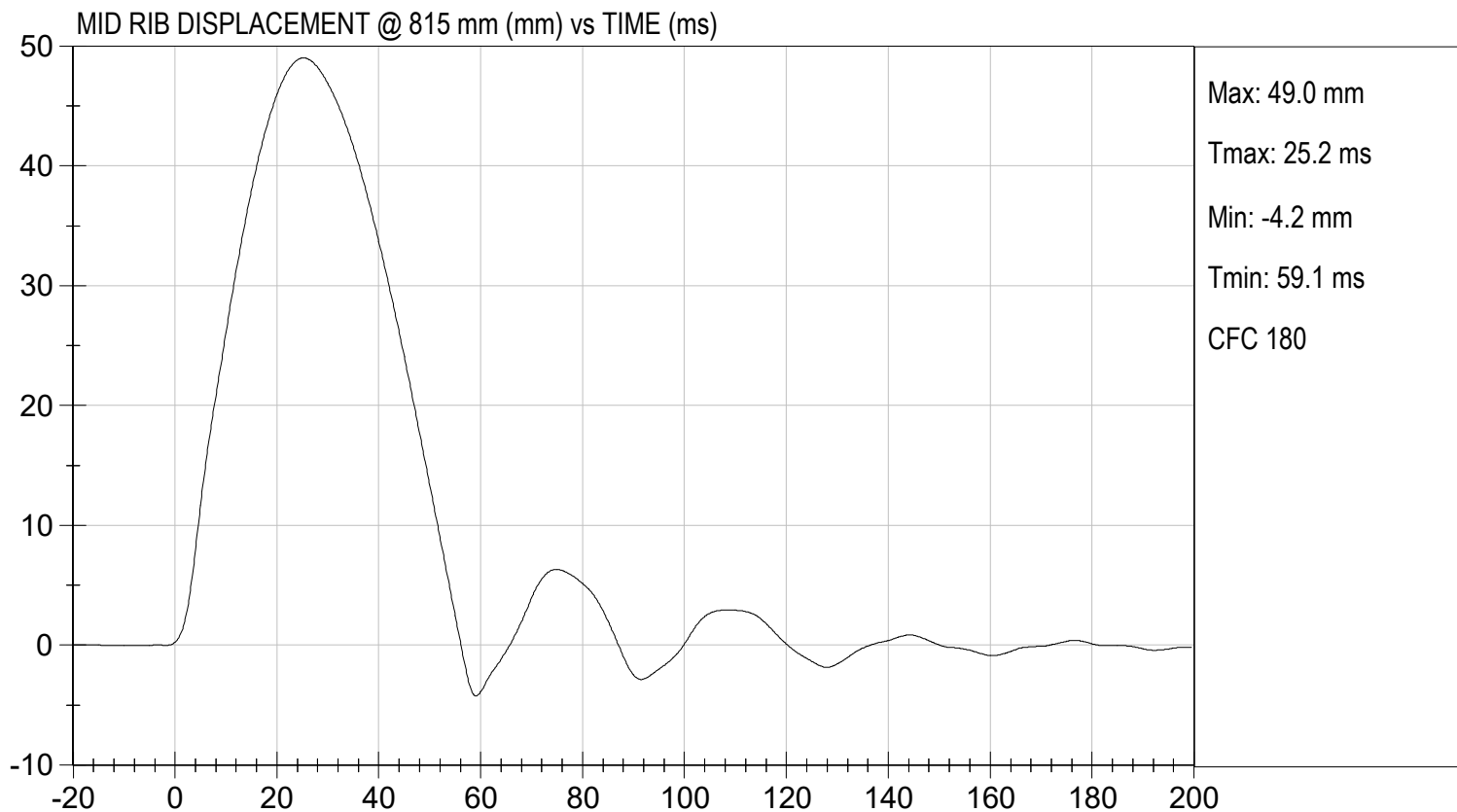
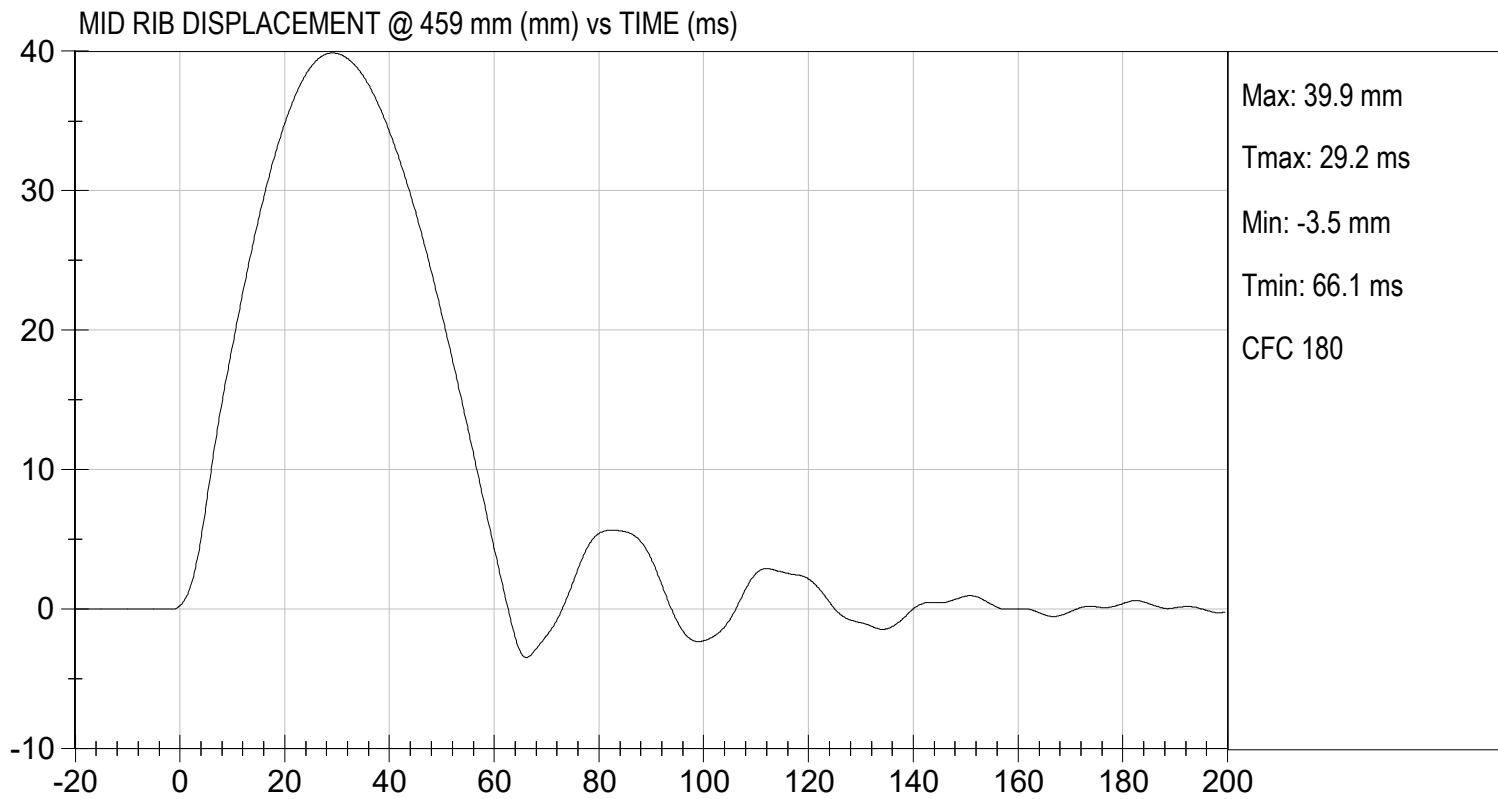
Test I.D: D241505

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	39.9	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.0	Pass
Overall Test Results			Pass	


Laboratory Technician

06/20/2024
Test Date


Approved By



MGA RESEARCH CORPORATION

LOWER RIB TEST

ES-2re DUMMY

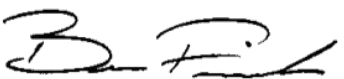
ATD Serial No: F032

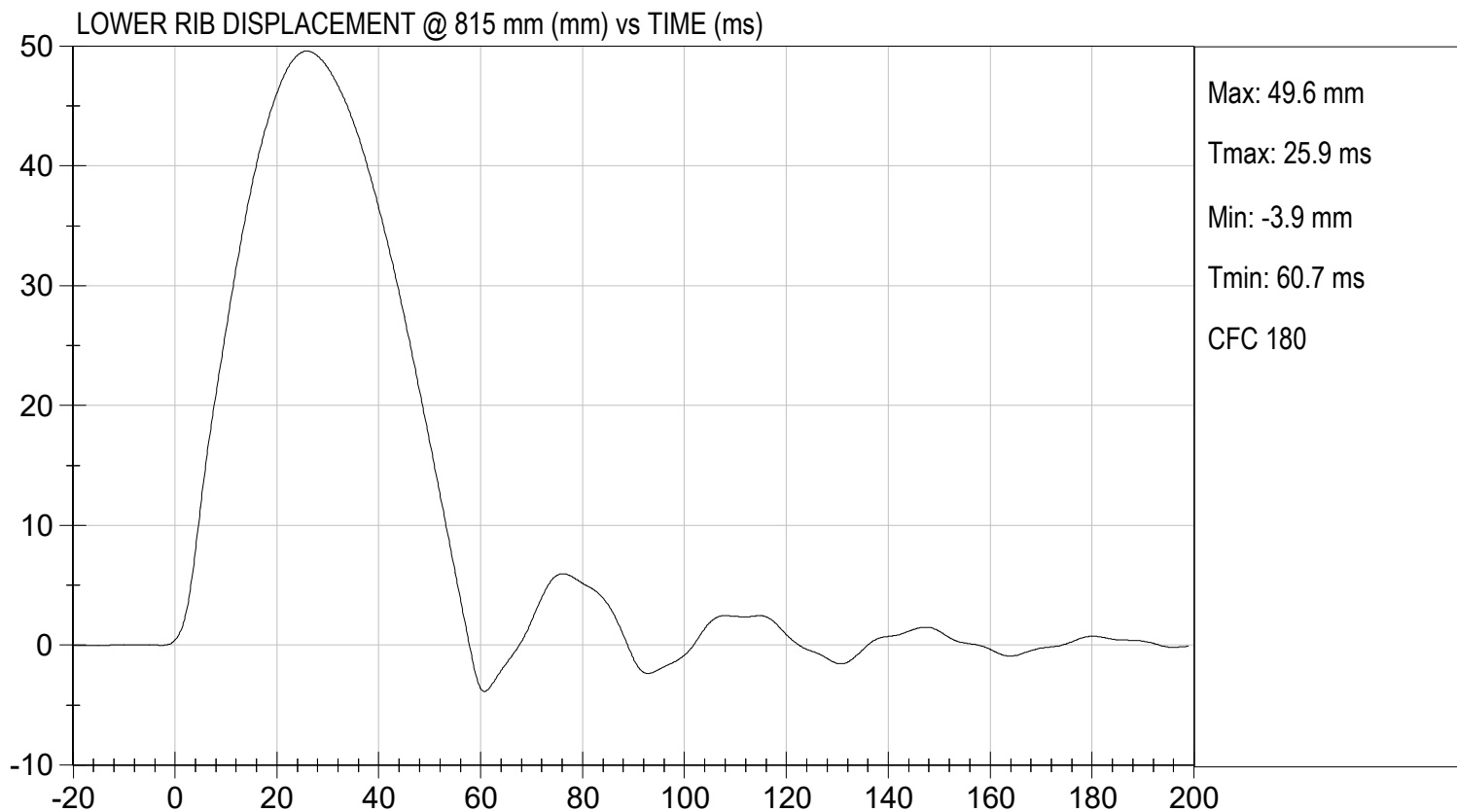
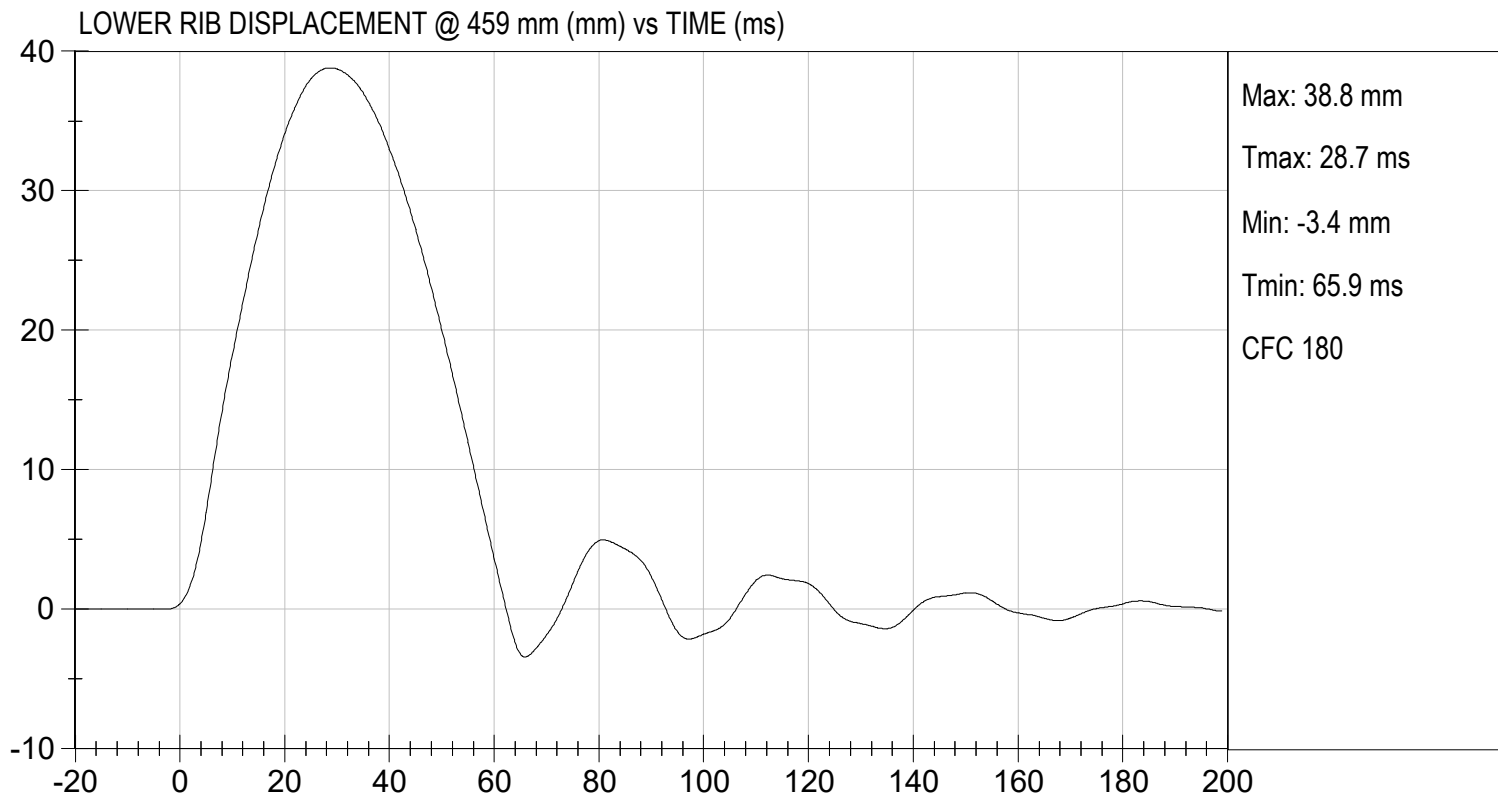
Test I.D: D241506

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	50	Pass
Displacement at 459 mm	mm	36.0 to 40.0	38.8	Pass
Displacement at 815 mm	mm	46.0 to 51.0	49.6	Pass
			Overall Test Results	Pass


Laboratory Technician

06/20/2024
Test Date


Approved By



MGA RESEARCH CORPORATION

ABDOMEN TEST

ES-2re DUMMY

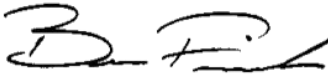
ATD Serial No: F032

Test I.D: D241507

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	3.90 to 4.10	4.01	Pass
Maximum Impactor Force	N	4000 to 4800	4159	Pass
Time of Maximum Impactor Force	ms	10.6 to 13.0	11.7	Pass
Maximum Total Abdomen Force	N	2200 to 2700	2369	Pass
Time of Maximum Abdomen Force	ms	10.0 to 12.3	11.6	Pass
Overall Test Results				Pass


Laboratory Technician

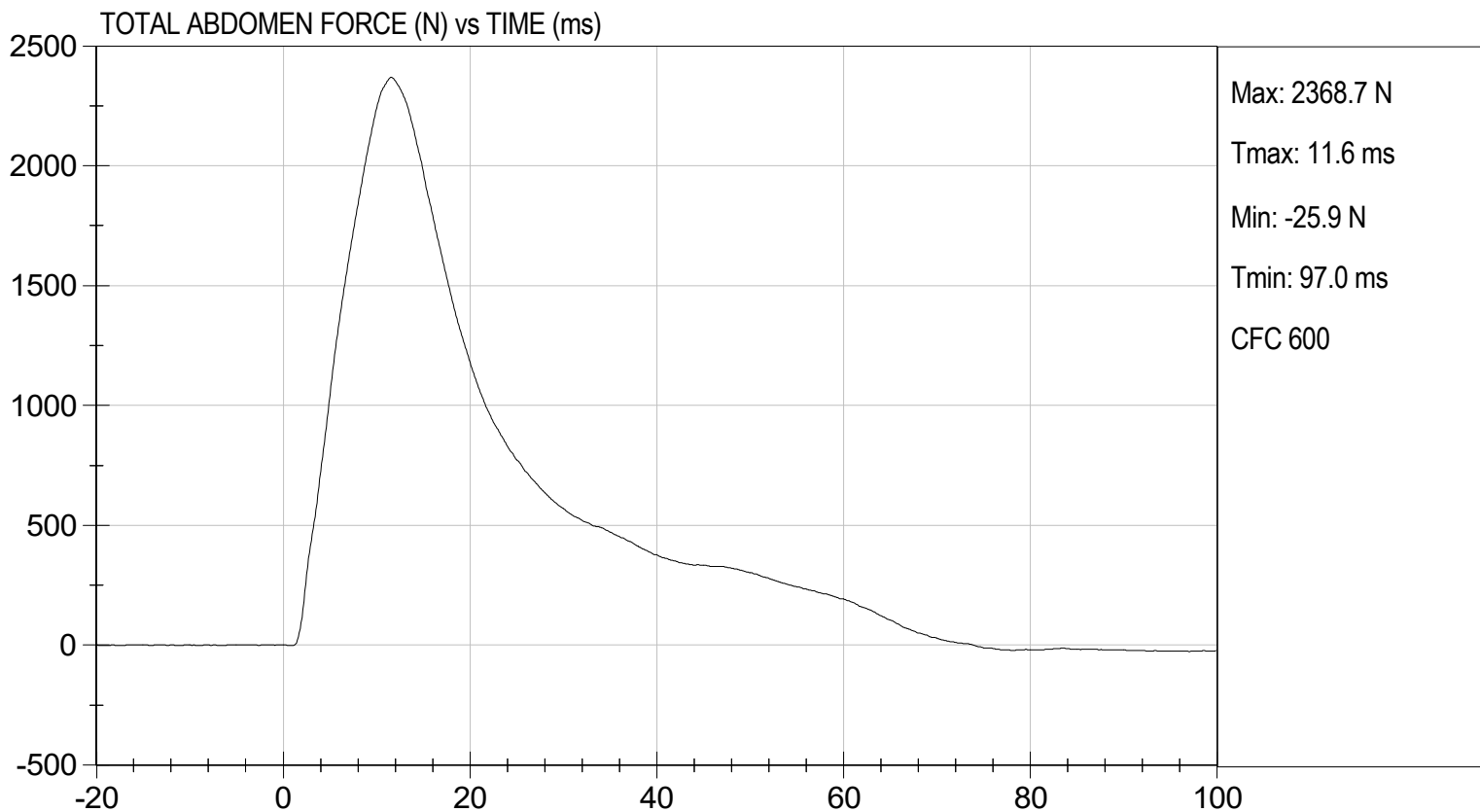
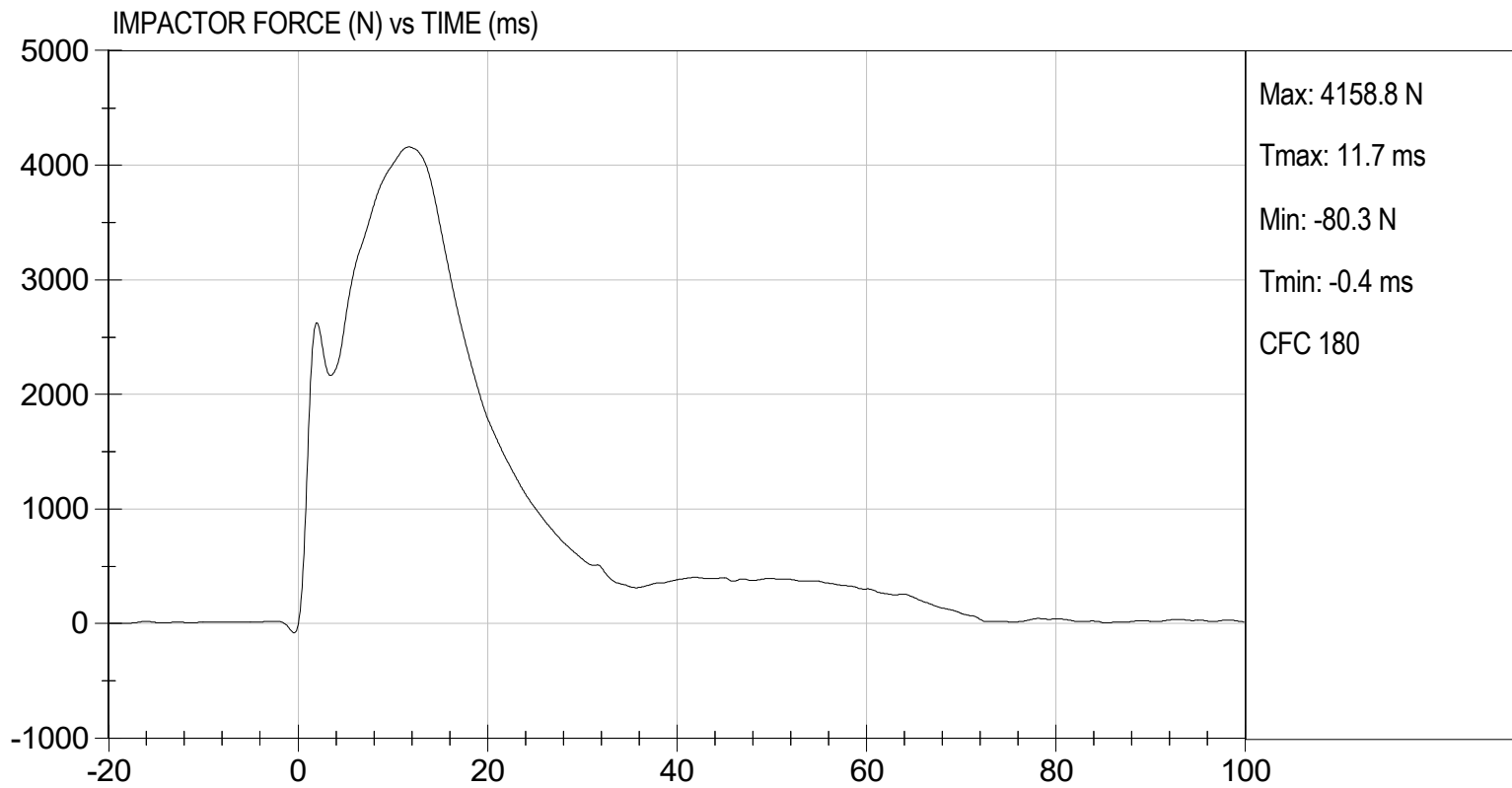
06/20/2024
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.15 ft/s, 4.01 m/s

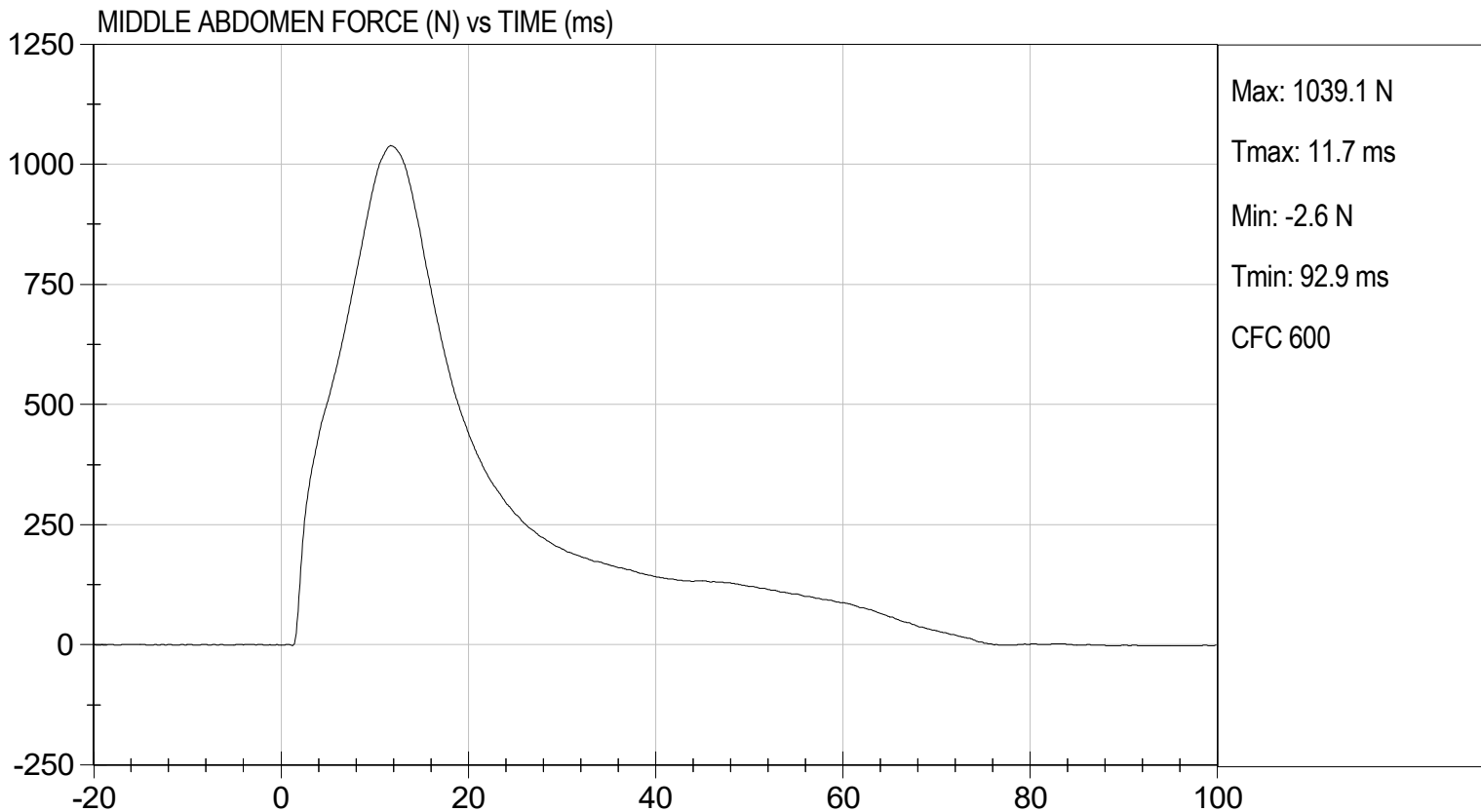
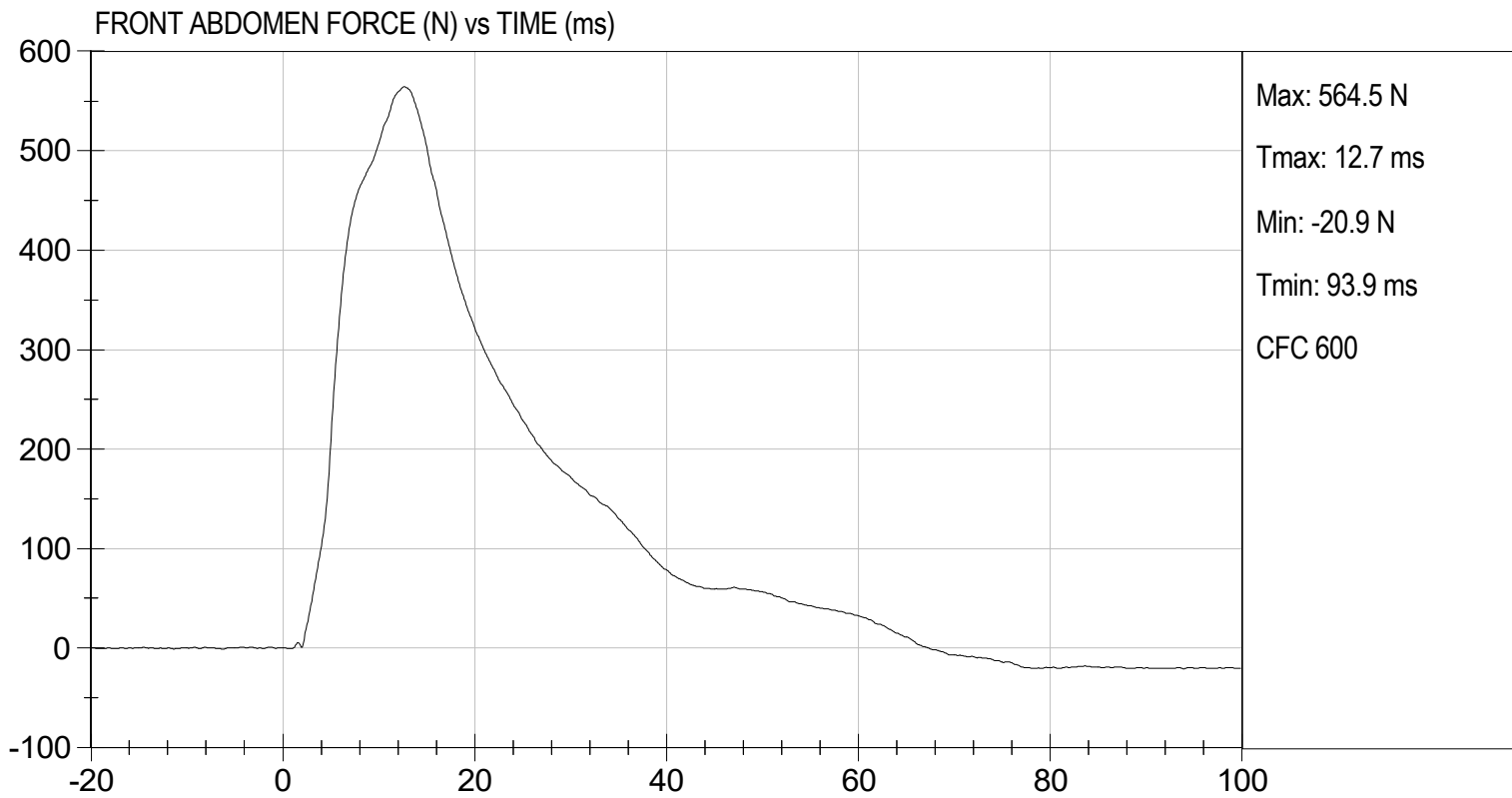
TEST DATE: 06/20/2024
TEST #: D241507





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.15 ft/s, 4.01 m/s

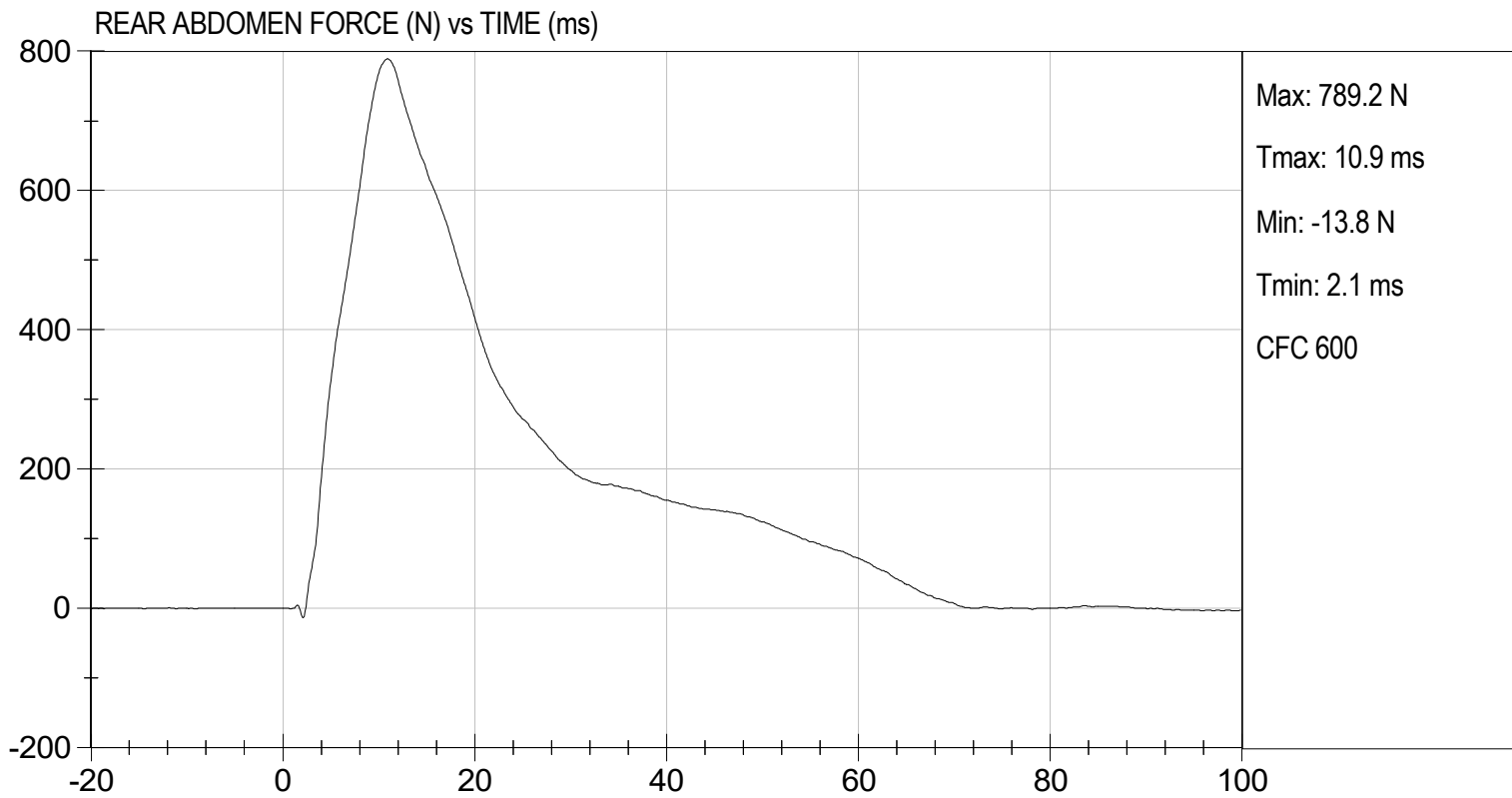
TEST DATE: 06/20/2024
TEST #: D241507





TEST DESC: ABDOMEN IMPACT
VELOCITY: 13.15 ft/s, 4.01 m/s

TEST DATE: 06/20/2024
TEST #: D241507



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

ES-2re DUMMY

ATD Serial No: F032

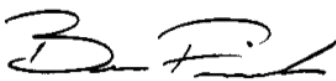
Test I.D: D241508

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	46	Pass
Pendulum Speed		m/s	5.95 to 6.15	6.12	Pass
Pendulum Velocity	1 ms	m/s	-0.05 to 0.00	-0.01	Pass
	3.7 ms	m/s	-0.425 to -0.24	-0.407	Pass
	27 ms	m/s	-6.50 to -5.80	-6.10	Pass
	30 ms	m/s	>= -6.50	-6.34	Pass
Maximum Flexion Angle		deg	45.0 to 55.0	50.6	Pass
Time of Maximum Flexion Angle		ms	39.0 to 53.0	48.2	Pass
Headform Rotation Decay to Initial Position		ms	37 to 57	40	Pass
Overall Results				Pass	


 Laboratory Technician

06/20/2024

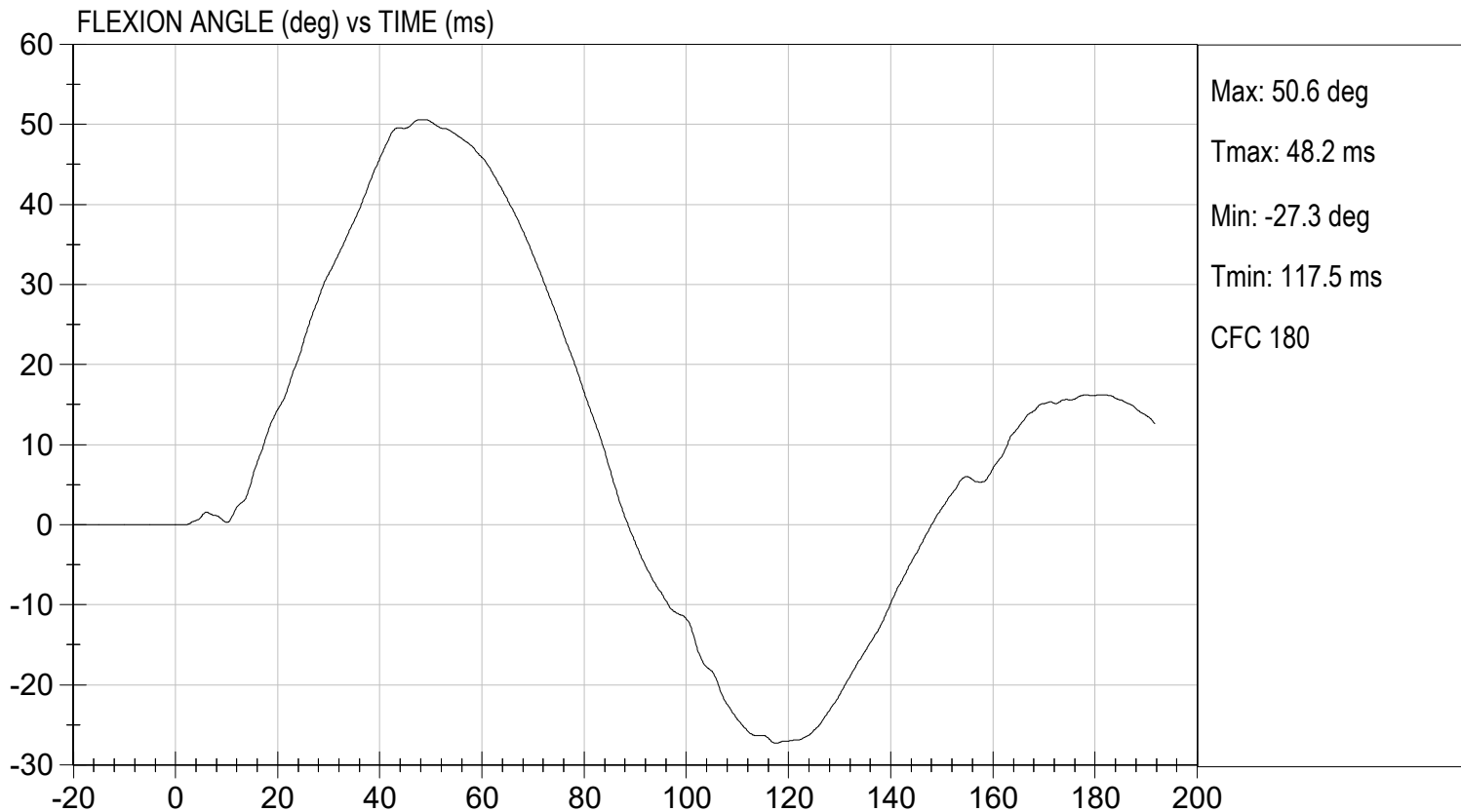
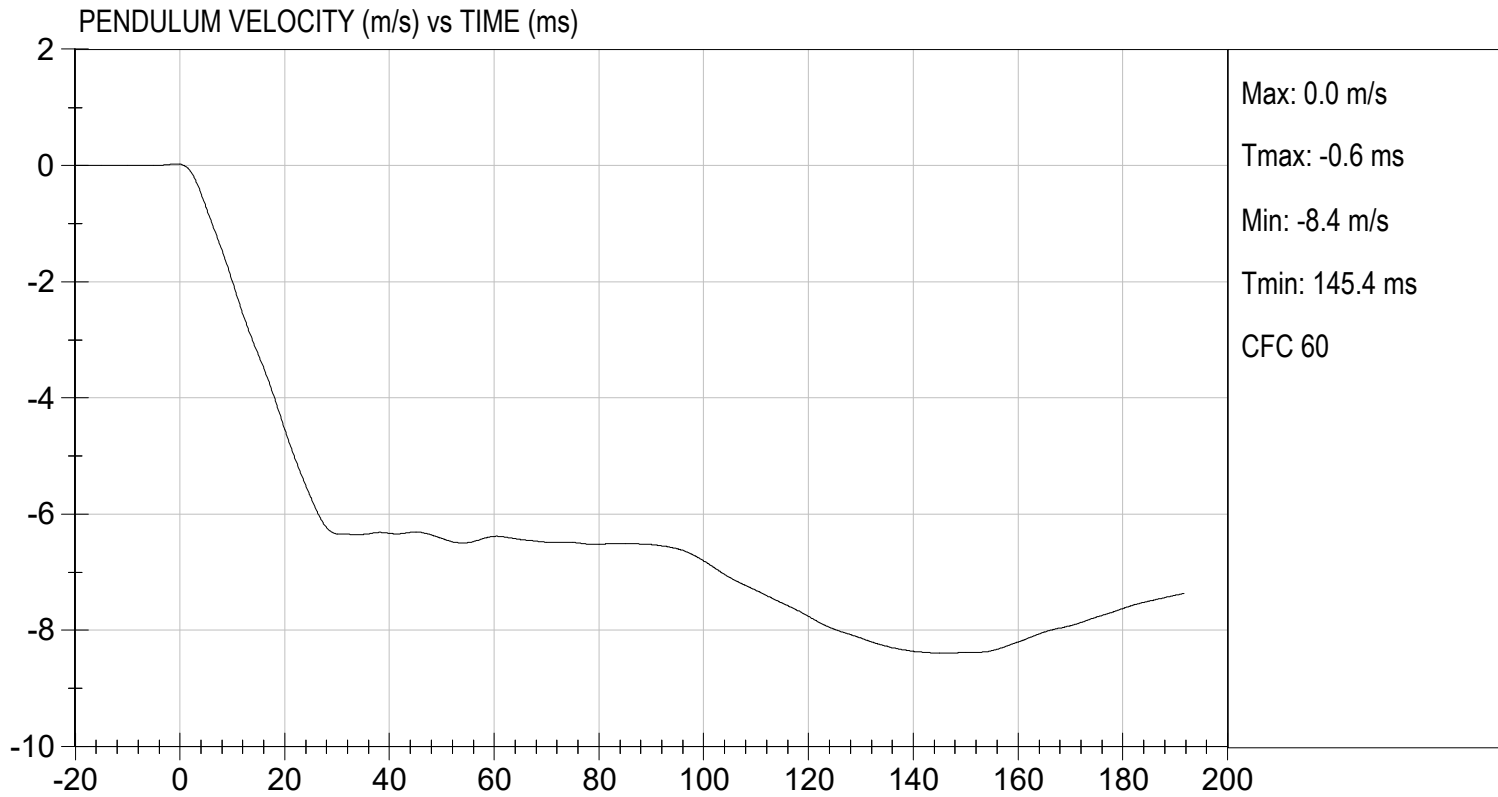
Test Date


 Approved By



TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

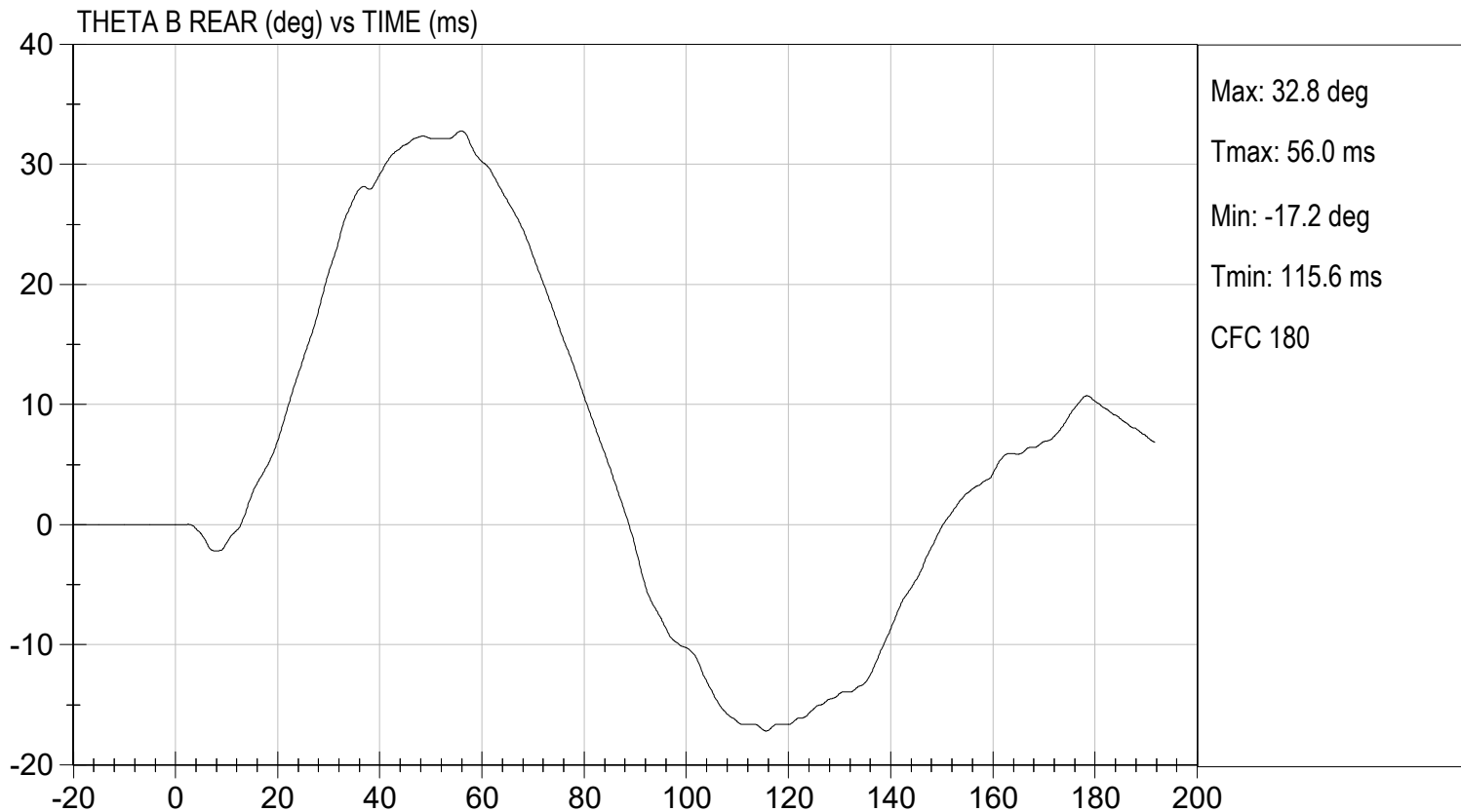
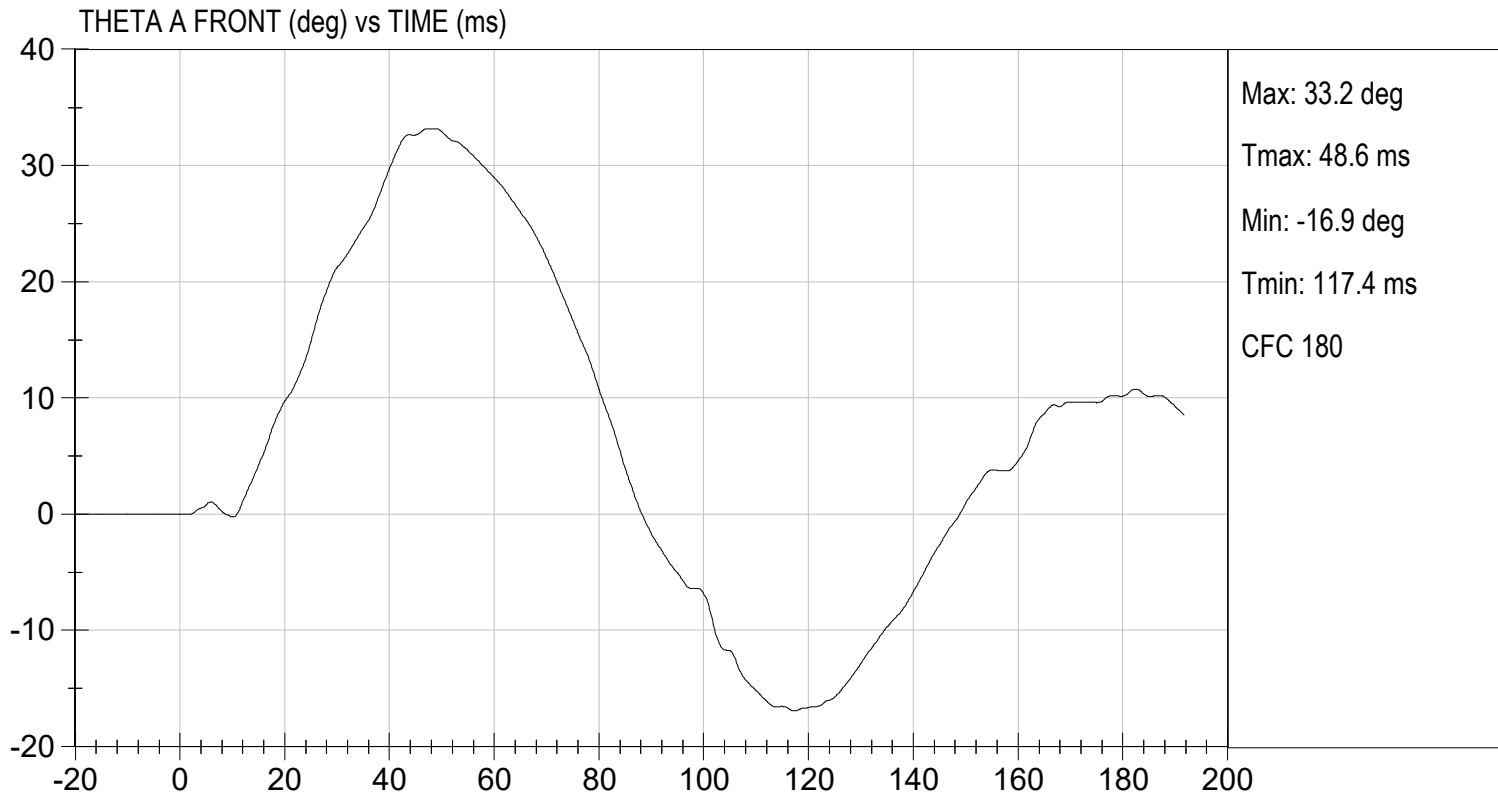
TEST DATE: 06/20/2024
TEST #: D241508





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

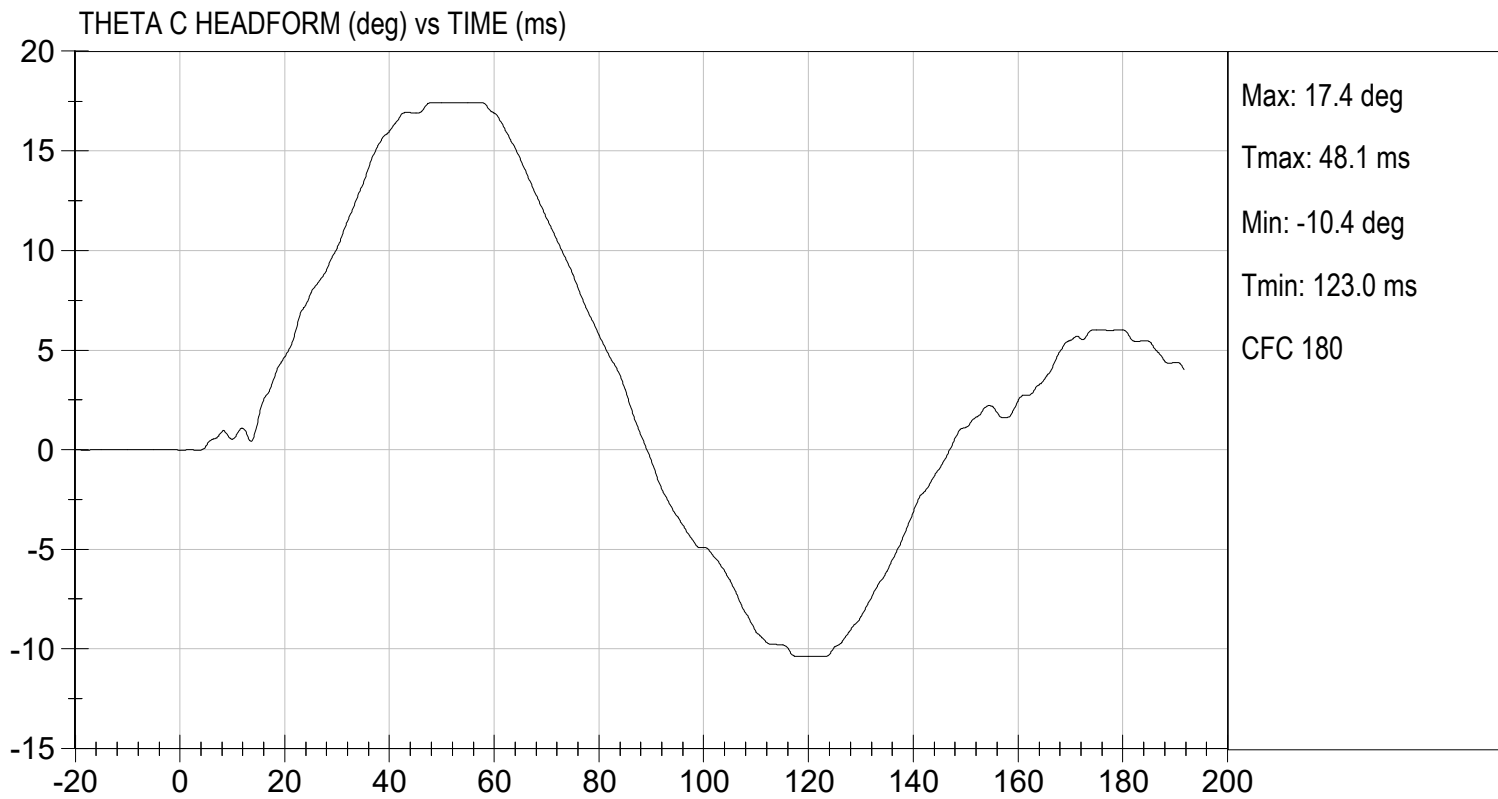
TEST DATE: 06/20/2024
TEST #: D241508





TEST DESC: LUMBAR BENDING
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 06/20/2024
TEST #: D241508

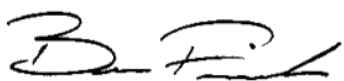


MGA RESEARCH CORPORATION**PELVIS TEST****ES-2re DUMMY****ATD Serial No:** F032**Test I.D:** D241509

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	4.20 to 4.40	4.34	Pass
Maximum Impactor Force	N	4700 to 5400	5013	Pass
Time of Maximum Impactor Force	ms	11.8 to 16.1	13.2	Pass
Maximum Pubic Force	N	1230 to 1590	1244	Pass
Time of Maximum Pubic Force	ms	12.2 to 17.0	14.2	Pass
Overall Test Results			Pass	


Laboratory Technician

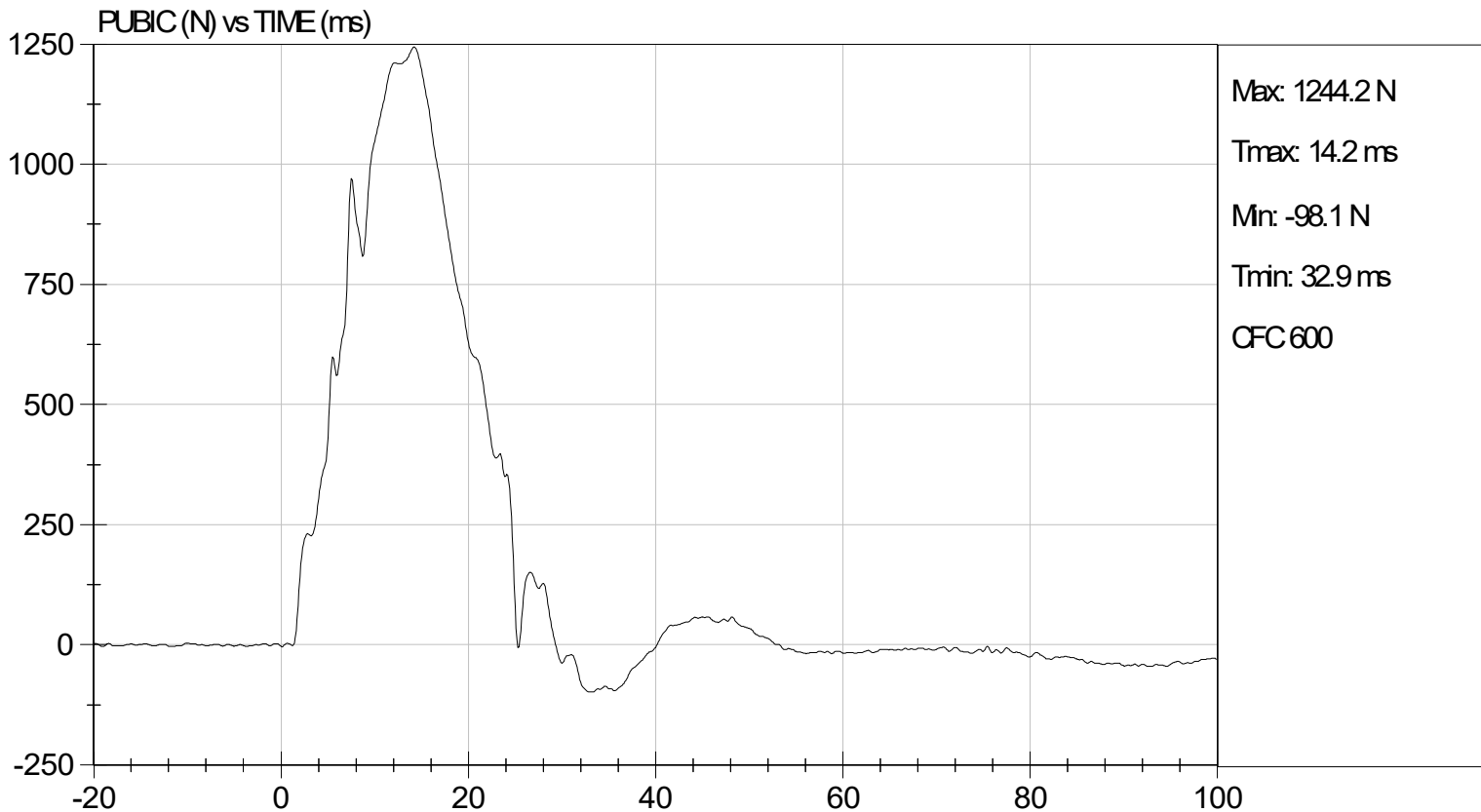
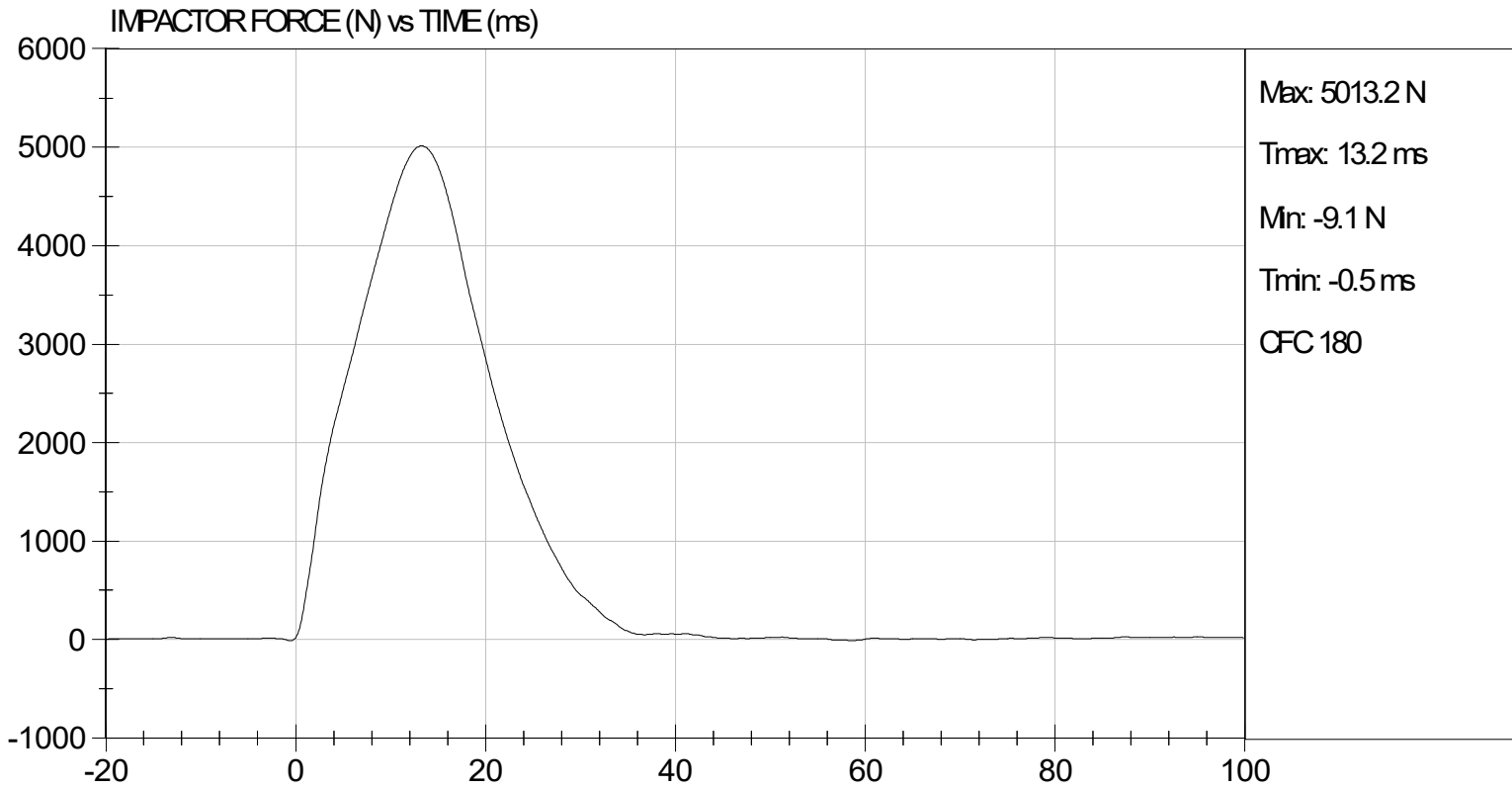
06/20/2024
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 06/20/2024
TEST #: D241509



MGA RESEARCH CORPORATION

THORAX IMPACT TEST

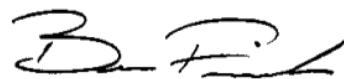
ES-2re DUMMY

ATD Serial No: F032Test I.D: D241500

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	48	Pass
Probe Speed	m/s	5.40 to 5.60	5.40	Pass
Maximum Impactor Force (after 6 ms)	N	5100 to 6200	6102	Pass
Upper Rib Displacement	mm	34.0 to 41.0	36.4	Pass
Middle Rib Displacement	mm	37.0 to 45.0	38.9	Pass
Lower Rib Displacement	mm	37.0 to 44.0	38.5	Pass
Overall Test Results			Pass	


Laboratory Technician

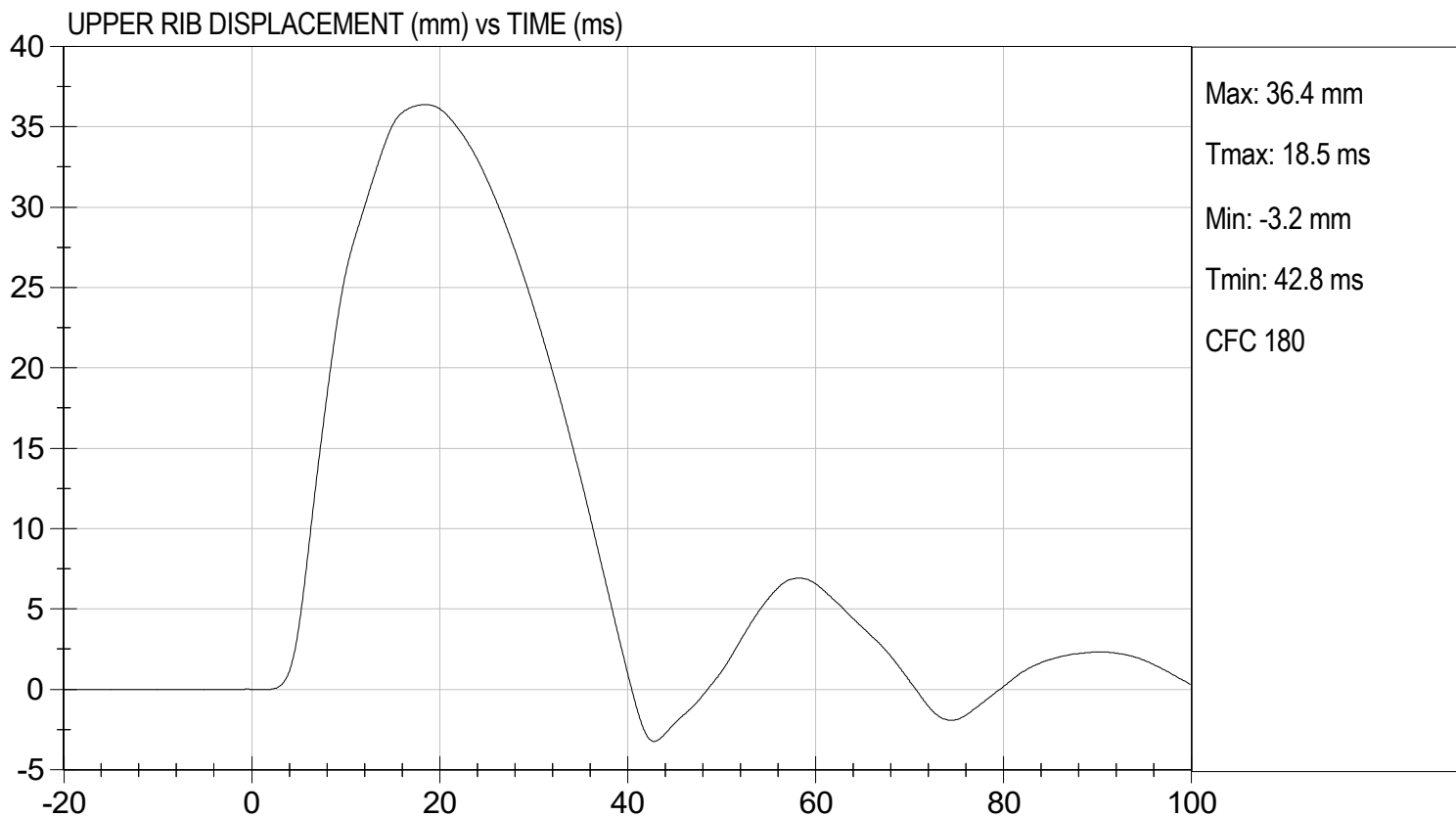
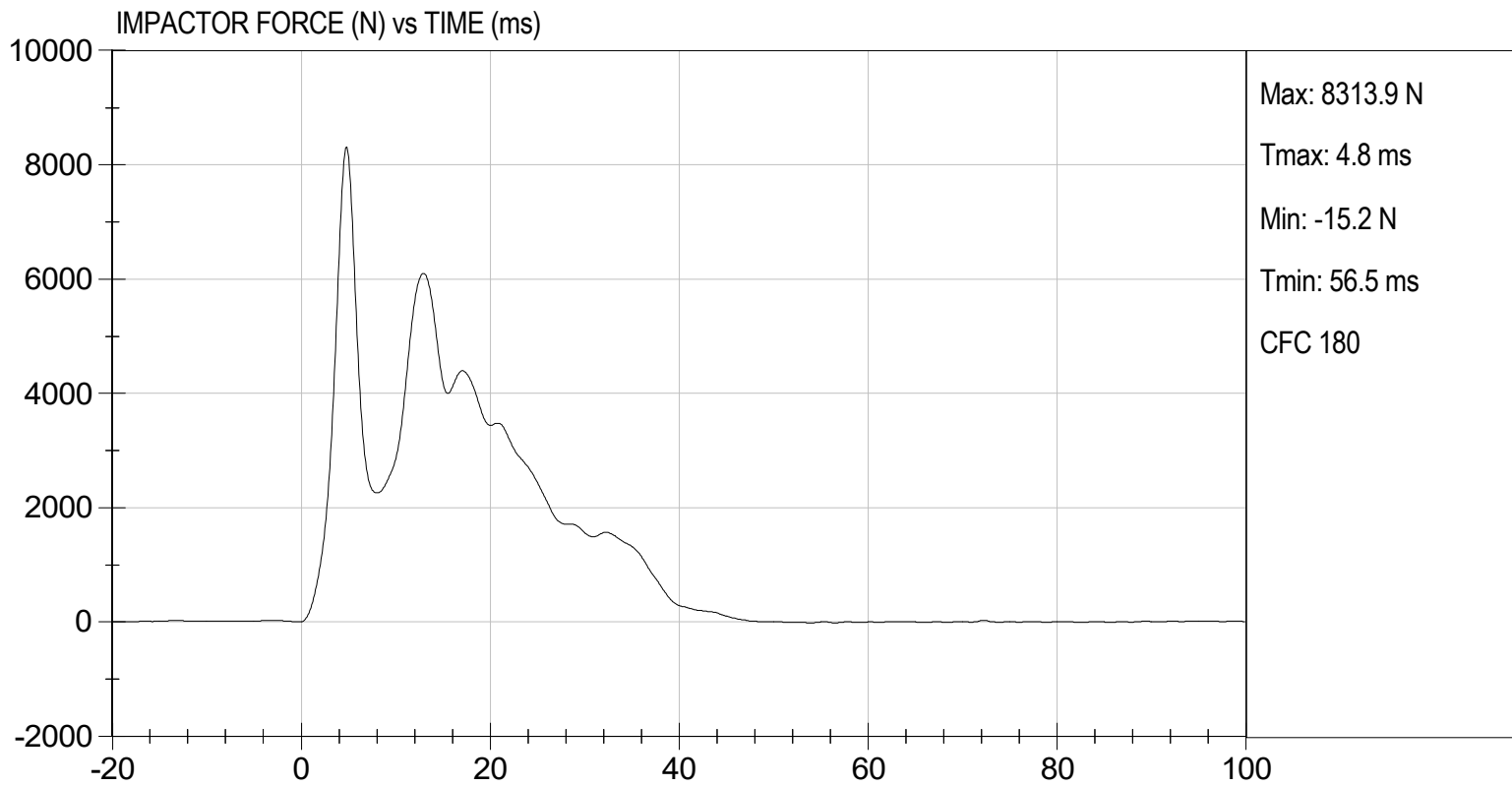
06/20/2024
Test Date


Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

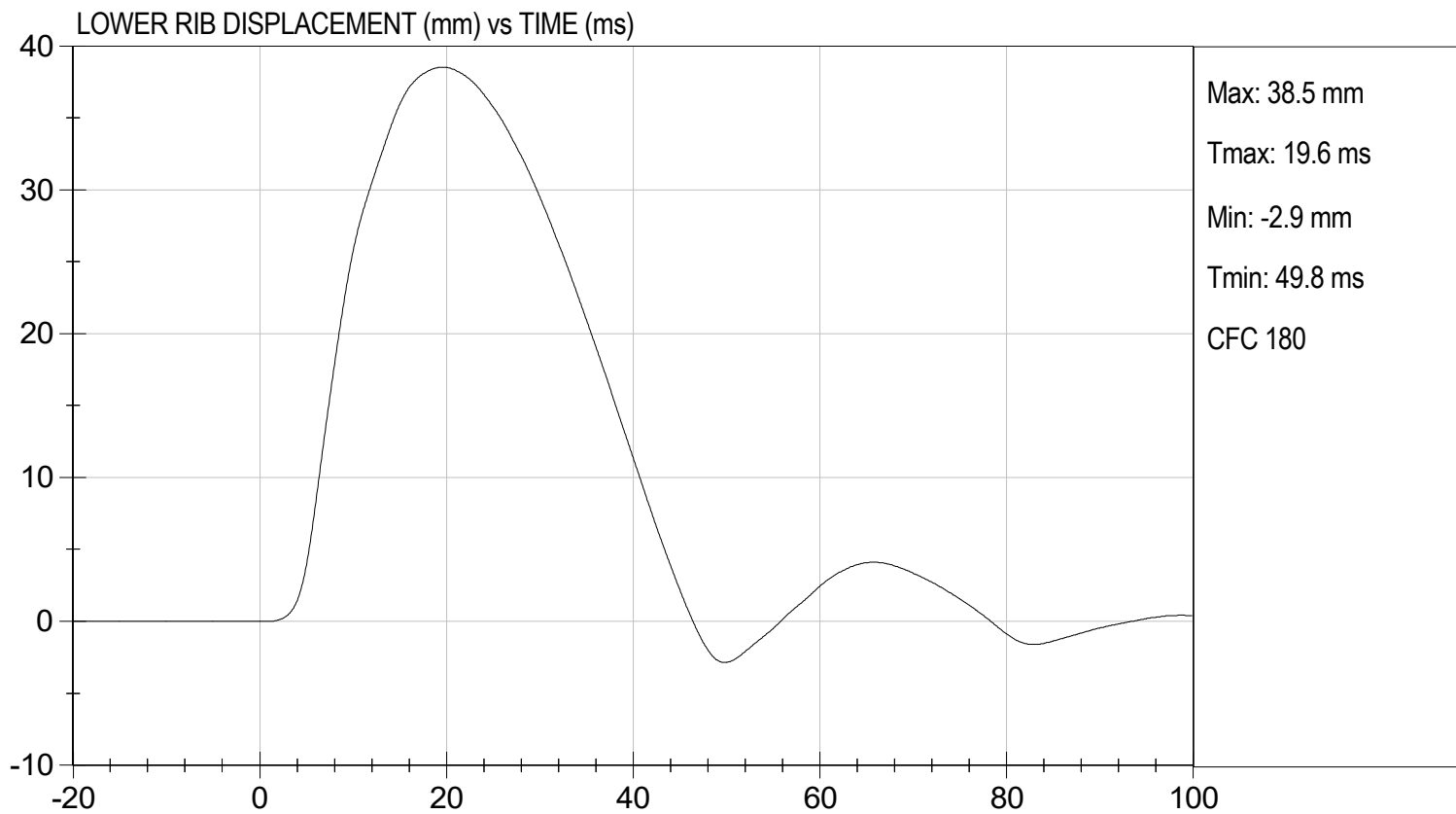
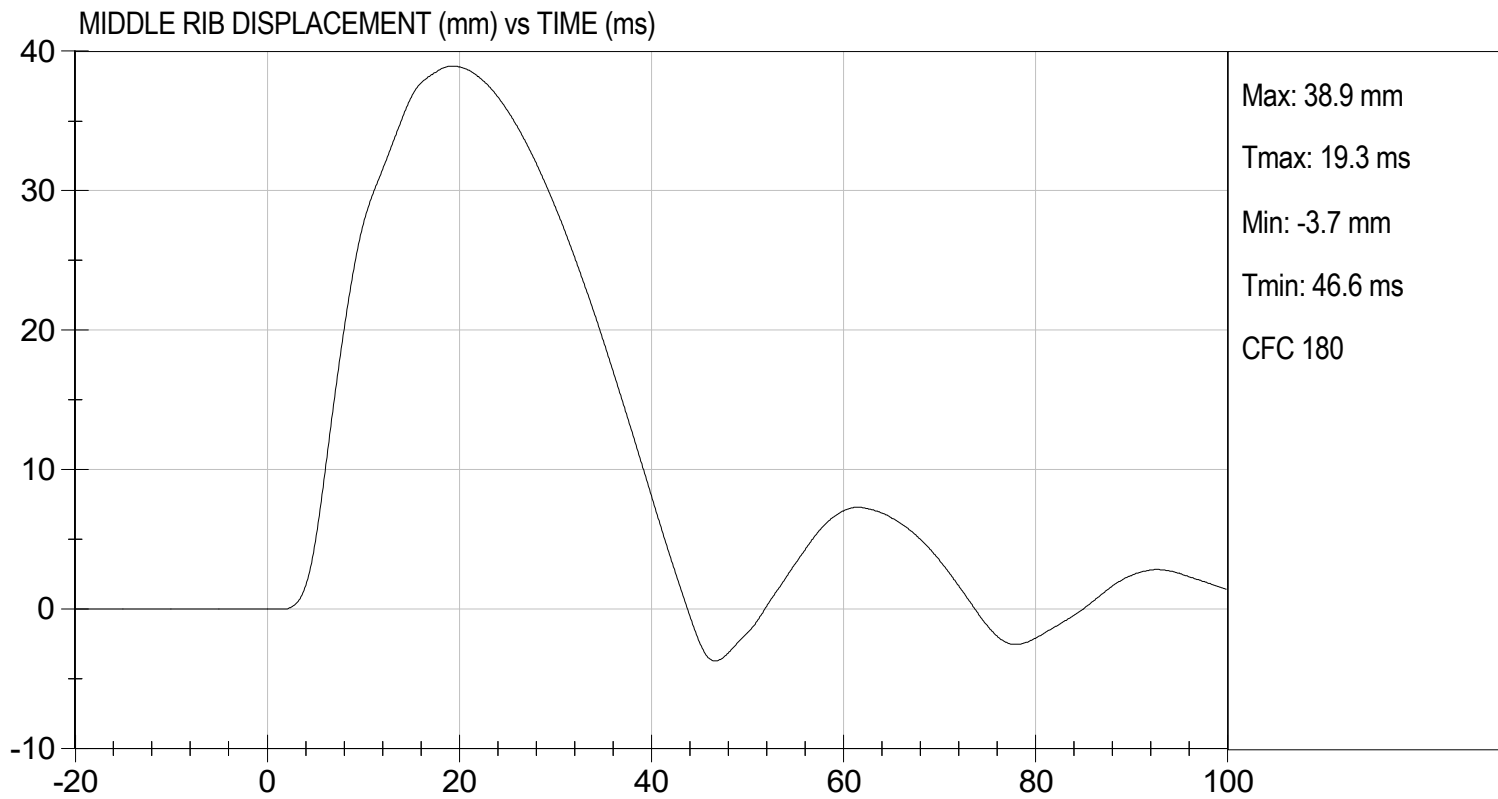
TEST DATE: 06/20/2024
TEST #: D241500





TEST DESC: THORAX IMPACT
VELOCITY: 17.73 ft/s, 5.40 m/s

TEST DATE: 06/20/2024
TEST #: D241500



QUALIFICATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 296

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	784	Pass
B	Shoulder Pivot Height	437 - 453	442	Pass
C	H-point Height	79 - 89	83	Pass
D	H-point from Seatback	141 - 151	145	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	121	Pass
G	Head Breadth	140 - 148	142	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	180	Pass
J	Head Circumference	541 - 551	548	Pass
K	Buttock to Knee Length	514 - 540	535	Pass
L	Popliteal Height	343 - 369	358	Pass
M	Knee Pivot to Floor Height	392 - 409	404	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	206	Pass
P	Foot Length	216 - 232	219	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	316	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	481	Pass
V	Shoulder Width	341 - 357	346	Pass
W	Foot Width	78 - 94	85	Pass
Y	Chest Circumference w/ jacket	851 - 881	870	Pass
Z	Waist Circumference	761 - 791	772	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

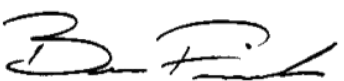
ATD Serial No: 296

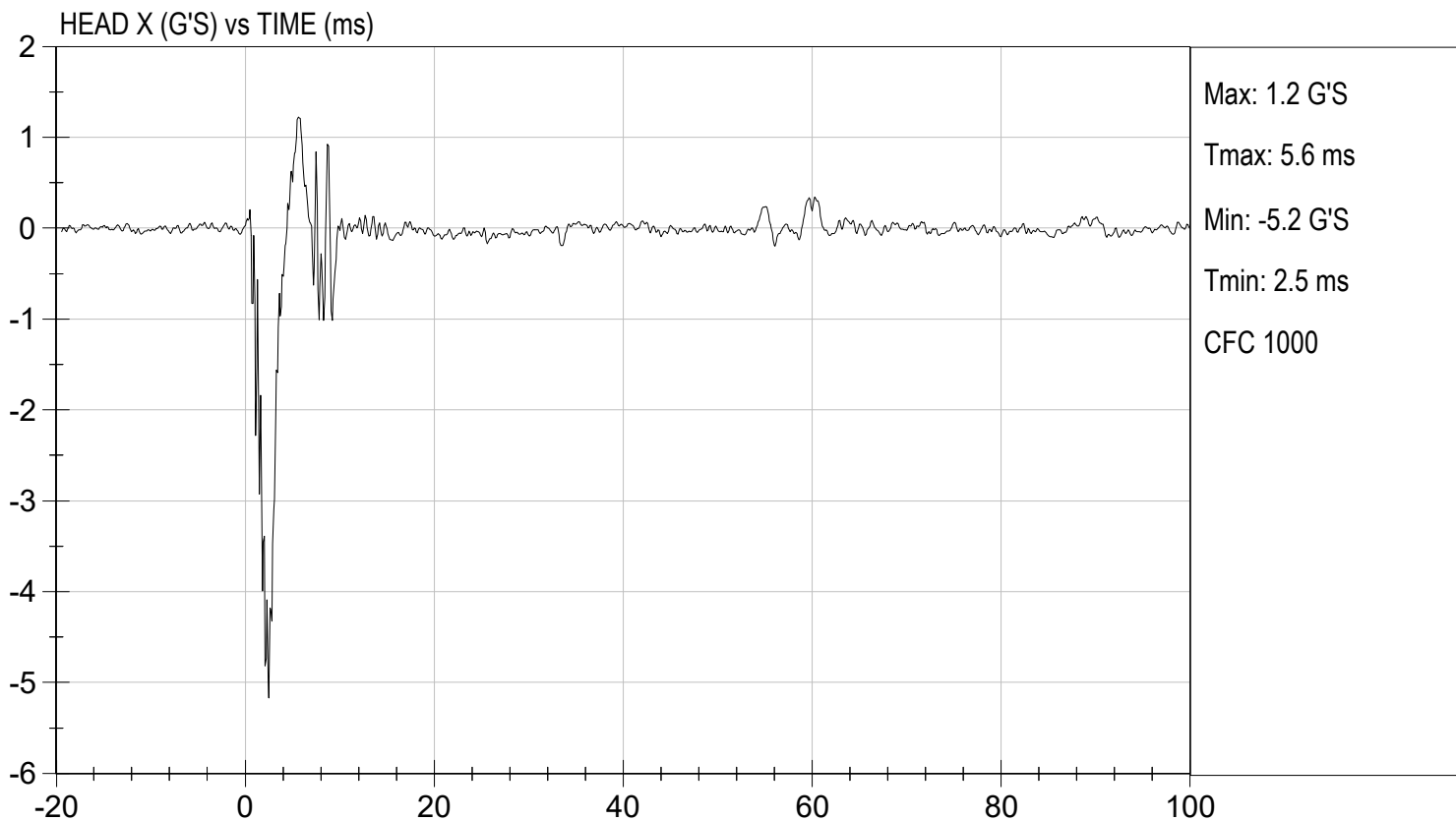
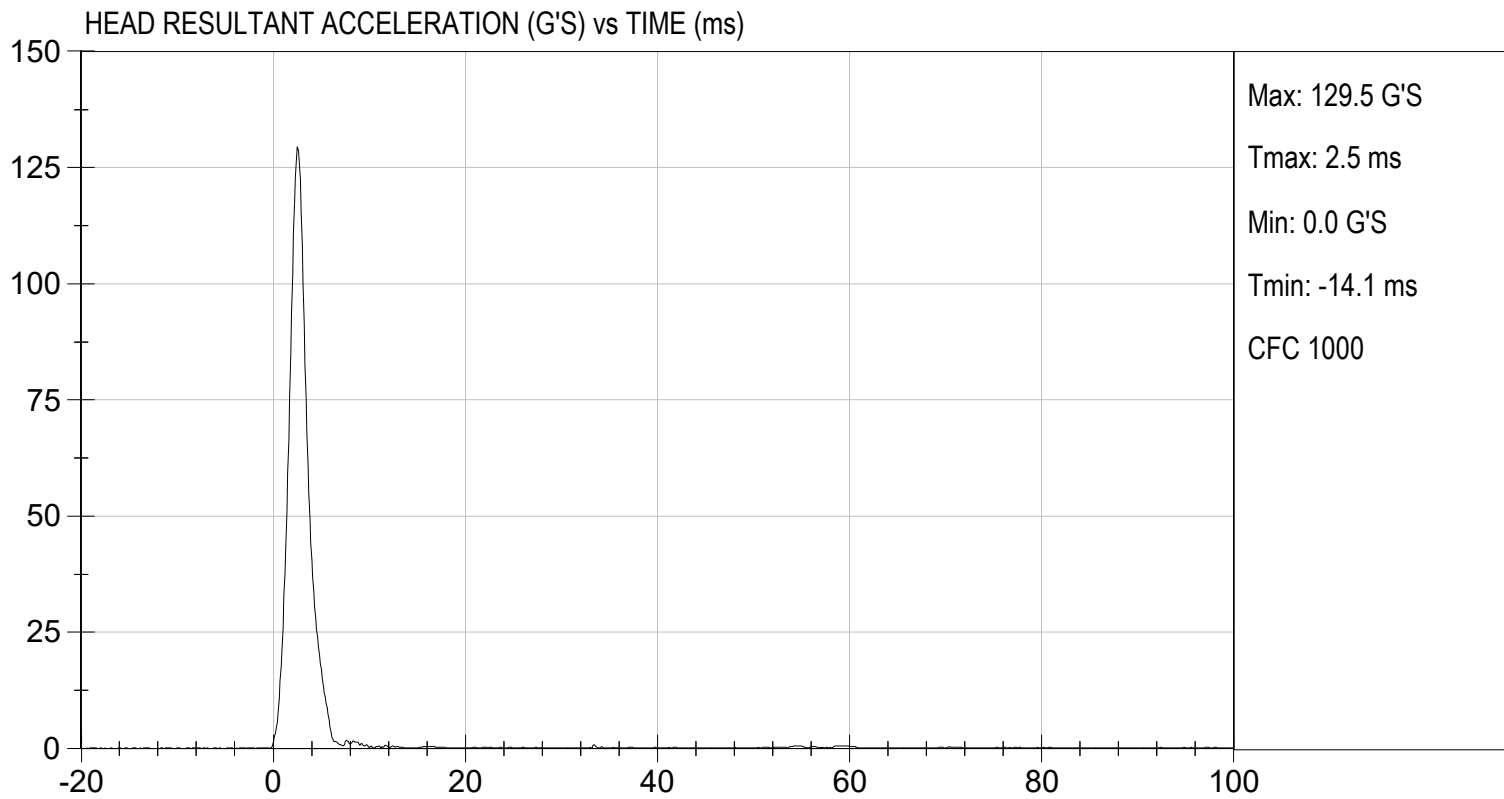
Test ID: D241371

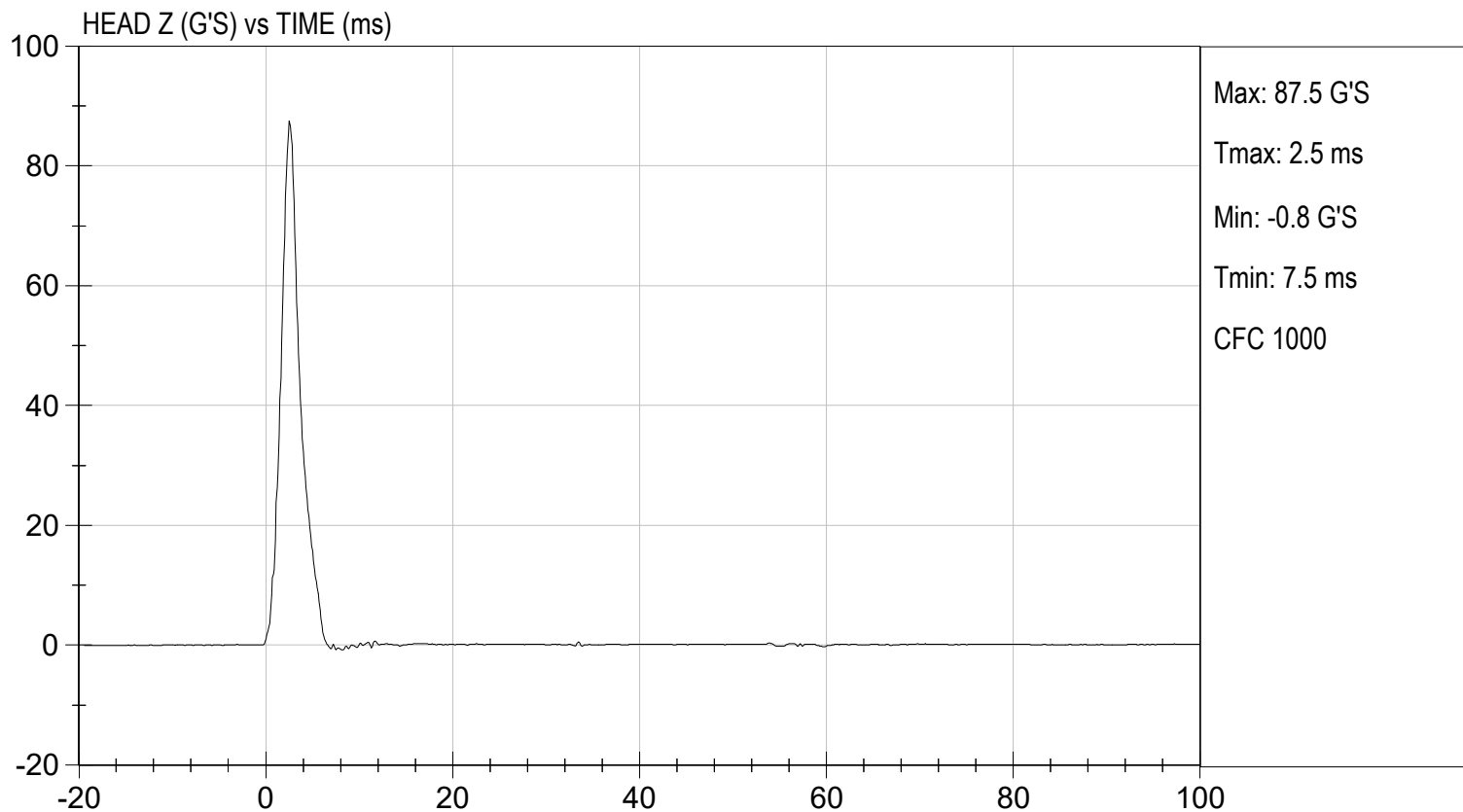
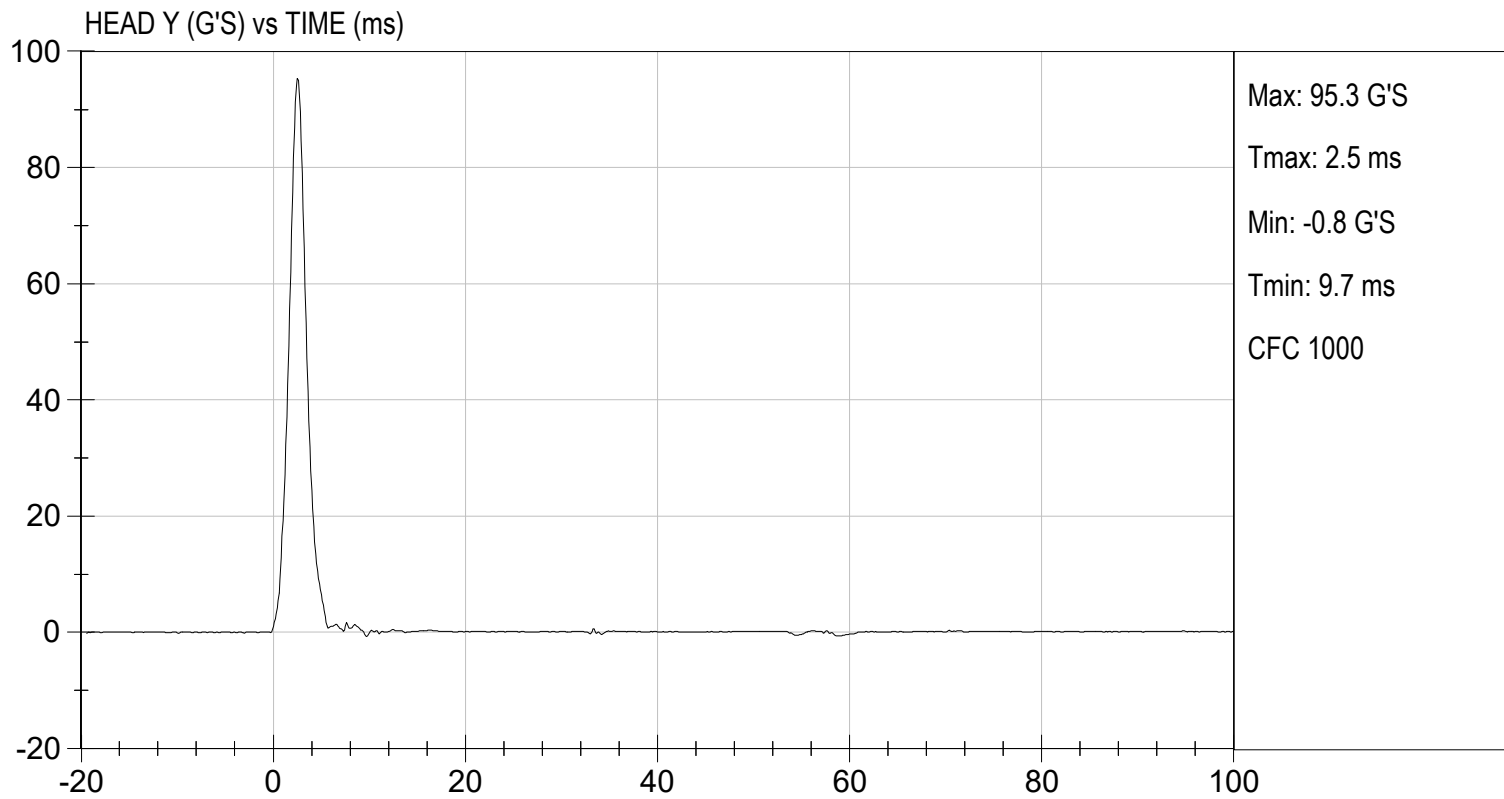
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	41	Pass
Peak Resultant Acceleration	G's	115 to 137	129	Pass
Peak Longitudinal Acceleration	G's	+/- 15	-5.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/06/2024
Test Date


Approved By





MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-Its BUILD LEVEL D DUMMY

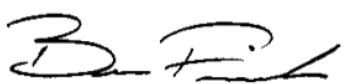
ATD Serial No: 296

Test I.D: D241372

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.3	Pass
Humidity		%	10 to 70	41	Pass
Impact Velocity		m/s	5.51 to 5.63	5.52	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.40	Pass
	15 ms	m/s	3.30 to 4.10	3.64	Pass
	20 ms	m/s	4.40 to 5.40	5.04	Pass
	25 ms	m/s	5.40 to 6.10	5.55	Pass
	25-100 ms	m/s	5.50 to 6.20	5.55	Pass
Maximum D-Plane Rotation		deg	71 to 81	73	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	65	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-41	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	119	Pass
Overall Test Results					Pass


 Laboratory Technician

06/06/2024
 Test Date

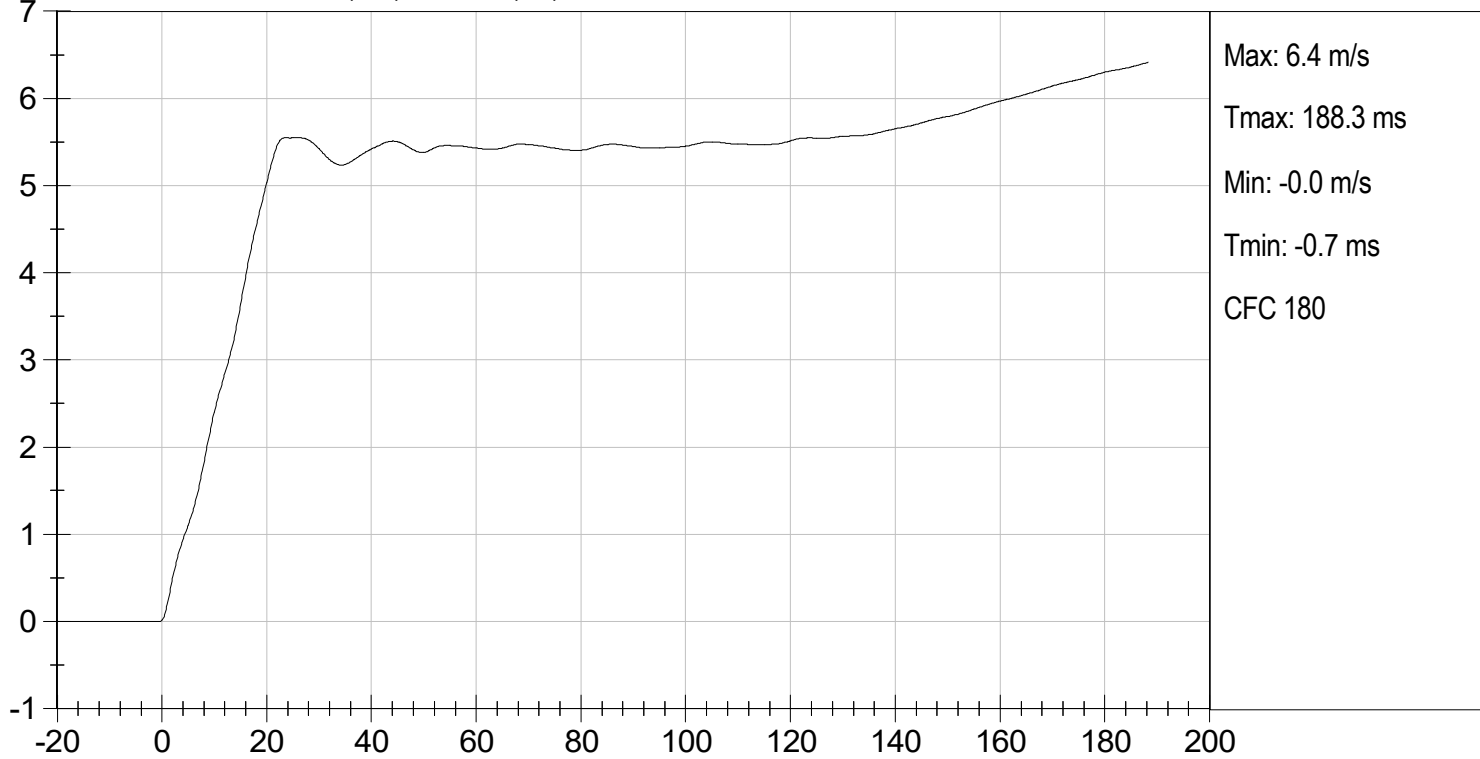

 Approved By



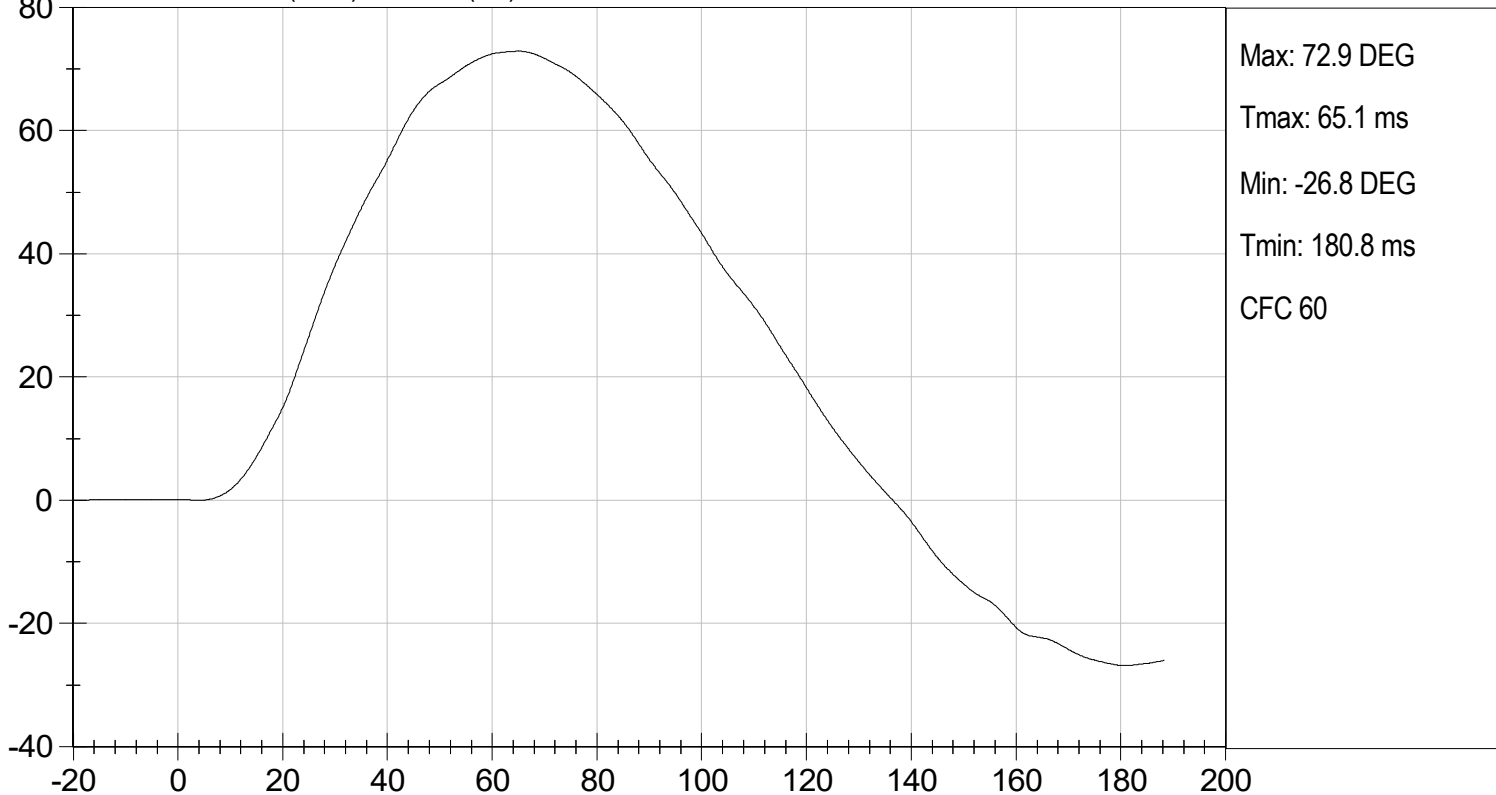
TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 06/06/2024
TEST #: D241372

PENDULUM VELOCITY (m/s) vs TIME (ms)



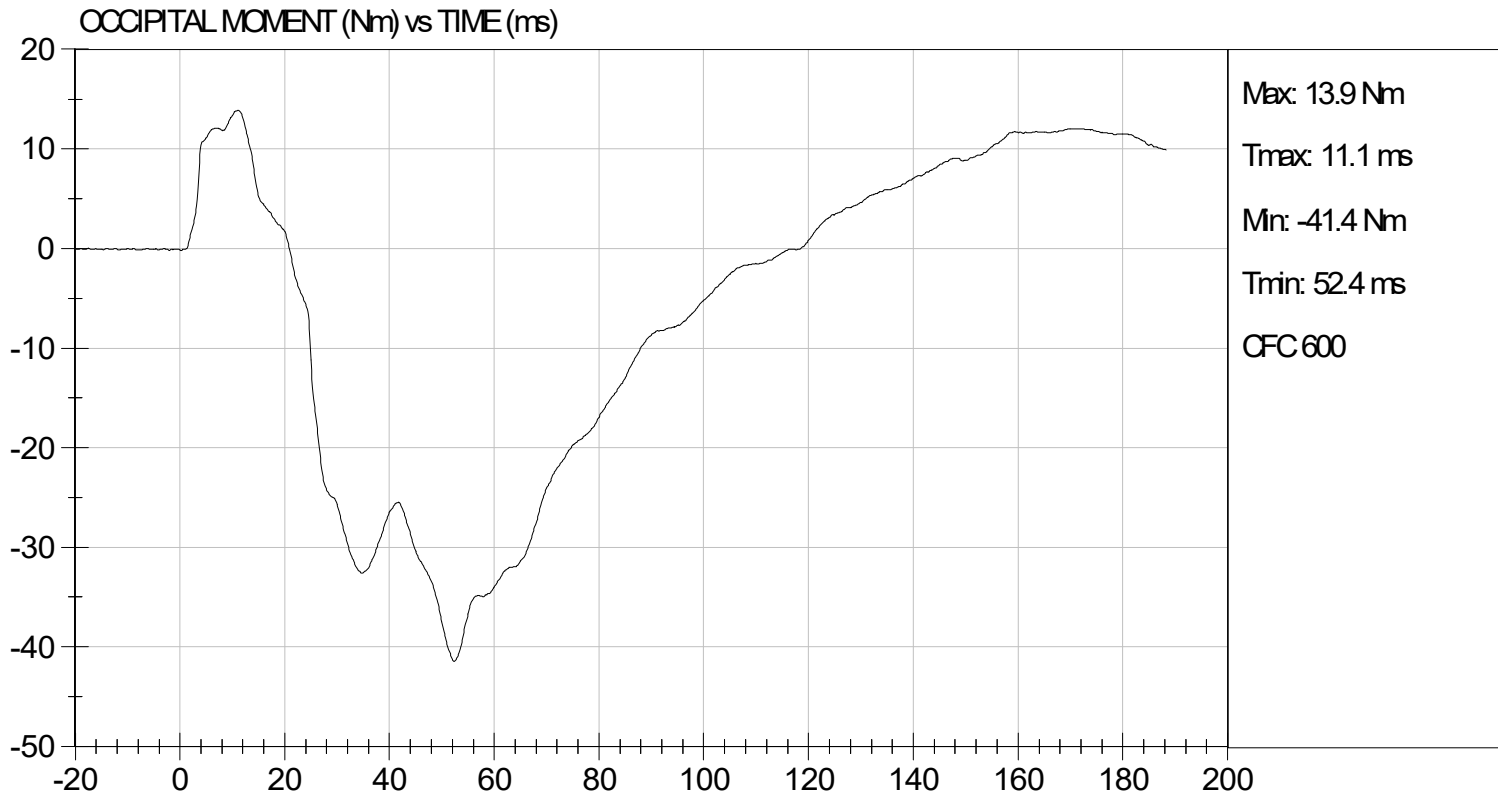
FLEXION ANGLE (DEG) vs TIME (ms)





TEST DESC: NECK BENDING
VELOCITY: 18.12 ft/s, 5.52 m/s

TEST DATE: 06/06/2024
TEST #: D241372



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

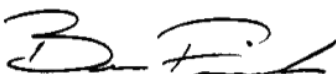
ATD Serial No: 296

Test ID: D241373

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
			Overall Test Results	Pass


Laboratory Technician

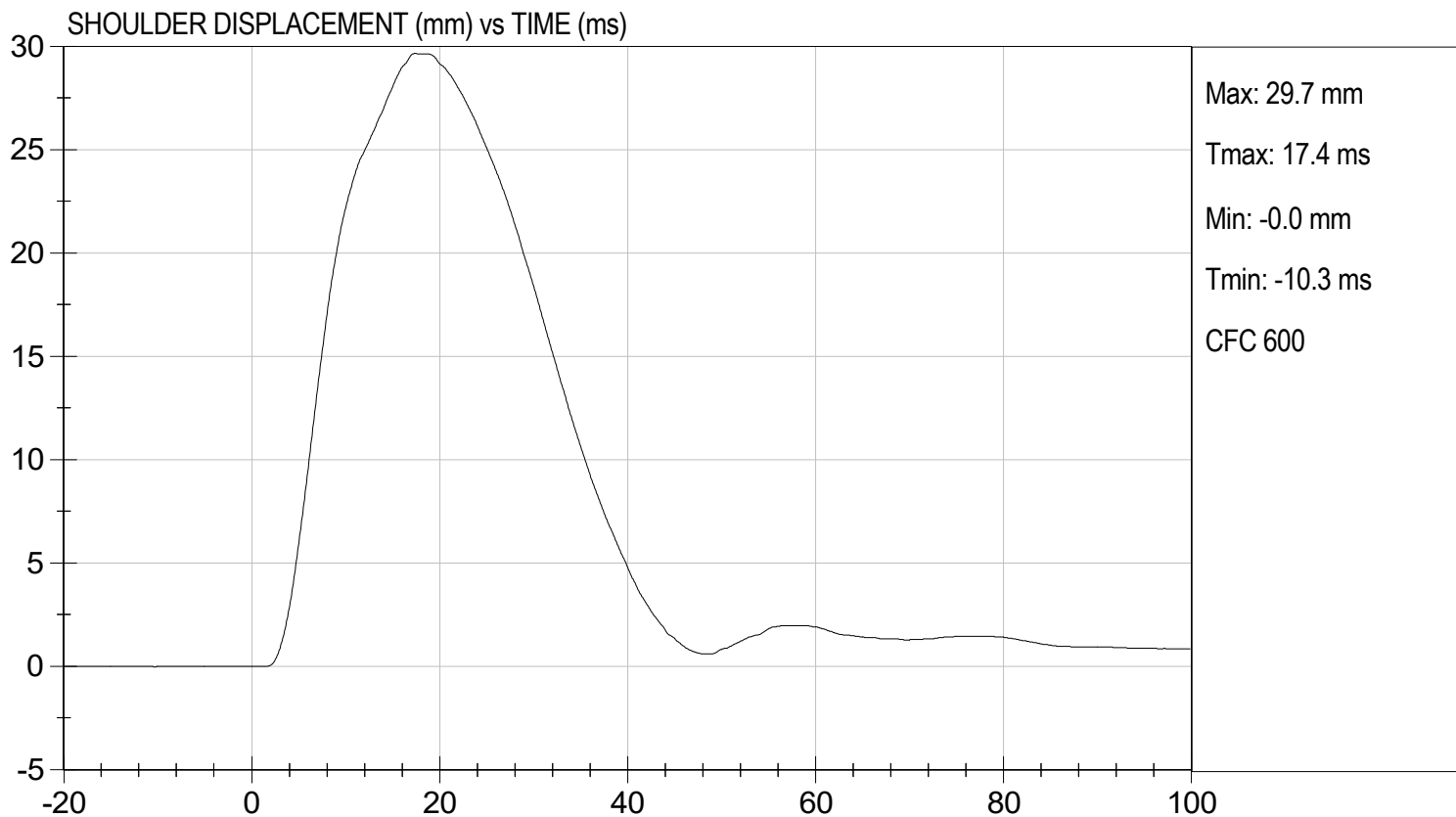
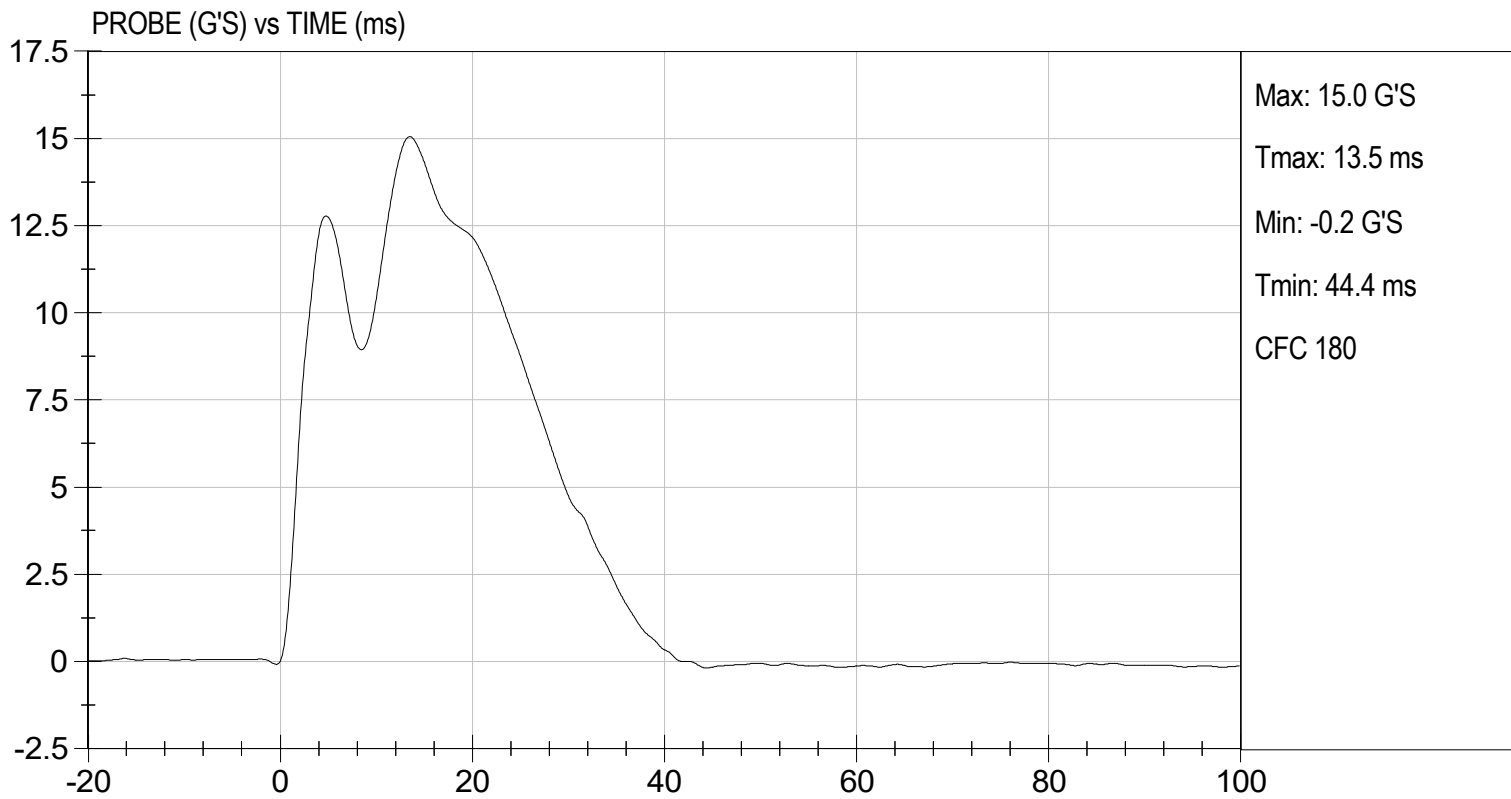
06/06/2024
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

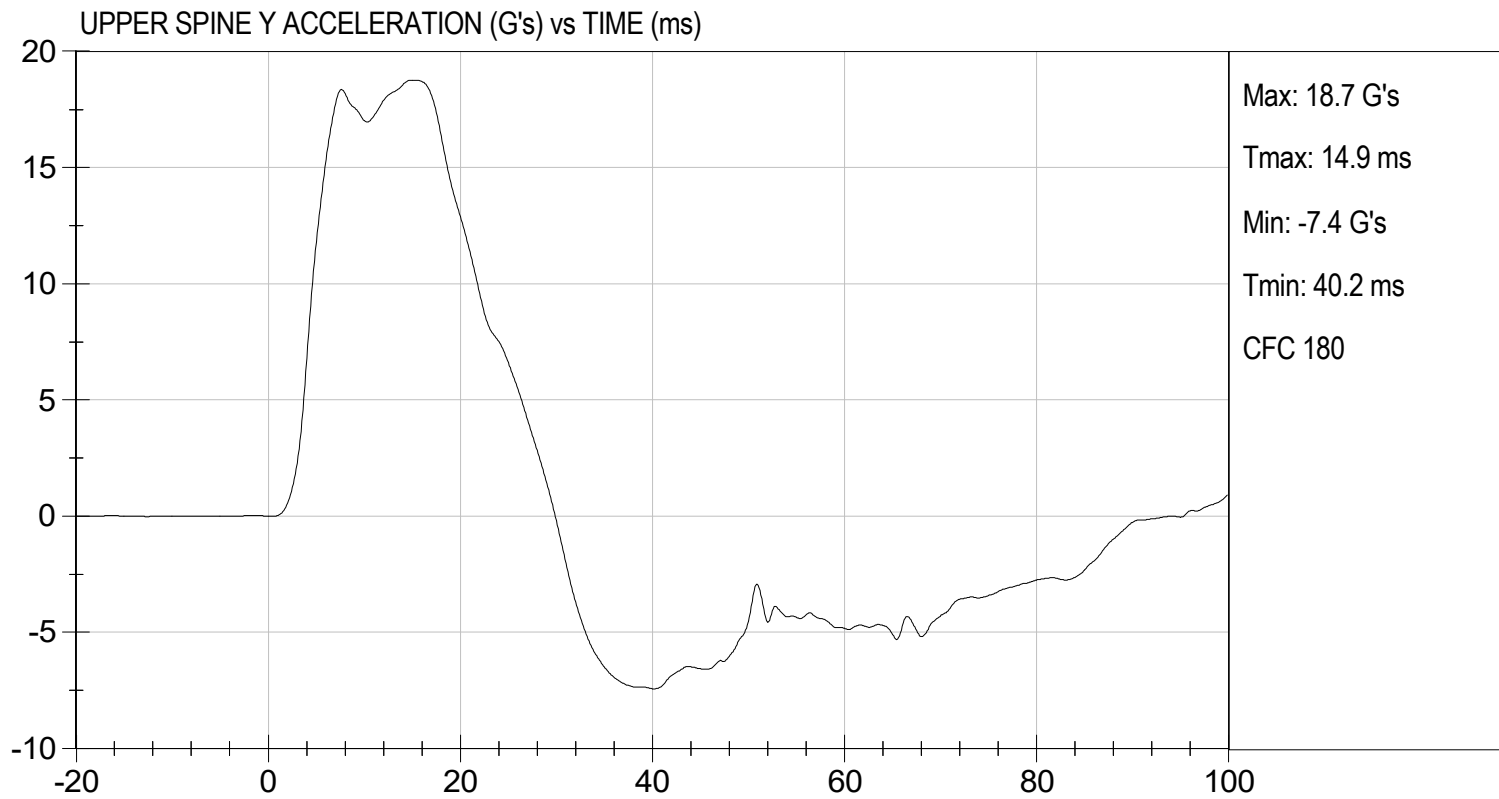
TEST DATE: 06/06/2024
TEST #: D241373





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 06/06/2024
TEST #: D241373



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

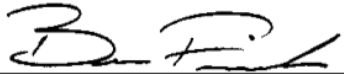
ATD Serial No: 296

Test I.D: D241374

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	34	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	28	Pass
Middle Rib Displacement	mm	30 to 36	31	Pass
Lower Rib Displacement	mm	32 to 38	33	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
Overall Test Results				Pass


Laboratory Technician

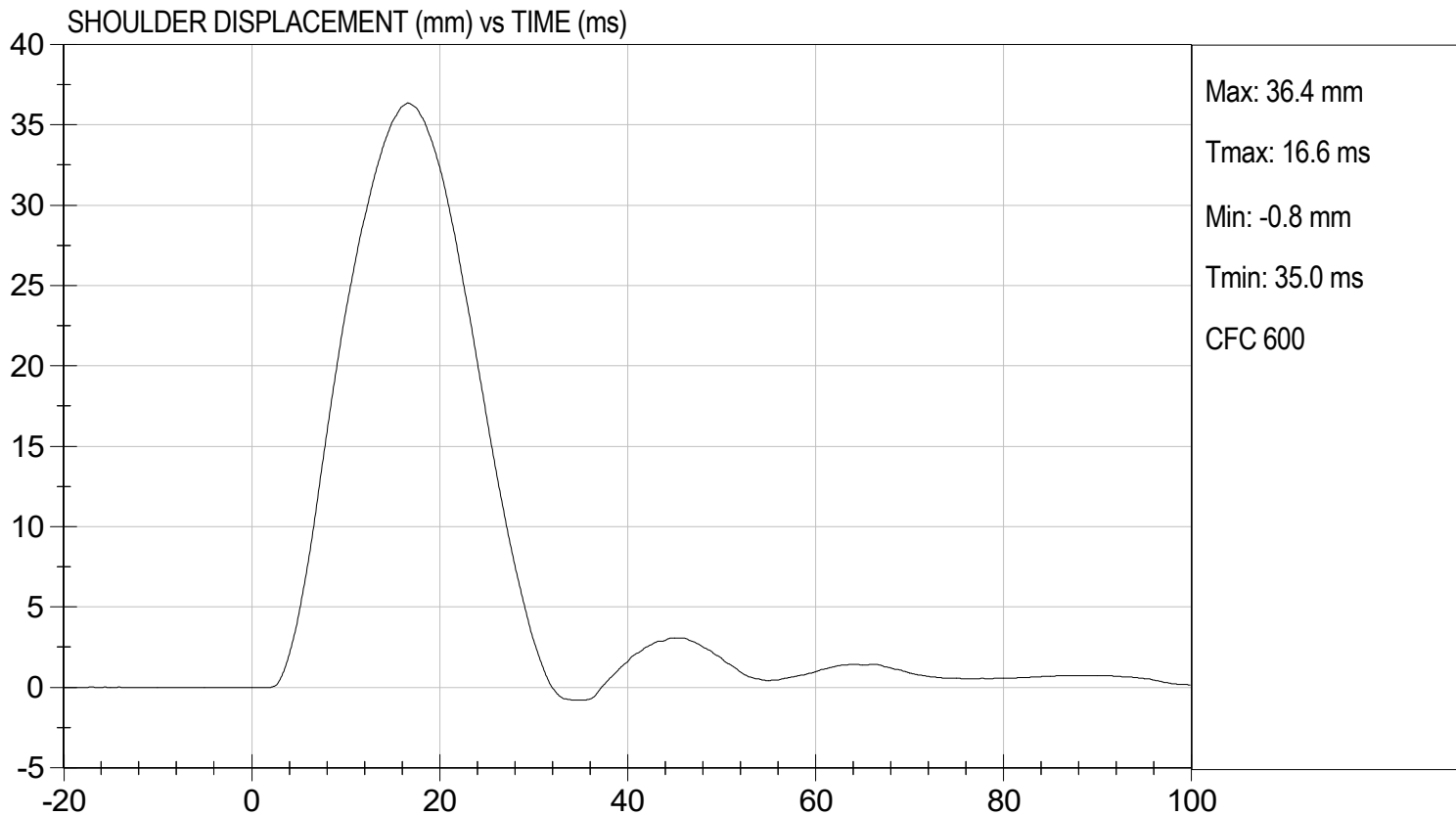
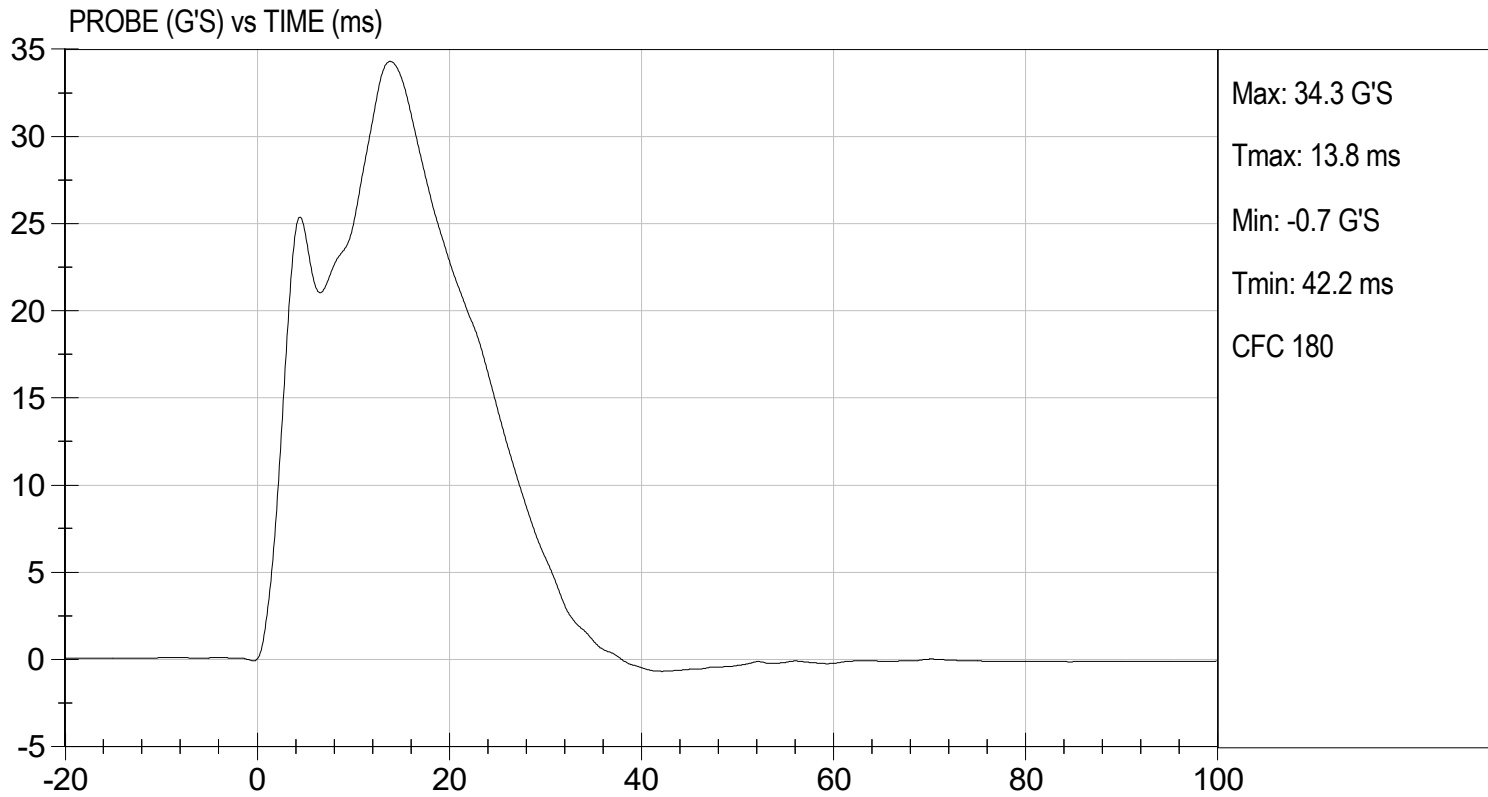
06/06/2024
Test Date

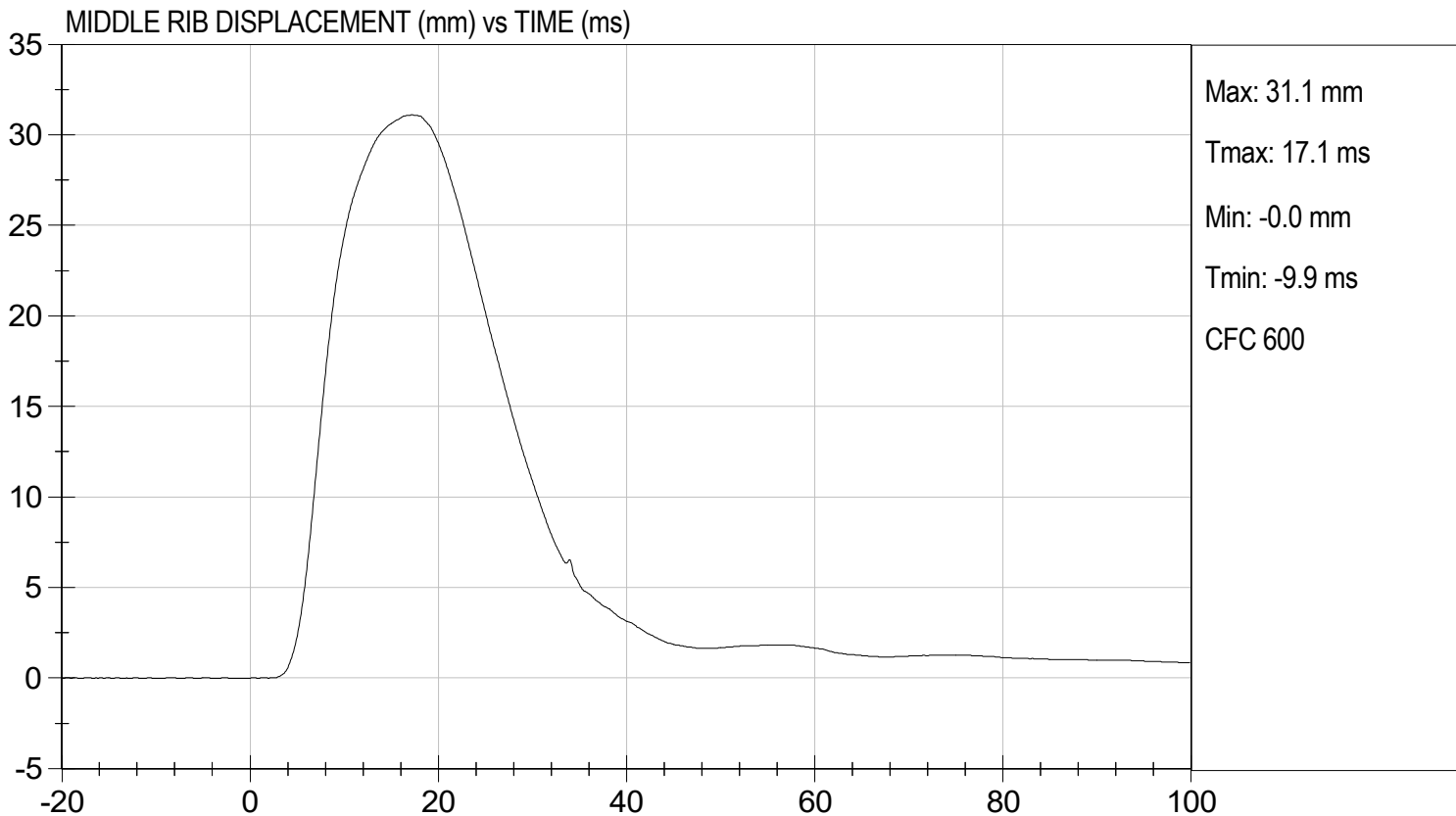
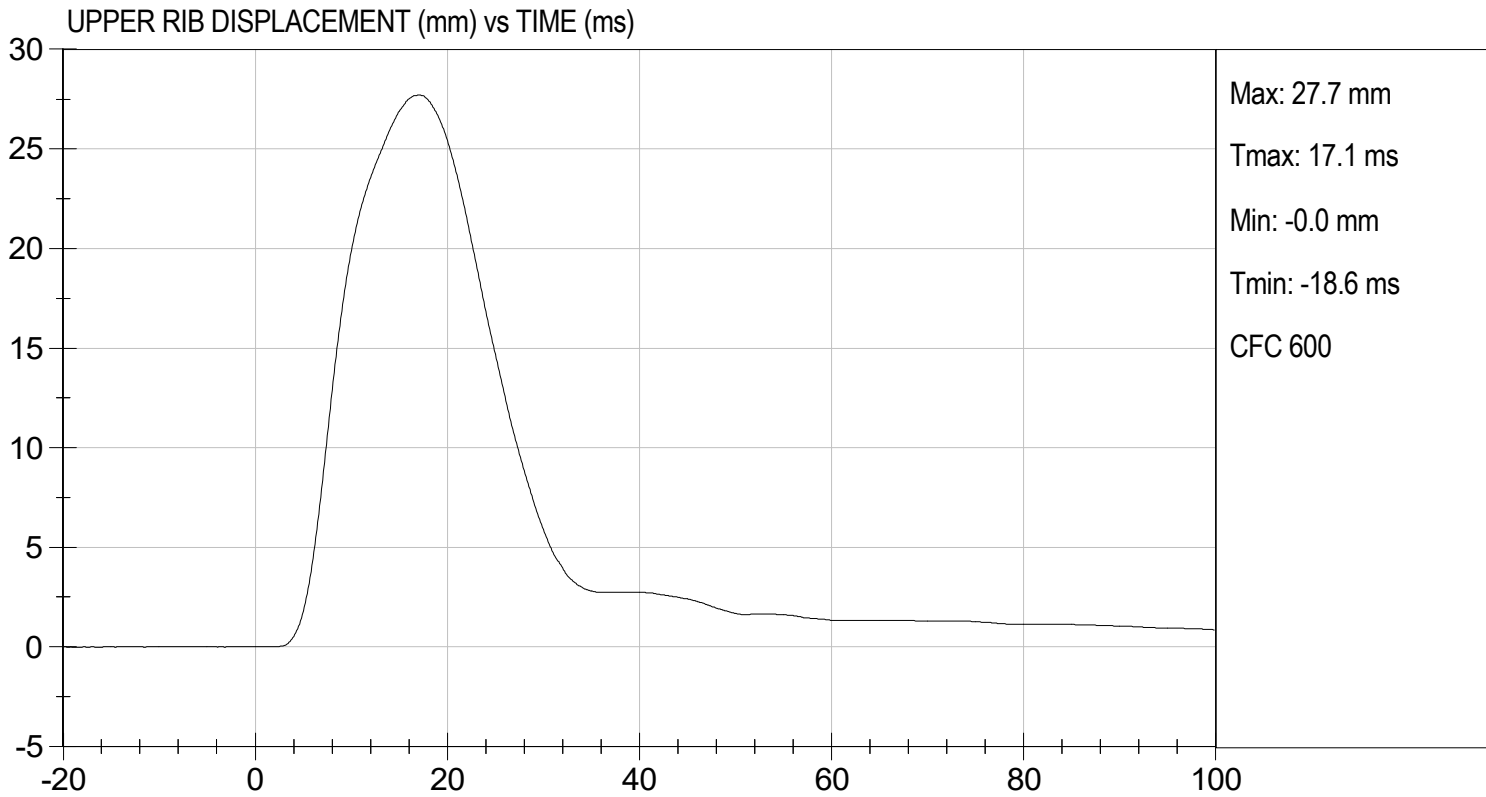

Approved By



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 06/06/2024
TEST #: D241374

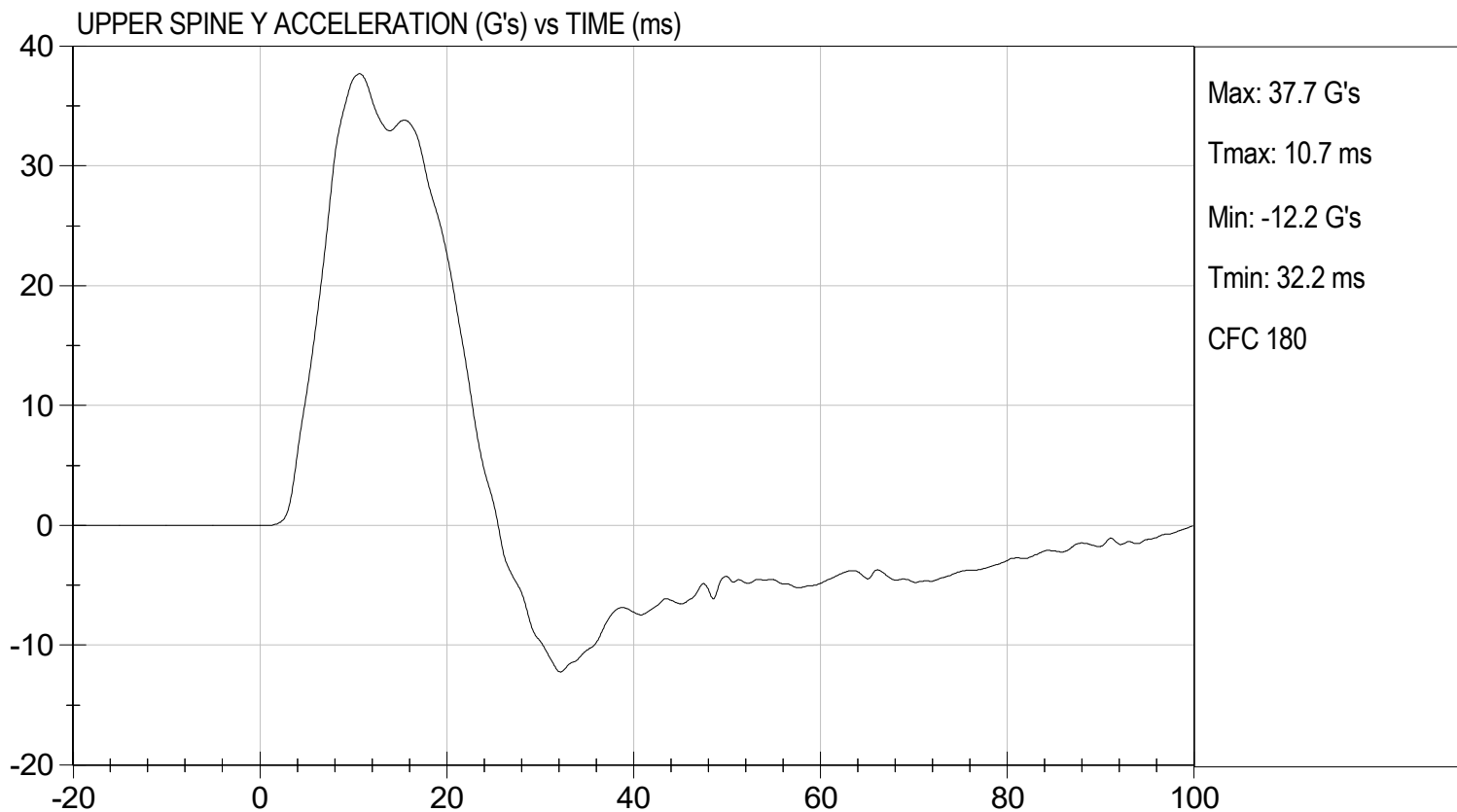
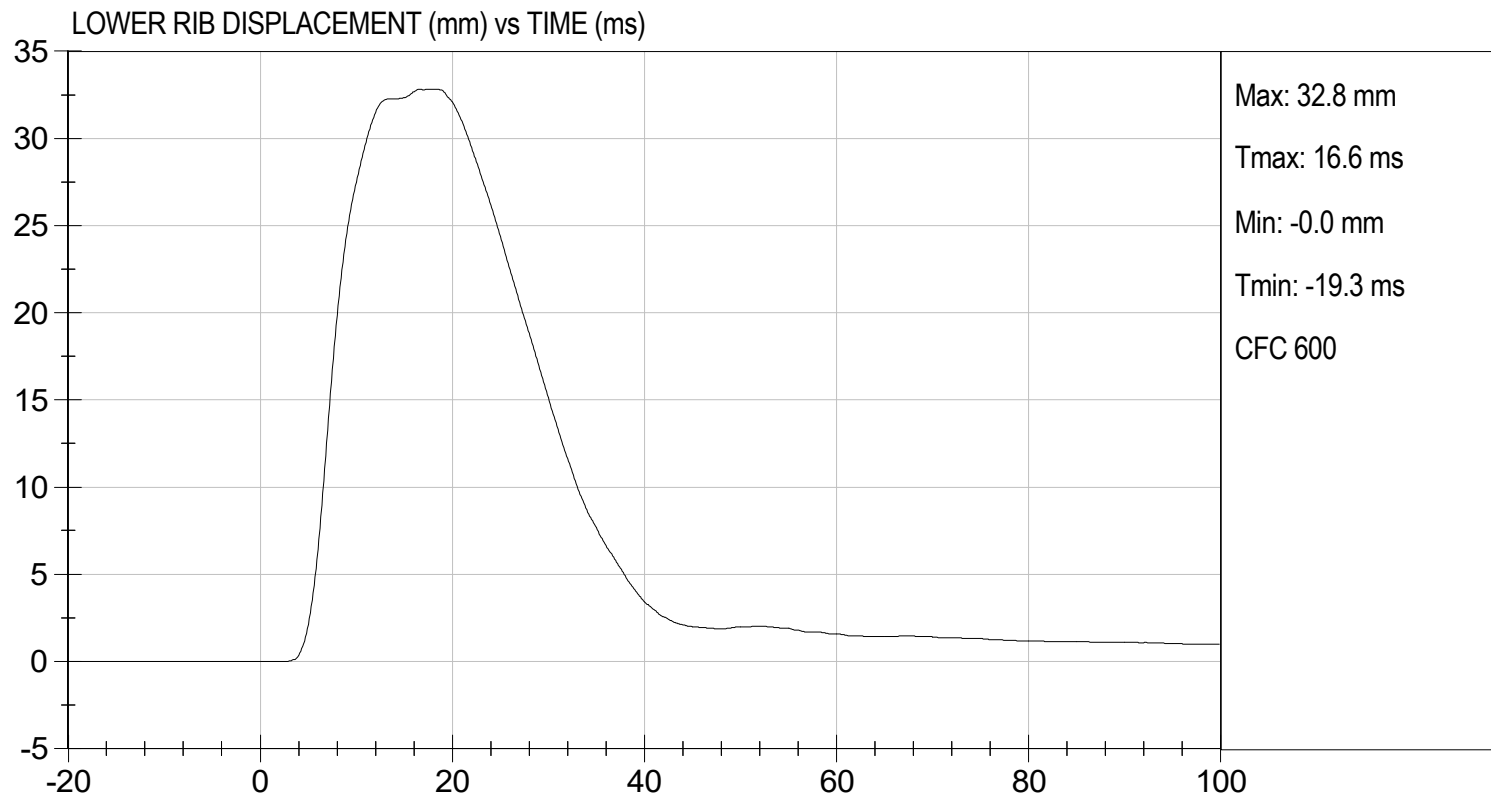






TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

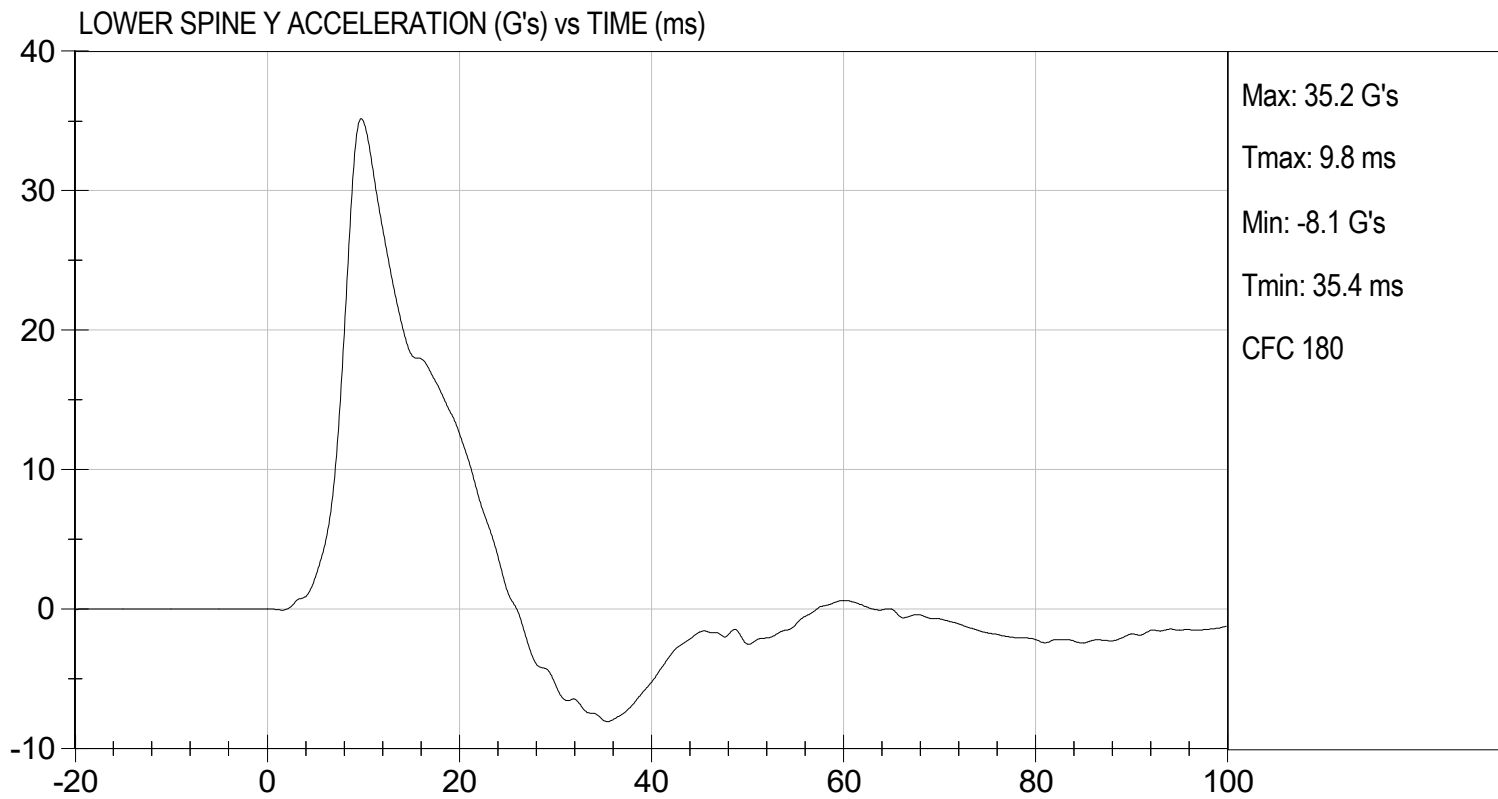
TEST DATE: 06/06/2024
TEST #: D241374





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 06/06/2024
TEST #: D241374



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

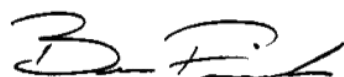
ATD Serial No: 296

Test I.D: D241375

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	36	Pass
Middle Rib Displacement	mm	39 to 45	41	Pass
Lower Rib Displacement	mm	35 to 43	39	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
Overall Test Results				Pass


Laboratory Technician

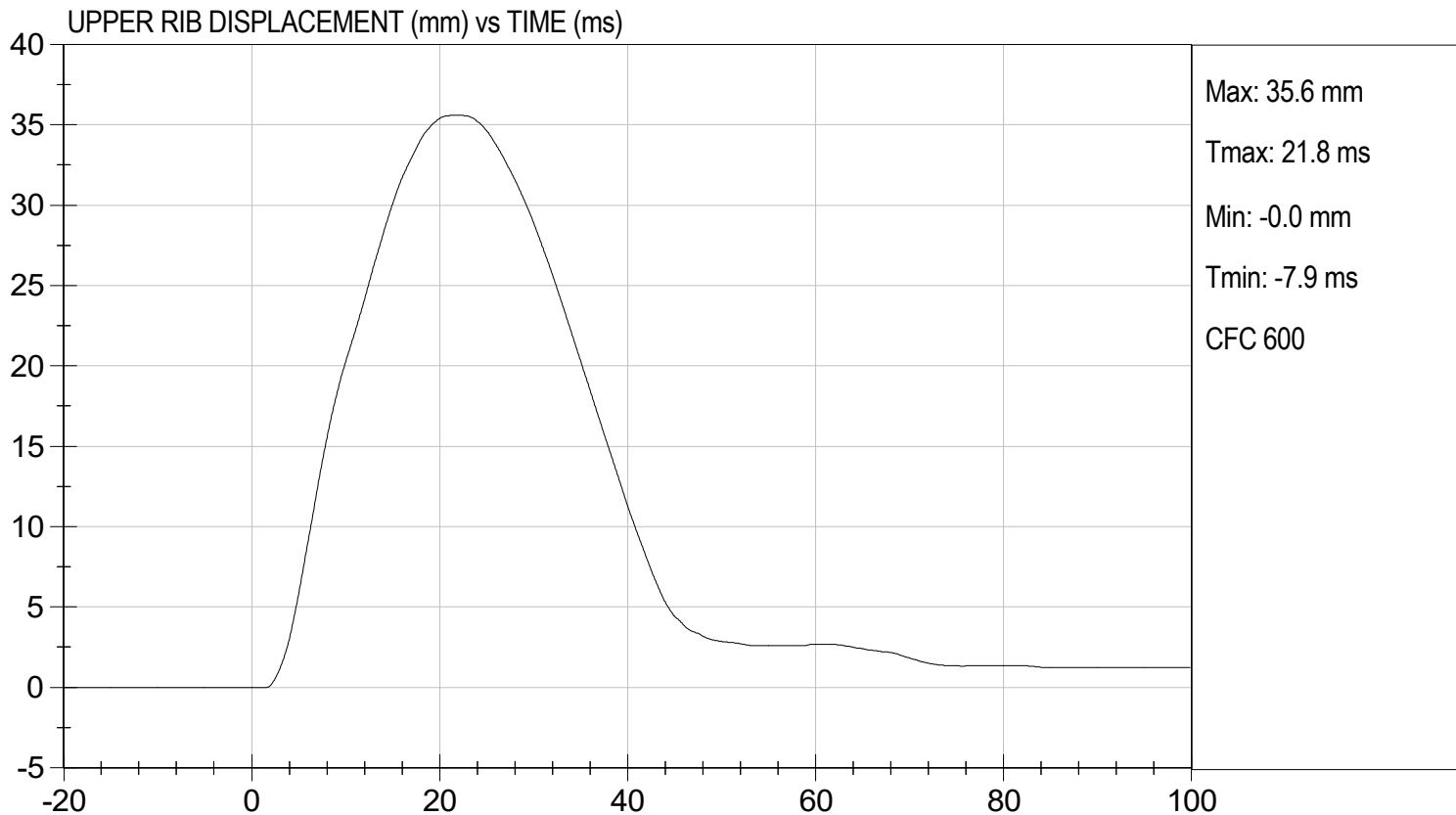
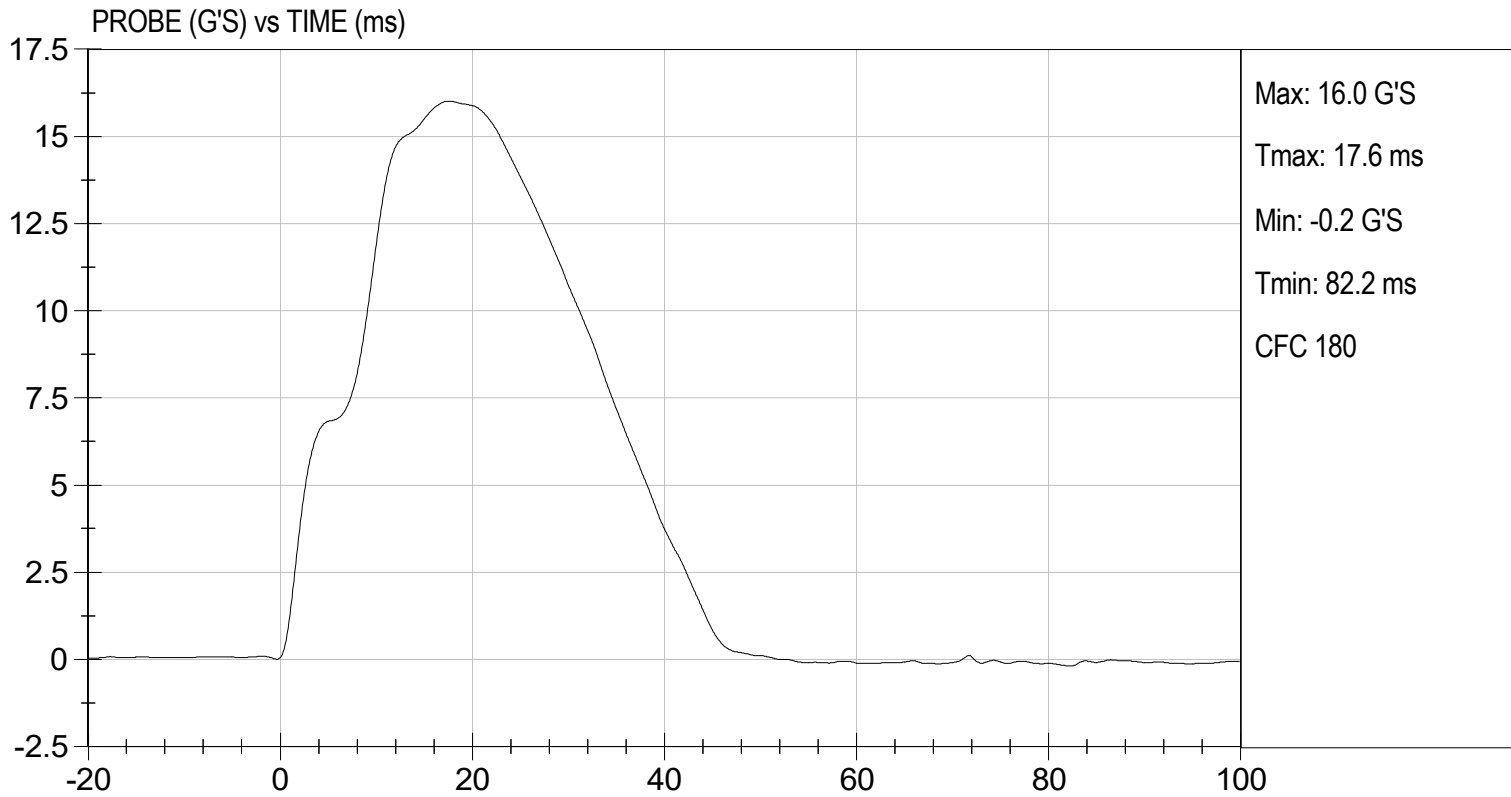
06/06/2024
Test Date


Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

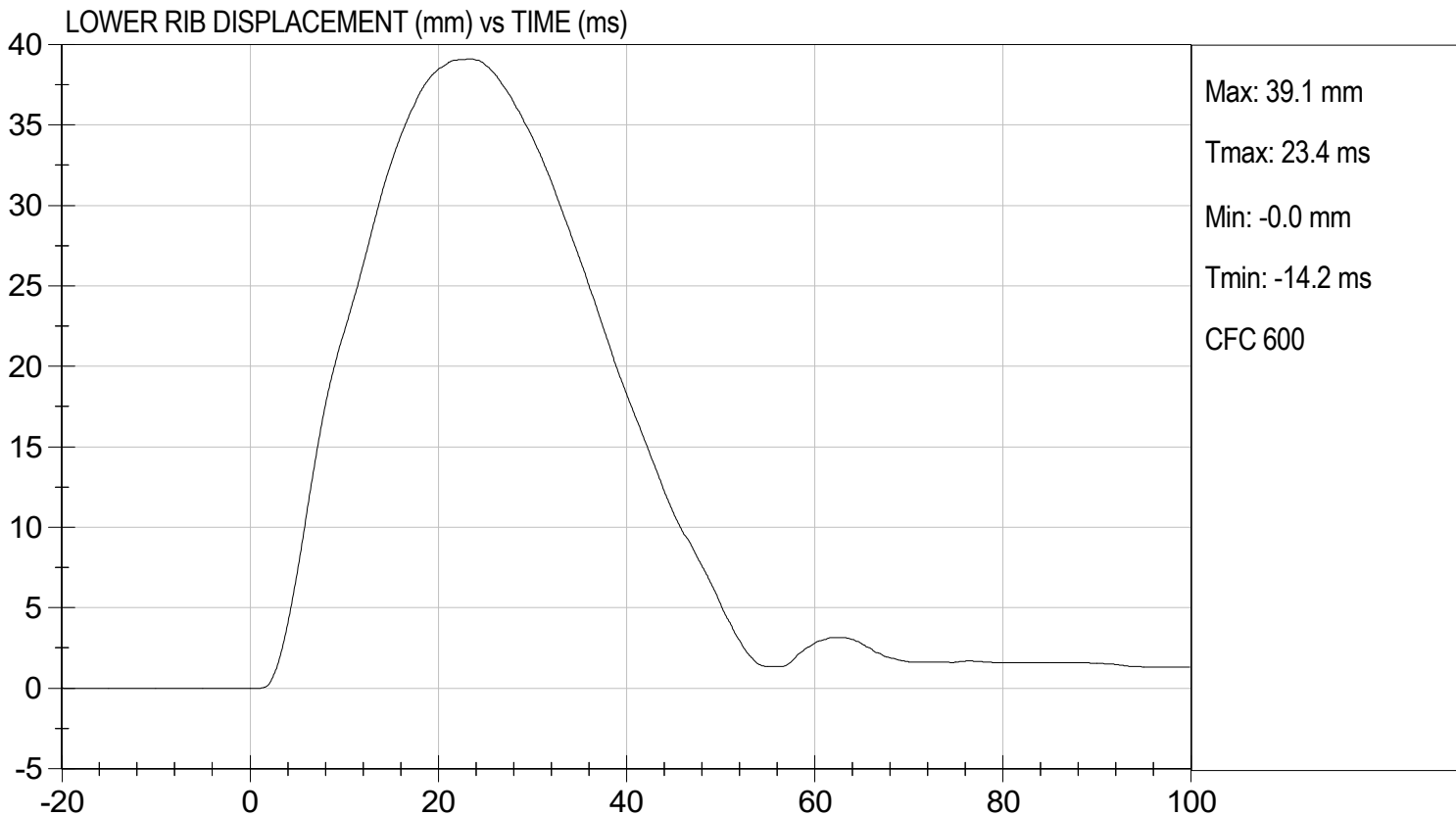
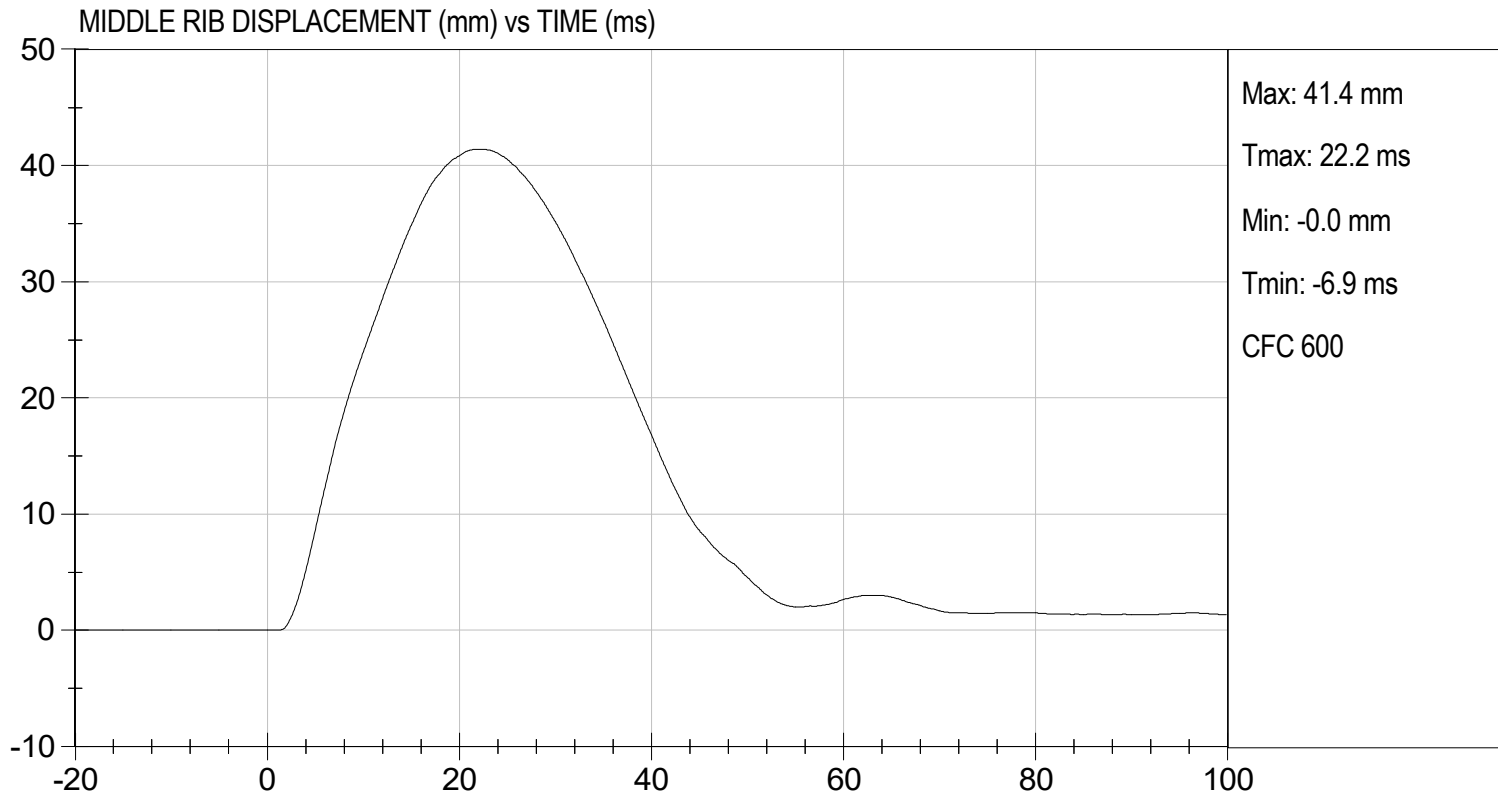
TEST DATE: 06/06/2024
TEST #: D241375





TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

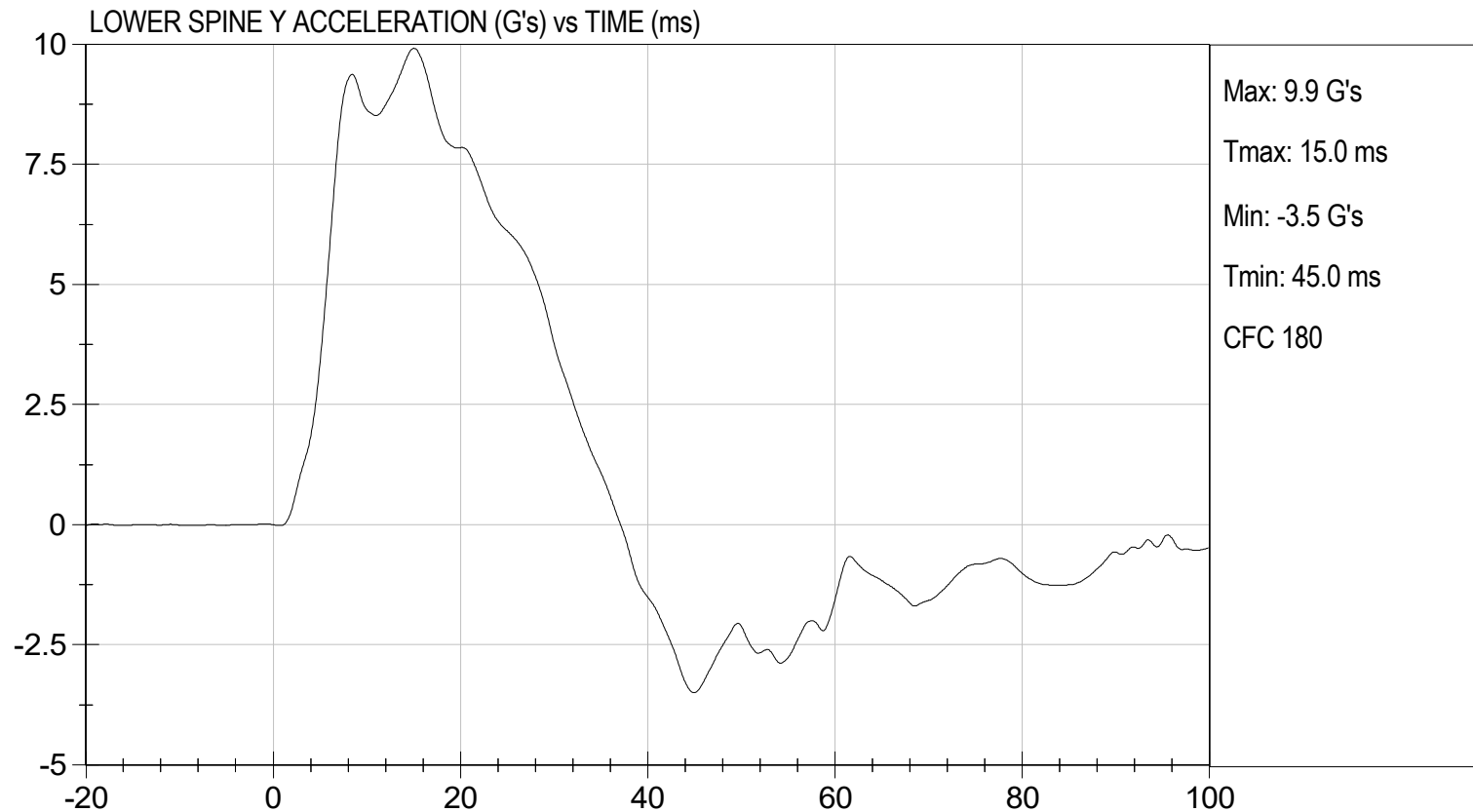
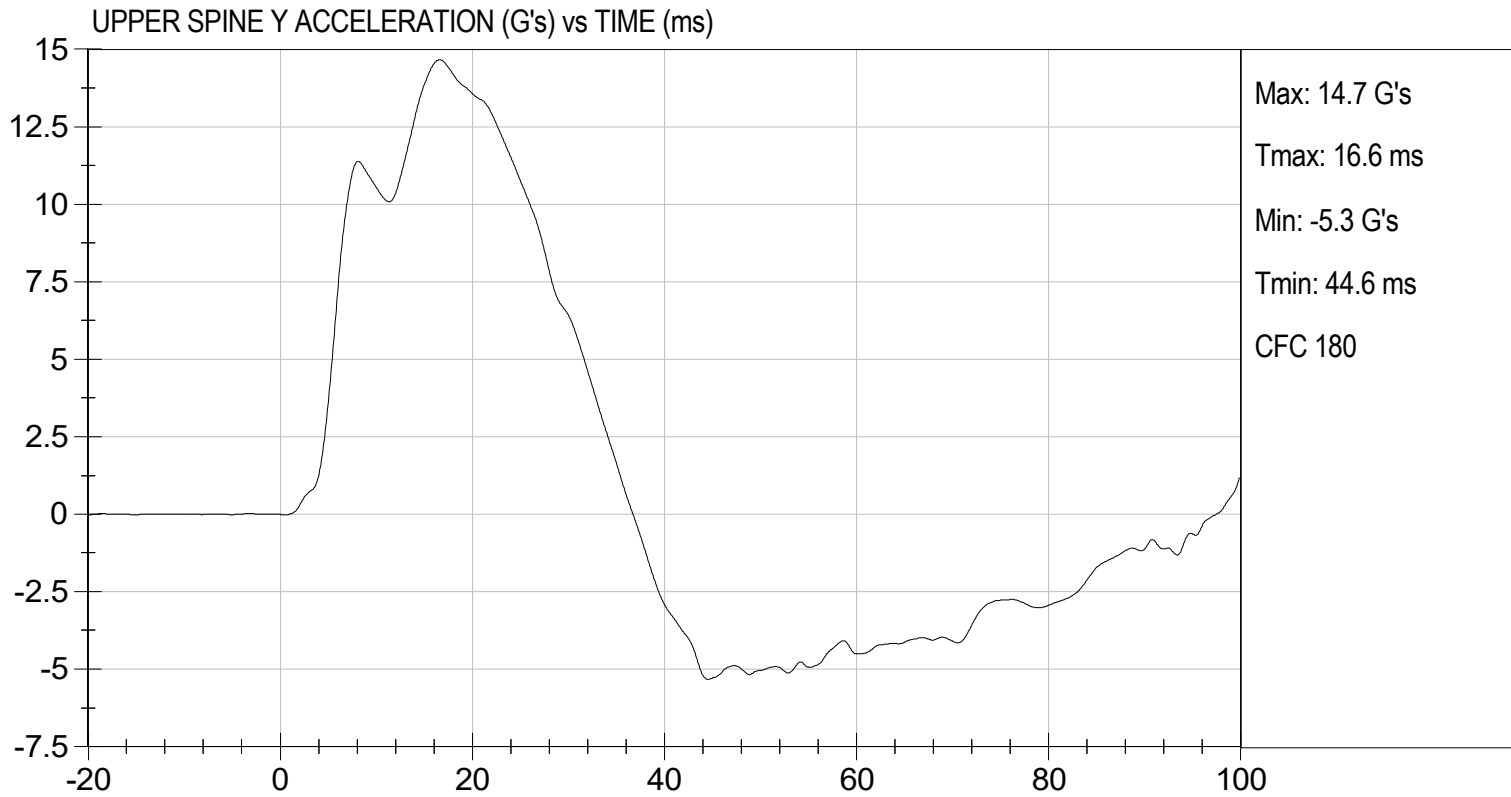
TEST DATE: 06/06/2024
TEST #: D241375





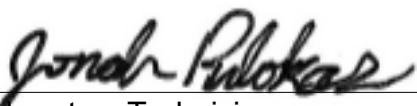
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 06/06/2024
TEST #: D241375

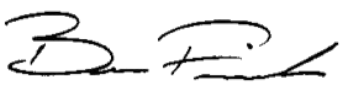


MGA RESEARCH CORPORATION**ABDOMINAL IMPACT TEST****SID-IIs BUILD LEVEL D DUMMY****ATD Serial No:** 296**Test I.D:** D241376

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	43	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	36	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results			Pass	


Laboratory Technician

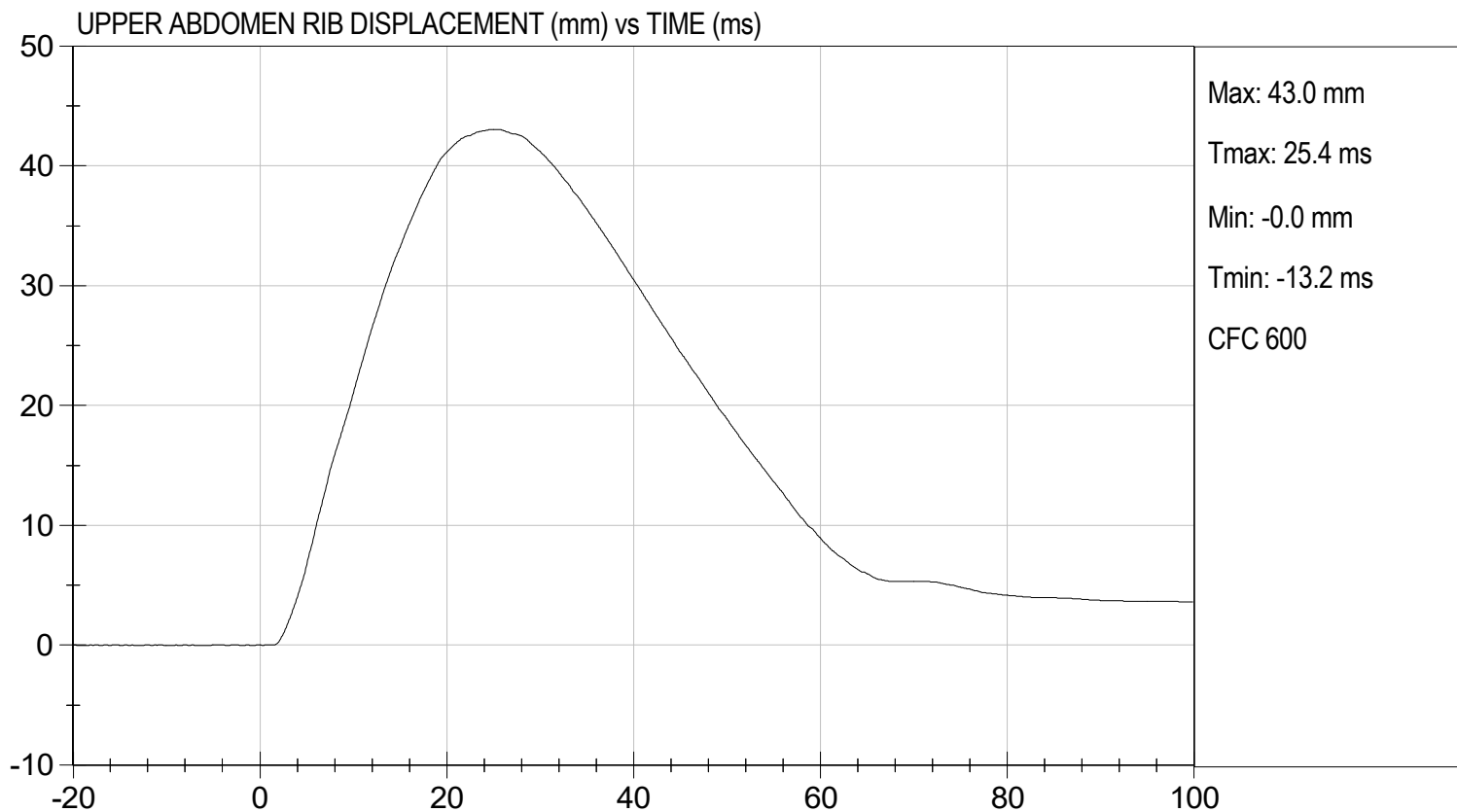
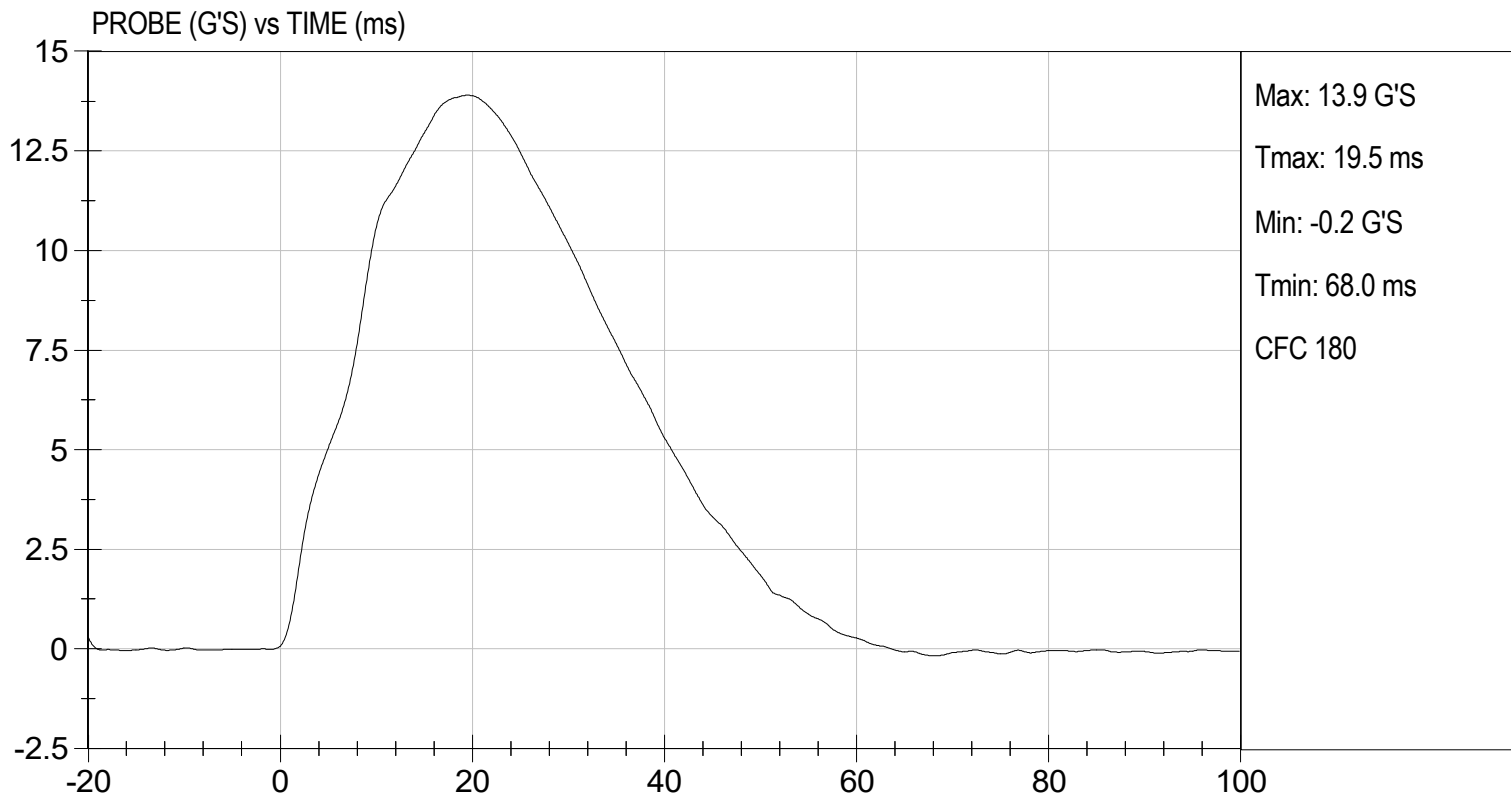
06/06/2024
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 06/06/2024
TEST #: D241376

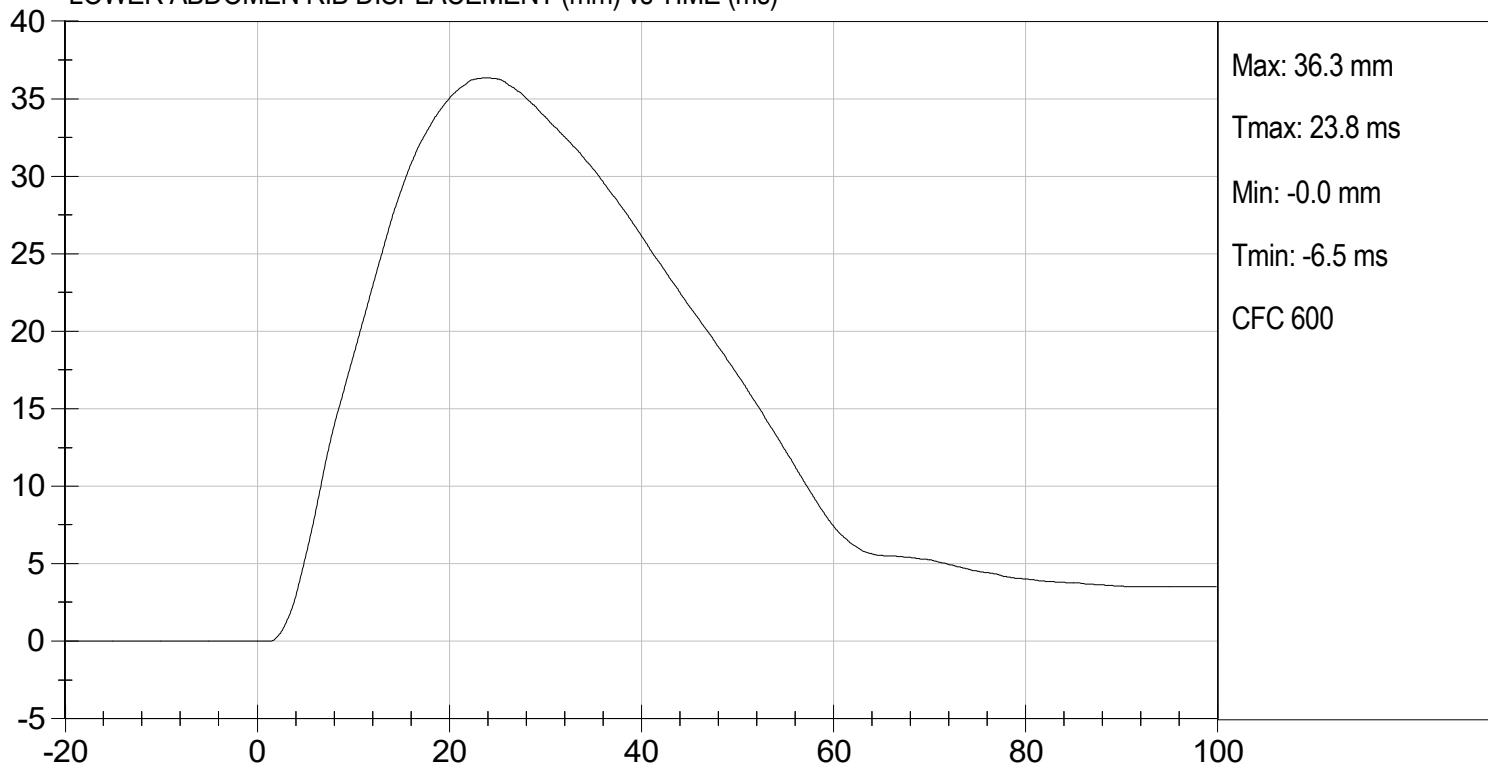




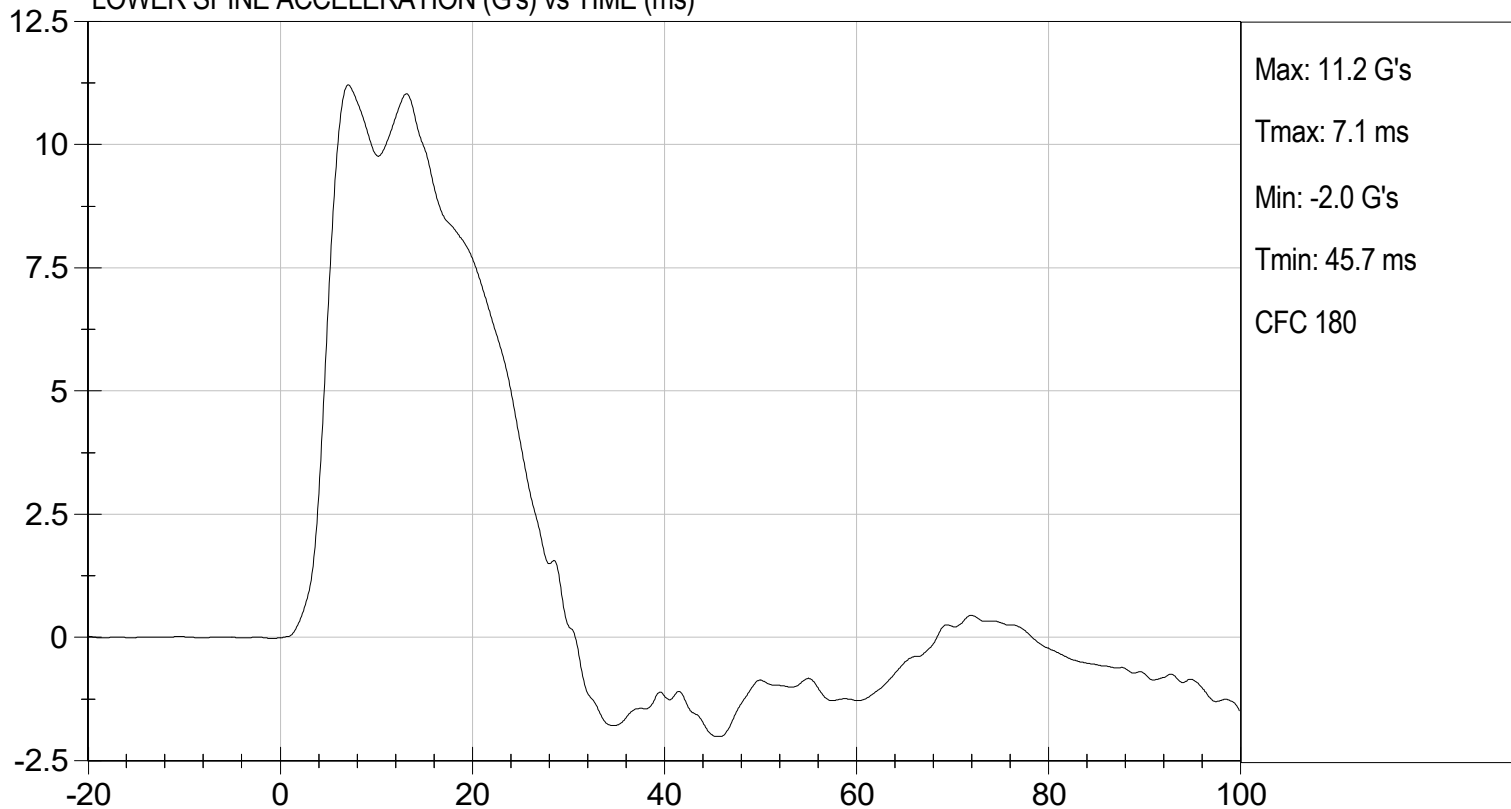
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 06/06/2024
TEST #: D241376

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-Its BUILD LEVEL D DUMMY

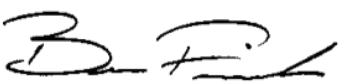
ATD Serial No: 296

Test I.D: D241377

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	40	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	38 to 47	42	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	40.2	Pass
Peak Acetabulum Force	N	3600 to 4300	3,896	Pass
Overall Test Results			Pass	


Laboratory Technician

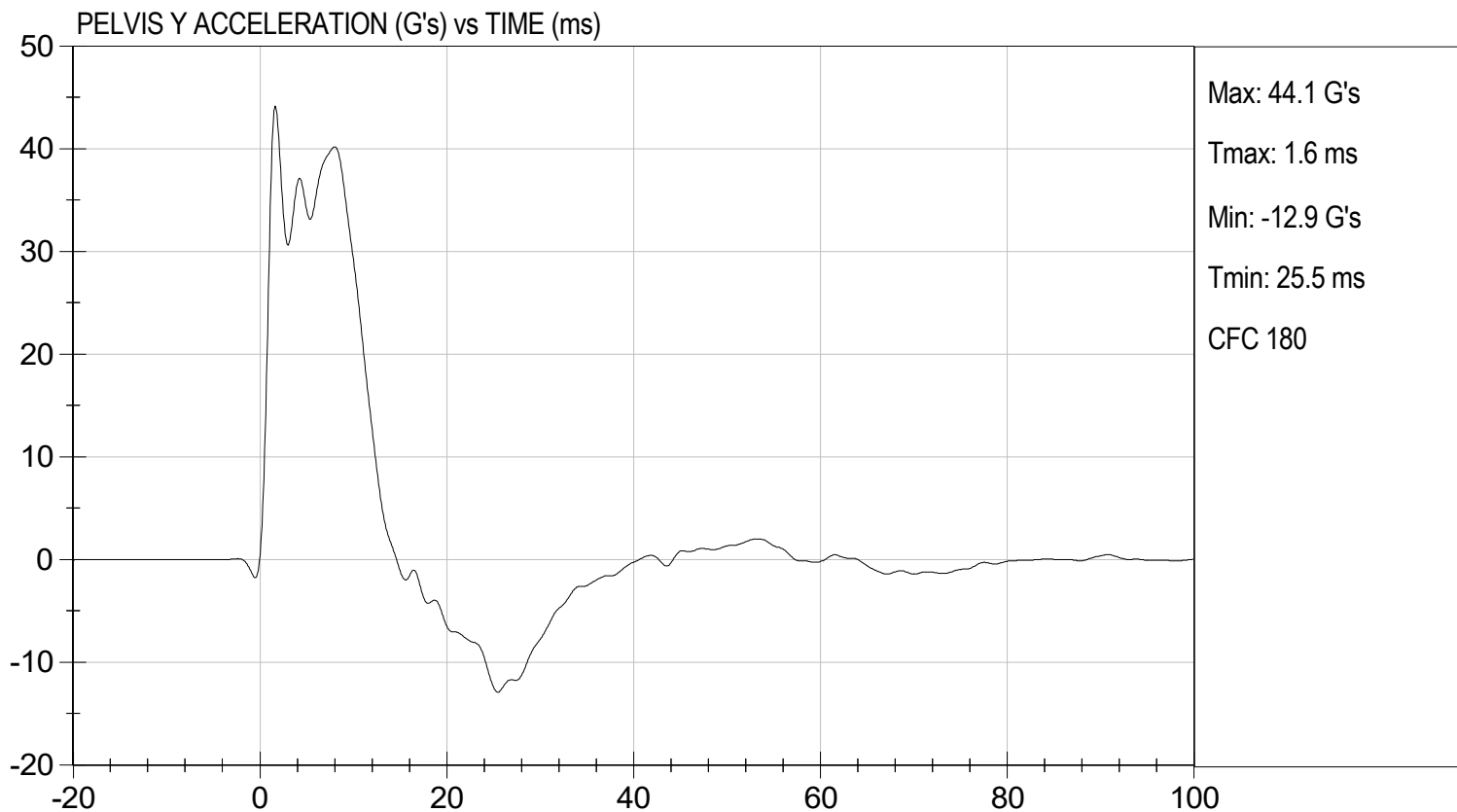
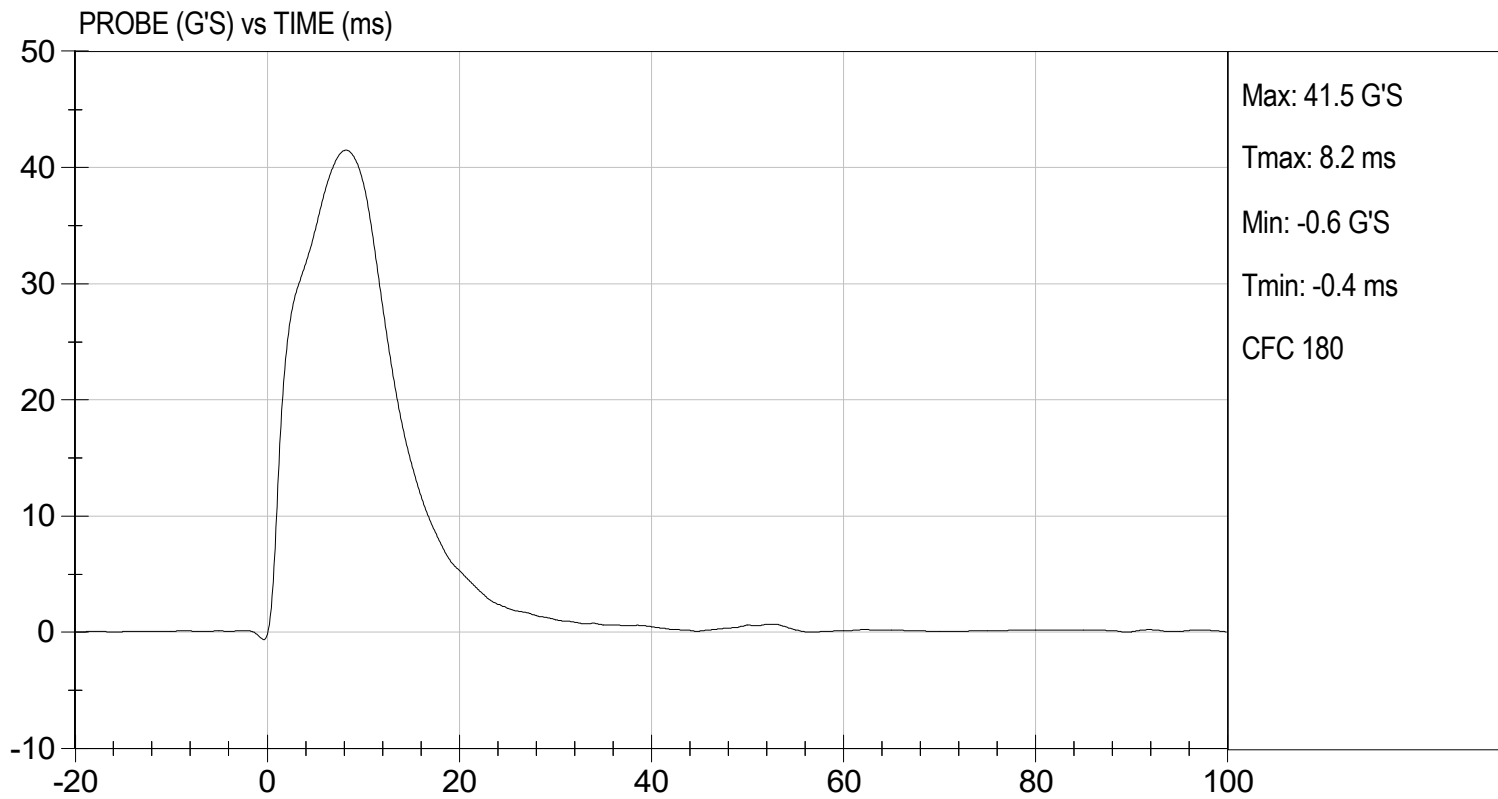
06/06/2024
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

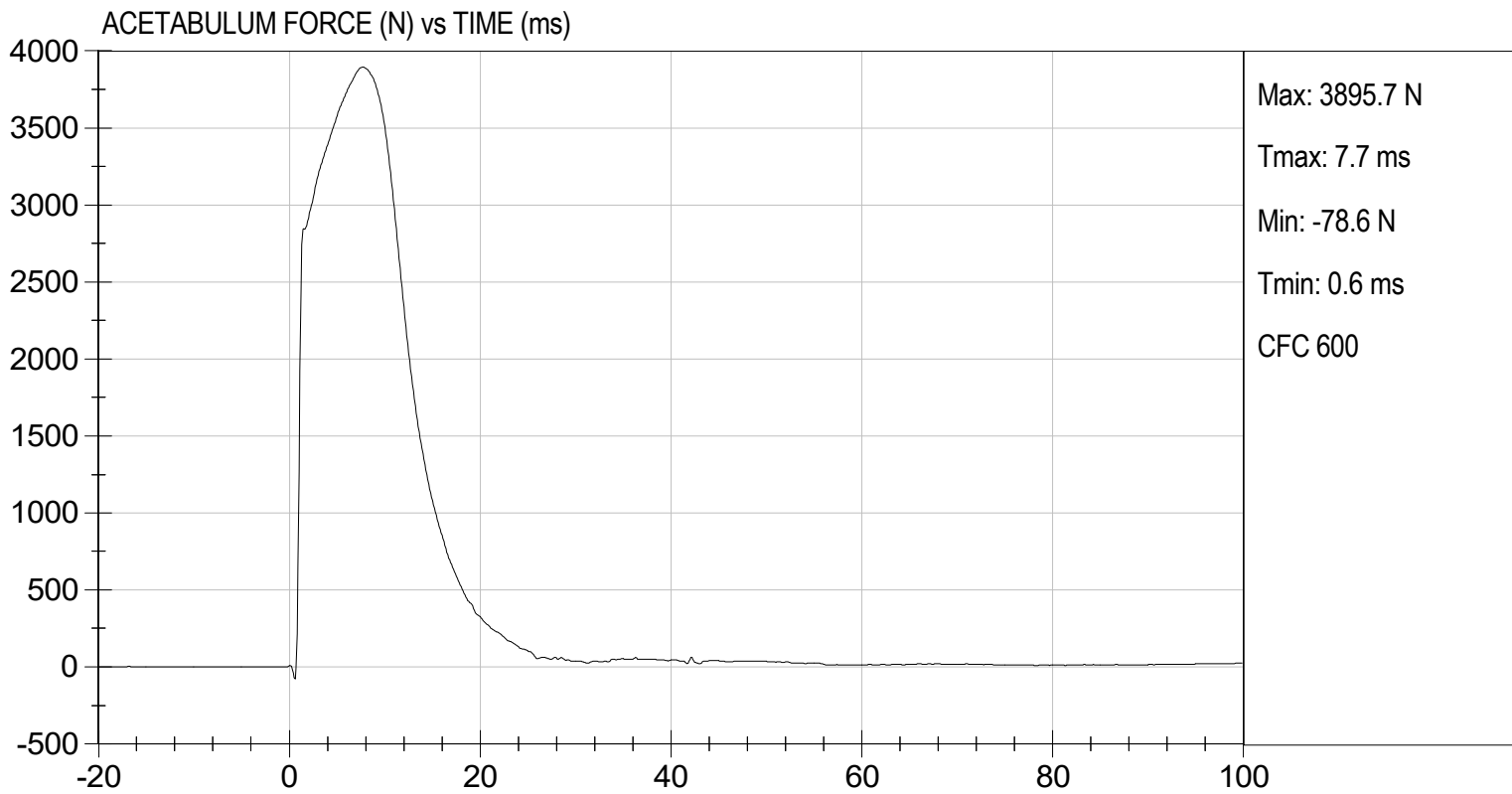
TEST DATE: 06/06/2024
TEST #: D241377





TEST DESC: PELVIS IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 06/06/2024
TEST #: D241377



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

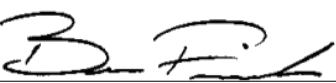
ATD Serial No: 296

Test I.D: D241378

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	41	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	36 to 45	38	Pass
Pelvis Y Acceleration	G's	28 to 39	30	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,302	Pass
			Overall Test Results	Pass


Laboratory Technician

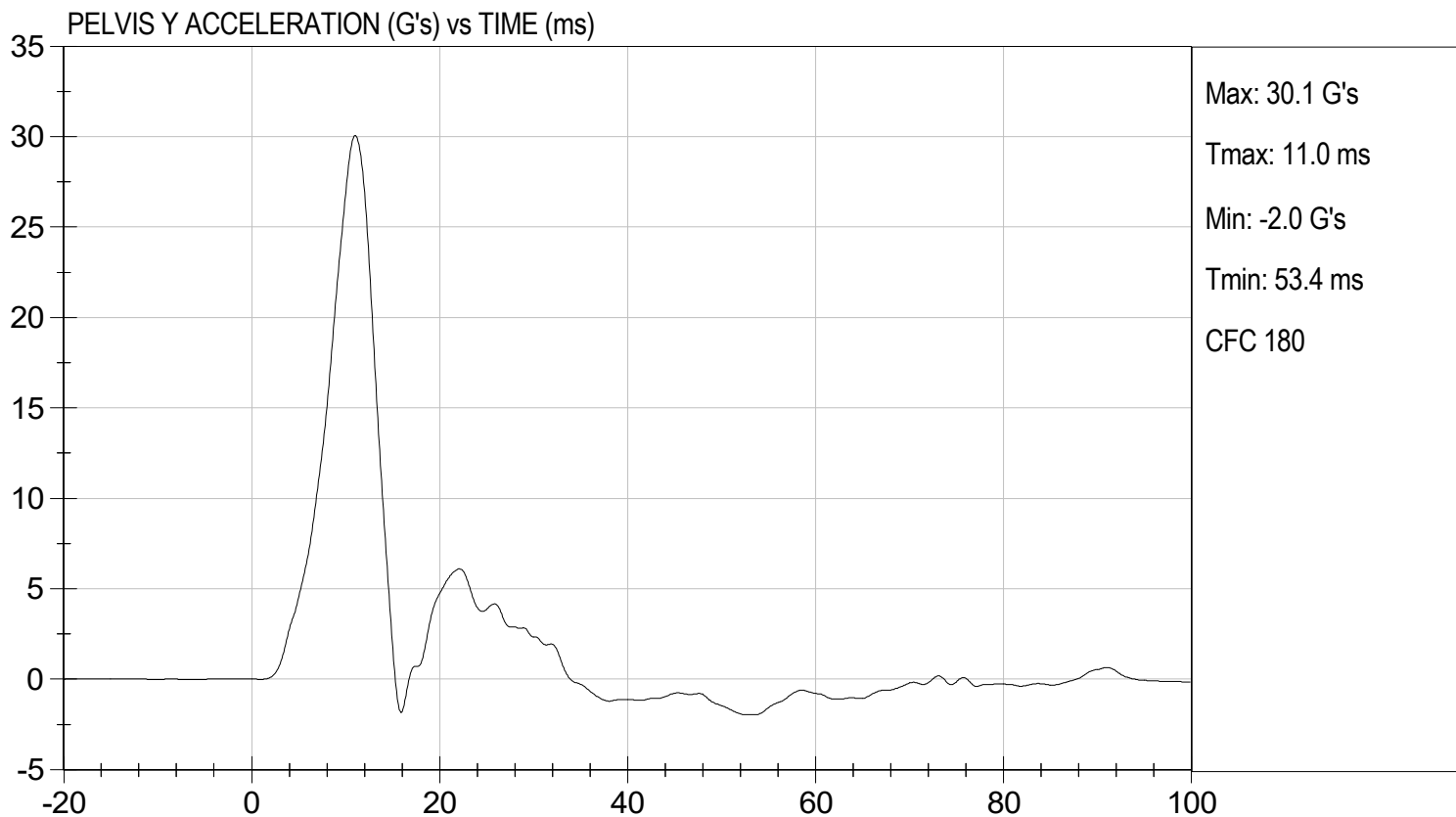
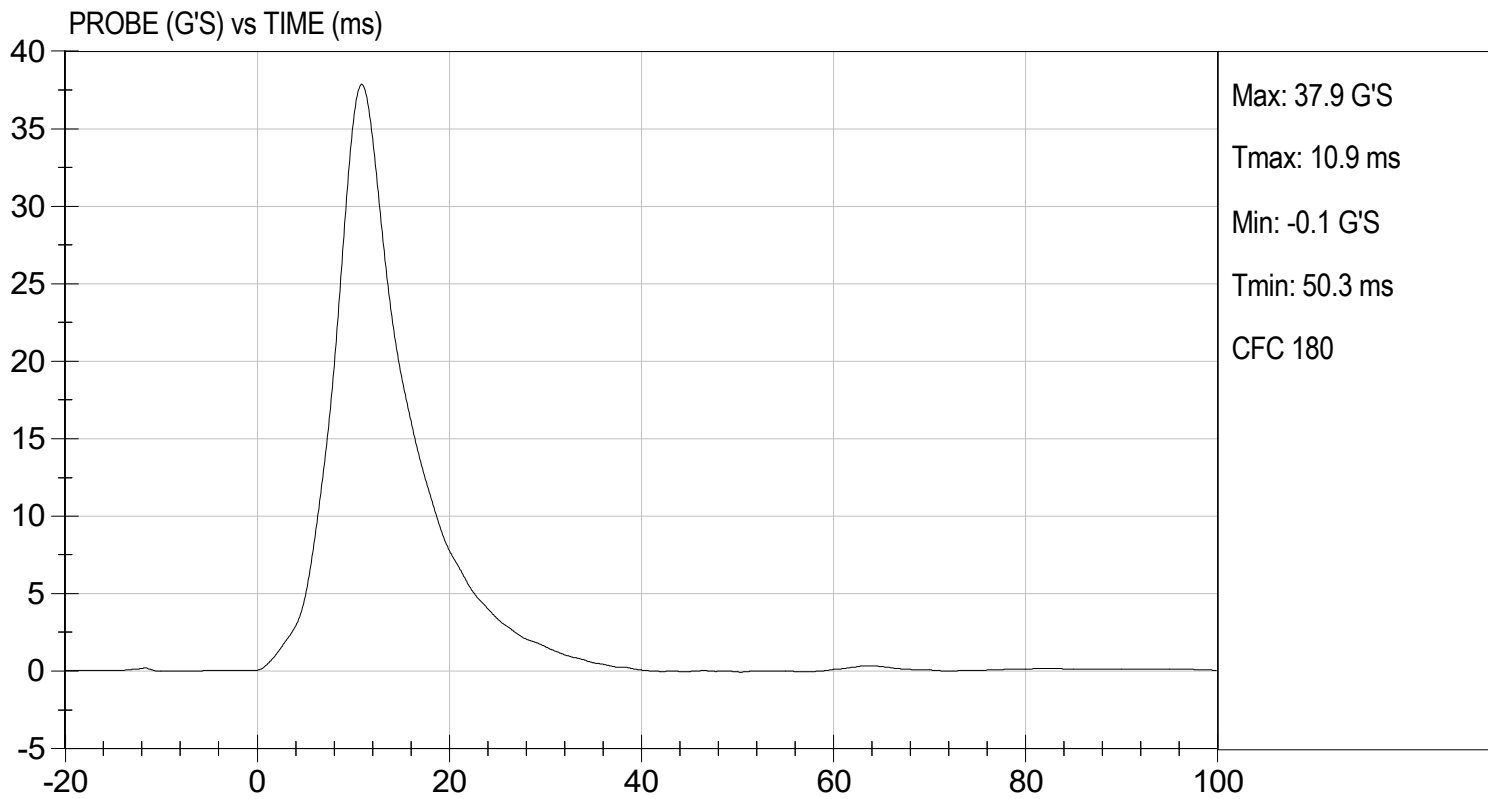
06/06/2024
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

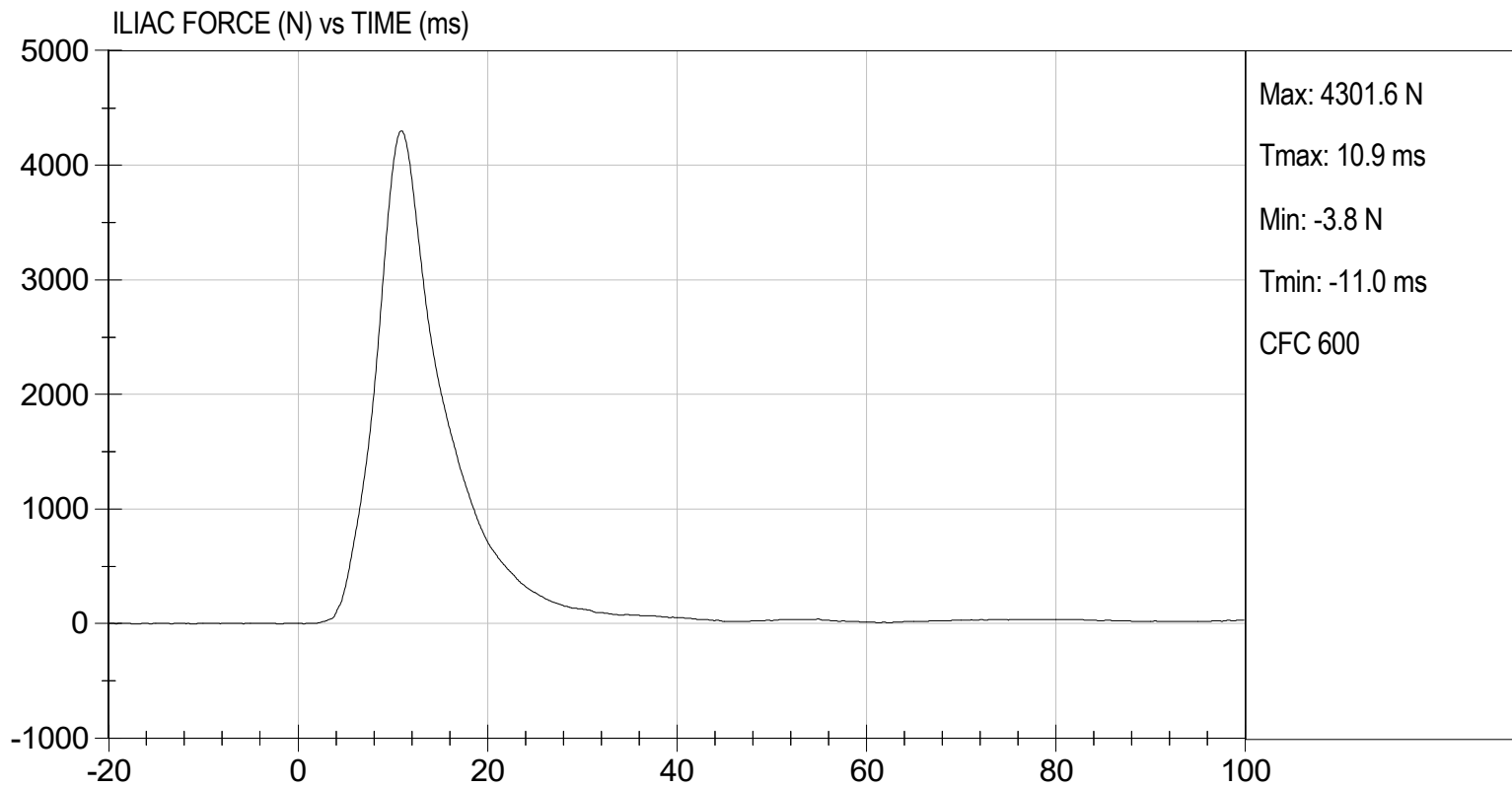
TEST DATE: 06/06/2024
TEST #: D241378





TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 06/06/2024
TEST #: D241378



QUALIFICATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

SID-IIsD External Measurements
SN: 296

No.	Name	Spec. (mm)	Result	Pass/Fail
A	Sitting Height	772 - 788	784	Pass
B	Shoulder Pivot Height	437 - 453	442	Pass
C	H-point Height	79 - 89	83	Pass
D	H-point from Seatback	141 - 151	145	Pass
E	Shoulder Pivot from Backline	97 - 107	99	Pass
F	Thigh Clearance	119 -135	121	Pass
G	Head Breadth	140 - 148	142	Pass
H	Head Back from Backline	40 - 46	45	Pass
I	Head Depth	178 - 188	180	Pass
J	Head Circumference	541 - 551	548	Pass
K	Buttock to Knee Length	514 - 540	535	Pass
L	Popliteal Height	343 - 369	358	Pass
M	Knee Pivot to Floor Height	392 - 409	404	Pass
N	Buttock Popliteal Length	416 - 442	435	Pass
O	Chest Depth w/o Jacket	195 - 211	206	Pass
P	Foot Length	216 - 232	219	Pass
Q	Hip Breadth (w/ pelvic plugs)	313 - 323	316	Pass
R	Arm Length	249 - 259	250	Pass
S	Knee Joint to Seatback	477 - 493	481	Pass
V	Shoulder Width	341 - 357	346	Pass
W	Foot Width	78 - 94	85	Pass
Y	Chest Circumference w/ jacket	851 - 881	870	Pass
Z	Waist Circumference	761 - 791	772	Pass

MGA RESEARCH CORPORATION
HEAD DROP TEST
SID-IIs BUILD LEVEL D DUMMY

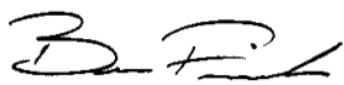
ATD Serial No: 296

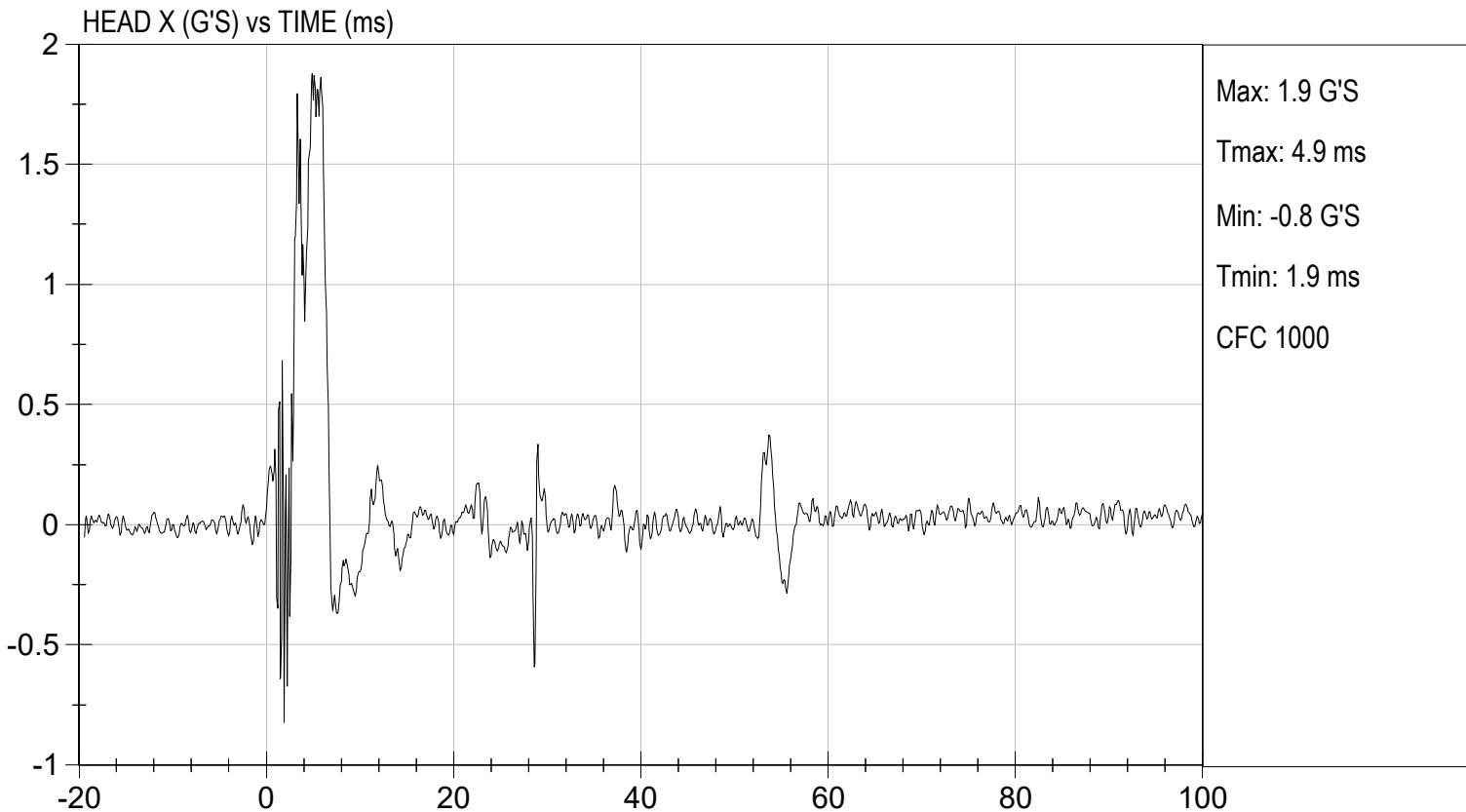
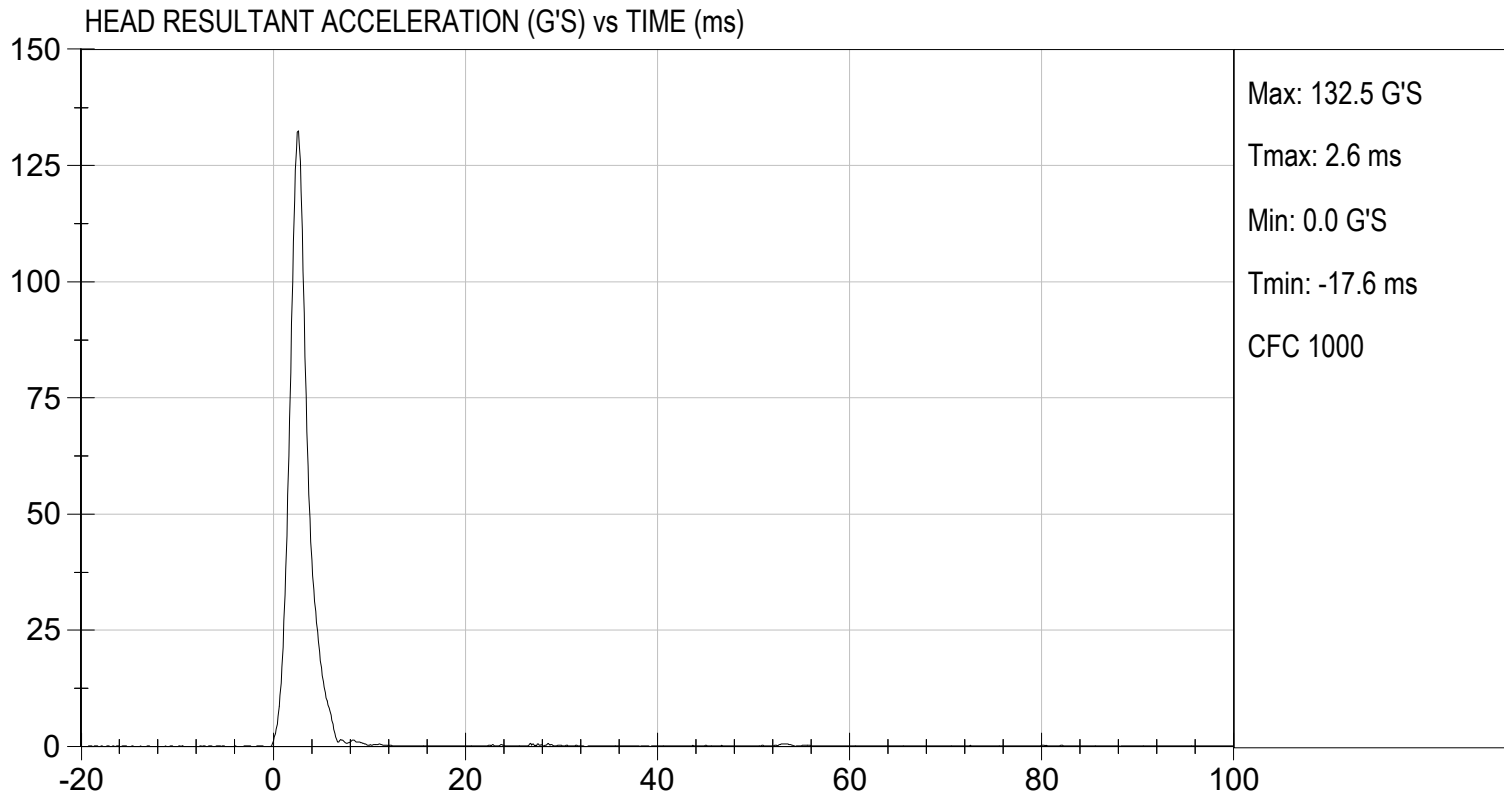
Test ID: D241511

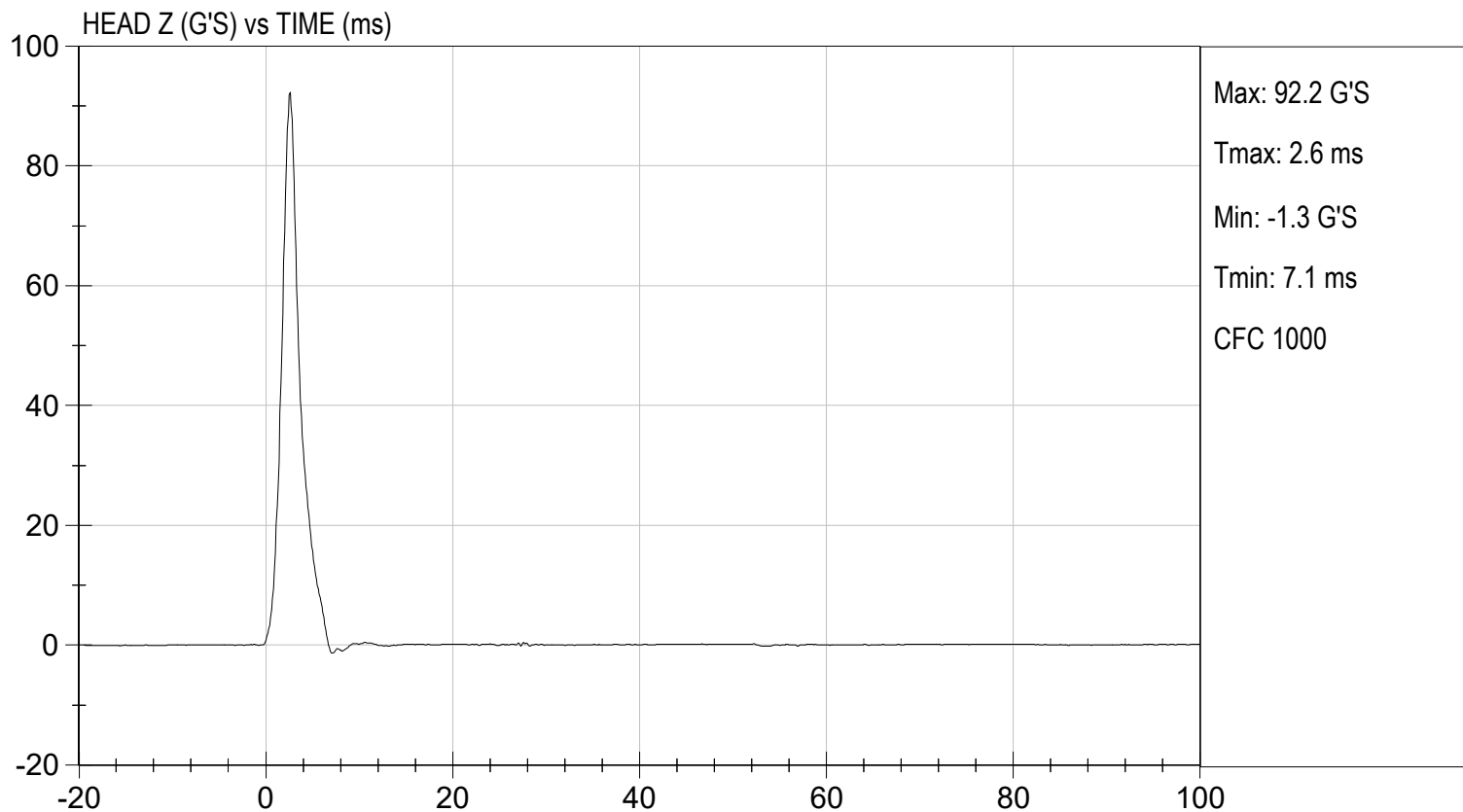
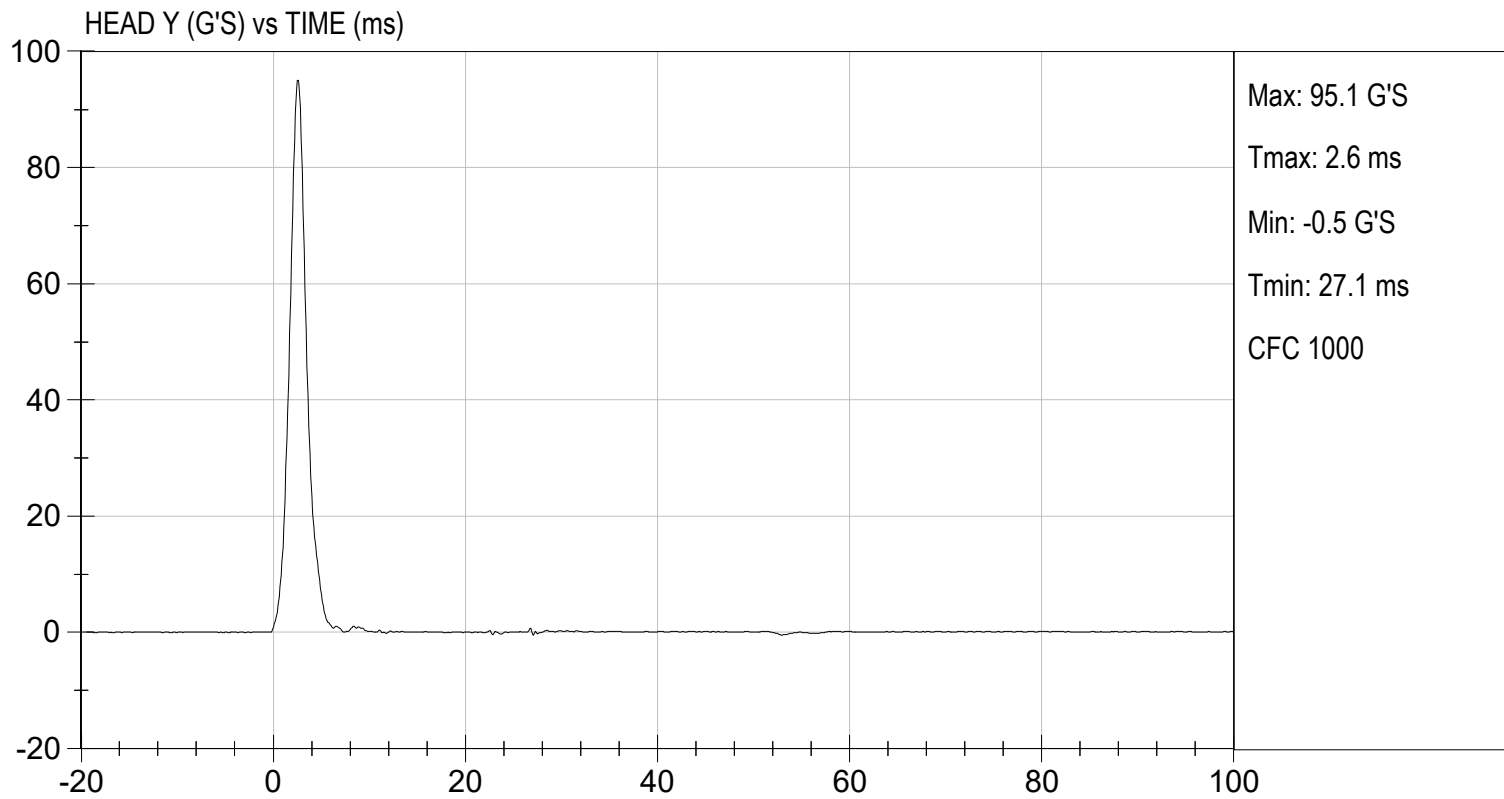
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	48	Pass
Peak Resultant Acceleration	G's	115 to 137	132	Pass
Peak Longitudinal Acceleration	G's	+/- 15	1.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	<15%	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

06/20/2024
Test Date


Approved By





MGA RESEARCH CORPORATION
LATERAL NECK PENDULUM TEST
SID-Its BUILD LEVEL D DUMMY

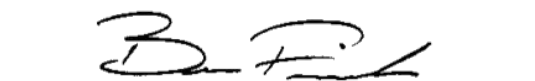
ATD Serial No: 296

Test I.D: D241512

Tested Parameter		Units	Specification	Result	Pass/Fail
Temperature		deg C	20.6 to 22.2	21.4	Pass
Humidity		%	10 to 70	48	Pass
Impact Velocity		m/s	5.51 to 5.63	5.53	Pass
Pendulum Velocity	10 ms	m/s	2.20 to 2.80	2.45	Pass
	15 ms	m/s	3.30 to 4.10	3.68	Pass
	20 ms	m/s	4.40 to 5.40	5.31	Pass
	25 ms	m/s	5.40 to 6.10	5.80	Pass
	25-100 ms	m/s	5.50 to 6.20	5.84	Pass
Maximum D-Plane Rotation		deg	71 to 81	71	Pass
Time of Maximum D-Plane Rotation		ms	50 to 70	63	Pass
Maximum Occipital Condyle Moment		Nm	-44 to -36	-38	Pass
Time of Moment Decay to 0 Nm		ms	102 to 126	119	Pass
Overall Test Results				Pass	


Laboratory Technician

06/20/2024
Test Date

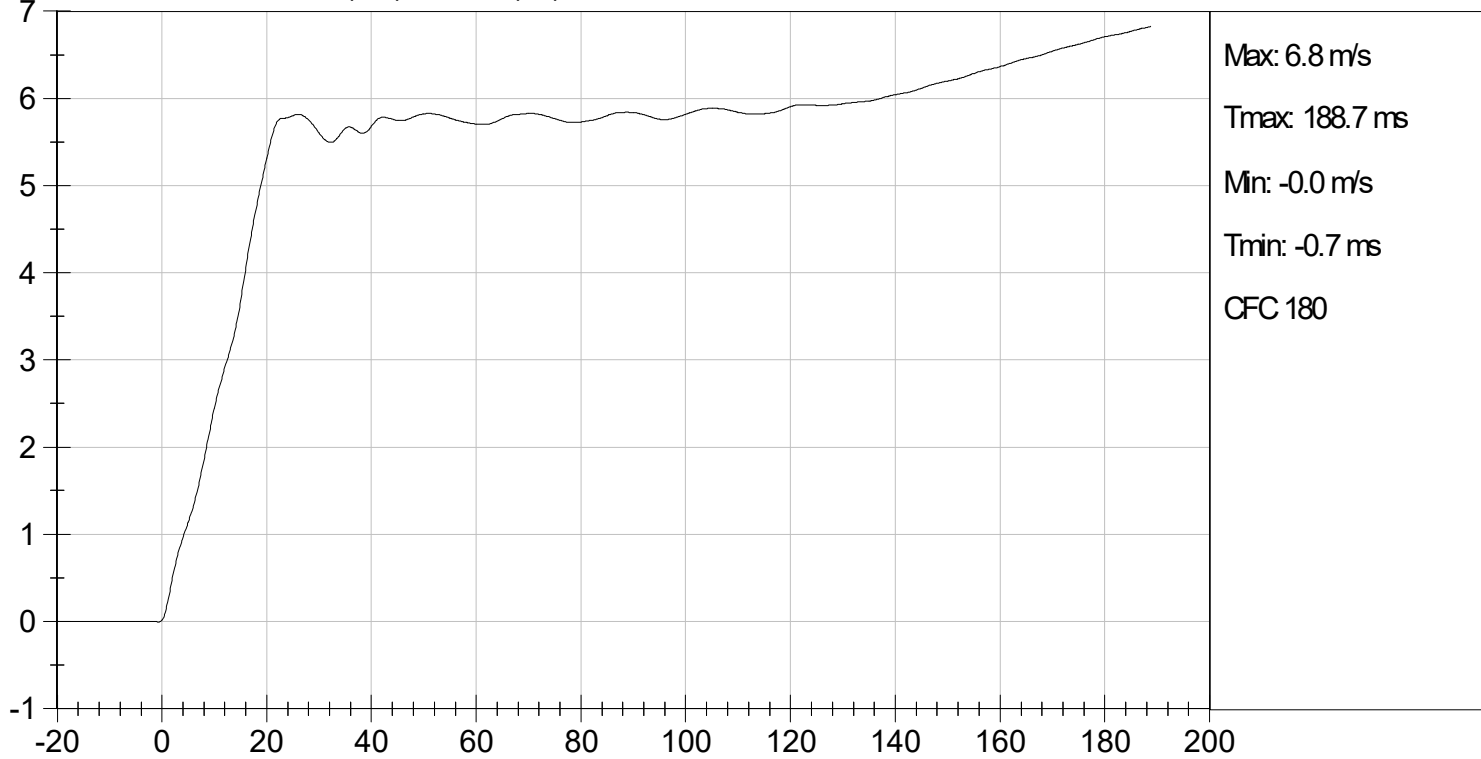

Approved By



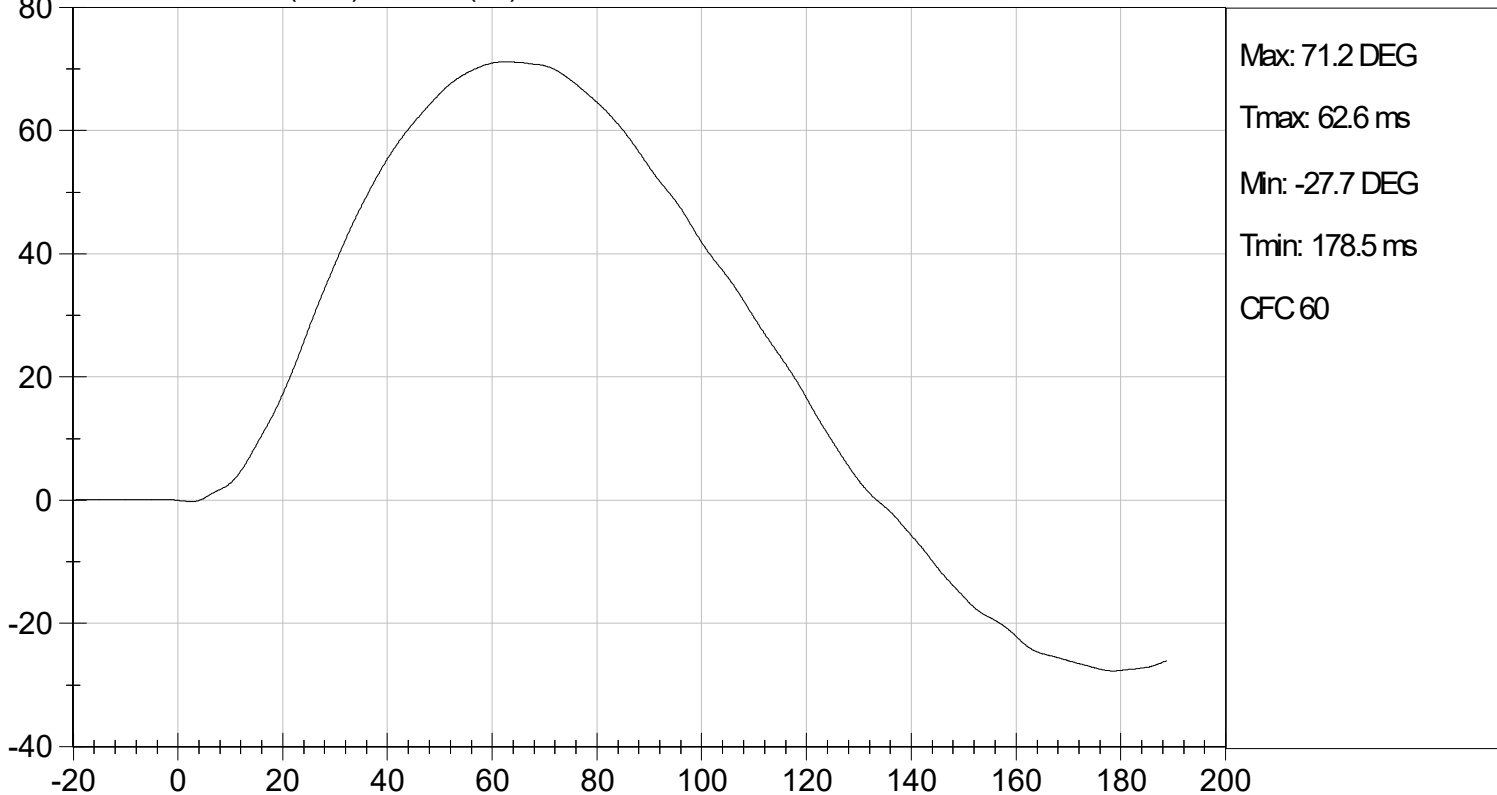
TEST DESC: NECK BENDING
VELOCITY: 18.15 ft/s, 5.53 m/s

TEST DATE: 06/20/2024
TEST #: D241512

PENDULUM VELOCITY (m/s) vs TIME (ms)



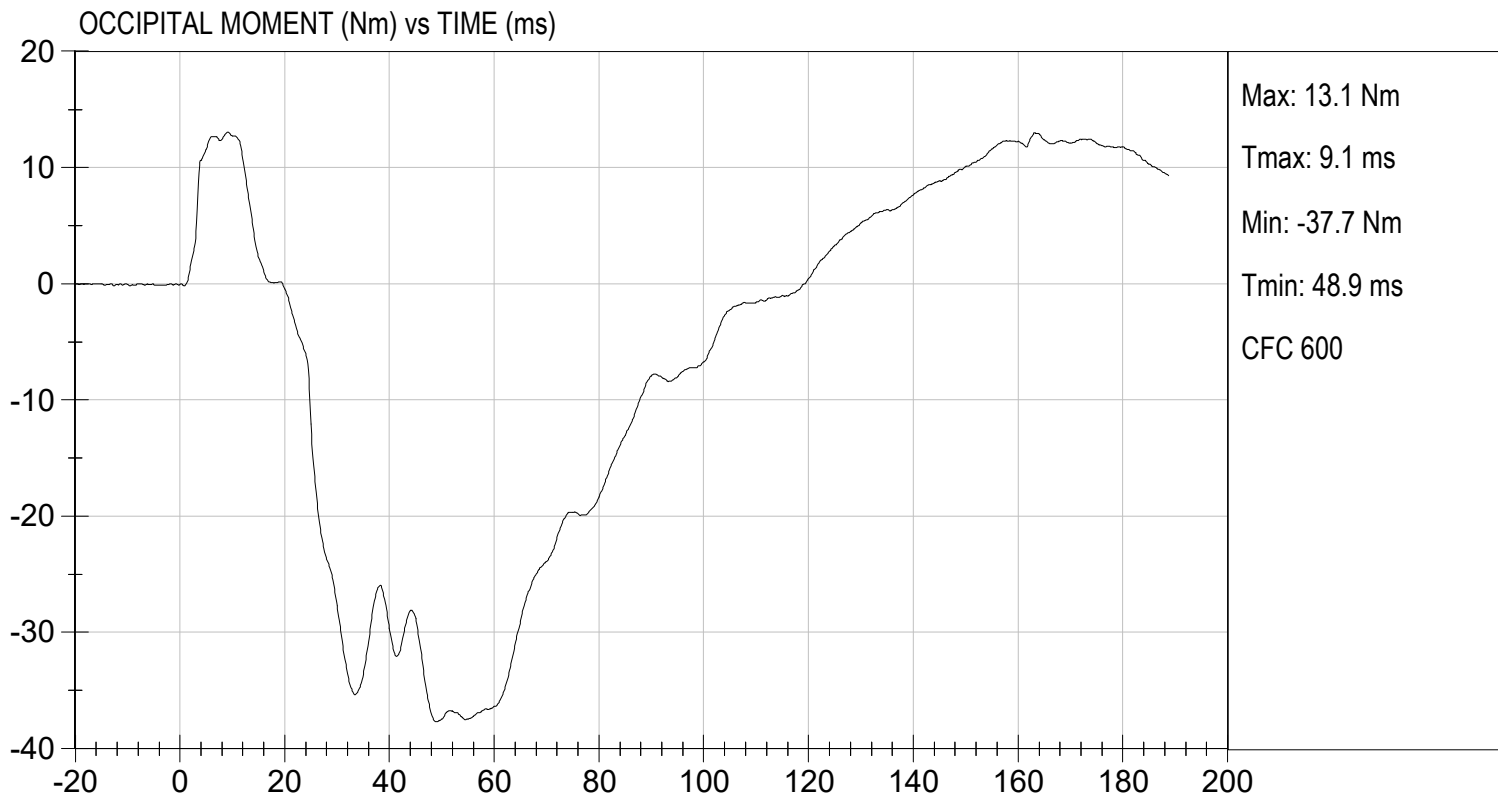
FLEXION ANGLE (DEG) vs TIME (ms)





TEST DESC: NECK BENDING
VELOCITY: 18.15 ft/s, 5.53 m/s

TEST DATE: 06/20/2024
TEST #: D241512



MGA RESEARCH CORPORATION
SHOULDER IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

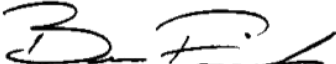
ATD Serial No: 296

Test ID: D241513

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	13 to 18	15	Pass
Shoulder Displacement	mm	28 to 37	30	Pass
Upper Spine (T1) Y Acceleration	G's	17 to 22	19	Pass
			Overall Test Results	Pass


Laboratory Technician

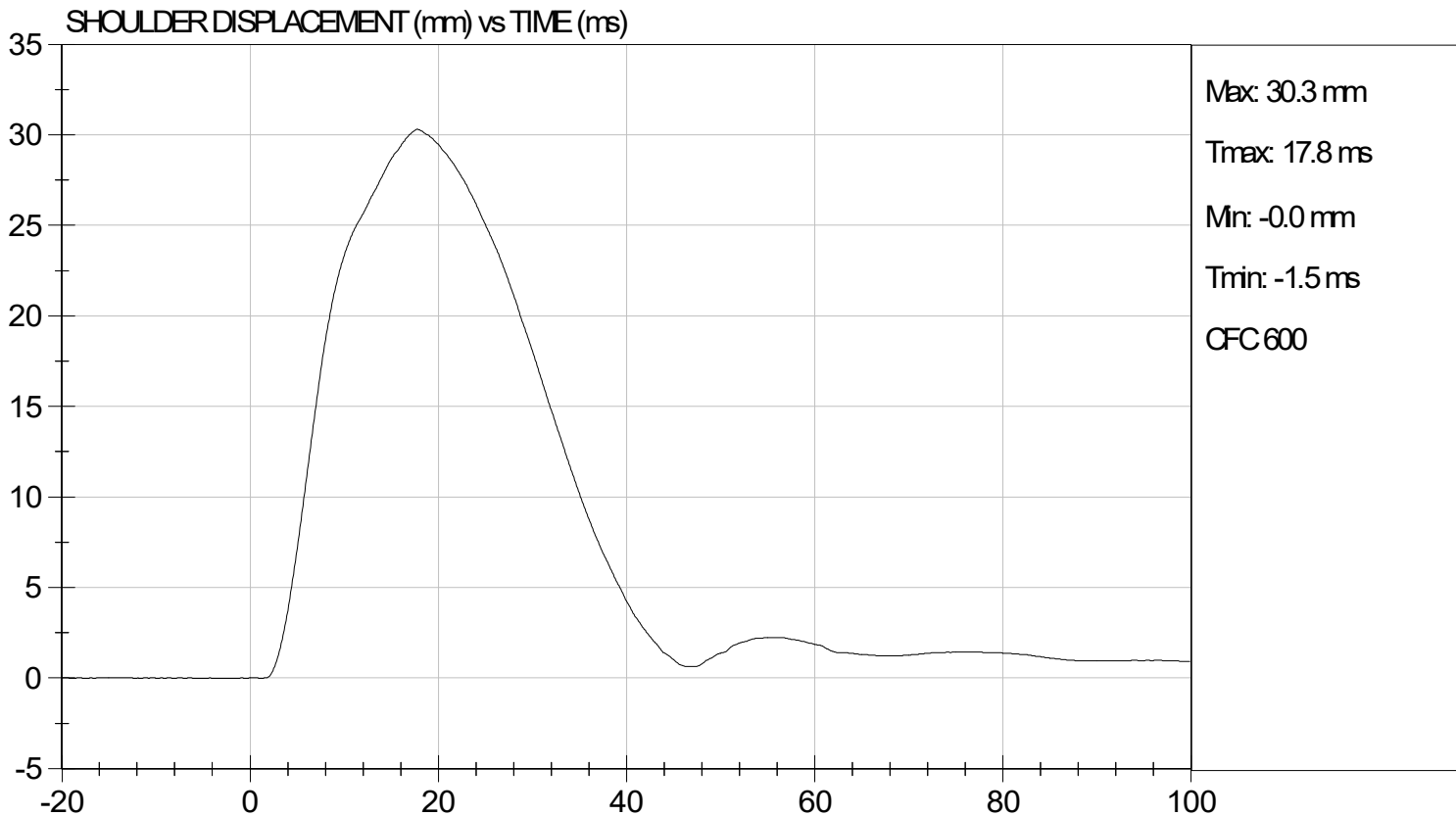
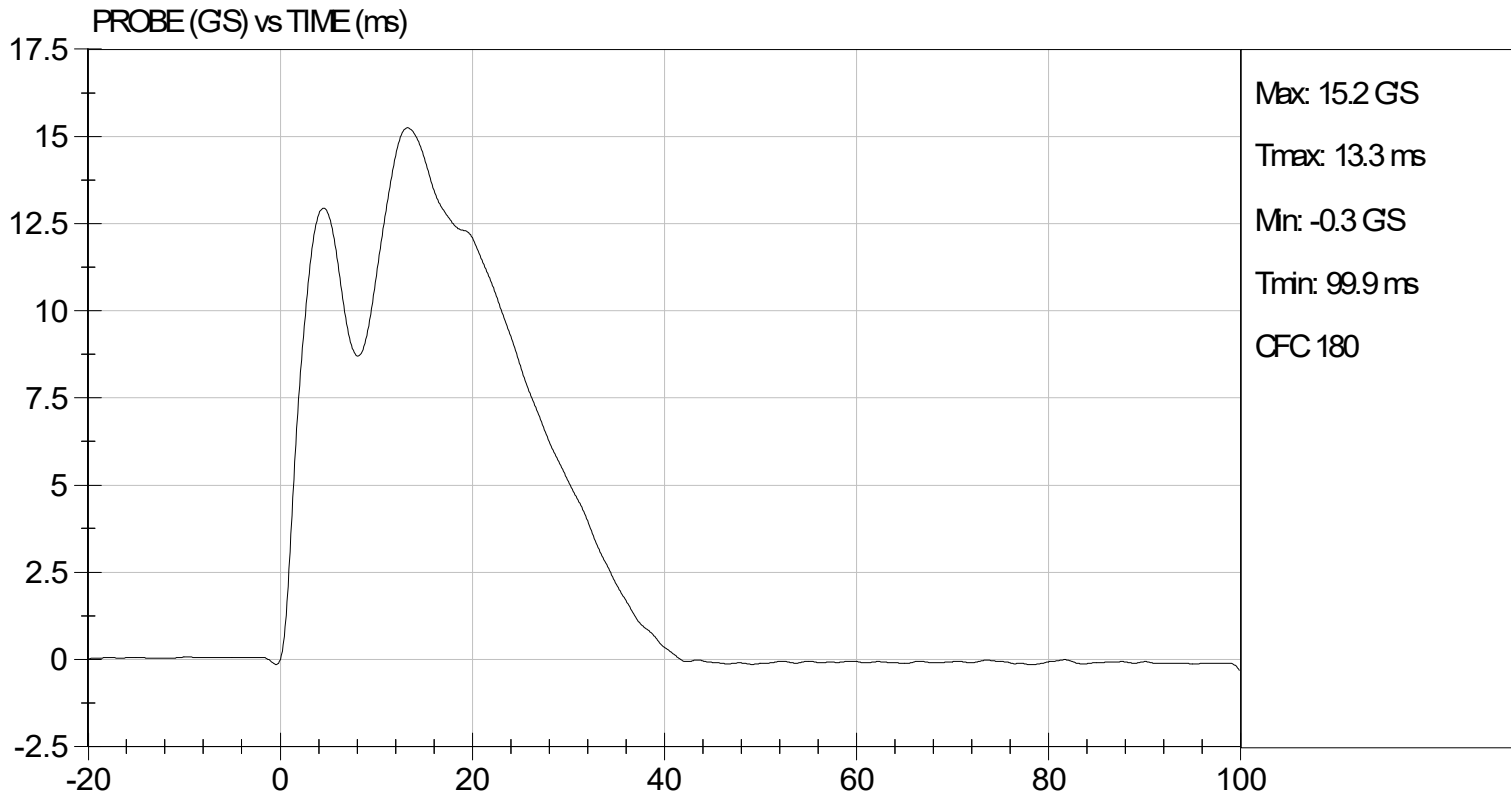
06/20/2024
Test Date


Approved By



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

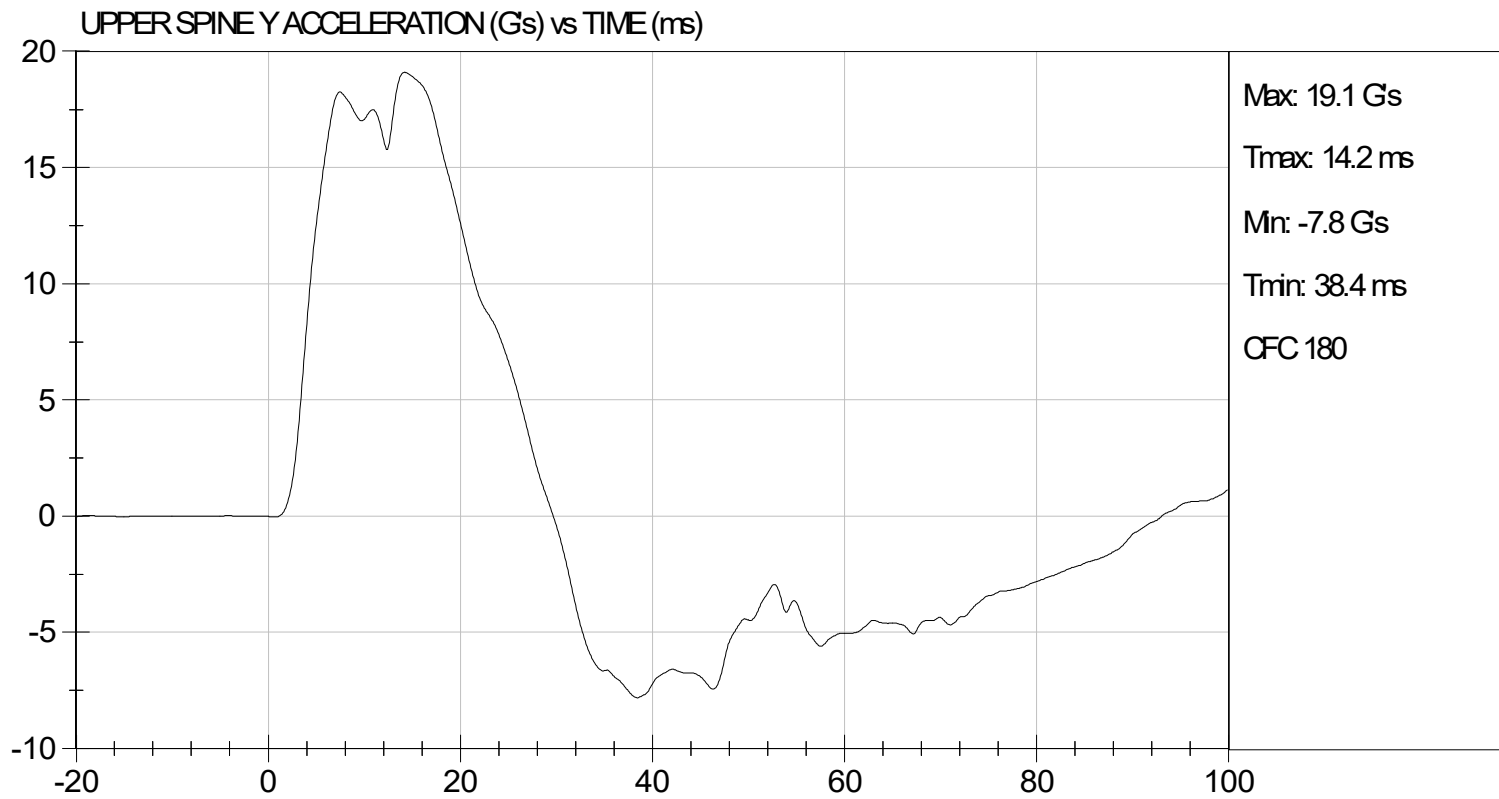
TEST DATE: 06/20/2024
TEST #: D241513





TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 06/20/2024
TEST #: D241513



MGA RESEARCH CORPORATION
THORAX (WITH ARM) IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

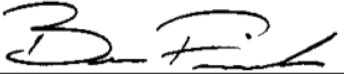
ATD Serial No: 296

Test I.D: D241514

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	6.60 to 6.80	6.77	Pass
Maximum Probe Acceleration	G's	30 to 36	34	Pass
Shoulder Displacement	mm	31 to 40	36	Pass
Upper Rib Displacement	mm	25 to 32	27	Pass
Middle Rib Displacement	mm	30 to 36	30	Pass
Lower Rib Displacement	mm	32 to 38	32	Pass
Upper Spine (T1) Y Acceleration	G's	34 to 43	38	Pass
Lower Spine (T12) Y Acceleration	G's	29 to 37	35	Pass
Overall Test Results				Pass


Laboratory Technician

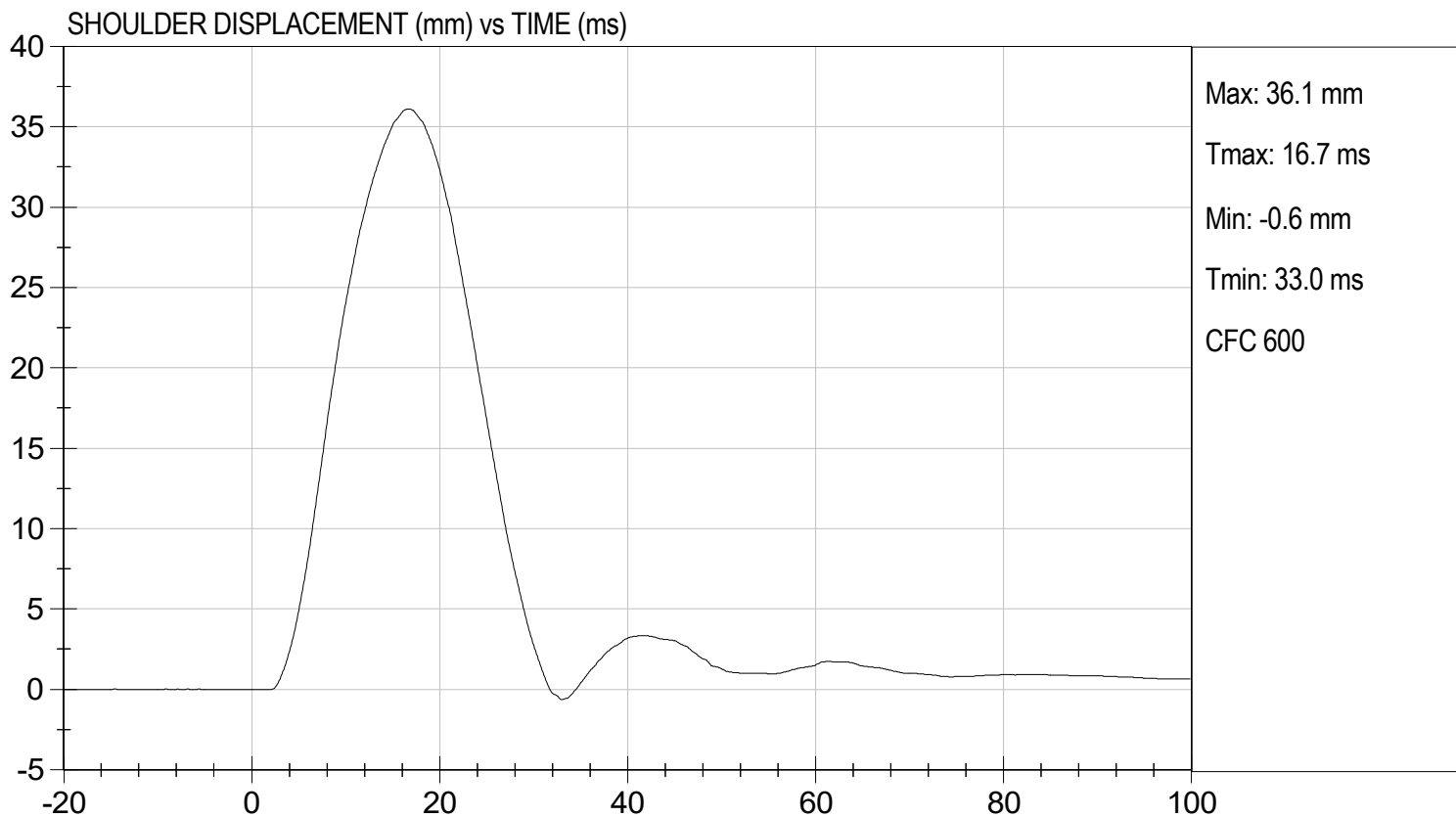
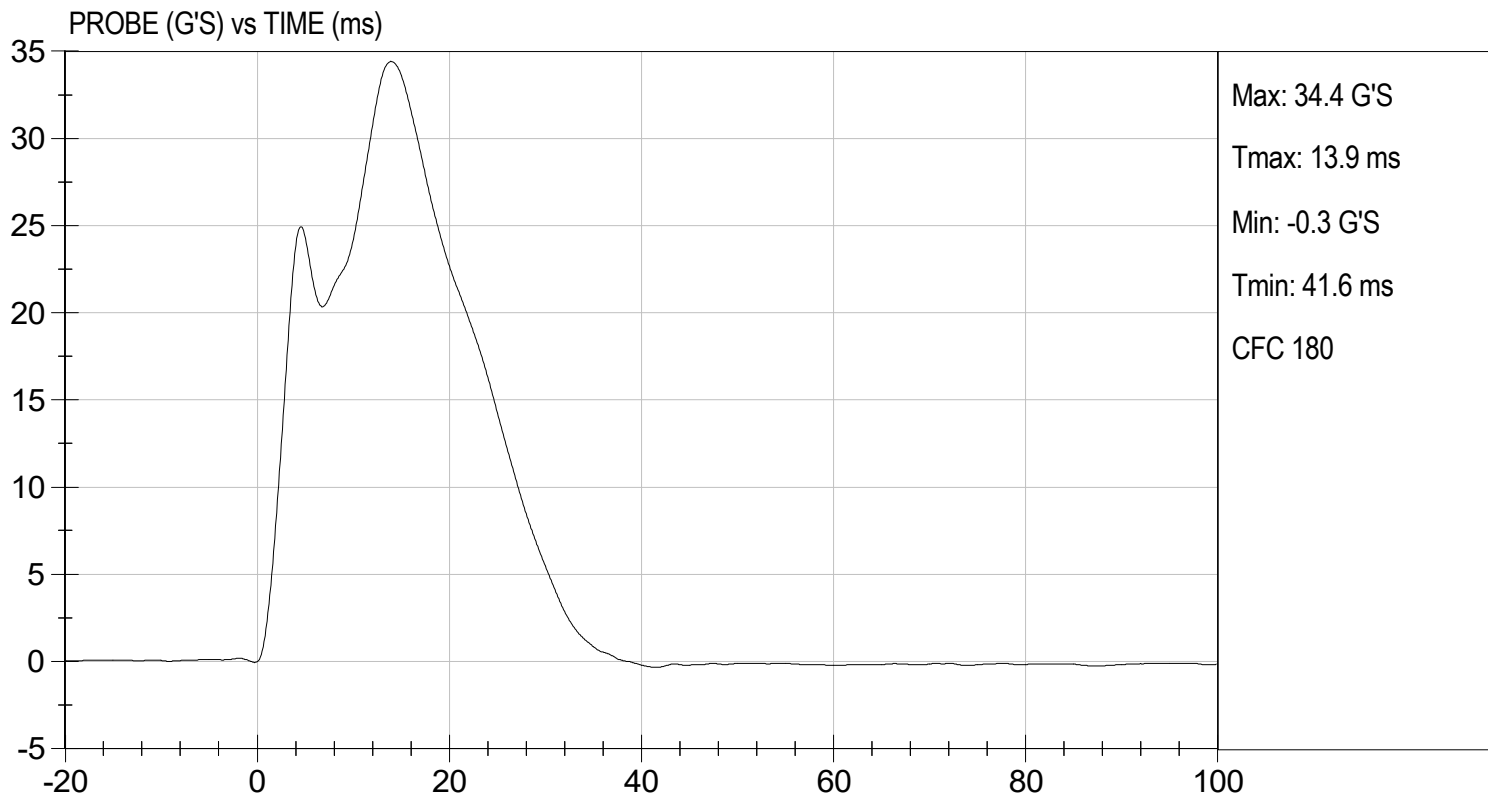
06/20/2024
Test Date

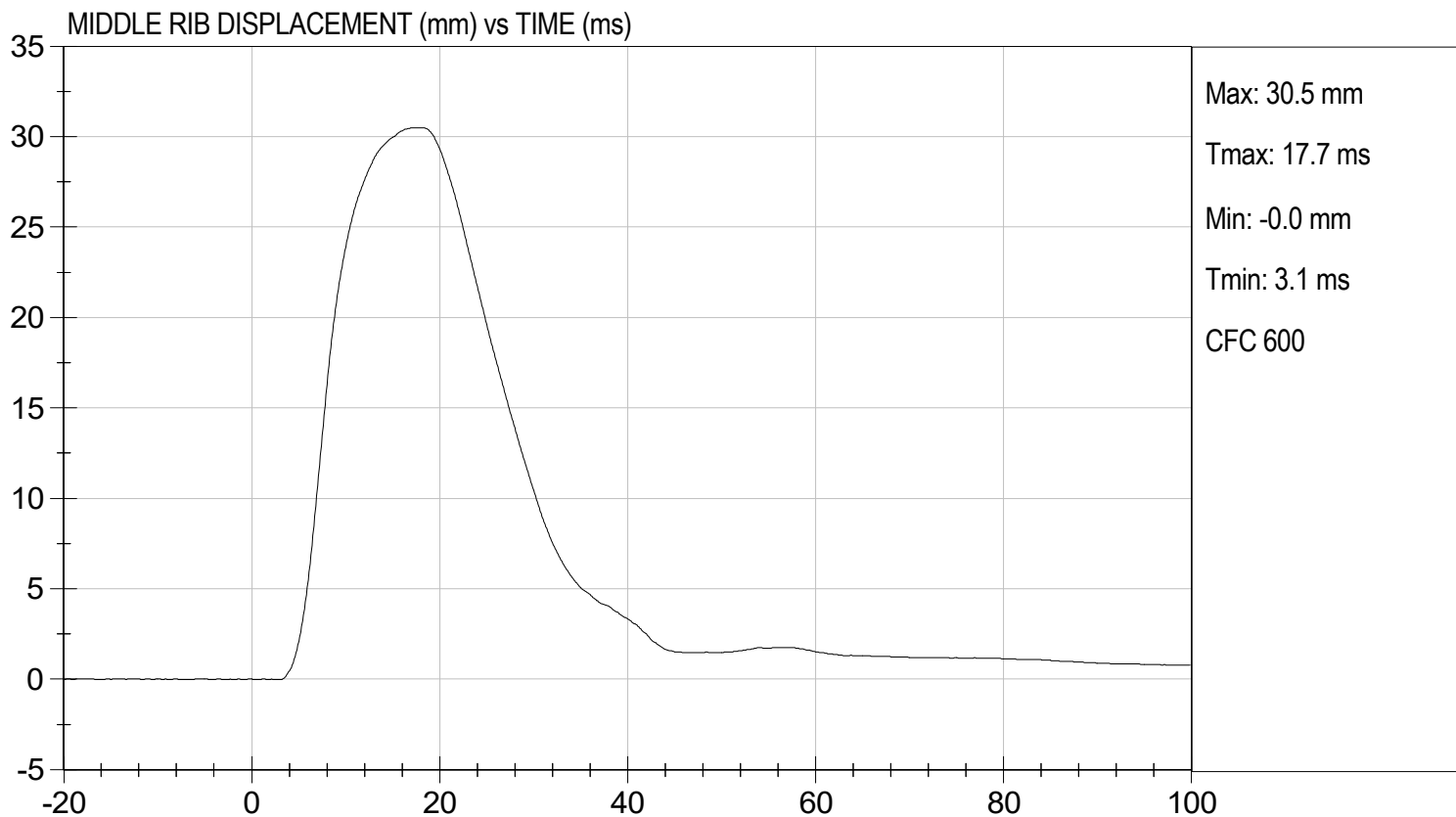
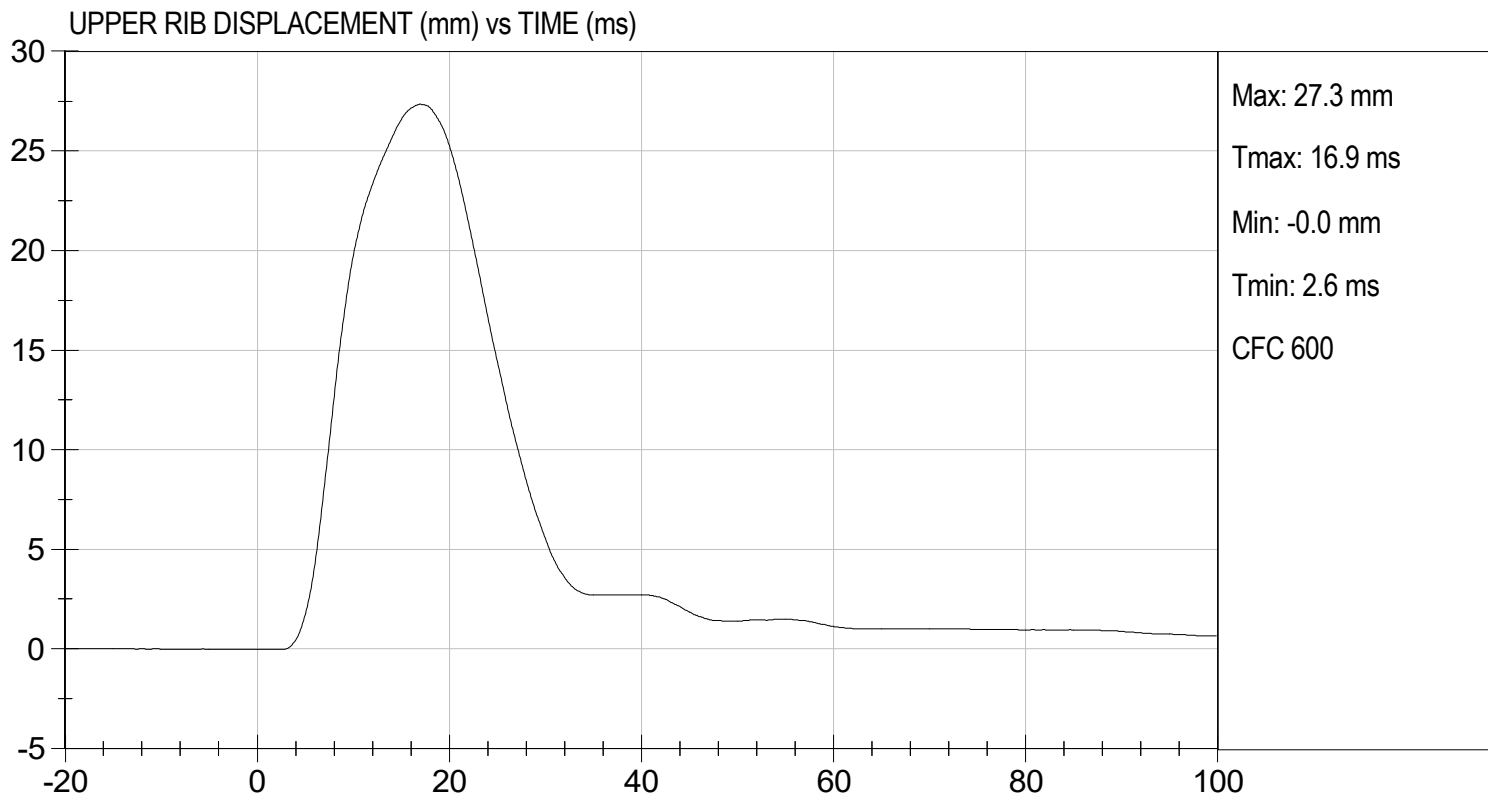

Approved By



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 06/20/2024
TEST #: D241514

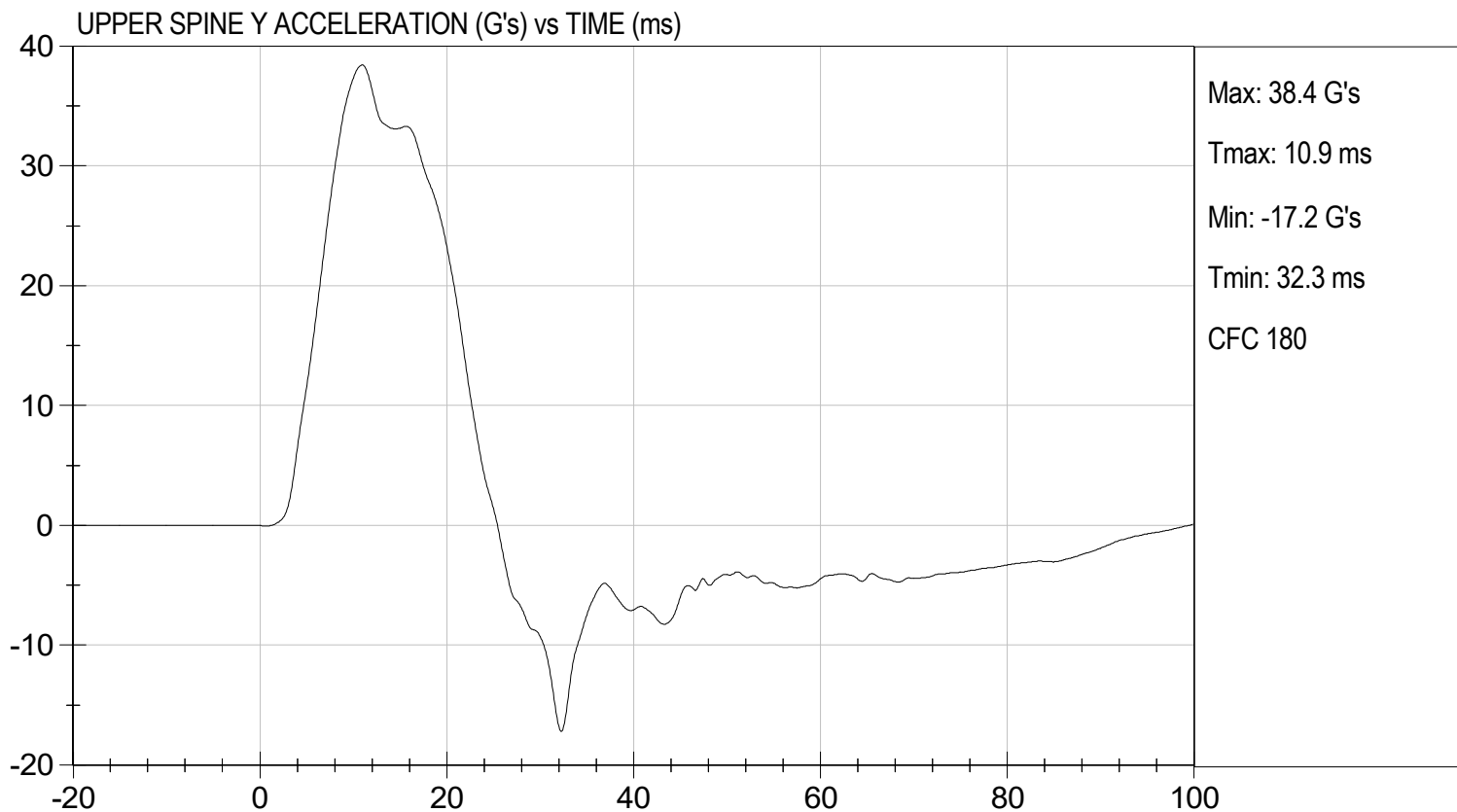
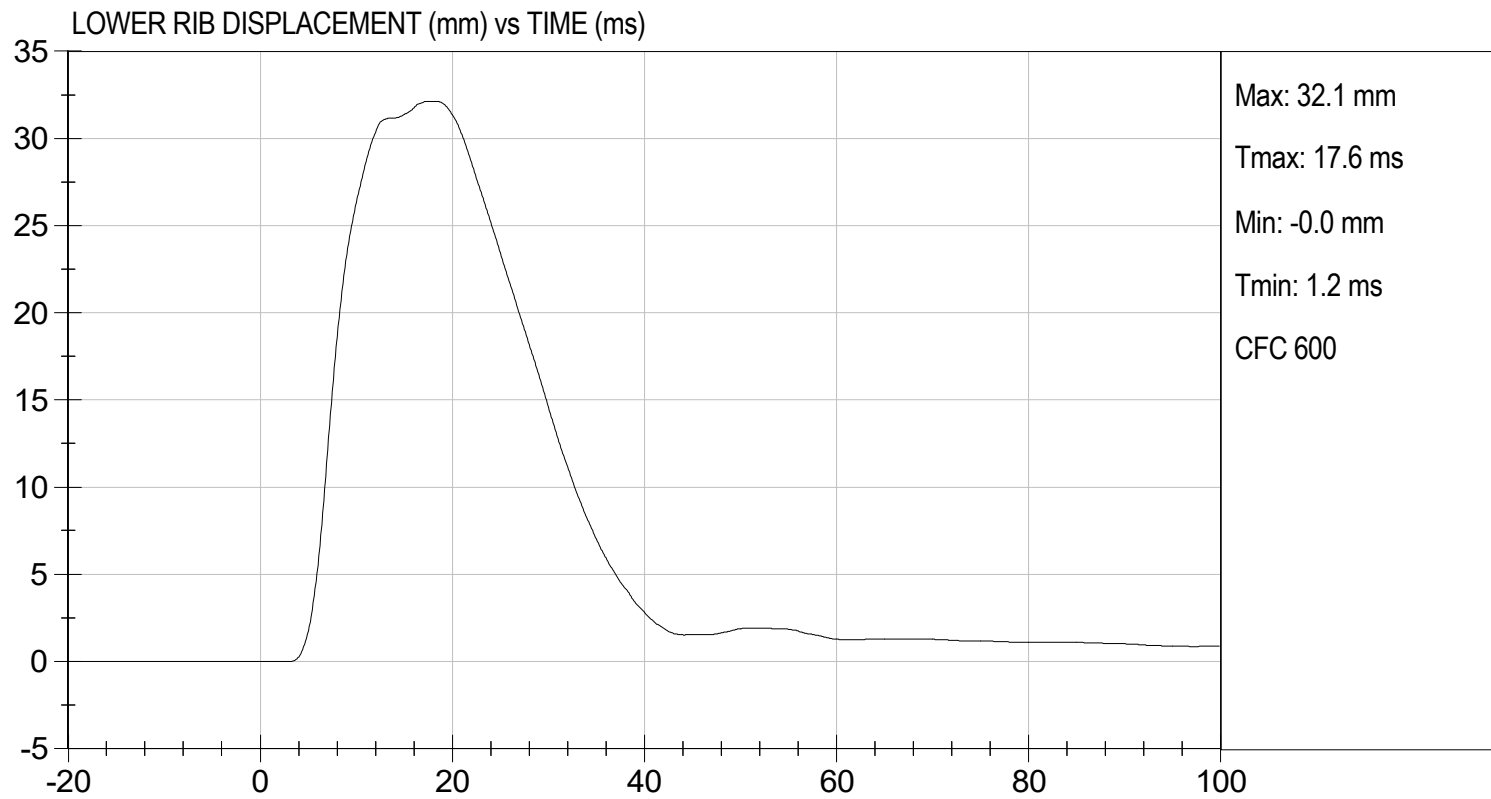






TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

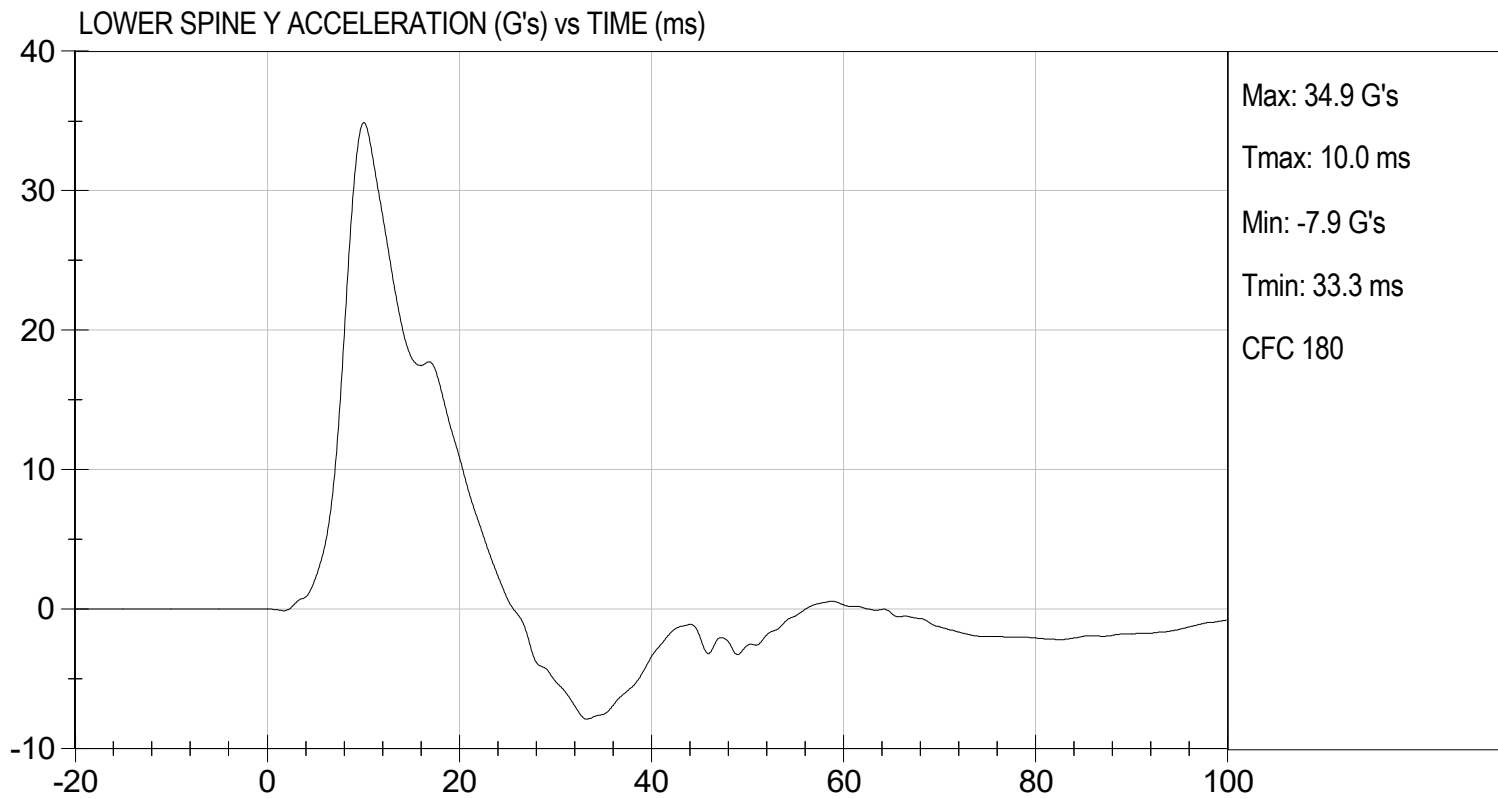
TEST DATE: 06/20/2024
TEST #: D241514





TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 06/20/2024
TEST #: D241514



MGA RESEARCH CORPORATION
THORAX (WITHOUT ARM) IMPACT TEST
SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 296

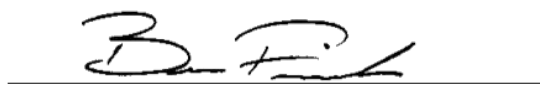
Test I.D: D241515

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.30	Pass
Maximum Probe Acceleration	G's	14 to 18	16	Pass
Upper Rib Displacement	mm	32 to 40	38	Pass
Middle Rib Displacement	mm	39 to 45	43	Pass
Lower Rib Displacement	mm	35 to 43	40	Pass
Upper Spine (T1) Y Acceleration	G's	13 to 17	15	Pass
Lower Spine (T12) Y Acceleration	G's	7 to 11	10	Pass
			Overall Test Results	Pass


Laboratory Technician

06/20/2024

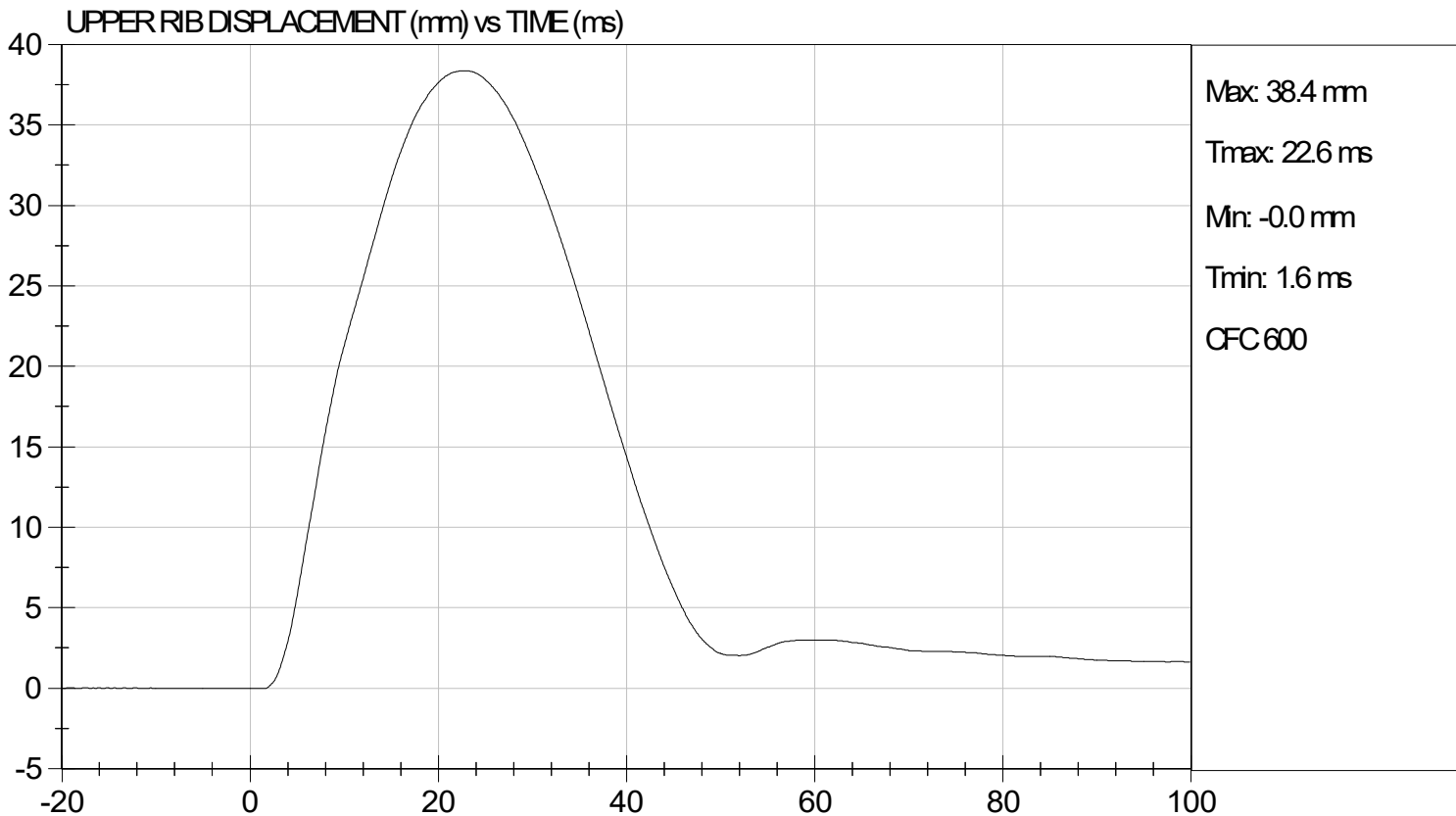
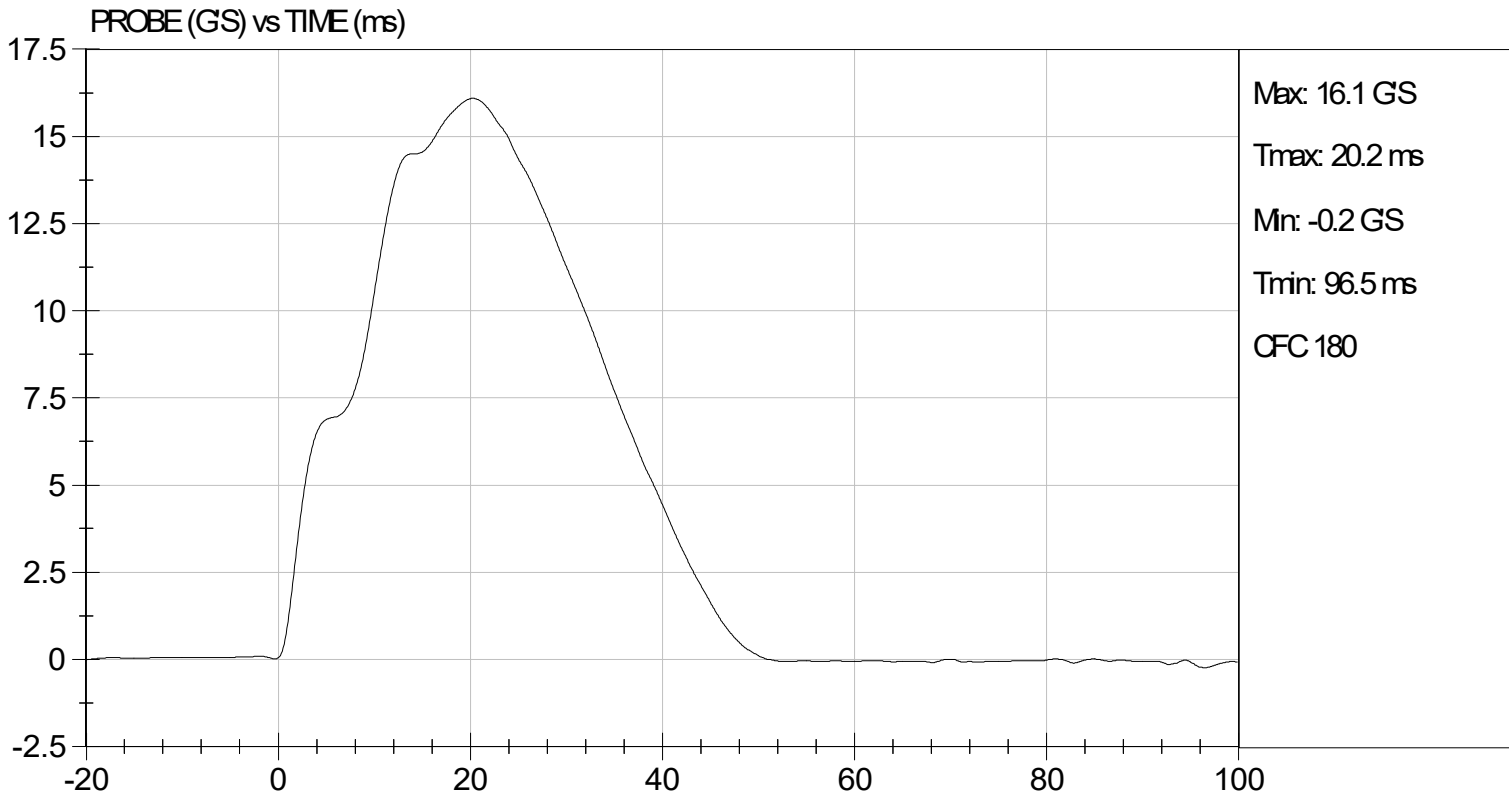
Test Date

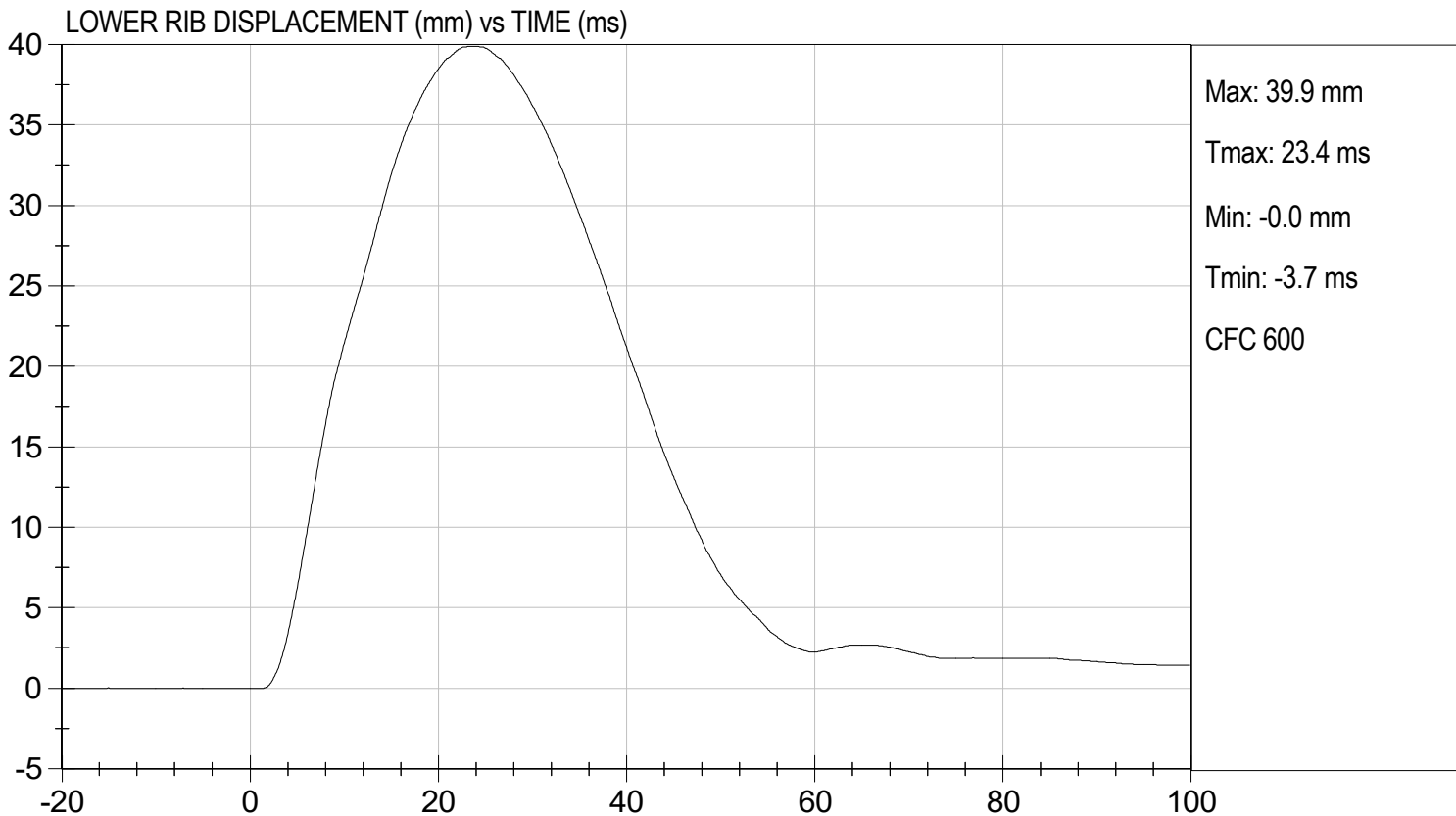
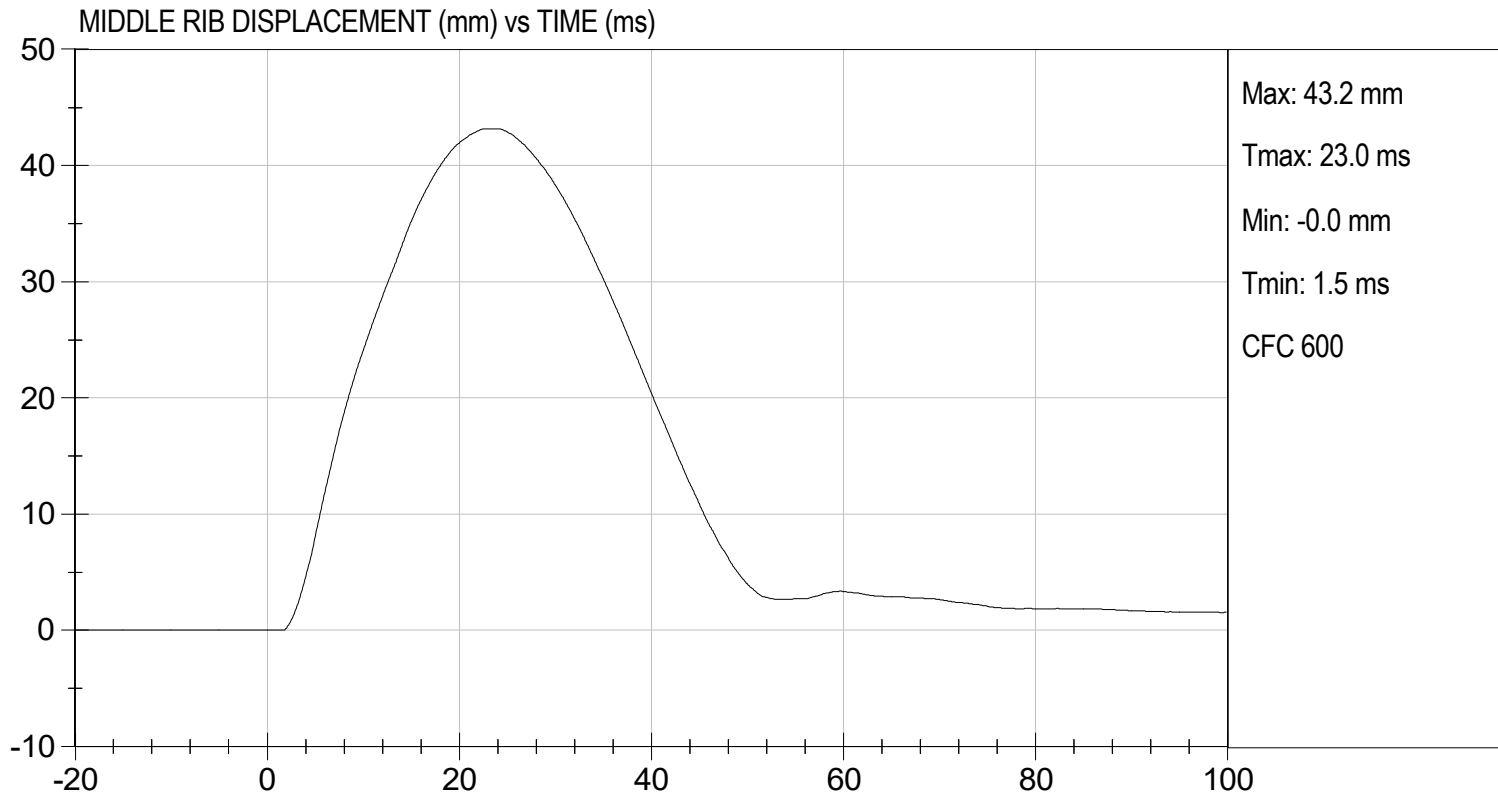

Approved By



TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 06/20/2024
TEST #: D241515

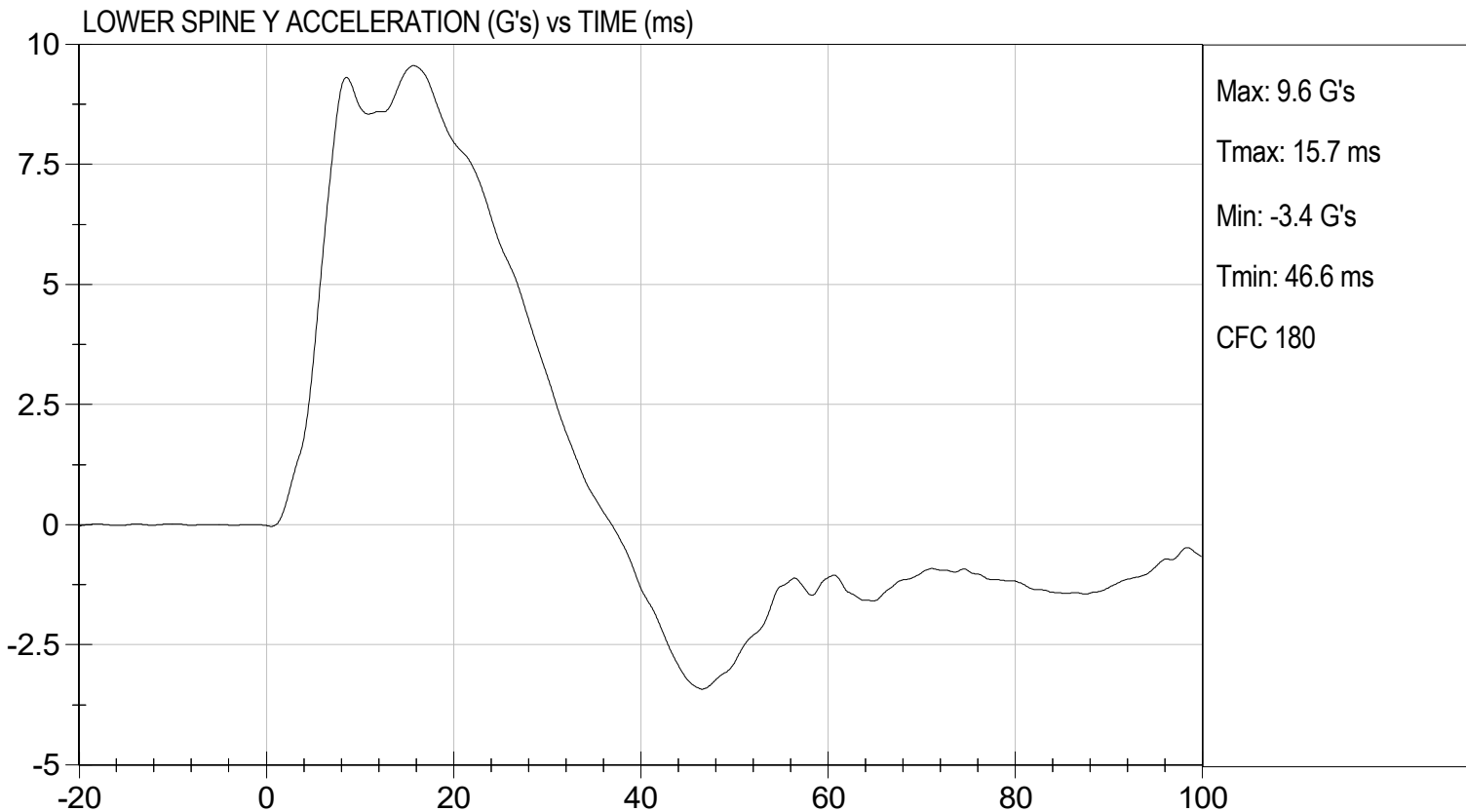
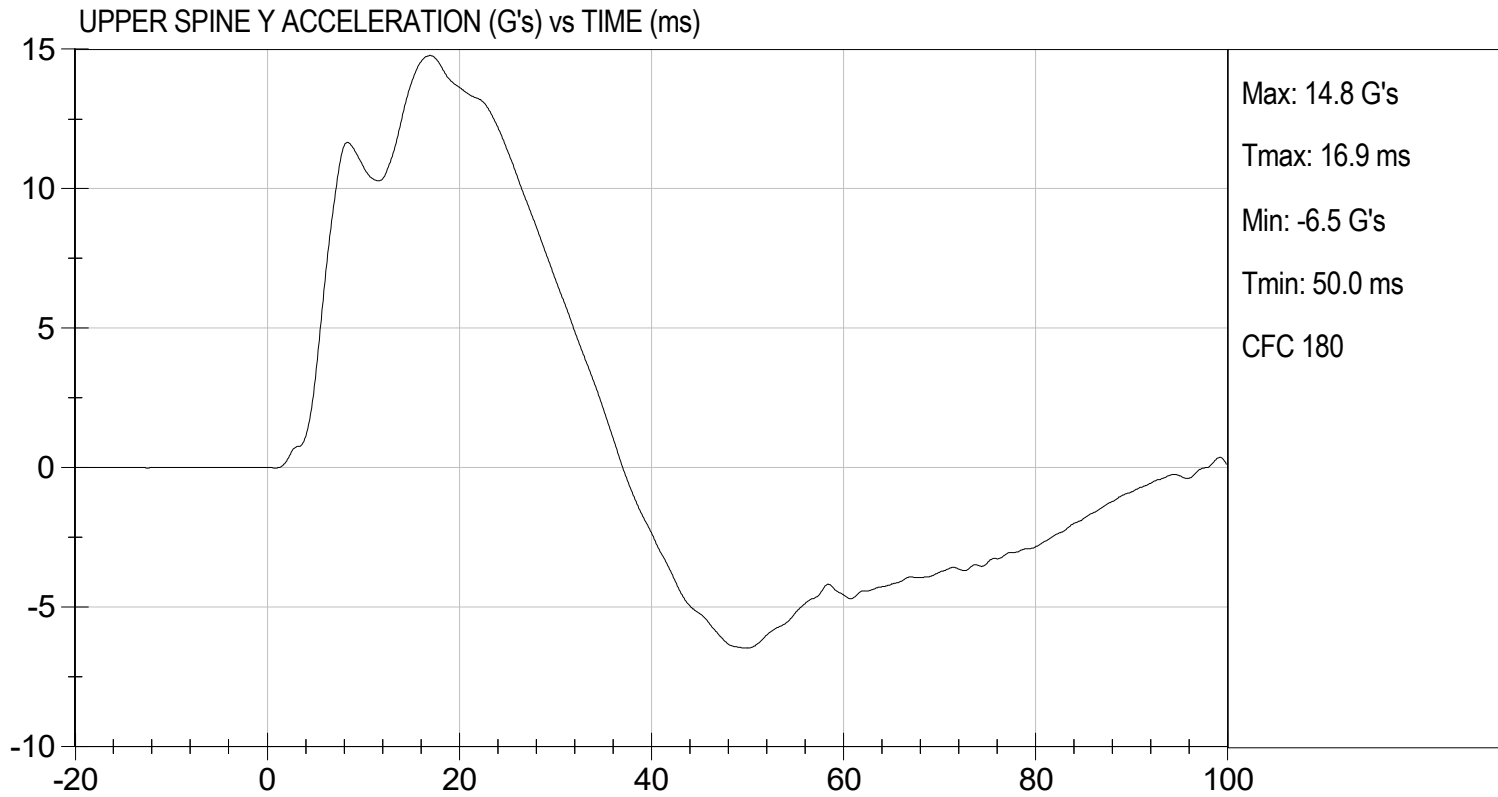






TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 06/20/2024
TEST #: D241515



MGA RESEARCH CORPORATION

ABDOMINAL IMPACT TEST

SID-IIs BUILD LEVEL D DUMMY

ATD Serial No: 296

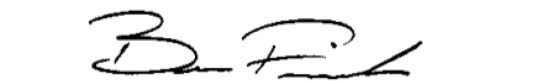
Test I.D: D241516

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Humidity	%	10 to 70	49	Pass
Impact Velocity	m/s	4.20 to 4.40	4.27	Pass
Maximum Probe Acceleration	G's	12 to 16	14	Pass
Upper Abdomen Rib Displacement	mm	36 to 47	41	Pass
Lower Abdomen Rib Displacement	mm	33 to 44	40	Pass
Lower Spine (T12) Y Acceleration	G's	9 to 14	11	Pass
Overall Test Results			Pass	


Laboratory Technician

06/20/2024

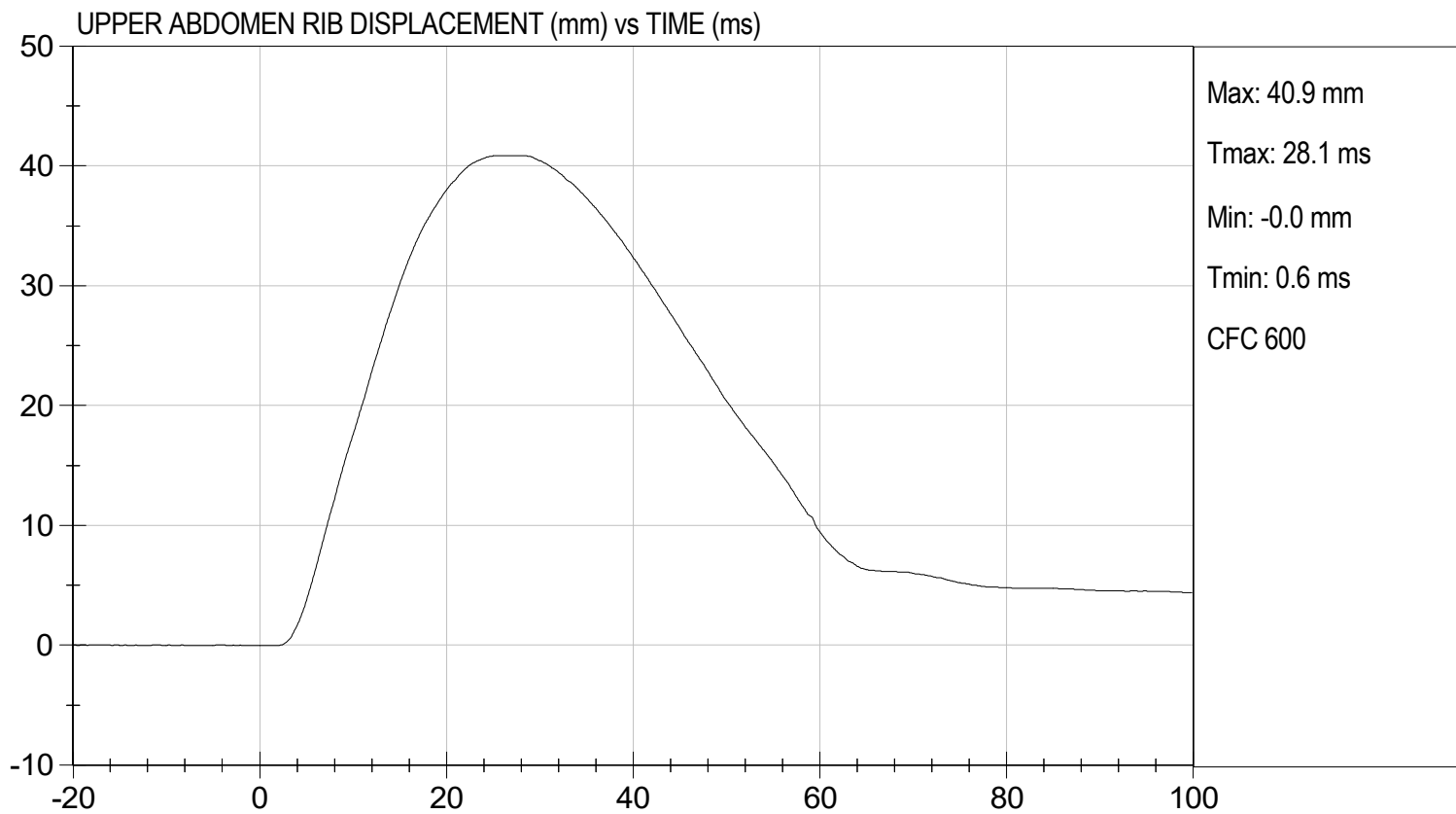
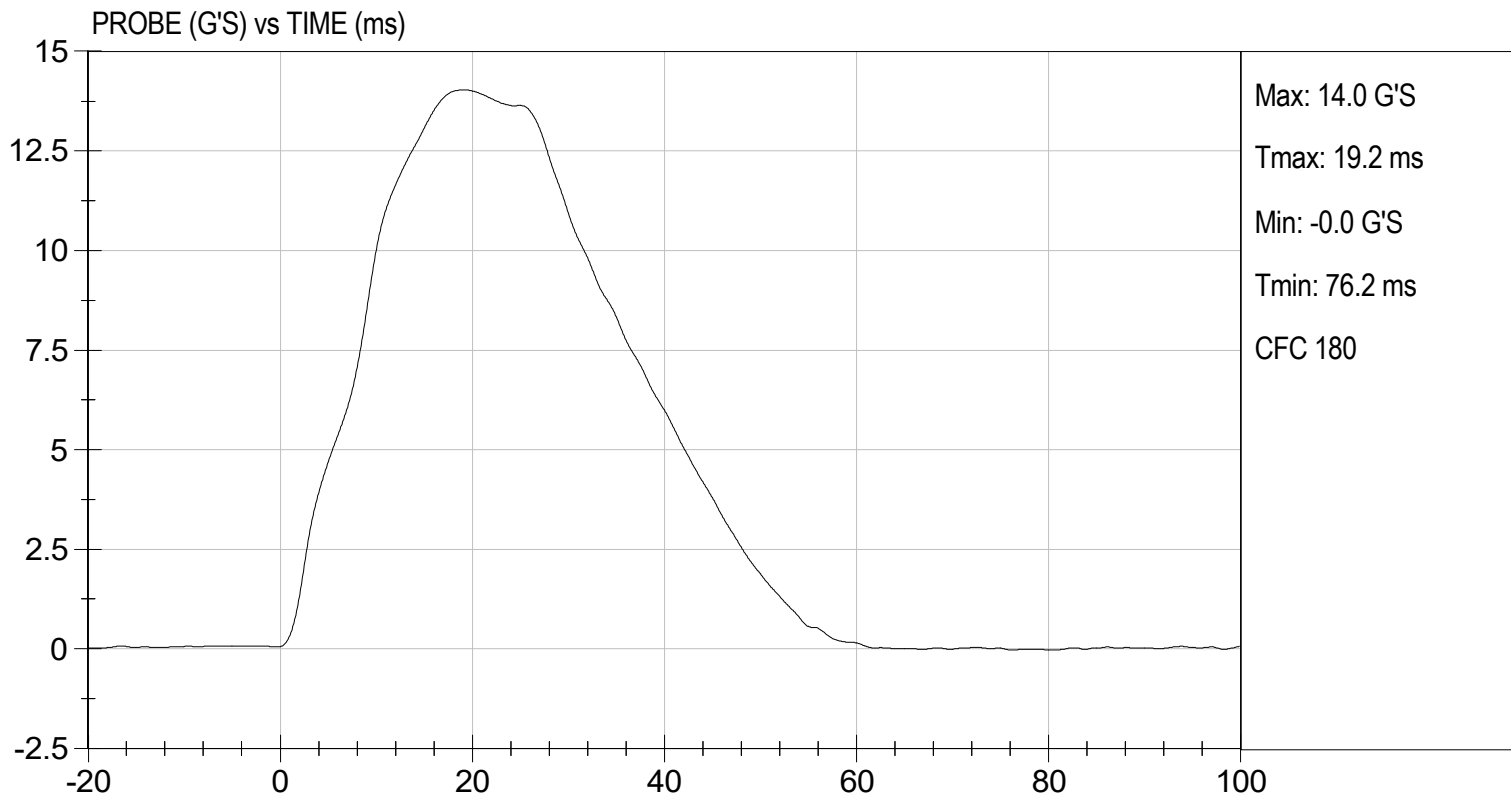
Test Date


Approved By



TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 06/20/2024
TEST #: D241516

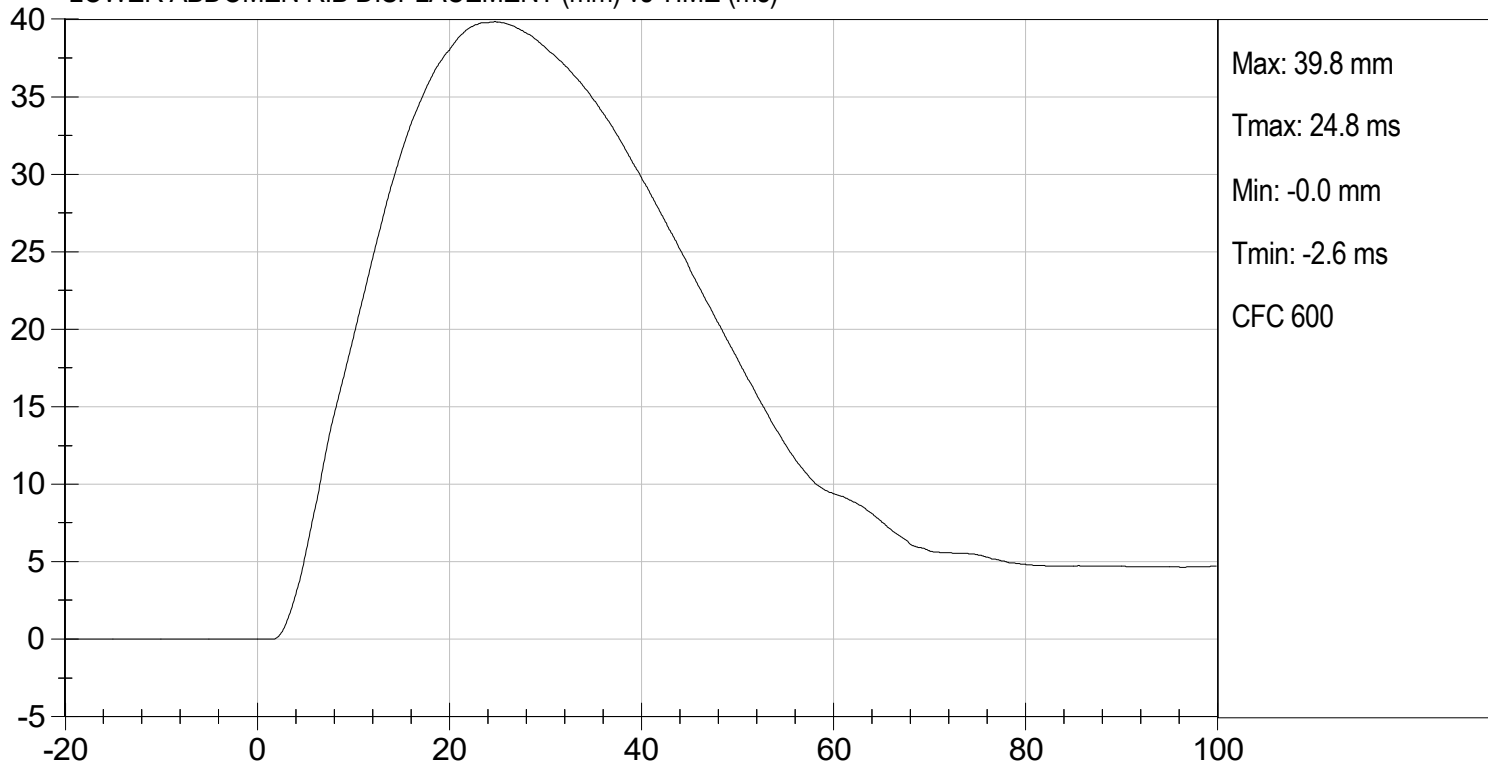




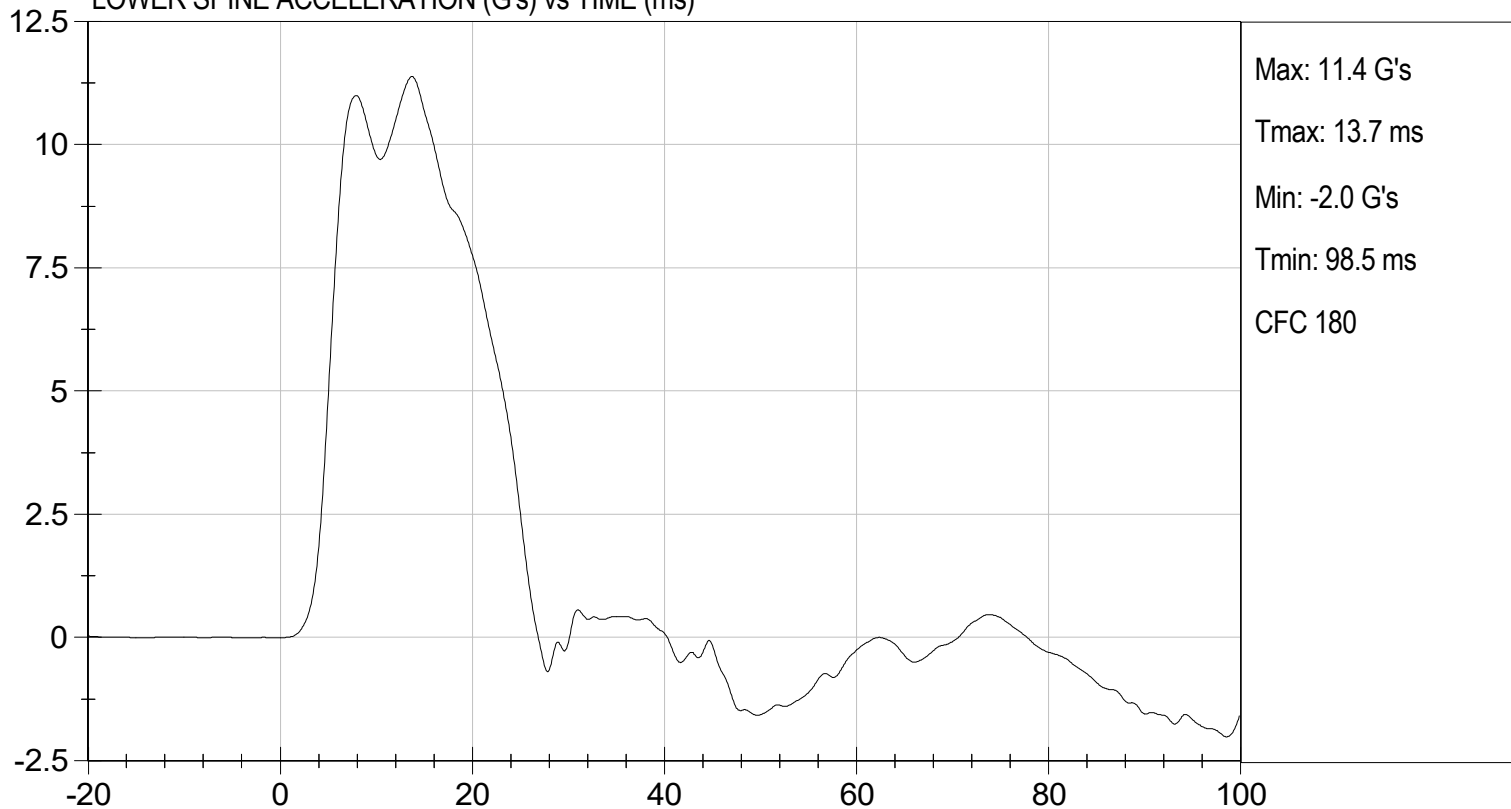
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 06/20/2024
TEST #: D241516

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)



LOWER SPINE ACCELERATION (G's) vs TIME (ms)



MGA RESEARCH CORPORATION

PELVIS IMPACT TEST

SID-Its BUILD LEVEL D DUMMY

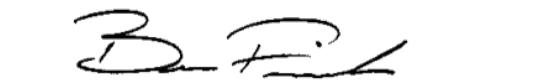
ATD Serial No: 296

Test I.D: D241517

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	46	Pass
Impact Velocity	m/s	6.60 to 6.80	6.68	Pass
Maximum Probe Acceleration	G's	38 to 47	41	Pass
Pelvis Y Acceleration After 6 ms	G's	34 to 42	39.9	Pass
Peak Acetabulum Force	N	3600 to 4300	3,918	Pass
			Overall Test Results	Pass


Laboratory Technician

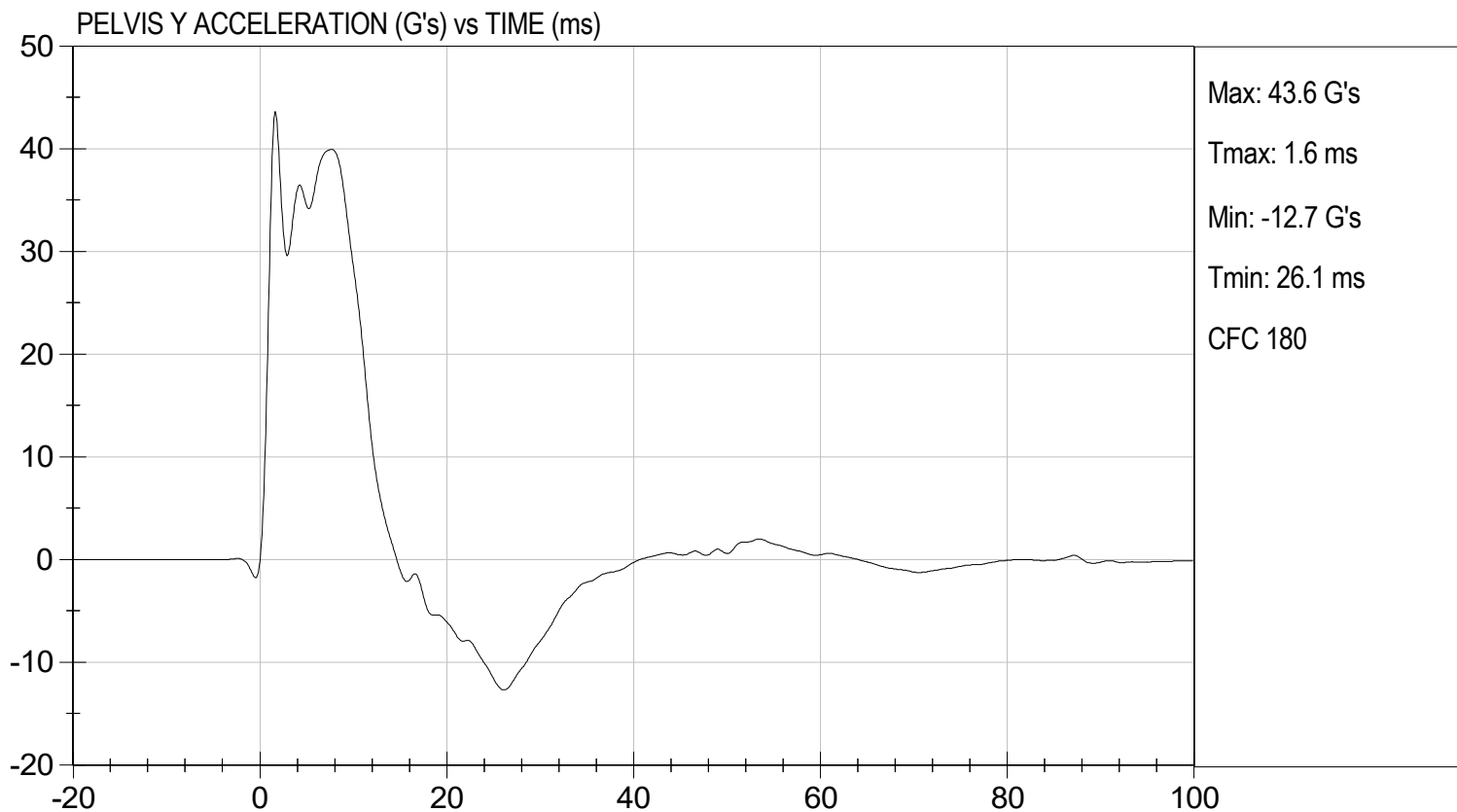
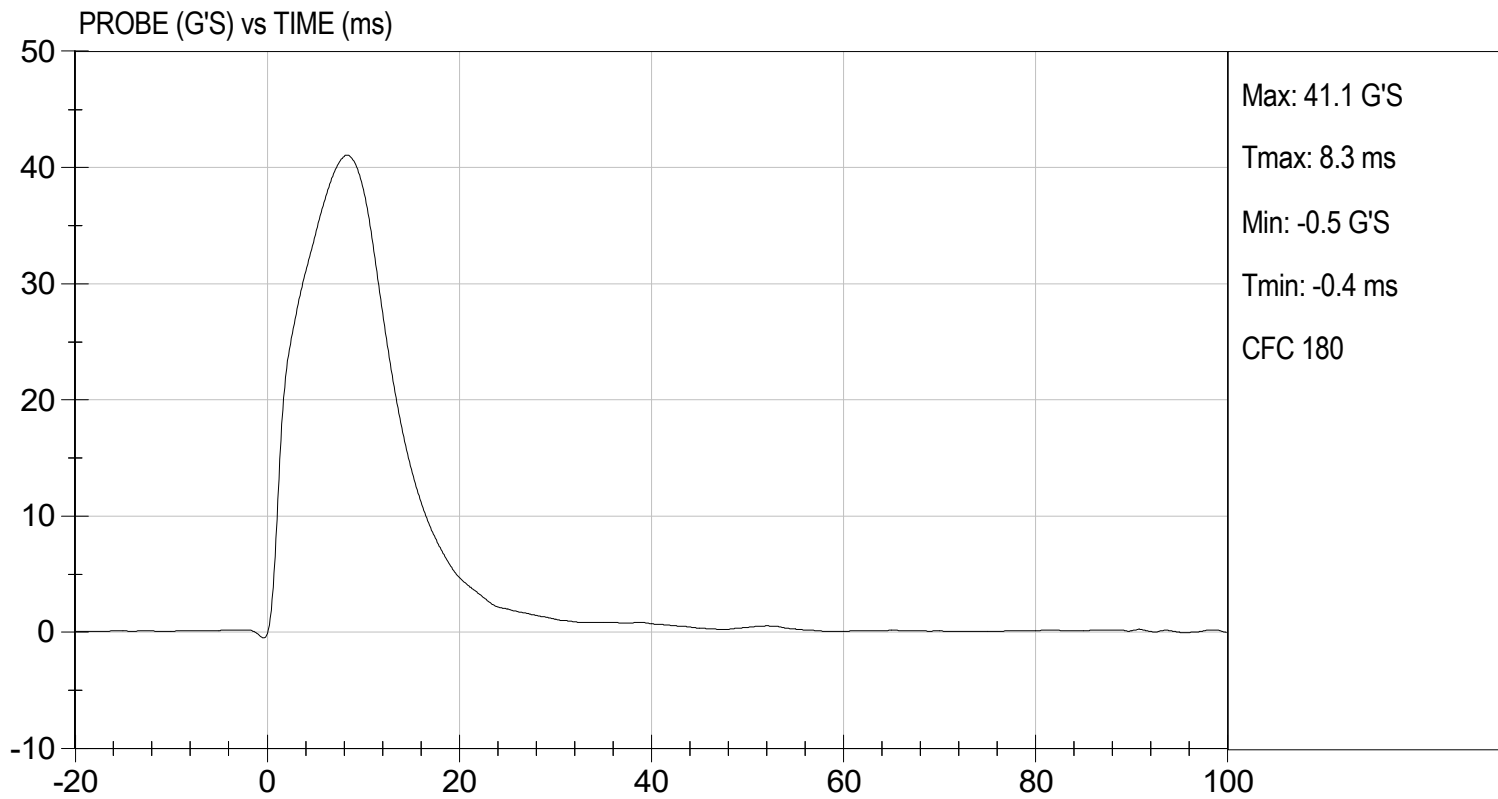
06/20/2024
Test Date


Approved By



TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

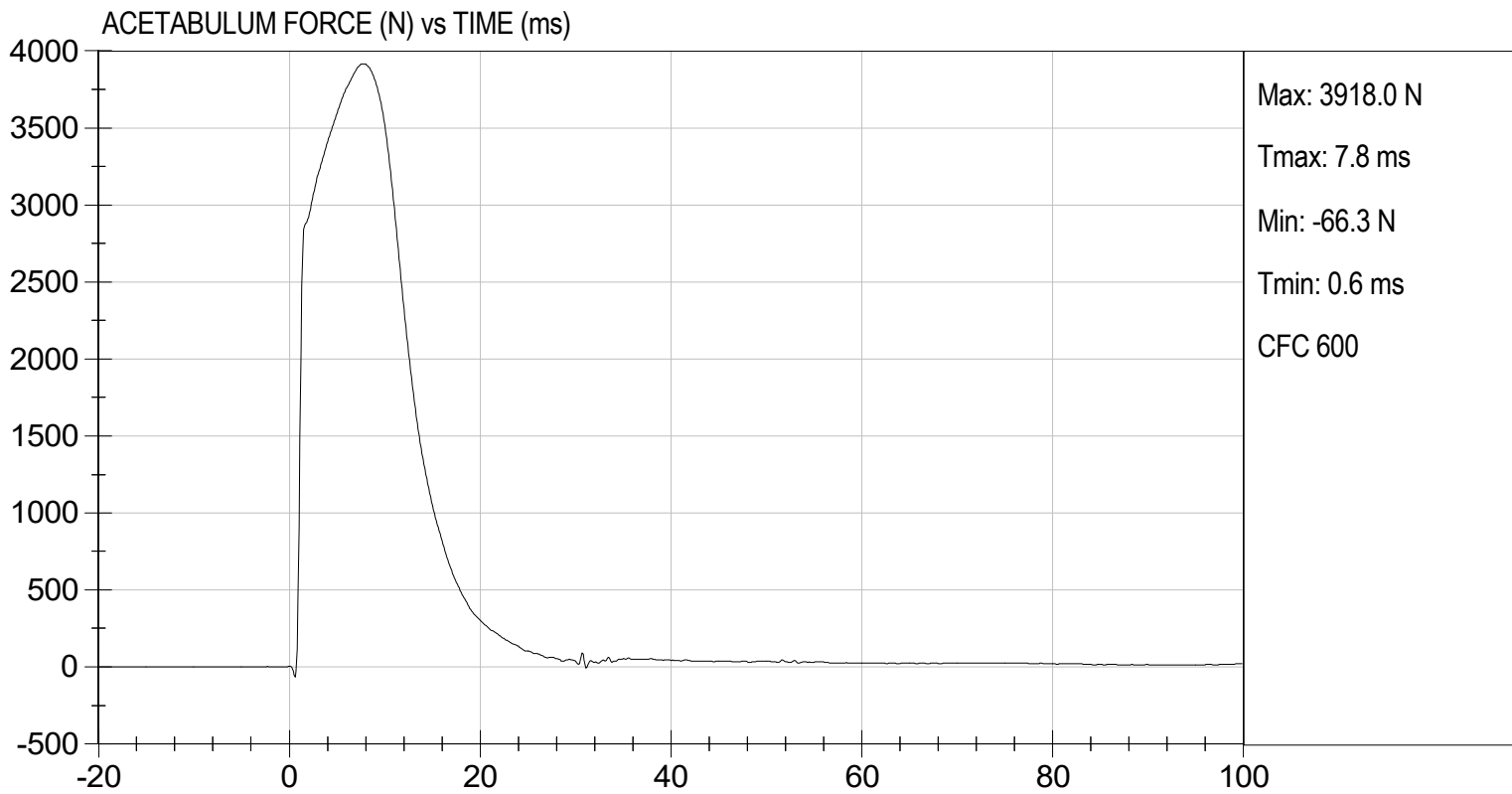
TEST DATE: 06/20/2024
TEST #: D241517





TEST DESC: PELVIS IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 06/20/2024
TEST #: D241517



MGA RESEARCH CORPORATION

ILIAC IMPACT TEST

SID-Its BUILD LEVEL D DUMMY

ATD Serial No: 296

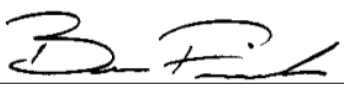
Test I.D: D241518

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.4	Pass
Humidity	%	10 to 70	45	Pass
Impact Velocity	m/s	4.20 to 4.40	4.34	Pass
Maximum Probe Acceleration	G's	36 to 45	40	Pass
Pelvis Y Acceleration	G's	28 to 39	31	Pass
Peak Pelvis Iliac Force	N	4100 to 5100	4,661	Pass
			Overall Test Results	Pass


Laboratory Technician

06/20/2024

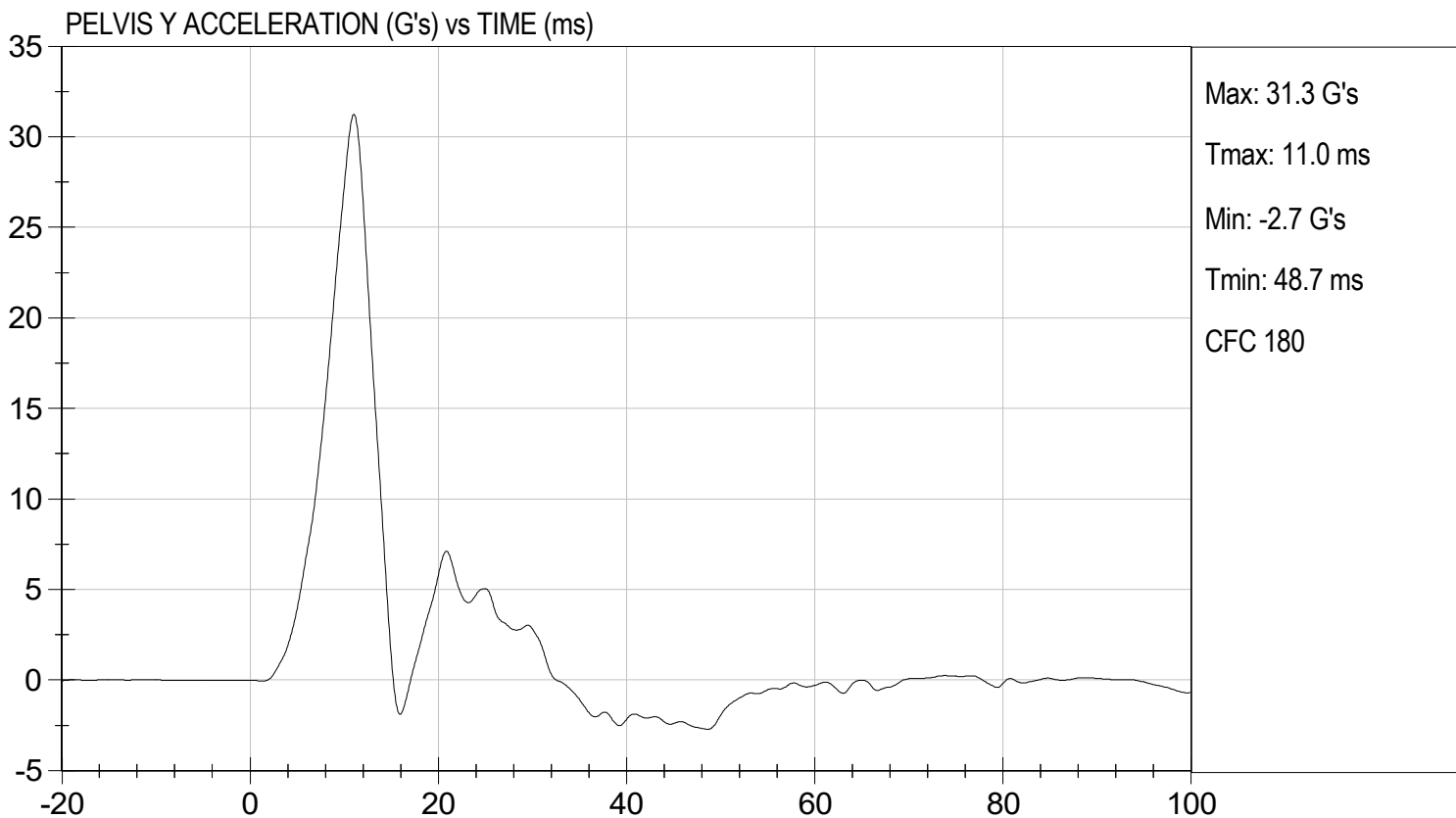
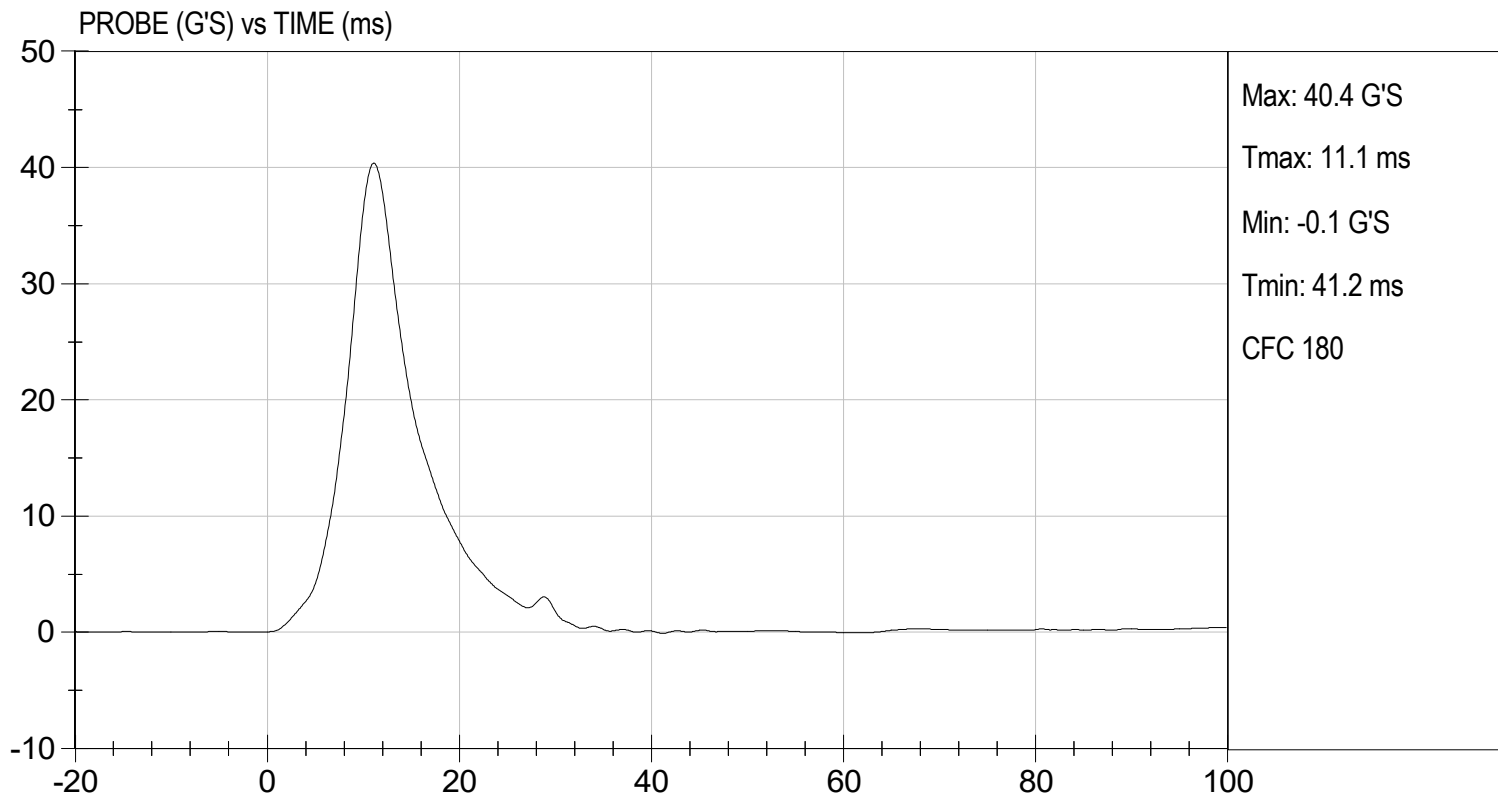
Test Date


Approved By



TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

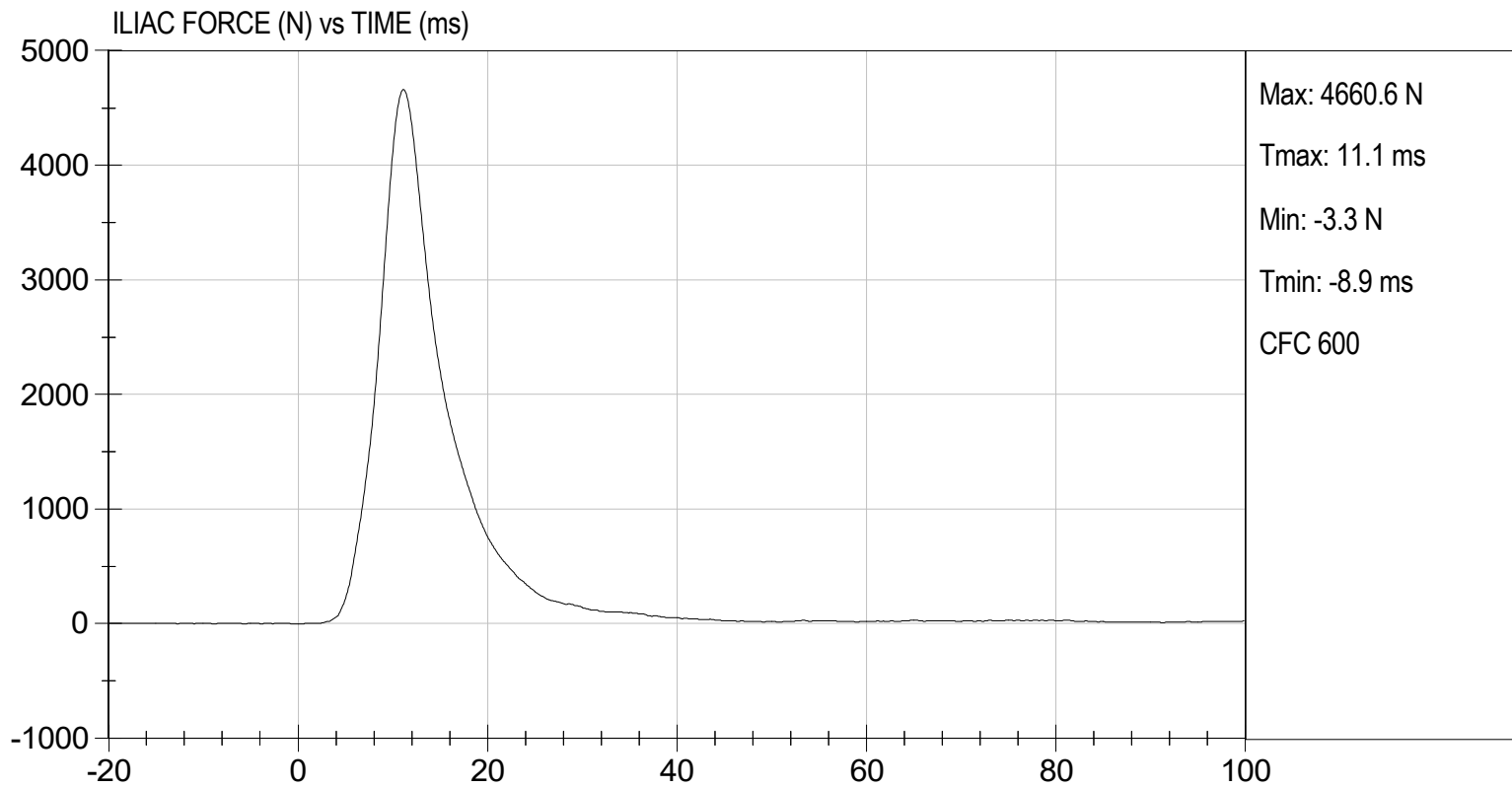
TEST DATE: 06/20/2024
TEST #: D241518





TEST DESC: ILLIAC
VELOCITY: 14.25 ft/s, 4.34 m/s

TEST DATE: 06/20/2024
TEST #: D241518





SID-IIs Pelvis Plug Certification Test

Plug S/N 17077

Test Number 23975

Report Number 24032

Test Date 8/21/2022 10:40:10 AM

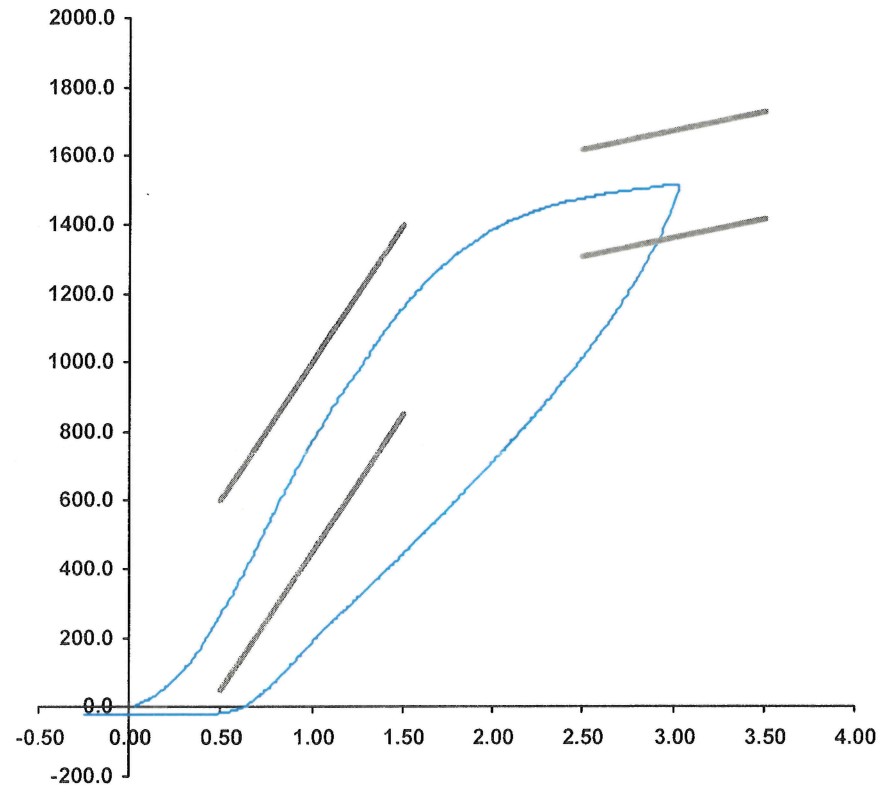
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	271	50	600
Force @ 1.5 mm (N)	1,165	850	1,400
Force @ 2.5 mm (N)	1,477	1,306	1,618
Force @ 3.0 mm (N)	1,516	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107

21-Aug-22

SACO Research

By : DC

Date : 8/21/22



SID-IIs Pelvis Plug Certification Test

Plug S/N 15780

Test Number 20680

Report Number 20734

Test Date 10/15/2021 8:12:23 AM

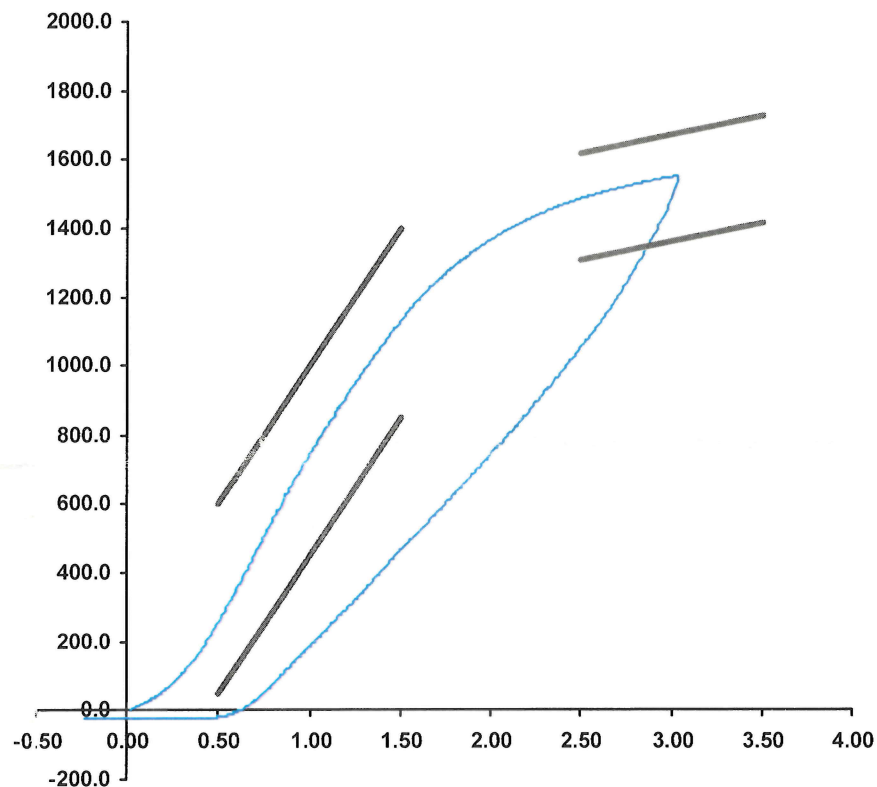
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	263	50	600
Force @ 1.5 mm (N)	1,136	850	1,400
Force @ 2.5 mm (N)	1,491	1,306	1,618
Force @ 3.0 mm (N)	1,553	1,361	1,673

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000

Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107

15-Oct-21

SACO Research

By : PL Date : 10/15/21

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N F032		
			Serial Number	Manufacturer	Calibration Date
Head CG Accelerometers		X	P79568	Endevco	05/28/2024
		Y	P79569	Endevco	05/28/2024
		Z	T30941	Endevco	05/28/2024
		Xr	P86797	Endevco	05/28/2024
		Yr	P94957	Endevco	05/28/2024
		Zr	P97381	Endevco	05/28/2024
Thorax Rib Displacement Potentiometers	Upper	Y	G236	Honeywell	05/28/2024
	Middle	Y	G368	Honeywell	05/28/2024
	Lower	Y	G164	Honeywell	05/28/2024
Abdomen Load Cells	Forward	Y	ABG1513	Denton	02/22/2024
	Middle	Y	ABG1531	Denton	02/22/2024
	Rear	Y	ABG1536	Denton	02/22/2024
Lower Spine Accelerometers (T12)		X	P79574	Endevco	05/28/2024
		Y	T14094	Endevco	05/28/2024
		Z	P82603	Endevco	05/28/2024
Public Symphysis Load Cell		Y	PG462	Denton	02/22/2024

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 296			
				Serial Number	Manufacturer	Calibration Date	
Head CG Accelerometers				X	P82109	Endevco	06/11/2024
				Y	P94783	Endevco	06/11/2024
				Z	P94786	Endevco	06/11/2024
				Xr	P94938	Endevco	06/11/2024
				Yr	P96854	Endevco	06/11/2024
				Zr	P97386	Endevco	06/11/2024
Head Angular Rate Sensors				X	ARS7391	DTS	11/17/2023
				Y	ARS7402	DTS	11/17/2023
				Z	ARS7416	DTS	11/17/2023
Displacement Potentiometers	Thoracic Rib	Upper	Y	G012	Servo	06/10/2024	
		Middle	Y	G1163	FTSS	06/10/2024	
		Lower	Y	G1158	FTSS	06/10/2024	
	Abdominal Rib	Upper	Y	G1146	FTSS	06/10/2024	
		Lower	Y	G1126	FTSS	06/10/2024	
Lower Spine Accelerometers (T12)				X	P79614	Endevco	06/11/2024
				Y	P79439	Endevco	06/11/2024
				Z	P79418	Endevco	06/11/2024
Acetabulum Load Cell				Y	ACG111	FTSS	02/22/2024
Iliac Wing Load Cell				Y	IWG226	FTSS	02/22/2024
Pelvis Plug (struck side)					17077	SACO	08/21/2022
Pelvis Plug (non-struck side)					15780	SACO	10/15/2021

Table 3 – Vehicle Instrumentation

			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	T41772	Endevco	06/14/2024
	Vehicle Center of Gravity	Y	T42828	Endevco	06/14/2024
	Vehicle Center of Gravity	Z	T41762	Endevco	06/14/2024
2	Right Sill at Front Seat	X	T42845	Endevco	06/14/2024
	Right Sill at Front Seat	Y	T42830	Endevco	06/14/2024
	Right Sill at Front Seat	Z	T41764	Endevco	06/14/2024
3	Right Sill at Rear Seat	X	T42827	Endevco	06/14/2024
	Right Sill at Rear Seat	Y	T41771	Endevco	06/14/2024
	Right Sill at Rear Seat	Z	T41754	Endevco	06/14/2024
4	Left Sill at Front Door	Y	T41142	Endevco	06/14/2024
5	Left Sill at Rear Door	Y	T42850	Endevco	06/14/2024
6	Left A-Post Lower	Y	T38334	Endevco	06/12/2024
7	Left A-Post Middle	Y	T39094	Endevco	06/12/2024
8	Left B-Post Lower	Y			
9	Left B-Post Middle	Y			
10	Front Seat Track	Y	T41755	Endevco	06/14/2024
11	Rear Seat Track or Structure	Y	T42829	Endevco	06/14/2024
12	Right Rear Occ. Compartment	Y	T42849	Endevco	06/14/2024
13	Engine Block	X	T34144	Endevco	03/07/2024
	Engine Block	Y	T33428	Endevco	03/06/2024
14	Rear Floorpan Above Axle	X	A383497	MSI	06/06/2024
	Rear Floorpan Above Axle	Y	A416927	MSI	06/07/2024
	Rear Floorpan Above Axle	Z	T41122	Endevco	05/30/2024

Table 4 – MDB Instrumentation

		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	PCB1183D	PCB	03/15/2024
MDB Center of Gravity	Y	PCB1822D	PCB	03/15/2024
MDB Center of Gravity	Z	PCB1753D	PCB	03/15/2024
Left Frame at Rear Axle Centerline	X	PCB1438D	PCB	03/08/2024
Left Frame at Rear Axle Centerline	Y	PCB1653D	PCB	03/08/2024