REPORT NUMBER: R&D-KAR-20-008

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

MAZDA MOTOR CORPORATION

2020 MAZDA CX-5 5-DOOR MPV

NHTSA No: R20205413

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JANUARY 28, 2021

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

VEHICLE SAFETY RESEARCH

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

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TOM, Vehicle Crash Testing
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15. Supplementary Notes

16. Abstract

A 48.0 km/h Left Side 30° Frontal Rigid Barrier Impact Test was conducted on a 2020 Mazda CX-5 5-door MPV in accordance with Contract DTNH22-14-D-00360L, Task Order #693JJ918F000199. The test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on December 15, 2020.

The impact velocity of the vehicle was 47.70 km/h and the ambient temperature at the barrier face at the time of impact was 17.8°C. The vehicle's post-test maximum crush was 434.4 mm measured to left of the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver Hybrid III	Passenger THOR
		Result	Result
Head Injury Criteria (HIC_{15})		379.57	213.00
Brain Injury Criteria (BrIC)			0.82
Nij		0.94	
Peak Neck Tension	N	686.17	506.20
Peak Neck Compression	N	-3406.37	-2473.90
Peak Chest Deflection	mm	-34.86	39.60
Peak Abdomen Deflection	mm		-41.90
Peak Resultant Acetabulum Force	N		3427.20
Peak Femur Force	N	-5008.90	-5145.50
Peak Tibia Index			0.51

17. Key Words	18. Distribution Statement
30° Frontal Rigid Barrier Impact Frontal Research Crash Test THOR Hybrid III	Copies of this report are available from: National Highway Traffic Safety Administration Technical Reference Division 1200 New Jersey Ave., SE Washington, D.C. 20590

19. Security Classification of this report	20. Security Classification of this page	21. No. of Pages	22. Price
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SECTION 1

TEST PURPOSE AND PROCEDURE

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

This 48.0 km/h (29.8 mph) Left Side 30° Frontal Rigid Barrier Impact Test is part of the Frontal Research Crash Test Program outlined in Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for research purposes.

This test was conducted in accordance with the instructions set forth for a 48.0 km/h Left Side 30° Frontal Rigid Barrier Impact, outlined in Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199. Data indicant of Federal Motor Vehicle Safety Standard FMVSS 208 - Occupant Crash Protection, FMVSS 212 – Windshield Mounting, FMVSS 219 (partial) – Windshield Zone Intrusion, and FMVSS 301 – Fuel System Integrity was obtained, in addition to the data required by Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199.

SECTION 2

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

A 48.0 km/h Left Side 30° Frontal Rigid Barrier Impact Test was conducted on a 2020 Mazda CX-5 5-door MPV. The test was performed at Applus IDIADA KARCO Engineering, LLC. on December 15, 2020.

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

One (1) 50th percentile adult male Hybrid III ATD (Serial No. 168) was seated in the right front passenger seating position (P1 - Driver) and one (1) 50th percentile adult male THOR anthropomorphic test device (ATD) (Serial No. DO9799) was seated in the right front seating position (P3 – Passenger). The driver was positioned according to instructions specified in FMVSS 208 Appendix F, Dummy Positioning Procedures for Driver and Passenger Test Dummy Conforming to Subpart E of Part 572. The passenger was positioned according to instructions specified in the THOR 50th Percentile Male Dummy Seating & Positioning Procedures: Right Front Passenger Position.

The driver was restrained with frontal, curtain, and torso/pelvis airbags. The passenger was restrained with a frontal airbag. Both ATDs were unbelted for this test.

One hundred ninety-one (191) channels of data from the two (2) ATD's and the test vehicle were collected using Diversified Technical Systems, Inc. data acquisition systems. Appendix B contains dummy data plots, as well as vehicle response data plots.

The windshield was broken during impact but there was no separation recorded. There was no intrusion into the protected zone of the windshield during any portion of the impact event. The maximum static crush of the vehicle was 434.4 mm measured on the left of the vehicle's centerline.

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

Structural observations include the following:

- The front end including the bumper, grille, and hood were crushed, with the damage concentrated on the left side
- The windshield was broken due to an impact with the driver and passenger ATD's head, respectively

The driver ATD's visible contact points were:

- Head contacted the front airbag, headliner, A-pillar, and windshield
- Upper torso contacted the front airbag, torso-pelvis airbag, and seat bolster
- Lower torso contacted the front airbag and seat bolster
- Left leg contacted the steering column, and knee bolster
- Right leg contacted the steering column, and knee bolster

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

- Head contacted the front airbag and windshield
- Upper torso contacted the front airbag
- Lower torso contacted the front airbag
- Left leg contacted the knee bolster
- Right leg contacted the knee bolster

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Impact Velocity	km/h	47.20
Test Vehicle Weight	kg	1785.0
Maximum Static Crush	mm	434.4
Number of Data Channels		191
Number of Real-Time Cameras		1
Number of High-Speed Cameras		18

DUMMY CONTACTS

Description	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	Hybrid III, S/N: 168		THOR, S/N: DO9799	
Head Contact	Front Airbag, Headliner, A-Pillar, Windshield	A-44, A-89, A-91a, A-91b	Front Airbag, Windshield	A-93, A-134
Upper Torso Contact	Front Airbag, Torso/Pelvis Airbag, Seat Bolster	A-91d, A-91e	Front Airbag	A-134
Lower Torso Contact	Front airbag, Seat Bolster	A-91e	Front airbag	A-134
Left Leg Contact	Steering Column, Knee Bolster	A-80	Knee bolster	A-136b
Right Leg Contact	Steering Column, Knee Bolster	A-80	Knee bolster	A-136b

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

DATA ANOMALIES

Channel Description	Explanation
Right Acetabulum Force X	No data recorded. The Right Acetabulum Force X was damaged upon receipt. Upon investigation it was determined that the load cell needed to be replaced. NHTSA approved running the test without recording the channel.
Occipital Condyle Potentiometer	No data recorded. The sensor was not wired when received and was not required to be recorded. NHTSA approved running the test without recording this channel.

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

	Driver, Hybrid III 50th Percentile Male S/N 168				
Injury Reading	**Units**	**Limit**	**Value**	**t^1**	**t^2**
HIC 15		700	379.570	110.2	125.2
Nij		1	0.939	123.4	***NCE***
Upper Neck Force Z (Tension)	N	4170	686.170	90.5	
Upper Neck Force Z (Compression)	N	4000	-3406.370	116.6	
Upper Neck Moment Y (Flexion)	Nm	310	27.043	160.2	
Upper Neck Moment Y (Extension)	Nm	135	-76.702	126.6	
Chest Deflection	mm	63	-34.855	117.7	
3 ms Chest Clip	g	60	46.186	112.8	115.8
Femur Force, Left	N	10000	-5008.901	87.1	
Femur Force, Right	N	10000	-4644.207	76.1	

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

Passenger, THOR S/N DO9799					
LOCATION	**DESCRIPTION**	**UNIT**	**SOURCE**	**MAX**	**MIN**
Head	HIC 15ms		Compute	213.0	
	Brain Injury Criteria (BrIC)		Compute	0.821	
	Head Rotational Velocity X	Deg/s	60	63.7	-1142.4
	Head Rotational Velocity Y	Deg/s	60	328.6	-1461.5
	Head Rotational Velocity Z	Deg/s	60	1512.7	-505.3
Neck	Upper Neck Z-axis Force	N	1000	506.2	-2473.9
	Upper Neck Y-axis Moment	Nm	600	20.1	-23.6
Chest	Upper Left Resultant Chest Deflection	mm	Compute	22.8	
	Upper Right Resultant Chest Deflection	mm	Compute	22.8	
	Lower Left Resultant Chest Deflection	mm	Compute	39.6	
	Lower Right Resultant Chest Deflection	mm	Compute	30.6	
Abdomen	Lower Left X-axis Deflection	mm	Compute	4.9	-41.9
	Lower Right X-axis Deflection	mm	Compute	6.8	-15.1
Acetabulum	Left Acetabulum Resultant Force	N	Compute	2504.1	
	Right Acetabulum Resultant Force	N	Compute	3427.2	
Femur	Left Femur Force, FZ	N	600	469.3	-3878.6
	Right Femur Force, FZ	N	600	216.4	-5145.5
Tibia	Left Upper Tibia, FZ	N	600	404.9	-1924.1
	Left Upper Tibia Index		Compute	0.507	
	Right Upper Tibia, FZ	N	600	155.6	-1703.1
	Right Upper Tibia Index		Compute	0.299	
	Left Lower Tibia, FZ	N	600	171.7	-2226.6
	Left Lower Tibia Index		Compute	0.198	
	Right Lower Tibia, FZ	N	600	143.9	-2059.0
	Right Lower Tibia Index		Compute	0.193	
Ankle	Left Ankle Rotation, RX	Deg	180	20.9	-8.9
	Left Ankle Rotation, RY	Deg	180	-1.2	-27.3
	Left Ankle Dorsiflexion Moment, MY	Nm	Compute	31.7	-80.0
	Left Ankle In/Eversion Moment, MX	Nm	Compute	25.7	-6.3
	Right Ankle Rotation, RX	Deg	180	19.0	-24.9
	Right Ankle Rotation, RY	Deg	180	15.8	7.7
	Right Ankle Dorsiflexion Moment, MY	Nm	Compute	8.9	-9.3
	Right Ankle In/Eversion Moment, MX	Nm	Compute	16.3	-35.3

Anomalies:

Right Acetabulum Force X not functioning

SECTION 3

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	R20205413
Model Year	2020
Make	Mazda
Model	CX-5
Body Style	5-Door MPV
VIN	JM3KFABM9L0804788
Body Color	Jet Black Mica
Odometer Reading (km / mi)	34 / 21
Engine Displacement (L)	2.5
Type / No. of Cylinders	Inline 4-Cylinder
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	3
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes (Driver)
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation
Date of Manufacture	Feb-20

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

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

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

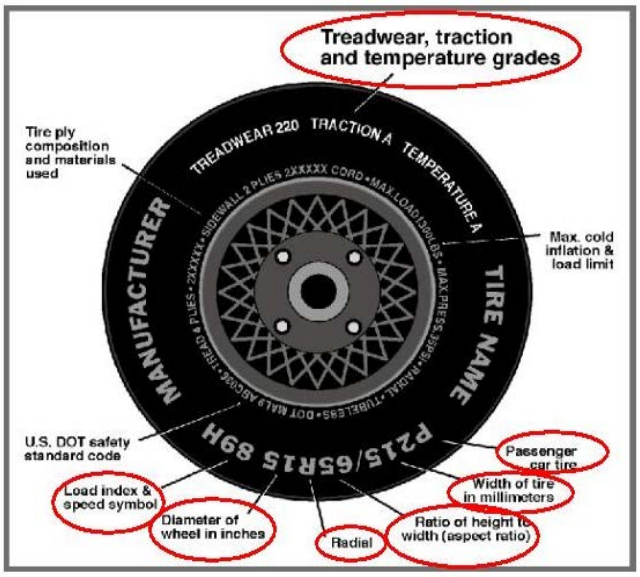
*A maximum RCLW of 136.0 kg is used for a truck, MPV, or bus

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	P225/65R17	P225/65R17
Tire Size on Vehicle	P225/65R17	P225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander G91	Geolander G91
Treadware	280	280
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index/Speed Symbol	100H	100H
Tire Material	Steel, Polyester, Nylon	Steel, Polyester, Nylon
DOT Safety Code Left	FDF5-PC50 520	FDF5-PC50 520
DOT Safety Code Right	FDF5-PC50 520	FDF5-PC50 520

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	460.0	310.0		497.0	400.0	
Right	kg	456.5	328.5		501.0	387.0	
Ratio	%	58.9%	41.1%	100.0%	55.9%	44.1%	100.0%
Total	kg	916.5	638.5	1555.0	998.0	787.0	1785.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1555.0	A
Weight of THOR-50M and AM50	kg	192.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	44.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1791.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	875	878	868	905	1109
As Tested	mm	864	864	831	867	1190
Post-Test	mm	845	840	810	920	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2700
Total Vehicle Length at Left Side	mm	4307
Total Vehicle Length at Centerline	mm	4558
Total Vehicle Length at Right Side	mm	4313
Weight of Ballast/Equipment in Cargo Area	kg	91.5
Weight of Vehicle Components Removed	kg	26.0
Amount of Stoddard Solvent in Fuel Tank	L	52.10

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Taillights, spare tire and tools, rear trim, underbody covers

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Units	Pre-Test
1	Total Length	mm	4558
2	Total Width	mm	1837
3*	Bumper Top Height	mm	599
4*	Bumper Bottom Height	mm	434
5*	Longitudinal Member Top Height	mm	599
6	Distance Between Longitudinal Members	mm	867
7	Longitudinal Member Width	mm	88
8*	Engine Top Height	mm	930
9*	Engine Bottom Height	mm	219
10	Engine and Gearbox Width	mm	603
11	Front Bumper to Engine Distance	mm	491
12*	Front Shock Absorber Fixing Height	mm	1020
13*	Bonnet Leading Edge Height	mm	900
14	Front Shock Absorber Fixing Width	mm	594
15	Front Bumper to Front Axle Distance	mm	945
16	Front Axle to A-Pillar Distance	mm	595
17	A-Pillar to B-Pillar Distance	mm	987
18	B-Pillar to Rear Axle Distance	mm	1102
19	B-Pillar to C-Pillar Distance	mm	990
20*	Roof Sill Bottom Height	mm	1555
21*	Roof Sill Top Height	mm	1665
22*	Floor Sill Bottom Height	mm	330
23*	Floor Sill Top Height	mm	420

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

DATA SHEET NO. 2

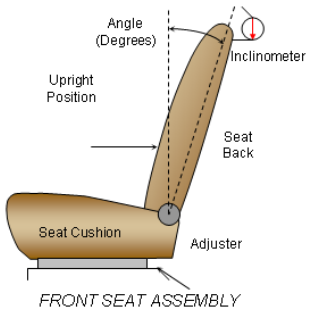
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

NOMINAL DESIGN RIDING POSITION

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

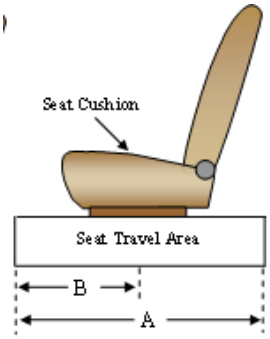


SEAT BACK ANGLE

Seating Position	Unit	FORM 208 Position	After ATD Positioning
Driver Seat Back Angle	Degrees	6.2	6.2
Passenger Seat Back Angle	Degrees	6.2	8.5

SEAT FORE / AFT POSITIONING

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



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore/Aft Travel (mm)	Placed in Position (mm)
Driver Seat	320	170
Passenger Seat	258	129

SEAT BELT UPPER ANCHORAGE

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

SEAT BELT UPPER ANCHORAGES

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

DATA SHEET NO. 2 … (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

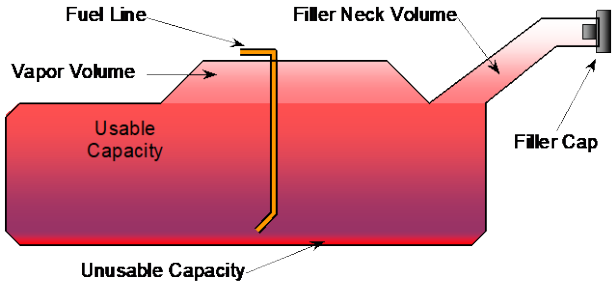
Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	56.02
Usable Capacity of "Optional Tank"	
93% of Usable Capacity	52.10
Actual Amount of Stoddard Solvent Used	52.10
1/3 of Usable Capacity	18.67

FUEL PUMP

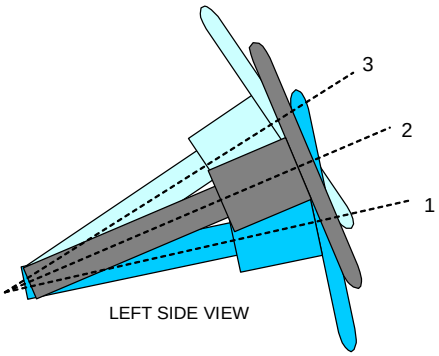
Fuel was evacuated according to the specifications provided by the manufacturer in Form 208. The electric fuel pump operates when the electrical system is activated.



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.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

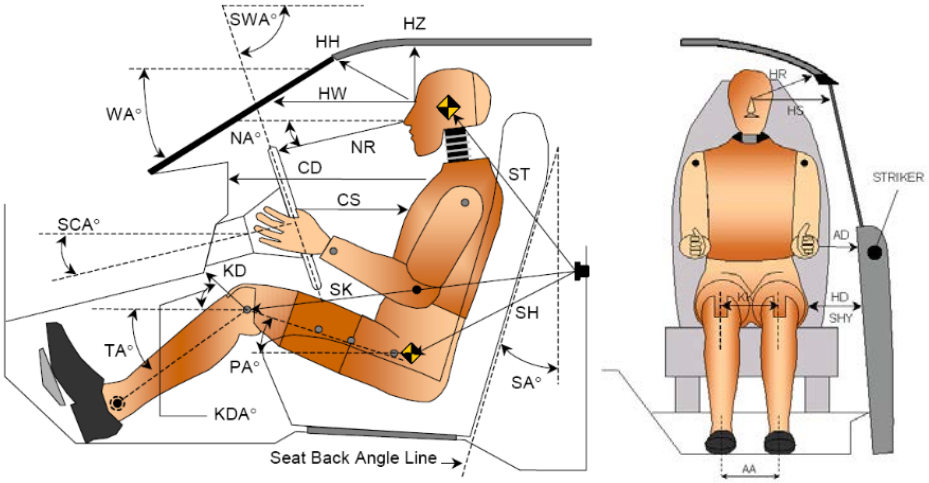
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	23.1	110
Geometric Center Position, No. 2	25.5	132.5
Uppermost Position, No. 3	27.8	155
Telescoping Steering Wheel Travel		45
Test Position	25.5	132.5

DATA SHEET NO. 3

DUMMY CLEARANCE DIMENSIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20



LEFT SIDE VIEW

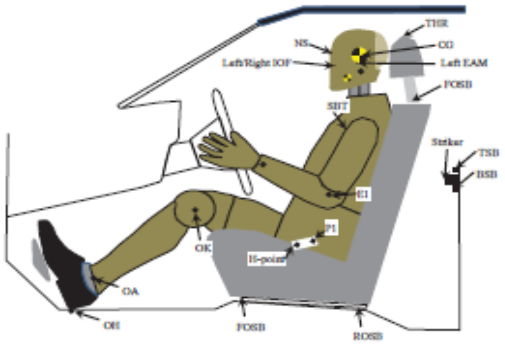
Code	Measurement Description	Driver S/N# 168		Passenger S/N# DO9799	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
HZ	Nasion to Roof (Z Distance)	233		186	
HH	Nasion to Header (3D Distance)	344		376	
HW	Nasion to Windshield Point 1 Inside (X Distance)	738		686	
NR	Tip of Nose to Top of Steering Wheel (3D Distance)	401			
CD	Chest Point 1 to Dash Point 1 (3D Distance)	528		564	
CS	Chest Point 2 to Center of Steering Wheel (X Distance)	297			
CBS	Chest Point 3 to Bottom of Steering Wheel (X Distance)	178			
IKD	Inboard Knee to Dash Point 3 (3D Distance)			82	
OKD	Outboard Knee to Dash Point 2 (3D Distance)	150		100	
HR	Nasion to Side Header (3D Distance)	245		201	
HS	Nasion to Side Window Distance (Y Distance)	366		331	
AD	Elbow to Door (Y Distance)	155		48	
HD	H-Point to Door (Y Distance)	222		211	
HLHL	Inboard Heel to Outboard Heel (Y Distance)			262	
KK	Inboard Knee to Outboard Knee (Y Distance)			233	
SH	Striker to H-Point (3D Distance)	329		333	
HRA	Head Restraint Post Angle		6.2		8.5
	H-Point Tool Angle		24.8		14.8
	Torso Angle		13.8		20.2
	Windshield Angle		60.4		61.3
	Head Angle (X)				0.6
	Head Angle (Y)				-0.8
	T1 Angle (X)				0.1
	T1 Angle (Y)				1.4
	T6 Angle (X)				0.1
	T6 Angle (Y)				21.0
	T12 Angle (X)				0.5
	T12 Angle (Y)				29.7
	Pelvis Angle (X)				0.0
	Pelvis Angle (Y)				31.1

DATA SHEET NO. 4

DUMMY CMM MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20



Description	Units	Driver S/N# 168			Passenger S/N# DO 9799		
		X	Y	Z	X	Y	Z
Center of Upper Striker Bolt	mm	2032	-792	-324	2034	798	-323
Center of Lower Striker Bolt	mm	2038	-793	-289	2039	800	-288
Center of Striker Bar	mm	2066	-795	-312	2067	801	-312
Front Outboard Seat Bolt	mm	2557	-606	83	2559	611	81
Rear Outboard Seat Bolt	mm	2116	-604	129	2118	610	128
Center of Steering Wheel Hub	mm	2557	-368	-531			
Outer Head Restraint Post	mm	1886	-446	-644	1871	457	-672
Right Head CG	mm	2133	-285	-768	2073	450	-826
Left Head CG	mm	2132	-438	-767	2074	294	-826
Right EAM	mm						
Left EAM	mm						
Nasion	mm	2225	-365	-772	2162	375	-840
Right IOF	mm				2161	406	-802
Left IOF	mm				2163	342	-803
Tip of Nose	mm	2247	-363	-728	2167	374	-772
Tip of Chin	mm	2228	-362	-658	2163	371	-698
Chest Point 1	mm	2275	-357	-520	2209	375	-581
Chest Point 2	mm	2264	-367	-536			
Chest Point 3	mm	2331	-367	-381			
Shoulder Point 1	mm	2112	-550	-512	2059	563	-592
Shoulder Point 2	mm				2113	554	-569
Elbow	mm	2325	-605	-356	2227	647	-312
Center of H-Point Tool	mm				2234	619	-202
H-Point on H-Point Tool	mm	2291	-646	-124	2311	616	-181
H-Point on ATD Skin	mm	2292	-546	-123	2311	561	-180
Outboard Knee	mm	2684	-551	-278	2723	519	-287
Inboard Knee	mm				2723	286	-289
Outboard Ankle	mm	2957	-578	57	3046	558	-22
Inboard Ankle	mm	2964	-260	61	3015	324	4
Outboard Heel	mm	2986	-549	161	3033	541	124
Inboard Heel	mm	2972	-227	153	2990	284	143

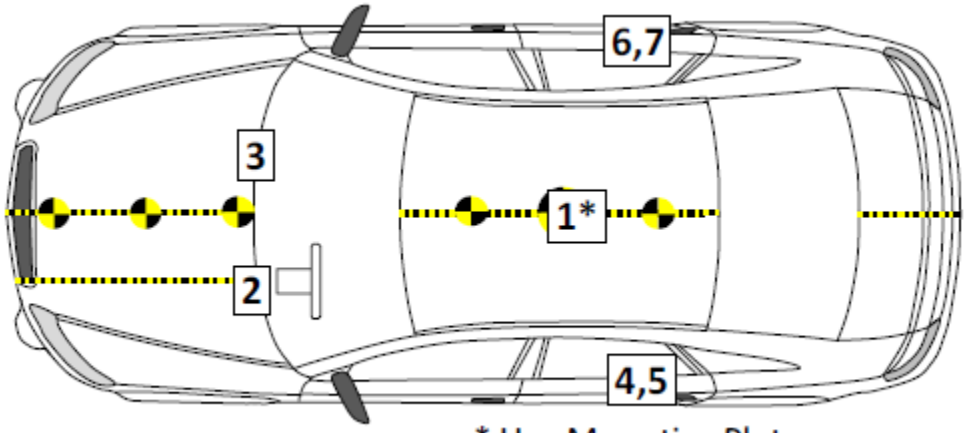
Reference Point:
+X – From the rear of the vehicle to the front of the vehicle
+Y – From the left side of the vehicle to the right side of the vehicle
+Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 5

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20



* 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	1812	2	78
2	Driver Floor Pan	x, y, z	°/s	3296	-402	33
3	Passenger Floor Pan	x, y, z	g	3235	396	80
4	Door Sill LR	x, y	g	1608	-718	157
5	Door Sill LR Redundant	x, y	g	1584	-720	157
6	Door Sill RR	x, y	g	1606	707	158
7	Door Sill RR Redundant	x, y	g	1583	707	158

Reference Point:

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

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

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

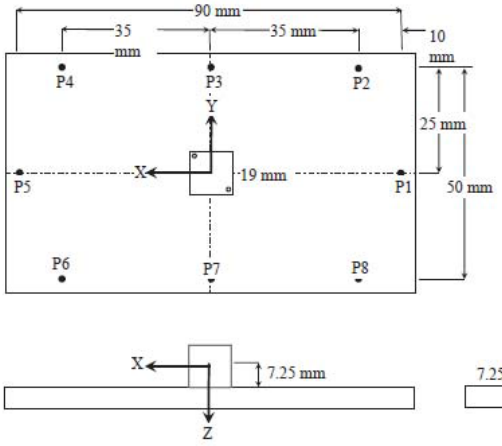
DATA SHEET NO. 5 … (CONTINUED)

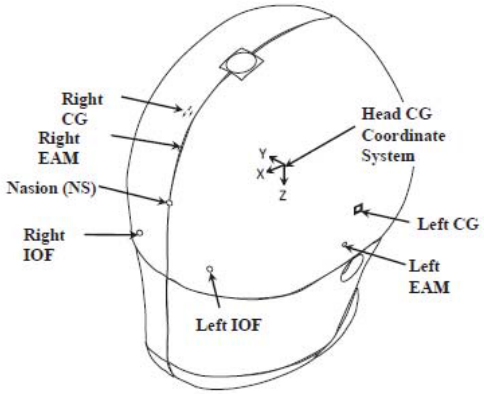
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

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	1859	1	74
P2	Plate Point 2	mm	1851	-21	75
P3	Plate Point 3	mm	1817	-23	75
P4	Plate Point 4	mm	1786	-23	76
P5	Plate Point 5	mm	1771	2	76
P6	Plate Point 6	mm	1778	29	80
P7	Plate Point 7	mm	1813	28	78
P8	Plate Point 8	mm	1851	26	75

PASSENGER HEAD POINTS IN RELATION TO HEAD CG COORDINATE SYSTEM

Description	Units	x	y	z
Left CG	mm	65	-41	44
Left EAM	mm	71	-36	72
Left IOF	mm	154	2	73
Right IOF	mm	153	66	72
Nasion	mm	157	36	35
Right EAM	mm	73	107	73
Right CG	mm	64	111	44

DATA SHEET NO. 5 … (CONTINUED)

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

Location No.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Min	Time (ms)
1	Vehicle CG	x	g	5.8	36.4	-43.6	67.7
		y	g	14.1	47.5	-4.6	35.2
		z	g	28.4	41.9	-26.1	33.7
	Vehicle CG Rotation	x	°/s	171.2	51.9	-131.1	63.4
		y	°/s	86.4	18.4	-164.1	43.6
		z	°/s	40.0	56.9	-53.1	297.6
2	Driver Floor Pan	x	g	13.4	15.6	-25.6	66.2
		y	g	15.9	43.9	-9.7	77.6
		z	g	36.8	68.6	-6.4	15.5
3	Passenger Floor Pan	x	g	3.0	22.6	-23.3	88.7
		y	g	16.6	44.7	-10.8	81.9
		z	g	27.5	66.9	-6.6	86.8
4	Door Sill LR	x	g	1.3	118.4	-36.0	68.8
		y	g	13.7	47.3	-4.6	78.6
5	Door Sill LR Redundant	x	g	2.7	118.3	-39.4	68.8
		y	g	13.5	47.4	-3.2	18.5
6	Door Sill RR	x	g	0.7	116.8	-27.7	67.1
		y	g	16.1	48.1	-5.1	18.8
7	Door Sill RR Redundant	x	g	0.6	155.8	-30.2	67.3
		y	g	16.1	48.3	-3.2	34.7

Note: See Appendix B for all vehicle data plots

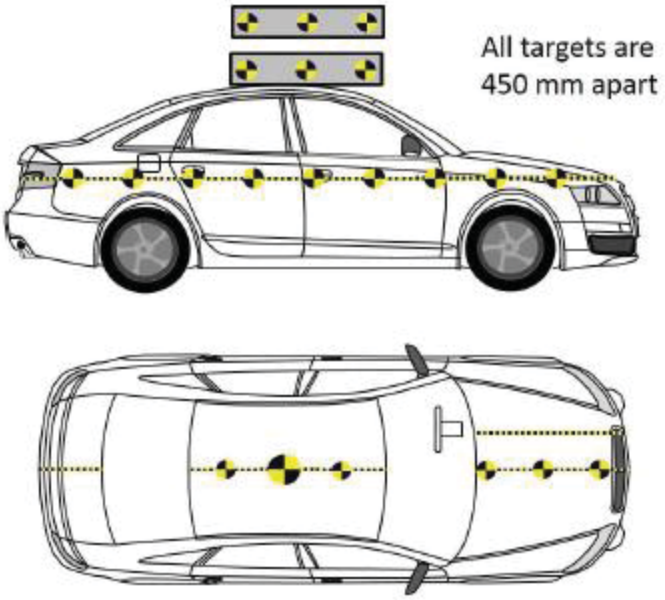
DATA SHEET NO. 6

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

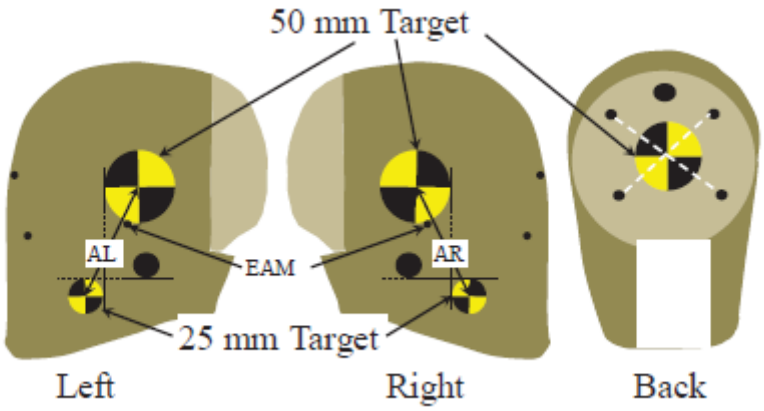
Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

VEHICLE TARGETS



ATD HEAD TARGETS



Driver

Target	Units	Measurement
AL	mm	97
AR	mm	98

DATA SHEET NO. 7

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Sensors	118
Passenger Dummy Sensors	43
Vehicle Structure Sensors	20
Airbag Timing Sensors	10
Total	191

CAMERA COVERAGE

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

DATA SHEET NO. 8

POST TEST OBSERVATIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	HIII / 168	THOR-50M / DO9799
Lower Leg Type		LX
Lower Leg Serial No.		
Head Contact	Front Airbag, Headliner, A-Pillar, Windshield	Front Airbag, Windshield
Upper Torso Contact	Front Airbag, Torso/Pelvis Airbag, Seat Bolster	Front Airbag
Lower Torso Contact	Front Airbag, Seat Bolster	Front Airbag
Left Knee Contact	Steering Column, Knee Bolster	Knee bolster
Right Knee Contact	Steering Column, 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)	0 mm	0 mm
Seat Back Failure	None	None
Glazing Damage	None	

POST TEST STRUCTURAL OBSERVATIONS

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

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 9

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4558	4528	-30
2	Rear Surface of Vehicle to Front of Engine	4066	3964	-102
3	RSOV to Firewall	3546	3548	1
4	RSOV to Upper Leading Edge of Right Door	3058	3059	1
5	RSOV to Upper Leading Edge of Left Door	3057	3057	0
6	RSOV to Lower Leading Edge of Right Door	3084	3086	1
7	RSOV to Lower Leading Edge of Left Door	3081	3071	-10
8	RSOV to Upper Trailing Edge of Right Door	1943	1945	2
9	RSOV to Upper Trailing Edge of Left Door	1943	1946	3
10	RSOV to Lower Trailing Edge of Right Door	2071	2075	4
11	RSOV to Lower Trailing Edge of Left Door	2069	2071	2
12	RSOV to Bottom of A-Pillar, Right Side	3017	3020	2
13	RSOV to Bottom of A-Pillar, Left Side	3017	3019	2
14	RSOV to Firewall, Right Side	3634	3636	1
15	RSOV to Firewall, Left Side	3632	3607	-25
16	RSOV to Steering Column	2559	2568	9
17	Center of Steering Column to A-Pillar	458	451	-8
18	Center of Steering Column to Headliner	468	563	95
19	RSOV to Right Side of Front Bumper	4313	4318	5
20	RSOV to Left Side of Front Bumper	4307	3967	-341
21	Length of Engine Block	488	457	-31
RD	RSOV to Right Side of Dash Panel	2784	2791	7
CD	RSOV to Center of Dash Panel	2752	2774	22
LD	RSOV to Left Side of Dash Panel	2785	2792	7

All measurements in millimeters.

DATA SHEET NO. 10

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

VEHICLE INFORMATION

VIN: JM3KFABM9L0804788 Wheelbase (mm): 2700

Vehicle Size Category: 5-door MPV Test Weight (kg): 1785.0

ACCELEROMETER DATA

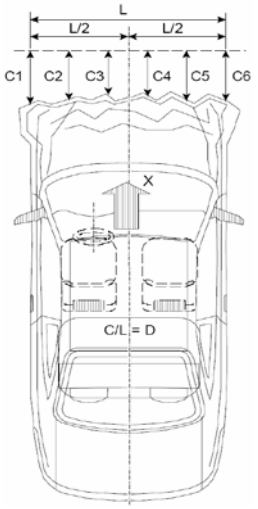
Accelerometer Locations: Vehicle CG_x

Cal. Procedure/Interval: Vibration Test / 6 months

Integration Algorithm: NHTSA Standard

Linearity: Good

Impact Velocity (km/h): 47.70



CRUSH PROFILE

Collision Deformation Classification: 12FLEW2

Midpoint of Damage: 750.2

Damage Region Length (mm): 1500.3

Impact Mode: Left Side 30° Frontal

Crush Measurements

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4305	3963	-343
C2	Crush Zone 2 at Left Side	mm	4451	4016	-434
C3	Crush Zone 3 at Left Side	mm	4509	4214	-295
C4	Crush Zone 4 at Right Side	mm	4510	4374	-136
C5	Crush Zone 5 at Right Side	mm	4449	4478	29
C6	Crush Zone 6 at Right Side	mm	4311	4314	3
L	C1 to C6	mm	1500		

DATA SHEET NO. 11

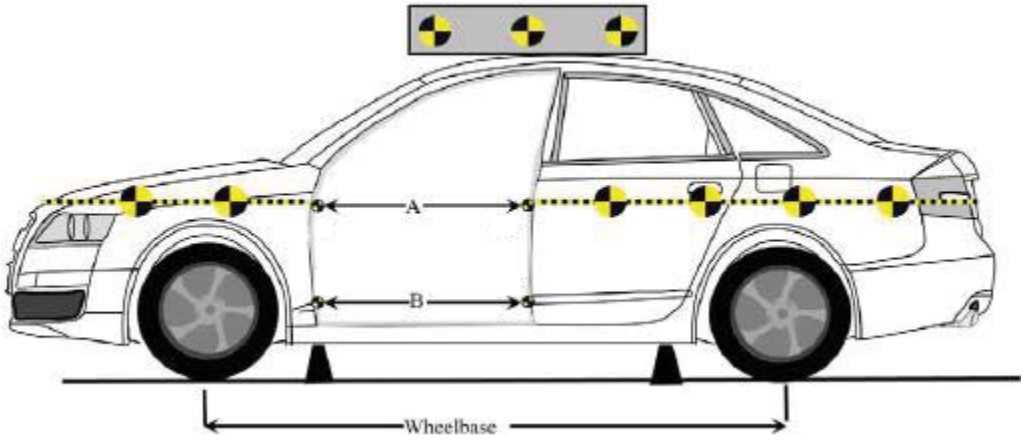
VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Driver Side Upper	mm	870	869	1
B	Driver Side Lower	mm	736	739	-3
D	Passenger Side Upper	mm	874	874	1
E	Passenger Side Lower	mm	737	739	-2



DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

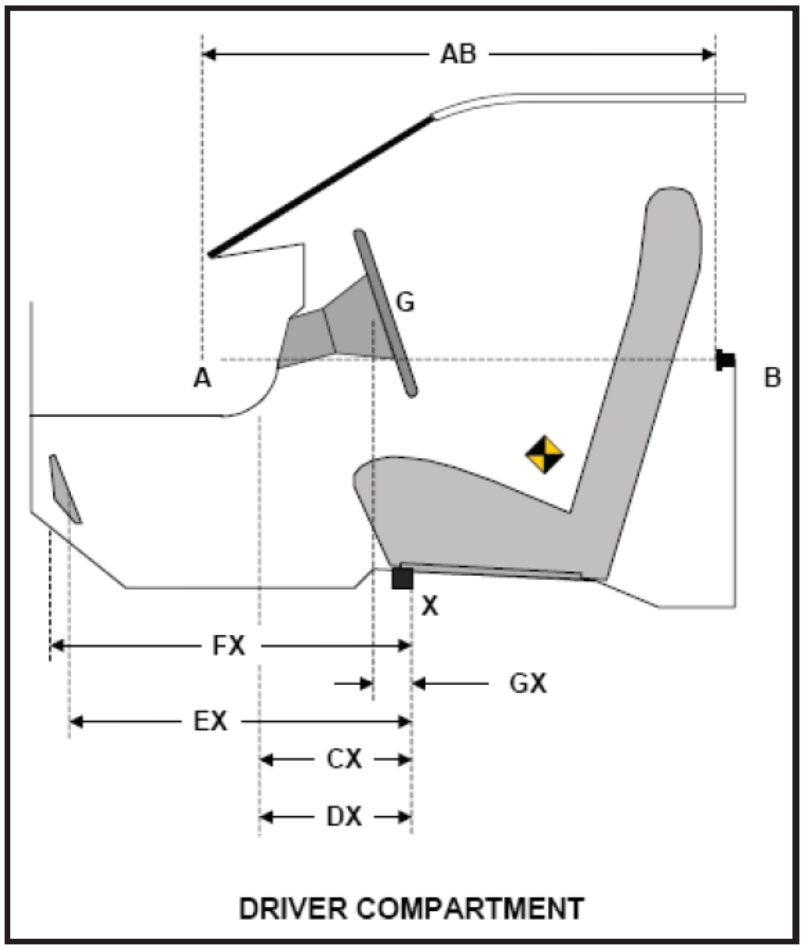
Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	858	857	1
CX	Left Knee Bolster to X	mm	281	277	4
DX	Right Knee Bolster to X	mm	260	296	-35
EX	Brake Pedal to X	mm	525	593	-68
FX	Footrest to X	mm	659	657	2
GX	Center of Steering Column Wheel Hub to X	mm	2	7	-5

X = Front of Seat Track (Stationary)



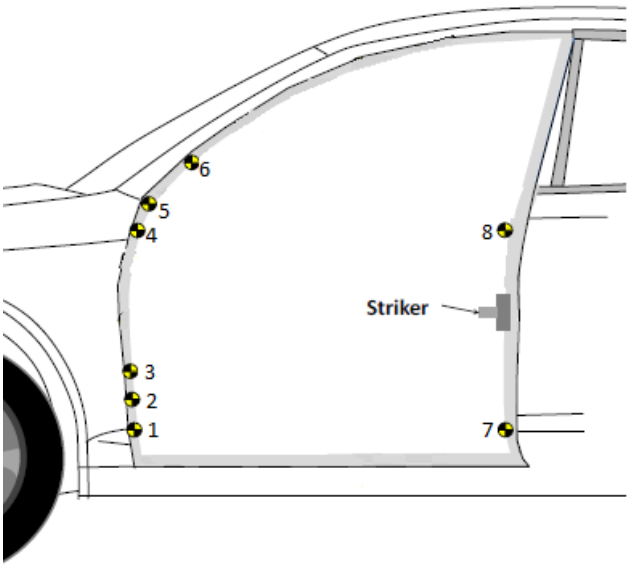
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

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	2957	-751	-14	2957	-749	-16	0	2	-2
2	2968	-747	-89	2968	-745	-93	0	2	-4
3	2956	-743	-166	2956	-742	-170	0	1	-4
4	2917	-745	-464	2918	-746	-466	1	-1	-2
5	2908	-749	-540	2907	-751	-544	-1	-2	-5
6	2880	-750	-614	2885	-752	-618	5	-2	-4
7	2221	-755	-14	2218	-755	-14	-3	0	0
8	2048	-738	-467	2049	-739	-467	2	-1	0

All measurements in millimeters.

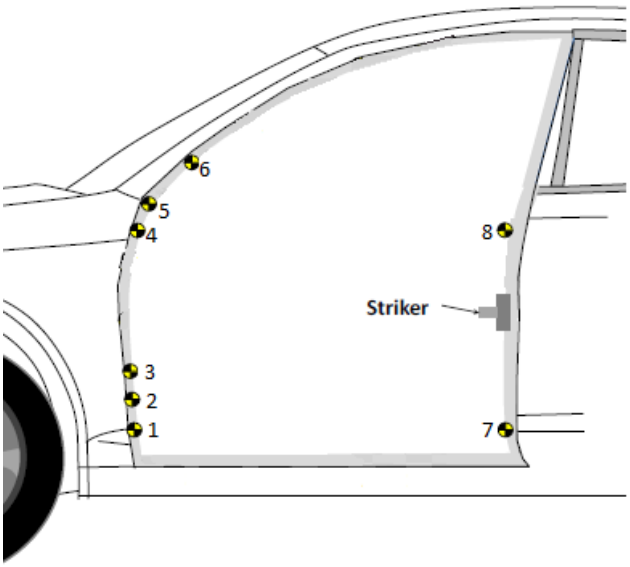
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

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	2958	756	-14	2960	756	-12	1	0	2
2	2966	751	-92	2965	752	-89	-1	1	3
3	2958	747	-164	2958	748	-162	0	1	2
4	2923	749	-468	2923	751	-465	0	2	3
5	2907	753	-540	2909	756	-541	1	2	-1
6	2880	755	-618	2877	757	-616	-2	2	2
7	2221	761	-14	2220	762	-11	-1	1	3
8	2048	744	-465	2049	746	-463	1	1	2

All measurements in millimeters.

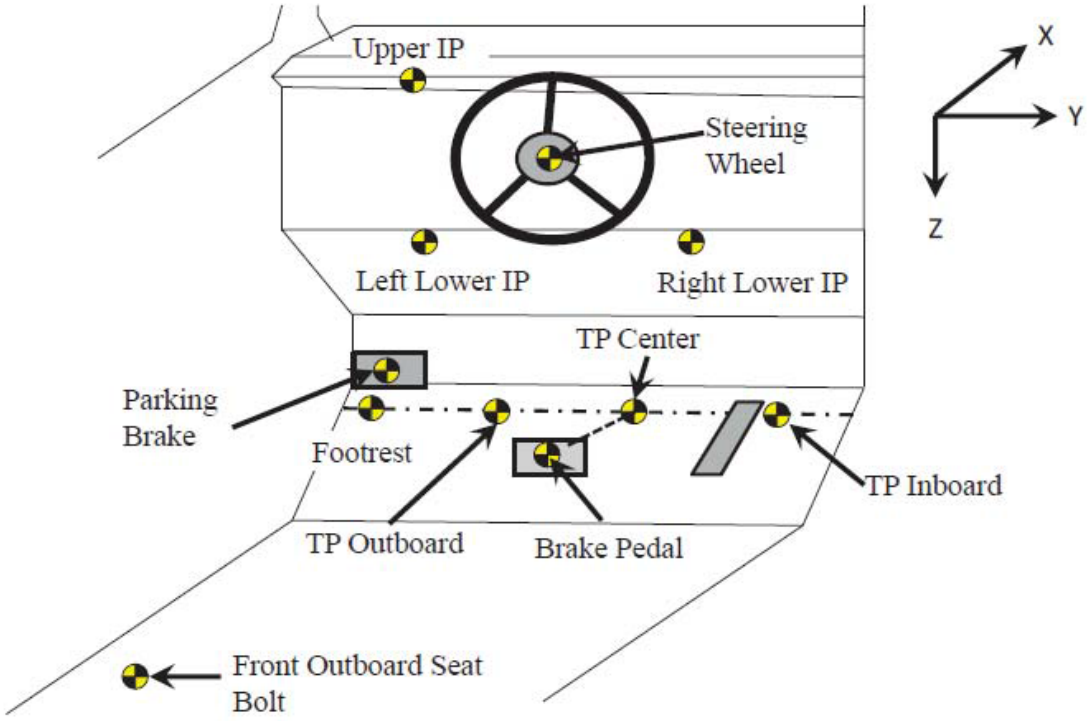
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

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	3364	-180	-27	3359	-177	-39	-5	3	-12
TP Center	3355	-332	-14	3349	-330	-28	-6	2	-14
TP Outboard	3293	-483	-15	3283	-475	-25	-11	7	-10
TP Footrest	3218	-584	-15	3215	-582	-16	-3	2	-2
Brake Pedal	3084	-331	-15	3150	-333	18	66	-1	32
Left Lower IP	2840	-523	-300	2859	-508	-291	20	14	9
Right Lower IP	2820	-220	-300	2852	-209	-258	32	11	42
Upper IP	2755	-522	-435	2763	-533	-440	8	-12	-6
Steering Wheel	2557	-368	-531	2564	-397	-436	7	-29	95
Front Outboard Bolt	2557	-606	83	2558	-604	81	1	2	-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

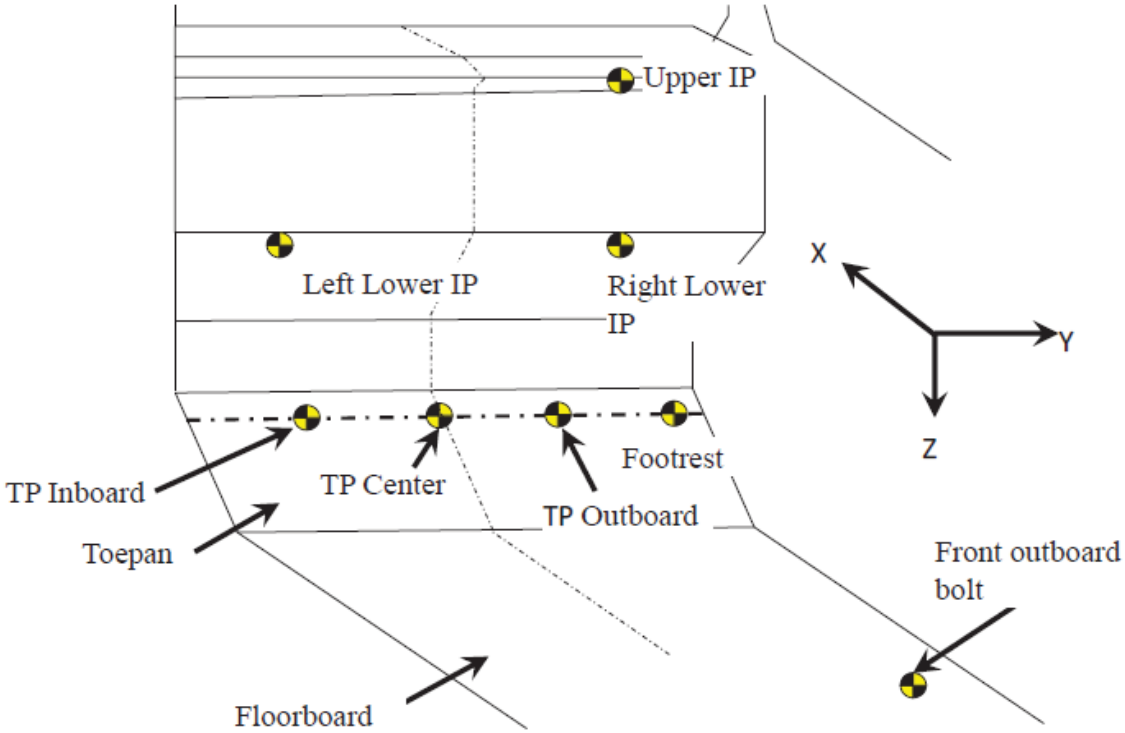
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

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	3324	214	-14	3311	208	-23	-12	-6	-9
TP Center	3353	363	-14	3348	355	-17	-5	-8	-3
TP Outboard	3252	517	-14	3250	514	-18	-2	-3	-4
TP Footrest	3206	614	-16	3205	612	-15	-1	-2	1
Left Lower IP	2808	213	-294	2834	208	-296	26	-5	-1
Right Lower IP	2843	514	-295	2853	509	-293	11	-5	2
Upper IP	2747	514	-455	2757	509	-455	10	-6	0
Front Outboard Seat Bolt	2559	611	81	2560	610	84	1	-1	3

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

DATA SHEET NO. 12

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

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

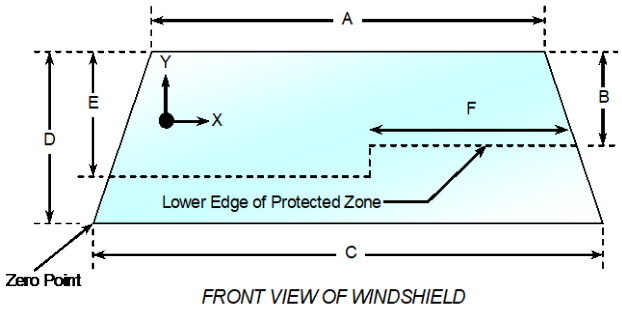
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with plastic molding and rubber cement.

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: 20.9°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2314	2314	100.0%
Right Side	2314	2314	100.0%
Total	4628	4628	100.0%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1245
B	mm	379
C	mm	1535
D	mm	924
E	mm	510
F	mm	560

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.

X	Y

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

DATA SHEET NO. 12 … (CONTINUED)

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

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 17.8°C Test Time: 6:12 PM

Stoddard Solvent Spillage Measurements

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)

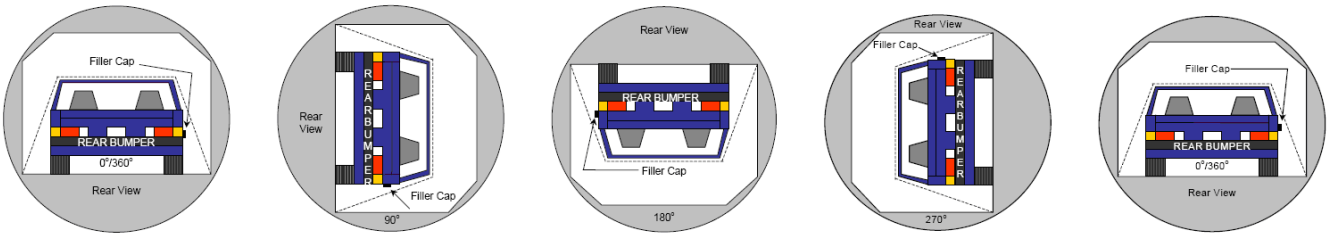
D. Spillage: There was no Stoddard solvent spillage.

DATA SHEET NO. 13

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205413

Test Program: R&D Left Side 30° Frontal Rigid Barrier Impact Test Date: 12/15/20



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

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°	78	300	378
90° To 180°	80	300	380
180° To 270°	81	300	381
270° To 360°	79	300	379

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

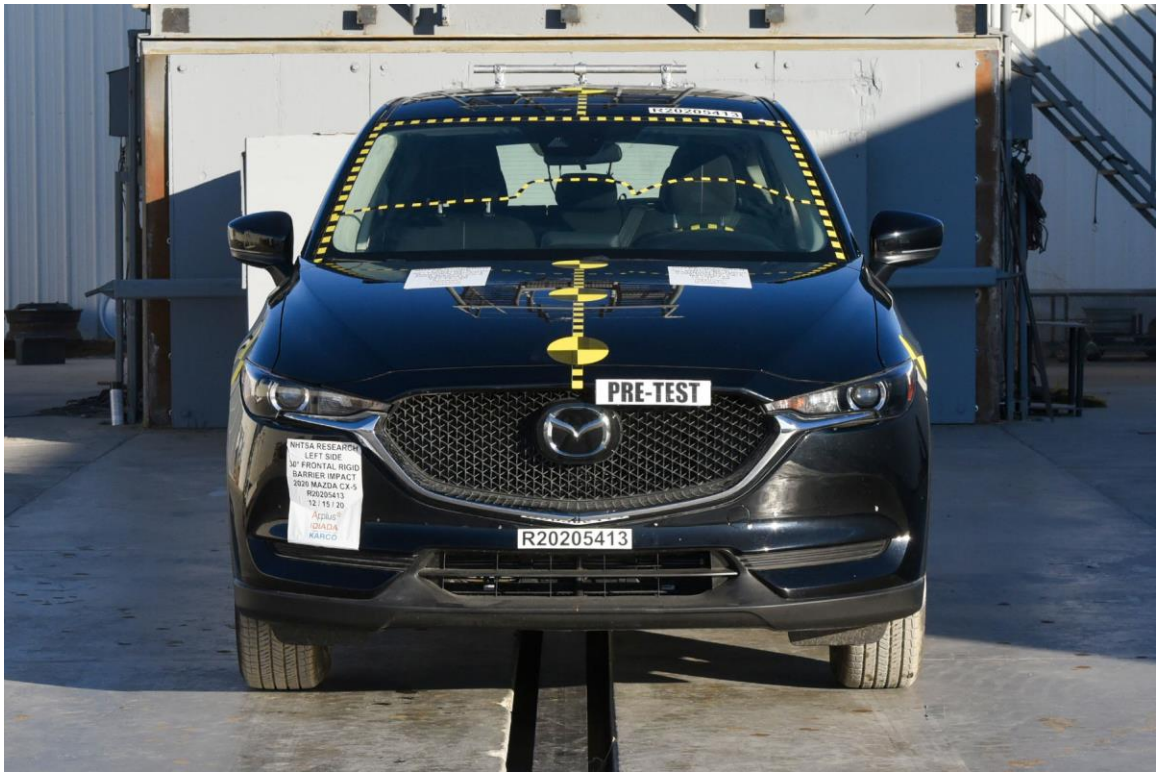

FIGURE 5. Pre-Test Front View of Test Vehicle

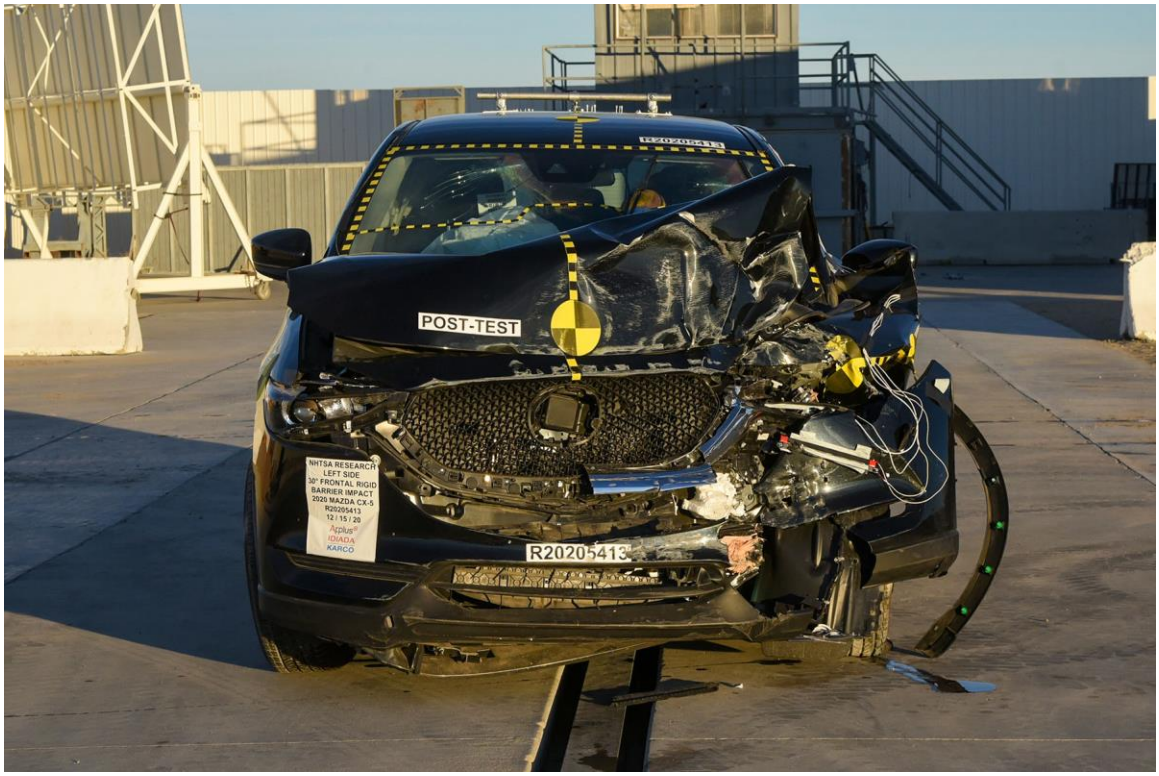

FIGURE 6. Post-Test Front View of Test Vehicle

FIGURE 7. Pre-Test Left View of Test Vehicle

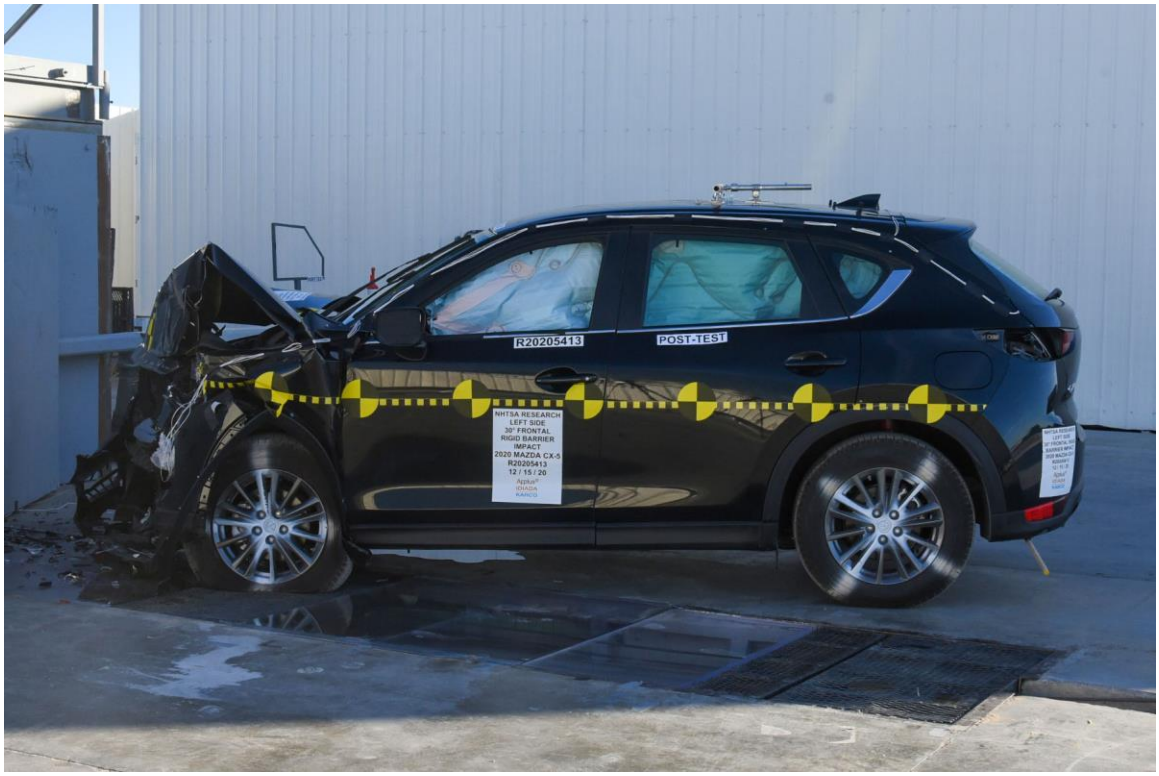

FIGURE 8. Post-Test Left View of Test Vehicle

FIGURE 9. Pre-Test Right View of Test Vehicle

FIGURE 10. Post-Test Right View of Test Vehicle

FIGURE 11. Pre-Test Left Front ¾ View of Test Vehicle

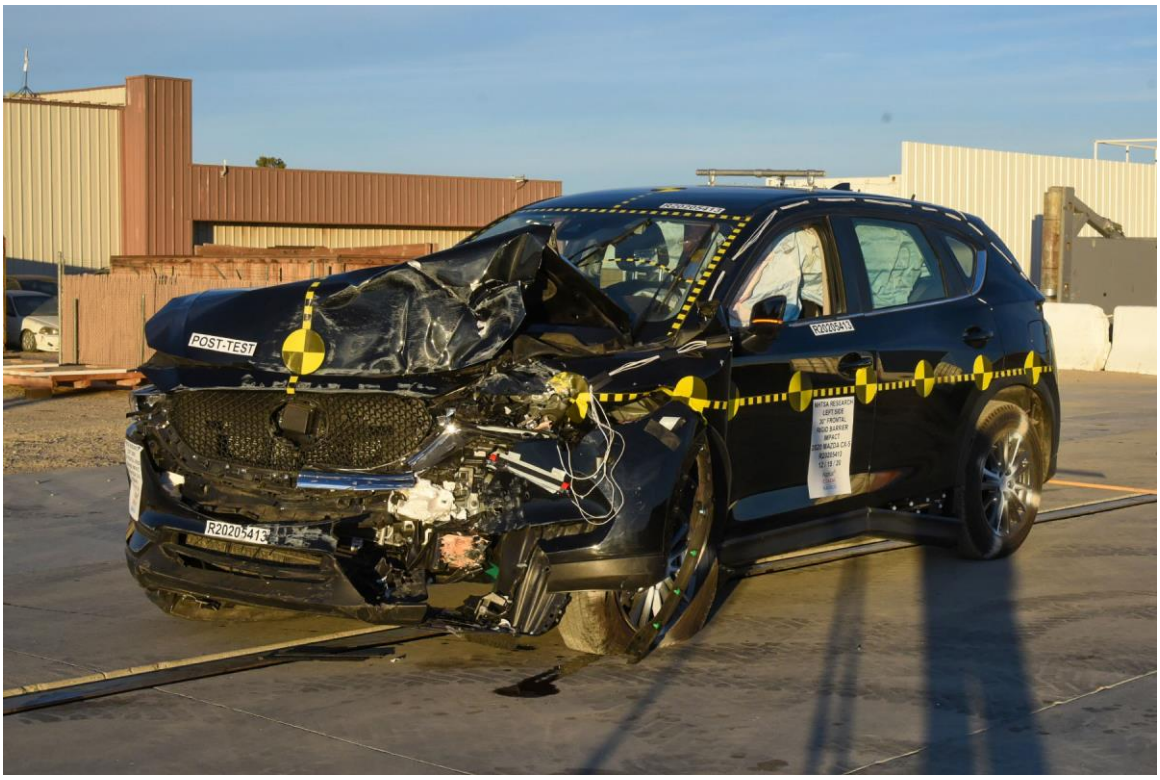

FIGURE 12. Post-Test Left Front ¾ View of Test Vehicle

FIGURE 13. Pre-Test Right Front ¾ View of Test Vehicle

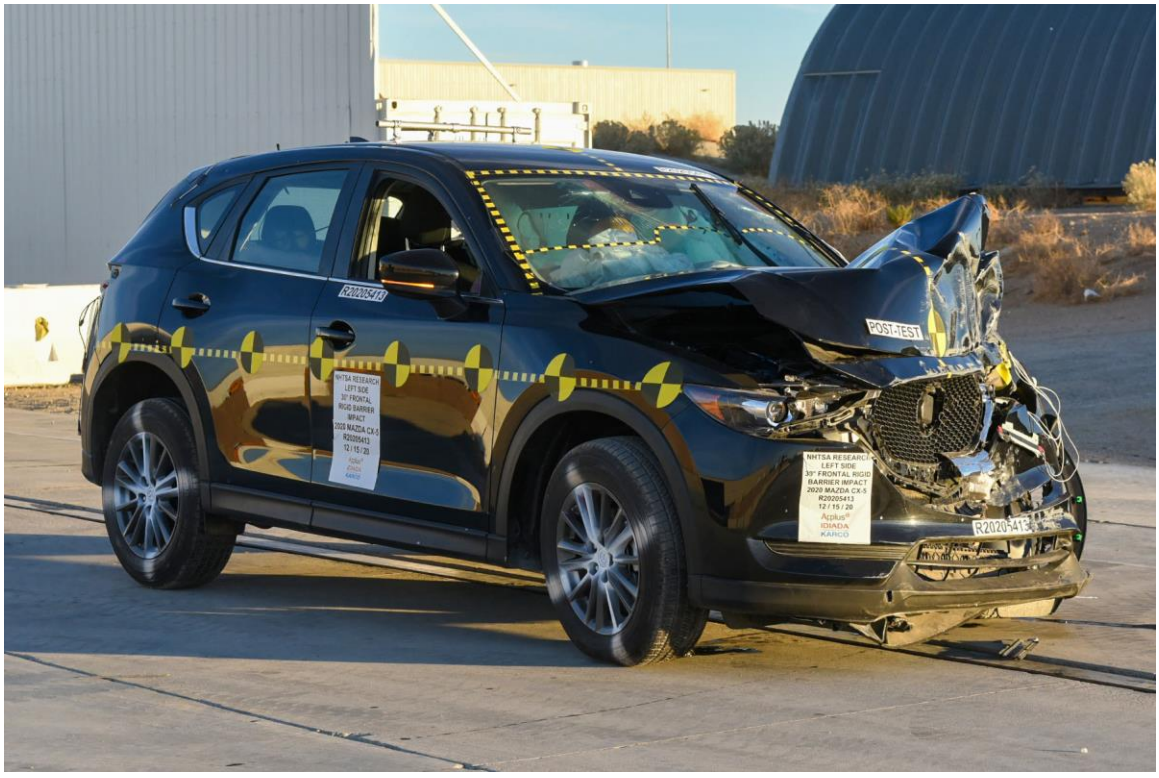

FIGURE 14. Post-Test Right Front ¾ View of Test Vehicle

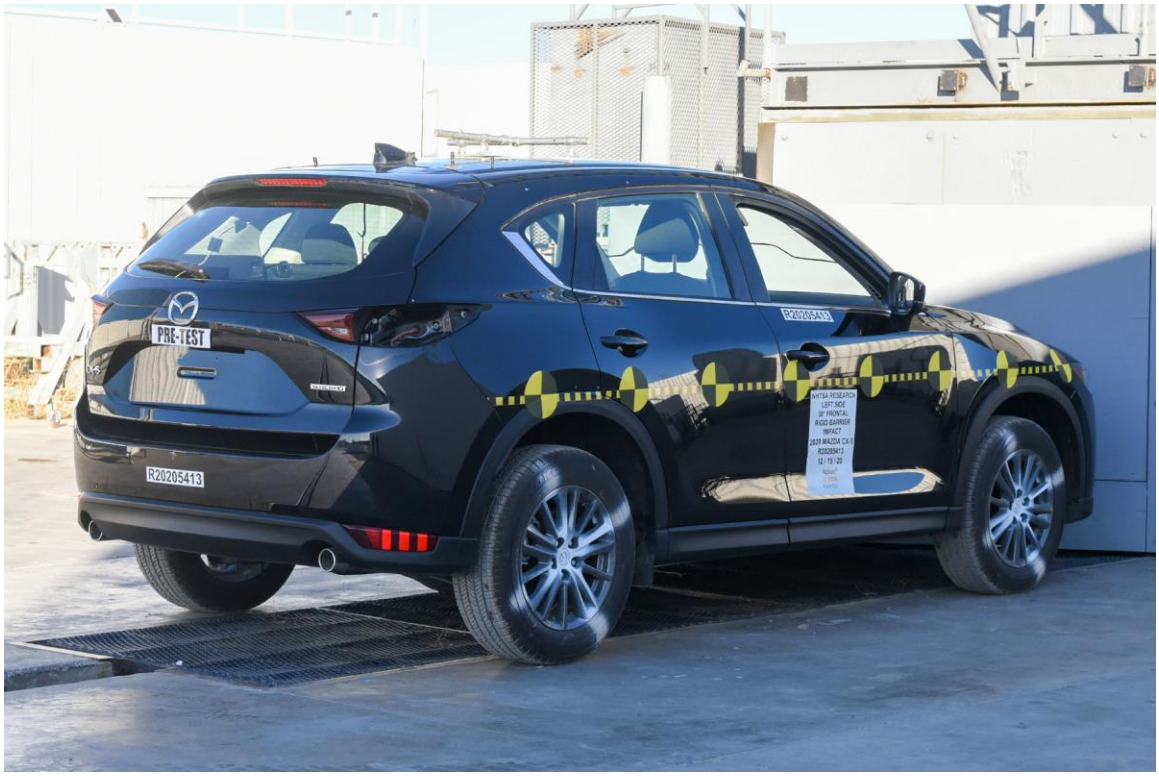

FIGURE 15. Pre-Test Right Rear ¾ View of Test Vehicle

FIGURE 16. Post-Test Right Rear ¾ View of Test Vehicle

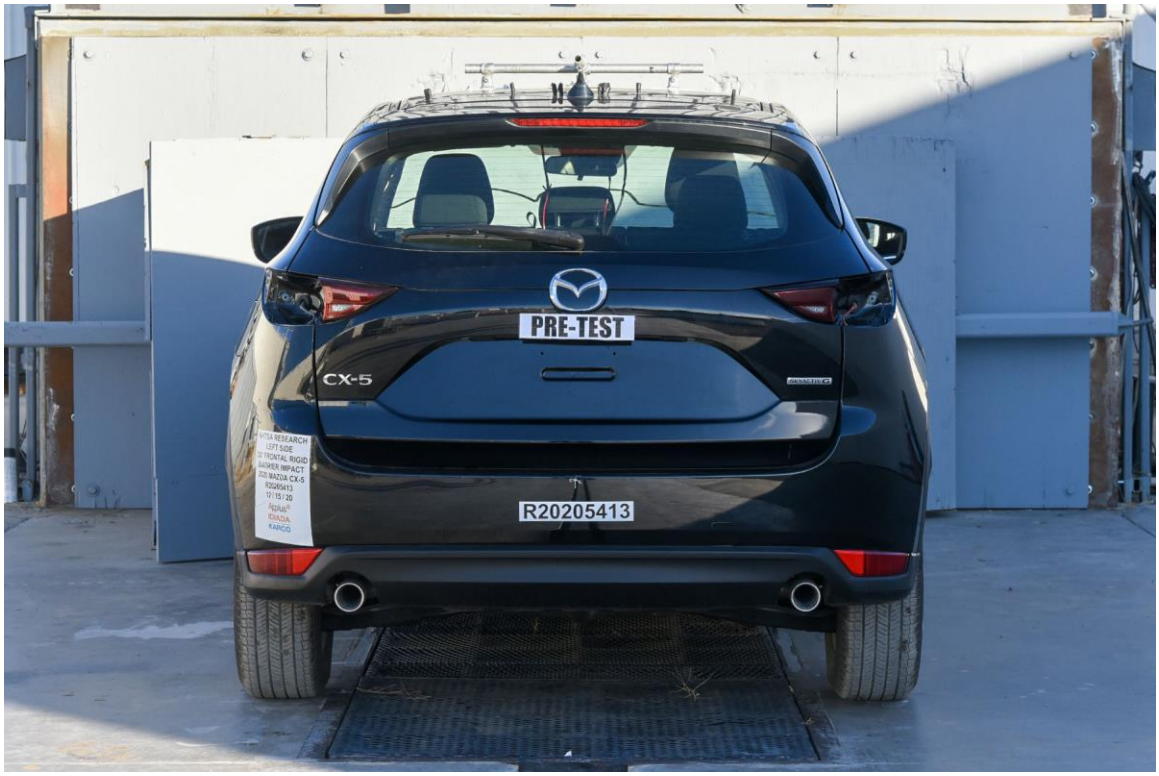

FIGURE 17. Pre-Test Rear View of Test Vehicle

FIGURE 18. Post-Test Rear View of Test Vehicle

FIGURE 19. Pre-Test Left Rear ¾ View of Test Vehicle

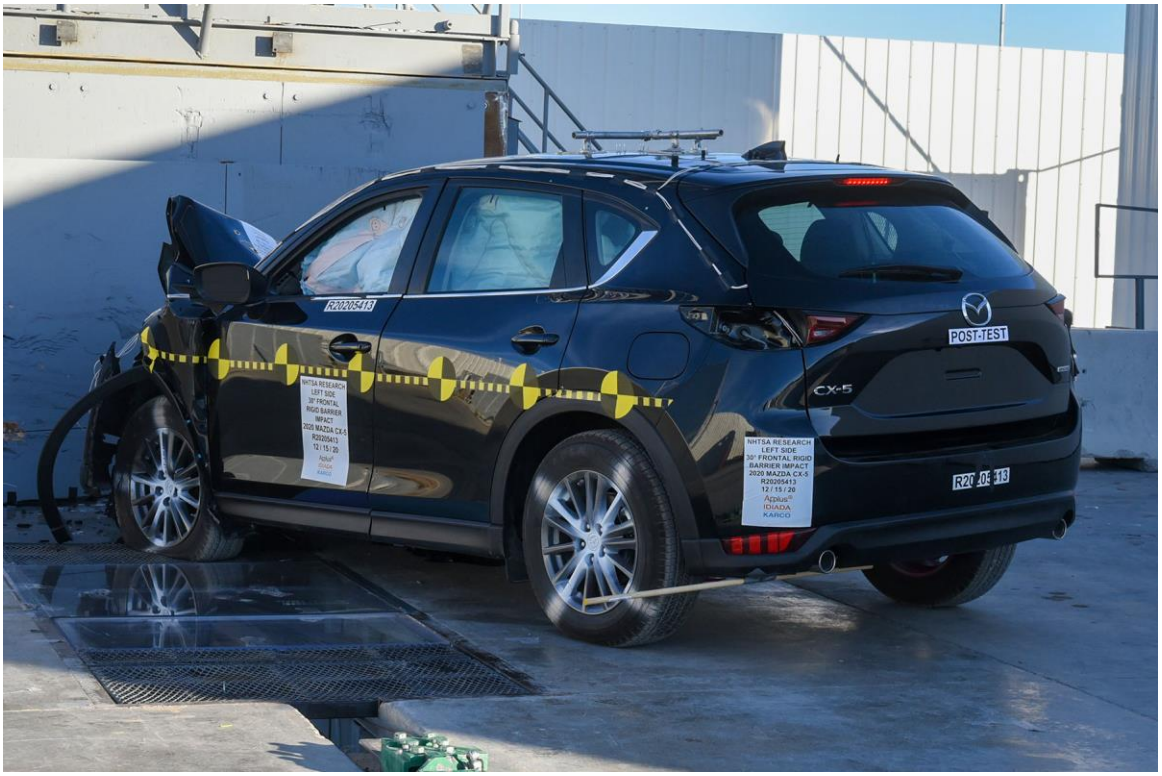

FIGURE 20. Post-Test Left Rear ¾ View of Test Vehicle

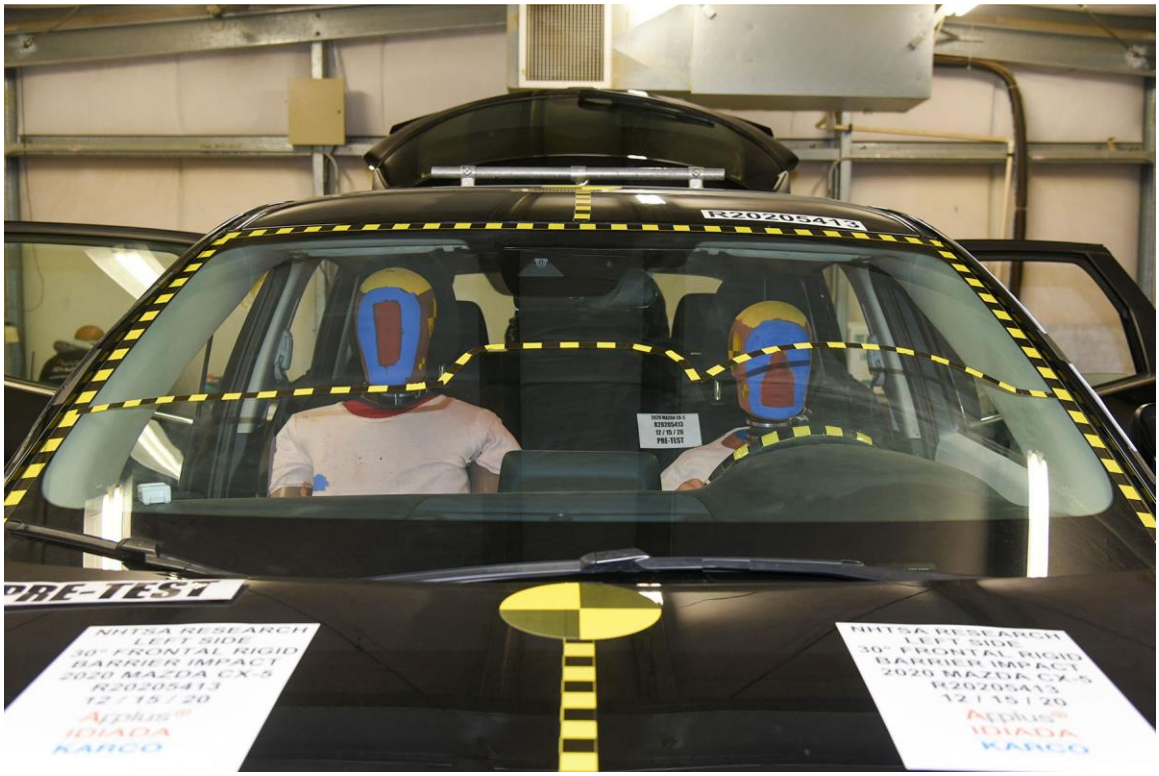

FIGURE 21. Pre-Test Windshield View

FIGURE 22. Post-Test Windshield View

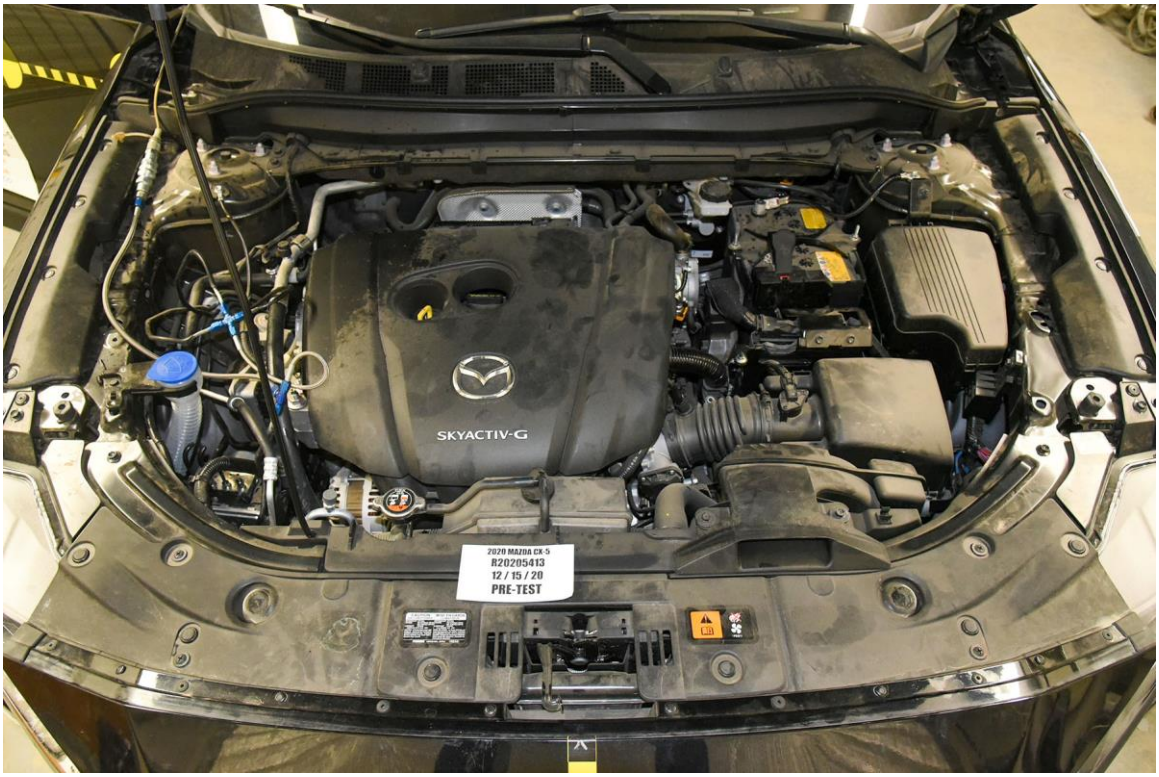

FIGURE 23. Pre-Test Engine Compartment View

Photograph Not Available

FIGURE 24. Post-Test Engine Compartment View

FIGURE 25. Pre-Test Fuel Filler Cap View

FIGURE 26. Post-Test Fuel Filler Cap View

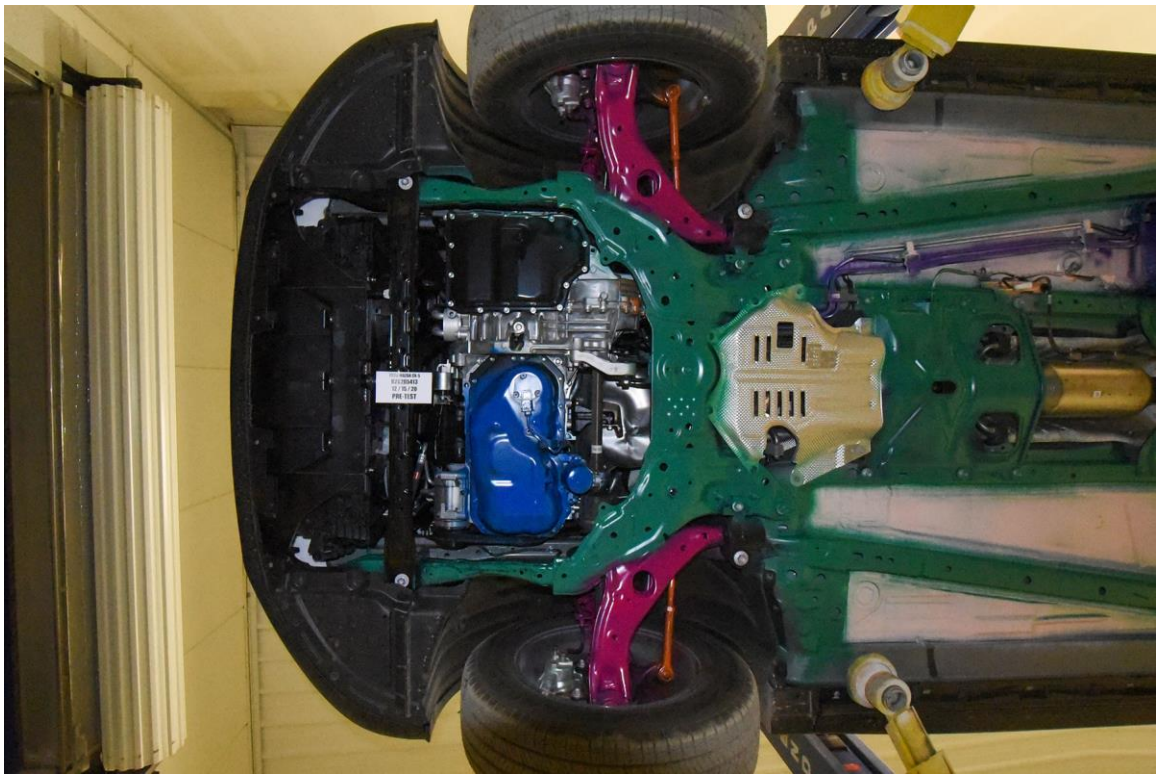

FIGURE 27. Pre-Test Front Underbody View

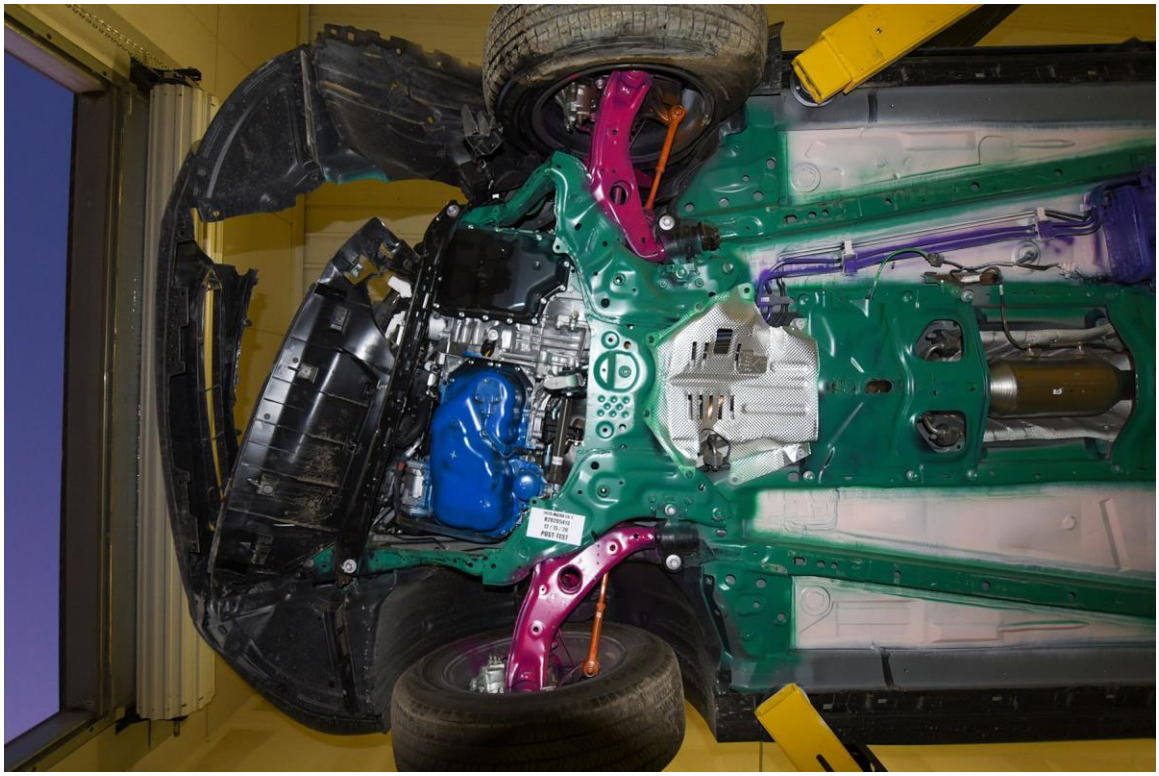

FIGURE 28. Post-Test Front Underbody View

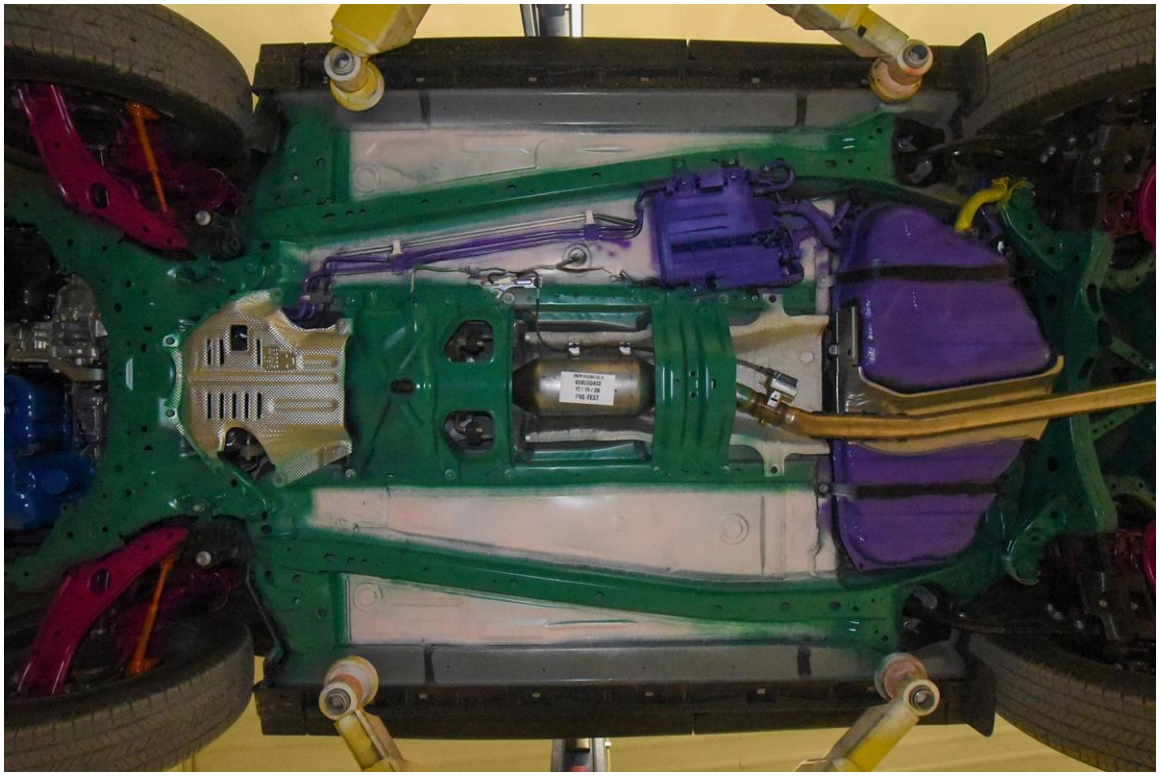

FIGURE 29. Pre-Test Mid Underbody View

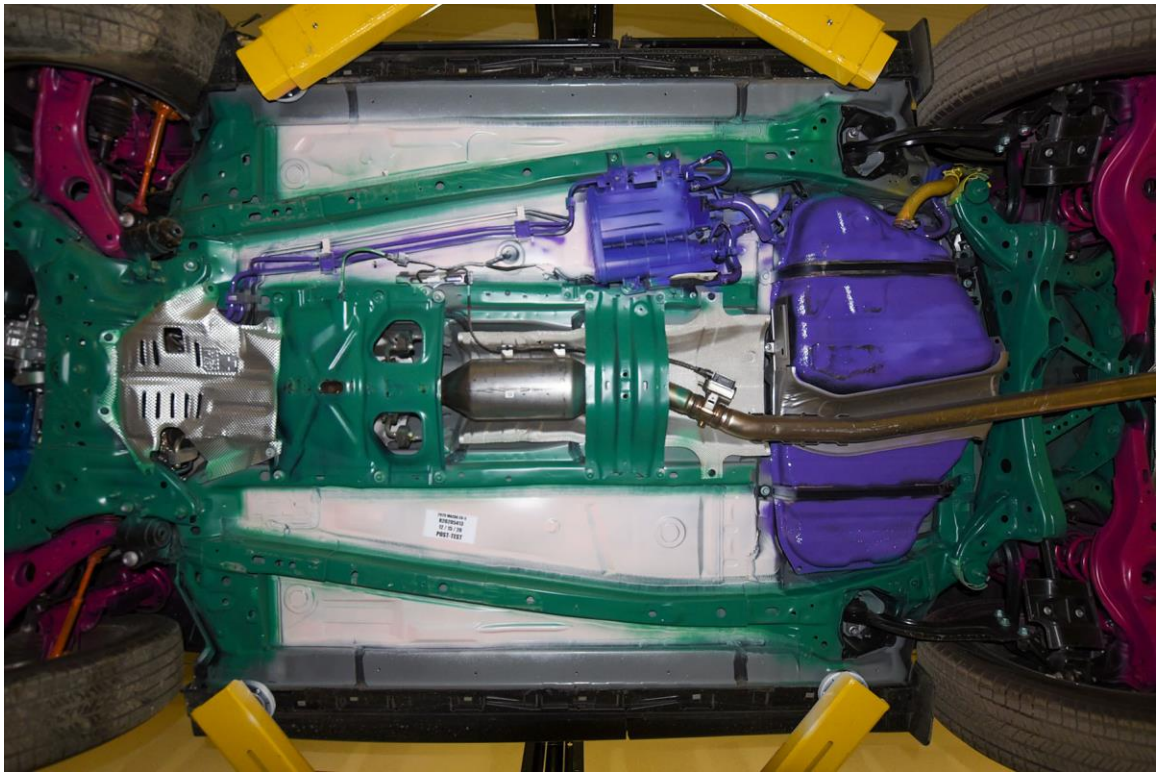

FIGURE 30. Post-Test Mid Underbody View

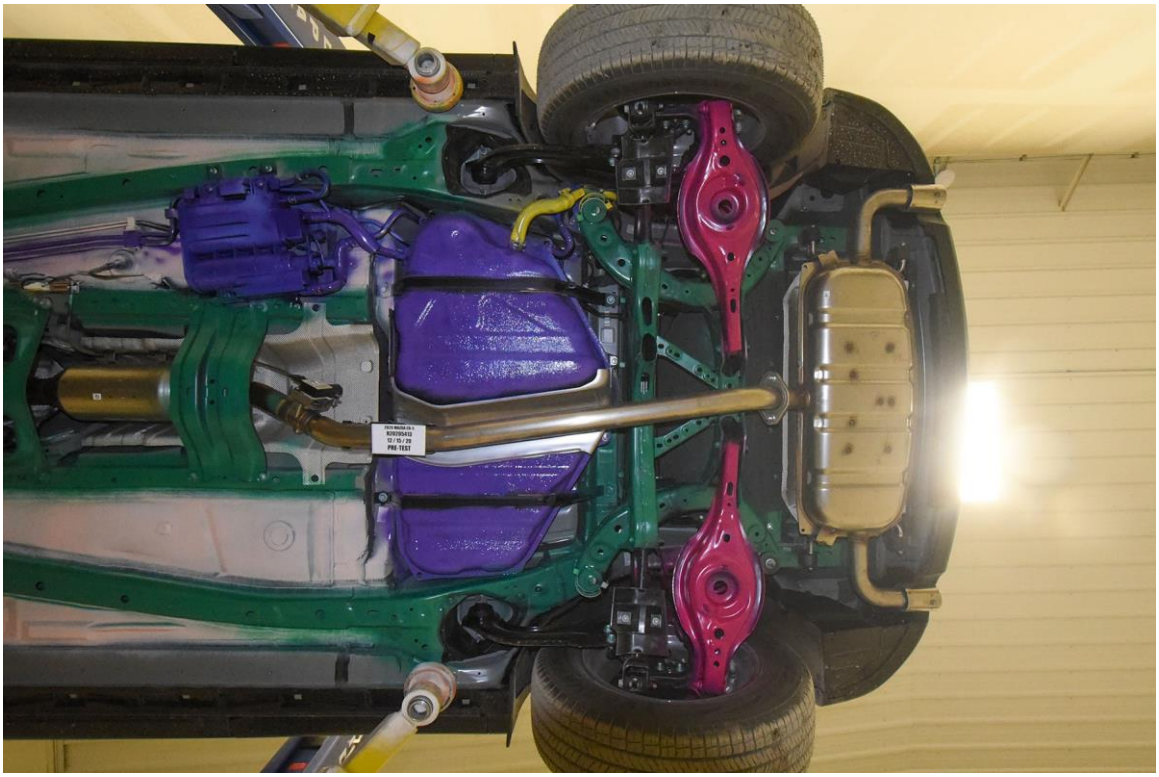

FIGURE 31. Pre-Test Rear Underbody View

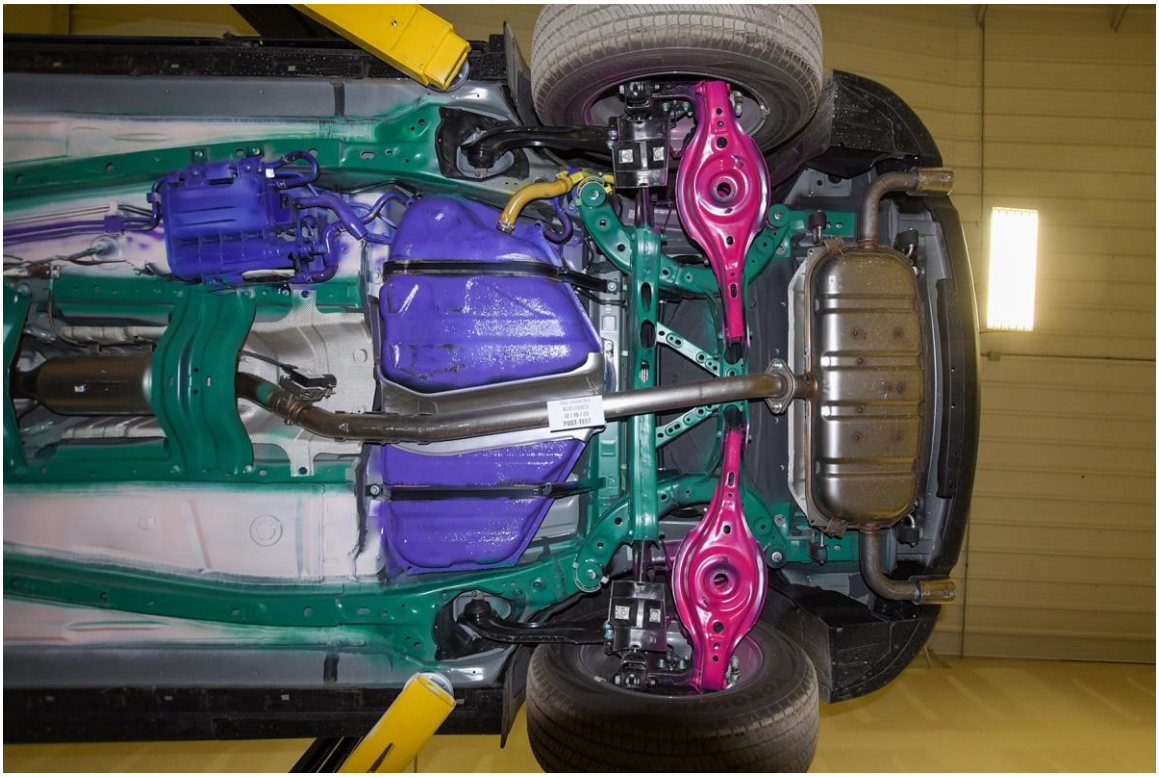

FIGURE 32. Post-Test Rear Underbody View

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

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

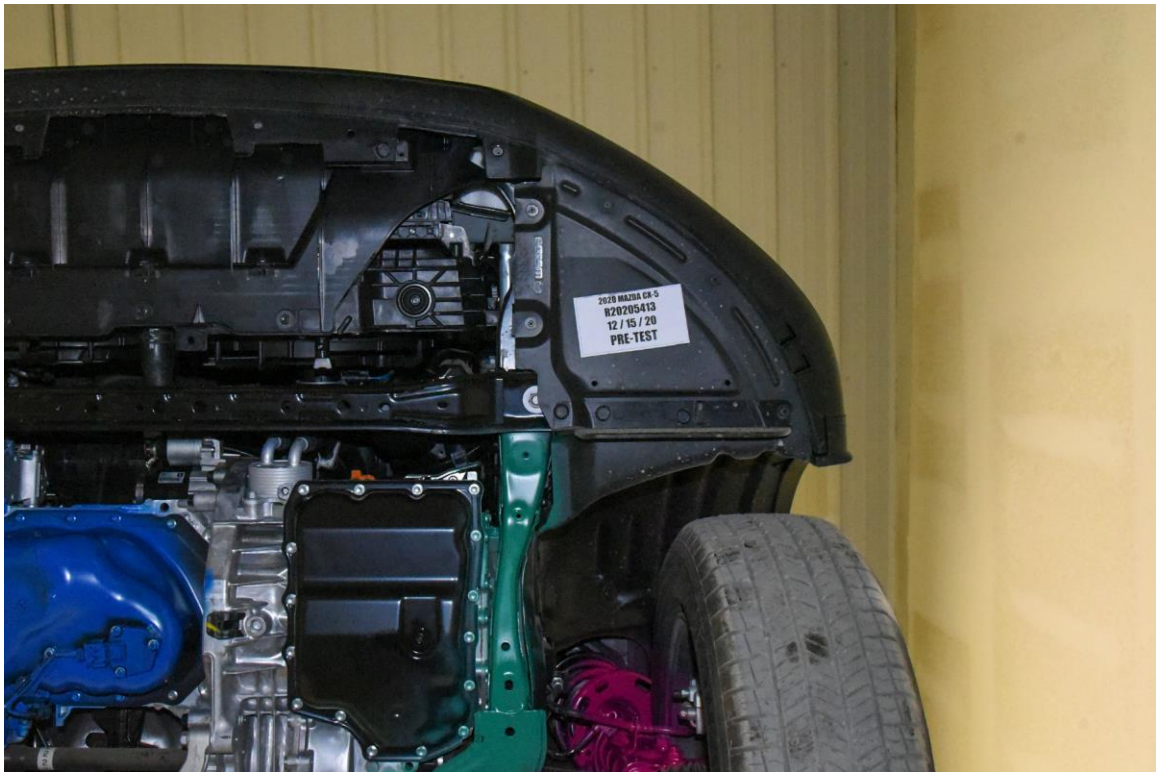

FIGURE 35. Pre-Test Driver Side Bumper to Rail Attachments and Crush Initiators

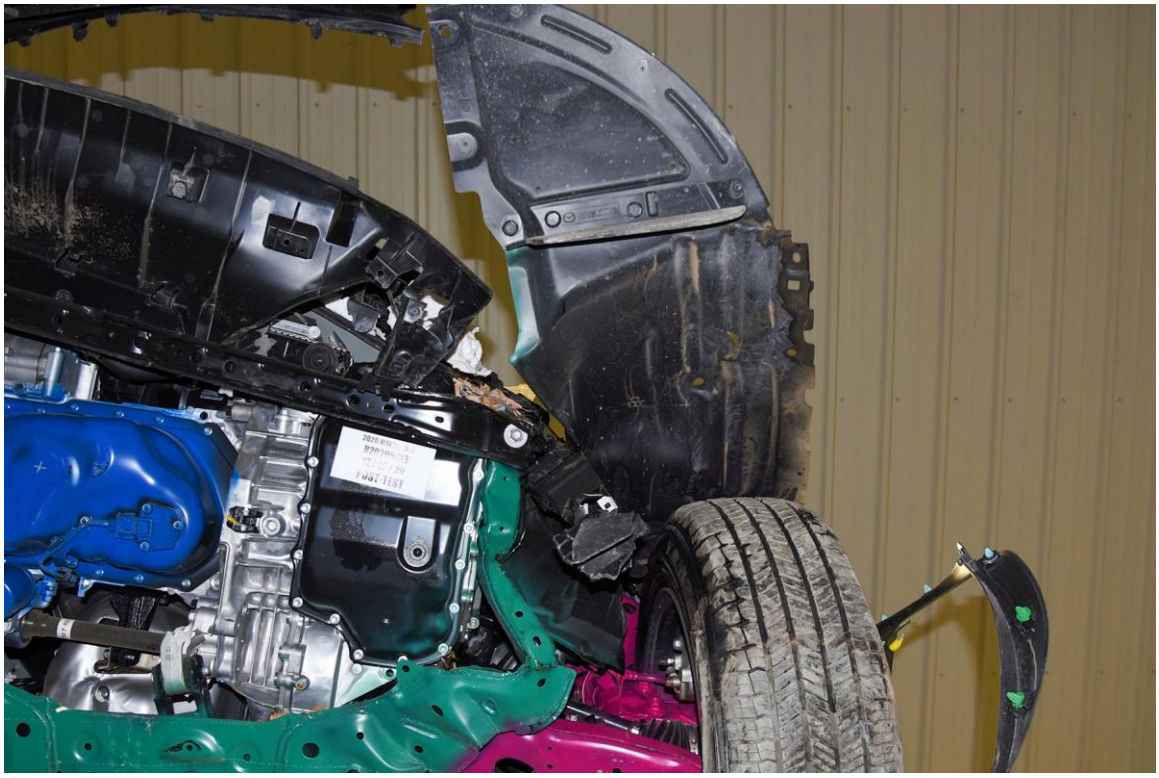

FIGURE 36. Post-Test Driver Side Bumper to Rail Attachments and Crush Initiators

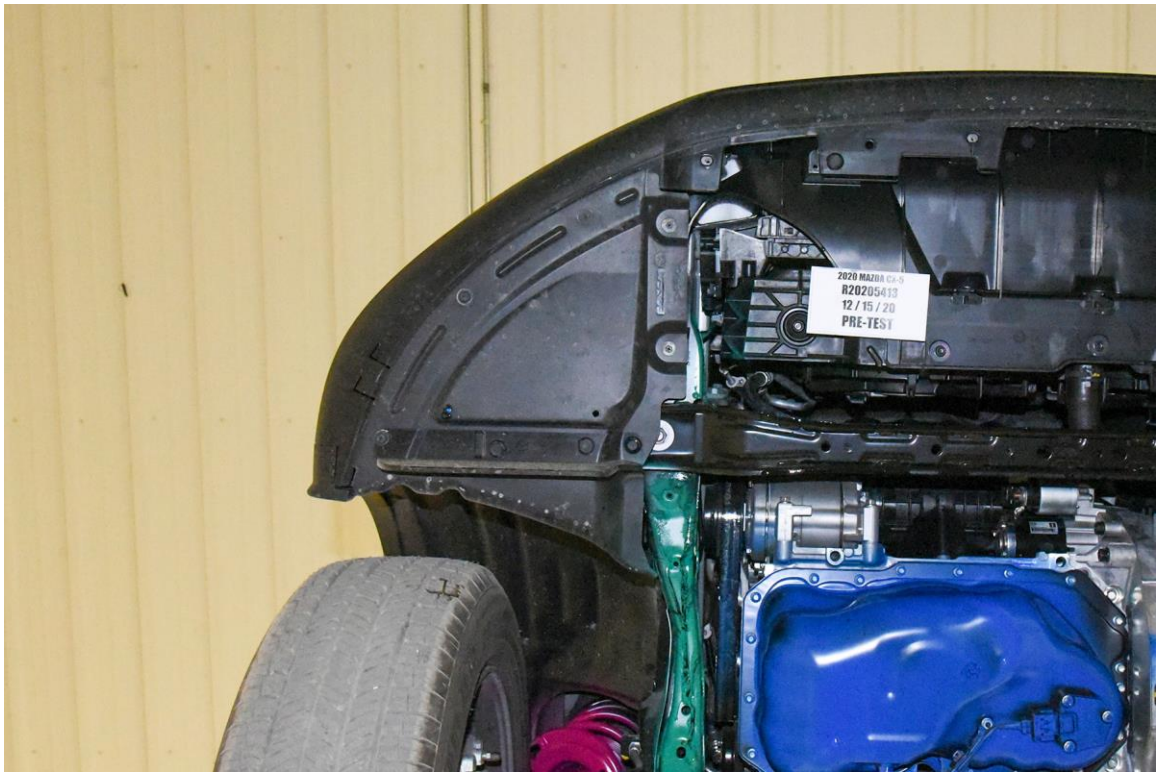

FIGURE 37. Pre-Test Passenger Side Bumper to Rail Attachments and Crush Initiators

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

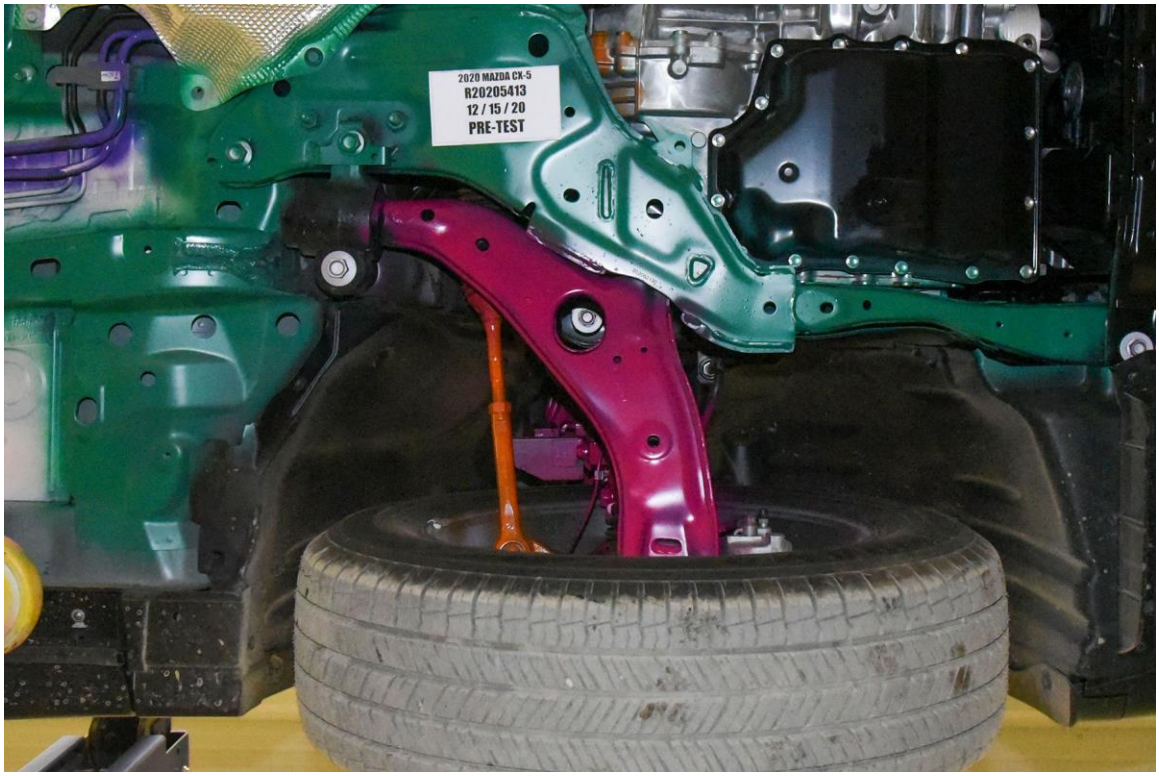

FIGURE 39. Pre-Test Driver Side Rocker

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

Photograph Not Available

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

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

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

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

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

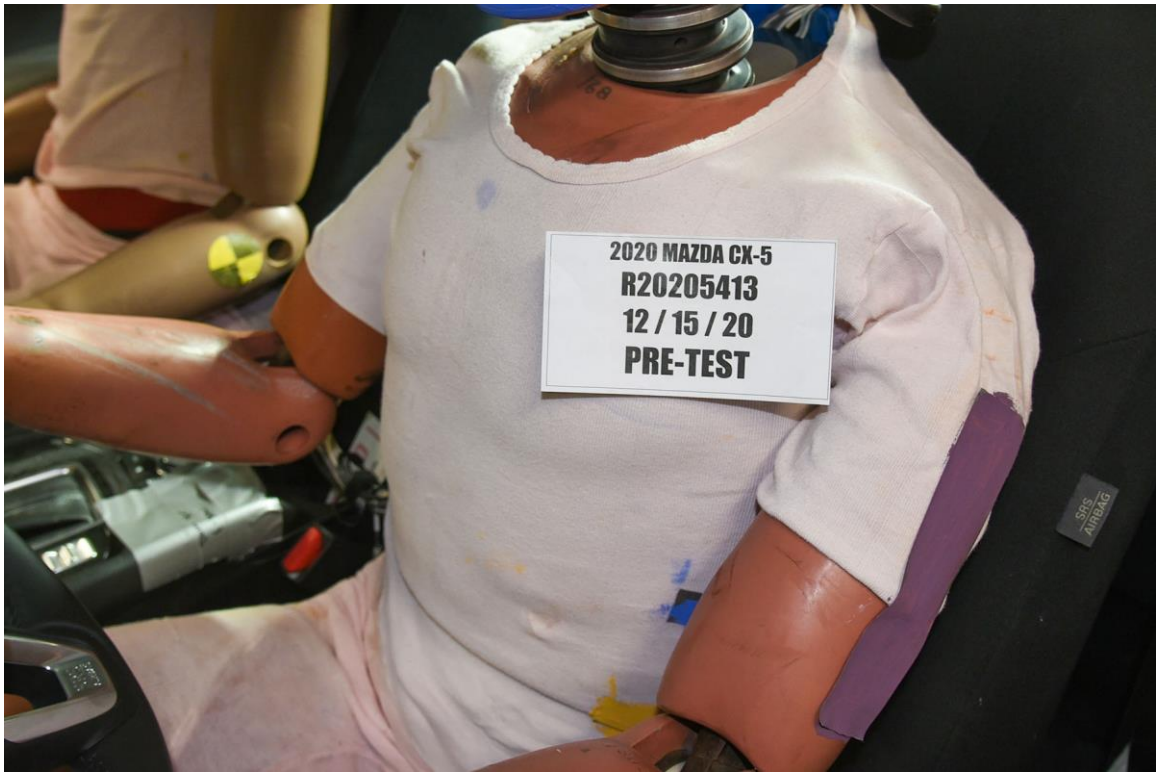

FIGURE 55. Pre-Test View of Driver Abdomen

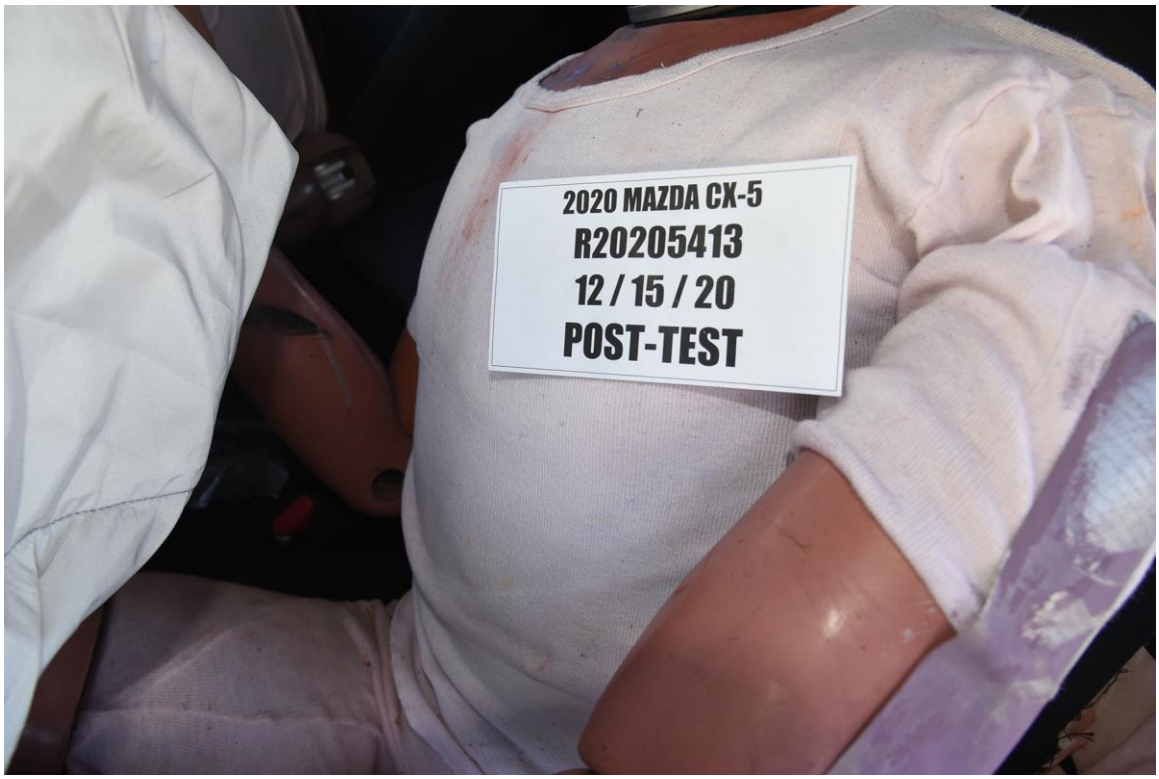

FIGURE 56. Post-Test View of Driver Abdomen

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

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

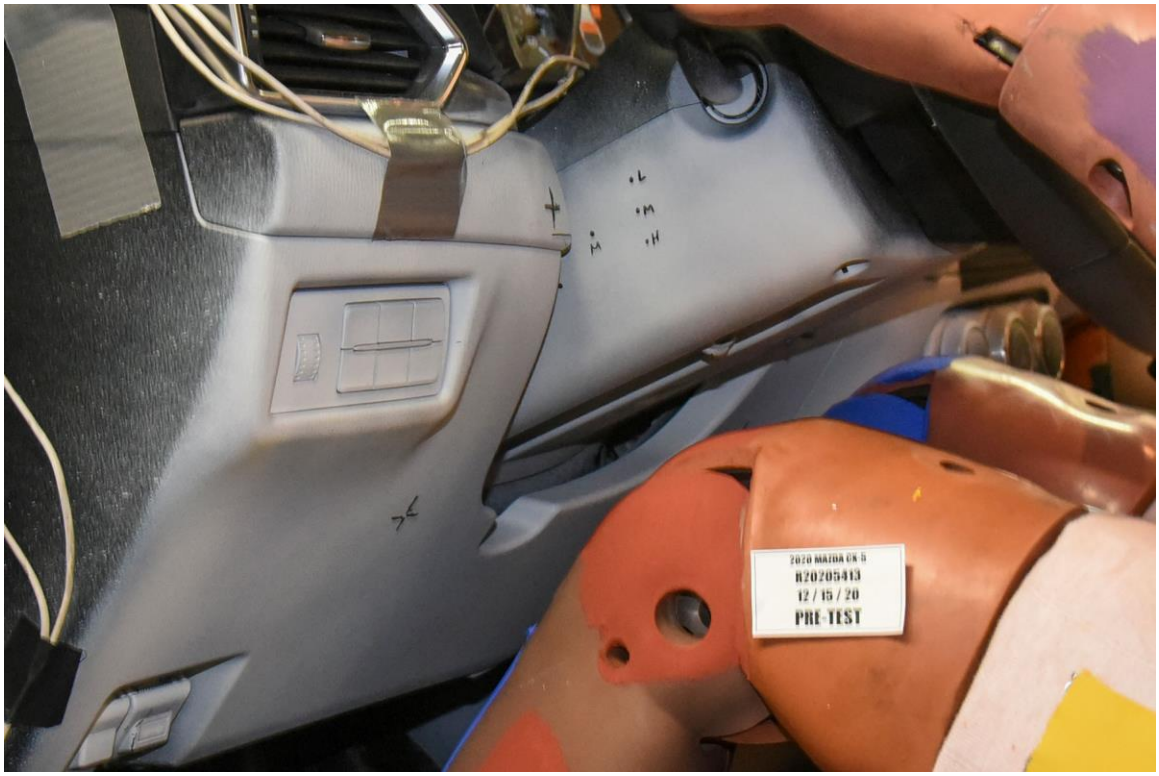

FIGURE 59. Pre-Test View of Driver Left Knee and Bolster

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

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

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

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

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

FIGURE 65. Pre-Test View of the Driver Feet

FIGURE 66. Post-Test View of the Driver Feet

FIGURE 67. Pre-Test Driver Adjustable D-Ring

FIGURE 68. Post-Test Driver Adjustable D-Ring

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

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

FIGURE 71. Pre-Test Driver Seat Back Markings

FIGURE 72. Post-Test Driver Seat Back Markings

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

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

FIGURE 75. Pre-Test Driver Inner Door Panel

FIGURE 76. Post-Test Driver Inner Door Panel

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

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

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

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

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

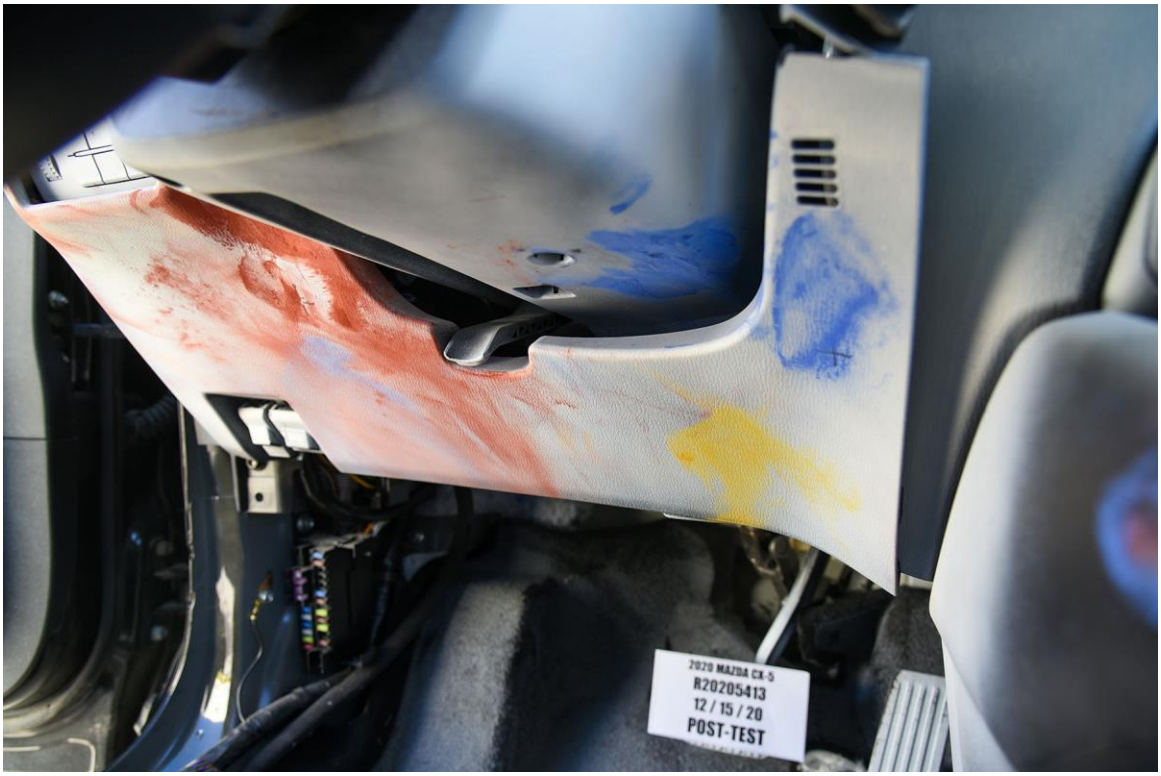

FIGURE 82. Post-Test Right Side View of Driver Knee Bolster

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

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

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

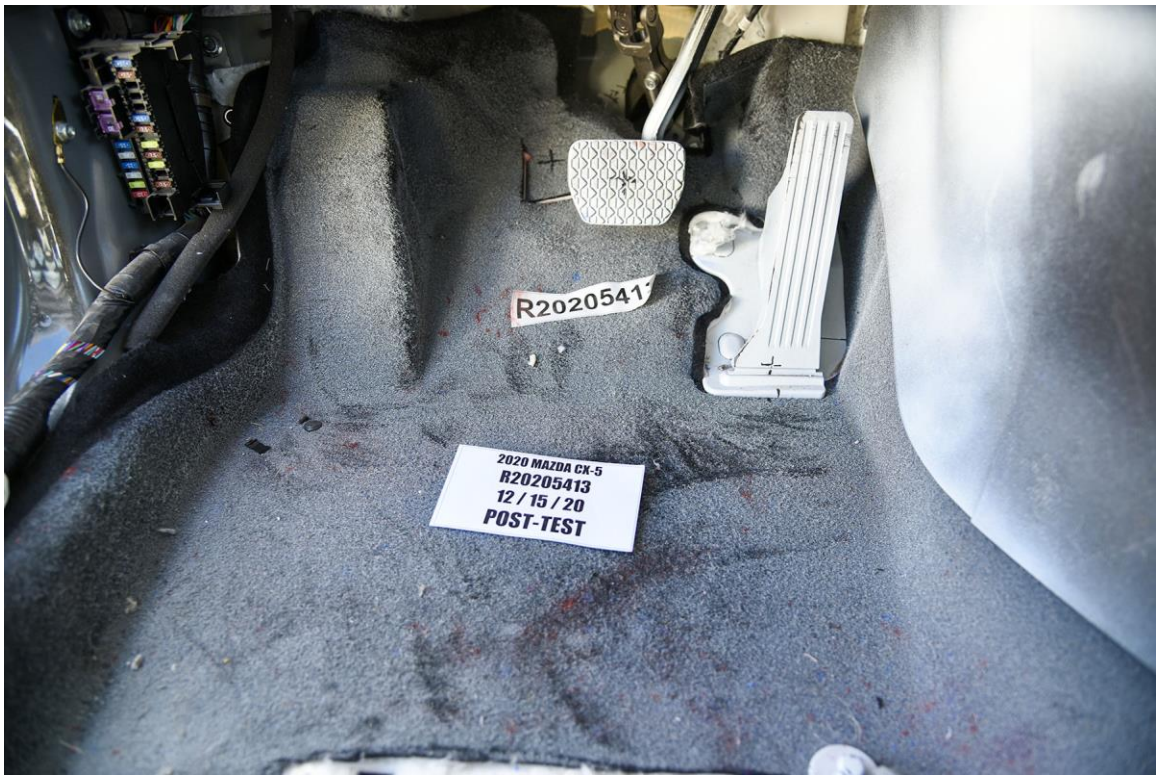

FIGURE 86. Post-Test View of Driver Floor Pan from Top of Seat

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

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

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

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

Photograph Not Applicable

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

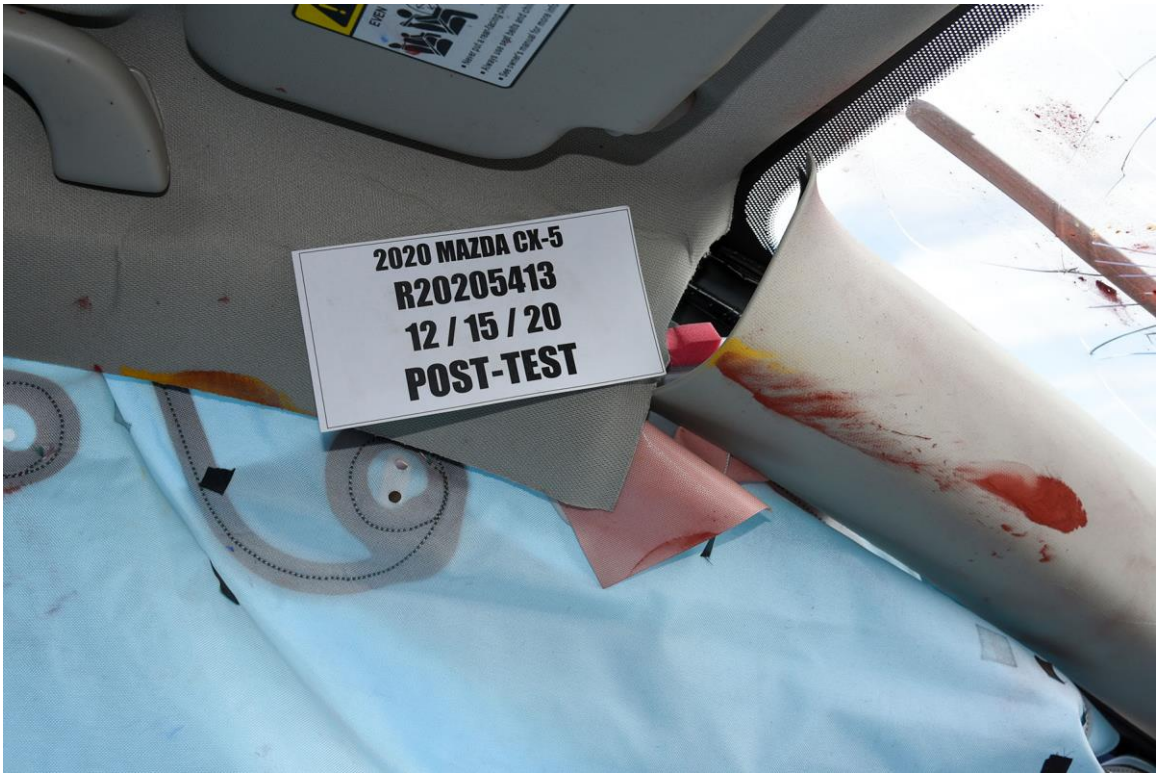

FIGURE 91a. Post-Test Driver Dummy Contact with Headliner and A-Pillar

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

FIGURE 91c. Post-Test Driver Dummy Contact with Door Panel

FIGURE 91d. Post-Test Driver Dummy Contact with Pelvis/Torso Airbag

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

FIGURE 92. Pre-Test Passenger Front Windshield View

FIGURE 93. Post-Test Passenger Front Windshield View

FIGURE 94. Pre-Test Passenger Side Front Window View

FIGURE 95. Post-Test Passenger Side Front Window View

FIGURE 96. Pre-Test View of Passenger Door Clearance

FIGURE 97. Post-Test View of Passenger Door Clearance

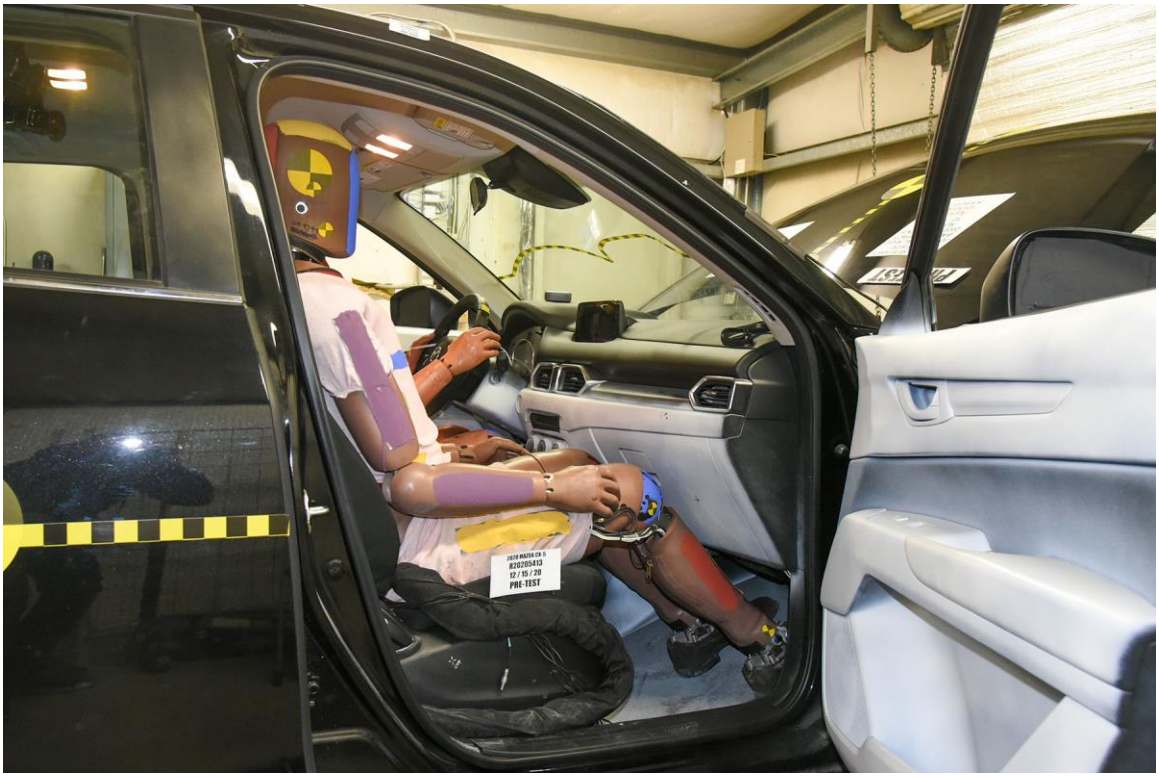

FIGURE 98. Pre-Test Right Side View of Passenger and Interior

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

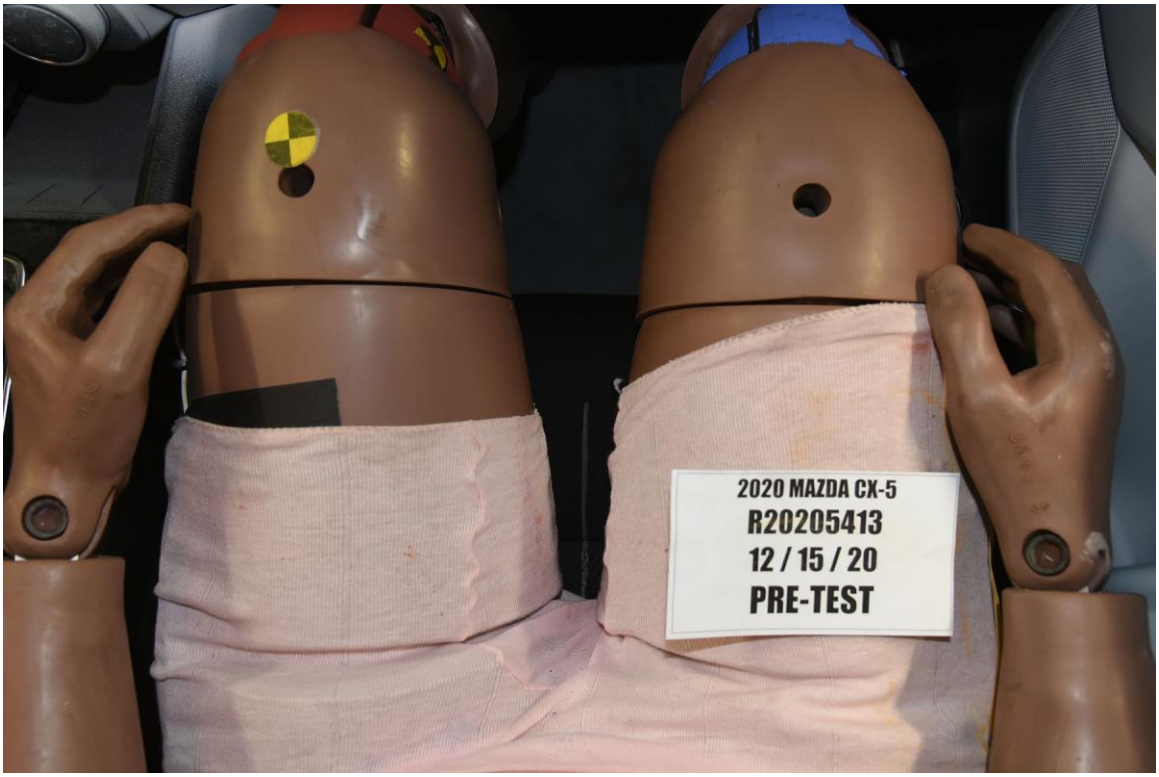

FIGURE 100. Pre-Test Overhead View of Passenger Thighs on Seat

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

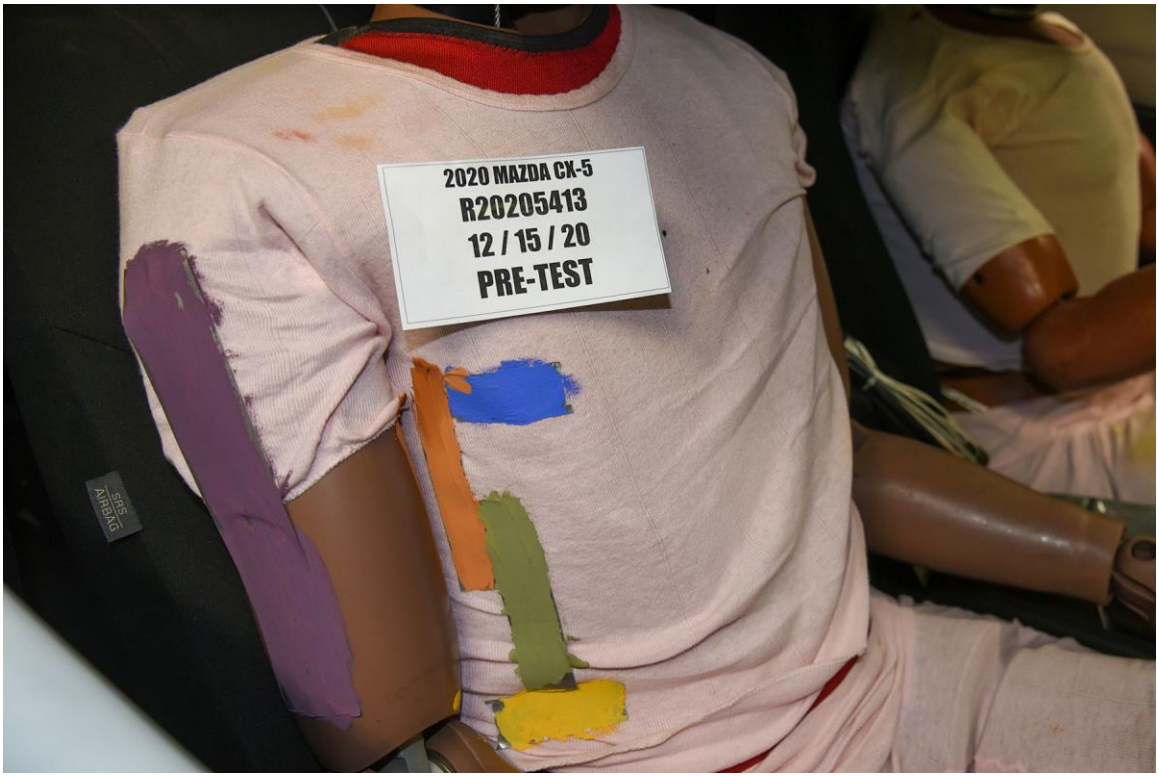

FIGURE 102. Pre-Test View of Passenger Abdomen

FIGURE 103. Post-Test View of Passenger Abdomen

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

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

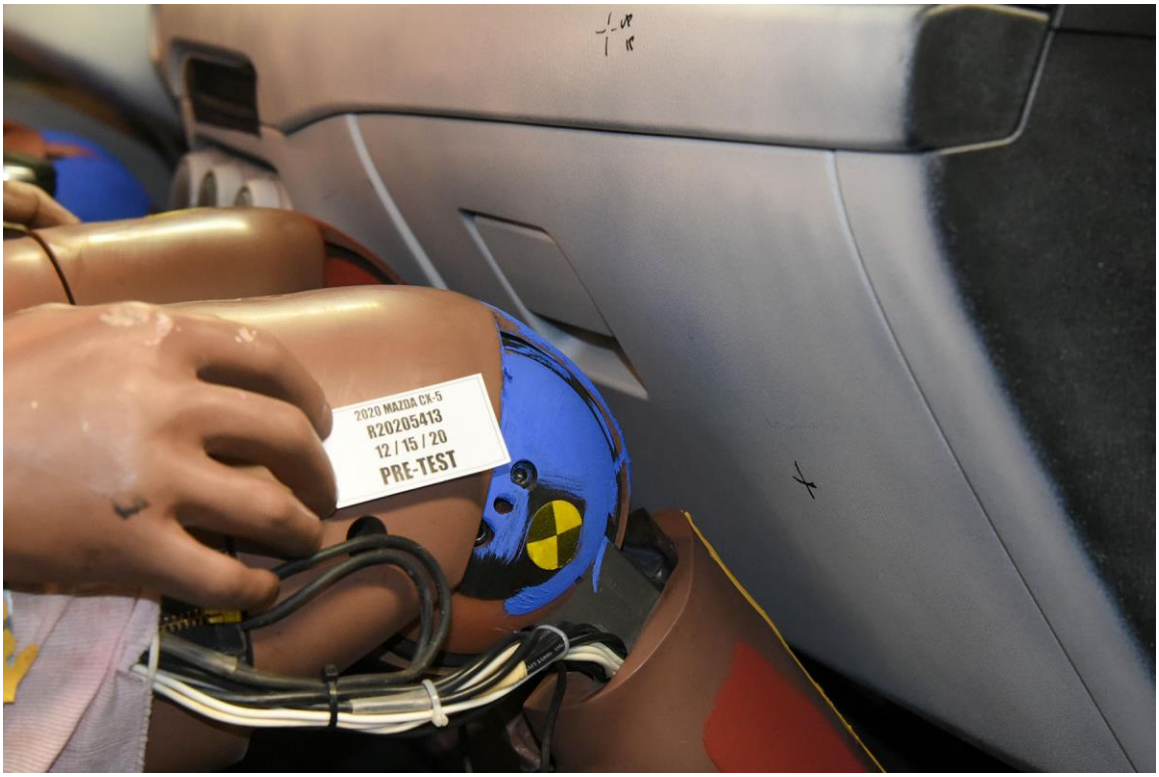

FIGURE 106. Pre-Test View of Passenger Right Knee and Bolster

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

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

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

FIGURE 110. Pre-Test View of the Passenger Feet

FIGURE 111. Post-Test View of the Passenger Feet

FIGURE 112. Pre-Test Passenger Adjustable D-Ring

FIGURE 113. Post-Test Passenger Adjustable D-Ring

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

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

FIGURE 116. Pre-Test Passenger Seat Back Markings

FIGURE 117. Post-Test Passenger Seat Back Markings

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

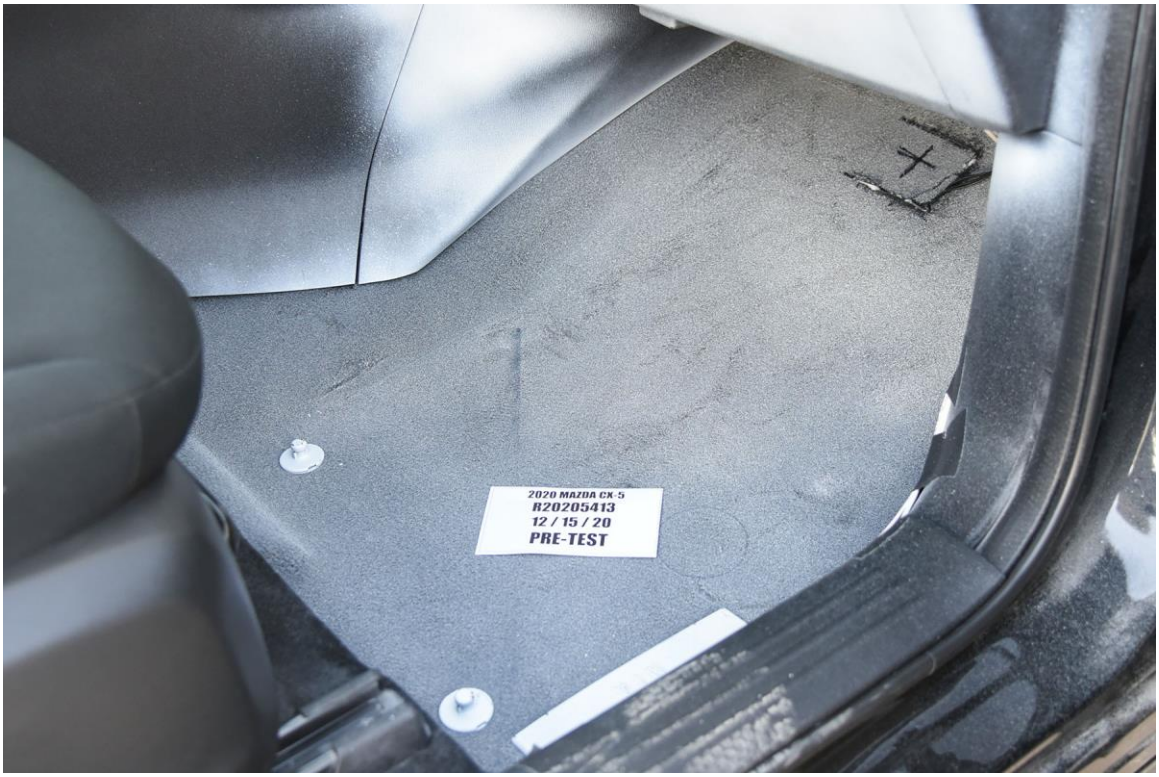

FIGURE 128. Pre-Test View of Passenger Floor Pan from Outside of Vehicle

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

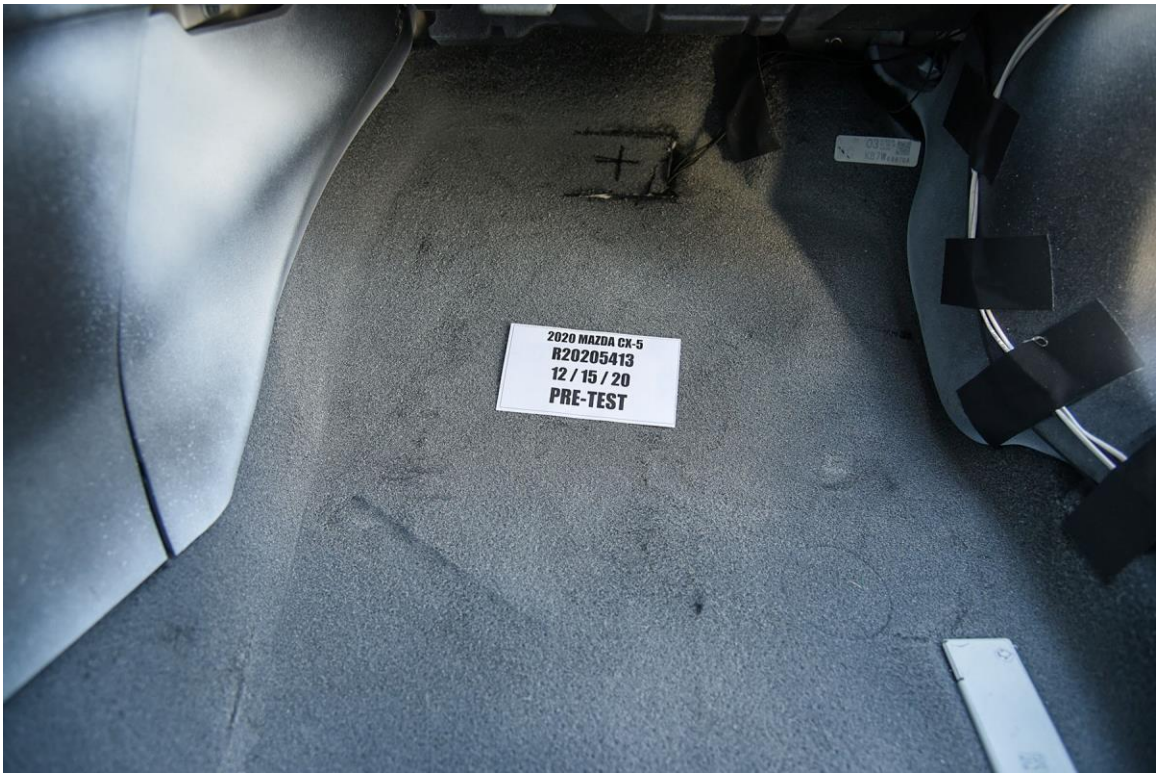

FIGURE 130. Pre-Test View of Passenger Floor Pan from Top of Front Seat

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 Knee Bolster

Photograph Not Available

FIGURE 137. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard Solvent Spillage

FIGURE 138. Post-Test Stoddard Solvent Spillage Location View

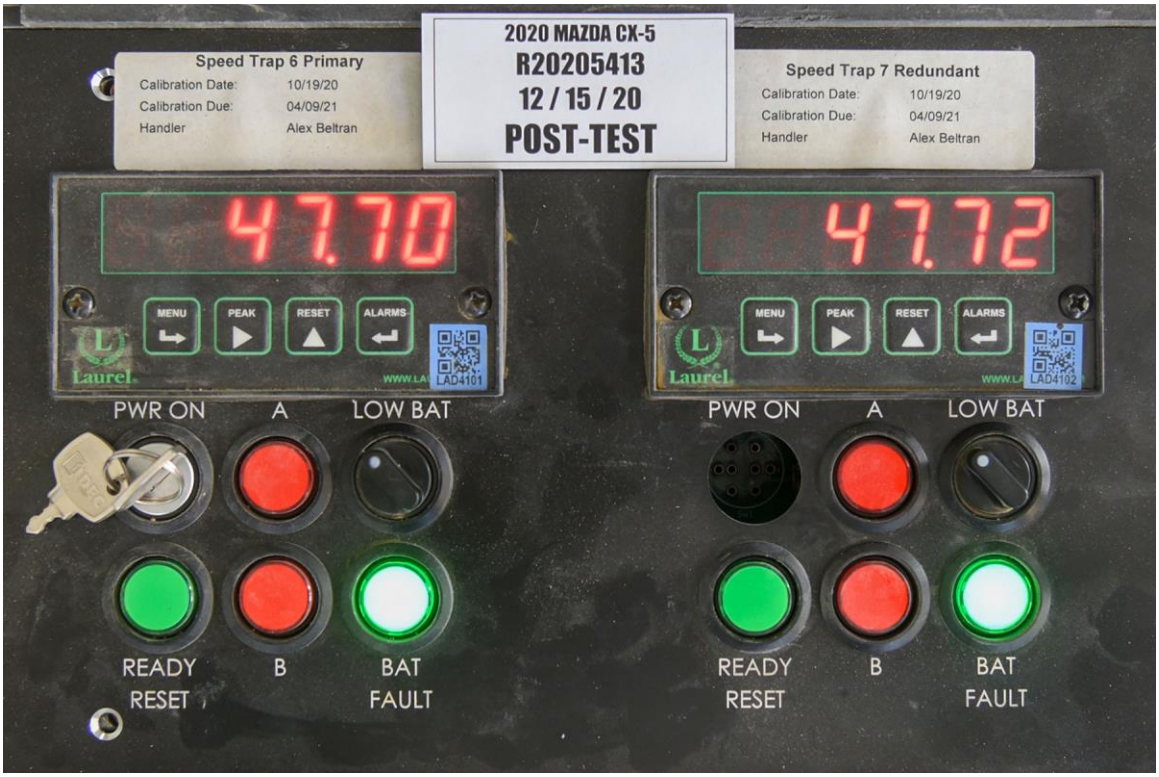

FIGURE 139. Post-Test Speed Trap Read-Out

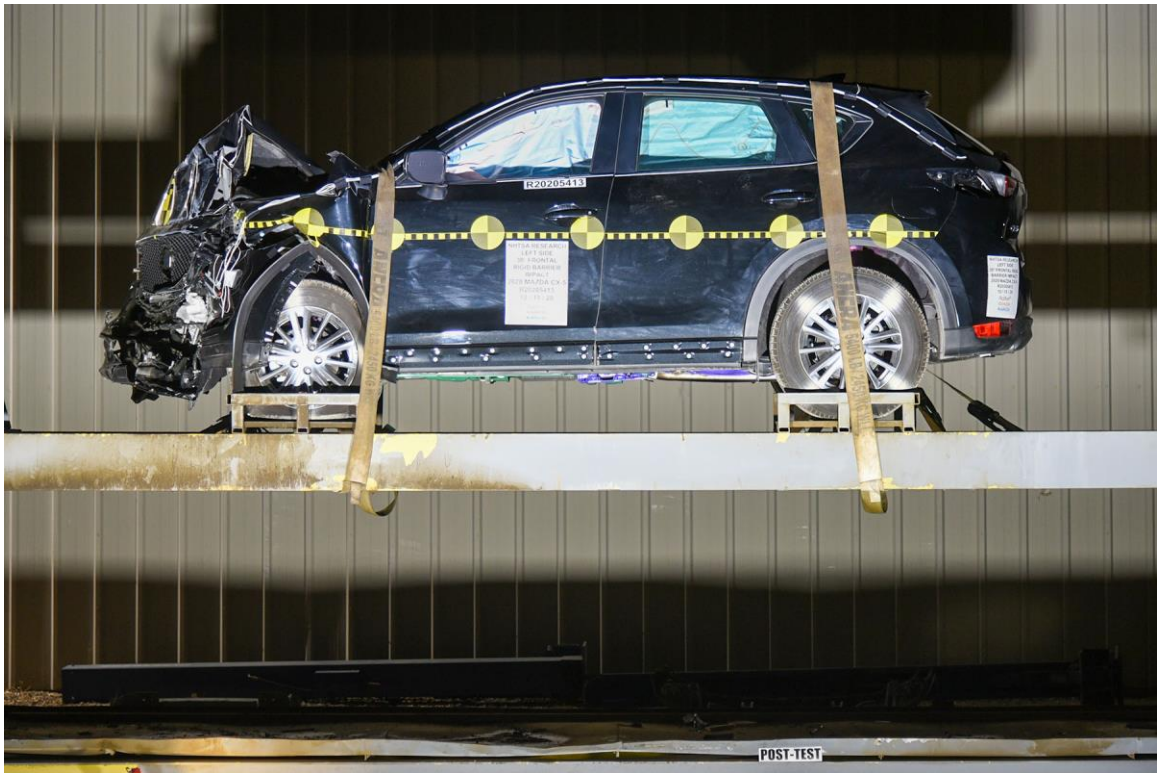

FIGURE 140. Vehicle at 0° on Static Rollover Device

FIGURE 141. Vehicle at 90° on Static Rollover Device

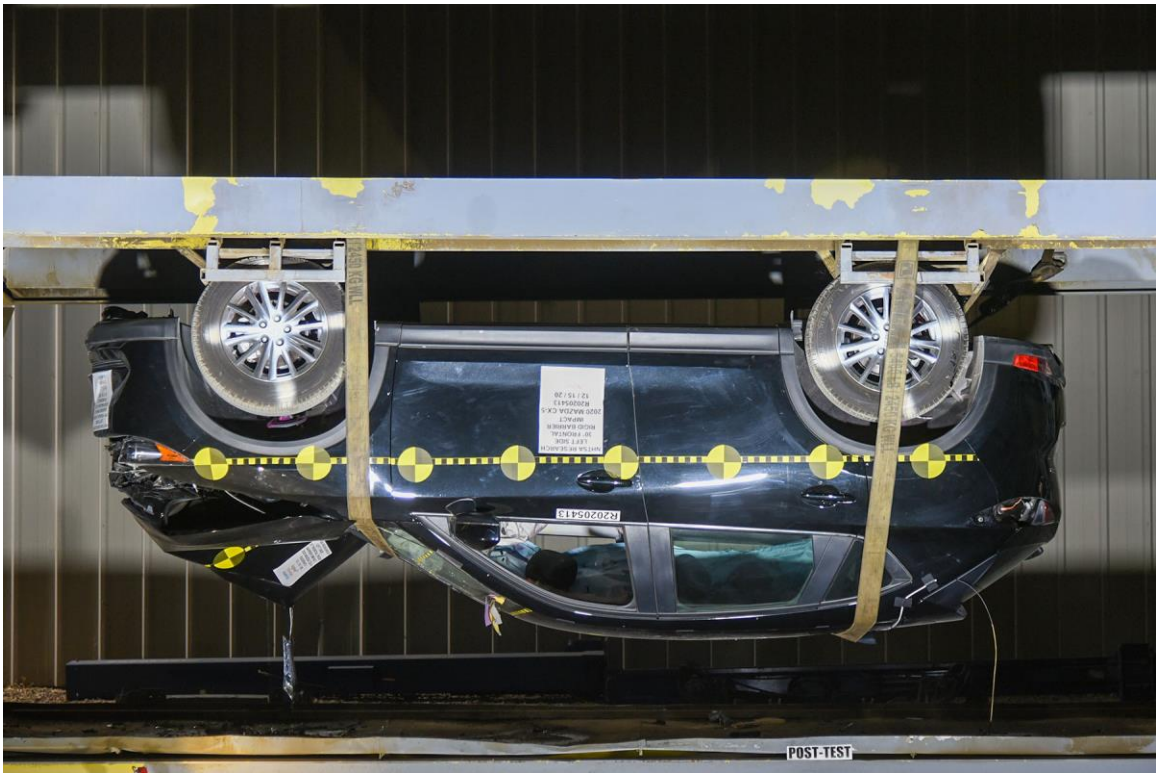

FIGURE 142. Vehicle at 180° on Static Rollover Device

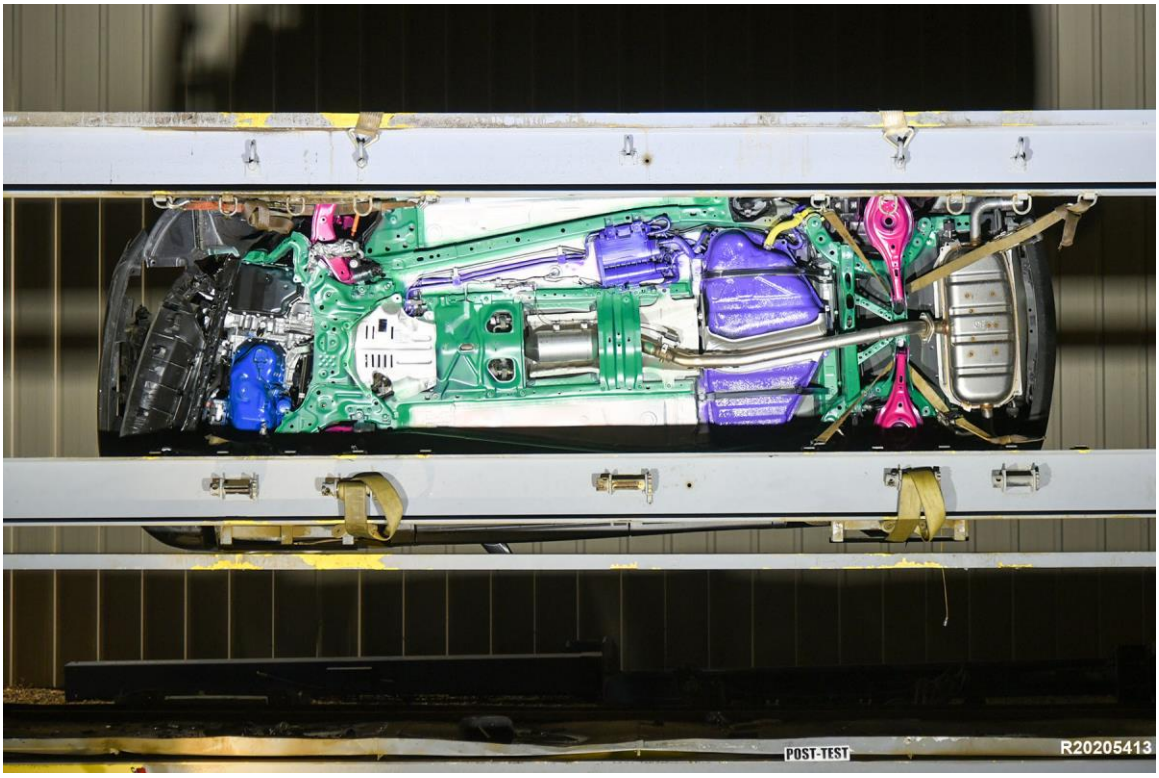

FIGURE 143. Vehicle at 270° on Static Rollover Device

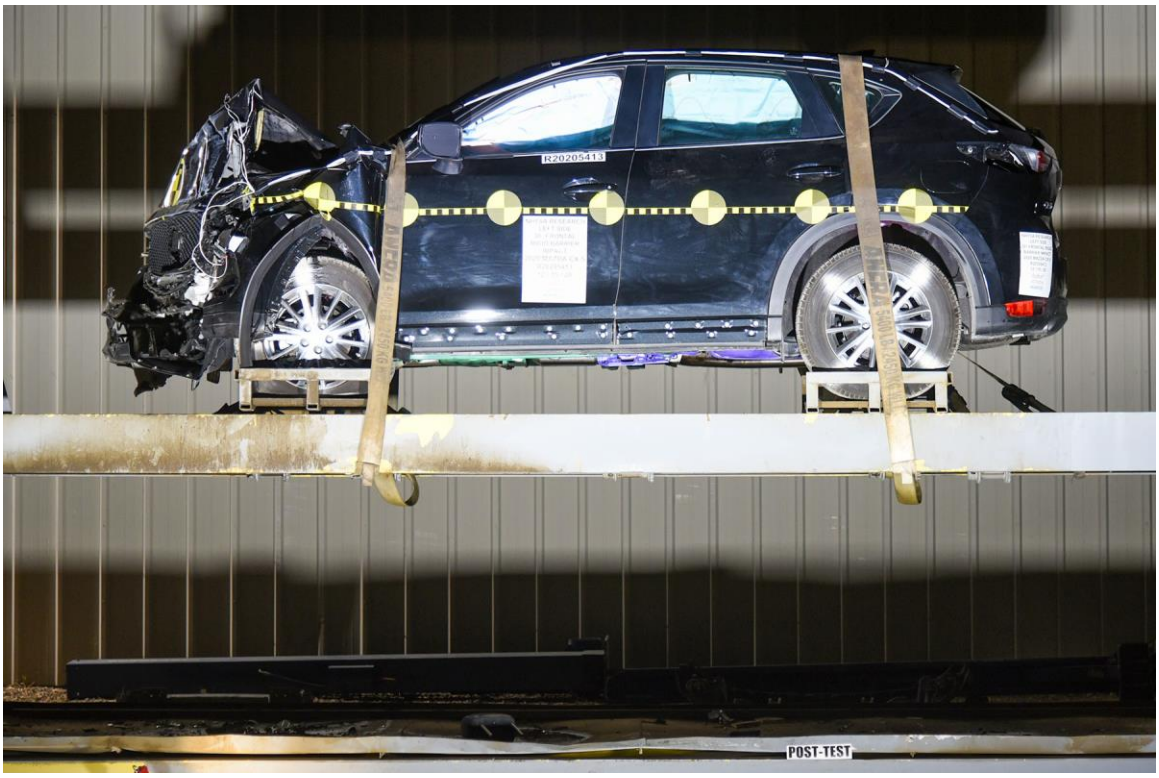

FIGURE 144. Vehicle at 360° on Static Rollover Device

FIGURE 145. Frontal Impact Event

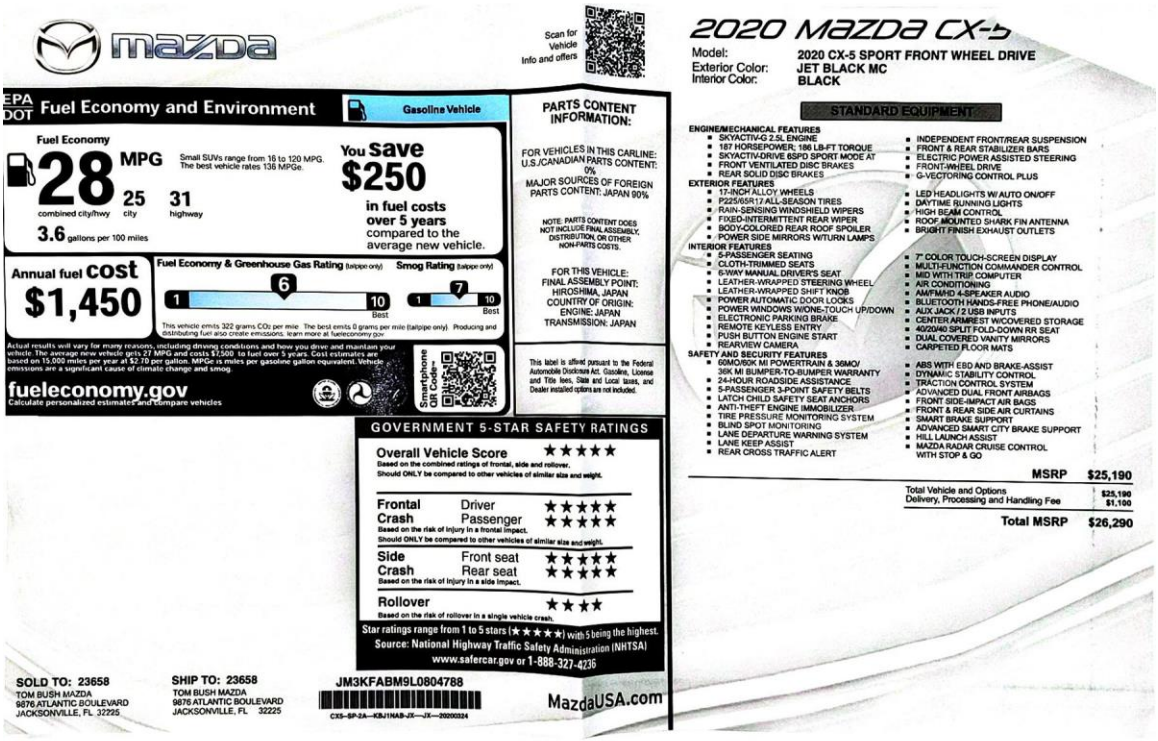

FIGURE 146. Monroney Label Photograph

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA TRACES

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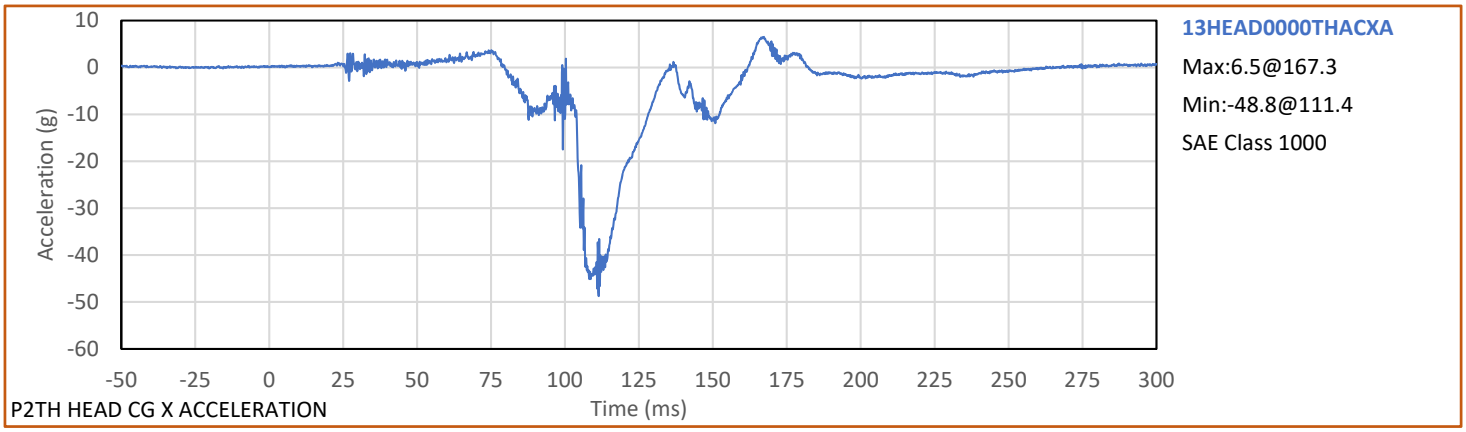
Test Vehicle: 2020 Mazda CX-5 5-Door MPV

Test Program: Left Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205413

Test Date: 12/15/2020



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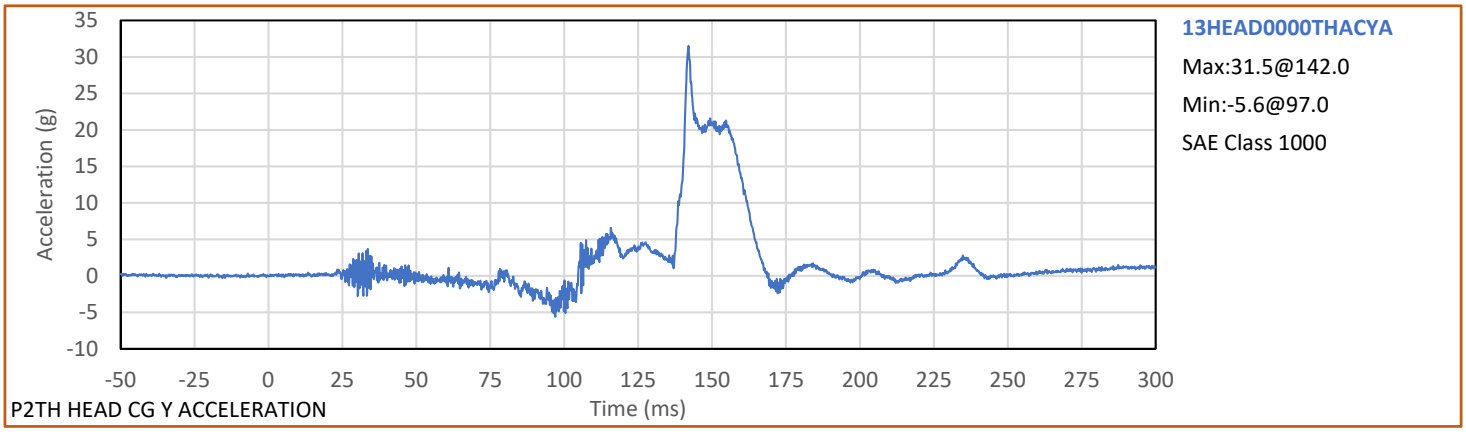

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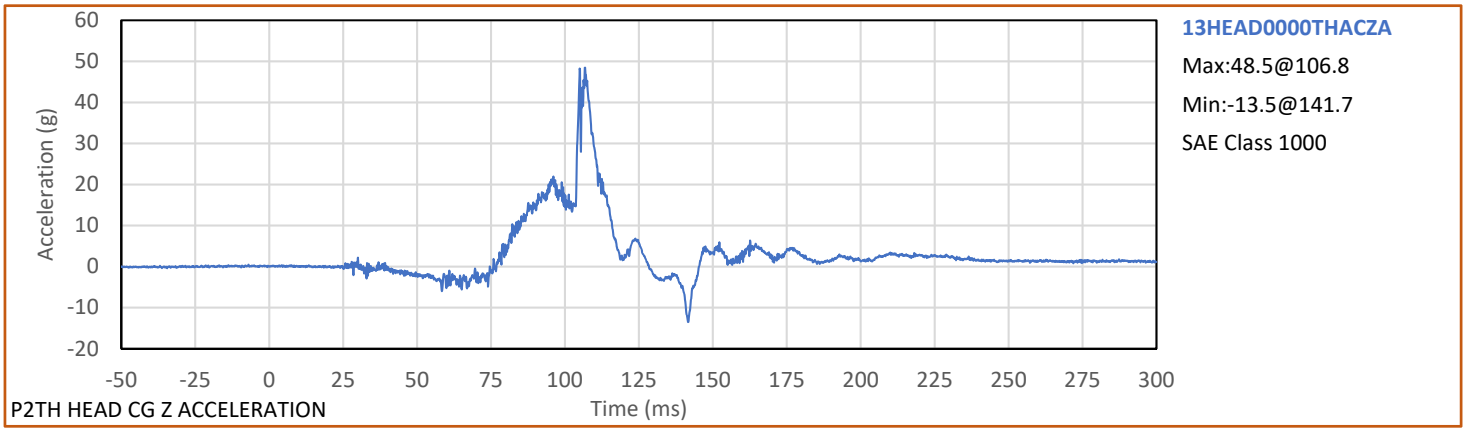

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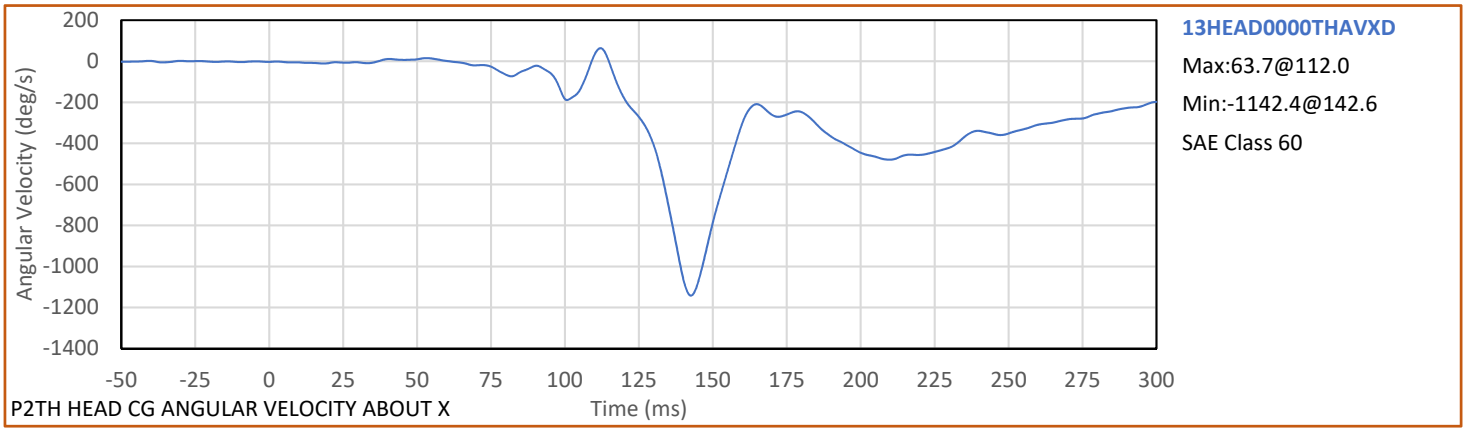

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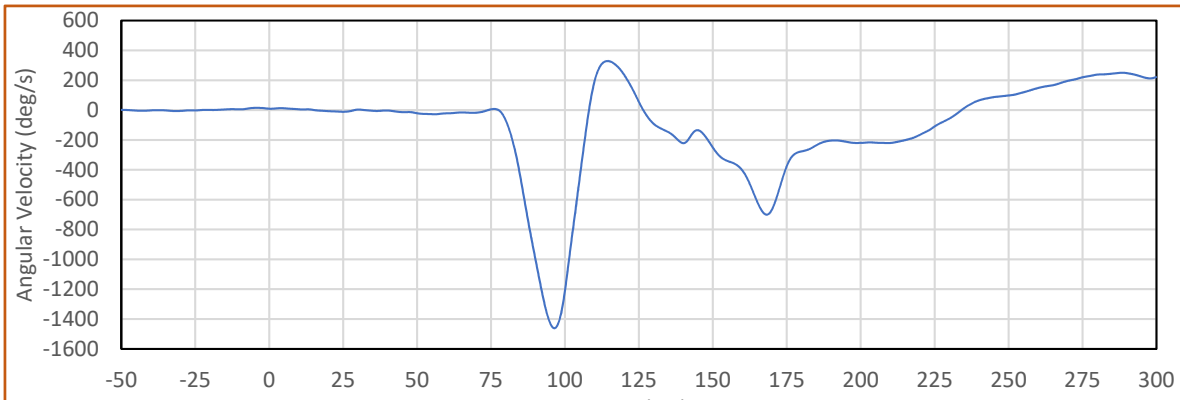

P2TH HEAD CG ANGULAR VELOCITY ABOUT Y

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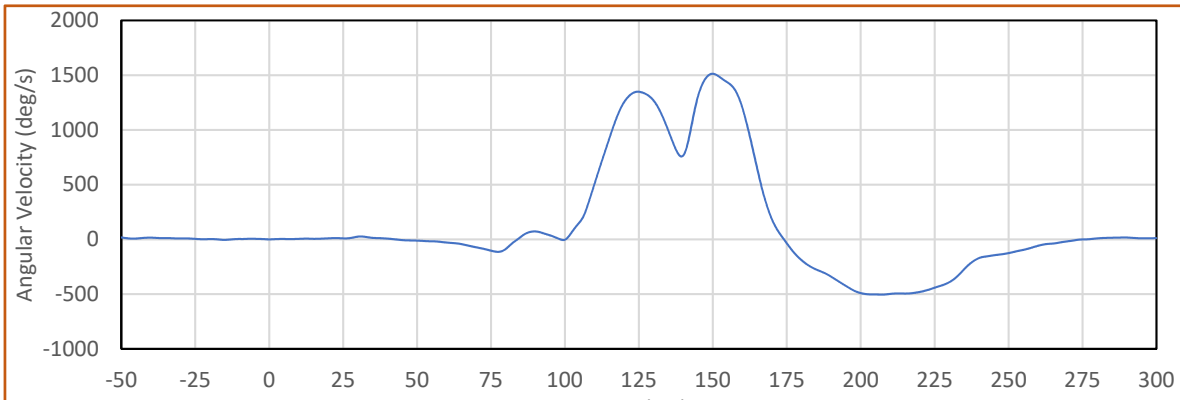

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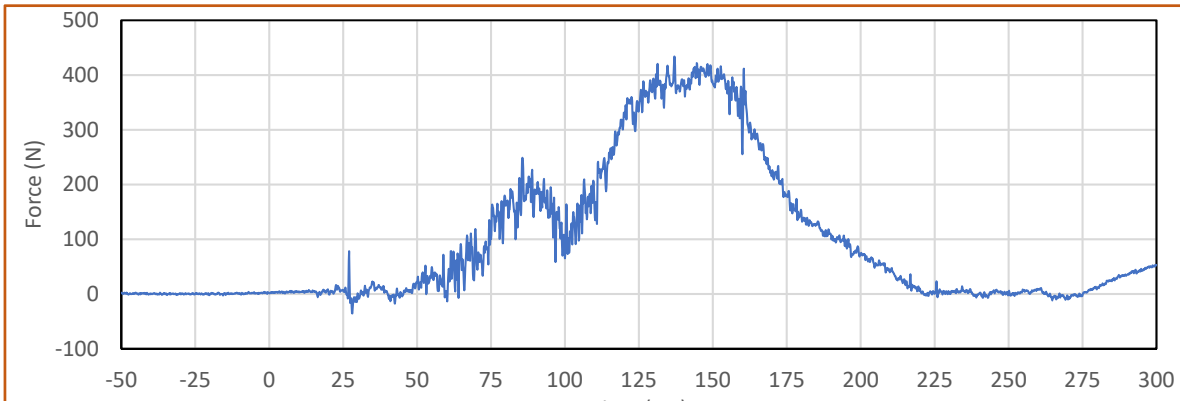

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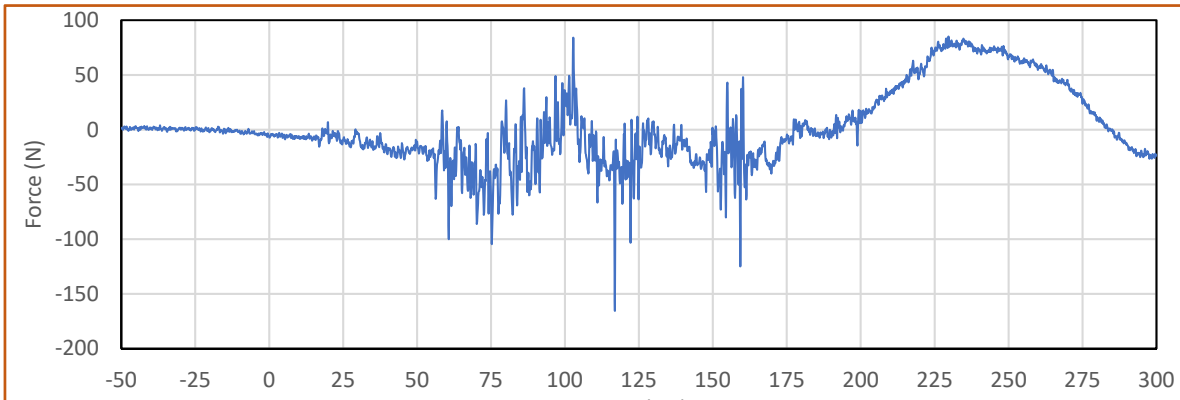

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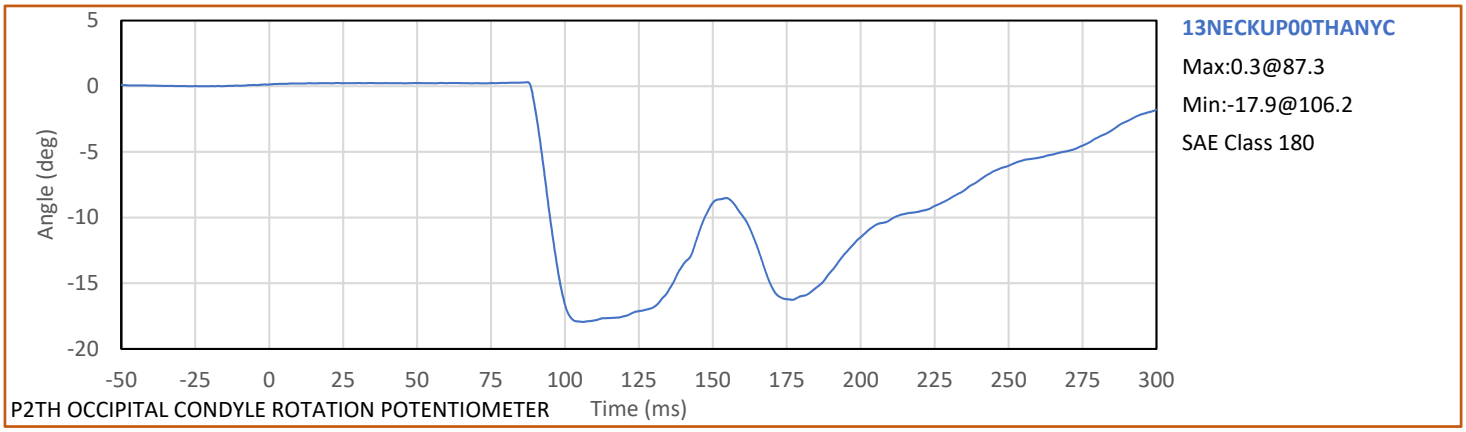
Angle (deg)
Time (ms)
P2TH OCCIPITAL CONDYLE ROTATION POTENTIOMETER
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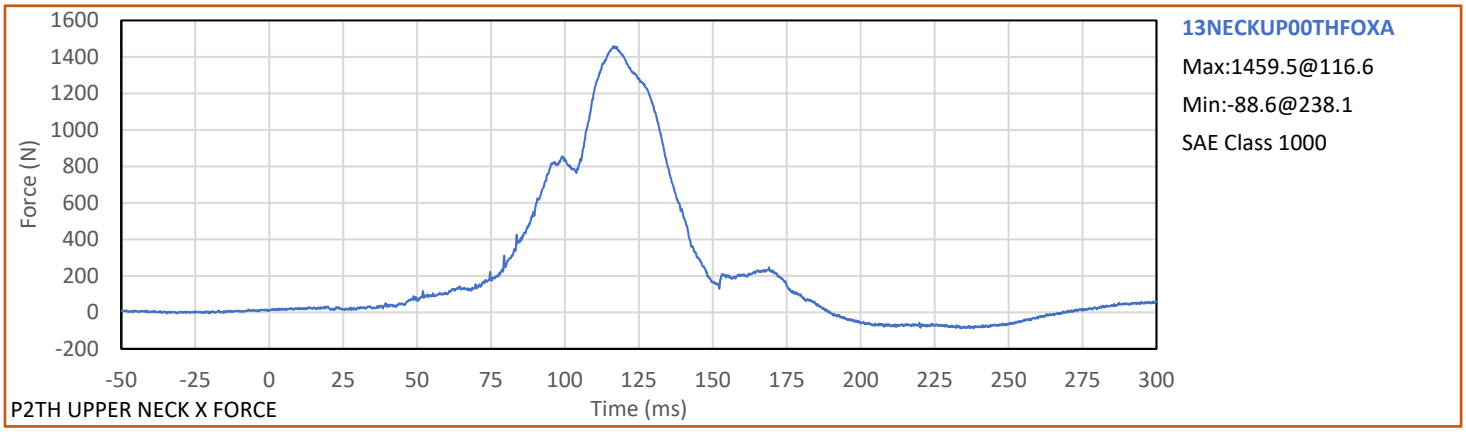
SAE Class 180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Time (ms)
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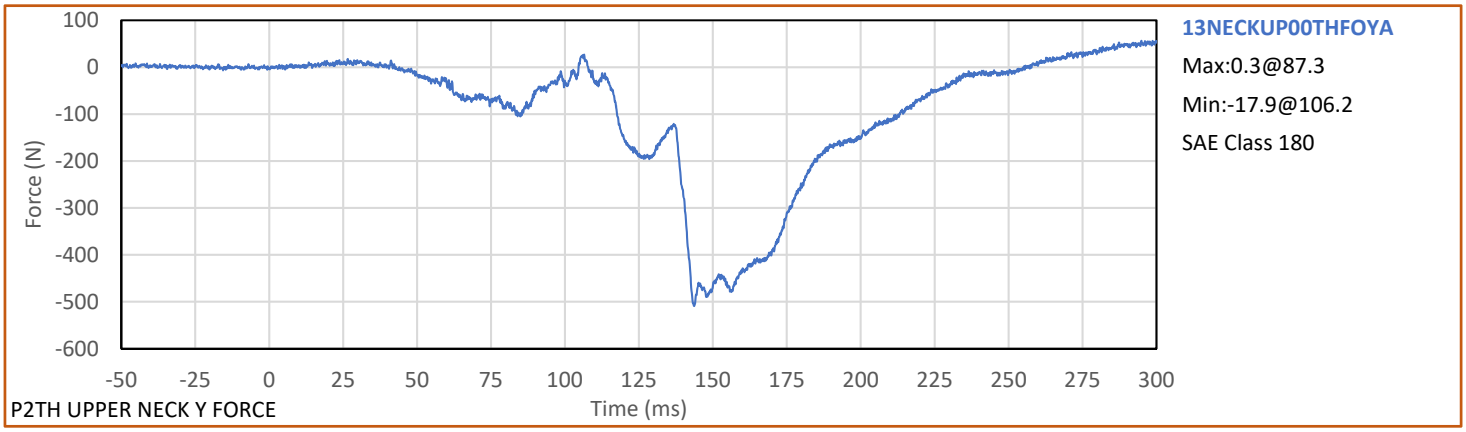
SAE Class 1000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Time (ms)
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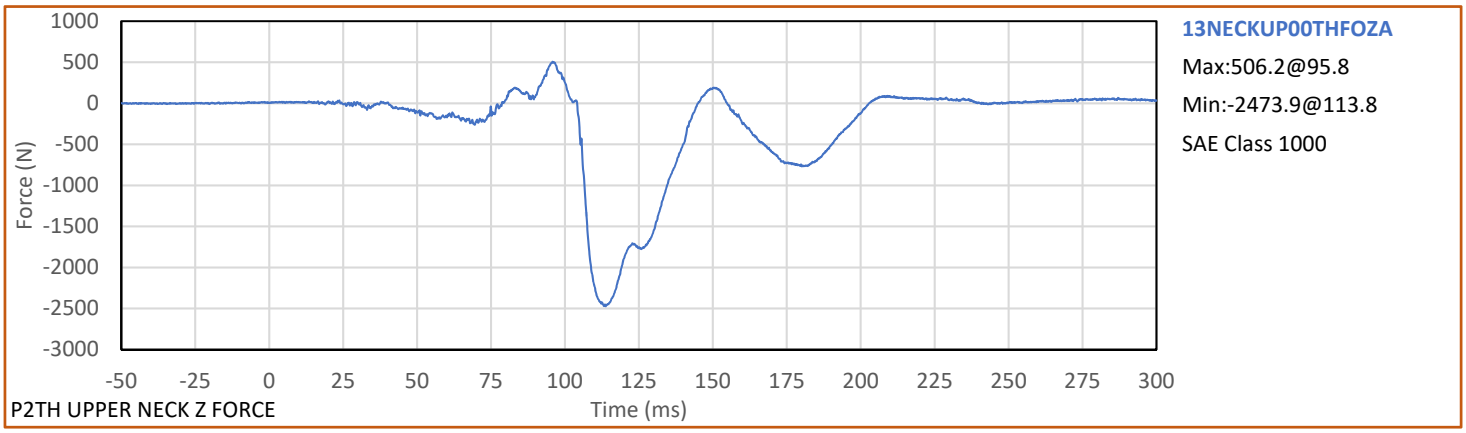
SAE Class 180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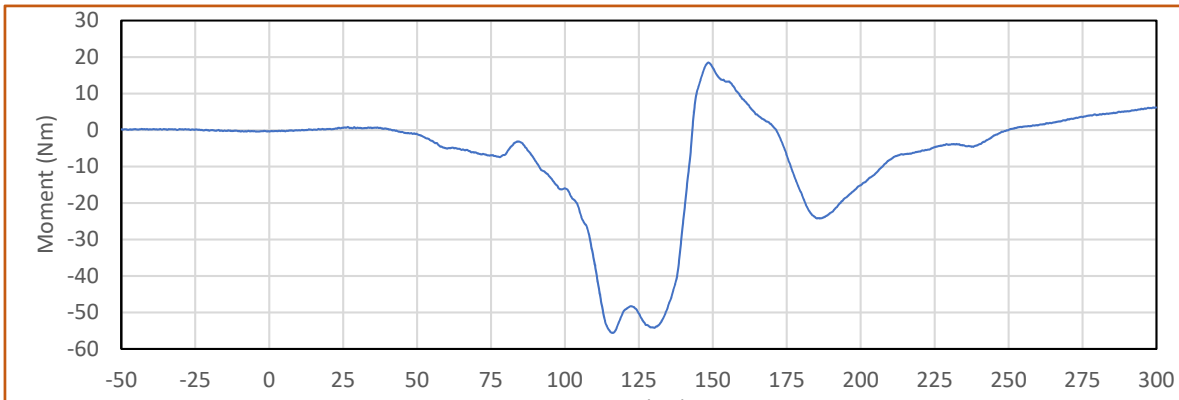
SAE Class 1000



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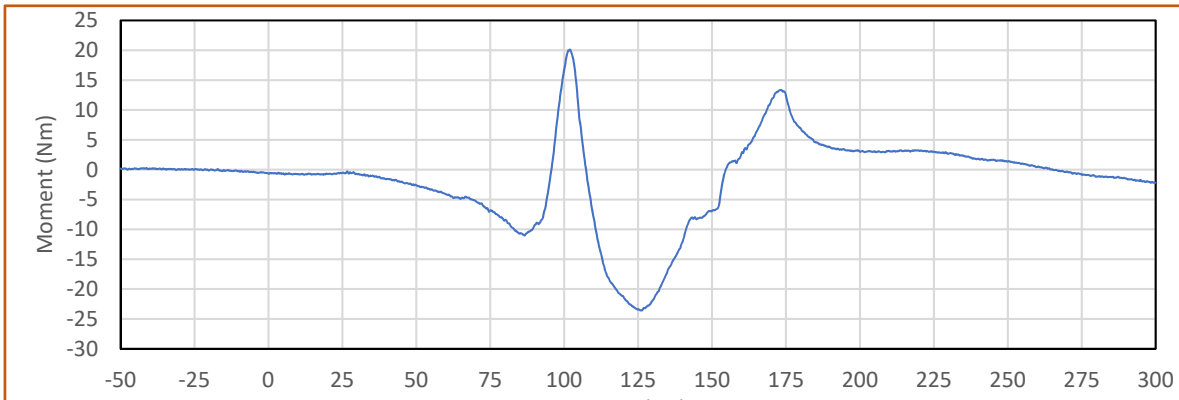
SAE Class 600



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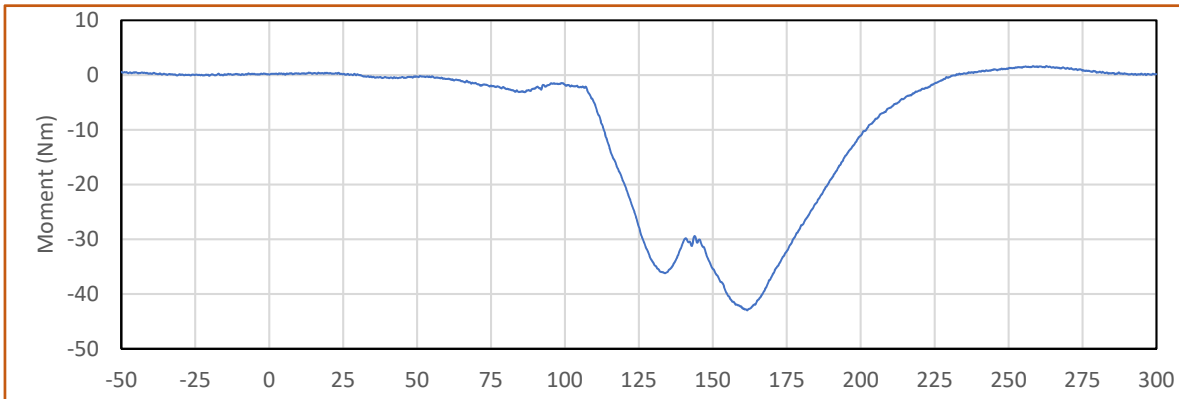

P2TH UPPER NECK Z MOMENT

13NECKUP00THMOZB
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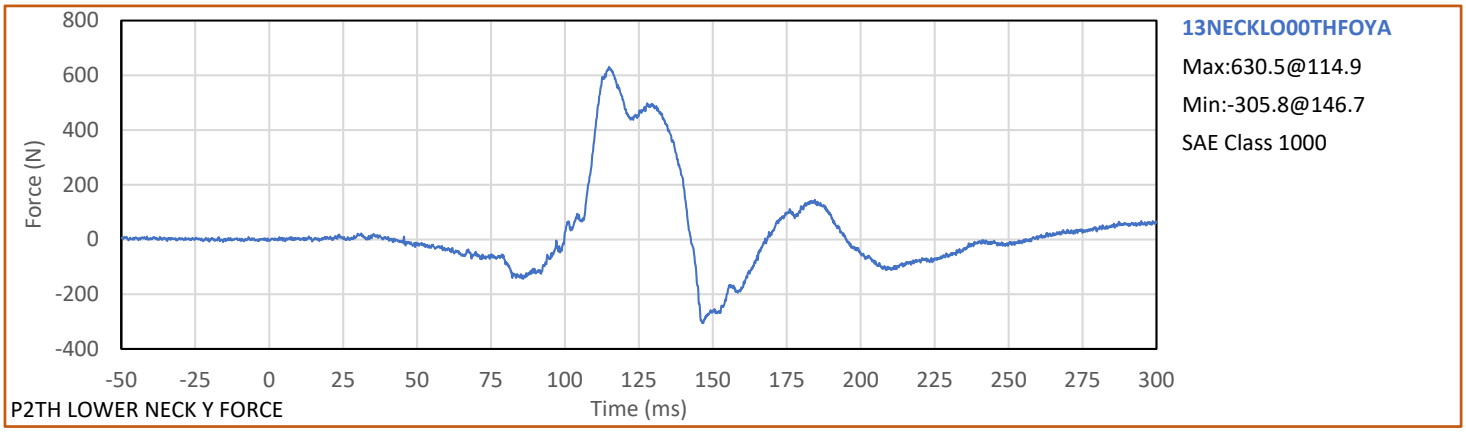

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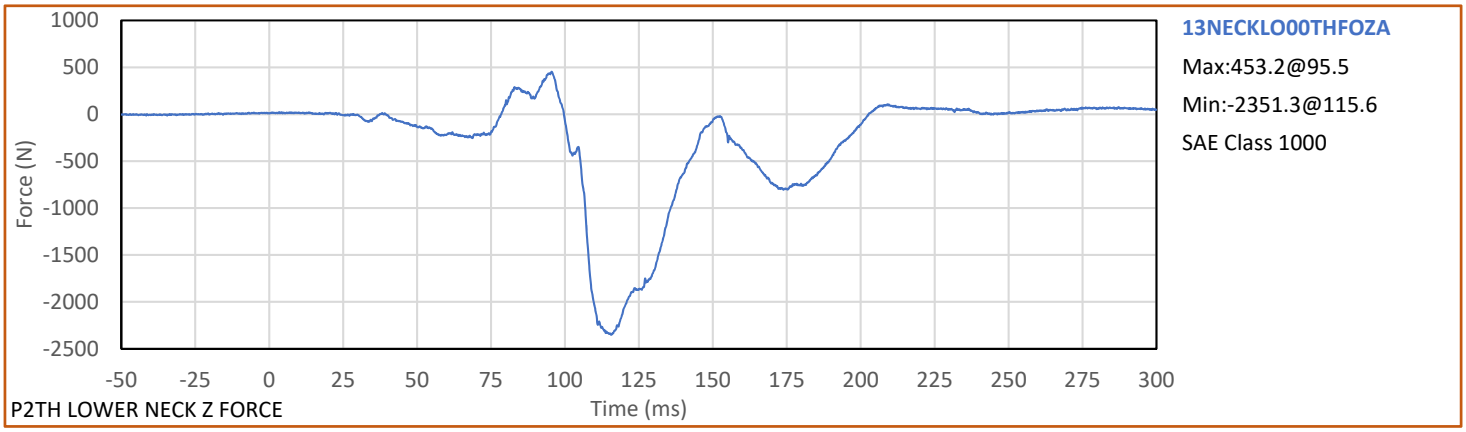

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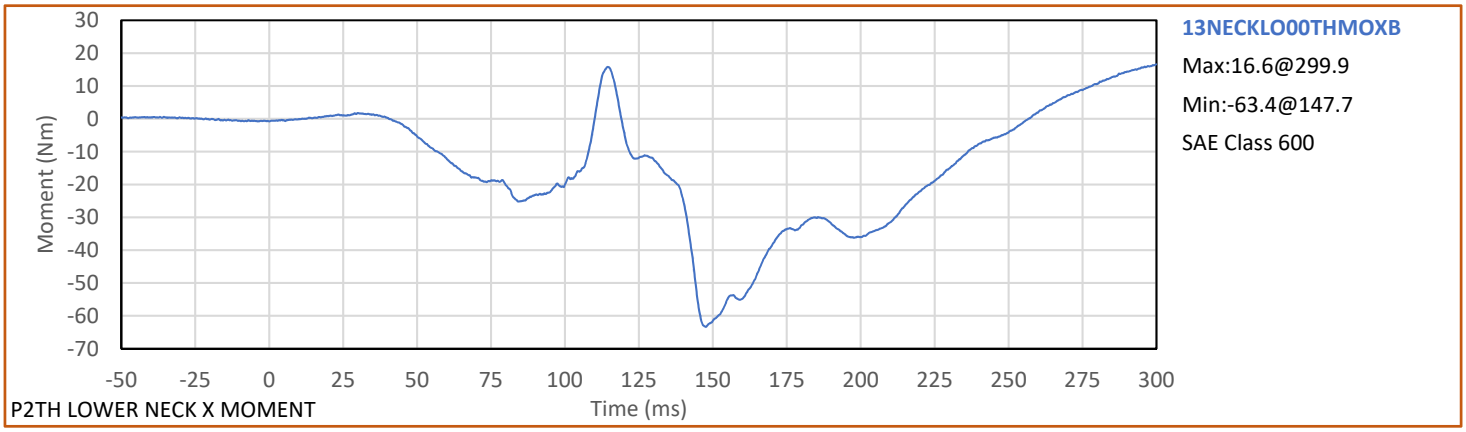

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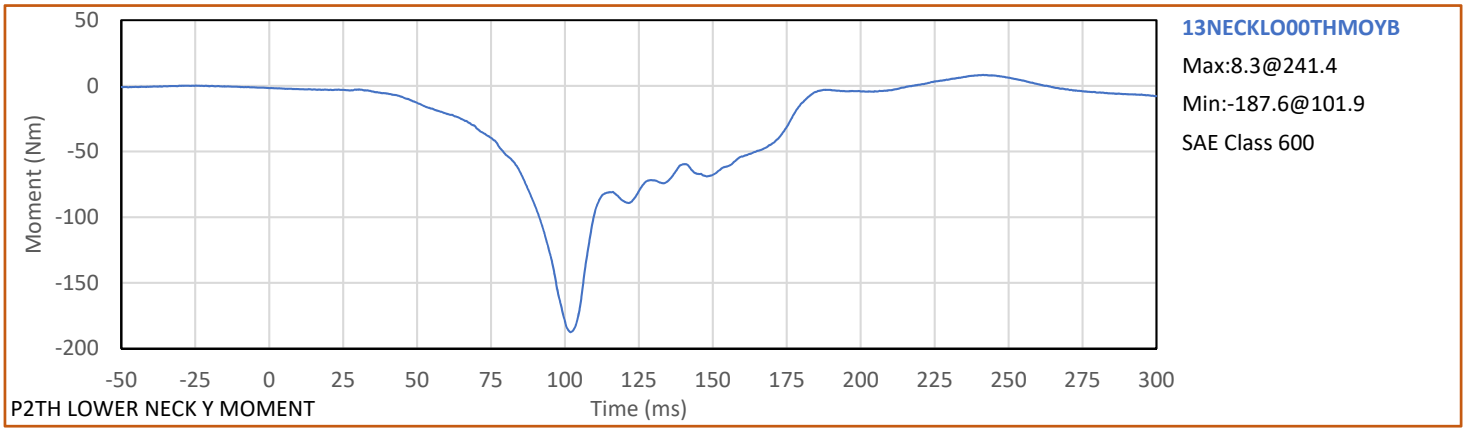
SAE Class 600



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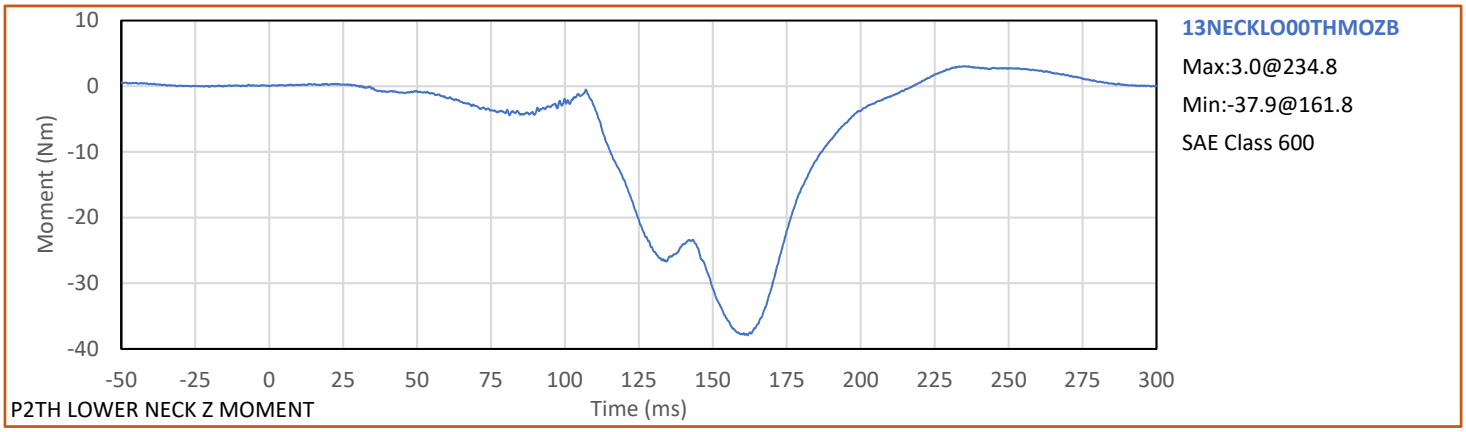
Moment (Nm)
Time (ms)
P2TH LOWER NECK Z MOMENT
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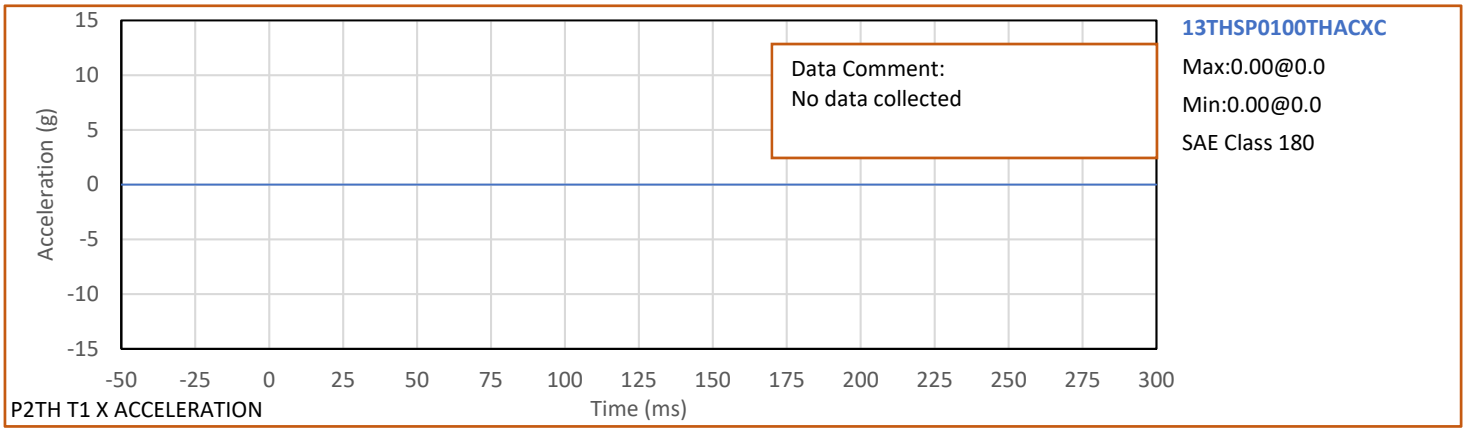
SAE Class 600


Acceleration (g)
Time (ms)
P2TH T1 X ACCELERATION
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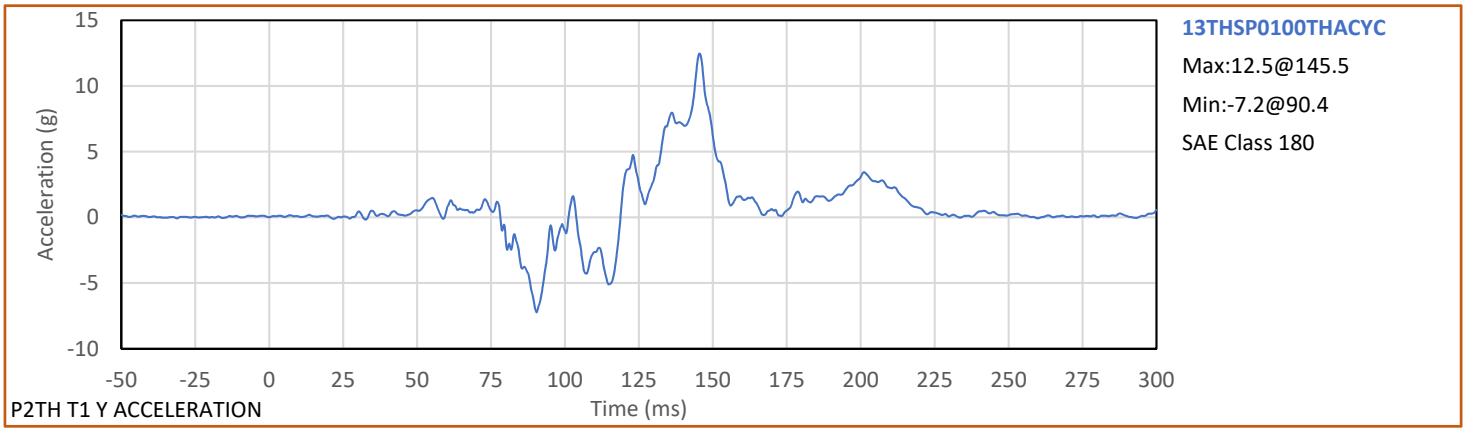
SAE Class 180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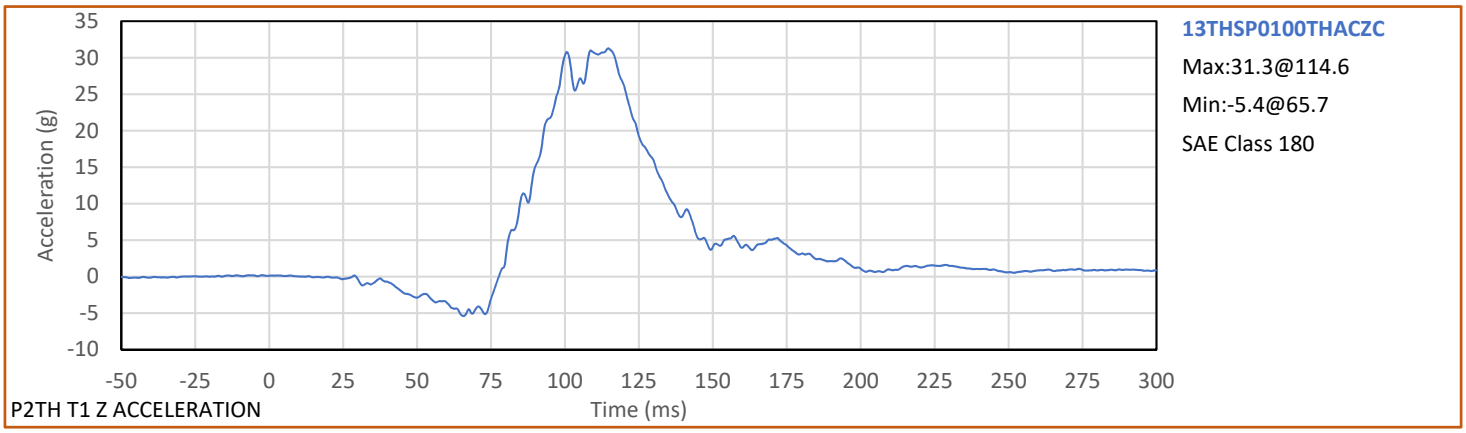
SAE Class 180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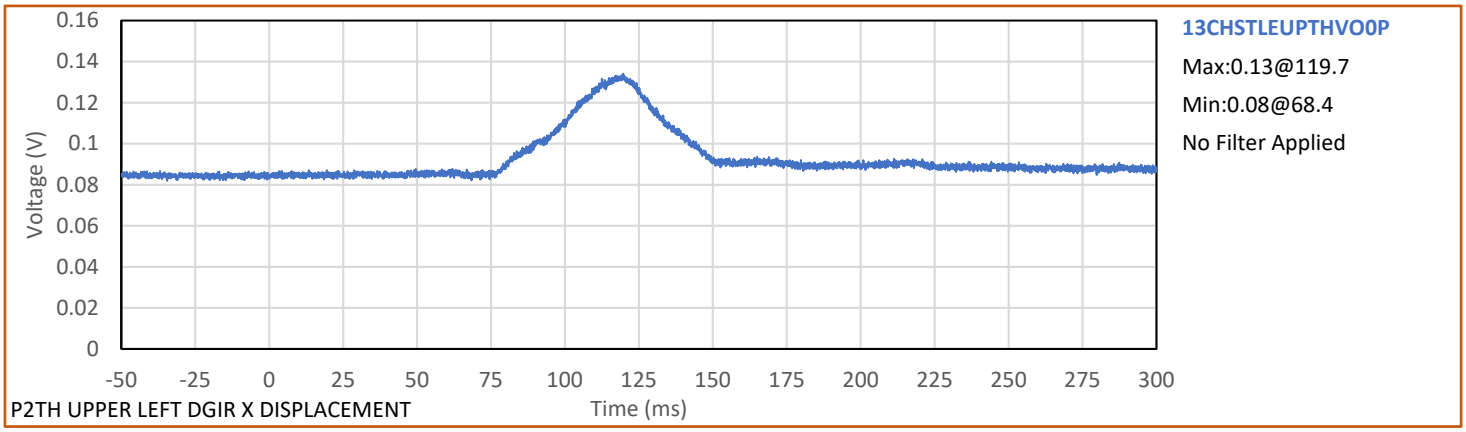
SAE Class 180


Voltage (V)
Time (ms)
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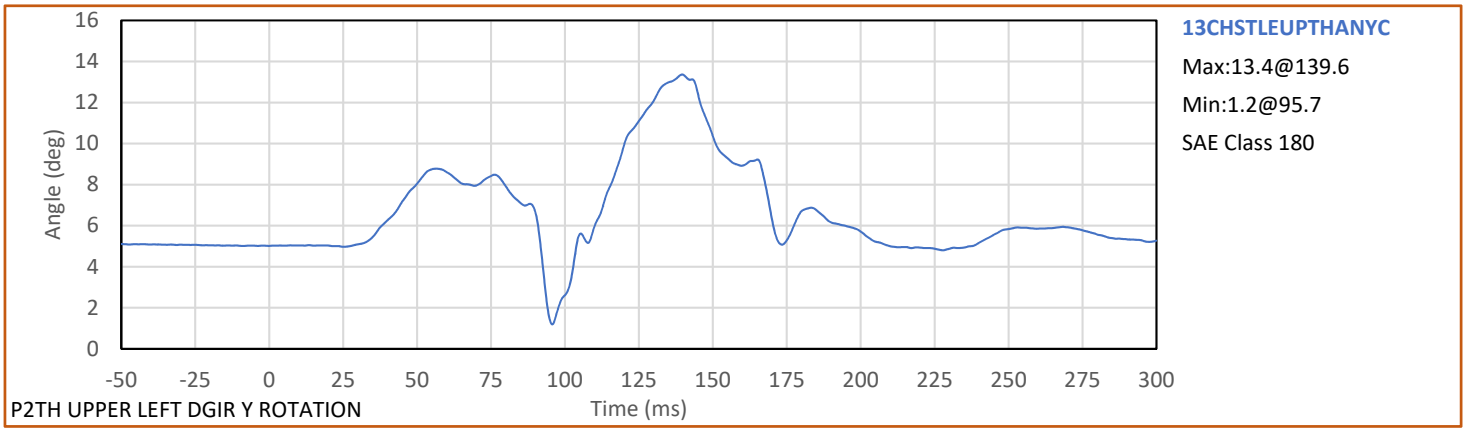
Angle (deg)
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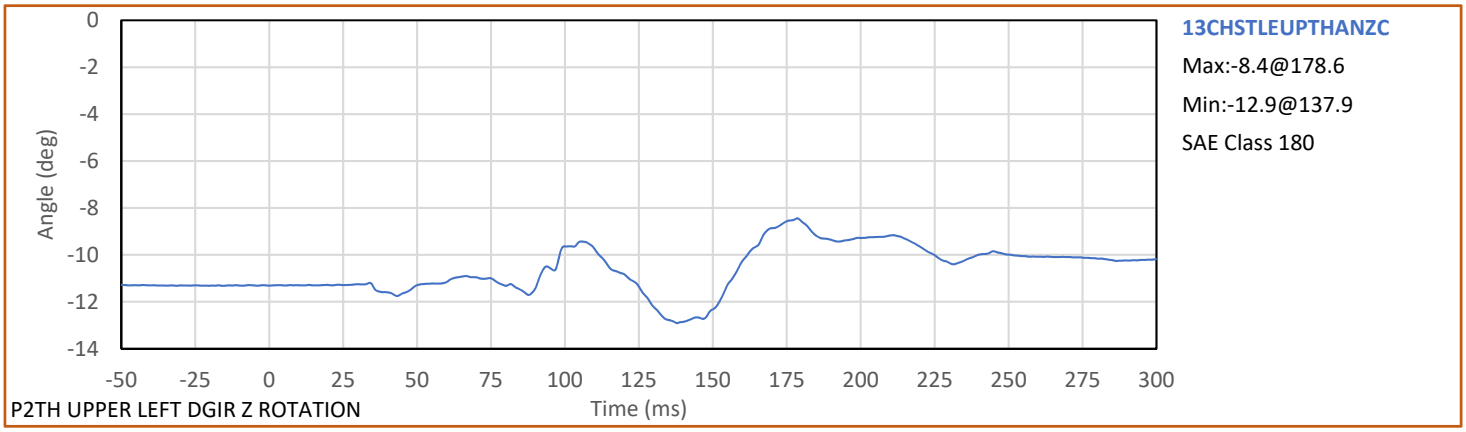
SAE Class 180


Angle (deg)
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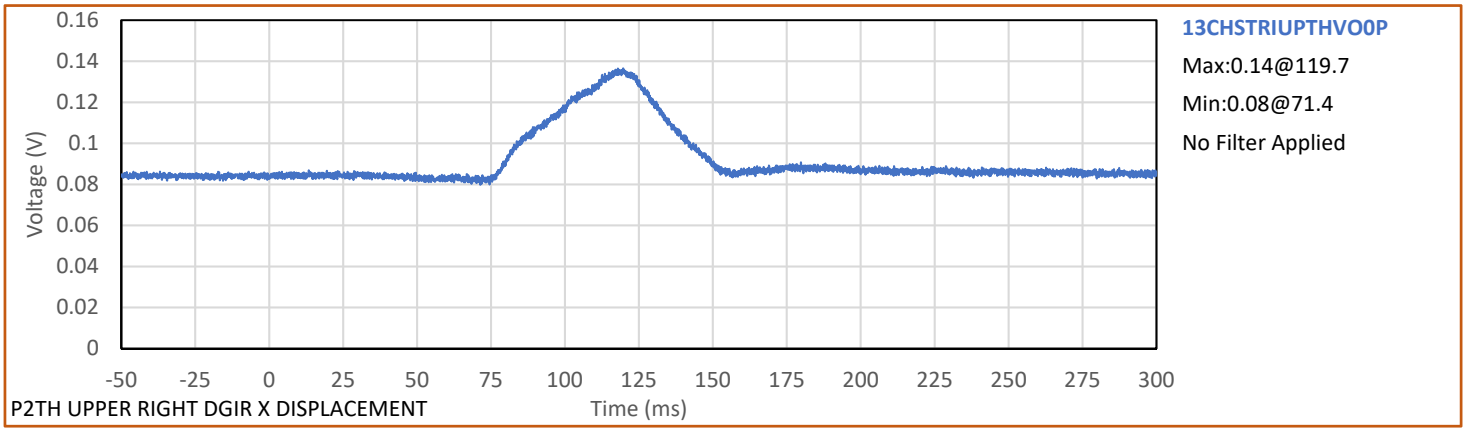
SAE Class 180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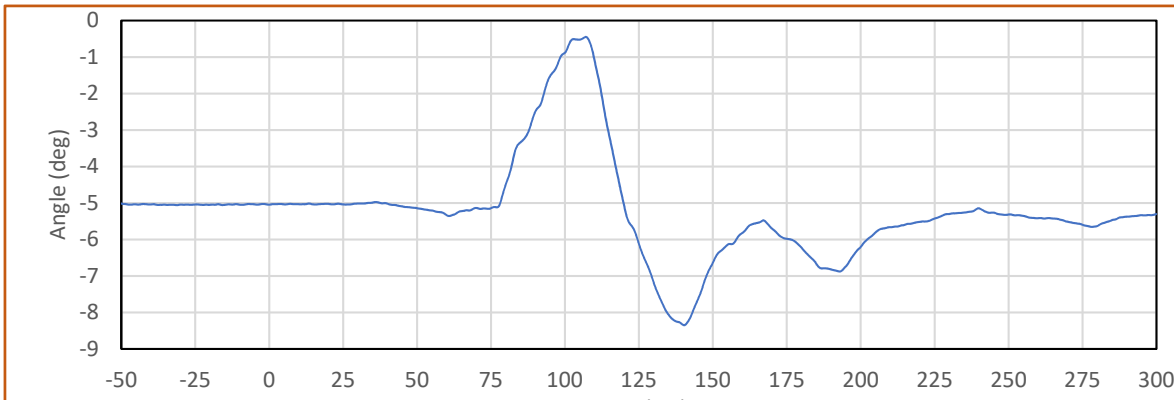

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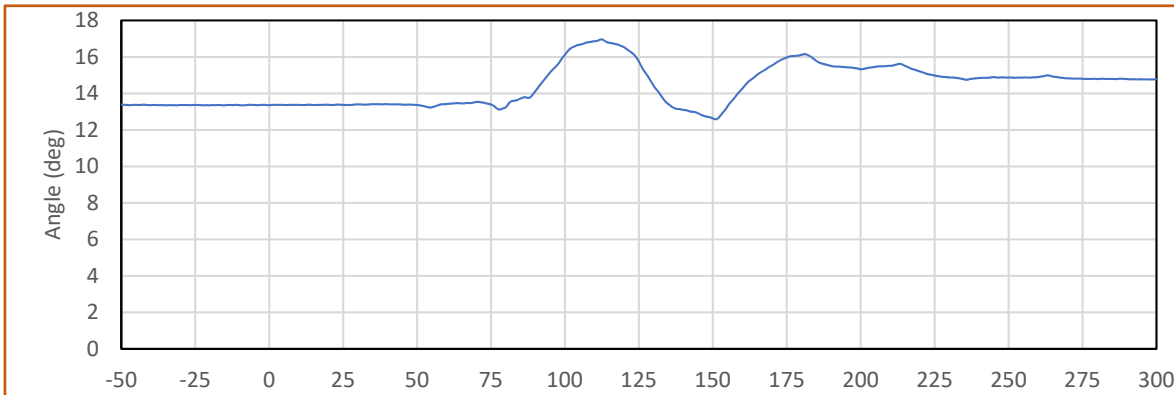

P2TH UPPER RIGHT DGIR Z ROTATION

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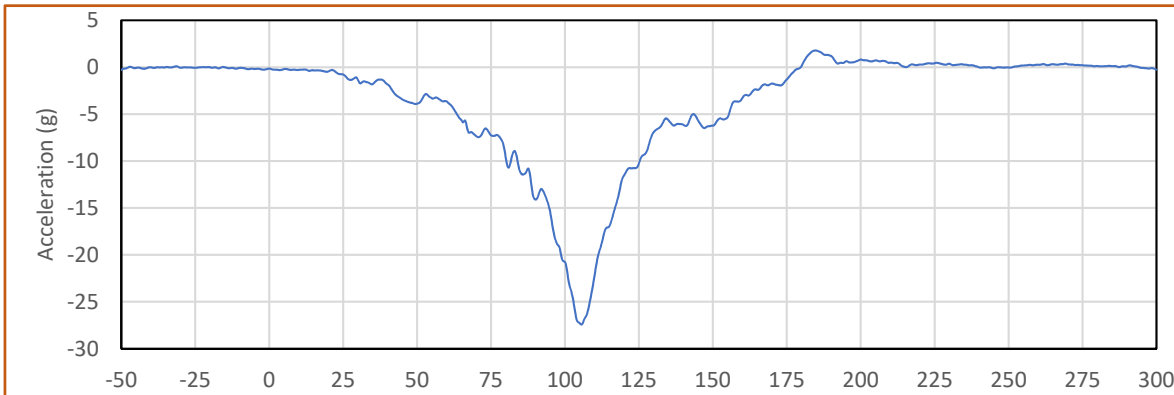

P2TH T6 X ACCELERATION

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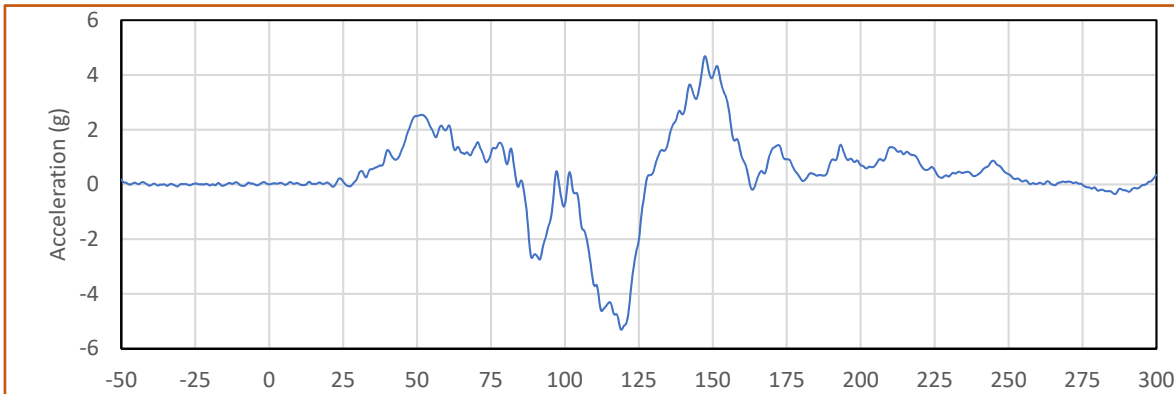
SAE Class 180



P2TH T6 Y ACCELERATION

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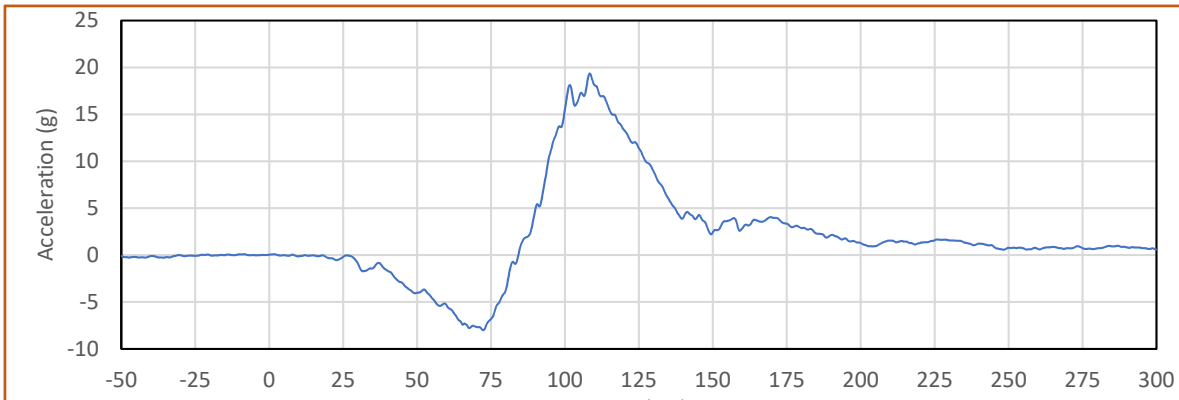
SAE Class 180



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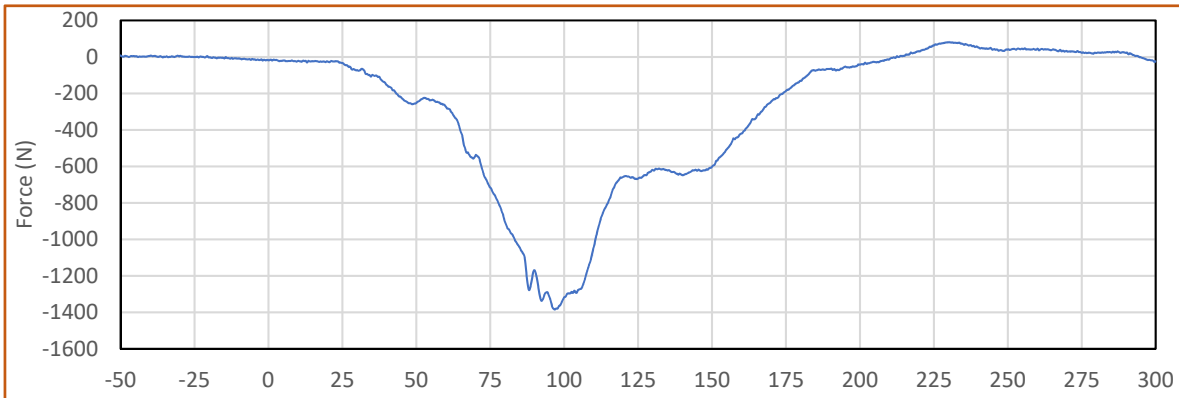

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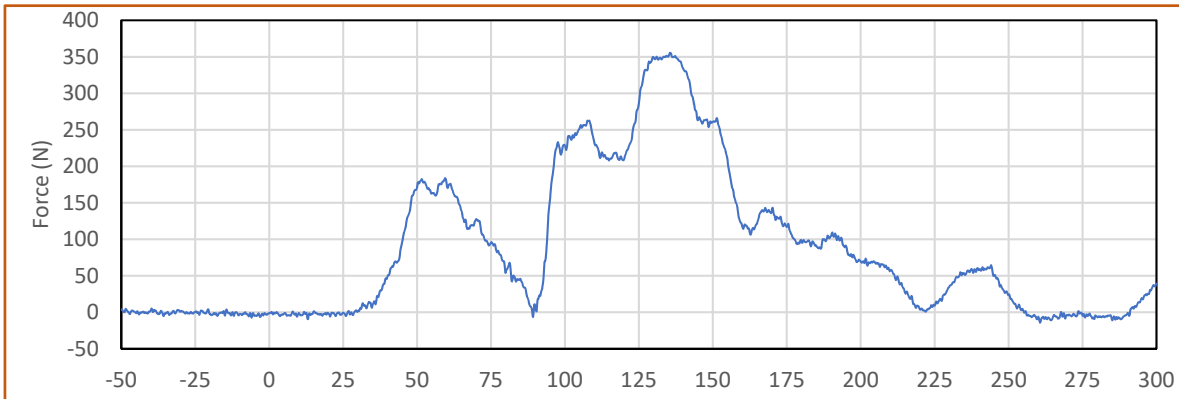

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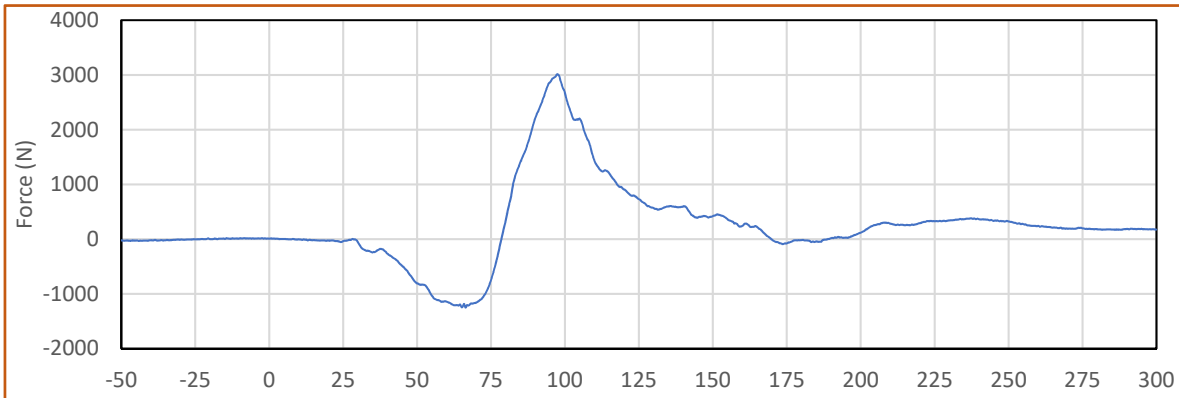

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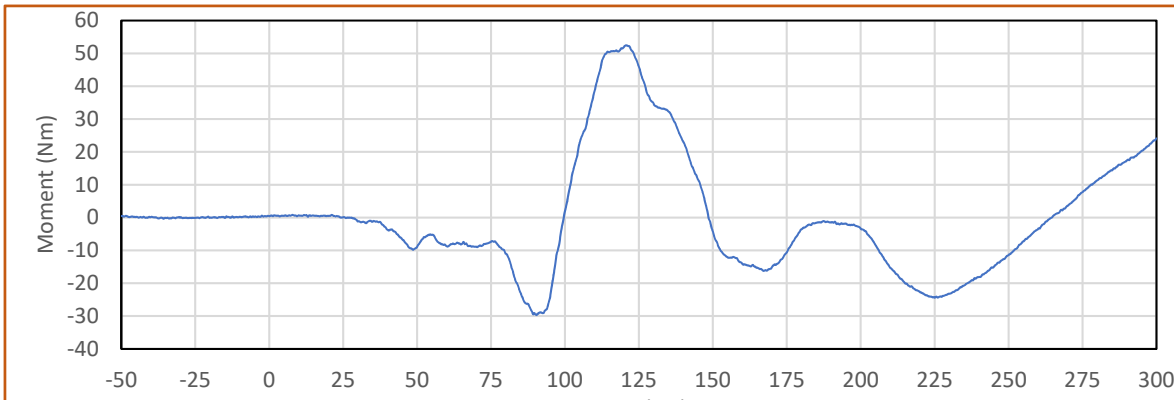

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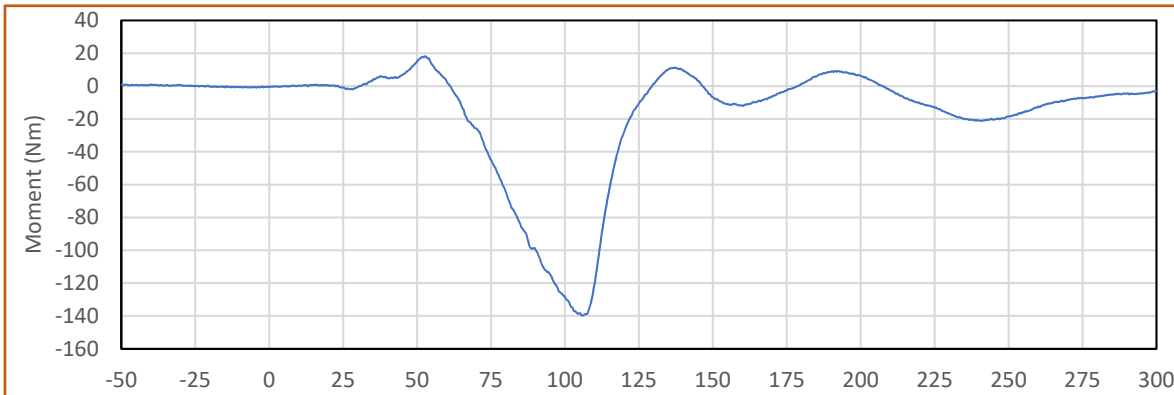

P2TH SPINE MOMENT Y

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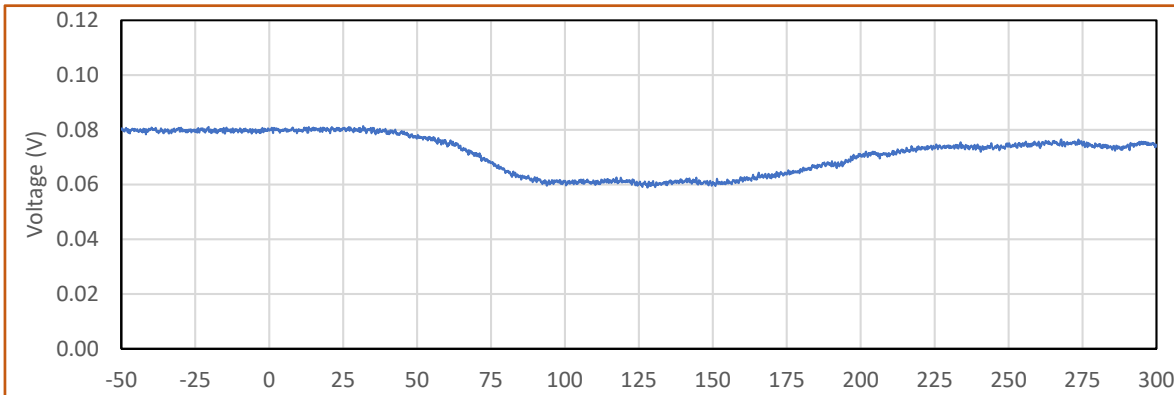
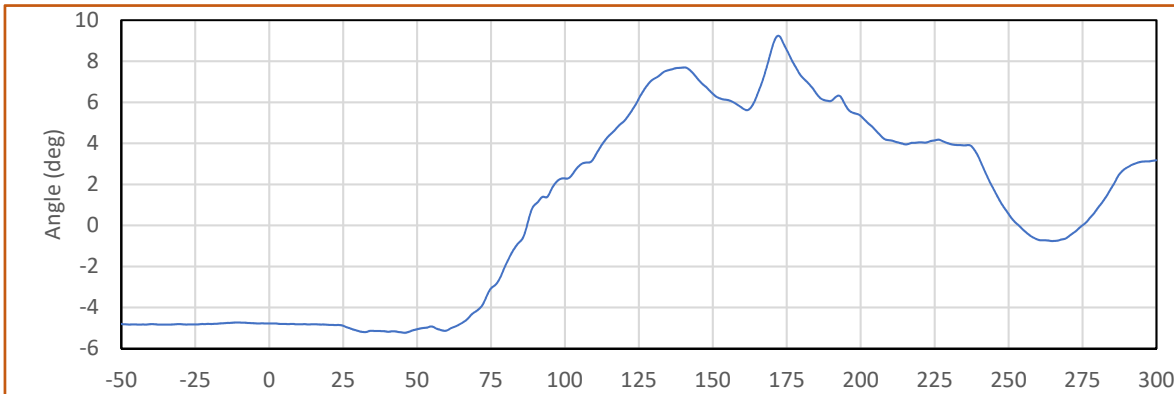
Min:-139.8@105.9
SAE Class 600



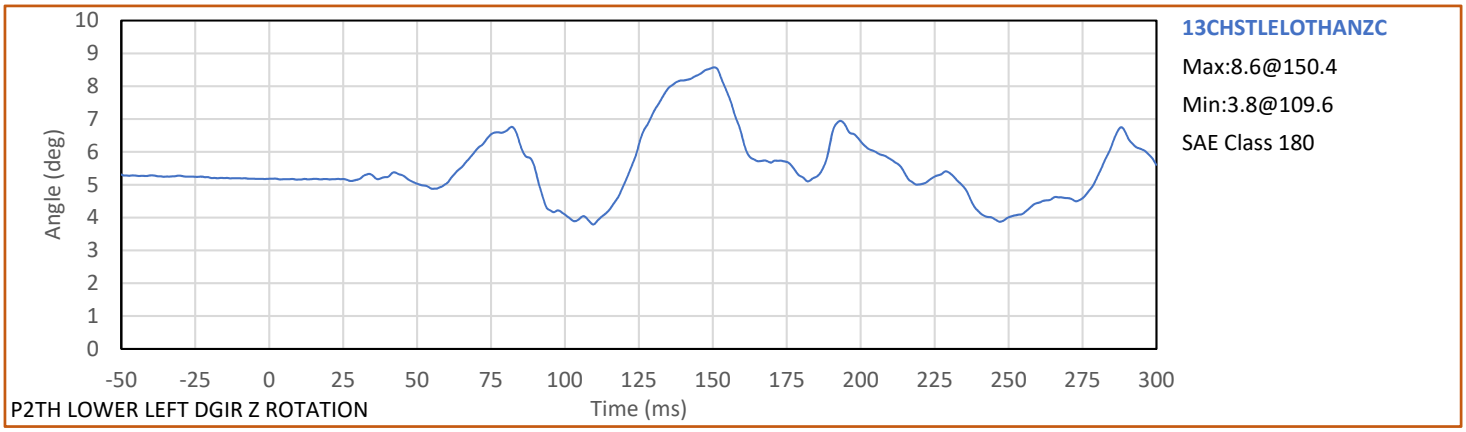
P2TH LOWER LEFT DGIR X DISPLACEMENT

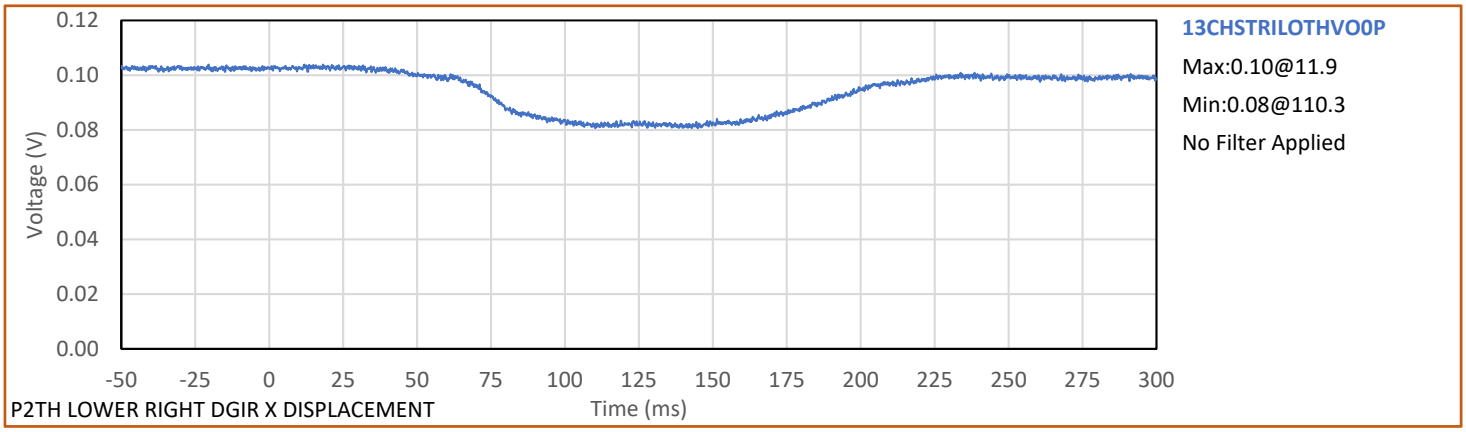
13CHSTLELOTHVO0P
Max:0.08@31.8
Min:0.06@127.9
No Filter Applied

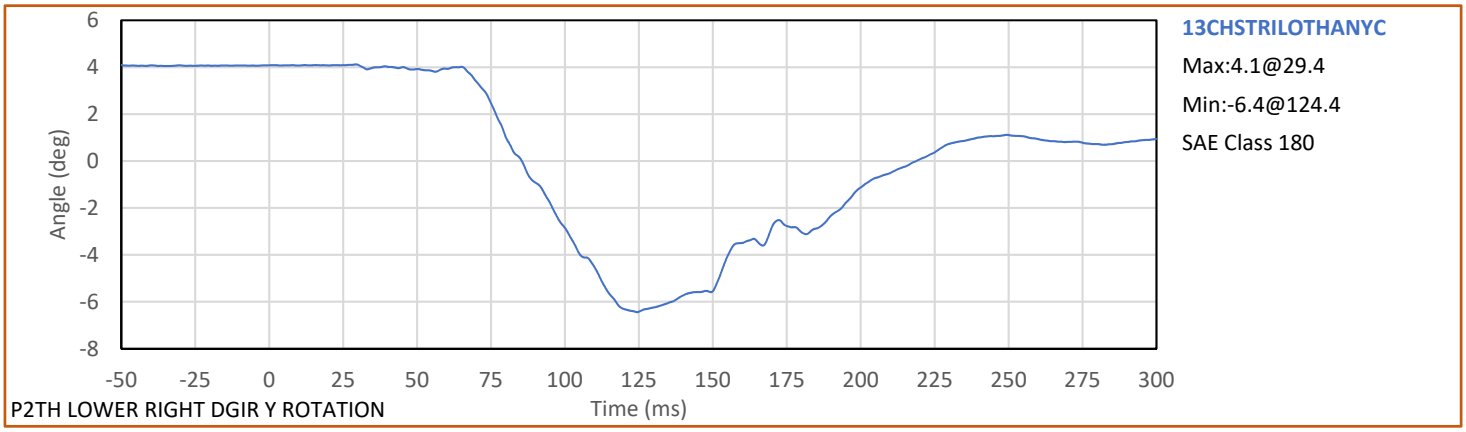


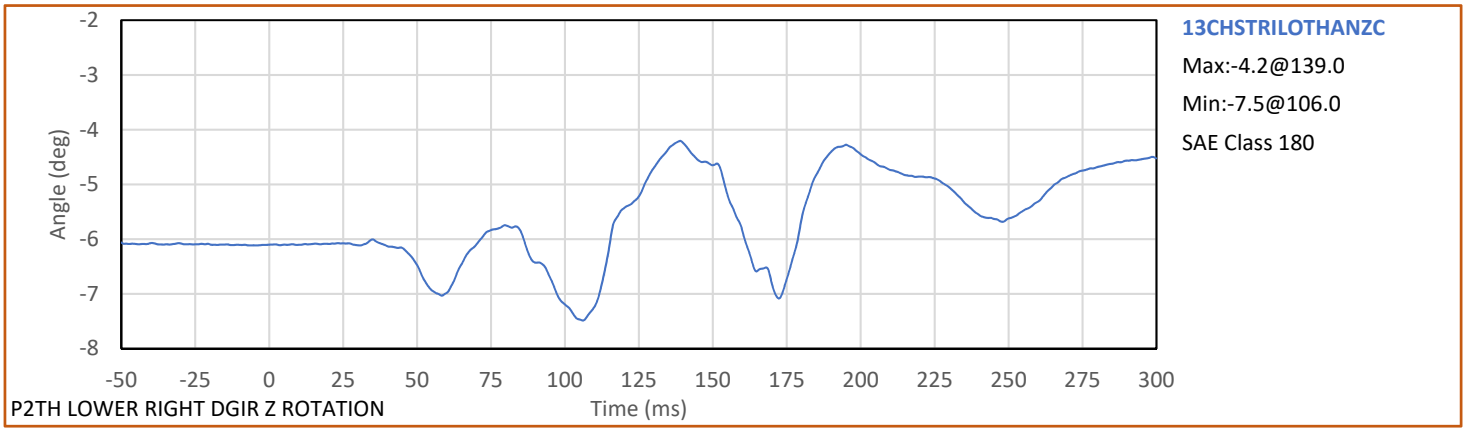
P2TH LOWER LEFT DGIR Y ROTATION

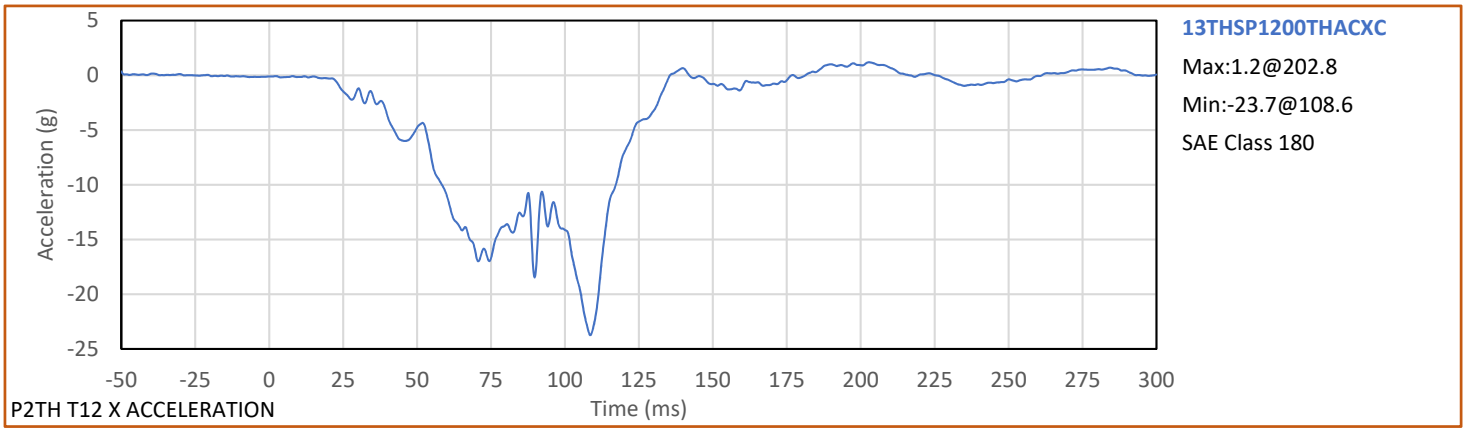
13CHSTLELOTHANYC
Max:9.2@172.2
Min:-5.2@45.8
SAE Class 180

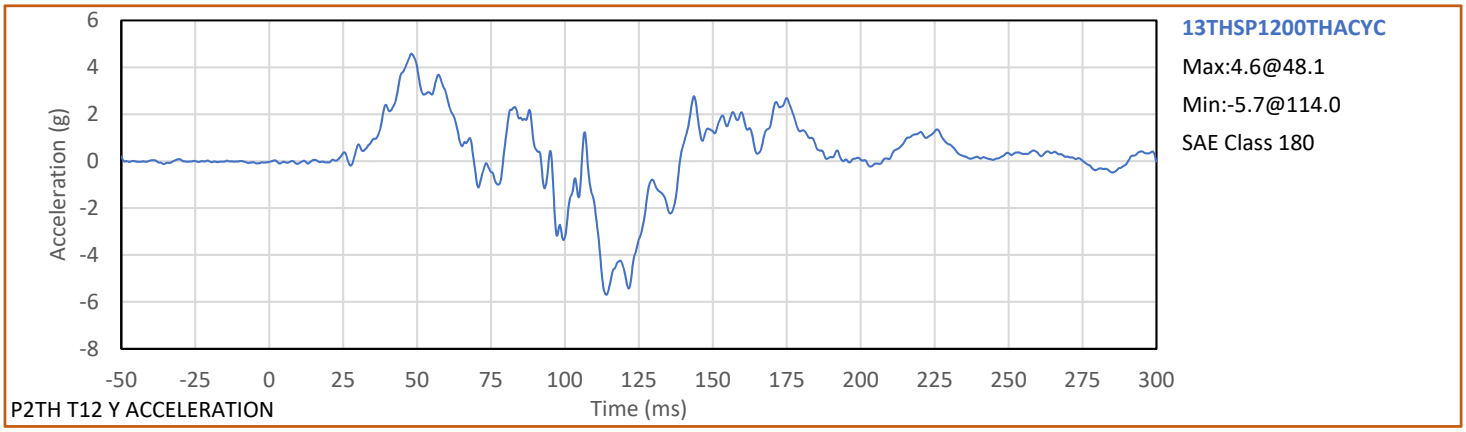

Angle (deg)
Time (ms)
P2TH LOWER LEFT DGIR Z ROTATION
13CHSTLELOTHANZC
Max:8.6@150.4
Min:3.8@109.6
SAE Class 180

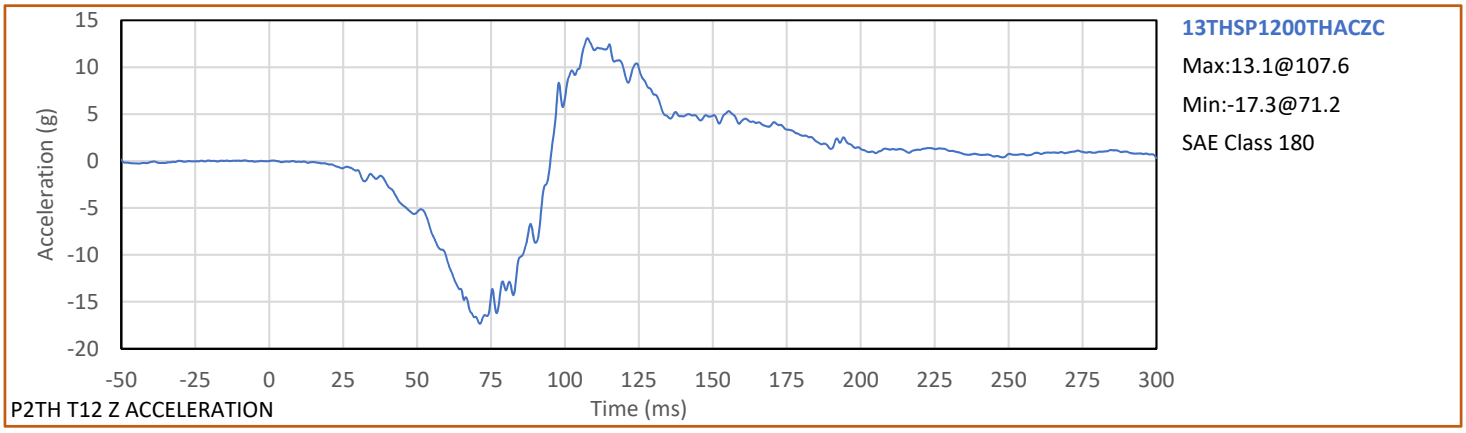

Voltage (V)
Time (ms)
P2TH LOWER RIGHT DGIR X DISPLACEMENT
13CHSTRILOTHVO0P
Max:0.10@11.9
Min:0.08@110.3
No Filter Applied

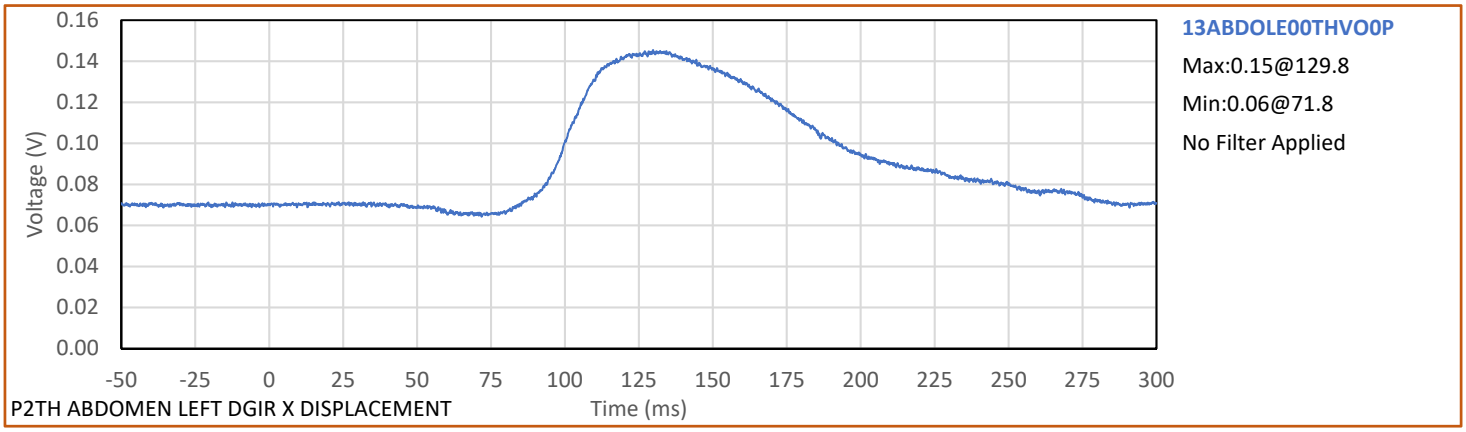

Angle (deg)
Time (ms)
P2TH LOWER RIGHT DGIR Y ROTATION
13CHSTRILOTHANYC
Max:4.1@29.4
Min:-6.4@124.4
SAE Class 180

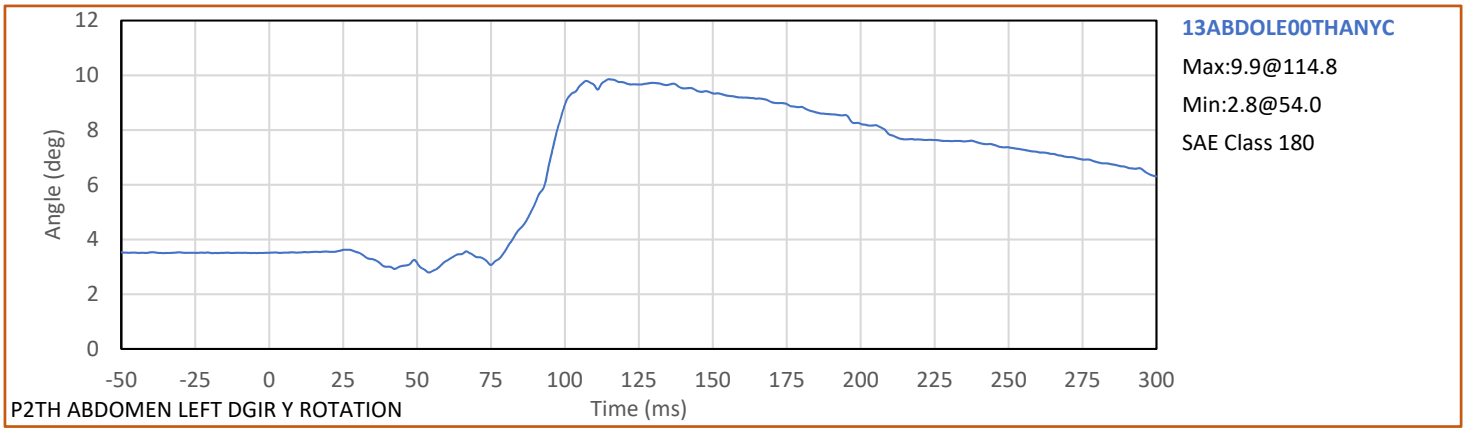

Angle (deg)
Time (ms)
P2TH LOWER RIGHT DGIR Z ROTATION
13CHSTRILOTHANZC
Max:-4.2@139.0
Min:-7.5@106.0
SAE Class 180

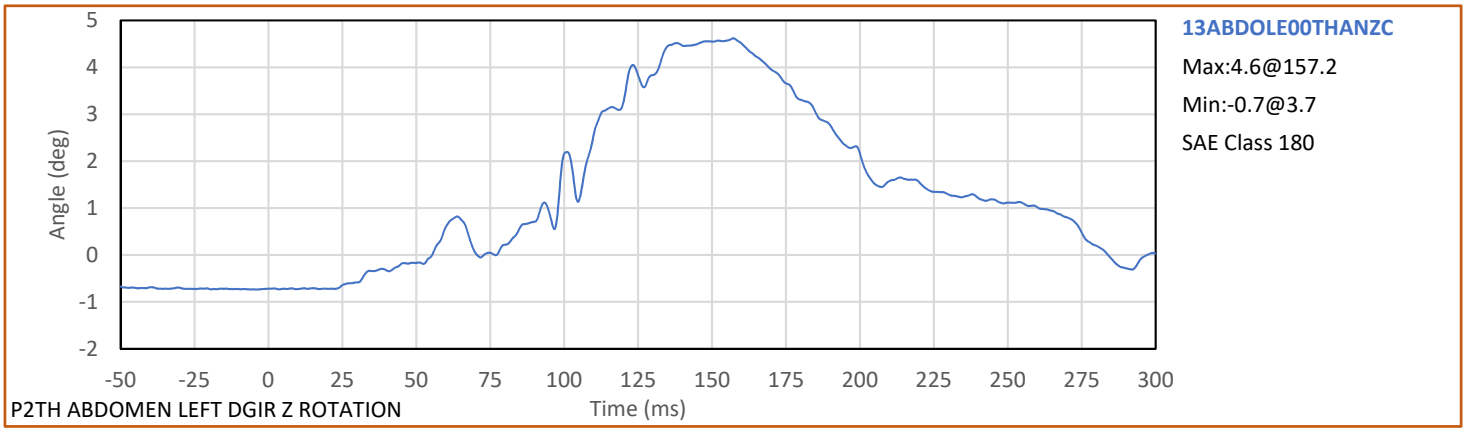

13THSP1200THACXC
Max:1.2@202.8
Min:-23.7@108.6
SAE Class 180
Acceleration (g)
Time (ms)
P2TH T12 X ACCELERATION

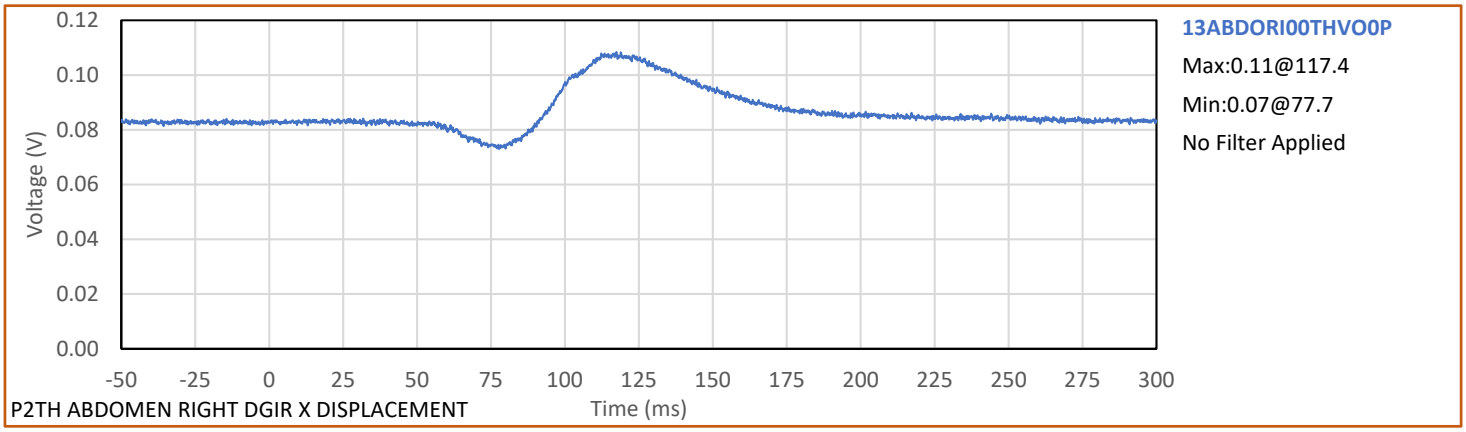

13THSP1200THACYC
Max:4.6@48.1
Min:-5.7@114.0
SAE Class 180
Acceleration (g)
Time (ms)
P2TH T12 Y ACCELERATION

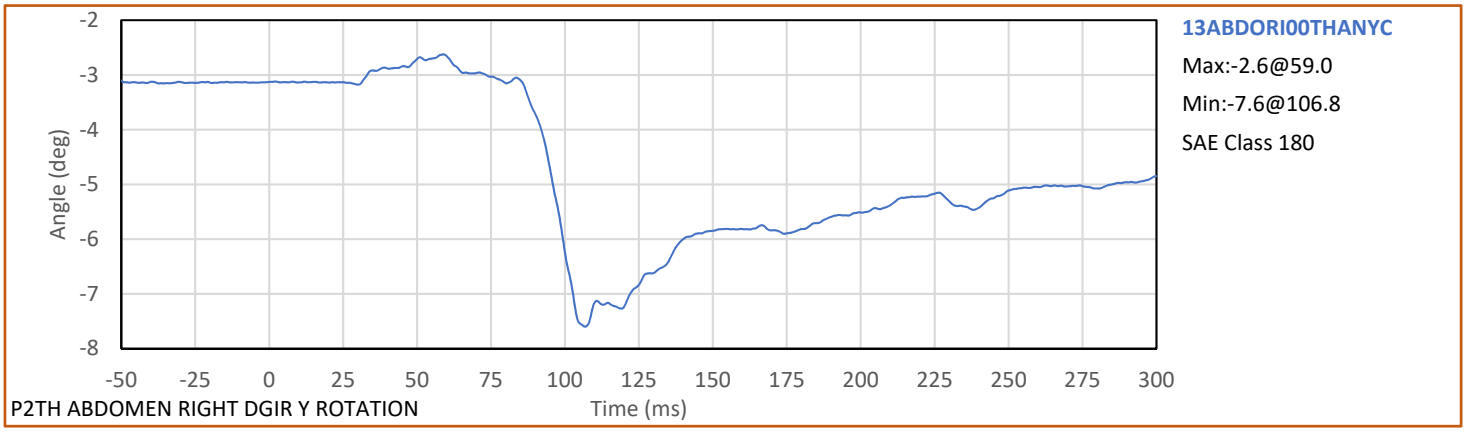

13THSP1200THACZC
Max:13.1@107.6
Min:-17.3@71.2
SAE Class 180
Acceleration (g)
Time (ms)
P2TH T12 Z ACCELERATION

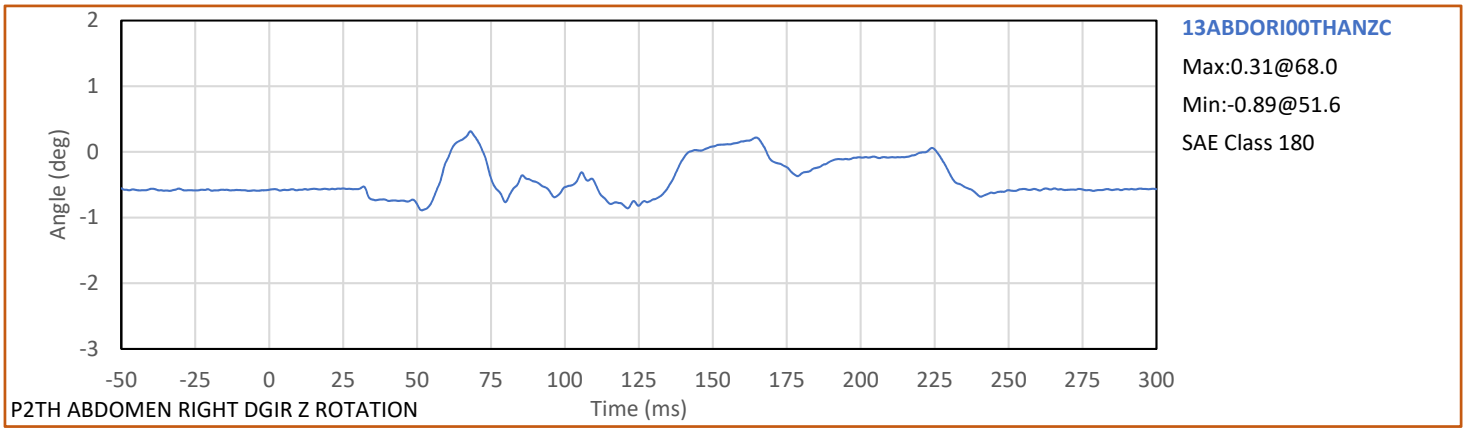

13ABDOLE00THVO0P
Max:0.15@129.8
Min:0.06@71.8
No Filter Applied
Voltage (V)
Time (ms)
P2TH ABDOMEN LEFT DGIR X DISPLACEMENT

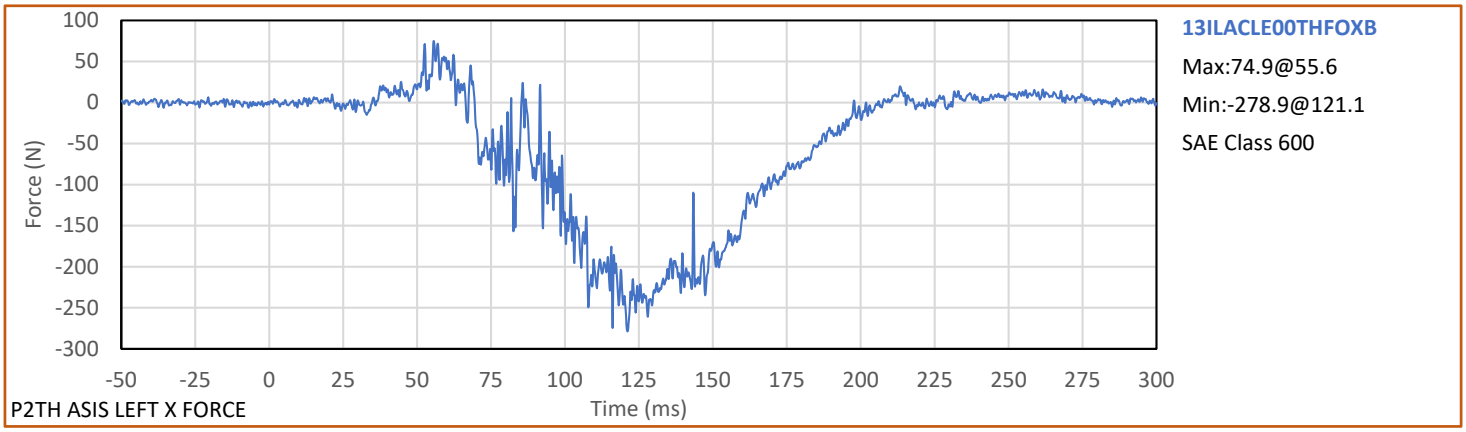

Angle (deg)
Time (ms)
P2TH ABDOMEN LEFT DGIR Y ROTATION
13ABDOLE00THANYC
Max:9.9@114.8
Min:2.8@54.0
SAE Class 180

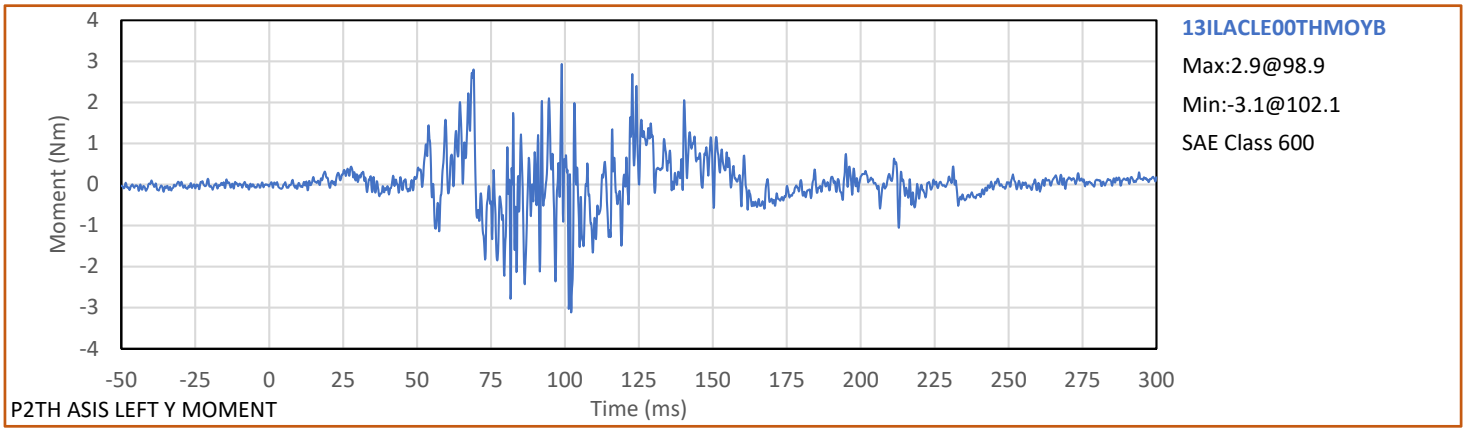

Angle (deg)
Time (ms)
P2TH ABDOMEN LEFT DGIR Z ROTATION
13ABDOLE00THANZC
Max:4.6@157.2
Min:-0.7@3.7
SAE Class 180

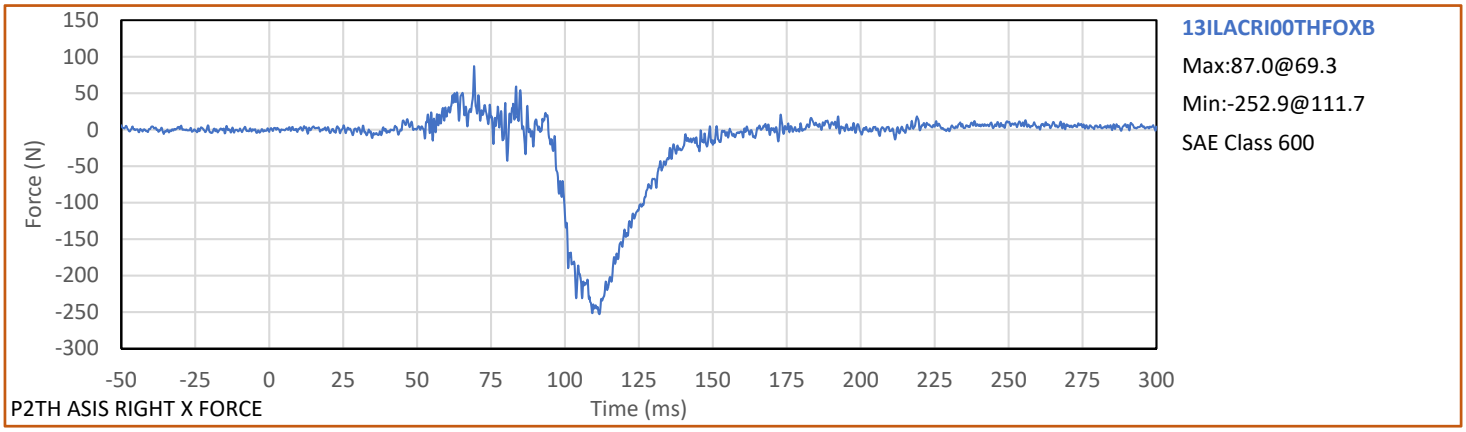

Voltage (V)
Time (ms)
P2TH ABDOMEN RIGHT DGIR X DISPLACEMENT
13ABDORI00THVO0P
Max:0.11@117.4
Min:0.07@77.7
No Filter Applied

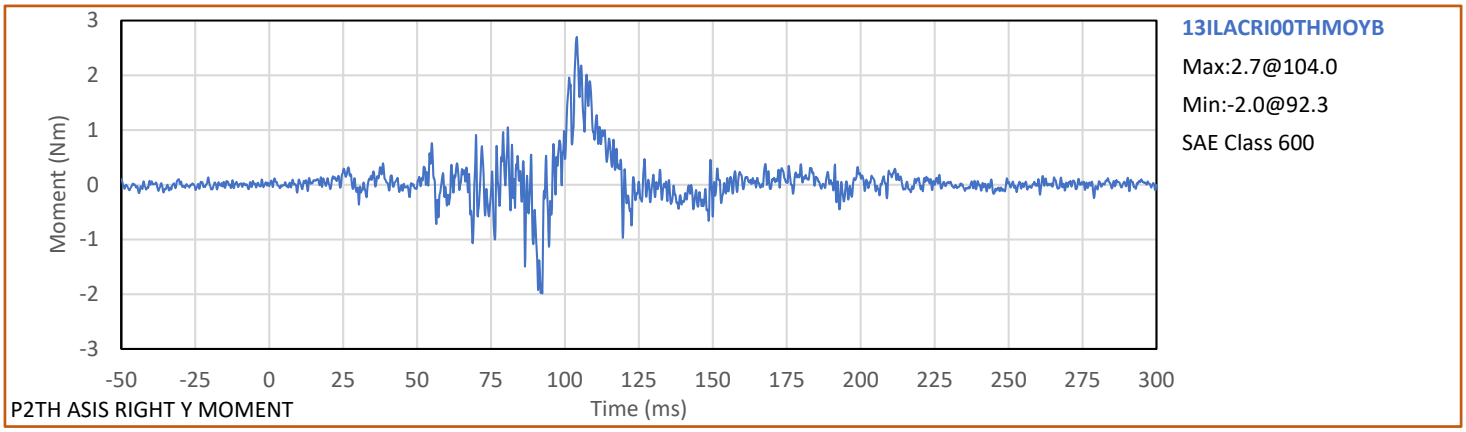

Angle (deg)
Time (ms)
P2TH ABDOMEN RIGHT DGIR Y ROTATION
13ABDORI00THANYC
Max:-2.6@59.0
Min:-7.6@106.8
SAE Class 180

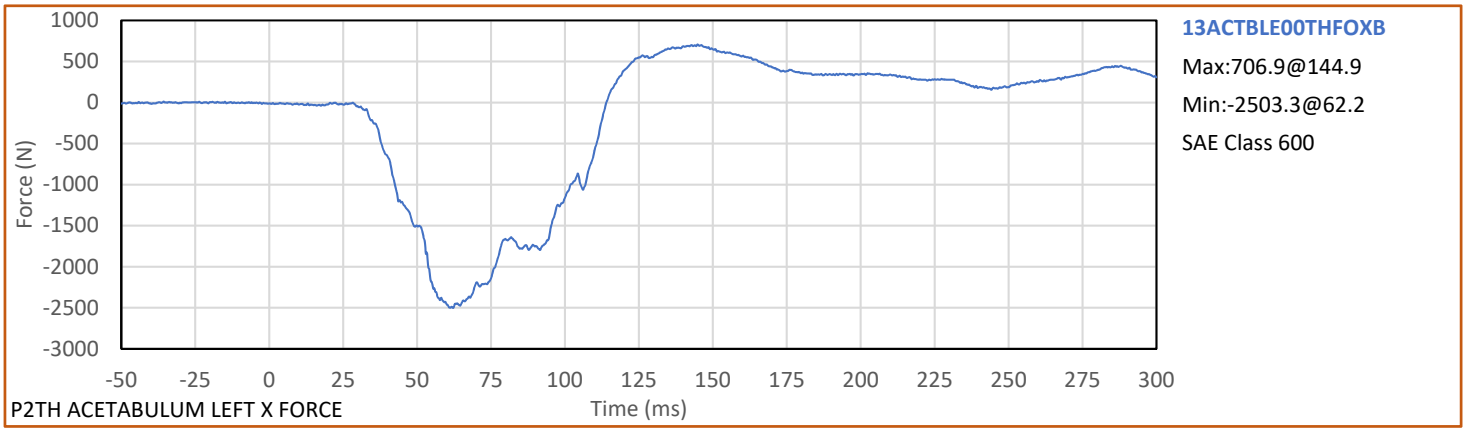

Angle (deg)
Time (ms)
P2TH ABDOMEN RIGHT DGIR Z ROTATION
13ABDORI00THANZC
Max:0.31@68.0
Min:-0.89@51.6
SAE Class 180

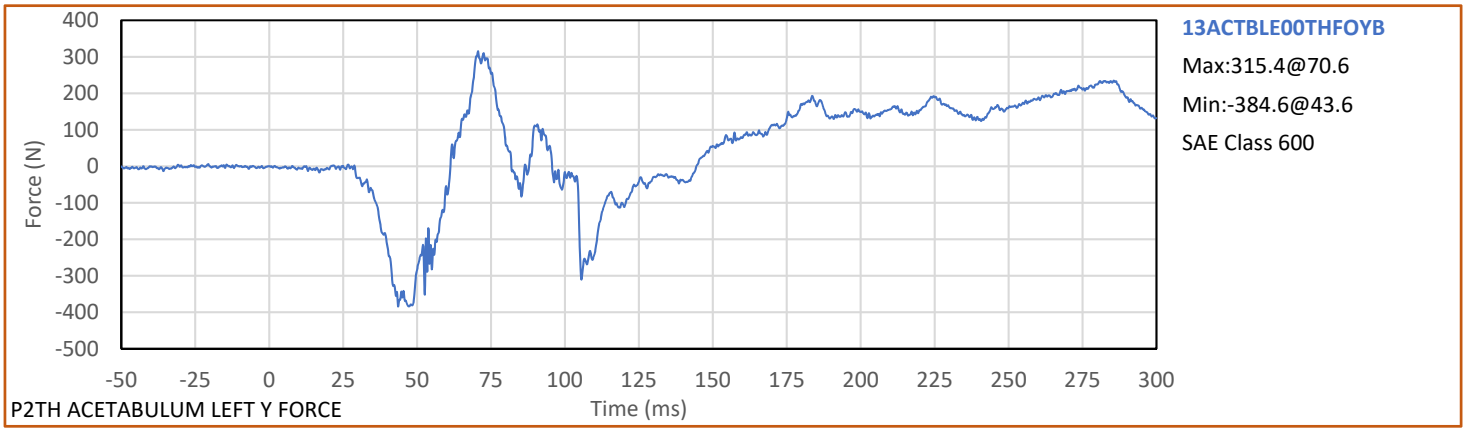

Force (N)
Time (ms)
P2TH ASIS LEFT X FORCE
13ILACLE00THFOXB
Max:74.9@55.6
Min:-278.9@121.1
SAE Class 600

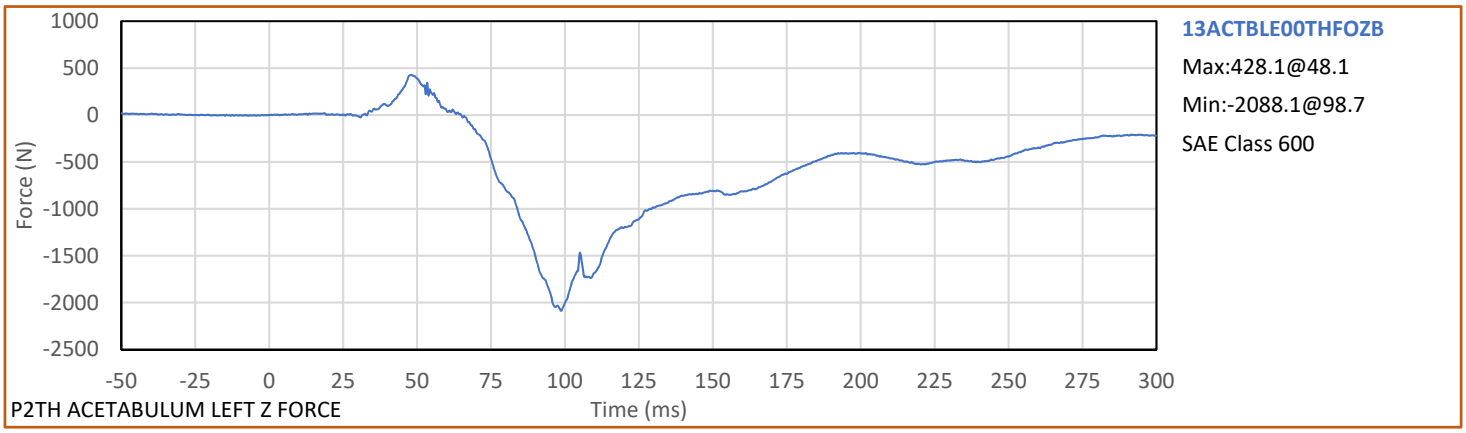

Moment (Nm)
Time (ms)
P2TH ASIS LEFT Y MOMENT
13ILACLE00THMOYB
Max:2.9@98.9
Min:-3.1@102.1
SAE Class 600

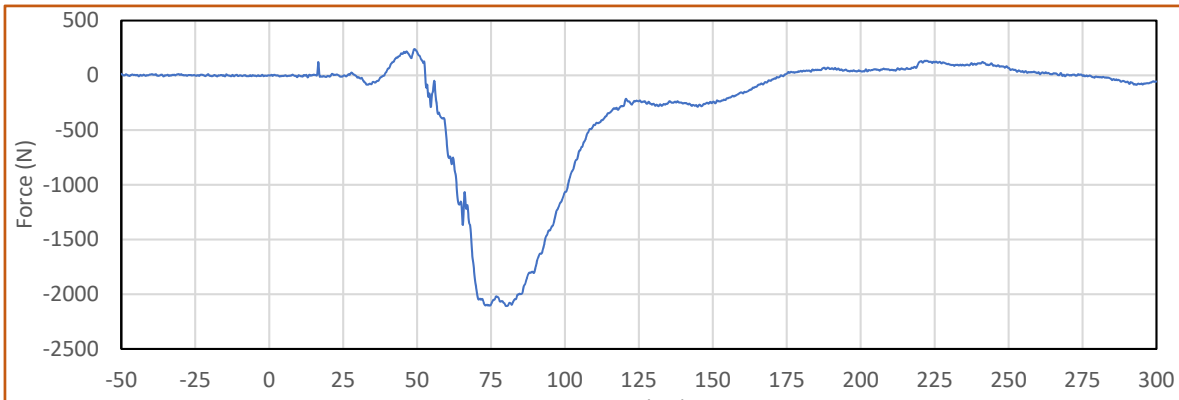

Force (N)
Time (ms)
P2TH ASIS RIGHT X FORCE
13ILACRI00THFOXB
Max:87.0@69.3
Min:-252.9@111.7
SAE Class 600


Moment (Nm)
Time (ms)
P2TH ASIS RIGHT Y MOMENT
13ILACRI00THMOYB
Max:2.7@104.0
Min:-2.0@92.3
SAE Class 600


Force (N)
Time (ms)
P2TH ACETABULUM LEFT X FORCE
13ACTBLE00THFOXB
Max:706.9@144.9
Min:-2503.3@62.2
SAE Class 600

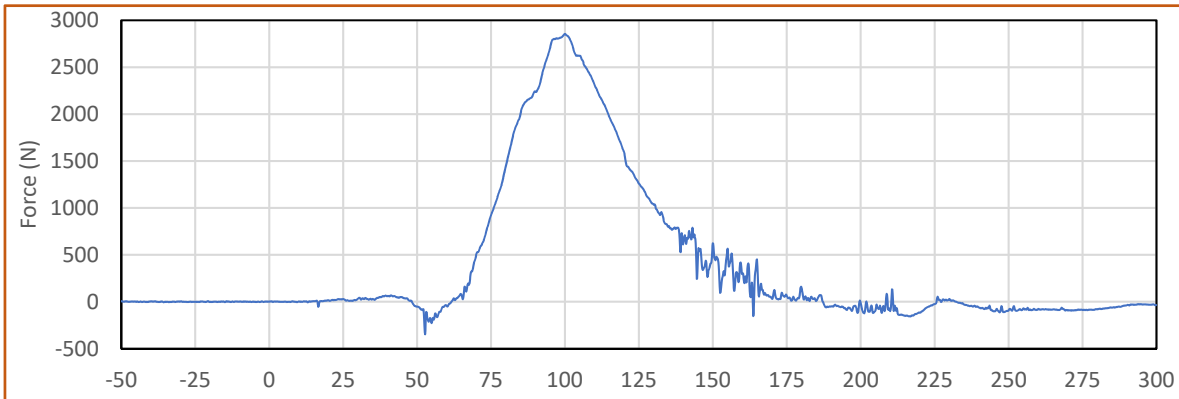

Force (N)
Time (ms)
P2TH ACETABULUM LEFT Y FORCE
13ACTBLE00THFOYB
Max:315.4@70.6
Min:-384.6@43.6
SAE Class 600


Force (N)
Time (ms)
P2TH ACETABULUM LEFT Z FORCE
13ACTBLE00THFOZB
Max:428.1@48.1
Min:-2088.1@98.7
SAE Class 600

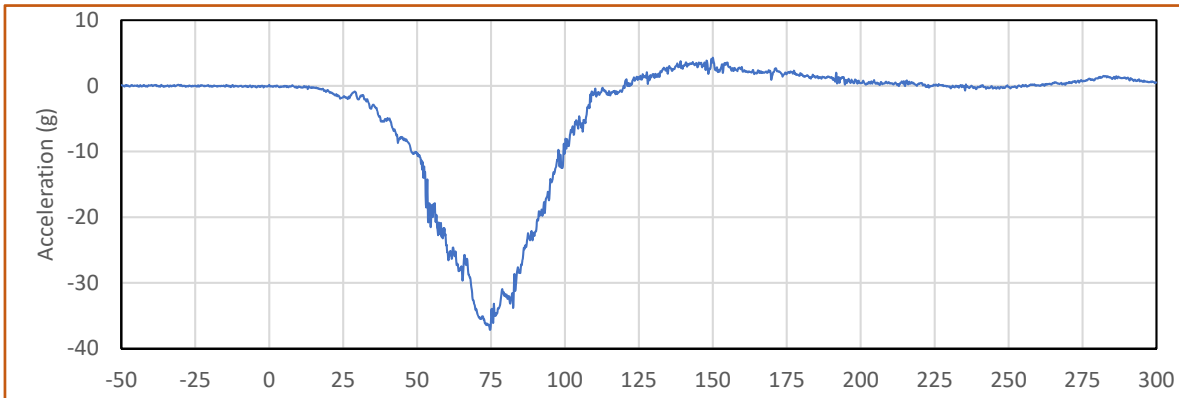


13ACTBRI00THFOXB
Max:239.7@49.1
Min:-2108.0@80.4
SAE Class 600

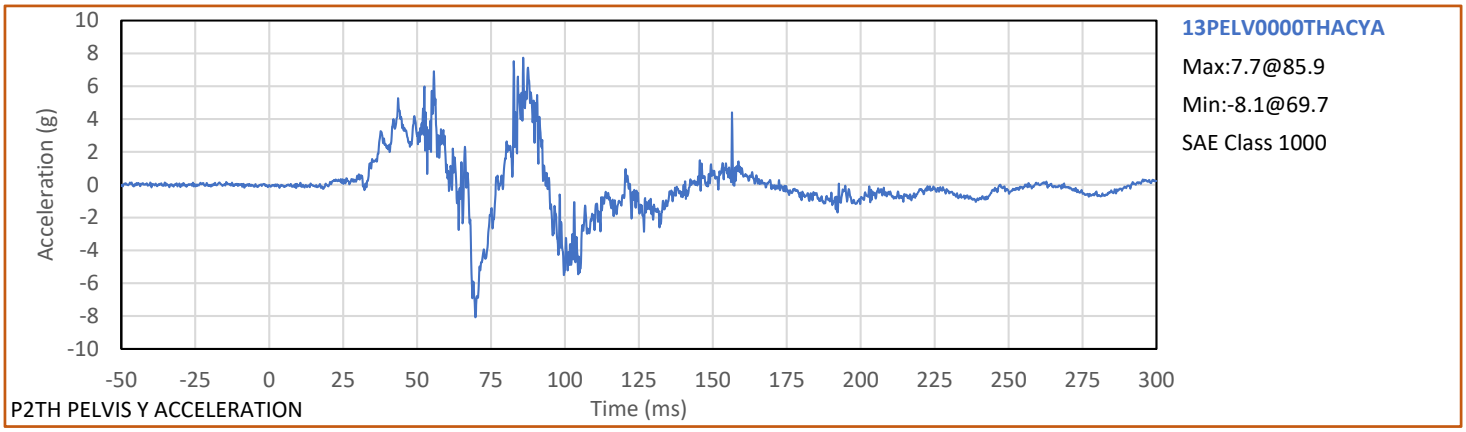
13ACTBRI00THFOYB
Max:1625.1@81.2
Min:-271.1@224.5
SAE Class 600

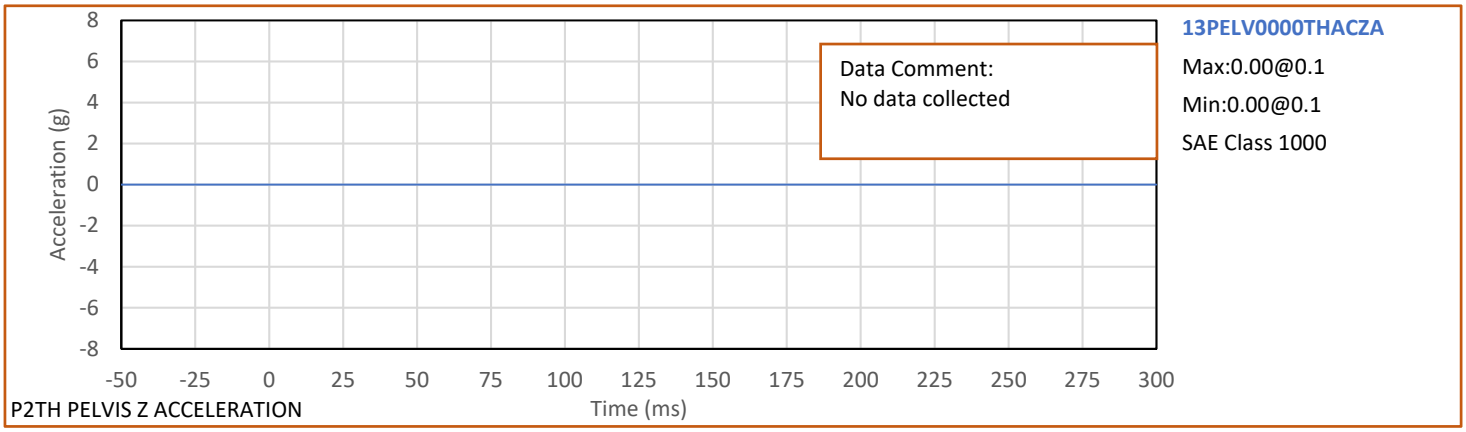


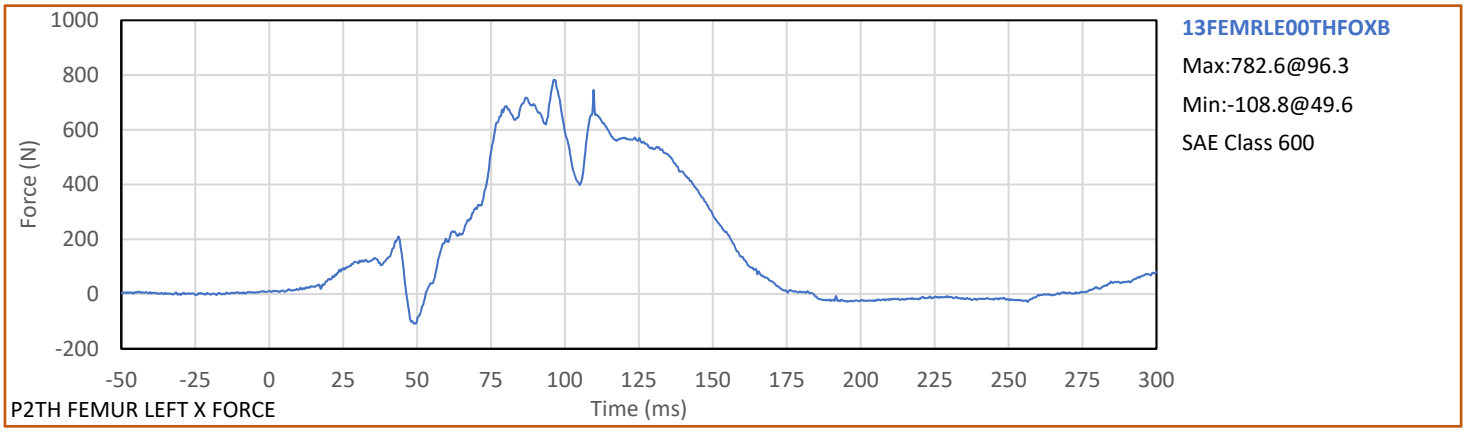
13ACTBRI00THFOZB
Max:2854.9@100.0
Min:-347.1@52.7
SAE Class 600

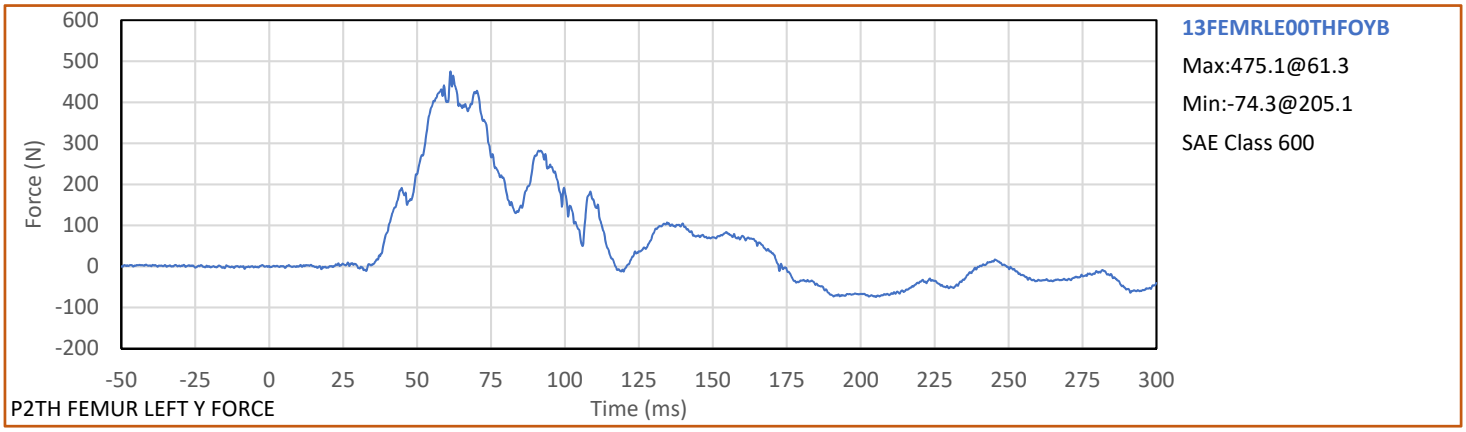


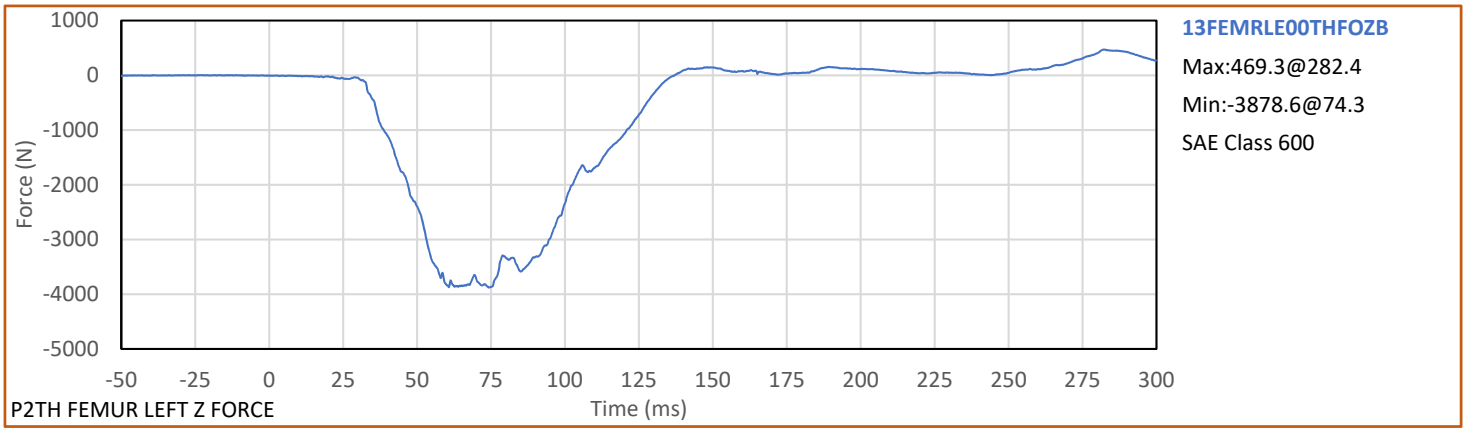
13PELV0000THACXA
Max:4.3@150.0
Min:-37.2@74.7
SAE Class 1000

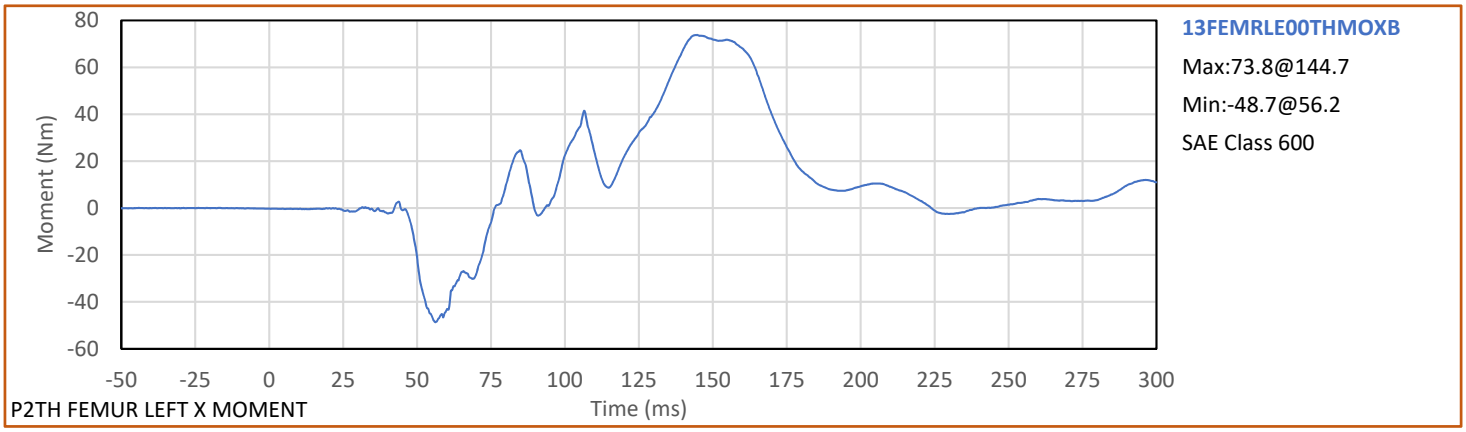

Acceleration (g)
Time (ms)
P2TH PELVIS Y ACCELERATION
13PELV0000THACYA
Max:7.7@85.9
Min:-8.1@69.7
SAE Class 1000

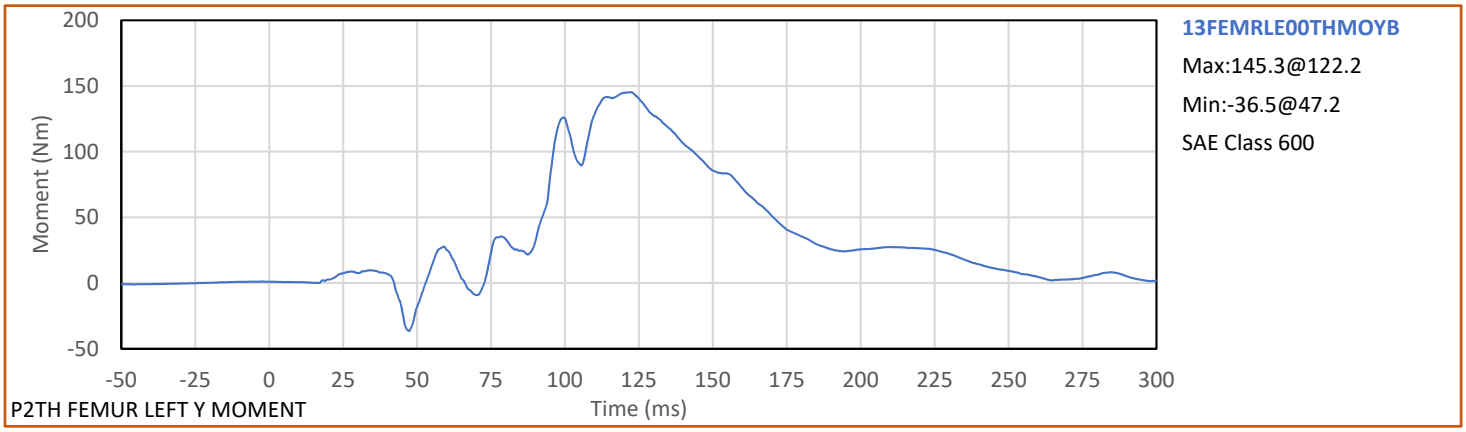

Acceleration (g)
Time (ms)
P2TH PELVIS Z ACCELERATION
Data Comment:
No data collected
13PELV0000THACZA
Max:0.00@0.1
Min:0.00@0.1
SAE Class 1000

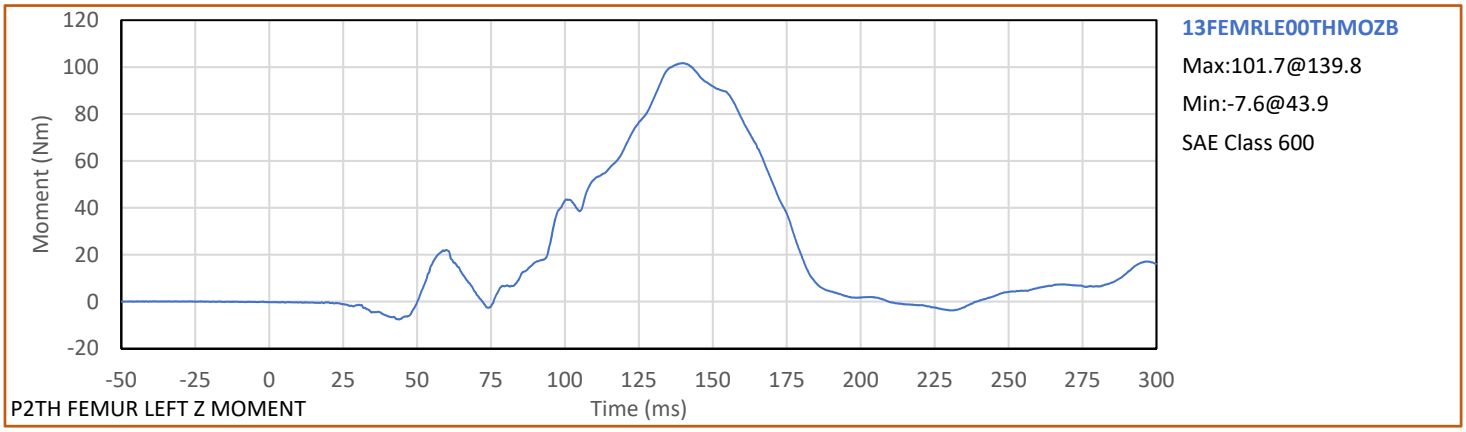

Force (N)
Time (ms)
P2TH FEMUR LEFT X FORCE
13FEMRLE00THFOXB
Max:782.6@96.3
Min:-108.8@49.6
SAE Class 600


Force (N)
Time (ms)
P2TH FEMUR LEFT Y FORCE
13FEMRLE00THFOYB
Max:475.1@61.3
Min:-74.3@205.1
SAE Class 600


1000
0
-1000
-2000
-3000
-4000
-5000
Force (N)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
P2TH FEMUR LEFT Z FORCE
13FEMRLE00THFOZB
Max:469.3@282.4
Min:-3878.6@74.3
SAE Class 600

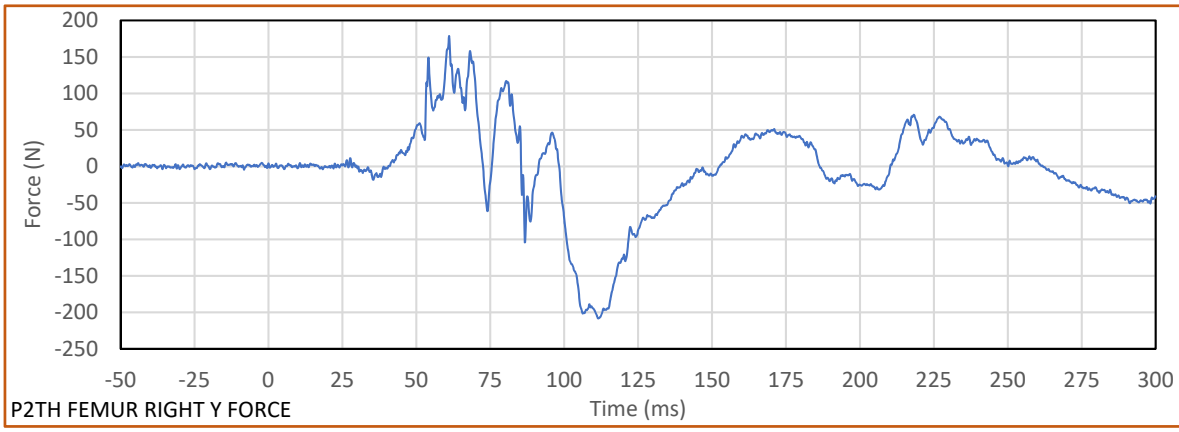

80
60
40
20
0
-20
-40
-60
Moment (Nm)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
P2TH FEMUR LEFT X MOMENT
13FEMRLE00THMOXB
Max:73.8@144.7
Min:-48.7@56.2
SAE Class 600


200
150
100
50
0
-50
Moment (Nm)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
P2TH FEMUR LEFT Y MOMENT
13FEMRLE00THMOYB
Max:145.3@122.2
Min:-36.5@47.2
SAE Class 600


120
100
80
60
40
20
0
-20
Moment (Nm)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
P2TH FEMUR LEFT Z MOMENT
13FEMRLE00THMOZB
Max:101.7@139.8
Min:-7.6@43.9
SAE Class 600

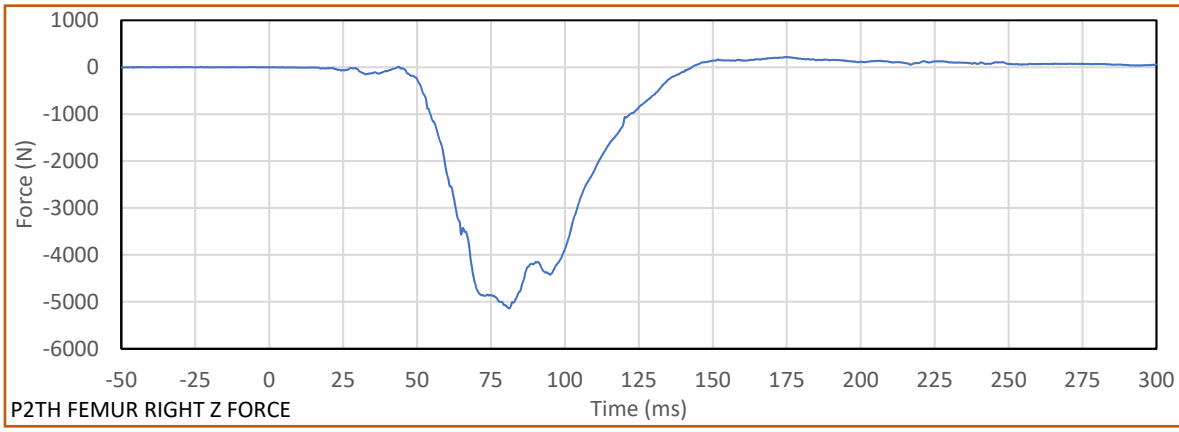
P2TH FEMUR RIGHT X FORCE

13FEMRRI00THFOXB
Max:798.0@94.0
Min:-151.4@225.0
SAE Class 600



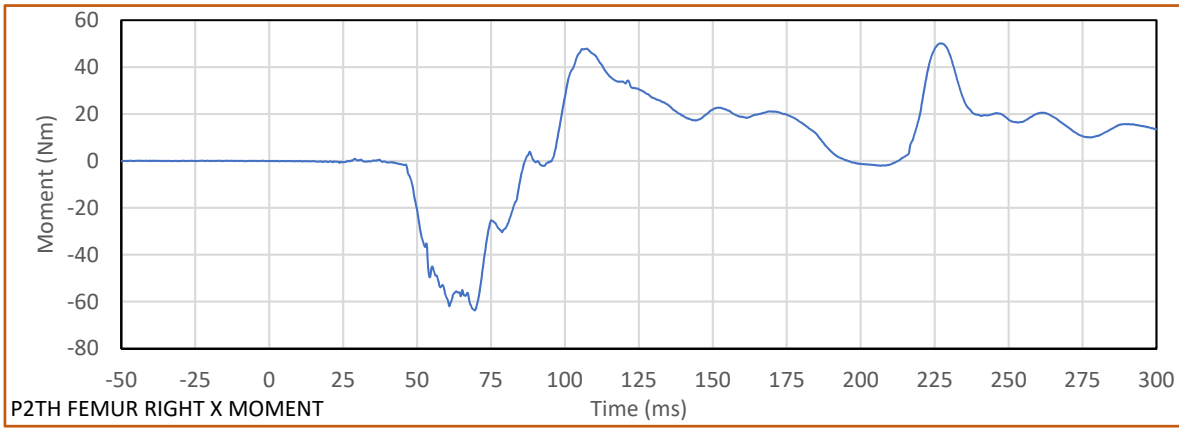
P2TH FEMUR RIGHT Y FORCE

13FEMRRI00THFOYB
Max:178.7@61.1
Min:-208.5@111.5
SAE Class 600



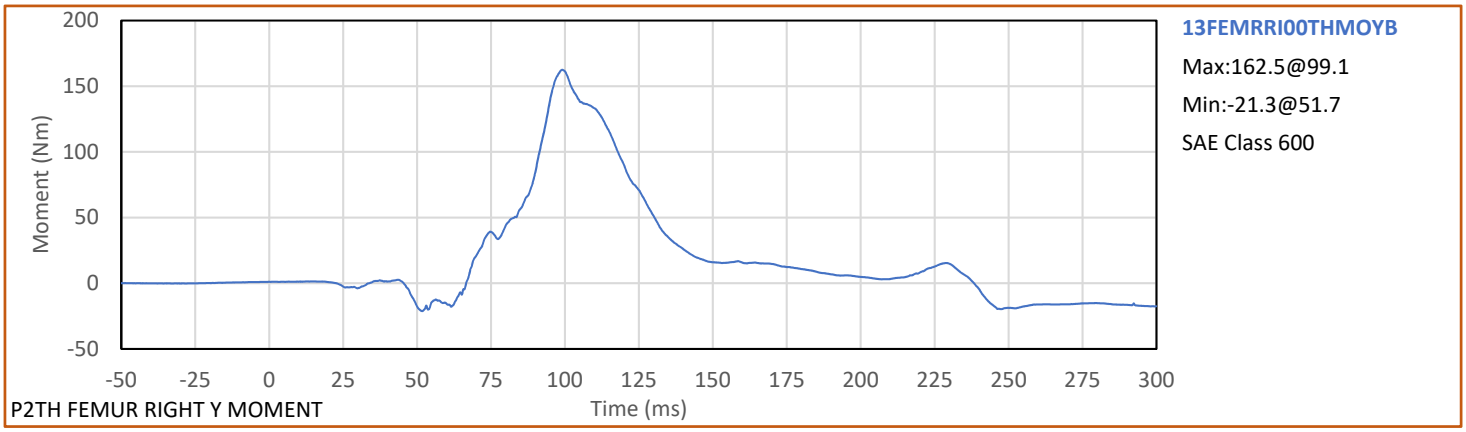
P2TH FEMUR RIGHT Z FORCE

13FEMRRI00THFOZB
Max:216.4@174.7
Min:-5145.5@81.2
SAE Class 600

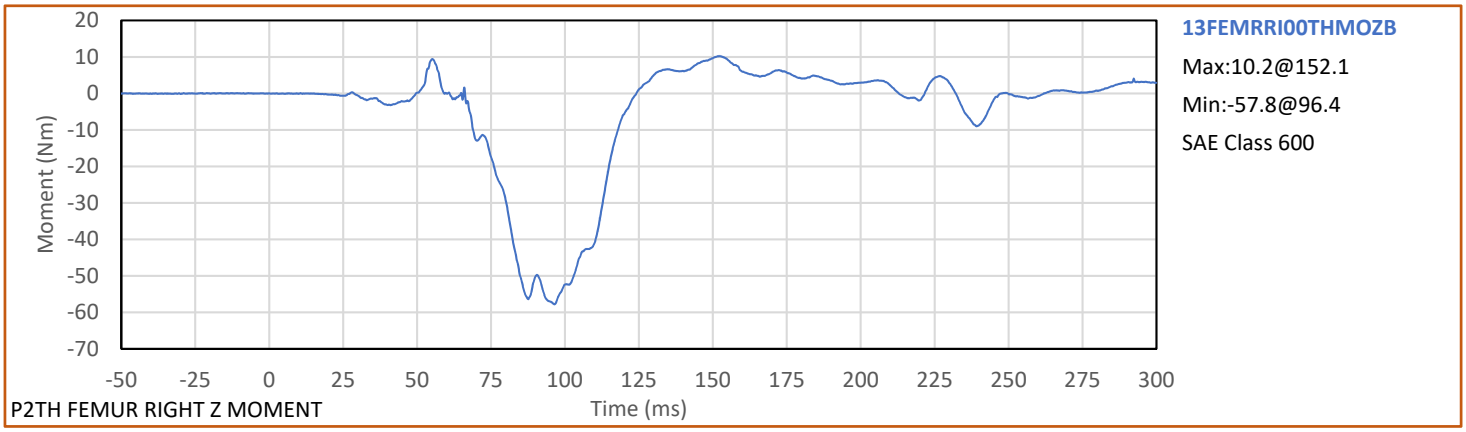


P2TH FEMUR RIGHT X MOMENT

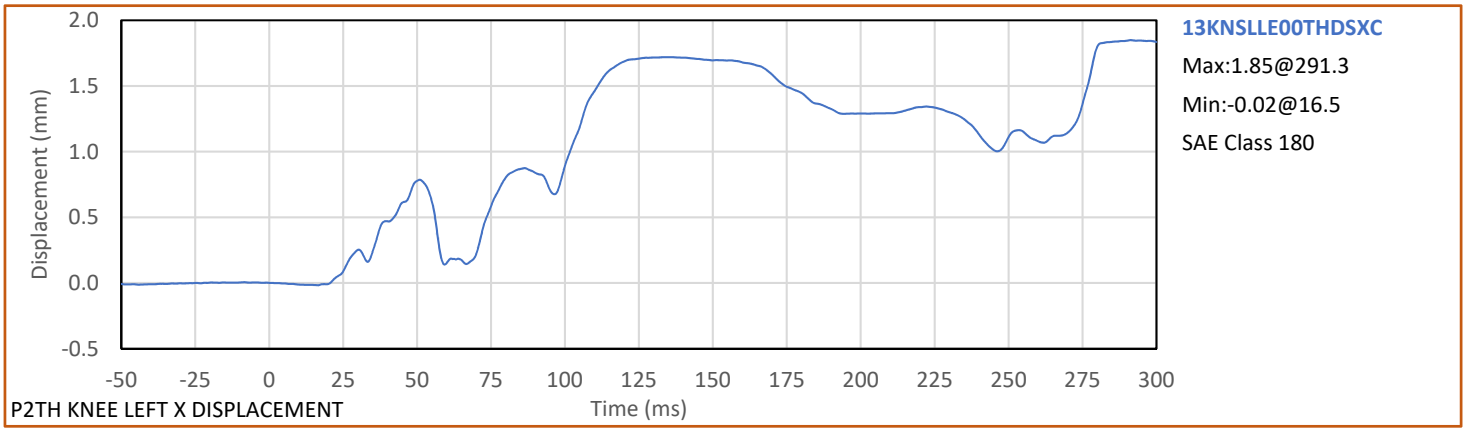
13FEMRRI00THMOXB
Max:50.1@227.0
Min:-63.7@69.5
SAE Class 600



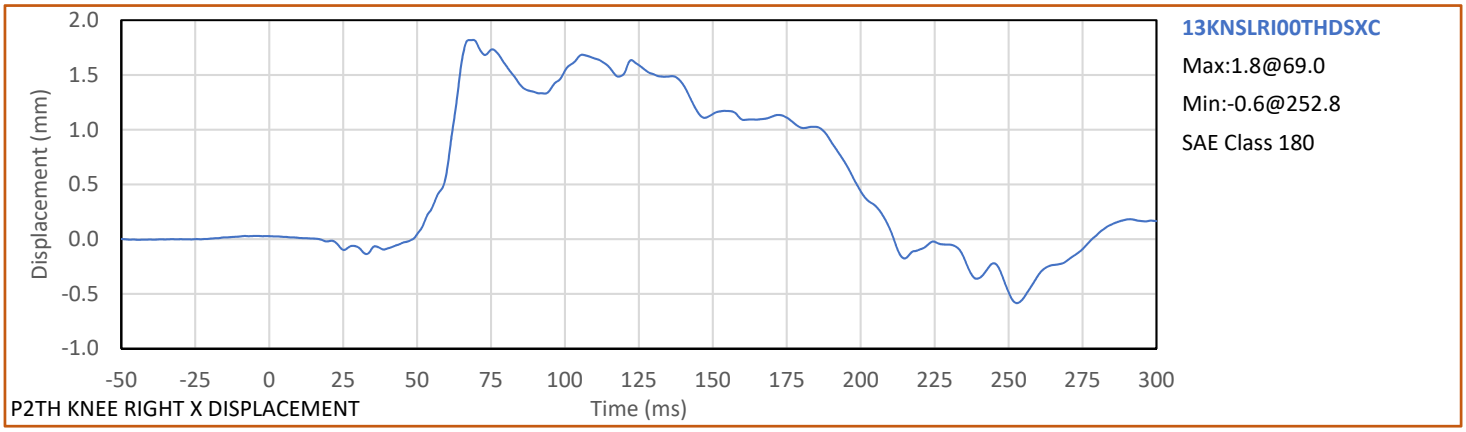
13FEMRRI00THMOYB
Max:162.5@99.1
Min:-21.3@51.7
SAE Class 600



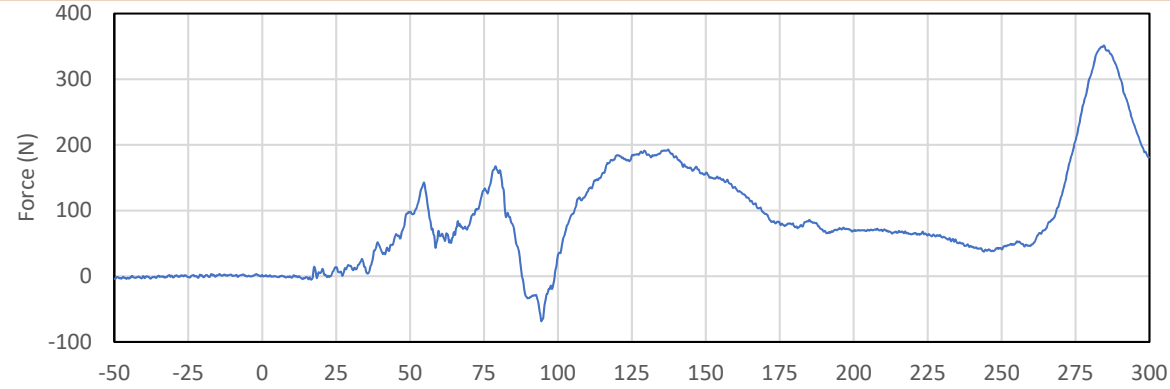
13FEMRRI00THMOZB
Max:10.2@152.1
Min:-57.8@96.4
SAE Class 600



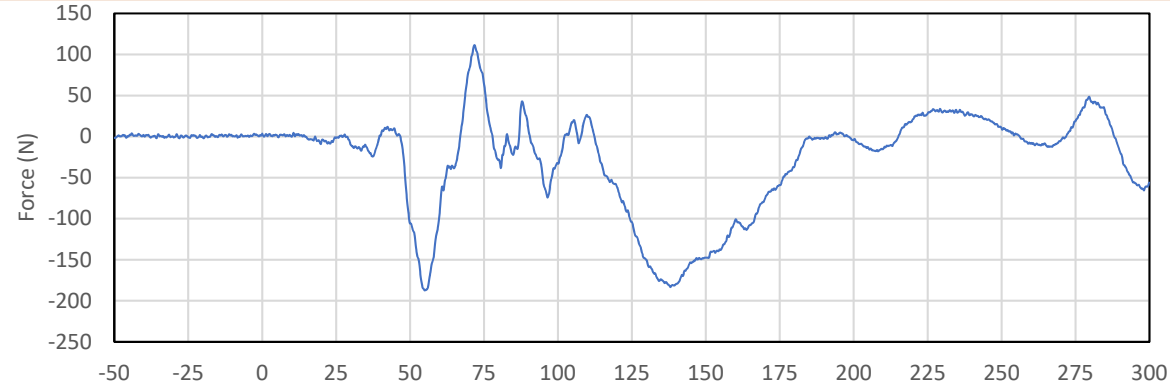
13KNSLLE00THDSXC
Max:1.85@291.3
Min:-0.02@16.5
SAE Class 180



13KNSLRI00THDSXC
Max:1.8@69.0
Min:-0.6@252.8
SAE Class 180

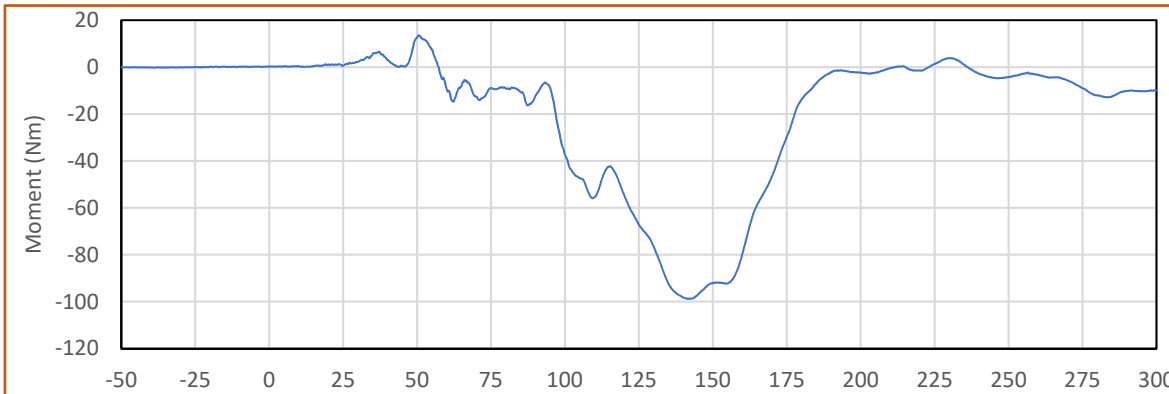


13TIBILEUPTHFOXB
Max:351.5@284.6
Min:-68.7@94.4
SAE Class 600

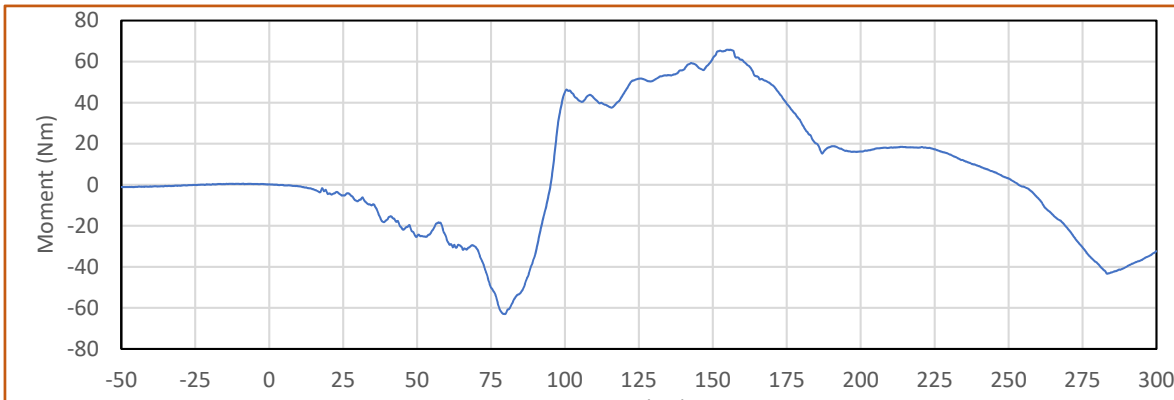


13TIBILEUPTHFOYB
Max:111.4@71.8
Min:-187.5@55.0
SAE Class 600

13TIBILEUPTHFOZB
Max:404.9@282.6
Min:-1924.1@88.3
SAE Class 600



13TIBILEUPTHMOXB
Max:13.5@50.6
Min:-98.8@141.6
SAE Class 600

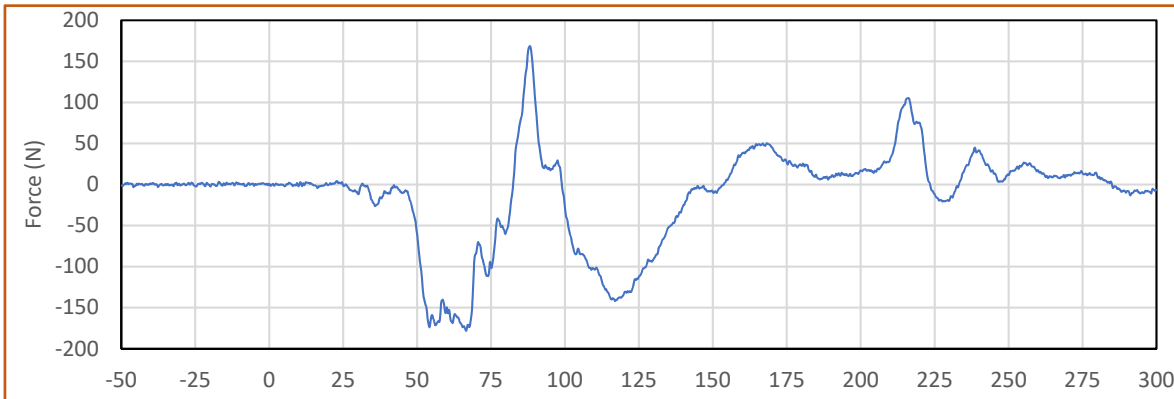


P2TH UPPER TIBIA LEFT Y MOMENT

13TIBILEUPTHMOYB
Max:65.8@154.8
Min:-63.0@79.8
SAE Class 600

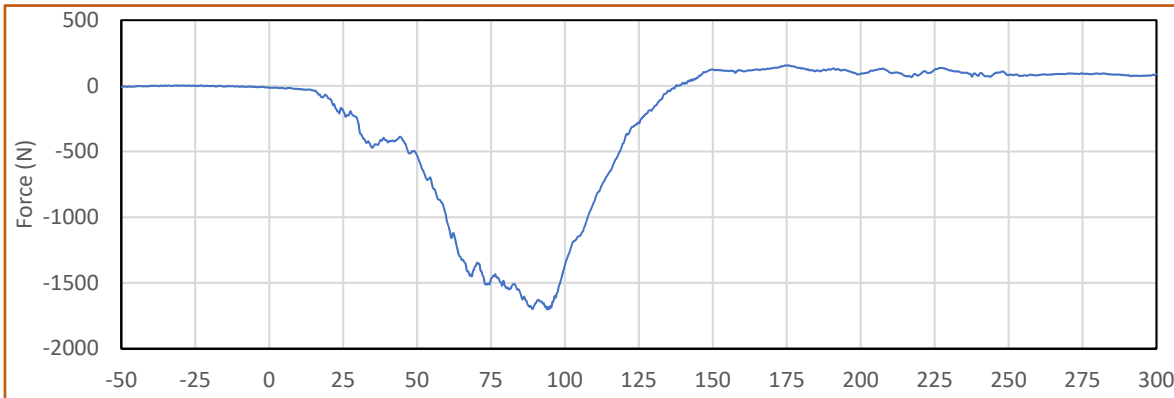
P2TH UPPER TIBIA RIGHT X FORCE

13TIBIRIUPTHFOXB
Max:267.9@66.4
Min:-39.5@111.9
SAE Class 600



P2TH UPPER TIBIA RIGHT Y FORCE

13TIBIRIUPTHFOYB
Max:168.6@88.2
Min:-178.2@66.5
SAE Class 600

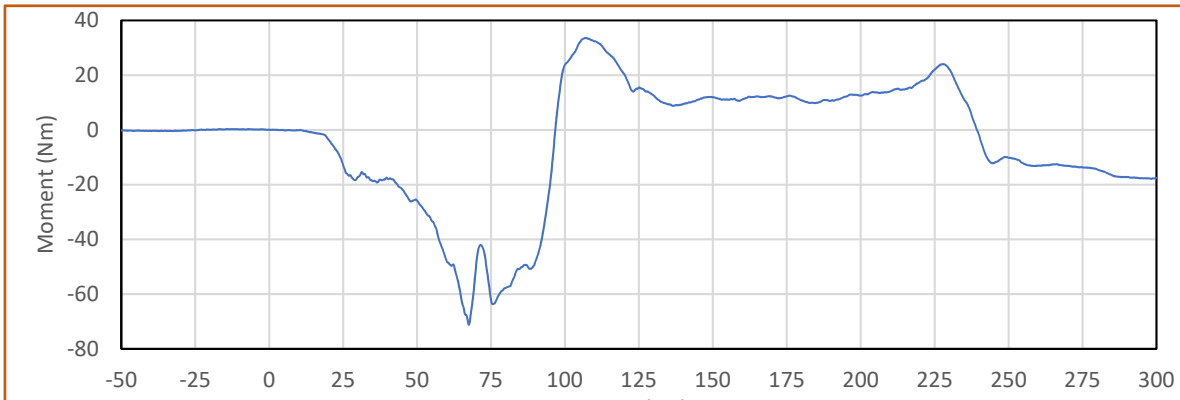


P2TH UPPER TIBIA RIGHT Z FORCE

13TIBIRIUPTHFOZB
Max:155.6@174.6
Min:-1703.1@94.0
SAE Class 600

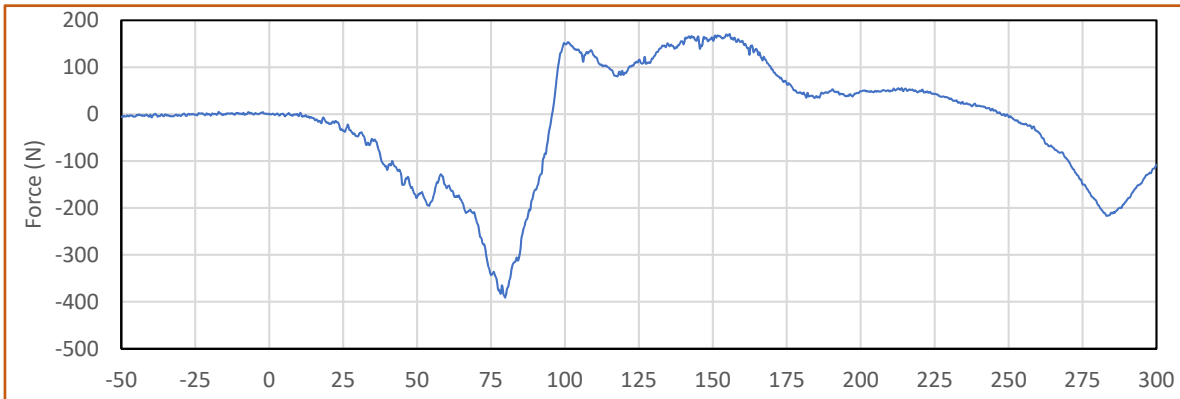
P2TH UPPER TIBIA RIGHT X MOMENT

13TIBIRIUPTHMOXB
Max:69.0@93.8
Min:-49.5@227.0
SAE Class 600



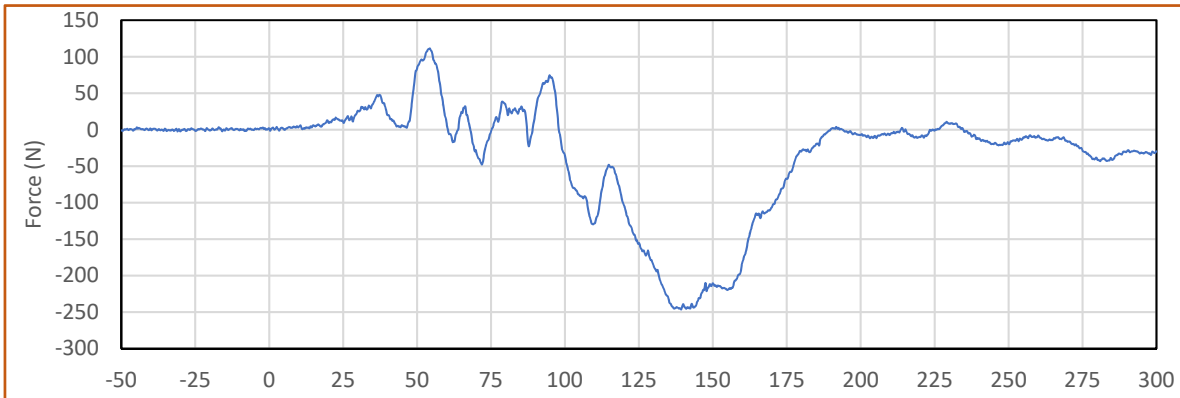
P2TH UPPER TIBIA RIGHT Y MOMENT

13TIBIRIUPTHMOYB
Max:33.6@107.2
Min:-71.2@67.5
SAE Class 600



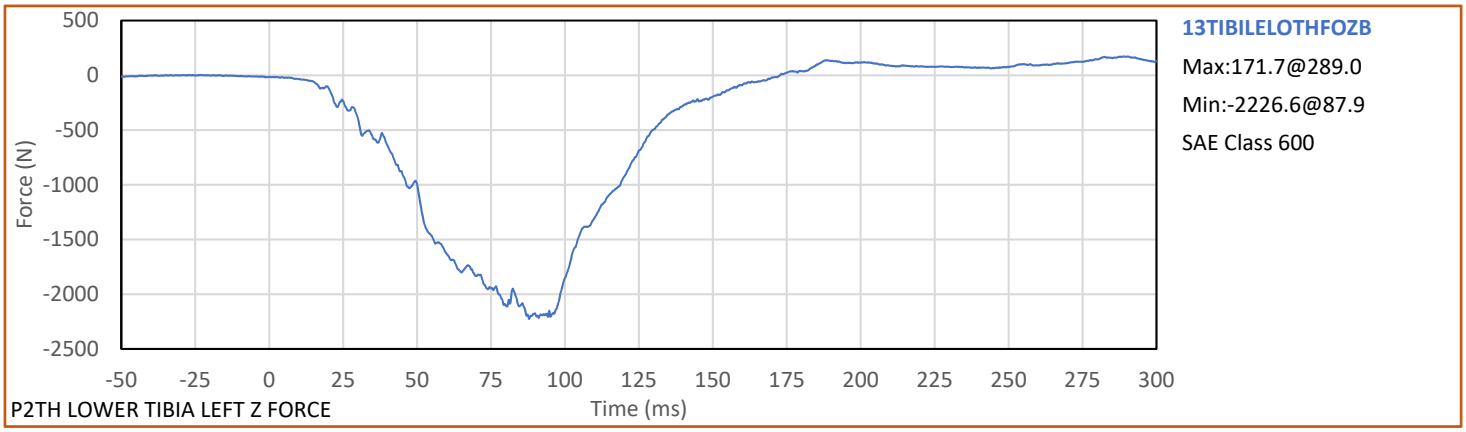
P2TH LOWER TIBIA LEFT X FORCE

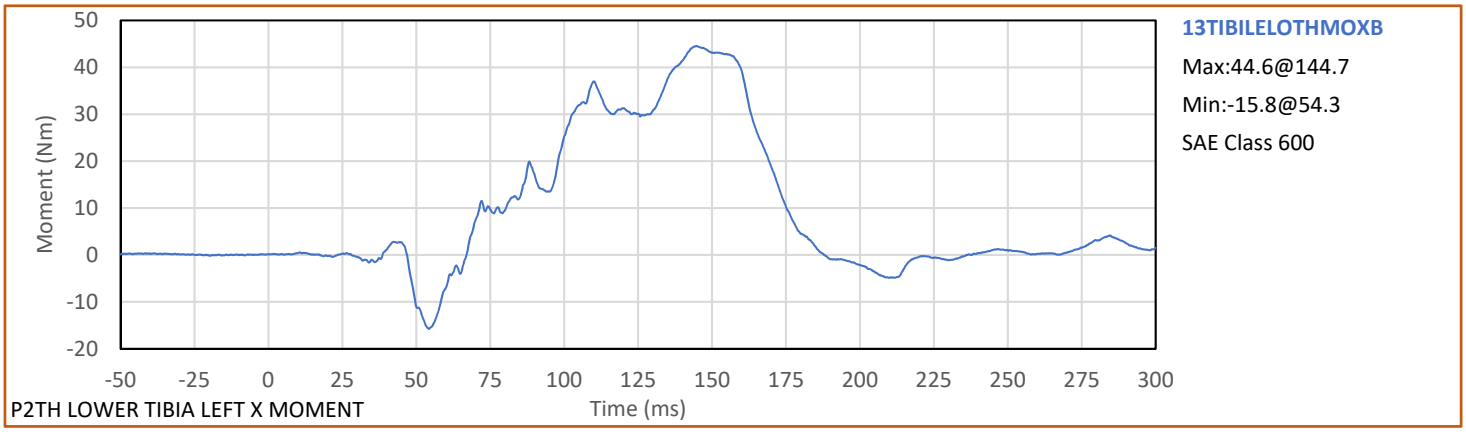
13TIBILELOTHFOXB
Max:170.5@155.7
Min:-391.2@79.8
SAE Class 600

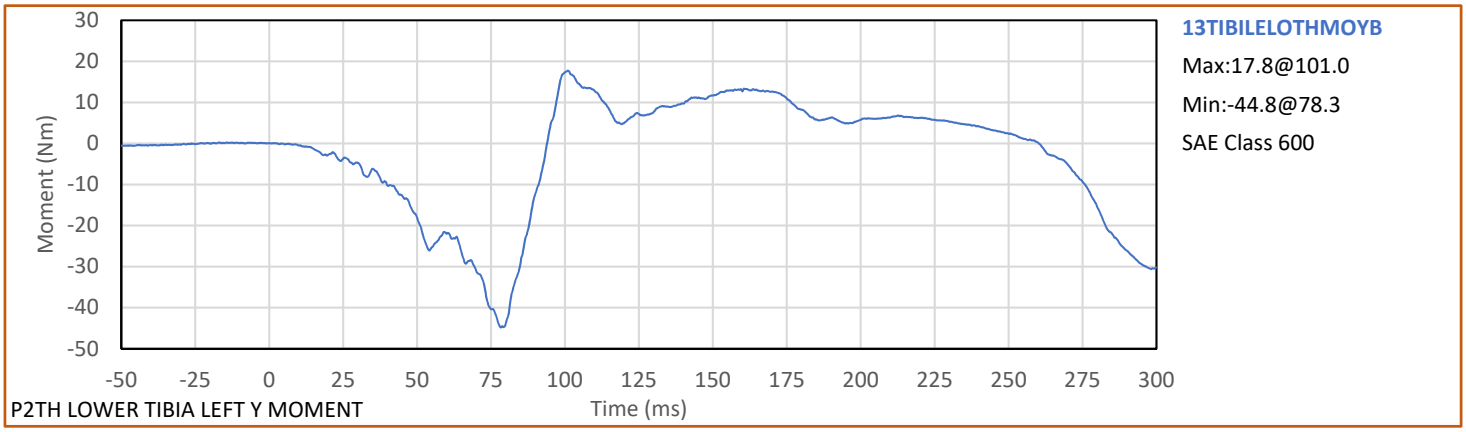


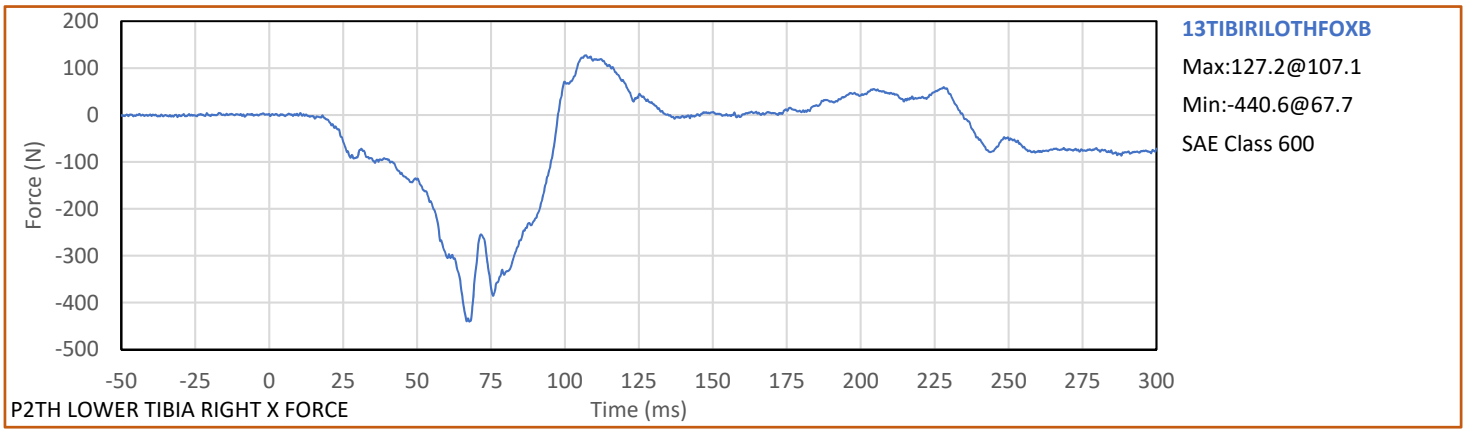
P2TH LOWER TIBIA LEFT Y FORCE

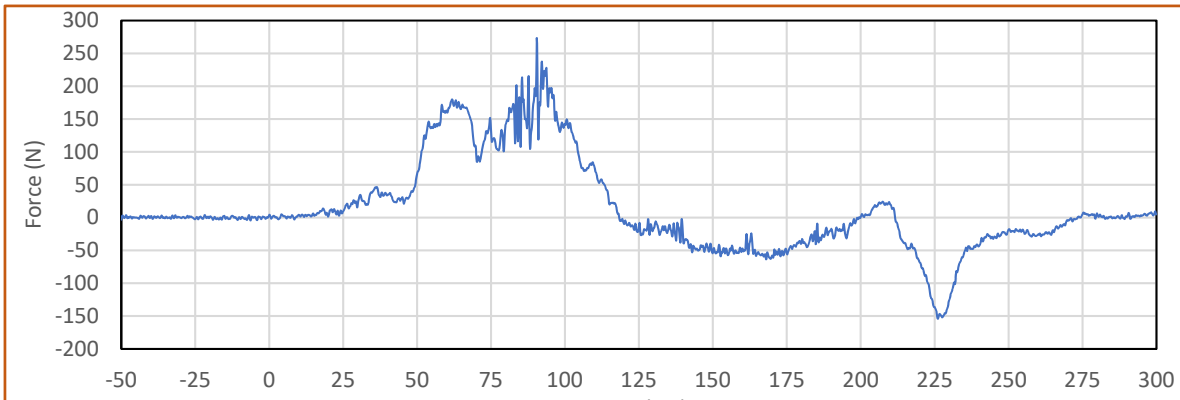
13TIBILELOTHFOYB
Max:111.4@54.3
Min:-246.6@139.3
SAE Class 600


Force (N)
Time (ms)
P2TH LOWER TIBIA LEFT Z FORCE
13TIBILELOTHFOZB
Max:171.7@289.0
Min:-2226.6@87.9
SAE Class 600


Moment (Nm)
Time (ms)
P2TH LOWER TIBIA LEFT X MOMENT
13TIBILELOTHMOXB
Max:44.6@144.7
Min:-15.8@54.3
SAE Class 600

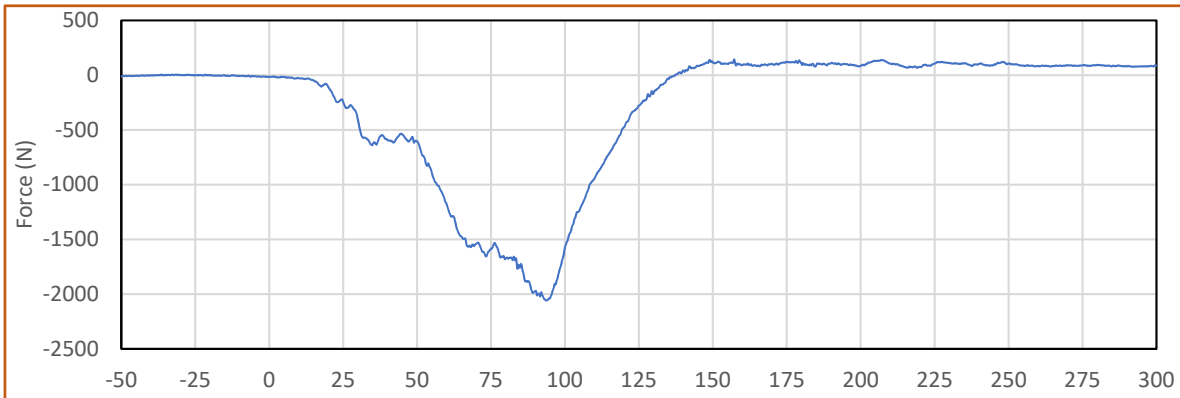

Moment (Nm)
Time (ms)
P2TH LOWER TIBIA LEFT Y MOMENT
13TIBILELOTHMOYB
Max:17.8@101.0
Min:-44.8@78.3
SAE Class 600


Force (N)
Time (ms)
P2TH LOWER TIBIA RIGHT X FORCE
13TIBIRILOTHFOXB
Max:127.2@107.1
Min:-440.6@67.7
SAE Class 600



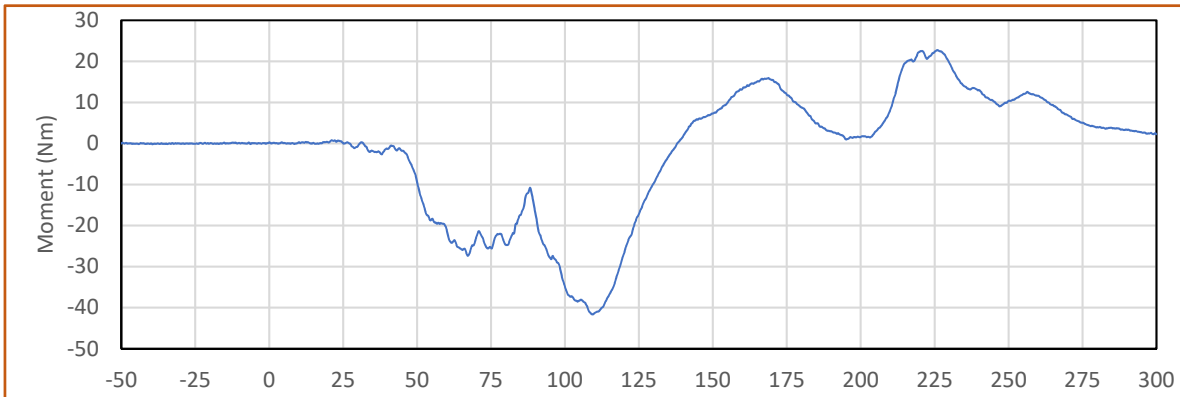
P2TH LOWER TIBIA RIGHT Y FORCE

13TIBIRILOTHFOYB
Max:273.4@90.5
Min:-154.2@226.1
SAE Class 600



P2TH LOWER TIBIA RIGHT Z FORCE

13TIBIRILOTHFOZB
Max:143.9@157.2
Min:-2059.0@93.7
SAE Class 600

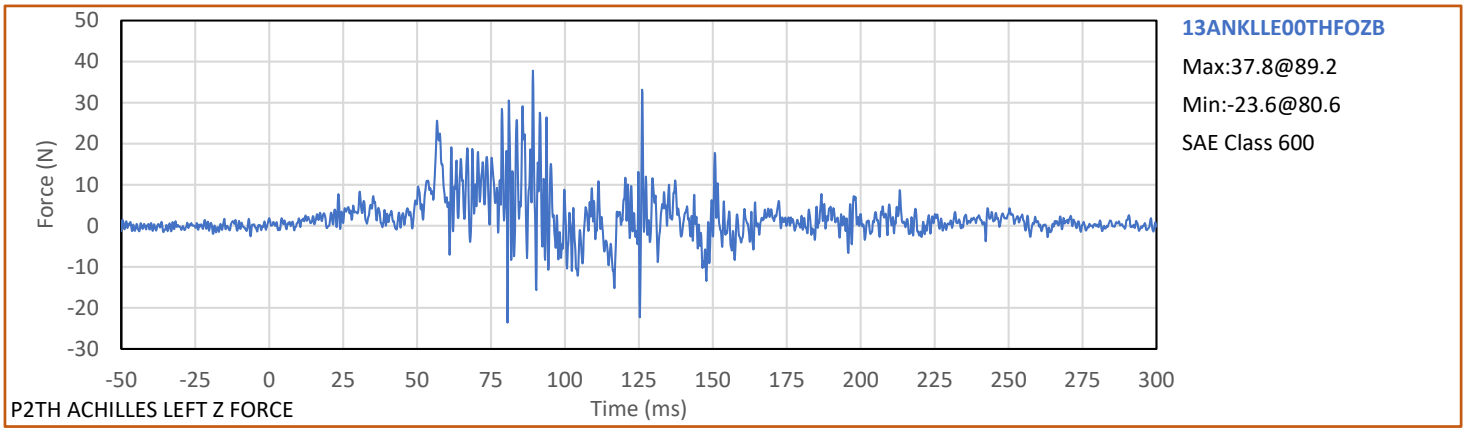


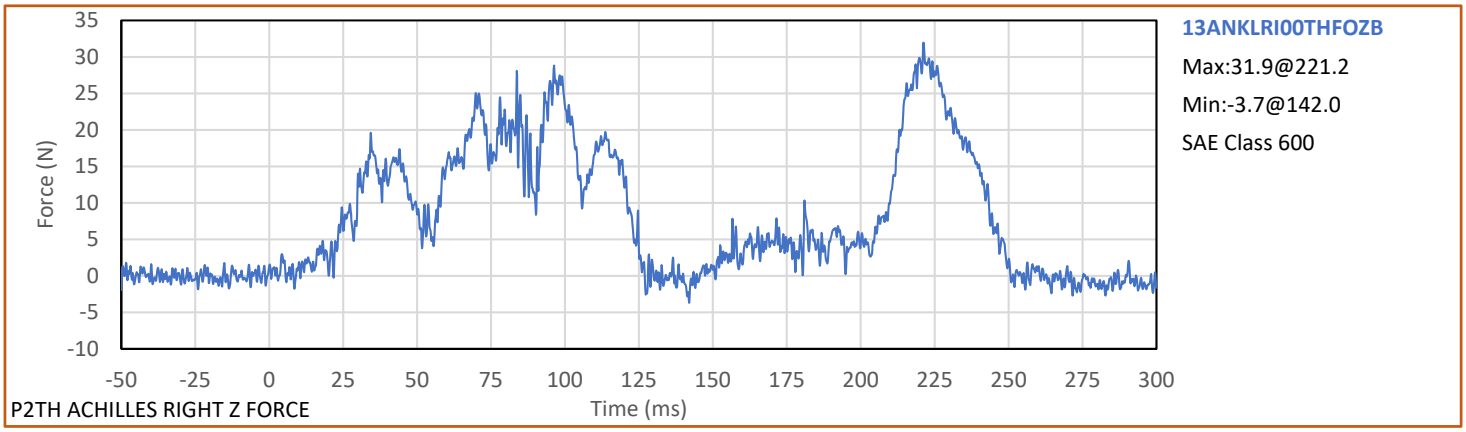
P2TH LOWER TIBIA RIGHT X MOMENT

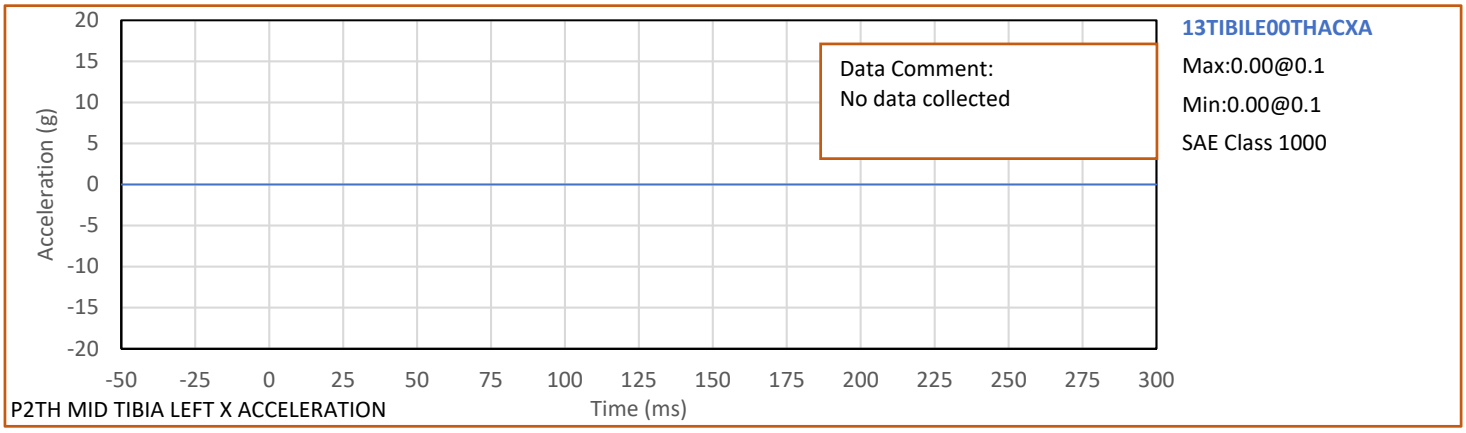
13TIBIRILOTHMOXB
Max:22.8@226.0
Min:-41.6@109.5
SAE Class 600

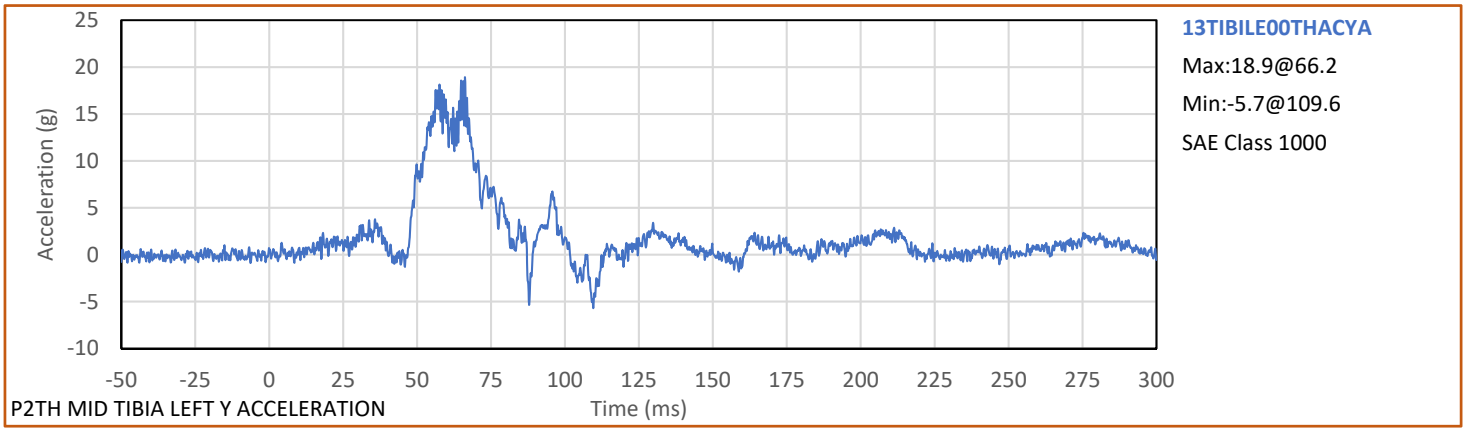
P2TH LOWER TIBIA RIGHT Y MOMENT

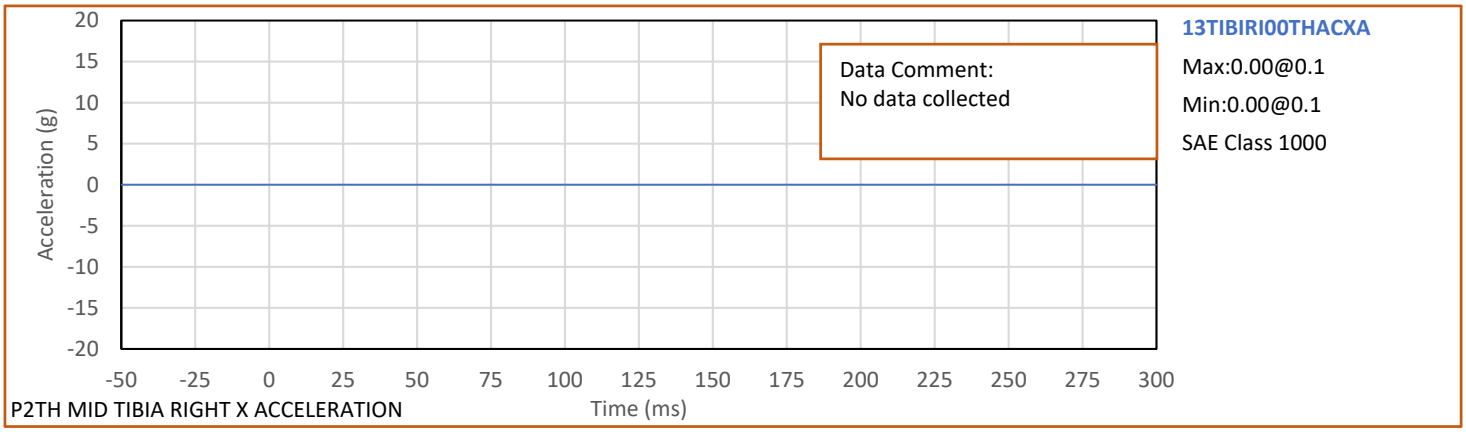
13TIBIRILOTHMOYB
Max:46.6@68.2
Min:-19.7@112.2
SAE Class 600


Force (N)
Time (ms)
13ANKLLE00THFOZB
Max:37.8@89.2
Min:-23.6@80.6
SAE Class 600
P2TH ACHILLES LEFT Z FORCE


Force (N)
Time (ms)
13ANKLRI00THFOZB
Max:31.9@221.2
Min:-3.7@142.0
SAE Class 600
P2TH ACHILLES RIGHT Z FORCE

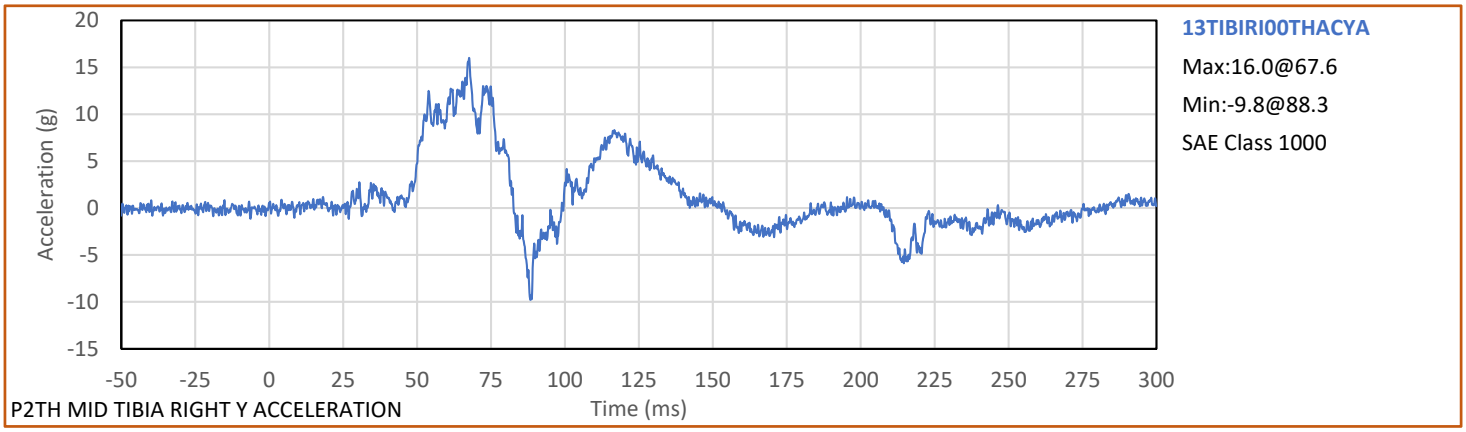

Acceleration (g)
Time (ms)
Data Comment:
No data collected
13TIBILE00THACXA
Max:0.00@0.1
Min:0.00@0.1
SAE Class 1000
P2TH MID TIBIA LEFT X ACCELERATION


Acceleration (g)
Time (ms)
13TIBILE00THACYA
Max:18.9@66.2
Min:-5.7@109.6
SAE Class 1000
P2TH MID TIBIA LEFT Y ACCELERATION



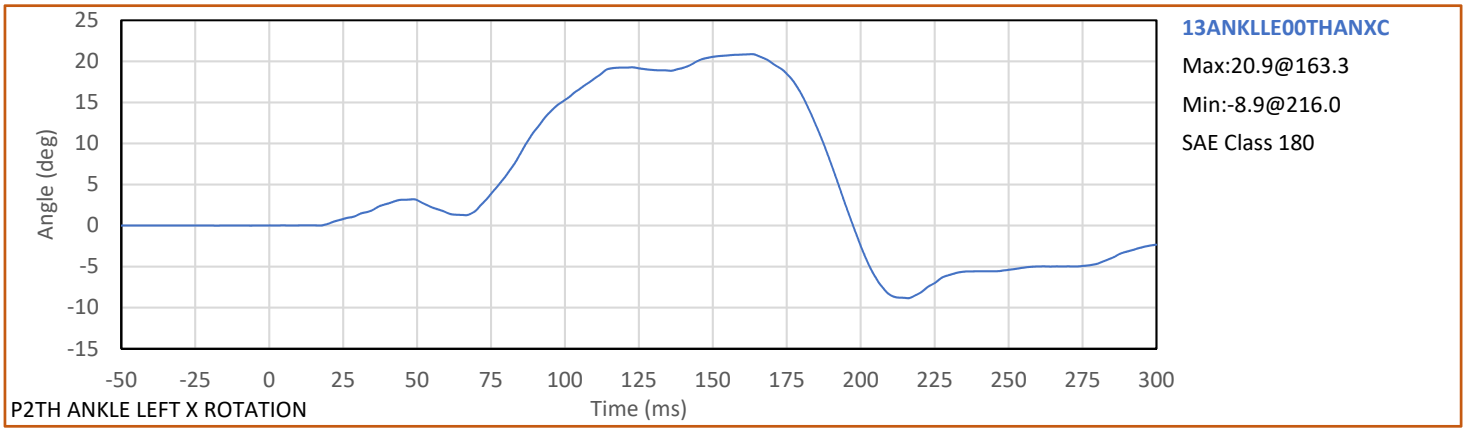
13TIBIRI00THACXA
Max:0.00@0.1
Min:0.00@0.1
SAE Class 1000

P2TH MID TIBIA RIGHT X ACCELERATION



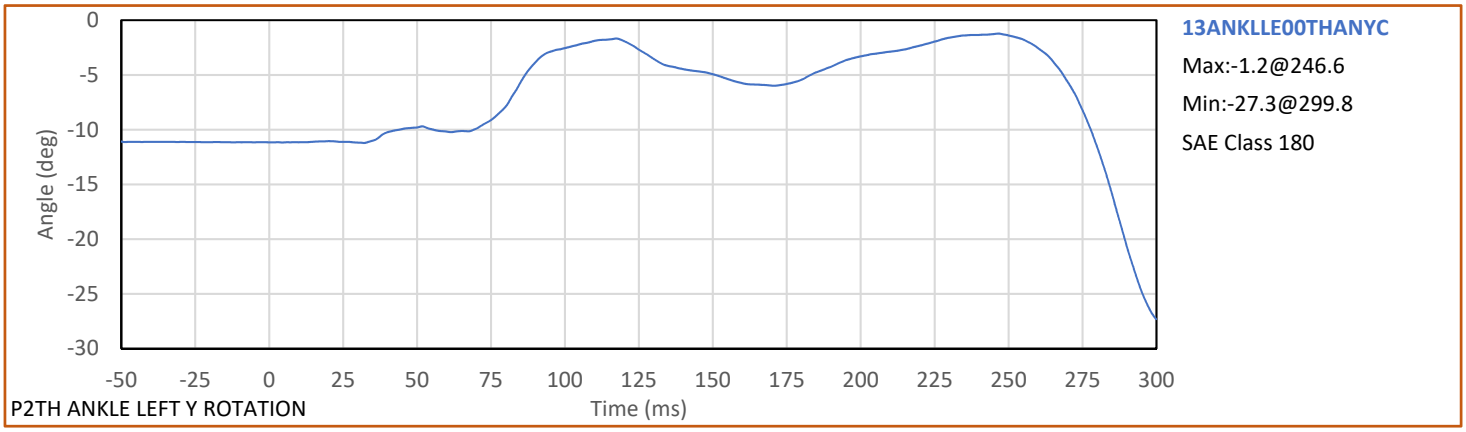
13TIBIRI00THACYA
Max:16.0@67.6
Min:-9.8@88.3
SAE Class 1000

P2TH MID TIBIA RIGHT Y ACCELERATION



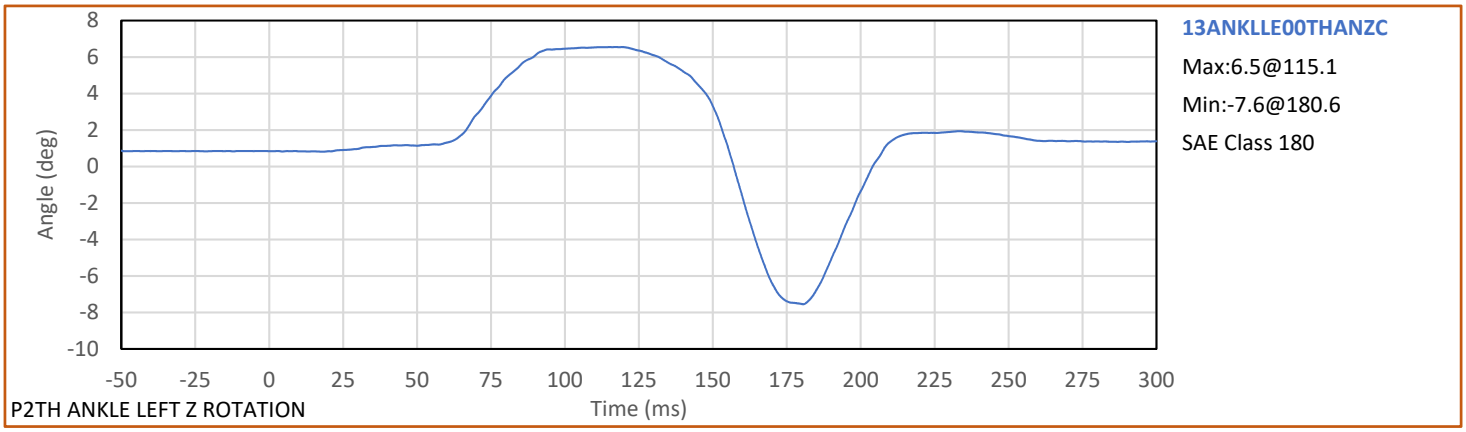
13ANKLLE00THANXC
Max:20.9@163.3
Min:-8.9@216.0
SAE Class 180

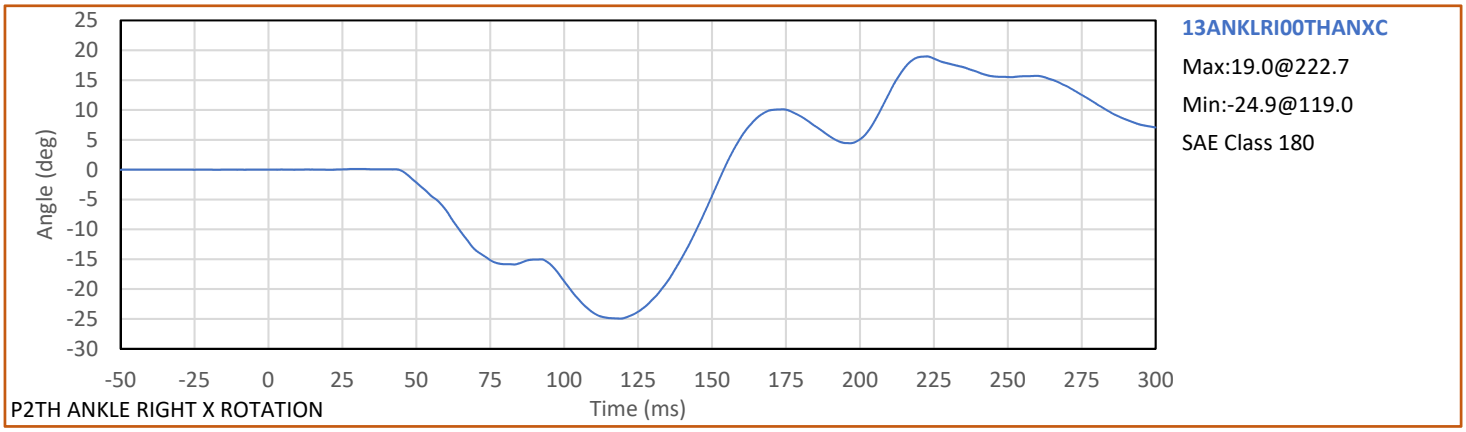
P2TH ANKLE LEFT X ROTATION

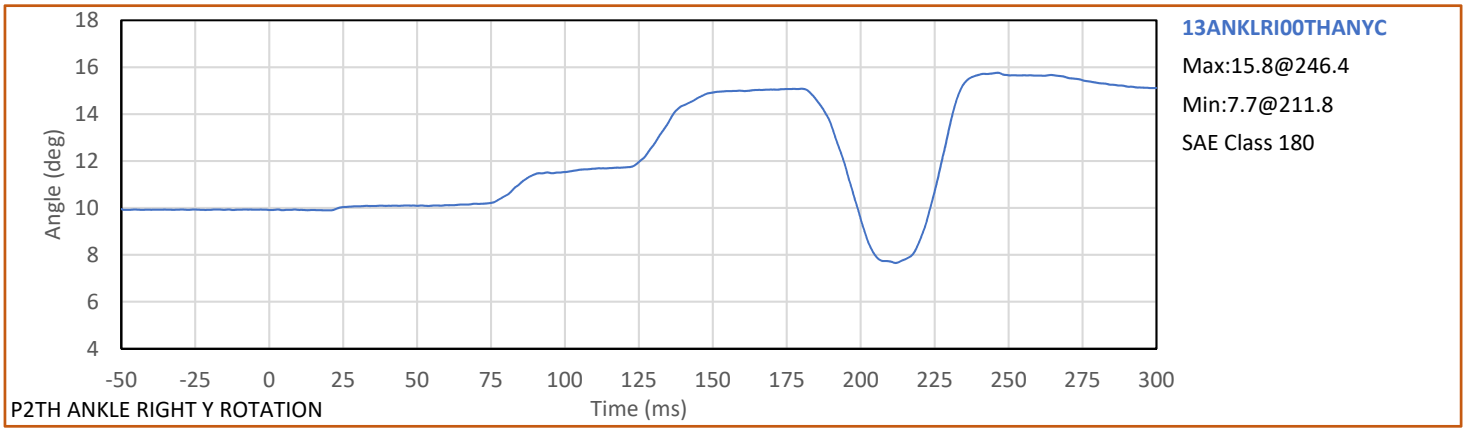


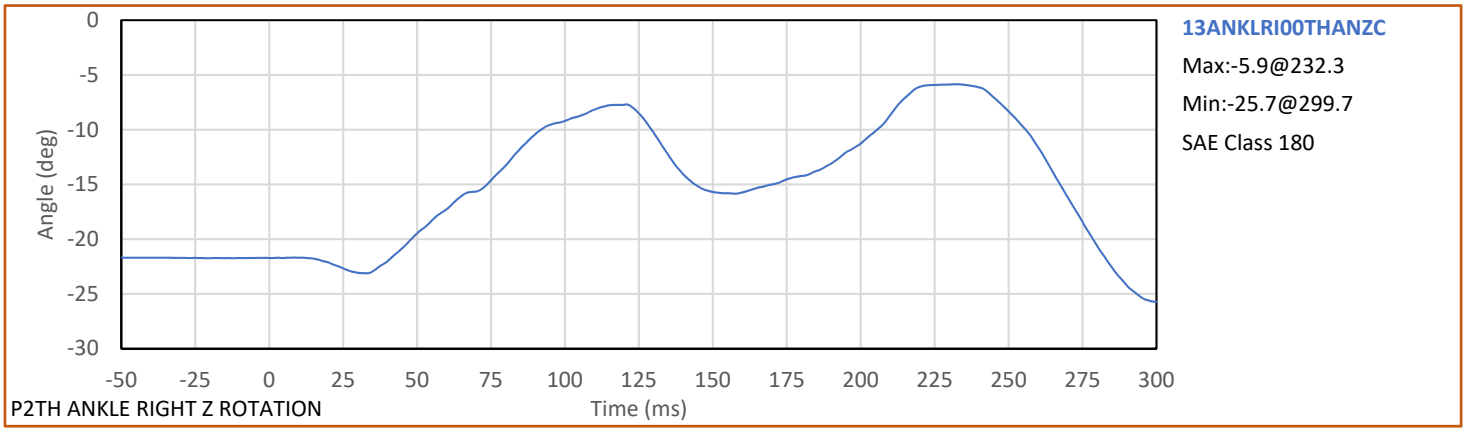
13ANKLLE00THANYC
Max:-1.2@246.6
Min:-27.3@299.8
SAE Class 180

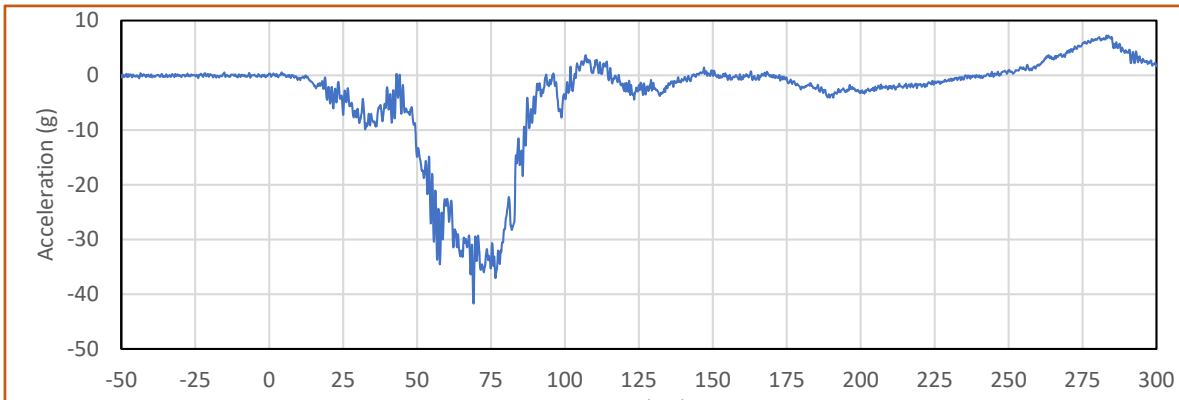
P2TH ANKLE LEFT Y ROTATION


13ANKLLE00THANZC
Max:6.5@115.1
Min:-7.6@180.6
SAE Class 180
Angle (deg)
Time (ms)
P2TH ANKLE LEFT Z ROTATION


13ANKLRI00THANXC
Max:19.0@222.7
Min:-24.9@119.0
SAE Class 180
Angle (deg)
Time (ms)
P2TH ANKLE RIGHT X ROTATION

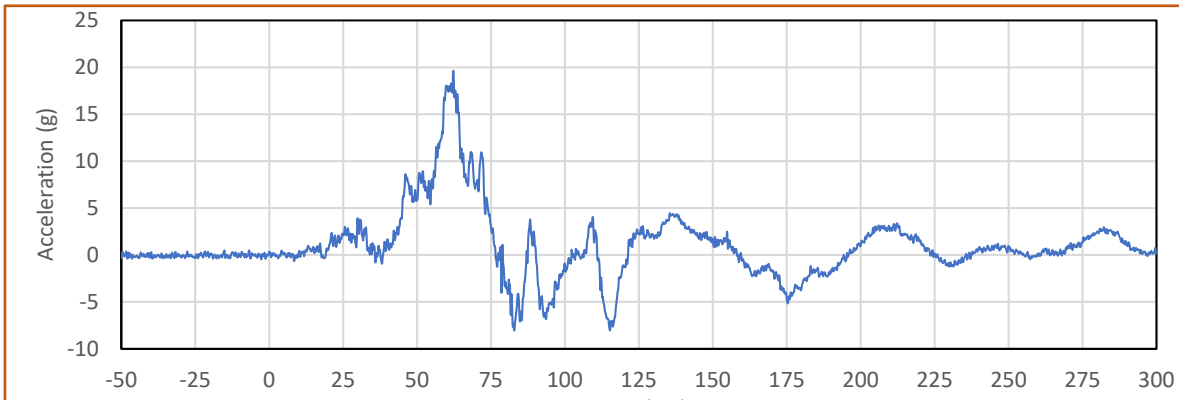

13ANKLRI00THANYC
Max:15.8@246.4
Min:7.7@211.8
SAE Class 180
Angle (deg)
Time (ms)
P2TH ANKLE RIGHT Y ROTATION


13ANKLRI00THANZC
Max:-5.9@232.3
Min:-25.7@299.7
SAE Class 180
Angle (deg)
Time (ms)
P2TH ANKLE RIGHT Z ROTATION



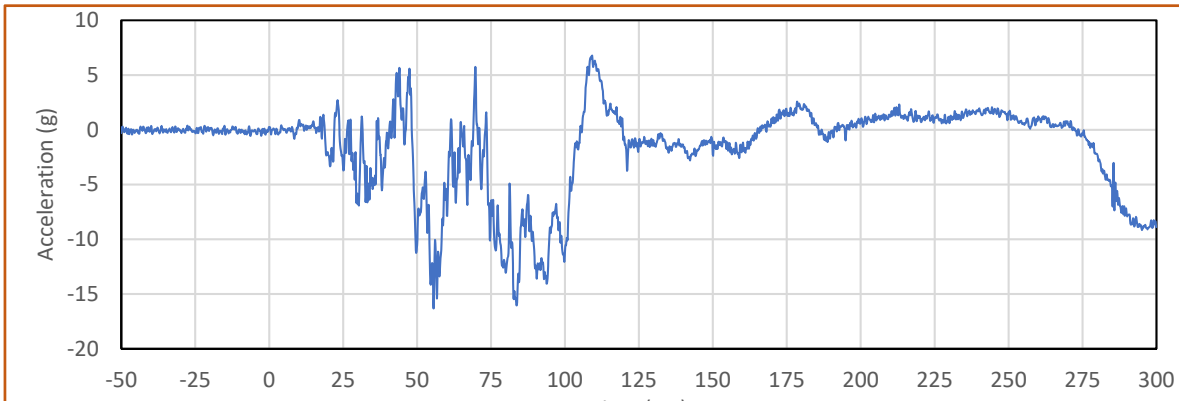
P2TH FOOT LEFT X ACCELERATION

13FOOTLE00THACXA
Max:7.3@283.1
Min:-41.7@69.1
SAE Class 1000



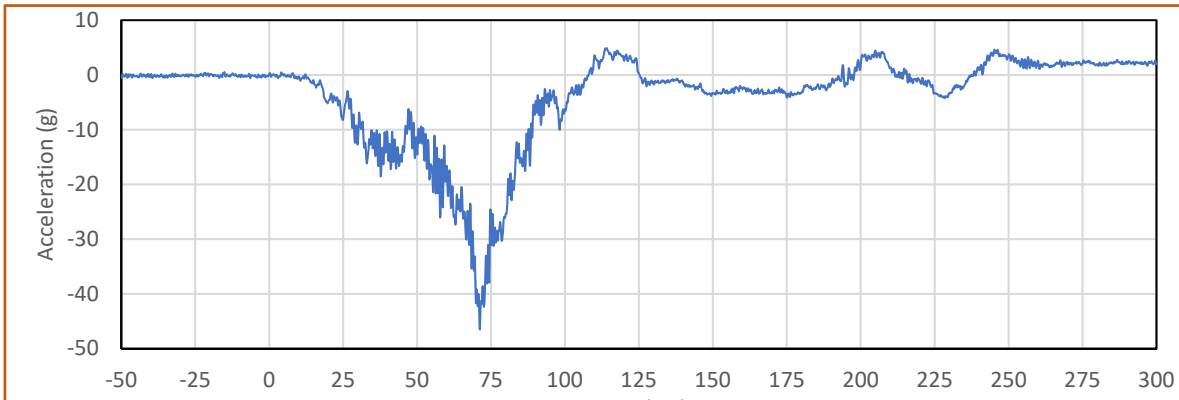
P2TH FOOT LEFT Y ACCELERATION

13FOOTLE00THACYA
Max:19.6@62.3
Min:-8.0@82.9
SAE Class 1000



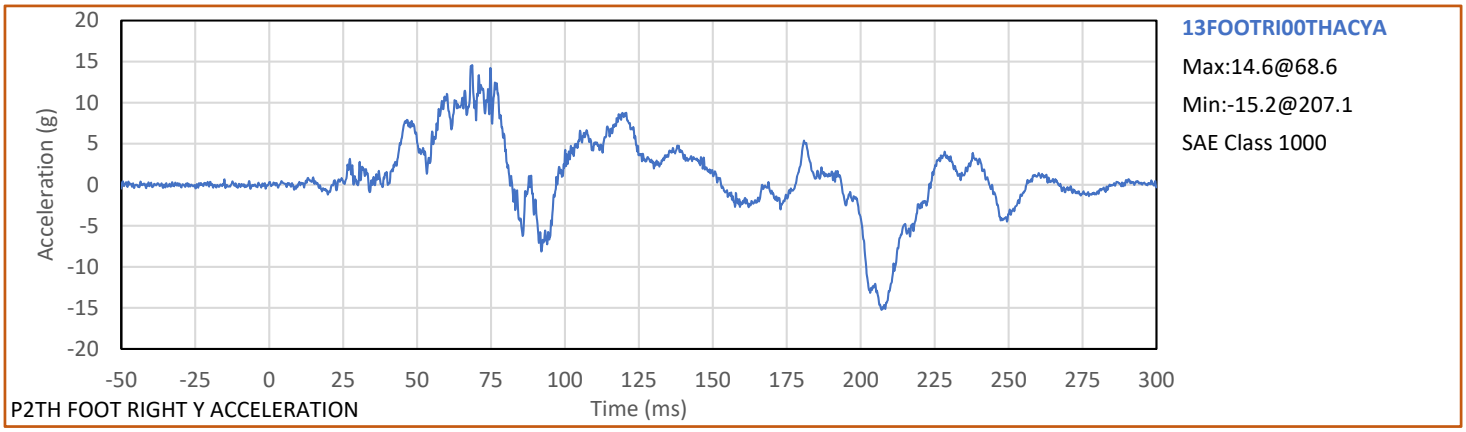
P2TH FOOT LEFT Z ACCELERATION

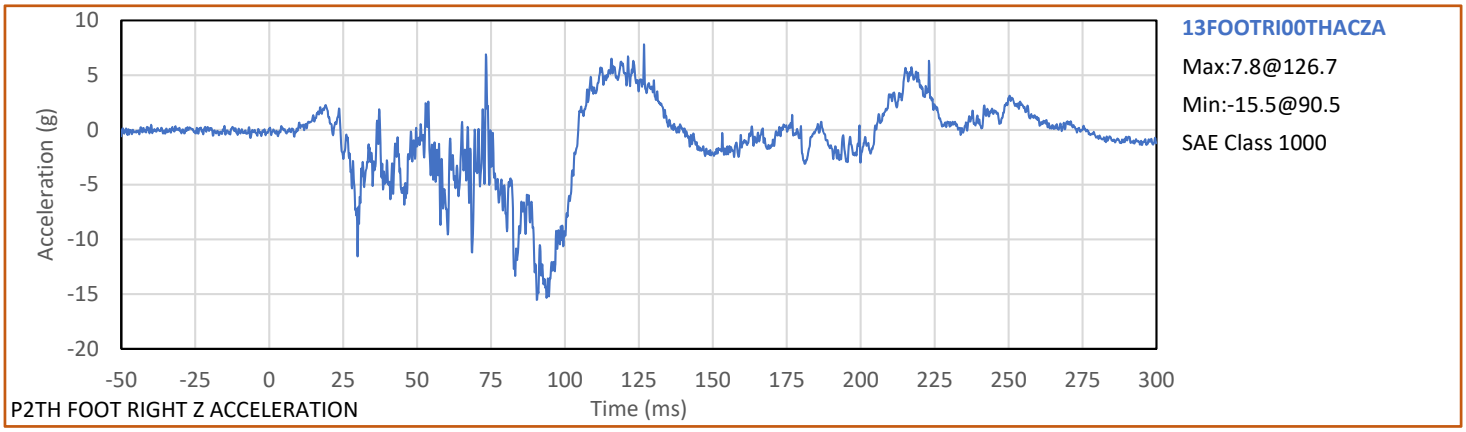
13FOOTLE00THACZA
Max:6.8@109.2
Min:-16.3@55.6
SAE Class 1000

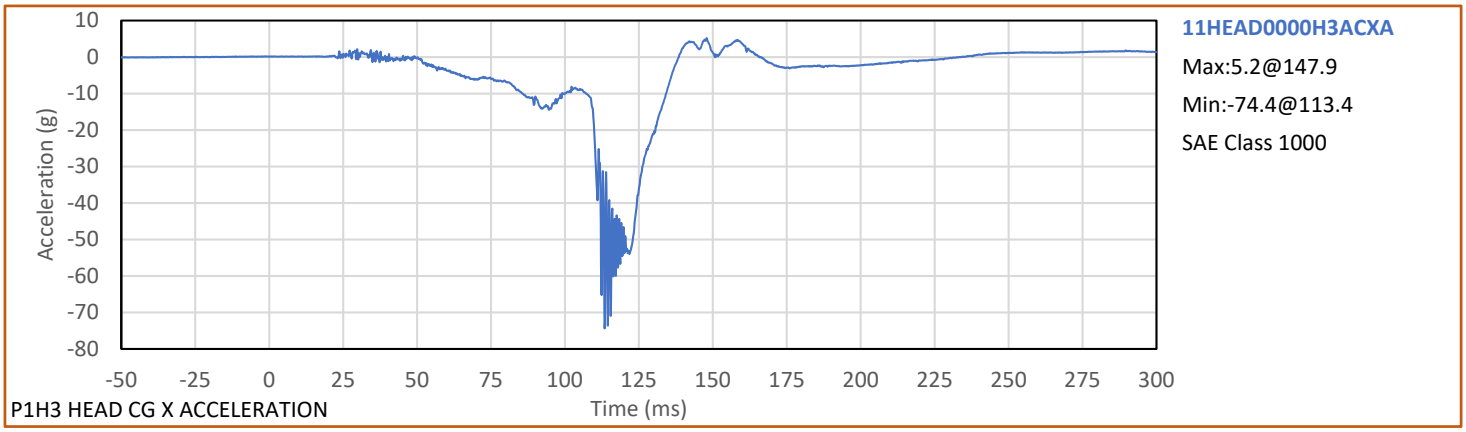


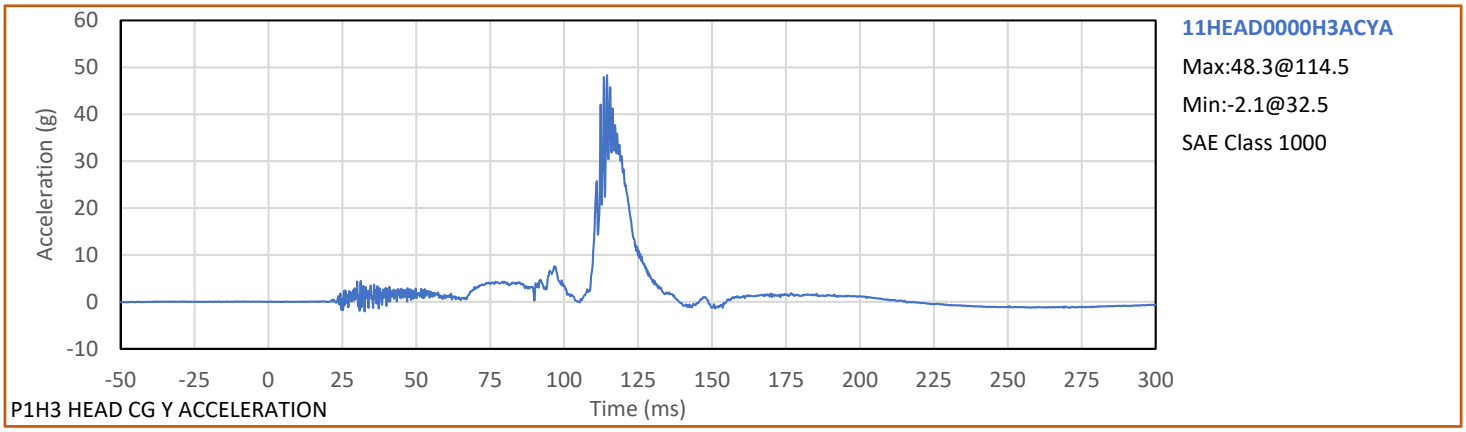
P2TH FOOT RIGHT X ACCELERATION

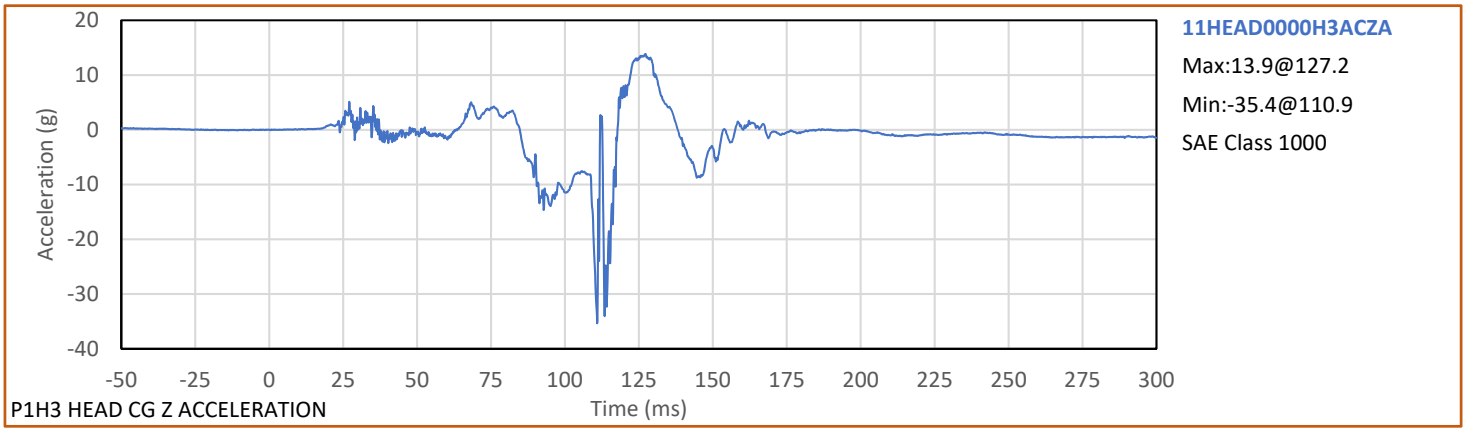
13FOOTRI00THACXA
Max:4.9@114.1
Min:-46.5@71.2
SAE Class 1000

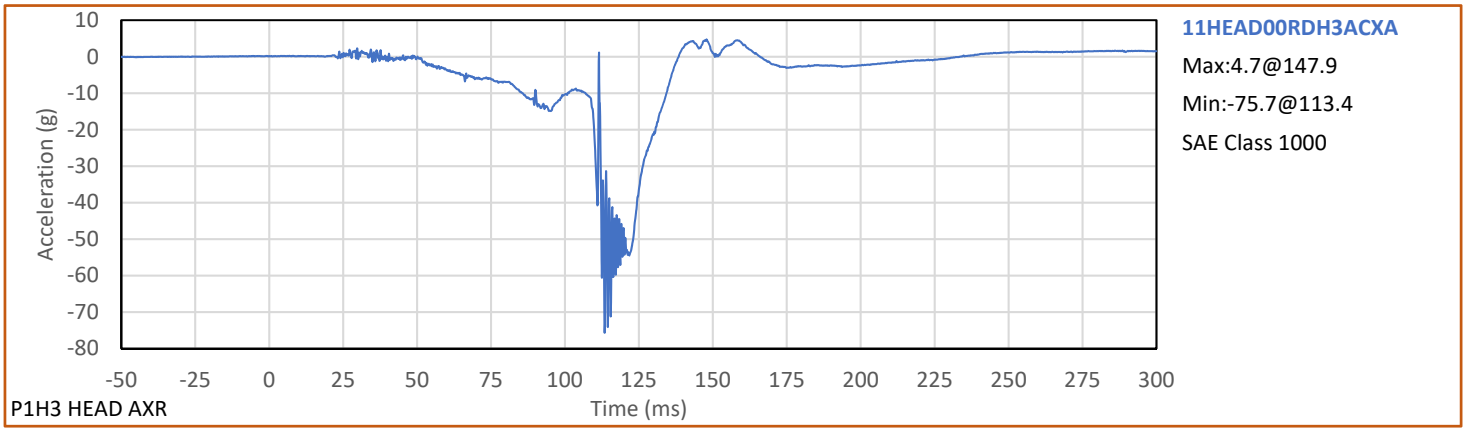

Acceleration (g)
Time (ms)
P2TH FOOT RIGHT Y ACCELERATION
13FOOTRI00THACYA
Max:14.6@68.6
Min:-15.2@207.1
SAE Class 1000

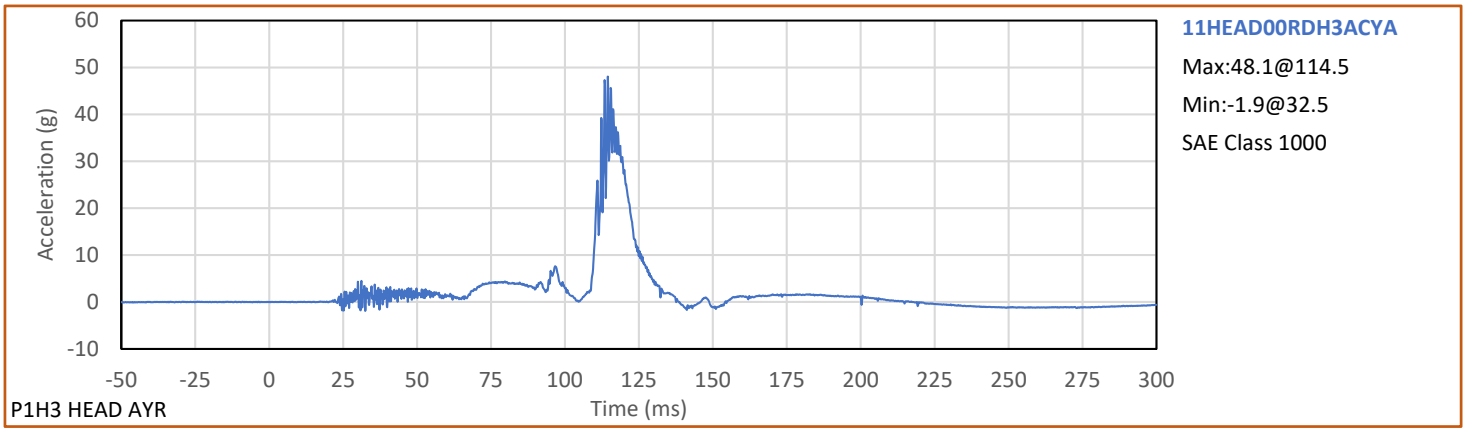

Acceleration (g)
Time (ms)
P2TH FOOT RIGHT Z ACCELERATION
13FOOTRI00THACZA
Max:7.8@126.7
Min:-15.5@90.5
SAE Class 1000

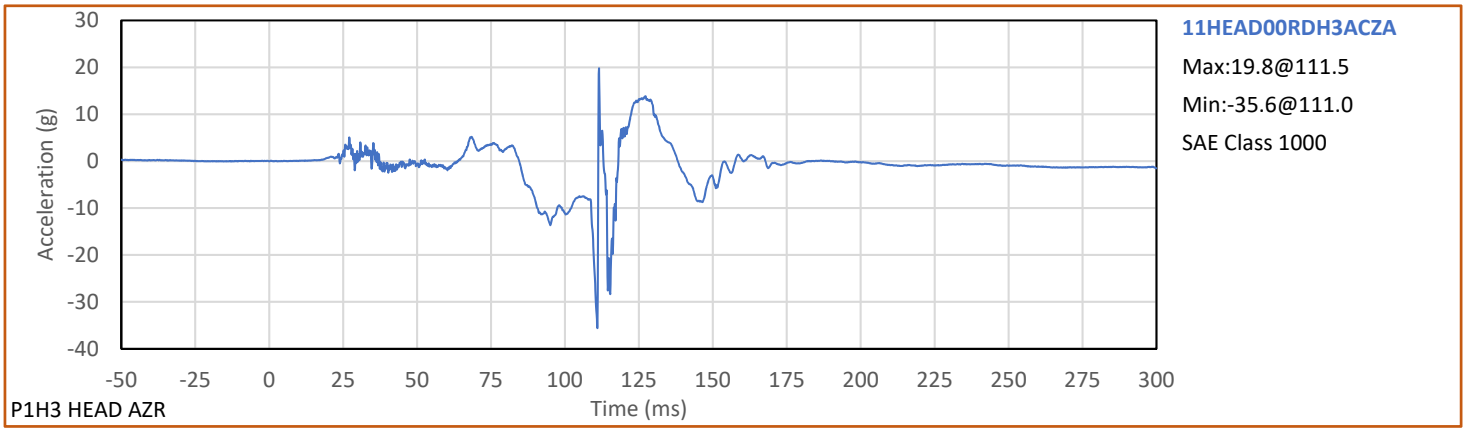

Acceleration (g)
Time (ms)
P1H3 HEAD CG X ACCELERATION
11HEAD0000H3ACXA
Max:5.2@147.9
Min:-74.4@113.4
SAE Class 1000

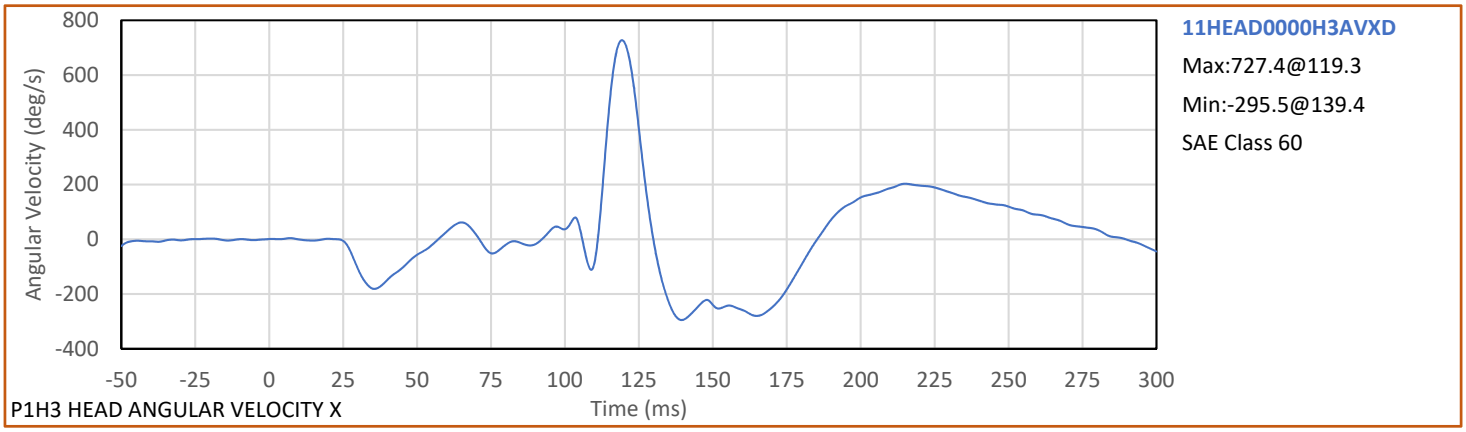

Acceleration (g)
Time (ms)
P1H3 HEAD CG Y ACCELERATION
11HEAD0000H3ACYA
Max:48.3@114.5
Min:-2.1@32.5
SAE Class 1000

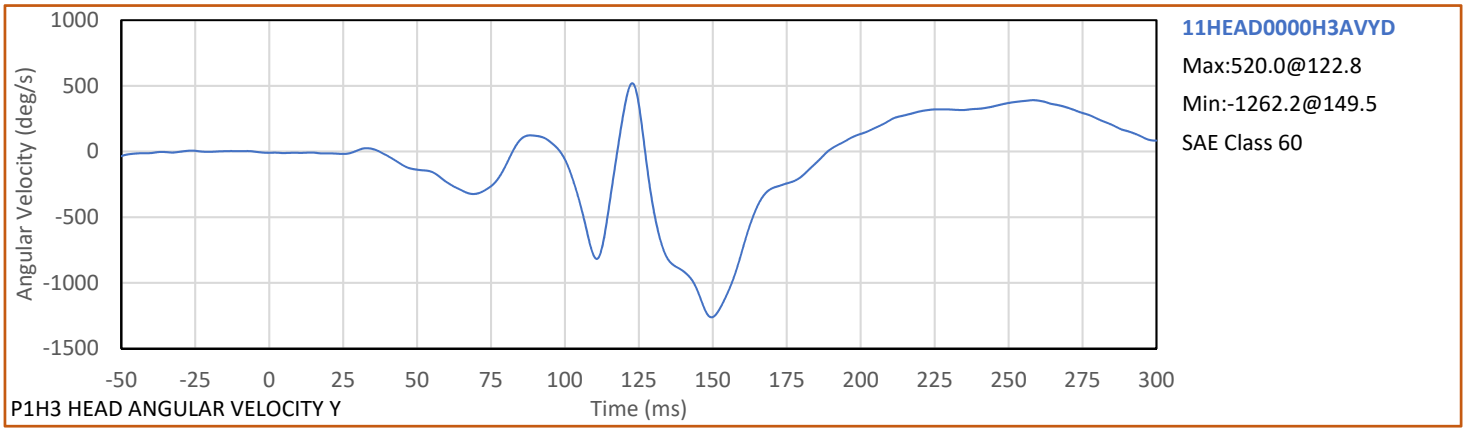

Acceleration (g)
Time (ms)
P1H3 HEAD CG Z ACCELERATION
11HEAD0000H3ACZA
Max:13.9@127.2
Min:-35.4@110.9
SAE Class 1000


Acceleration (g)
Time (ms)
P1H3 HEAD AXR
11HEAD00RDH3ACXA
Max:4.7@147.9
Min:-75.7@113.4
SAE Class 1000


Acceleration (g)
Time (ms)
P1H3 HEAD AYR
11HEAD00RDH3ACYA
Max:48.1@114.5
Min:-1.9@32.5
SAE Class 1000


Acceleration (g)
Time (ms)
P1H3 HEAD AZR
11HEAD00RDH3ACZA
Max:19.8@111.5
Min:-35.6@111.0
SAE Class 1000


Angular Velocity (deg/s)
Time (ms)
P1H3 HEAD ANGULAR VELOCITY X
11HEAD0000H3AVXD
Max:727.4@119.3
Min:-295.5@139.4
SAE Class 60

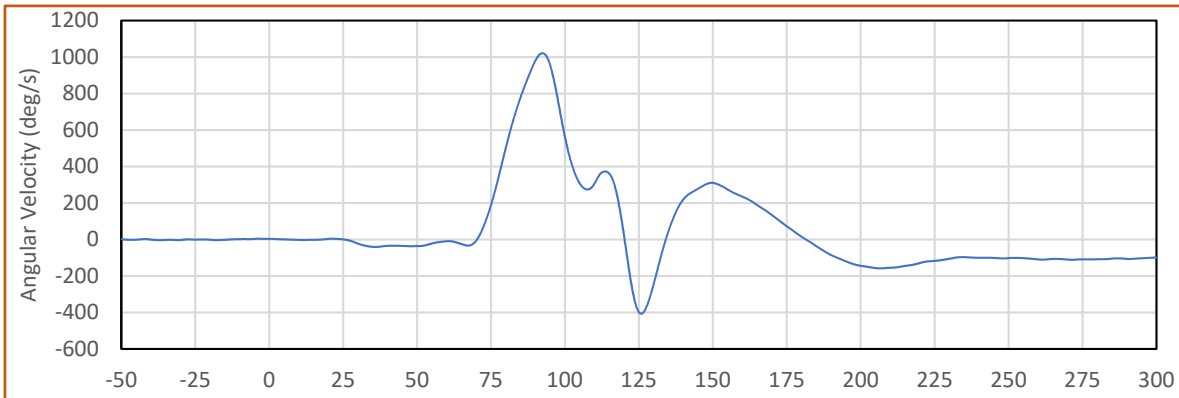

Angular Velocity (deg/s)
Time (ms)
P1H3 HEAD ANGULAR VELOCITY Y
11HEAD0000H3AVYD
Max:520.0@122.8
Min:-1262.2@149.5
SAE Class 60

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

Test Program: Left Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205413

Test Date: 12/15/2020

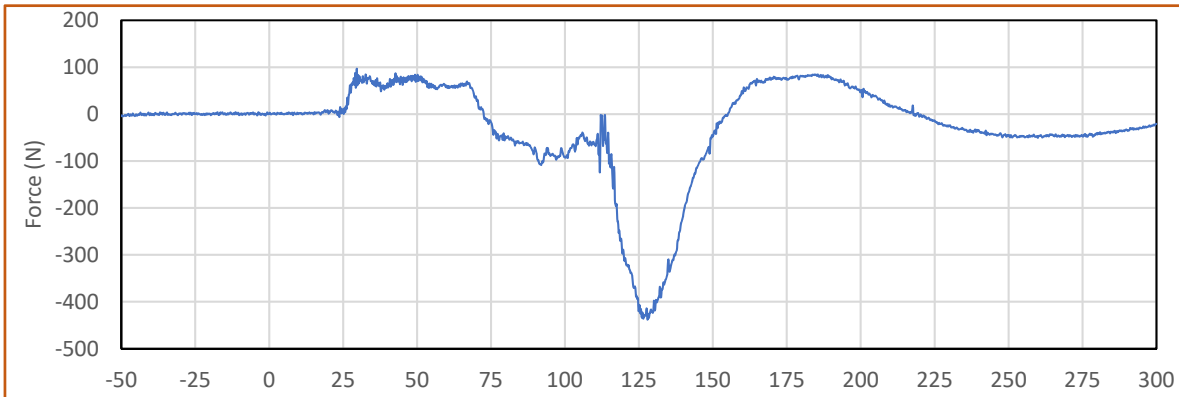


11HEAD0000H3AVZD
Max:1020.8@92.4
Min:-407.4@125.8
SAE Class 60

P1H3 HEAD ANGULAR VELOCITY Z

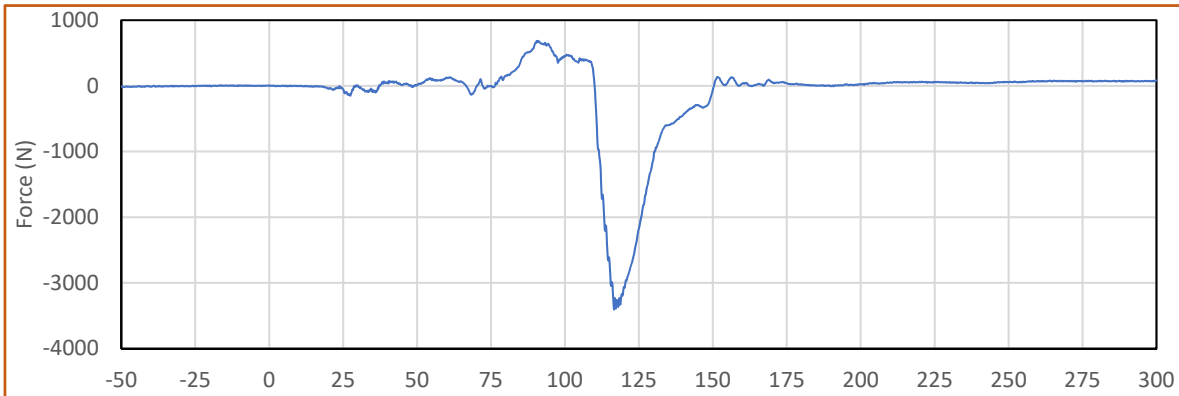
11NECKUP00H3FOXA
Max:748.4@116.6
Min:-274.0@133.3
SAE Class 1000

P1H3 UPPER NECK FX



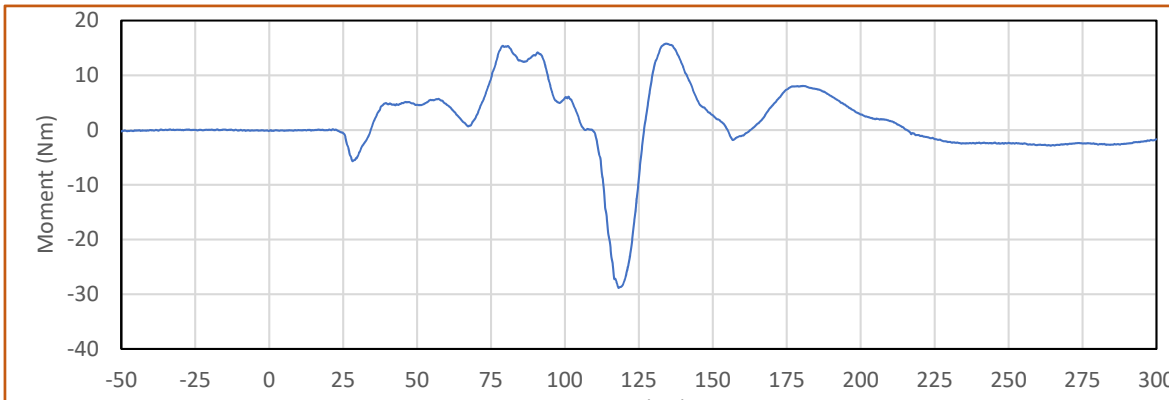
11NECKUP00H3FOYA
Max:96.9@29.6
Min:-438.2@127.9
SAE Class 1000

P1H3 UPPER NECK FY



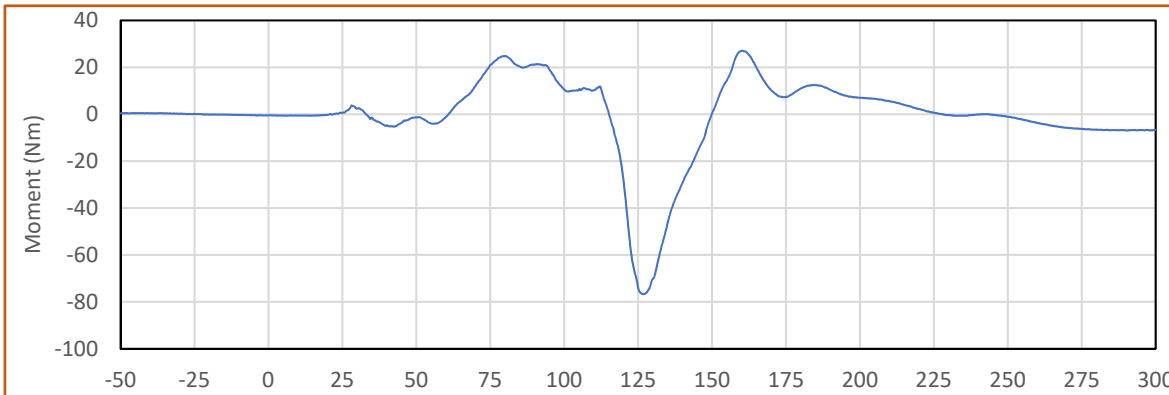
11NECKUP00H3FOZA
Max:686.2@90.5
Min:-3406.4@116.6
SAE Class 1000

P1H3 UPPER NECK FZ



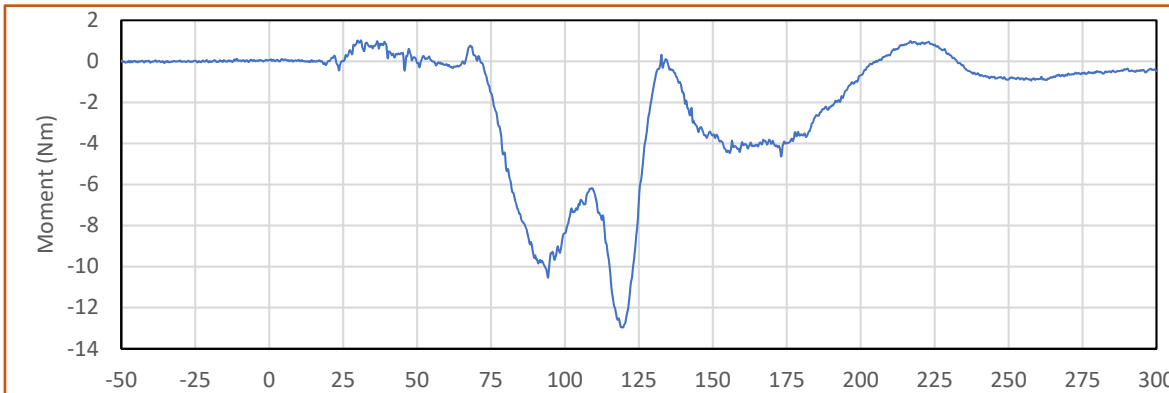
P1H3 UPPER NECK MX

11NECKUP00H3MOXB
Max:15.8@134.3
Min:-28.9@118.1
SAE Class 600



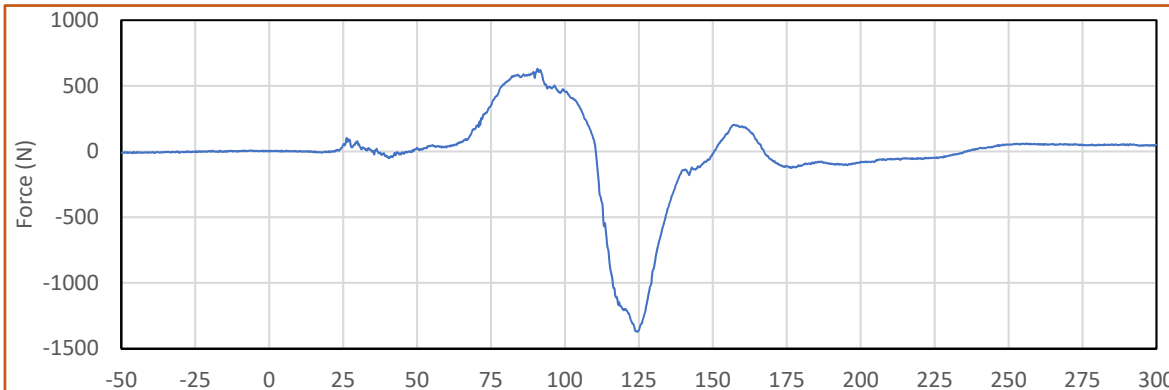
P1H3 UPPER NECK MY

11NECKUP00H3MOYB
Max:27.0@160.2
Min:-76.7@126.6
SAE Class 600



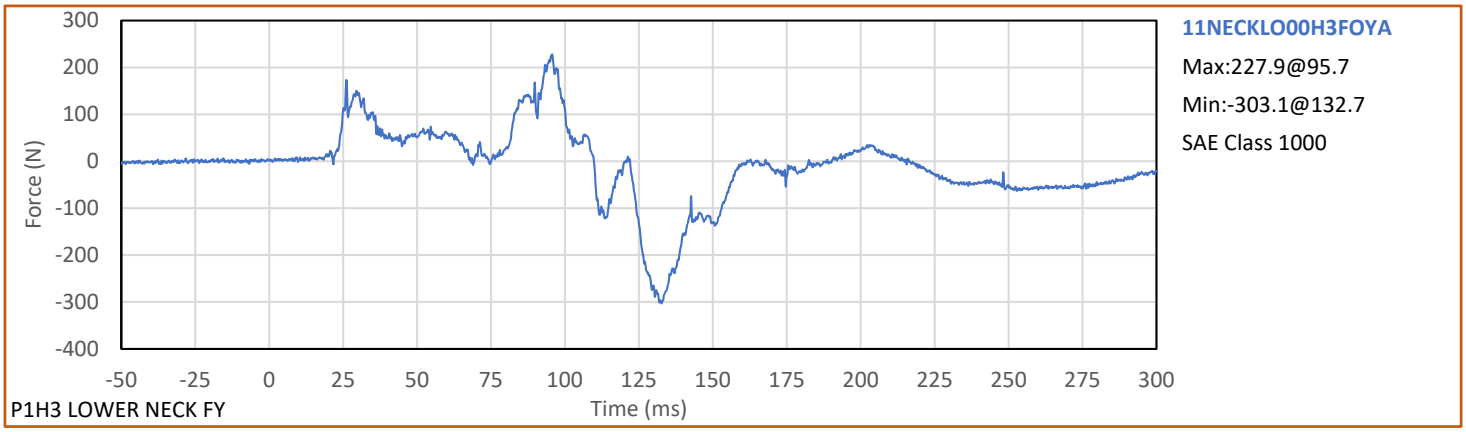
P1H3 UPPER NECK MZ

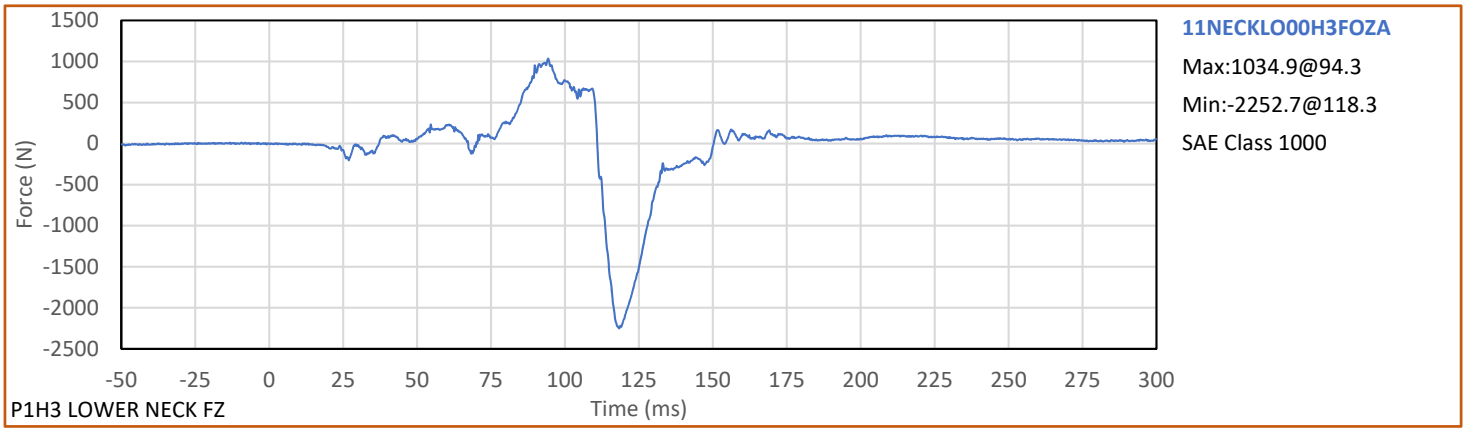
11NECKUP00H3MOZB
Max:1.0@31.0
Min:-13.0@119.6
SAE Class 600

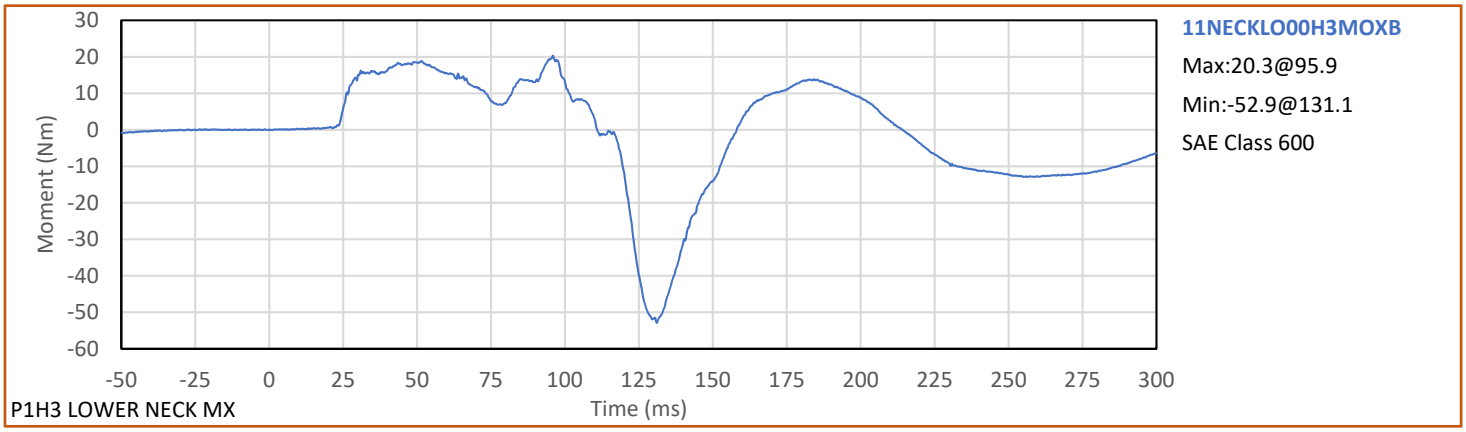


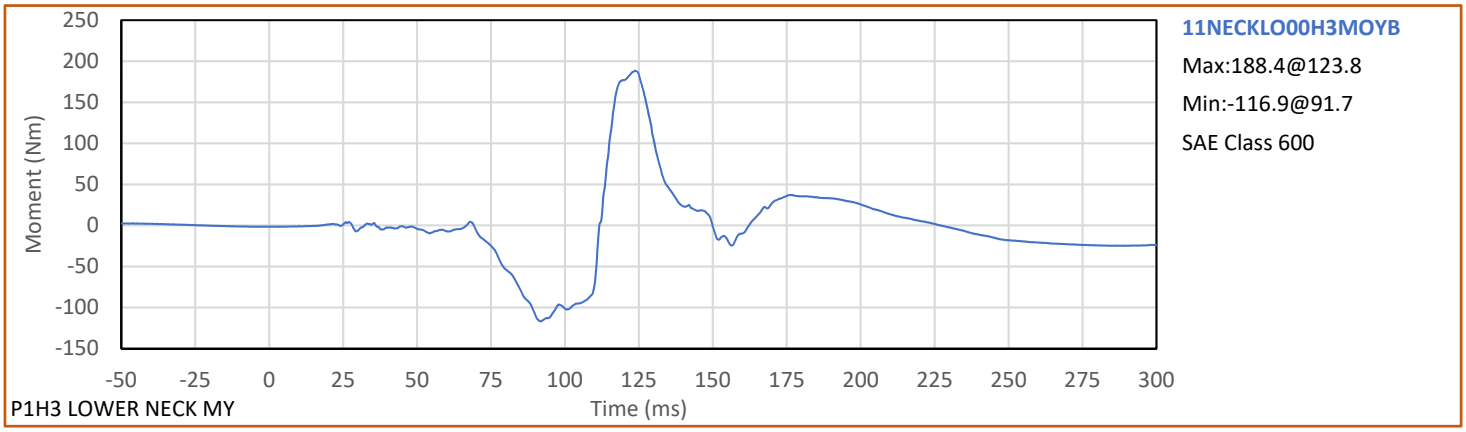
P1H3 LOWER NECK FX

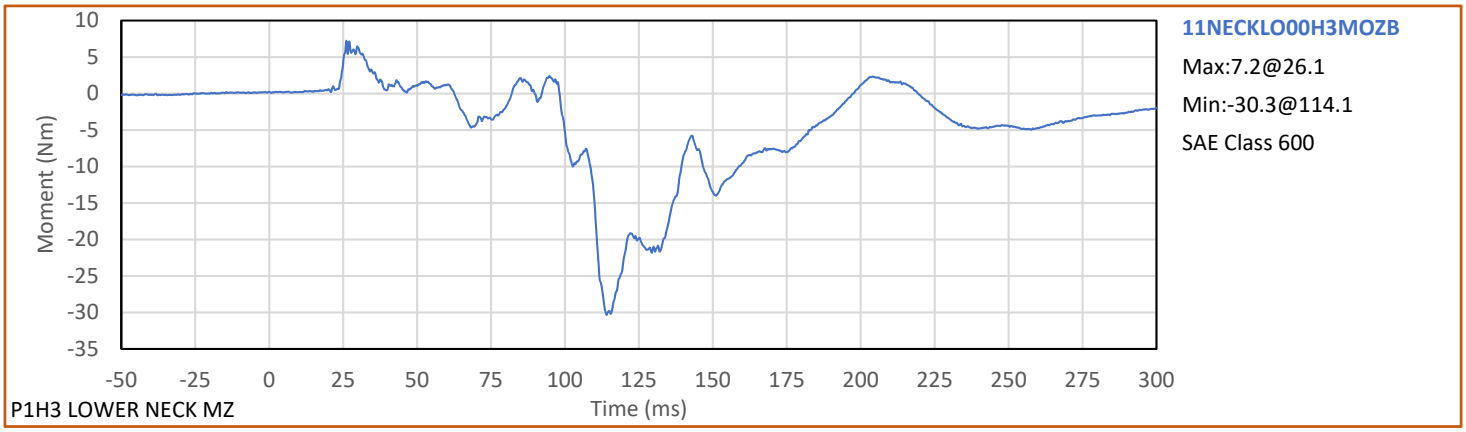
11NECKLO00H3FOXA
Max:630.0@90.7
Min:-1371.8@124.5
SAE Class 1000


Force (N)
Time (ms)
P1H3 LOWER NECK FY
11NECKLO00H3FOYA
Max:227.9@95.7
Min:-303.1@132.7
SAE Class 1000

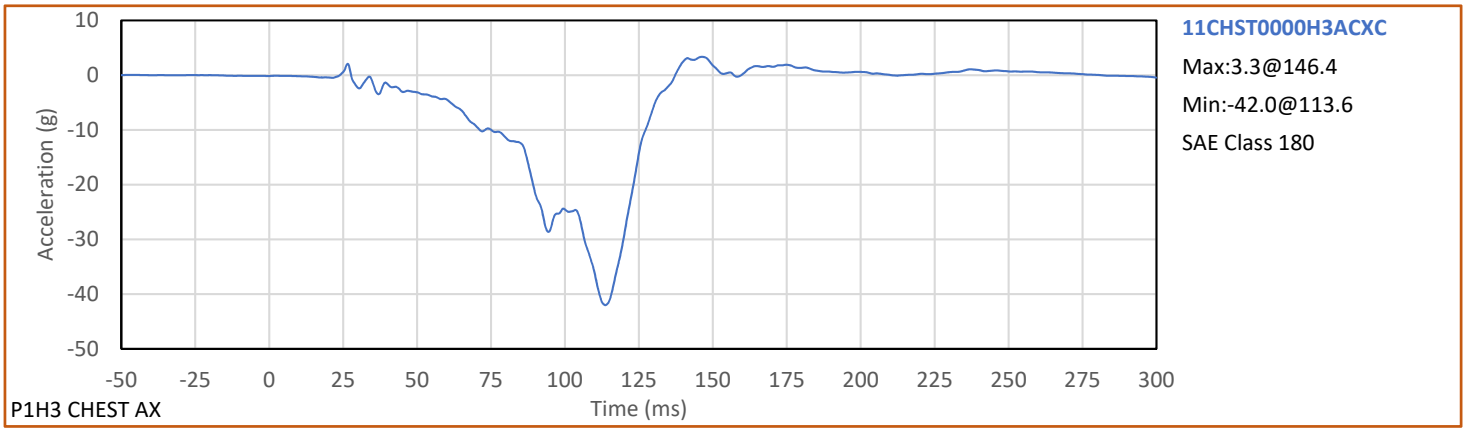

Force (N)
Time (ms)
P1H3 LOWER NECK FZ
11NECKLO00H3FOZA
Max:1034.9@94.3
Min:-2252.7@118.3
SAE Class 1000


Moment (Nm)
Time (ms)
P1H3 LOWER NECK MX
11NECKLO00H3MOXB
Max:20.3@95.9
Min:-52.9@131.1
SAE Class 600

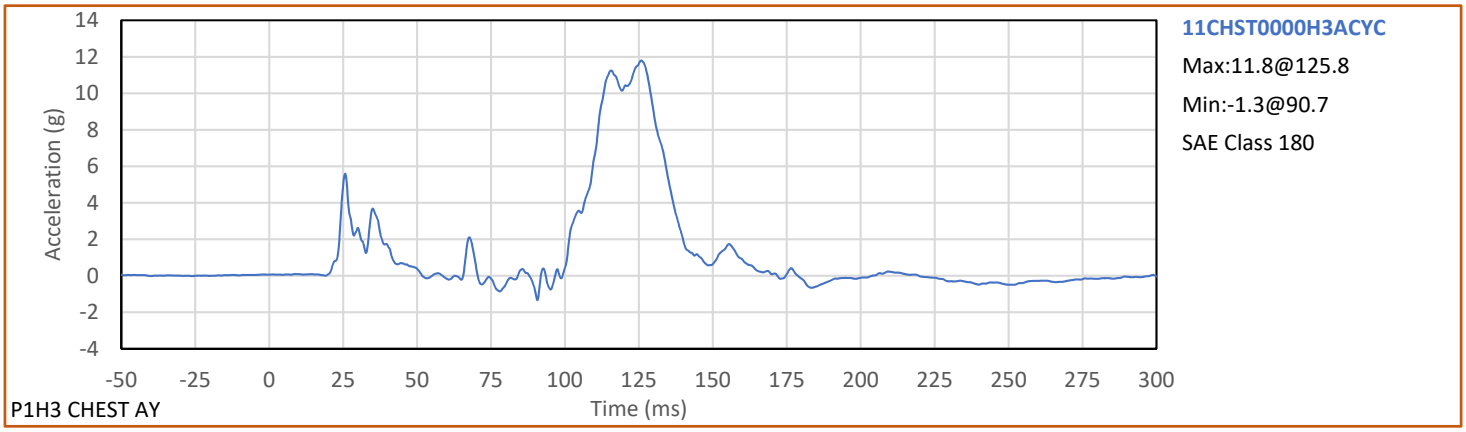

Moment (Nm)
Time (ms)
P1H3 LOWER NECK MY
11NECKLO00H3MOYB
Max:188.4@123.8
Min:-116.9@91.7
SAE Class 600



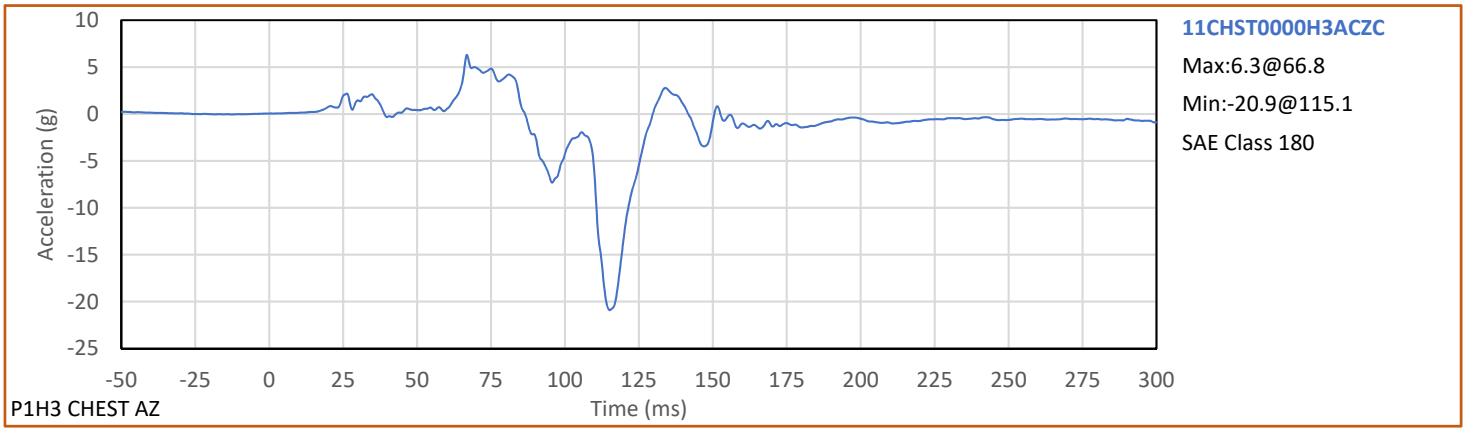
11NECKLO00H3MOZB
Max:7.2@26.1
Min:-30.3@114.1
SAE Class 600



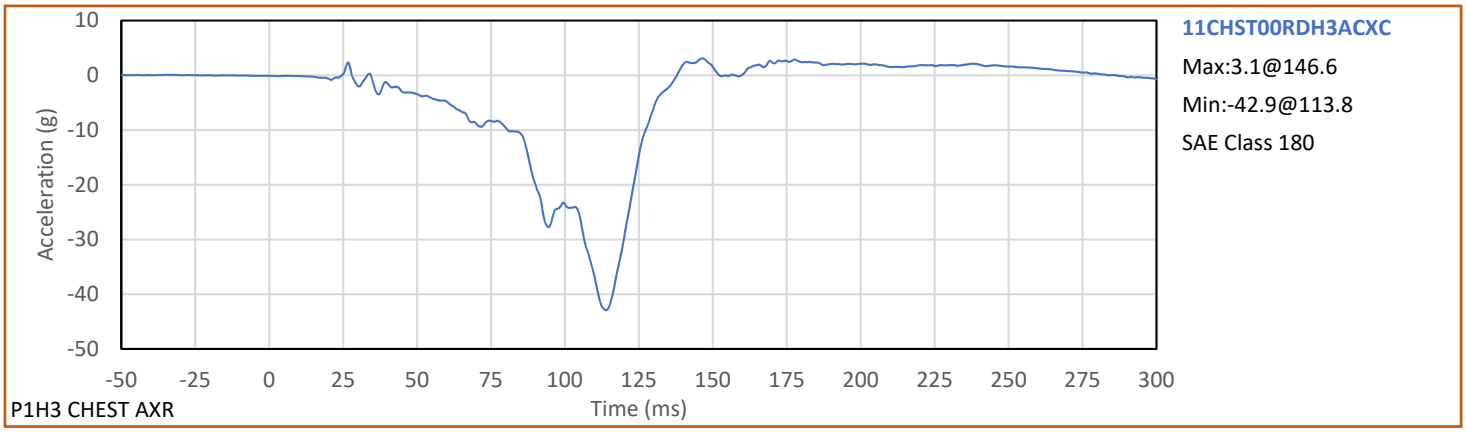
11CHST0000H3ACXC
Max:3.3@146.4
Min:-42.0@113.6
SAE Class 180



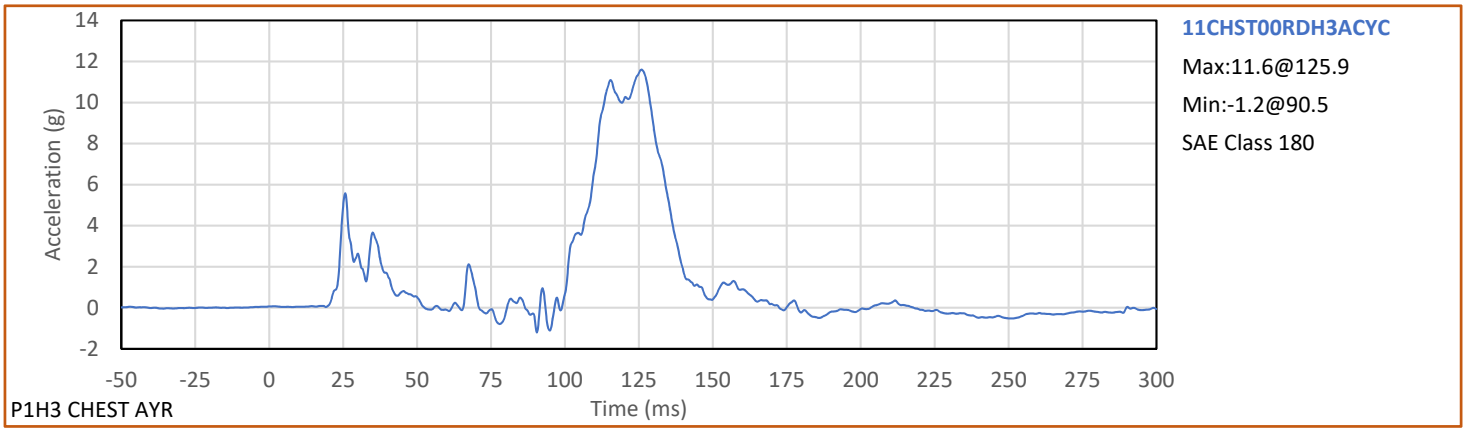
11CHST0000H3ACYC
Max:11.8@125.8
Min:-1.3@90.7
SAE Class 180



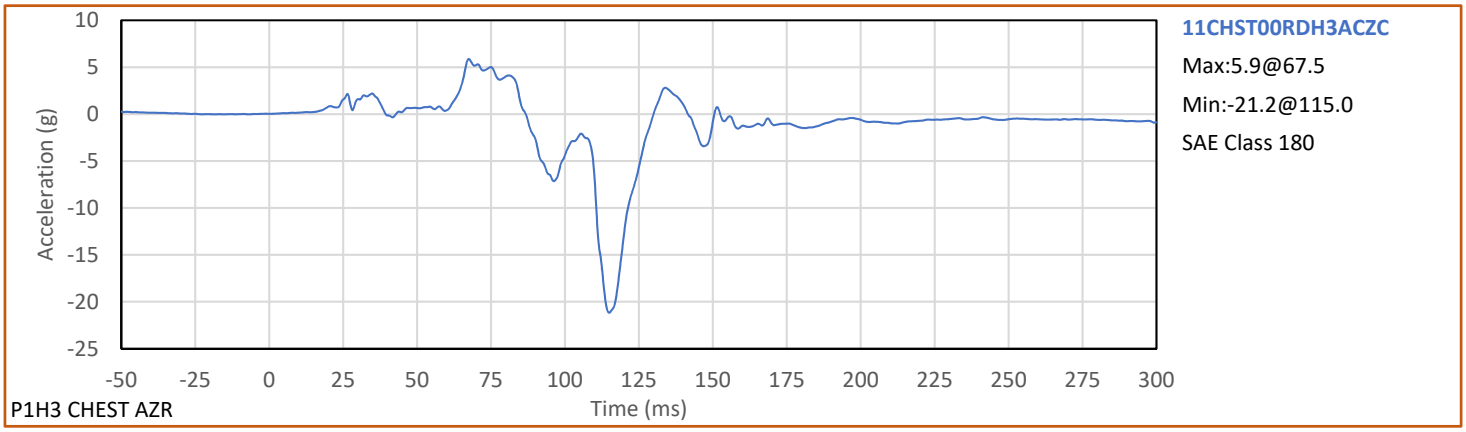
11CHST0000H3ACZC
Max:6.3@66.8
Min:-20.9@115.1
SAE Class 180



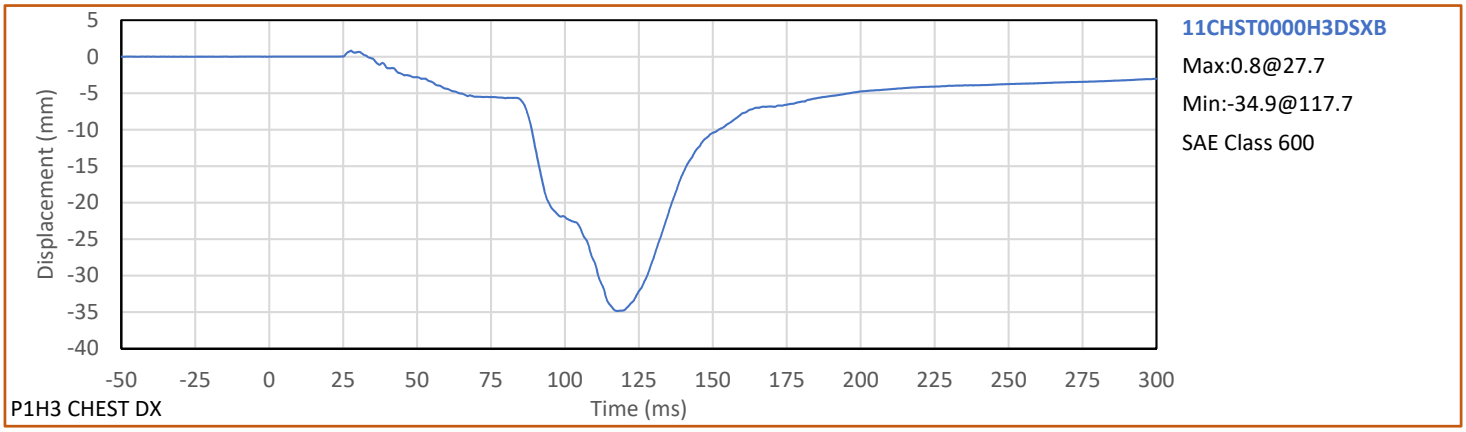
11CHST00RDH3ACXC
Max:3.1@146.6
Min:-42.9@113.8
SAE Class 180



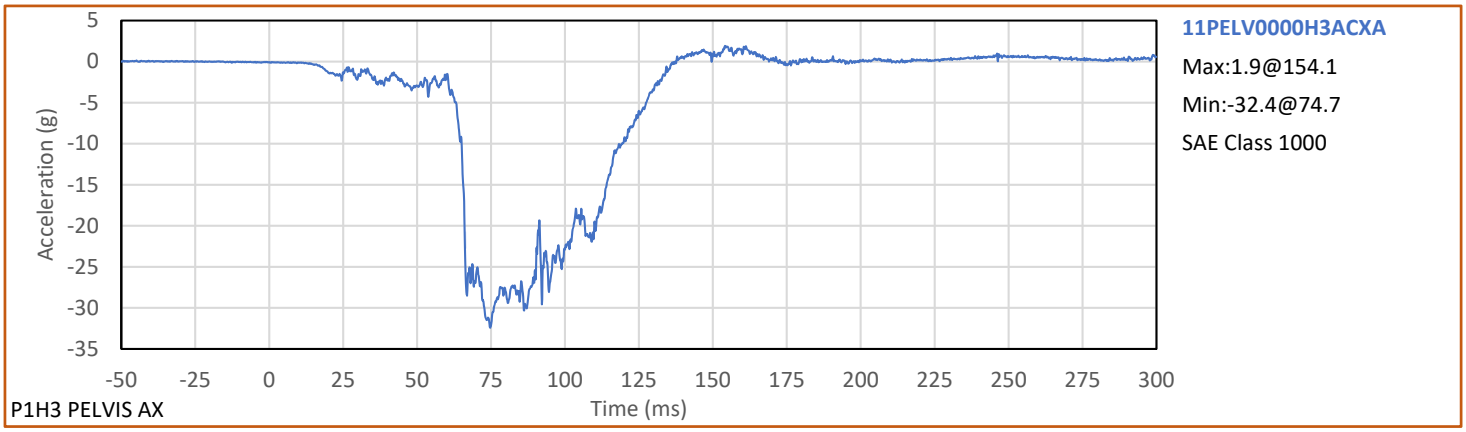
11CHST00RDH3ACYC
Max:11.6@125.9
Min:-1.2@90.5
SAE Class 180



11CHST00RDH3ACZC
Max:5.9@67.5
Min:-21.2@115.0
SAE Class 180



11CHST0000H3DSXB
Max:0.8@27.7
Min:-34.9@117.7
SAE Class 600


Acceleration (g)
Time (ms)
P1H3 PELVIS AX
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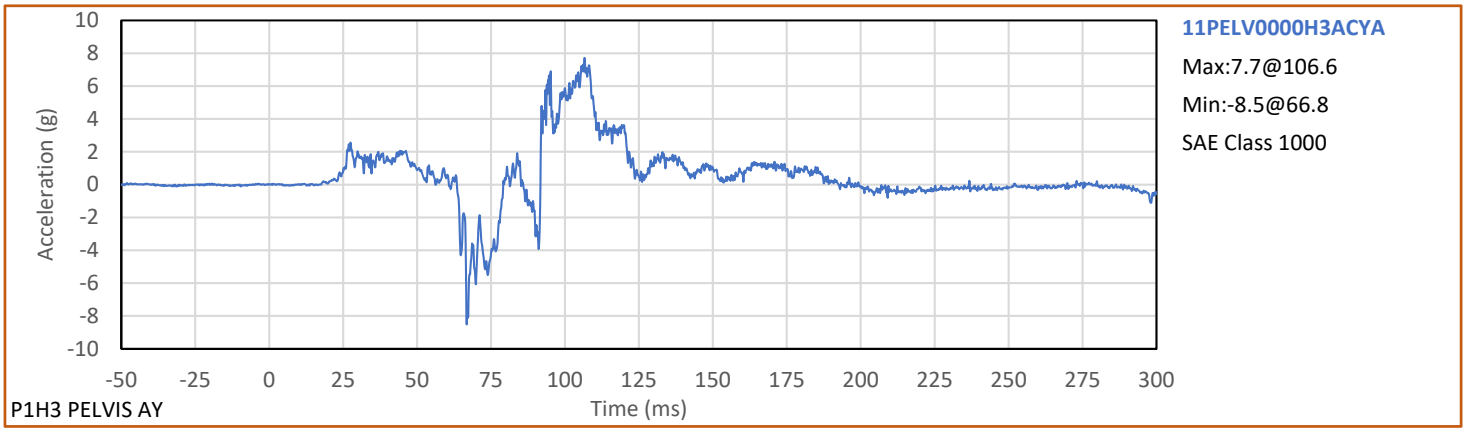
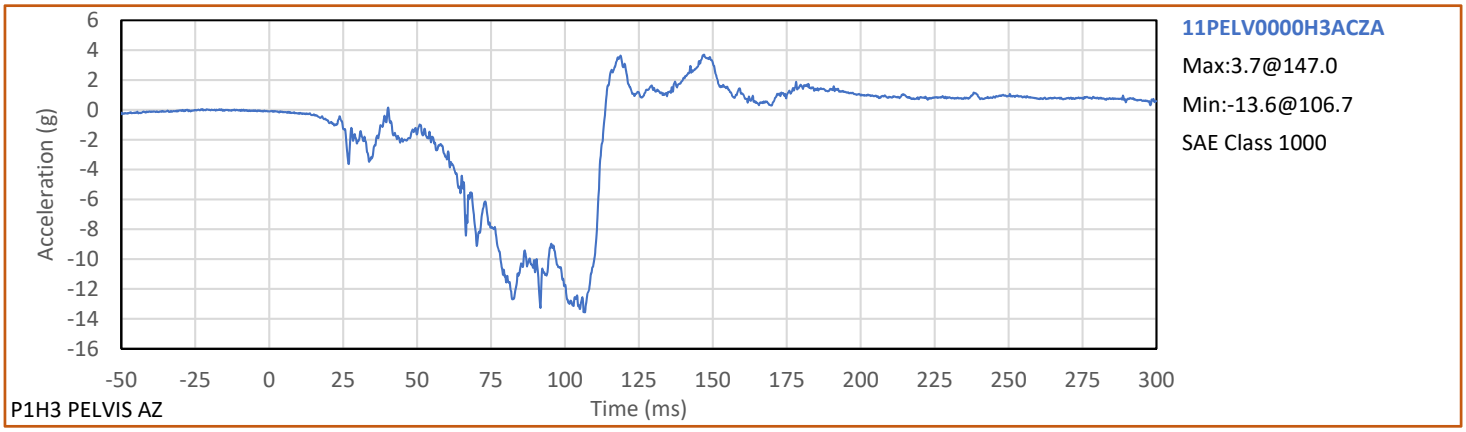
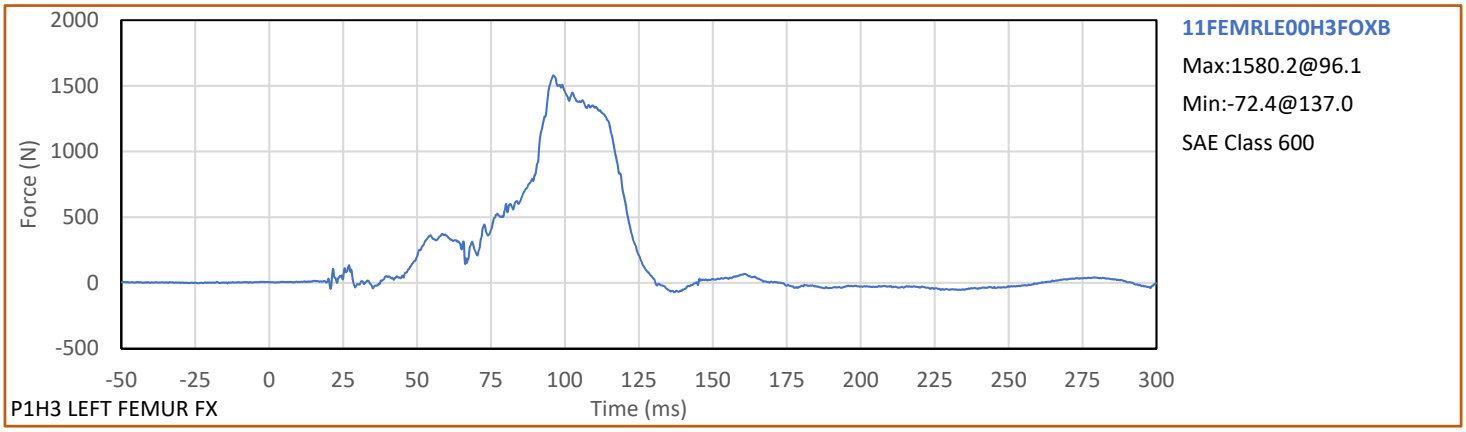
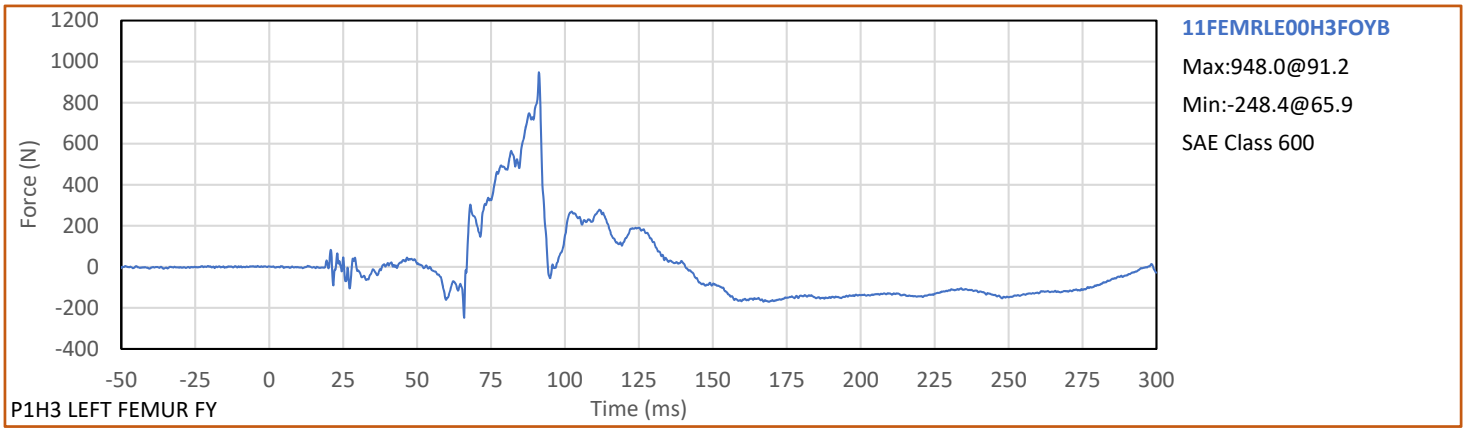
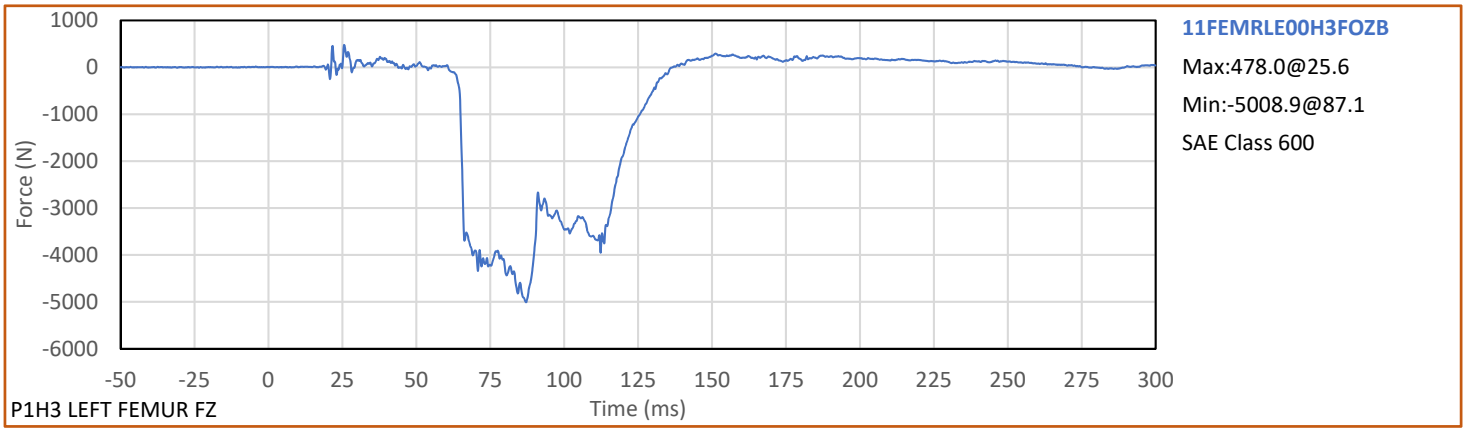
Max:1.9@154.1
Min:-32.4@74.7
SAE Class 1000

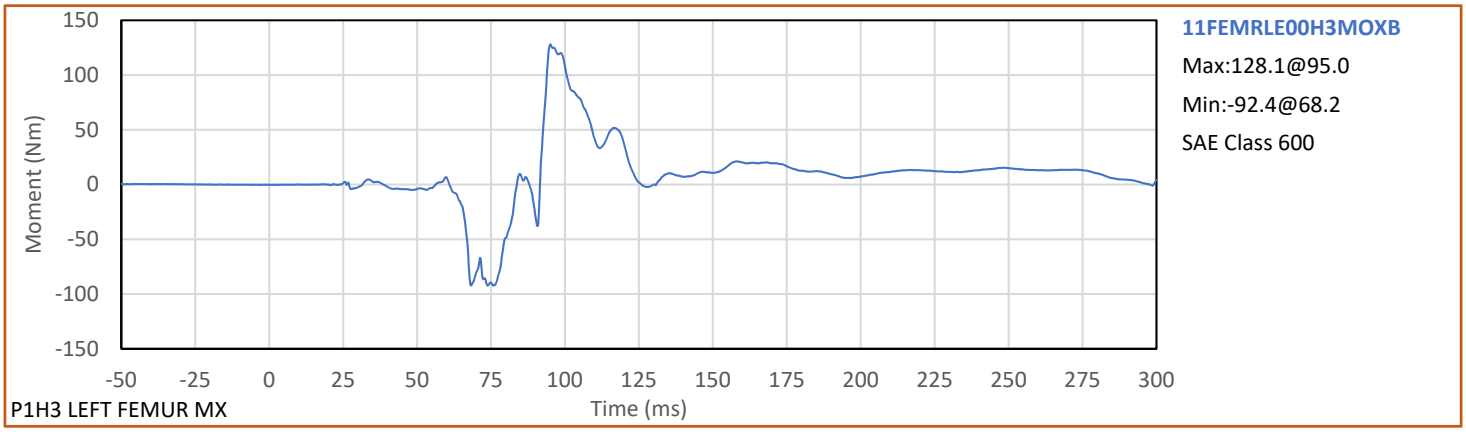

Acceleration (g)
Time (ms)
P1H3 PELVIS AY
11PELV0000H3ACYA
Max:7.7@106.6
Min:-8.5@66.8
SAE Class 1000

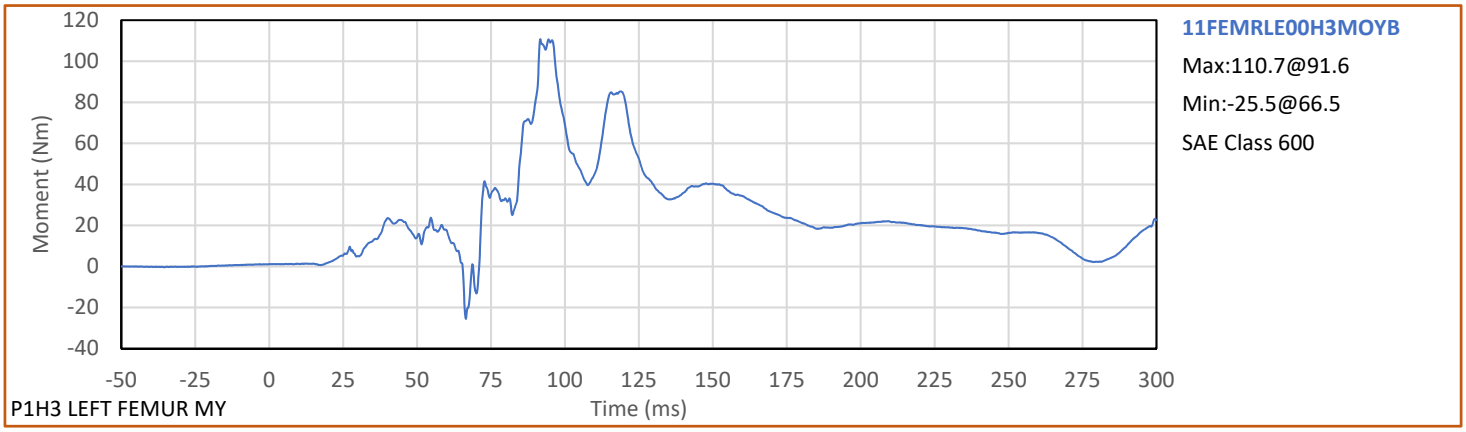

Acceleration (g)
Time (ms)
P1H3 PELVIS AZ
11PELV0000H3ACZA
Max:3.7@147.0
Min:-13.6@106.7
SAE Class 1000

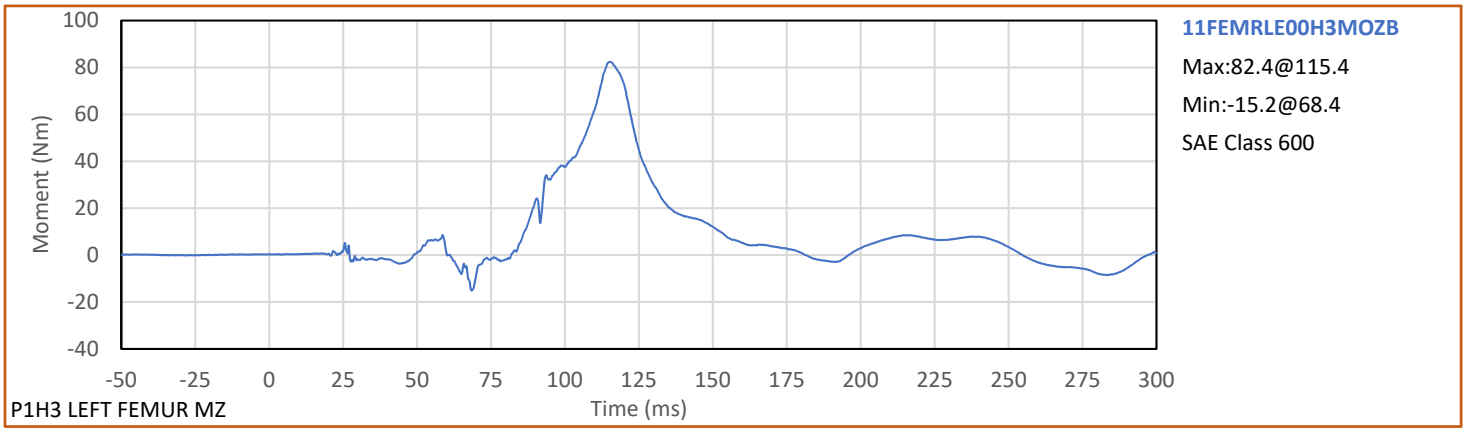

Force (N)
Time (ms)
P1H3 LEFT FEMUR FX
11FEMRLE00H3FOXB
Max:1580.2@96.1
Min:-72.4@137.0
SAE Class 600

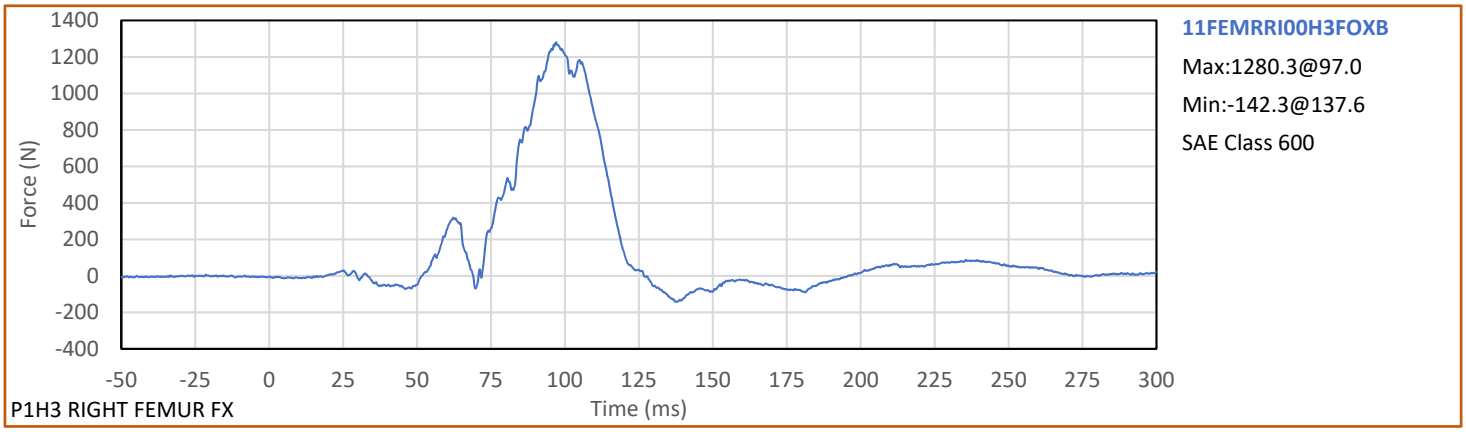

Force (N)
Time (ms)
P1H3 LEFT FEMUR FY
11FEMRLE00H3FOYB
Max:948.0@91.2
Min:-248.4@65.9
SAE Class 600


Force (N)
Time (ms)
P1H3 LEFT FEMUR FZ
11FEMRLE00H3FOZB
Max:478.0@25.6
Min:-5008.9@87.1
SAE Class 600


Moment (Nm)
Time (ms)
P1H3 LEFT FEMUR MX
11FEMRLE00H3MOXB
Max:128.1@95.0
Min:-92.4@68.2
SAE Class 600


Moment (Nm)
Time (ms)
P1H3 LEFT FEMUR MY
11FEMRLE00H3MOYB
Max:110.7@91.6
Min:-25.5@66.5
SAE Class 600


Moment (Nm)
Time (ms)
P1H3 LEFT FEMUR MZ
11FEMRLE00H3MOZB
Max:82.4@115.4
Min:-15.2@68.4
SAE Class 600


Force (N)
Time (ms)
P1H3 RIGHT FEMUR FX
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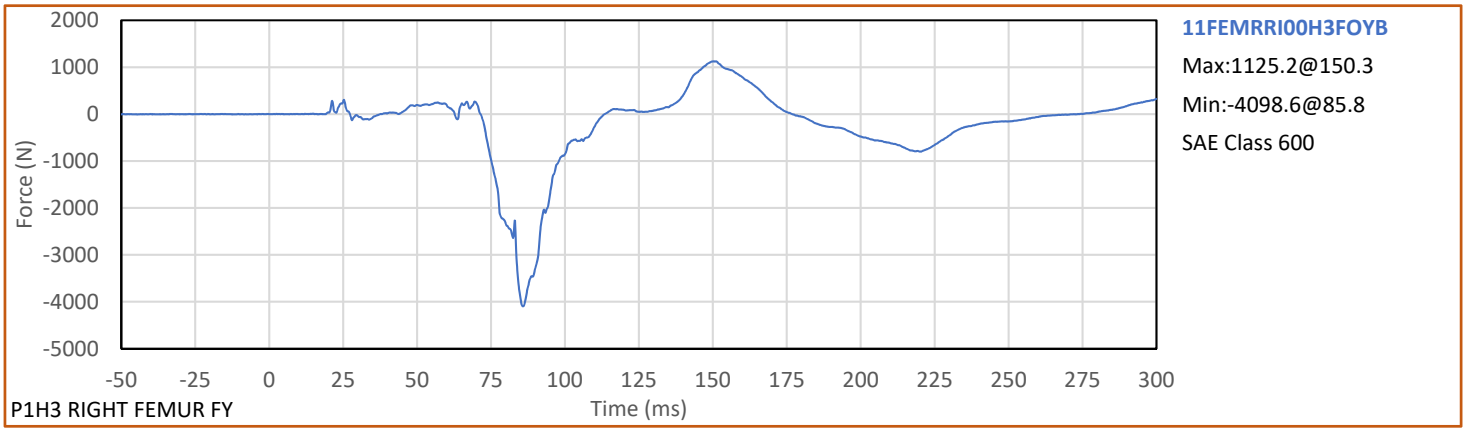
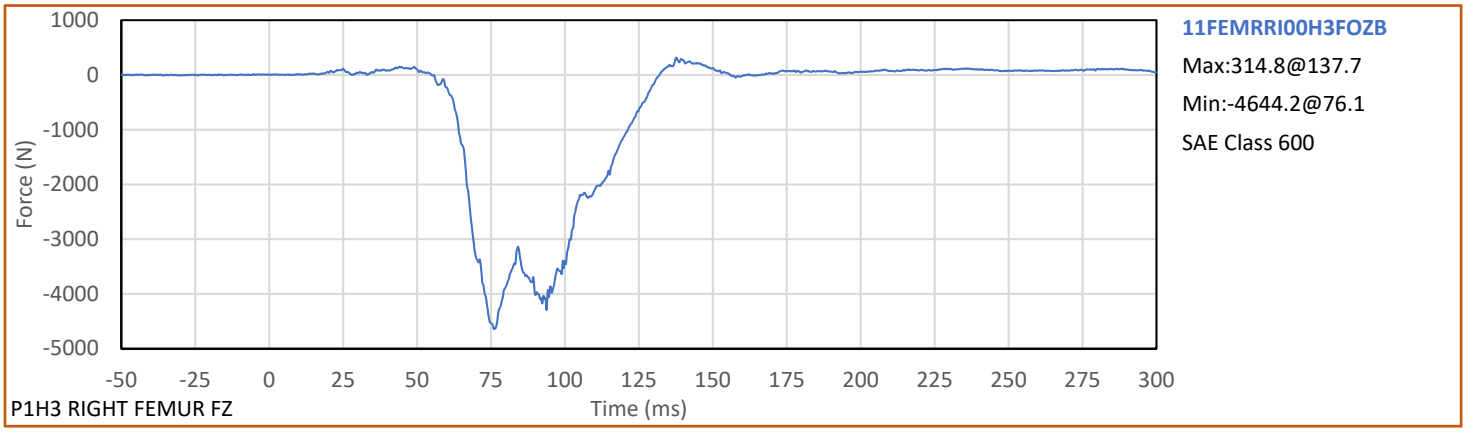
Max:1280.3@97.0
Min:-142.3@137.6
SAE Class 600


Force (N)
Time (ms)
P1H3 RIGHT FEMUR FY
11FEMRRI00H3FOYB
Max:1125.2@150.3
Min:-4098.6@85.8
SAE Class 600


Force (N)
Time (ms)
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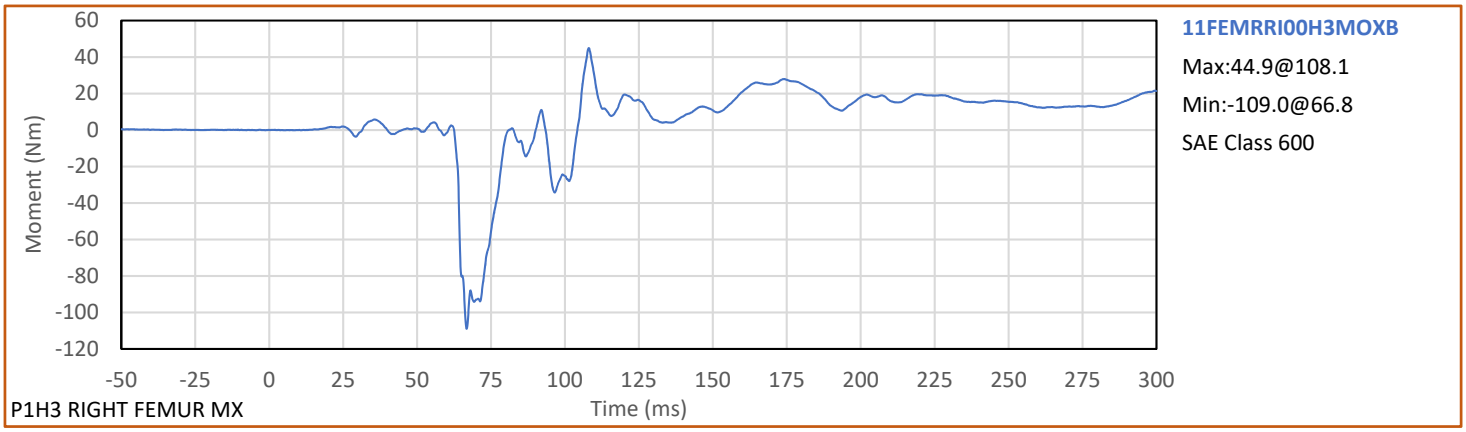
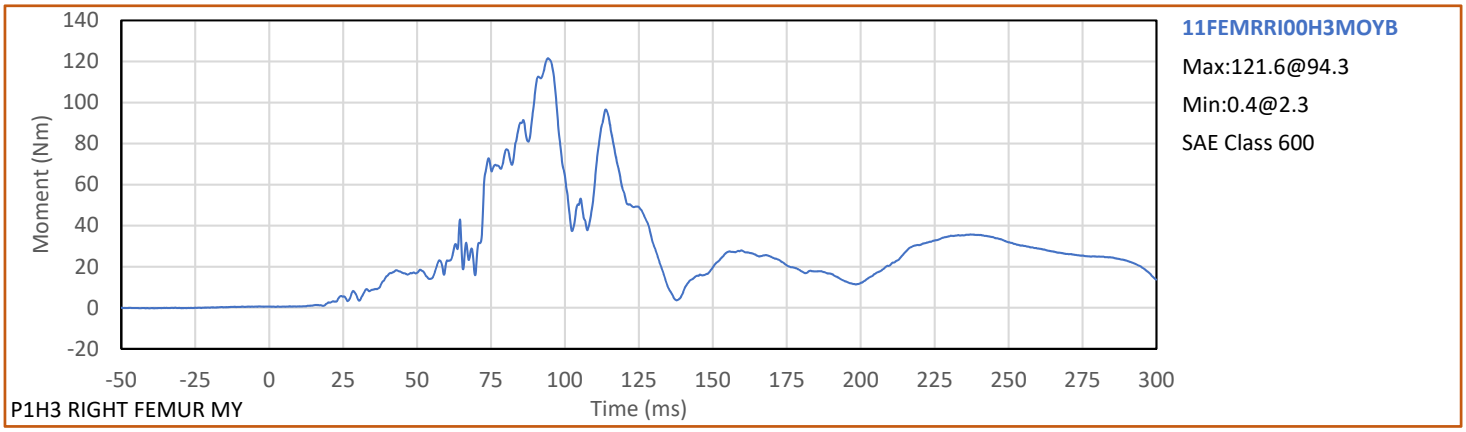
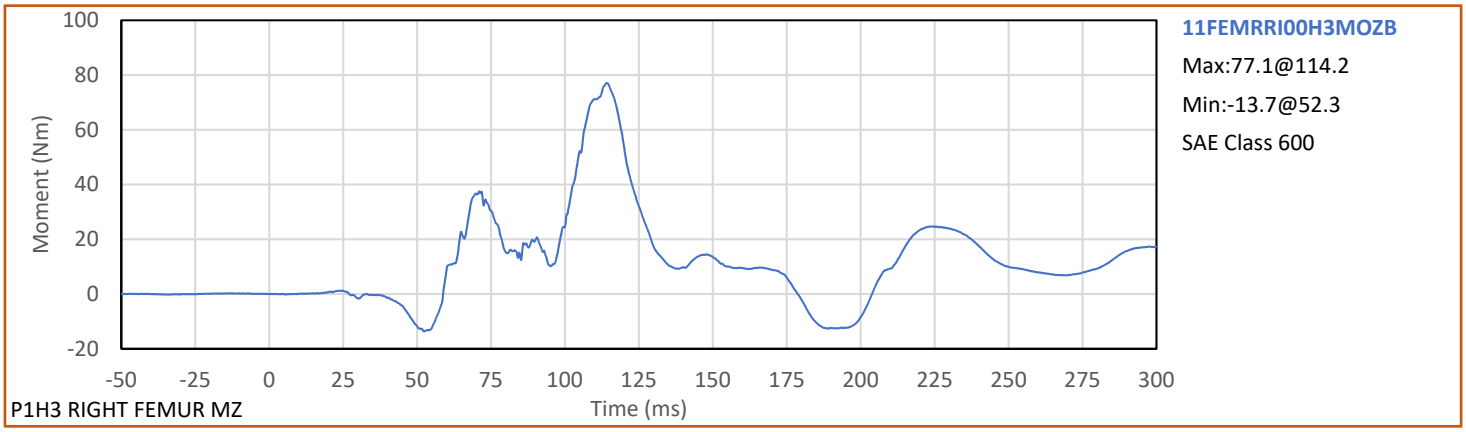
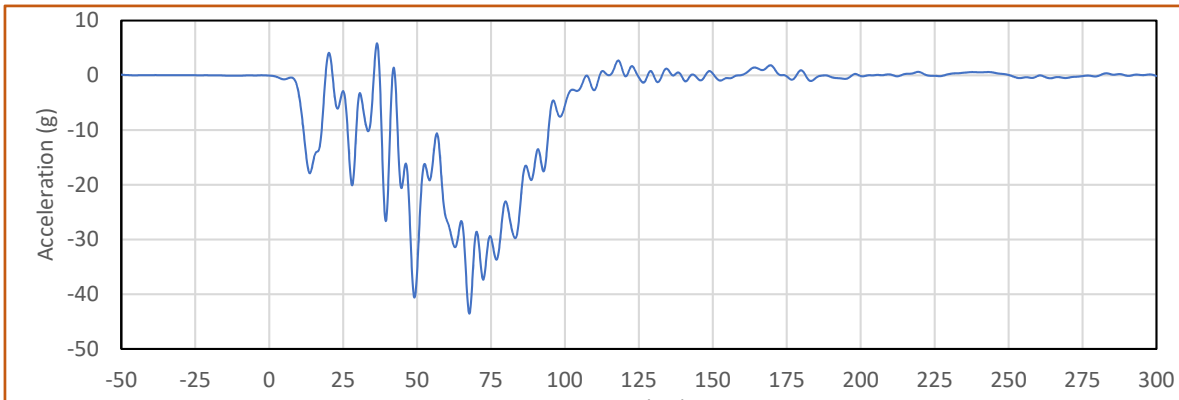
Max:314.8@137.7
Min:-4644.2@76.1
SAE Class 600

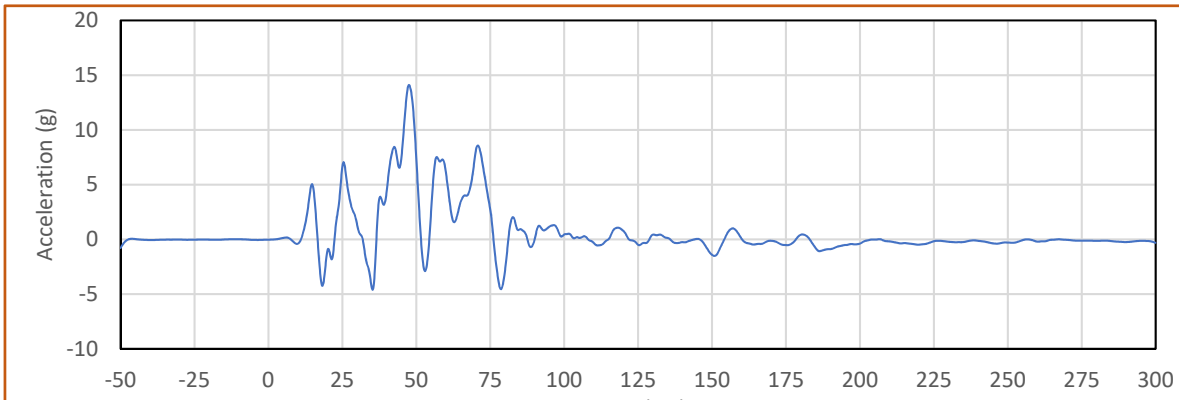

Moment (Nm)
Time (ms)
P1H3 RIGHT FEMUR MX
11FEMRRI00H3MOXB
Max:44.9@108.1
Min:-109.0@66.8
SAE Class 600


Moment (Nm)
Time (ms)
P1H3 RIGHT FEMUR MY
11FEMRRI00H3MOYB
Max:121.6@94.3
Min:0.4@2.3
SAE Class 600

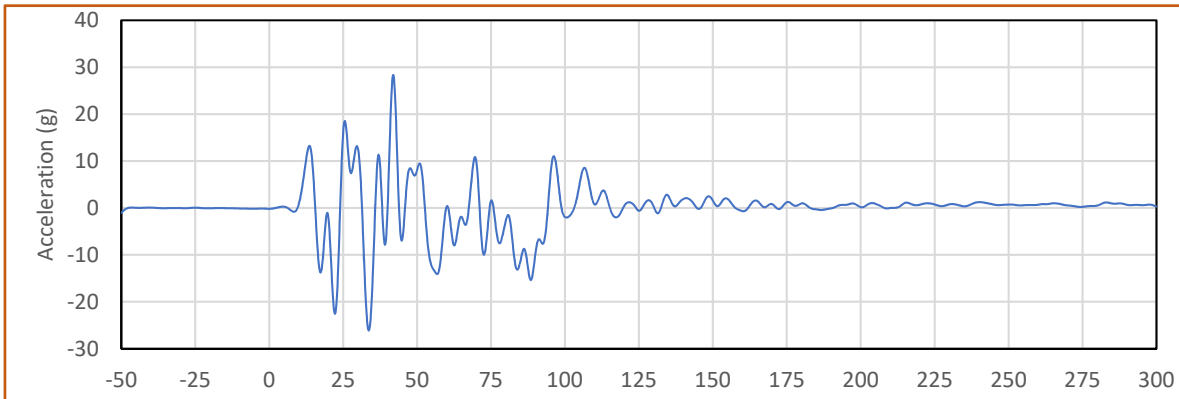

Moment (Nm)
Time (ms)
P1H3 RIGHT FEMUR MZ
11FEMRRI00H3MOZB
Max:77.1@114.2
Min:-13.7@52.3
SAE Class 600



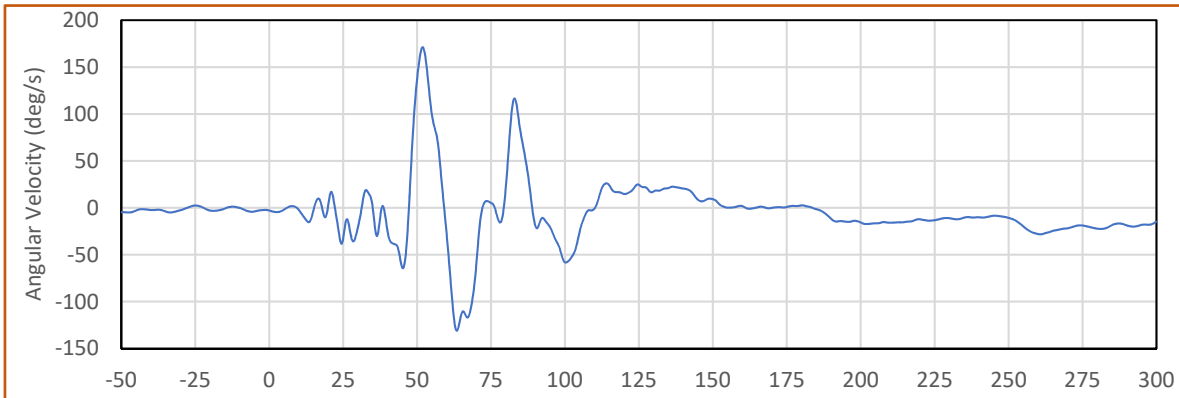
15TUNNCGLO00ACXD
Max:5.8@36.4
Min:-43.6@67.7
SAE Class 60



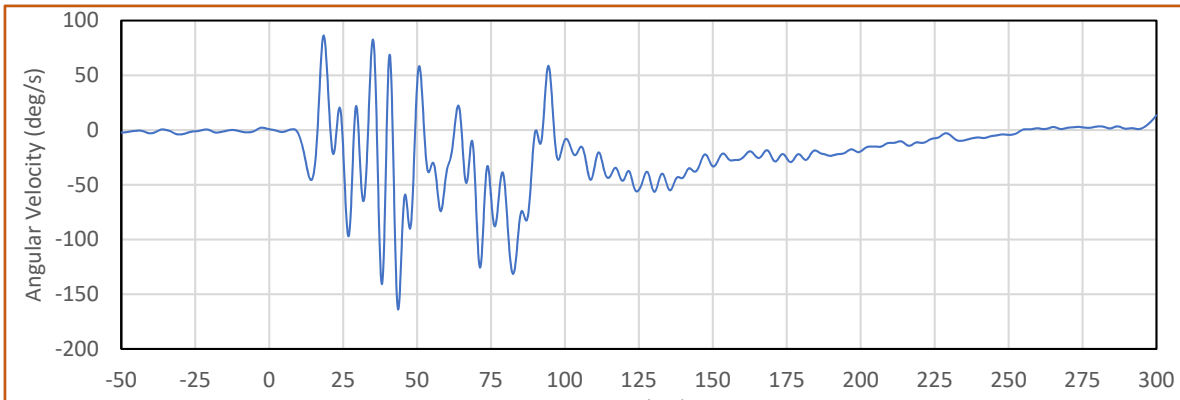
15TUNNCGLO00ACYD
Max:14.1@47.5
Min:-4.6@35.2
SAE Class 60



15TUNNCGLO00ACZD
Max:28.4@41.9
Min:-26.1@33.7
SAE Class 60



15TUNNCGLO00AVXD
Max:171.2@51.9
Min:-131.1@63.4
SAE Class 60

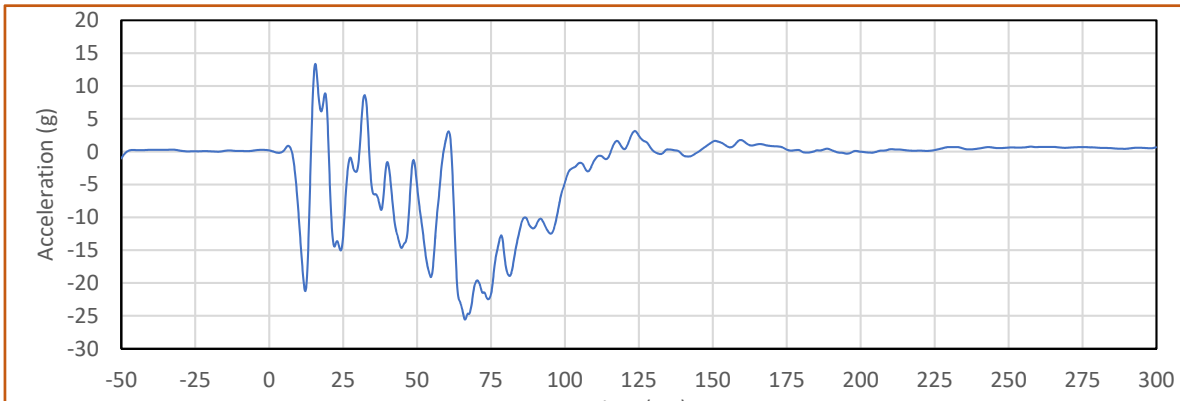


15TUNNCGLO00AVYD
Max:86.4@18.4
Min:-164.1@43.6
SAE Class 60

VEHICLE CG ROTATION ABOUT Y

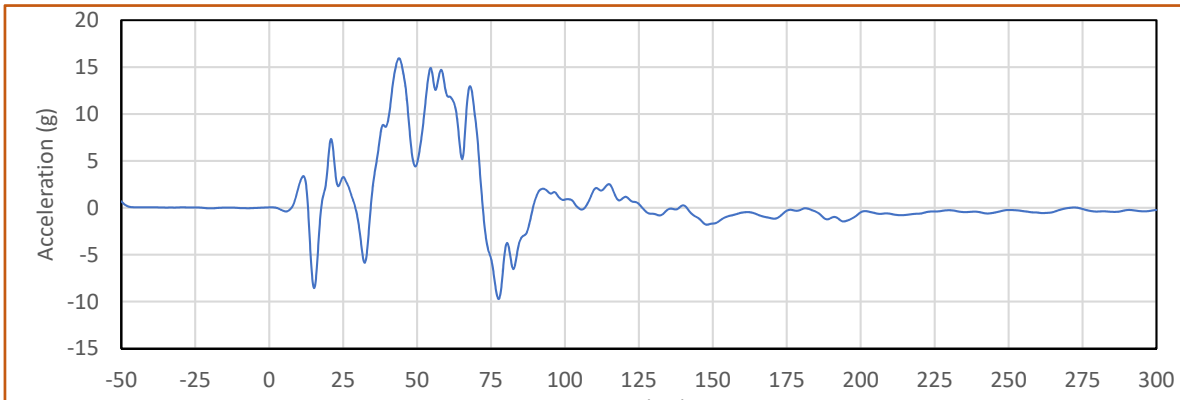
15TUNNCGLO00AVZD
Max:40.0@56.9
Min:-53.1@297.6
SAE Class 60

VEHICLE CG ROTATION ABOUT Z



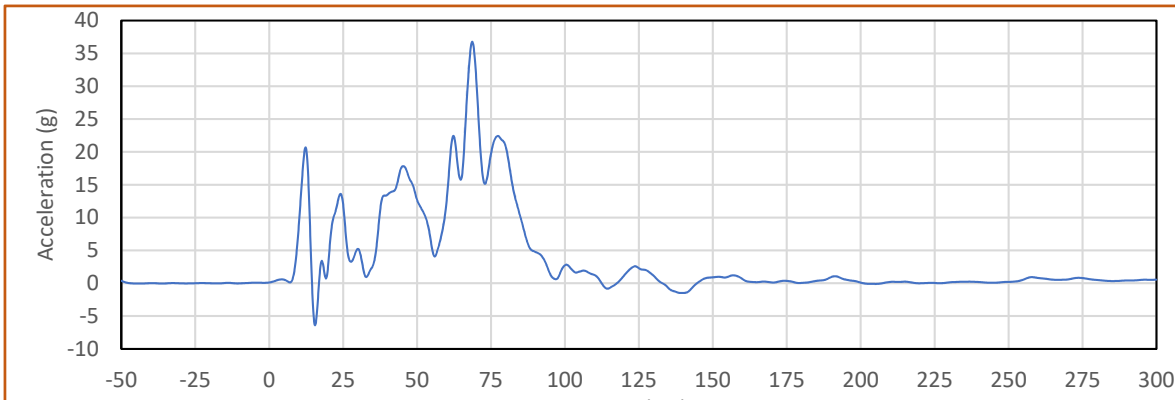
11FOWE000000ACXD
Max:13.4@15.6
Min:-25.6@66.2
SAE Class 60

DRIVER FLOOR PAN X



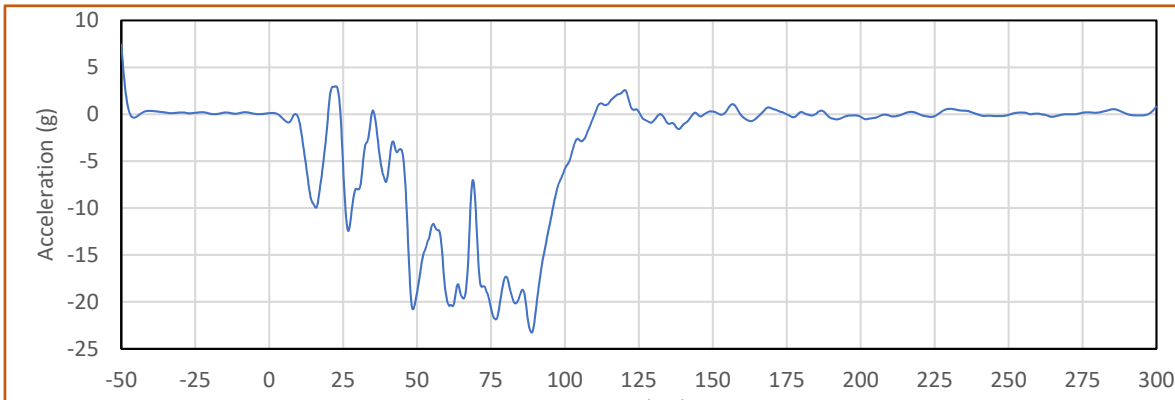
11FOWE000000ACYD
Max:15.9@43.9
Min:-9.7@77.6
SAE Class 60

DRIVER FLOOR PAN Y



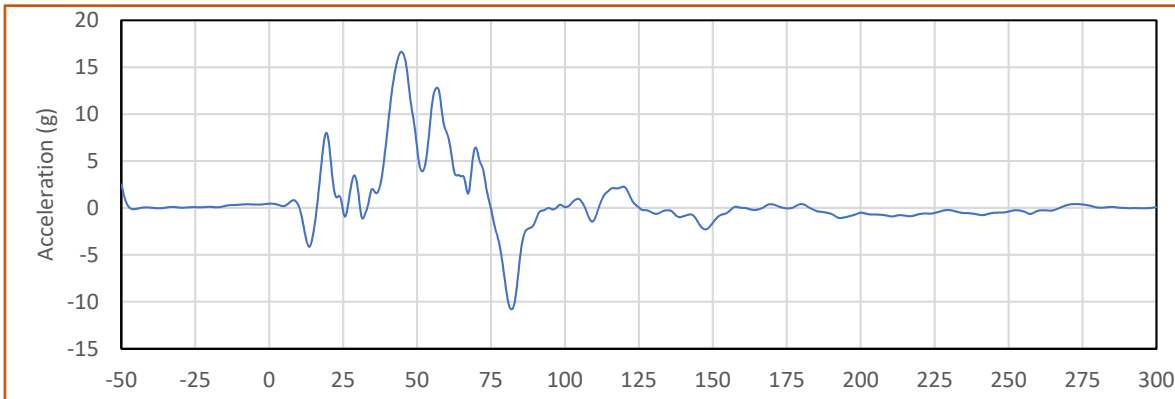
DRIVER FLOOR PAN Z

11FOWE000000ACZD
Max:36.8@68.6
Min:-6.4@15.5
SAE Class 60



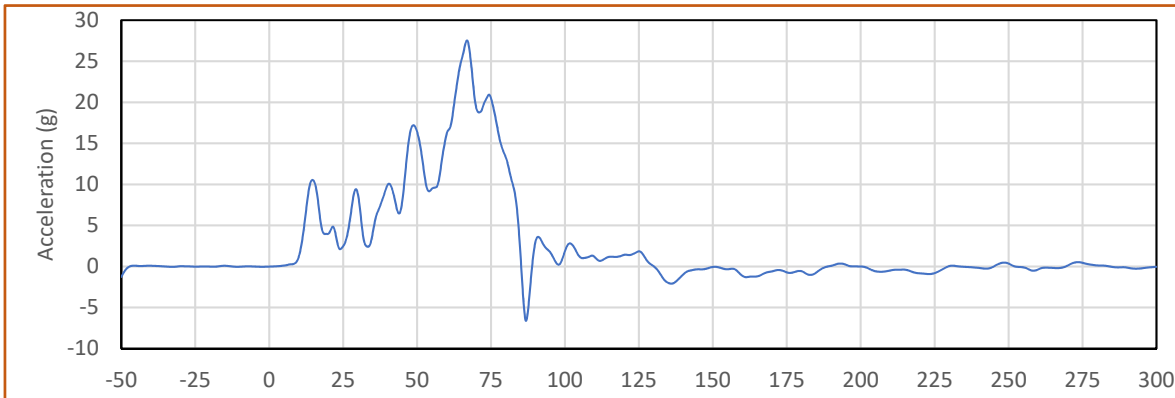
PASSENGER FLOOR PAN X

13FOWE000000ACXD
Max:3.0@22.6
Min:-23.3@88.7
SAE Class 60



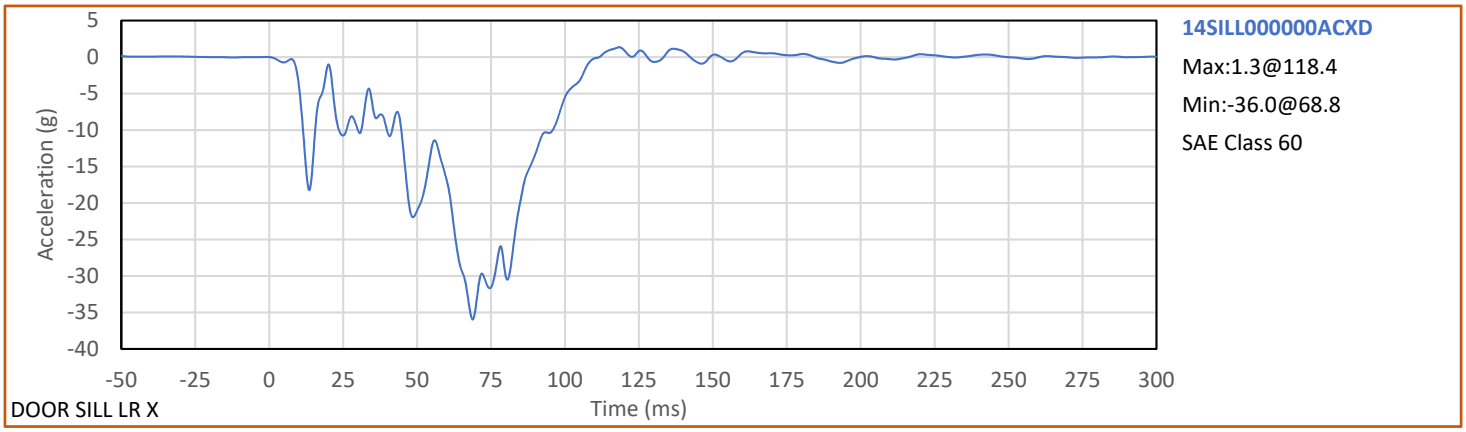
PASSENGER FLOOR PAN Y

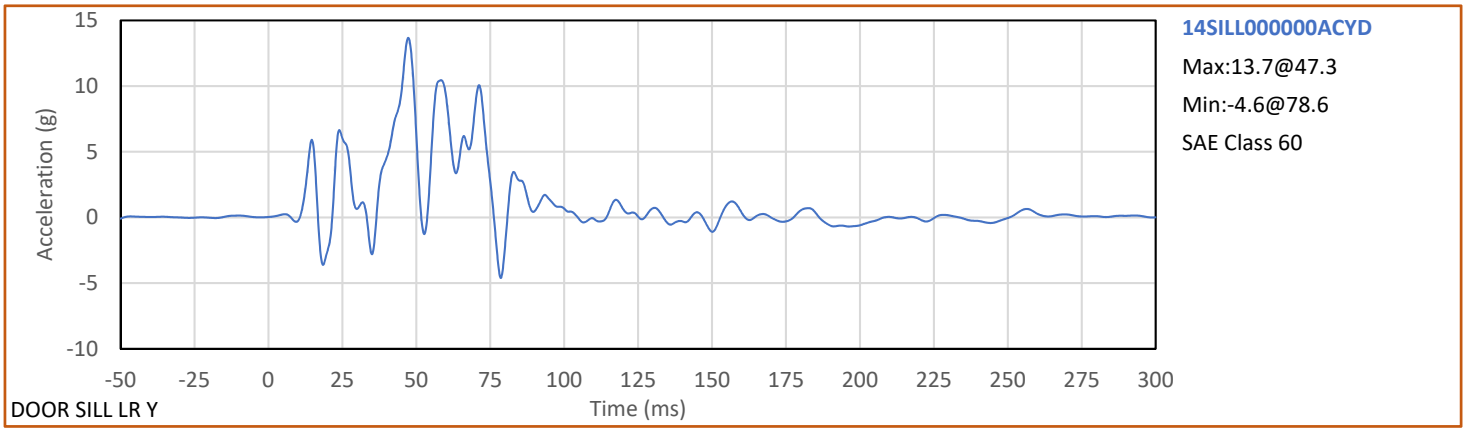
13FOWE000000ACYD
Max:16.6@44.7
Min:-10.8@81.9
SAE Class 60

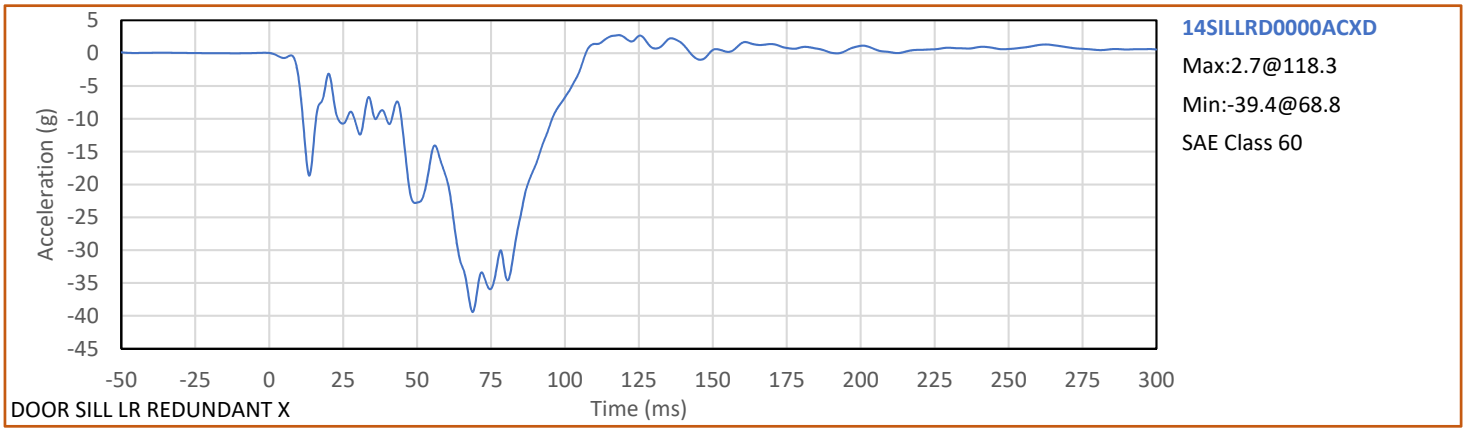


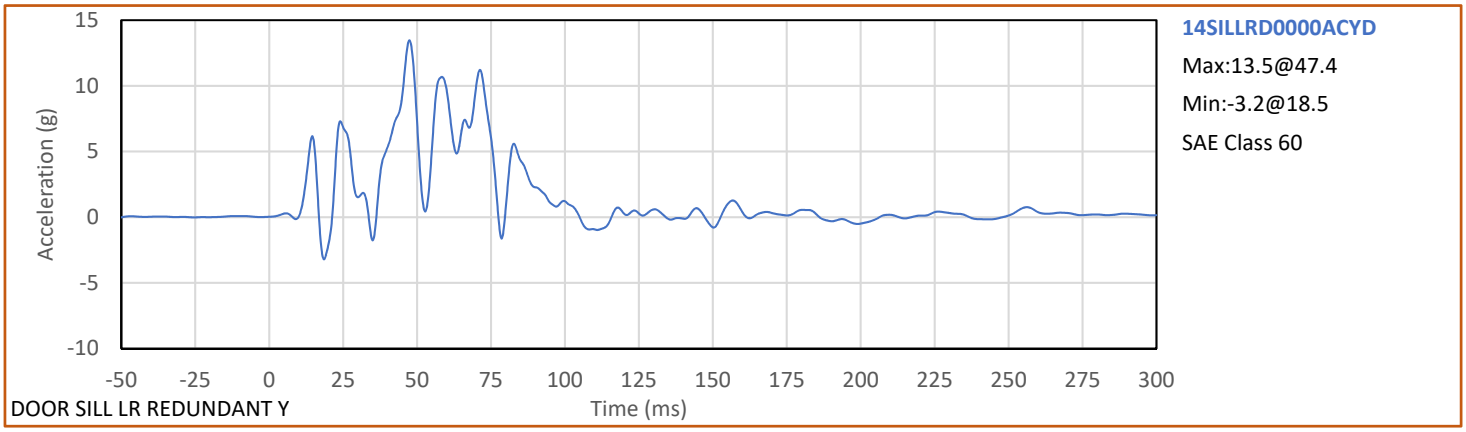
PASSENGER FLOOR PAN Z

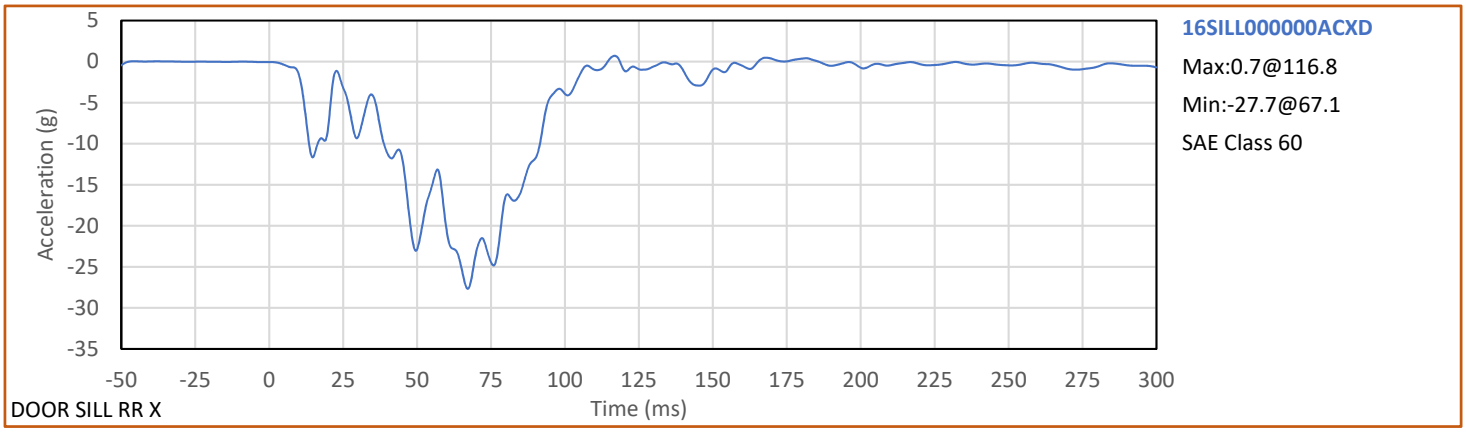
13FOWE000000ACZD
Max:27.5@66.9
Min:-6.6@86.8
SAE Class 60

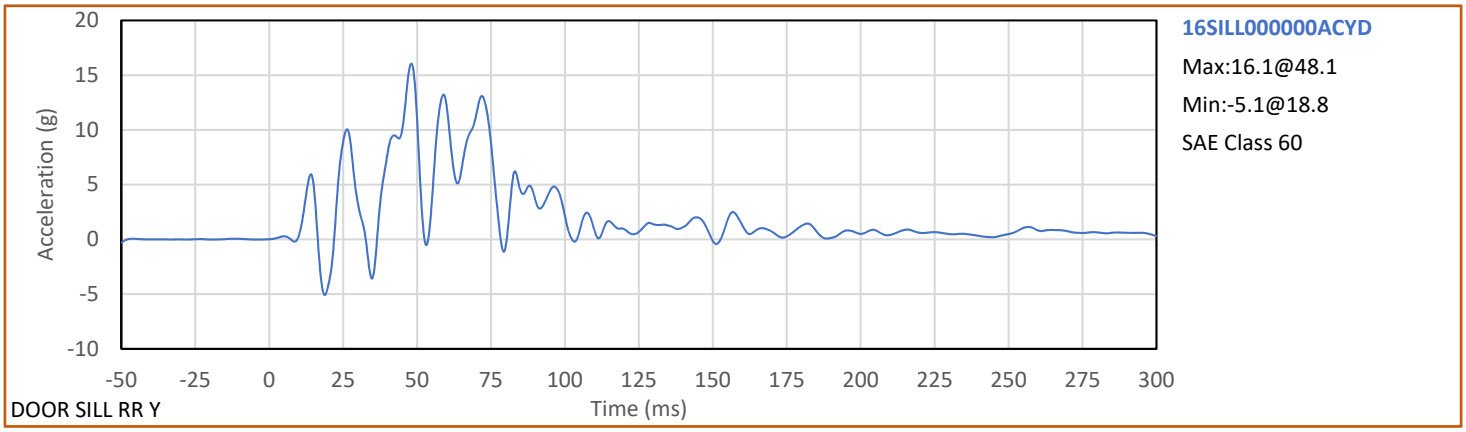

Acceleration (g)
Time (ms)
DOOR SILL LR X
14SILL000000ACXD
Max:1.3@118.4
Min:-36.0@68.8
SAE Class 60

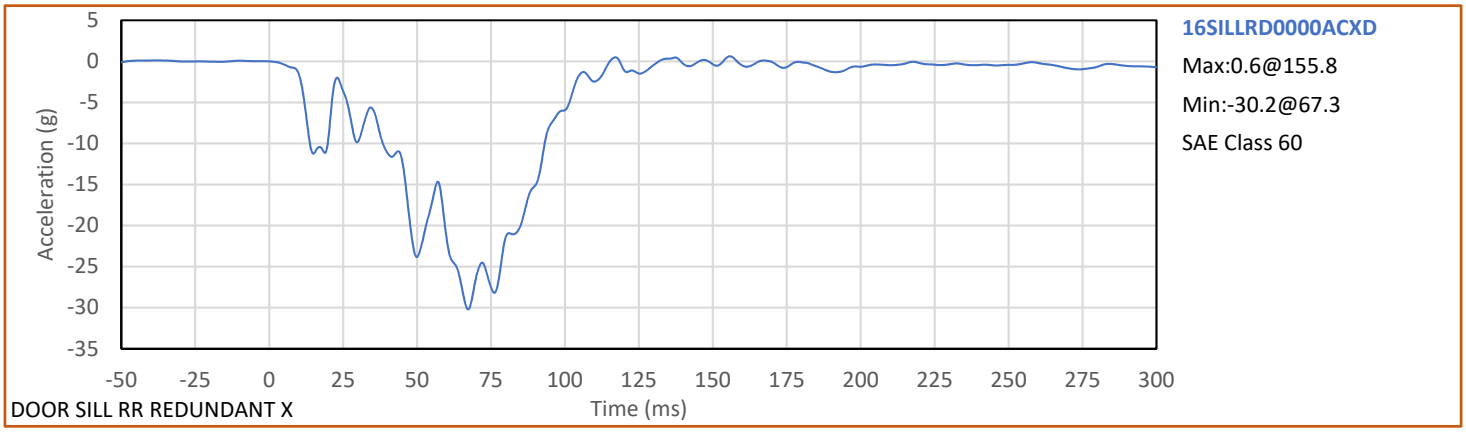

Acceleration (g)
Time (ms)
DOOR SILL LR Y
14SILL000000ACYD
Max:13.7@47.3
Min:-4.6@78.6
SAE Class 60

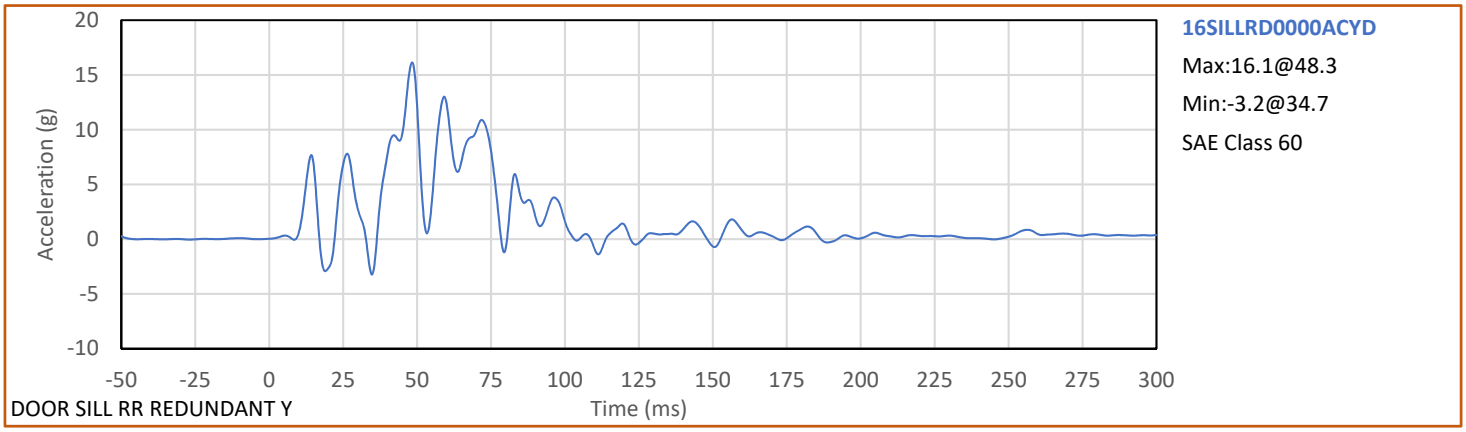

Acceleration (g)
Time (ms)
DOOR SILL LR REDUNDANT X
14SILLRD0000ACXD
Max:2.7@118.3
Min:-39.4@68.8
SAE Class 60

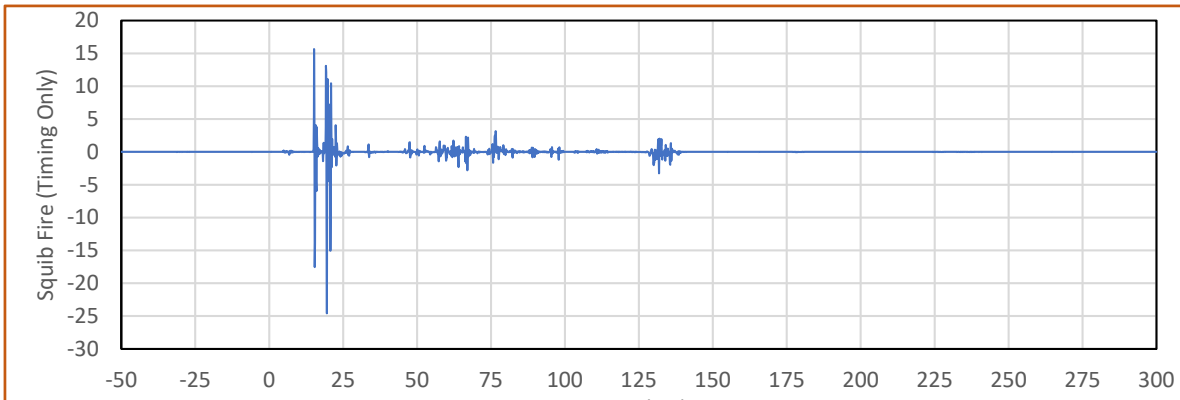

Acceleration (g)
Time (ms)
DOOR SILL LR REDUNDANT Y
14SILLRD0000ACYD
Max:13.5@47.4
Min:-3.2@18.5
SAE Class 60


Acceleration (g)
Time (ms)
DOOR SILL RR X
16SILL000000ACXD
Max:0.7@116.8
Min:-27.7@67.1
SAE Class 60


Acceleration (g)
Time (ms)
DOOR SILL RR Y
16SILL000000ACYD
Max:16.1@48.1
Min:-5.1@18.8
SAE Class 60

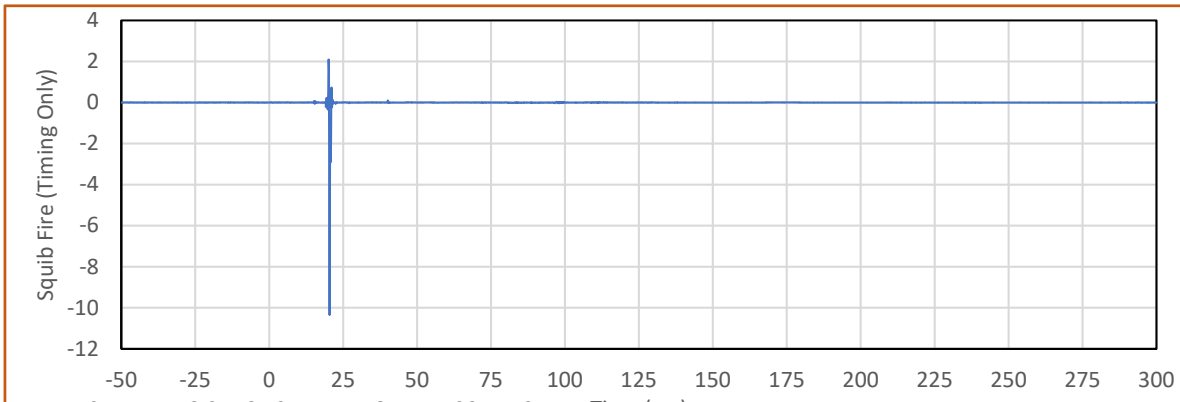

Acceleration (g)
Time (ms)
DOOR SILL RR REDUNDANT X
16SILLRD0000ACXD
Max:0.6@155.8
Min:-30.2@67.3
SAE Class 60


Acceleration (g)
Time (ms)
DOOR SILL RR REDUNDANT Y
16SILLRD0000ACYD
Max:16.1@48.3
Min:-3.2@34.7
SAE Class 60



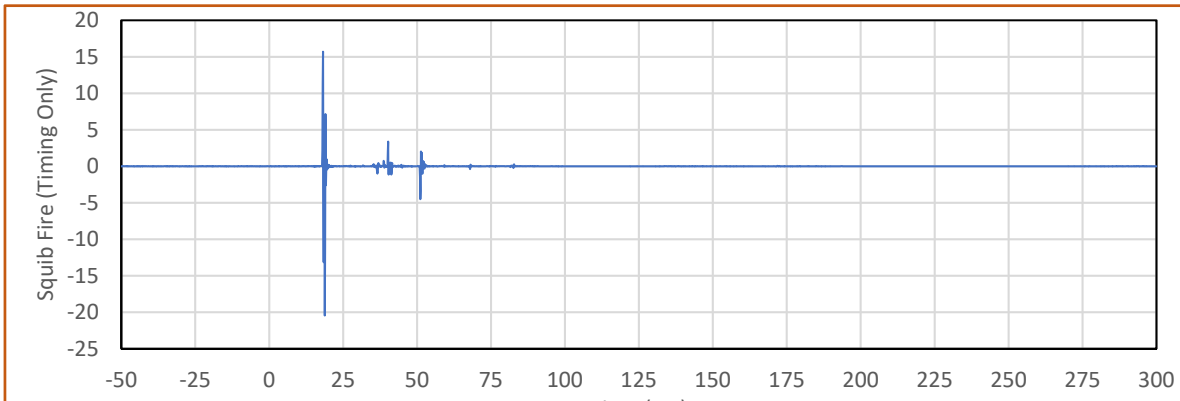
11STWL0100AFCU0P
Max:15.6@15.2
Min:-24.6@19.5
No Filter Applied

DRIVER SW AIRBAG STAGE 1 - TIME TO FIRE - 15.1 MS.



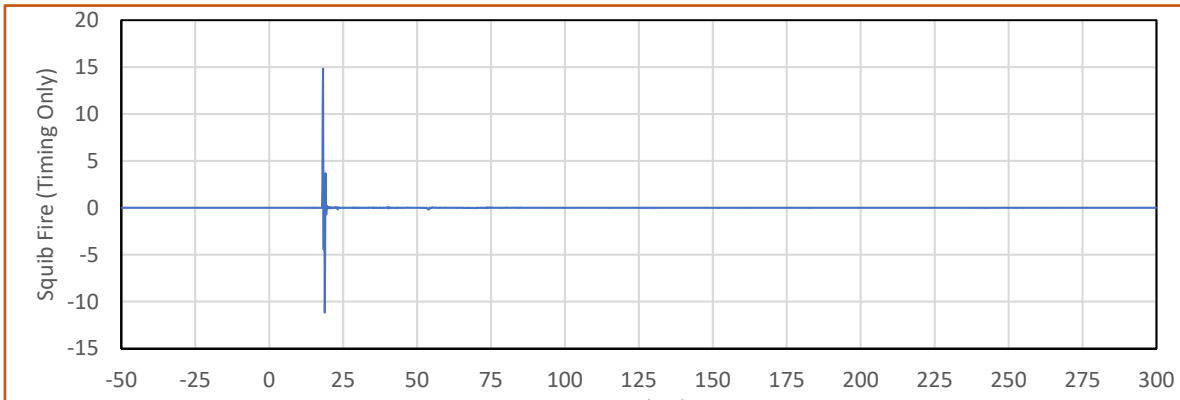
11STWL0200AFCU0P
Max:2.1@20.1
Min:-10.4@20.4
No Filter Applied

DRIVER SW AIRBAG STAGE 2 - TIME TO FIRE - 20.1 MS.



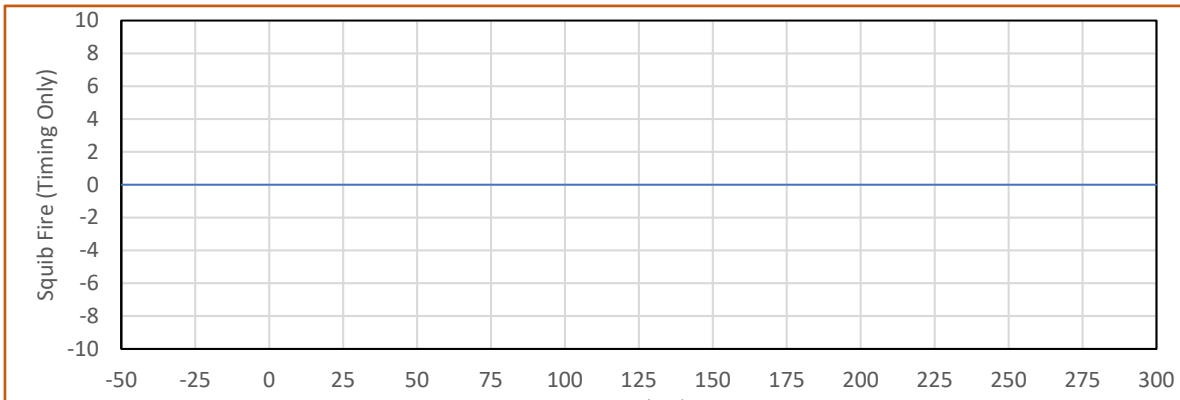
11ROFR0000AHCU0P
Max:15.7@18.2
Min:-20.5@18.8
No Filter Applied

DRIVER CURTAIN AIRBAG - TIME TO FIRE - 18.0 MS.



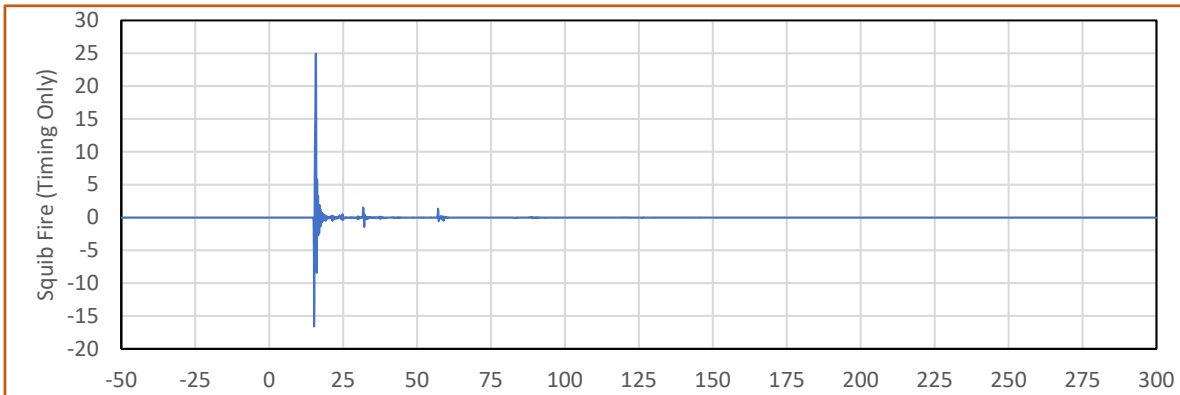
11SEBA0000ASCU0P
Max:14.8@18.2
Min:-11.2@18.8
No Filter Applied

DRIVER SEAT AIRBAG - TIME TO FIRE - 18.0 MS.



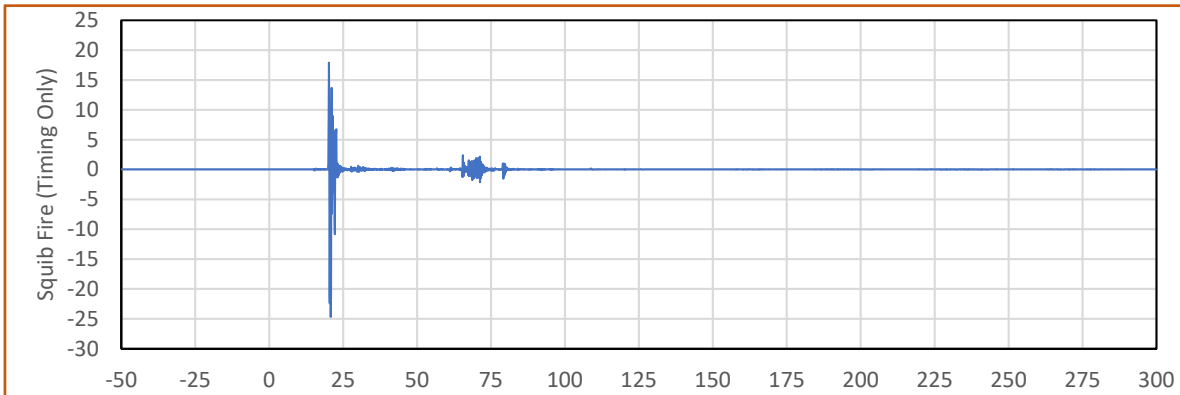
11AIRB0100ASCU0P
Max:0.00@0.1
Min:0.00@0.1
No Filter Applied

DRIVER KNEE AIRBAG - TIME TO FIRE - NO FIRE



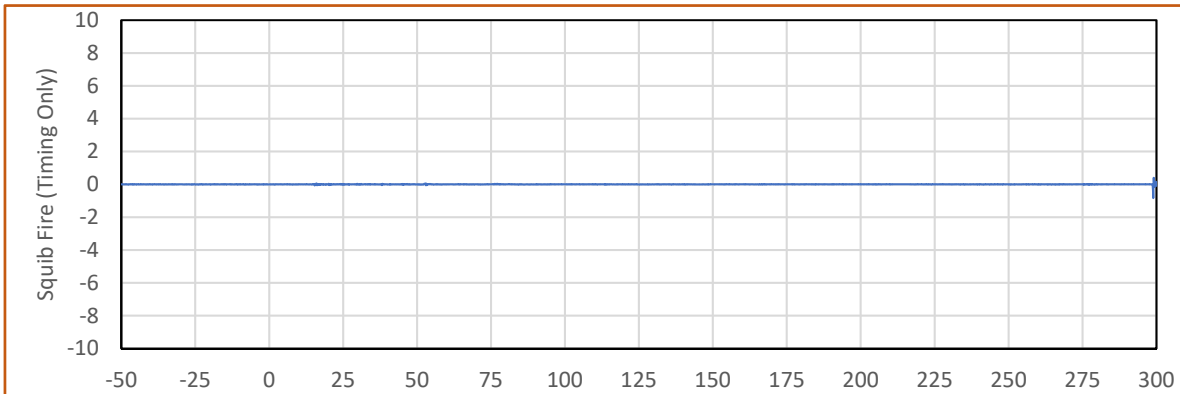
13DASH0100AFCU0P
Max:24.9@15.7
Min:-16.6@15.2
No Filter Applied

PASSENGER AIRBAG STAGE 1 - TIME TO FIRE - 15.1 MS.



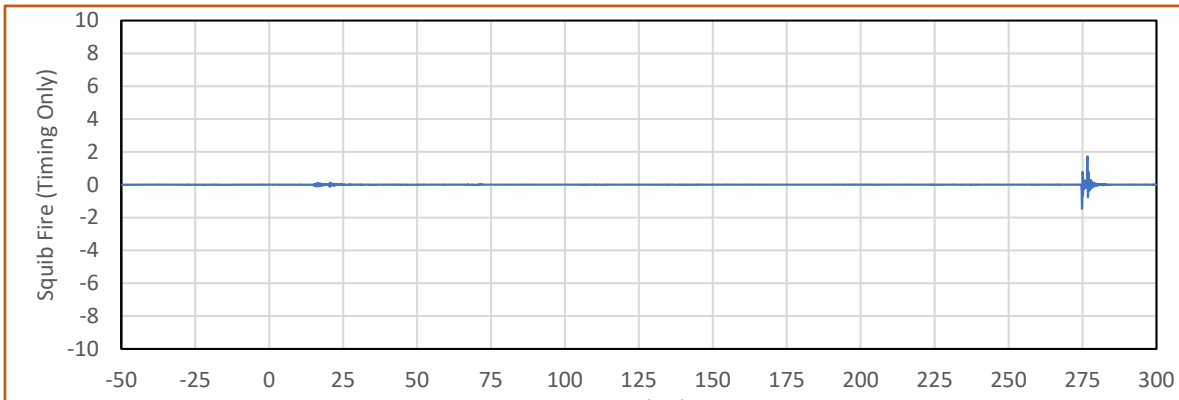
13DASH0200AFCU0P
Max:17.9@20.2
Min:-24.7@20.8
No Filter Applied

PASSENGER AIRBAG STAGE 2 - TIME TO FIRE - 20.1 MS.



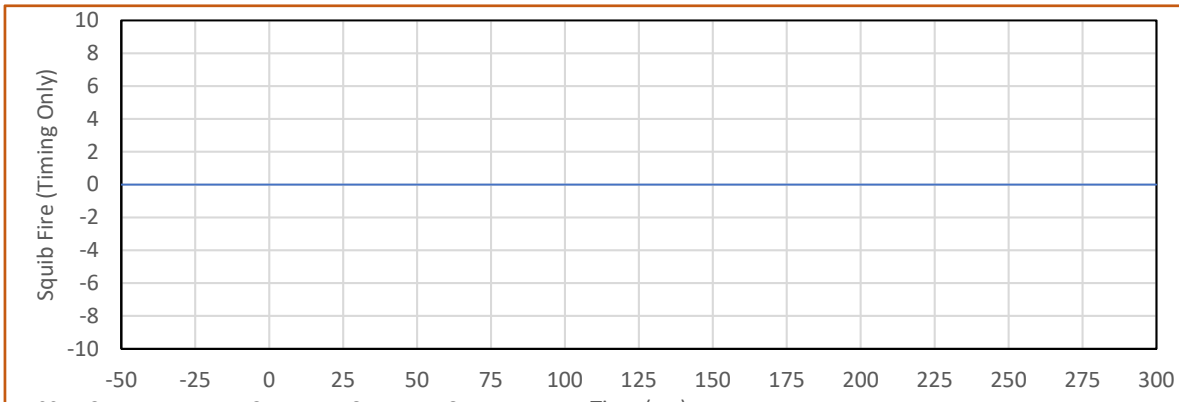
13ROFR0000AHCU0P
Max:0.40@299.1
Min:-0.83@298.9
No Filter Applied

PASSENGER CURTAIN AIRBAG - TIME TO FIRE - NO FIRE



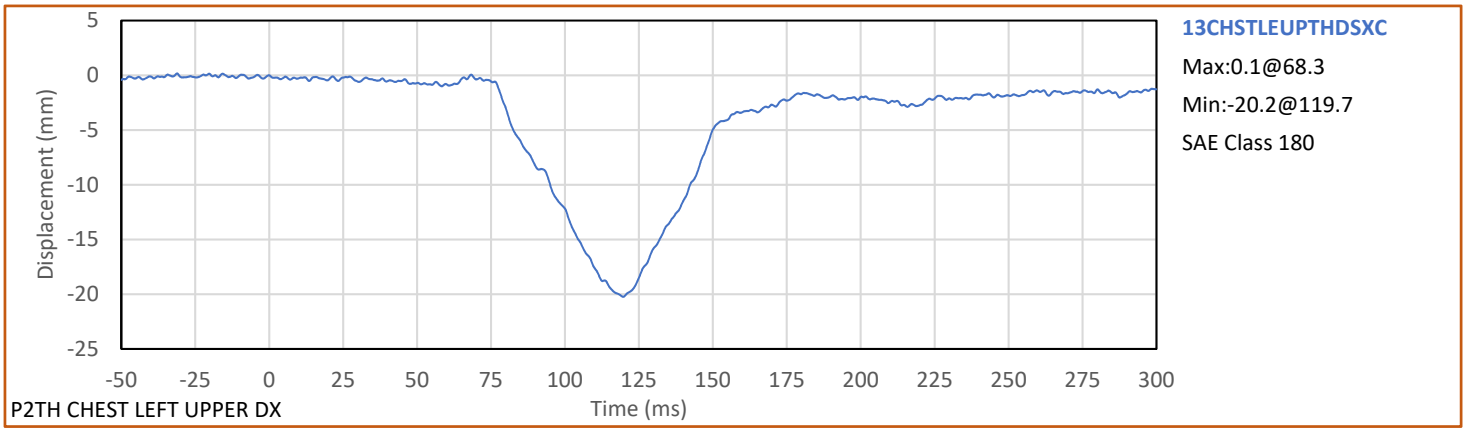
PASSENGER SEAT AIRBAG - TIME TO FIRE - NO FIRE

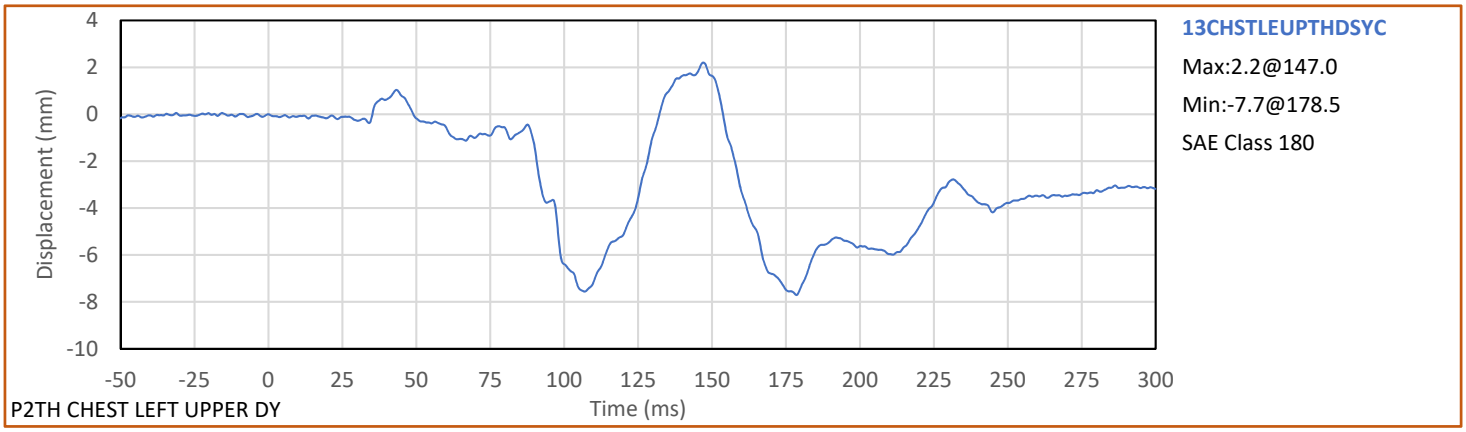
13SEBA0000ASCU0P
Max:1.7@276.7
Min:-1.5@274.8
No Filter Applied

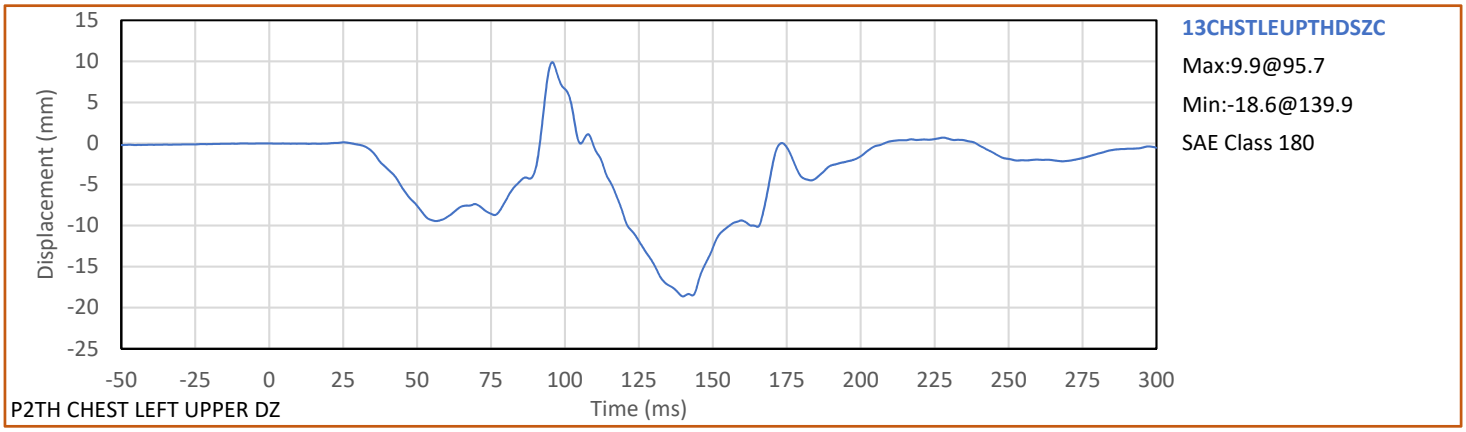


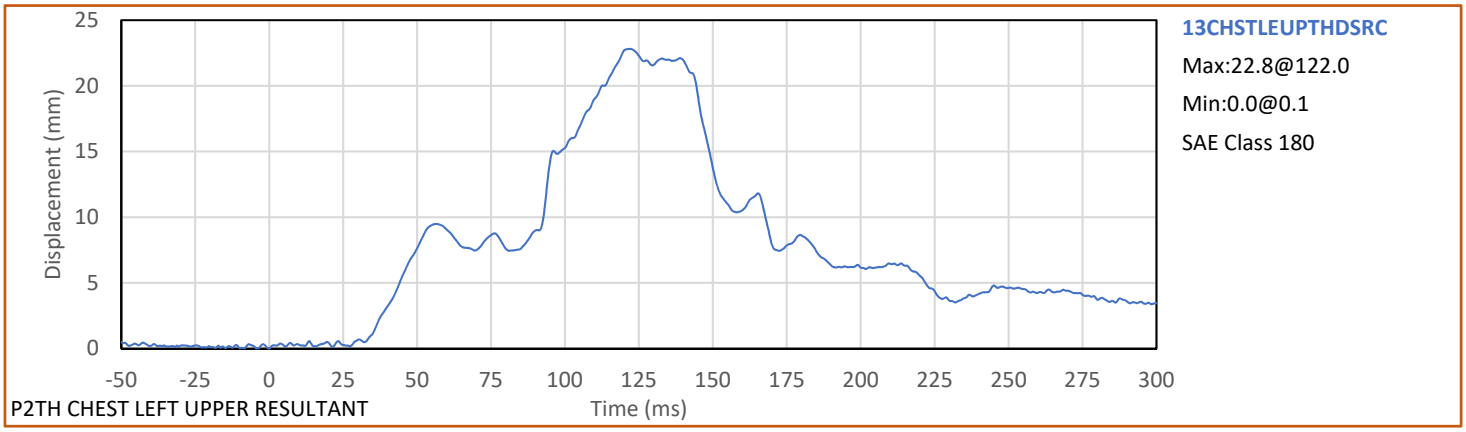
PASSENGER KNEE AIRBAG - TIME TO FIRE - NO FIRE

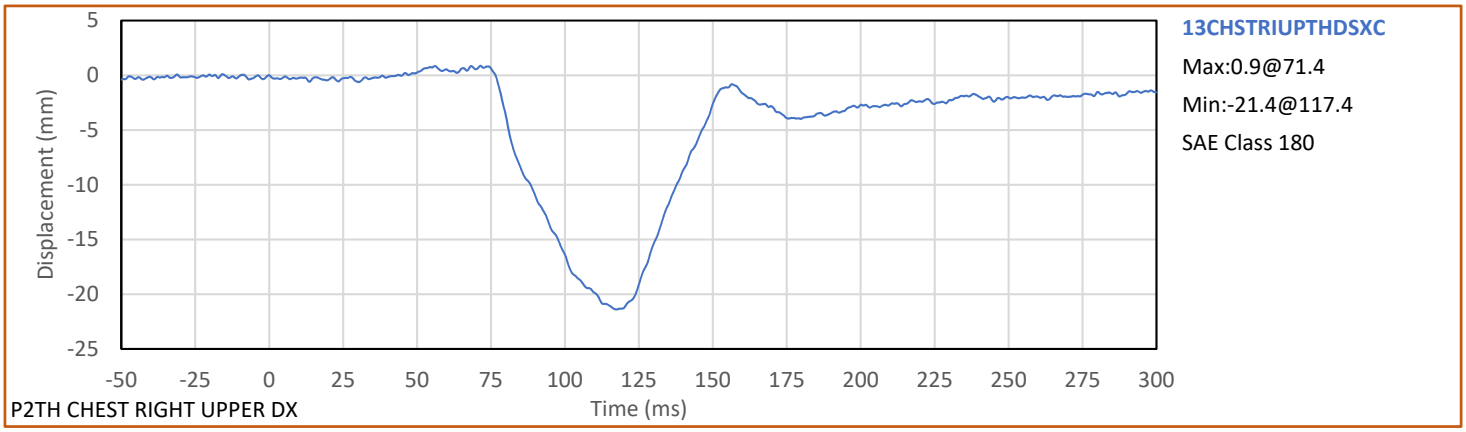
13AIRB0100ASCU0P
Max:0.00@0.1
Min:0.00@0.1
No Filter Applied

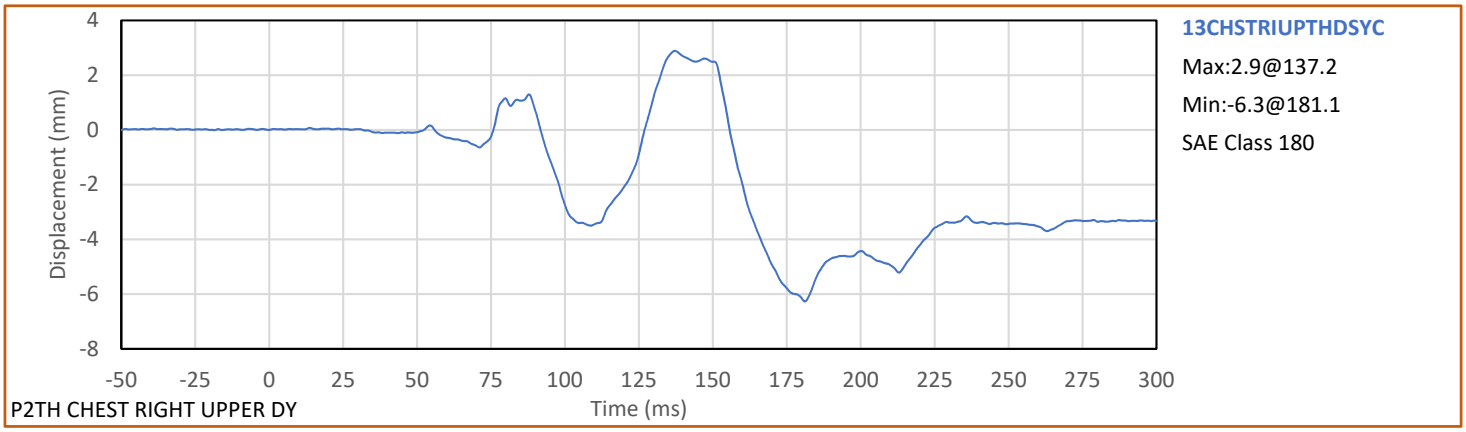

Displacement (mm)
Time (ms)
P2TH CHEST LEFT UPPER DX
13CHSTLEUPTHDSXC
Max:0.1@68.3
Min:-20.2@119.7
SAE Class 180

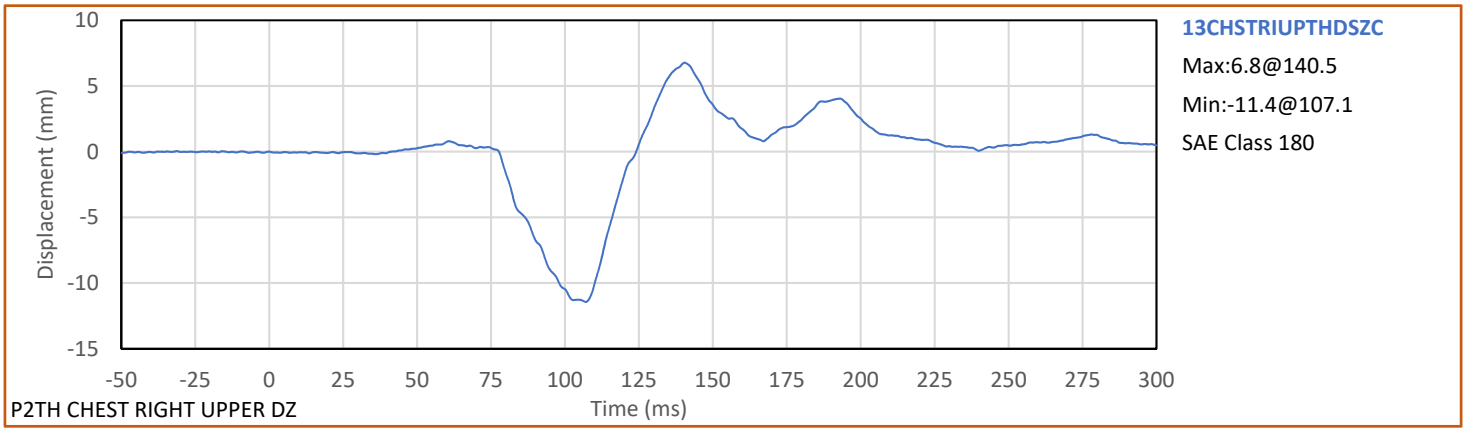

Displacement (mm)
Time (ms)
P2TH CHEST LEFT UPPER DY
13CHSTLEUPTHDSYC
Max:2.2@147.0
Min:-7.7@178.5
SAE Class 180

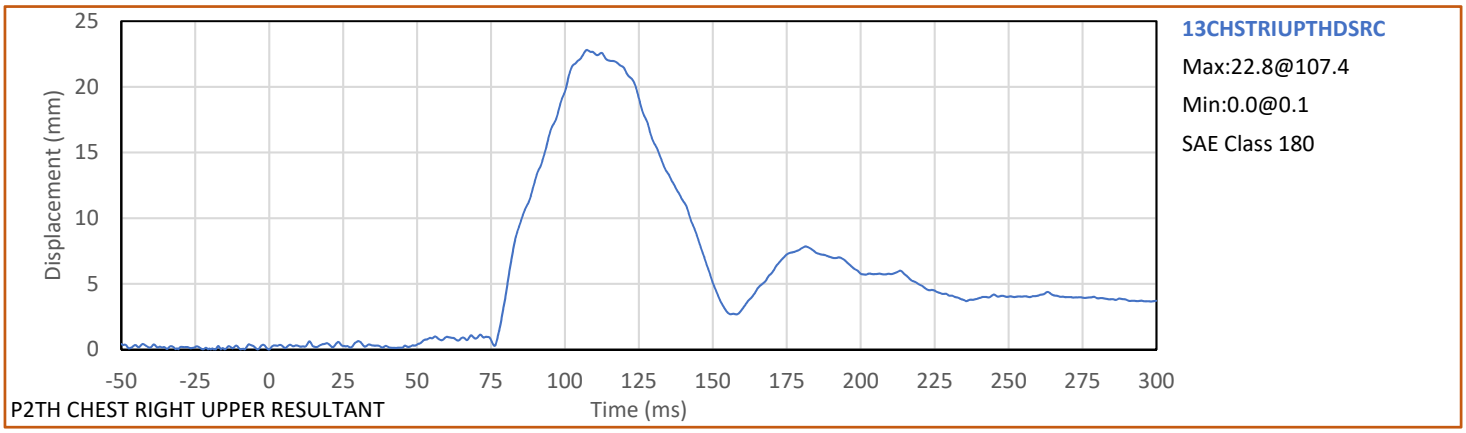

Displacement (mm)
Time (ms)
P2TH CHEST LEFT UPPER DZ
13CHSTLEUPTHDSZC
Max:9.9@95.7
Min:-18.6@139.9
SAE Class 180

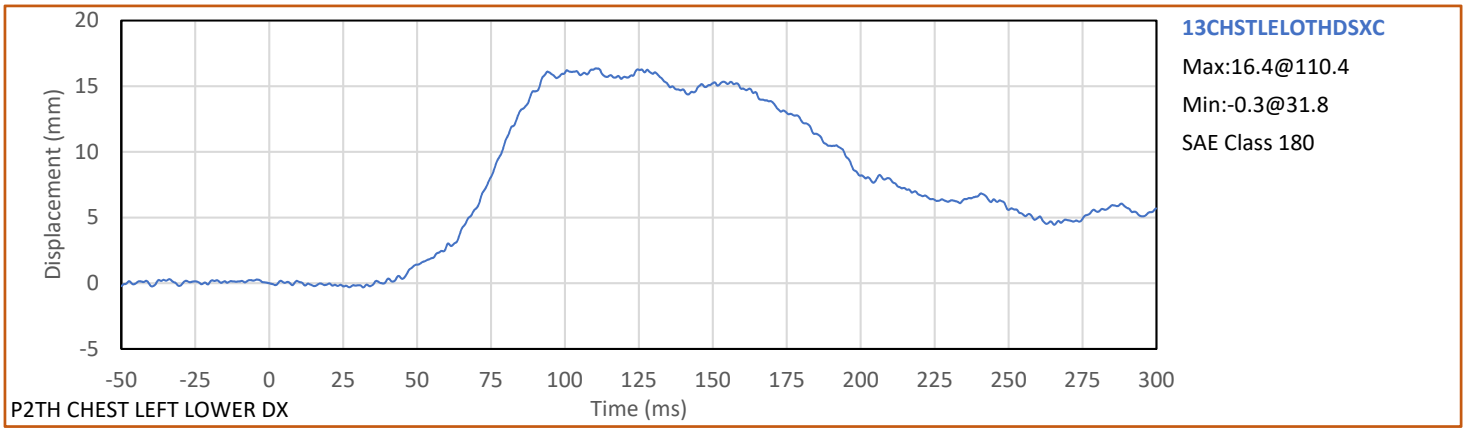

Displacement (mm)
Time (ms)
P2TH CHEST LEFT UPPER RESULTANT
13CHSTLEUPTHDSRC
Max:22.8@122.0
Min:0.0@0.1
SAE Class 180

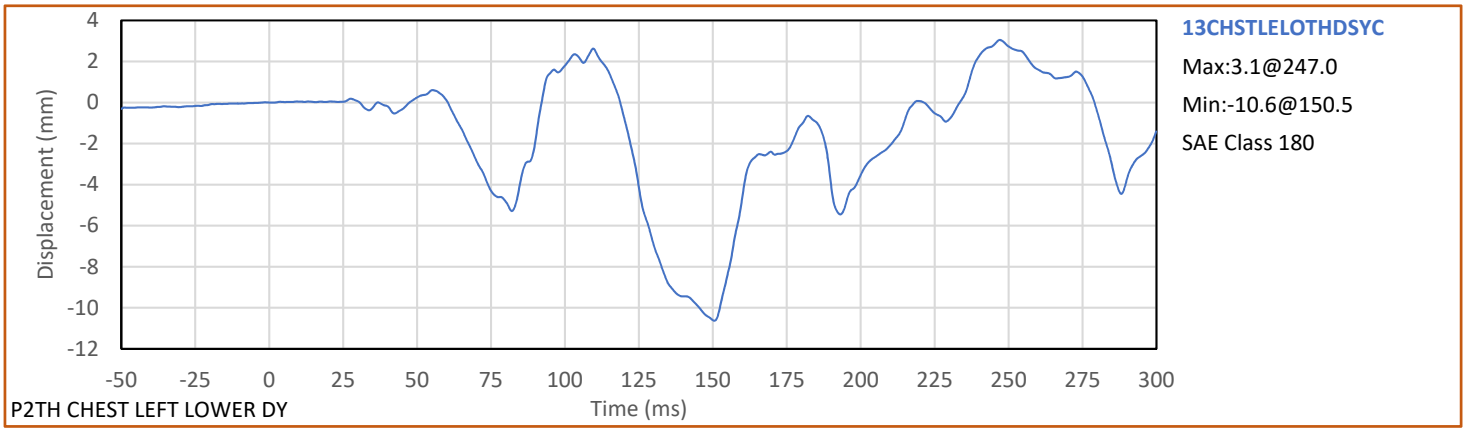

Displacement (mm)
Time (ms)
P2TH CHEST RIGHT UPPER DX
13CHSTRIUPTHDSXC
Max:0.9@71.4
Min:-21.4@117.4
SAE Class 180

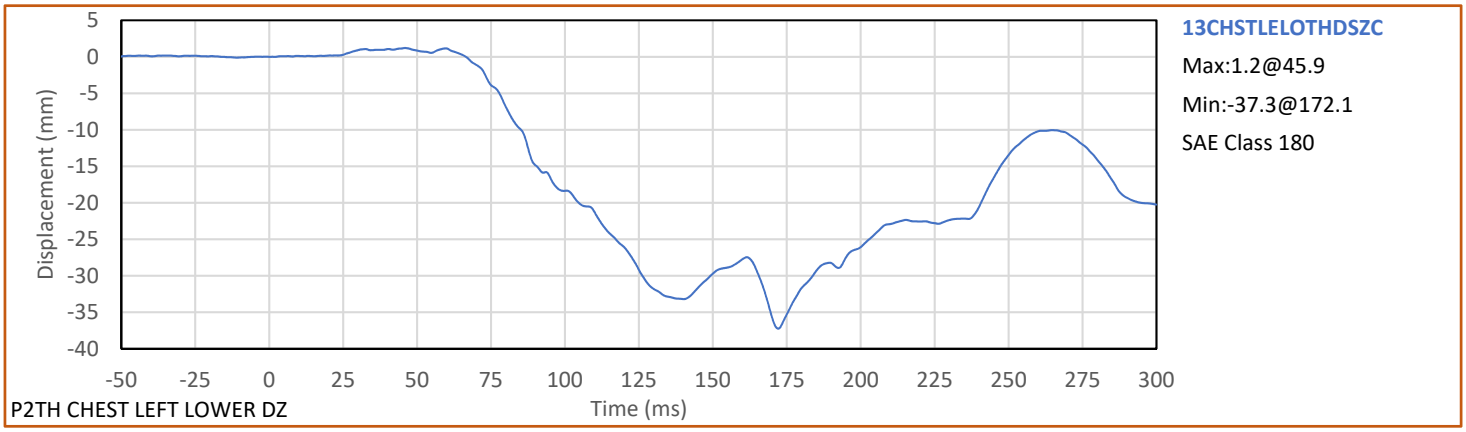

Displacement (mm)
Time (ms)
P2TH CHEST RIGHT UPPER DY
13CHSTRIUPTHDSYC
Max:2.9@137.2
Min:-6.3@181.1
SAE Class 180

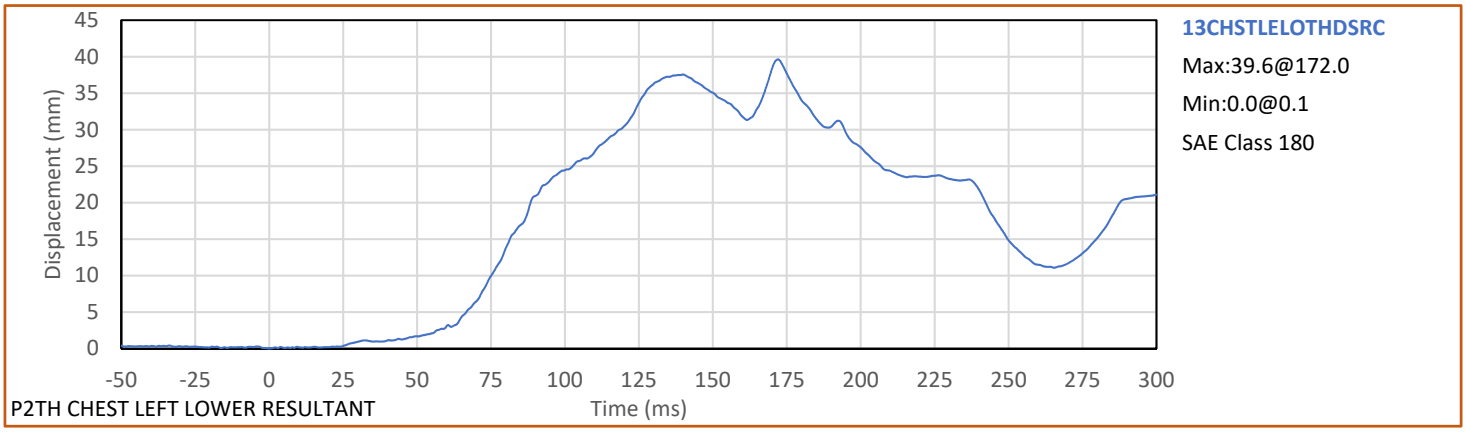

Displacement (mm)
Time (ms)
P2TH CHEST RIGHT UPPER DZ
13CHSTRIUPTHDSZC
Max:6.8@140.5
Min:-11.4@107.1
SAE Class 180

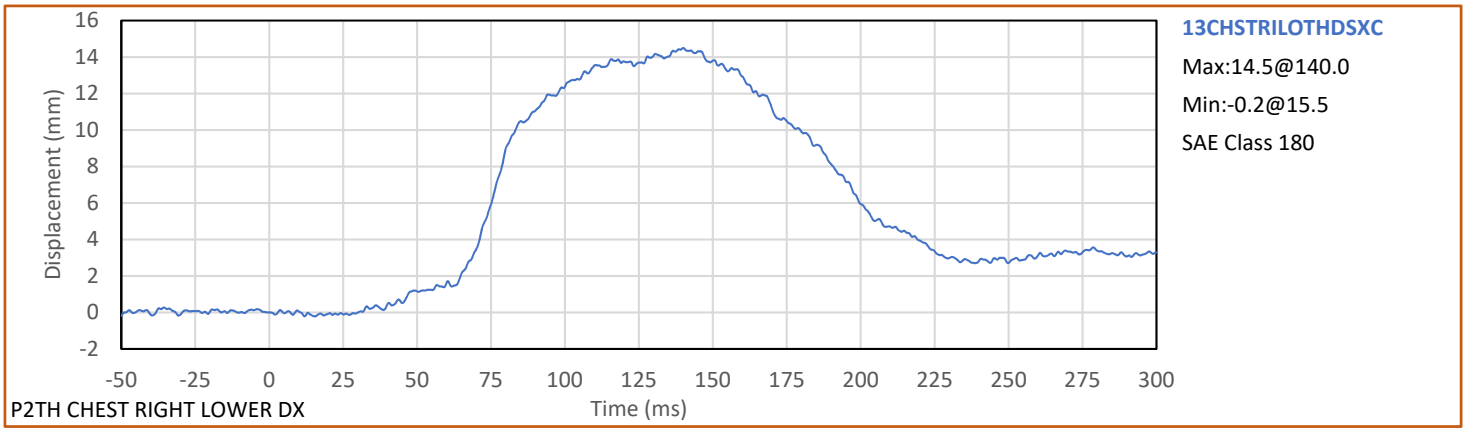

Displacement (mm)
Time (ms)
P2TH CHEST RIGHT UPPER RESULTANT
13CHSTRIUPTHDSRC
Max:22.8@107.4
Min:0.0@0.1
SAE Class 180


Displacement (mm)
Time (ms)
P2TH CHEST LEFT LOWER DX
13CHSTLELOTHDSXC
Max:16.4@110.4
Min:-0.3@31.8
SAE Class 180

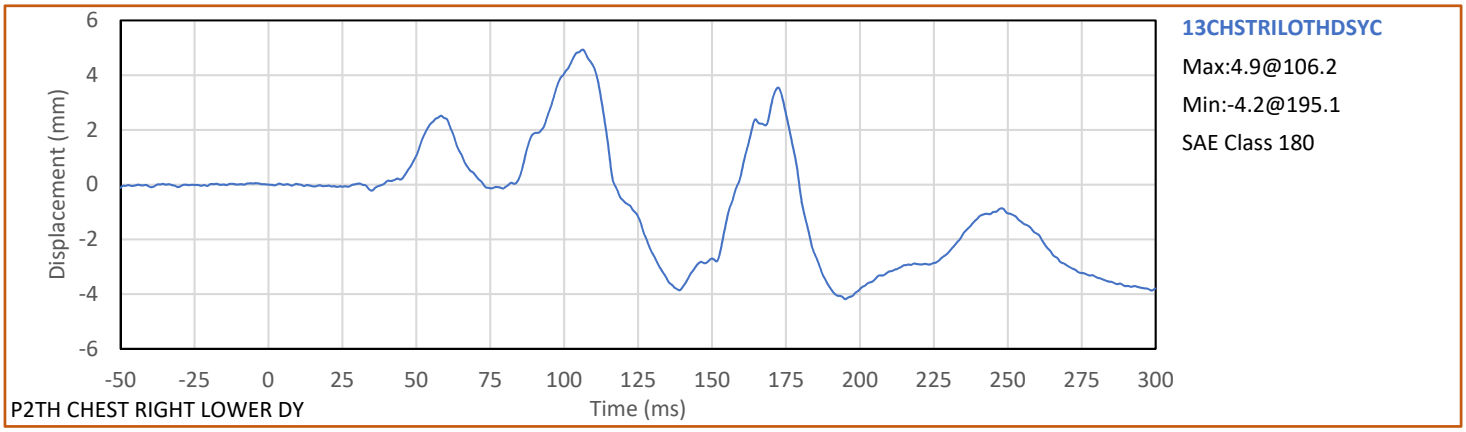

Displacement (mm)
Time (ms)
P2TH CHEST LEFT LOWER DY
13CHSTLELOTHDSYC
Max:3.1@247.0
Min:-10.6@150.5
SAE Class 180


Displacement (mm)
Time (ms)
P2TH CHEST LEFT LOWER DZ
13CHSTLELOTHDSZC
Max:1.2@45.9
Min:-37.3@172.1
SAE Class 180

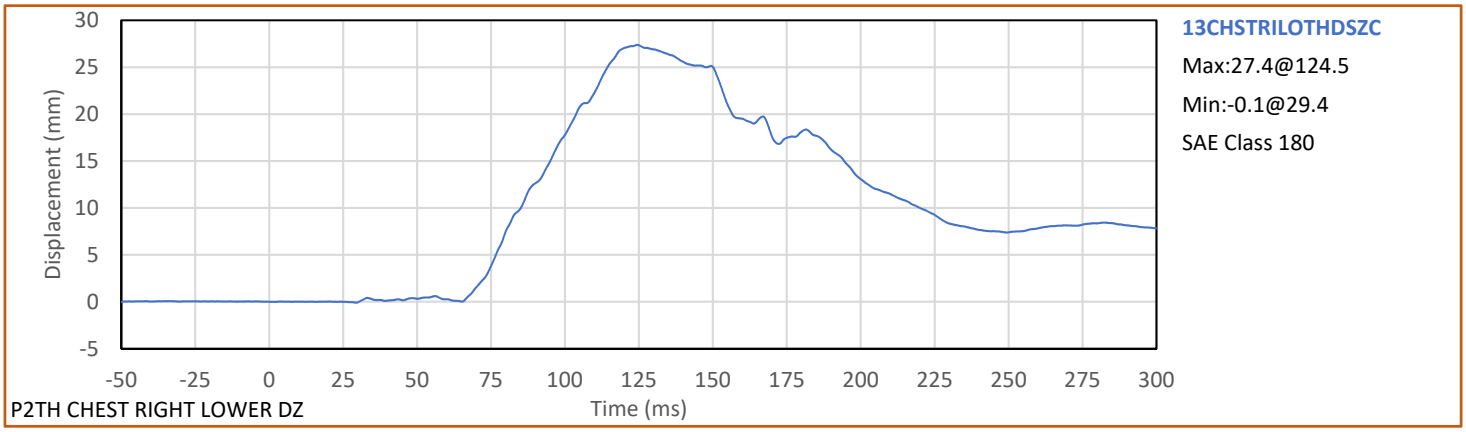

Displacement (mm)
Time (ms)
P2TH CHEST LEFT LOWER RESULTANT
13CHSTLELOTHDSRC
Max:39.6@172.0
Min:0.0@0.1
SAE Class 180



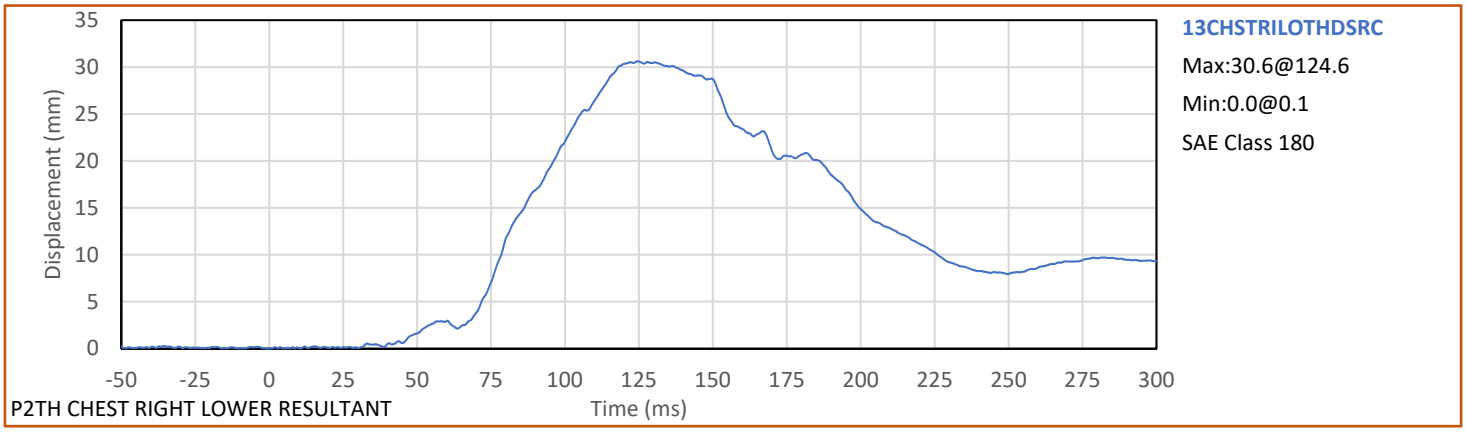
13CHSTRILOTHDSXC
Max:14.5@140.0
Min:-0.2@15.5
SAE Class 180



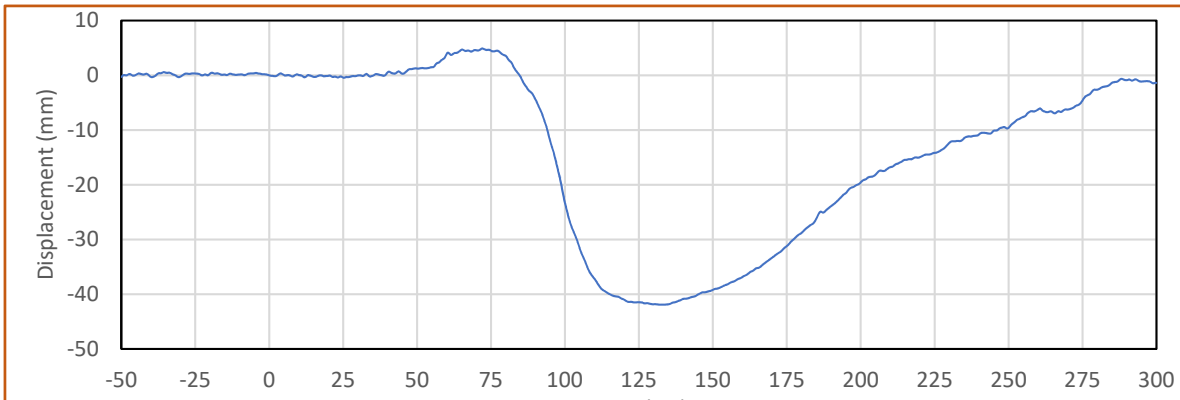
13CHSTRILOTHDSYC
Max:4.9@106.2
Min:-4.2@195.1
SAE Class 180



13CHSTRILOTHDSZC
Max:27.4@124.5
Min:-0.1@29.4
SAE Class 180

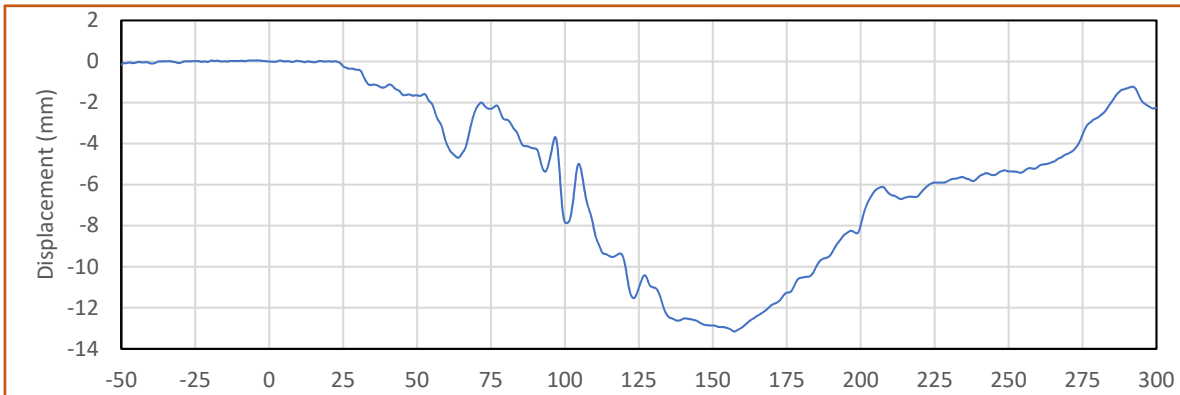


13CHSTRILOTHDSRC
Max:30.6@124.6
Min:0.0@0.1
SAE Class 180



P2TH ABDOMEN LEFT LOWER DX

13ABDOLE00THDSXC
Max:4.9@72.0
Min:-41.9@132.2
SAE Class 180

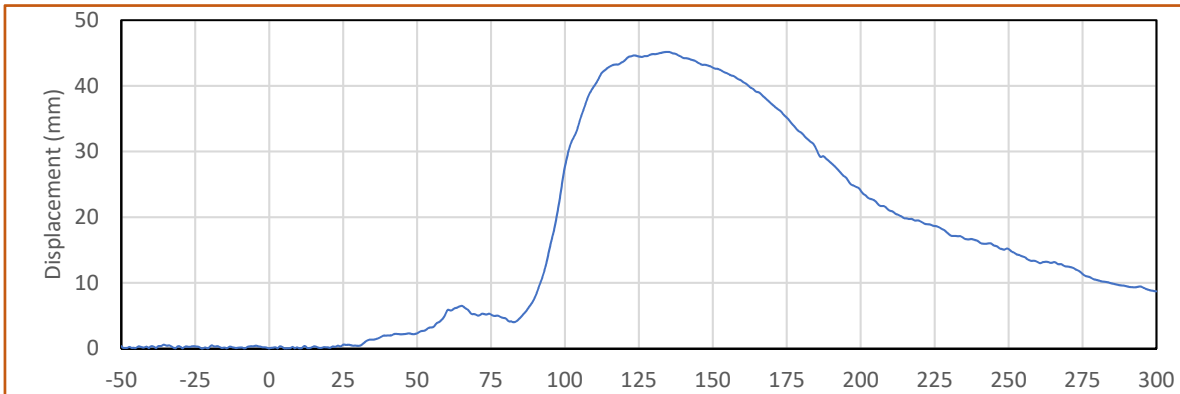


P2TH ABDOMEN LEFT LOWER DY

13ABDOLE00THDSYC
Max:0.0@3.7
Min:-13.2@157.3
SAE Class 180

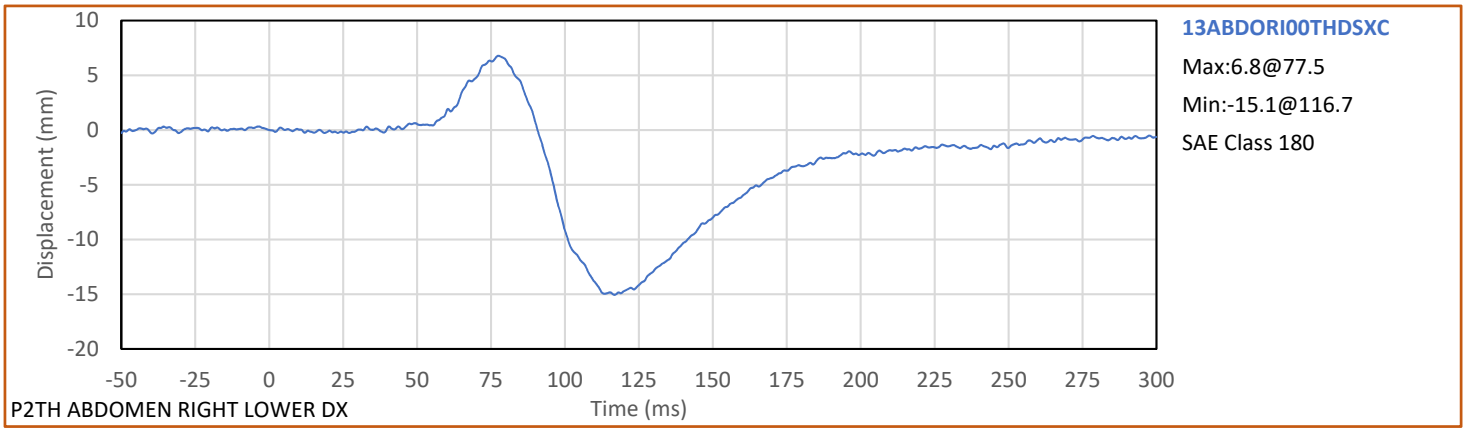
P2TH ABDOMEN LEFT LOWER DZ

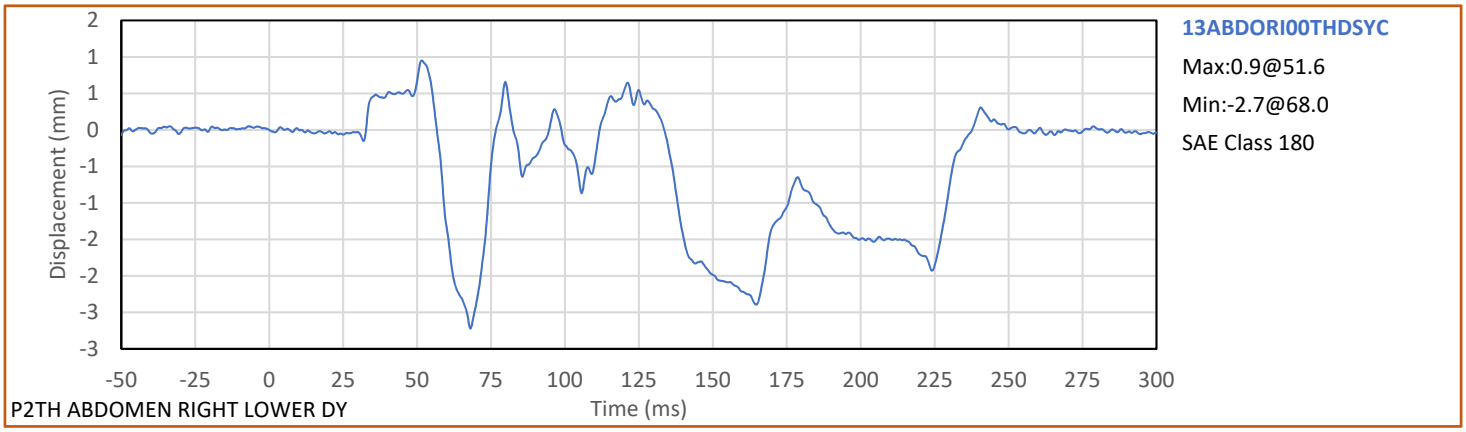
13ABDOLE00THDSZC
Max:2.1@54.0
Min:-13.2@106.6
SAE Class 180

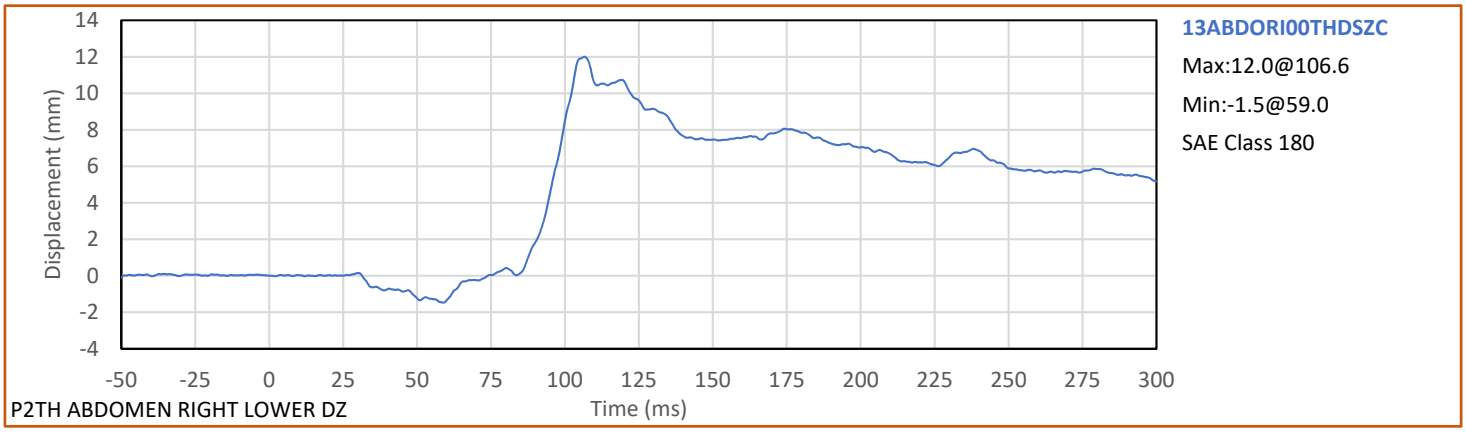


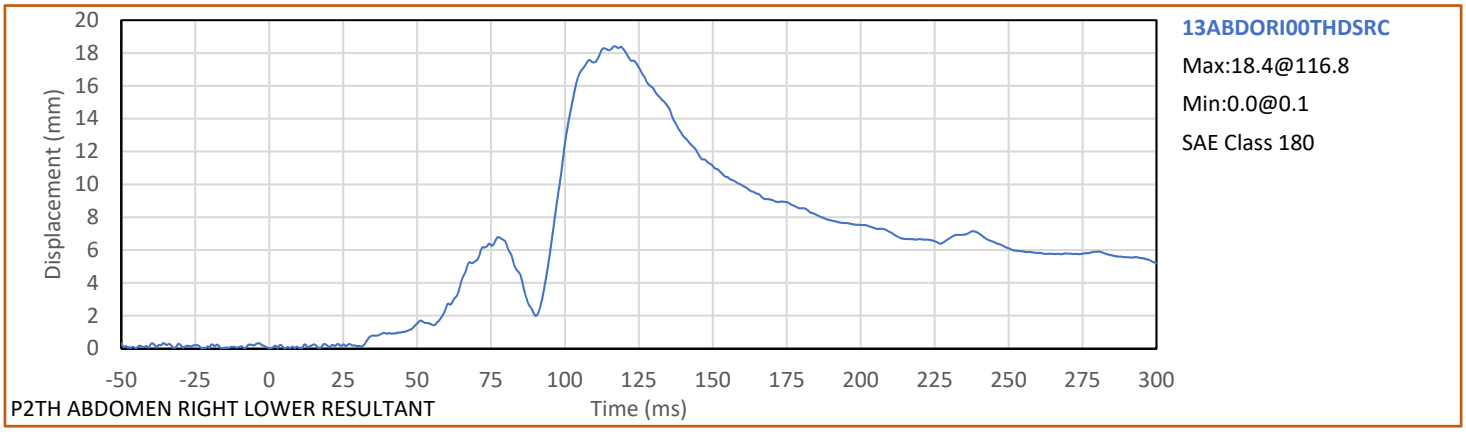
P2TH ABDOMEN LEFT LOWER RESULTANT

13ABDOLE00THDSRC
Max:45.2@135.0
Min:0.0@5.1
SAE Class 180


Displacement (mm)
Time (ms)
P2TH ABDOMEN RIGHT LOWER DX
13ABDORI00THDSXC
Max:6.8@77.5
Min:-15.1@116.7
SAE Class 180


Displacement (mm)
Time (ms)
P2TH ABDOMEN RIGHT LOWER DY
13ABDORI00THDSYC
Max:0.9@51.6
Min:-2.7@68.0
SAE Class 180


Displacement (mm)
Time (ms)
P2TH ABDOMEN RIGHT LOWER DZ
13ABDORI00THDSZC
Max:12.0@106.6
Min:-1.5@59.0
SAE Class 180


Displacement (mm)
Time (ms)
P2TH ABDOMEN RIGHT LOWER RESULTANT
13ABDORI00THDSRC
Max:18.4@116.8
Min:0.0@0.1
SAE Class 180

APPENDIX C

DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA SHEETS

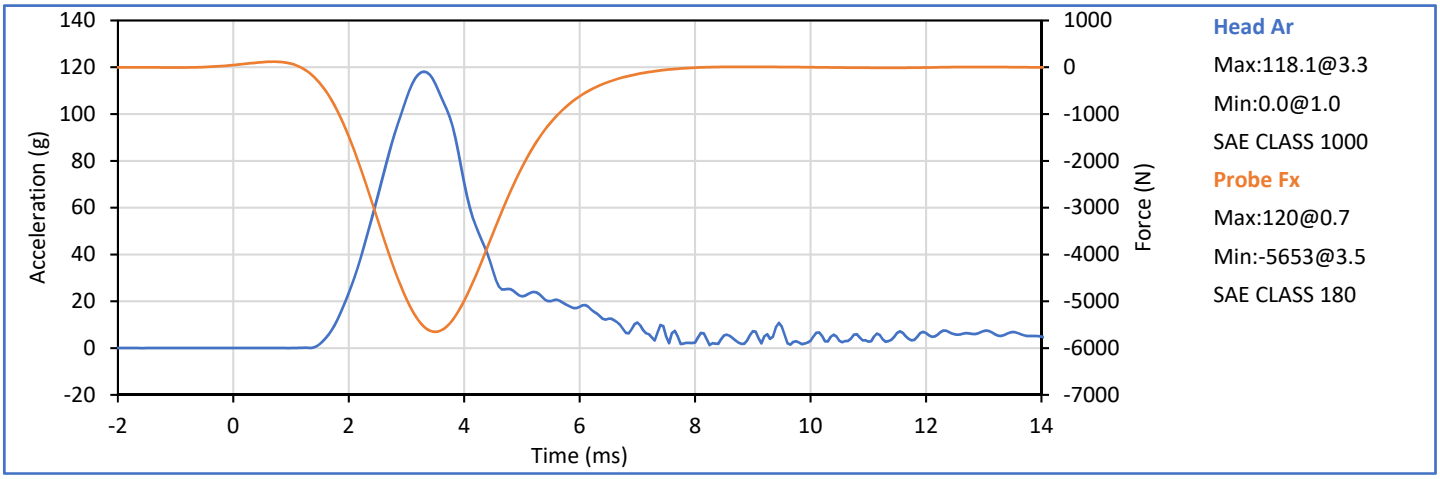
APPENDIX C
Pre-Test ATD Configuration and Performance Verification Data
THOR-50M 50th Percentile Male ATD
S/N: D09799

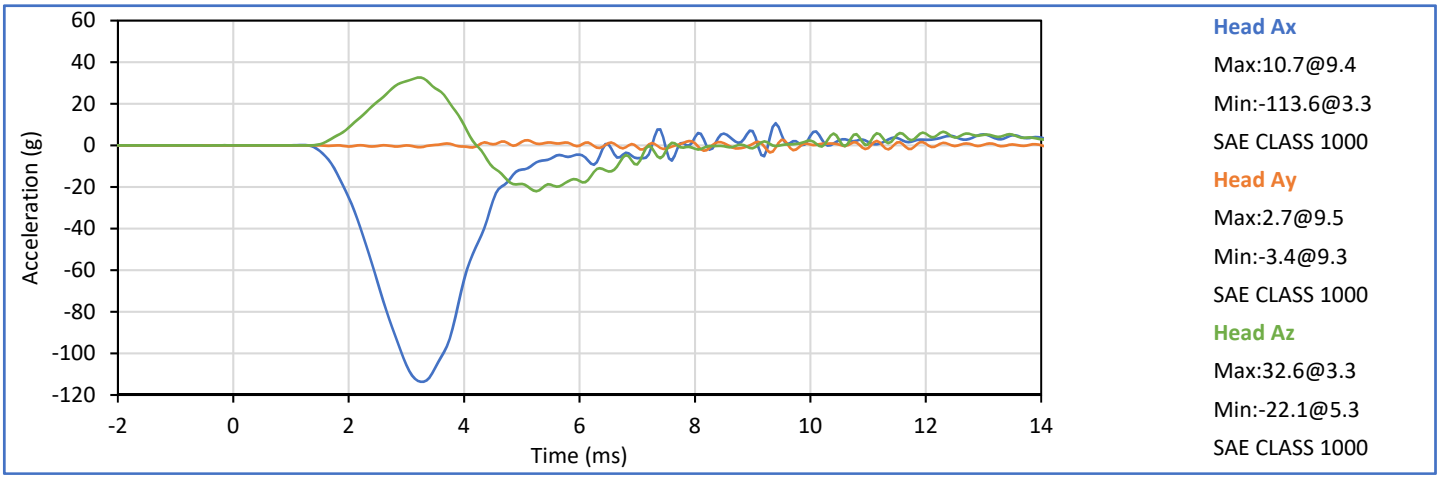
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Head Qualification

ATD Serial No.: D09799 Test Date: 2020-10-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Relative Humidity	%	10	70	19	Pass
Velocity	m/s	1.95	2.05	2.02	Pass
Peak Probe Force	N	-6138	-5022	-5653	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	118.1	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

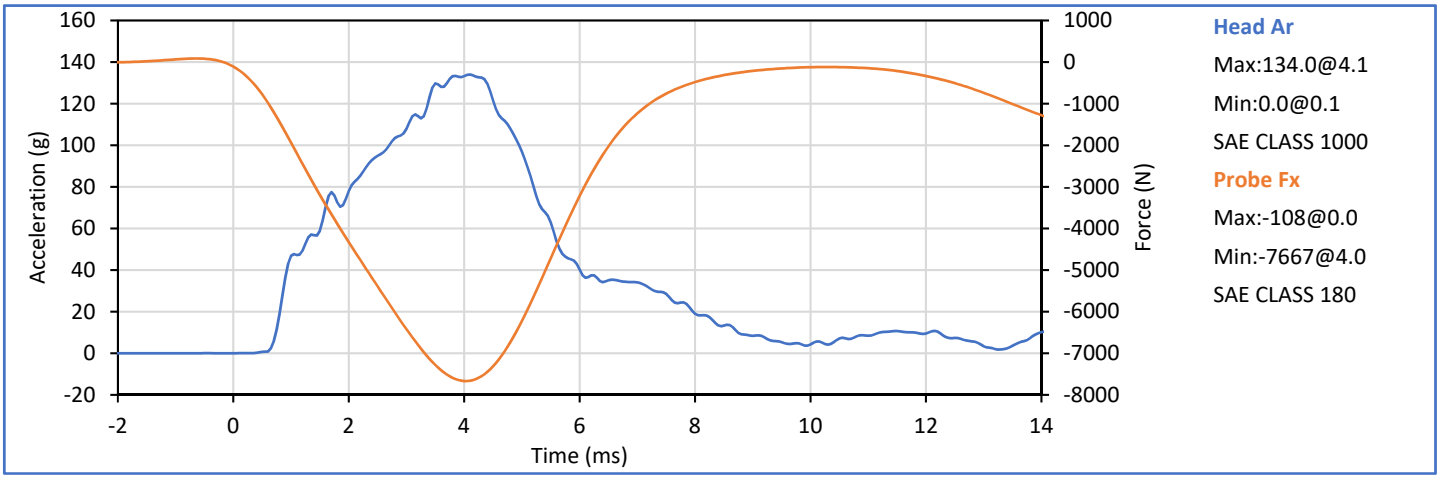
Approved By: P. Puzzuto

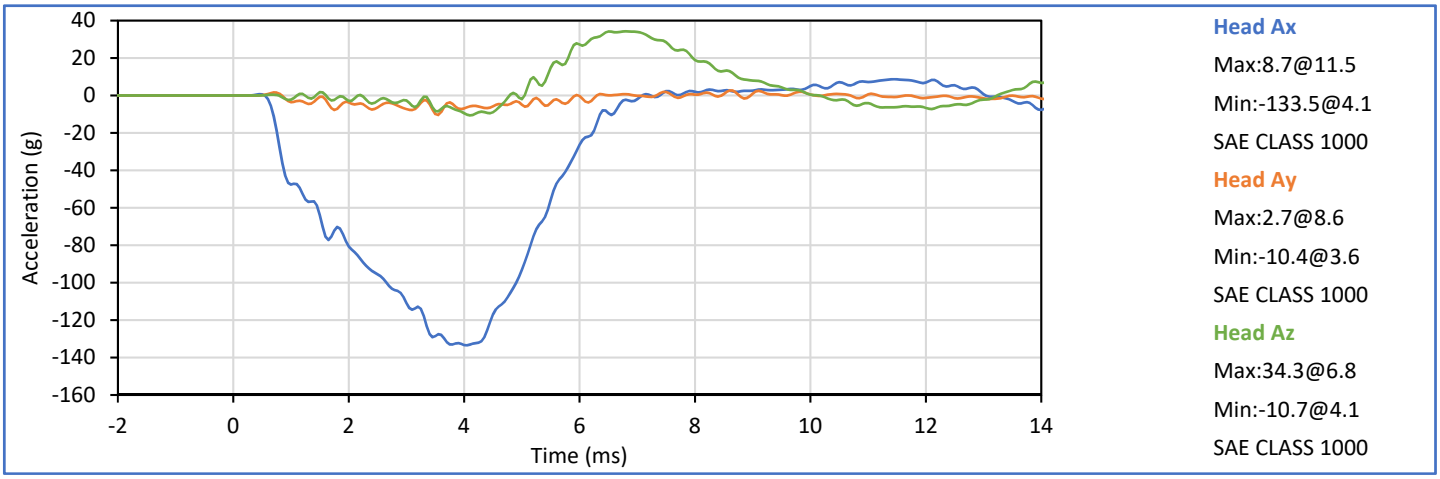
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Face Qualification

ATD Serial No.: D09799 Test Date: 2020-10-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	18	Pass
Velocity	m/s	6.68	6.78	6.71	Pass
Peak Probe Force	N	-7796	-6378	-7667	Pass
Peak Head Resultant Acceleration	g	124.0	152.0	134.0	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

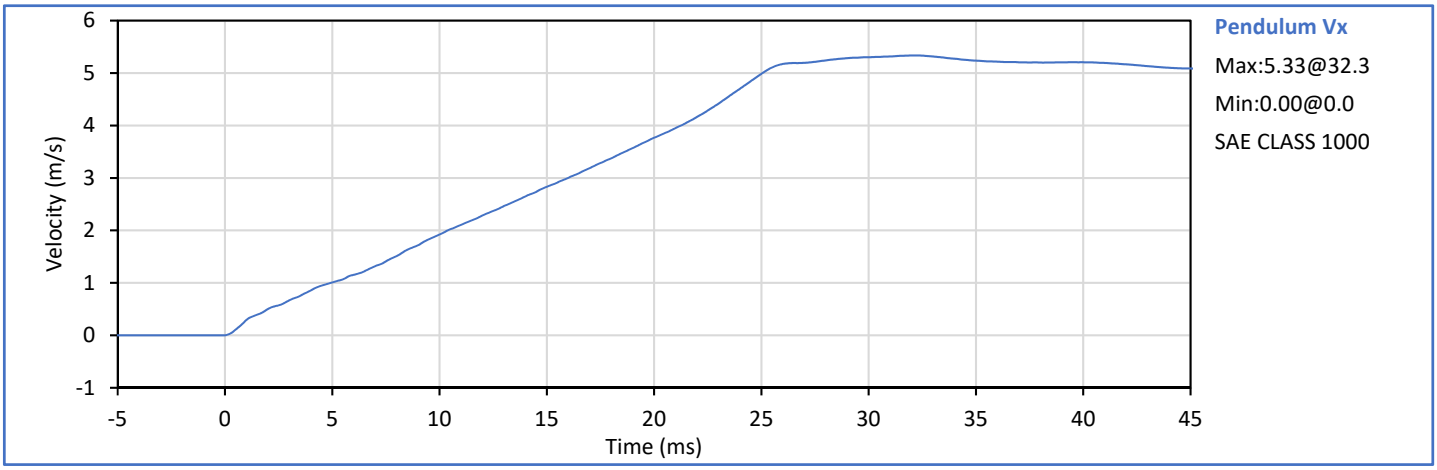
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Torsion (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	4.95	5.05	4.96	Pass
Pendulum Velocity at 10 ms	m/s	1.71	2.09	1.92	Pass
Pendulum Velocity at 15 ms	m/s	2.57	3.14	2.83	Pass
Pendulum Velocity at 20 ms	m/s	3.46	4.23	3.77	Pass
Pendulum Velocity at 25 ms	m/s	4.27	5.22	4.99	Pass
Peak Upper Neck Mz	Nm	37.3	45.6	39.9	Pass
Peak Head Wz	deg/s	1251	1529	1254	Pass
Peak Neck Fixture Rotation	deg	43.1	52.7	45.3	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



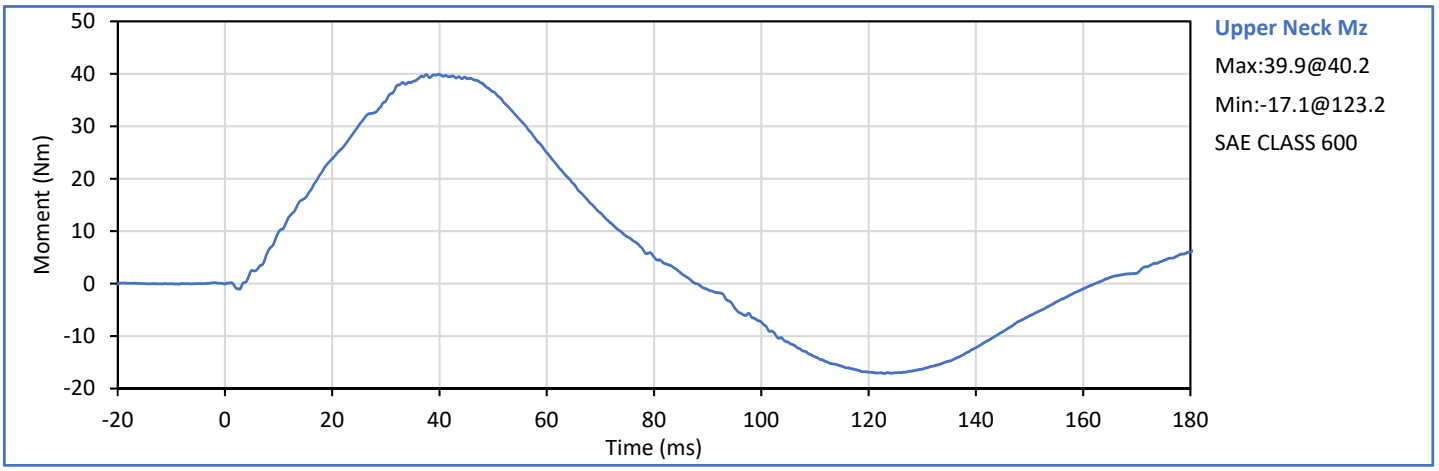
Technician: J. Hernandez

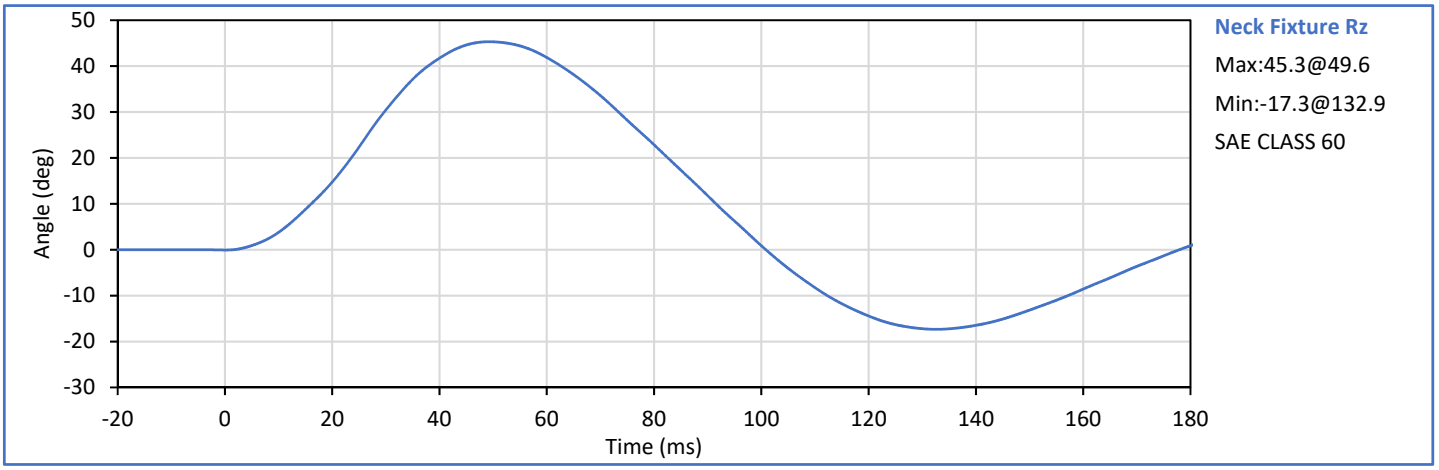
Approved By: P. Puzzuto

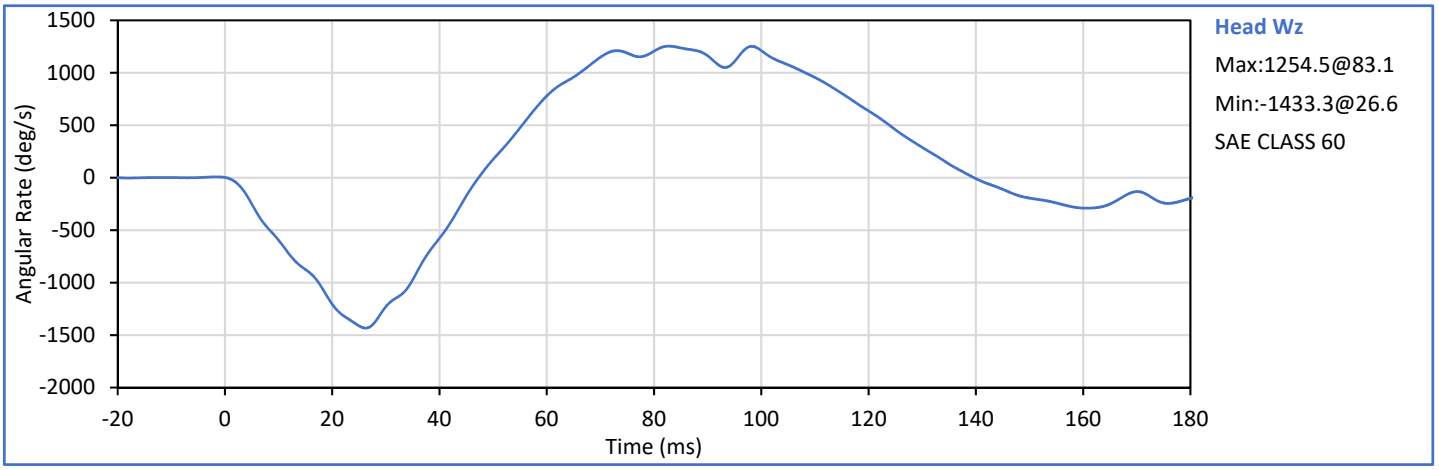
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Torsion (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17







Technician: J. Hernandez

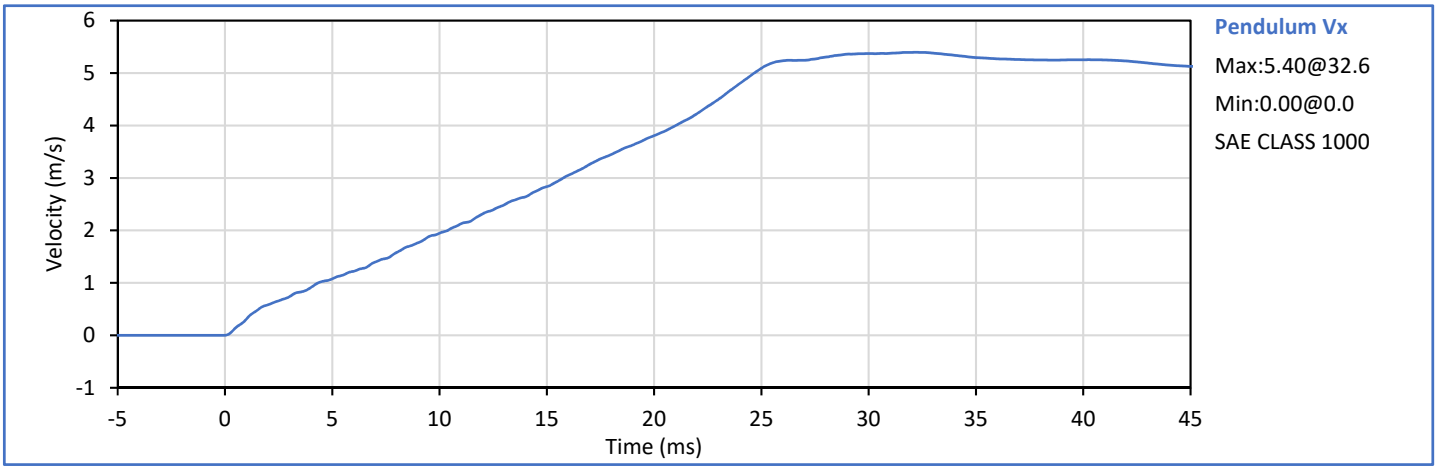
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Torsion (Right) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	4.95	5.05	4.97	Pass
Pendulum Velocity at 10 ms	m/s	1.71	2.09	1.95	Pass
Pendulum Velocity at 15 ms	m/s	2.57	3.14	2.83	Pass
Pendulum Velocity at 20 ms	m/s	3.46	4.23	3.81	Pass
Pendulum Velocity at 25 ms	m/s	4.27	5.22	5.09	Pass
Peak Upper Neck Mz	Nm	-45.6	-37.3	-39.6	Pass
Peak Head Wz	deg/s	-1529	-1251	-1263	Pass
Peak Neck Fixture Rotation	deg	-52.7	-43.1	-48.0	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



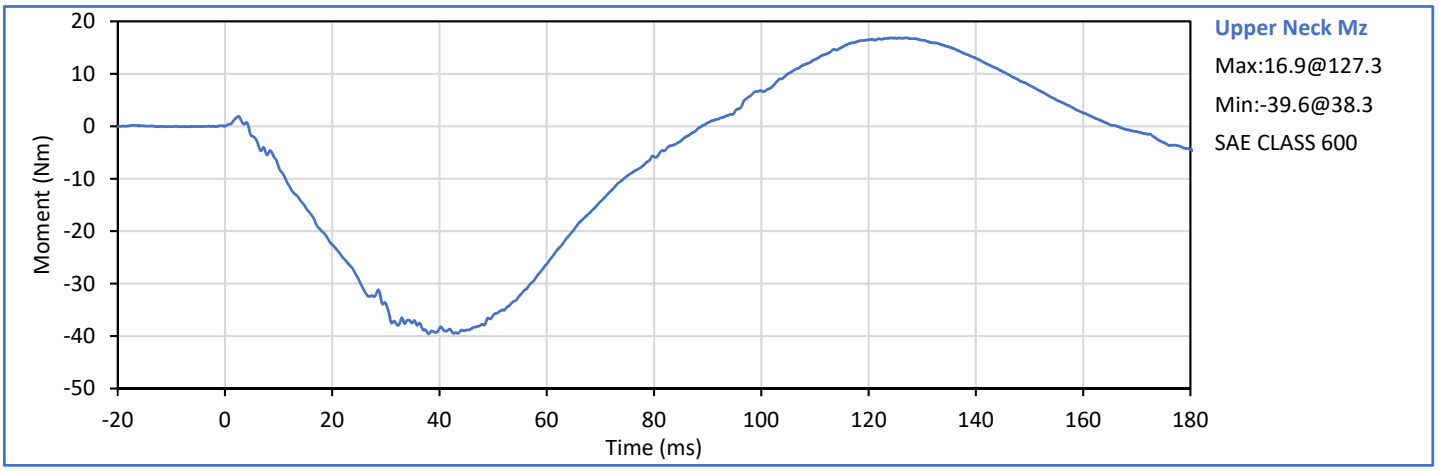
Technician: J. Hernandez

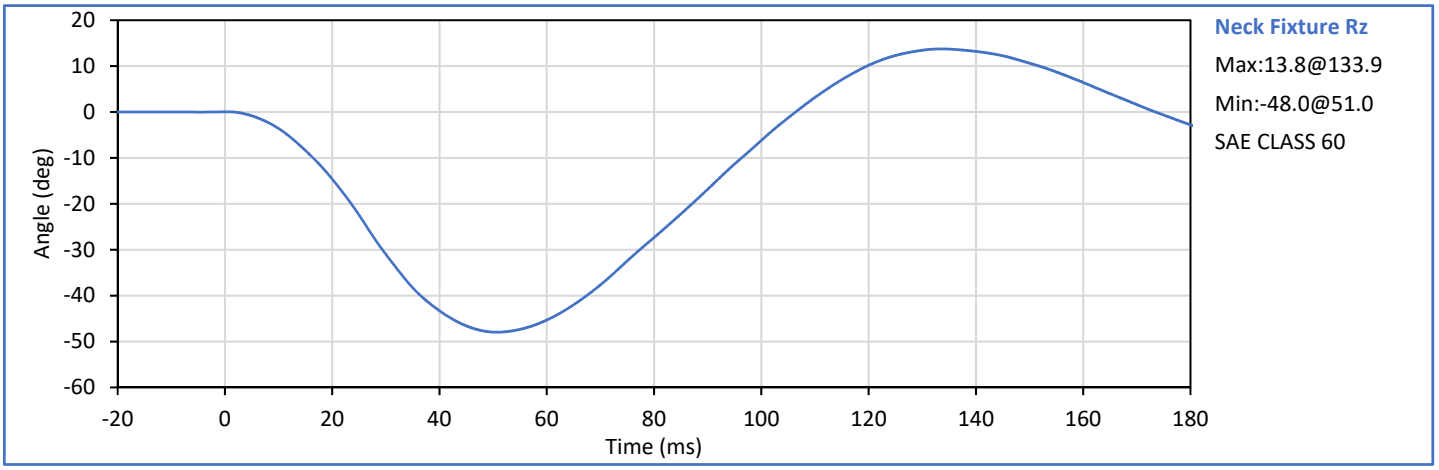
Approved By: P. Puzzuto

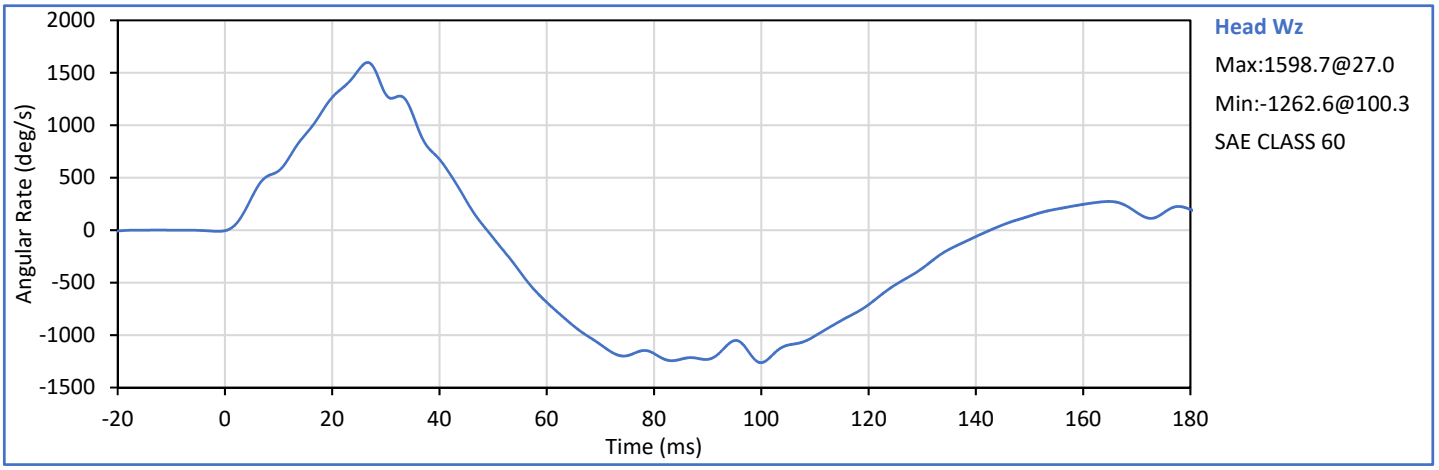
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Torsion (Right) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17







Technician: J. Hernandez

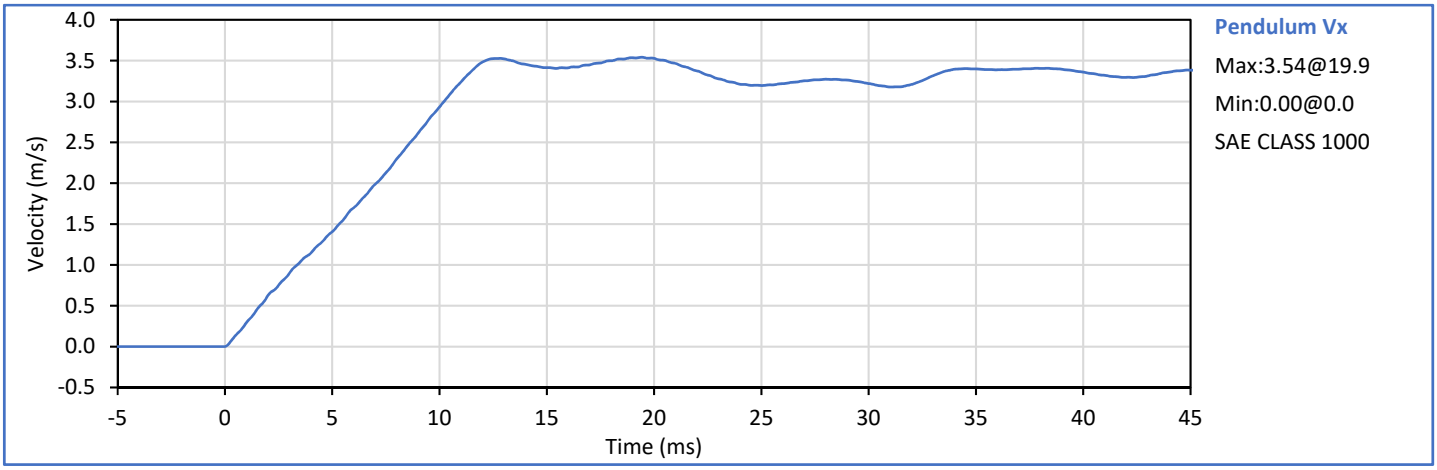
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Lateral Flexion (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	3.35	3.45	3.44	Pass
Pendulum Velocity at 4 ms	m/s	1.06	1.30	1.14	Pass
Pendulum Velocity at 8 ms	m/s	2.09	2.55	2.30	Pass
Pendulum Velocity at 12 ms	m/s	3.16	3.86	3.48	Pass
Peak Upper Neck Mx after 40 ms	Nm	44.8	54.7	52.8	Pass
Peak Head Wx	deg/s	-1498	-1226	-1396	Pass
Peak Head Relative Rotation	deg	-45.9	-37.6	-41.1	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



Technician: J. Hernandez

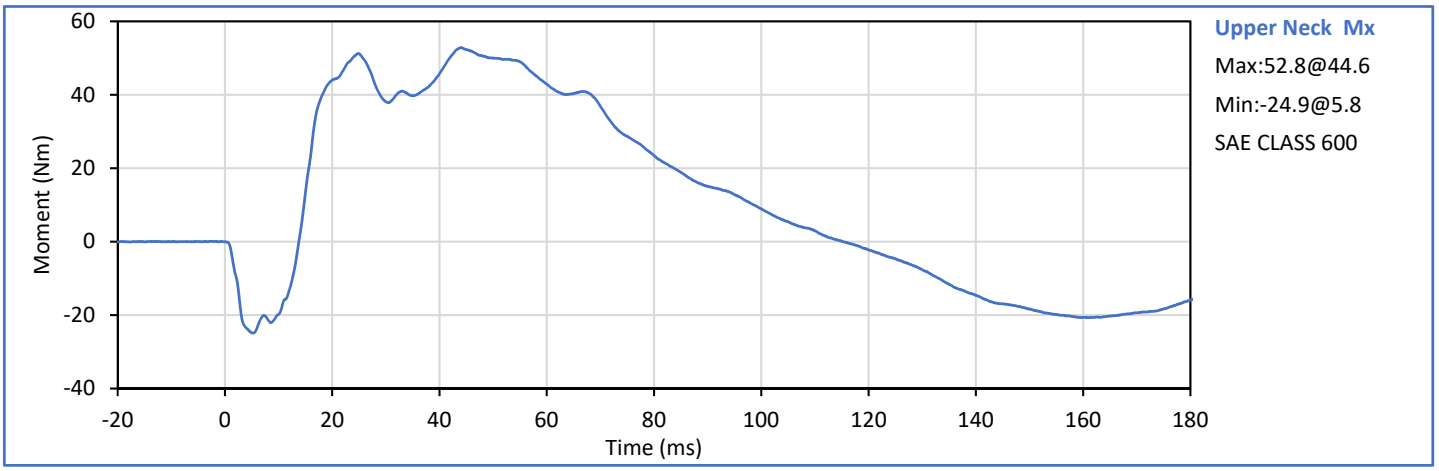
Approved By: P. Puzzuto

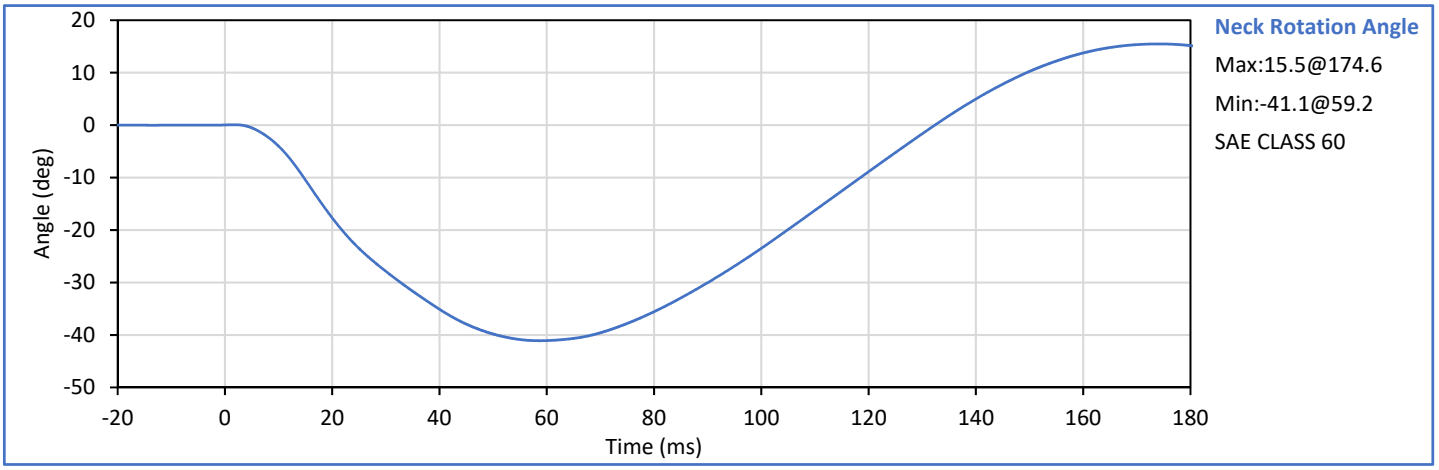
Applus IDIADA KARCO

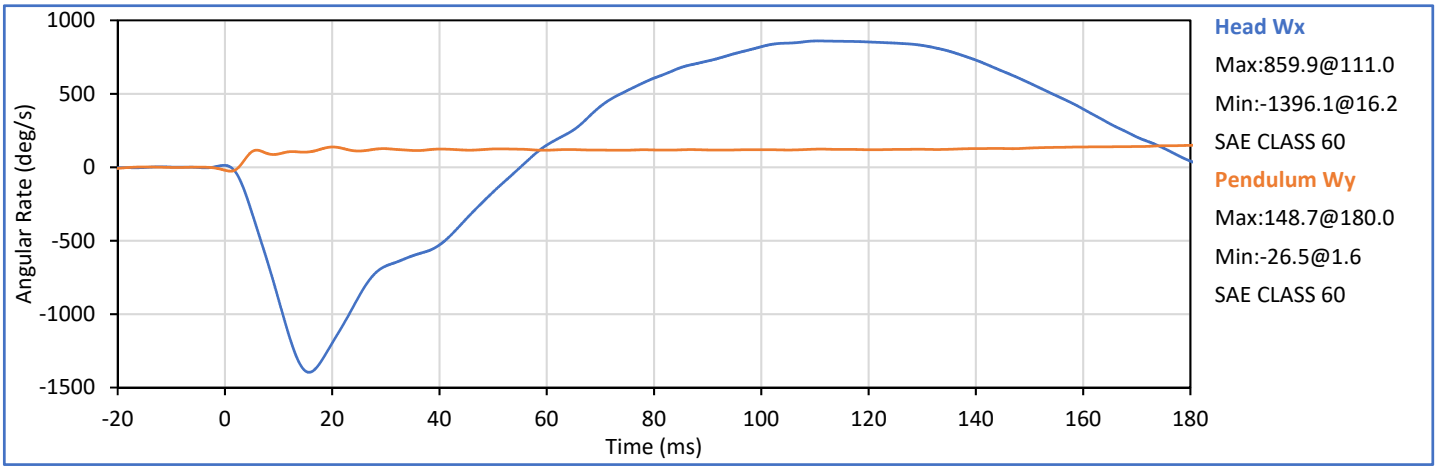
THOR-50M 50th Percentile Male ATD
Neck Lateral Flexion (Left) Qualification

ATD Serial No.: DO9799

Test Date: 2020-11-17







Technician: J. Hernandez

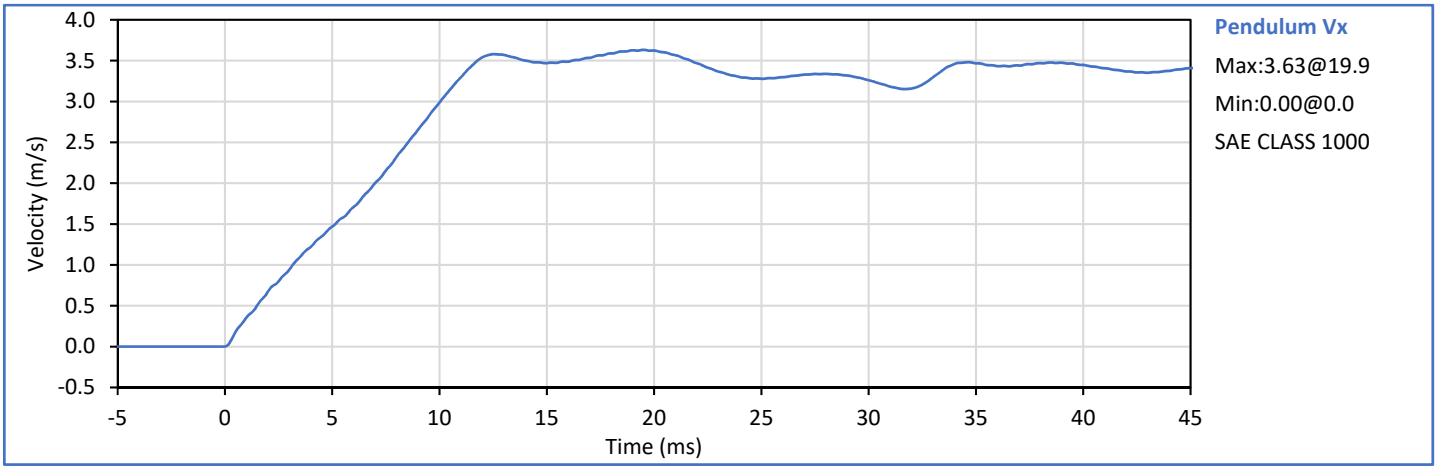
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Lateral Flexion (Right) Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	3.35	3.45	3.44	Pass
Pendulum Velocity at 4 ms	m/s	1.06	1.30	1.22	Pass
Pendulum Velocity at 8 ms	m/s	2.09	2.55	2.32	Pass
Pendulum Velocity at 12 ms	m/s	3.16	3.86	3.54	Pass
Peak Upper Neck Mx after 40 ms	Nm	-54.7	-44.8	-48.8	Pass
Peak Head Wx	deg/s	1226	1498	1384	Pass
Peak Head Relative Rotation	deg	37.6	45.9	42.2	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



Technician: J. Hernandez

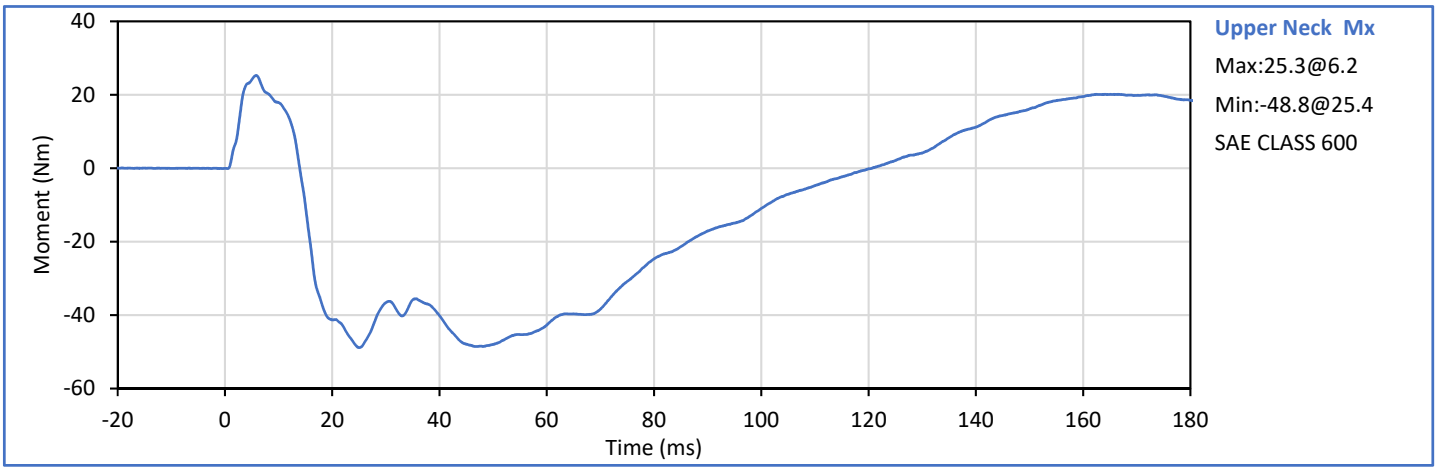
Approved By: P. Puzzuto

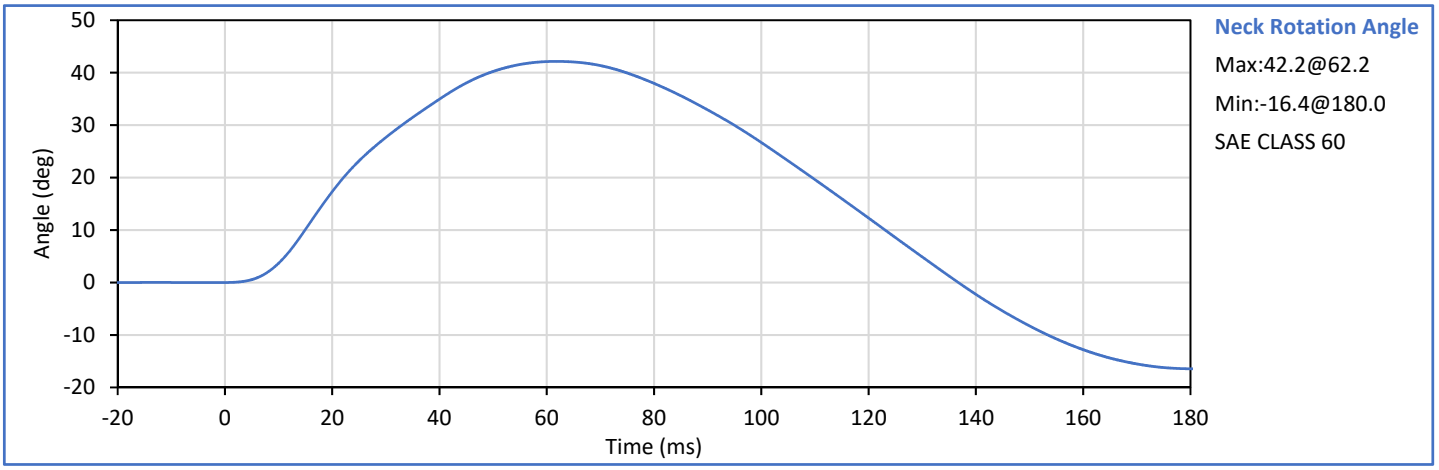
Applus IDIADA
KARCO

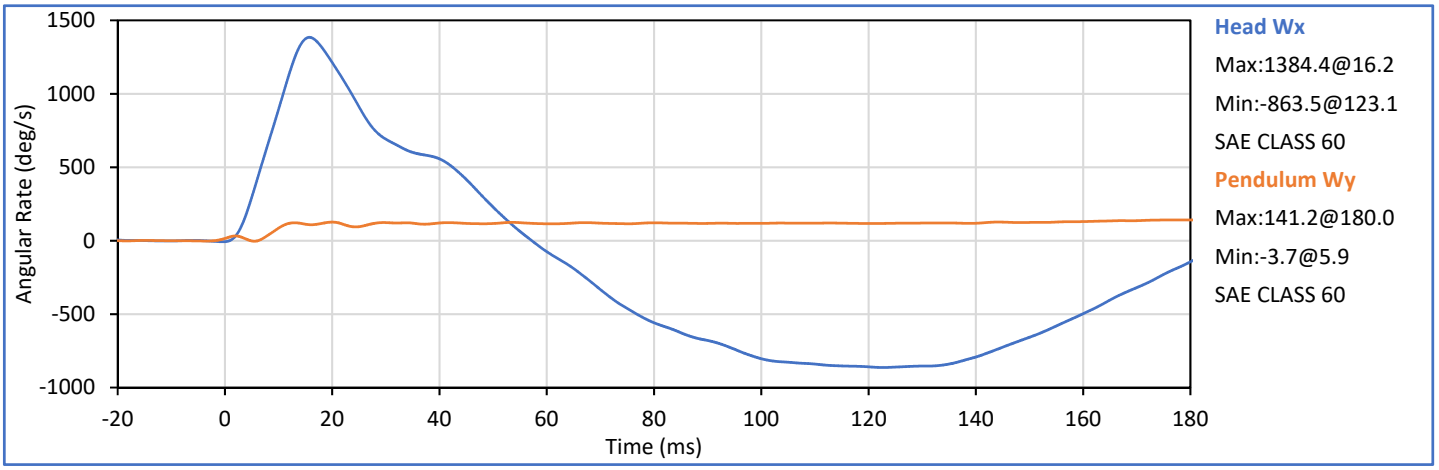
THOR-50M 50th Percentile Male ATD
Neck Lateral Flexion (Right) Qualification

ATD Serial No.: DO9799

Test Date: 2020-11-17







Technician: J. Hernandez

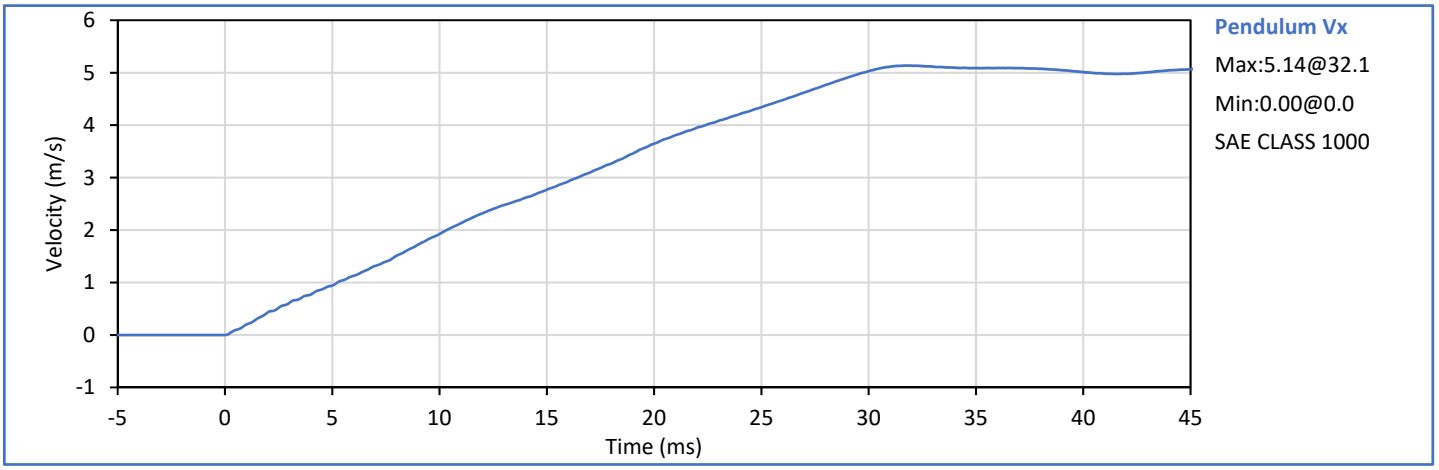
Approved By: P. Puzzuto

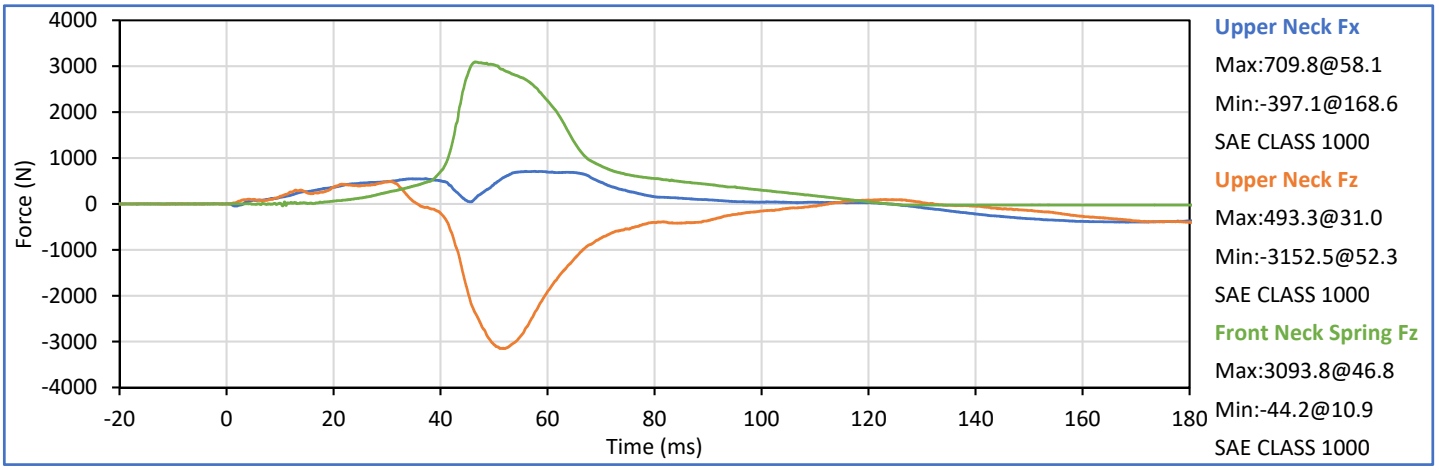
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Extension Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	4.95	5.05	5.01	Pass
Pendulum Velocity at 10 ms	m/s	1.74	2.12	1.94	Pass
Pendulum Velocity at 20 ms	m/s	3.30	4.04	3.65	Pass
Pendulum Velocity at 30 ms	m/s	4.53	5.54	5.03	Pass
Peak Upper Neck My	Nm	-25.3	-20.7	-25.0	Pass
Peak Upper Neck Fz	N	-3210	-2626	-3153	Pass
Peak Head Wy	deg/s	1855	2267	2260	Pass
Peak Head Relative Rotation	deg	58.5	71.5	64.7	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass





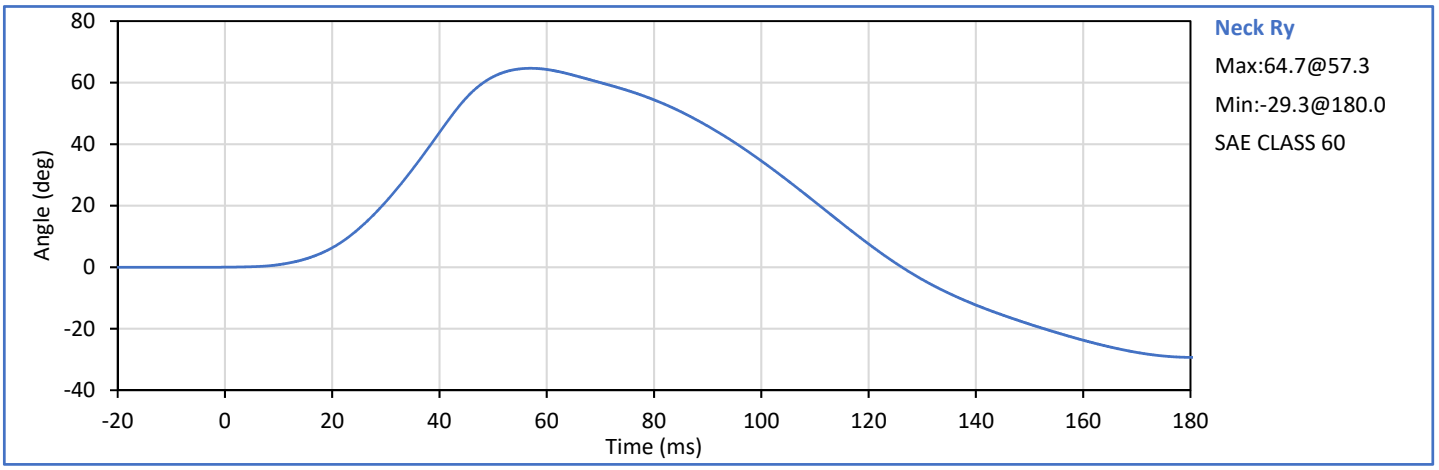
Technician: J. Hernandez

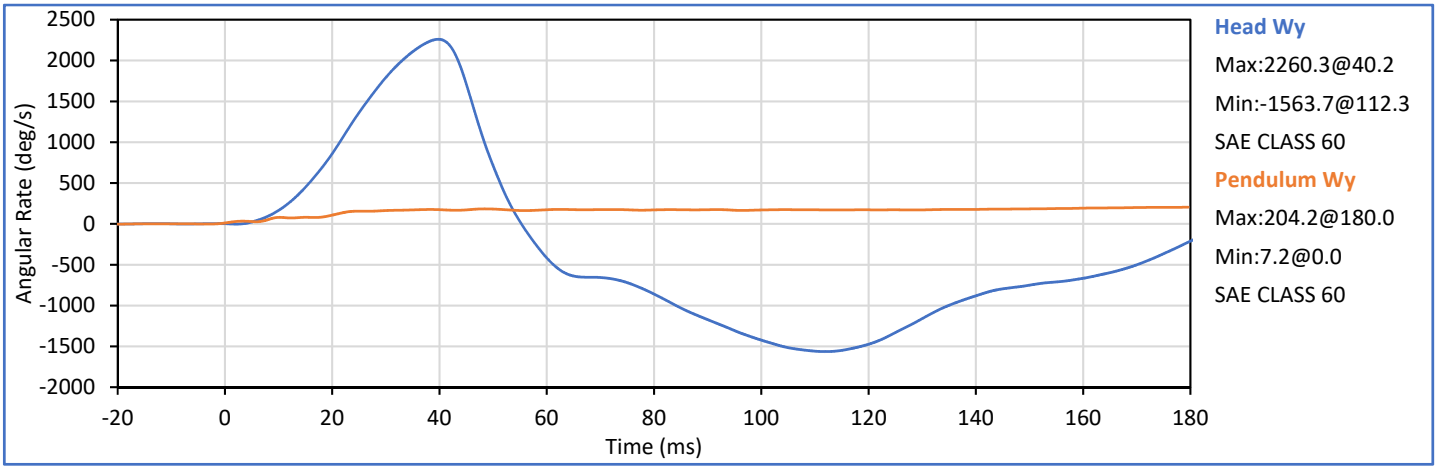
Approved By: P. Puzzuto

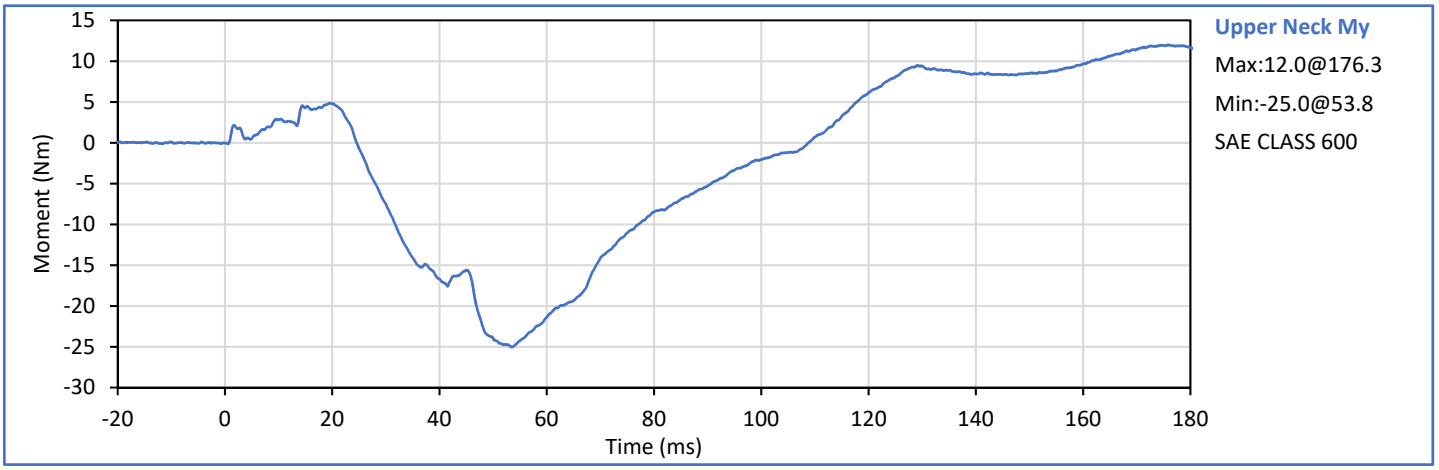
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Extension Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-17







Technician: J. Hernandez

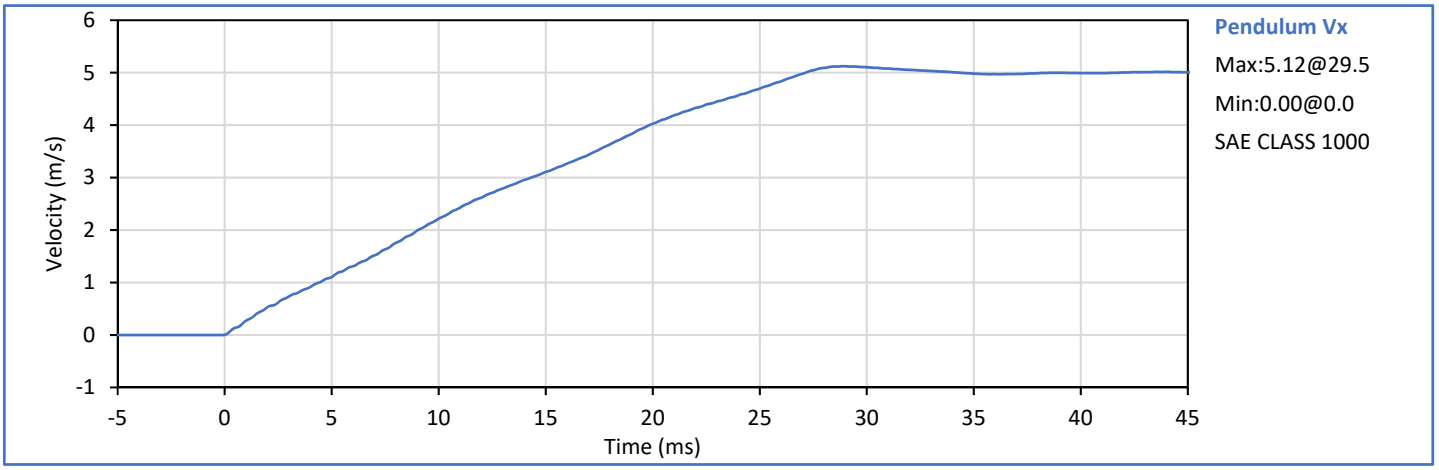
Approved By: P. Puzzuto

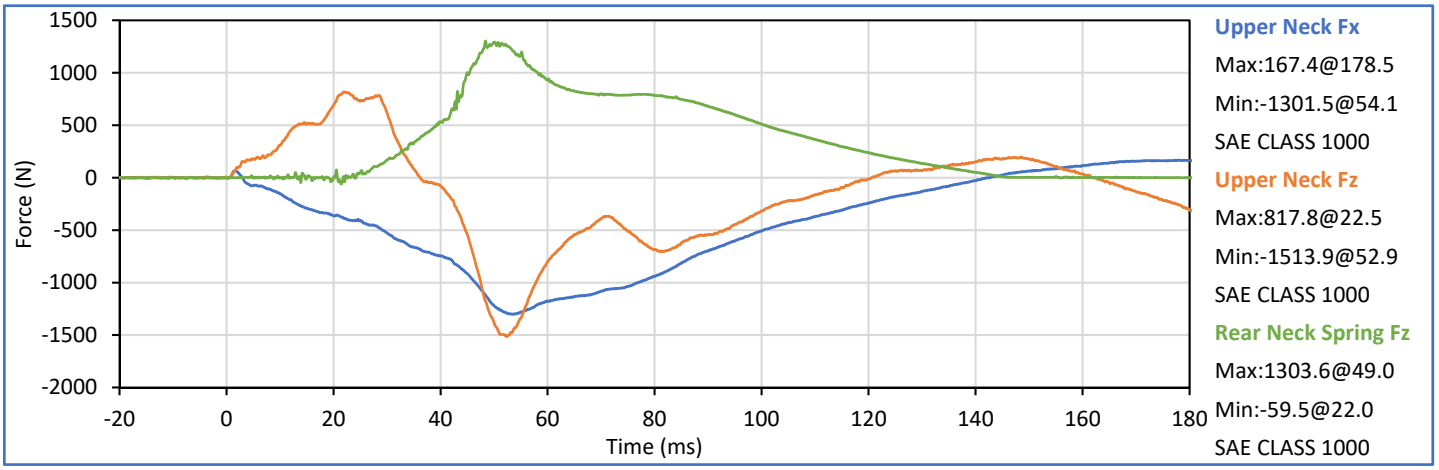
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Neck Flexion Front Qualification

ATD Serial No.: DO9799 Test Date: 2020-11-11

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	4.95	5.05	5.01	Pass
Pendulum Velocity at 8 ms	m/s	1.57	1.92	1.76	Pass
Pendulum Velocity at 16 ms	m/s	3.13	3.82	3.27	Pass
Pendulum Velocity at 24 ms	m/s	4.42	5.41	4.57	Pass
Peak Upper Neck My	Nm	27.9	34.1	33.3	Pass
Peak Upper Neck Fz (before 40 ms)	N	774	946	818	Pass
Peak Head Wy	deg/s	-2172	-1777	-1916	Pass
Peak Head Relative Rotation	deg	-71.0	-58.1	-61.9	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass





Technician: J. Hernandez

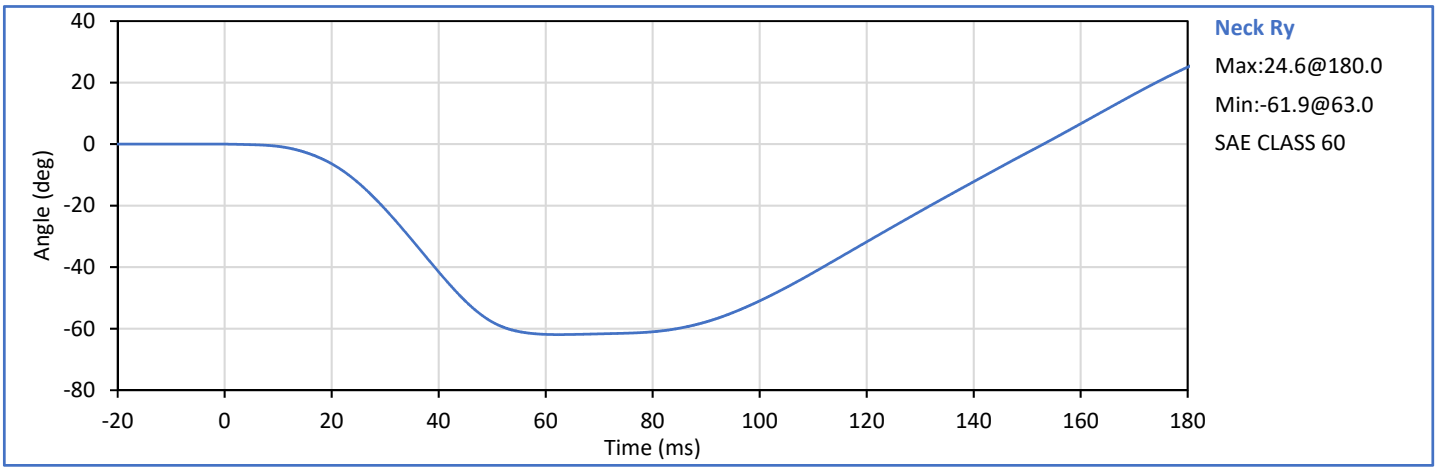
Approved By: P. Puzzuto

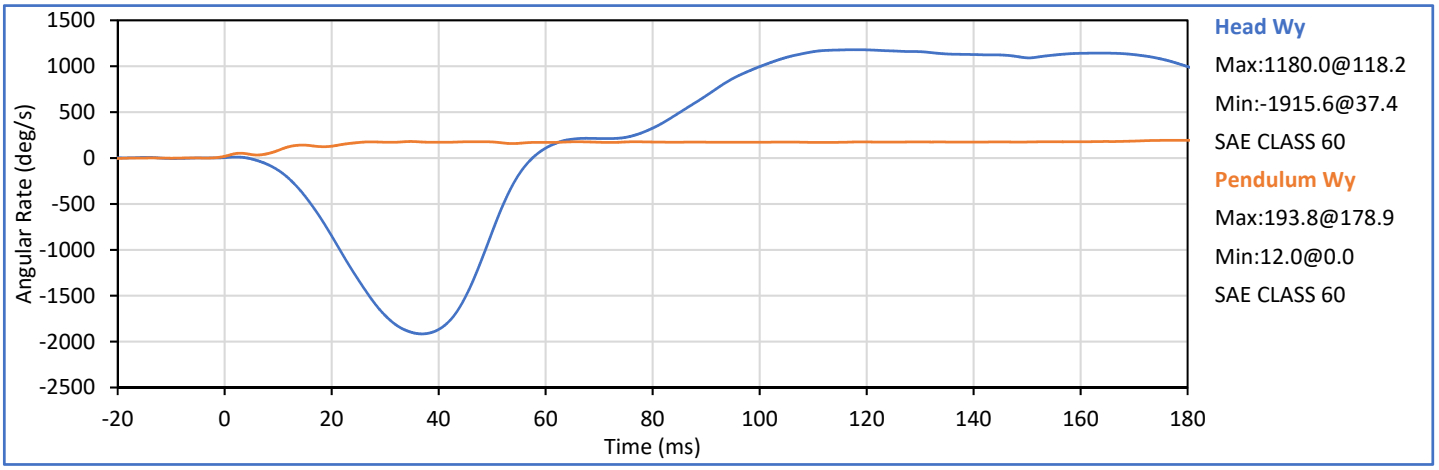
Applus IDIADA KARCO

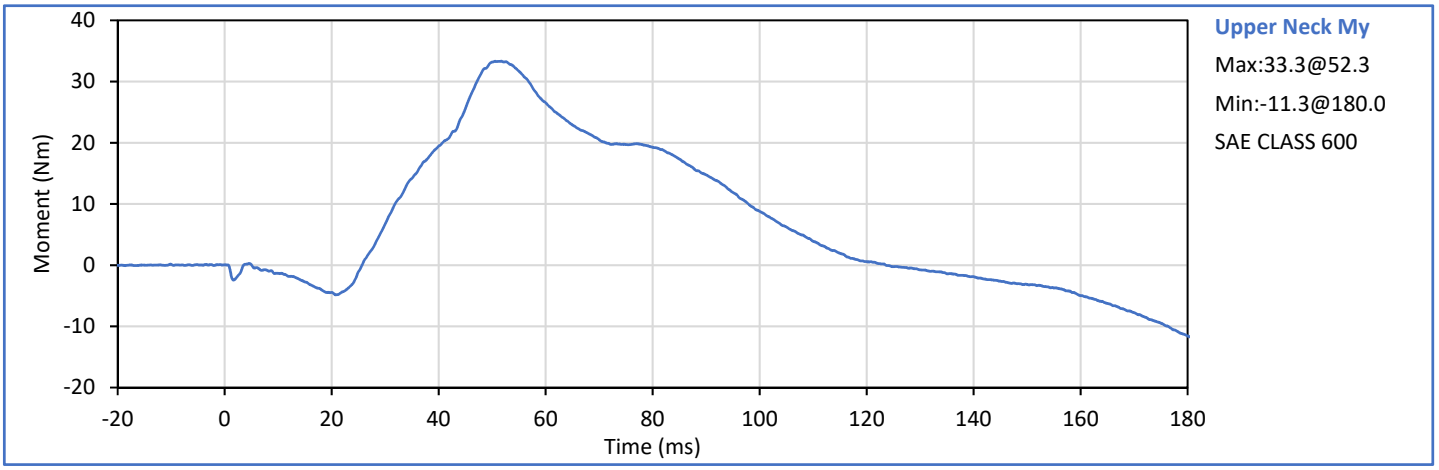
THOR-50M 50th Percentile Male ATD
Neck Flexion Front Qualification

ATD Serial No.: DO9799

Test Date: 2020-11-11







Technician: J. Hernandez

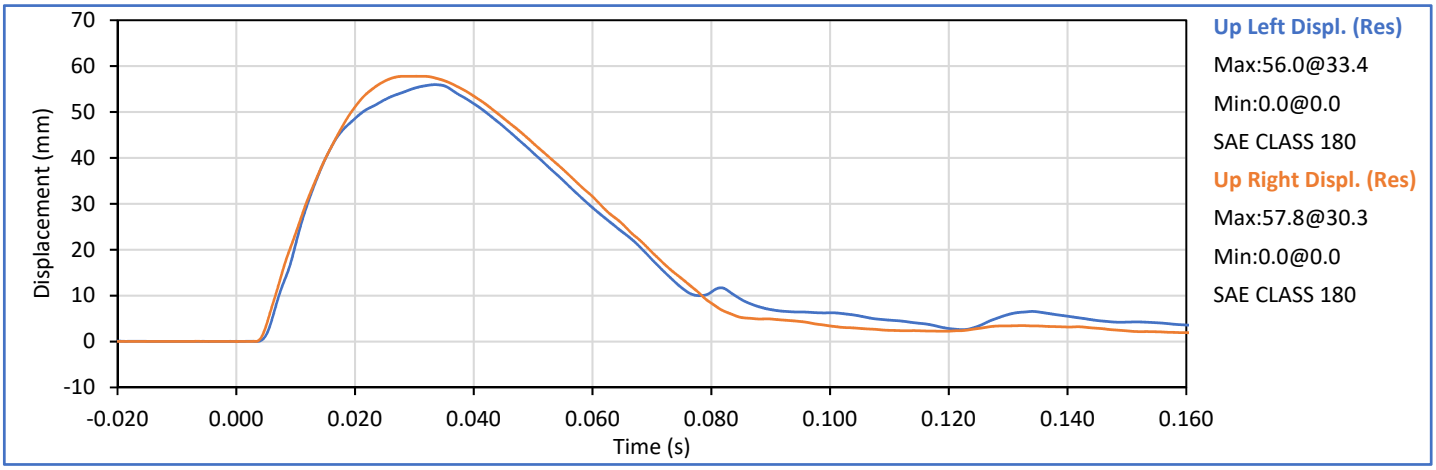
Approved By: P. Puzzuto

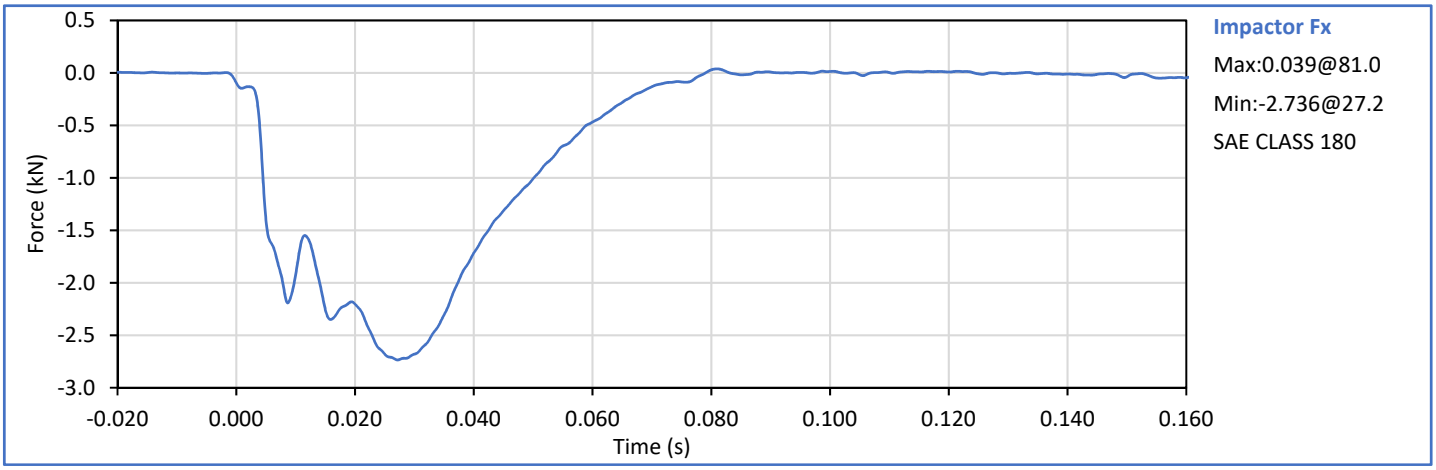
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Upper)

ATD Serial No.: DO9799 Test Date: 2020-11-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.039		-2.736	Pass
Peak Upper Left Deflection Resultant	mm	48.3	59.0	56.0	Pass
Peak Upper Right Deflection Resultar	mm			57.8	Pass
Absolute Difference L/R Dx Resultant	mm	0.0	5.0	1.8	Pass
Force at Peak Upper Left Resultant	mm	-2.944	-2.409	-2.458	Pass
Force at Peak Upper Right Resultant	mm			-2.675	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

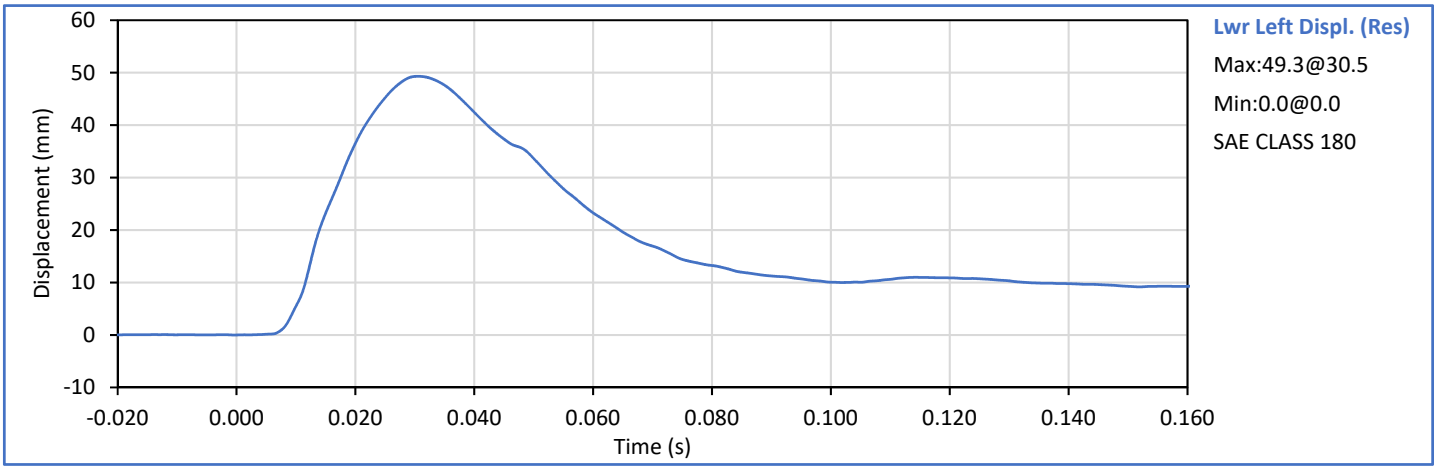
Approved By: P. Puzzuto

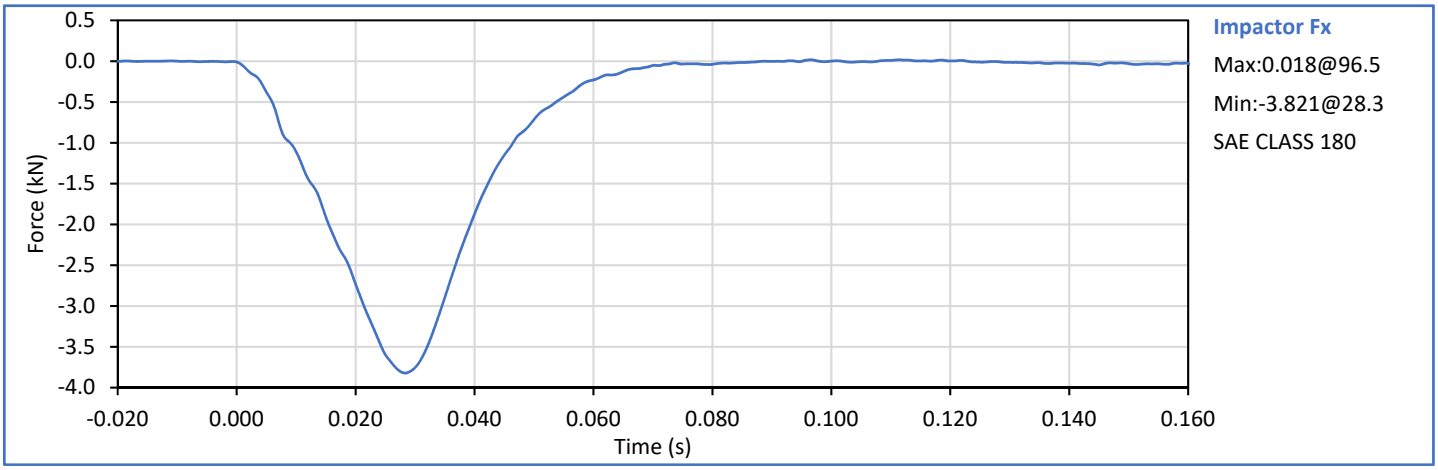
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Lower Left)

ATD Serial No.: DO9799 Test Date: 2020-11-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	35	Pass
Probe Velocity	m/sec	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.821	Pass
Lower Left Resultant Dx at Peak Fx	mm	45.8	56.0	48.7	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

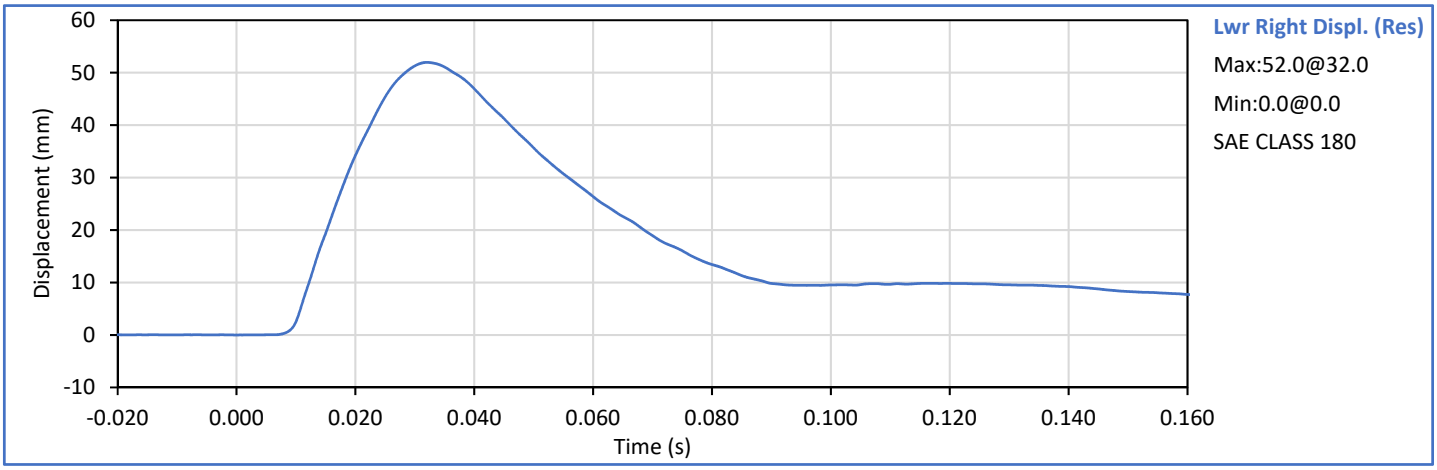
Approved By: P. Puzzuto

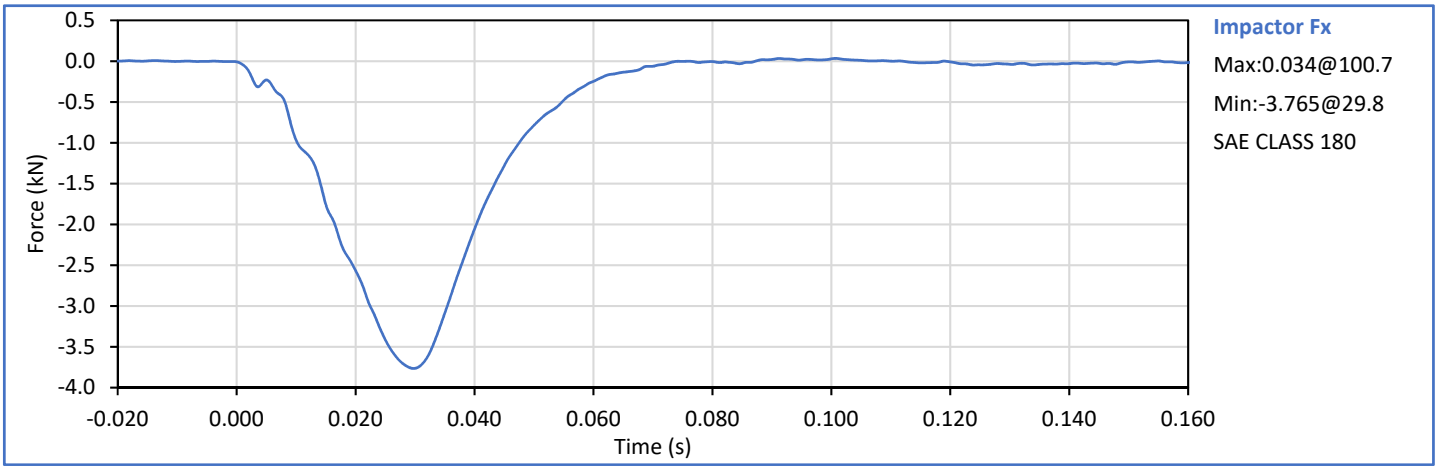
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Lower Right)

ATD Serial No.: DO9799 Test Date: 2020-11-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.765	Pass
Lower Right Resultant Dx at Peak Fx	mm	45.8	56.0	51.1	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

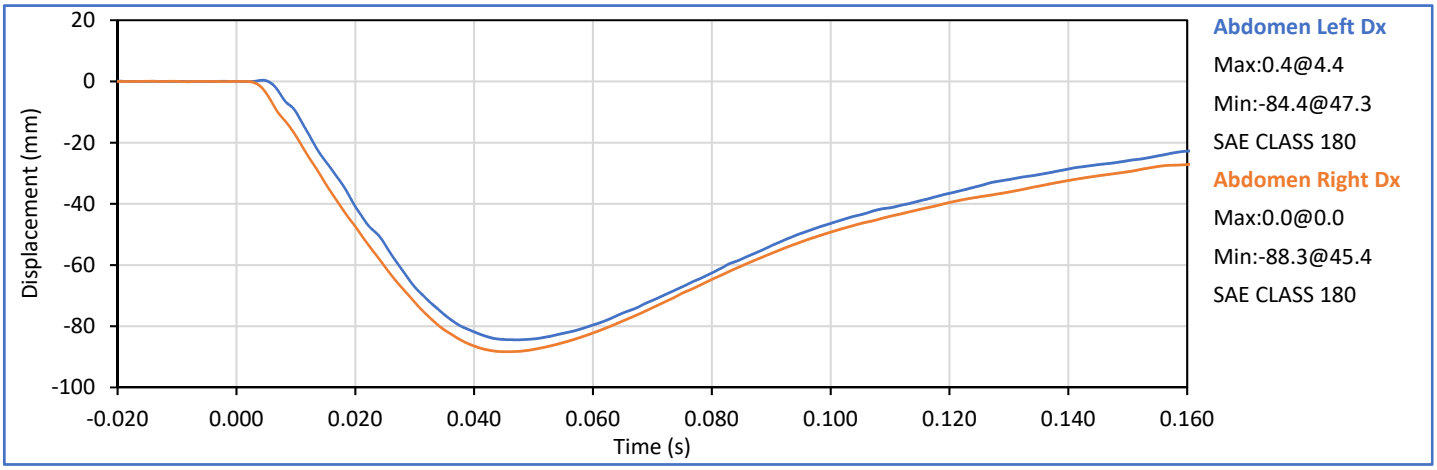
Approved By: P. Puzzuto

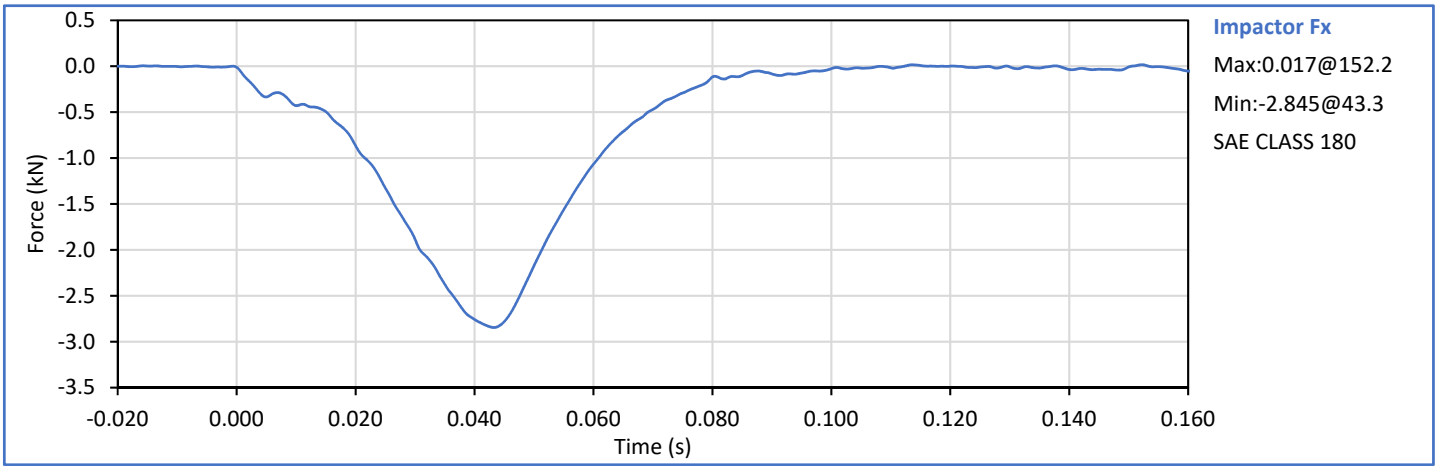
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Abdomen Qualificaion

ATD Serial No.: DO9799 Test Date: 2020-11-03

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	22	Pass
Probe Velocity	m/sec	3.25	3.35	3.32	Pass
Peak Probe Force	kN	-3.210	-2.626	-2.845	Pass
Lower Left Dx at Time of Peak Force	mm	-91.3	-74.7	-84.0	Pass
Lower Right Dx at Time of Peak Force	mm			-88.1	Pass
Absolute Difference of Left/Right Dx	mm	0.0	8.0	4.1	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

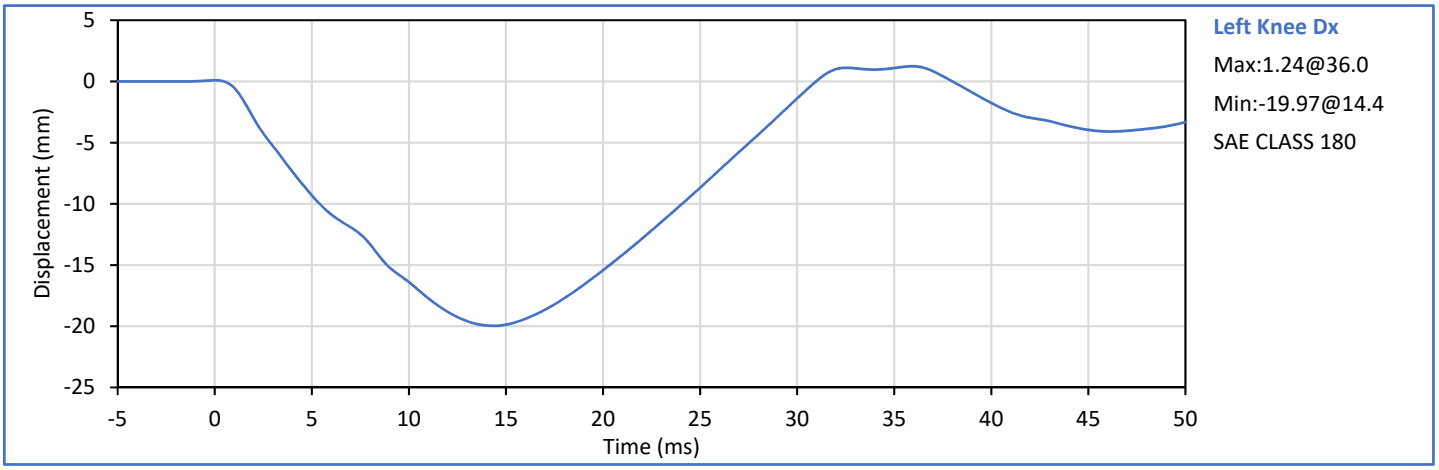
Approved By: P. Puzzuto

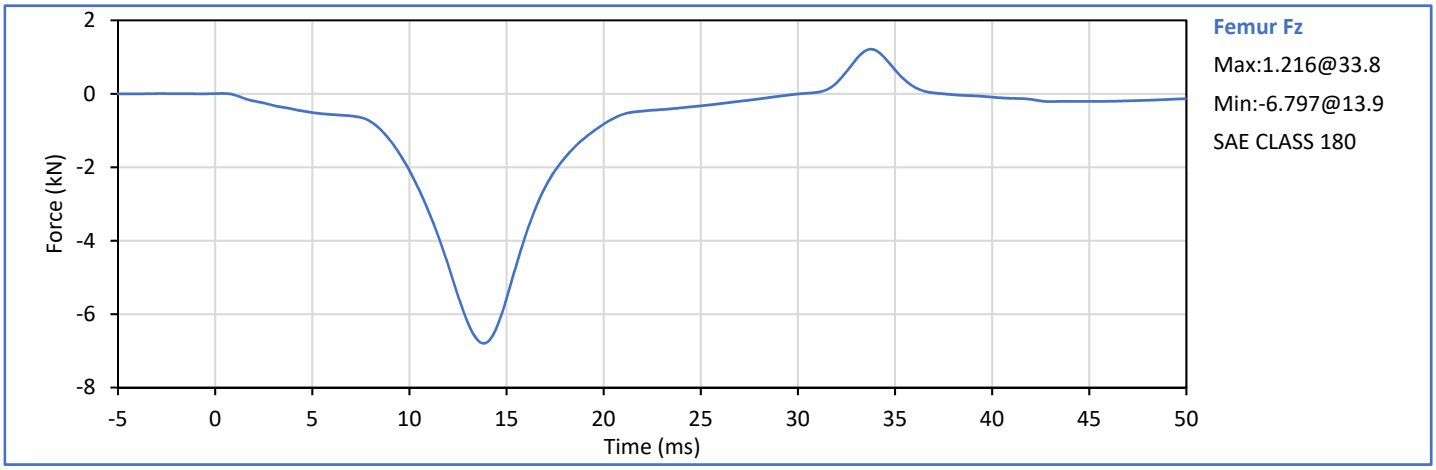
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Knee (Left) Qualification

ATD Serial No.: D09799 Test Date: 2020-11-05

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	2.15	2.25	2.24	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.797	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-19.90	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

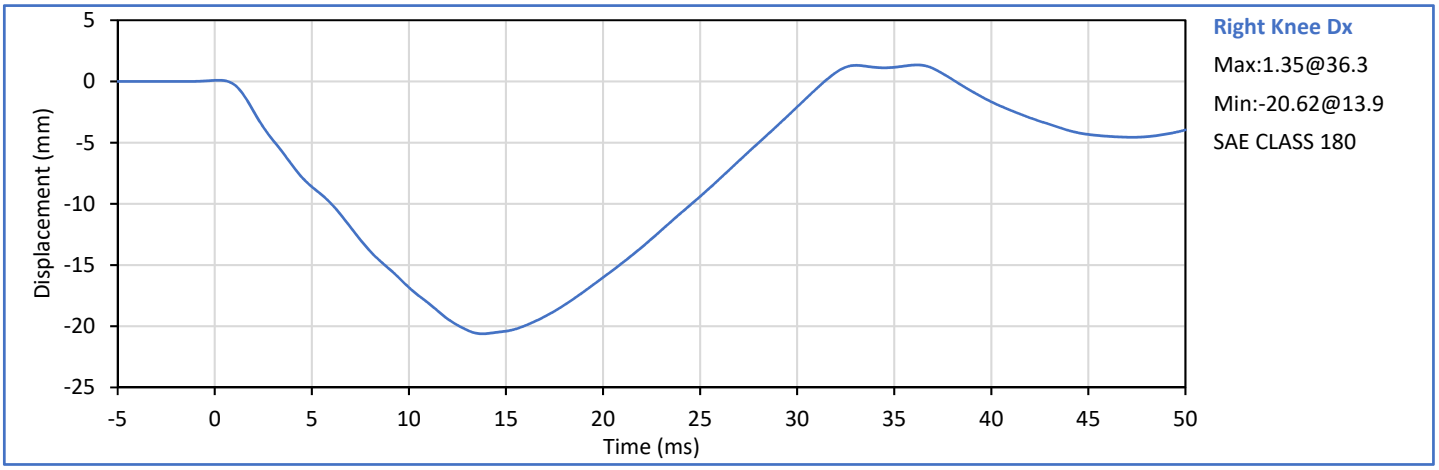
Approved By: P. Puzzuto

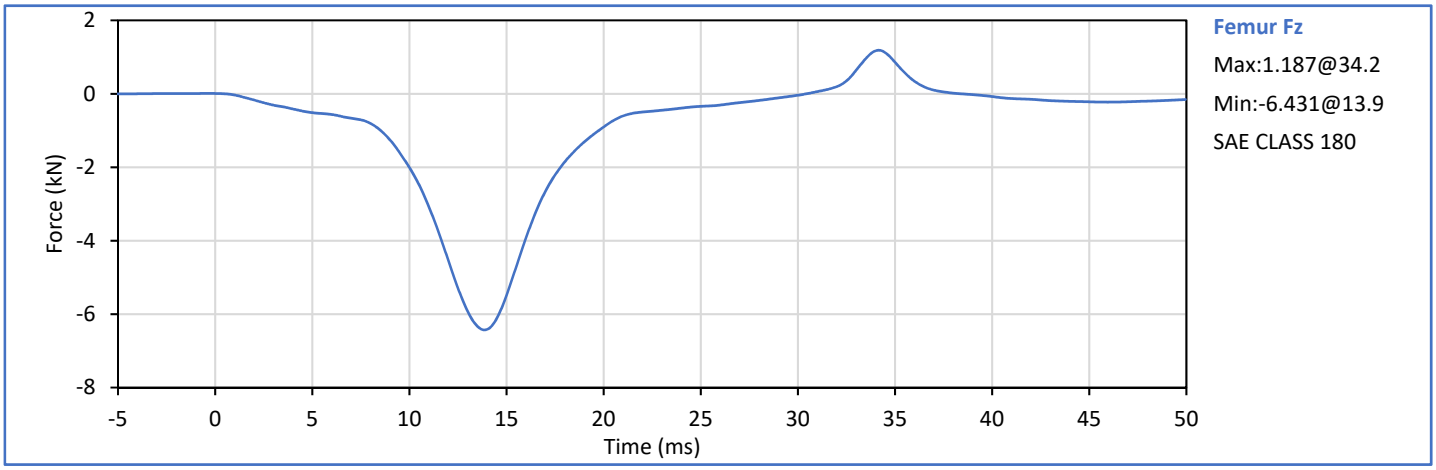
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Knee (Right) Qualification

ATD Serial No.: D09799 Test Date: 2020-11-04

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	2.15	2.25	2.23	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.431	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-20.62	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

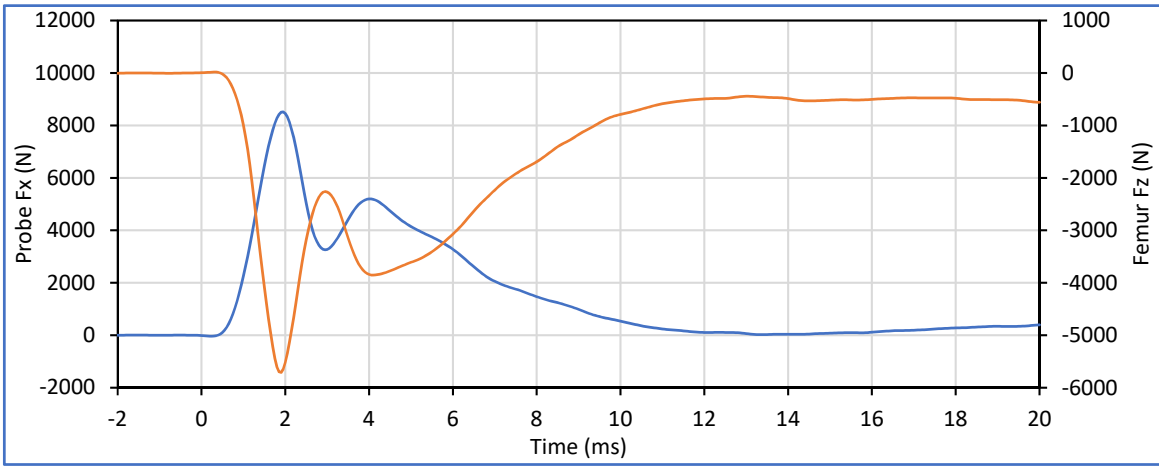
Applus IDIADA KARCO

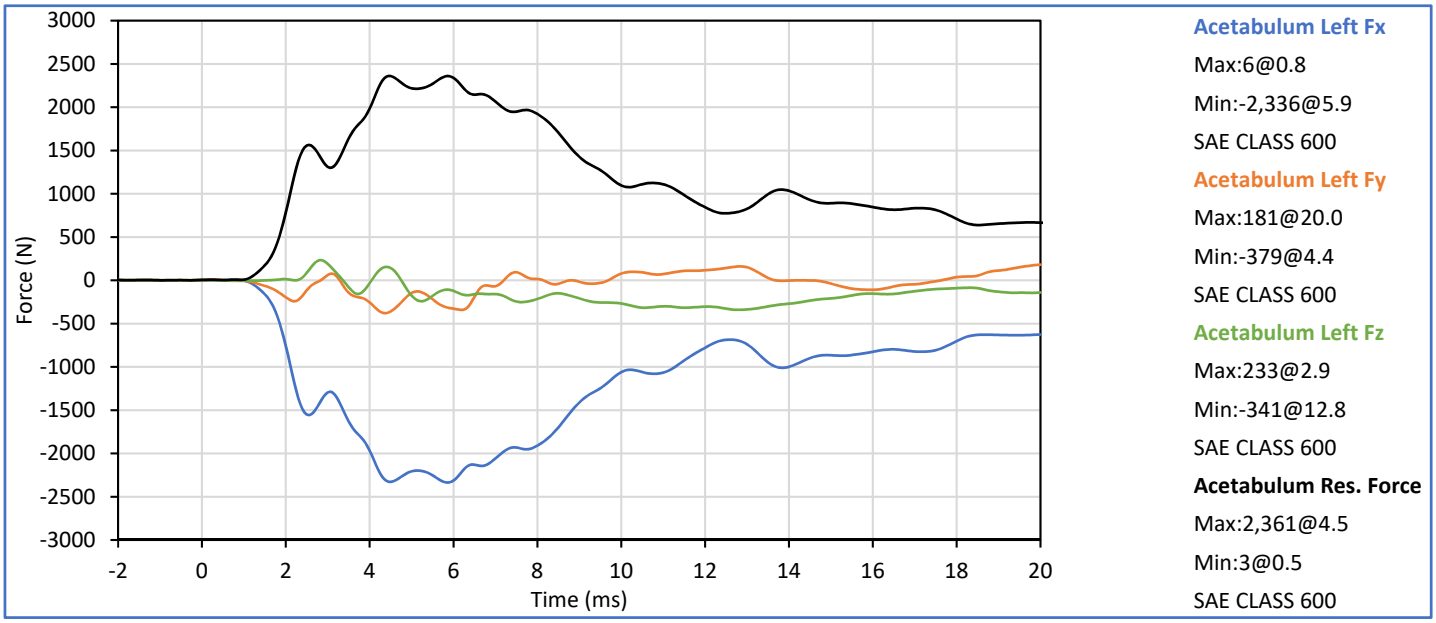
THOR-50M 50th Percentile Male ATD
Upper Leg (Left) Qualification
2020-11-04 TH D09799 Knee Left 001

ATD Serial No.: D09799 Test Date: 2020-11-04

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
Pendulum Velocity	m/s	3.25	3.35	3.33	Pass
Peak Probe Force	N	*	*	8,516	*
Peak Femur Fz	N	*	*	-5,709	*
Acetabulum Force Resultant	N	*	*	2,361	*
* Research data. No defined P/F corridor			Overall Test Results		Pass

Research Data Only
Upper Leg Qualification - DRAFT 2020-03-12





Technician: J. Hernandez

Approved By: P. Puzzuto

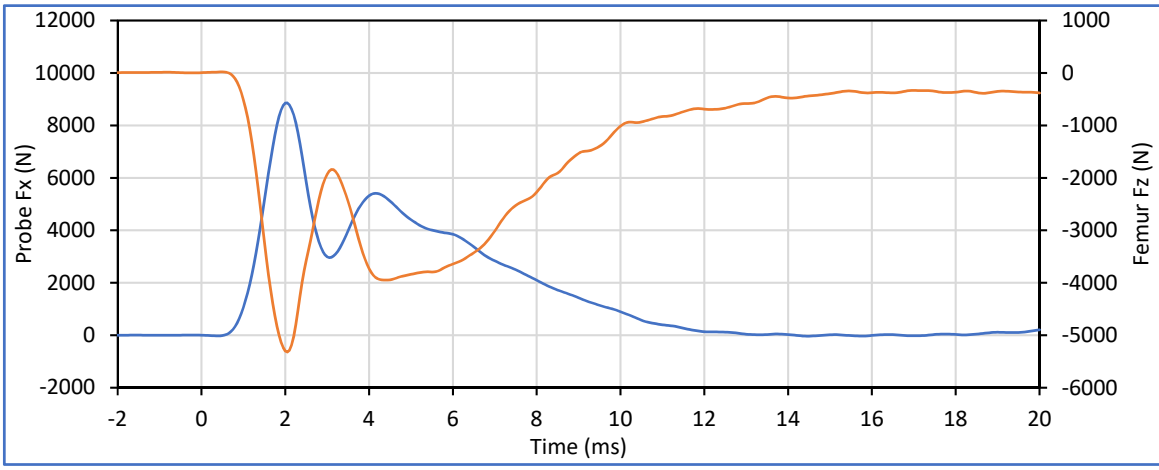
Applus IDIADA KARCO

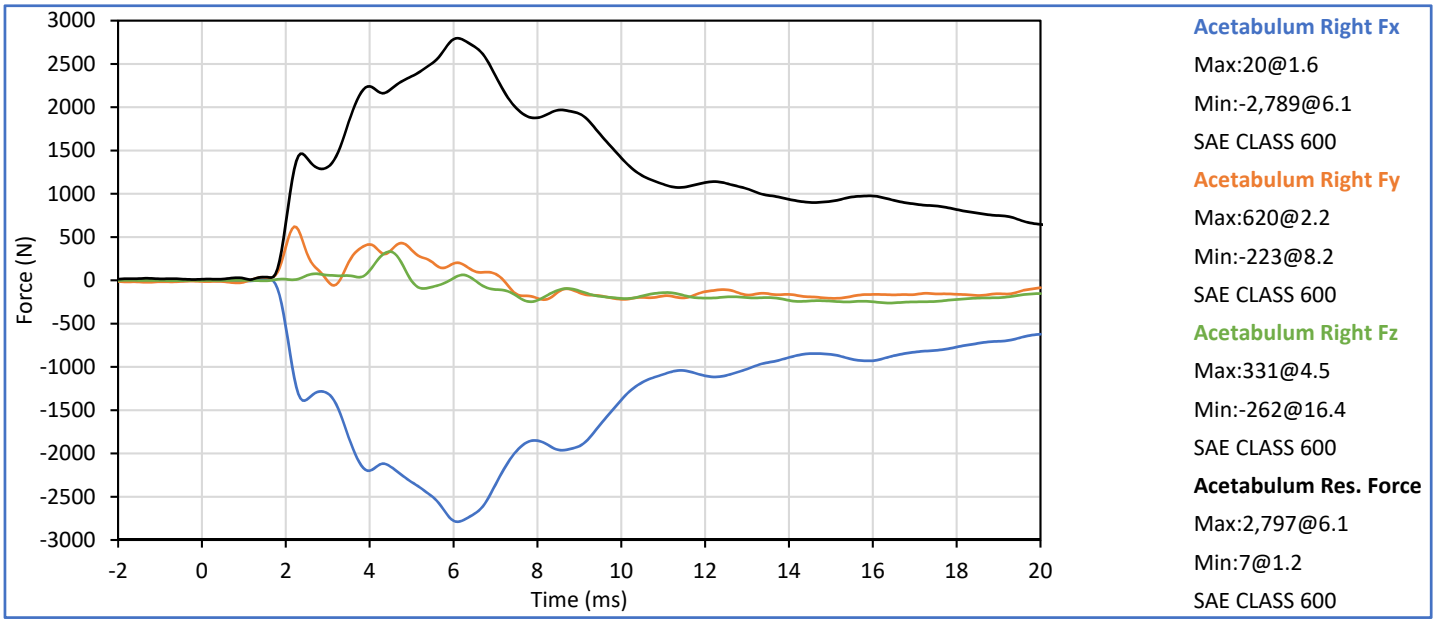
THOR-50M 50th Percentile Male ATD
Upper Leg (Right) Qualification
2020-11-04 TH D09799 Knee Right 001

ATD Serial No.: D09799 Test Date: 2020-11-04

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
Pendulum Velocity	m/s	3.25	3.35	3.31	Pass
Peak Probe Force	N	*	*	8,856	*
Peak Femur Fz	N	*	*	-5,320	*
Acetabulum Force Resultant	N	*	*	2,797	*
* Research data. No defined P/F corridor			Overall Test Results		Pass

Research Data Only
Upper Leg Qualification - DRAFT 2020-03-12





Technician: J. Hernandez

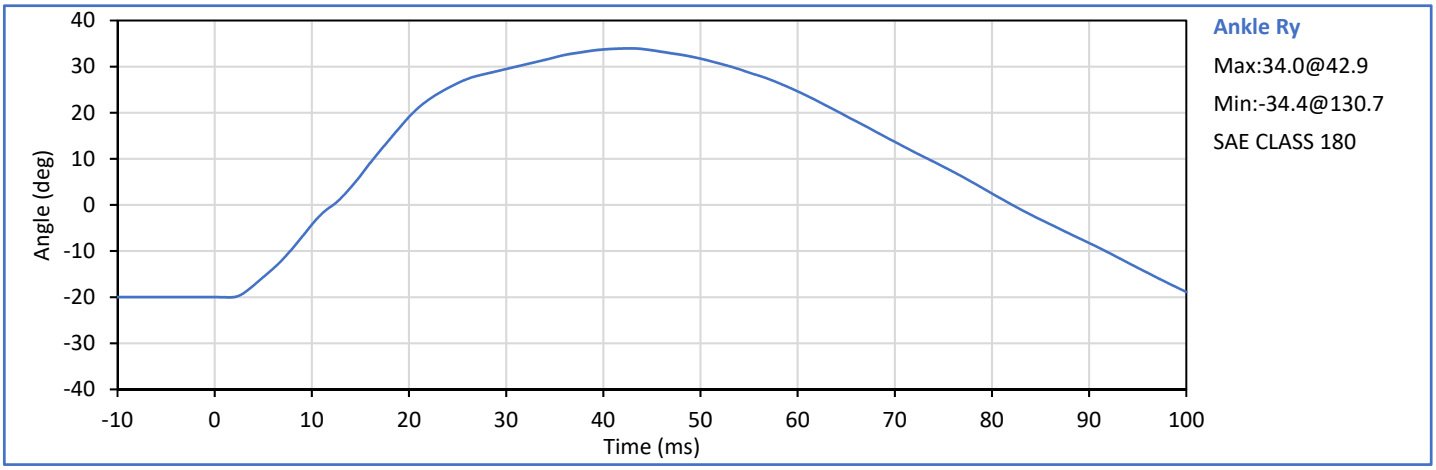
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ball of Foot (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	15	Pass
Pendulum Velocity	m/s	4.95	5.05	5.03	Pass
Peak Ankle Ry	deg	30.4	37.2	34.0	Pass
Peak Ankle Resistive Moment	Nm	49.8	60.8	55.5	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-2.934	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



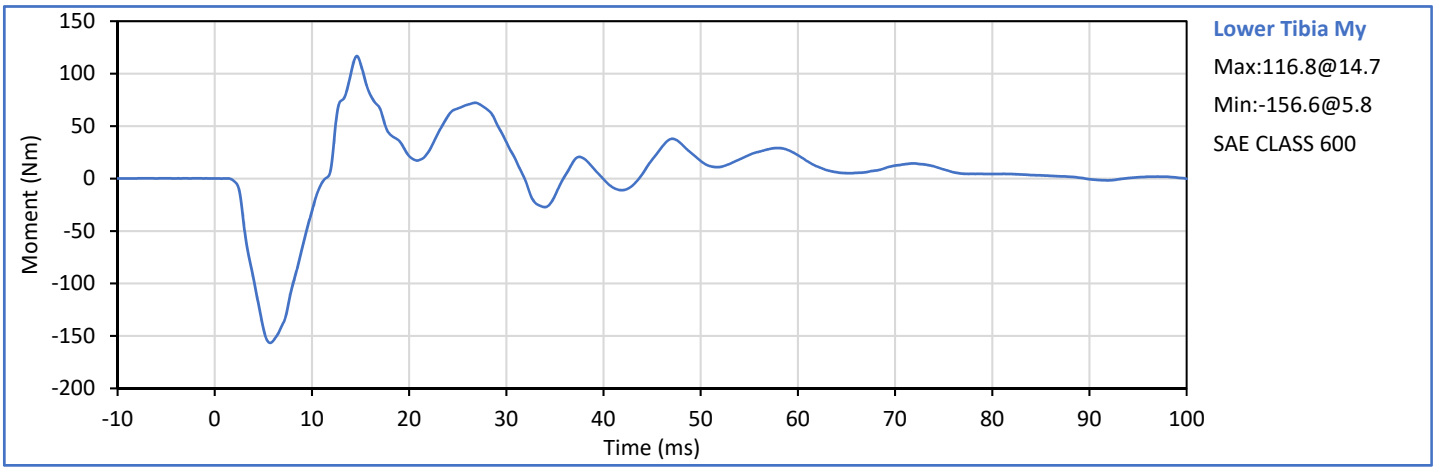
Technician: J. Hernandez

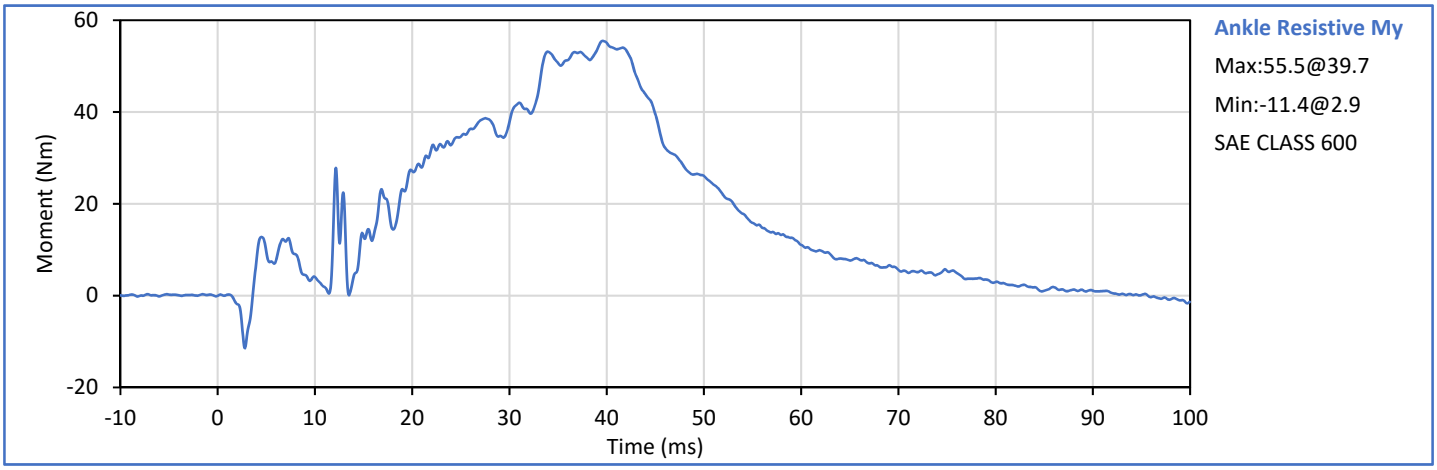
Approved By: P. Puzzuto

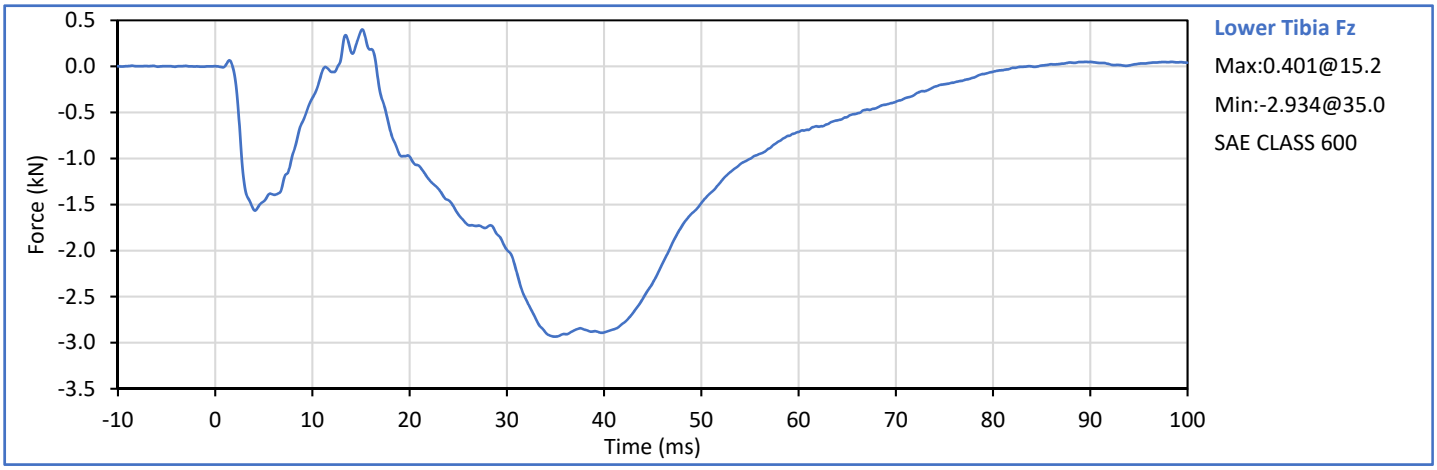
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ball of Foot (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11







Technician: J. Hernandez

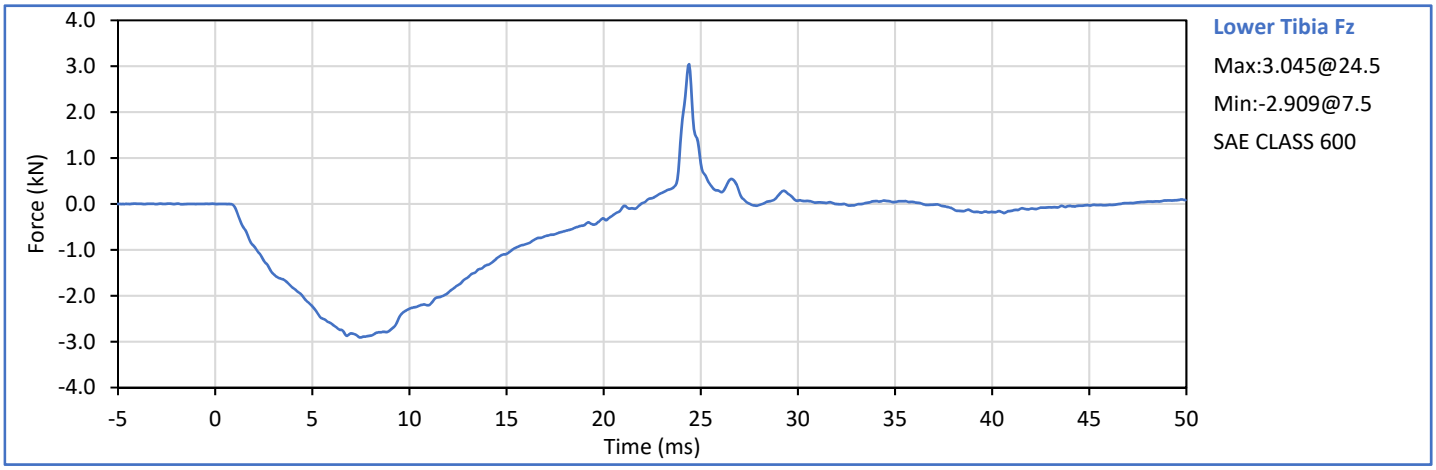
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Heel of Foot (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	15	Pass
Pendulum Velocity	m/s	3.95	4.05	3.96	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-2.909	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

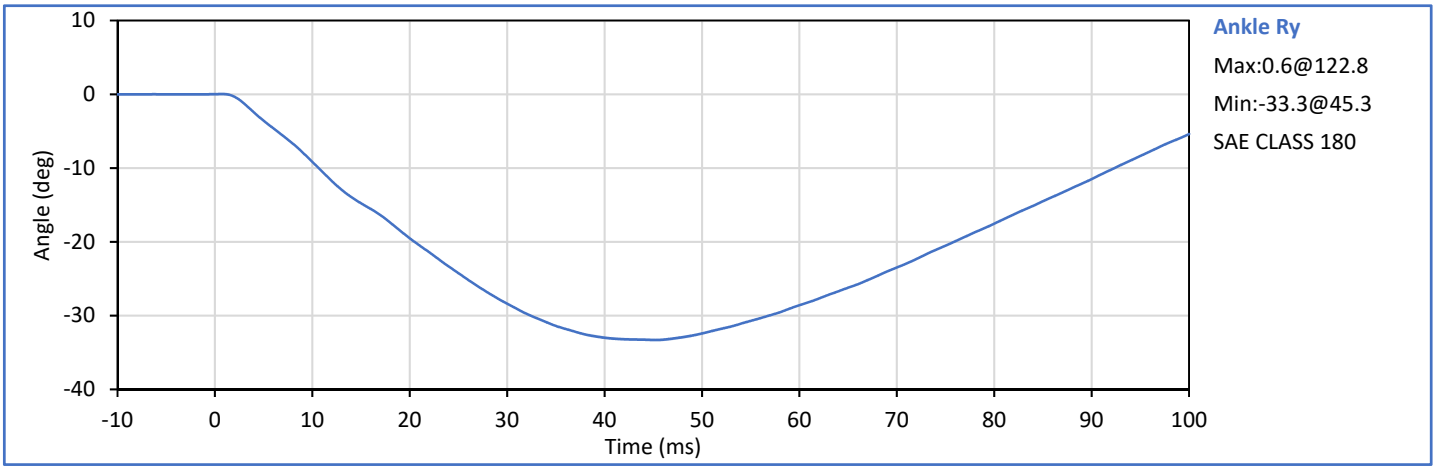
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ankle Inversion (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

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	20	Pass
Pendulum Velocity	m/s	1.95	2.05	2.01	Pass
Peak Ankle Rx	deg	-37.9	-31.0	-33.3	Pass
Peak Ankle Resistive Mx	Nm	-43.0	-35.2	-37.3	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.535	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

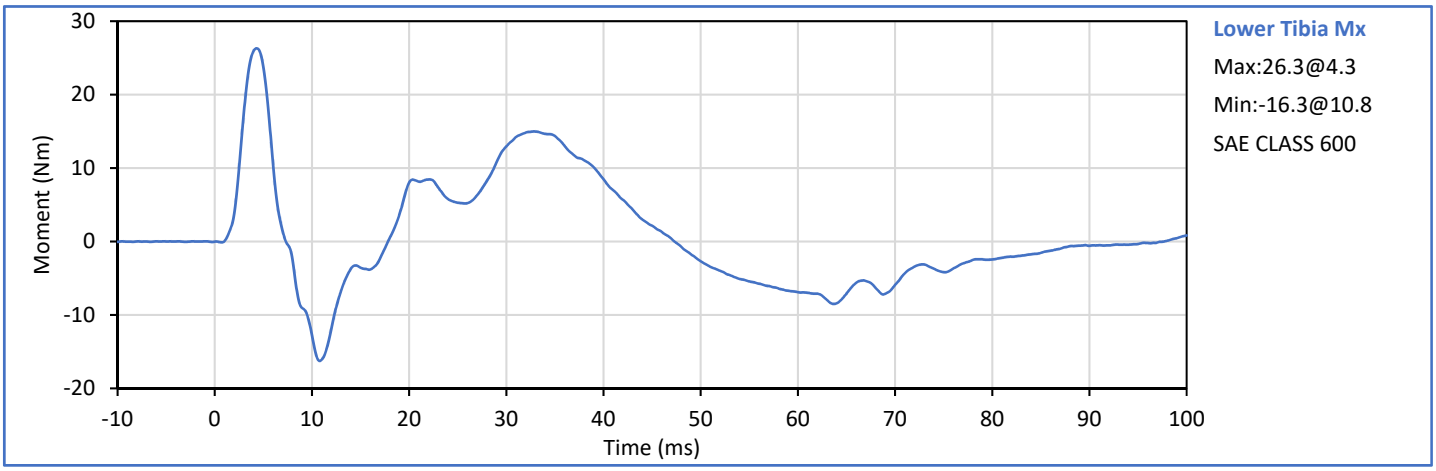
Approved By: P. Puzzuto

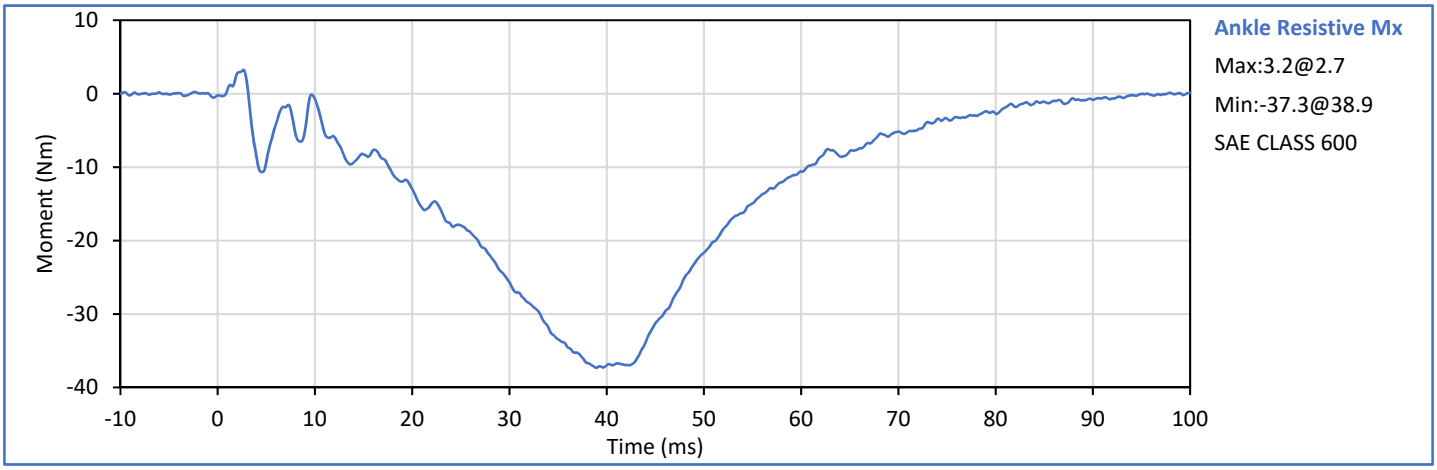
Applus IDIADA KARCO

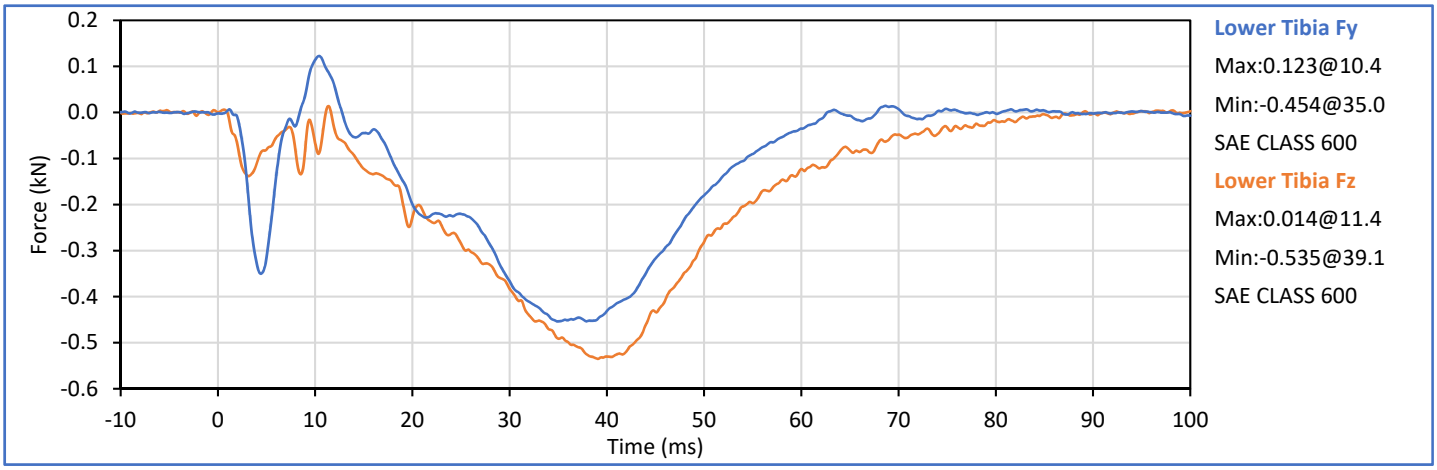
THOR-50M 50th Percentile Male ATD
Ankle Inversion (Left) Qualification

ATD Serial No.: DO9799

Test Date: 2020-12-11







Technician: J. Hernandez

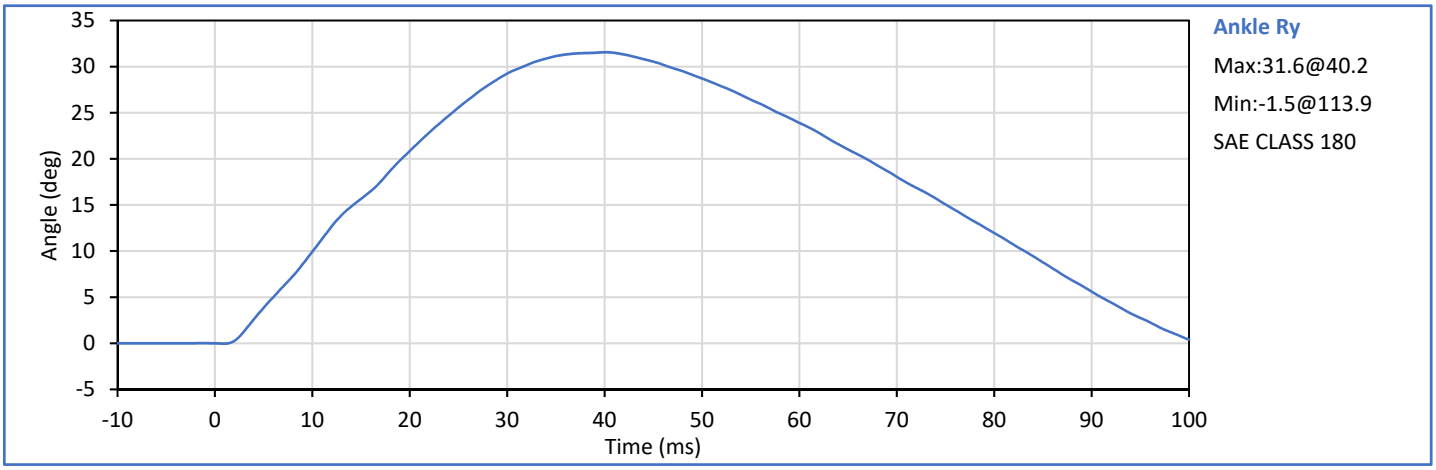
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ankle Eversion (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	15	Pass
Pendulum Velocity	m/s	1.95	2.05	2.01	Pass
Peak Ankle Rx	deg	26.6	32.5	31.6	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	39.2	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.572	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

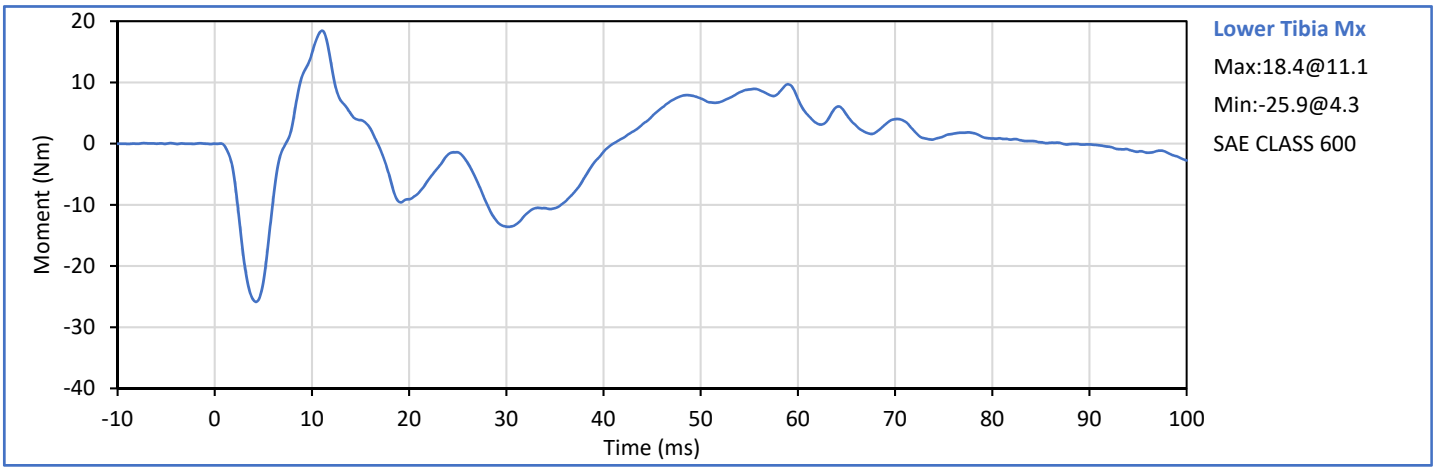
Approved By: P. Puzzuto

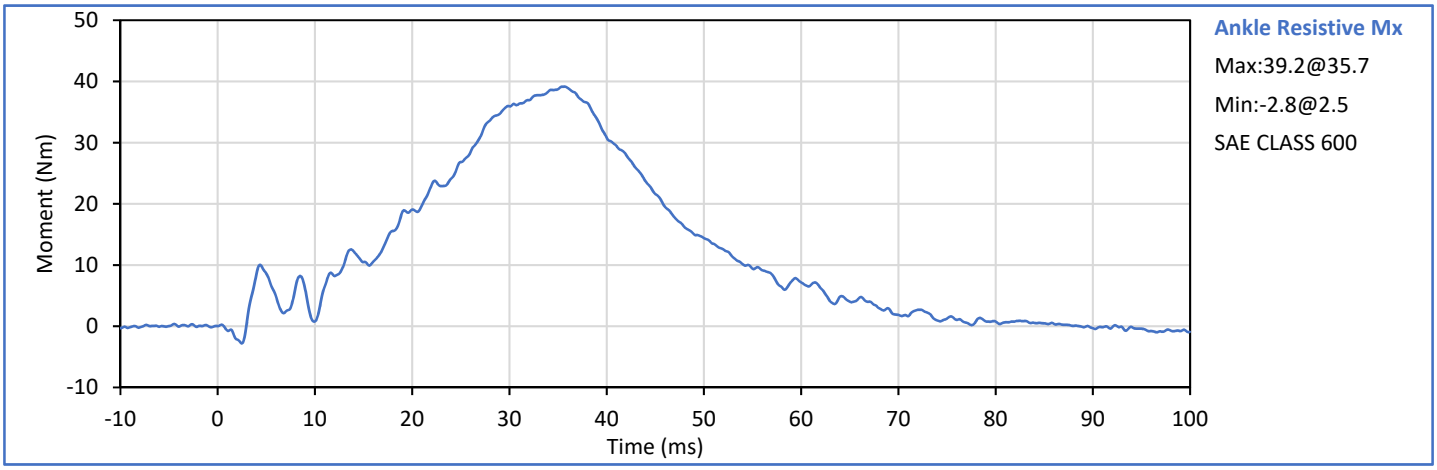
Applus IDIADA KARCO

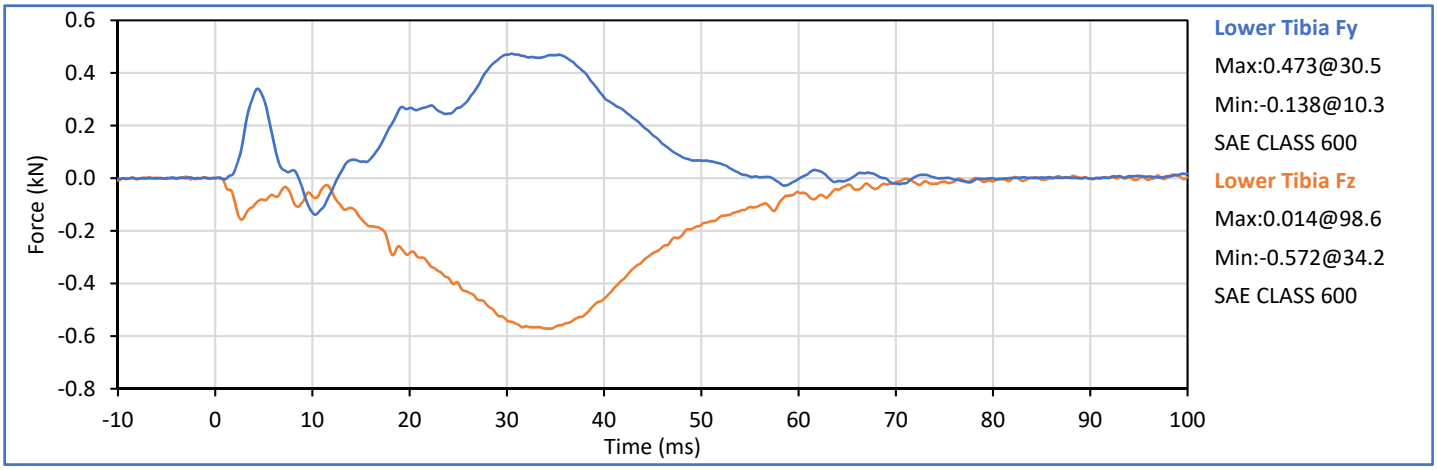
THOR-50M 50th Percentile Male ATD
Ankle Eversion (Left) Qualification

ATD Serial No.: DO9799

Test Date: 2020-12-11







Technician: J. Hernandez

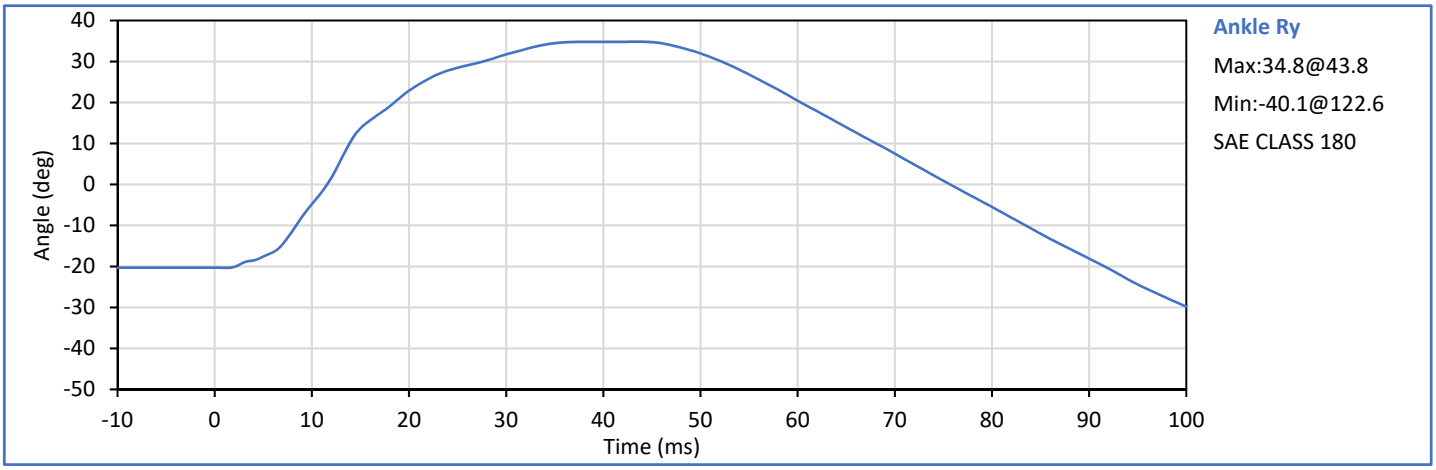
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ball of Foot (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Relative Humidity	%	10	70	13	Pass
Pendulum Velocity	m/s	4.95	5.05	5.00	Pass
Peak Ankle Ry	deg	30.4	37.2	34.8	Pass
Peak Ankle Resistive Moment	Nm	49.8	60.8	56.7	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-3.122	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

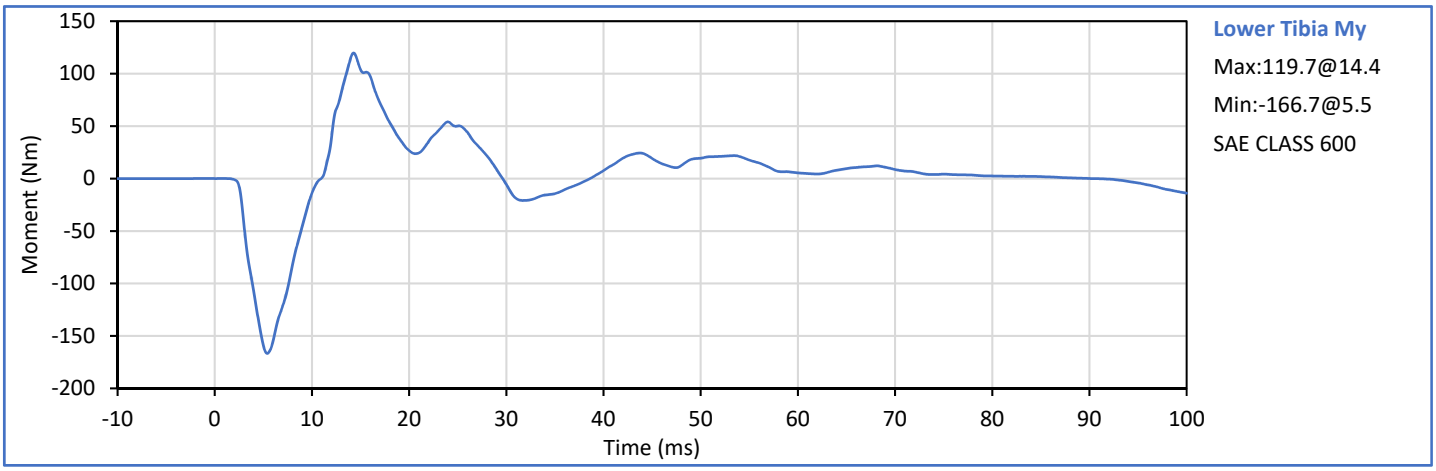
Approved By: P. Puzzuto

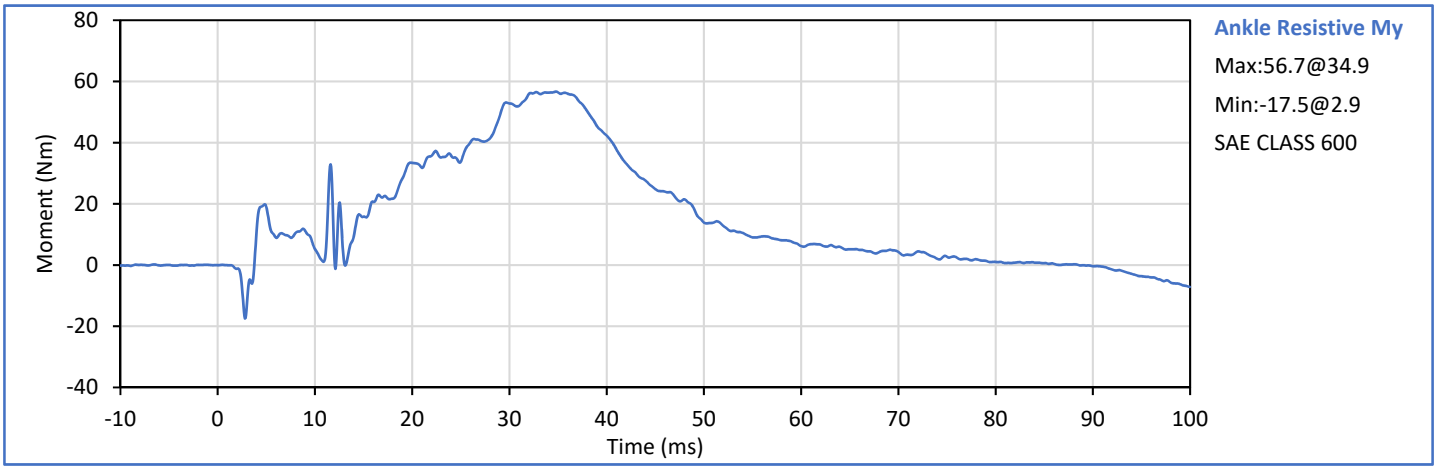
Applus IDIADA KARCO

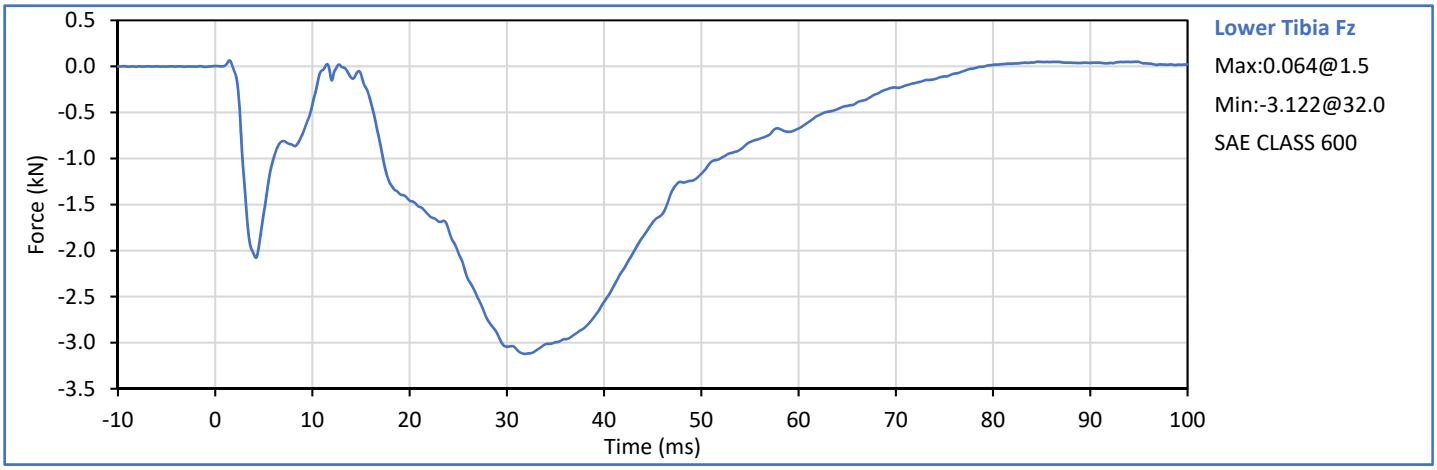
THOR-50M 50th Percentile Male ATD
Ball of Foot (Left) Qualification

ATD Serial No.: DO9799

Test Date: 2020-12-11







Technician: J. Hernandez

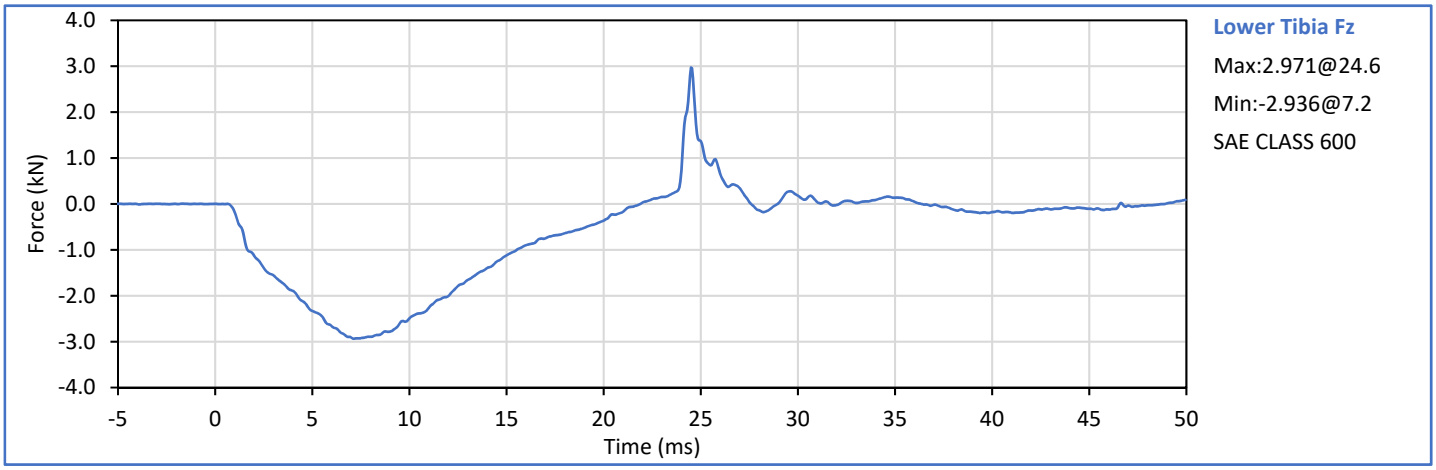
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Heel of Foot (Left) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

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	17	Pass
Pendulum Velocity	m/s	3.95	4.05	4.02	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-2.936	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

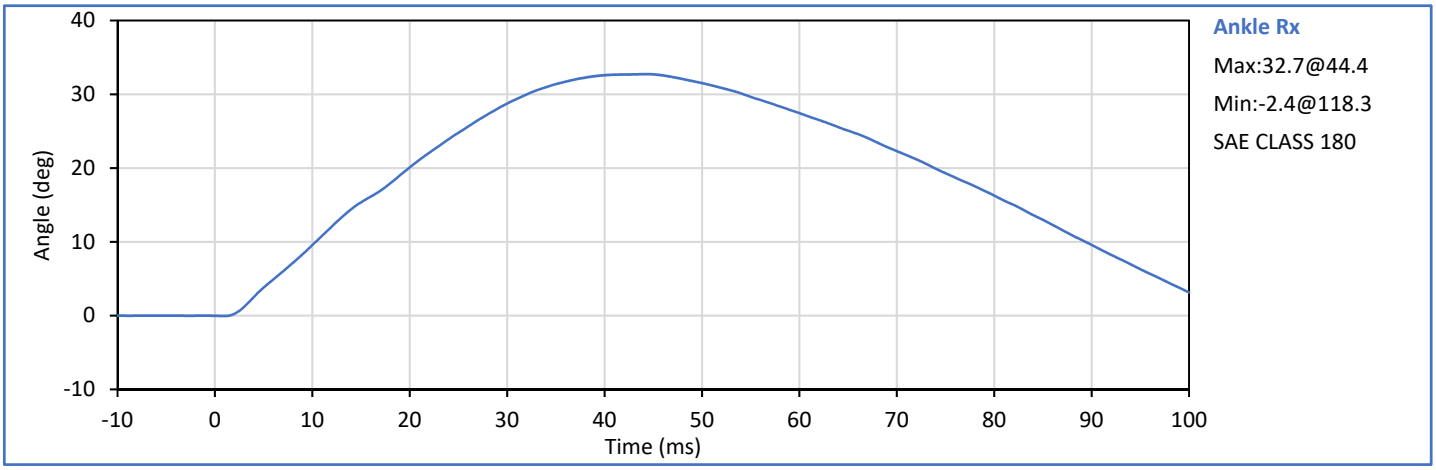
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ankle Inversion (Right) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

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	15	Pass
Pendulum Velocity	m/s	1.95	2.05	2.01	Pass
Peak Ankle Rx	deg	31.0	37.9	32.7	Pass
Peak Ankle Resistive Mx	Nm	35.2	43.0	40.3	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.531	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

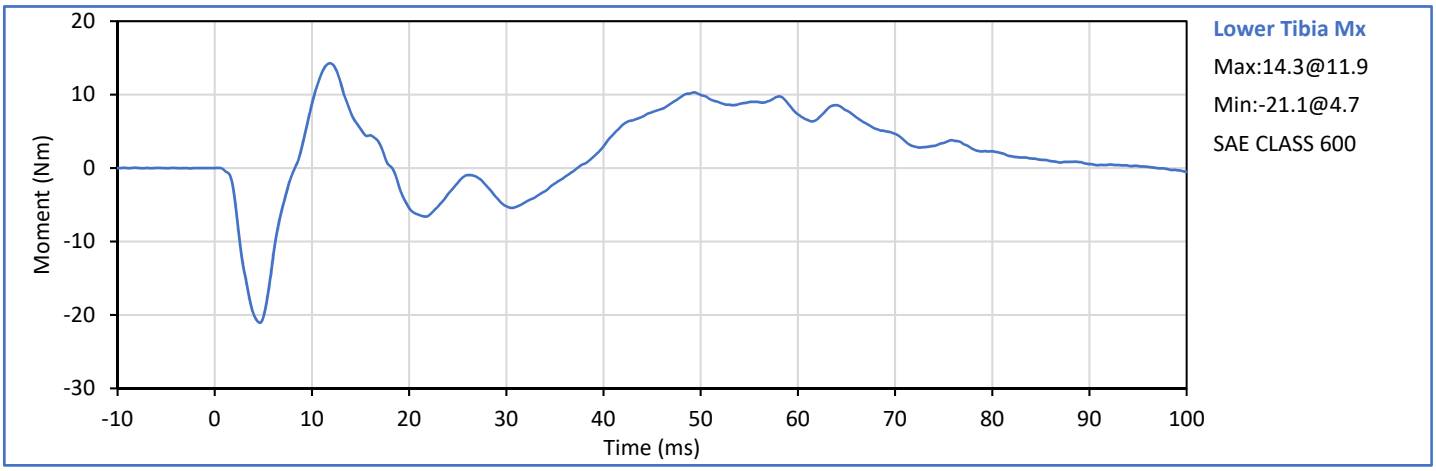
Approved By: P. Puzzuto

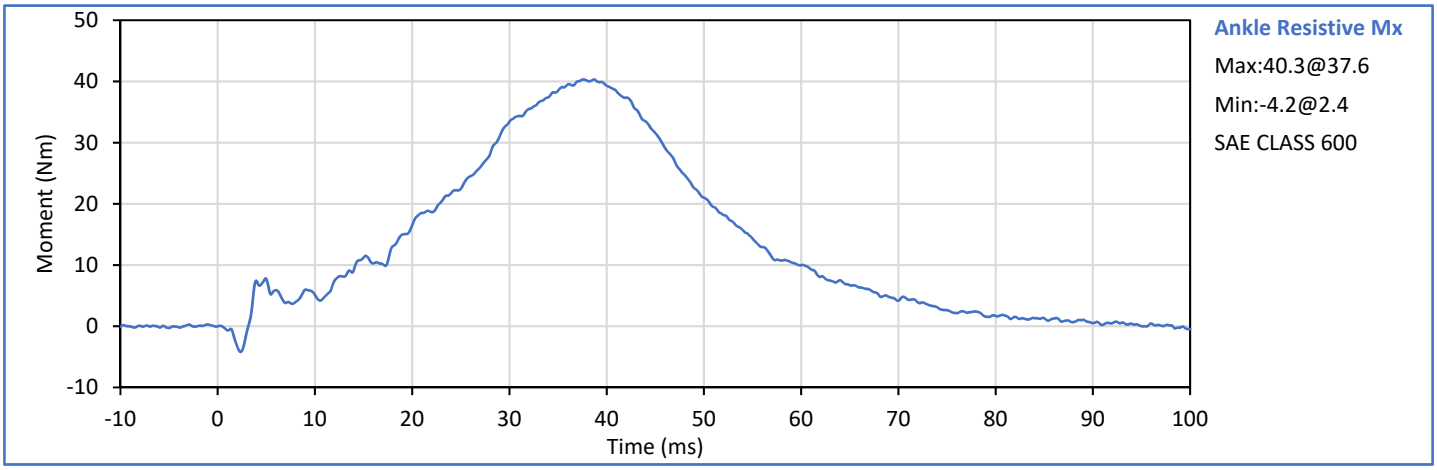
Applus IDIADA KARCO

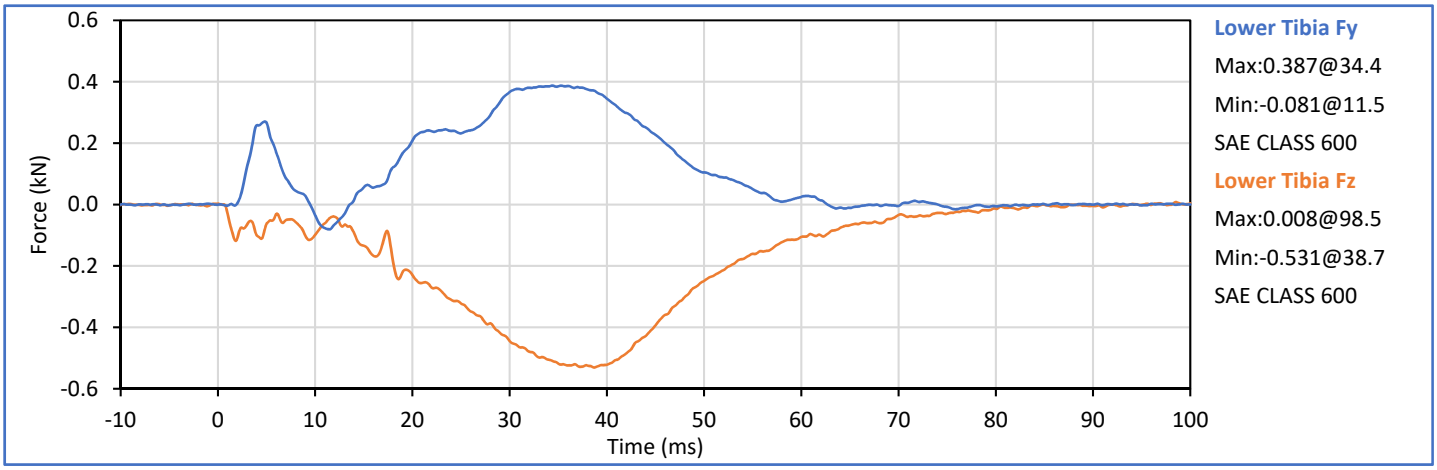
THOR-50M 50th Percentile Male ATD
Ankle Inversion (Right) Qualification

ATD Serial No.: DO9799

Test Date: 2020-12-11







Technician: J. Hernandez

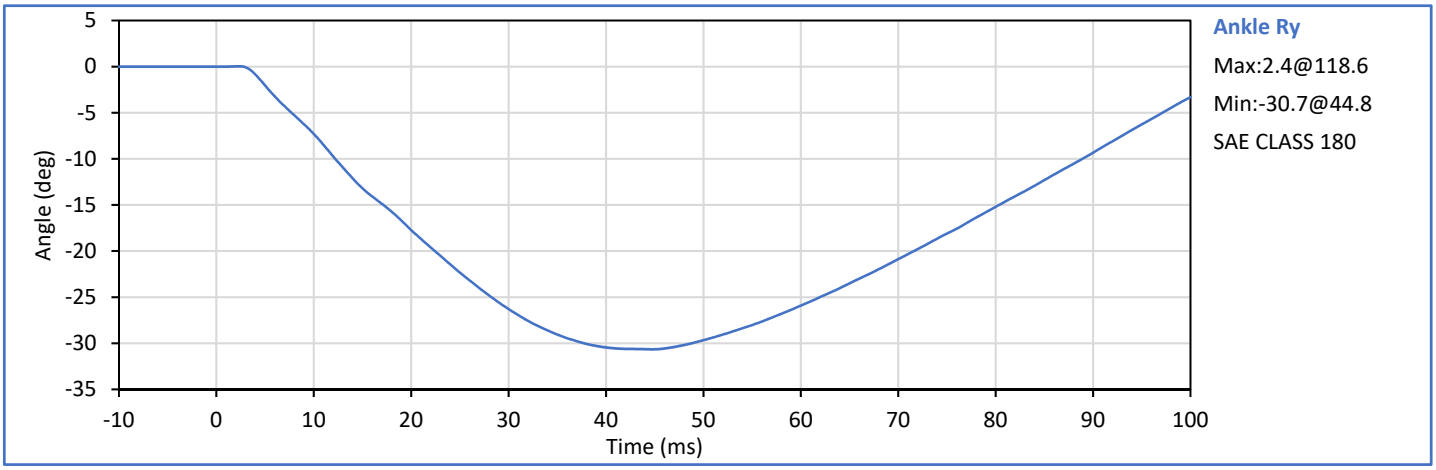
Approved By: P. Puzzuto

Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Ankle Eversion (Right) Qualification

ATD Serial No.: DO9799 Test Date: 2020-12-11

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	15	Pass
Pendulum Velocity	m/s	1.95	2.05	2.01	Pass
Peak Ankle Rx	deg	26.6	32.5	30.7	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	46.3	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.610	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

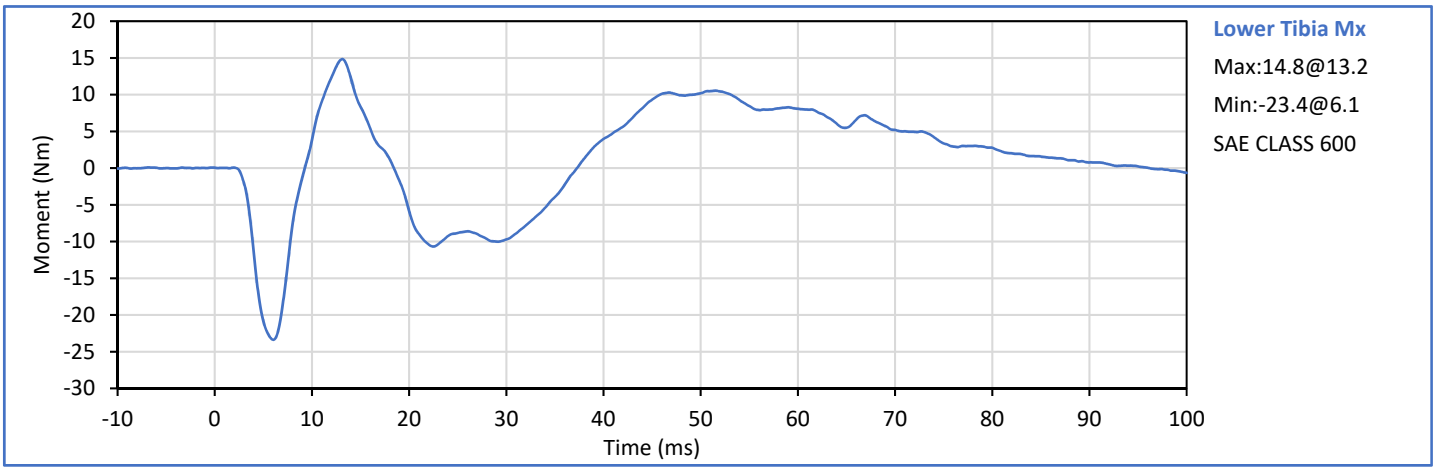
Approved By: P. Puzzuto

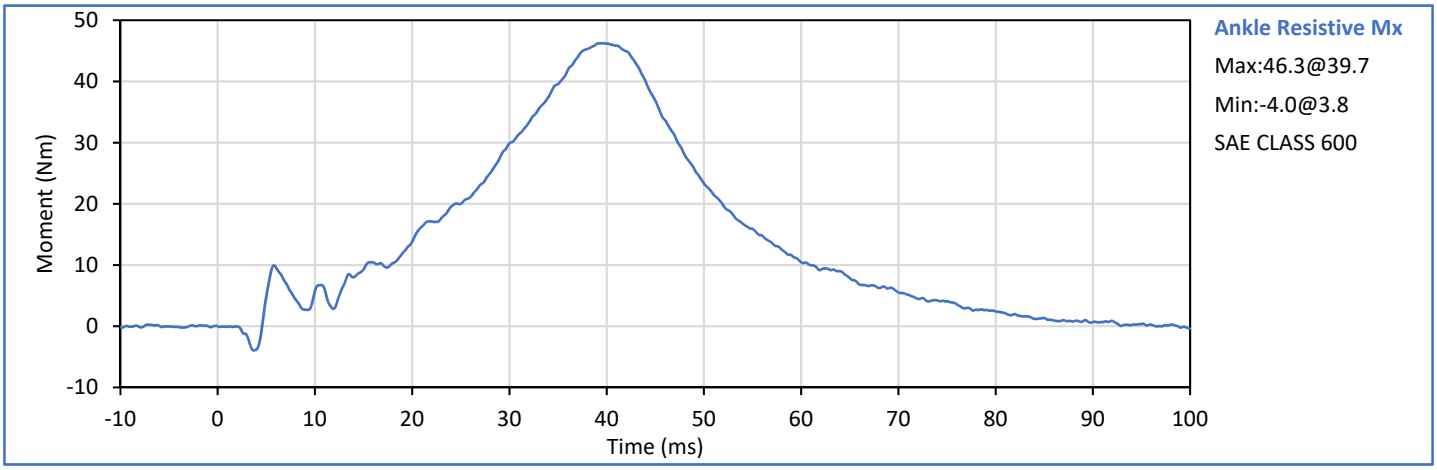
Applus IDIADA KARCO

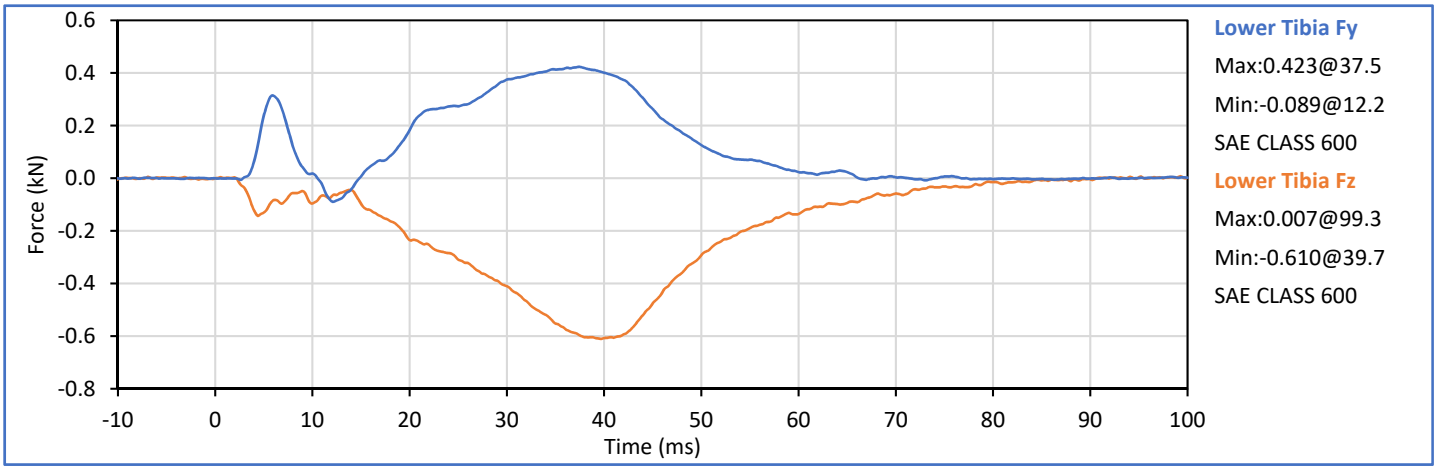
THOR-50M 50th Percentile Male ATD
Ankle Eversion (Right) Qualification

ATD Serial No.: DO9799

Test Date: 2020-12-11







Technician: J. Hernandez

Approved By: P. Puzzuto

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

Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
ATD Damage Checklist

ATD Serial No.: 168 Test Date: 2020-10-23

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

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician: J. Hernandez

Approved By: P. Puzzuto

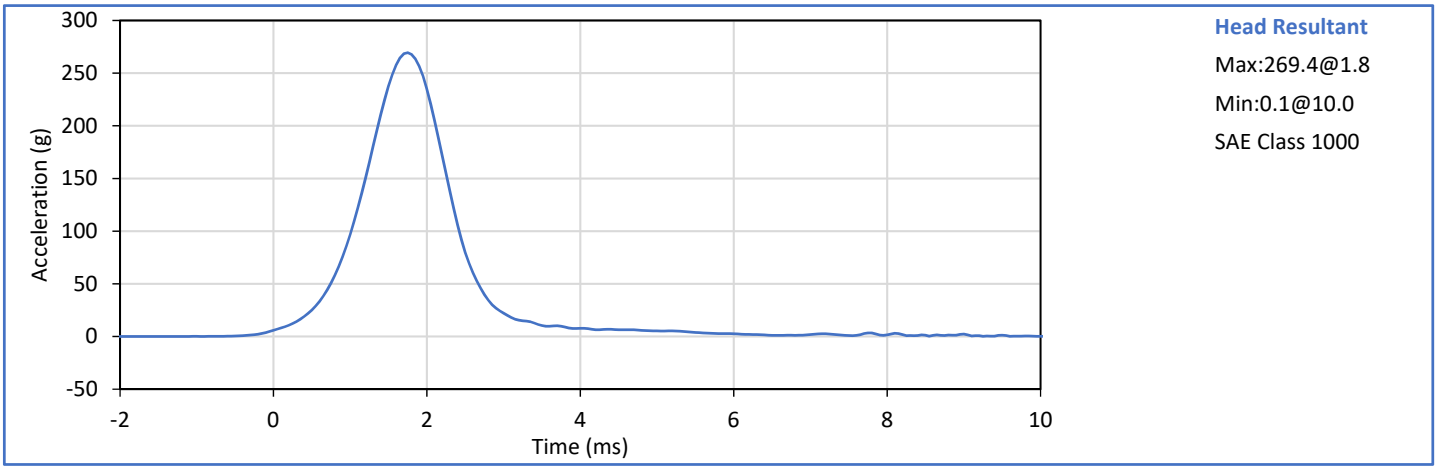
Applus IDIADA
KARCO

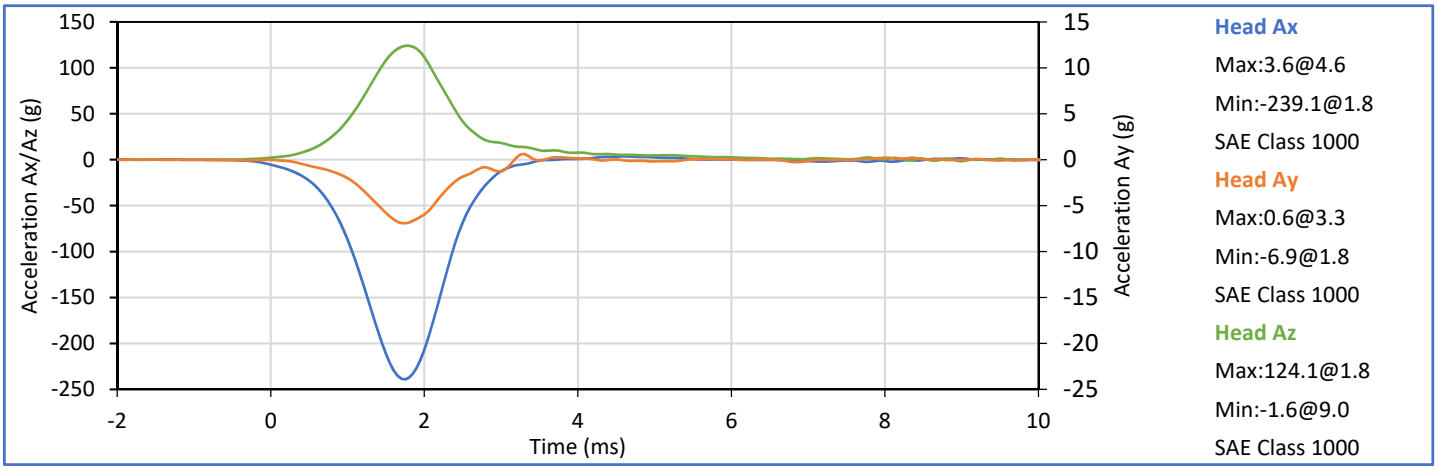
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 168

Test Date: 2020-10-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	225.0	275.0	269.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-6.9	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

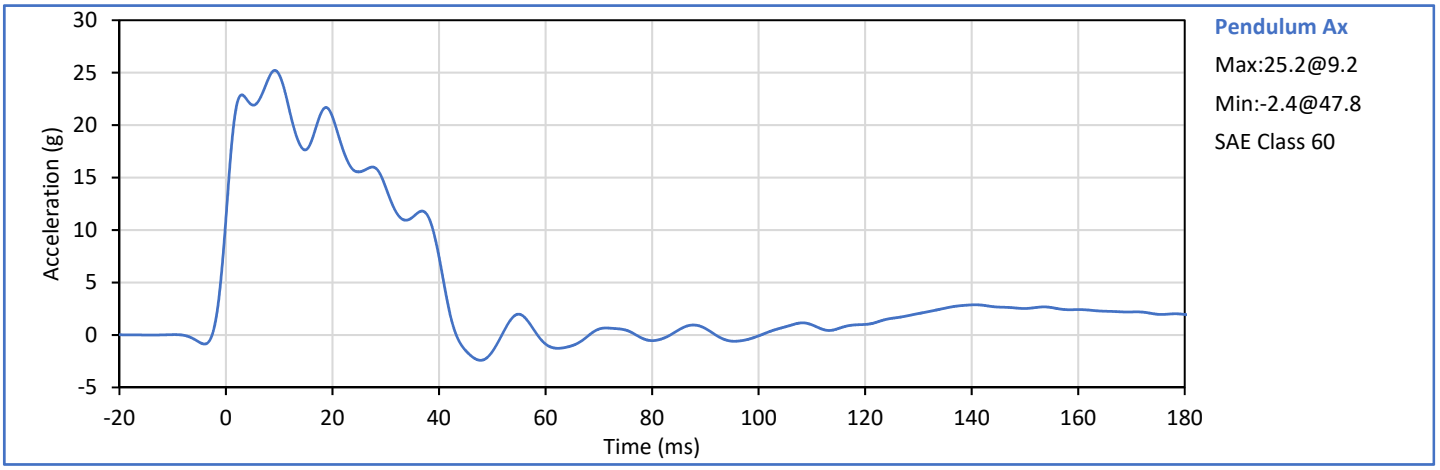
Approved By: P. Puzzuto

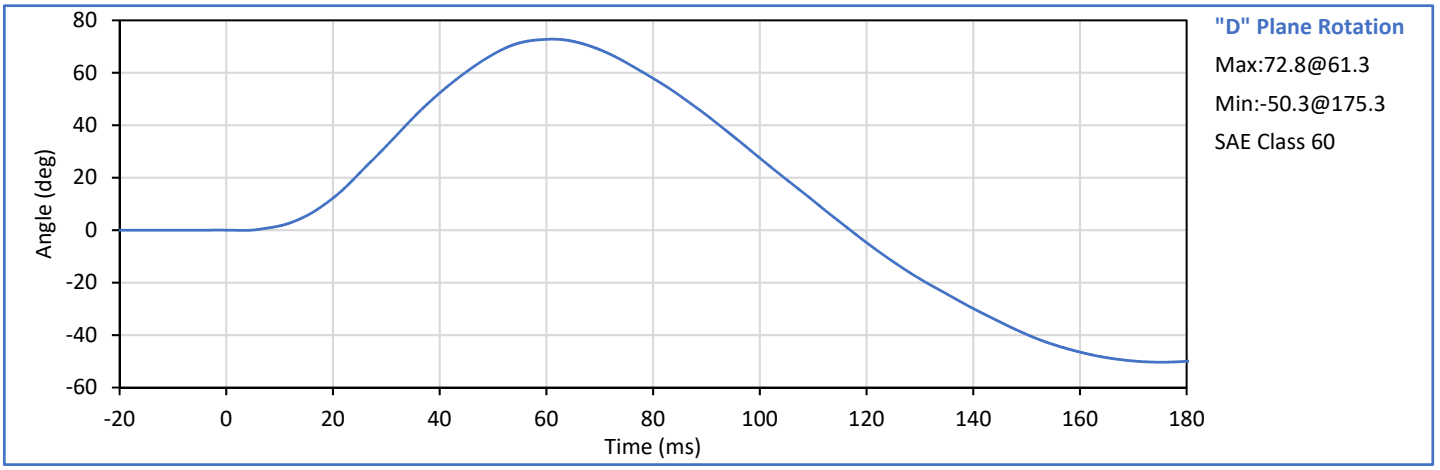
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-10-26

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Relative Humidity	%	10	70	21	Pass
Pendulum Velocity	m/s	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.8	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	20.8	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	14.1	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	14.1	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	40.9	Pass
"D" Plane Rotation peak	deg	64.0	78.0	72.8	Pass
	ms	57.0	64.0	61.3	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	117.0	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	97.6	Pass
	ms	47.0	58.0	54.6	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	101.7	Pass
			Overall Test Results		Pass



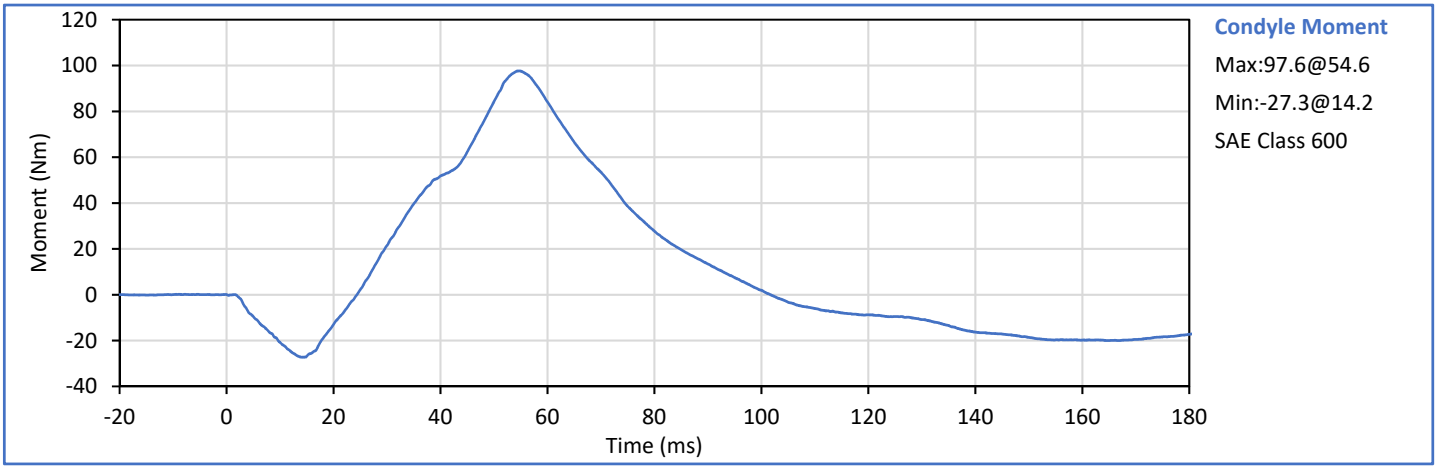


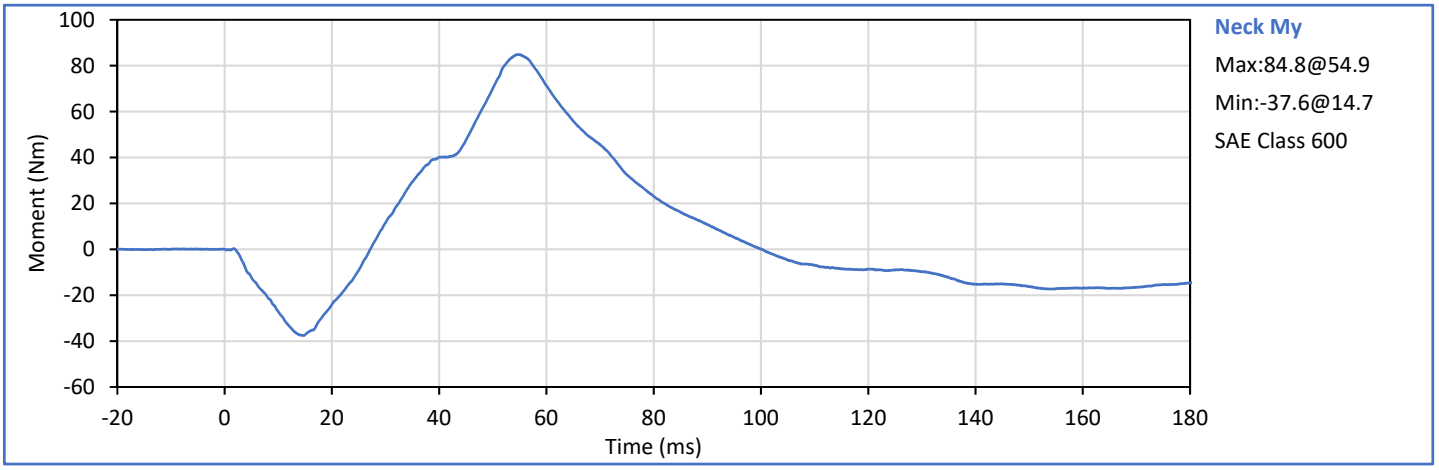
Technician: J. Hernandez

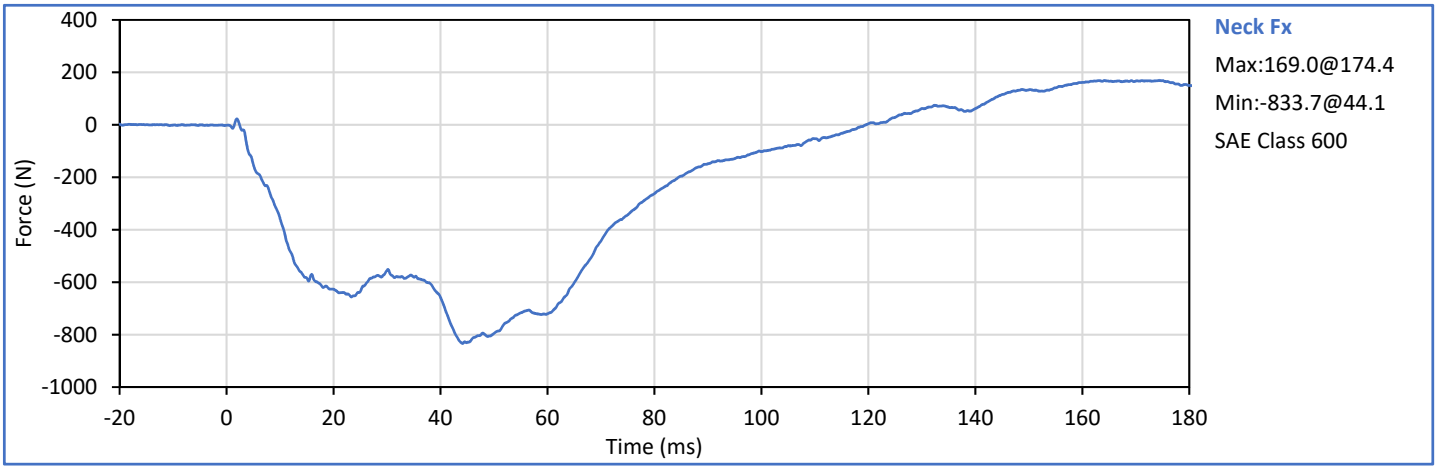
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-10-26





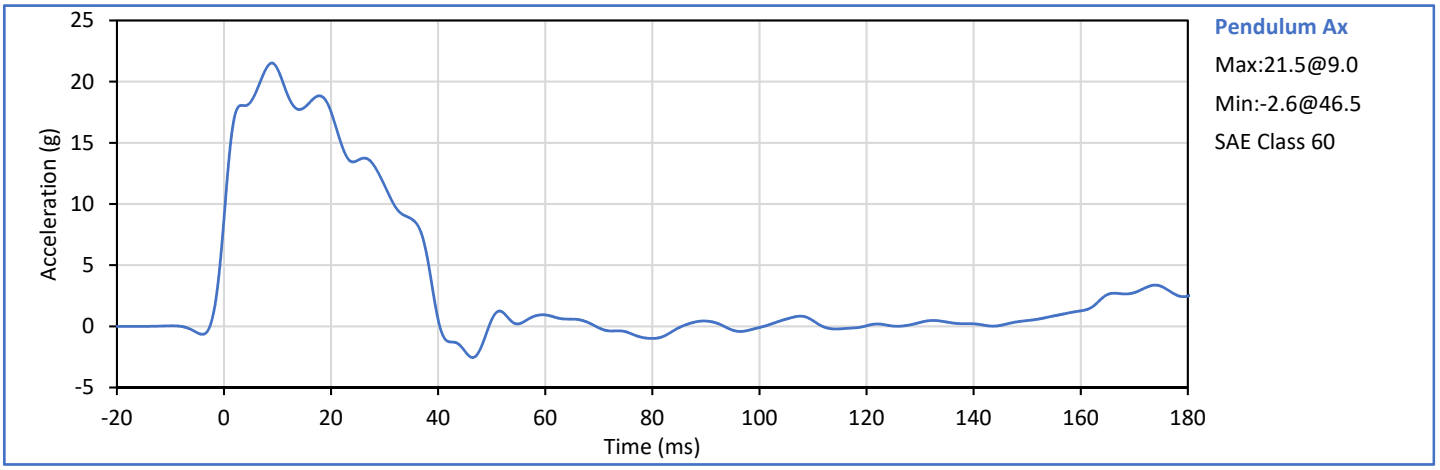


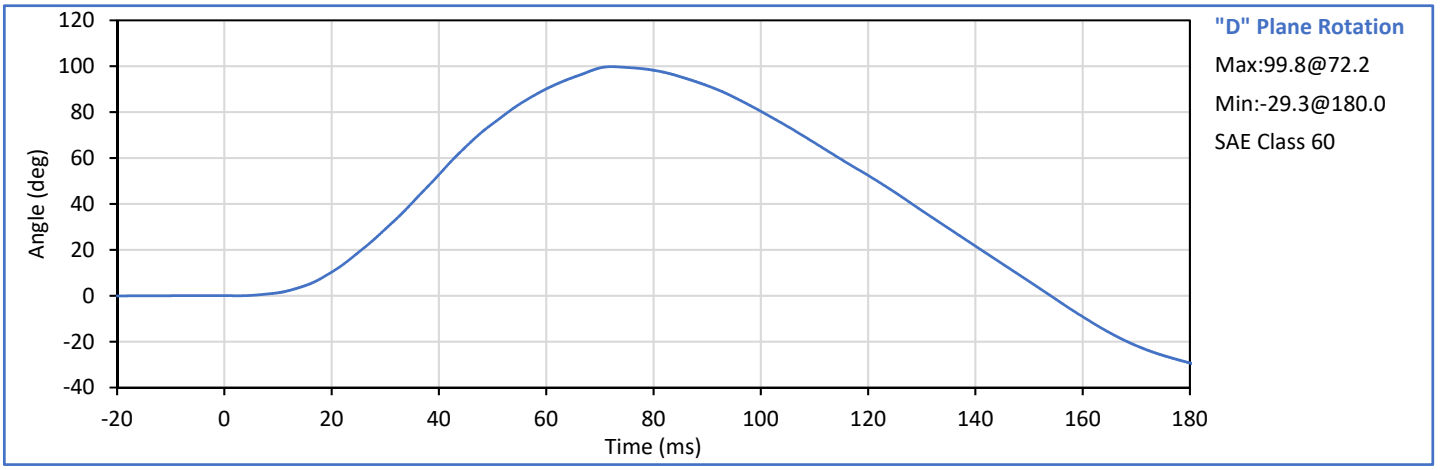
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-10-26

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	17	Pass
Pendulum Velocity	m/s	5.94	6.19	6.10	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	21.0	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	17.5	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	11.5	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	11.5	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	38.2	Pass
"D" Plane Rotation peak	deg	81.0	106.0	99.8	Pass
	ms	72.0	82.0	72.2	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	154.1	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-75.3	Pass
	ms	65.0	79.0	69.3	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	141.7	Pass
			Overall Test Results		Pass





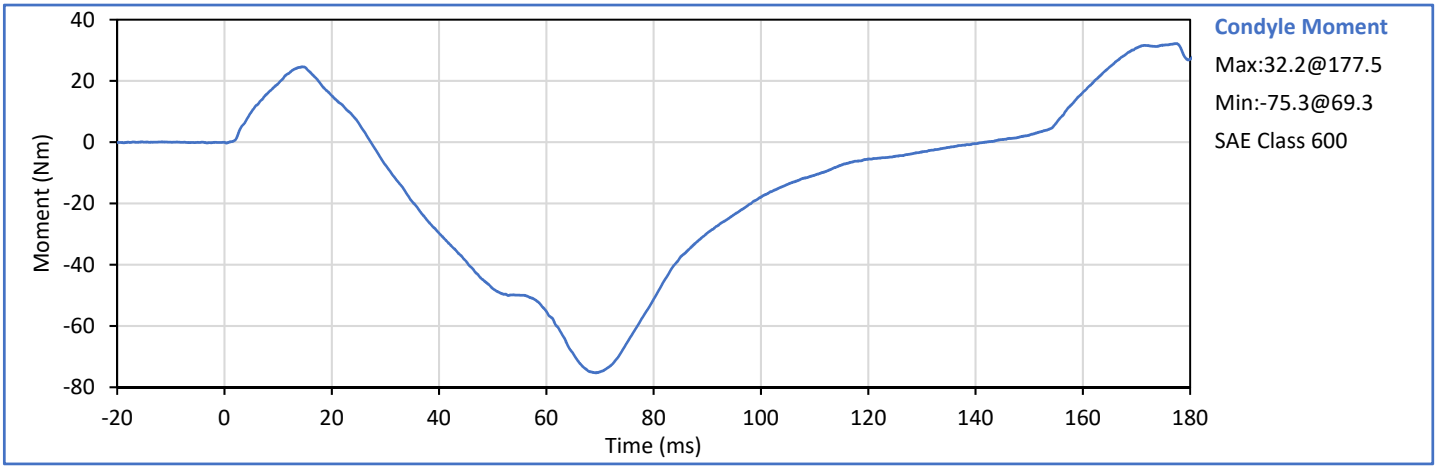
Technician: J. Hernandez

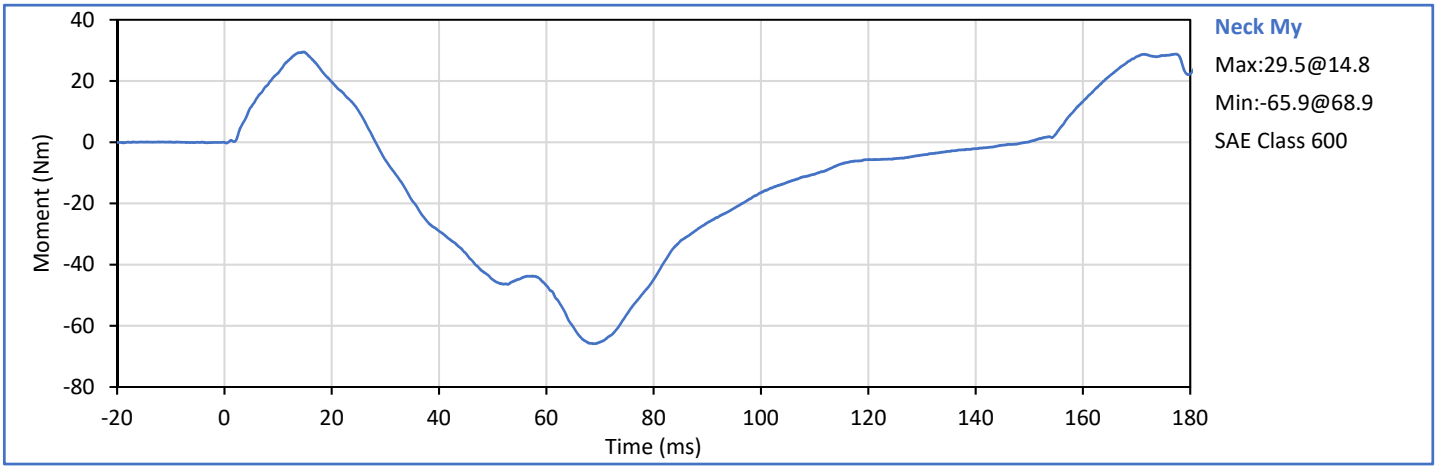
Approved By: P. Puzzuto

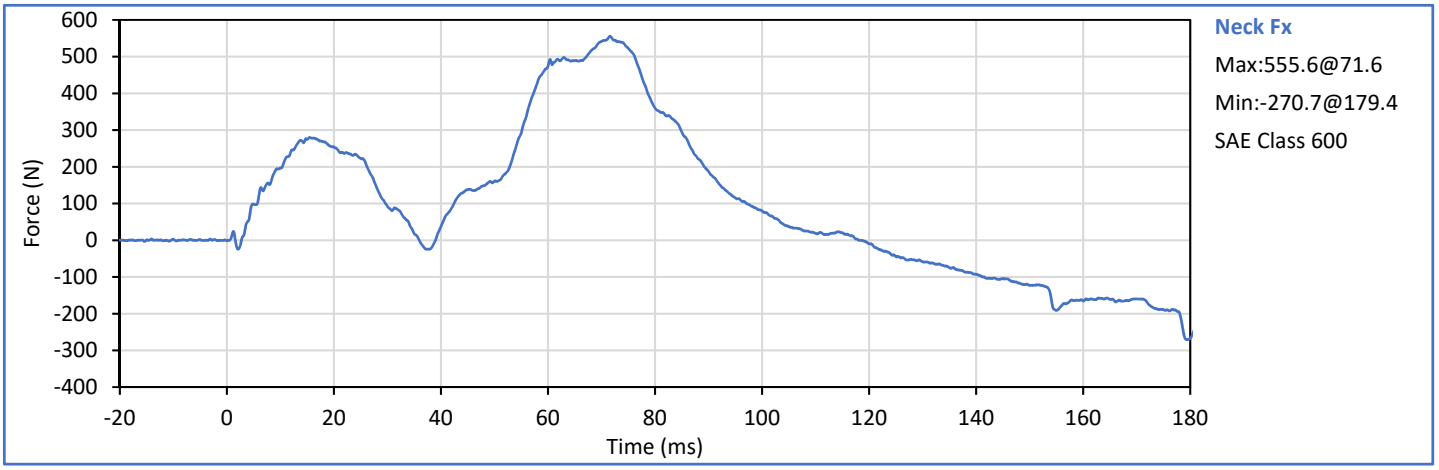
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-10-26







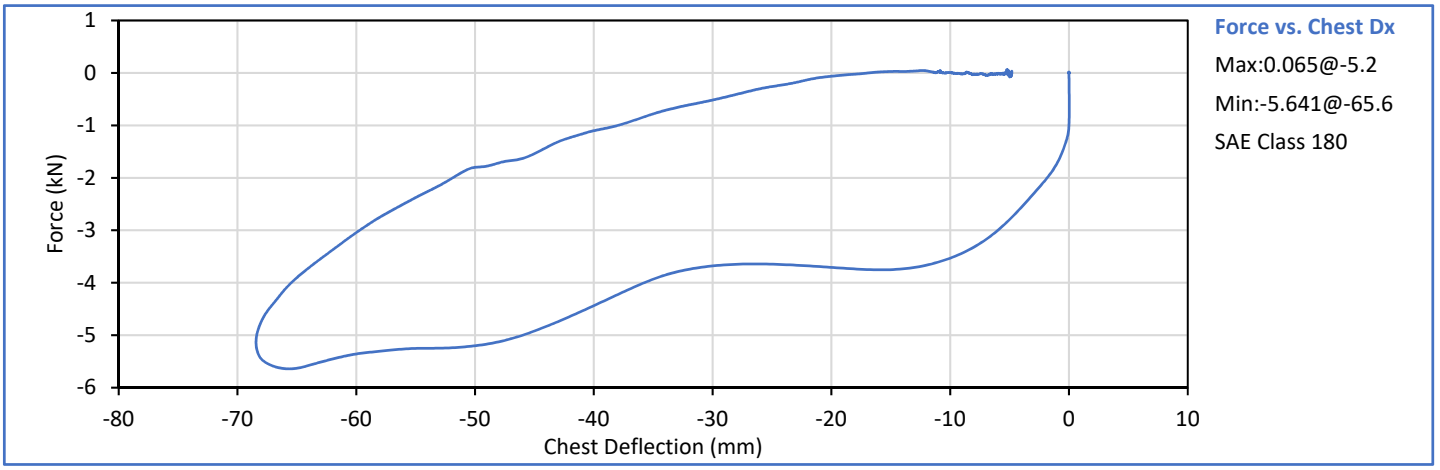
Applus IDIADA
KARCO

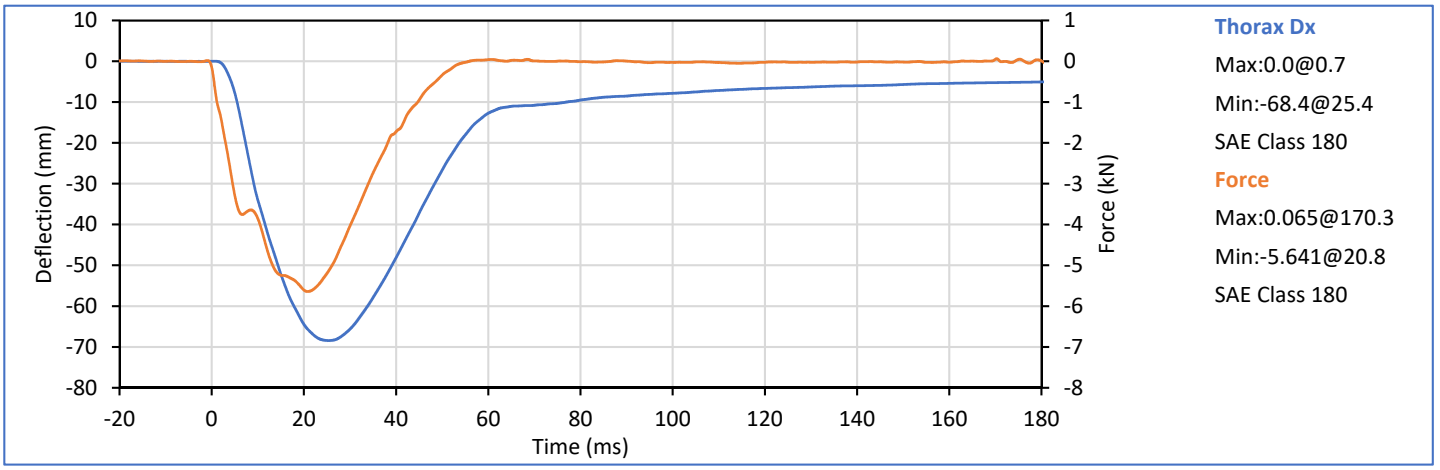
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 168

Test Date: 2020-10-26

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Probe Velocity	m/s	6.58	6.82	6.67	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-68.4	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.641	Pass
Internal Hysterisis	%	69.0	85.0	71.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

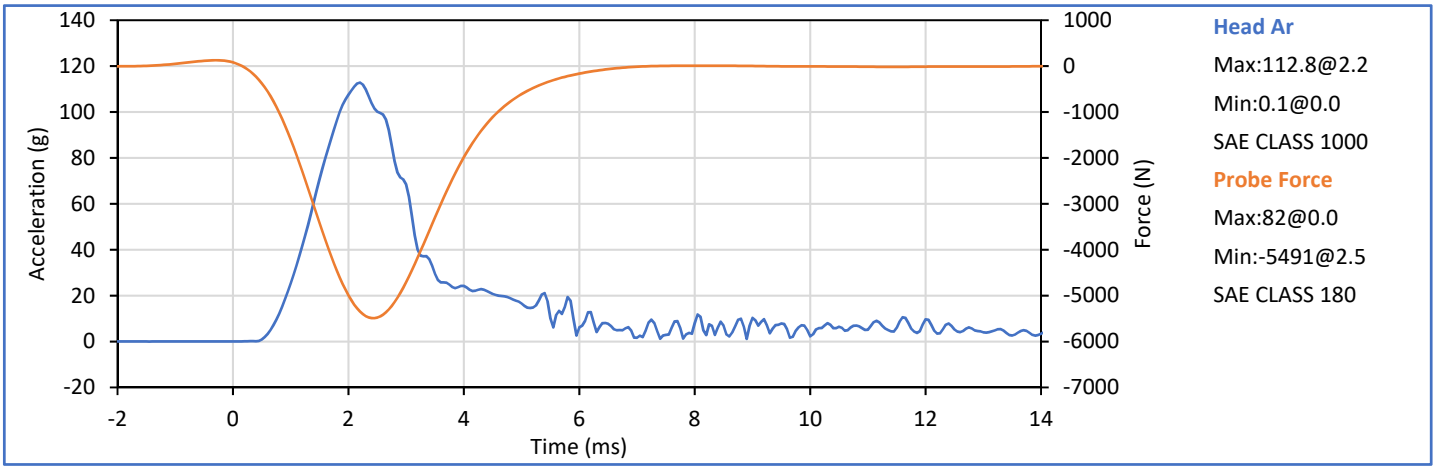
APPENDIX C
Post-Test ATD Qualification and Performance Verification
THOR-50M 50th Percentile Male ATD, (Reduced Certification)
S/N: D09799

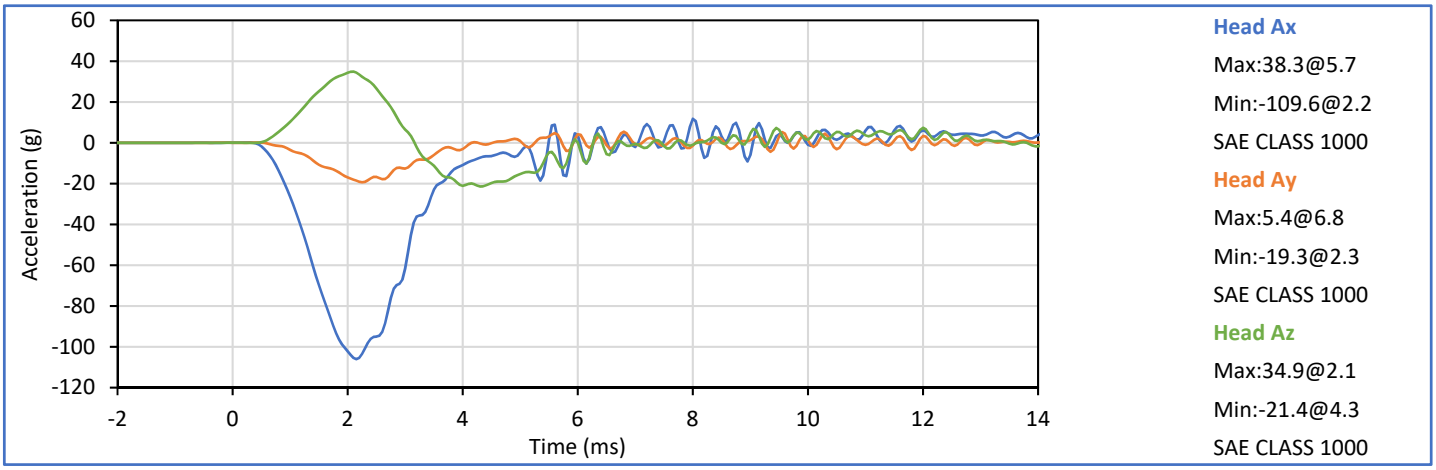
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Head Qualification

ATD Serial No.: D09799 Test Date: 2021-01-05

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Probe Velocity	m/s	1.95	2.05	2.02	Pass
Peak Probe Force	kN	-6138	-5022	-5491	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	112.8	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

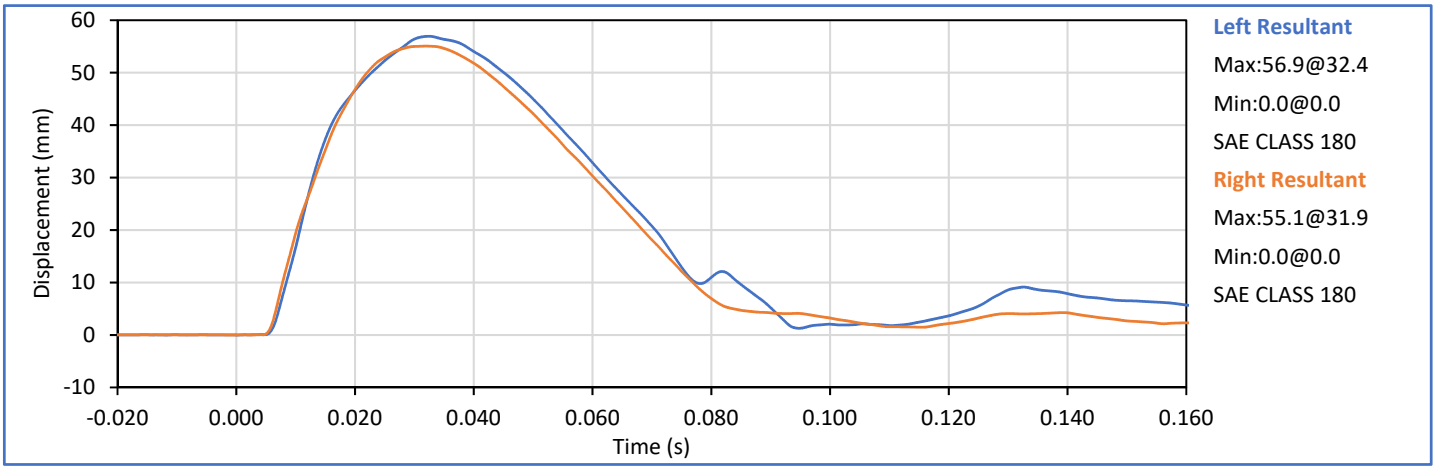
Approved By: P. Puzzuto

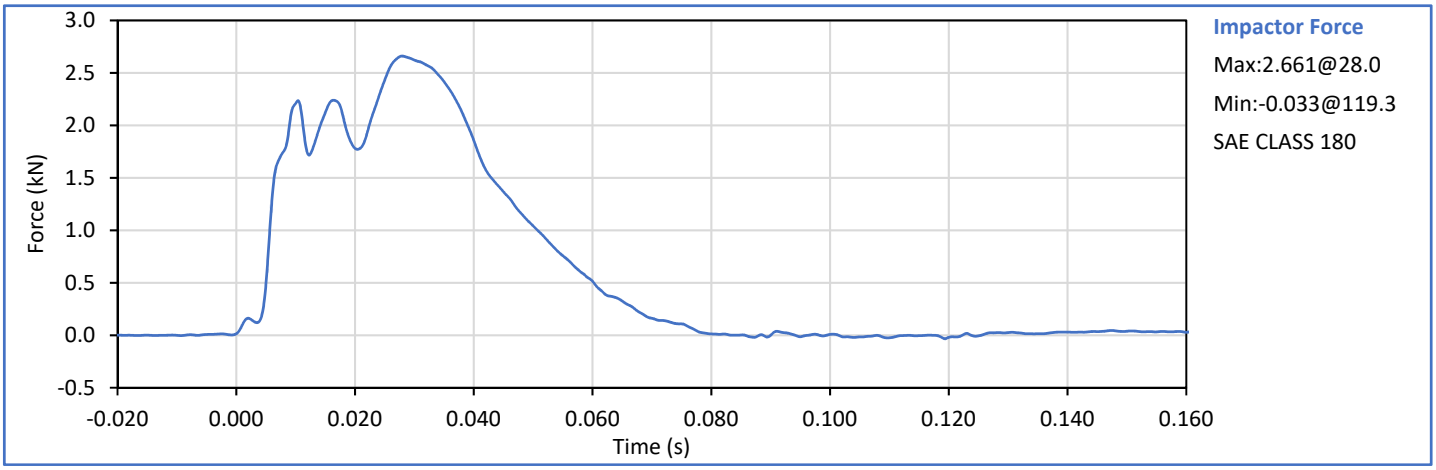
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Upper)

ATD Serial No.: D09799 Test Date: 2021-01-05

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
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN		3.039	2.661	Pass
Peak Upper Left Deflection Resultant	mm	48.3	59.0	56.9	Pass
Peak Upper Right Deflection Resultar	mm			55.1	Pass
Absolute Difference L/R Dx Resultant	mm	0.0	5.0	1.9	Pass
Force at Peak Upper Left Resultant	mm	2.409	2.944	2.564	Pass
Force at Peak Upper Right Resultant	mm			2.579	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

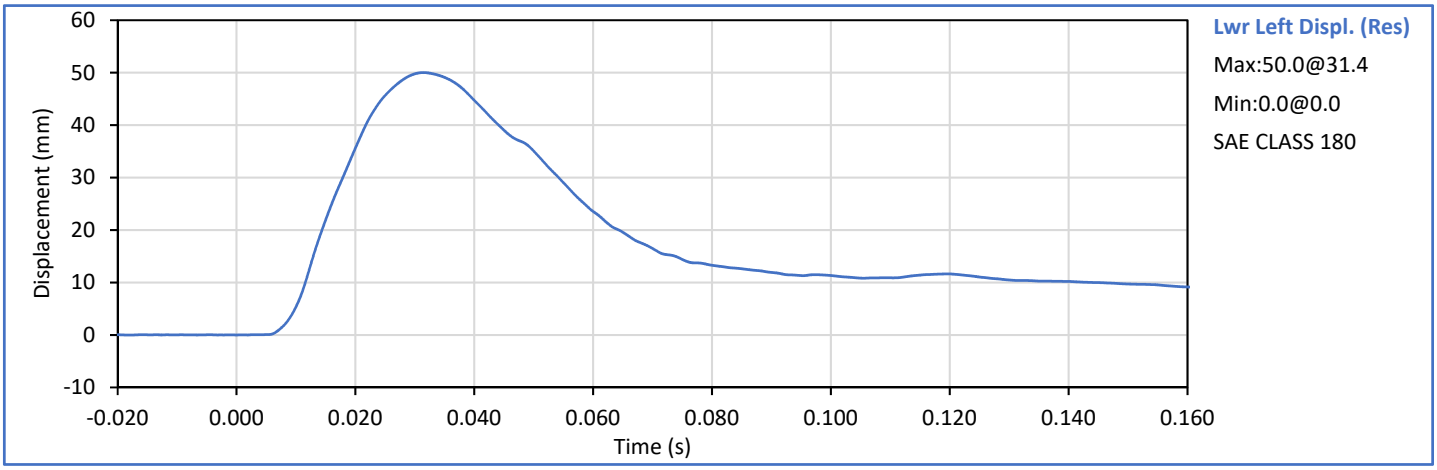
Approved By: P. Puzzuto

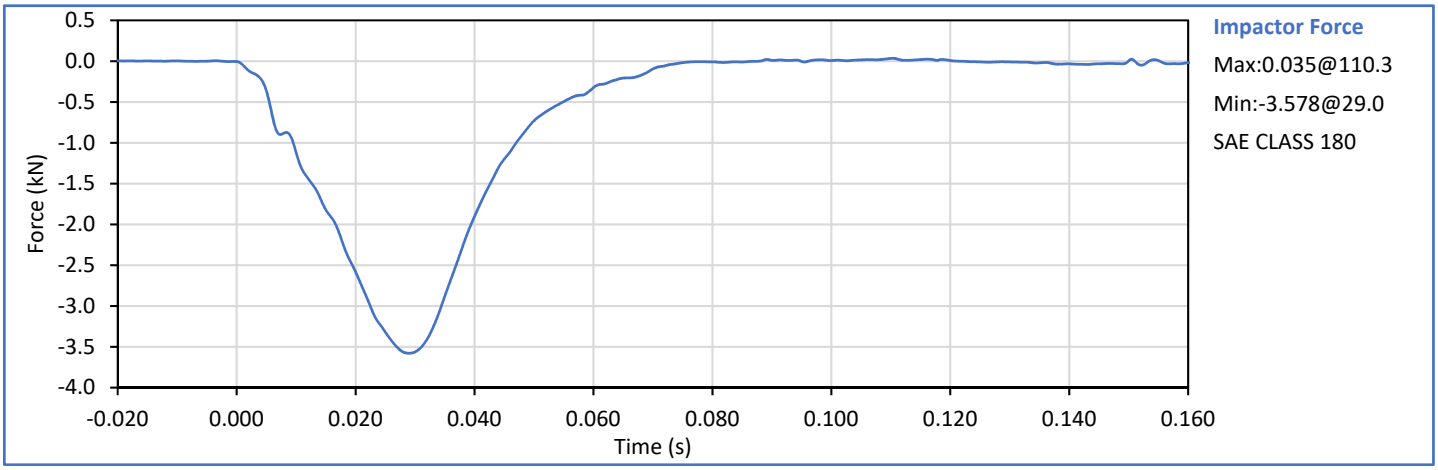
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Lower Left)

ATD Serial No.: D09799 Test Date: 2021-01-05

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	33	Pass
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.578	Pass
Lower Left Resultant Dx at Peak Fx	mm	45.8	56.0	49.3	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

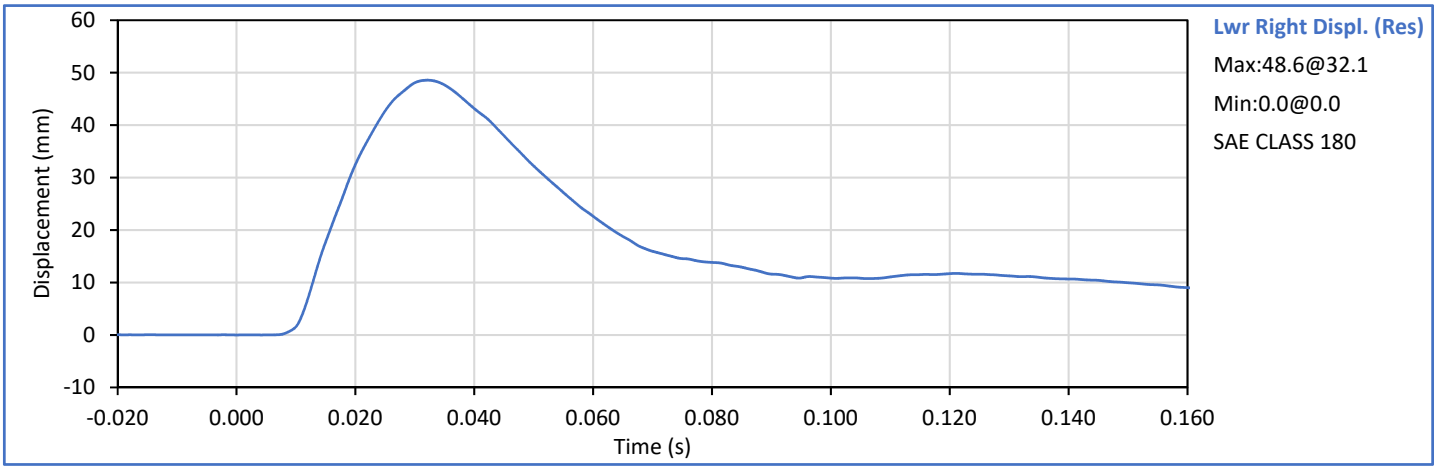
Approved By: P. Puzzuto

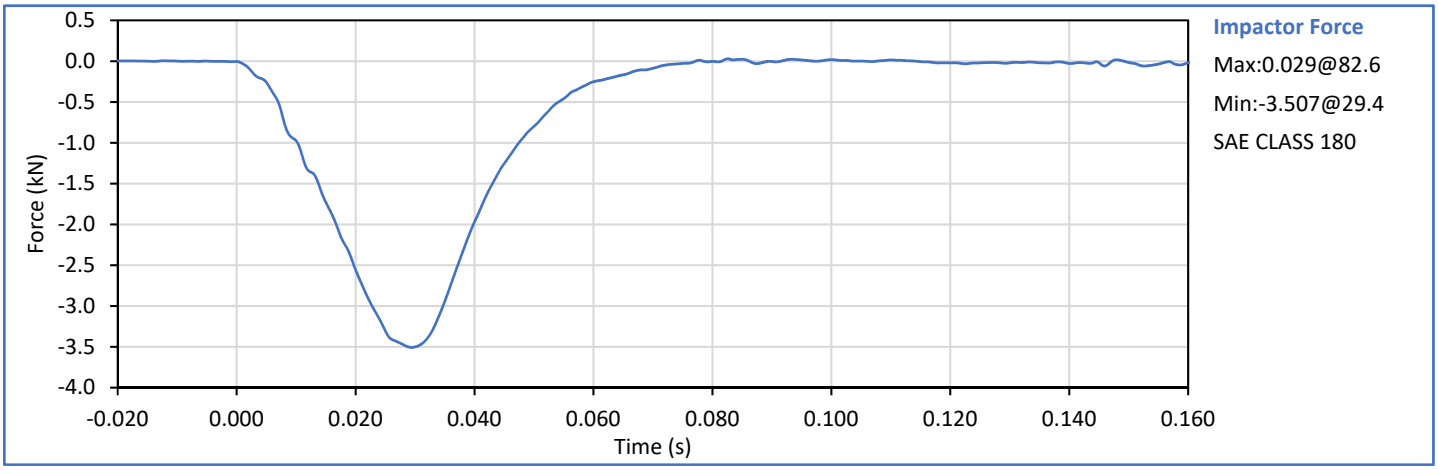
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Thorax Impact (Lower Right)

ATD Serial No.: D09799 Test Date: 2021-01-05

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
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.507	Pass
Lower Right Resultant Dx at Peak Fx	mm	45.8	56.0	47.7	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

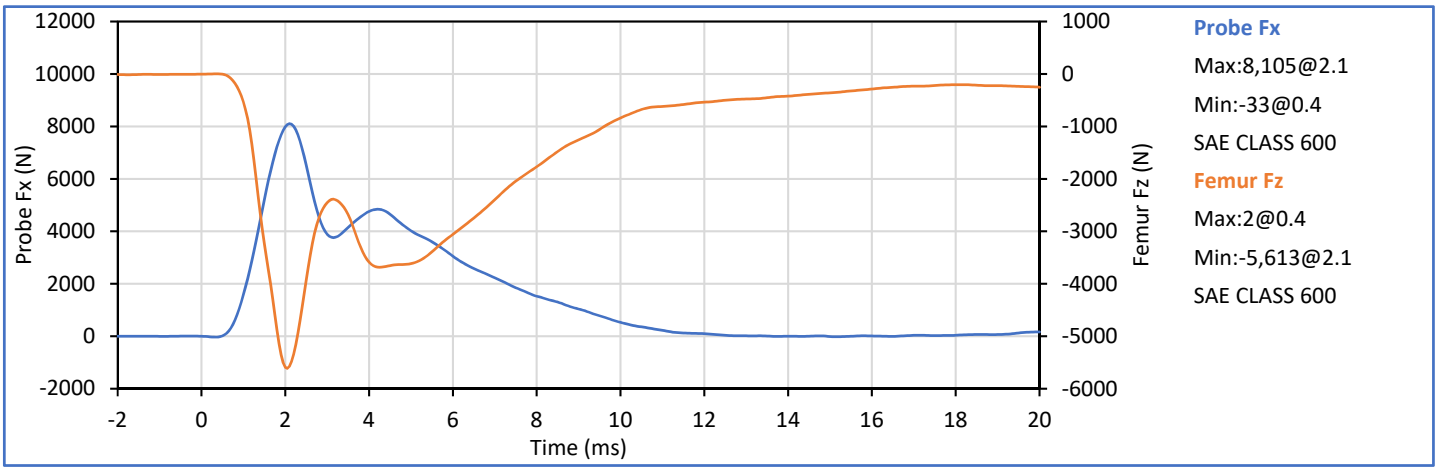
Approved By: P. Puzzuto

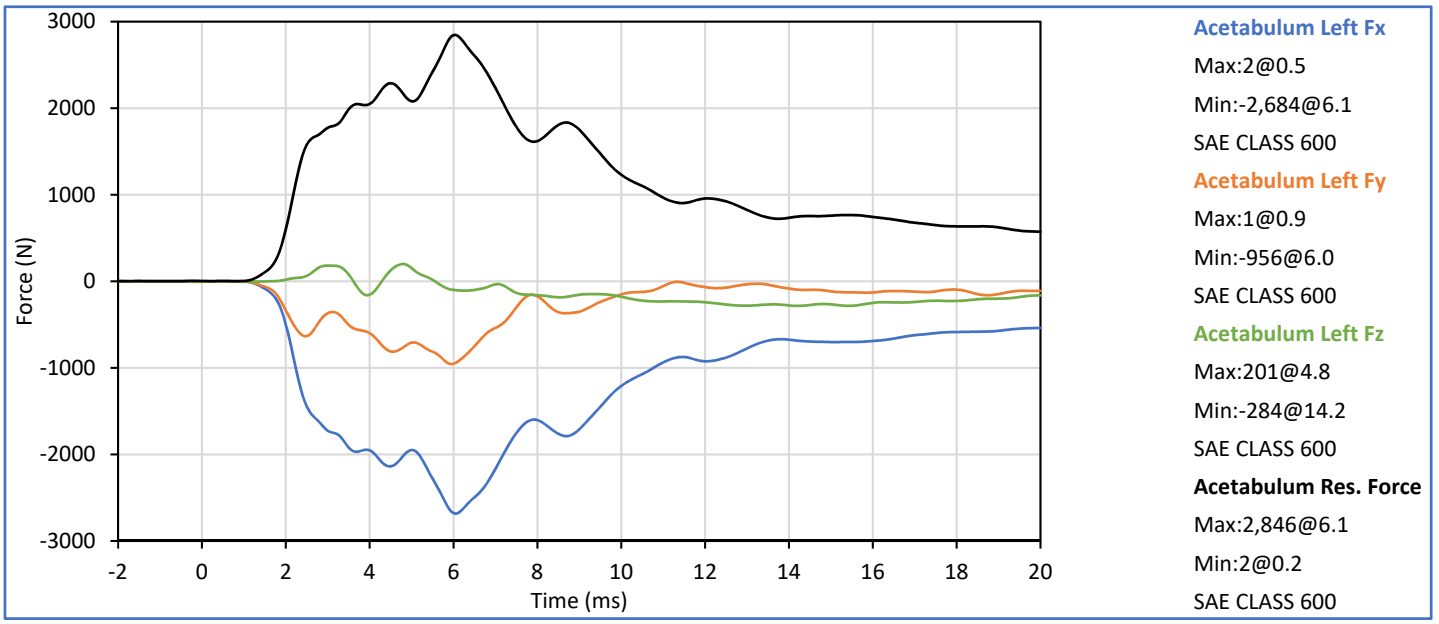
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Upper Leg (Left) Qualification

ATD Serial No.: D09799 Test Date: 2020-12-23

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	34	Pass
Pendulum Velocity	m/s	3.25	3.35	3.31	Pass
Peak Probe Force	N	*	*	8105	*
Peak Femur Fz	N	*	*	-5613	*
Acetabulum Force Resultant	N	*	*	2846	*
* Research data. No defined P/F corridor			Overall Test Results		Pass





Technician: J. Hernandez

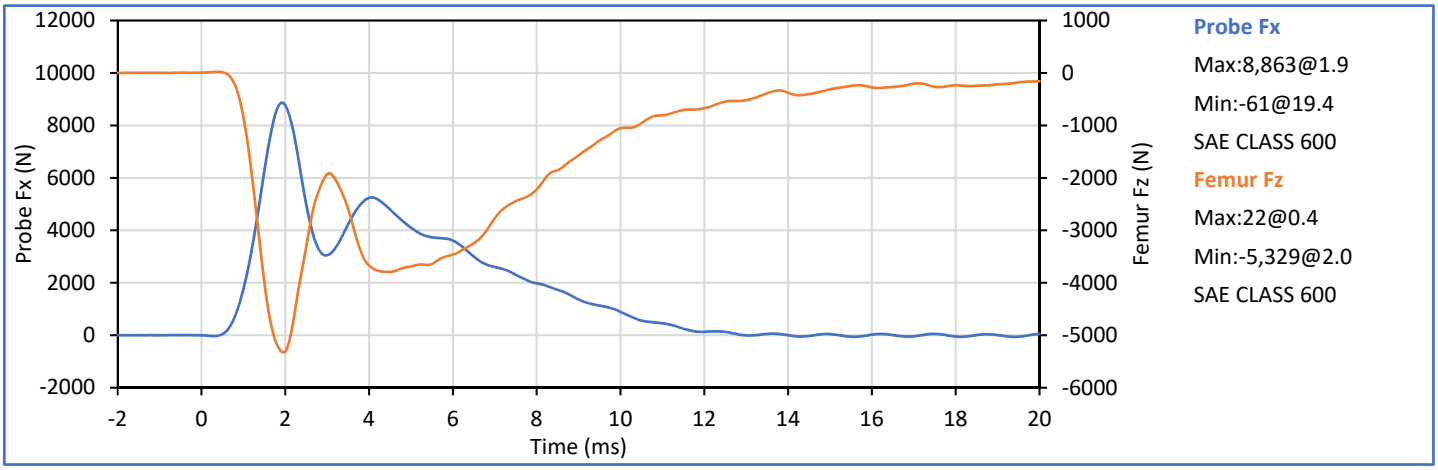
Approved By: P. Puzzuto

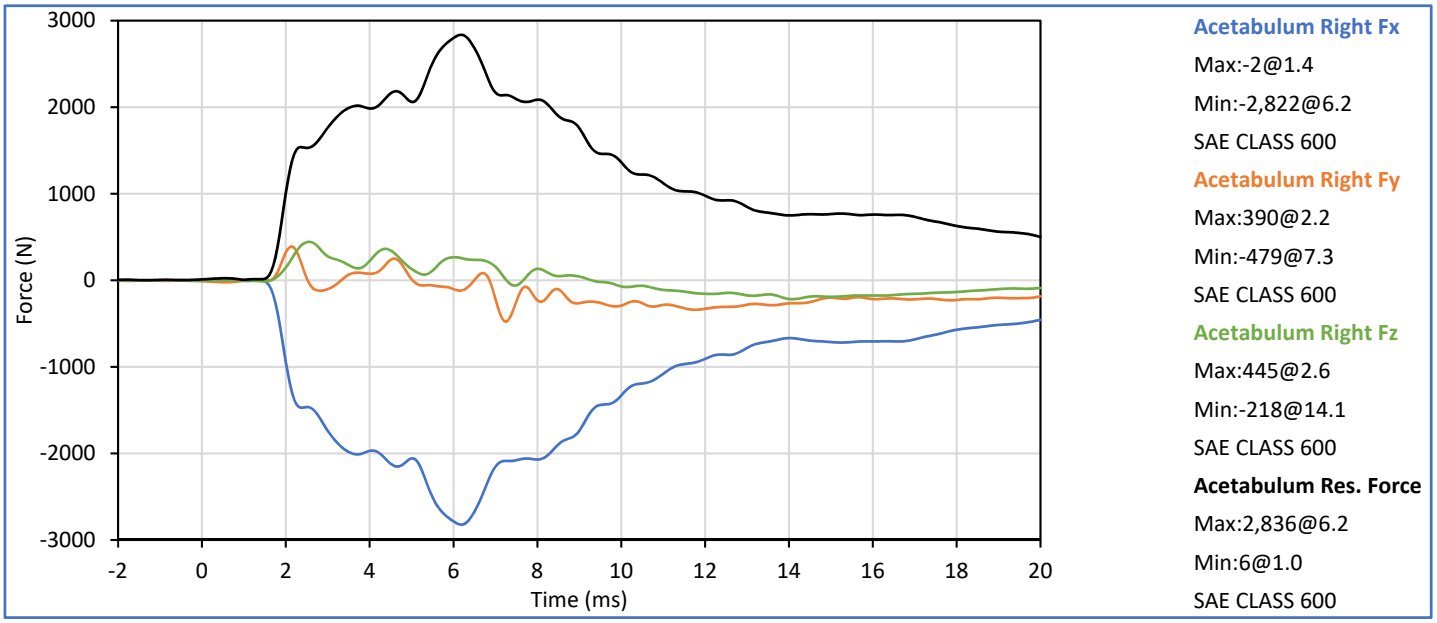
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Upper Leg (Right) Qualification

ATD Serial No.: D09799 Test Date: 2020-12-23

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	15	Pass
Pendulum Velocity	m/s	3.25	3.35	3.32	Pass
Peak Probe Force	N	*	*	8863	*
Peak Femur Fz	N	*	*	-5329	*
Acetabulum Force Resultant	N	*	*	2836	*
* Research data. No defined P/F corridor			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

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

Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
ATD Damage Checklist

ATD Serial No.: 168 Test Date: 2020-12-16

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

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician: J. Hernandez

Approved By: P. Puzzuto

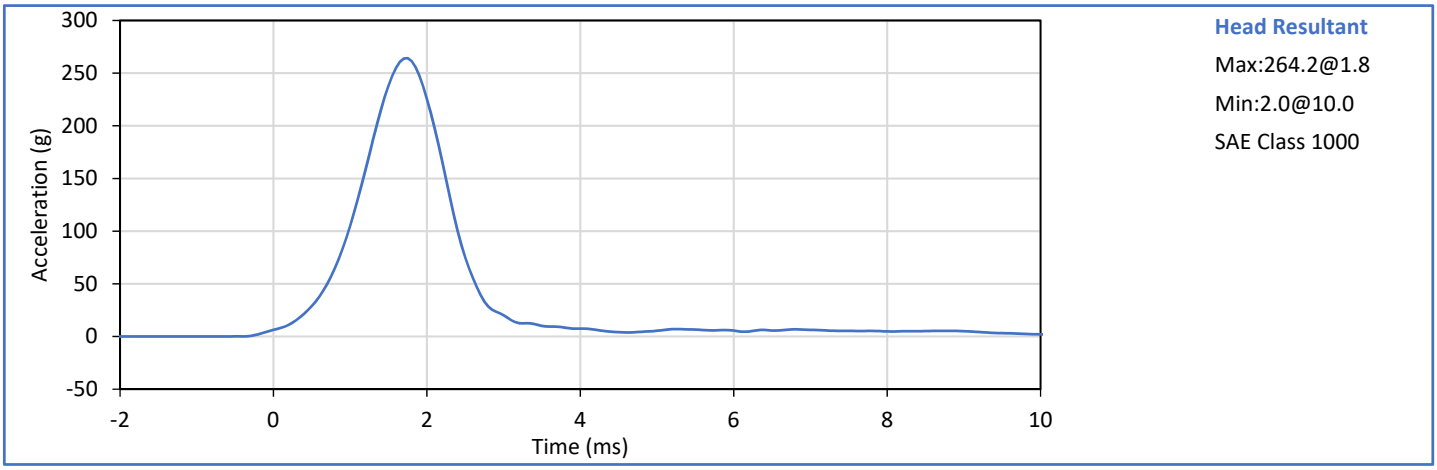
Applus IDIADA
KARCO

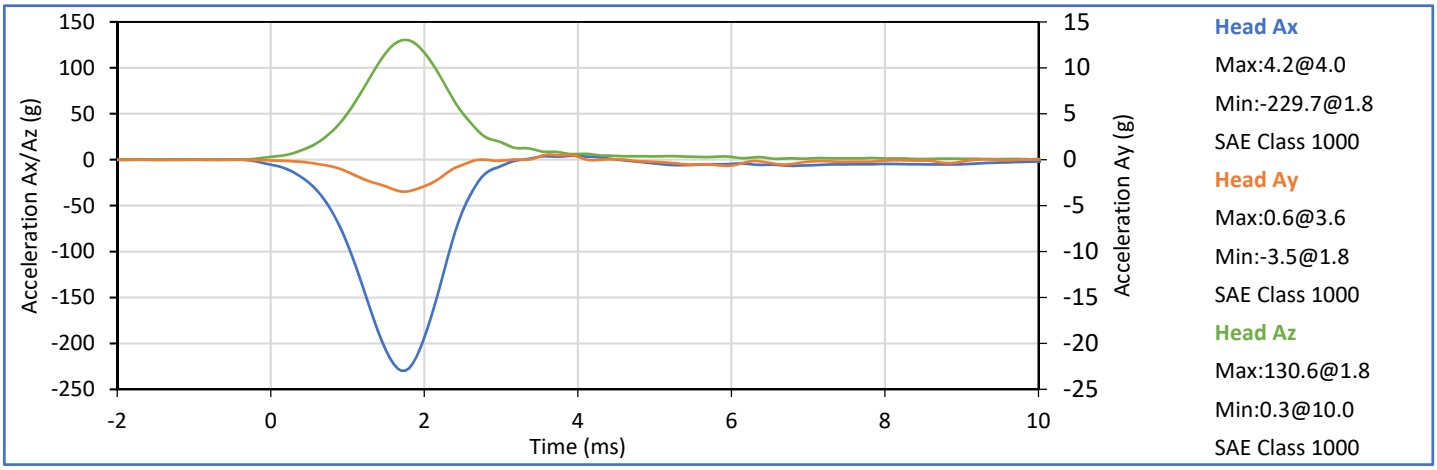
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 168

Test Date: 2020-12-16

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.8	Pass
Laboratory Relative Humidity	%	10	70	15	Pass
Peak Resultant Acceleration	g	225.0	275.0	264.2	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-3.5	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

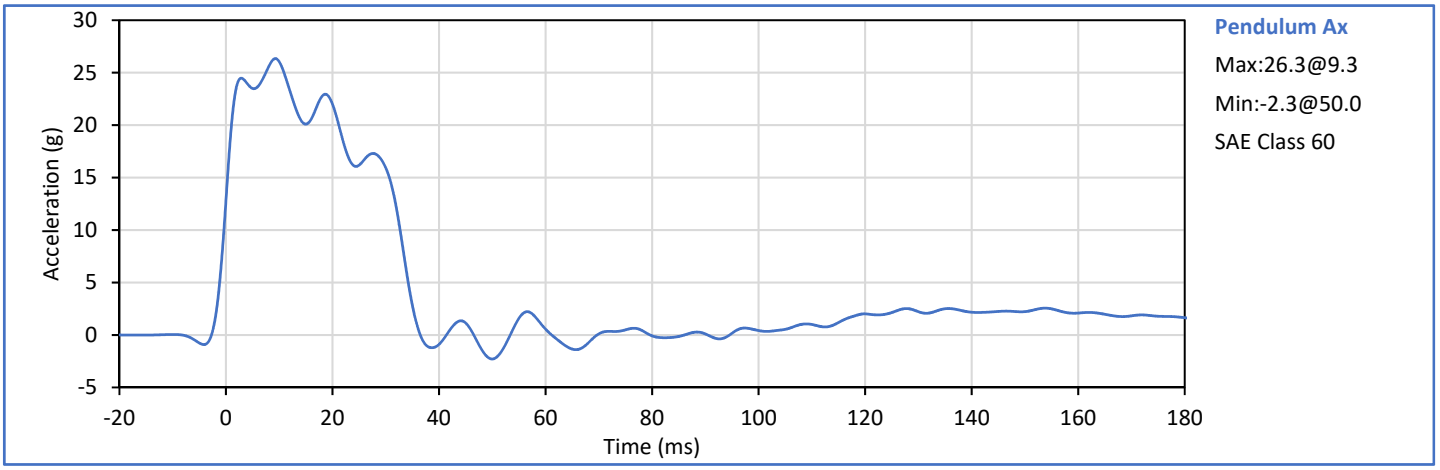
Approved By: P. Puzzuto

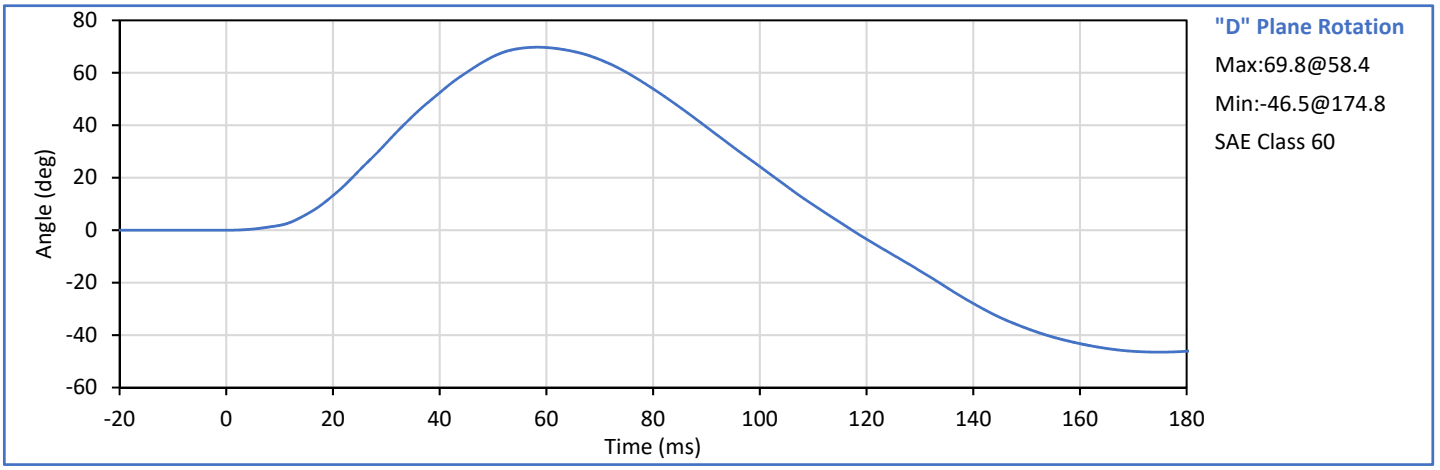
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-12-16

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	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	26.0	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	22.0	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.9	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.9	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	34.2	Pass
"D" Plane Rotation peak	deg	64.0	78.0	69.8	Pass
	ms	57.0	64.0	58.4	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	117.4	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	89.4	Pass
	ms	47.0	58.0	53.2	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	97.8	Pass
			Overall Test Results		Pass





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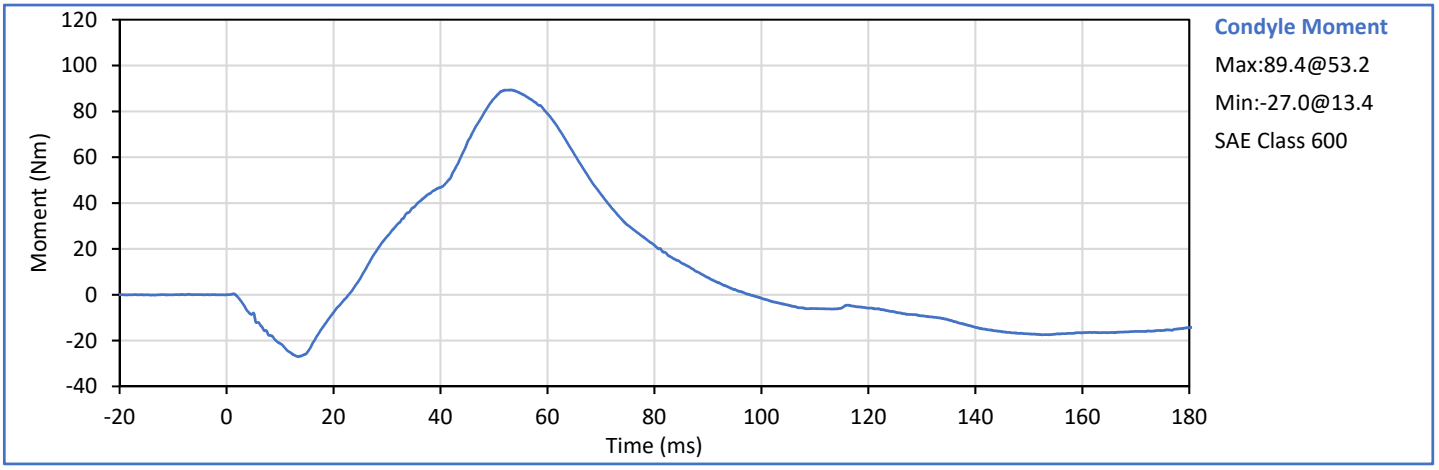
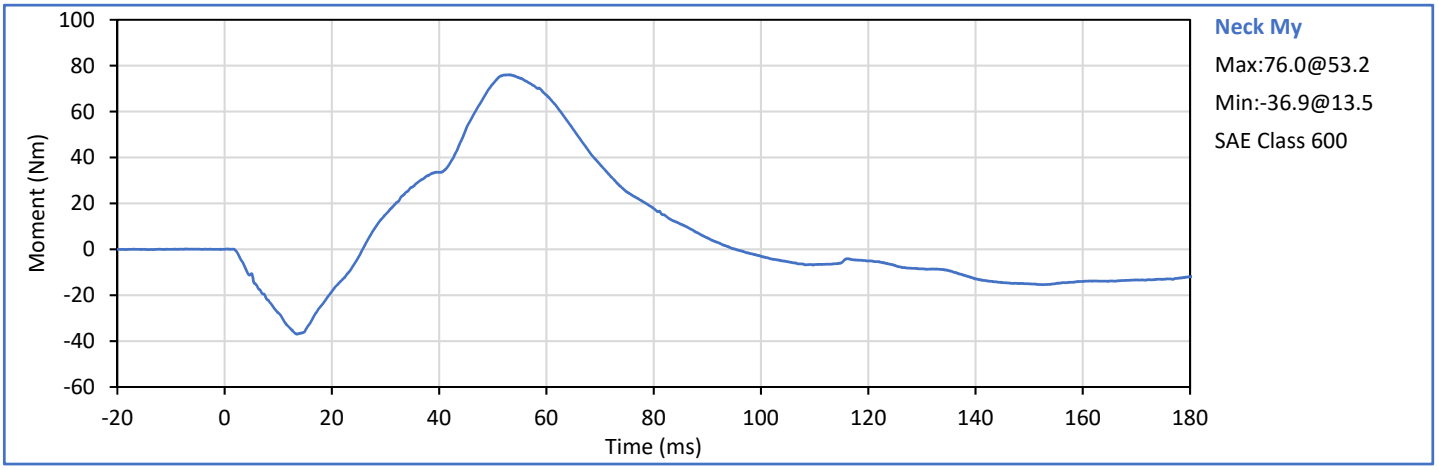
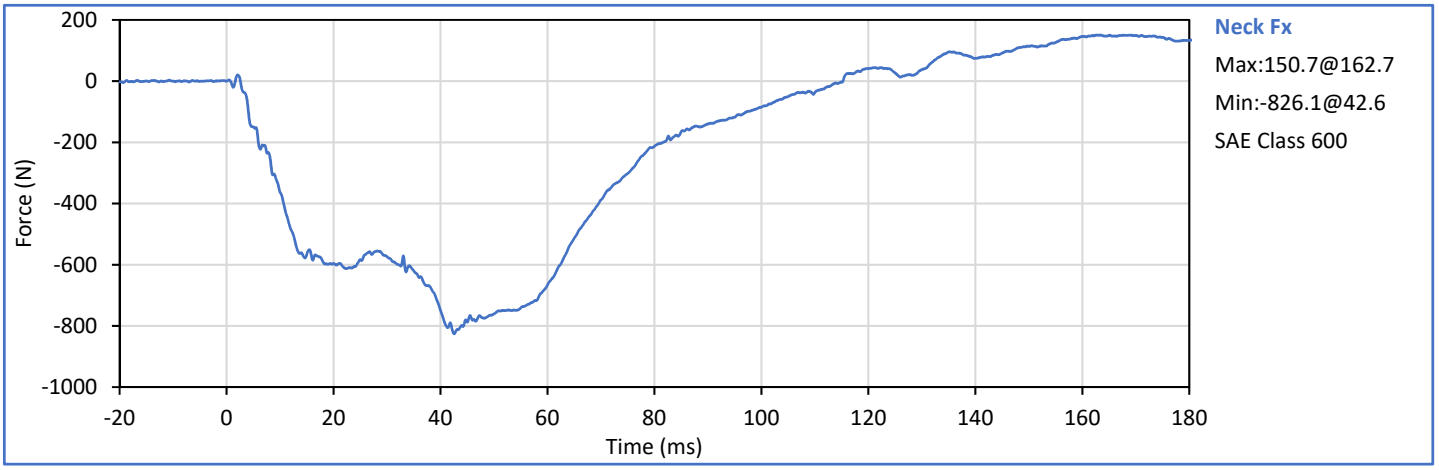
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-12-16





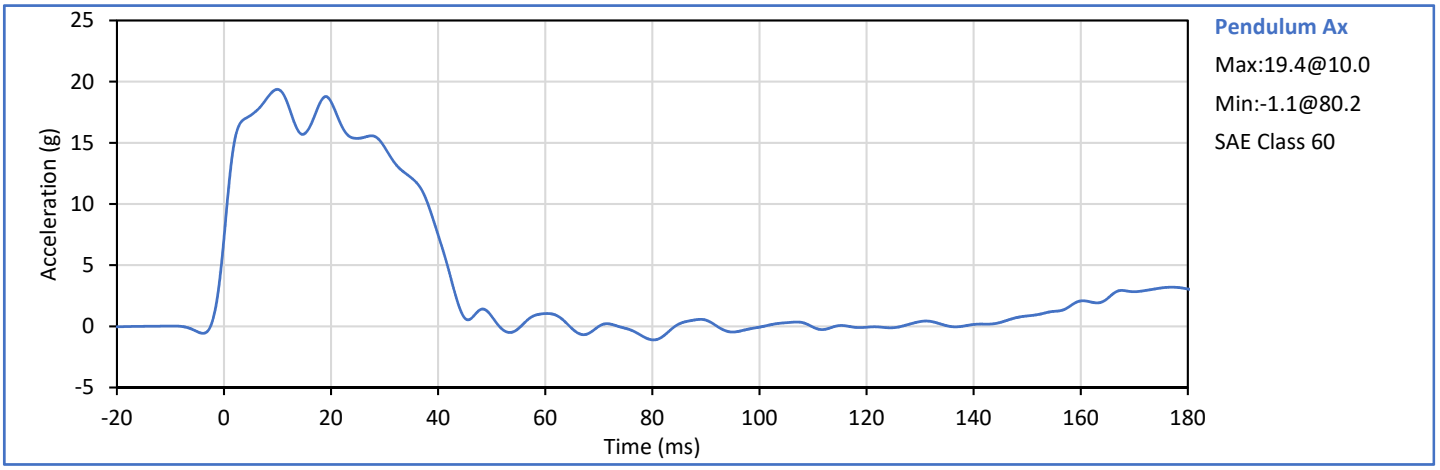


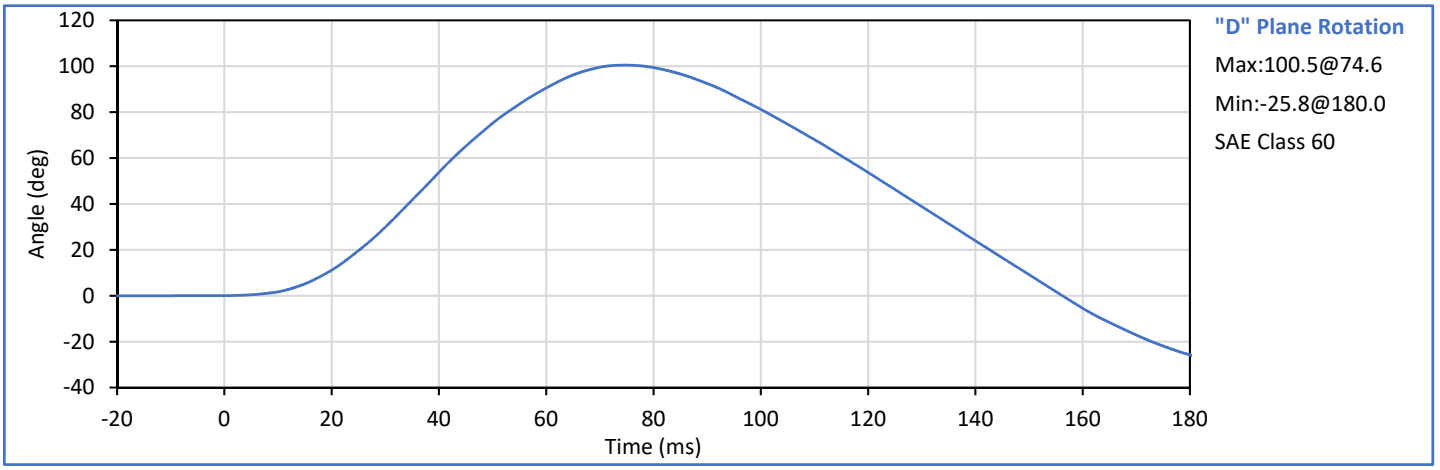
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-12-17

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	17	Pass
Pendulum Velocity	m/s	5.94	6.19	6.07	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	19.4	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.4	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.6	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	14.6	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	41.7	Pass
"D" Plane Rotation peak	deg	81.0	106.0	100.5	Pass
	ms	72.0	82.0	74.6	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	156.3	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-71.5	Pass
	ms	65.0	79.0	69.2	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	137.1	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

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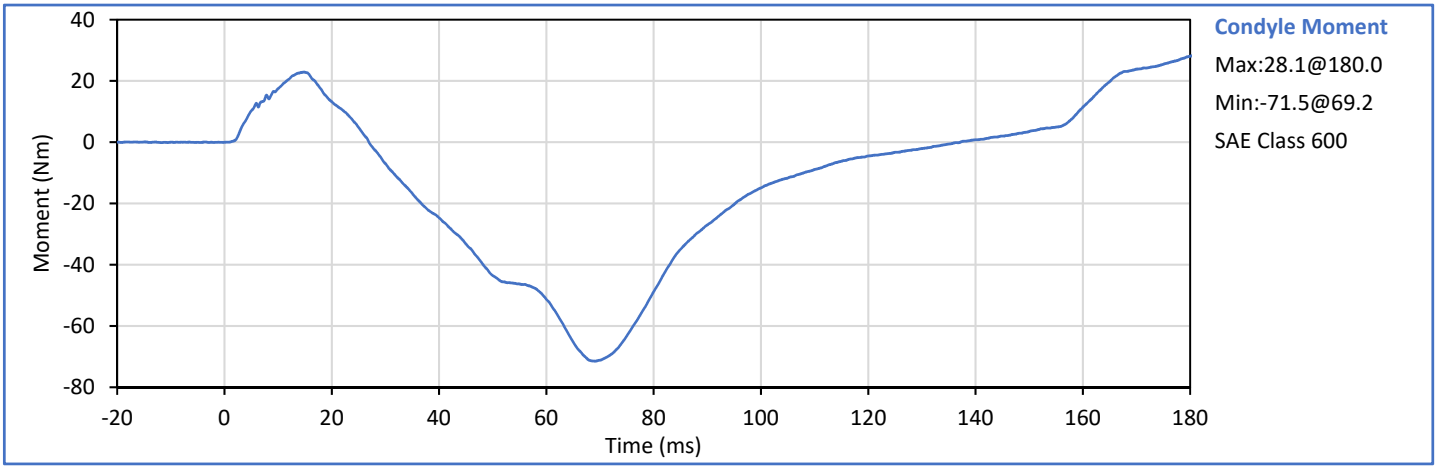
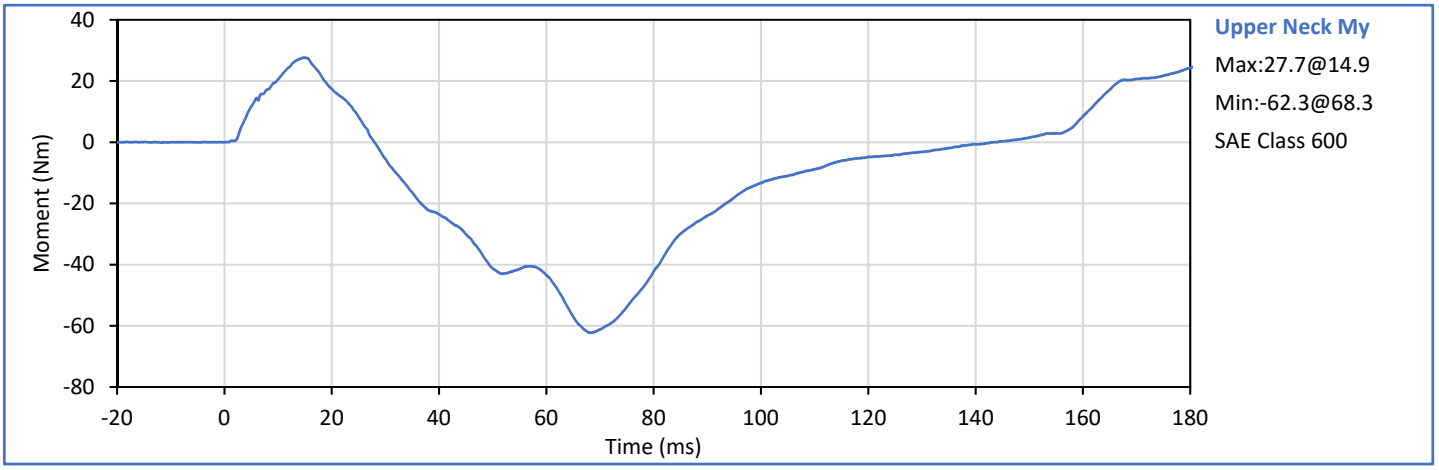
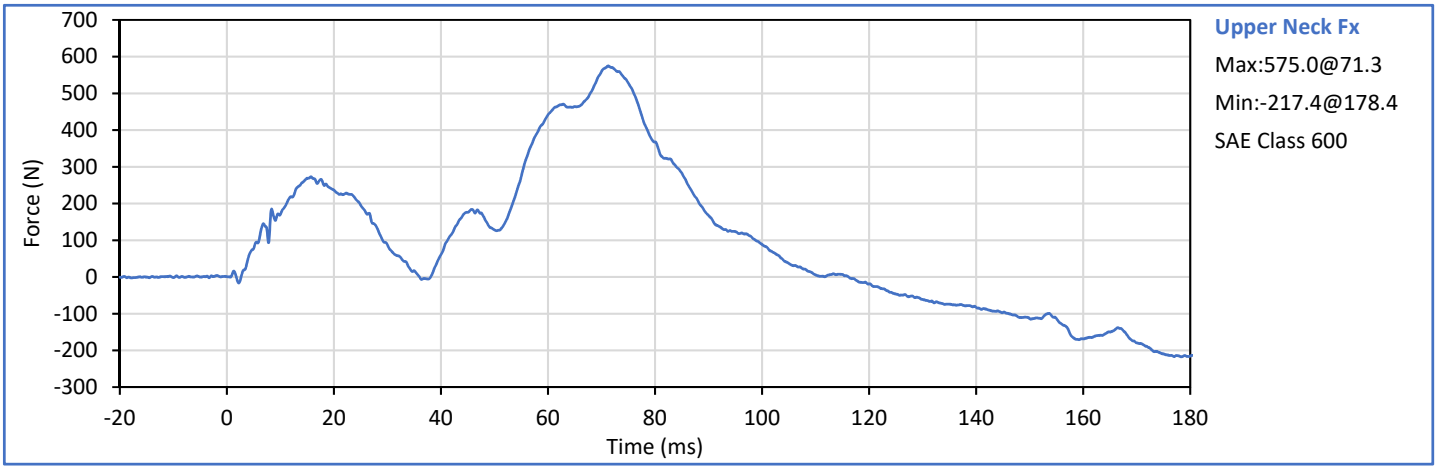
Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-12-17







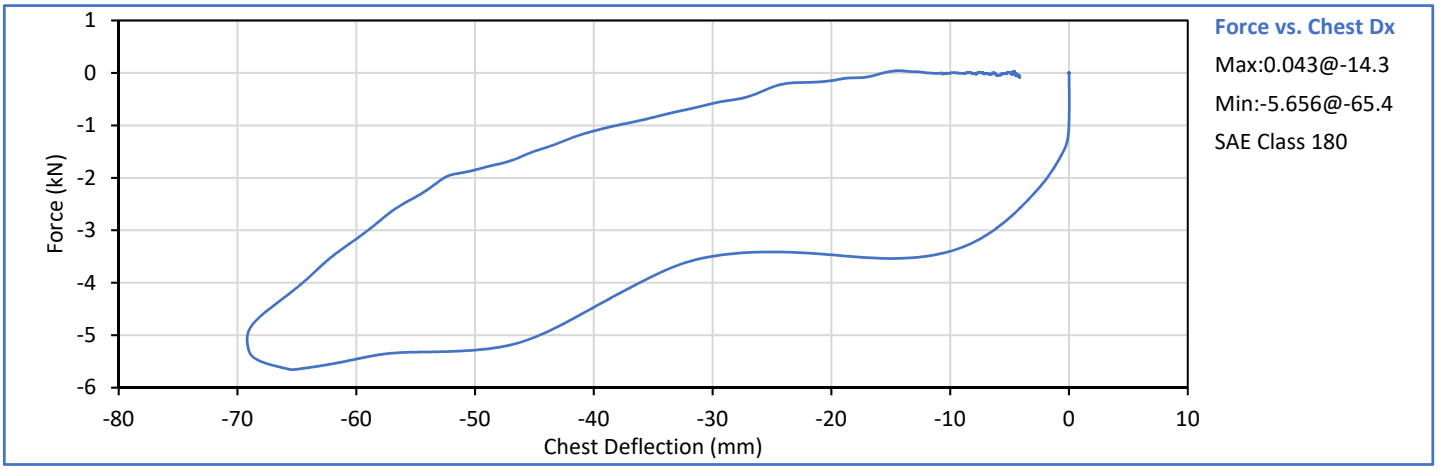
Applus IDIADA
KARCO

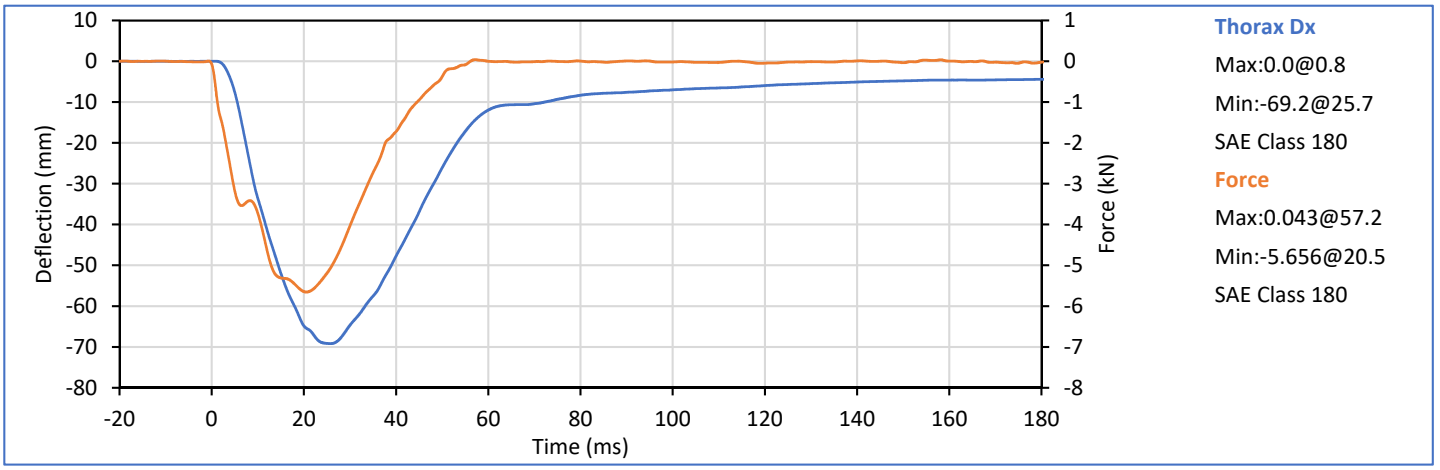
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 168

Test Date: 2020-12-16

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	15	Pass
Probe Velocity	m/s	6.58	6.82	6.71	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-69.2	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.656	Pass
Internal Hysterisis	%	69.0	85.0	69.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

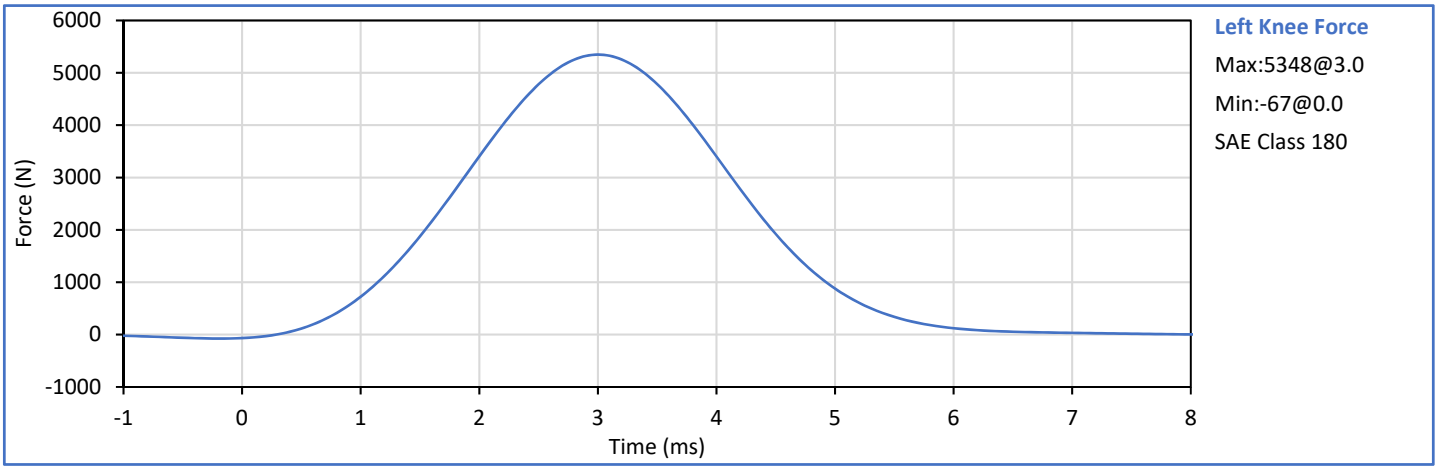
Applus IDIADA
KARCO

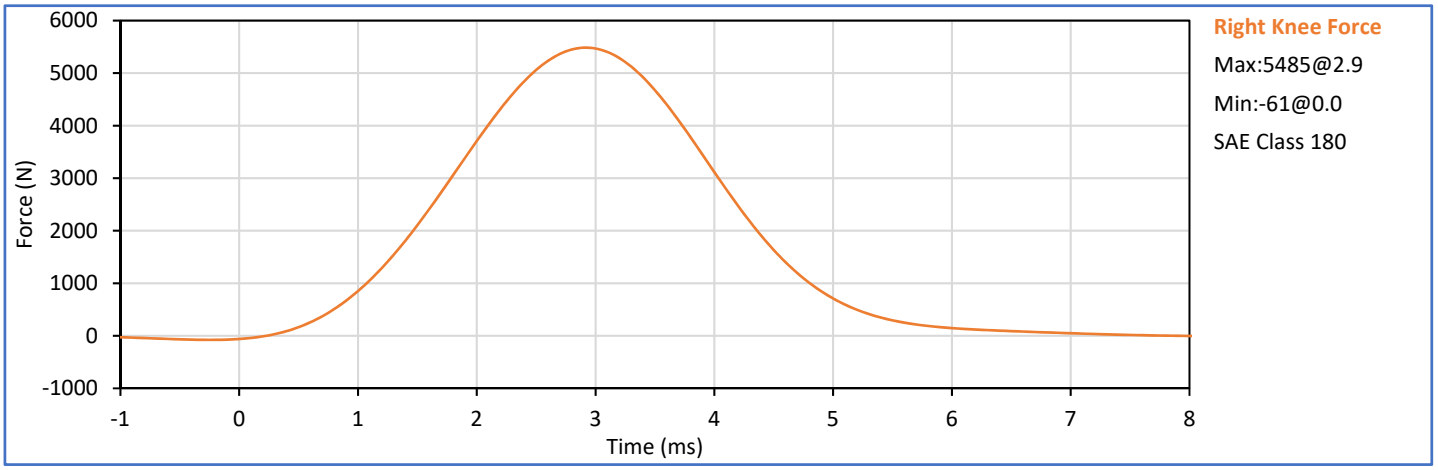
Hybrid III 50th Percentile Male ATD
Knee Impact (Left/Right)

ATD Serial No.: 168

Test Date: 2020-12-16

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.7	Pass
	Laboratory Relative Humidity	%	10	70	22	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.083	Pass
	Peak Resistive Force	N	4715	5782	5348	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.106	Pass
	Peak Resistive Force	N	4715	5782	5485	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

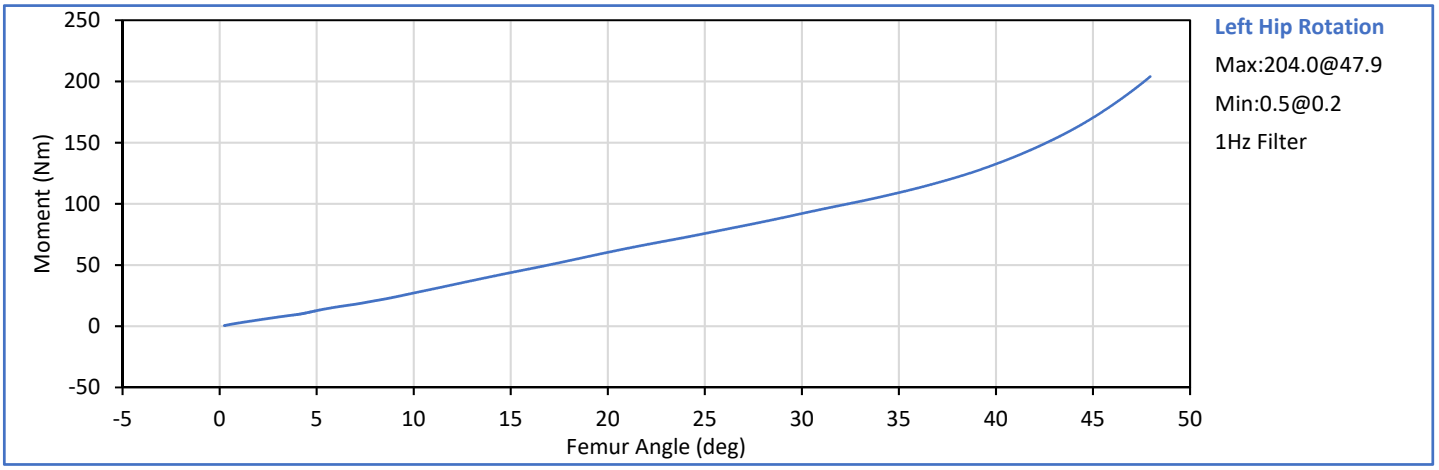
Applus IDIADA KARCO

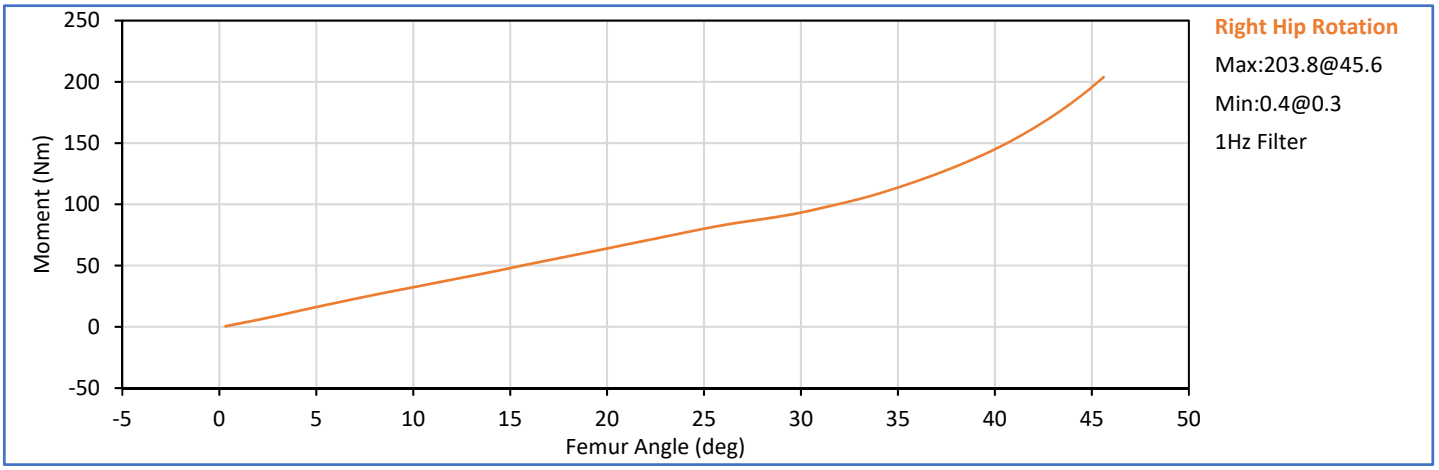
Hybrid III 50th Percentile Male ATD
Hip Flexion (Left/Right)

ATD Serial No.: 168

Test Date: 2020-12-16

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.8	Pass
	Laboratory Relative Humidity	%	10	70	15	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.7	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	92.2	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	47.9	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	6.1	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	93.4	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	45.5	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

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