

**REPORT NUMBER: R&D-KAR-20-018**

**VEHICLE TO RIGID BARRIER CRASH TEST IN SUPPORT OF  
NHTSA'S FRONTAL RESEARCH CRASH TEST PROGRAM  
FULL FRONTAL RIGID BARRIER IMPACT**

**FORD MOTOR COMPANY  
2021 FORD ESCAPE S 5-DOOR MPV**

**NHTSA No: R20210230**

**PREPARED BY:  
APPLUS IDIADA KARCO ENGINEERING, LLC.  
9270 HOLLY ROAD  
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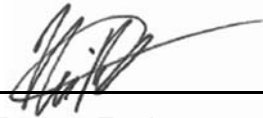


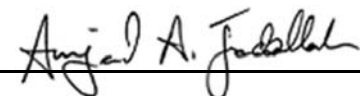
**OCTOBER 6, 2021**

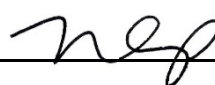
**FINAL REPORT**

**PREPARED FOR:  
U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
VEHICLE SAFETY RESEARCH  
1200 NEW JERSEY AVE, SE, ROOM W46-446  
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Approval Date: October 6, 2021

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OFFICE OF STRUCTURAL AND RESTRAINTS RESEARCH DIVISION:

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

Date: \_\_\_\_\_

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<b>15. Supplementary Notes</b>																																																	
<b>16. Abstract</b> <p>A 40 km/h Full Frontal Rigid Barrier Impact Test was conducted on a 2021 Ford Escape S 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 footwell intrusion performance. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on September 22, 2021.</p> <p>The impact velocity of the vehicle was 40.37 km/h and the ambient temperature at the barrier face at the time of impact was 33.0°C. The vehicle's post-test maximum crush was 204 mm measured at the vehicle's centerline. 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 THOR</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 (HIC<sub>15</sub>)</td> <td></td> <td style="text-align: center;">66.1</td> <td style="text-align: center;">69.8</td> </tr> <tr> <td>Brain Injury Criteria (BrIC)</td> <td></td> <td style="text-align: center;">0.636</td> <td style="text-align: center;">0.530</td> </tr> <tr> <td>Nij</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Peak Neck Tension</td> <td style="text-align: center;">N</td> <td style="text-align: center;">1423.8</td> <td style="text-align: center;">242.6</td> </tr> <tr> <td>Peak Neck Compression</td> <td style="text-align: center;">N</td> <td style="text-align: center;">-380.5</td> <td style="text-align: center;">-997.3</td> </tr> <tr> <td>Peak Chest Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">41.2</td> <td style="text-align: center;">22.0</td> </tr> <tr> <td>Peak Abdomen Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">-9.3</td> <td style="text-align: center;">-30.2</td> </tr> <tr> <td>Peak Resultant Acetabulum Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">1909.2</td> <td style="text-align: center;">2313.4</td> </tr> <tr> <td>Peak Femur Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">-3043.4</td> <td style="text-align: center;">-3737.7</td> </tr> <tr> <td>Peak Tibia Index</td> <td></td> <td style="text-align: center;">0.902</td> <td style="text-align: center;">0.445</td> </tr> </tbody> </table>				Measurement Description	Units	Driver THOR	Passenger THOR	Result	Result	Head Injury Criteria (HIC <sub>15</sub> )		66.1	69.8	Brain Injury Criteria (BrIC)		0.636	0.530	Nij				Peak Neck Tension	N	1423.8	242.6	Peak Neck Compression	N	-380.5	-997.3	Peak Chest Deflection	mm	41.2	22.0	Peak Abdomen Deflection	mm	-9.3	-30.2	Peak Resultant Acetabulum Force	N	1909.2	2313.4	Peak Femur Force	N	-3043.4	-3737.7	Peak Tibia Index		0.902	0.445
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## SECTION 1

### TEST PURPOSE AND PROCEDURE

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

This 40.0 km/h (24.9 mph) Full 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 Full 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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

A 40.0 km/h Full Frontal Rigid Barrier Impact Test was conducted on a 2021 Ford Escape S 5-Door MPV. The test was performed at Applus IDIADA KARCO Engineering, LLC. on September 22, 2021.

The test was documented by one (1) real-time and eighteen (18) high-speed video cameras. All four (4) high-speed onboard cameras experienced power failure during the test which resulted in no onboard videos recorded. 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) 50<sup>th</sup> percentile adult male THOR anthropomorphic test device (Serial No. EG2595) was seated in the left front seating position (P1 – Driver) and one (1) 50<sup>th</sup> percentile adult male THOR anthropomorphic test device (ATD) (Serial No. DO9799) was seated in the right front passenger seating position (P2 - Passenger). The driver was positioned according to instructions specified in THOR 50<sup>th</sup> Percentile Male Dummy Seating & Positioning Procedures: Driver Position. The passenger was positioned according to instructions specified in the THOR 50<sup>th</sup> Percentile Male Dummy Seating & Positioning Procedures: Passenger Position.

The driver was restrained with frontal and knee airbags. The passenger was restrained with a frontal airbag. Both ATDs were unbelted for this test.

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

Two hundred and sixty-three (263) 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.

There was 100% total windshield retention. 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 204 mm measured at 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, grille, and hood were crushed, with the damage spread evenly throughout the width of the front end
- The windshield was broken passenger side due to deployment of the frontal airbag and impact with the passenger ATD's head
- The transmission mount under the vehicle fractured from impact.

The driver ATD's visible contact points were:

- Head contacted the frontal airbag, A-pillar trim, and windshield
- Torso contacted the frontal airbag, door panel, and roof
- Left leg contacted the knee airbag
- Right leg contacted the knee airbag and knee bolster

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

- Head contacted the frontal airbag and windshield
- Torso contacted the frontal airbag and door panel
- Left leg contacted the knee bolster
- Right leg contacted the knee bolster

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**PRIMARY IMPACT DATA**

Measured Parameter	Units	Value
Velocity at Impact	km/h	40.37
Vehicle Test Weight	kg	1794.5
Vehicle Maximum Static Crush	mm	204
Number of Data Channels		263
Number of Real-Time Cameras		1
Number of High-Speed Cameras		18

**DUMMY CONTACTS**

Description	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	THOR, S/N: EG2595		THOR, S/N: DO9799	
Head Contact	Frontal airbag, A-pillar trim, windshield	A-89, A-91a	Frontal airbag, windshield	A-134, A-136a
Upper Torso Contact	Frontal airbag, roof	A-89	Frontal airbag	A-134
Lower Torso Contact	Frontal airbag, door panel	A-89, A-91b	Frontal airbag, door panel	A-134, A-136b
Left Leg Contact	Knee airbag	A-91	Knee bolster	A-125
Right Leg Contact	Knee airbag, knee bolster	A-91	Knee bolster	A-125

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**DATA ANOMALIES**

Channel Description	Explanation
P1TH Acetabulum Right X Force	No data, known failure
P2TH ASIS Left Y Moment	Channel failed, cabling issue
P2TH ASIS Left X Force	Random noise spikes after 70.0 ms
P2TH Femur Right Z Moment	Channel failed at 49.6 ms
Passenger Floor Pan X, Y, Z	Channel failed at 33.5 ms, mounting block decoupled

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

Driver, THOR-50M S/N EG2595					
LOCATION	DESCRIPTION	UNIT	SOURCE	MAX	MIN
Head	HIC 15ms		Compute	66.1	
	Brain Injury Criteria (BrIC)		Compute	0.636	
	Head Rotational Velocity X	Deg/s	60	96.5	-174.2
	Head Rotational Velocity Y	Deg/s	60	196.9	-2002.9
	Head Rotational Velocity Z	Deg/s	60	338.7	-250.1
Neck	Upper Neck Z-axis Force	N	1000	1423.8	-380.5
	Upper Neck Y-axis Moment	Nm	600	13.0	-12.8
Chest	Upper Left Resultant Chest Deflection	mm	Compute	41.2	
	Upper Right Resultant Chest Deflection	mm	Compute	38.8	
	Lower Left Resultant Chest Deflection	mm	Compute	8.7	
	Lower Right Resultant Chest Deflection	mm	Compute	10.2	
Abdomen	Lower Left X-axis Deflection	mm	Compute	3.1	-9.3
	Lower Right X-axis Deflection	mm	Compute	1.5	-6.9
Acetabulum	Left Acetabulum Resultant Force	N	Compute	1909.2	
	Right Acetabulum Resultant Force	N	Compute	1008.0	
Femur	Left Femur Force, FZ	N	600	778.7	-3043.4
	Right Femur Force, FZ	N	600	1679.1	-2977.9
Tibia	Left Upper Tibia, FZ	N	600	913.7	-2818.5
	Left Upper Tibia Index		Compute	0.400	
	Right Upper Tibia, FZ	N	600	1882.3	-3366.4
	Right Upper Tibia Index		Compute	0.902	
	Left Lower Tibia, FZ	N	600	483.9	-4447.1
	Left Lower Tibia Index		Compute	0.119	
	Right Lower Tibia, FZ	N	600	441.2	-4533.2
	Right Lower Tibia Index		Compute	0.223	
Ankle	Left Ankle Rotation, RX	Deg	180	10.8	-3.4
	Left Ankle Rotation, RY	Deg	180	20.0	-36.8
	Left Ankle Dorsiflexion Moment, MY	Nm	Compute	57.6	-43.6
	Left Ankle In/Eversion Moment, MX	Nm	Compute	12.4	-5.4
	Right Ankle Rotation, RX	Deg	180	13.2	-6.5
	Right Ankle Rotation, RY	Deg	180	16.9	-42.5
	Right Ankle Dorsiflexion Moment, MY	Nm	Compute	105.0	-111.8
	Right Ankle In/Eversion Moment, MX	Nm	Compute	11.8	-12.6

Anomalies:

Acetabulum Fx not functional

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

<b>Passenger, THOR-50M S/N DO9799</b>					
<b>LOCATION</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>SOURCE</b>	<b>MAX</b>	<b>MIN</b>
Head	HIC 15ms		Compute	69.8	
	Brain Injury Criteria (BrIC)		Compute	0.530	
	Head Rotational Velocity X	Deg/s	60	90.6	-321.3
	Head Rotational Velocity Y	Deg/s	60	196.0	-1631.2
	Head Rotational Velocity Z	Deg/s	60	66.2	-338.8
Neck	Upper Neck Z-axis Force	N	1000	242.6	-997.3
	Upper Neck Y-axis Moment	Nm	600	13.6	-16.3
Chest	Upper Left Resultant Chest Deflection	mm	Compute	19.2	
	Upper Right Resultant Chest Deflection	mm	Compute	22.0	
	Lower Left Resultant Chest Deflection	mm	Compute	8.8	
	Lower Right Resultant Chest Deflection	mm	Compute	13.0	
Abdomen	Lower Left X-axis Deflection	mm	Compute	4.2	-21.1
	Lower Right X-axis Deflection	mm	Compute	5.3	-30.2
Acetabulum	Left Acetabulum Resultant Force	N	Compute	2313.4	
	Right Acetabulum Resultant Force	N	Compute	1974.5	
Femur	Left Femur Force, FZ	N	600	256.7	-3737.7
	Right Femur Force, FZ	N	600	283.4	-3636.2
Tibia	Left Upper Tibia, FZ	N	600	302.8	-1568.8
	Left Upper Tibia Index		Compute	0.445	
	Right Upper Tibia, FZ	N	600	292.1	-1178.0
	Right Upper Tibia Index		Compute	0.321	
	Left Lower Tibia, FZ	N	600	339.9	-2901.9
	Left Lower Tibia Index		Compute	0.177	
	Right Lower Tibia, FZ	N	600	396.0	-2732.6
	Right Lower Tibia Index		Compute	0.136	
Ankle	Left Ankle Rotation, RX	Deg	180	6.7	-8.1
	Left Ankle Rotation, RY	Deg	180	35.4	-25.2
	Left Ankle Dorsiflexion Moment, MY	Nm	Compute	71.4	-73.8
	Left Ankle In/Eversion Moment, MX	Nm	Compute	18.9	-7.9
	Right Ankle Rotation, RX	Deg	180	3.1	-13.3
	Right Ankle Rotation, RY	Deg	180	40.3	-25.7
	Right Ankle Dorsiflexion Moment, MY	Nm	Compute	45.1	-84.9
	Right Ankle In/Eversion Moment, MX	Nm	Compute	16.4	-20.5

Anomalies:

ASIS Left Y Moment, channel failed, signal dropout

### SECTION 3

#### OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

#### 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 <sup>2</sup>	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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA Number	R20210230
Model Year	2021
Make	Ford
Model	Escape
Body Style	5-Door MPV
VIN	1FMCU0F66MUA10457
Body Color	Velocity Blue Metallic
Odometer Reading (km / mi)	8 / 5
Engine Displacement (L)	1.5
Type / No. of Cylinders	Inline 3
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	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	No
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	Yes
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? No

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Ford Motor Company
Date of Manufacture	Feb-21

GVWR (kg)	1978
GAWR Front (kg)	1061
GAWR Rear (kg)	975

**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)				472.0
DSC x 68.04 (kg)				340.2
Cargo Weight (RCLW) (kg)				131.8

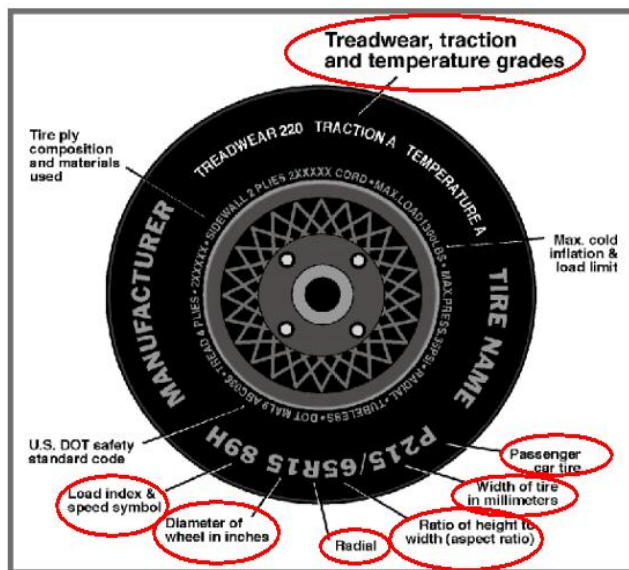
A  
B  
A-B\*

\*A maximum RCLW of 136.0 kg is used for a truck, MPV, or bus

## DATA SHEET NO. 1 ... (CONTINUED)

### GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	225/65 R17	225/65 R17
Tire Size on Vehicle	225/65 R17	225/65 R17
Tire Manufacturer	Continental	Continental
Tire Model	ProContact TX	ProContact TX
Treadware	500	500
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	102 H	102 H
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	DOT P52Y WC4H	DOT P52Y WC4H
DOT Safety Code Right	DOT P52Y WC4H	DOT P52Y WC4H

**DATA SHEET NO. 1 ... (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	446.0	289.5		523.5	355.0	
Right	kg	439.5	310.0		543.0	373.0	
Ratio	%	59.6%	40.4%	100.0%	59.4%	40.6%	100.0%
Total	kg	885.5	599.5	1485.0	1066.5	728.0	1794.5

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1485.0	A
Weight of two THOR-50M	kg	186.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	131.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1802.8	A+B+C

**TEST VEHICLE ATTITUDES**

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	832	838	860	860	1087
As Tested	mm	823	826	822	831	1092
Post-Test	mm	853	856	824	829	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2692
Total Vehicle Length at Left Side	mm	4352
Total Vehicle Length at Centerline	mm	4587
Total Vehicle Length at Right Side	mm	4318
Weight of Ballast/Equipment in Cargo Area	kg	132.5
Weight of Vehicle Components Removed	kg	9.0
Amount of Stoddard Solvent in Fuel Tank	L	55.20

**VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:**

Rear trim, tire pump

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

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**TARGET VEHICLE STRUCTURAL MEASUREMENTS**

<b>No.</b>	<b>Description</b>	<b>Units</b>	<b>Pre-Test</b>
1	Total Length	mm	4587
2	Total Width	mm	1861
3*	Bumper Top Height	mm	923
4*	Bumper Bottom Height	mm	511
5*	Longitudinal Member Top Height	mm	782
6	Distance Between Longitudinal Members	mm	896
7	Longitudinal Member Width	mm	84
8*	Engine Top Height	mm	1019
9*	Engine Bottom Height	mm	386
10	Engine and Gearbox Width	mm	628
11	Front Bumper to Engine Distance	mm	517
12*	Front Shock Absorber Fixing Height	mm	1069
13*	Bonnet Leading Edge Height	mm	1069
14	Front Shock Absorber Fixing Width	mm	1100
15	Front Bumper to Front Axle Distance	mm	963
16	Front Axle to A-Pillar Distance	mm	570
17	A-Pillar to B-Pillar Distance	mm	960
18	B-Pillar to Rear Axle Distance	mm	1167
19	B-Pillar to C-Pillar Distance	mm	974
20*	Roof Sill Bottom Height	mm	1592
21*	Roof Sill Top Height	mm	1733
22*	Floor Sill Bottom Height	mm	382
23*	Floor Sill Top Height	mm	530

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

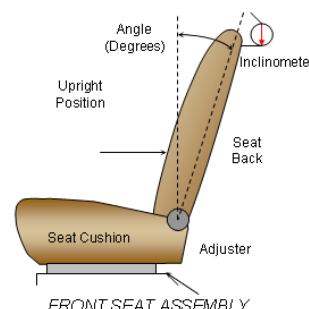
## DATA SHEET NO. 2

### SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

#### NOMINAL DESIGN RIDING POSITION

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

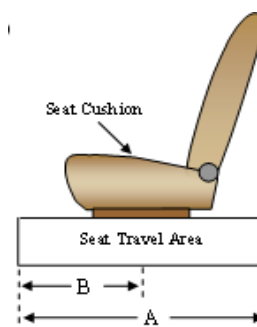


#### SEAT BACK ANGLE

Seating Position	Unit	FORM 208 Position	After ATD Positioning
Driver Seat Back Angle	Degrees	3.1	4.9
Passenger Seat Back Angle	Degrees	3.1	4.5

#### SEAT FORE / AFT POSITIONING

The driver seat travel is measured from the forward most position to the rear most position with the seat cushion set at mid angle. The driver 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 passenger seat travel is measured from the forward most possible position to the rear most possible position. The passenger 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	241	117
Passenger Seat	255	131

#### SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer’s design position for a 50<sup>th</sup> 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**

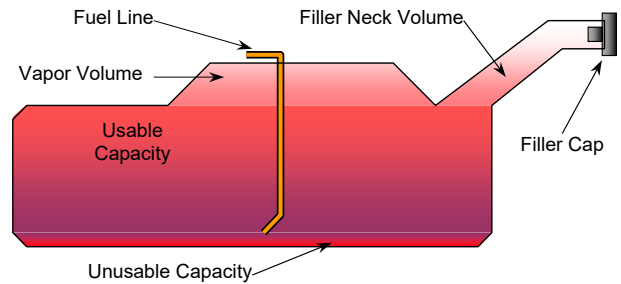
Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**FUEL TANK CAPACITY**

Description	Liters
Usable Capacity of "Standard Tank"	59.81
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	55.62
Actual Amount of Stoddard Solvent Used	55.62
1/3 of Usable Capacity	19.94

**FUEL PUMP**

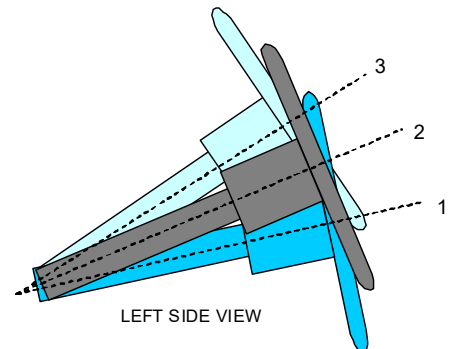
Fuel was evacuated according to the specifications provided by the manufacturer in Form 208. The electric fuel pump operates when the electrical system is activated.



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.



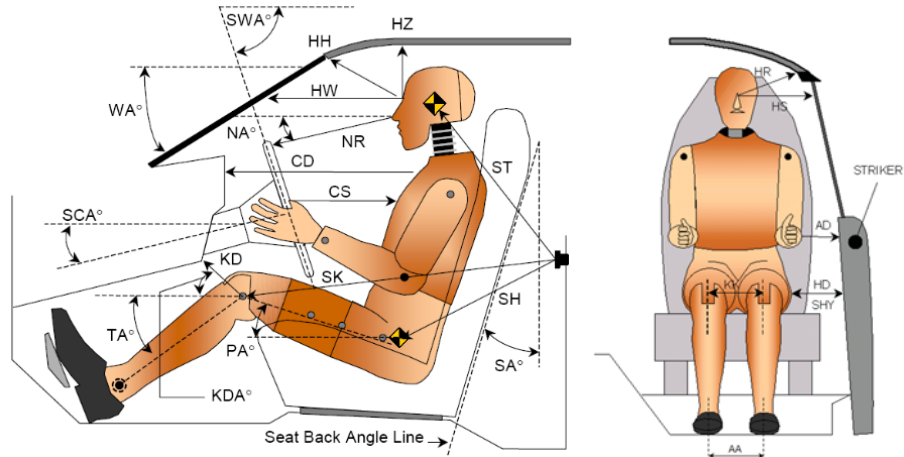
LEFT SIDE VIEW  
STEERING COLUMN ASSEMBLY

**STEERING COLUMN POSITIONING**

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	23.0	80
Geometric Center Position, No. 2	25.4	110
Uppermost Position, No. 3	27.8	140
Telescoping Steering Wheel Travel		60
Test Position	25.4	110

**DATA SHEET NO. 3**  
**DUMMY CLEARANCE DIMENSIONS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21



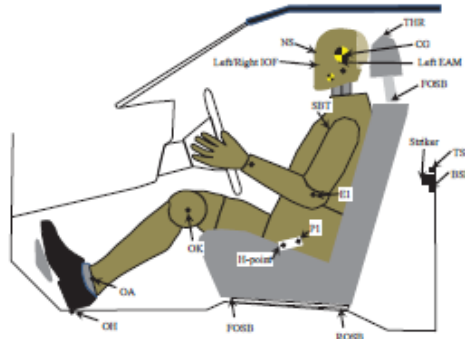
**LEFT SIDE VIEW**

Code	Measurement Description	Driver S/N# EG2595		Passenger S/N# DO9799	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
HZ	Nasion to Roof (Z Distance)	227		209	
HH	Nasion to Header (3D Distance)	389		366	
HW	Nasion to Windshield Point 1 Inside (X Distance)	742		701	
NR	Tip of Nose to Top of Steering Wheel (3D Distance)	517			
CD	Chest Point 1 to Dash Point 1 (3D Distance)	622		569	
CS	Chest Point 2 to Center of Steering Wheel (X Distance)	370			
CBS	Chest Point 3 to Bottom of Steering Wheel (X Distance)	195			
IKD	Inboard Knee to Dash Point 3 (3D Distance)	103		111	
OKD	Outboard Knee to Dash Point 2 (3D Distance)	191		123	
HR	Nasion to Side Header (3D Distance)	243		231	
HS	Nasion to Side Window Distance (Y Distance)	360		354	
AD	Elbow to Door (Y Distance)	121		32	
HD	H-Point to Door (Y Distance)	126		124	
HLHL	Inboard Heel to Outboard Heel (Y Distance)	366		175	
KK	Inboard Knee to Outboard Knee (Y Distance)	316		228	
SH	Striker to H-Point (3D Distance)	288		277	
HRA	Head Restraint Post Angle	4.9		4.5	
	H-Point Tool Angle		18.5		18.5
	Torso Angle		19.9		71.5
	Windshield Angle		60.7		61.8
	Head Angle (X)		0.2		0.1
	Head Angle (Y)		-0.7		-0.4
	T1 Angle (X)				-0.4
	T1 Angle (Y)				2.5
	T6 Angle (X)		-1.3		-0.4
	T6 Angle (Y)		-21.6		22.2
	T12 Angle (X)				-0.4
	T12 Angle (Y)				33.9
	Pelvis Angle (X)		-0.6		-0.3
	Pelvis Angle (Y)		35.2		35.4

**DATA SHEET NO. 4**

**DUMMY CMM MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21



Description	Units	Driver S/N# EG2595			Passenger S/N# DO9799		
		X	Y	Z	X	Y	Z
Center of Upper Striker Bolt	mm	2079	-787	-213	2108	792	-203
Center of Lower Striker Bolt	mm	2082	-789	-183	2110	793	-196
Center of Striker Bar	mm	2112	-792	-202	2110	792	-200
Front Outboard Seat Bolt	mm	2533	-533	203	2532	531	201
Rear Outboard Seat Bolt	mm				2165	635	206
Center of Steering Wheel Hub	mm	2596	-371	-458			
Outer Head Restraint Post	mm	1899	-456	-604	1915	457	-617
Right Head CG	mm	2081	-300	-757	2095	459	-765
Left Head CG	mm	2076	-455	-757	2096	306	-764
Right EAM	mm	2087	-304	-728	2102	455	-738
Left EAM	mm	2086	-451	-728	2104	309	-738
Nasion	mm	2173	-378	-768	2191	385	-777
Right IOF	mm	2174	-348	-731	2188	417	-737
Left IOF	mm	2172	-412	-730	2190	353	-740
Tip of Nose	mm	2174	-380	-730	2192	386	-740
Tip of Chin	mm	2172	-377	-632	2189	384	-641
Chest Point 1	mm	2204	-378	-504	2226	384	-511
Chest Point 2	mm	2226	-370	-458			
Chest Point 3	mm	2346	-371	-276			
Shoulder Point 1	mm	2060	-571	-529	2080	580	-535
Shoulder Point 2	mm	2113	-568	-507	2130	570	-510
Elbow	mm	2300	-626	-304	2258	657	-253
Center of H-Point Tool	mm	2228	-645	-145	2248	637	-150
H-Point on H-Point Tool	mm	2307	-598	-119	2324	632	-124
H-Point on ATD Skin	mm	2306	-573	-118	2325	578	-124
Outboard Knee	mm	2703	-584	-222	2741	549	-214
Inboard Knee	mm	2724	-269	-206	2746	321	-213
Outboard Ankle	mm	2925	-571	149	2949	434	148
Inboard Ankle	mm	2984	-201	137	2966	250	154
Outboard Heel	mm	2928	-560	265	2960	413	262
Inboard Heel	mm	2994	-200	253	2974	239	263

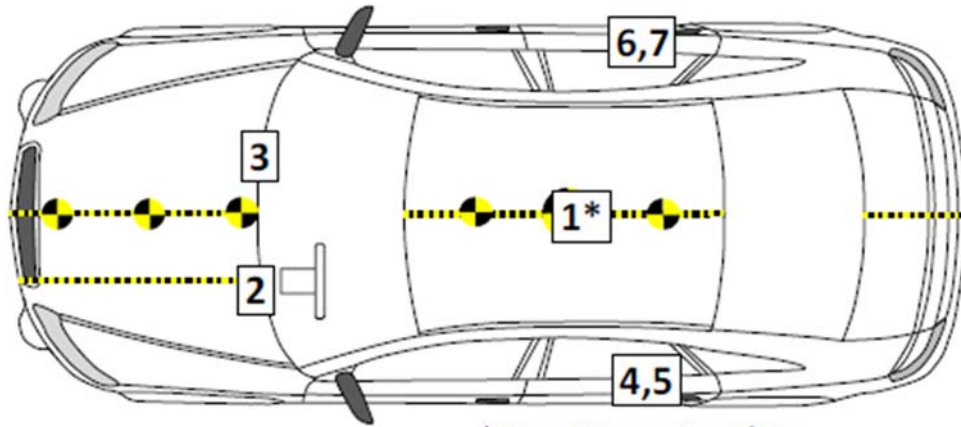
Reference Point:

- +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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21



\* Use Mounting Plate

**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	1834	3	153
2	Driver Floor Pan	x, y, z	°/s	3191	-335	193
3	Passenger Floor Pan	x, y, z	g	3109	368	187
4	Door Sill LR	x, y	g	1707	-717	163
5	Door Sill LR Redundant	x, y	g	1682	-715	163
6	Door Sill RR	x, y	g	1705	725	165
7	Door Sill RR Redundant	x, y	g	1683	726	164

Reference Point:

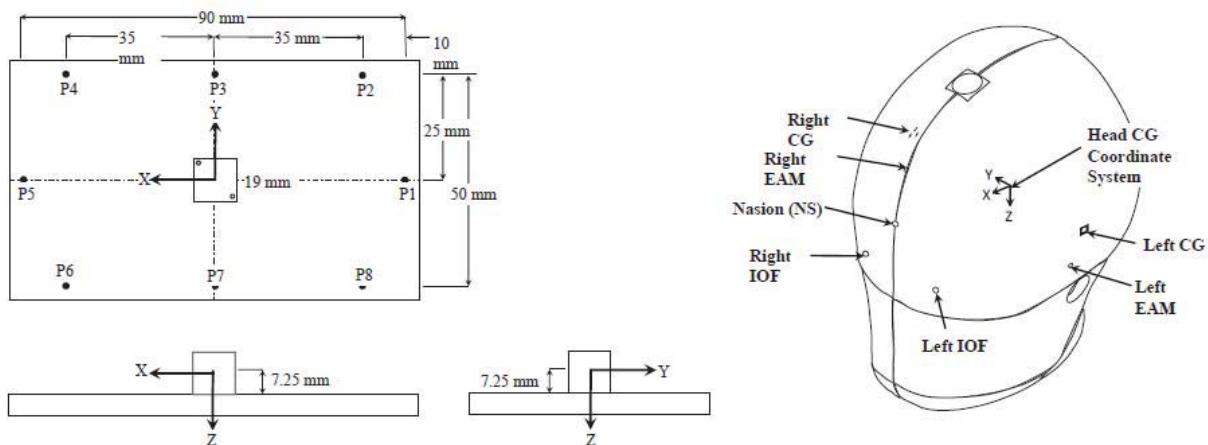
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

**DATA SHEET NO. 5 ... (CONTINUED)**

**VEHICLE INSTRUMENTATION DATA**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**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	1786	1	144
P2	Plate Point 2	mm	1800	31	146
P3	Plate Point 3	mm	1836	30	145
P4	Plate Point 4	mm	1870	30	146
P5	Plate Point 5	mm	1878	1	144
P6	Plate Point 6	mm	1869	-21	145
P7	Plate Point 7	mm	1834	-19	145
P8	Plate Point 8	mm	1801	-21	146

**DRIVER HEAD POINTS IN RELATION TO HEAD CG COORDINATE SYSTEM**

Description	Units	x	y	z
Left CG	mm	65	-41	45
Left EAM	mm	73	-38	73
Left IOF	mm	153	4	74
Right IOF	mm	152	69	75
Nasion	mm	156	37	37
Right EAM	mm	72	108	74
Right CG	mm	66	111	46

**DATA SHEET NO. 5 ... (CONTINUED)**

**VEHICLE INSTRUMENTATION DATA**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

Location No.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Min	Time (ms)
1	Vehicle CG	x	g	1.8	112.7	-41.1	32.8
		y	g	4.5	39.7	-3.4	63.3
		z	g	30.6	36.5	-47.9	40.9
	Vehicle CG Rotation	x	°/s	126.0	40.4	-71.7	28.5
		y	°/s	171.9	46.3	-253.4	23.3
		z	°/s	32.4	28.5	-39.5	35.8
2	Driver Floor Pan	x	g	2.4	22.8	-28.4	28.5
		y	g	11.2	24.3	-11.9	27.8
		z	g	34.5	17.1	-11.4	27.4
3	Passenger Floor Pan	x	g	1.0	36.0	-27.7	29.2
		y	g	1.7	21.7	-3.4	16.3
		z	g	33.5	16.5	-0.4	36.3
4	Door Sill LR	x	g	1.7	112.5	-42.0	35.2
		y	g	5.4	39.6	-6.0	32.7
5	Door Sill LR Redundant	x	g	1.7	112.3	-38.6	35.3
		y	g	8.3	39.4	-1.7	64.4
6	Door Sill RR	x	g	1.4	115.7	-36.4	35.2
		y	g	4.0	41.3	-5.8	22.2
7	Door Sill RR Redundant	x	g	1.2	115.1	-36.4	35.2
		y	g	3.2	69.6	-6.6	22.2

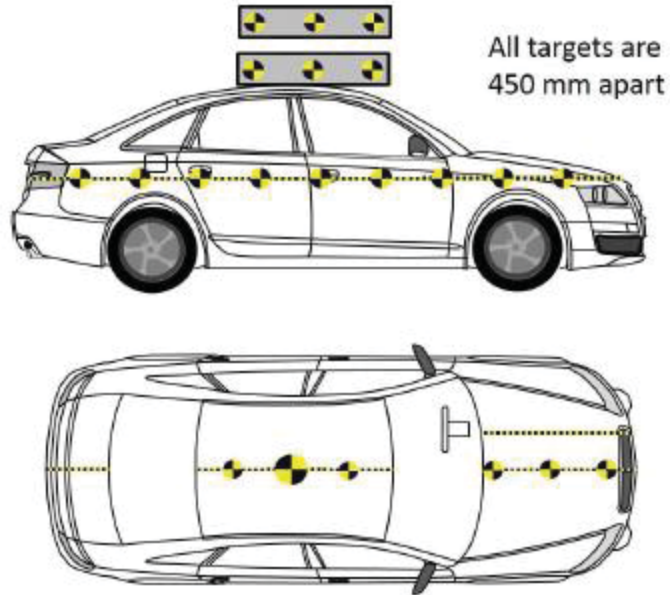
Note: See Appendix B for all vehicle data plots

**DATA SHEET NO. 6**

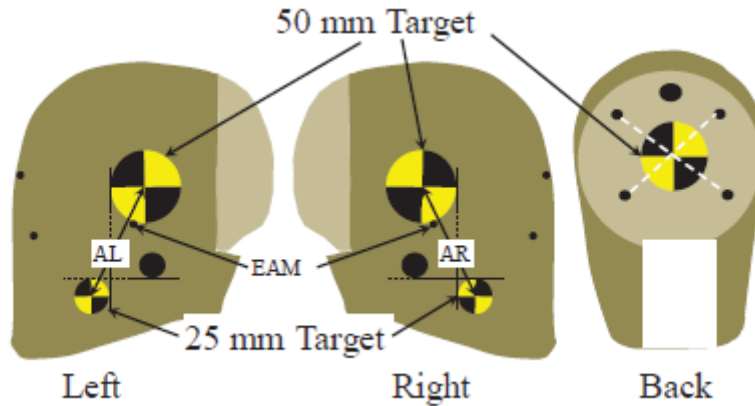
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**VEHICLE TARGETS**



**ATD HEAD TARGETS**



**Driver**

Target	Units	Measurement
AL	mm	97
AR	mm	98

**Passenger**

Target	Units	Measurement
AL	mm	89
AR	mm	86

## DATA SHEET NO. 7

### TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

### INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Sensors	99
Passenger Dummy Sensors	134
Vehicle Structure Sensors	20
Airbag Timing Sensor	10
Total	263

### 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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**TEST DUMMY INFORMATION AND CONTACT**

Description	Driver	Passenger
Dummy Type/Serial No.	THOR-50M / EG2595	THOR-50M / DO9799
Head Contact	Frontal airbag, A-pillar trim, windshield	Frontal airbag, windshield
Upper Torso Contact	Frontal airbag, roof	Frontal airbag
Lower Torso Contact	Frontal airbag, door panel	Frontal airbag, door panel
Left Knee Contact	Knee airbag	Knee bolster
Right Knee Contact	Knee airbag, knee bolster	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)	None	None
Seat Back Failure	None	None
Glazing Damage	Broken	

**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	Yes
Side Airbag 1 (Curtain)	Yes	No	Yes	No
Side Airbag 2 (Torso/Pelvis)	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	
Seat Belt Pretensioner				
Seat Belt Load Limiter				

**DATA SHEET NO. 9**

**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4587	4383	-204
2	Rear Surface of Vehicle to Front of Engine	4071	3999	-71
3	RSOV to Firewall	3448	3420	-28
4	RSOV to Upper Leading Edge of Right Door	3171	3137	-34
5	RSOV to Upper Leading Edge of Left Door	3168	3136	-32
6	RSOV to Lower Leading Edge of Right Door	3171	3104	-66
7	RSOV to Lower Leading Edge of Left Door	3141	3109	-32
8	RSOV to Upper Trailing Edge of Right Door	2028	1996	-32
9	RSOV to Upper Trailing Edge of Left Door	2026	1996	-31
10	RSOV to Lower Trailing Edge of Right Door	2075	2042	-33
11	RSOV to Lower Trailing Edge of Left Door	2075	2044	-30
12	RSOV to Bottom of A-Pillar, Right Side	3055	3022	-33
13	RSOV to Bottom of A-Pillar, Left Side	3054	3022	-33
14	RSOV to Firewall, Right Side	3450	3418	-32
15	RSOV to Firewall, Left Side	3496	3469	-26
16	RSOV to Steering Column	2626	2654	28
17	Center of Steering Column to A-Pillar	428	367	-61
18	Center of Steering Column to Headliner	507	524	17
19	RSOV to Right Side of Front Bumper	4318	4208	-110
20	RSOV to Left Side of Front Bumper	4352	4234	-118
21	Length of Engine Block	418	418	0
RD	RSOV to Right Side of Dash Panel	2866	2834	-32
CD	RSOV to Center of Dash Panel	2775	2750	-25
LD	RSOV to Left Side of Dash Panel	2856	2825	-31

All measurements in millimeters.

**DATA SHEET NO. 10**

**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

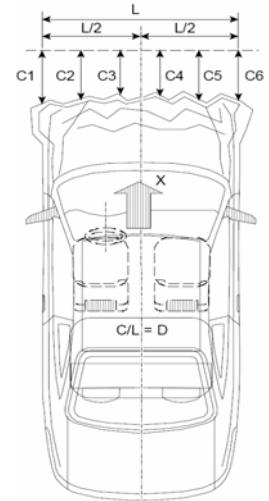
**VEHICLE INFORMATION**

VIN: 1FMCU0F66MUA10457  
 Vehicle Size Category: Passenger Car

Wheelbase (mm): 2692  
 Test Weight (kg): 1794.5

**ACCELEROMETER DATA**

Accelerometer Locations: Vehicle CG<sub>x</sub>  
 Cal. Procedure/Interval: Vibration Test / 6 months  
 Integration Algorithm: NHTSA Standard  
 Linearity: Good  
 Impact Velocity (km/h): 40.37



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW1  
 Midpoint of Damage: Vehicle Centerline  
 Damage Region Length (mm): 1452  
 Impact Mode: Full Frontal

**Crush Measurements**

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4320	4234	-86
C2	Crush Zone 2 at Left Side	mm	4469	4350	-119
C3	Crush Zone 3 at Left Side	mm	4530	4384	-146
C4	Crush Zone 4 at Right Side	mm	4531	4370	-161
C5	Crush Zone 5 at Right Side	mm	4470	4311	-159
C6	Crush Zone 6 at Right Side	mm	4286	4208	-78
L	C1 to C6	mm	1452		

**DATA SHEET NO. 11**

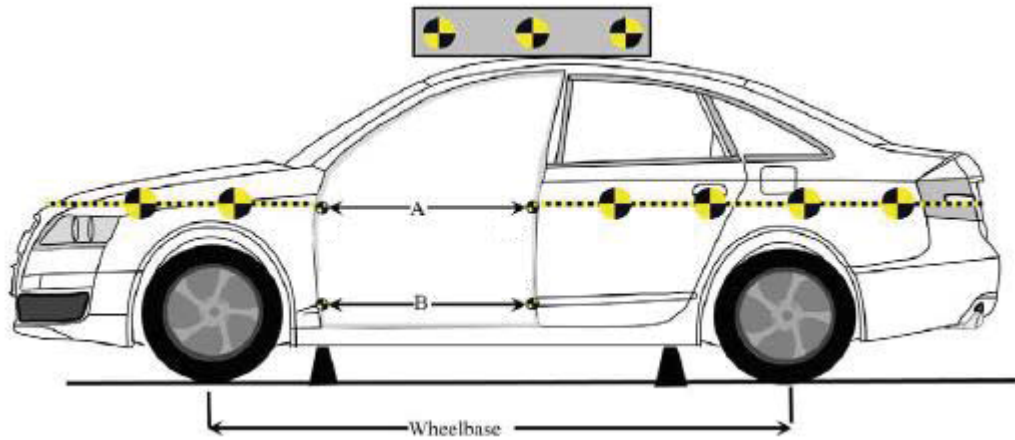
**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Driver Side Upper	mm	877	875	2
B	Driver Side Lower	mm	718	718	0
D	Passenger Side Upper	mm	878	878	0
E	Passenger Side Lower	mm	716	718	-2



**DATA SHEET NO. 11 ... (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

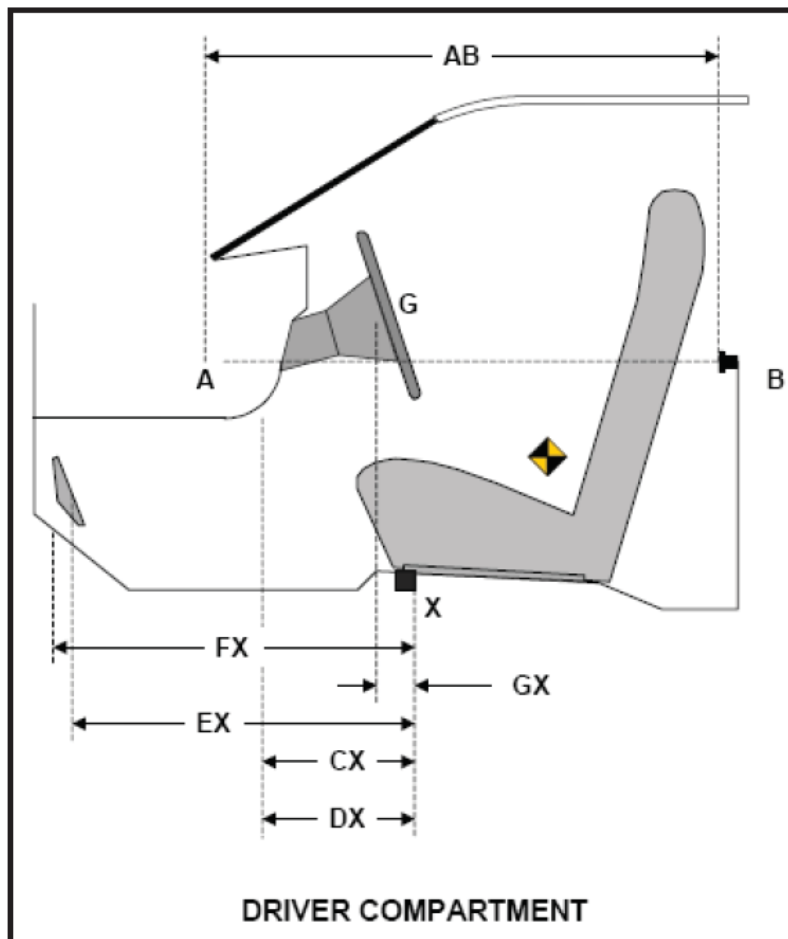
Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	844	844	0
CX	Left Knee Bolster to X	mm	342	345	-3
DX	Right Knee Bolster to X	mm	350	355	-5
EX	Brake Pedal to X	mm	553	550	3
FX	Footrest to X	mm	678	673	5
GX	Center of Steering Column Wheel Hub to X	mm	61	118	-57

X = Front of Seat Track (Stationary)



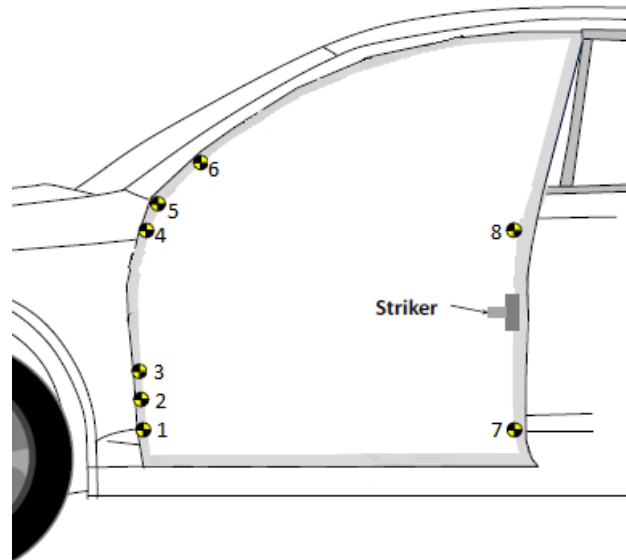
**DATA SHEET NO. 11 ... (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**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	2951	-758	76	2952	-759	77	1	-1	1
2	2965	-756	-1	2967	-757	0	2	-2	2
3	2969	-751	-75	2970	-753	-75	0	-2	1
4	2972	-742	-375	2971	-741	-375	-1	1	0
5	2968	-740	-452	2968	-739	-451	-1	0	1
6	2957	-736	-526	2958	-735	-524	1	0	2
7	2234	-761	73	2234	-761	73	0	0	0
8	2095	-743	-378	2096	-743	-376	1	0	2

All measurements in millimeters.

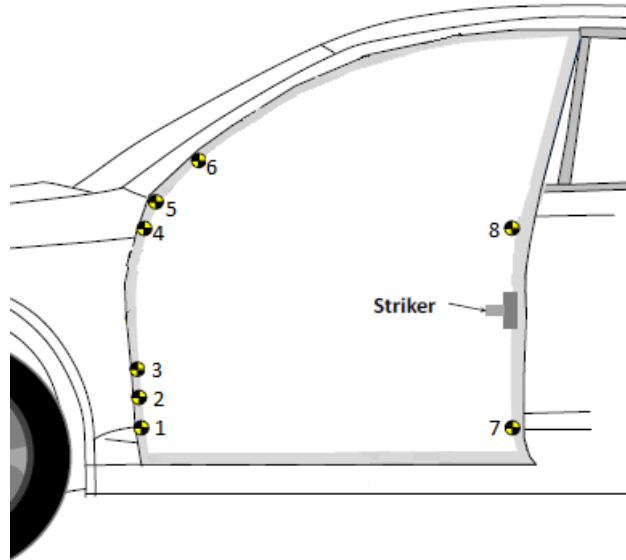
**DATA SHEET NO. 11 ... (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**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	2951	763	73	2951	736	76	1	-27	3
2	2967	760	-1	2964	736	1	-3	-24	3
3	2969	756	-77	2967	734	-74	-2	-22	3
4	2974	745	-378	2973	730	-374	-1	-15	4
5	2969	743	-452	2967	729	-449	-2	-14	3
6	2954	740	-528	2954	728	-523	0	-12	4
7	2235	763	73	2233	737	76	-2	-26	3
8	2096	747	-377	2096	732	-373	-1	-15	4

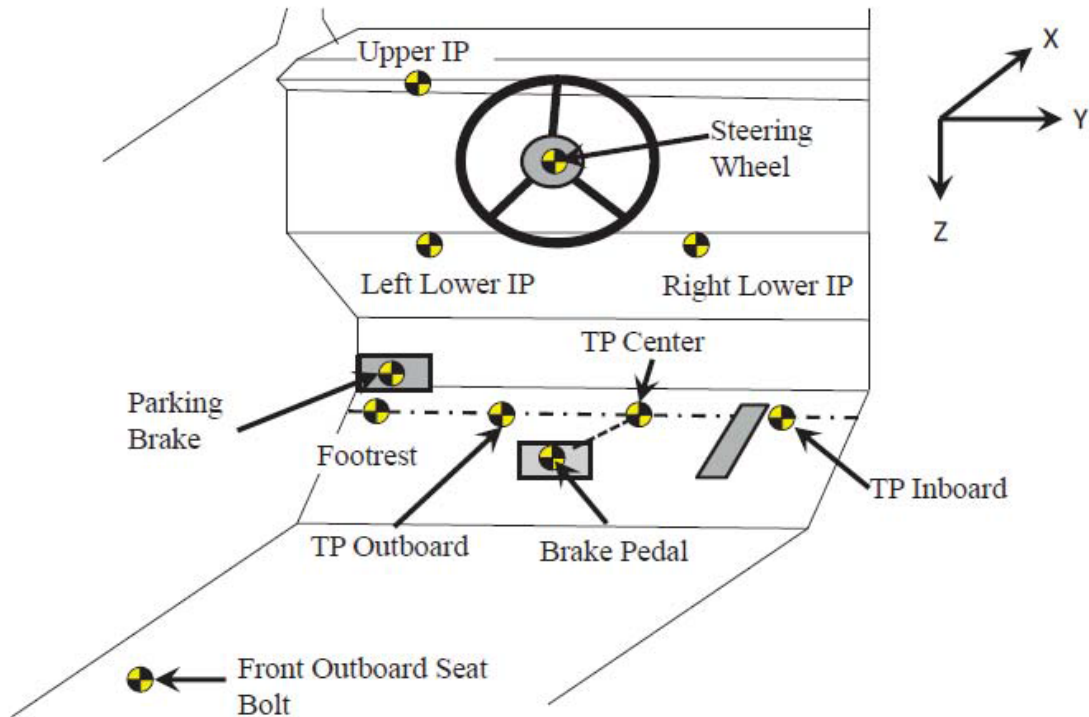
All measurements in millimeters.

**DATA SHEET NO. 11 ... (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**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	3299	-166	76	3297	-173	77	-2	-7	1
TP Center	3346	-316	76	3329	-320	73	-17	-5	-3
TP Outboard	3276	-468	74	3266	-465	68	-10	3	-6
TP Footrest	3211	-570	73	3208	-567	70	-3	3	-3
Brake Pedal	3086	-316	74	3085	-314	69	-1	3	-5
Left Lower IP	2875	-524	-260	2880	-521	-262	5	3	-2
Right Lower IP	2883	-223	-260	2890	-222	-262	7	1	-2
Upper IP	2798	-525	-432	2802	-524	-435	5	1	-2
Steering Wheel	2594	-373	-459	2653	-374	-442	59	-1	18
Front Outboard Bolt	2533	-533	203	2535	-533	205	2	0	2
Emergency Brake									

Reference point:

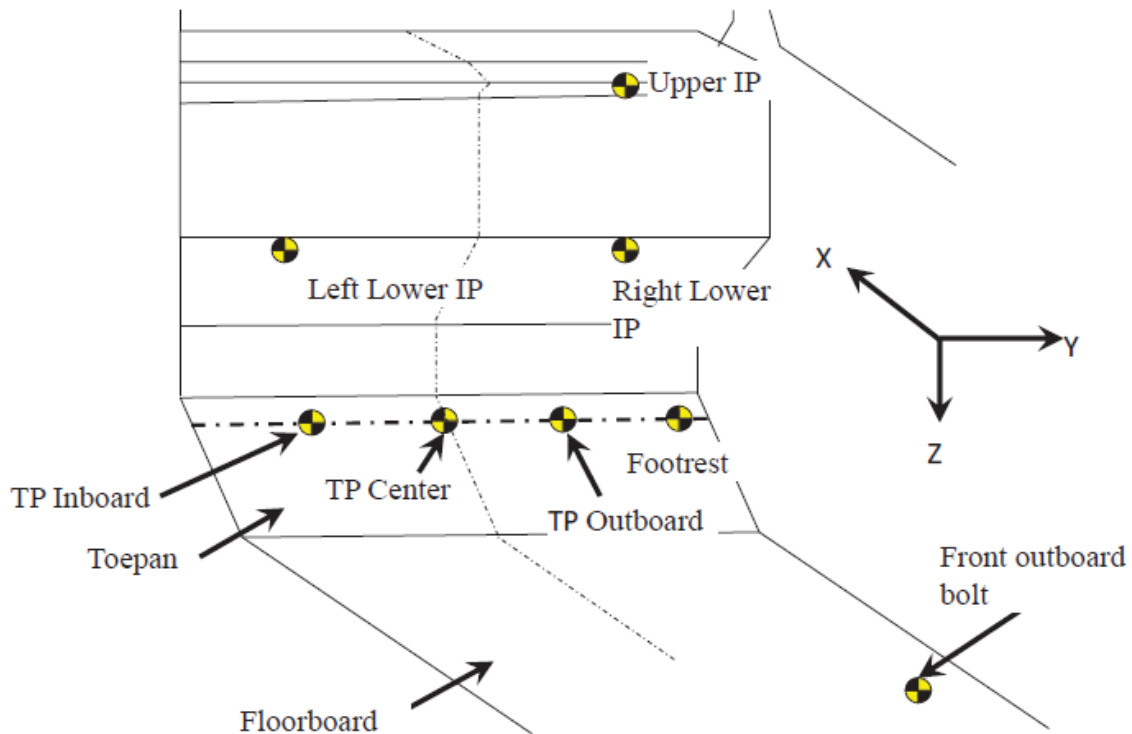
- +X – From the rear of the vehicle to the front of the vehicle
- +Y – From the left side of the vehicle to the right side of the vehicle
- +Z – From the top of the vehicle to the bottom of the vehicle

**DATA SHEET NO. 11 ... (CONTINUED)**

**VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**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	3290	222	75	3289	190	69	-1	-32	-5
TP Center	3273	370	75	3267	340	72	-6	-30	-3
TP Outboard	3246	521	72	3238	491	69	-8	-31	-3
TP Footrest	3189	620	73	3186	591	72	-3	-28	-1
Left Lower IP	2893	219	-189	2927	199	-207	35	-21	-18
Right Lower IP	2902	521	-189	2915	499	-189	13	-23	0
Upper IP	2792	521	-415	2798	509	-415	5	-13	-1
Front Outboard Seat Bolt	2532	531	201	2533	505	202	1	-26	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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
 Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

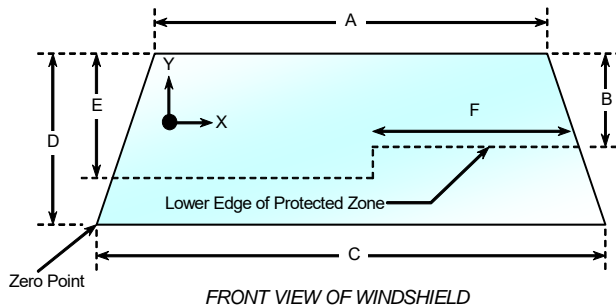
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with plastic molding and rubber cement.

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: 21.3° C

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2429	2429	100.0%
Right Side	2429	2429	100.0%
Total	4858	4858	100.0%



Item	Units	Value
A	mm	1348
B	mm	425
C	mm	1550
D	mm	980
E	mm	535
F	mm	615

**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: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230  
Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 33.0 ° C Test Time: 9:52 AM

**Stoddard Solvent Spillage Measurements**

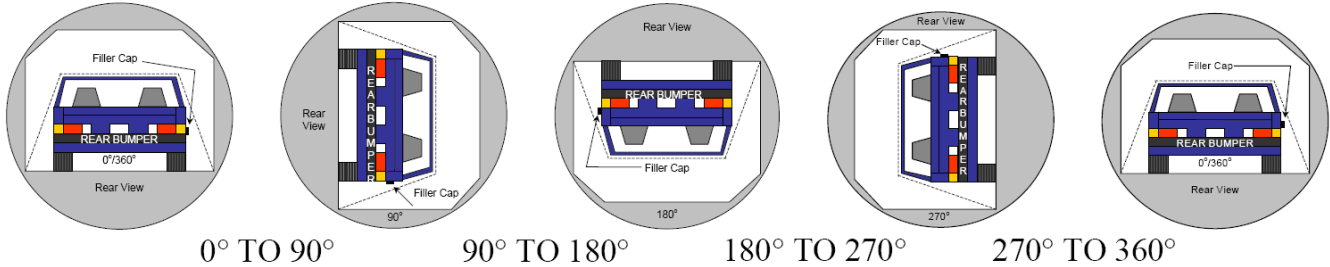
- A. From impact until vehicle motion ceases: 0 oz.  
(Maximum allowable = 1 oz.)
- B. For the 5 minute period after motion ceases: 0 oz.  
(Maximum allowable = 5 oz.)
- C. For the following 25 minutes: 0 oz.  
(Maximum allowable = 1 oz./minute)
- D. Spillage: There was no Stoddard solvent spillage.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

**DATA SHEET NO. 13**

**FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2021 Ford Escape S 5-Door MPV NHTSA No. R20210230

Test Program: R&D Full Frontal Rigid Barrier Impact Test Date: 09/22/21



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°	80	300	380
90° To 180°	86	300	386
180° To 270°	90	300	390
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**

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FIGURE 1. Test Vehicle Certification Label



FIGURE 2. Test Vehicle Tire Placard



FIGURE 3. Right Front ¾ View, As Received



FIGURE 4. Left Rear ¾ 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

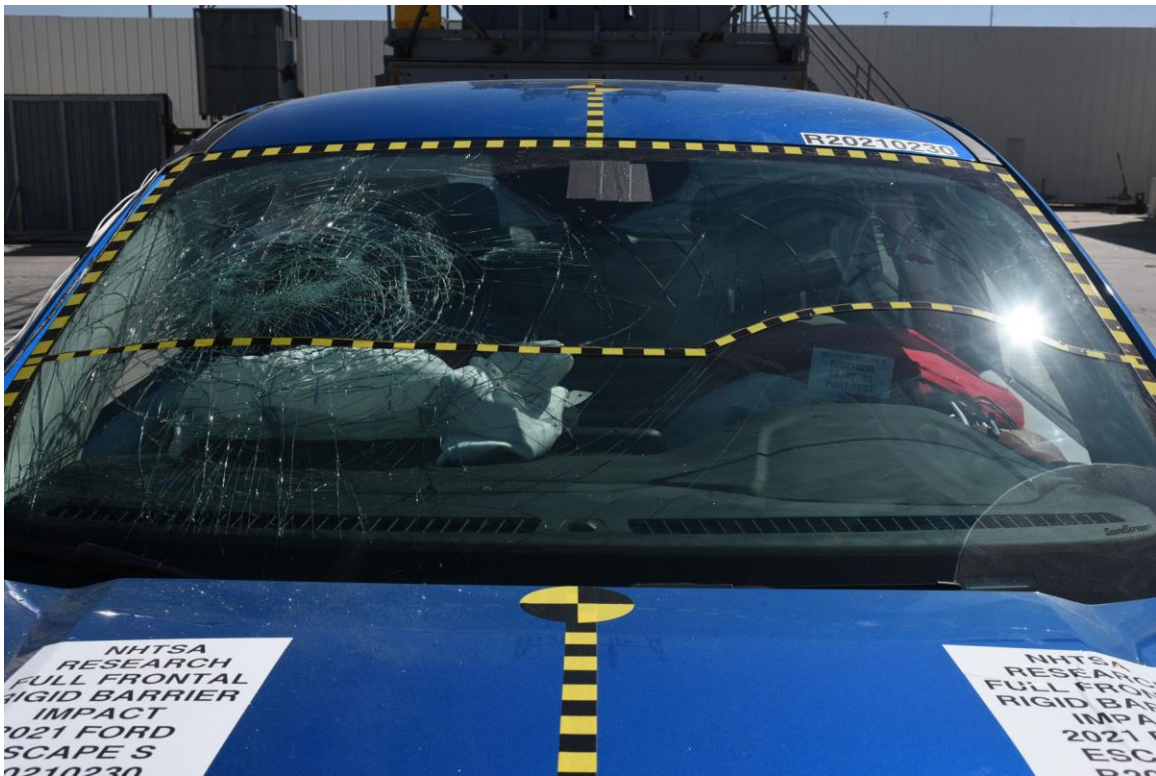


FIGURE 22. Post-Test Windshield View



FIGURE 23. Pre-Test Engine Compartment View

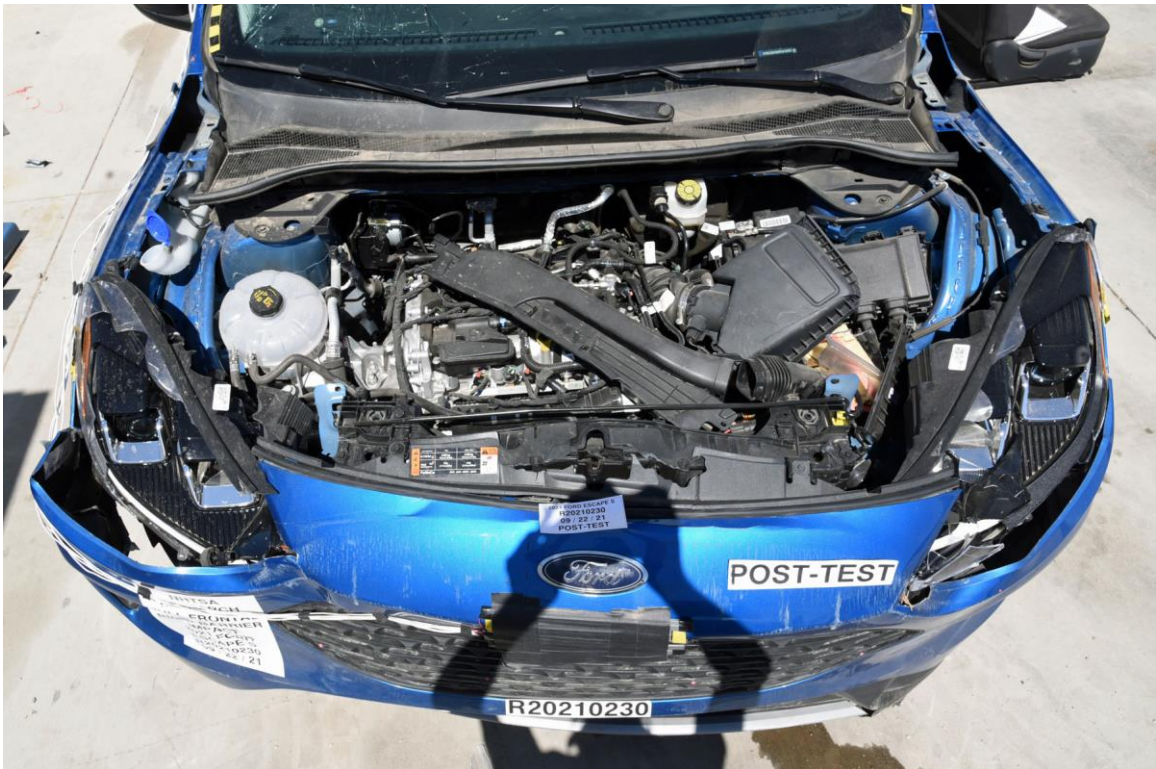


FIGURE 24. Post-Test Engine Compartment View



FIGURE 25. Pre-Test Fuel Filler Cap View



FIGURE 26. Post-Test Fuel Filler Cap View

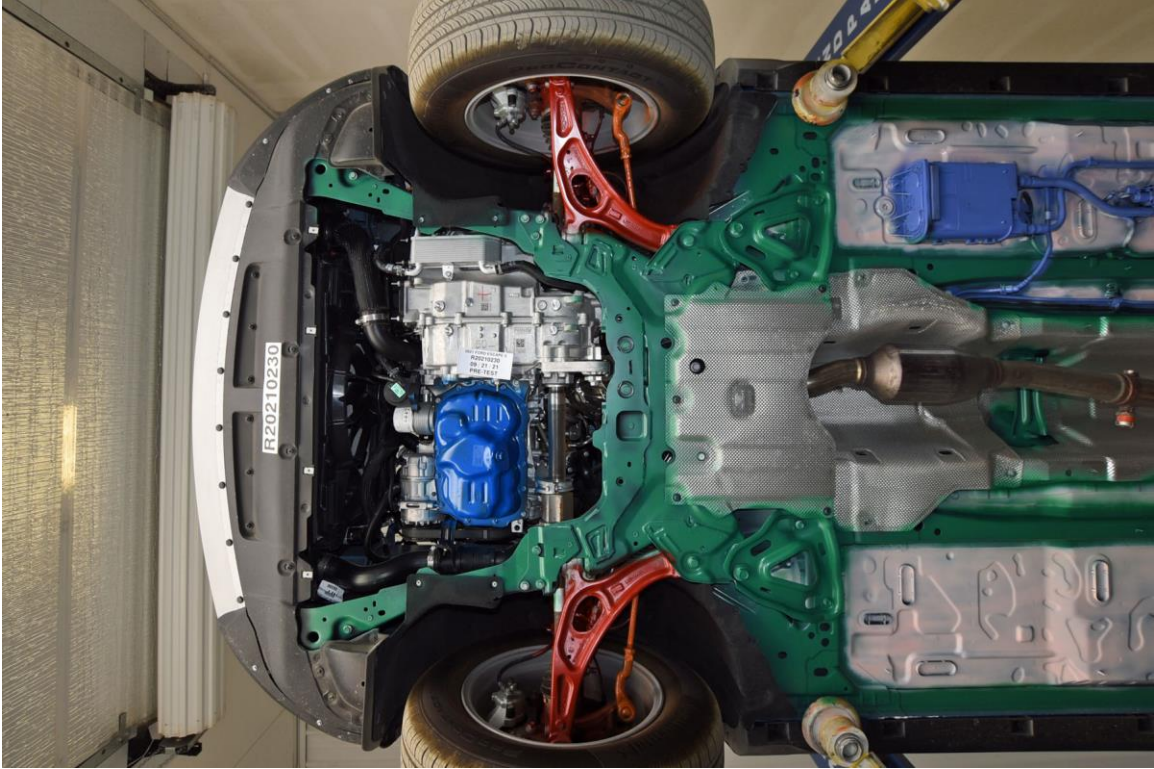


FIGURE 27. Pre-Test Front Underbody View

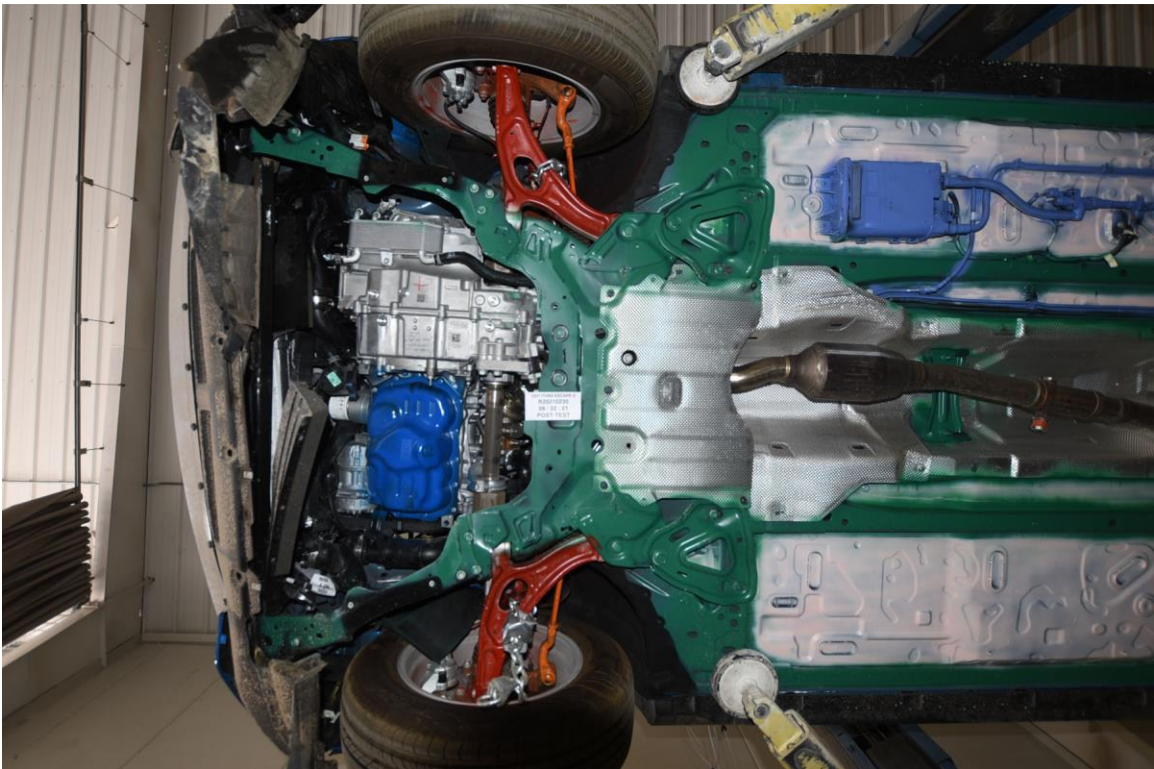


FIGURE 28. Post-Test Front Underbody View



FIGURE 29. Pre-Test Mid Underbody View

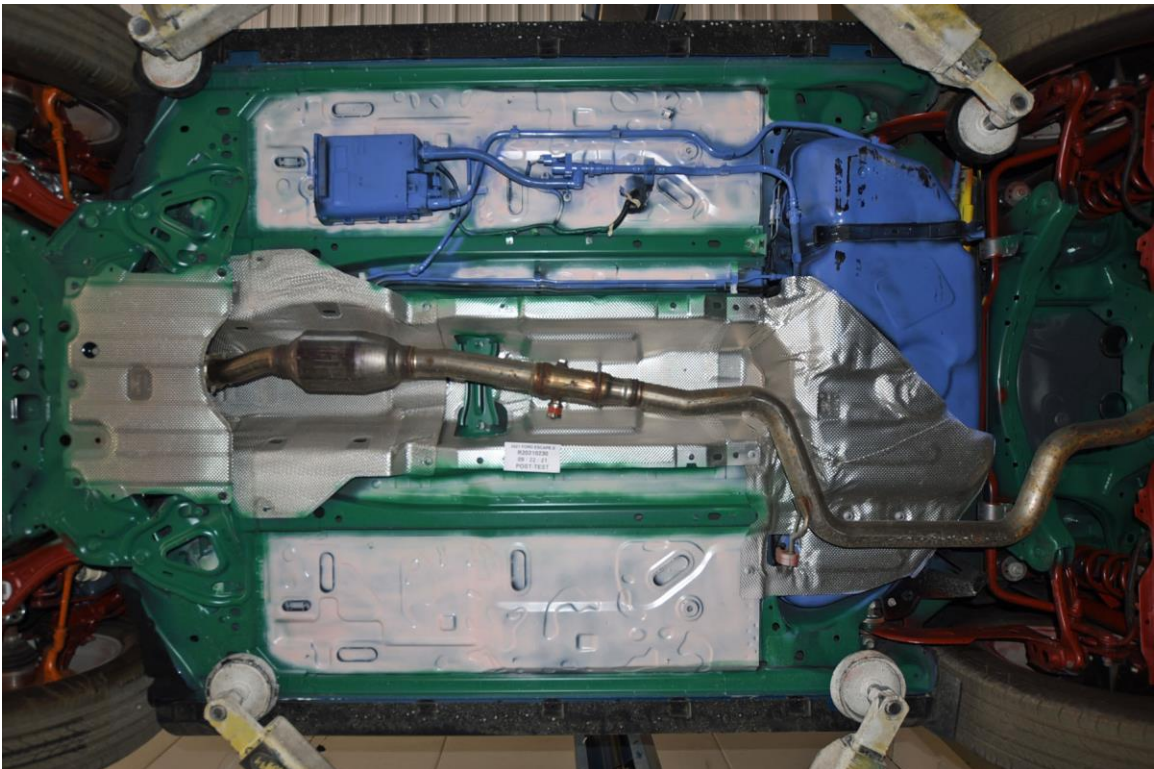


FIGURE 30. Post-Test Mid Underbody View

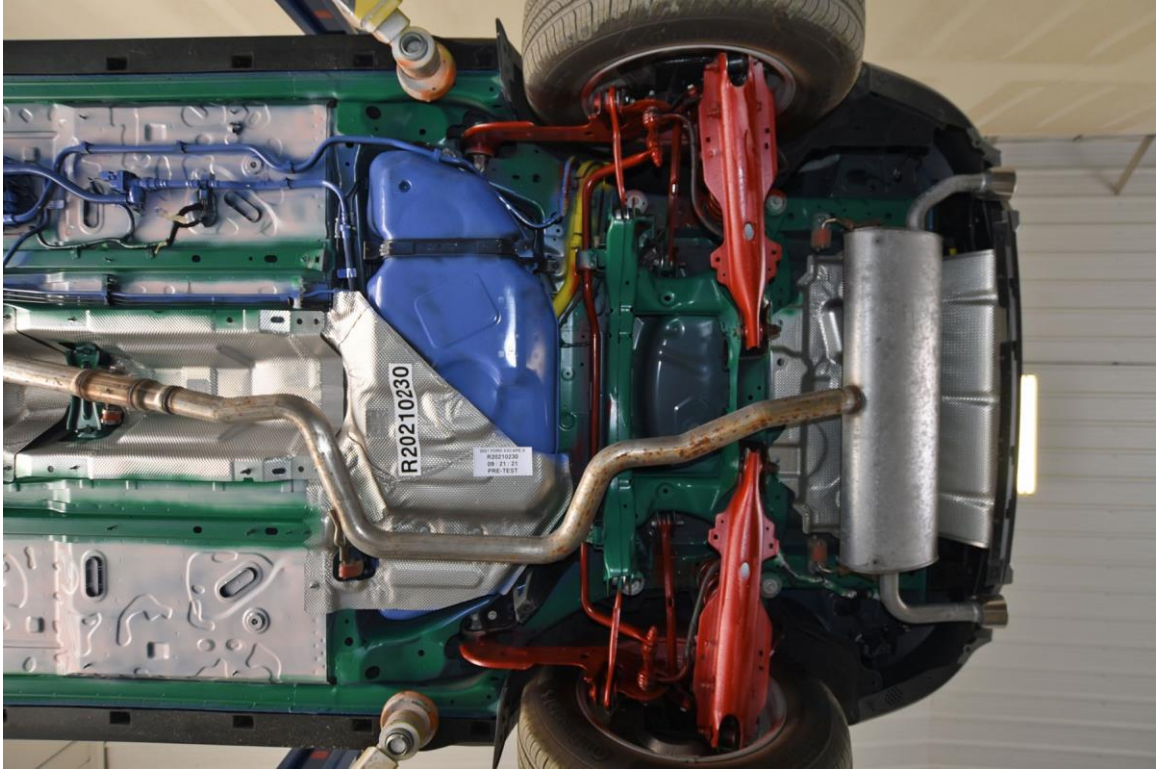


FIGURE 31. Pre-Test Rear Underbody View



FIGURE 32. Post-Test Rear Underbody View



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

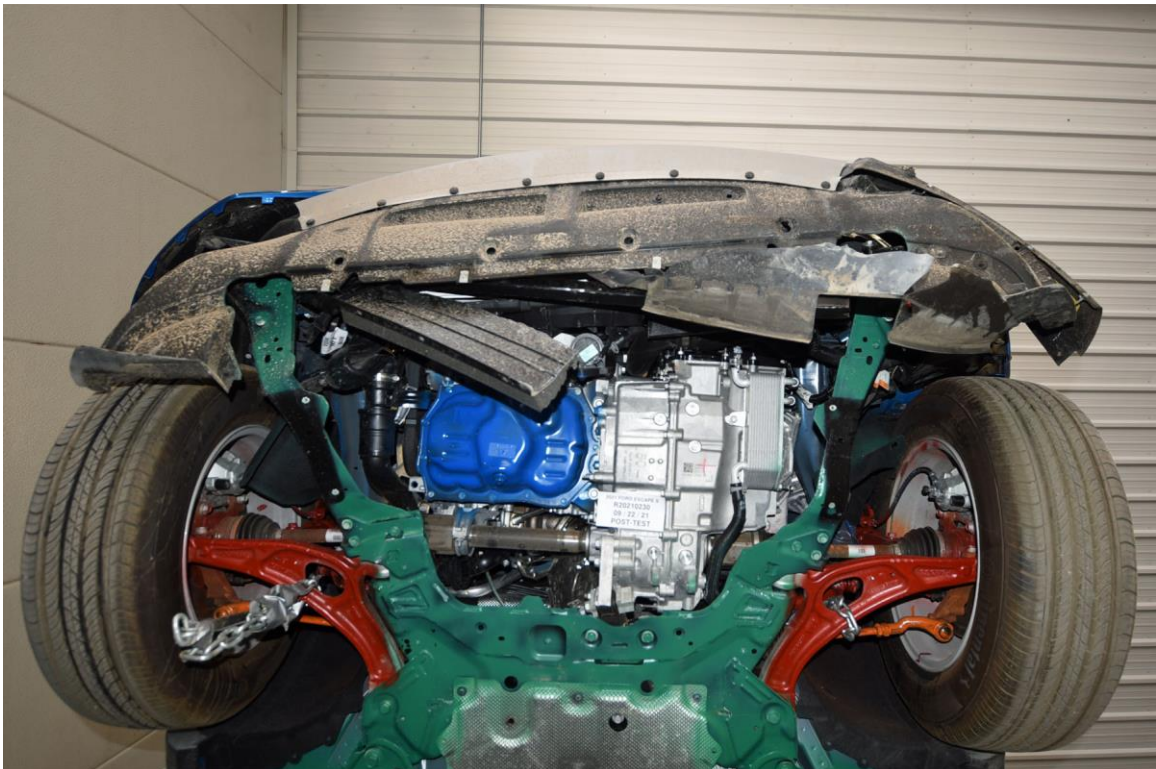


FIGURE 34. Post-Test Bumper to Rail Attachments and Crush Initiators



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

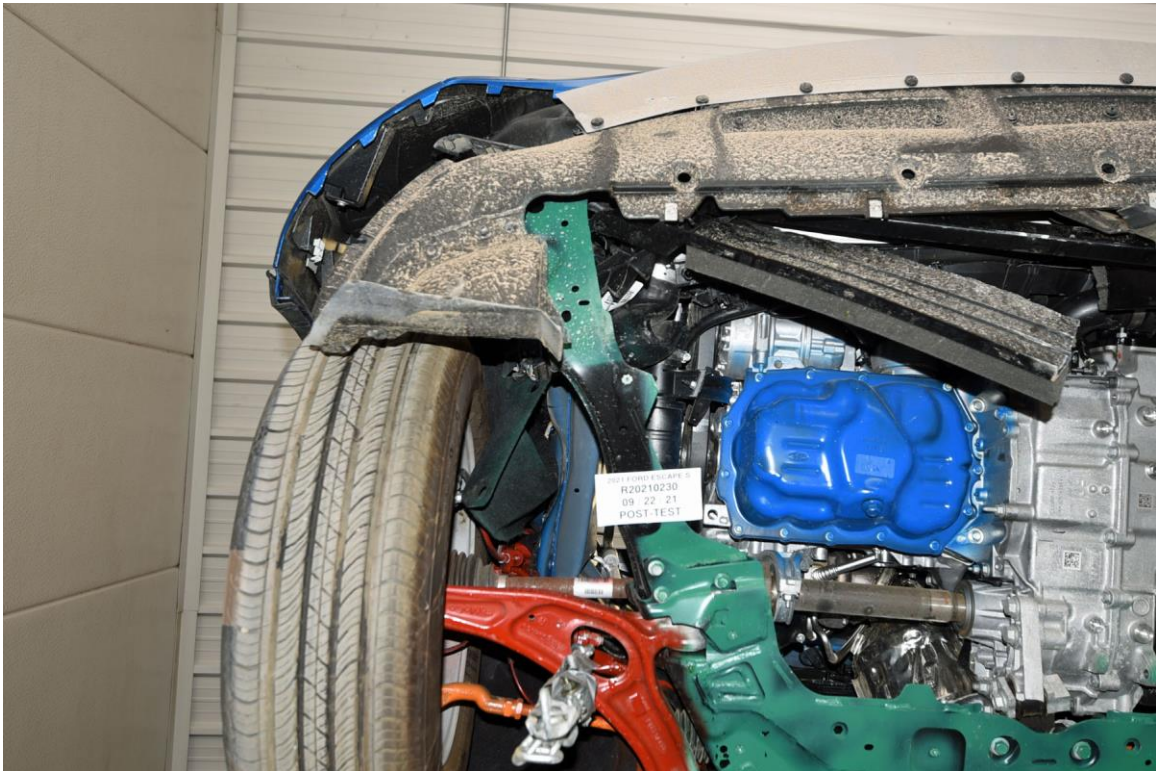


FIGURE 38. Post-Test Passenger Side Bumper to Rail Attachments and Crush Initiators

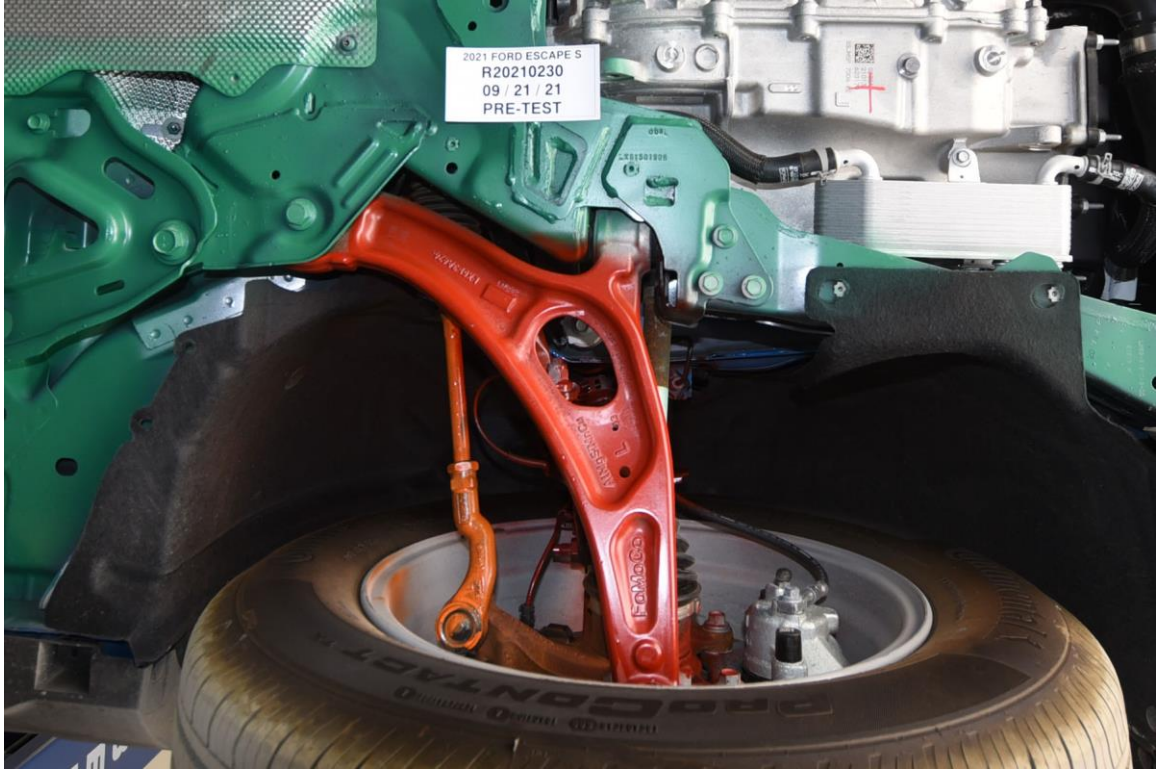


FIGURE 39. Pre-Test Driver Side Rocker



FIGURE 40. Post-Test Driver Side Rocker

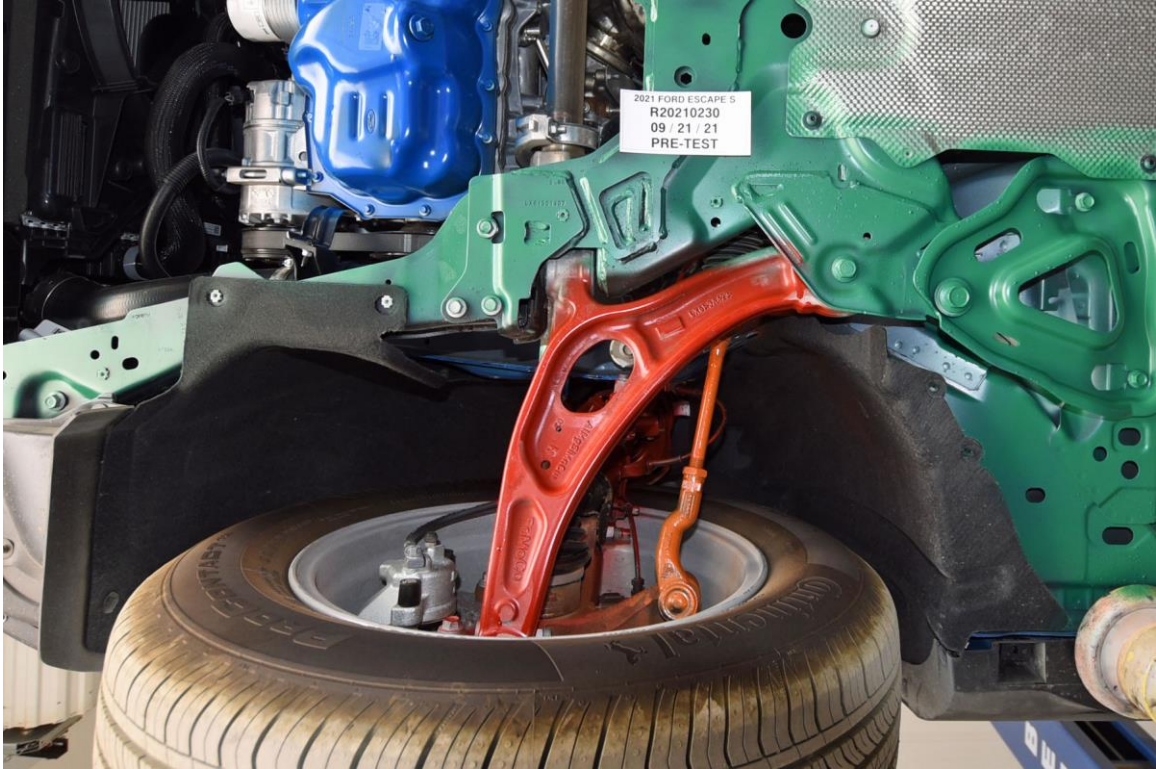


FIGURE 41. Pre-Test Passenger Side Rocker



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

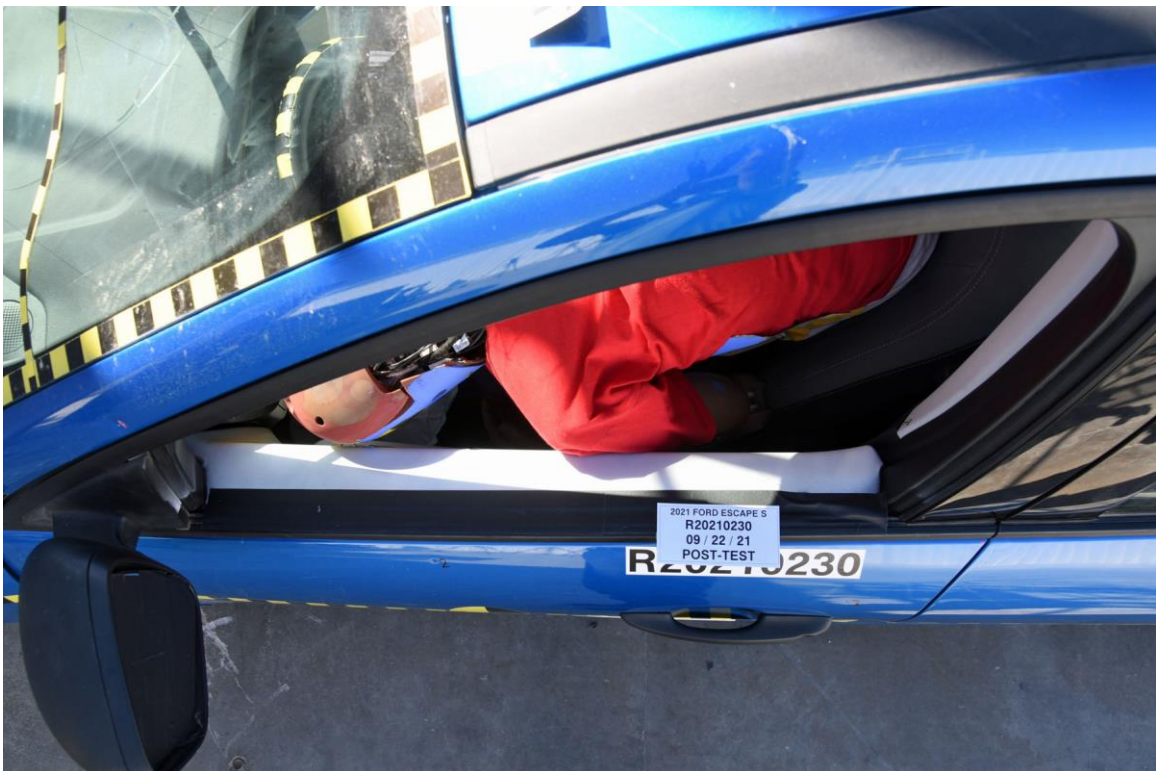


FIGURE 48. Post-Test View of Driver Door Clearance



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

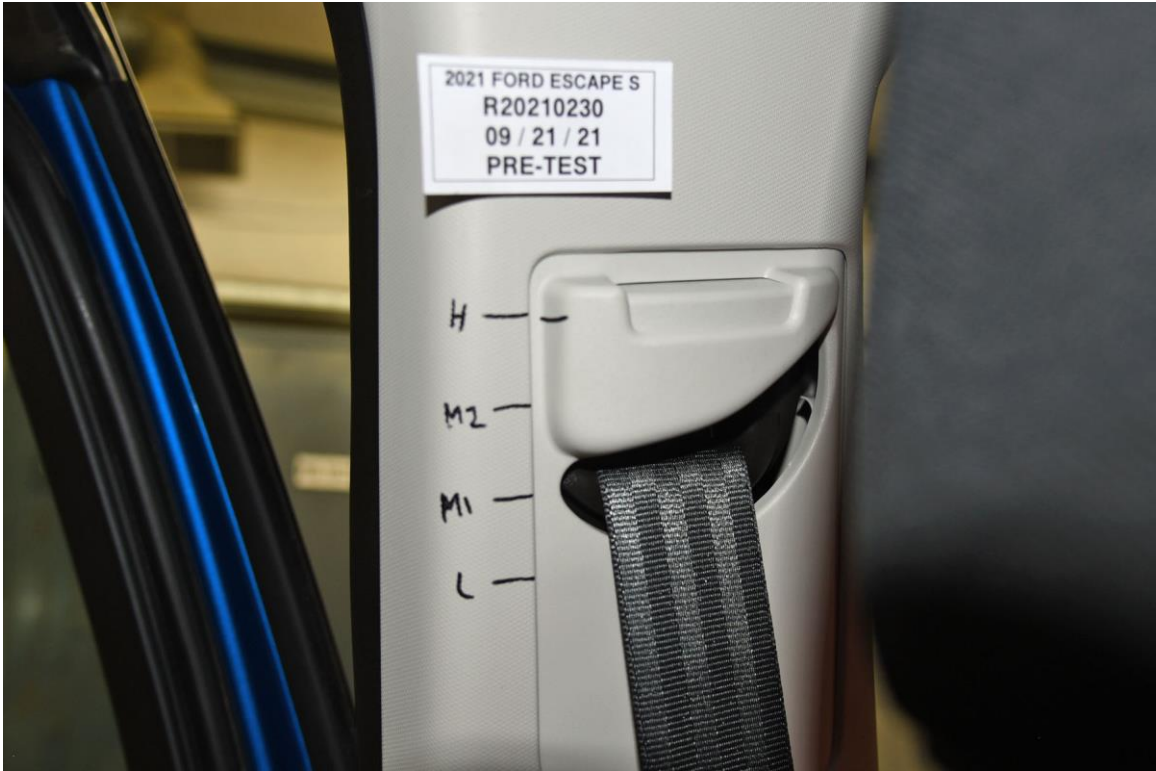


FIGURE 67. Pre-Test Driver Adjustable D-Ring



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

# Photograph Not Applicable

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



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



FIGURE 91a. Post-Test Driver Dummy Contact with A-Pillar



FIGURE 91b. Post-Test Driver Dummy Contact with Interior



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

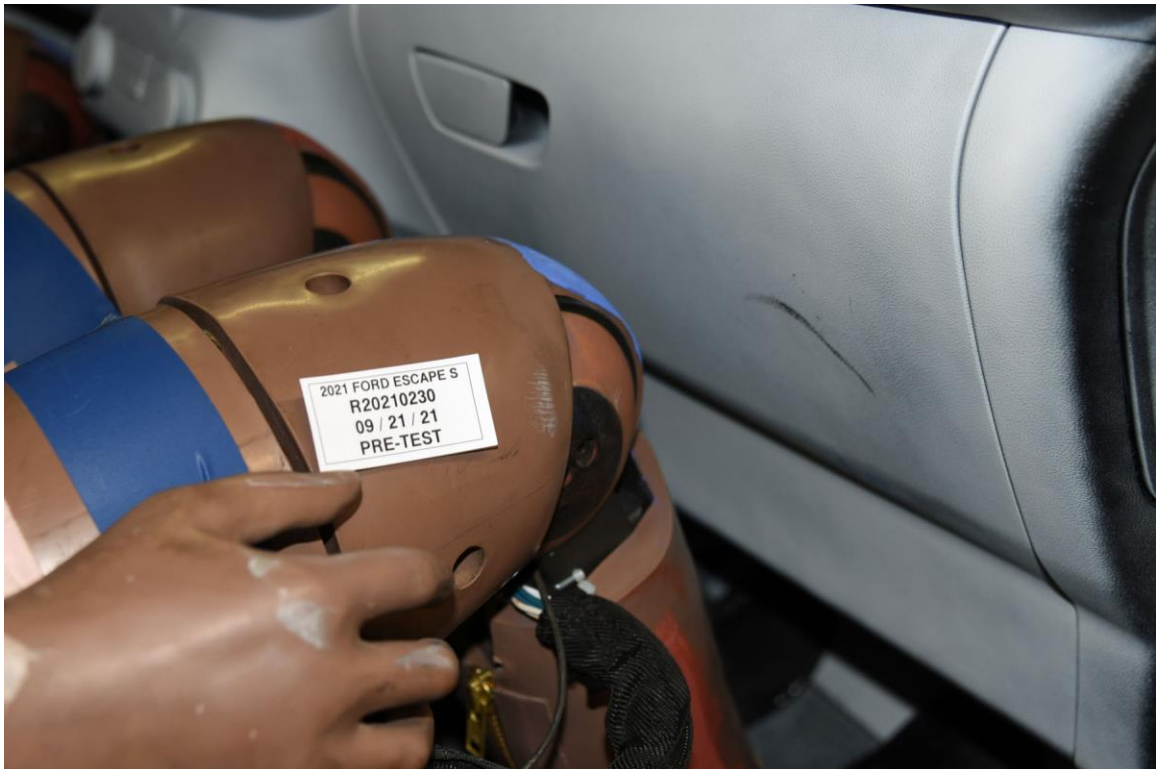


FIGURE 106. Pre-Test View of Passenger Right Knee and Bolster



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



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



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 Interior

# 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

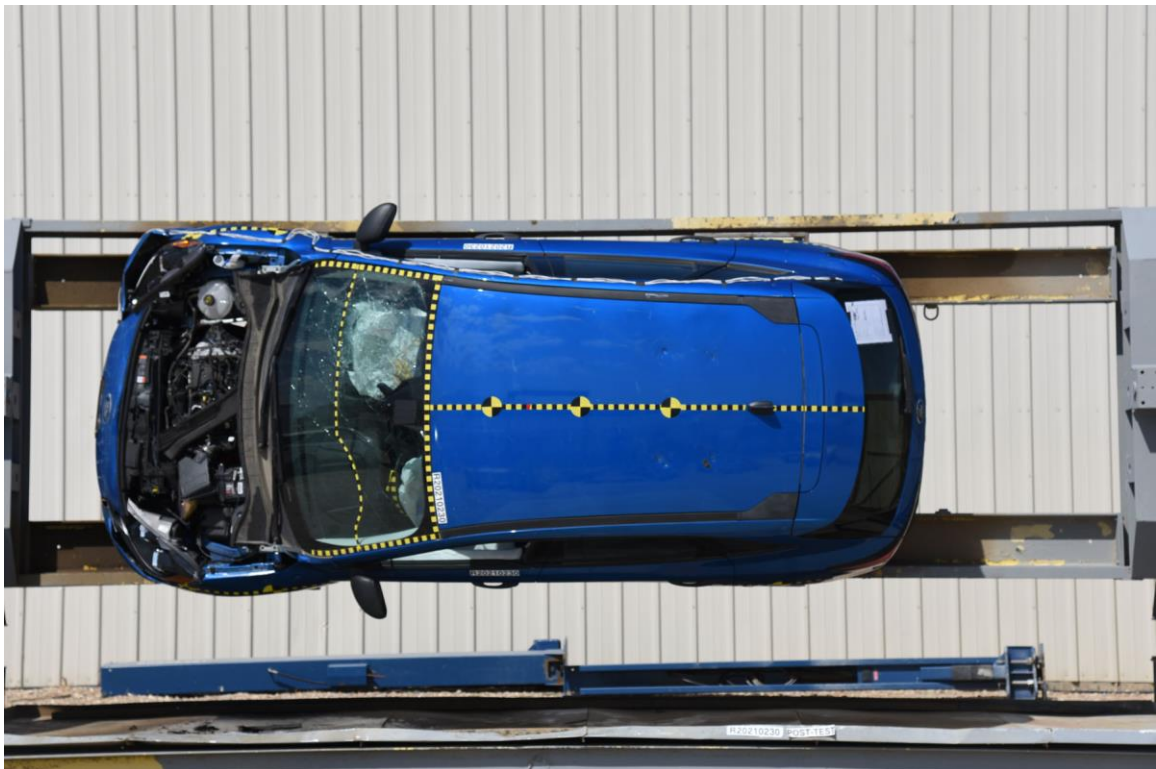


FIGURE 140. Vehicle at 90° on Static Rollover Device



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


 <p><b>ESCAPE FWD</b></p> <p>2021 ESCAPE S FWD 106.2" WHEELBASE 1.9L ECOBOOST W/START-STOP 8-SPEED AUTO TRANSMISSION</p>		<p><b>MU A10457</b></p> <p>EXTERIOR: VELOCITY BLUE METALLIC INTERIOR: DARK EARTH GRAY CLOTH SEATS</p>		<p><b>Fuel Economy and Environment</b></p> <p><b>30</b> MPG combined city/hwy</p> <p>28 city 34 highway</p> <p>3.3 gallons per 100 miles</p> <p><b>You save \$750</b> in fuel costs over 5 years compared to the average new vehicle.</p>									
<p><b>STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE</b></p> <p><b>EXTERIOR</b></p> <ul style="list-style-type: none"> <li>ACTIVE GRILLE SHUTTERS</li> <li>DUAL EXHAUST CHROME TIPS</li> <li>EASY FUEL FILL CARLESS FILLER</li> <li>HEADLAMP COURTESY DELAY</li> <li>HEADLAMPS - AUTO HALOGEN</li> <li>MIRRORS - POWER GLASS</li> <li>MANUAL FOLD</li> <li>REAR INT WIPER/WASH/DFRST</li> <li>REAR SPOILER</li> <li>TAILLAMPS-LED</li> </ul> <p><b>INTERIOR</b></p> <ul style="list-style-type: none"> <li>7.5 TOUCH-DOWN DRIVER WINDOW</li> <li>CLOTH BUCKET FRONT SEATS</li> <li>DUAL VISION VARIETY MIRRORS</li> <li>ILLUMINATED ENTRY SYSTEM</li> <li>MANUAL A/C, SINGLE ZONE</li> <li>MANUAL DRIV SEAT - 6-WAY</li> <li>MANUAL PASS SEAT - 4-WAY</li> <li>POWERPOINTS - 12X</li> <li>ROTARY GEAR SHIFT DIAL</li> <li>SMART CHARGING USB PORTS</li> <li>SPLIT FOLD/SLIDE REAR SEAT</li> <li>STEERING WHEEL TELESCOPE, CRUISE &amp; AUDIO CONTROLS</li> </ul> <p><b>FUNCTIONAL</b></p> <ul style="list-style-type: none"> <li>AM/FM STEREO W/8 SPEAKERS</li> <li>AUTO START STOP TECH</li> <li>BLS W/CRUISE TRAFFIC ALERT</li> <li>BRAKES, 4-WHEEL DISC/ABS</li> <li>CURVE CONTROL</li> <li>ELECTRIC PARKING BRAKE</li> <li>FORD CO-PILOT360™</li> <li>FORDPASS™ CONNECT (4GW-FI)</li> <li>HOTSPOT TELEMATICS MODEM</li> <li>POWER LOCKS AND WINDOWS</li> <li>POWER STEERING W/EPAS</li> <li>REAR VIEW CAMERA</li> <li>REMOTE KEYLESS ENTRY</li> <li>SYNCR WITH APPLE/iOS</li> </ul> <p><b>SAFETY/SECURITY</b></p> <ul style="list-style-type: none"> <li>ADVANCED TRACK W/4 REQ'D</li> <li>AIRBAG - DRIVER KNEE</li> <li>AIRBAGS - DUAL STGE FRONT</li> <li>AIRBAGS - FRONT &amp; AT MOUNTED SIDE IMPCT</li> <li>AIRBAGS - SAFETY ANCHORPS</li> <li>LATCH CHILD SAFE/ SYSTEM</li> <li>PERSONAL SAFETY SYSTEM™</li> <li>SECURELOCK® ANTI-THEFT SYS</li> <li>SOB POST-CRASH ALERT SYS™</li> <li>TIRE PRESSURE MCHT SYS</li> </ul> <p><b>WARRANTY</b></p> <ul style="list-style-type: none"> <li>3YR/36,000 BUMPER BUMPER</li> <li>5YR/60,000 POWERTRAIN</li> <li>5YR/60,000 ROADSIDE ASSIST</li> </ul>		<p><b>Annual fuel cost \$1,350</b></p> <p><b>Fuel Economy &amp; Greenhouse Gas Rating</b> (tailpipe only)</p> <p><b>Smog Rating</b> (tailpipe only)</p> <p>This vehicle emits 280 grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and transporting fuel also emits greenhouse gases from a full economy gas.</p>											
<p><b>INCLUDED ON THIS VEHICLE EQUIPMENT GROUP 100A</b></p> <p>(MSRP)</p> <p><b>OPTIONAL EQUIPMENT/OTHER</b></p> <p>225/65R17 105H A/S BSWG TIRES TIRE WET/SLAT KIT NO SPRING SUPPLEMENTAL PTC HEATER 17" SHOW SLWR-PNTD ALUM WHEELS</p> <p>NO CHARGE 595.00</p>		<p><b>PRICE INFORMATION</b></p> <p>BASE PRICE \$24,885.00 TOTAL OPTIONS/OTHER \$95.00</p> <p>TOTAL VEHICLE &amp; OPTIONS/OTHER \$25,480.00 DESTINATION &amp; DELIVERY \$1,340.00</p>		<p><b>fuel economygov</b></p> <p>Calculate personalized estimates and compare vehicles.</p> <p><b>GOVERNMENT 5-STAR SAFETY RATINGS</b></p> <p><b>Overall Vehicle Score</b> ★★★★★</p> <p>Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.</p> <p><b>Frontal Crash</b></p> <table border="1"> <tr><td>Driver</td><td>★★★★★</td></tr> <tr><td>Passenger</td><td>★★★★★</td></tr> </table> <p>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</p> <p><b>Side Crash</b></p> <table border="1"> <tr><td>Front seat</td><td>★★★★★</td></tr> <tr><td>Rear seat</td><td>★★★★★</td></tr> </table> <p>Based on the risk of injury in a side impact.</p> <p><b>Rollover</b></p> <p>★★★★★</p> <p>Based on the risk of rollover in a single-vehicle crash.</p> <p>Star ratings range from 1 to 5 stars (★★★★★), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236</p>		Driver	★★★★★	Passenger	★★★★★	Front seat	★★★★★	Rear seat	★★★★★
Driver	★★★★★												
Passenger	★★★★★												
Front seat	★★★★★												
Rear seat	★★★★★												
<p>MA201 N RB 2X 115 006127 010 21</p>		<p>1FMCU0F66MUA10457</p> <p><b>WARNING:</b> Operating, servicing and maintaining a passenger vehicle, pickup truck, van, or off-road vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.</p>		<p><b>FordPass Connect™</b></p> <p>Download the FordPass™ app and you can:</p> <ul style="list-style-type: none"> <li>Access Vehicle Control Features</li> <li>Remotely start, lock and unlock your vehicle</li> <li>Locate your vehicle and check approximate fuel range</li> <li>Receive vehicle health alerts</li> <li>Activate 4G LTE Wi-Fi Hotspot</li> <li>New vehicles include a 3-month or 3GB data (whichever comes first) Wi-Fi trial.</li> <li>Connect up to ten Wi-Fi-equipped devices.</li> </ul> <p>The FordPass Connect™ feature is active and sending vehicle data (e.g., diagnostics) to Ford. See in-vehicle Settings for connectivity options.</p> <p><b>FORD PROTECT™</b></p> <p>Insist on Ford Protect! The only extended service plan fully backed by Ford and honored at every Ford dealership in the U.S., Canada and Mexico. See your Ford dealer or visit www.FordOwner.com.</p>									
<p>MA201 N RB 2X 115 006127 010 21</p>		<p>1FMCU0F66MUA10457</p>		<p>MA201 N RB 2X 115 006127 010 21</p>									

FIGURE 145. Monroney Label Photograph

**APPENDIX B**  
**VEHICLE AND DUMMY RESPONSE DATA TRACES**

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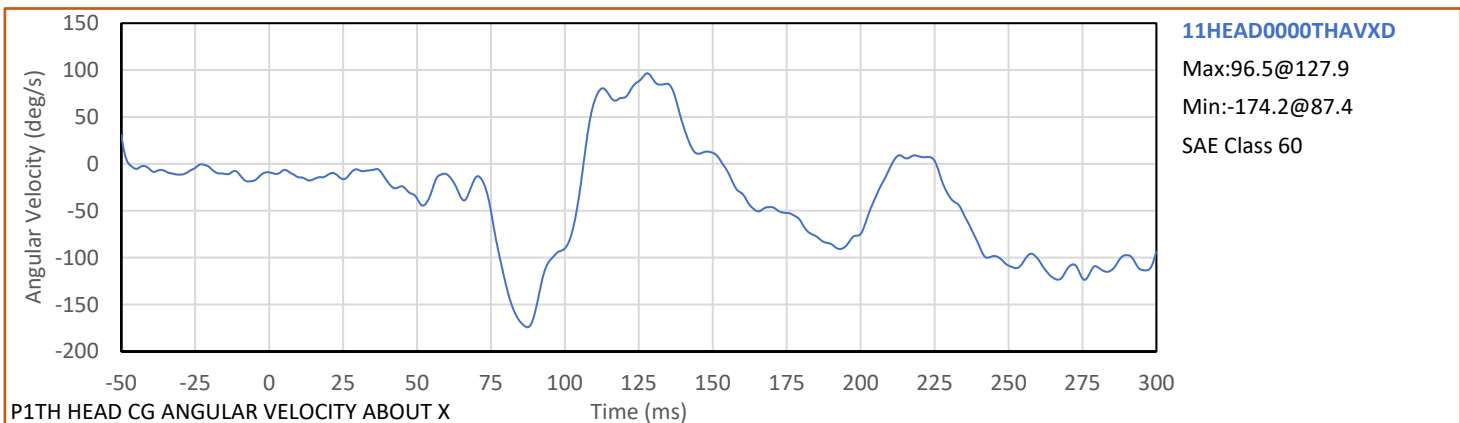
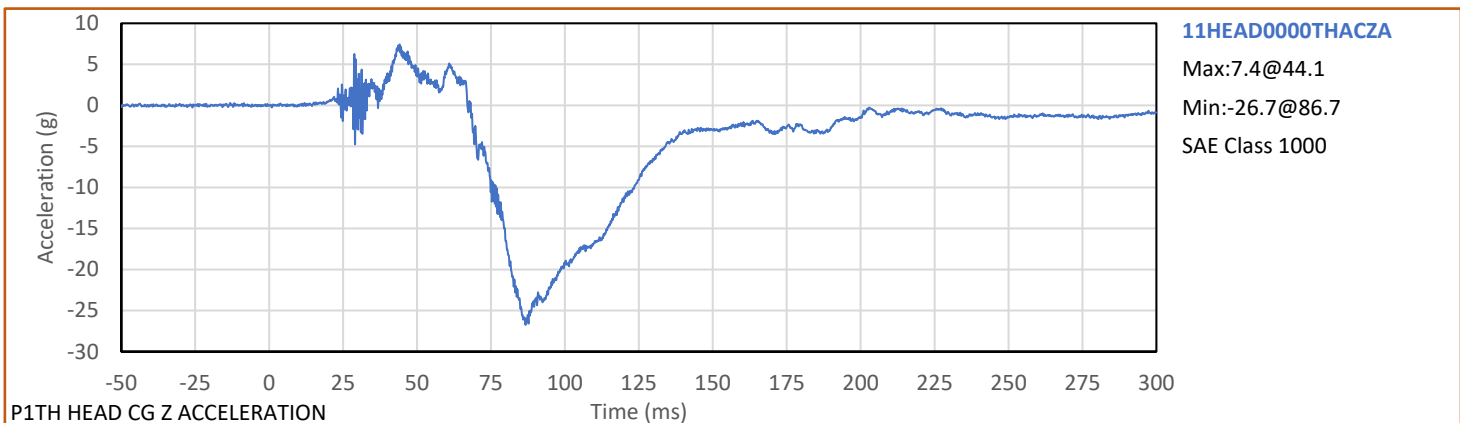
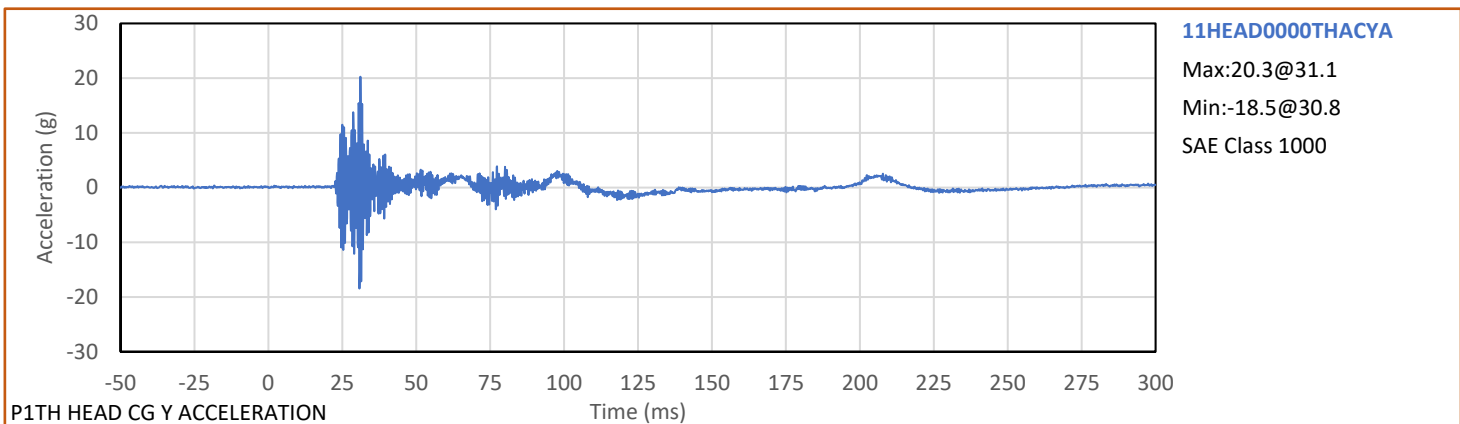
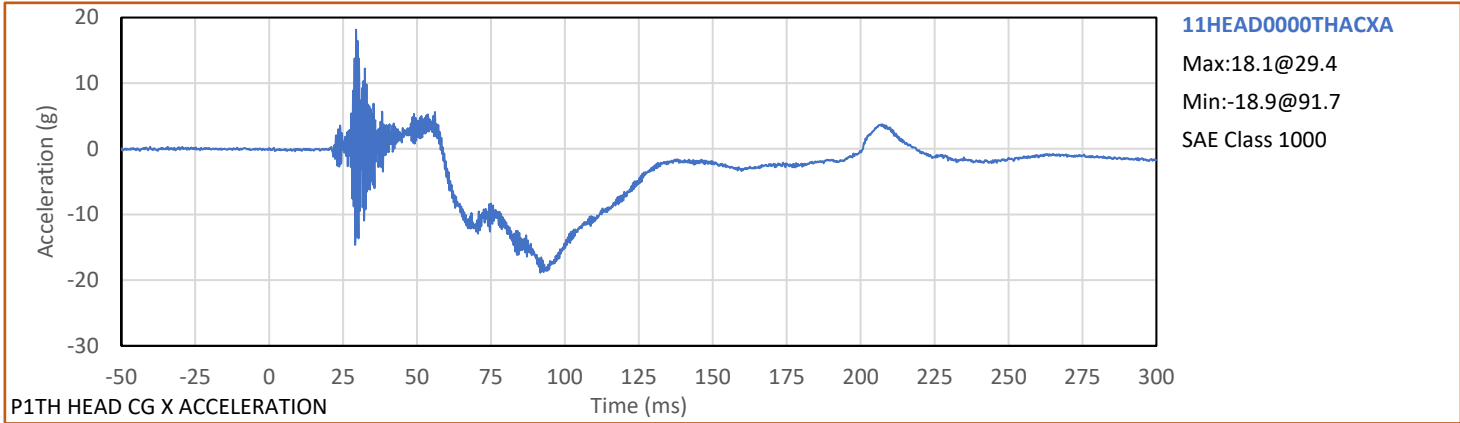
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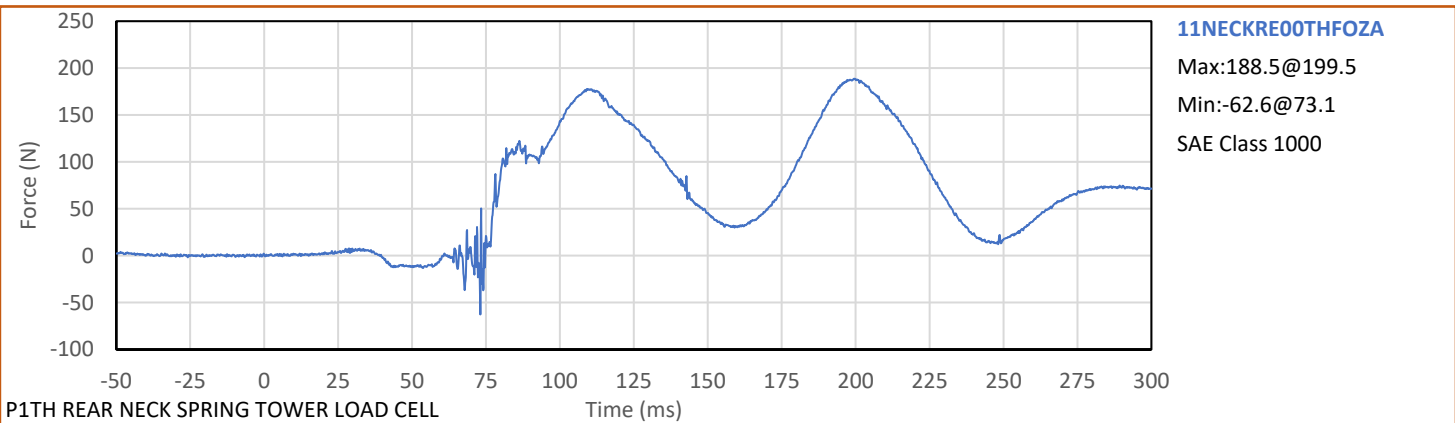
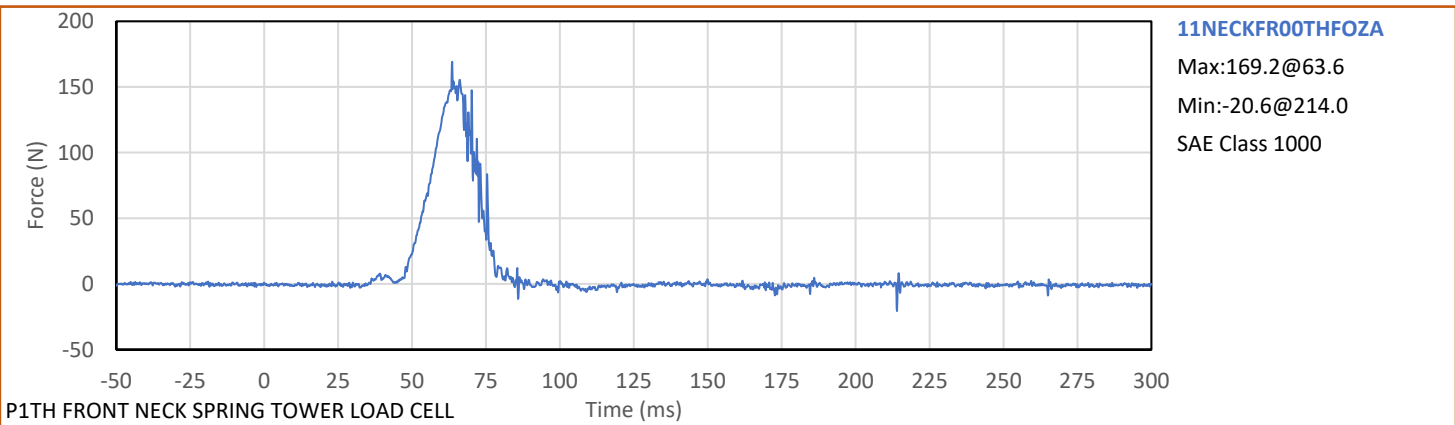
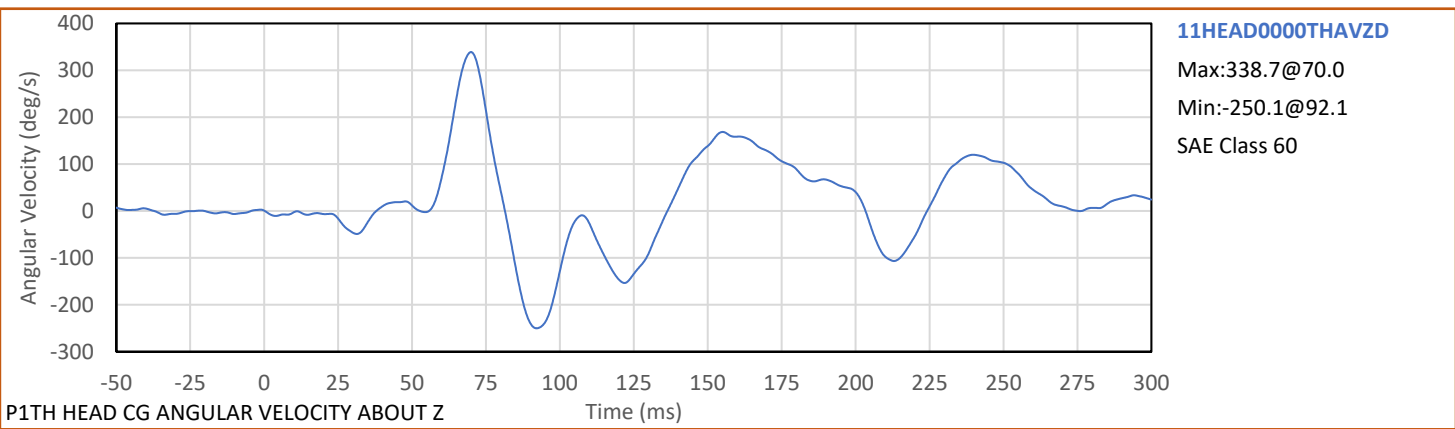
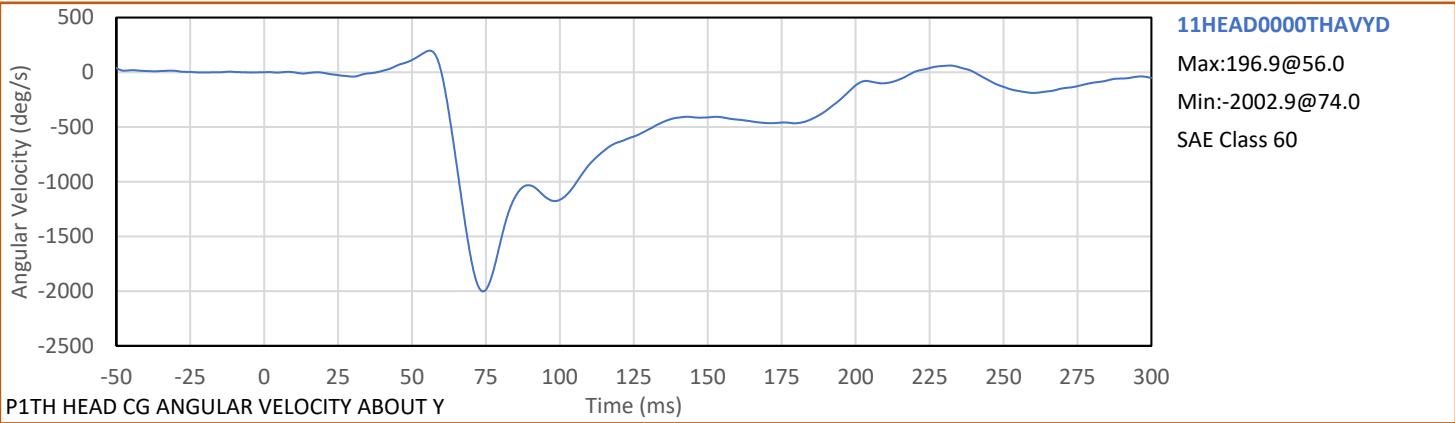
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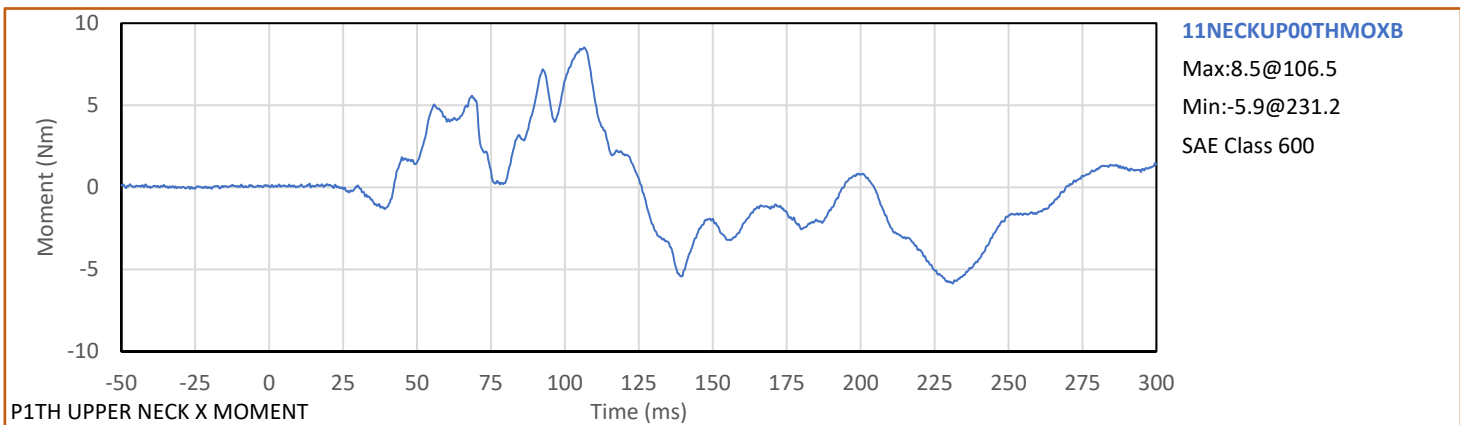
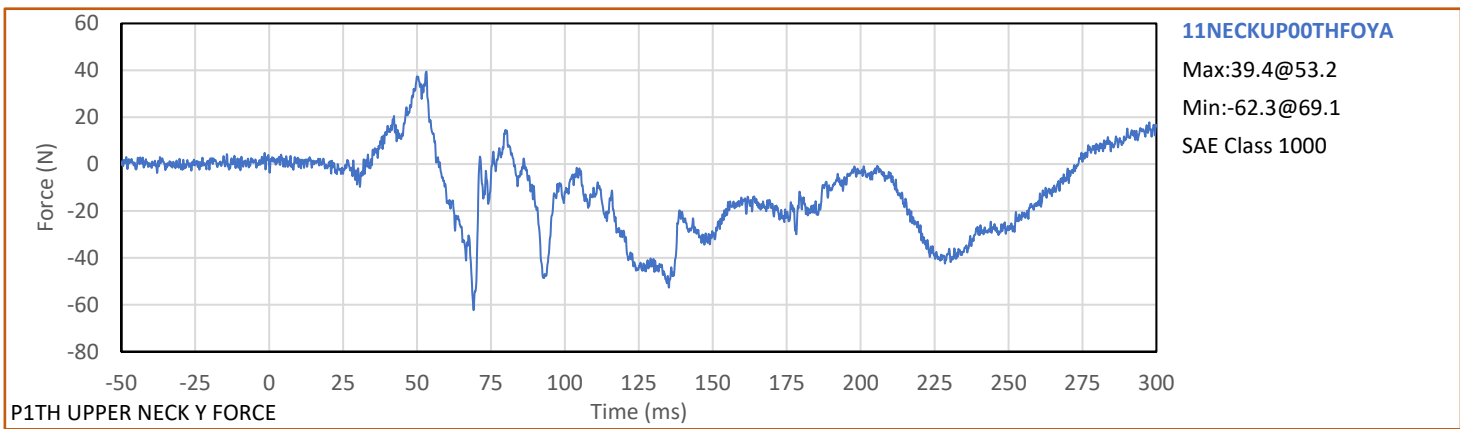
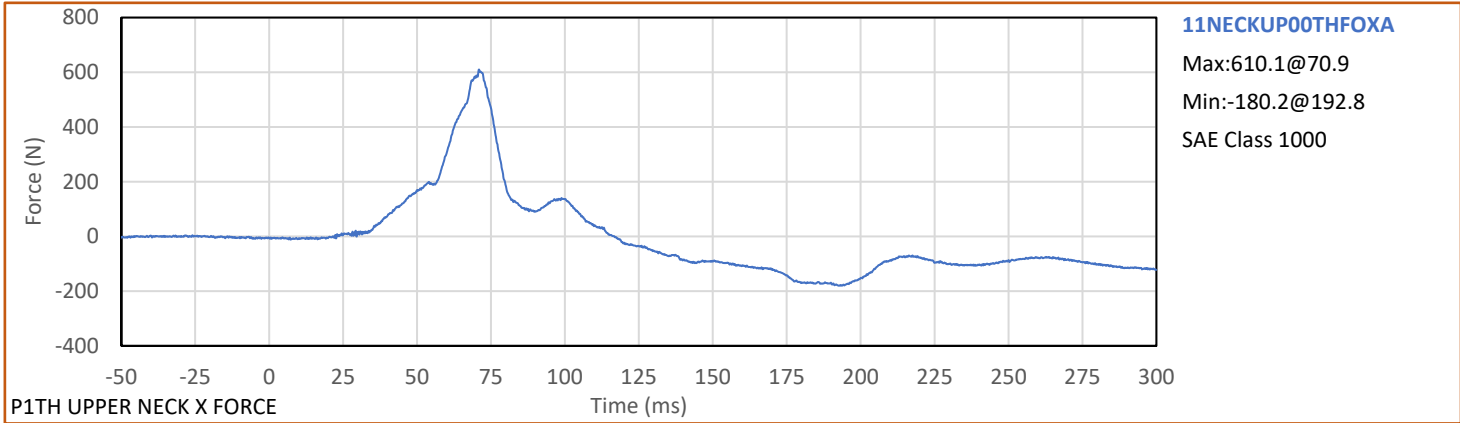
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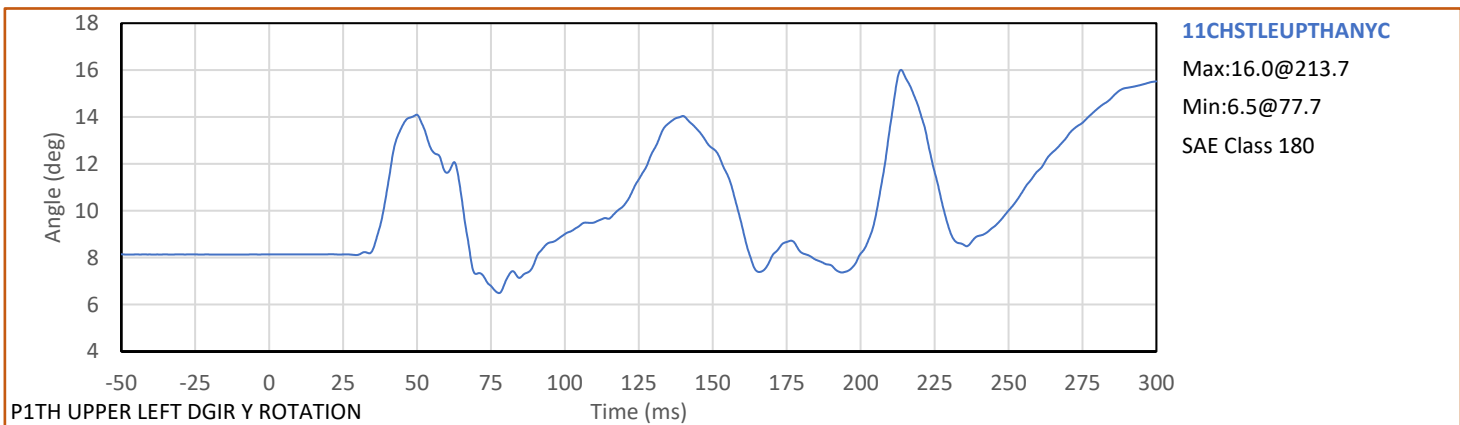
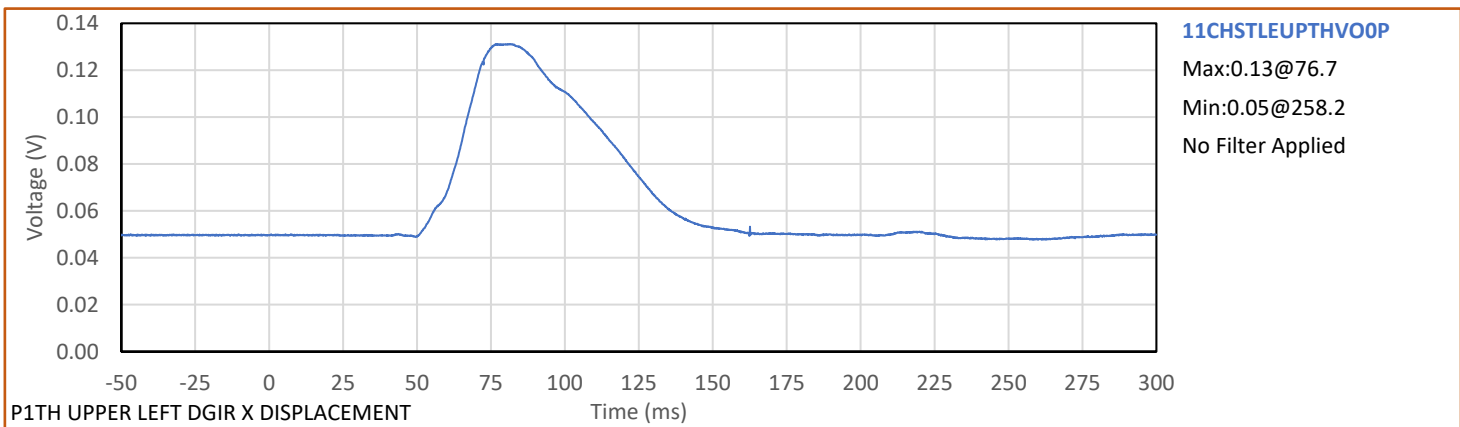
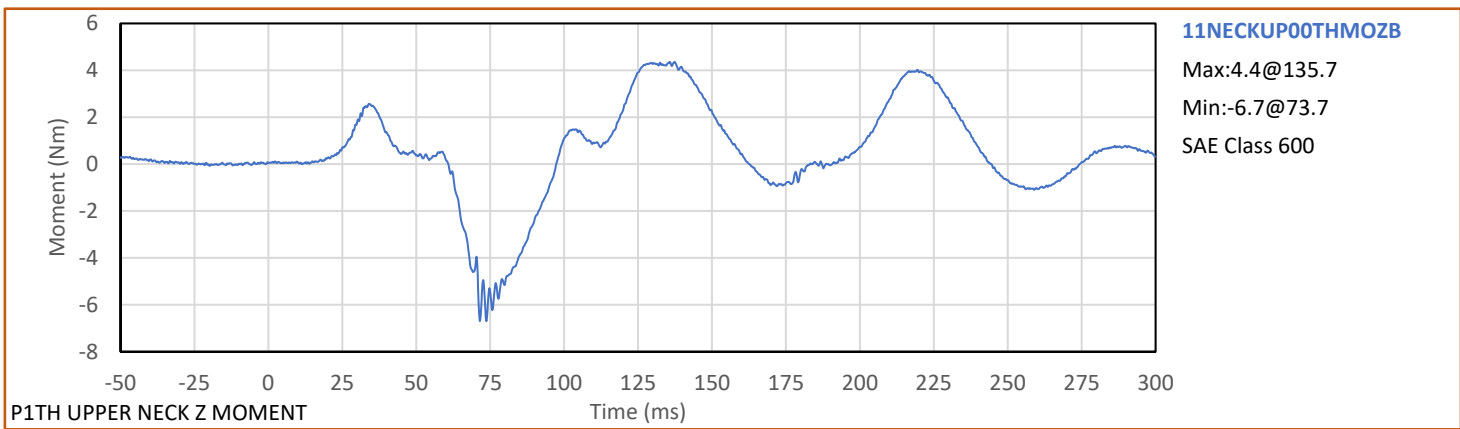
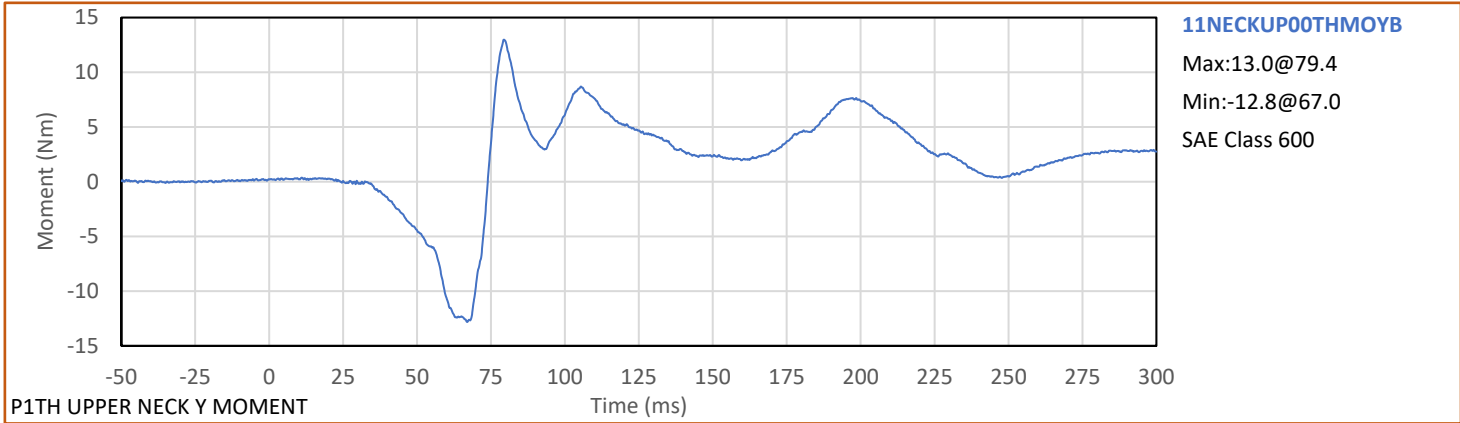
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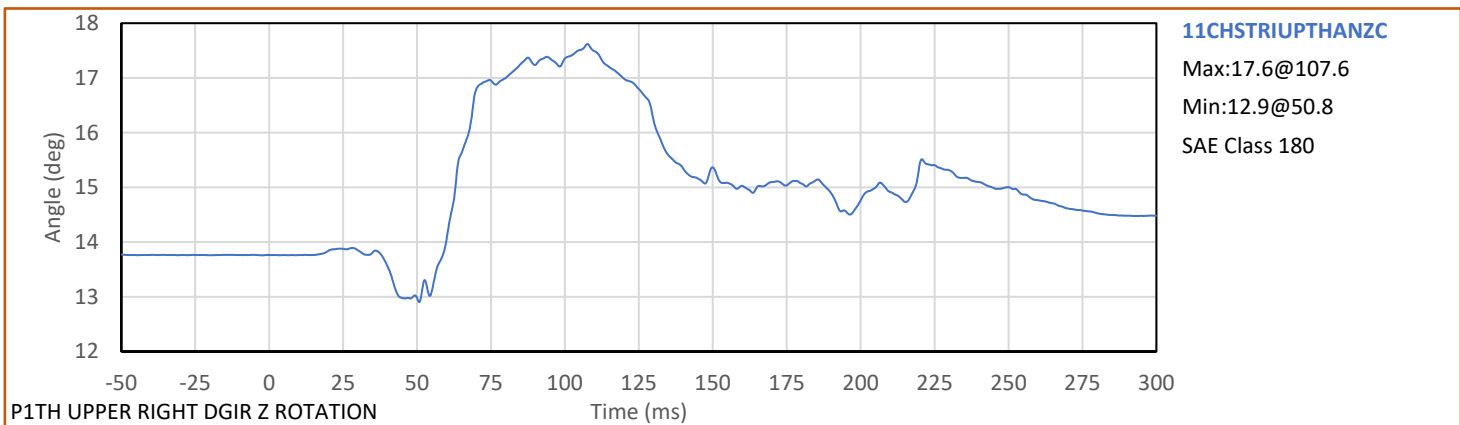
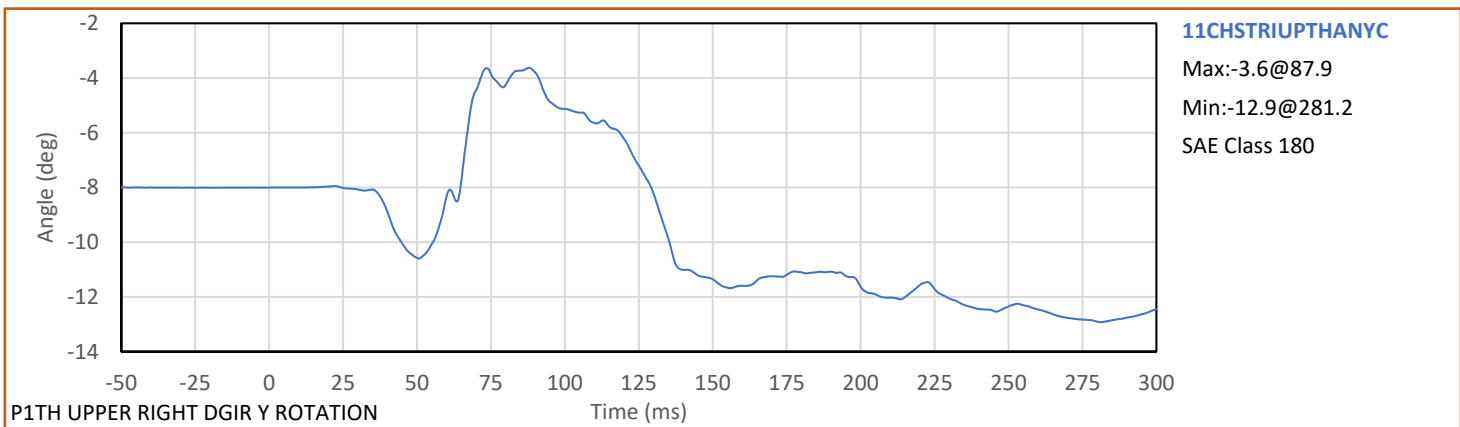
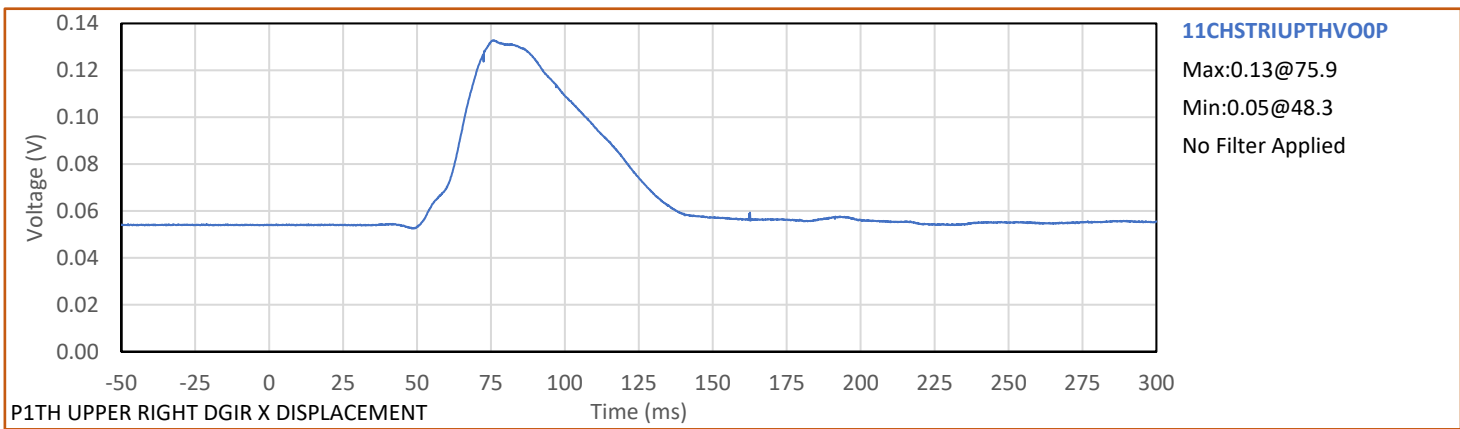
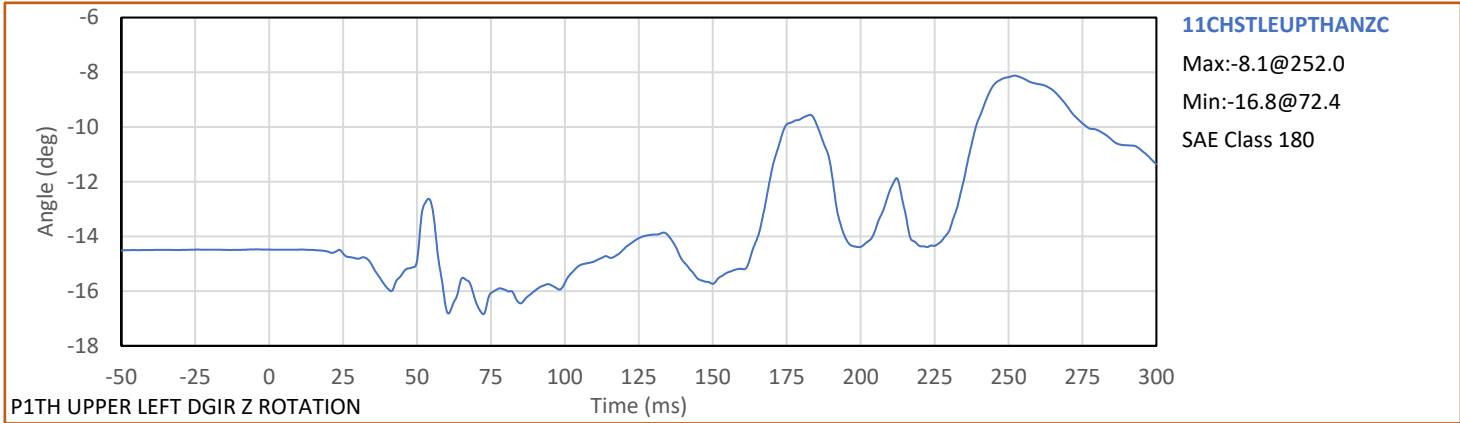
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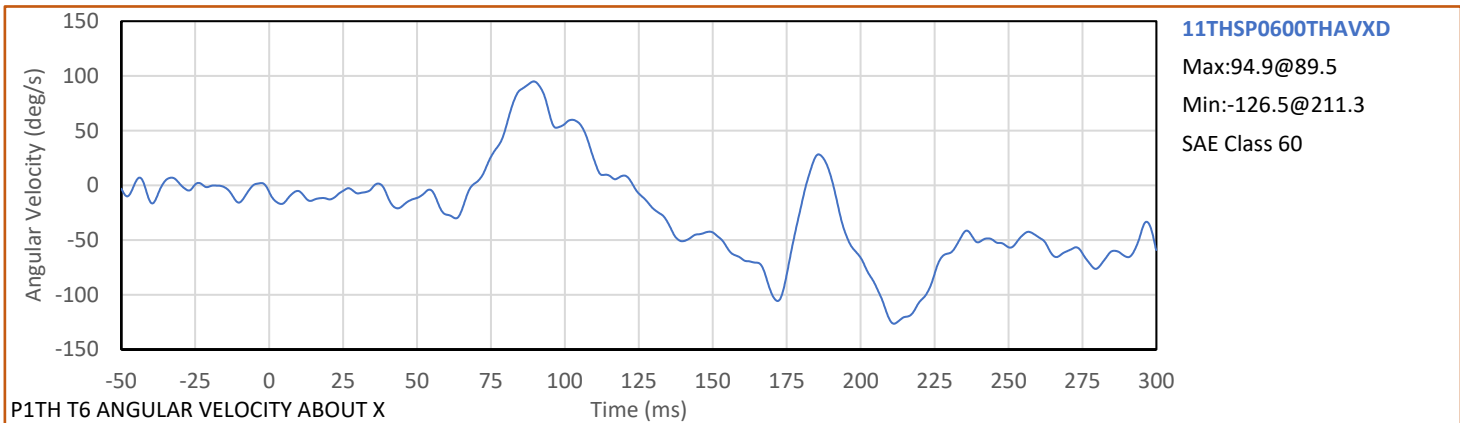
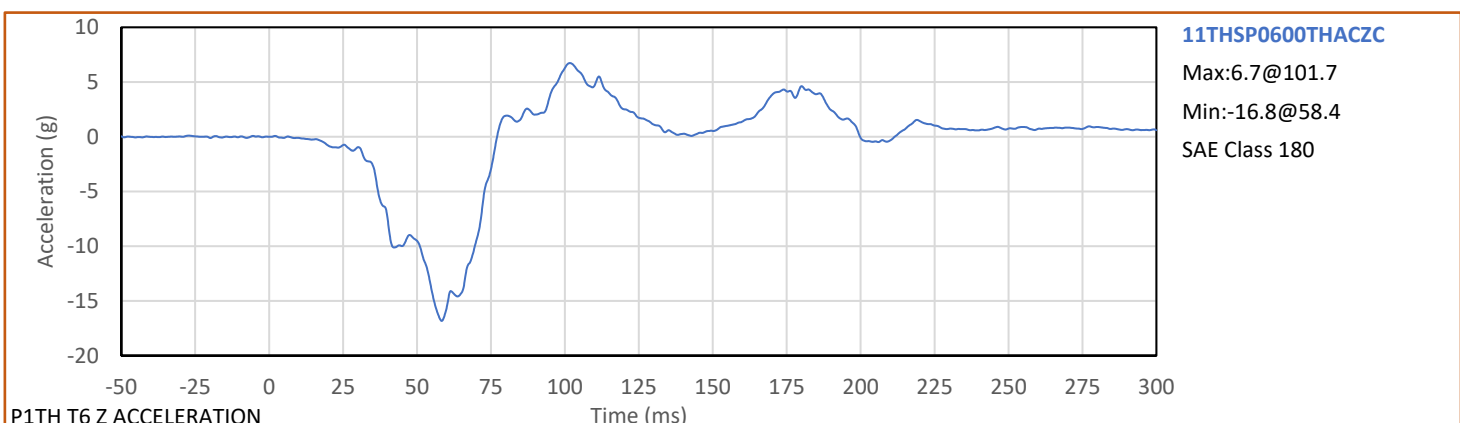
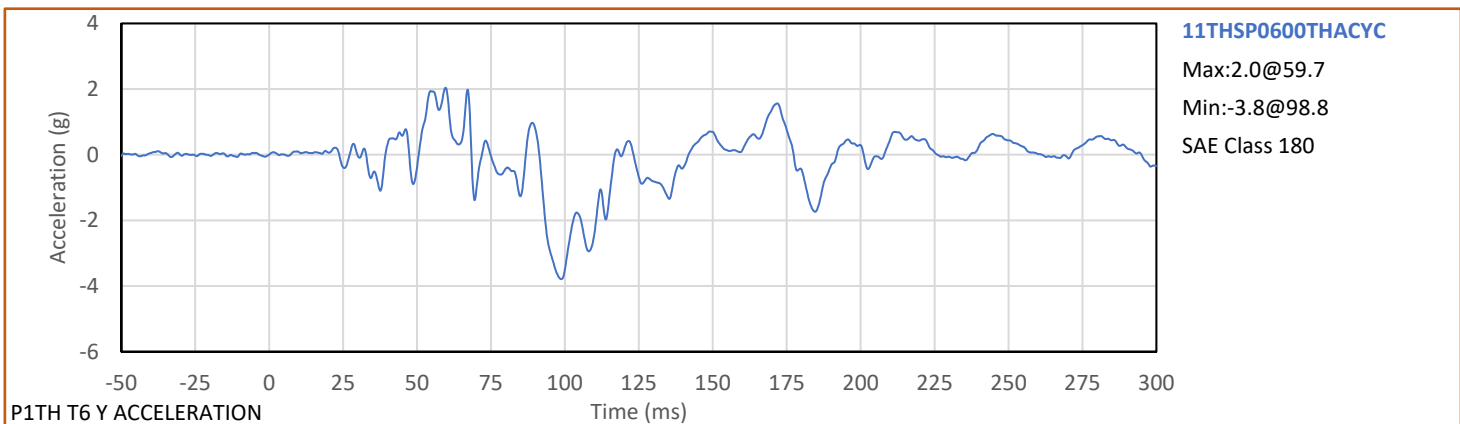
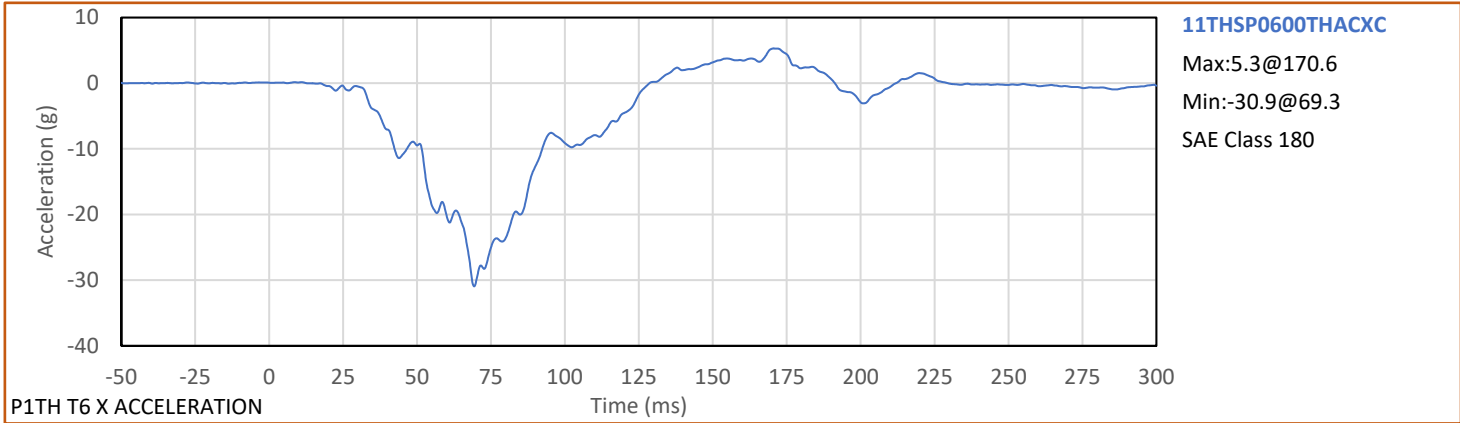


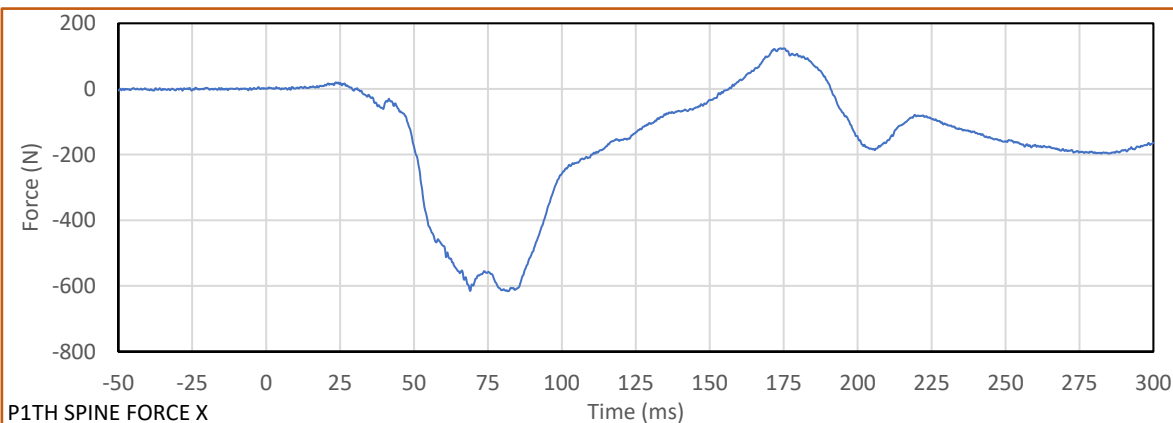
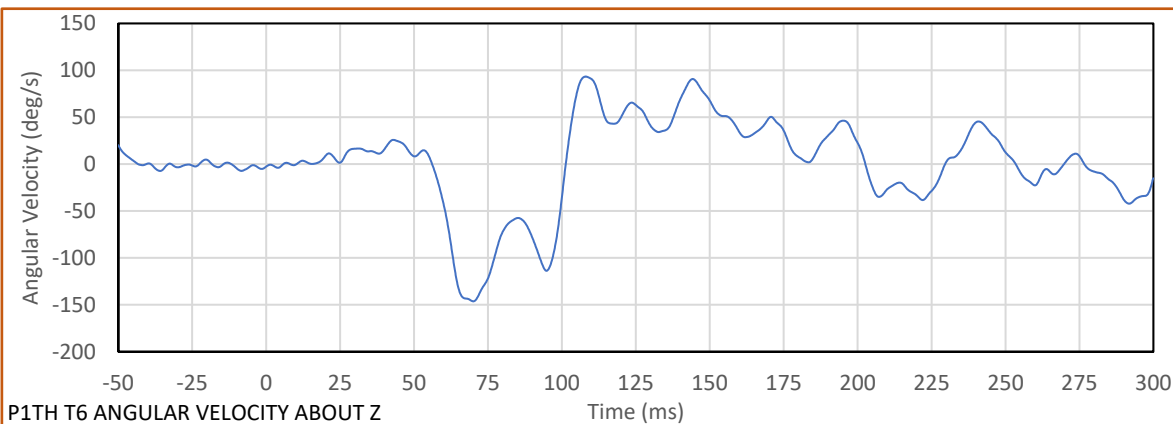
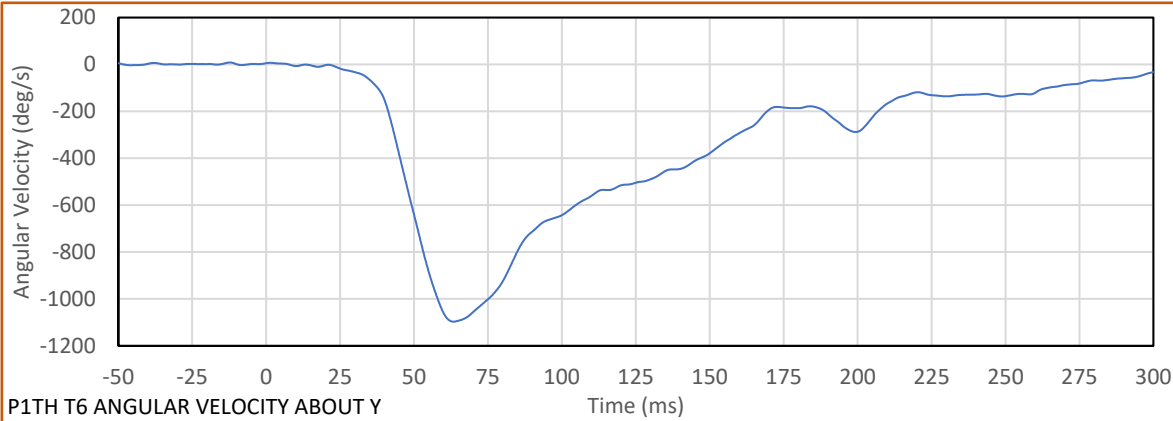


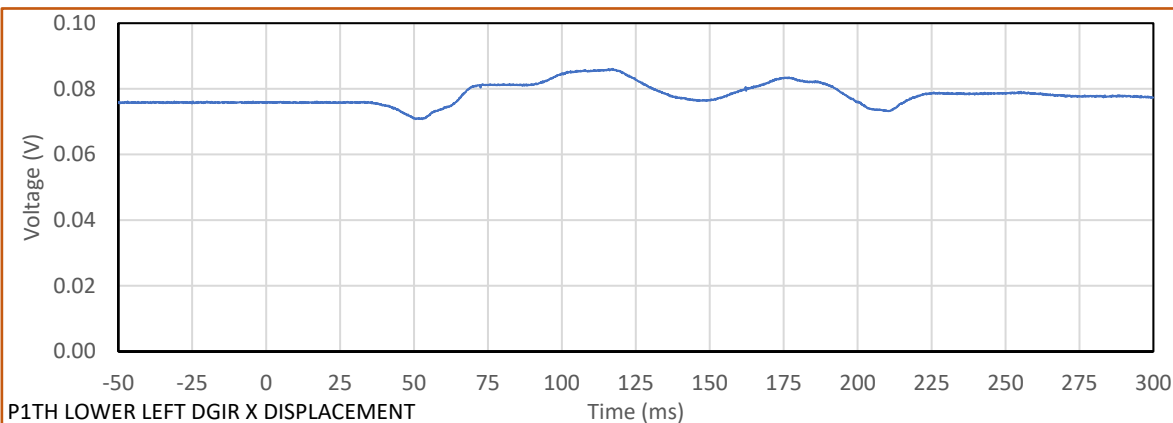
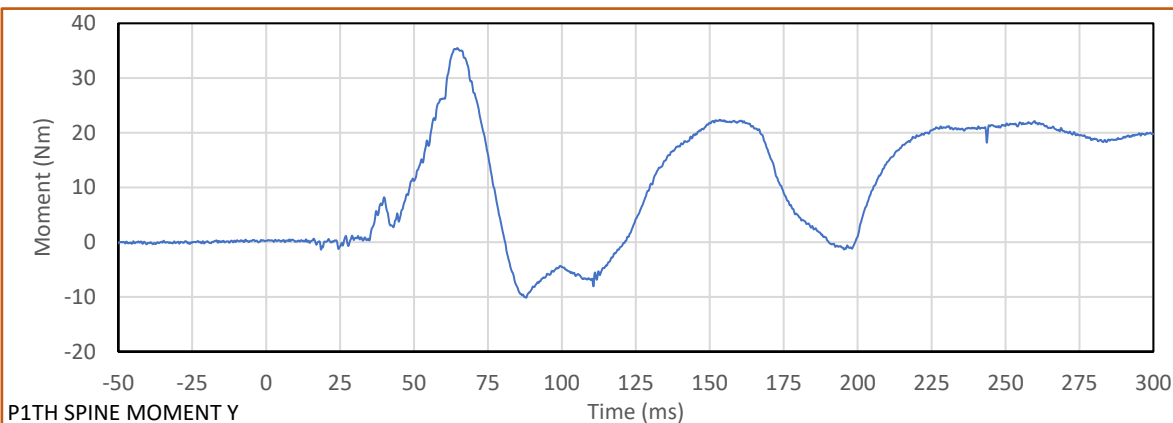
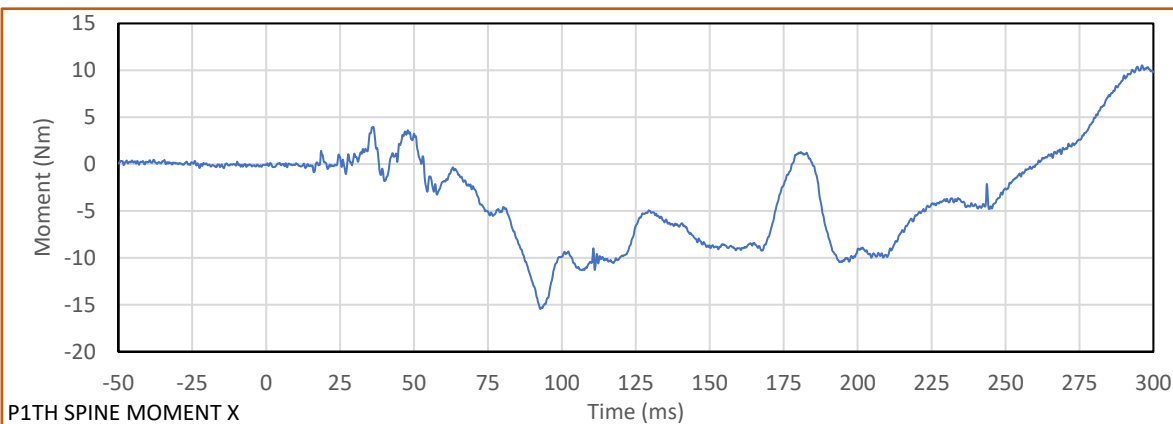
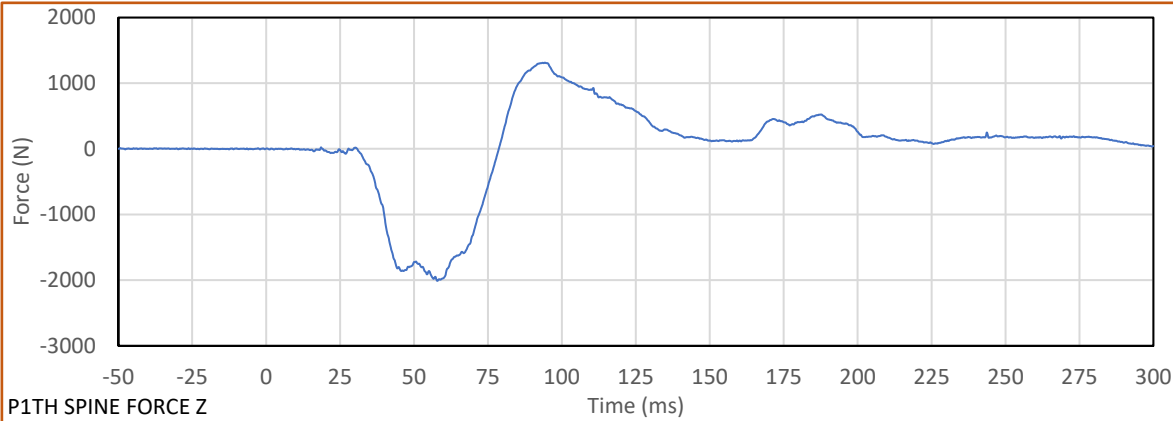


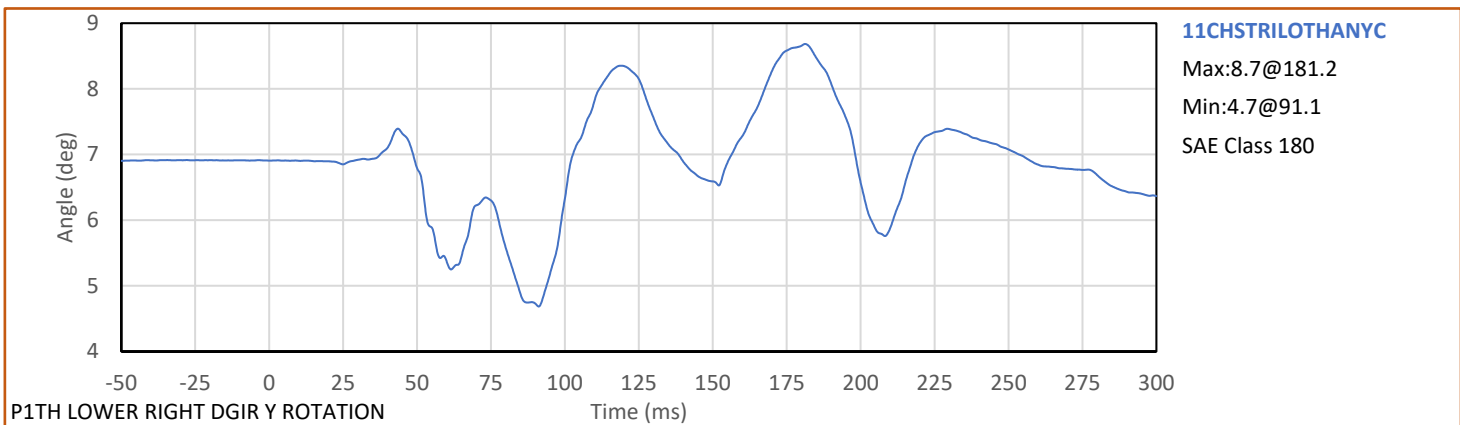
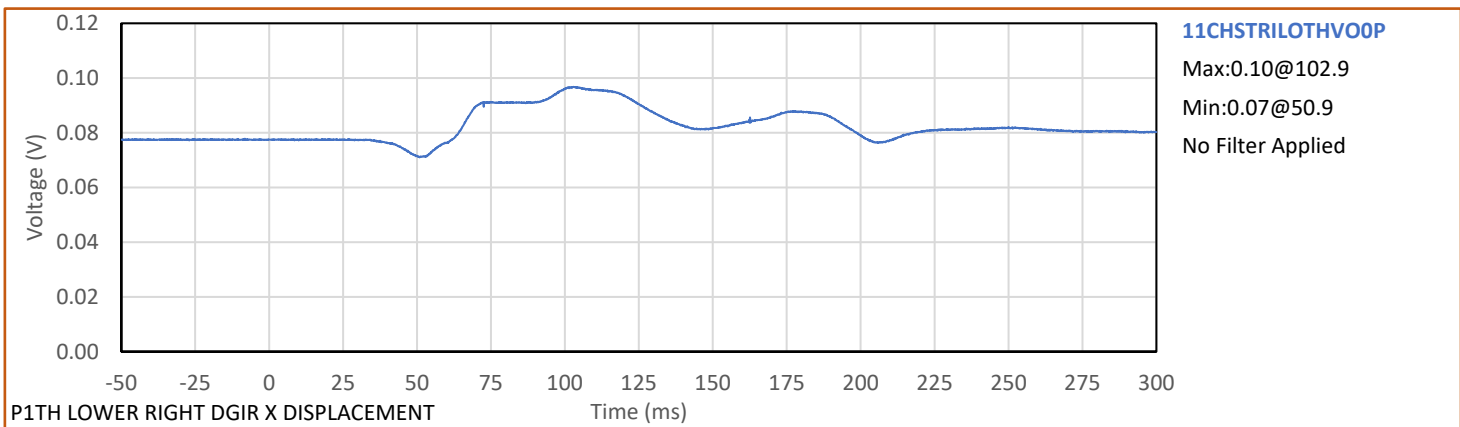
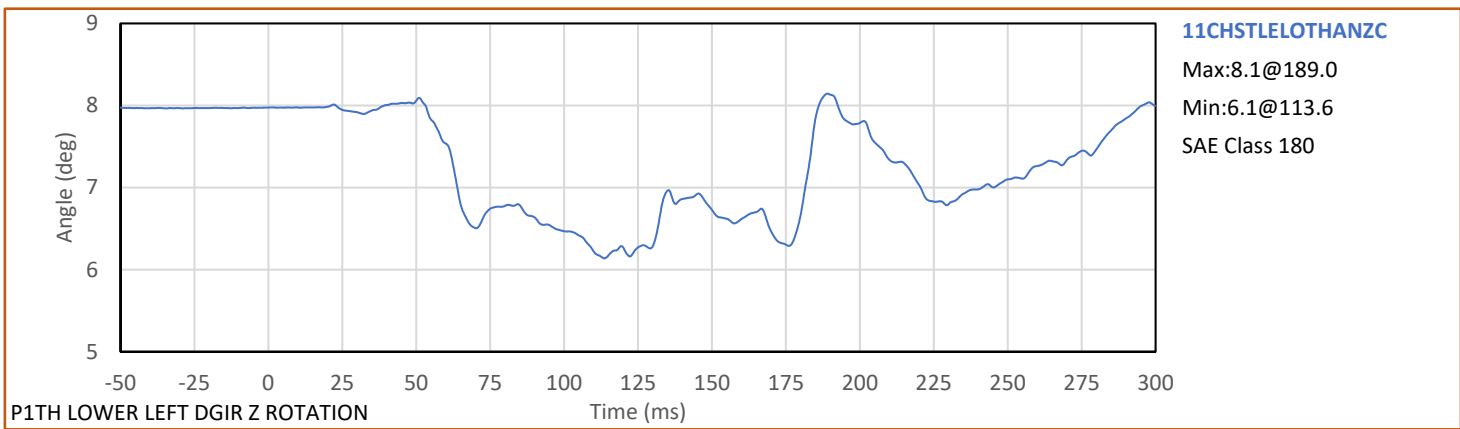
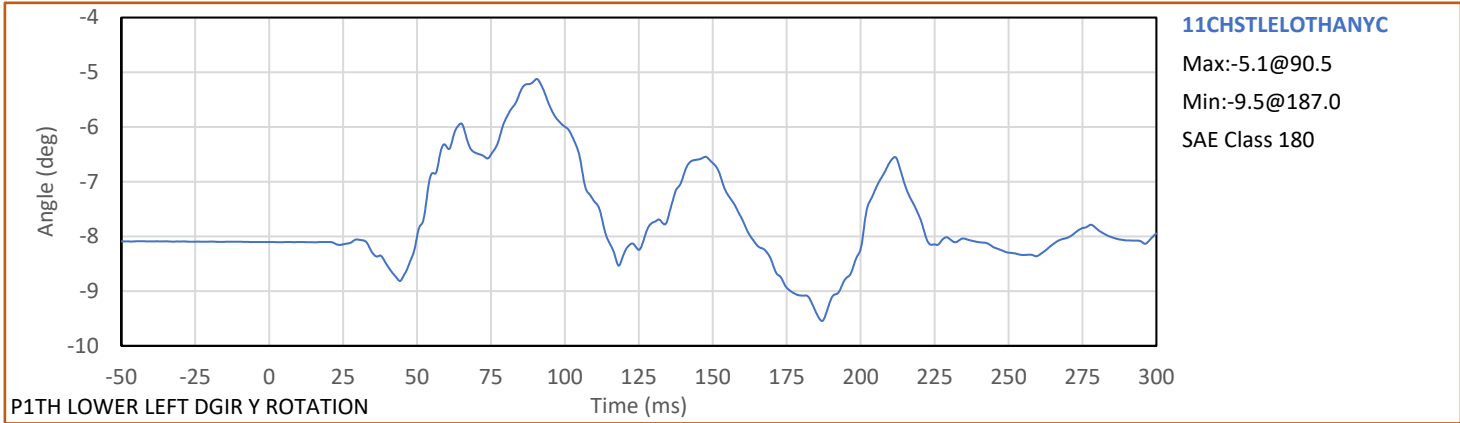


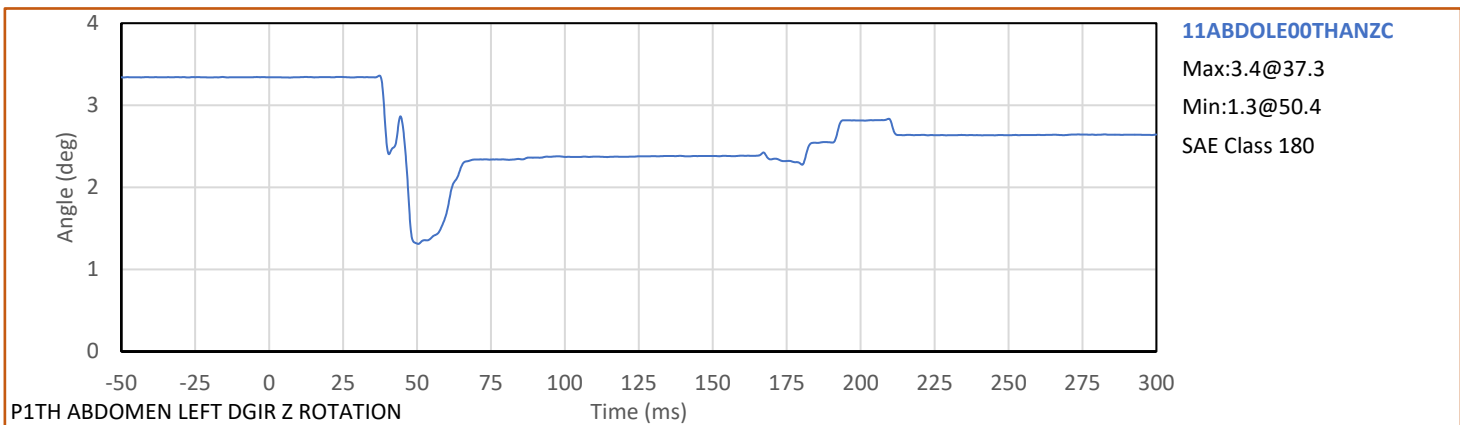
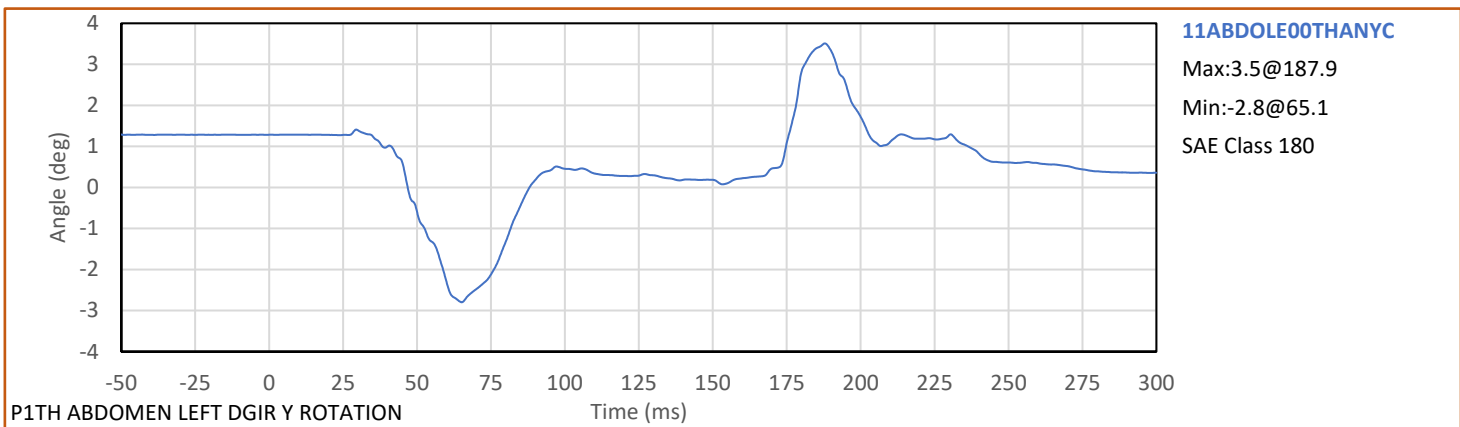
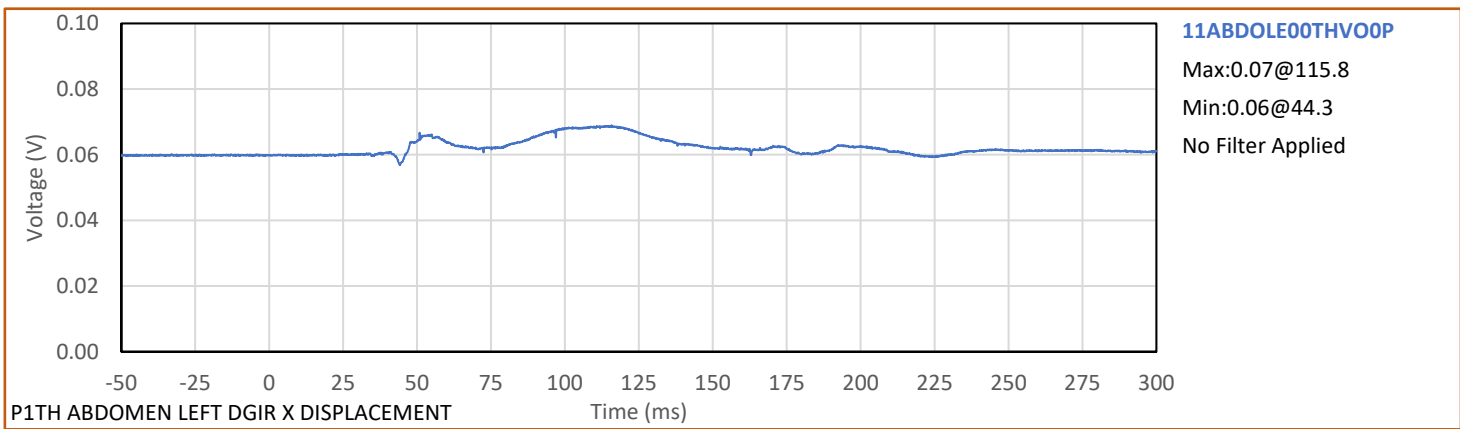
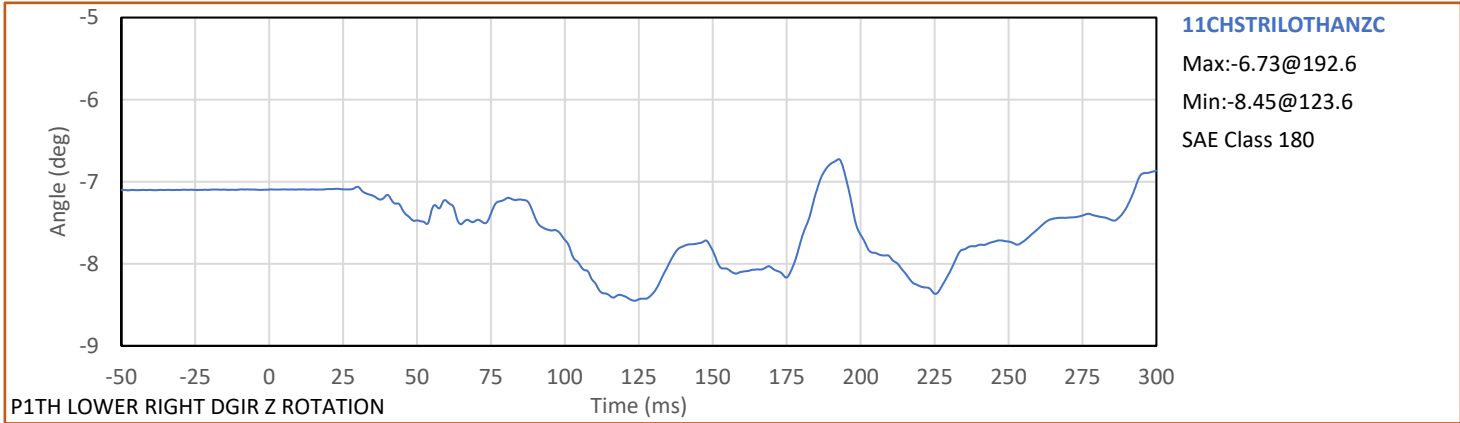


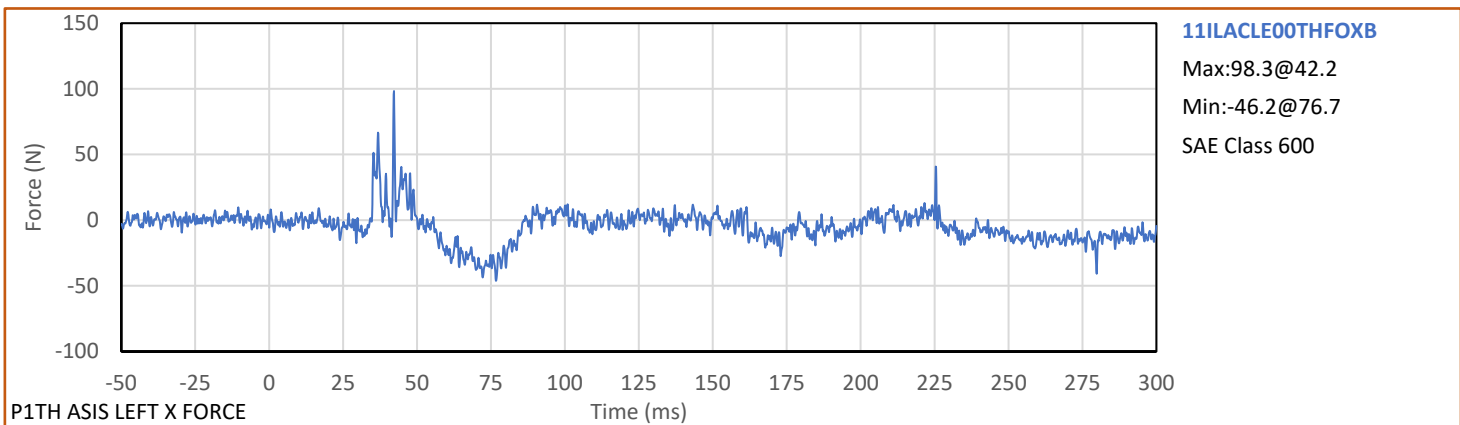
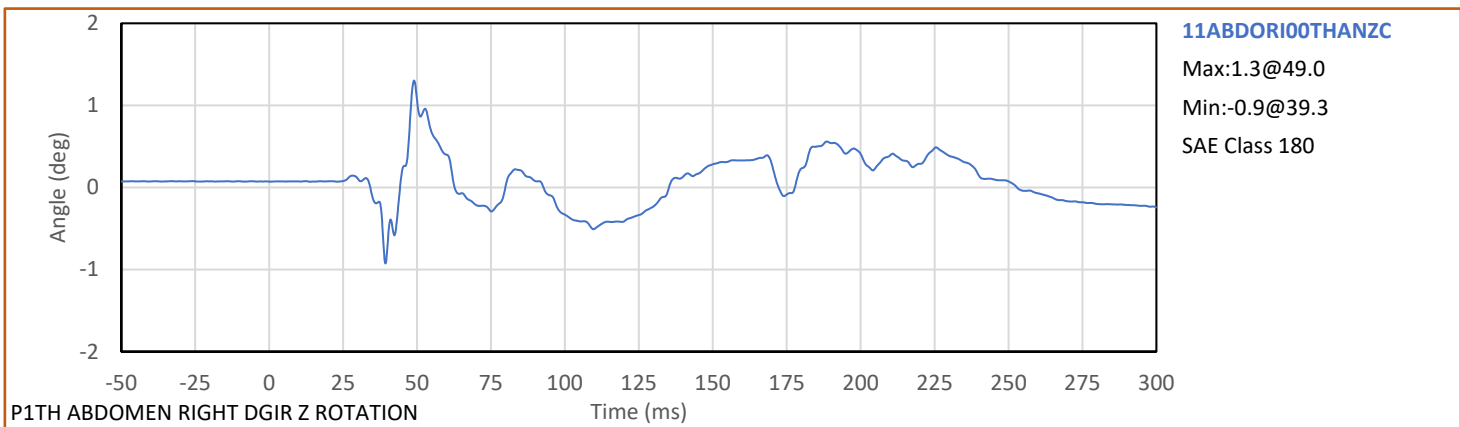
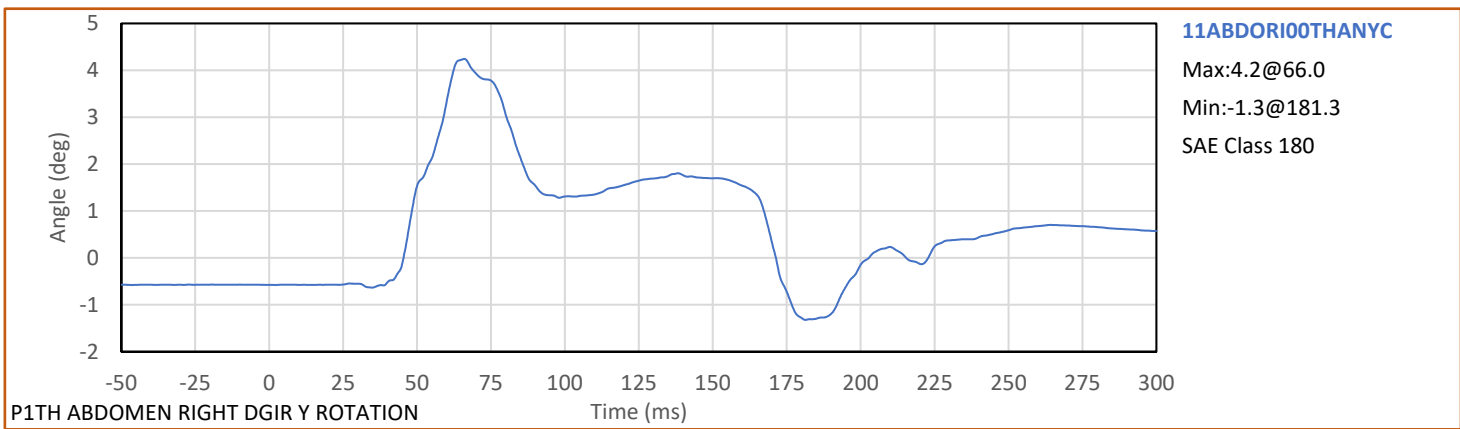
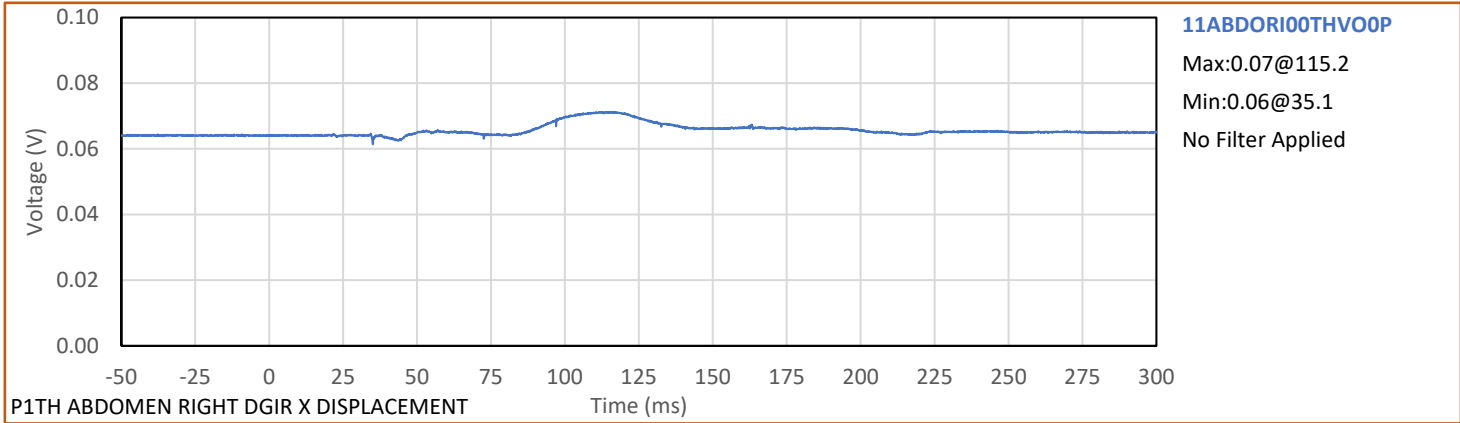


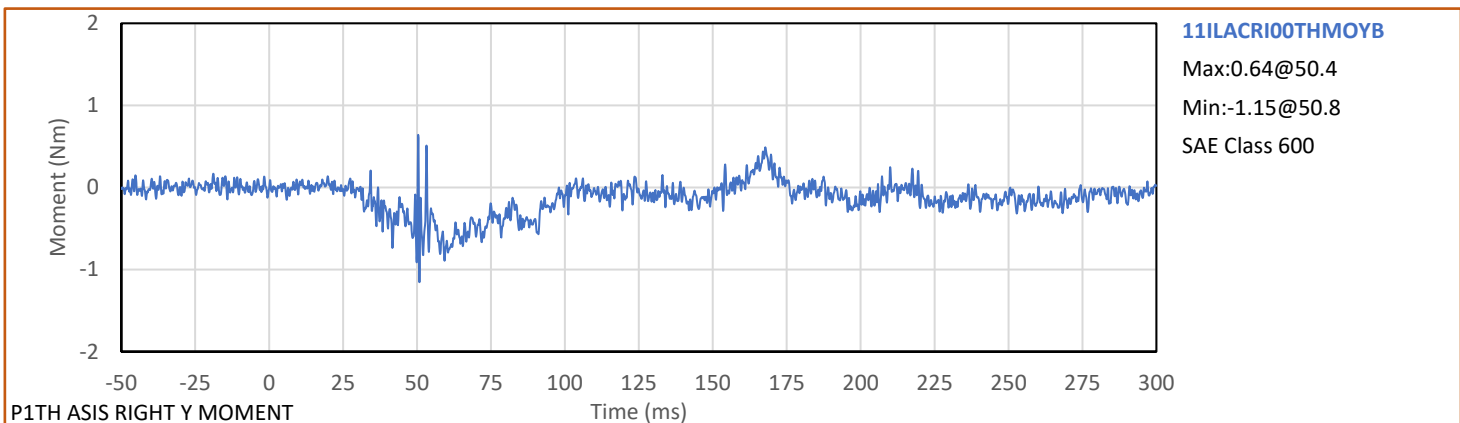
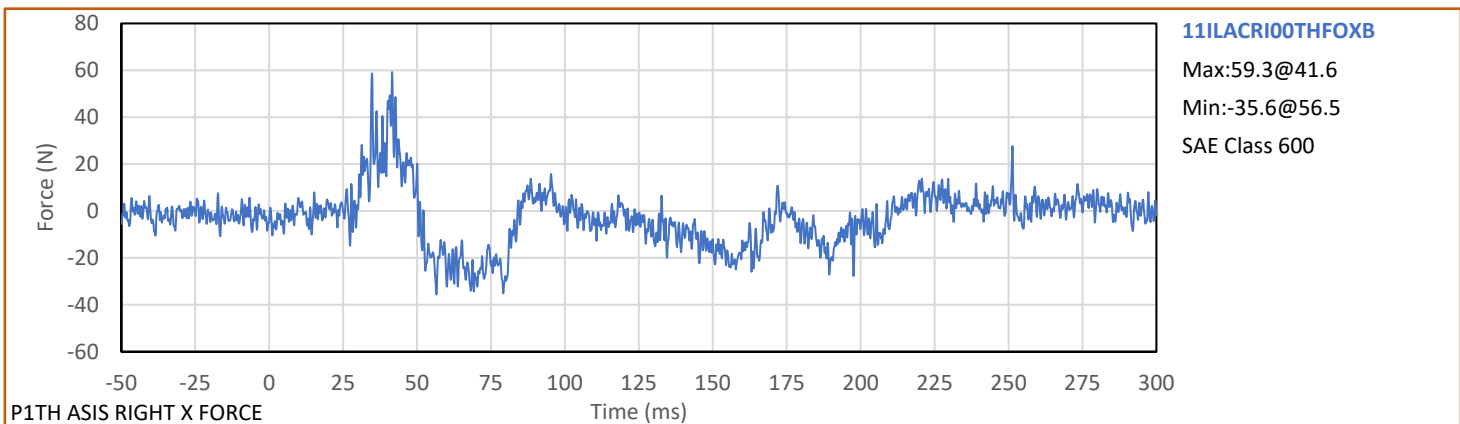
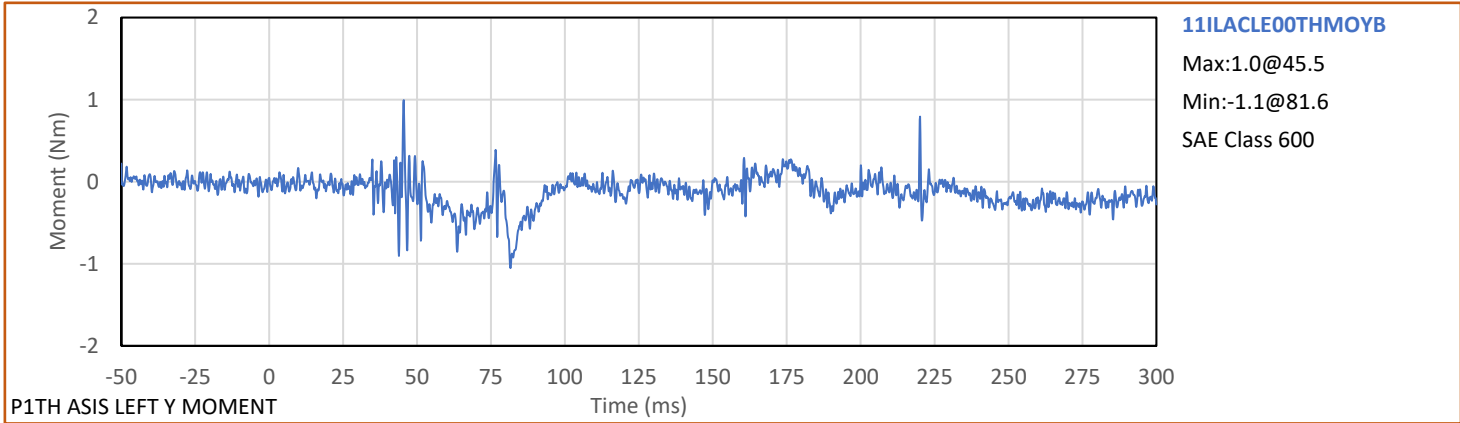


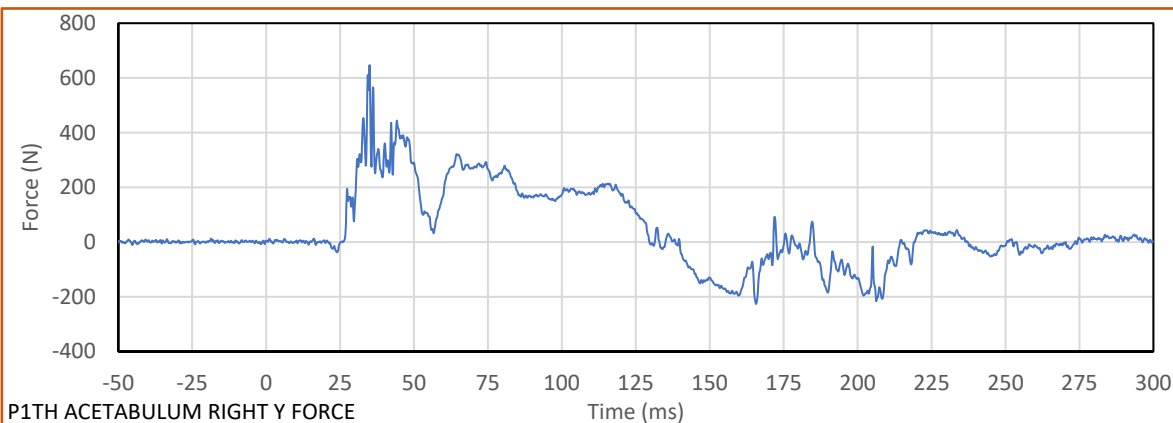
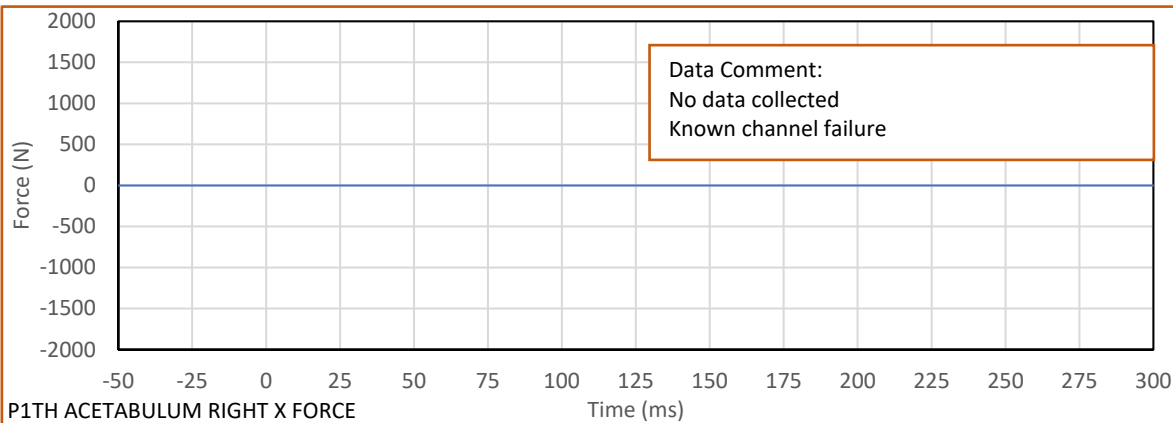
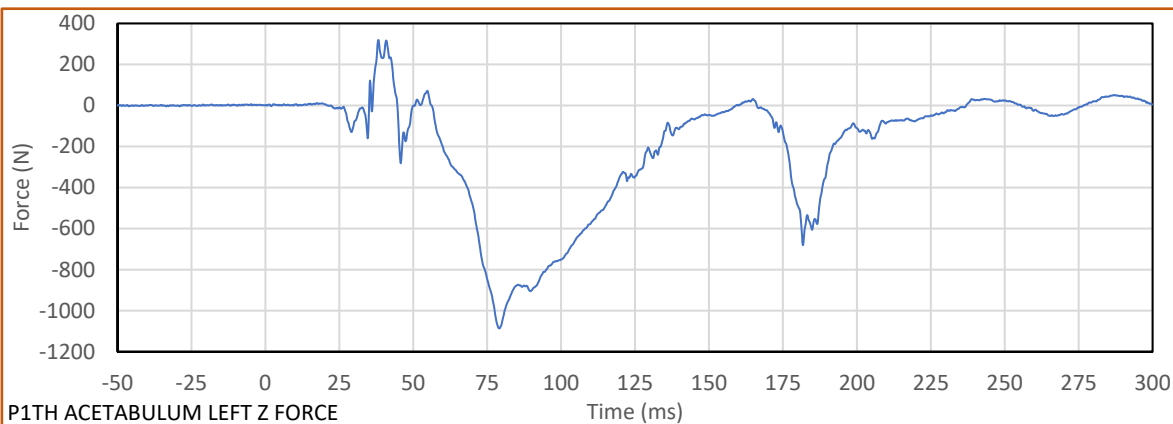
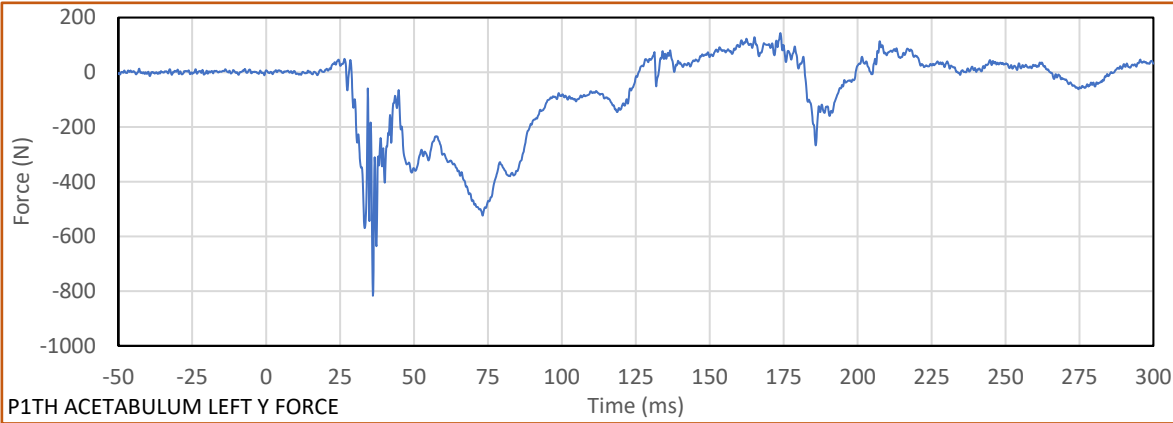


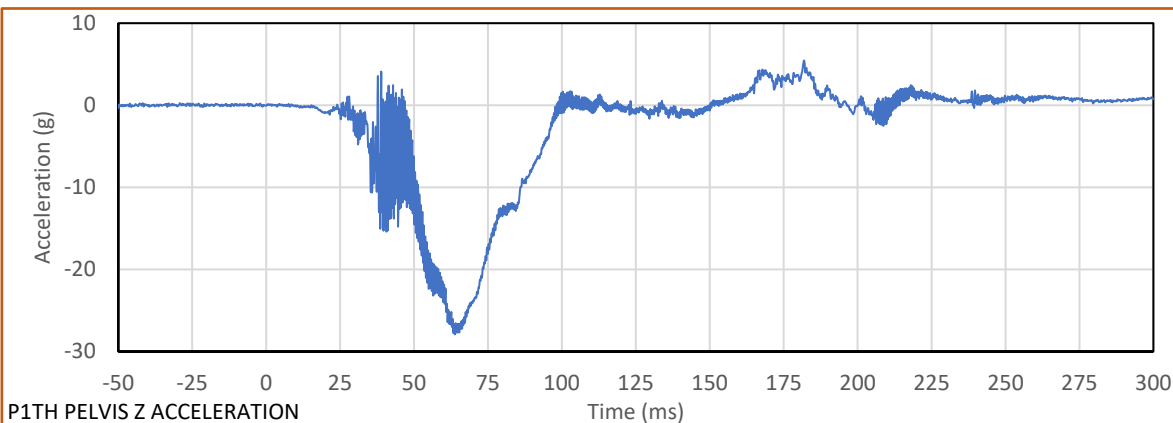
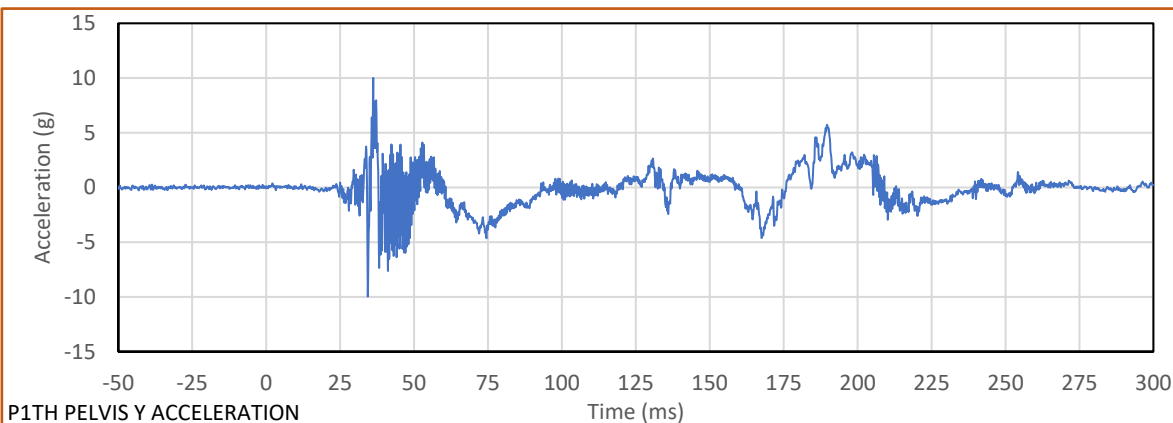
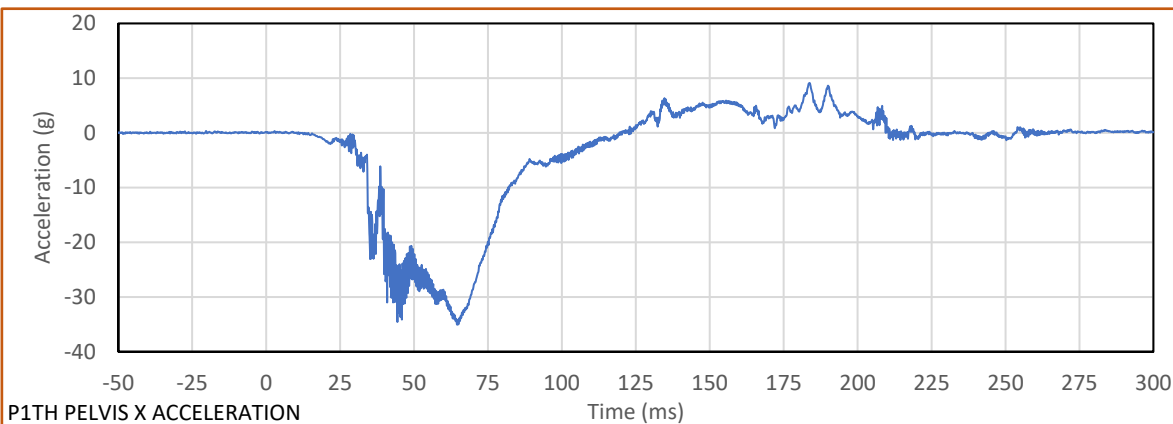
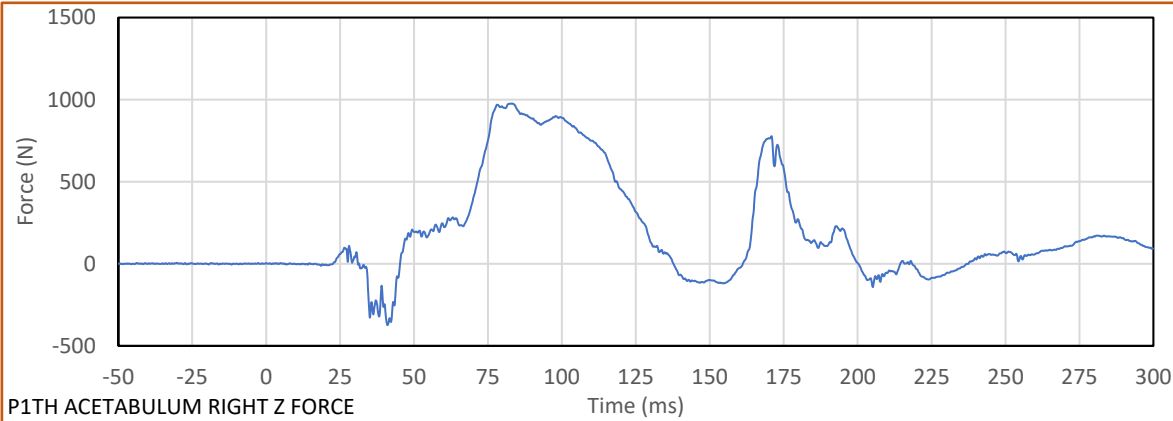


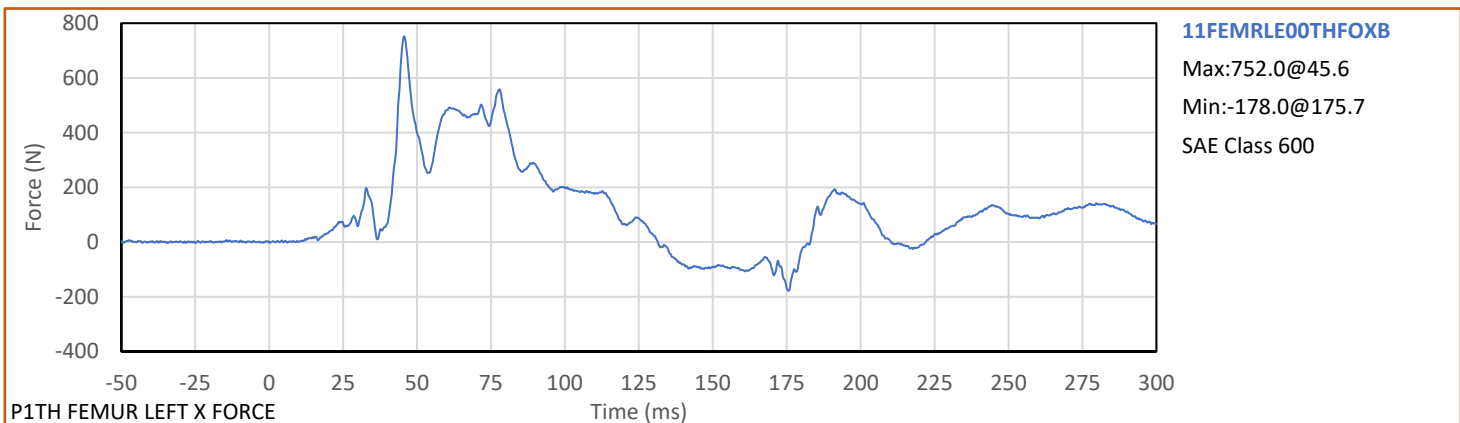
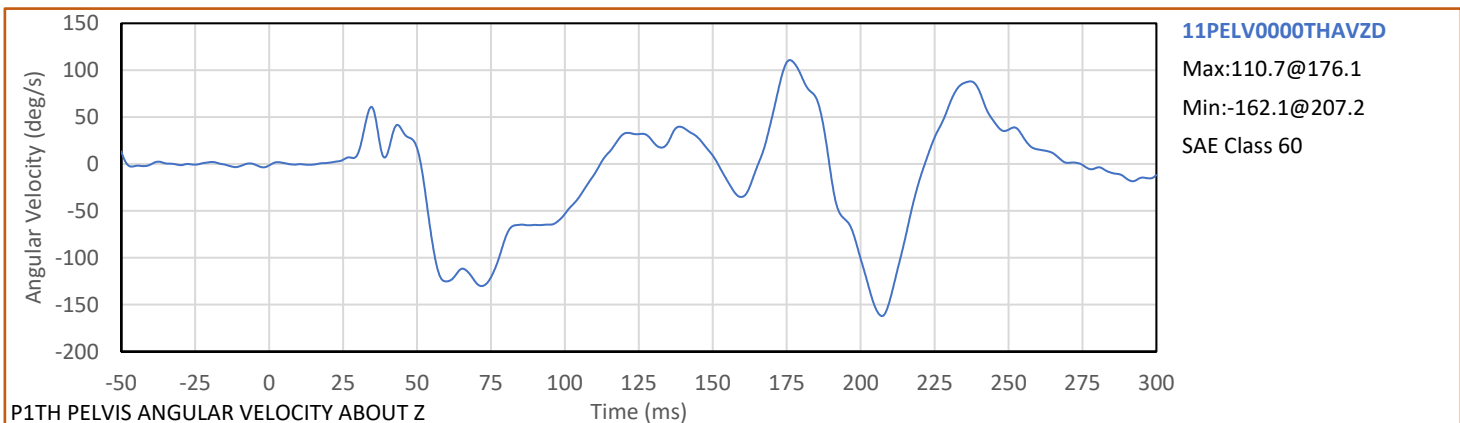
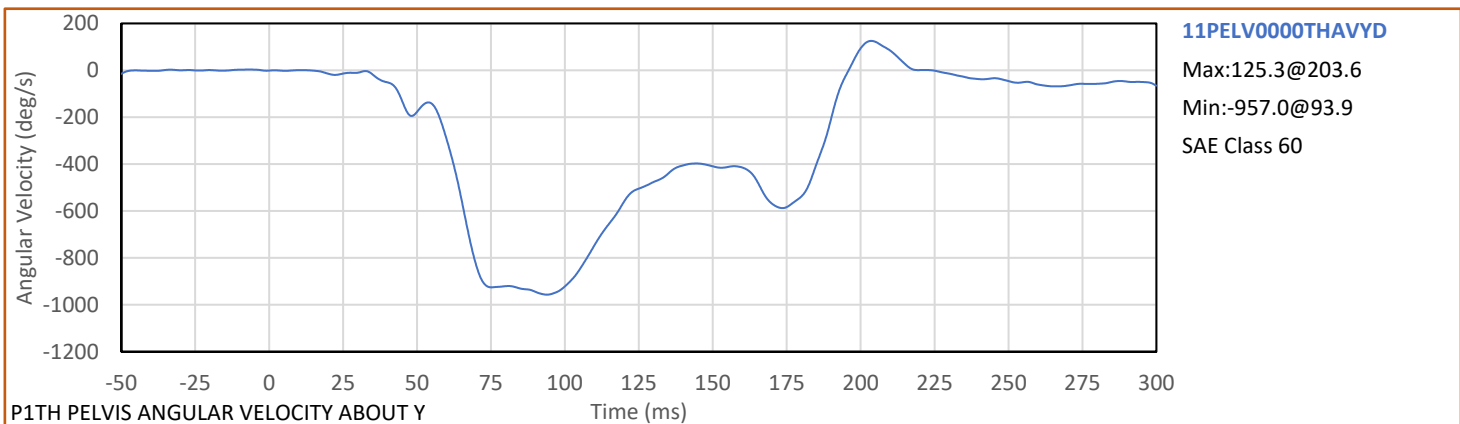
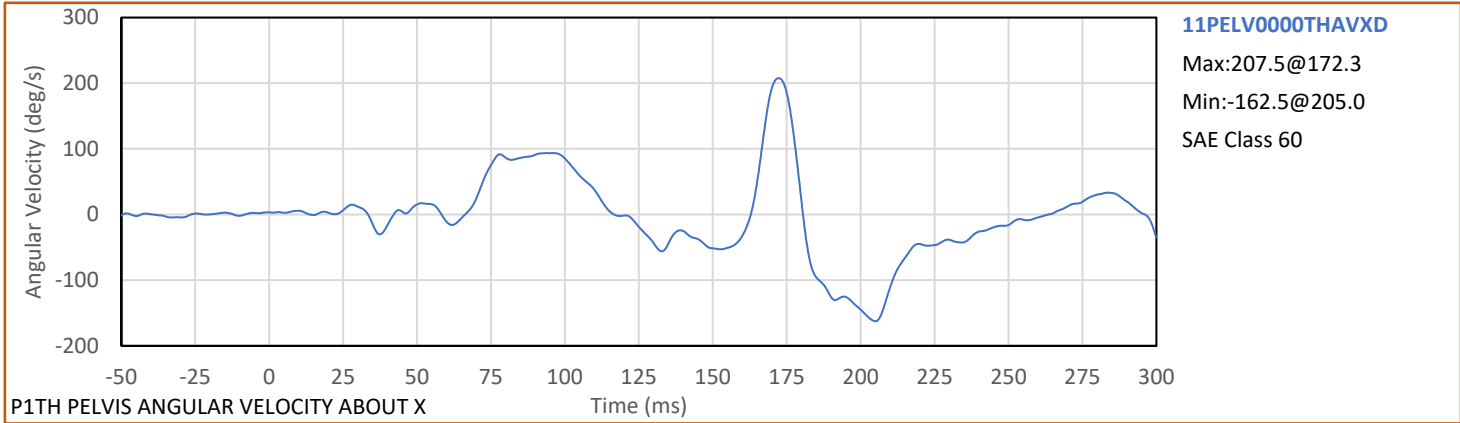


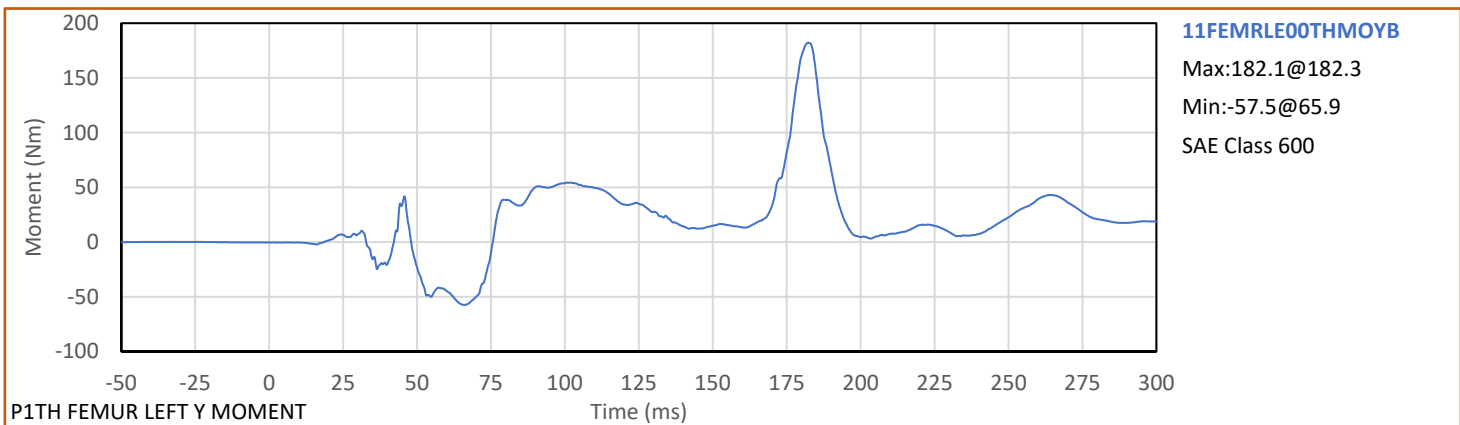
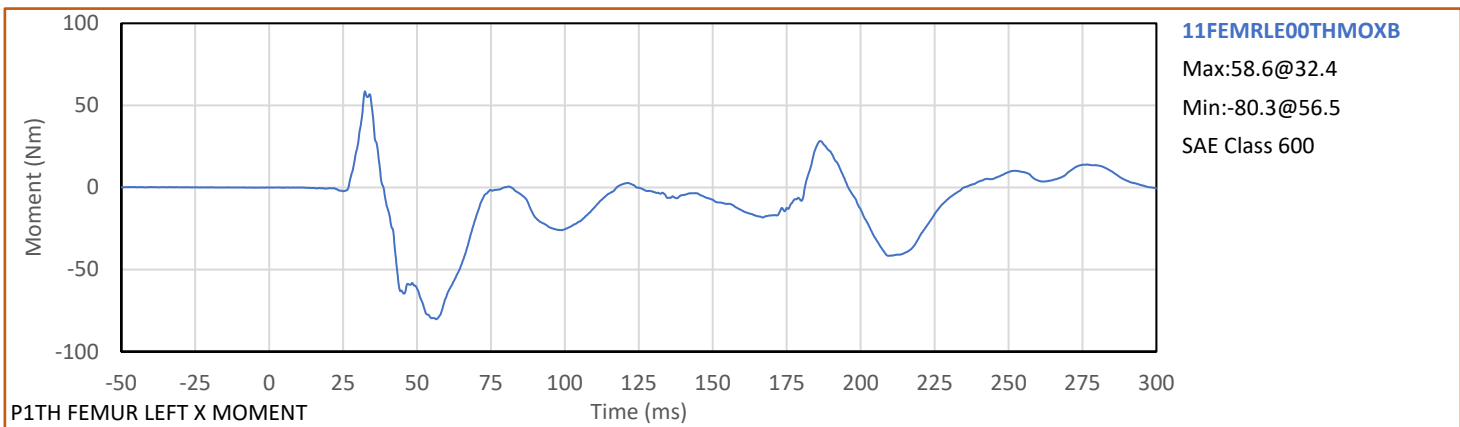
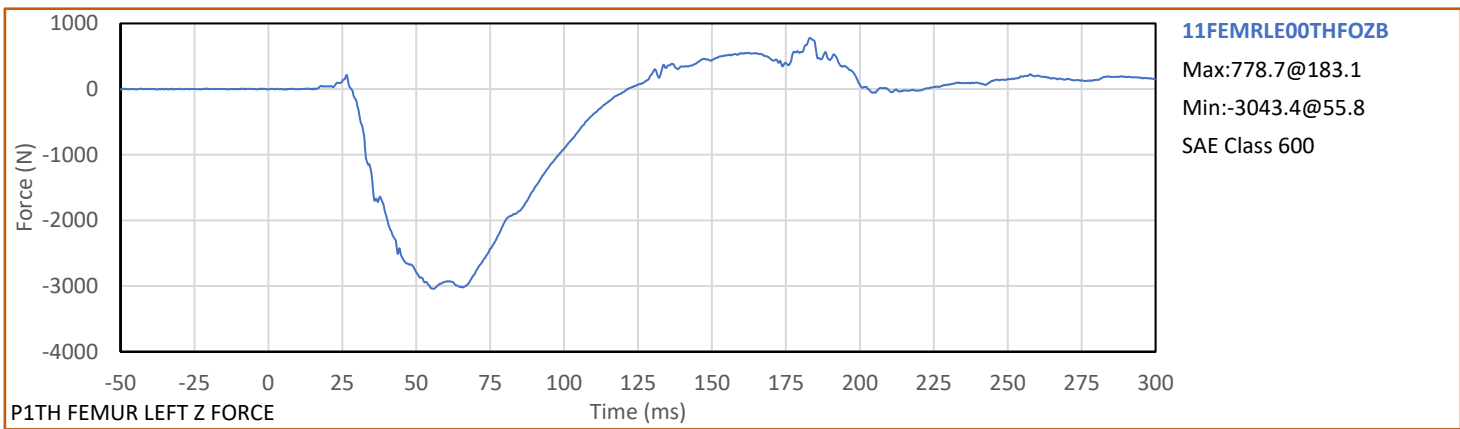
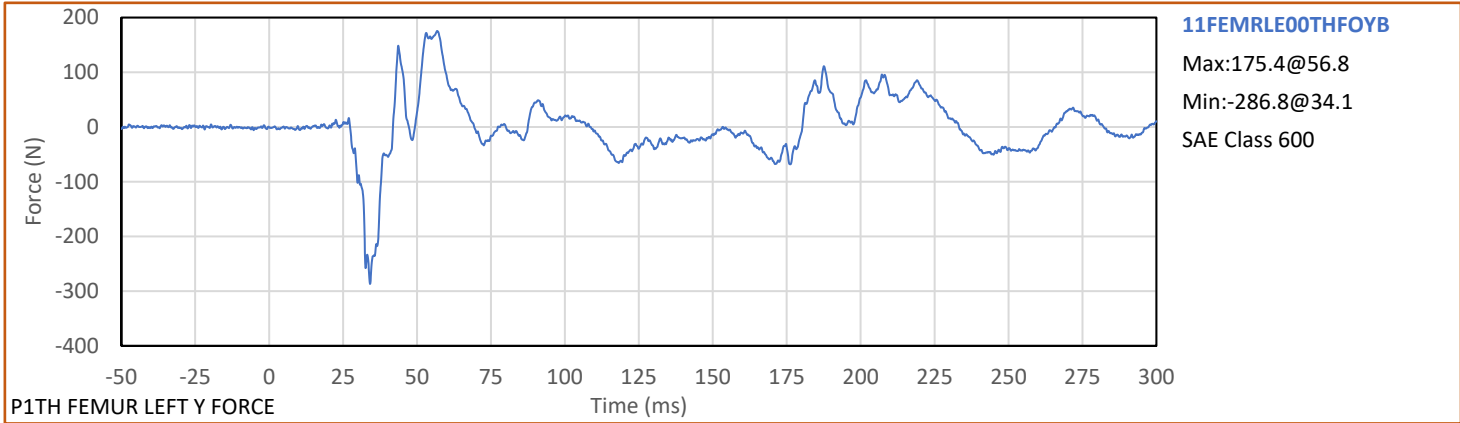


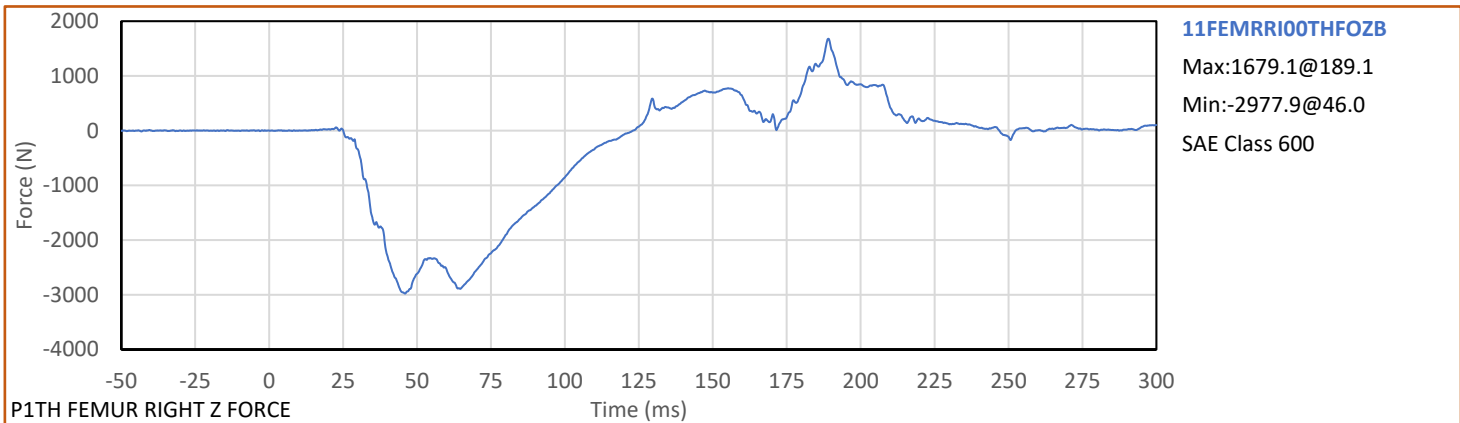
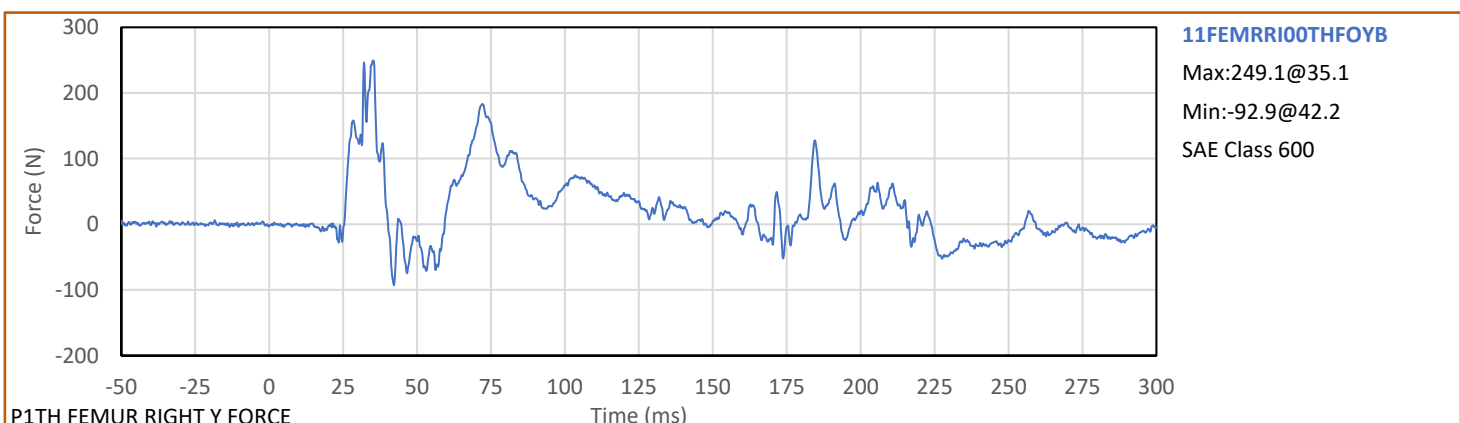
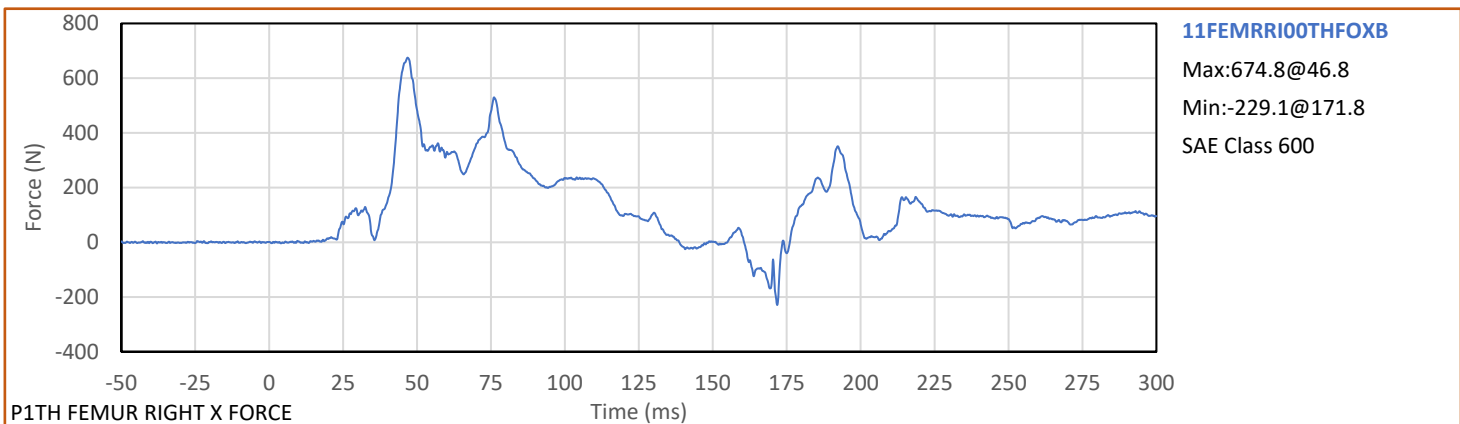
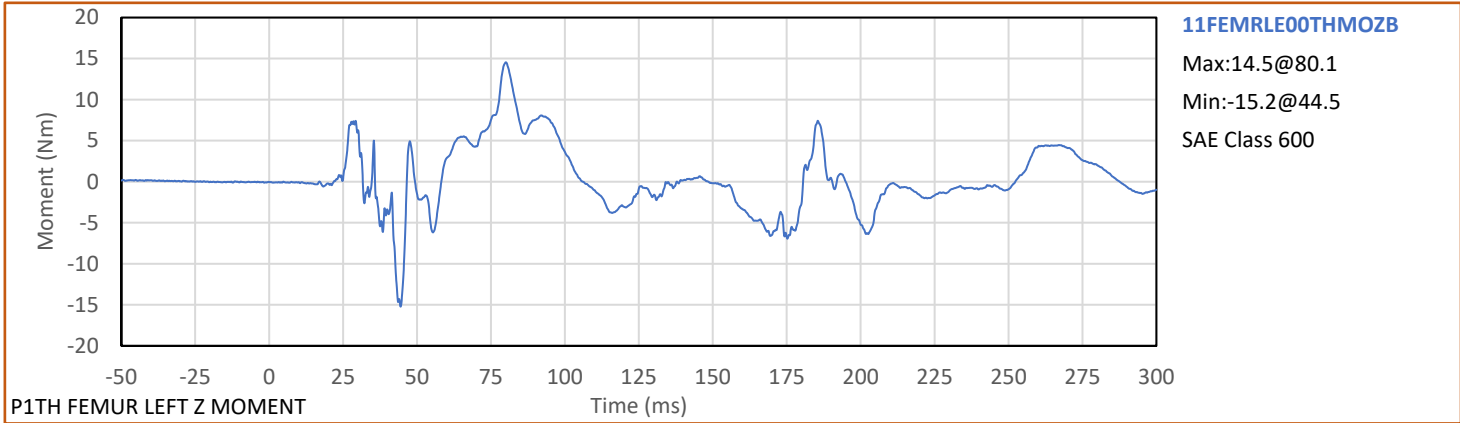


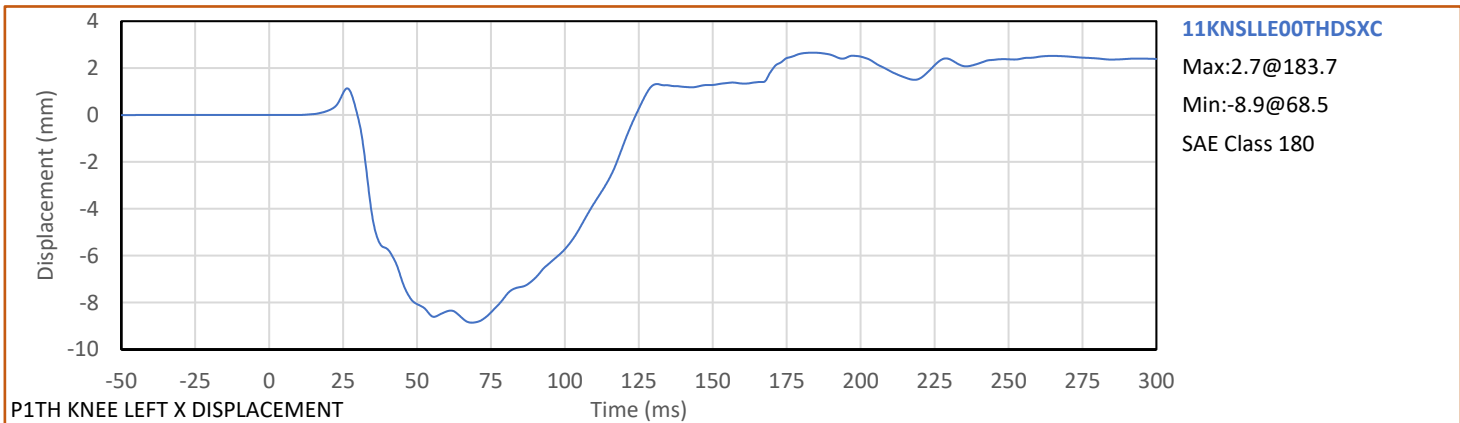
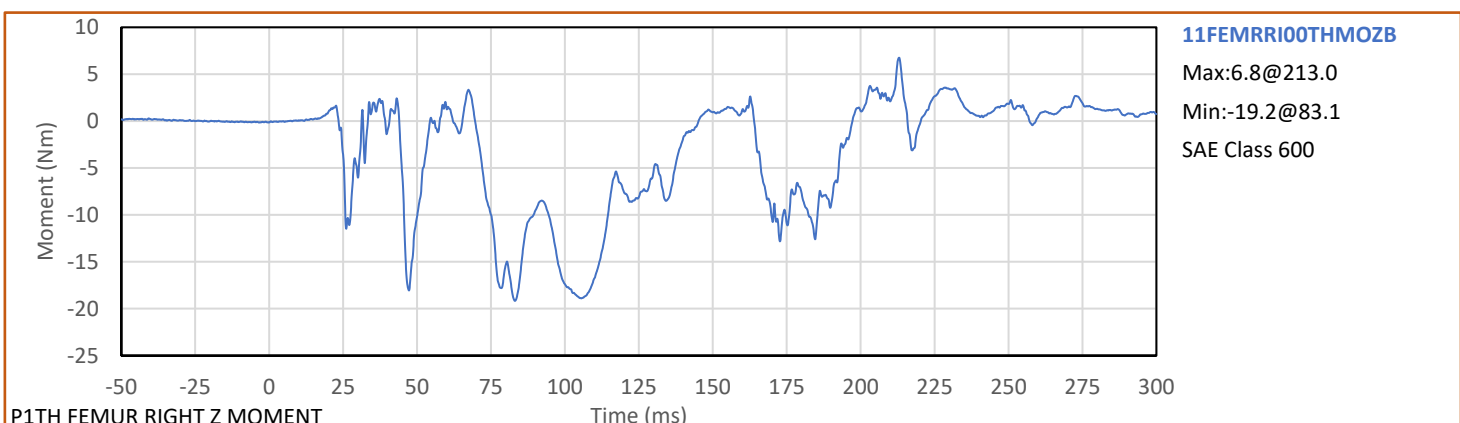
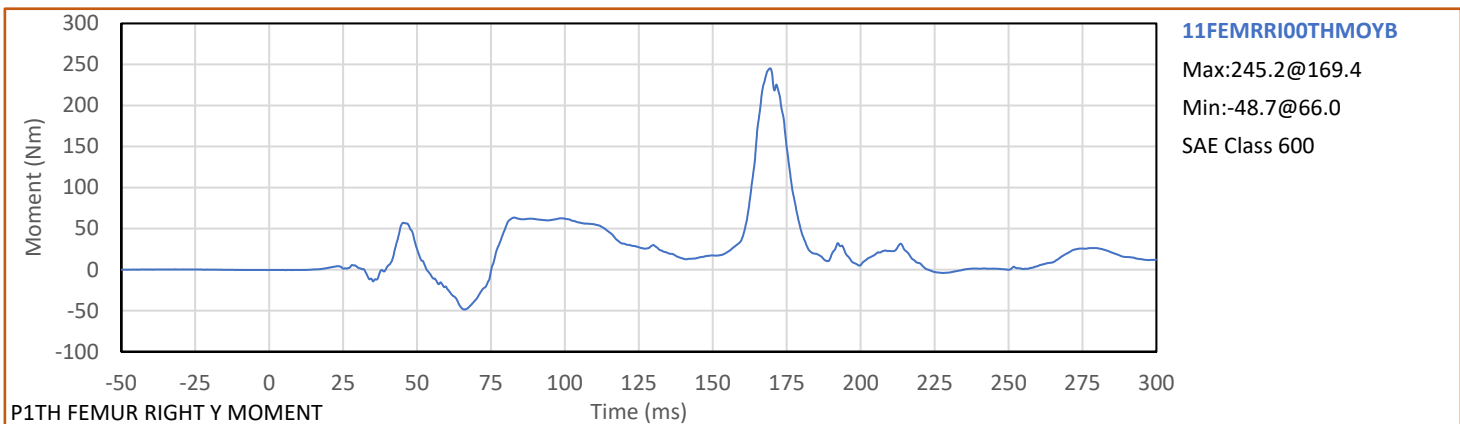
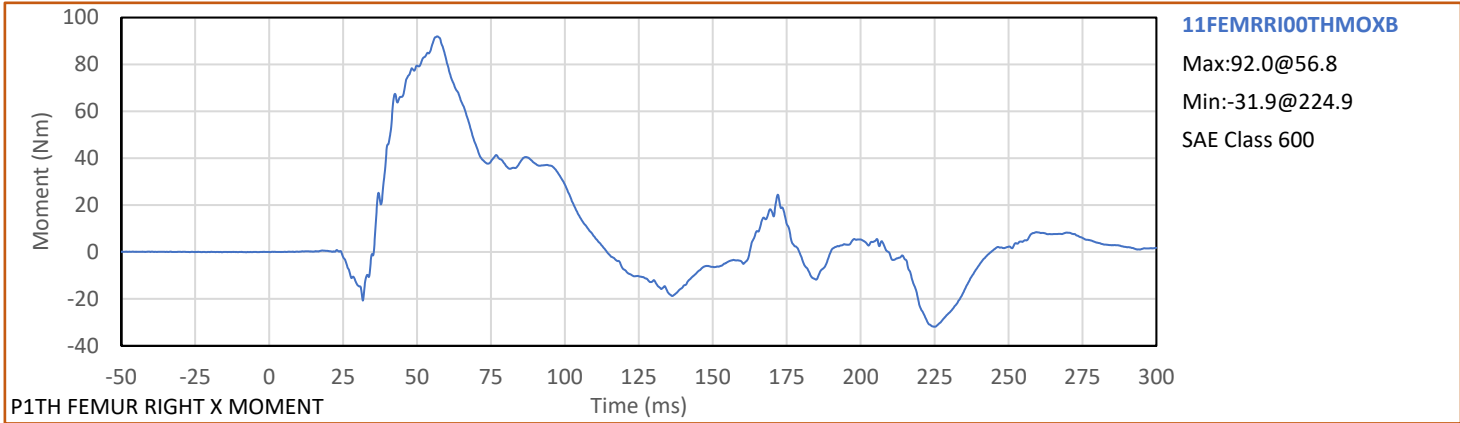


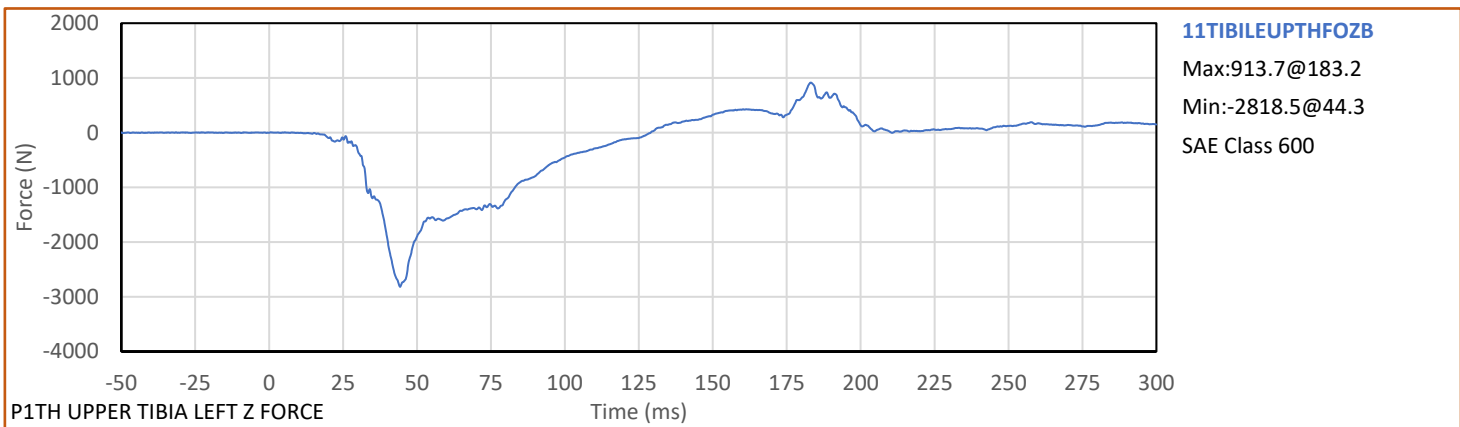
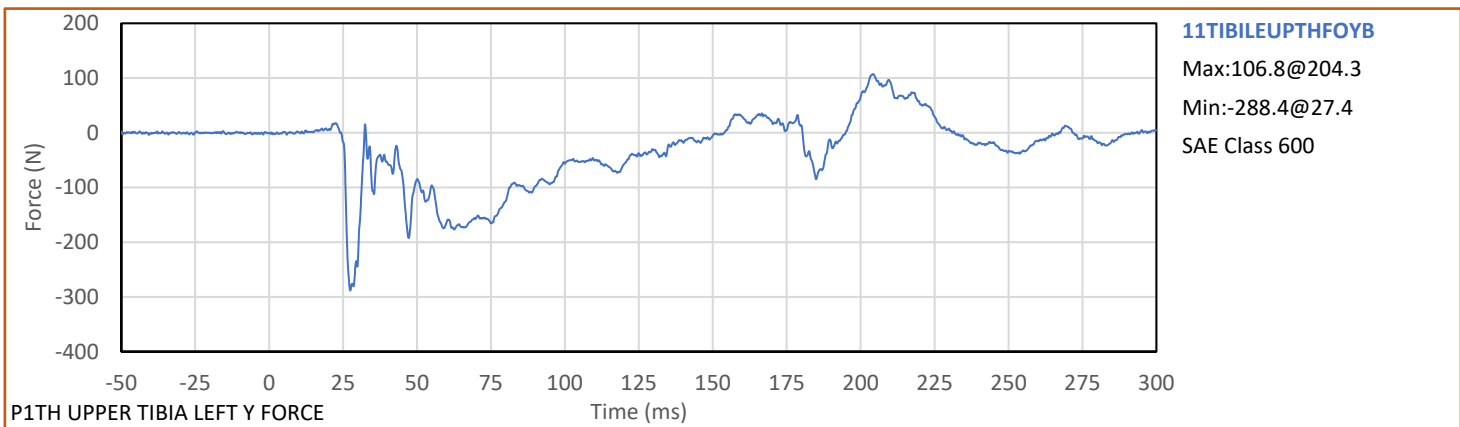
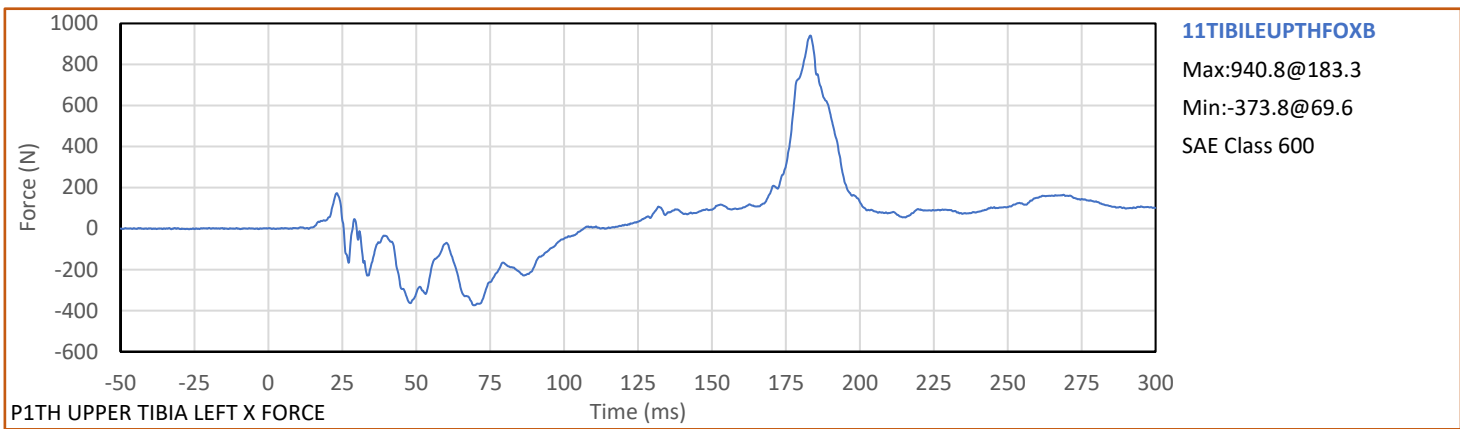
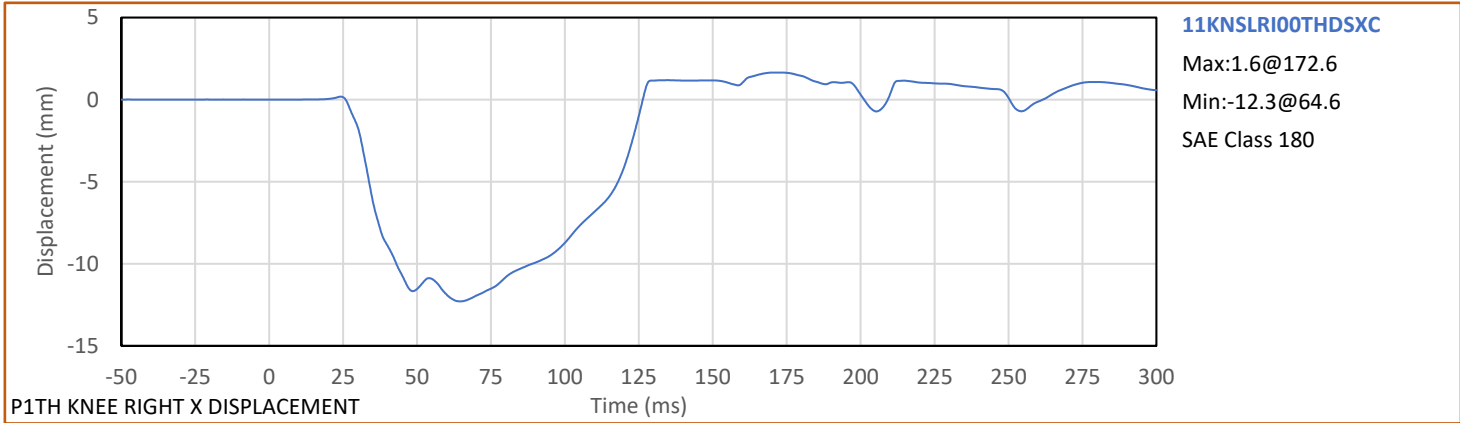


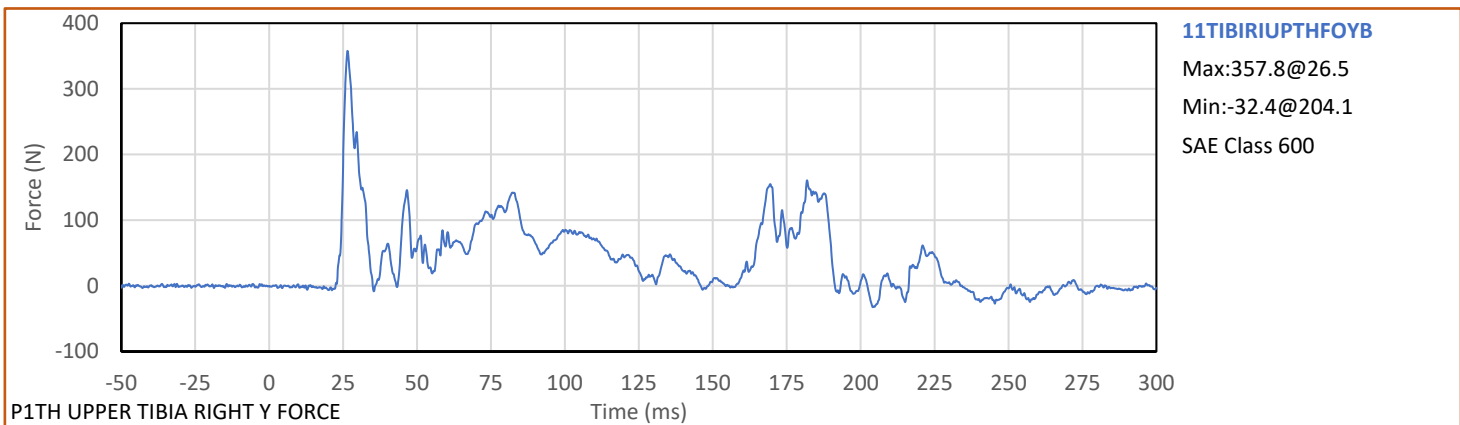
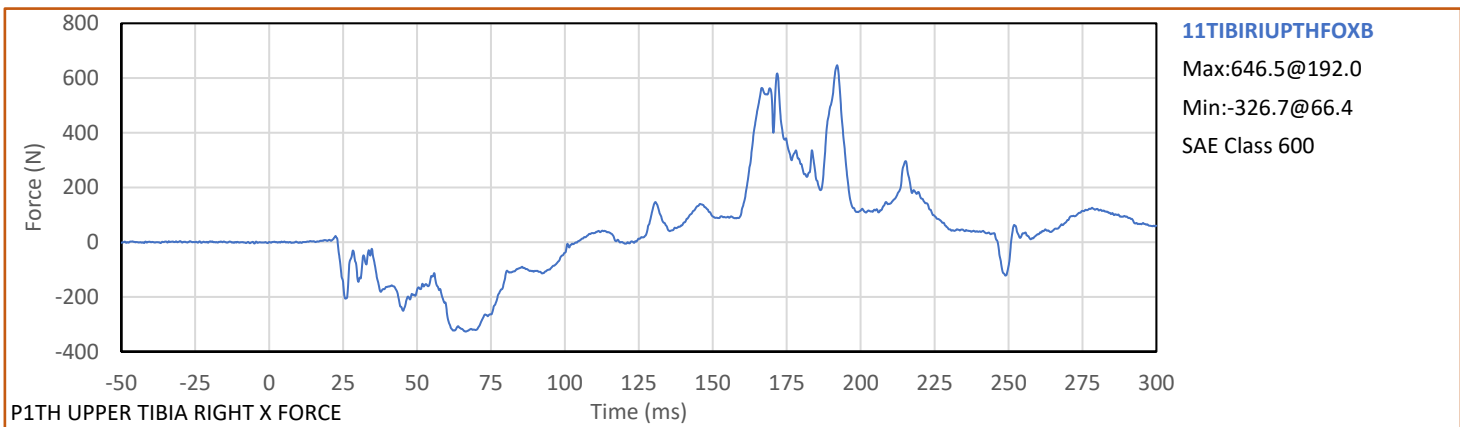
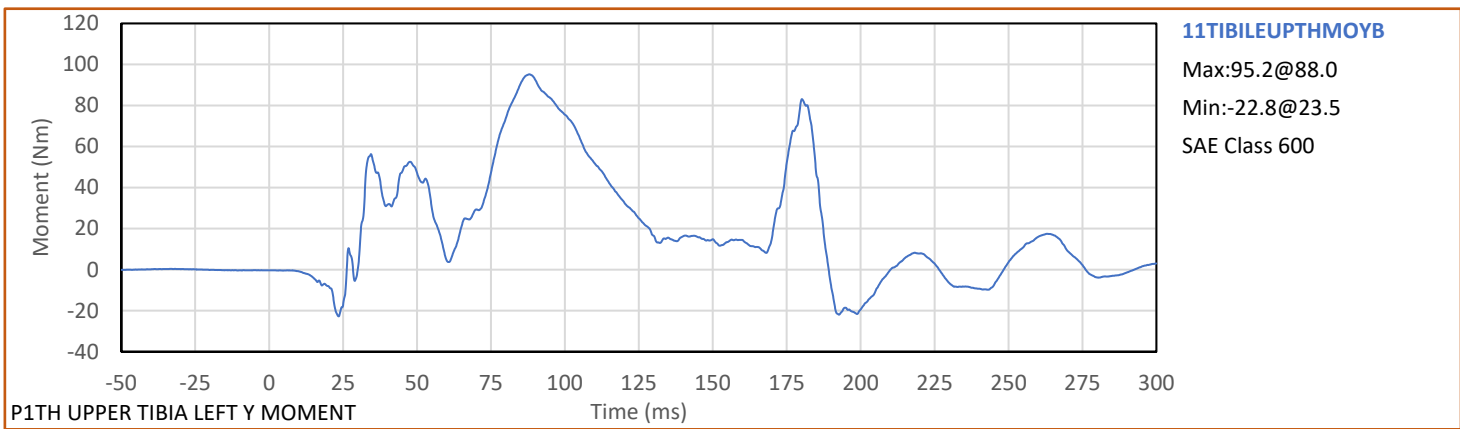
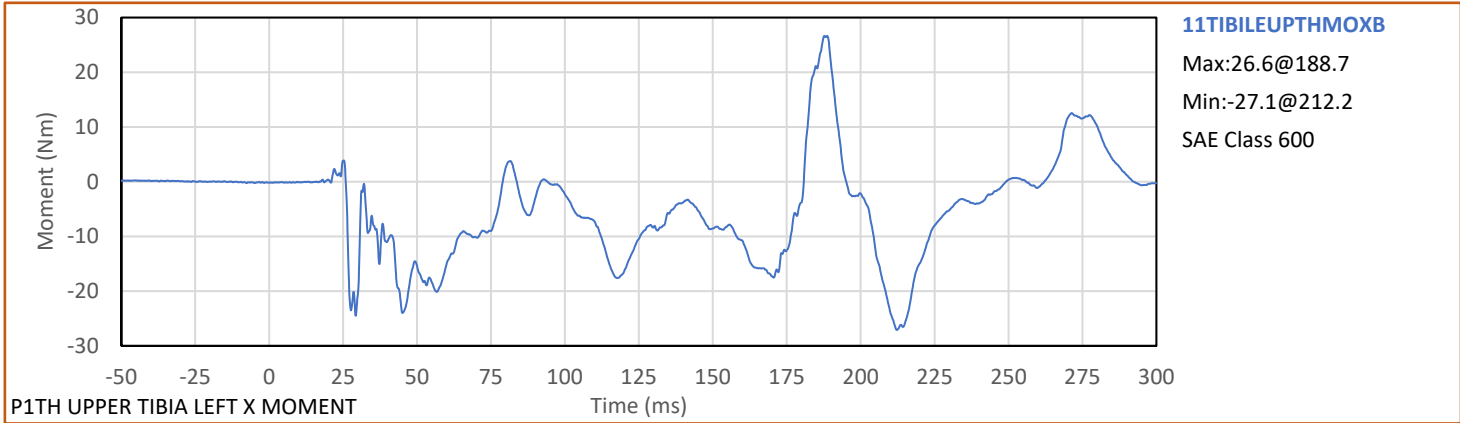


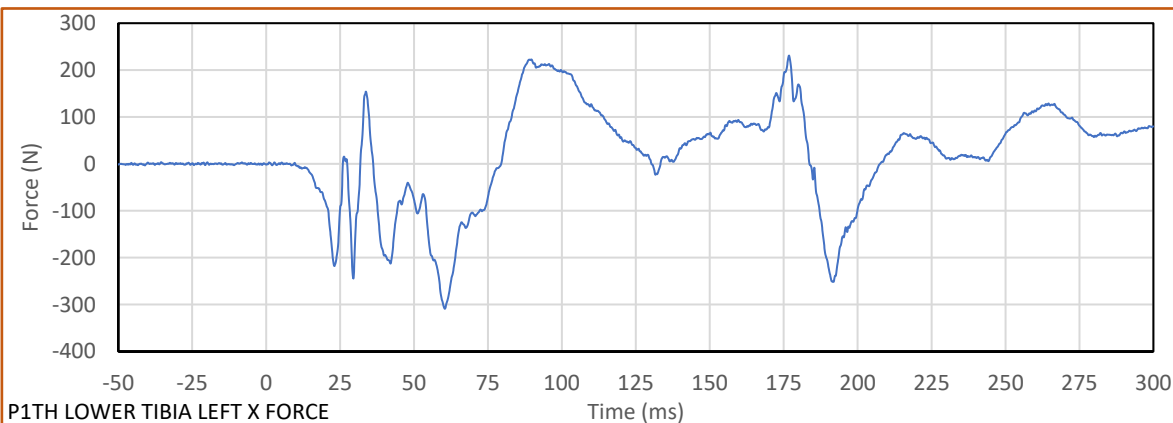
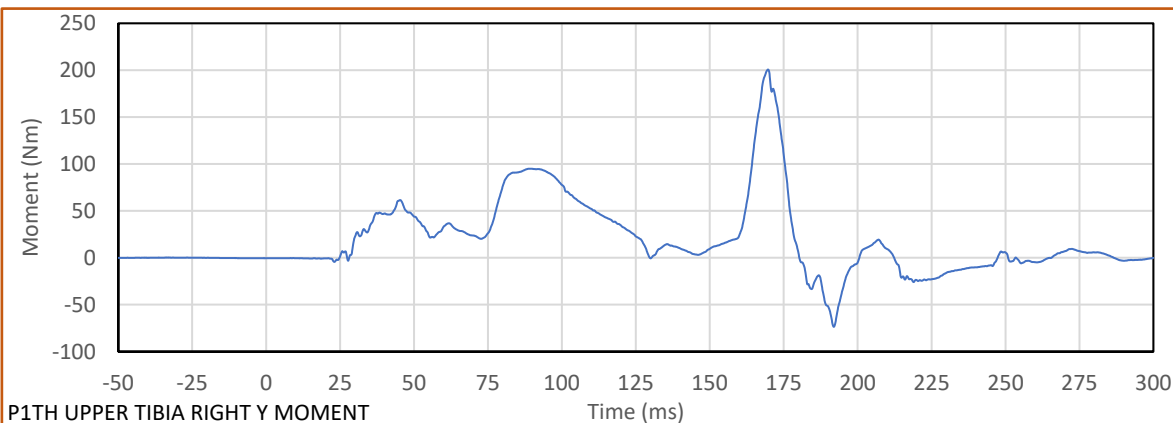
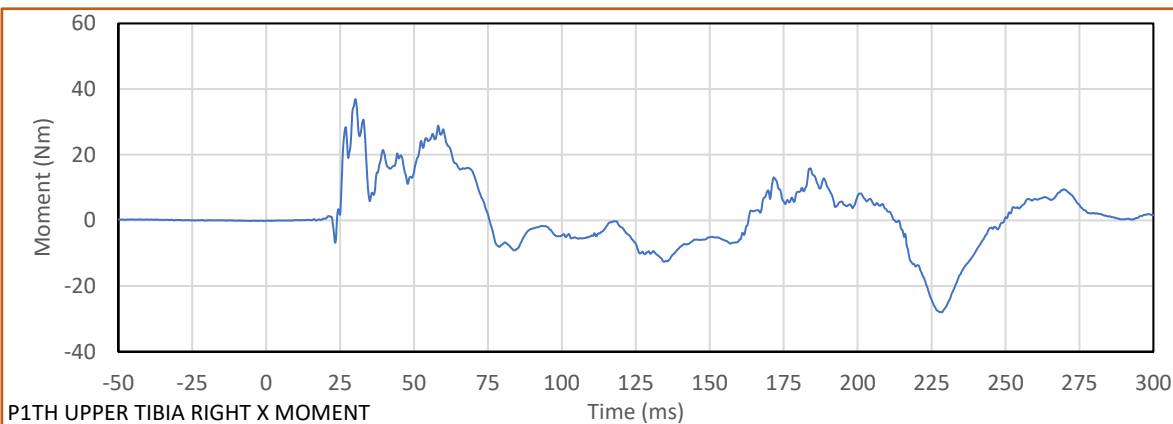
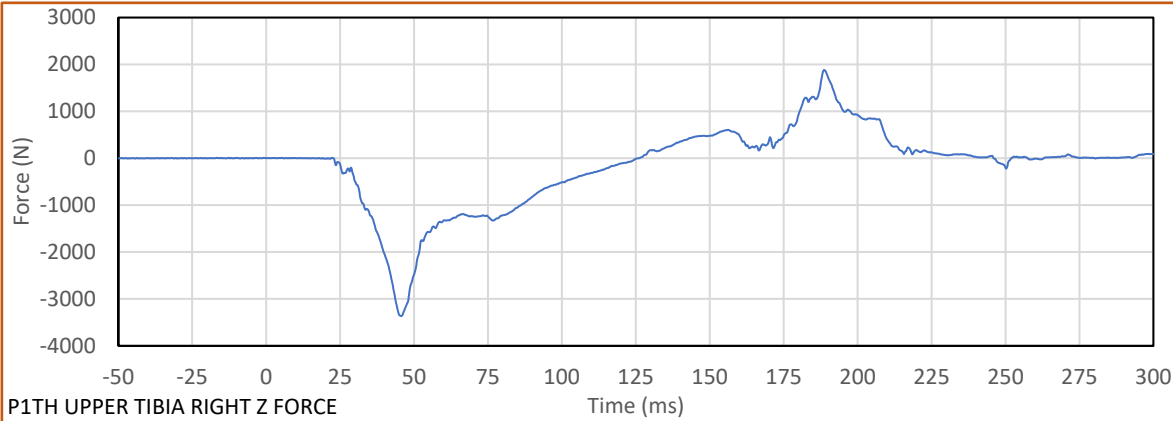


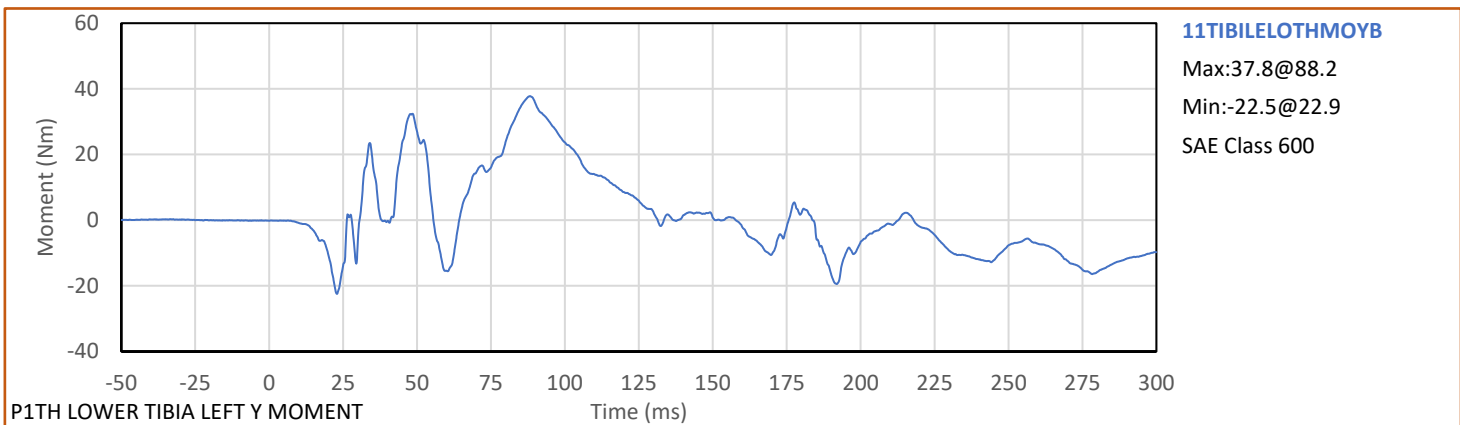
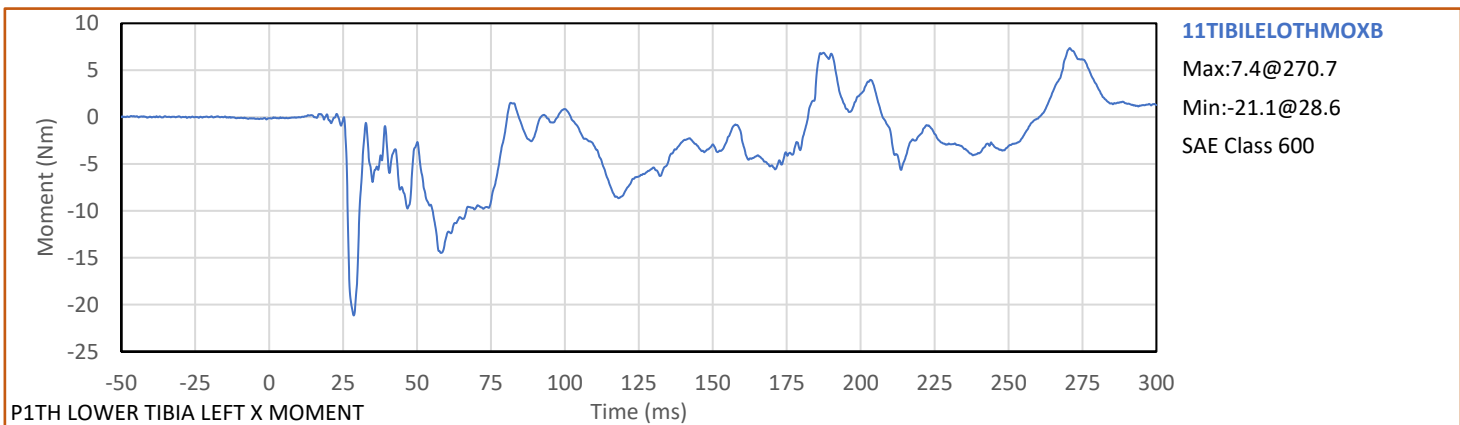
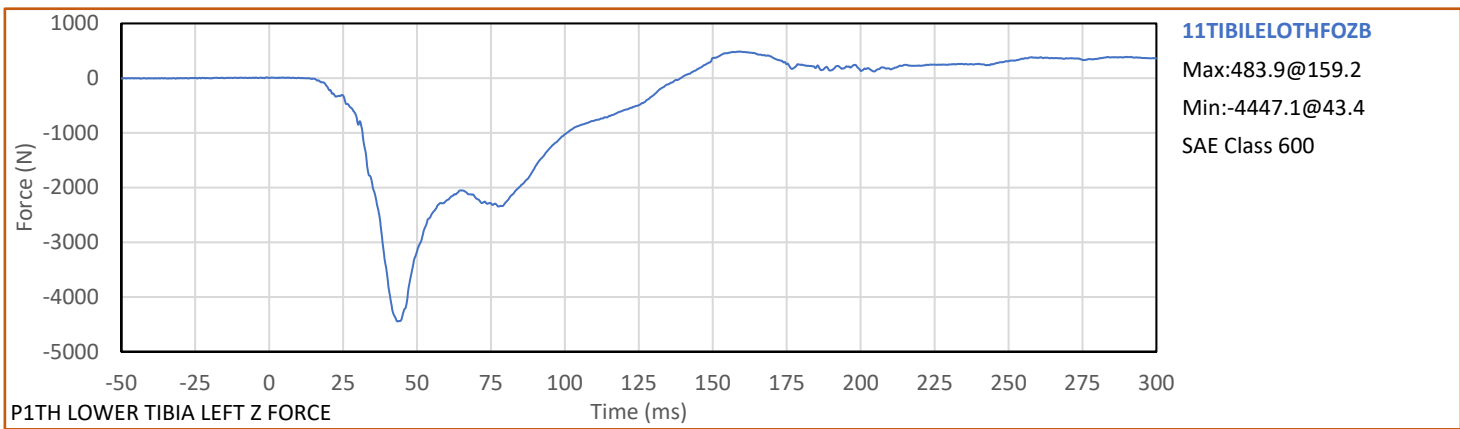
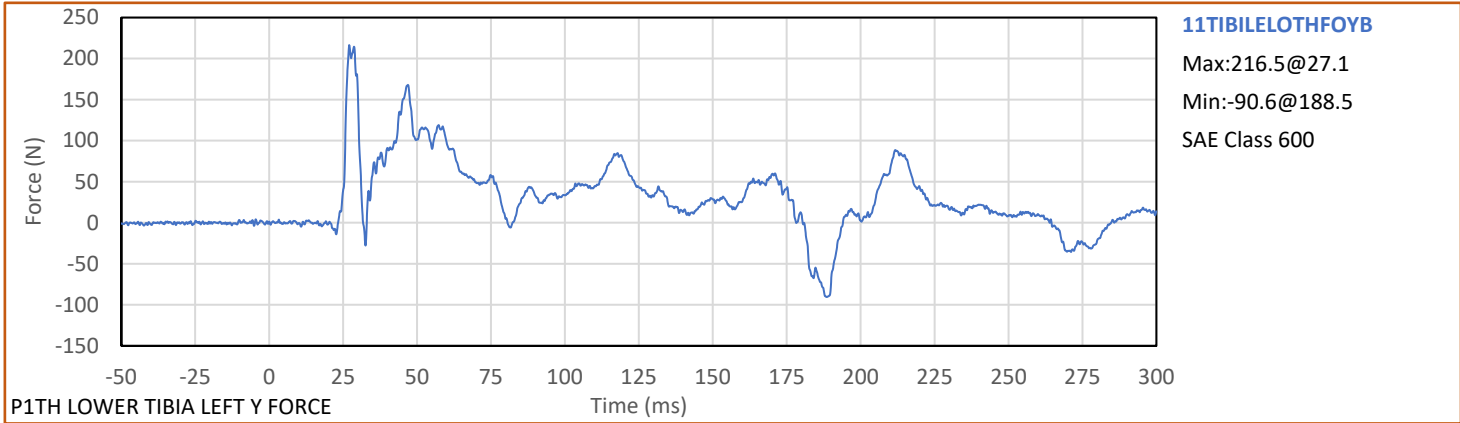


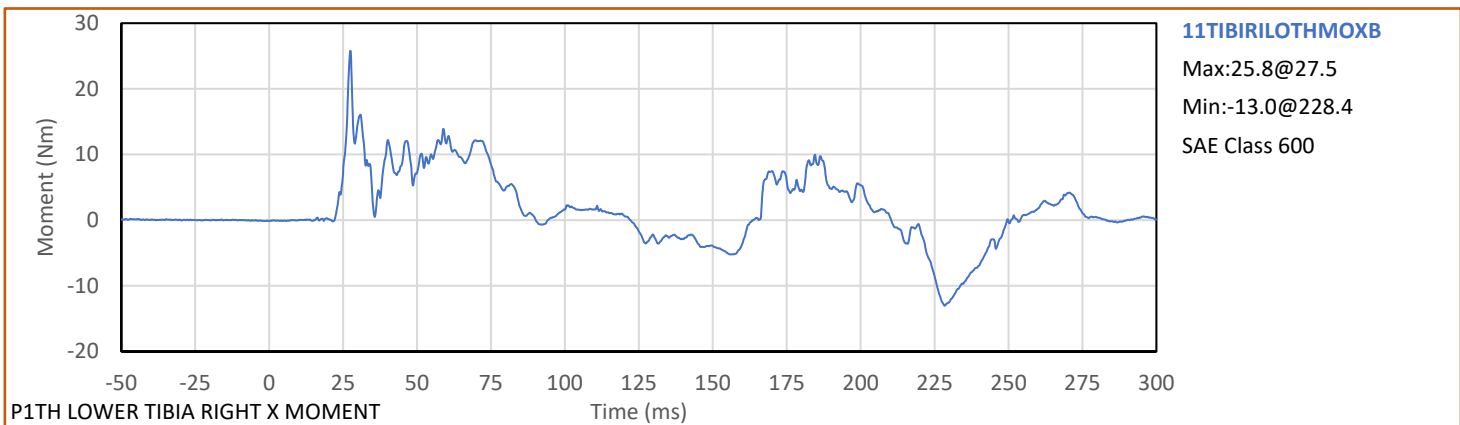
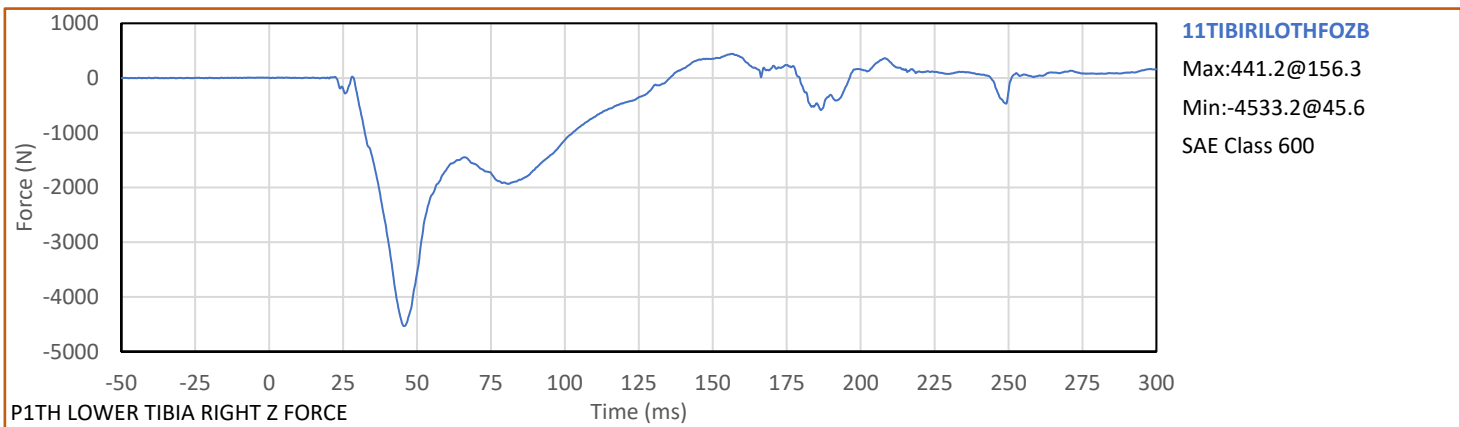
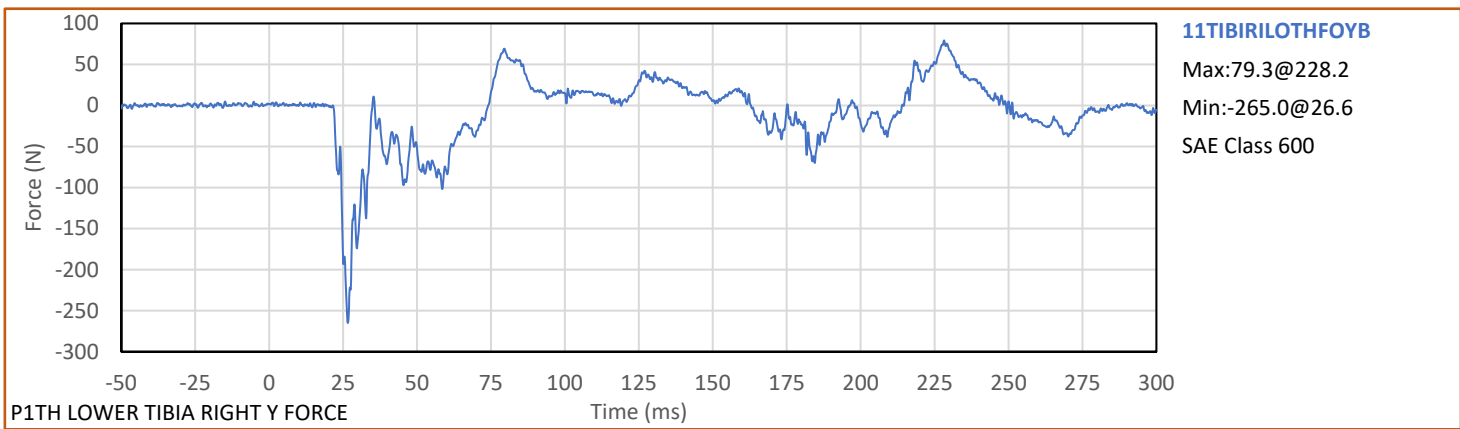
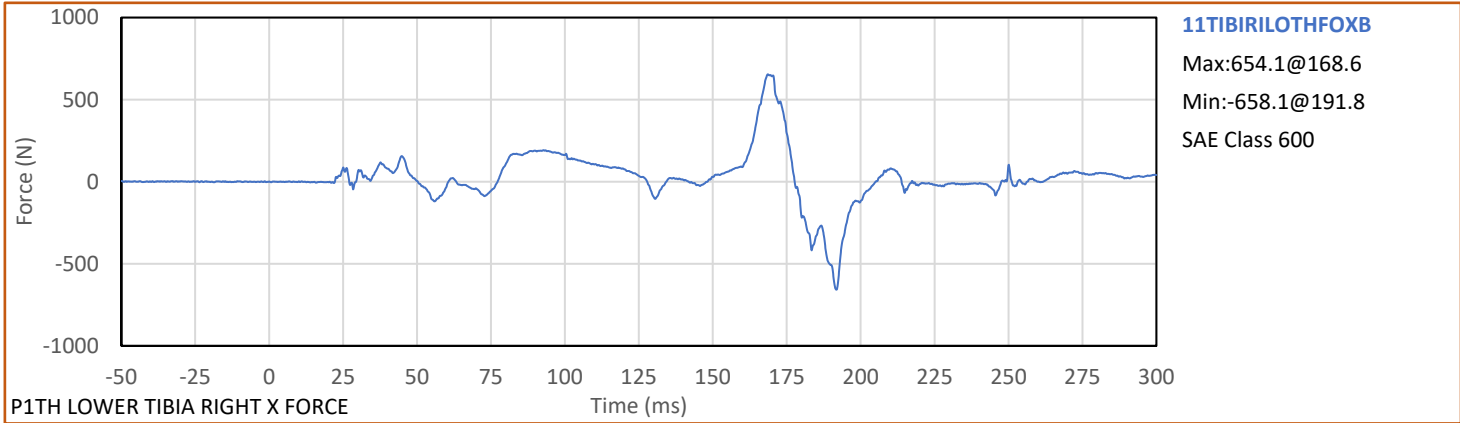


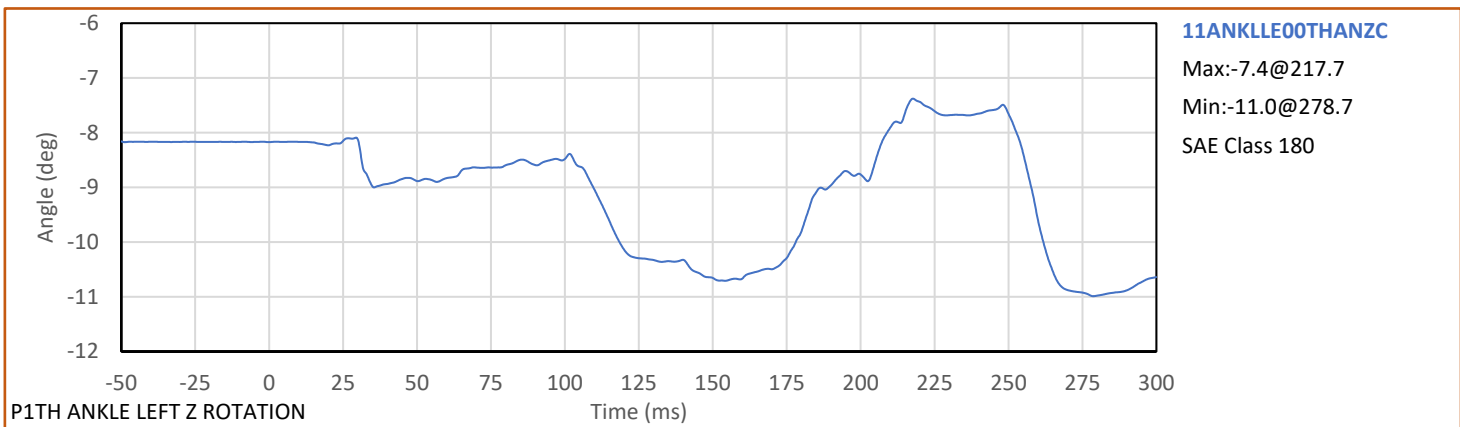
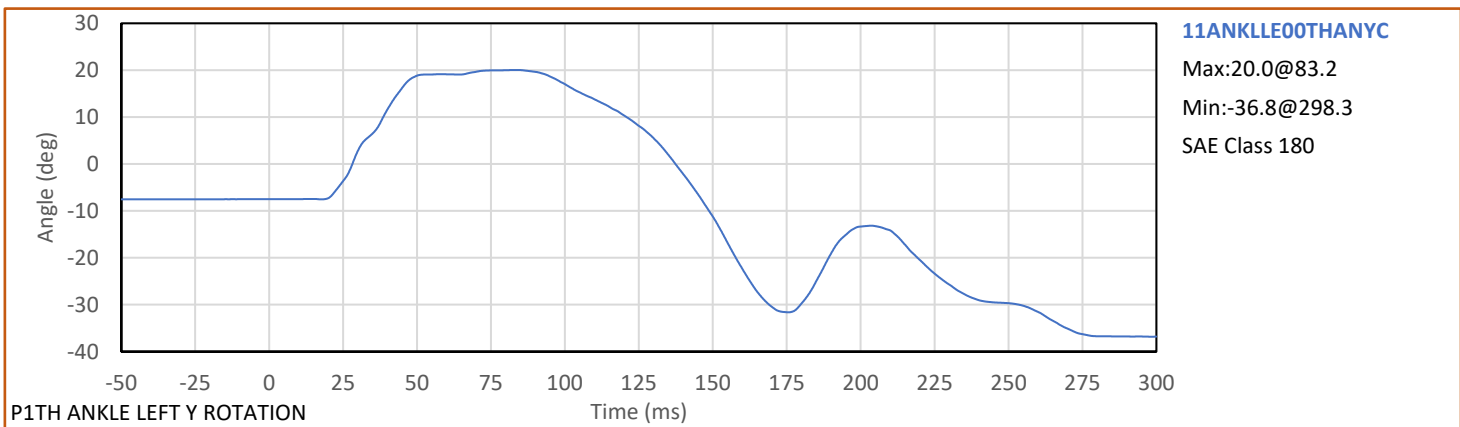
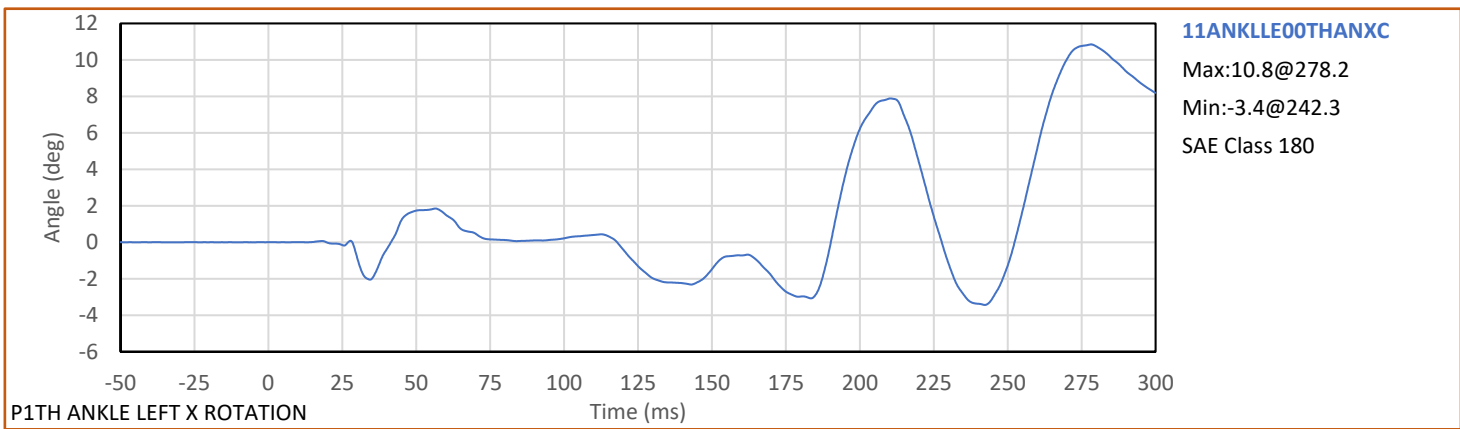
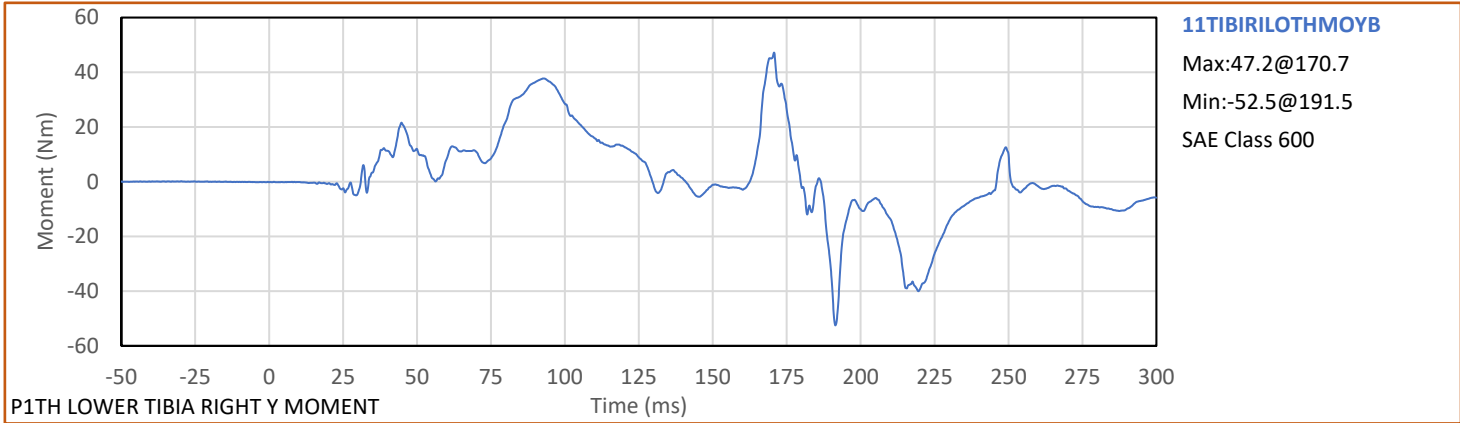


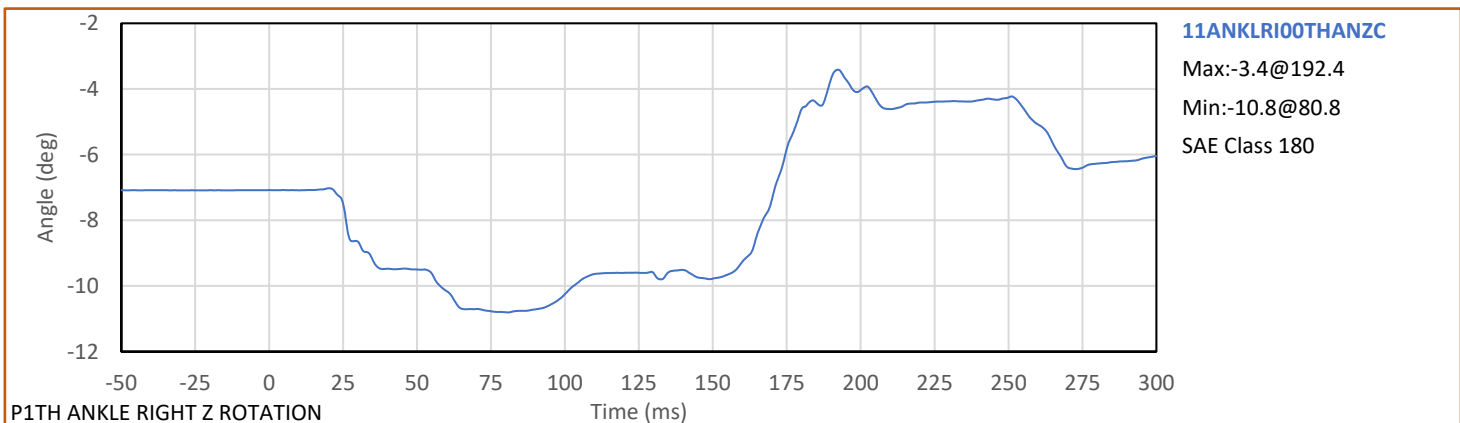
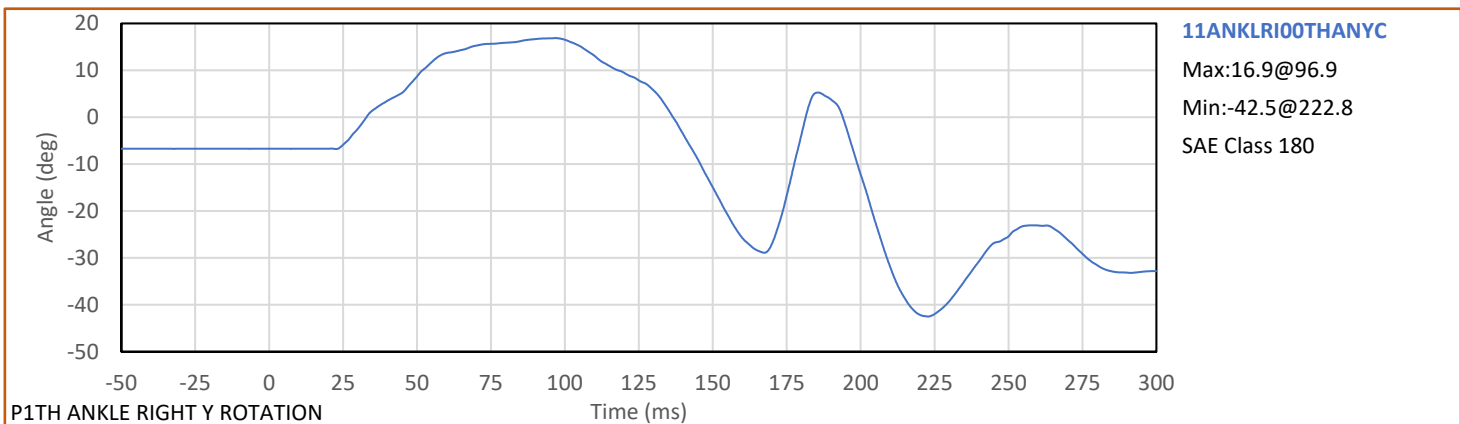
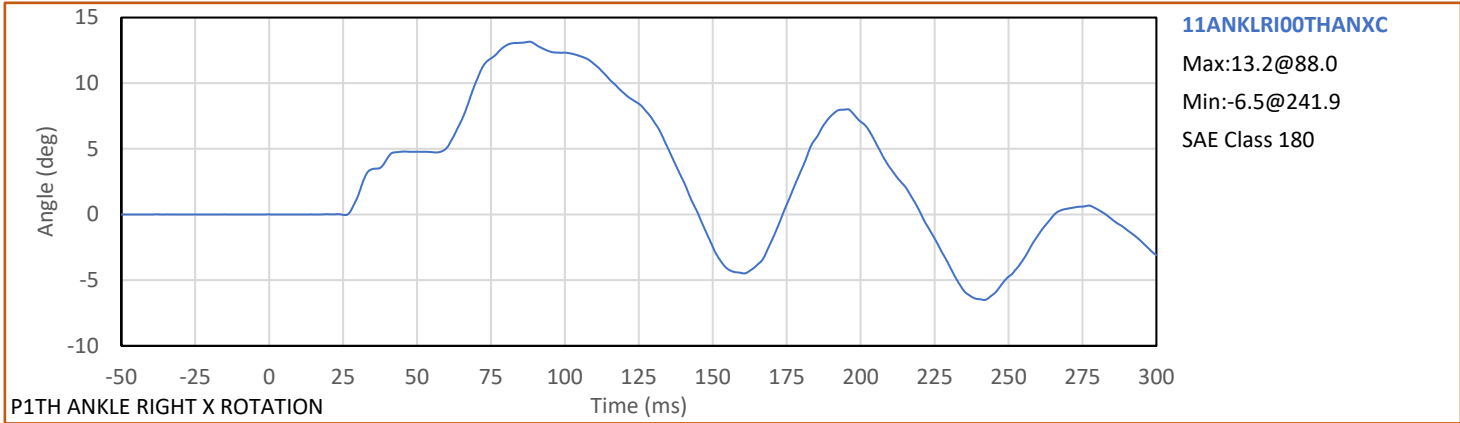


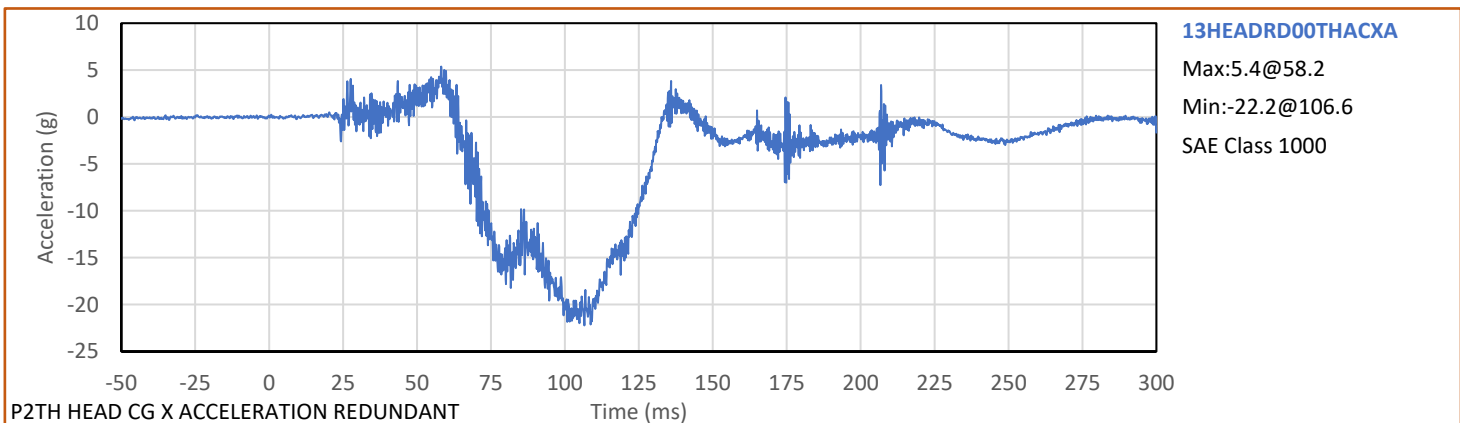
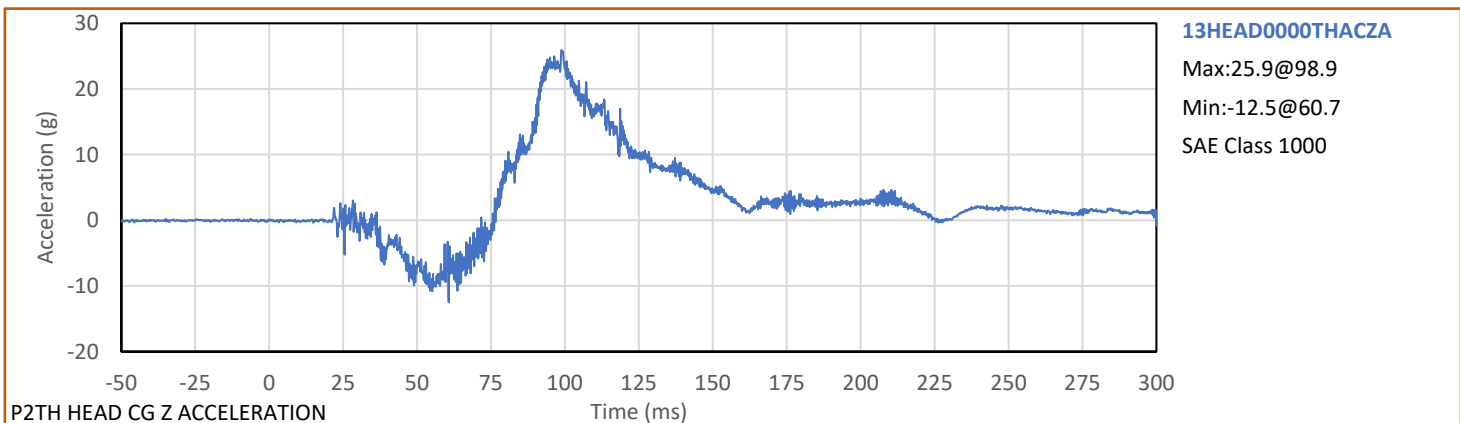
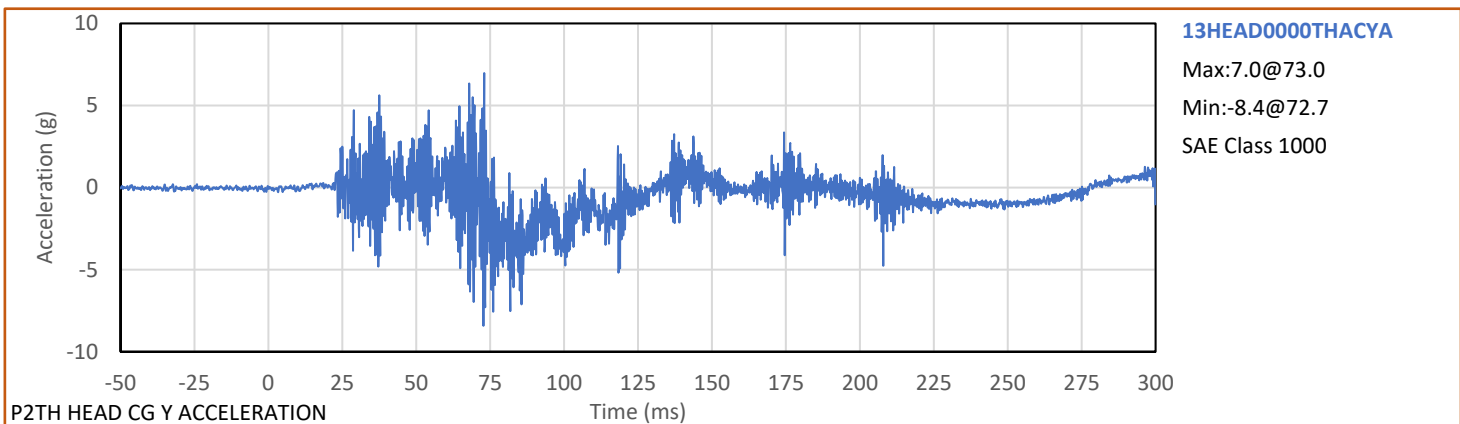
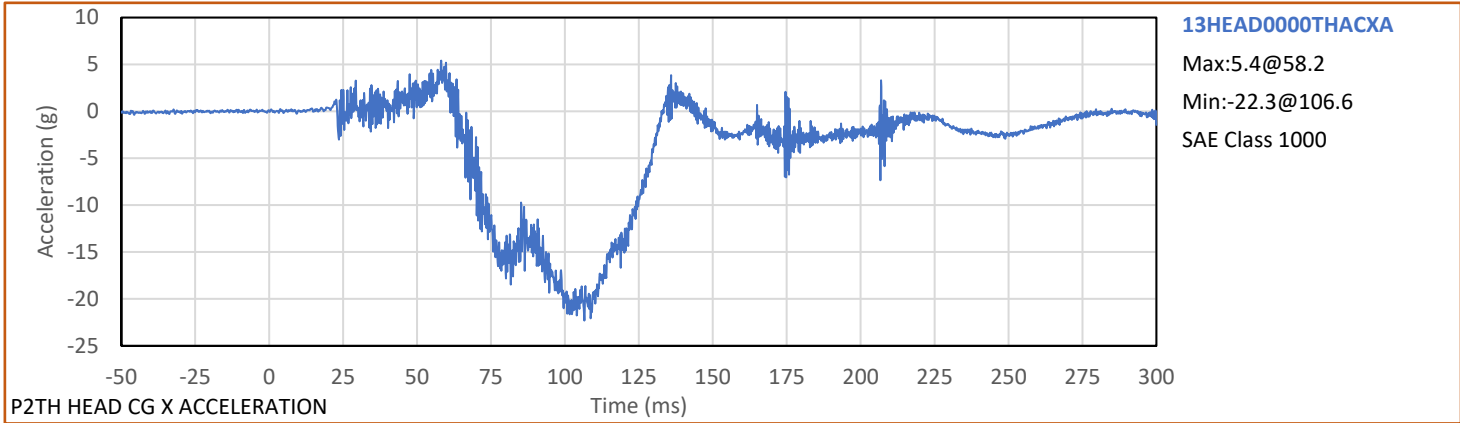


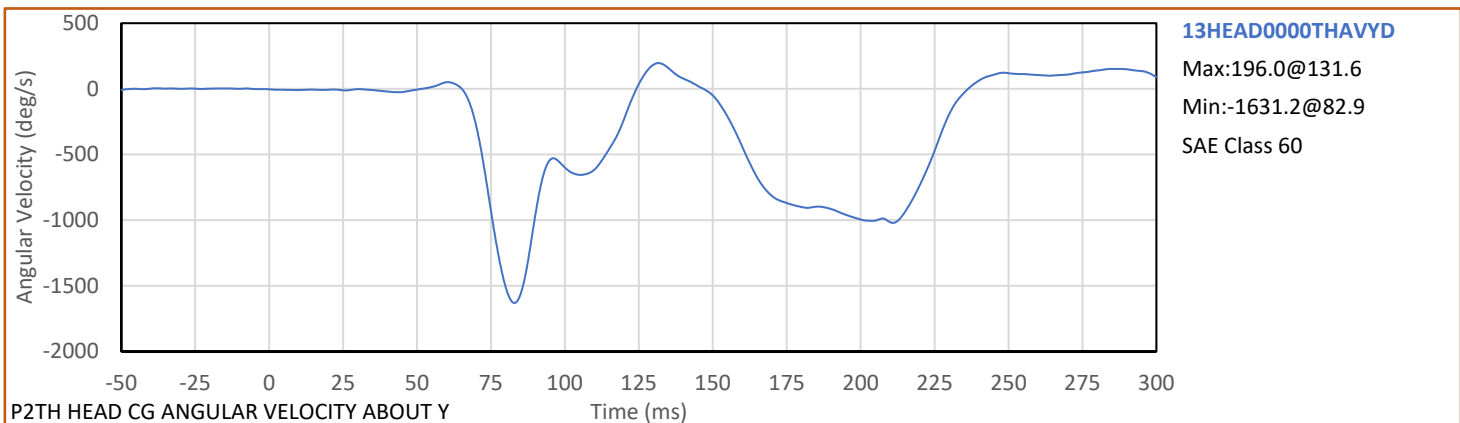
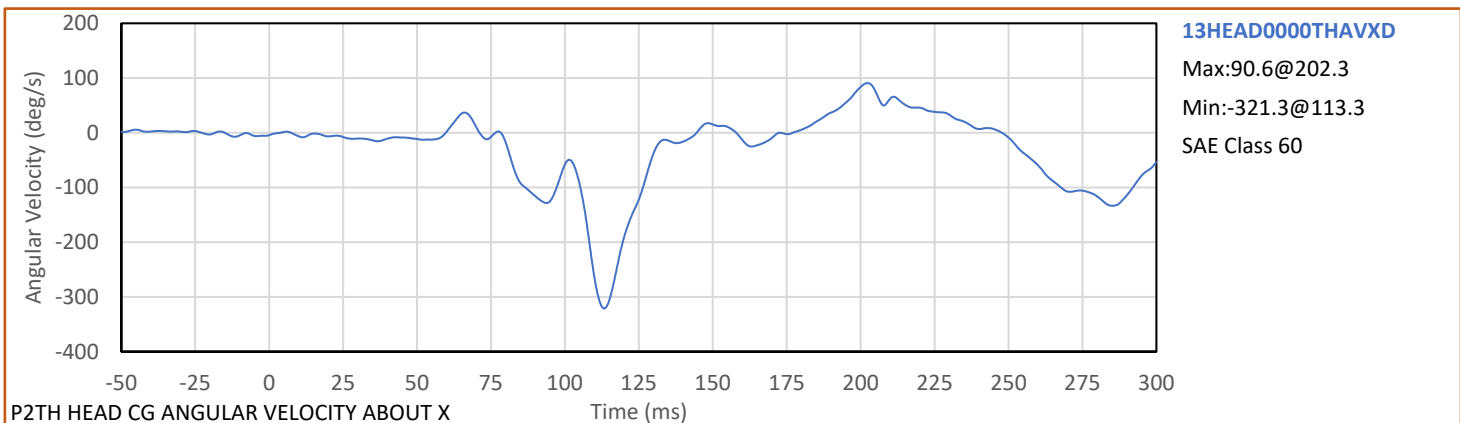
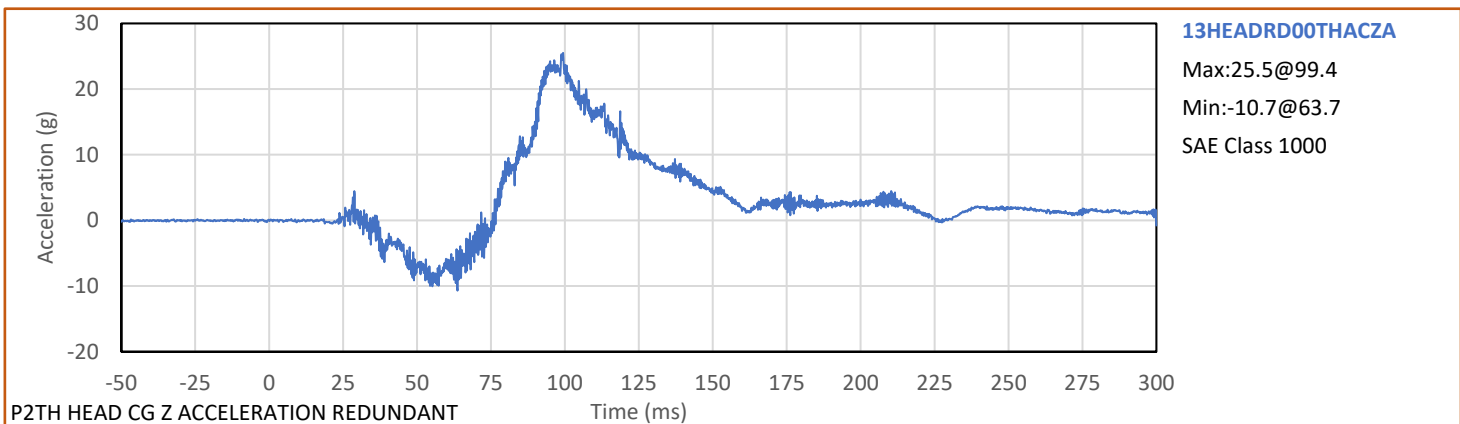
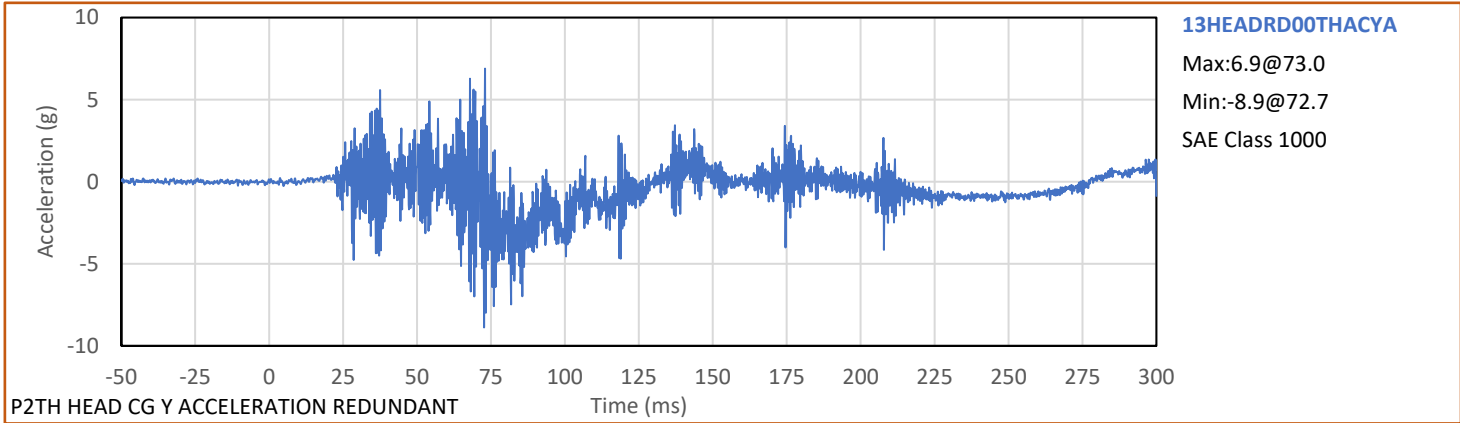


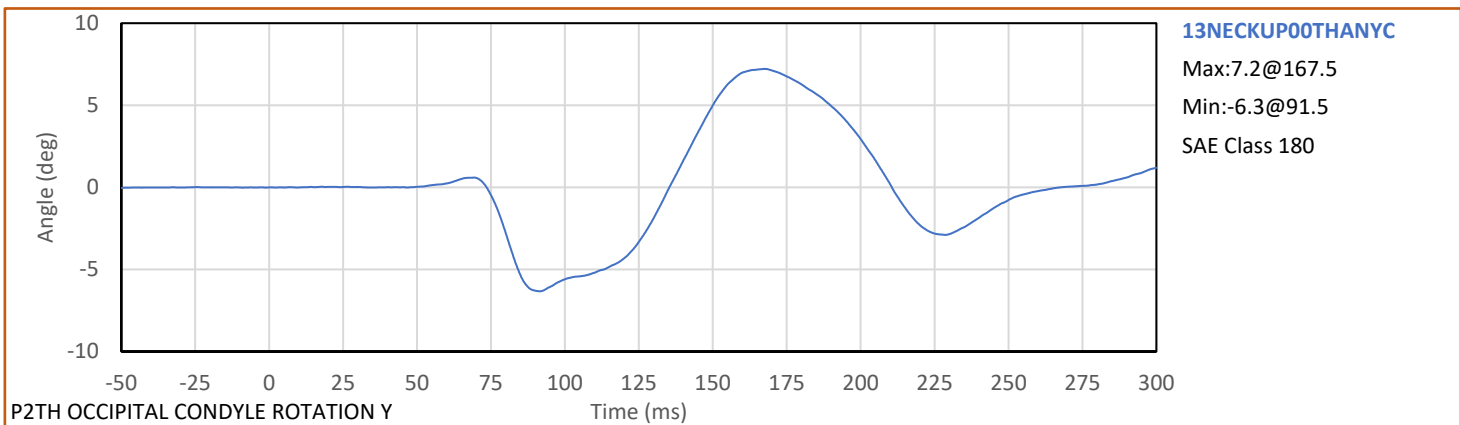
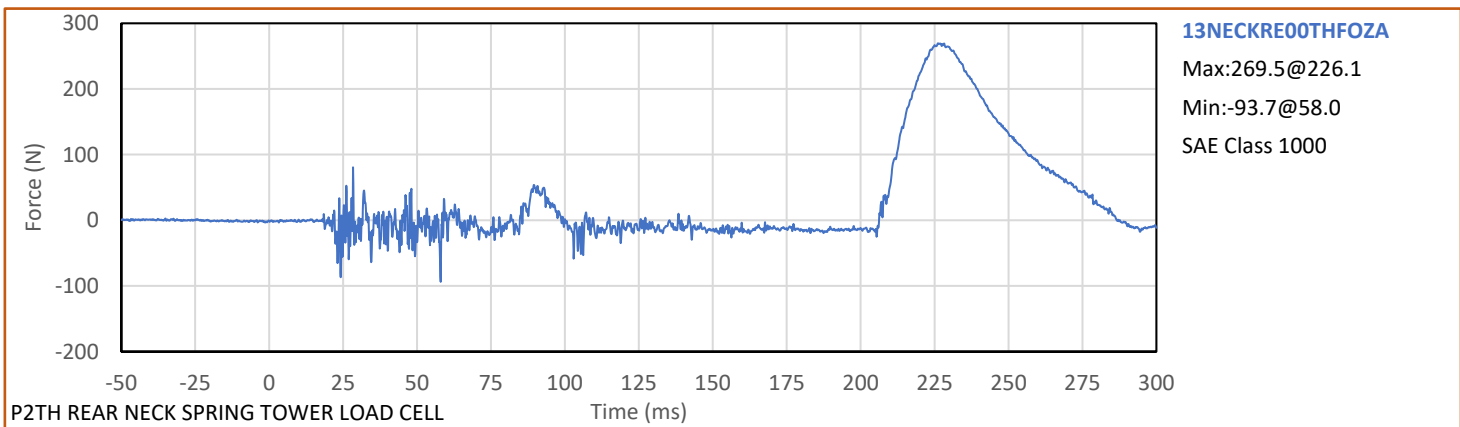
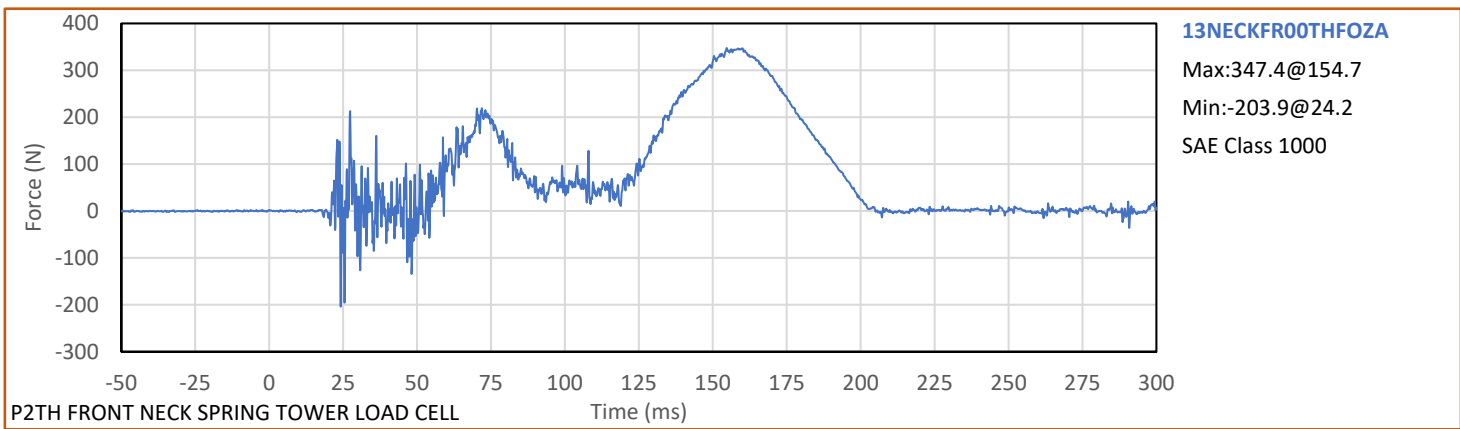
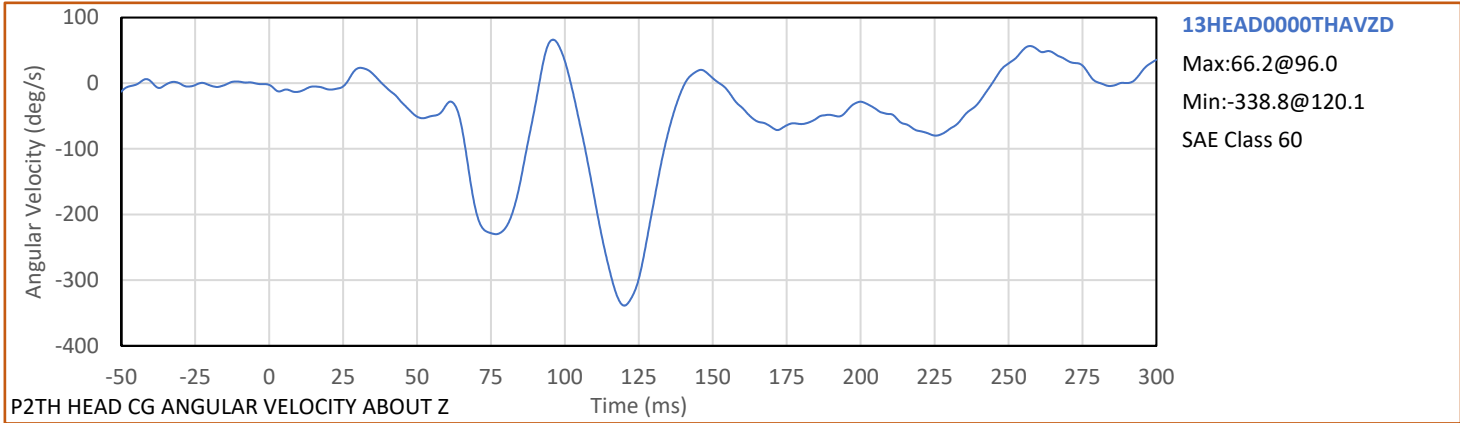


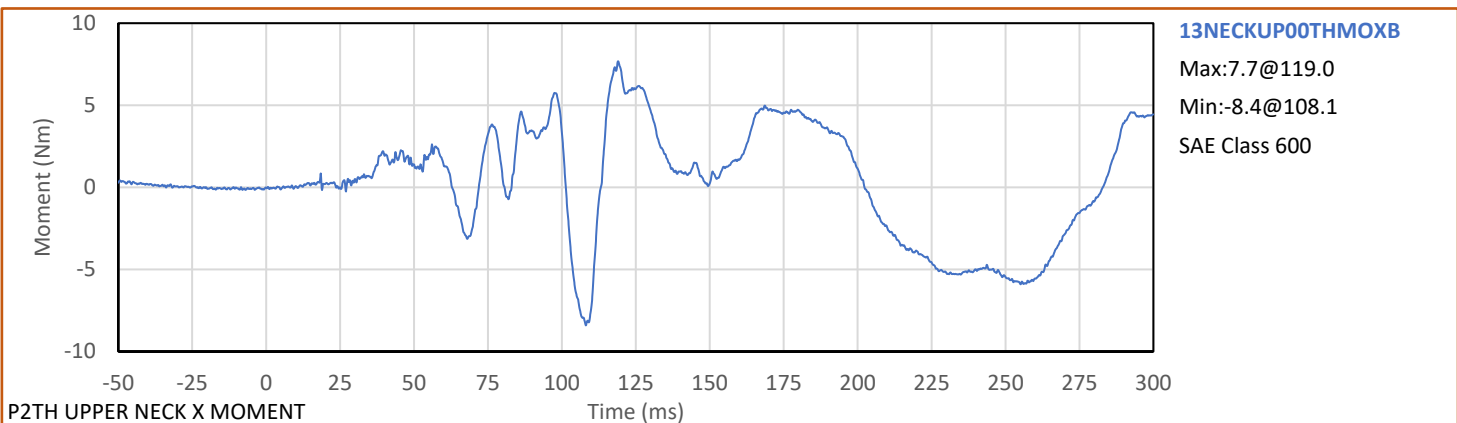
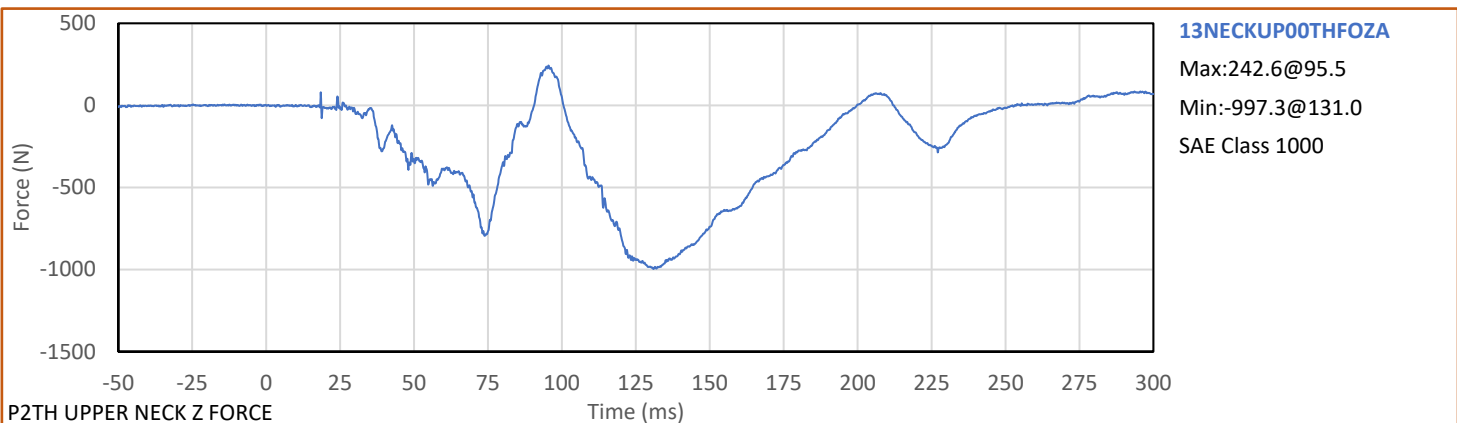
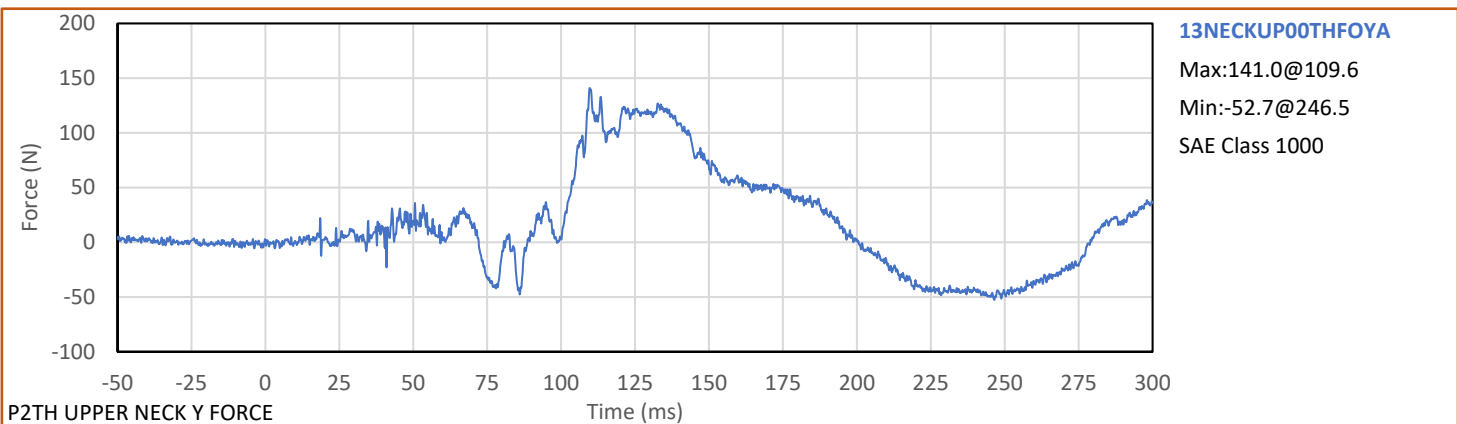
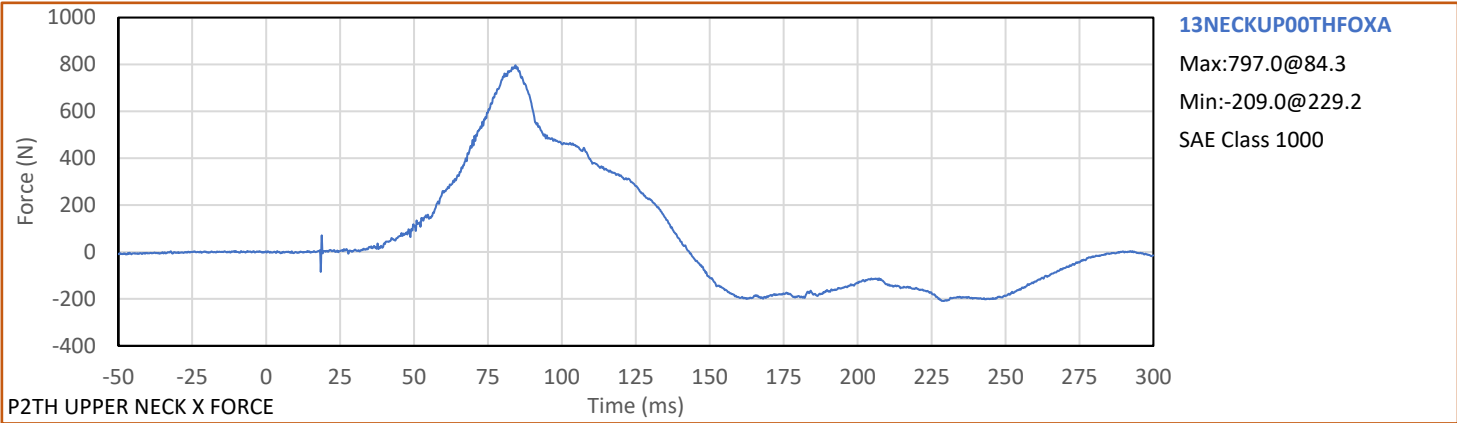


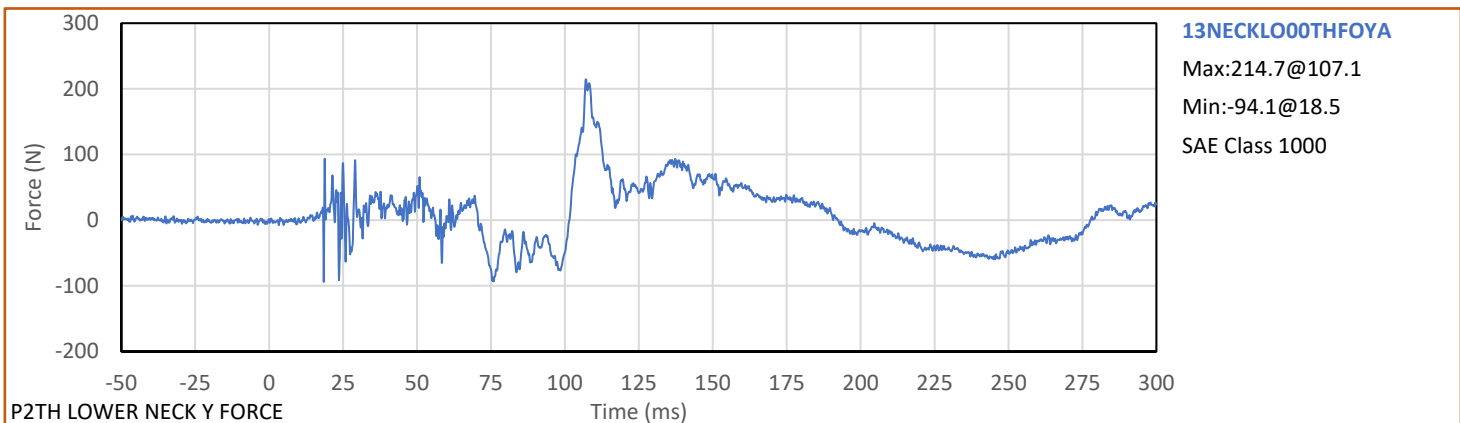
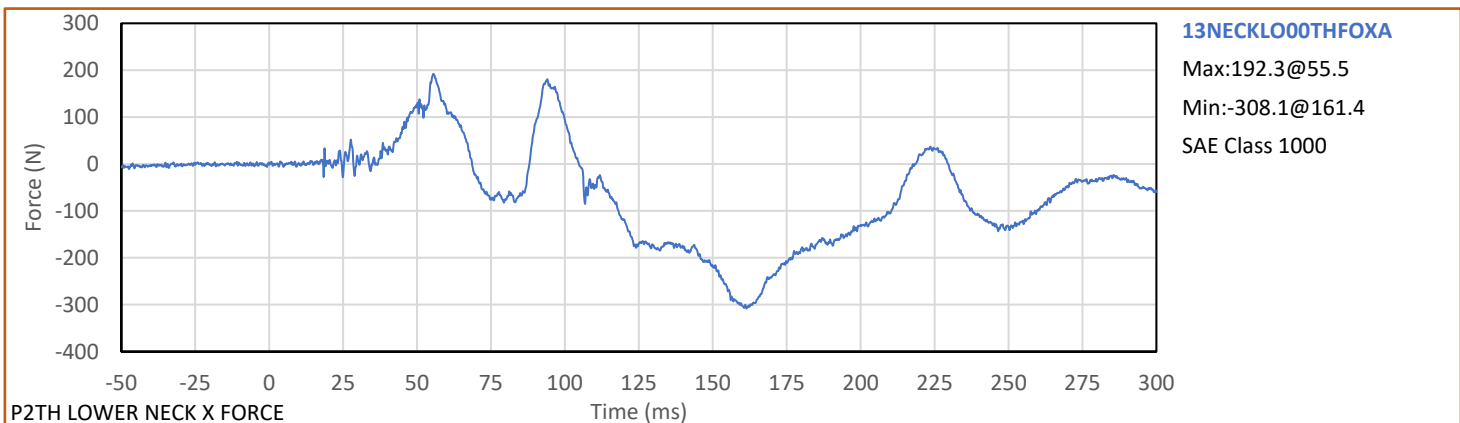
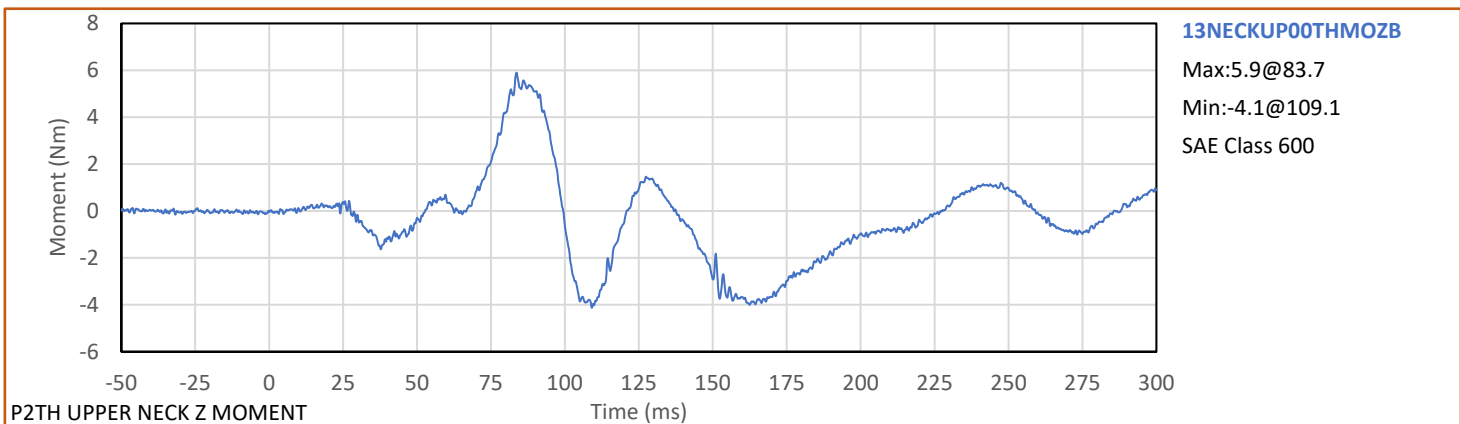
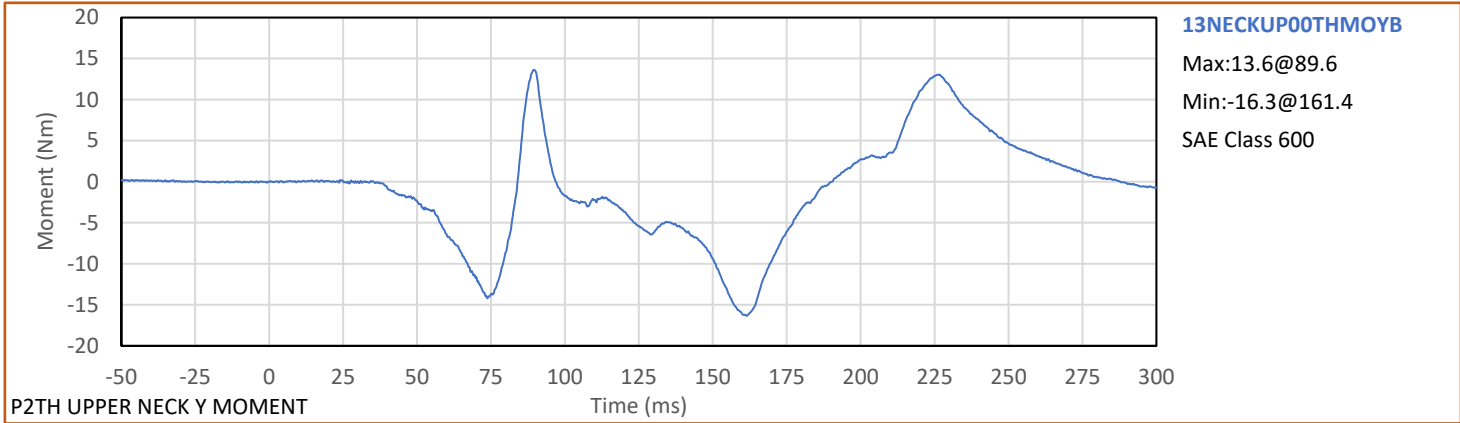


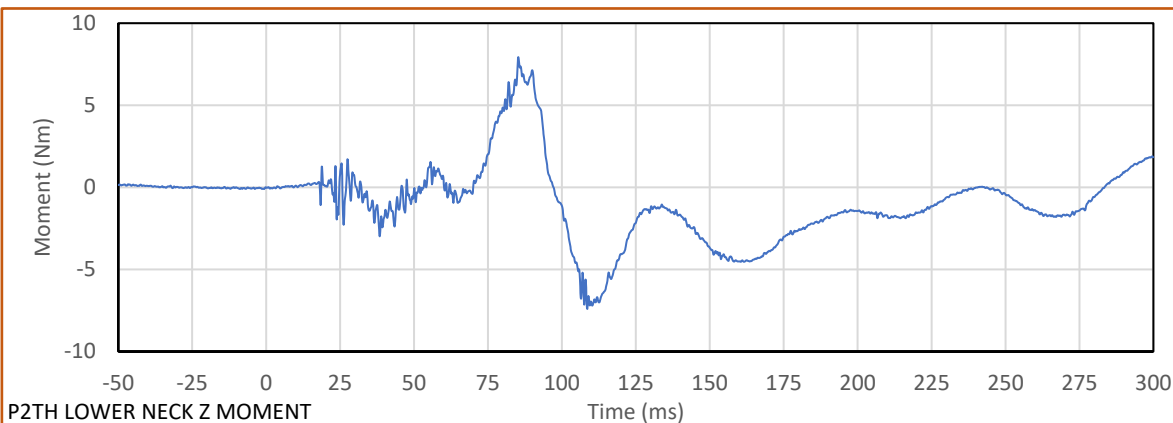
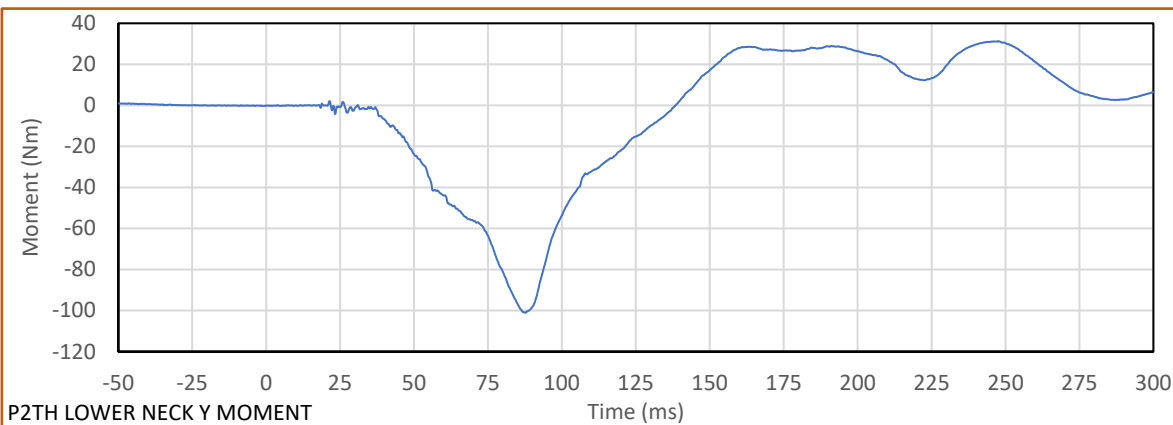
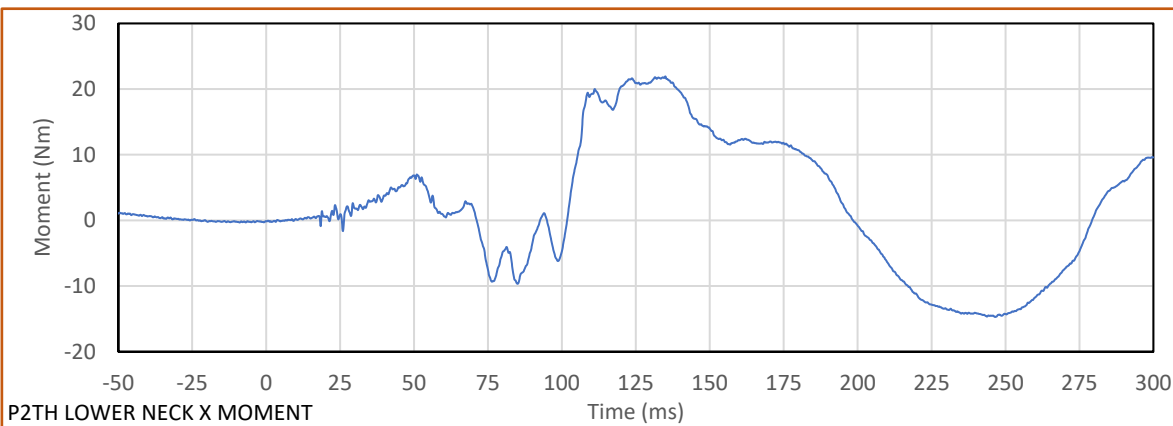
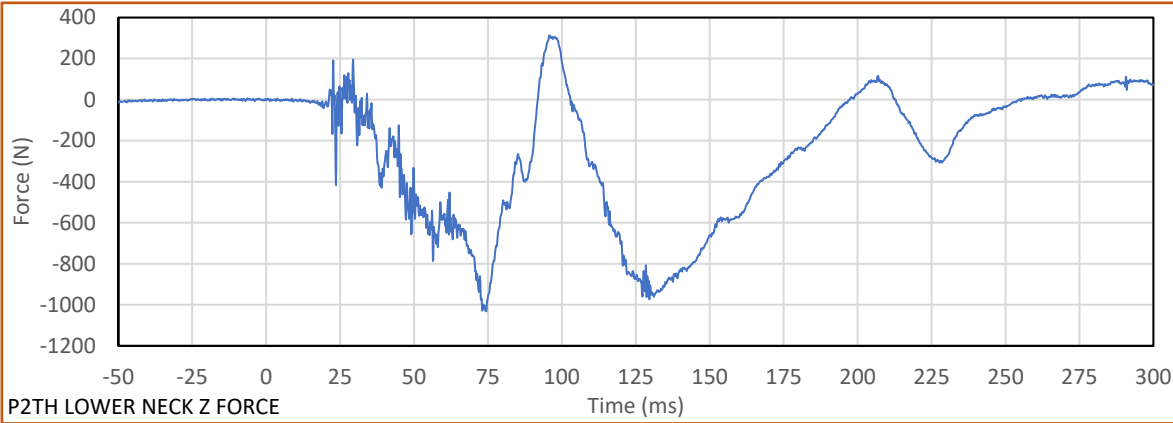


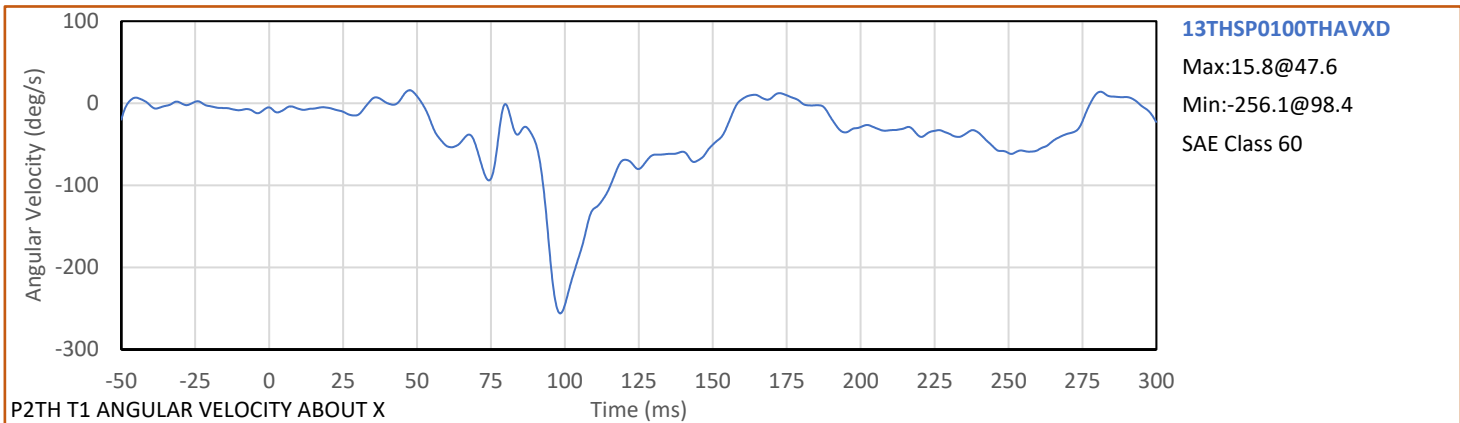
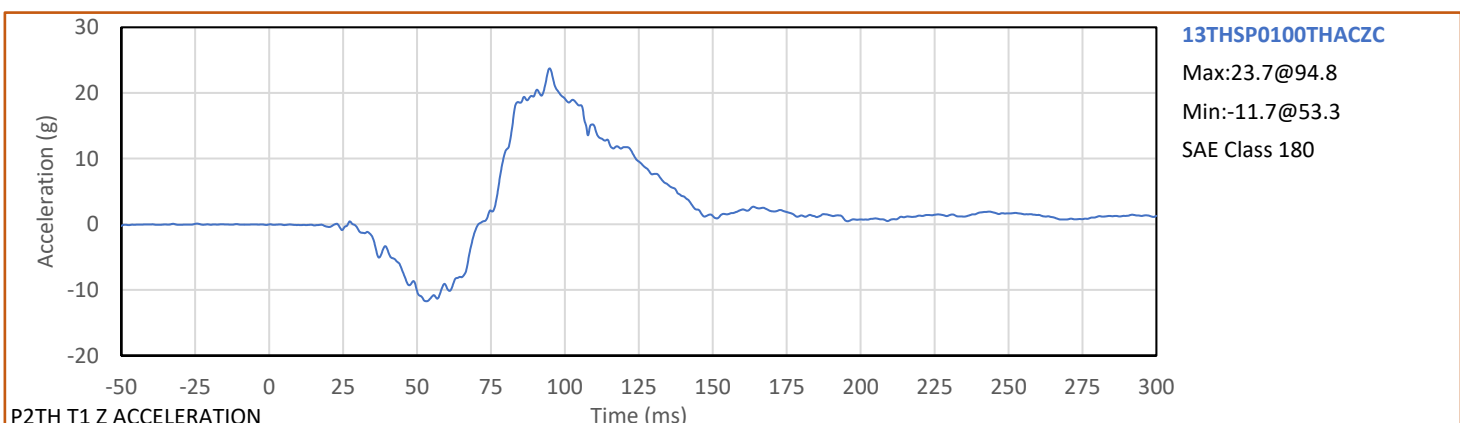
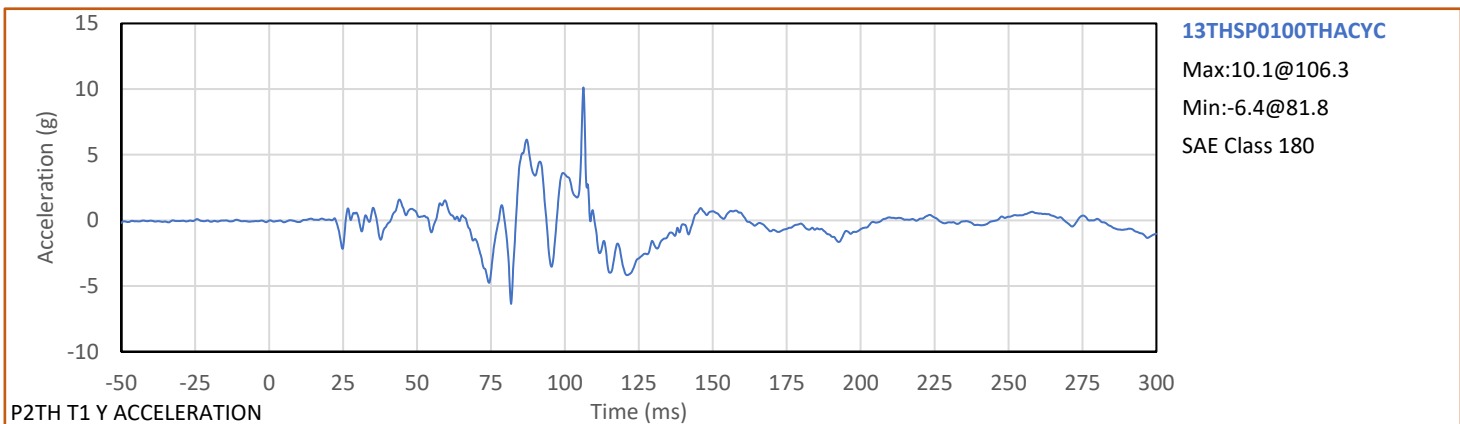
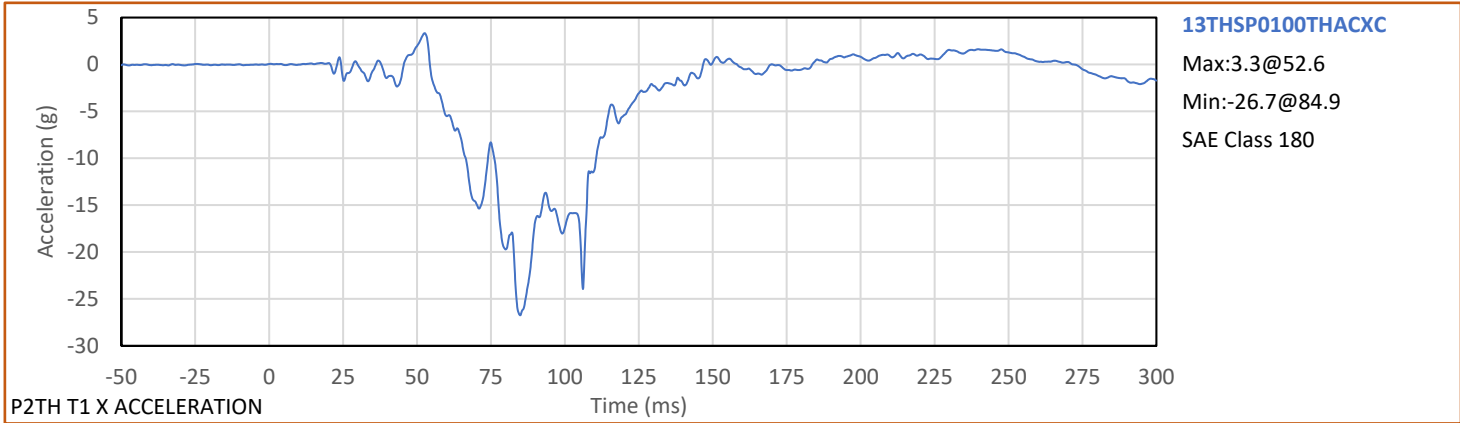


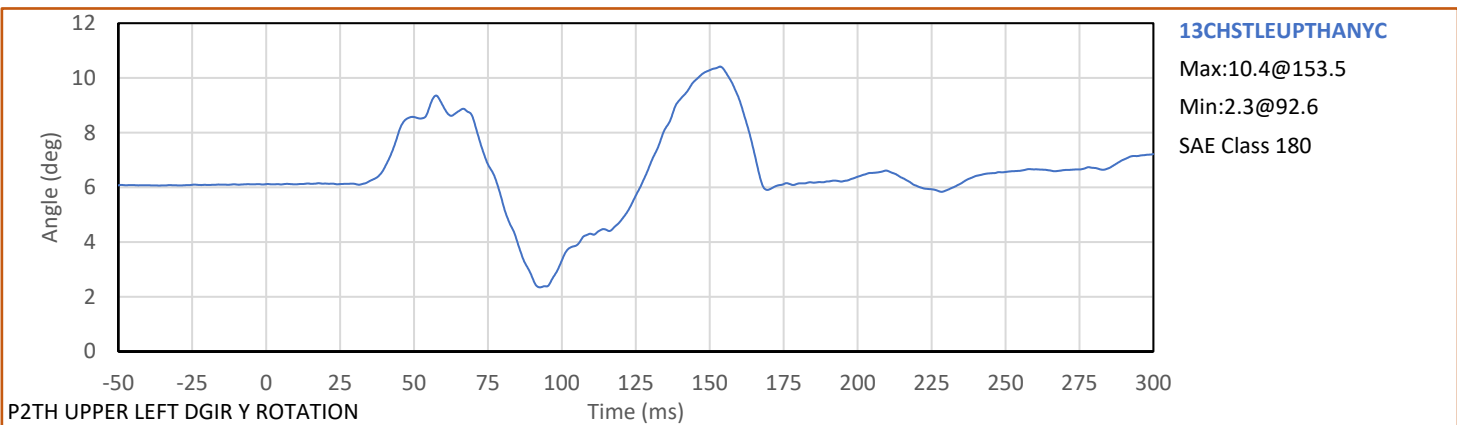
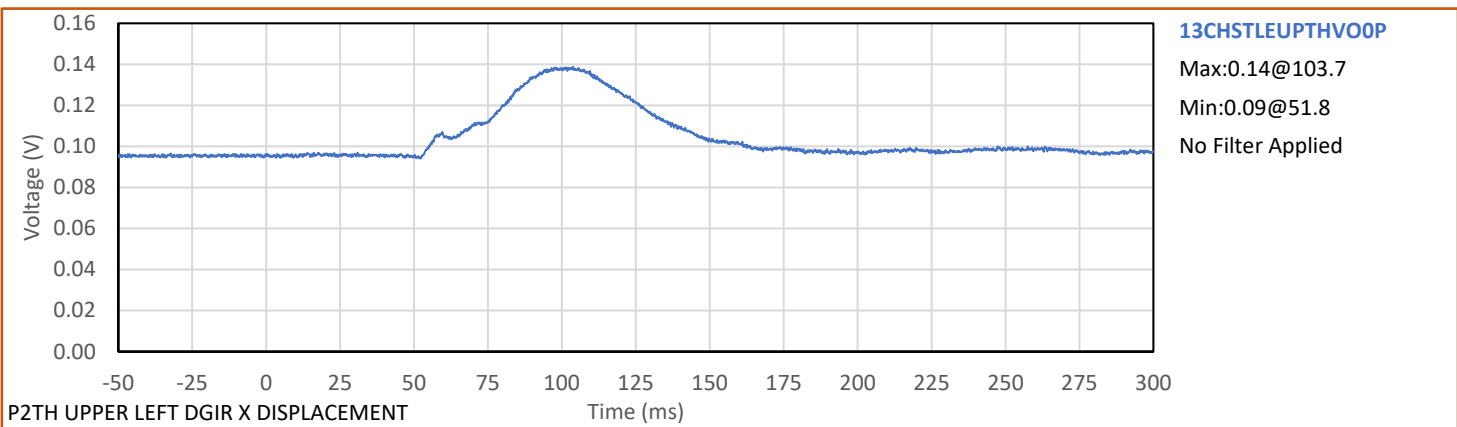
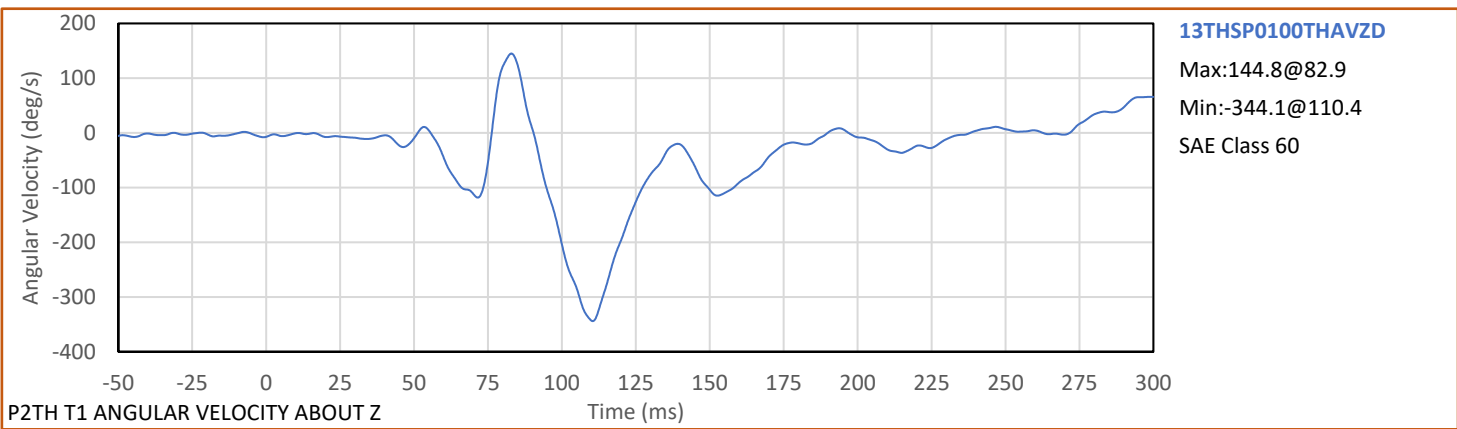
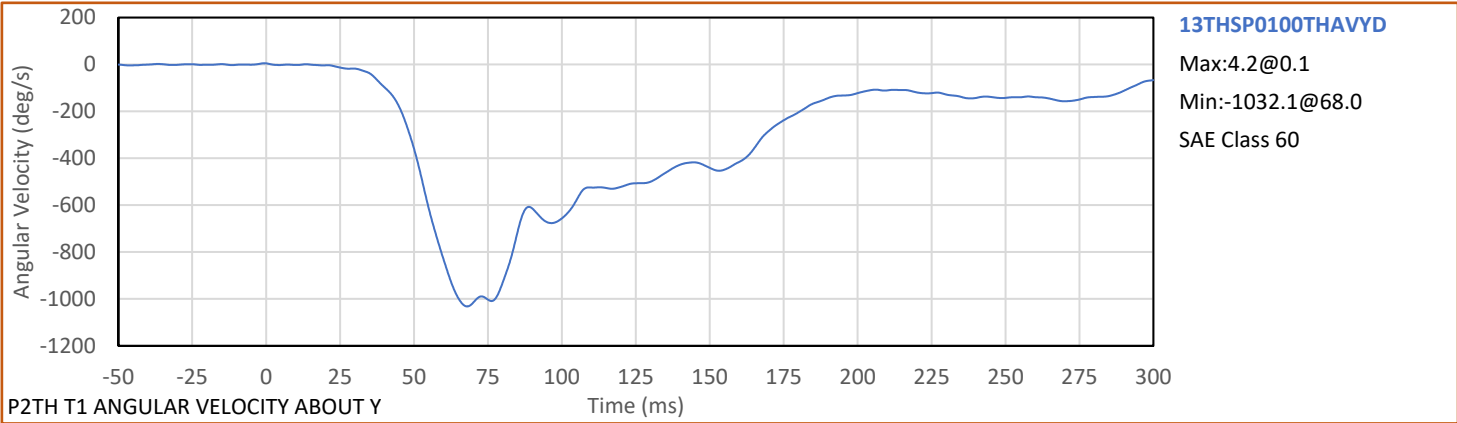


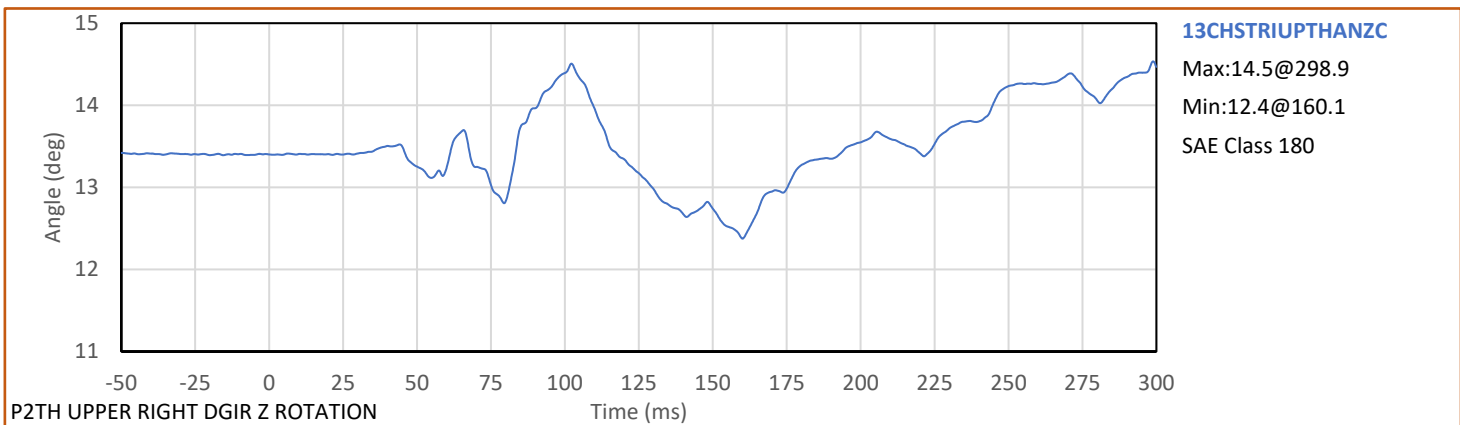
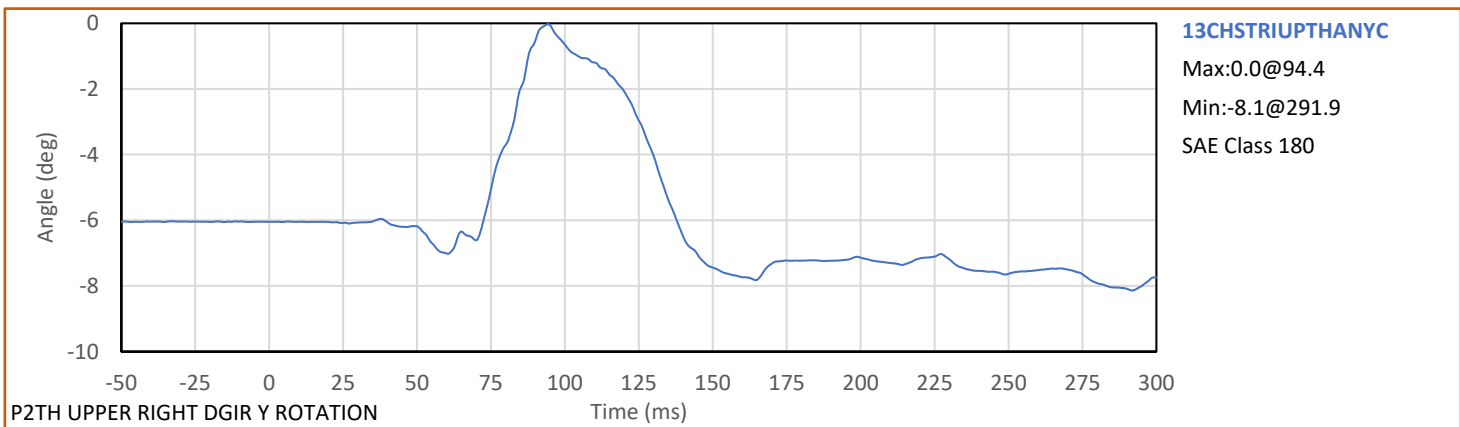
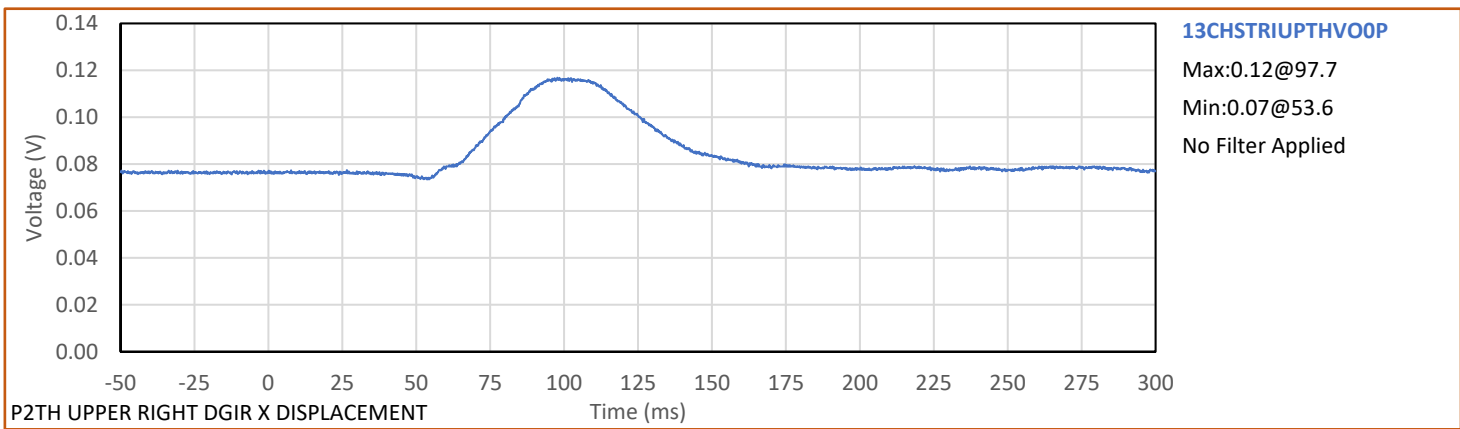
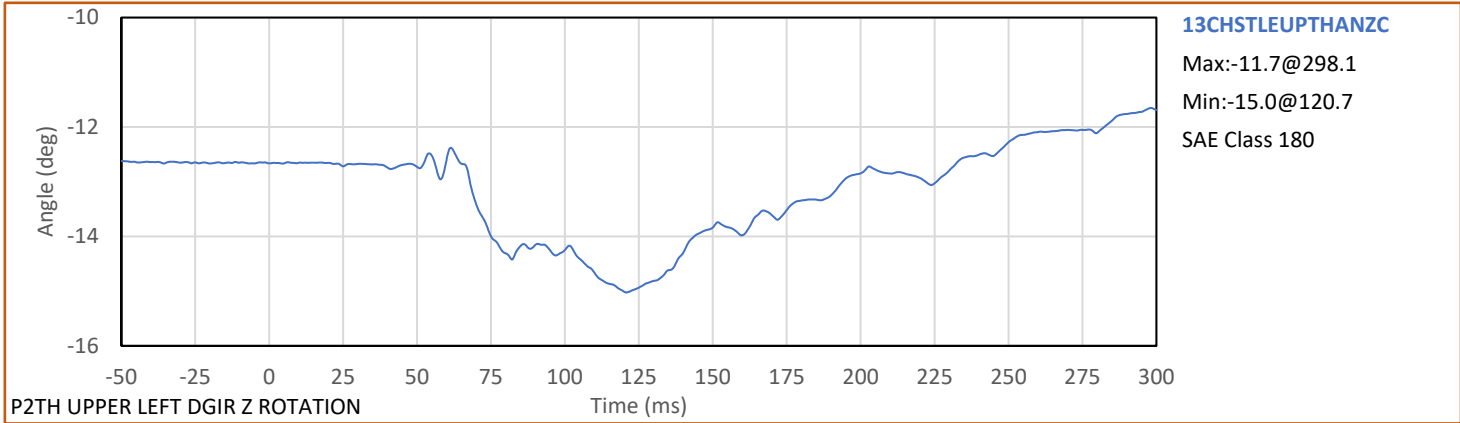


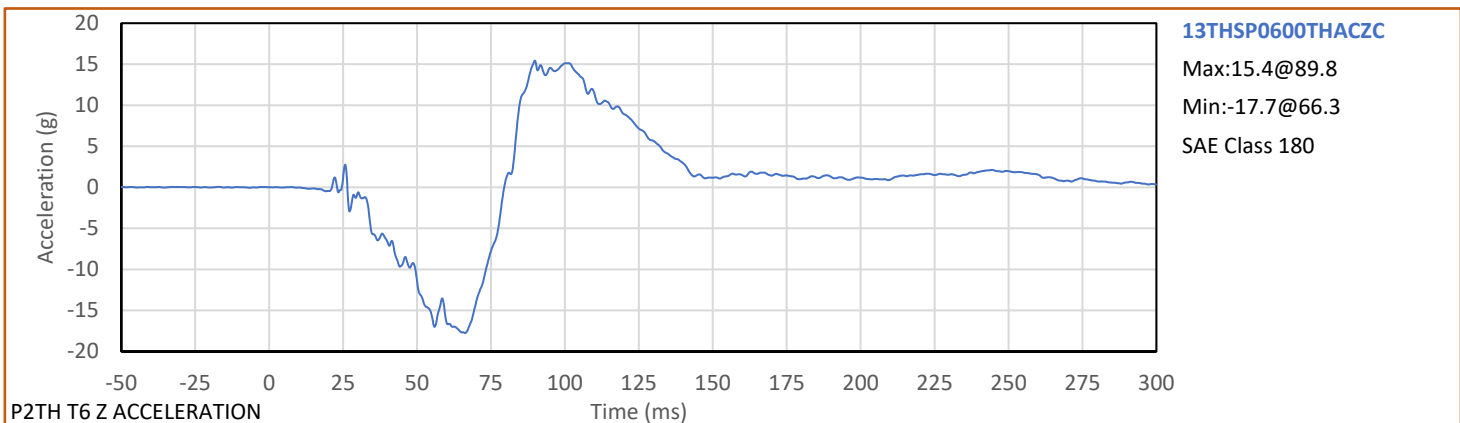
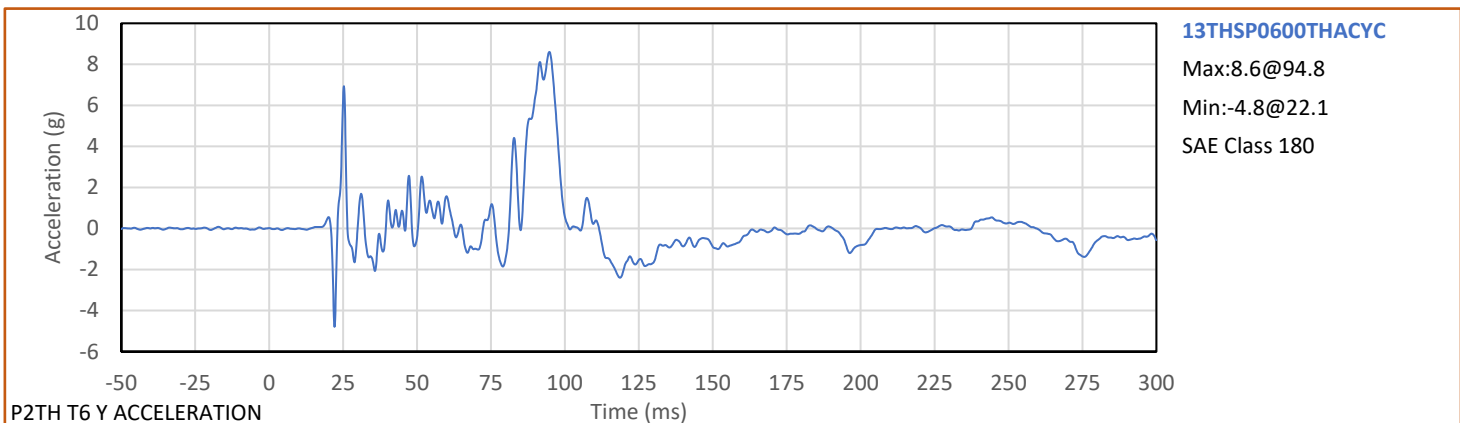
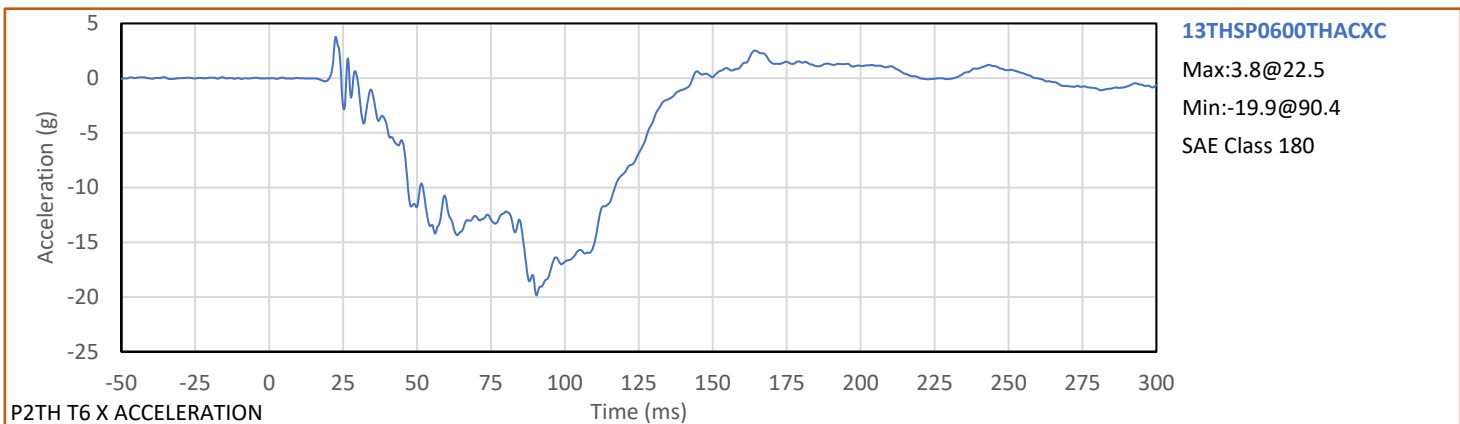
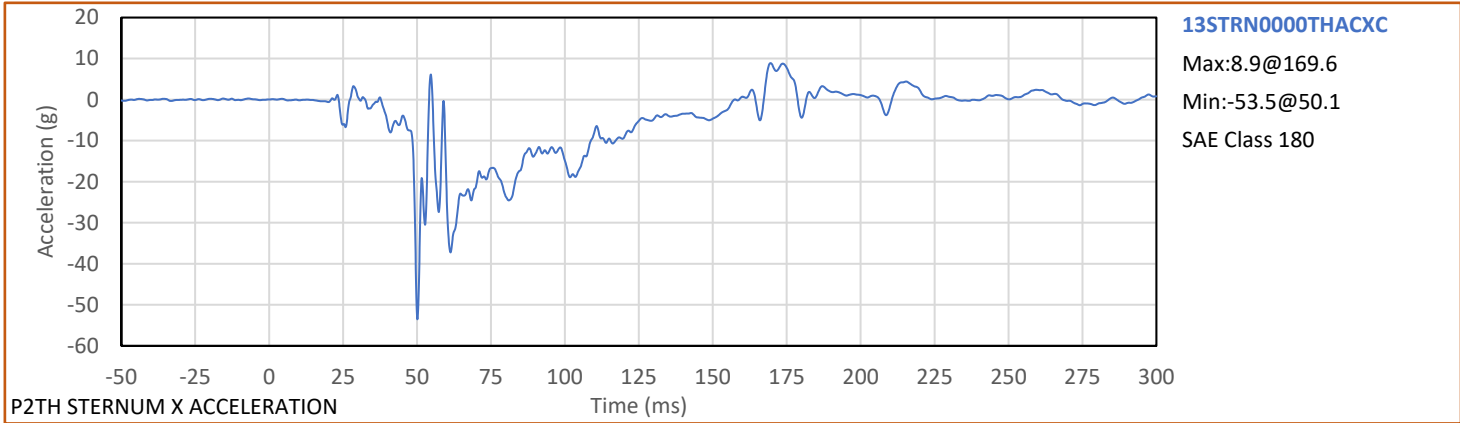


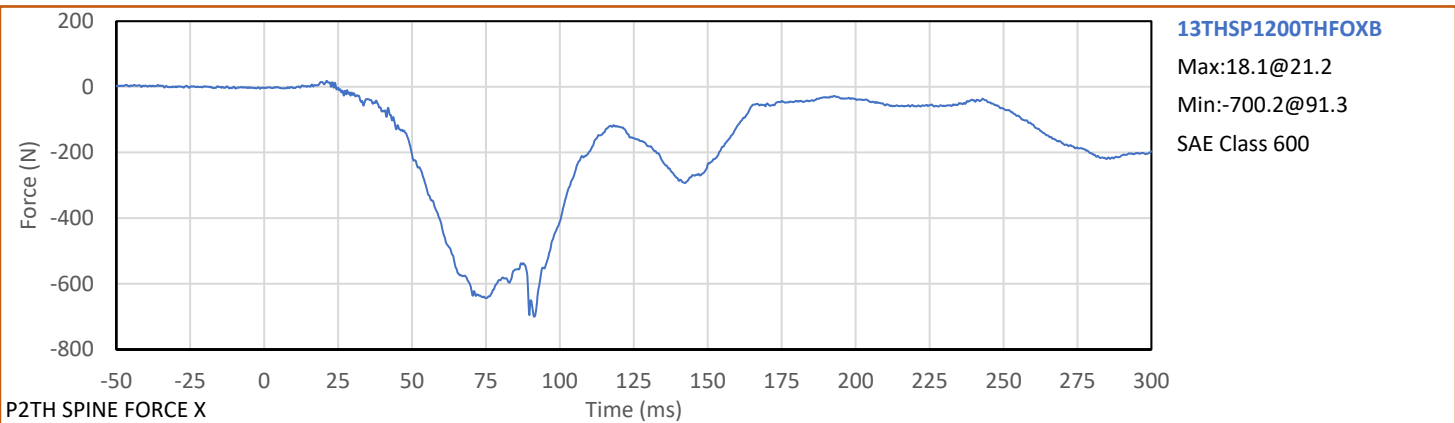
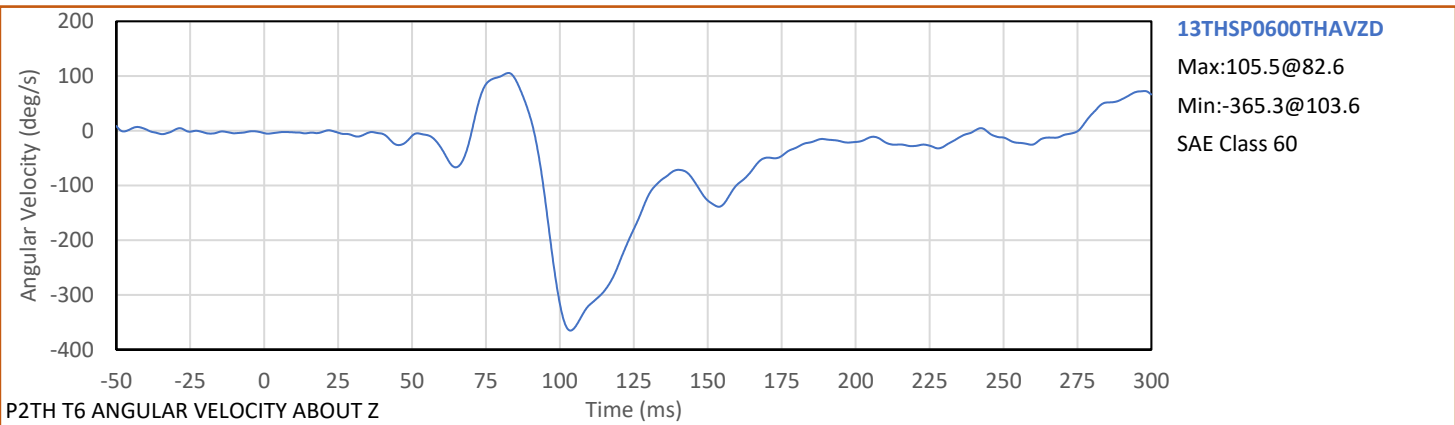
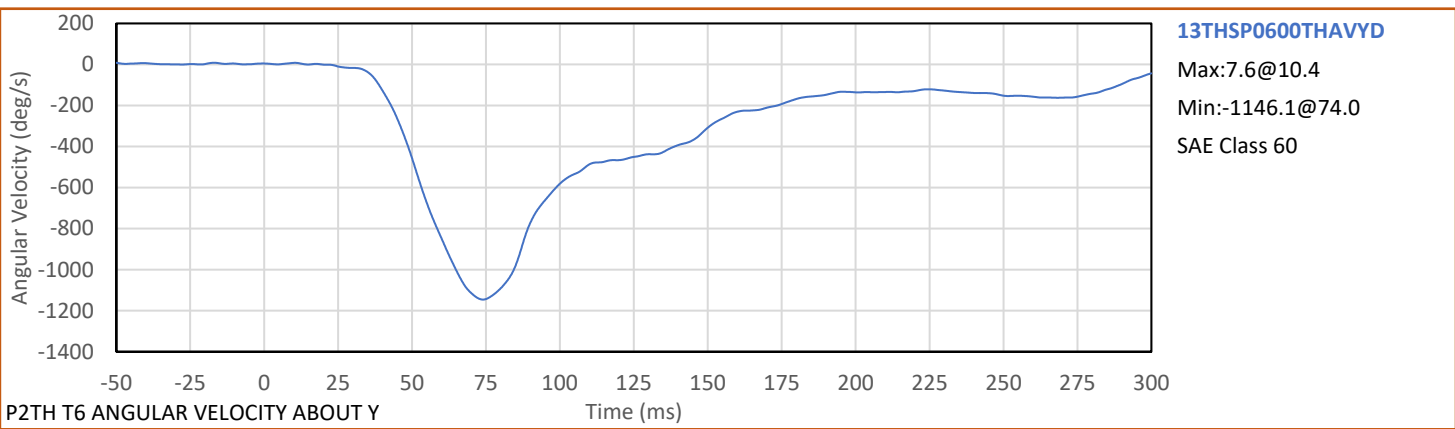
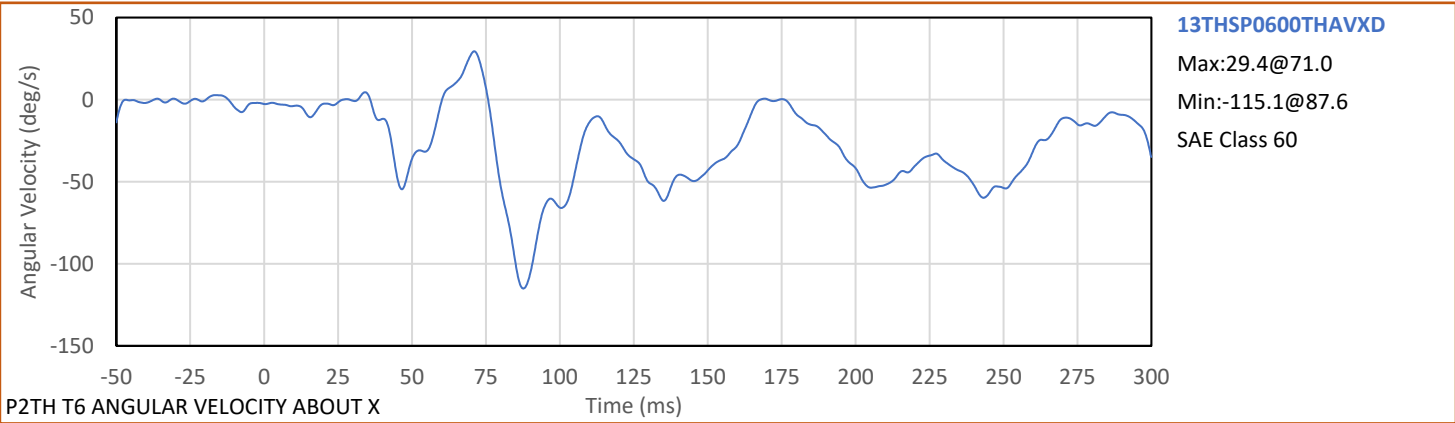


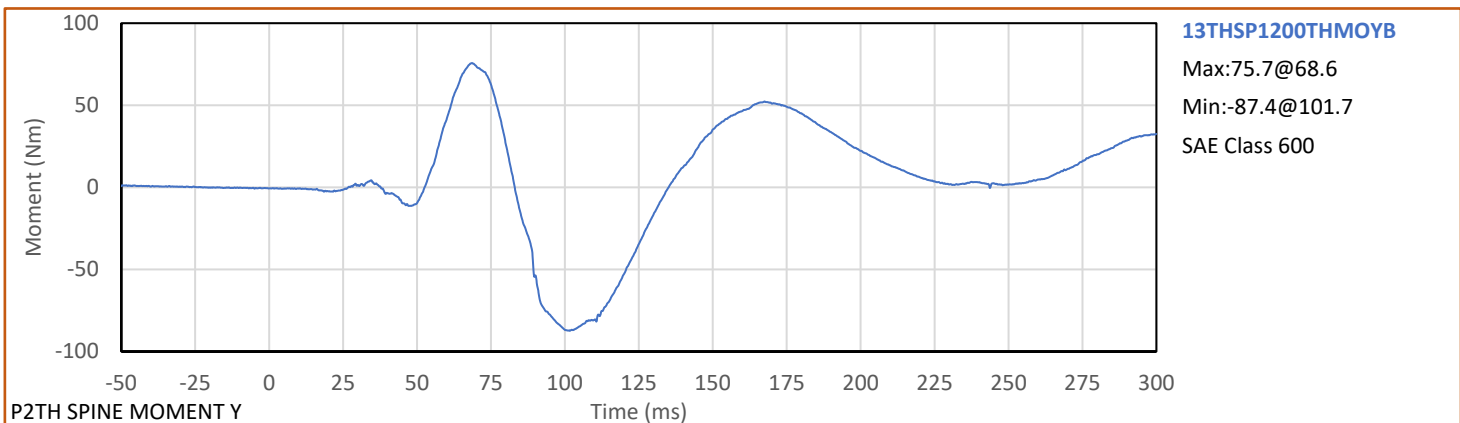
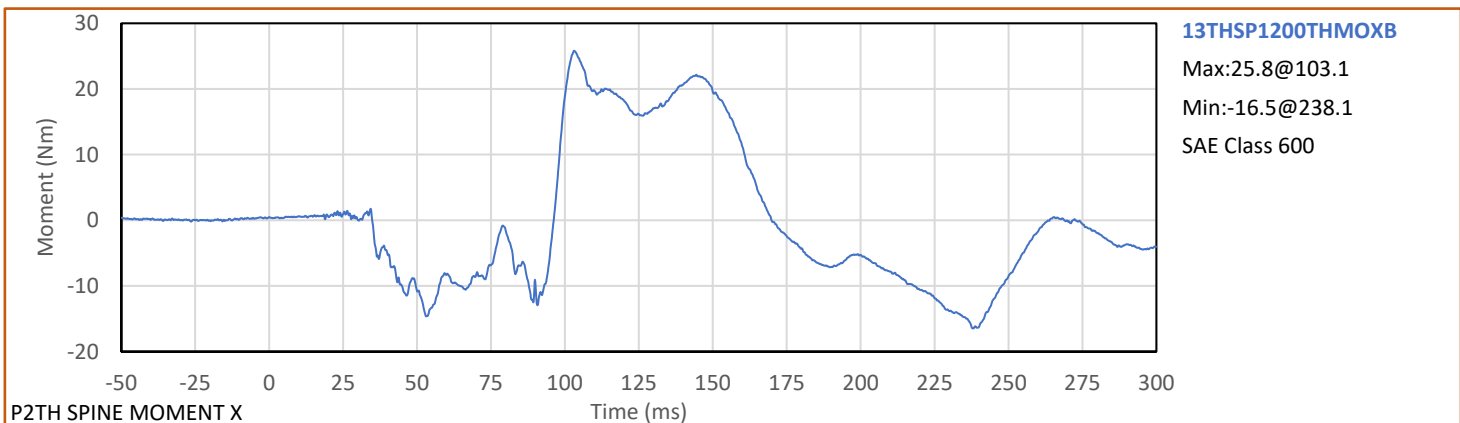
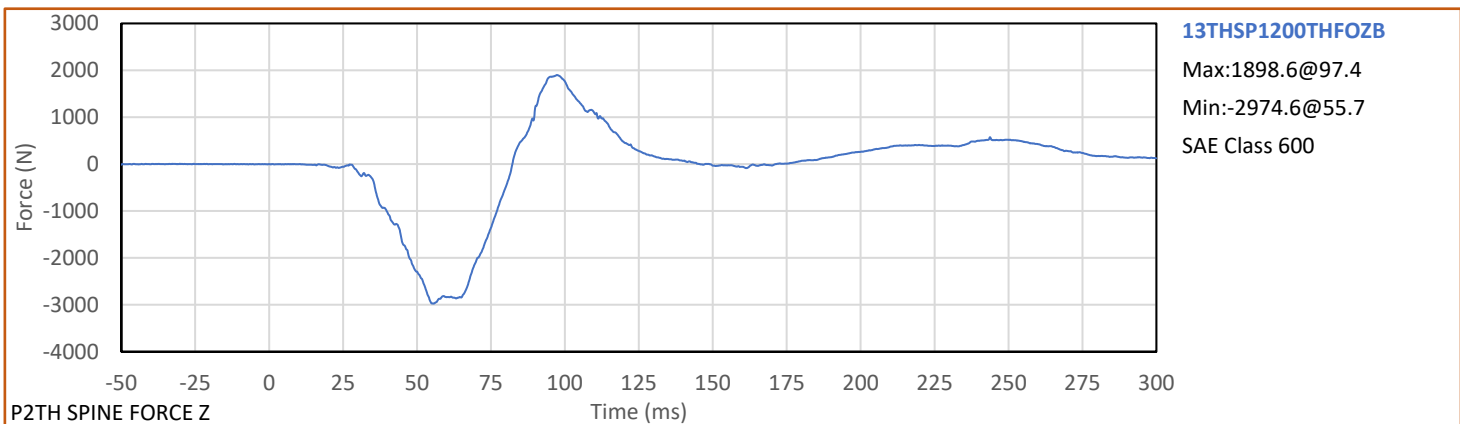
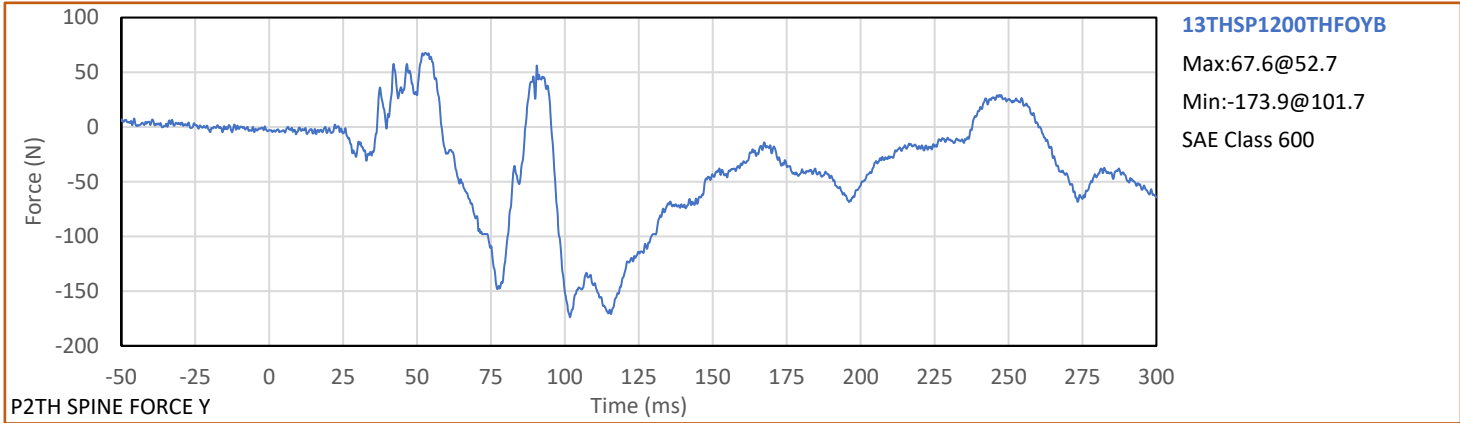


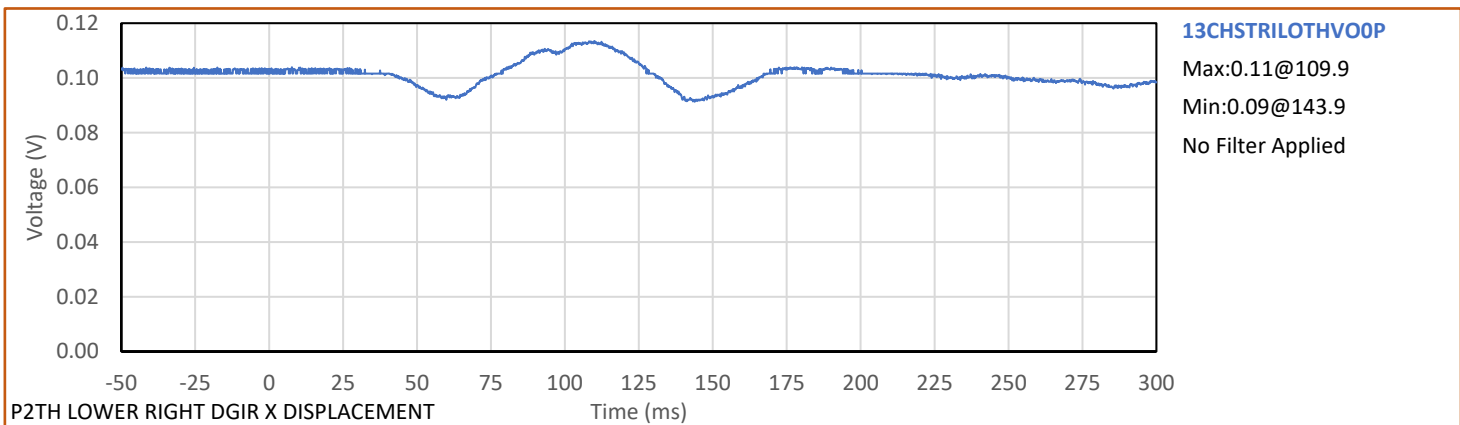
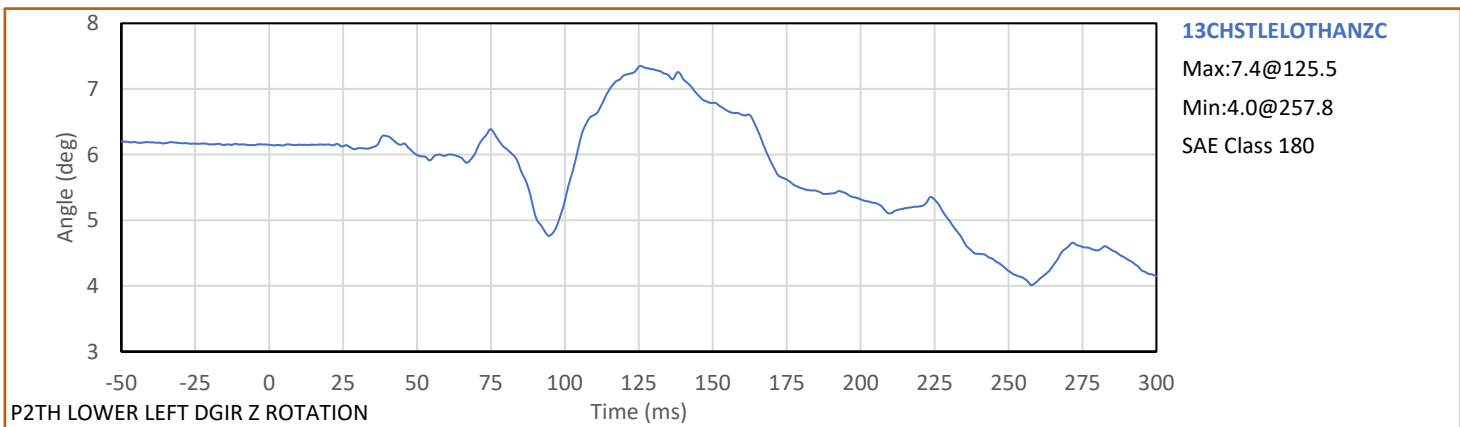
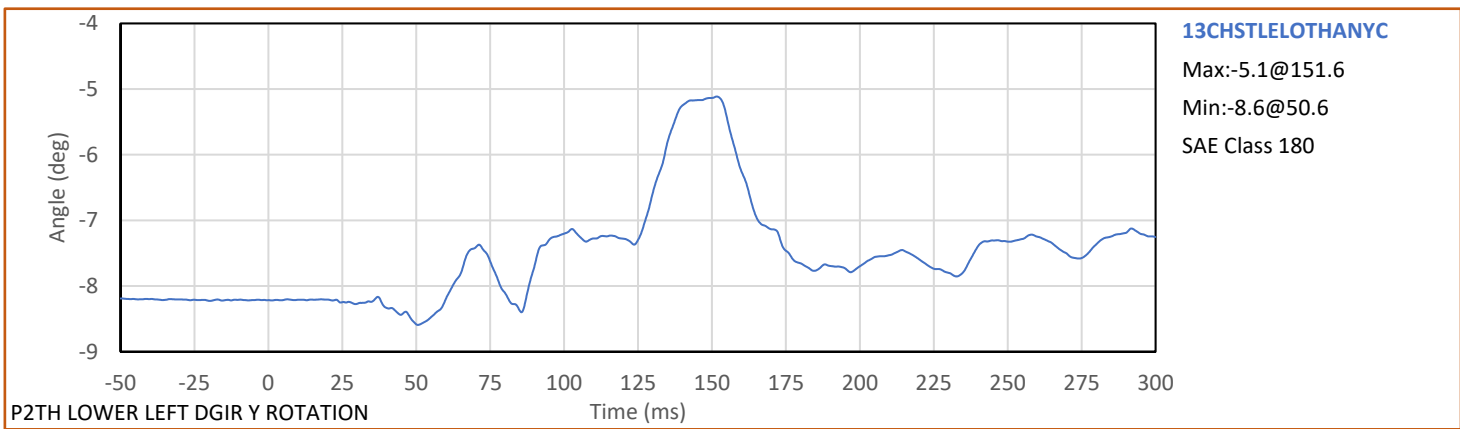
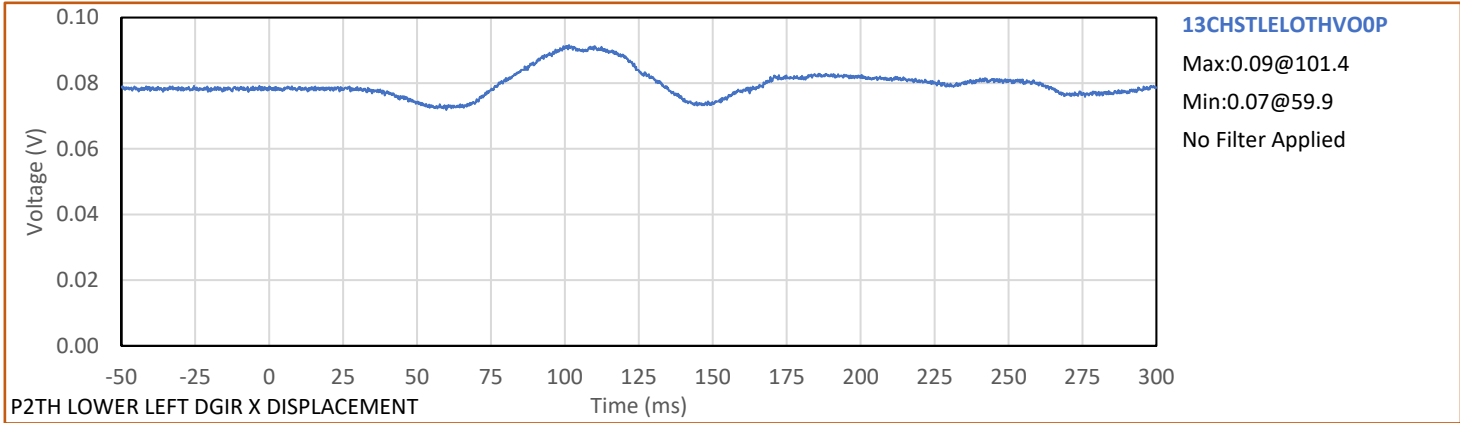


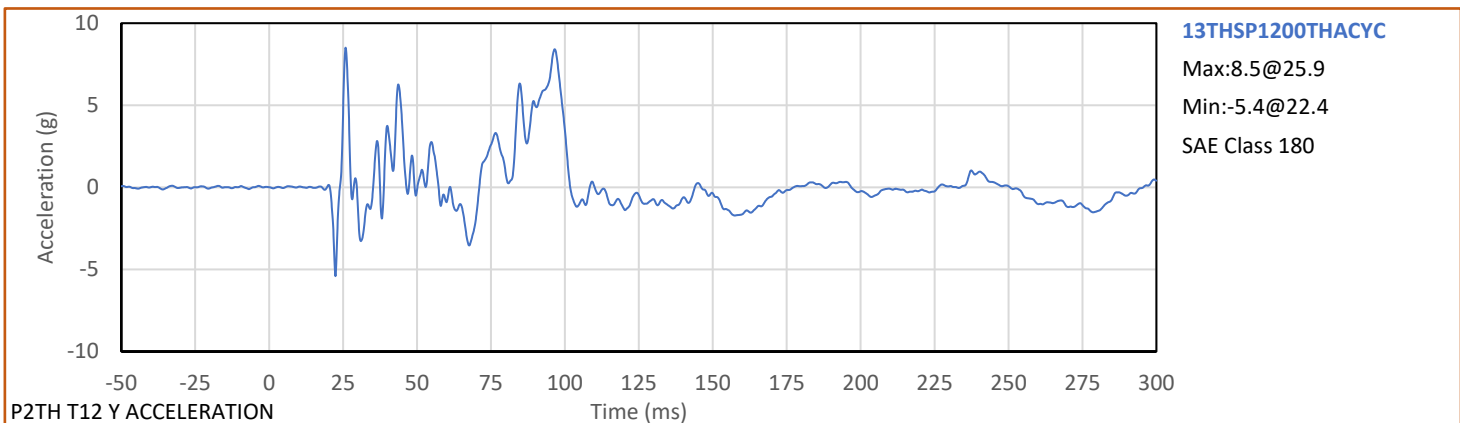
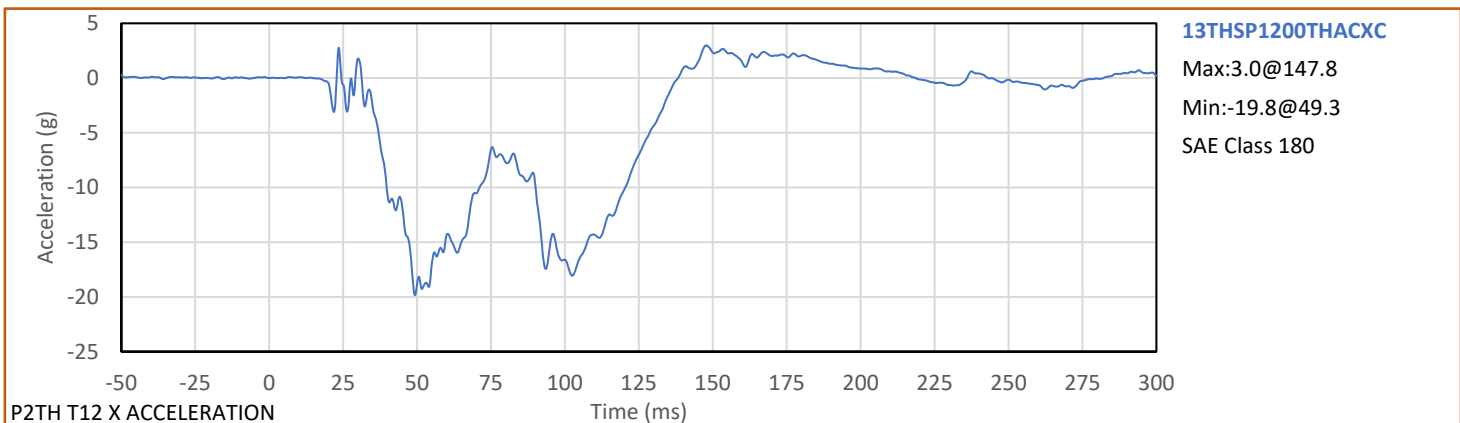
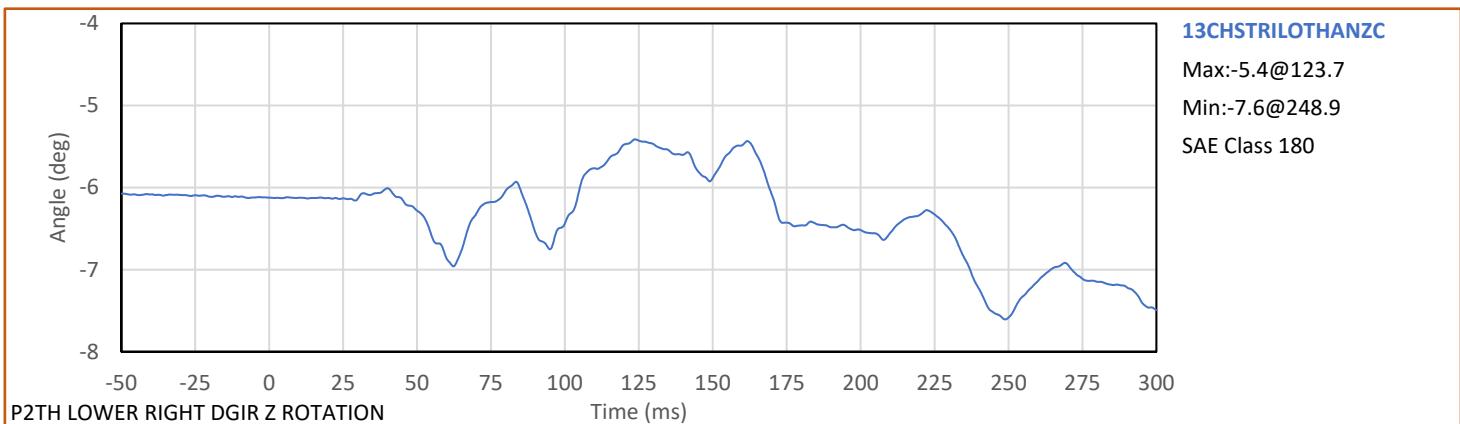
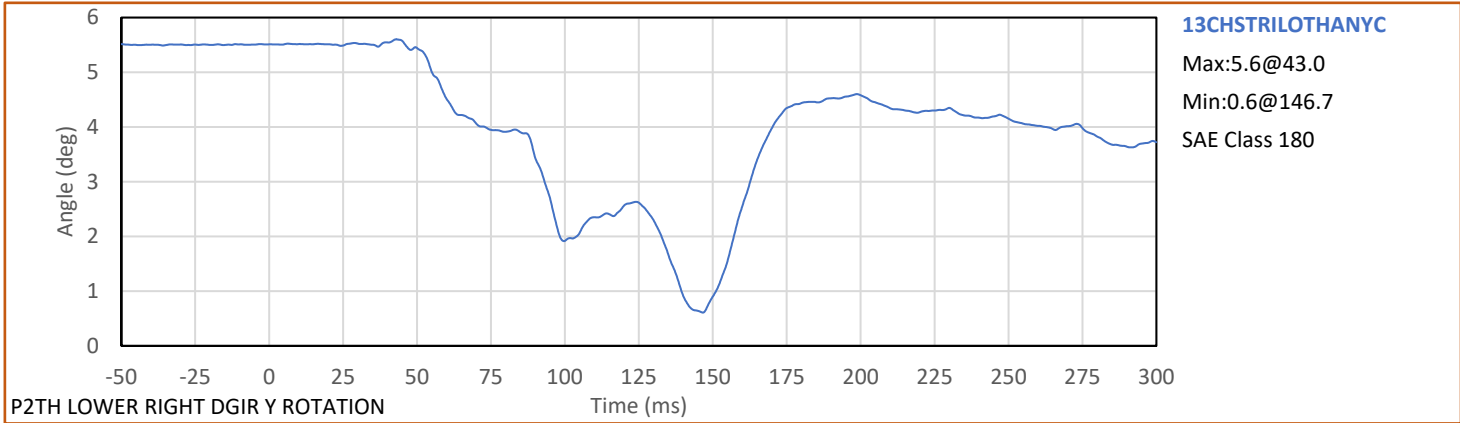


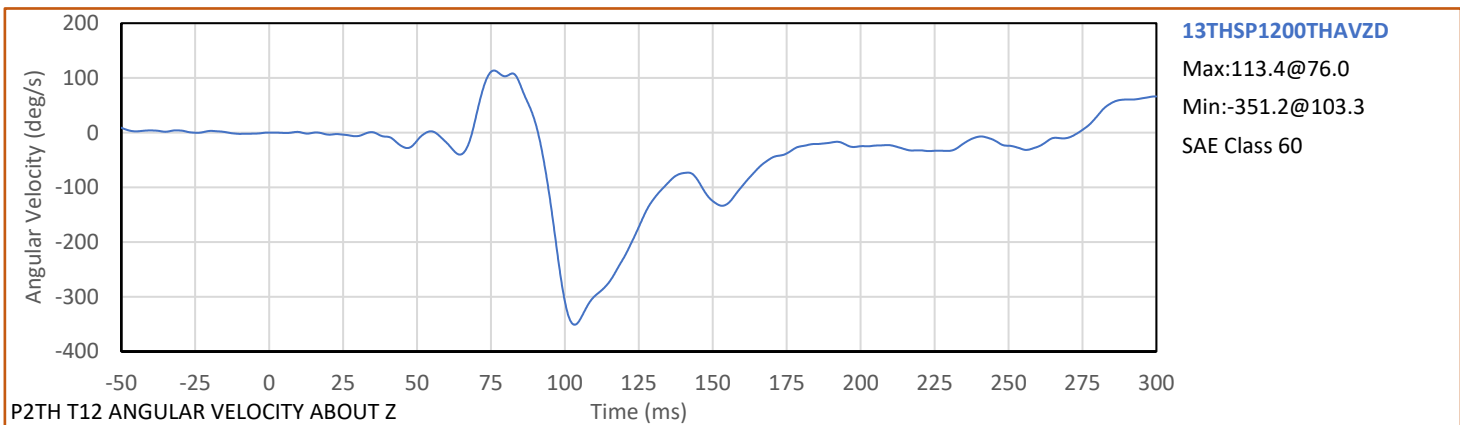
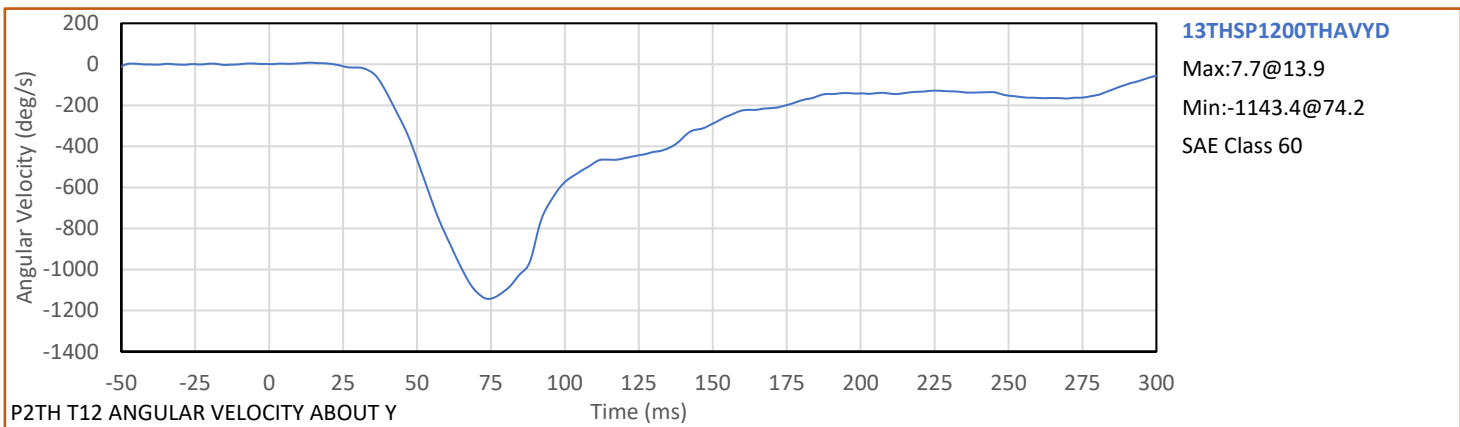
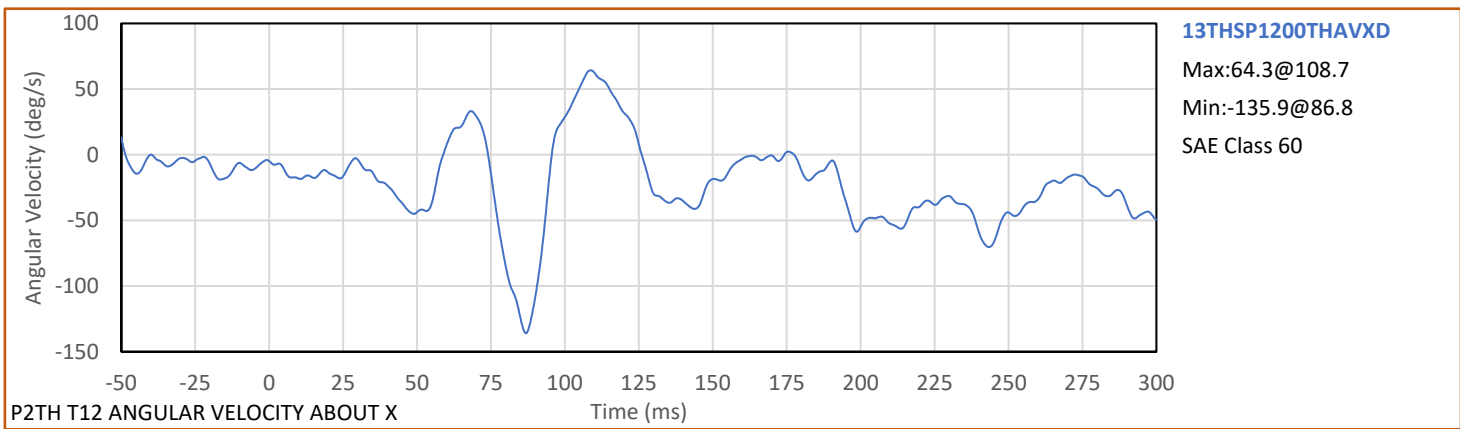
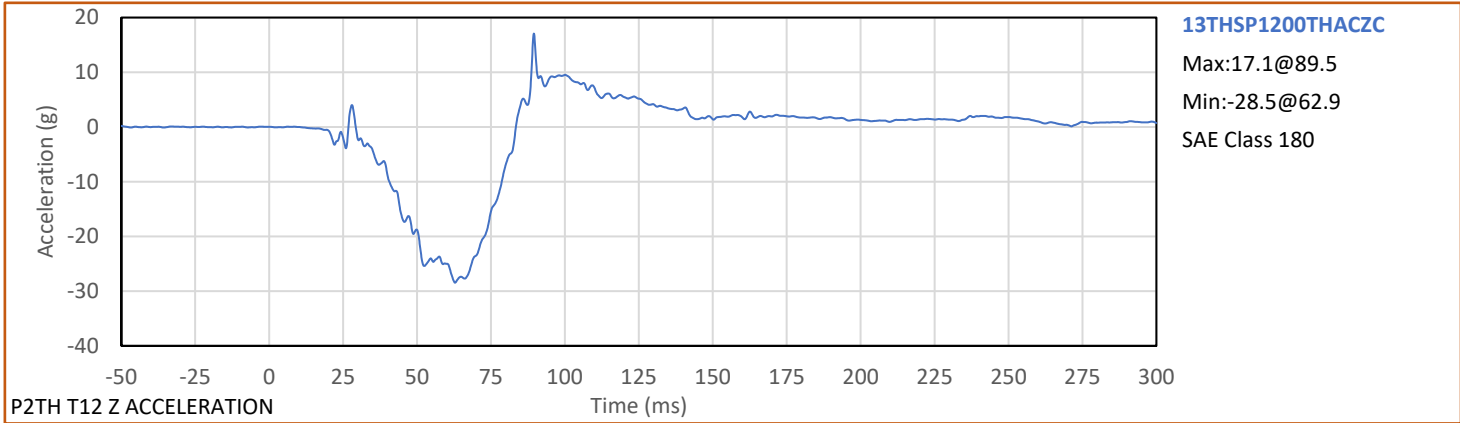


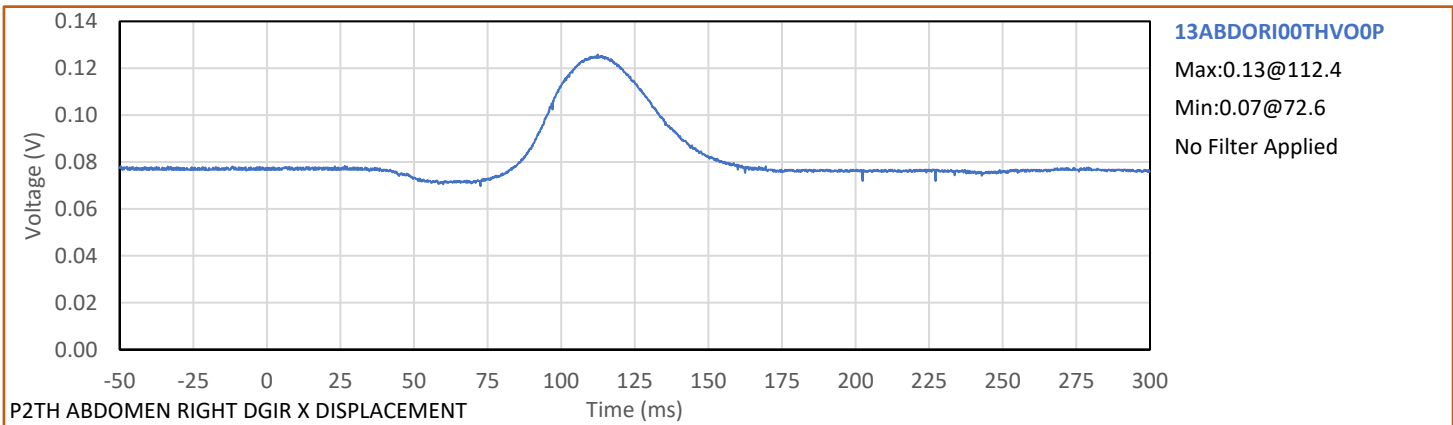
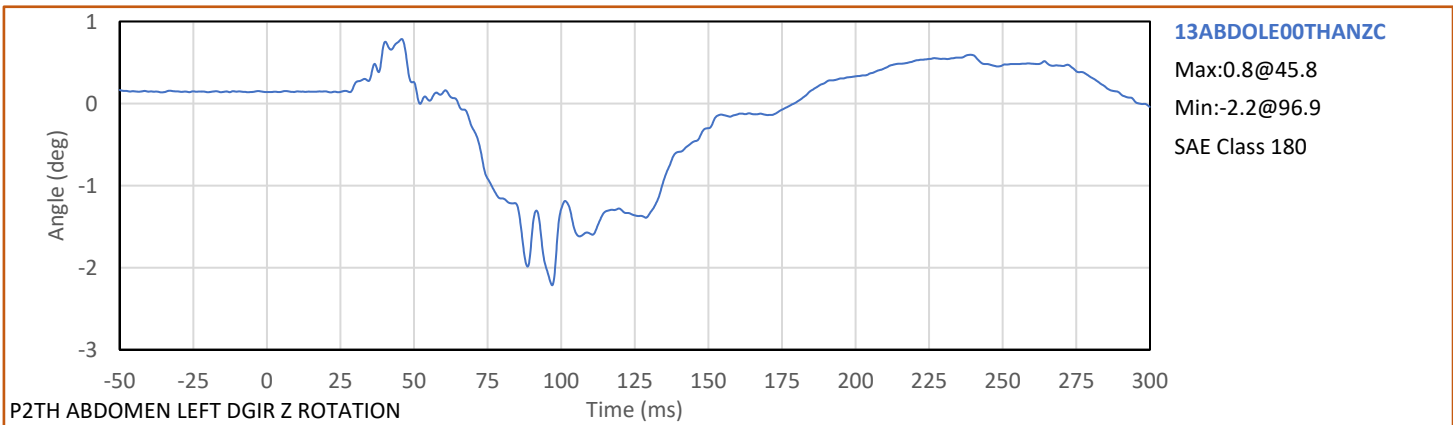
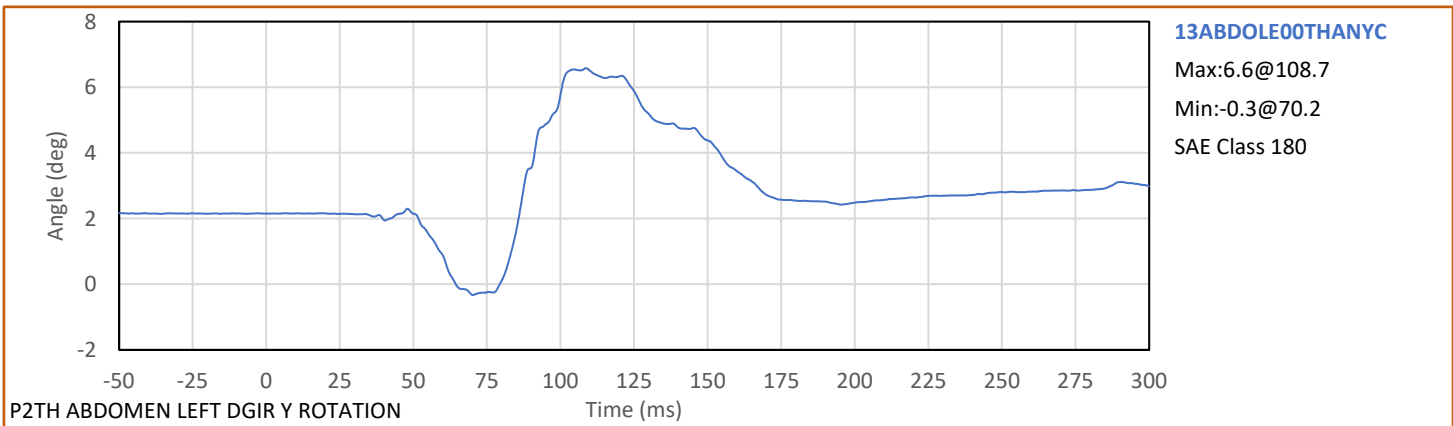
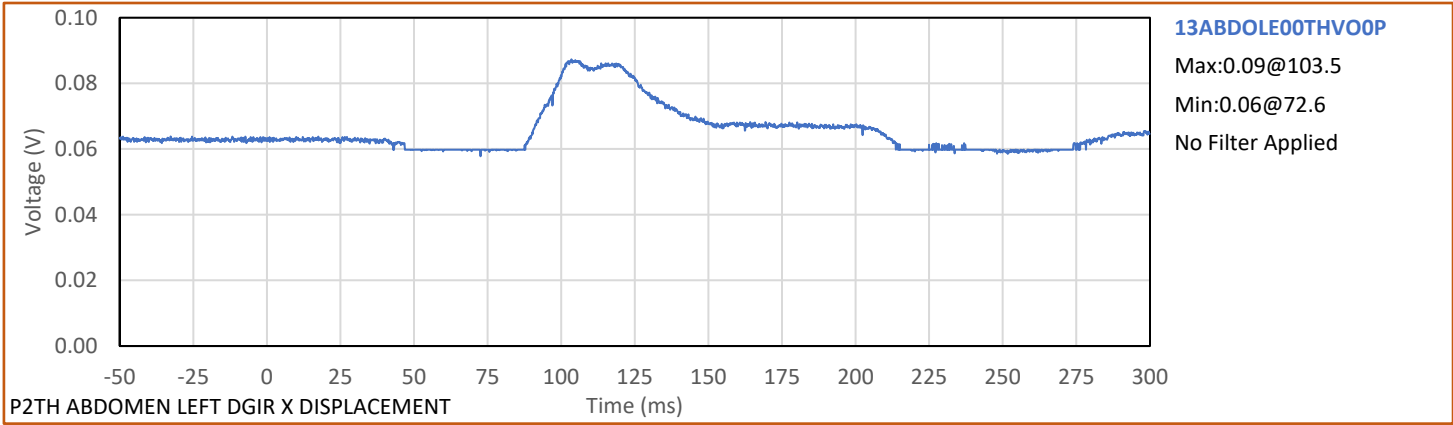


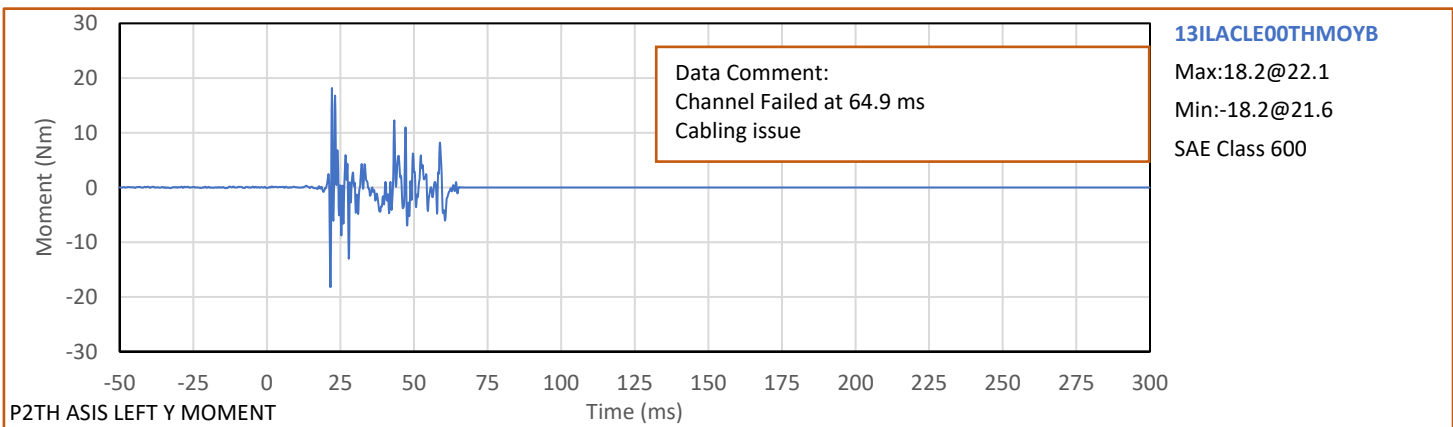
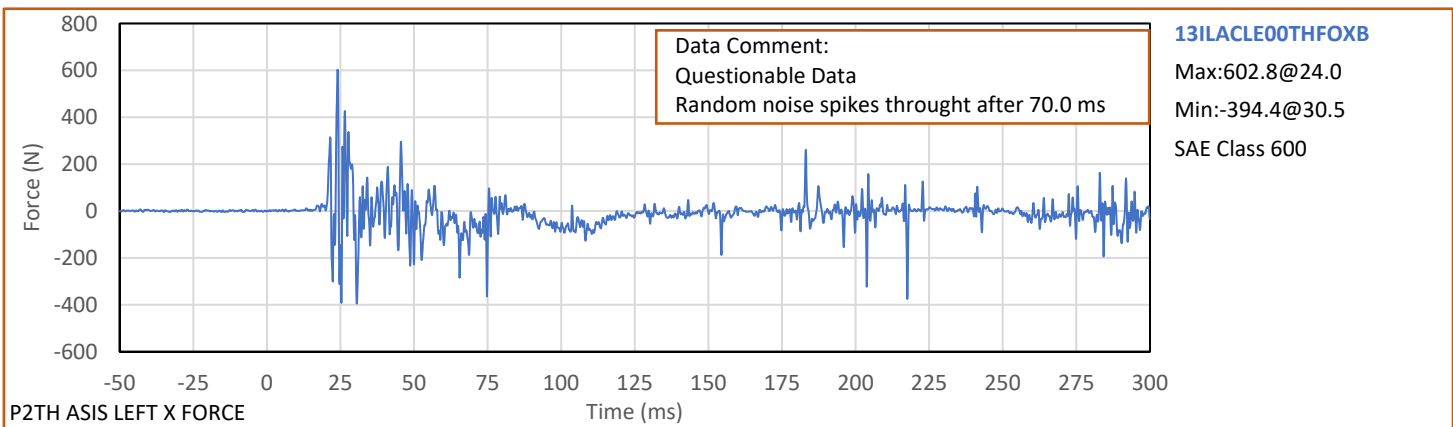
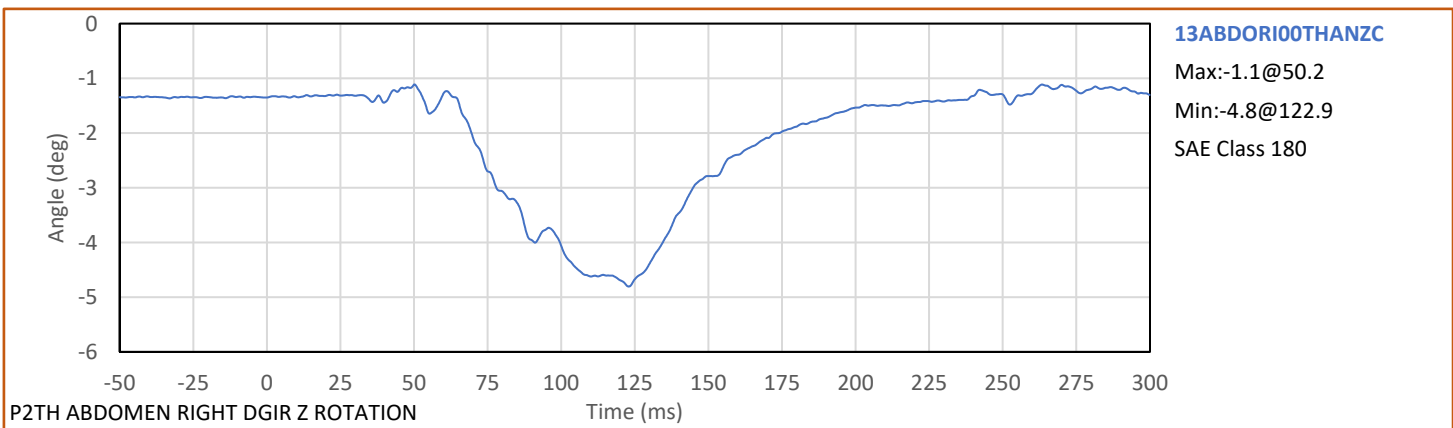
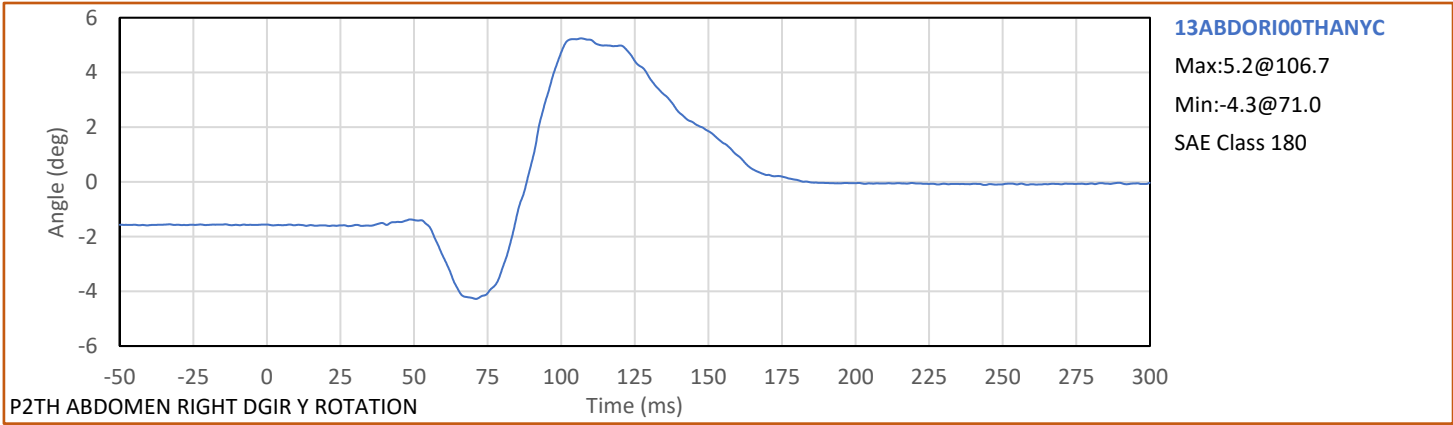


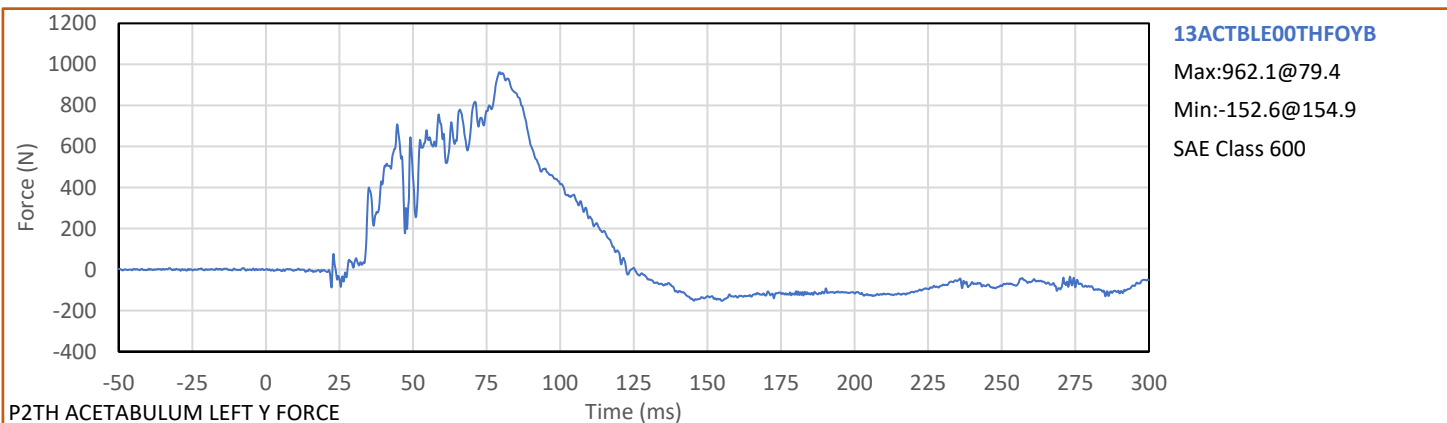
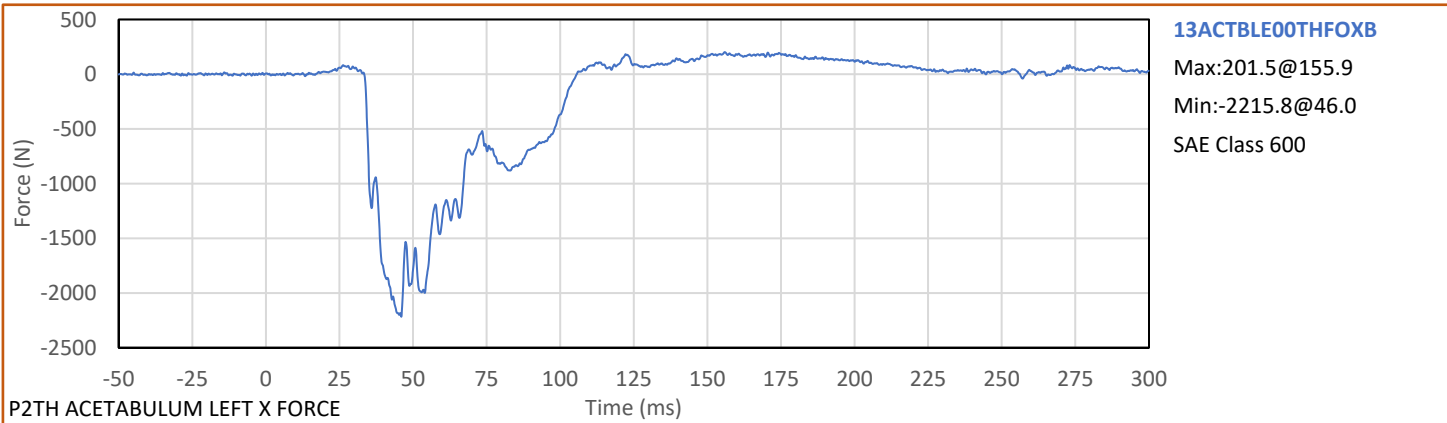
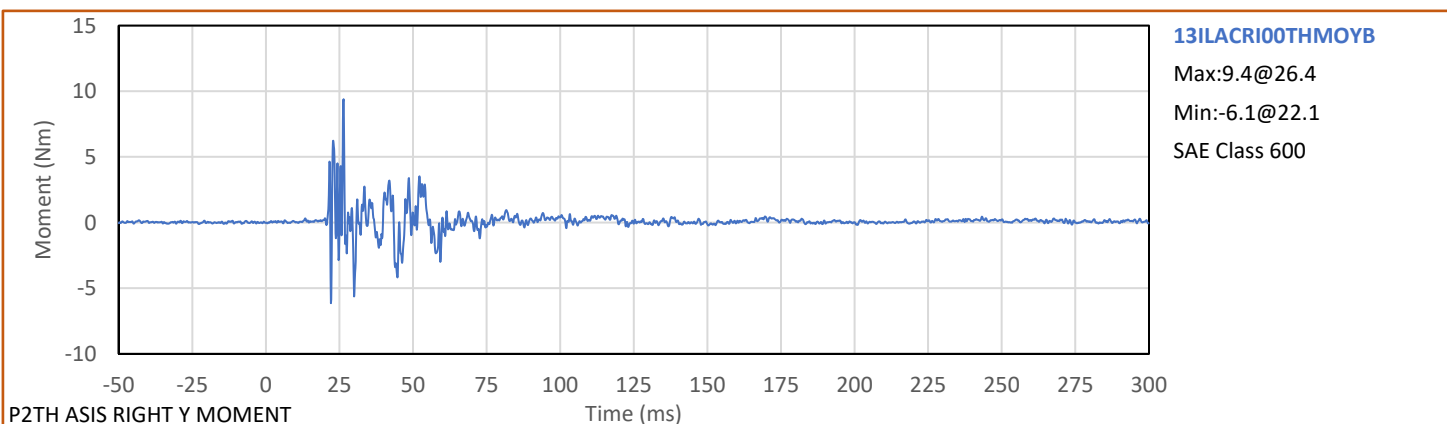
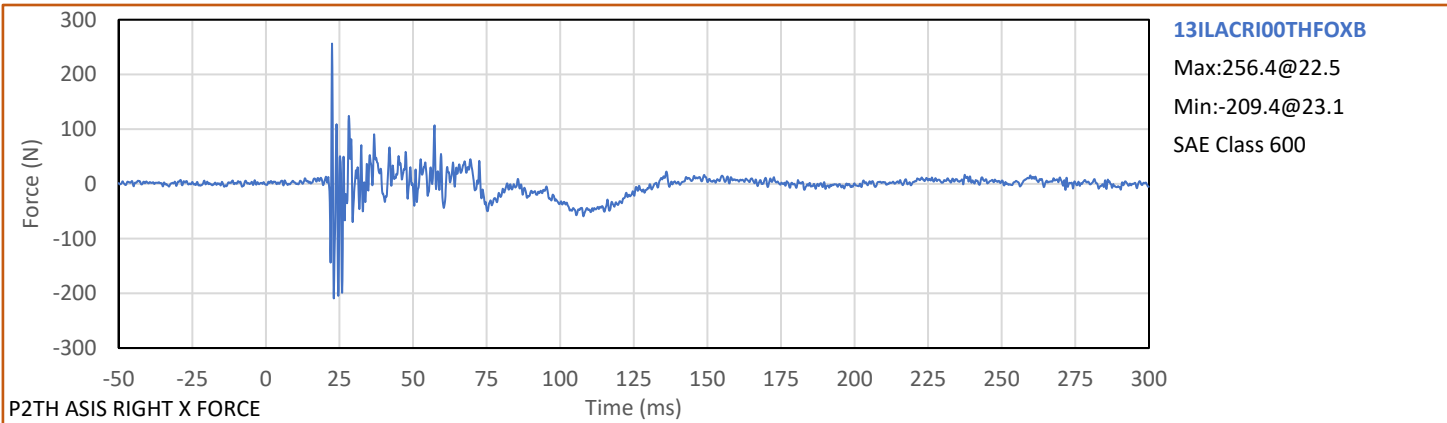


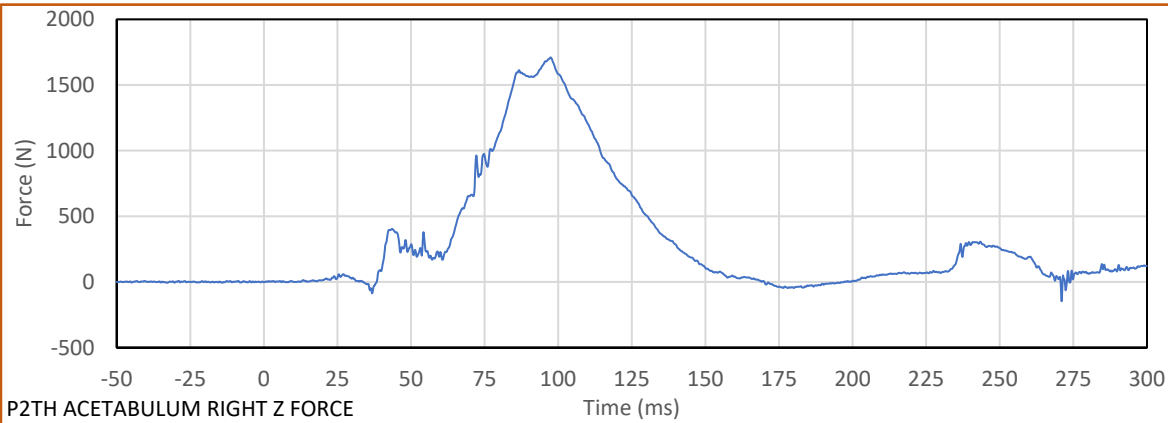
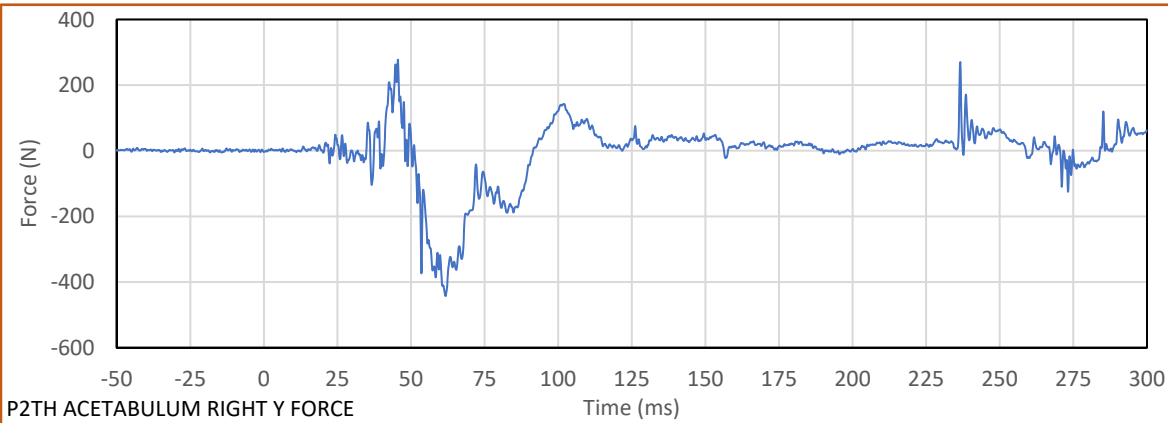
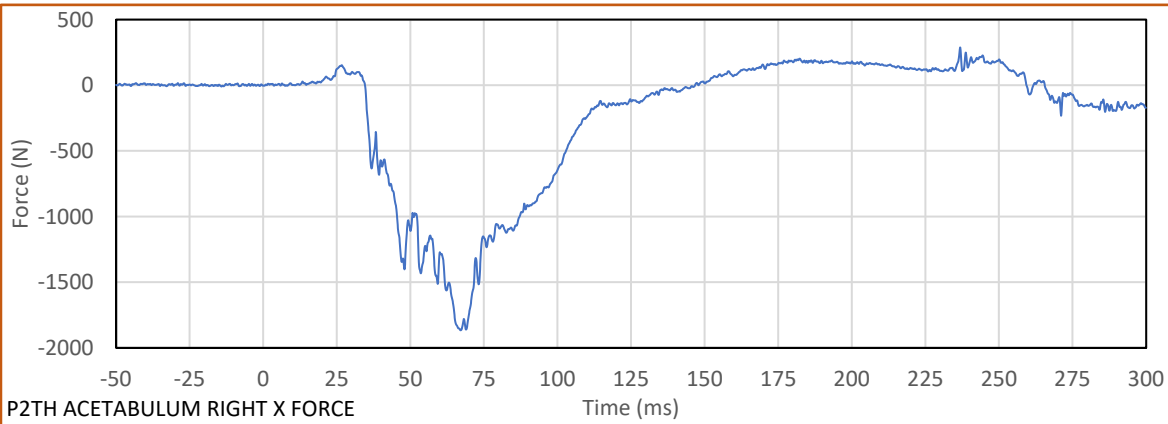
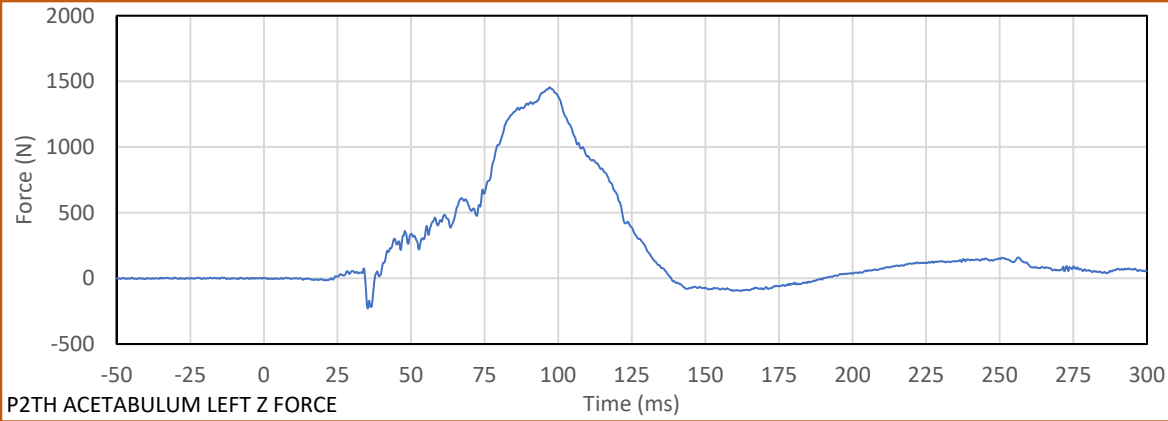


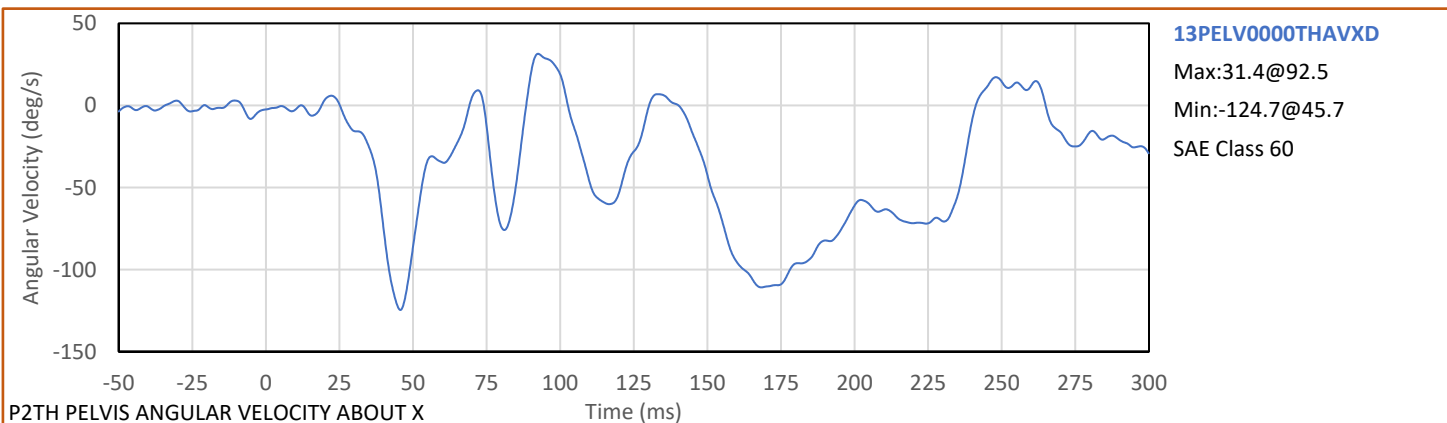
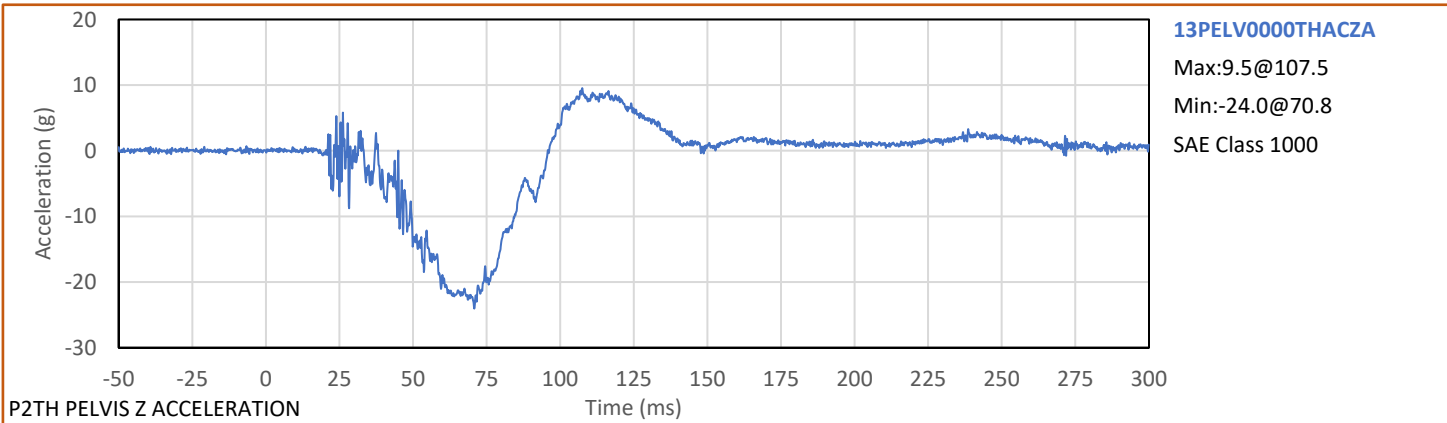
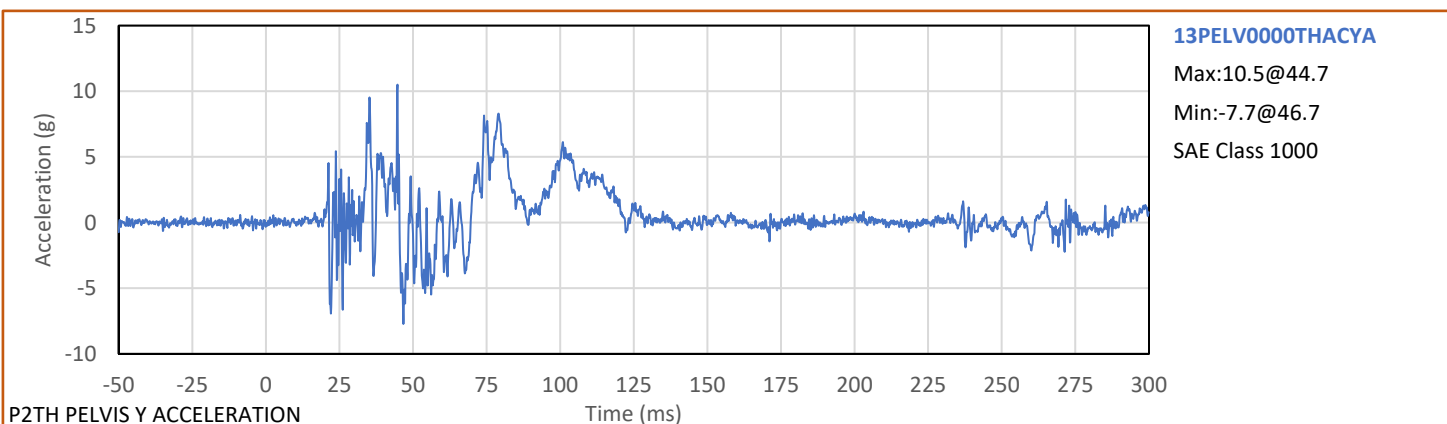
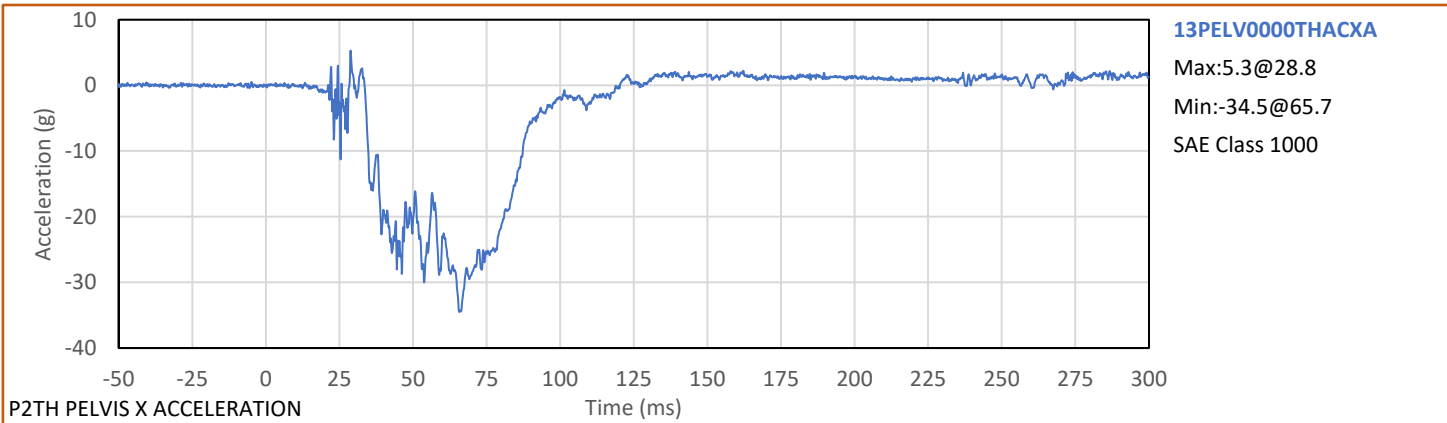


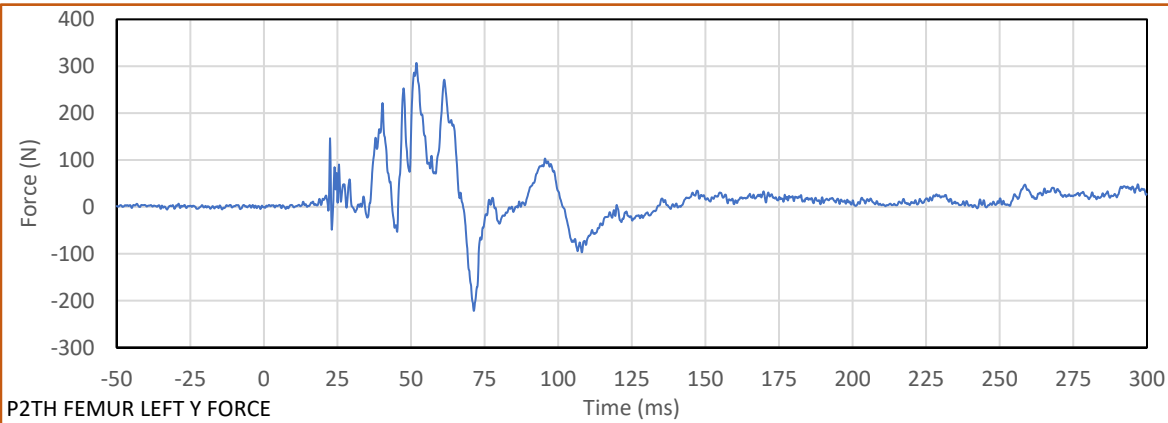
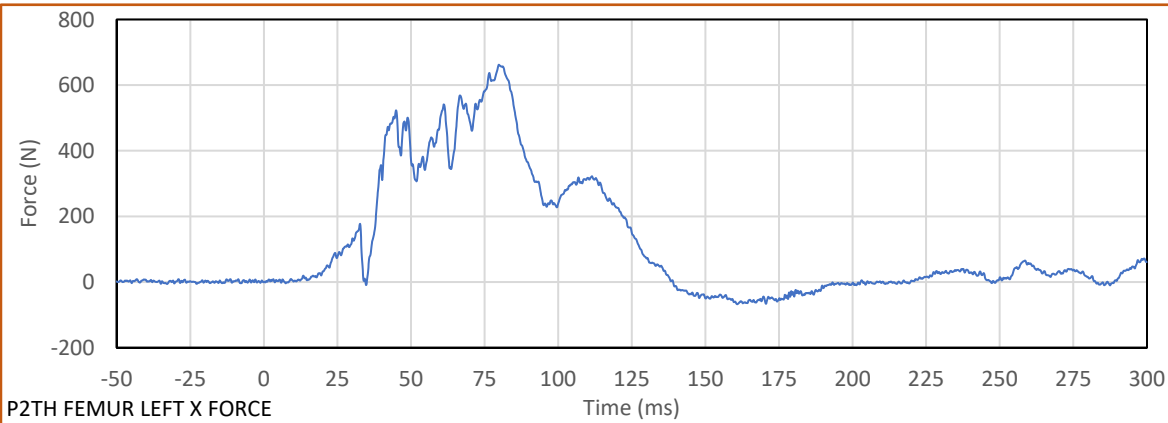
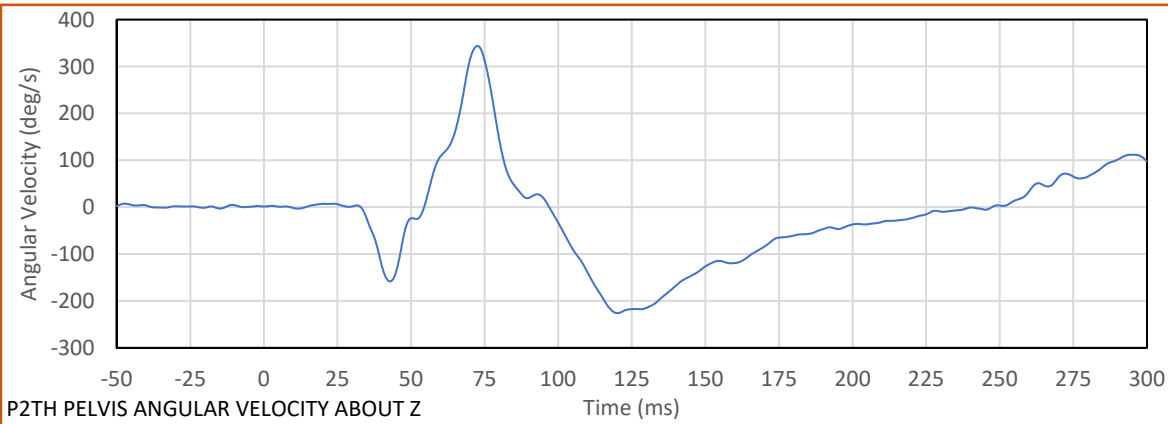
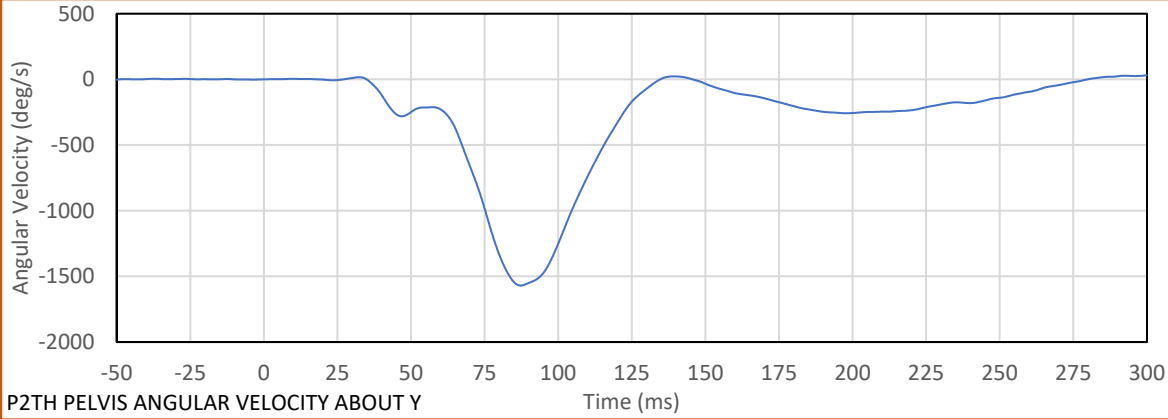


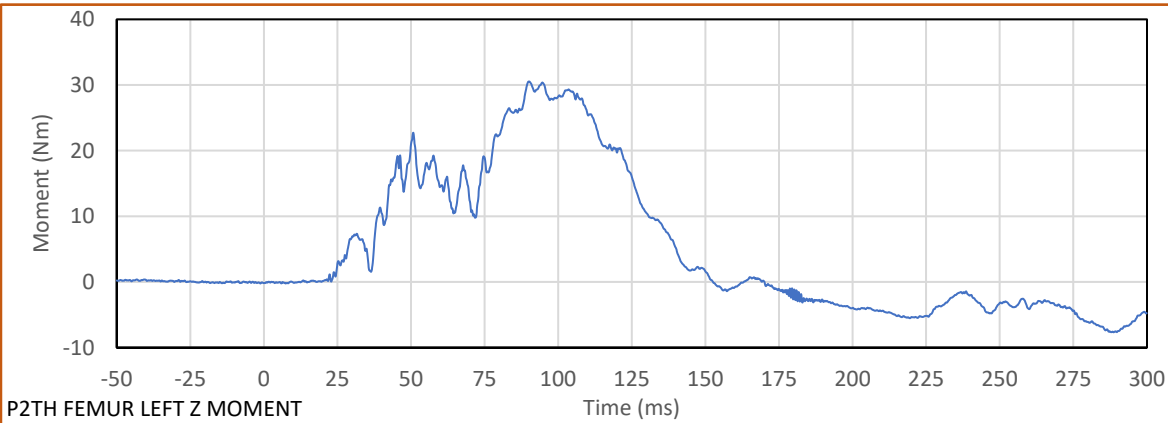
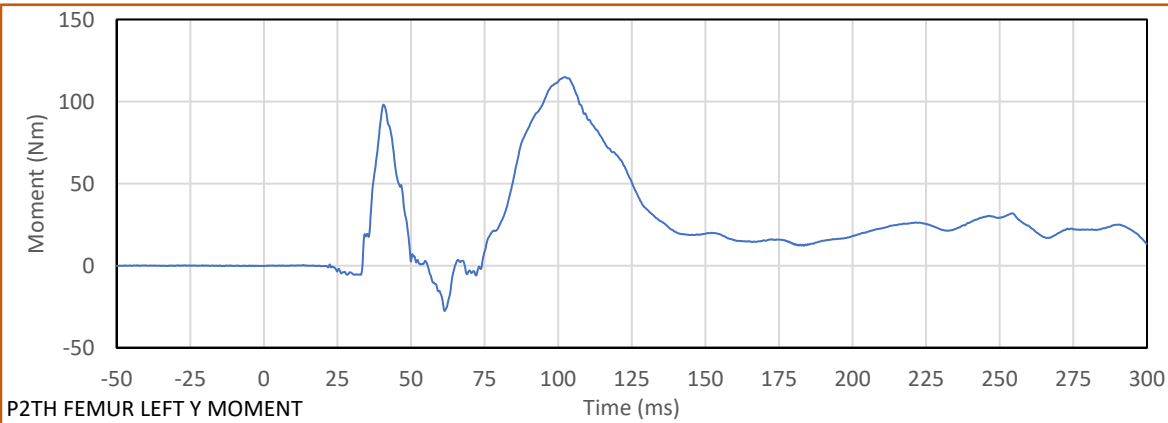
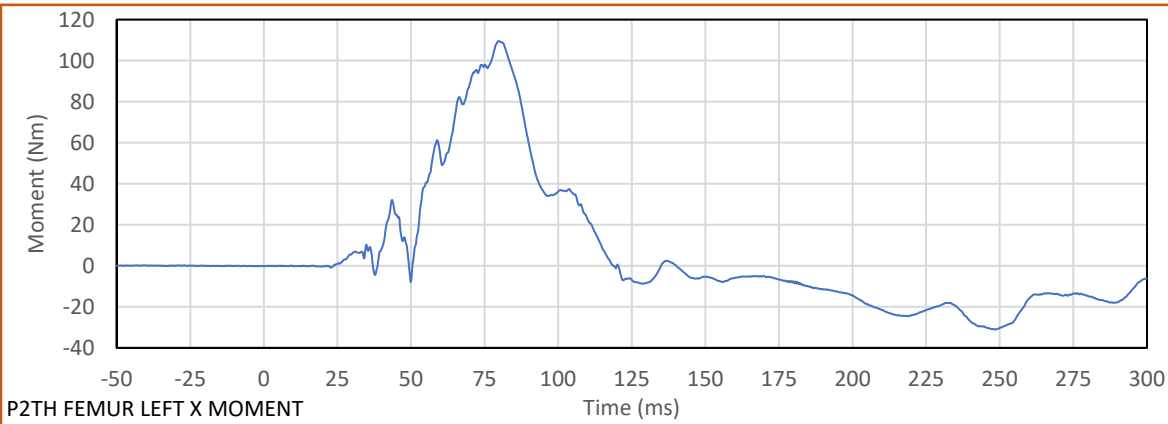
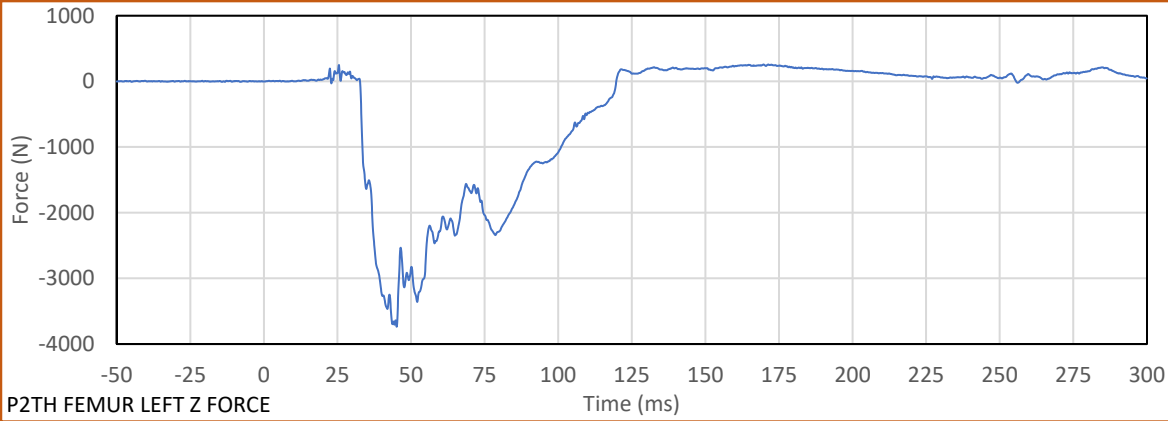


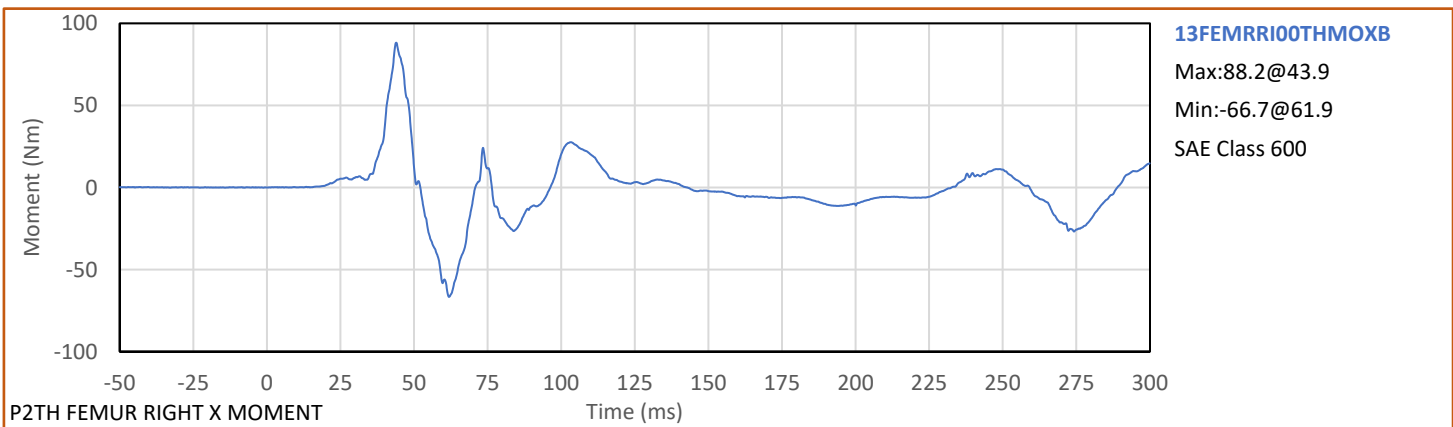
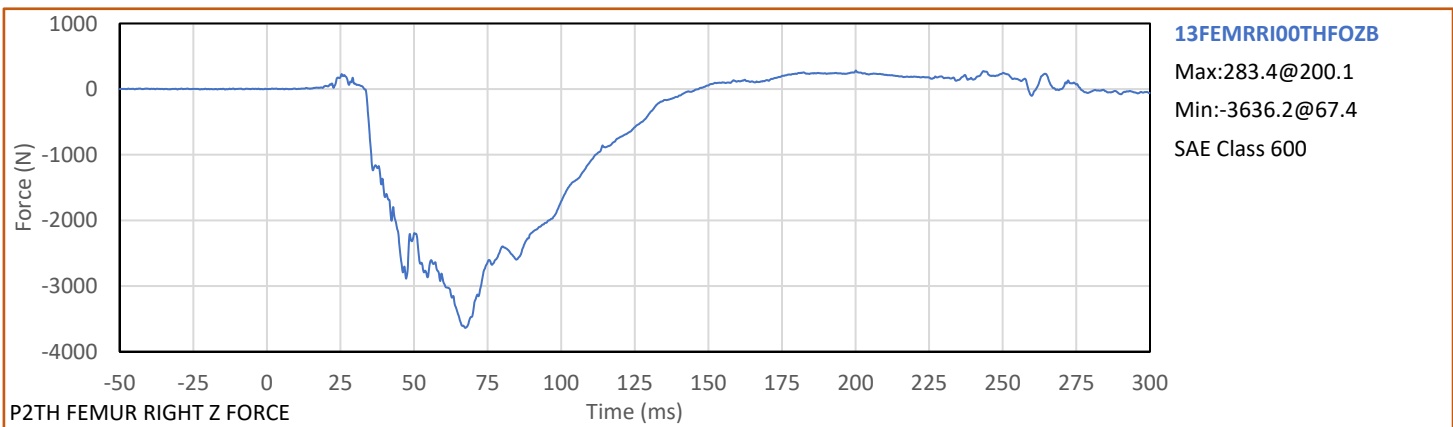
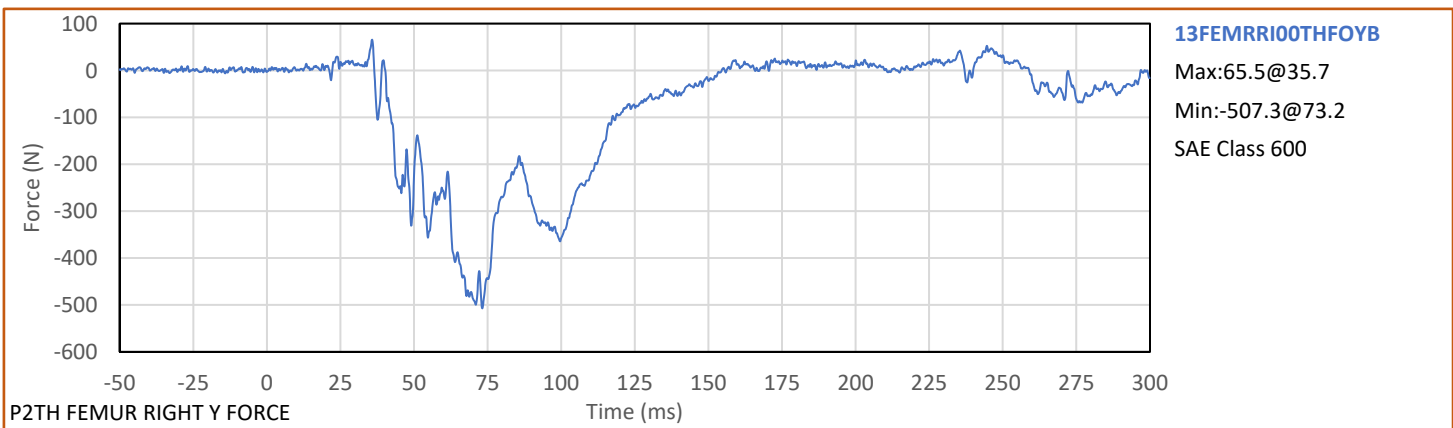
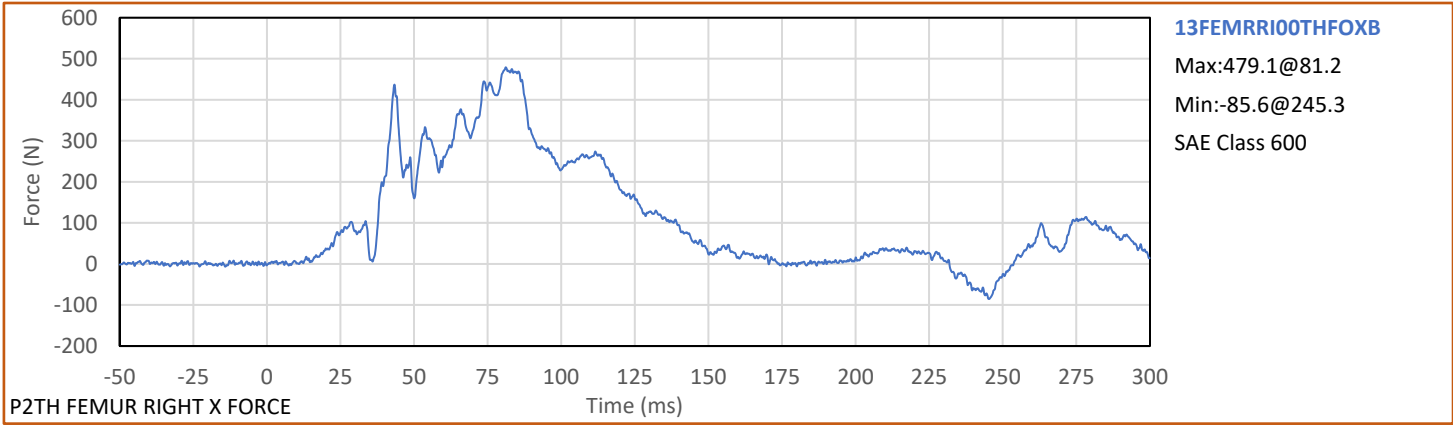


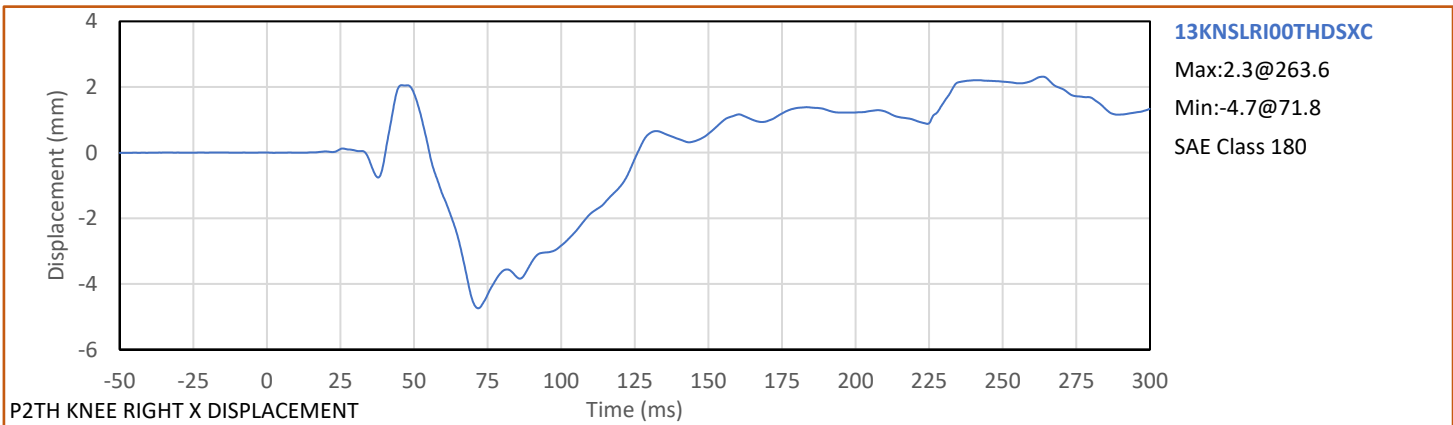
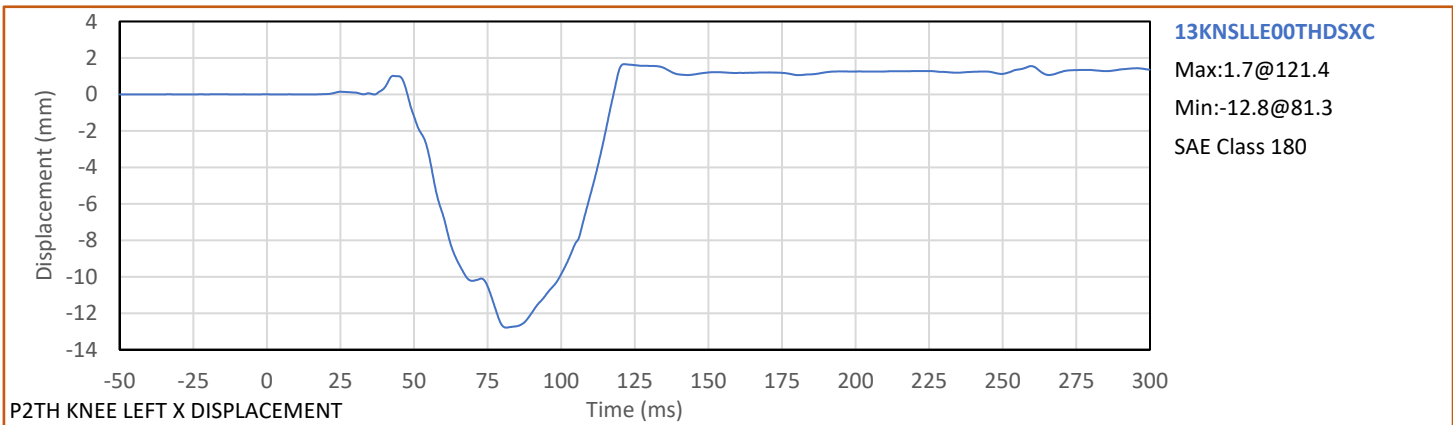
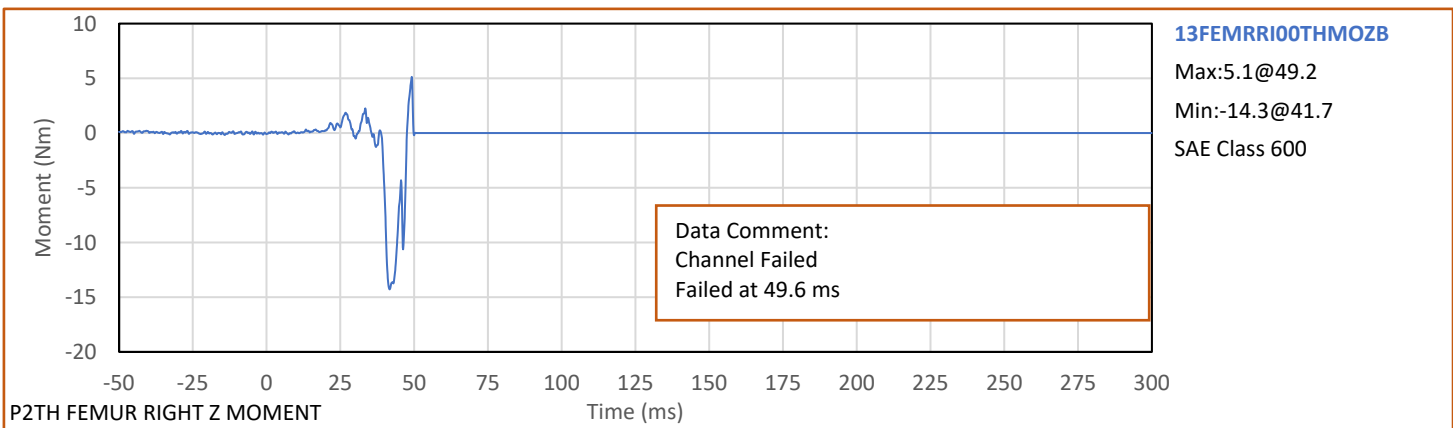
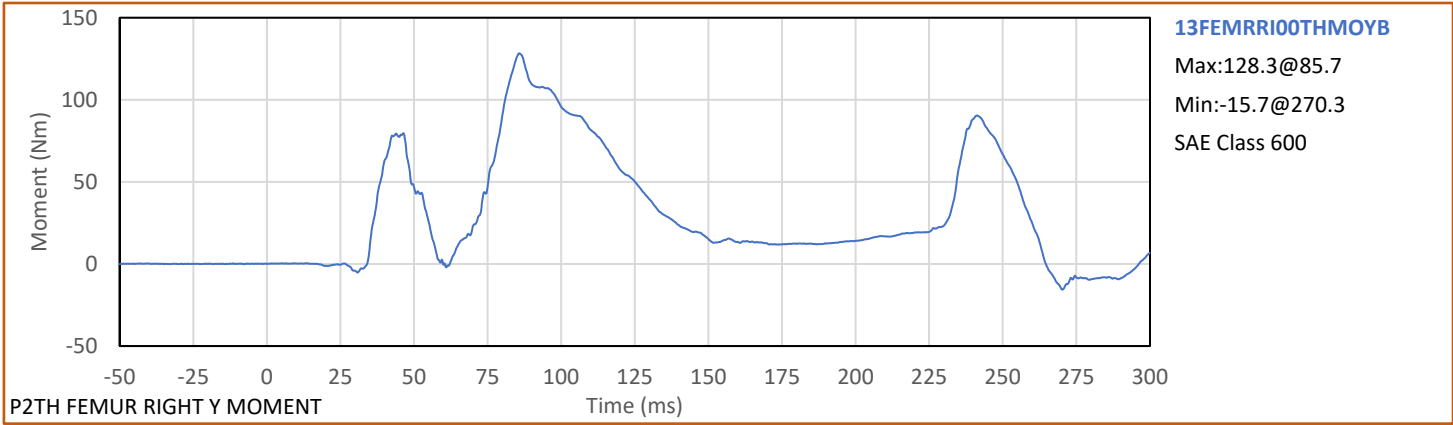


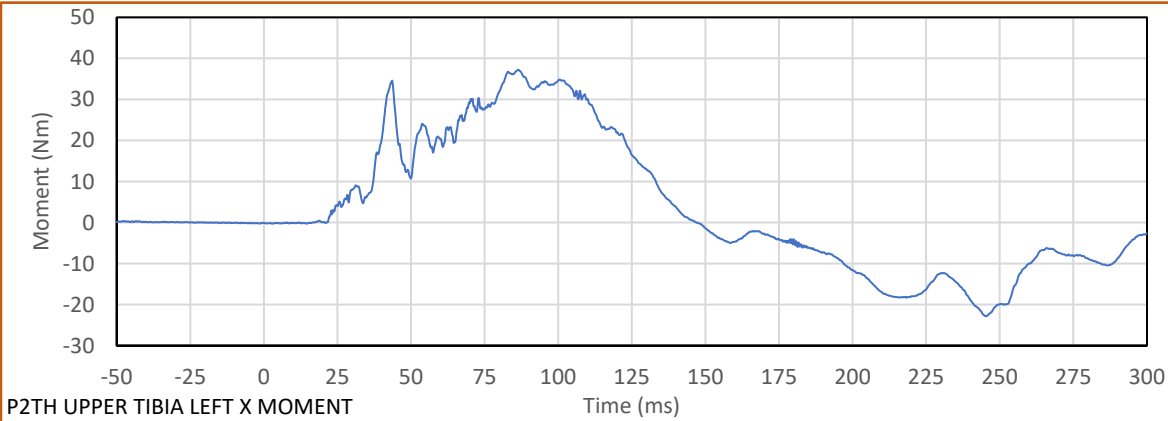
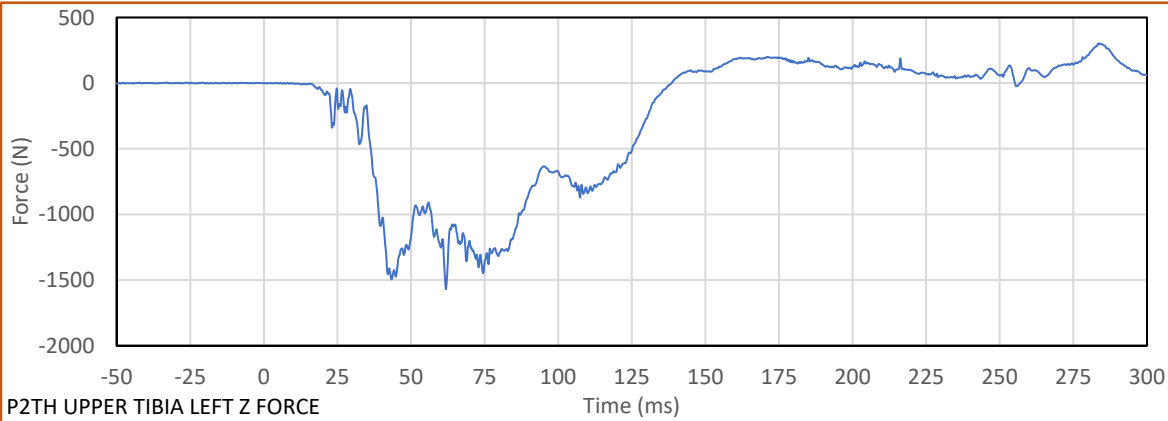
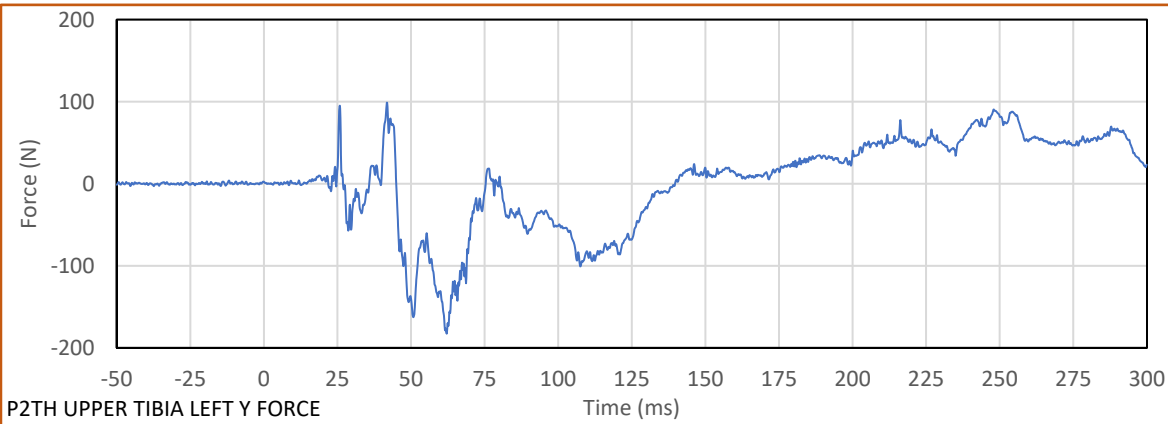
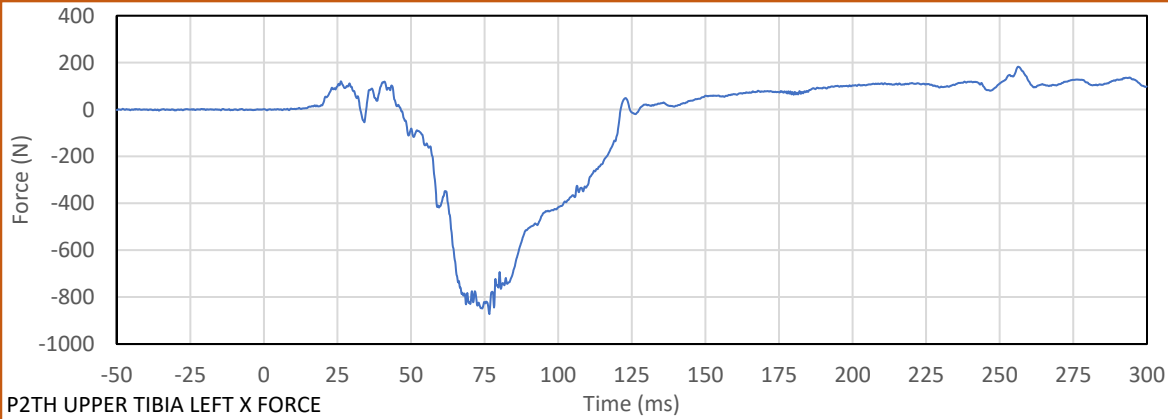


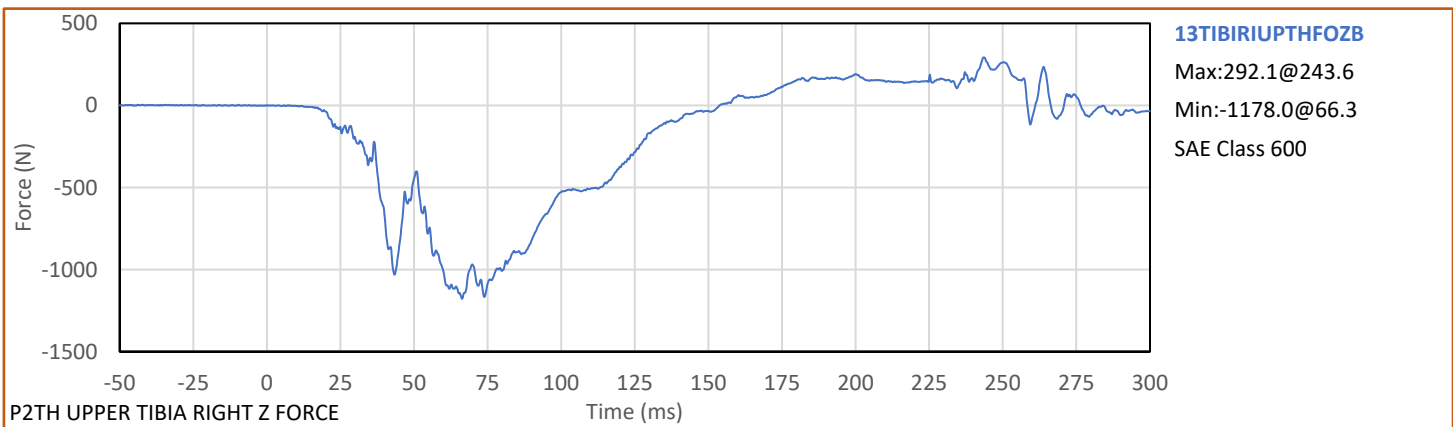
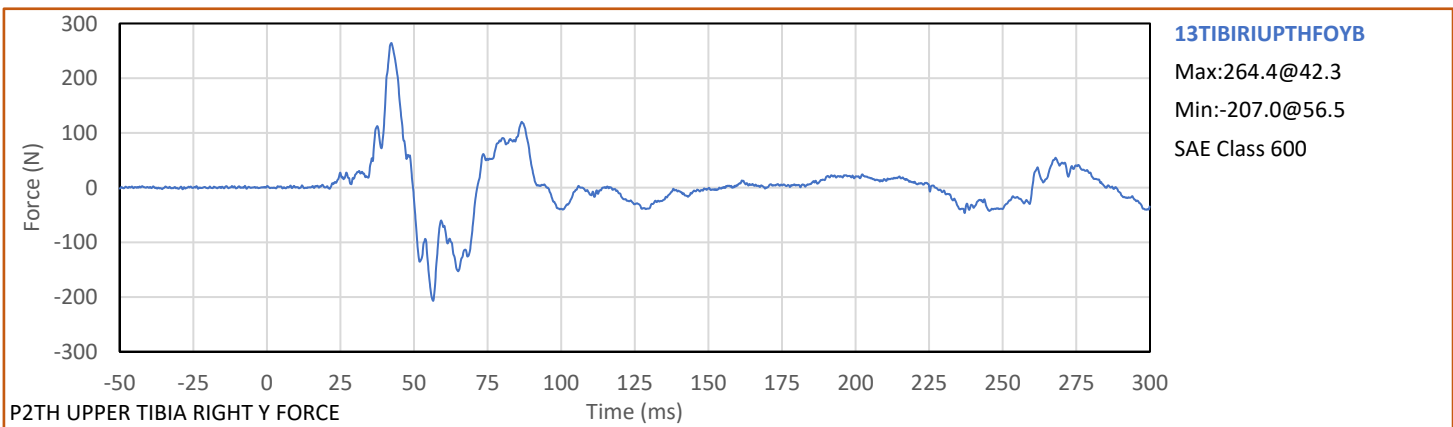
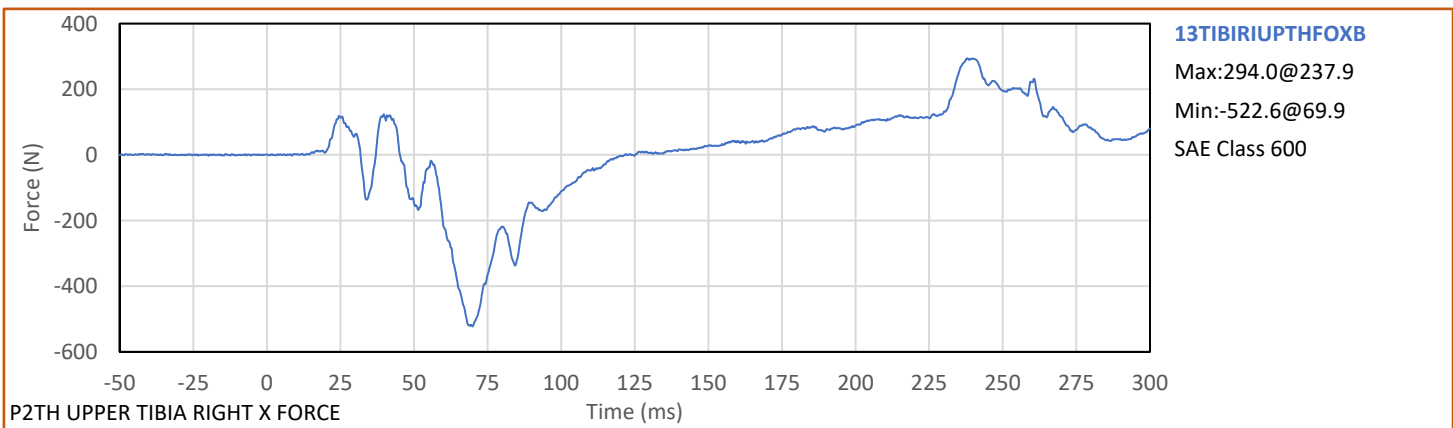
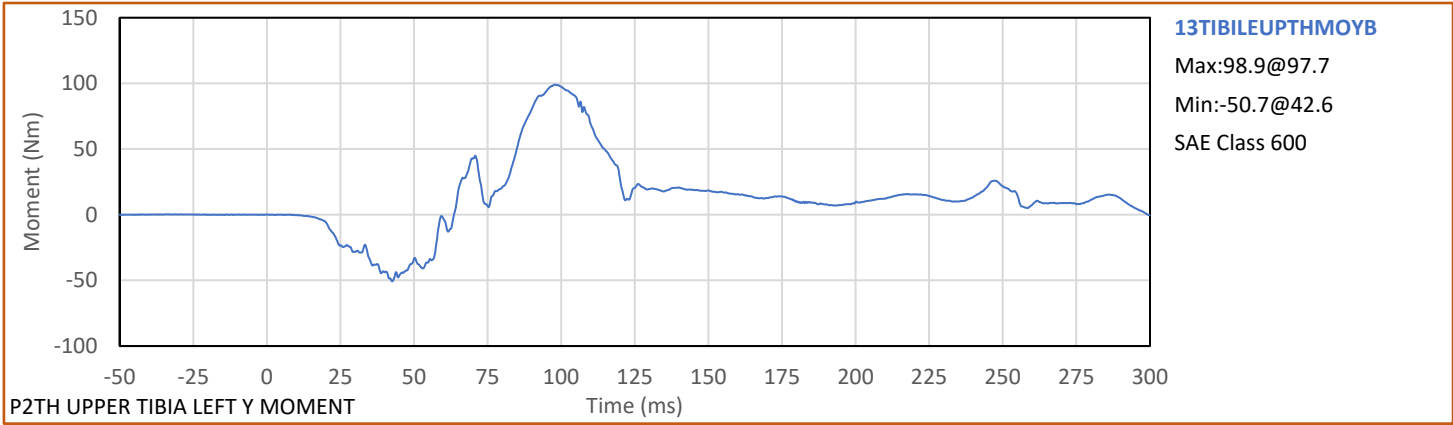


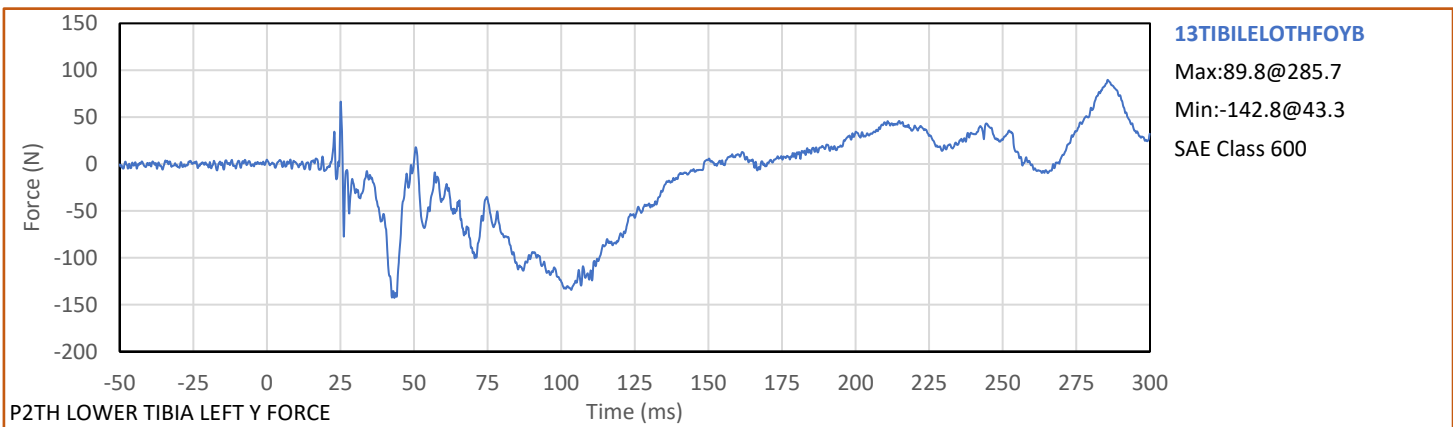
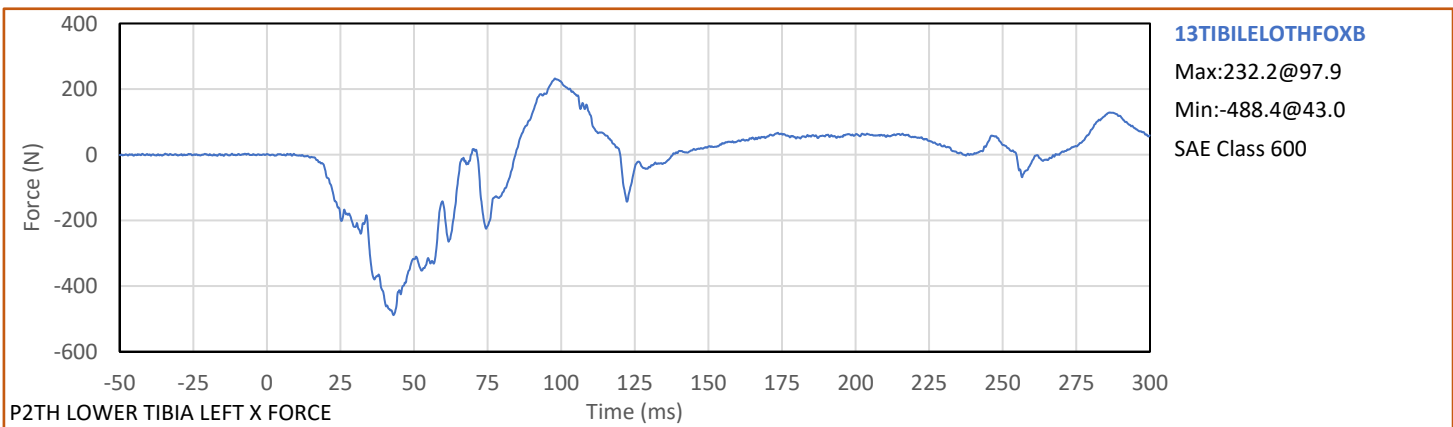
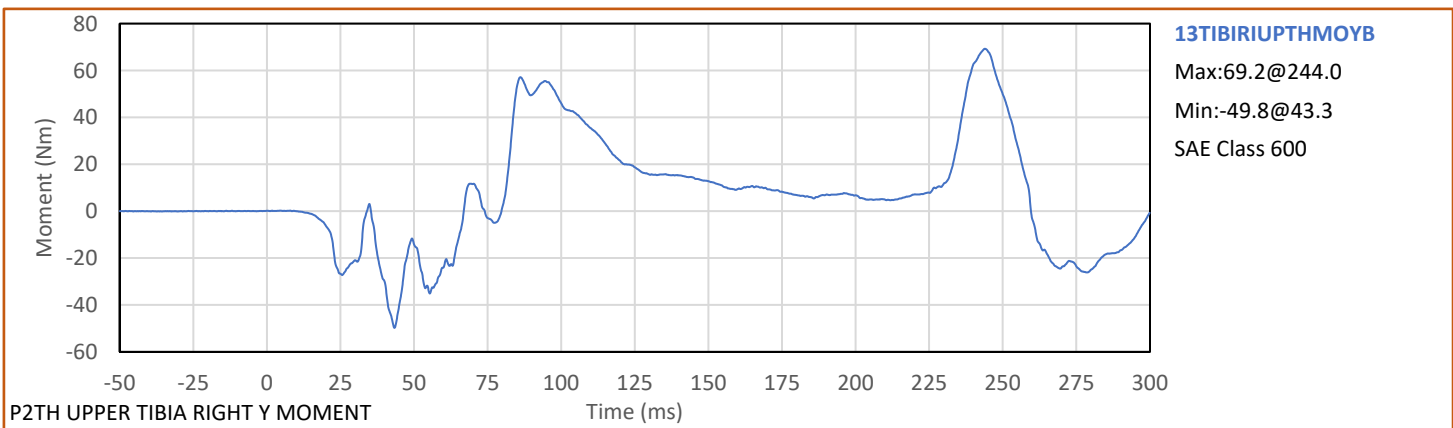
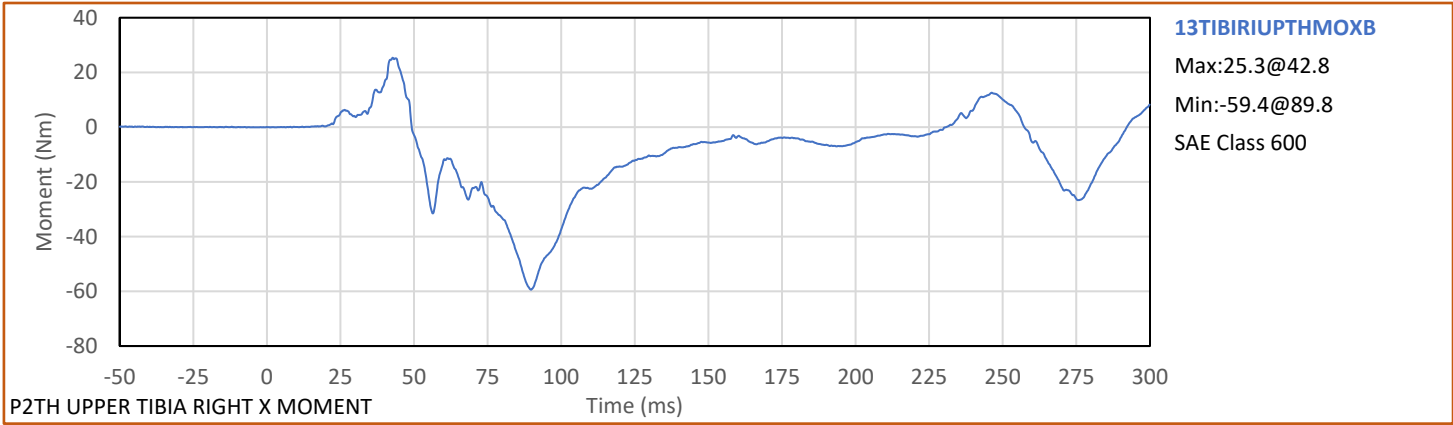


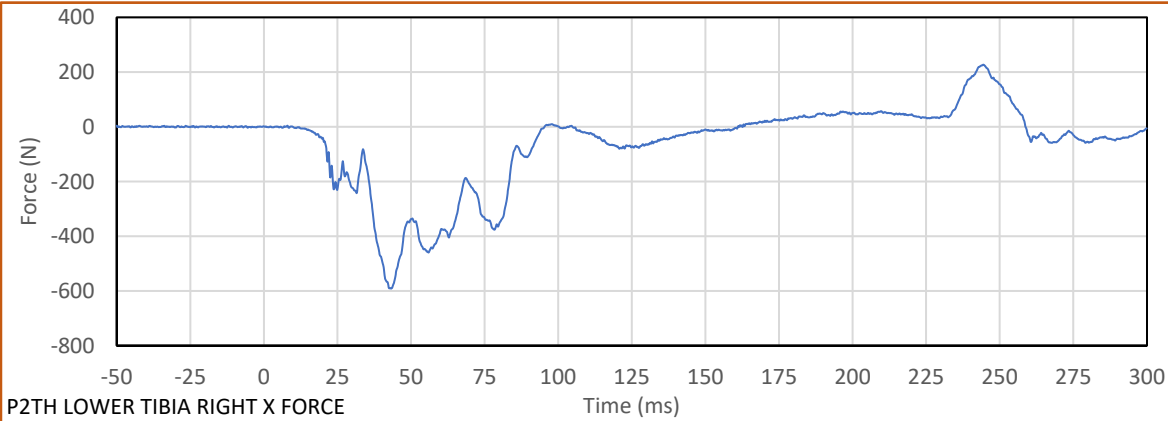
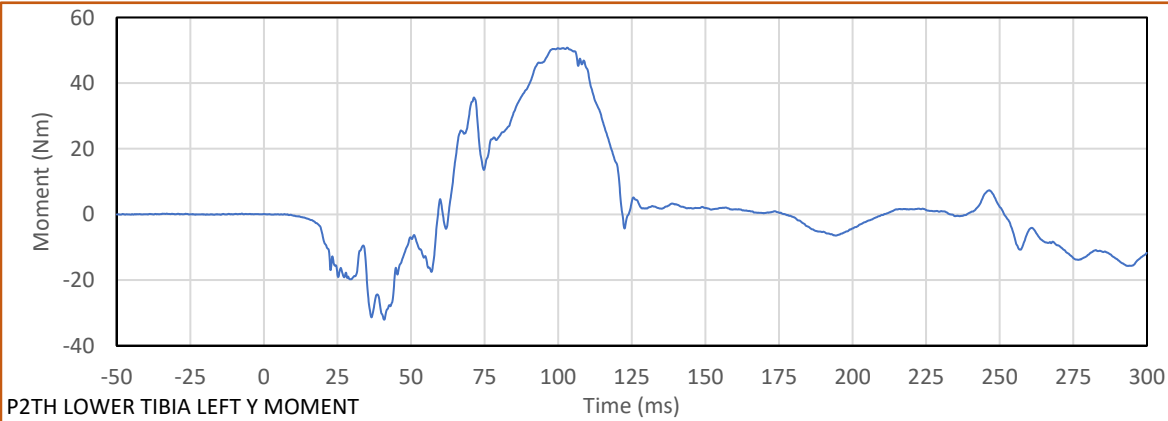
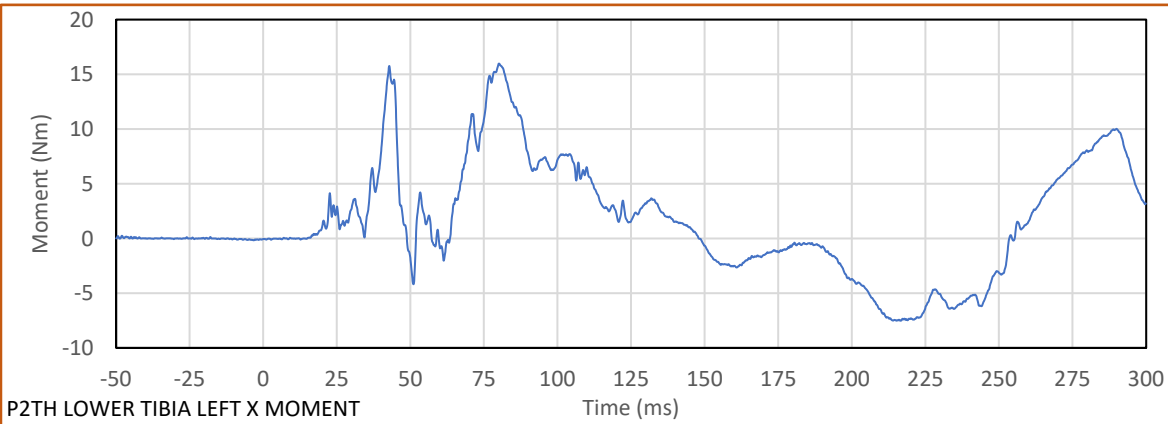
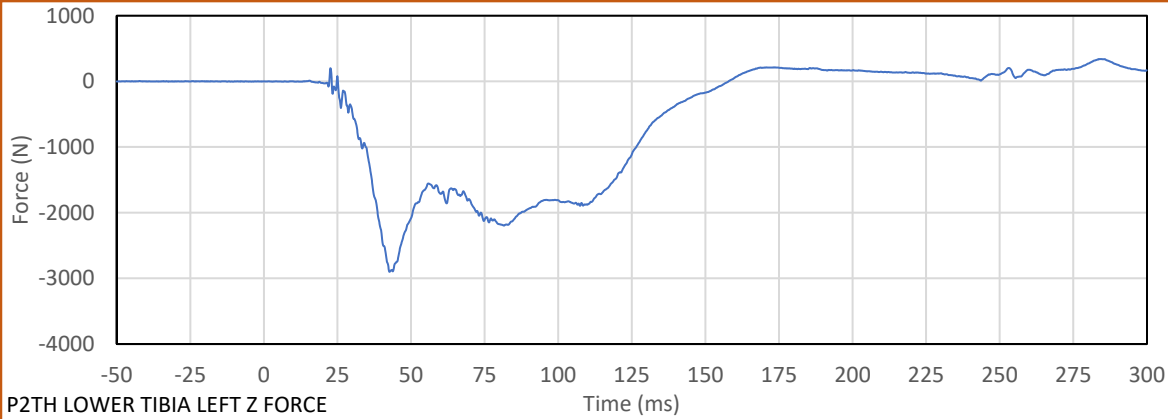


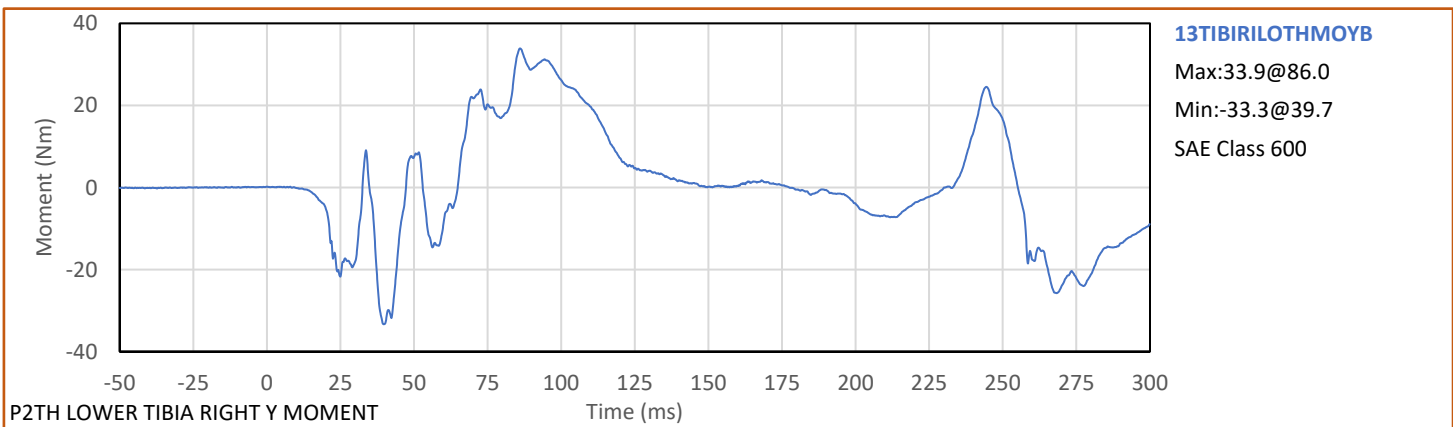
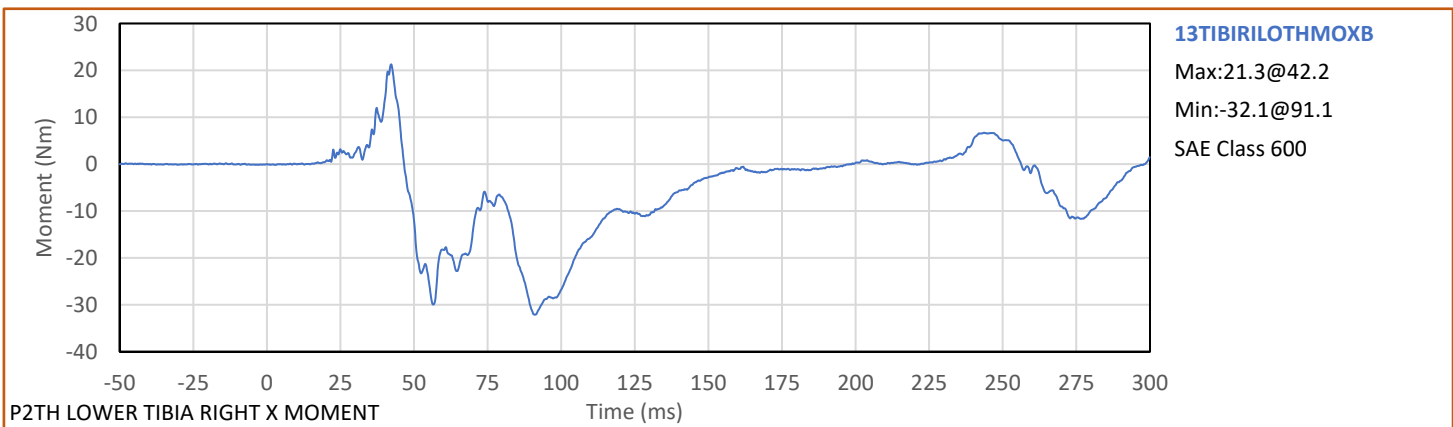
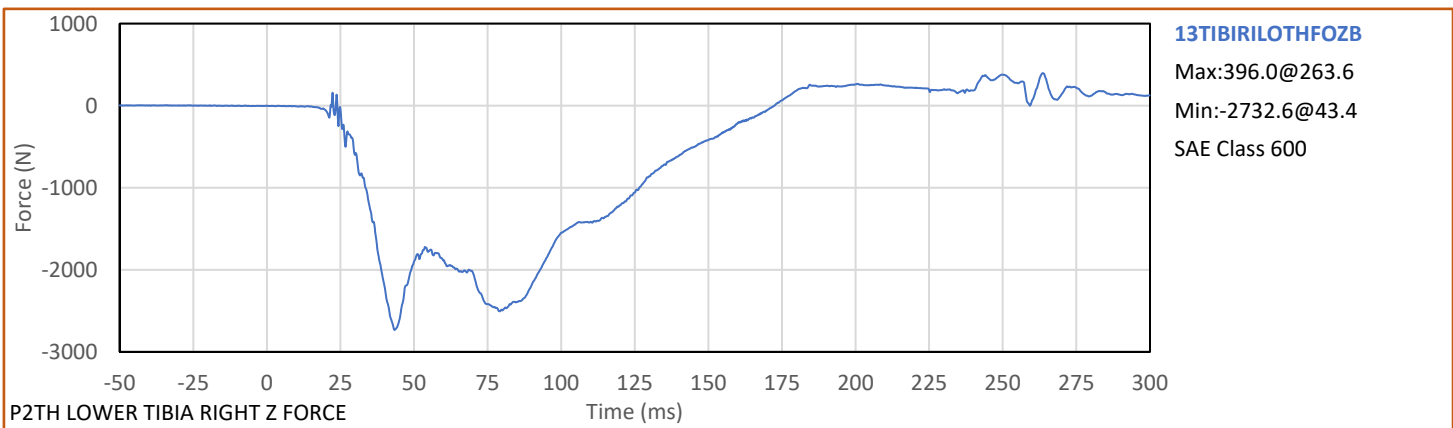
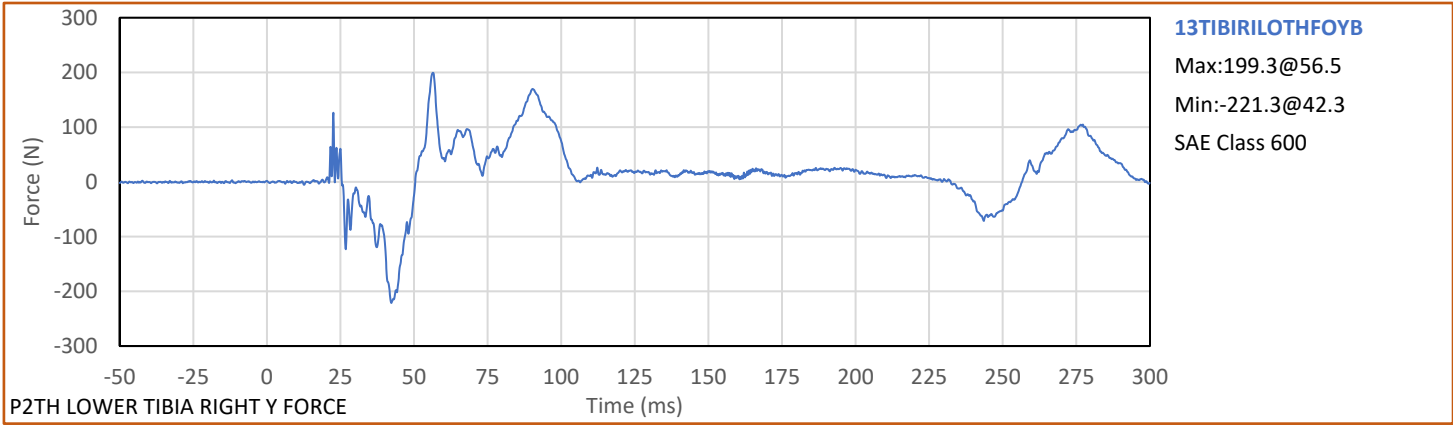


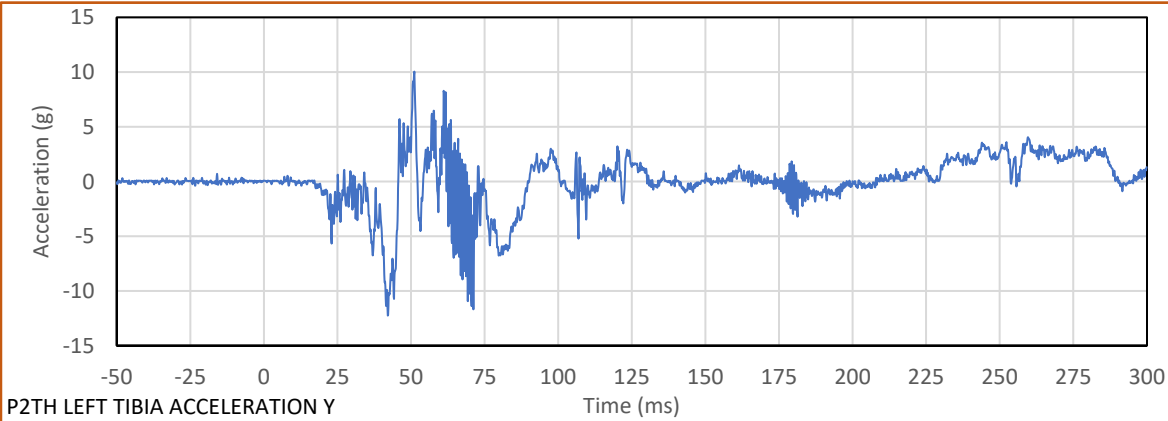
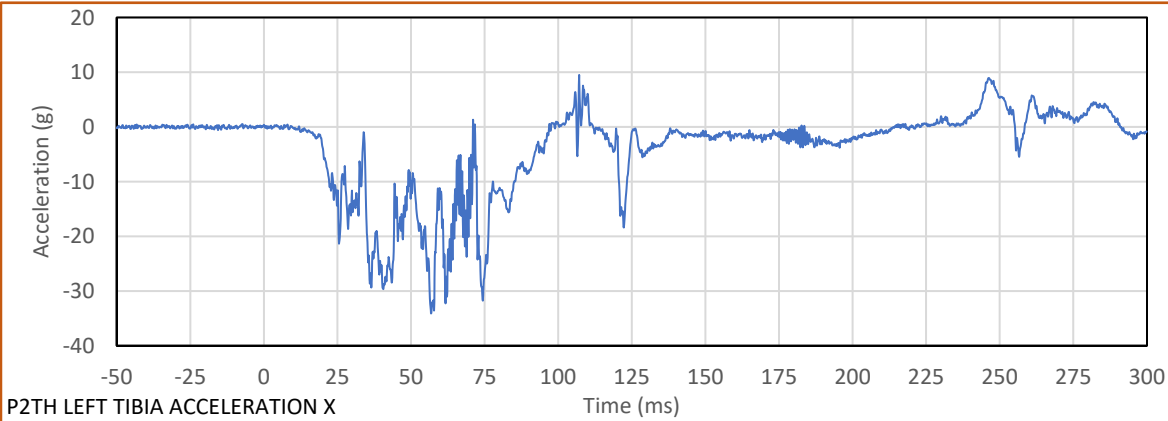
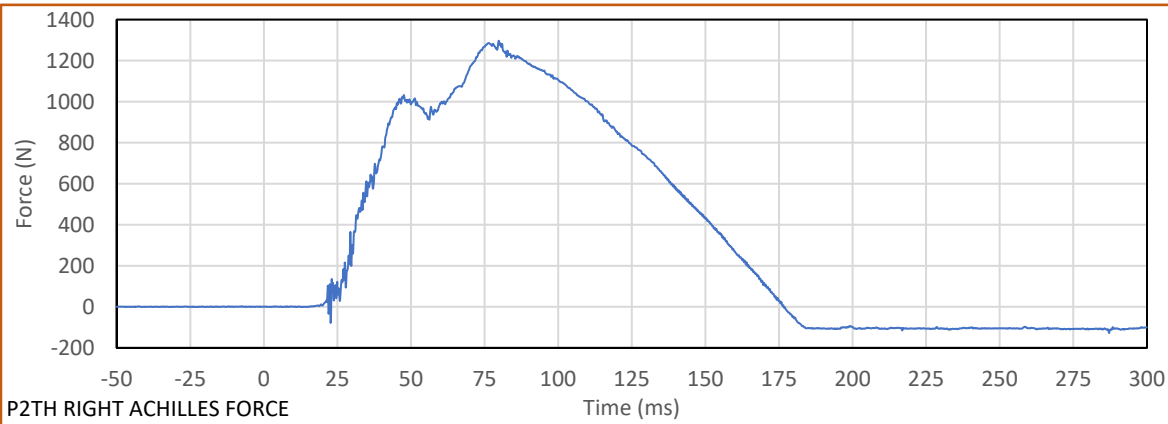
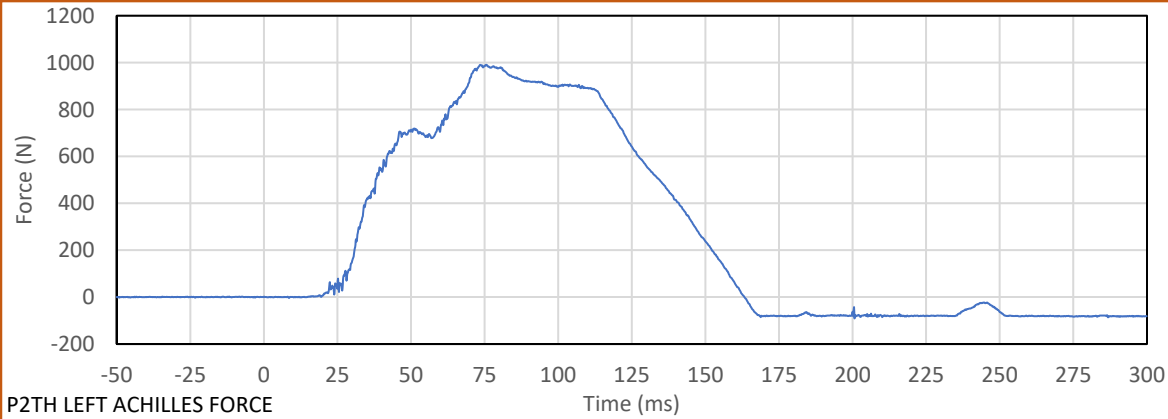






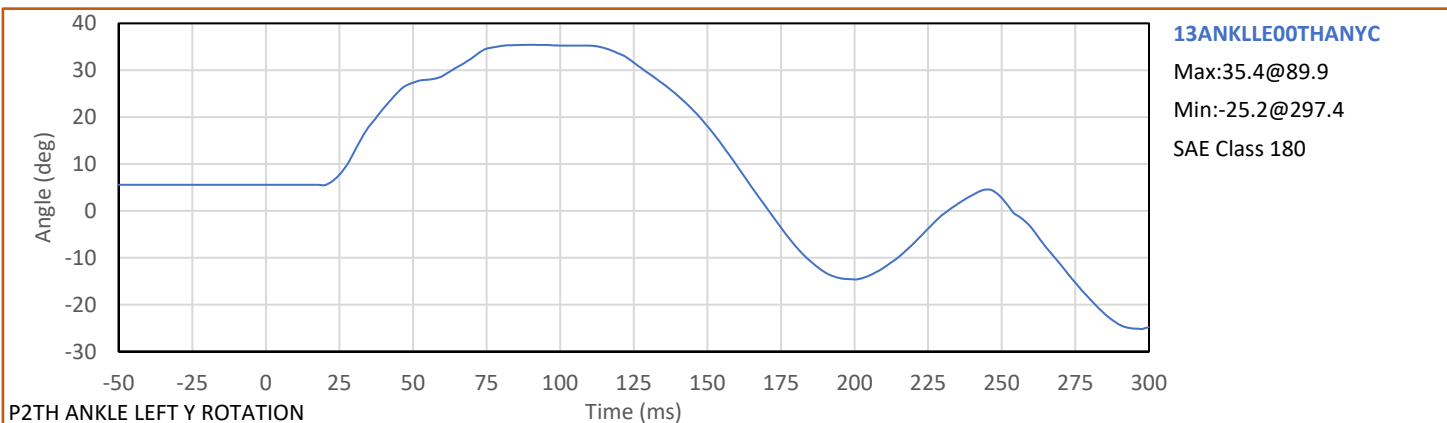
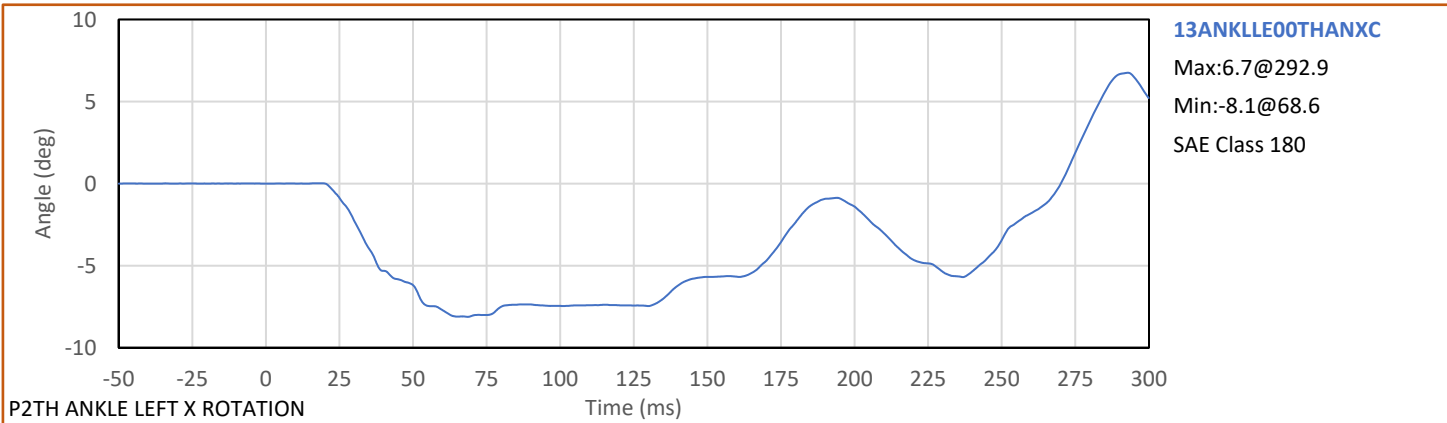
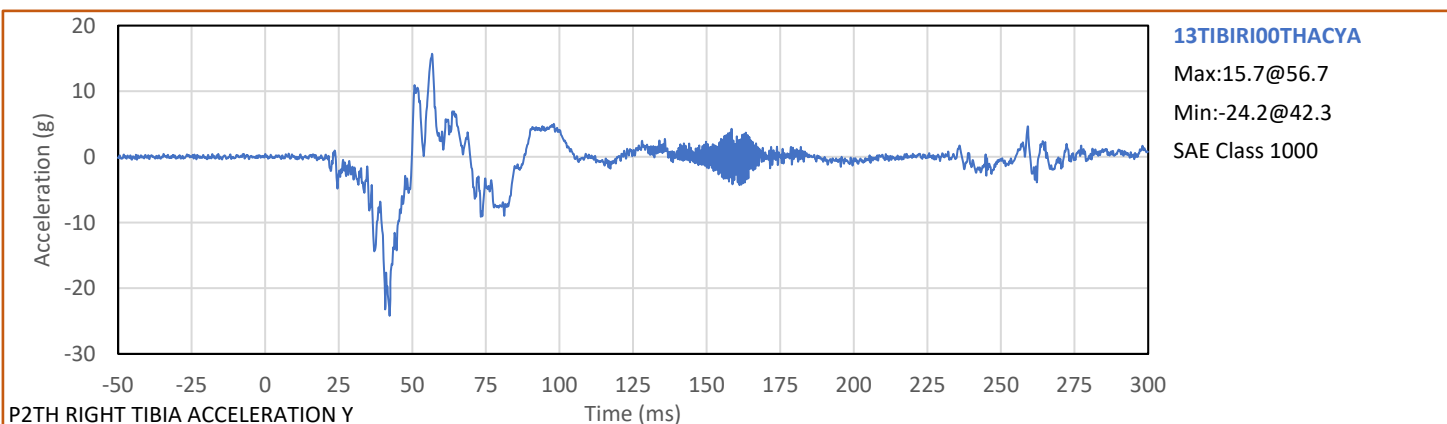
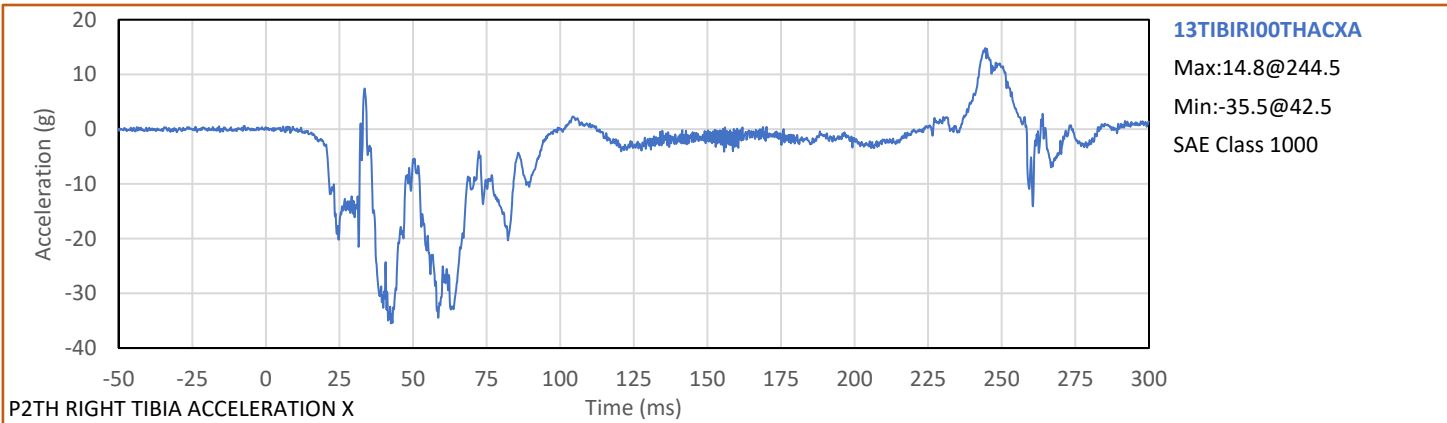


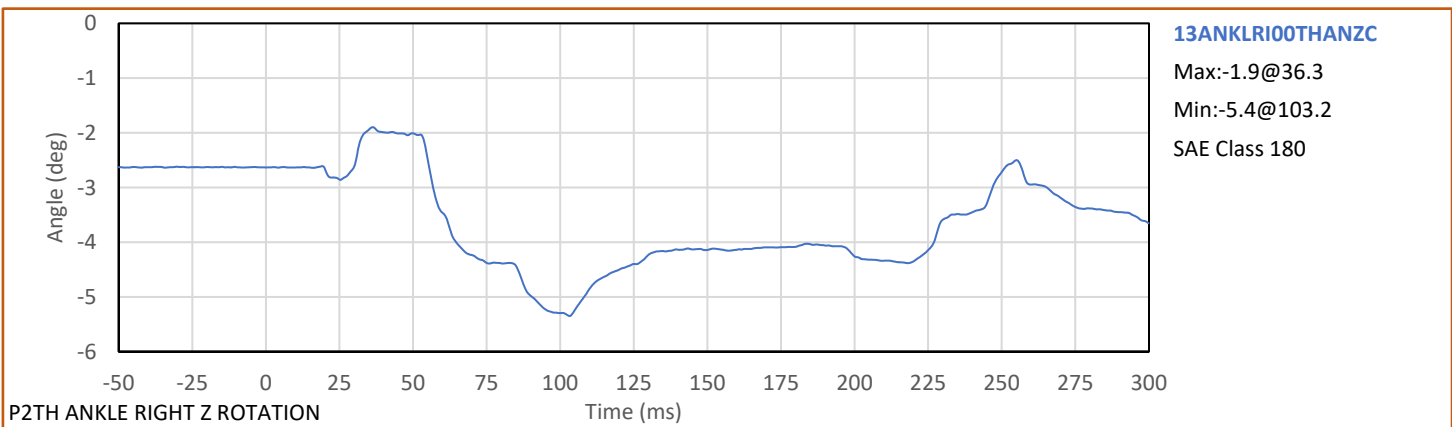
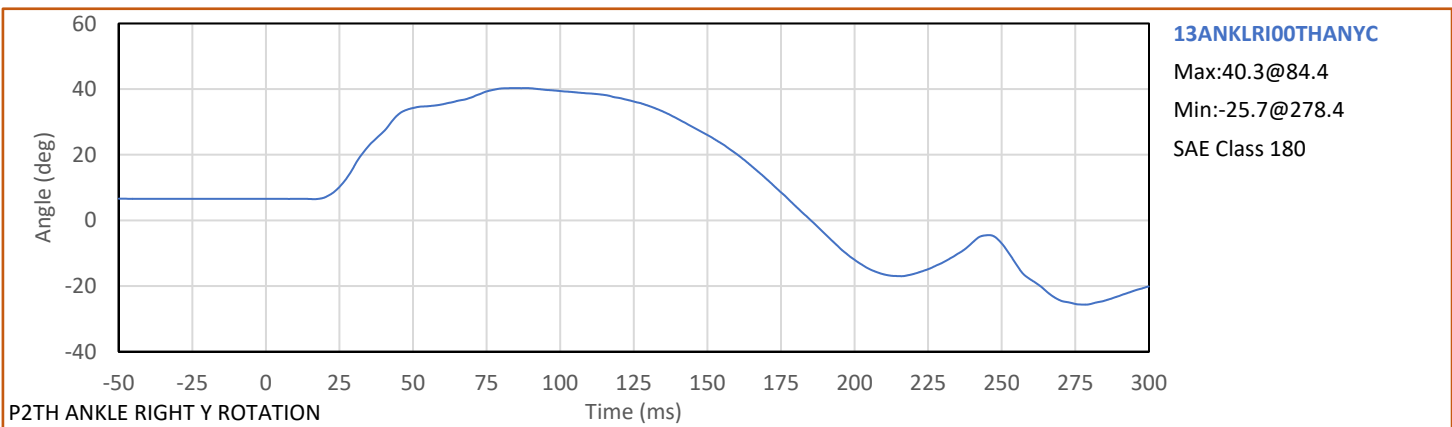
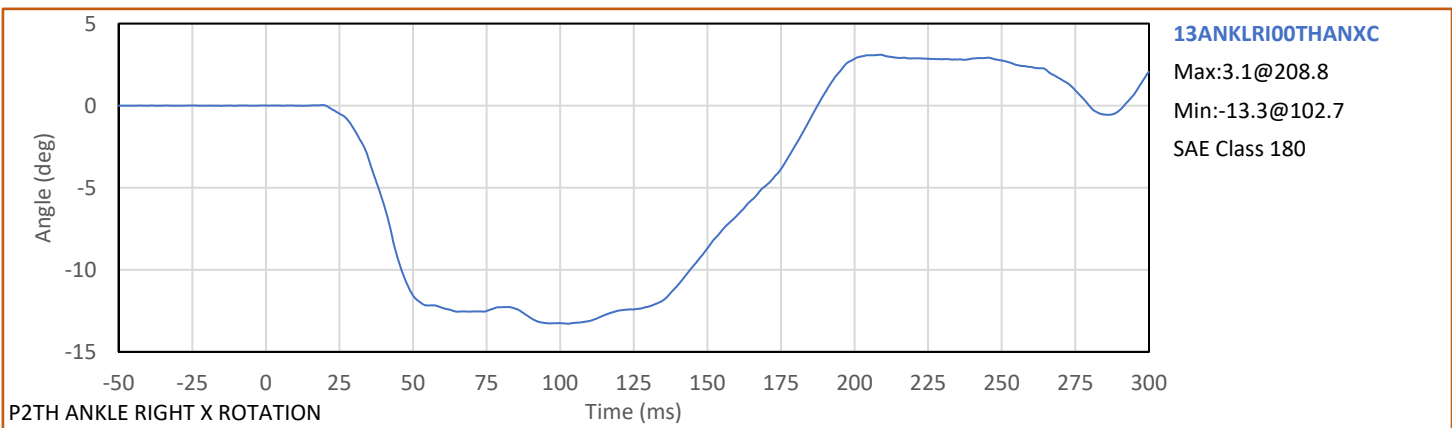
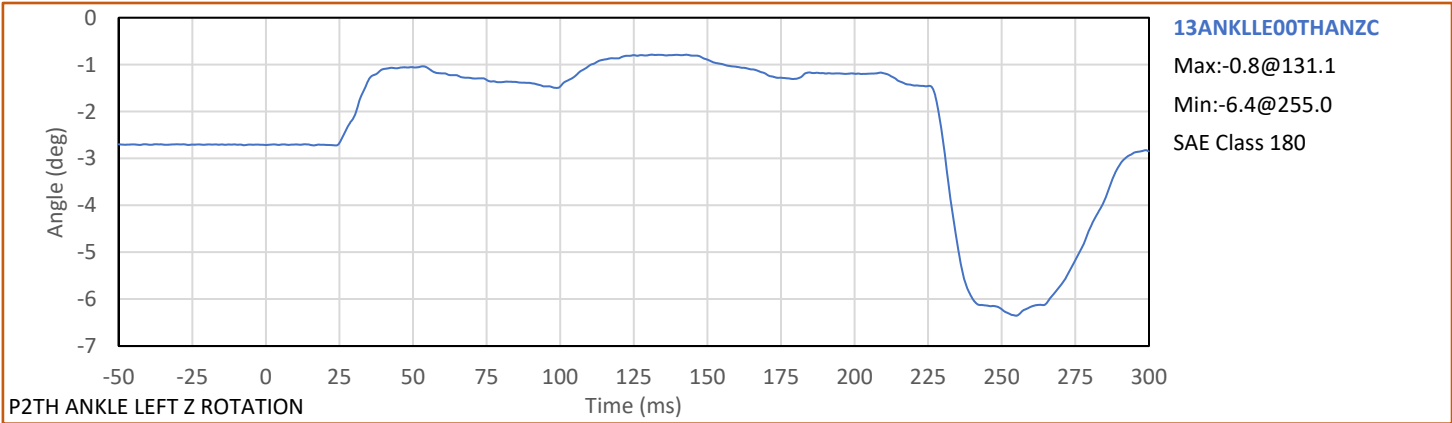


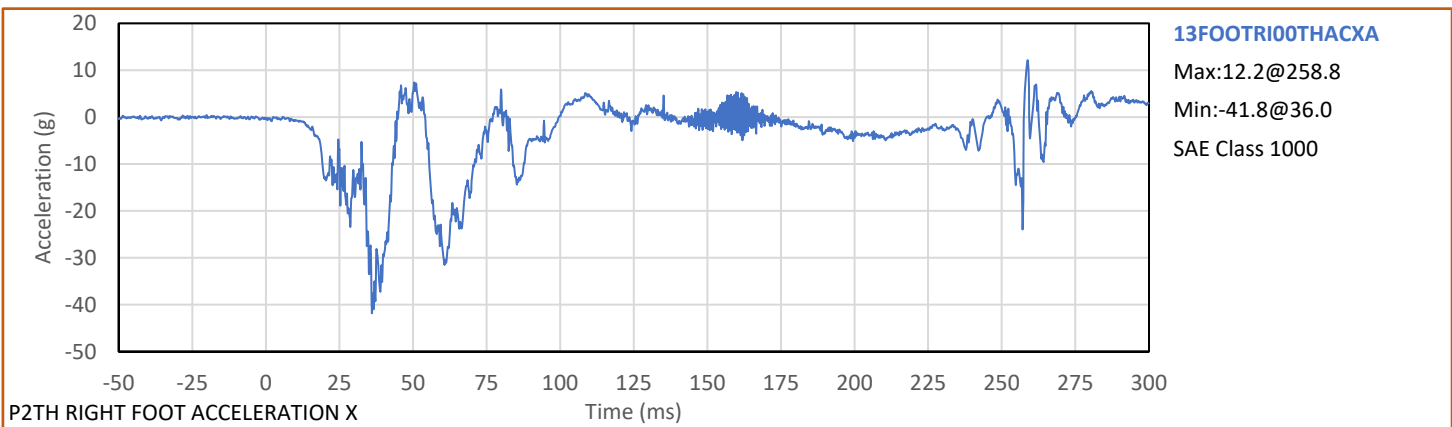
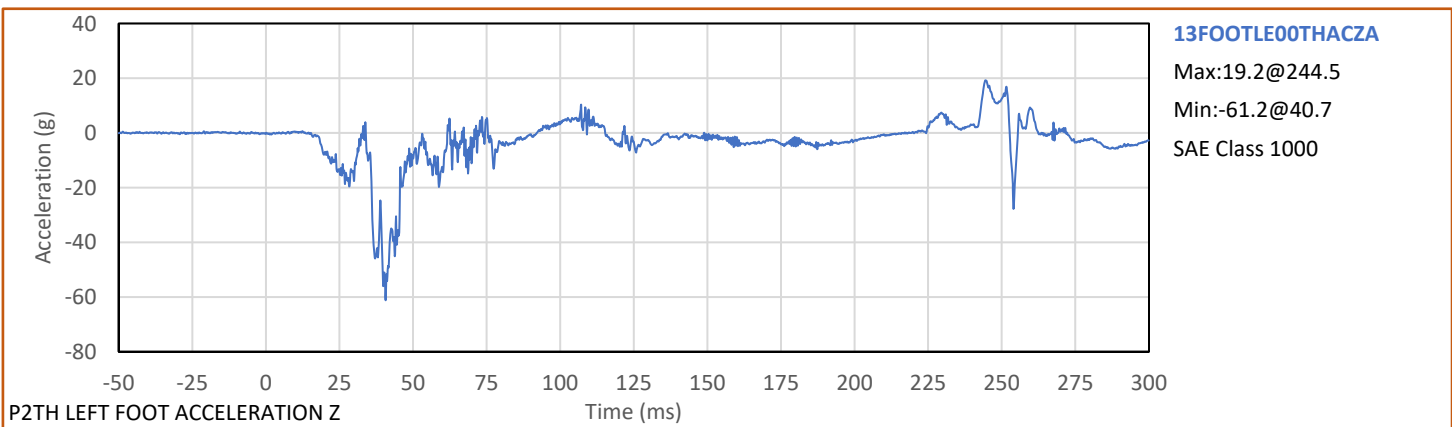
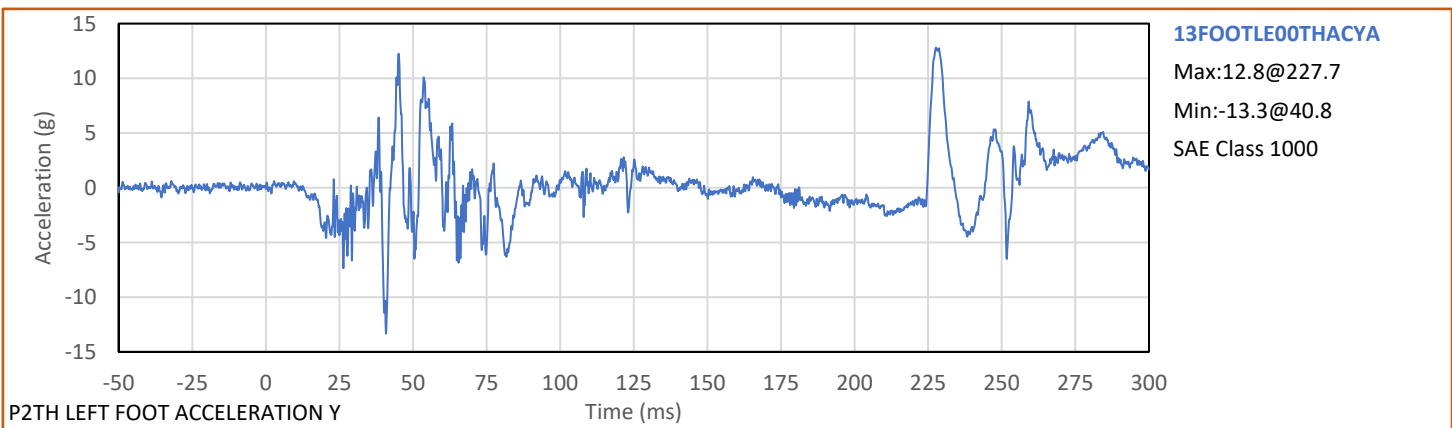
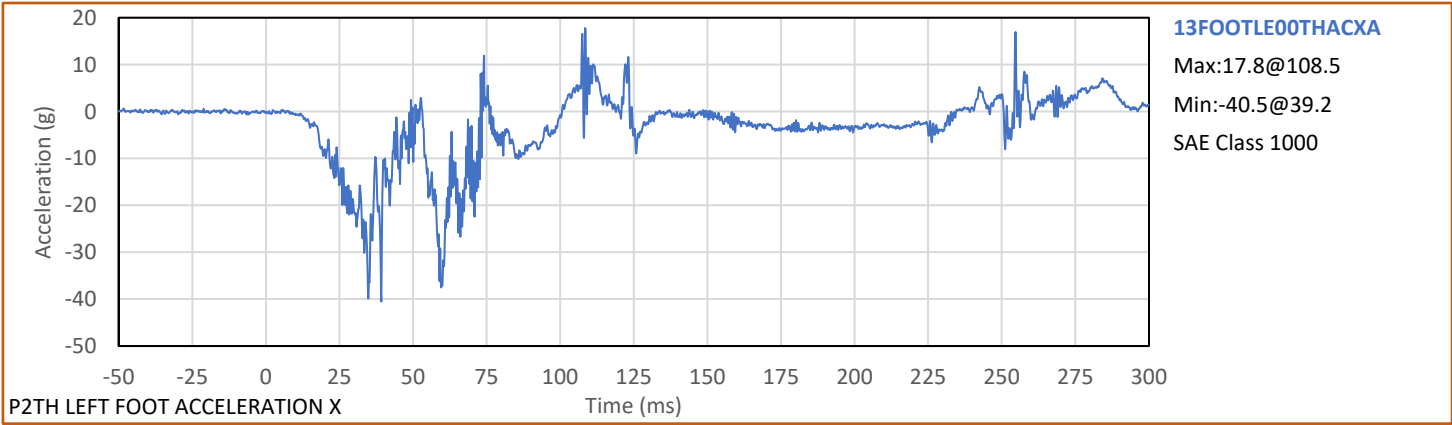


Test Vehicle: 2021 Ford Escape S 5-Door MPV  
Test Program: Full Frontal Rigid Barrier Impact

NHTSA No.: R20210230  
Test Date: 9/22/2021

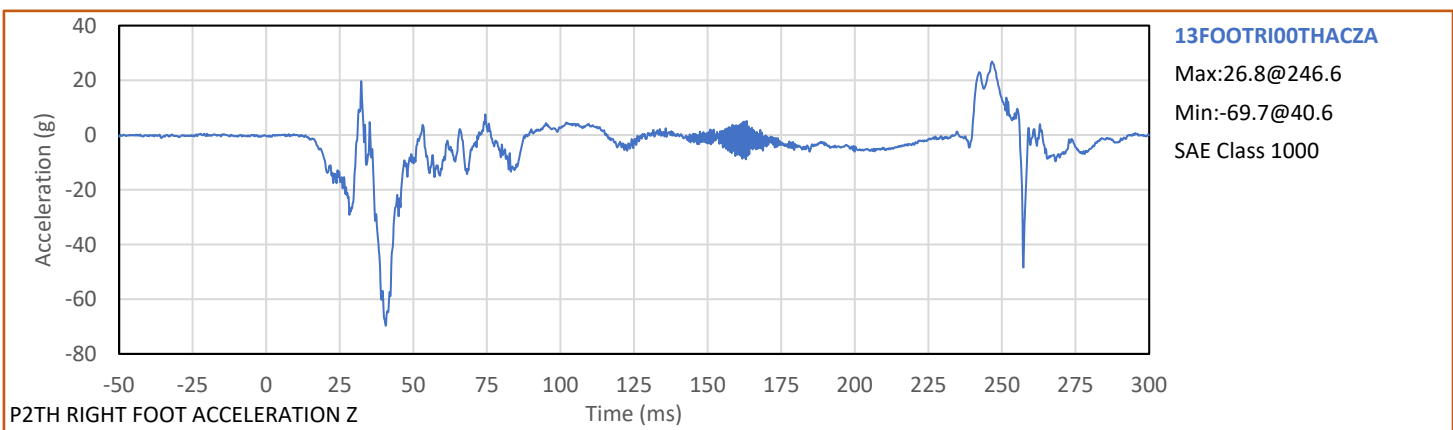
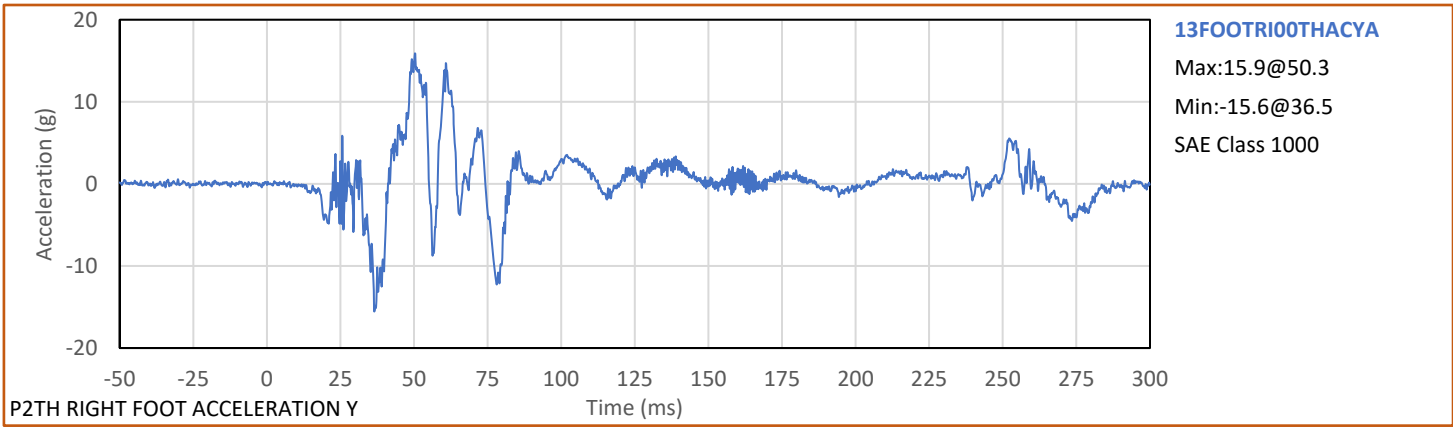


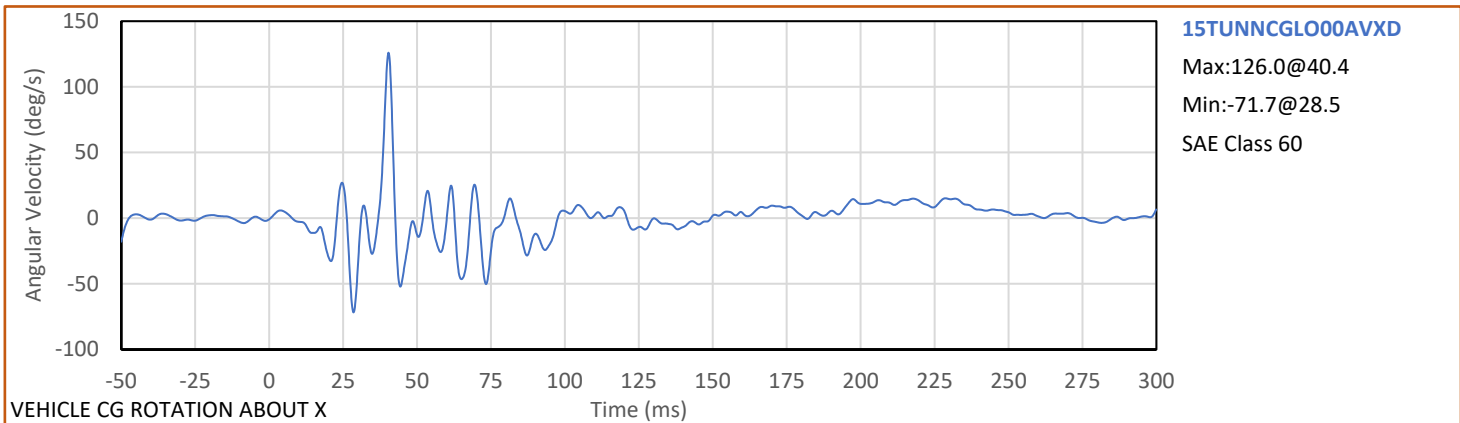
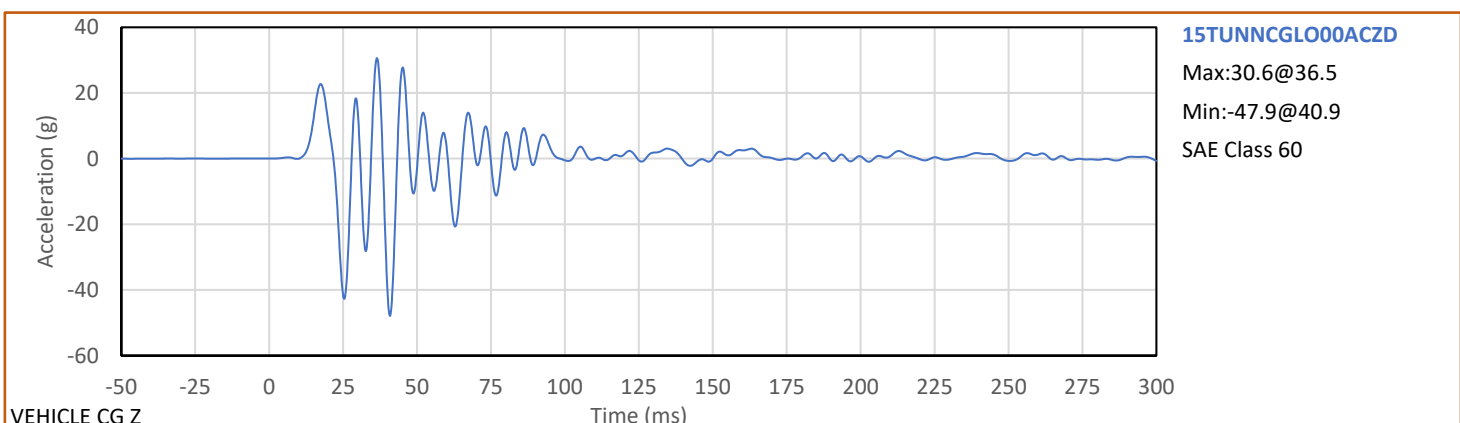
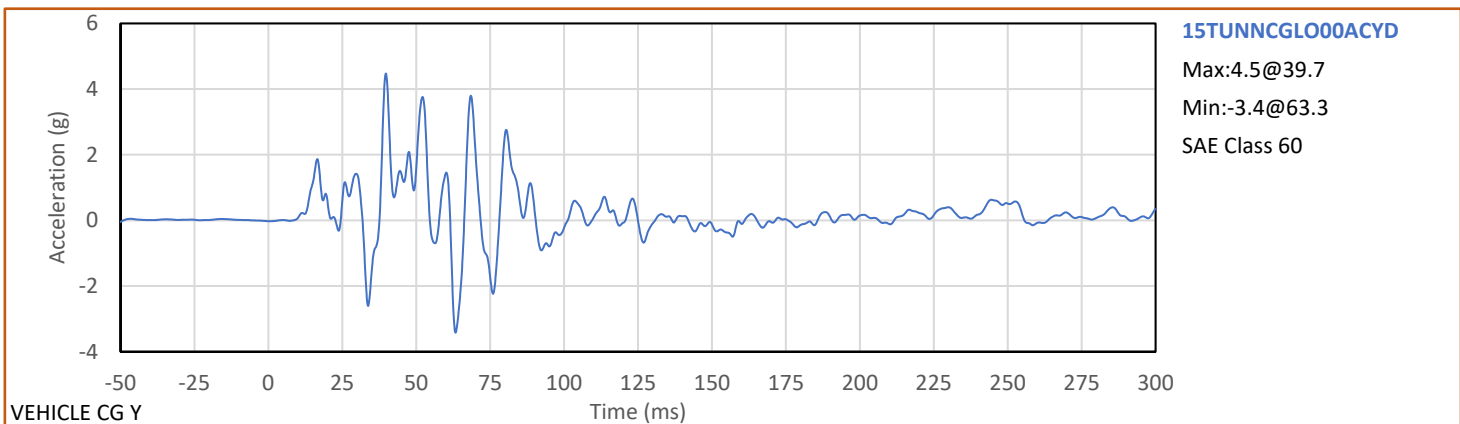
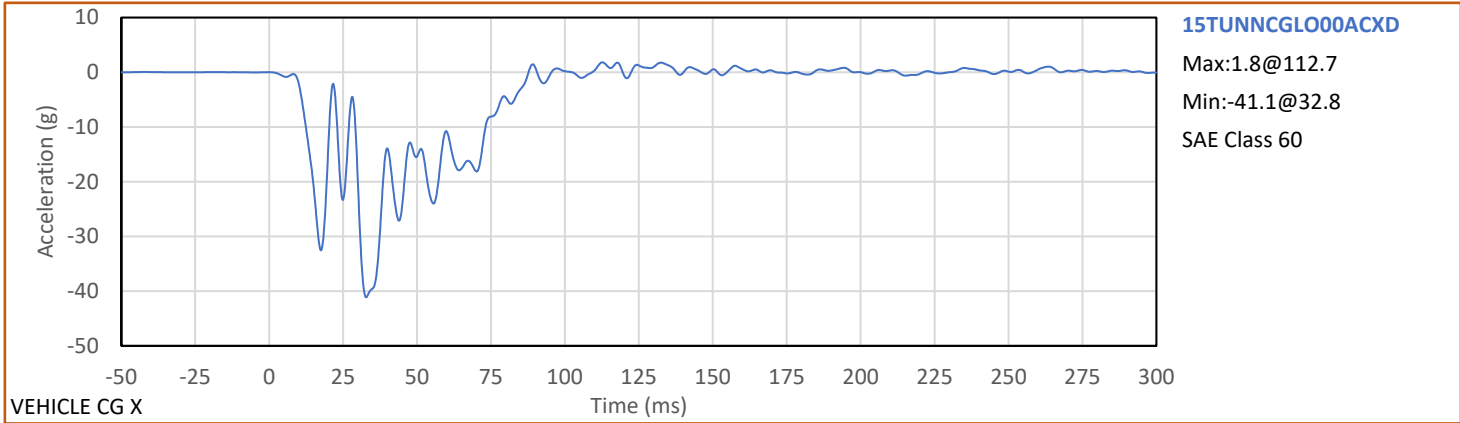


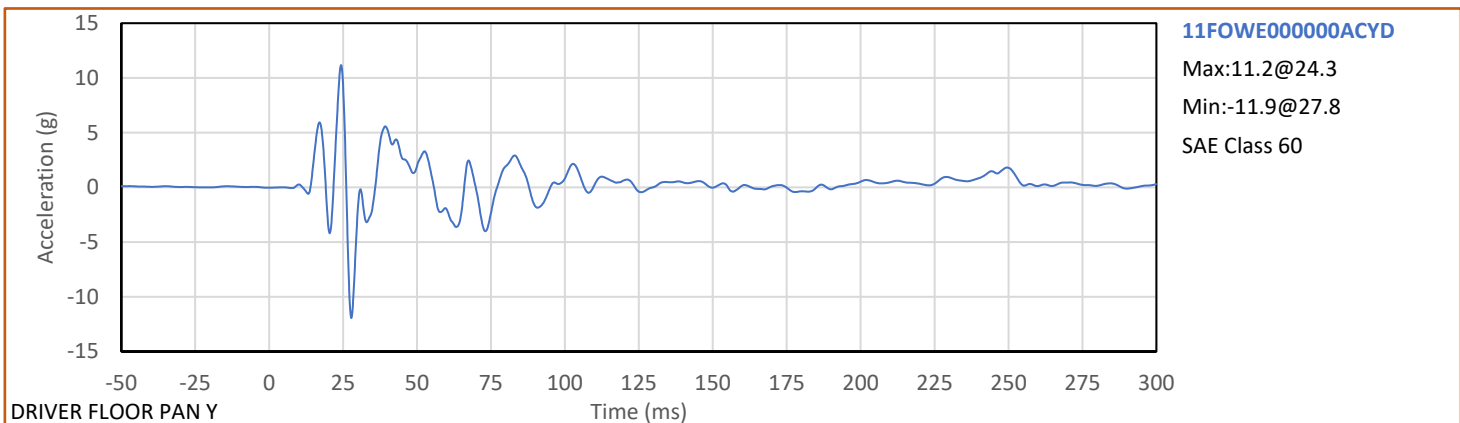
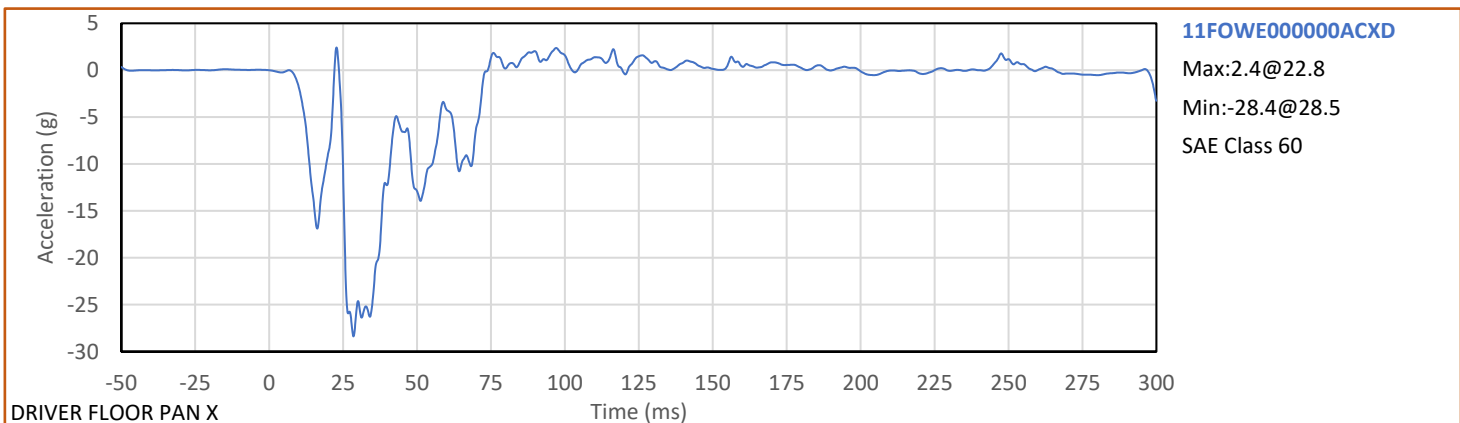
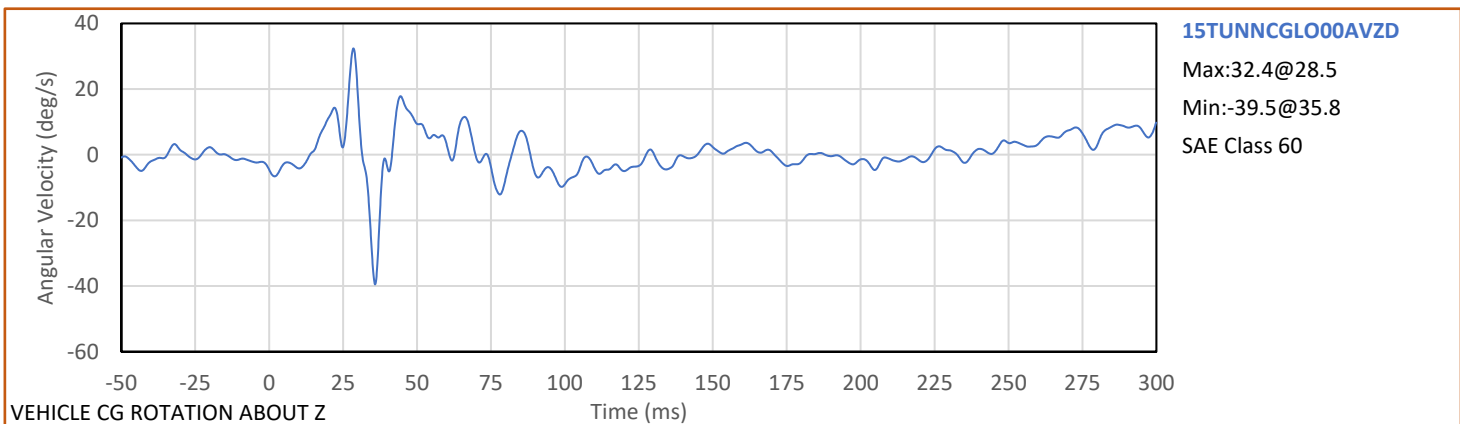
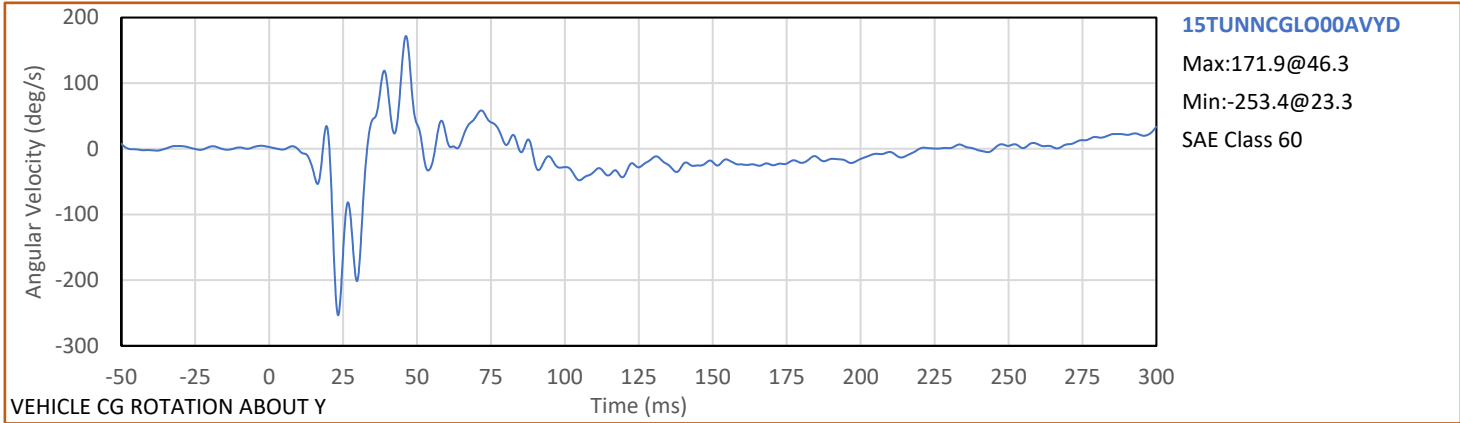


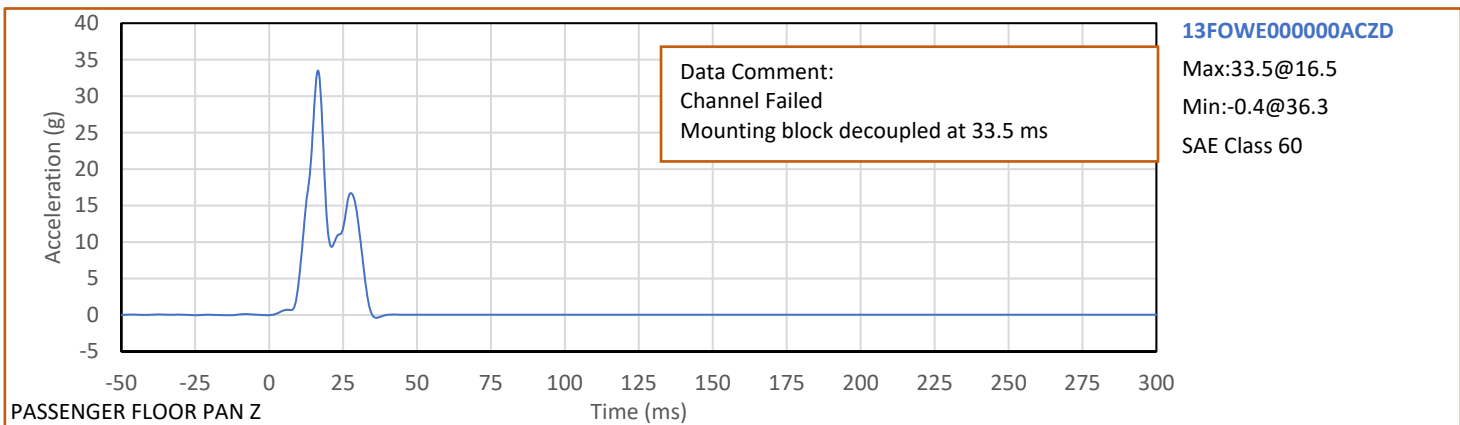
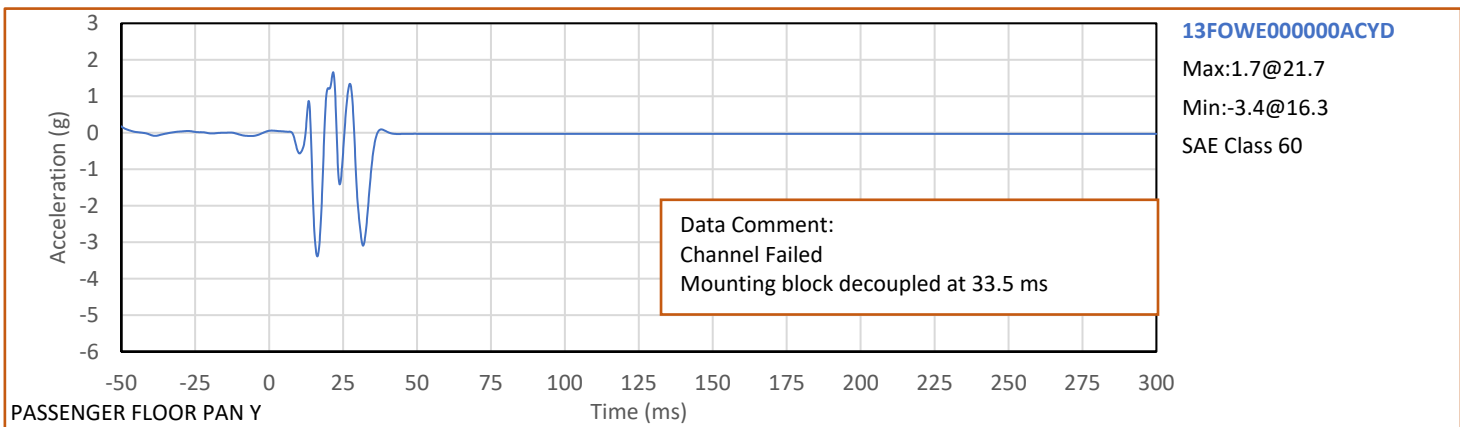
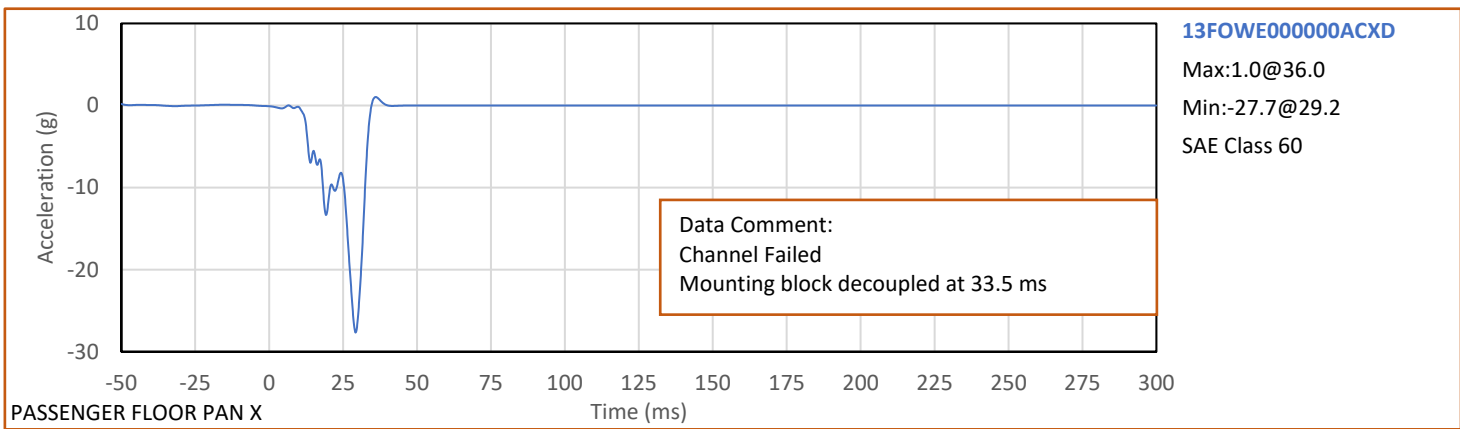
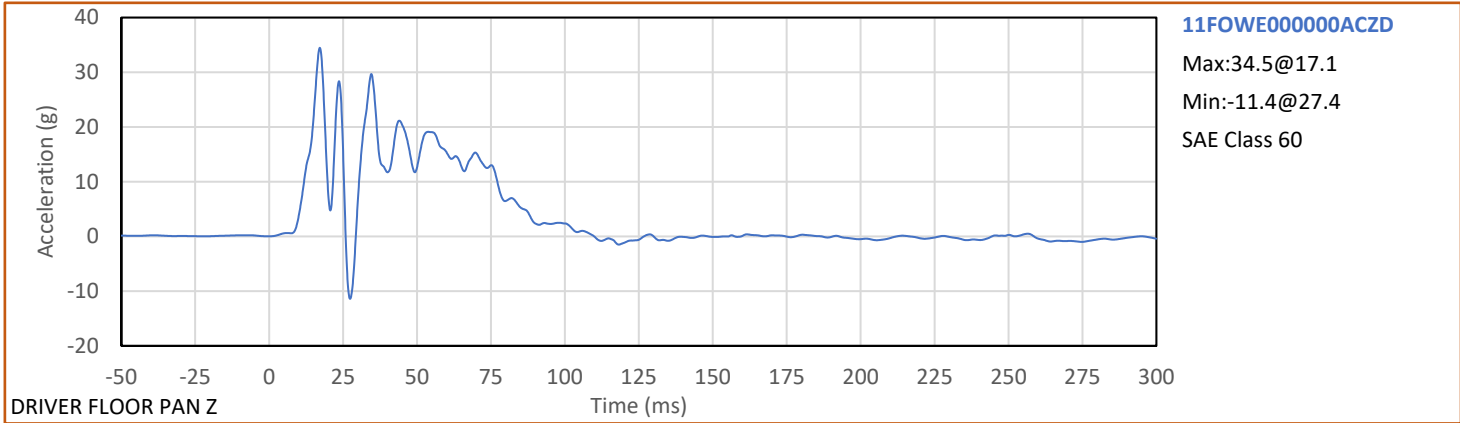
Test Vehicle: 2021 Ford Escape S 5-Door MPV  
Test Program: Full Frontal Rigid Barrier Impact

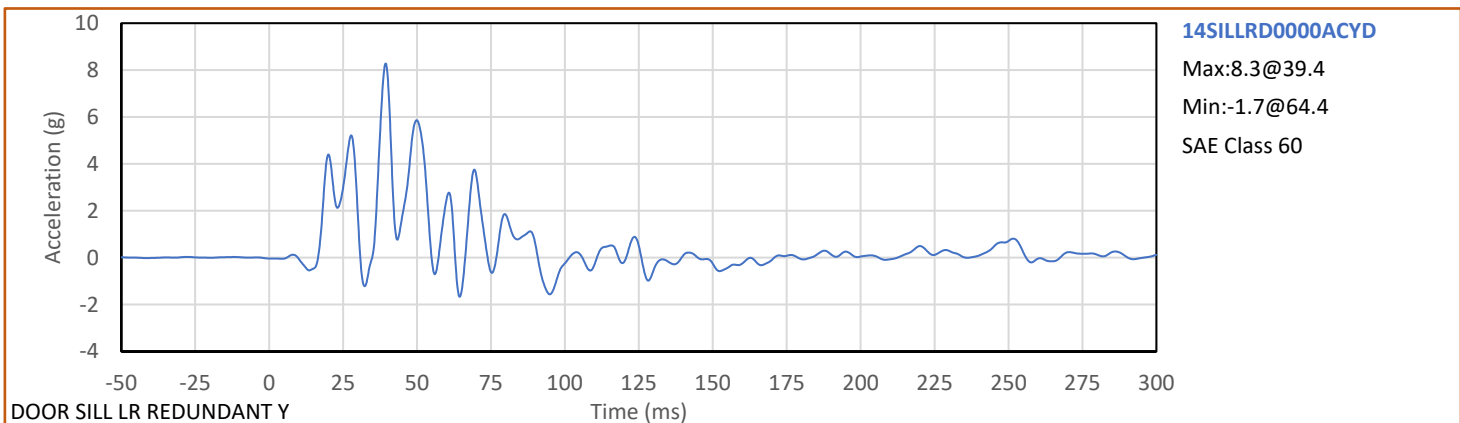
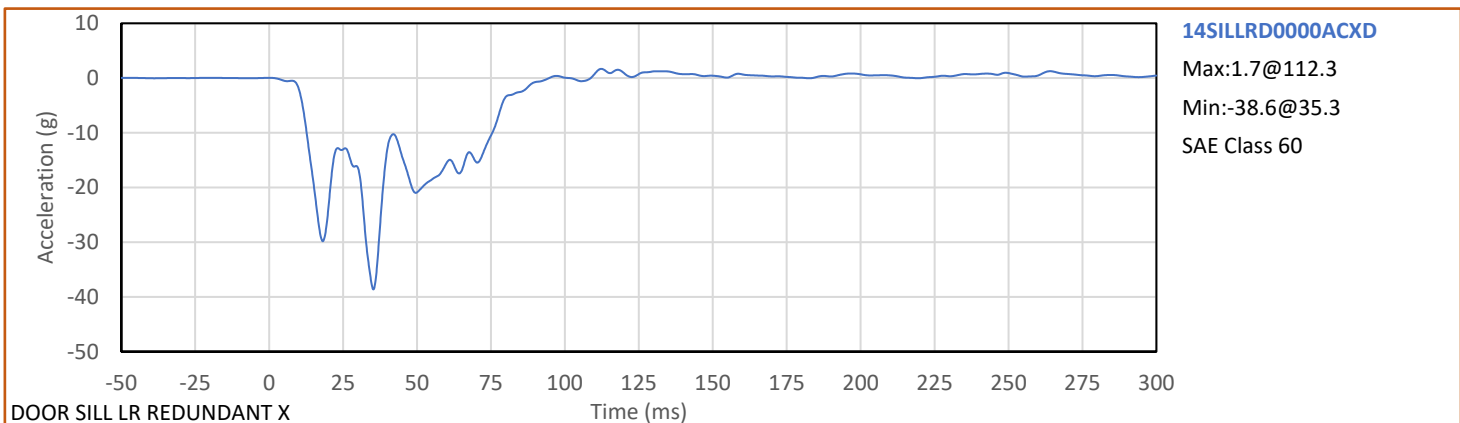
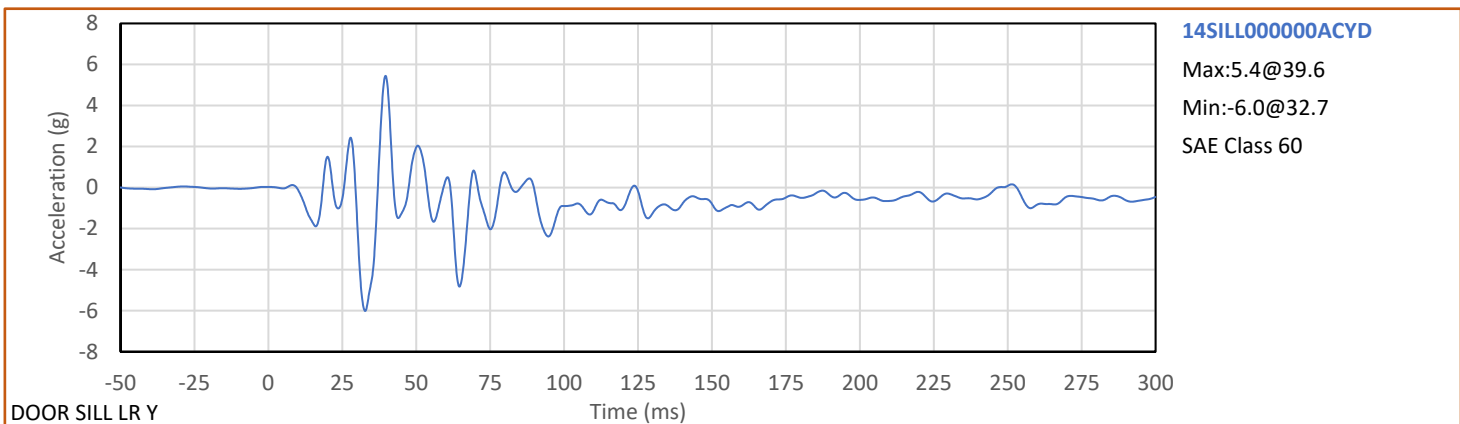
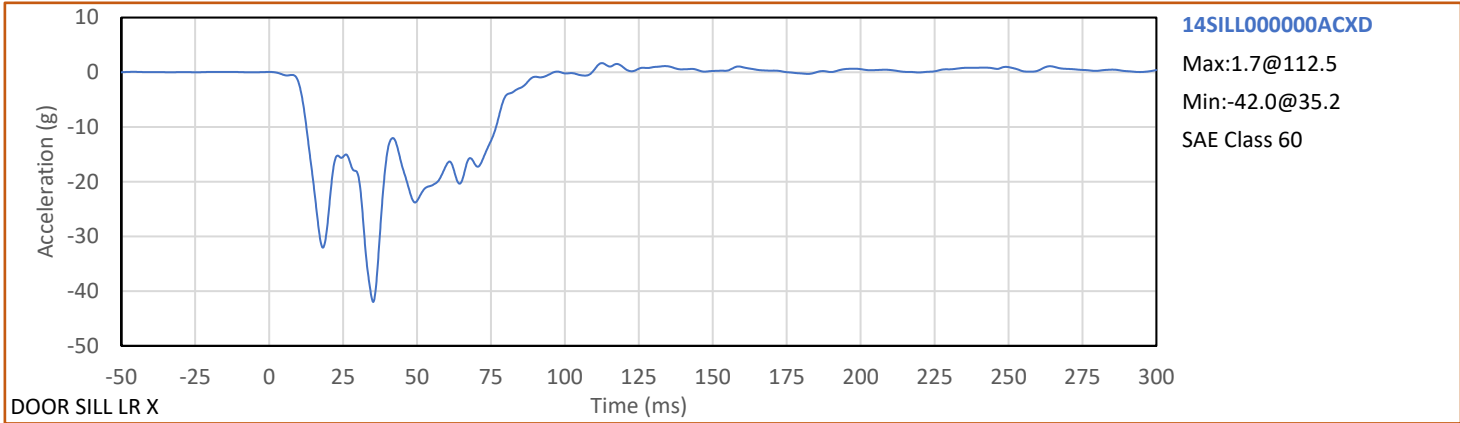
NHTSA No.: R20210230  
Test Date: 9/22/2021

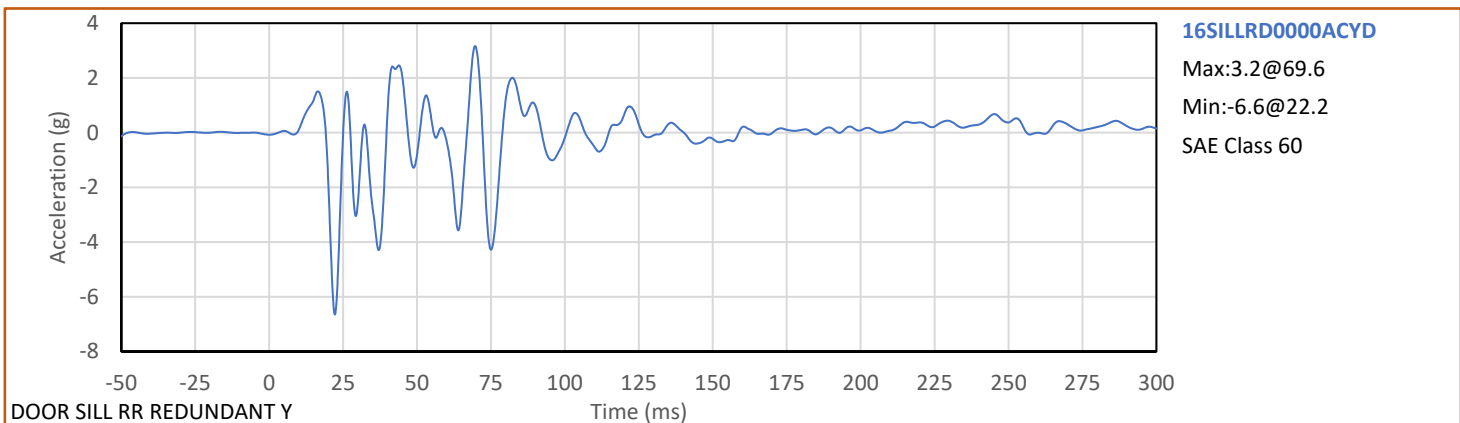
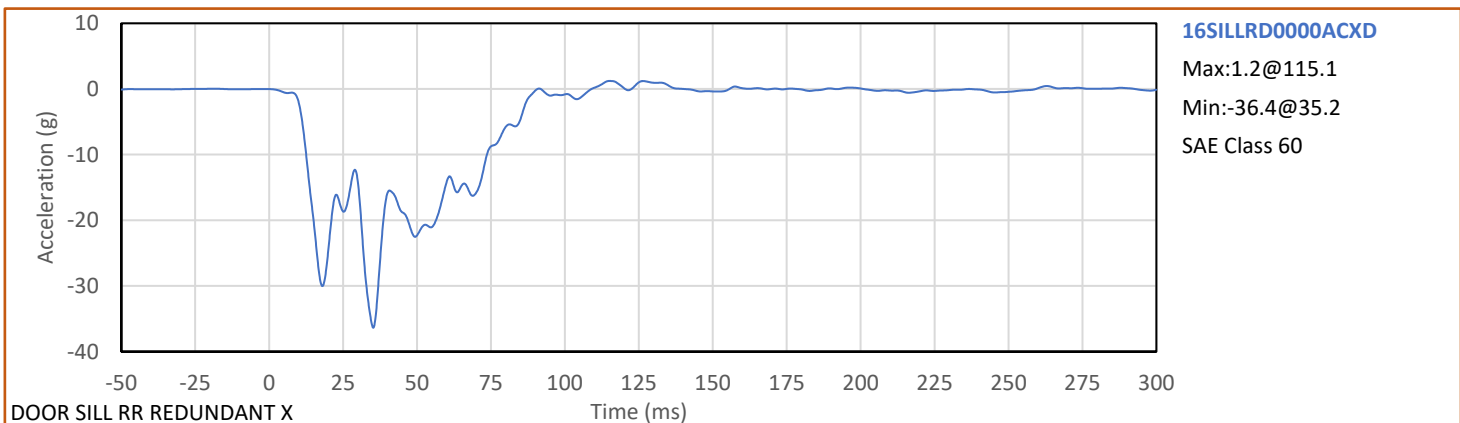
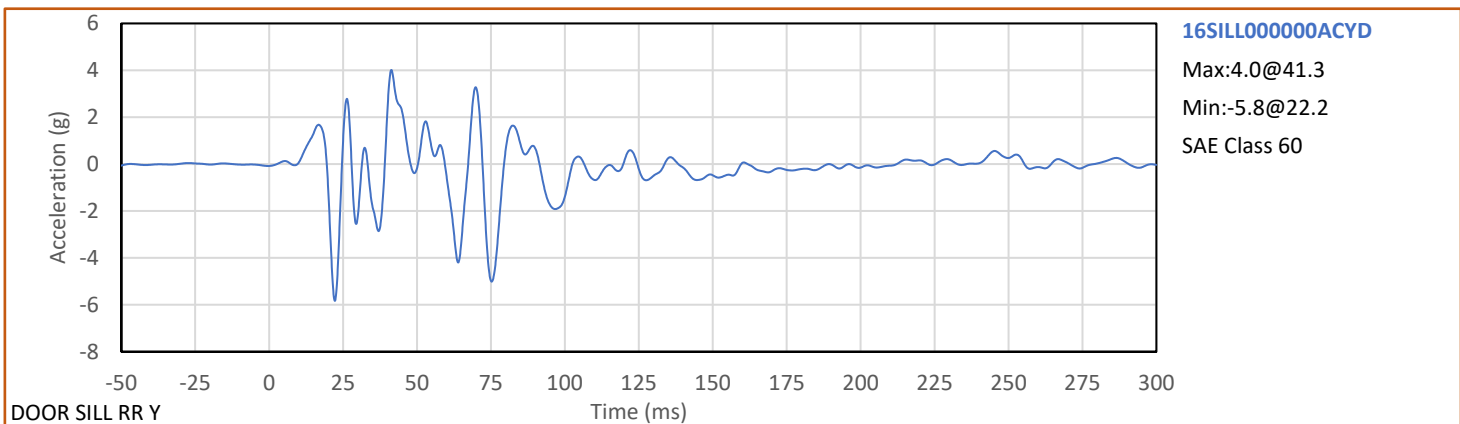
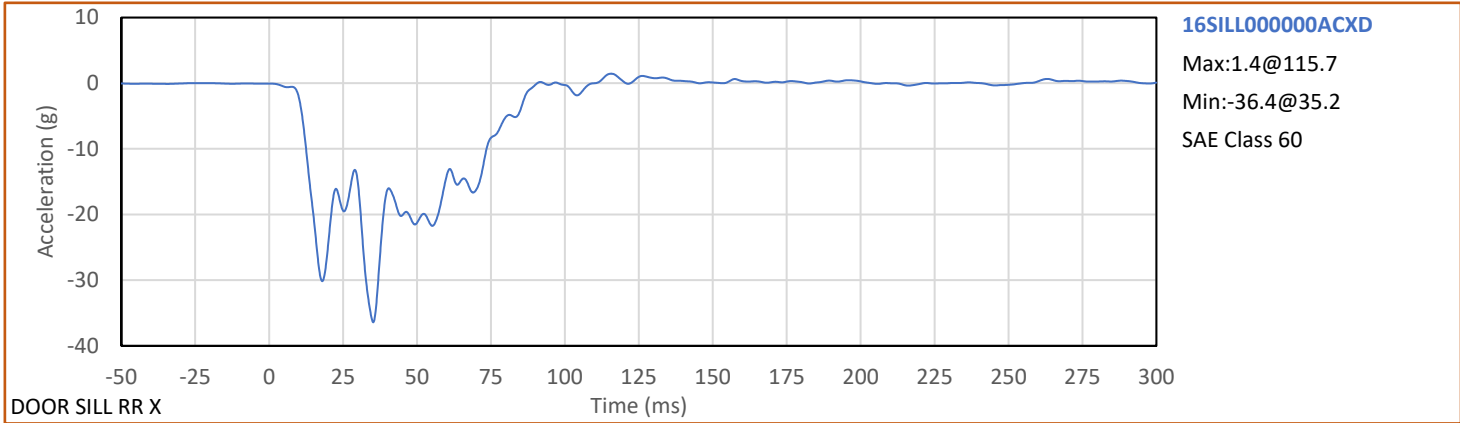






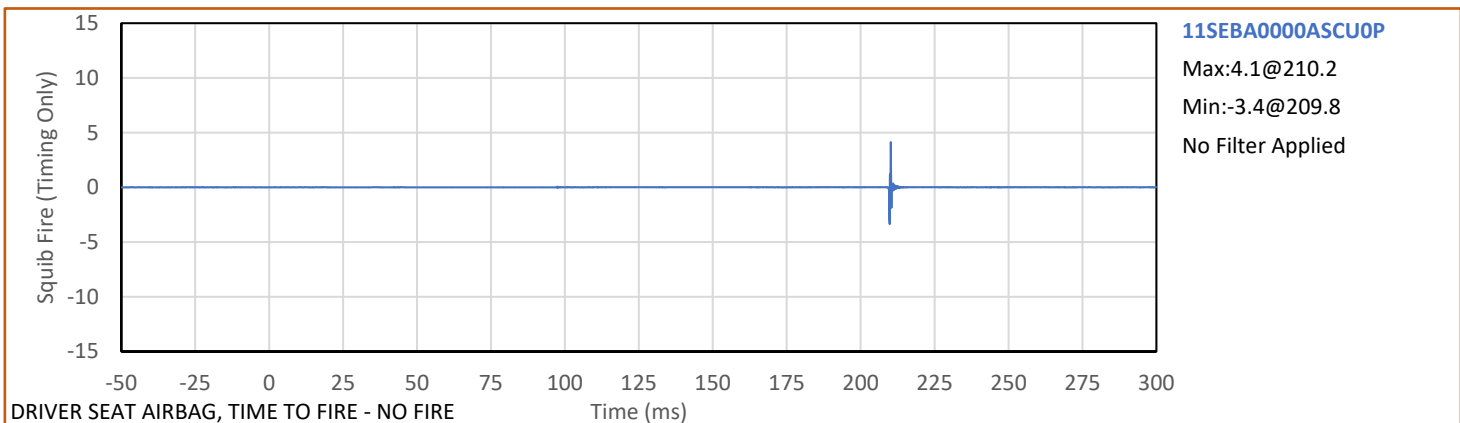
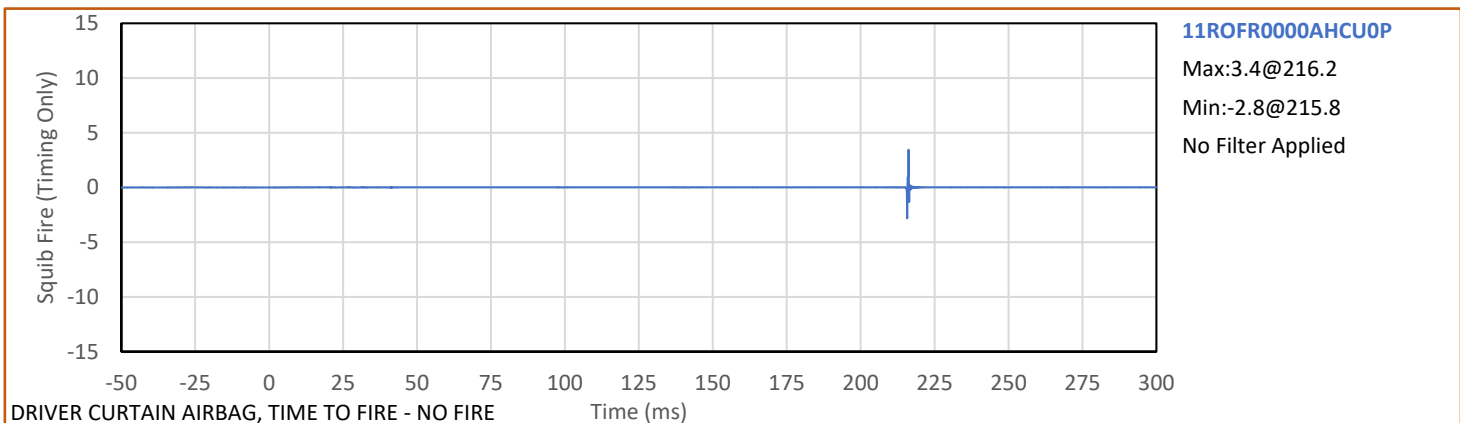
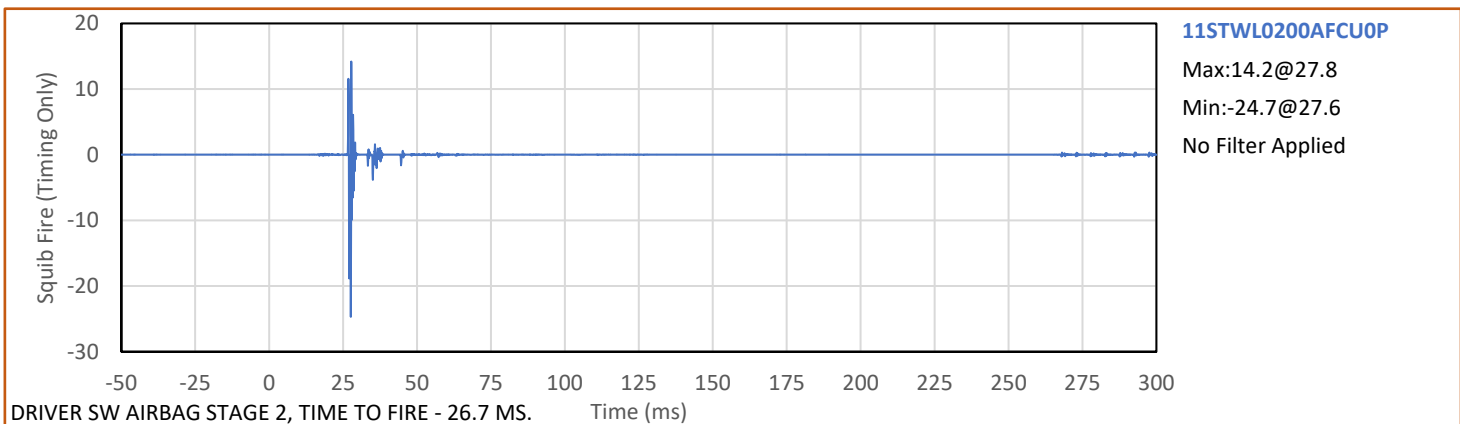
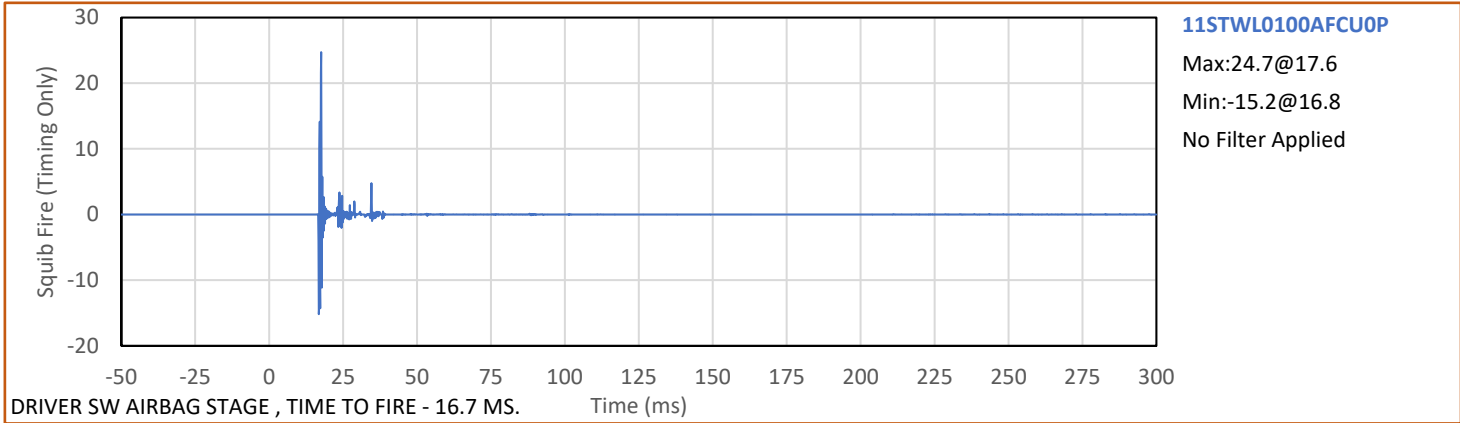


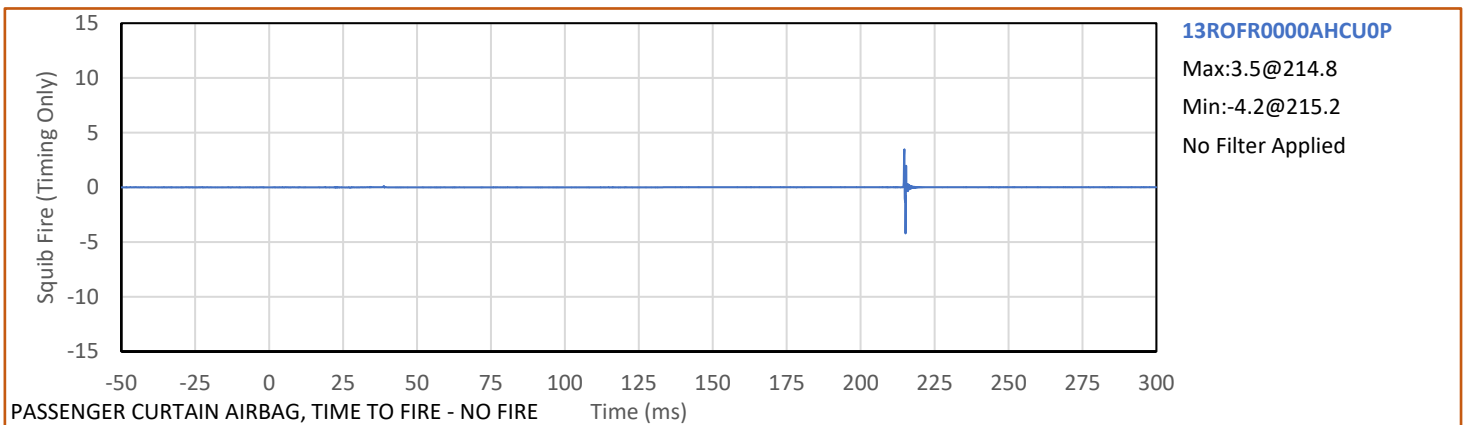
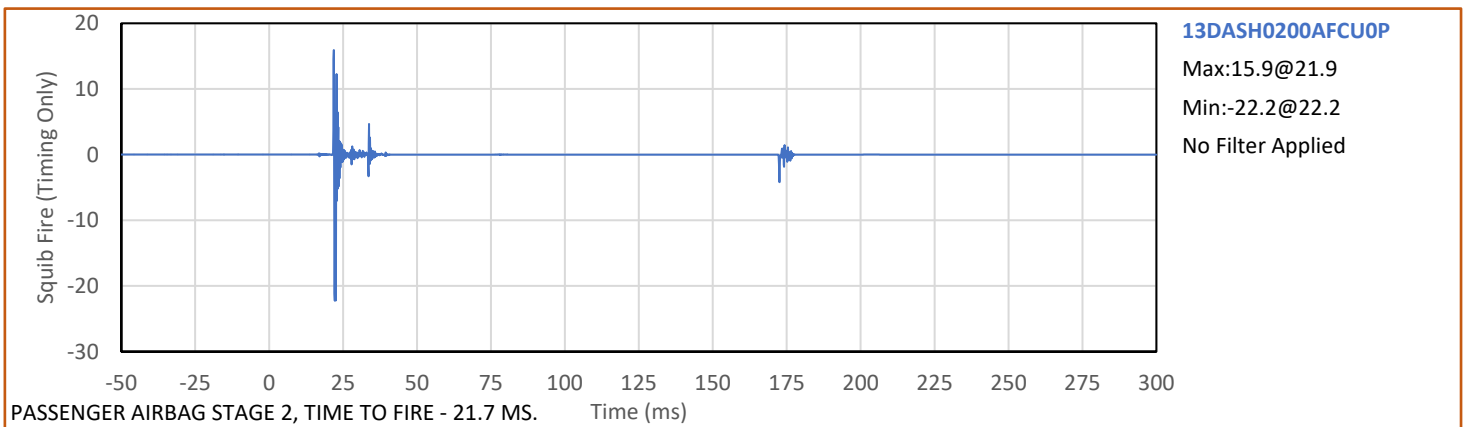
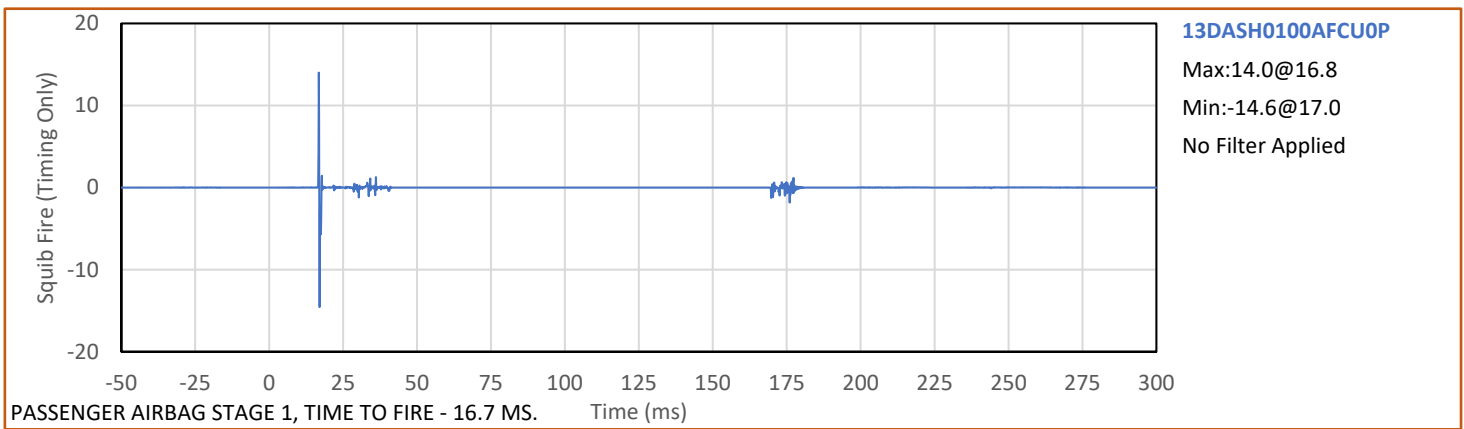
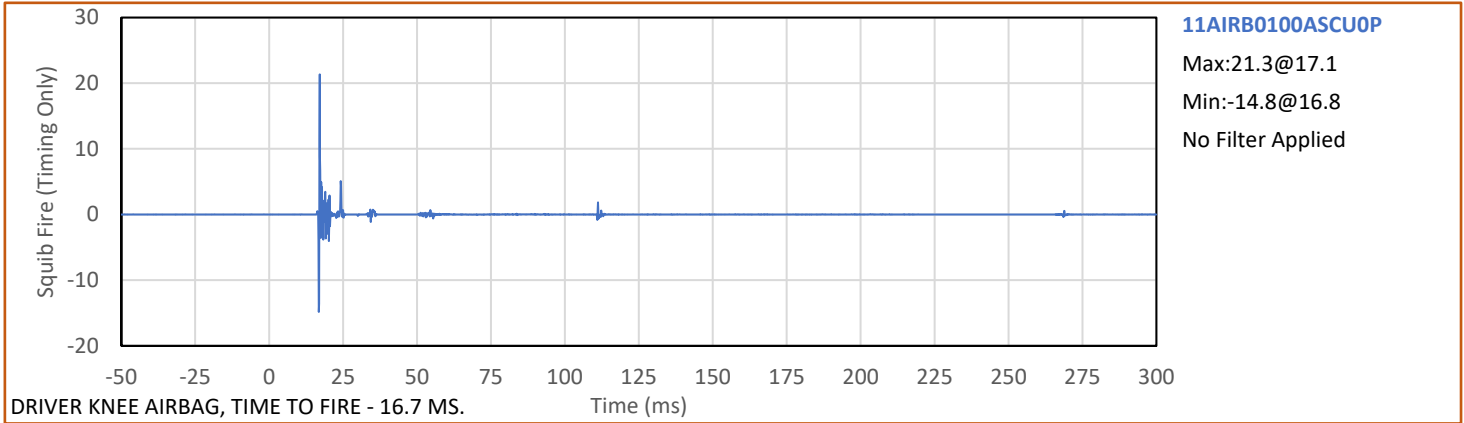




Test Vehicle: 2021 Ford Escape S 5-Door MPV  
Test Program: Full Frontal Rigid Barrier Impact

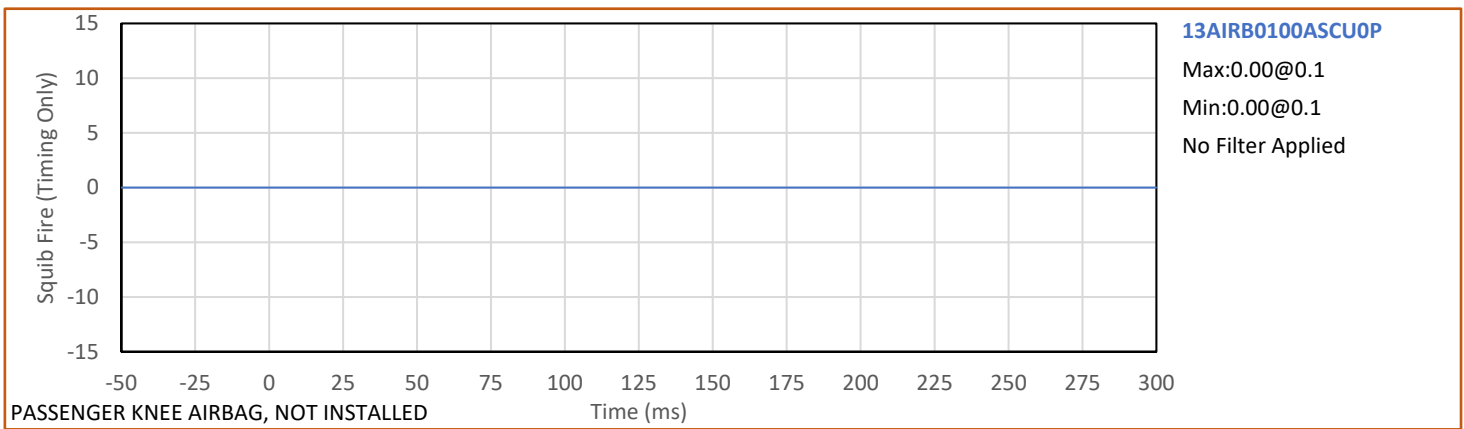
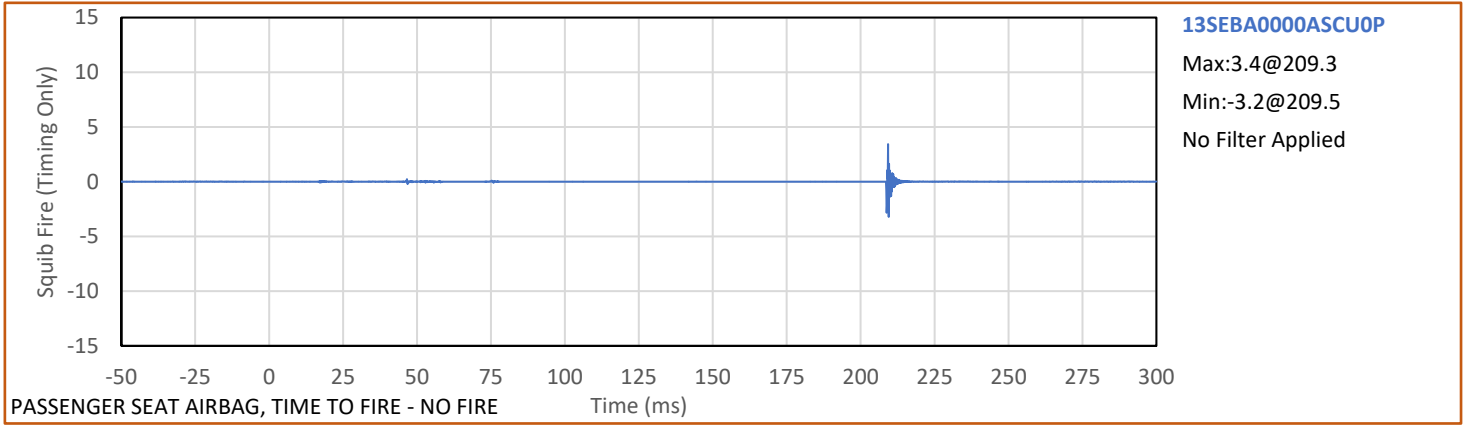
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Test Date: 9/22/2021

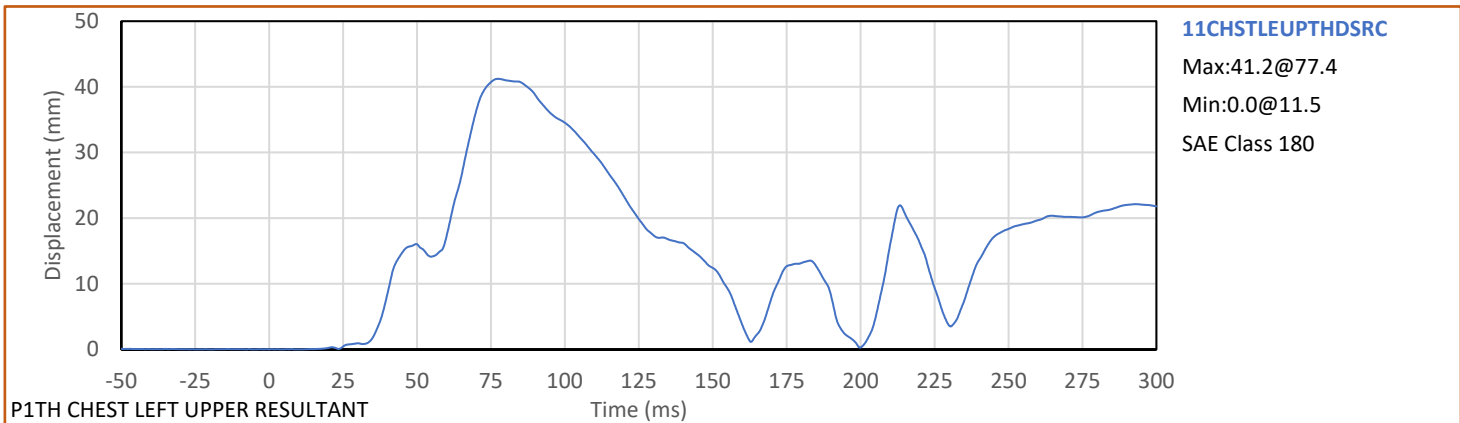
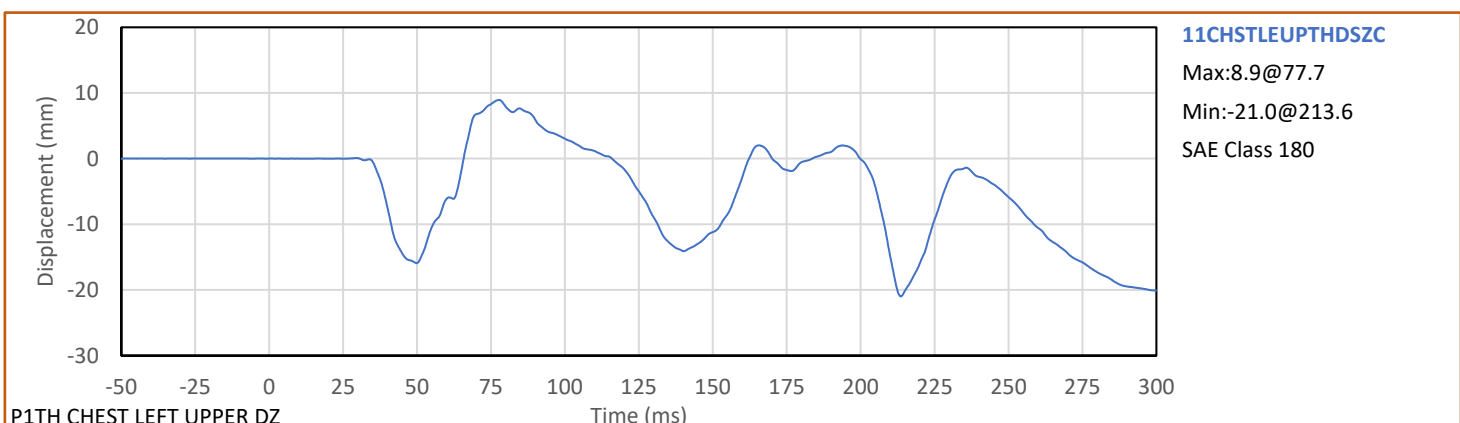
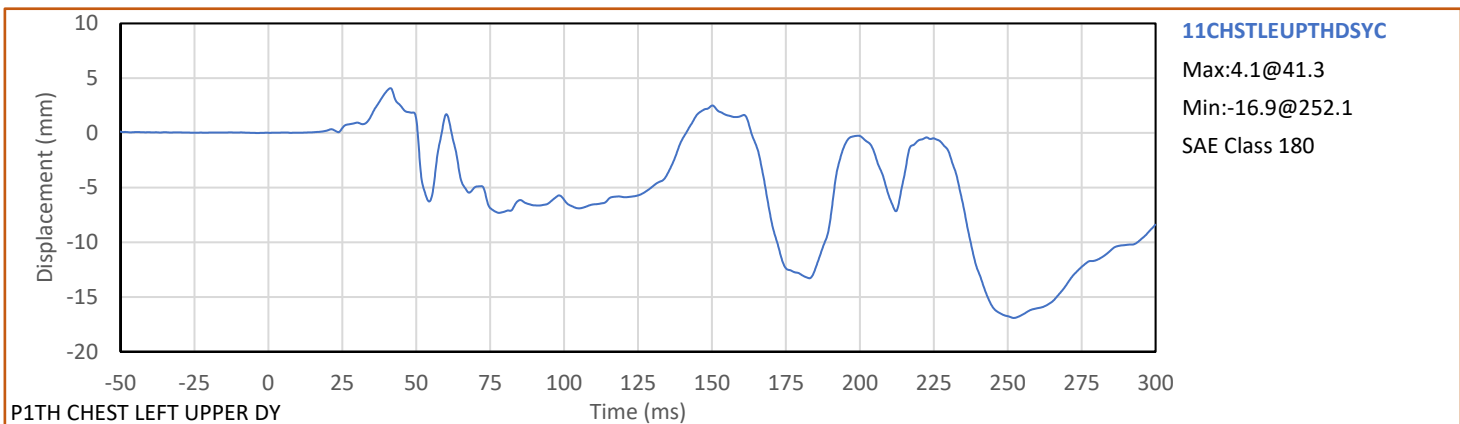
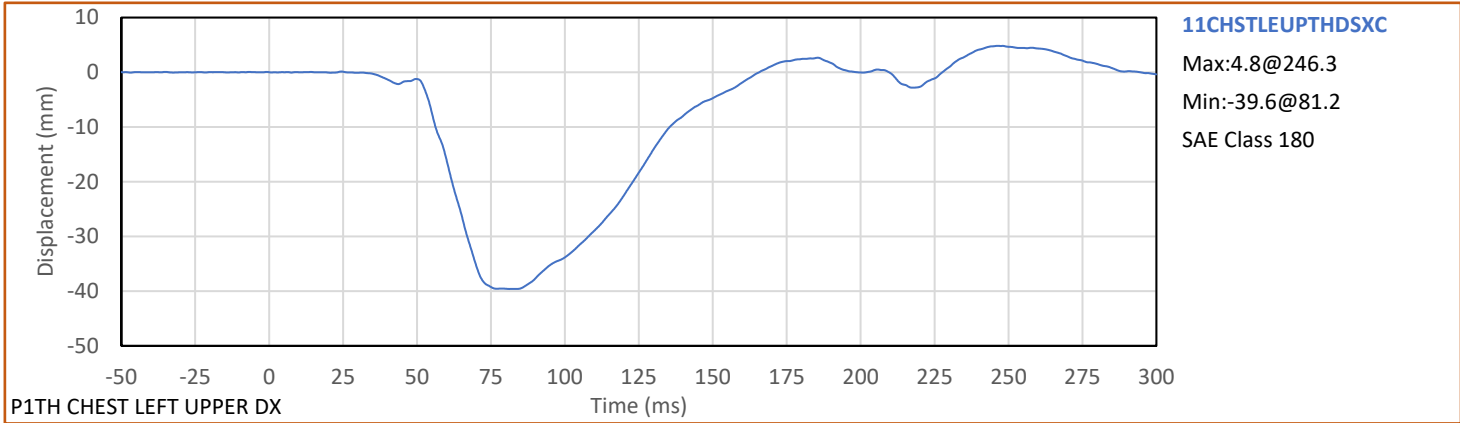


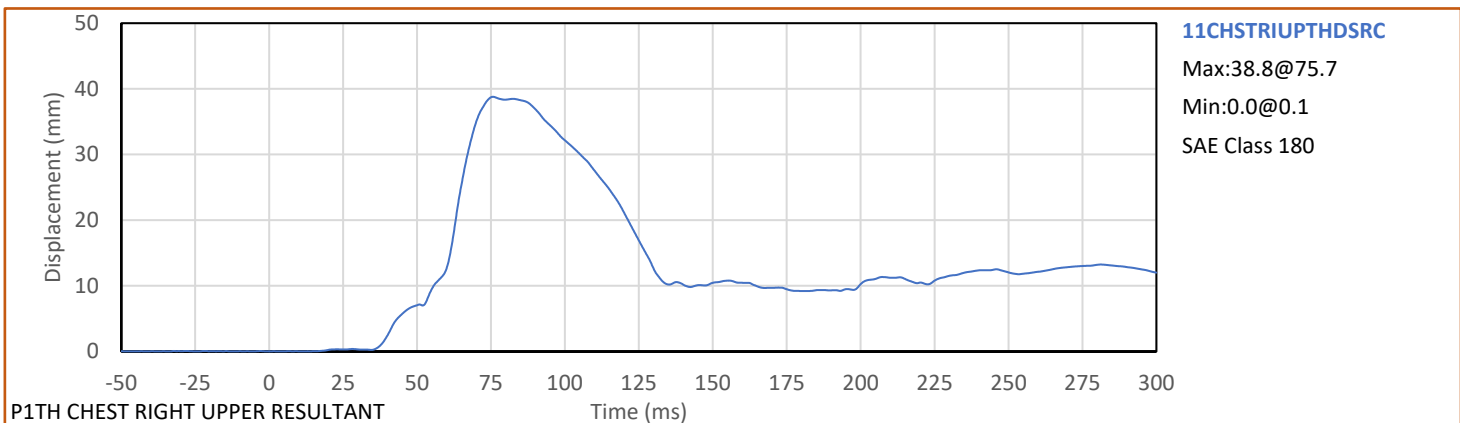
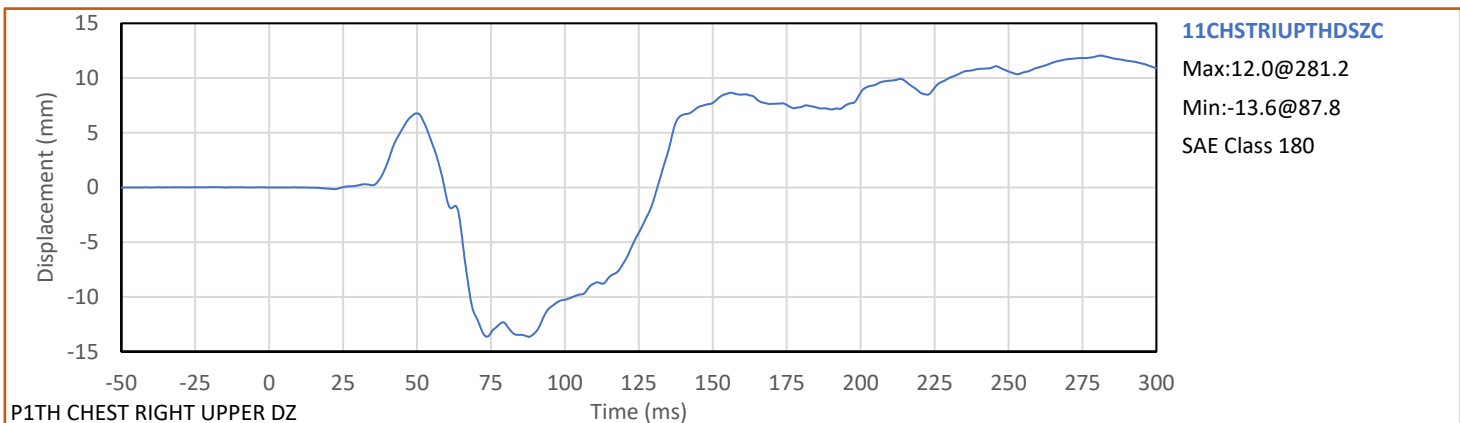
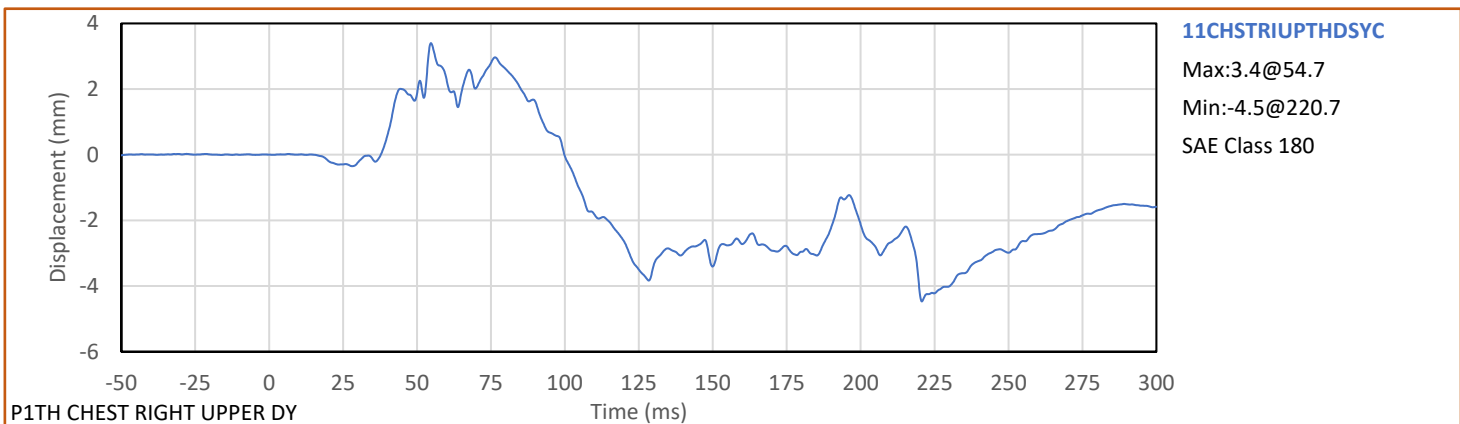
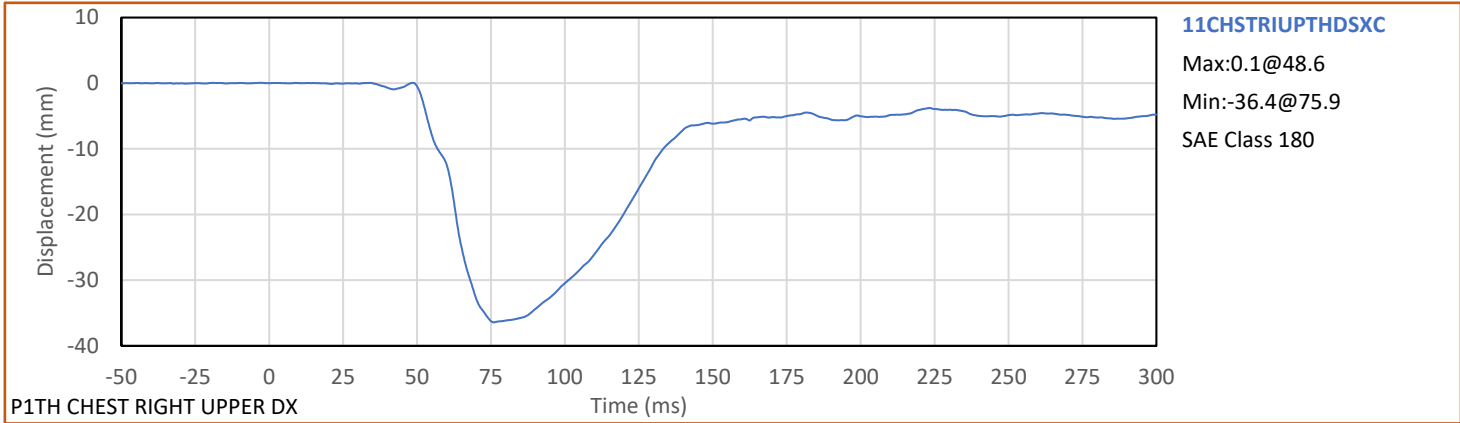


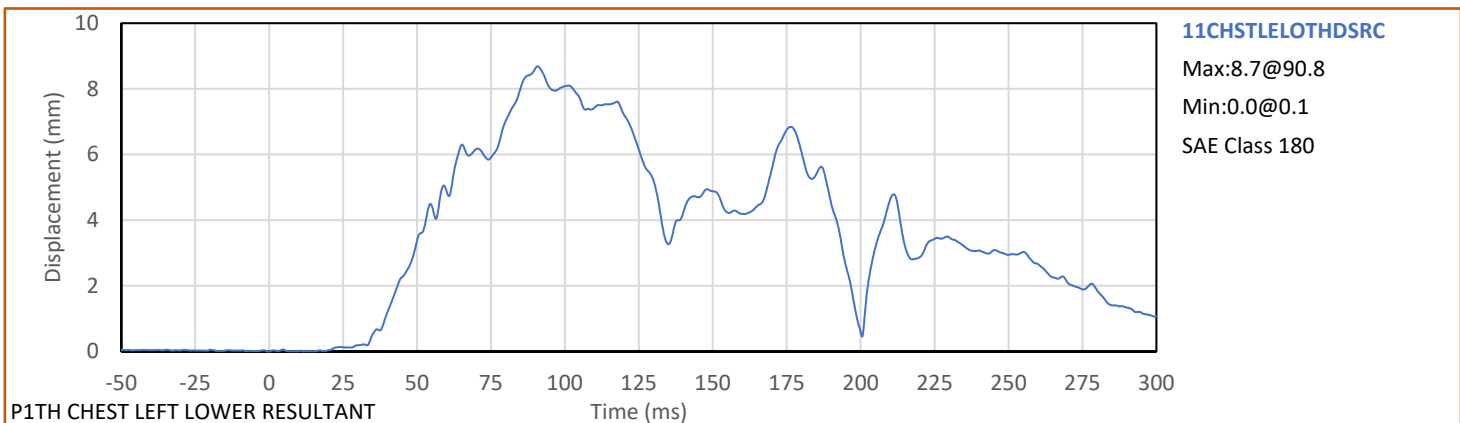
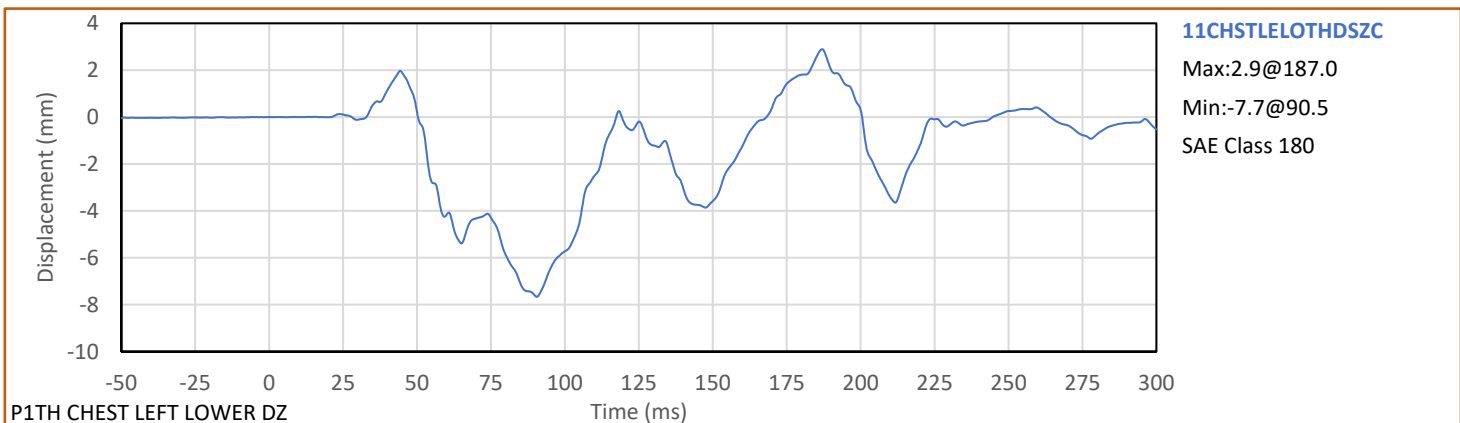
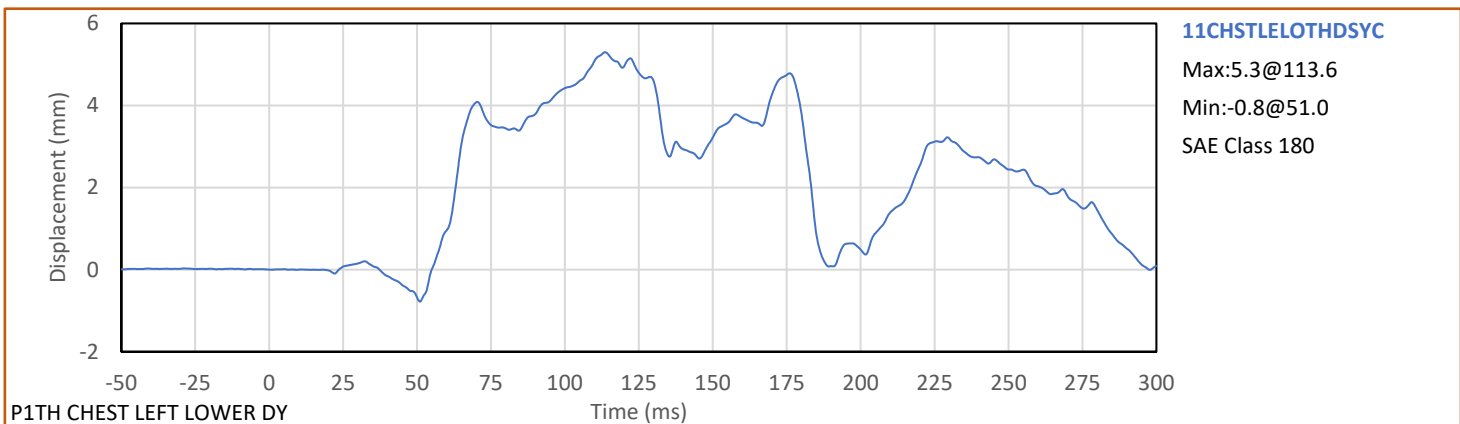
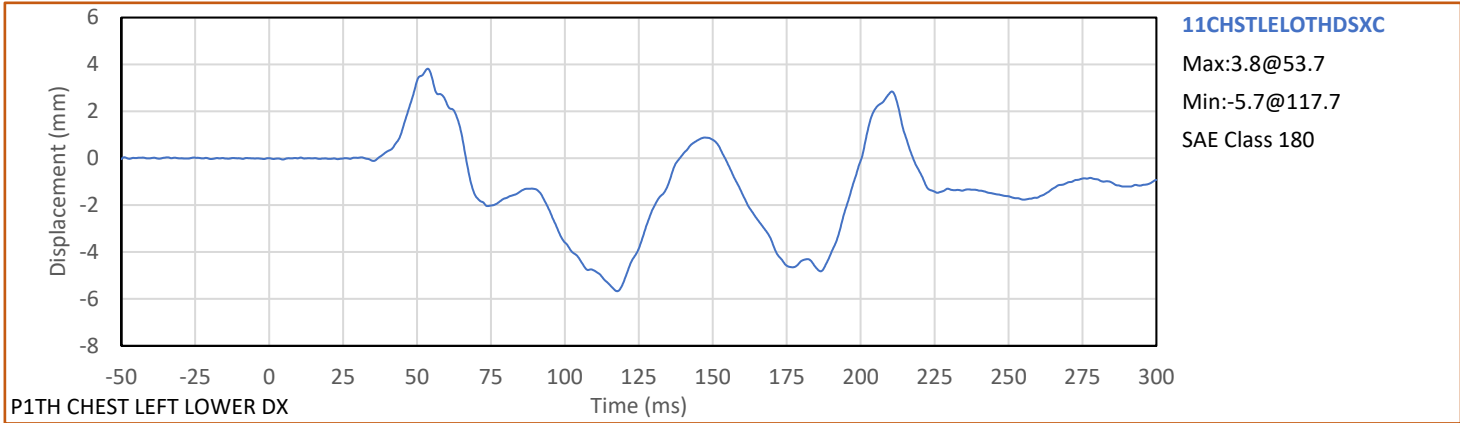
Test Vehicle: 2021 Ford Escape S 5-Door MPV  
Test Program: Full Frontal Rigid Barrier Impact

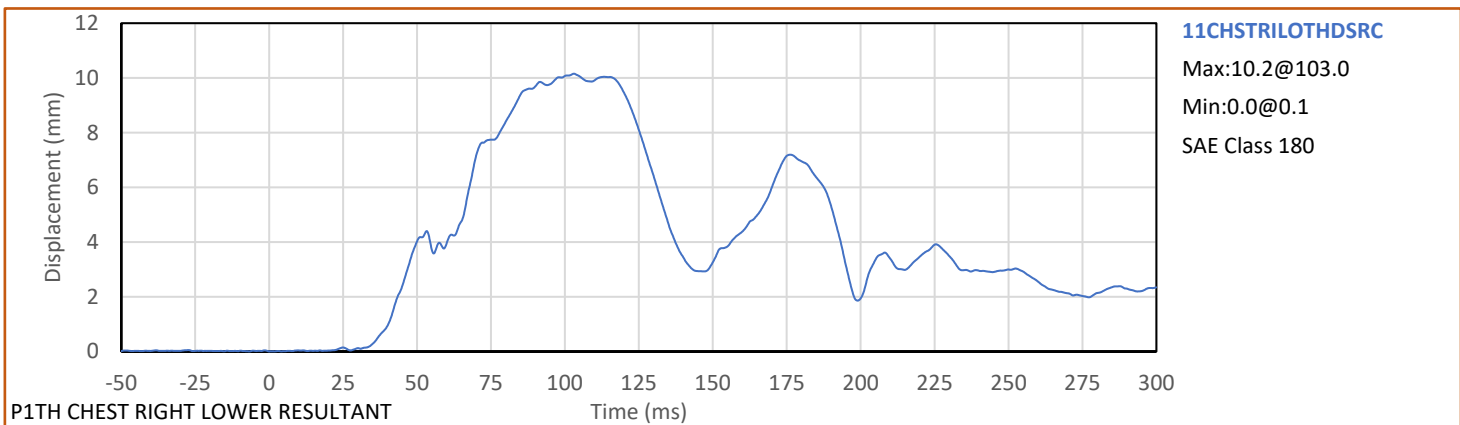
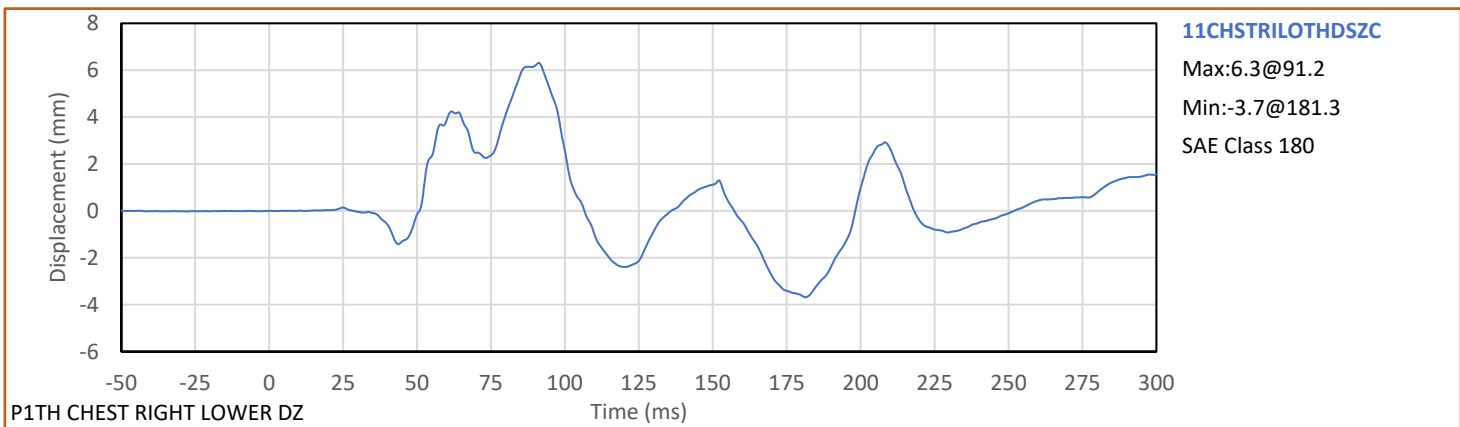
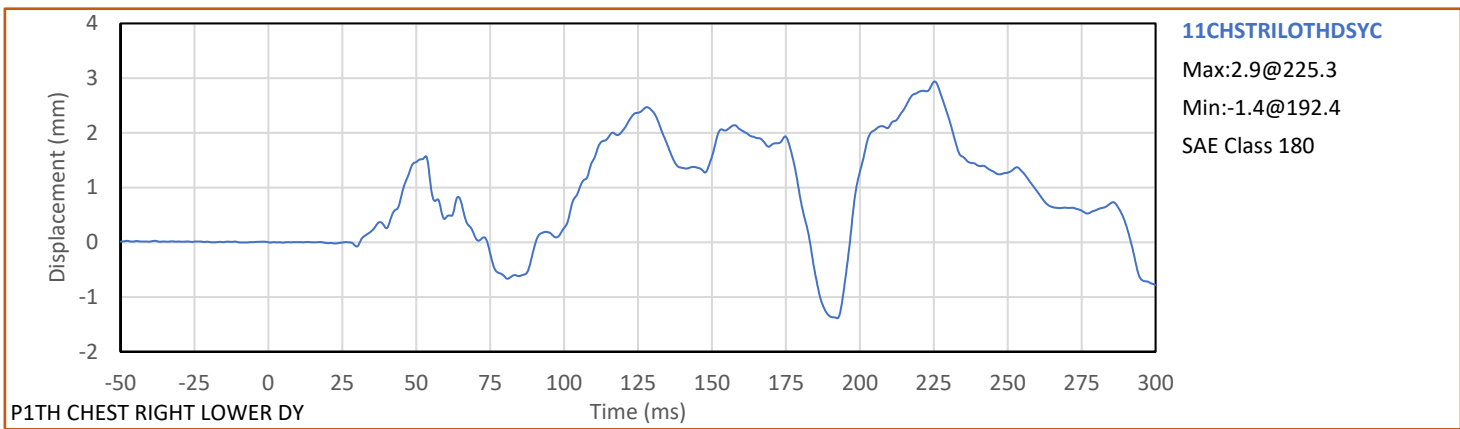
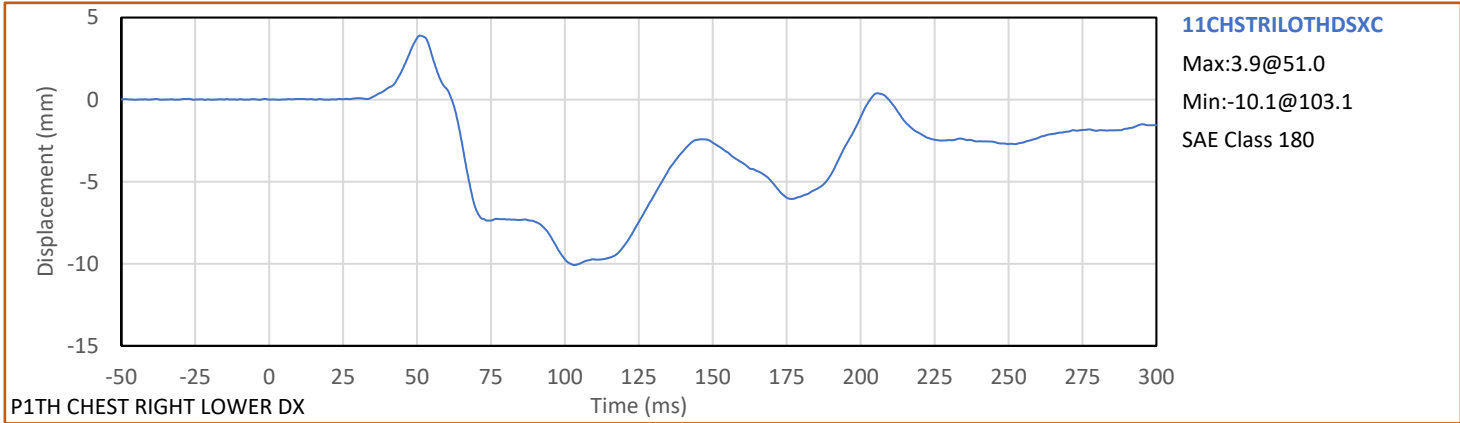
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Test Date: 9/22/2021

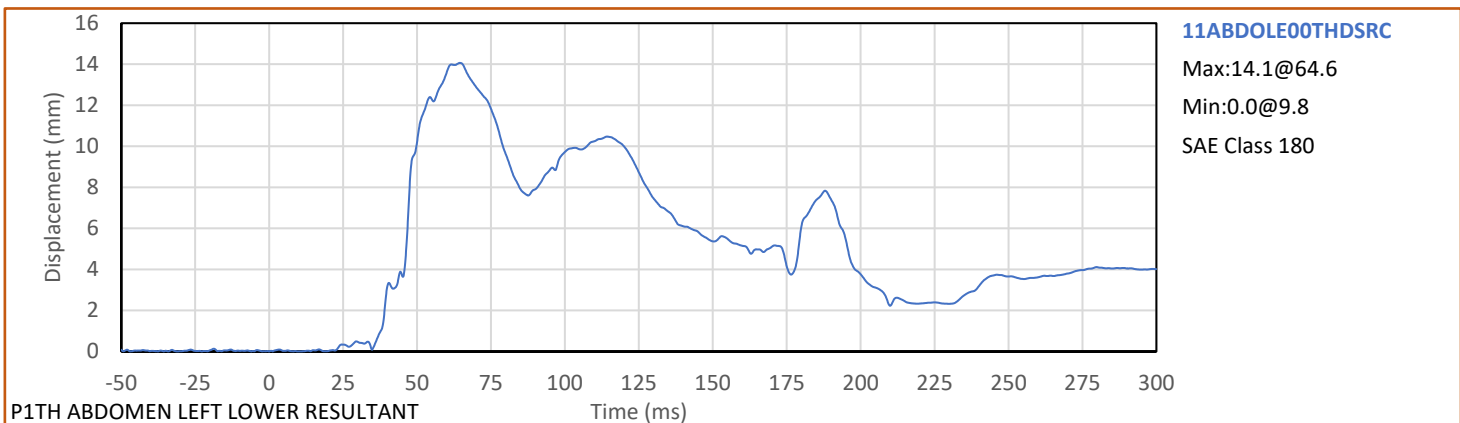
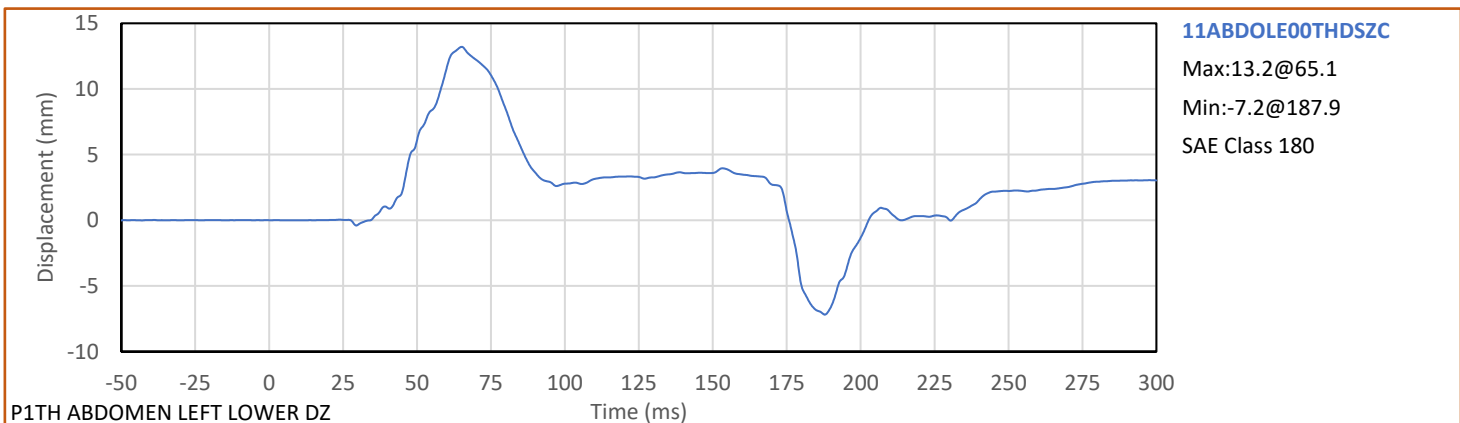
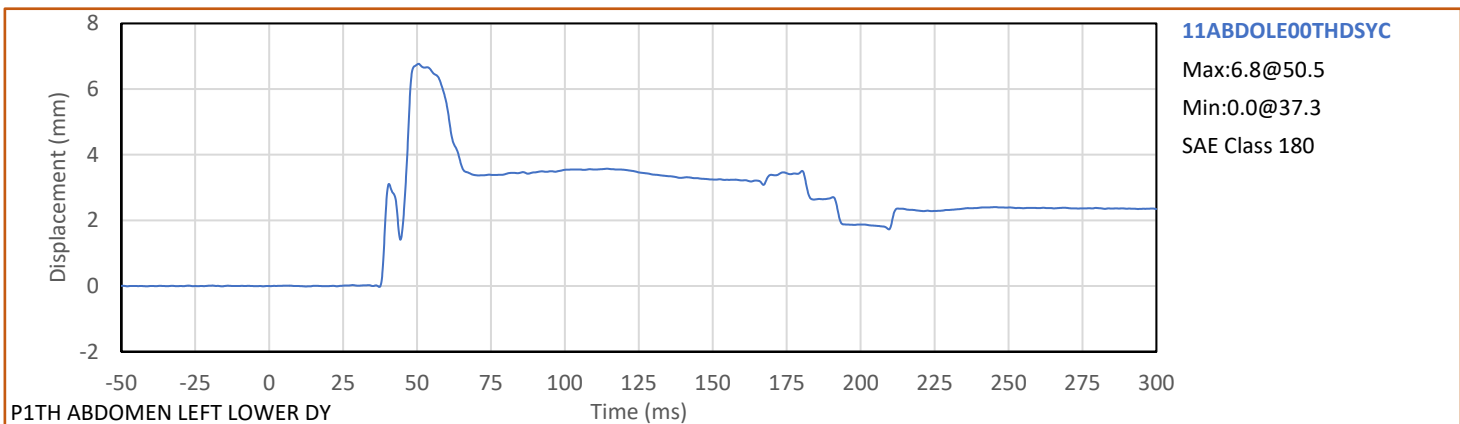
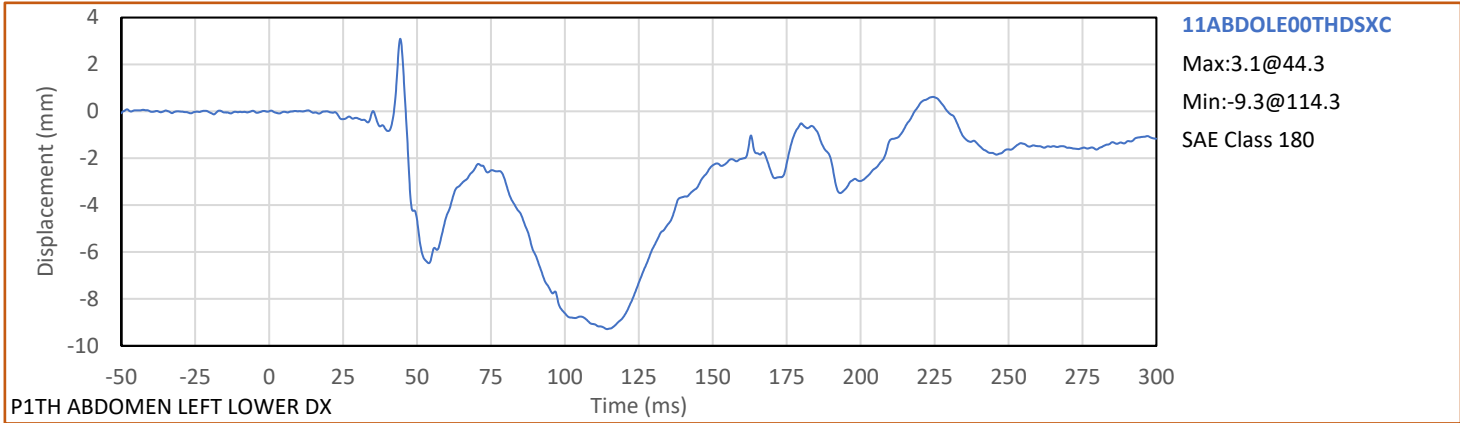


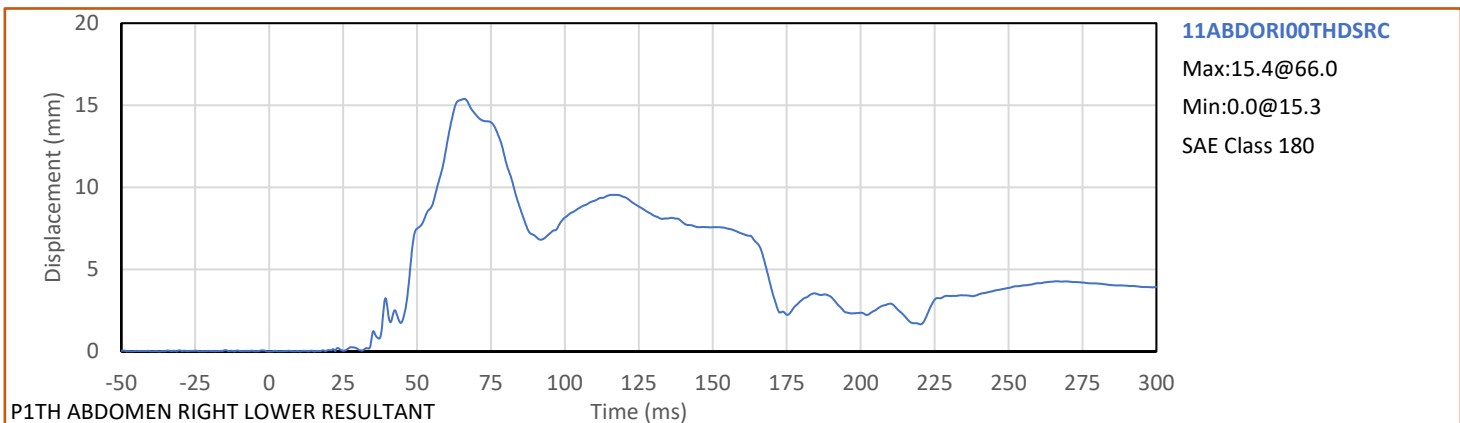
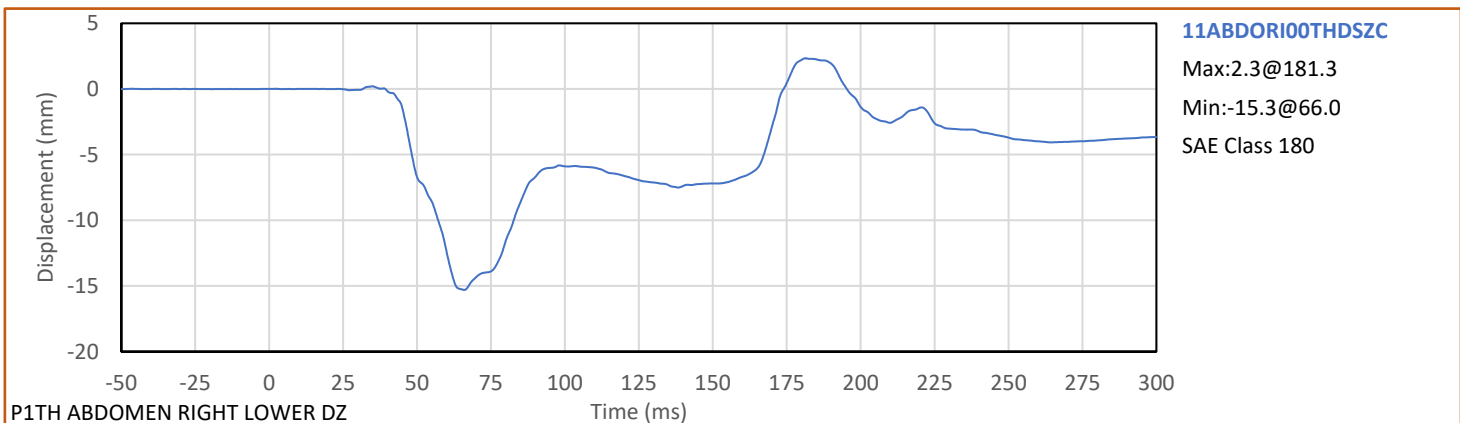
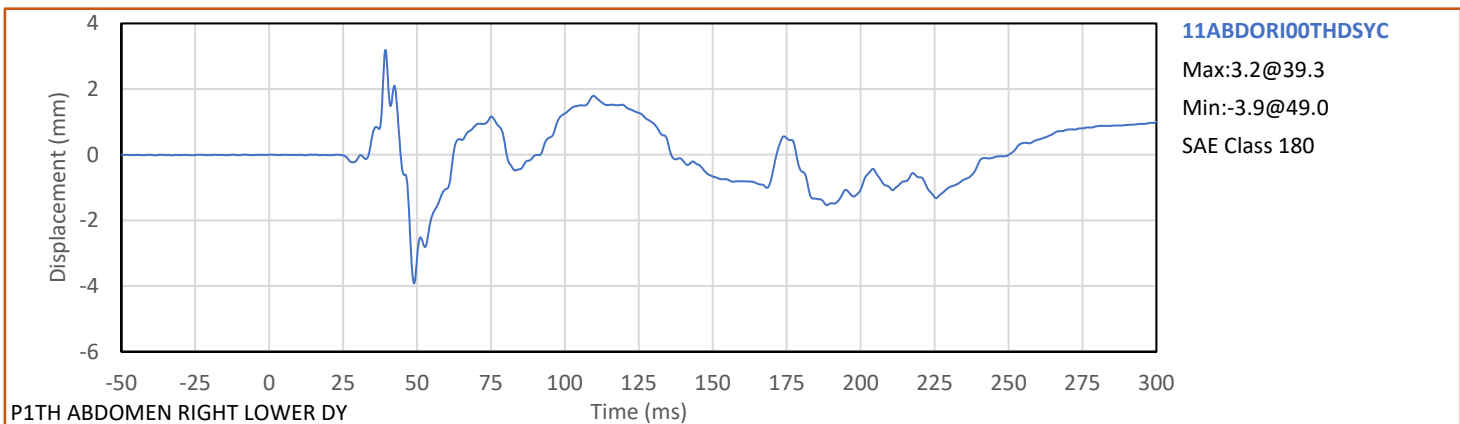
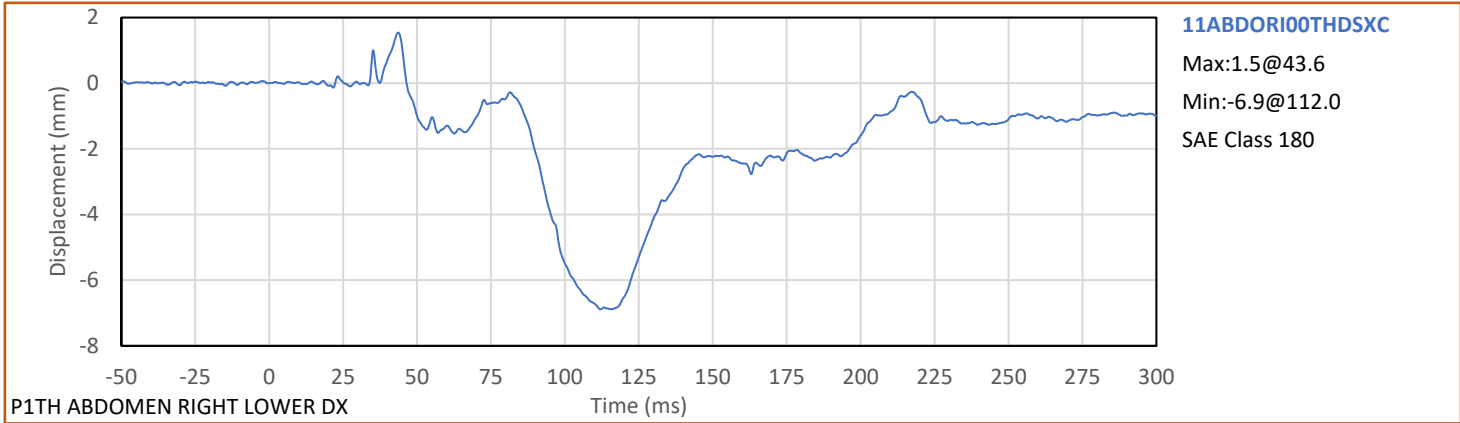


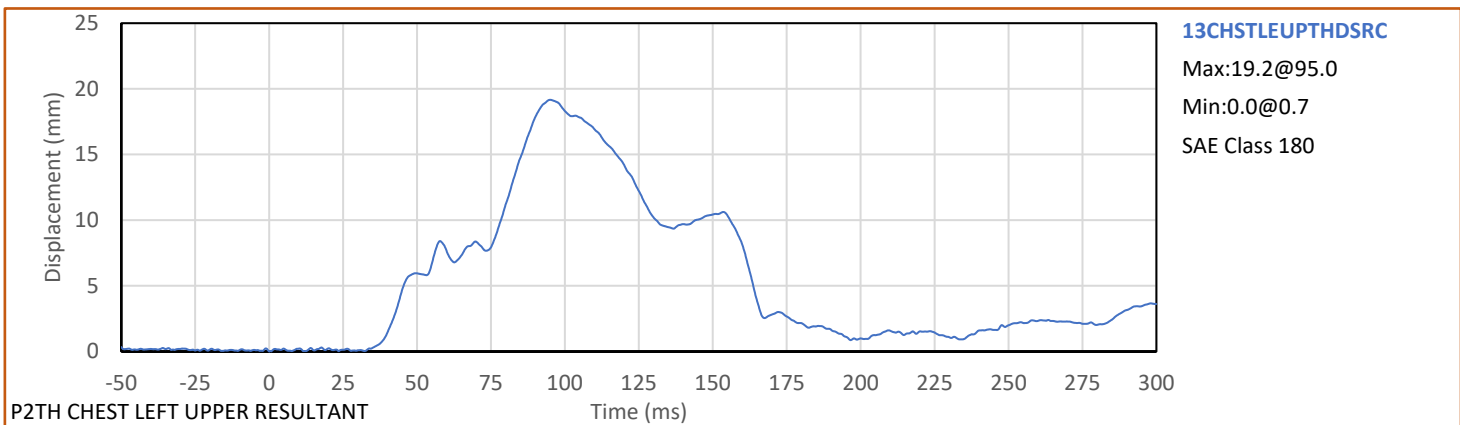
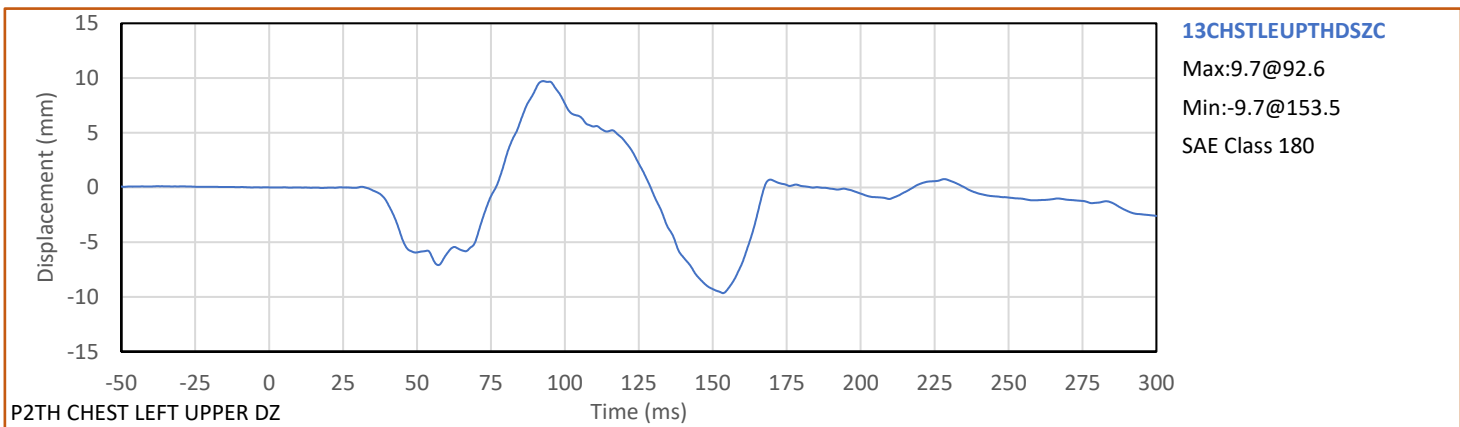
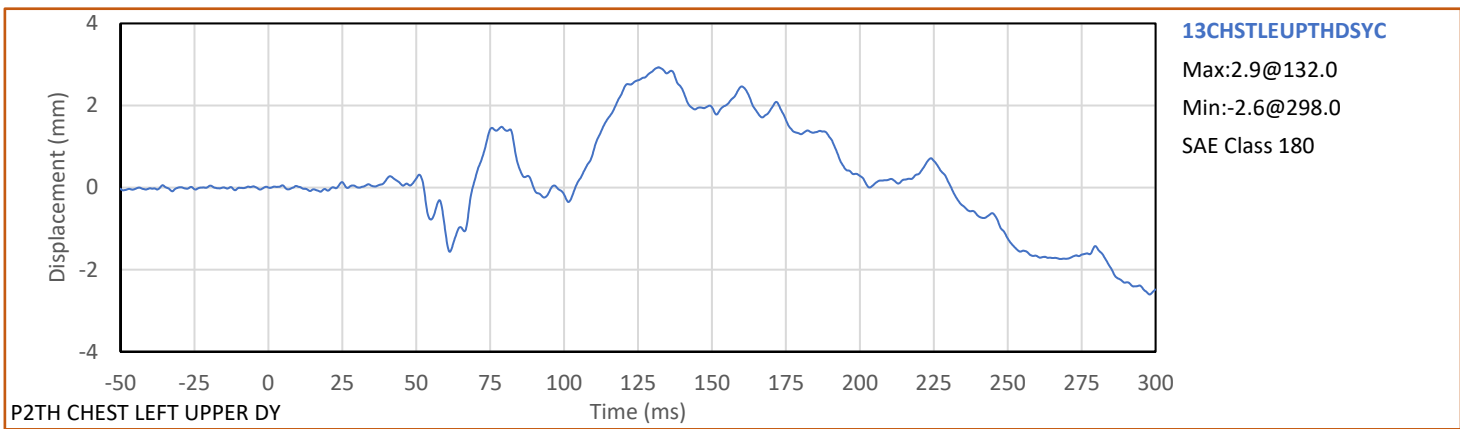
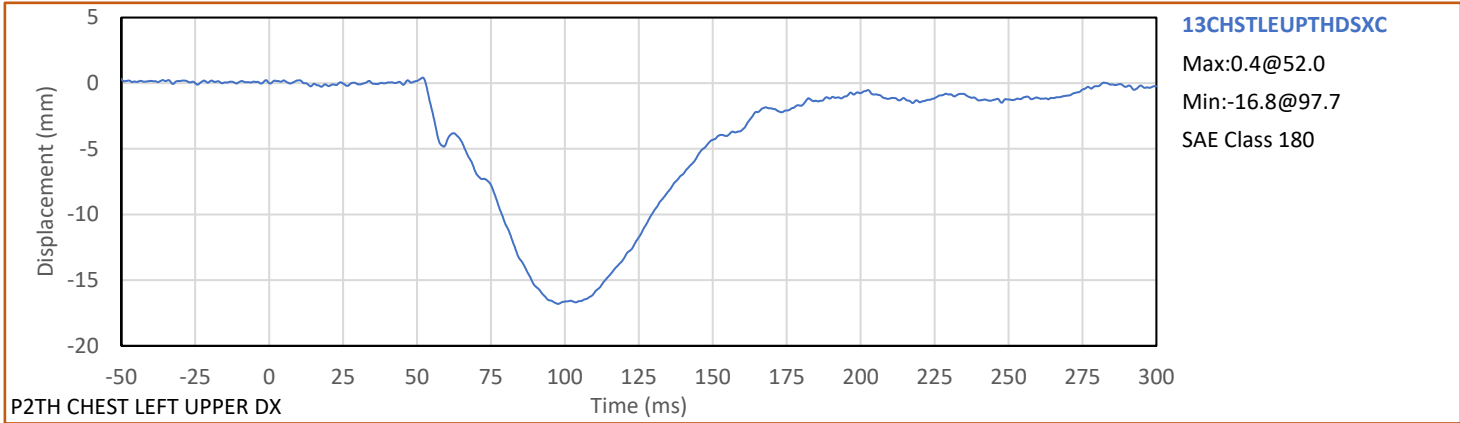


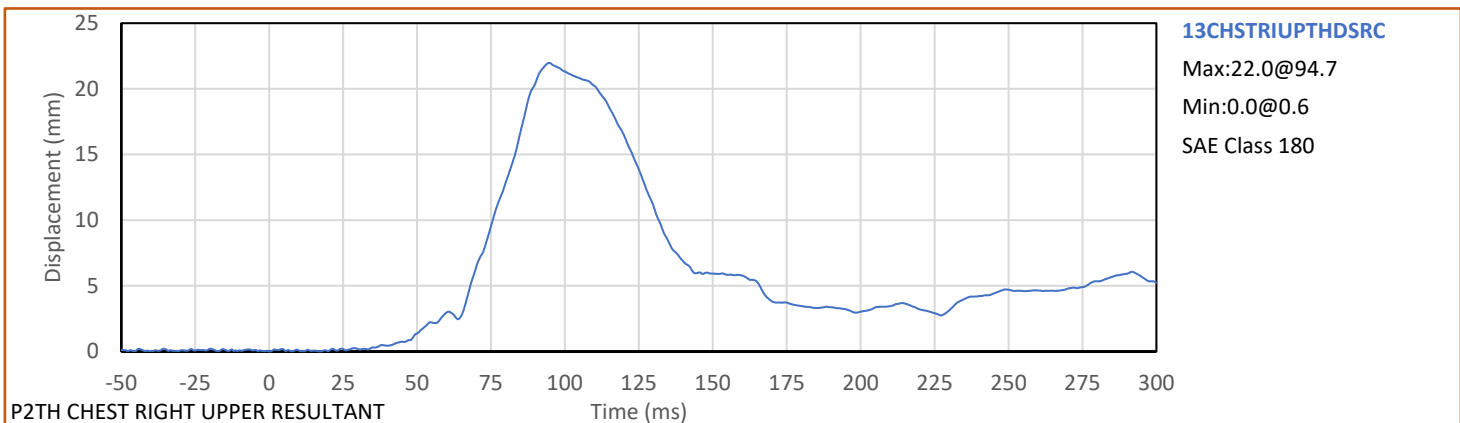
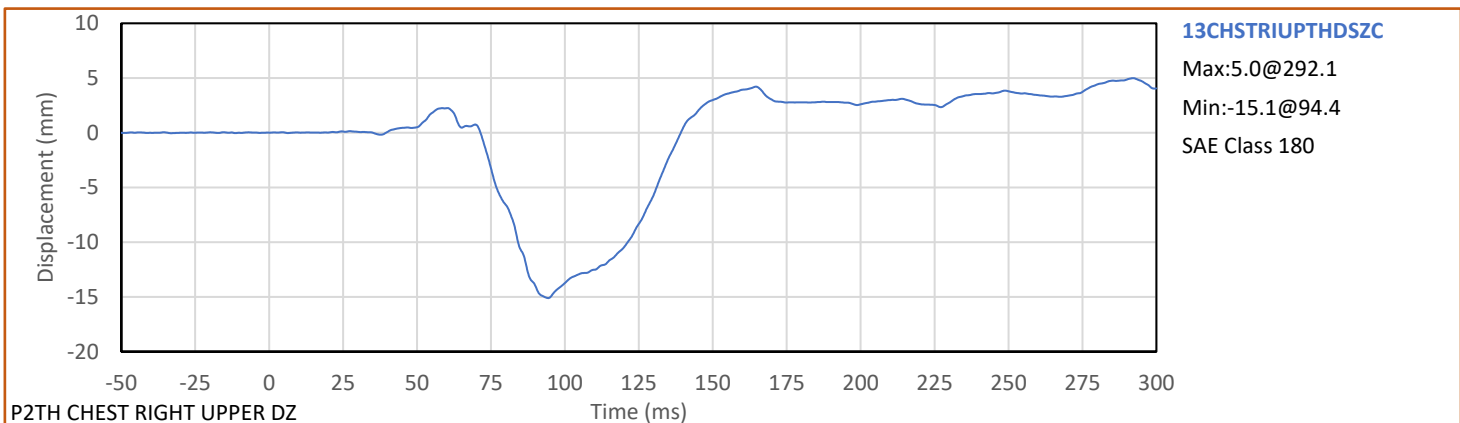
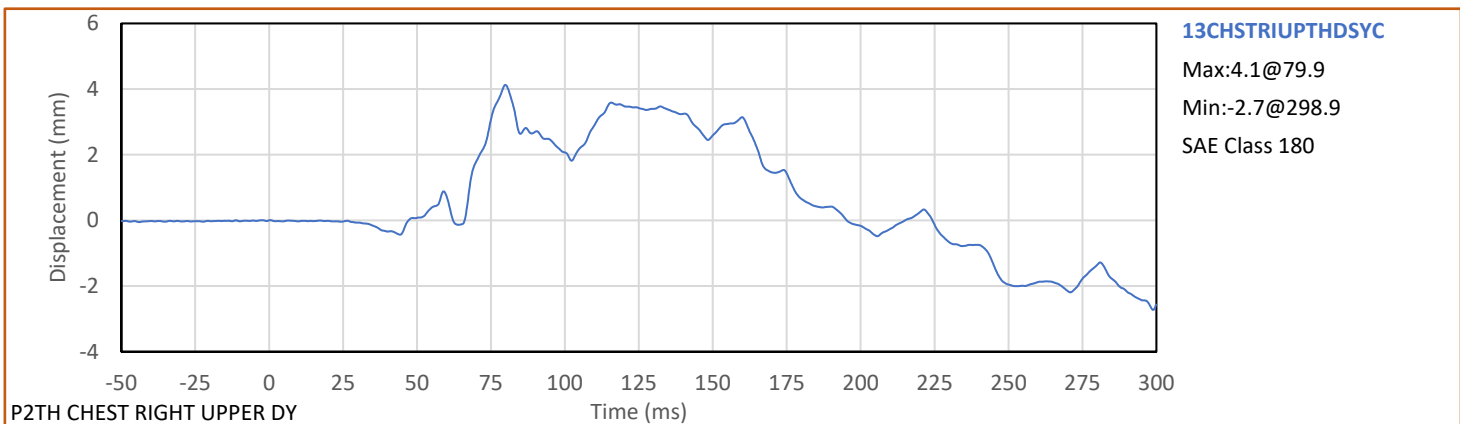
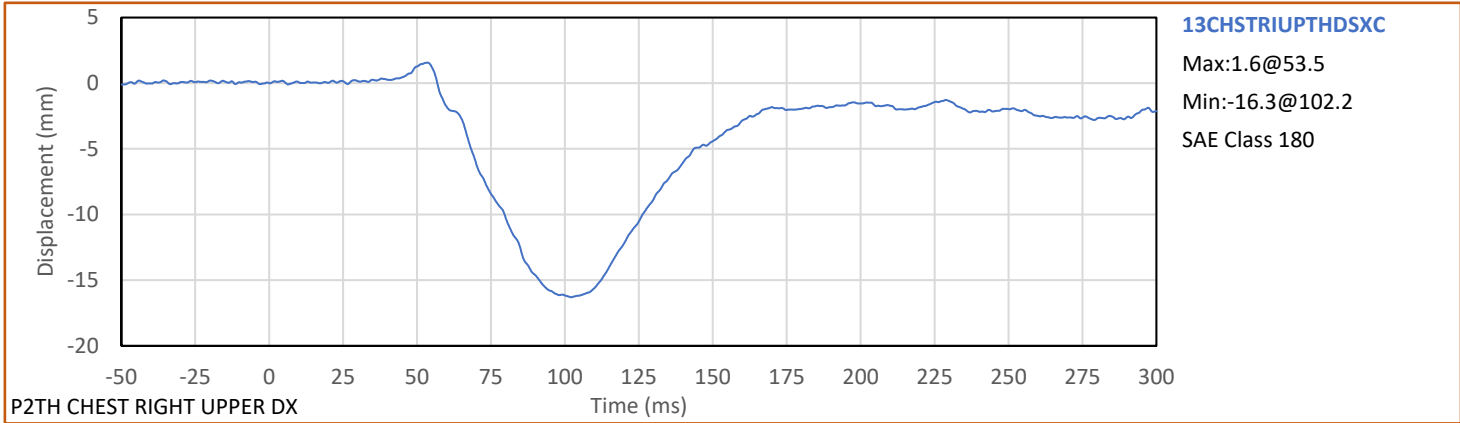


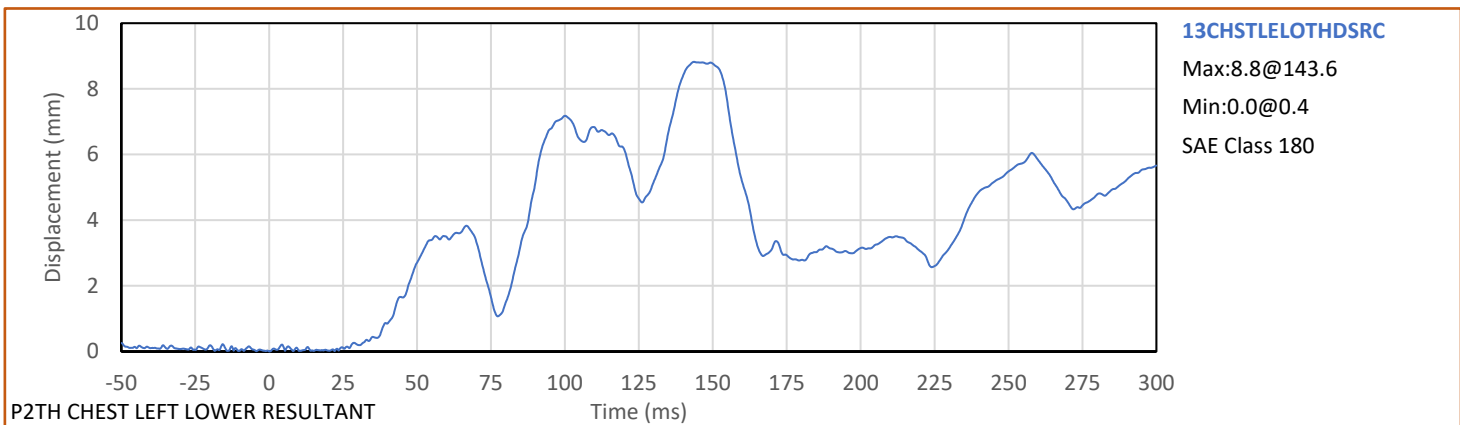
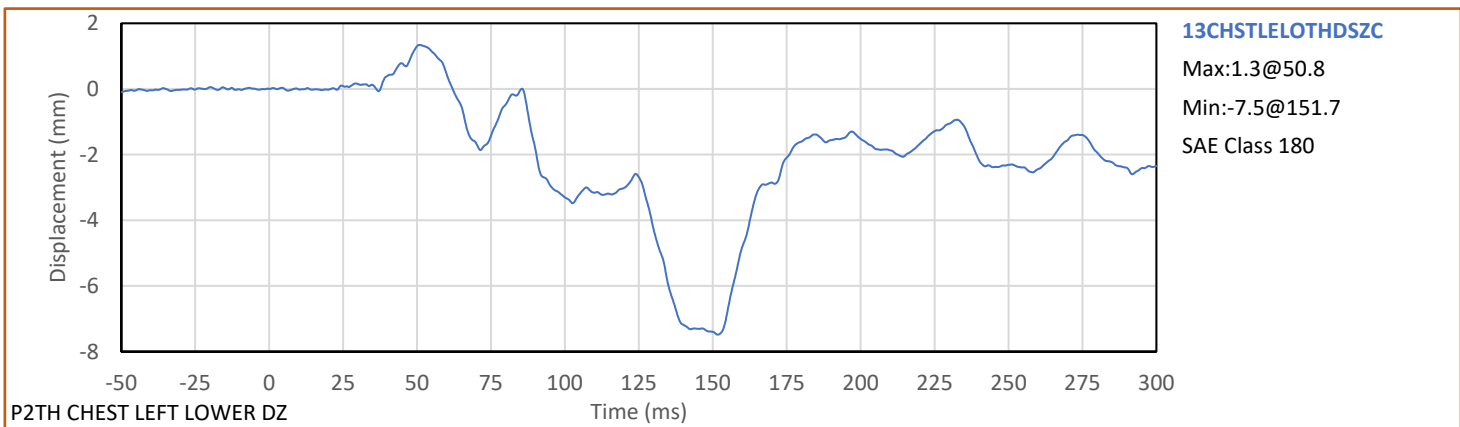
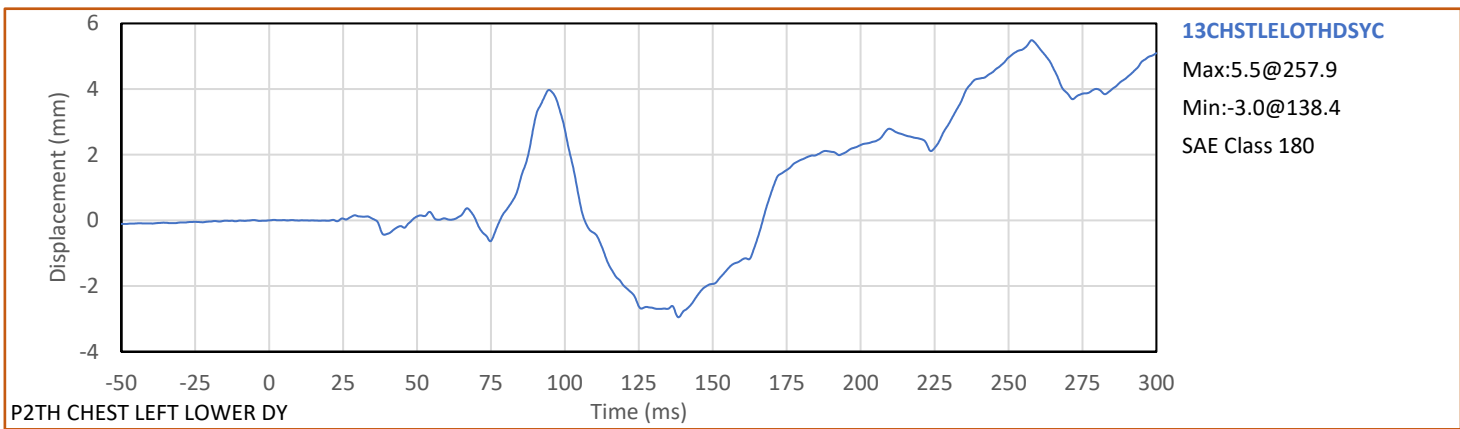
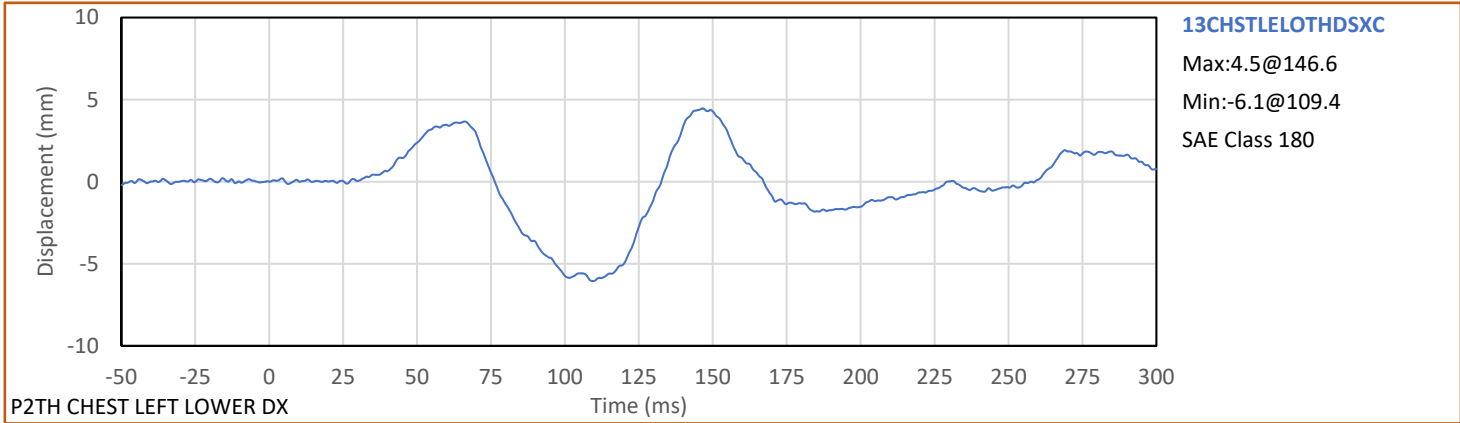


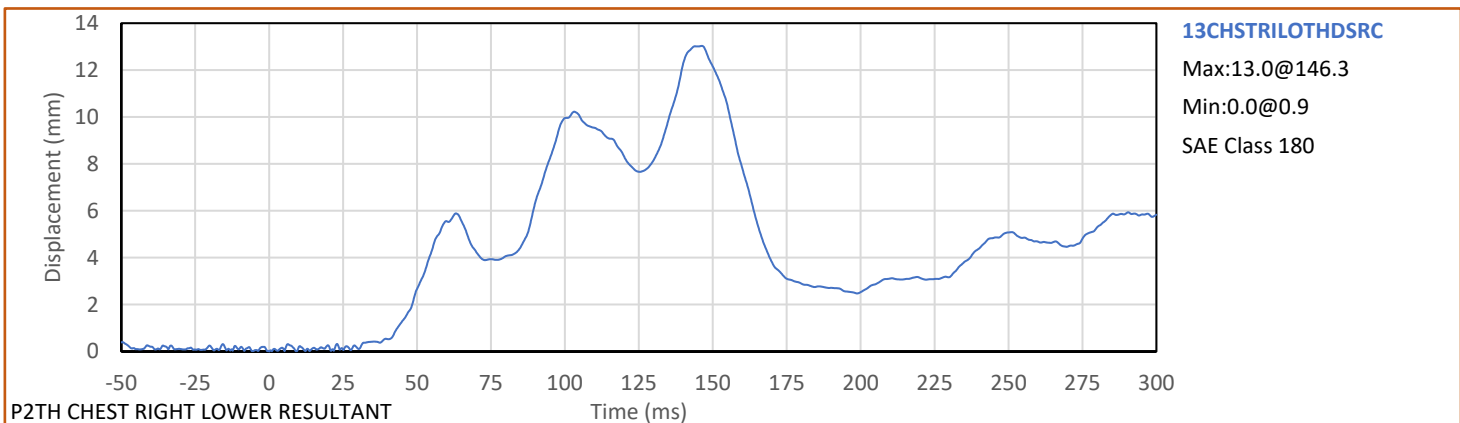
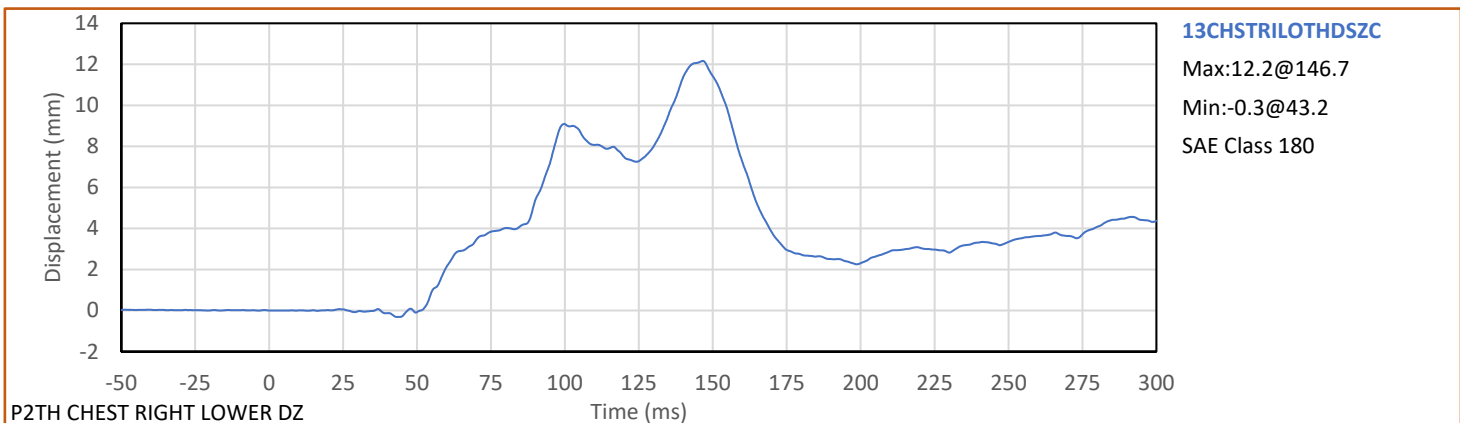
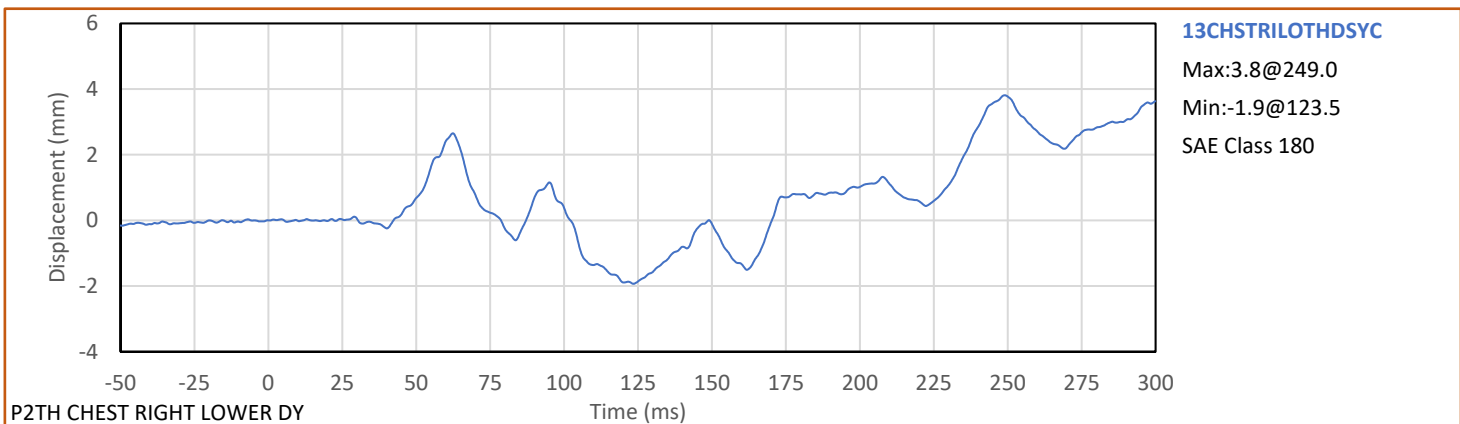
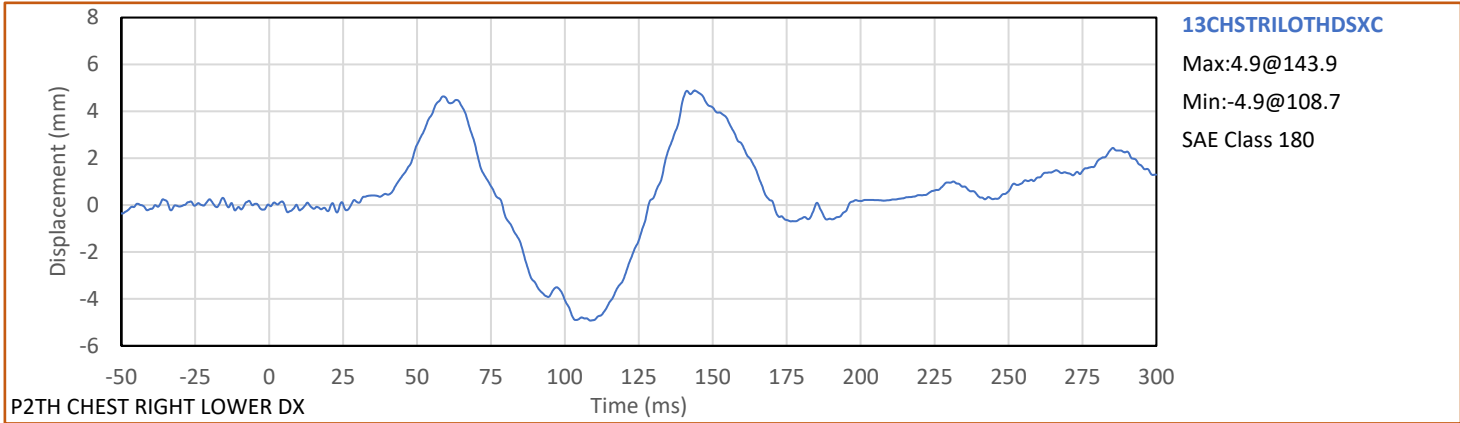


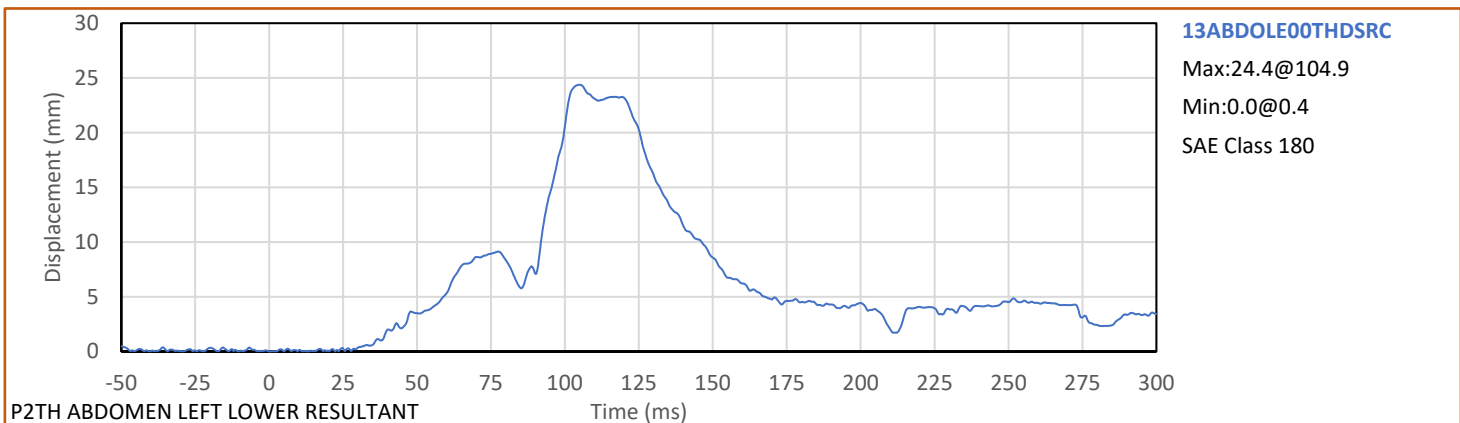
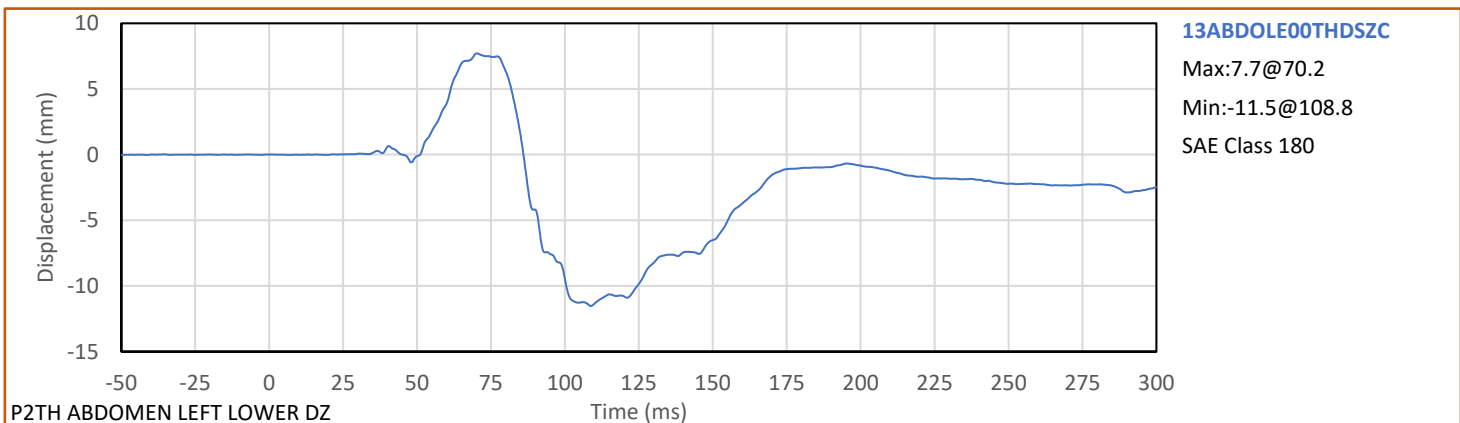
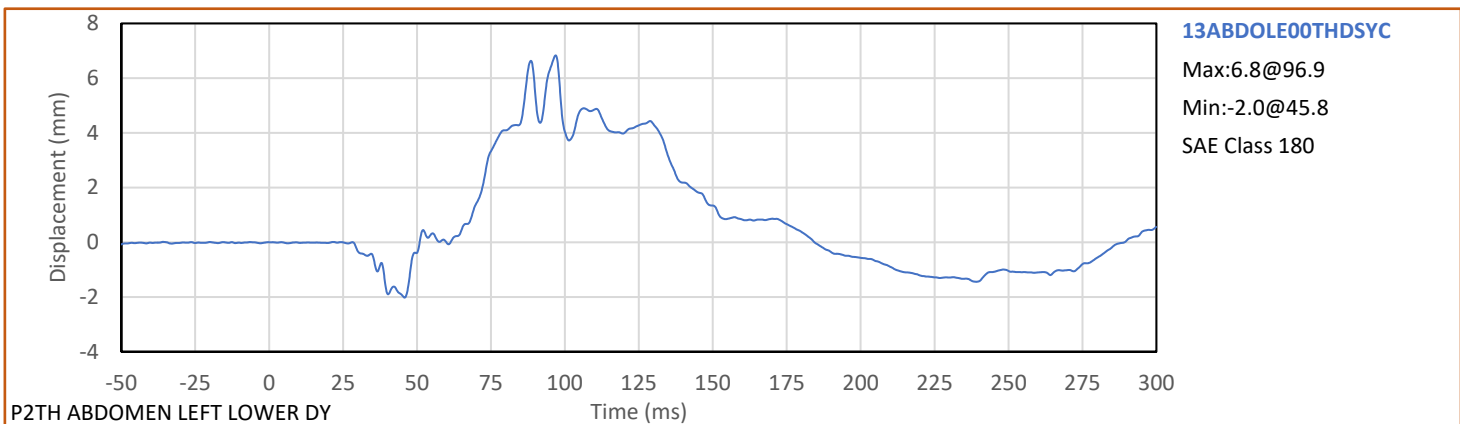
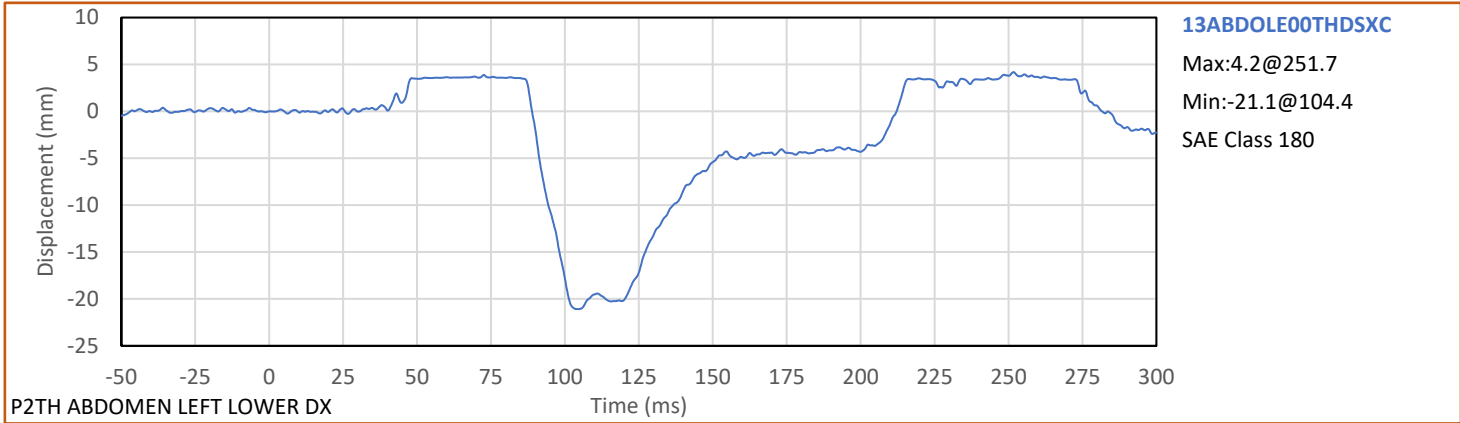


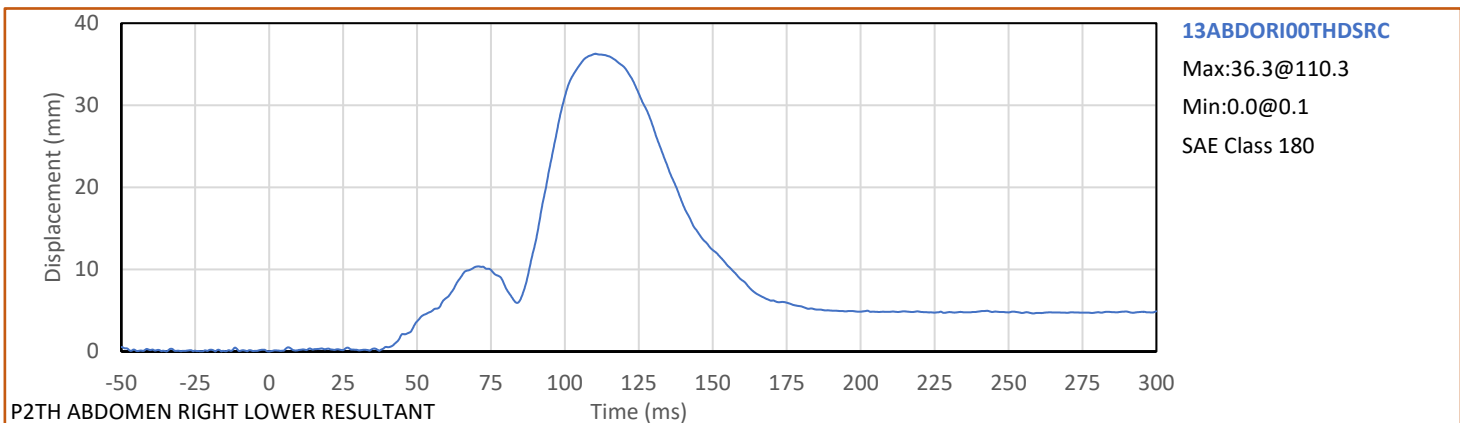
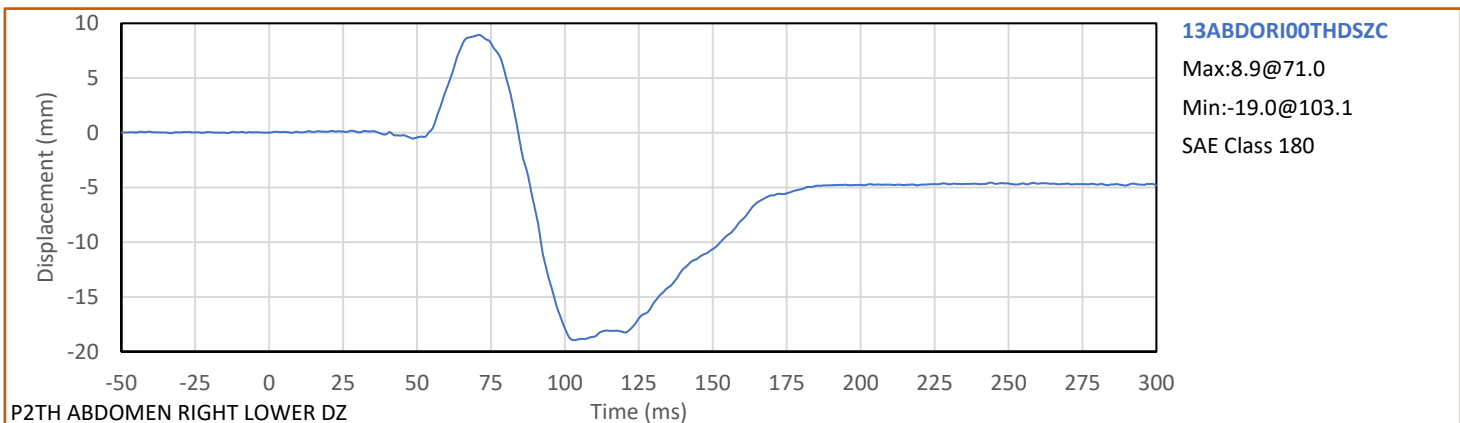
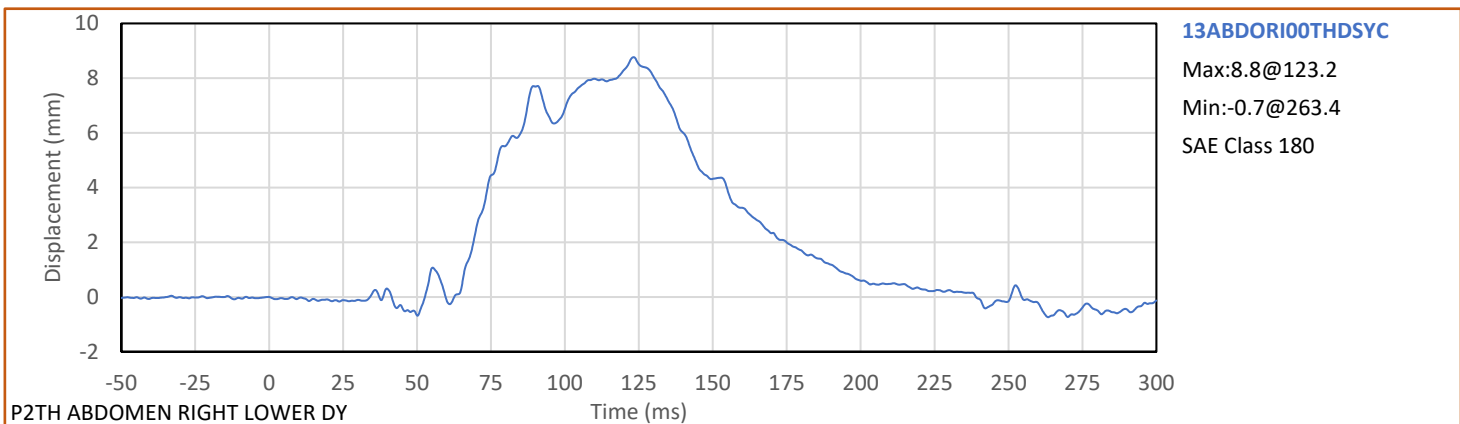
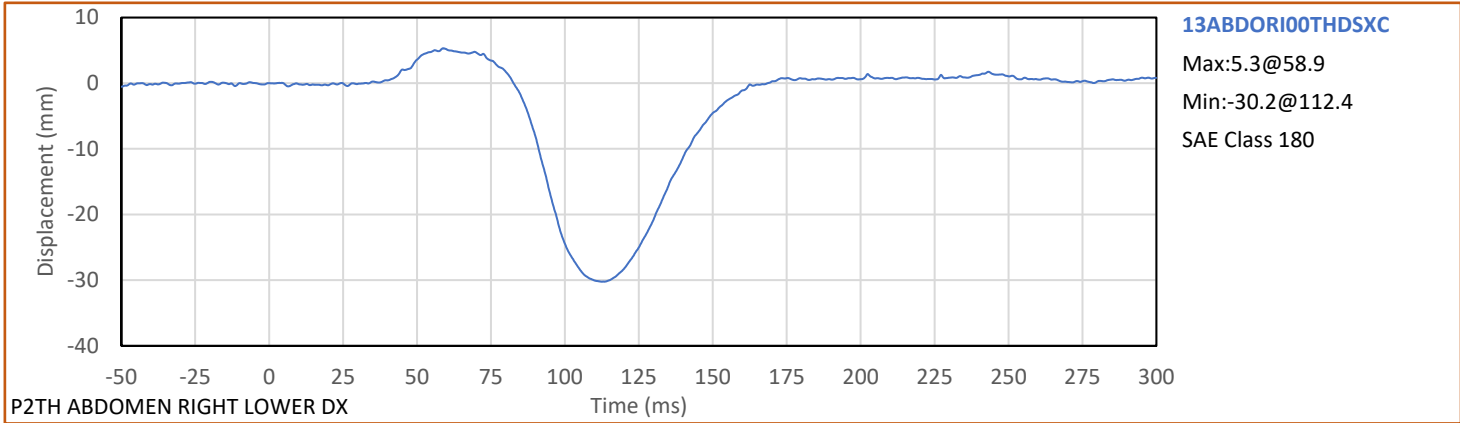








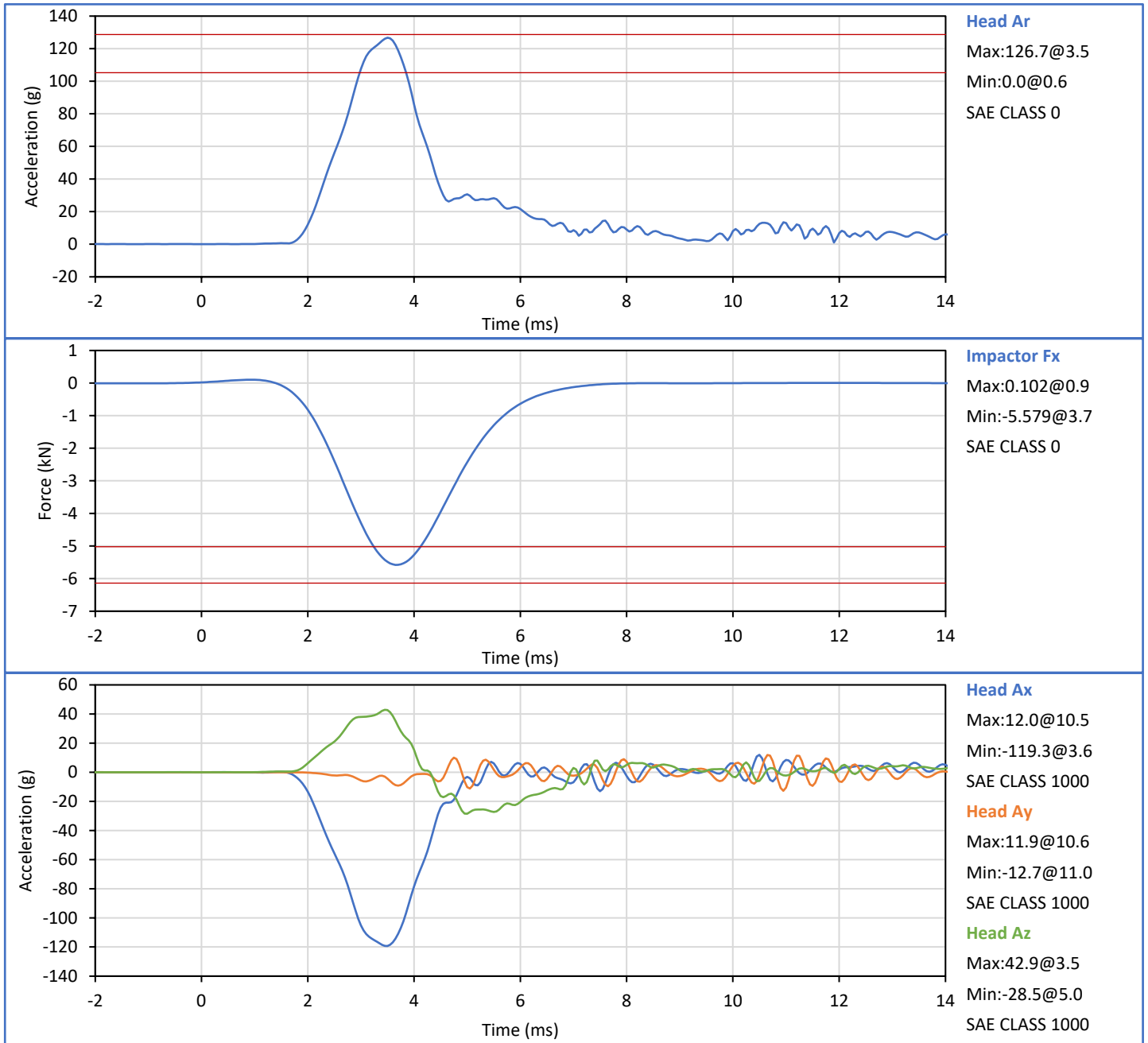




**APPENDIX C**  
**ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA**  
**THOR-50M 50TH PERCENTILE MALE ATD**  
**PRE-TEST QUALIFICATION (PARTIAL)**

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

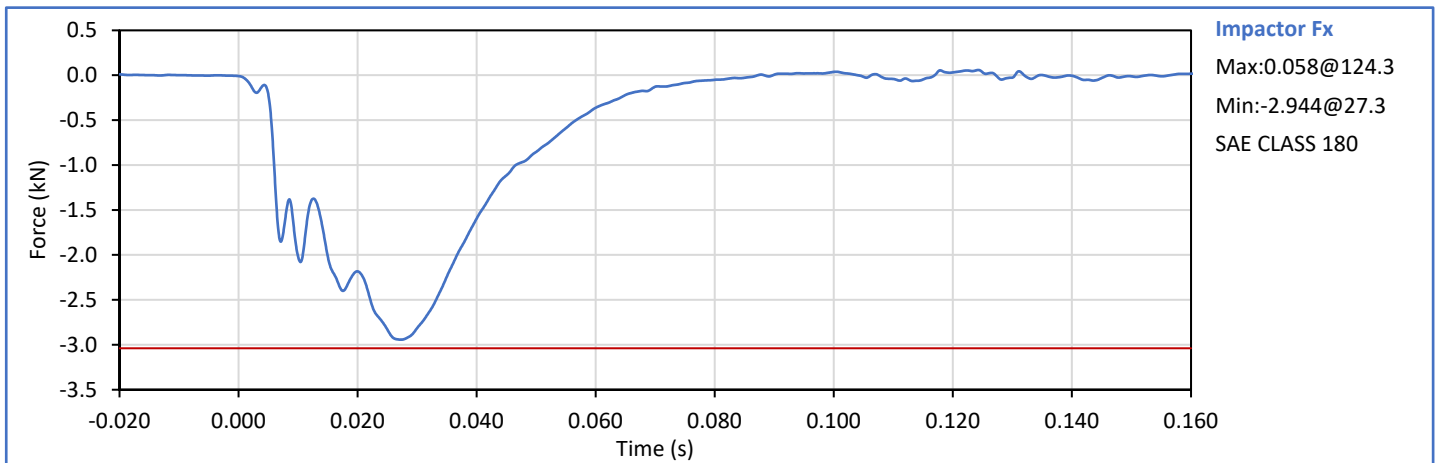
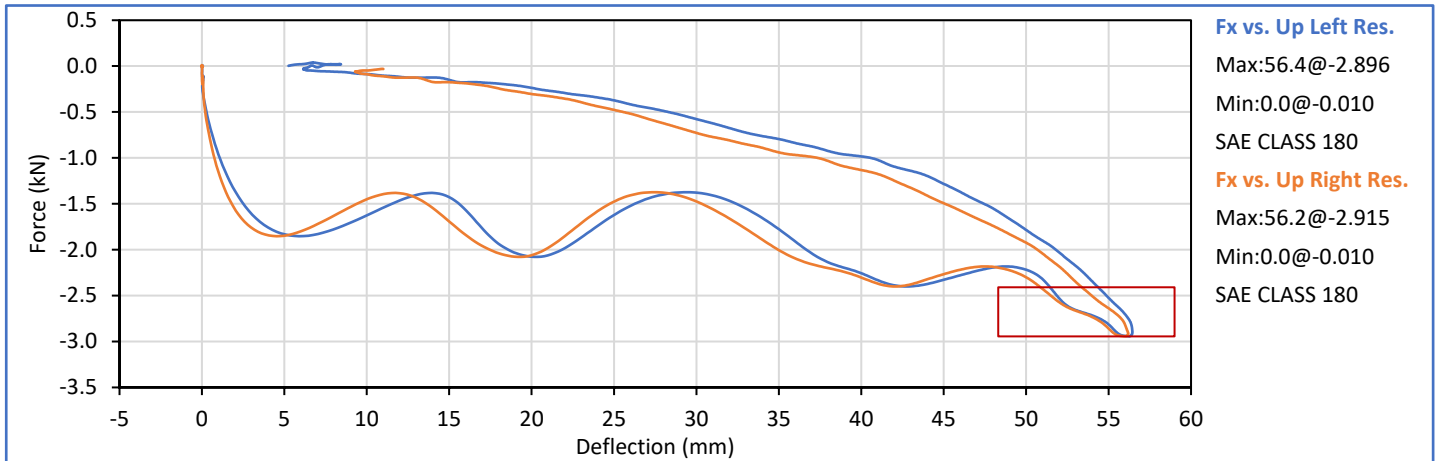
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Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	46	Pass
Velocity	m/s	1.95	2.05	1.99	Pass
Peak Impactor Force	kN	-6.138	-5.022	-5.579	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	126.7	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>




Technician: *J. Hernandez*  
J. Hernandez

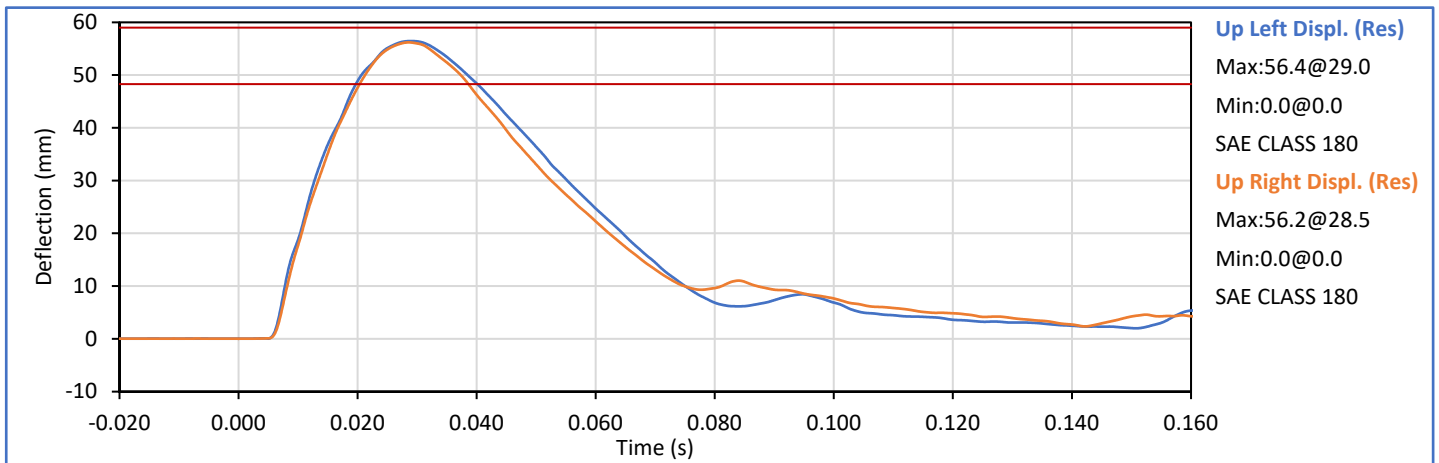
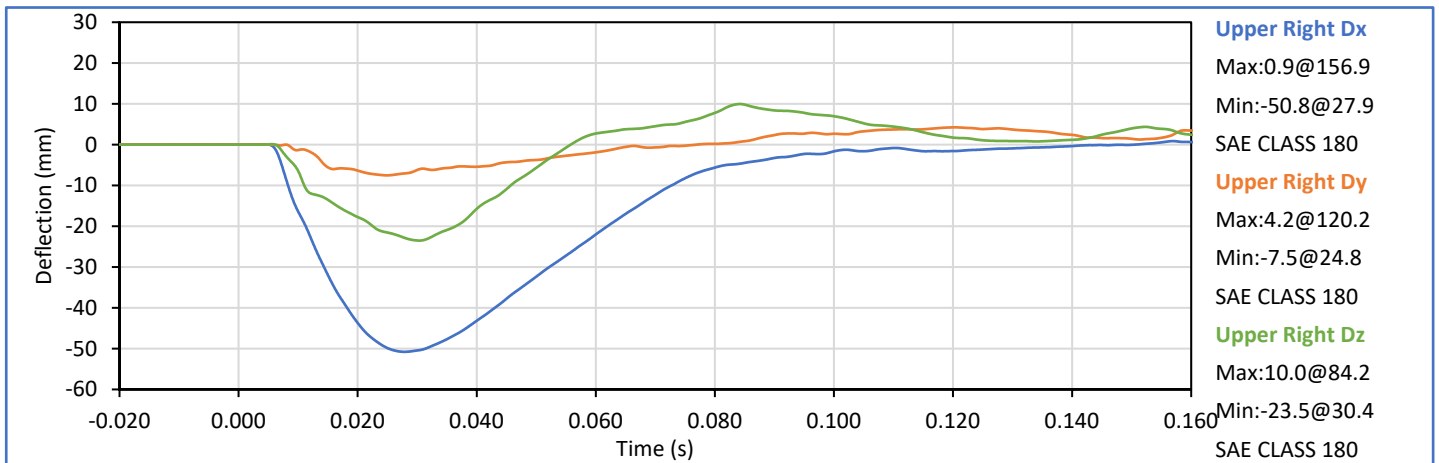
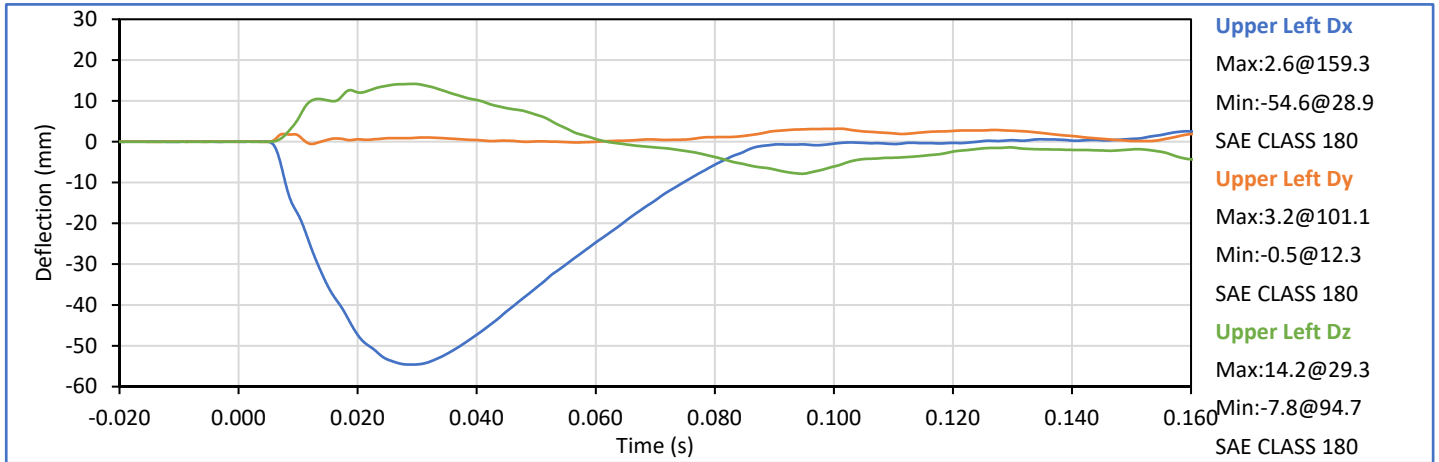
Approved By: *P. Puzuto*  
P. Puzuto

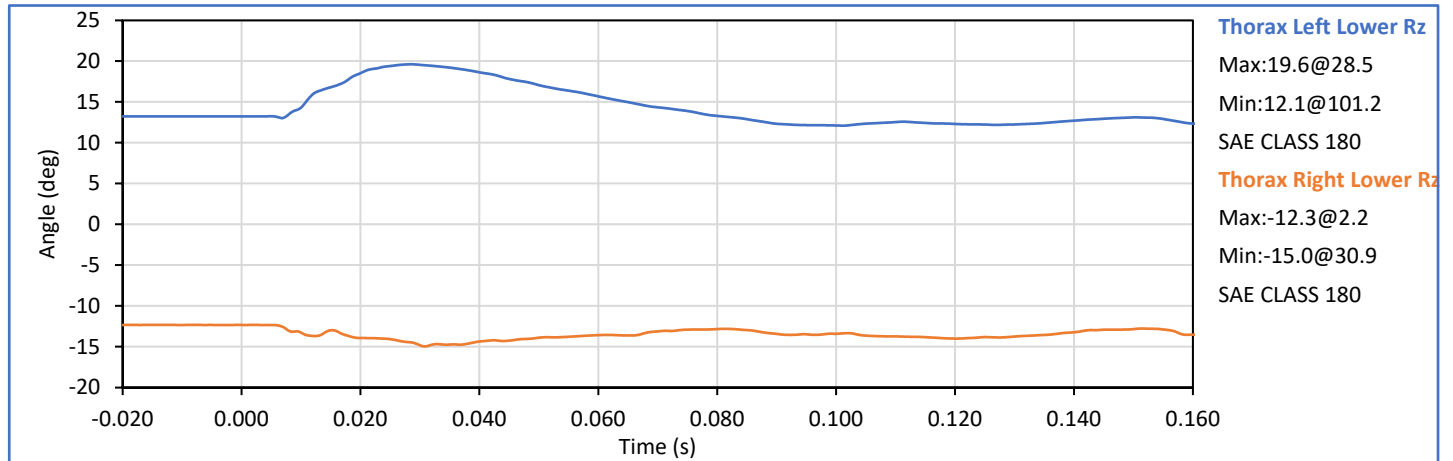
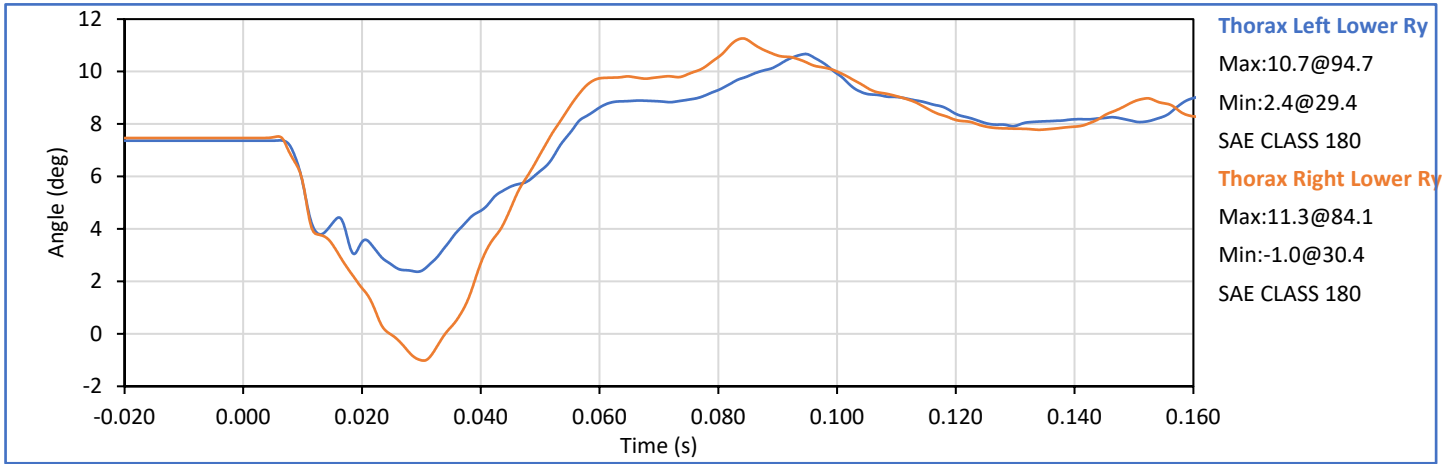
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	52	Pass
Probe Velocity	m/s	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.039		-2.944	Pass
Peak Upper Left Deflection Res.	mm	48.3	59.0	56.4	Pass
Peak Upper Right Deflection Res.	mm			56.2	Pass
Absolute Difference L/R Defl. Res.	mm	0.0	5.0	0.3	Pass
Force at Peak Upper Left Res.	mm	-2.944	-2.409	-2.896	Pass
Force at Peak Upper Right Res.	mm			-2.915	Pass
<b>NHTSA Corridor 2019-05</b>			<b>Overall Test Results</b>	<b>Pass</b>	



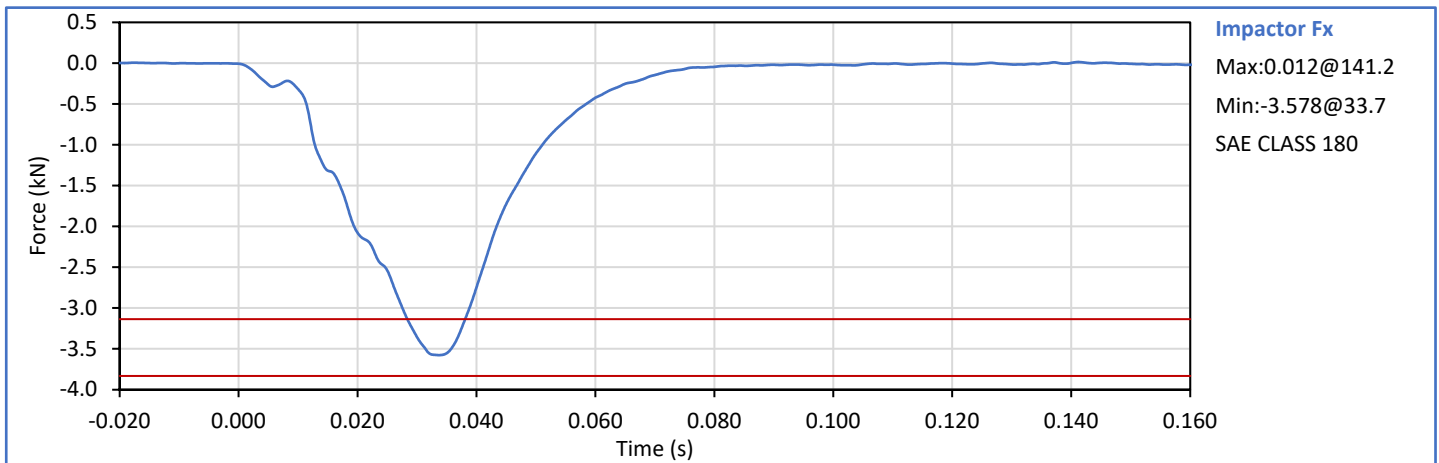
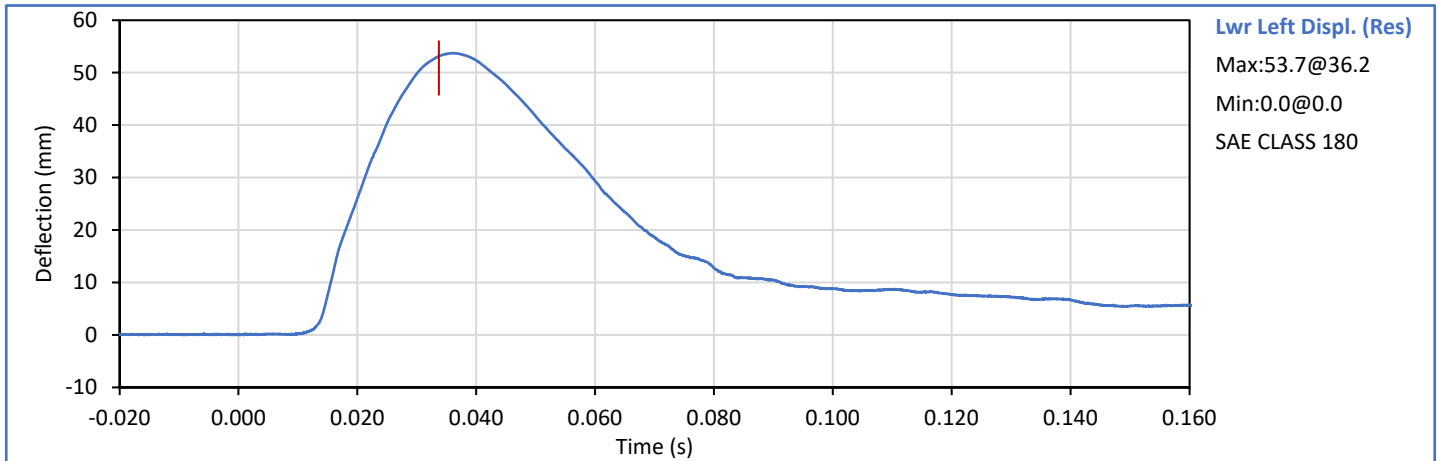
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto





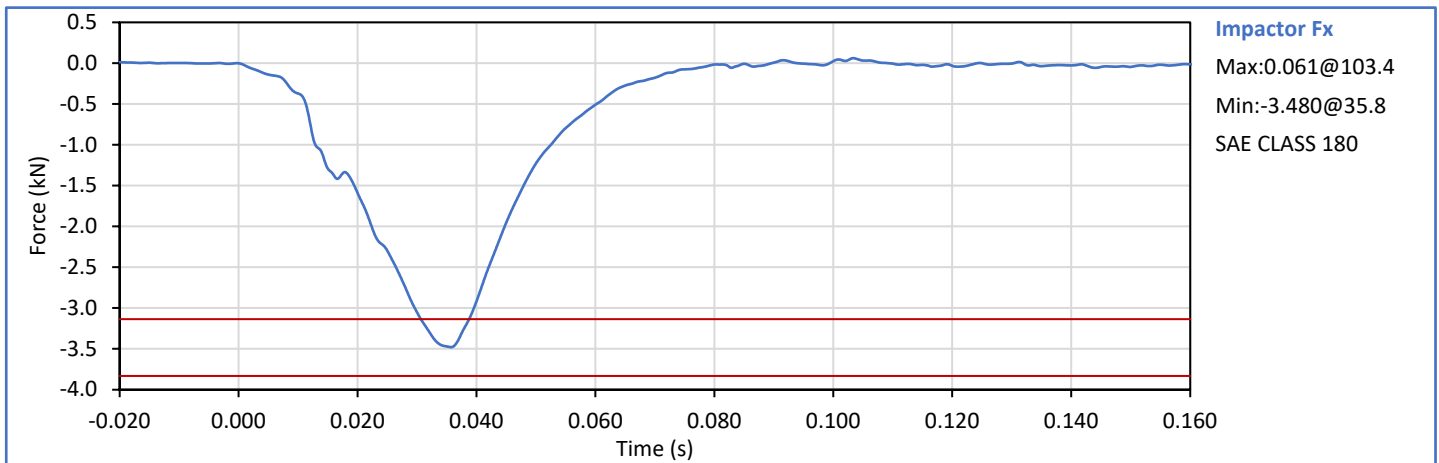
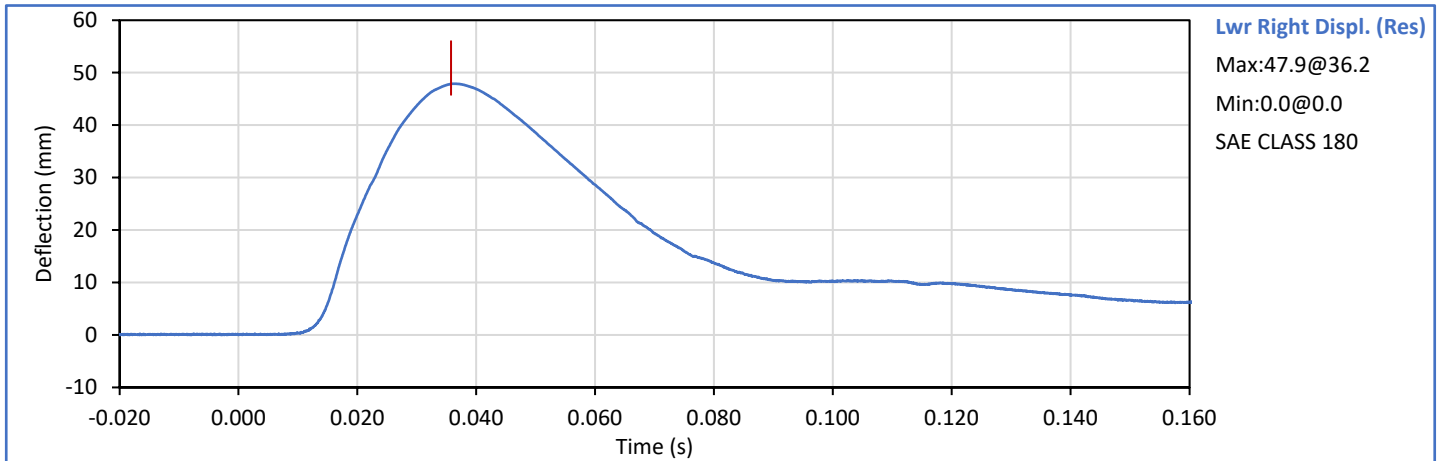
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Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	44	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.578	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	53.1	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass





Technician: *J. Hernandez*  
 J. Hernandez

Approved By: *P. Puzzuto*  
 P. Puzzuto

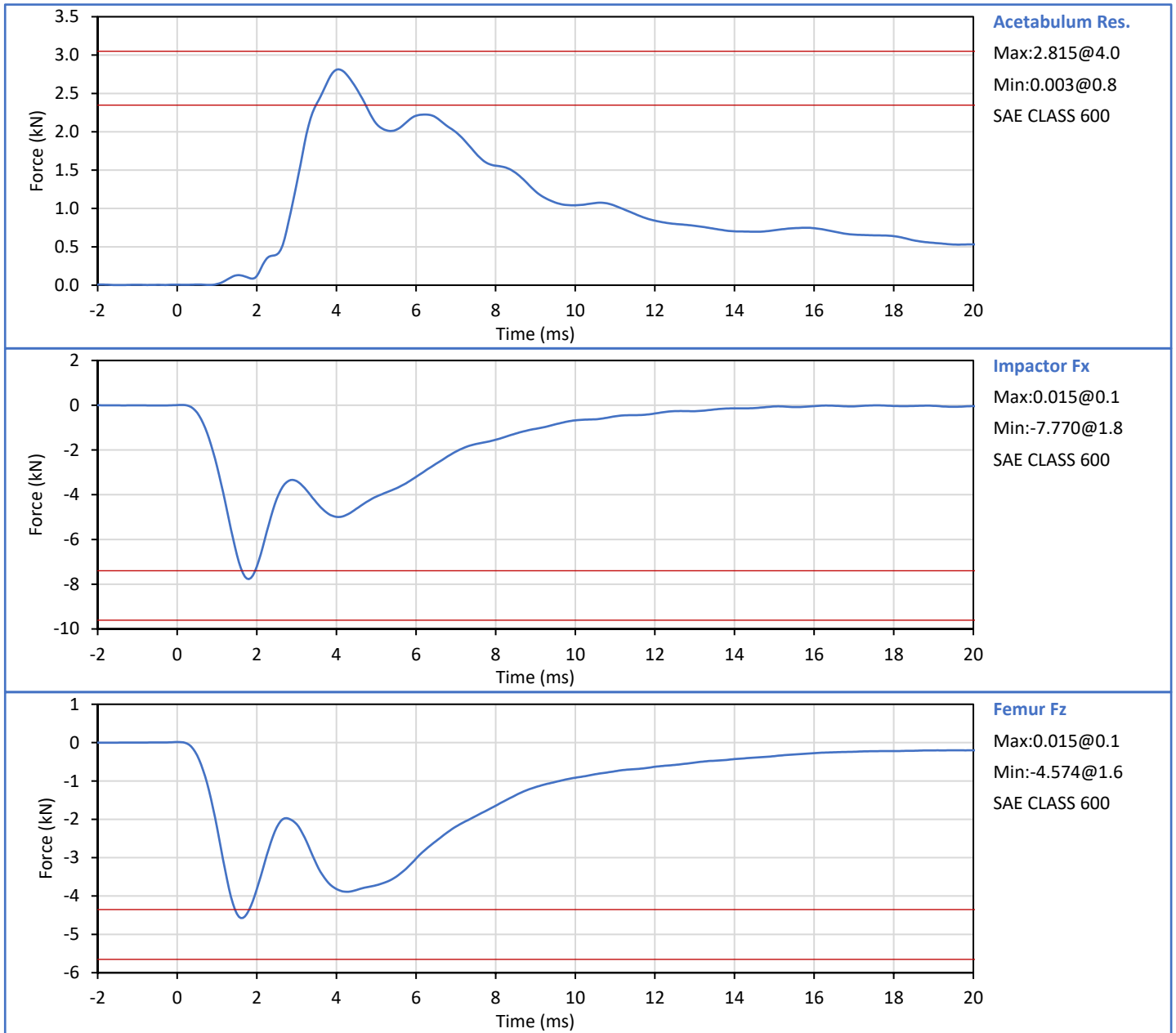
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.2	Pass
Laboratory Relative Humidity	%	10	70	42	Pass
Probe Velocity	m/s	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.480	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	47.8	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

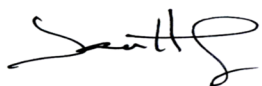



Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.6	Pass
Laboratory Humidity	%	10	70	37	Pass
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Impactor Force	kN	-9.188	-7.517	-7.770	Pass
Peak Femur Fz	kN	-5.478	-4.482	-4.574	Pass
Acetabulum Force Resultant	kN	2.447	2.991	2.815	Pass
NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass

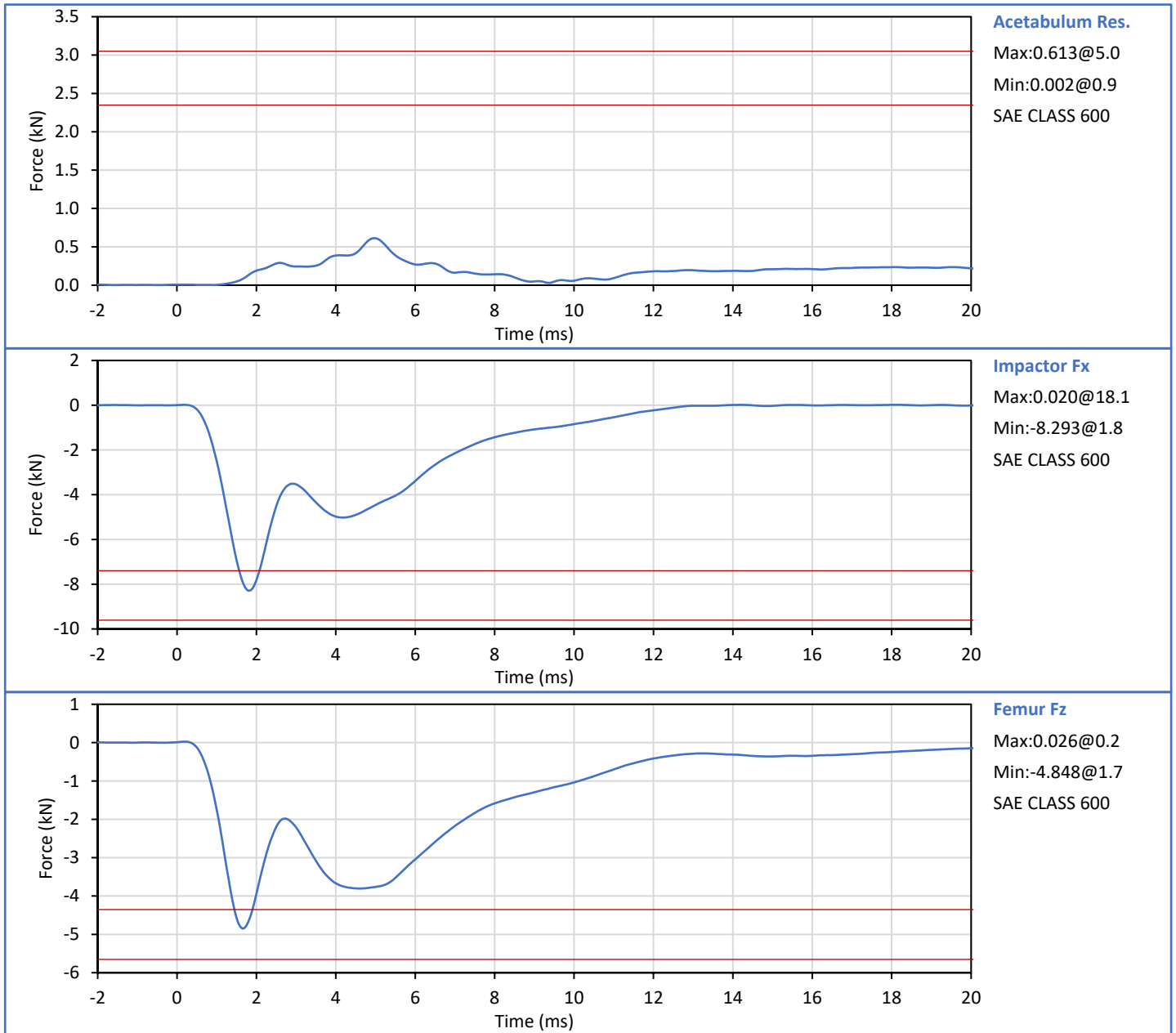


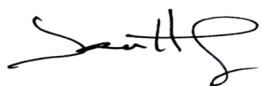
Technician:   
J. Hernandez


Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	36	Pass
Pendulum Velocity	m/s	3.25	3.35	3.35	Pass
Peak Impactor Force	kN	-9.188	-7.517	-8.293	Pass
Peak Femur Fz	kN	-5.478	-4.482	-4.848	Pass
Acetabulum Force Resultant	kN	2.447	2.991	0.613	Fail
<b>NHTSA Corridor 2020-03 (Preliminary Corridor)</b>				<b>Overall Test Results</b>	<b>Fail</b>

\* Acetabulum Load Cell Fx is not functioning



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

**APPENDIX C**  
**ATD Configuration and Performance Verification Data**  
**THOR-50M 50th Percentile Male ATD**  
**Pre-Test Qualification (Partial/VRTC) S/N: DO9799**

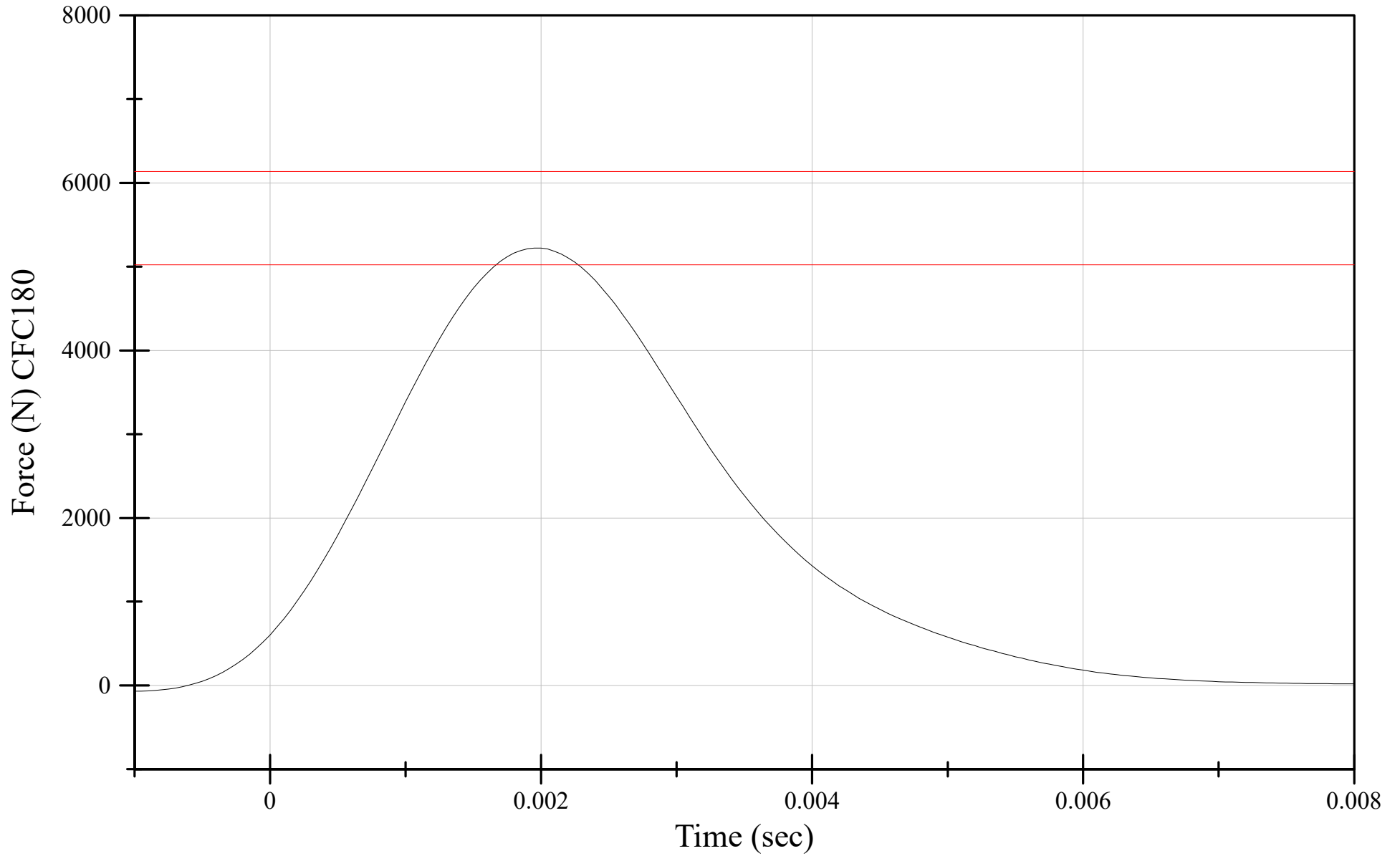
# THOR 50M DO9799 210624 Qualification

## Pre-Test Qualification (Partial)

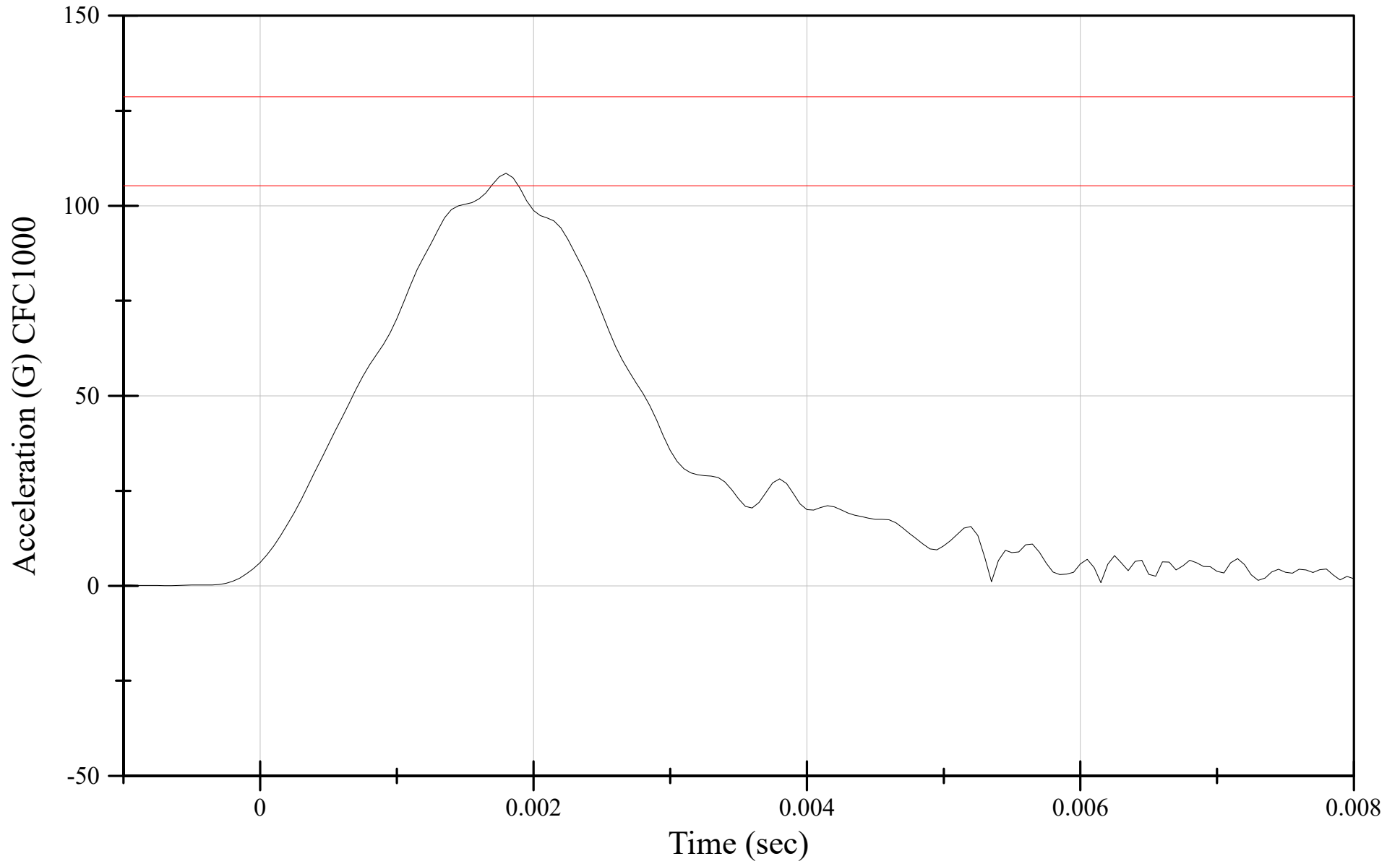
Head: **Pass**  
Neck Torsion Left: **Pass**  
Neck Torsion Right: **Pass**  
Neck Frontal Flexion: **Pass**  
Neck Extension: **Fail**  
Neck Lateral Flexion Left: **N/A**  
Neck Lateral Flexion Right: **N/A**  
Upper Thorax: **Pass**  
Lower Left Thorax: **Pass**  
Lower Right Thorax: **Pass**  
Lower Abdomen: **Pass**  
Left Upper Leg: **Pass**  
Right Upper Leg: **Pass**

# Head Qualification

Pre-Test Qualification (Partial)  
THOR-50M Head Impact Qualification  
Probe Force  
Serial Number: DO9799

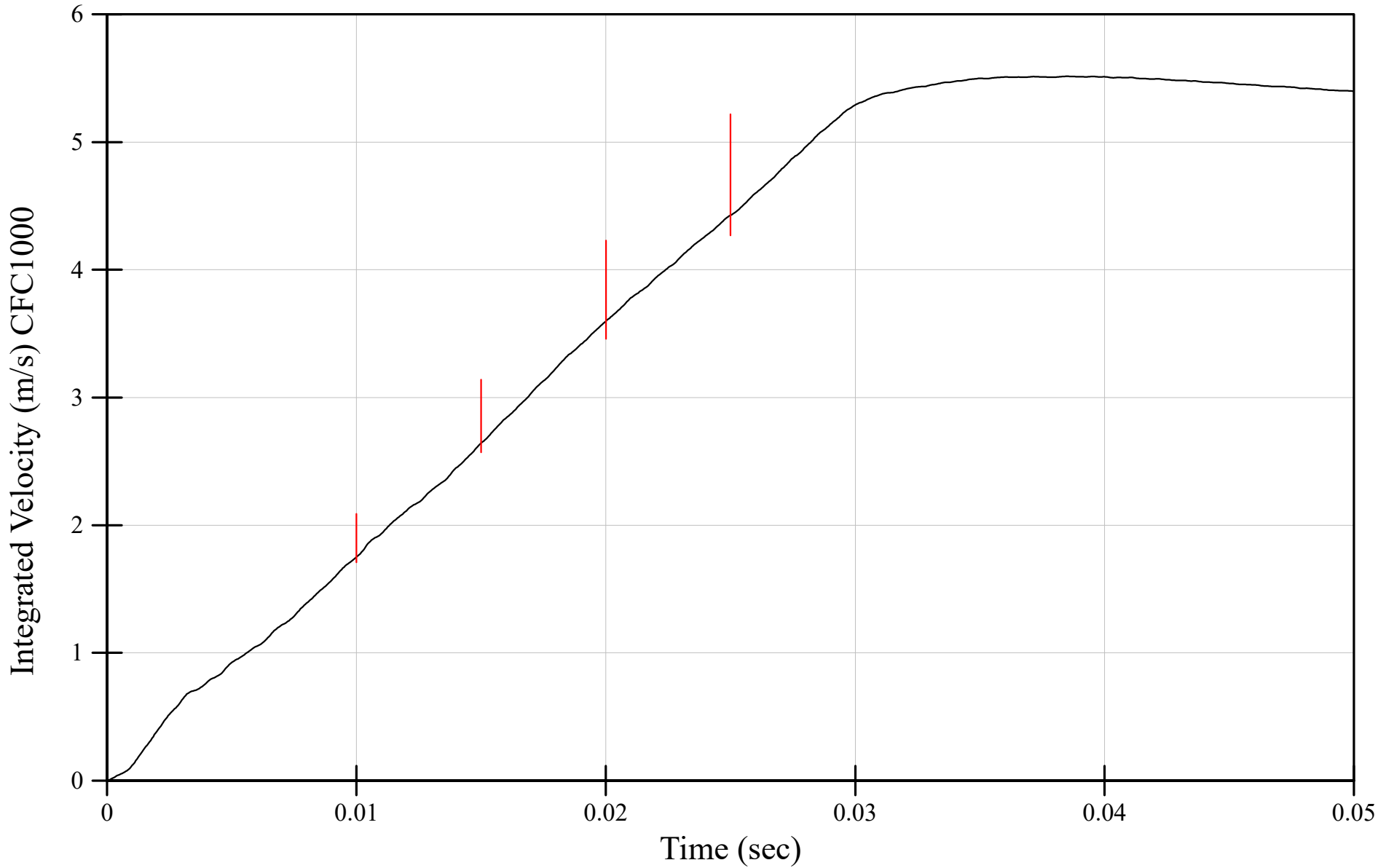


Pre-Test Qualification (Partial)  
THOR-50M Head Impact Qualification  
Head CG Resultant Acceleration  
Serial Number: DO9799

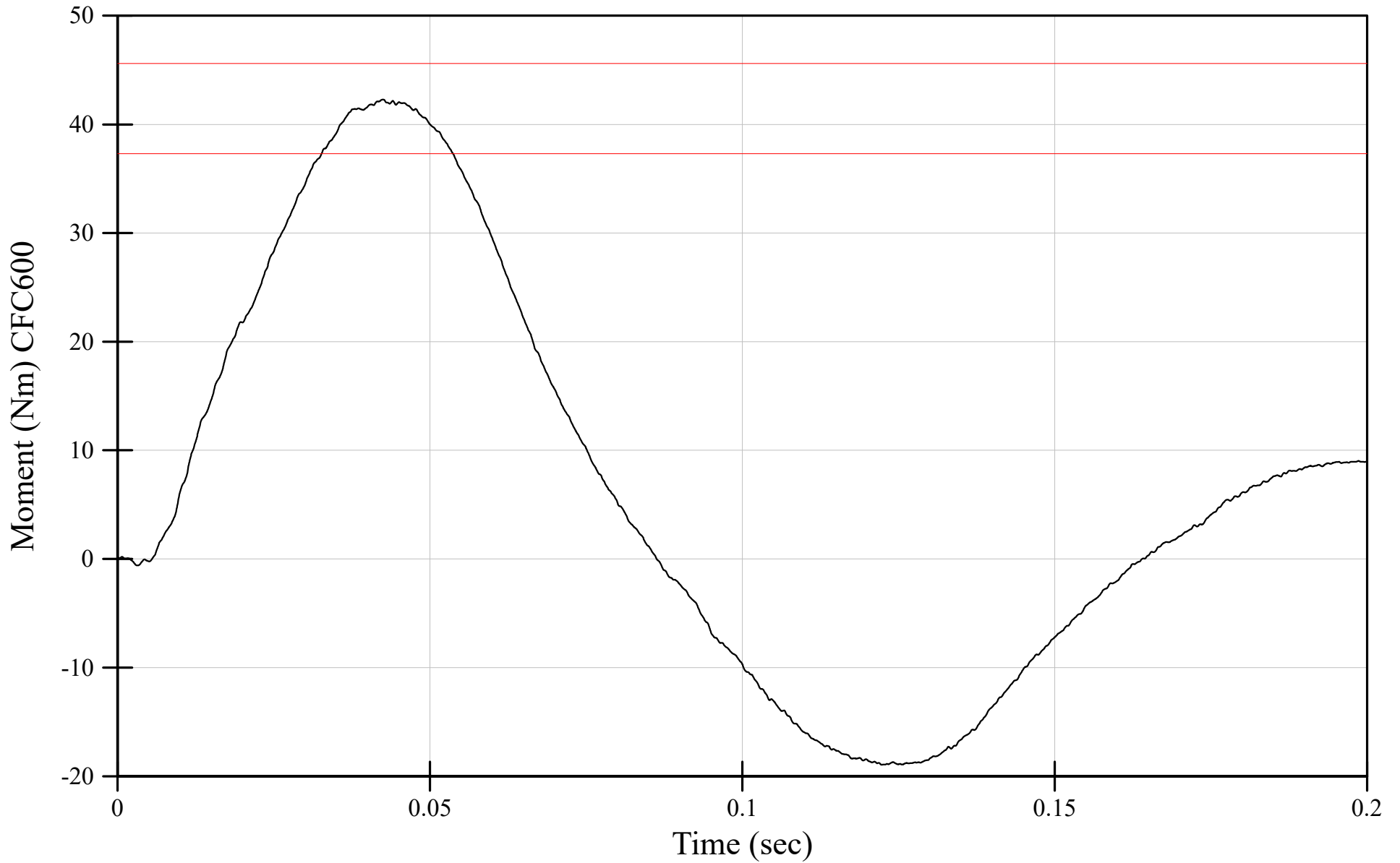


# Neck Torsion Left Qualification

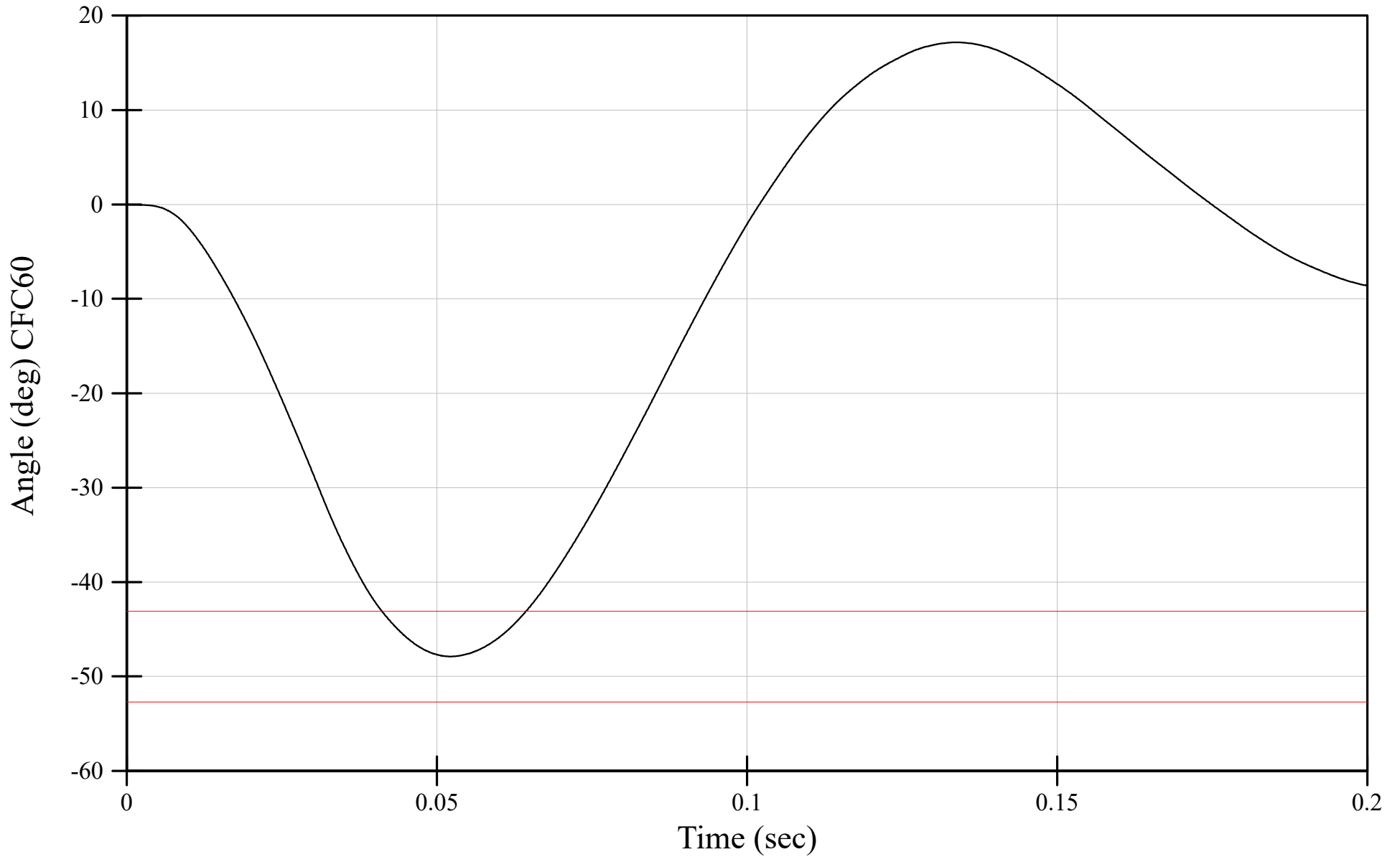
Pre-Test Qualification (Partial)  
THOR-50M Neck Left Torsion Qualification  
Pendulum Velocity  
Serial Number: DO9799



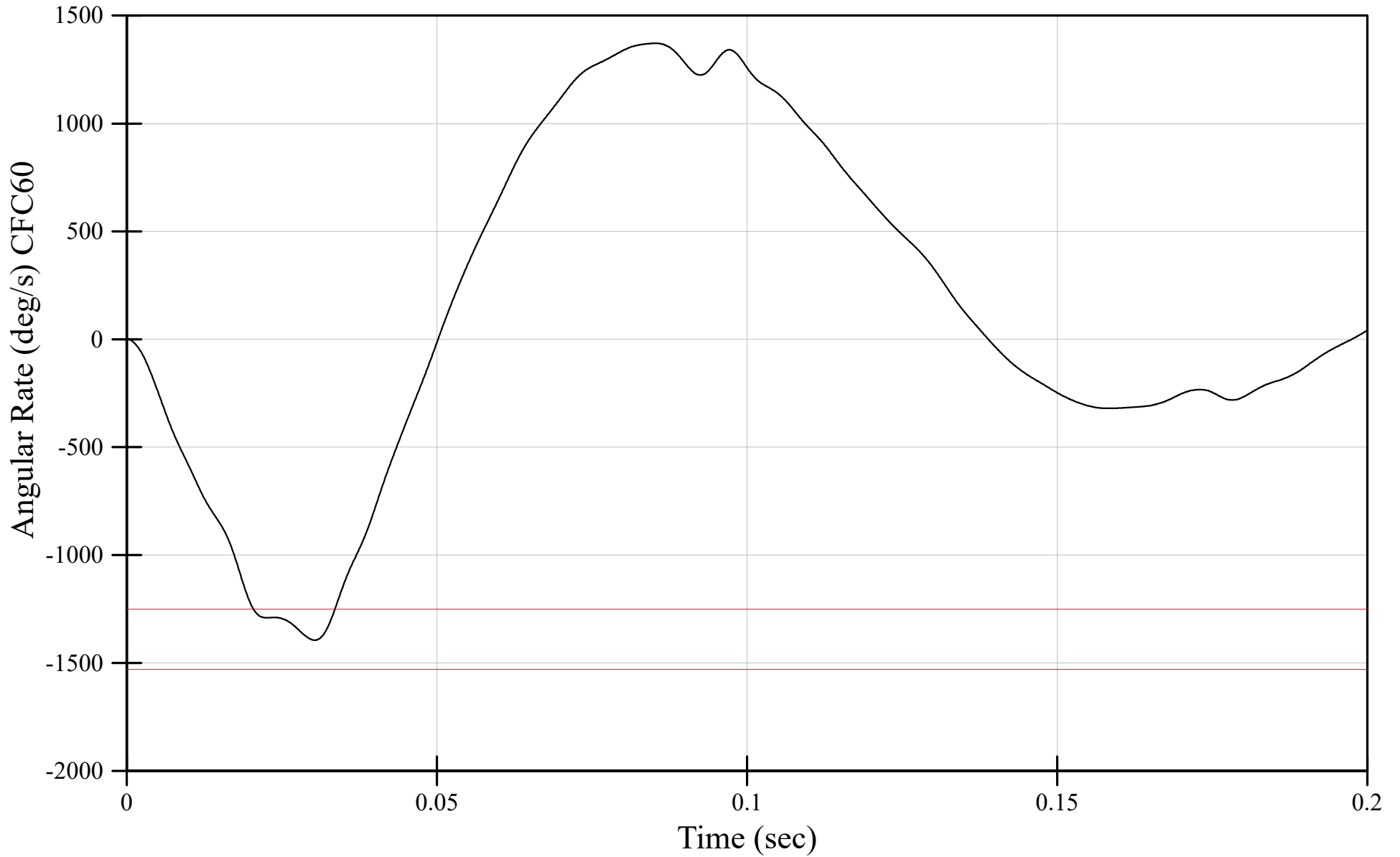
Pre-Test Qualification (Partial)  
THOR-50M Neck Left Torsion Qualification  
Z-Moment as Measured  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Neck Left Torsion Qualification  
Neck Fixture Rotation  
Serial Number: DO9799

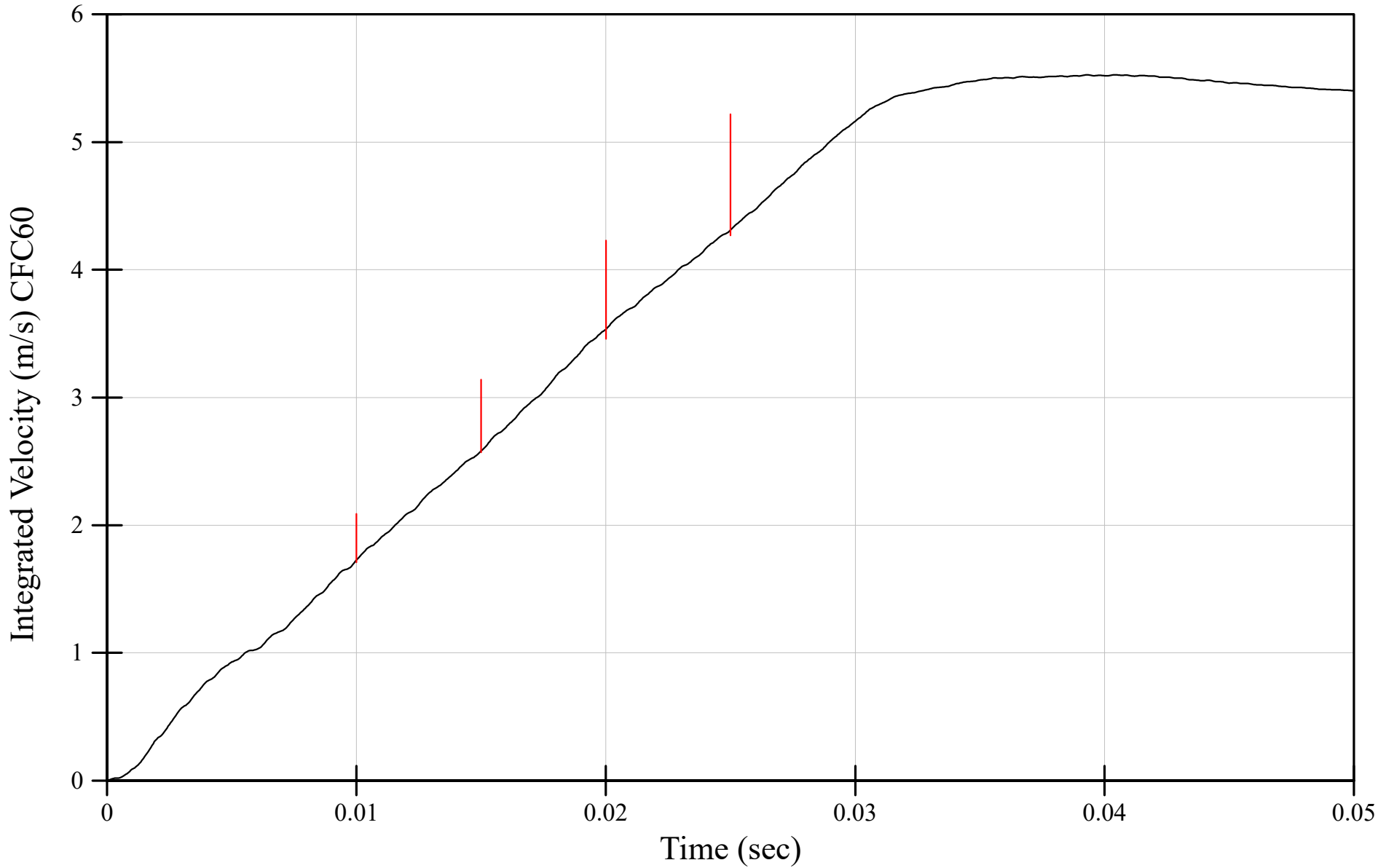


Pre-Test Qualification (Partial)  
THOR-50M Neck Left Torsion Qualification  
Peak Angular Rate  
Serial Number: DO9799

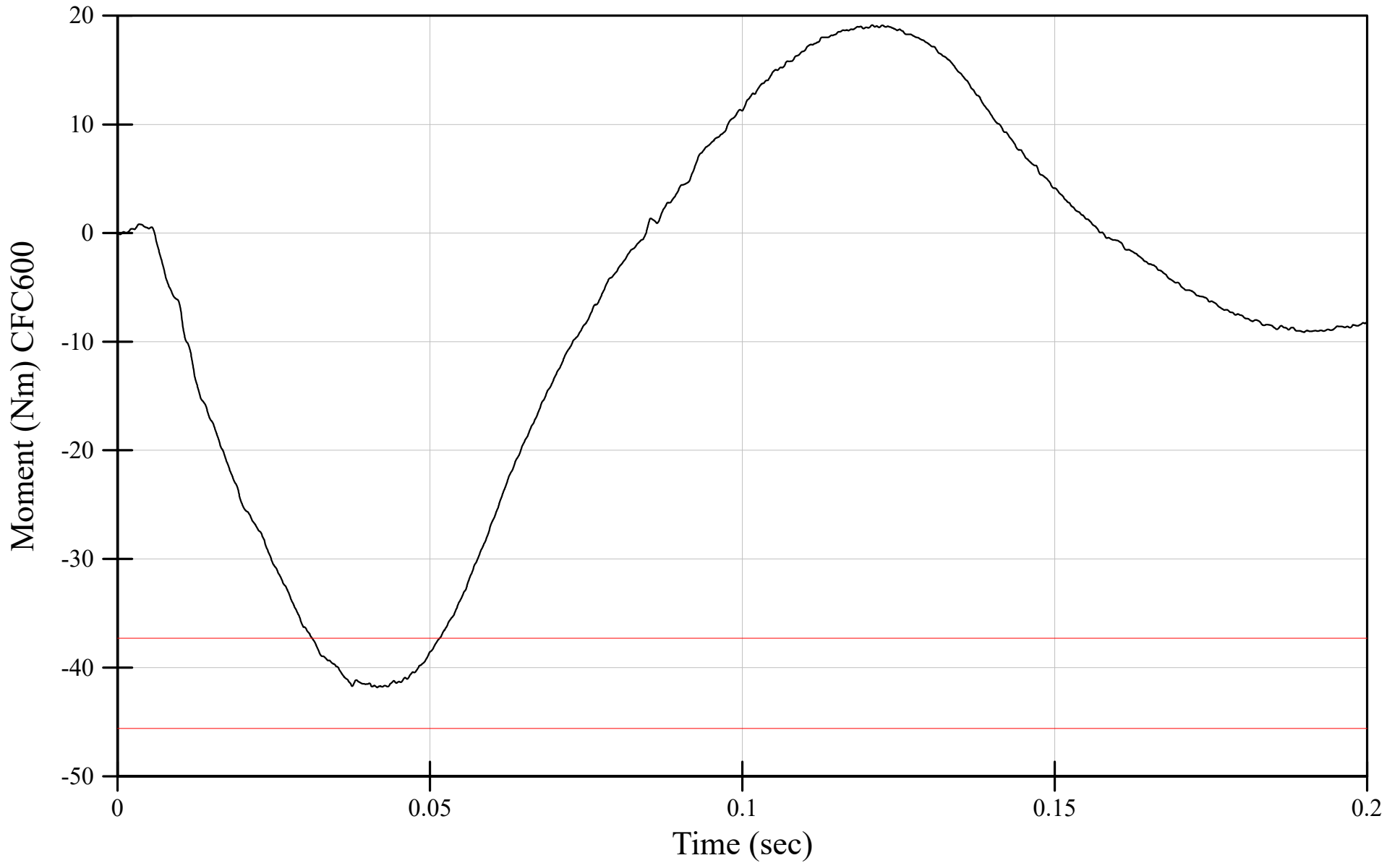


# Neck Torsion Right Qualification

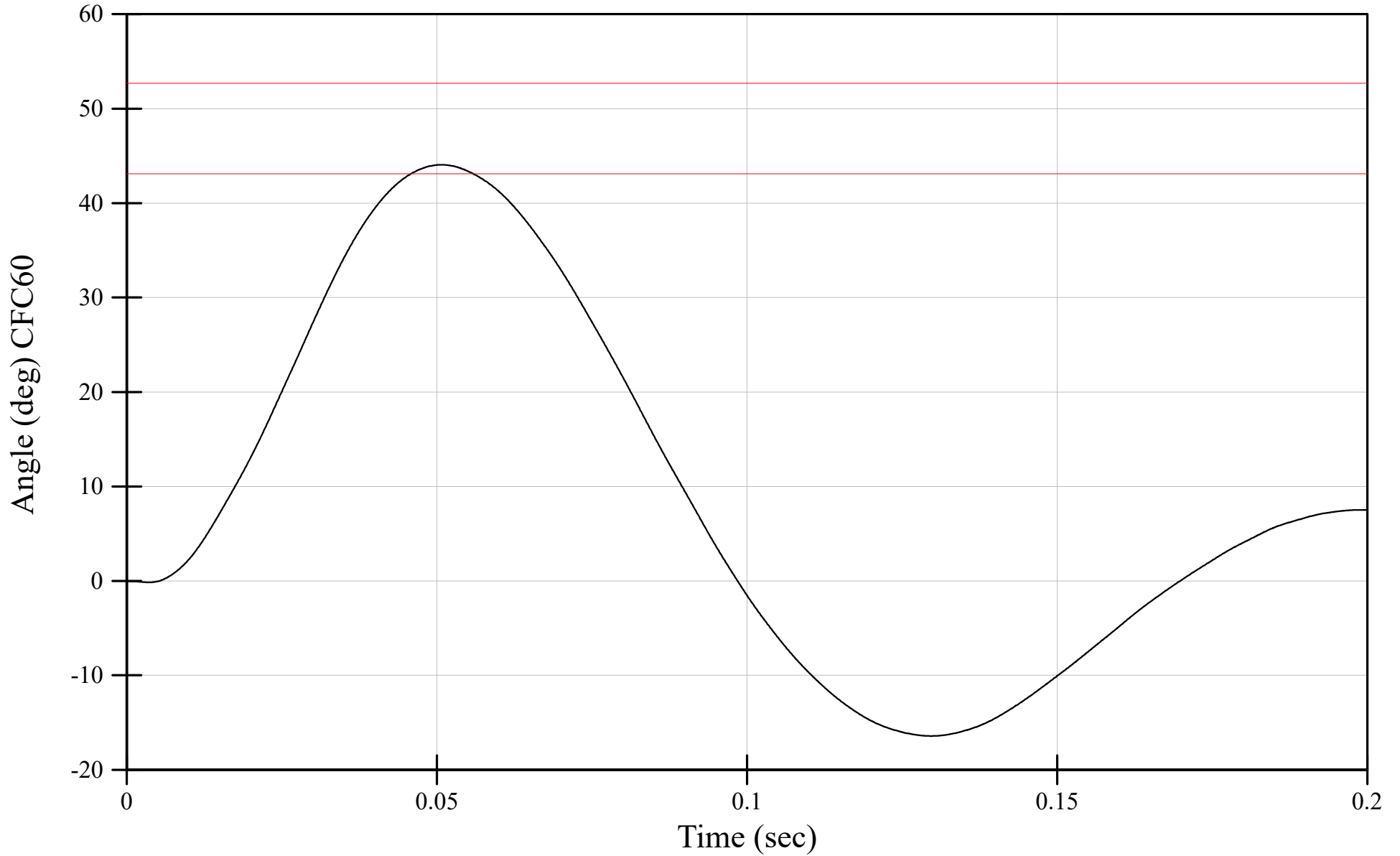
Pre-Test Qualification (Partial)  
THOR-50M Neck Right Torsion Qualification  
Pendulum Velocity  
Serial Number: DO9799



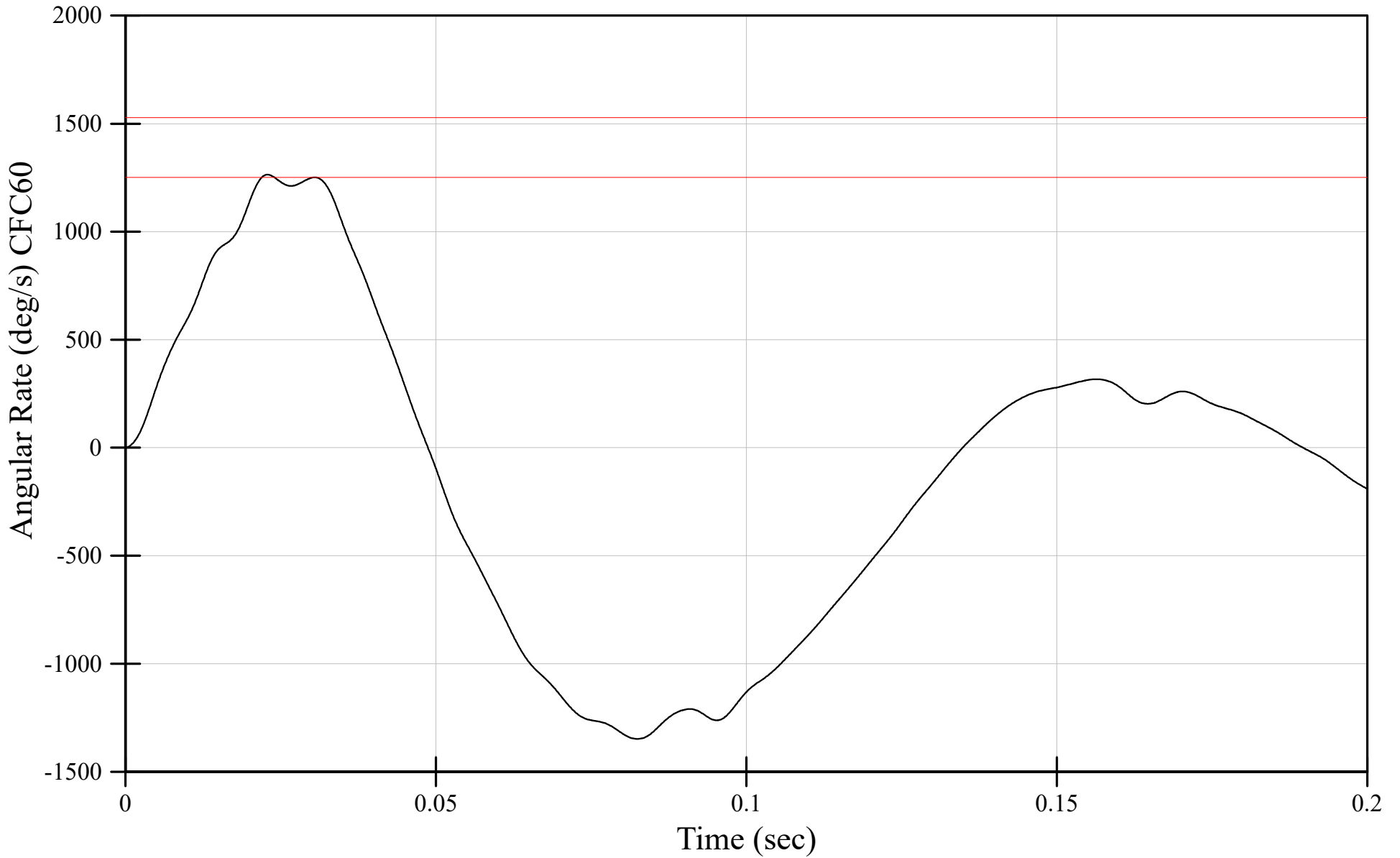
Pre-Test Qualification (Partial)  
THOR-50M Neck Right Torsion Qualification  
Z-Moment as Measured  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Neck Right Torsion Qualification  
Neck Fixture Rotation  
Serial Number: DO9799

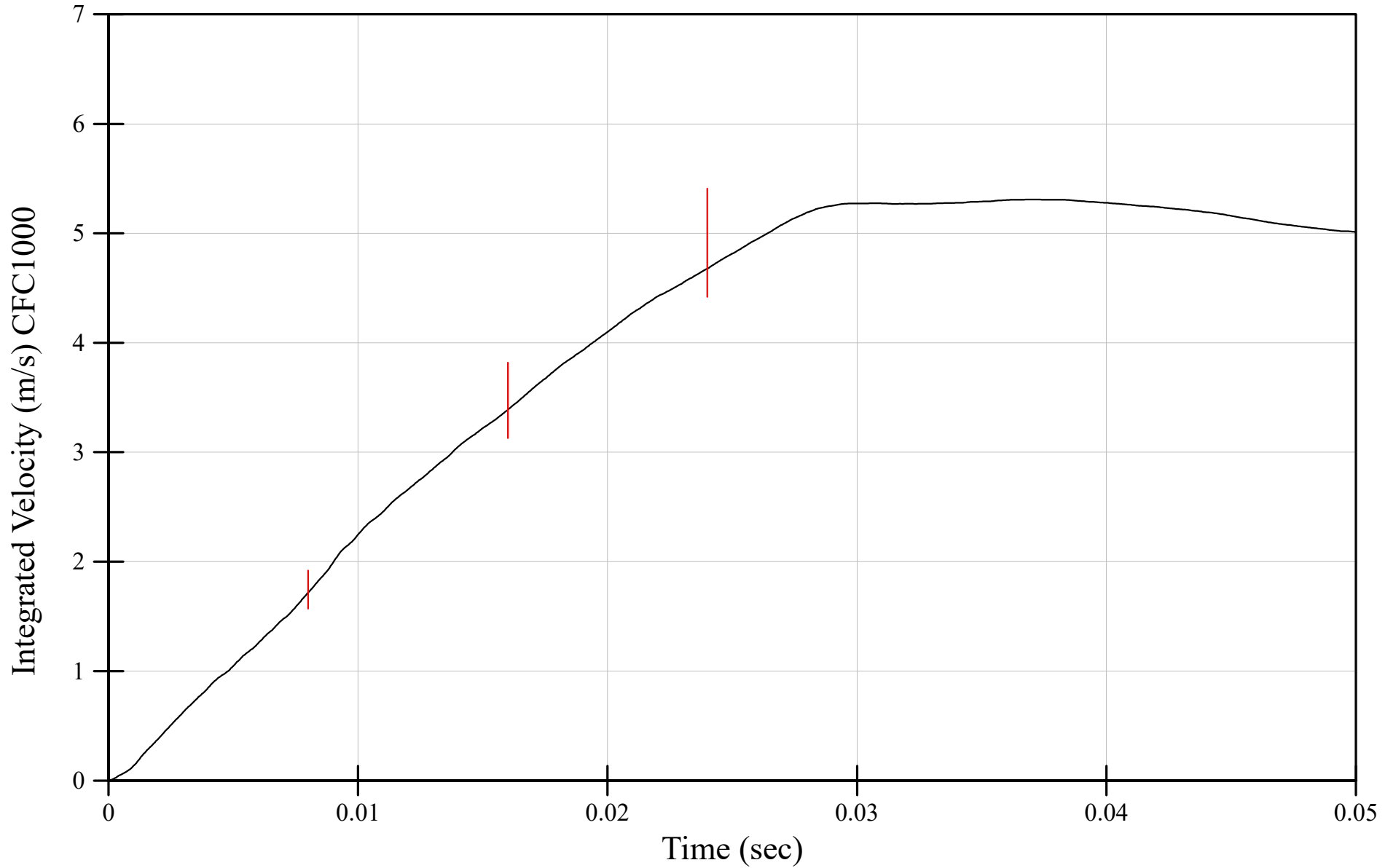


Pre-Test Qualification (Partial)  
THOR-50M Neck Right Torsion Qualification  
Peak Angular Rate  
Serial Number: DO9799

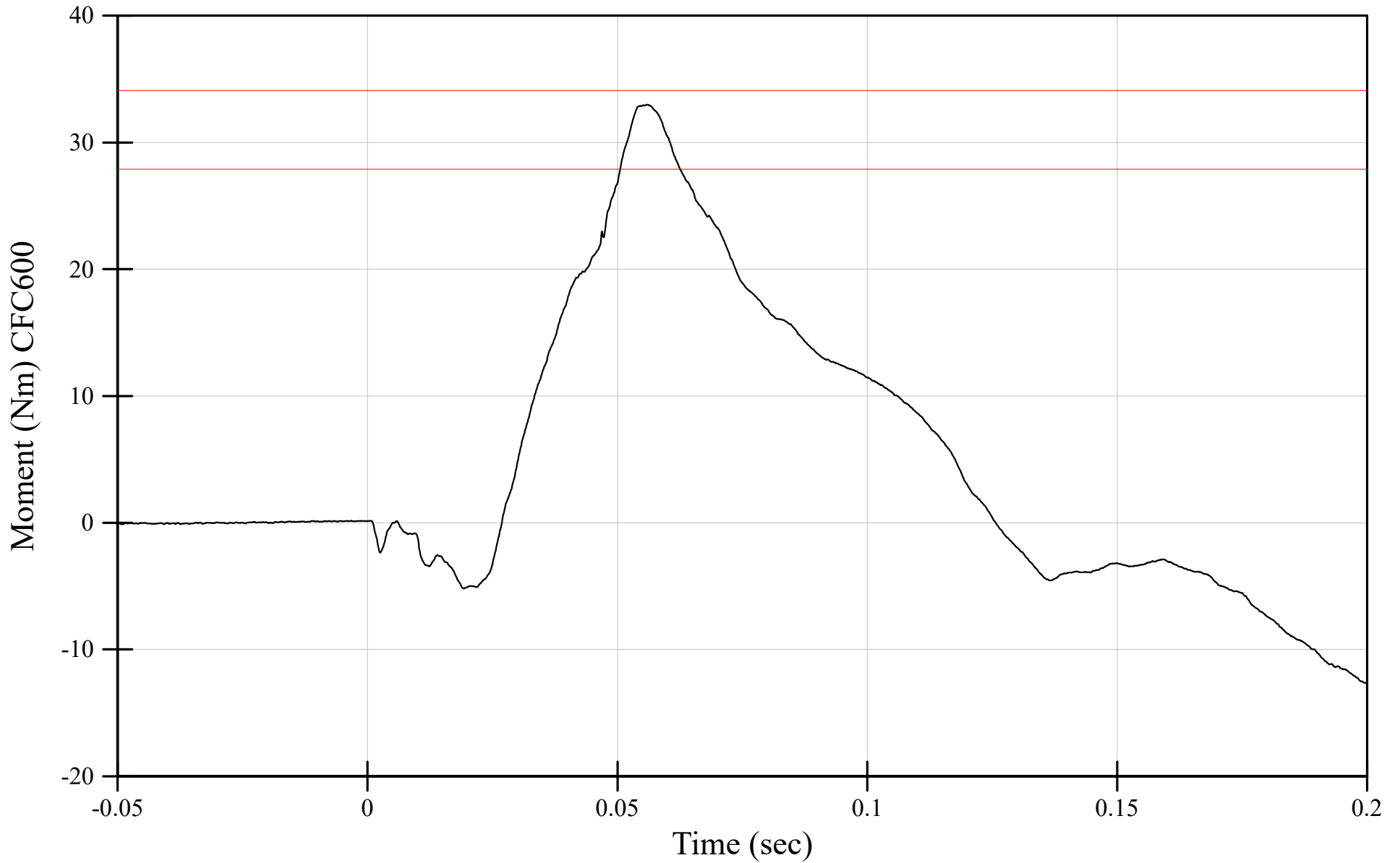


# Neck Frontal Flexion Qualification

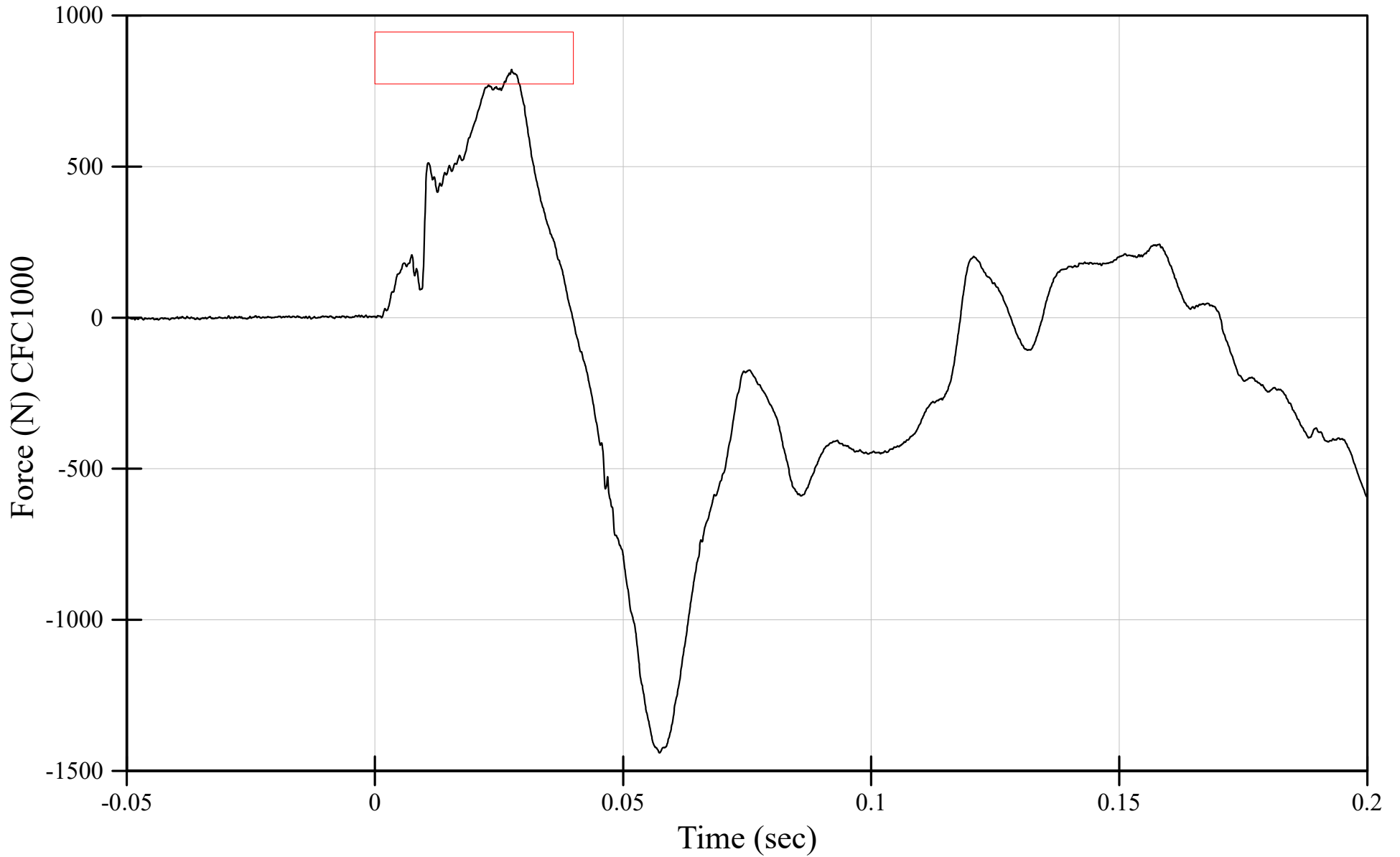
Pre-Test Qualification (Partial)  
THOR-50M Neck Front Flexion Qualification  
Pendulum Velocity  
Neck Serial Number: EA0643



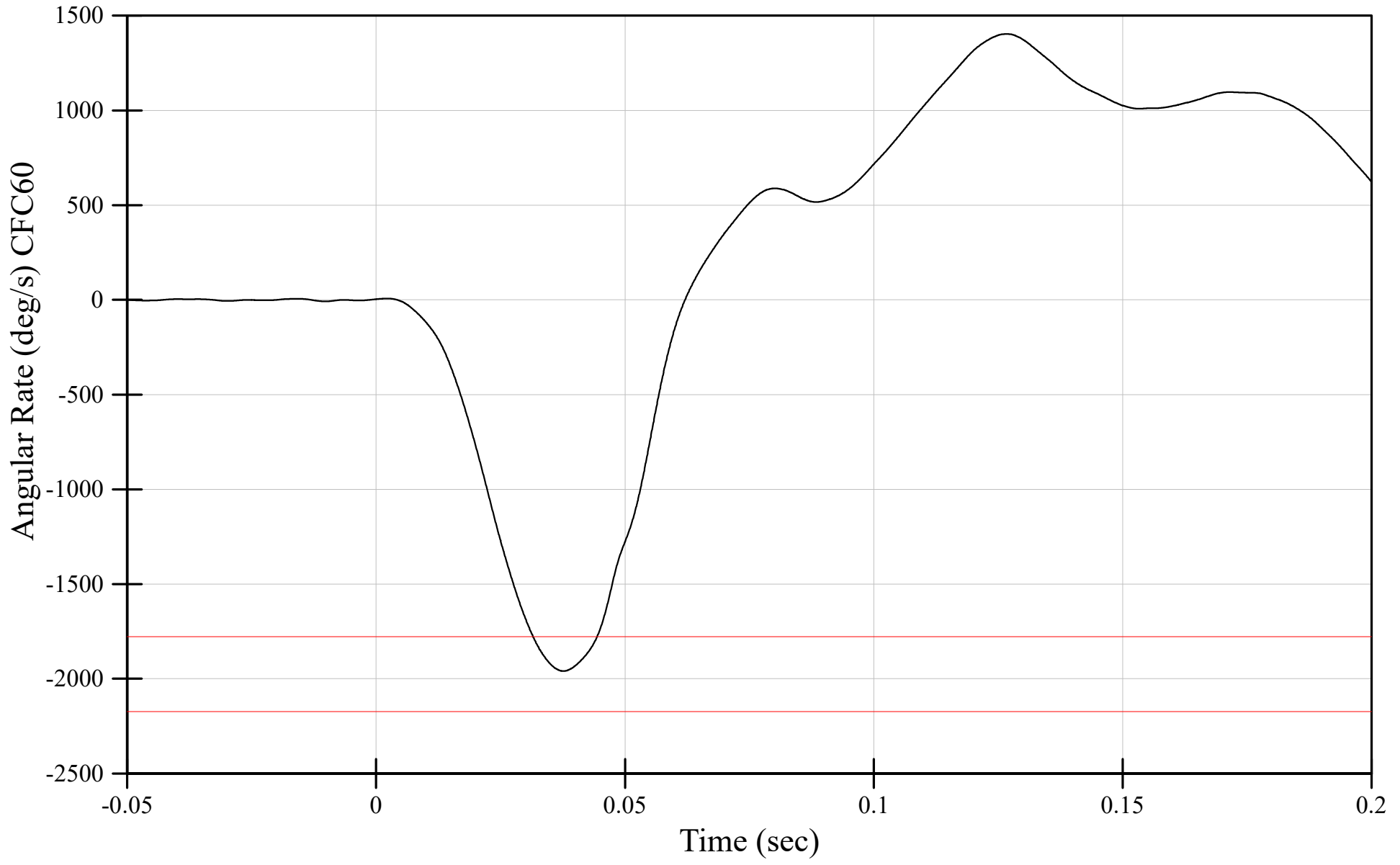
Pre-Test Qualification (Partial)  
THOR-50M Neck Front Flexion Qualification  
Upper Neck My  
Neck Serial Number: EA0643



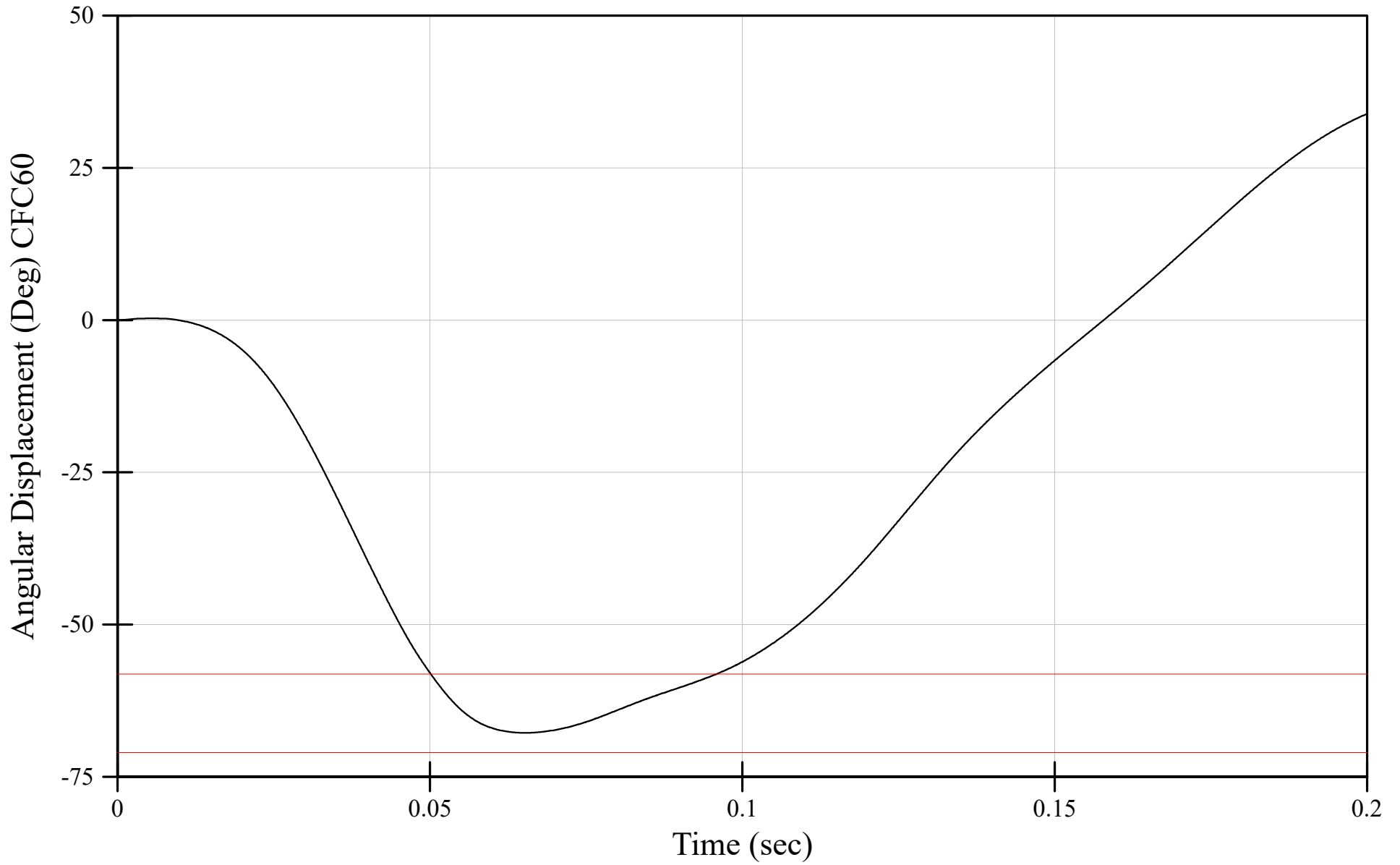
Pre-Test Qualification (Partial)  
THOR-50M Neck Front Flexion Qualification  
Upper Neck Fz  
Neck Serial Number: EA0643



Pre-Test Qualification (Partial)  
THOR-50M Neck Front Flexion Qualification  
Peak Head Angular Rate  
Neck Serial Number: EA0643

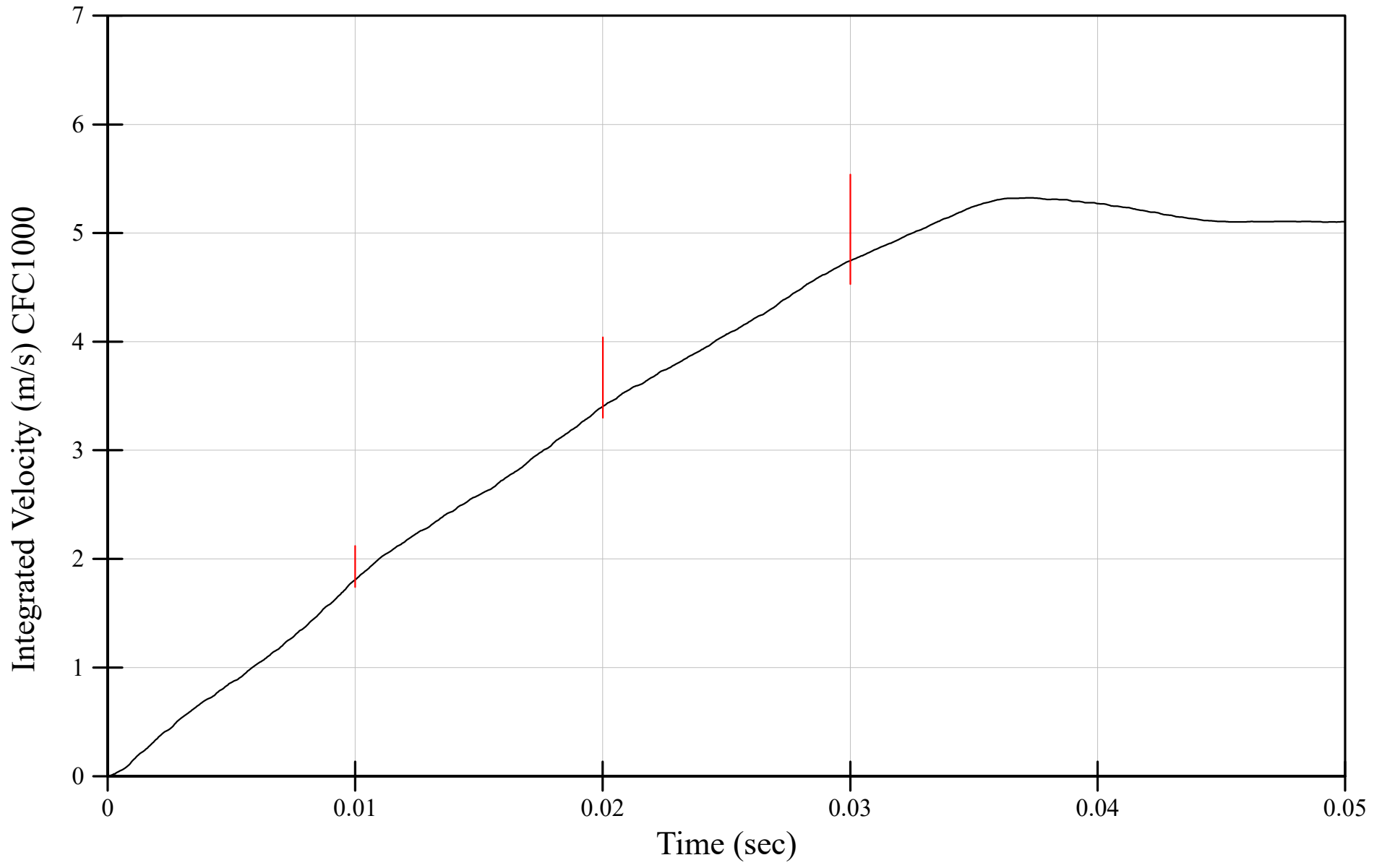


Pre-Test Qualification (Partial)  
THOR-50M Neck Front Flexion Qualification  
Head Rotation  
Neck Serial Number: EA0643

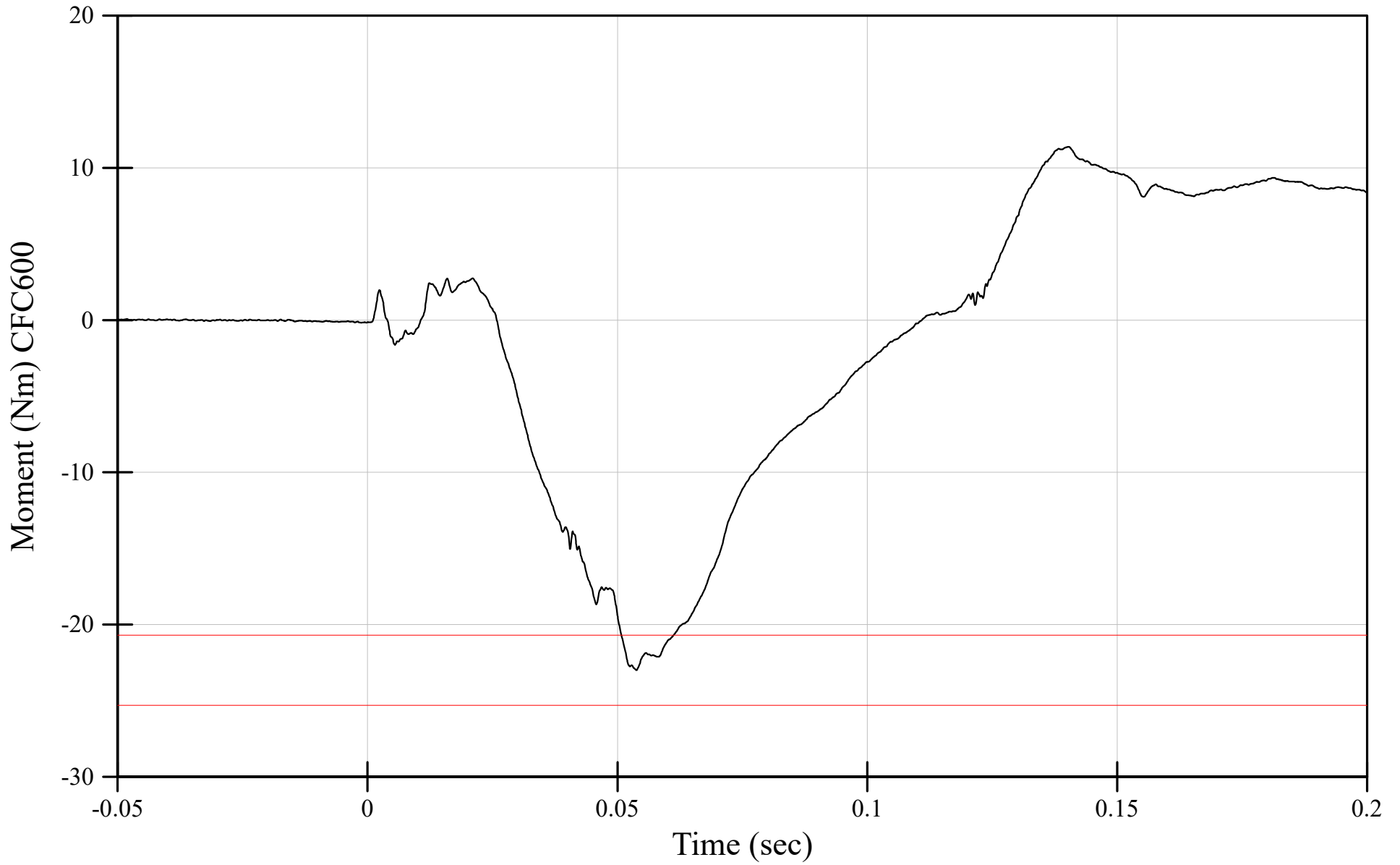


# Neck Extension Qualification

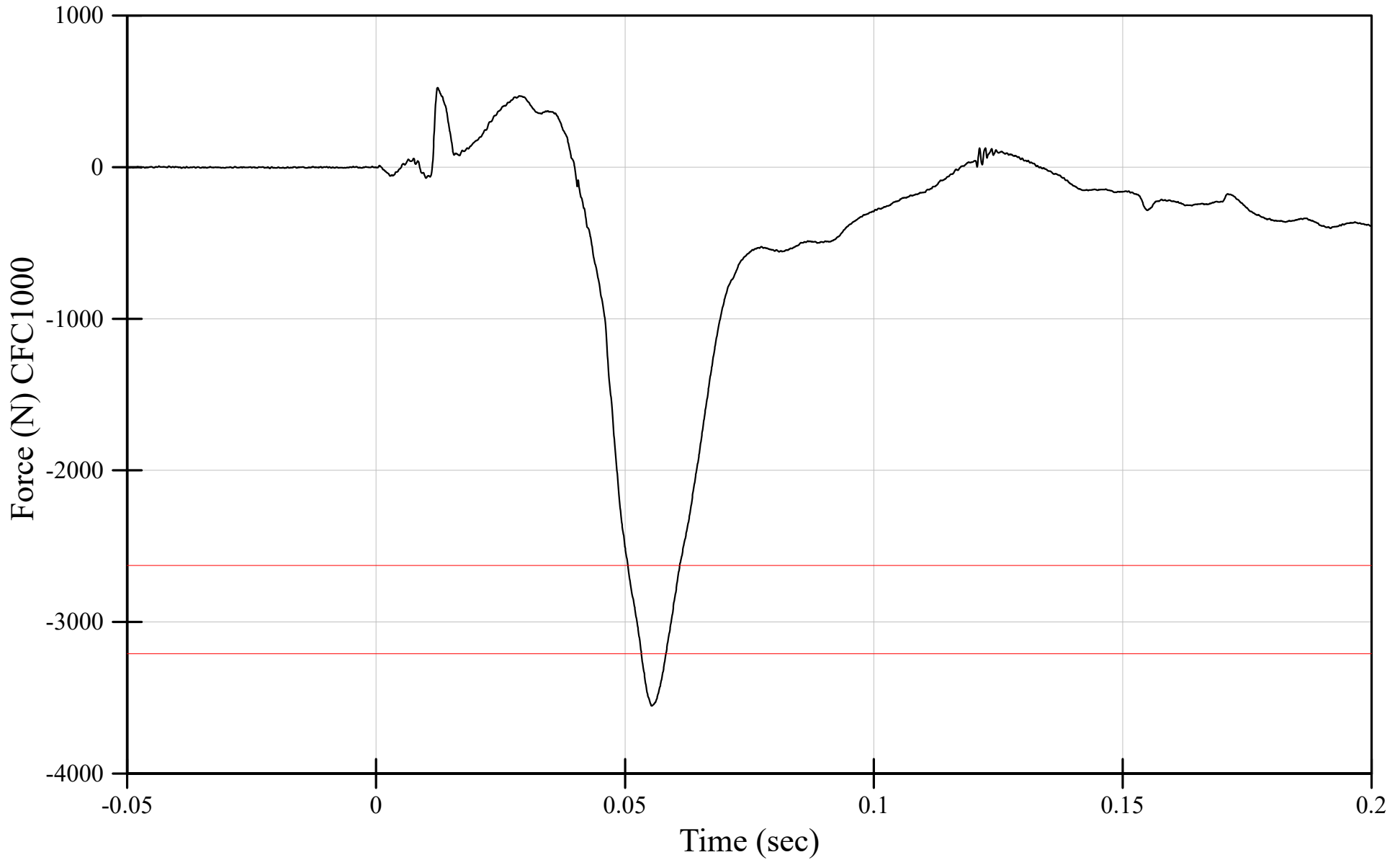
Pre-Test Qualification (Partial)  
THOR-50M Neck Extension Qualification  
Pendulum Velocity  
Neck Serial Number: EA0643



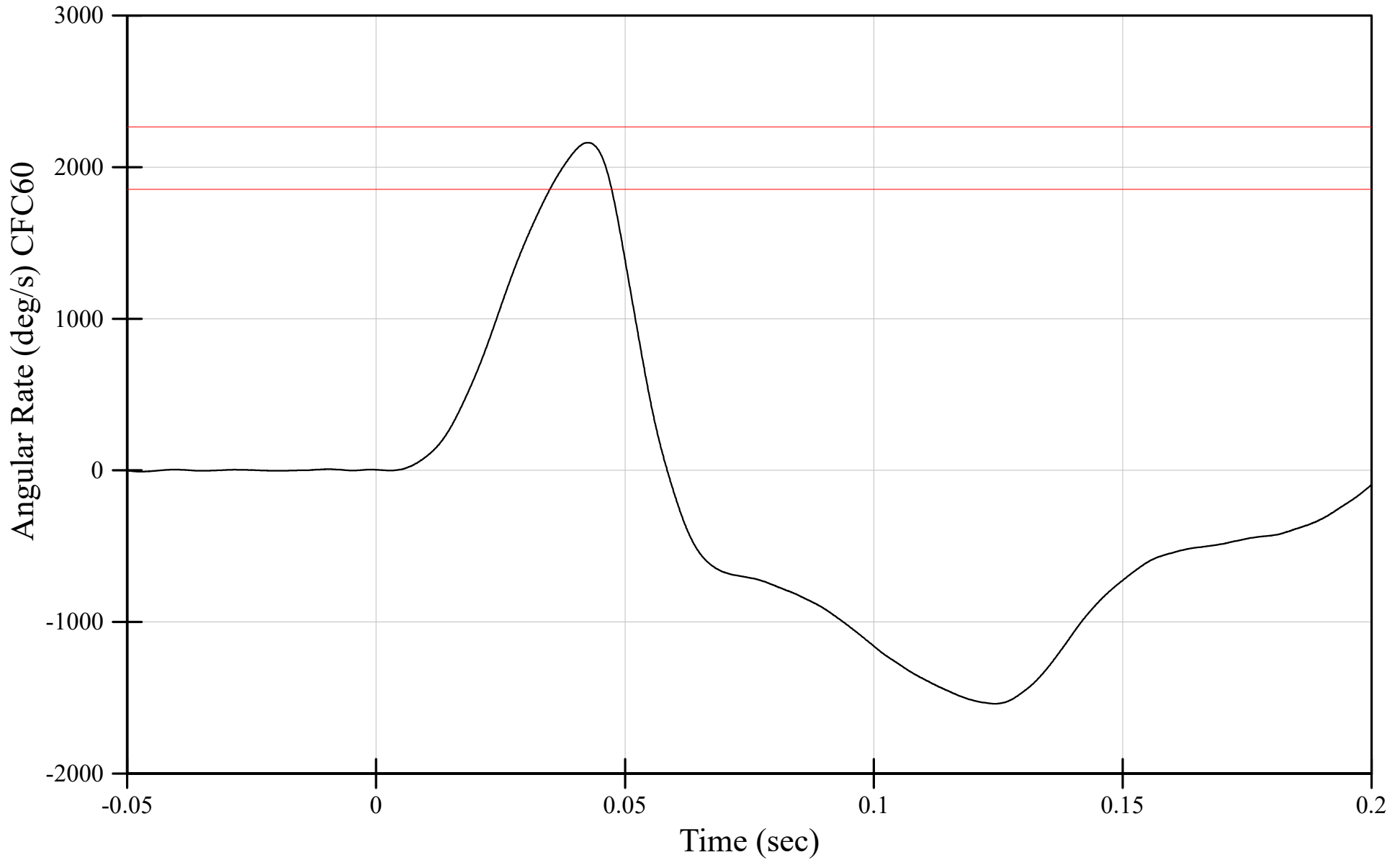
Pre-Test Qualification (Partial)  
THOR-50M Neck Extension Qualification  
Upper Neck My  
Neck Serial Number: EA0643



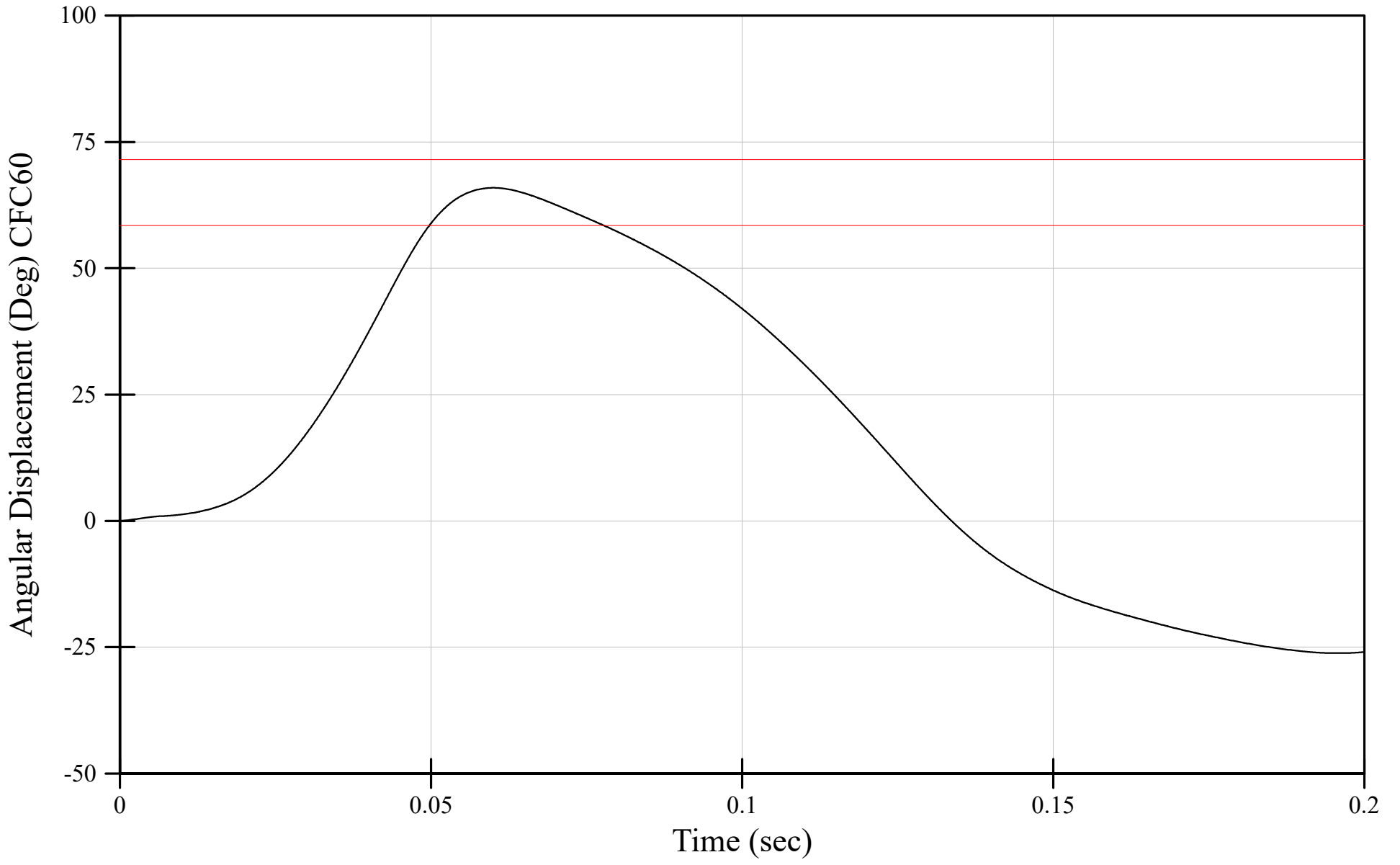
Pre-Test Qualification (Partial)  
THOR-50M Neck Extension Qualification  
Upper Neck Fz  
Neck Serial Number: EA0643



Pre-Test Qualification (Partial)  
THOR-50M Neck Extension Qualification  
Peak Head Angular Rate  
Neck Serial Number: EA0643

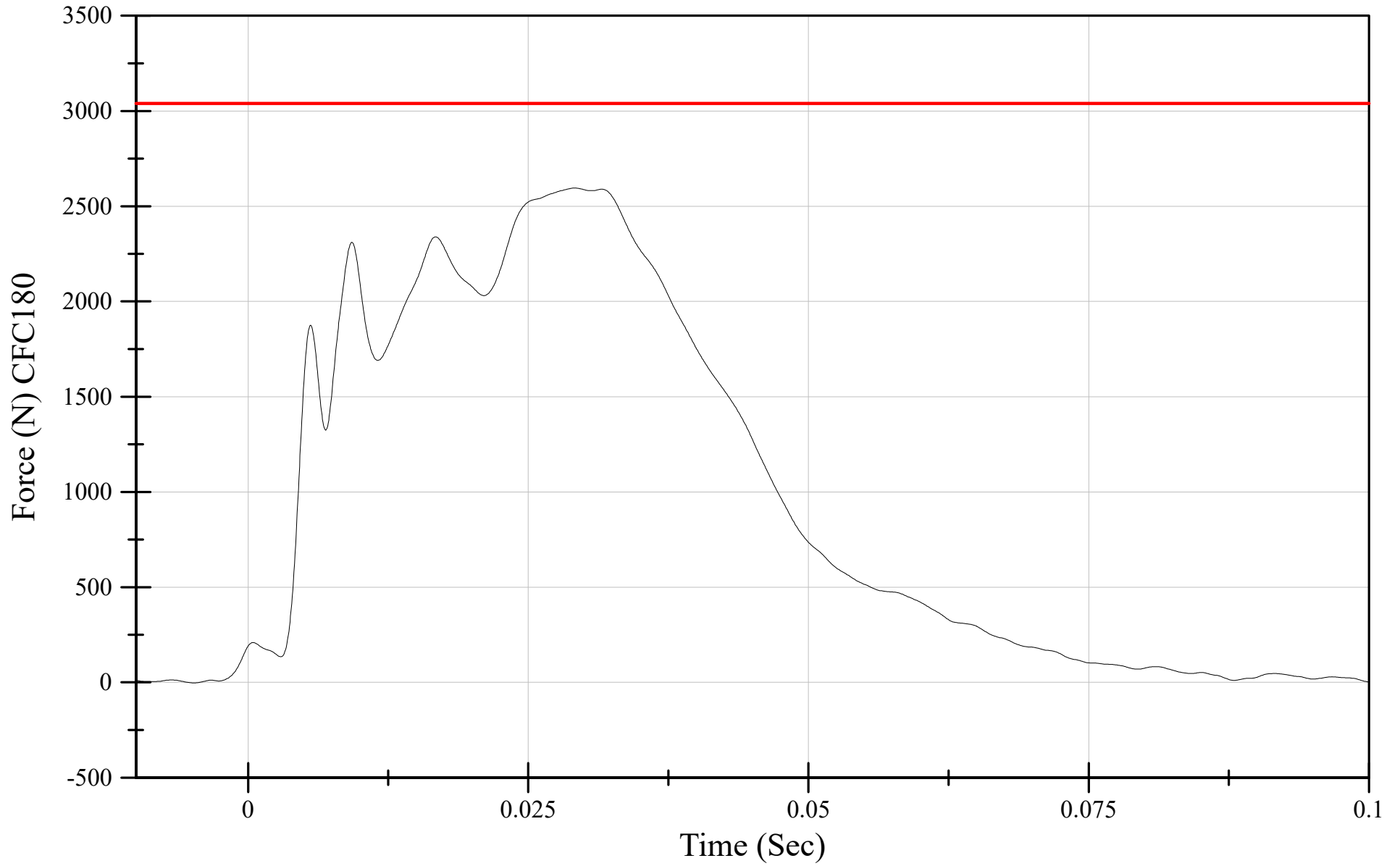


Pre-Test Qualification (Partial)  
THOR-50M Neck Extension Qualification  
Neck Rotation  
Neck Serial Number: EA0643

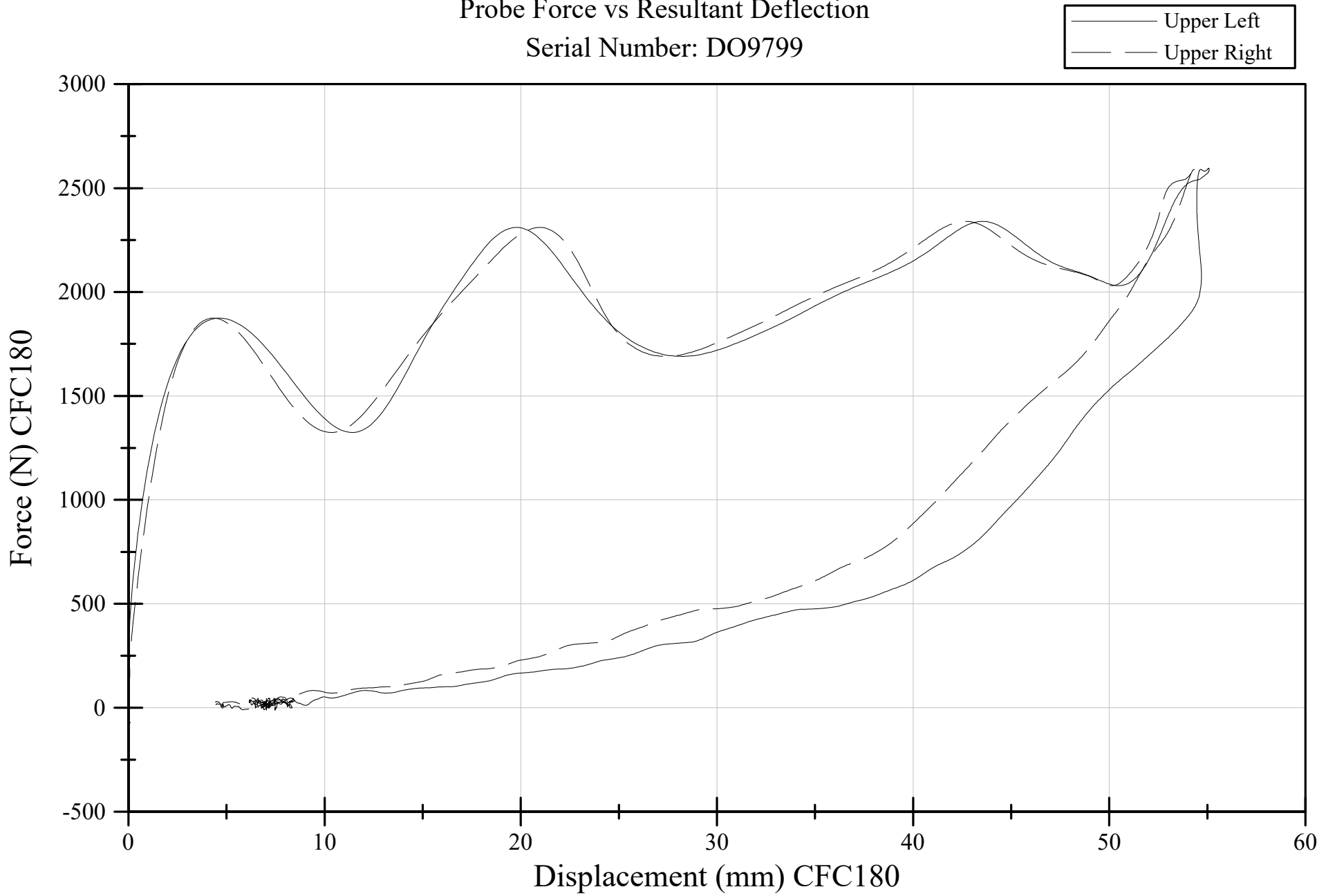


# Upper Thorax Qualification

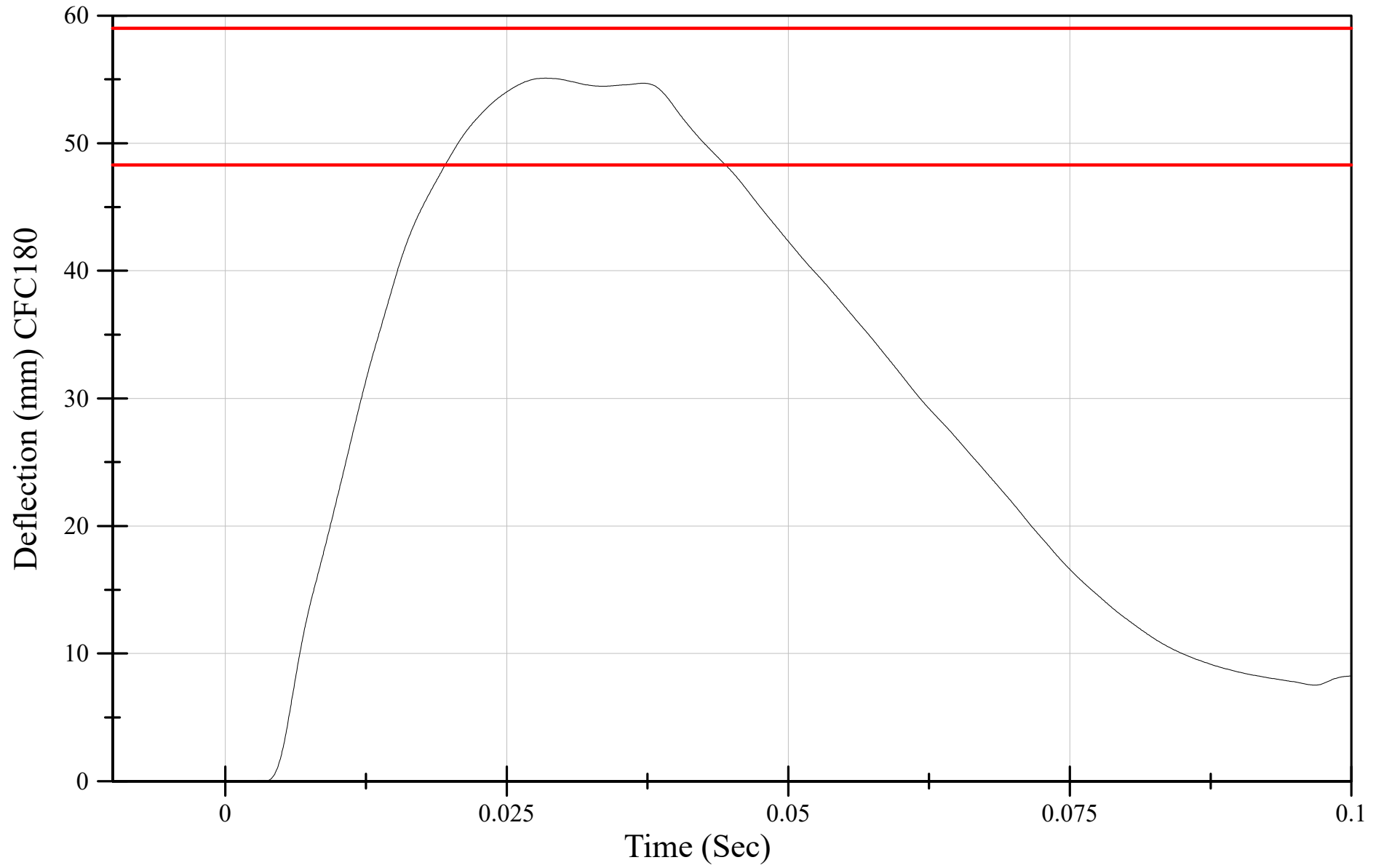
Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Probe Force  
Serial Number: DO9799



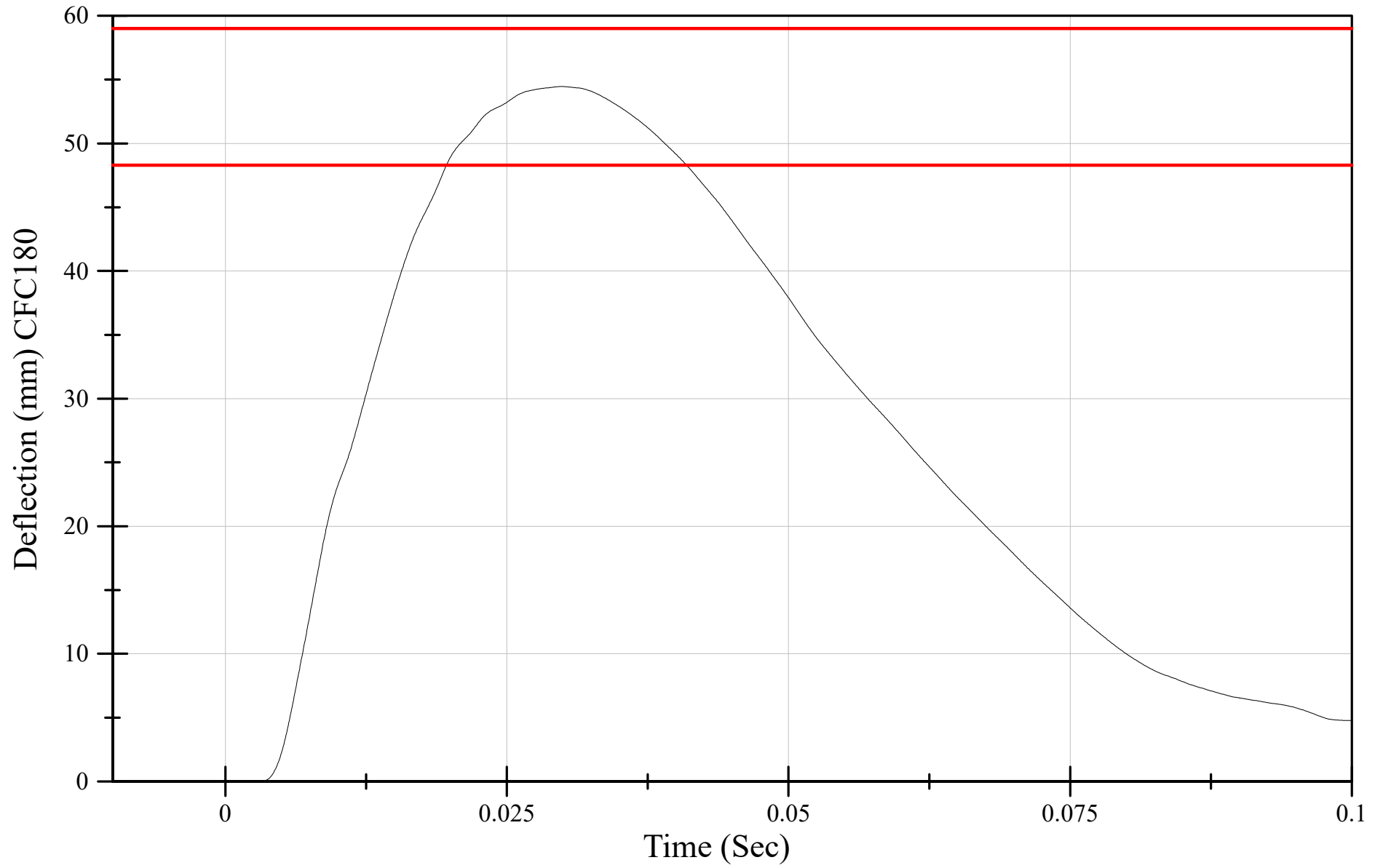
Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Probe Force vs Resultant Deflection  
Serial Number: DO9799



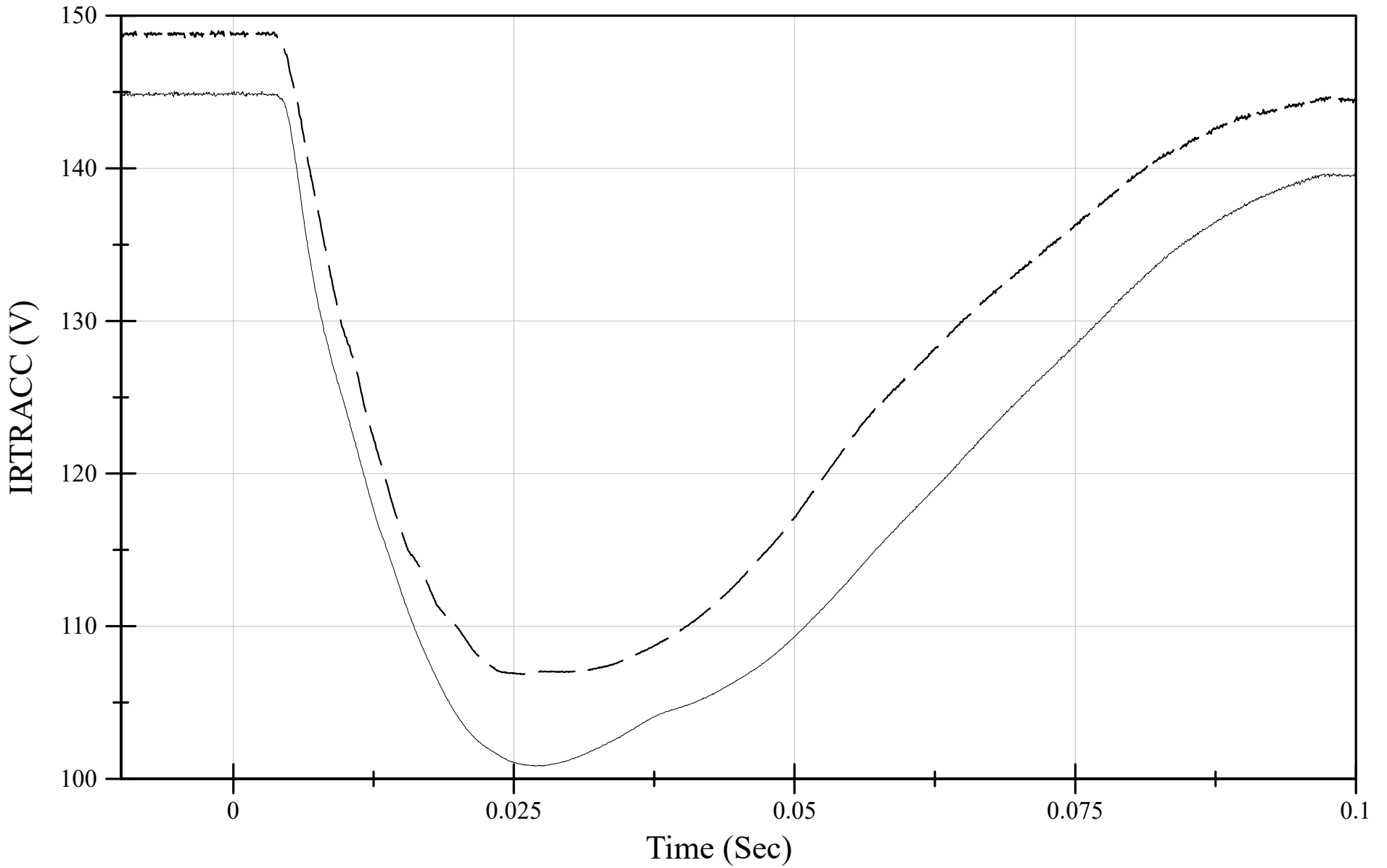
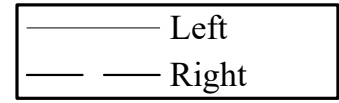
Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Left Resultant Deflection  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Right Resultant Deflection  
Serial Number: DO9799

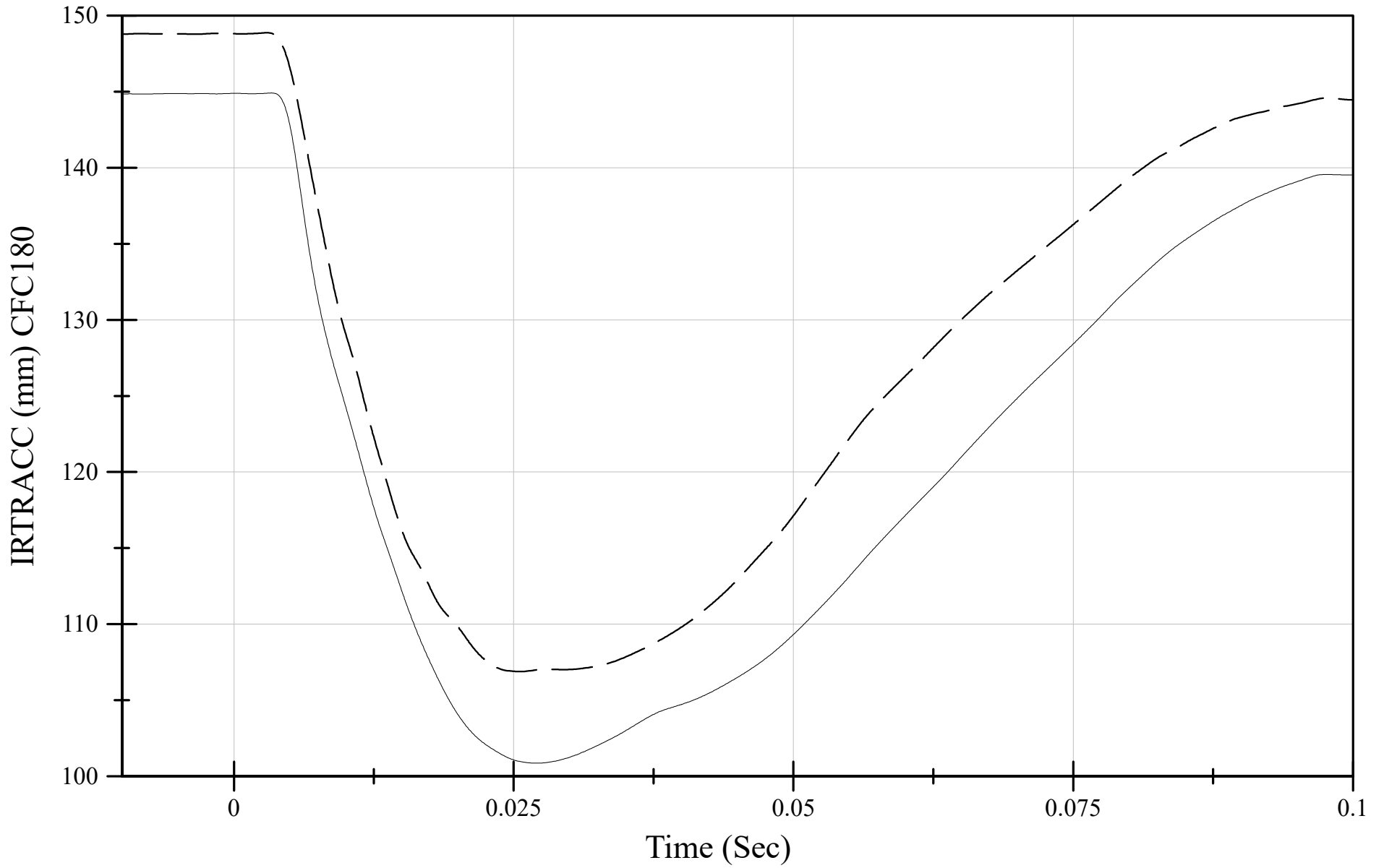


Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
IRTRACC Voltage  
Serial Number: DO9799

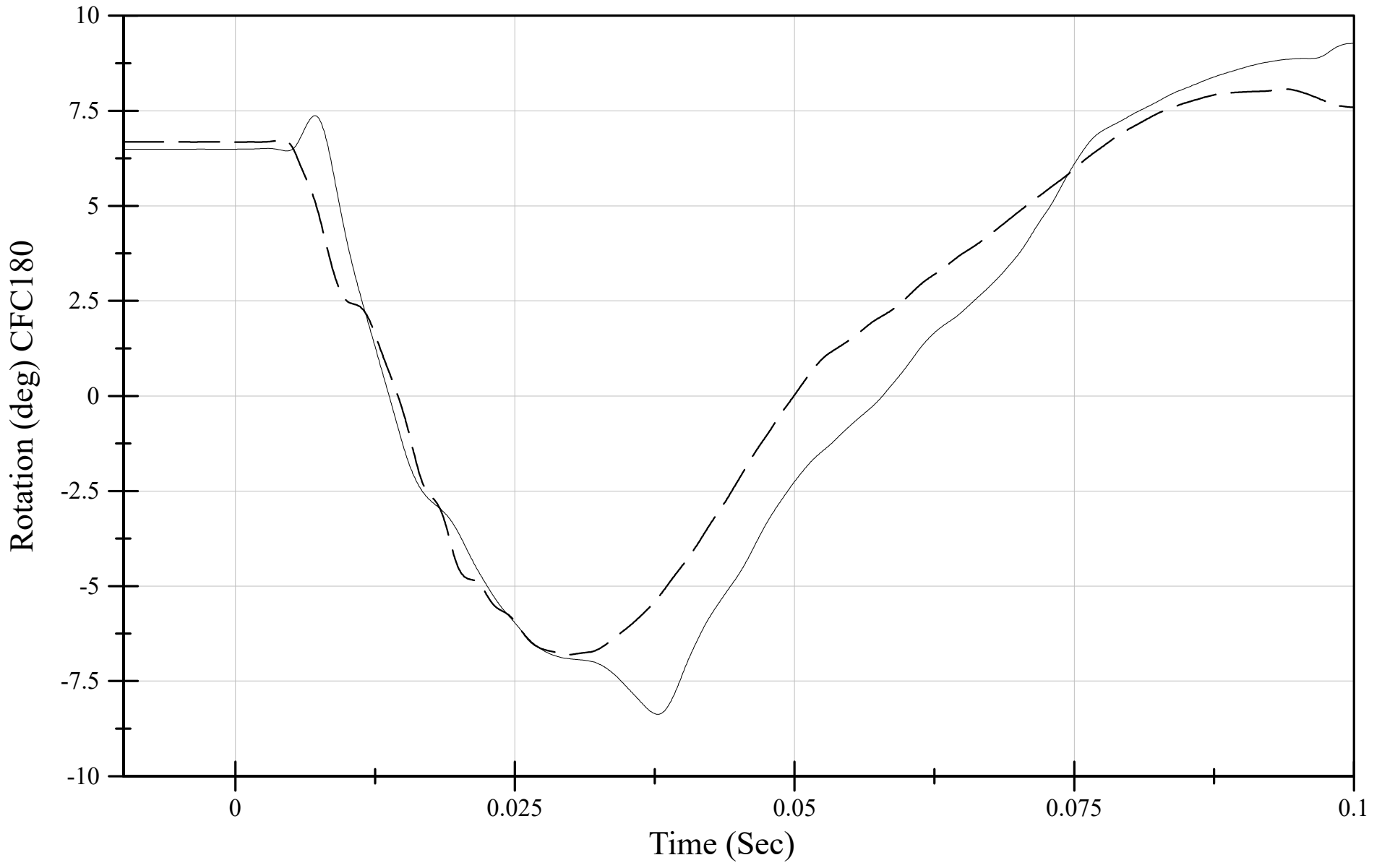
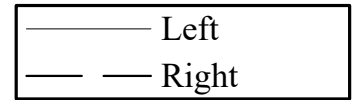


Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
IRTRACC X-Deflection  
Serial Number: DO9799

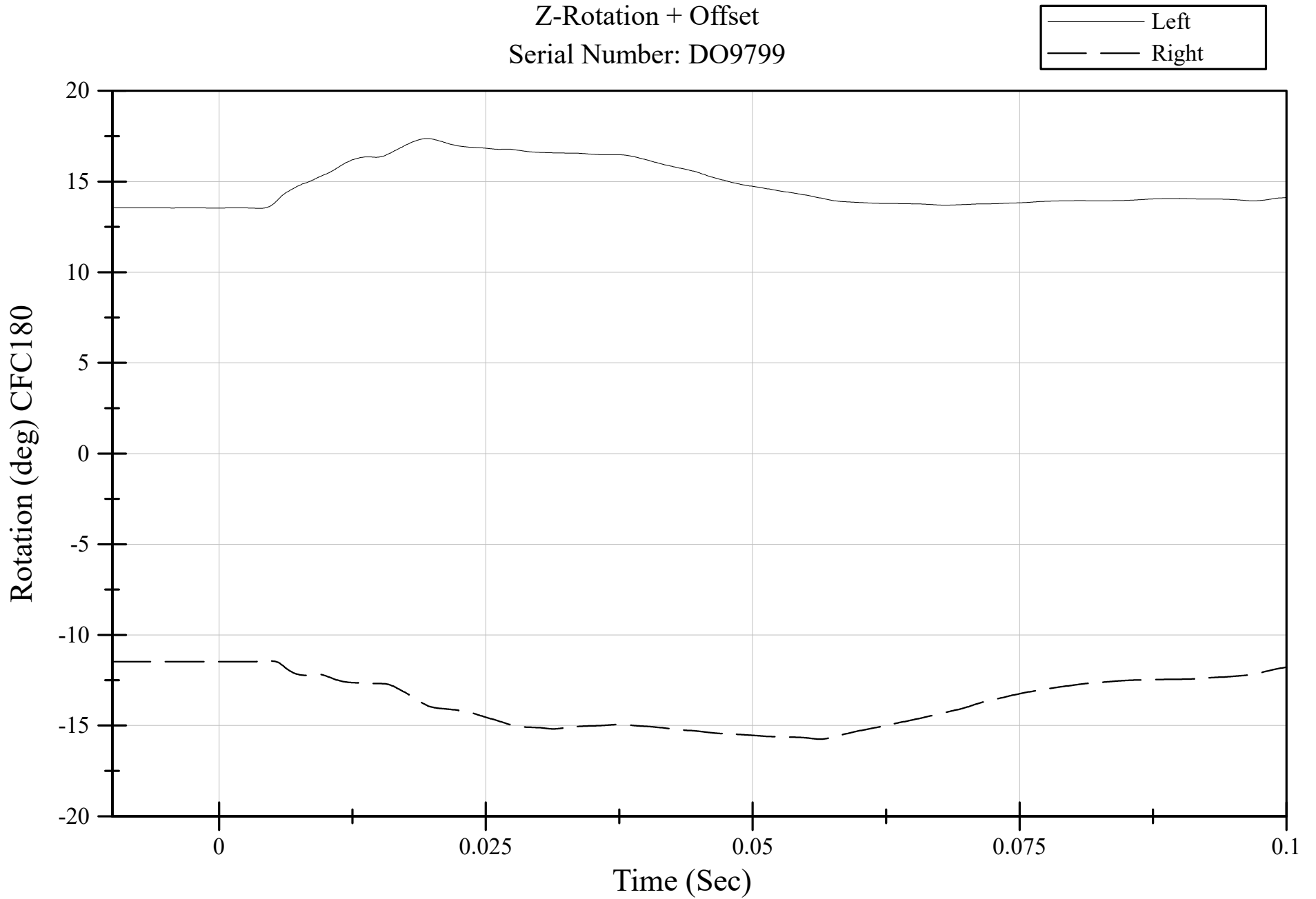
Left  
Right



Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Y-Rotation + Offset  
Serial Number: DO9799

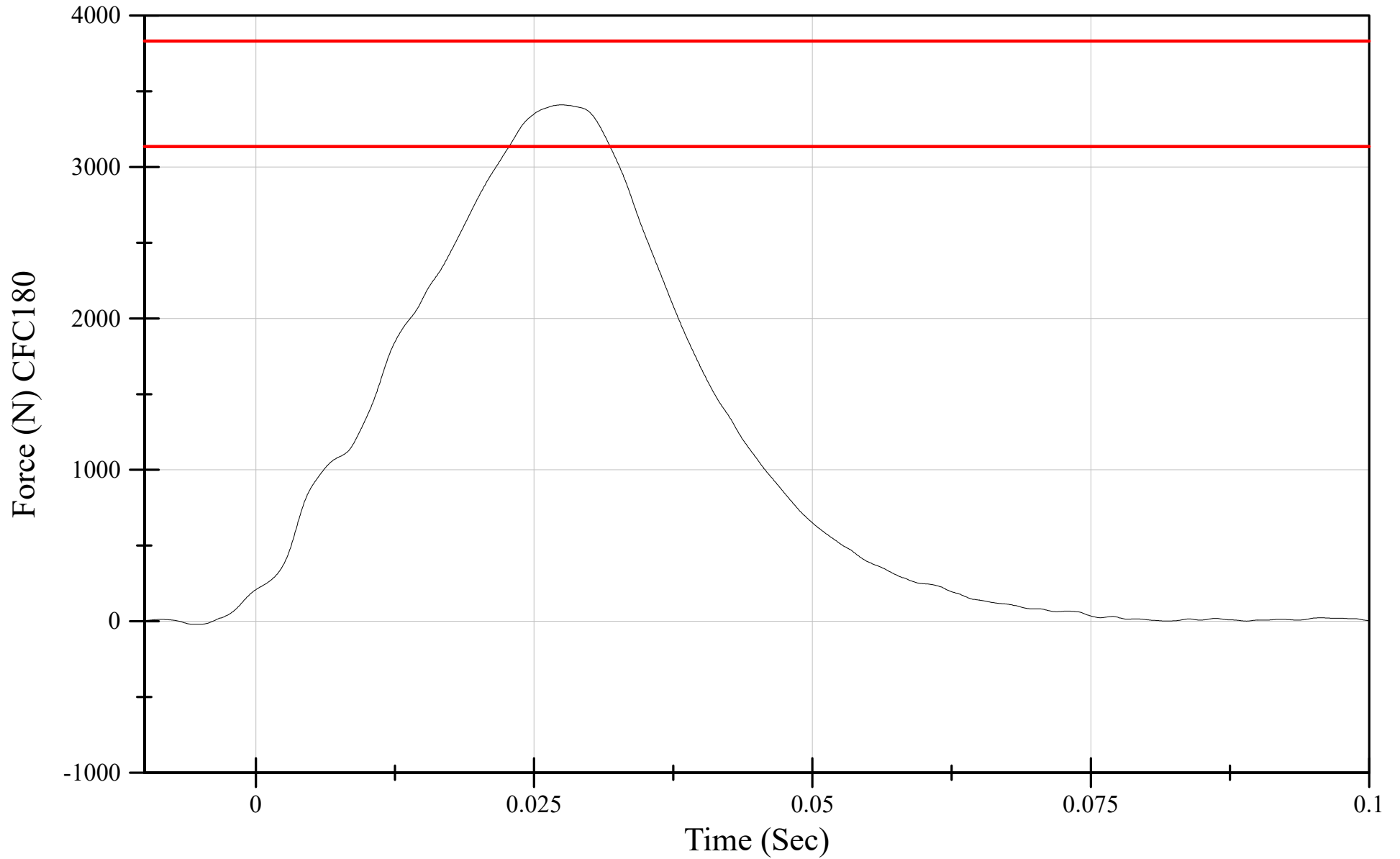


Pre-Test Qualification (Partial)  
THOR-50M Upper Thorax Qualification  
Z-Rotation + Offset  
Serial Number: DO9799

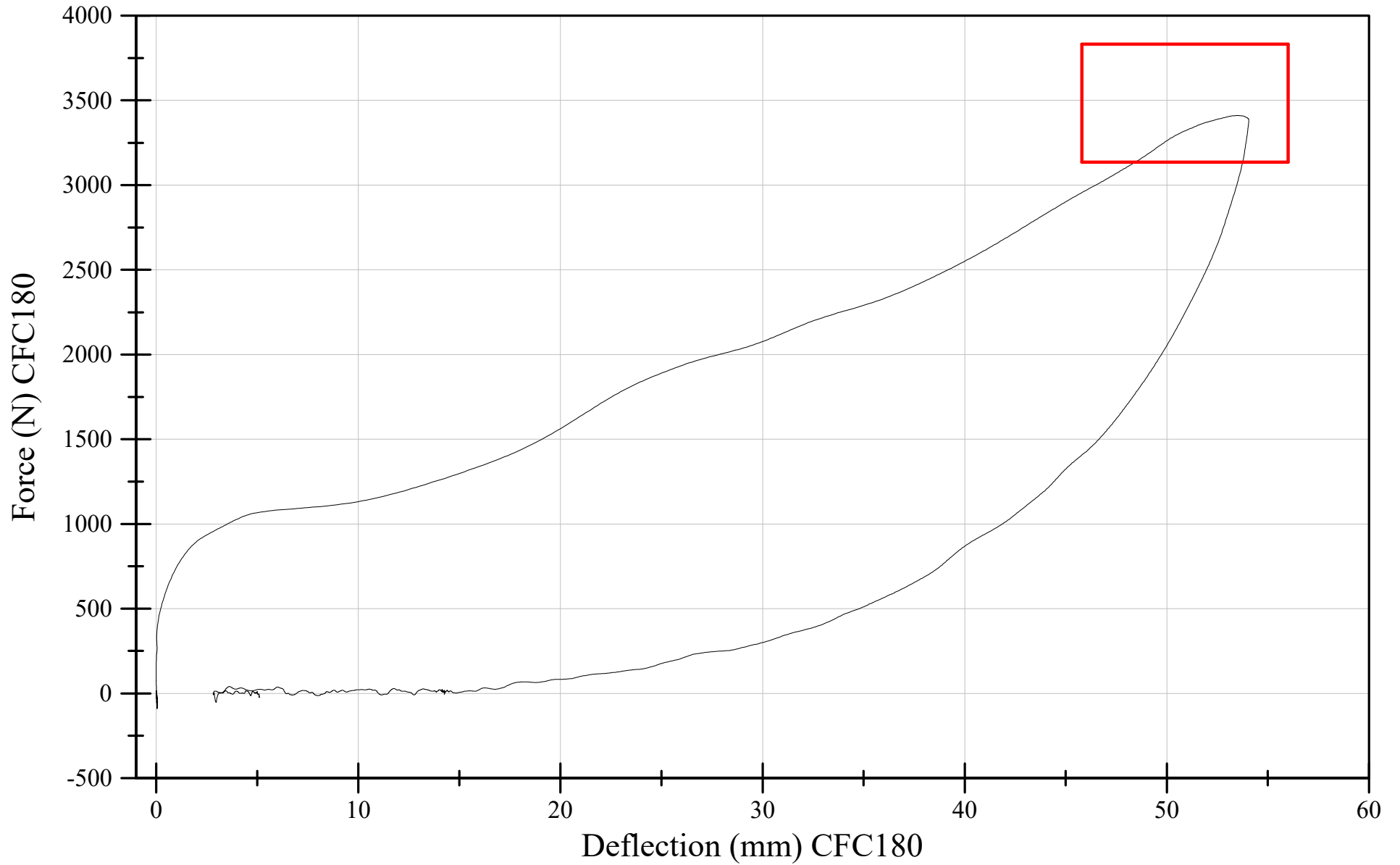


## Lower Left Thorax Qualification

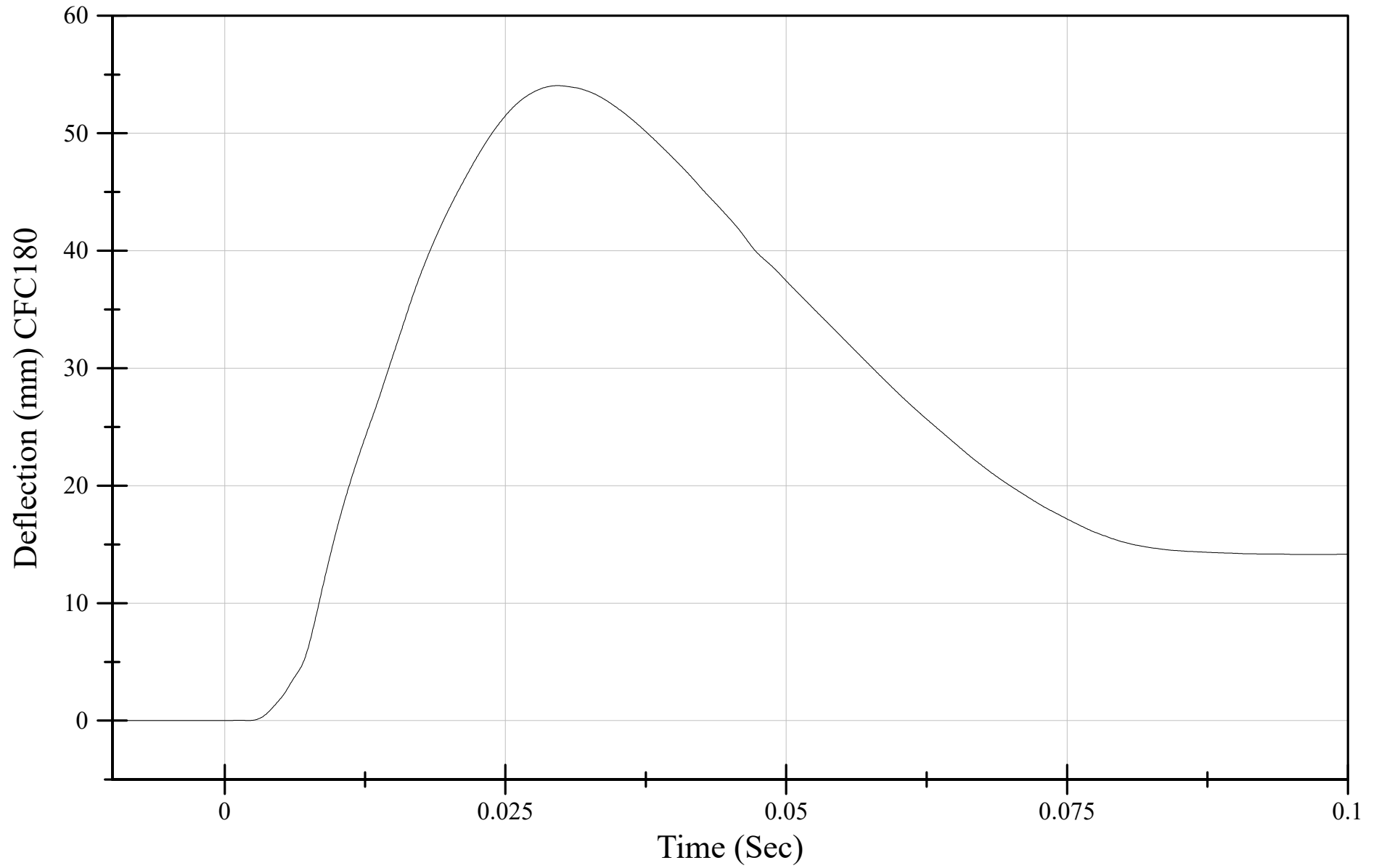
Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
Probe Force  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
Probe Force vs Left Resultant Deflection  
Serial Number: DO9799

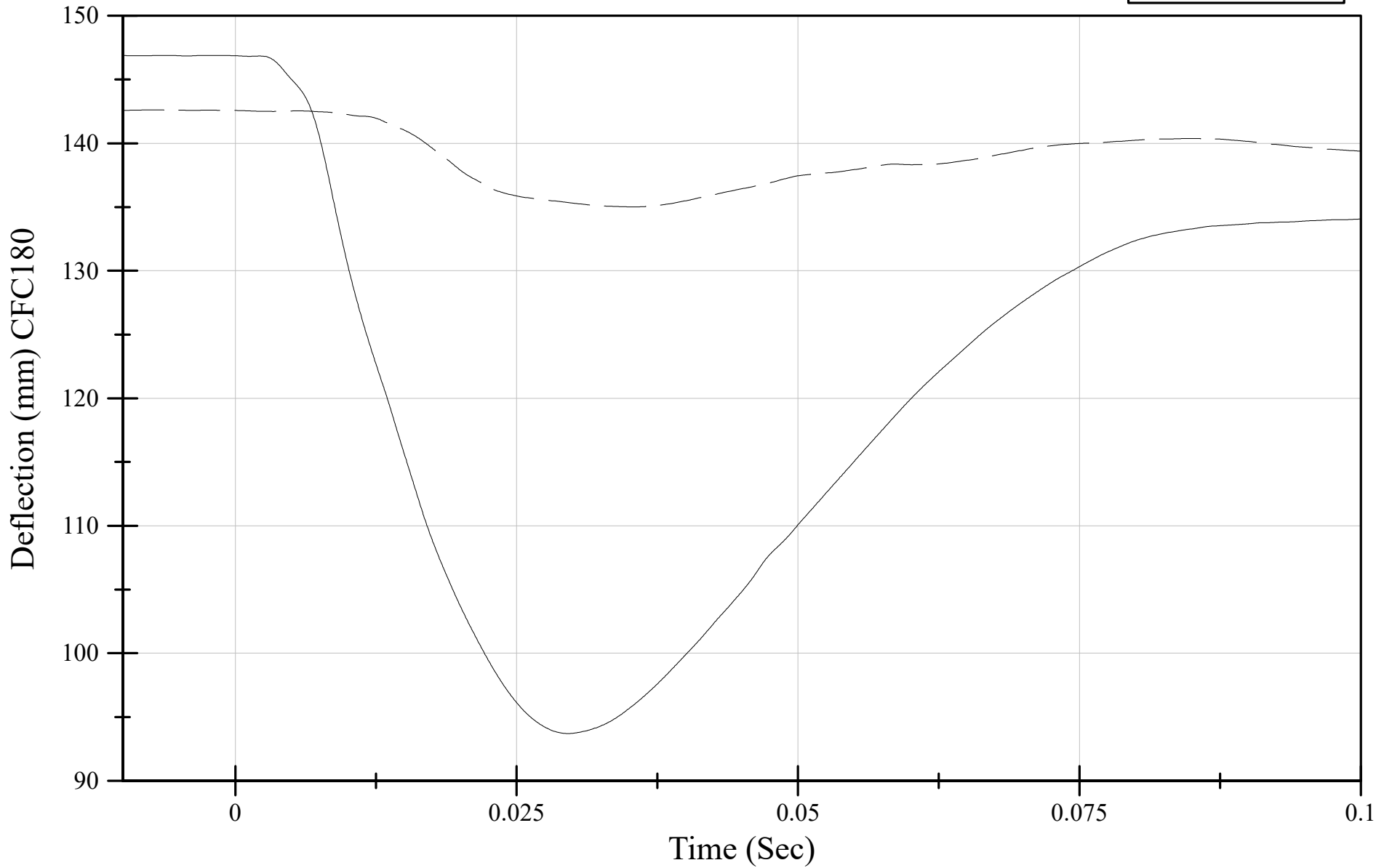


Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
Left Resultant Deflection  
Serial Number: DO9799

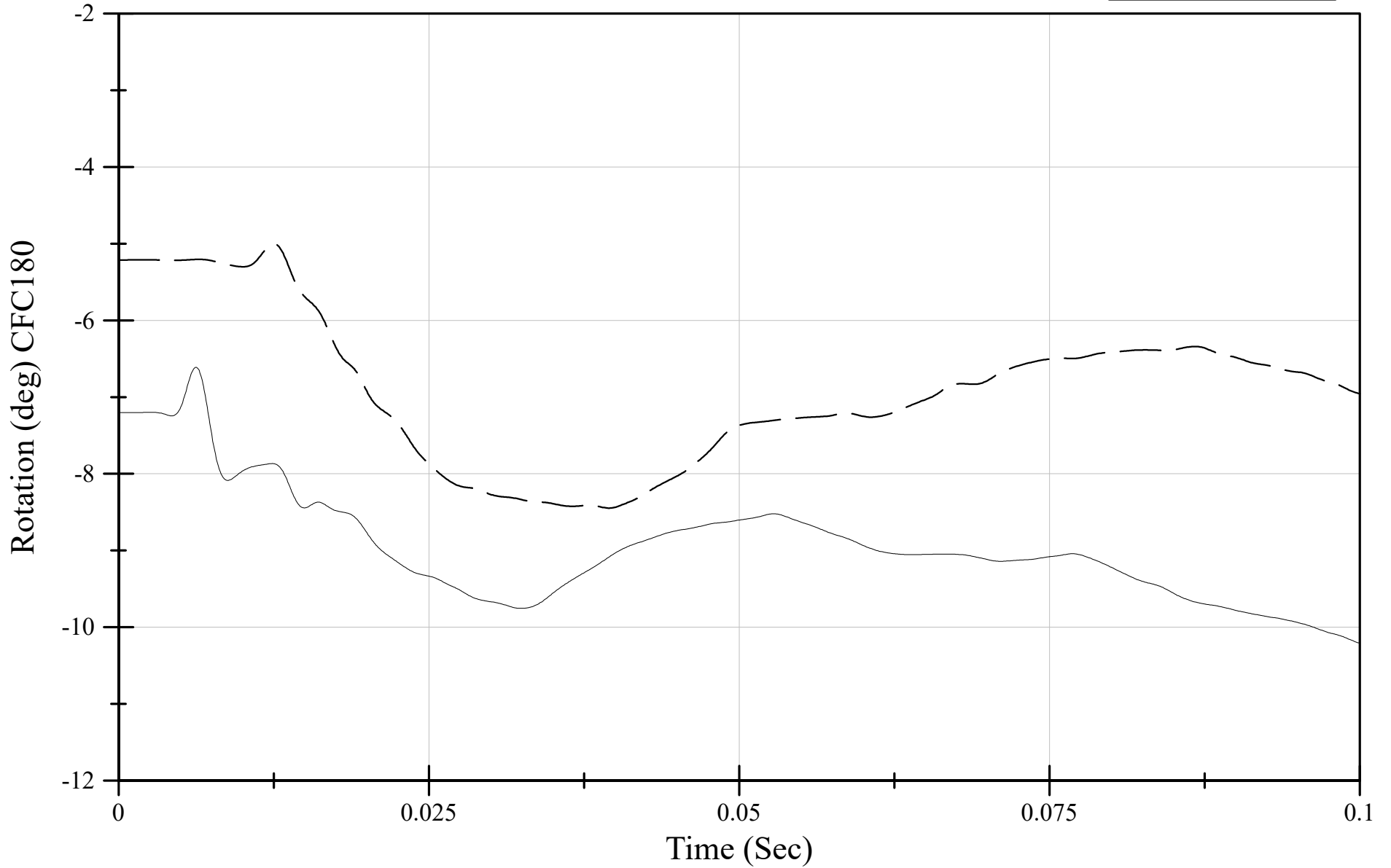


Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
X-Deflection  
Serial Number: DO9799

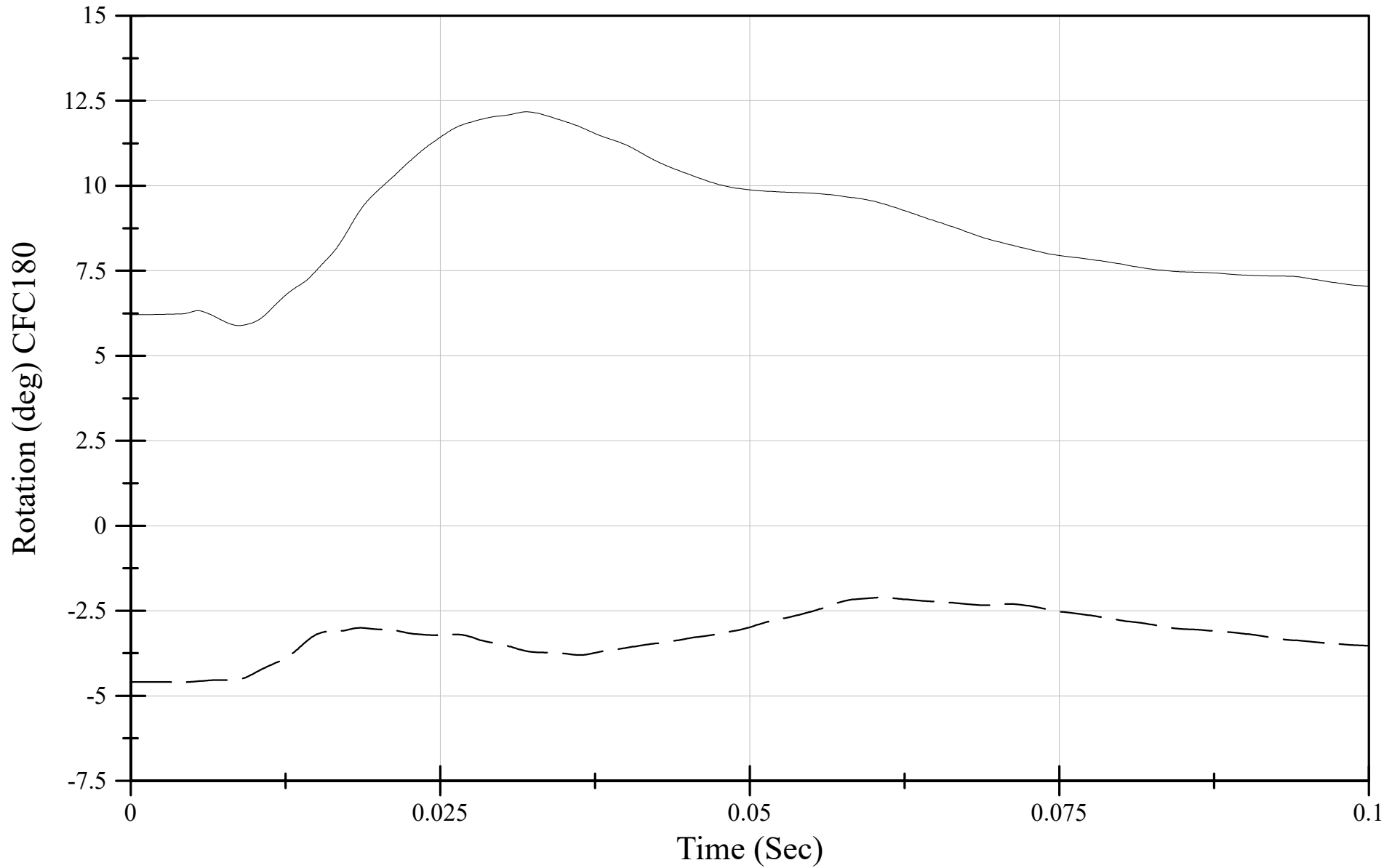
Left  
Right



Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
Y-Rotation + Offset  
Serial Number: DO9799

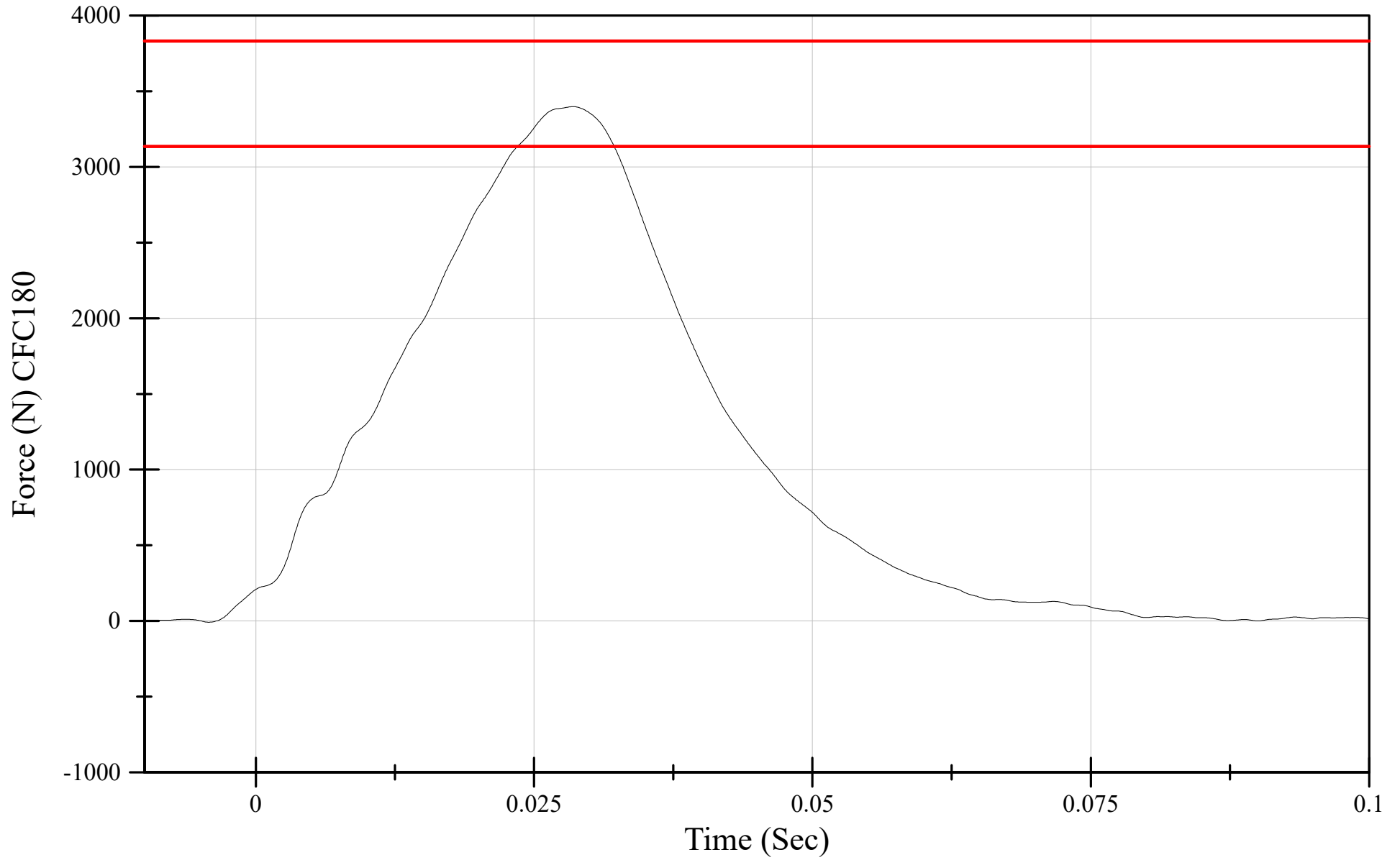


Pre-Test Qualification (Partial)  
THOR-50M Lower Left Thorax Qualification  
Z-Rotation + Offset  
Serial Number: DO9799

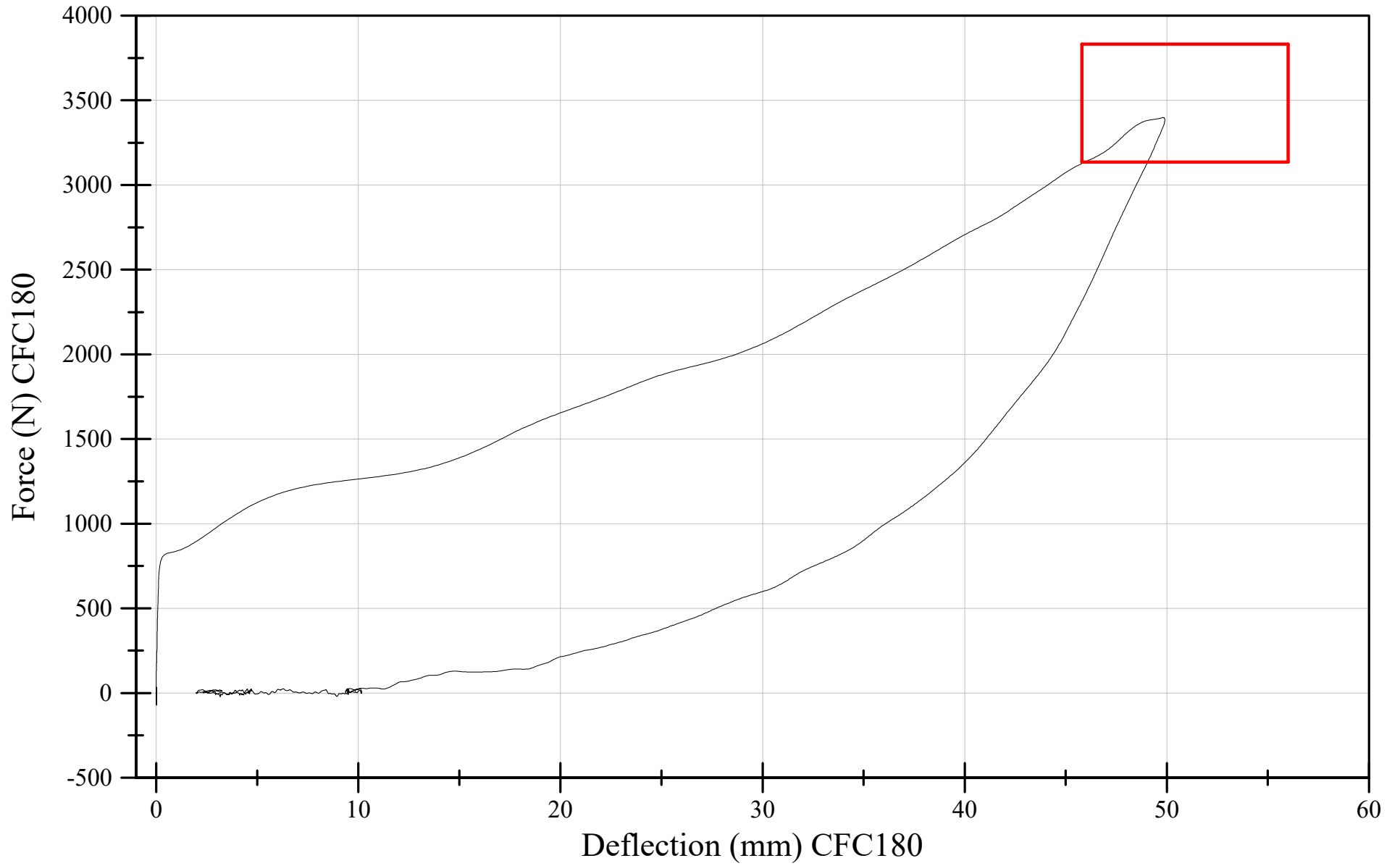


# Lower Right Thorax Qualification

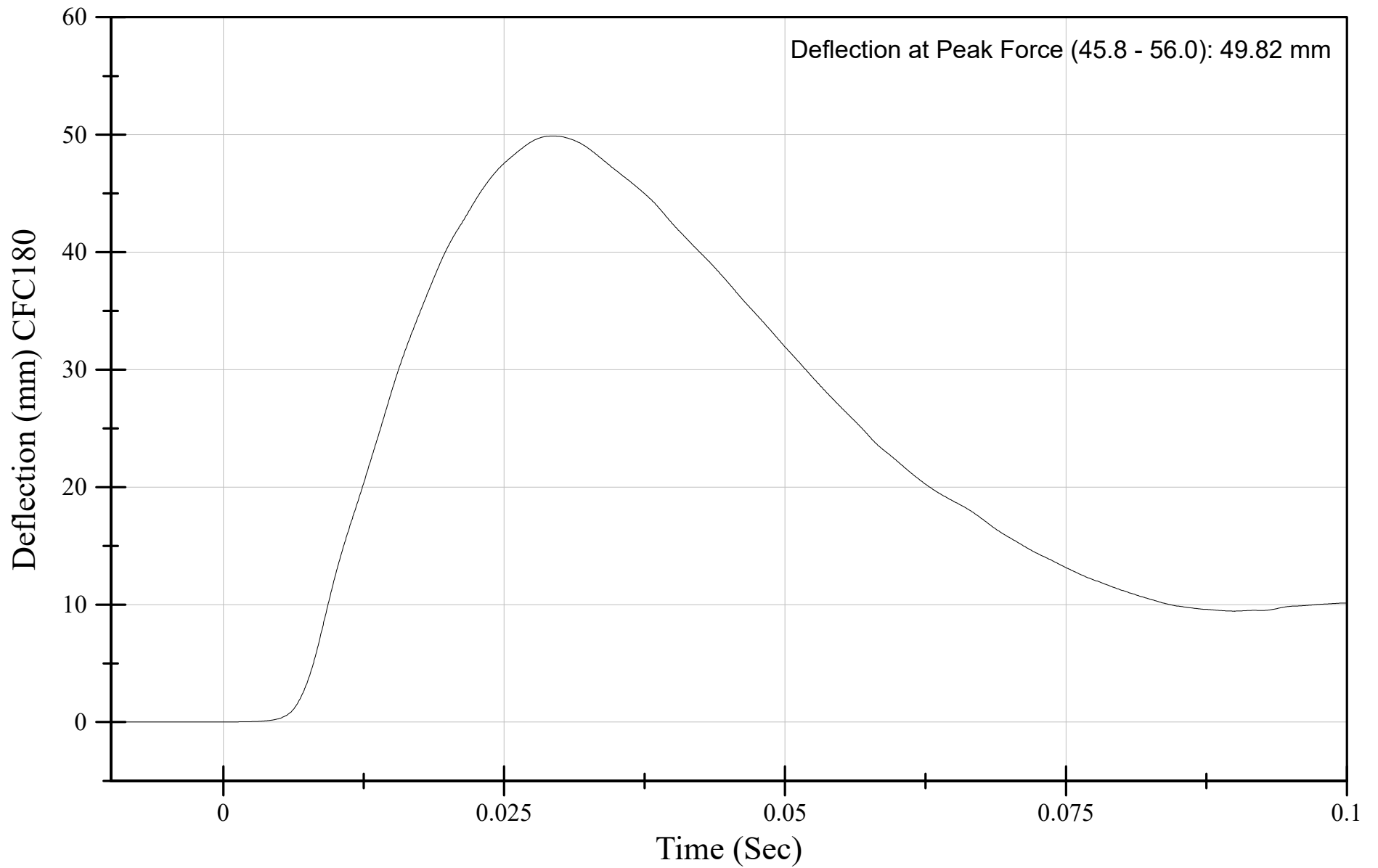
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
Probe Force  
Serial Number: DO9799



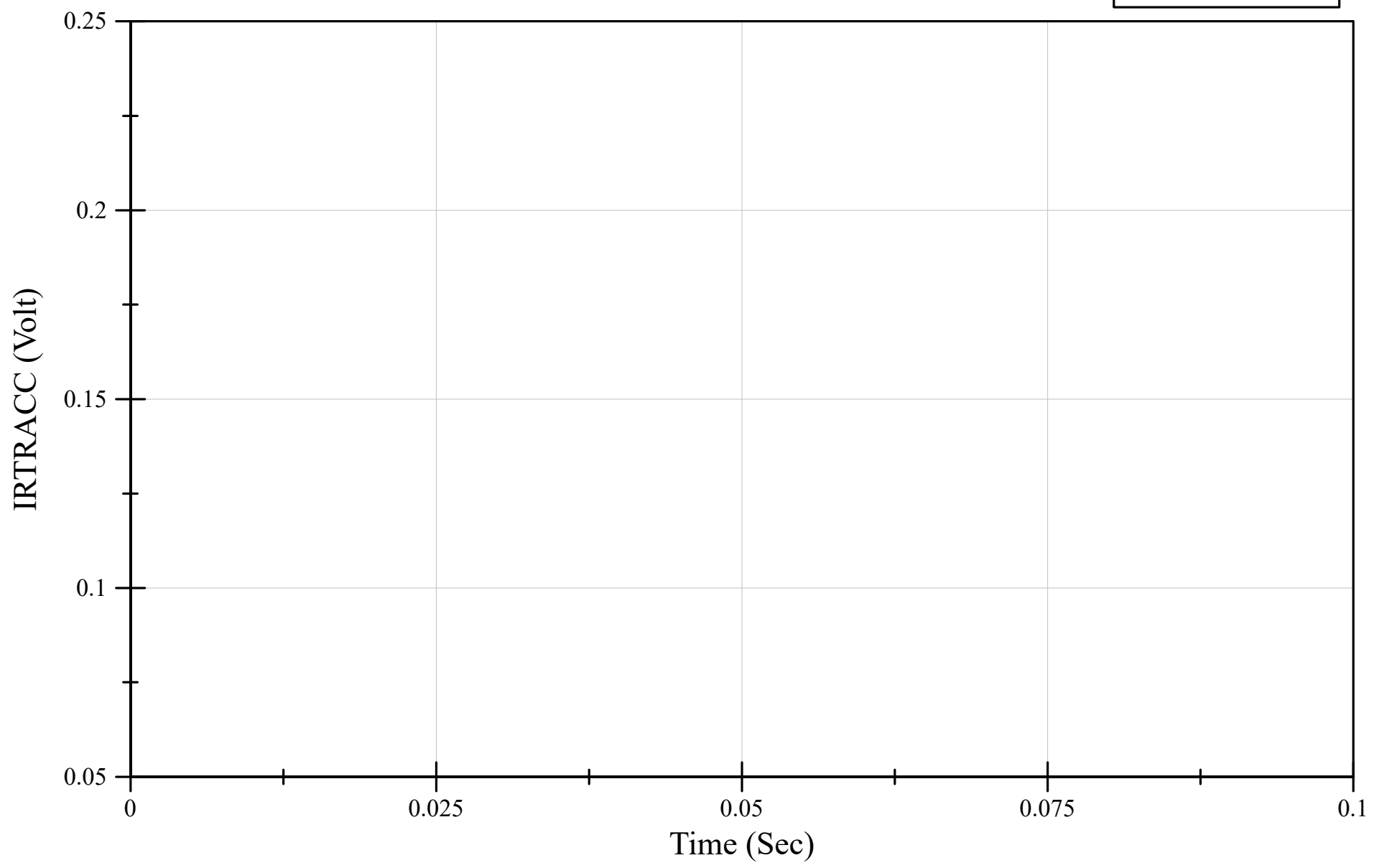
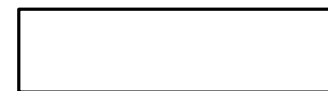
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
Probe Force vs Right Resultant Deflection  
Serial Number: DO9799



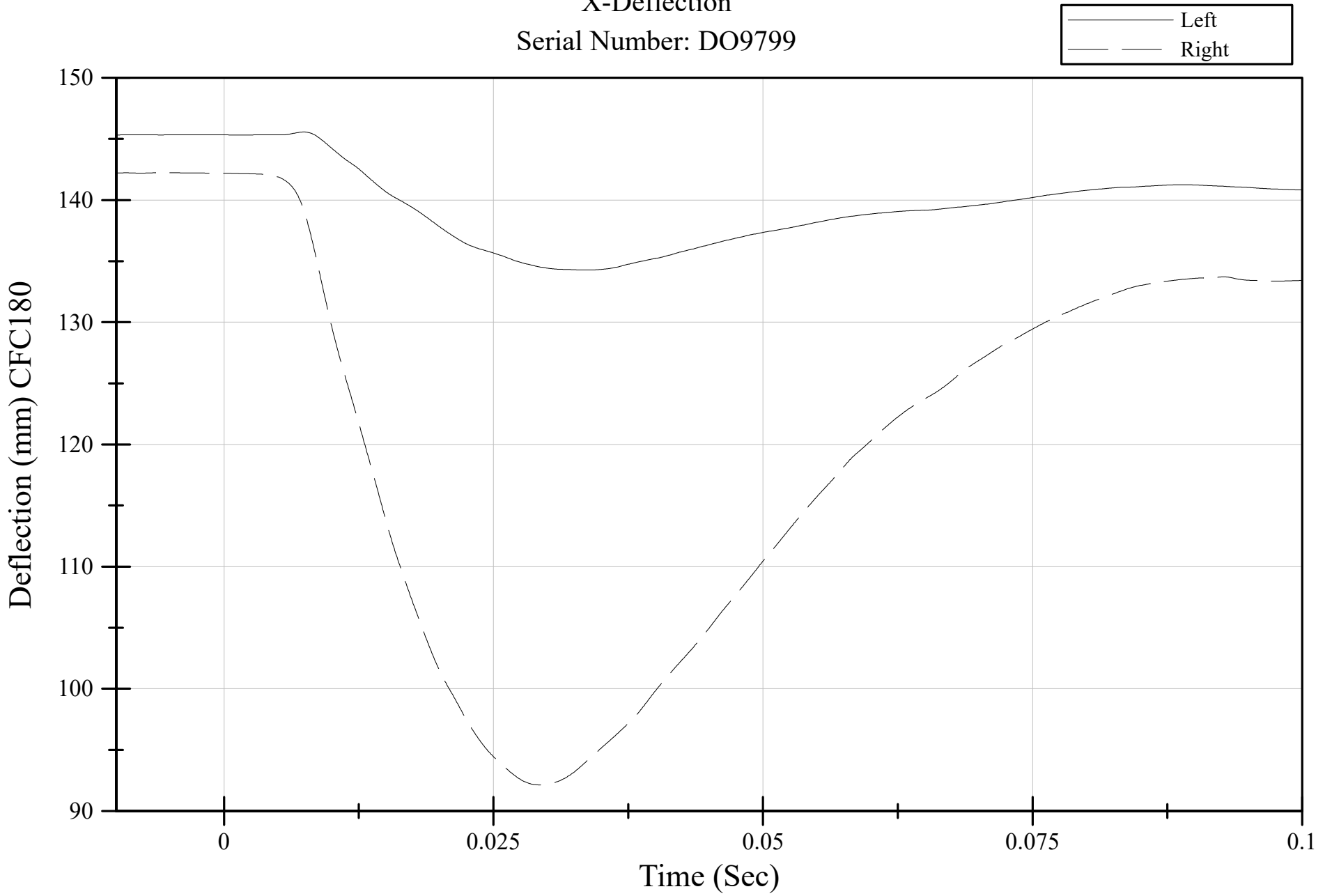
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
Right Resultant Deflection  
Serial Number: DO9799



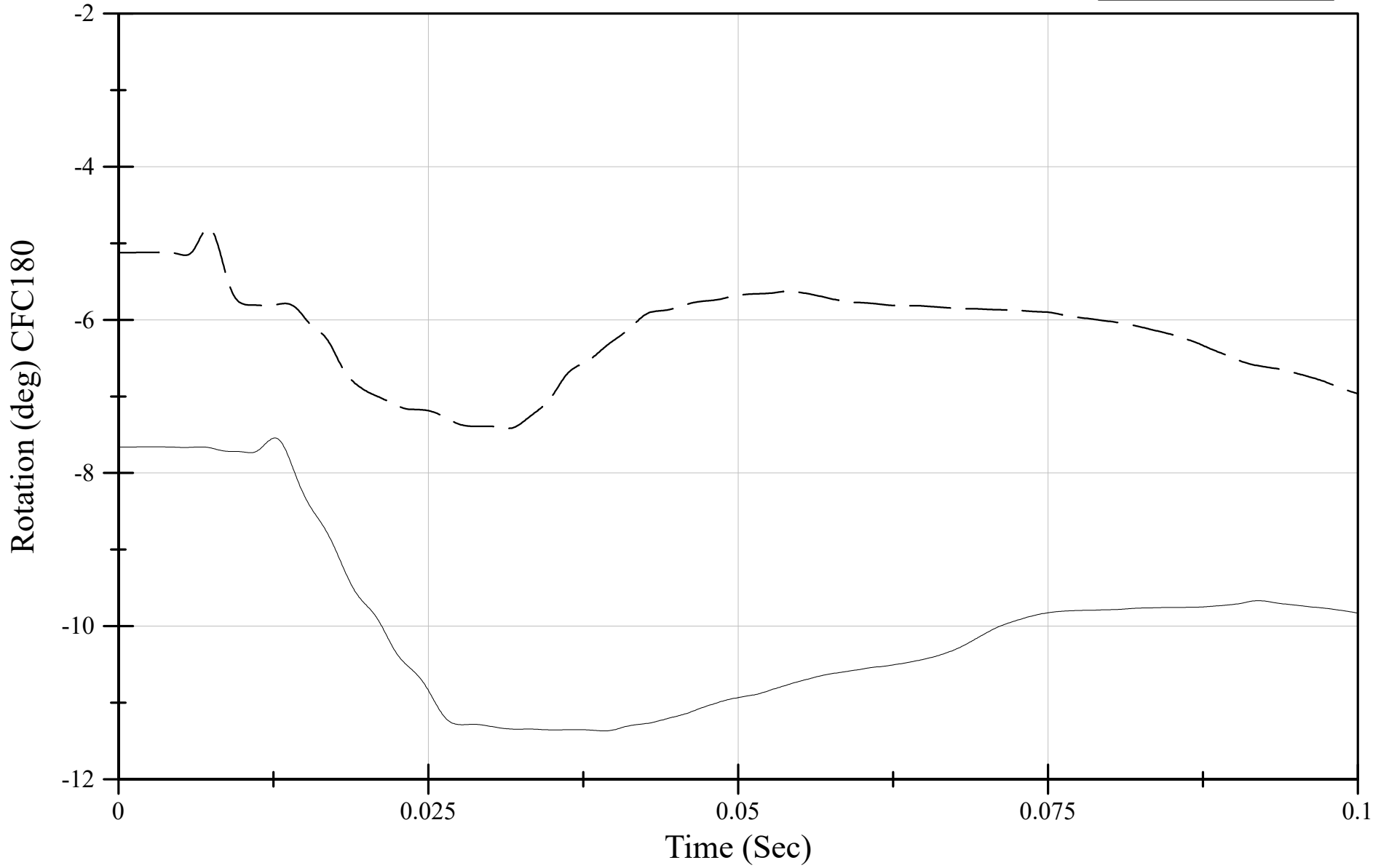
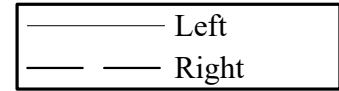
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
IRTRACC Voltage  
Serial Number: DO9799



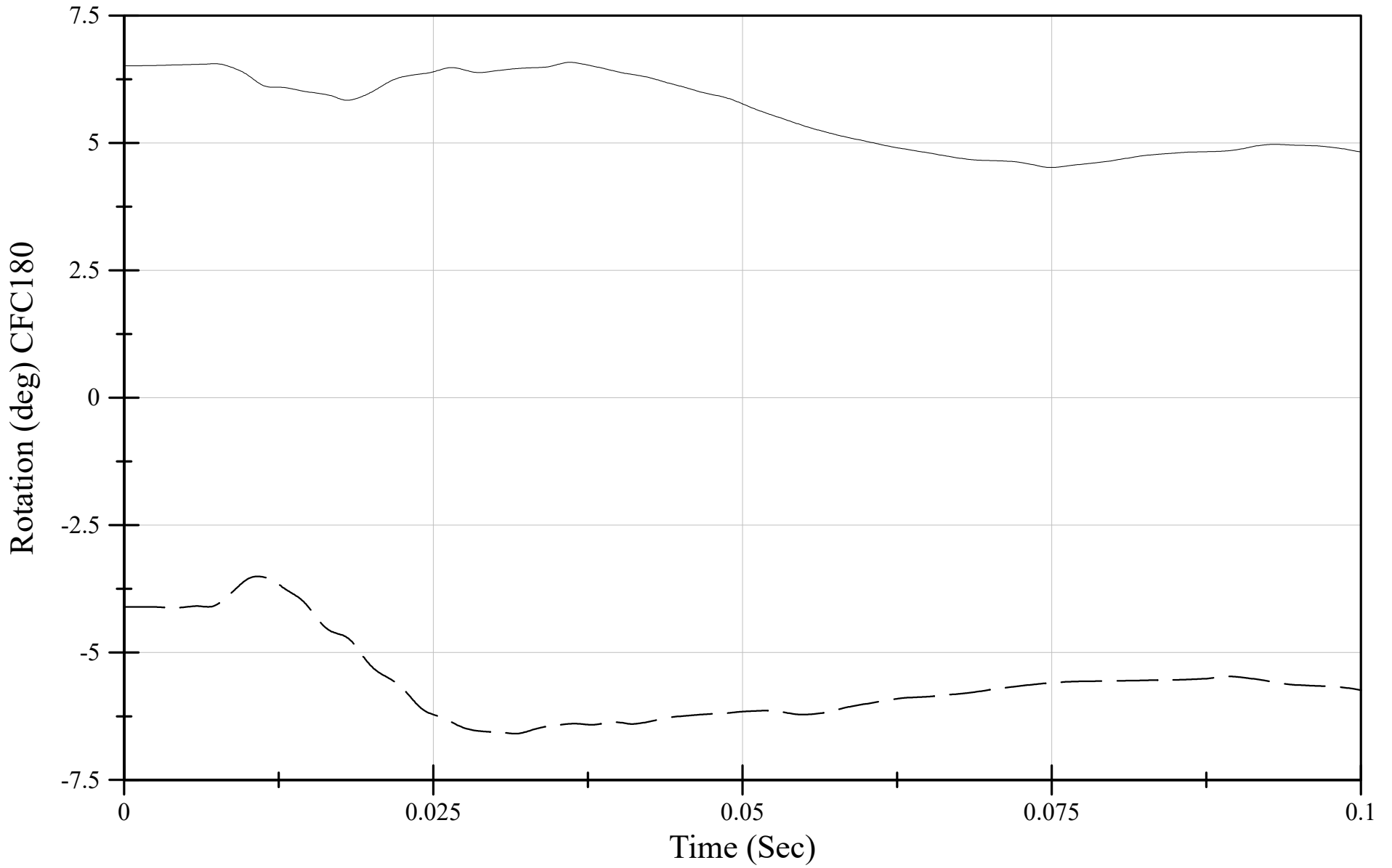
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
X-Deflection  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
Y-Rotation + Offset  
Serial Number: DO9799



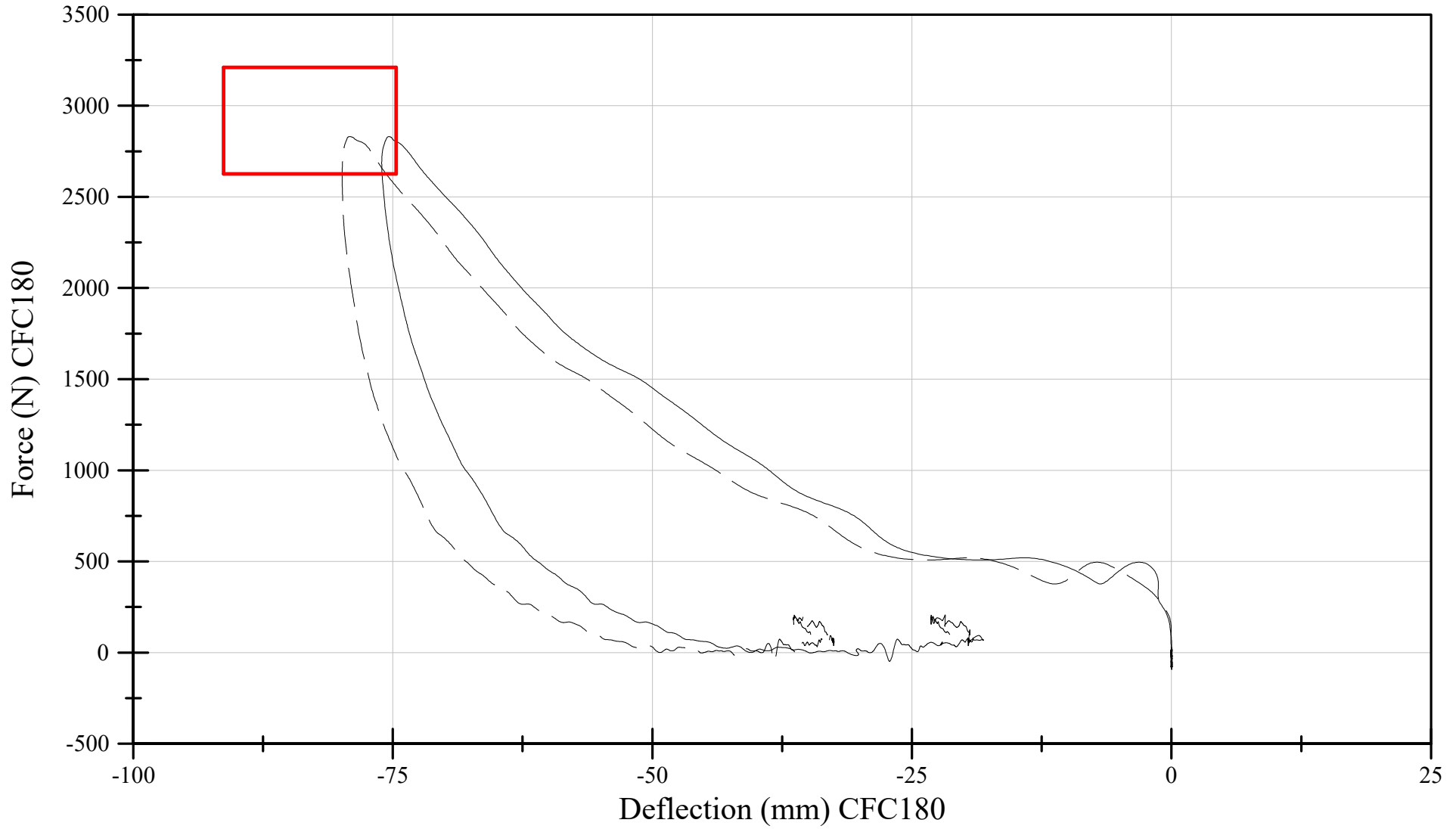
Pre-Test Qualification (Partial)  
THOR-50M Lower Right Thorax Qualification  
Z-Rotation + Offset  
Serial Number: DO9799



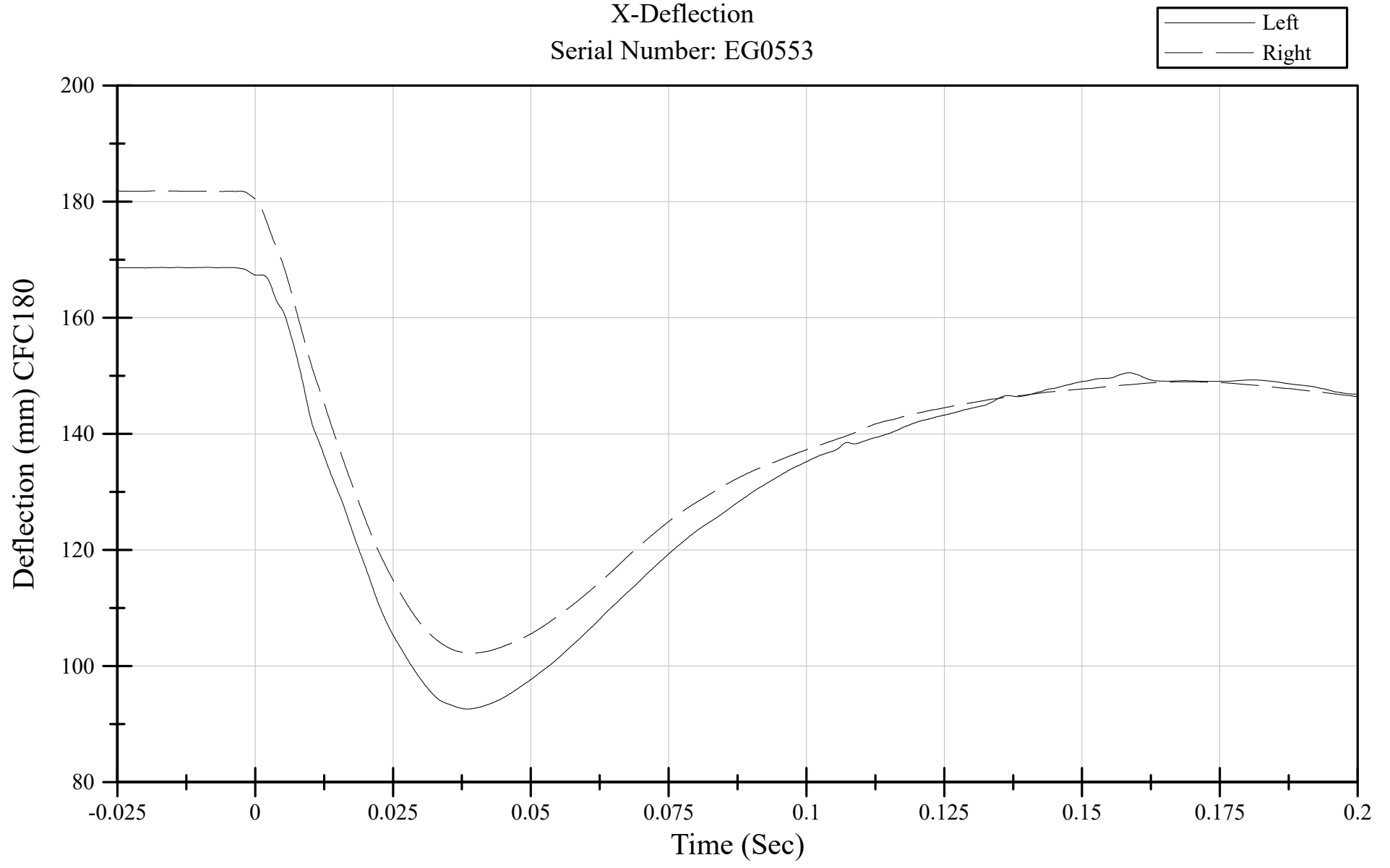
# Lower Abdomen Qualification

Pre-Test Qualification (Partial)  
THOR-50M Lower Abdomen Qualification  
Pendulum Force vs Abdomen Deflection  
Serial Number: EG0553

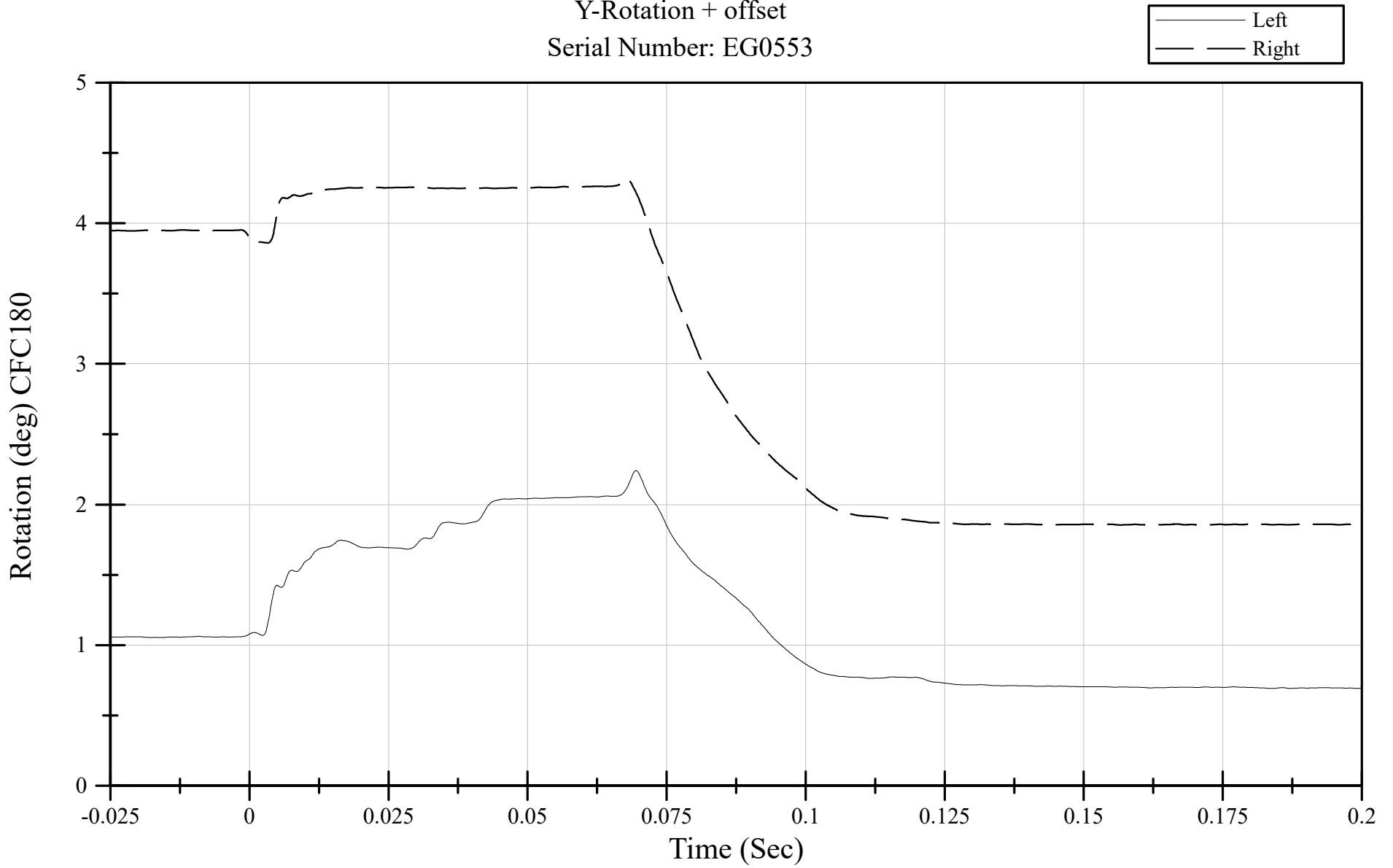
— Left  
— Right



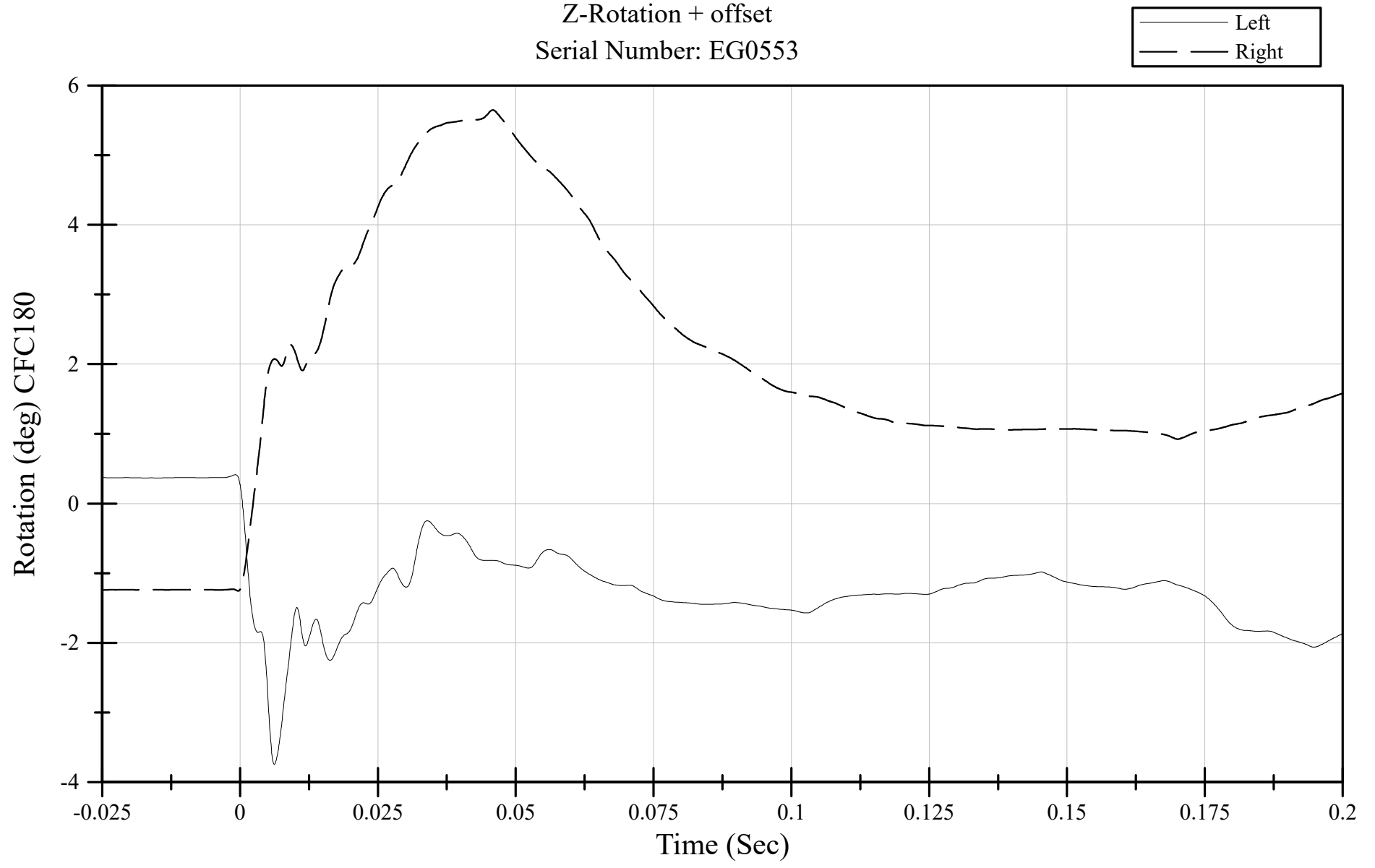
Pre-Test Qualification (Partial)  
THOR-50M Lower Abdomen Qualification  
X-Deflection  
Serial Number: EG0553



Pre-Test Qualification (Partial)  
THOR-50M Lower Abdomen Qualification  
Y-Rotation + offset  
Serial Number: EG0553

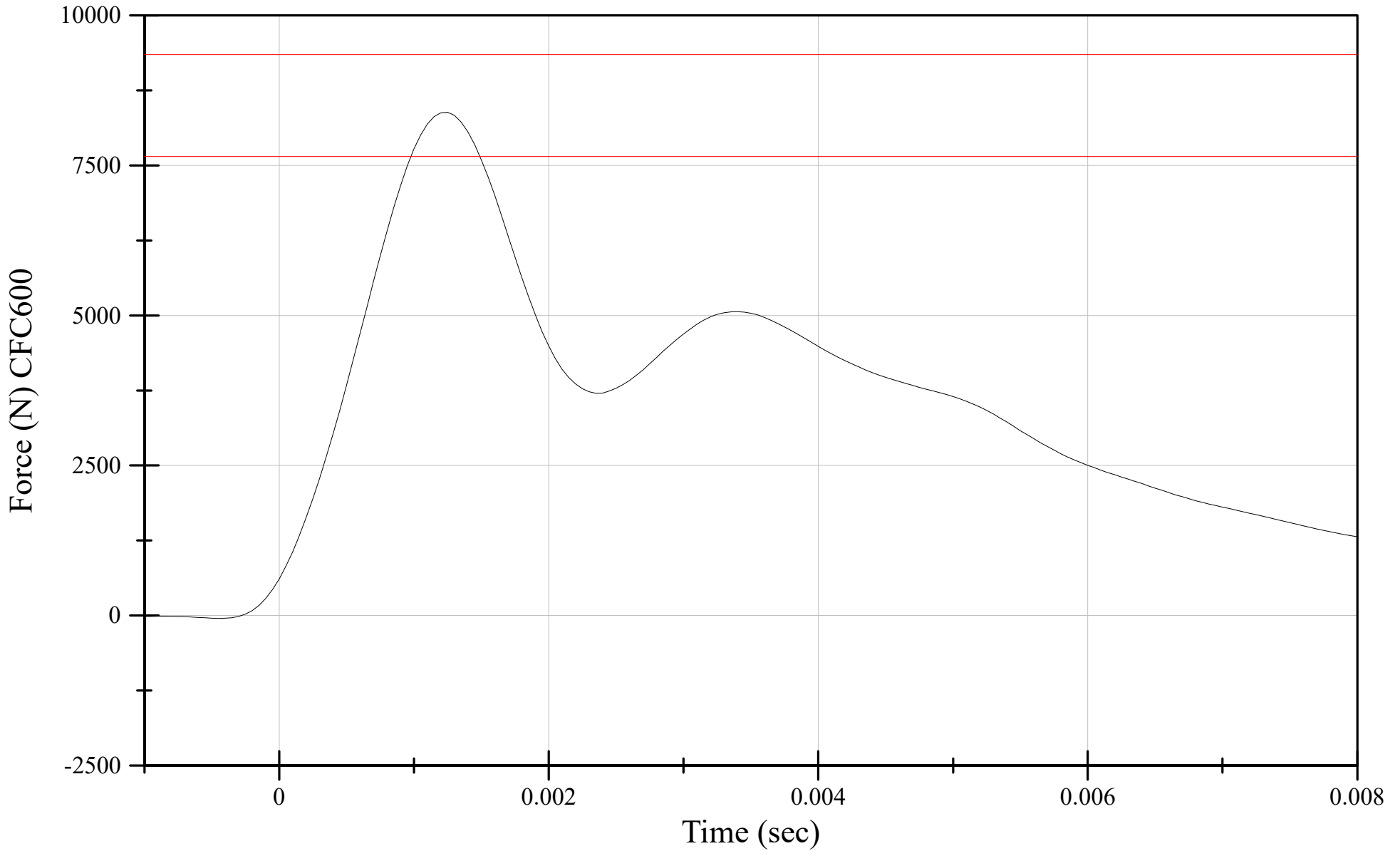


Pre-Test Qualification (Partial)  
THOR-50M Lower Abdomen Qualification  
Z-Rotation + offset  
Serial Number: EG0553

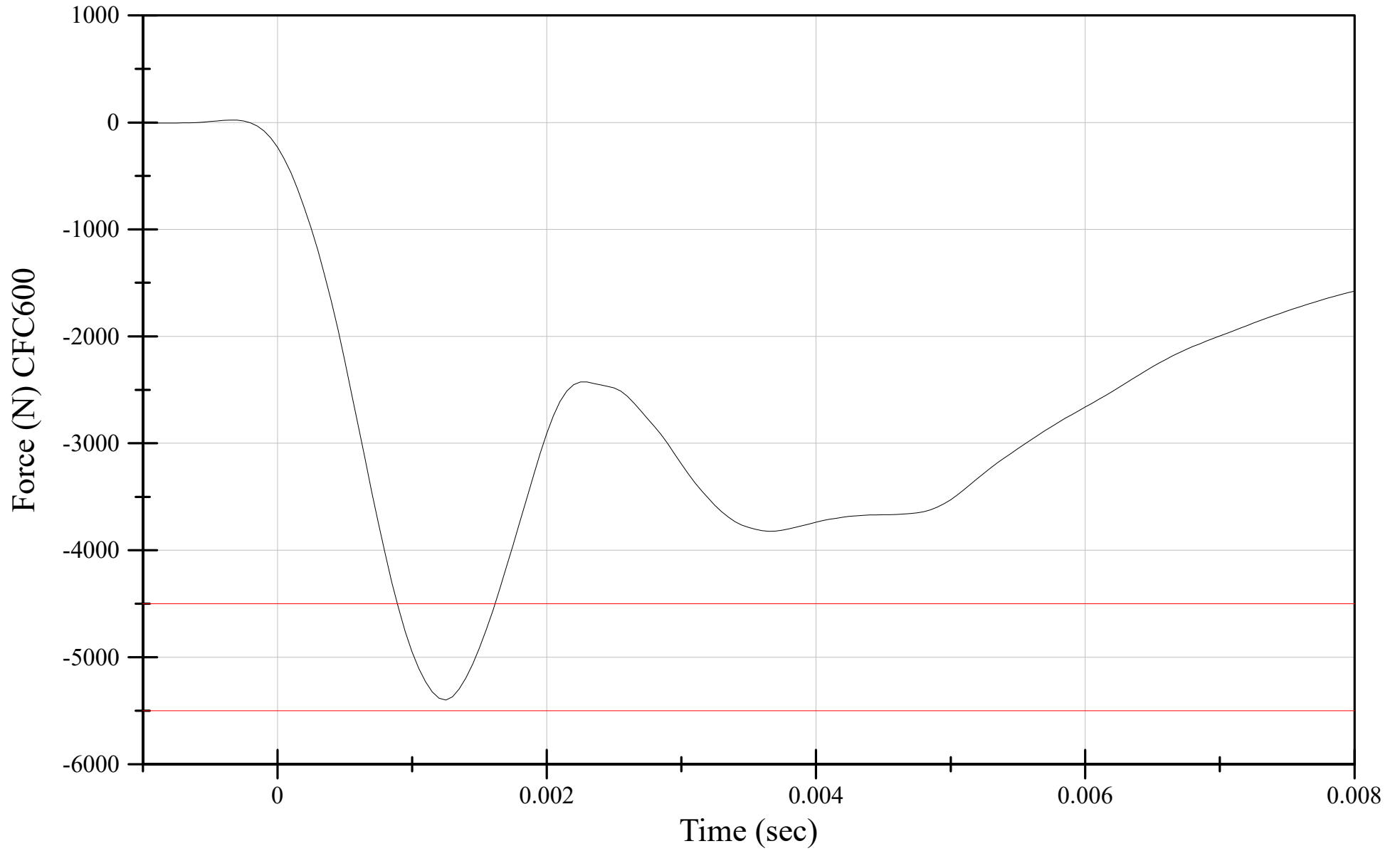


# Left Upper Leg Qualification

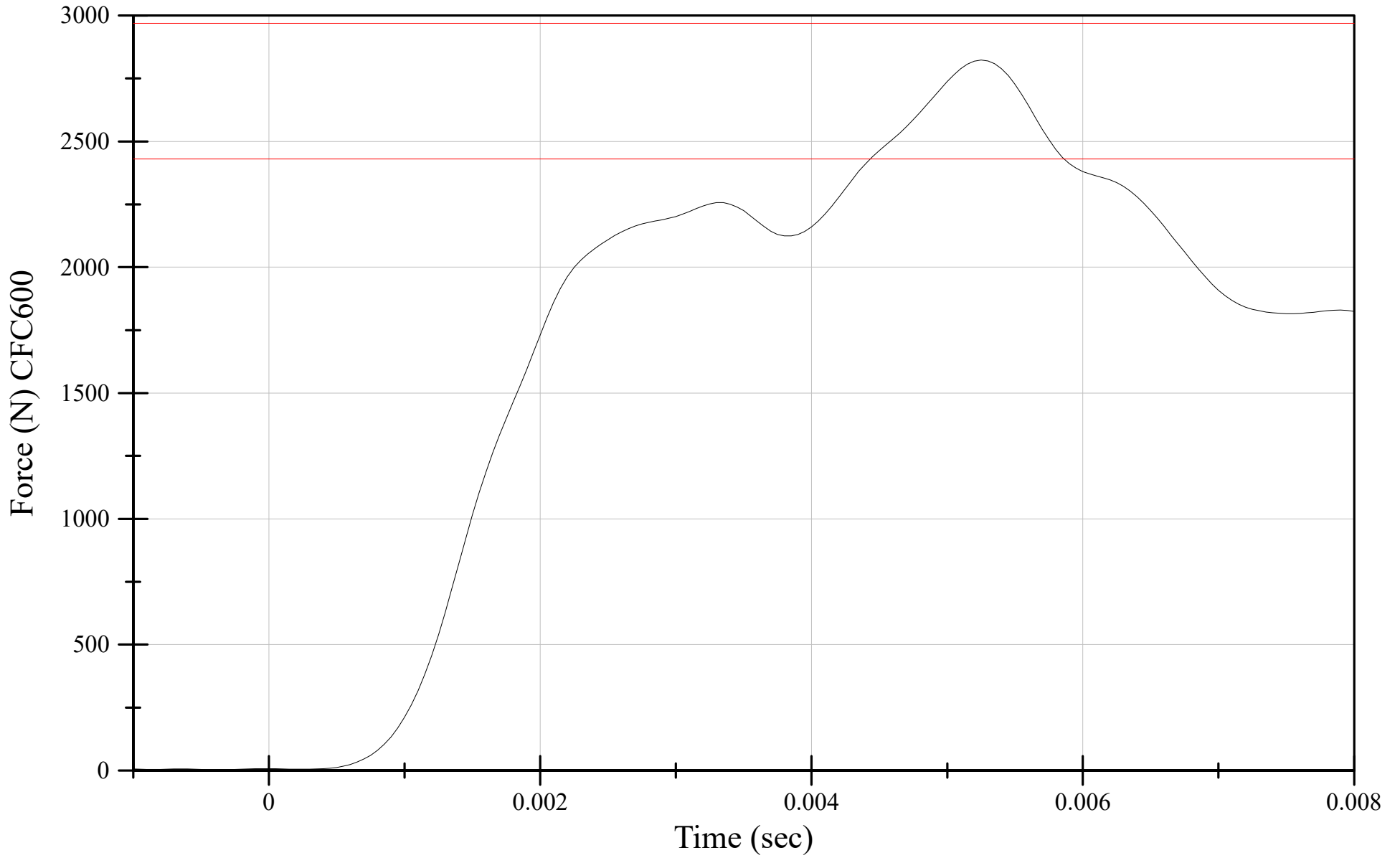
Pre-Test Qualification (Partial)  
THOR-50M Left Upper Leg Qualification  
Probe Force  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Left Upper Leg Qualification  
Femur Z-Force  
Serial Number: DO9799

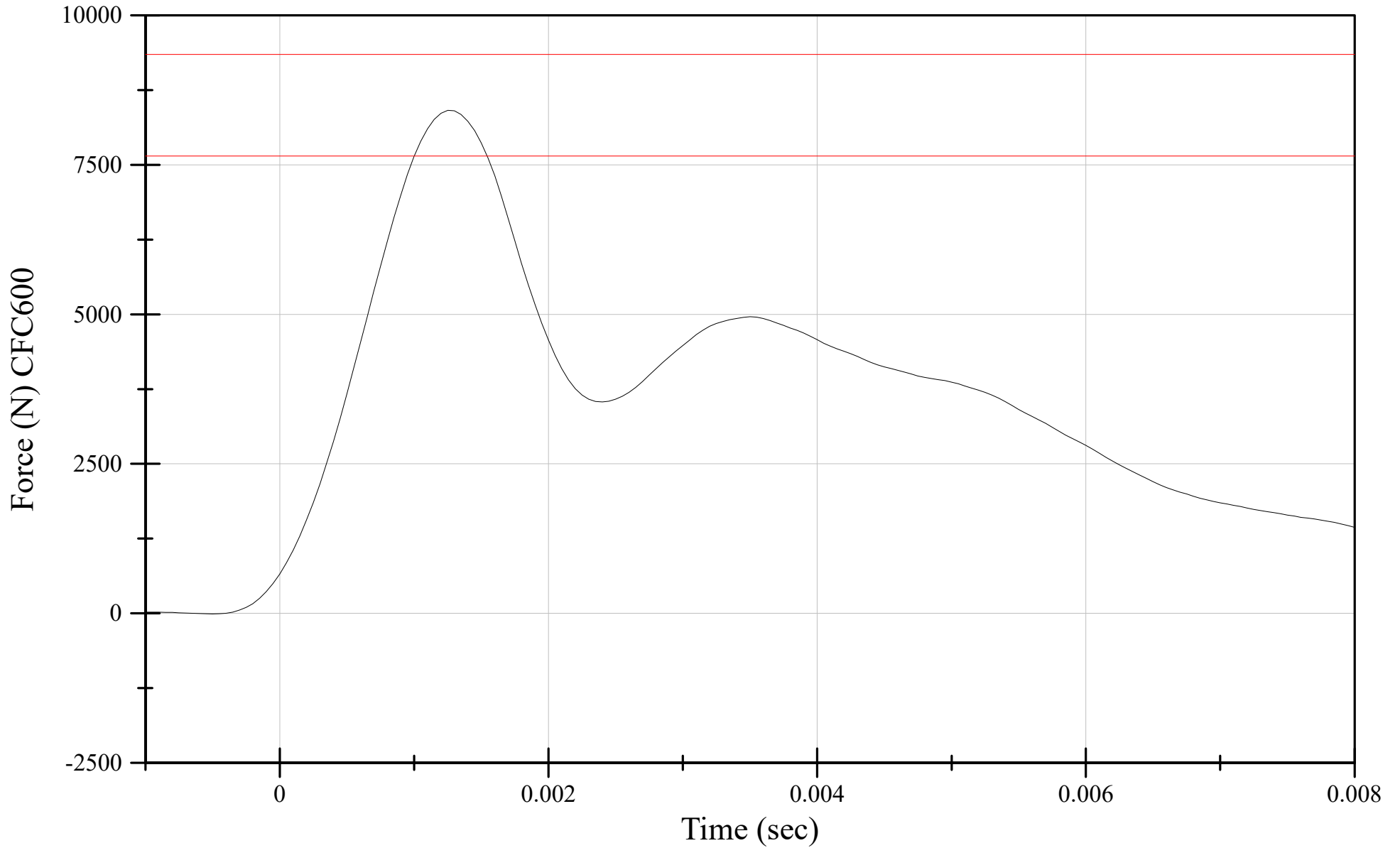


Pre-Test Qualification (Partial)  
THOR-50M Left Upper Leg Qualification  
Peak Acetabulum Resultant Force  
Serial Number: DO9799

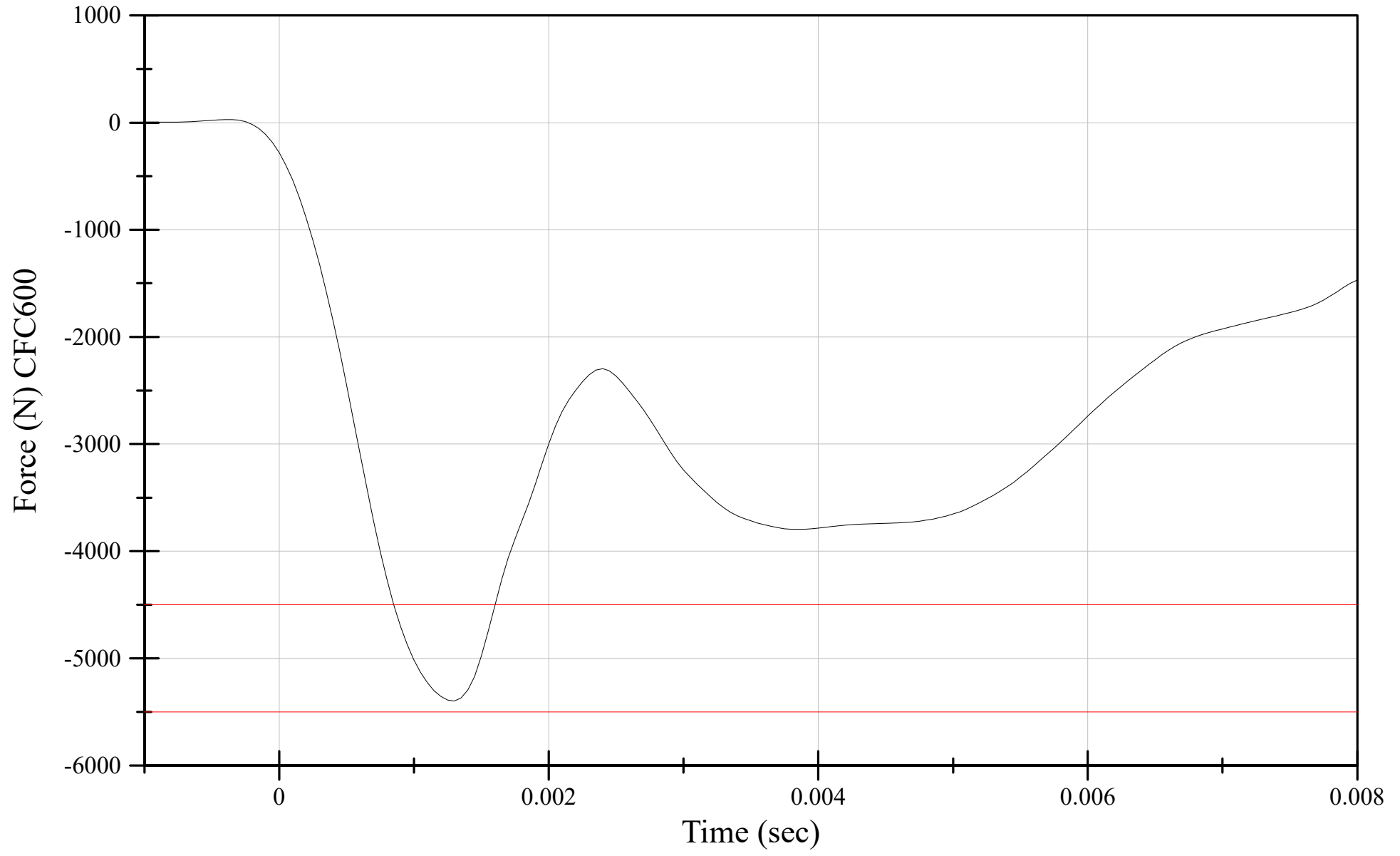


# Right Upper Leg Qualification

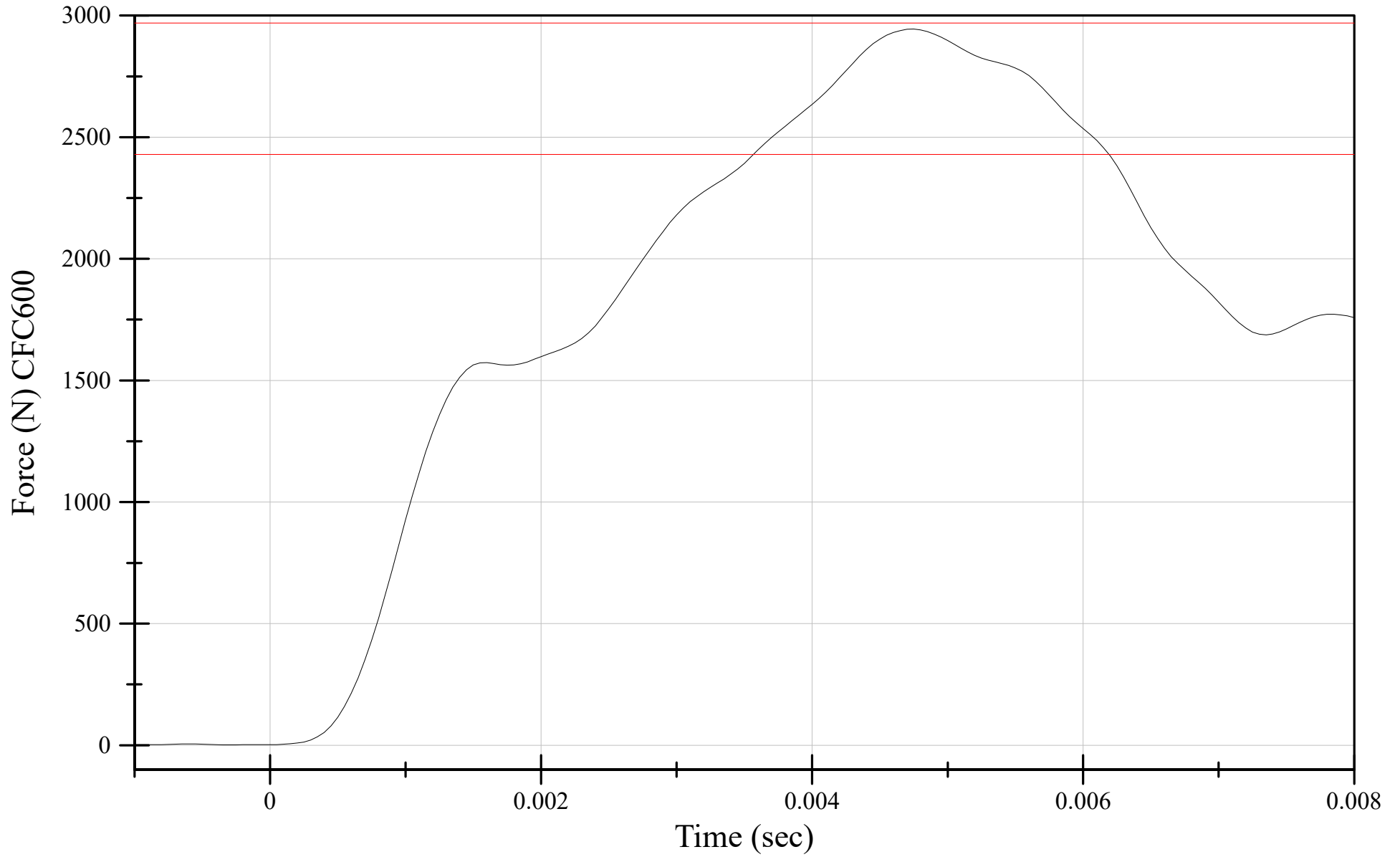
Pre-Test Qualification (Partial)  
THOR-50M Right Upper Leg Qualification  
Probe Force  
Serial Number: DO9799



Pre-Test Qualification (Partial)  
THOR-50M Right Upper Leg Qualification  
Femur Z-Force  
Serial Number: DO9799



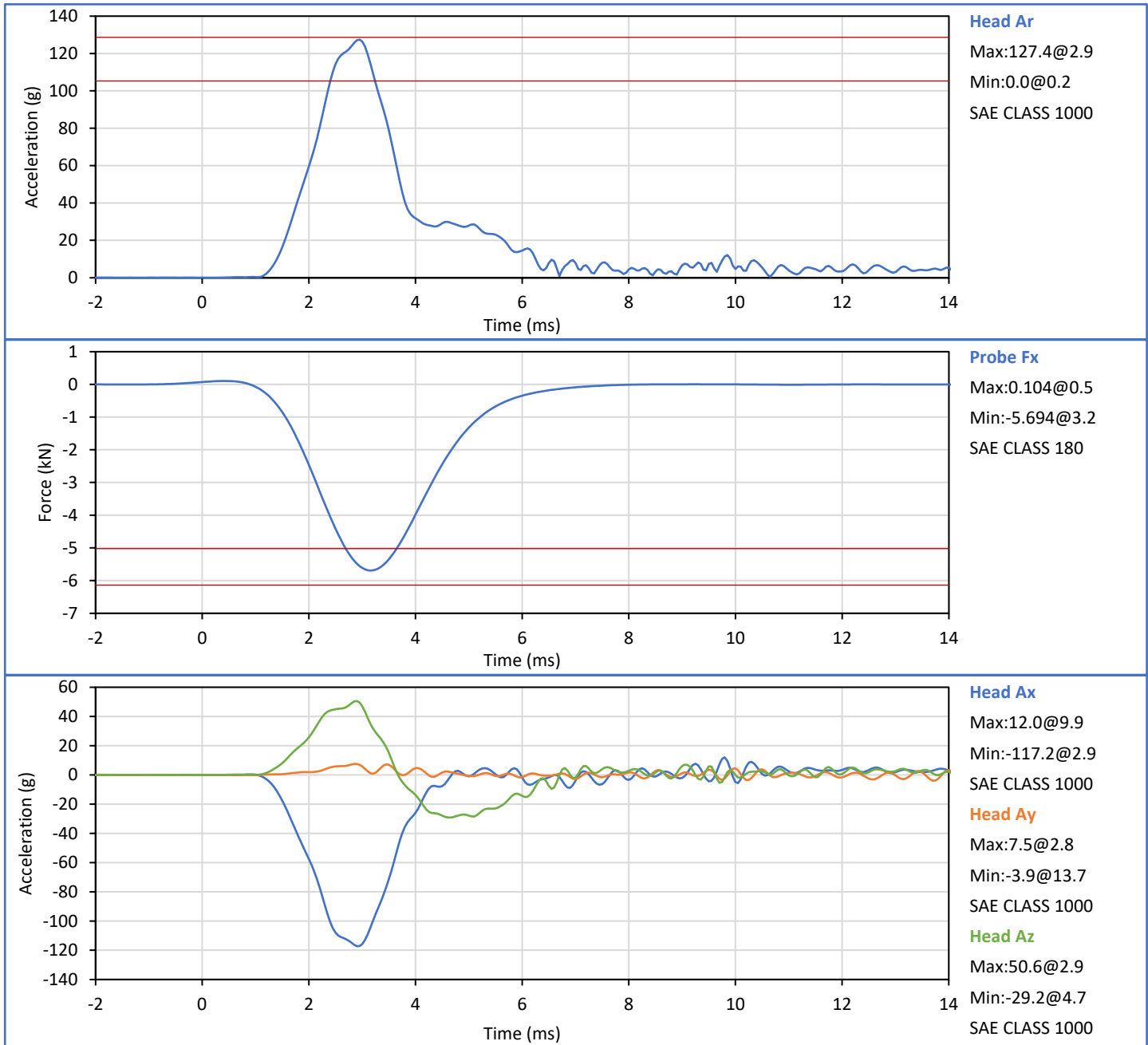
Pre-Test Qualification (Partial)  
THOR-50M Right Upper Leg Qualification  
Peak Acetabulum Resultant Force  
Serial Number: DO9799



**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 (Full) S/N: EG2595**

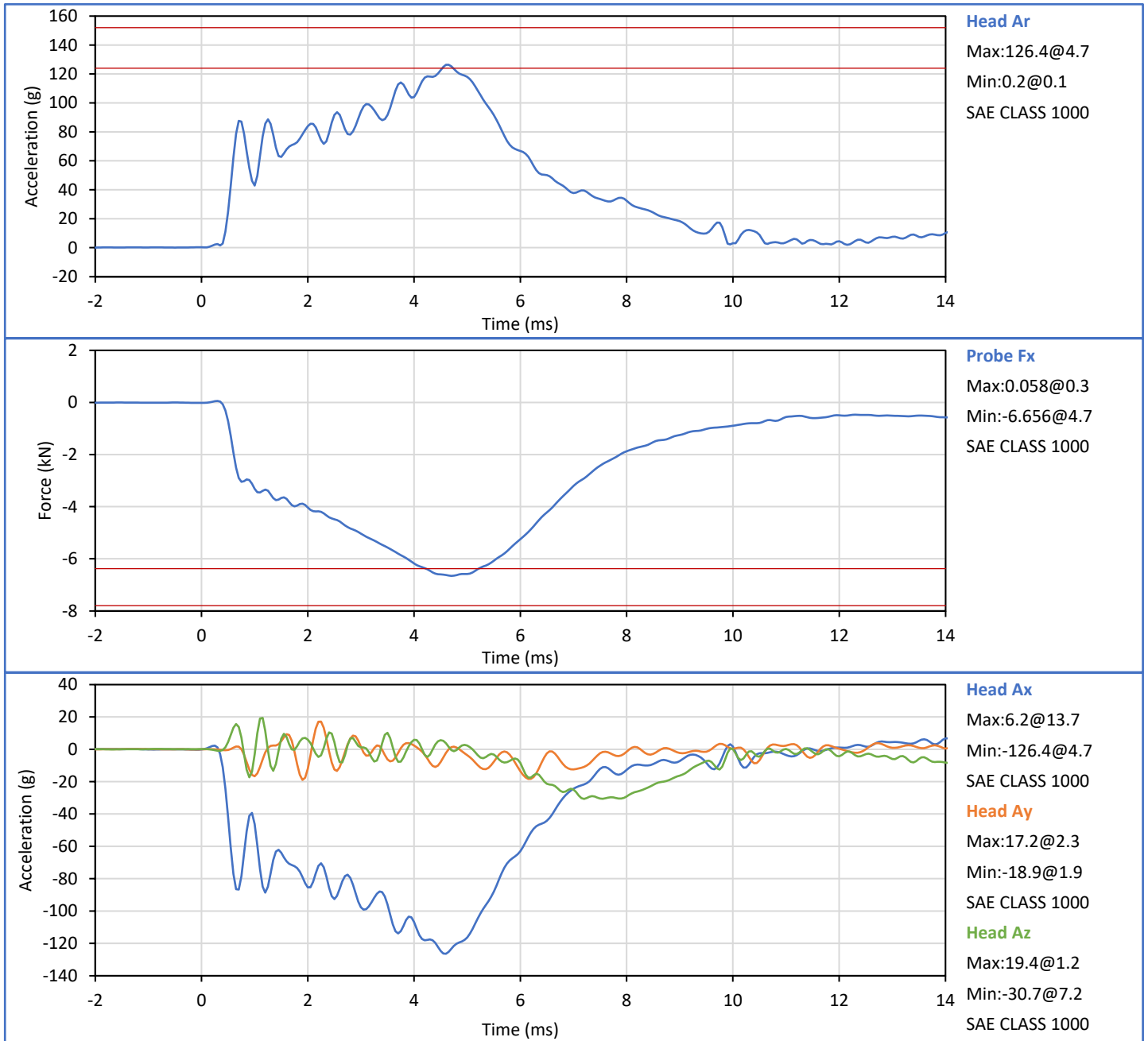
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Velocity	m/s	1.95	2.05	1.98	Pass
Peak Probe Force	kN	-6.138	-5.022	-5.694	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	127.4	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>



Technician: J. Hernandez

Approved By: P. Puzuto

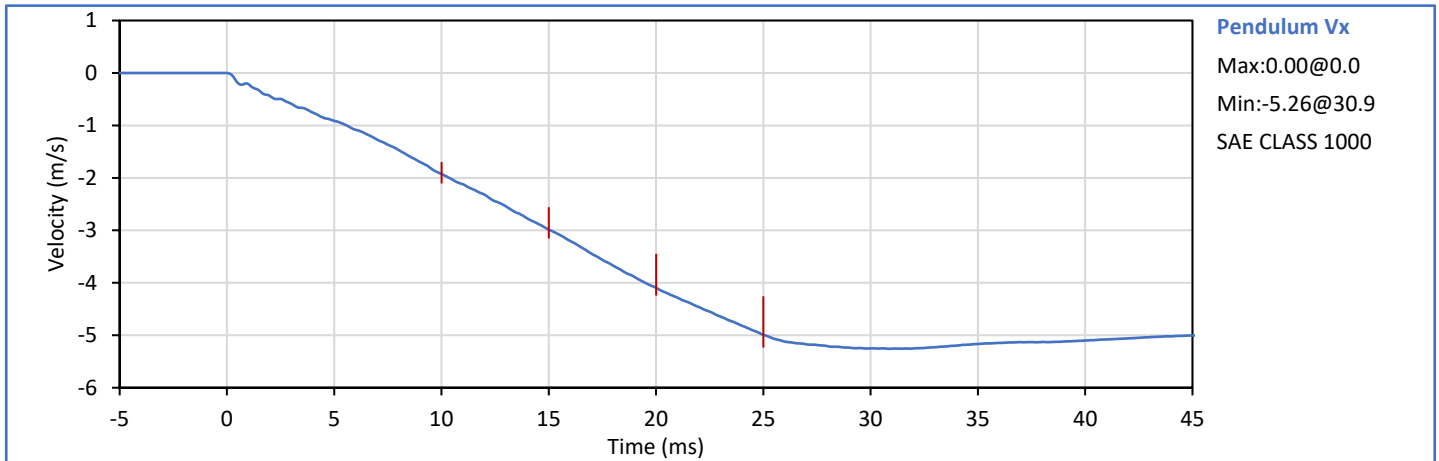
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Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Velocity	m/s	6.68	6.78	6.72	Pass
Peak Probe Force	kN	-7.796	-6.378	-6.656	Pass
Peak Head Resultant Acceleration	g	124.0	152.0	126.4	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>

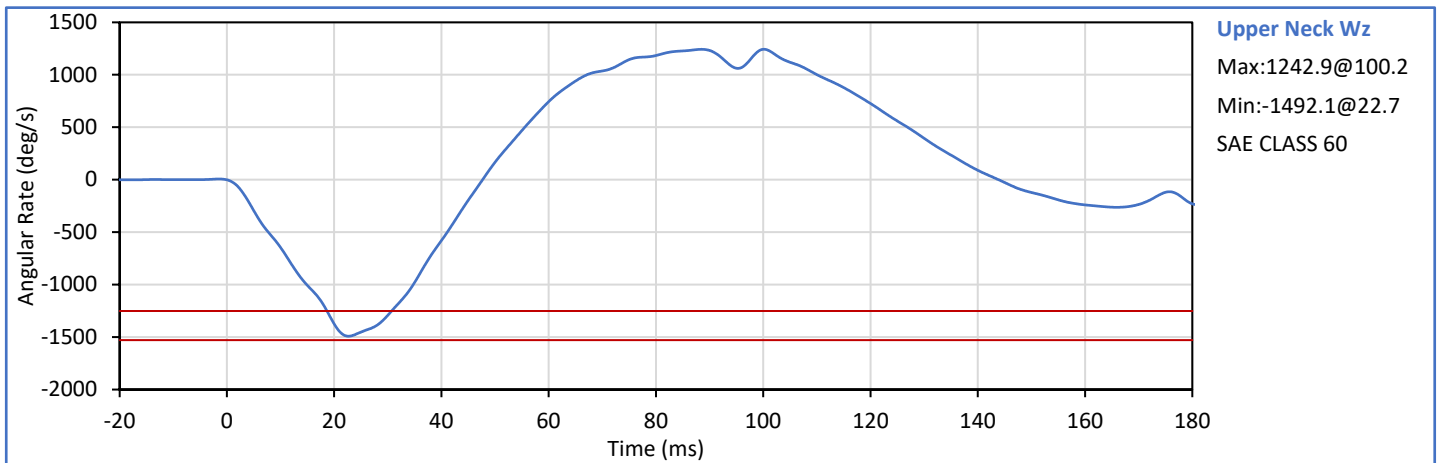
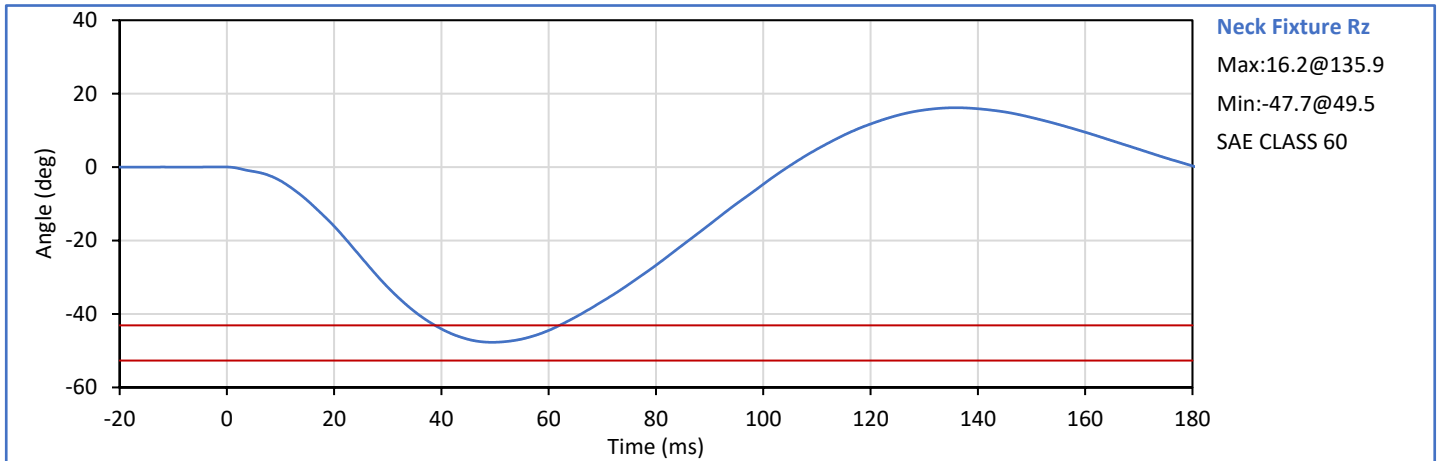
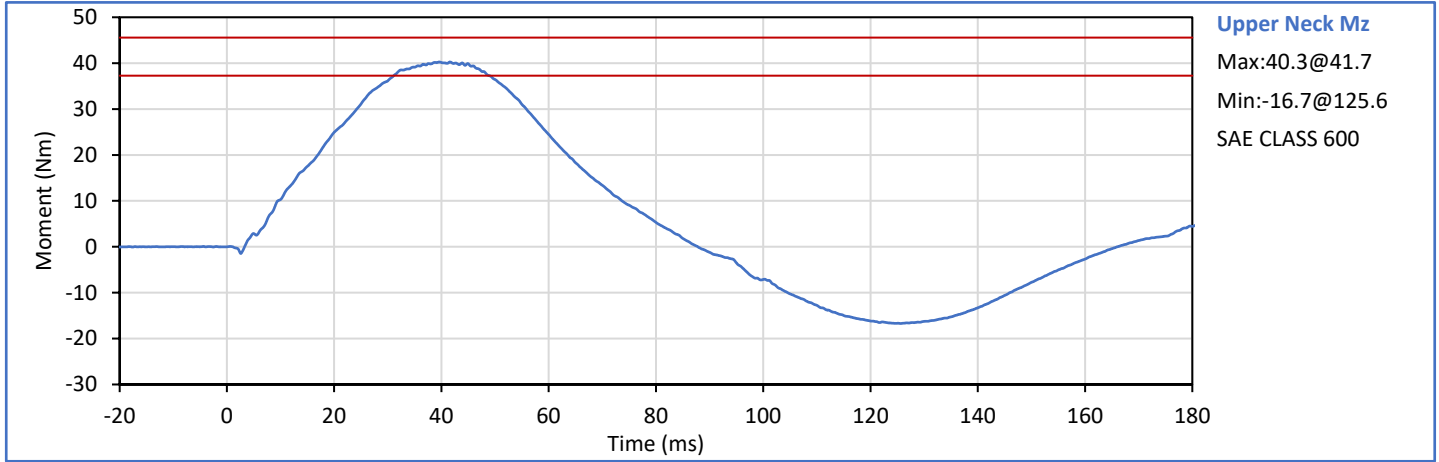



Technician: *J. Hernandez*  
J. Hernandez


Approved By: *P. Puzuto*  
P. Puzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	4.95	5.05	5.02	Pass
Pendulum Velocity at 10 ms	m/s	-2.09	-1.71	-1.93	Pass
Pendulum Velocity at 15 ms	m/s	-3.14	-2.57	-2.99	Pass
Pendulum Velocity at 20 ms	m/s	-4.23	-3.46	-4.10	Pass
Pendulum Velocity at 25 ms	m/s	-5.22	-4.27	-4.99	Pass
Peak Upper Neck Mz	Nm	37.3	45.6	40.3	Pass
Peak Head Wz	deg/s	-1529	-1251	-1492	Pass
Peak Neck Fixture Rotation	deg	-52.7	-43.1	-47.7	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

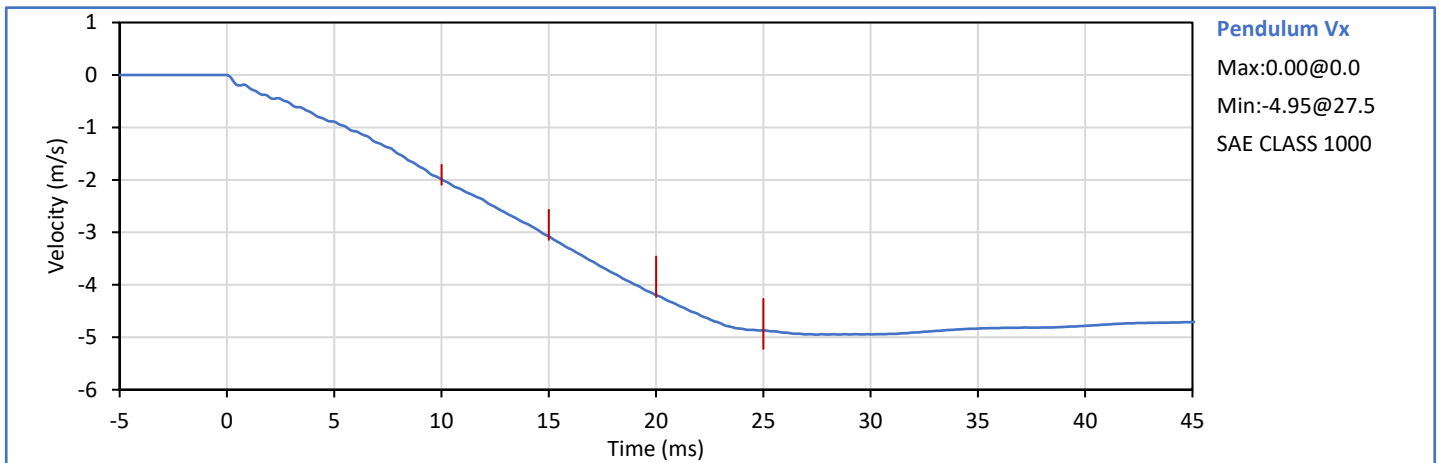


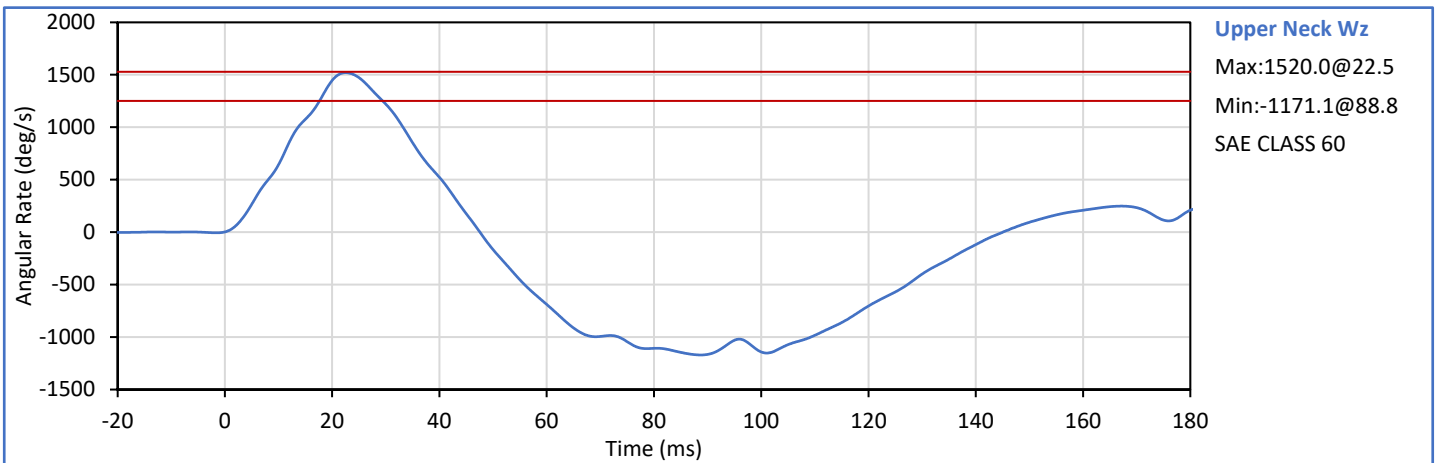
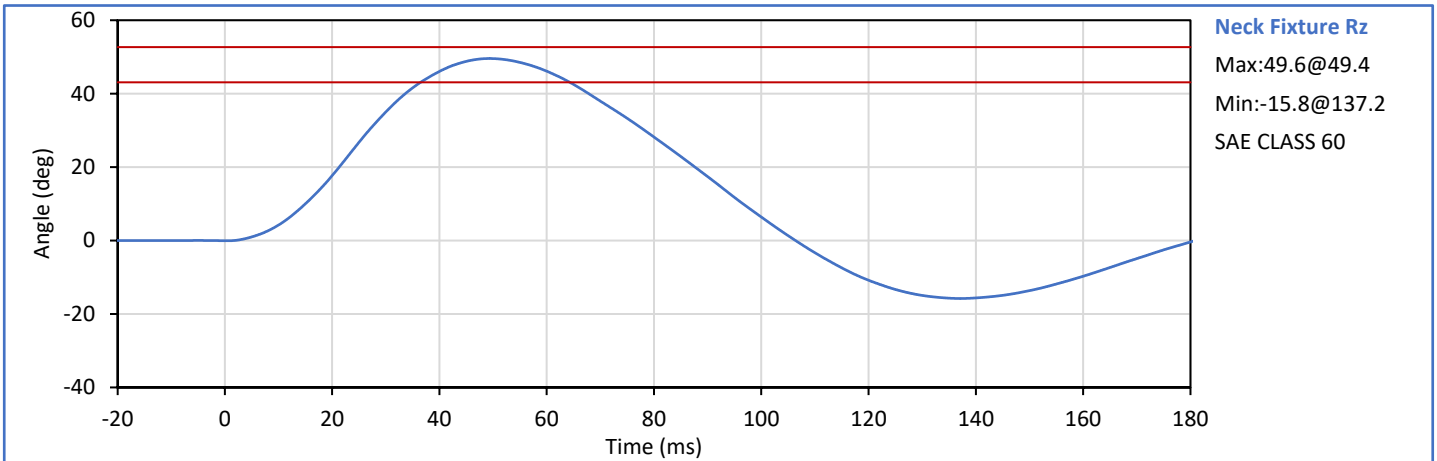
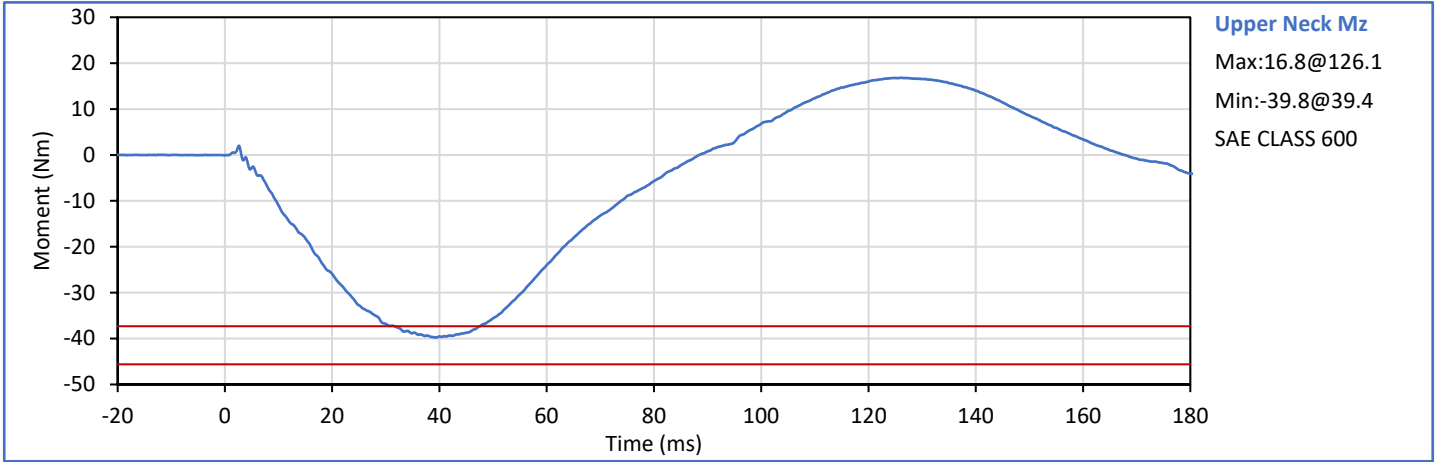



Technician:   
J. Hernandez


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 Humidity	%	10	70	26	Pass
Pendulum Velocity	m/s	4.95	5.05	5.00	Pass
Pendulum Velocity at 10 ms	m/s	-2.09	-1.71	-1.99	Pass
Pendulum Velocity at 15 ms	m/s	-3.14	-2.57	-3.08	Pass
Pendulum Velocity at 20 ms	m/s	-4.23	-3.46	-4.20	Pass
Pendulum Velocity at 25 ms	m/s	-5.22	-4.27	-4.87	Pass
Peak Upper Neck Mz	Nm	-45.6	-37.3	-39.8	Pass
Peak Head Wz	deg/s	1251	1529	1520	Pass
Peak Neck Fixture Rotation	deg	43.1	52.7	49.6	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

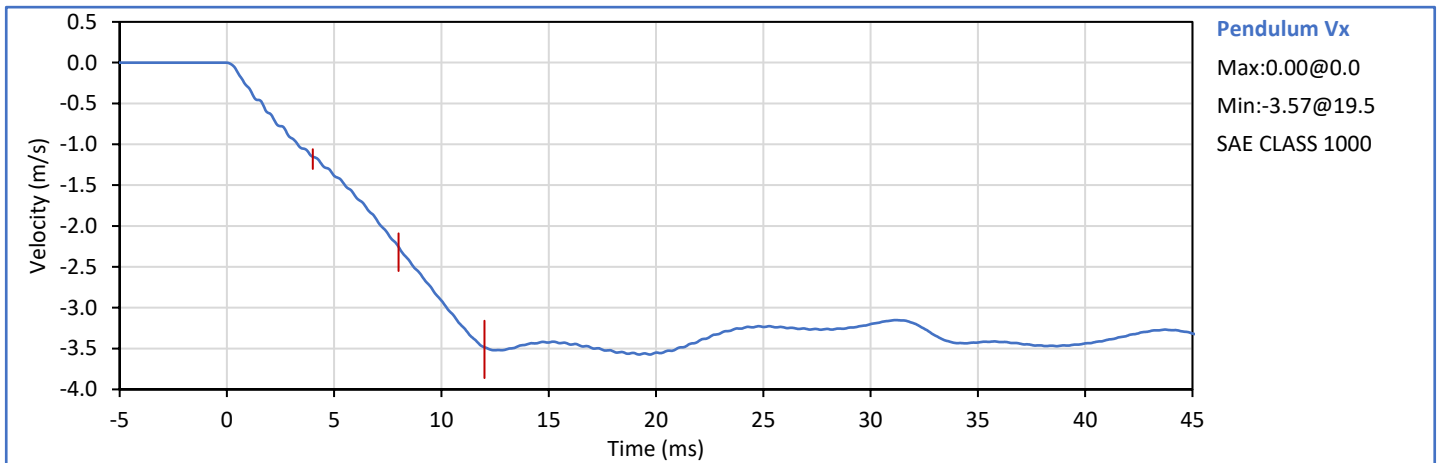


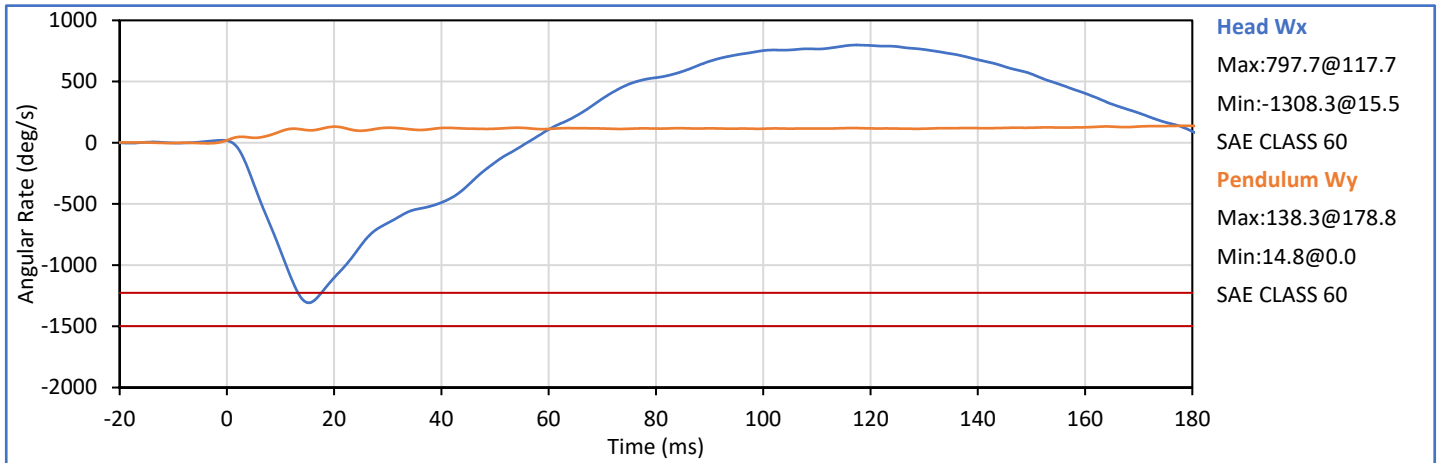
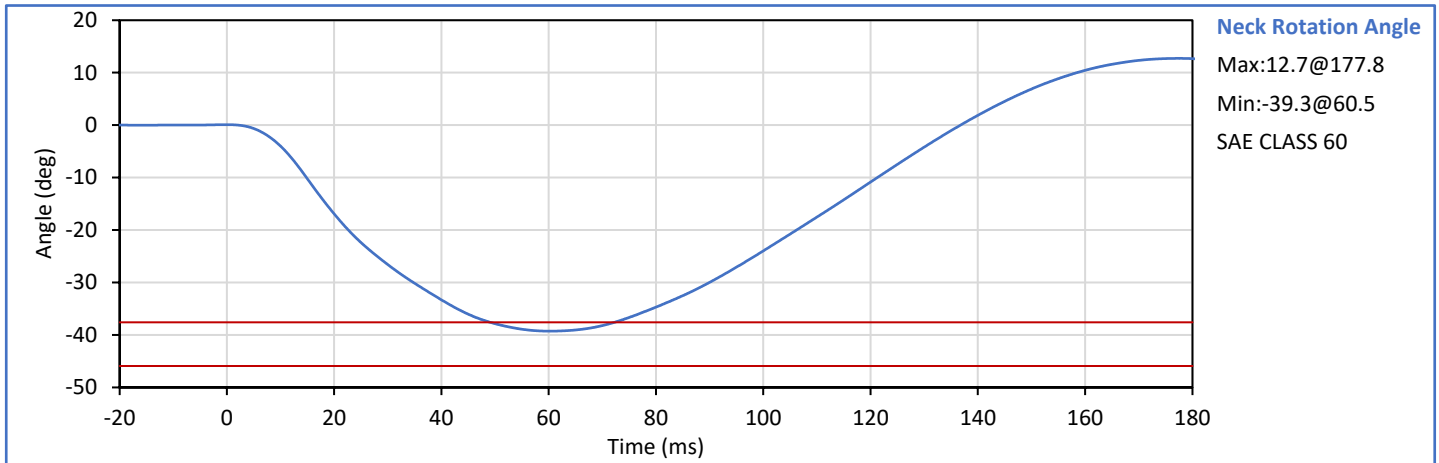
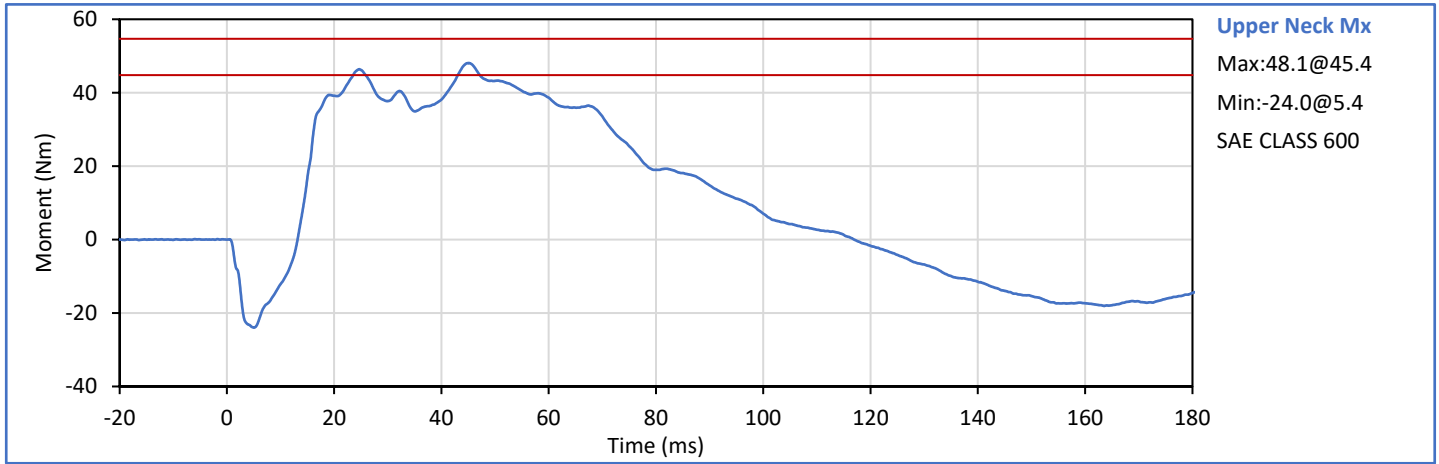



Technician:   
J. Hernandez


Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	3.35	3.45	3.38	Pass
Pendulum Velocity at 4 ms	m/s	-1.30	-1.06	-1.15	Pass
Pendulum Velocity at 8 ms	m/s	-2.55	-2.09	-2.25	Pass
Pendulum Velocity at 12 ms	m/s	-3.86	-3.16	-3.48	Pass
Peak Upper Neck Mx after 40 ms	Nm	44.8	54.7	48.1	Pass
Peak Head Wx	deg/s	-1498	-1226	-1308	Pass
Peak Head Relative Rotation	deg	-45.9	-37.6	-39.3	Pass
<b>NHTSA 2019-05 Corridor</b>				Overall Test Results	Pass

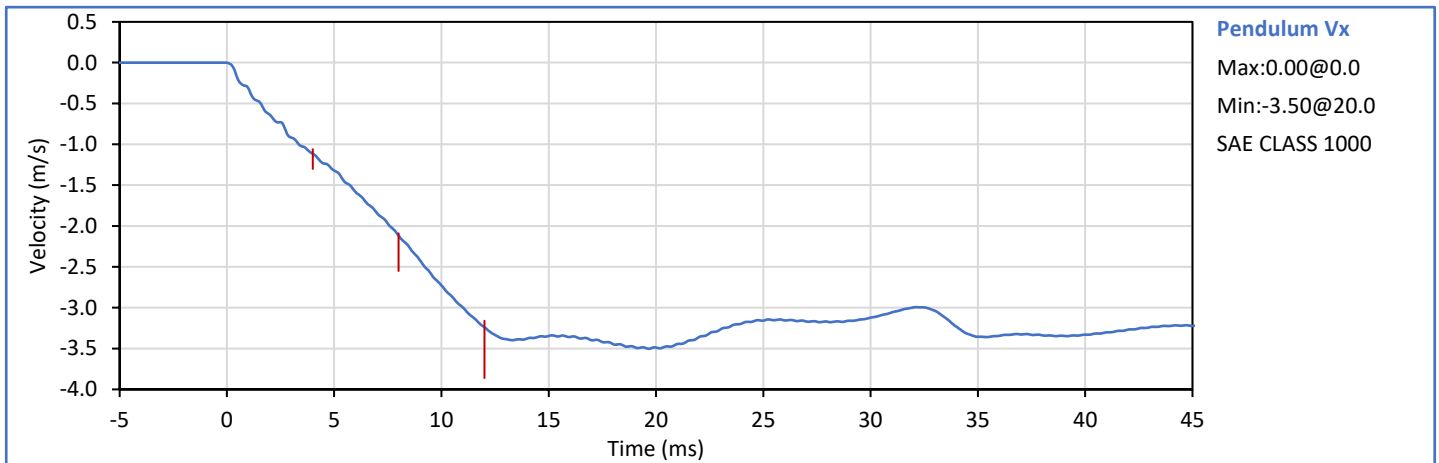


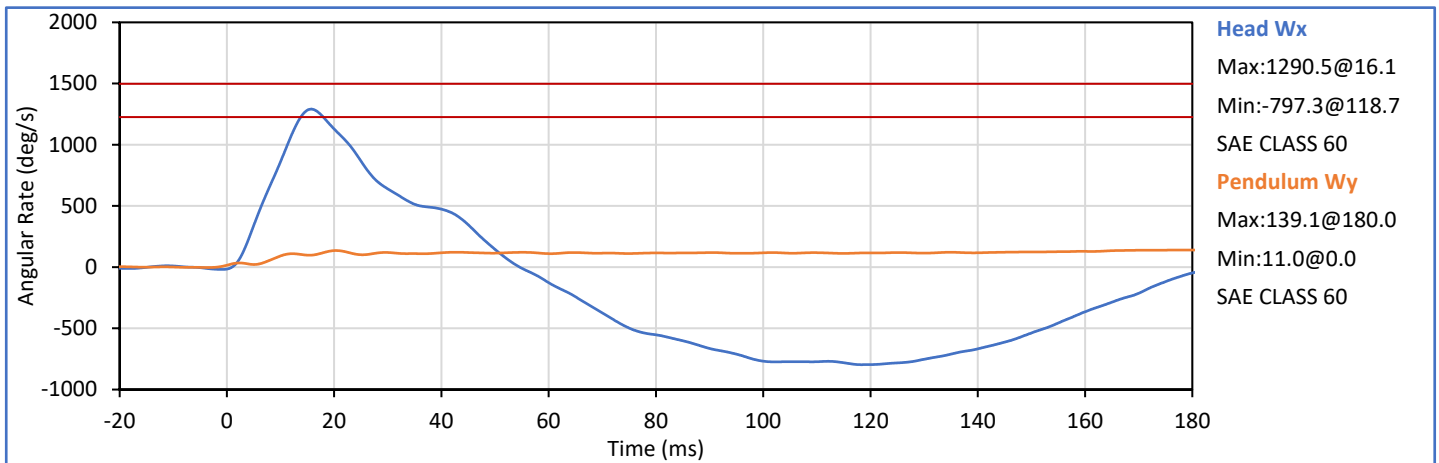
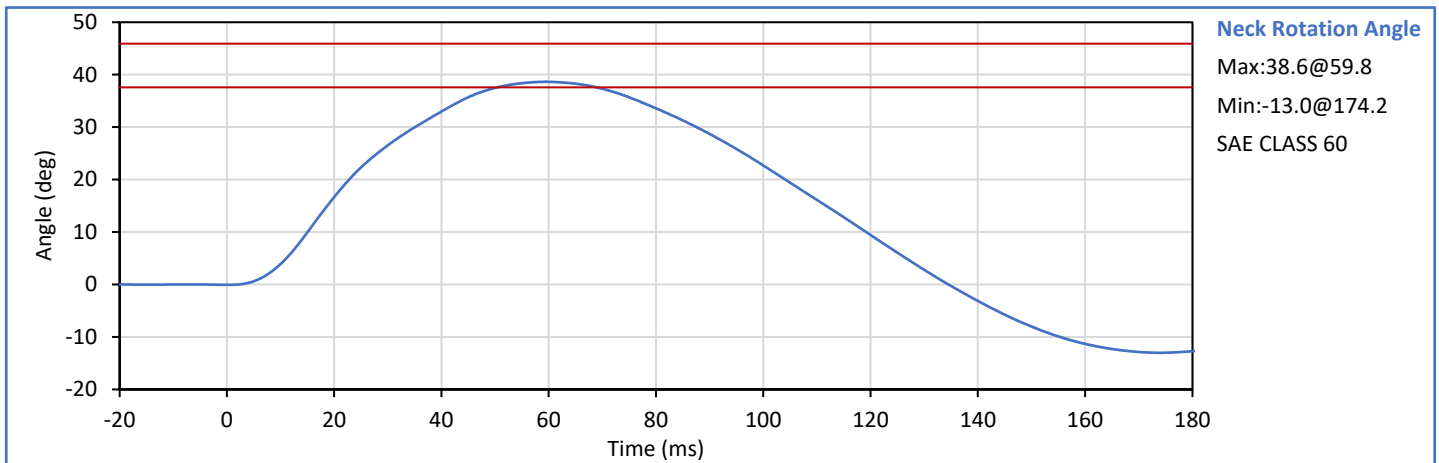
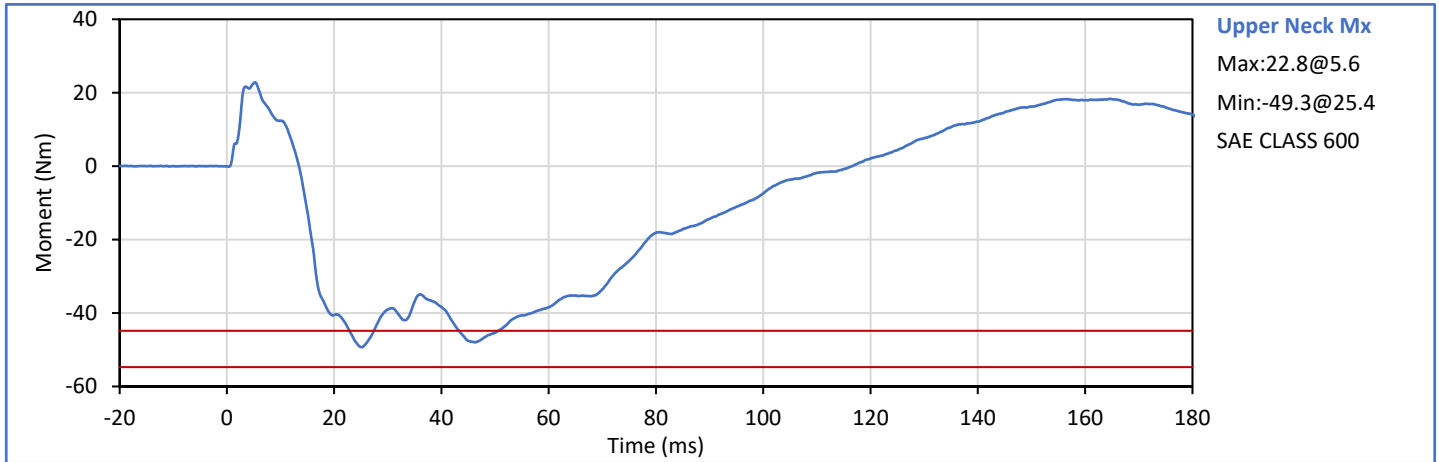



Technician:   
J. Hernandez


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 Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	3.35	3.45	3.37	Pass
Pendulum Velocity at 4 ms	m/s	-1.30	-1.06	-1.11	Pass
Pendulum Velocity at 8 ms	m/s	-2.55	-2.09	-2.12	Pass
Pendulum Velocity at 12 ms	m/s	-3.86	-3.16	-3.24	Pass
Peak Upper Neck Mx after 40 ms	Nm	-54.7	-44.8	-49.3	Pass
Peak Head Wx	deg/s	1226	1498	1290	Pass
Peak Head Relative Rotation	deg	37.6	45.9	38.6	Pass
<b>NHTSA 2019-05 Corridor</b>				Overall Test Results	Pass

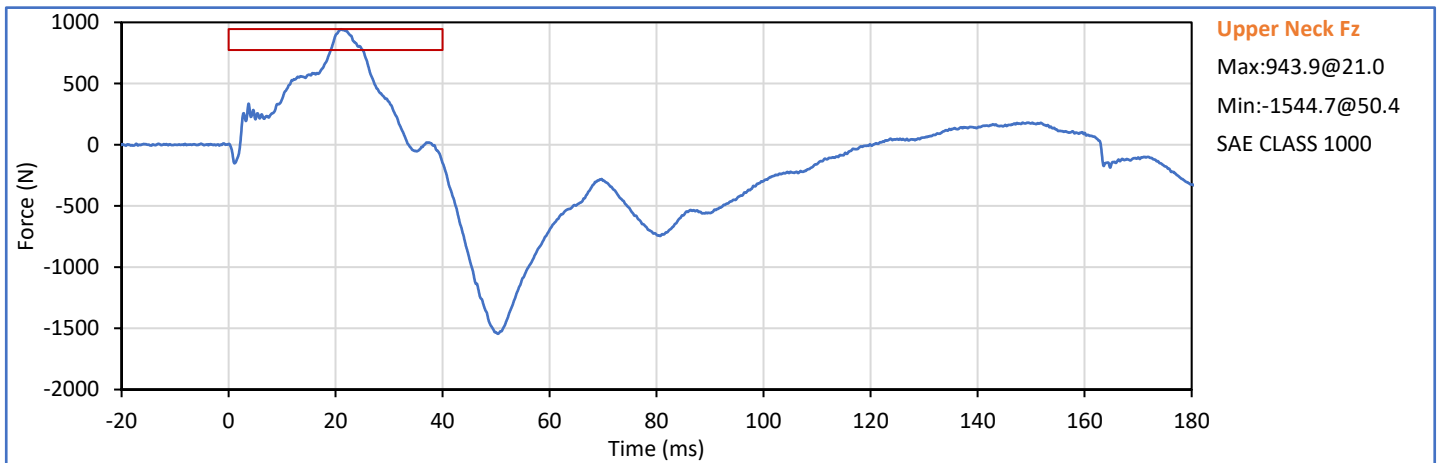
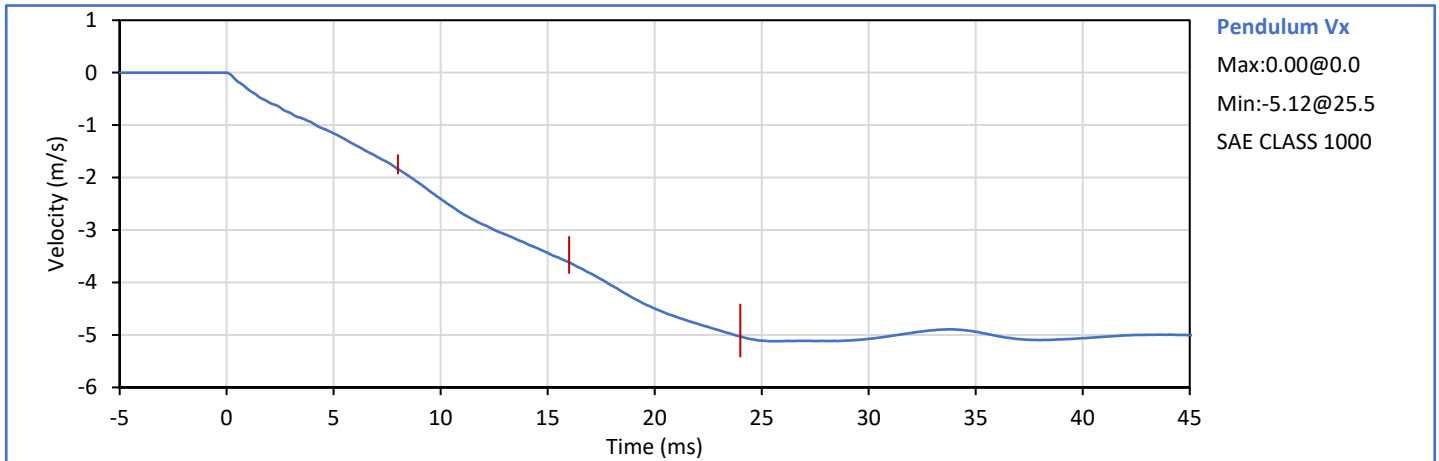


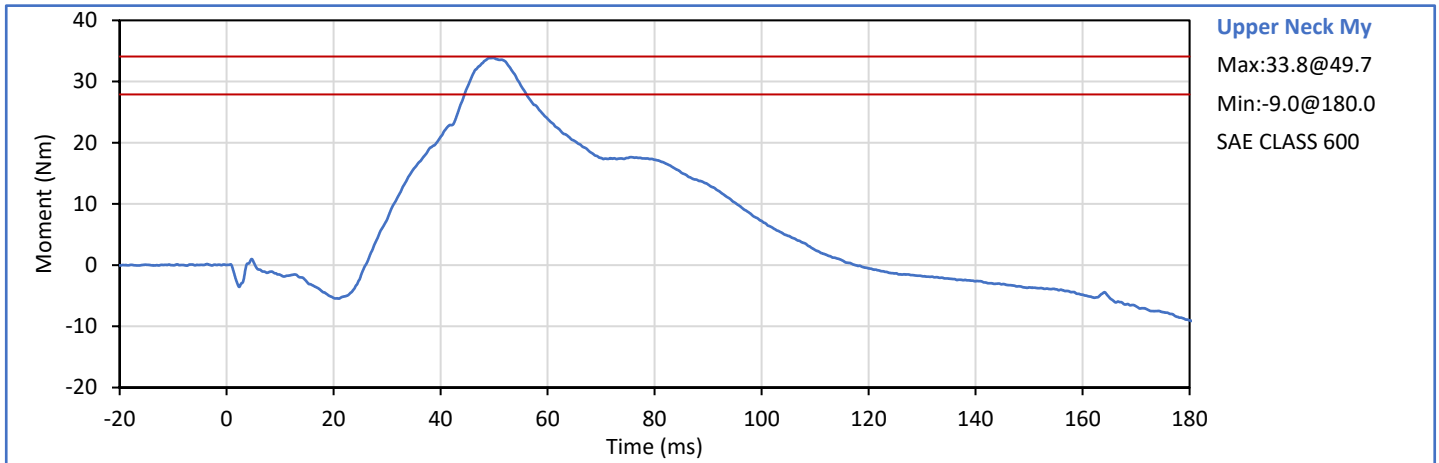
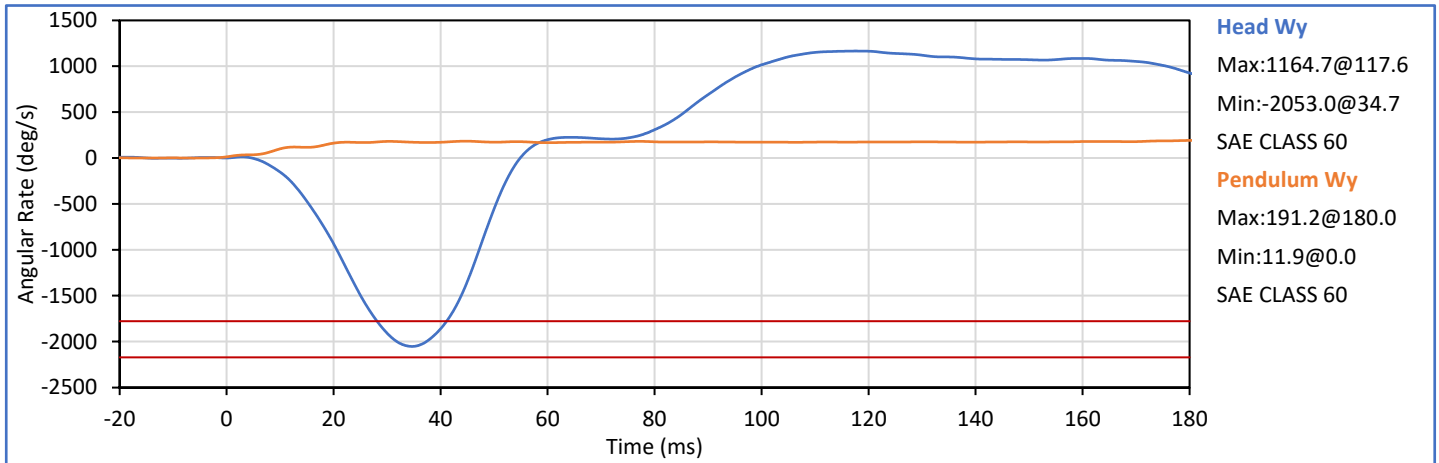
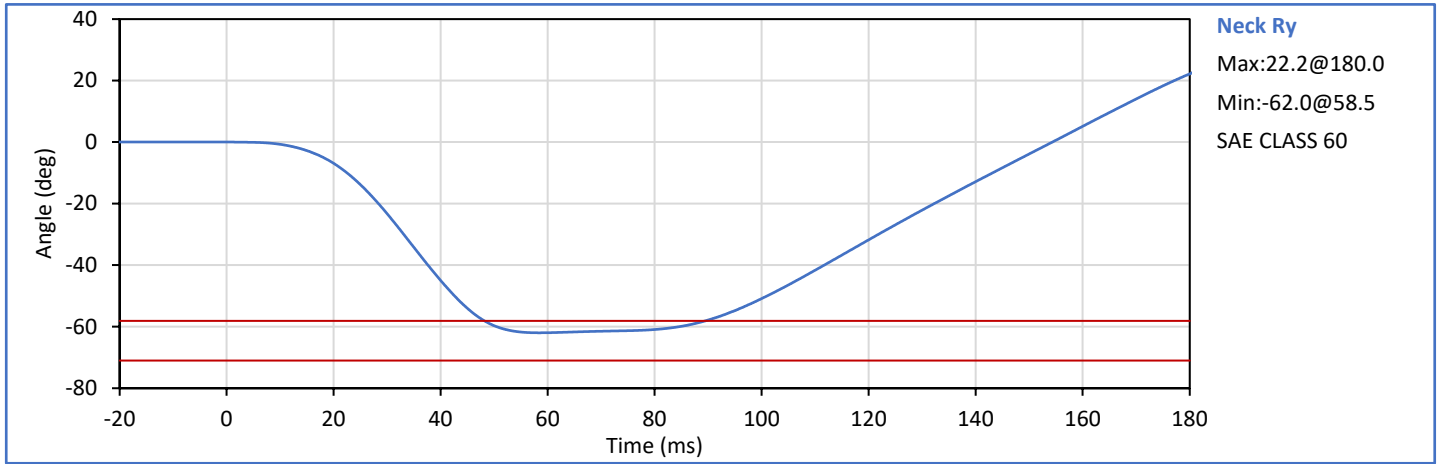



Technician:   
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Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	4.95	5.05	5.02	Pass
Pendulum Velocity at 8 ms	m/s	-1.92	-1.57	-1.84	Pass
Pendulum Velocity at 16 ms	m/s	-3.82	-3.13	-3.62	Pass
Pendulum Velocity at 24 ms	m/s	-5.41	-4.42	-5.03	Pass
Peak Upper Neck My	Nm	27.9	34.1	33.8	Pass
Peak Upper Neck Fz (before 40 ms)	N	774	946	944	Pass
Peak Head Wy	deg/s	-2172	-1777	-2053	Pass
Peak Head Relative Rotation	deg	-71.0	-58.1	-62.0	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

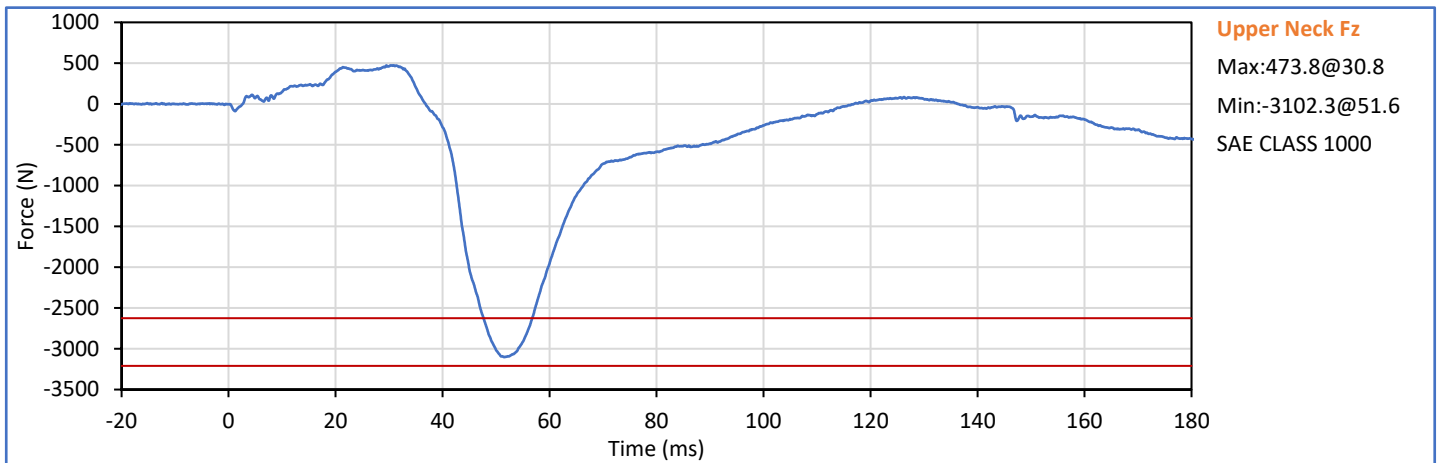
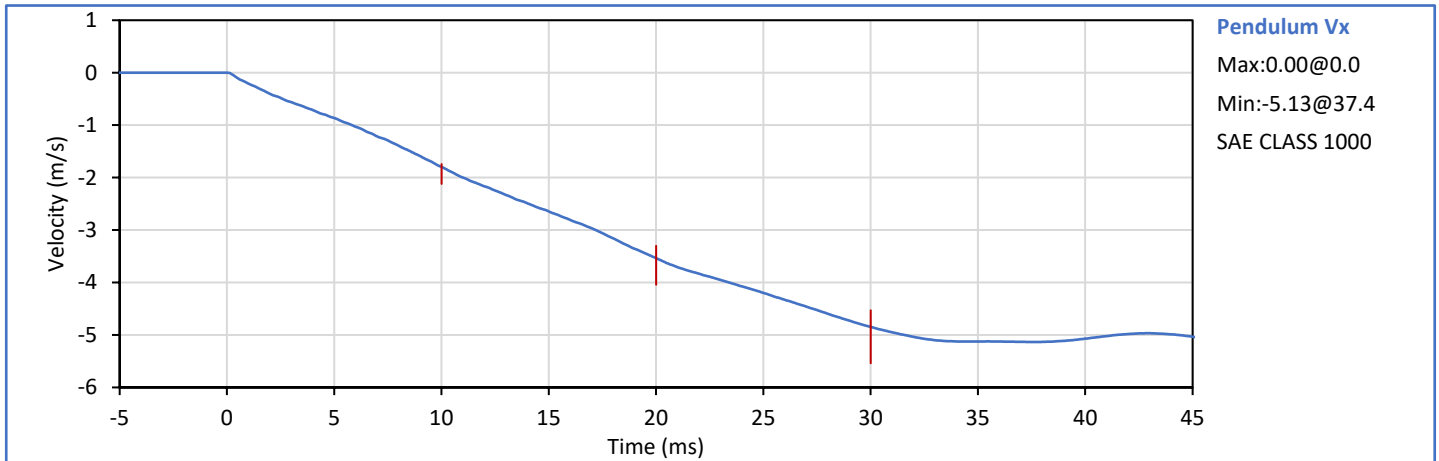


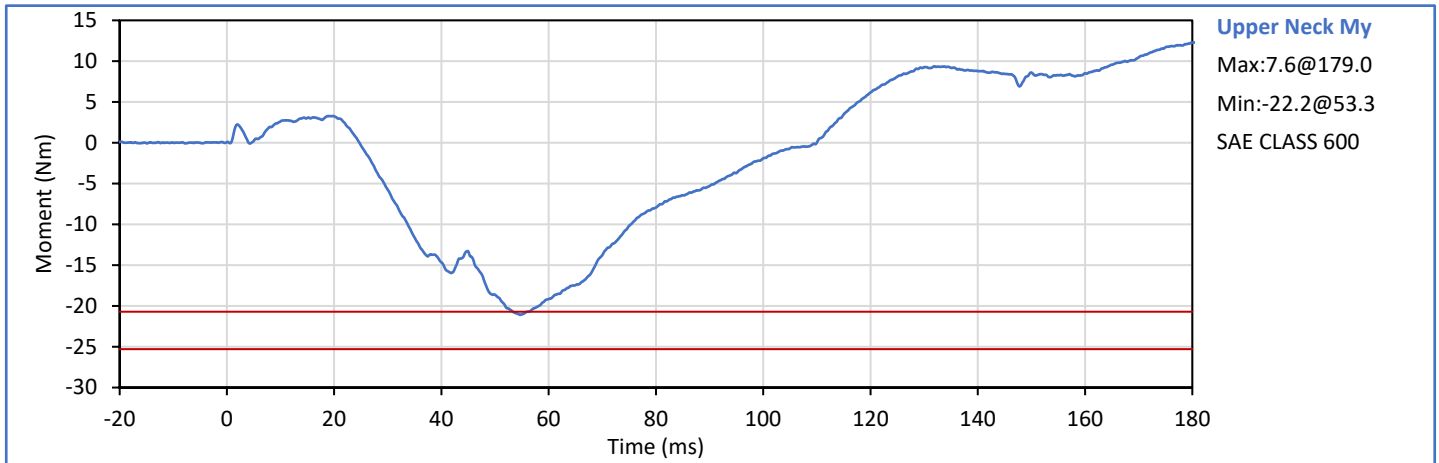
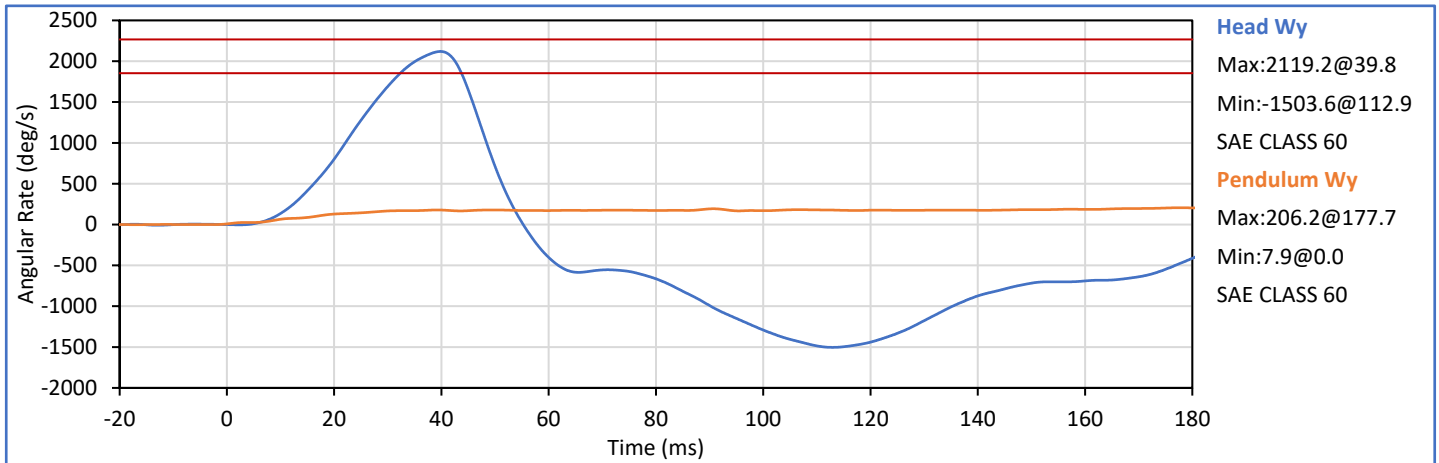
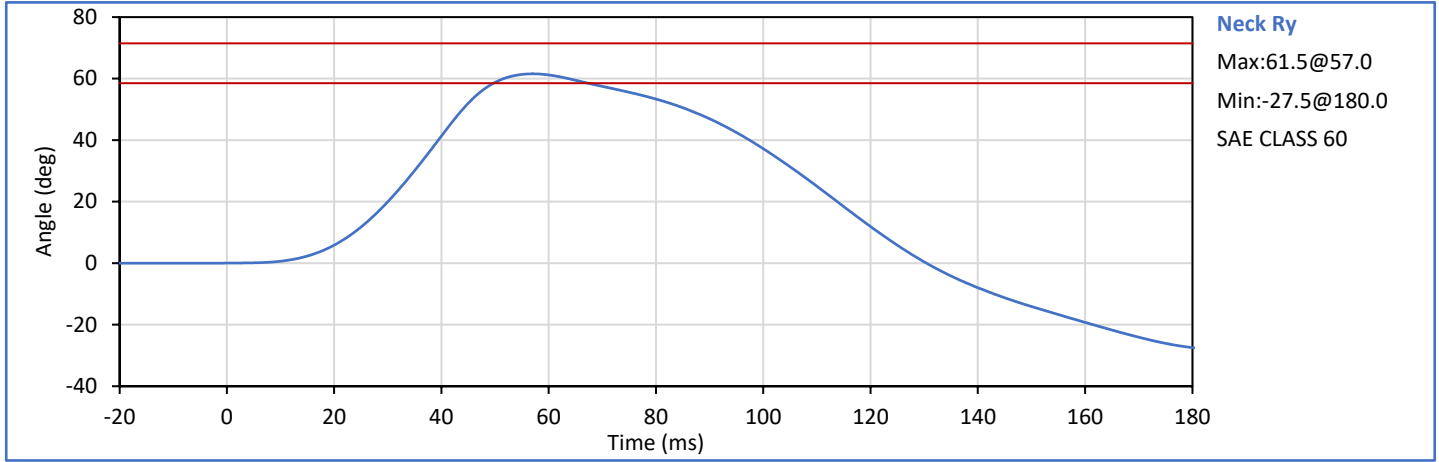


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Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
Pendulum Velocity	m/s	4.95	5.05	5.01	Pass
Pendulum Velocity at 10 ms	m/s	-2.12	-1.74	-1.81	Pass
Pendulum Velocity at 20 ms	m/s	-4.04	-3.30	-3.55	Pass
Pendulum Velocity at 30 ms	m/s	-5.54	-4.53	-4.85	Pass
Peak Upper Neck My	Nm	-25.3	-20.7	-21.1	Pass
Peak Upper Neck Fz	N	-3210	-2626	-3102	Pass
Peak Head Wy	deg/s	1855	2267	2119	Pass
Peak Head Relative Rotation	deg	58.5	71.5	61.5	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

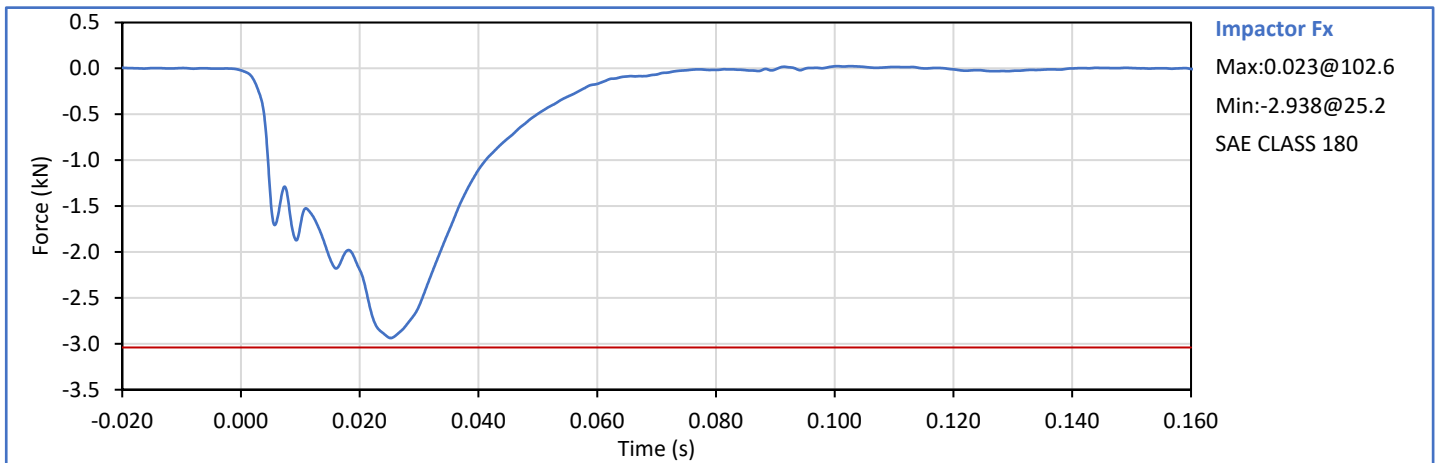
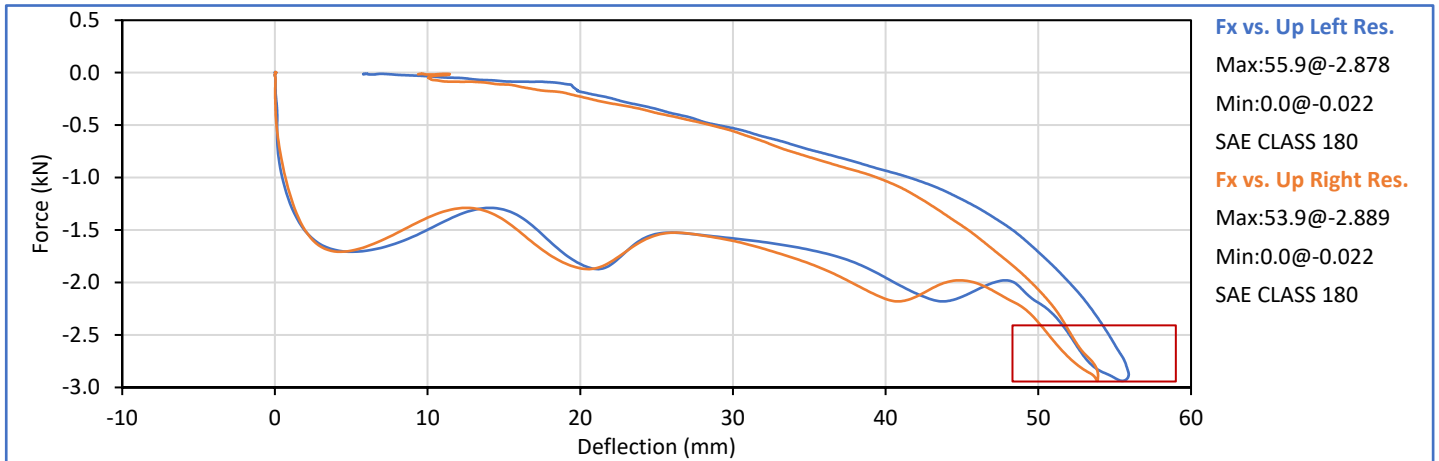





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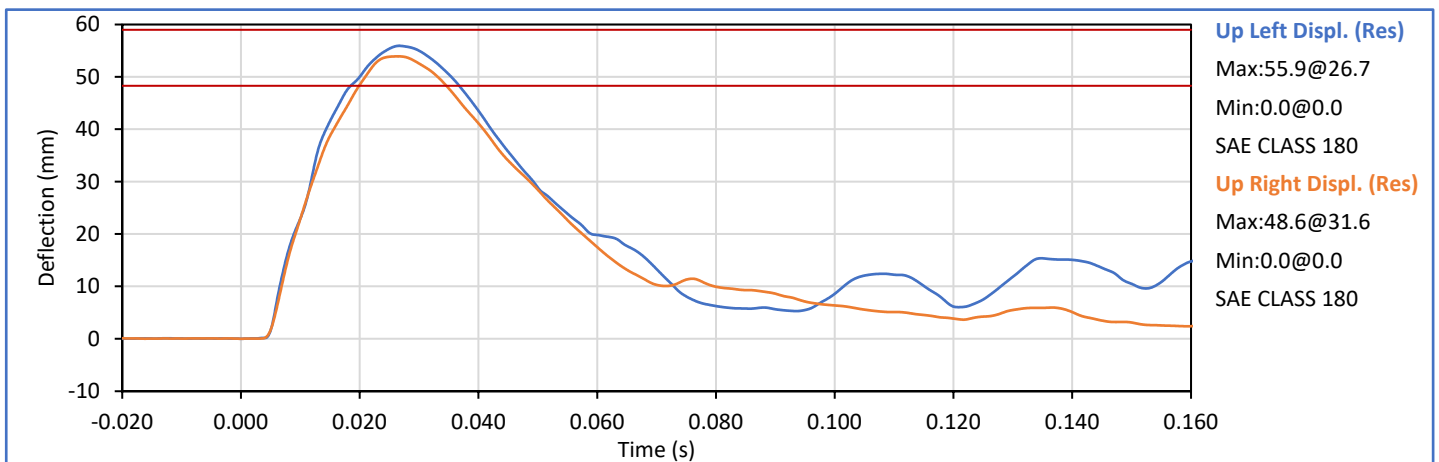
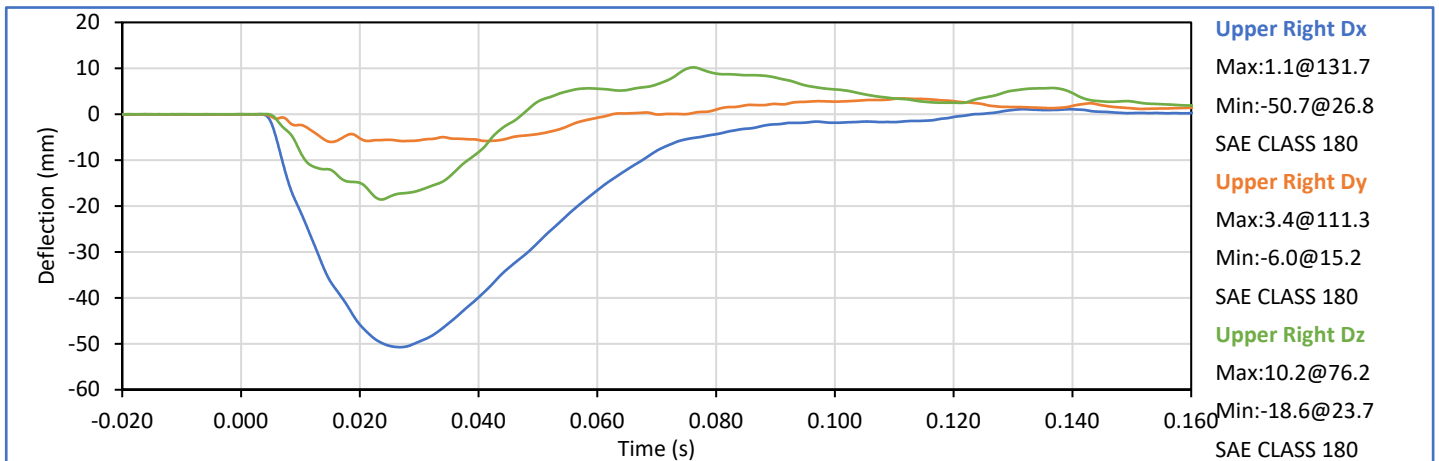
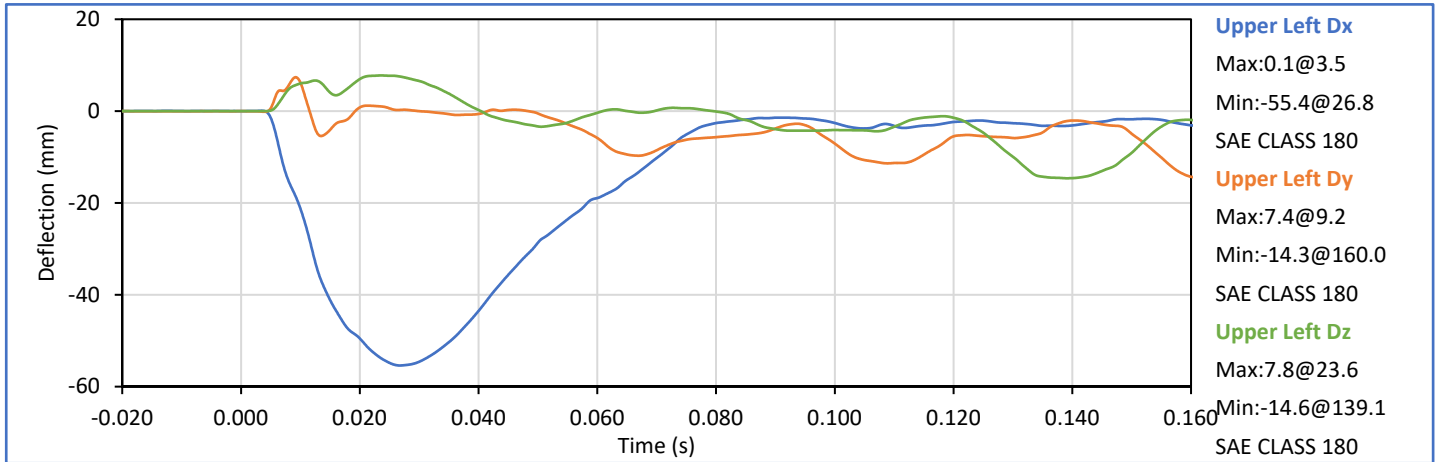
Approved By:   
P. Puzzuto

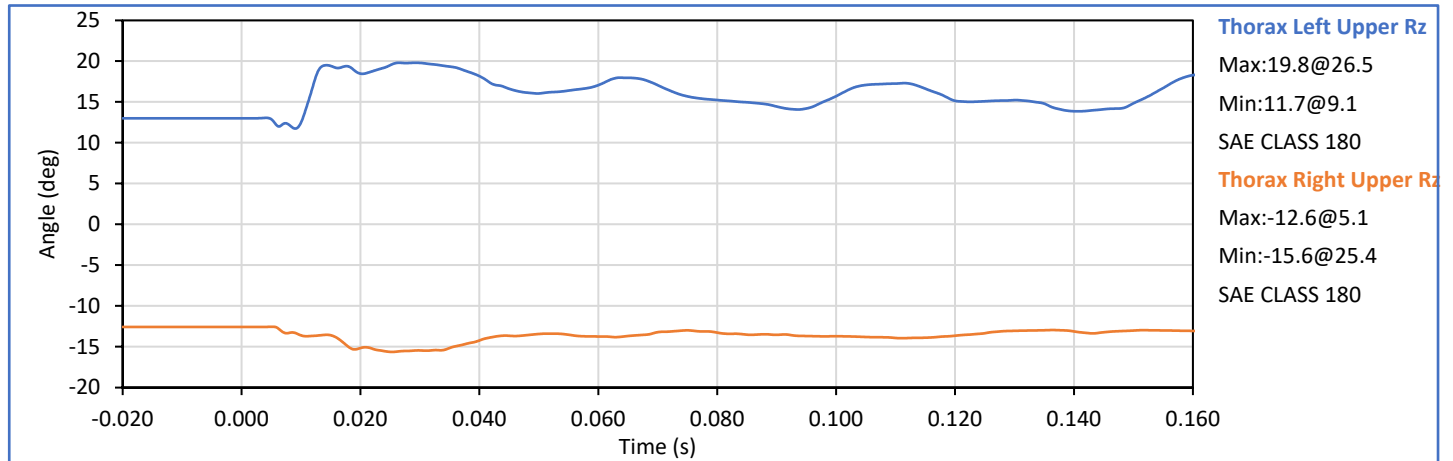
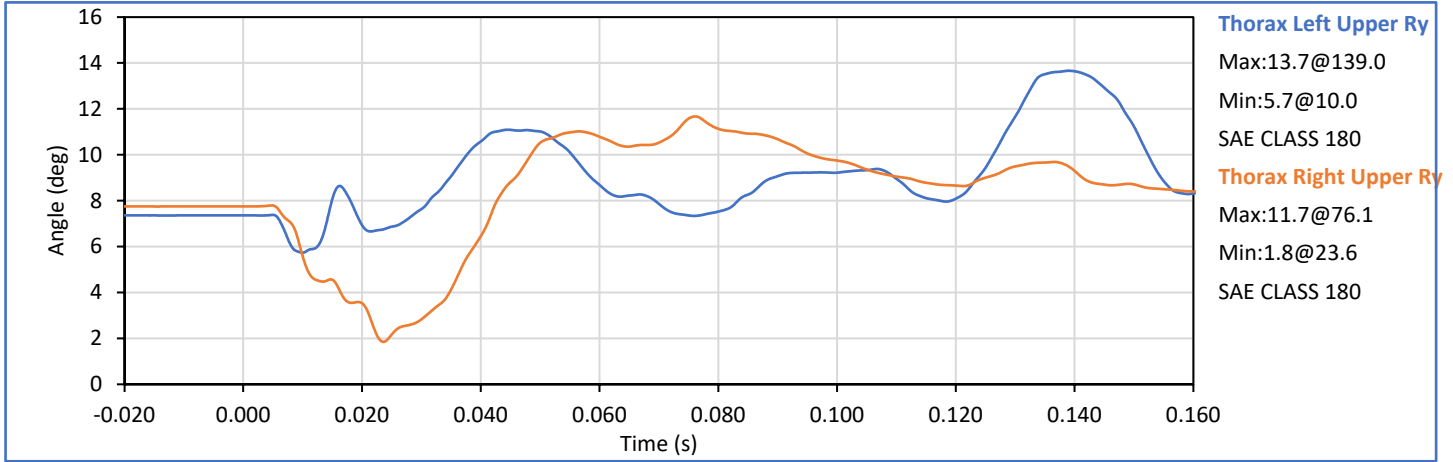
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
Probe Velocity	m/s	4.25	4.35	4.31	Pass
Peak Probe Force	kN	-3.039		-2.938	Pass
Peak Upper Left Deflection Res.	mm	48.3	59.0	55.9	Pass
Peak Upper Right Deflection Res.	mm			53.9	Pass
Absolute Difference L/R Defl. Res.	mm	0.0	5.0	2.0	Pass
Force at Peak Upper Left Res.	mm	-2.944	-2.409	-2.878	Pass
Force at Peak Upper Right Res.	mm			-2.889	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>



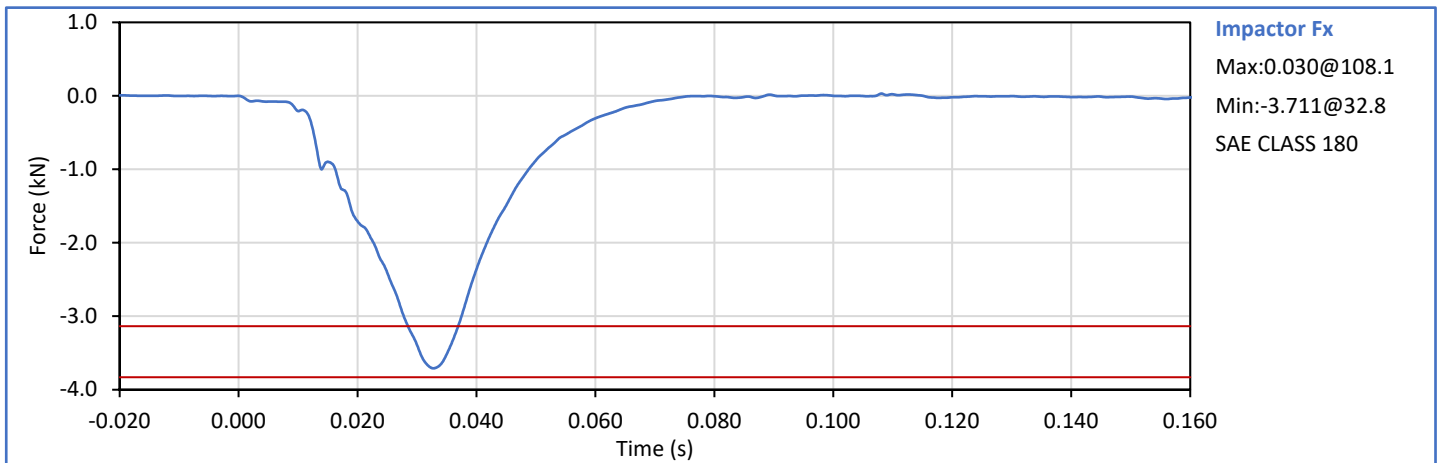
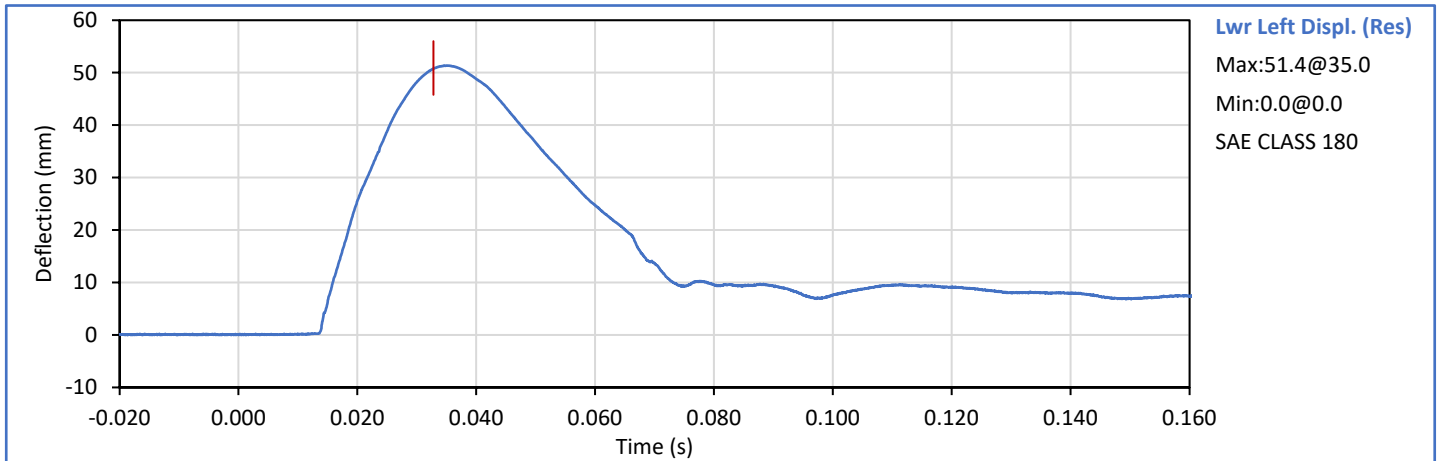
Technician:   
J. Hernandez


Approved By:   
P. Puzuto






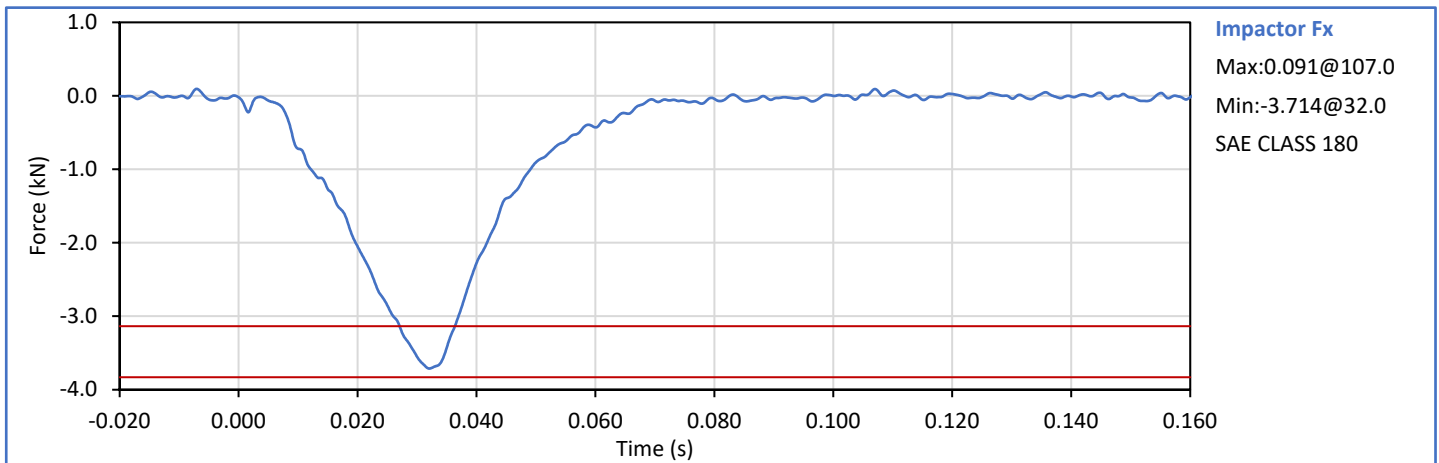
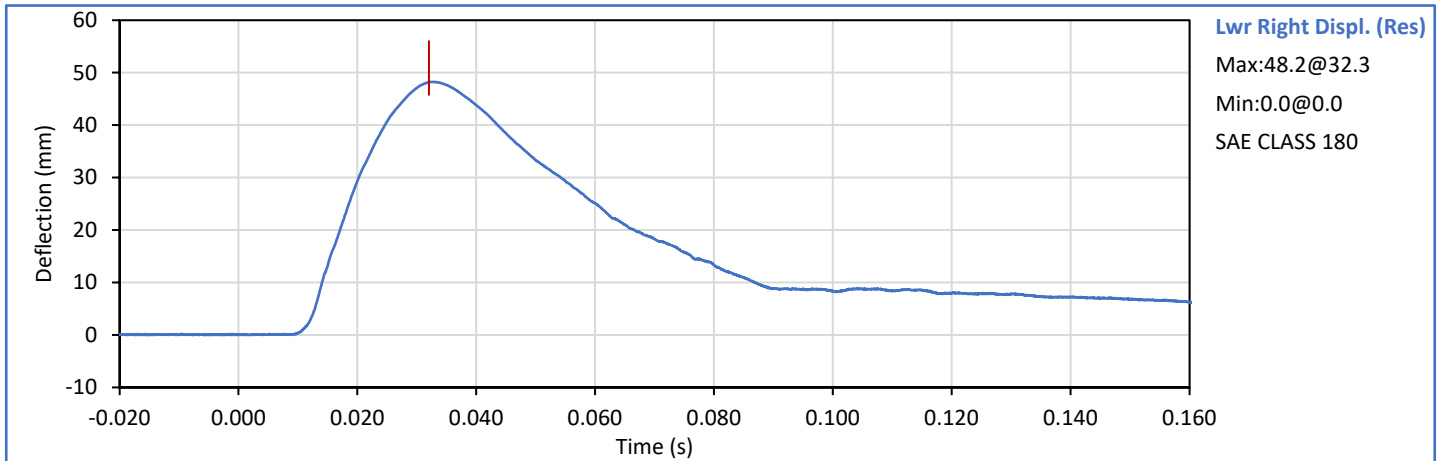
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Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.711	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	50.8	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass





Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

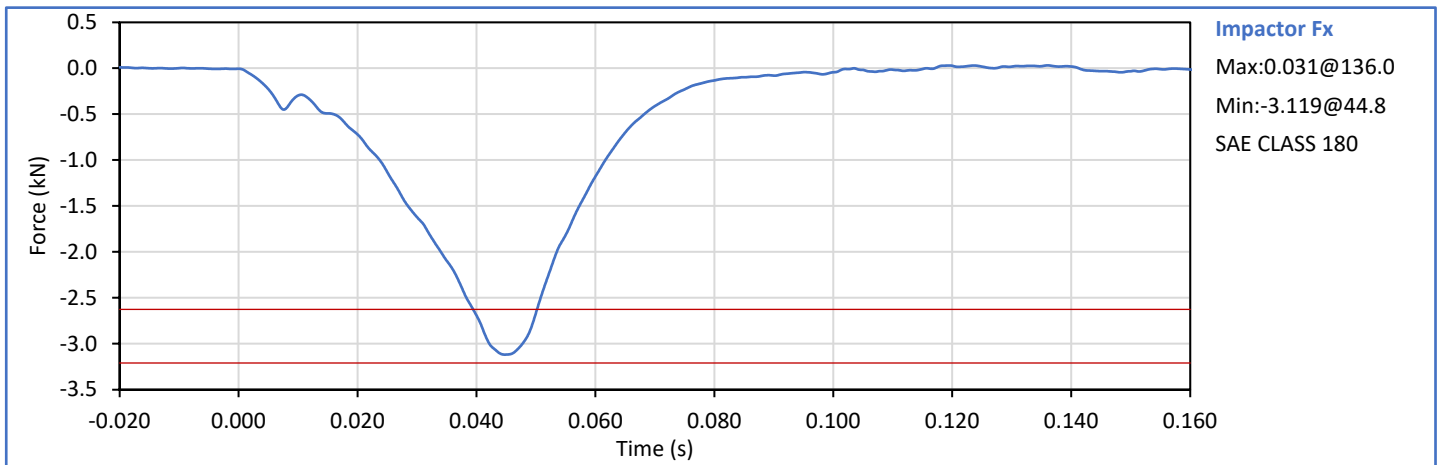
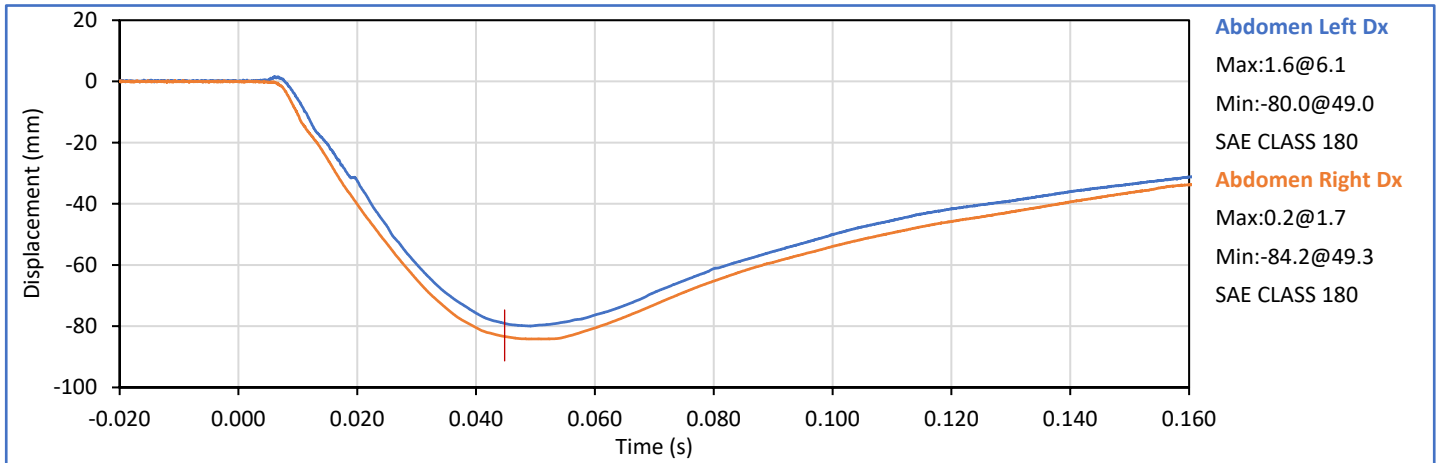
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.714	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	48.2	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass




Technician:   
 J. Hernandez

Approved By:   
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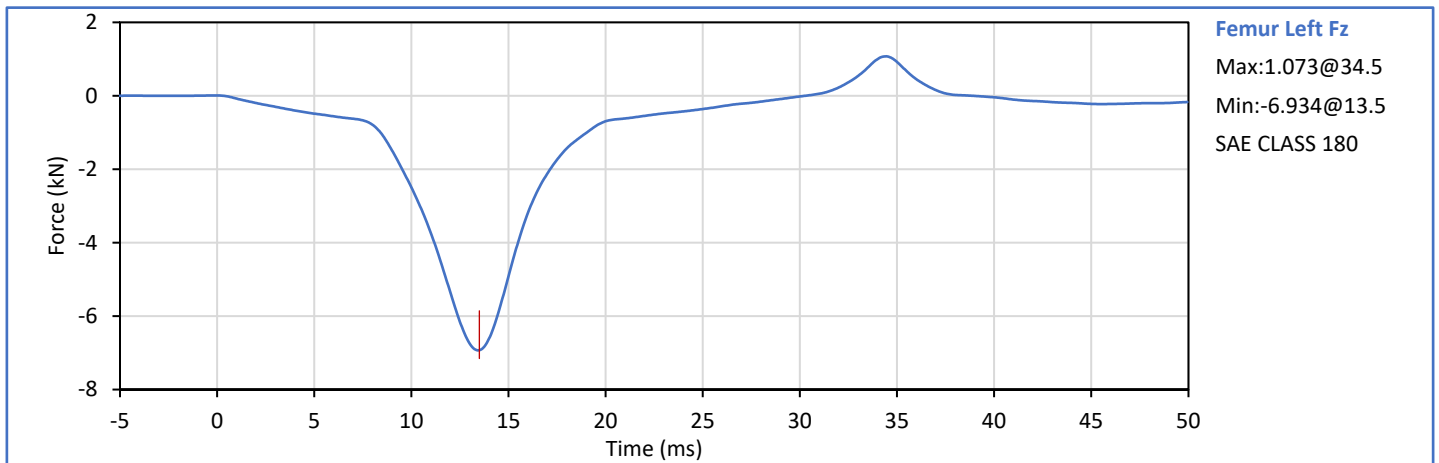
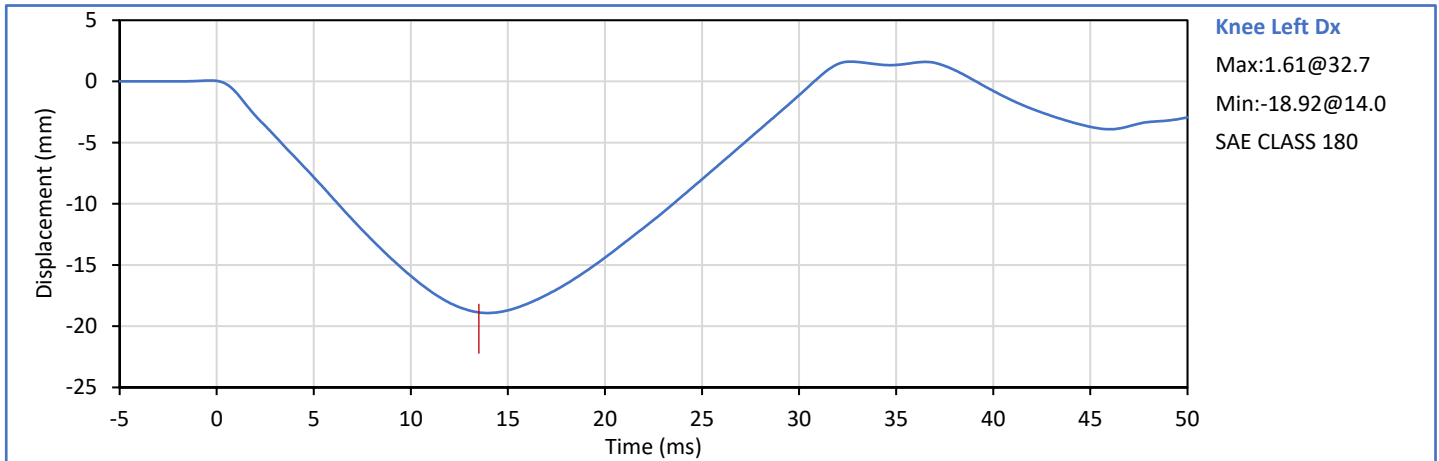
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Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	35	Pass
Probe Velocity	m/sec	3.25	3.35	3.31	Pass
Peak Probe Force	kN	-3.210	-2.626	-3.119	Pass
Lower Left Dx at Time of Peak Force	mm	-91.3	-74.7	-79.1	Pass
Lower Right Dx at Time of Peak Force	mm			-83.4	Pass
Absolute Difference of Left/Right Dx	mm	0.0	8.0	4.3	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>

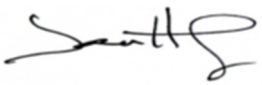



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

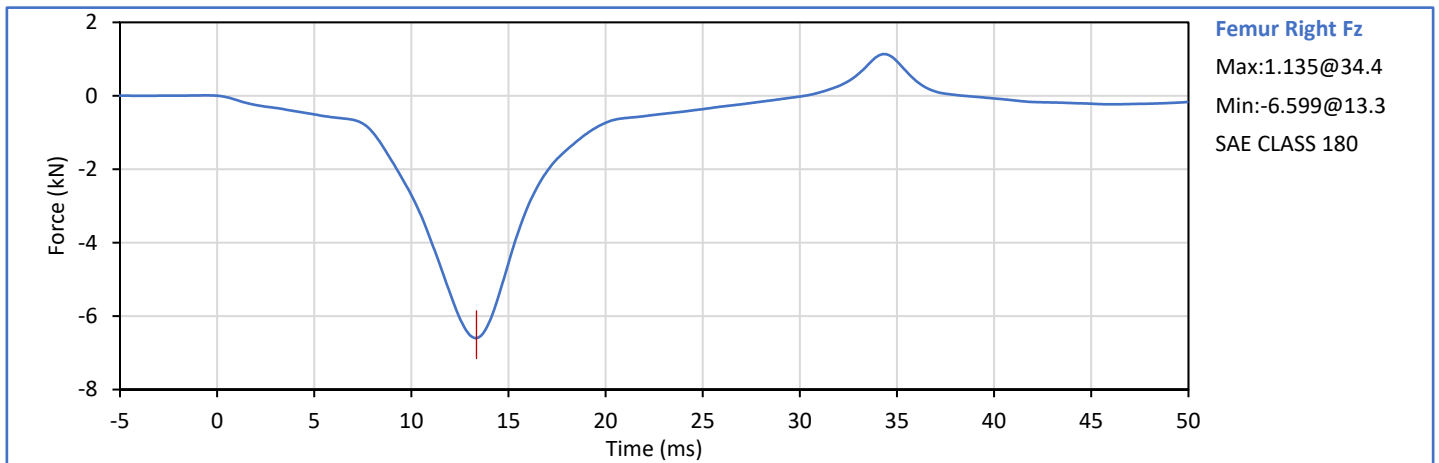
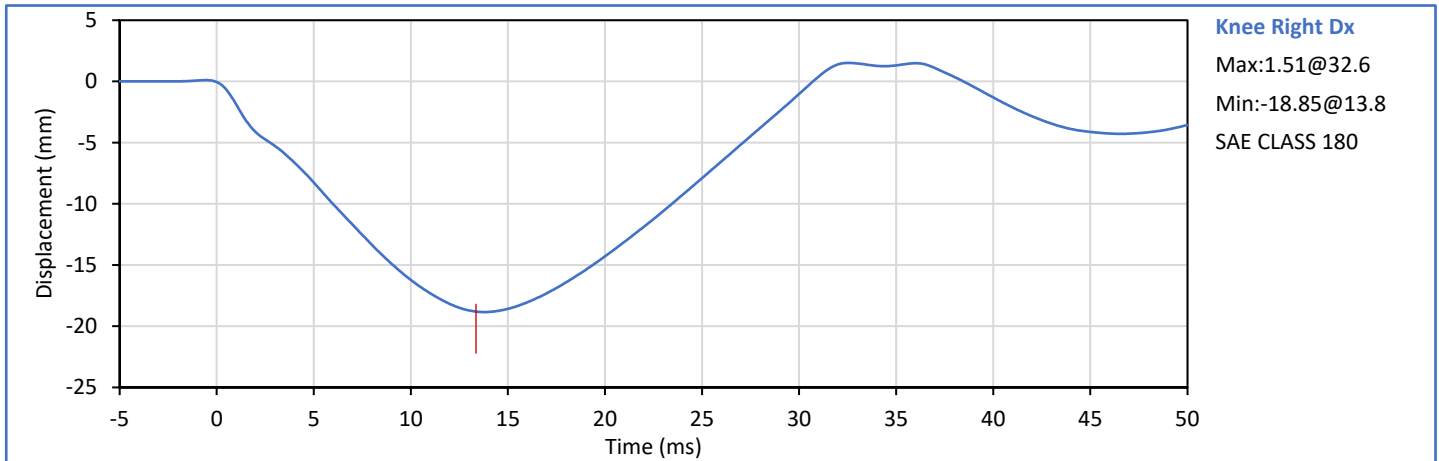
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	2.15	2.25	2.20	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.934	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-18.87	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

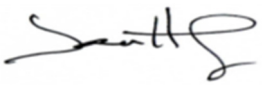



Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

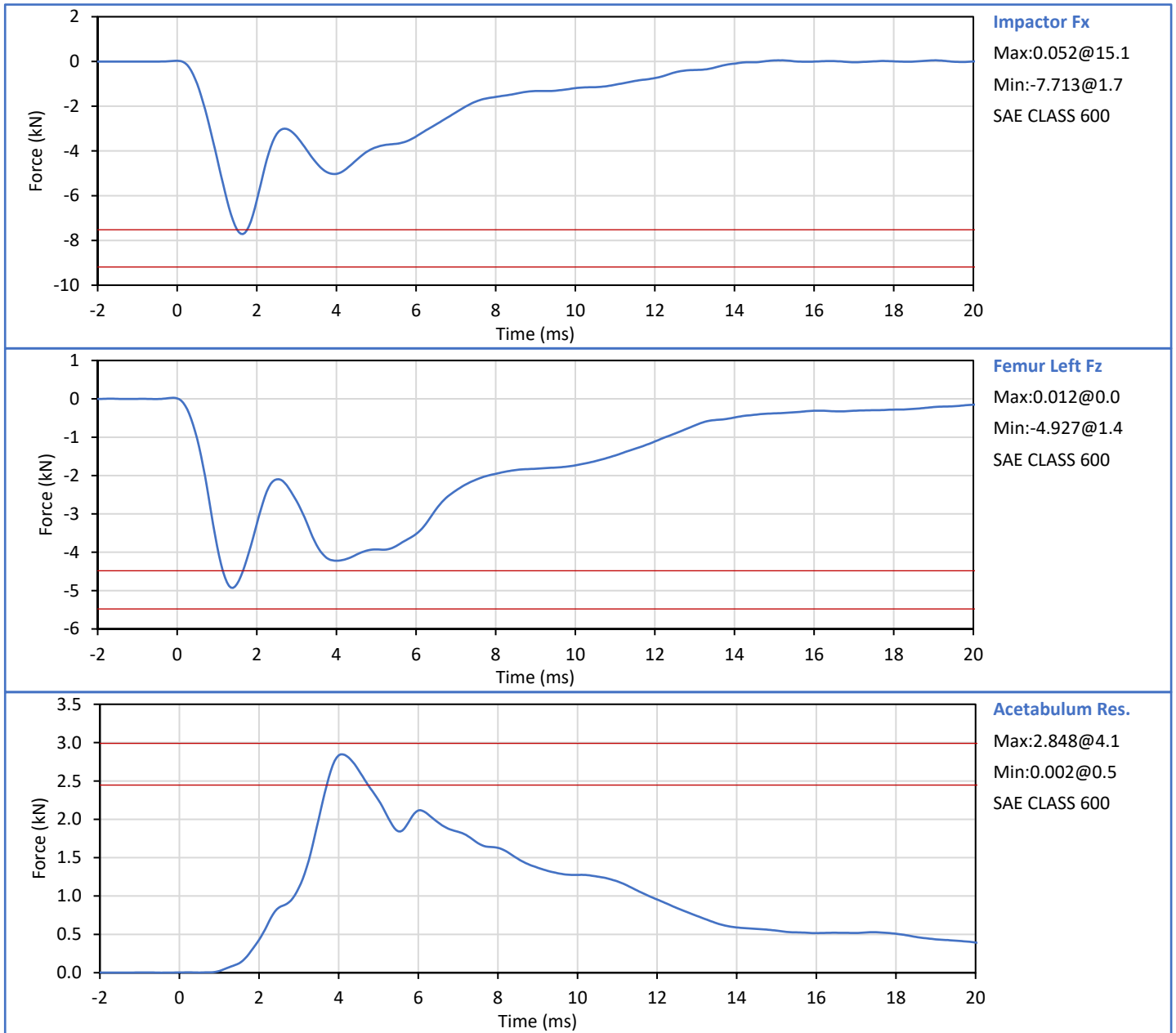
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Pendulum Velocity	m/s	2.15	2.25	2.21	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.599	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-18.80	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

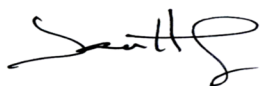



Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	3.25	3.35	3.34	Pass
Peak Impactor Fx	kN	-9.188	-7.517	-7.713	Pass
Peak Femur Fz	kN	-5.478	-4.482	-4.927	Pass
Acetabulum Force Resultant	kN	2.447	2.991	2.848	Pass
<sup>1</sup> NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass



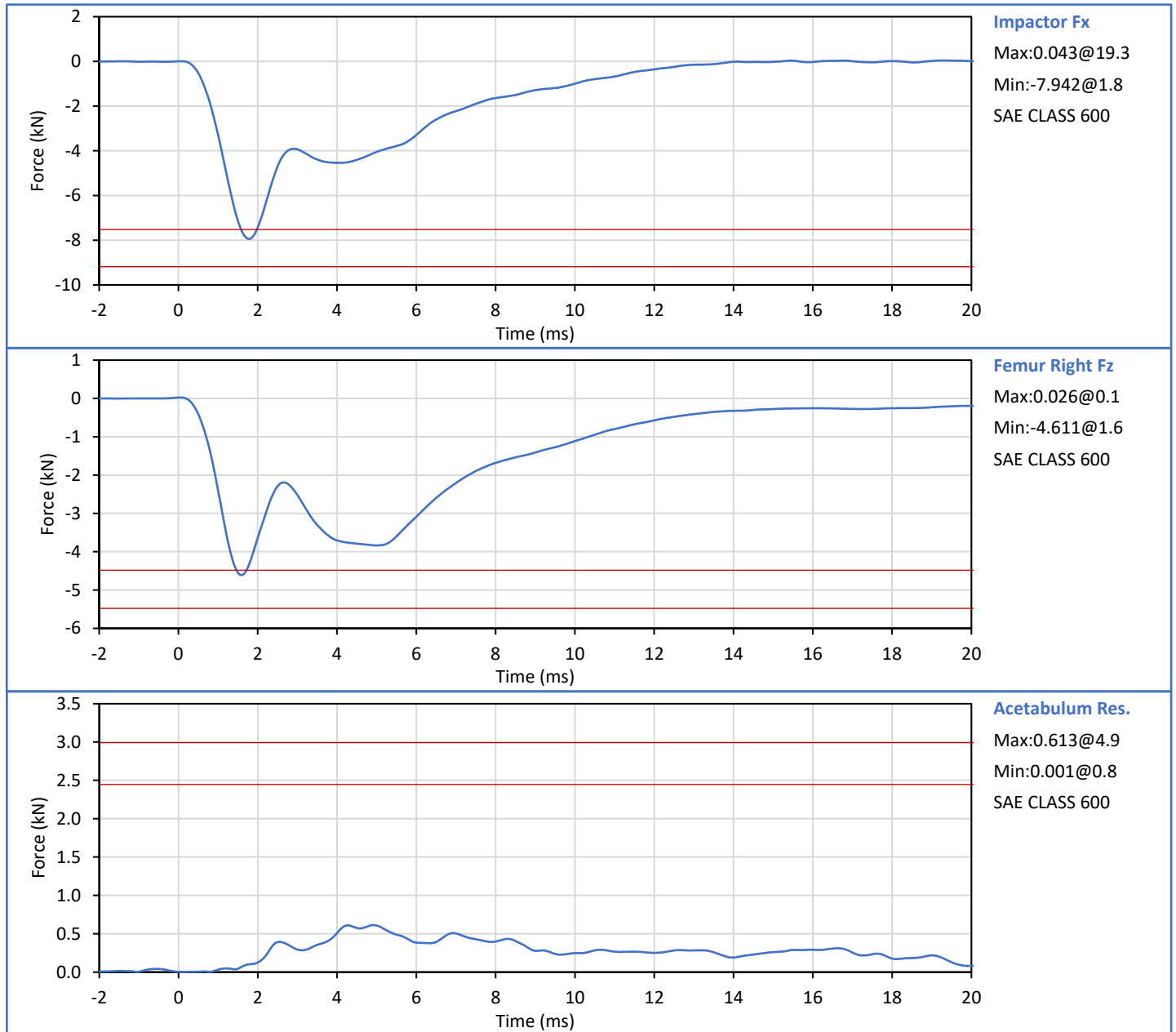
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto


Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	3.25	3.35	3.35	Pass
Peak Impactor Fx	kN	-9.188	-7.517	-7.942	Pass
Peak Femur Fz	kN	-5.478	-4.482	-4.611	Pass
Acetabulum Force Resultant	kN	2.447	2.991	0.613	Fail
				Overall Test Results	Fail

<sup>1</sup>NHTSA Corridor 2020-03 (Preliminary Corridor)

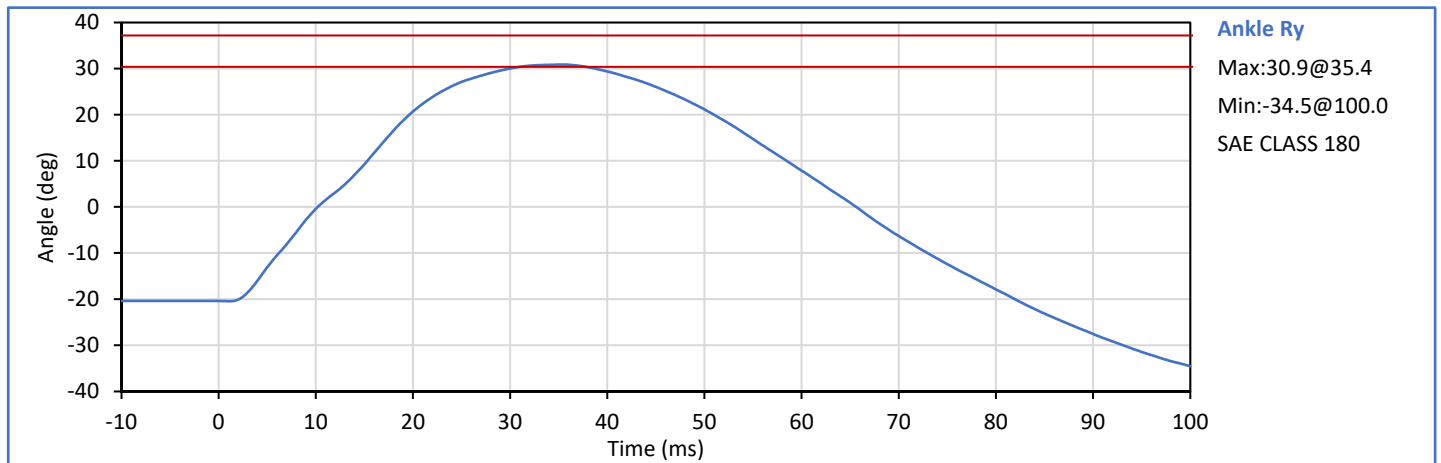
\* Acetabulum Load Cell Fx is not functioning

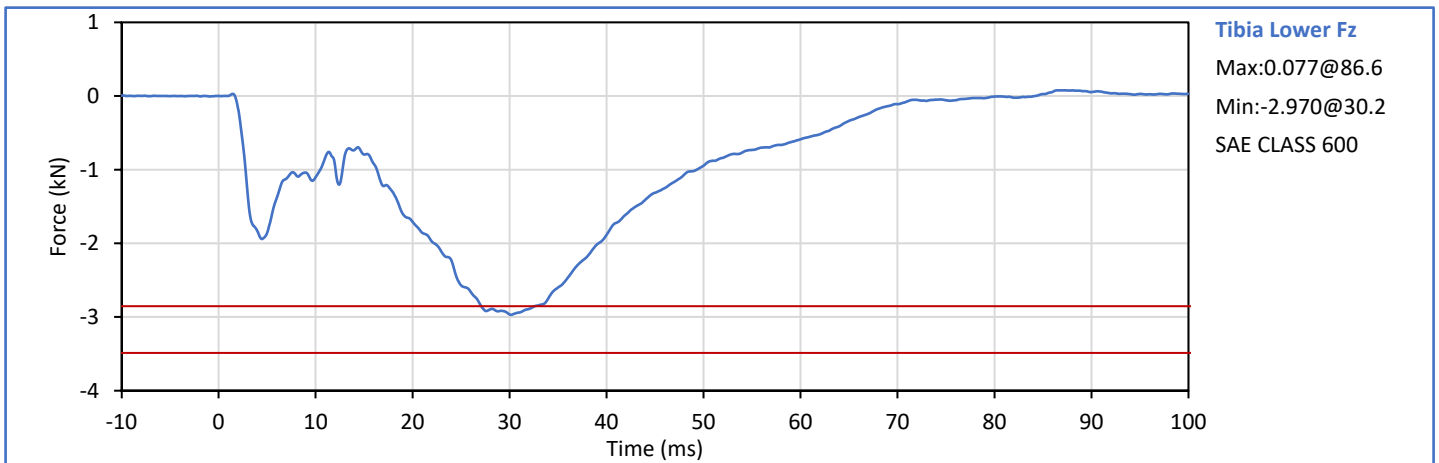
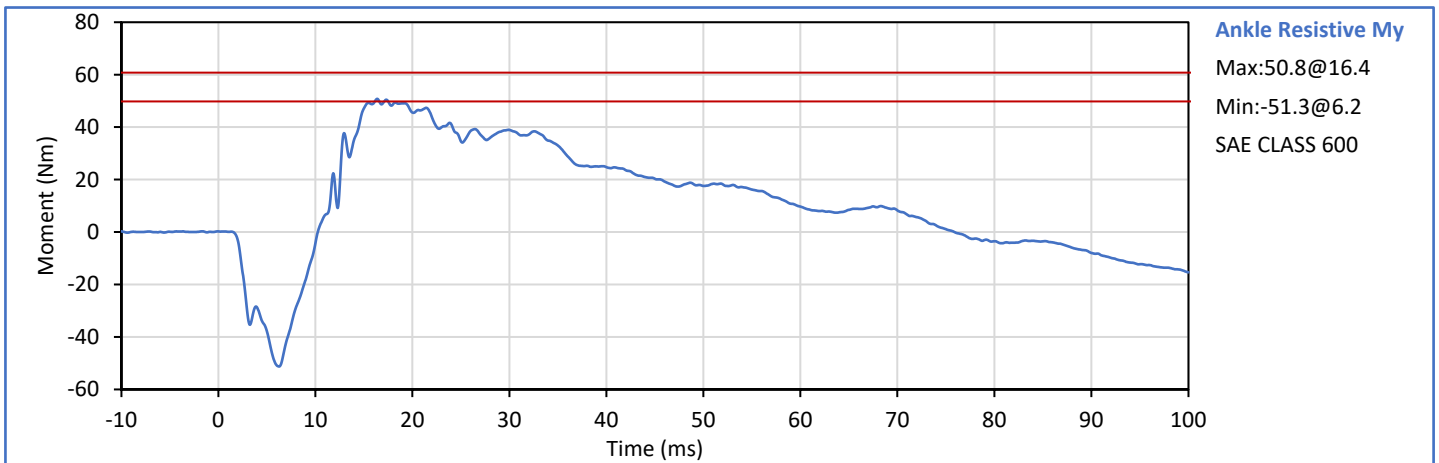
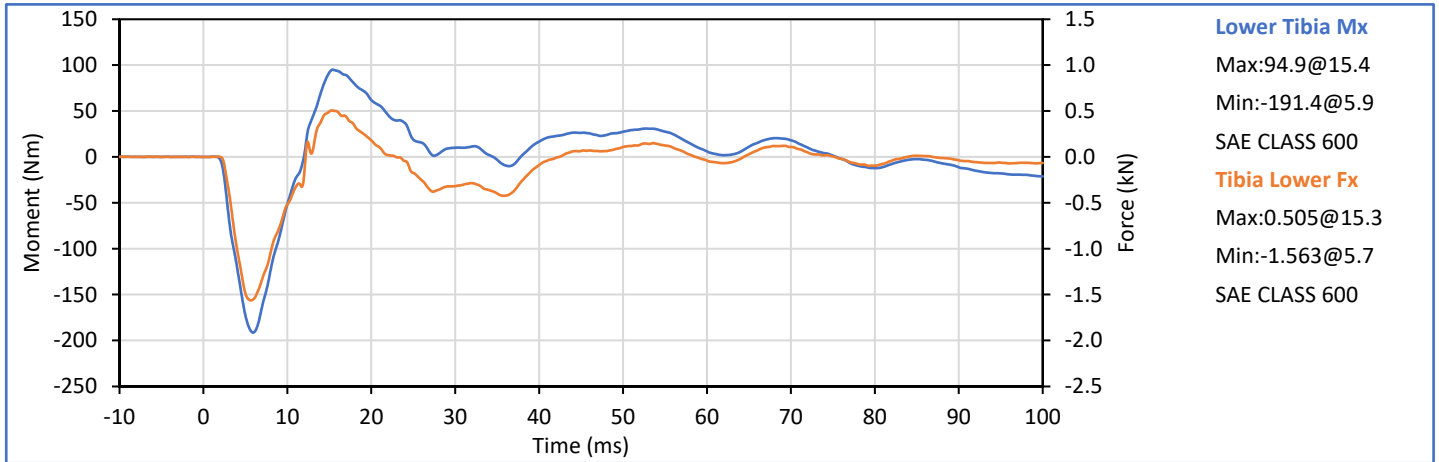


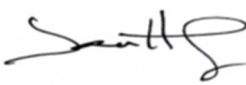
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	4.95	5.05	5.00	Pass
Peak Ankle Ry	deg	30.4	37.2	30.9	Pass
Peak Ankle Resistive My	Nm	49.8	60.8	50.8	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-2.970	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

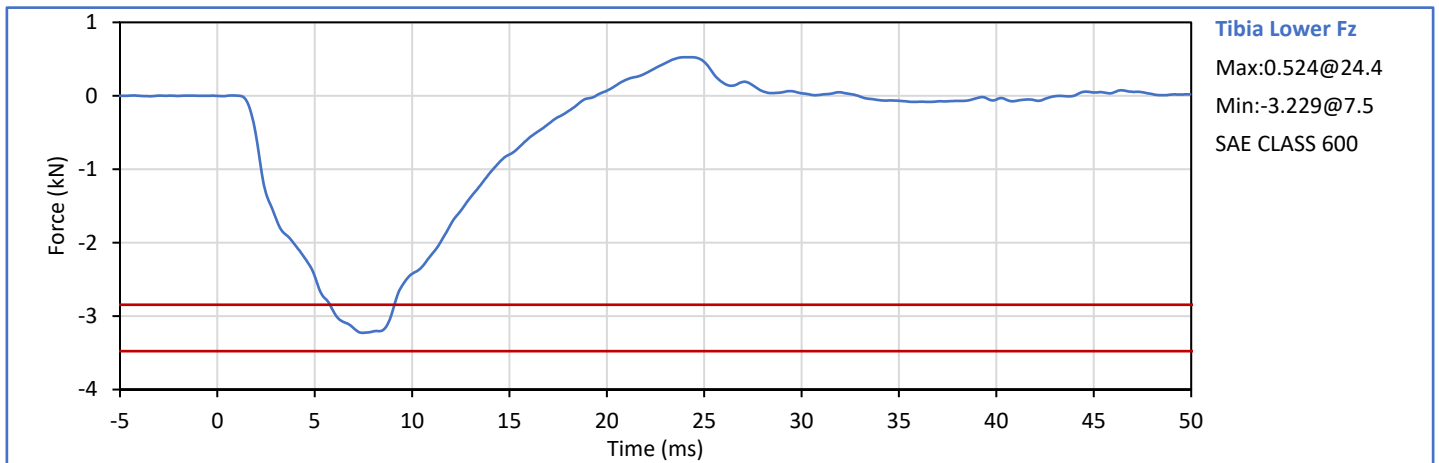




Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

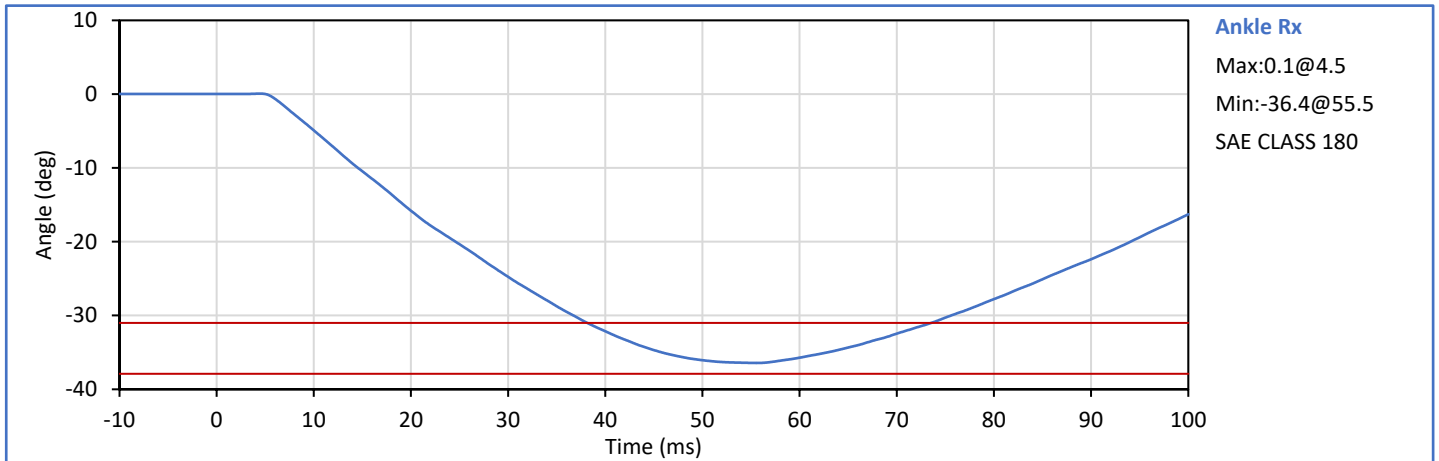
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	46	Pass
Pendulum Velocity	m/s	3.95	4.05	4.03	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.229	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

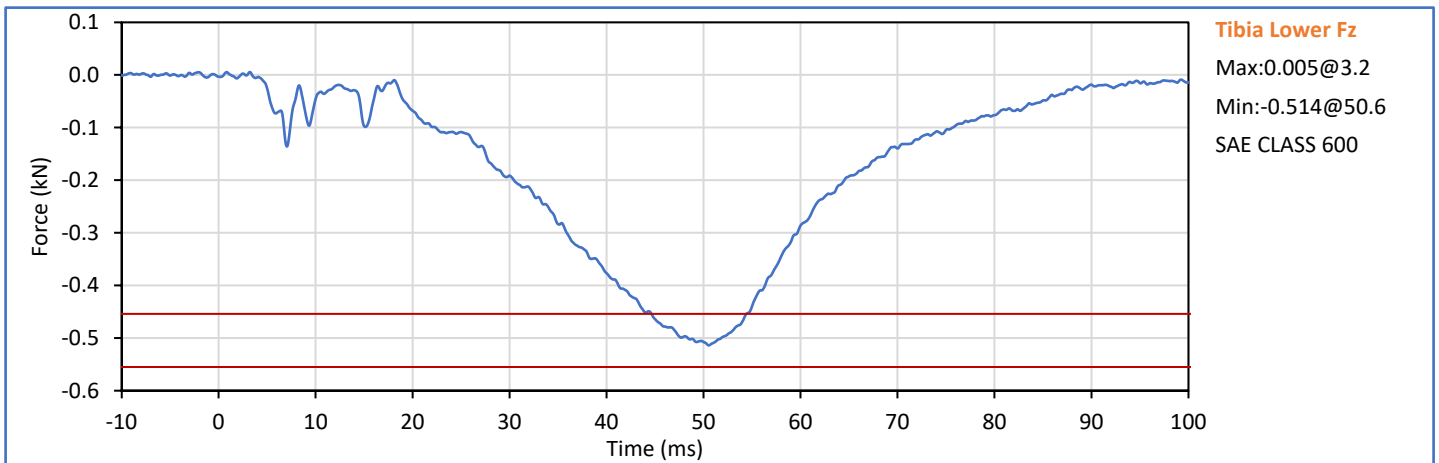
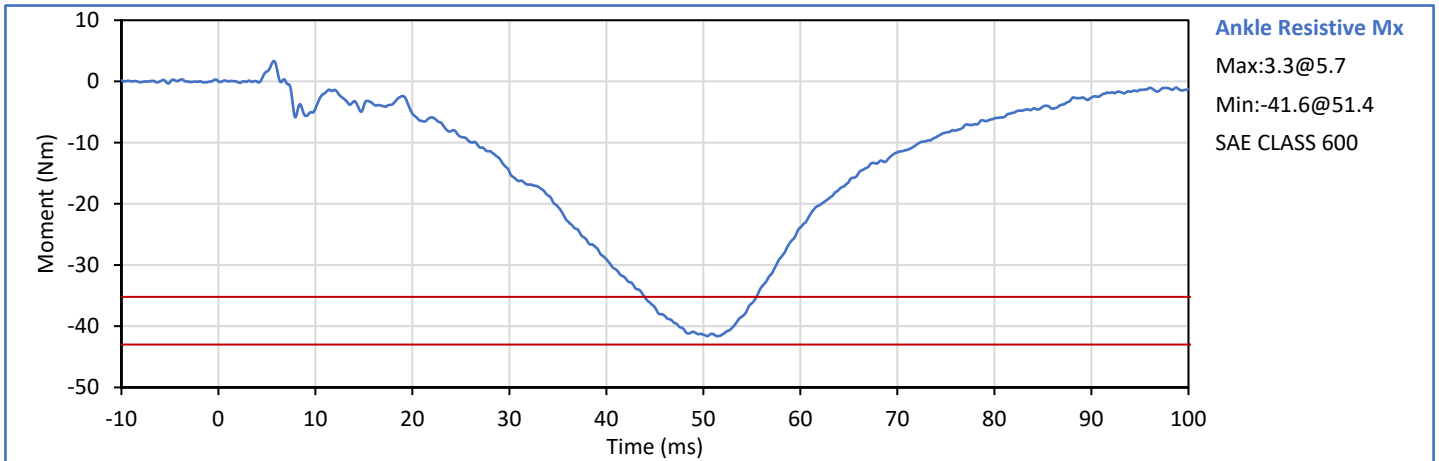
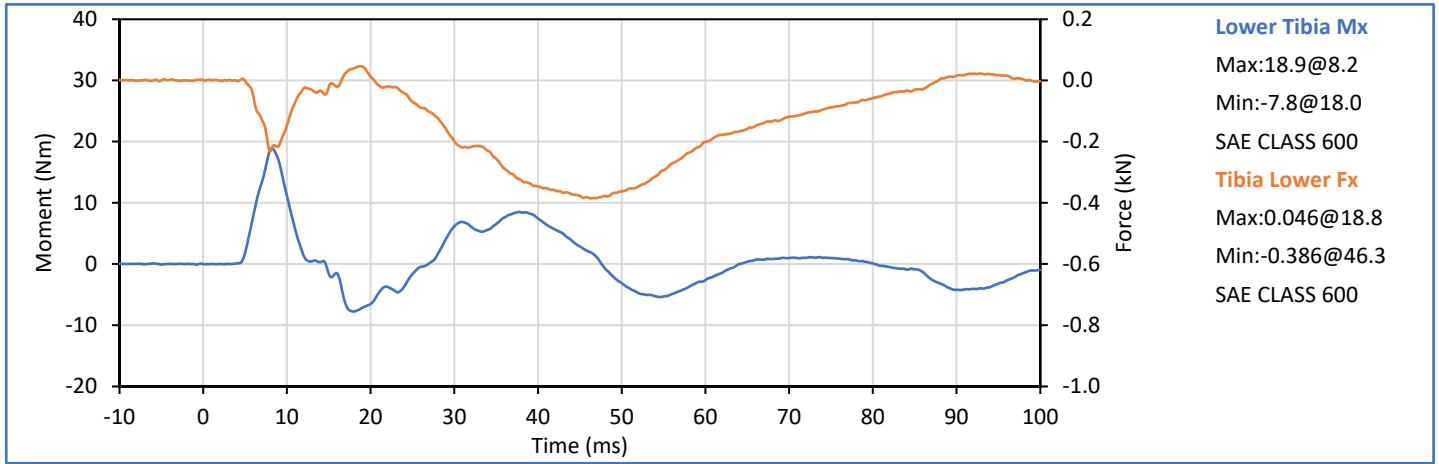


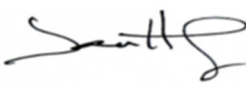
Technician: *J. Hernandez*  
 J. Hernandez

Approved By: *P. Puzzuto*  
 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	49	Pass
Pendulum Velocity	m/s	1.95	2.05	2.02	Pass
Peak Ankle Rx	deg	-37.9	-31.0	-36.4	Pass
Peak Ankle Resistive Mx	Nm	-43.0	-35.2	-41.6	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.514	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

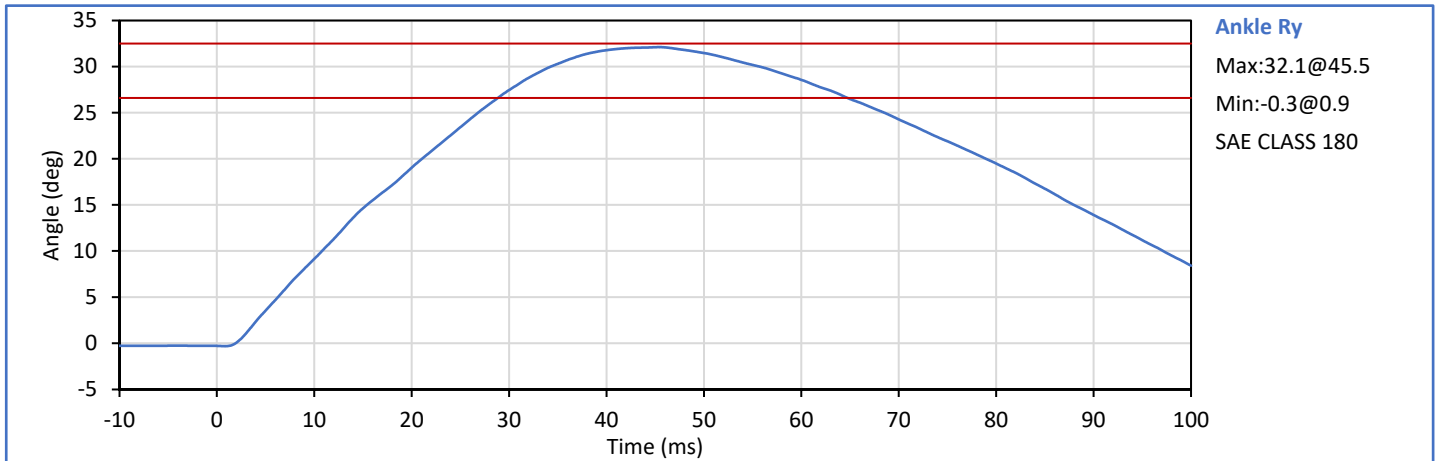


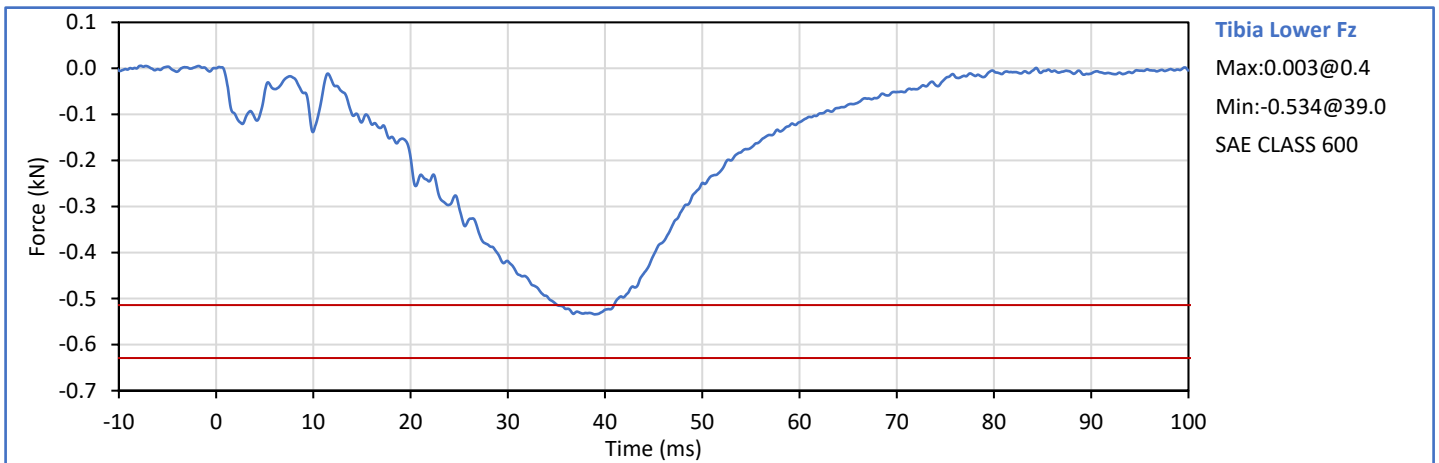
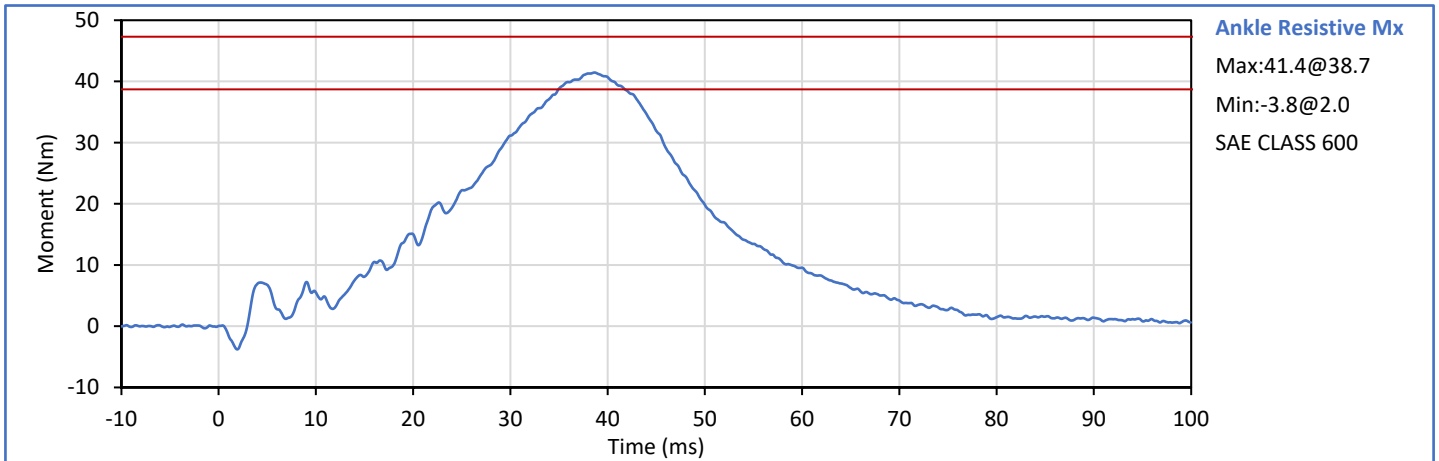
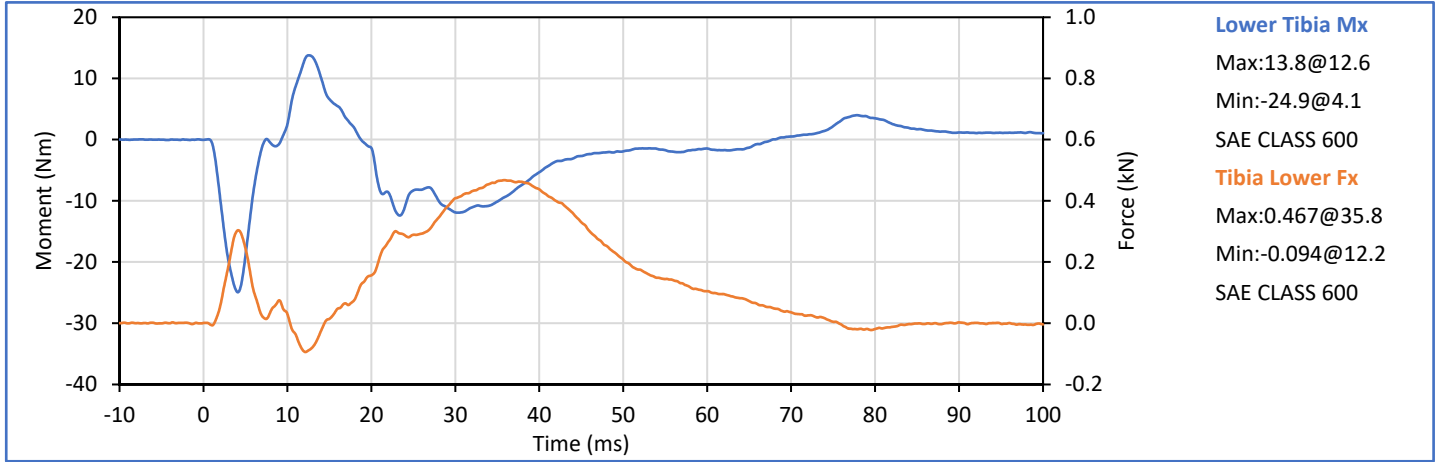


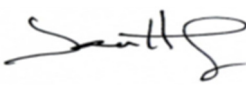
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Pendulum Velocity	m/s	1.95	2.05	2.04	Pass
Peak Ankle Rx	deg	26.6	32.5	32.1	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	41.4	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.534	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

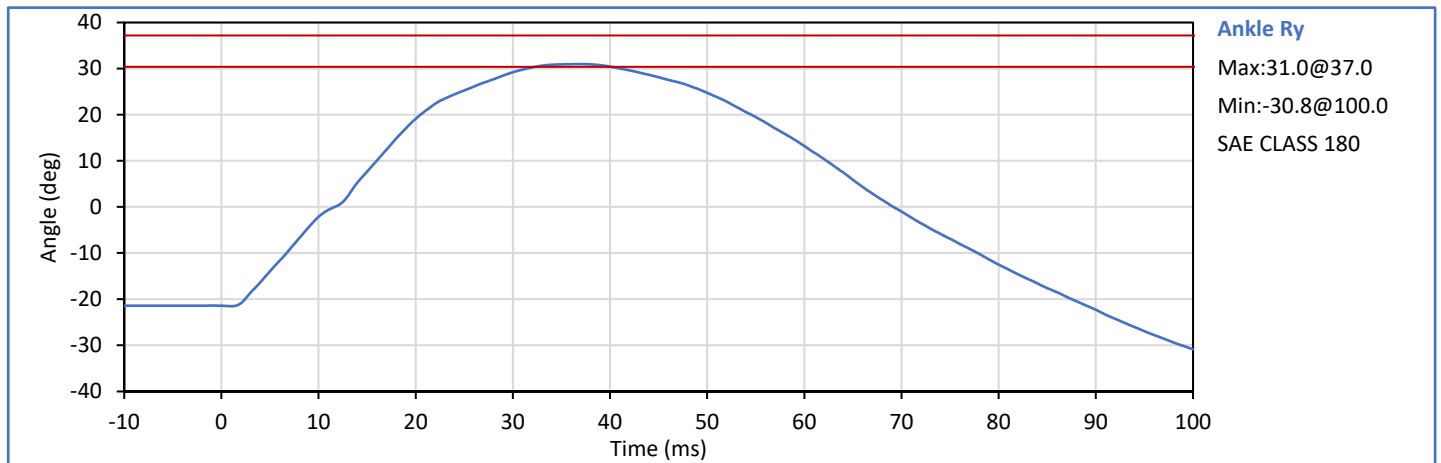


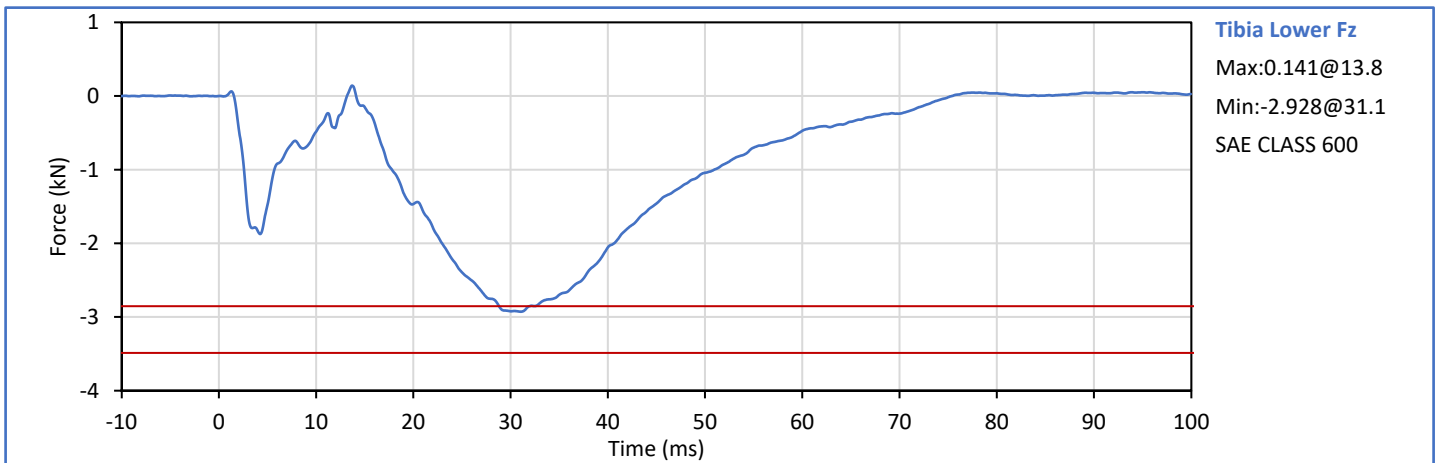
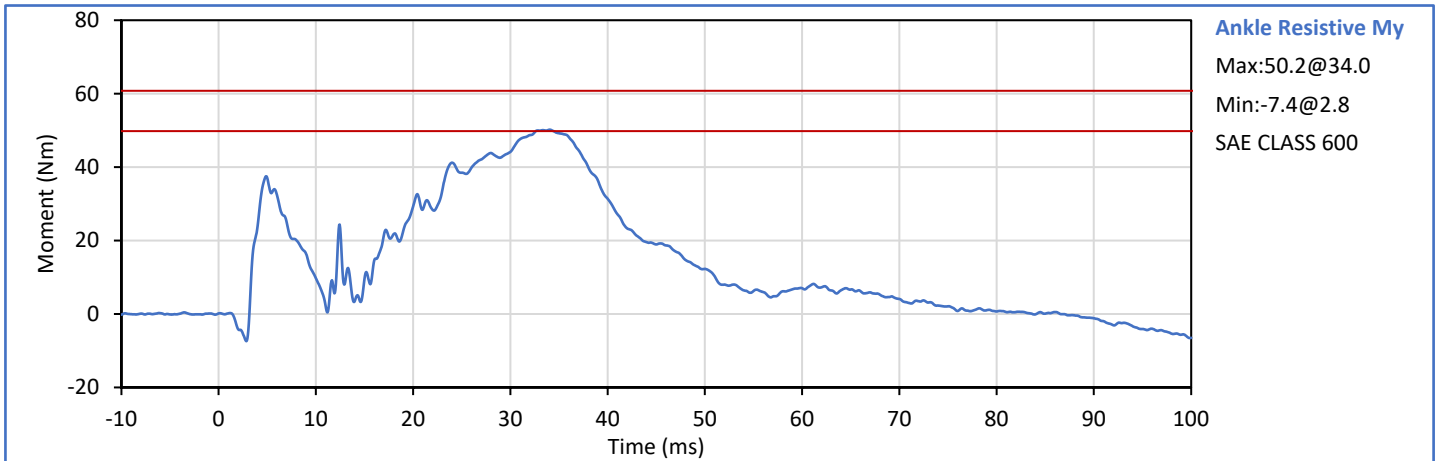
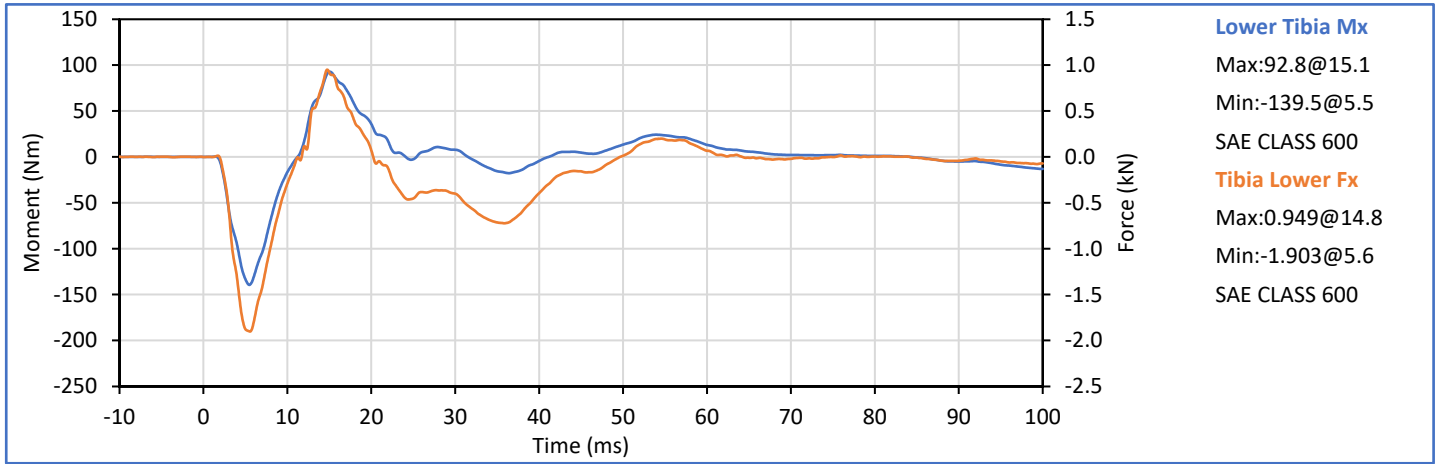


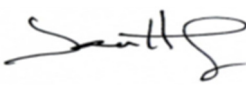
Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	4.95	5.05	5.00	Pass
Peak Ankle Ry	deg	30.4	37.2	31.0	Pass
Peak Ankle Resistive My	Nm	49.8	60.8	50.2	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-2.928	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

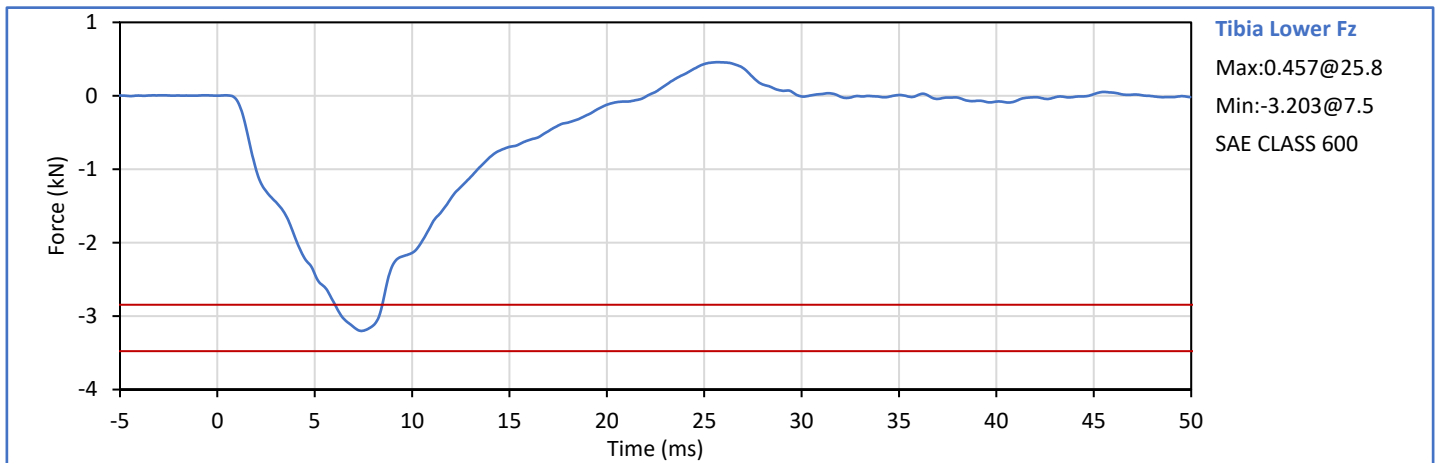




Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

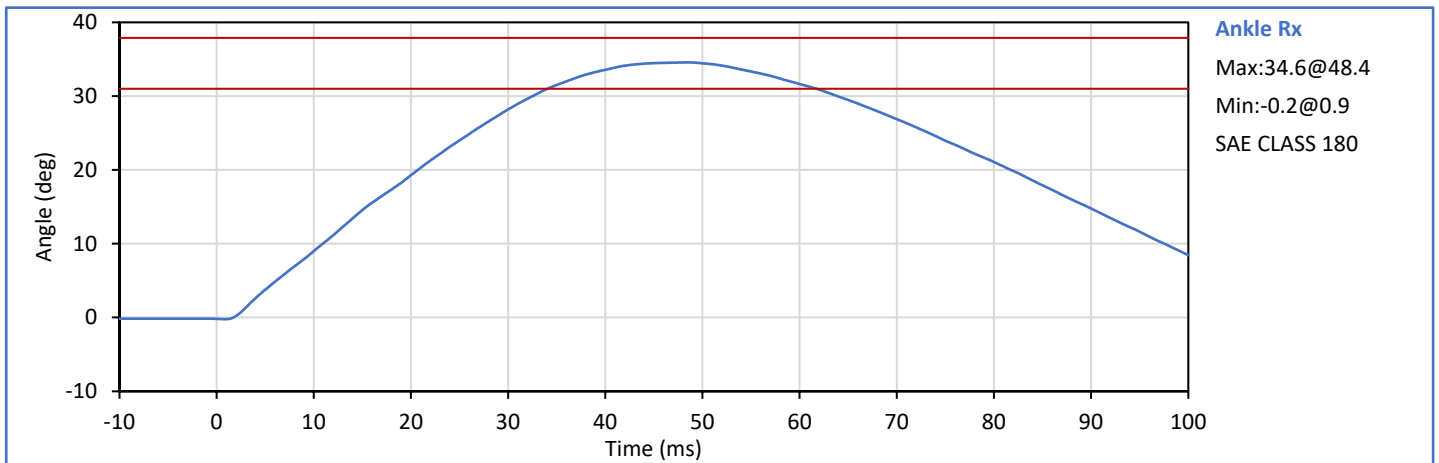
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	47	Pass
Pendulum Velocity	m/s	3.95	4.05	4.02	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.203	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>

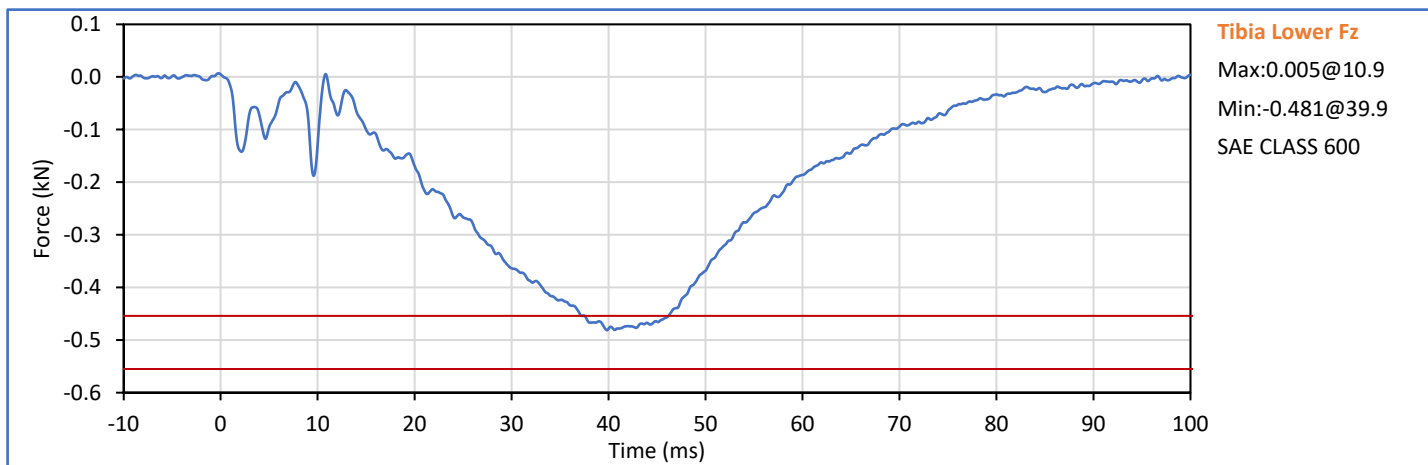
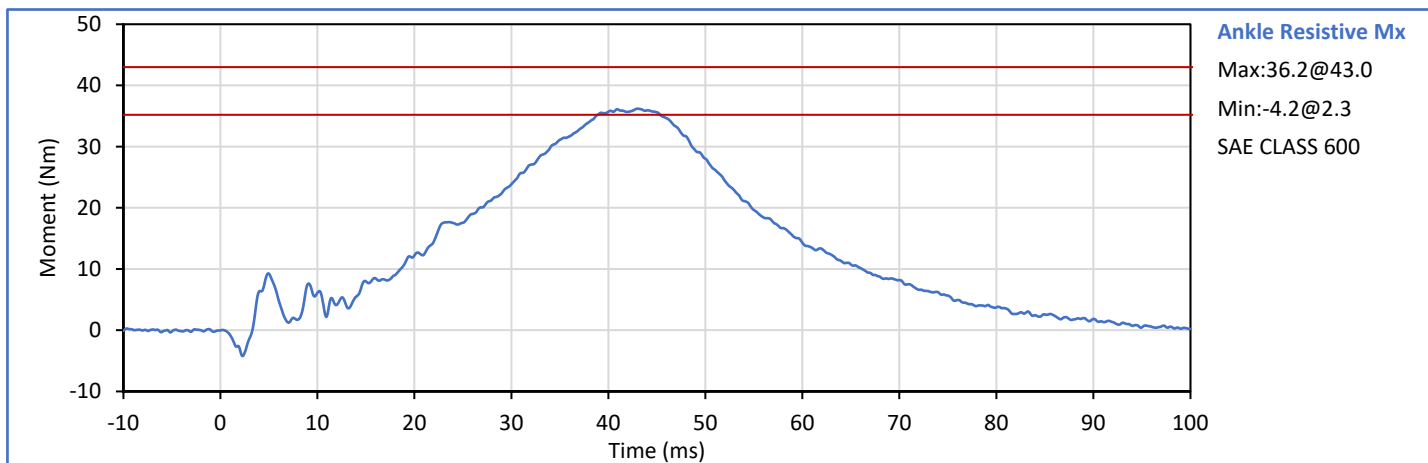
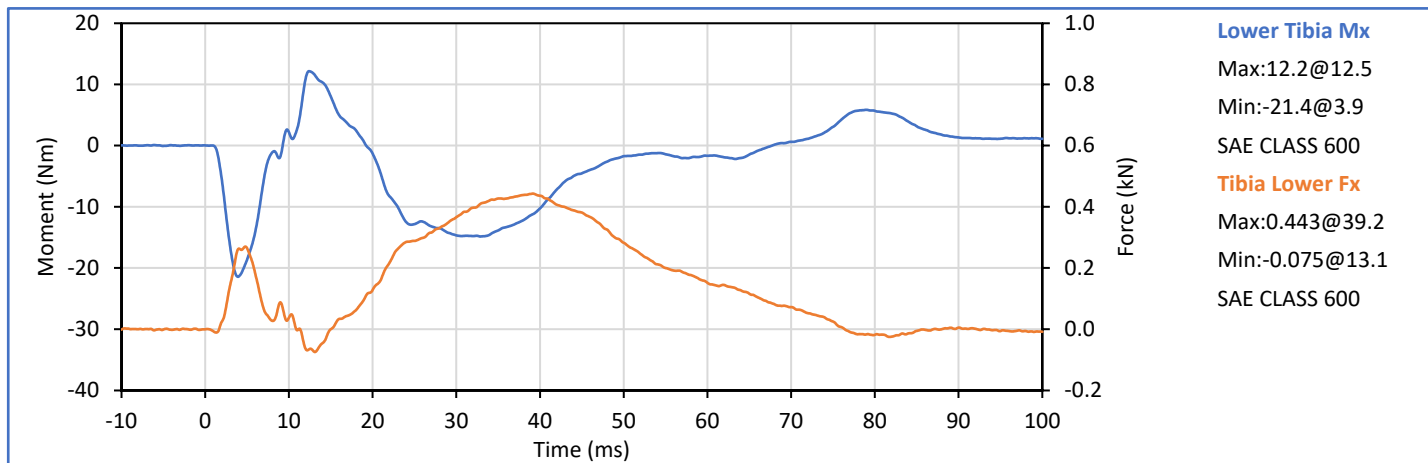


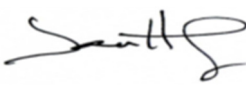
Technician: *J. Hernandez*  
 J. Hernandez


Approved By: *P. Puzzuto*  
 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	1.95	2.05	2.04	Pass
Peak Ankle Rx	deg	31.0	37.9	34.6	Pass
Peak Ankle Resistive Mx	Nm	35.2	43.0	36.2	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.481	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

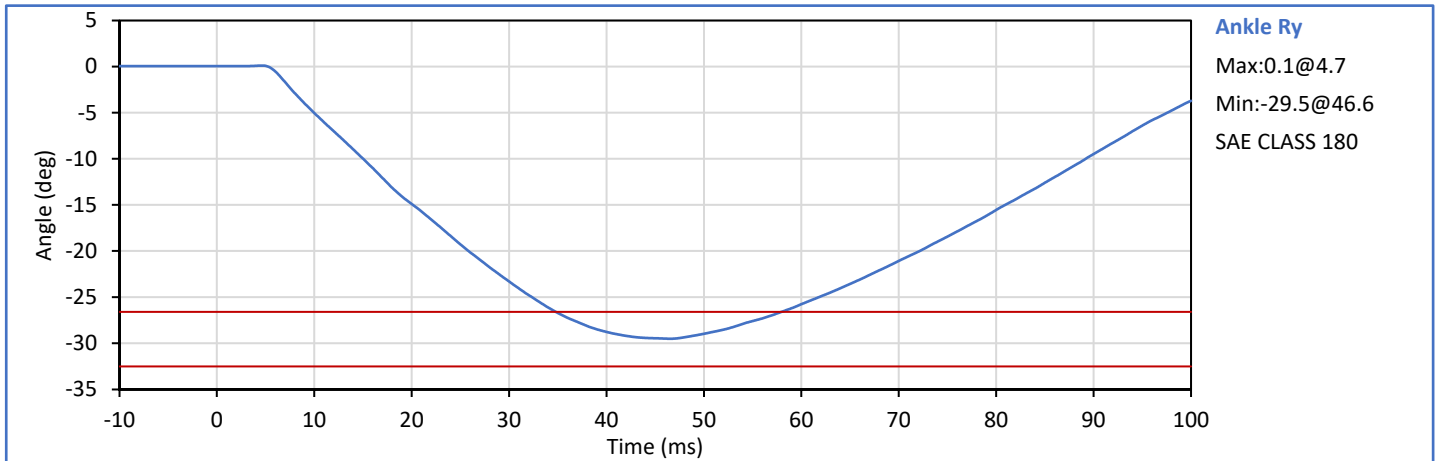


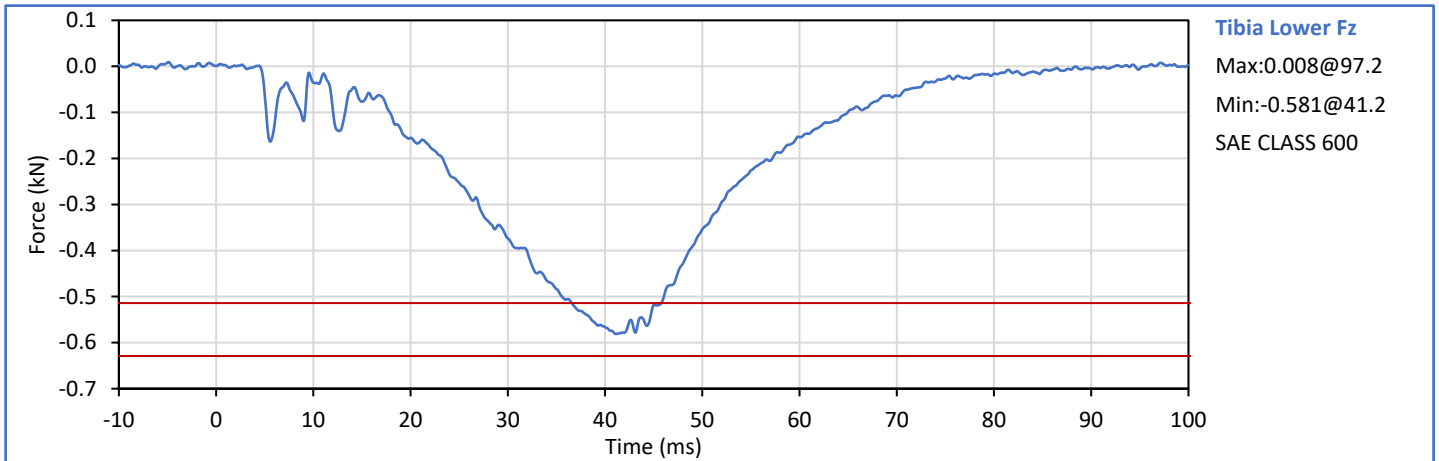
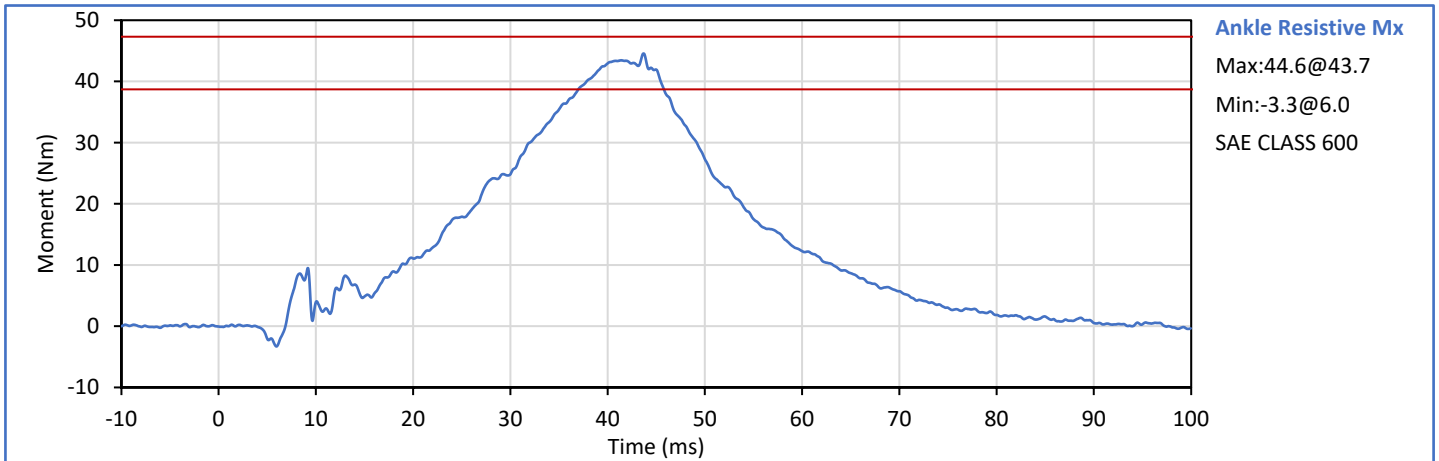
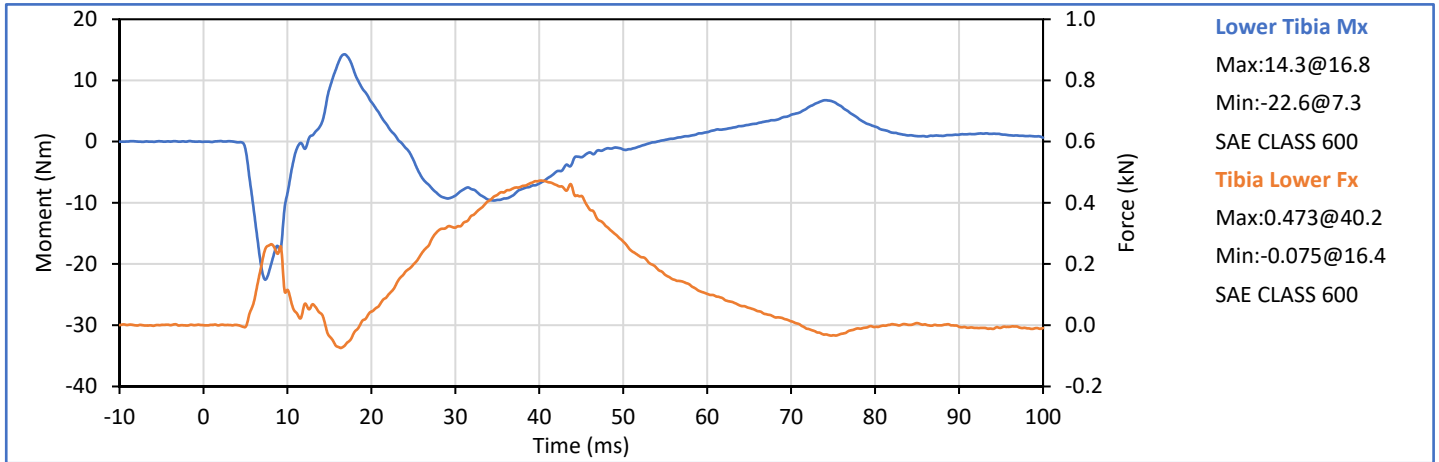


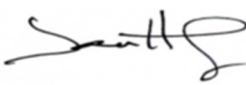
Technician:   
 J. Hernandez


Approved By:   
 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	1.95	2.05	2.04	Pass
Peak Ankle Rx	deg	-32.5	-26.6	-29.5	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	44.6	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.581	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass



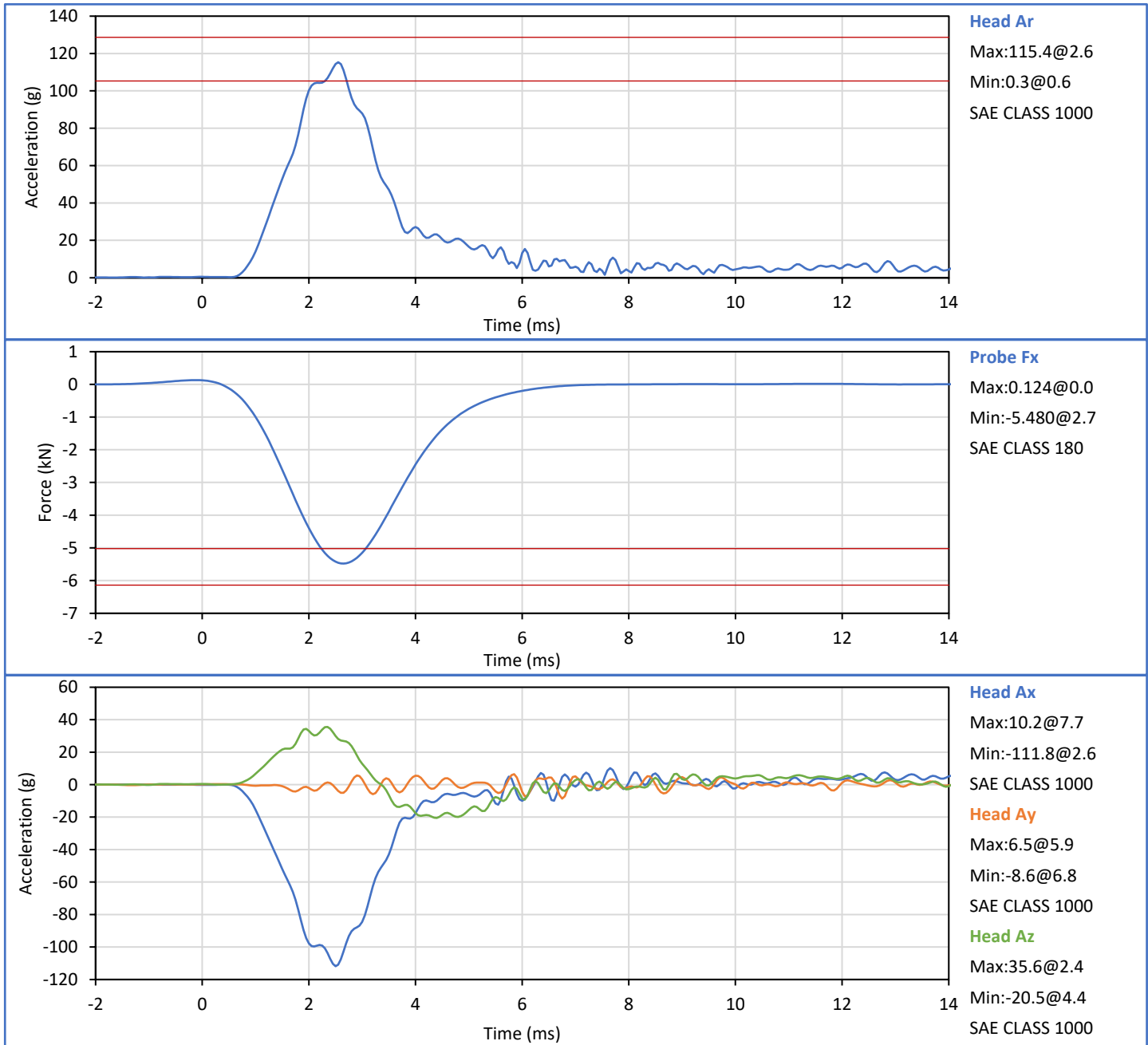


Technician:   
 J. Hernandez

Approved By:   
 P. Puzzuto

**APPENDIX D**  
**ATD Configuration and Performance Verification Data**  
**THOR-50M 50th Percentile Male ATD**  
**Post-Test Qualification (Full) S/N: D09799**

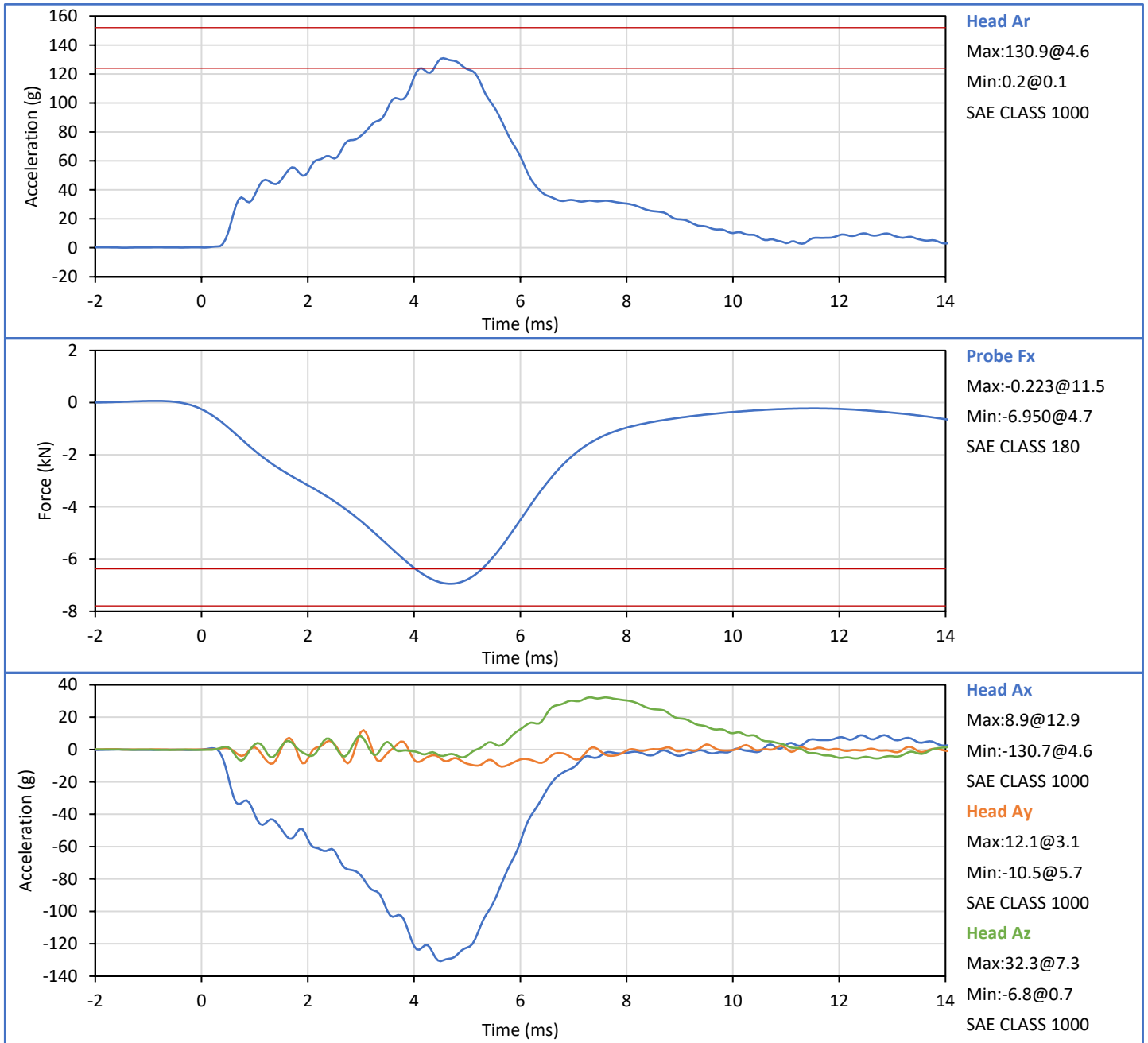
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Velocity	m/s	1.95	2.05	1.98	Pass
Peak Probe Fx	kN	-6.138	-5.022	-5.480	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	115.4	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>



Technician:           *J. Hernandez*            
J. Hernandez

Approved By:           *P. Puzzuto*            
P. Puzzuto

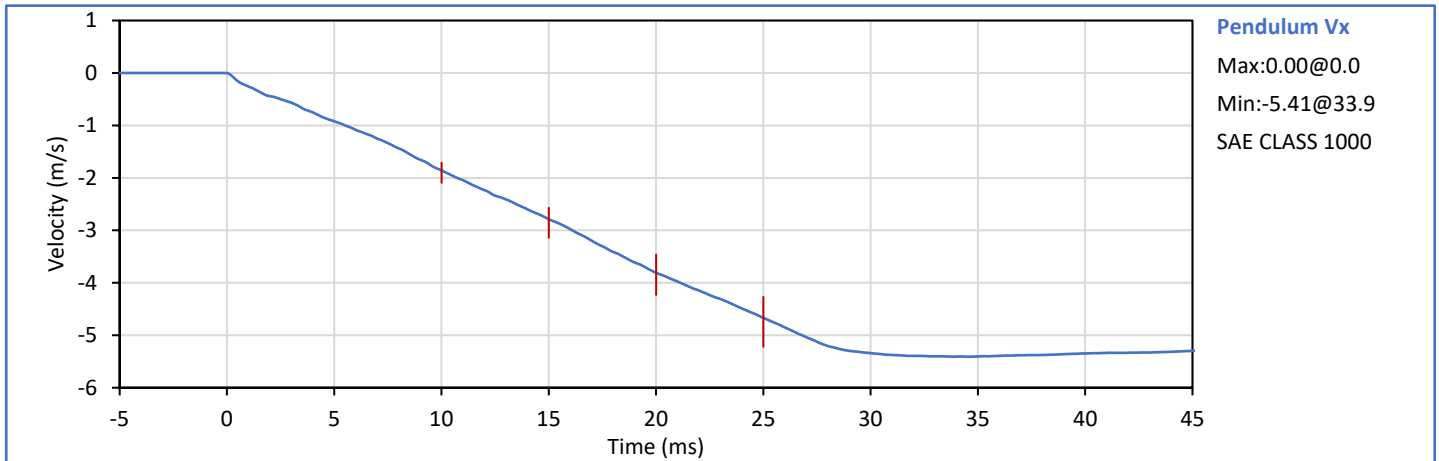
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Velocity	m/s	6.68	6.78	6.70	Pass
Peak Probe Fx	kN	-7.796	-6.378	-6.950	Pass
Peak Head Resultant Acceleration	g	124.0	152.0	130.9	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>

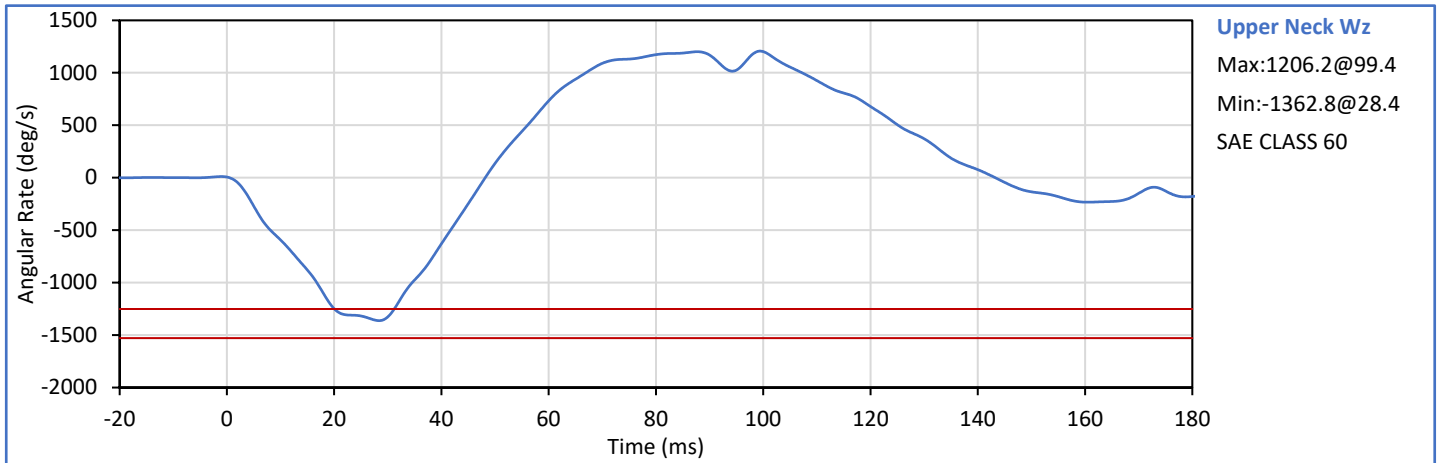
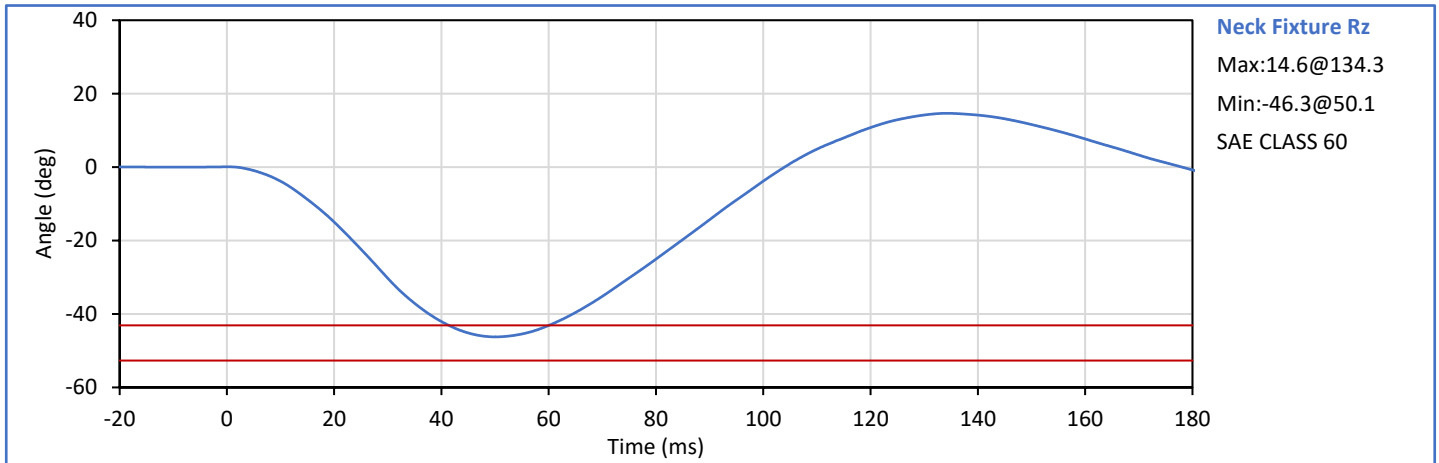
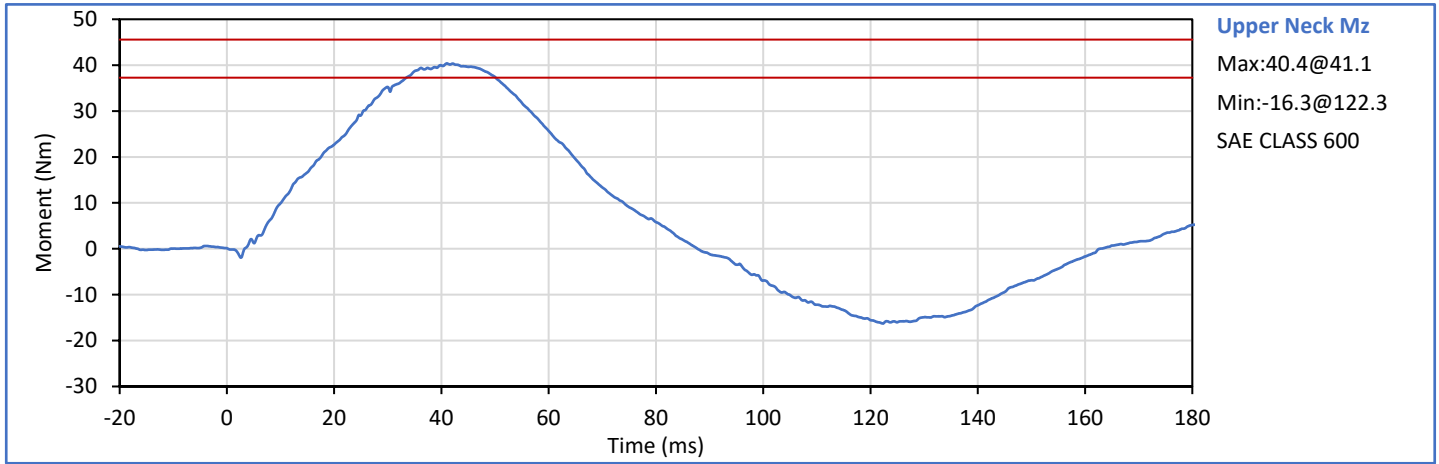


Technician: J. Hernandez

Approved By: P. Puzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
Pendulum Velocity	m/s	4.95	5.05	5.03	Pass
Pendulum Velocity at 10 ms	m/s	-2.09	-1.71	-1.86	Pass
Pendulum Velocity at 15 ms	m/s	-3.14	-2.57	-2.79	Pass
Pendulum Velocity at 20 ms	m/s	-4.23	-3.46	-3.81	Pass
Pendulum Velocity at 25 ms	m/s	-5.22	-4.27	-4.67	Pass
Peak Upper Neck Mz	Nm	37.3	45.6	40.4	Pass
Peak Head Wz	deg/s	-1529	-1251	-1363	Pass
Peak Neck Fixture Rotation	deg	-52.7	-43.1	-46.3	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

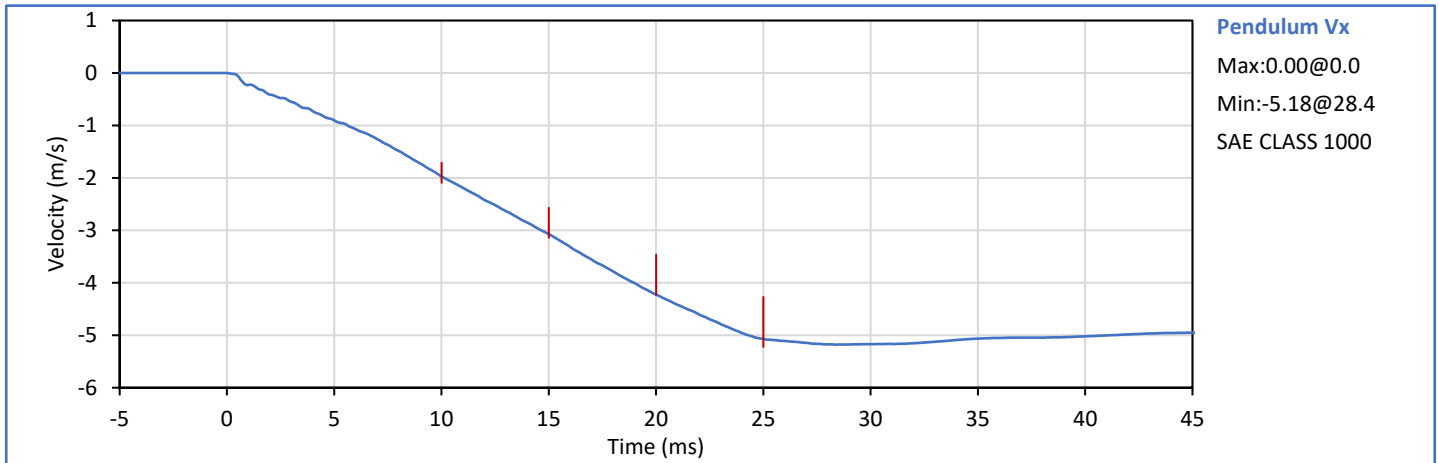


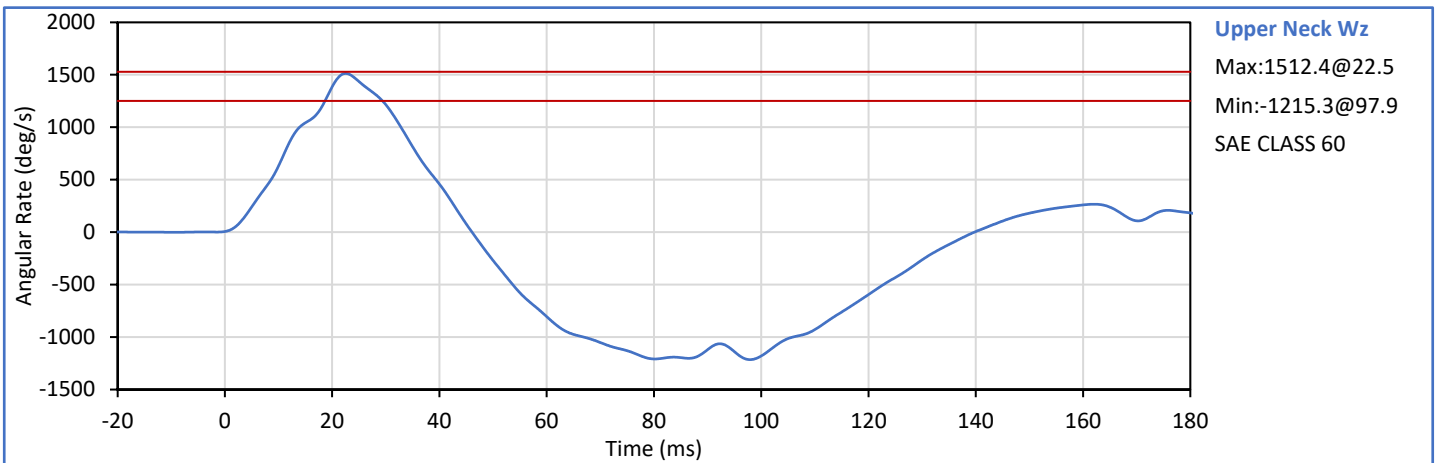
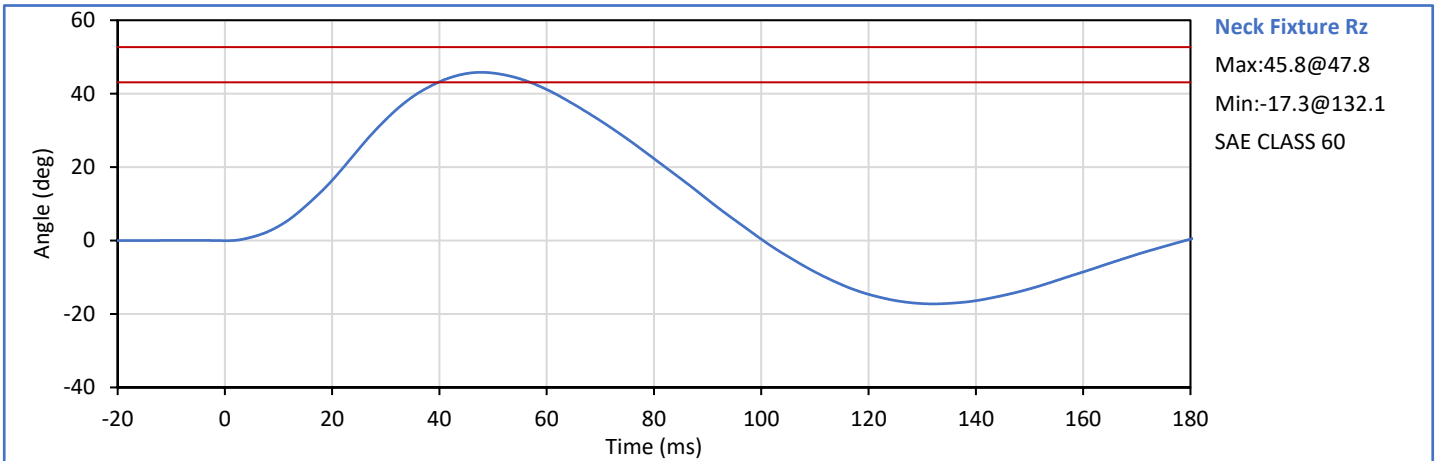
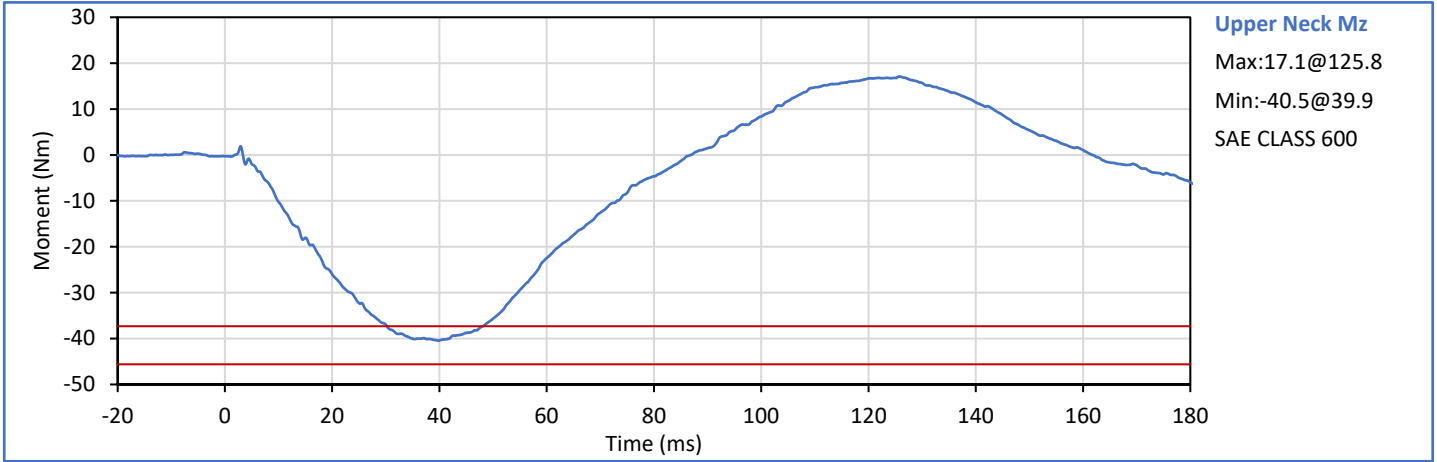


Technician:           *J. Hernandez*            
J. Hernandez

Approved By:           *P. Puzzuto*            
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Humidity	%	10	70	26	Pass
Pendulum Velocity	m/s	4.95	5.05	5.03	Pass
Pendulum Velocity at 10 ms	m/s	-2.09	-1.71	-1.97	Pass
Pendulum Velocity at 15 ms	m/s	-3.14	-2.57	-3.07	Pass
Pendulum Velocity at 20 ms	m/s	-4.23	-3.46	-4.23	Pass
Pendulum Velocity at 25 ms	m/s	-5.22	-4.27	-5.07	Pass
Peak Upper Neck Mz	Nm	-45.6	-37.3	-40.5	Pass
Peak Head Wz	deg/s	1251	1529	1512	Pass
Peak Neck Fixture Rotation	deg	43.1	52.7	45.8	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

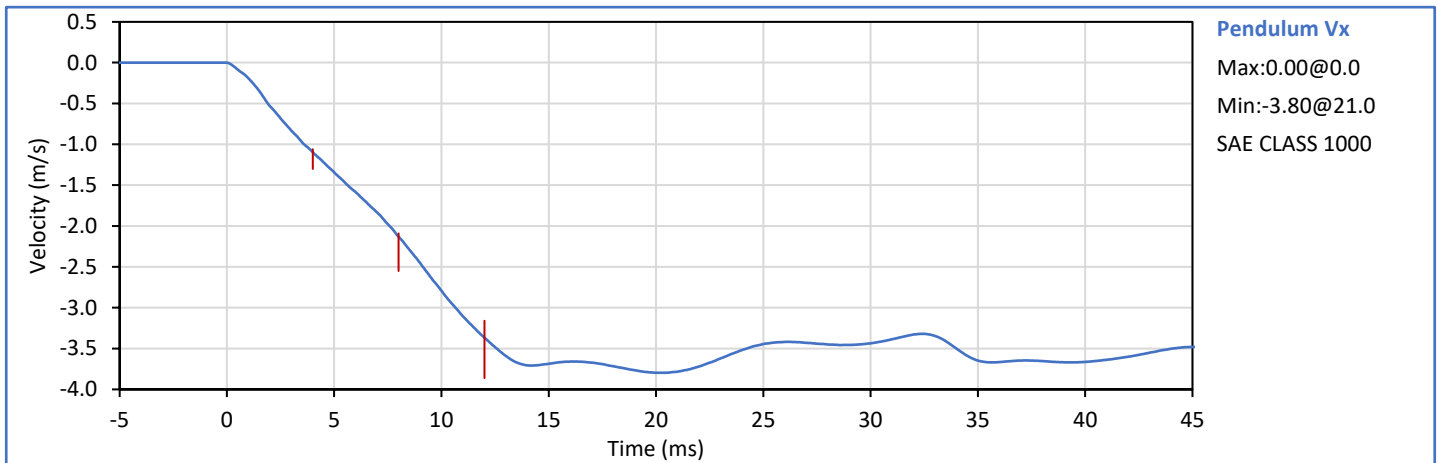




Technician:           *J. Hernandez*            
J. Hernandez

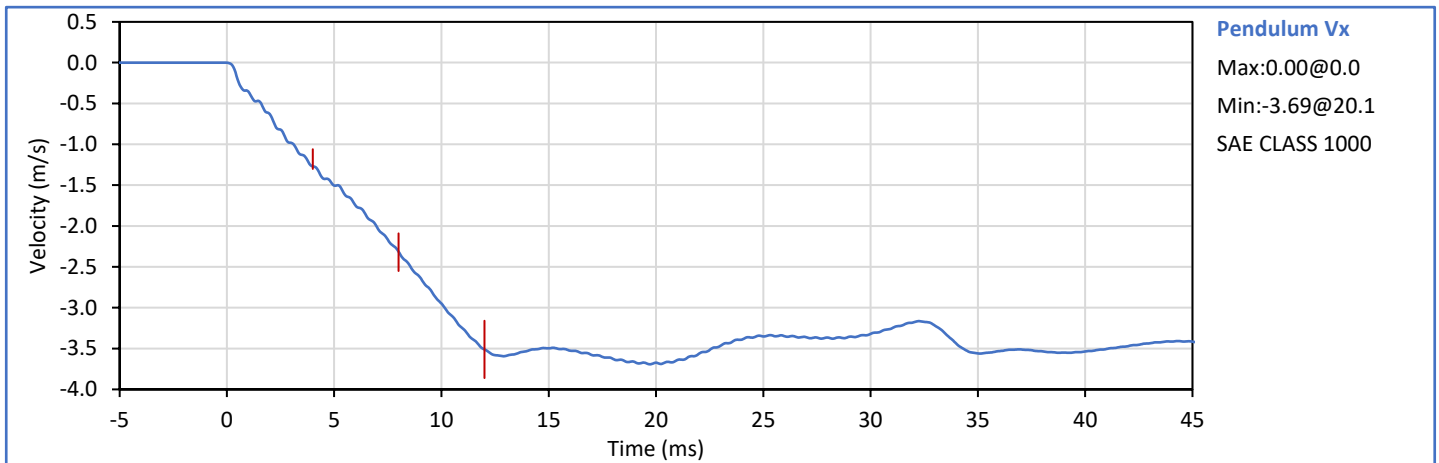
Approved By:           *P. Puzzuto*            
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	3.35	3.45	3.40	Pass
Pendulum Velocity at 4 ms	m/s	-1.30	-1.06	-1.10	Pass
Pendulum Velocity at 8 ms	m/s	-2.55	-2.09	-2.13	Pass
Pendulum Velocity at 12 ms	m/s	-3.86	-3.16	-3.37	Pass
Peak Upper Neck Mx after 40 ms	Nm	44.8	54.7	52.1	Pass
Peak Head Wx	deg/s	-1498	-1226	-1310	Pass
Peak Head Relative Rotation	deg	-45.9	-37.6	-38.7	Pass
<b>NHTSA 2019-05 Corridor</b>				Overall Test Results	Pass



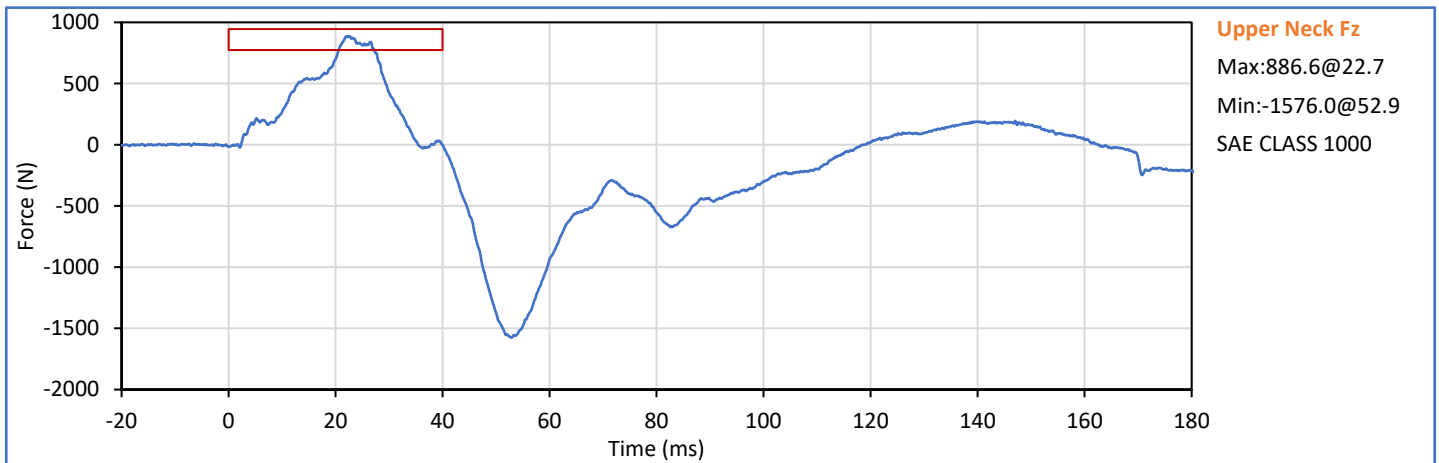
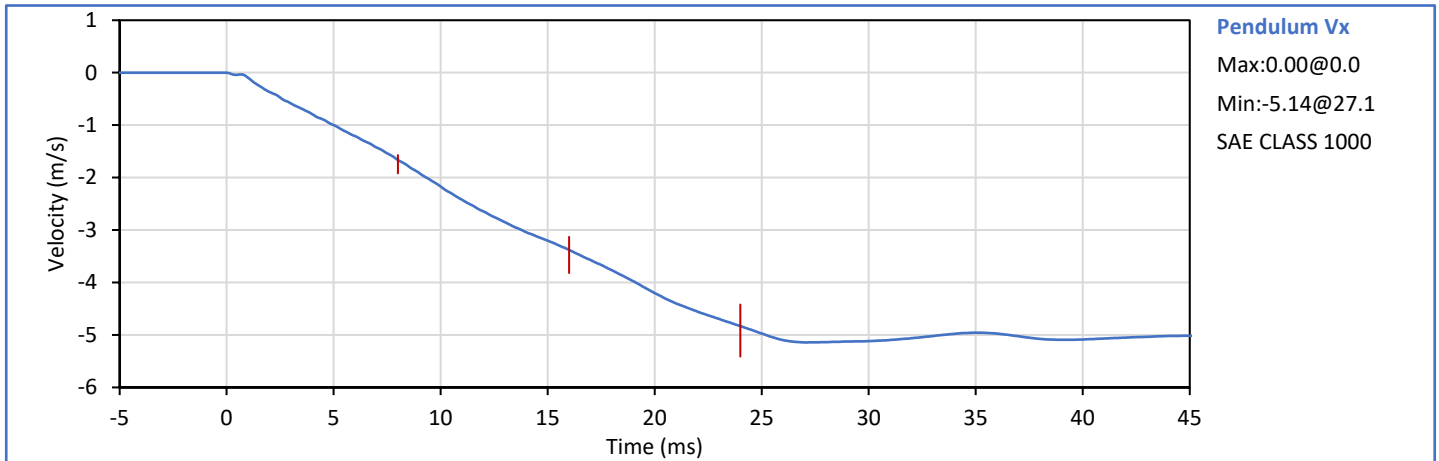


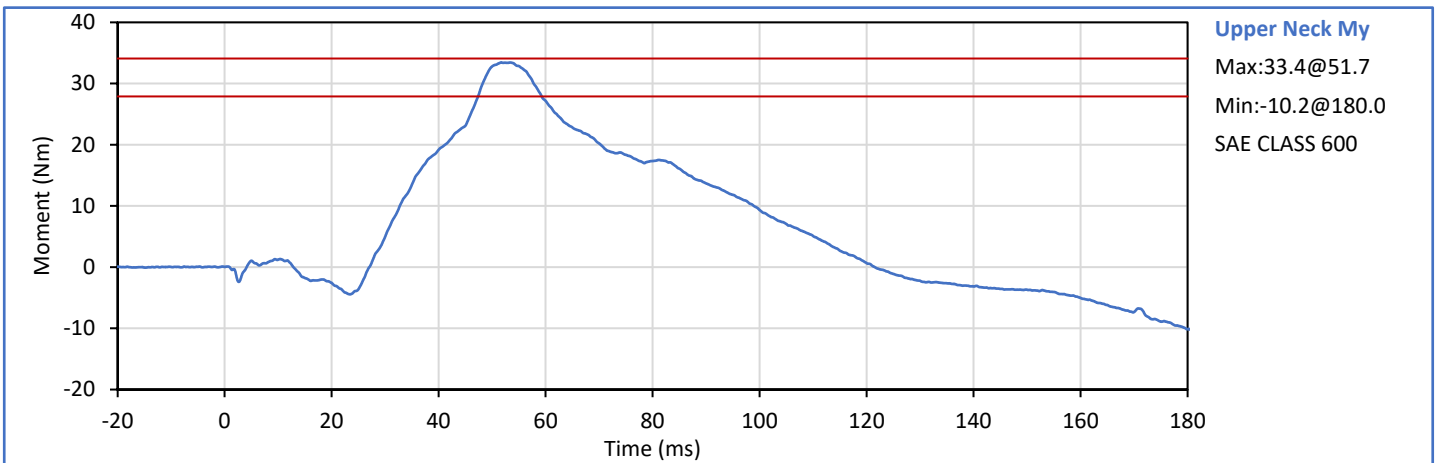
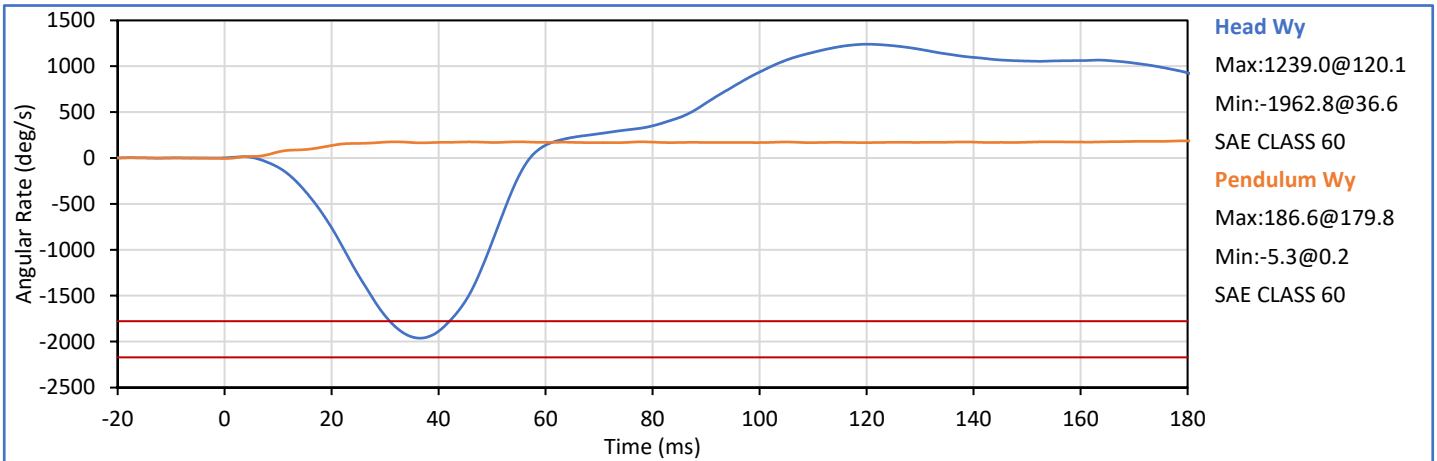
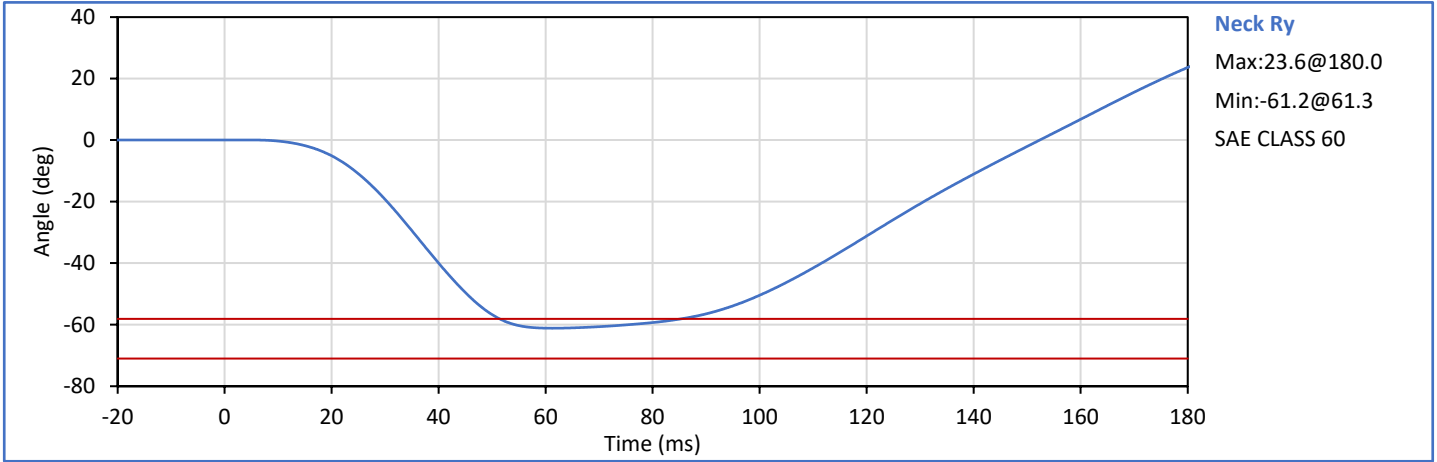
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	3.35	3.45	3.41	Pass
Pendulum Velocity at 4 ms	m/s	-1.30	-1.06	-1.27	Pass
Pendulum Velocity at 8 ms	m/s	-2.55	-2.09	-2.31	Pass
Pendulum Velocity at 12 ms	m/s	-3.86	-3.16	-3.51	Pass
Peak Upper Neck Mx after 40 ms	Nm	-54.7	-44.8	-49.1	Pass
Peak Head Wx	deg/s	1226	1498	1370	Pass
Peak Head Relative Rotation	deg	37.6	45.9	40.6	Pass
<b>NHTSA 2019-05 Corridor</b>				Overall Test Results	Pass





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	24	Pass
Pendulum Velocity	m/s	4.95	5.05	4.99	Pass
Pendulum Velocity at 8 ms	m/s	-1.92	-1.57	-1.67	Pass
Pendulum Velocity at 16 ms	m/s	-3.82	-3.13	-3.38	Pass
Pendulum Velocity at 24 ms	m/s	-5.41	-4.42	-4.83	Pass
Peak Upper Neck My	Nm	27.9	34.1	33.4	Pass
Peak Upper Neck Fz (before 40 ms)	N	774	946	887	Pass
Peak Head Wy	deg/s	-2172	-1777	-1963	Pass
Peak Head Relative Rotation	deg	-71.0	-58.1	-61.2	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Pass</b>

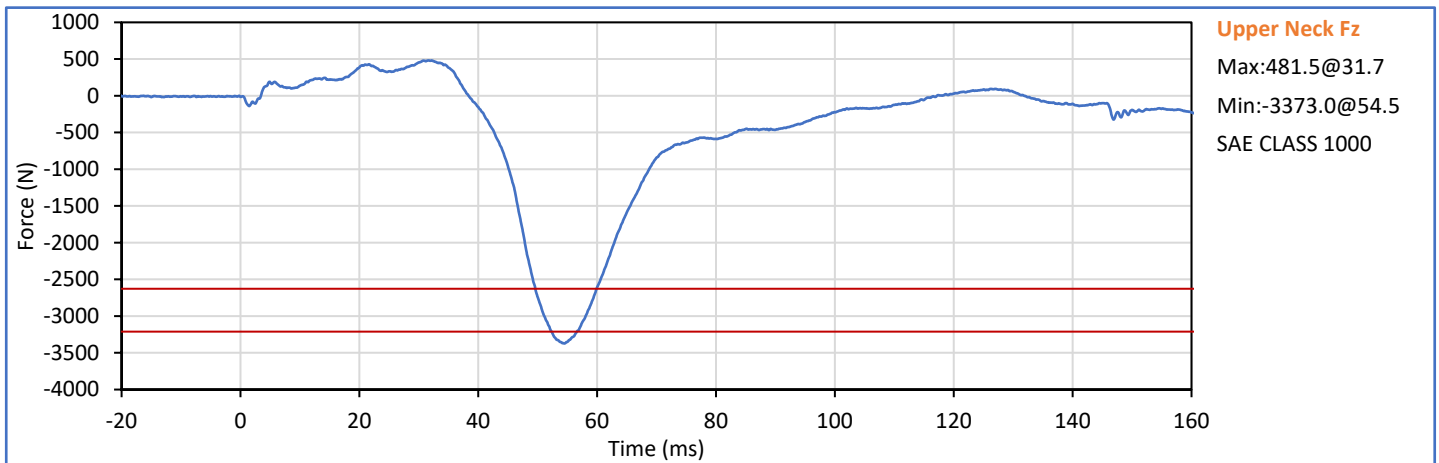
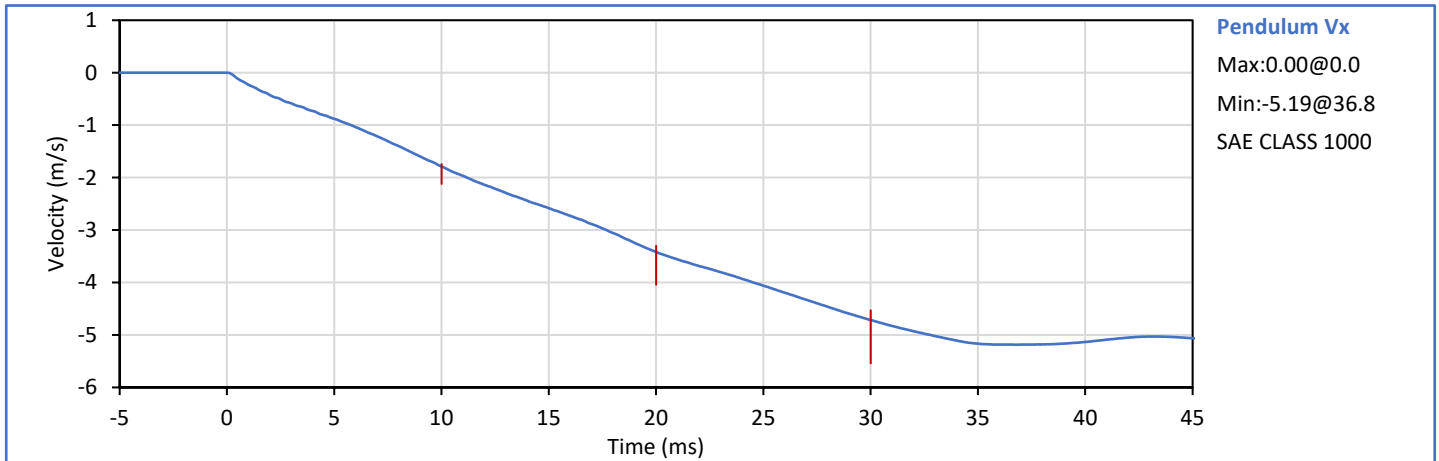


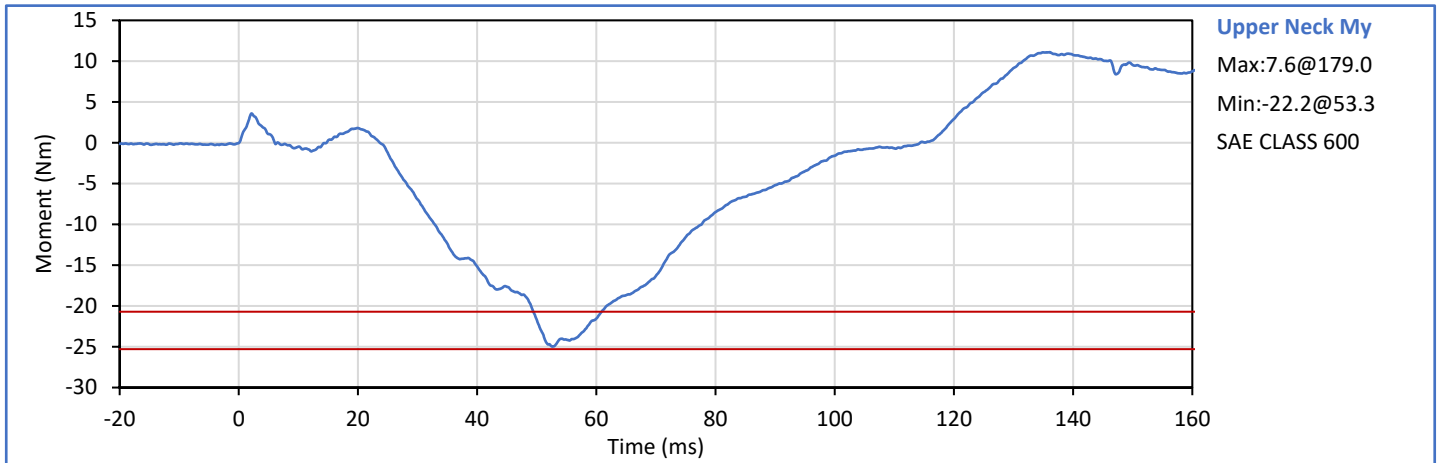
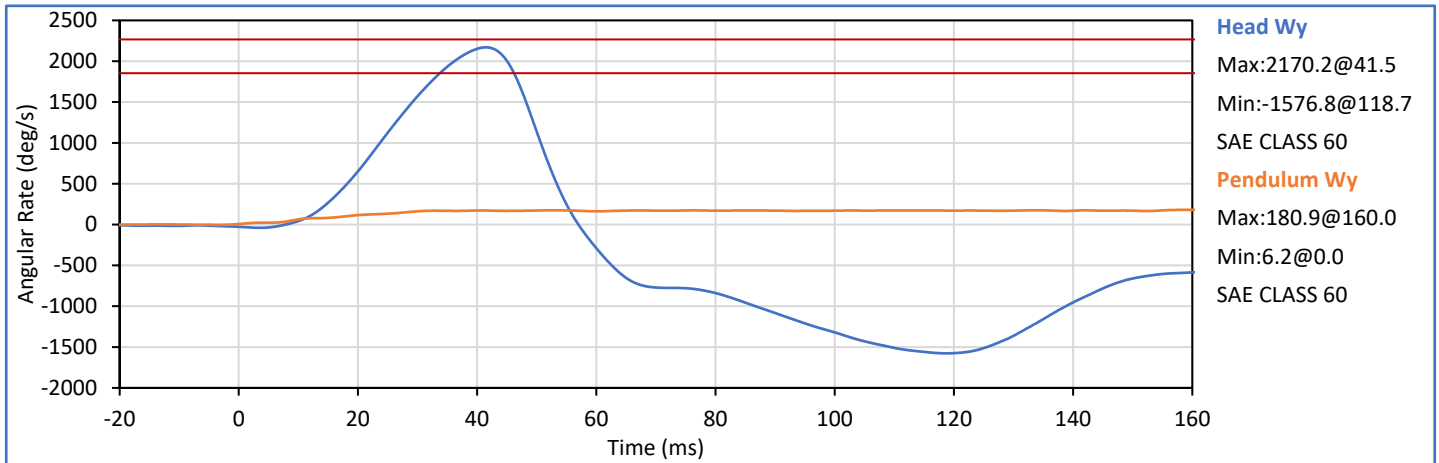
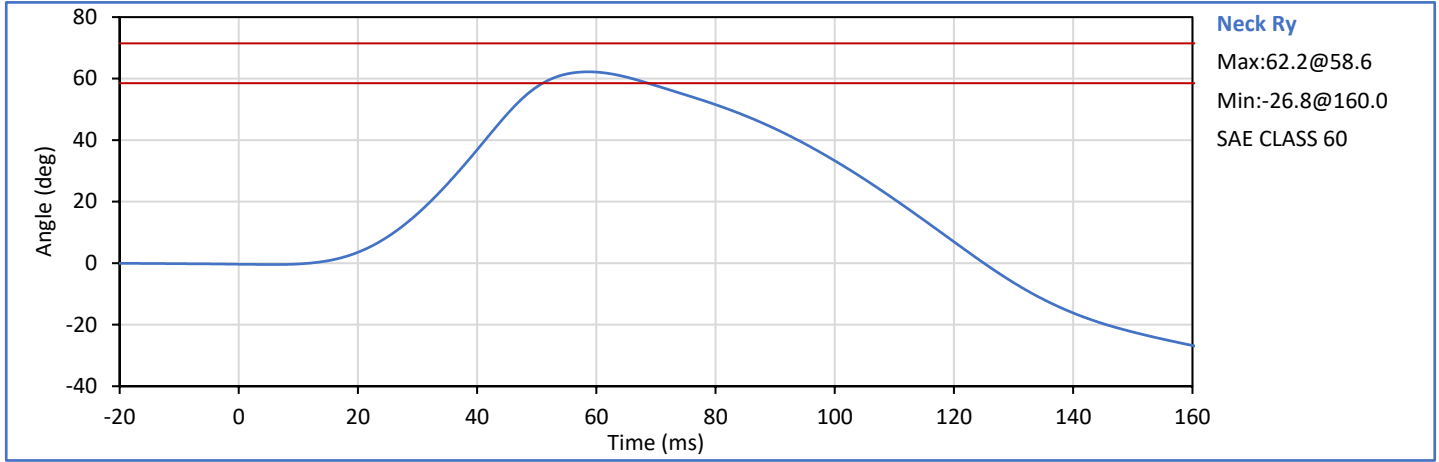


Technician:           *J. Hernandez*            
J. Hernandez

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P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
Pendulum Velocity	m/s	4.95	5.05	5.01	Pass
Pendulum Velocity at 10 ms	m/s	-2.12	-1.74	-1.80	Pass
Pendulum Velocity at 20 ms	m/s	-4.04	-3.30	-3.43	Pass
Pendulum Velocity at 30 ms	m/s	-5.54	-4.53	-4.72	Pass
Peak Upper Neck My	Nm	-25.3	-20.7	-25.0	Pass
Peak Upper Neck Fz	N	-3210	-2626	-3373	Fail
Peak Head Wy	deg/s	1855	2267	2170	Pass
Peak Head Relative Rotation	deg	58.5	71.5	62.2	Pass
<b>NHTSA 2019-05 Corridor</b>				<b>Overall Test Results</b>	<b>Fail</b>

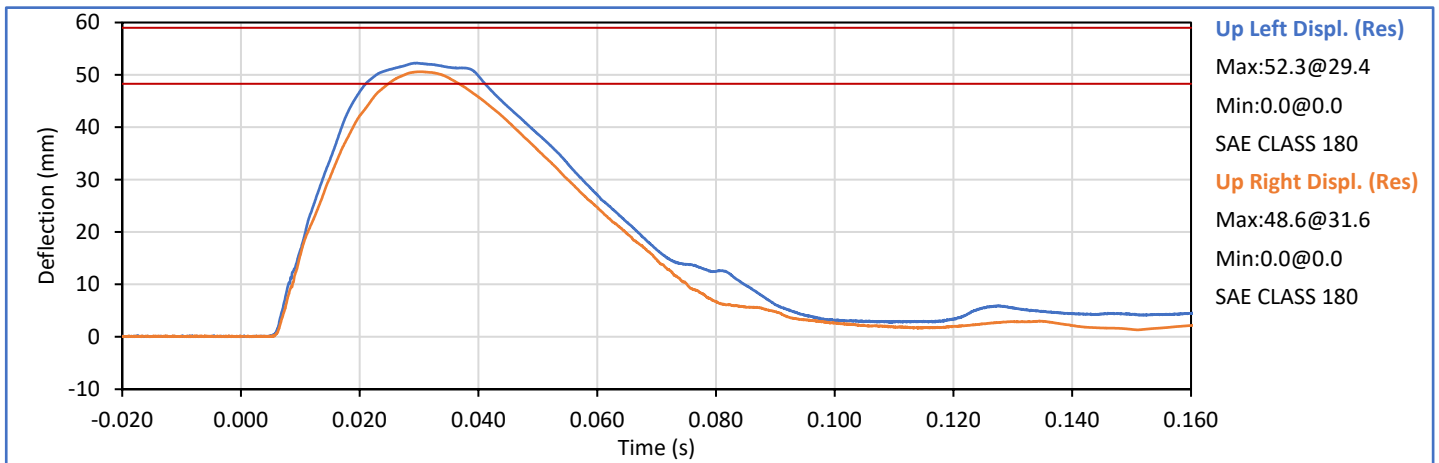
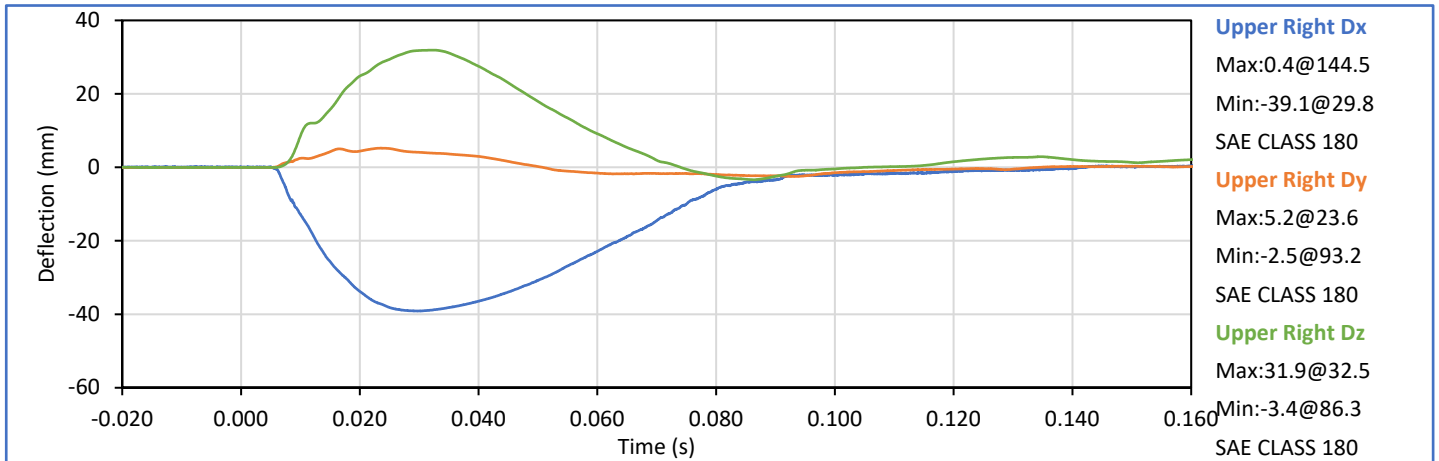
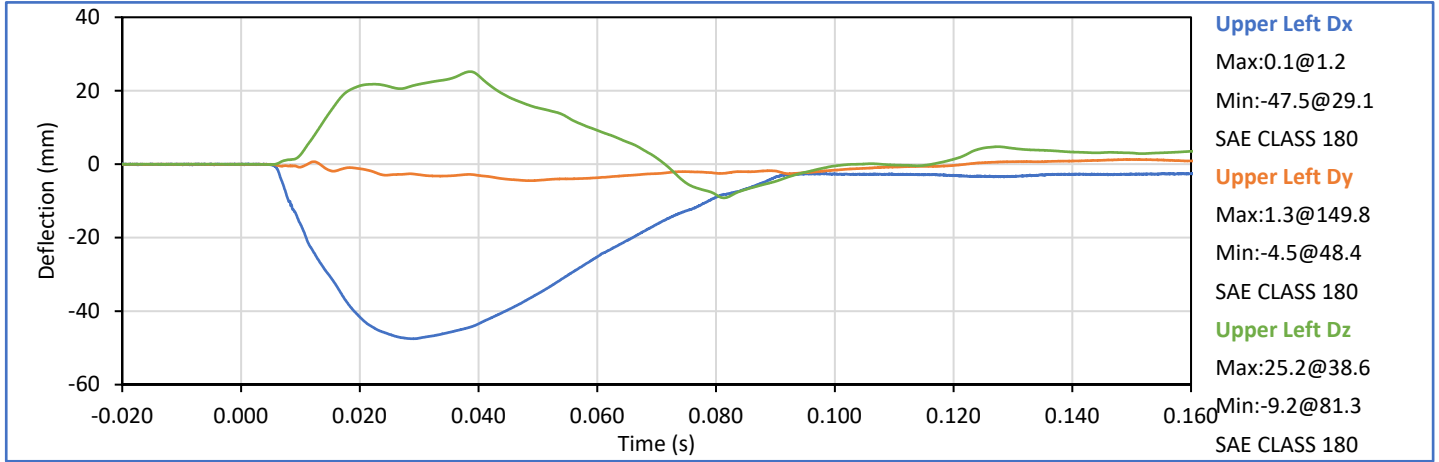


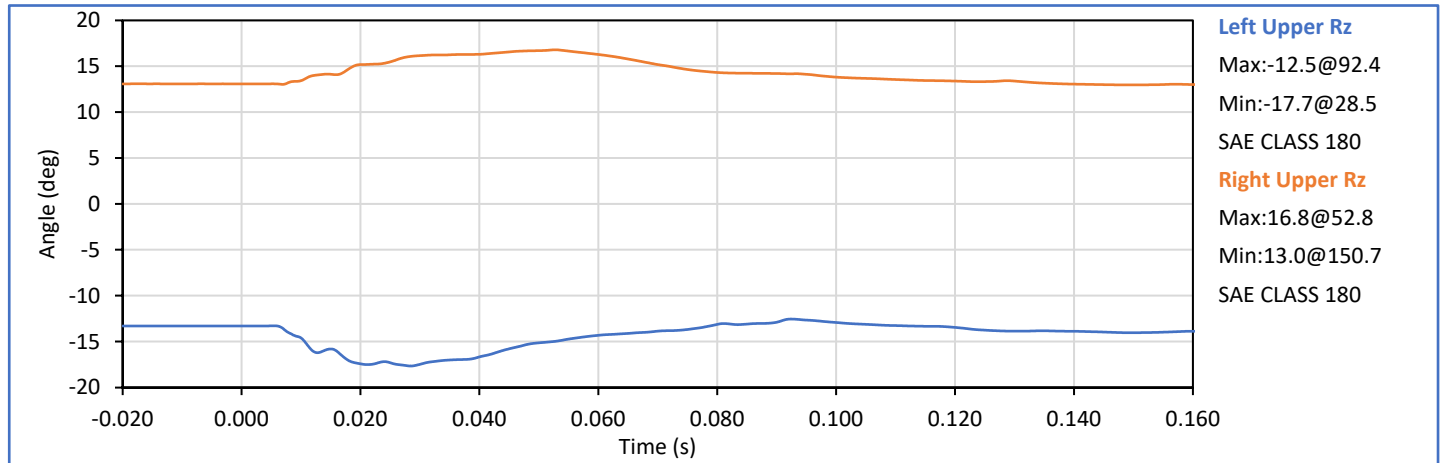
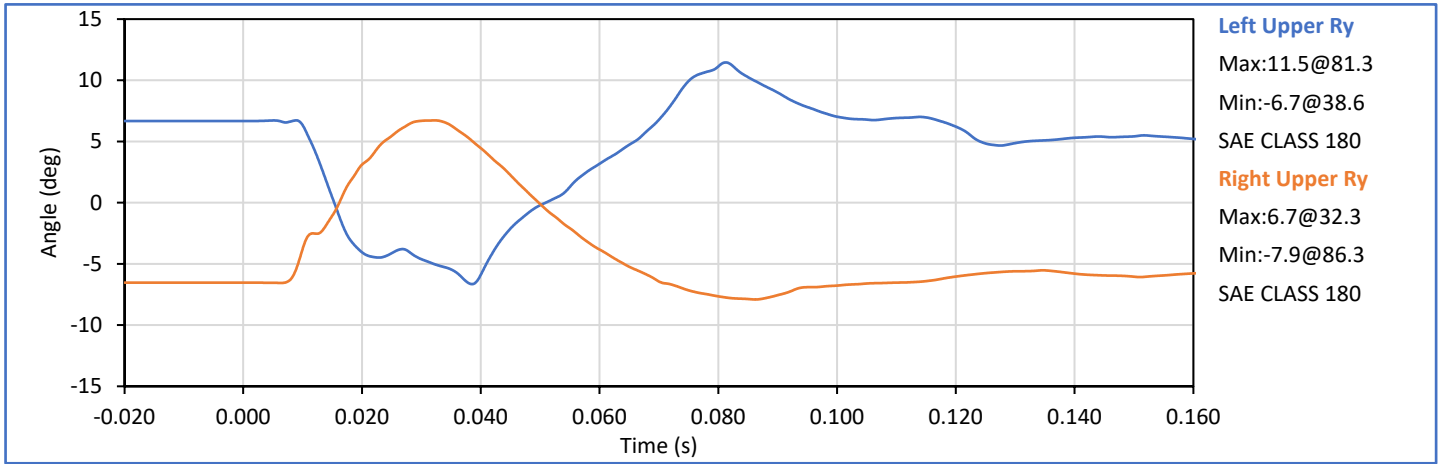


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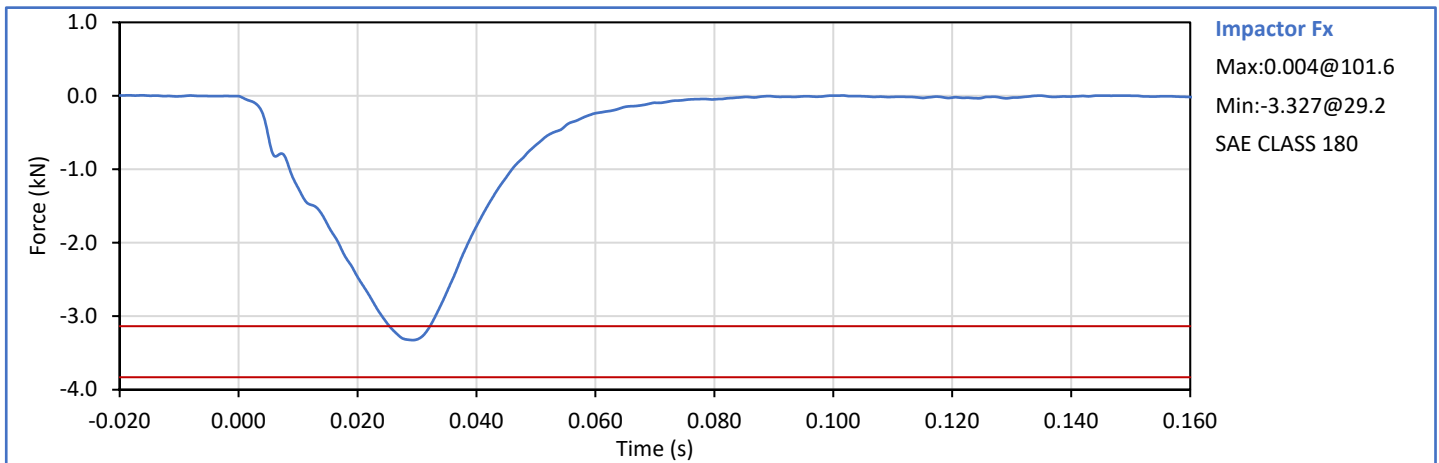
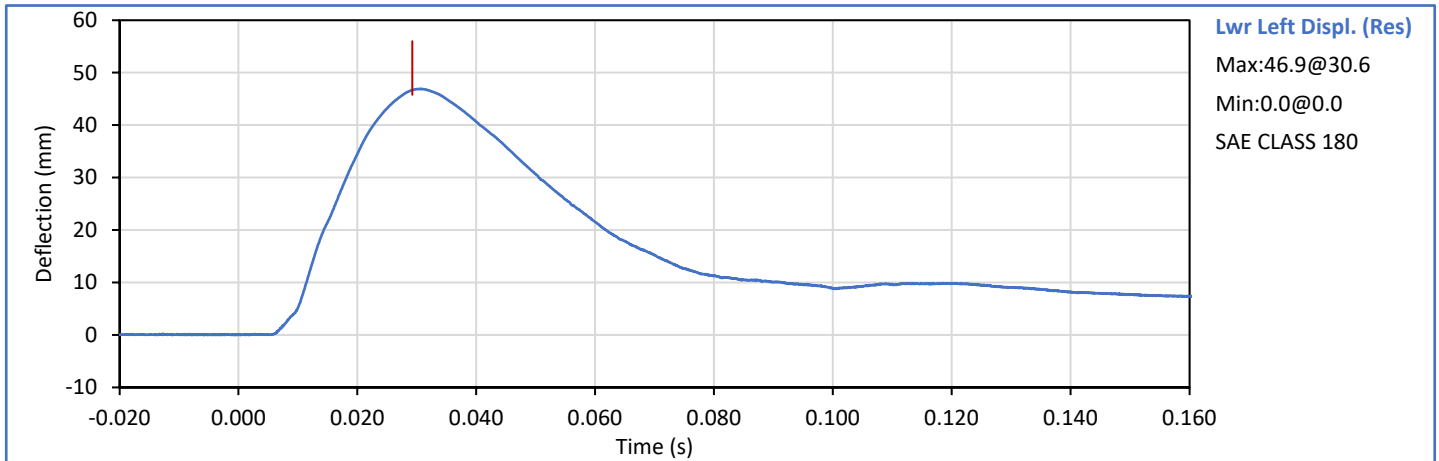
Approved By:           *P. Puzzuto*            
P. Puzzuto







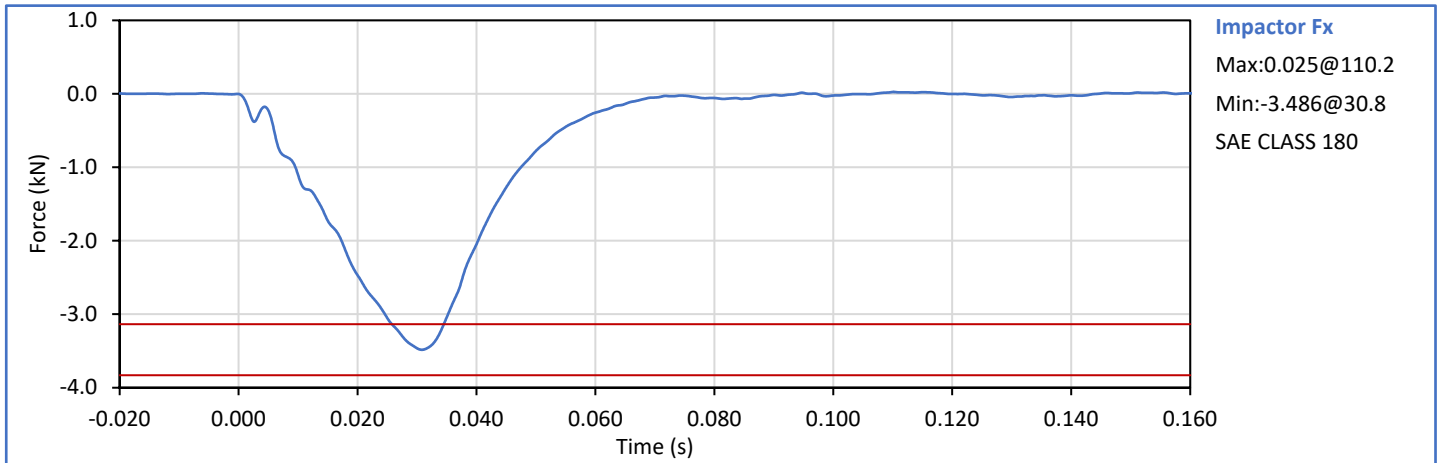
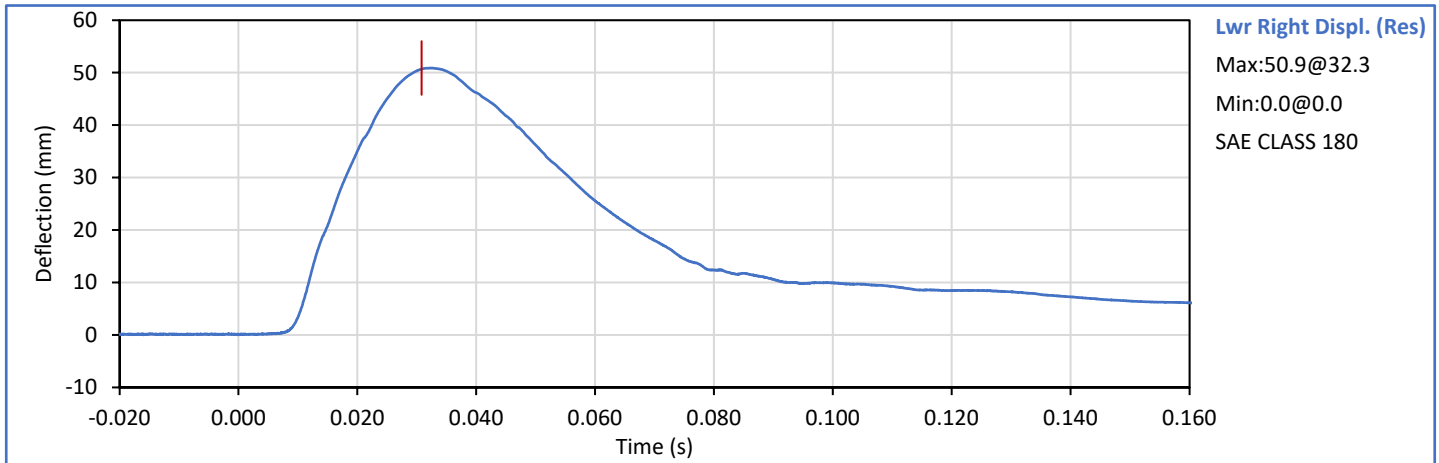
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.327	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	46.7	Pass
NHTSA Corridor 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	21.5	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	4.25	4.35	4.32	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.486	Pass
Lower Left Defl. Res. at Peak Fx	mm	45.8	56.0	50.7	Pass
NHTSA Corridor 2019-05				Overall Test Results	Pass

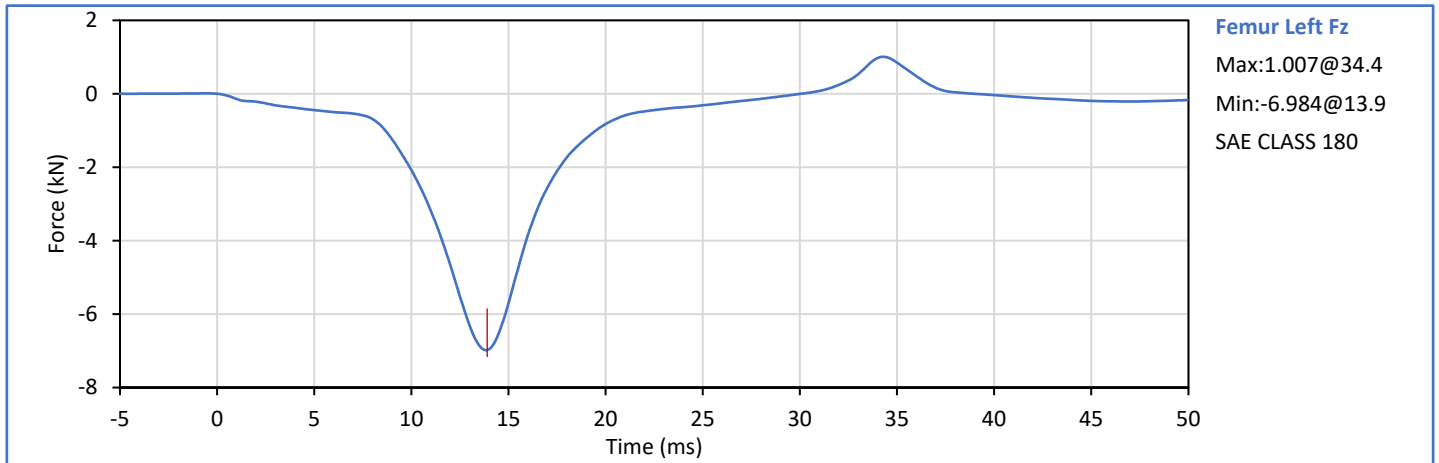
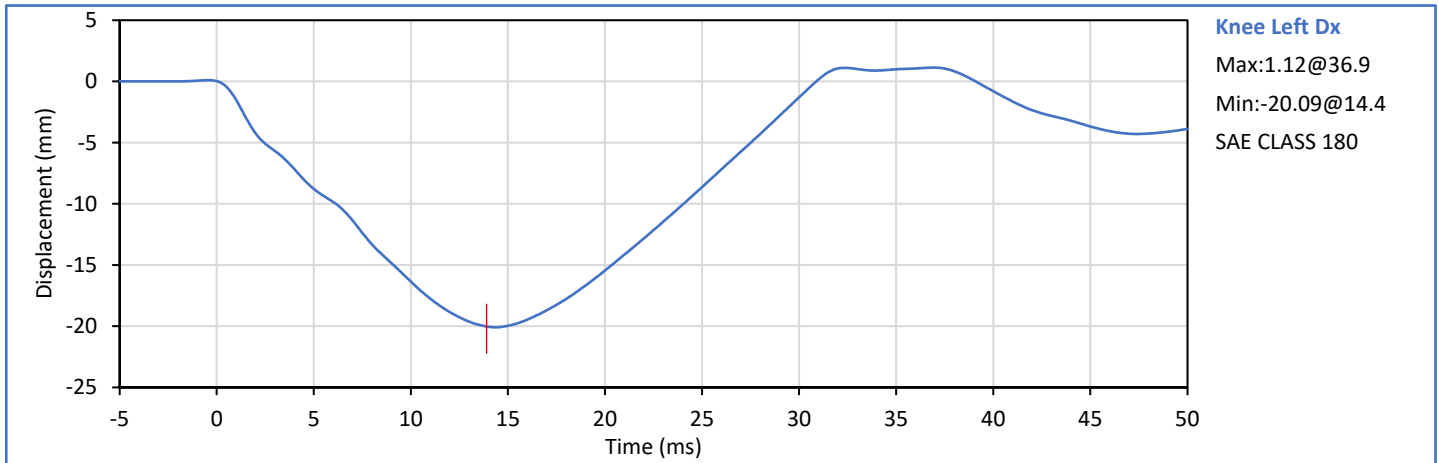


Technician:           *J. Hernandez*            
 J. Hernandez

Approved By:           *P. Puzzuto*            
 P. Puzzuto



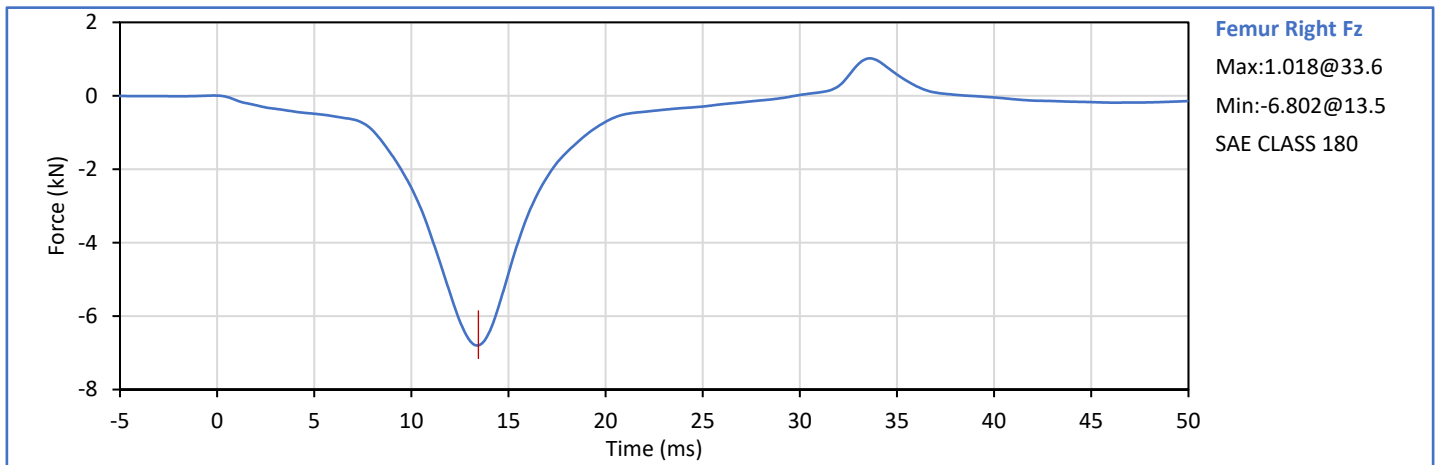
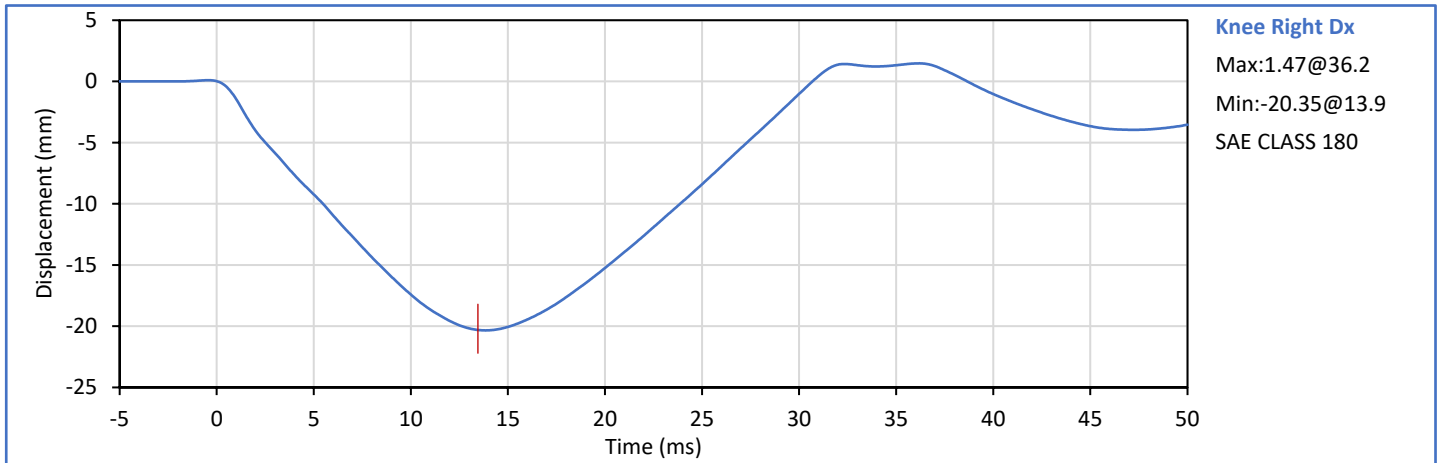
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.9	Pass
Laboratory Relative Humidity	%	10	70	21	Pass
Pendulum Velocity	m/s	2.15	2.25	2.20	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.984	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-20.01	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>



Technician:           *J. Hernandez*            
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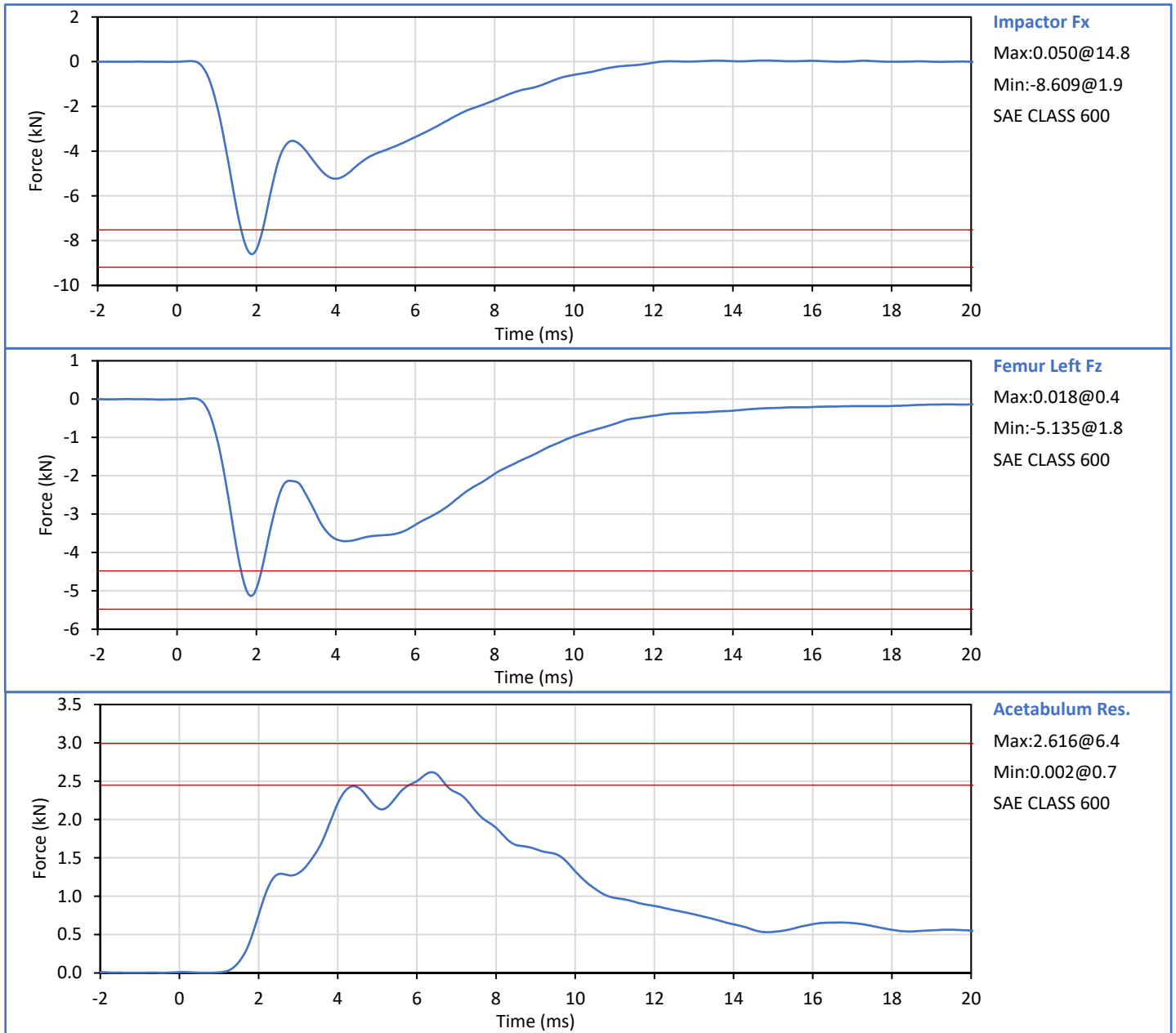
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	23	Pass
Pendulum Velocity	m/s	2.15	2.25	2.21	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.802	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-20.30	Pass
<b>NHTSA Corridor 2019-05</b>				<b>Overall Test Results</b>	<b>Pass</b>

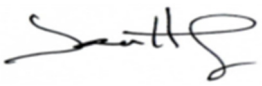



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P. Puzzuto

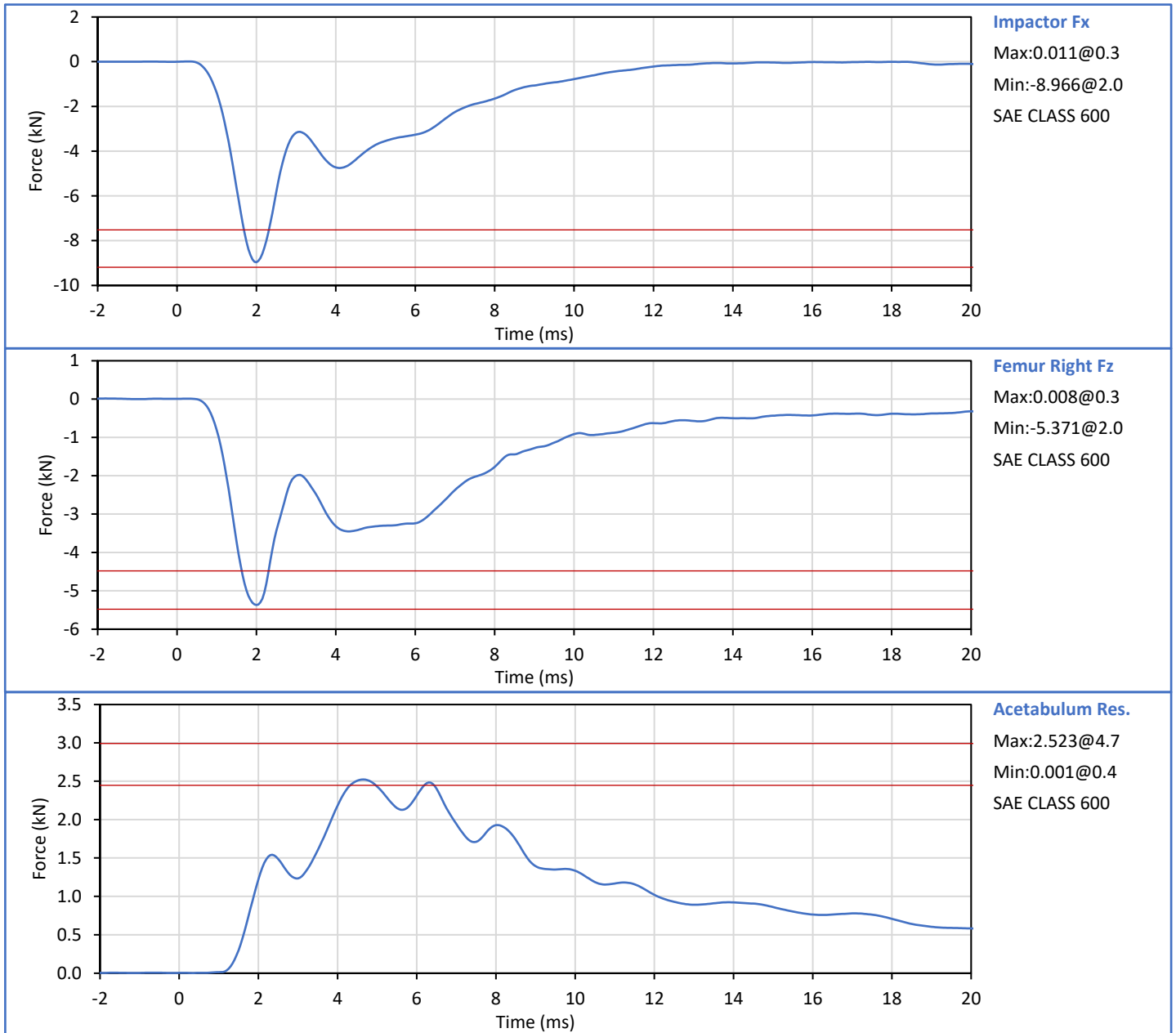
Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	37	Pass
Pendulum Velocity	m/s	3.25	3.35	3.31	Pass
Peak Impactor Fx	kN	-9.188	-7.517	-8.609	Pass
Peak Femur Fz	kN	-5.478	-4.482	-5.135	Pass
Acetabulum Force Resultant	kN	2.447	2.991	2.616	Pass
<sup>1</sup> NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass

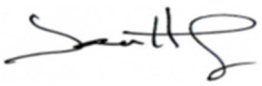



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P. Puzzuto

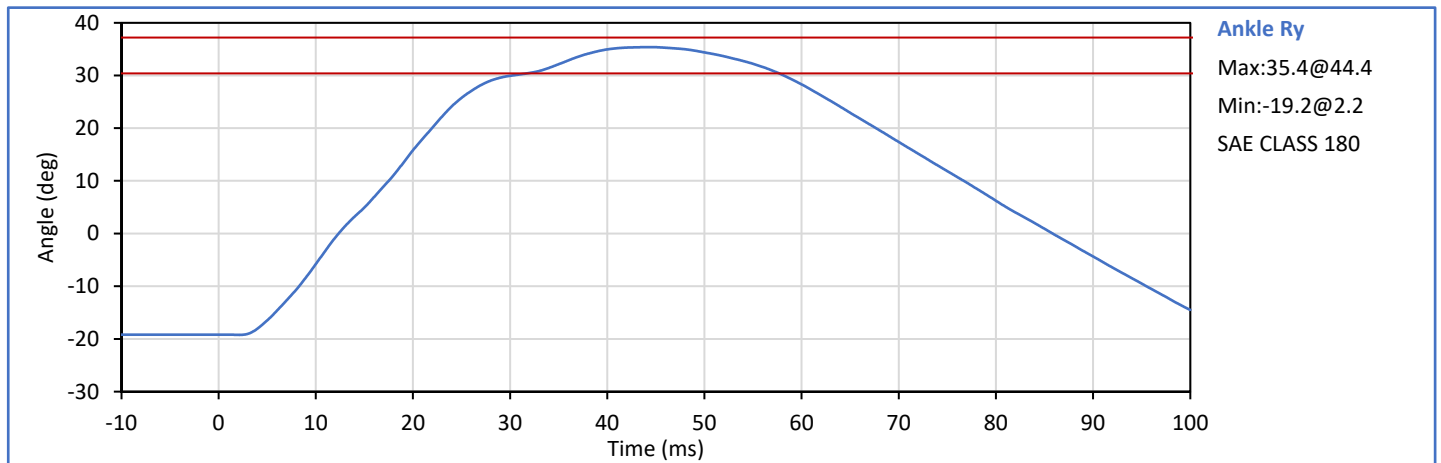
Tested Parameter	Units	Spec. Low <sup>1</sup>	Spec. High <sup>1</sup>	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	37	Pass
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Impactor Fx	kN	-9.188	-7.517	-8.966	Pass
Peak Femur Fz	kN	-5.478	-4.482	-5.371	Pass
Acetabulum Force Resultant	kN	2.447	2.991	2.523	Pass
<sup>1</sup> NHTSA Corridor 2020-03 (Preliminary Corridor)				Overall Test Results	Pass

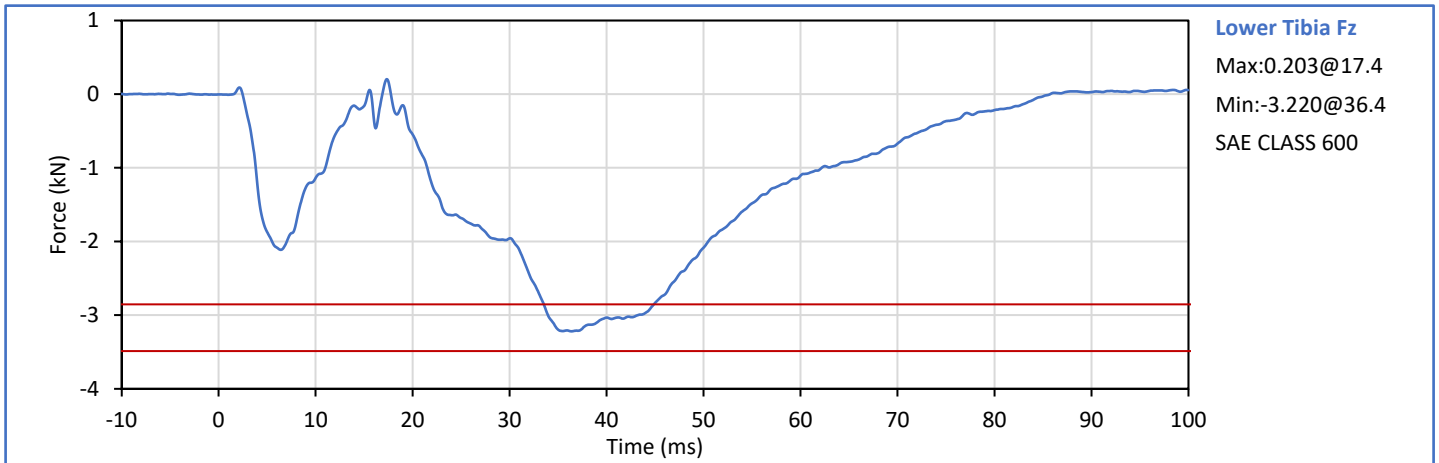
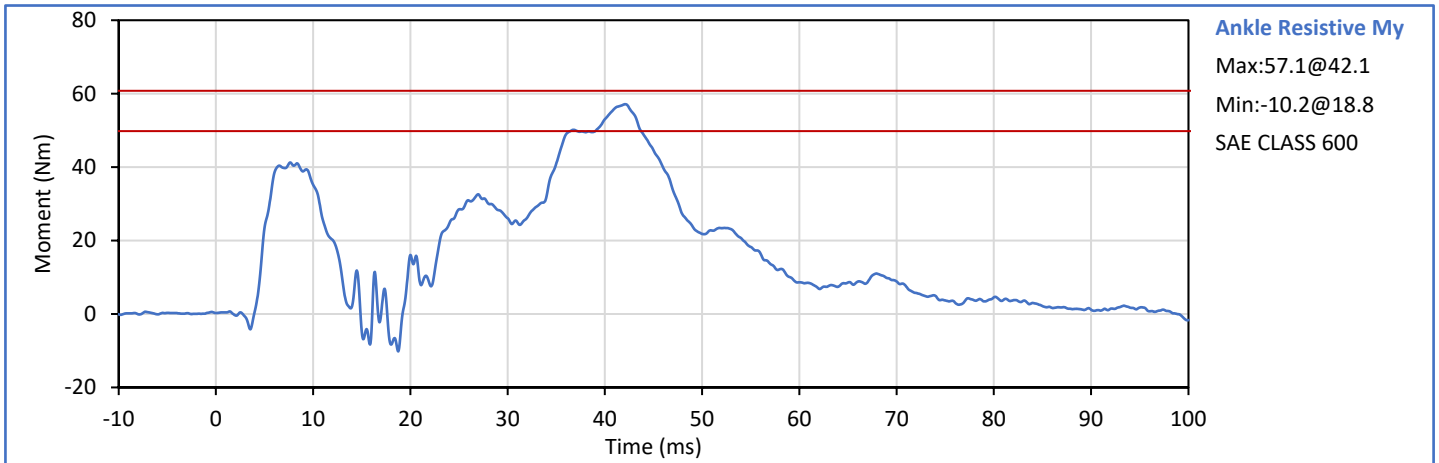
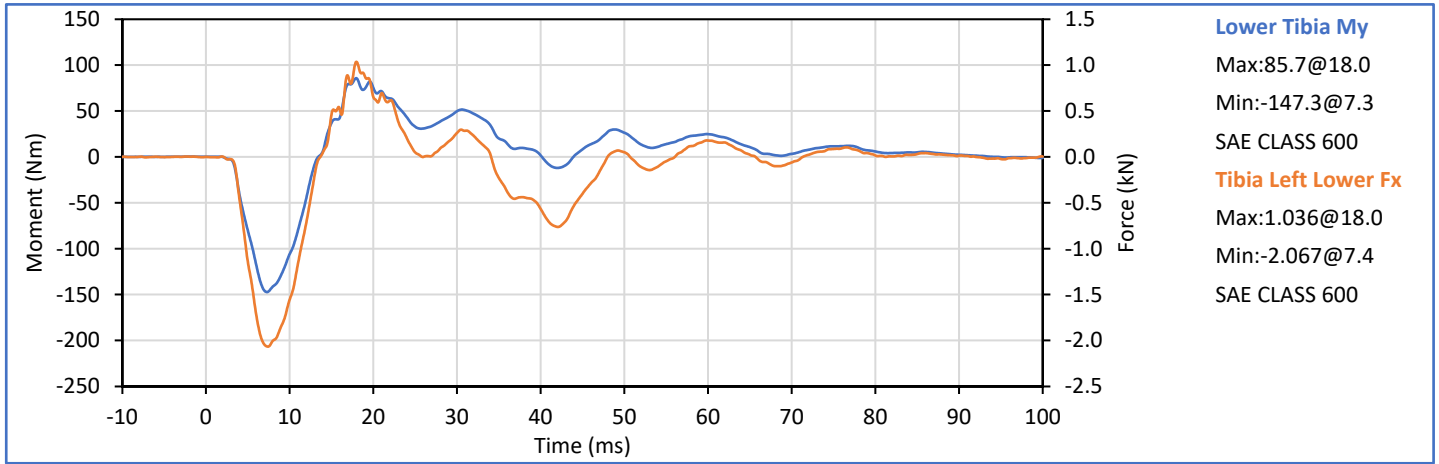


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Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	4.95	5.05	5.01	Pass
Peak Ankle Ry	deg	30.4	37.2	35.4	Pass
Peak Ankle Resistive My	Nm	49.8	60.8	57.1	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-3.220	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

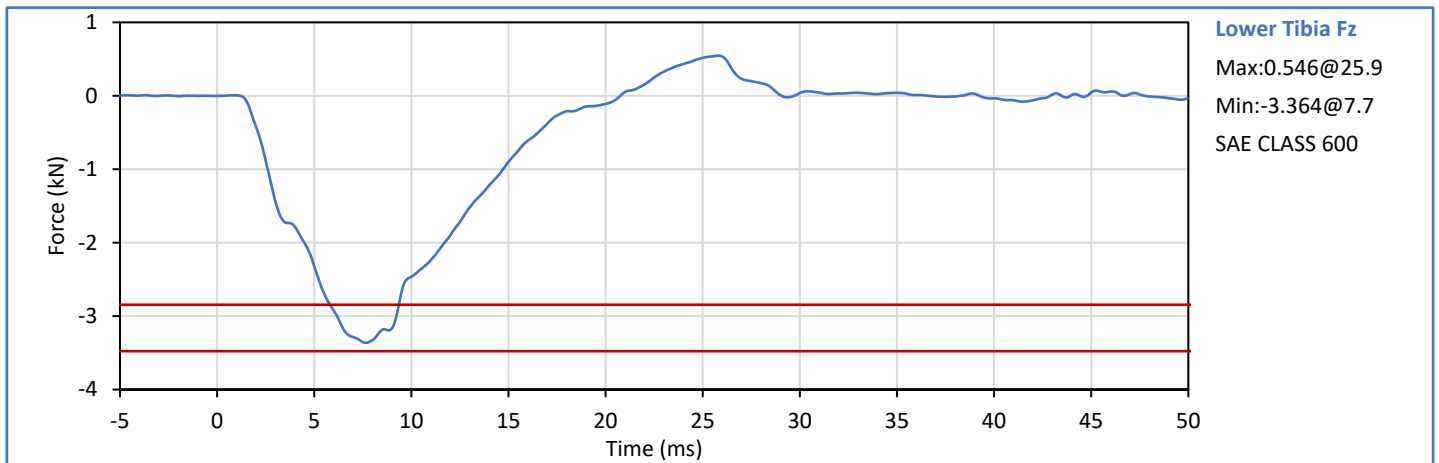




Technician:           *J. Hernandez*            
J. Hernandez

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P. Puzzuto

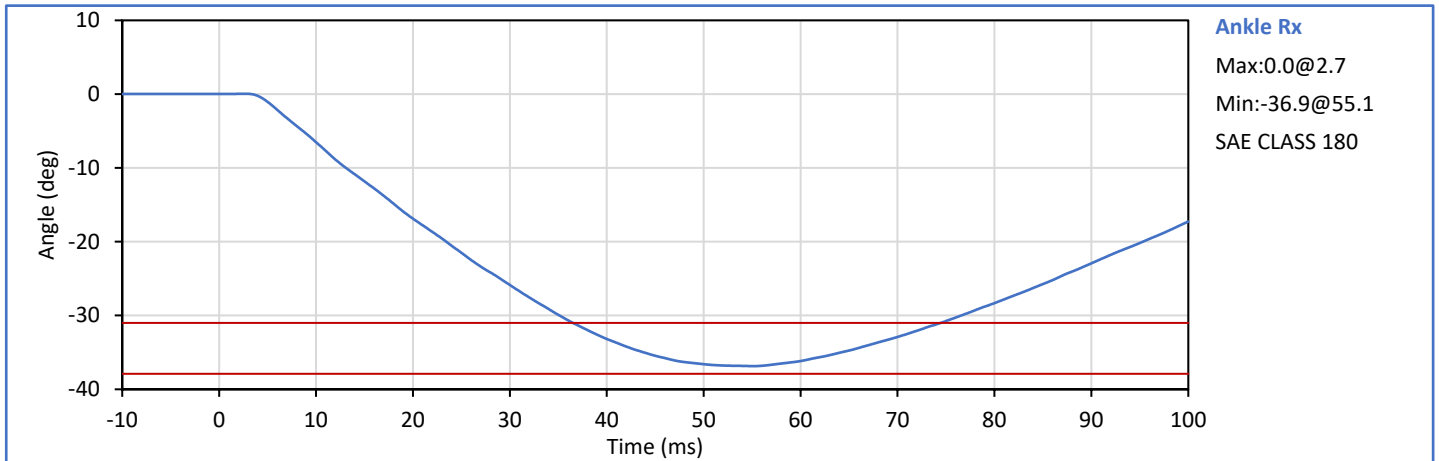
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	19	Pass
Pendulum Velocity	m/s	3.95	4.05	4.01	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.364	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

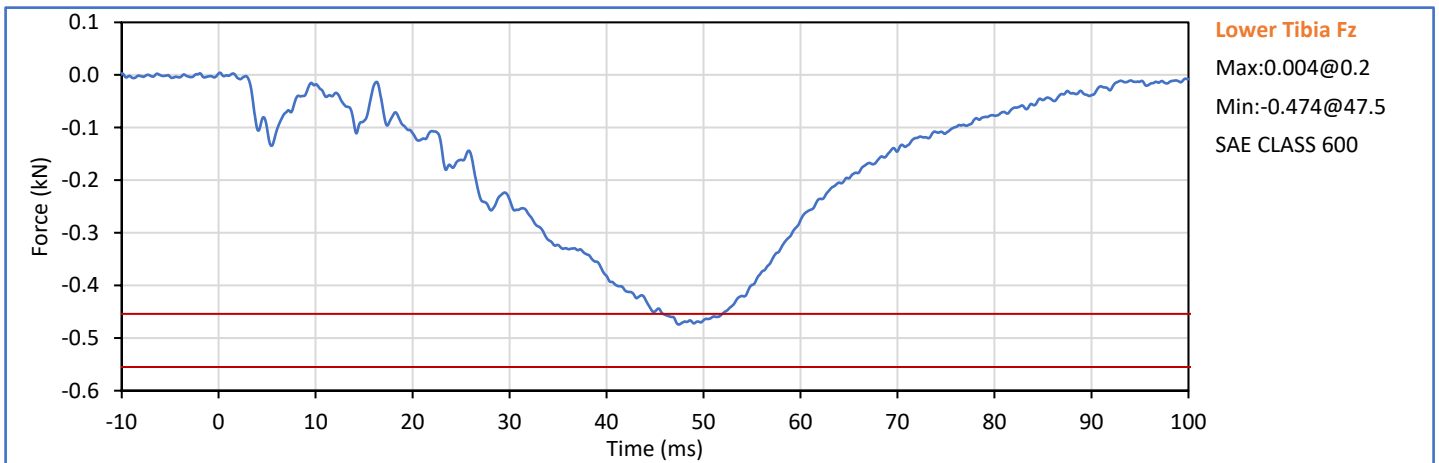
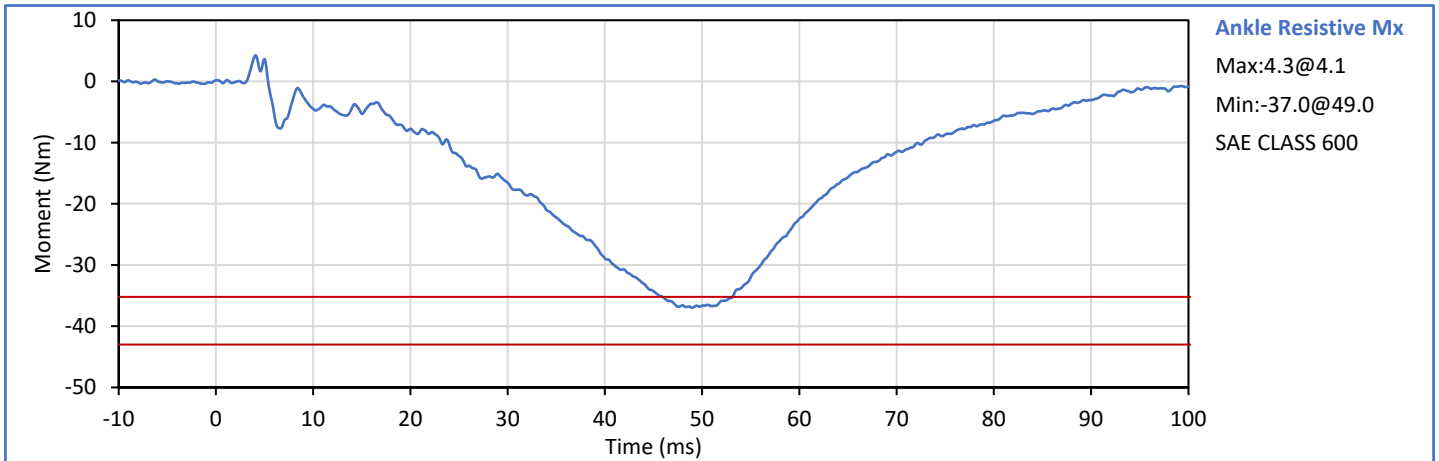
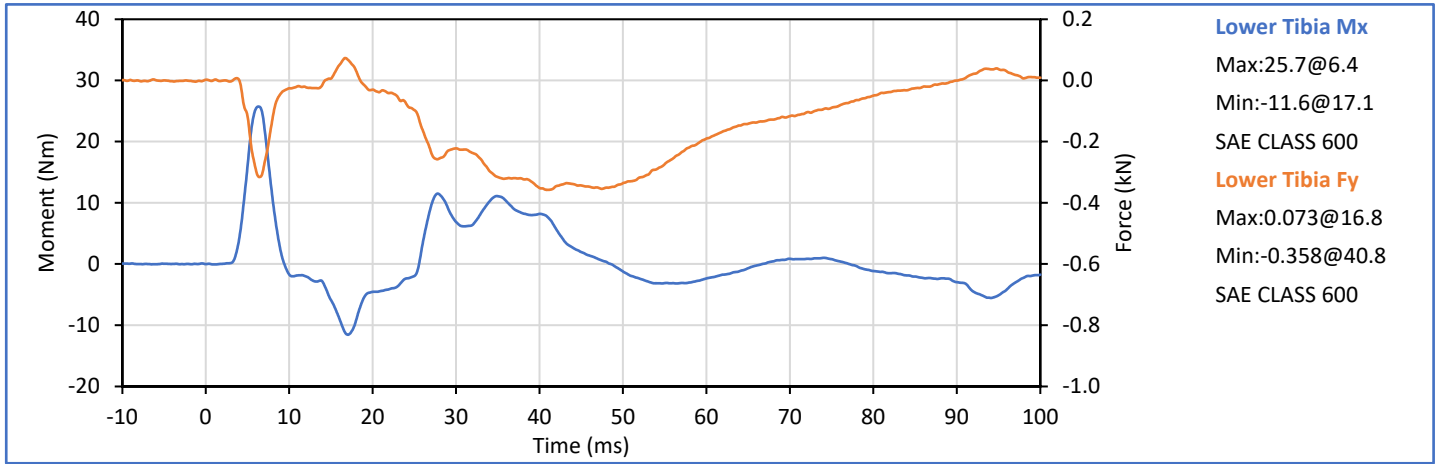


Technician:           *J. Hernandez*            
 J. Hernandez

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 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	1.95	2.05	2.02	Pass
Peak Ankle Rx	deg	-37.9	-31.0	-36.9	Pass
Peak Ankle Resistive Mx	Nm	-43.0	-35.2	-37.0	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.474	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

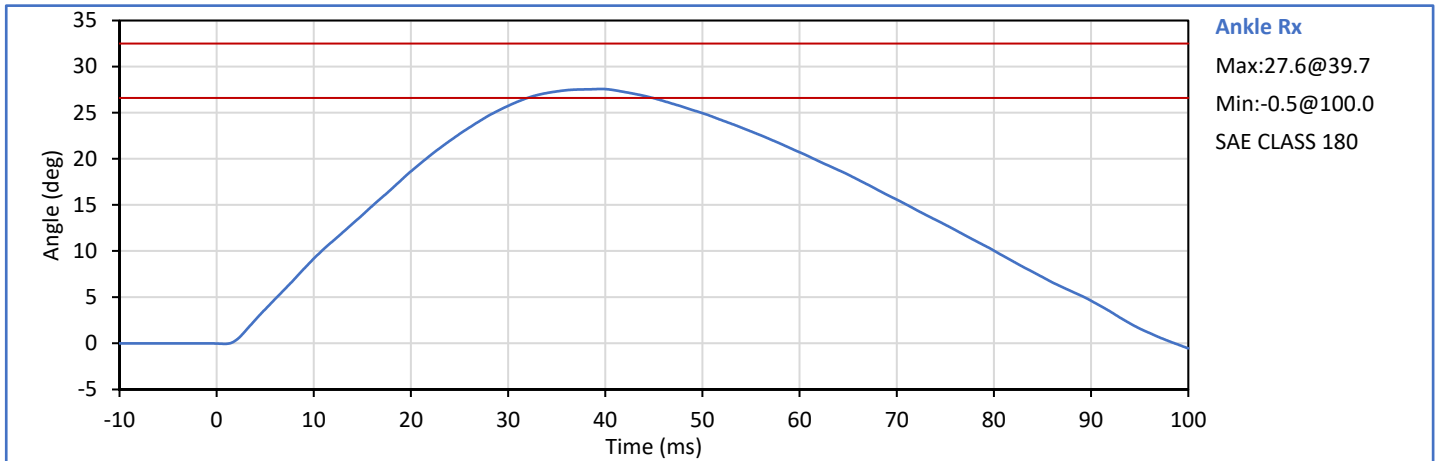


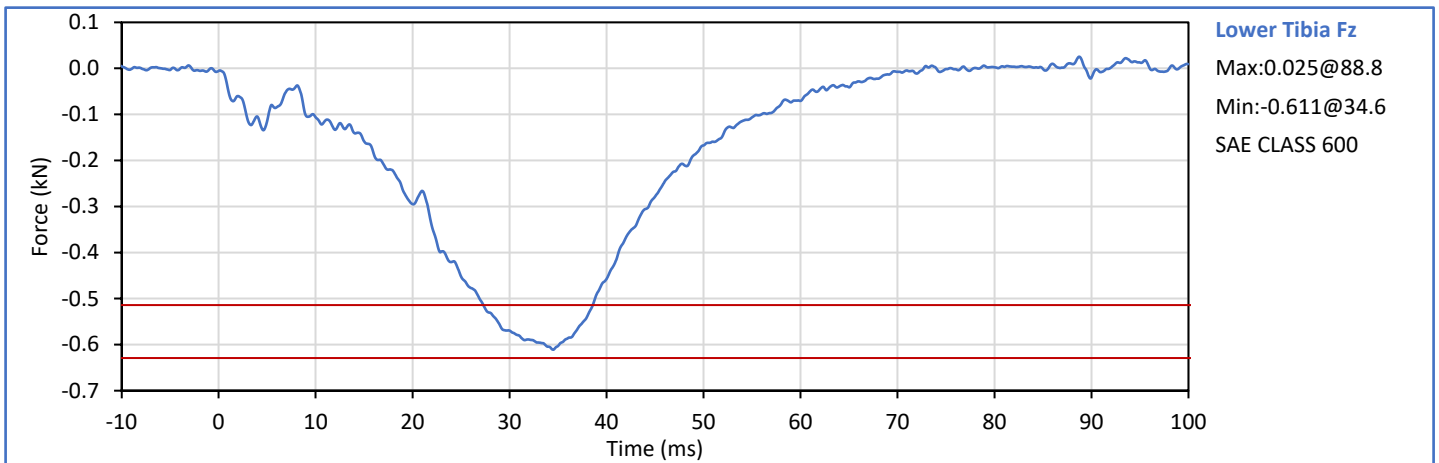
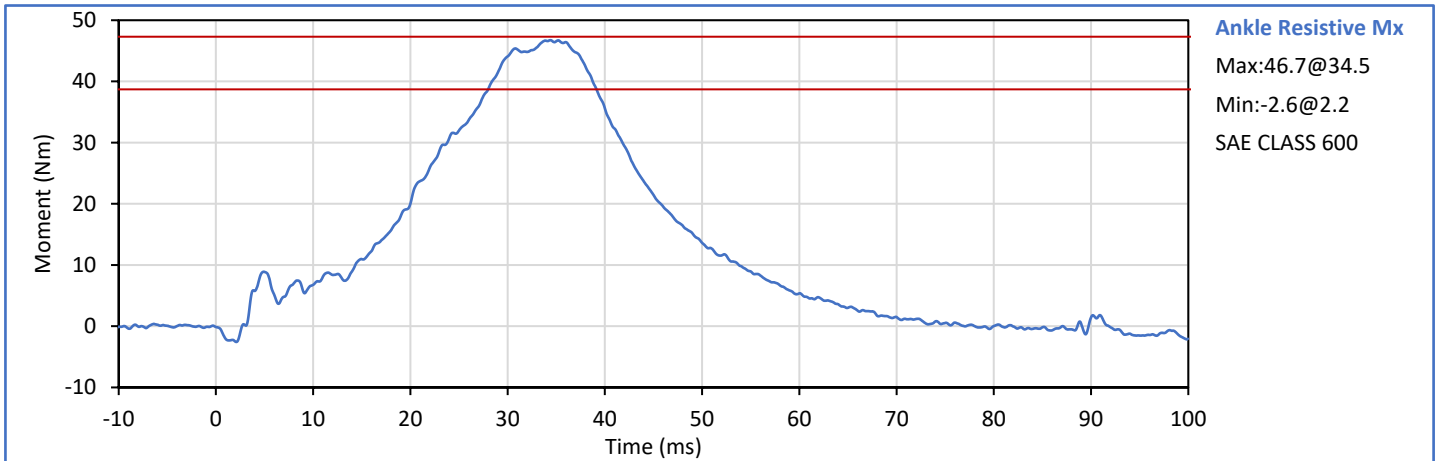
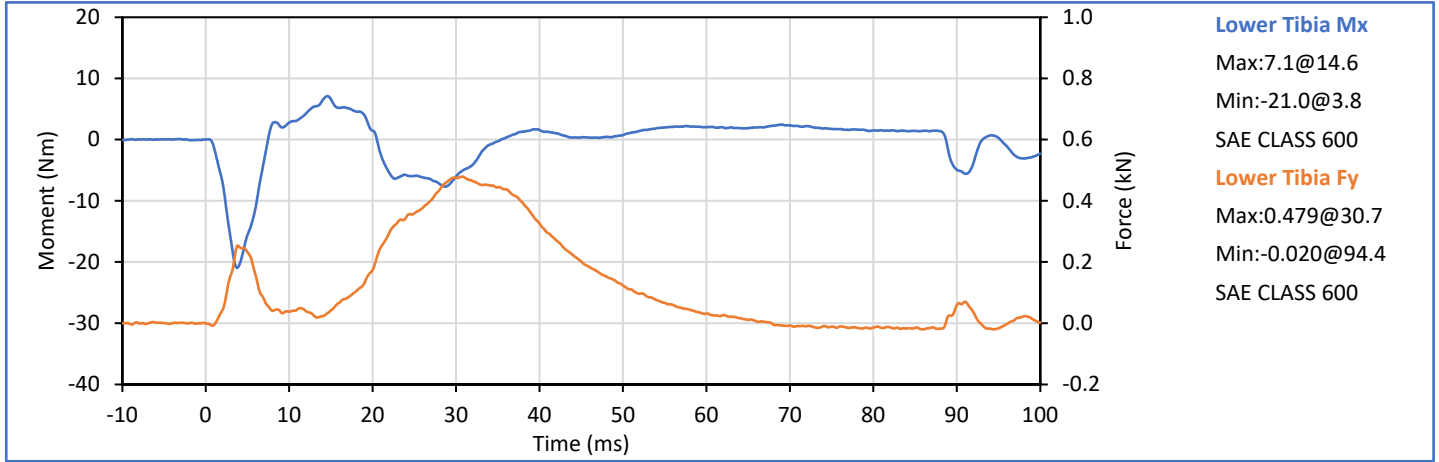


Technician:           *J. Hernandez*            
 J. Hernandez

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 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	19	Pass
Pendulum Velocity	m/s	1.95	2.05	2.01	Pass
Peak Ankle Rx	deg	26.6	32.5	27.6	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	46.7	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.611	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

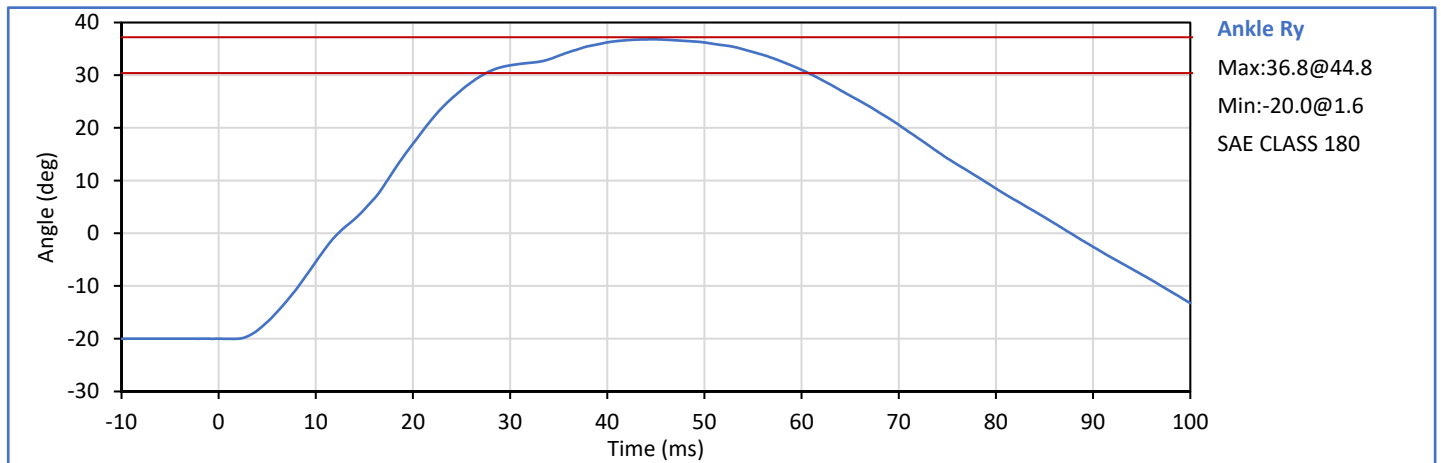


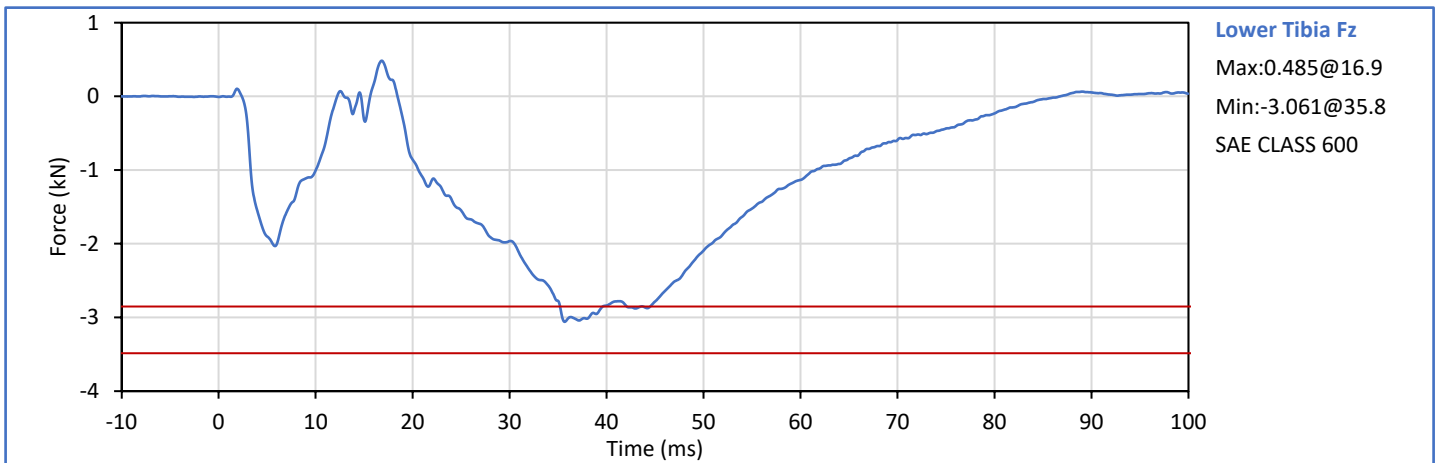
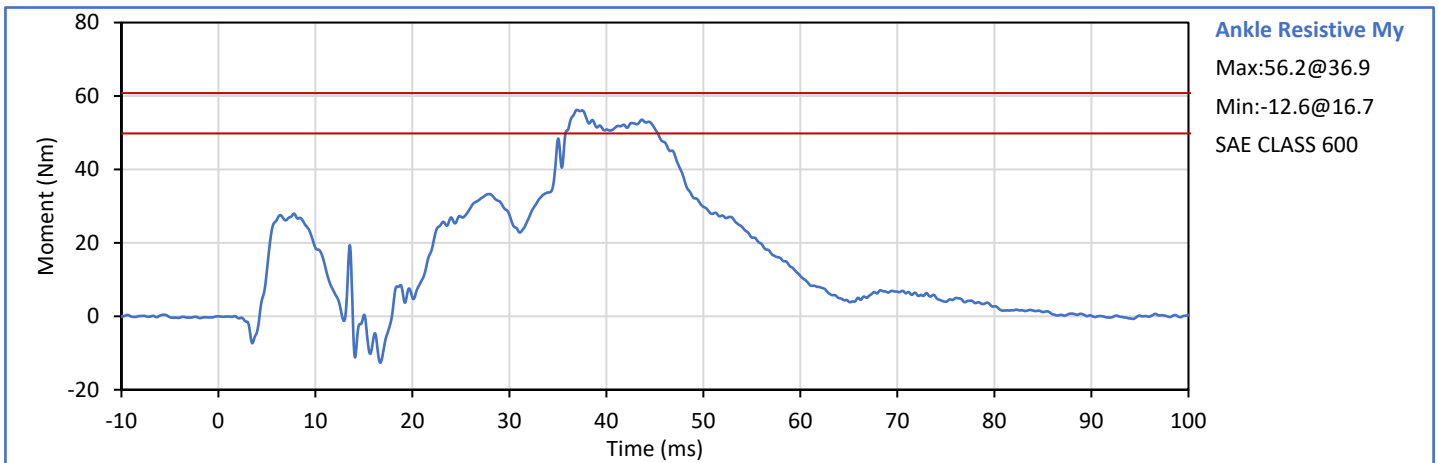
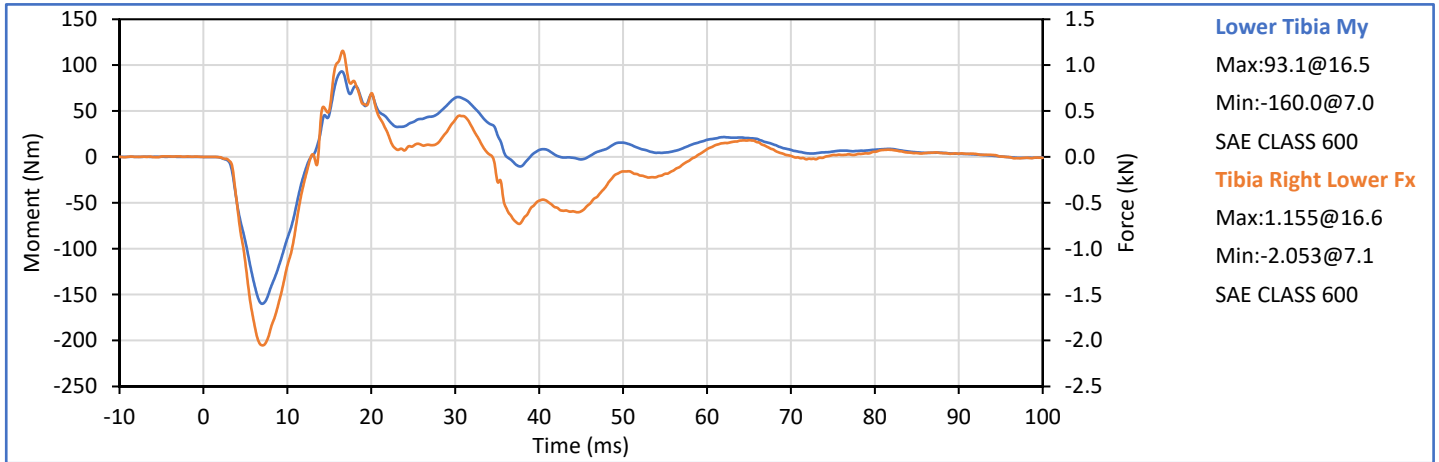


Technician:           *J. Hernandez*            
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P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	4.95	5.05	4.98	Pass
Peak Ankle Ry	deg	30.4	37.2	36.8	Pass
Peak Ankle Resistive My	Nm	49.8	60.8	56.2	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-3.061	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

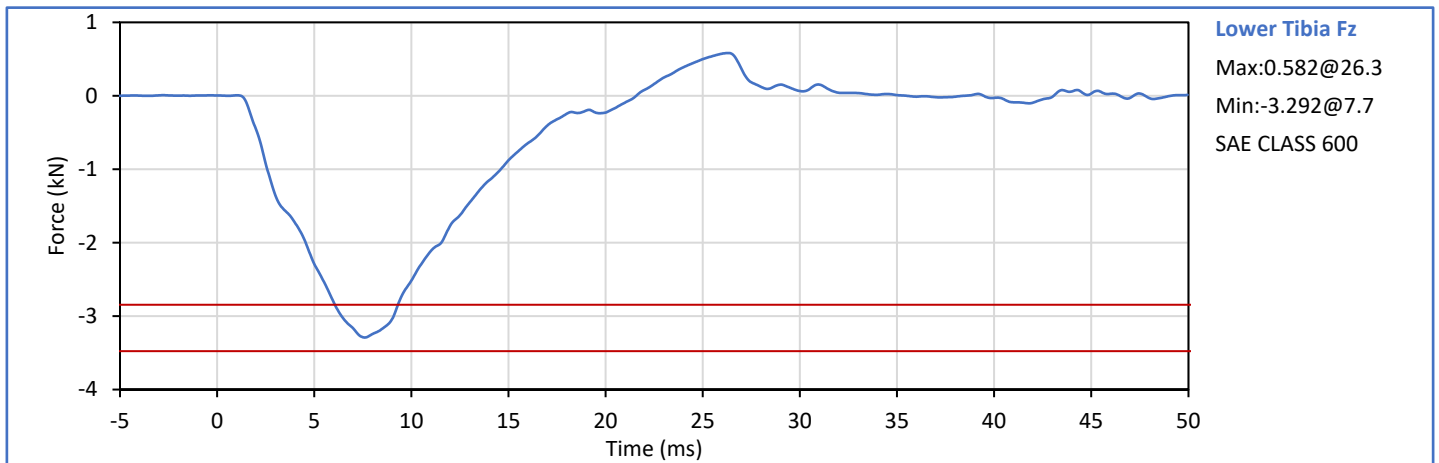




Technician:           *J. Hernandez*            
 J. Hernandez

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 P. Puzzuto

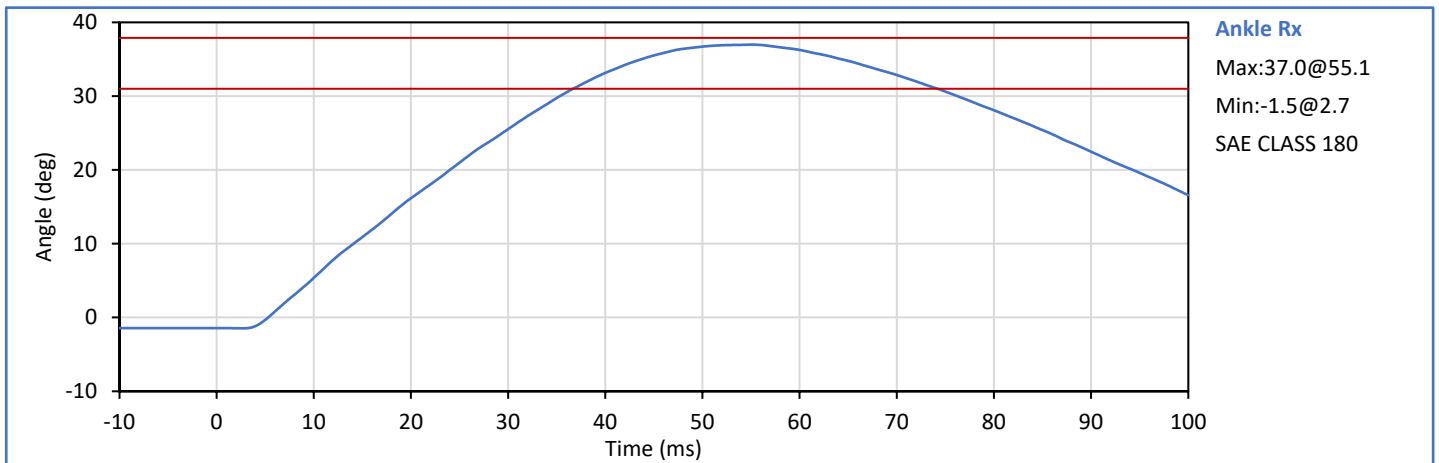
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.6	Pass
Laboratory Relative Humidity	%	10	70	47	Pass
Pendulum Velocity	m/s	3.95	4.05	4.02	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.292	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

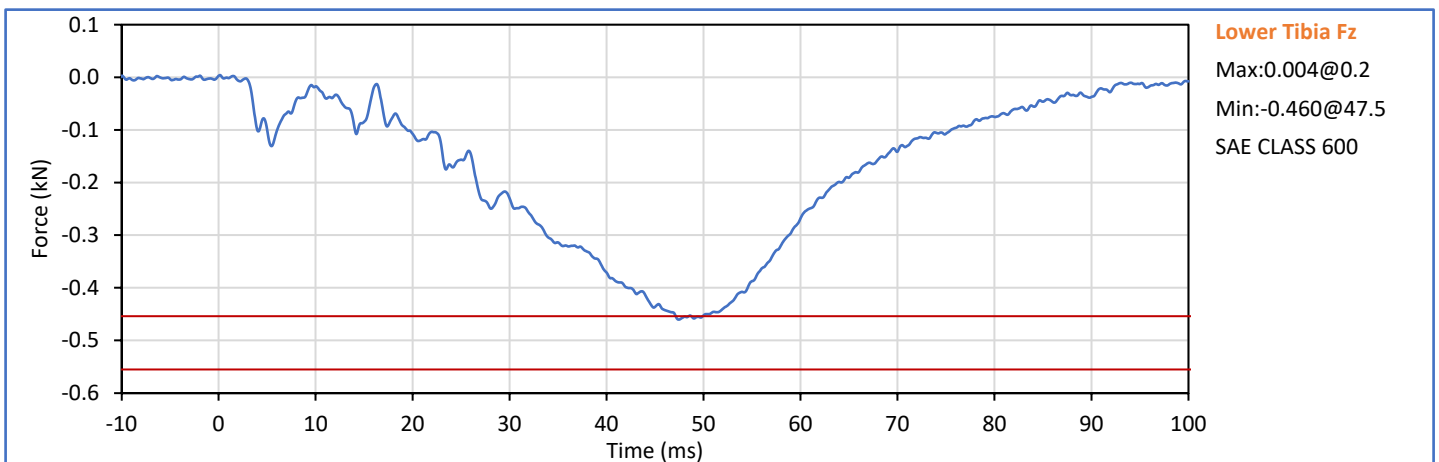
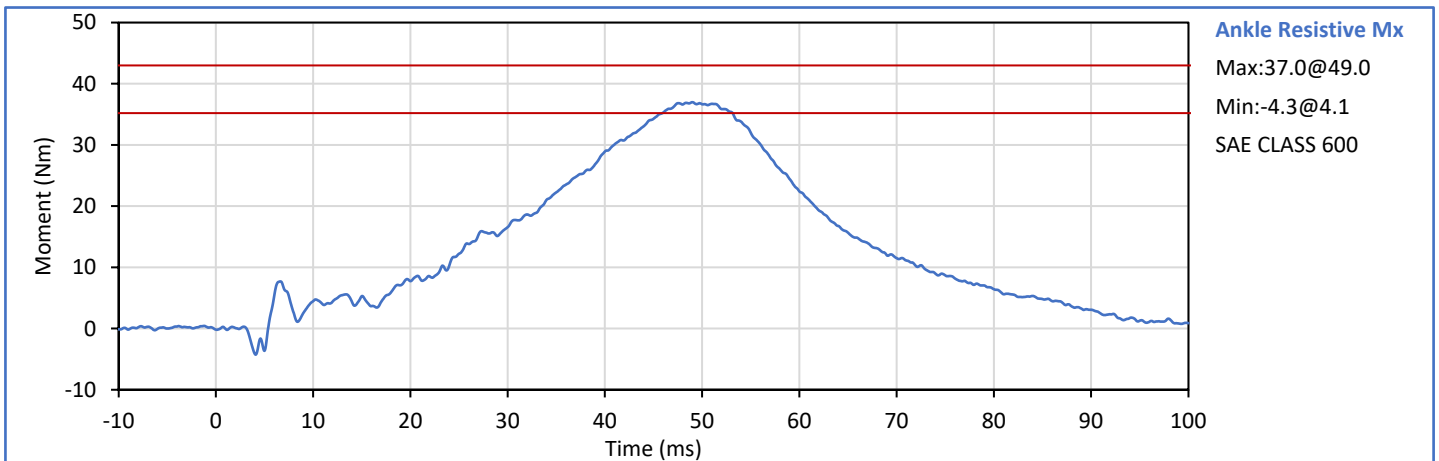
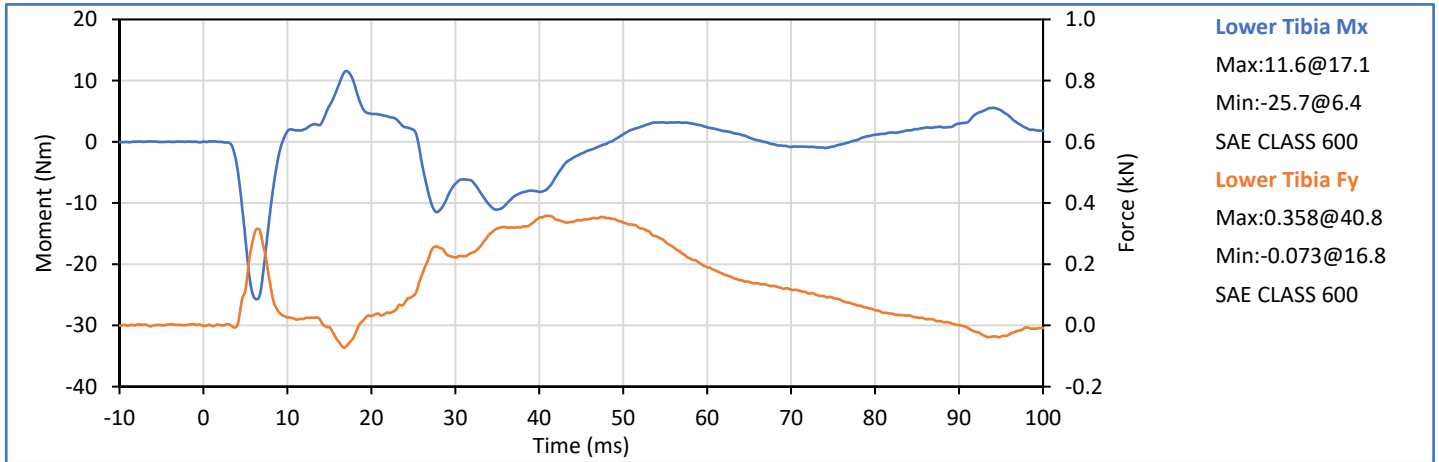


Technician:           *J. Hernandez*            
 J. Hernandez

Approved By:           *P. Puzzuto*            
 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	1.95	2.05	2.04	Pass
Peak Ankle Rx	deg	31.0	37.9	37.0	Pass
Peak Ankle Resistive Mx	Nm	35.2	43.0	37.0	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.460	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass

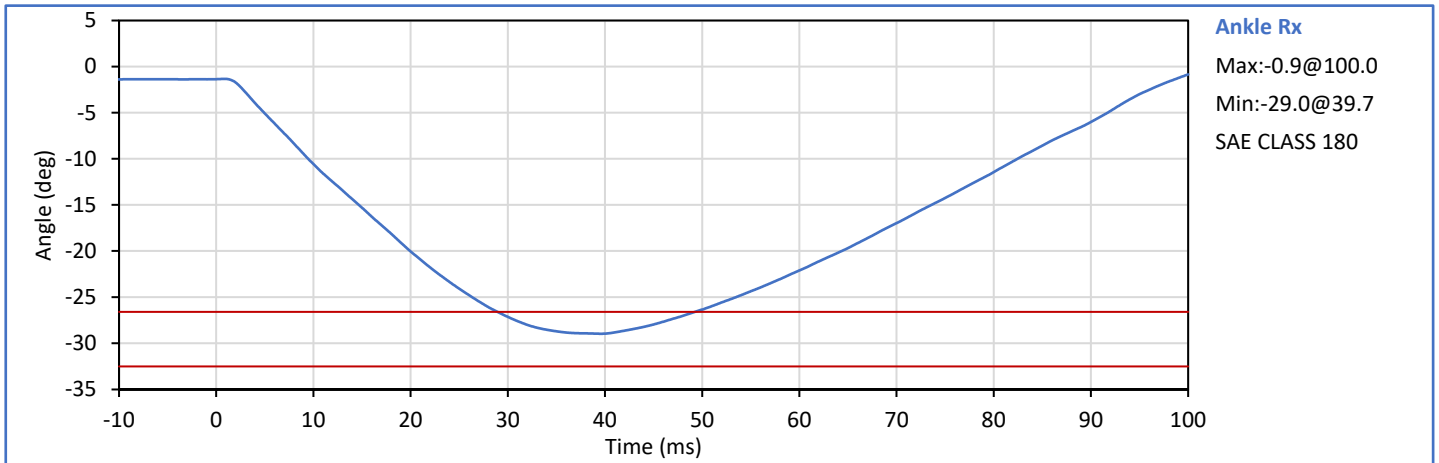


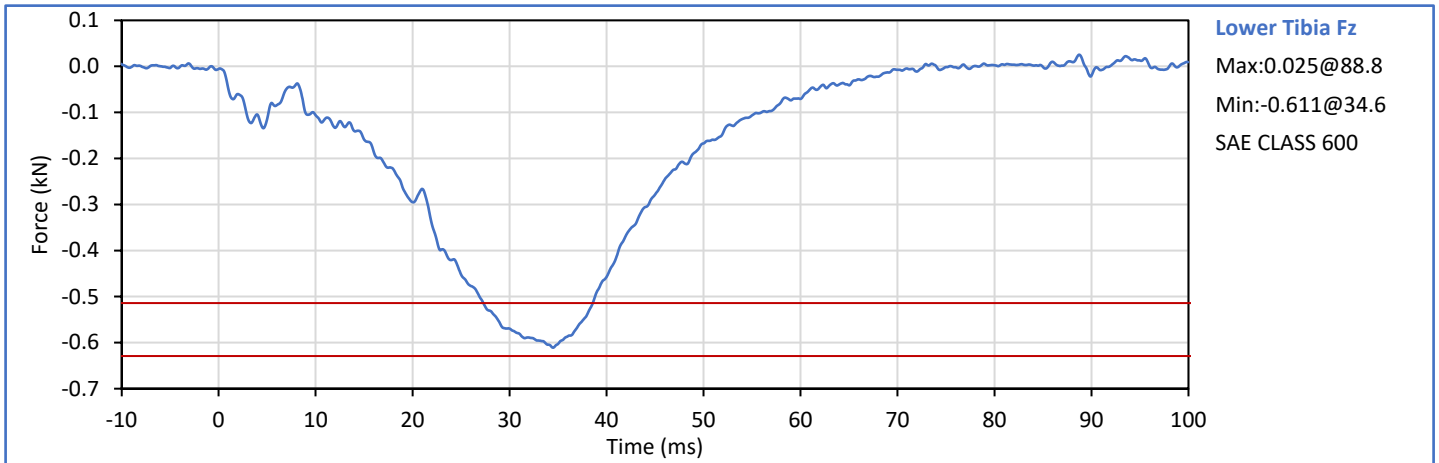
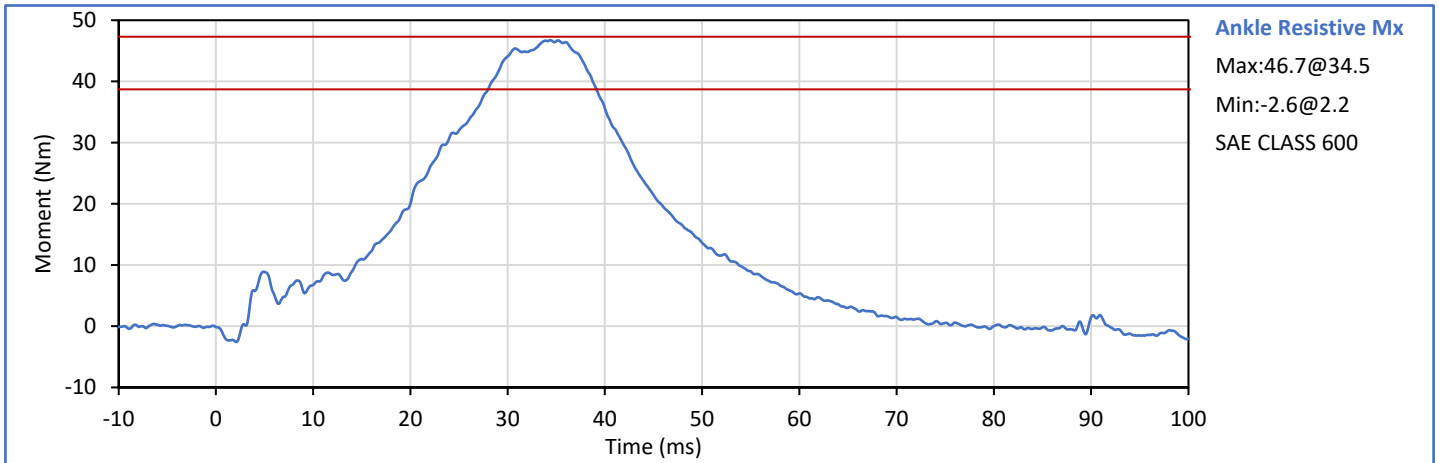
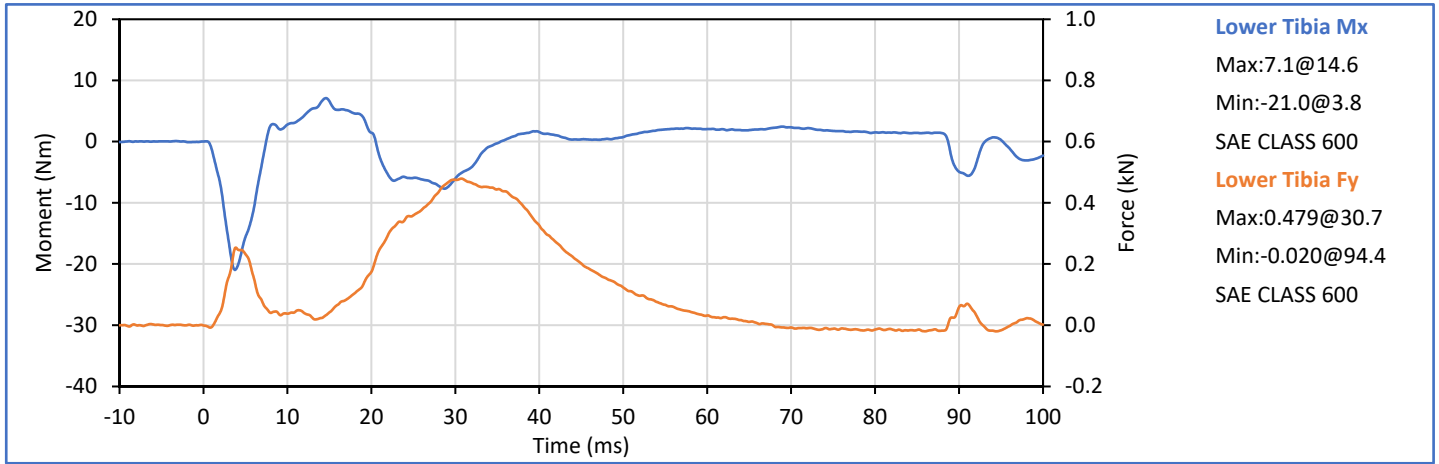


Technician:           *J. Hernandez*            
 J. Hernandez

Approved By:           *P. Puzzuto*            
 P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	51	Pass
Pendulum Velocity	m/s	1.95	2.05	2.02	Pass
Peak Ankle Rx	deg	-32.5	-26.6	-29.0	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	46.7	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.611	Pass
<b>NHTSA Corridor 2019-05</b>				Overall Test Results	Pass





Technician:           *J. Hernandez*            
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P. Puzzuto


**APPENDIX E**  
**THOR-50M 50<sup>TH</sup> PERCENTILE MALE ATD**  
**PHYSICAL INSPECTION, PRE-TEST**

ATD Serial No.: EG2595

Inspection Date: 2021-09-20

Overall Conditon/Functionality	Note
<p><u>Known errors in data channels (no data, clipping, unexpected drops):</u></p> <p>Serial Number: DL9552-FX Right Acetabulum Force X bad channel.</p> <p>Serial Number: DW9502 Occipital Condyle Potentiometer not wired.</p> <p>Serial Number: DL9552-FX Right Acetabulum Force X bad channel, no data recorded during the test*</p> <p>Serial Number: DW9502 Occipital Condyle Potentiometer, no data recorded during the test**</p>	
<p><u>Physical evidence of damage:</u></p> <p>*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.</p> <p>**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></p> <p>THOR-50M S/N EG2595 with DTS SLICE6 Internal DAS</p> <p>Laptop</p> <p>DTS MiniDistributor with cables and PSU</p>	

Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

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

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: 2021-09-20


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:	

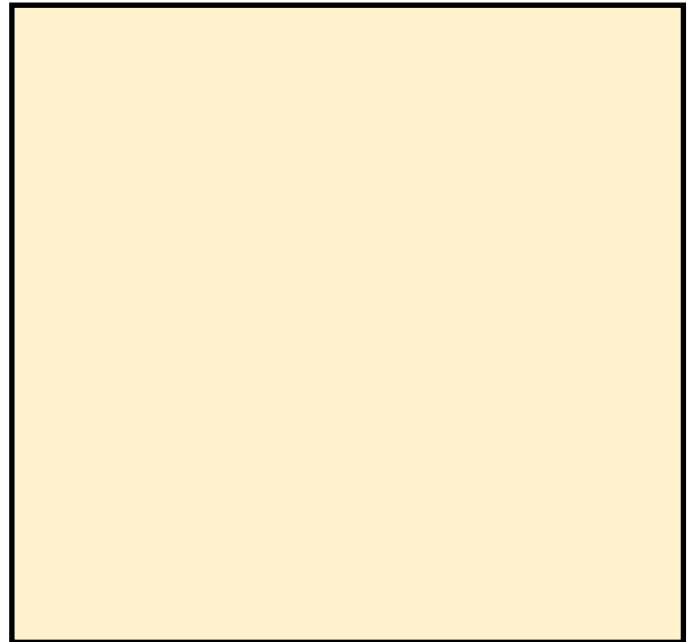
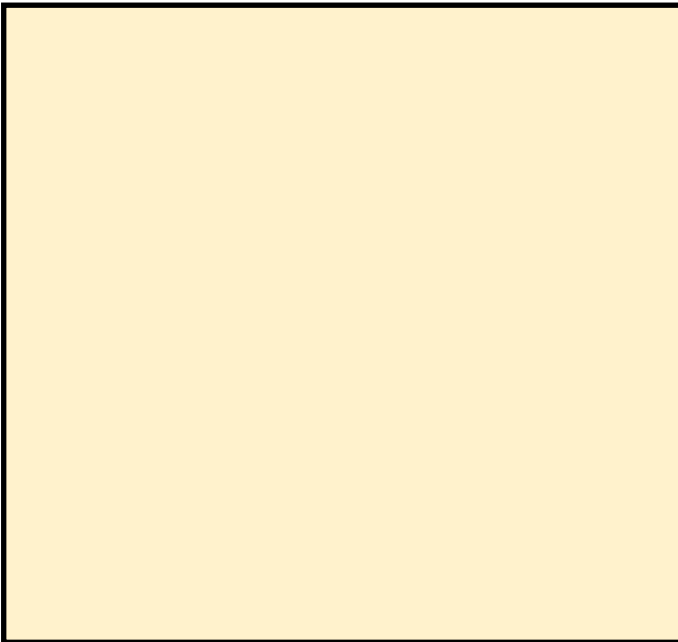
LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts,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



Additional Notes:

Technician: *J. Hernandez*  
J. Hernandez

Approved By: *P. Puzzuto*  
P. Puzzuto







ATD Serial No.: DO9799


Inspection Date: 2021-09-20


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:	

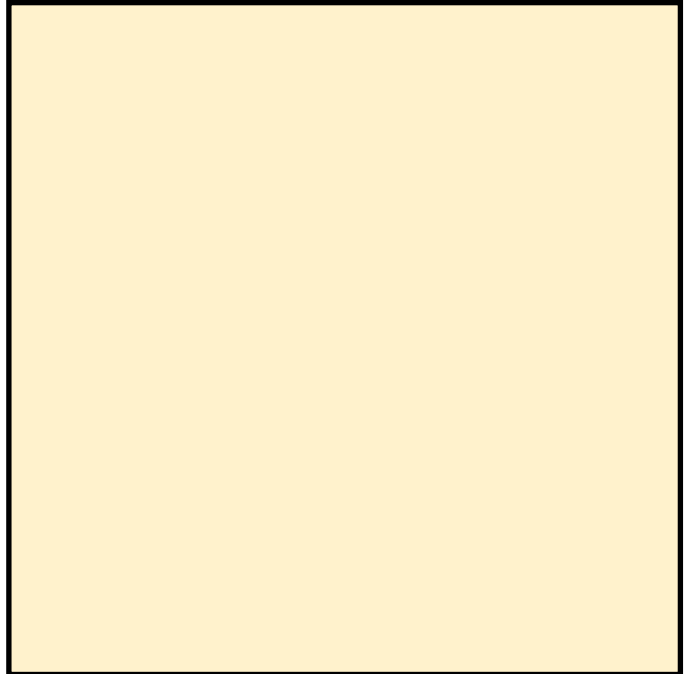
LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts,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



Additional Notes:

Technician:           *J. Hernandez*            
J. Hernandez


Approved By:           *P. Puzzuto*            
P. Puzzuto


**APPENDIX F**  
**THOR-50M 50<sup>TH</sup> PERCENTILE MALE ATD**  
**PHYSICAL INSPECTION, POST-TEST**

ATD Serial No.: EG2595

Inspection Date: 2021-09-23

Overall Conditon/Functionality	Note
<p><u>Known errors in data channels (no data, clipping, unexpected drops):</u></p> <p>Serial Number: DL9552-FX Right Acetabulum Force X bad channel.</p> <p>Serial Number: DW9502 Occipital Condyle Potentiometer not wired.</p> <p>Serial Number: DL9552-FX Right Acetabulum Force X bad channel, no data recorded during the test*</p> <p>Serial Number: DW9502 Occipital Condyle Potentiometer, no data recorded during the test**</p>	
<p><u>Physical evidence of damage:</u></p> <p>*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.</p> <p>**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></p> <p>THOR-50M S/N EG2595 with DTS SLICE6 Internal DAS</p> <p>Laptop</p> <p>DTS MiniDistributor with cables and PSU</p>	

Technician:   
J. Hernandez

Approved By:   
P. Puzzuto

ATD Serial No.: EG2595

Inspection Date: 2021-09-23

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

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: 2021-09-23


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:	

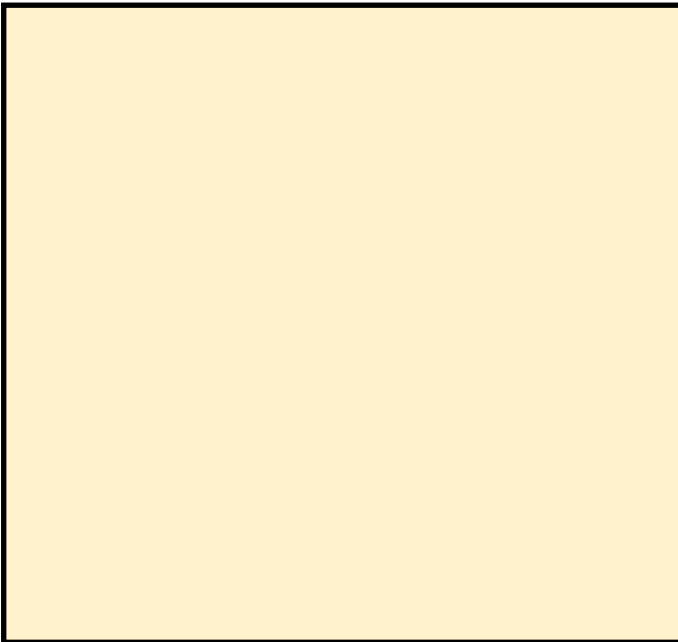
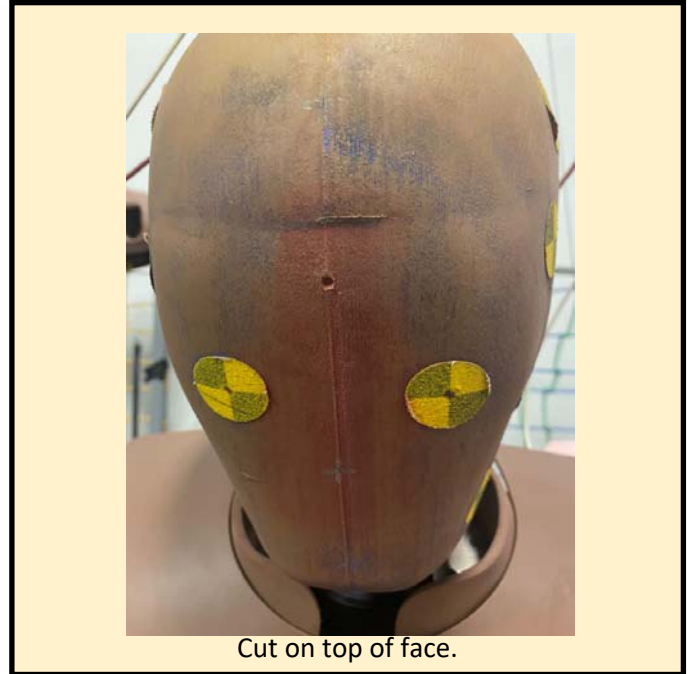
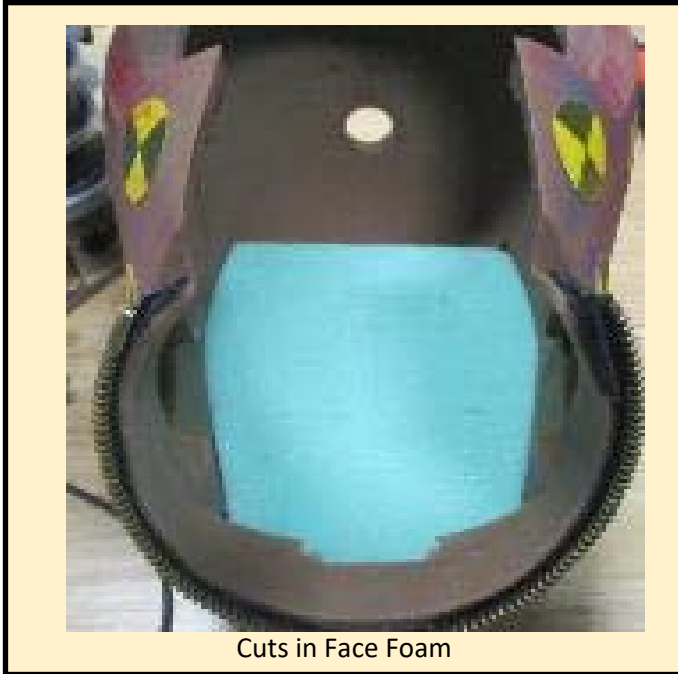
LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts,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



Additional Notes:

Technician: *J. Hernandez*  
J. Hernandez

Approved By: *P. Puzzuto*  
P. Puzzuto







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.:           DO9799          


Inspection Date:           2021-09-23          


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:	

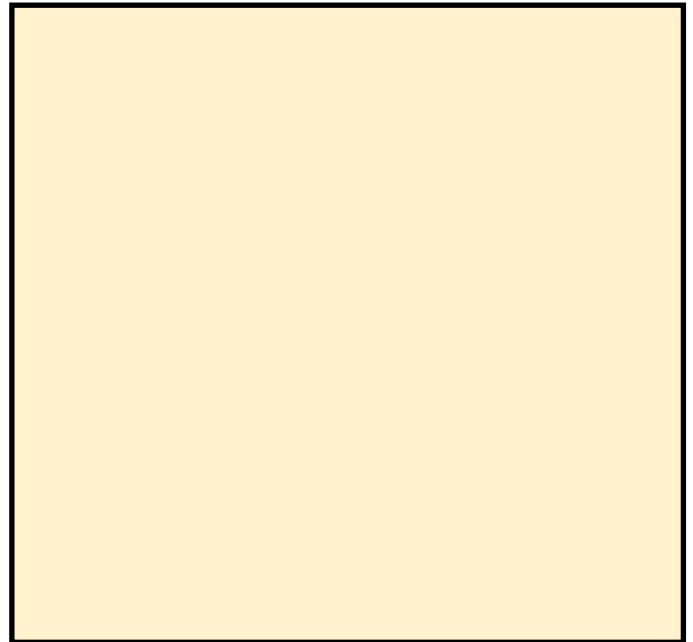
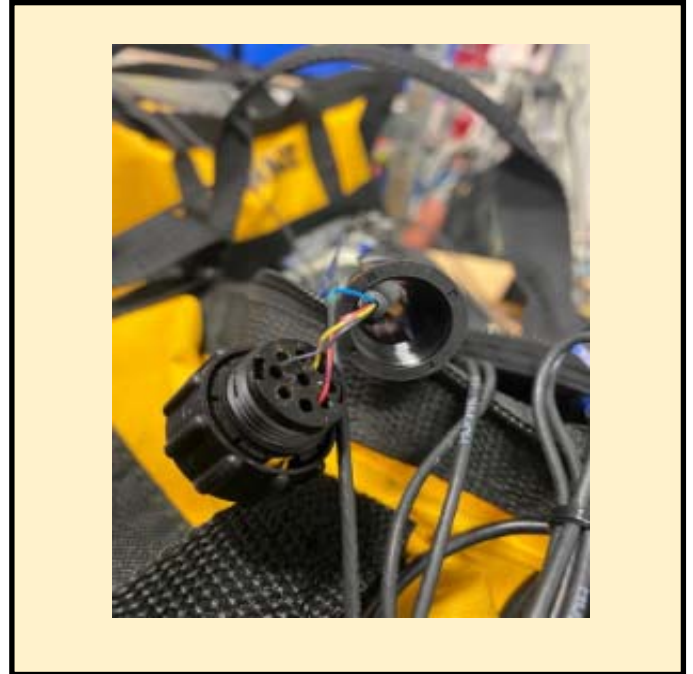
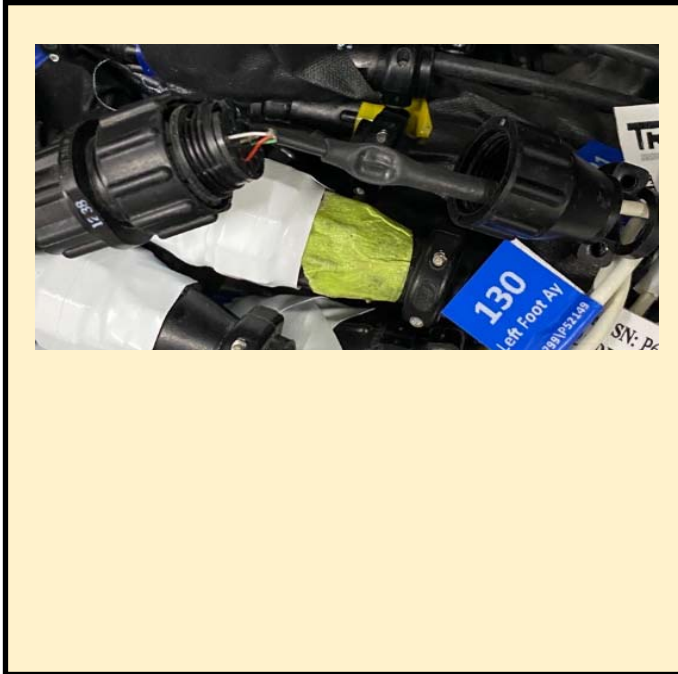
LEFT LOWER EXTREMITY (LX) – Pass(✓)/Fail(✗). If Fail, explain reason and/or attach picture		Note
✓	Rotational potentiometers in ankle securely attached:	
✓	Achilles tendon provides resistance to dorsiflexion:	
✓	No evidence of debonding, tearing, or permanent compression of ankle soft stops:	
✓	No cuts,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



Additional Notes:

Technician:           *J. Hernandez*            
J. Hernandez

Approved By:           *P. Puzzuto*            
P. Puzzuto

**APPENDIX G**  
**THOR-50M 50<sup>TH</sup> 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	ωx	HEAD0000THAVXP	Rotate right ear toward right shoulder	+	-	Yes
		ωy	HEAD0000THAVYP	Rotate chin away from sternum	+	+	No
		ωz	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  
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
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	$\omega_x$	THSP0100THAVXP	Rotate spine sideways to the right	+	NA	NA
		$\omega_y$	THSP0100THAVYP	Rotate spine rearward	+	NA	NA
		$\omega_z$	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	$\omega_x$	THSP0600THAVXP	Right shoulder down	+	-	Yes
		$\omega_y$	THSP0600THAVYP	Shoulders back	+	+	No
		$\omega_z$	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	$\omega_x$	THSP1200THAVXP	Impact back of T12 Spine	+	NA	NA
		$\omega_y$	THSP1200THAVYP	Impact left of T12 Spine	+	NA	NA
		$\omega_z$	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

ATD S/N: EG2595

Date: 5/10/2021

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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
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	$\omega_x$	PELV0000THAVXP	Right shoulder down	+	-	Yes
$\omega_y$		PELV0000THAVYP	Shoulders back, legs up	+	+	No	
$\omega_z$		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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Date: 5/10/2021

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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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Sensor Polarities

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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

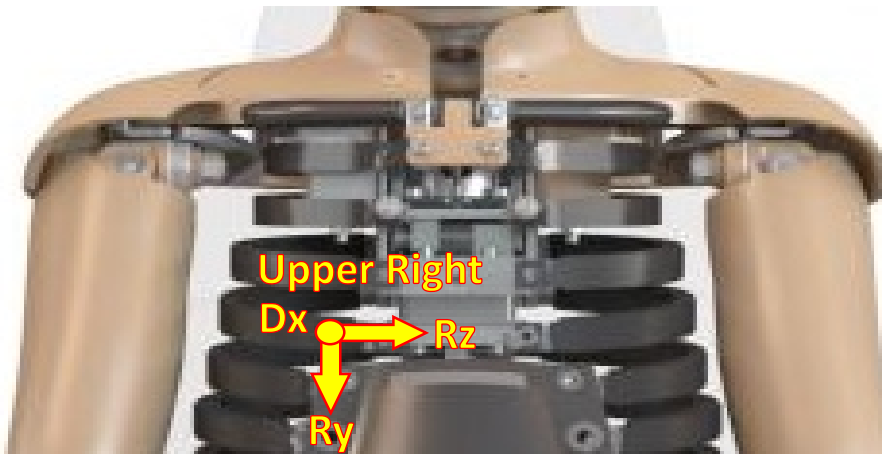
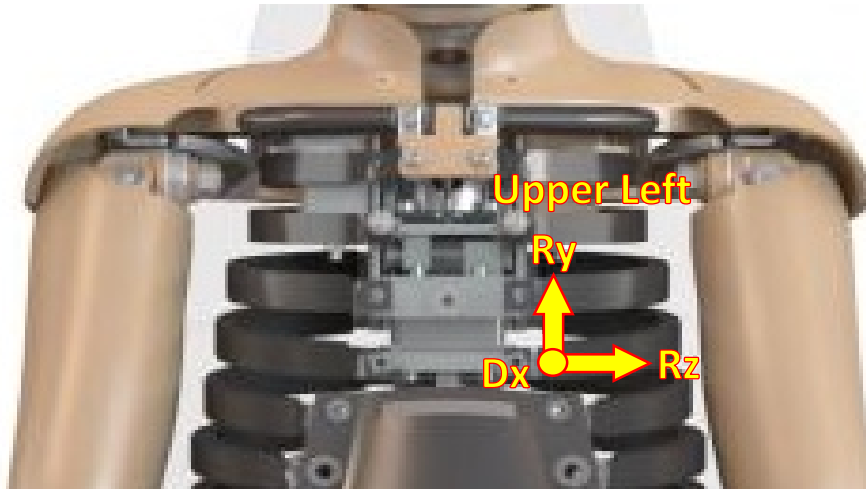
ATD S/N: EG2595

Date: 5/10/2021

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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

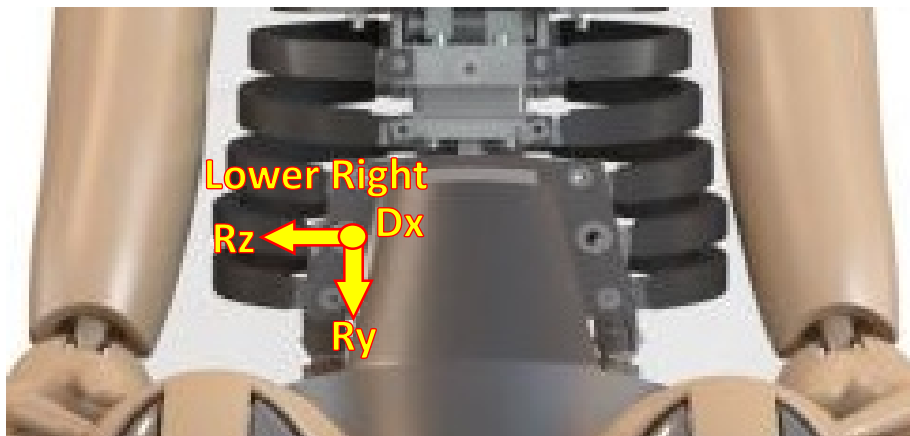
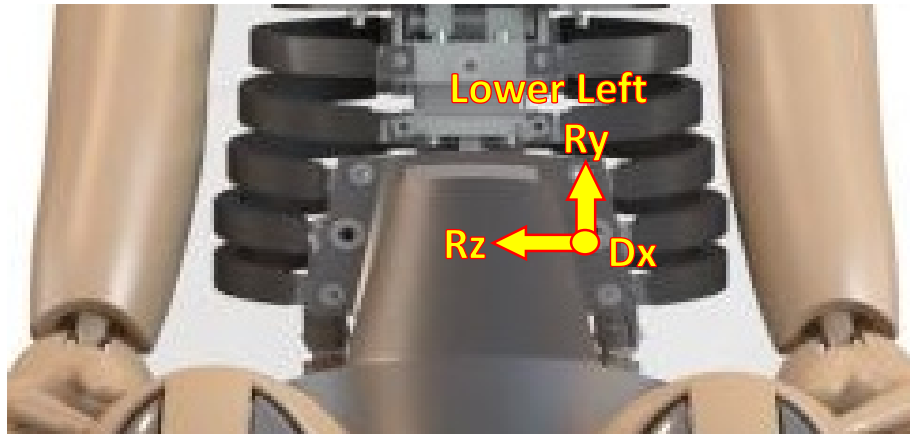
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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
Thorax Lower Left	IRTRACC Raw Voltage	Dx (V)	CHSTLELOTHVOOP	Push Inward	+	+	No
	Rotation Pitch	Ry	CHSTLELOTHANYP	Push upward	+	+	No
	Rotation Yaw	Rz	CHSTLELOTHANZP	Push rightward	+	+	No
Thorax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



THOR-50M 50th Percentile Male ATD  
Sensor Polarities

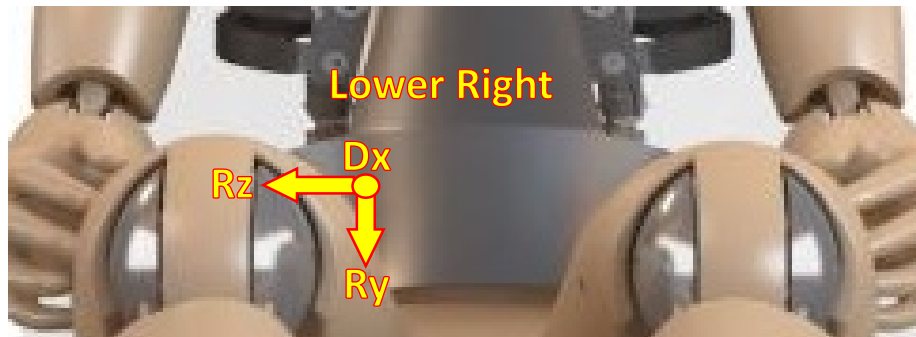
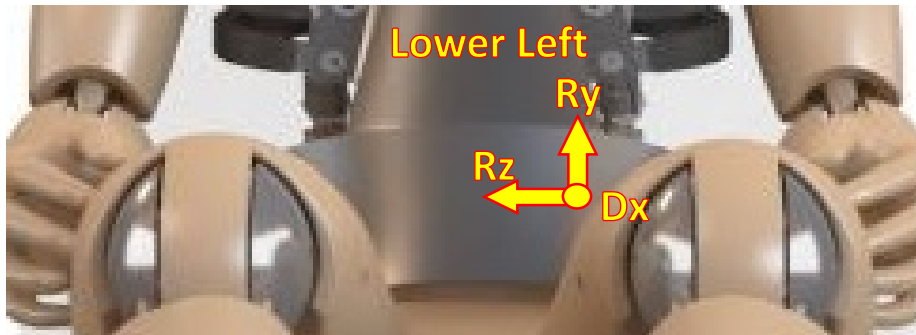
ATD S/N: EG2595

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Segment	Instrument	Axis	ISO Code	Motion	J211	Actual	Invert
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



THOR-50M 50th Percentile Male ATD  
Sensor Polarities

ATD S/N:                     DO9799                    

Date:                     9/10/2021                    

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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	Ax	HEAD0000THACXP	Impact back of head	+	+	No
	Primary	Ay	HEAD0000THACYP	Impact left of head	+	+	No
		Az	HEAD0000THACZP	Impact top of head	+	+	No
		Head Accelerometers	Ax	HEADRD00THACXP	Impact back of head	+	+
	Redundant	Ay	HEADRD00THACYP	Impact left of head	+	+	No
		Az	HEADRD00THACZP	Impact top of head	+	+	No
		Head ARS	$\omega_x$	HEAD0000THAVXP	Rotate right ear toward right shoulder	+	+
	$\omega_y$		HEAD0000THAVYP	Rotate chin away from sternum	+	+	No
	$\omega_z$		HEAD0000THAVZP	Rotate chin toward right shoulder	+	+	No
	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	+	+	No
	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	+	+	No
		Fy	NECKLO00THFOYP	Move head left, chest right	+	+	No
		Fz	NECKLO00THFOZP	Move head up, chest down	+	+	No
		Mx	NECKLO00THMOXP	Rotate left ear toward left shoulder	+	+	No
		My	NECKLO00THMOYP	Rotate chin toward sternum	+	+	No
Mz		NECKLO00THMOZP	Rotate chin toward left shoulder	+	+	No	
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	+	+	No
		Ay	THSP0100THACYP	Impact left of T1Spine	+	+	No
		Az	THSP0100THACZP	Impact top of Spine	+	+	No
	T1 ARS	$\omega_x$	THSP0100THAVXP	Rotate spine sideways to the right	+	+	No
		$\omega_y$	THSP0100THAVYP	Rotate spine rearward	+	+	No
		$\omega_z$	THSP0100THAVZP	Left shoulder forward, right shoulder aft	+	+	No
	Mid Sternum Accelerometer	Ax	STRN0000THACXP	Rotate dummy back (face up)	+	-	Yes
	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	+	+	No
	T6 ARS	$\omega_x$	THSP0600THAVXP	Right shoulder down	+	+	No
		$\omega_y$	THSP0600THAVYP	Shoulders back	+	+	No
		$\omega_z$	THSP0600THAVZP	Left shoulder forward, right shoulder back	+	+	No
	T12 (Thoracic Spine) Accelerometer	Ax	THSP1200THACXP	Impact back of T12 Spine	+	+	No
		Ay	THSP1200THACYP	Impact left of T12 Spine	+	+	No
		Az	THSP1200THACZP	Impact top of Spine	+	+	No
	T12 (Thoracic Spine) ARS	$\omega_x$	THSP1200THAVXP	Impact back of T12 Spine	+	+	No
		$\omega_y$	THSP1200THAVYP	Impact left of T12 Spine	+	+	No
		$\omega_z$	THSP1200THAVZP	Impact top of Spine	+	+	No
	T12 (Thoracic Spine) Load	Fx	THSP1200THFOXP	Move chest rear, pelvis forward	+	-	Yes
		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  
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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	+	+	No
		Fy	ACTBLE00THFOYP	Move femur right, pelvis left	+	-	Yes
		Fz	ACTBLE00THFOZP	Move femur down, pelvis up	+	-	Yes
	Right Acetabular Load	Fx	ACTBRI00THFOXP	Move femur forward, pelvis rear	+	-	Yes
		Fy	ACTBRI00THFOYP	Move femur right, pelvis left	+	+	No
		Fz	ACTBRI00THFOZP	Move femur down, pelvis up	+	+	No
	Pelvis CG Accelerometer	Ax	PELV0000THACXP	Impact back of Pelvis	+	+	No
		Ay	PELV0000THACYP	Impact left of Pelvis	+	+	No
		Az	PELV0000THACZP	Impact top of Spine	+	+	No
	Pelvis CG ARS	$\omega_x$	PELV0000THAVXP	Right shoulder down	+	+	No
		$\omega_y$	PELV0000THAVYP	Shoulders back, legs up	+	+	No
$\omega_z$		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	+	-	Yes
	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	+	+	No
		Ay	TIBILE00THACYP	Impact left of Tibia	+	+	No
	Achilles Load	Fz	ANKLLE00THFOOP	Rotate foot forward	+	+	No
	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	+	+	No
Ay		FOOTLE00THACYP	Impact left of Foot	+	+	No	
Az		FOOTLE00THACZP	Impact top of Foot	+	+	No	

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Date: 9/10/2021

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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
Lower Extremity Right	Knee Shear Displacement	Dx	KNSLR100THDSXP	Hold femur, move tibia forward	+	-	Yes
	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	+	-	Yes
		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	+	+	No
		Ay	TIBIRI00THACYP	Impact left of Tibia	+	+	No
	Achilles Load	Fz	ANKLR100THFOOP	Rotate foot forward	+	+	No
	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	+	+	No
	Foot Acceleration	Ax	FOOTRI00THACXP	Impact back of Foot	+	+	No
Ay		FOOTRI00THACYP	Impact left of Foot	+	+	No	
Az		FOOTRI00THACZP	Impact top of Foot	+	+	No	

THOR-50M 50th Percentile Male ATD  
Sensor Polarities

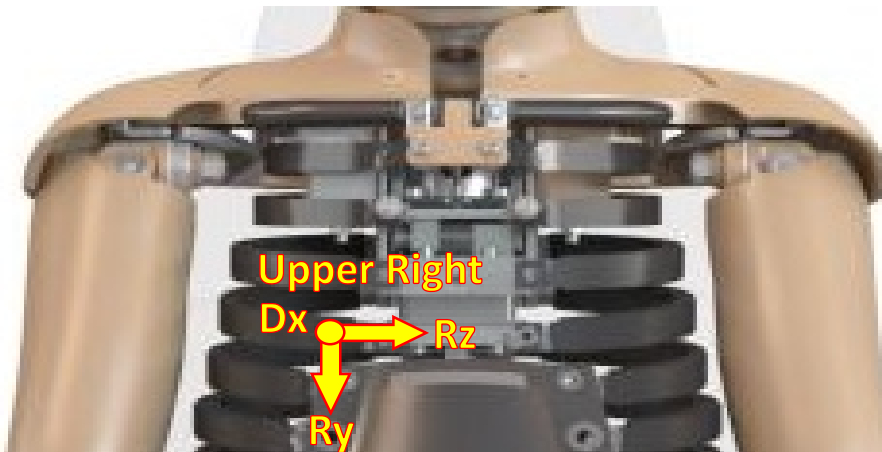
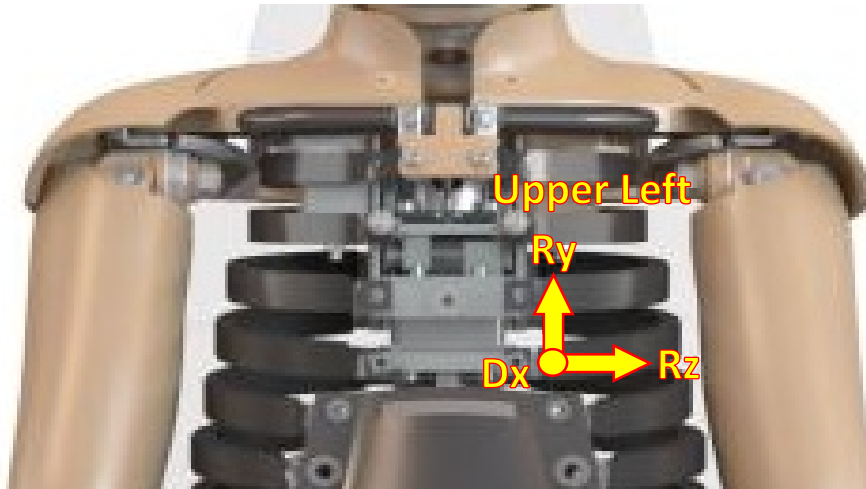
ATD S/N:                      DO9799

Date:            9/10/2021

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
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

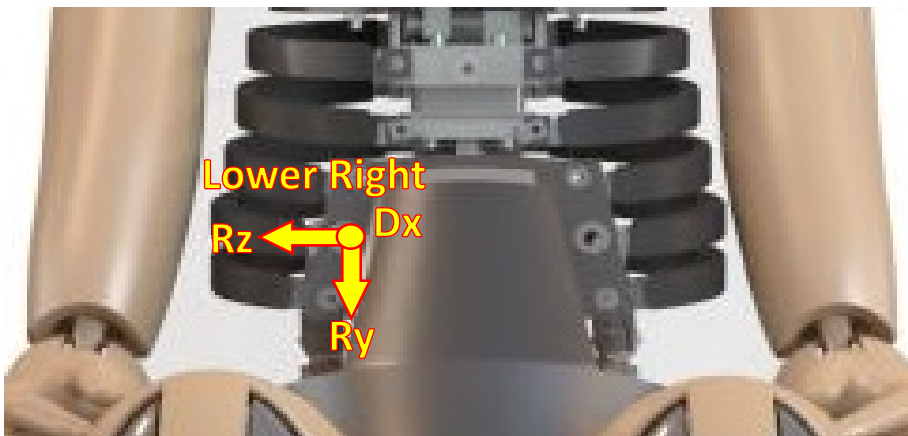
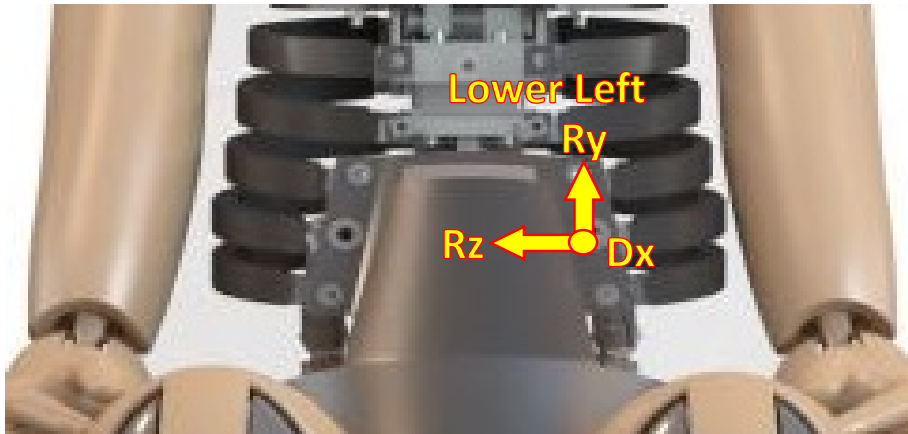
ATD S/N:                     DO9799                    

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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



THOR-50M 50th Percentile Male ATD  
Sensor Polarities

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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

