

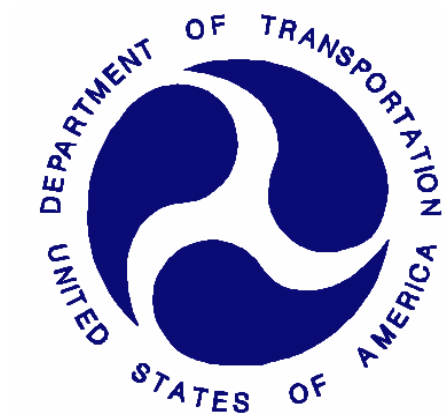
REPORT NUMBER: R&D-KAR-20-012

**VEHICLE TO RIGID BARRIER CRASH TEST IN SUPPORT OF
NHTSA'S FRONTAL RESEARCH CRASH TEST PROGRAM
LEFT SIDE 30° FRONTAL RIGID BARRIER IMPACT**

**MAZDA MOTOR CORPORATION
2020 MAZDA CX-5 5-DOOR MPV**

NHTSA No: R20205417

**PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
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ADELANTO, CA 92301**

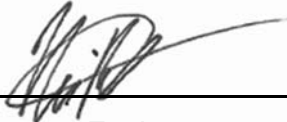



AUGUST 24, 2021

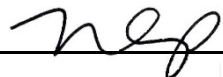
FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
VEHICLE SAFETY RESEARCH
1200 NEW JERSEY AVE, SE, ROOM W46-446
WASHINGTON, D.C. 20590**

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Approval Date: August 24, 2021

FINAL REPORT ACCEPTANCE BY VEHICLE SAFETY RESEARCH,
OFFICE OF STRUCTURAL AND RESTRAINTS RESEARCH DIVISION:


TOM, Vehicle Crash Testing
NHTSA, Office of Structures and Restraints Research

Date: _____

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16. Abstract <p>A 40.0 km/h Left Side 30° Frontal Rigid Barrier Impact Test was conducted on a 2020 Mazda CX-5 5-door MPV in accordance with Contract DTNH22-14-D-00360L, Task Order #693JJ918F000199. The test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on June 7, 2021.</p> <p>The impact velocity of the vehicle was 39.95 km/h and the ambient temperature at the test vehicle at the time of impact was 21.7°C. The vehicle's post-test maximum crush was 364 mm measured to left of the vehicle's centerline. The passenger occupant sensor was not programmed prior to this test which resulted in the passenger frontal airbag not deploying upon impact. The test vehicle's performance was as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Measurement Description</th> <th rowspan="2" style="text-align: center;">Units</th> <th style="text-align: center;">Driver Hybrid III</th> <th style="text-align: center;">Passenger THOR</th> </tr> <tr> <th style="text-align: center;">Result</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td></td> <td style="text-align: center;">137.4</td> <td style="text-align: center;">232.3</td> </tr> <tr> <td>Brain Injury Criteria (BrIC)</td> <td></td> <td></td> <td style="text-align: center;">1.2</td> </tr> <tr> <td>Nij</td> <td></td> <td style="text-align: center;">0.2</td> <td></td> </tr> <tr> <td>Peak Neck Tension</td> <td style="text-align: center;">N</td> <td style="text-align: center;">1106.9</td> <td style="text-align: center;">3034.3</td> </tr> <tr> <td>Peak Neck Compression</td> <td style="text-align: center;">N</td> <td style="text-align: center;">-369.0</td> <td style="text-align: center;">-3071.9</td> </tr> <tr> <td>Peak Chest Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">-31.5</td> <td style="text-align: center;">46.1</td> </tr> <tr> <td>Peak Abdomen Deflection</td> <td style="text-align: center;">mm</td> <td></td> <td style="text-align: center;">-49.3</td> </tr> <tr> <td>Peak Resultant Acetabulum Force</td> <td style="text-align: center;">N</td> <td></td> <td style="text-align: center;">2818.7</td> </tr> <tr> <td>Peak Femur Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">-4314.1</td> <td style="text-align: center;">-3911.3</td> </tr> <tr> <td>Peak Tibia Index</td> <td></td> <td></td> <td style="text-align: center;">0.6</td> </tr> </tbody> </table>				Measurement Description	Units	Driver Hybrid III	Passenger THOR	Result	Result	Head Injury Criteria (HIC ₁₅)		137.4	232.3	Brain Injury Criteria (BrIC)			1.2	Nij		0.2		Peak Neck Tension	N	1106.9	3034.3	Peak Neck Compression	N	-369.0	-3071.9	Peak Chest Deflection	mm	-31.5	46.1	Peak Abdomen Deflection	mm		-49.3	Peak Resultant Acetabulum Force	N		2818.7	Peak Femur Force	N	-4314.1	-3911.3	Peak Tibia Index			0.6
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TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1	Test Purpose and Procedure	1
2	Summary of Test Results	2
3	Occupant and Vehicle Information / Data Sheets	8
<u>Data Sheet</u>		<u>Page</u>
1	General Test and Vehicle Parameter Data	9
2	Seat Adjustment, Fuel System, and Steering Wheel	13
3	Dummy Clearance Dimensions	15
4	Dummy CMM Measurements Relative to VCS	16
5	Vehicle Instrumentation Data	17
6	Photographic Reference Target Locations	20
7	Test Vehicle Summary of Results	21
8	Post-Test Observations	22
9	Vehicle Profile Measurements	23
10	Accident Investigation Division Data	24
11	Vehicle Intrusion Measurements Relative to VCS	25
12	Summary of FMVSS 212, 219 (Partial), and 301 Data	31
13	FMVSS 301 Static Rollover Results	33
<u>Appendix</u>		<u>Page</u>
A	Photographs	A
B	Vehicle and Dummy Response Data Traces	B
C	ATD Configuration and Performance Verification Data, Pre-Test	C
D	ATD Configuration and Performance Verification Data, Post-Test	D
E	THOR-50M 50 th Percentile Male ATD Physical Inspection, Pre-Test	E
F	THOR-50M 50 th Percentile Male ATD Physical Inspection, Post-Test	F
G	THOR-50M 50 th Percentile Male ATD Sensor Polarities	G

SECTION 1

TEST PURPOSE AND PROCEDURE

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

This 40.0 km/h (24.8 mph) Left Side 30° Frontal Rigid Barrier Impact Test is part of the Frontal Research Crash Test Program outlined in Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for research purposes.

This test was conducted in accordance with the instructions set forth for a 40.0 km/h Left Side 30° Frontal Rigid Barrier Impact, outlined in Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199. Data indicant of Federal Motor Vehicle Safety Standard FMVSS 208 - Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity was obtained, in addition to the data required by Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199.

SECTION 2
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

A 40.0 km/h Left Side 30° Frontal Rigid Barrier Impact Test was conducted on a 2020 Mazda CX-5 5-Door MPV. The test was performed at Applus IDIADA KARCO Engineering, LLC. on June 7, 2021.

The test was documented by one (1) real-time and eighteen (18) high-speed video cameras. Pre- and post-test photographs of the test vehicle and test setup were taken using a digital still camera. Photographic documentation of the test is presented in Appendix A of this report.

One (1) 50th percentile adult male Hybrid III anthropomorphic test device (ATD) (Serial No. 168) was seated in the left front seating position (P1 – Driver) and one 50th percentile adult male THOR ATD (Serial No. EG2595) was seated in the right front seating position (P3 – Passenger). The driver was positioned according to instructions specified in FMVSS 208 Appendix F, Dummy Positioning Procedures for Driver and Passenger Test Dummy Conforming to Subpart E of Part 572. The passenger was positioned according to instructions specified in the THOR 50th Percentile Male Dummy Seating & Positioning Procedures: Passenger Position.

Both ATD's are unbelted.

The passenger occupant sensor was not programmed prior to this test which resulted in the passenger frontal airbag not deploying upon impact.

SECTION 2 ... (CONTINUED)
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

One hundred seventy-two (172) channels of data from the two (2) ATD's and the test vehicle were collected using Diversified Technical Systems, Inc. data acquisition systems. Appendix B contains dummy data plots, as well as vehicle response data plots.

The windshield was broken during impact but there was no separation recorded. There was no intrusion into the protected zone of the windshield during any portion of the impact event. The maximum static crush of the vehicle was 364 mm measured to the left of the vehicle's centerline.

All four vehicle doors remained closed and latched during the test. All doors remained operational after the impact event.

Structural observations include the following:

- The front end including the bumper, grill, and hood were crushed, with the damage concentrated on the left side
- The windshield was broken due to impact with the rigid barrier and contact with the driver and passenger ATD heads.

The driver ATD's visible contact points were:

- Head contacted the frontal airbag, windshield, and curtain airbag
- Torso contacted the frontal airbag, torso-pelvis airbag, and seat bolster
- Left leg contacted the knee bolster
- Right leg contacted the knee bolster and steering column trim

The right front passenger ATD's visible contact points were:

- Head contacted the windshield and dashboard
- Torso contacted the windshield, dashboard, roof trim, sun visor, and rearview mirror
- Left leg contacted the knee bolster
- Right leg contacted the knee bolster

SECTION 2 ... (CONTINUED)
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Vehicle Test Weight	kg	1745.0
Vehicle Maximum Static Crush	mm	364
Number of Data Channels		172
Number of Real-Time Cameras		1
Number of High-Speed Cameras		18

DUMMY CONTACTS

Description	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	Hybrid III, S/N: 168		THOR, S/N: EG2595	
Head Contact	Frontal airbag, windshield, curtain airbag	A-44, A-89, A-90	Windshield, dashboard	A-93, A-136a
Upper Torso Contact	Frontal airbag	A-89	Windshield, dashboard, roof trim, sun visor, rearview mirror	A-136a
Lower Torso Contact	Frontal airbag, torso-pelvis airbag, seat bolster	A-89, A-91a	Dashboard	A-136a
Left Leg Contact	Knee bolster	A-82	Knee bolster	A-127
Right Leg Contact	Knee bolster, steering column trim	A-82	Knee bolster	A-127

SECTION 2 ... (CONTINUED)
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

DATA ANOMALIES

Channel Description	Explanation
P2TH ACETABULUM RIGHT X FORCE	No data collected, known channel failure

SECTION 2 ... (CONTINUED)
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

Driver, Hybrid III 50th Percentile Male S/N 168					
Injury Reading	Units	Limit	Value	t¹	t²
HIC 15		700	137.438	125.8	140.8
Nij		1	0.237	138.0	NTE
Upper Neck Force Z (Tension)	N	4170	1106.916	142.1	
Upper Neck Force Z (Compression)	N	4000	-369.036	174.4	
Upper Neck Moment Y (Flexion)	Nm	310	28.236	81.2	
Upper Neck Moment Y (Extension)	Nm	135	-17.837	137.2	
Chest Deflection	mm	63	-31.475	128.3	
3 ms Chest Clip	g	60	27.791	121.2	124.2
Femur Force, Left	N	10000	-3947.981	70.8	
Femur Force, Right	N	10000	-4314.143	74.7	

SECTION 2 ... (CONTINUED)
SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

Passenger, THOR S/N EG2595					
LOCATION	DESCRIPTION	UNIT	SOURCE	MAX	MIN
Head	HIC 15ms		Compute	232.3	
	Brain Injury Criteria (BrIC)		Compute	1.181	
	Head Rotational Velocity X	Deg/s	60	64.9	-712.8
	Head Rotational Velocity Y	Deg/s	60	150.4	-3672.4
	Head Rotational Velocity Z	Deg/s	60	654.2	-368.8
Neck	Upper Neck Z-axis Force	N	1000	3034.3	-3071.9
	Upper Neck Y-axis Moment	Nm	600	10.9	-30.7
Chest	Upper Left Resultant Chest Deflection	mm	Compute	22.7	
	Upper Right Resultant Chest Deflection	mm	Compute	26.3	
	Lower Left Resultant Chest Deflection	mm	Compute	46.1	
	Lower Right Resultant Chest Deflection	mm	Compute	42.6	
Abdomen	Lower Left X-axis Deflection	mm	Compute	2.5	-49.3
	Lower Right X-axis Deflection	mm	Compute	5.4	-16.0
Acetabulum	Left Acetabulum Resultant Force	N	Compute	2818.7	
	Right Acetabulum Resultant Force	N	Compute	1899.4	
Femur	Left Femur Force, FZ	N	600	449.2	-3673.8
	Right Femur Force, FZ	N	600	834.6	-3911.3
Tibia	Left Upper Tibia, FZ	N	600	260.2	-1542.8
	Left Upper Tibia Index		Compute	0.642	
	Right Upper Tibia, FZ	N	600	796.3	-1176.5
	Right Upper Tibia Index		Compute	0.230	
	Left Lower Tibia, FZ	N	600	176.7	-1844.6
	Left Lower Tibia Index		Compute	0.403	
	Right Lower Tibia, FZ	N	600	717.5	-1274.4
	Right Lower Tibia Index		Compute	0.263	
Ankle	Left Ankle Rotation, RX	Deg	180	44.6	-6.6
	Left Ankle Rotation, RY	Deg	180	0.0	-10.5
	Left Ankle Dorsiflexion Moment, MY	Nm	Compute	20.7	-82.6
	Left Ankle In/Eversion Moment, MX	Nm	Compute	82.6	-4.3
	Right Ankle Rotation, RX	Deg	180	0.4	-17.0
	Right Ankle Rotation, RY	Deg	180	-6.1	-38.2
	Right Ankle Dorsiflexion Moment, MY	Nm	Compute	29.4	-70.8
	Right Ankle In/Eversion Moment, MX	Nm	Compute	7.2	-15.4

Anomalies:

P1TH ACETABULUM Right X FORCE, OCCIPITAL CONDYLE POTENTIOMETER

SECTION 3

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	R20205417
Model Year	2020
Make	Mazda
Model	CX-5
Body Style	5-Door MPV
VIN	JM3KFABM8L0838933
Body Color	Blue
Odometer Reading (km / mi)	26 / 16
Engine Displacement (L)	2.5
Type / No. of Cylinders	Inline 4-Cylinder
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Seat Belt Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other Safety Restraint	Yes

Does Owner's Manual provide instructions to turn off automatic door locks? Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation
Date of Manufacture	Jul-20

GVWR (kg)	2075
GAWR Front (kg)	1075
GAWR Rear (kg)	1000

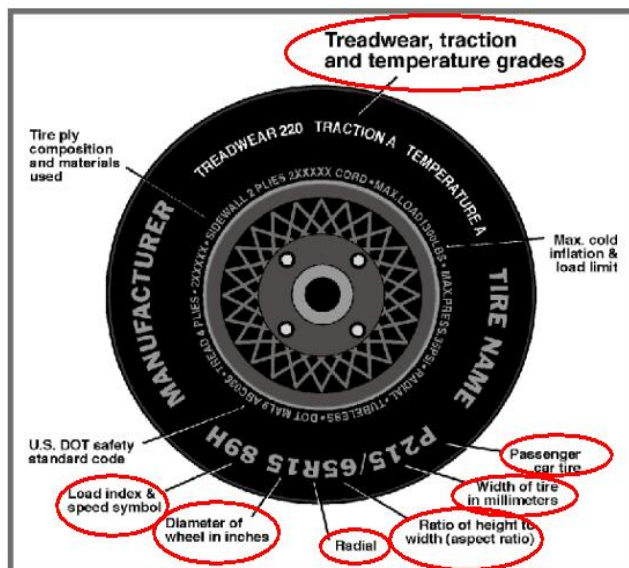
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Split Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				385.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				44.8	A-B

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander G91	Geolander G91
Treadware	280	280
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	100H	100H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	FDF5-PC52 5720	FDF5-PC52 5720
DOT Safety Code Right	FDF5-PC52 5720	FDF5-PC52 5720

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	454.5	322.0		497.0	382.0	
Right	kg	459.0	307.0		479.0	387.0	
Ratio	%	59.2%	40.8%	100.0%	55.9%	44.1%	100.0%
Total	kg	913.5	629.0	1542.5	976.0	769.0	1745.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1542.5	A
Weight of THOR-50M and AM50	kg	164.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	44.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1751.3	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	803	810	828	841	1091
As Tested	mm	805	805	807	808	1179
Post-Test	mm	N/A	805	794	825	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2680
Total Vehicle Length at Left Side	mm	4303
Total Vehicle Length at Centerline	mm	4552
Total Vehicle Length at Right Side	mm	4302
Weight of Ballast/Equipment in Cargo Area	kg	89.1
Weight of Vehicle Components Removed	kg	26.0
Amount of Stoddard Solvent in Fuel Tank	L	52.10

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk trim (1.5 kg), spare tire (18.0 kg), underbody covers (3.5 kg), trunk trim (3.0 kg)
Rear seatbacks, (16.0 kg), rear seat cushion (6.5 kg)

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

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Units	Pre-Test
1	Total Length	mm	4552
2	Total Width	mm	1846
3*	Bumper Top Height	mm	620
4*	Bumper Bottom Height	mm	495
5*	Longitudinal Member Top Height	mm	598
6	Distance Between Longitudinal Members	mm	899
7	Longitudinal Member Width	mm	83
8*	Engine Top Height	mm	843
9*	Engine Bottom Height	mm	223
10	Engine and Gearbox Width	mm	630
11	Front Bumper to Engine Distance	mm	488
12*	Front Shock Absorber Fixing Height	mm	990
13*	Bonnet Leading Edge Height	mm	920
14	Front Shock Absorber Fixing Width	mm	592
15	Front Bumper to Front Axle Distance	mm	940
16	Front Axle to A-Pillar Distance	mm	599
17	A-Pillar to B-Pillar Distance	mm	990
18	B-Pillar to Rear Axle Distance	mm	1091
19	B-Pillar to C-Pillar Distance	mm	990
20*	Roof Sill Bottom Height	mm	1495
21*	Roof Sill Top Height	mm	1600
22*	Floor Sill Bottom Height	mm	410
23*	Floor Sill Top Height	mm	470

*Note: Height measurements are in reference to the ground.

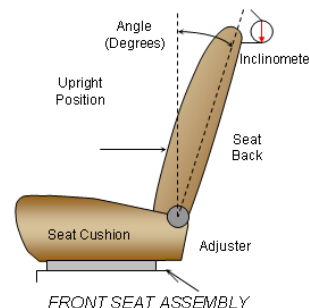
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

NOMINAL DESIGN RIDING POSITION

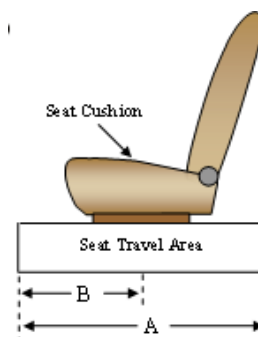
The driver seat back was initially set to the manufacturer’s designated angle listed in FORM 208 but was moved forward per THOR seating procedure to level the head. The passenger seat back was set to the manufacturer’s designated angle listed in FORM 208 but was moved rearward to level the head.



Seating Position	Unit	FORM 208 Position	After ATD Positioning
Driver Seat Back Angle	Degrees	6.2	6.5
Passenger Seat Back Angle	Degrees	3.5	3.8

SEAT FORE / AFT POSITIONING

The passenger seat travel is measured from the forward most position to the rear most position with the seat cushion set at mid angle. The passenger seat was initially positioned 25 mm rearward of mid-track before being moved as far forward as possible where the ATD did not contact any interior panels, up to mid-track. The driver seat travel is measured from the forward most possible position to the rear most possible position. The driver seat is set to the middle of the fore-aft travel.



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore/Aft Travel (mm)	Placed in Position (mm)
Driver Seat	320	160
Passenger Seat	259	130

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer’s design position for a 50th percentile adult male ATD for the driver and passenger. Position “H” is the uppermost position, followed by position “M1” and “M2.” Position “L” is the lowermost position.

SEAT BELT UPPER ANCHORAGES

Seating Position	Total No. of Positions	Placed in Position
Driver Seat	4	H
Passenger Seat	4	H

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

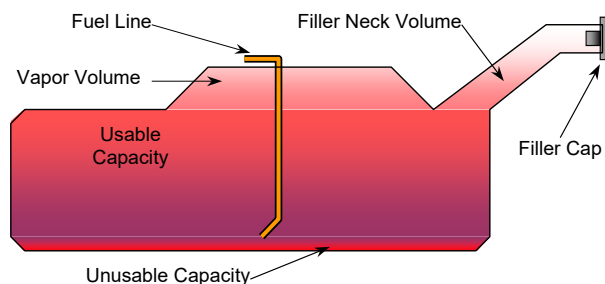
Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	57.02
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	53.03
Actual Amount of Stoddard Solvent Used	56.02
1/3 of Usable Capacity	19.01

FUEL PUMP

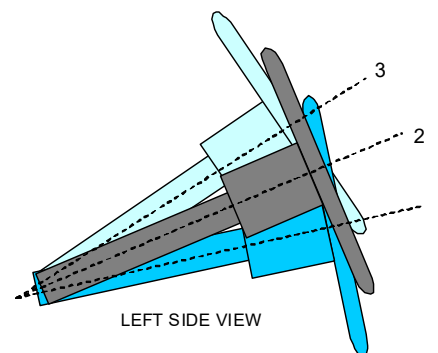
Fuel was evacuated according to the specifications provided by the manufacturer in Form 208. The electric fuel pump operates when the starter or engine is activated.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements. A tape measure is used to measure telescoping steering wheel travel.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	23.5	105
Geometric Center Position, No. 2	25.8	128.5
Uppermost Position, No. 3	28.0	152
Telescoping Steering Wheel Travel		47
Test Position	25.8	128.5

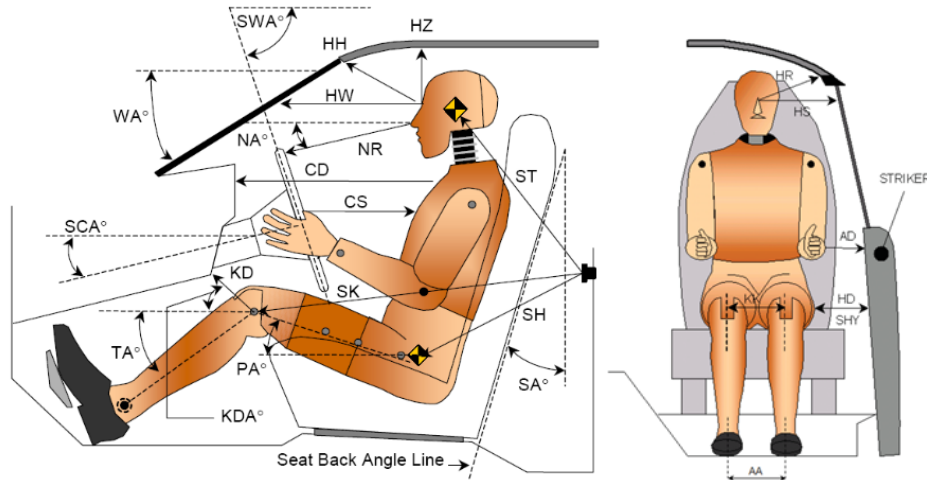
DATA SHEET NO. 3
DUMMY CLEARANCE DIMENSIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV

NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact

Test Date: 06/07/21



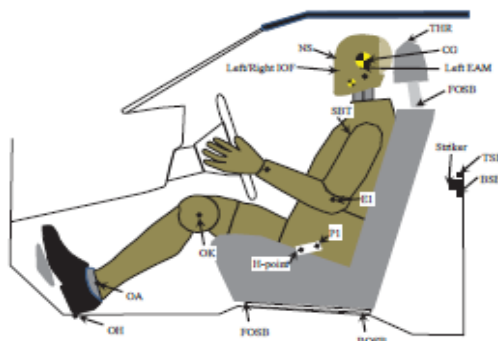
LEFT SIDE VIEW

Code	Measurement Description	Driver S/N# 168		Passenger S/N# EG2595	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
HZ	Nasion to Roof (Z Distance)	235		197	
HH	Nasion to Header (3D Distance)	350		387	
HW	Nasion to Windshield Point 1 Inside (X Distance)	764		714	
NR	Tip of Nose to Top of Steering Wheel (3D Distance)	391			
CD	Chest Point 1 to Dash Point 1 (3D Distance)	547		559	
CS	Chest Point 2 to Center of Steering Wheel (X Distance)	295			
CBS	Chest Point 3 to Bottom of Steering Wheel (X Distance)	179			
IKD	Inboard Knee to Dash Point 3 (3D Distance)			88	
OKD	Outboard Knee to Dash Point 2 (3D Distance)	142		111	
HR	Nasion to Side Header (3D Distance)			204	
HS	Nasion to Side Window Distance (Y Distance)	362			
AD	Elbow to Door (Y Distance)	147		63	
HD	H-Point to Door (Y Distance)				
HLHL	Inboard Heel to Outboard Heel (Y Distance)	321		217	
KK	Inboard Knee to Outboard Knee (Y Distance)			216	
SH	Striker to H-Point (3D Distance)	332		339	
HRA	Head Restraint Post Angle				
	H-Point Tool Angle				33
	Torso Angle		14.2		
	Windshield Angle		60.3		61
	Head Angle (X)		0.0		0.3
	Head Angle (Y)		0.0		0.0
	T1 Angle (X)				
	T1 Angle (Y)				
	T6 Angle (X)				
	T6 Angle (Y)				
	T12 Angle (X)				
	T12 Angle (Y)				
	Pelvis Angle (X)				29
	Pelvis Angle (Y)				

DATA SHEET NO. 4

DUMMY CMM MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21



Description	Units	Driver S/N# 168			Passenger S/N# EG2595		
		X	Y	Z	X	Y	Z
Center of Upper Striker Bolt	mm	2032	-789	-327	2034	791	-325
Center of Lower Striker Bolt	mm	2038	-790	-291	2040	792	-290
Center of Striker Bar	mm	2066	-792	-314	2067	792	-313
Front Outboard Seat Bolt	mm	2557	-606	81	2561	601	78
Rear Outboard Seat Bolt	mm	2117	-602	127	2119	598	126
Center of Steering Wheel Hub	mm	2549	-364	-530			
Outer Head Restraint Post	mm	1890	-447	-643	1853	452	-666
Right Head CG	mm	2137	-284	-763	2071	442	-816
Left Head CG	mm	2137	-436	-765	2070	290	-820
Right EAM	mm				2064	440	-790
Left EAM	mm				2065	293	-794
Nasion	mm	2227	-365	-770	2157	373	-839
Right IOF	mm				2155	402	-798
Left IOF	mm				2157	335	-801
Tip of Nose	mm	2250	-363	-724	2159	361	-767
Tip of Chin	mm	2229	-363	-651	2159	362	-701
Chest Point 1	mm	2262	-372	-529	2216	362	-581
Chest Point 2	mm	2255	-363	-531			
Chest Point 3	mm	2323	-364	-369			
Shoulder Point 1	mm	2126	-552	-510	2062	563	-590
Shoulder Point 2	mm				2117	549	-565
Elbow	mm	2324	-610	-350	2215	627	-310
Center of H-Point Tool	mm				2227	631	-203
H-Point on H-Point Tool	mm	2298	-547	-125	2306	593	-178
H-Point on ATD Skin	mm	2673	-543	-276	2306	559	-178
Outboard Knee	mm	2673	-543	-276	2717	540	-289
Inboard Knee	mm				2723	323	-296
Outboard Ankle	mm	2971	-574	49	3008	541	10
Inboard Ankle	mm	2978	-266	54	2994	325	19
Outboard Heel	mm	2987	-546	159	2985	496	149
Inboard Heel	mm	2978	-225	154	2974	279	147

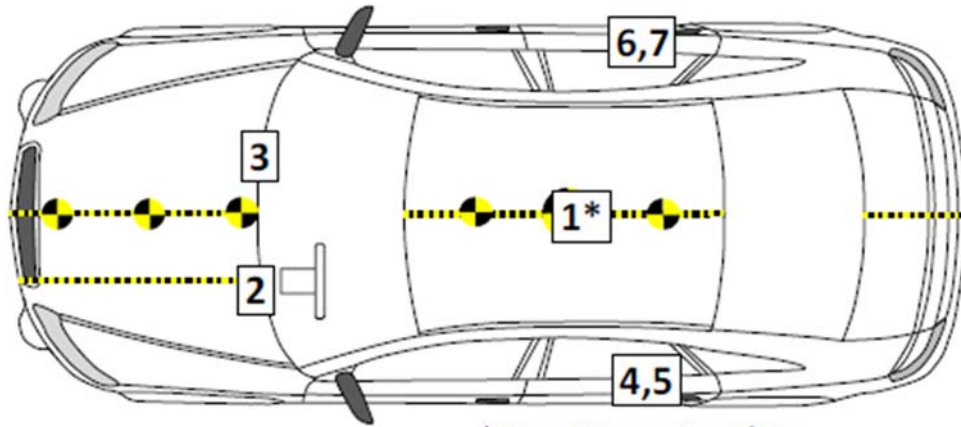
Reference Point:

- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 5

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS RELATIVE TO VCS

No.	Instrumentation Location	Axes	Units	Coordinates (mm)		
				X	Y	Z
1	Vehicle CG (Acceleration and Angular Rate)	x, y, z	g, °/s	1825	-3	75
2	Driver Floor Pan	x, y, z	°/s	3297	-404	31
3	Passenger Floor Pan	x, y, z	g	3230	393	79
4	Door Sill LR	x, y	g	1608	-721	156
5	Door Sill LR Redundant	x, y	g	1586	-719	156
6	Door Sill RR	x, y	g	1608	707	155
7	Door Sill RR Redundant	x, y	g	1583	706	156

Reference Point:

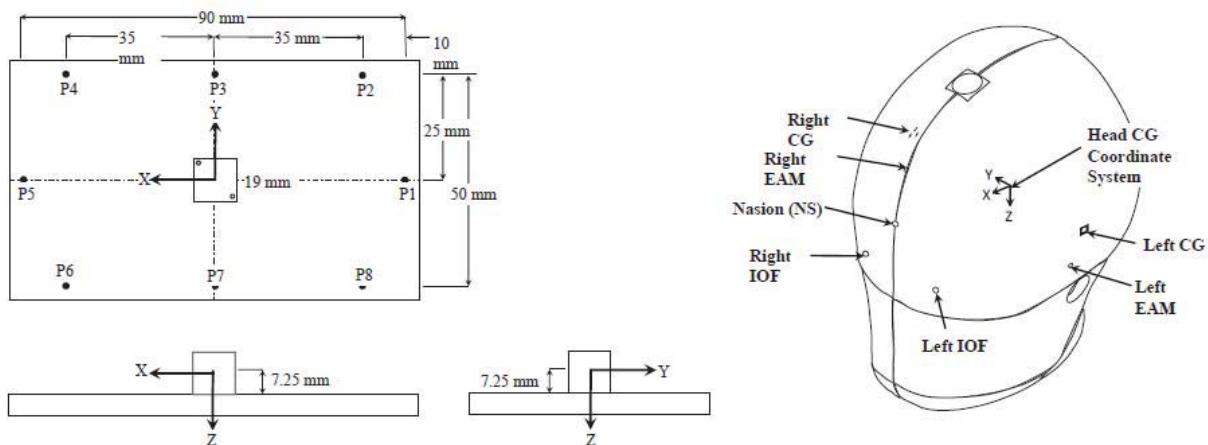
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 5 ... (CONTINUED)

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

ANGULAR RATE SENSOR MOUNTING PLATE & THOR HEAD POINT DEFINITIONS



CG ARS MOUNTING PLATE - VEHICLE COORDINATE SYSTEM

No.	Description	Units	X	Y	Z
P1	Plate Point 1	mm	1860	-3	68
P2	Plate Point 2	mm	1853	-27	69
P3	Plate Point 3	mm	1820	-30	73
P4	Plate Point 4	mm	1780	-27	78
P5	Plate Point 5	mm	1774	-4	78
P6	Plate Point 6	mm	1784	22	76
P7	Plate Point 7	mm	1817	25	72
P8	Plate Point 8	mm	1849	-25	70

PASSENGER HEAD POINTS IN RELATION TO HEAD CG COORDINATE SYSTEM

Description	Units	x	y	z
Left CG	mm	67	-41	47
Left EAM	mm	74	-36	74
Left IOF	mm	154	5	72
Right IOF	mm	156	66	75
Nasion	mm	157	37	37
Right EAM	mm	73	108	72
Right CG	mm	66	113	44

DATA SHEET NO. 5 ... (CONTINUED)

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

Location No.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Min	Time (ms)
1	Vehicle CG	x	g	5.6	26.3	-24.3	57.9
		y	g	9.3	47.8	-4.1	18.8
		z	g	21.2	31.1	-28.6	40.2
	Vehicle CG Rotation	x	°/s	151.1	62.3	-64.9	76.7
		y	°/s	67.9	25.0	-88.1	45.0
		z	°/s	39.4	69.3	-76.0	298.3
2	Driver Floor Pan	x	g	7.4	18.4	-15.3	62.4
		y	g	11.2	43.2	-11.4	82.9
		z	g	22.0	57.8	-6.9	16.2
3	Passenger Floor Pan	x	g	1.7	137.5	-10.3	64.5
		y	g	13.2	49.1	-8.4	86.8
		z	g	22.7	61.1	-1.4	172.0
4	Door Sill LR	x	g	0.9	133.2	-22.3	78.3
		y	g	7.8	47.1	-3.3	18.9
5	Door Sill LR Redundant	x	g	0.9	132.1	-21.4	78.2
		y	g	8.0	47.1	-4.3	18.8
6	Door Sill RR	x	g	1.2	146.1	-22.4	61.7
		y	g	8.1	46.7	-4.3	41.0
7	Door Sill RR Redundant	x	g	1.0	135.2	-21.9	61.7
		y	g	8.1	46.7	-4.3	18.9

Note: See Appendix B for all vehicle data plots

DATA SHEET NO. 6

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

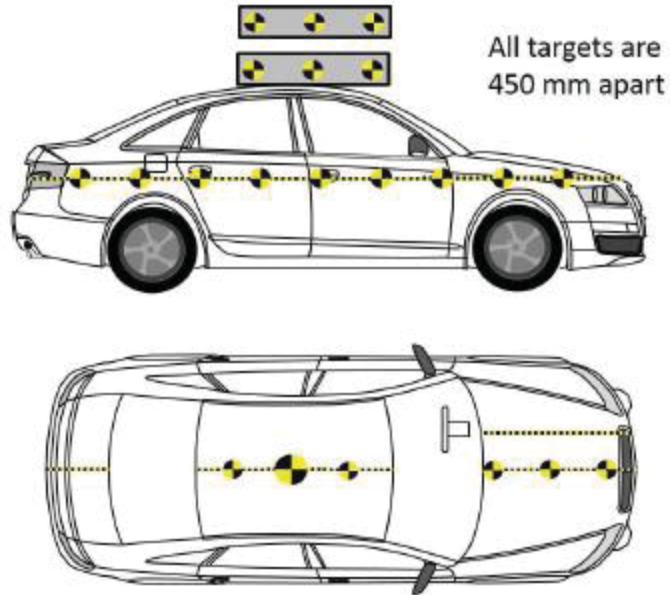
Test Vehicle: 2020 Mazda CX-5 5-Door MPV

NHTSA No. R20205417

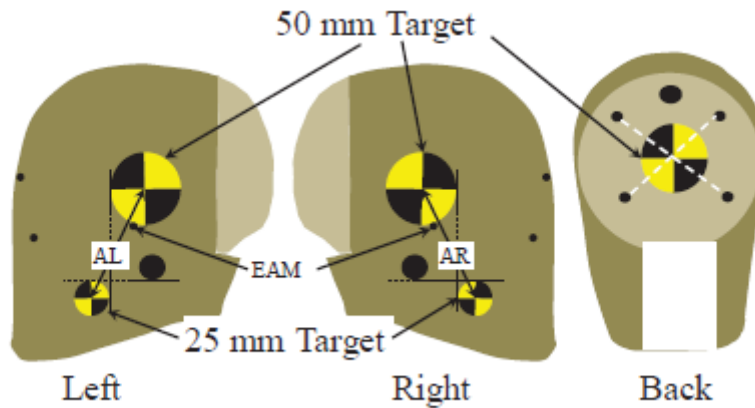
Test Program: Left Side 30° Frontal Rigid Barrier Impact

Test Date: 06/07/21

VEHICLE TARGETS



ATD HEAD TARGETS



Driver

Target	Units	Measurement
AL	mm	97
AR	mm	98

DATA SHEET NO. 7

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Sensors	43
Passenger Dummy Sensors	99
Airbag Timing Sensors	10
Vehicle Structure Sensors	20
Total	172

CAMERA COVERAGE

Type of Camera	Number of Cameras Collected
High-Speed Vehicle Onboard	4
High-Speed Off-Board	14
Real-Time Panning	1
Total	19

DATA SHEET NO. 8
POST TEST OBSERVATIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	Hybrid III / 168	THOR-50M / EG2595
Lower Leg Type		LX
Lower Leg Serial No.		
Head Contact	Frontal airbag, windshield, curtain airbag	Windshield, dashboard
Upper Torso Contact	Frontal airbag	Windshield, dashboard, roof trim, sun visor, rearview mirror
Lower Torso Contact	Frontal airbag, torso-pelvis airbag, seat bolster	Dashboard
Left Knee Contact	Knee bolster	Knee bolster
Right Knee Contact	Knee bolster, steering column trim	Knee bolster

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Rear Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Seat Track Shift (mm)		
Seat Back Failure	None	None
Glazing Damage	None	

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Windshield Damage	Broken
Window Damage	None
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	No
Side Airbag 1 (Curtain)	Yes	Yes	Yes	No
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	No	Yes	No
Seat Belt Load Limiter	Yes	No	Yes	No

DATA SHEET NO. 9

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4552	4397	-154
2	Rear Surface of Vehicle to Front of Engine	4063	3989	-74
3	RSOV to Firewall	3541	3546	5
4	RSOV to Upper Leading Edge of Right Door	3052	3056	4
5	RSOV to Upper Leading Edge of Left Door	3052	3053	1
6	RSOV to Lower Leading Edge of Right Door	3080	3081	2
7	RSOV to Lower Leading Edge of Left Door	3078	3077	-1
8	RSOV to Upper Trailing Edge of Right Door	1939	1943	5
9	RSOV to Upper Trailing Edge of Left Door	1937	1939	2
10	RSOV to Lower Trailing Edge of Right Door	2067	2071	4
11	RSOV to Lower Trailing Edge of Left Door	2063	2065	3
12	RSOV to Bottom of A-Pillar, Right Side	3015	3018	4
13	RSOV to Bottom of A-Pillar, Left Side	3013	3016	4
14	RSOV to Firewall, Right Side	3628	3632	4
15	RSOV to Firewall, Left Side	3627	3618	-9
16	RSOV to Steering Column	2552	2622	70
17	Center of Steering Column to A-Pillar	461	395	-66
18	Center of Steering Column to Headliner	470	480	10
19	RSOV to Right Side of Front Bumper	4302	4311	9
20	RSOV to Left Side of Front Bumper	4303	3980	-324
21	Length of Engine Block	488	460	-28
RD	RSOV to Right Side of Dash Panel	2775	2782	7
CD	RSOV to Center of Dash Panel	2748	2763	15
LD	RSOV to Left Side of Dash Panel	2777	2785	8

All measurements in millimeters.

DATA SHEET NO. 10

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

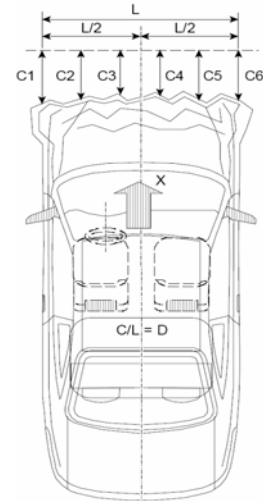
VEHICLE INFORMATION

VIN: JM3KFABM8L0838933
 Vehicle Size Category: 5-door MPV

Wheelbase (mm): 2680
 Test Weight (kg): 1745.0

ACCELEROMETER DATA

Accelerometer Locations: Vehicle CG_x
 Cal. Procedure/Interval: Vibration Test / 6 months
 Integration Algorithm: NHTSA Standard
 Linearity: Good
 Impact Velocity (km/h): 39.95



CRUSH PROFILE

Collision Deformation Classification: 12FLEW2
 Midpoint of Damage: 753.1
 Damage Region Length (mm): 1506.3
 Impact Mode: Left Side 30° Frontal

Crush Measurements

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4307	3980	-327
C2	Crush Zone 2 at Left Side	mm	4450	4085	-364
C3	Crush Zone 3 at Left Side	mm	4508	4255	-254
C4	Crush Zone 4 at Right Side	mm	4509	4393	-116
C5	Crush Zone 5 at Right Side	mm	4451	4444	-7
C6	Crush Zone 6 at Right Side	mm	4306	4311	6
L	C1 to C6	mm	1217		

DATA SHEET NO. 11

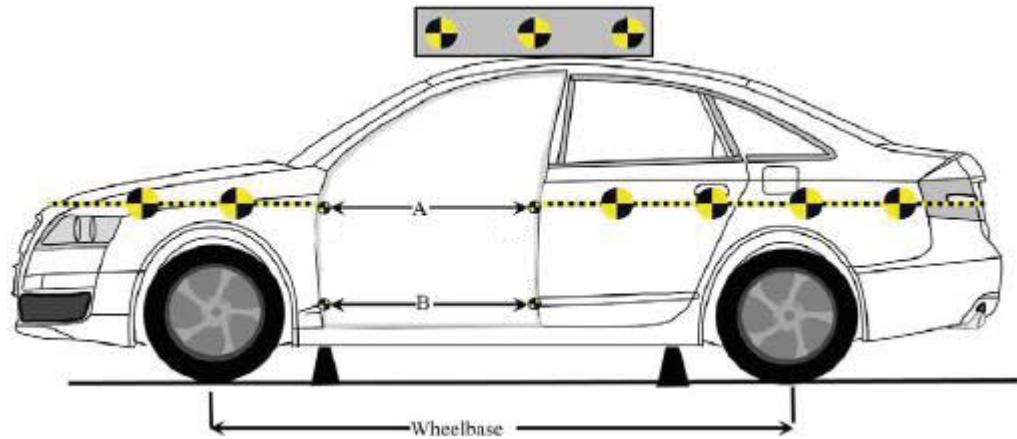
VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Driver Side Upper	mm	871	871	0
B	Driver Side Lower	mm	734	736	-2
D	Passenger Side Upper	mm	873	873	0
E	Passenger Side Lower	mm	734	737	-2



DATA SHEET NO. 11 ... (CONTINUED)

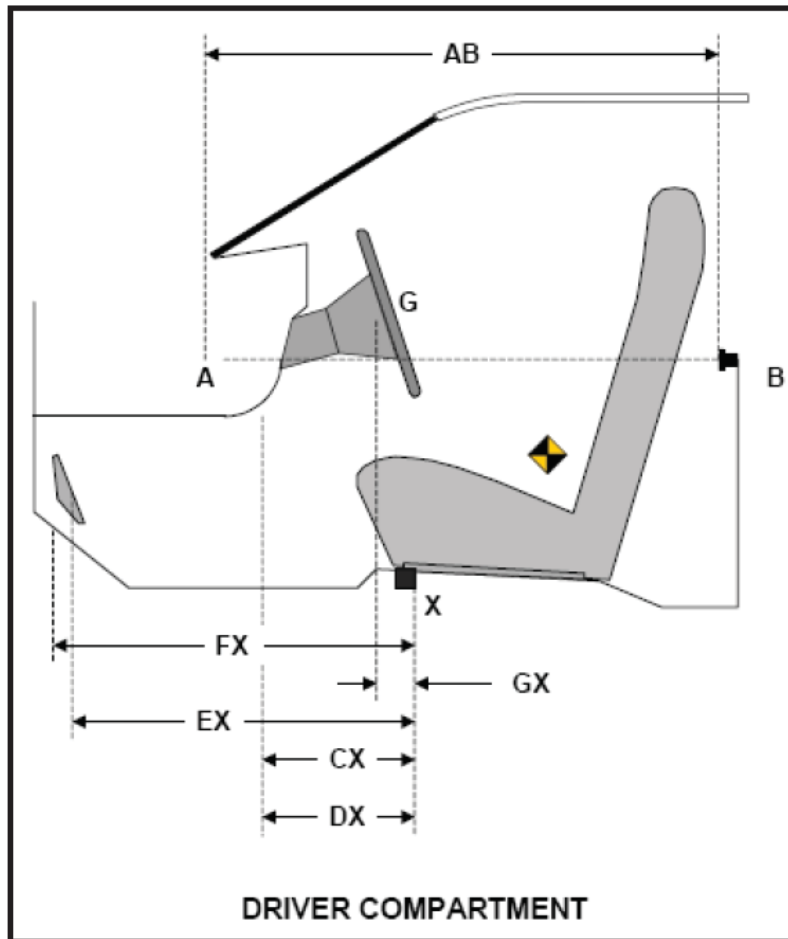
VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	863	865	-2
CX	Left Knee Bolster to X	mm	287	301	-14
DX	Right Knee Bolster to X	mm	272	291	-20
EX	Brake Pedal to X	mm	527	525	2
FX	Footrest to X	mm	661	659	1
GX	Center of Steering Column Wheel Hub to X	mm	-2	64	-66

X = Front of Seat Track (Stationary)



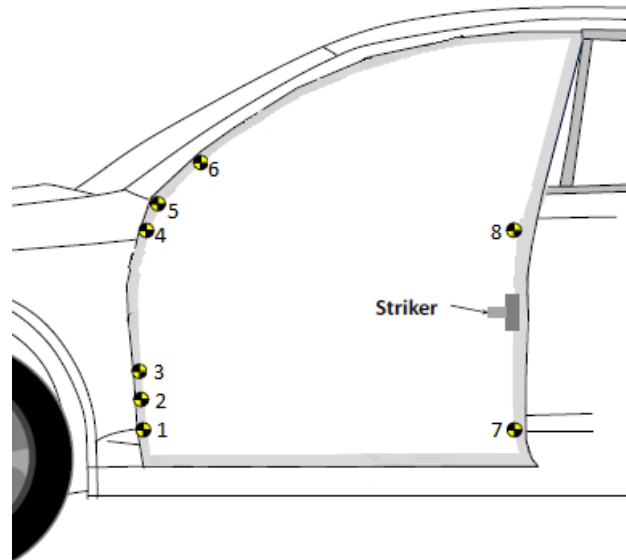
DATA SHEET NO. 11 ... (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

DRIVER SIDE DOOR SILL INTRUSIONS



- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

Point	Pre-Test			Post-Test			Difference		
	x	y	z	x	y	z	x	y	z
1	2956	-750	-12	2957	-750	-11	1	0	1
2	2967	-745	-88	2966	-745	-87	0	-1	1
3	2957	-741	-162	2957	-742	-163	0	-1	0
4	2918	-743	-464	2918	-745	-464	0	-2	0
5	2907	-747	-538	2905	-749	-537	-1	-2	0
6	2880	-749	-615	2881	-751	-615	0	-2	0
7	2222	-752	-11	2221	-753	-13	-1	-1	-1
8	2047	-736	-464	2047	-737	-465	0	-2	0

All measurements in millimeters.

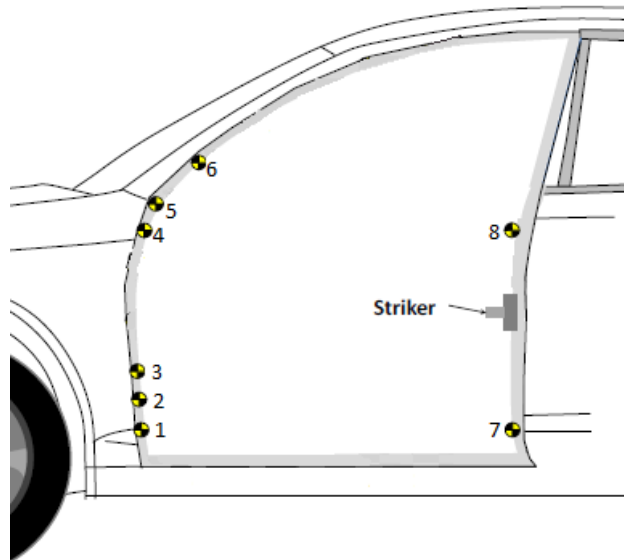
DATA SHEET NO. 11 ... (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417

Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

PASSENGER SIDE DOOR SILL INTRUSIONS



- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

Point	Pre-Test			Post-Test			Difference		
	x	y	z	x	y	z	x	y	z
1	2959	747	-18	2961	748	-18	2	0	-1
2	2970	743	-88	2967	744	-85	-3	0	3
3	2958	740	-165	2958	741	-167	0	0	-2
4	2921	746	-467	2922	746	-467	1	0	0
5	2909	751	-539	2911	751	-538	3	0	1
6	2881	753	-616	2884	753	-615	3	0	1
7	2224	750	-11	2225	751	-10	0	1	1
8	2049	738	-465	2049	739	-462	0	1	3

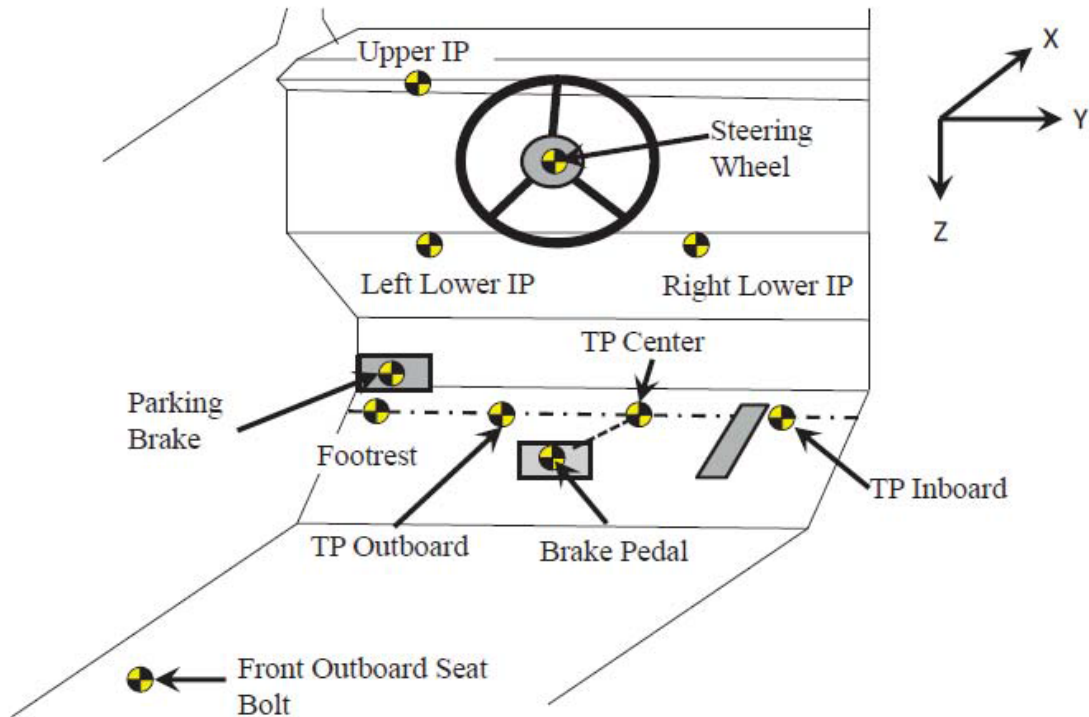
All measurements in millimeters.

DATA SHEET NO. 11 ... (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

DRIVER FLOOR PAN MEASUREMENTS



Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	x	y	z	x	y	z	x	y	z
TP Inboard	3362	-184	-27	3359	-183	-29	-3	1	-2
TP Center	3350	-336	-12	3345	-336	-17	-6	0	-5
TP Outboard	3298	-482	-16	3291	-477	-18	-7	5	-2
TP Footrest	3218	-586	-12	3217	-584	-12	-1	2	0
Brake Pedal	3084	-329	-13	3083	-325	-13	-1	4	0
Left Lower IP	2844	-521	-299	2858	-514	-300	14	7	-1
Right Lower IP	2829	-221	-298	2849	-217	-292	20	4	6
Upper IP	2756	-523	-433	2763	-515	-430	7	8	3
Steering Wheel	2555	-368	-531	2621	-352	-519	66	16	11
Front Outboard Bolt	2557	-606	81	2557	-603	81	0	4	1
Emergency Brake									

Reference point:

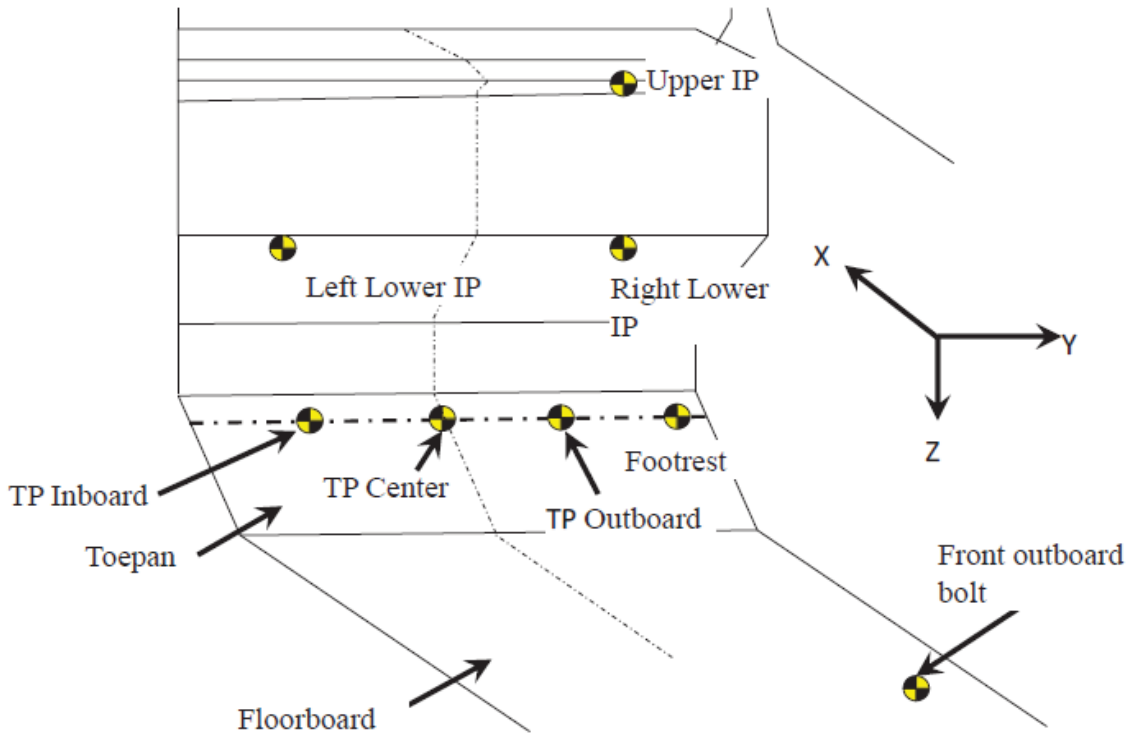
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 11 ... (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

PASSENGER FLOOR PAN MEASUREMENTS



Intrusion Location	Pre-Test (mm)			Post-Test (mm)			Difference (mm)		
	x	y	z	x	y	z	x	y	z
TP Inboard	3337	218	-10	3338	218	-12	1	1	-1
TP Center	3350	363	-14	3353	364	-18	2	1	-3
TP Outboard	3253	516	-15	3252	520	-16	-2	4	-1
TP Footrest	3205	612	-14	3208	609	-16	3	-3	-2
Left Lower IP	2819	212	-298	2827	211	-298	8	-1	0
Right Lower IP	2849	511	-296	2854	510	-297	6	-1	-1
Upper IP	2750	516	-453	2754	515	-451	4	-1	2
Front Outboard Seat Bolt	2561	601	78	2561	602	79	0	1	1

Reference point:

+X – From the rear of the vehicle to the front of the vehicle

+Y – From the left side of the vehicle to the right side of the vehicle

+Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 12

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

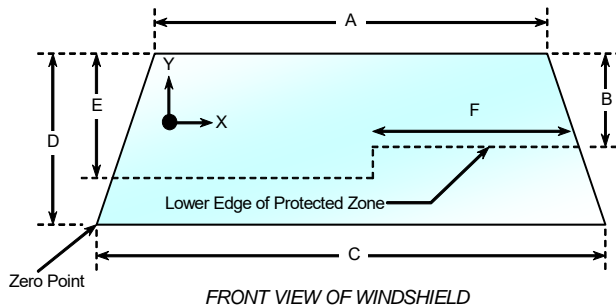
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with plastic molding and rubber cement.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.1 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2153	2153	100.0%
Right Side	2153	2153	100.0%
Total	4306	4306	100.0%



Item	Units	Value
A	mm	620
B	mm	765
C	mm	768
D	mm	620
E	mm	765
F	mm	768

AREAS OF PROTECTED ZONE FAILURES

- A. Provide Coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield.
- B. Provide Coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y

X	Y

DATA SHEET NO. 12 ... (CONTINUED)

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.7 °C Test Time: 2:33 PM

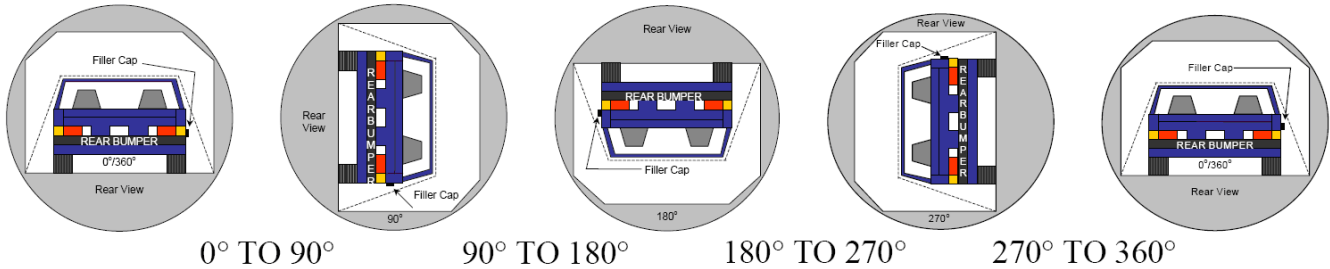
Stoddard Solvent Spillage Measurements

- A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)
- D. Spillage: There was no Stoddard solvent spillage.

DATA SHEET NO. 13

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205417
 Test Program: Left Side 30° Frontal Rigid Barrier Impact Test Date: 06/07/21



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: There was no Stoddard solvent spillage.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	89	300	389
90° To 180°	85	300	385
180° To 270°	91	300	391
270° To 360°	81	300	381

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

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

**APPENDIX A
PHOTOGRAPHS**

TABLE OF PHOTOGRAPHS

Figure		Page
1	Test Vehicle Certification Label	A-1
2	Test Vehicle Tire Placard	A-1
3	Right Front $\frac{3}{4}$ View, As Received	A-2
4	Left Rear $\frac{3}{4}$ View, As Received	A-2
5	Pre-Test Front View of Test Vehicle	A-3
6	Post-Test Front View of Test Vehicle	A-3
7	Pre-Test Left View of Test Vehicle	A-4
8	Post-Test Left View of Test Vehicle	A-4
9	Pre-Test Right View of Test Vehicle	A-5
10	Post-Test Right View of Test Vehicle	A-5
11	Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-6
12	Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle	A-6
13	Pre-Test Right Front $\frac{3}{4}$ View of Test Vehicle	A-7
14	Post-Test Right Front $\frac{3}{4}$ View of Test Vehicle	A-7
15	Pre-Test Right Rear $\frac{3}{4}$ View of Test Vehicle	A-8
16	Post-Test Right Rear $\frac{3}{4}$ View of Test Vehicle	A-8
17	Pre-Test Rear View of Test Vehicle	A-9
18	Post-Test Rear View of Test Vehicle	A-9
19	Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-10
20	Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-10
21	Pre-Test Windshield View	A-11
22	Post-Test Windshield View	A-11
23	Pre-Test Engine Compartment View	A-12
24	Post-Test Engine Compartment View	A-12
25	Pre-Test Fuel Filler Cap View	A-13
26	Post-Test Fuel Filler Cap View	A-13
27	Pre-Test Front Underbody View	A-14
28	Post-Test Front Underbody View	A-14
29	Pre-Test Mid Underbody View	A-15
30	Post-Test Mid Underbody View	A-15
31	Pre-Test Rear Underbody View	A-16
32	Post-Test Rear Underbody View	A-16
33	Pre-Test Bumper to Rail Attachments and Crush Initiators	A-17
34	Post-Test Bumper to Rail Attachments and Crush Initiators	A-17
35	Pre-Test Driver Side Bumper to Rail Attachments and Crush Initiators	A-18
36	Post-Test Driver Side Bumper to Rail Attachments and Crush Initiators	A-18

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
37	Pre-Test Passenger Side Bumper to Rail Attachments and Crush Initiators	A-19
38	Post-Test Passenger Side Bumper to Rail Attachments and Crush Initiators	A-19
39	Pre-Test Driver Side Rocker	A-20
40	Post-Test Driver Side Rocker	A-20
41	Pre-Test Passenger Side Rocker	A-21
42	Post-Test Passenger Side Rocker	A-21
43	Pre-Test Driver Front Windshield View	A-22
44	Post-Test Driver Front Windshield View	A-22
45	Pre-Test Driver Side Front Window View	A-23
46	Post-Test Driver Side Front Window View	A-23
47	Pre-Test View of Driver Door Clearance	A-24
48	Post-Test View of Driver Door Clearance	A-24
49	Pre-Test Left Side View of Driver and Interior	A-25
50	Post-Test Left Side View of Driver and Interior	A-25
51	Pre-Test Left Side View of Steering Wheel Position	A-26
52	Post-Test Left Side View of Steering Wheel Position	A-26
53	Pre-Test Overhead View of Driver Thighs on Seat	A-27
54	Post-Test Overhead View of Driver Thighs on Seat	A-27
55	Pre-Test View of Driver Abdomen	A-28
56	Post-Test View of Driver Abdomen	A-28
57	Pre-Test Right Side View of Driver and Interior	A-29
58	Post-Test Right Side View of Driver and Interior	A-29
59	Pre-Test View of Driver Left Knee and Bolster	A-30
60	Post-Test View of Driver Left Knee and Bolster	A-30
61	Pre-Test View of Driver Right Knee and Bolster	A-31
62	Post-Test View of Driver Right Knee and Bolster	A-31
63	Pre-Test View of the Driver Left Leg	A-32
64	Post-Test View of the Driver Left Leg	A-32
65	Pre-Test View of the Driver Feet	A-33
66	Post-Test View of the Driver Feet	A-33
67	Pre-Test Driver Adjustable D-Ring	A-34
68	Post-Test Driver Adjustable D-Ring	A-34
69	Pre-Test Driver Seat Fore-Aft Markings	A-35
70	Post-Test Driver Seat Fore-Aft Markings	A-35
71	Pre-Test Driver Seat Back Markings	A-36
72	Post-Test Driver Seat Back Markings	A-36

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
73	Pre-Test Close-Up View of Driver Door Latch	A-37
74	Post-Test Close-Up View of Driver Door Latch	A-37
75	Pre-Test Driver Inner Door Panel	A-38
76	Post-Test Driver Inner Door Panel	A-38
77	Pre-Test Left Side View of Driver Knee Bolster	A-39
78	Post-Test Left Side View of Driver Knee Bolster	A-39
79	Pre-Test Overall View of Driver Knee Bolster	A-40
80	Post-Test Overall View of Driver Knee Bolster	A-40
81	Pre-Test Right Side View of Driver Knee Bolster	A-41
82	Post-Test Right Side View of Driver Knee Bolster	A-41
83	Pre-Test View of Driver Floor Pan from Outside of Vehicle	A-42
84	Post-Test View of Driver Floor Pan from Outside of Vehicle	A-42
85	Pre-Test View of Driver Floor Pan from Top of Seat	A-43
86	Post-Test View of Driver Floor Pan from Top of Seat	A-43
87	Pre-Test View of Driver Floor Pan from Center of Vehicle	A-44
88	Post-Test View of Driver Floor Pan from Center of Vehicle	A-44
89	Post-Test Driver Dummy Contact with Front Airbag	A-45
90	Post-Test Driver Dummy Contact with Side Airbag	A-45
91	Post-Test Driver Dummy Contact with Knee Airbag	A-46
91a	Post-Test Driver Dummy Contact with Seat	A-46
92	Pre-Test Passenger Front Windshield View	A-47
93	Post-Test Passenger Front Windshield View	A-47
94	Pre-Test Passenger Side Front Window View	A-48
95	Post-Test Passenger Side Front Window View	A-48
96	Pre-Test View of Passenger Door Clearance	A-49
97	Post-Test View of Passenger Door Clearance	A-49
98	Pre-Test Right Side View of Passenger and Interior	A-50
99	Post-Test Right Side View of Passenger and Interior	A-50
100	Pre-Test Overhead View of Passenger Thighs on Seat	A-51
101	Post-Test Overhead View of Passenger Thighs on Seat	A-51
102	Pre-Test View of Passenger Abdomen	A-52
103	Post-Test View of Passenger Abdomen	A-52
104	Pre-Test Left Side Passenger and Interior View	A-53
105	Post-Test Left Side Passenger and Interior View	A-53
106	Pre-Test View of Passenger Right Knee and Bolster	A-54
107	Post-Test View of Passenger Right Knee and Bolster	A-54

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
108	Pre-Test View of Passenger Left Knee and Bolster	A-55
109	Post-Test View of Passenger Left Knee and Bolster	A-55
110	Pre-Test View of the Passenger Feet	A-56
111	Post-Test View of the Passenger Feet	A-56
112	Pre-Test Passenger Adjustable D-Ring	A-57
113	Post-Test Passenger Adjustable D-Ring	A-57
114	Pre-Test Right Front Passenger Seat Fore-Aft Markings	A-58
115	Post-Test Right Front Passenger Seat Fore-Aft Markings	A-58
116	Pre-Test Passenger Seat Back Markings	A-59
117	Post-Test Passenger Seat Back Markings	A-59
118	Pre-Test Close-up View of Passenger Door Latch	A-60
119	Post-Test Close-up View of Passenger Door Latch	A-60
120	Pre-Test Passenger Inner Door Panel	A-61
121	Post-Test Passenger Inner Door Panel	A-61
122	Pre-Test Right Side View of Passenger Knee Bolster	A-62
123	Post-Test Right Side View of Passenger Knee Bolster	A-62
124	Pre-Test Center View of Passenger Knee Bolster	A-63
125	Post-Test Center View of Passenger Knee Bolster	A-63
126	Pre-Test Left Side View of Passenger Knee Bolster	A-64
127	Post-Test Left Side View of Passenger Knee Bolster	A-64
128	Pre-Test View of Passenger Floor Pan from Outside of Vehicle	A-65
129	Post-Test View of Passenger Floor Pan from Outside of Vehicle	A-65
130	Pre-Test View of Passenger Floor Pan from Top of Front Seat	A-66
131	Post-Test View of Passenger Floor Pan from Top of Front Seat	A-66
132	Pre-Test View of Passenger Floor Pan from Center of Vehicle	A-67
133	Post-Test View of Passenger Floor Pan from Center of Vehicle	A-67
134	Post-Test Passenger Dummy Contact with Front Airbag	A-68
135	Post-Test Passenger Dummy Contact with Side Airbag	A-68
136	Post-Test Passenger Dummy Contact with Knee Airbag	A-69
136a	Post-Test Passenger Dummy Contact with Windshield	A-69
136b	Post-Test Passenger Dummy Contact with Dashboard	A-70
136c	Post-Test Passenger Dummy Contact with Knee Bolster	A-70
137	Post-Test Stoddard Solvent Spillage Location View	A-71
138	Post-Test Speed Trap Read-Out	A-71
139	Vehicle at 0° on Static Rollover Device	A-72
140	Vehicle at 90° on Static Rollover Device	A-72

TABLE OF PHOTOGRAPHS ... (CONTINUED)

<u>Figure</u>		<u>Page</u>
141	Vehicle at 180° on Static Rollover Device	A-73
142	Vehicle at 270° on Static Rollover Device	A-73
143	Vehicle at 360° on Static Rollover Device	A-74
144	Frontal Impact Event	A-74
145	Monronev Label Photograph	A-75

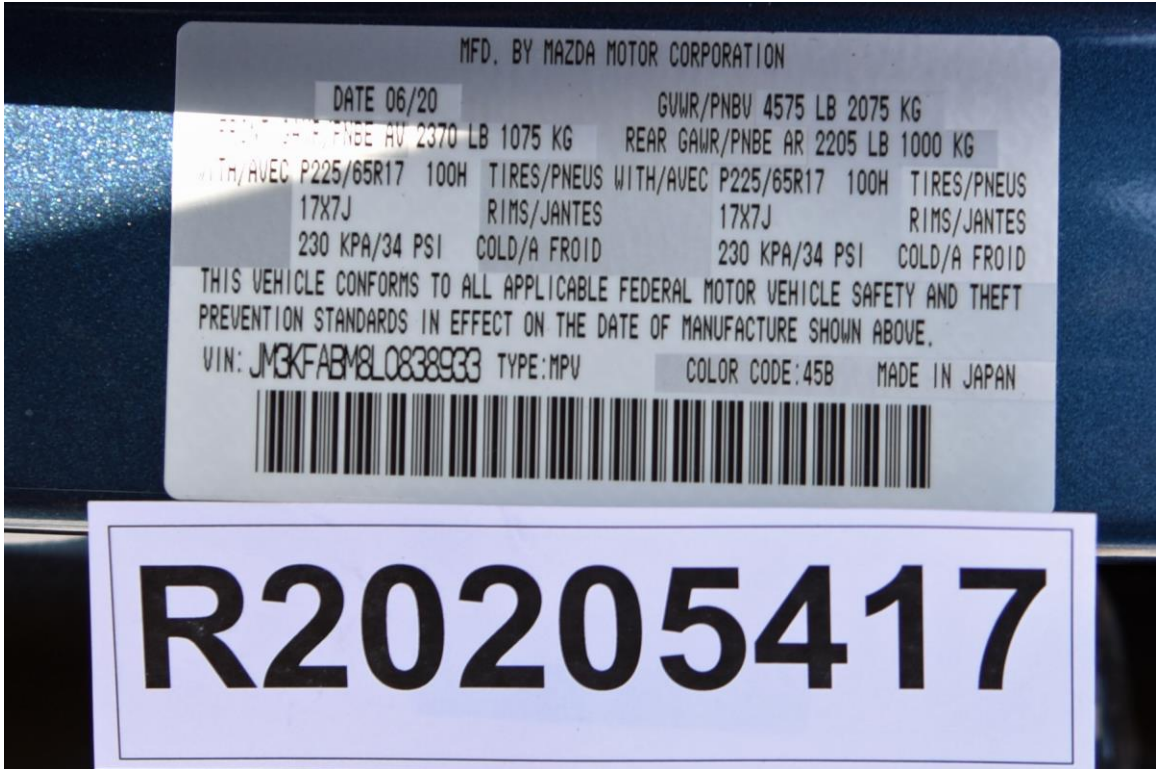


FIGURE 1. Test Vehicle Certification Label

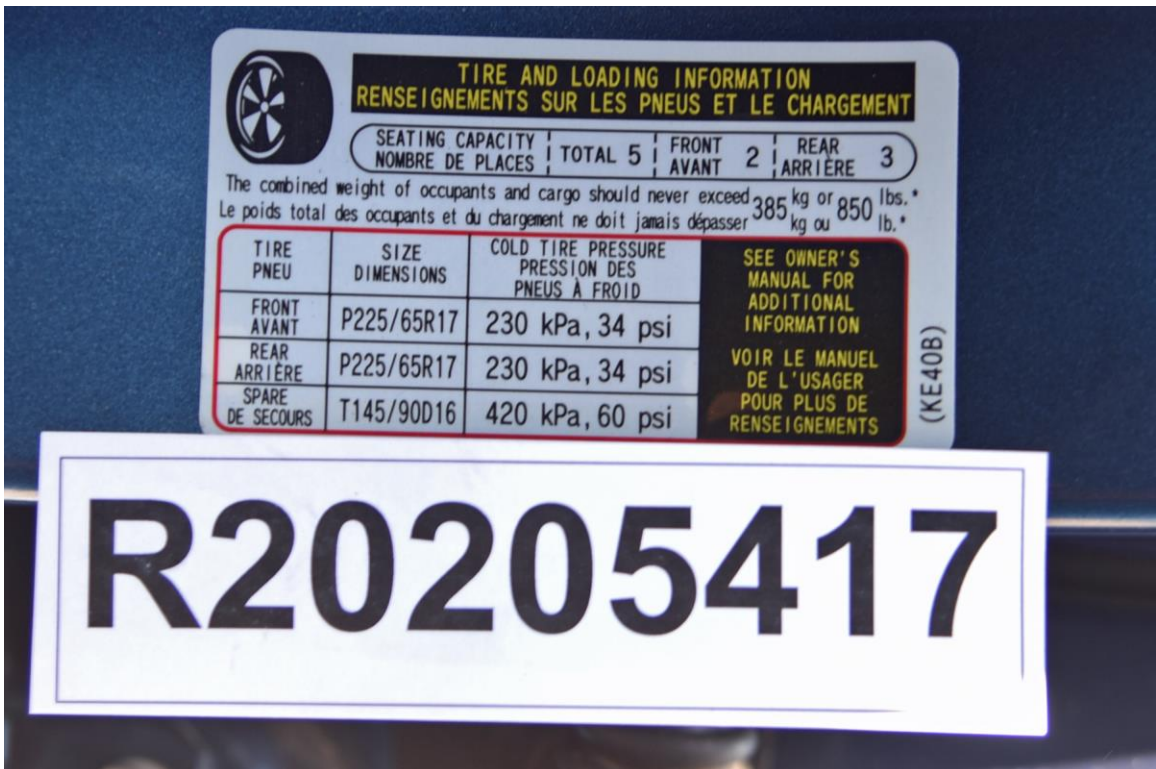


FIGURE 2. Test Vehicle Tire Placard



FIGURE 3. Right Front $\frac{3}{4}$ View, As Received



FIGURE 4. Left Rear $\frac{3}{4}$ View, As Received



FIGURE 5. Pre-Test Front View of Test Vehicle

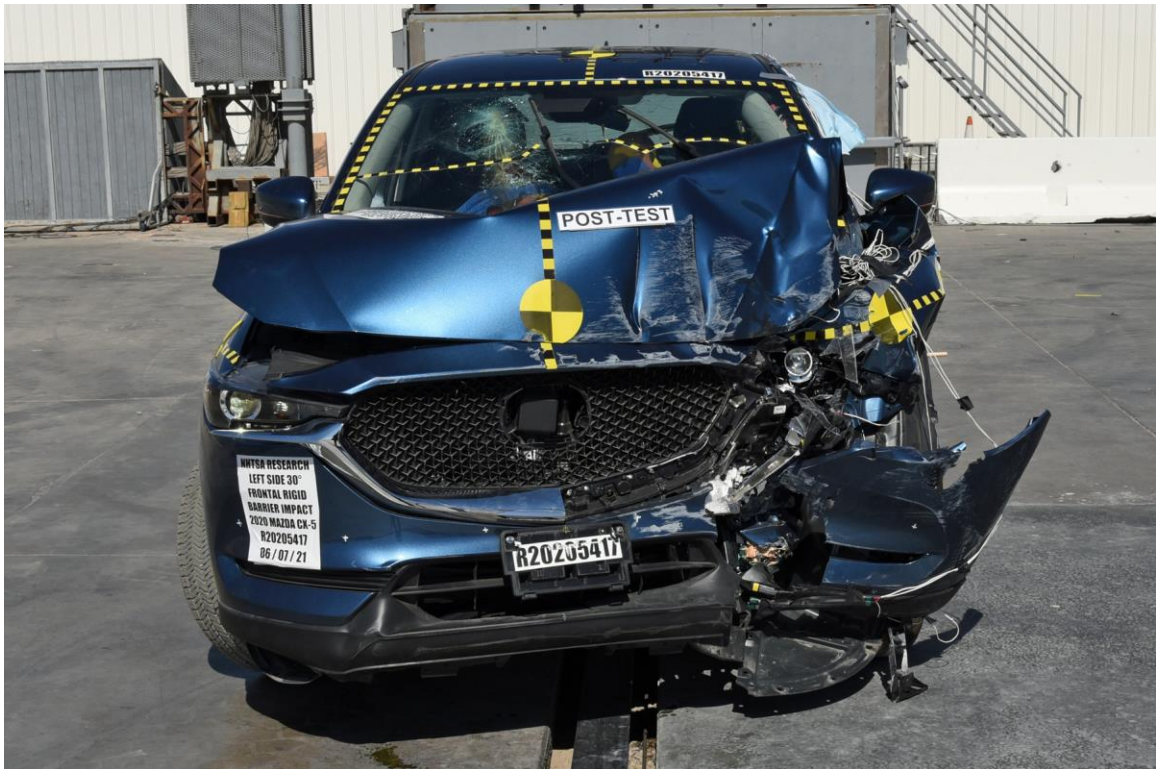


FIGURE 6. Post-Test Front View of Test Vehicle



FIGURE 7. Pre-Test Left View of Test Vehicle



FIGURE 8. Post-Test Left View of Test Vehicle



FIGURE 9. Pre-Test Right View of Test Vehicle



FIGURE 10. Post-Test Right View of Test Vehicle



FIGURE 11. Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle

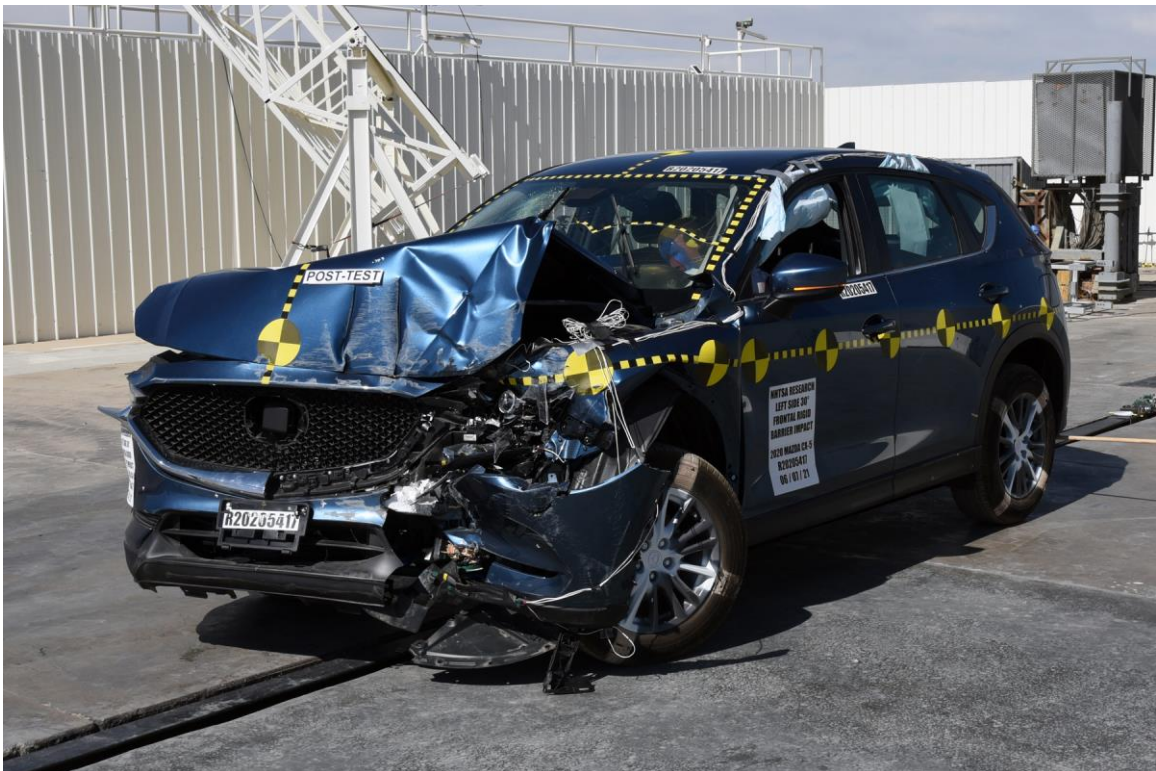


FIGURE 12. Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 13. Pre-Test Right Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 14. Post-Test Right Front $\frac{3}{4}$ View of Test Vehicle



FIGURE 15. Pre-Test Right Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 16. Post-Test Right Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 17. Pre-Test Rear View of Test Vehicle



FIGURE 18. Post-Test Rear View of Test Vehicle



FIGURE 19. Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 20. Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



FIGURE 21. Pre-Test Windshield View



FIGURE 22. Post-Test Windshield View



FIGURE 23. Pre-Test Engine Compartment View



FIGURE 24. Post-Test Engine Compartment View



FIGURE 25. Pre-Test Fuel Filler Cap View



FIGURE 26. Post-Test Fuel Filler Cap View

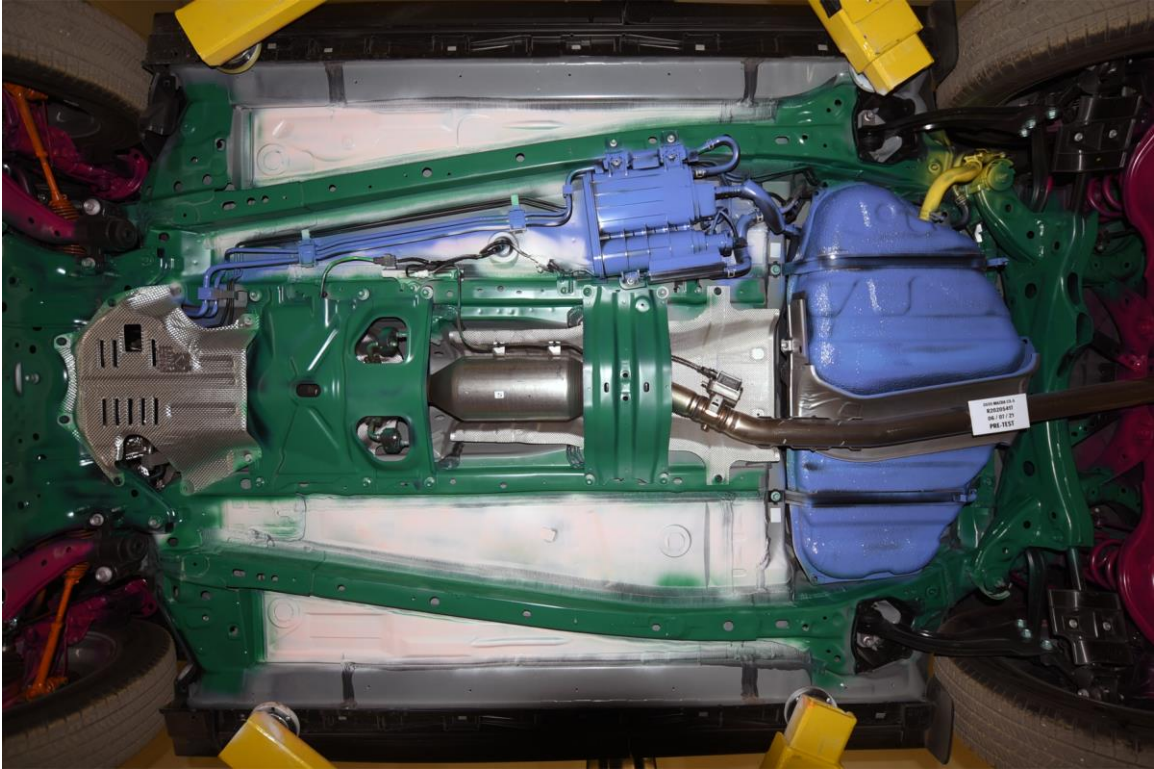


FIGURE 29. Pre-Test Mid Underbody View

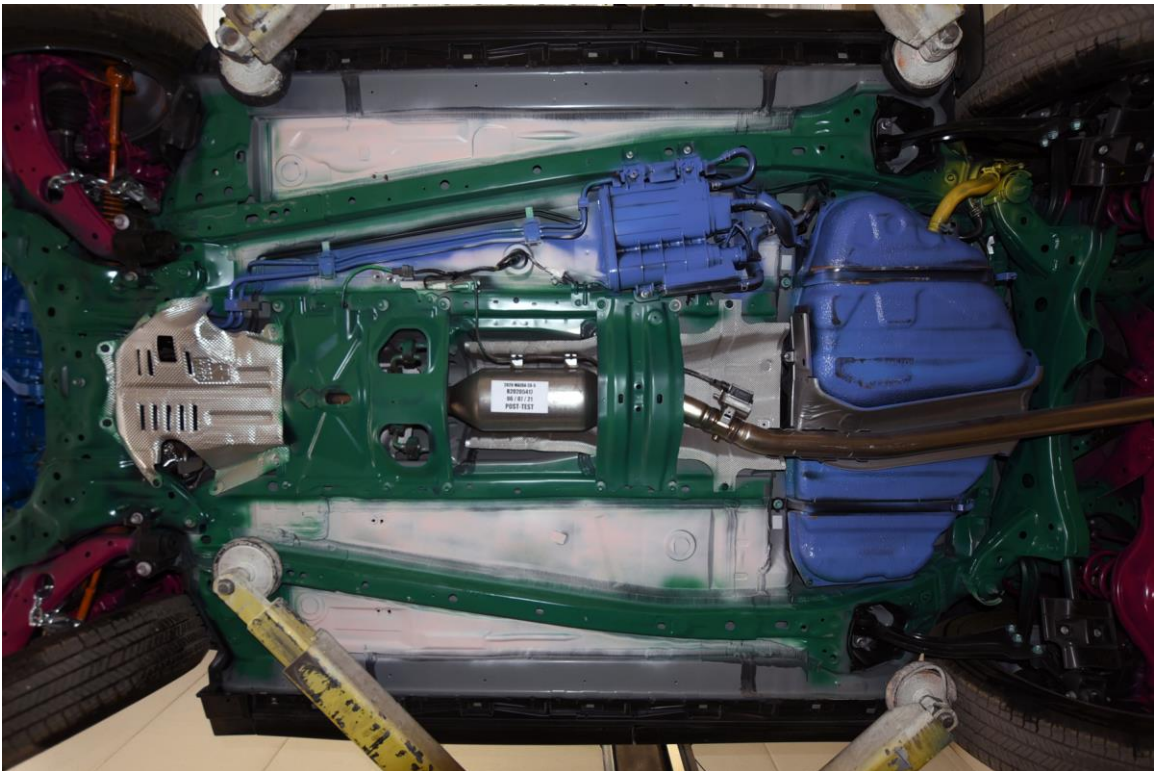


FIGURE 30. Post-Test Mid Underbody View

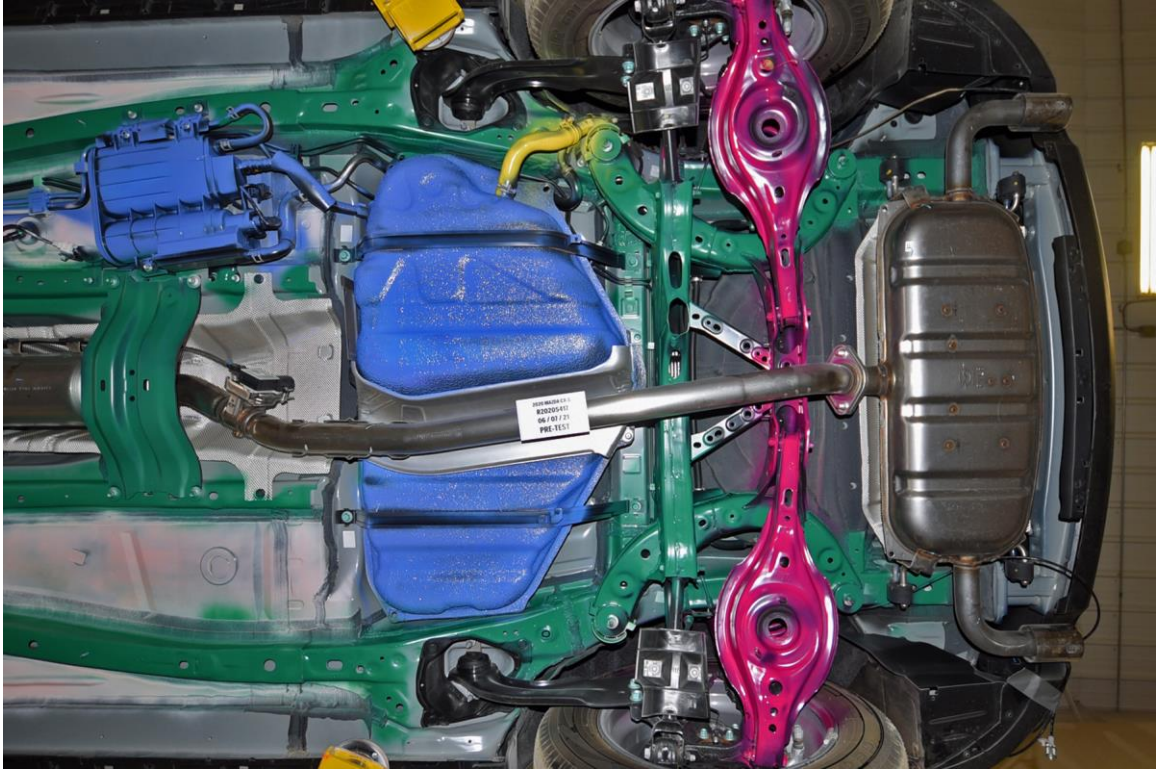


FIGURE 31. Pre-Test Rear Underbody View

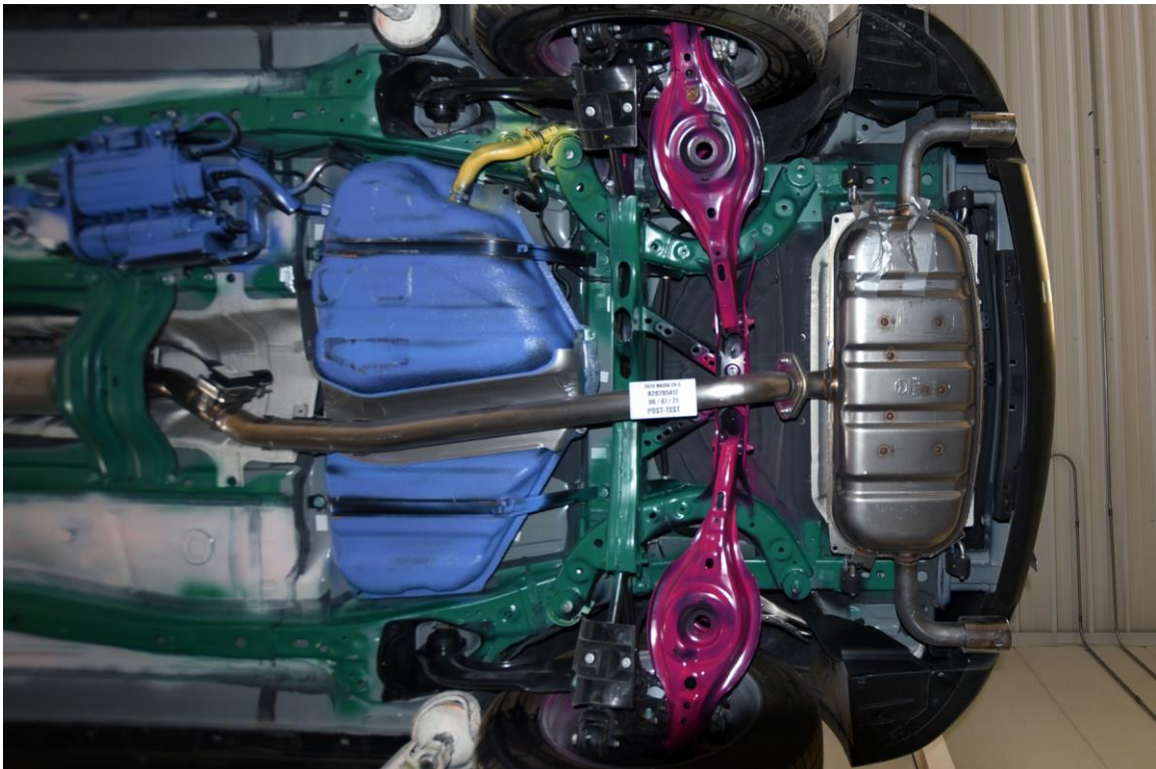


FIGURE 32. Post-Test Rear Underbody View



FIGURE 33. Pre-Test Bumper to Rail Attachments and Crush Initiators

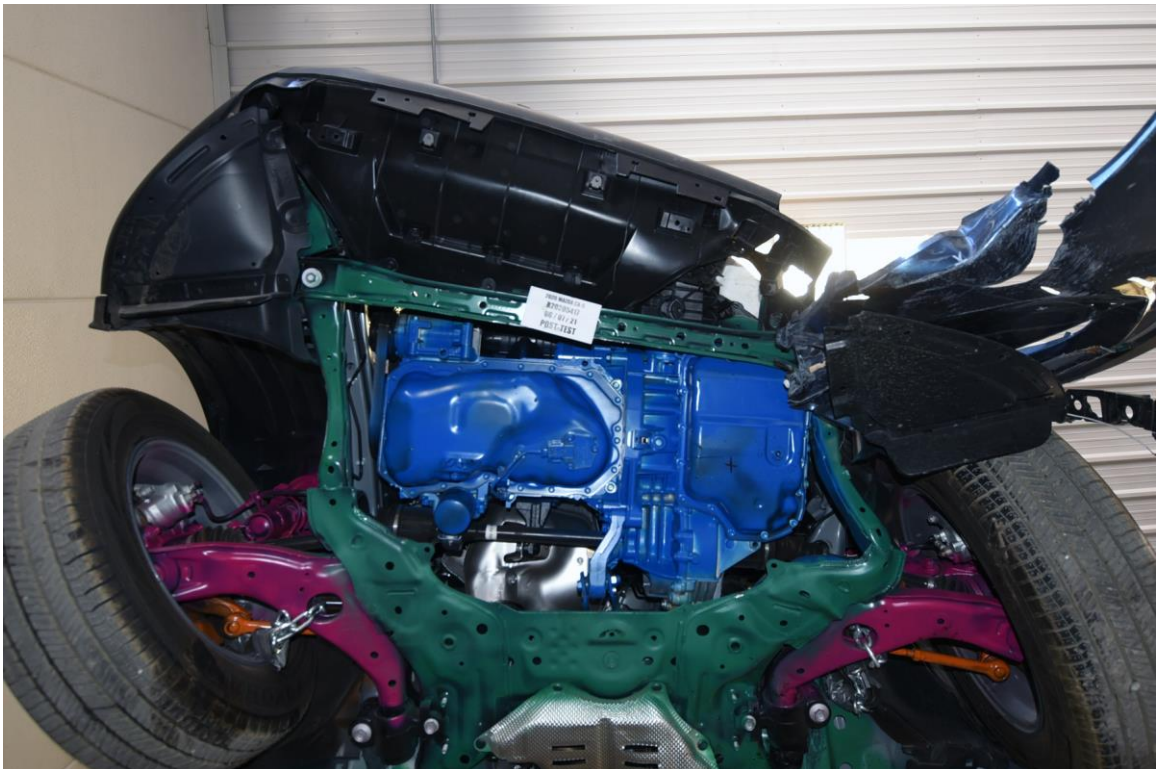


FIGURE 34. Post-Test Bumper to Rail Attachments and Crush Initiators



FIGURE 35. Pre-Test Driver Side Bumper to Rail Attachments and Crush Initiators

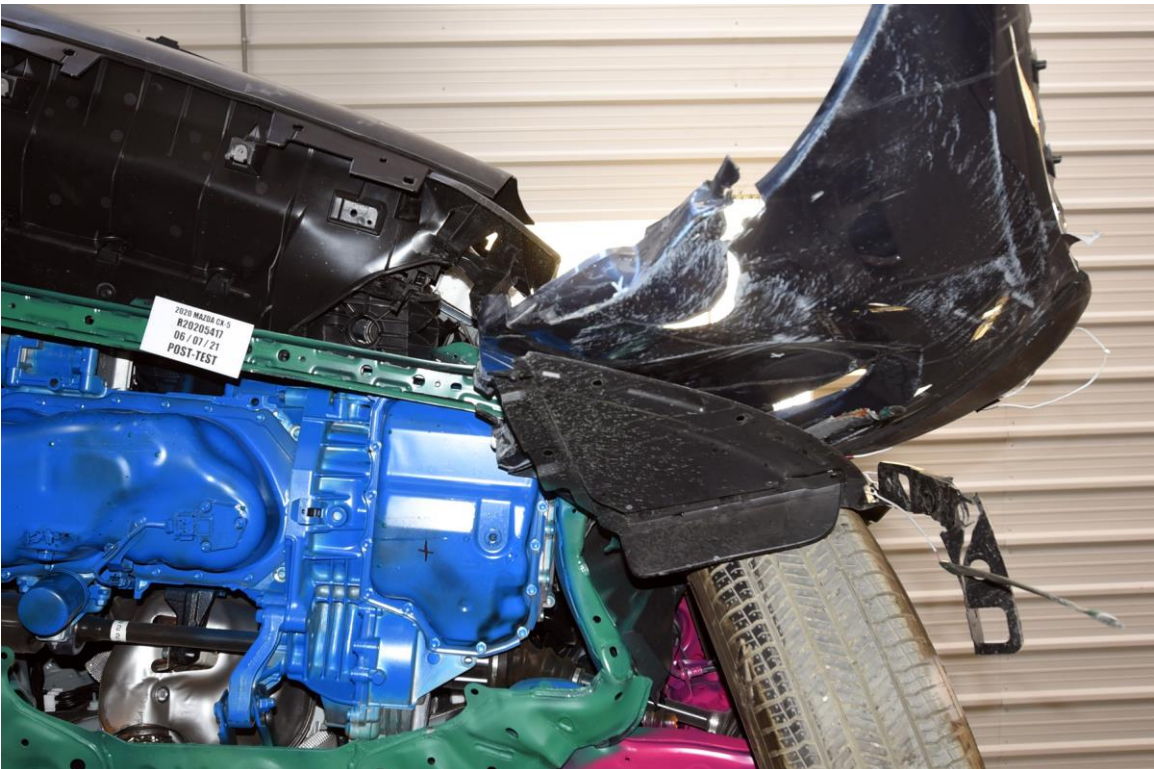


FIGURE 36. Post-Test Driver Side Bumper to Rail Attachments and Crush Initiators



FIGURE 37. Pre-Test Passenger Side Bumper to Rail Attachments and Crush Initiators



FIGURE 38. Post-Test Passenger Side Bumper to Rail Attachments and Crush Initiators

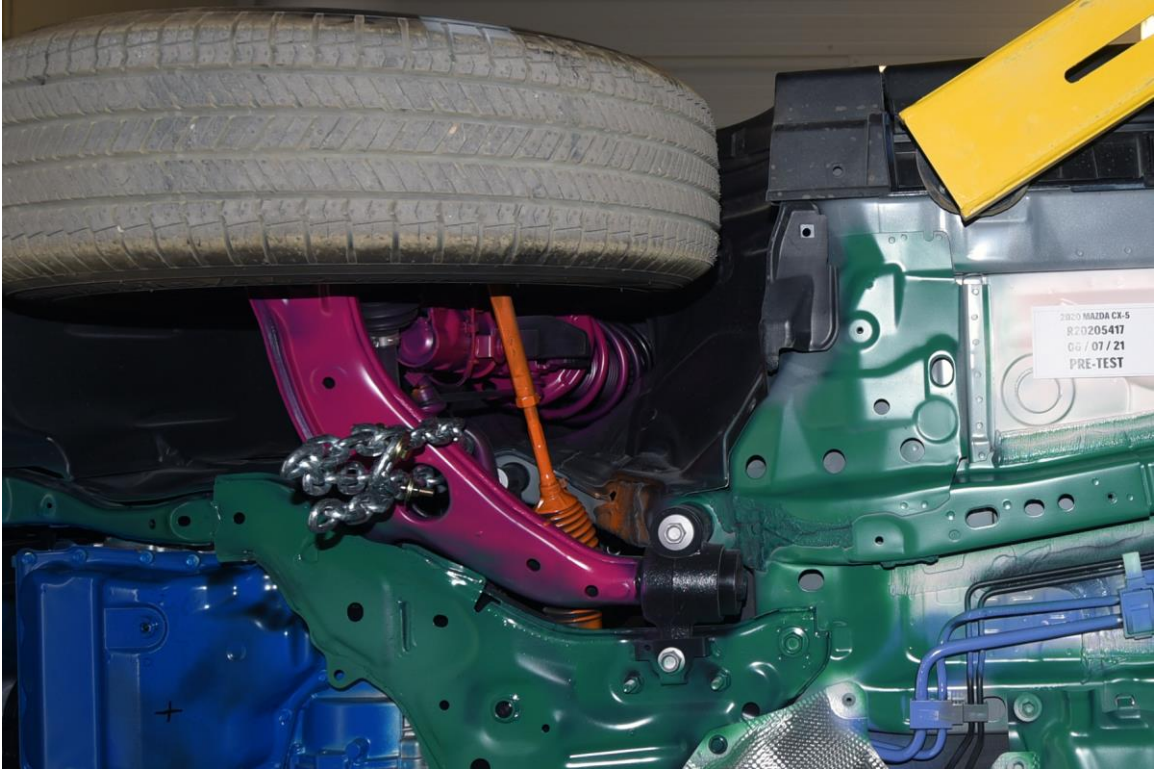


FIGURE 39. Pre-Test Driver Side Rocker



FIGURE 40. Post-Test Driver Side Rocker



FIGURE 41. Pre-Test Passenger Side Rocker



FIGURE 42. Post-Test Passenger Side Rocker

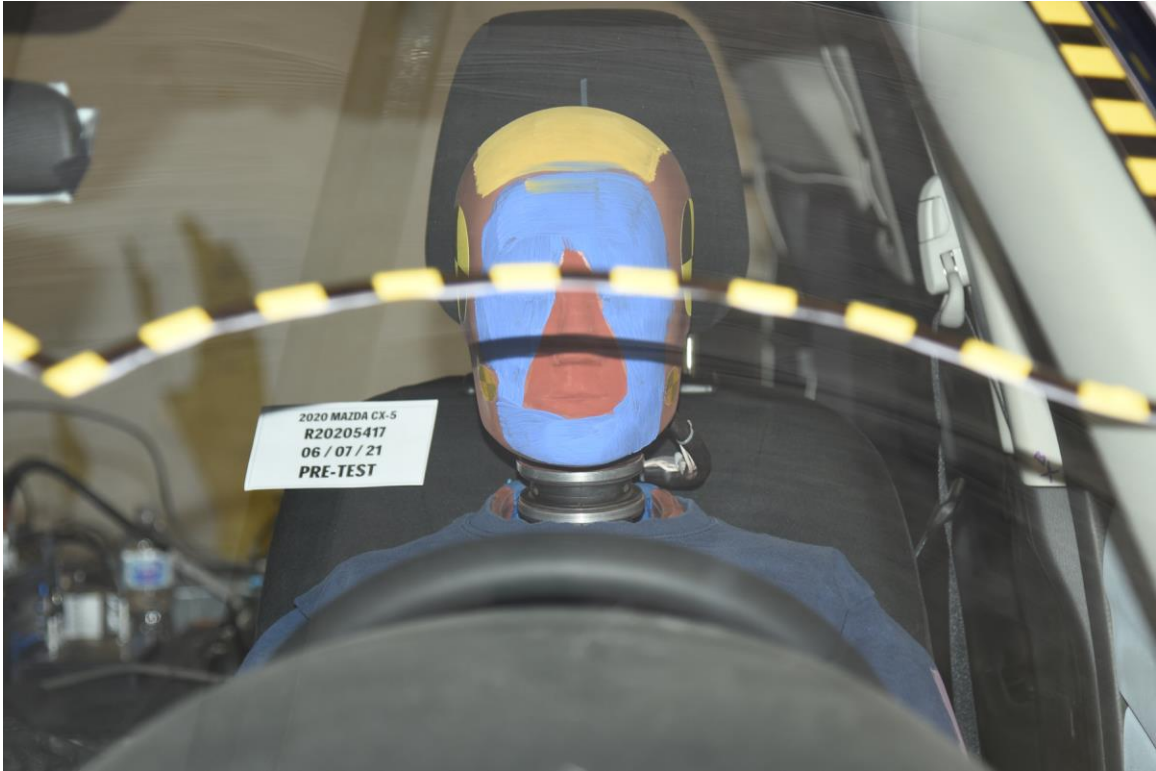


FIGURE 43. Pre-Test Driver Front Windshield View



FIGURE 44. Post-Test Driver Front Windshield View



FIGURE 45. Pre-Test Driver Side Front Window View



FIGURE 46. Post-Test Driver Side Front Window View



FIGURE 47. Pre-Test View of Driver Door Clearance



FIGURE 48. Post-Test View of Driver Door Clearance



FIGURE 49. Pre-Test Left Side View of Driver and Interior



FIGURE 50. Post-Test Left Side View of Driver and Interior



FIGURE 51. Pre-Test Left Side View of Steering Wheel Position



FIGURE 52. Post-Test Left Side View of Steering Wheel Position



FIGURE 53. Pre-Test Overhead View of Driver Thighs on Seat



FIGURE 54. Post-Test Overhead View of Driver Thighs on Seat



FIGURE 55. Pre-Test View of Driver Abdomen



FIGURE 56. Post-Test View of Driver Abdomen



FIGURE 57. Pre-Test Right Side View of Driver and Interior



FIGURE 58. Post-Test Right Side View of Driver and Interior

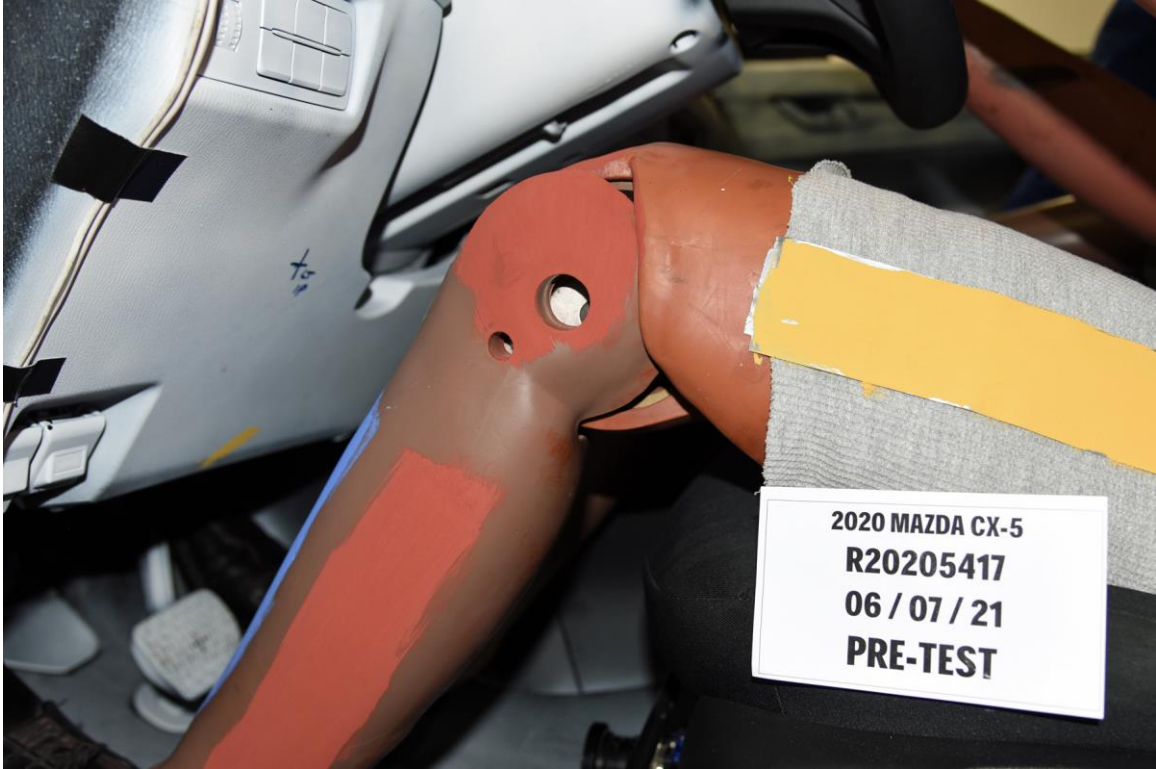


FIGURE 59. Pre-Test View of Driver Left Knee and Bolster



FIGURE 60. Post-Test View of Driver Left Knee and Bolster



FIGURE 61. Pre-Test View of Driver Right Knee and Bolster

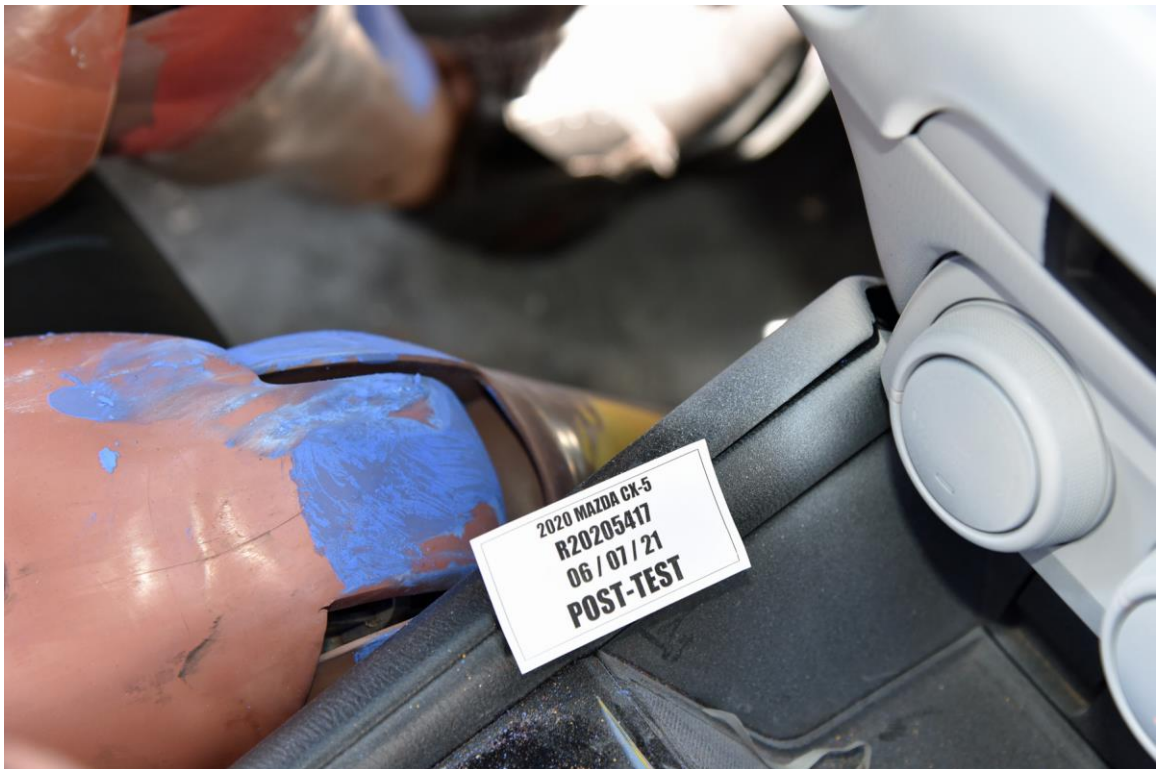


FIGURE 62. Post-Test View of Driver Right Knee and Bolster



FIGURE 63. Pre-Test View of the Driver Left Leg



FIGURE 64. Post-Test View of the Driver Left Leg



FIGURE 65. Pre-Test View of the Driver Feet



FIGURE 66. Post-Test View of the Driver Feet

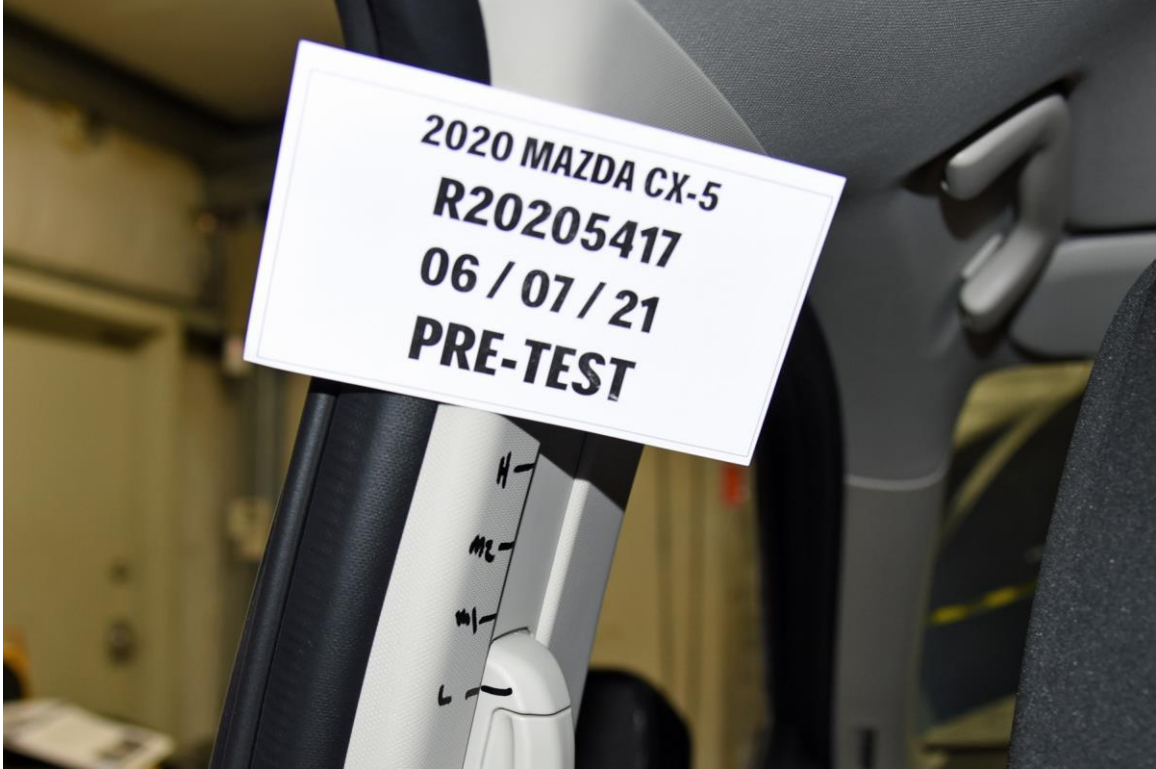


FIGURE 67. Pre-Test Driver Adjustable D-Ring



FIGURE 68. Post-Test Driver Adjustable D-Ring



FIGURE 69. Pre-Test Driver Seat Fore-Aft Markings



FIGURE 70. Post-Test Driver Seat Fore-Aft Markings

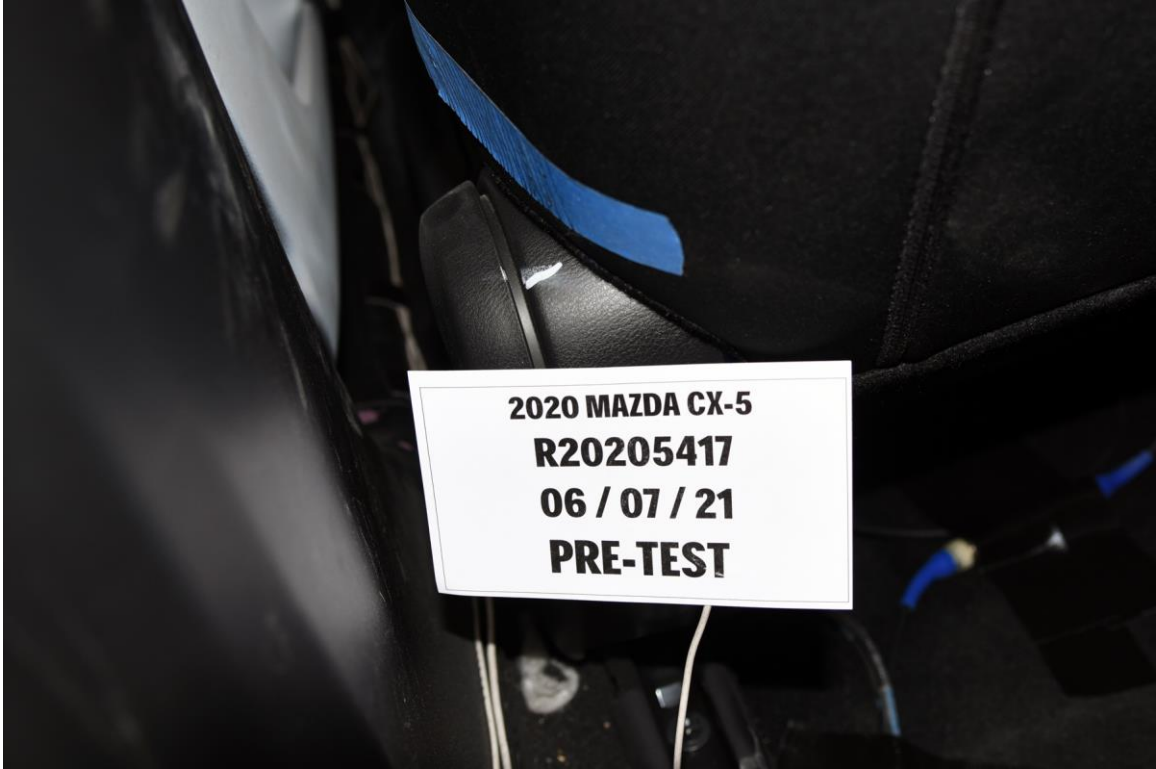


FIGURE 71. Pre-Test Driver Seat Back Markings



FIGURE 72. Post-Test Driver Seat Back Markings

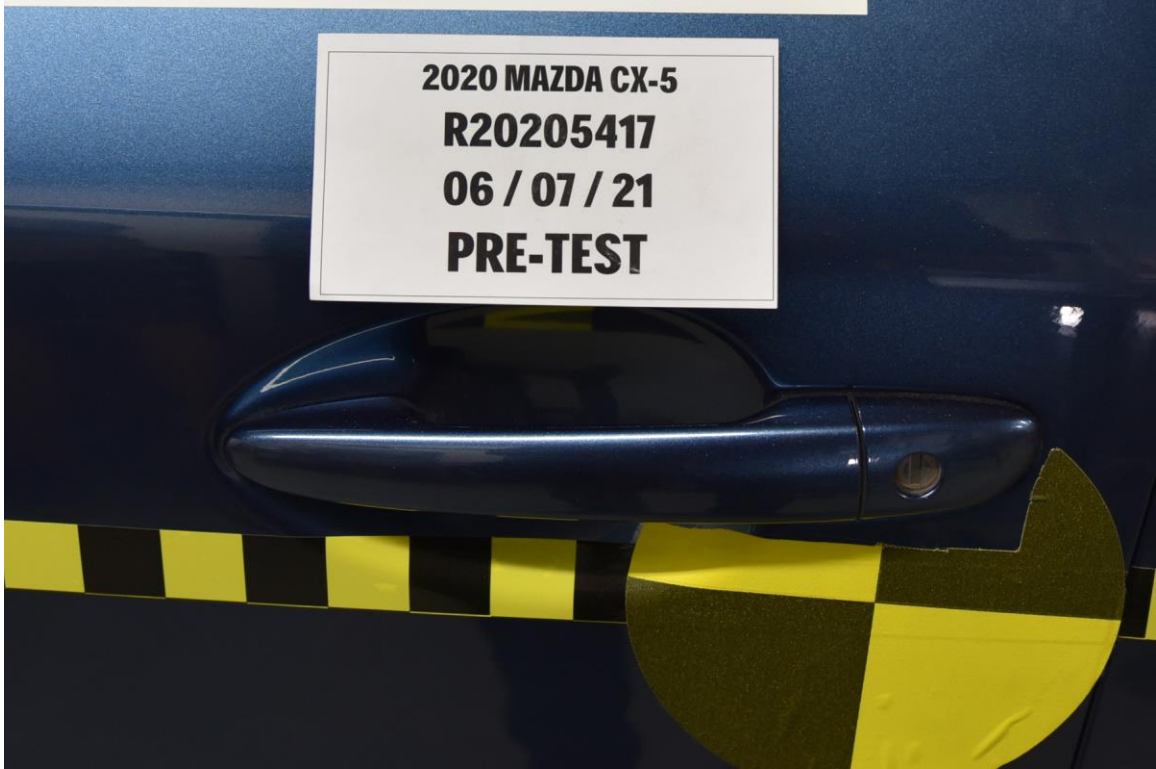


FIGURE 73. Pre-Test Close-Up View of Driver Door Latch



FIGURE 74. Post-Test Close-Up View of Driver Door Latch



FIGURE 75. Pre-Test Driver Inner Door Panel



FIGURE 76. Post-Test Driver Inner Door Panel



FIGURE 77. Pre-Test Left Side View of Driver Knee Bolster



FIGURE 78. Post-Test Left Side View of Driver Knee Bolster



FIGURE 79. Pre-Test Overall View of Driver Knee Bolster

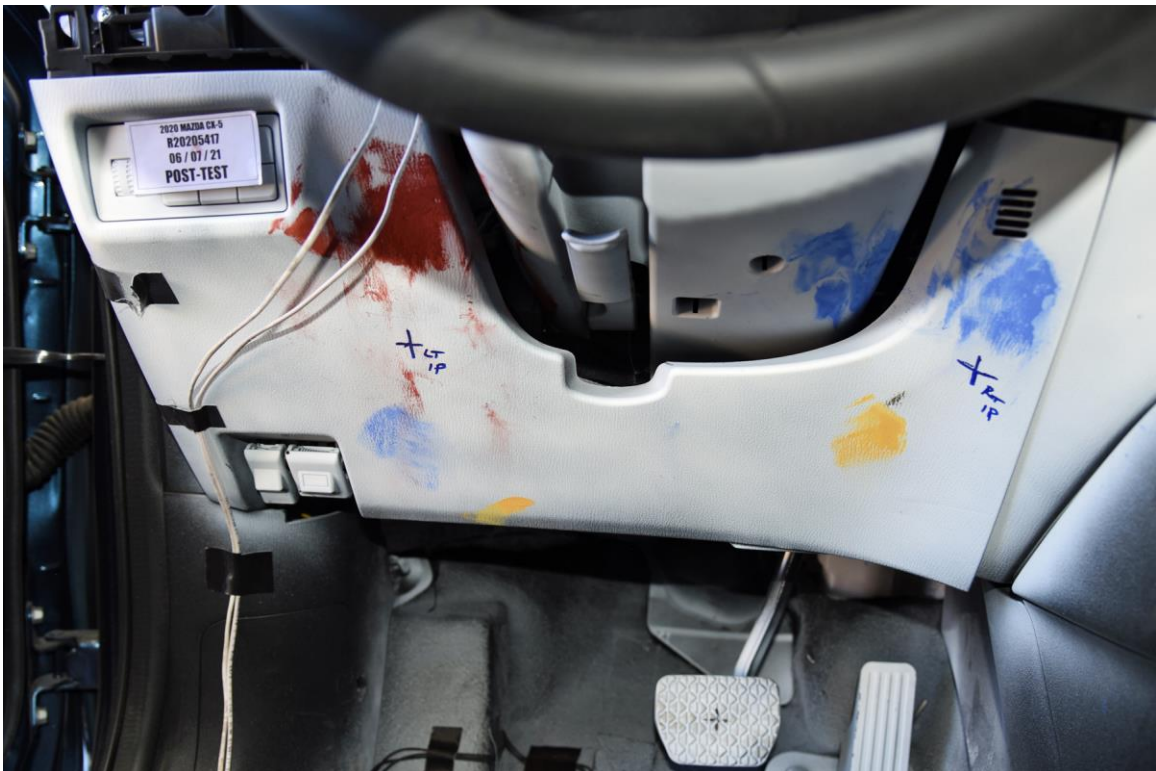


FIGURE 80. Post-Test Overall View of Driver Knee Bolster



FIGURE 81. Pre-Test Right Side View of Driver Knee Bolster

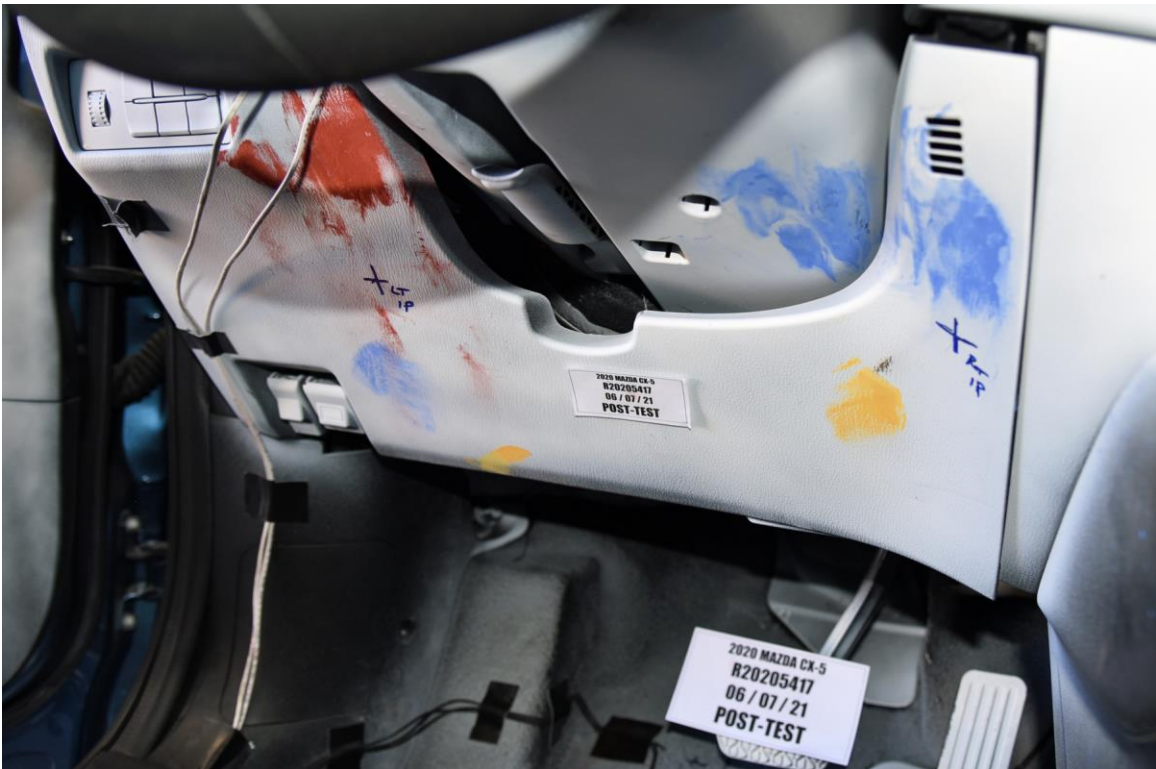


FIGURE 82. Post-Test Right Side View of Driver Knee Bolster



FIGURE 83. Pre-Test View of Driver Floor Pan from Outside of Vehicle

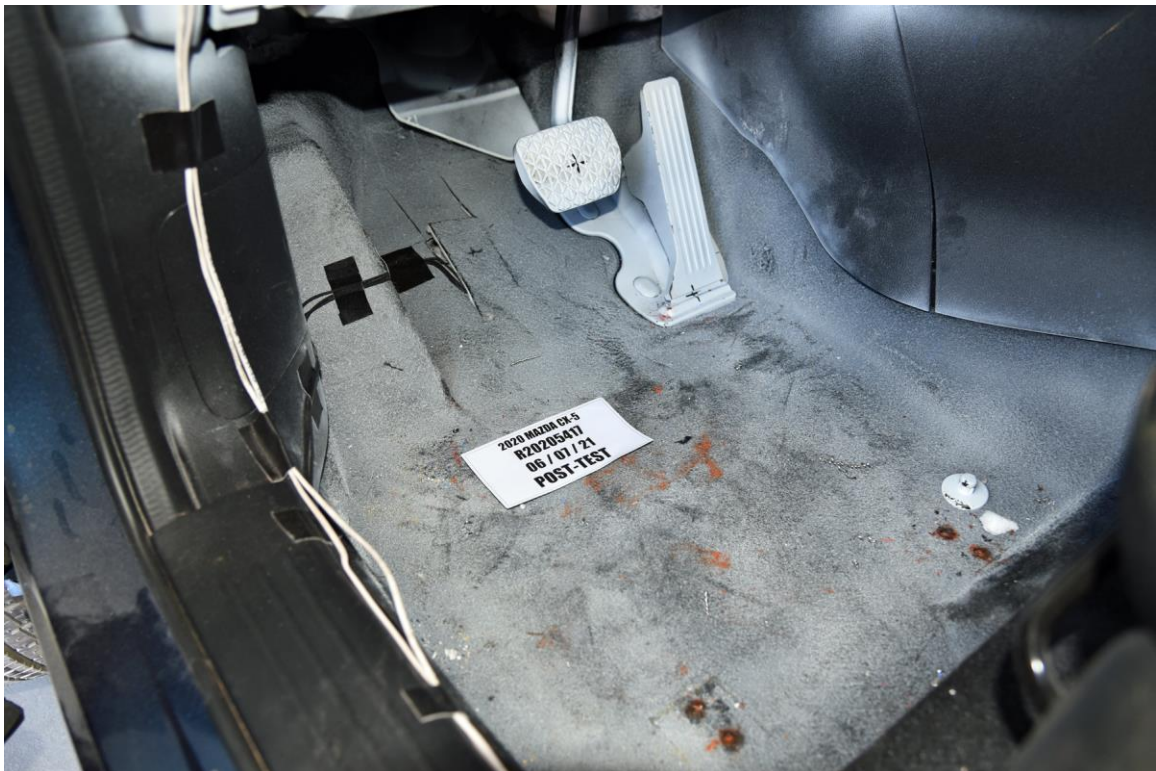


FIGURE 84. Post-Test View of Driver Floor Pan from Outside of Vehicle



FIGURE 85. Pre-Test View of Driver Floor Pan from Top of Seat



FIGURE 86. Post-Test View of Driver Floor Pan from Top of Seat



FIGURE 87. Pre-Test View of Driver Floor Pan from Center of Vehicle



FIGURE 88. Post-Test View of Driver Floor Pan from Center of Vehicle



FIGURE 89. Post-Test Driver Dummy Contact with Front Airbag



FIGURE 90. Post-Test Driver Dummy Contact with Side Airbag

Photograph Not Applicable

FIGURE 91. Post-Test Driver Dummy Contact with Knee Airbag



FIGURE 91a. Post-Test Driver Dummy Contact with Seat



FIGURE 92. Pre-Test Passenger Front Windshield View



FIGURE 93. Post-Test Passenger Front Windshield View



FIGURE 94. Pre-Test Passenger Side Front Window View



FIGURE 95. Post-Test Passenger Side Front Window View



FIGURE 96. Pre-Test View of Passenger Door Clearance



FIGURE 97. Post-Test View of Passenger Door Clearance



FIGURE 98. Pre-Test Right Side View of Passenger and Interior



FIGURE 99. Post-Test Right Side View of Passenger and Interior

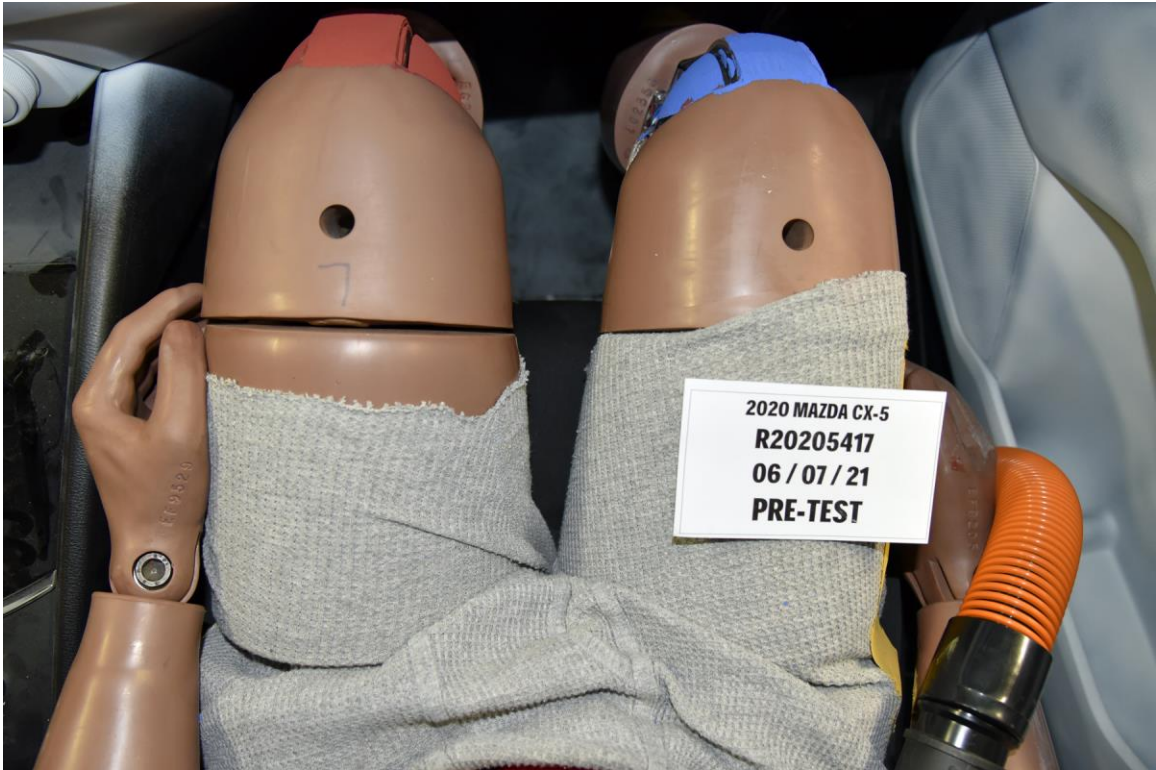


FIGURE 100. Pre-Test Overhead View of Passenger Thighs on Seat

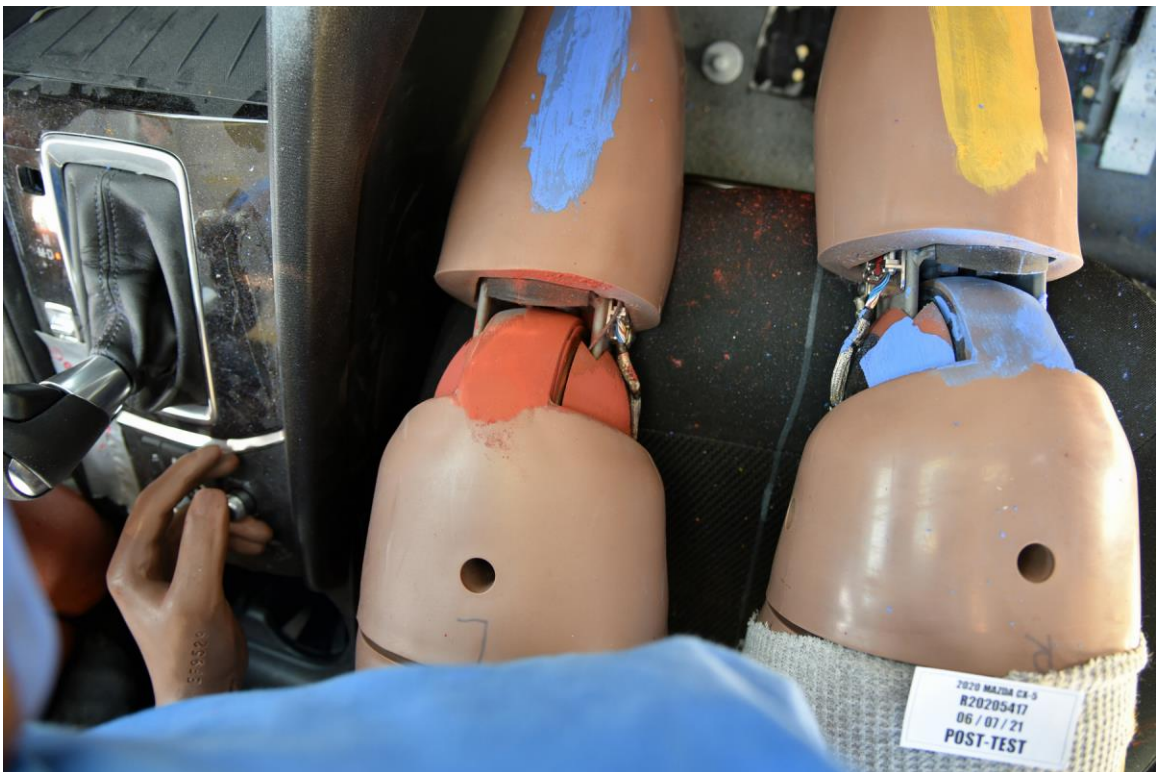


FIGURE 101. Post-Test Overhead View of Passenger Thighs on Seat



FIGURE 102. Pre-Test View of Passenger Abdomen



FIGURE 103. Post-Test View of Passenger Abdomen



FIGURE 104. Pre-Test Left Side Passenger and Interior View



FIGURE 105. Post-Test Left Side Passenger and Interior View

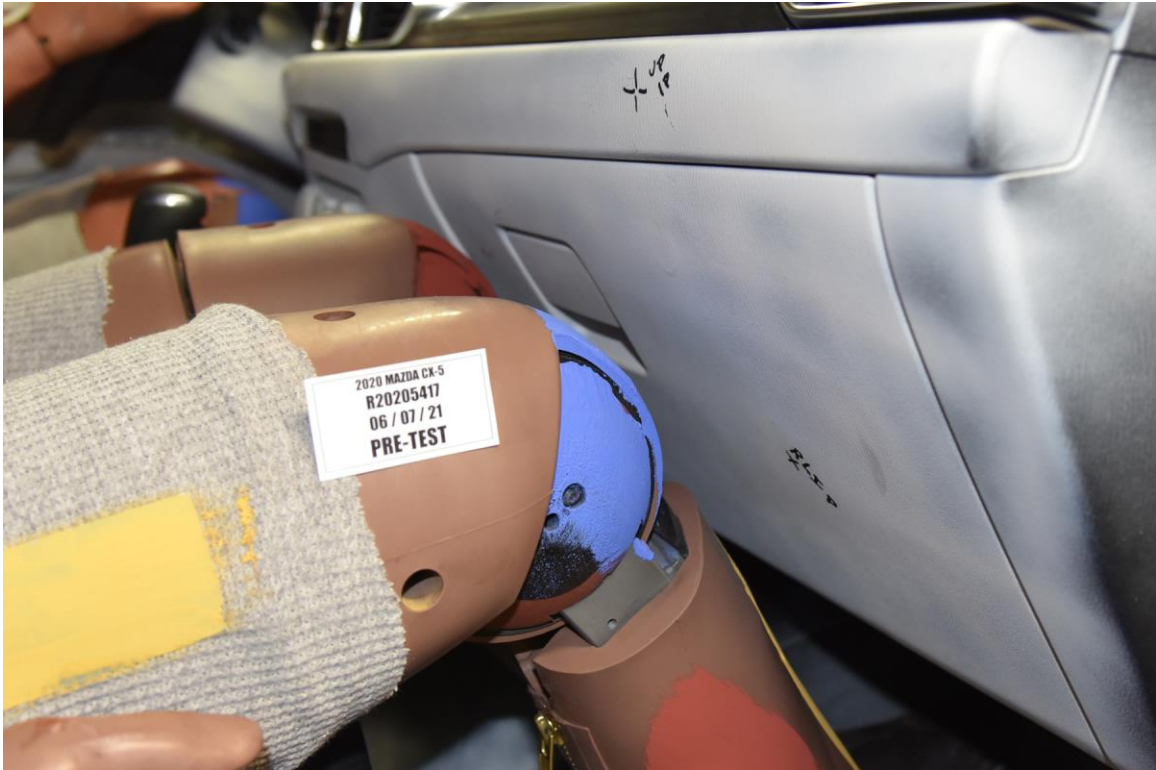


FIGURE 106. Pre-Test View of Passenger Right Knee and Bolster



FIGURE 107. Post-Test View of Passenger Right Knee and Bolster



FIGURE 108. Pre-Test View of Passenger Left Knee and Bolster



FIGURE 109. Post-Test View of Passenger Left Knee and Bolster

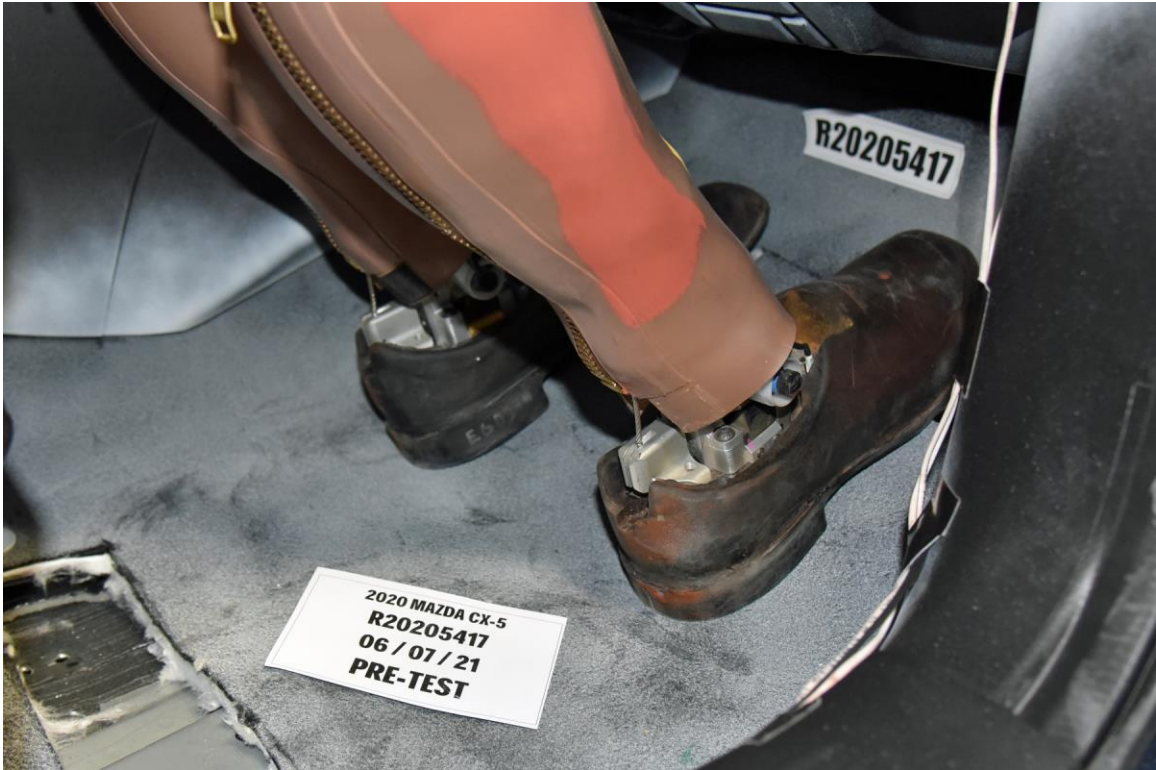


FIGURE 110. Pre-Test View of the Passenger Feet



FIGURE 111. Post-Test View of the Passenger Feet



FIGURE 112. Pre-Test Passenger Adjustable D-Ring



FIGURE 113. Post-Test Passenger Adjustable D-Ring

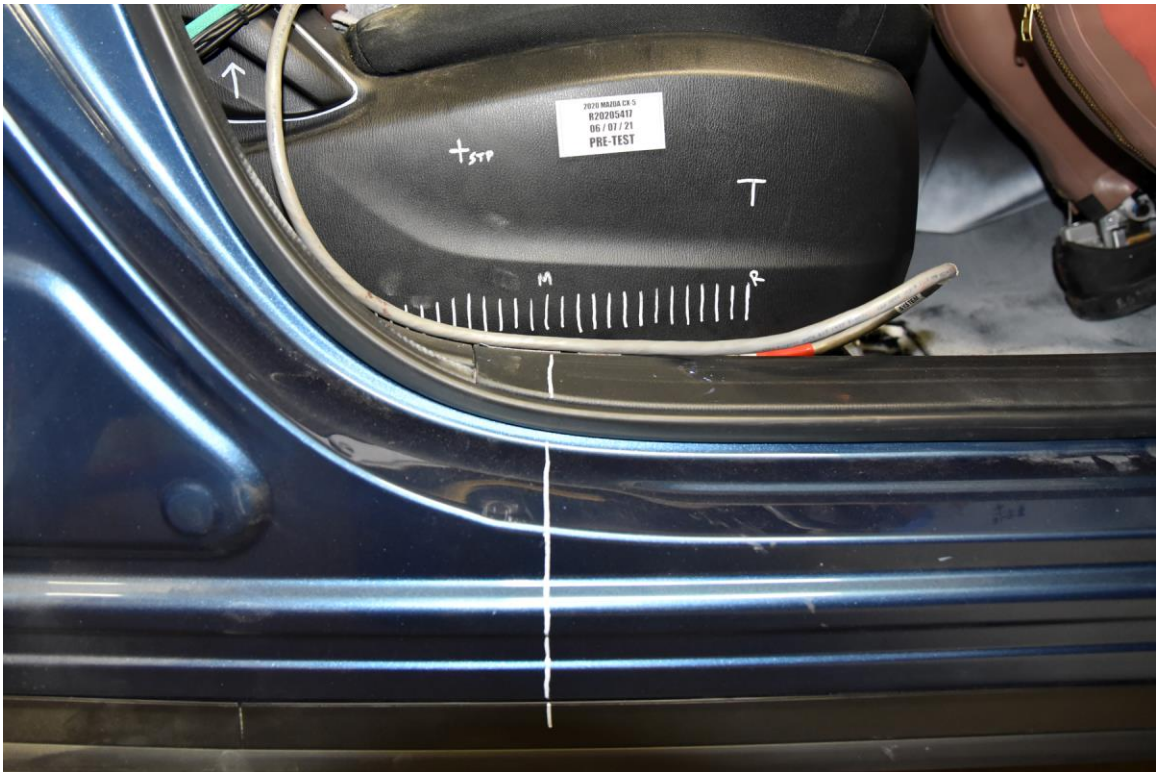


FIGURE 114. Pre-Test Right Front Passenger Seat Fore-Aft Markings



FIGURE 115. Post-Test Right Front Passenger Seat Fore-Aft Markings



FIGURE 116. Pre-Test Passenger Seat Back Markings



FIGURE 117. Post-Test Passenger Seat Back Markings

Photograph Not Available

FIGURE 118. Pre-Test Close-up View of Passenger Door Latch



FIGURE 119. Post-Test Close-up View of Passenger Door Latch



FIGURE 120. Pre-Test Passenger Inner Door Panel



FIGURE 121. Post-Test Passenger Inner Door Panel



FIGURE 122. Pre-Test Right Side View of Passenger Knee Bolster



FIGURE 123. Post-Test Right Side View of Passenger Knee Bolster



FIGURE 124. Pre-Test Center View of Passenger Knee Bolster



FIGURE 125. Post-Test Center View of Passenger Knee Bolster



FIGURE 126. Pre-Test Left Side View of Passenger Knee Bolster



FIGURE 127. Post-Test Left Side View of Passenger Knee Bolster



FIGURE 128. Pre-Test View of Passenger Floor Pan from Outside of Vehicle



FIGURE 129. Post-Test View of Passenger Floor Pan from Outside of Vehicle



FIGURE 130. Pre-Test View of Passenger Floor Pan from Top of Front Seat



FIGURE 131. Post-Test View of Passenger Floor Pan from Top of Front Seat



FIGURE 132. Pre-Test View of Passenger Floor Pan from Center of Vehicle



FIGURE 133. Post-Test View of Passenger Floor Pan from Center of Vehicle

Photograph Not Available

FIGURE 134. Post-Test Passenger Dummy Contact with Front Airbag

Photograph Not Applicable

FIGURE 135. Post-Test Passenger Dummy Contact with Side Airbag

Photograph Not Applicable

FIGURE 136. Post-Test Passenger Dummy Contact with Knee Airbag

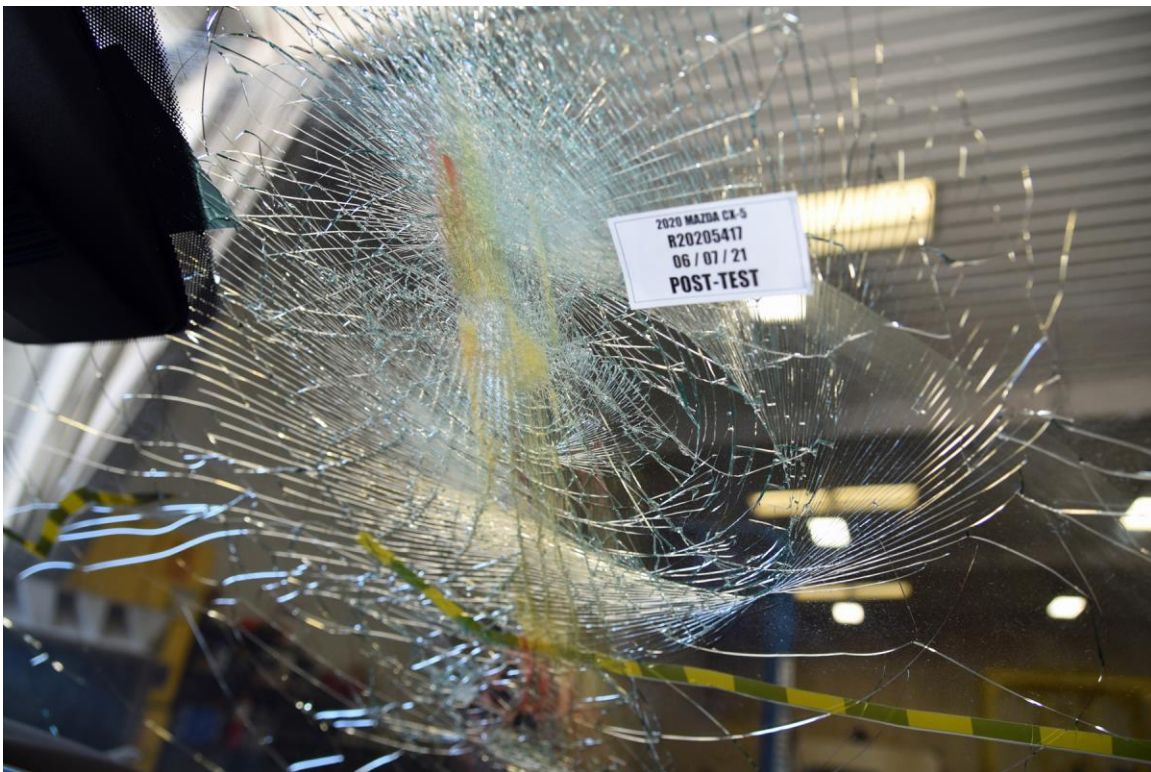


FIGURE 136a. Post-Test Passenger Dummy Contact with Windshield



FIGURE 136b. Post-Test Passenger Dummy Contact with Dashboard



FIGURE 136c. Post-Test Passenger Dummy Contact with Knee Bolster

Photograph Not Applicable

No Stoddard Solvent Spillage

FIGURE 137. Post-Test Stoddard Solvent Spillage Location View



FIGURE 138. Post-Test Speed Trap Read-Out



FIGURE 139. Vehicle at 0° on Static Rollover Device



FIGURE 140. Vehicle at 90° on Static Rollover Device

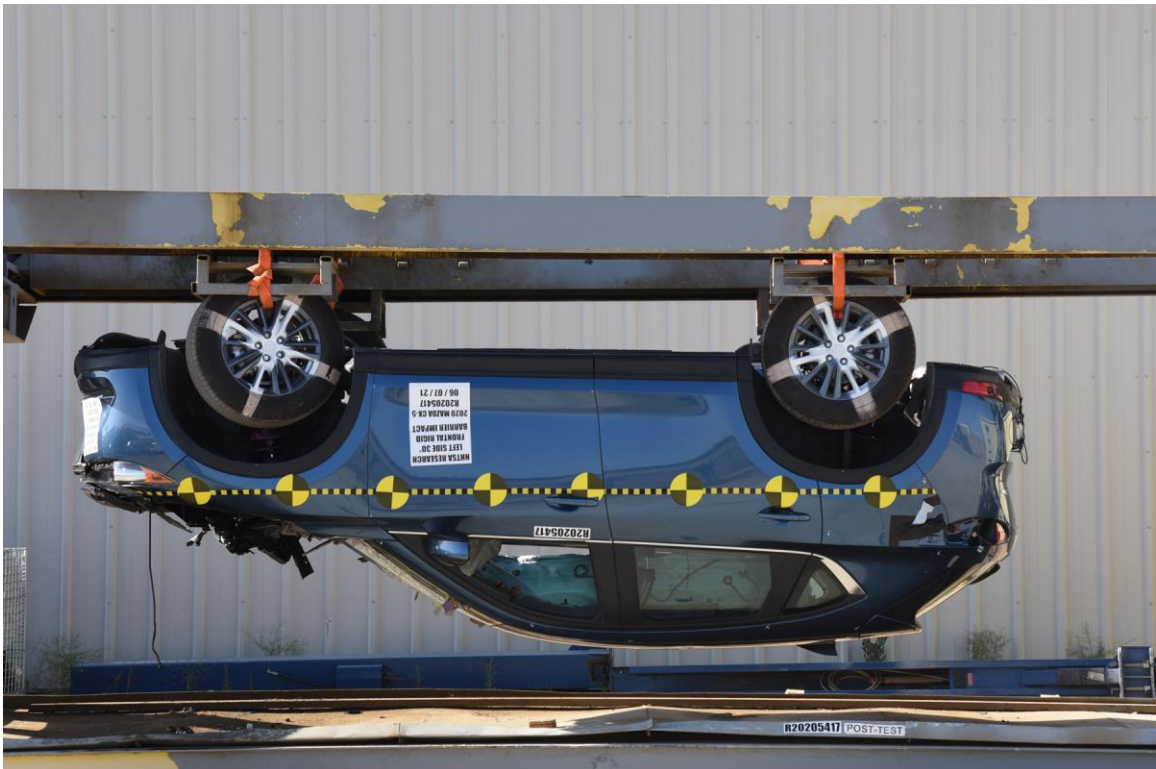


FIGURE 141. Vehicle at 180° on Static Rollover Device




FIGURE 142. Vehicle at 270° on Static Rollover Device




FIGURE 143. Vehicle at 360° on Static Rollover Device



FIGURE 144. Frontal Impact Event



Scan for
Vehicle
Info and offer



2020 Mazda CX-5

Model: 2020 CX-5 SPORT FRONT WHEEL DRIVE
Exterior Color: ETERNAL BLUE MICA
Interior Color: BLACK

EPA DOT Fuel Economy and Environment

Fuel Economy

28 MPG combined city/hwy
25 city
31 highway
3.6 gallons per 100 miles

You save \$250 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$1,450

Fuel Economy & Greenhouse Gas Rating 6 (Best)

Smog Rating 7 (Best)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$1,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.70 per gallon. MSRP is shown for gasoline engine equipment. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov
Calculate personalized estimates and compare vehicles

PARTS CONTENT INFORMATION:

FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 0%
MAJOR SOURCES OF FOREIGN PARTS CONTENT: JAPAN 90%

NOTE: THIS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: HIRO HIMA, JAPAN
COUNTRY OF ORIGIN: CHINA, JAPAN
TRANSMISSION: JAPAN

This label is filed pursuant to the Federal Automobile Dealer Act, Gasoline, License and Title fees, Sales and Local taxes, and Dealer installed items are not included.

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score ★★★★★
Based on the combined ratings of front, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash	Driver	★★★★★
	Passenger	★★★★★
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat	★★★★★
	Rear seat	★★★★★
Based on the risk of injury in a side impact.		
Rollover		★★★★★
Based on the risk of rollover in a single vehicle crash.		

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-436

STANDARD EQUIPMENT

ENGINE/MECHANICAL FEATURES

- SKYACTIV-G 2.5L ENGINE
- 187 HORSEPOWER/186 LB-FT TORQUE
- SKYACTIV-DRIVE 6SPD SPORT MODE AT
- FRONT VENTILATED DISC BRAKES
- REAR SOLID DISC BRAKES

EXTERIOR FEATURES

- 17" X 18" ALL-CLY WHEELS
- P225/65R17 ALL-SEASON TIRES
- RAIN-SENSING WINDSHIELD WIPERS
- FIXED-INTERMITTENT REAR WIPER
- BODY-COLORED REAR ROOF SPOILER
- POWER SIDE MIRRORS WITH TURN LAMPS

INTERIOR FEATURES

- 6-PASSENGER SEATING
- CLOTH TRIMMED SEATS
- 6-WAY MANUAL DRIVER'S SEAT
- LEATHER-WRAPPED STEERING WHEEL
- POWER AUTOMATIC DOOR LOCKS
- POWER WINDOWS WITH ONE-TOUCH UP/DOWN
- ELECTRONIC PARKING BRAKE
- REMOTE KEYLESS ENTRY
- PUSH BUTTON ENGINE START
- REARVIEW CAMERA

SAFETY AND SECURITY FEATURES

- 6-GEAR, 6-1 POWERTRAIN & 36MO/100K MI BUMPER-TO-BUMPER WARRANTY
- 24-HOUR ROADSIDE ASSISTANCE
- 5-PASSENGER 3-POINT SAFETY BELTS
- LATCH CHILD SAFETY SEAT ANCHORS
- ANTI-THEFT ENGINE IMMOBILIZER
- TIRE PRESSURE MONITORING SYSTEM
- BLIND SPOT MONITORING
- LANE DEPARTURE WARNING SYSTEM
- LANE KEEP ASSIST
- REAR CROSS TRAFFIC ALERT

OTHER FEATURES


- INDEPENDENT FRONT/REAR SUSPENSION
- FRONT & REAR STABILIZER BARS
- ELECTRIC POWER ASSISTED STEERING
- FRONT-WHEEL DRIVE
- 0-VISION CONTROL PLUS
- LED HEADLIGHTS W/ AUTO ON/OFF
- DAYTIME RUNNING LIGHTS
- HIGH BEAM CONTROL
- ROOF-MOUNTED SHARK FIN ANTENNA
- BRIGHT FINISH EXHAUST OUTLETS
- 7" COLOR TOUCH-SCREEN DISPLAY
- MULTI-FUNCTION COMMANDER CONTROL
- MDI WITH TRIP COMPUTER
- AIR CONDITIONING
- AM/FM/HD 4-SPEAKER AUDIO
- BLUETOOTH HANDS-FREE PHONE/AUDIO
- AUX JACK / 2 USB INPUTS
- CENTER ARMREST WOODGRAIN STORAGE
- 46/20/40 SPLIT FOLD-DOWN RR SEAT
- DUAL COVERED VANITY MIRRORS
- CARPETED FLOOR MATS
- ABS WITH EBD AND BRAKE-ASSIST
- DYNAMIC STABILITY CONTROL
- TRACTION CONTROL SYSTEM
- ADVANCED DUAL FRONT AIRBAGS
- FRONT SIDE-IMPACT AIRBAGS
- FRONT & REAR SIDE AIR CURTAINS
- SMART BRAKE SUPPORT
- ADVANCED SMART CITY BRAKE SUPPORT
- HILL LAUNCH ASSIST
- MAZDA RADAR CRUISE CONTROL WITH STOP & GO

MSRP	\$25,100
Total Vehicle and Options	\$25,100
Delivery, Processing and Handling Fee	\$1,100
Total MSRP	\$26,200

SOLD TO: 61449
FRANK BOUCHER MAZDA RACINE
9601 WASHINGTON AVENUE
RACINE, WI 53406

SHIP TO: 61449 DY
FRANK BOUCHER MAZDA RACINE
9601 WASHINGTON AVENUE
RACINE, WI 53406

JM3KFABM6L0838933



CX-5P-24--R619HAB-15--1A--20200728

MazdaUSA.com

FIGURE 145. Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Plot		Page
1	P2TH HEAD CG X ACCELERATION	B-1
2	P2TH HEAD CG Y ACCELERATION	B-1
3	P2TH HEAD CG Z ACCELERATION	B-1
4	P2TH HEAD CG ANGULAR VELOCITY ABOUT X	B-1
5	P2TH HEAD CG ANGULAR VELOCITY ABOUT Y	B-2
6	P2TH HEAD CG ANGULAR VELOCITY ABOUT Z	B-2
7	P2TH FRONT NECK SPRING TOWER LOAD CELL	B-2
8	P2TH REAR NECK SPRING TOWER LOAD CELL	B-2
9	P2TH UPPER NECK X FORCE	B-3
10	P2TH UPPER NECK Y FORCE	B-3
11	P2TH UPPER NECK Z FORCE	B-3
12	P2TH UPPER NECK X MOMENT	B-3
13	P2TH UPPER NECK Y MOMENT	B-4
14	P2TH UPPER NECK Z MOMENT	B-4
15	P2TH UPPER LEFT DGIR X DISPLACEMENT	B-4
16	P2TH UPPER LEFT DGIR Y ROTATION	B-4
17	P2TH UPPER LEFT DGIR Z ROTATION	B-5
18	P2TH UPPER RIGHT DGIR X DISPLACEMENT	B-5
19	P2TH UPPER RIGHT DGIR Y ROTATION	B-5
20	P2TH UPPER RIGHT DGIR Z ROTATION	B-5
21	P2TH T6 X ACCELERATION	B-6
22	P2TH T6 Y ACCELERATION	B-6
23	P2TH T6 Z ACCELERATION	B-6
24	P2TH T6 ANGULAR VELOCITY ABOUT X	B-6
25	P2TH T6 ANGULAR VELOCITY ABOUT Y	B-7
26	P2TH T6 ANGULAR VELOCITY ABOUT Z	B-7
27	P2TH SPINE FORCE X	B-7
28	P2TH SPINE FORCE Y	B-7
29	P2TH SPINE FORCE Z	B-8
30	P2TH SPINE MOMENT X	B-8
31	P2TH SPINE MOMENT Y	B-8
32	P2TH LOWER LEFT DGIR X DISPLACEMENT	B-8
33	P2TH LOWER LEFT DGIR Y ROTATION	B-9
34	P2TH LOWER LEFT DGIR Z ROTATION	B-9
35	P2TH LOWER RIGHT DGIR X DISPLACEMENT	B-9
36	P2TH LOWER RIGHT DGIR Y ROTATION	B-9

TABLE OF DATA PLOTS ... (CONTINUED)

Plot		Page
37	P2TH LOWER RIGHT DGIR Z ROTATION	B-10
38	P2TH ABDOMEN LEFT DGIR X DISPLACEMENT	B-10
39	P2TH ABDOMEN LEFT DGIR Y ROTATION	B-10
40	P2TH ABDOMEN LEFT DGIR Z ROTATION	B-10
41	P2TH ABDOMEN RIGHT DGIR X DISPLACEMENT	B-11
42	P2TH ABDOMEN RIGHT DGIR Y ROTATION	B-11
43	P2TH ABDOMEN RIGHT DGIR Z ROTATION	B-11
44	P2TH ASIS LEFT X FORCE	B-11
45	P2TH ASIS LEFT Y MOMENT	B-12
46	P2TH ASIS RIGHT X FORCE	B-12
47	P2TH ASIS RIGHT Y MOMENT	B-12
48	P2TH ACETABULUM LEFT X FORCE	B-12
49	P2TH ACETABULUM LEFT Y FORCE	B-13
50	P2TH ACETABULUM LEFT Z FORCE	B-13
51	P2TH ACETABULUM RIGHT X FORCE	B-13
52	P2TH ACETABULUM RIGHT Y FORCE	B-13
53	P2TH ACETABULUM RIGHT Z FORCE	B-14
54	P2TH PELVIS X ACCELERATION	B-14
55	P2TH PELVIS Y ACCELERATION	B-14
56	P2TH PELVIS Z ACCELERATION	B-14
57	P2TH PELVIS ANGULAR VELOCITY ABOUT X	B-15
58	P2TH PELVIS ANGULAR VELOCITY ABOUT Y	B-15
59	P2TH PELVIS ANGULAR VELOCITY ABOUT Z	B-15
60	P2TH FEMUR LEFT X FORCE	B-15
61	P2TH FEMUR LEFT Y FORCE	B-16
62	P2TH FEMUR LEFT Z FORCE	B-16
63	P2TH FEMUR LEFT X MOMENT	B-16
64	P2TH FEMUR LEFT Y MOMENT	B-16
65	P2TH FEMUR LEFT Z MOMENT	B-17
66	P2TH FEMUR RIGHT X FORCE	B-17
67	P2TH FEMUR RIGHT Y FORCE	B-17
68	P2TH FEMUR RIGHT Z FORCE	B-17
69	P2TH FEMUR RIGHT X MOMENT	B-18
70	P2TH FEMUR RIGHT Y MOMENT	B-18
71	P2TH FEMUR RIGHT Z MOMENT	B-18
72	P2TH KNEE LEFT X DISPLACEMENT	B-18

TABLE OF DATA PLOTS ... (CONTINUED)

Plot		Page
73	P2TH KNEE RIGHT X DISPLACEMENT	B-19
74	P2TH UPPER TIBIA LEFT X FORCE	B-19
75	P2TH UPPER TIBIA LEFT Y FORCE	B-19
76	P2TH UPPER TIBIA LEFT Z FORCE	B-19
77	P2TH UPPER TIBIA LEFT X MOMENT	B-20
78	P2TH UPPER TIBIA LEFT Y MOMENT	B-20
79	P2TH UPPER TIBIA RIGHT X FORCE	B-20
80	P2TH UPPER TIBIA RIGHT Y FORCE	B-20
81	P2TH UPPER TIBIA RIGHT Z FORCE	B-21
82	P2TH UPPER TIBIA RIGHT X MOMENT	B-21
83	P2TH UPPER TIBIA RIGHT Y MOMENT	B-21
84	P2TH LOWER TIBIA LEFT X FORCE	B-21
85	P2TH LOWER TIBIA LEFT Y FORCE	B-22
86	P2TH LOWER TIBIA LEFT Z FORCE	B-22
87	P2TH LOWER TIBIA LEFT X MOMENT	B-22
88	P2TH LOWER TIBIA LEFT Y MOMENT	B-22
89	P2TH LOWER TIBIA RIGHT X FORCE	B-23
90	P2TH LOWER TIBIA RIGHT Y FORCE	B-23
91	P2TH LOWER TIBIA RIGHT Z FORCE	B-23
92	P2TH LOWER TIBIA RIGHT X MOMENT	B-23
93	P2TH LOWER TIBIA RIGHT Y MOMENT	B-24
94	P2TH ANKLE LEFT X ROTATION	B-24
95	P2TH ANKLE LEFT Y ROTATION	B-24
96	P2TH ANKLE LEFT Z ROTATION	B-24
97	P2TH ANKLE RIGHT X ROTATION	B-25
98	P2TH ANKLE RIGHT Y ROTATION	B-25
99	P2TH ANKLE RIGHT Z ROTATION	B-25
100	P1H3 HEAD CG X ACCELERATION	B-26
101	P1H3 HEAD CG Y ACCELERATION	B-26
102	P1H3 HEAD CG Z ACCELERATION	B-26
103	P1H3 HEAD AXR	B-26
104	P1H3 HEAD AYR	B-27
105	P1H3 HEAD AZR	B-27
106	P1H3 HEAD ANGULAR VELOCITY X	B-27
107	P1H3 HEAD ANGULAR VELOCITY Y	B-27
108	P1H3 HEAD ANGULAR VELOCITY Z	B-28

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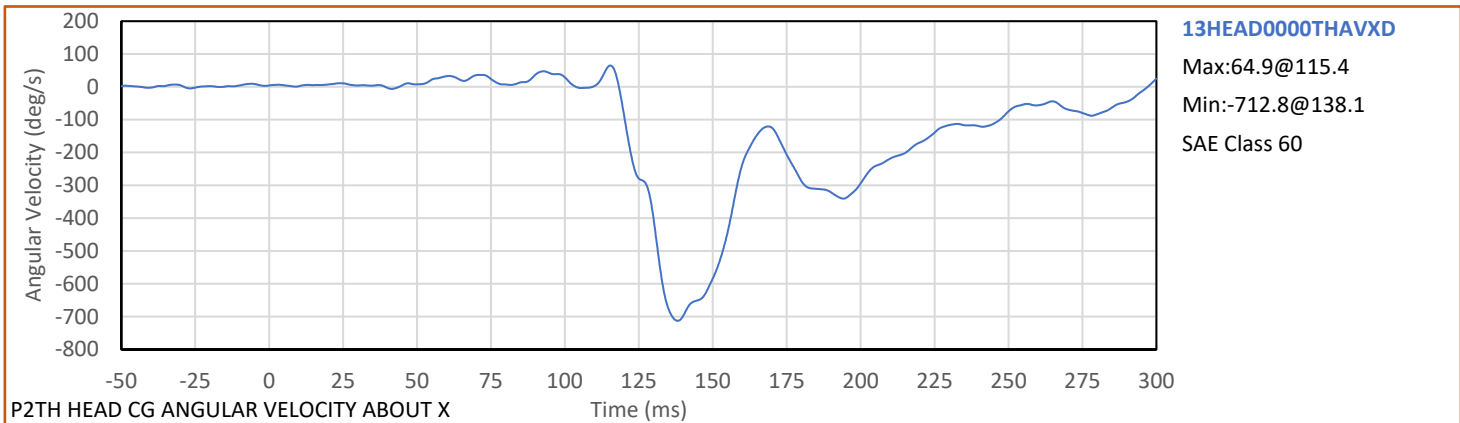
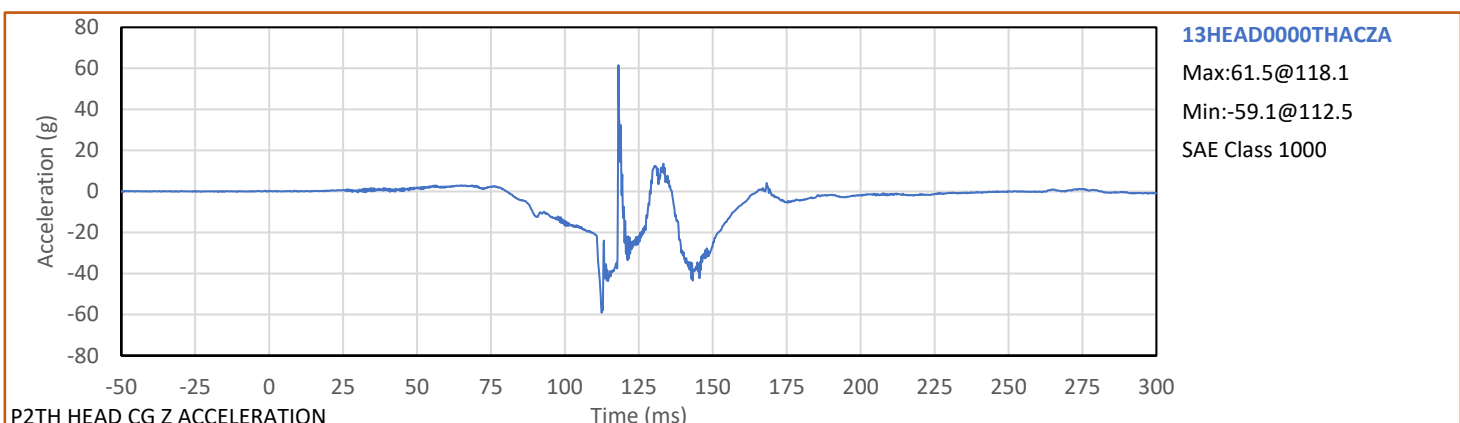
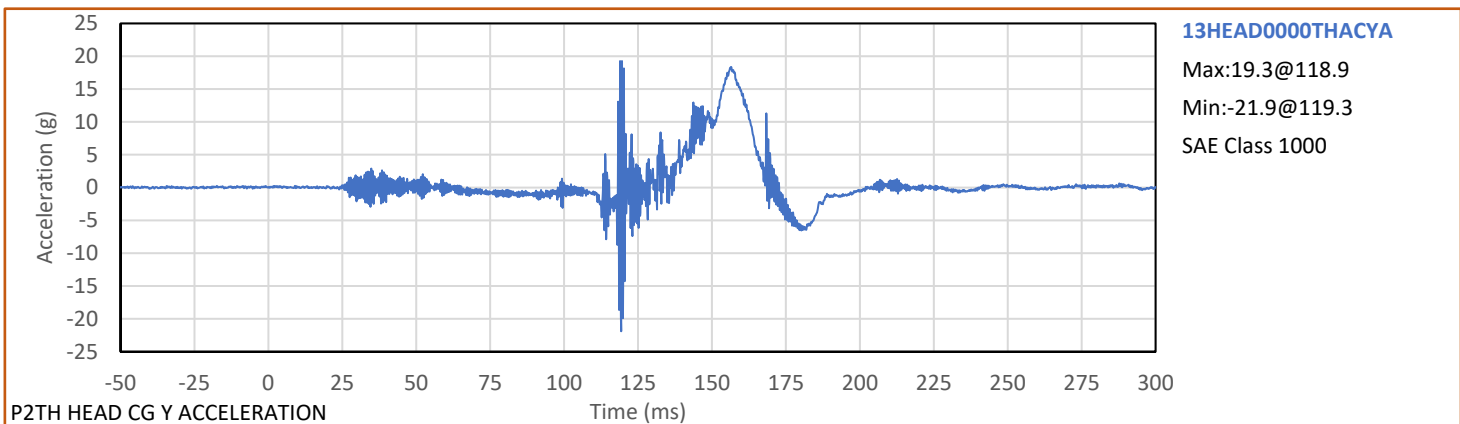
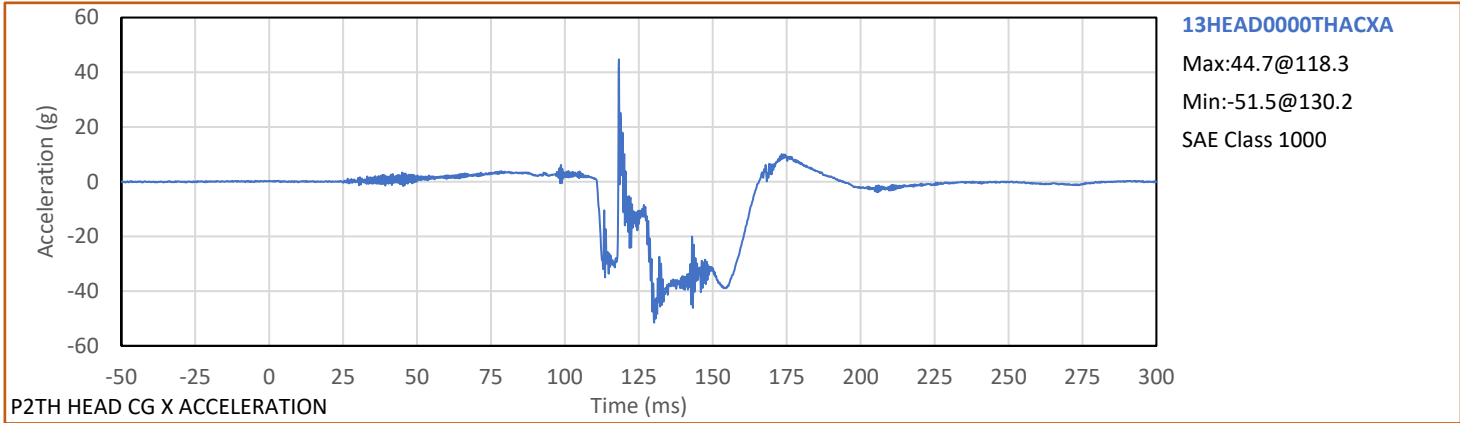
<u>Plot</u>		<u>Page</u>
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110	P1H3 UPPER NECK FY	B-28
111	P1H3 UPPER NECK FZ	B-28
112	P1H3 UPPER NECK MX	B-29
113	P1H3 UPPER NECK MY	B-29
114	P1H3 UPPER NECK MZ	B-29
115	P1H3 LOWER NECK FX	B-29
116	P1H3 LOWER NECK FY	B-30
117	P1H3 LOWER NECK FZ	B-30
118	P1H3 LOWER NECK MX	B-30
119	P1H3 LOWER NECK MY	B-30
120	P1H3 LOWER NECK MZ	B-31
121	P1H3 CHEST AX	B-31
122	P1H3 CHEST AY	B-31
123	P1H3 CHEST AZ	B-31
124	P1H3 CHEST AXR	B-32
125	P1H3 CHEST AYR	B-32
126	P1H3 CHEST AZR	B-32
127	P1H3 CHEST DX	B-32
128	P1H3 PELVIS AX	B-33
129	P1H3 PELVIS AY	B-33
130	P1H3 PELVIS AZ	B-33
131	P1H3 LEFT FEMUR FX	B-33
132	P1H3 LEFT FEMUR FY	B-34
133	P1H3 LEFT FEMUR FZ	B-34
134	P1H3 LEFT FEMUR MX	B-34
135	P1H3 LEFT FEMUR MY	B-34
136	P1H3 LEFT FEMUR MZ	B-35
137	P1H3 RIGHT FEMUR FX	B-35
138	P1H3 RIGHT FEMUR FY	B-35
139	P1H3 RIGHT FEMUR FZ	B-35
140	P1H3 RIGHT FEMUR MX	B-36
141	P1H3 RIGHT FEMUR MY	B-36
142	P1H3 RIGHT FEMUR MZ	B-36
143	VEHICLE CG X	B-37
144	VEHICLE CG Y	B-37

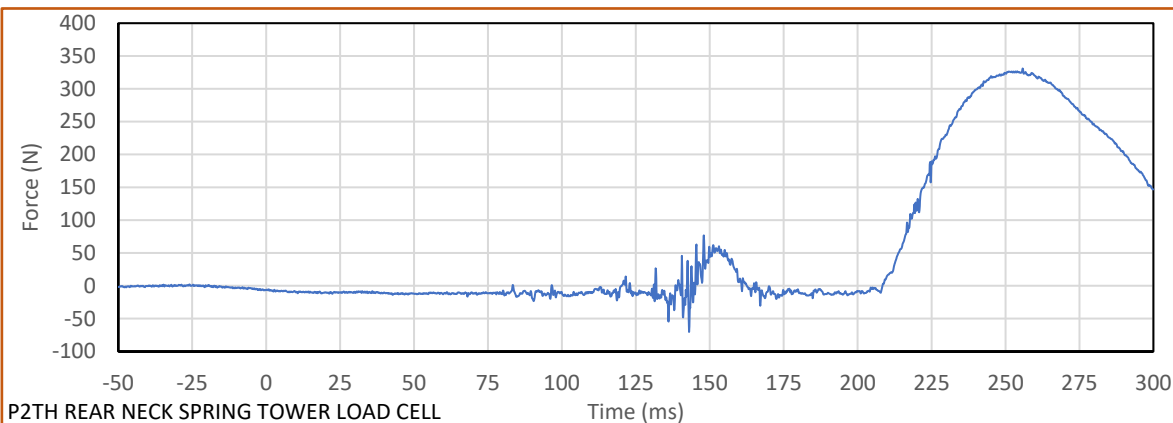
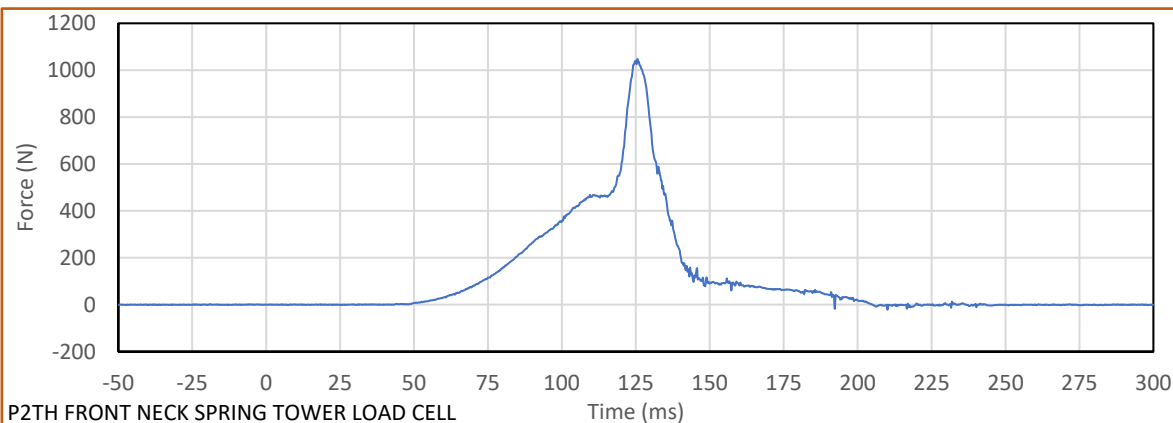
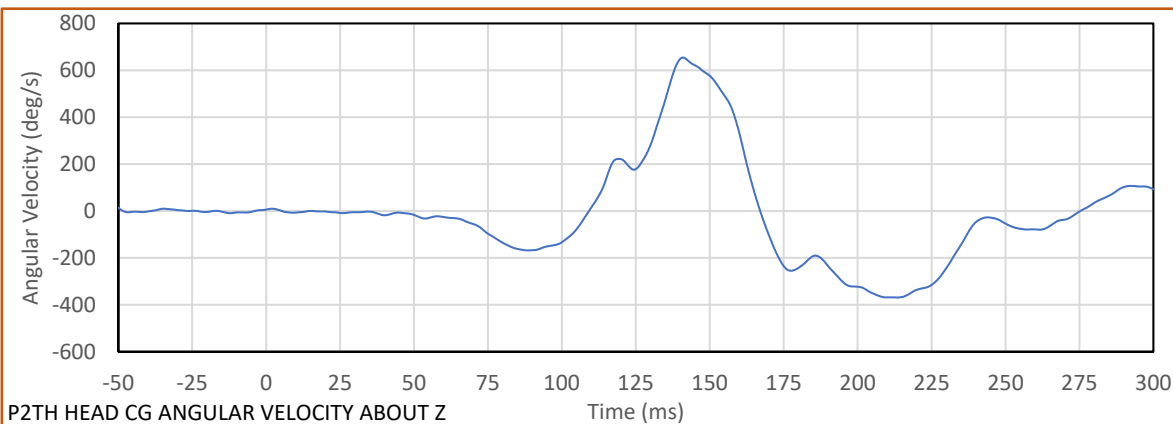
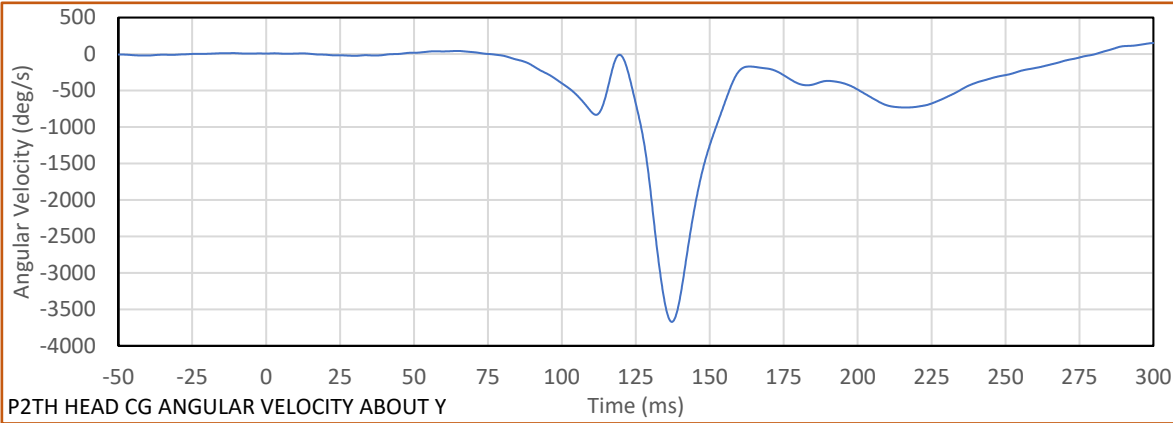
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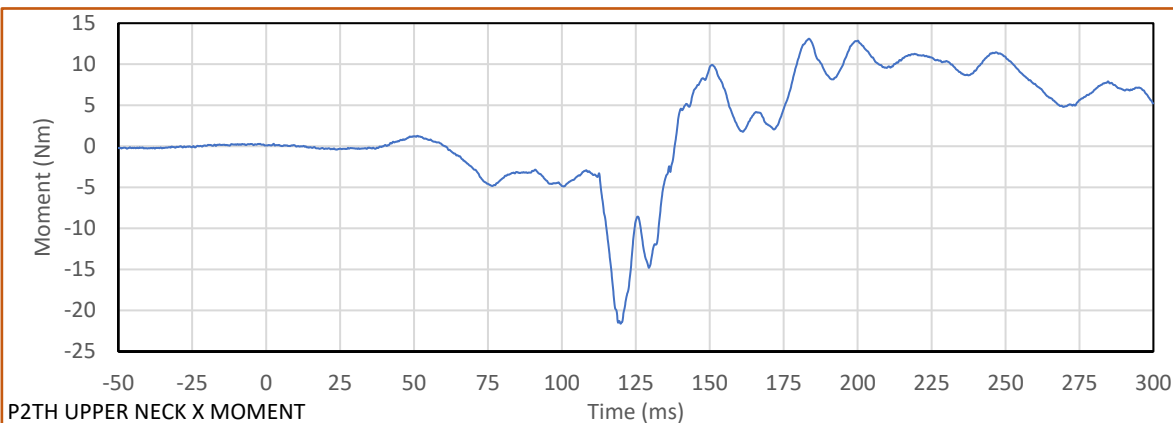
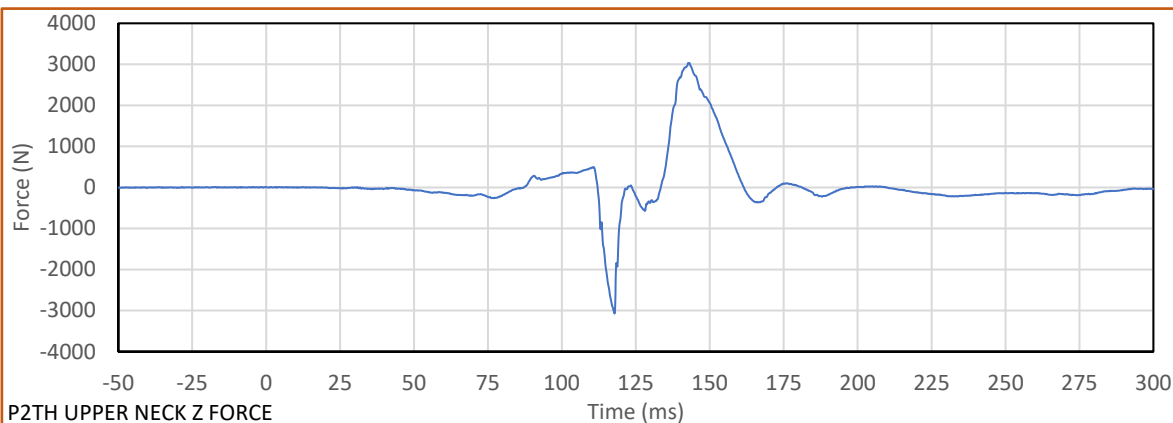
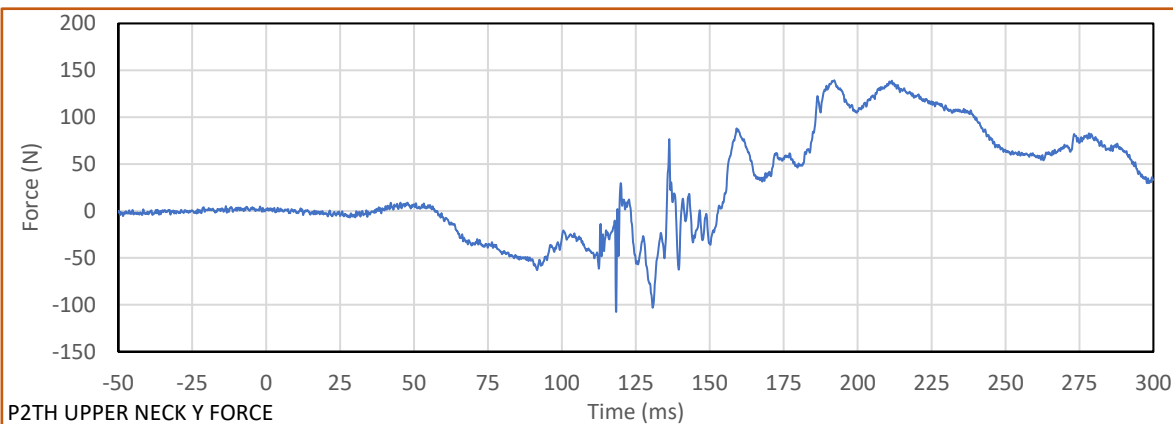
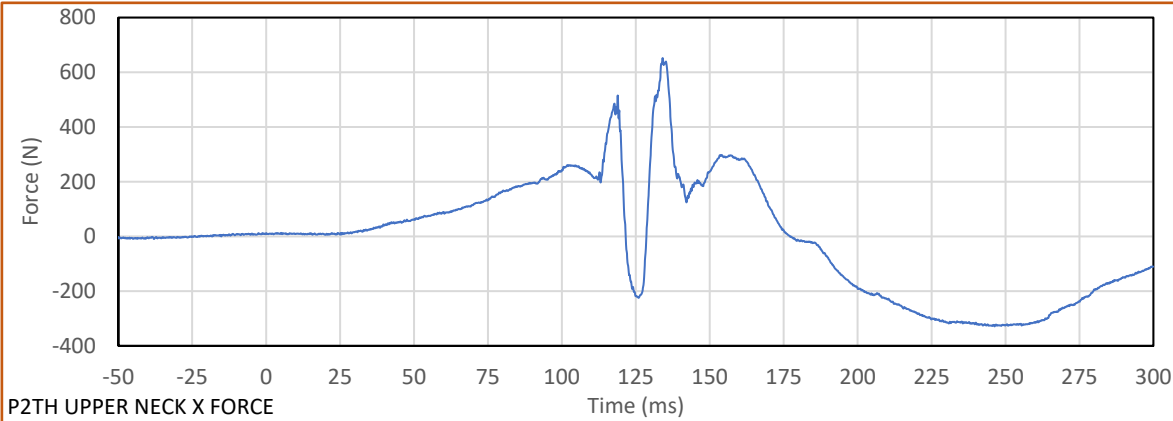
Plot		Page
145	VEHICLE CG Z	B-37
146	VEHICLE CG ROTATION ABOUT X	B-37
147	VEHICLE CG ROTATION ABOUT Y	B-38
148	VEHICLE CG ROTATION ABOUT Z	B-38
149	DRIVER FLOOR PAN X	B-38
150	DRIVER FLOOR PAN Y	B-38
151	DRIVER FLOOR PAN Z	B-39
152	PASSENGER FLOOR PAN X	B-39
153	PASSENGER FLOOR PAN Y	B-39
154	PASSENGER FLOOR PAN Z	B-39
155	DOOR SILL LR X	B-40
156	DOOR SILL LR Y	B-40
157	DOOR SILL LR REDUNDANT X	B-40
158	DOOR SILL LR REDUNDANT Y	B-40
159	DOOR SILL RR X	B-41
160	DOOR SILL RR Y	B-41
161	DOOR SILL RR REDUNDANT X	B-41
162	DOOR SILL RR REDUNDANT Y	B-41
163	DRIVER SW AIRBAG STAGE 1, TIME TO FIRE: 12.9 MS.	B-42
164	DRIVER SW AIRBAG STAGE 2, NOT INSTALLED	B-42
165	DRIVER CURTAIN AIRBAG, TIME TO FIRE: 54.9 MS.	B-42
166	DRIVER SEAT AIRBAG, TIME TO FIRE: NO FIRE.	B-42
167	DRIVER KNEE AIRBAG, TIME TO FIRE: 12.9 MS.	B-43
168	PASSENGER AIRBAG STAGE 1, TIME TO FIRE: 12.9 MS.	B-43
169	PASSENGER AIRBAG STAGE 2, TIME TO FIRE: 33.1 MS.	B-43
170	PASSENGER CURTAIN AIRBAG, TIME TO FIRE: NO FIRE	B-43
171	PASSENGER SEAT AIRBAG, TIME TO FIRE: NO FIRE	B-44
172	PASSENGER KNEE AIRBAG, TIME TO FIRE: 12.8 MS.	B-44
173	P2TH CHEST LEFT UPPER DX	B-45
174	P2TH CHEST LEFT UPPER DY	B-45
175	P2TH CHEST LEFT UPPER DZ	B-45
176	P2TH CHEST LEFT UPPER RESULTANT	B-45
177	P2TH CHEST RIGHT UPPER DX	B-46
178	P2TH CHEST RIGHT UPPER DY	B-46
179	P2TH CHEST RIGHT UPPER DZ	B-46
180	P2TH CHEST RIGHT UPPER RESULTANT	B-46

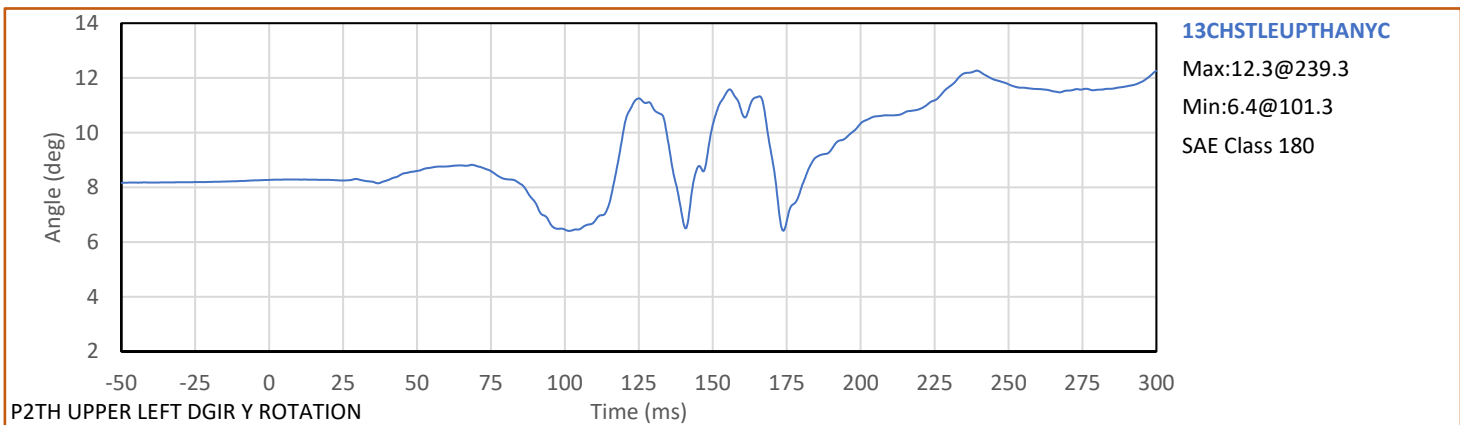
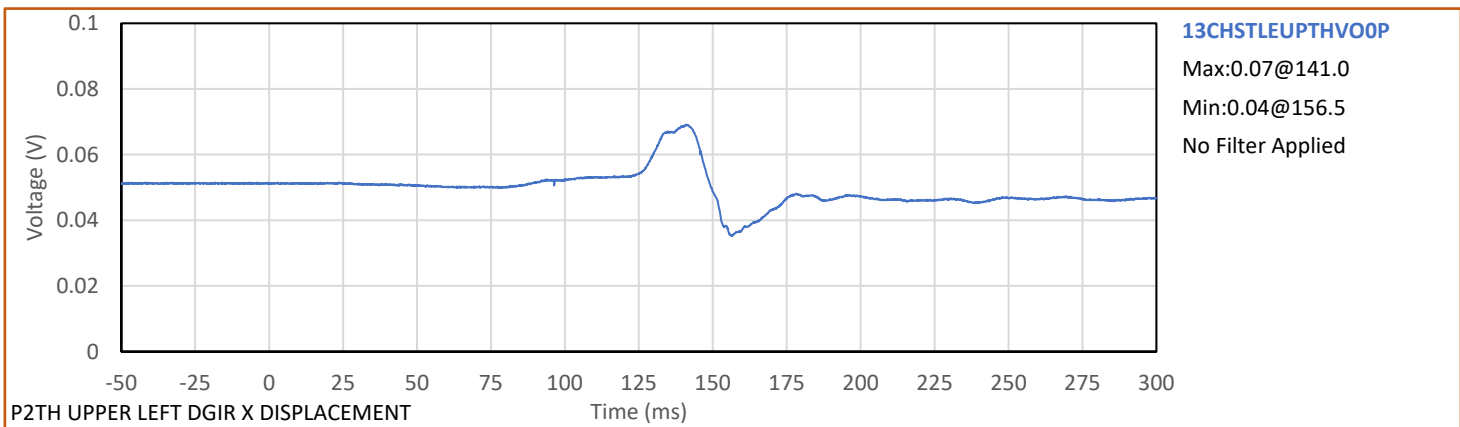
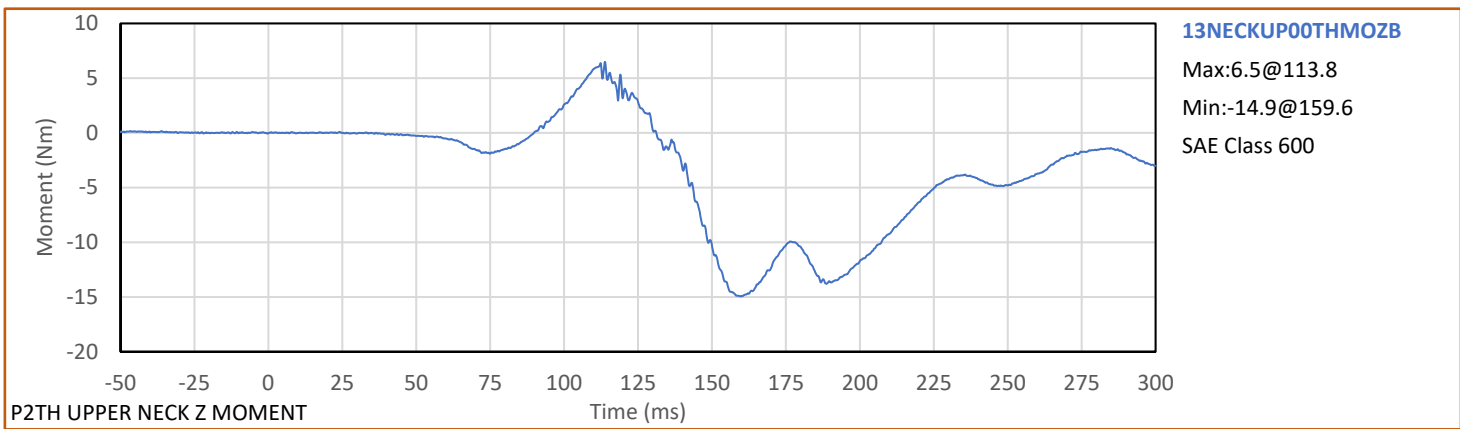
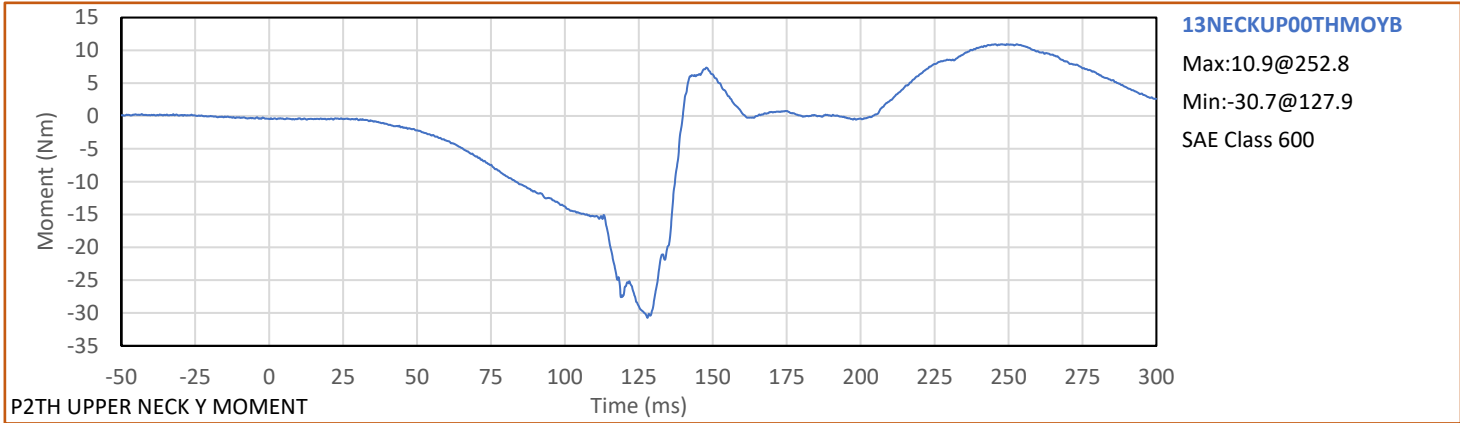
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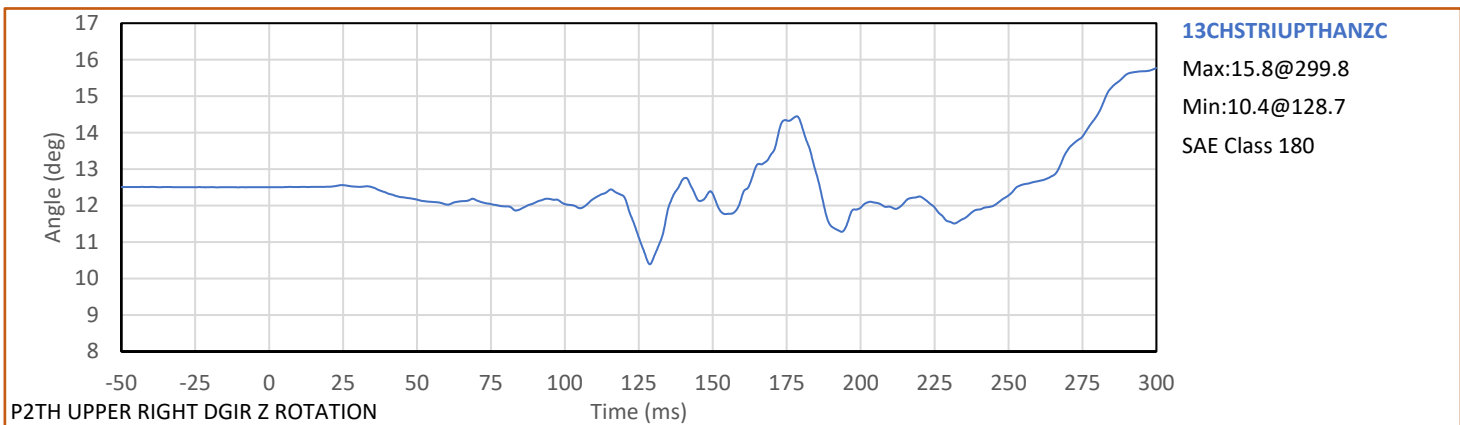
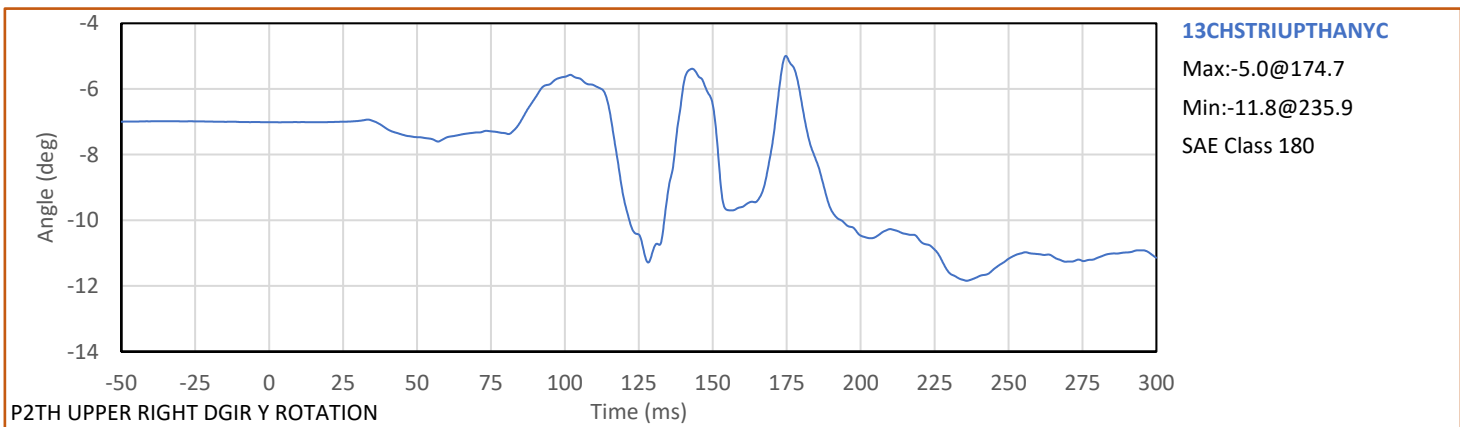
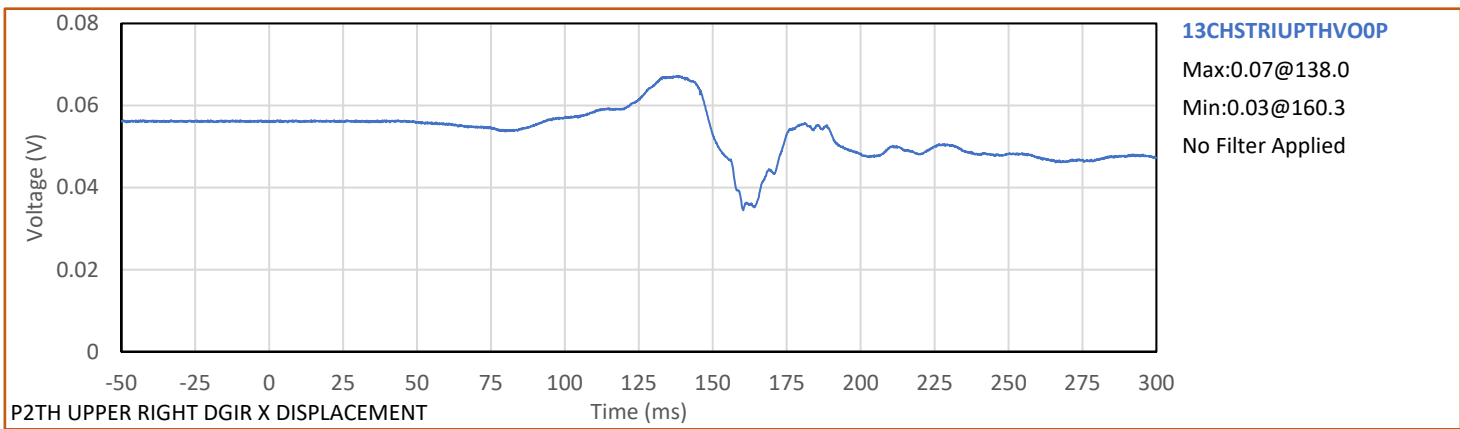
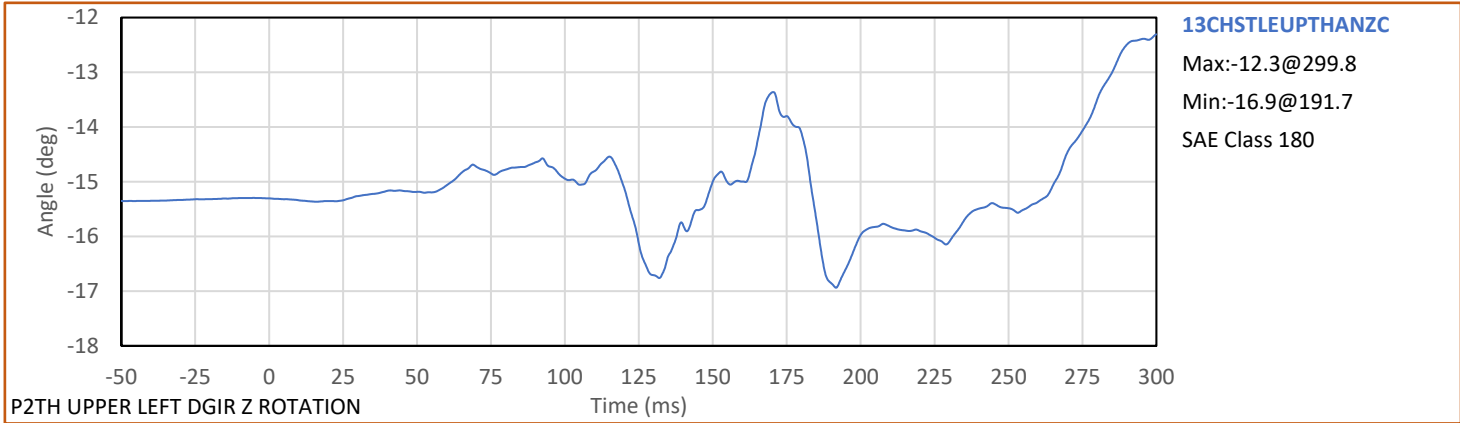
<u>Plot</u>		<u>Page</u>
181	P2TH CHEST LEFT LOWER DX	B-47
182	P2TH CHEST LEFT LOWER DY	B-47
183	P2TH CHEST LEFT LOWER DZ	B-47
184	P2TH CHEST LEFT LOWER RESULTANT	B-47
185	P2TH CHEST RIGHT LOWER DX	B-48
186	P2TH CHEST RIGHT LOWER DY	B-48
187	P2TH CHEST RIGHT LOWER DZ	B-48
188	P2TH CHEST RIGHT LOWER RESULTANT	B-48
189	P2TH ABDOMEN LEFT LOWER DX	B-49
190	P2TH ABDOMEN LEFT LOWER DY	B-49
191	P2TH ABDOMEN LEFT LOWER DZ	B-49
192	P2TH ABDOMEN LEFT LOWER RESULTANT	B-49
193	P2TH ABDOMEN RIGHT LOWER DX	B-50
194	P2TH ABDOMEN RIGHT LOWER DY	B-50
195	P2TH ABDOMEN RIGHT LOWER DZ	B-50
196	P2TH ABDOMEN RIGHT LOWER RESULTANT	B-50

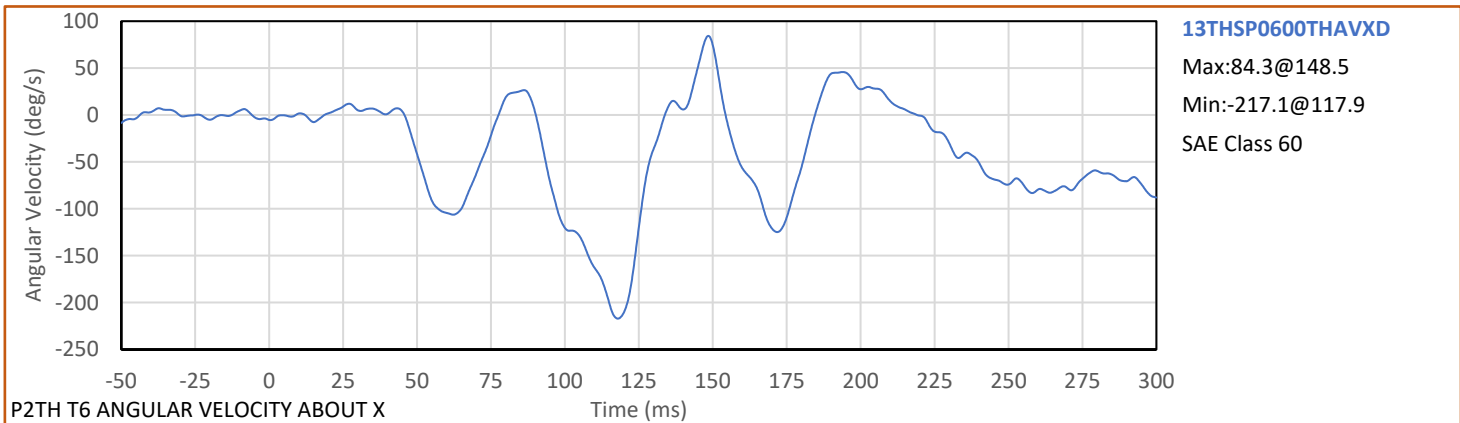
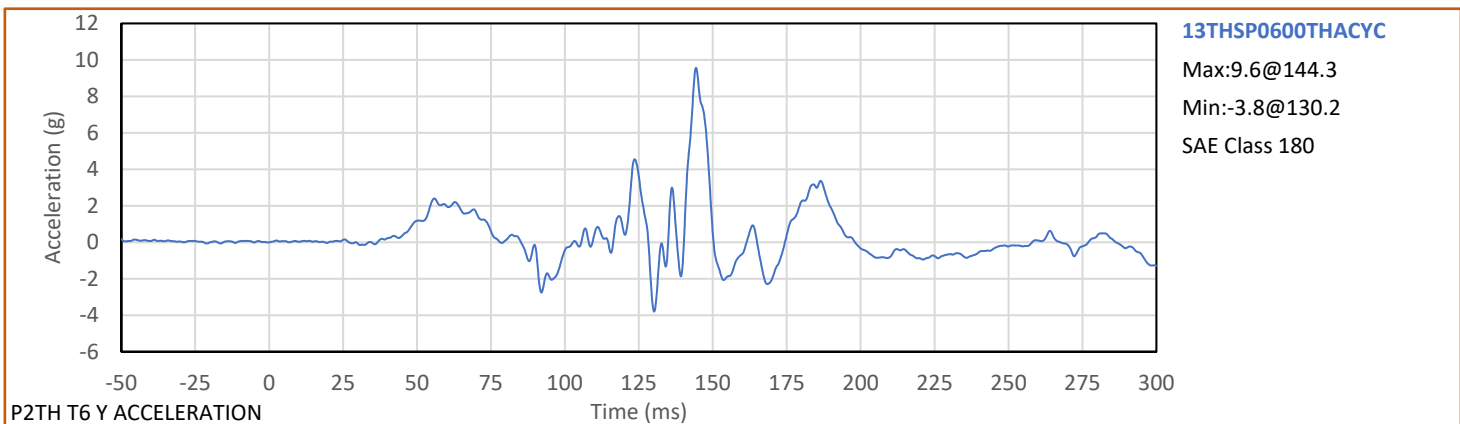
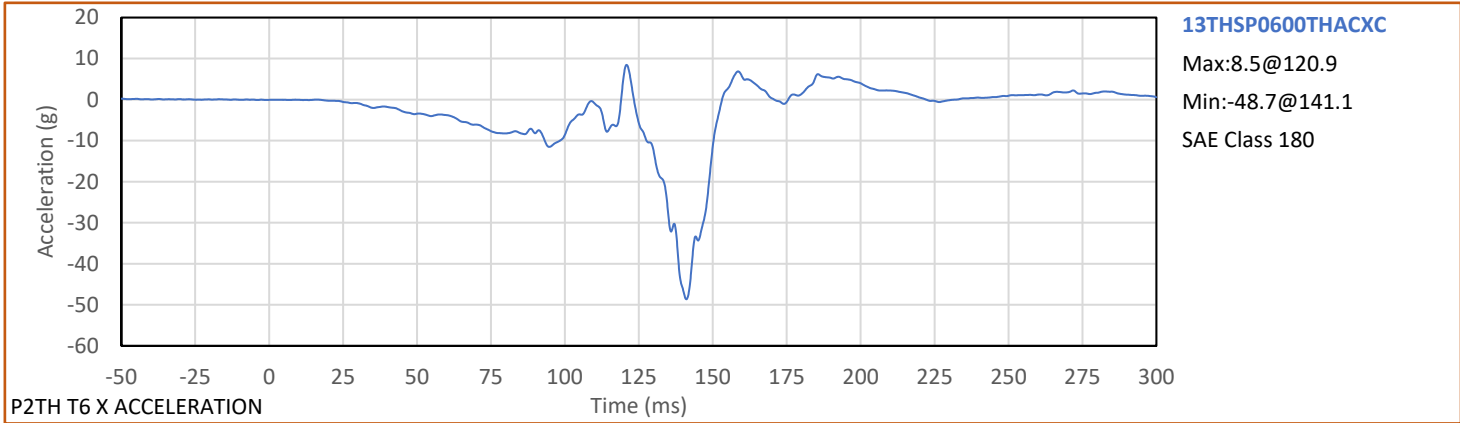


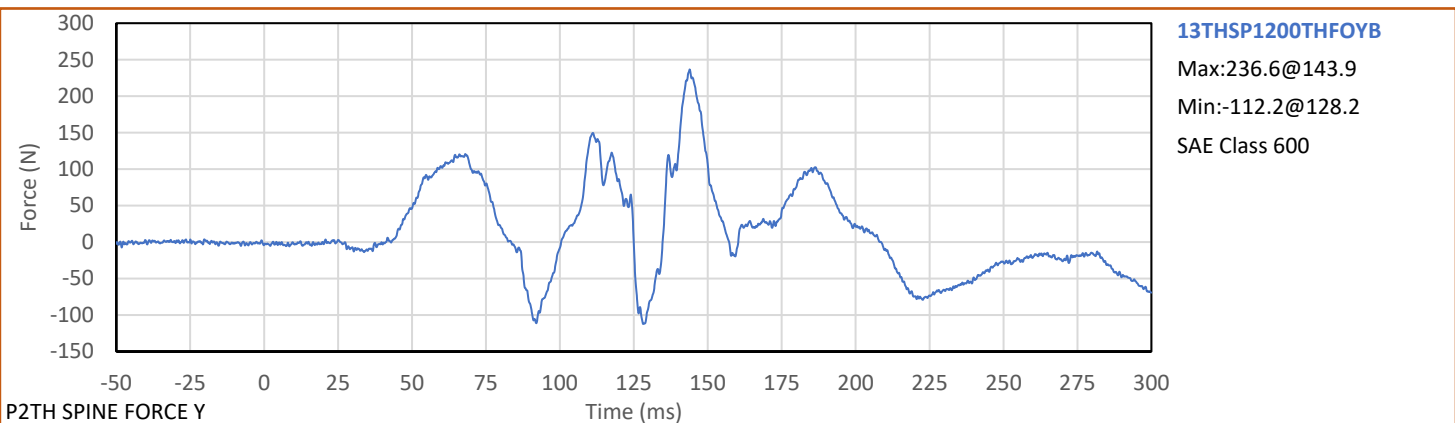
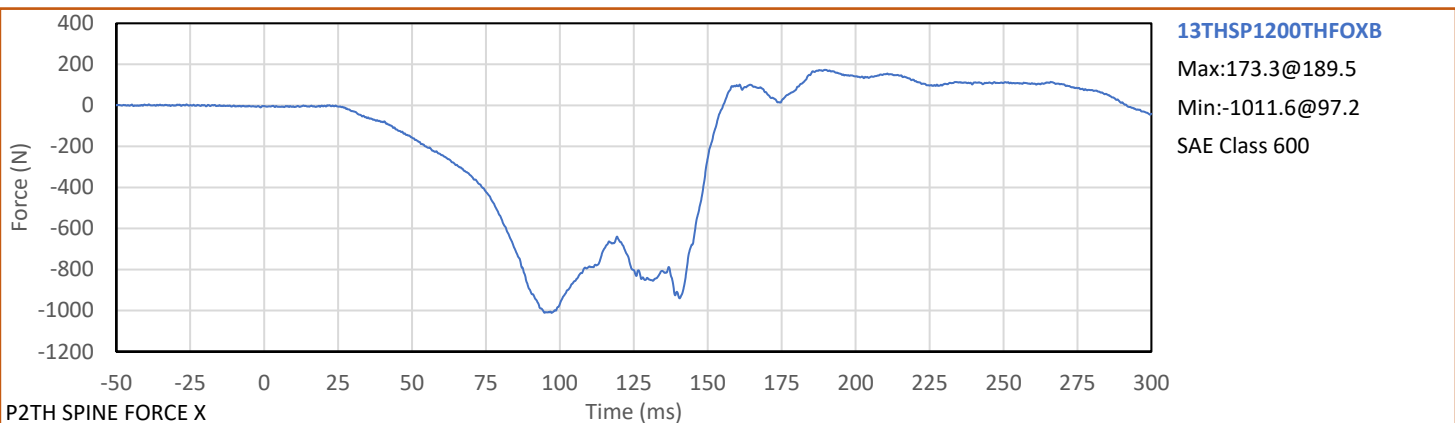
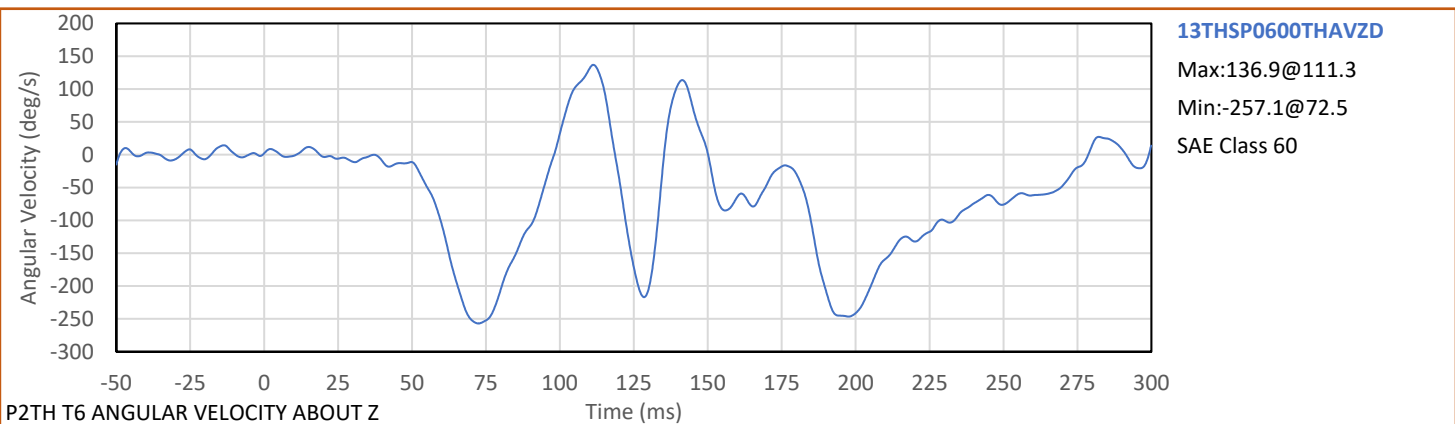
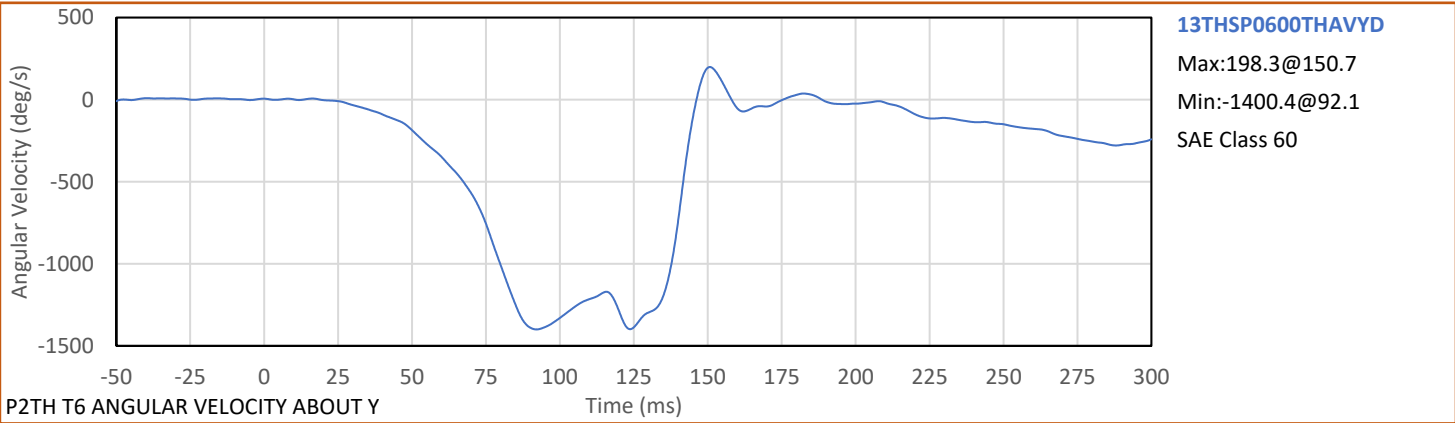


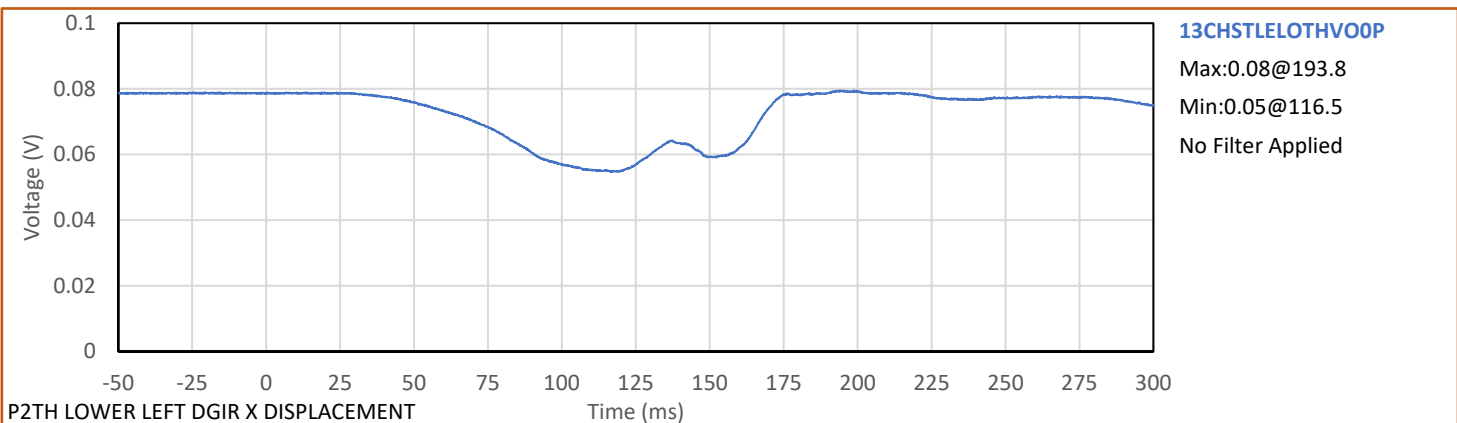
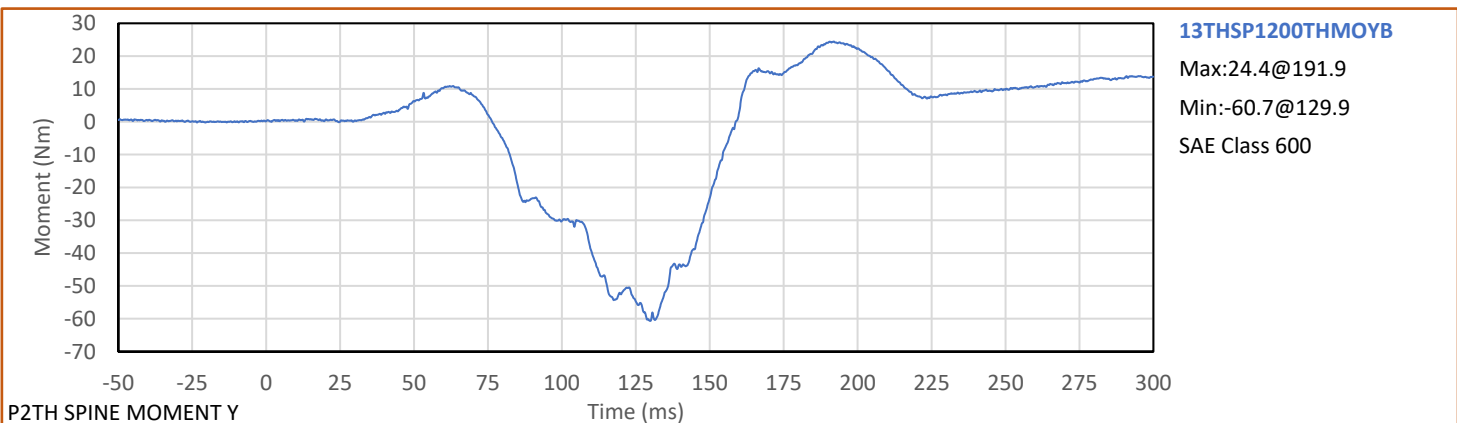
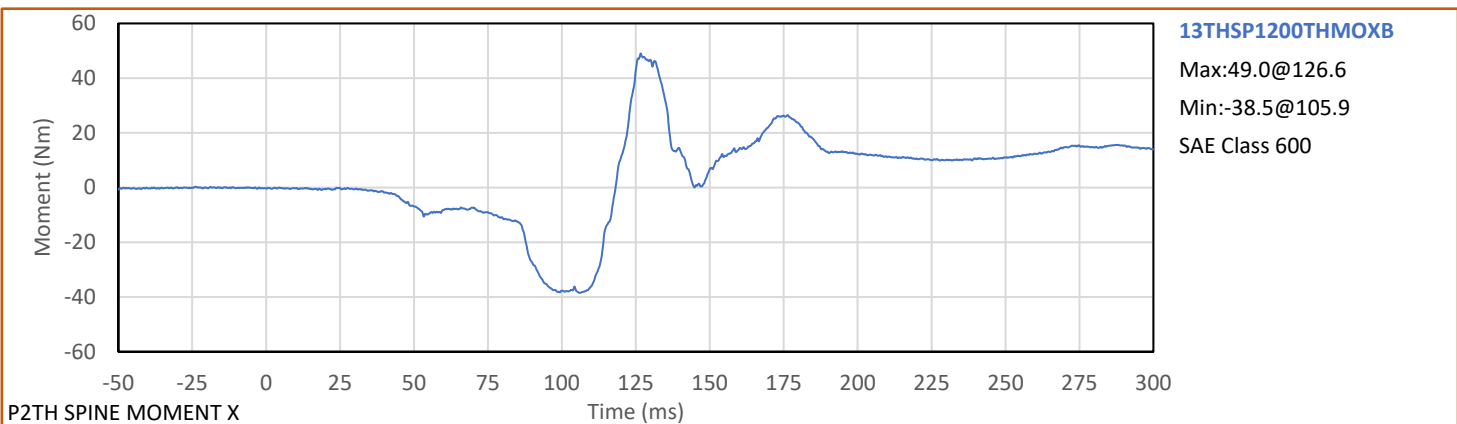
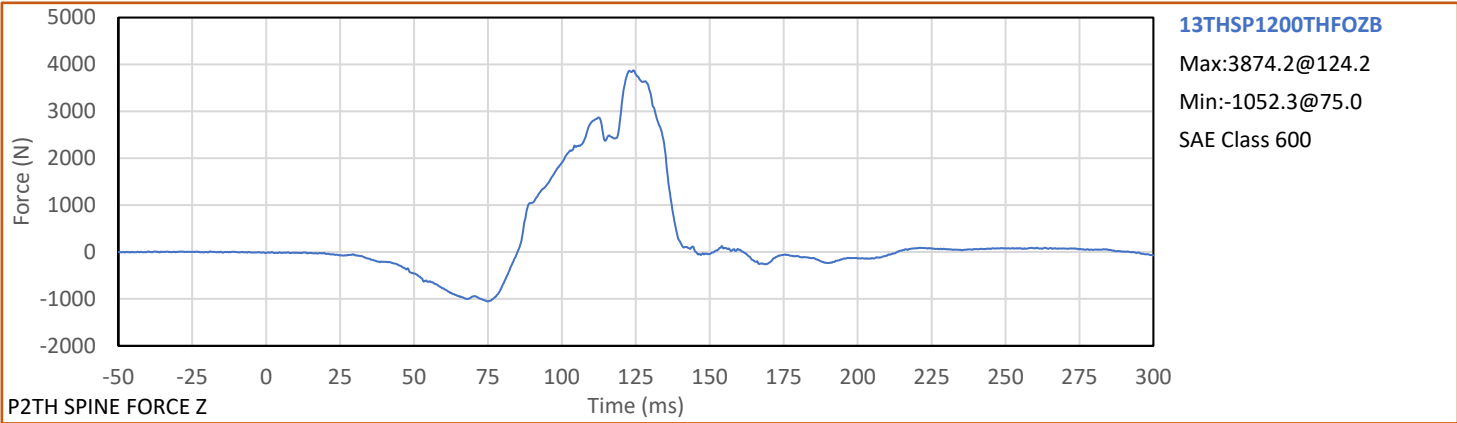


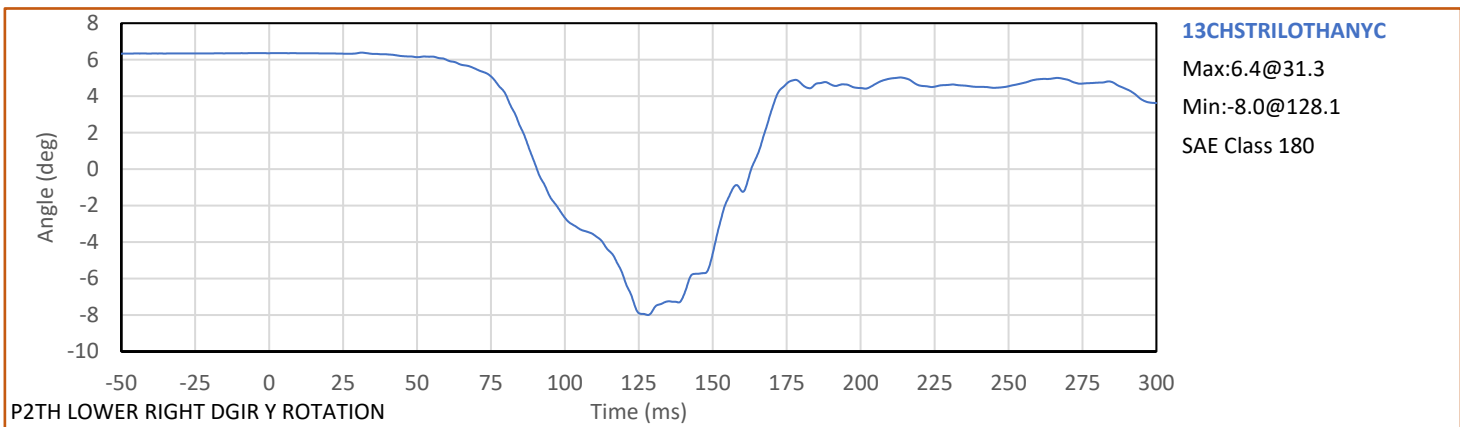
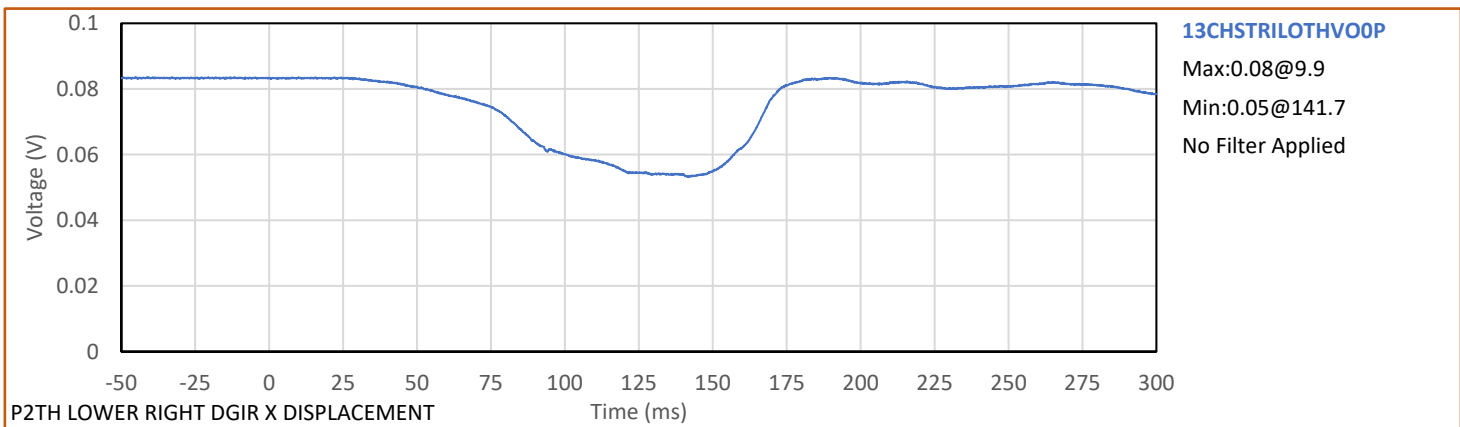
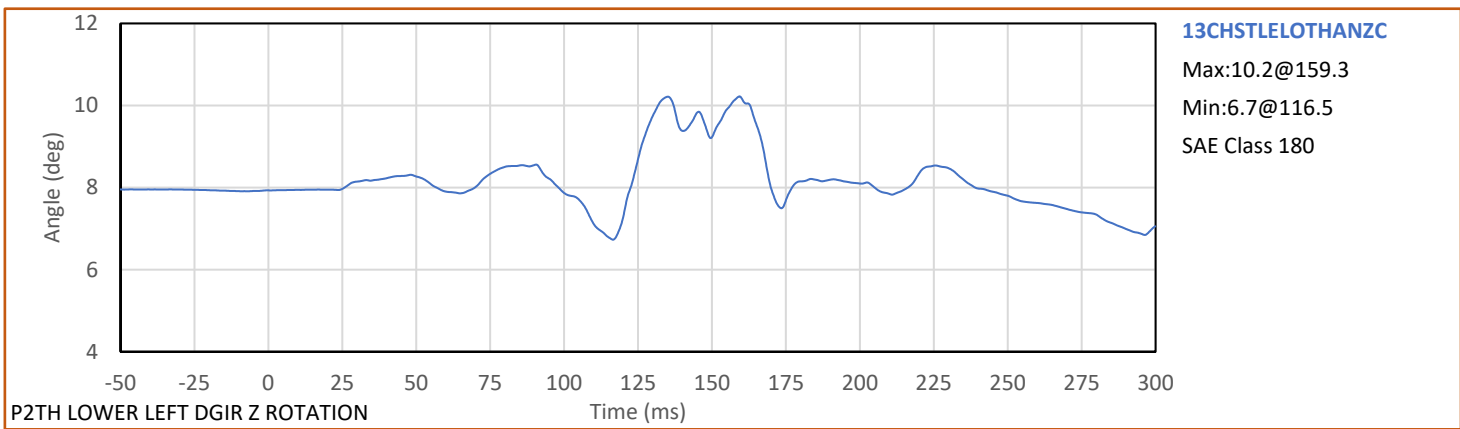
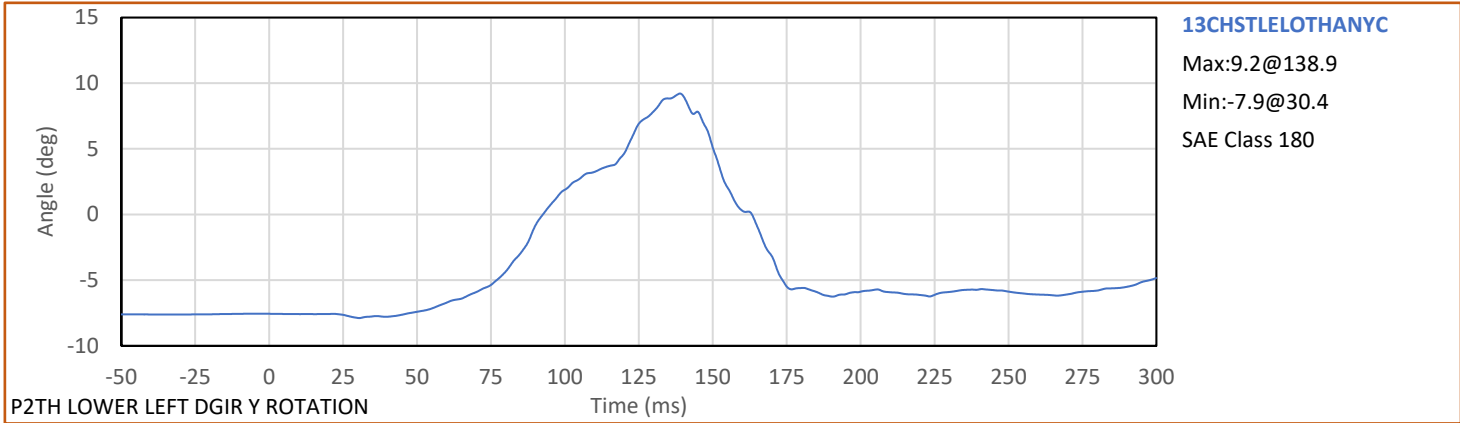


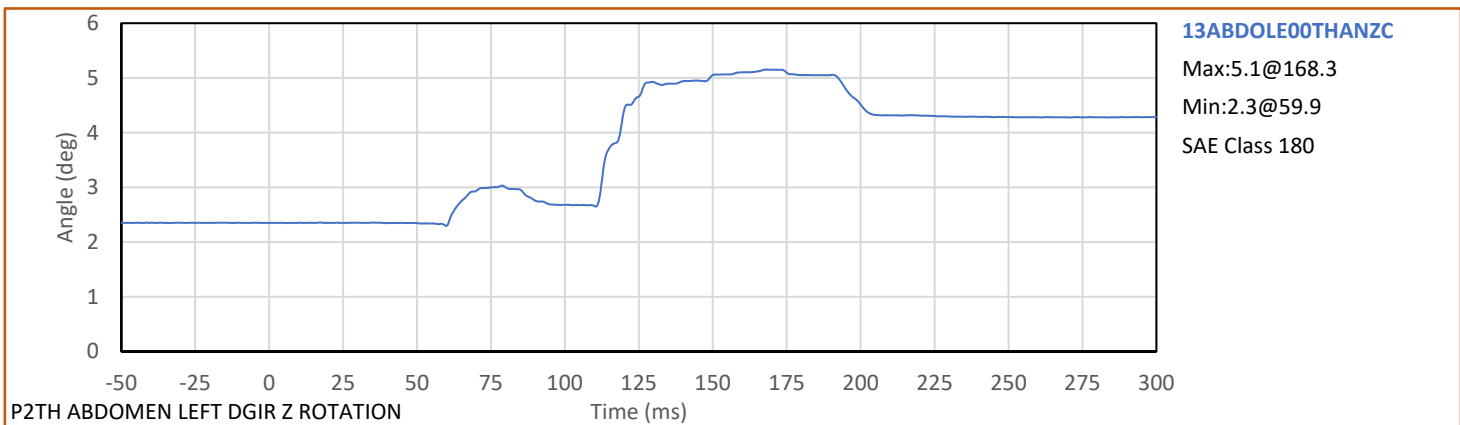
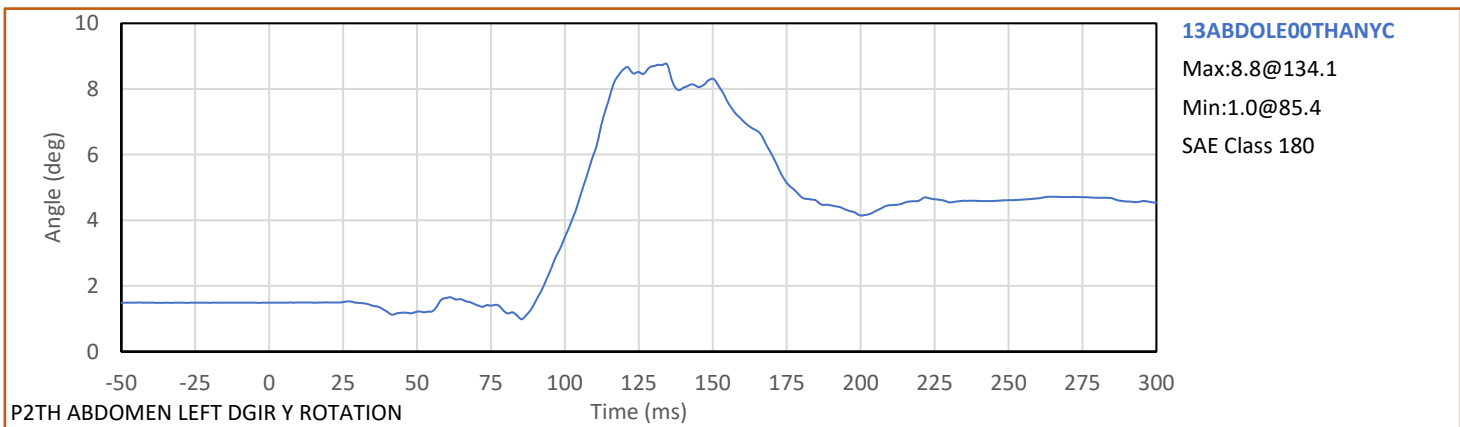
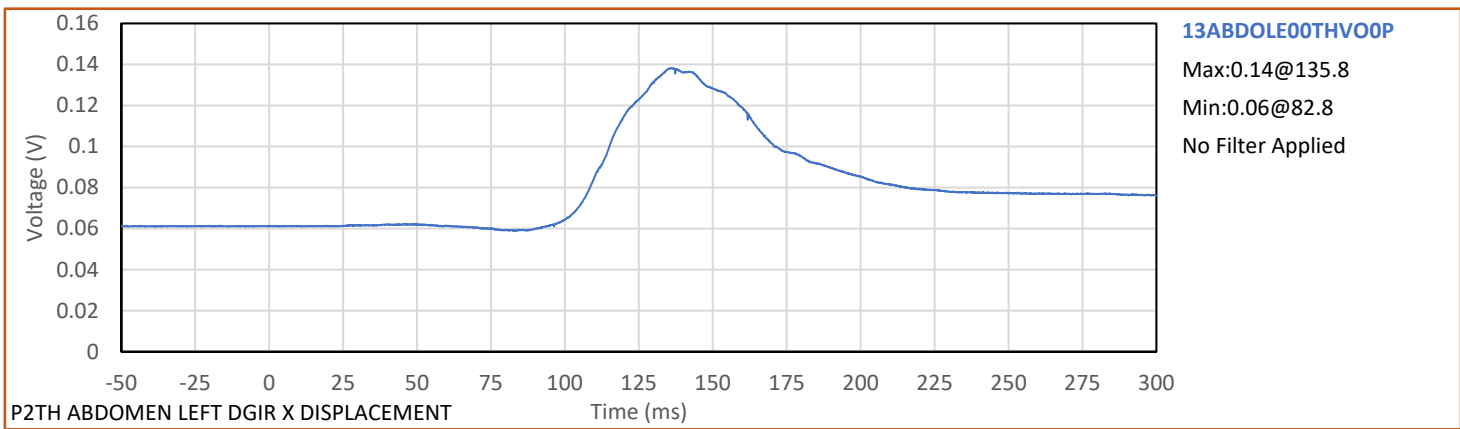
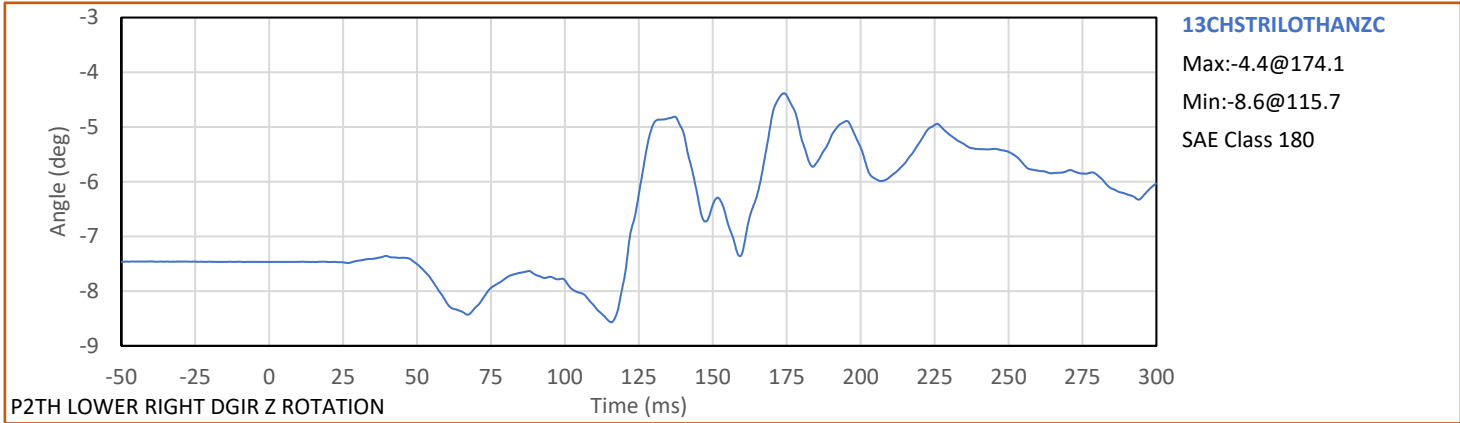


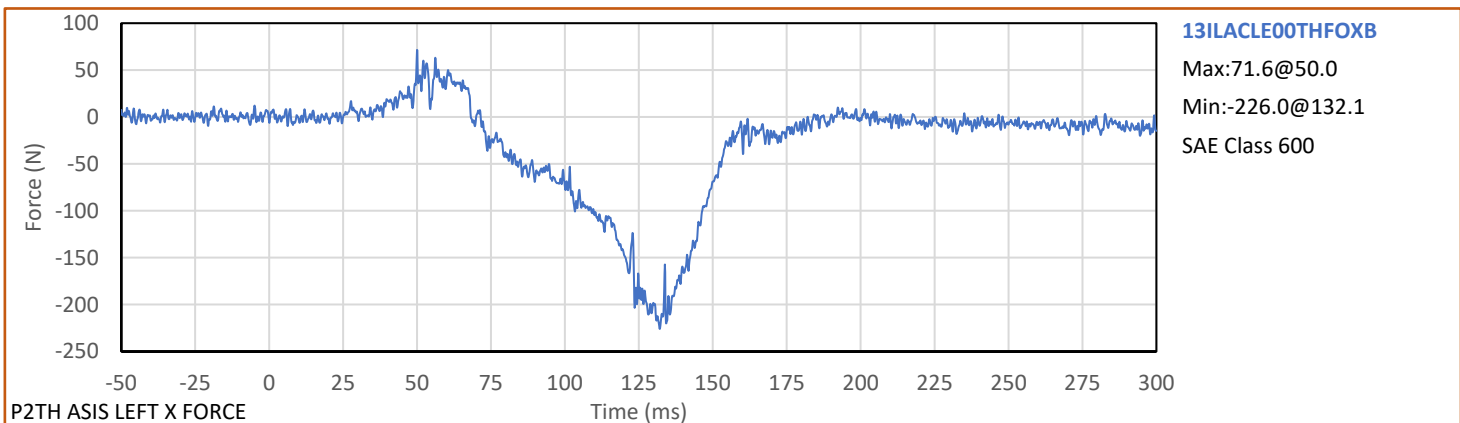
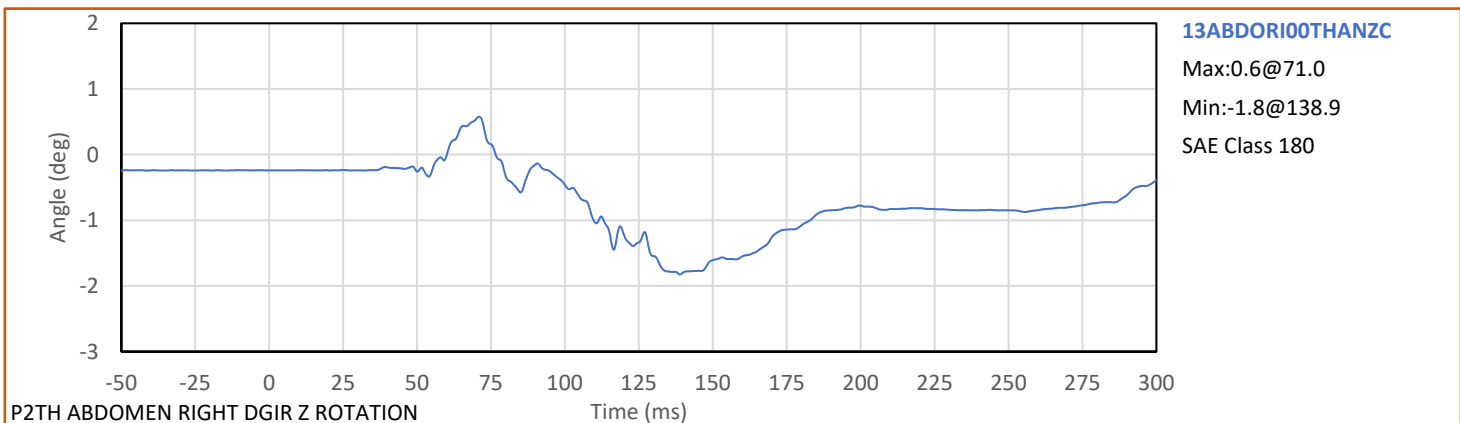
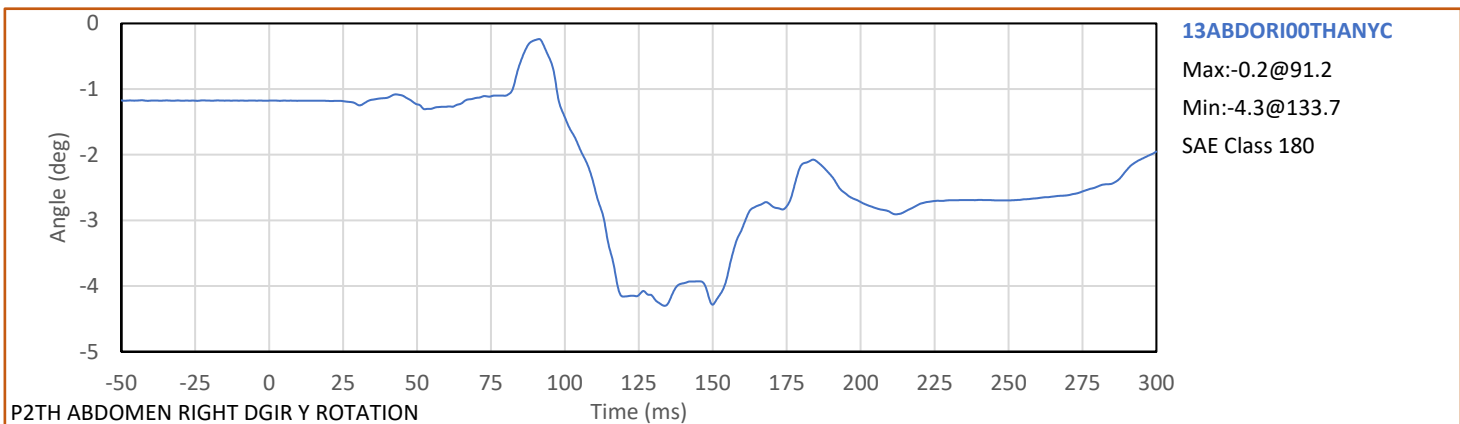
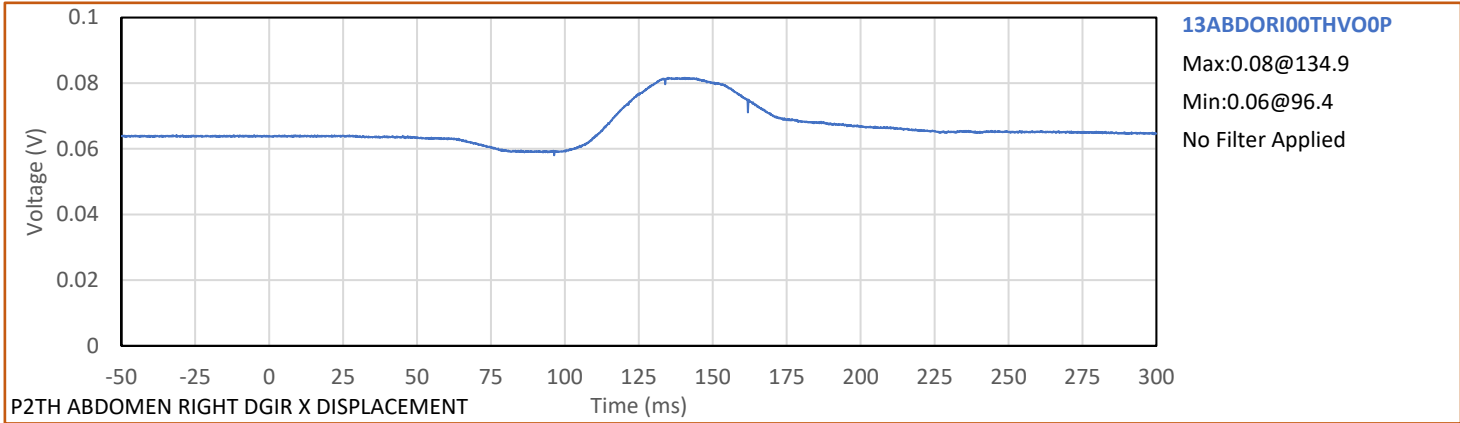


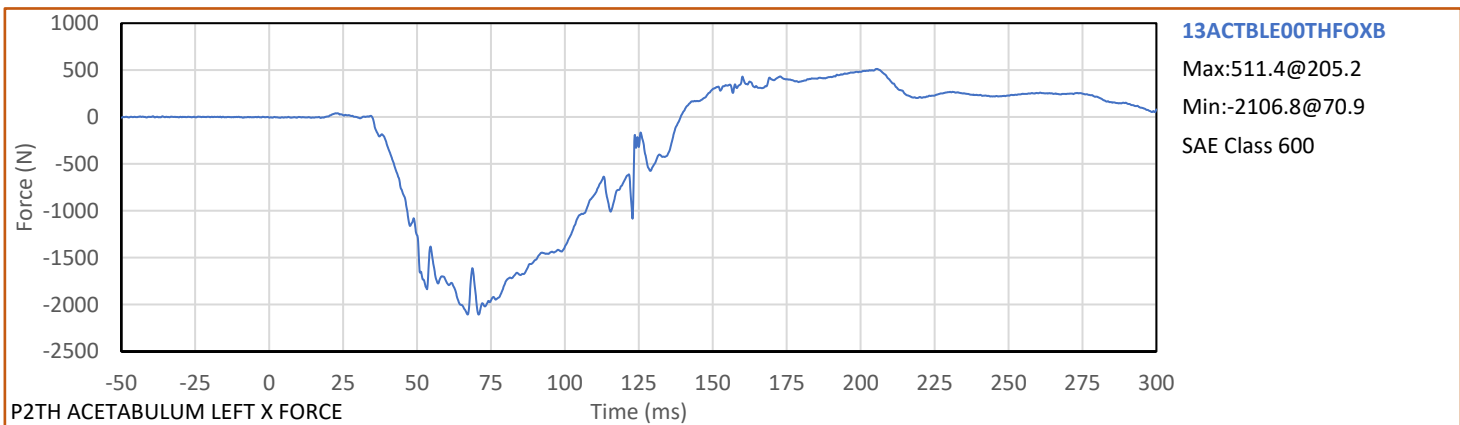
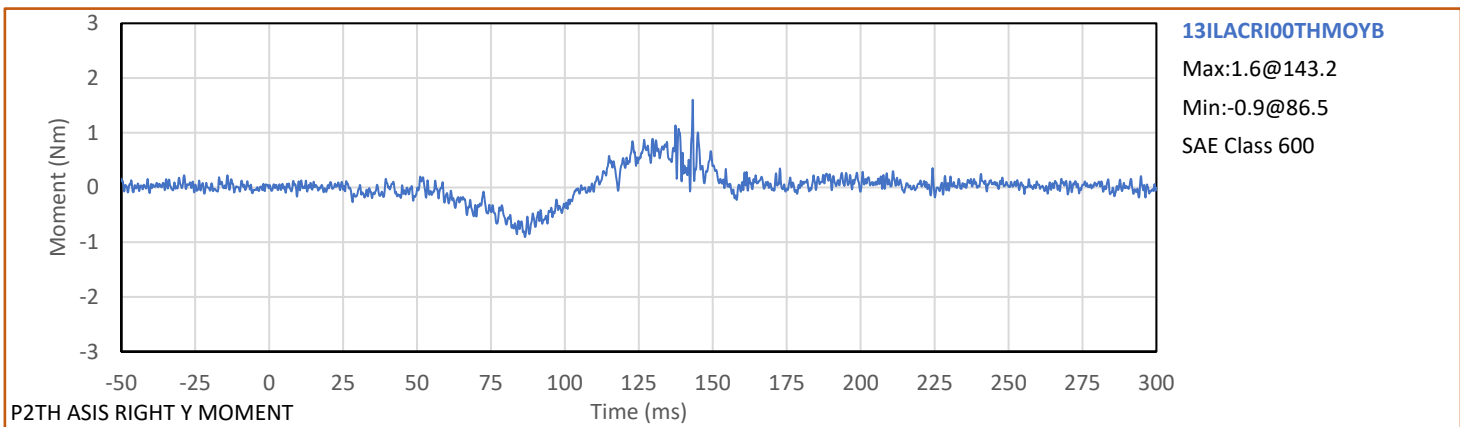
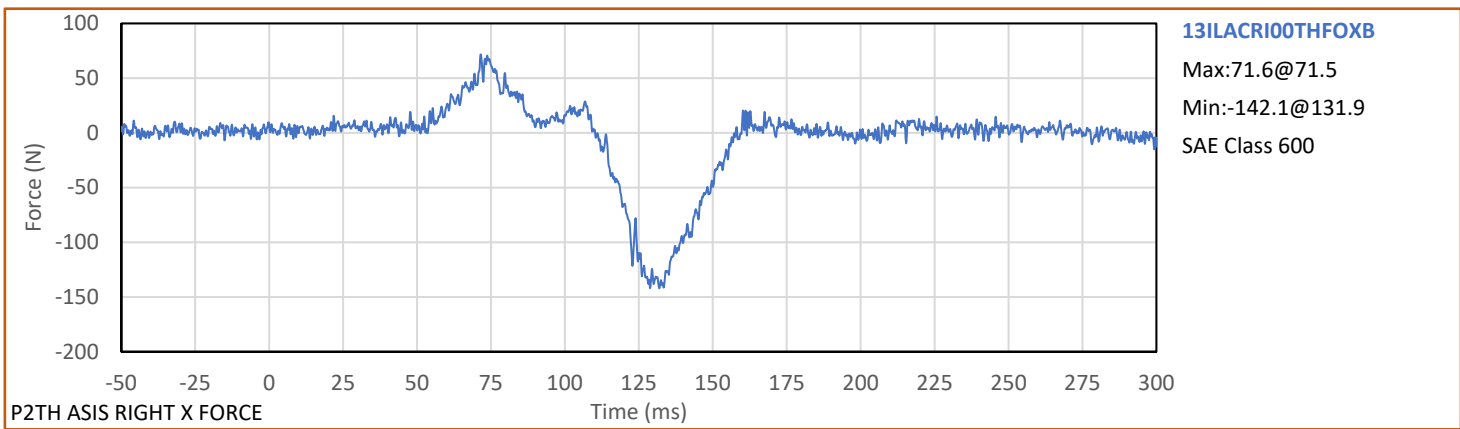
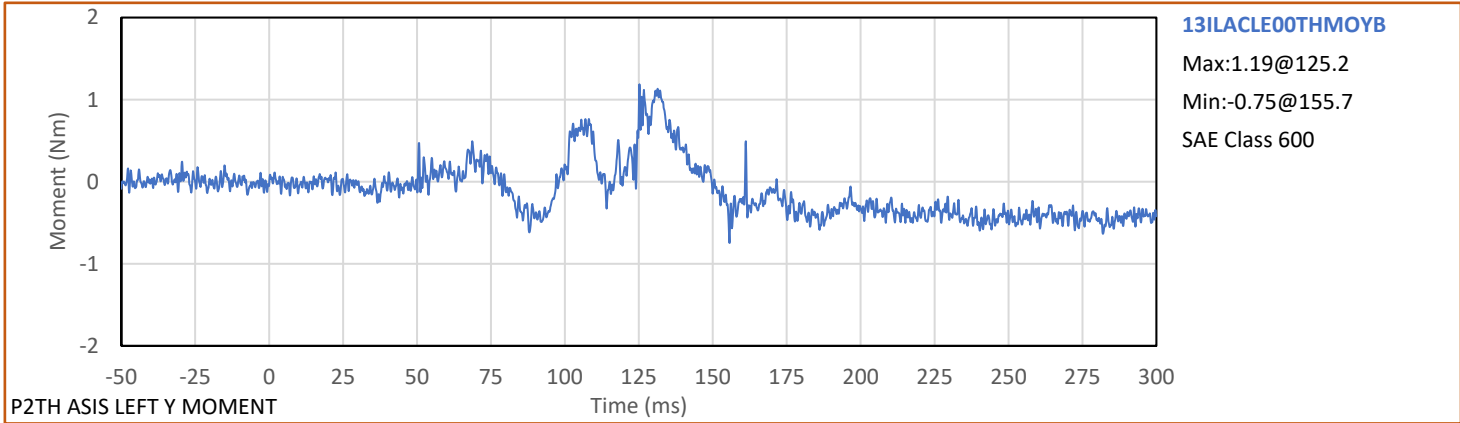


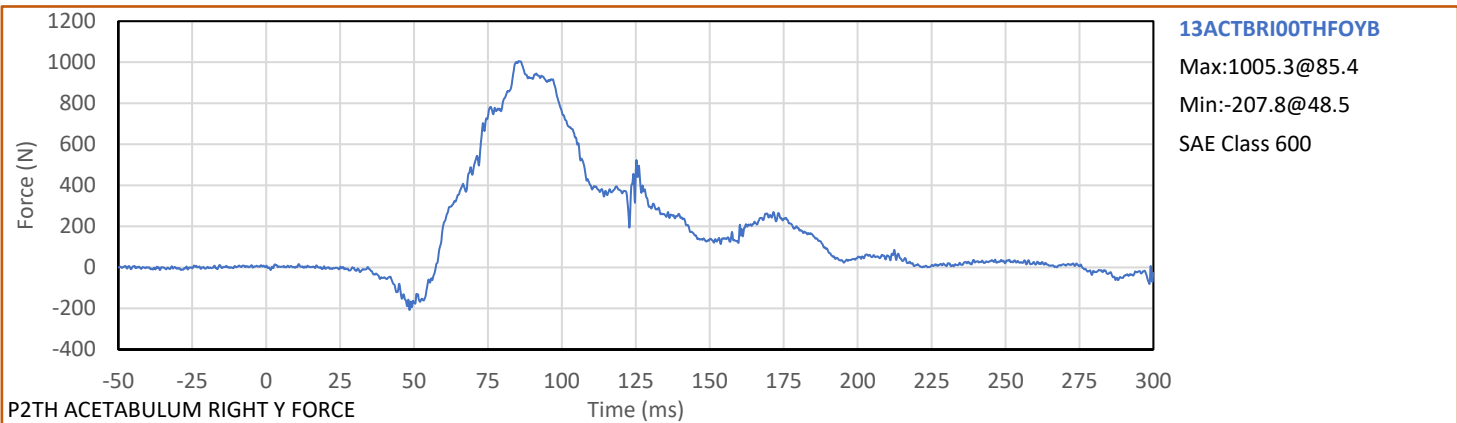
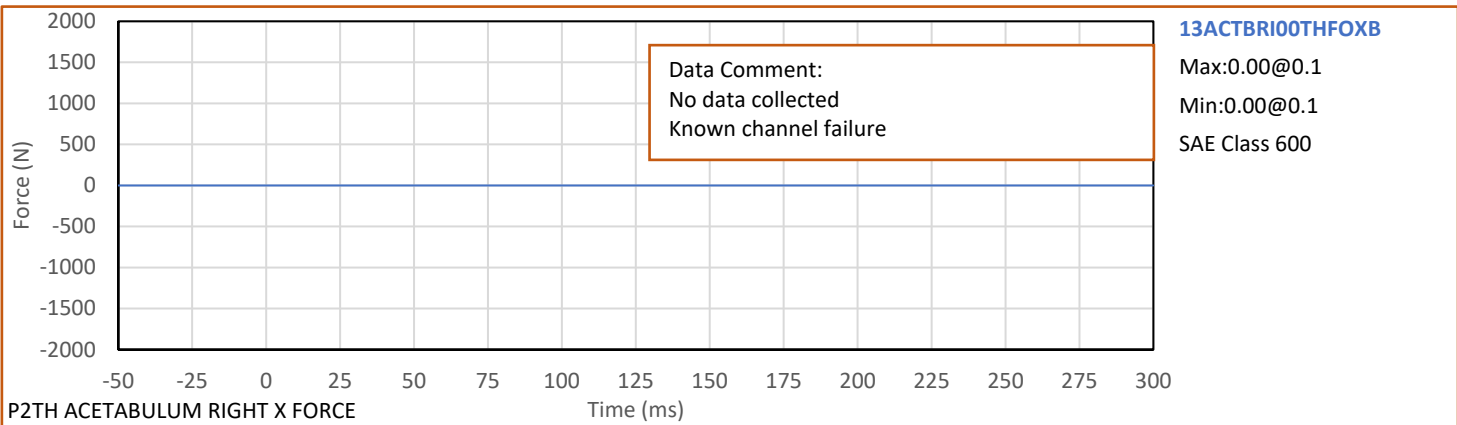
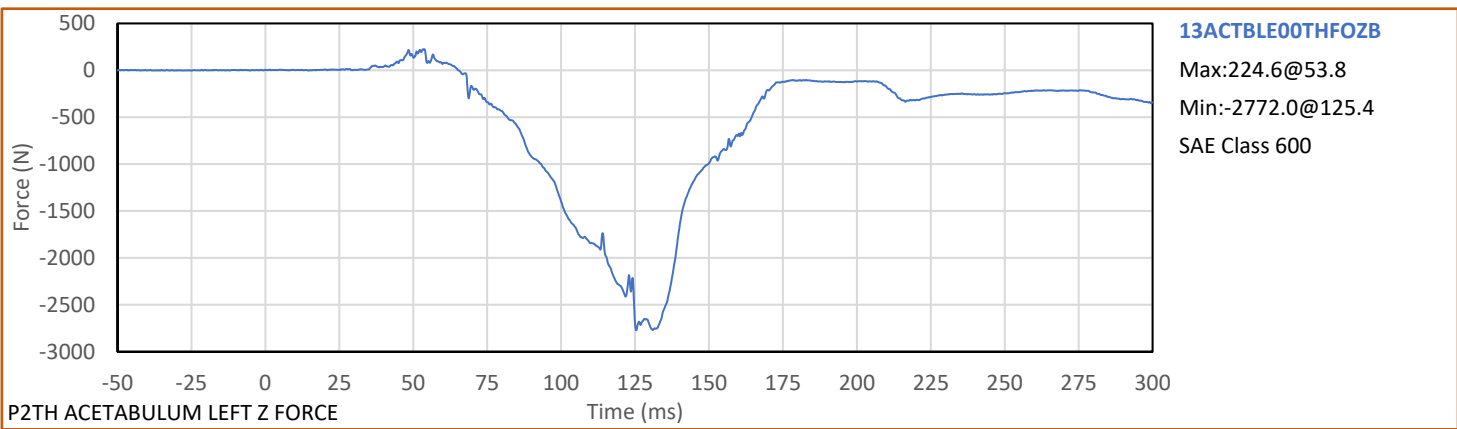
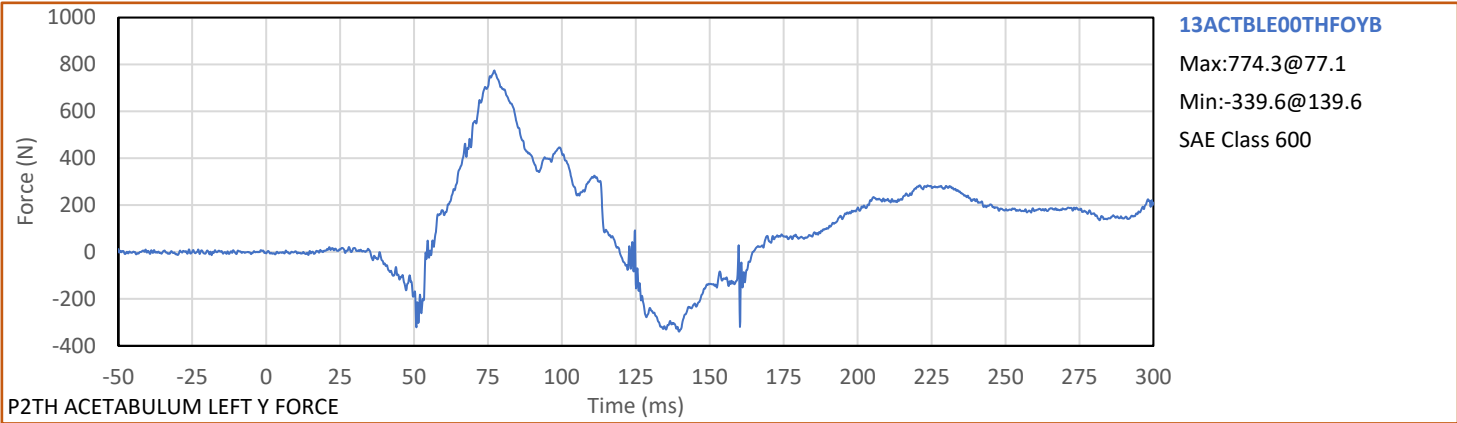


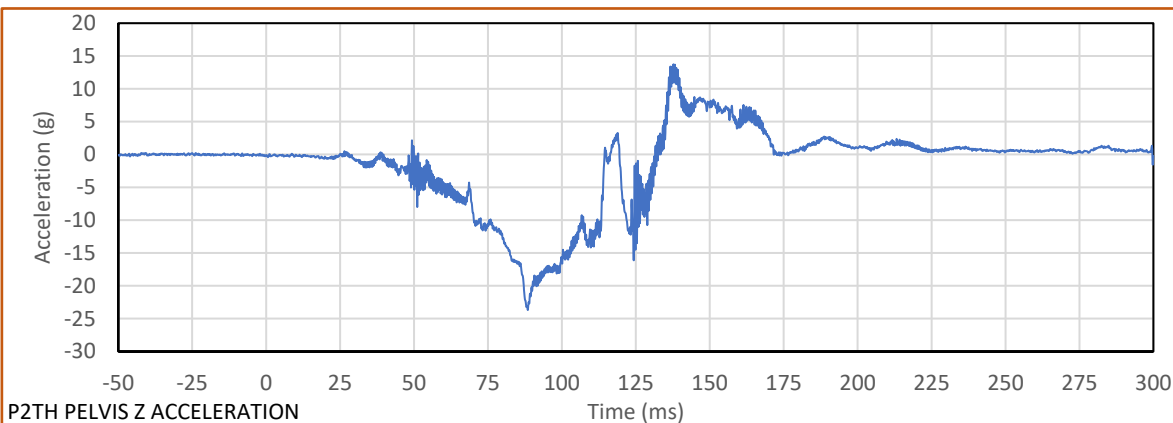
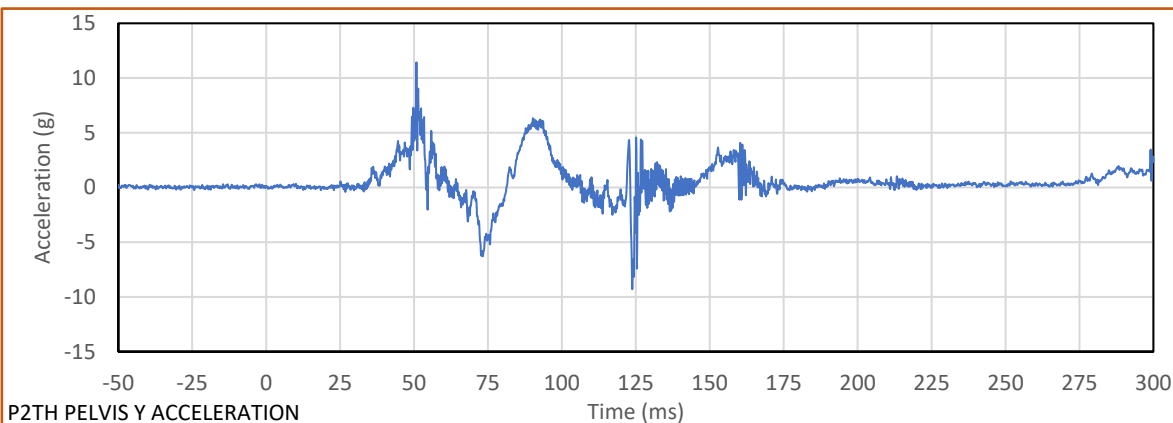
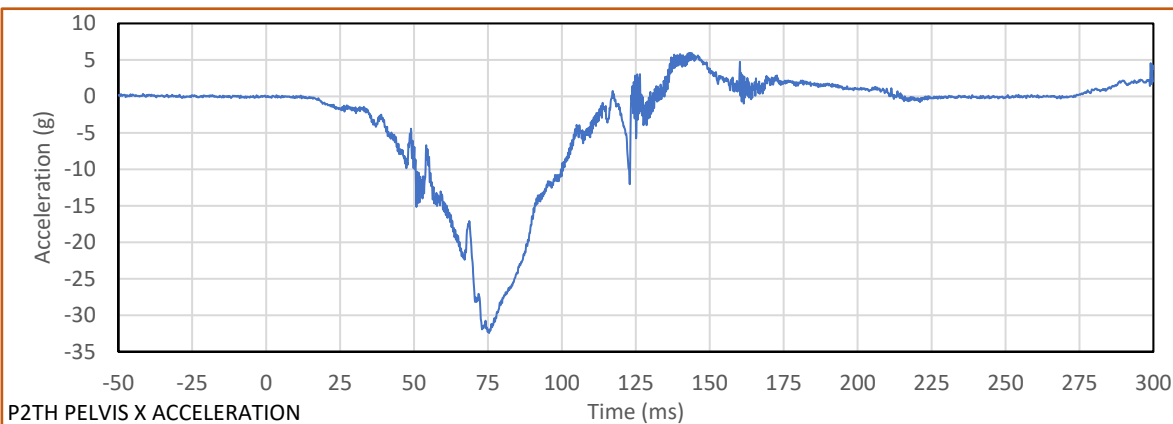
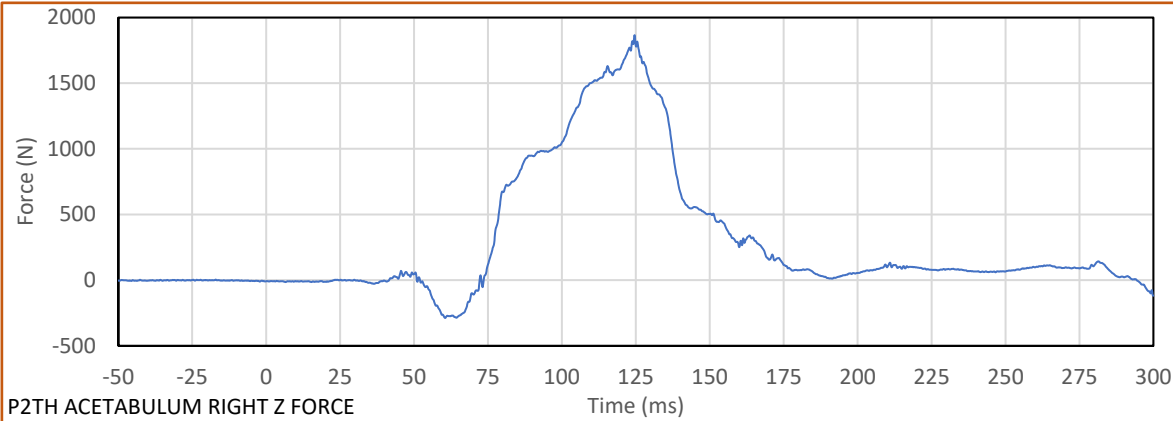


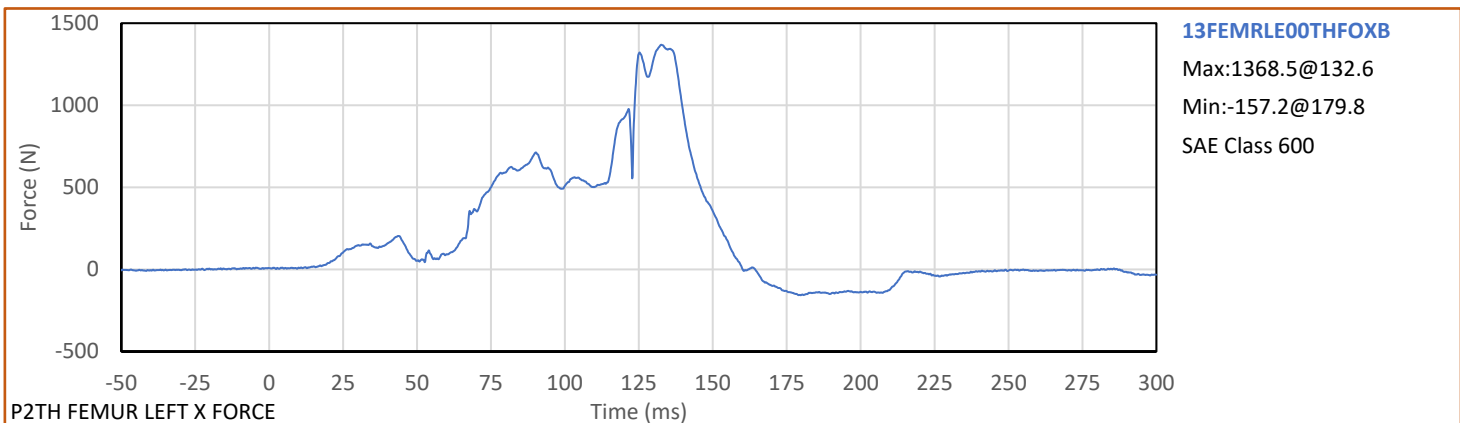
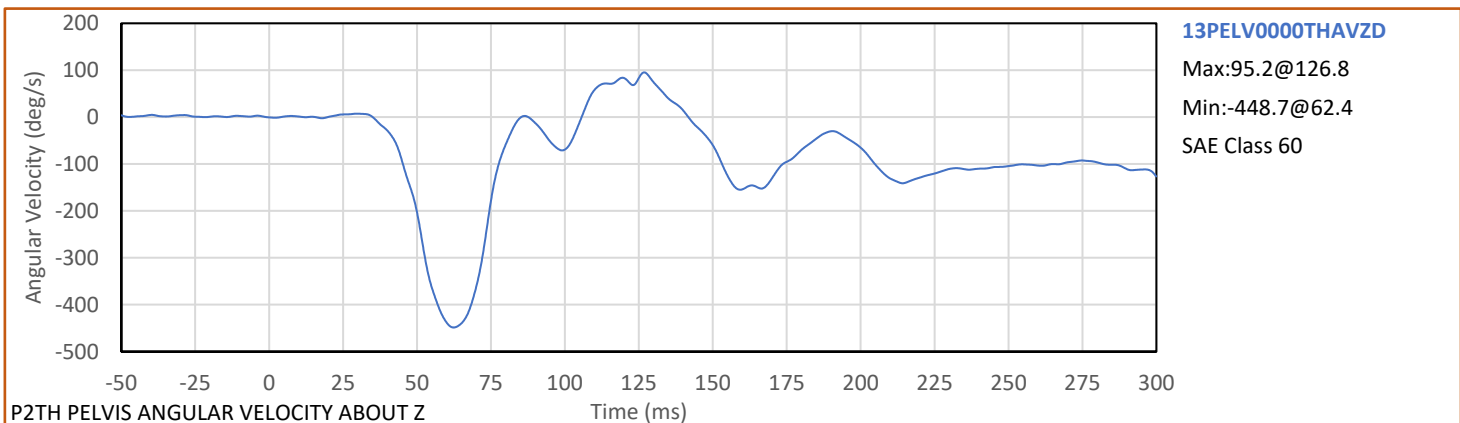
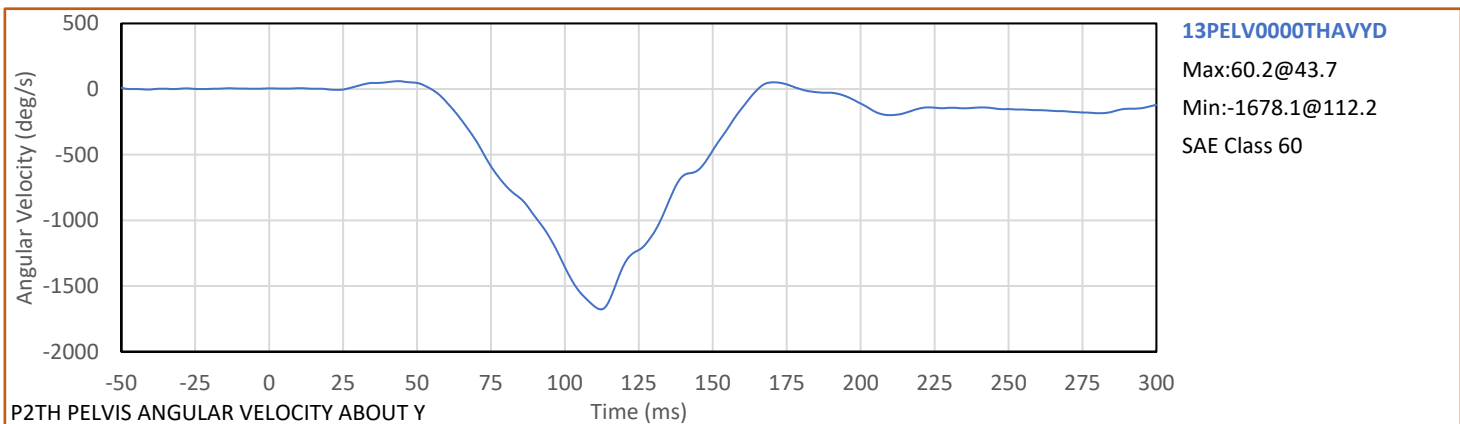
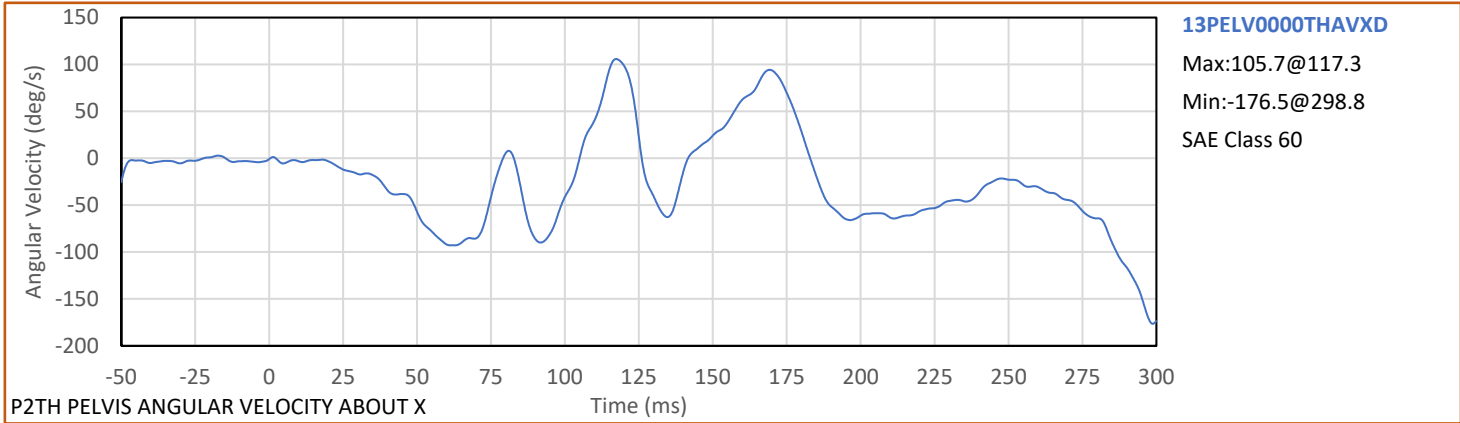


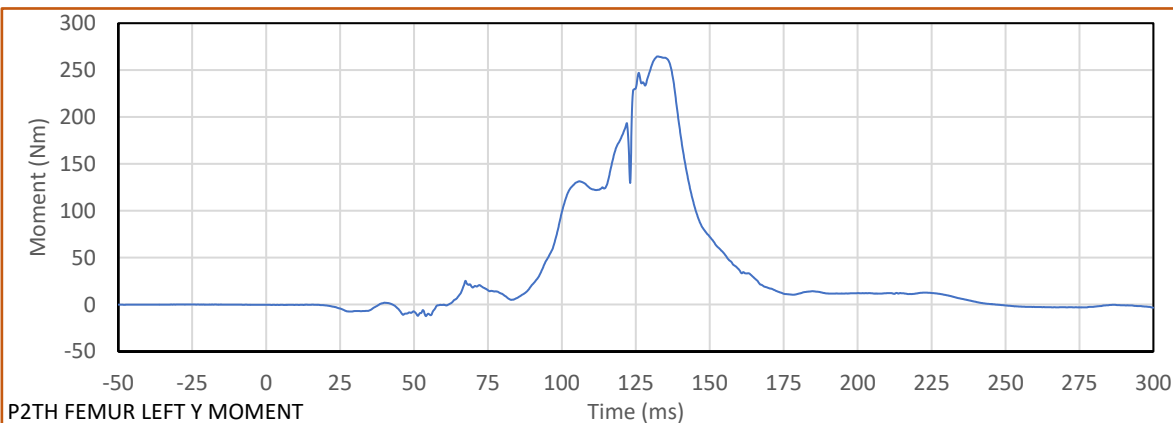
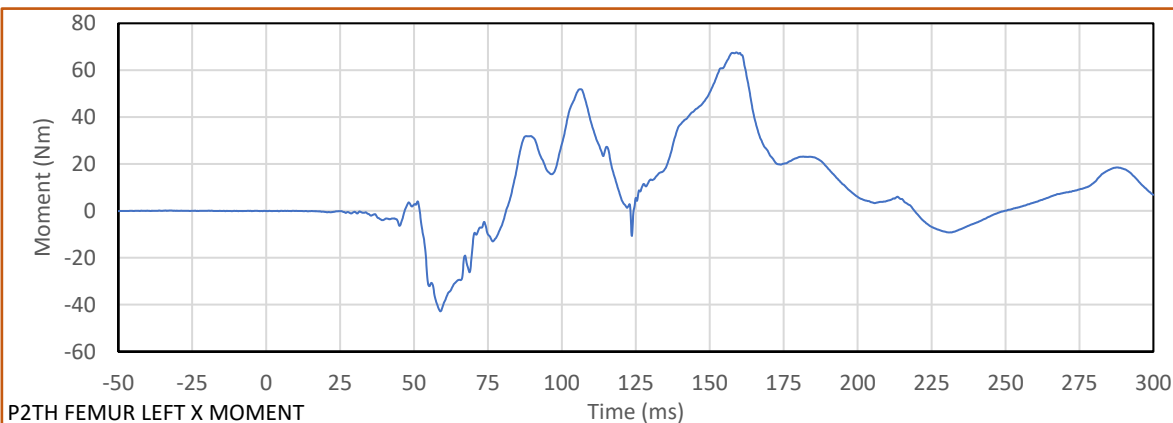
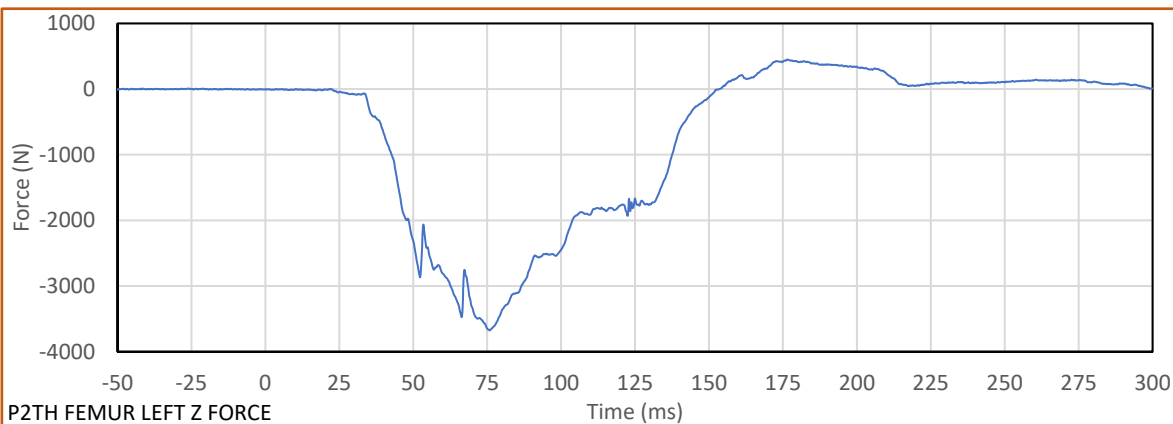
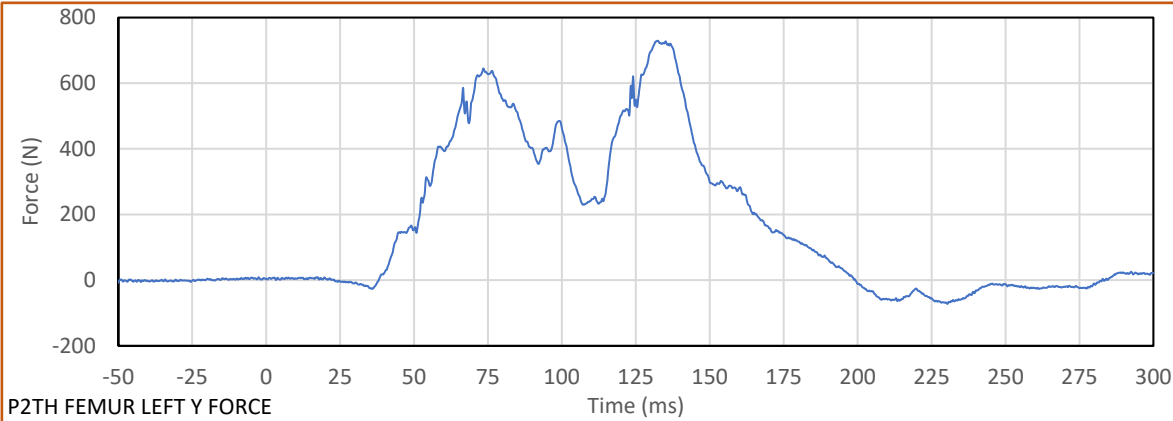


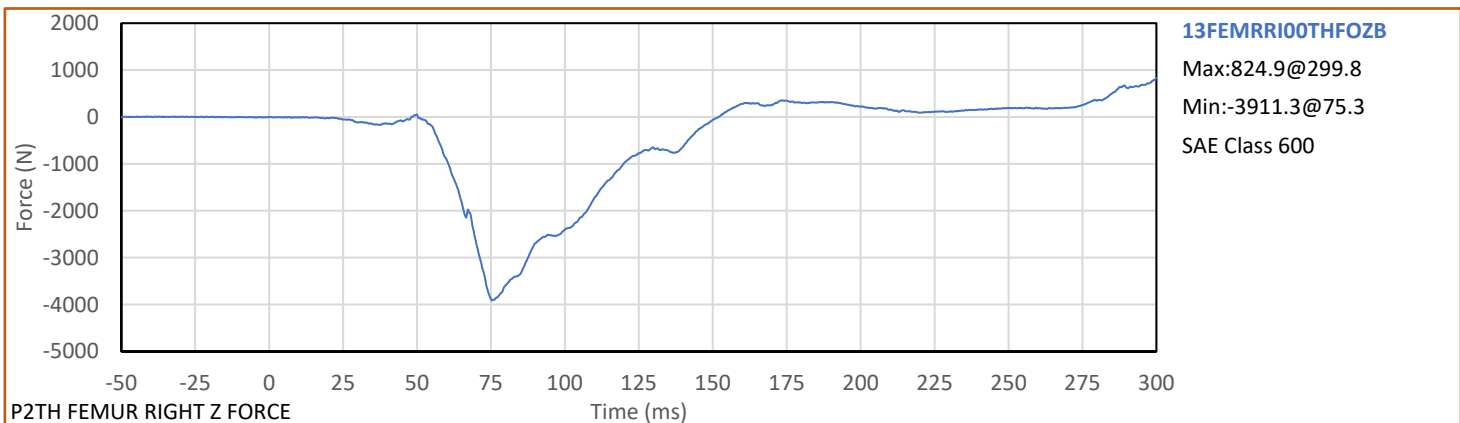
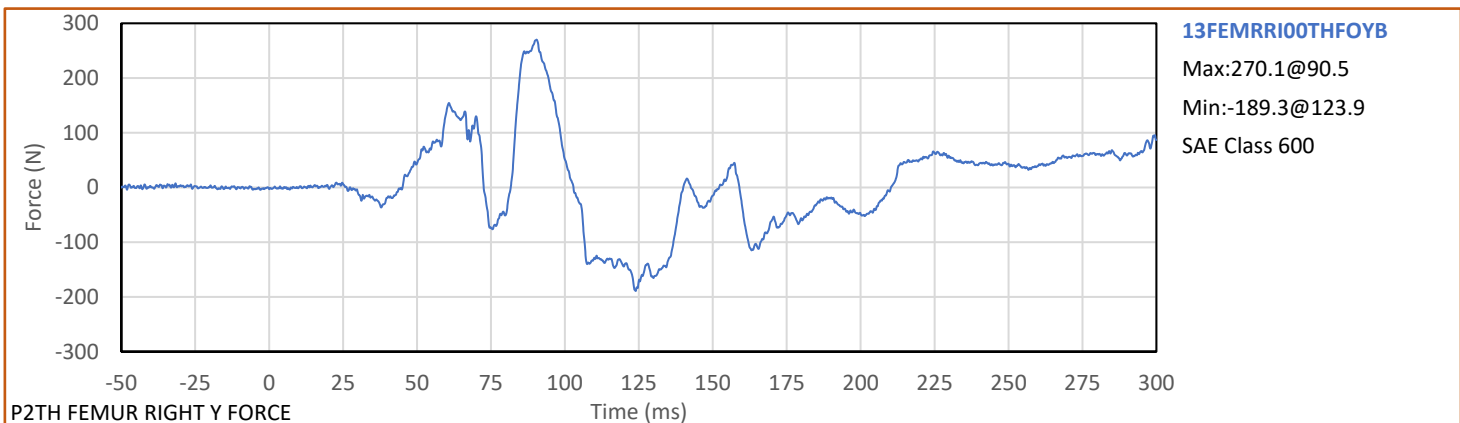
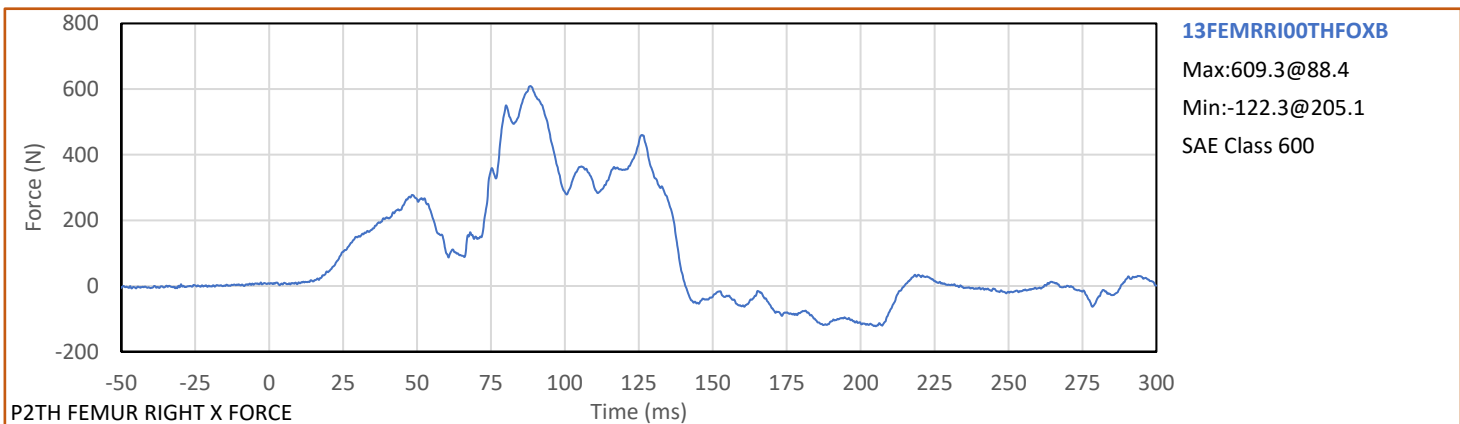
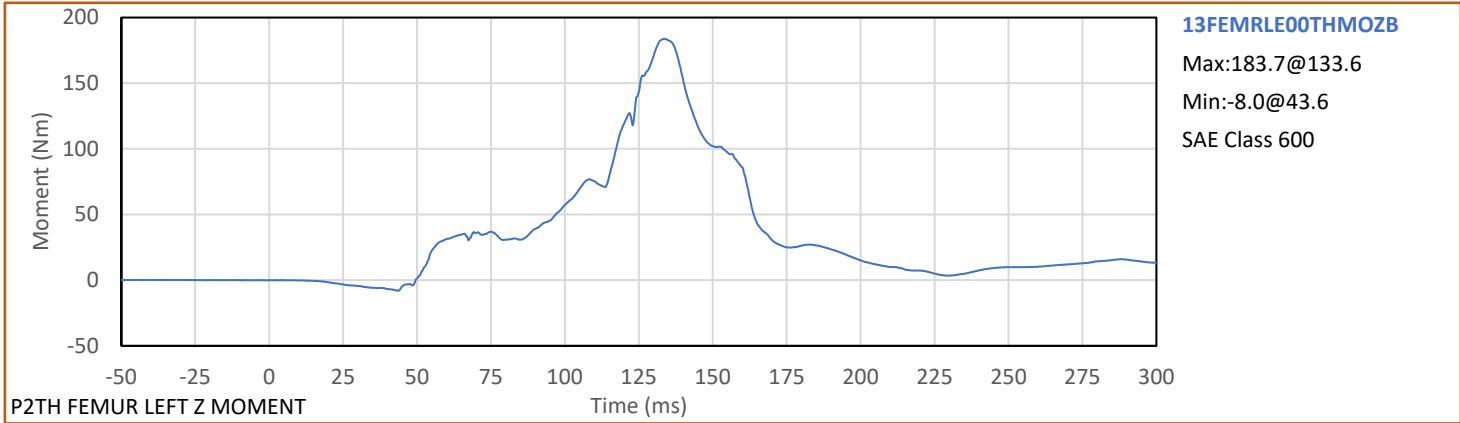


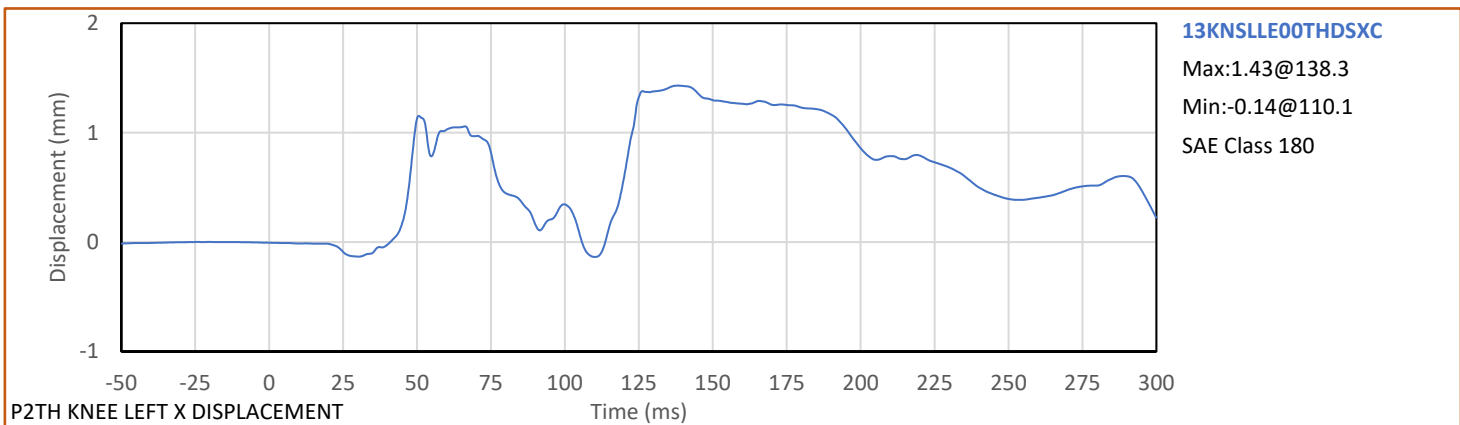
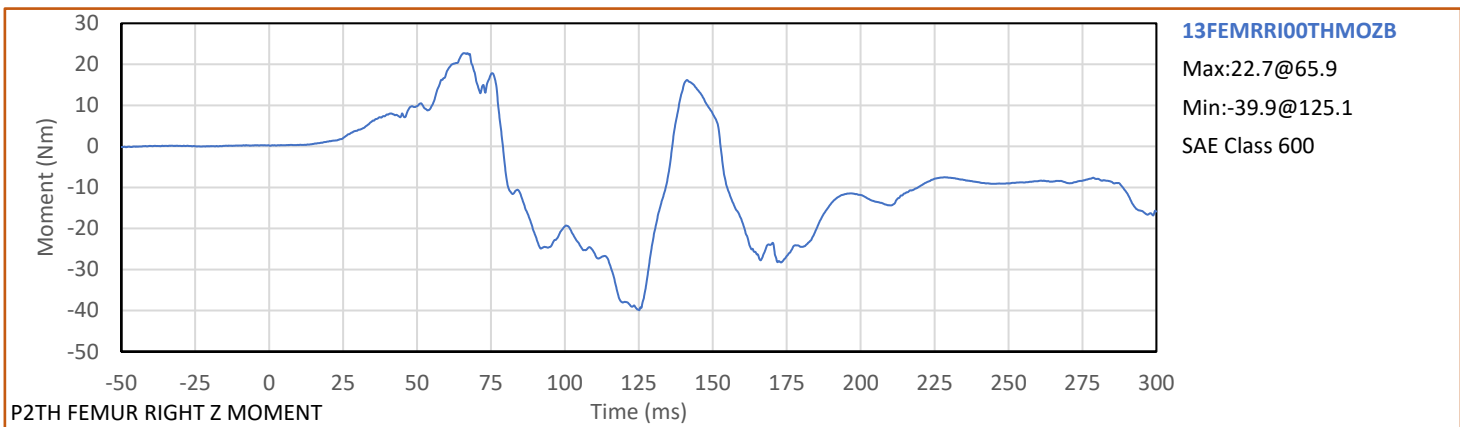
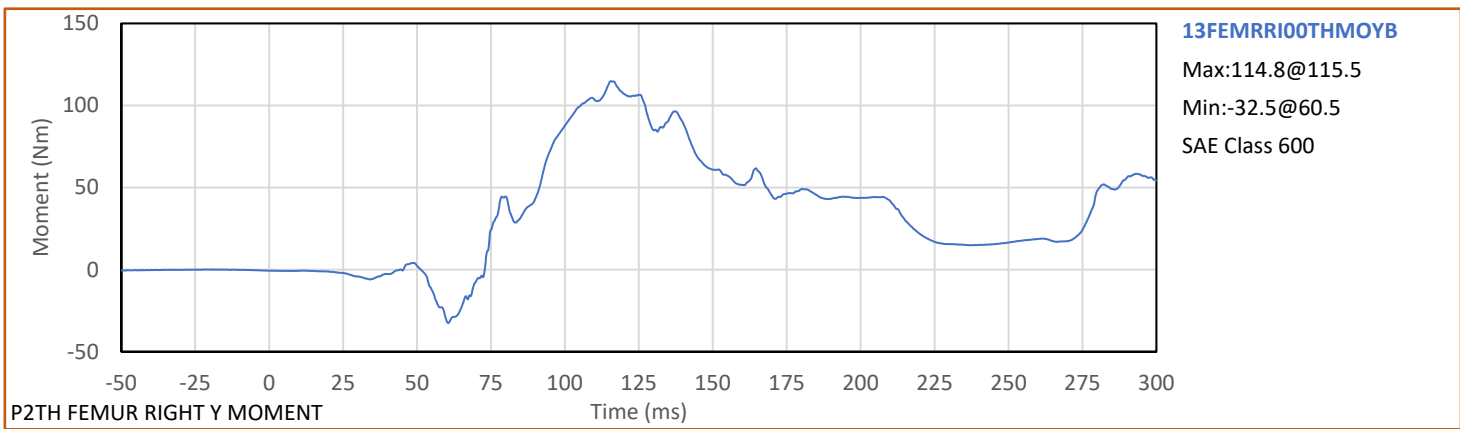
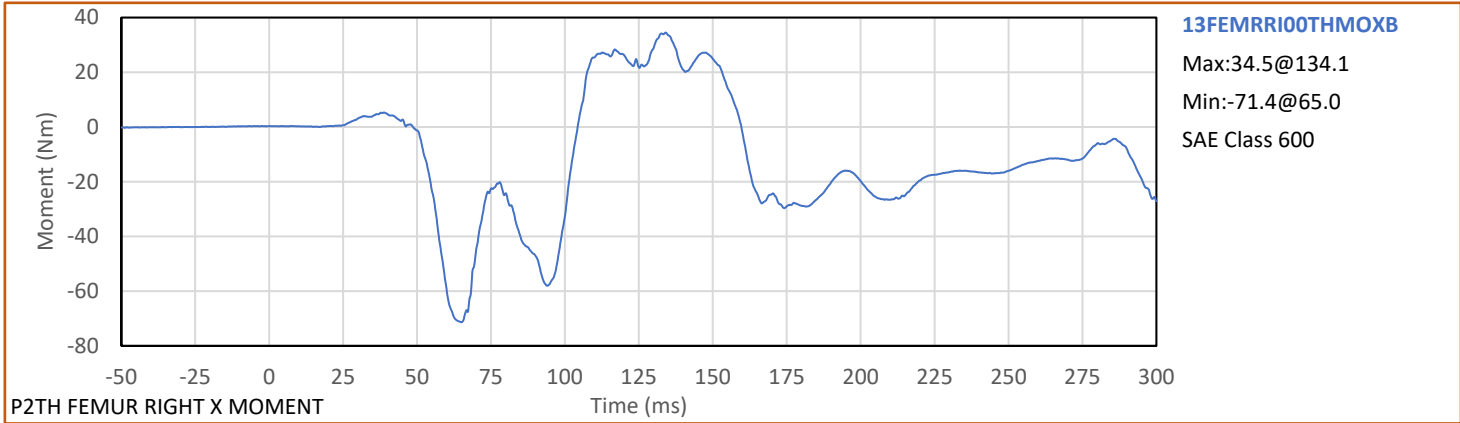


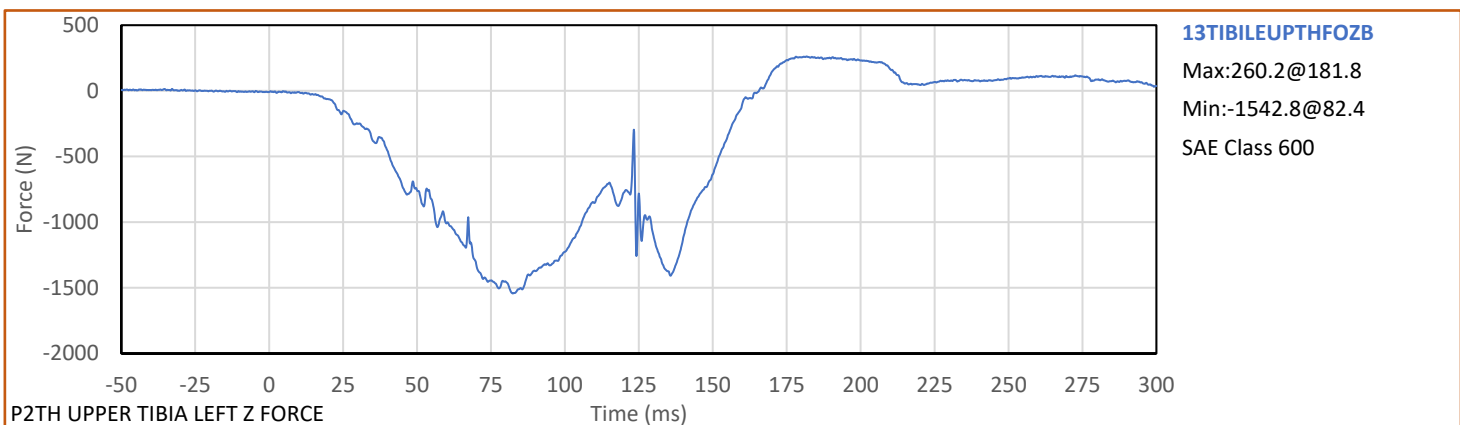
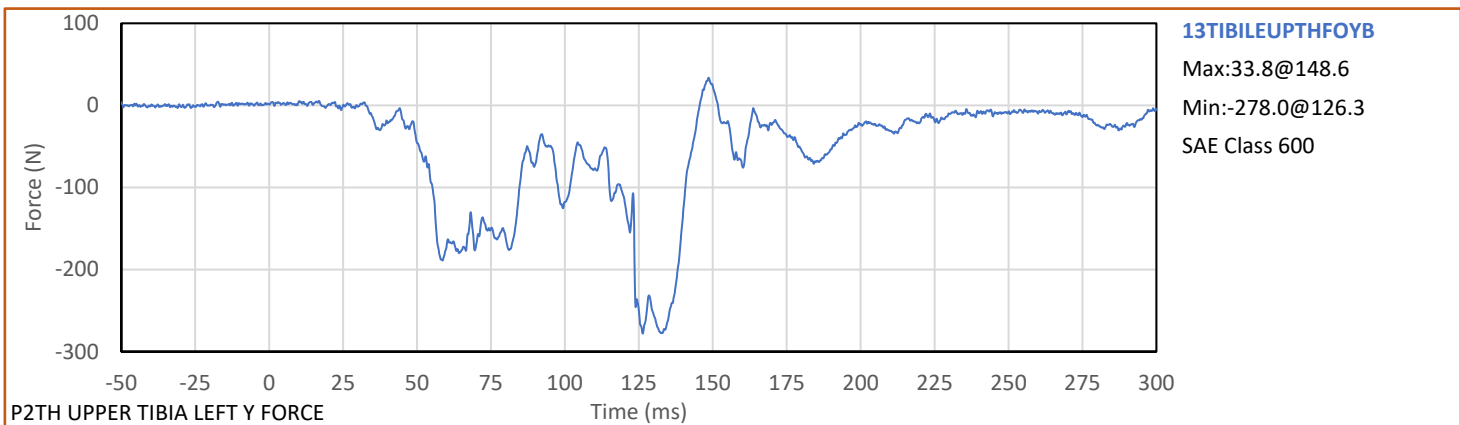
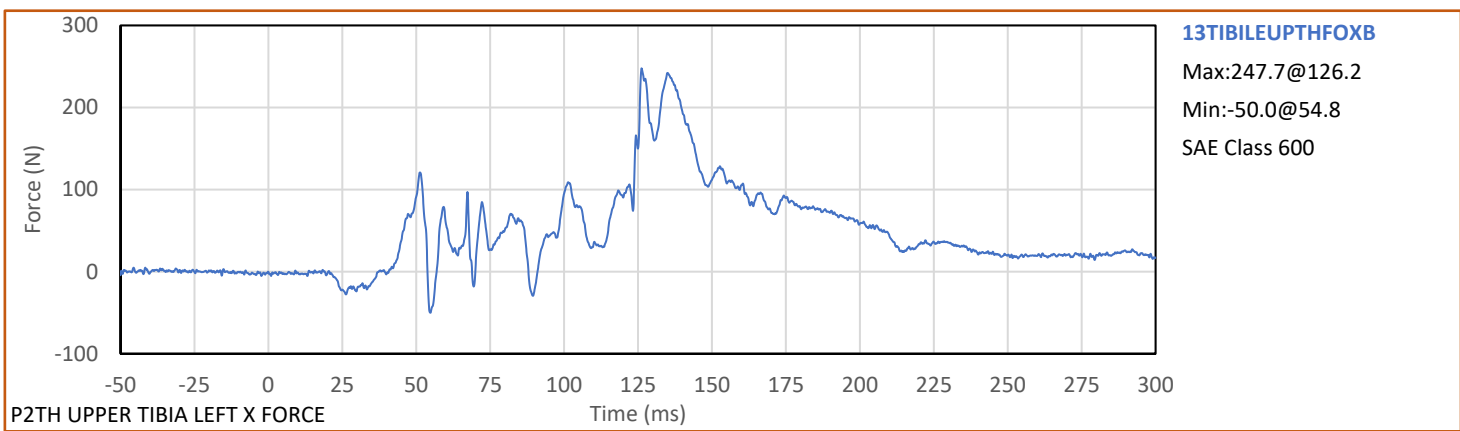
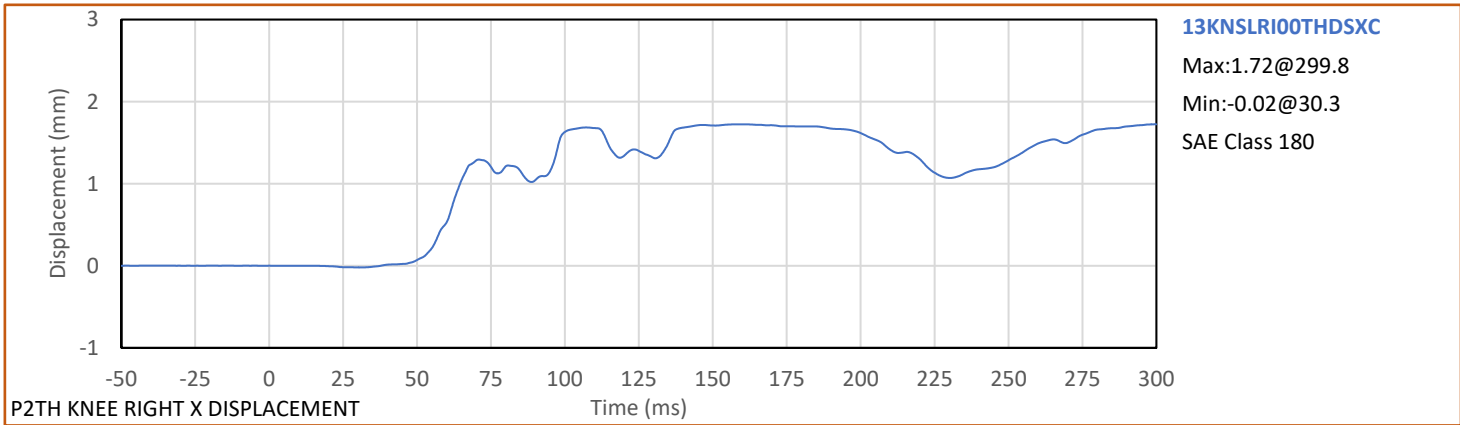


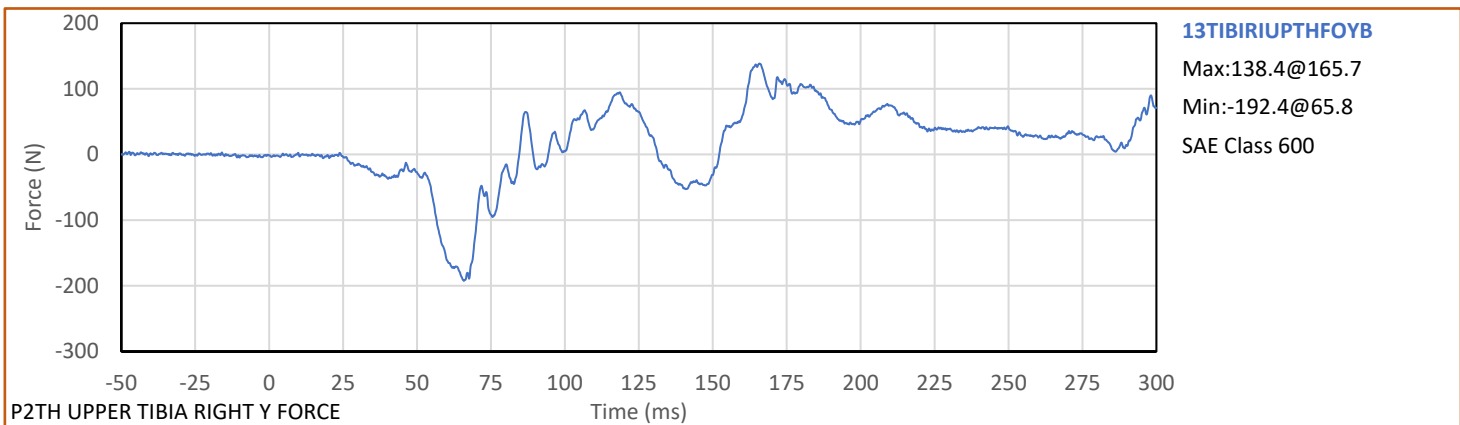
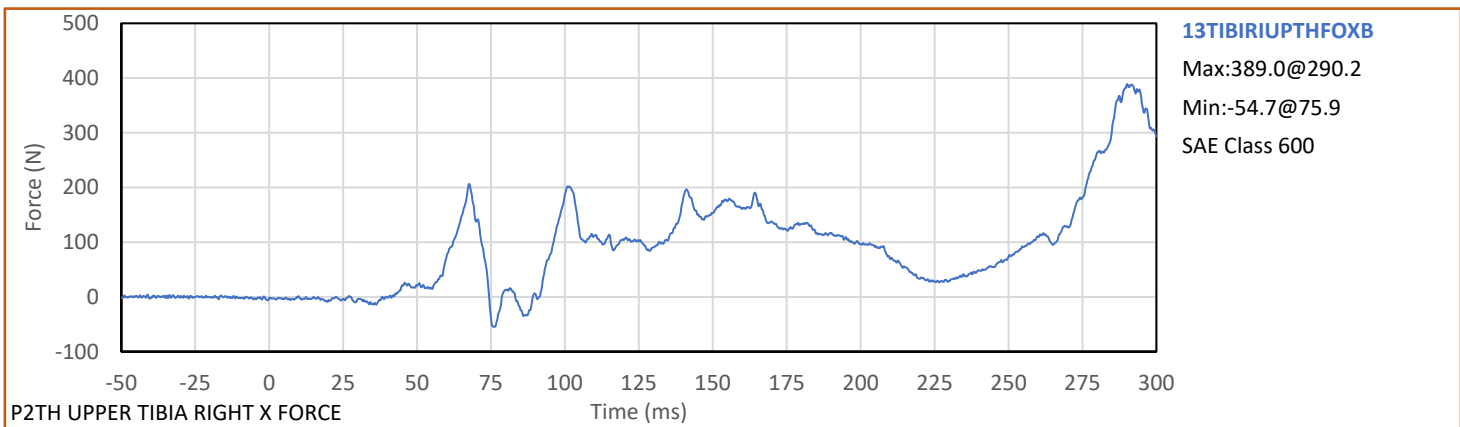
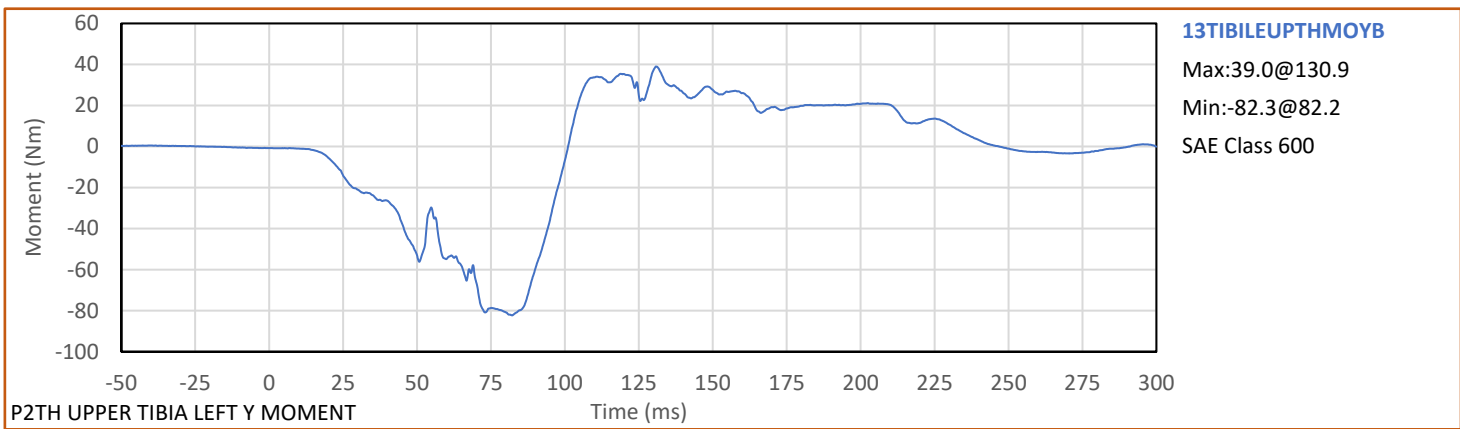
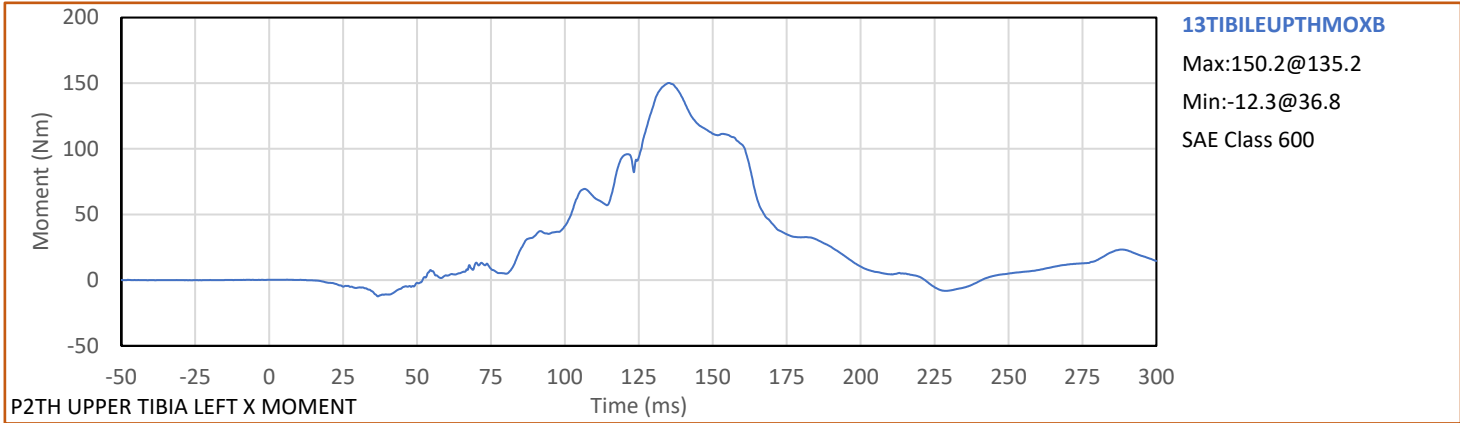


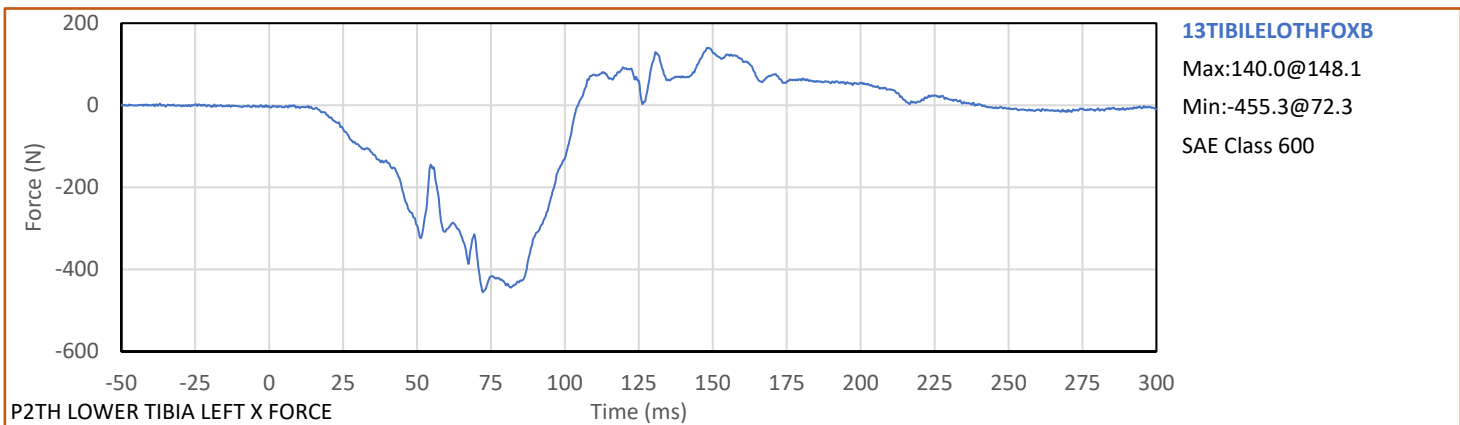
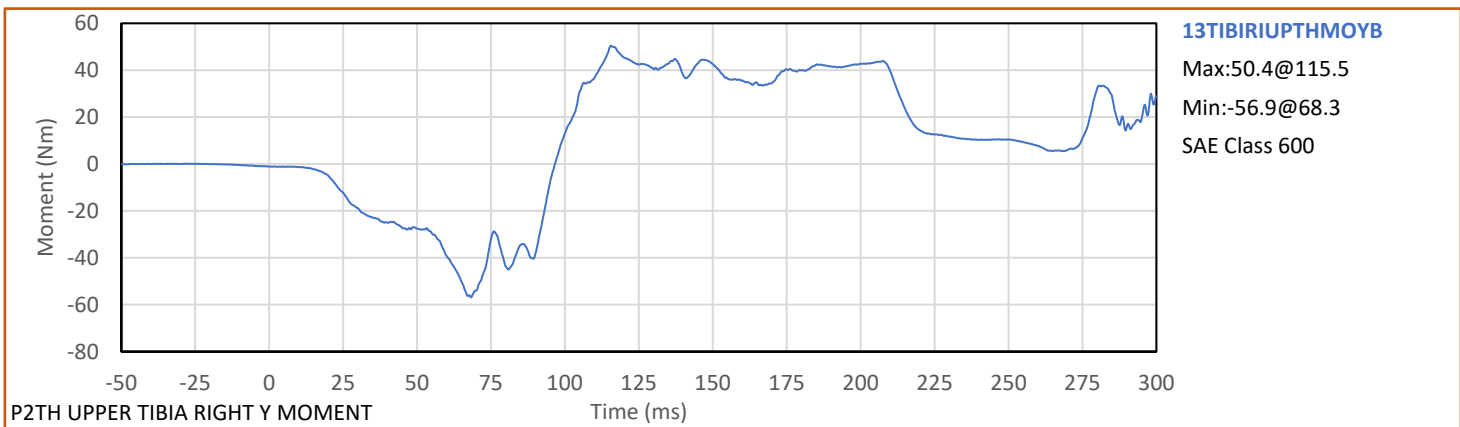
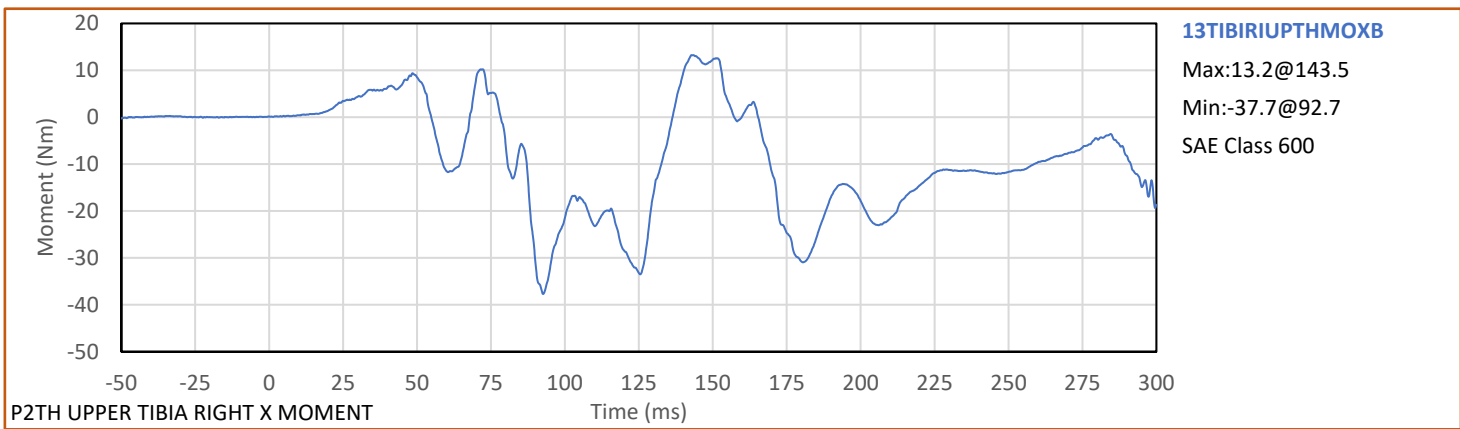
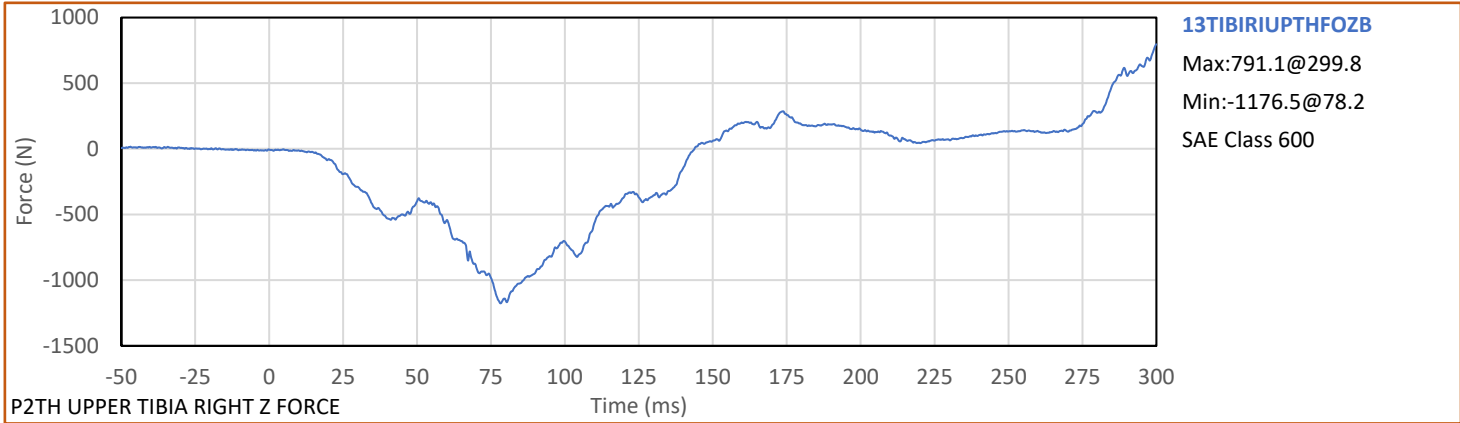


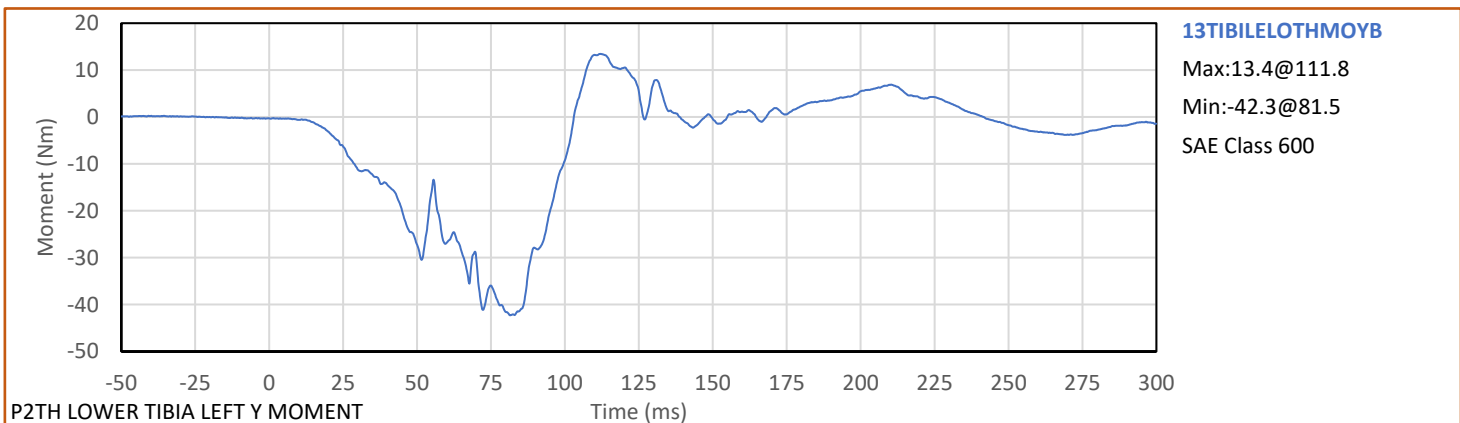
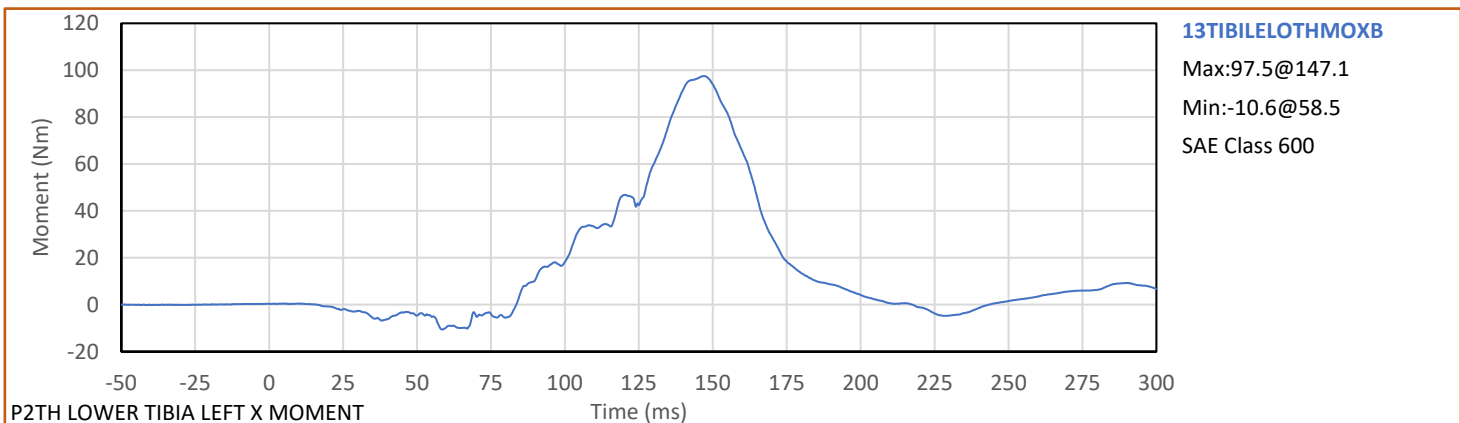
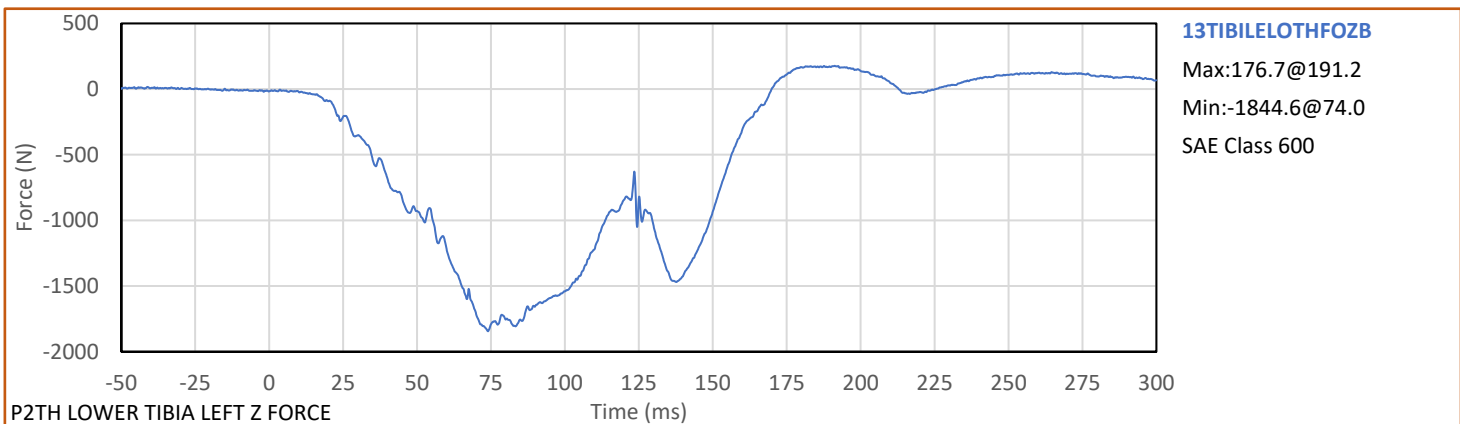
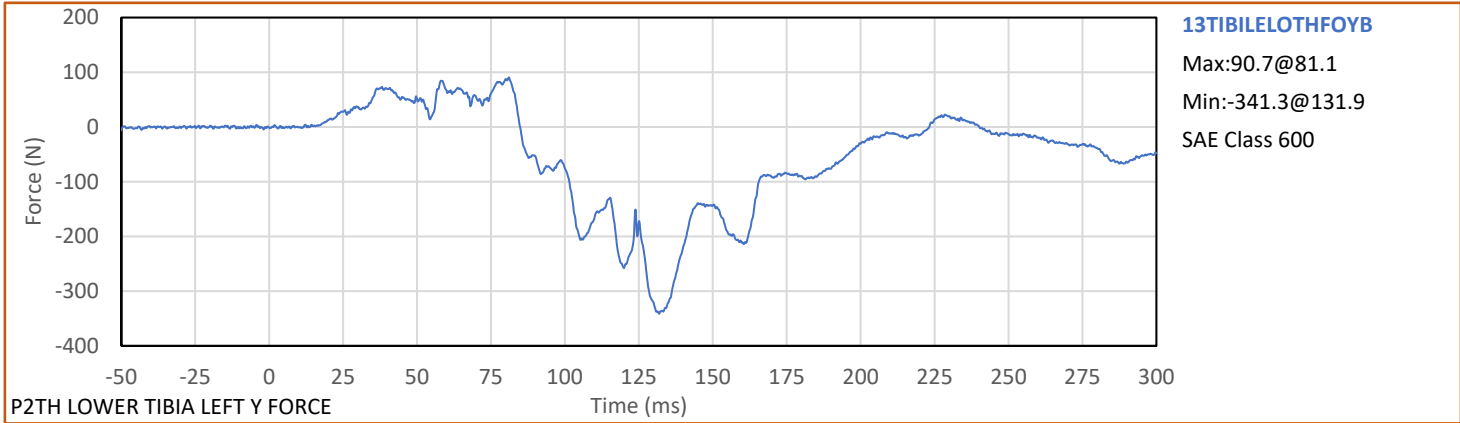


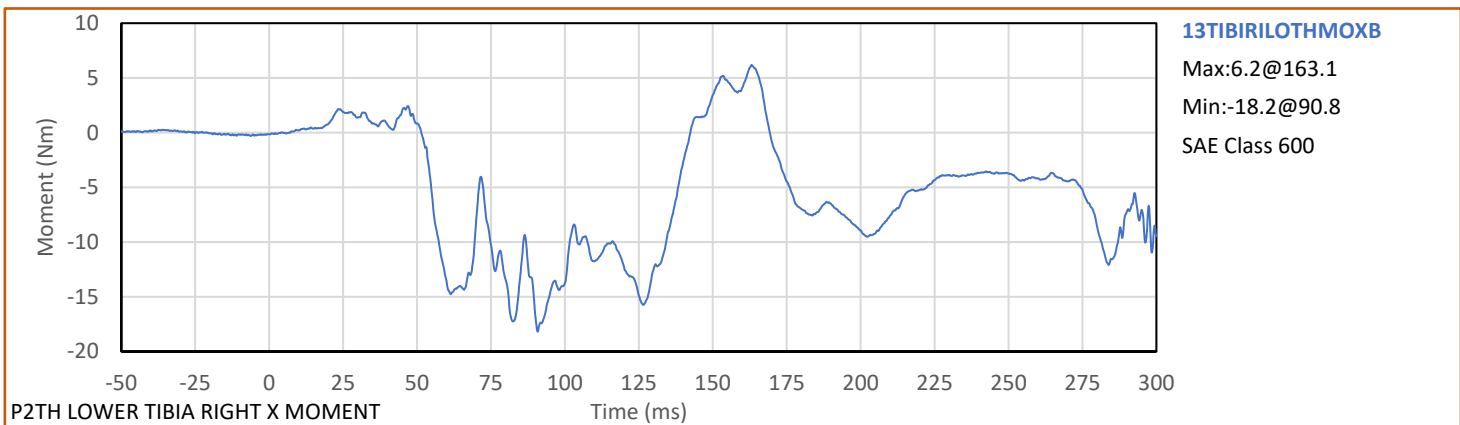
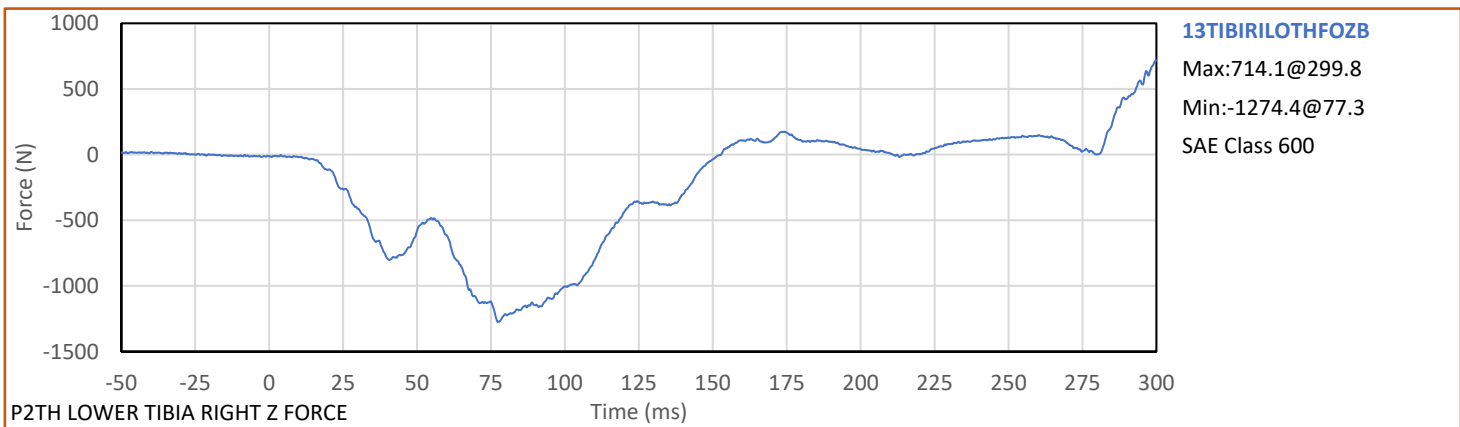
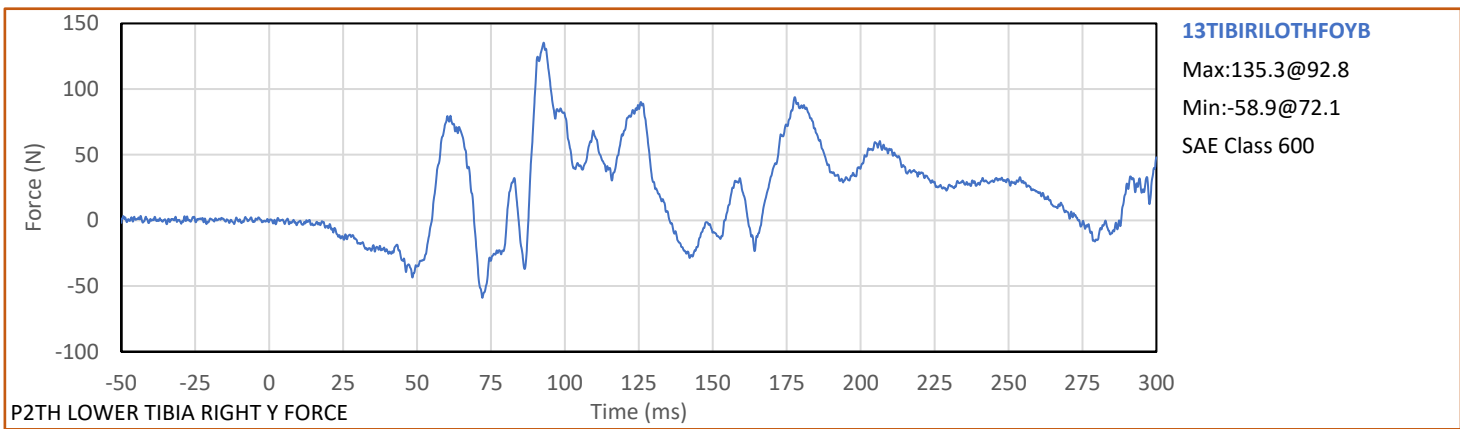
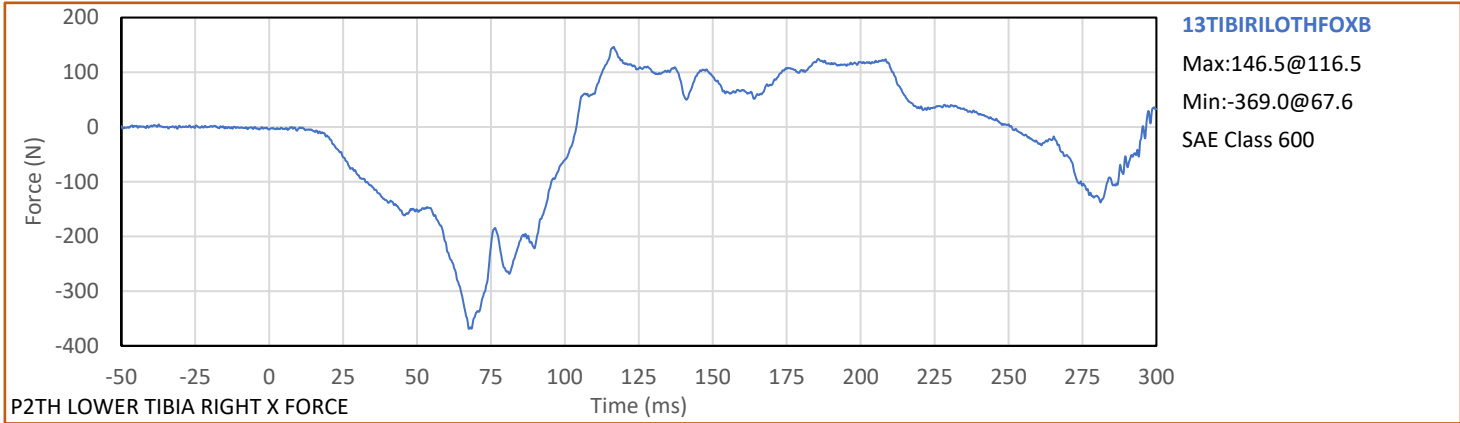


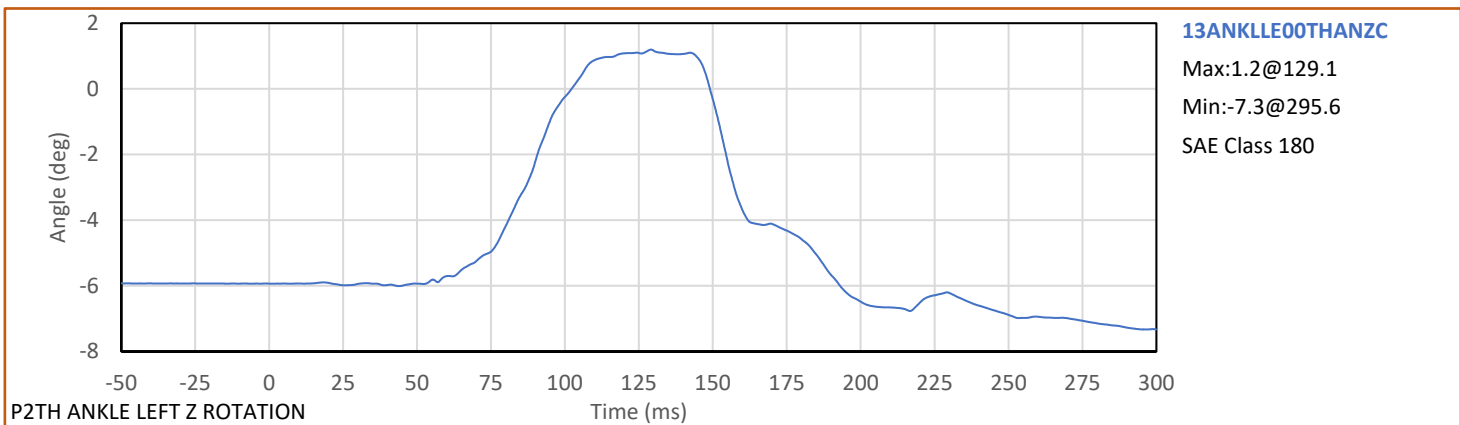
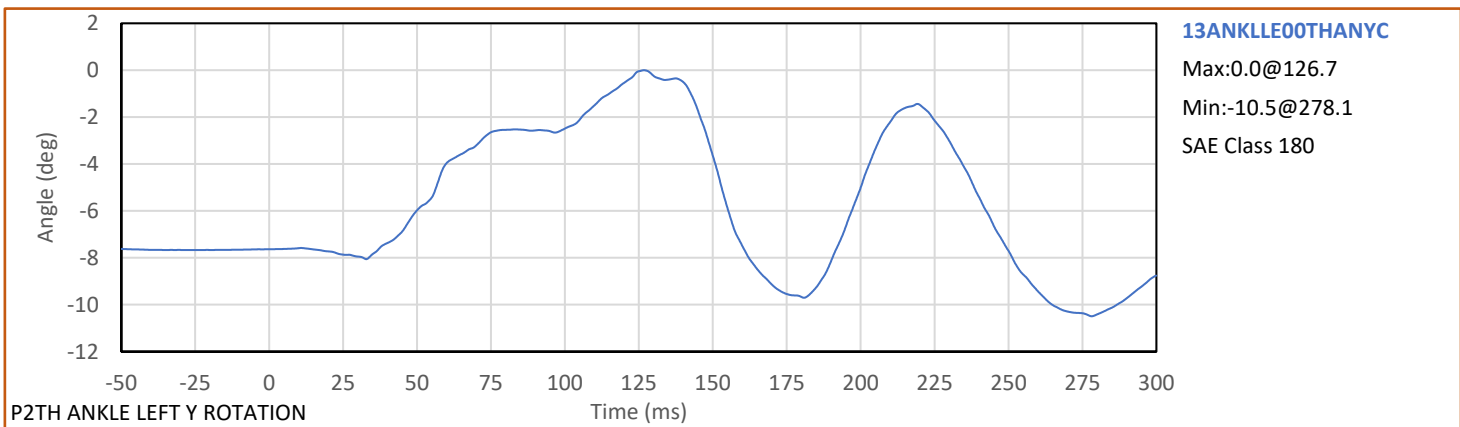
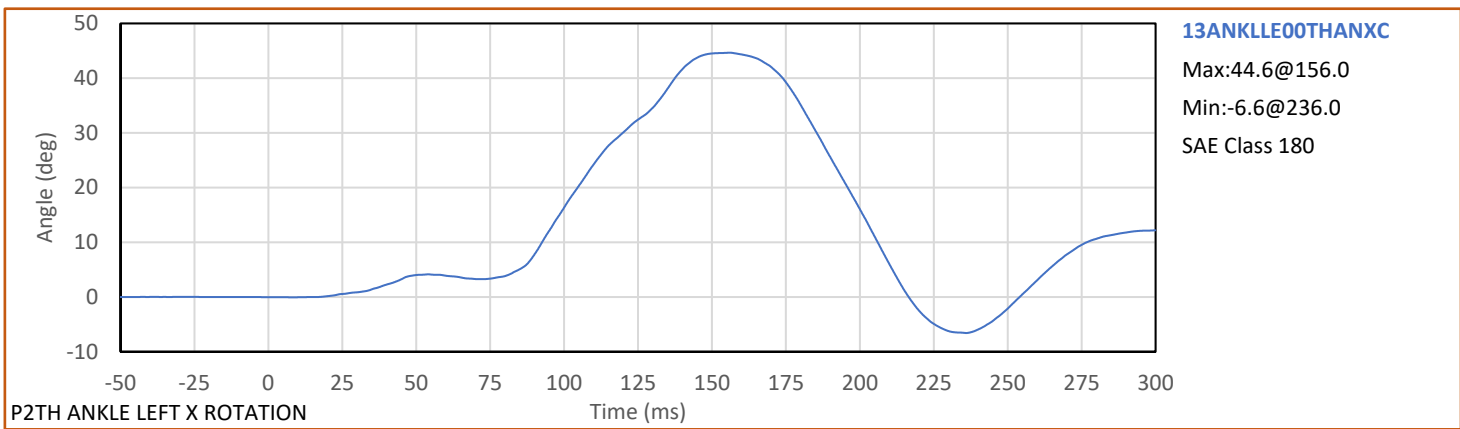
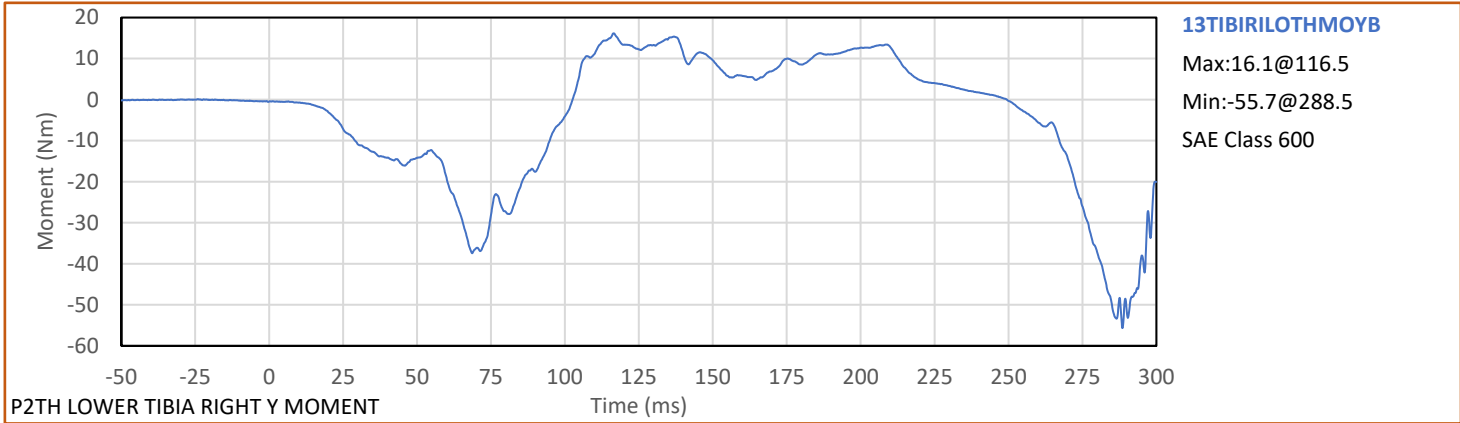


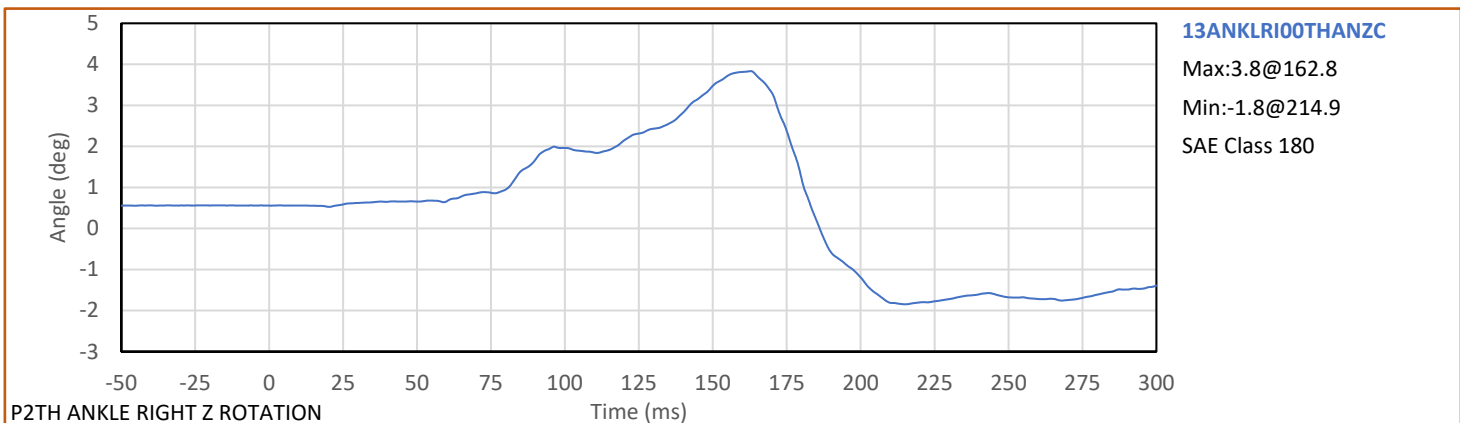
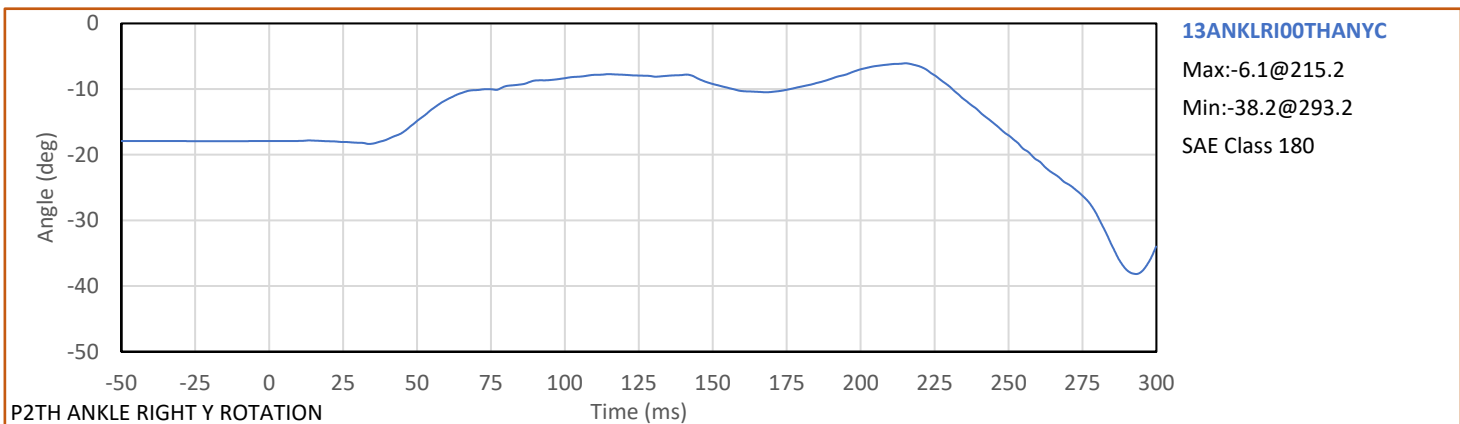
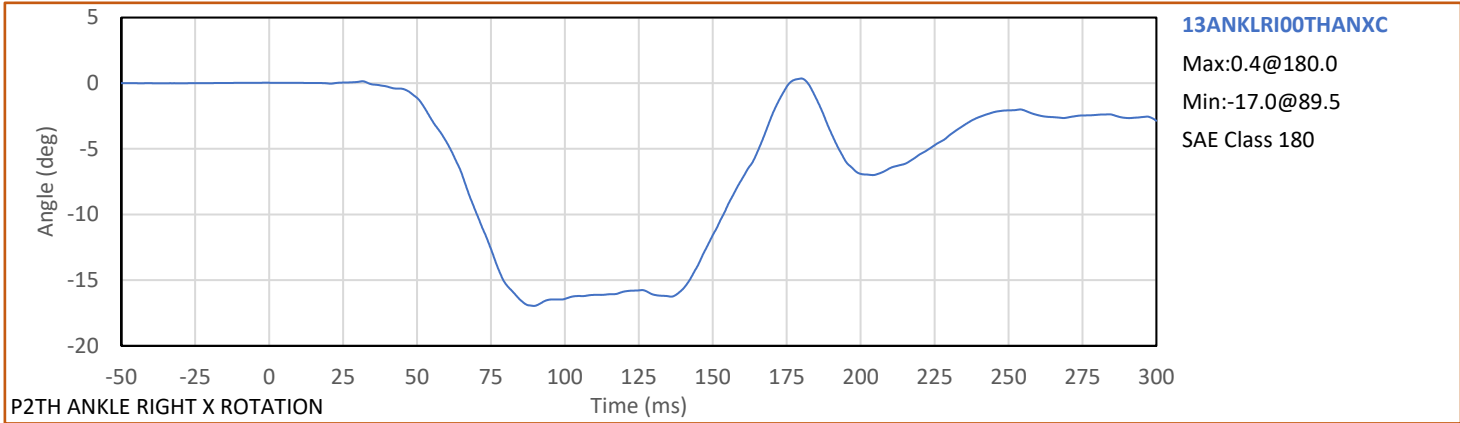


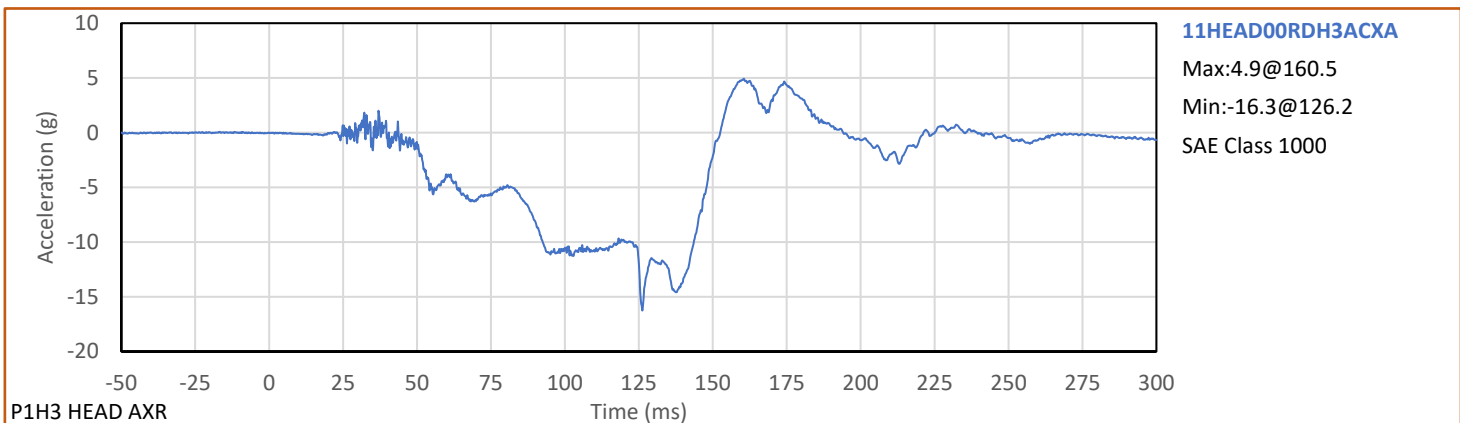
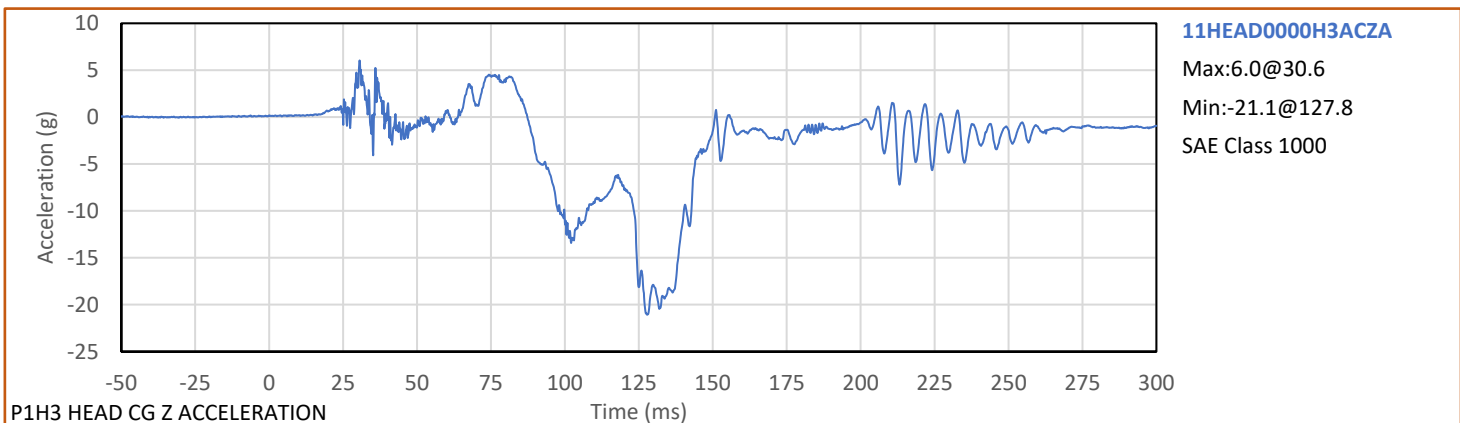
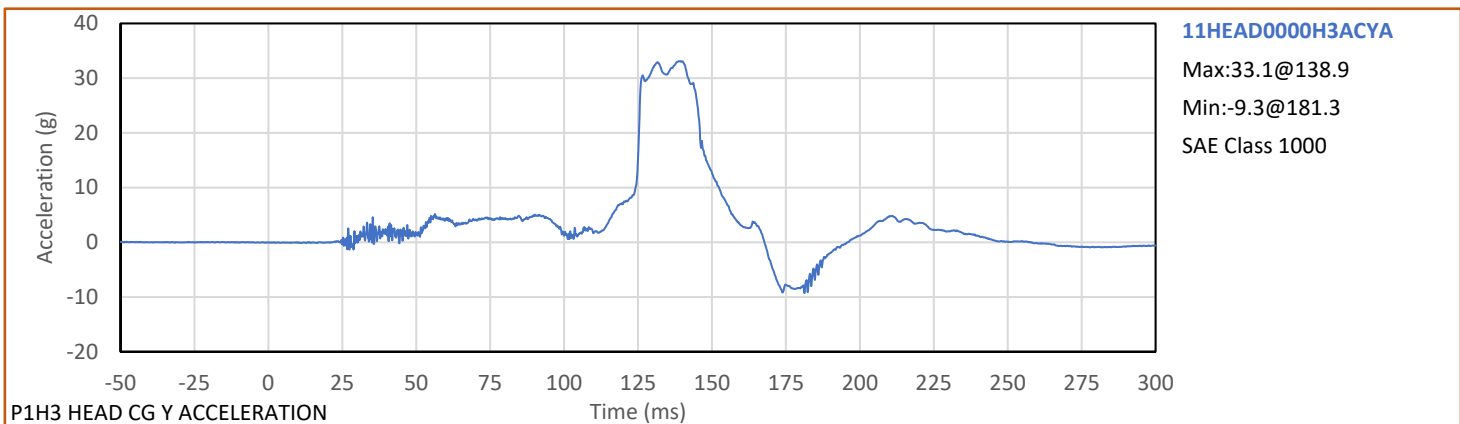
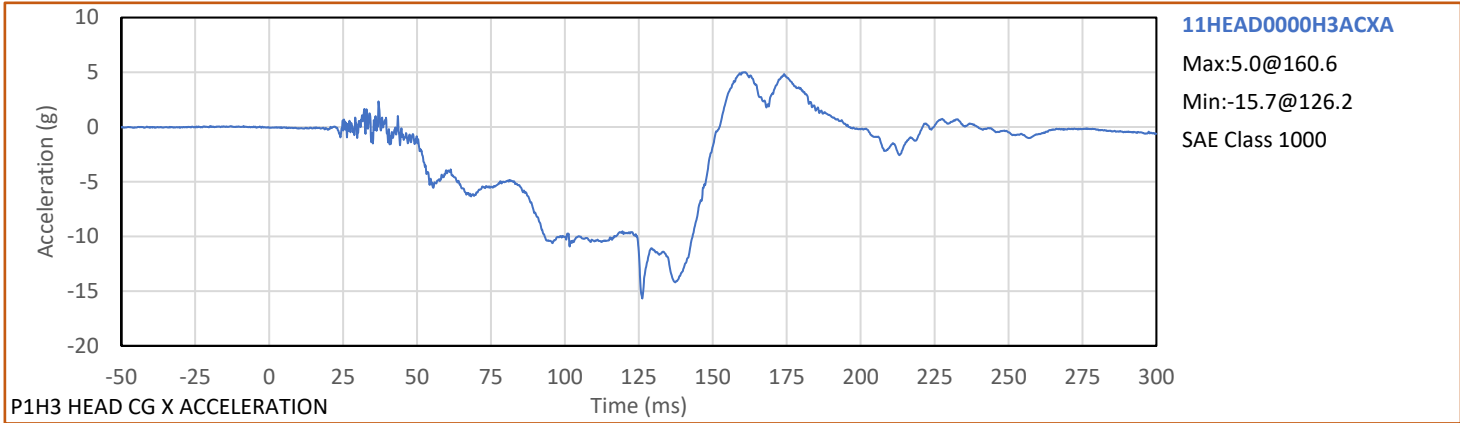


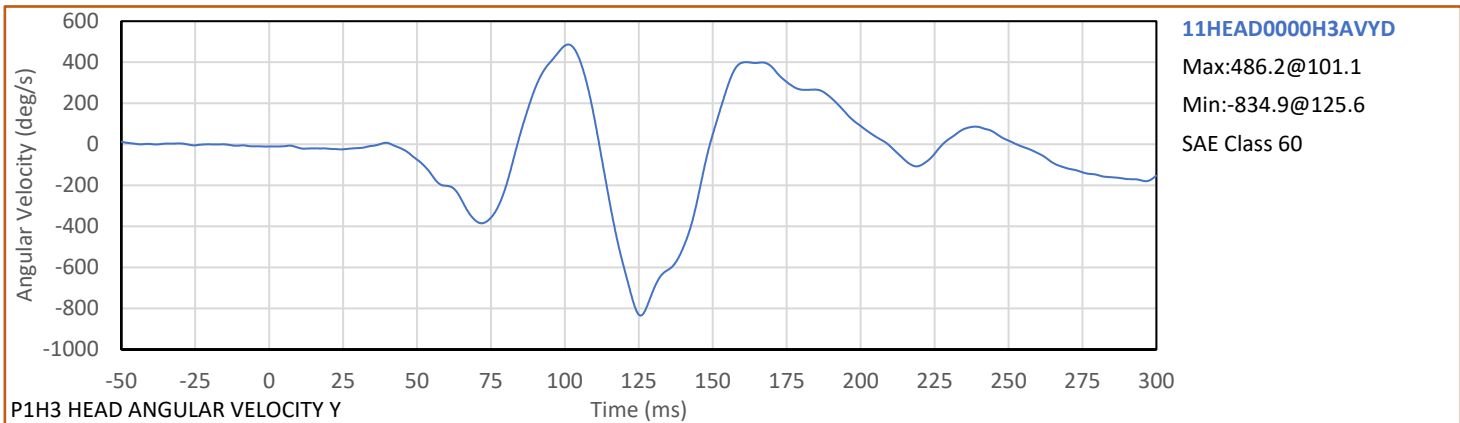
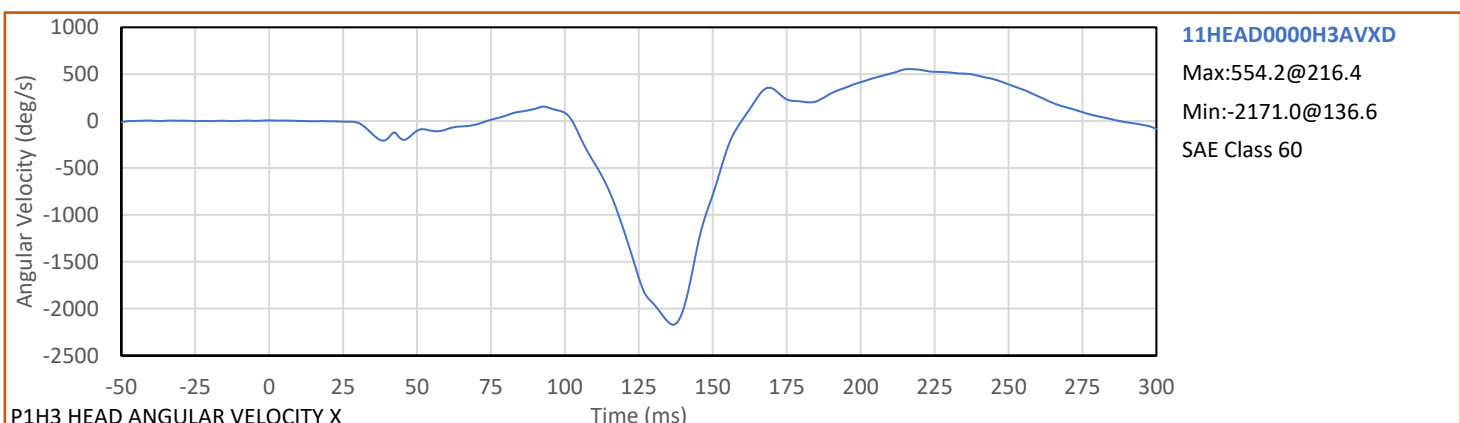
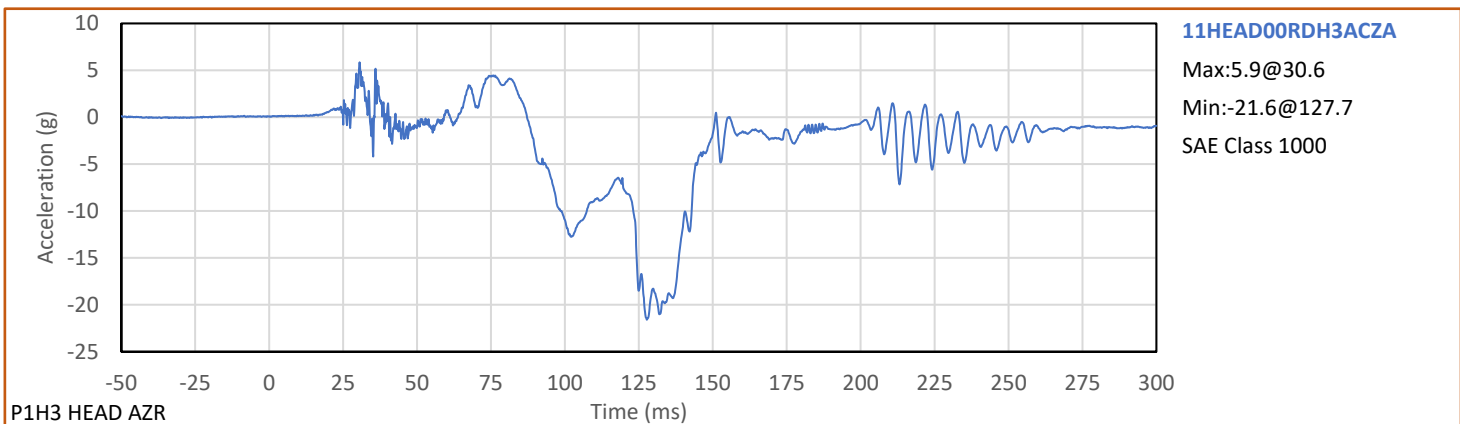
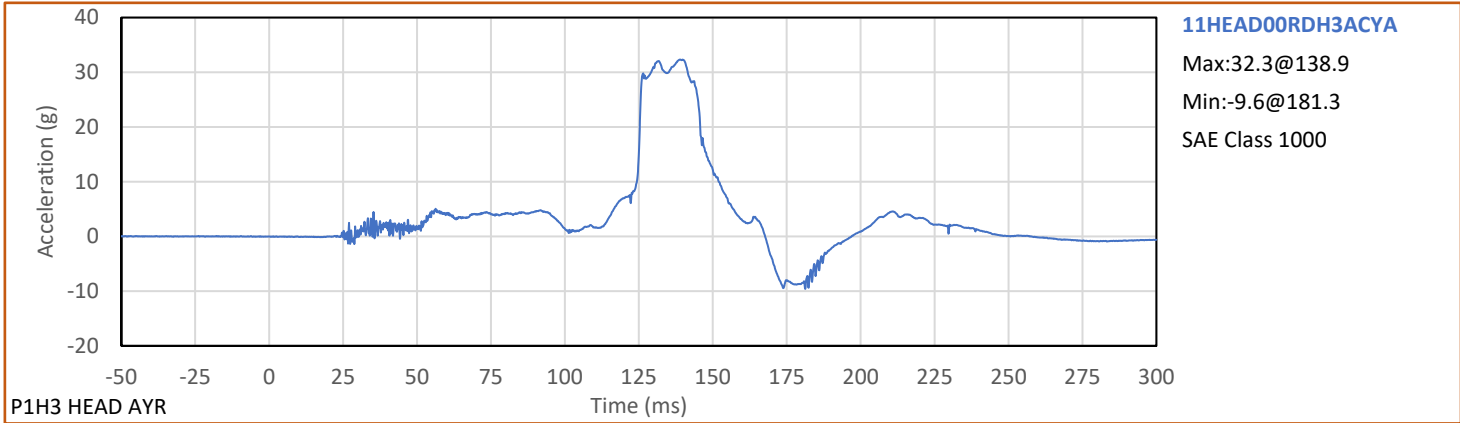


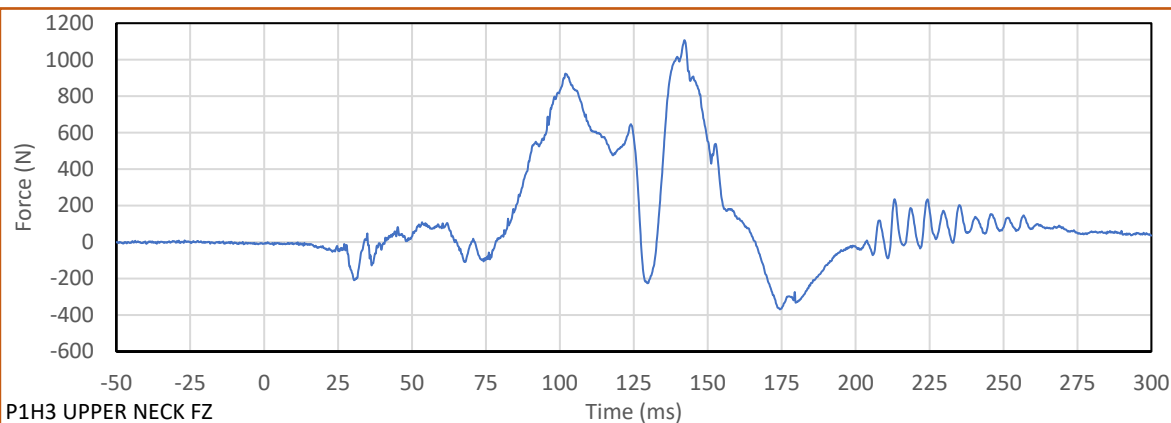
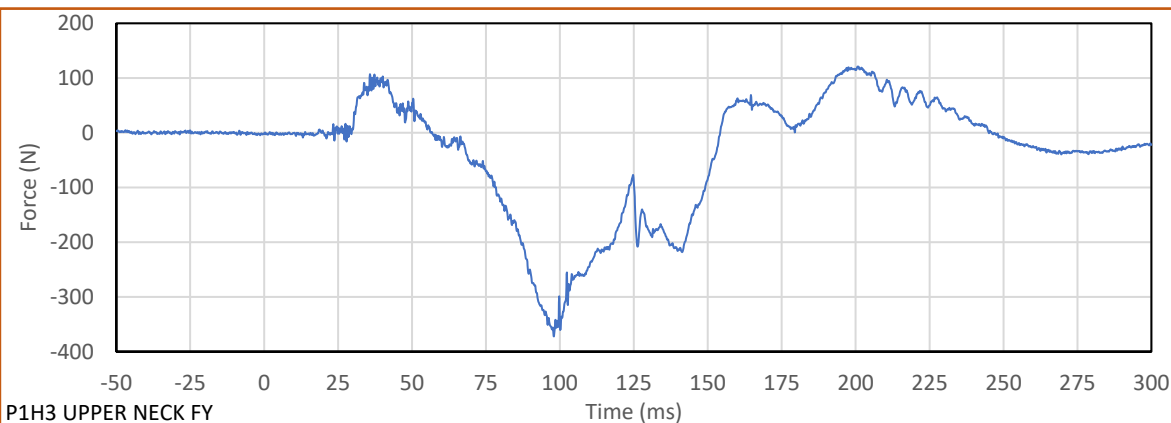
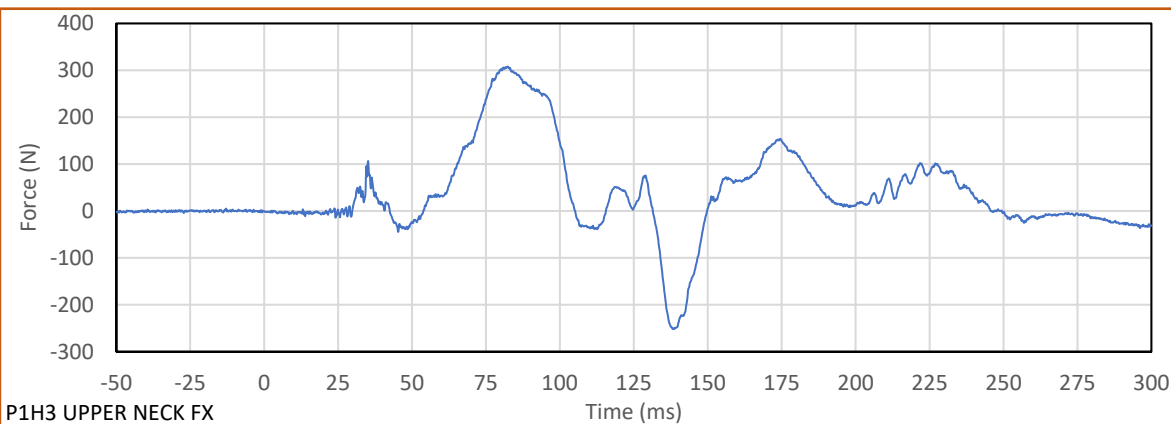
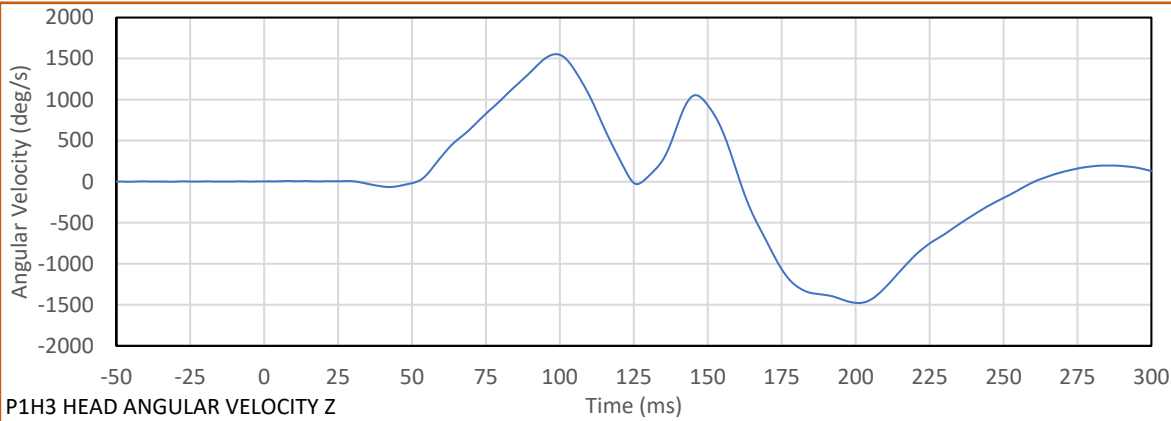


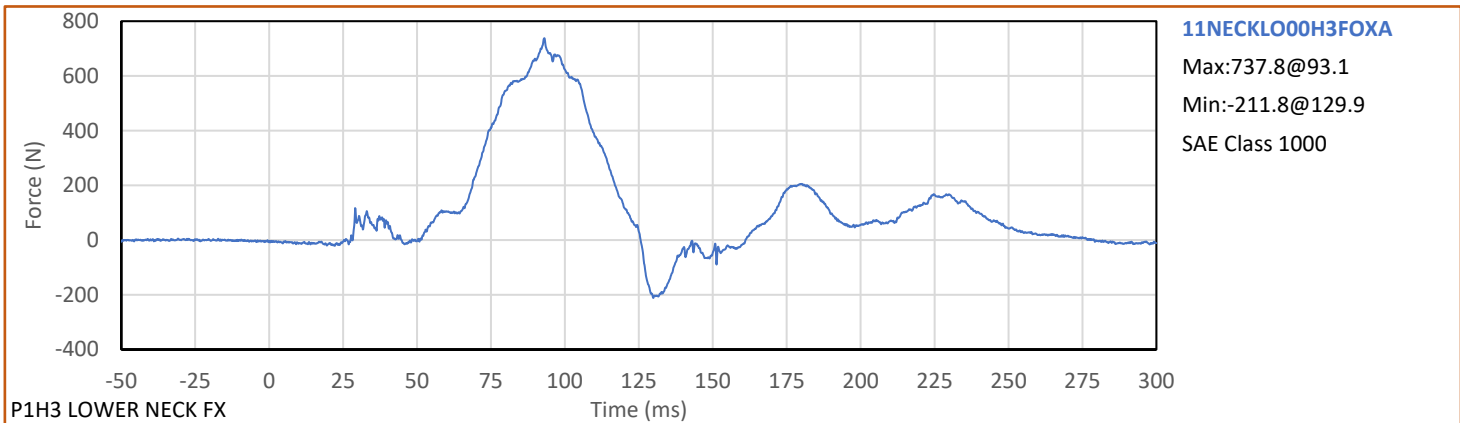
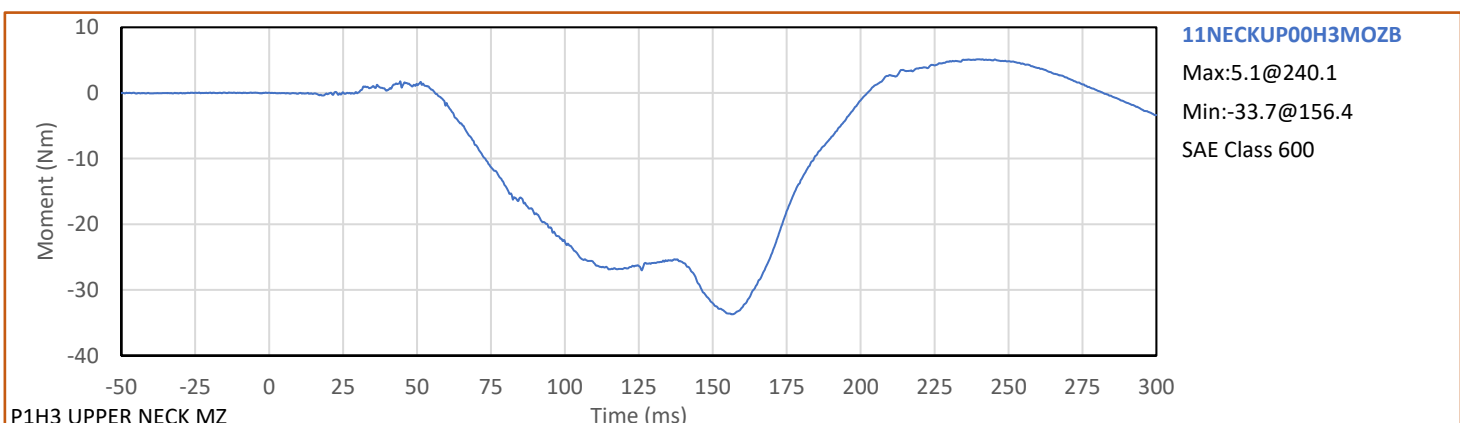
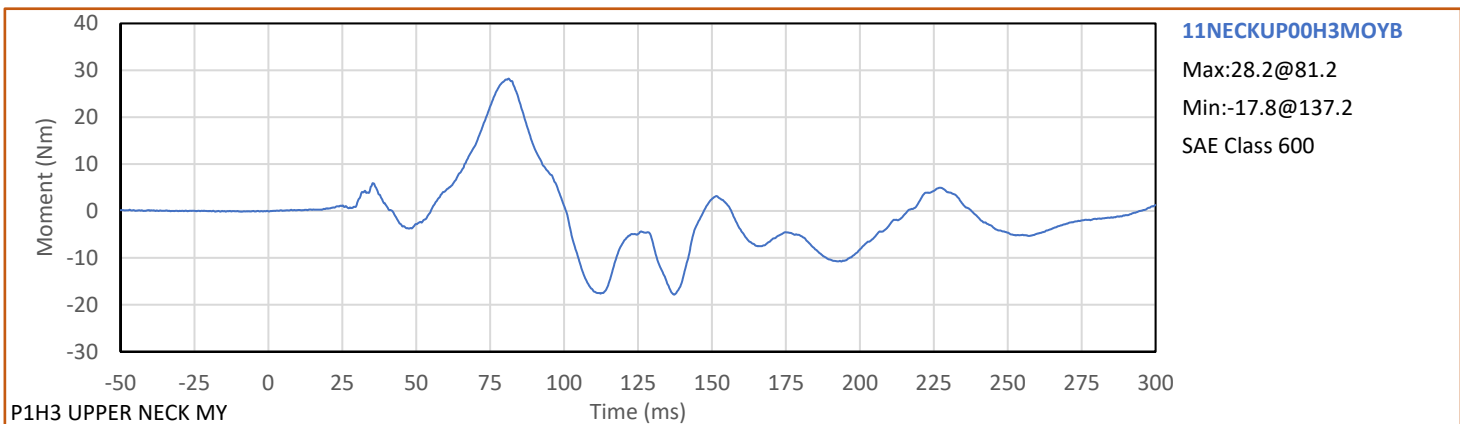
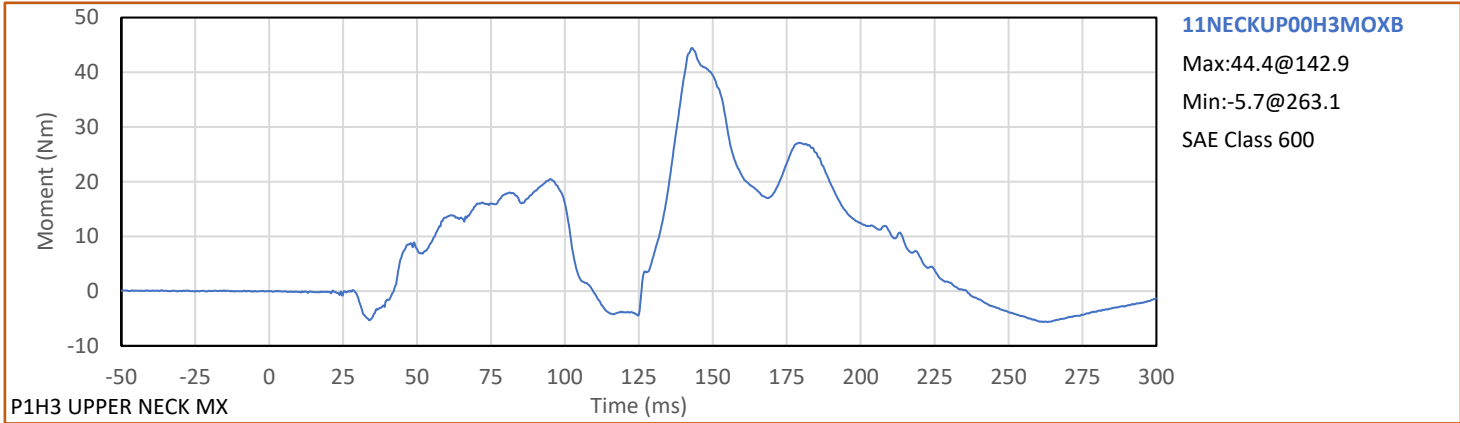


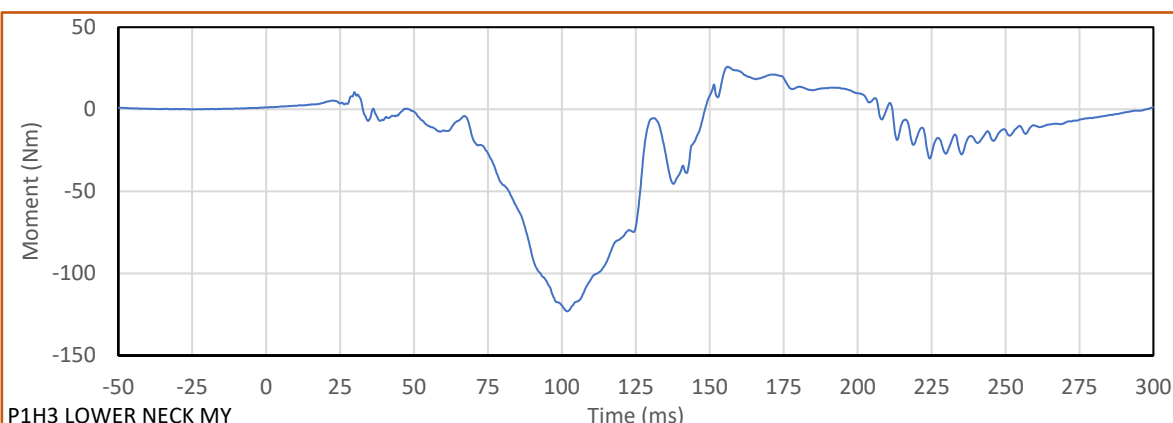
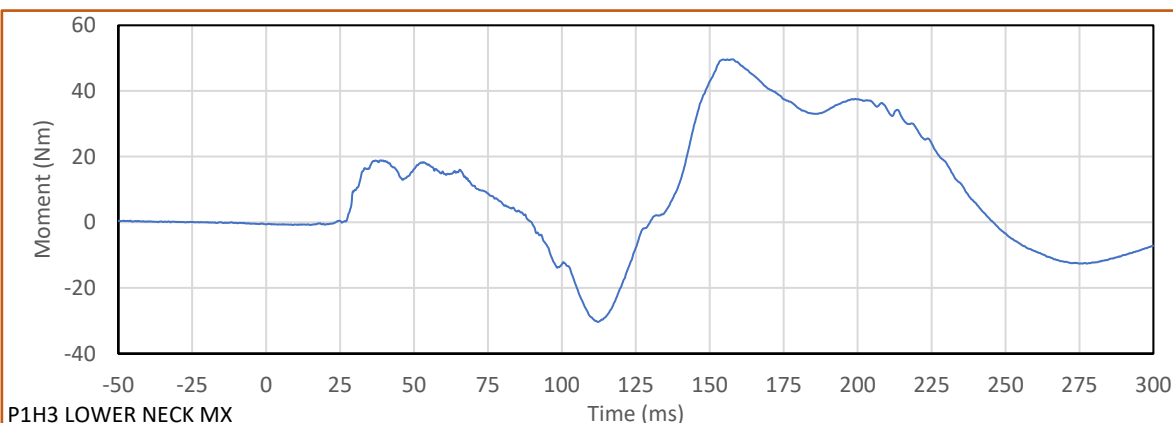
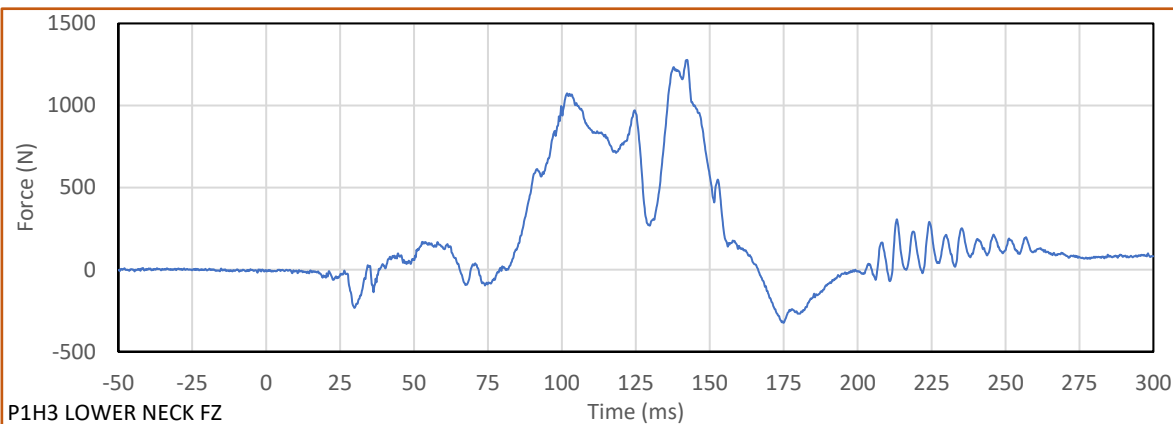
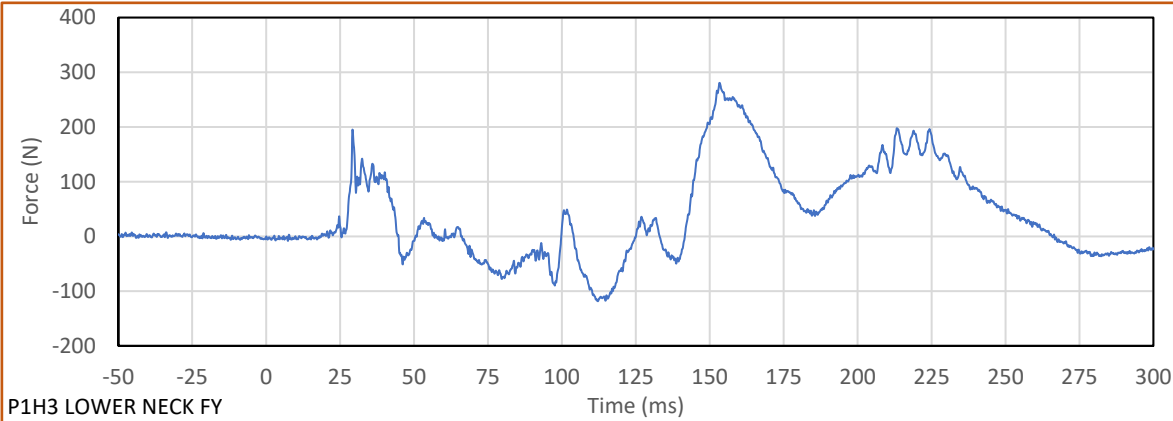


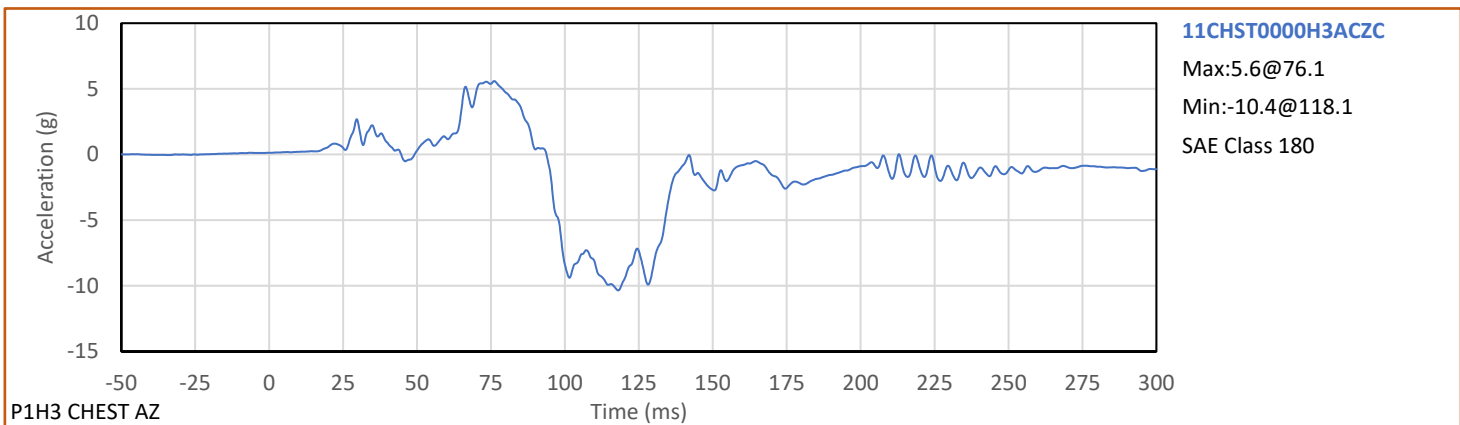
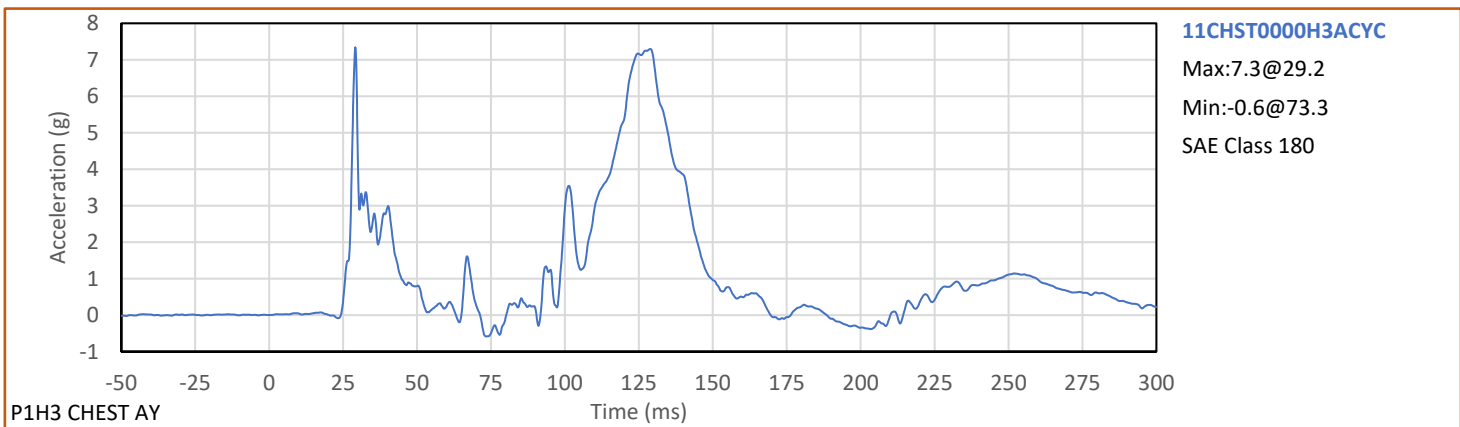
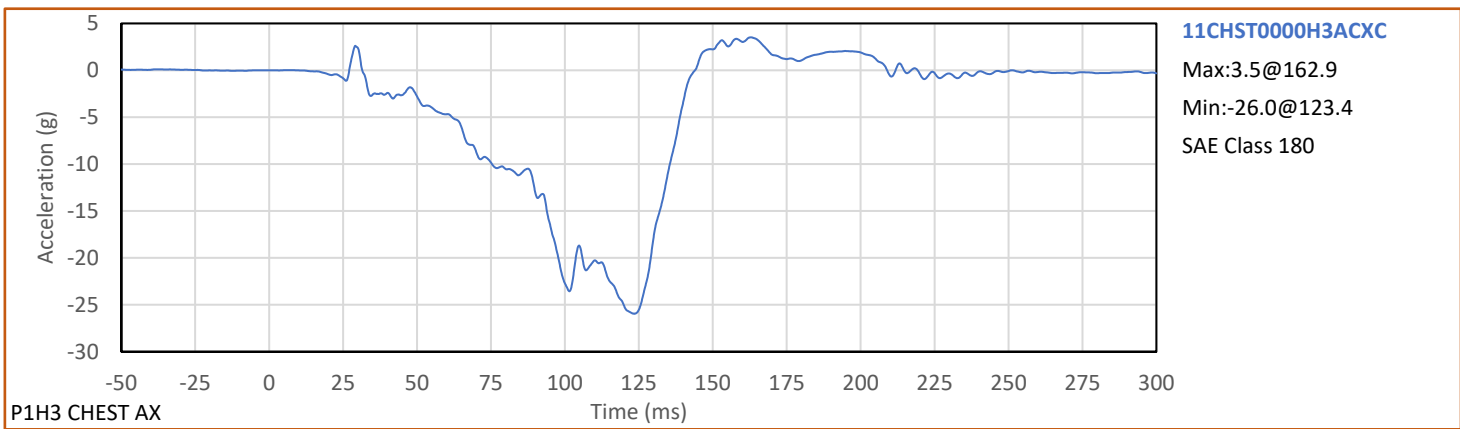
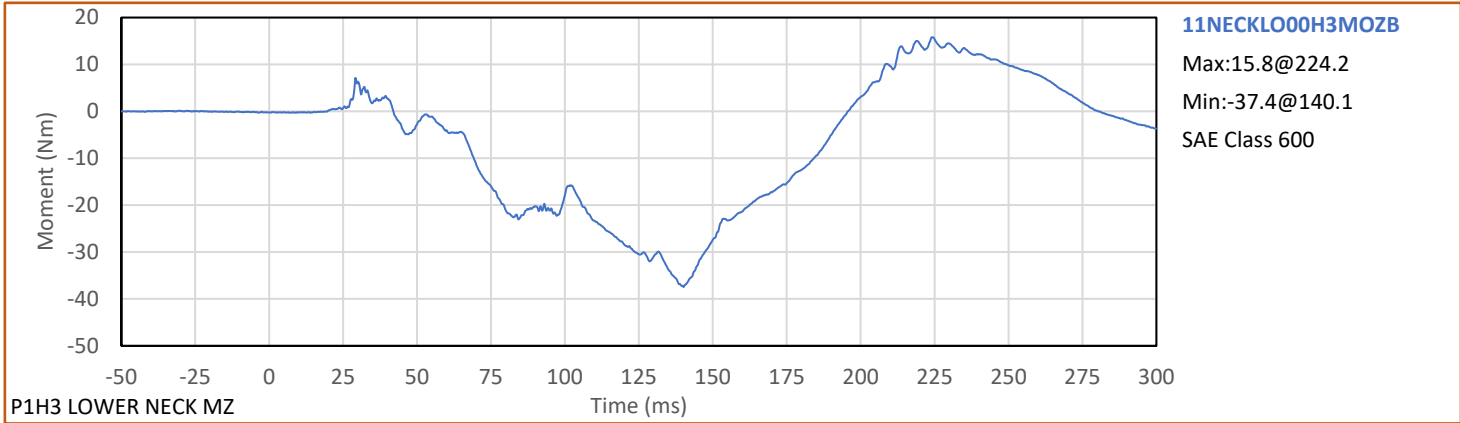


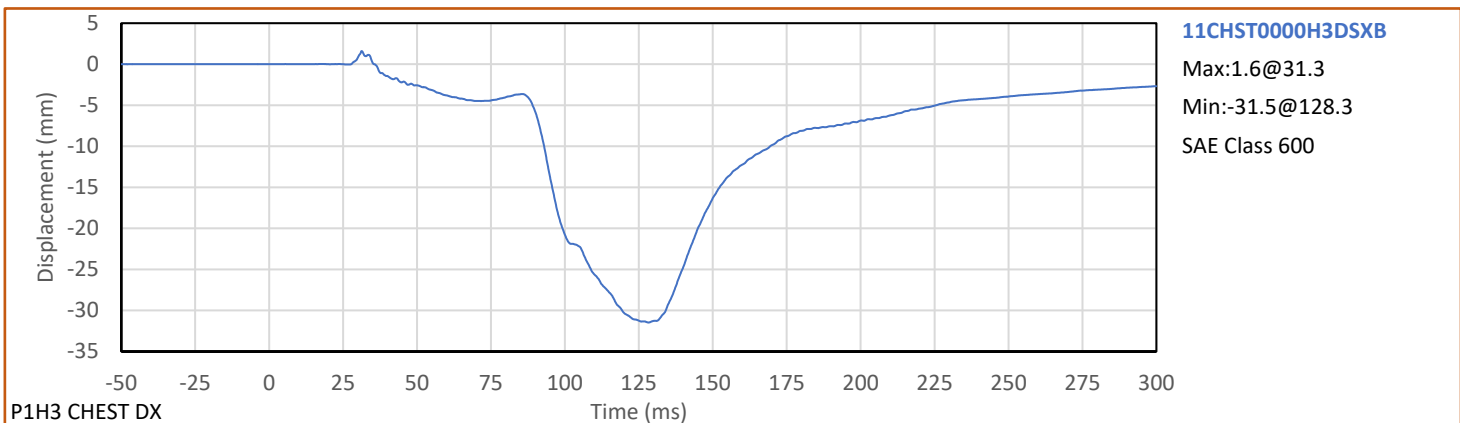
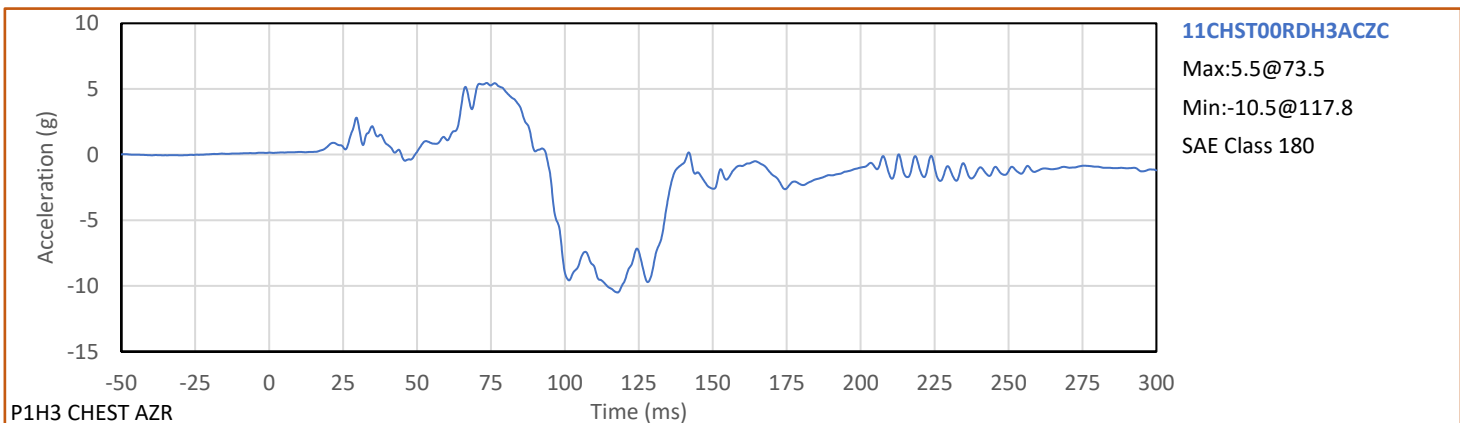
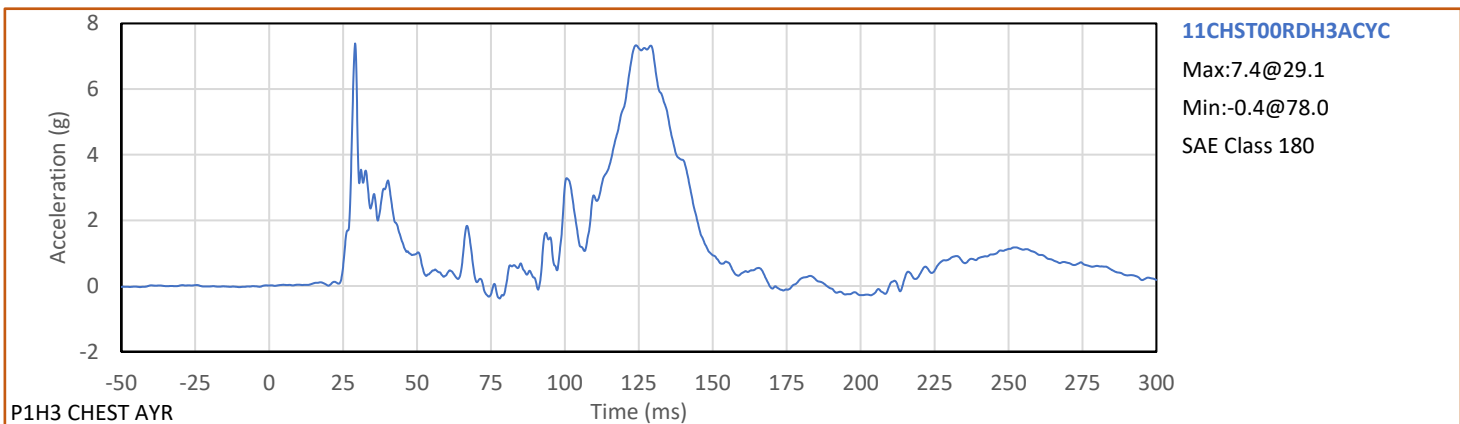
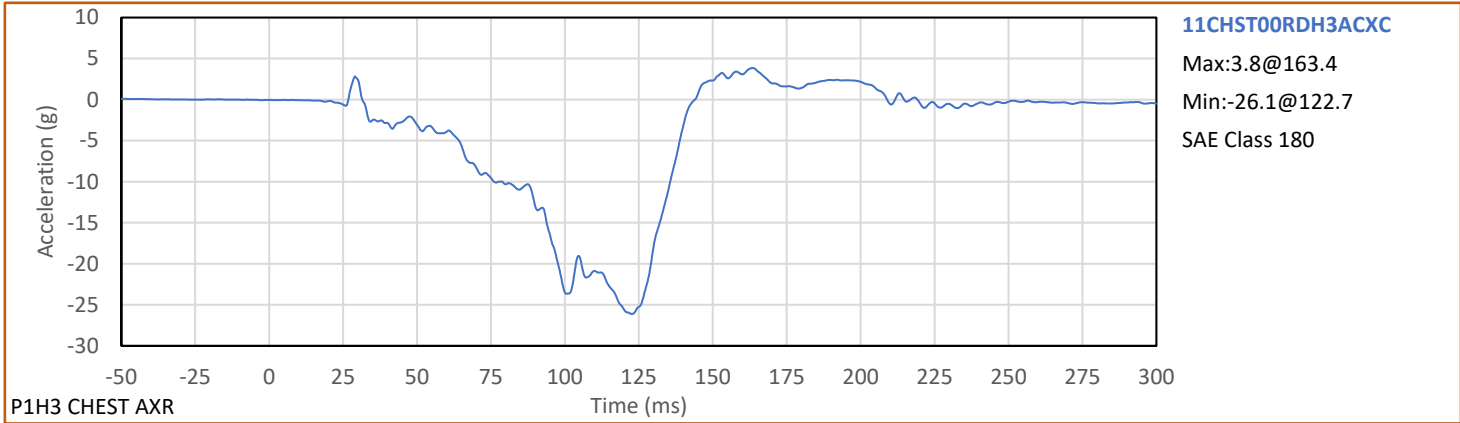


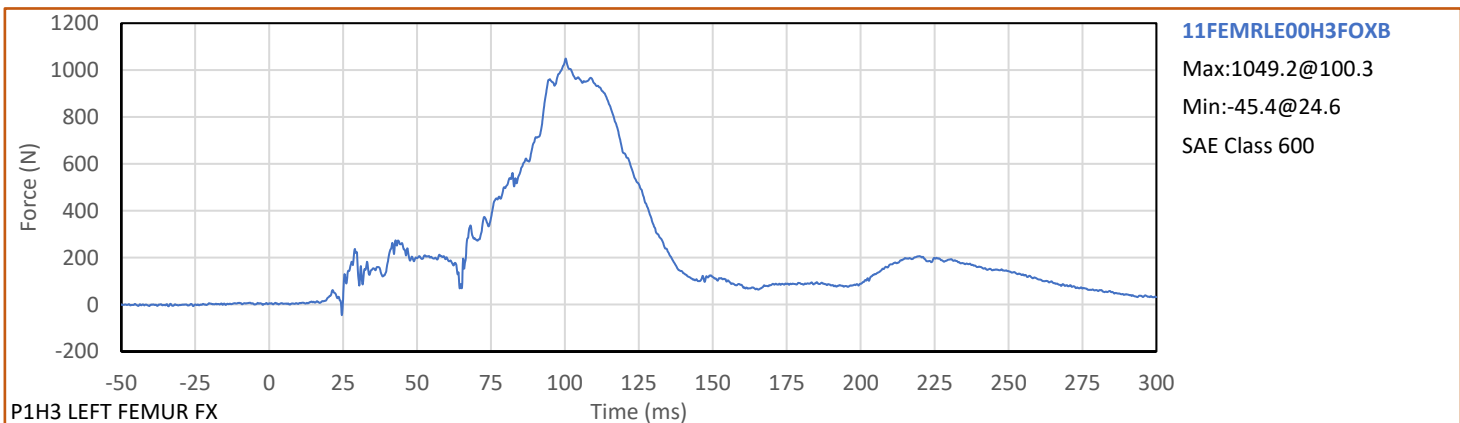
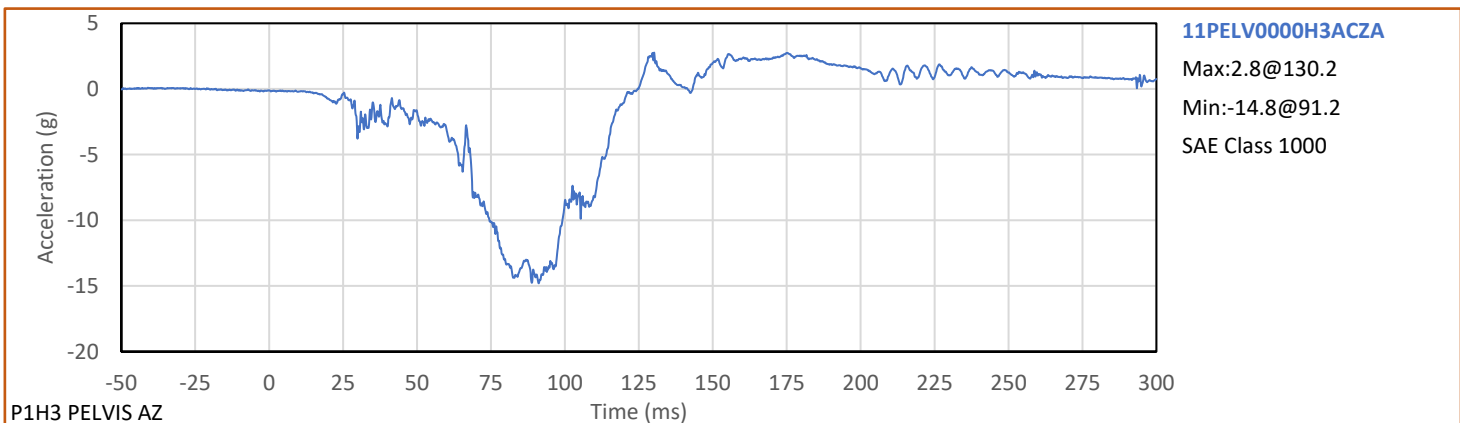
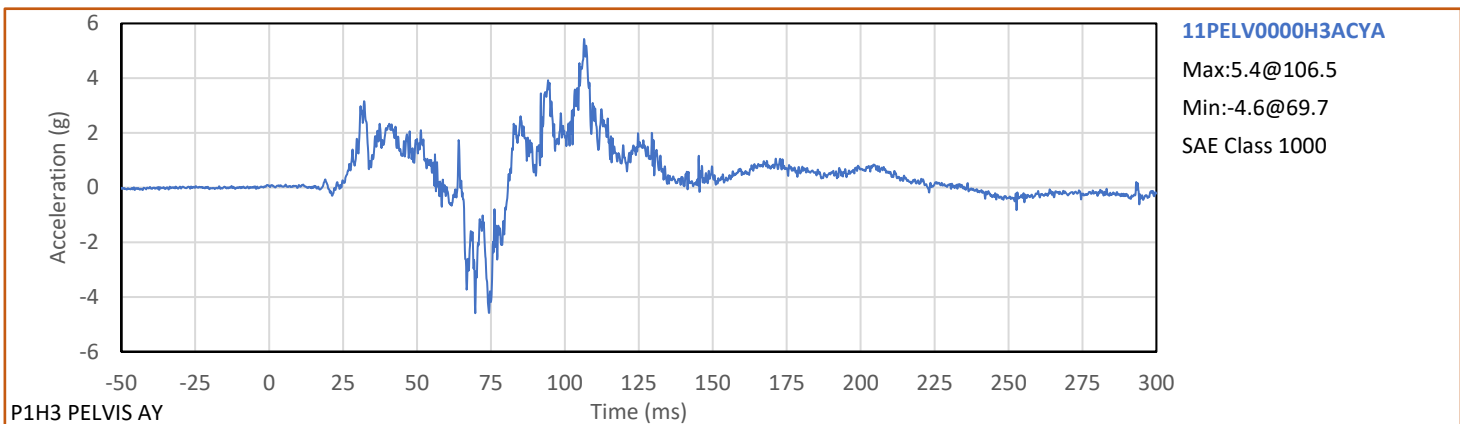
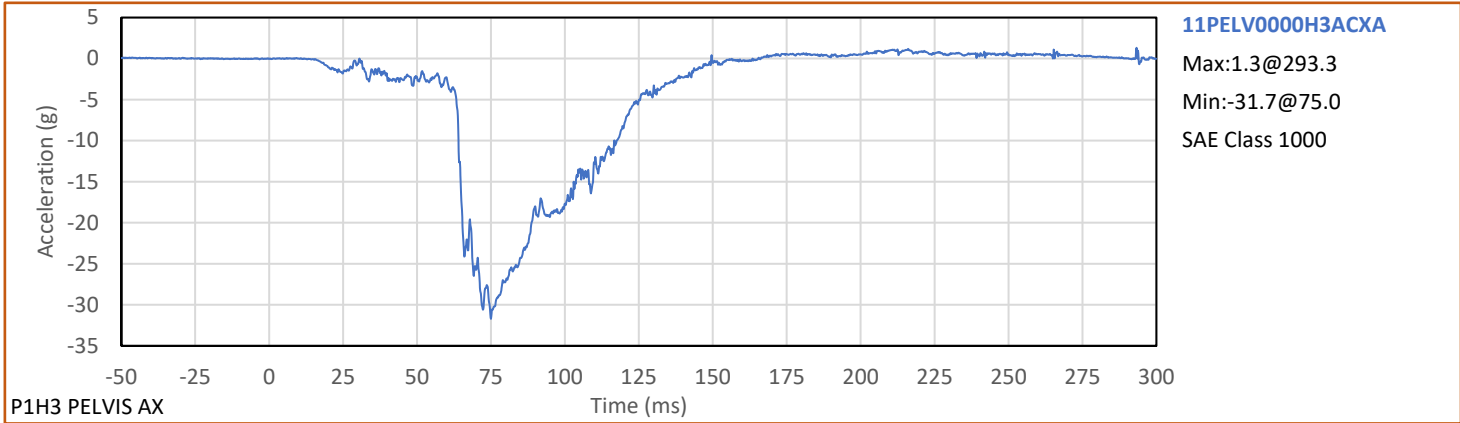


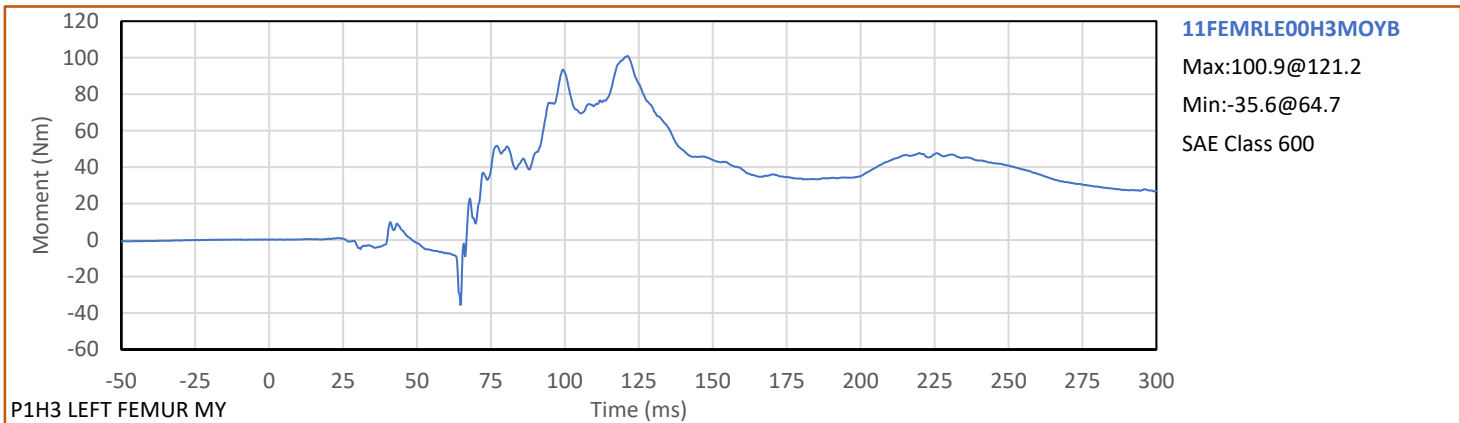
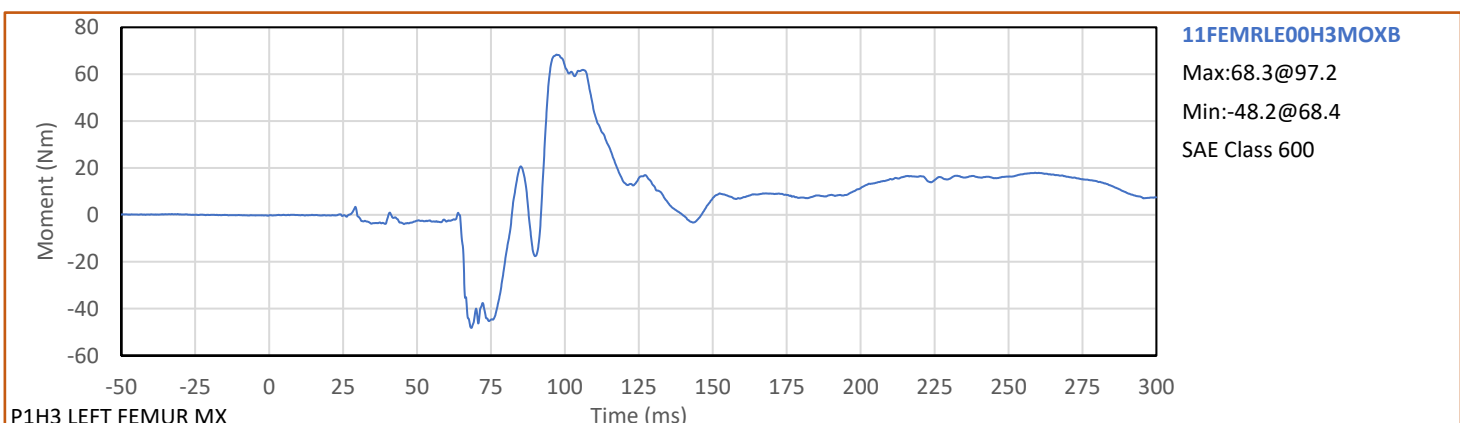
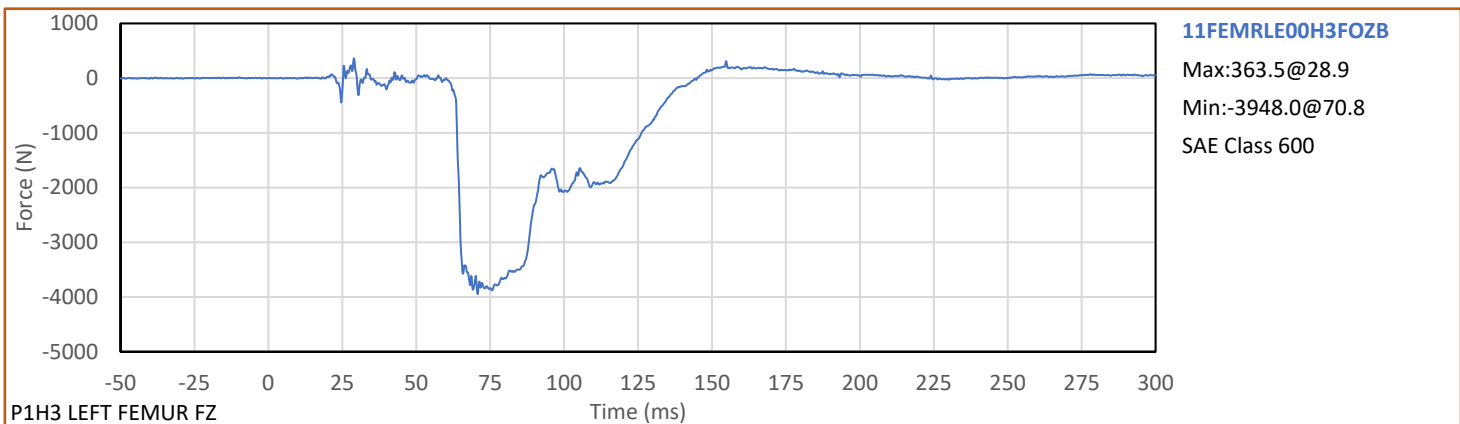
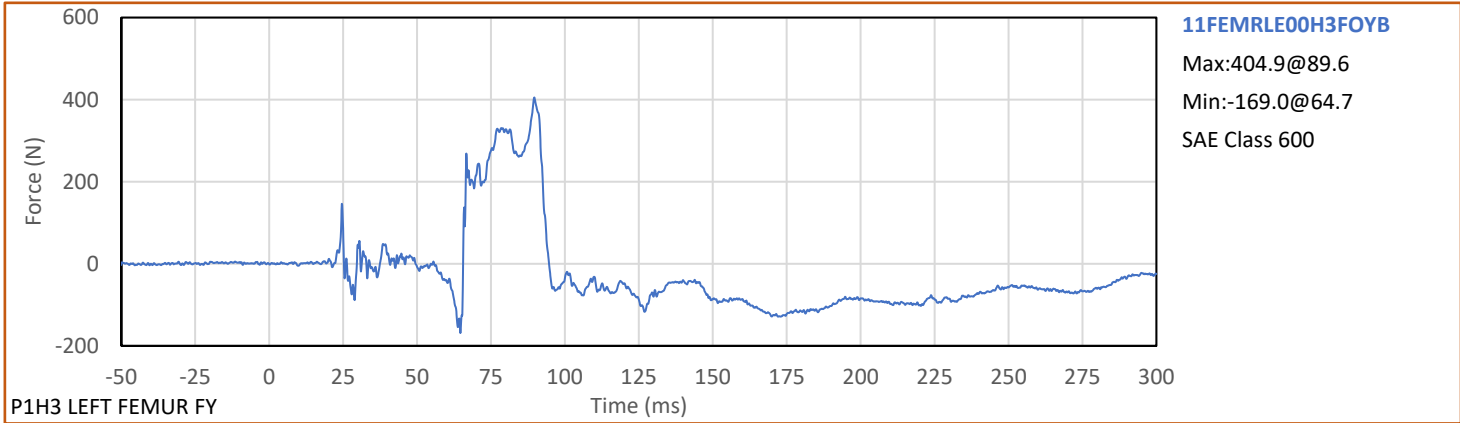


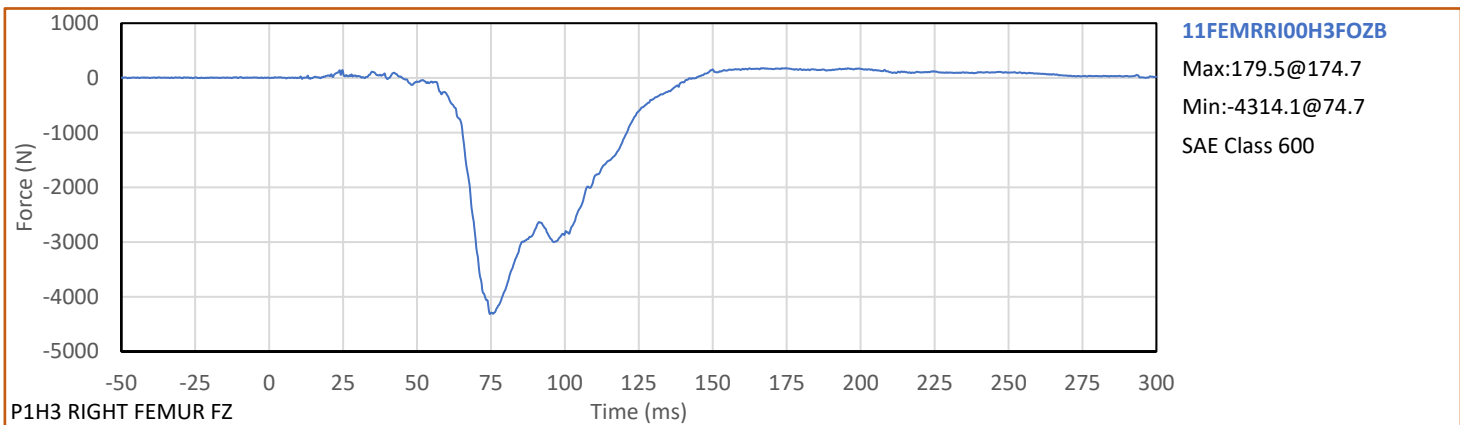
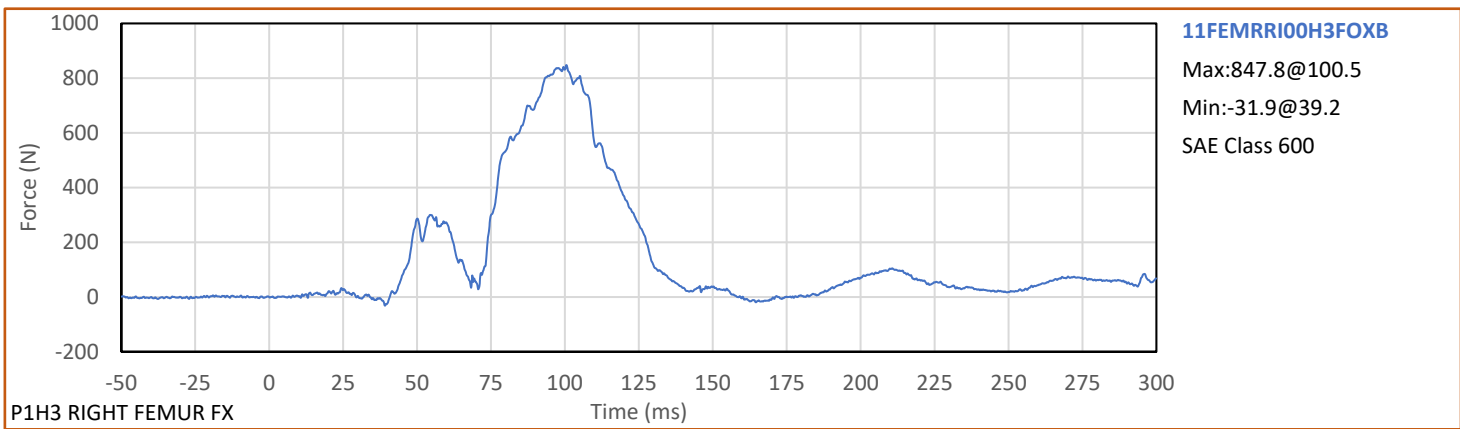
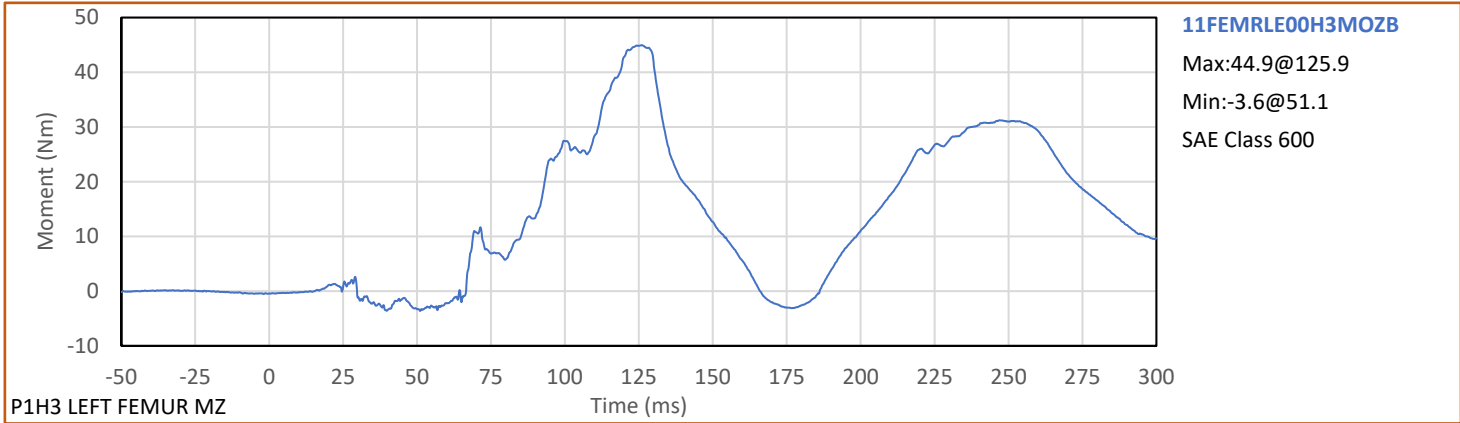


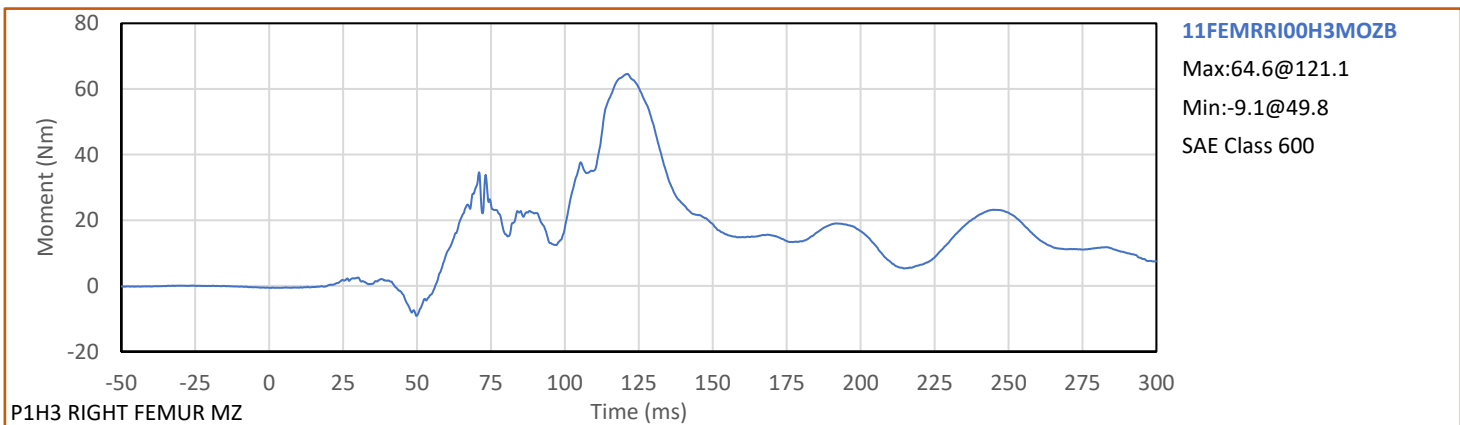
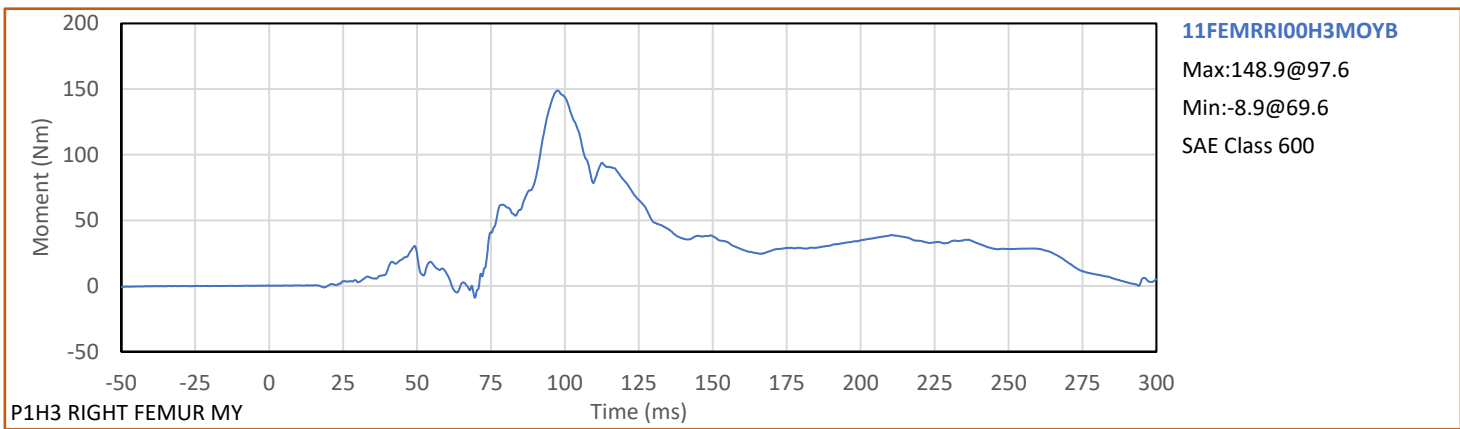
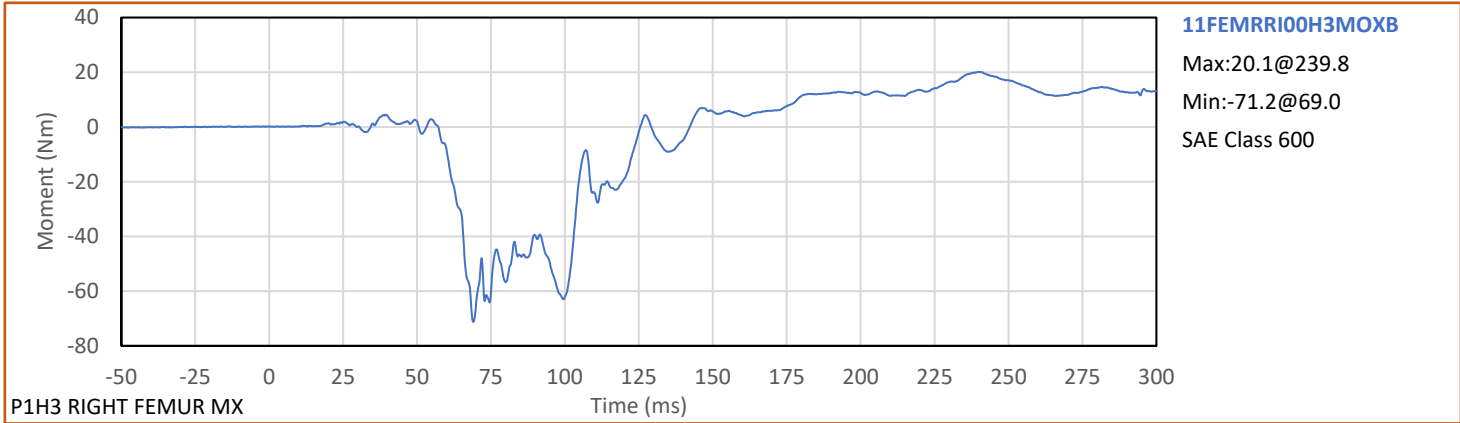


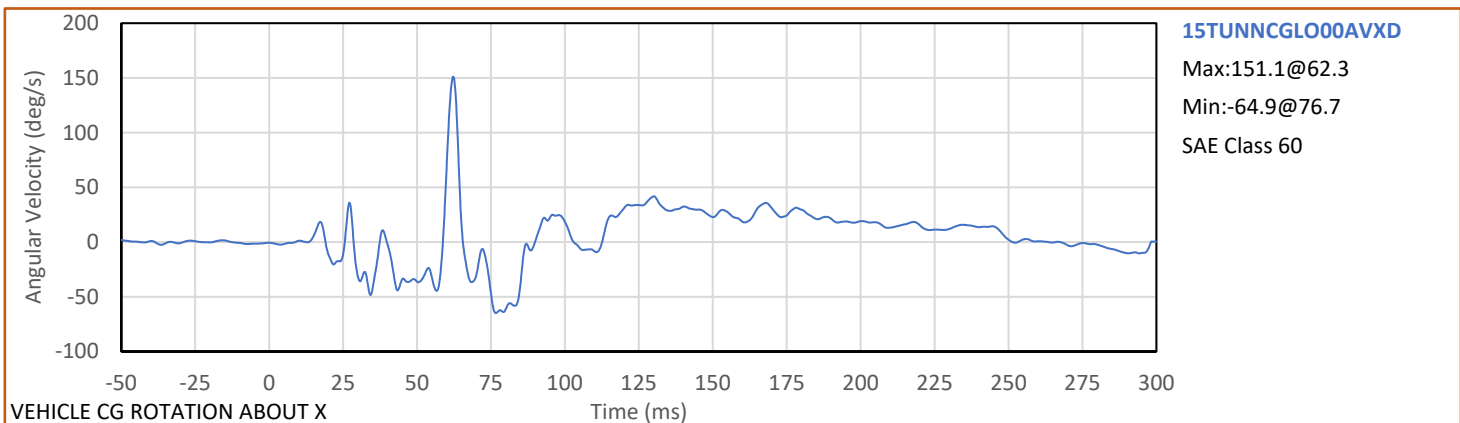
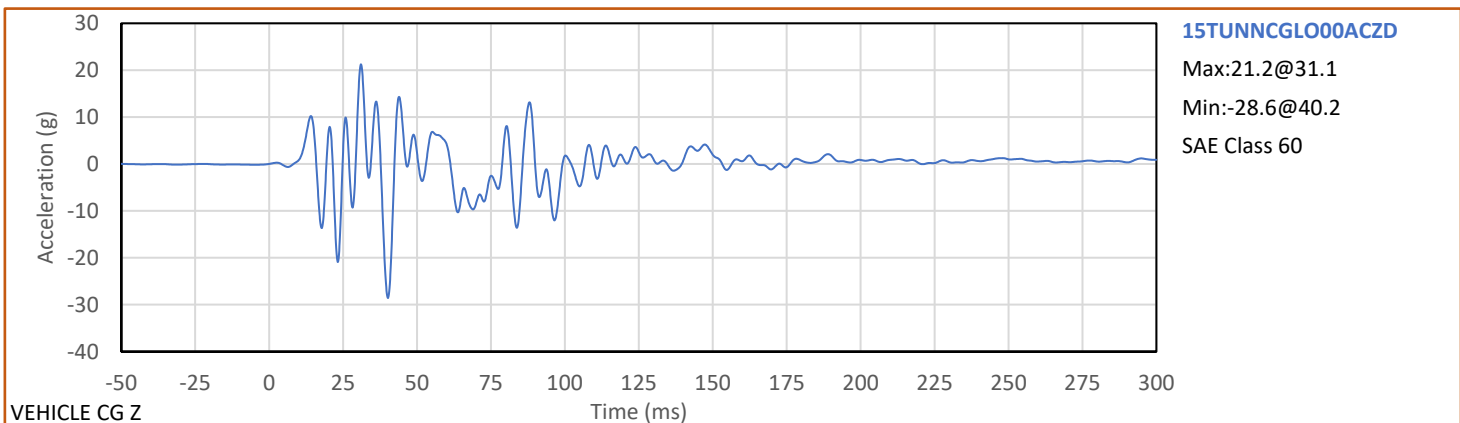
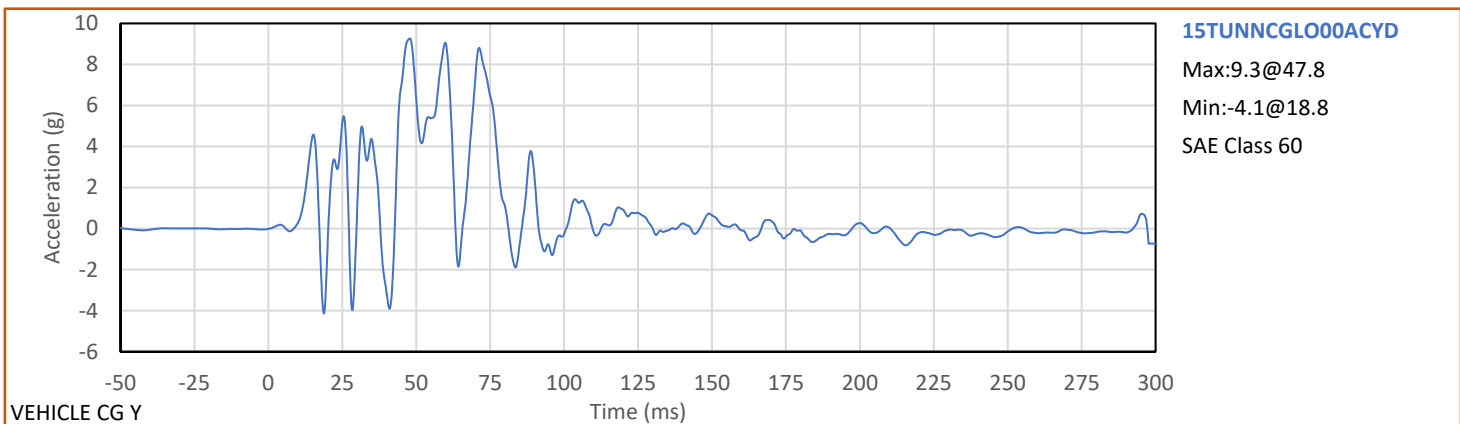
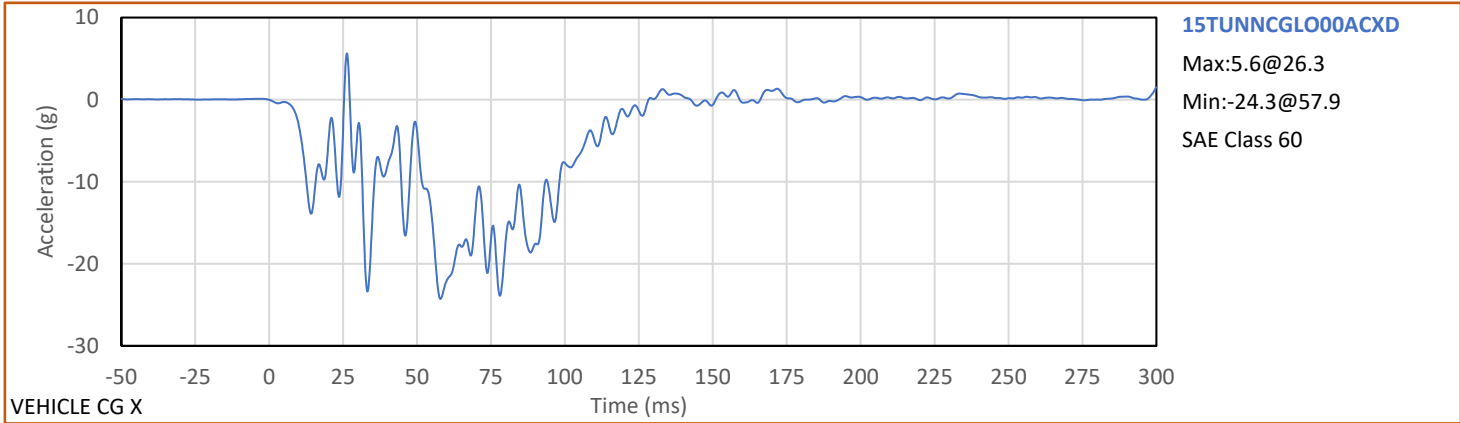


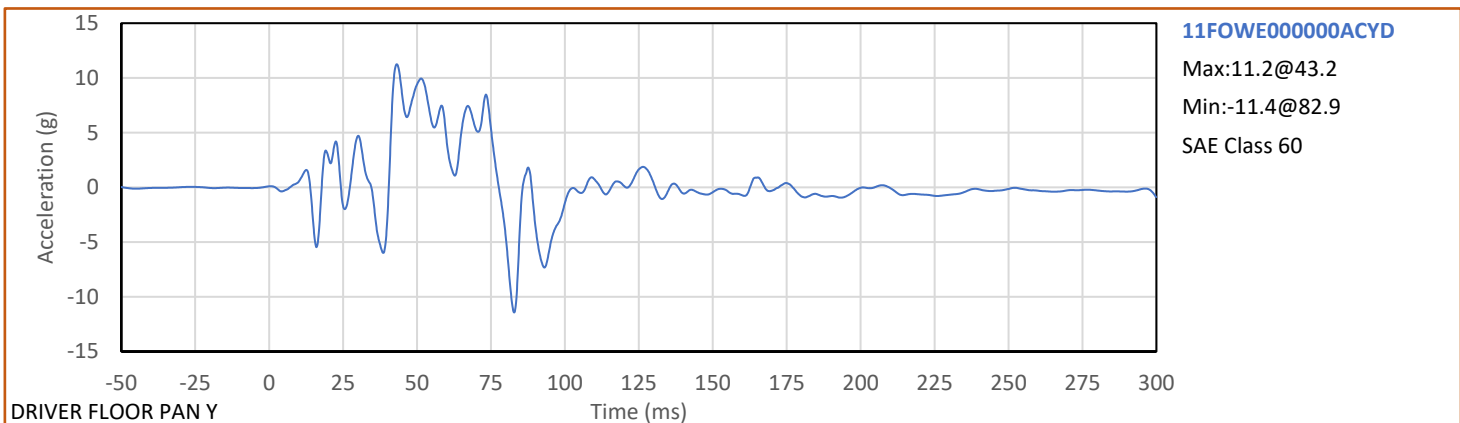
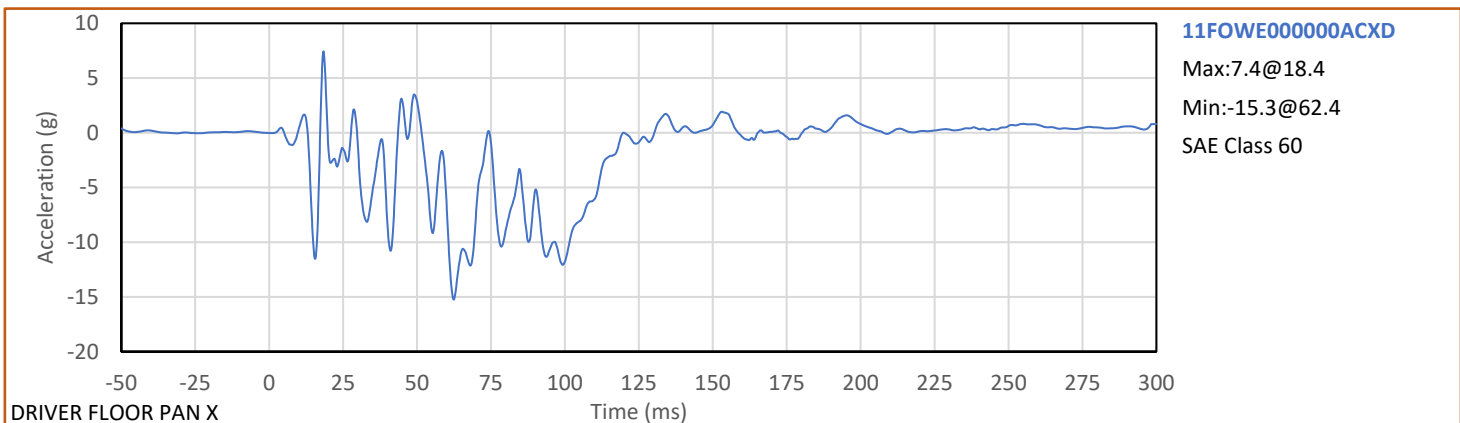
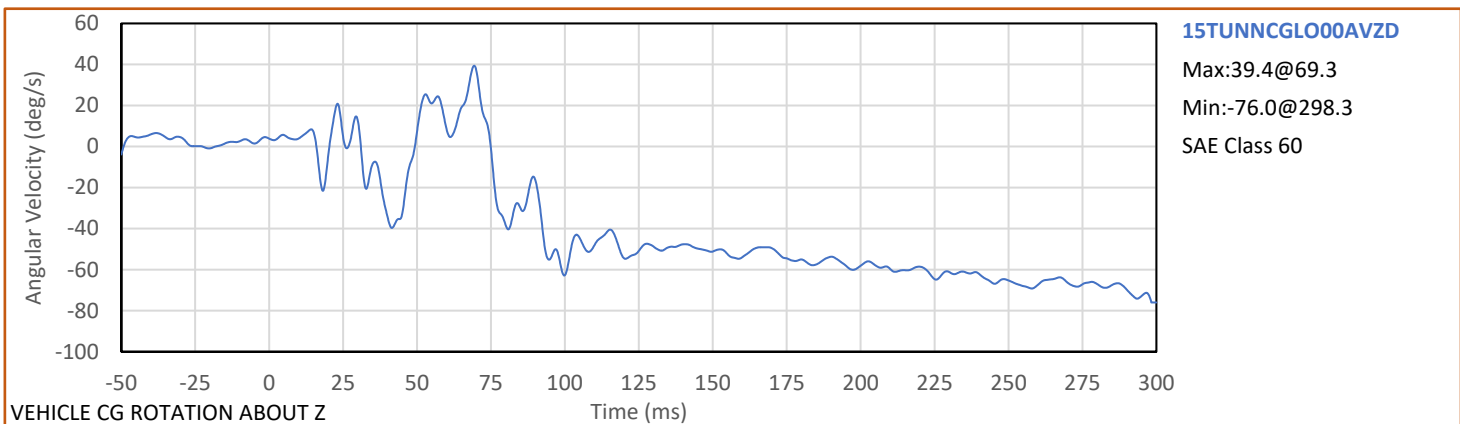
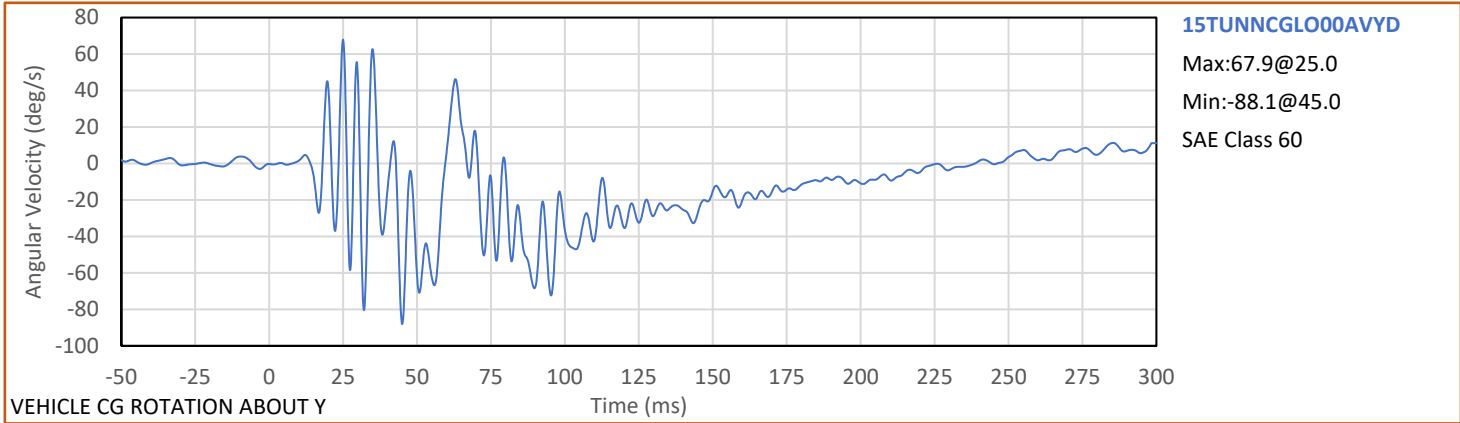


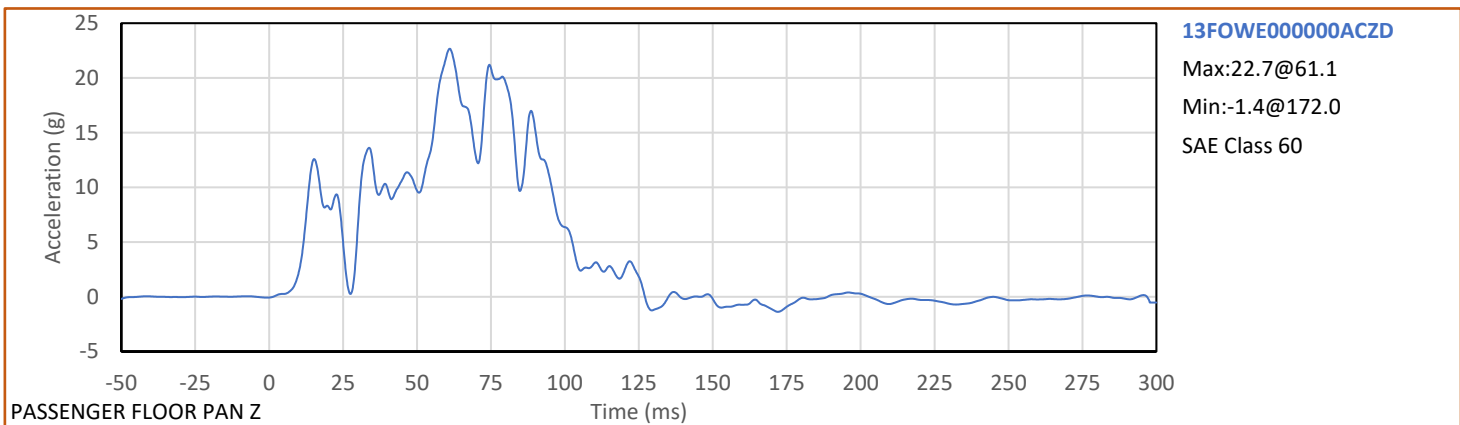
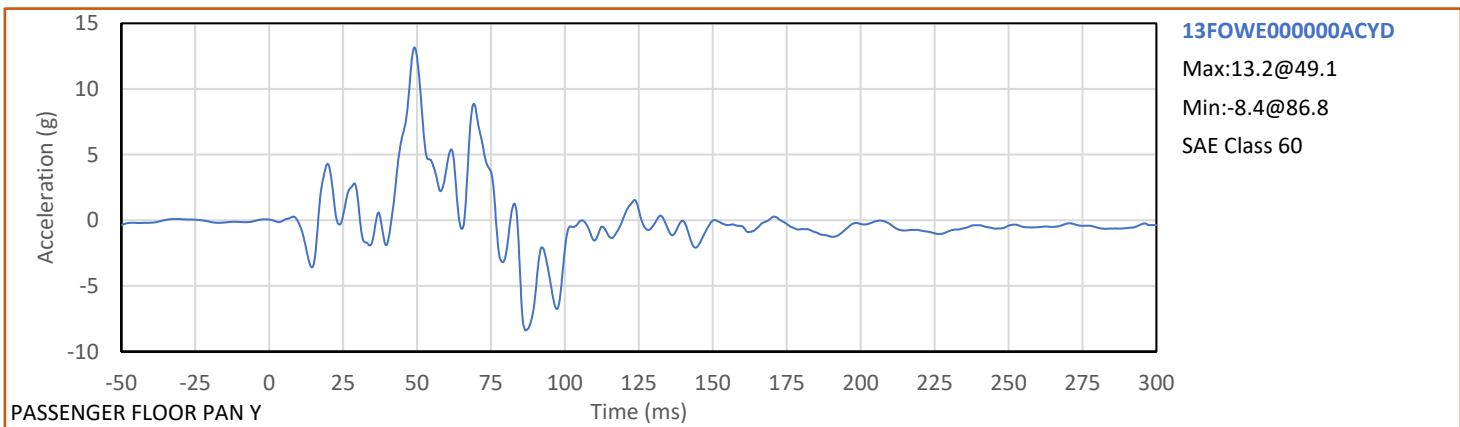
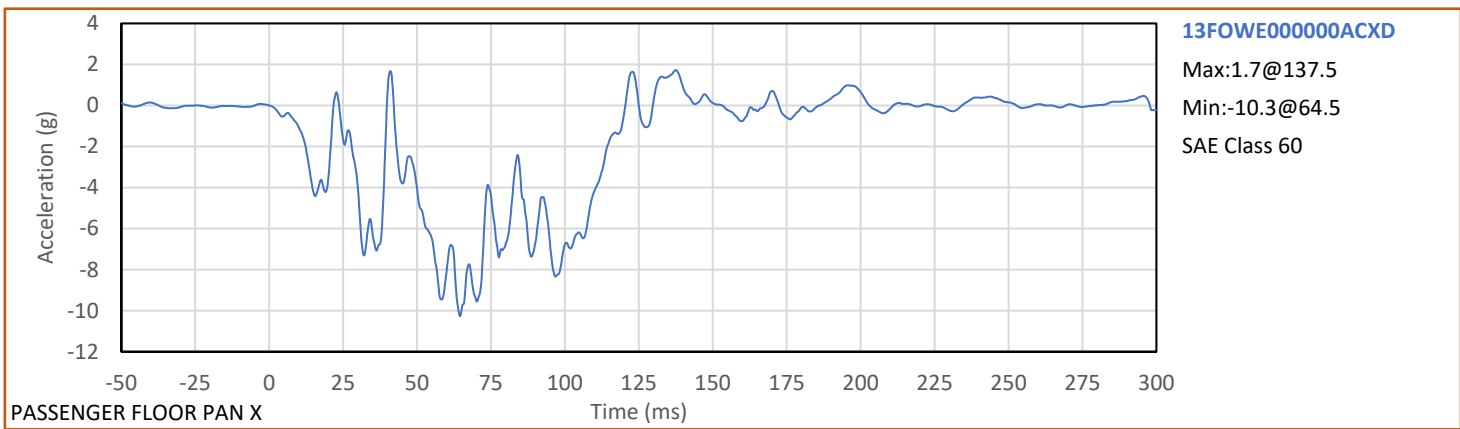
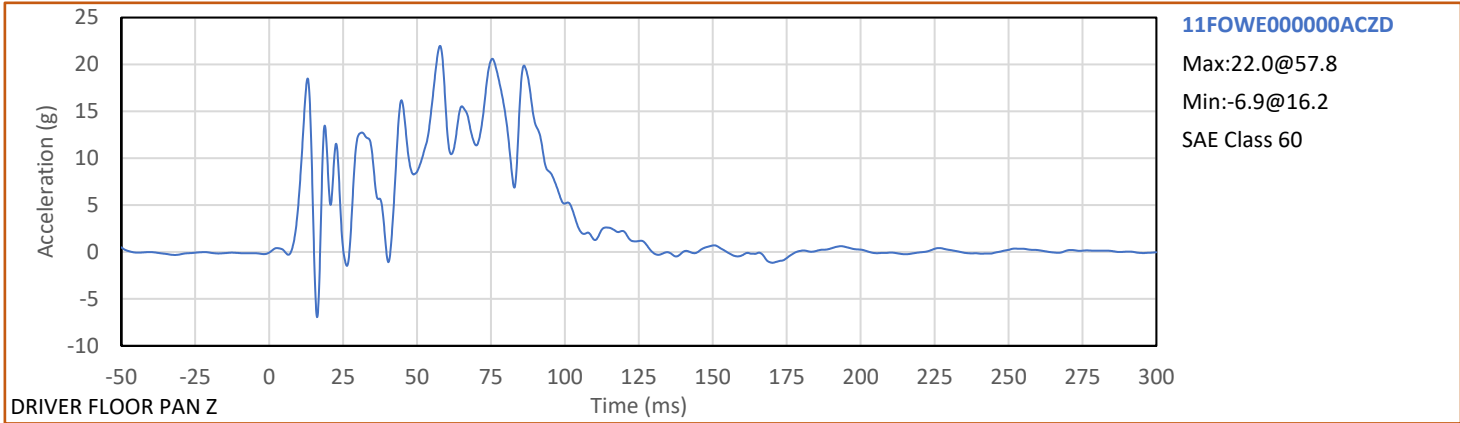


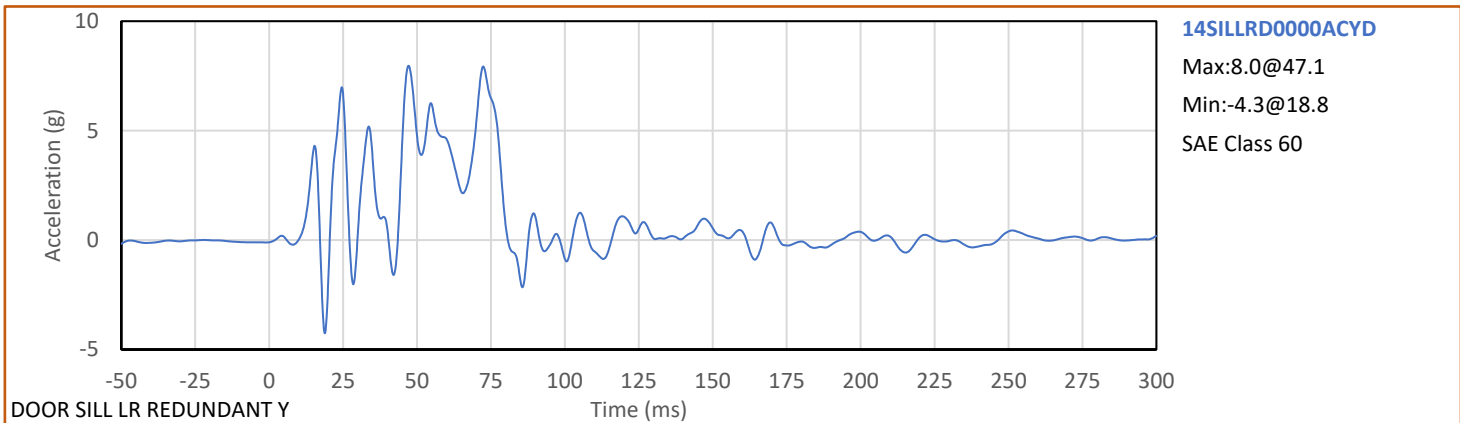
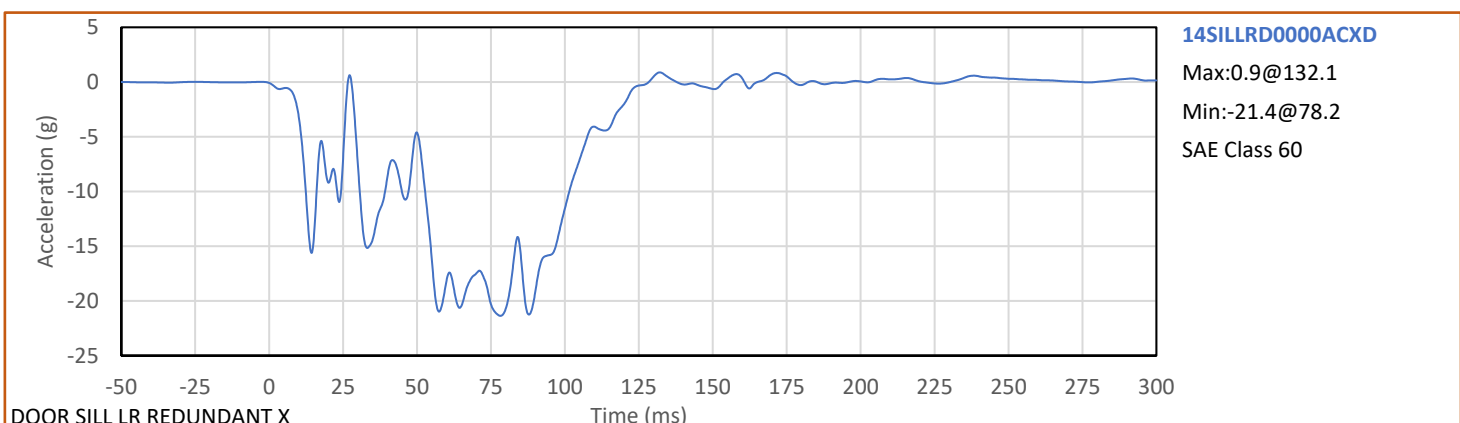
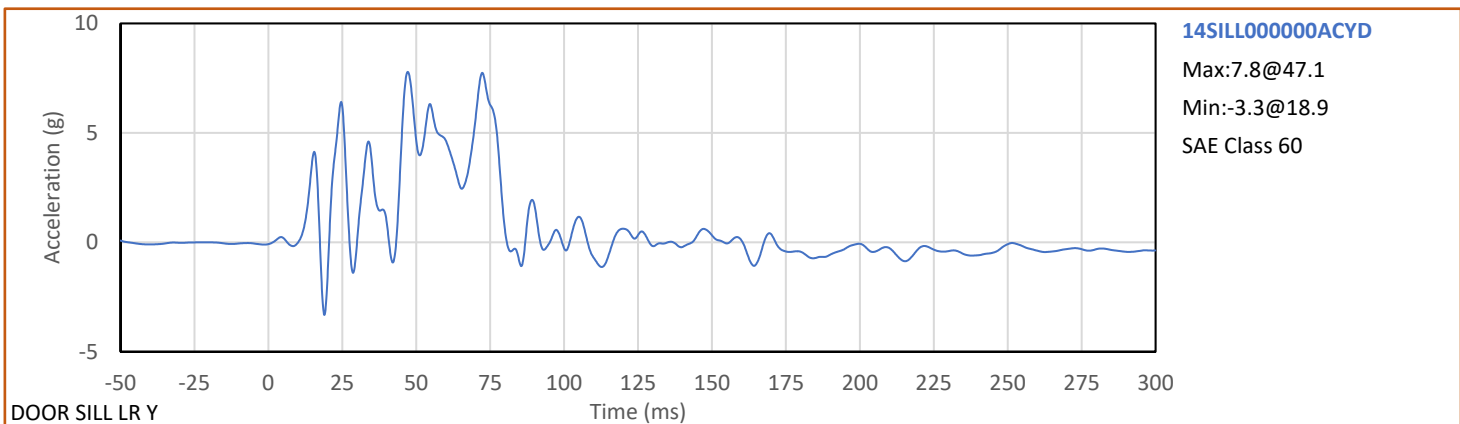
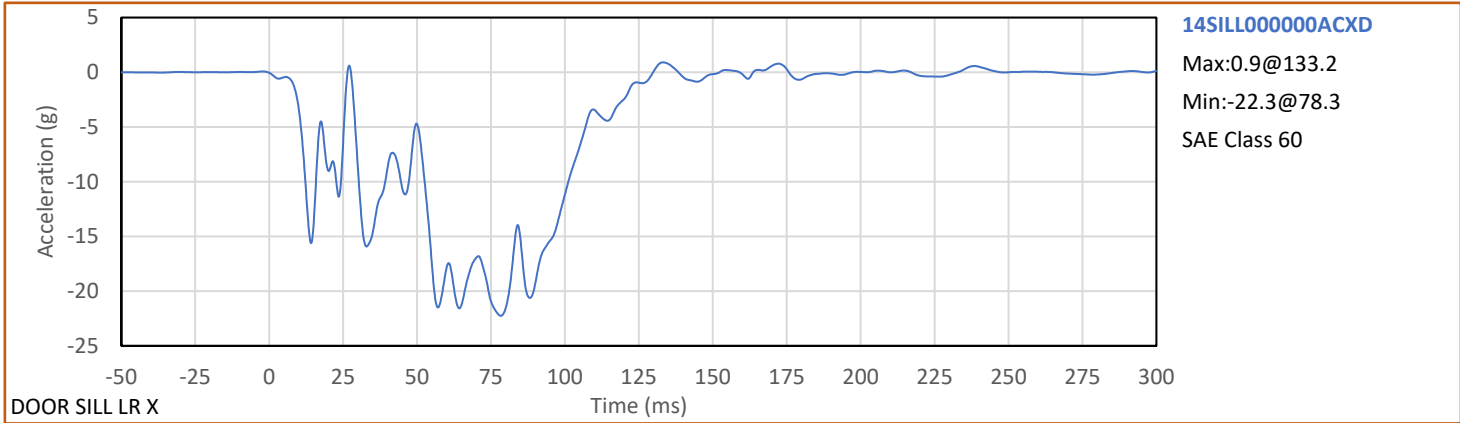


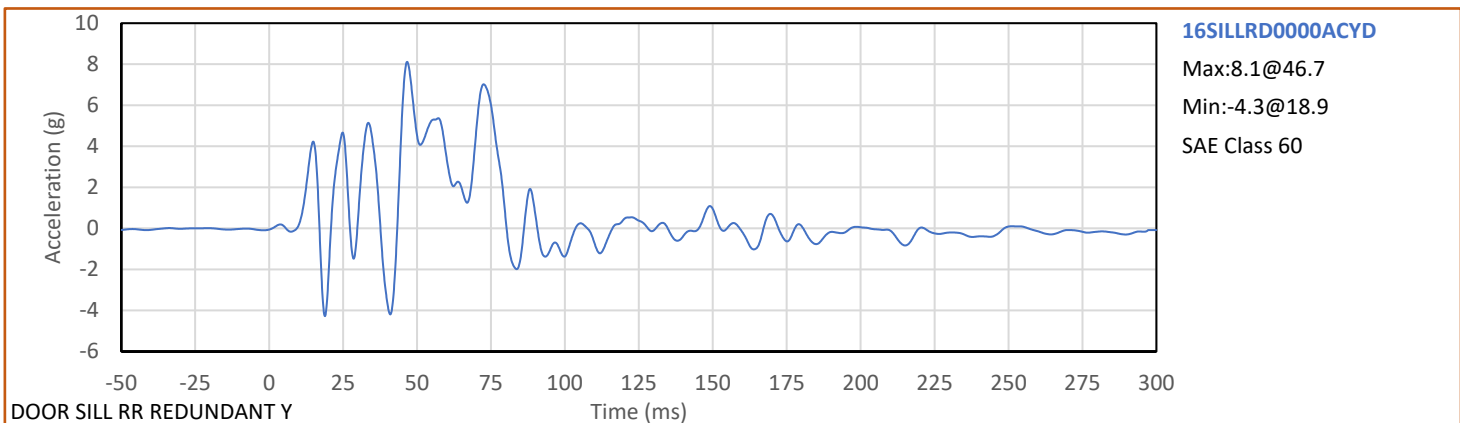
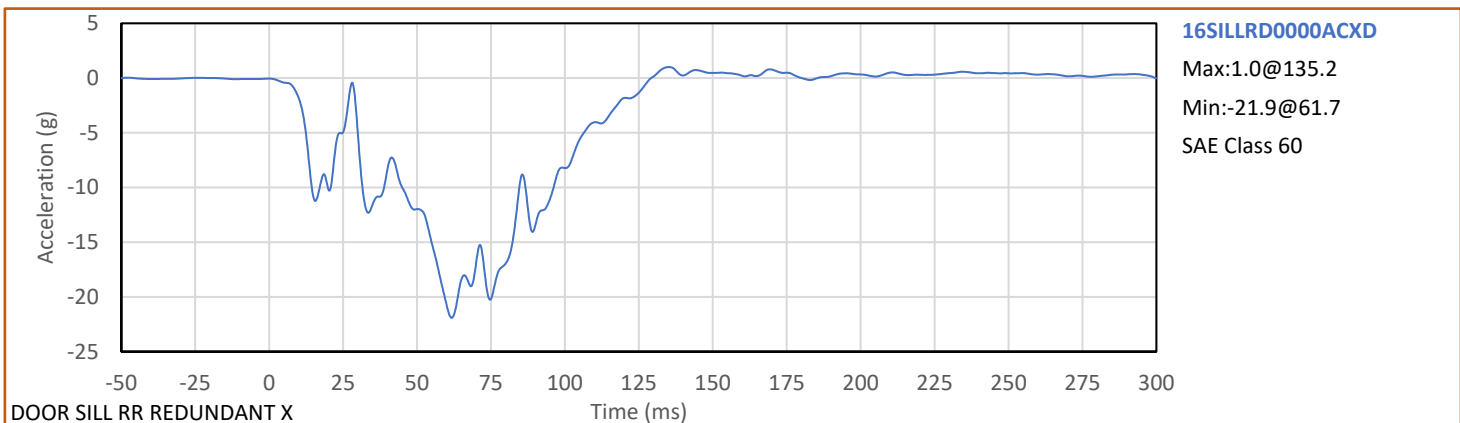
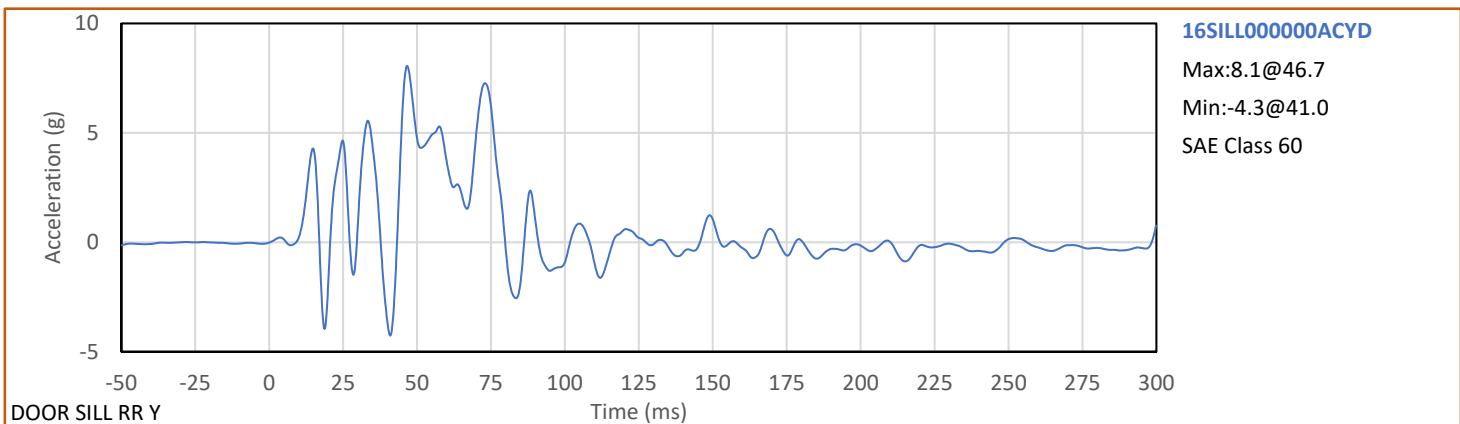
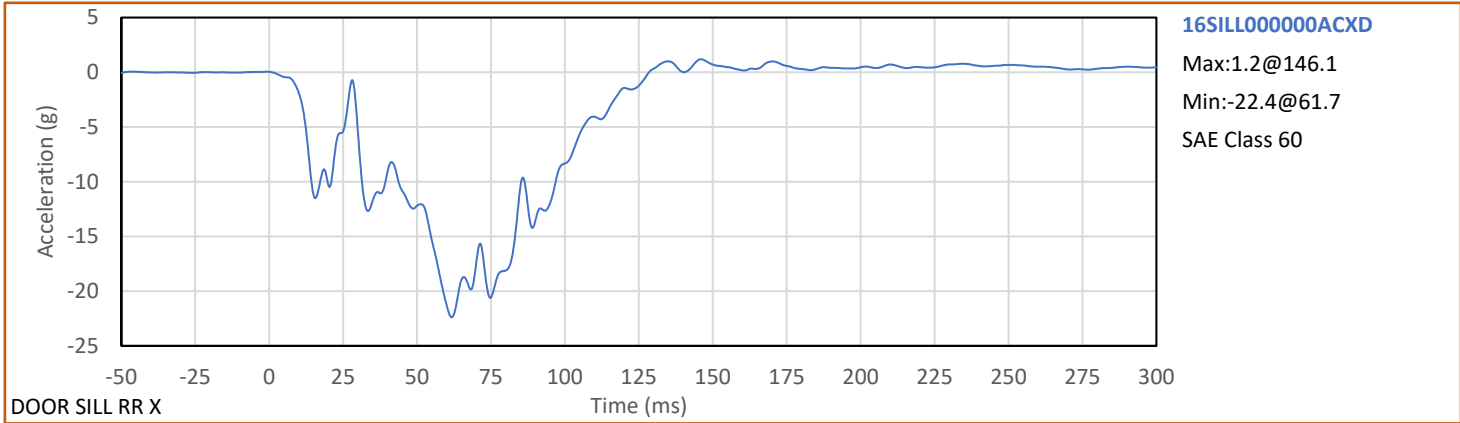






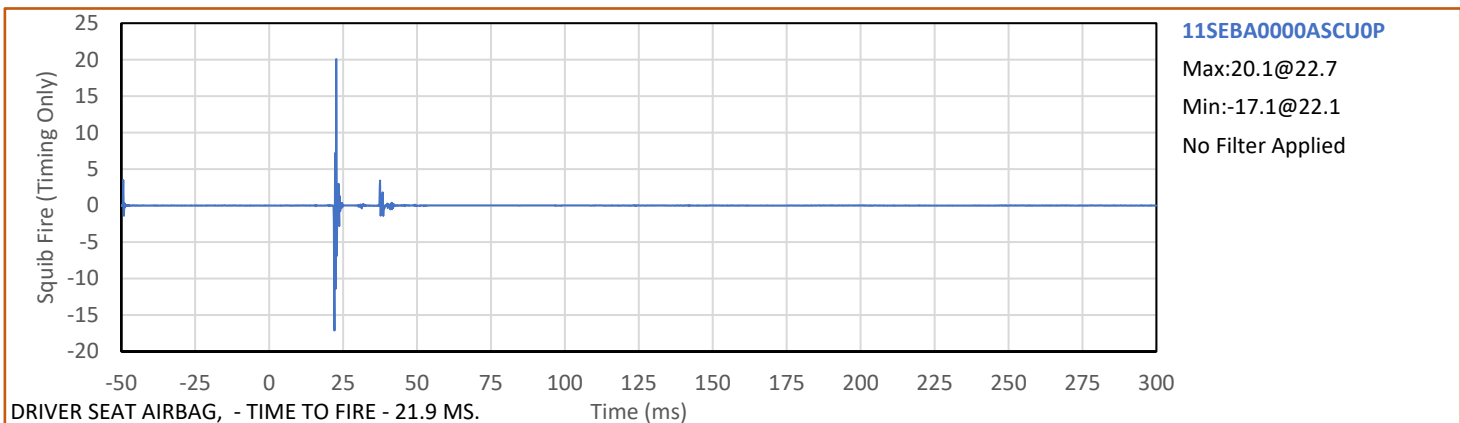
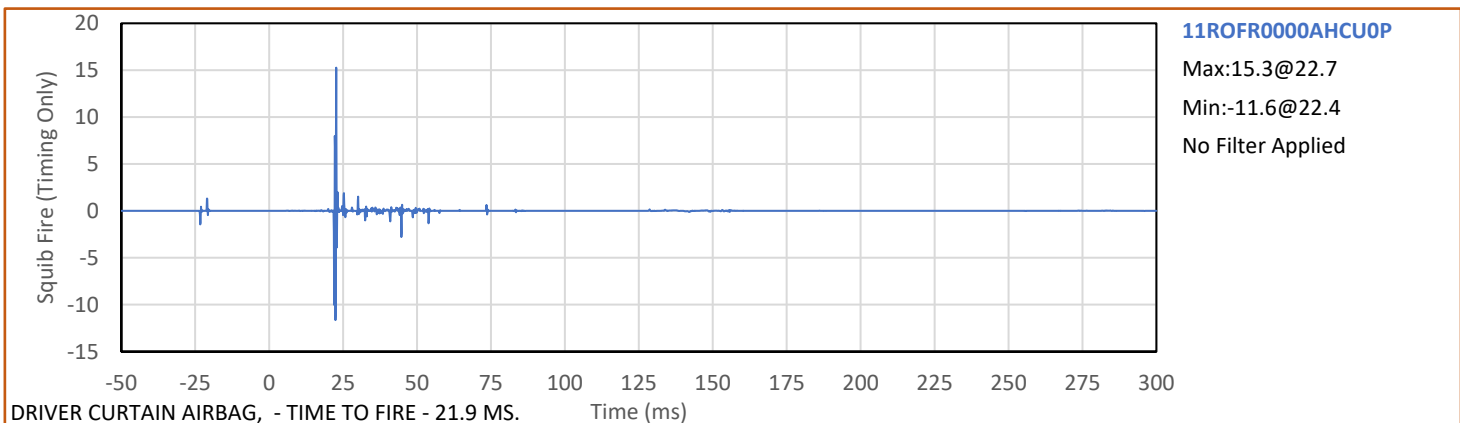
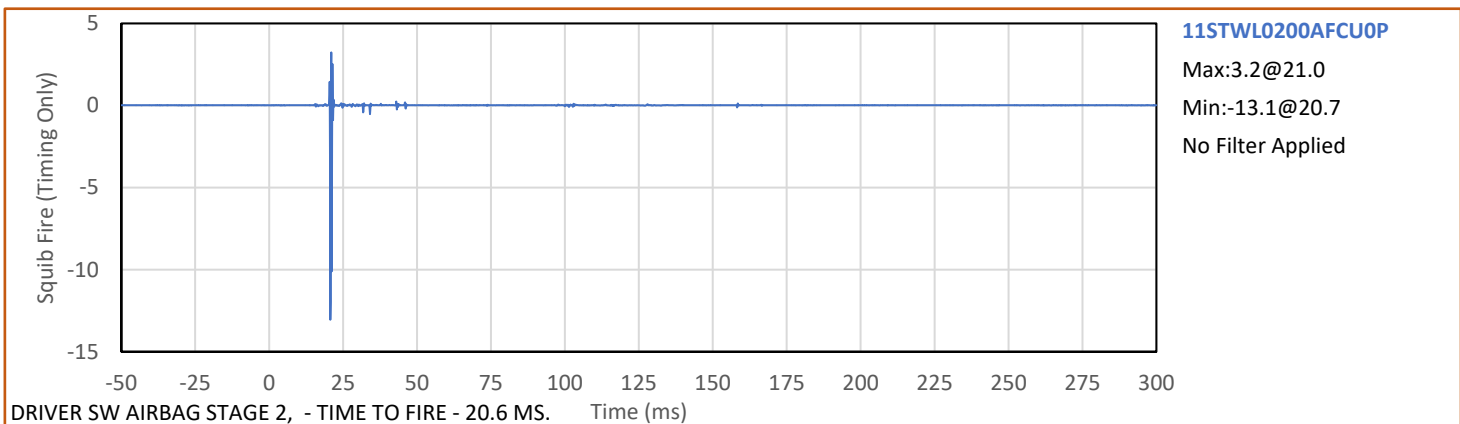
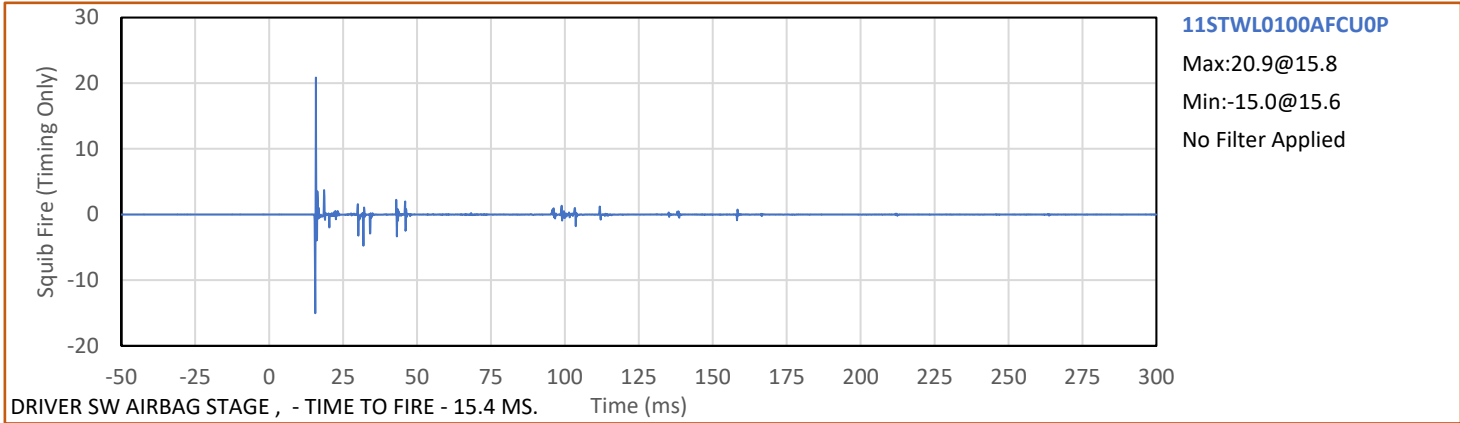






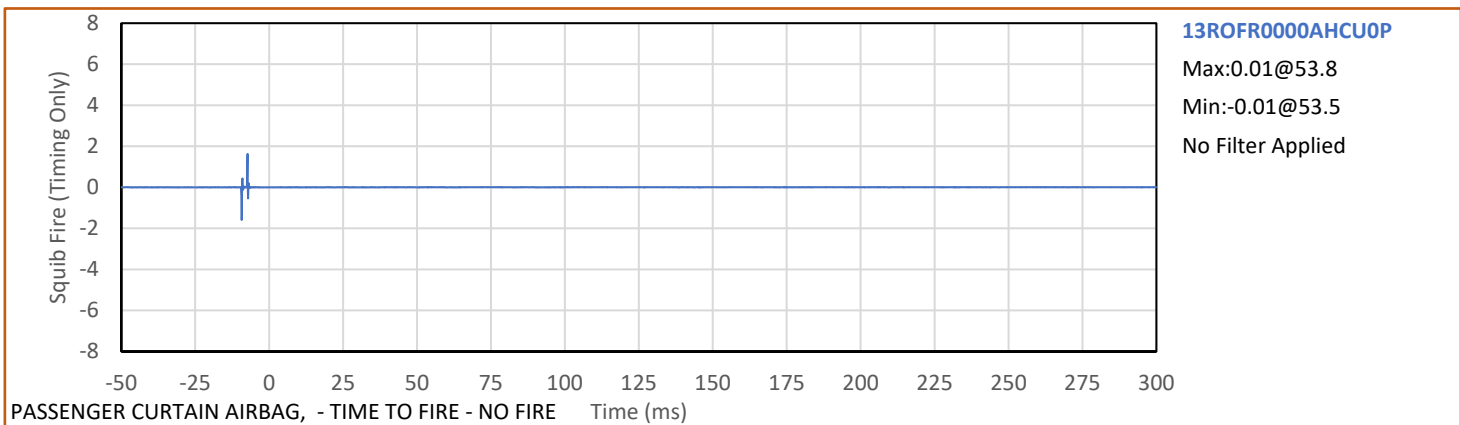
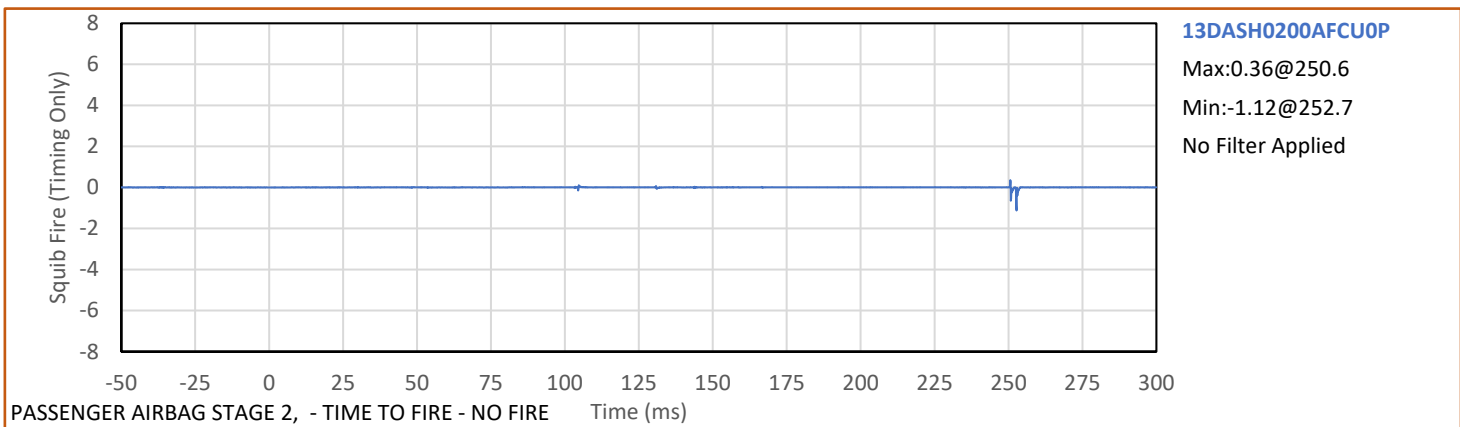
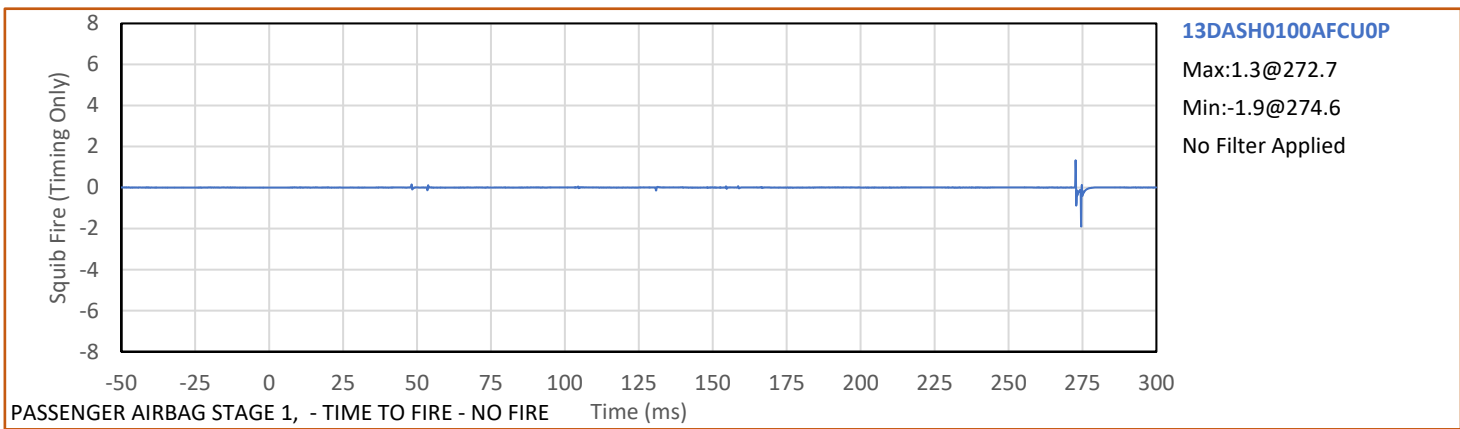
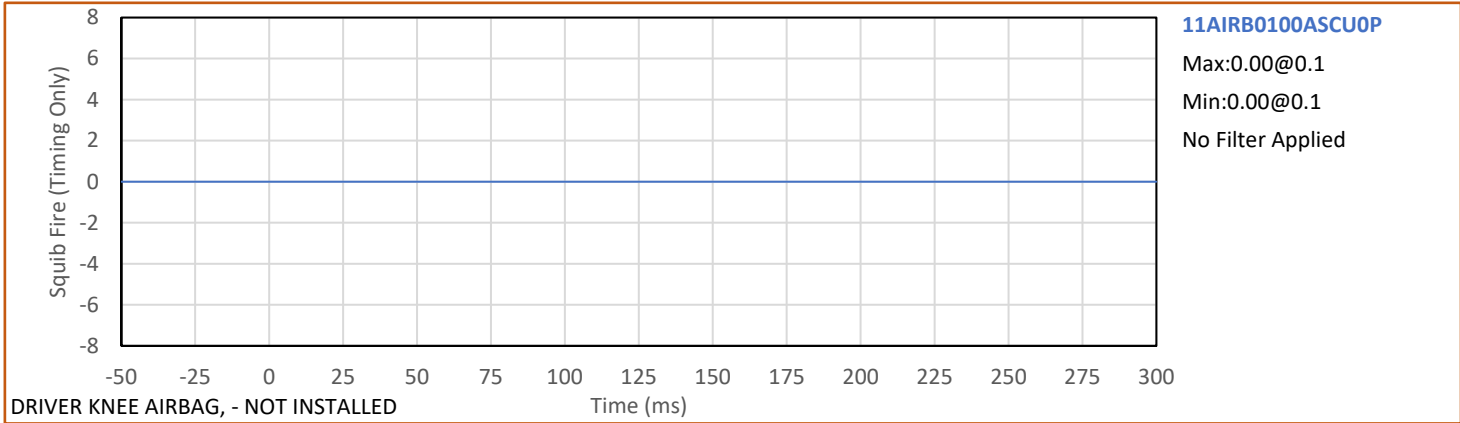
Test Vehicle: 2020 Mazda CX-5 AWD 5-Door MPV
Test Program: Left Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205417
Test Date: 6/7/2021



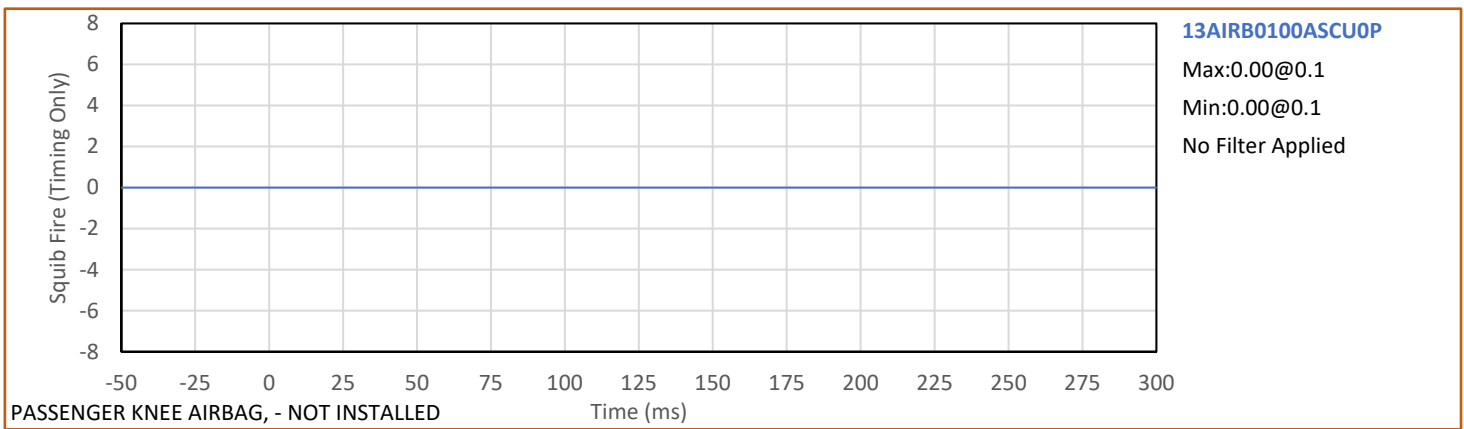
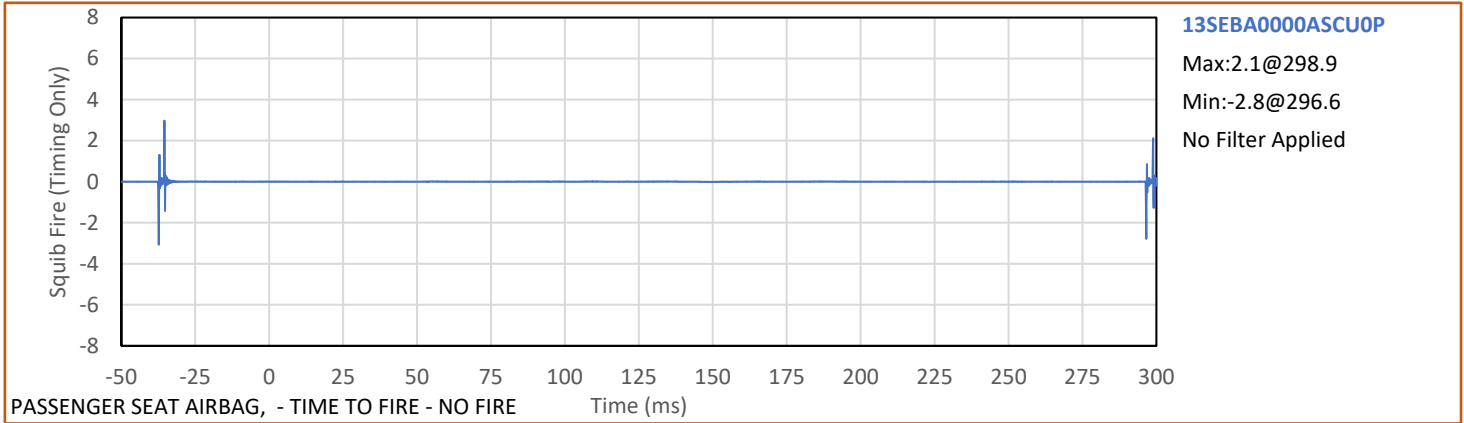
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Test Program: Left Side 30° Frontal Rigid Barrier Impact

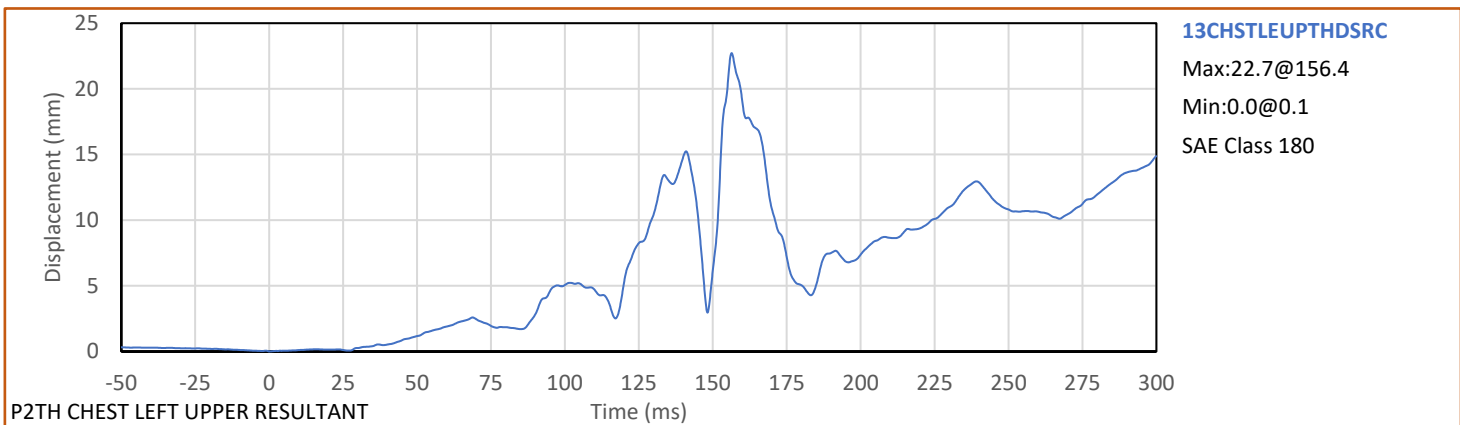
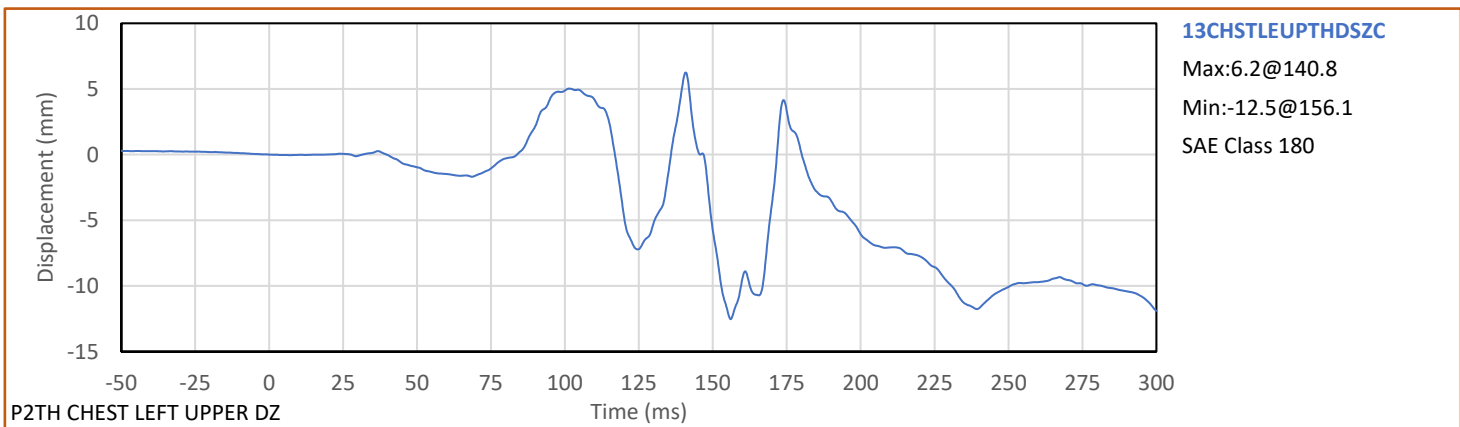
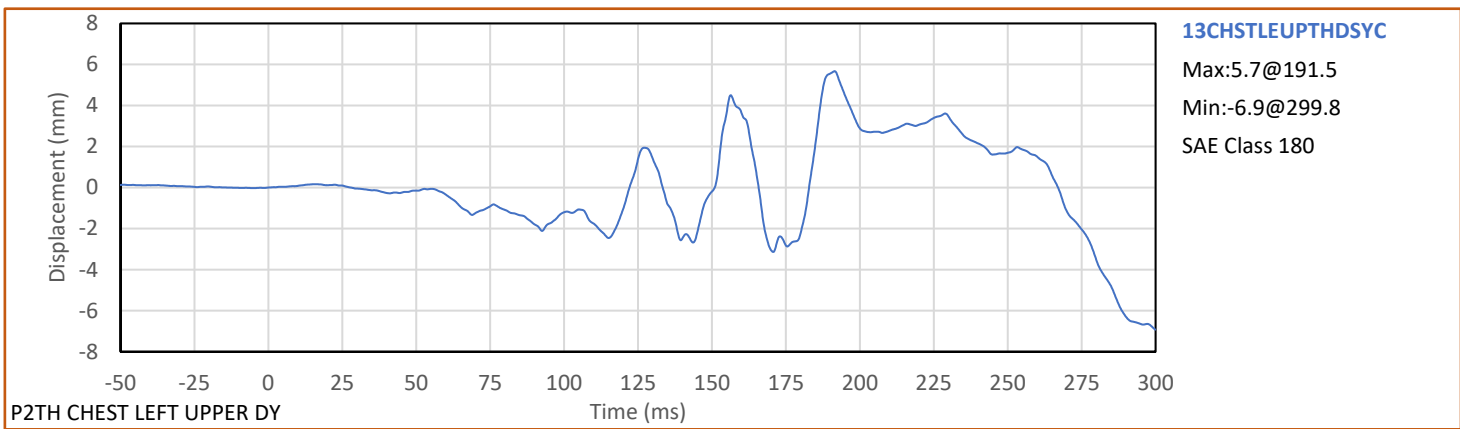
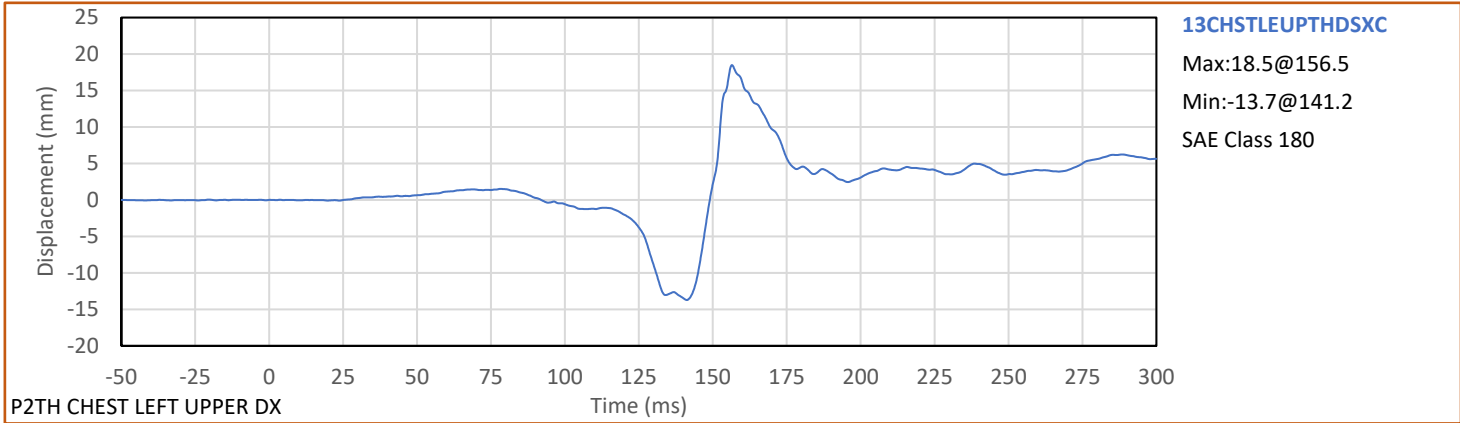
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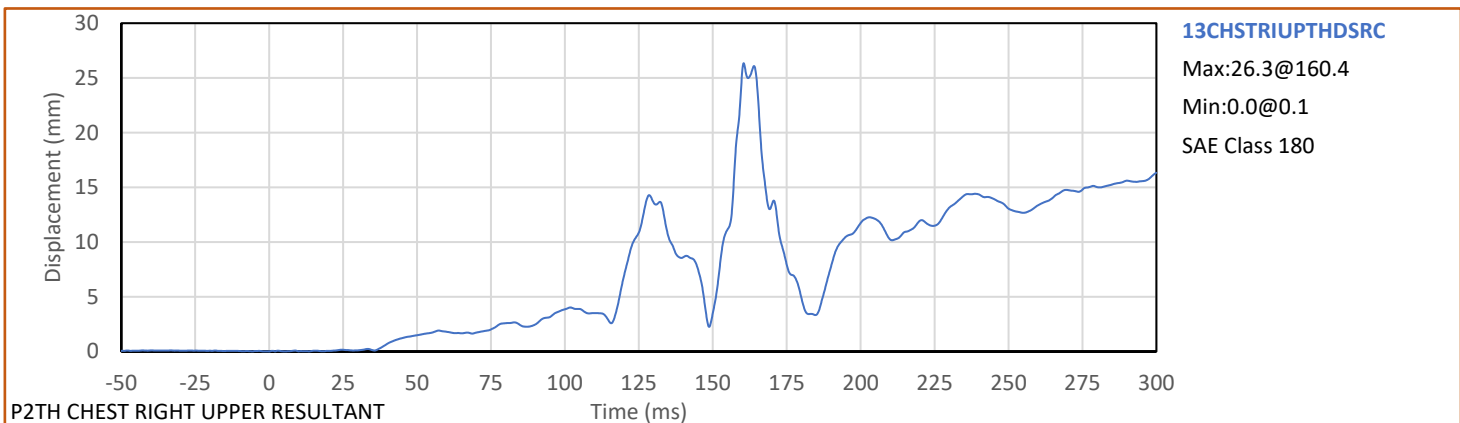
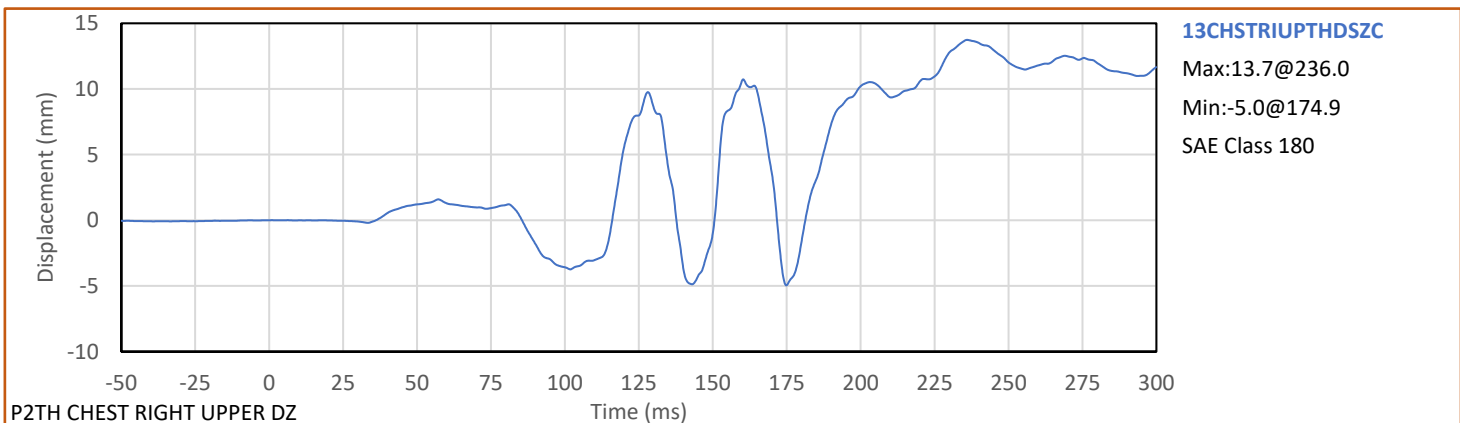
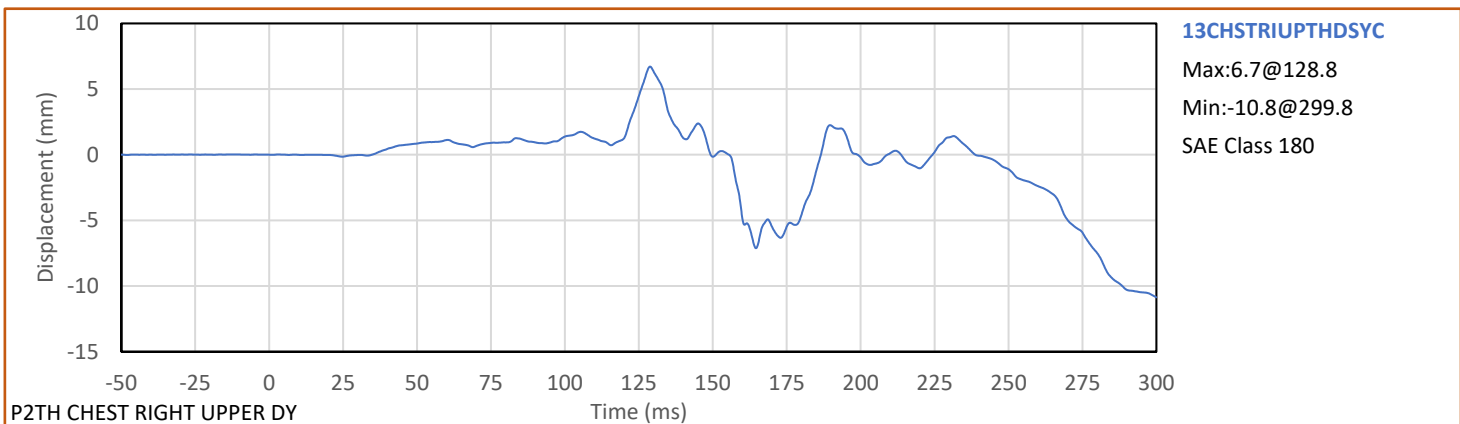
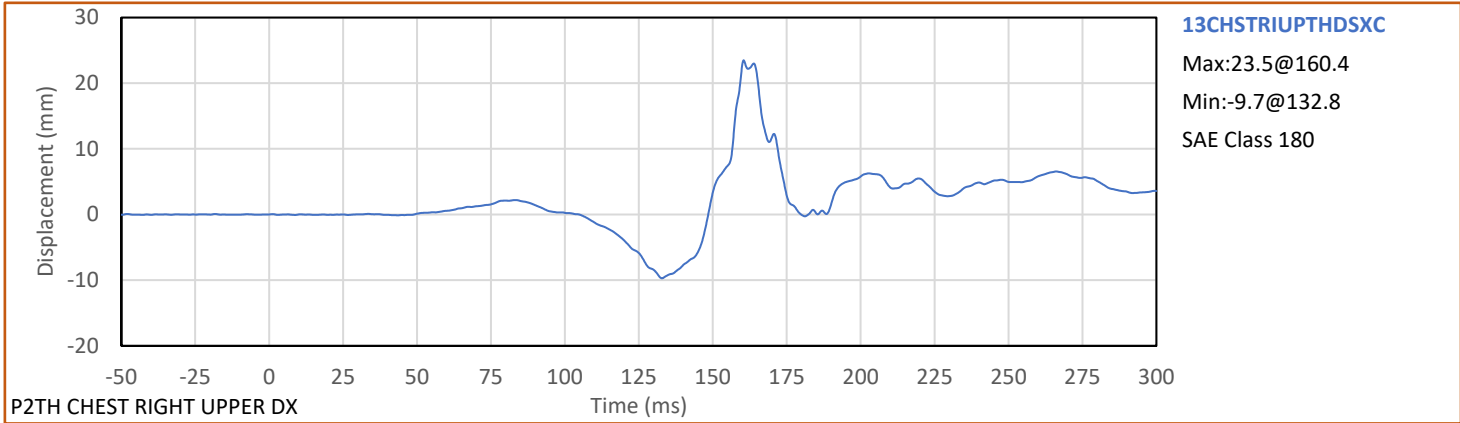


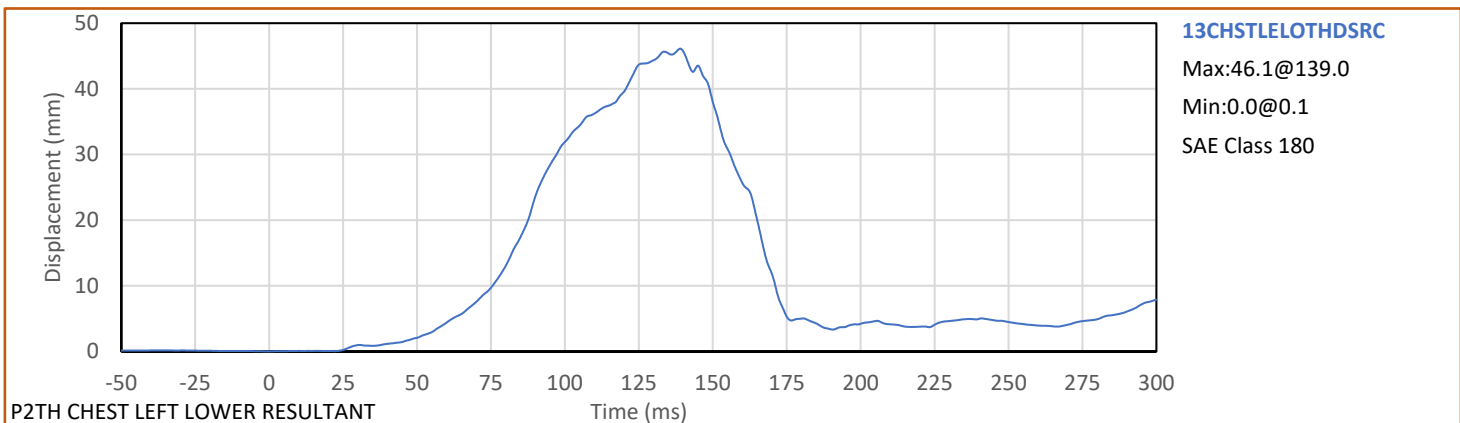
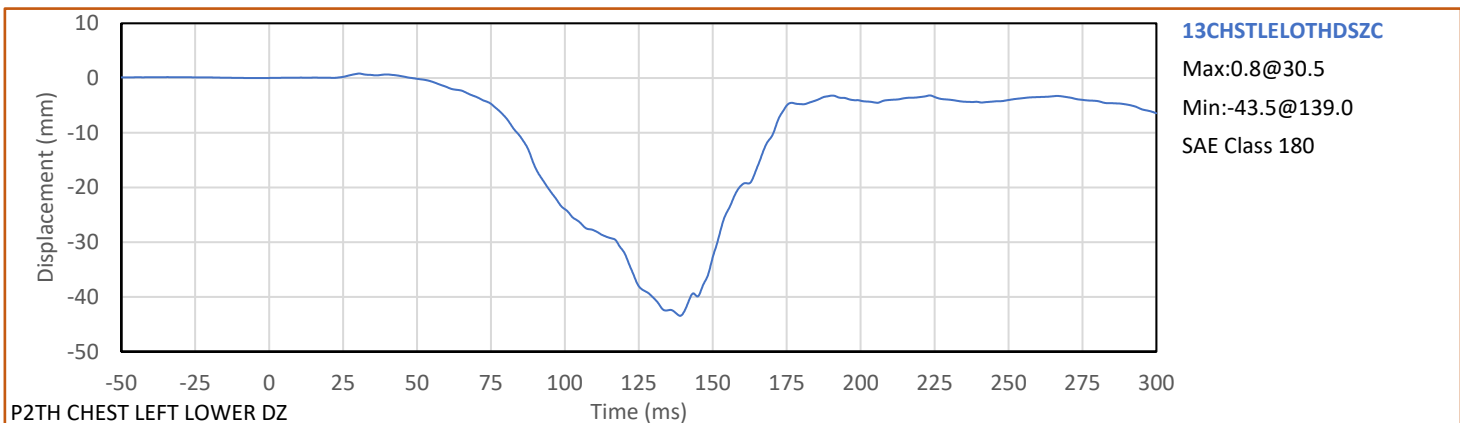
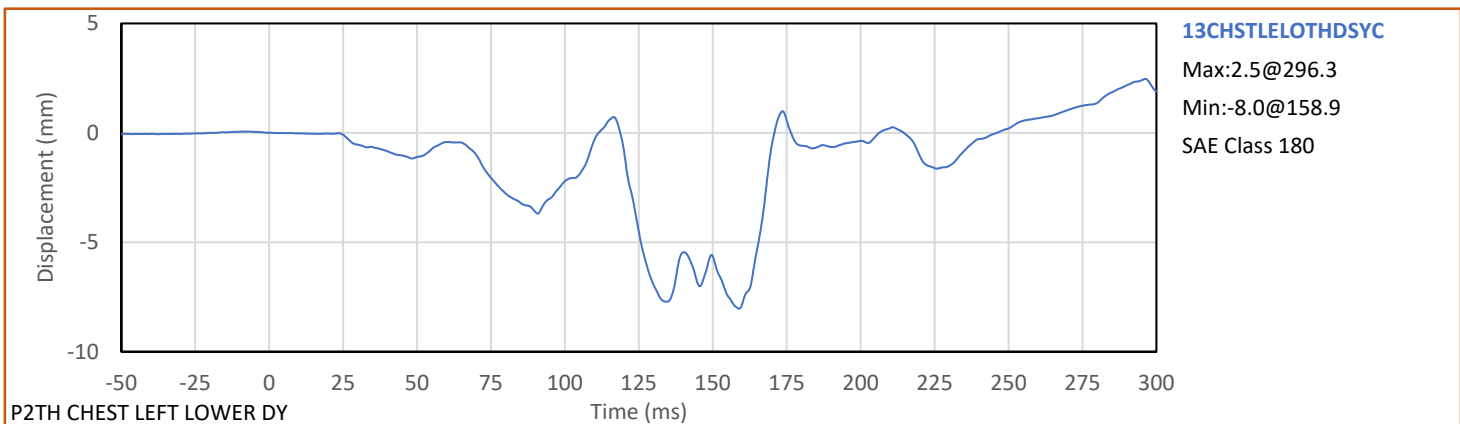
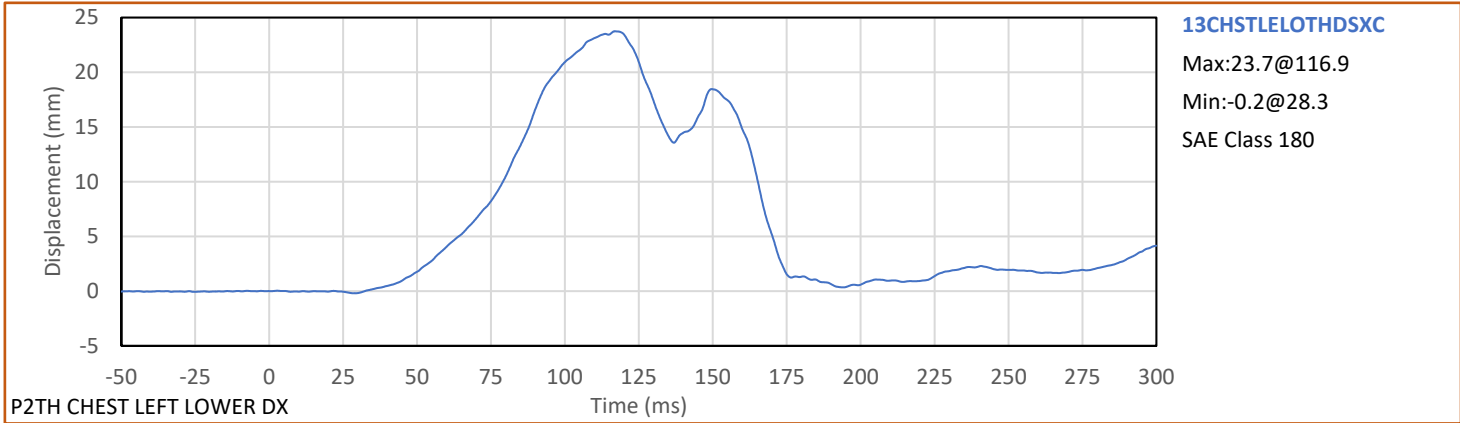
Test Vehicle: 2020 Mazda CX-5 AWD 5-Door MPV
Test Program: Left Side 30° Frontal Rigid Barrier Impact

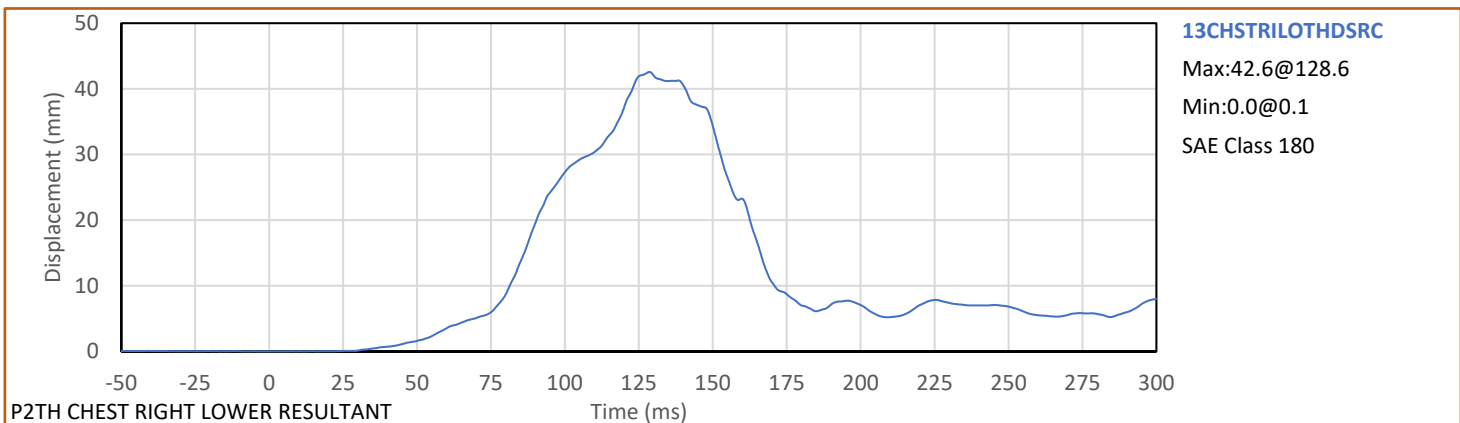
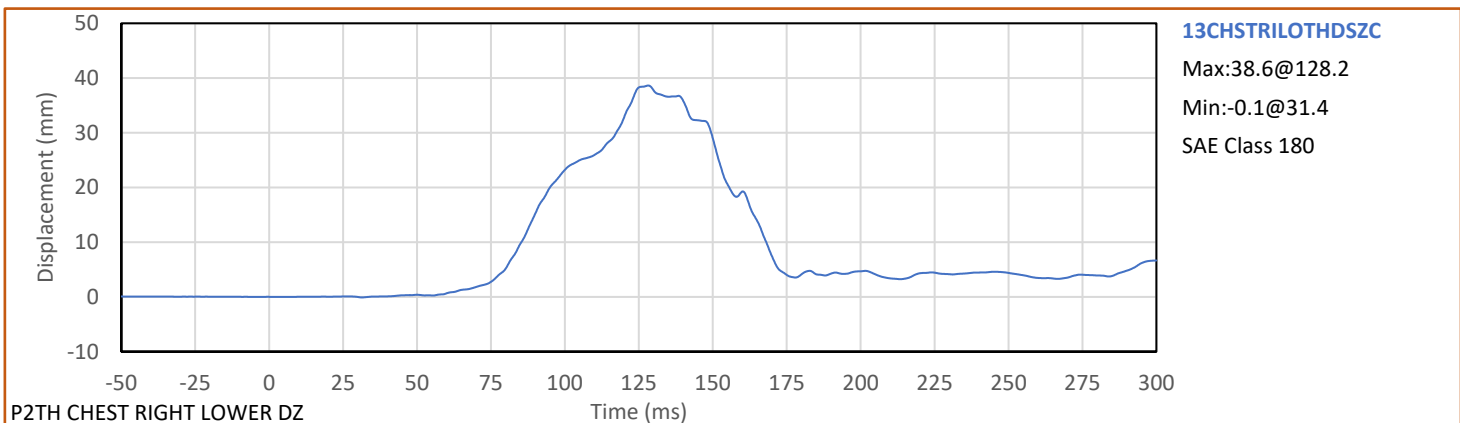
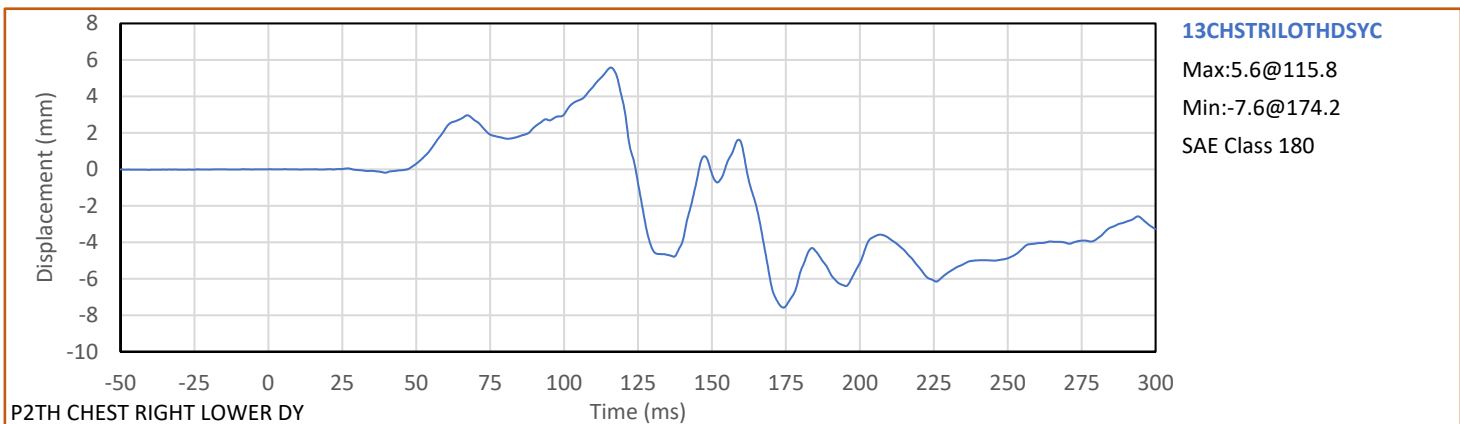
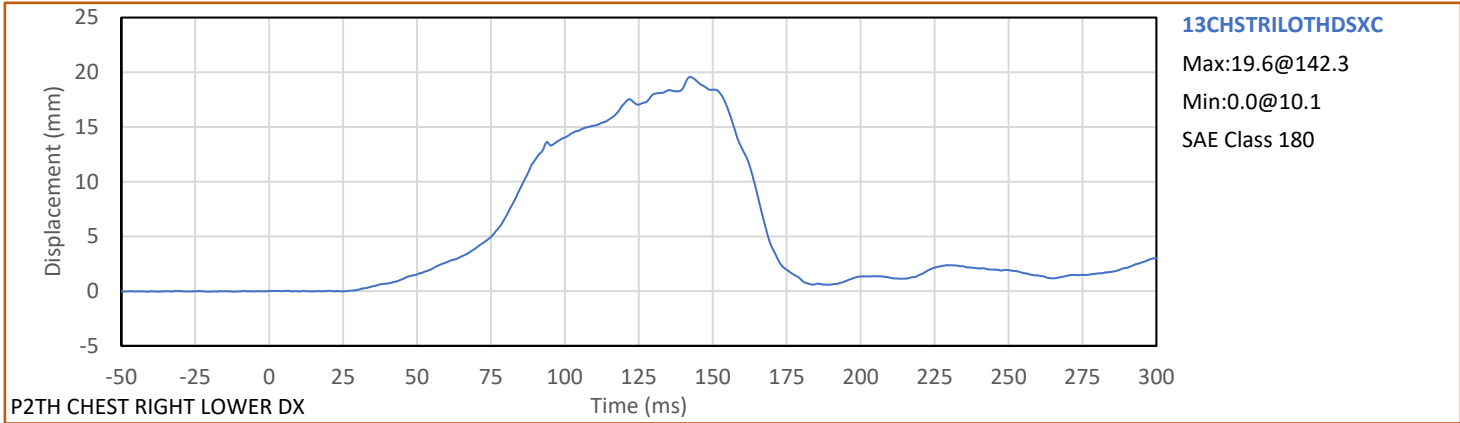
NHTSA No.: R20205417
Test Date: 6/7/2021

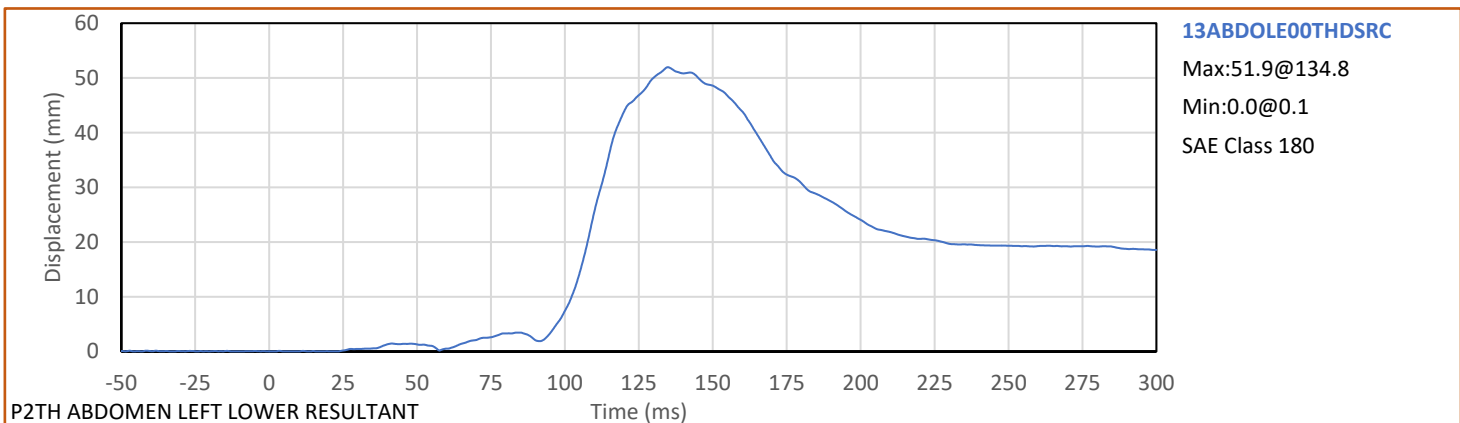
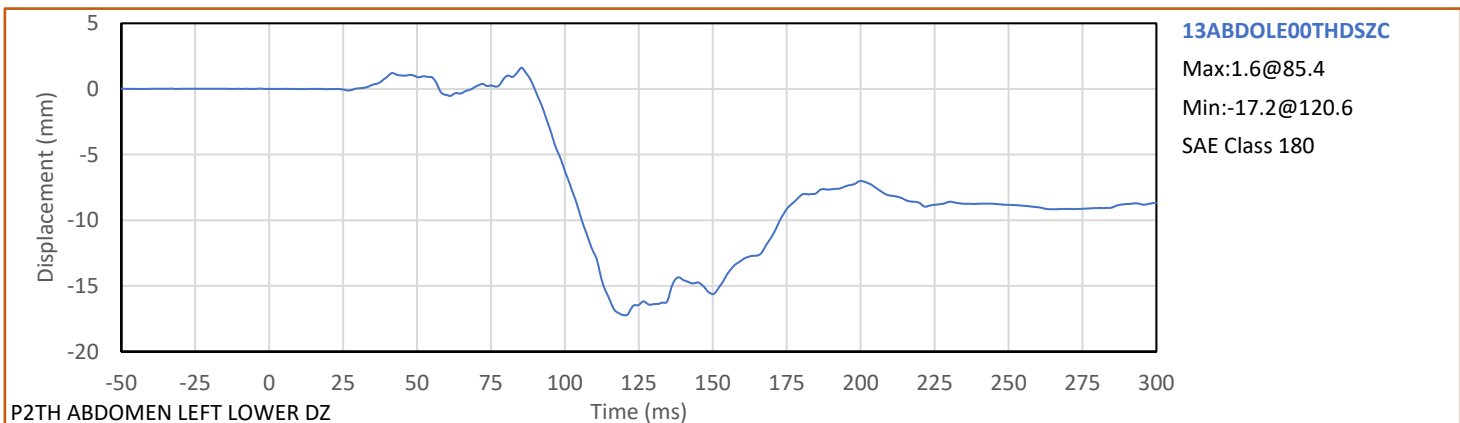
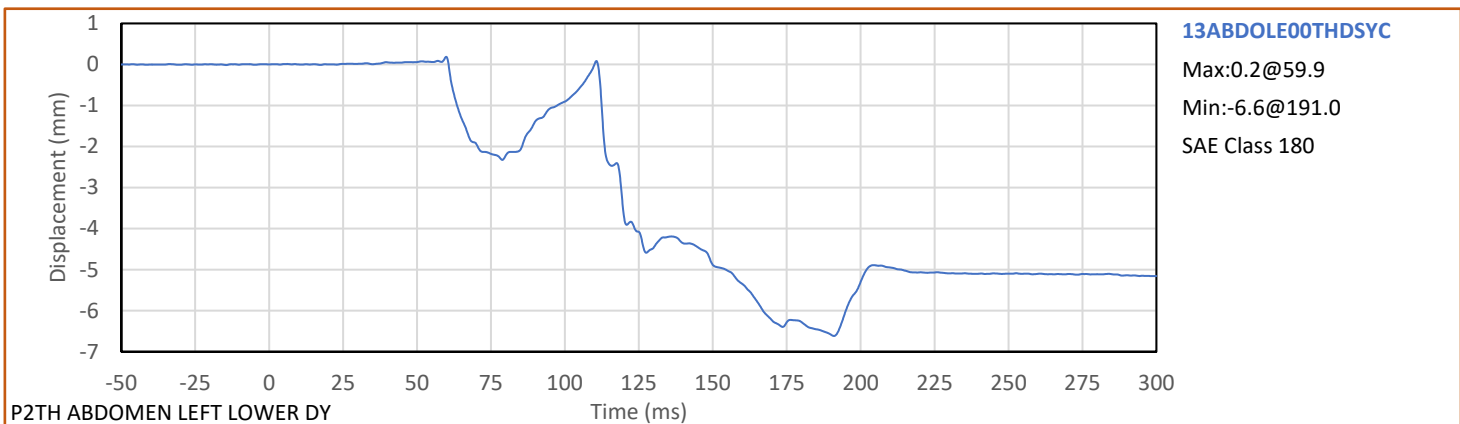
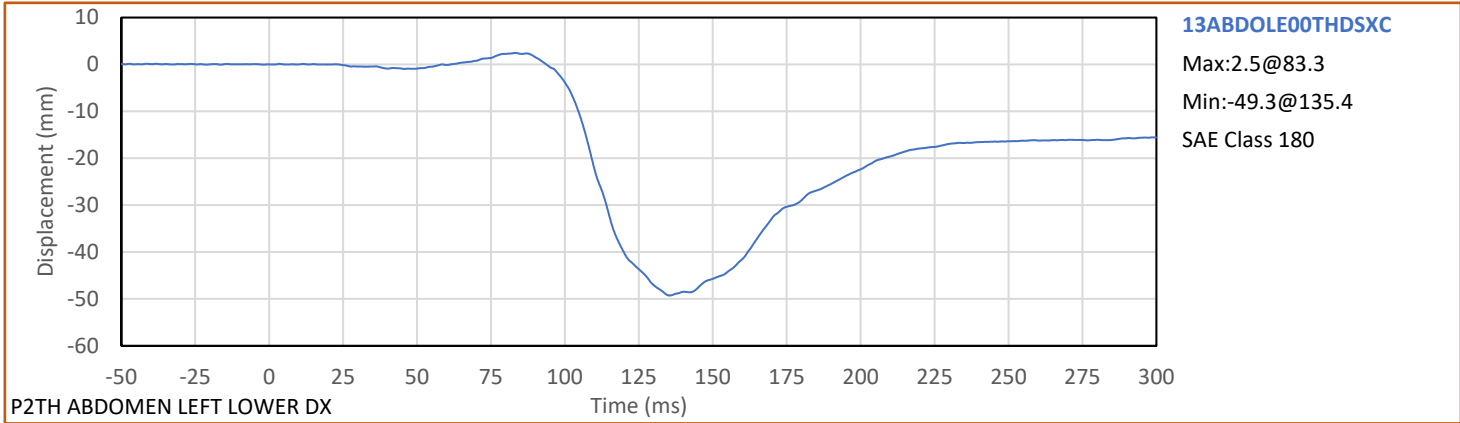


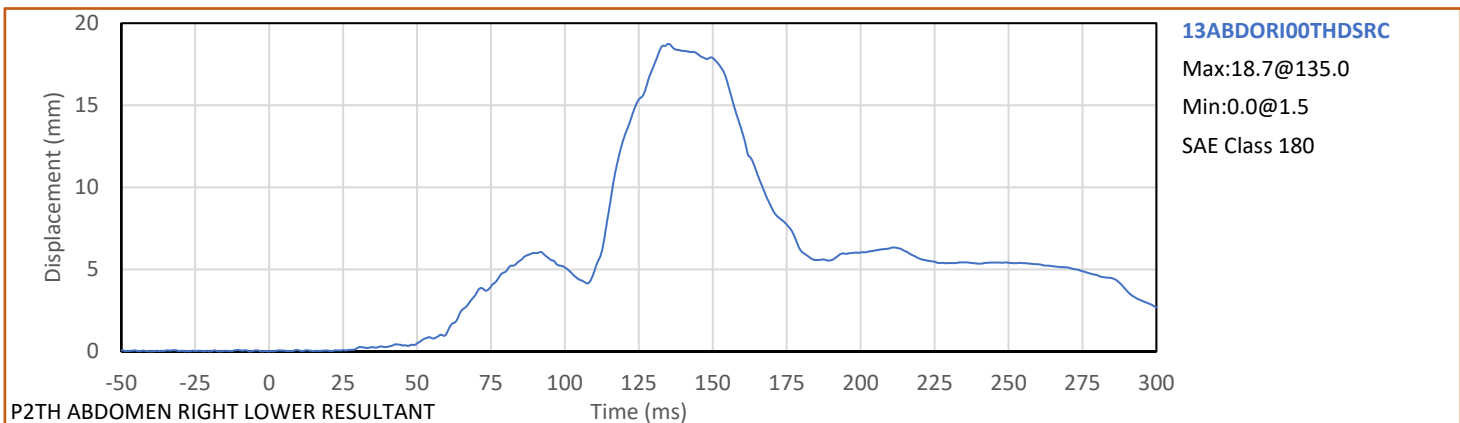
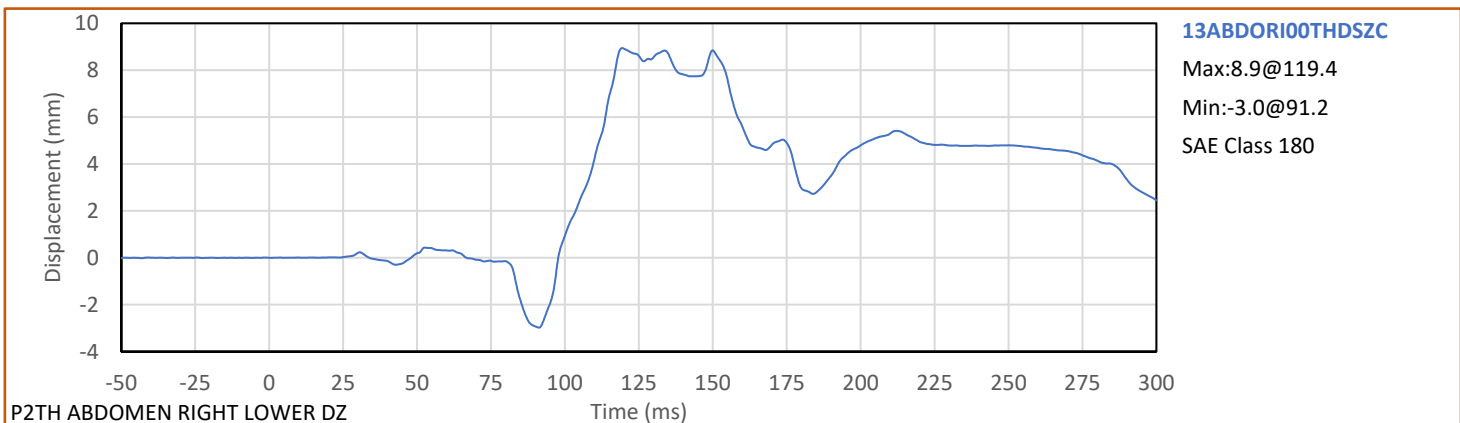
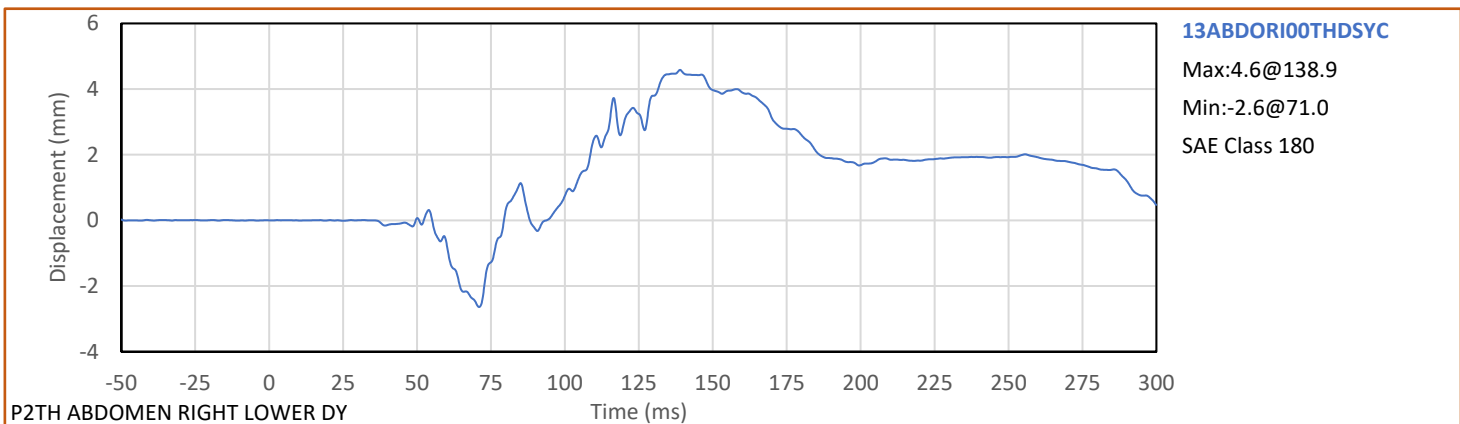
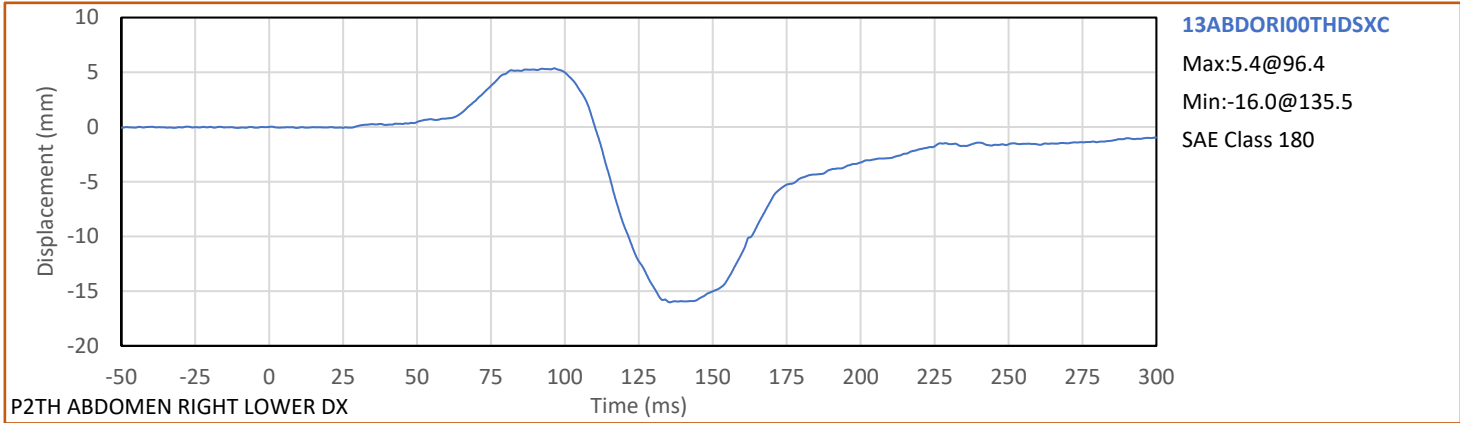








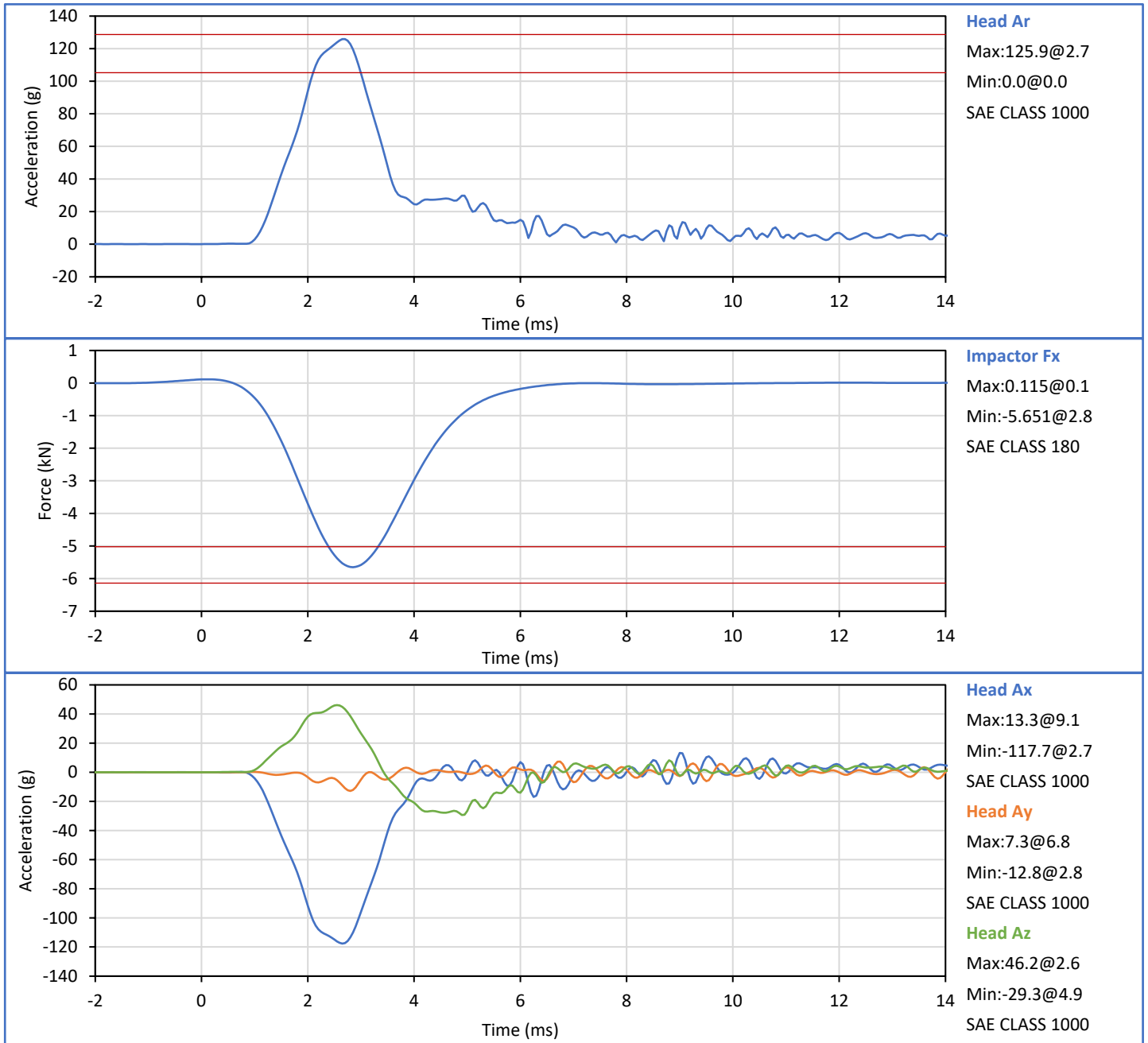




APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
THOR-50M 50TH PERCENTILE MALE ATD
PRE-TEST QUALIFICATION (PARTIAL)

APPENDIX C
ATD Configuration and Performance Verification Data
THOR-50M 50th Percentile Male ATD
Pre-Test Qualification (Partial) S/N: EG2595

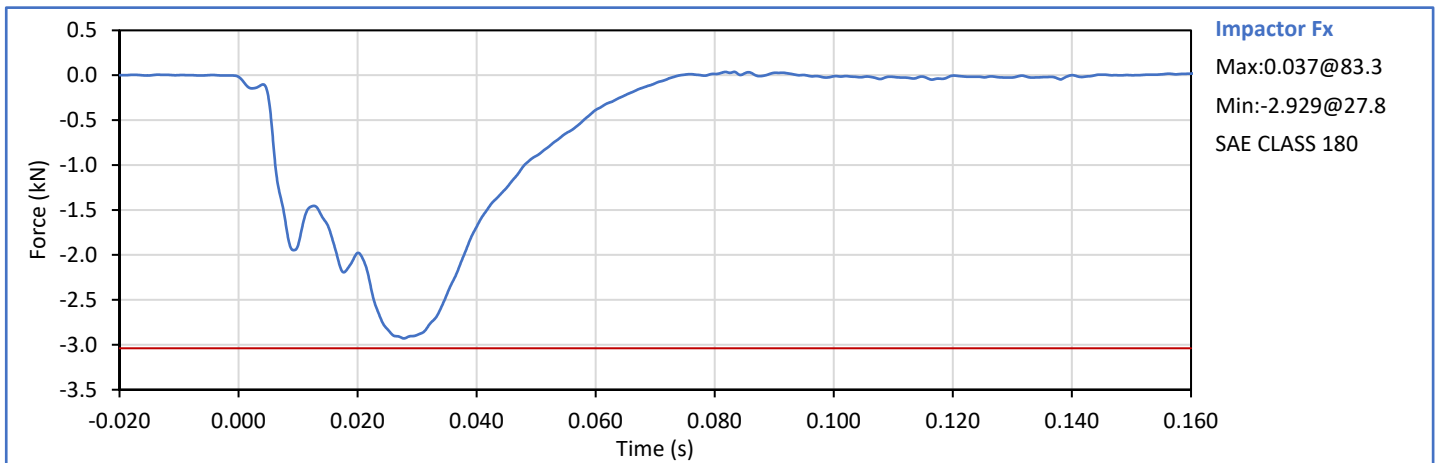
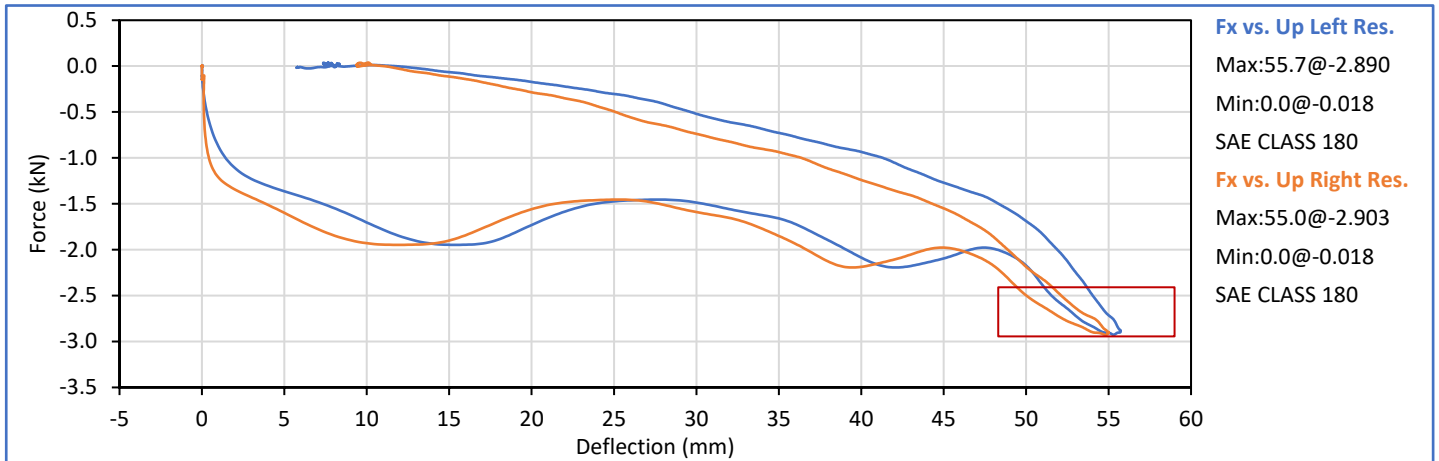
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Velocity	m/s	1.95	2.05	1.97	Pass
Peak Impactor Force	kN	-6.138	-5.022	-5.651	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	125.9	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass





Technician: *J. Hernandez*
J. Hernandez

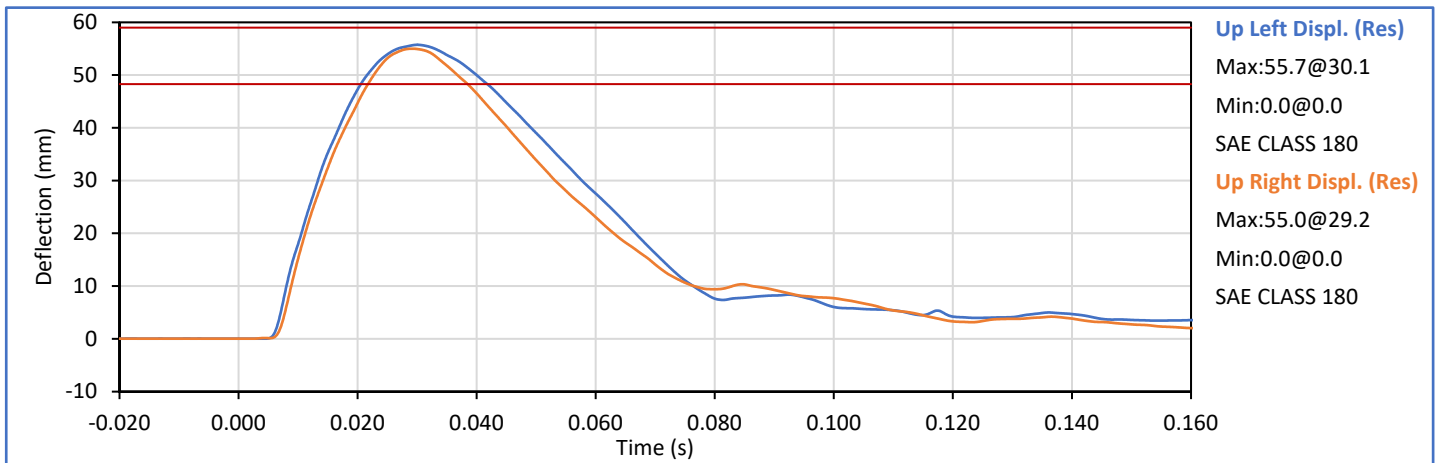
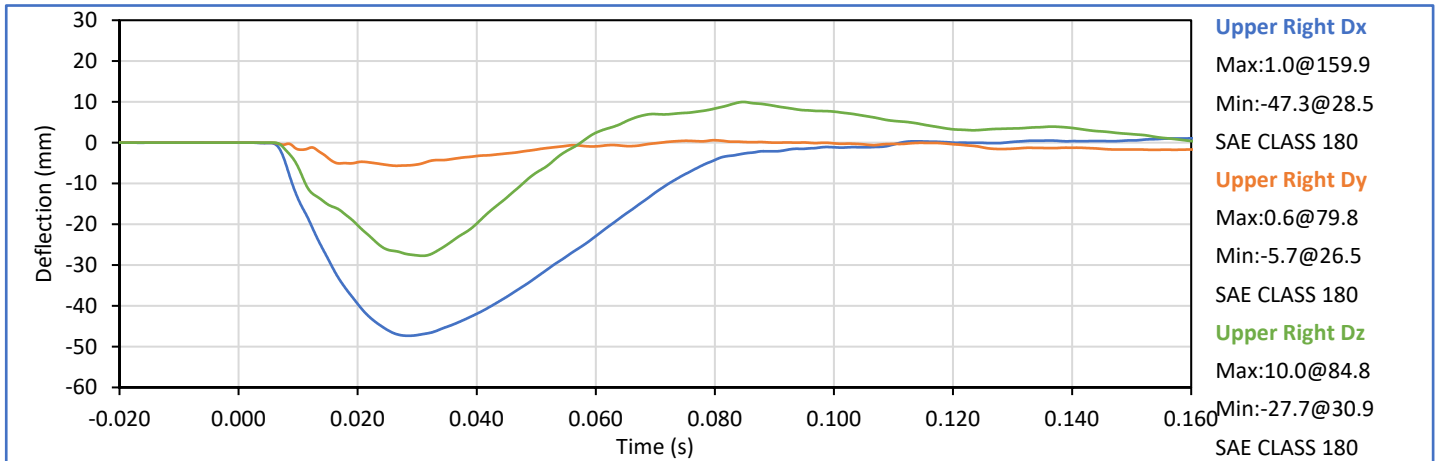
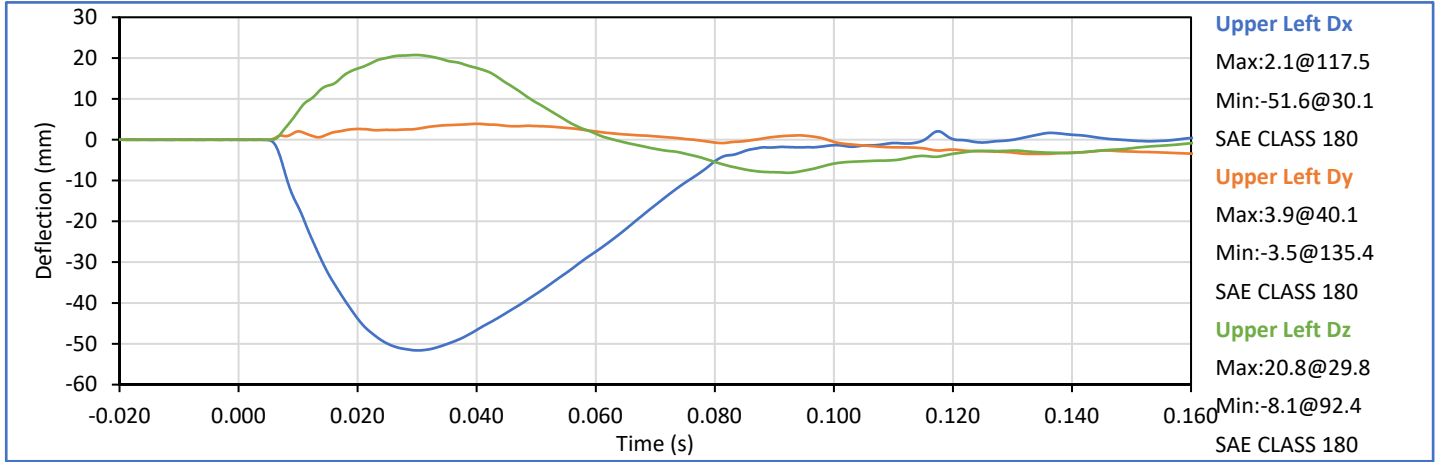
Approved By: *P. Puzuto*
P. Puzuto

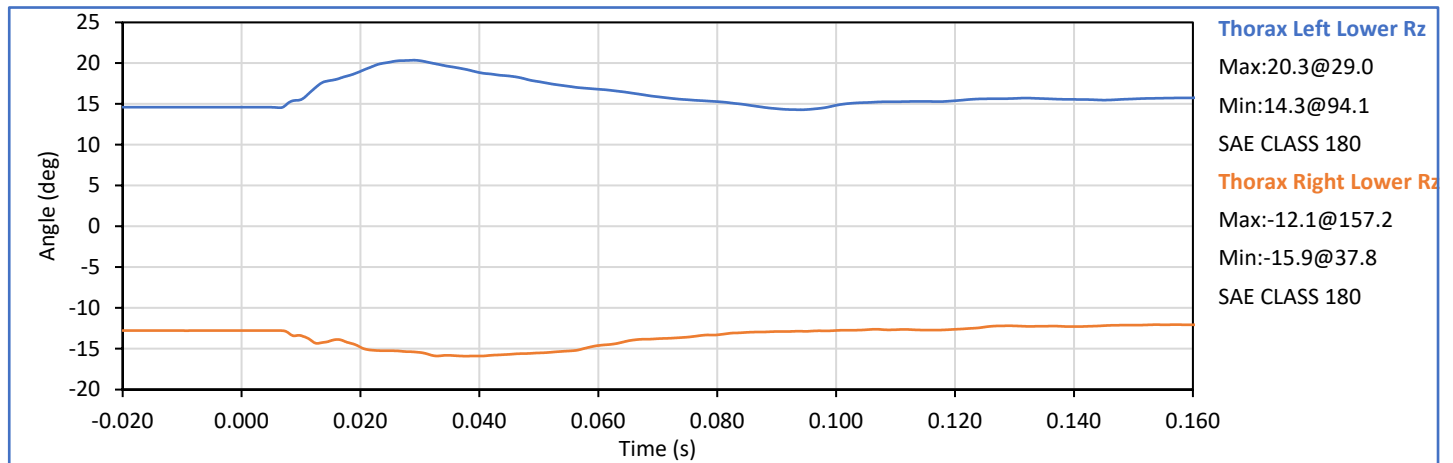
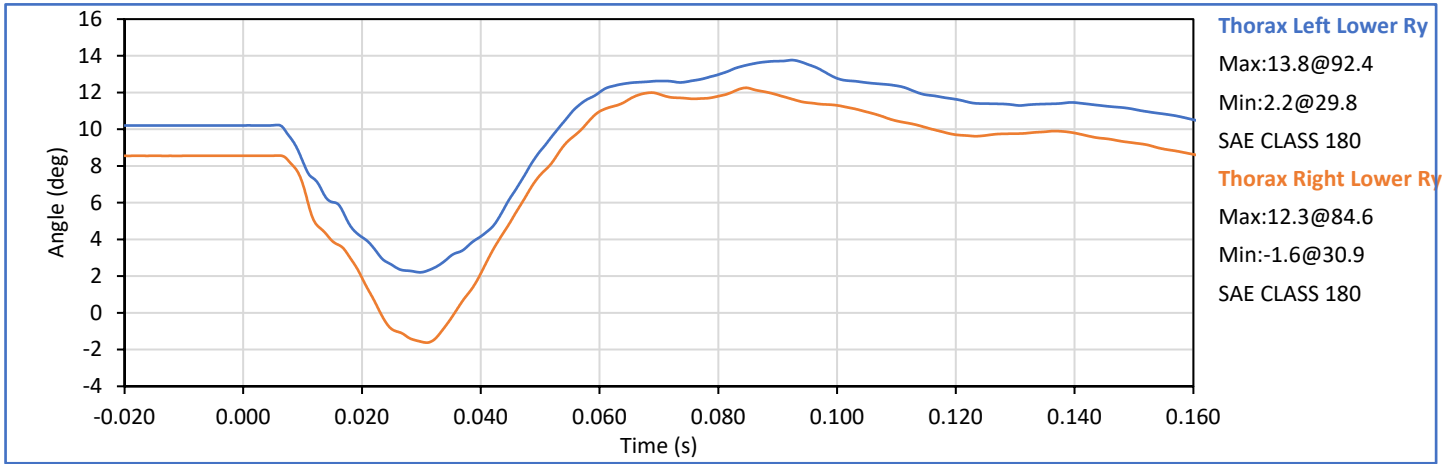
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.30	Pass
Peak Probe Force	kN	-3.039		-2.929	Pass
Peak Upper Left Deflection Res.	mm	48.3	59.0	55.7	Pass
Peak Upper Right Deflection Res.	mm			55.0	Pass
Absolute Difference L/R Defl. Res.	mm	0.0	5.0	0.7	Pass
Force at Peak Upper Left Res.	mm	-2.944	-2.409	-2.890	Pass
Force at Peak Upper Right Res.	mm			-2.903	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass



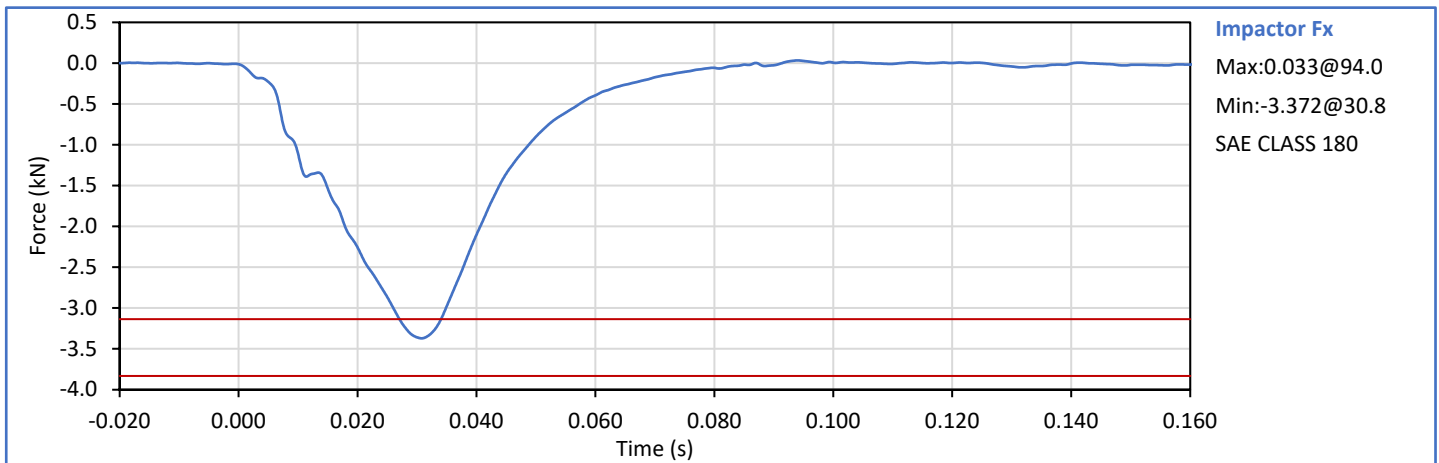
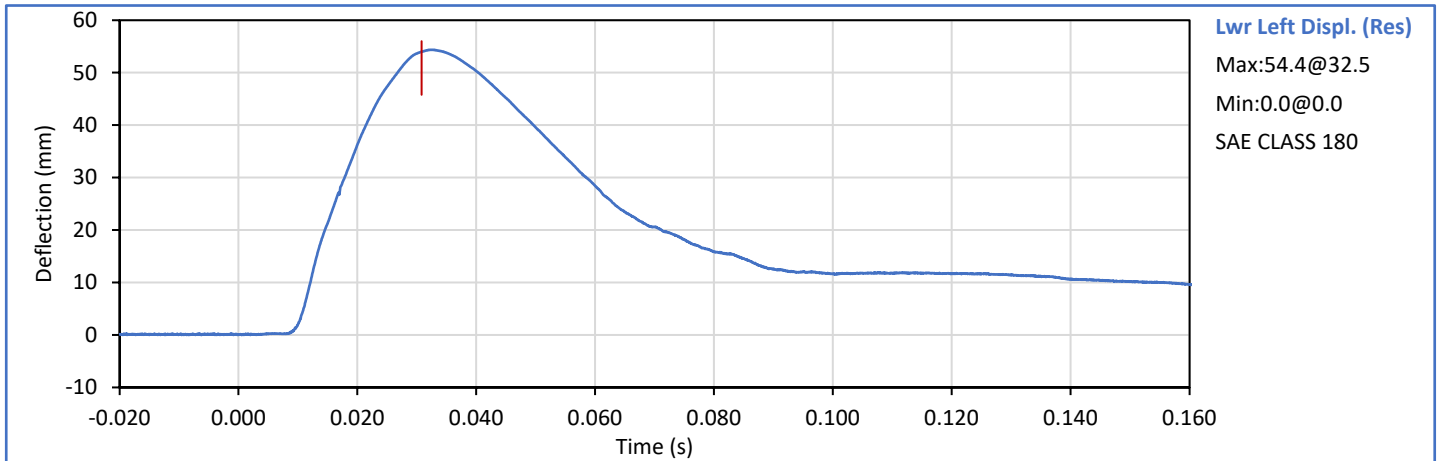
Technician: 
J. Hernandez

Approved By: 
P. Puzzuto






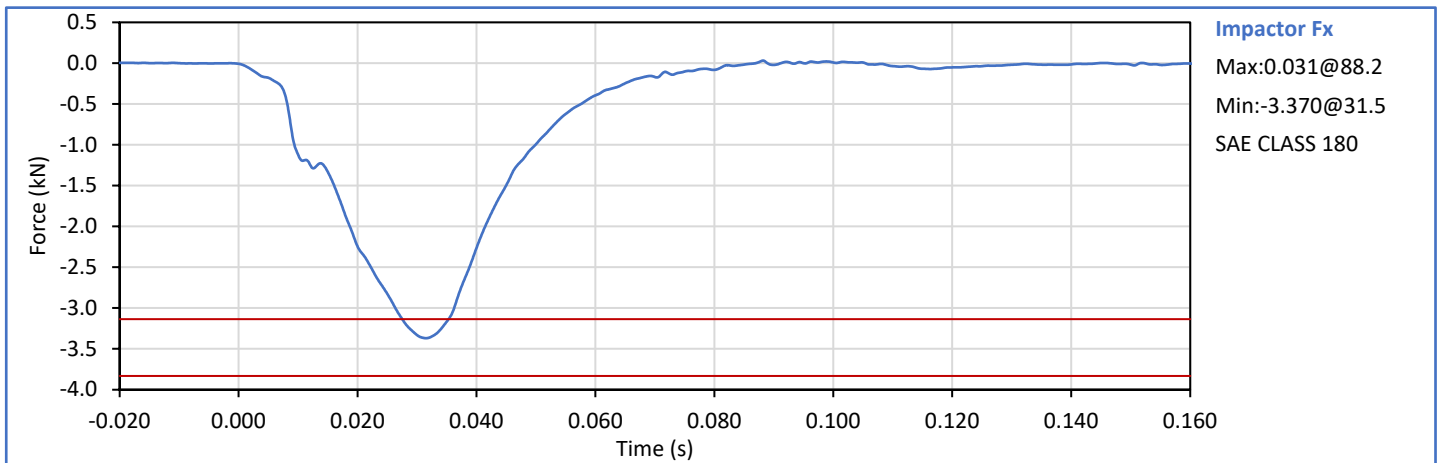
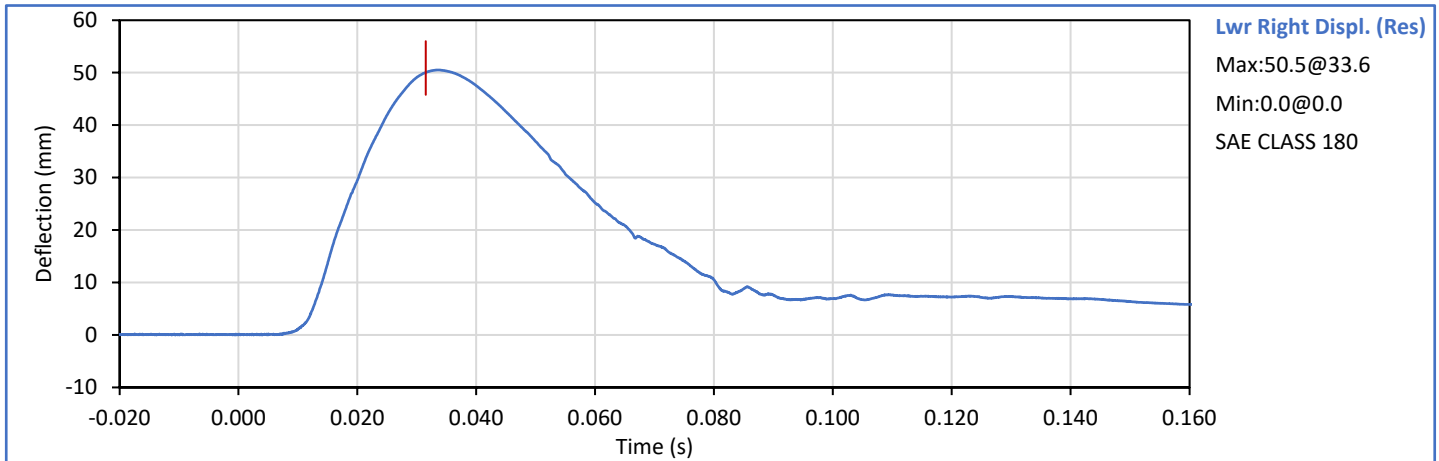
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.372	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	54.0	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

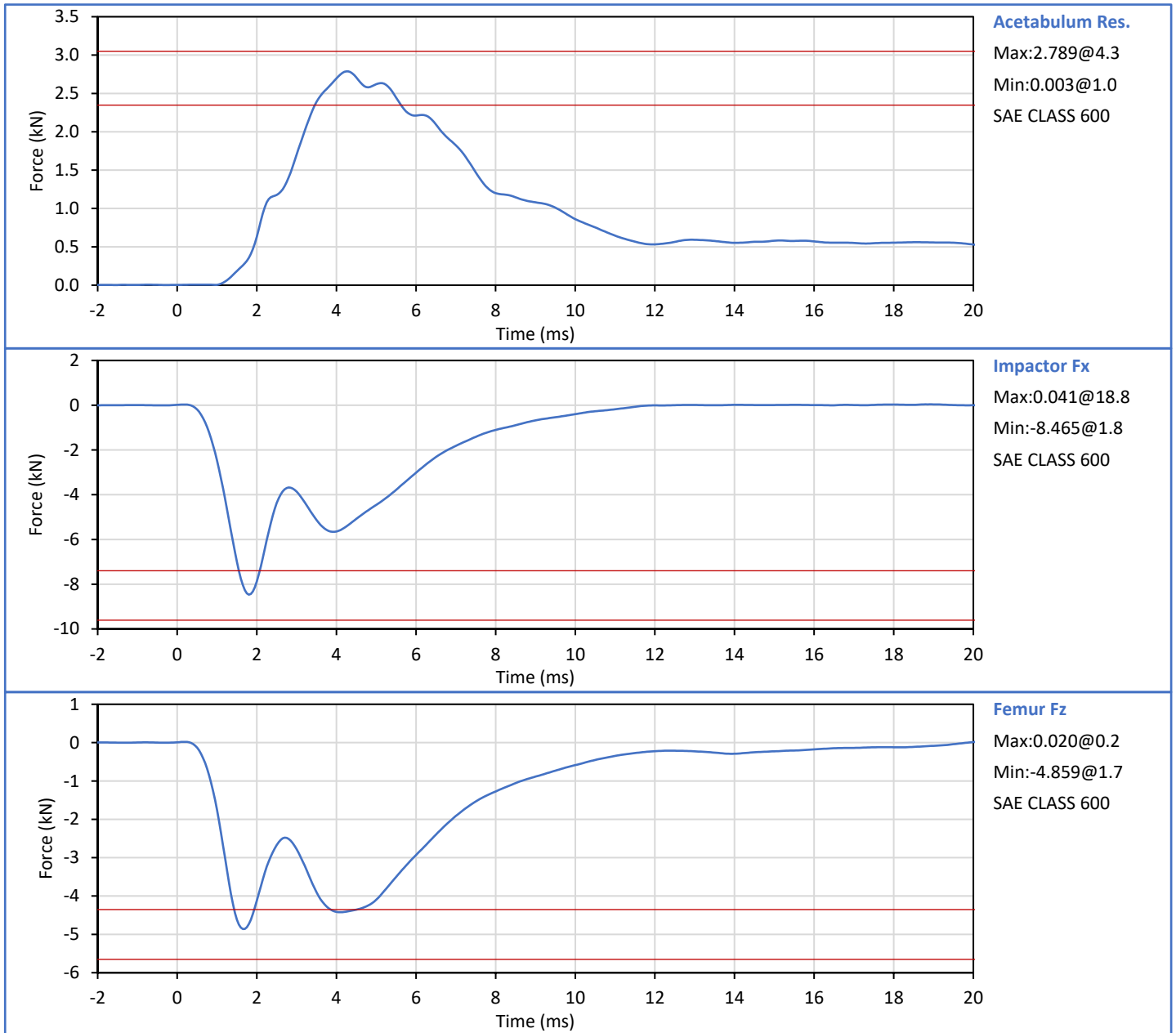
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.370	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	50.0	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

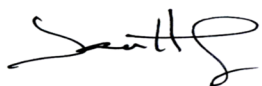



Technician: *J. Hernandez*
 J. Hernandez

Approved By: *P. Puzzuto*
 P. Puzzuto

Tested Parameter	Units	Spec. Low ¹	Spec. High ¹	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	34	Pass
Pendulum Velocity	m/s	3.25	3.35	3.32	Pass
Peak Impactor Force	kN	-9.605	-7.395	-8.465	Pass
Peak Femur Fz	kN	-5.650	-4.350	-4.859	Pass
Acetabulum Force Resultant	kN	2.349	3.051	2.789	Pass
NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass

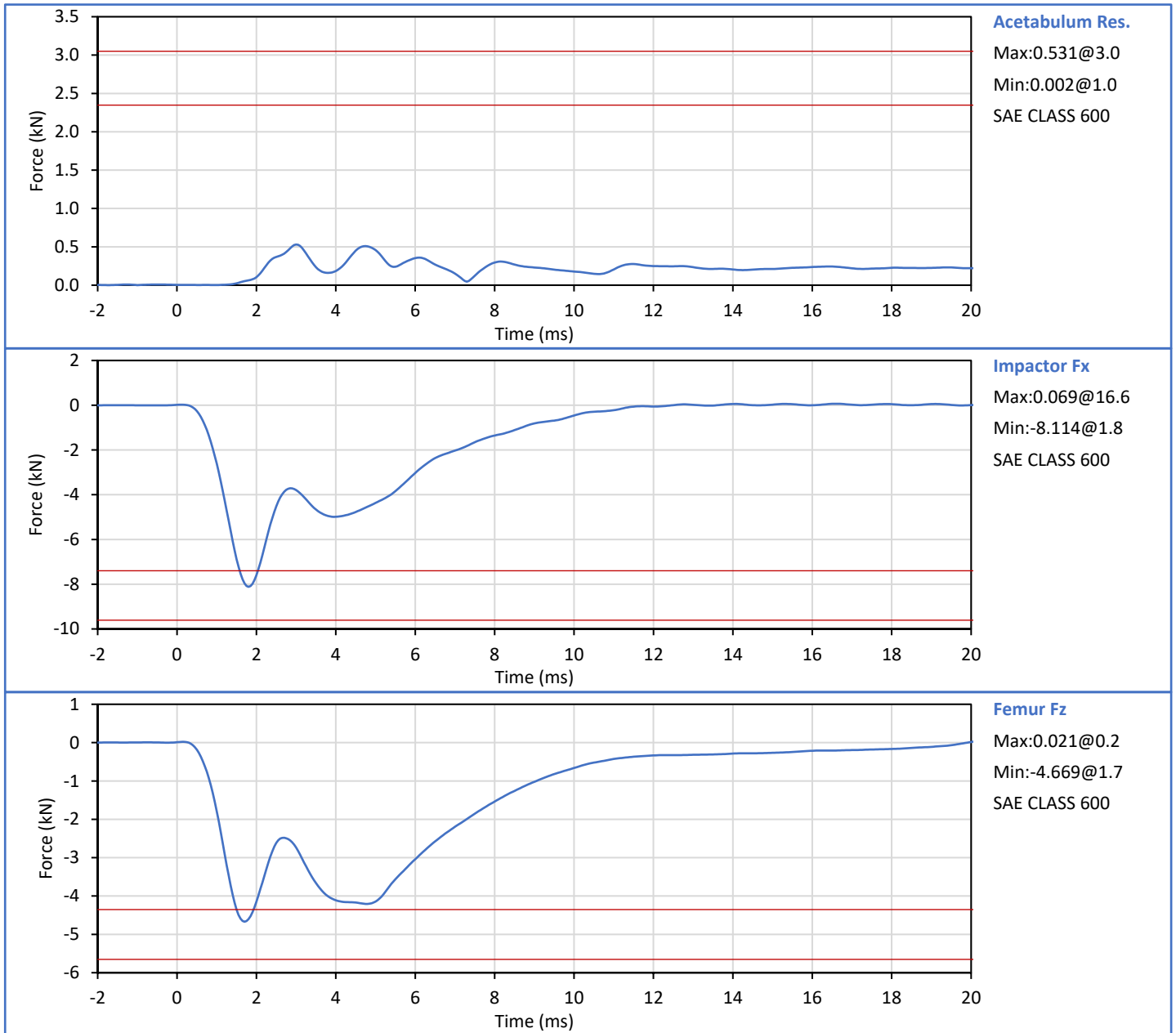


Technician: 
J. Hernandez


Approved By: 
P. Puzzuto

Tested Parameter	Units	Spec. Low ¹	Spec. High ¹	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	34	Pass
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Impactor Force	kN	-9.605	-7.395	-8.114	Pass
Peak Femur Fz	kN	-5.650	-4.350	-4.669	Pass
Acetabulum Force Resultant	kN	2.349	3.051	0.531	Fail
NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Fail

* Acetabulum Load Cell Fx is not functioning



Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

APPENDIX C
ATD Qualification and Performance Verification
Hybrid III 50th Percentile Male ATD
Pre-Test Qualification (Partial) S/N: 168

ATD Serial No.: 168

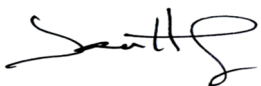
Test Date: 2021-05-26


Dummy Item	Inspect for	Comments	Damage	OK
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

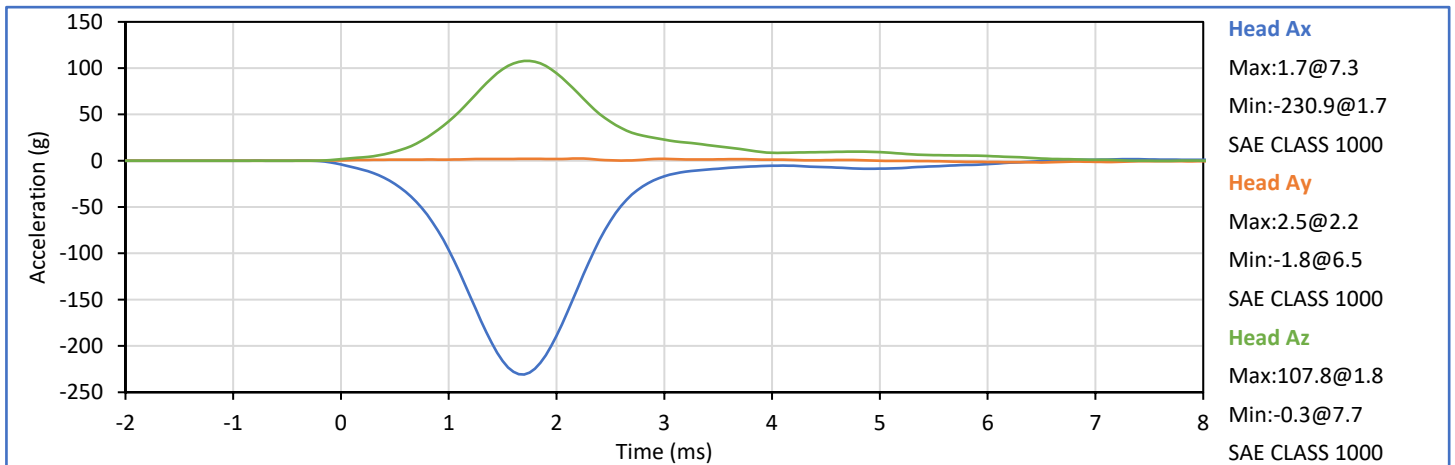
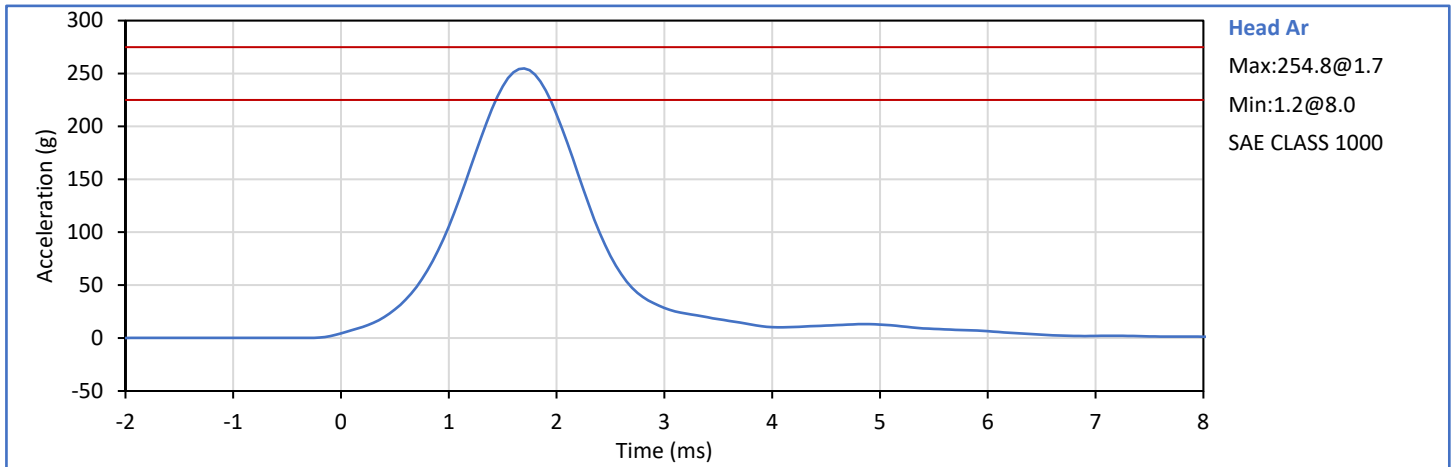
No Problems Found

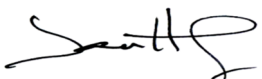
Due to data excursions in the Head Redundant Ay and Head Redundant Az, sensors and cabling was checked to ensure accelerometers are properly secured and cabling is properly strain relieved; no issues found.


Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

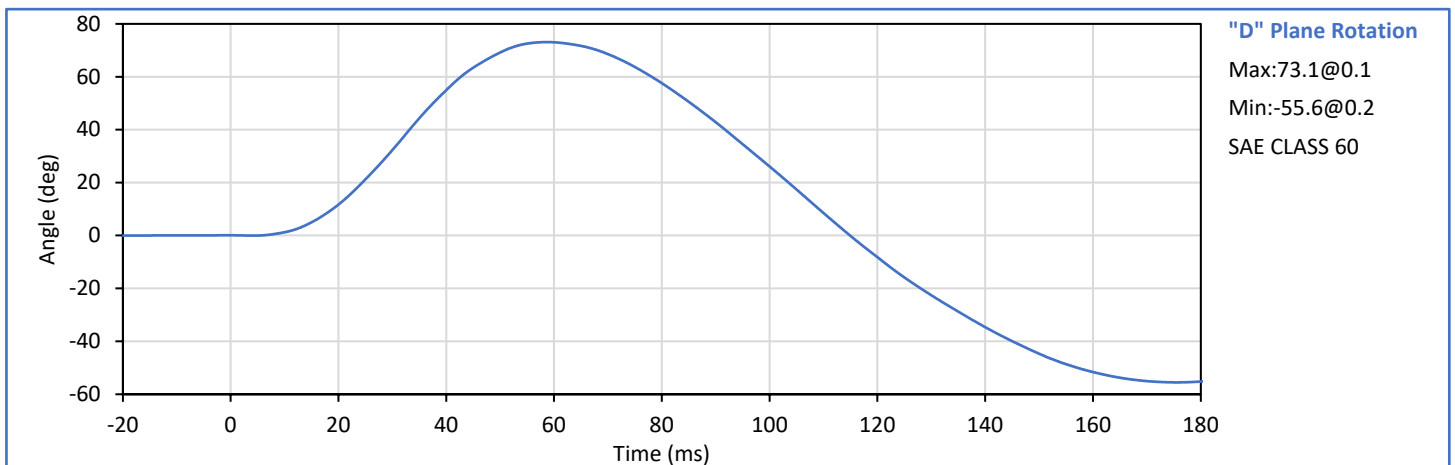
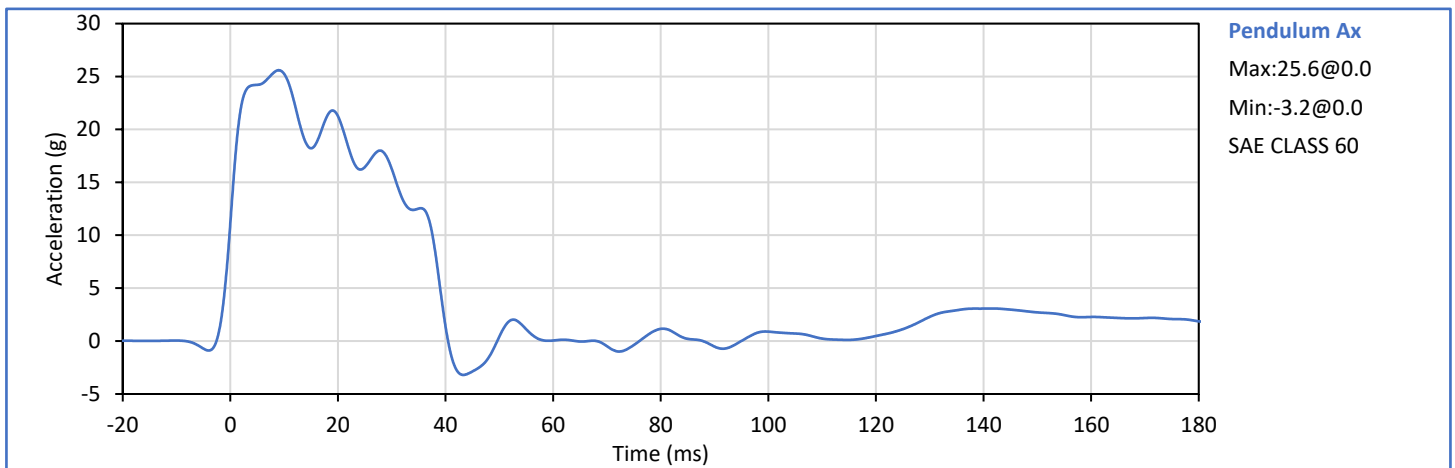
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	225.0	275.0	254.8	Pass
Peak Lateral Acceleration	g	-15.0	15.0	2.5	Pass
Oscillations After Main Pulse	%	0.0	10.0	3.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass




Technician: 
J. Hernandez

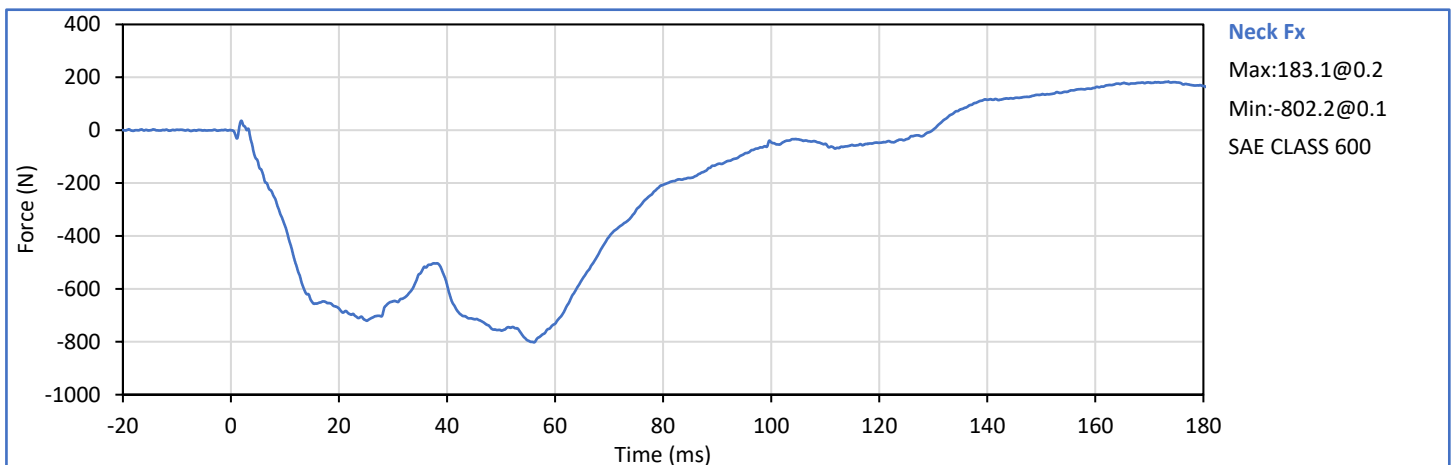
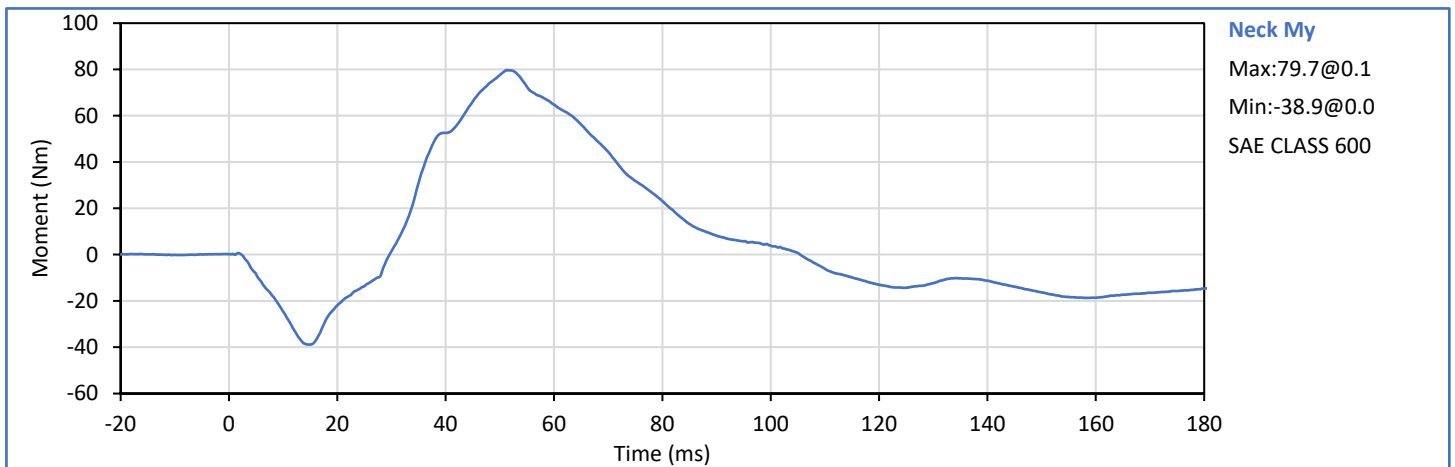
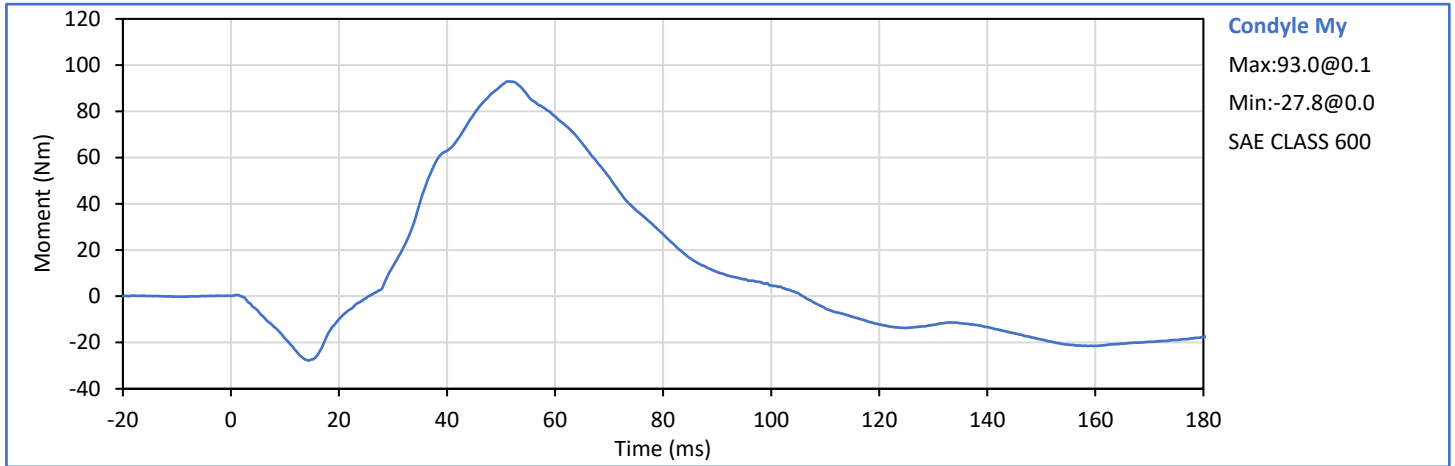
Approved By: 
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	7.03	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	25.2	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.3	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	16.3	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	16.3	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	39.0	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.1	Pass
	ms	57.0	64.0	58.7	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	115.0	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	93.0	Pass
	ms	47.0	58.0	51.4	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	105.9	Pass
Overall Test Results					Pass

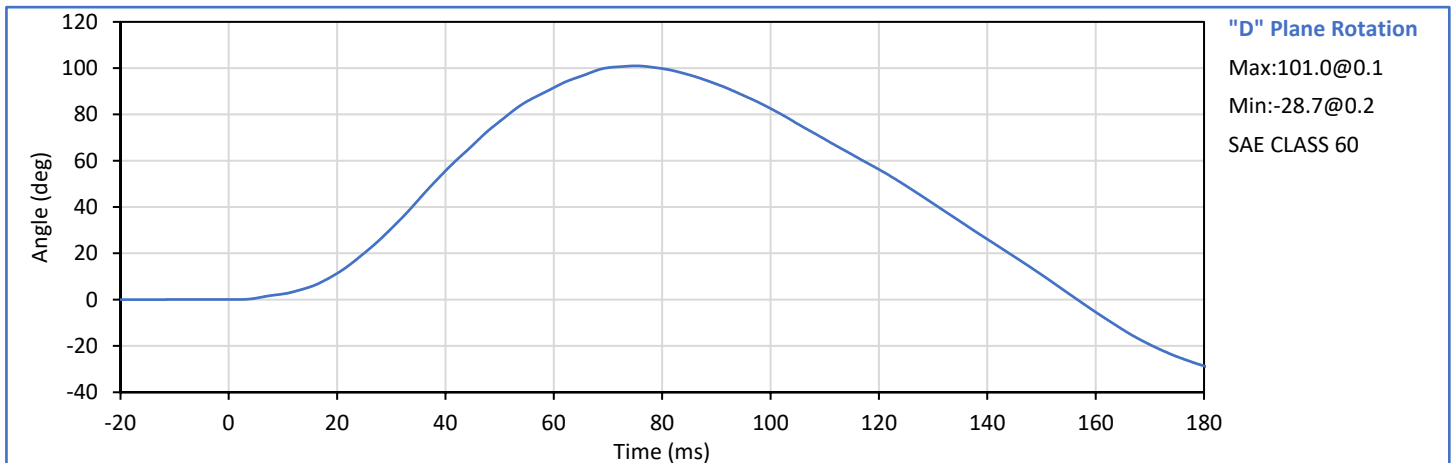
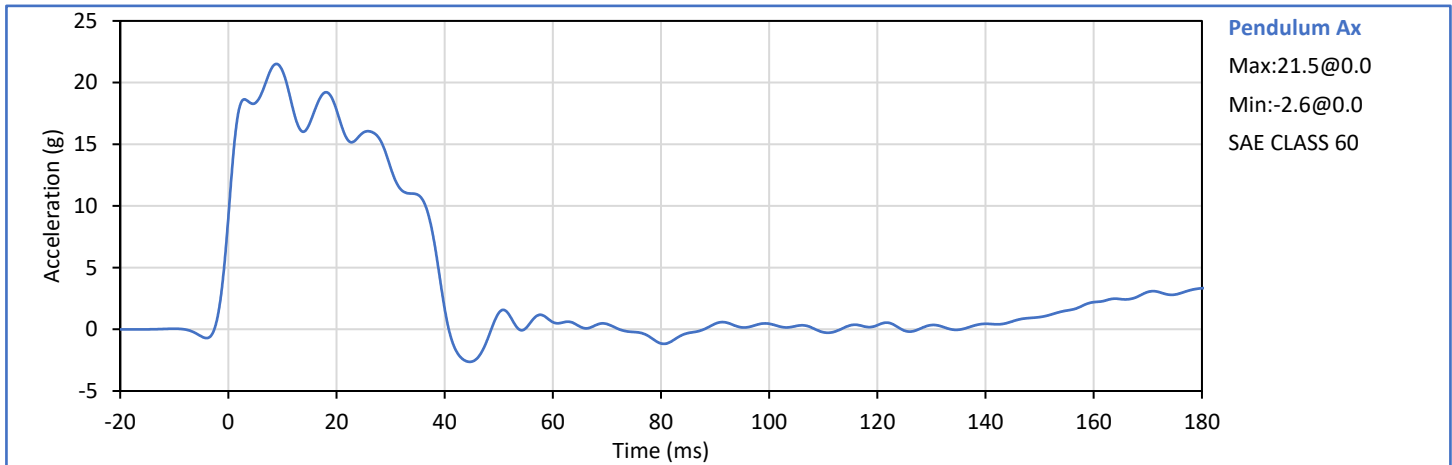


Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

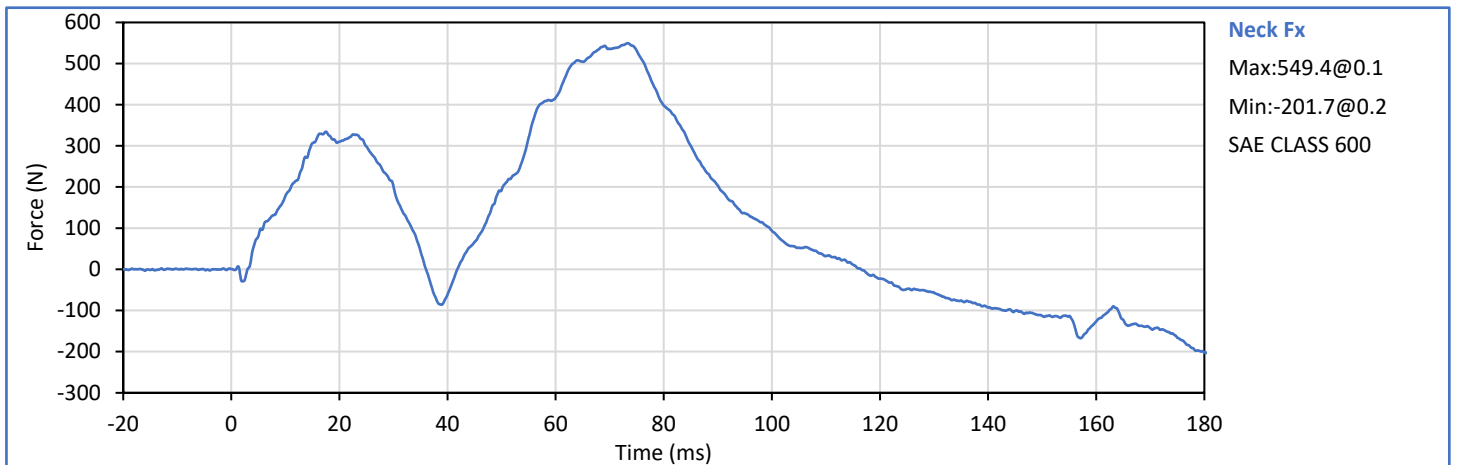
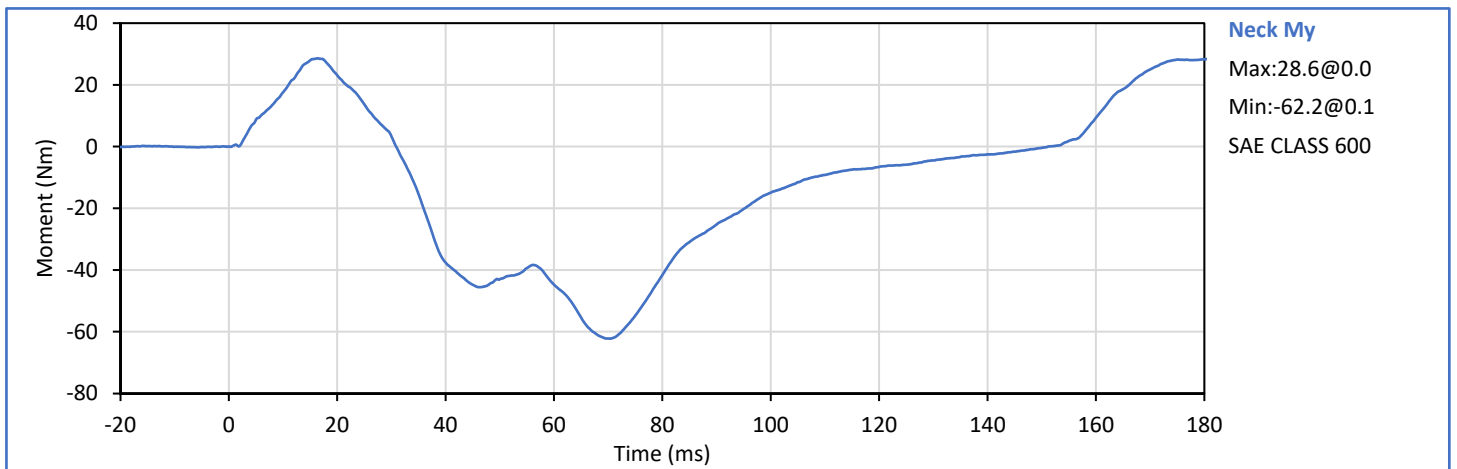
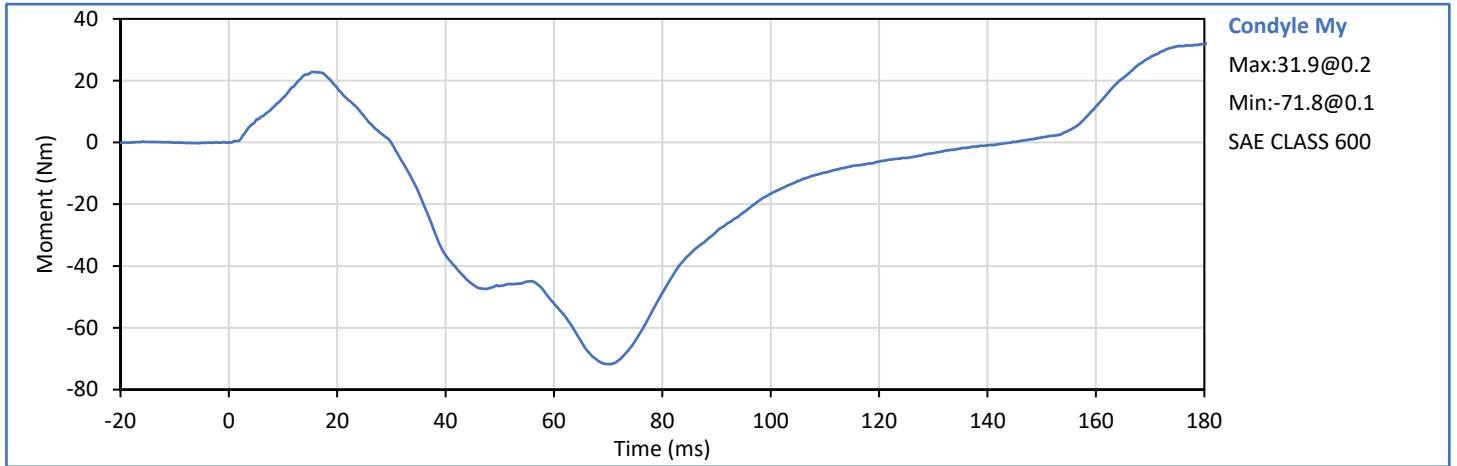


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	5.94	6.19	6.16	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	21.0	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	17.8	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.1	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.1	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	38.8	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.0	Pass
	ms	72.0	82.0	75.2	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	156.7	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-71.8	Pass
	ms	65.0	79.0	70.4	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	144.4	Pass
Overall Test Results					Pass

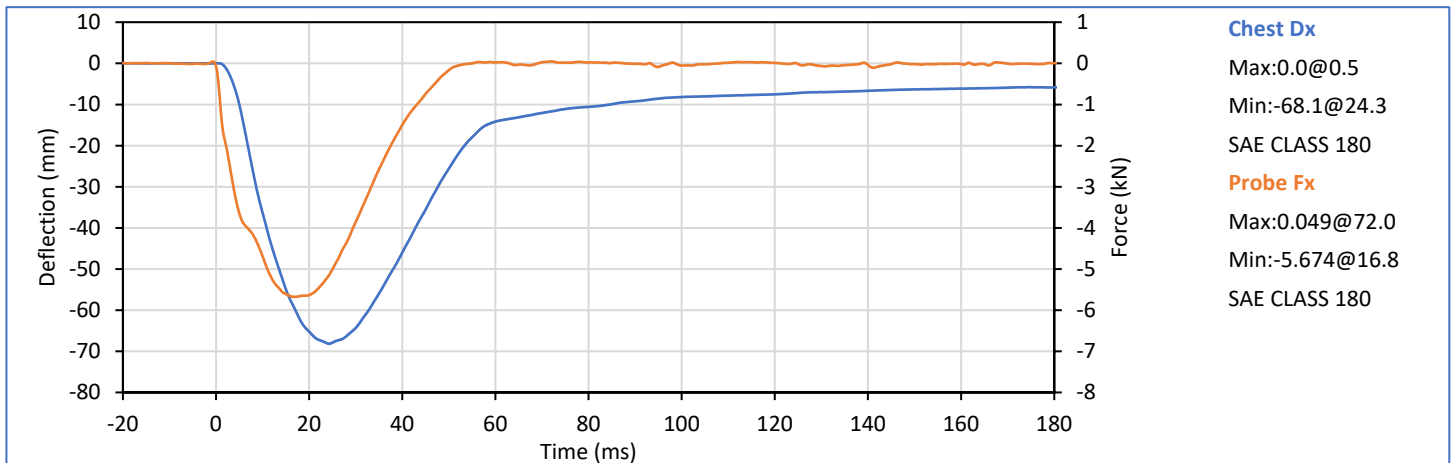
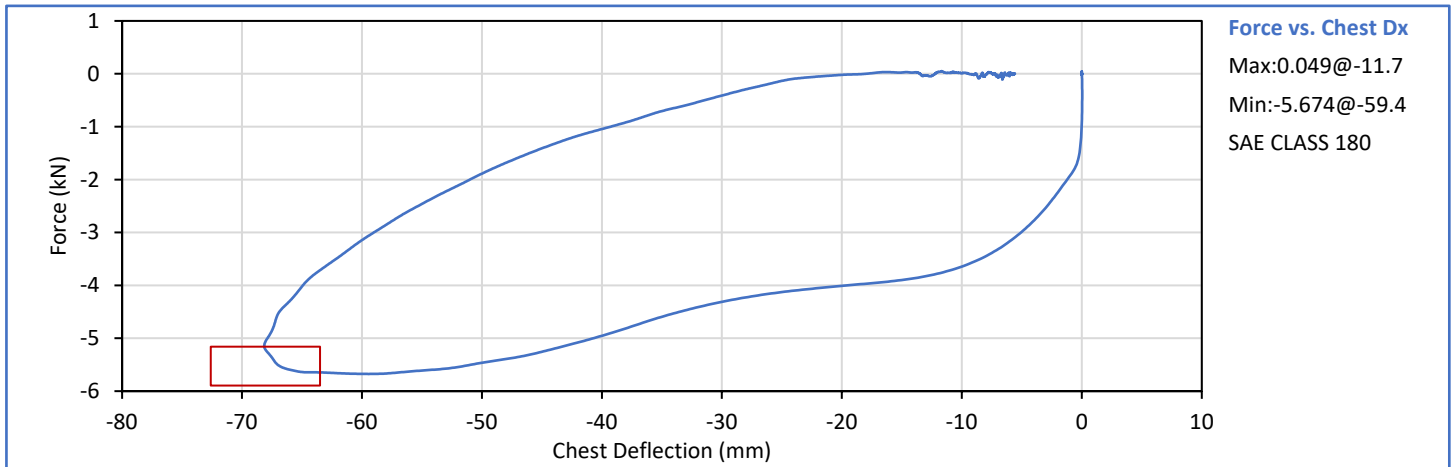


Technician: *J. Hernandez*
J. Hernandez


Approved By: *P. Puzzuto*
P. Puzzuto



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Probe Velocity	m/s	6.58	6.82	6.71	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-68.1	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.674	Pass
Internal Hysterisis	%	69.0	85.0	74.1	Pass
Overall Test Results					Pass



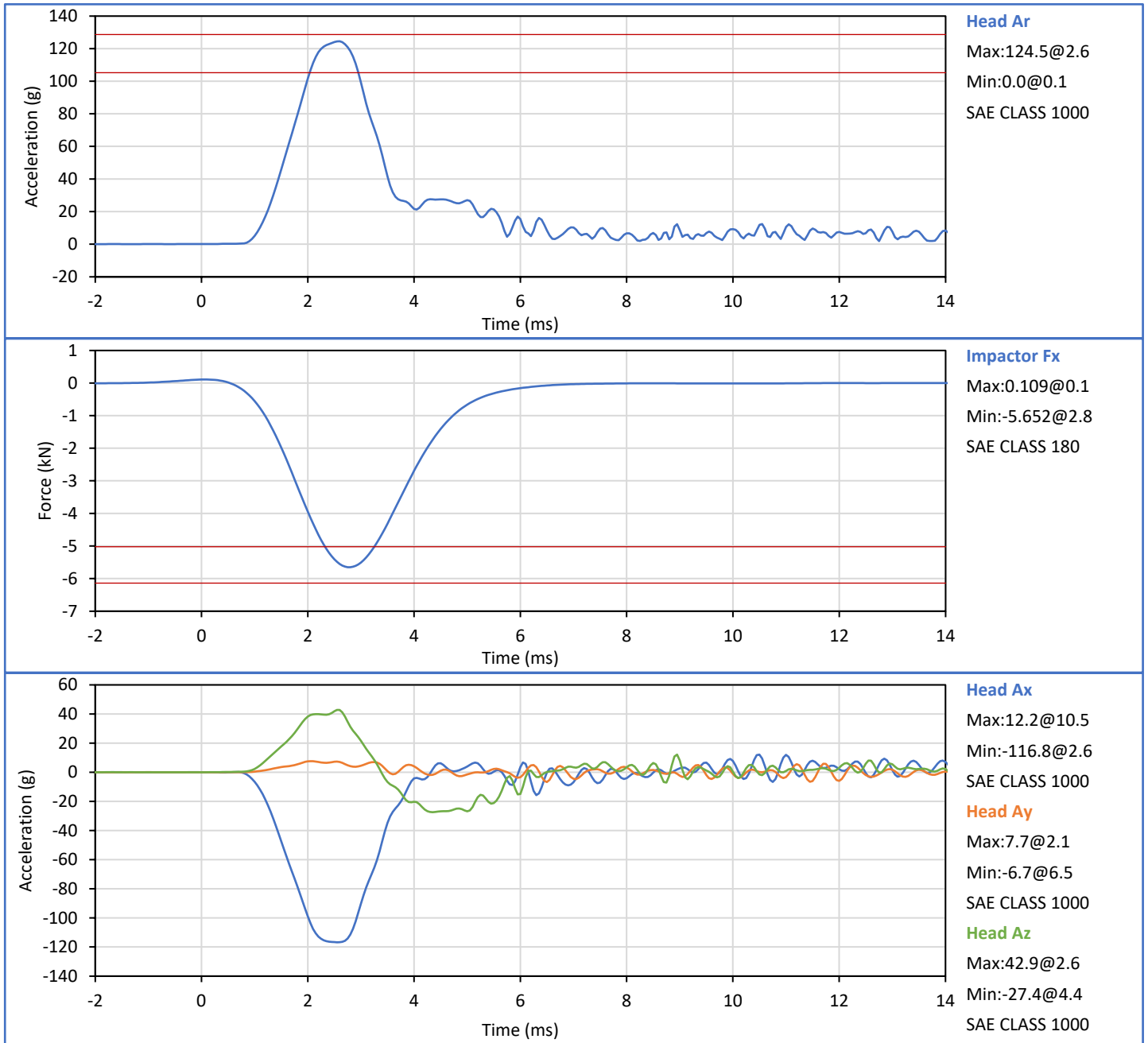
Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

APPENDIX D
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA
THOR-50M 50TH PERCENTILE MALE ATD
POST-TEST QUALIFICATION (FULL)

APPENDIX D
ATD Configuration and Performance Verification Data
THOR-50M 50th Percentile Male ATD
Post-Test Qualification (Partial) S/N: EG2595

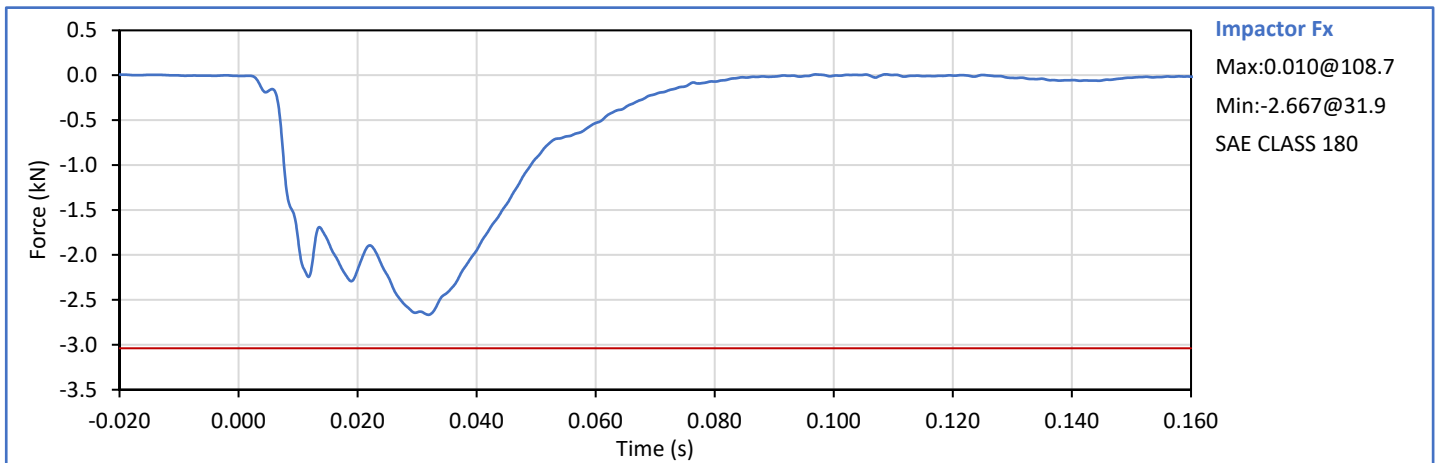
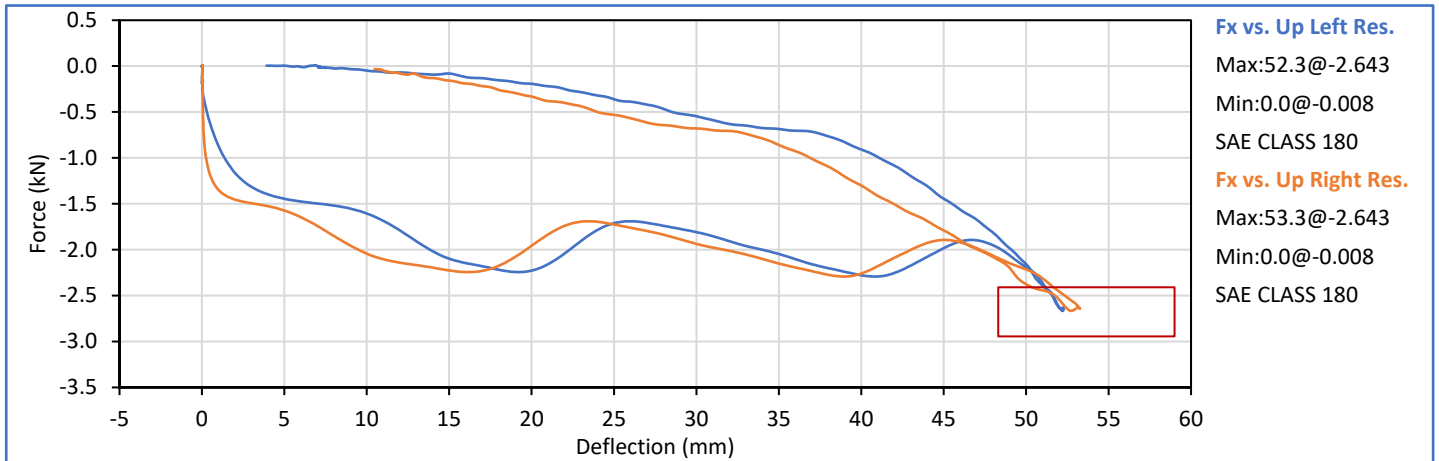
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Velocity	m/s	1.95	2.05	1.97	Pass
Peak Impactor Force	kN	-6.138	-5.022	-5.652	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	124.5	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass




Technician: *J. Hernandez*
J. Hernandez

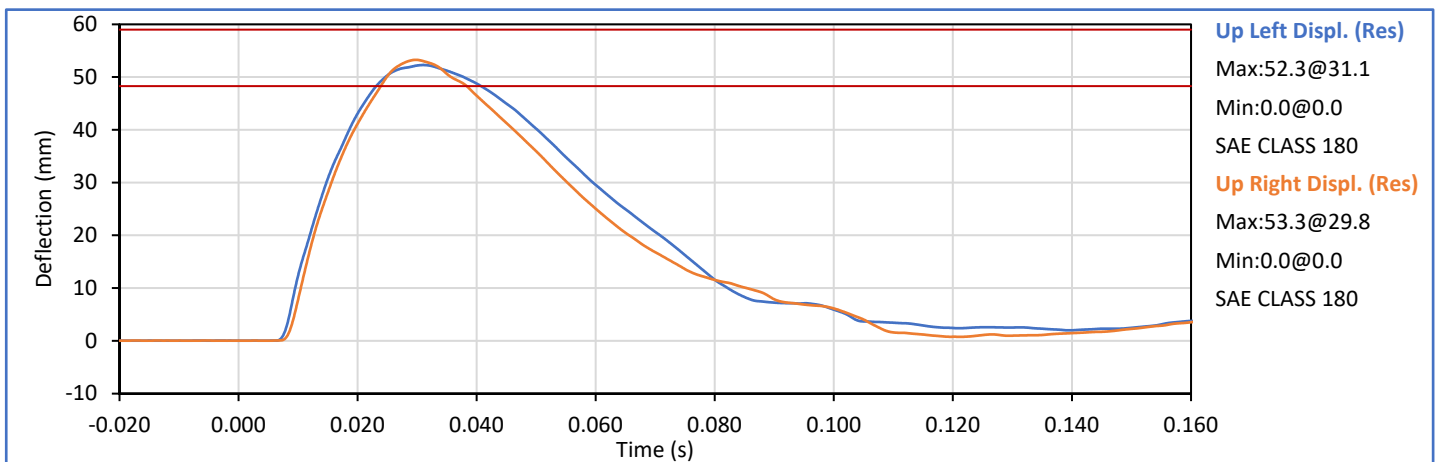
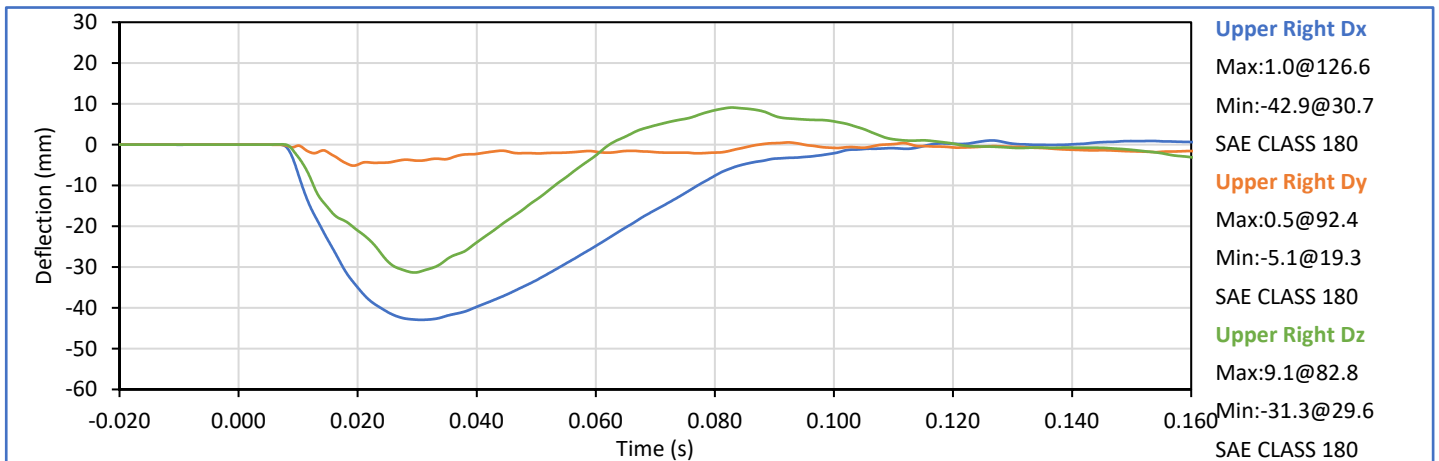
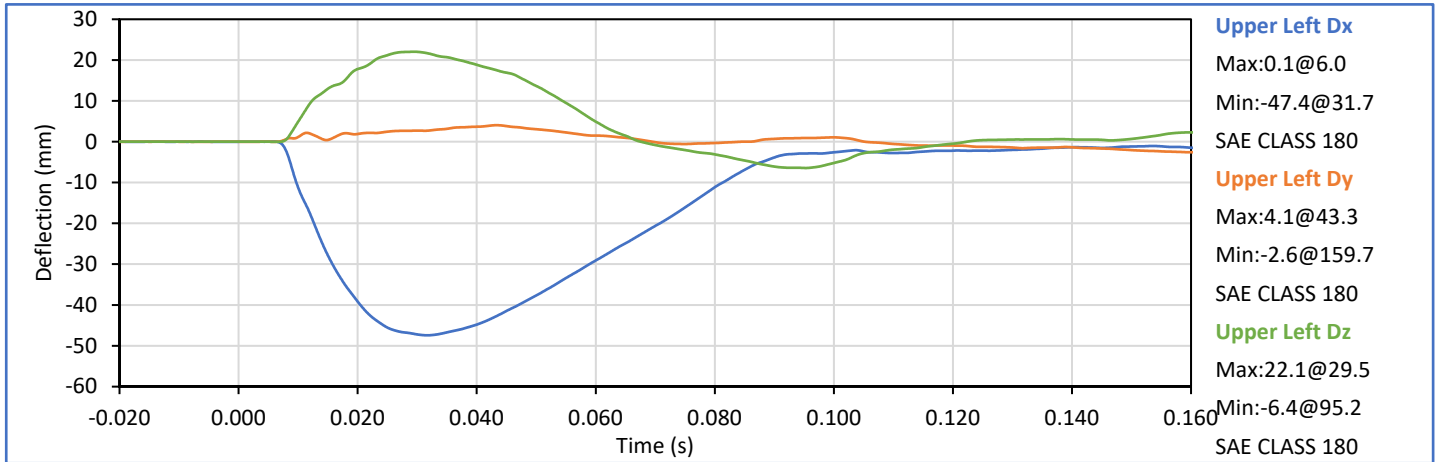
Approved By: *P. Puzzuto*
P. Puzzuto

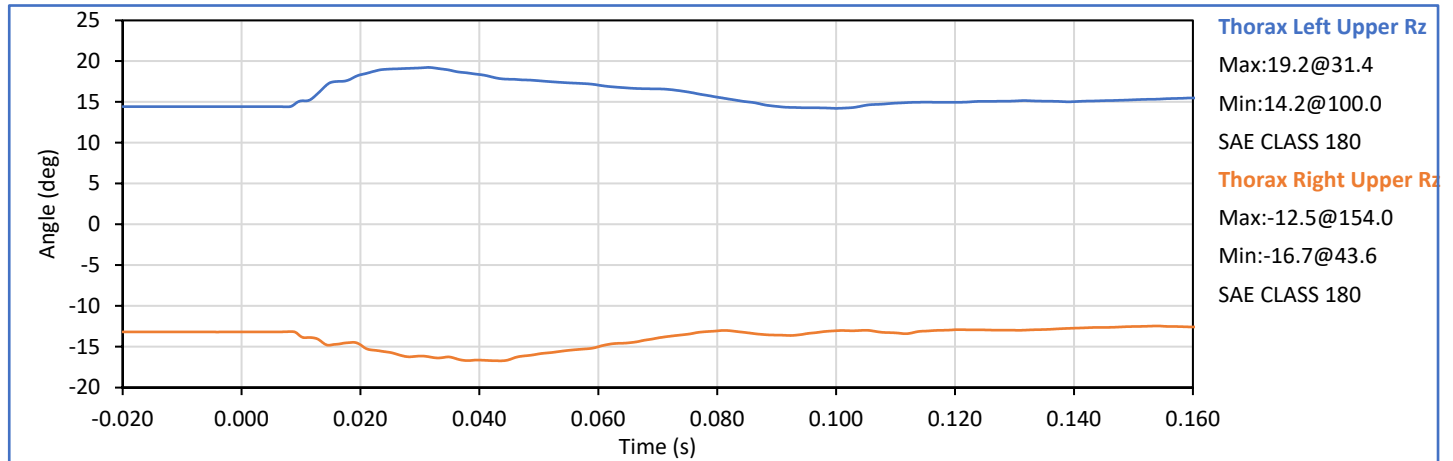
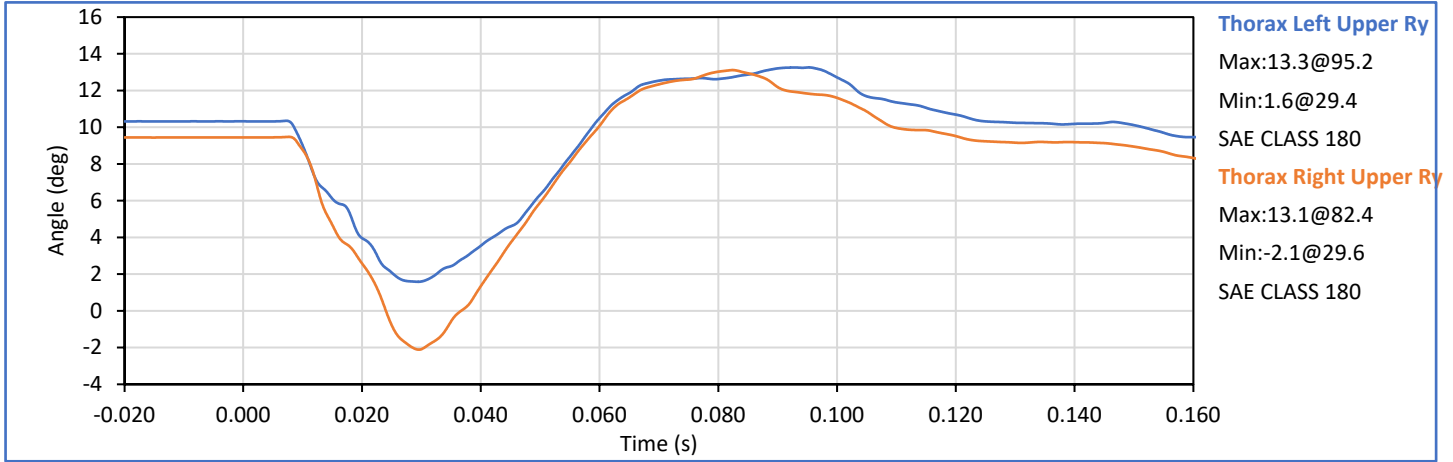
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.30	Pass
Peak Probe Force	kN	-3.039		-2.667	Pass
Peak Upper Left Deflection Res.	mm	48.3	59.0	52.3	Pass
Peak Upper Right Deflection Res.	mm			53.3	Pass
Absolute Difference L/R Defl. Res.	mm	0.0	5.0	1.0	Pass
Force at Peak Upper Left Res.	mm	-2.944	-2.409	-2.643	Pass
Force at Peak Upper Right Res.	mm			-2.643	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass



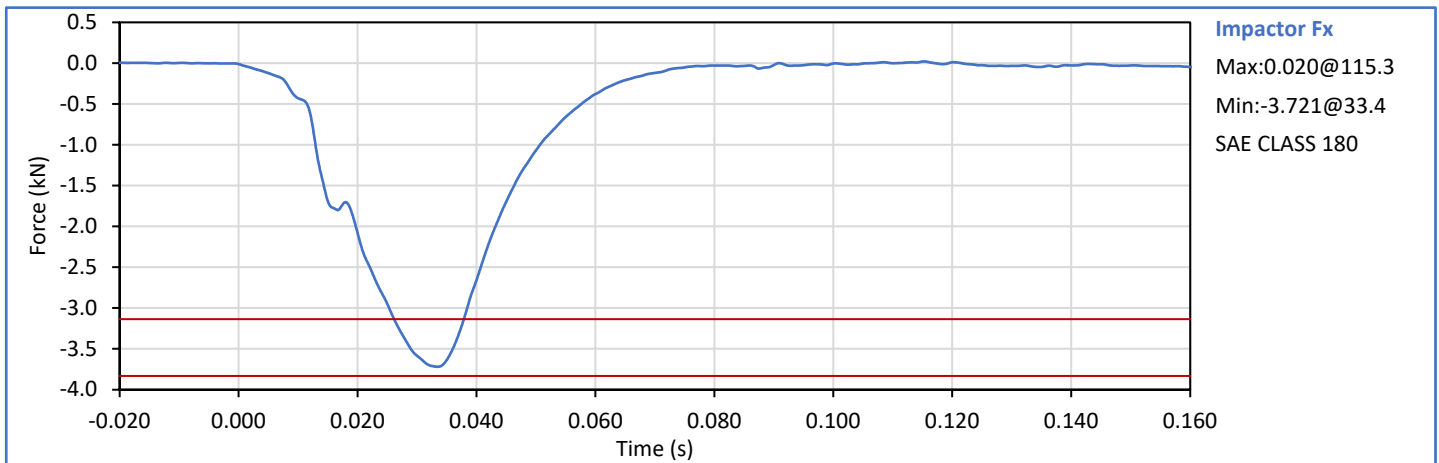
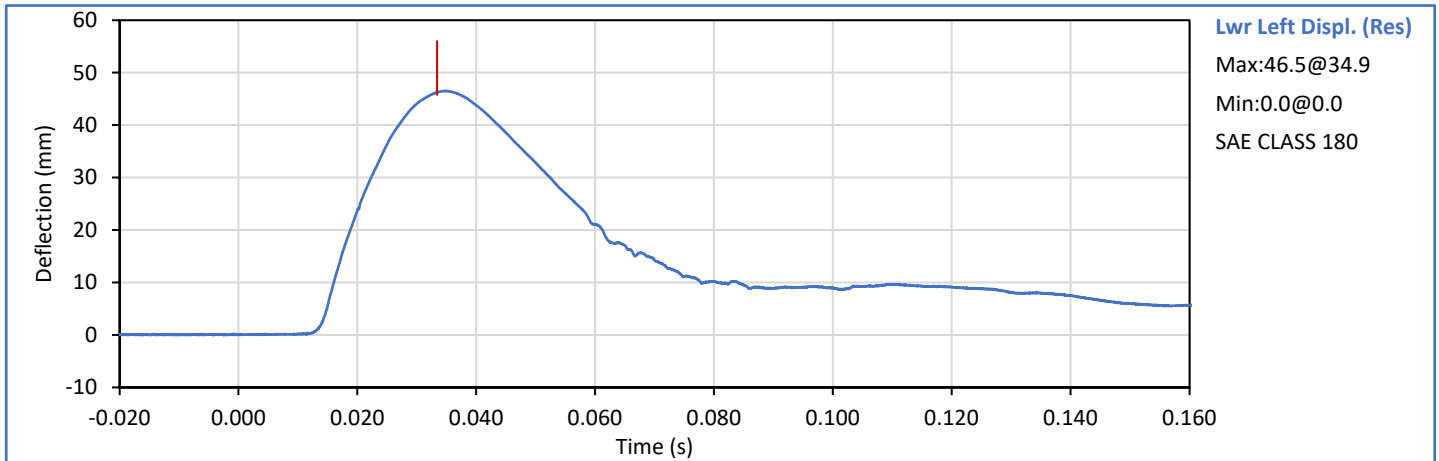
Technician: 
J. Hernandez

Approved By: 
P. Puzzuto






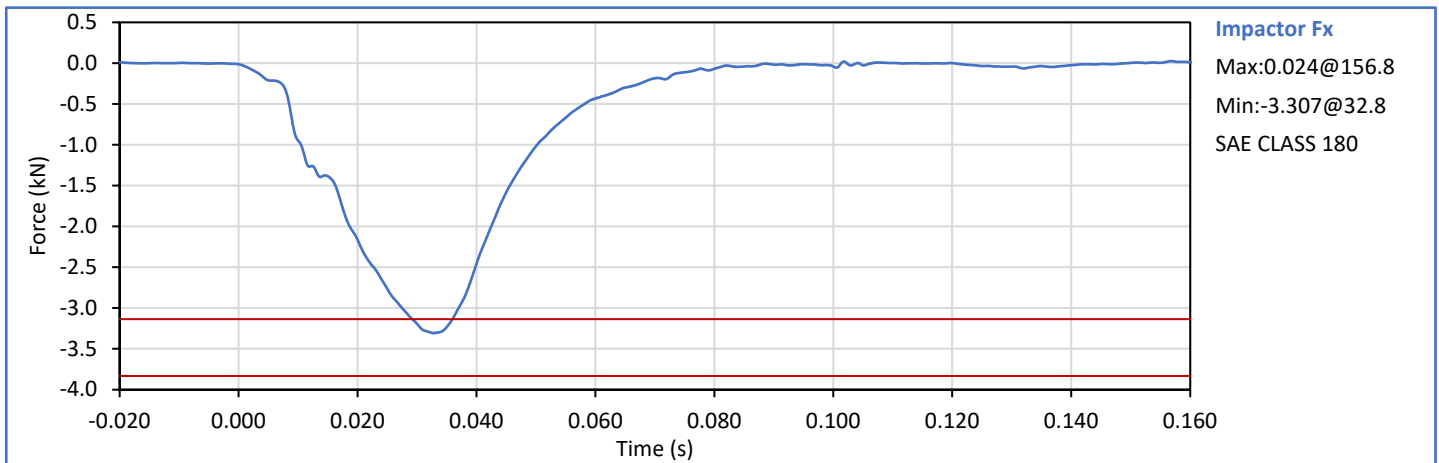
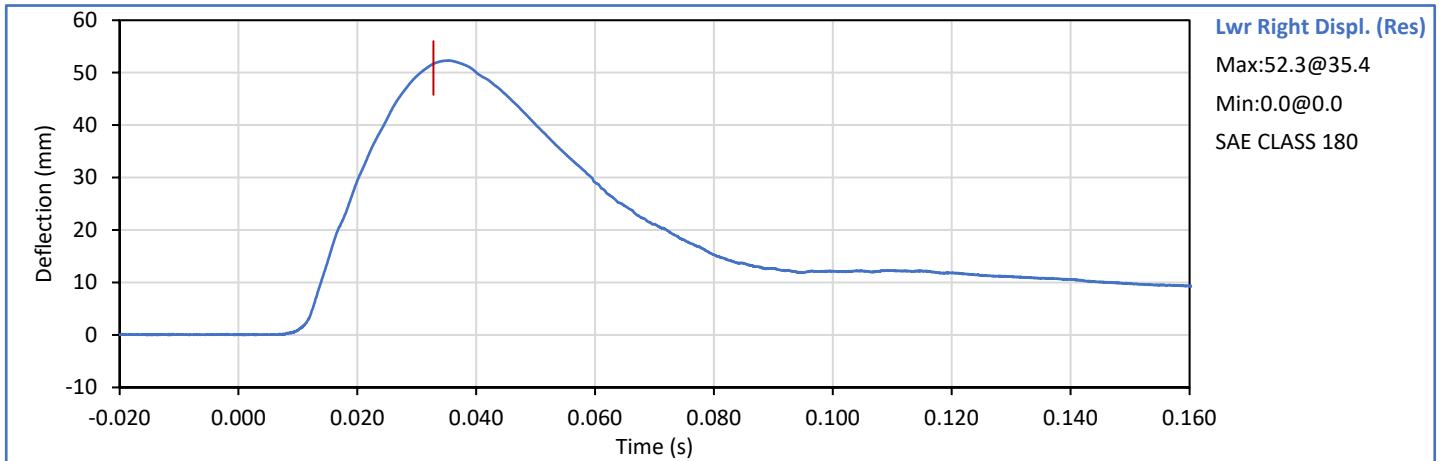
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.721	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	46.3	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass




Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

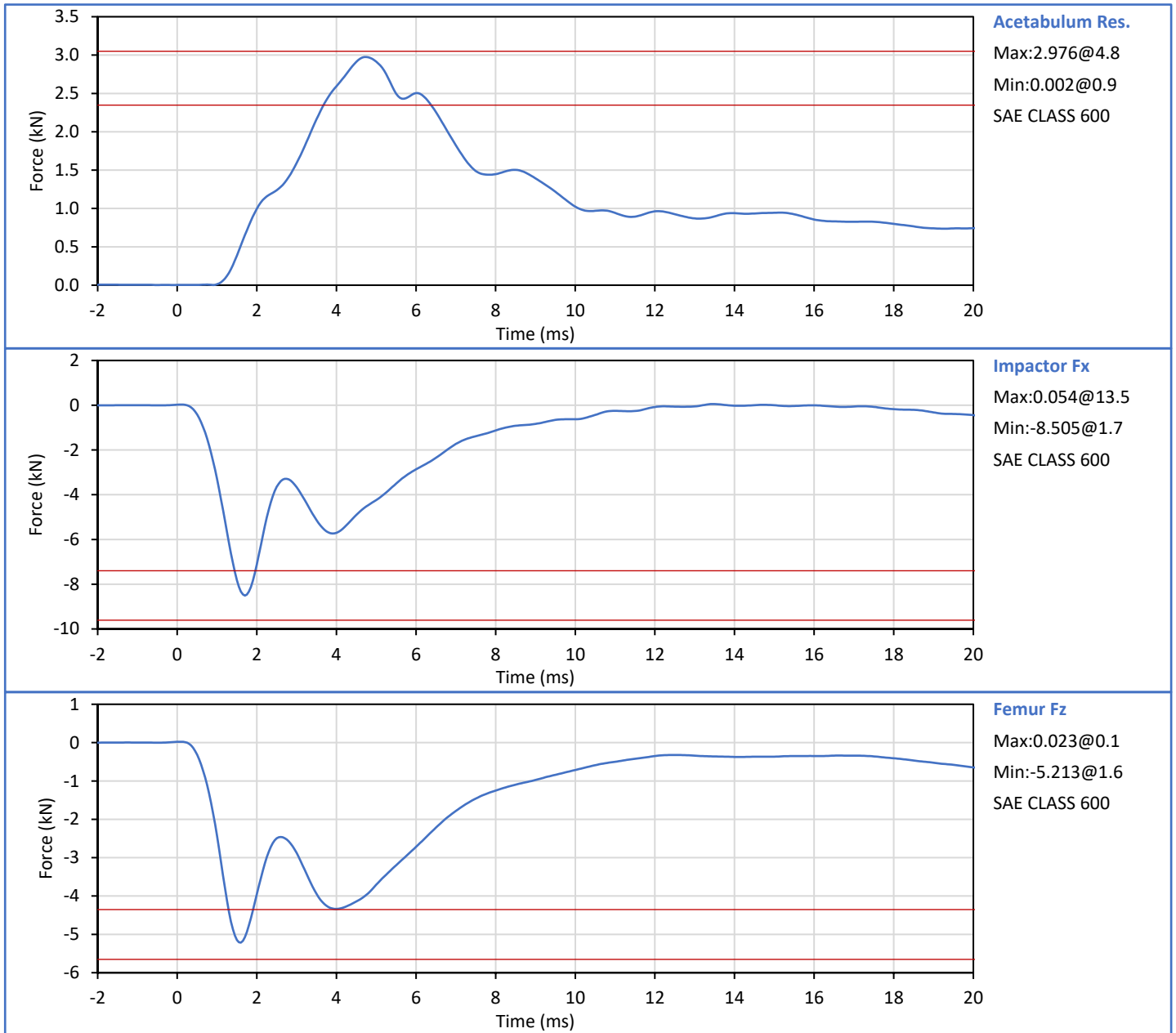
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.307	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	51.7	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

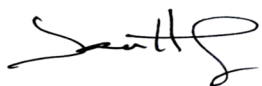



Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

Tested Parameter	Units	Spec. Low ¹	Spec. High ¹	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.0	Pass
Laboratory Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	3.25	3.35	3.31	Pass
Peak Impactor Force	kN	-9.605	-7.395	-8.505	Pass
Peak Femur Fz	kN	-5.650	-4.350	-5.213	Pass
Acetabulum Force Resultant	kN	2.349	3.051	2.976	Pass
NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass

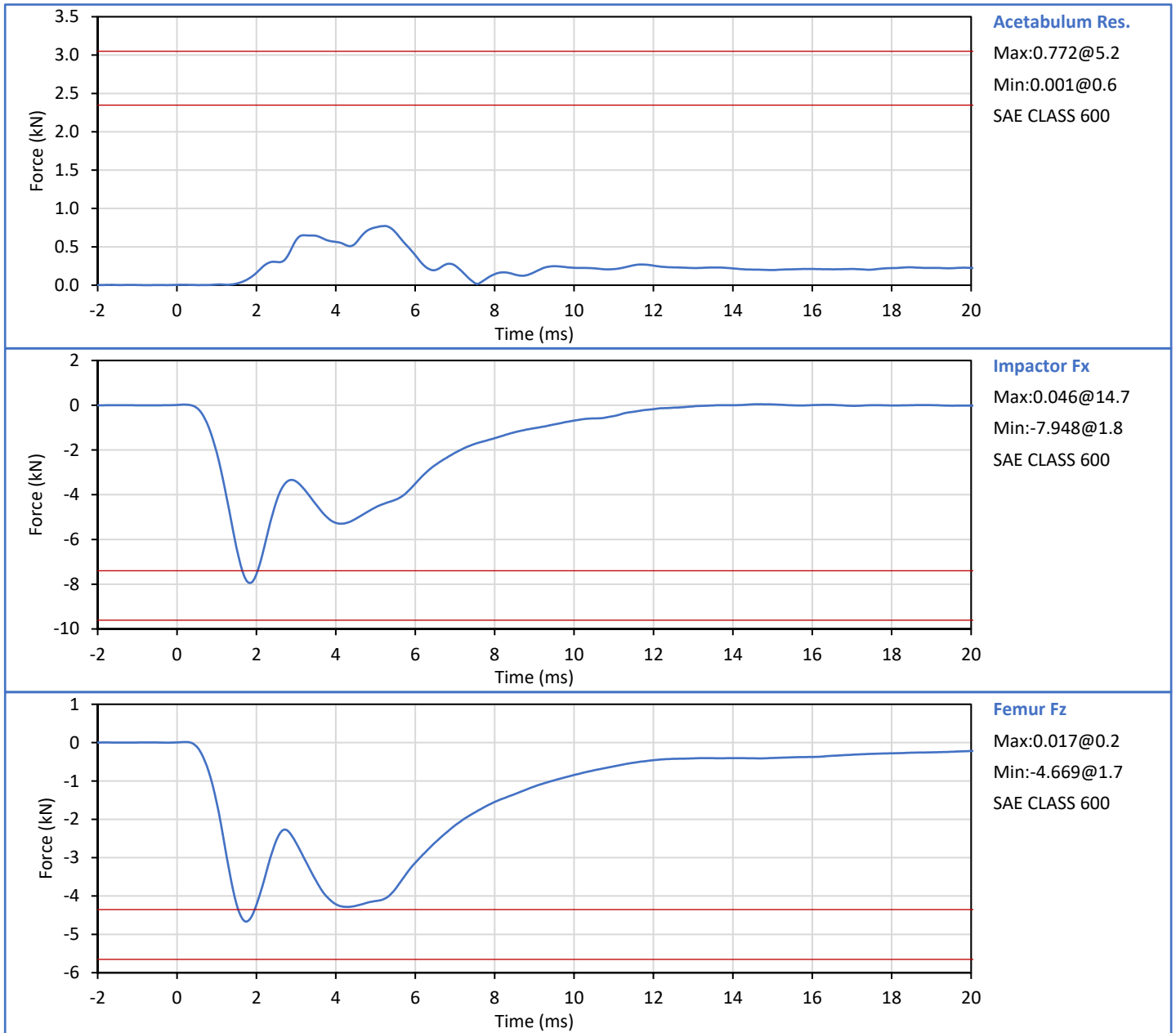


Technician: 
J. Hernandez


Approved By: 
P. Puzzuto

Tested Parameter	Units	Spec. Low ¹	Spec. High ¹	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Impactor Force	kN	-9.605	-7.395	-7.948	Pass
Peak Femur Fz	kN	-5.650	-4.350	-4.669	Pass
Acetabulum Force Resultant	kN	2.349	3.051	0.772	Fail
NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Fail

* Acetabulum Load Cell Fx is not functioning



Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

APPENDIX D
ATD Qualification and Performance Verification
Hybrid III 50th Percentile Male ATD
Post-Test Qualification (Partial) S/N: 168

ATD Serial No.: 168


Test Date: 2021-06-15

Dummy Item	Inspect for	Comments	Damage	OK
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

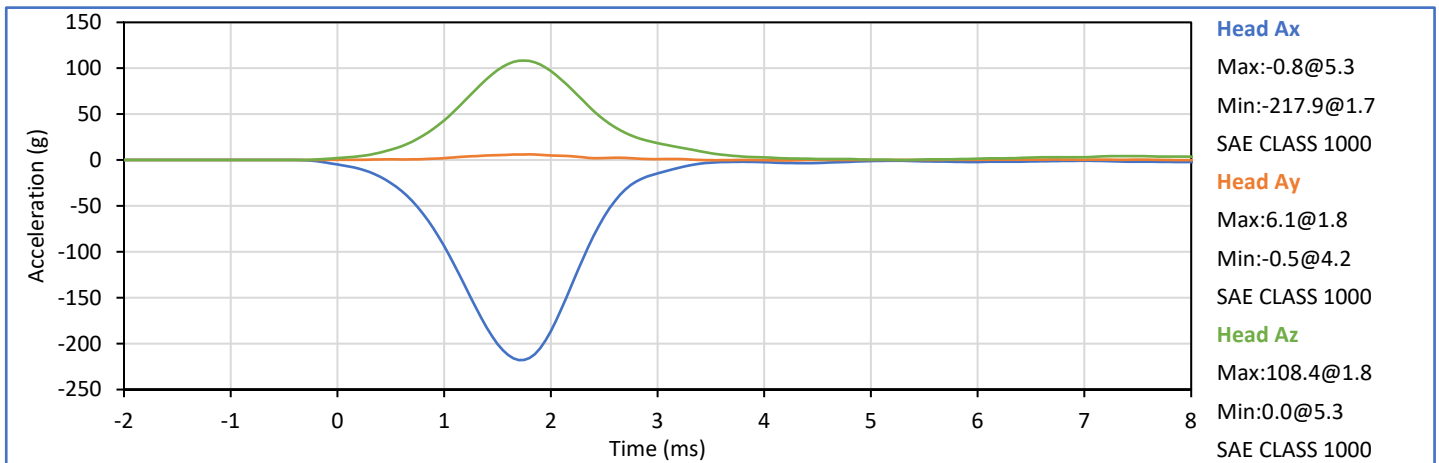
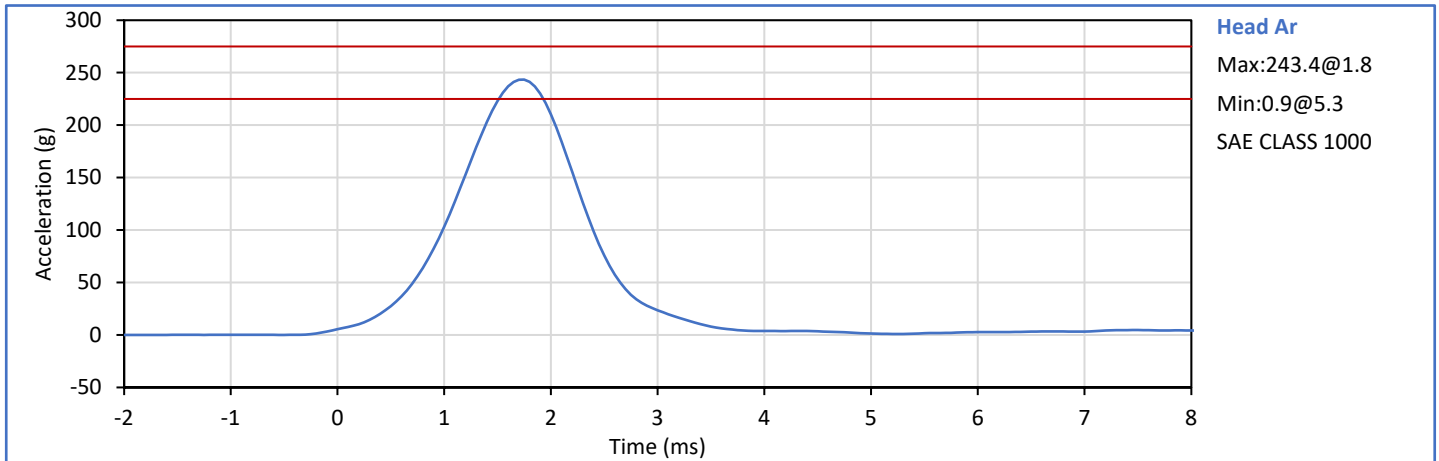
Describe any repairs or replacement of parts or other findings:

No Problems Found
Due to data excursions in the Head Redundant Ay and Head Redundant Az, sensors and cabling was checked to ensure accelerometers are properly secured and cabling is properly strain relieved; no issues found.


Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

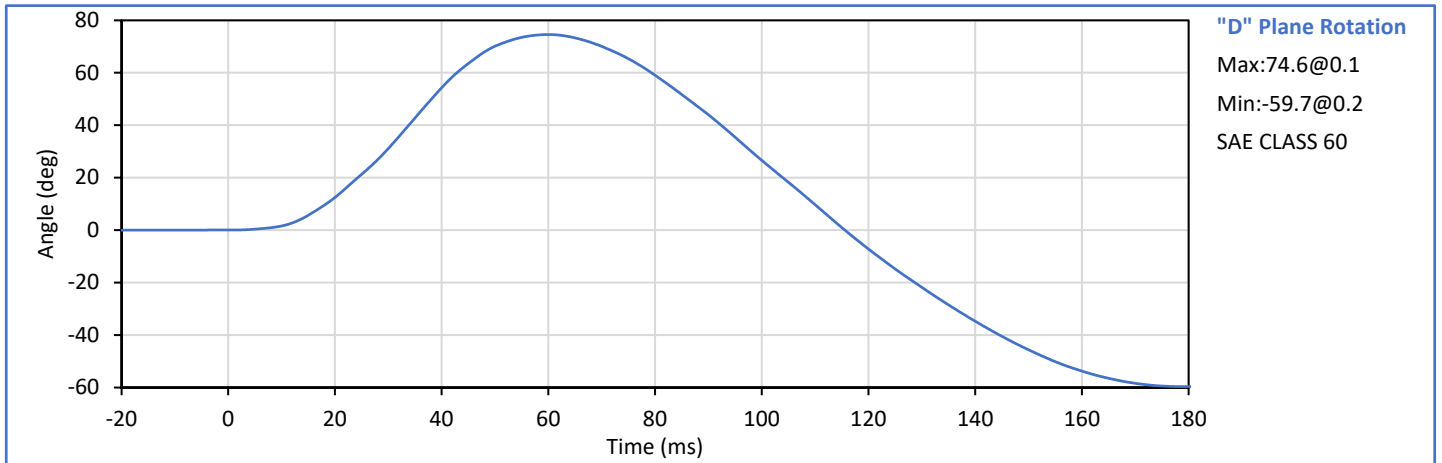
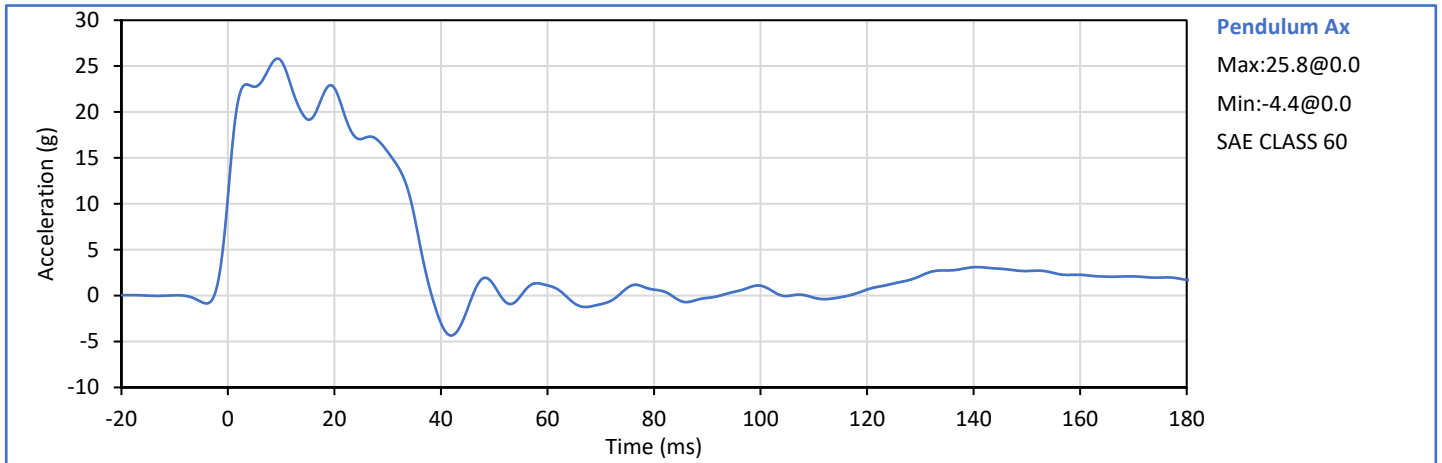
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	225.0	275.0	243.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	6.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass





Technician: 
J. Hernandez

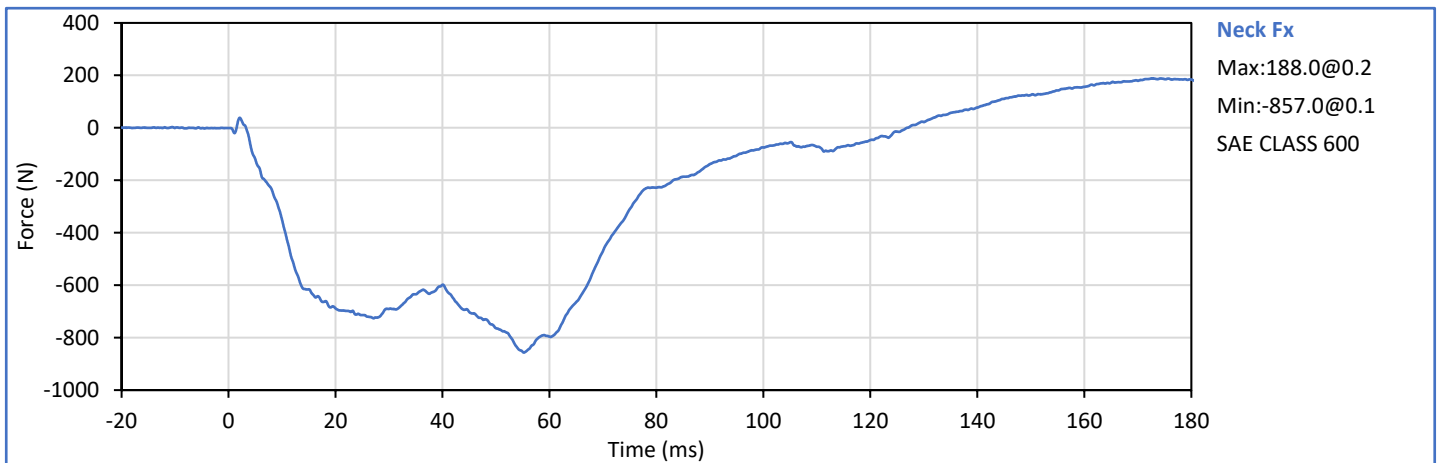
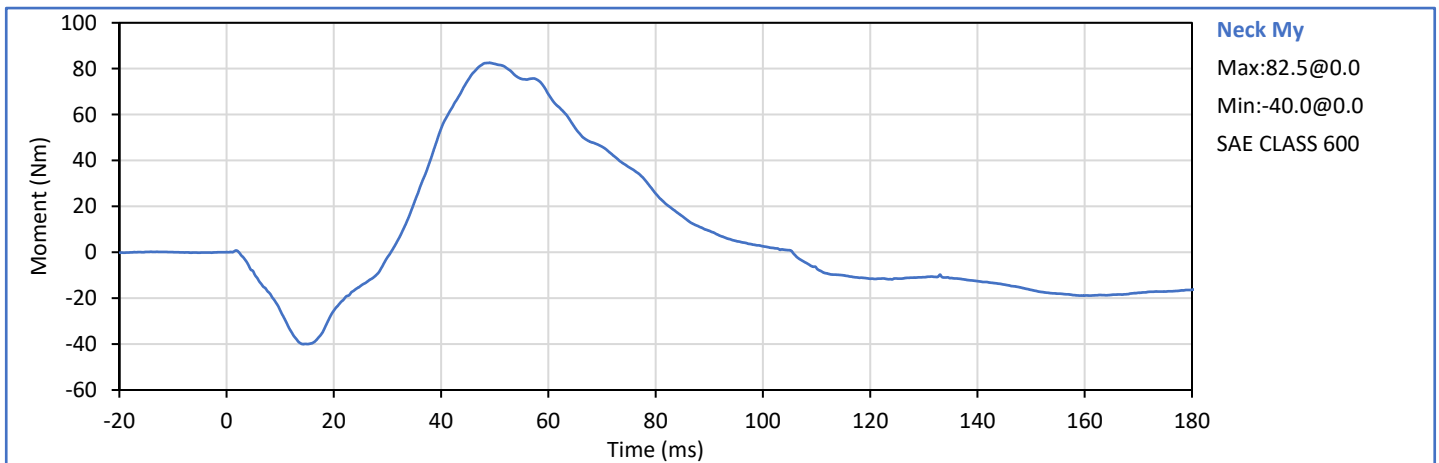
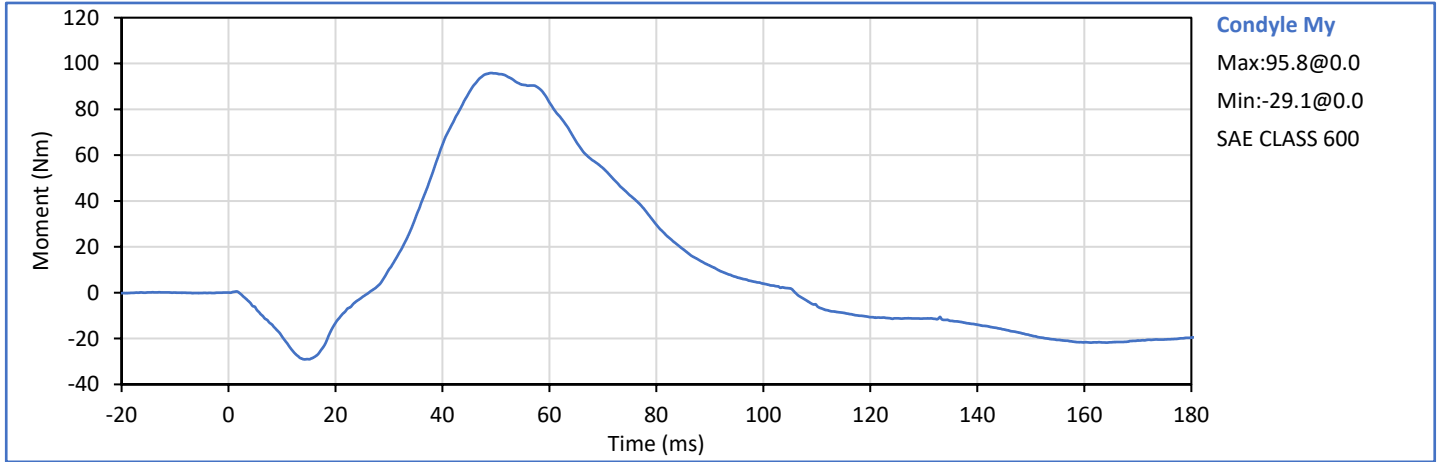
Approved By: 
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	7.04	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	25.6	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	22.6	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.7	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.7	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	36.2	Pass
"D" Plane Rotation peak	deg	64.0	78.0	74.6	Pass
	ms	57.0	64.0	60.1	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	115.6	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	95.8	Pass
	ms	47.0	58.0	49.1	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	106.0	Pass
Overall Test Results					Pass

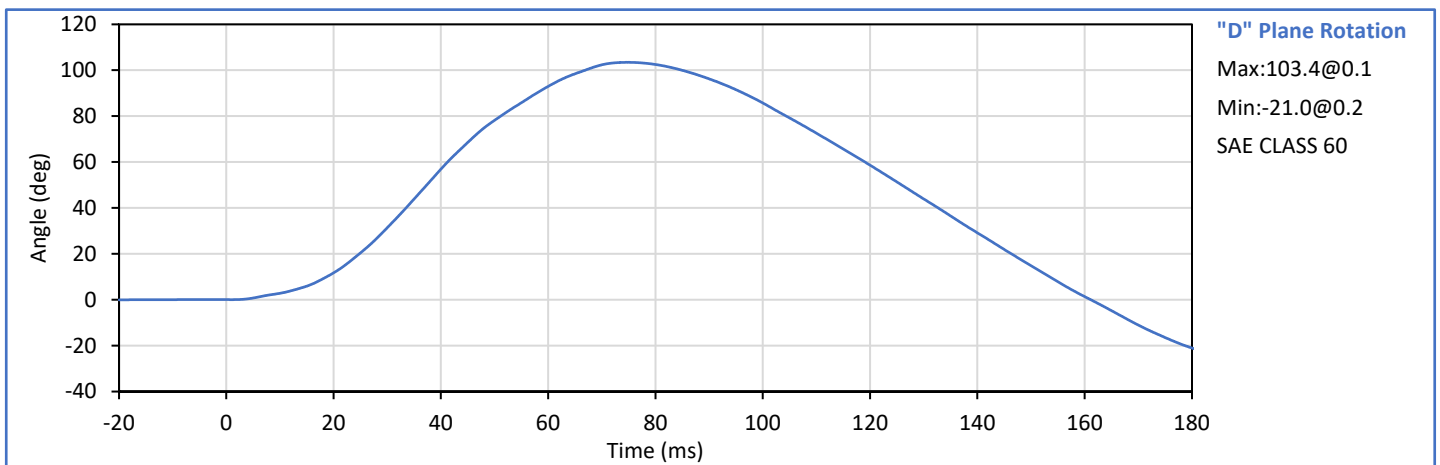
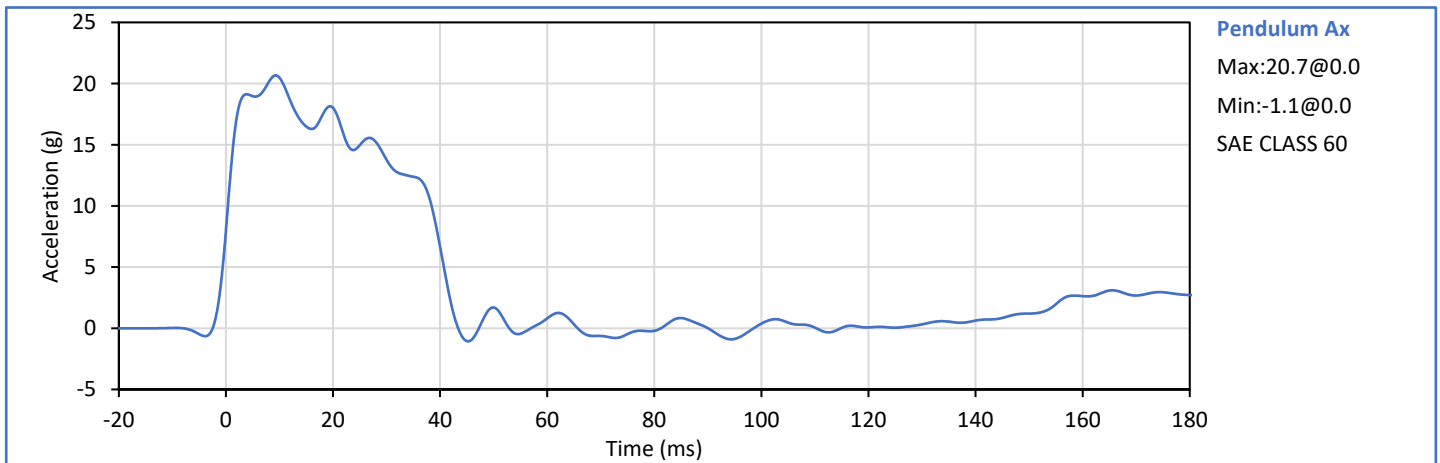


Technician: 
J. Hernandez


Approved By: 
P. Puzzuto

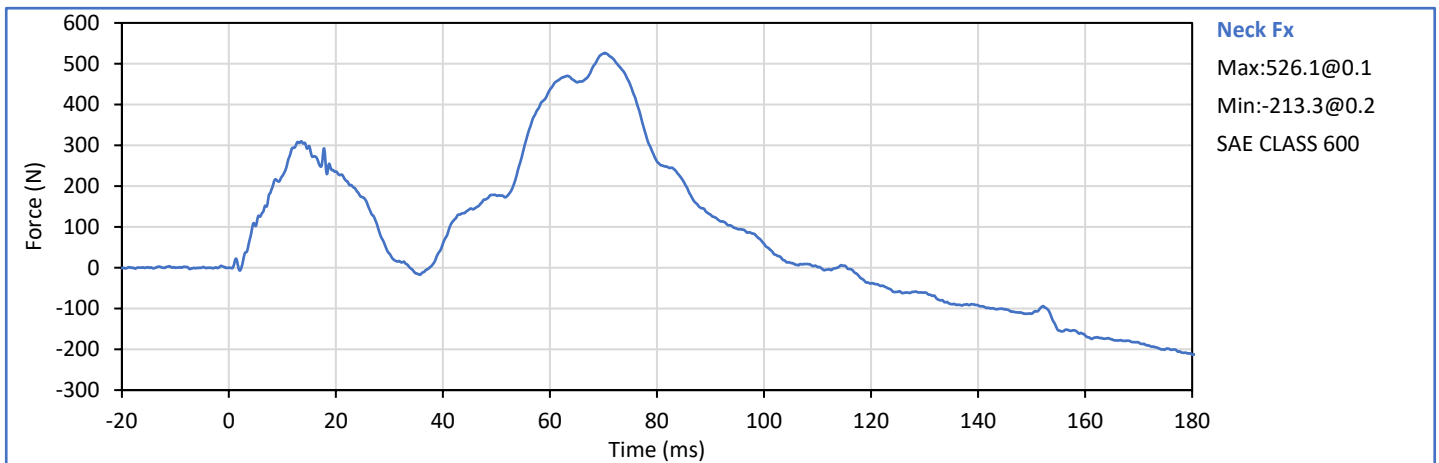
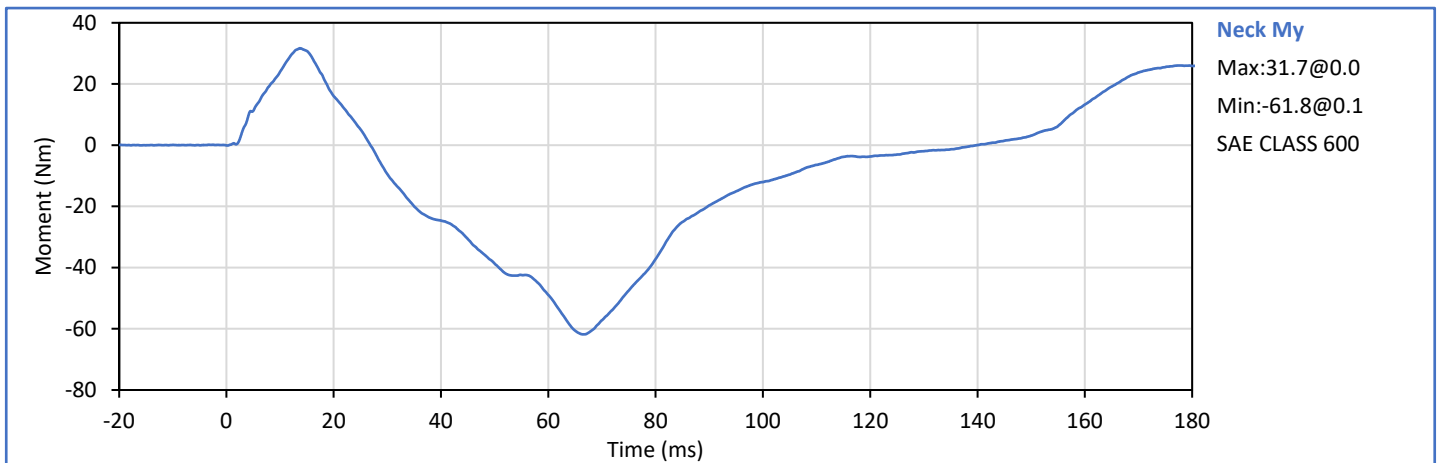
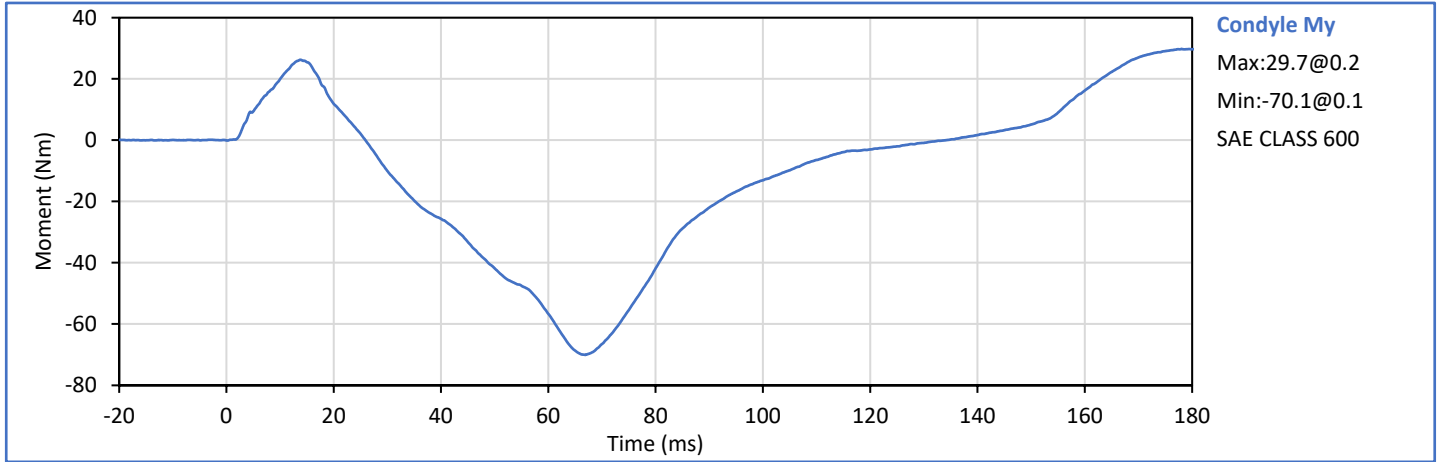


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	5.94	6.19	6.17	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.5	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.0	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.8	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.8	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	40.7	Pass
"D" Plane Rotation peak	deg	81.0	106.0	103.4	Pass
	ms	72.0	82.0	74.8	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	161.2	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-70.1	Pass
	ms	65.0	79.0	66.9	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	134.2	Pass
Overall Test Results					Pass

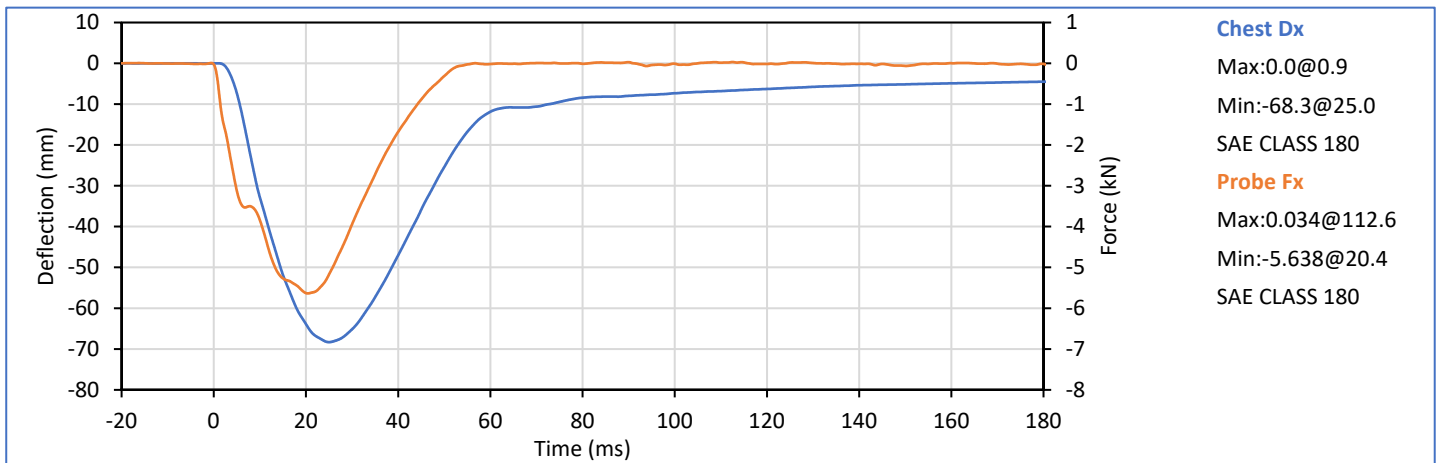
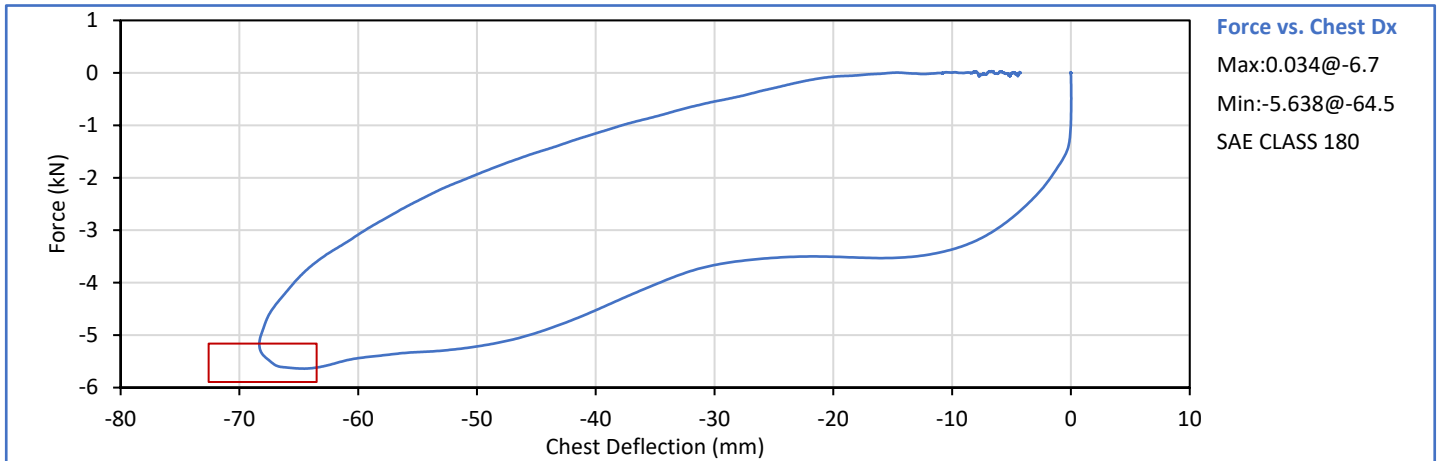


Technician: 
J. Hernandez


Approved By: 
P. Puzzuto



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.0	Pass
Laboratory Relative Humidity	%	10	70	39	Pass
Probe Velocity	m/s	6.58	6.82	6.79	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-68.3	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.638	Pass
Internal Hysteresis	%	69.0	85.0	70.9	Pass
Overall Test Results					Pass



Technician: 
 J. Hernandez


Approved By: 
 P. Puzzuto


APPENDIX E
THOR-50M 50TH PERCENTILE MALE ATD
PHYSICAL INSPECTION, PRE-TEST

ATD Serial No.: EG2595

Inspection Date: 2021-05-24

Overall Conditon/Functionality	Note
<p><u>Known errors in data channels (no data, clipping, unexpected drops):</u> Serial Number: DL9552-FX Right Acetabulum Force X bad channel. Serial Number: DW9502 Occipital Condyle Potentiometer not wired. Serial Number: DL9552-FX Right Acetabulum Force X bad channel, no data recorded during the test* Serial Number: DW9502 Occipital Condyle Potentiometer, no data recorded during the test**</p>	
<p><u>Physical evidence of damage:</u> *Right acetabulum force X was received with bad channel. It was investigated why it was not working and was determined it was not fixable without replacing the loadcell. NHTSA approved running the test without recording this channel. **Occipital Condyle Potentiometer was not wired when received and was required to be recorded. NHTSA approved running the test without recording this channel.</p>	
<p><u>Anecdotal evidence of damage:</u></p>	
<p><u>Equipment delivered to Borrower:</u> THOR-50M S/N EG2595 with DTS SLICE6 Internal DAS Laptop DTS MiniDistributor with cables and PSU</p>	

Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

ATD Serial No.: EG2595

Inspection Date: 2021-05-24

HEAD – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rear head cap mounts securely to head:	
✓	Head skin fits securely over skull	
✓	Head skin shows no sign of tears or damage	
✓	Interior components of skull (ballast, sensor mounts, sensors) securely attached:	
✓	Head securely mounted to OC joint:	
✗	Other:	See Details Page


Neck – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Neck cables slide freely through holes in neck plates:	
✓	Head can rotate about occipital condyle joint freely until the bump stops are engaged:	
✓	Neck cables show no sign of fraying, broken strands, or kinking	
✓	No evidence of de-bonding between neck pucks and plates. If failure, indicate which interface (i.e.: where plate/puck 1 attach to upper neck load cell):	
✓	No evidence of de-bonding or permanent compression in neck soft stop assemblies:	
✓	Neck securely attached to upper neck load cell:	
✓	Neck securely attached to lower neck load cell	
✓	Neck pitch change joint mechanism mating teeth are engaged	
✓	Other:	


JACKET – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rib stiffeners show no sign of permanent deformation:	
✓	No evidence of tears or holes in jacket fabric, velcro, or zippers:	
✓	Other:	

LEFT SHOULDER/ARM – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Urethane shoulder pads show no evidence of contact:	
✓	Clavicle securely attached to sternum and shoulder:	
✓	No evidence of debonding, tearing, or permanent compression of posterior soft stops	
✓	Other:	

RIGHT SHOULDER/ARM – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Urethane shoulder pads show no evidence of contact:	
✓	Clavicle securely attached to sternum and shoulder:	
✓	No evidence of debonding, tearing, or permanent compression of posterior soft stops	
✓	Other:	

Spine – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of de-bonding between thoracic spine flex joint and metal plates:	
✓	No evidence of de-bonding between lumbar spine flex joint and metal plates:	
✓	Lumbar spine pitch change joint mechanism mating teeth are engaged:	
✓	Other:	

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto


ATD Serial No.: EG2595


Inspection Date: 2021-05-24

THORAX – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of contact at top, bottom, or interior faces of rib damping material:	
✓	No evidence of debonding between rib damping material and ribs:	
✓	IR-TRACC tubes securely attached to anterior ribs	
✓	IR-TRACC tubes securely attached to double gimbals, spine:	
✓	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration:	
✓	Ribs securely attached to posterior spine:	
✓	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners):	
✓	Other:	

ABDOMEN – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper:	
✓	Upper abdomen insert securely attached to spine:	
✓	Upper abdomen insert shows no evidence of permanent set:	
✓	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper:	
✓	Lower abdomen insert securely attached to spine:	
✓	Lower abdomen insert shows no evidence of permanent set:	
✓	Other:	

Pelvis – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Pelvis flesh fits securely over pelvis bones:	
✓	H-point tool fits securely into hole on both sides of pelvis:	
✓	ASIS load cells are secured to the iliac bones and iliac bones are firmly attached to the pelvis	
✓	The iliac bones are free from cracks or fractures	
✓	If welds are present in the iliac bones, the welds are continuous and devoid of cracks	
✓	Other:	

Technician: 
J. Hernandez


Approved By: 
P. Puzzuto


LEFT FEMUR – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Acetabular load cells firmly attached:	
✓	Femur load cell firmly attached:	
✓	No evidence of deformation of knee slider bump stop:	
✓	No cuts, tears, or scuffing of knee flesh:	
✓	Other:	

RIGHT FEMUR – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Acetabular load cells firmly attached:	
✓	Femur load cell firmly attached:	
✓	No evidence of deformation of knee slider bump stop:	
✓	No cuts, tears, or scuffing of knee flesh:	
✓	Other:	

LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts, tears, or scuffing of leg flesh	
✓	Other:	

RIGHT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts, tears, or scuffing of leg flesh	
✓	Other:	

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

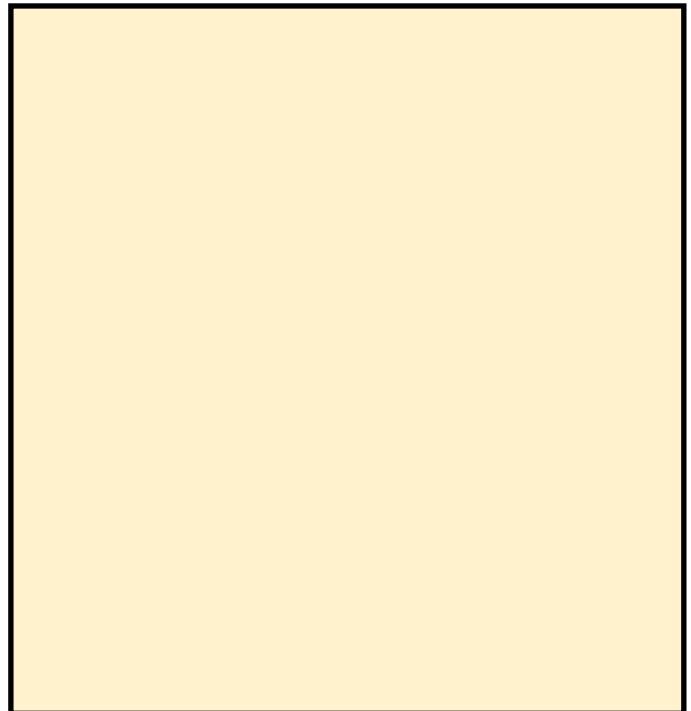
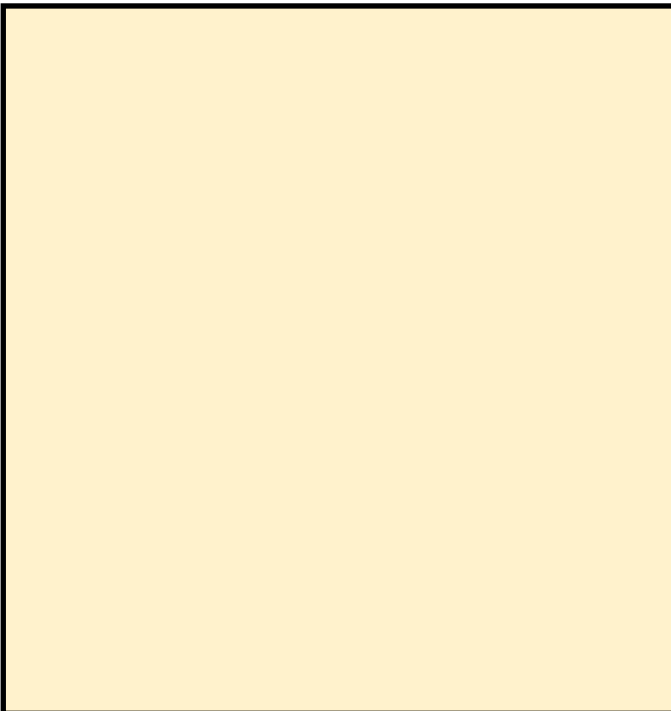
Damage and Discrepancy Details



Cuts in Face Foam



Cut on top of face.



Additional Notes:


None


APPENDIX F
THOR-50M 50TH PERCENTILE MALE ATD
PHYSICAL INSPECTION, POST-TEST

ATD Serial No.: EG2595

Inspection Date: 2021-06-11

Overall Conditon/Functionality	Note
<p><u>Known errors in data channels (no data, clipping, unexpected drops):</u> Serial Number: DL9552-FX Right Acetabulum Force X bad channel. Serial Number: DW9502 Occipital Condyle Potentiometer not wired. Serial Number: DL9552-FX Right Acetabulum Force X bad channel, no data recorded during the test* Serial Number: DW9502 Occipital Condyle Potentiometer, no data recorded during the test**</p>	
<p><u>Physical evidence of damage:</u> *Right acetabulum force X was received with bad channel. It was investigated why it was not working and was determined it was not fixable without replacing the loadcell. NHTSA approved running the test without recording this channel. **Occipital Condyle Potentiometer was not wired when received and was required to be recorded. NHTSA approved running the test without recording this channel.</p>	
<p><u>Anecdotal evidence of damage:</u></p>	
<p><u>Equipment delivered to Borrower:</u> THOR-50M S/N EG2595 with DTS SLICE6 Internal DAS Laptop DTS MiniDistributor with cables and PSU</p>	

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

ATD Serial No.: EG2595

Inspection Date: 2021-06-11

HEAD – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rear head cap mounts securely to head:	
✓	Head skin fits securely over skull	
✓	Head skin shows no sign of tears or damage	
✓	Interior components of skull (ballast, sensor mounts, sensors) securely attached:	
✓	Head securely mounted to OC joint:	
✗	Other:	See Details Page


Neck – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Neck cables slide freely through holes in neck plates:	
✓	Head can rotate about occipital condyle joint freely until the bump stops are engaged:	
✓	Neck cables show no sign of fraying, broken strands, or kinking	
✓	No evidence of de-bonding between neck pucks and plates. If failure, indicate which interface (i.e.: where plate/puck 1 attach to upper neck load cell):	
✓	No evidence of de-bonding or permanent compression in neck soft stop assemblies:	
✓	Neck securely attached to upper neck load cell:	
✓	Neck securely attached to lower neck load cell	
✓	Neck pitch change joint mechanism mating teeth are engaged	
✓	Other:	


JACKET – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rib stiffeners show no sign of permanent deformation:	
✓	No evidence of tears or holes in jacket fabric, velcro, or zippers:	
✓	Other:	

LEFT SHOULDER/ARM – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Urethane shoulder pads show no evidence of contact:	
✓	Clavicle securely attached to sternum and shoulder:	
✓	No evidence of debonding, tearing, or permanent compression of posterior soft stops	
✓	Other:	

RIGHT SHOULDER/ARM – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Urethane shoulder pads show no evidence of contact:	
✓	Clavicle securely attached to sternum and shoulder:	
✓	No evidence of debonding, tearing, or permanent compression of posterior soft stops	
✓	Other:	

Spine – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of de-bonding between thoracic spine flex joint and metal plates:	
✓	No evidence of de-bonding between lumbar spine flex joint and metal plates:	
✓	Lumbar spine pitch change joint mechanism mating teeth are engaged:	
✓	Other:	

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto


ATD Serial No.: EG2595


Inspection Date: 2021-06-11

THORAX – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of contact at top, bottom, or interior faces of rib damping material:	
✓	No evidence of debonding between rib damping material and ribs:	
✓	IR-TRACC tubes securely attached to anterior ribs	
✓	IR-TRACC tubes securely attached to double gimbals, spine:	
✓	Urethane bib is securely attached to ribs with no sign of tearing or washer penetration:	
✓	Ribs securely attached to posterior spine:	
✓	Rib stiffeners show no evidence of bending (no gaps between ribs and stiffeners):	
✓	Other:	

ABDOMEN – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	No evidence of tearing, cuts, or broken stitches in upper abdomen bag and zipper:	
✓	Upper abdomen insert securely attached to spine:	
✓	Upper abdomen insert shows no evidence of permanent set:	
✓	No evidence of tearing, cuts, or broken stitches in lower abdomen bag and zipper:	
✓	Lower abdomen insert securely attached to spine:	
✓	Lower abdomen insert shows no evidence of permanent set:	
✓	Other:	

Pelvis – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Pelvis flesh fits securely over pelvis bones:	
✓	H-point tool fits securely into hole on both sides of pelvis:	
✓	ASIS load cells are secured to the iliac bones and iliac bones are firmly attached to the pelvis	
✓	The iliac bones are free from cracks or fractures	
✓	If welds are present in the iliac bones, the welds are continuous and devoid of cracks	
✓	Other:	

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto

ATD Serial No.: EG2595


Inspection Date: 2021-06-11


LEFT FEMUR – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Acetabular load cells firmly attached:	
✓	Femur load cell firmly attached:	
✓	No evidence of deformation of knee slider bump stop:	
✓	No cuts, tears, or scuffing of knee flesh:	
✓	Other:	

RIGHT FEMUR – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Acetabular load cells firmly attached:	
✓	Femur load cell firmly attached:	
✓	No evidence of deformation of knee slider bump stop:	
✓	No cuts, tears, or scuffing of knee flesh:	
✓	Other:	

LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts, tears, or scuffing of leg flesh	
✓	Other:	

RIGHT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts, tears, or scuffing of leg flesh	
✓	Other:	

Technician: 
 J. Hernandez

Approved By: 
 P. Puzzuto

Damage and Discrepancy Details



Cuts in Face Foam



Cut on top of face.

Additional Notes:

None

APPENDIX G
THOR-50M 50TH PERCENTILE MALE ATD
SENSOR POLARITIES

THOR-50M 50th Percentile Male ATD
Sensor Polarities

ATD S/N: EG2595

Date: 5/10/2021

Note 1: Some polarities may appear counter to the specified wiring. The use of wired adapters may influence polarities

Note 2: Highlighted SAE polarity shows a deviation from SAE standard or an expected negative polarity to the mechanical input

Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Head and Neck	Head Accelerometers Primary	Ax	HEAD0000THACXP	Impact back of head	+	-	Yes
		Ay	HEAD0000THACYP	Impact left of head	+	+	No
		Az	HEAD0000THACZP	Impact top of head	+	+	No
	Head Accelerometers Redundant	Ax	HEADRD00THACXP	Impact back of head	+	NA	NA
		Ay	HEADRD00THACYP	Impact left of head	+	NA	NA
		Az	HEADRD00THACZP	Impact top of head	+	NA	NA
	Head ARS	ω_x	HEAD0000THAVXP	Rotate right ear toward right shoulder	+	-	Yes
		ω_y	HEAD0000THAVYP	Rotate chin away from sternum	+	+	No
		ω_z	HEAD0000THAVZP	Rotate chin toward right shoulder	+	-	Yes
	Front Neck Spring	Fz	NECKFR00THFOZP	Rotate head rearward	+	+	No
	Rear Neck Spring	Fz	NECKRE00THFOZP	Rotate chin toward chest	+	+	No
	O.C. Rotary Pot	Ry	NECKUP00THANYP	Rotate chin toward chest	+	NA	NA
	Upper Neck Load	Fx	NECKUP00THFOXP	Move head rear, chest forward	+	+	No
		Fy	NECKUP00THFOYP	Move head left, chest right	+	+	No
		Fz	NECKUP00THFOZP	Move head up, chest down	+	+	No
		Mx	NECKUP00THMOXP	Rotate left ear toward left shoulder	+	+	No
		My	NECKUP00THMOYP	Rotate chin toward sternum	+	+	No
		Mz	NECKUP00THMOZP	Rotate chin toward left shoulder	+	+	No
	Lower Neck Load	Fx	NECKLO00THFOXP	Move head rear, chest forward	+	NA	NA
		Fy	NECKLO00THFOYP	Move head left, chest right	+	NA	NA
		Fz	NECKLO00THFOZP	Move head up, chest down	+	NA	NA
		Mx	NECKLO00THMOXP	Rotate left ear toward left shoulder	+	NA	Yes
		My	NECKLO00THMOYP	Rotate chin toward sternum	+	NA	Yes
Mz		NECKLO00THMOZP	Rotate chin toward left shoulder	+	NA	Yes	
Face Loads	Fx	NA	Hold back of head, push face rearward	-	NA	NA	

THOR-50M 50th Percentile Male ATD
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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Spine and Thorax	T1 Accelerometer	Ax	THSP0100THACXP	Impact back of T1Spine	+	NA	NA
		Ay	THSP0100THACYP	Impact left of T1Spine	+	NA	NA
		Az	THSP0100THACZP	Impact top of Spine	+	NA	NA
	T1 ARS	ω_x	THSP0100THAVXP	Rotate spine sideways to the right	+	NA	NA
		ω_y	THSP0100THAVYP	Rotate spine rearward	+	NA	NA
		ω_z	THSP0100THAVZP	Left shoulder forward, right shoulder aft	+	NA	NA
	Mid Sternum Accelerometer	Ax	STRN0000THACXP	Rotate dummy back (face up)	+	NA	NA
	T6 Accelerometer (Chest CG)	Ax	THSP0600THACXP	Impact back of T6 Spine	+	-	Yes
		Ay	THSP0600THACYP	Impact left of T6 Spine	+	+	No
		Az	THSP0600THACZP	Impact top of Spine	+	-	Yes
	T6 ARS	ω_x	THSP0600THAVXP	Right shoulder down	+	-	Yes
		ω_y	THSP0600THAVYP	Shoulders back	+	+	No
		ω_z	THSP0600THAVZP	Left shoulder forward, right shoulder back	+	-	Yes
	T12 (Thoracic Spine) Accelerometer	Ax	THSP1200THACXP	Impact back of T12 Spine	+	NA	NA
		Ay	THSP1200THACYP	Impact left of T12 Spine	+	NA	NA
		Az	THSP1200THACZP	Impact top of Spine	+	NA	NA
	T12 (Thoracic Spine) ARS	ω_x	THSP1200THAVXP	Impact back of T12 Spine	+	NA	NA
		ω_y	THSP1200THAVYP	Impact left of T12 Spine	+	NA	NA
		ω_z	THSP1200THAVZP	Impact top of Spine	+	NA	NA
	T12 (Thoracic Spine) Load	Fx	THSP1200THFOXP	Move chest rear, pelvis forward	+	+	No
		Fy	THSP1200THFOYP	Move chest left, pelvis right	+	+	No
		Fz	THSP1200THFOZP	Move chest up, pelvis down	+	+	No
		Mx	THSP1200THMOXP	Rotate left shoulder toward left hip	+	+	No
		My	THSP1200THMOYP	Rotate sternum towards front of legs	+	+	No
	Left Clavicle (Medial) Load	Fx	NA	Pull clavicle forward away from spine	+	NA	NA
		Fz	NA	Push clavicle down towards pelvis	+	NA	NA
	Left Clavicle (Lateral) Load	Fx	NA	Push clavicle forward away from spine	+	NA	NA
Fz		NA	Push clavicle down towards pelvis	+	NA	NA	
Right Clavicle (Medial) Load	Fx	NA	Push clavicle forward away from spine	+	NA	NA	
	Fz	NA	Push clavicle down towards pelvis	+	NA	NA	
Right Clavicle (Lateral) Load	Fx	NA	Push clavicle forward away from spine	+	NA	NA	
	Fz	NA	Push clavicle down towards pelvis	+	NA	NA	
Abdomen	Upper Abdomen Accel,	Ax	NA	Impact back of Spine	+	NA	NA

THOR-50M 50th Percentile Male ATD
Sensor Polarities

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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Pelvis	Left ASIS Load (Anterior Superior Iliac Spine)	Fx	ILACLE00THFOXP	Push in towards back of pelvis	-	-	No
		My	ILACLE00THMOYP	Push top of ASIS towards back of pelvis	+	+	No
	Right ASIS Load (Anterior Superior Iliac Spine)	Fx	ILACRI00THFOXP	Push in towards back of pelvis	-	-	No
		My	ILACRI00THMOYP	Push top of ASIS towards back of pelvis	+	+	No
	Left Acetabular Load	Fx	ACTBLE00THFOXP	Move femur forward, pelvis rear	+	-	Yes
		Fy	ACTBLE00THFOYP	Move femur right, pelvis left	+	+	No
		Fz	ACTBLE00THFOZP	Move femur down, pelvis up	+	+	No
	Right Acetabular Load	Fx	ACTBRI00THFOXP	Move femur forward, pelvis rear	+	+	No
		Fy	ACTBRI00THFOYP	Move femur right, pelvis left	+	-	Yes
		Fz	ACTBRI00THFOZP	Move femur down, pelvis up	+	-	Yes
	Pelvis CG Accelerometer	Ax	PELV0000THACXP	Impact back of Pelvis	+	-	Yes
		Ay	PELV0000THACYP	Impact left of Pelvis	+	+	No
		Az	PELV0000THACZP	Impact top of Spine	+	+	No
	Pelvis CG ARS	ω_x	PELV0000THAVXP	Right shoulder down	+	-	Yes
		ω_y	PELV0000THAVYP	Shoulders back, legs up	+	+	No
ω_z		PELV0000THAVZP	Twist pelvis, body, and legs right	+	+	No	
Femurs	Left Femur Load	Fx	FEMRLE00THFOXP	Move knee upward, upper femur down	+	+	No
		Fy	FEMRLE00THFOYP	Move knee right, upper femur left	+	+	No
		Fz	FEMRLE00THFOZP	Move knee forward, femur rear	+	+	No
		Mx	FEMRLE00THMOXP	Rotate knee left, hold upper femur	+	+	No
		My	FEMRLE00THMOYP	Rotate knee up, hold upper femur	+	+	No
		Mz	FEMRLE00THMOZP	Rotate tibia left, hold pelvis	+	+	No
	Right Femur Load	Fx	FEMRRI00THFOXP	Move knee upward, upper femur down	+	+	No
		Fy	FEMRRI00THFOYP	Move knee right, upper femur left	+	+	No
		Fz	FEMRRI00THFOZP	Move knee forward, femur rear	+	+	No
		Mx	FEMRRI00THMOXP	Rotate knee left, hold upper femur	+	+	No
		My	FEMRRI00THMOYP	Rotate knee up, hold upper femur	+	+	No
		Mz	FEMRRI00THMOZP	Rotate tibia left, hold pelvis	+	+	No

THOR-50M 50th Percentile Male ATD
Sensor Polarities

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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Lower Extremity Left	Knee Shear Displacement	Dx	KNSLLE00THDSXP	Hold femur, move tibia forward	+	+	No
	Upper Tibia Load	Fx	TIBILEUPTHFOXP	Move tibia forward, knee rearward	+	+	No
		Fy	TIBILEUPTHFOYP	Move ankle right, knee left	+	+	No
		Fz	TIBILEUPTHFOZP	Move ankle down, knee up	+	+	No
		Mx	TIBILEUPTHMOXP	Impact left of Tibia	+	+	No
		My	TIBILEUPTHMOYP	Impact front of Tibia	+	+	No
	Lower Tibia Load	Fx	TIBILELOTHFOXP	Move ankle forward, knee rearward	+	+	No
		Fy	TIBILELOTHFOYP	Move ankle right, knee left	+	+	No
		Fz	TIBILELOTHFOZP	Move ankle down, knee up	+	+	No
		Mx	TIBILELOTHMOXP	Impact left of Tibia	+	+	No
		My	TIBILELOTHMOYP	Impact front of Tibia	+	+	No
	Tibia Accelerometer	Ax	TIBILE00THACXP	Impact back of Tibia	+	NA	NA
		Ay	TIBILE00THACYP	Impact left of Tibia	+	NA	NA
	Achilles Load	Fz	ANKLLE00THFOOP	Rotate foot forward	+	NA	NA
	Ankle Rotation	Rx	ANKLLE00THANXP	Hold tibia, rotate foot leftward	+	+	No
		Ry	ANKLLE00THANYP	Hold tibia, push toe upward	+	-	Yes
		Rz	ANKLLE00THANZP	From top, hold tibia, rotate foot CCW	+	-	Yes
	Foot Acceleration	Ax	FOOTLE00THACXP	Impact back of Foot	+	NA	NA
Ay		FOOTLE00THACYP	Impact left of Foot	+	NA	NA	
Az		FOOTLE00THACZP	Impact top of Foot	+	NA	NA	

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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Lower Extremity Right	Knee Shear Displacement	Dx	KNSLR100THDSXP	Hold femur, move tibia forward	+	+	No
	Upper Tibia Load	Fx	TIBIRIUPTHFOXP	Move tibia forward, knee rearward	+	+	No
		Fy	TIBIRIUPTHFOYP	Move ankle right, knee left	+	+	No
		Fz	TIBIRIUPTHFOZP	Move ankle down, knee up	+	+	No
		Mx	TIBIRIUPTHMOXP	Impact left of Tibia	+	+	No
		My	TIBIRIUPTHMOYP	Impact front of Tibia	+	+	No
	Lower Tibia Load	Fx	TIBIRILOTHFOXP	Move ankle forward, knee rearward	+	+	No
		Fy	TIBIRILOTHFOYP	Move ankle right, knee left	+	+	No
		Fz	TIBIRILOTHFOZP	Move ankle down, knee up	+	+	No
		Mx	TIBIRILOTHMOXP	Impact left of Tibia	+	+	No
		My	TIBIRILOTHMOYP	Impact front of Tibia	+	+	No
	Tibia Accelerometer	Ax	TIBIRI00THACXP	Impact back of Tibia	+	NA	NA
		Ay	TIBIRI00THACYP	Impact left of Tibia	+	NA	NA
	Achilles Load	Fz	ANKLR100THFOOP	Rotate foot forward	+	NA	NA
	Ankle Rotation	Rx	ANKLR100THANXP	Hold tibia, rotate foot leftward	+	+	No
		Ry	ANKLR100THANYP	Hold tibia, push toe upward	+	-	Yes
		Rz	ANKLR100THANZP	From top, hold tibia, rotate foot CCW	+	-	Yes
	Foot Acceleration	Ax	FOOTRI00THACXP	Impact back of Foot	+	NA	NA
Ay		FOOTRI00THACYP	Impact left of Foot	+	NA	NA	
Az		FOOTRI00THACZP	Impact top of Foot	+	NA	NA	

THOR-50M 50th Percentile Male ATD
Sensor Polarities

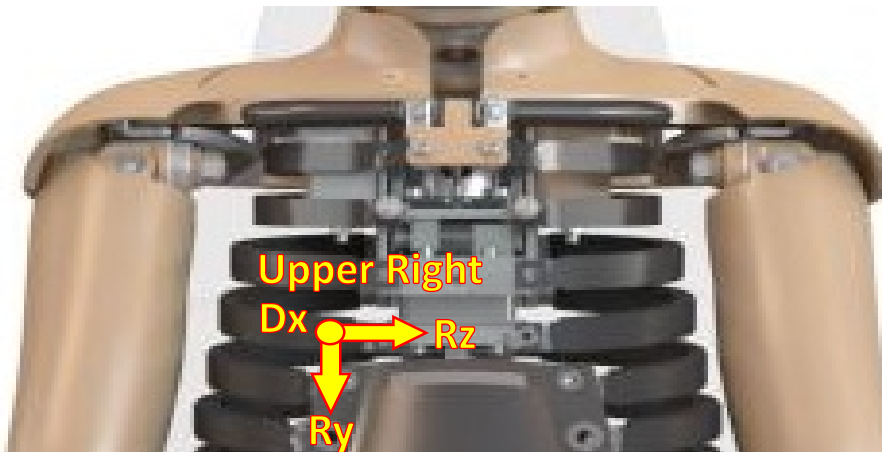
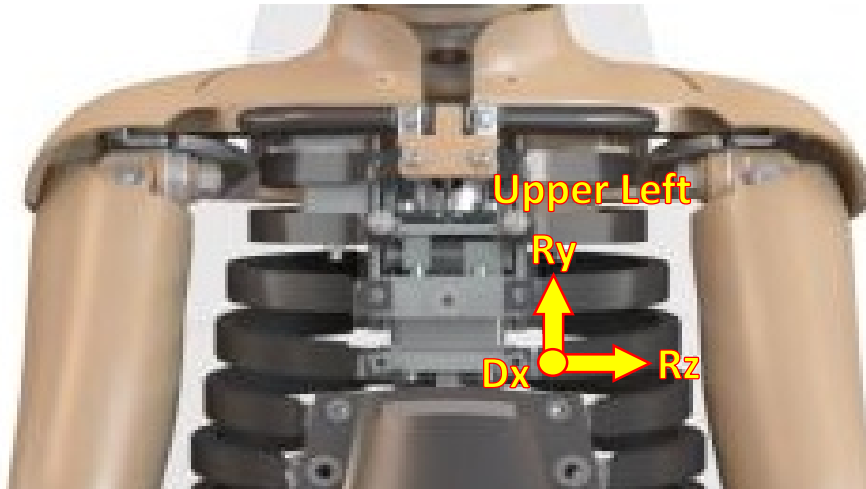
ATD S/N: EG2595

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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Thorax Upper Left	IRTRACC Raw Voltage	Dx (V)	CHSTLEUPTHVOOP	Push Inward	+	+	No
	Rotation Pitch	Ry	CHSTLEUPTHANYP	Push upward	+	+	No
	Rotation Yaw	Rz	CHSTLEUPTHANZP	Push leftward	+	+	No
Thorax Upper Right	IRTRACC Raw Voltage	Dx (V)	CHSTRIUPTHVOOP	Push Inward	+	+	No
	Rotation Pitch	Ry	CHSTRIUPTHANYP	Push downward	+	+	No
	Rotation Yaw	Rz	CHSTRIUPTHANZP	Push leftward	+	+	No



THOR-50M 50th Percentile Male ATD
Sensor Polarities

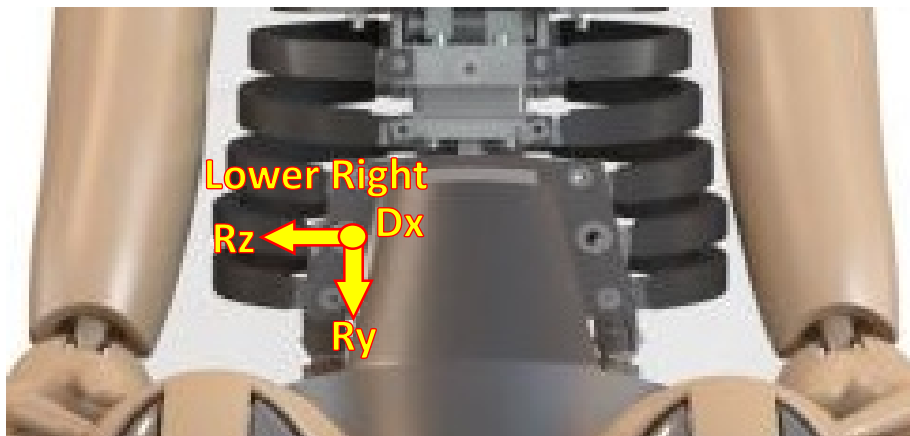
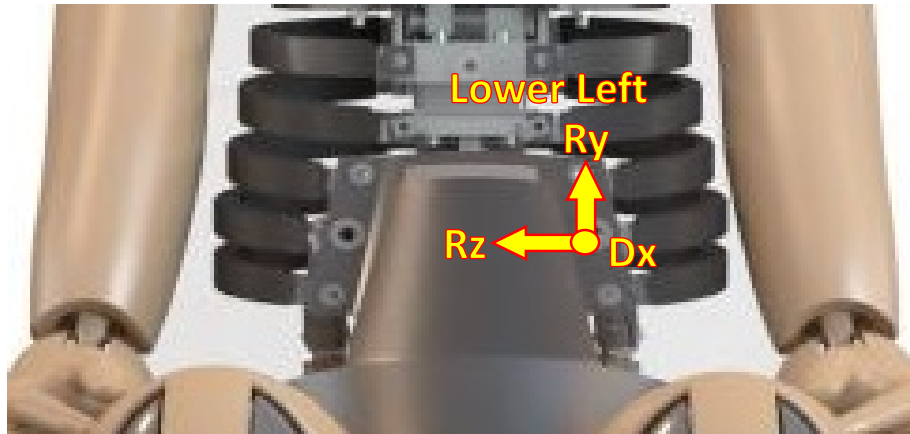
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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Thorax Lower Left	IRTRACC Raw Voltage	Dx (V)	CHSTLELOTHVOOP	Push Inward	+	+	No
	Rotation Pitch	Ry	CHSTLELOTHANYP	Push upward	+	+	No
	Rotation Yaw	Rz	CHSTLELOTHANZP	Push rightward	+	+	No
Thorax Lower Right	IRTRACC Raw Voltage	Dx (V)	CHSTRILOTHVOOP	Push Inward	+	+	No
	Rotation Pitch	Ry	CHSTRILOTHANYP	Push downward	+	+	No
	Rotation Yaw	Rz	CHSTRILOTHANZP	Push rightward	+	+	No



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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Abdomen Left	IRTRACC Raw Voltage	Dx (V)	ABDOLE00THVO0P	Push Inward	+	+	No
	Rotation Pitch	Ry	ABDOLE00THANYP	Push upward	+	+	No
	Rotation Yaw	Rz	ABDOLE00THANZP	Push rightward	+	+	No
Abdomen Right	IRTRACC Raw Voltage	Dx (V)	ABDORI00THVO0P	Push Inward	+	+	No
	Rotation Pitch	Ry	ABDORI00THANYP	Push downward	+	+	No
	Rotation Yaw	Rz	ABDORI00THANZP	Push rightward	+	+	No

