REPORT NUMBER: R&D-KAR-20-007

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

MAZDA MOTOR CORPORATION

2020 MAZDA CX-5 5-DOOR MPV

NHTSA No: R20205412

PREPARED BY:

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JULY 2, 2021

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

VEHICLE SAFETY RESEARCH

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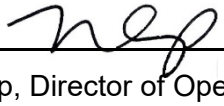
Approved By: 

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Approval Date: July 2, 2021

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

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

Date:

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Final Report of Frontal Research Crash Testing of a 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412	July 2, 2021
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9. Performing Organization Name and Address Applus IDIADA KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301	**10. Work Unit No.** **11. Contract or Grant No.** DTNH22-14-D-00360L
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Research 1200 New Jersey Ave., SE, Room W46-446 Washington, D.C. 20590	**13. Type of Report and Period Covered** Final Test Report, December 7, 2020 -July 2, 2021 **14. Sponsoring Agency Code** NVS-321

15. Supplementary Notes

16. Abstract

A 40.0 km/h Right 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 7, 2020.

The impact velocity of the vehicle was 40.63 km/h and the ambient temperature at the barrier face at the time of impact was 15.6°C. The vehicle's post-test maximum crush was 310.2 mm measured to the right of the vehicle's centerline. The test vehicle's performance was as follows:

Measurement Description	Units	Driver THOR	Passenger Hybrid III
		Result	Result
Head Injury Criteria (HIC_{15})		320.30	142.74
Brain Injury Criteria (BrIC)		0.87	
Nij			0.47
Peak Neck Tension	N	1288.70	270.84
Peak Neck Compression	N	-1457.40	-2128.99
Peak Chest Deflection	mm	28.70	-4.49
Peak Abdomen Deflection	mm	-25.90	
Peak Resultant Acetabulum Force	N	1867.60	
Peak Femur Force	N	-4502.50	-5340.19
Peak Tibia Index		0.64	

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
UNCLASSIFIED	UNCLASSIFIED	238	

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SECTION 1

TEST PURPOSE AND PROCEDURE

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

This 40.0 km/h (24.9 mph) Right Side 30° Frontal Rigid Barrier Impact Test is part of the Frontal Research Crash Test Program outlined in Contract No. DTNH22-14-D-00360L, Task Order #693JJ918F000199. The purpose of this test is to obtain vehicle crashworthiness and occupant restraint system performance data for research purposes.

This test was conducted in accordance with the instructions set forth for a 40.0 km/h Right 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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

A 40.0 km/h Right 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 7, 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 THOR anthropomorphic test device (ATD) (Serial No. EG2595) was seated in the left front seating position (P1 – Driver) and one (1) 50th percentile adult male Hybrid III ATD (Serial No. 168) was seated in the right front passenger seating position (P2). The driver was positioned according to instructions specified in the THOR 50th Percentile Male Dummy Seating & Positioning Procedures: Driver Position. The passenger 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 driver was restrained with a frontal airbag. The passenger was restrained with frontal, curtain, and torso/pelvis airbags. Both ATDs were unbelted for this test.

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

There was 100% total windshield retention. There was no intrusion into the protected zone of the windshield during any portion of the impact event. The maximum static crush of the vehicle was 310 mm measured on the right 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 right side of the vehicle.
- The windshield was broken due to the impact with the driver and passenger ATD's head.

The driver 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

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

- Head contacted the front airbag, windshield, and headliner
- 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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Impact Velocity	km/h	40.63
Test Vehicle Weight	kg	1759
Maximum Static Crush	mm	310.2
Number of Data Channels		172
Number of Real-Time Cameras		1
Number of High-Speed Cameras		18

DUMMY CONTACTS

Description	Driver	Picture Ref.	Passenger	Picture Ref.
Dummy Type	THOR, S/N: EG 2595		Hybrid III, S/N: 168	
Head Contact	Front Airbag and Windshield	A-89	Front Airbag, Windshield, and Headliner	A-134, A-136a, A-136b
Upper Torso Contact	Front Airbag		Front Airbag	
Lower Torso Contact	Front Airbag		Front Airbag	
Left Leg Contact	Knee Bolster	A-91a	Knee Bolster	A-109
Right Leg Contact	Knee Bolster	A-80, A-91a	Knee Bolster	A-109

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

DATA ANOMALIES

Channel Description	Explanation
Abdomen Right IRTRACC	Spikes in the data, does not affect negative peak.
Right Acetabulum Force X (S/N: EG2595)	Received ATD with a bad channel, was determined not fixable without replacing the loadcell, no data collected.
Occipital Condyle Potentiometer (S/N: EG2595)	Received ATD without potentiometer wired and was not required to be recorded, no data collected.

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

LOCATION	DESCRIPTION	UNIT	SOURCE	MAX	MIN	
Head	HIC 15ms		Compute	320.3		
	Brain Injury Criteria (BrIC)		Compute	0.869		
	Head Rotational Velocity X	Deg/s	60	956.7	-331.7	
	Head Rotational Velocity Y	Deg/s	60	286.3	-1578.0	
	Head Rotational Velocity Z	Deg/s	60	527.1	-1653.0	
Neck	Upper Neck Z-axis Force	N	1000	1288.7	-1457.4	
	Upper Neck Y-axis Moment	Nm	600	9.7	-7.9	
Chest	Upper Left Resultant Chest Deflection	mm	Compute	23.9		
	Upper Right Resultant Chest Deflection	mm	Compute	28.7		
	Lower Left Resultant Chest Deflection	mm	Compute	14.0		
	Lower Right Resultant Chest Deflection	mm	Compute	20.7		
Abdomen	Lower Left X-axis Deflection	mm	Compute	9.2	-5.5	
	Lower Right X-axis Deflection	mm	Compute	14.0	-25.9	
Acetabulum	Left Acetabulum Resultant Force	N	Compute	1404.8		
	Right Acetabulum Resultant Force	N	Compute	1867.6		*
Femur	Left Femur Force, FZ	N	600	1268.3	-1390.9	
	Right Femur Force, FZ	N	600	696.8	-4502.5	
Tibia	Left Upper Tibia, FZ	N	600	1347.1	-558.6	
	Left Upper Tibia Index		Compute	0.514		
	Right Upper Tibia, FZ	N	600	454.6	-1957.5	
	Right Upper Tibia Index		Compute	0.643		
	Left Lower Tibia, FZ	N	600	336.9	-1084.6	
	Left Lower Tibia Index		Compute	0.133		
	Right Lower Tibia, FZ	N	600	409.7	-2444.1	
	Right Lower Tibia Index		Compute	0.196		
Ankle	Left Ankle Rotation, RX	Deg	180	31.2	-7.7	
	Left Ankle Rotation, RY	Deg	180	21.4	-24.5	
	Left Ankle Dorsiflexion Moment, MY	Nm	Compute	58.0	-74.0	
	Left Ankle In/Eversion Moment, MX	Nm	Compute	44.6	-5.8	
	Right Ankle Rotation, RX	Deg	180	14.4	-20.2	
	Right Ankle Rotation, RY	Deg	180	8.3	-29.2	
	Right Ankle Dorsiflexion Moment, MY	Nm	Compute	37.2	-45.6	
	Right Ankle In/Eversion Moment, MX	Nm	Compute	14.8	-26.7	

Anomalies:

Spikes in Abdomen Right IRTRACC. Does not affect negative peak.

Right Acetabulum Fx is not functioning

SECTION 2 … (CONTINUED)

SUMMARY OF TEST RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

	Passenger, Hybrid III 50th Percentile Male S/N 168				
Injury Reading	**Units**	**Limit**	**Value**	**t^1**	**t^2**
HIC 15		700	142.738	105.7	120.7
Nij		1	0.467	108.1	***NCF***
Upper Neck Force Z (Tension)	N	4170	270.842	210.7	
Upper Neck Force Z (Compression)	N	4000	-2128.992	108.2	
Upper Neck Moment Y (Flexion)	Nm	310	64.137	101.0	
Upper Neck Moment Y (Extension)	Nm	135	-23.948	174.5	
Chest Deflection	mm	63	-4.490	105.7	
3 ms Chest Clip	g	60	25.591	107.5	110.5
Femur Force, Left	N	10000	-4114.311	81.7	
Femur Force, Right	N	10000	-5340.191	75.8	

SECTION 3

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	R20205412	Traction Control System	Yes
Model Year	2020	Power Steering	Yes
Make	Mazda	Power Window Auto-Reverse	Yes
Model	CX-5	Driver Frontal Airbag	Yes
Body Style	5-door MPV	Driver Curtain Airbag	Yes
VIN	JM3KFABM4L0818954	Driver Head/Torso Airbag	No
Body Color	Jet Black Mica	Driver Torso Airbag	No
Odometer Reading (km / mi)	8 / 5	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.5	Driver Pelvis Airbag	No
Type / No. of Cylinders	Inline 4-cylinder	Driver Knee Airbag	No
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	6	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	FWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	No	Front Pass. Seat Belt Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other Safety Restraint	Yes

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation	GVWR (kg)	2075
Date of Manufacture	Mar-20	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*

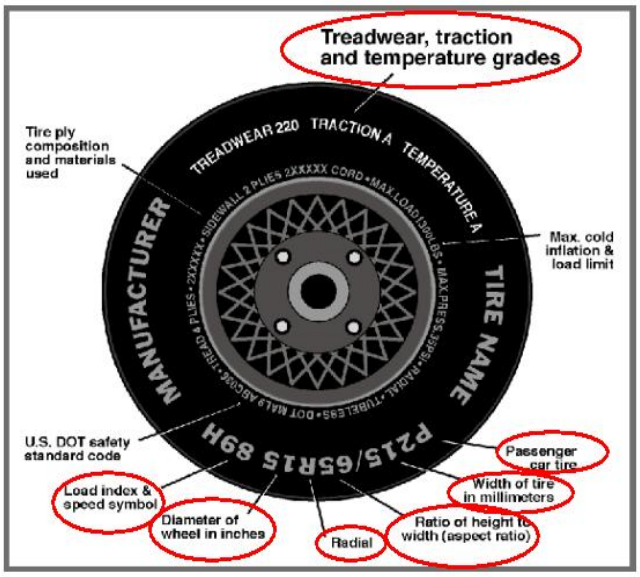
*A maximum RCLW of 136.0 kg is used for a truck, MPV, or bus

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	225/65R17	225/65R17
Tire Size on Vehicle	225/65R17	225/65R17
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	Polyester, Nylon, Steel	Polyester, Nylon, Steel
DOT Safety Code Left	FDF5 PC50820	FDF5 PC50820
DOT Safety Code Right	FDF5 PC50820	FDF5 PC50820

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	456.0	335.0		489.5	419.0	
Right	kg	460.5	307.5		474.0	376.5	
Ratio	%	58.8%	41.2%	100.0%	54.8%	45.2%	100.0%
Total	kg	916.5	642.5	1559.0	963.5	795.5	1759.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1559.0	A
Weight of THOR-50M and AM50	kg	164.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	44.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1767.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	868	875	900	900	1113
As Tested	mm	853	861	891	895	1221
Post-Test	mm	770	855	816	796	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2700
Total Vehicle Length at Left Side	mm	4313
Total Vehicle Length at Centerline	mm	4562
Total Vehicle Length at Right Side	mm	4299
Weight of Ballast/Equipment in Cargo Area	kg	97.7
Weight of Vehicle Components Removed	kg	35.0
Amount of Stoddard Solvent in Fuel Tank	L	52.10

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Taillights, trunk trim, spare tire and tools, seat cushion.

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Units	Pre-Test
1	Total Length	mm	4562
2	Total Width	mm	1835
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	924
7	Longitudinal Member Width	mm	51
8*	Engine Top Height	mm	930
9*	Engine Bottom Height	mm	219
10	Engine and Gearbox Width	mm	615
11	Front Bumper to Engine Distance	mm	488
12*	Front Shock Absorber Fixing Height	mm	1020
13*	Bonnet Leading Edge Height	mm	900
14	Front Shock Absorber Fixing Width	mm	587
15	Front Bumper to Front Axle Distance	mm	944
16	Front Axle to A-Pillar Distance	mm	603
17	A-Pillar to B-Pillar Distance	mm	985
18	B-Pillar to Rear Axle Distance	mm	1100
19	B-Pillar to C-Pillar Distance	mm	992
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

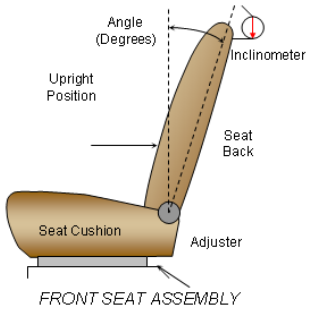
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

NOMINAL DESIGN RIDING POSITION

The driver 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. The passenger seat back was set to the manufacturer's designated angle listed in FORM 208. The seat back angle was taken at the back of the headrest post.

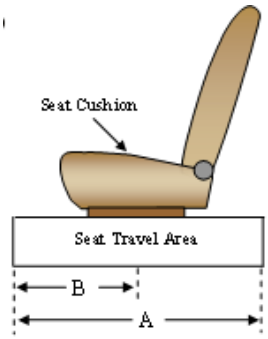


SEAT BACK ANGLE

Seating Position	Unit	FORM 208 Position	After ATD Positioning
Driver Seat Back Angle	Degrees	6.2	7.6
Passenger Seat Back Angle	Degrees	6.2	8.6

SEAT FORE / AFT POSITIONING

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



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore/Aft Travel (mm)	Placed in Position (mm)
Driver Seat	260	130
Passenger Seat	260	130

SEAT BELT UPPER ANCHORAGE

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

SEAT BELT UPPER ANCHORAGES

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

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

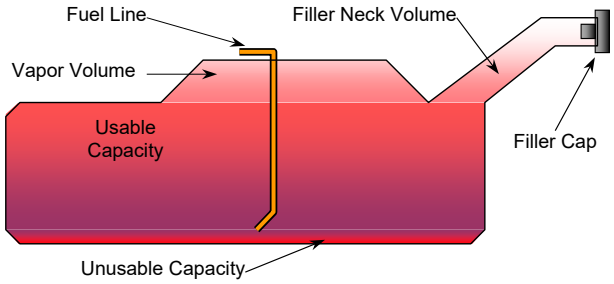
Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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

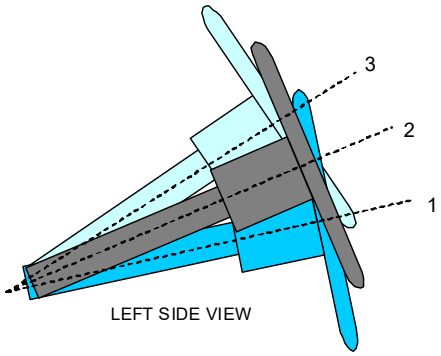
Fuel was evacuated according to the specifications provided by the manufacturer in Form 208. The electric fuel pump operates when the electrical system is activated.



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

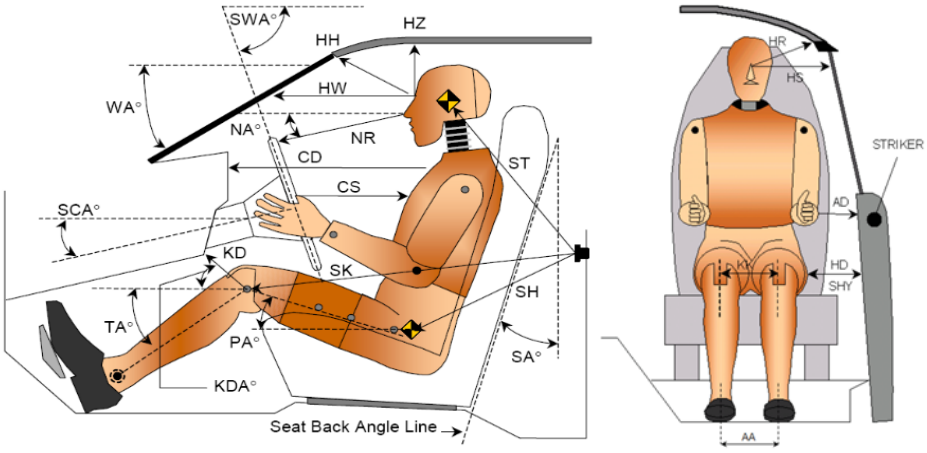
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	23.2	105
Geometric Center Position, No. 2	25.7	128
Uppermost Position, No. 3	28.2	151
Telescoping Steering Wheel Travel		46
Test Position	28.2	128

DATA SHEET NO. 3

DUMMY CLEARANCE DIMENSIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20



LEFT SIDE VIEW

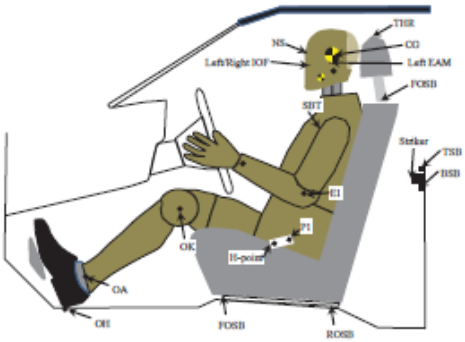
Code	Measurement Description	Driver S/N# EG2595		Passenger S/N# 168	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
HZ	Nasion to Roof (Z Distance)	206		200	
HH	Nasion to Header (3D Distance)	376		344	
HW	Nasion to Windshield Point 1 Inside (X Distance)	731		701	
NR	Tip of Nose to Top of Steering Wheel (3D Distance)	485			
CD	Chest Point 1 to Dash Point 1 (3D Distance)	575		500	
CS	Chest Point 2 to Center of Steering Wheel (X Distance)	327			
CBS	Chest Point 3 to Bottom of Steering Wheel (X Distance)	201			
IKD	Inboard Knee to Dash Point 3 (3D Distance)			153	
OKD	Outboard Knee to Dash Point 2 (3D Distance)	114		156	
HR	Nasion to Side Header (3D Distance)	334		382	
HS	Nasion to Side Window Distance (Y Distance)	334		353	
AD	Elbow to Door (Y Distance)	74		41	
HD	H-Point to Door (Y Distance)	203		214	
HLHL	Inboard Heel to Outboard Heel (Y Distance)	364		220	
KK	Inboard Knee to Outboard Knee (Y Distance)			196	
SH	Striker to H-Point (3D Distance)	338		319	
HRA	Head Restraint Post Angle		7.6		8.6
	H-Point Tool Angle		25.7		24.6
	Torso Angle		19.4		N/A
	Windshield Angle		61.0		61.0
	Head Angle (X)		0.4		N/A
	Head Angle (Y)		-0.7		N/A
	T1 Angle (X)				
	T1 Angle (Y)				
	T6 Angle (X)		-1.3		
	T6 Angle (Y)		18.5		
	T12 Angle (X)				
	T12 Angle (Y)				
	Pelvis Angle (X)		-0.7		
	Pelvis Angle (Y)		33.2		

DATA SHEET NO. 4

DUMMY CMM MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20



Description	Units	Driver S/N# EG2595			Passenger S/N# 168		
		X	Y	Z	X	Y	Z
Center of Upper Striker Bolt	mm	2031	-798	-331	2032	792	-329
Center of Lower Striker Bolt	mm	2037	-798	-296	2038	794	-294
Center of Striker Bar	mm	2065	-799	-319	2066	794	-316
Front Outboard Seat Bolt	mm	2556	-614	74	2559	604	74
Rear Outboard Seat Bolt	mm	2115	-612	121	2117	604	122
Center of Steering Wheel Hub	mm	2555	-376	-532			
Outer Head Restraint Post	mm	1866	-457	-669	1861	450	-669
Right Head CG	mm	2073	-296	-811	2125	448	-815
Left Head CG	mm	2074	-449	-812	2123	296	-814
Right EAM	mm	2076	-303	-783			
Left EAM	mm	2075	-447	-784			
Nasion	mm	2163	-374	-826	2209	370	-816
Right IOF	mm	2162	-343	-792			
Left IOF	mm	2162	-405	-792			
Tip of Nose	mm	2165	-375	-789	2231	371	-773
Tip of Chin	mm	2166	-374	-698	2200	379	-696
Chest Point 1	mm	2209	-375	-573	2248	377	-569
Chest Point 2	mm	2229	-376	-532			
Chest Point 3	mm	2307	-375	-373			
Shoulder Point 1	mm	2069	-574	-591	2120	559	-549
Shoulder Point 2	mm	2138	-564	-566			
Elbow	mm	2302	-623	-343	2248	-647	-320
Center of H-Point Tool	mm	2229	-647	-201			
H-Point on H-Point Tool	mm	2301	-612	-166	2299	641	-161
H-Point on ATD Skin	mm	2302	-572	-167	2300	551	-161
Outboard Knee	mm	2697	-565	-312	2682	508	-258
Inboard Knee	mm				2676	312	-248
Outboard Ankle	mm	2961	-584	13	2991	531	28
Inboard Ankle	mm	2986	-244	19			
Outboard Heel	mm	2970	-575	148	2999	491	134
Inboard Heel	mm	2977	-212	151	2991	272	135

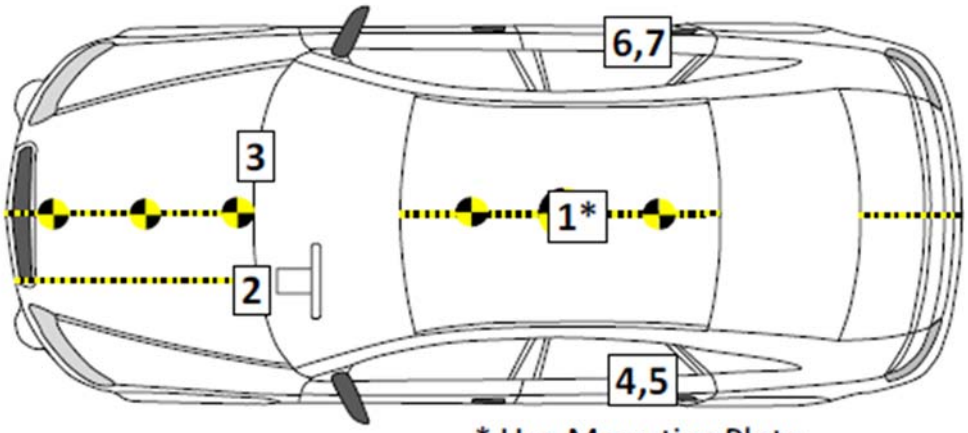
Reference Point:
+X – From the rear of the vehicle to the front of the vehicle
+Y – From the left side of the vehicle to the right side of the vehicle
+Z – From the top of the vehicle to the bottom of the vehicle

DATA SHEET NO. 5

VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20



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	1801	-4	72
2	Driver Floor Pan	x, y, z	°/s	3287	-405	31
3	Passenger Floor Pan	x, y, z	g	3217	393	79
4	Door Sill LR	x, y	g	1608	-717	151
5	Door Sill LR Redundant	x, y	g	1582	-718	152
6	Door Sill RR	x, y	g	1607	707	153
7	Door Sill RR Redundant	x, y	g	1586	708	154

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

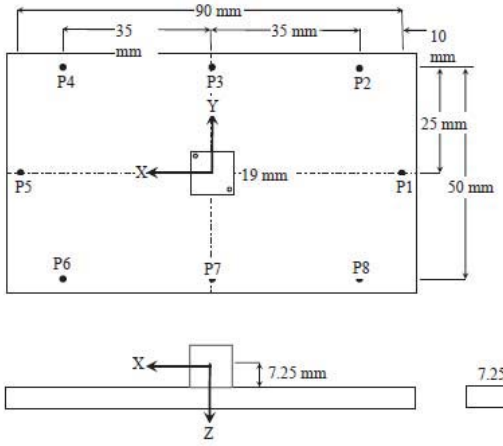
DATA SHEET NO. 5 … (CONTINUED)

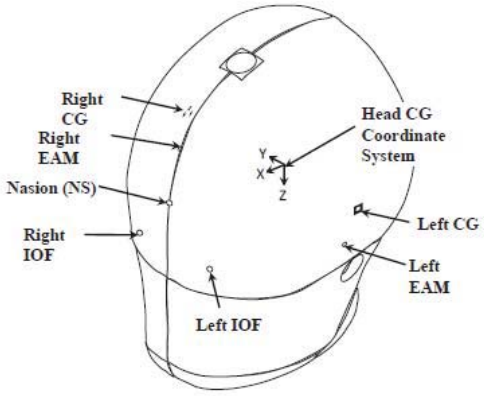
VEHICLE INSTRUMENTATION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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	1864	-2	67
P2	Plate Point 2	mm	1853	-27	67
P3	Plate Point 3	mm	1818	-26	71
P4	Plate Point 4	mm	1783	-25	74
P5	Plate Point 5	mm	1774	0	75
P6	Plate Point 6	mm	1785	25	74
P7	Plate Point 7	mm	1820	24	71
P8	Plate Point 8	mm	1854	23	68

DRIVER HEAD POINTS IN RELATION TO HEAD CG COORDINATE SYSTEM

Description	Units	x	y	z
Left CG	mm	66	-41	44
Left EAM	mm	72	-36	72
Left IOF	mm	154	2	72
Right IOF	mm	153	66	72
Nasion	mm	157	35	35
Right EAM	mm	72	107	72
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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

Location No.	Description	Axes	Units	Positive Direction		Negative Direction	
				Max	Time (ms)	Min	Time (ms)
1	Vehicle CG	x	g	7.2	40.5	-22.3	81.5
		y	g	4.7	38.7	19.2	47.1
		z	g	26.3	45.9	-27.9	37.3
	Vehicle CG Rotation	x	°/s	95.7	44.7	-58.5	105.1
		y	°/s	126.5	42.0	-114.3	39.0
		z	°/s	60.6	289.4	-41.5	67.3
2	Driver Floor Pan	x	g	0.8	22.4	-14.4	72.9
		y	g	9.7	73.0	-20.5	47.7
		z	g	19.3	59.5	-1.8	26.8
3	Passenger Floor Pan	x	g	6.6	63.4	-16.5	75.9
		y	g	4.7	15.1	-26.3	46.1
		z	g	17.5	31.7	-4.7	15.5
4	Door Sill LR	x	g	1.1	146.9	-21.4	56.5
		y	g	3.6	38.0	-15.6	48.0
5	Door Sill LR Redundant	x	g	1.1	157.9	-19.6	55.9
		y	g	4.1	37.9	-13.3	48.1
6	Door Sill RR	x	g	0.5	176.9	-18.7	82.5
		y	g	4.0	17.9	-15.5	48.8
7	Door Sill RR Redundant	x	g	0.5	218.8	-18.5	82.6
		y	g	3.8	17.9	-14.0	48.8

Note: See Appendix B for all vehicle data plots

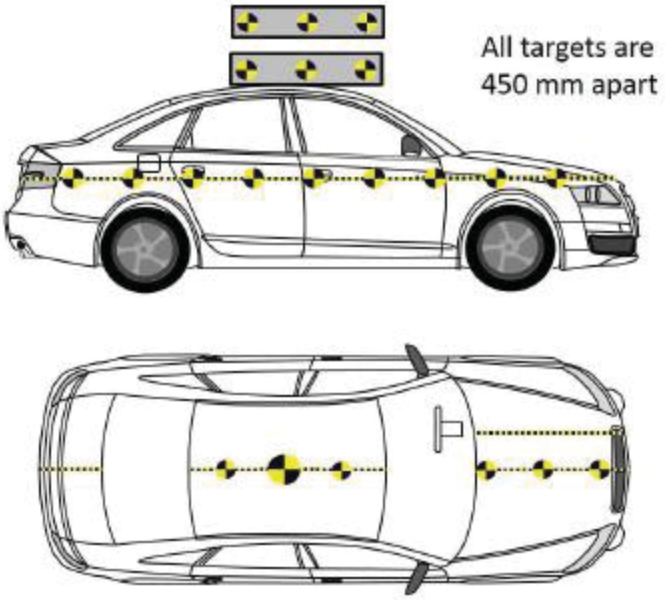
DATA SHEET NO. 6

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

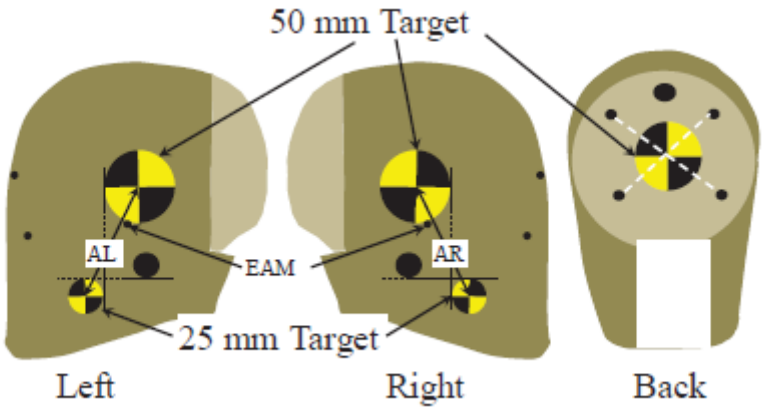
Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Sensors	99
Passenger Dummy Sensors	43
Vehicle Structure Sensors	30
Total	172

CAMERA COVERAGE

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

DATA SHEET NO. 8

POST TEST OBSERVATIONS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	THOR-50M / EG2595	AM50 / 168
Lower Leg Type	LX	
Lower Leg Serial No.		
Head Contact	Front Airbag and Windshield	Front Airbag, Windshield, and Headliner
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	Front Airbag	Front Airbag
Left Knee Contact	Knee Bolster	Knee Bolster
Right Knee Contact	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)		
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	No	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	No	Yes	Yes
Knee Airbag	No	No	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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4562	4549	-12
2	Rear Surface of Vehicle to Front of Engine	4074	3920	-154
3	RSOV to Firewall	3545	3549	4
4	RSOV to Upper Leading Edge of Right Door	3061	3060	-1
5	RSOV to Upper Leading Edge of Left Door	3058	3058	0
6	RSOV to Lower Leading Edge of Right Door	3087	3080	-7
7	RSOV to Lower Leading Edge of Left Door	3083	3083	0
8	RSOV to Upper Trailing Edge of Right Door	1945	1943	-2
9	RSOV to Upper Trailing Edge of Left Door	1942	1943	1
10	RSOV to Lower Trailing Edge of Right Door	2073	2070	-3
11	RSOV to Lower Trailing Edge of Left Door	2070	2071	1
12	RSOV to Bottom of A-Pillar, Right Side	3018	3018	0
13	RSOV to Bottom of A-Pillar, Left Side	3015	3016	1
14	RSOV to Firewall, Right Side	3635	3610	-24
15	RSOV to Firewall, Left Side	3632	3635	3
16	RSOV to Steering Column	2558	2577	19
17	Center of Steering Column to A-Pillar	457	439	-18
18	Center of Steering Column to Headliner	477	469	-8
19	RSOV to Right Side of Front Bumper	4299	3989	-310
20	RSOV to Left Side of Front Bumper	4313	4321	8
21	Length of Engine Block	500	440	-60
RD	RSOV to Right Side of Dash Panel	2780	2786	6
CD	RSOV to Center of Dash Panel	2748	2759	11
LD	RSOV to Left Side of Dash Panel	2779	2782	3

All measurements in millimeters.

DATA SHEET NO. 10

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

VEHICLE INFORMATION

VIN: JM3KFABM4L0818954 Wheelbase (mm): 2700

Vehicle Size Category: 5-door MPV Test Weight (kg): 1759.0

ACCELEROMETER DATA

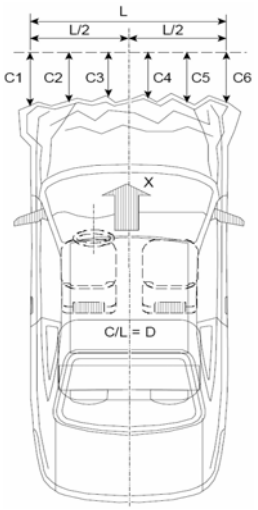
Accelerometer Locations: Vehicle CG_x

Cal. Procedure/Interval: Vibration Test / 6 months

Integration Algorithm: NHTSA Standard

Linearity: Good

Impact Velocity (km/h): 40.63



CRUSH PROFILE

Collision Deformation Classification: 12FREW2

Midpoint of Damage: Vehicle Centerline

Damage Region Length (mm): 1508

Impact Mode: Right Side 30° Frontal

Crush Measurements

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4310	4318	8
C2	Crush Zone 2 at Left Side	mm	4453	4474	20
C3	Crush Zone 3 at Left Side	mm	4511	4515	3
C4	Crush Zone 4 at Right Side	mm	4511	4497	-14
C5	Crush Zone 5 at Right Side	mm	4446	4171	-274
C6	Crush Zone 6 at Right Side	mm	4297	3986	-310
L	C1 to C6	mm	1508		

DATA SHEET NO. 11

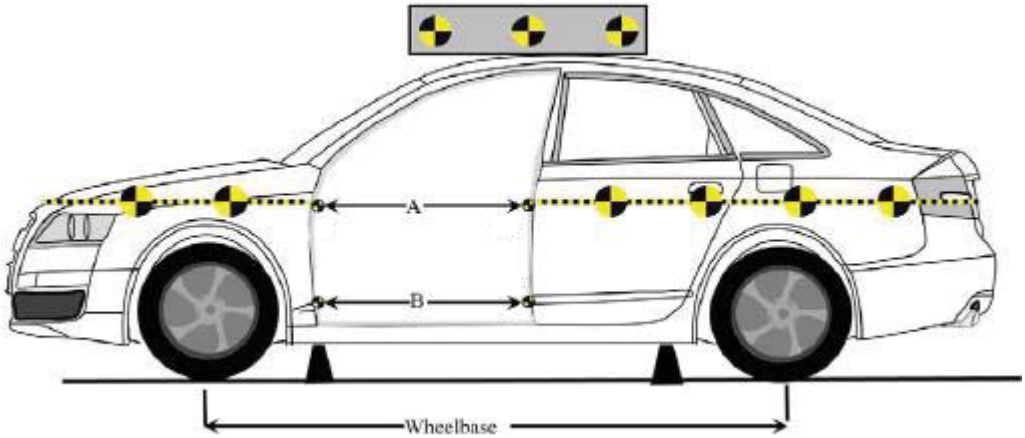
VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Driver Side Upper	mm	872	874	-1
B	Driver Side Lower	mm	735	736	-2
D	Passenger Side Upper	mm	872	871	1
E	Passenger Side Lower	mm	735	736	-1



DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

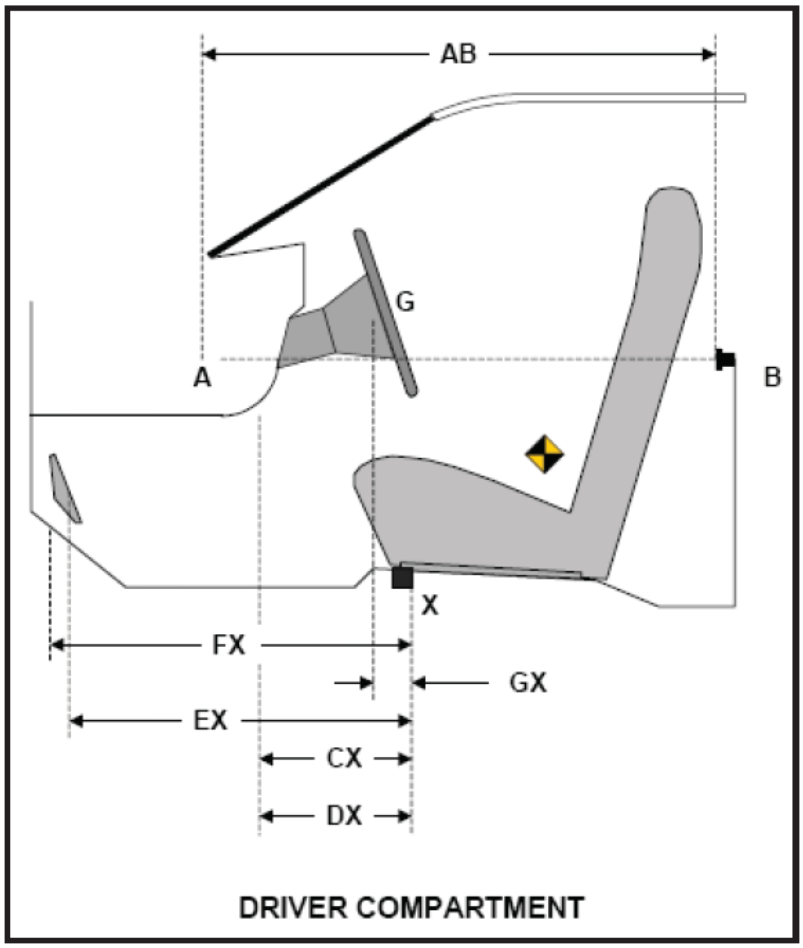
Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	865	864	1
CX	Left Knee Bolster to X	mm	286	290	-4
DX	Right Knee Bolster to X	mm	263	284	-21
EX	Brake Pedal to X	mm	519	520	0
FX	Footrest to X	mm	659	662	-3
GX	Center of Steering Column Wheel Hub to X	mm	4	15	-12

X = Front of Seat Bolt



DRIVER COMPARTMENT

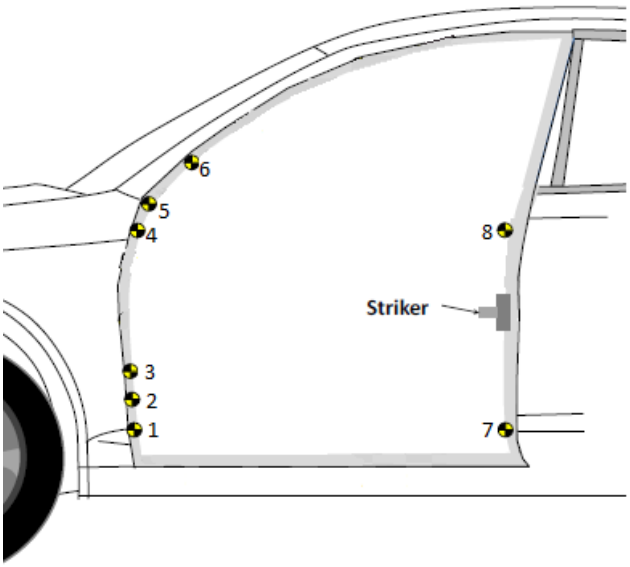
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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	-759	-14	2958	-759	-16	1	0	-2
2	2965	-754	-91	2966	-754	-92	1	0	-1
3	2955	-750	-165	2955	-751	-165	-1	0	0
4	2920	-751	-465	2918	-751	-463	-1	0	2
5	2907	-755	-540	2908	-755	-539	1	0	1
6	2880	-757	-615	2882	-757	-615	1	0	0
7	2223	-762	-14	2222	-762	-14	-2	0	0
8	2046	-745	-465	2045	-746	-466	-1	0	-1

All measurements in millimeters.

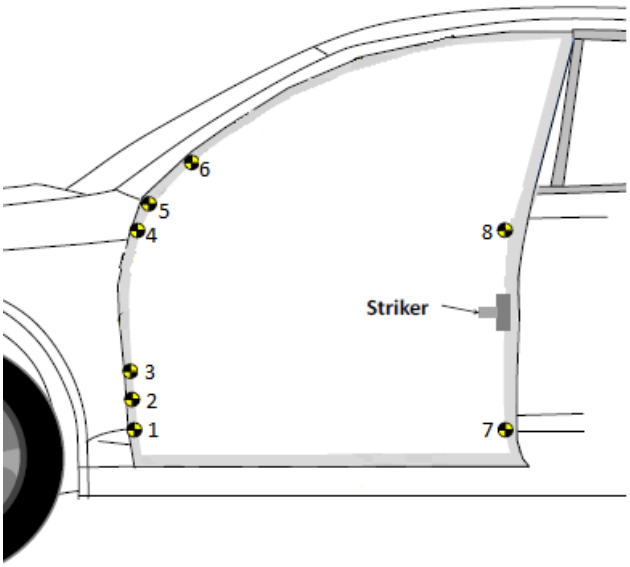
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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	2959	748	-15	2960	748	-14	2	0	1
2	2966	743	-89	2968	743	-89	1	0	1
3	2959	739	-166	2956	739	-166	-3	0	0
4	2921	742	-467	2920	743	-465	-1	0	2
5	2907	746	-538	2908	747	-536	1	1	3
6	2879	749	-618	2880	750	-617	1	1	1
7	2224	753	-14	2225	754	-14	0	1	0
8	2049	738	-464	2049	739	-463	0	1	1

All measurements in millimeters.

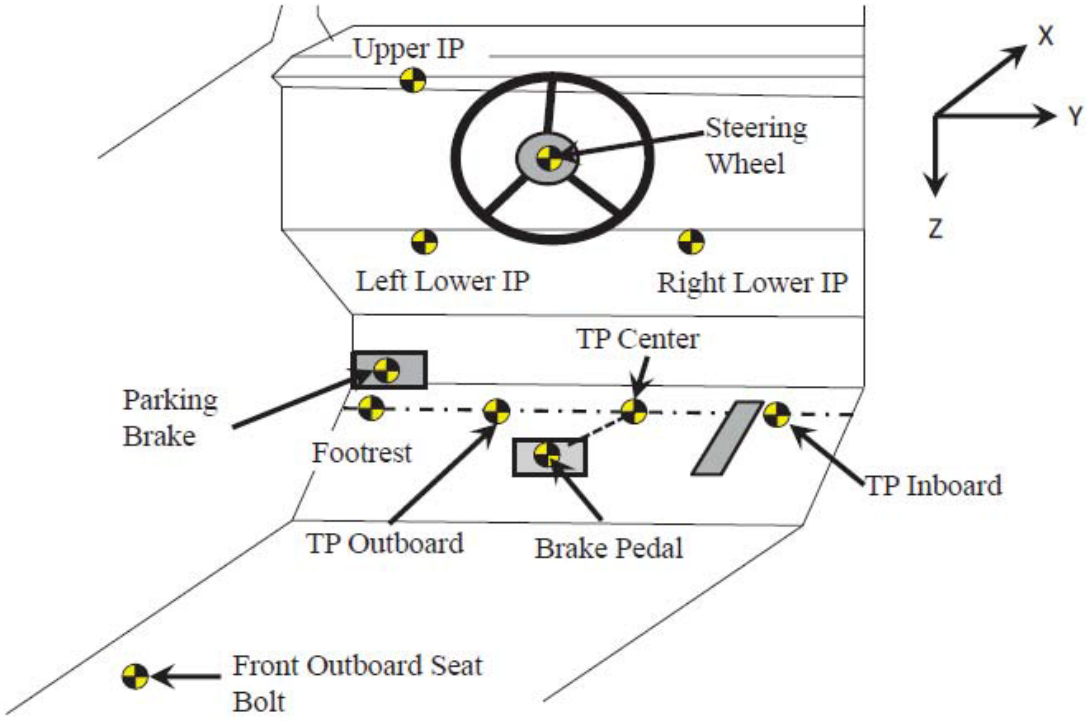
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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	3354	-180	-29	3354	-184	-30	0	-4	-1
TP Center	3346	-339	-17	3346	-339	-18	0	0	-1
TP Outboard	3304	-483	-14	3305	-483	-14	0	0	0
TP Footrest	3219	-585	-14	3218	-585	-13	0	0	1
Brake Pedal	3078	-335	-15	3076	-340	-19	-3	-5	-3
Left Lower IP	2845	-523	-300	2846	-522	-299	1	1	2
Right Lower IP	2822	-220	-300	2840	-220	-310	18	0	-10
Upper IP	2754	-522	-436	2757	-520	-440	4	2	-5
Steering Wheel	2555	-376	-532	2574	-368	-540	19	8	-8
Front Outboard Bolt	2556	-613	74	2556	-615	73	0	-1	0
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

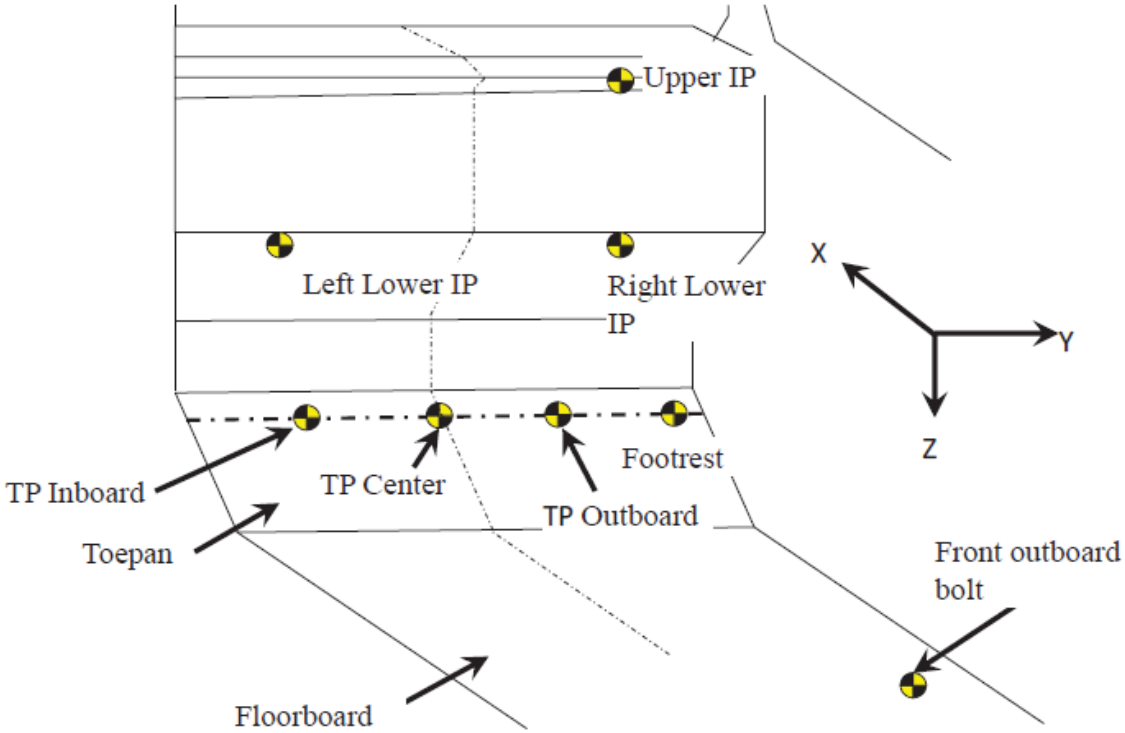
DATA SHEET NO. 11 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS RELATIVE TO VCS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

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	211	-14	3325	207	-20	2	-4	-6
TP Center	3343	361	-16	3341	357	-18	-2	-4	-1
TP Outboard	3252	512	-15	3251	507	-17	-1	-5	-1
TP Footrest	3200	612	-15	3199	609	-17	0	-4	-2
Left Lower IP	2809	210	-305	2826	214	-307	17	4	-2
Right Lower IP	2844	512	-303	2845	511	-304	1	0	-1
Upper IP	2745	512	-469	2753	516	-471	8	4	-2
Front Outboard Seat Bolt	2559	604	74	2559	602	74	0	-1	1

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

DATA SHEET NO. 12

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

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

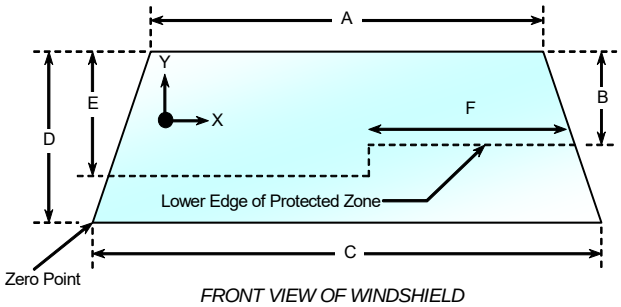
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with plastic molding and rubber cement.

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: 21.1° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1317	1317	100.0%
Right Side	1317	1317	100.0%
Total	2634	2634	100.0%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	623
B	mm	760
C	mm	765
D	mm	623
E	mm	760
F	mm	765

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. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 15.6° C Test Time: 7:33 PM

Stoddard Solvent Spillage Measurements

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

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

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

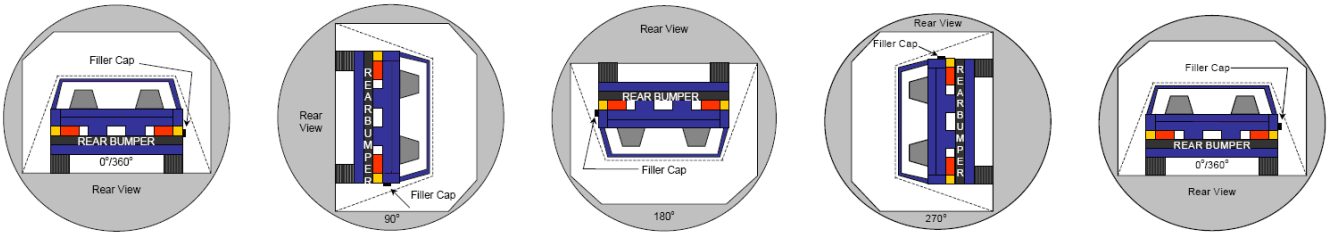
D. Spillage: There was no Stoddard solvent spillage.

DATA SHEET NO. 13

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Mazda CX-5 5-Door MPV NHTSA No. R20205412

Test Program: R&D Right Side 30° Frontal Rigid Barrier Impact Test Date: 12/07/20



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°	79	300	379
90° To 180°	80	300	380
180° To 270°	84	300	384
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

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

FIGURE 1. Test Vehicle Certification Label

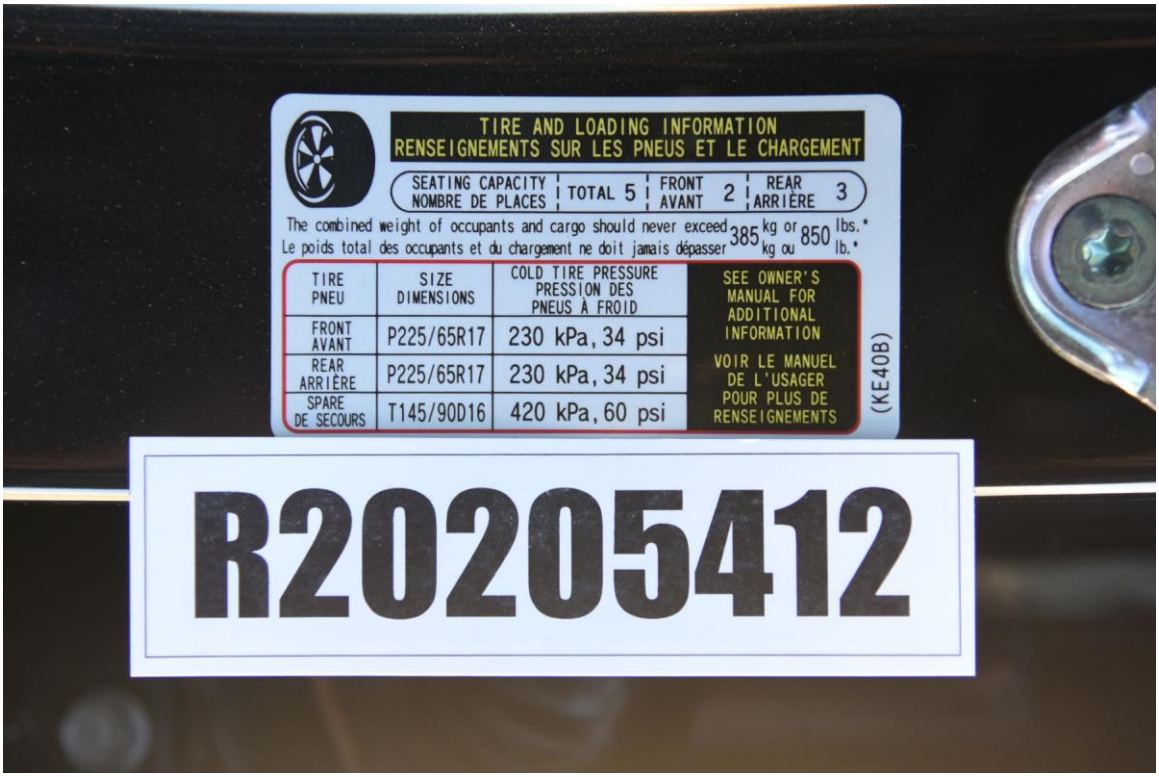


FIGURE 2. Test Vehicle Tire Placard

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

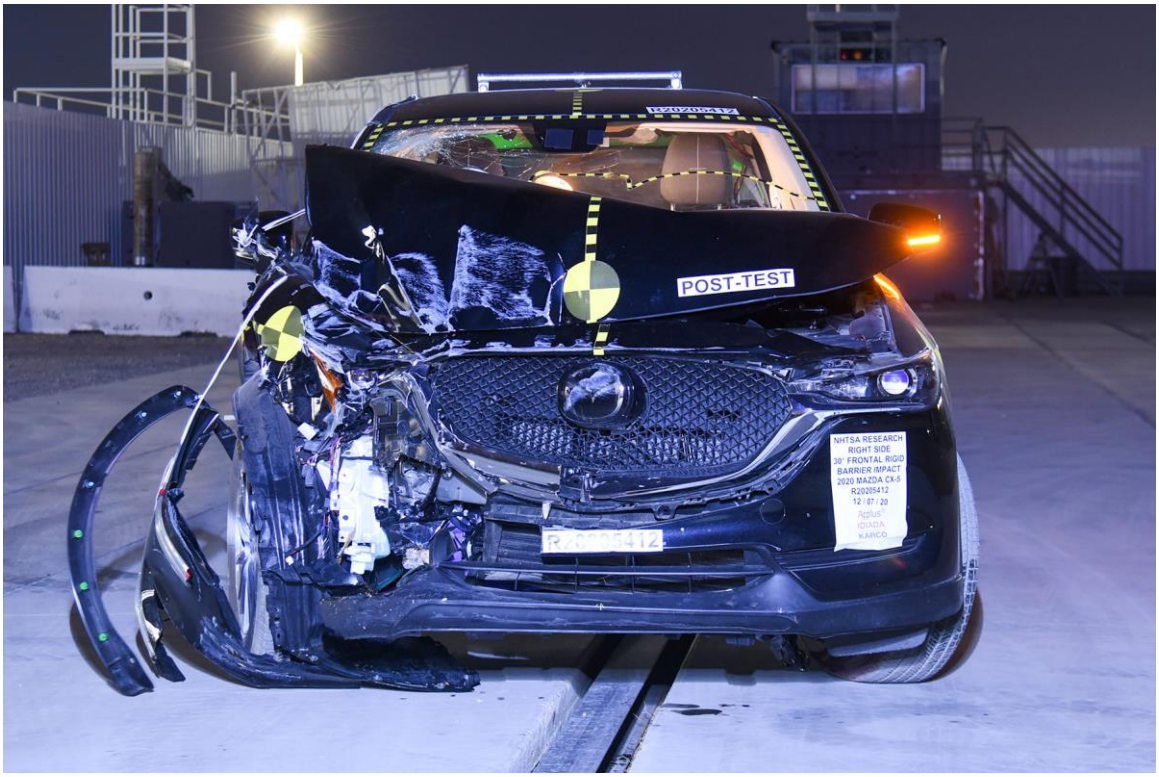


FIGURE 6. Post-Test Front View of Test Vehicle

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

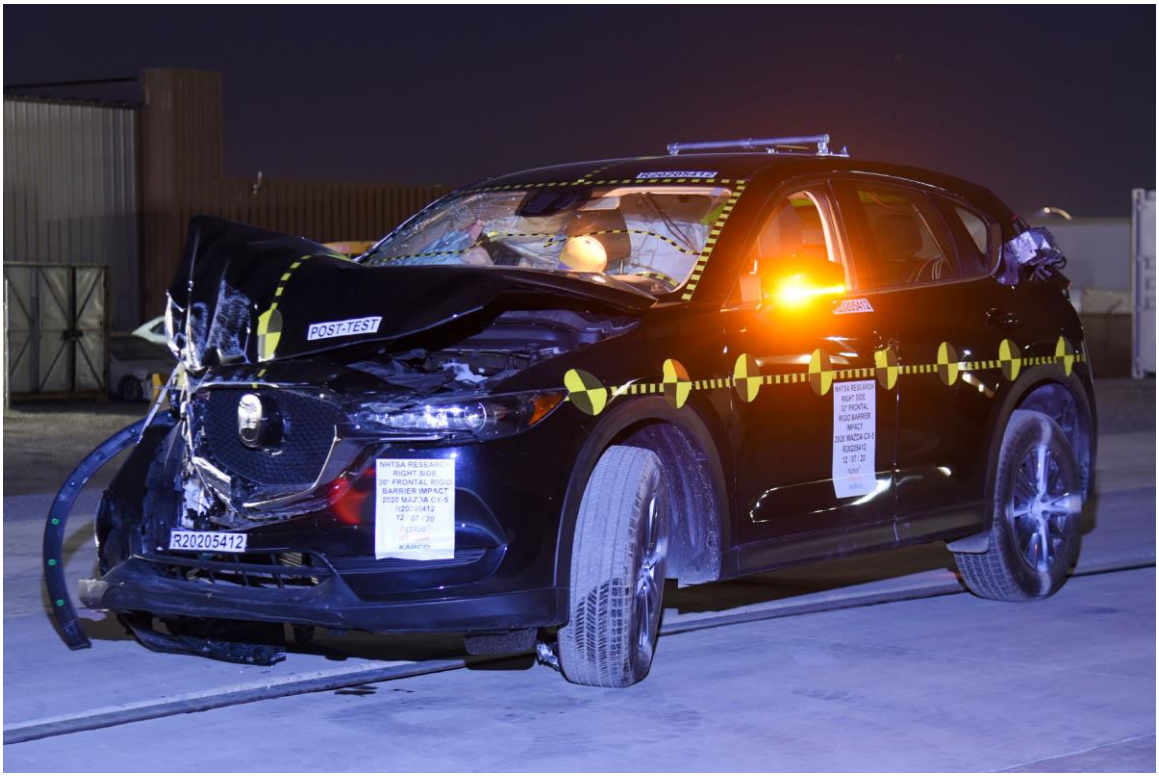


FIGURE 12. Post-Test Left Front ¾ View of Test Vehicle

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

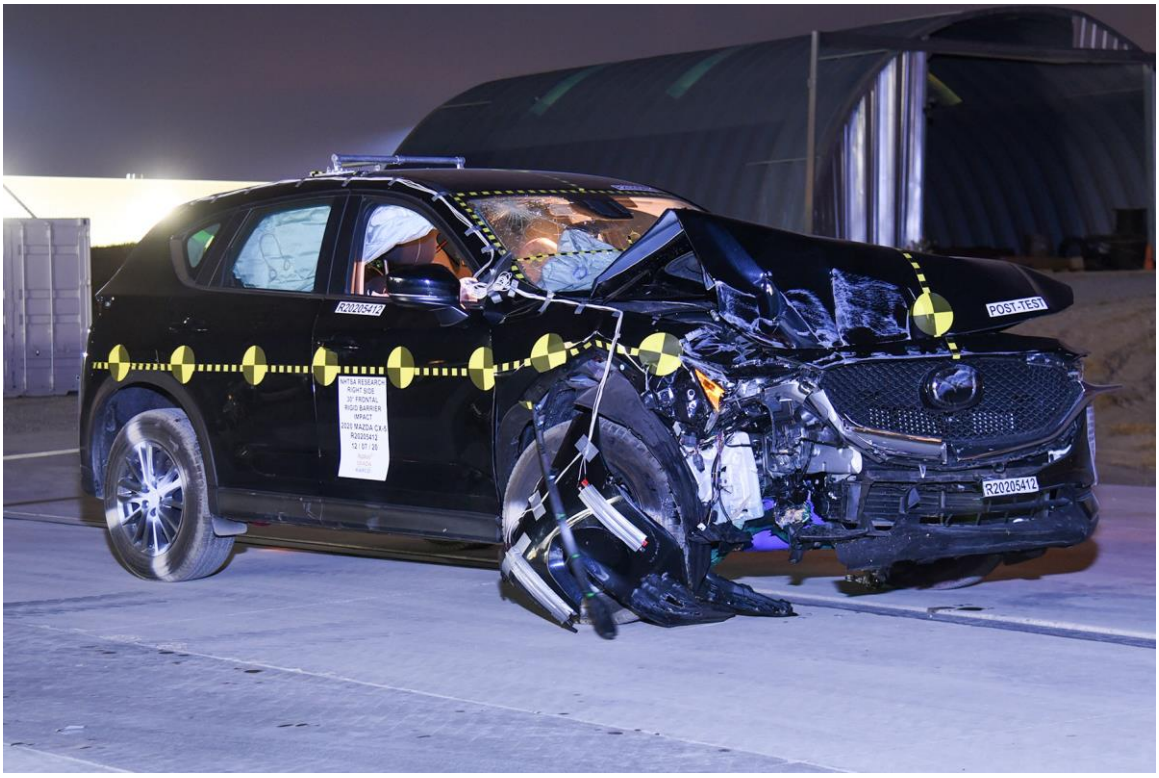


FIGURE 14. Post-Test Right Front ¾ View of Test Vehicle

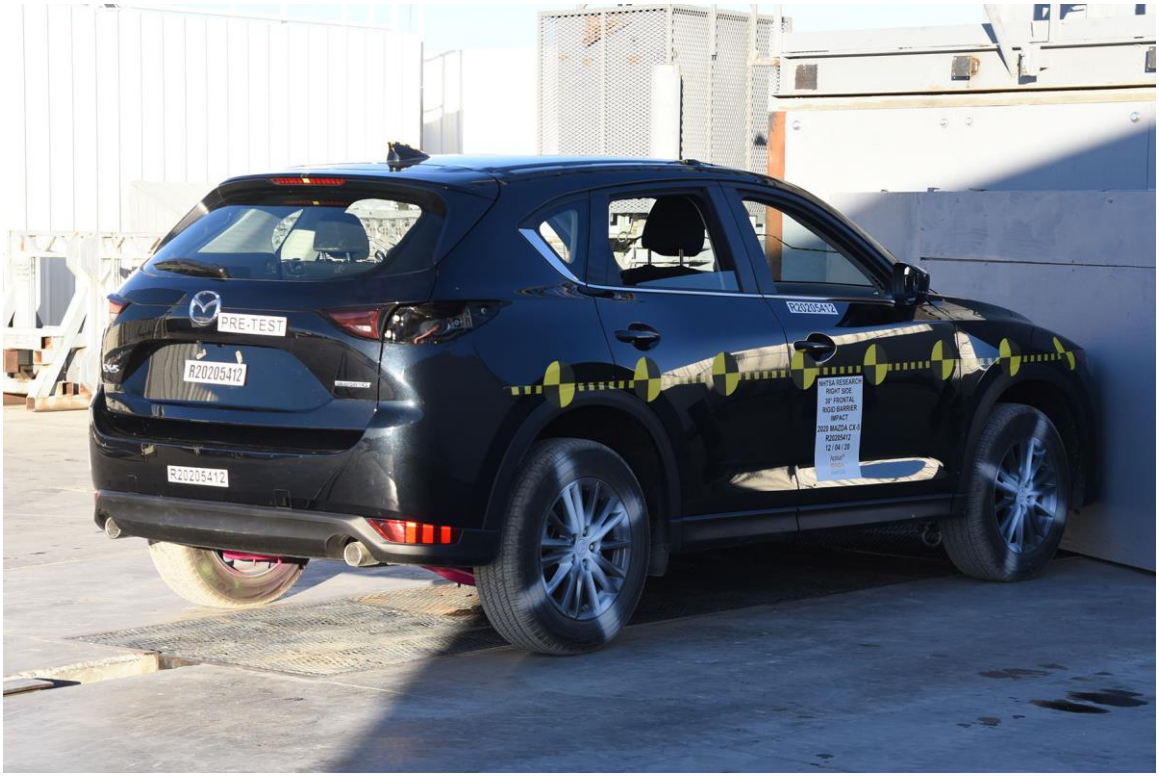


FIGURE 15. Pre-Test Right Rear ¾ View of Test Vehicle

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

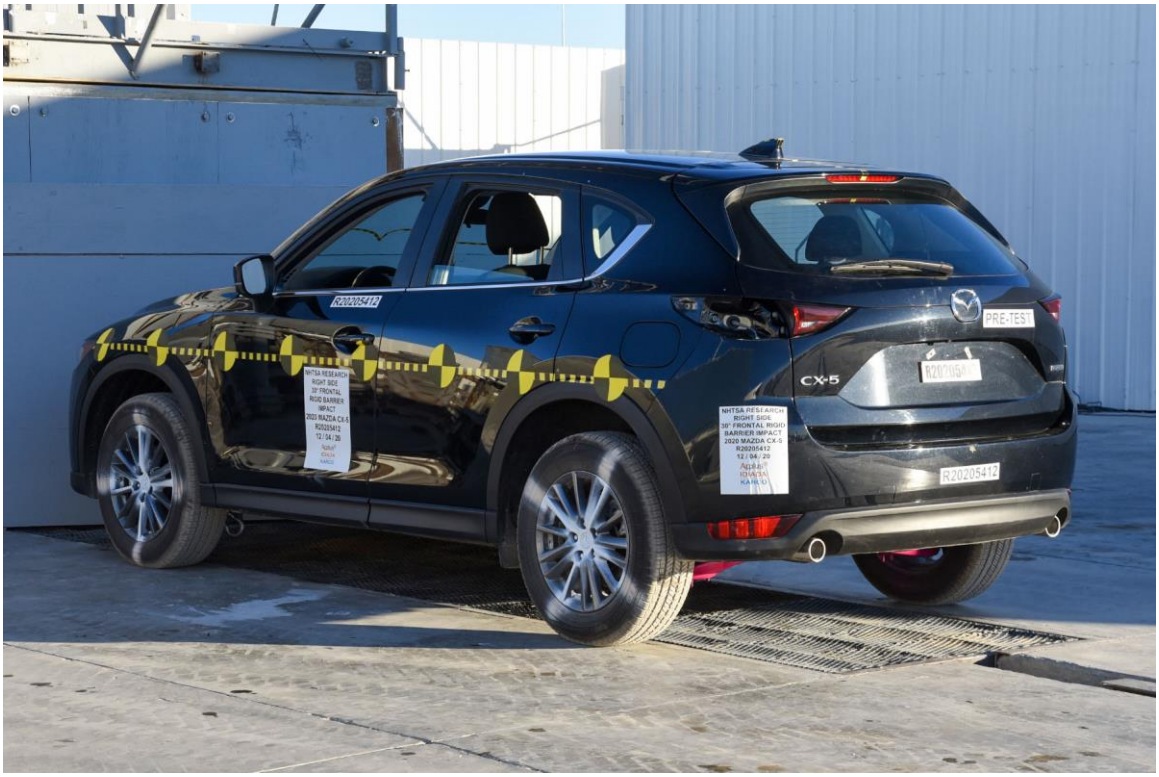


FIGURE 19. Pre-Test Left Rear ¾ View of Test Vehicle

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

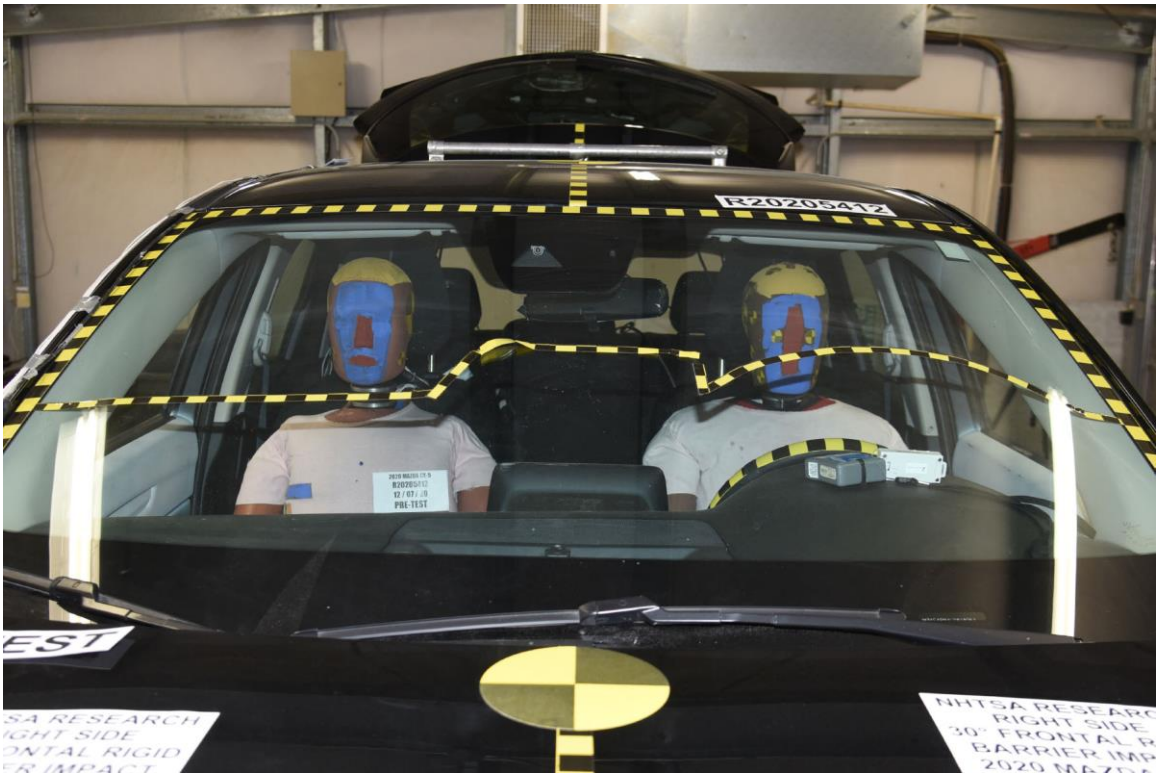


FIGURE 21. Pre-Test Windshield View

FIGURE 22. Post-Test Windshield View

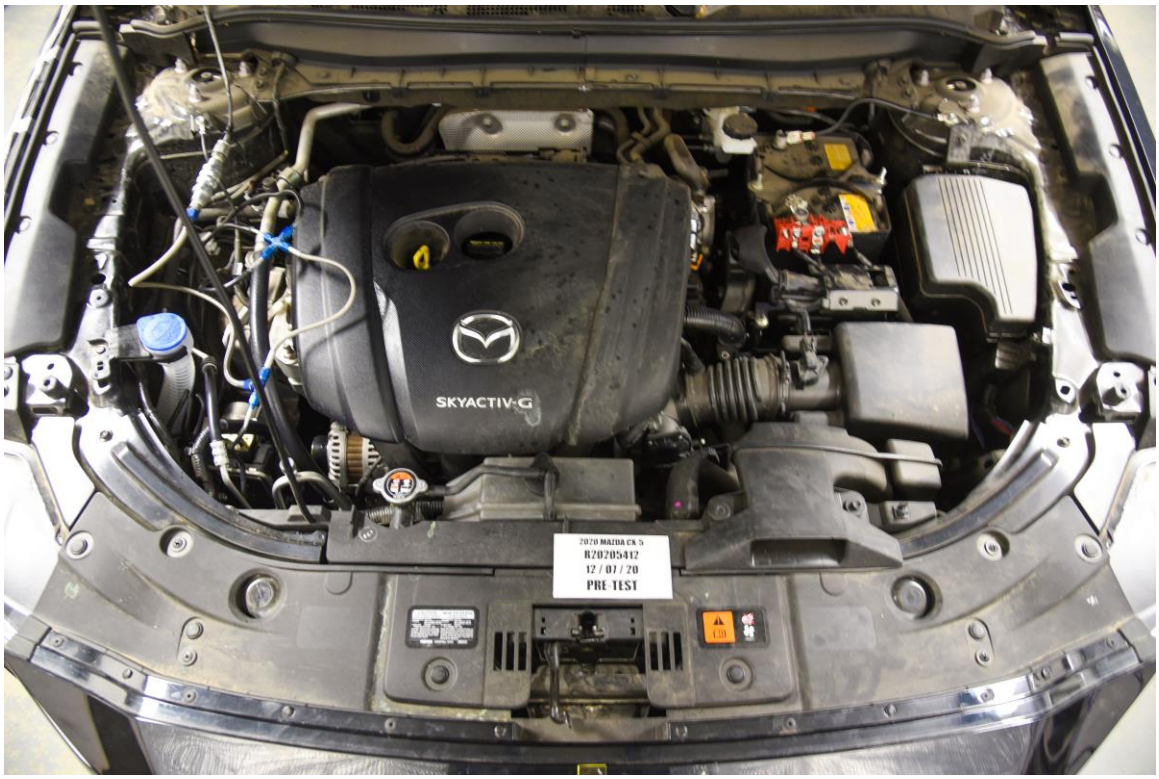


FIGURE 23. Pre-Test Engine Compartment View

Photograph Not Available

FIGURE 24. Post-Test Engine Compartment View

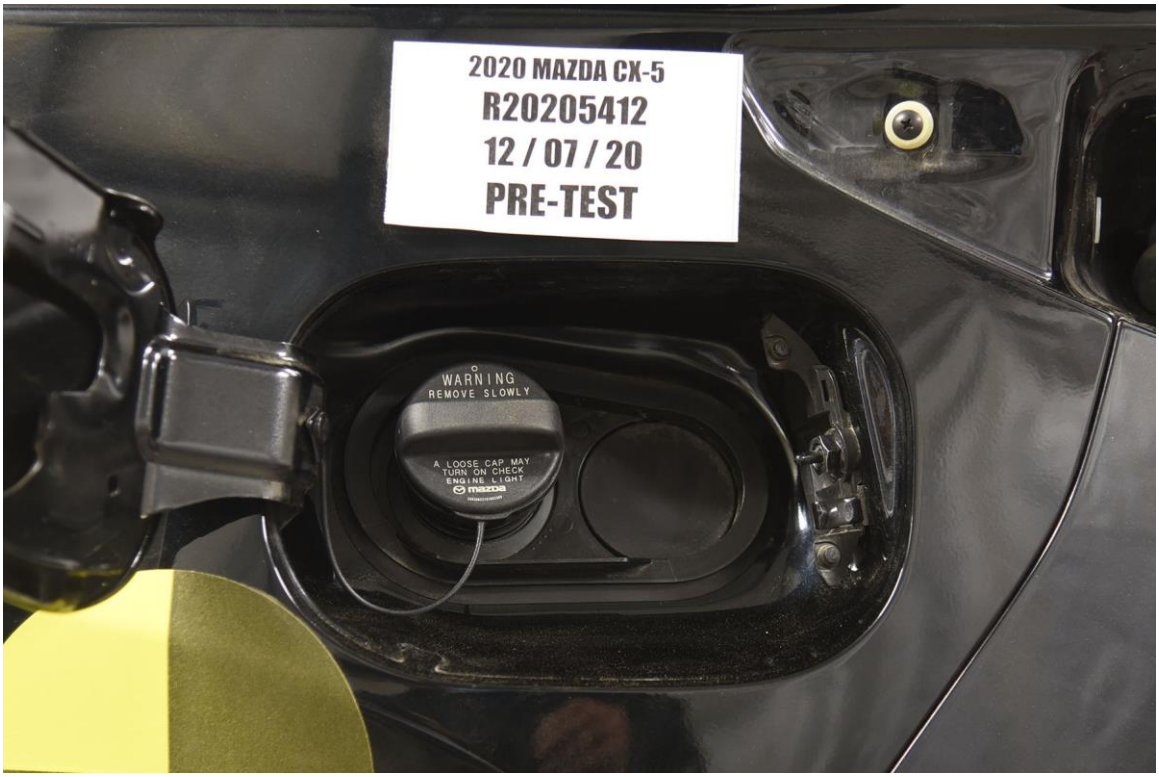


FIGURE 25. Pre-Test Fuel Filler Cap View

FIGURE 26. Post-Test Fuel Filler Cap View

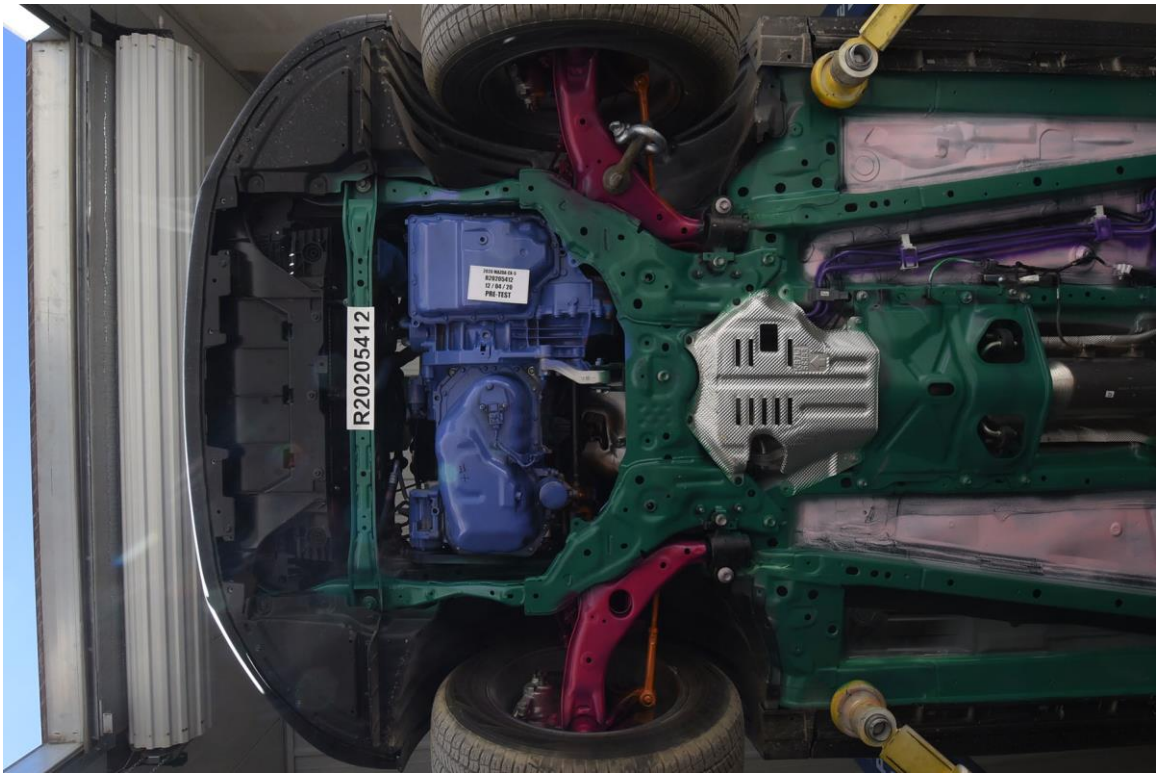


FIGURE 27. Pre-Test Front Underbody View

FIGURE 28. Post-Test Front Underbody View

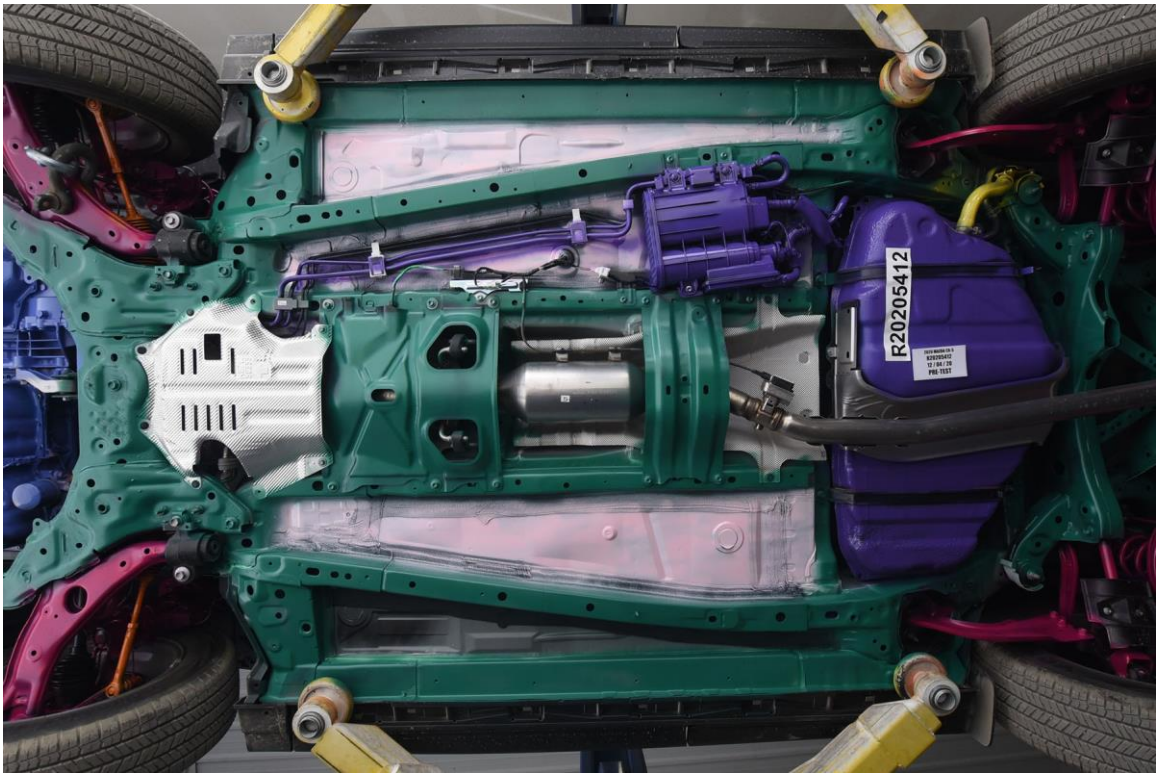


FIGURE 29. Pre-Test Mid Underbody View

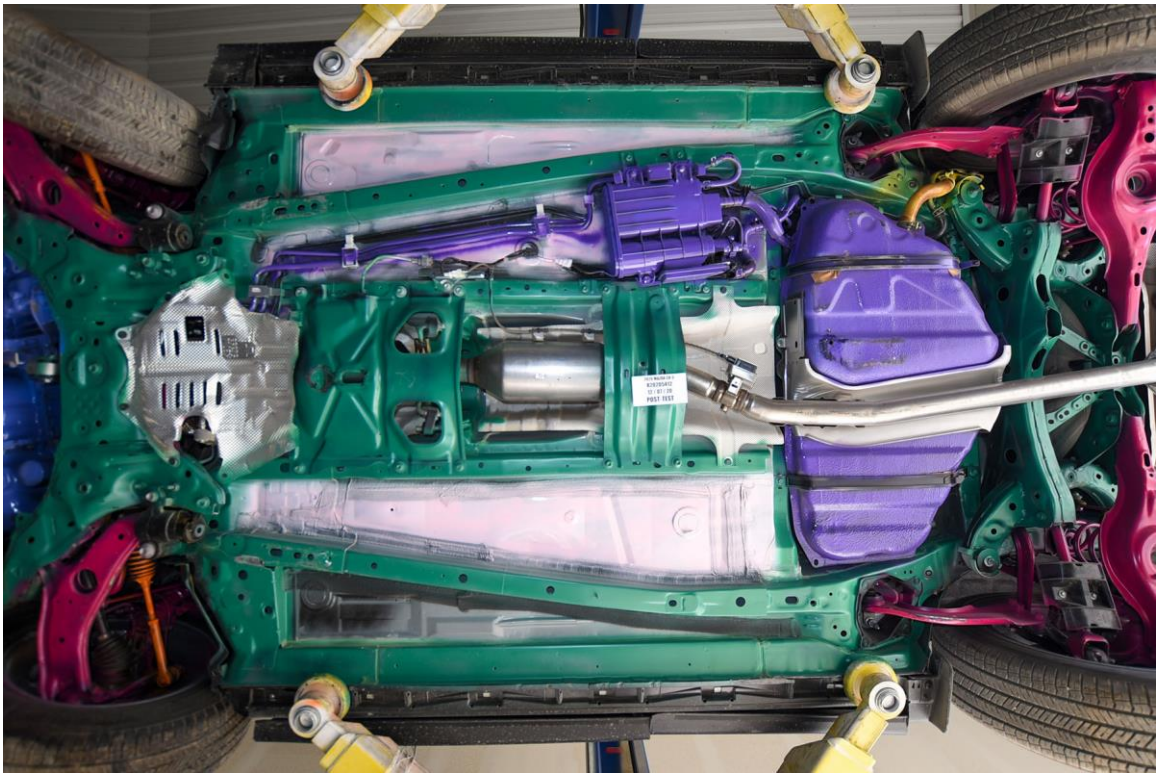


FIGURE 30. Post-Test Mid Underbody View

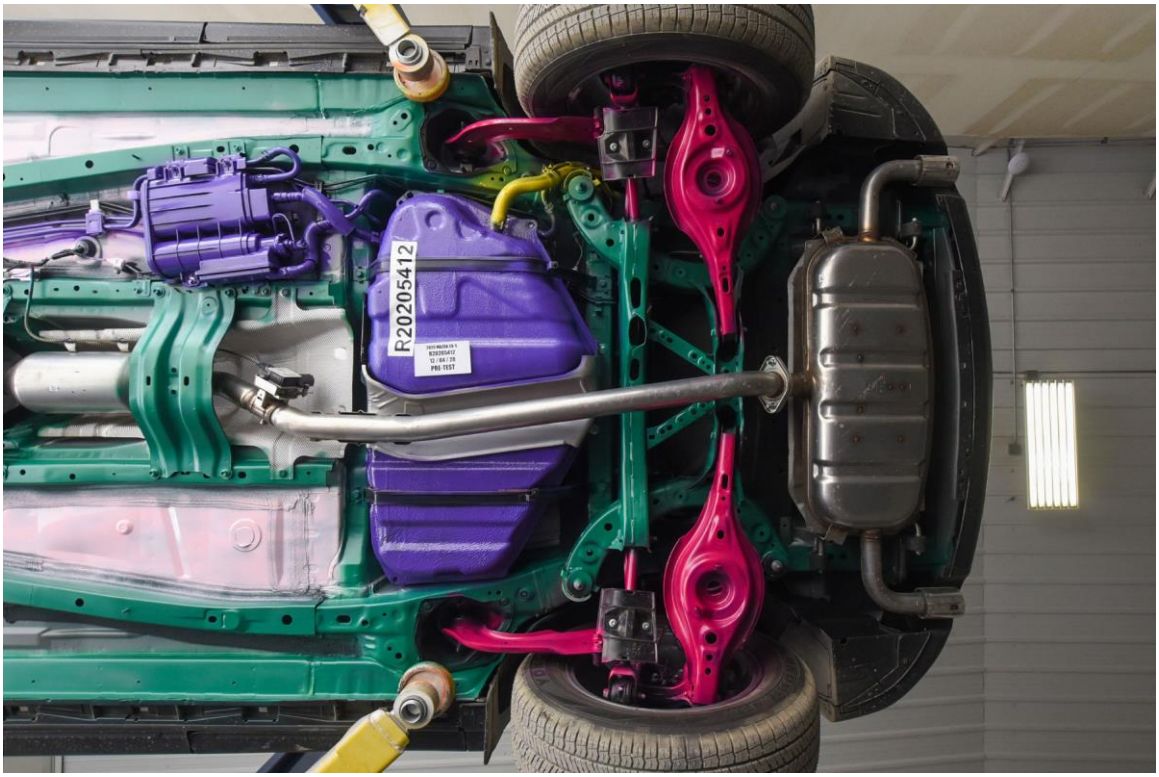


FIGURE 31. Pre-Test Rear Underbody View

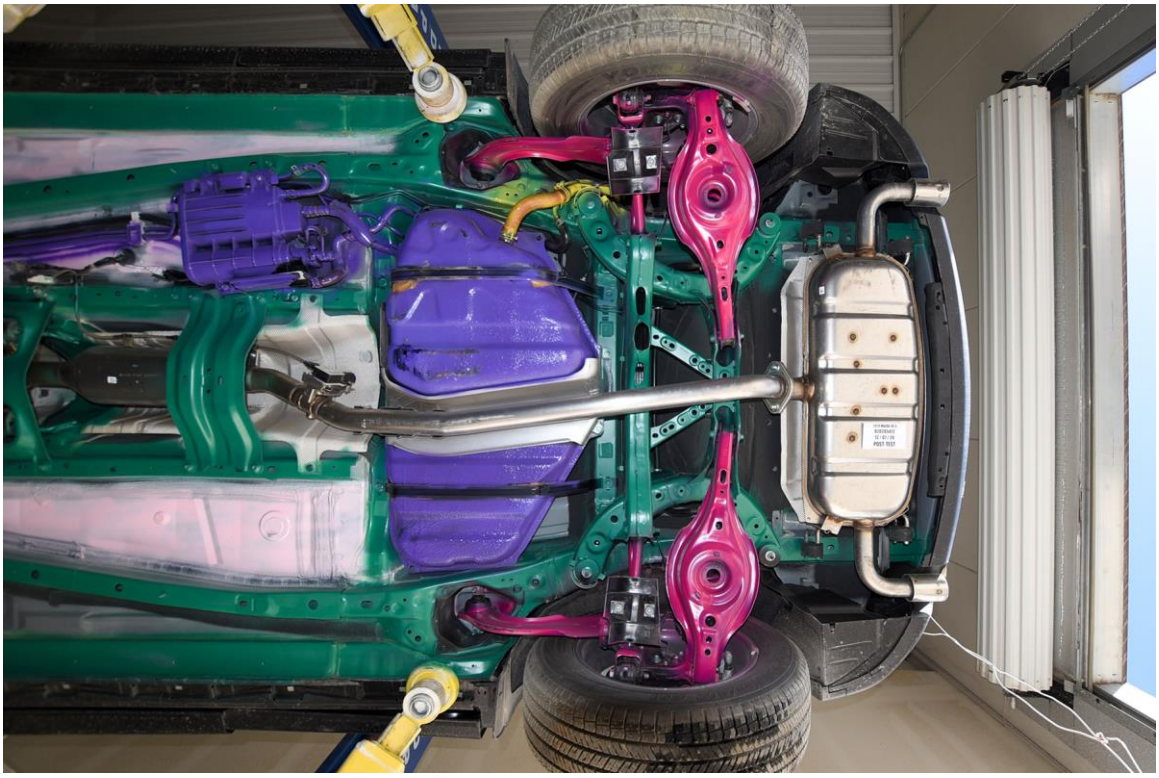


FIGURE 32. Post-Test Rear Underbody View

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

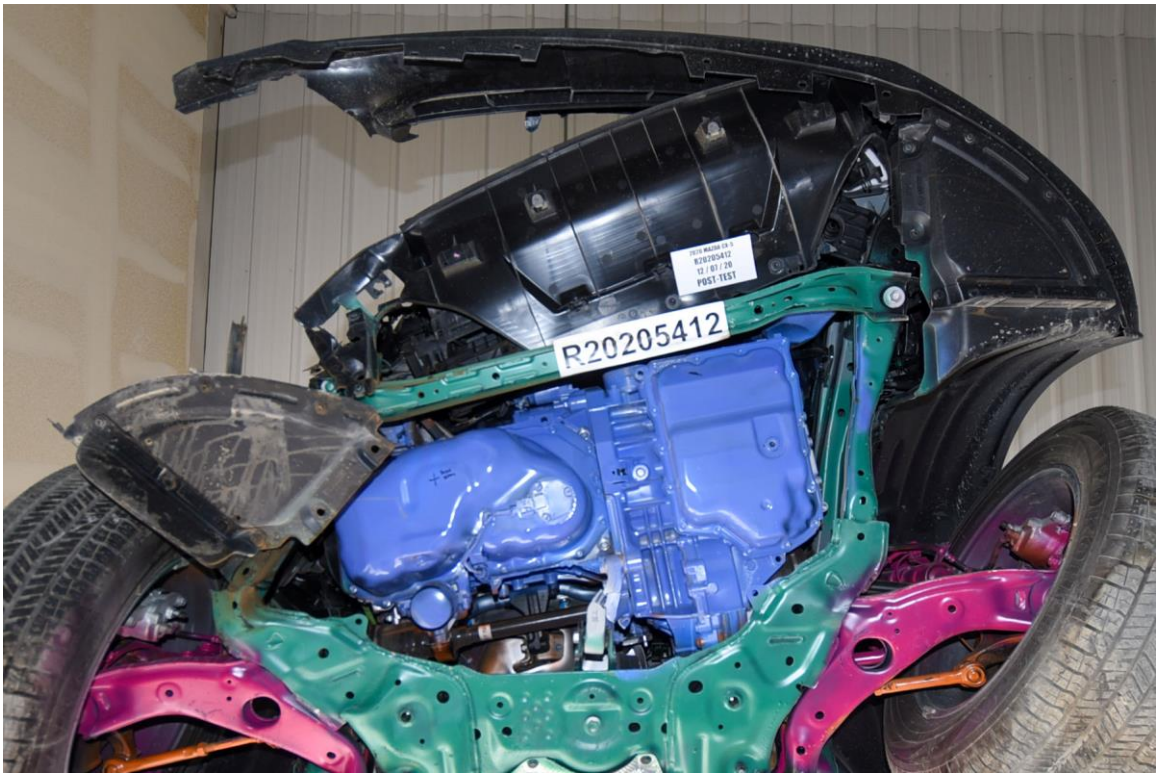


FIGURE 34. Post-Test Bumper to Rail Attachments and Crush Initiators

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

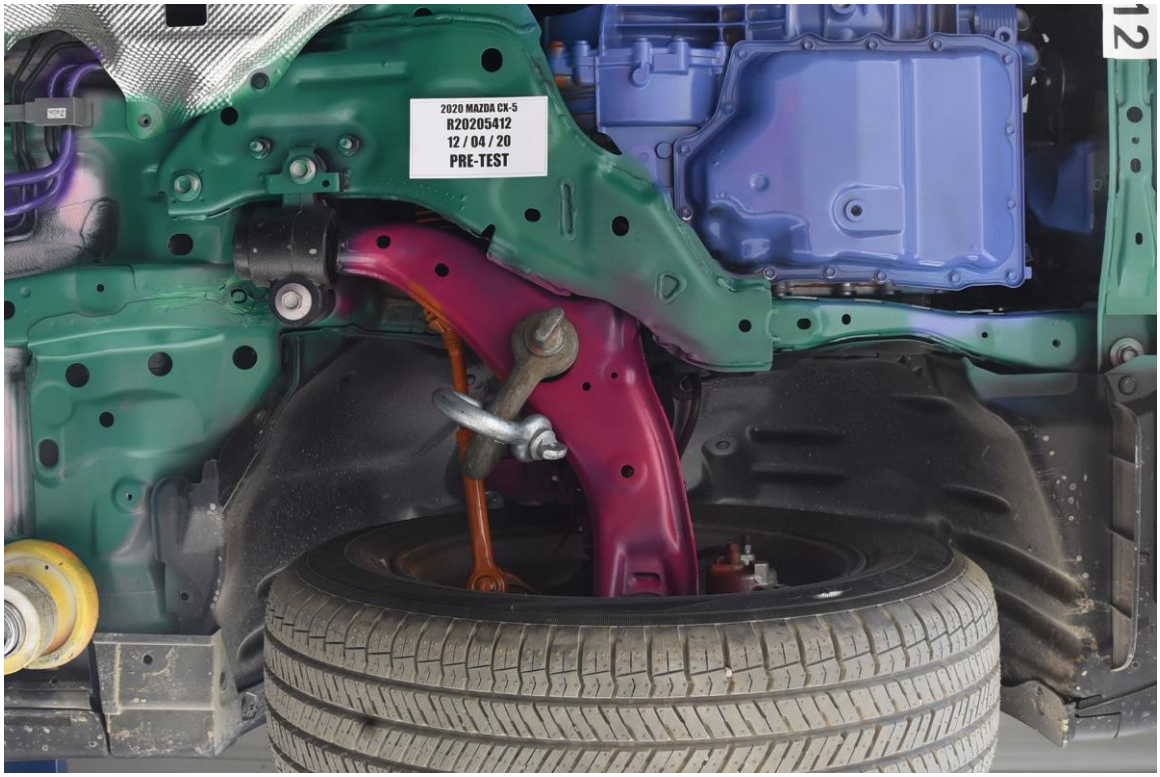


FIGURE 39. Pre-Test Driver Side Rocker

FIGURE 40. Post-Test Driver Side Rocker

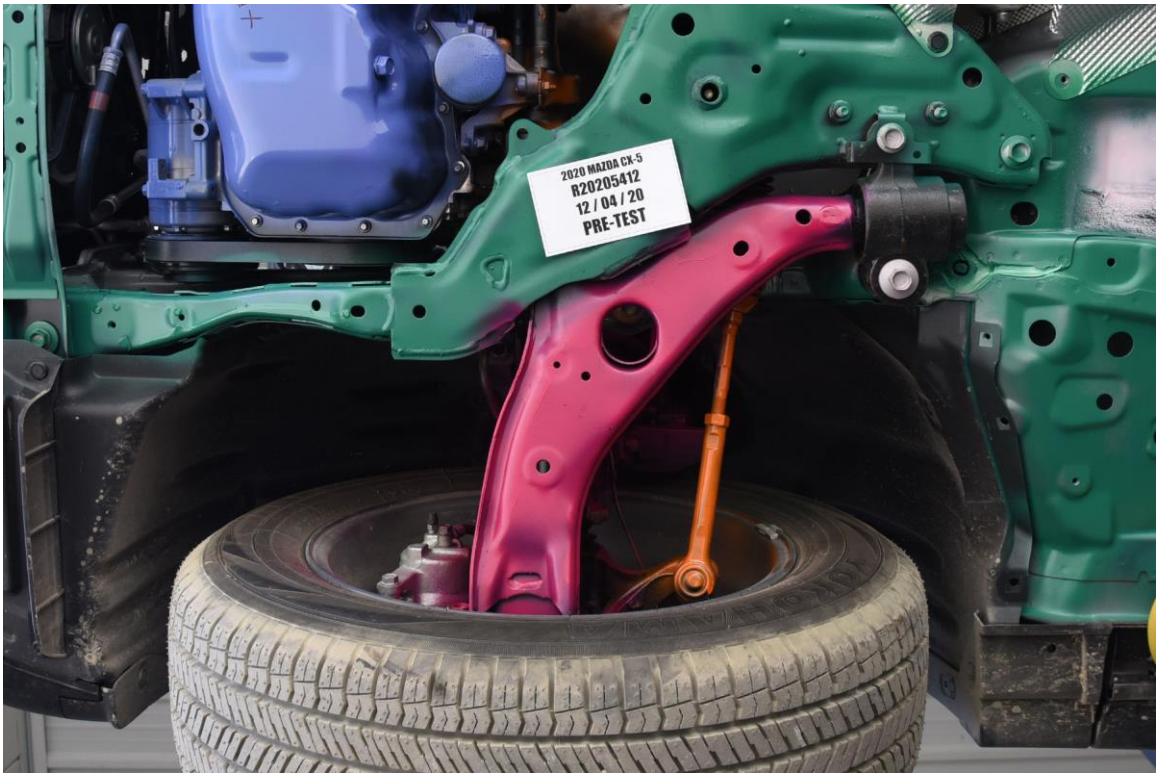


FIGURE 41. Pre-Test Passenger Side Rocker

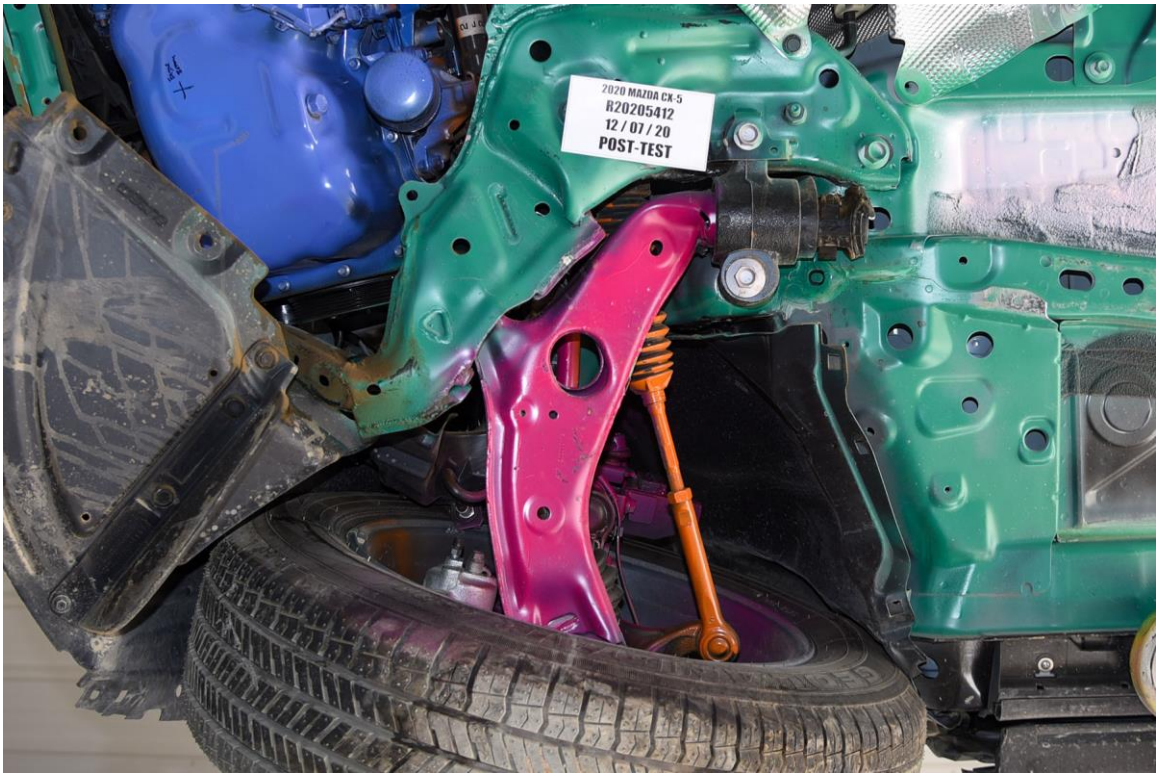


FIGURE 42. Post-Test Passenger Side Rocker

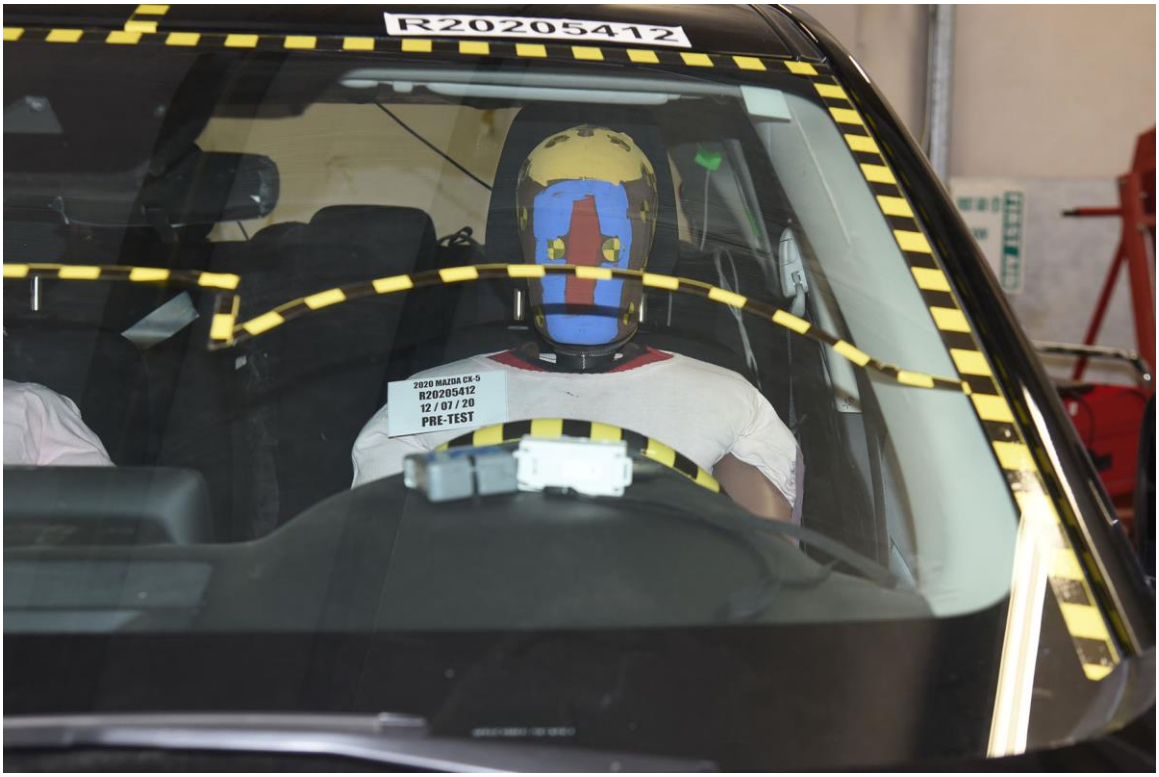


FIGURE 43. Pre-Test Driver Front Windshield View

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

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

Photograph Not Applicable

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

FIGURE 55. Pre-Test View of Driver Abdomen

Photograph Not Applicable

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

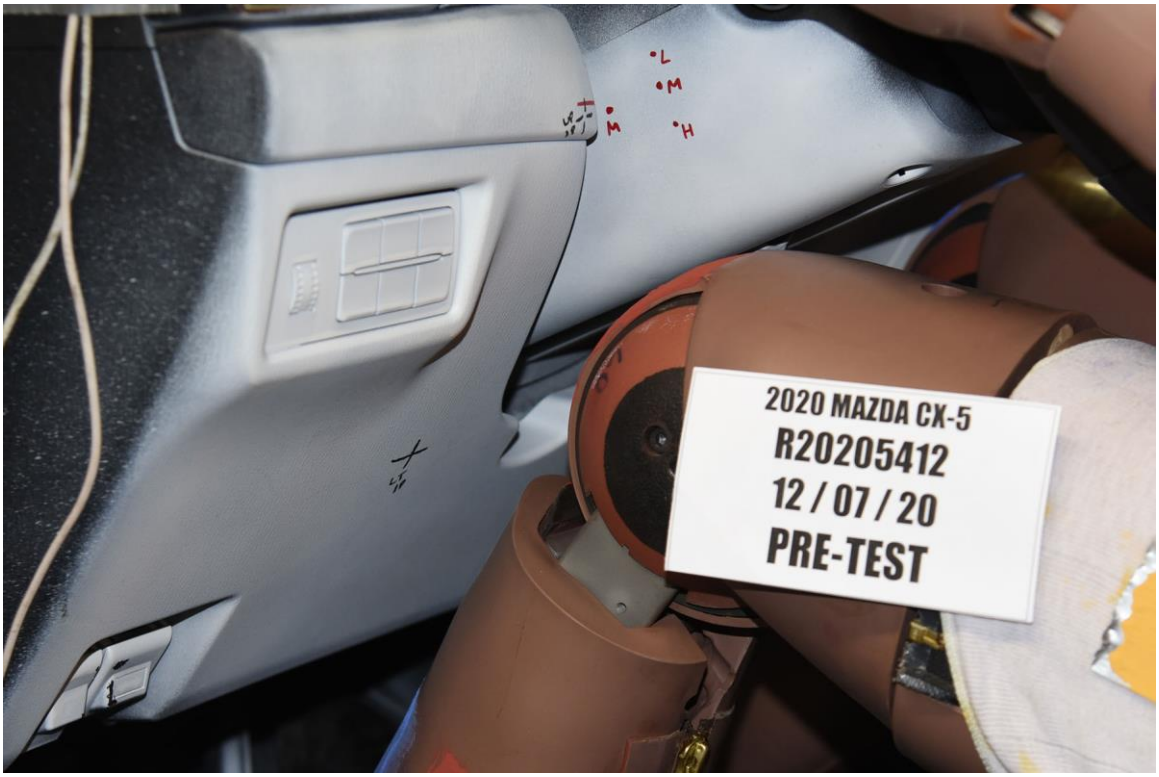


FIGURE 59. Pre-Test View of Driver Left Knee and Bolster

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

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

Photograph Not Applicable

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

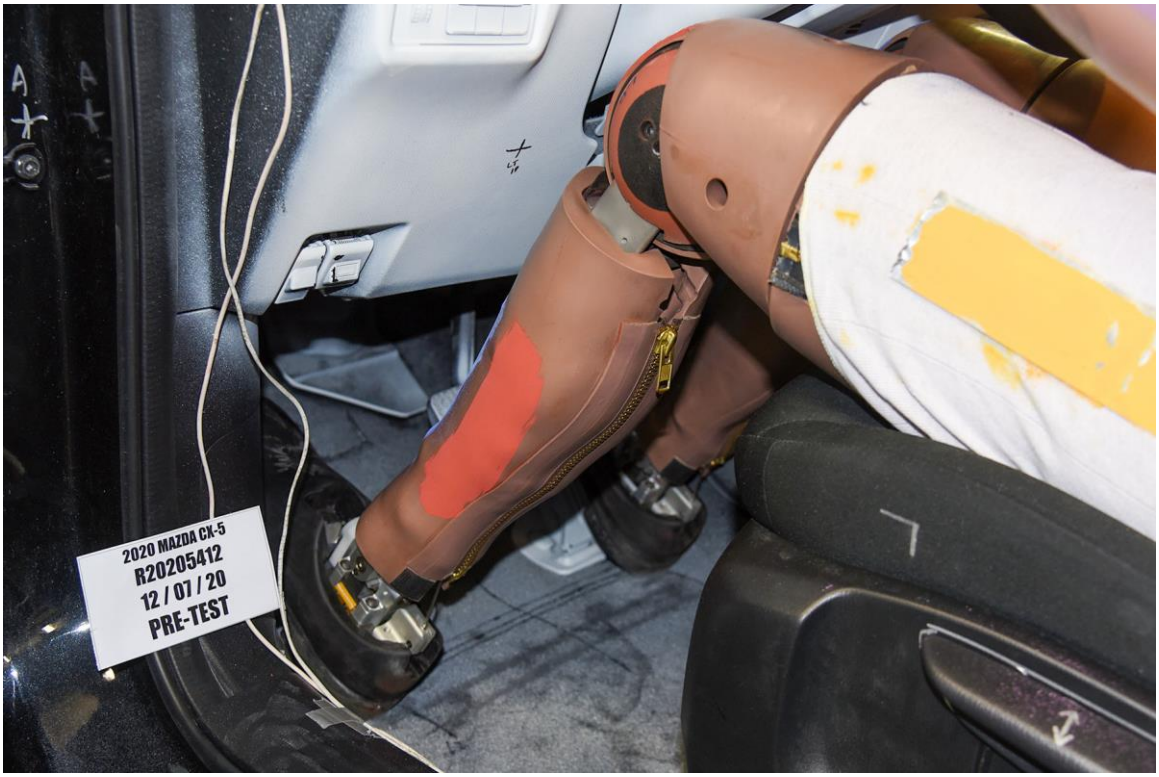


FIGURE 63. Pre-Test View of the Driver Left Leg

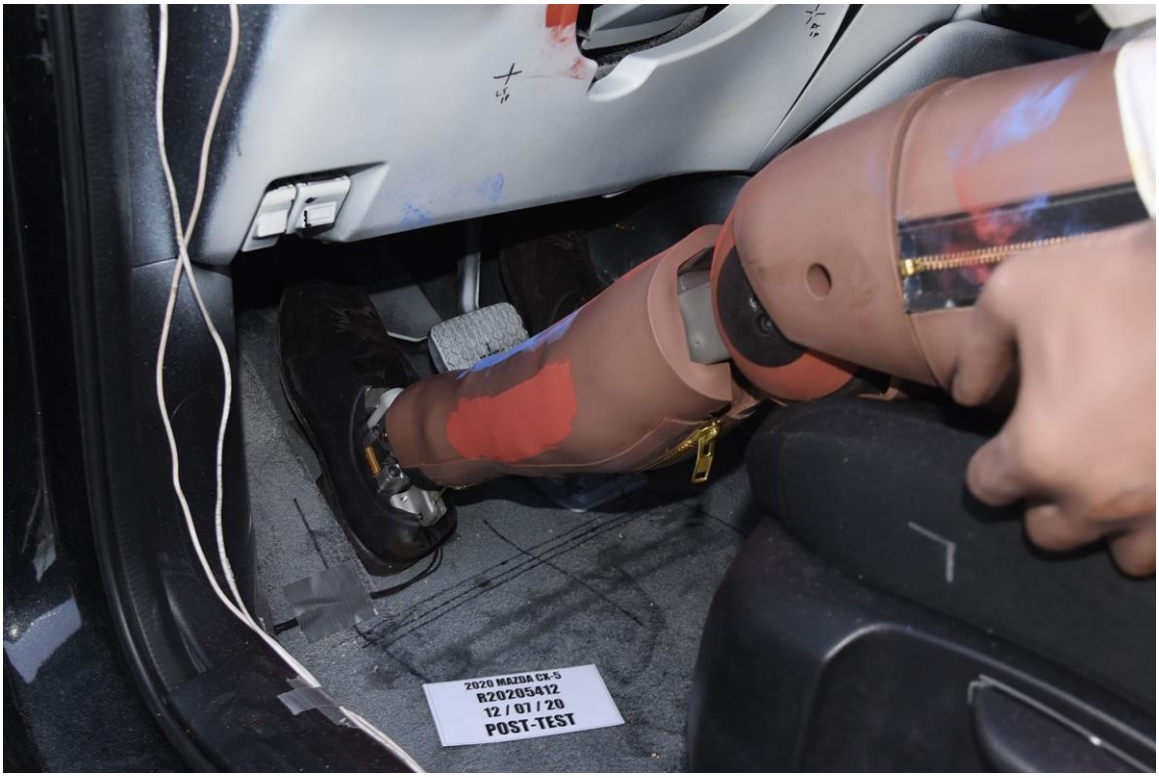


FIGURE 64. Post-Test View of the Driver Left Leg

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

Photograph Not Available

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

FIGURE 75. Pre-Test Driver Inner Door Panel

FIGURE 76. Post-Test Driver Inner Door Panel

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

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

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

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

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

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

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

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

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

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

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

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

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

Photograph Not Applicable

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

Photograph Not Applicable

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

FIGURE 91a. Post-Test Driver Dummy Contact with Knee Bolster

FIGURE 92. Pre-Test Passenger Front Windshield View

FIGURE 93. Post-Test Passenger Front Windshield View

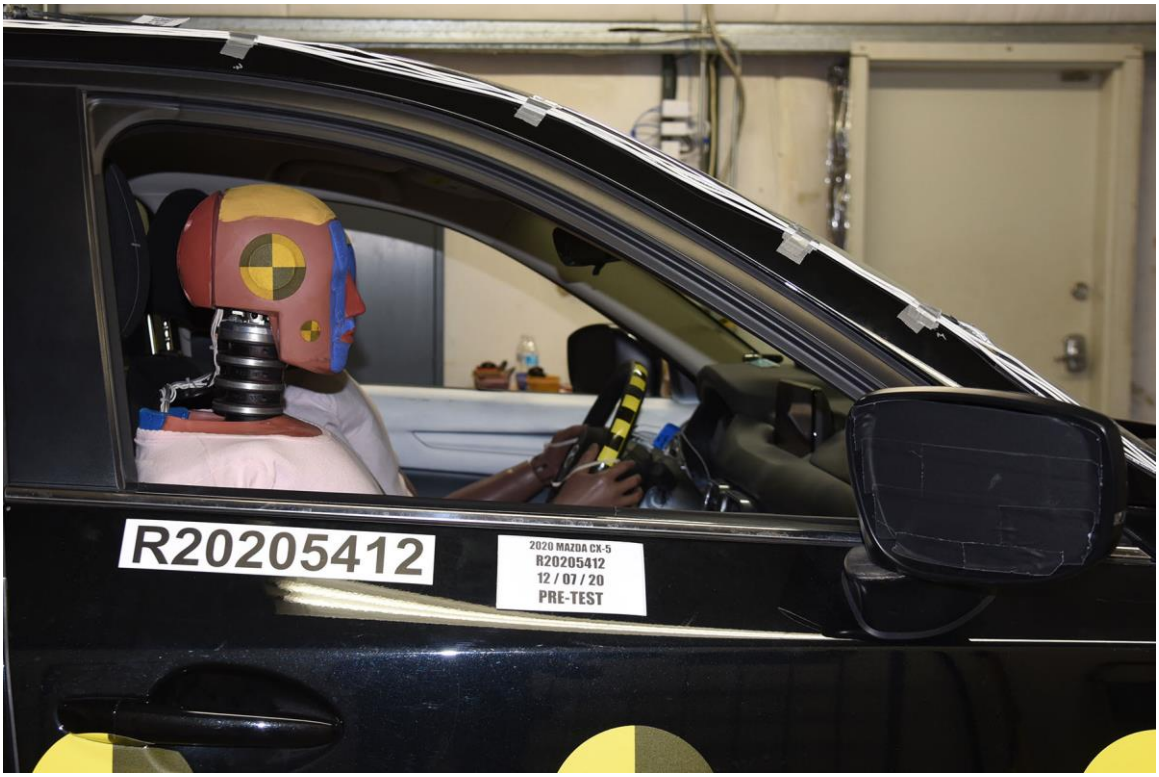


FIGURE 94. Pre-Test Passenger Side Front Window View

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

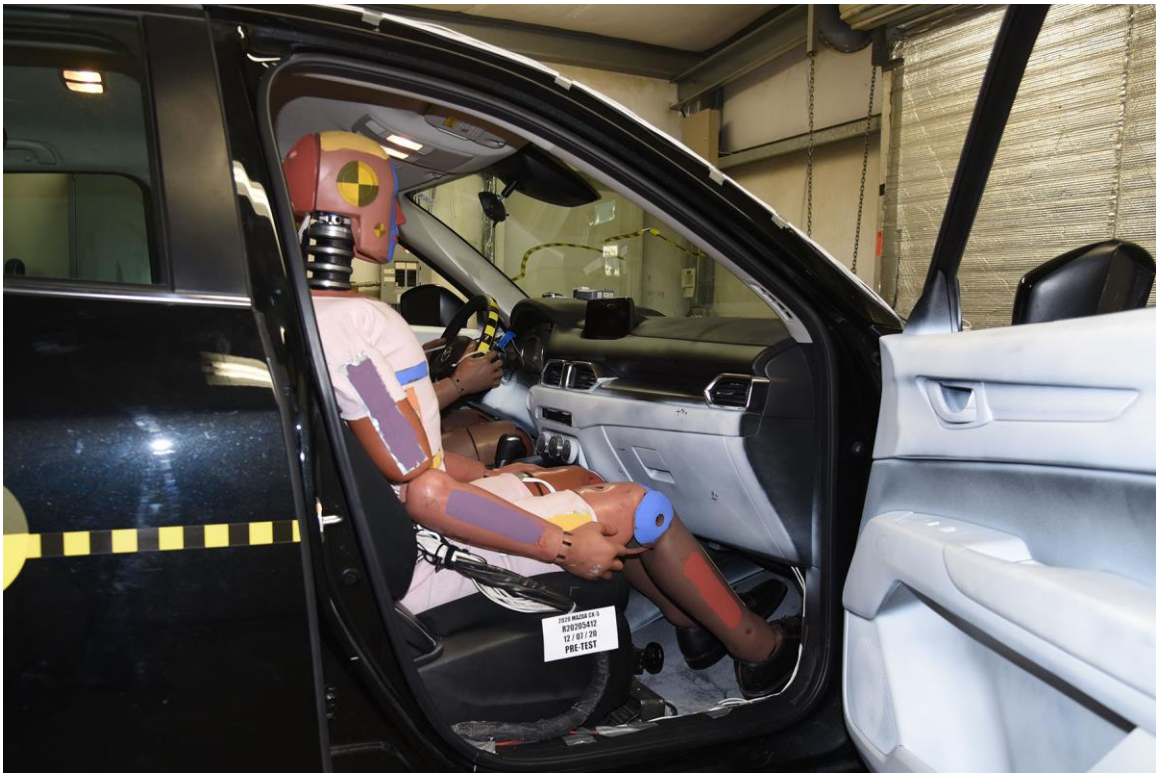


FIGURE 98. Pre-Test Right Side View of Passenger and Interior

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

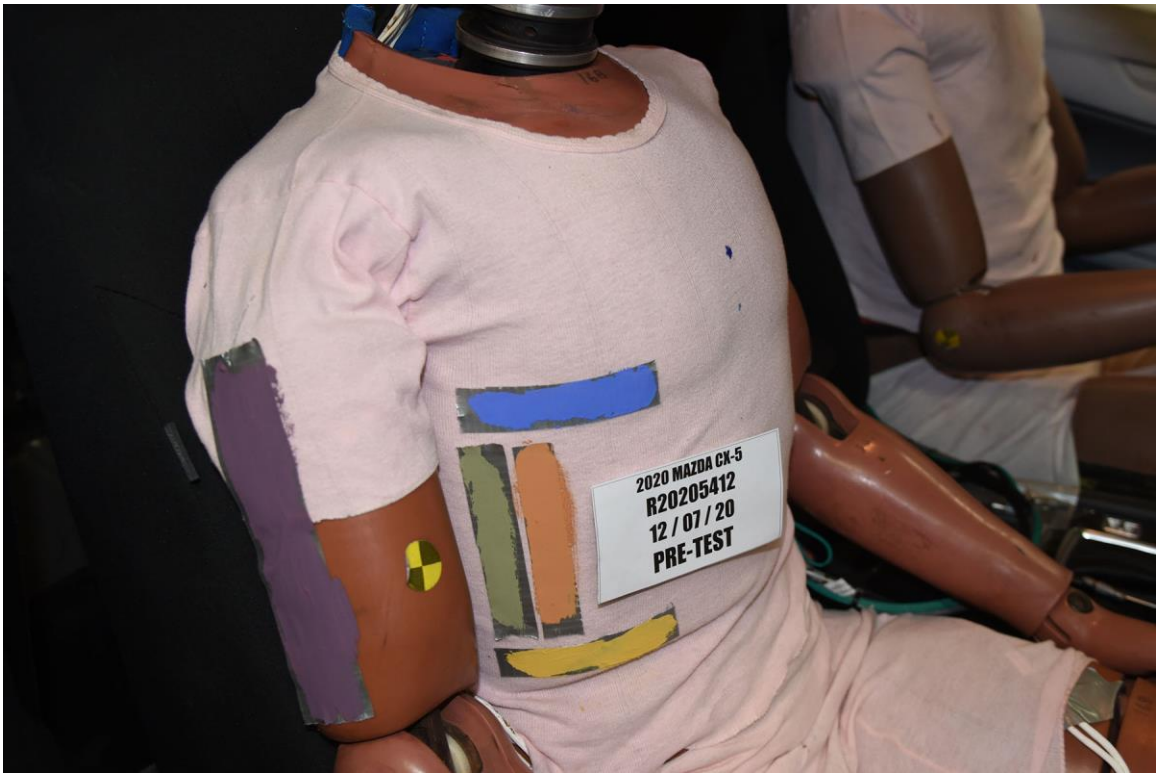


FIGURE 102. Pre-Test View of Passenger Abdomen

FIGURE 103. Post-Test View of Passenger Abdomen

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

Photograph Not Applicable

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

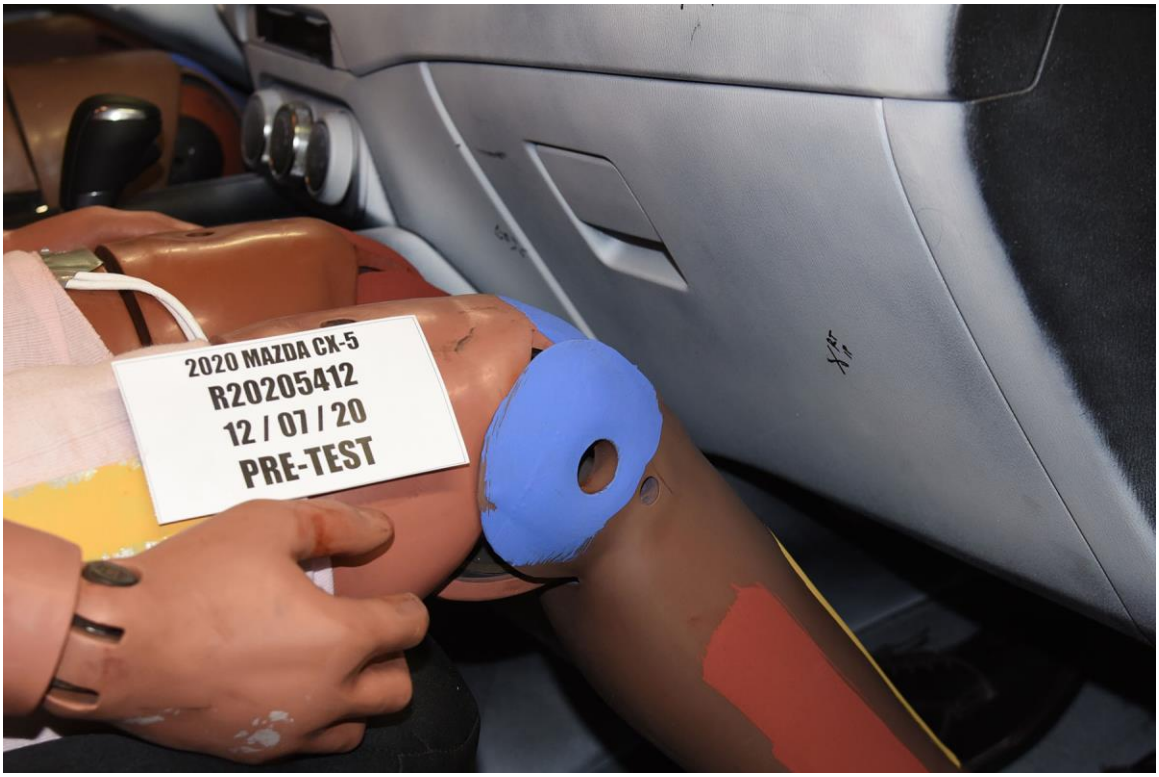


FIGURE 106. Pre-Test View of Passenger Right Knee and Bolster

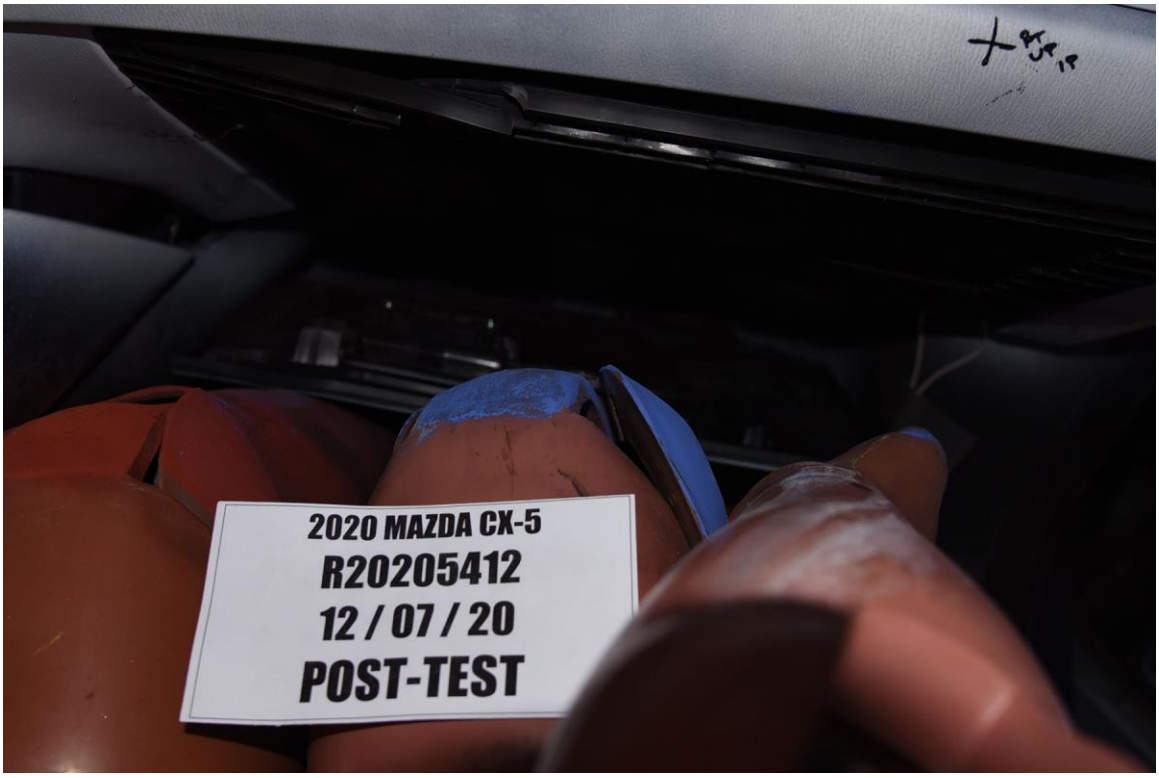


FIGURE 107. Post-Test View of Passenger Right Knee and Bolster

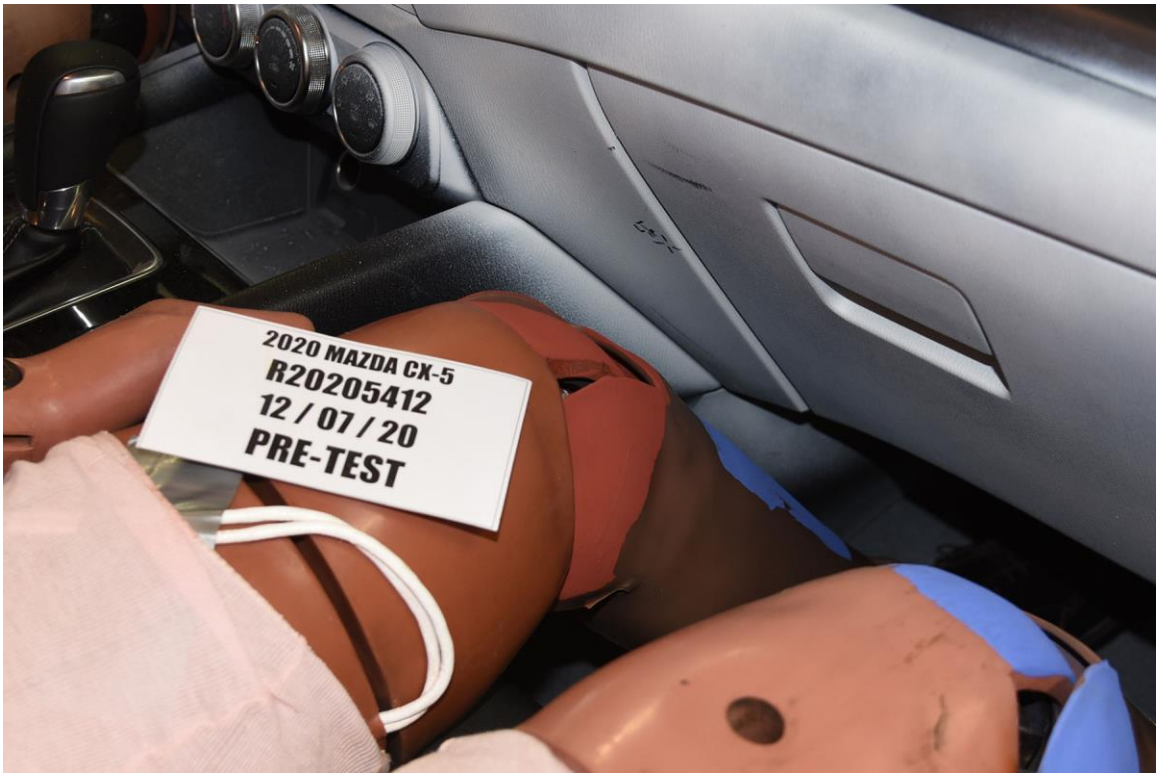


FIGURE 108. Pre-Test View of Passenger Left Knee and Bolster

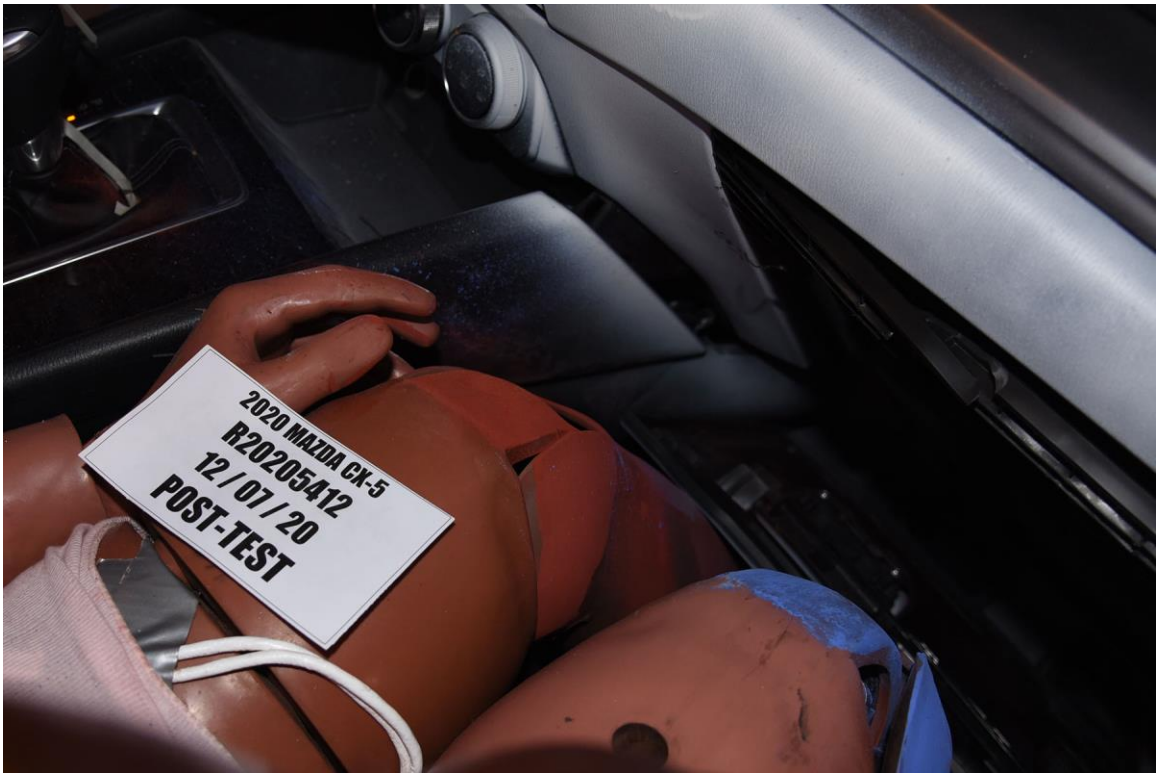


FIGURE 109. Post-Test View of Passenger Left Knee and Bolster

FIGURE 110. Pre-Test View of the Passenger Feet

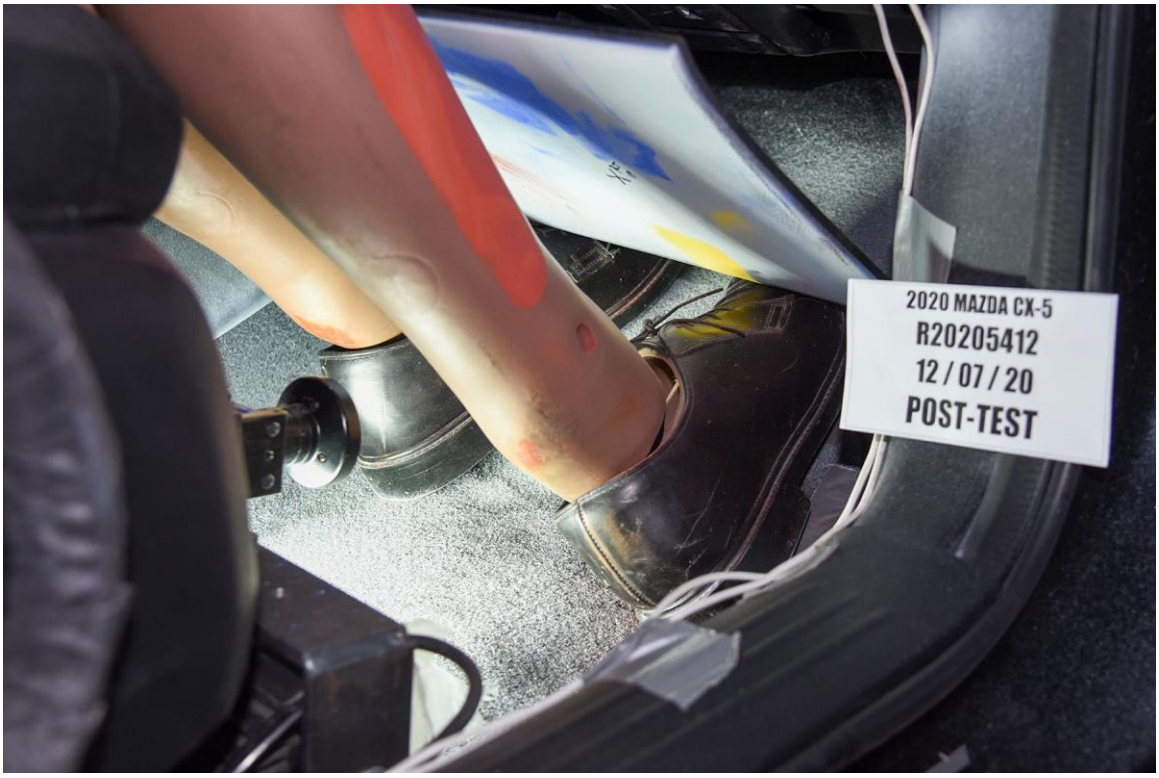


FIGURE 111. Post-Test View of the Passenger Feet

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

Photograph Not Available

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

Photograph Not Available

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

Photograph Not Available

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

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

Photograph Not Available

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

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

Photograph Not Available

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

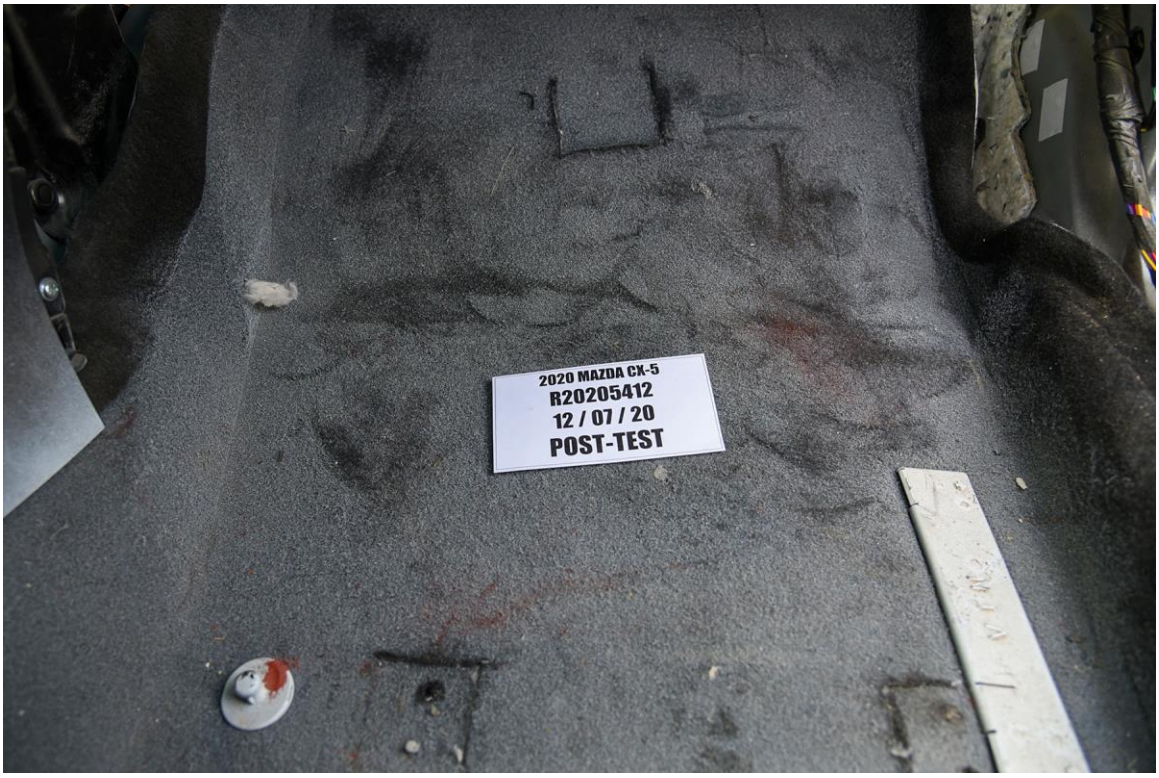


FIGURE 131. Post-Test View of Passenger Floor Pan from Top of Front Seat

FIGURE 133. Post-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

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 Headliner

FIGURE 136b. Post-Test Passenger Dummy Contact with A-Pillar

FIGURE 136c. Post-Test Passenger Dummy Contact with Pelvis/Torso Airbag

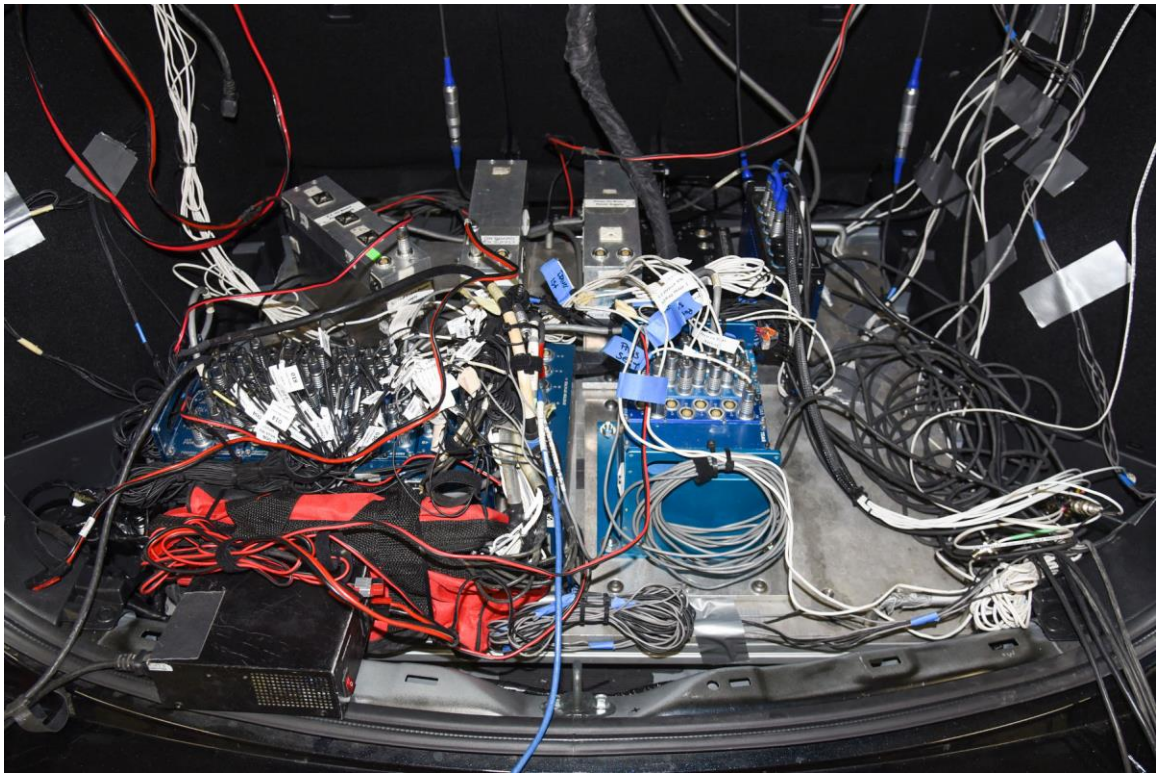


FIGURE 137. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard
Solvent Spillage

FIGURE 138. Post-Test Stoddard Solvent Spillage Location View

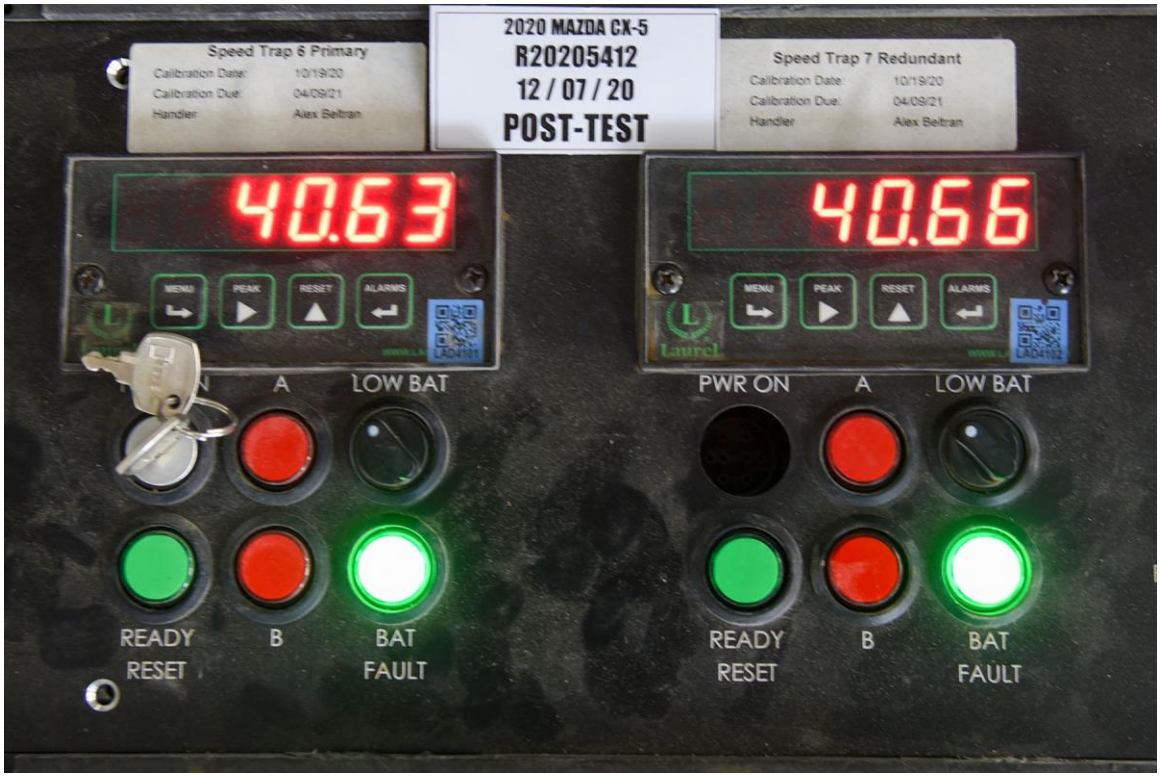


FIGURE 139. Post-Test Speed Trap Read-Out

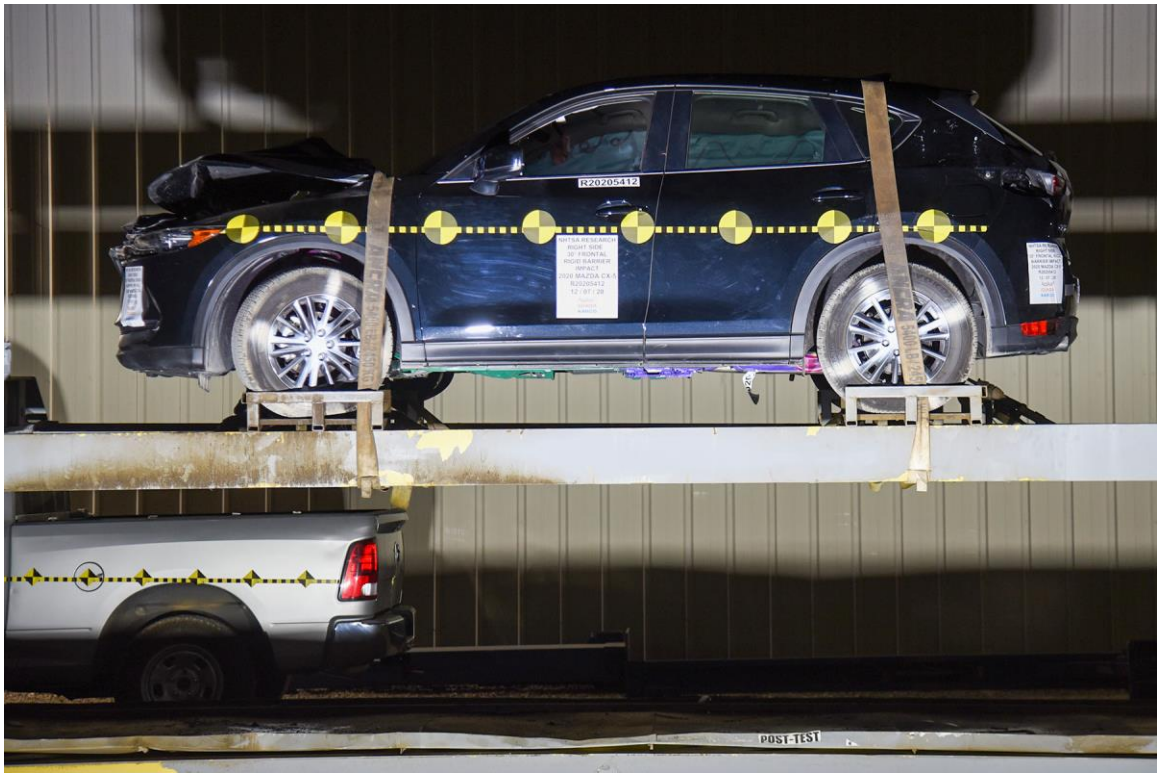


FIGURE 140. Vehicle at 0° on Static Rollover Device

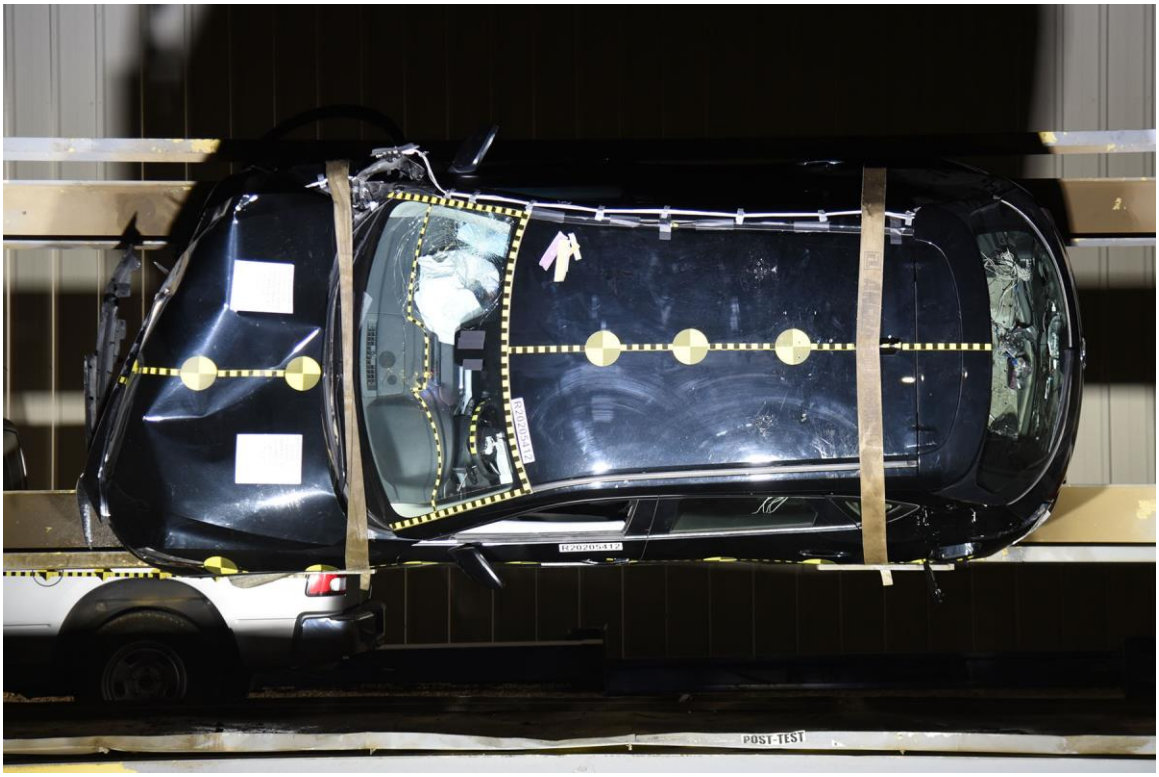


FIGURE 141. Vehicle at 90° on Static Rollover Device

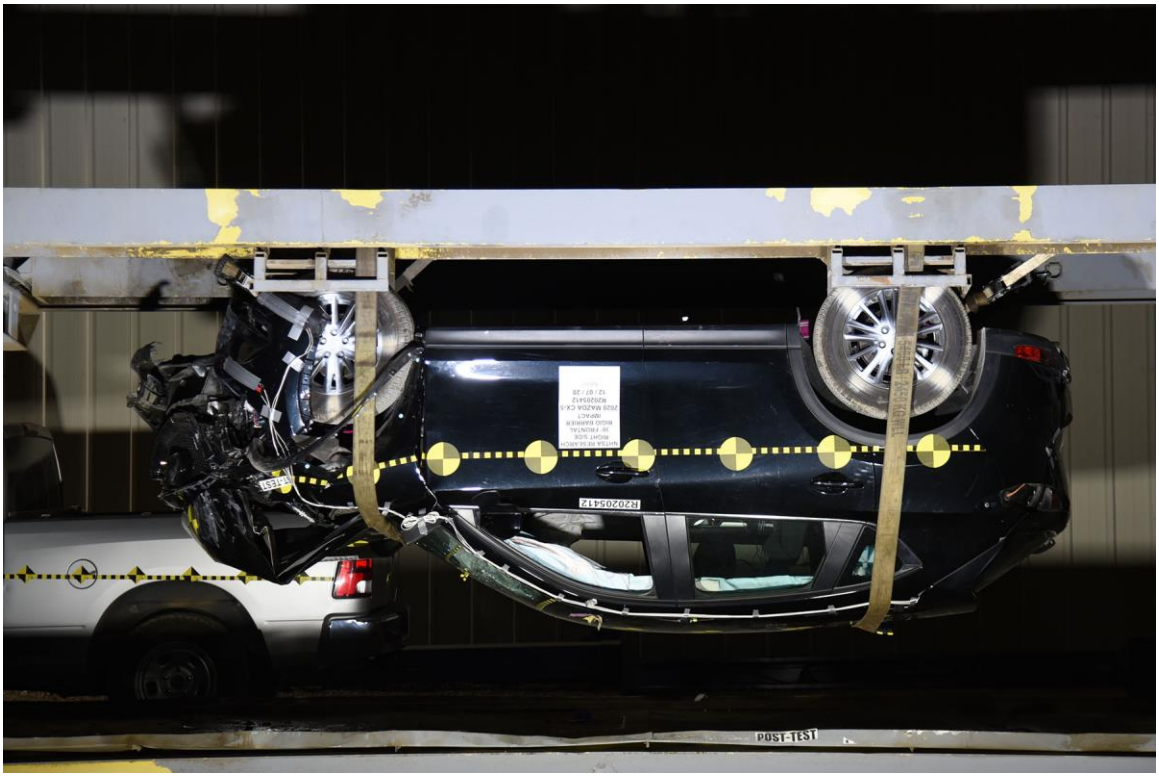


FIGURE 142. Vehicle at 180° on Static Rollover Device

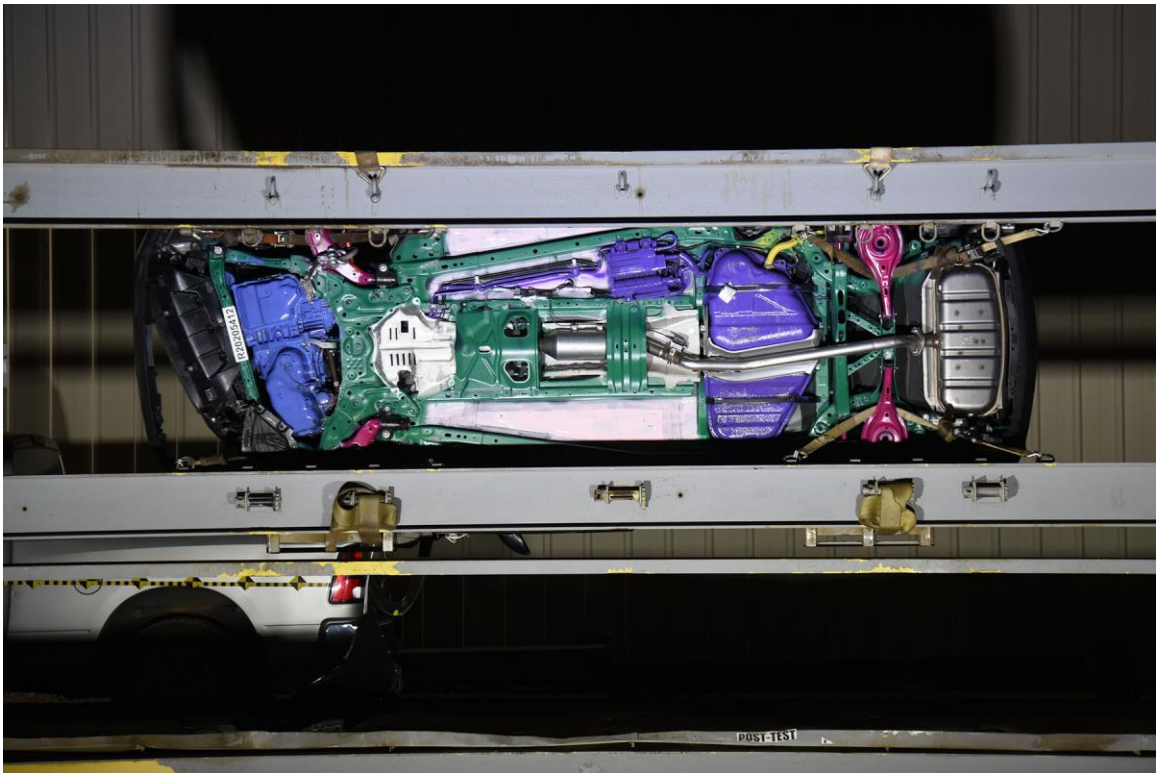


FIGURE 143. Vehicle at 270° on Static Rollover Device

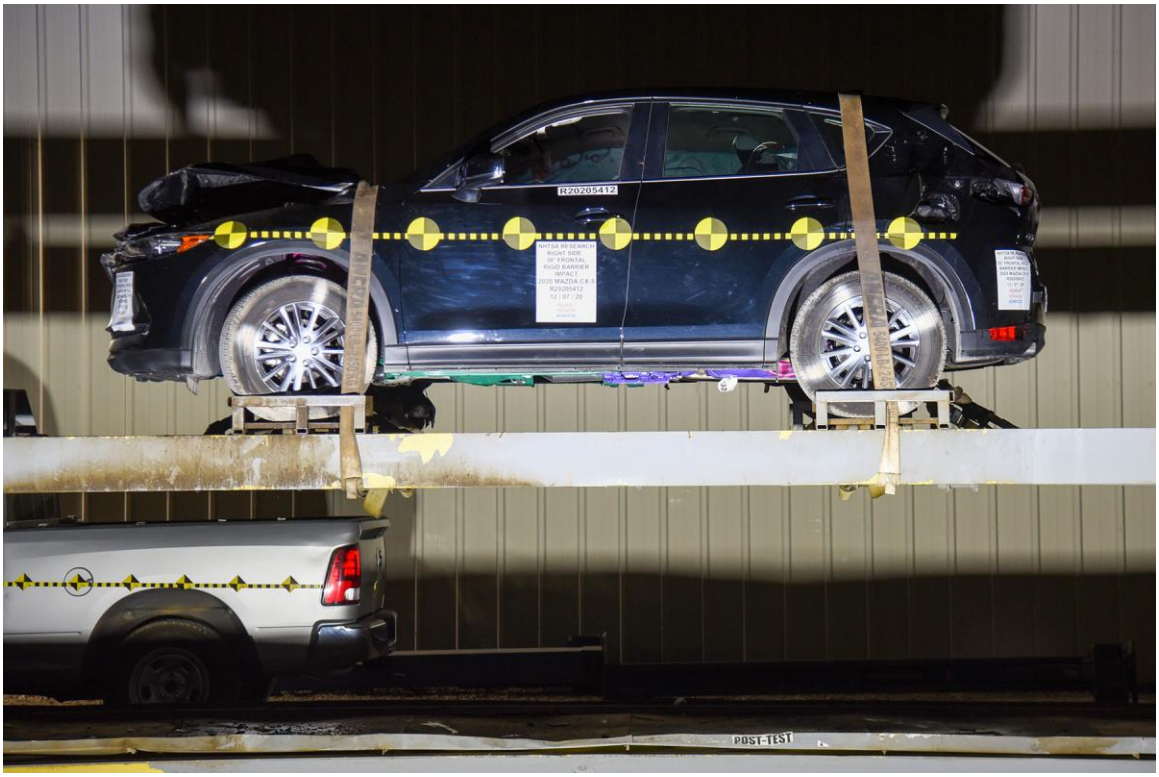


FIGURE 144. Vehicle at 360° on Static Rollover Device

FIGURE 145. Frontal Impact Event

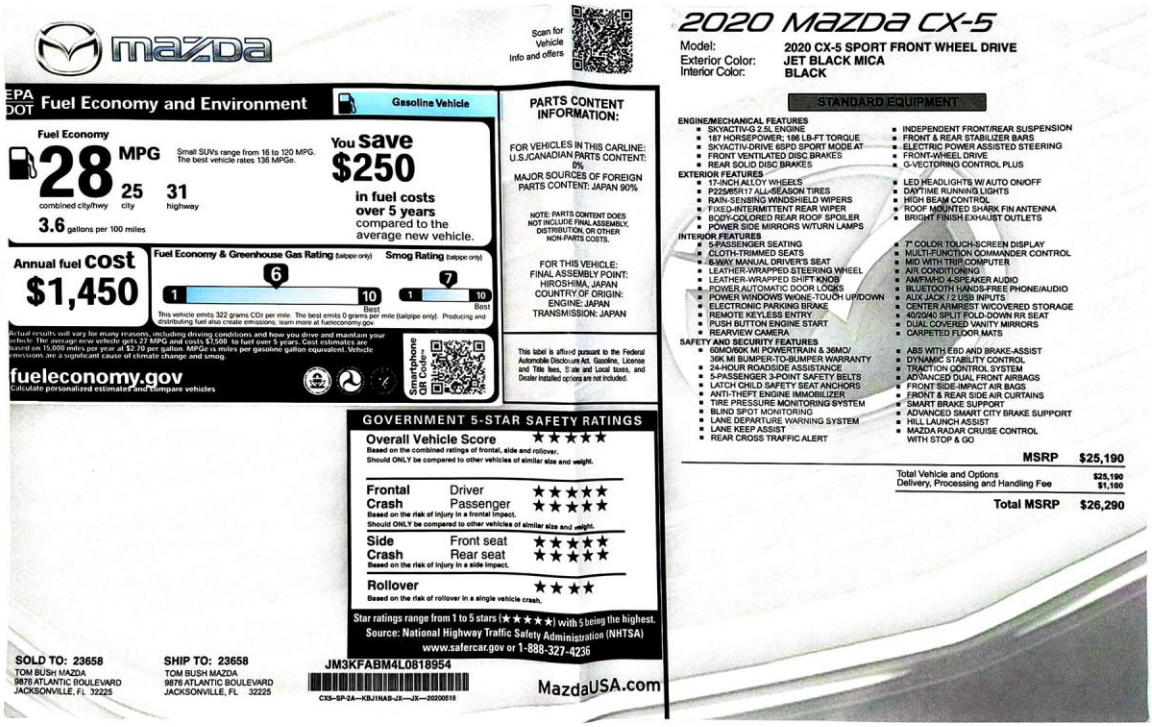


FIGURE 146. Monroney Label Photograph

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA TRACE

TABLE OF DATA PLOTS

TABLE OF DATA PLOTS … (CONTINUED)

TABLE OF DATA PLOTS … (CONTINUED)

TABLE OF DATA PLOTS … (CONTINUED)

TABLE OF DATA PLOTS … (CONTINUED)

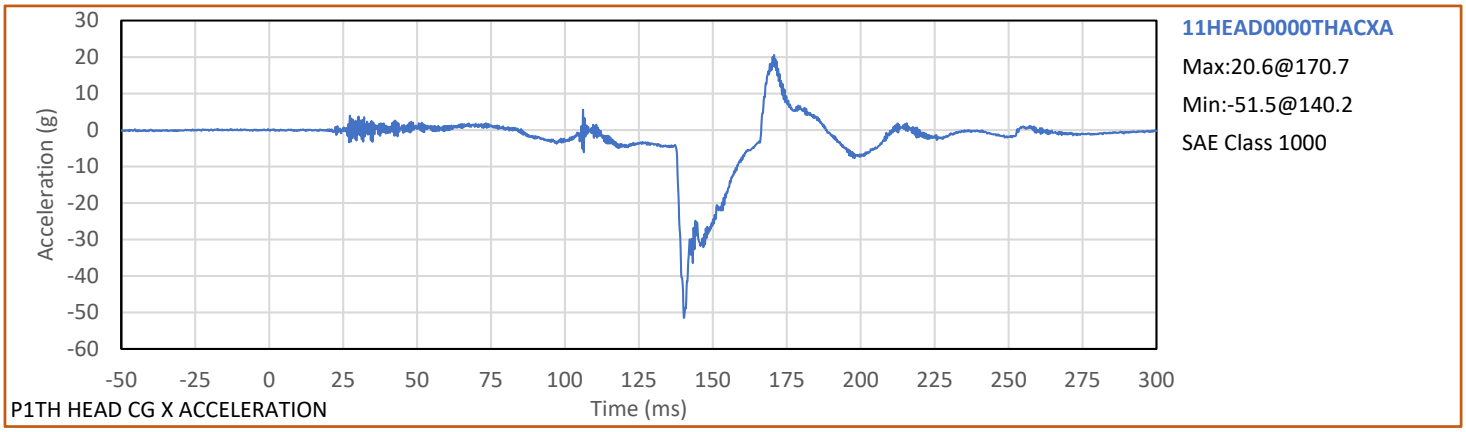
TABLE OF DATA PLOTS … (CONTINUED)

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

Test Program: Right Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205412

Test Date: 12/7/2020

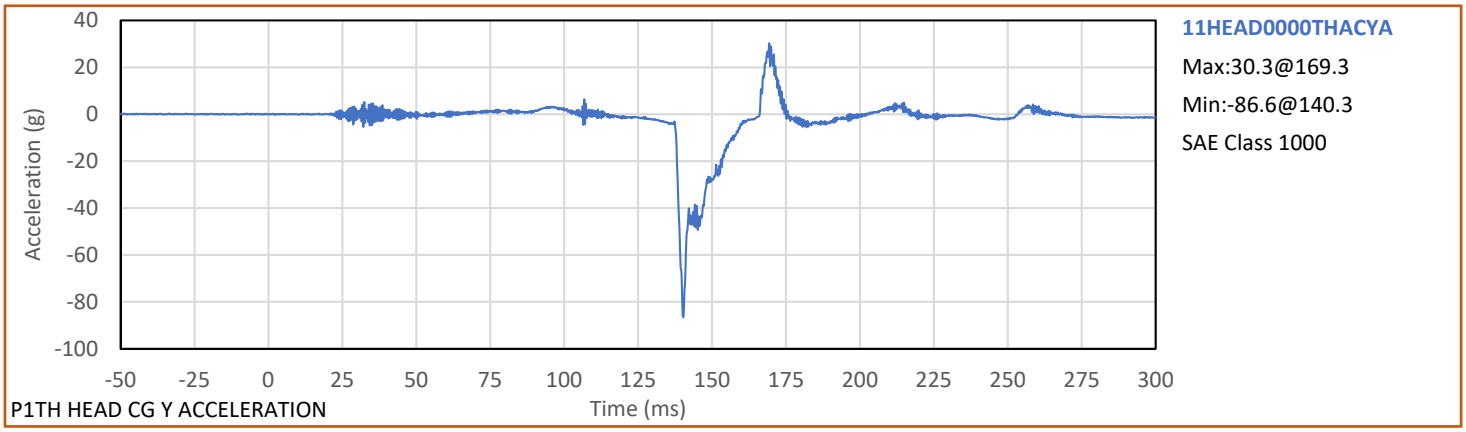


11HEAD0000THACXA

Max:20.6@170.7

Min:-51.5@140.2

SAE Class 1000

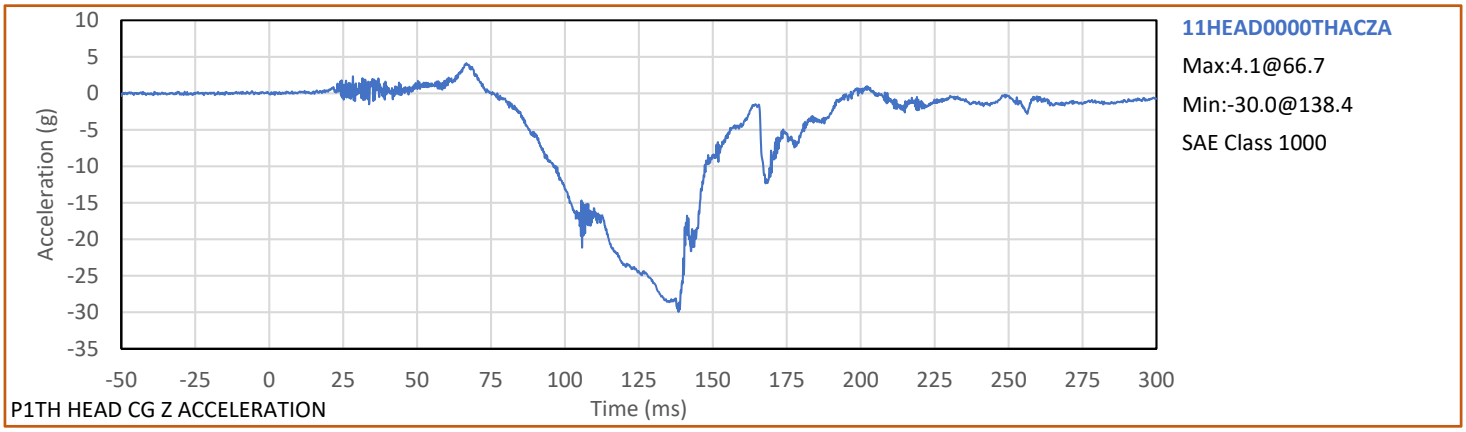


11HEAD0000THACYA

Max:30.3@169.3

Min:-86.6@140.3

SAE Class 1000

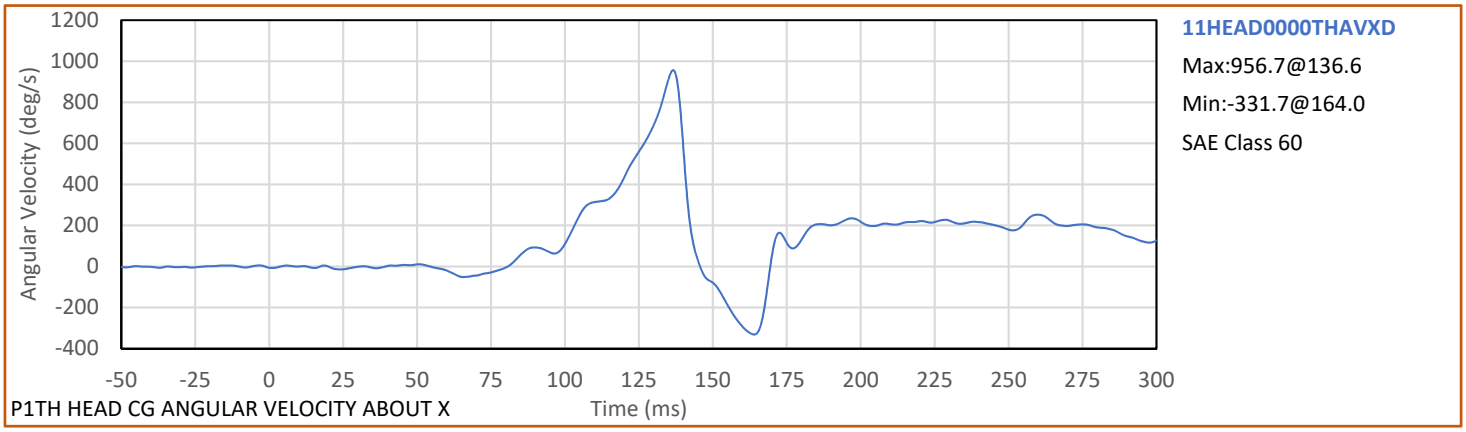


11HEAD0000THACZA

Max:4.1@66.7

Min:-30.0@138.4

SAE Class 1000

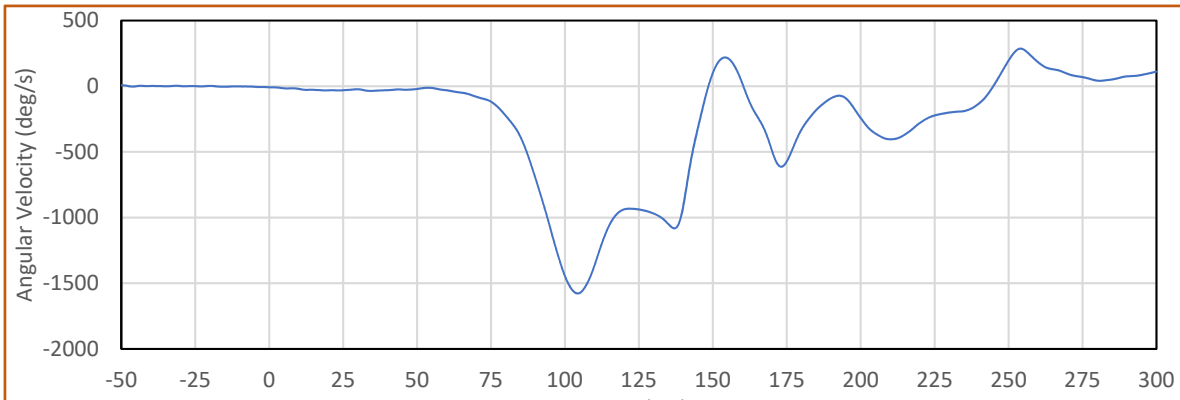


11HEAD0000THAVXD

Max:956.7@136.6

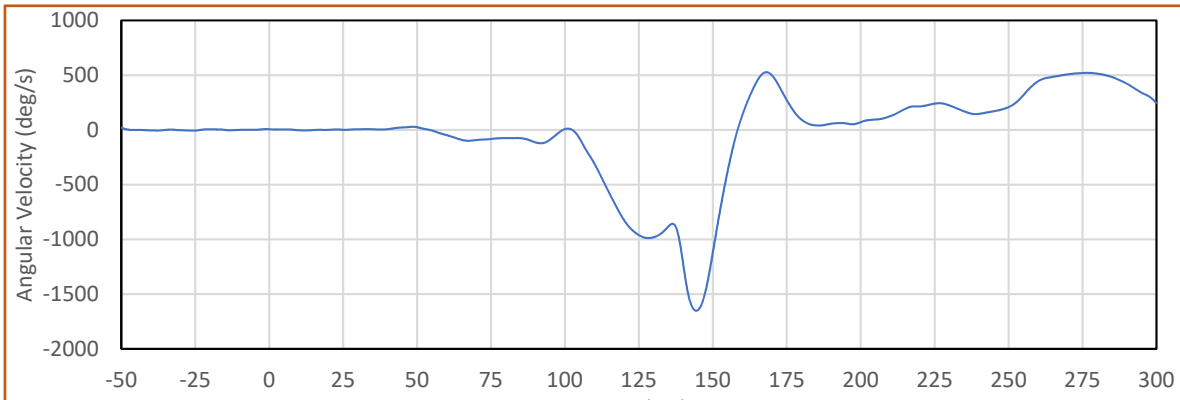
Min:-331.7@164.0

SAE Class 60



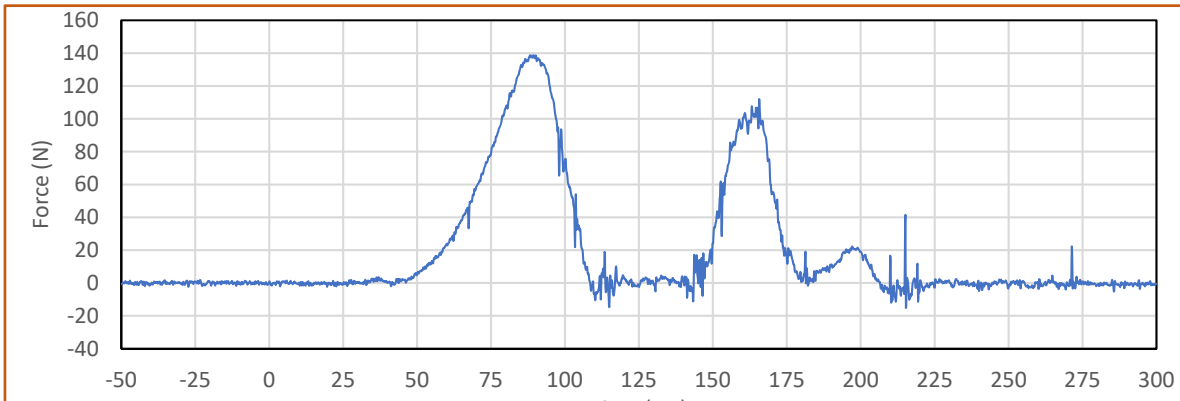
11HEAD0000THAVYD
Max:286.3@254.1
Min:-1578.0@104.3
SAE Class 60

P1TH HEAD CG ANGULAR VELOCITY ABOUT Y



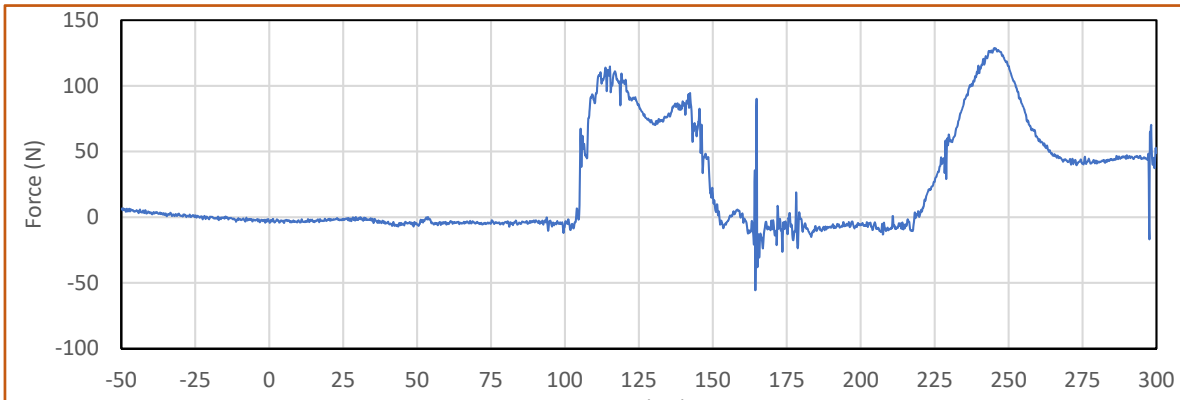
11HEAD0000THAVZD
Max:527.1@168.1
Min:-1653.0@144.4
SAE Class 60

P1TH HEAD CG ANGULAR VELOCITY ABOUT Z



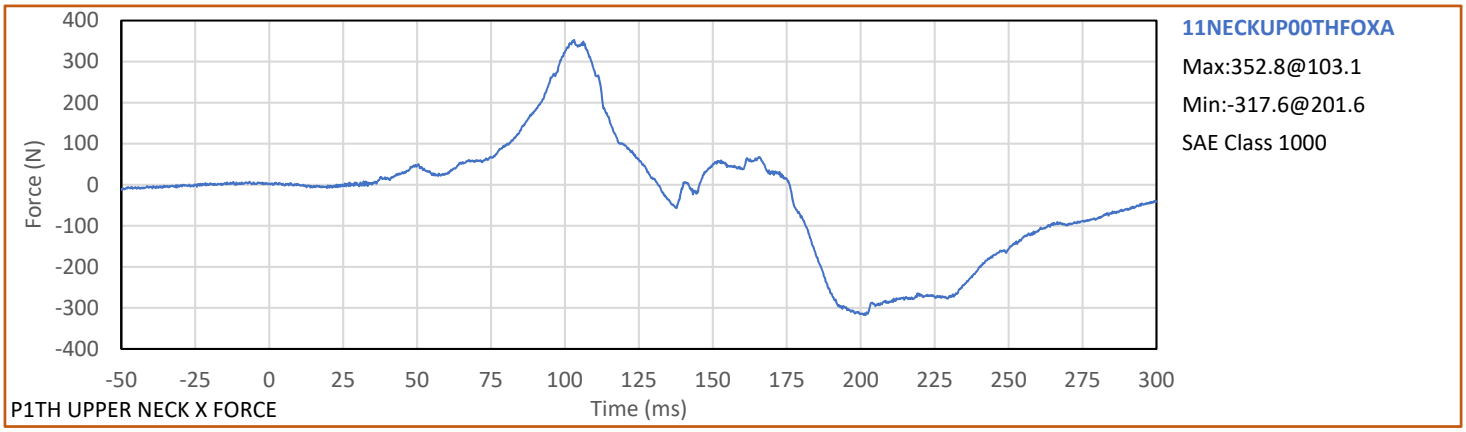
11NECKFR00THFOZA
Max:138.8@89.4
Min:-15.2@215.3
SAE Class 1000

P1TH FRONT NECK SPRING TOWER LOAD CELL

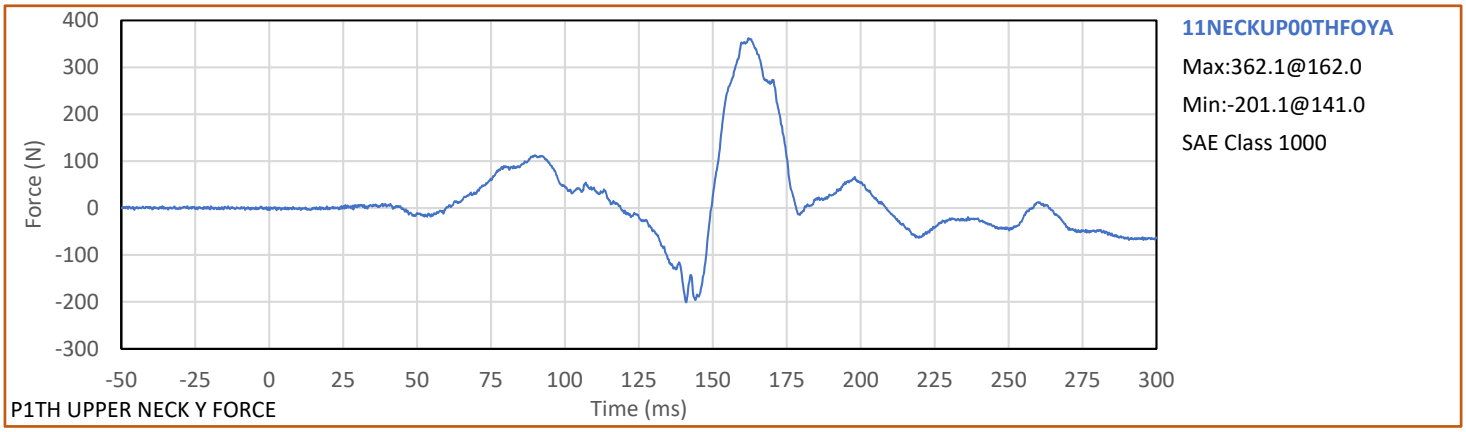


11NECKRE00THFOZA
Max:128.6@245.5
Min:-55.6@164.4
SAE Class 1000

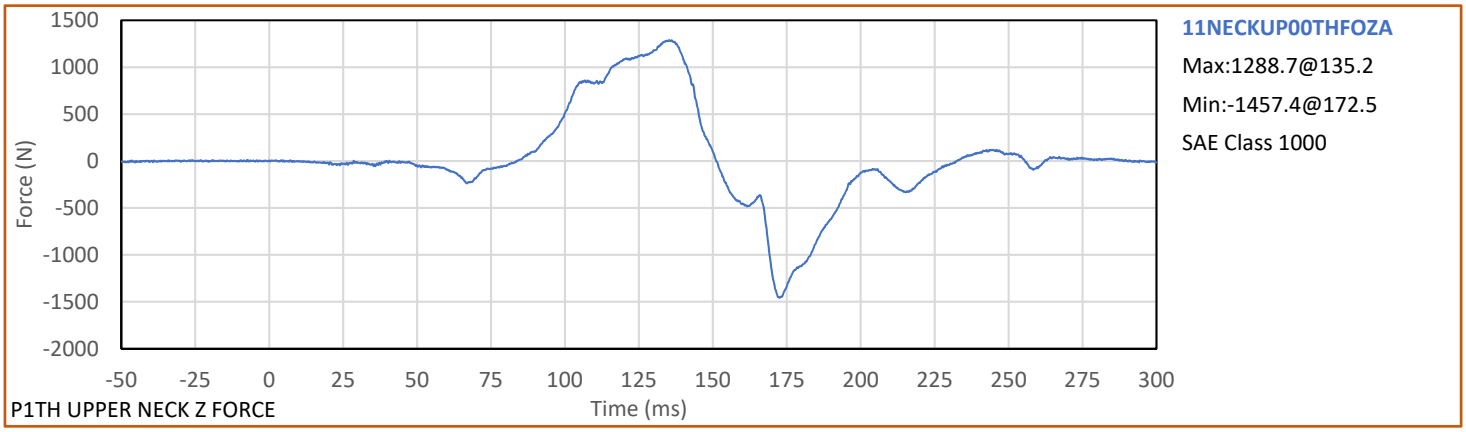
P1TH REAR NECK SPRING TOWER LOAD CELL



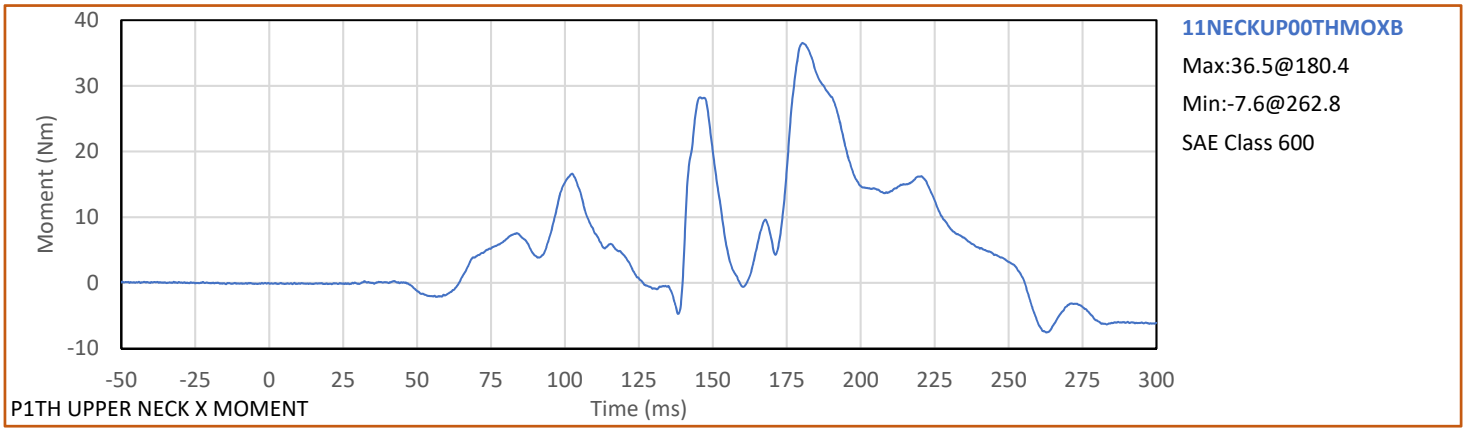
11NECKUP00THFOXA
Max:352.8@103.1
Min:-317.6@201.6
SAE Class 1000



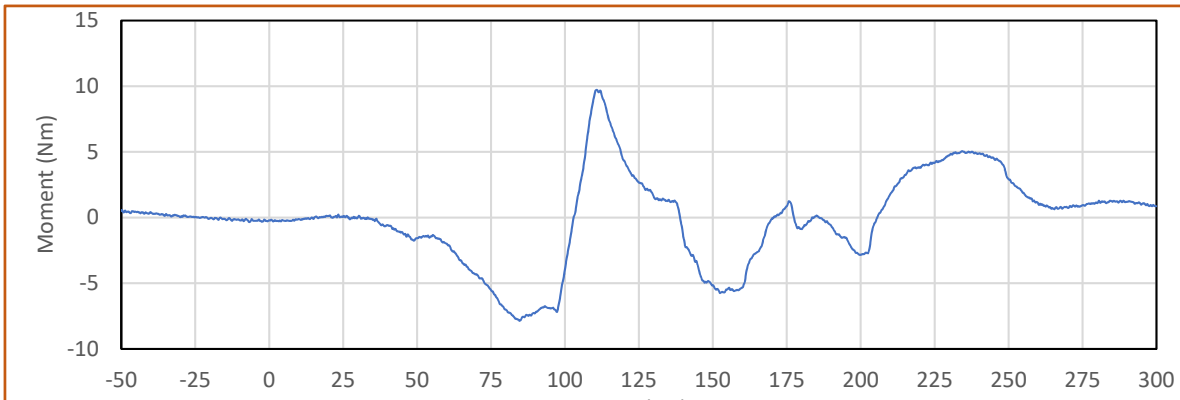
11NECKUP00THFOYA
Max:362.1@162.0
Min:-201.1@141.0
SAE Class 1000



11NECKUP00THFOZA
Max:1288.7@135.2
Min:-1457.4@172.5
SAE Class 1000

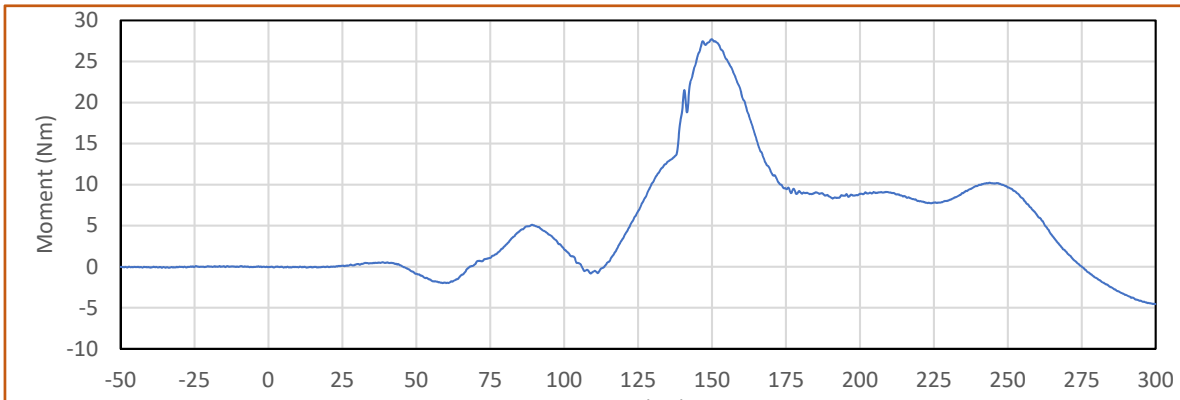


11NECKUP00THMOXB
Max:36.5@180.4
Min:-7.6@262.8
SAE Class 600



P1TH UPPER NECK Y MOMENT

11NECKUP00THMOYB
Max:9.7@110.8
Min:-7.9@84.7
SAE Class 600



P1TH UPPER NECK Z MOMENT

11NECKUP00THMOZB
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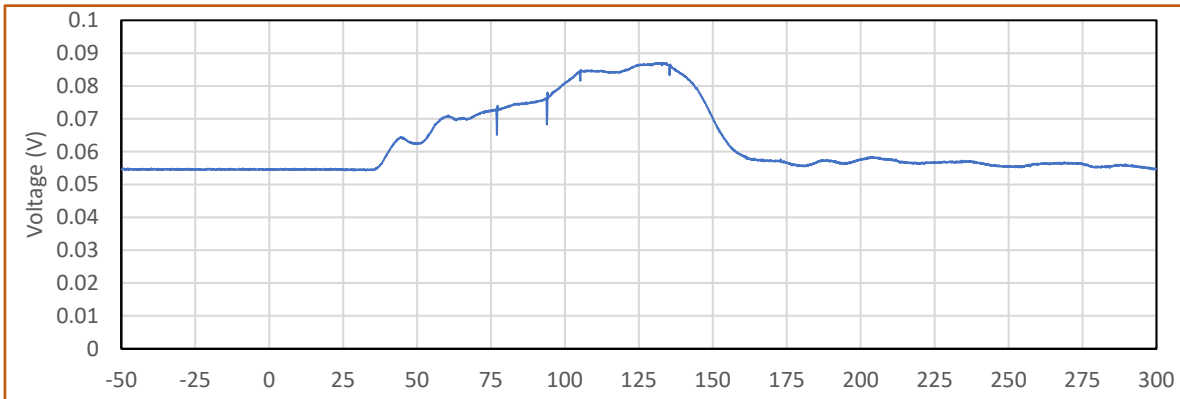
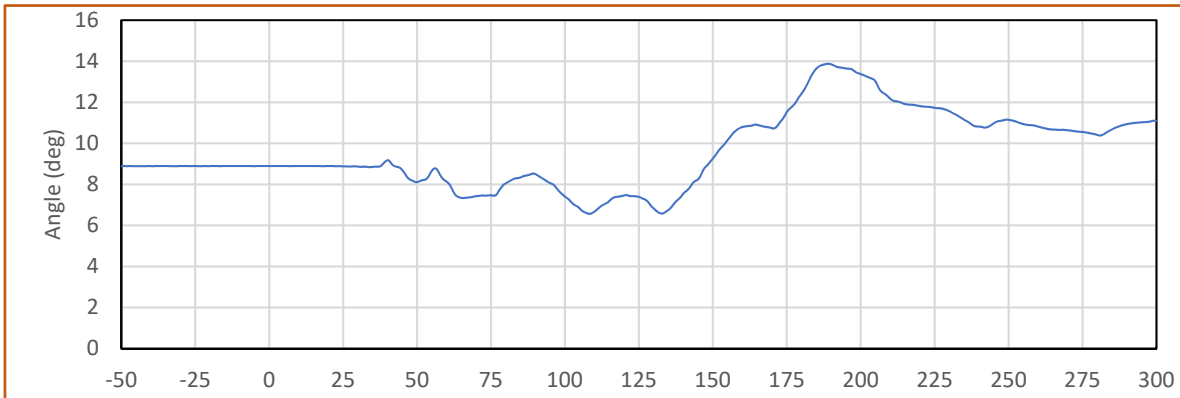
Min:-4.5@299.8
SAE Class 600



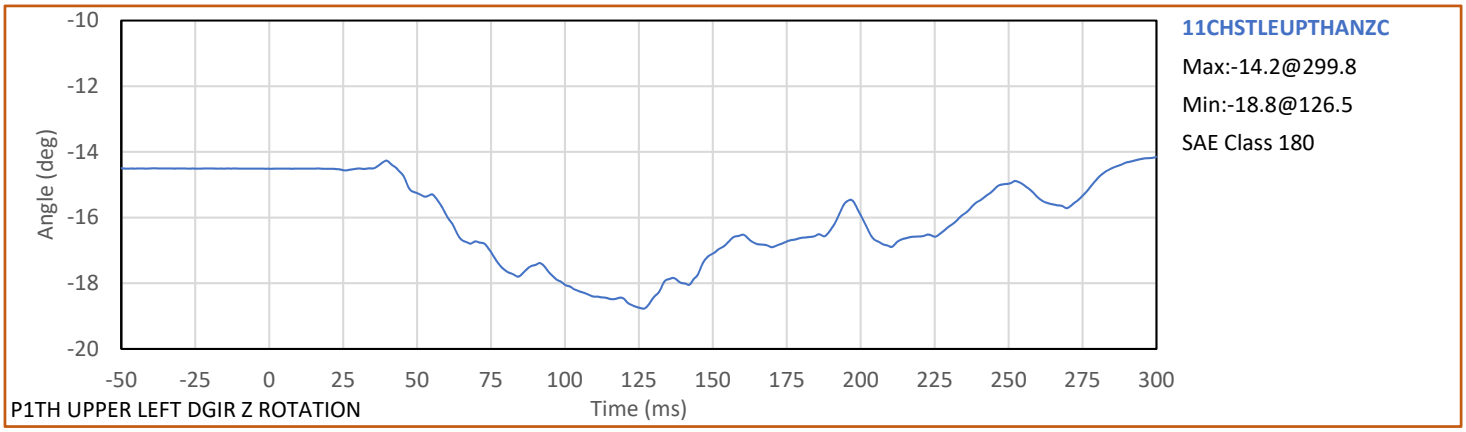
P1TH UPPER LEFT DGIR X DISPLACEMENT

11CHSTLEUPTHVO0P
Max:0.09@131.0
Min:0.05@25.9
No Filter Applied



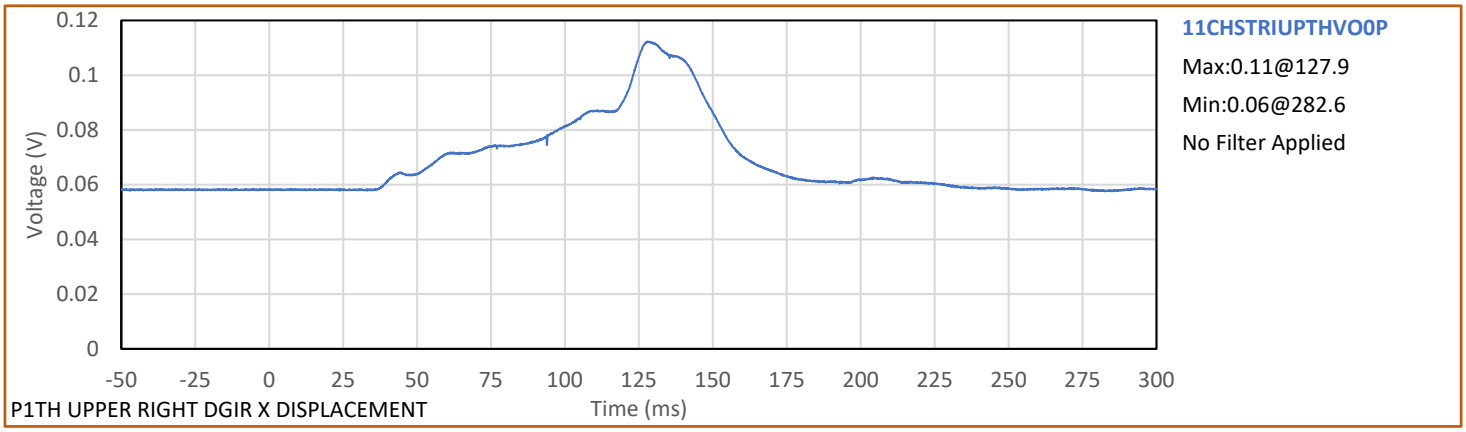
P1TH UPPER LEFT DGIR Y ROTATION

11CHSTLEUPTHANYC
Max:13.9@188.9
Min:6.6@108.3
SAE Class 180



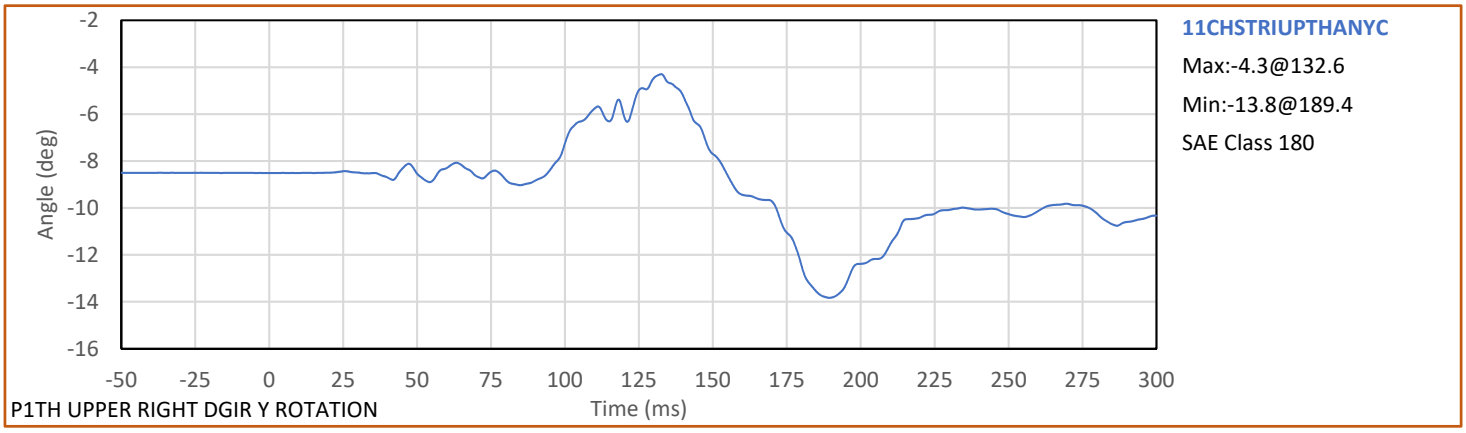
P1TH UPPER LEFT DGIR Z ROTATION

11CHSTLEUPTHANZC
Max:-14.2@299.8
Min:-18.8@126.5
SAE Class 180



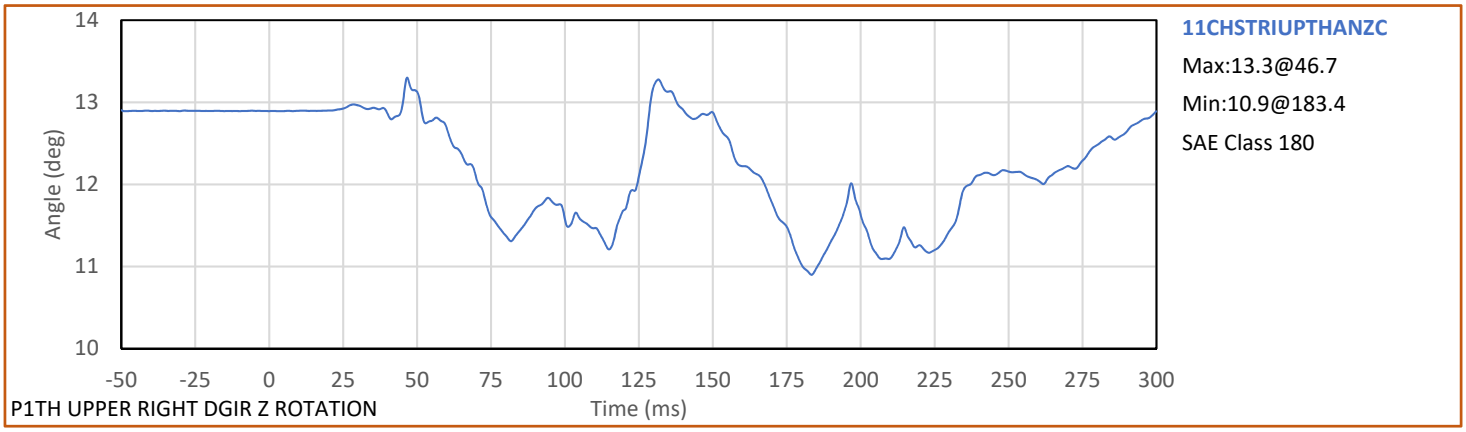
P1TH UPPER RIGHT DGIR X DISPLACEMENT

11CHSTRIUPTHVO0P
Max:0.11@127.9
Min:0.06@282.6
No Filter Applied



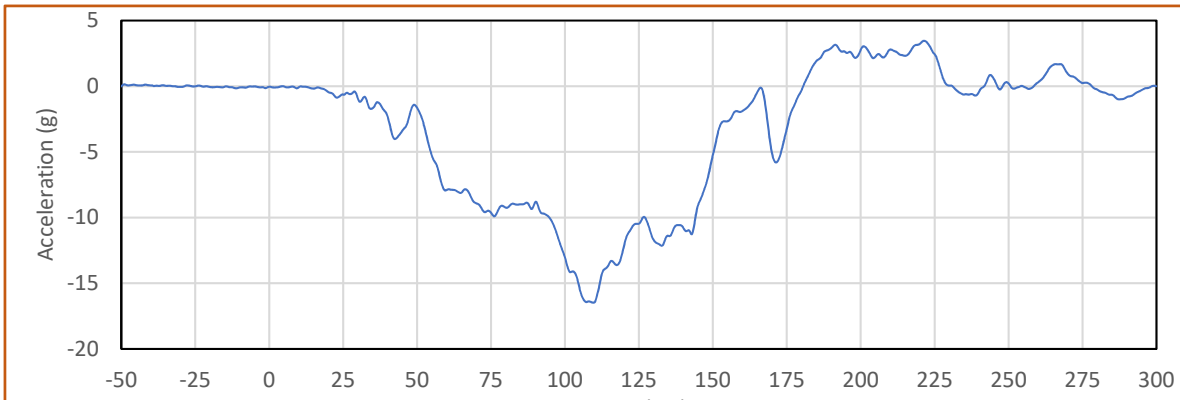
P1TH UPPER RIGHT DGIR Y ROTATION

11CHSTRIUPTHANYC
Max:-4.3@132.6
Min:-13.8@189.4
SAE Class 180



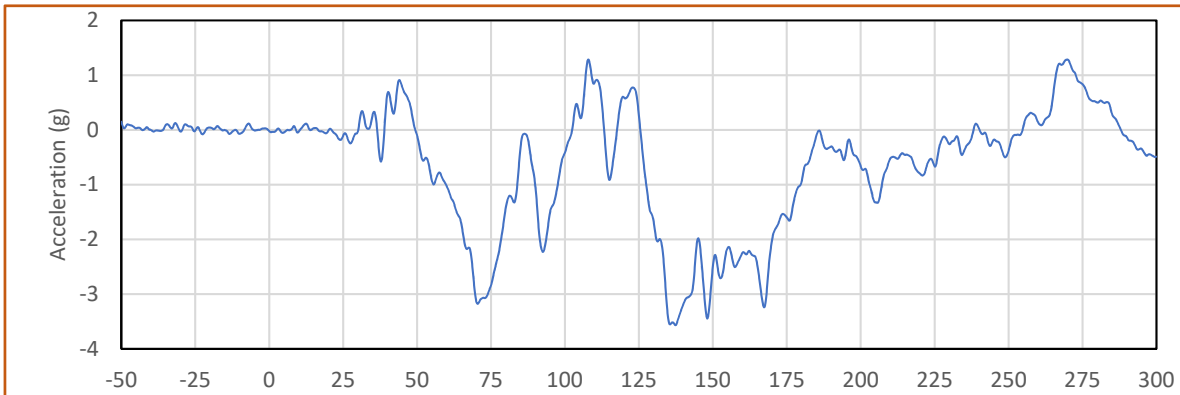
P1TH UPPER RIGHT DGIR Z ROTATION

11CHSTRIUPTHANZC
Max:13.3@46.7
Min:10.9@183.4
SAE Class 180



P1TH T6 X ACCELERATION

11THSP0600THACXC
Max:3.5@221.4
Min:-16.5@109.7
SAE Class 180

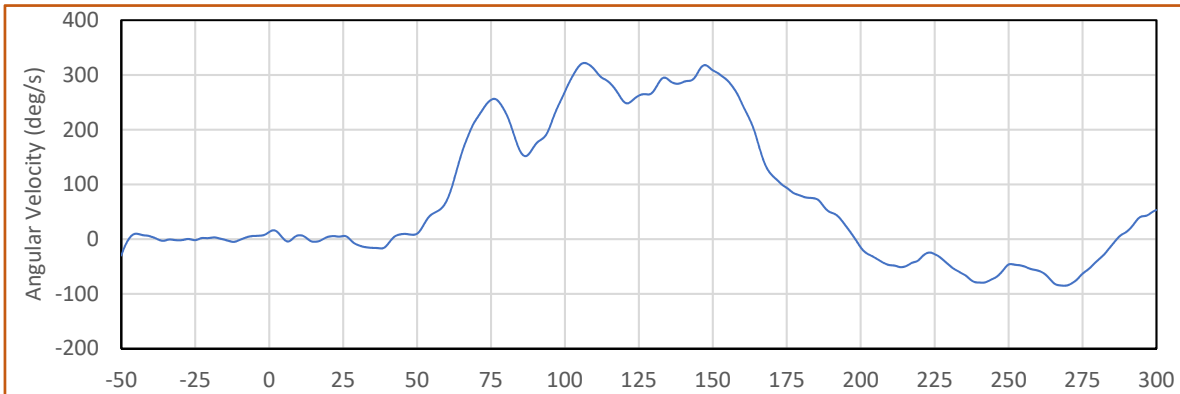


P1TH T6 Y ACCELERATION

11THSP0600THACYC
Max:1.3@107.9
Min:-3.6@137.4
SAE Class 180

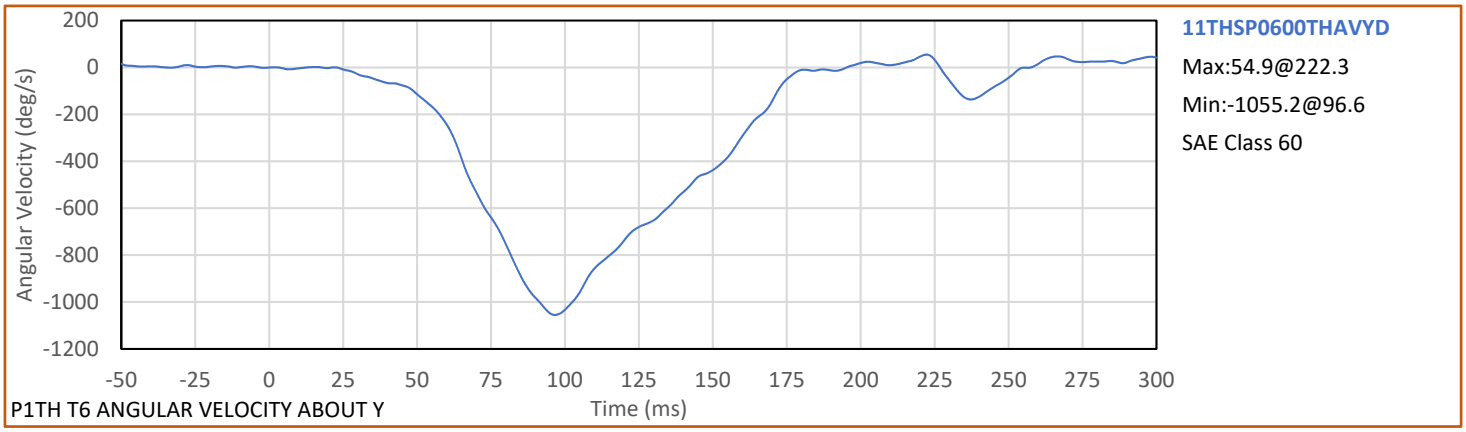
P1TH T6 Z ACCELERATION

11THSP0600THACZC
Max:7.1@145.9
Min:-6.7@70.2
SAE Class 180

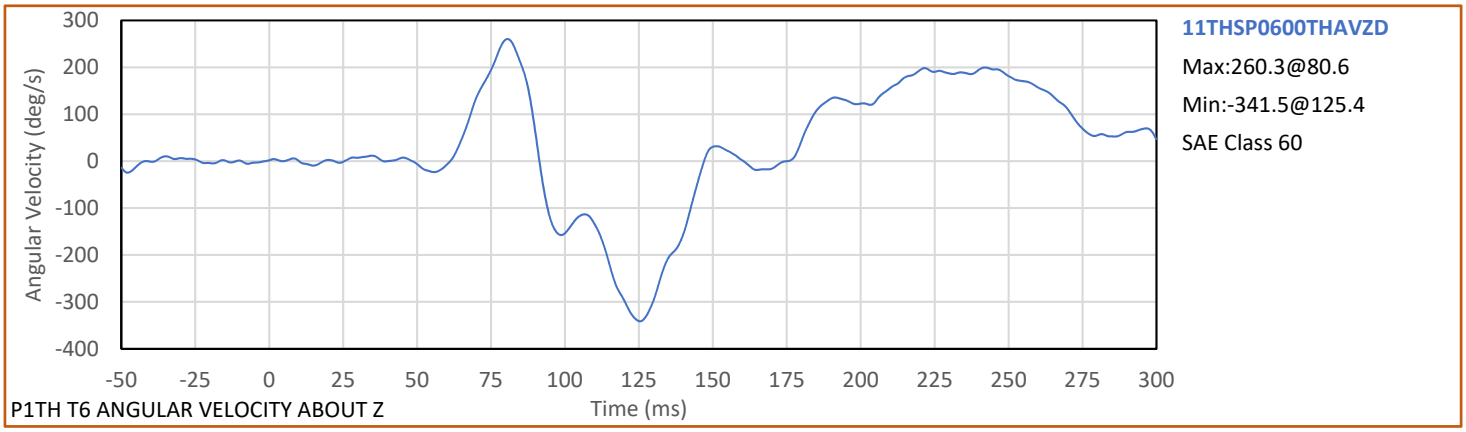


P1TH T6 ANGULAR VELOCITY ABOUT X

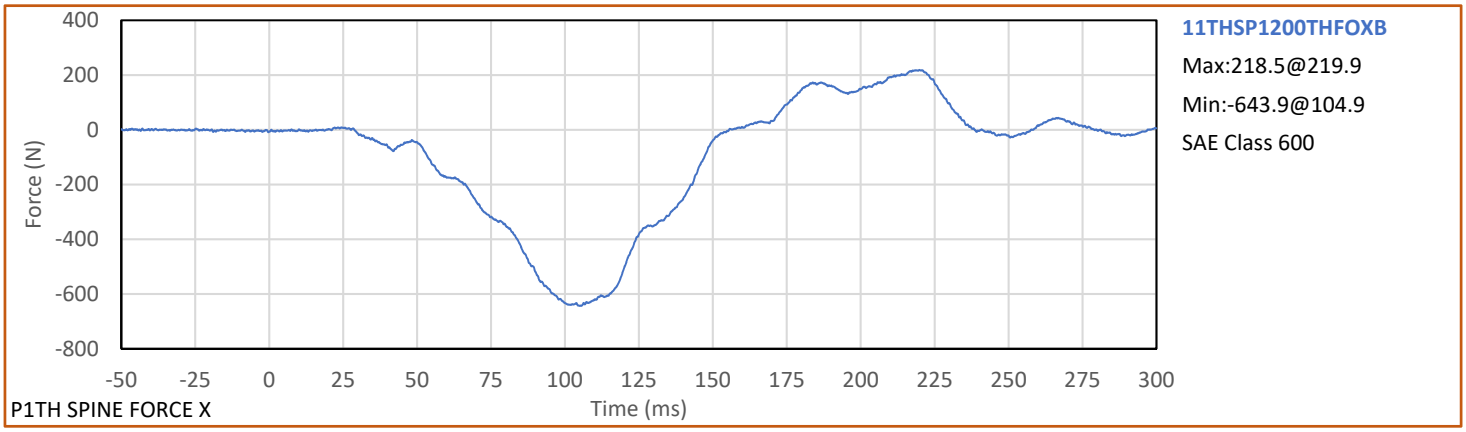
11THSP0600THAVXD
Max:321.8@106.6
Min:-85.2@268.8
SAE Class 60



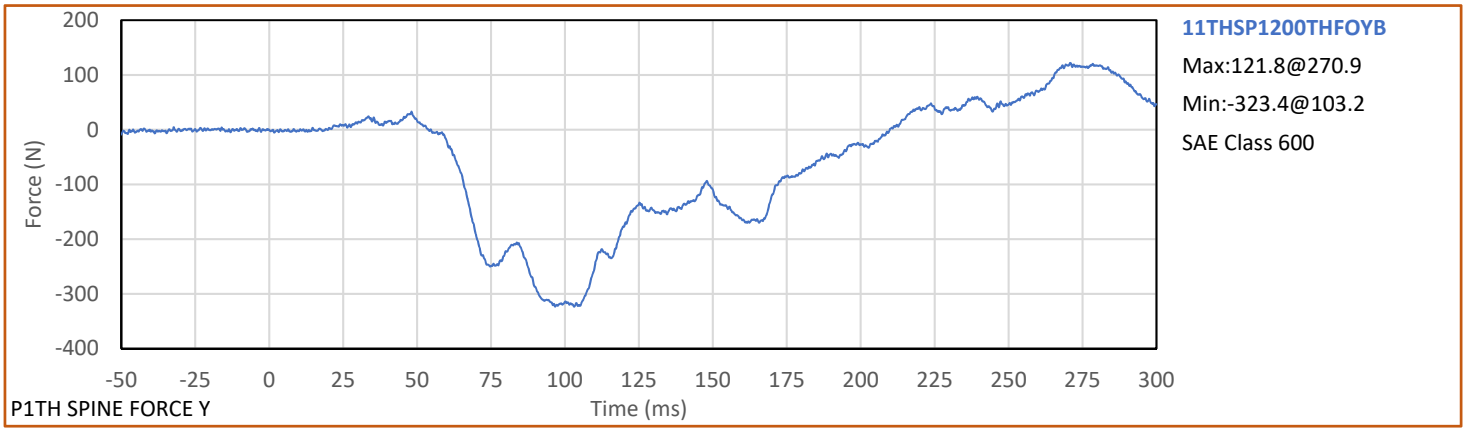
11THSP0600THAVYD
Max:54.9@222.3
Min:-1055.2@96.6
SAE Class 60



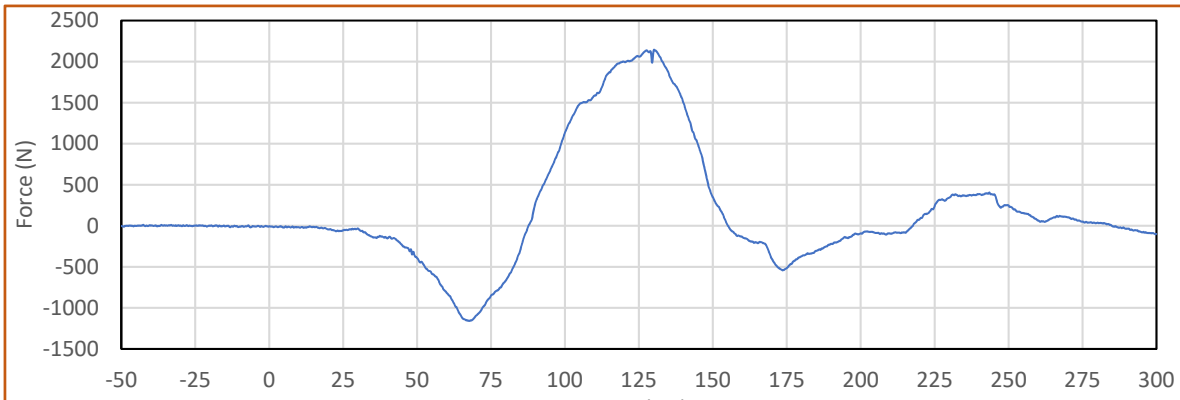
11THSP0600THAVZD
Max:260.3@80.6
Min:-341.5@125.4
SAE Class 60



11THSP1200THFOXB
Max:218.5@219.9
Min:-643.9@104.9
SAE Class 600



11THSP1200THFOYB
Max:121.8@270.9
Min:-323.4@103.2
SAE Class 600

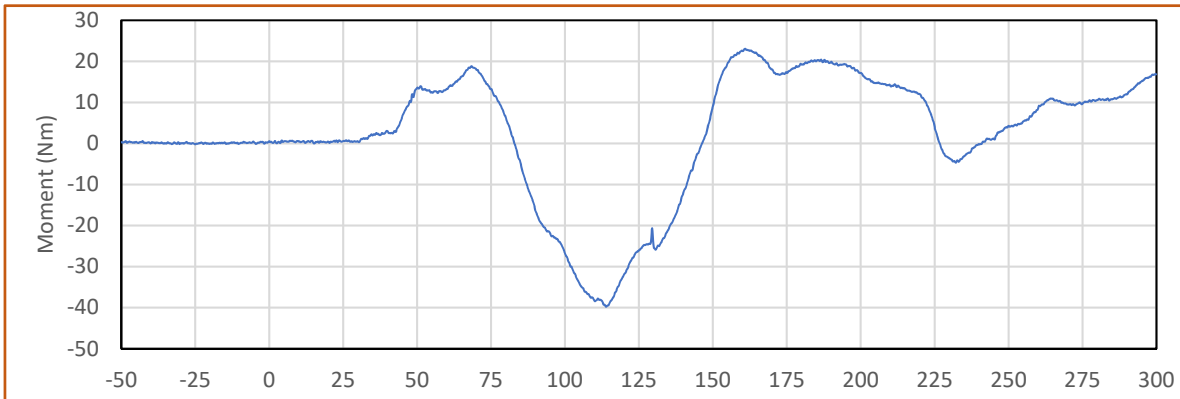


P1TH SPINE FORCE Z

11THSP1200THFOZB
Max:2144.4@130.1
Min:-1159.0@67.7
SAE Class 600

P1TH SPINE MOMENT X

11THSP1200THMOXB
Max:39.6@94.5
Min:-13.2@161.7
SAE Class 600



P1TH SPINE MOMENT Y

11THSP1200THMOYB
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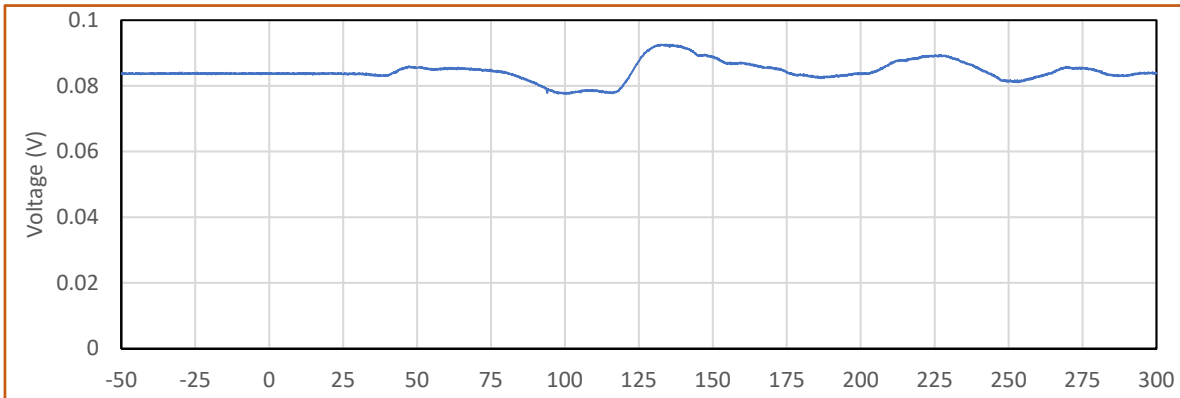
Min:-39.8@113.9
SAE Class 600



P1TH LOWER LEFT DGIR X DISPLACEMENT

11CHSTLELOTHVO0P
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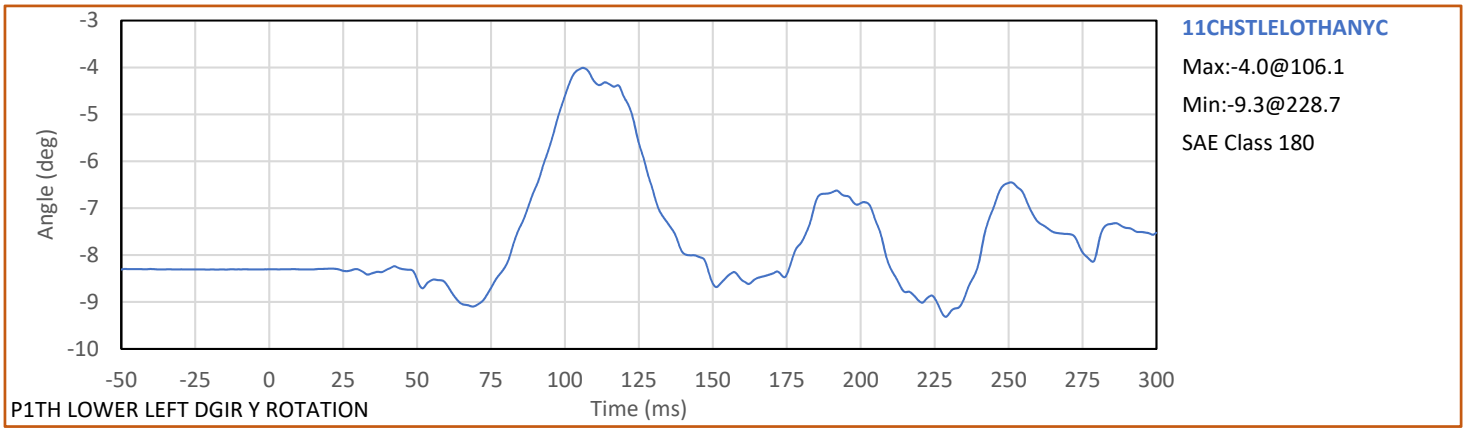
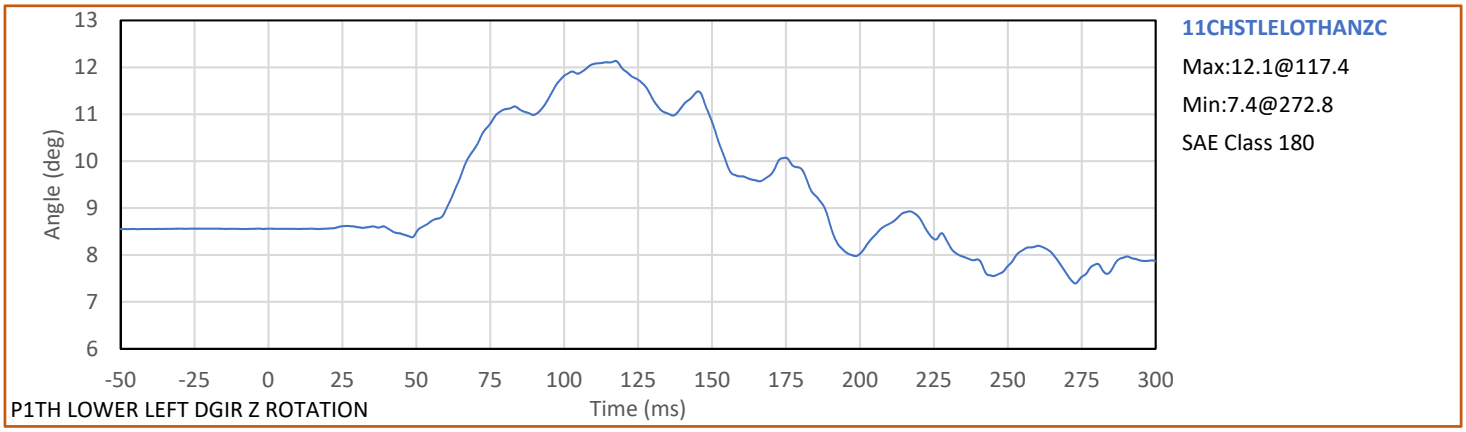
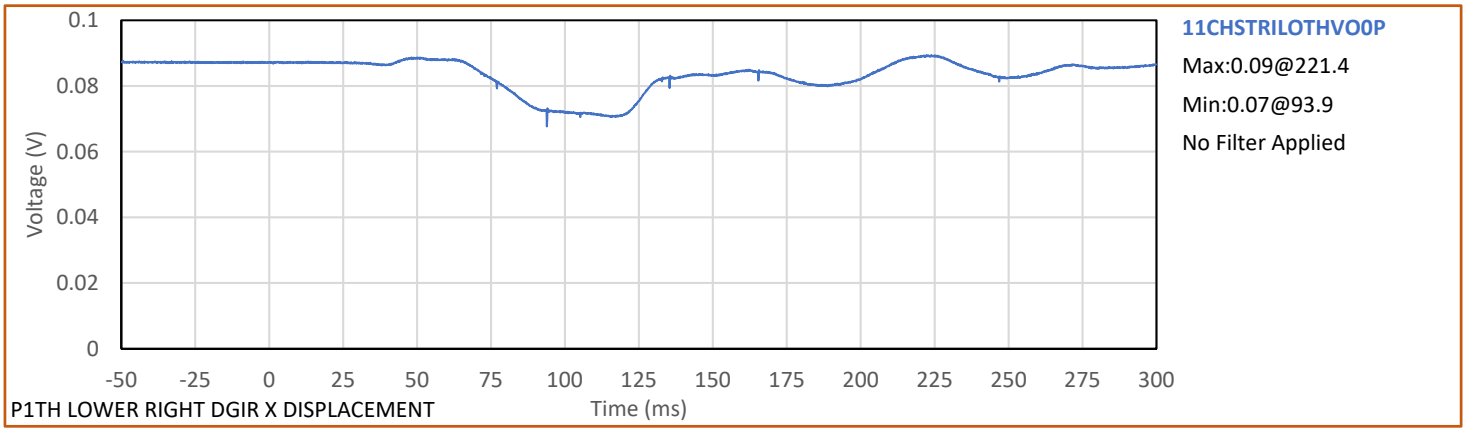
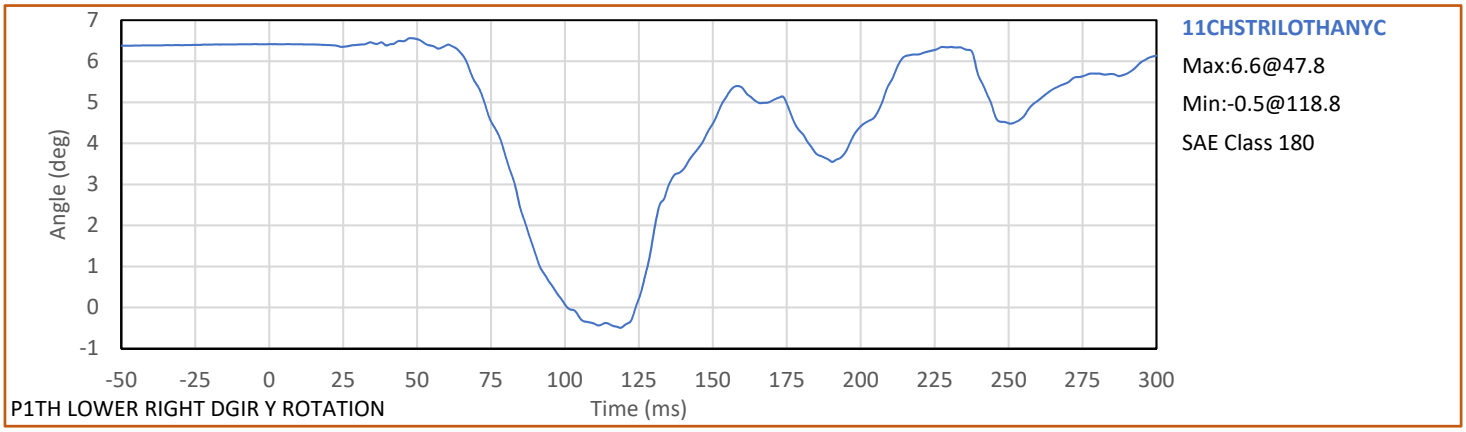
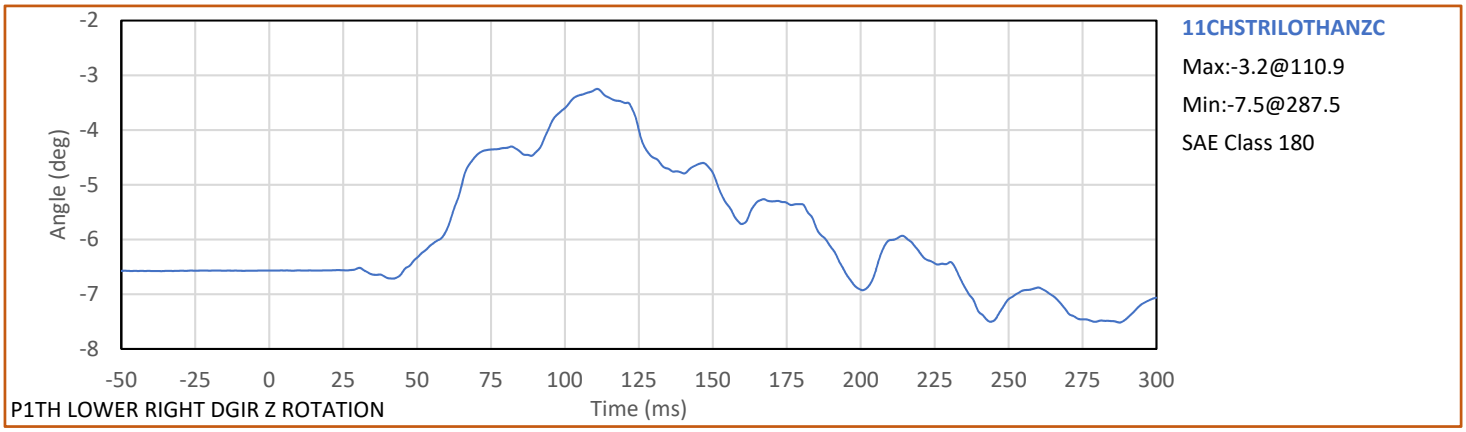
Min:0.08@100.7
No Filter Applied

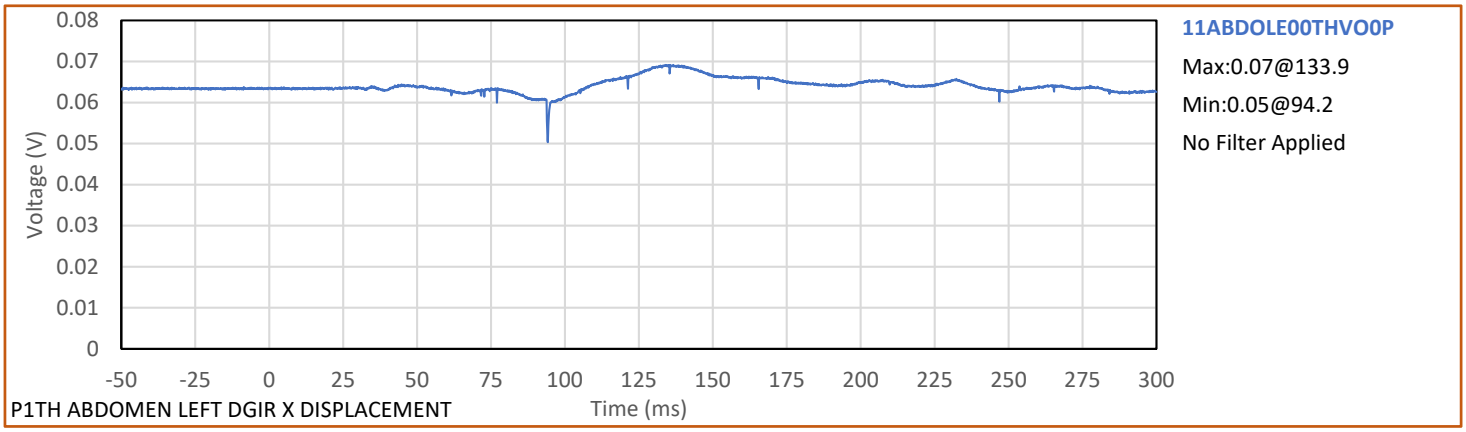

Angle (deg)
Time (ms)
P1TH LOWER LEFT DGIR Y ROTATION
11CHSTLELOTHANYC
Max:-4.0@106.1
Min:-9.3@228.7
SAE Class 180

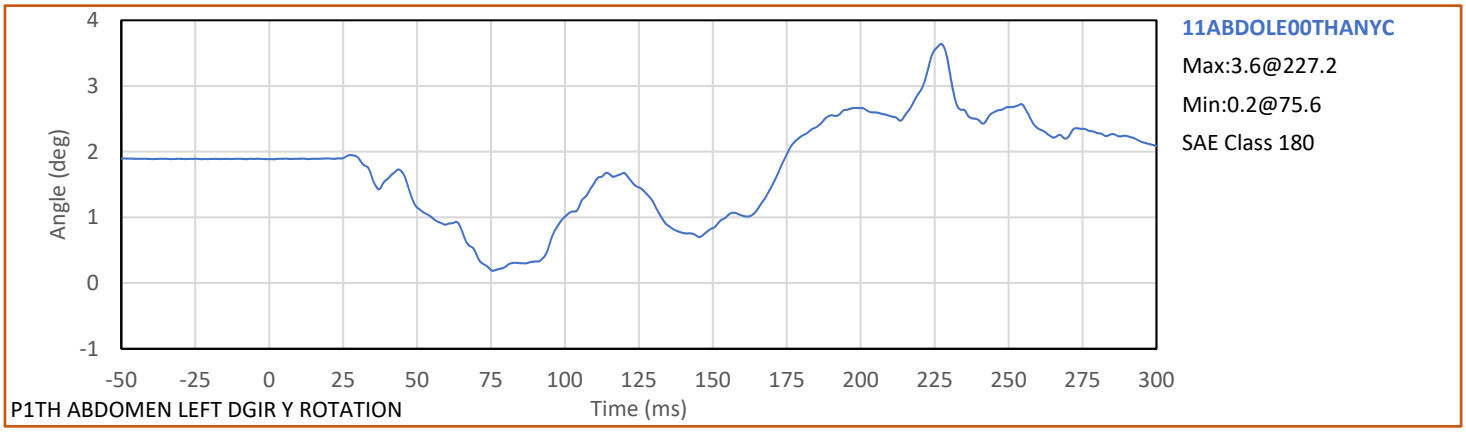

Angle (deg)
Time (ms)
P1TH LOWER LEFT DGIR Z ROTATION
11CHSTLELOTHANZC
Max:12.1@117.4
Min:7.4@272.8
SAE Class 180

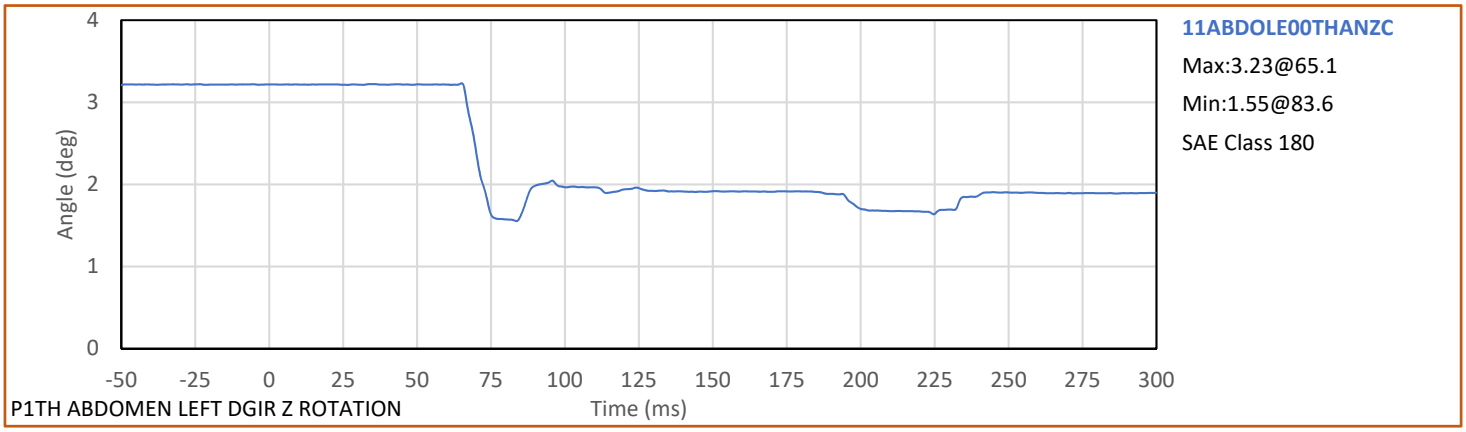

Voltage (V)
Time (ms)
P1TH LOWER RIGHT DGIR X DISPLACEMENT
11CHSTRILOTHVO0P
Max:0.09@221.4
Min:0.07@93.9
No Filter Applied

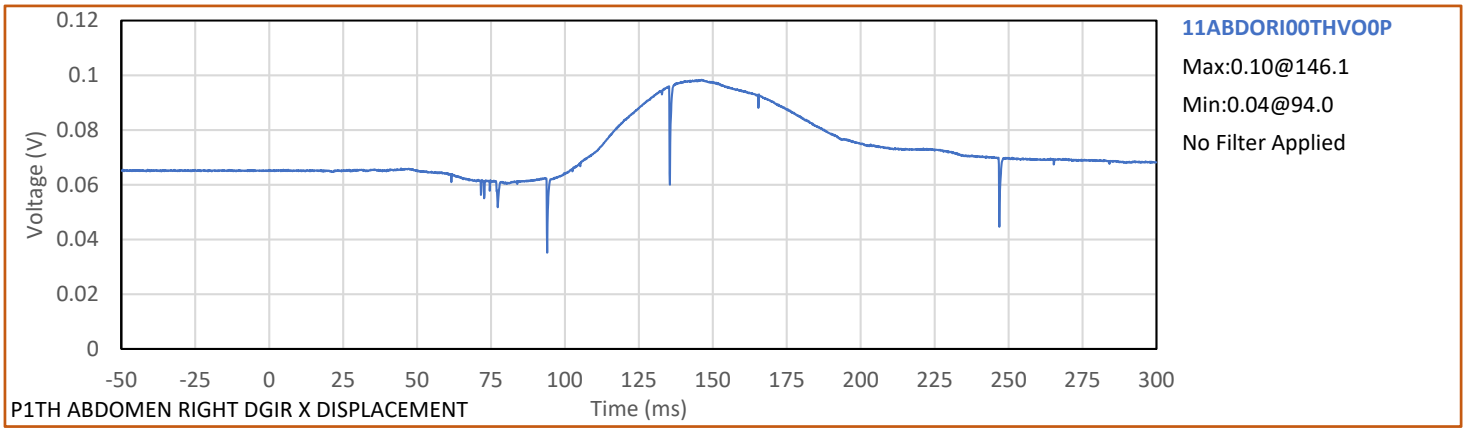

Angle (deg)
Time (ms)
P1TH LOWER RIGHT DGIR Y ROTATION
11CHSTRILOTHANYC
Max:6.6@47.8
Min:-0.5@118.8
SAE Class 180

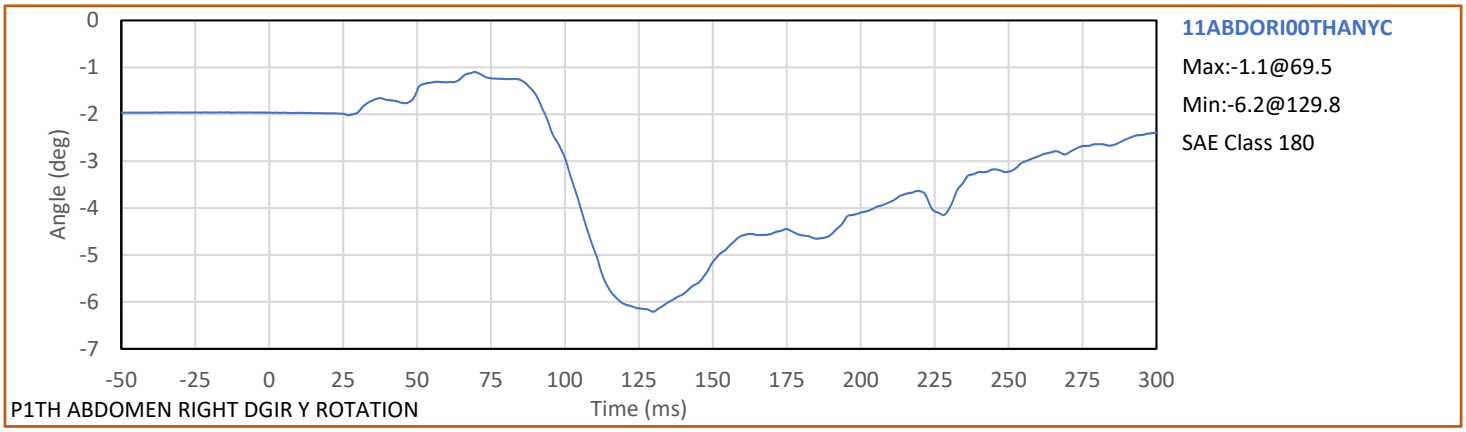

Angle (deg)
Time (ms)
11CHSTRILOTHANZC
Max:-3.2@110.9
Min:-7.5@287.5
SAE Class 180
P1TH LOWER RIGHT DGIR Z ROTATION

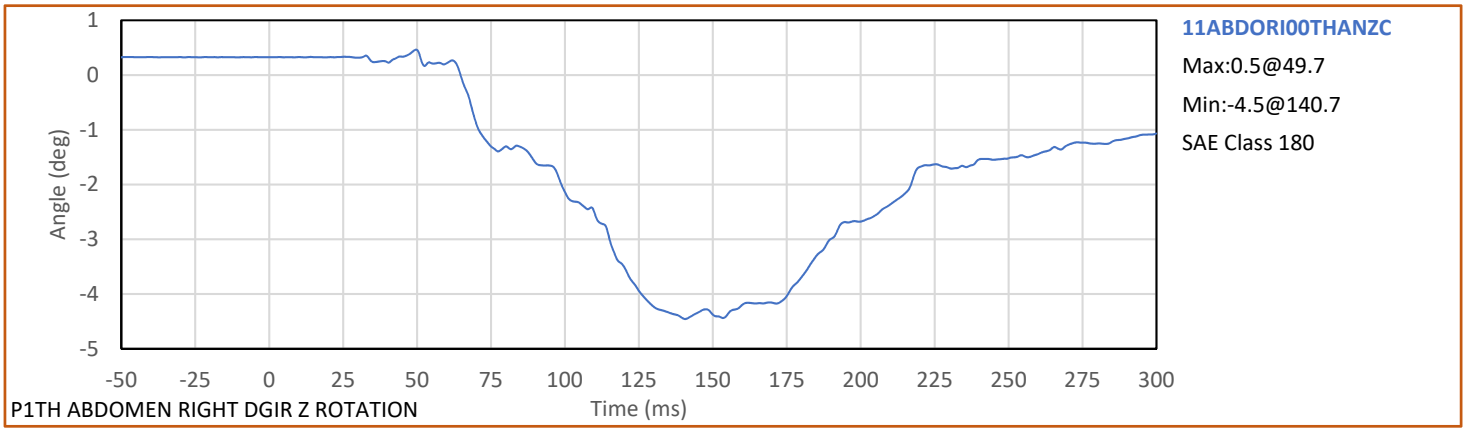

Voltage (V)
Time (ms)
11ABDOLE00THVO0P
Max:0.07@133.9
Min:0.05@94.2
No Filter Applied
P1TH ABDOMEN LEFT DGIR X DISPLACEMENT

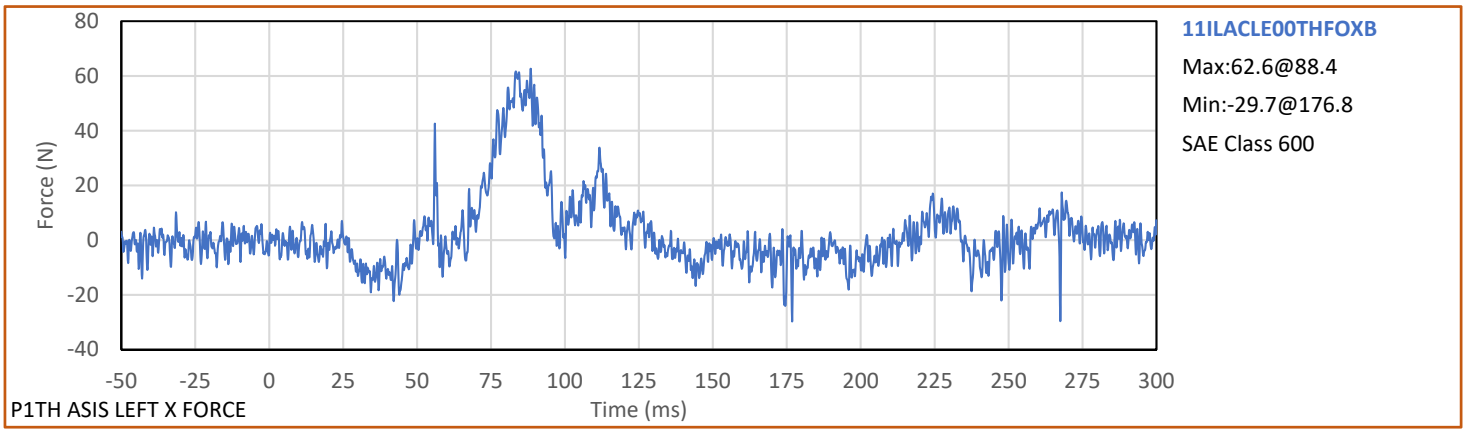

Angle (deg)
Time (ms)
11ABDOLE00THANYC
Max:3.6@227.2
Min:0.2@75.6
SAE Class 180
P1TH ABDOMEN LEFT DGIR Y ROTATION


Angle (deg)
Time (ms)
11ABDOLE00THANZC
Max:3.23@65.1
Min:1.55@83.6
SAE Class 180
P1TH ABDOMEN LEFT DGIR Z ROTATION


Voltage (V)
Time (ms)
11ABDORI00THVO0P
Max:0.10@146.1
Min:0.04@94.0
No Filter Applied
P1TH ABDOMEN RIGHT DGIR X DISPLACEMENT


Angle (deg)
Time (ms)
11ABDORI00THANYC
Max:-1.1@69.5
Min:-6.2@129.8
SAE Class 180
P1TH ABDOMEN RIGHT DGIR Y ROTATION


Angle (deg)
Time (ms)
11ABDORI00THANZC
Max:0.5@49.7
Min:-4.5@140.7
SAE Class 180
P1TH ABDOMEN RIGHT DGIR Z ROTATION

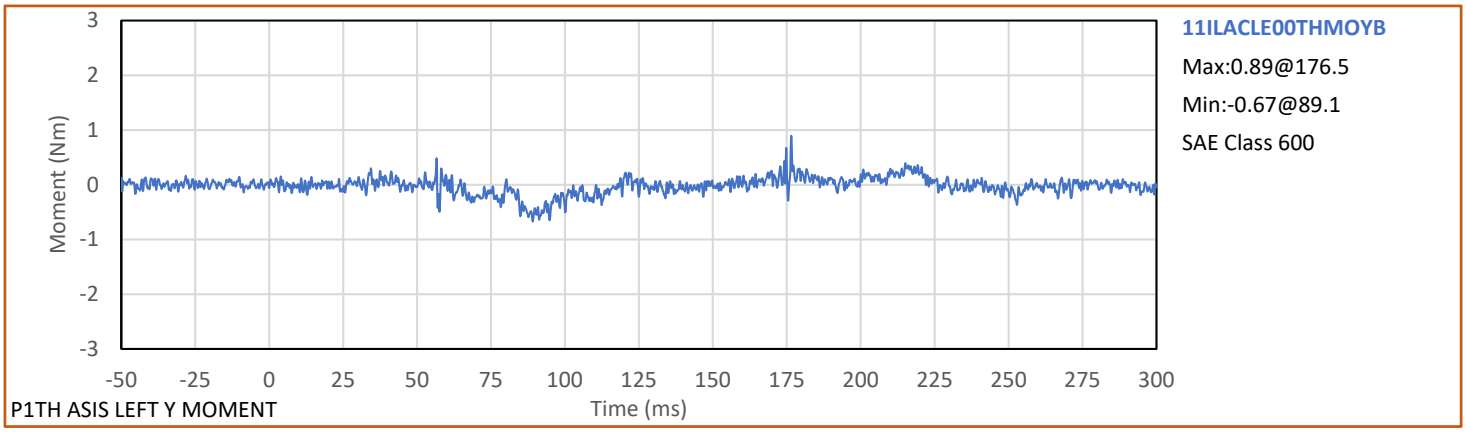

Force (N)
Time (ms)
11ILACLE00THFOXB
Max:62.6@88.4
Min:-29.7@176.8
SAE Class 600
P1TH ASIS LEFT X FORCE

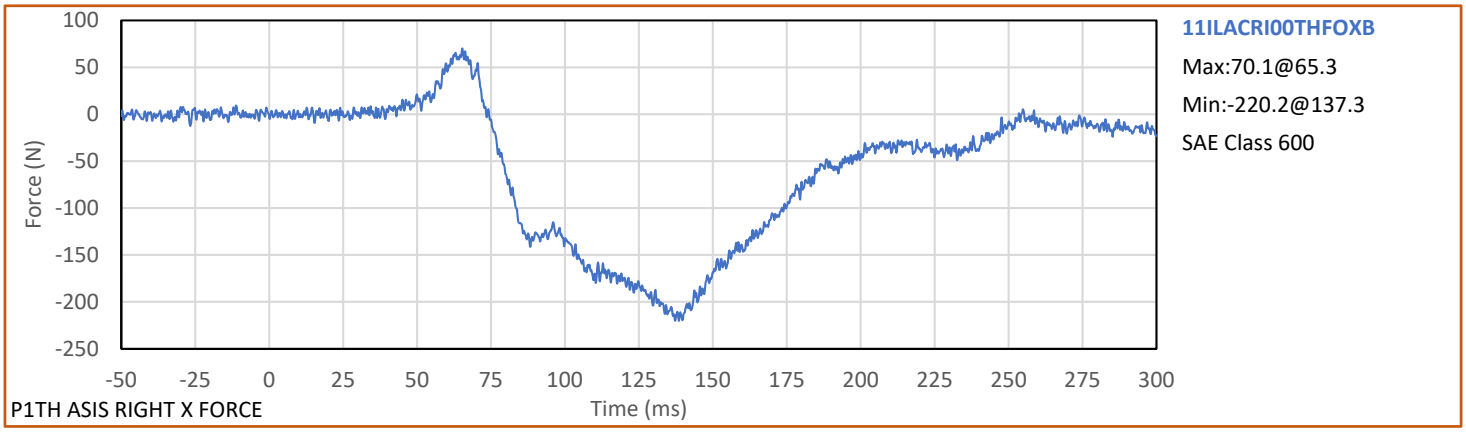
Test Vehicle: 2020 Mazda CX-5 5-Door MPV

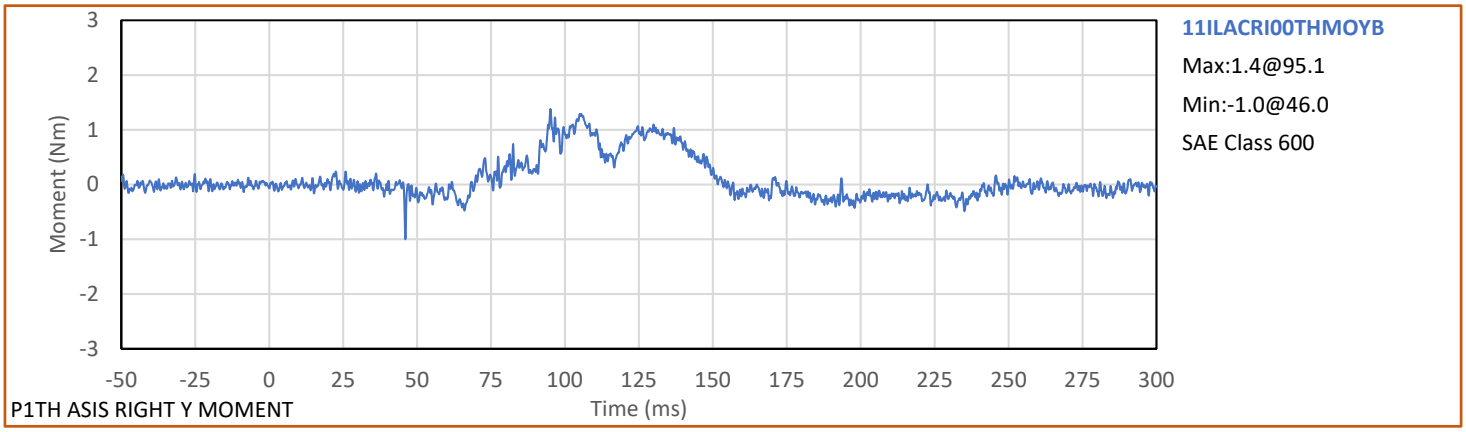
Test Program: Right Side 30° Frontal Rigid Barrier Impact

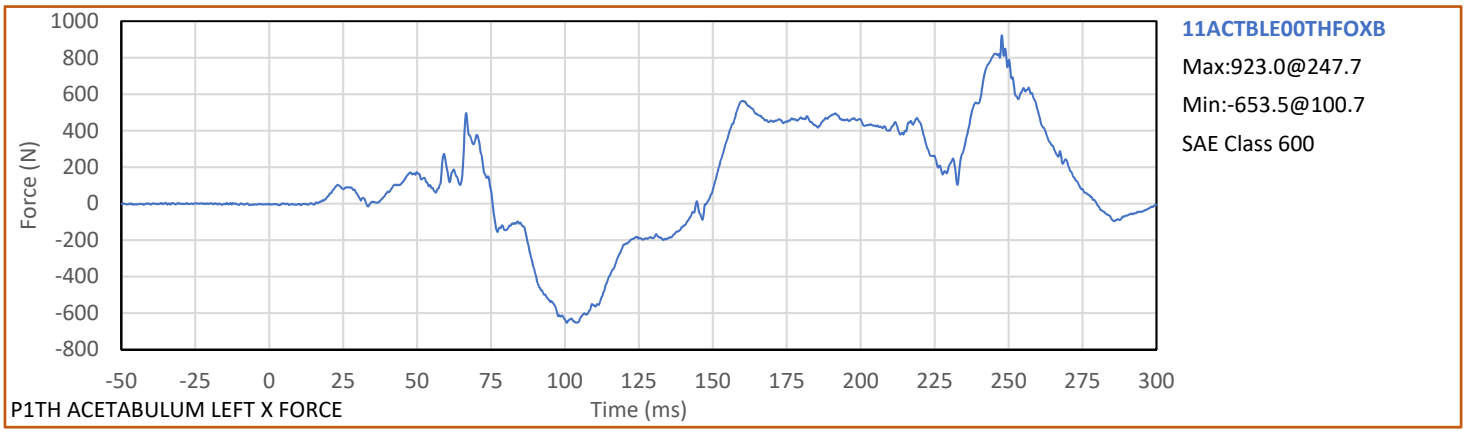
NHTSA No.: R20205412

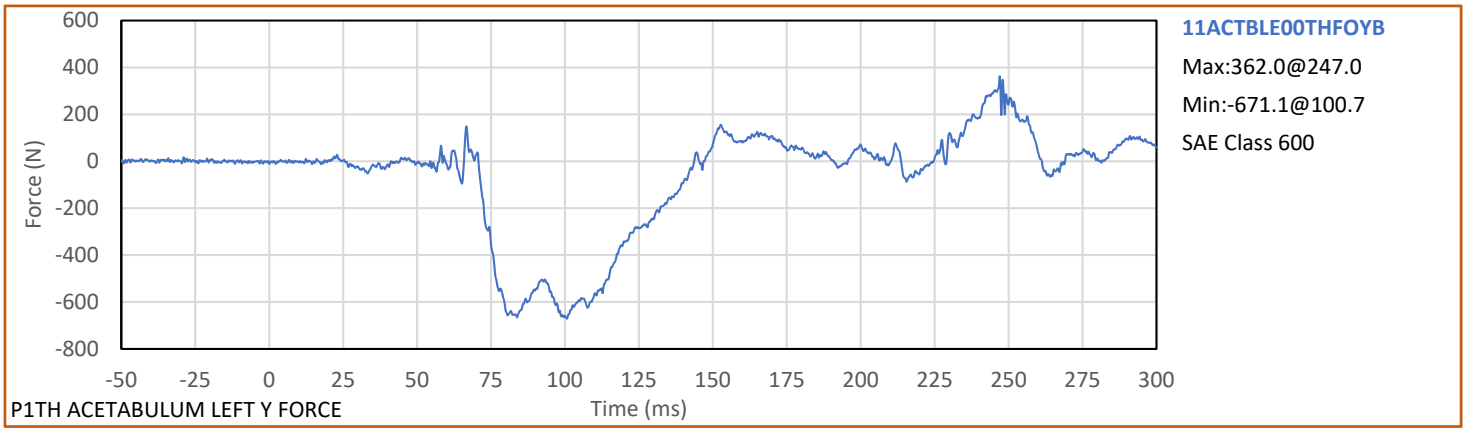
Test Date: 12/7/2020

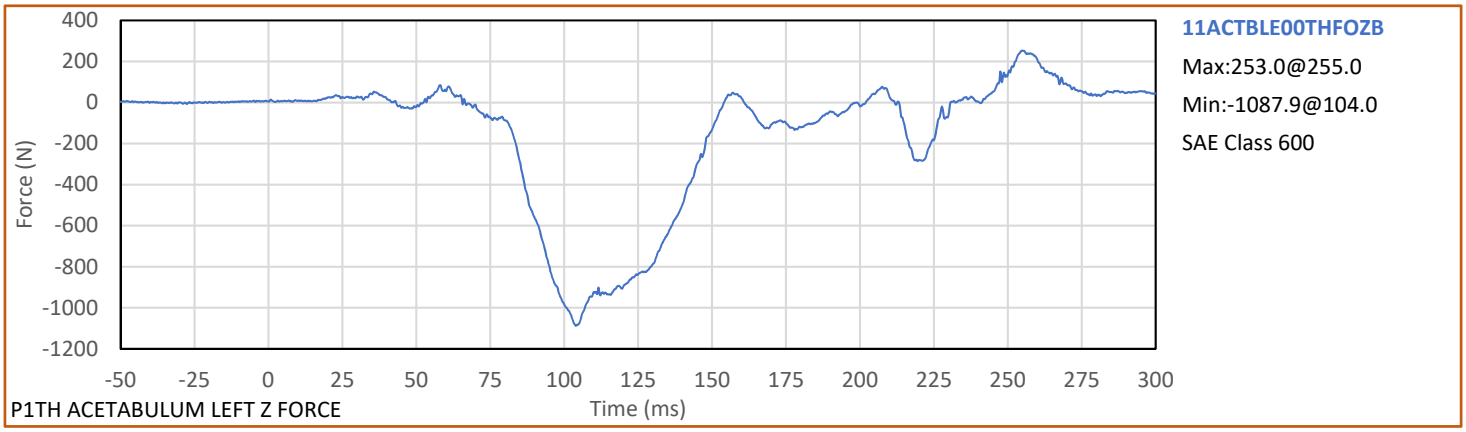


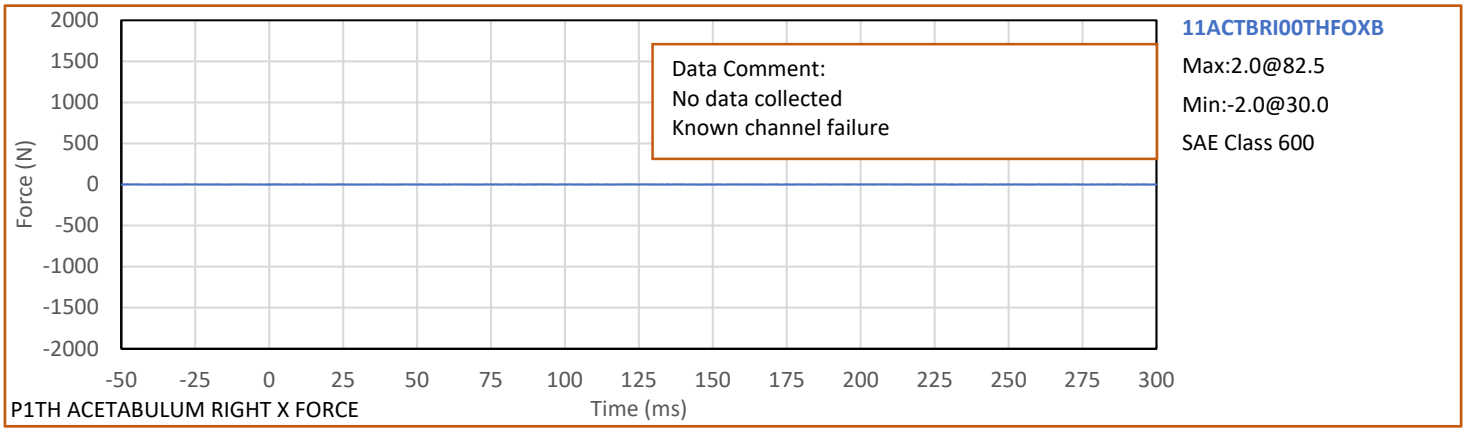


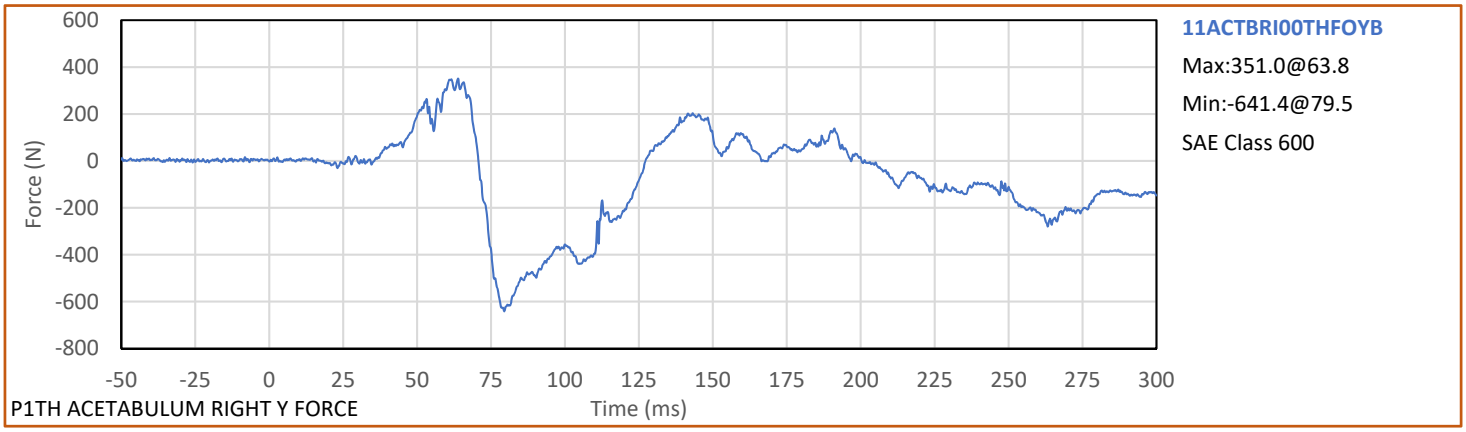





Force (N)
Time (ms)
P1TH ACETABULUM LEFT Y FORCE
11ACTBLE00THFOYB
Max:362.0@247.0
Min:-671.1@100.7
SAE Class 600

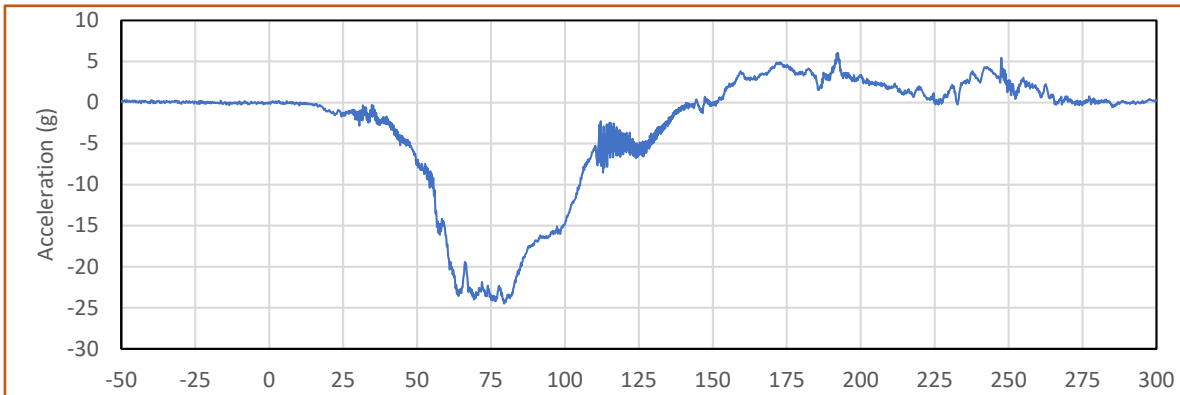

Force (N)
Time (ms)
P1TH ACETABULUM LEFT Z FORCE
11ACTBLE00THFOZB
Max:253.0@255.0
Min:-1087.9@104.0
SAE Class 600


Data Comment:
No data collected
Known channel failure
Force (N)
Time (ms)
P1TH ACETABULUM RIGHT X FORCE
11ACTBRI00THFOXB
Max:2.0@82.5
Min:-2.0@30.0
SAE Class 600


Force (N)
Time (ms)
P1TH ACETABULUM RIGHT Y FORCE
11ACTBRI00THFOYB
Max:351.0@63.8
Min:-641.4@79.5
SAE Class 600

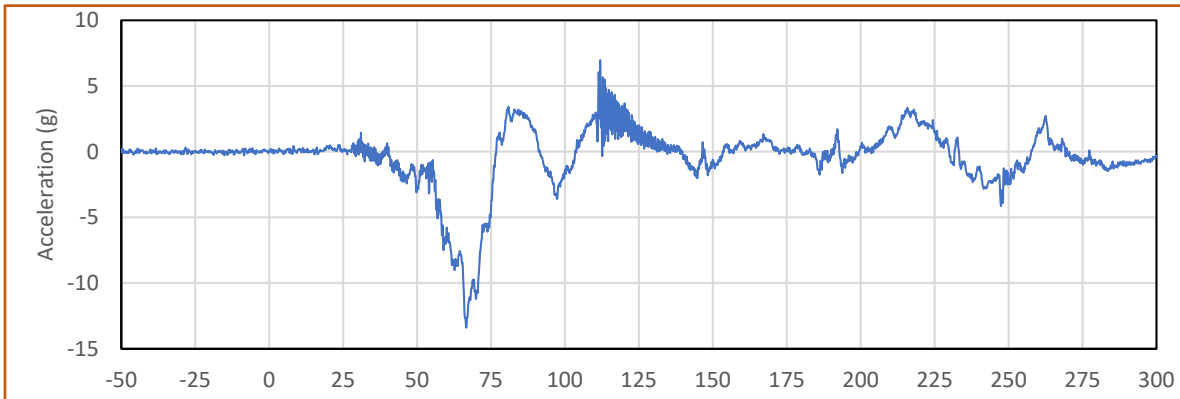
11ACTBRI00THFOZB
Max:1867.6@127.5
Min:-319.9@63.9
SAE Class 600

P1TH ACETABULUM RIGHT Z FORCE



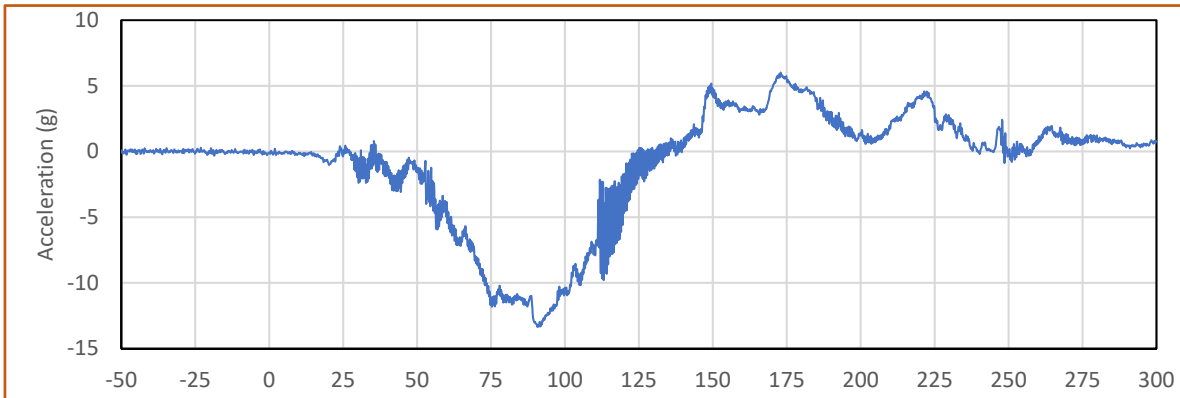
11PELV0000THACXA
Max:6.0@192.3
Min:-24.5@79.5
SAE Class 1000

P1TH PELVIS X ACCELERATION



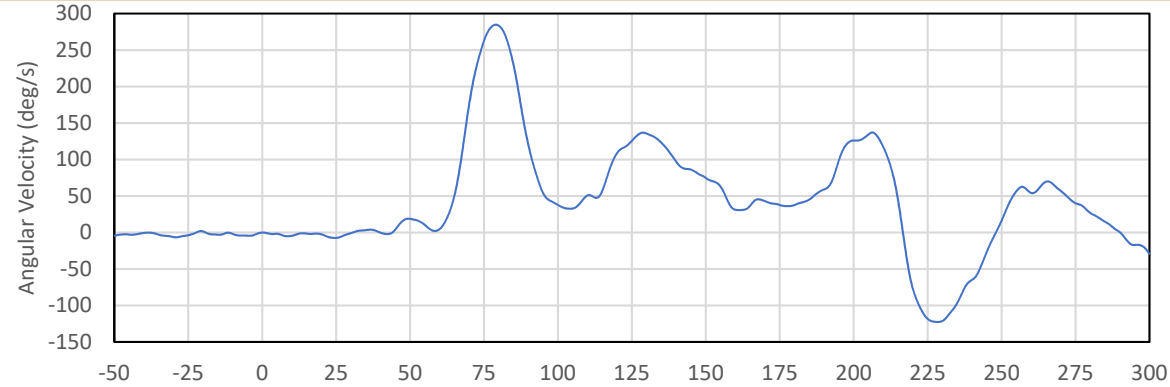
11PELV0000THACYA
Max:7.0@111.9
Min:-13.4@66.6
SAE Class 1000

P1TH PELVIS Y ACCELERATION



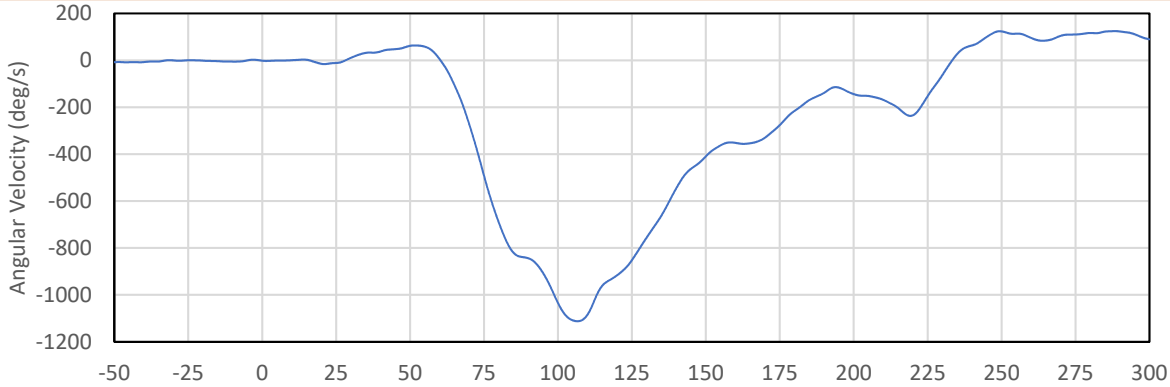
11PELV0000THACZA
Max:6.0@172.9
Min:-13.4@90.7
SAE Class 1000

P1TH PELVIS Z ACCELERATION



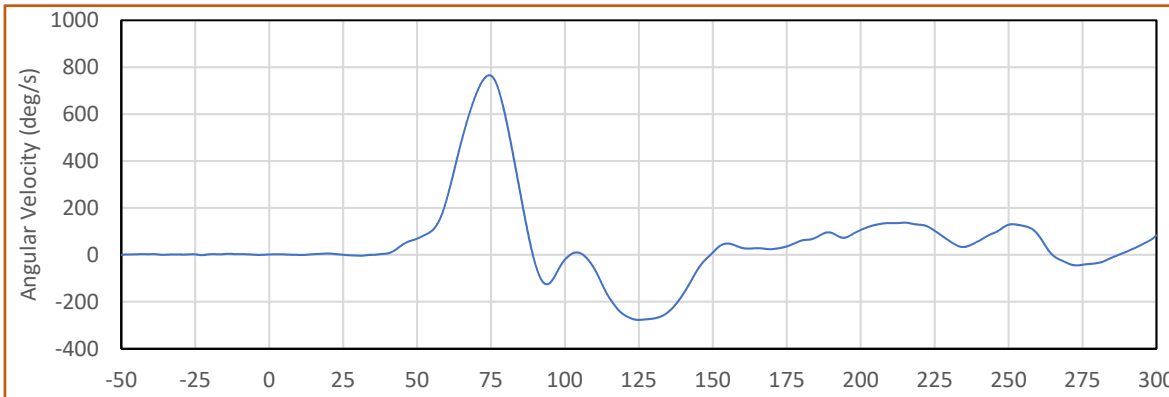
P1TH PELVIS ANGULAR VELOCITY ABOUT X

11PELV0000THAVXD
Max:284.7@79.0
Min:-122.7@228.5
SAE Class 60



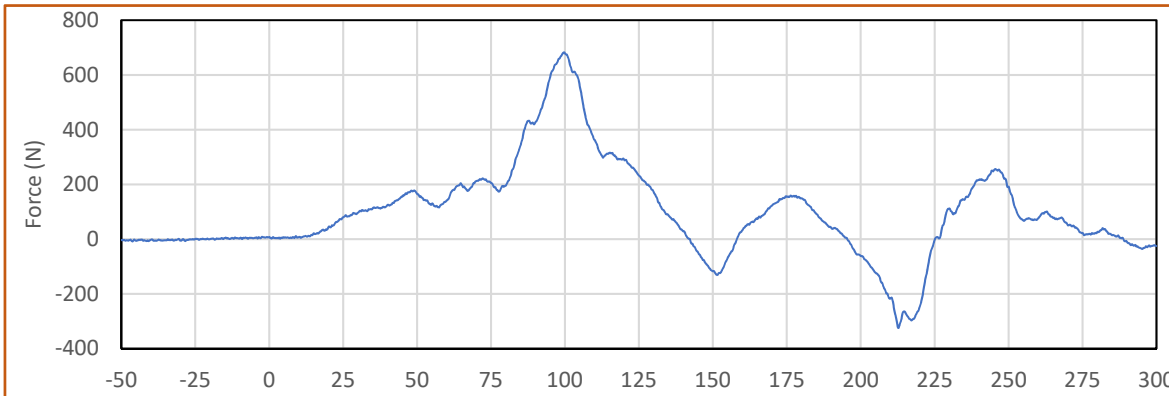
P1TH PELVIS ANGULAR VELOCITY ABOUT Y

11PELV0000THAVYD
Max:124.6@288.3
Min:-1112.5@106.6
SAE Class 60



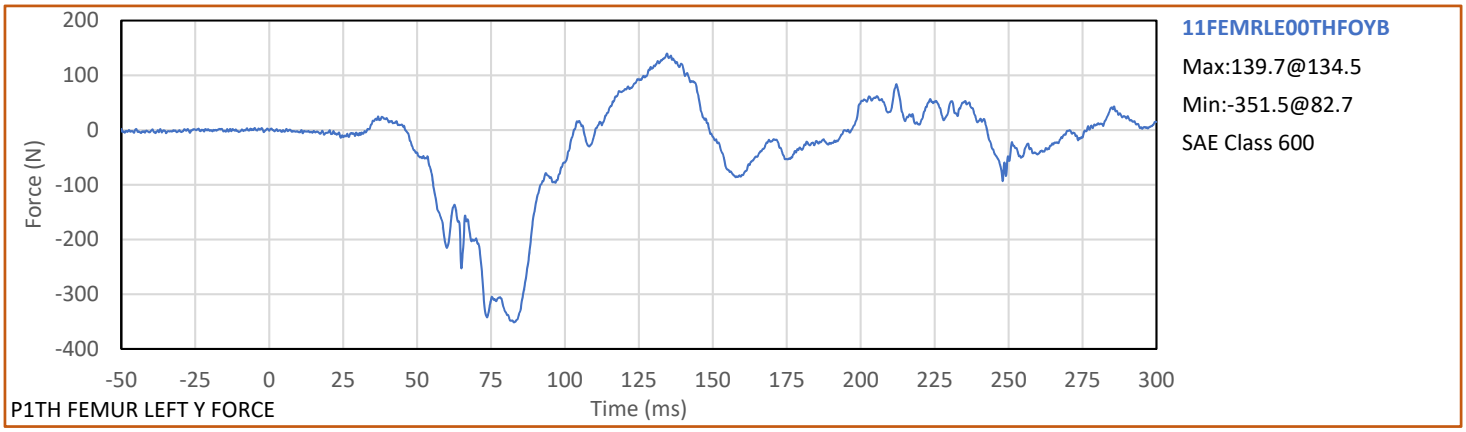
P1TH PELVIS ANGULAR VELOCITY ABOUT Z

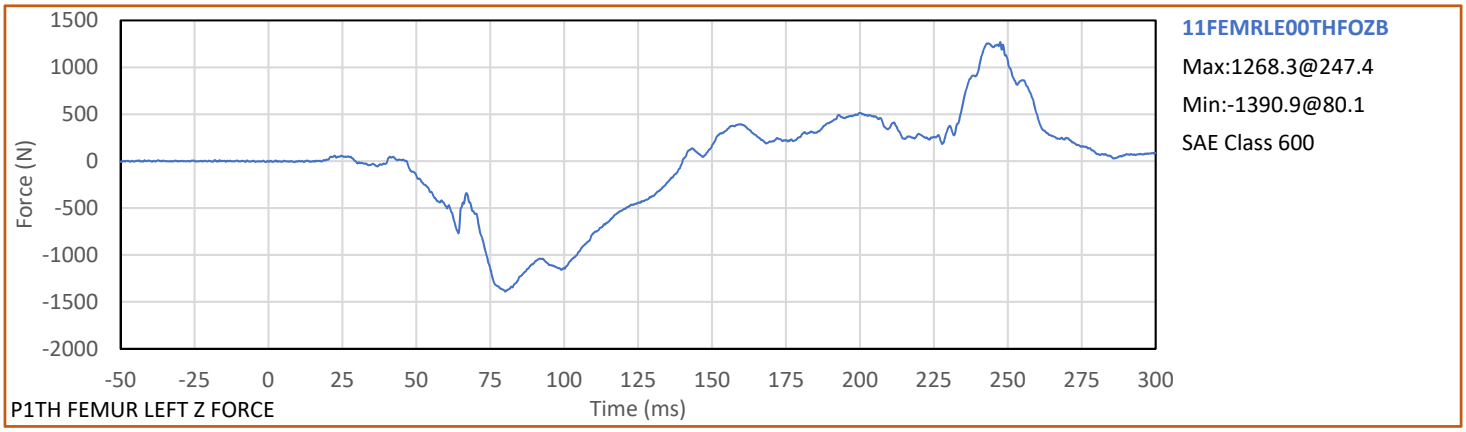
11PELV0000THAVZD
Max:765.8@74.4
Min:-277.4@124.9
SAE Class 60

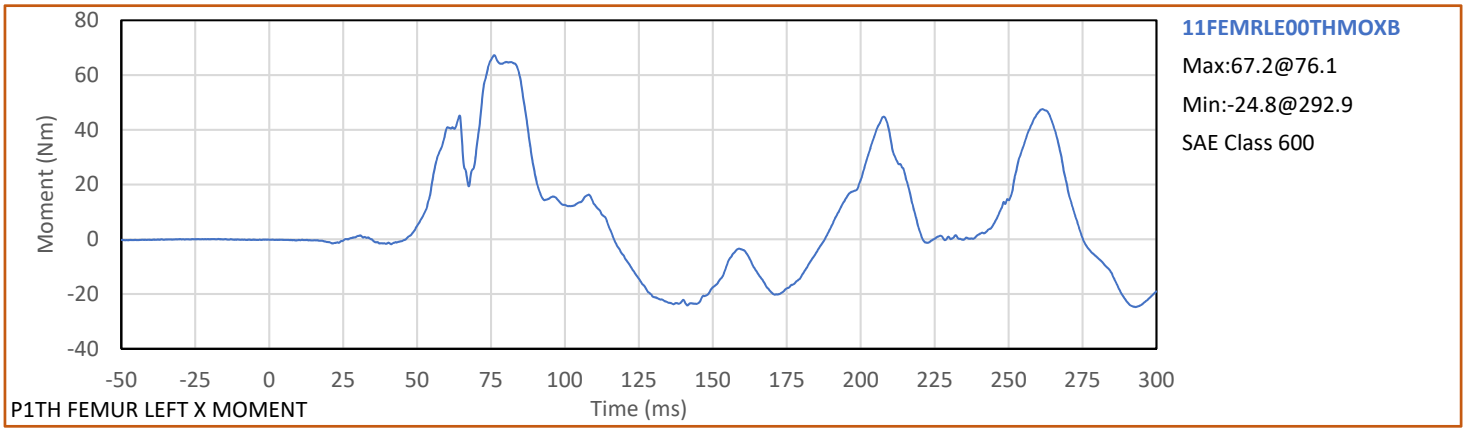


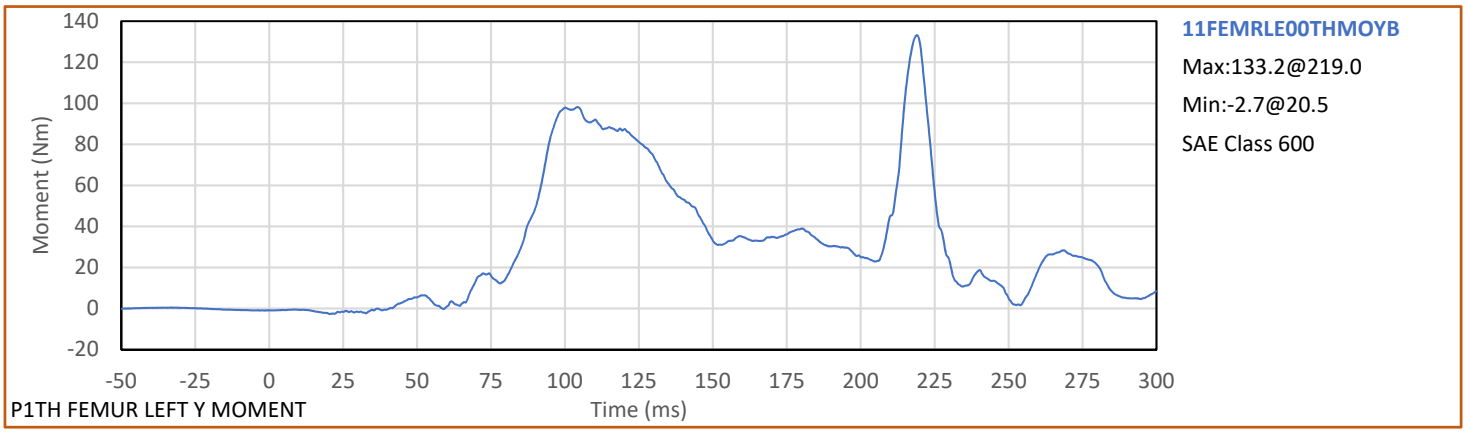
P1TH FEMUR LEFT X FORCE

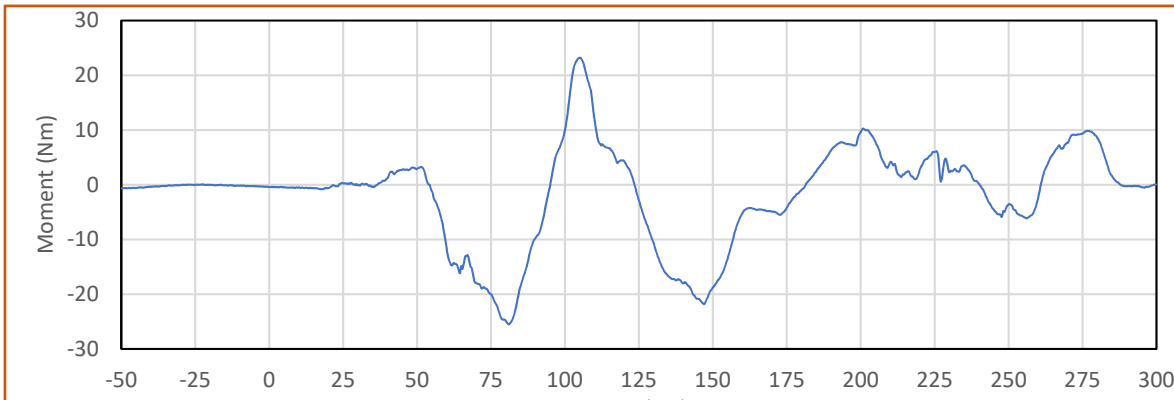
11FEMRLE00THFOXB
Max:682.4@99.8
Min:-325.1@212.7
SAE Class 600


Force (N)
Time (ms)
P1TH FEMUR LEFT Y FORCE
11FEMRLE00THFOYB
Max:139.7@134.5
Min:-351.5@82.7
SAE Class 600


Force (N)
Time (ms)
P1TH FEMUR LEFT Z FORCE
11FEMRLE00THFOZB
Max:1268.3@247.4
Min:-1390.9@80.1
SAE Class 600

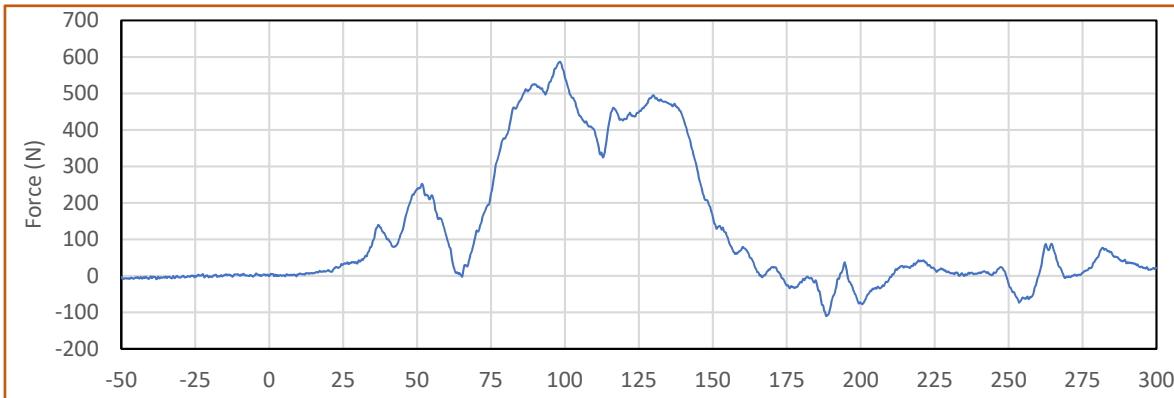

Moment (Nm)
Time (ms)
P1TH FEMUR LEFT X MOMENT
11FEMRLE00THMOXB
Max:67.2@76.1
Min:-24.8@292.9
SAE Class 600


Moment (Nm)
Time (ms)
P1TH FEMUR LEFT Y MOMENT
11FEMRLE00THMOYB
Max:133.2@219.0
Min:-2.7@20.5
SAE Class 600



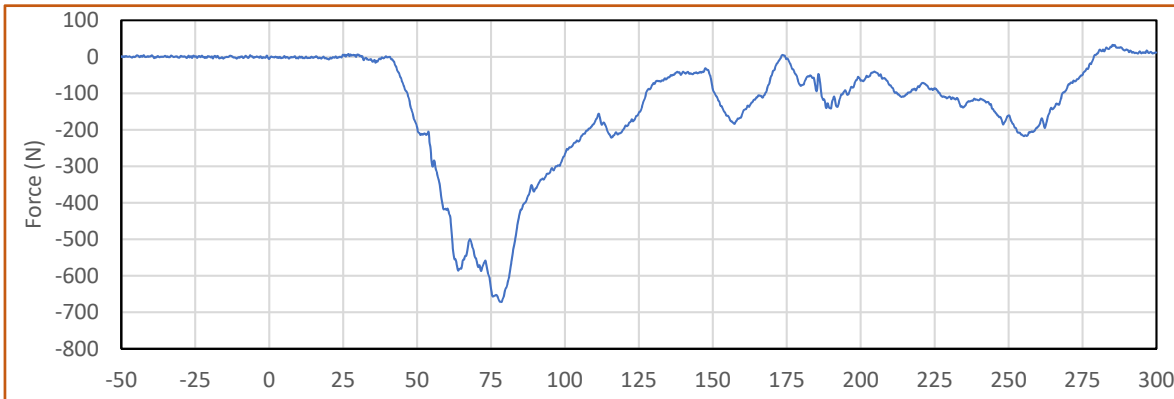
P1TH FEMUR LEFT Z MOMENT

11FEMRLE00THMOZB
Max:23.2@105.1
Min:-25.5@81.0
SAE Class 600



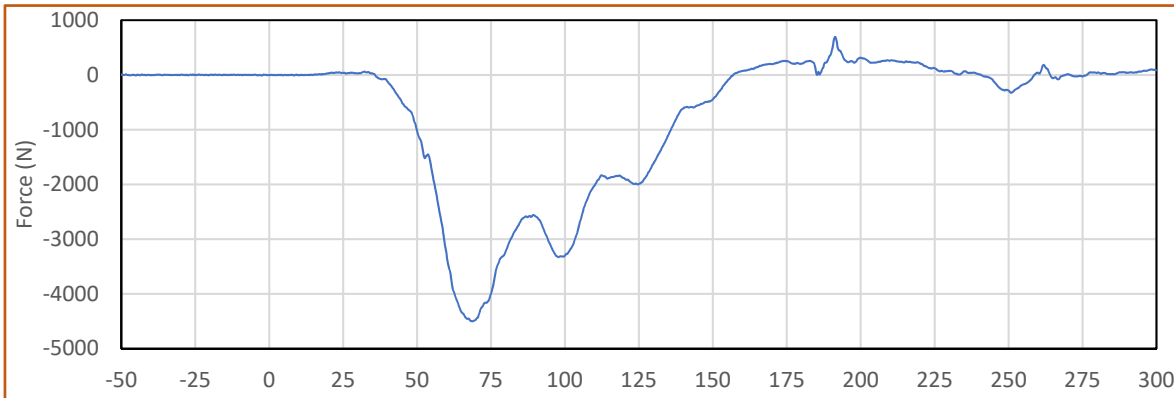
P1TH FEMUR RIGHT X FORCE

11FEMRRI00THFOXB
Max:586.9@98.3
Min:-110.6@188.4
SAE Class 600



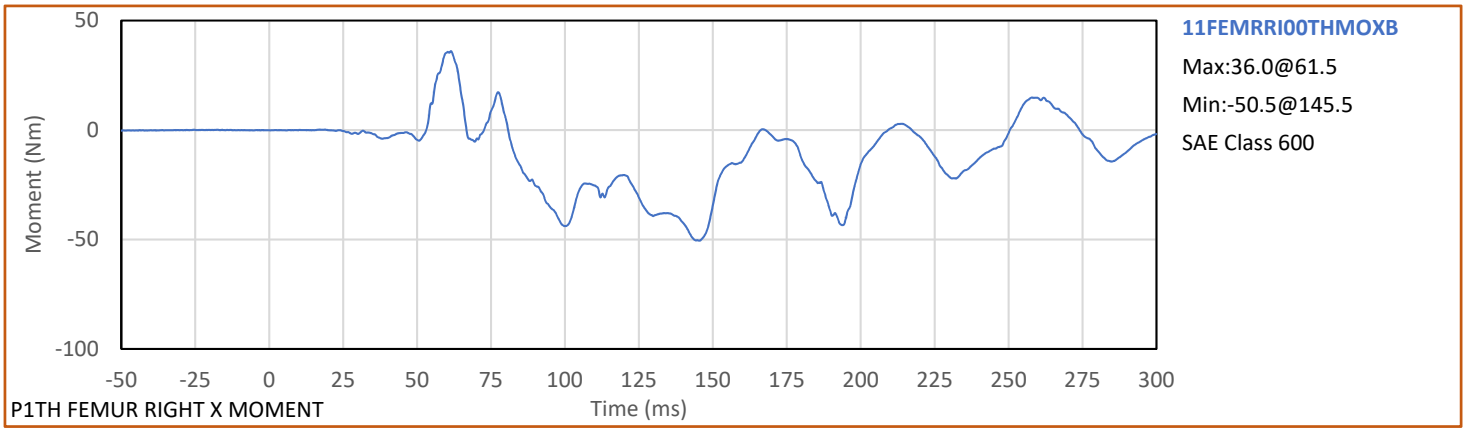
P1TH FEMUR RIGHT Y FORCE

11FEMRRI00THFOYB
Max:32.7@285.2
Min:-672.1@78.5
SAE Class 600

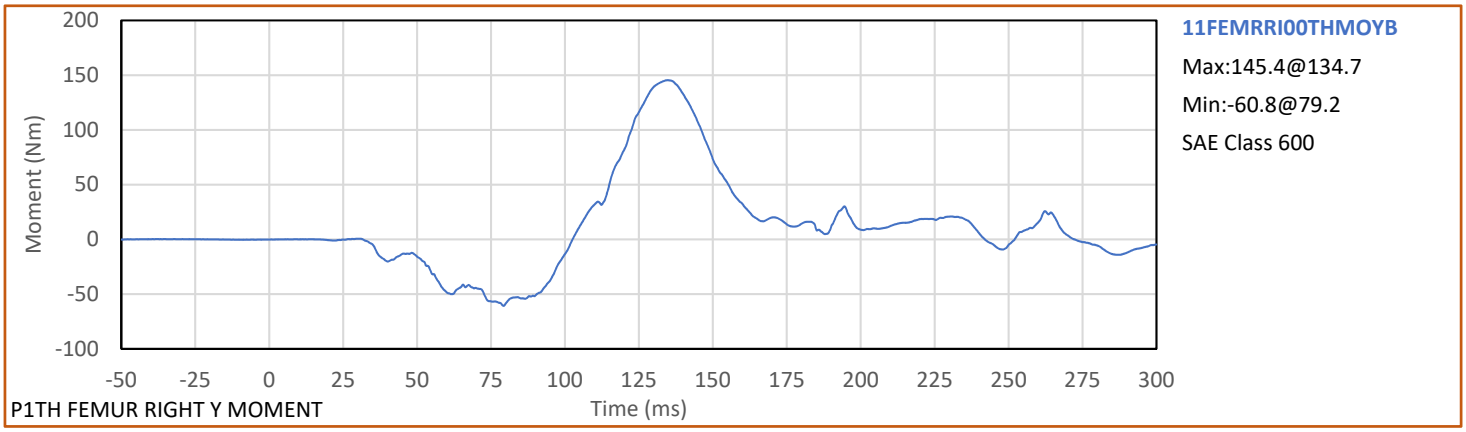


P1TH FEMUR RIGHT Z FORCE

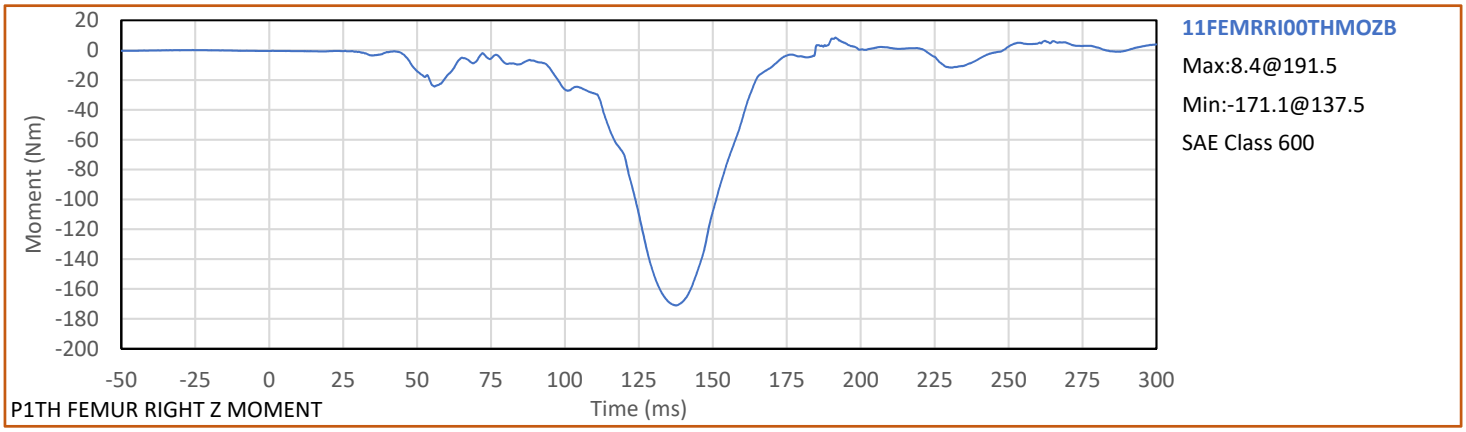
11FEMRRI00THFOZB
Max:696.8@191.4
Min:-4502.5@68.8
SAE Class 600



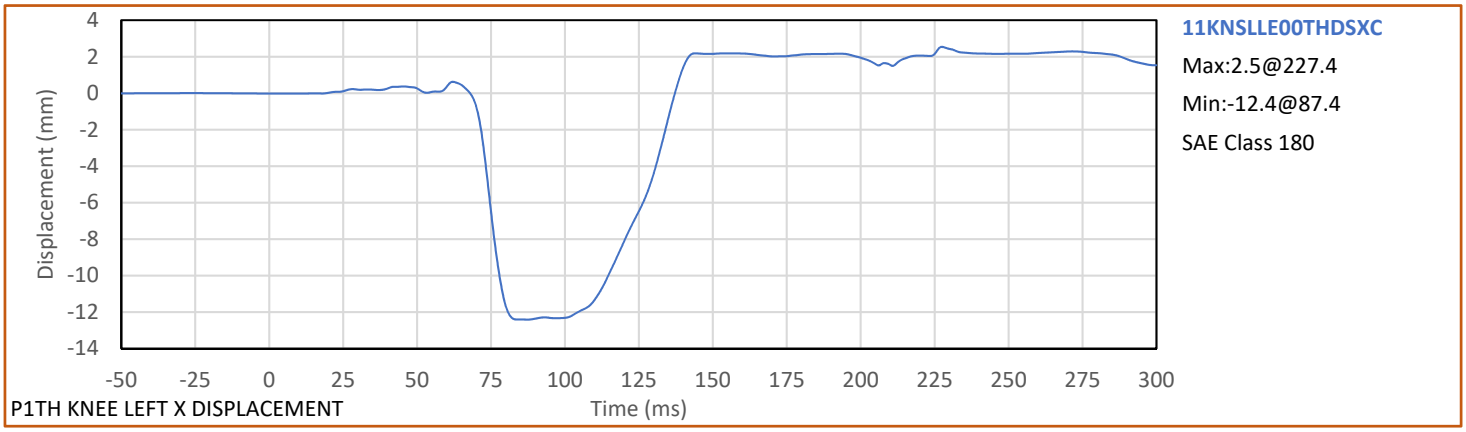
11FEMRRI00THMOXB
Max:36.0@61.5
Min:-50.5@145.5
SAE Class 600



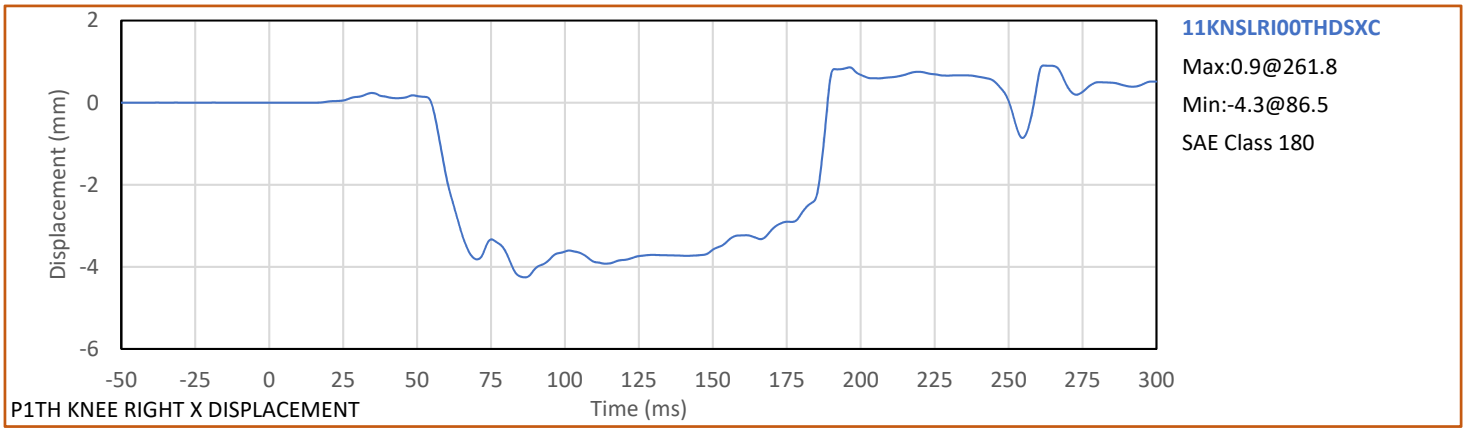
11FEMRRI00THMOYB
Max:145.4@134.7
Min:-60.8@79.2
SAE Class 600

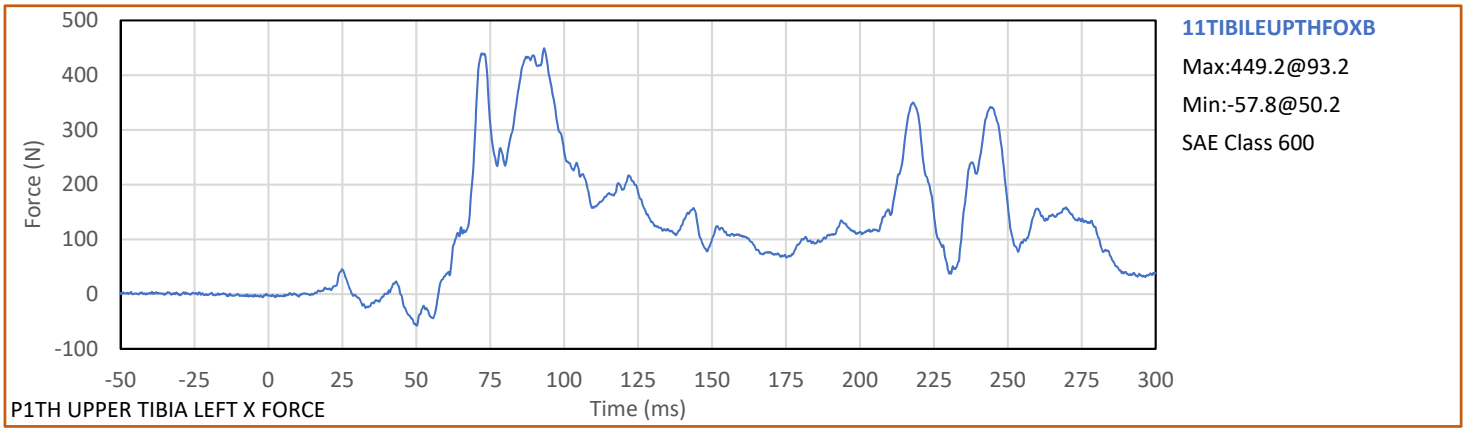


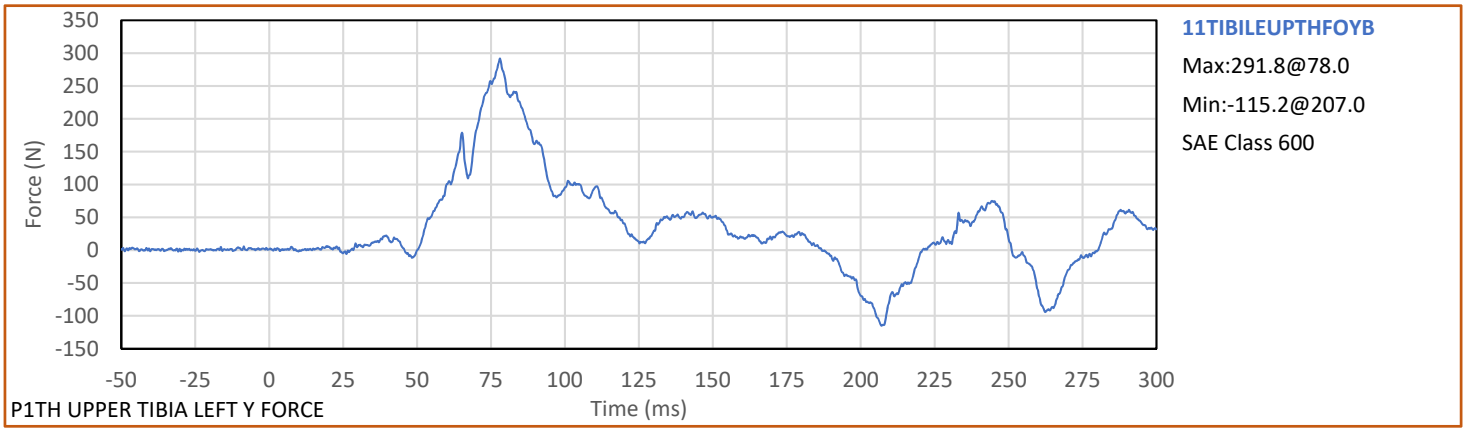
11FEMRRI00THMOZB
Max:8.4@191.5
Min:-171.1@137.5
SAE Class 600

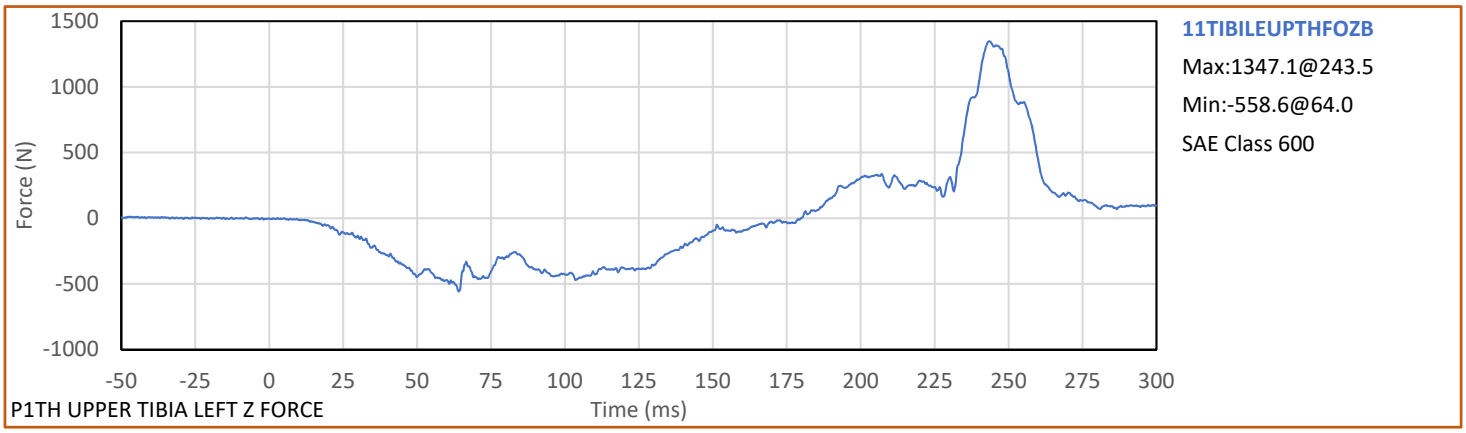


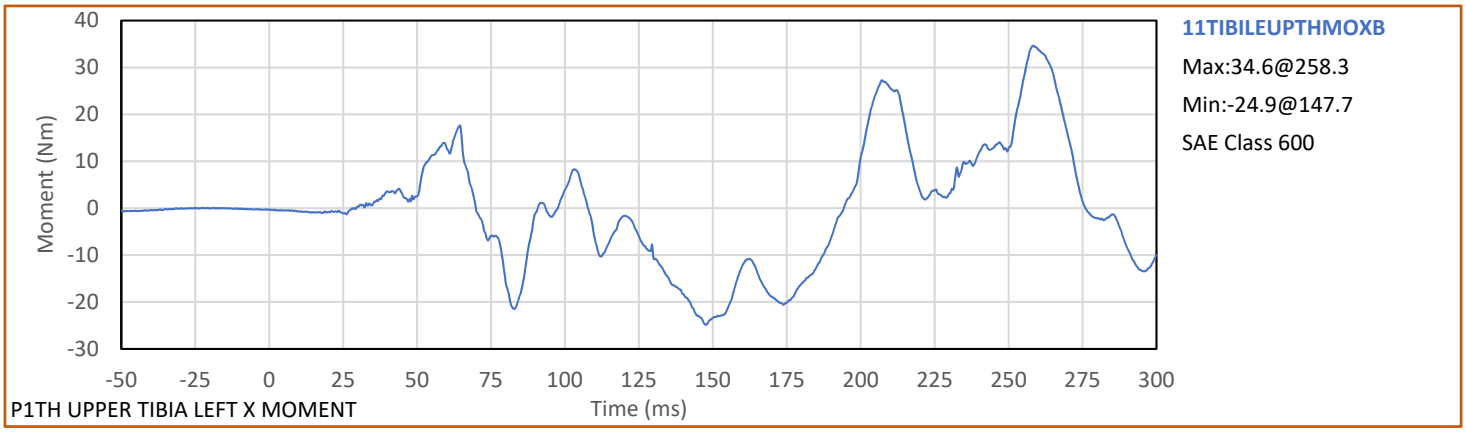
11KNSLLE00THDSXC
Max:2.5@227.4
Min:-12.4@87.4
SAE Class 180

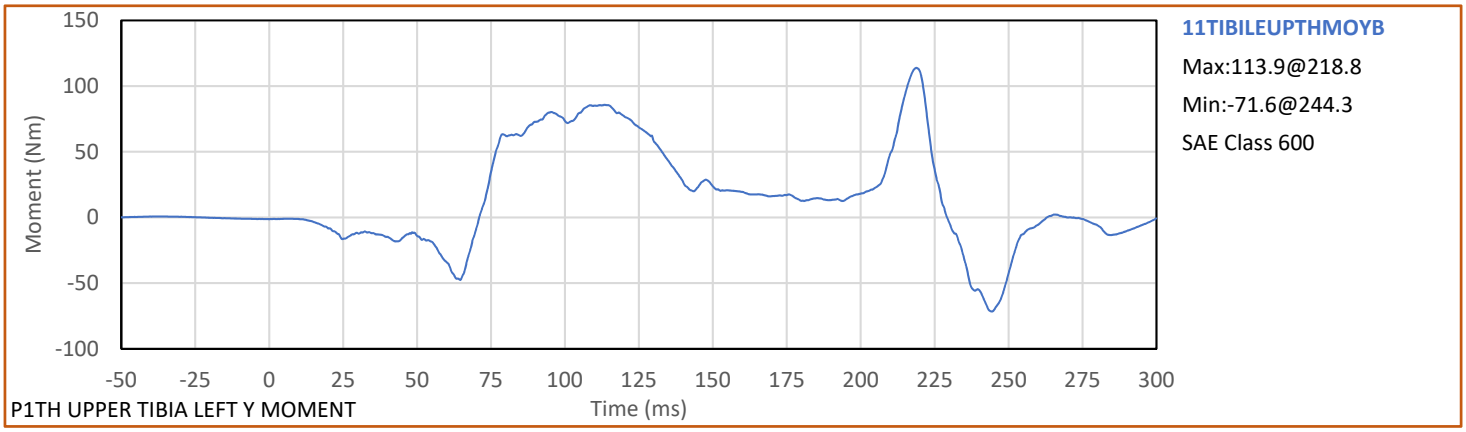

Displacement (mm)
Time (ms)
P1TH KNEE RIGHT X DISPLACEMENT
11KNSLRI00THDSXC
Max:0.9@261.8
Min:-4.3@86.5
SAE Class 180

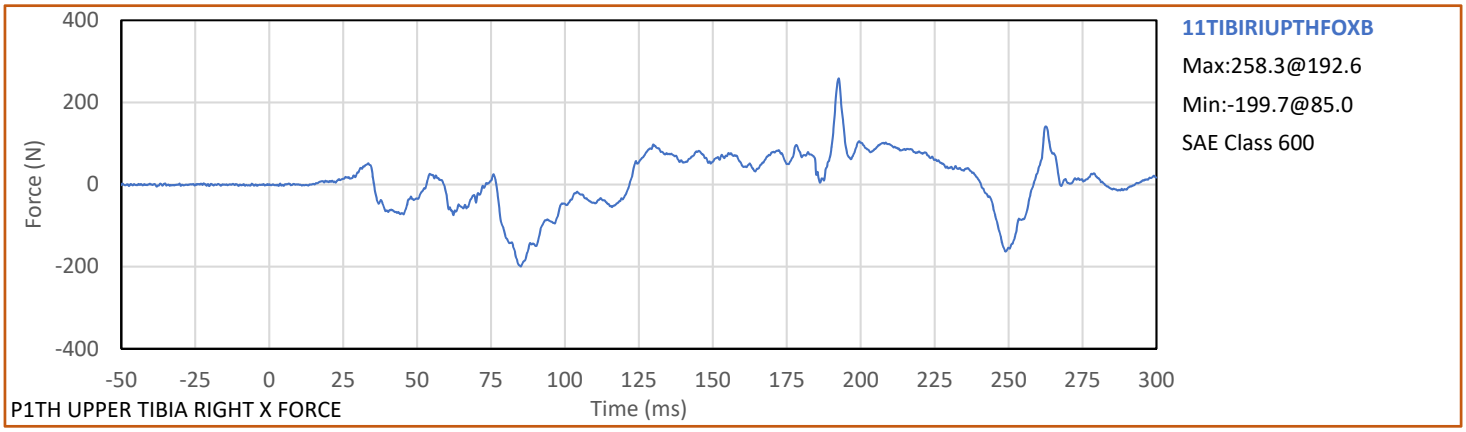

Force (N)
Time (ms)
P1TH UPPER TIBIA LEFT X FORCE
11TIBILEUPTHFOXB
Max:449.2@93.2
Min:-57.8@50.2
SAE Class 600

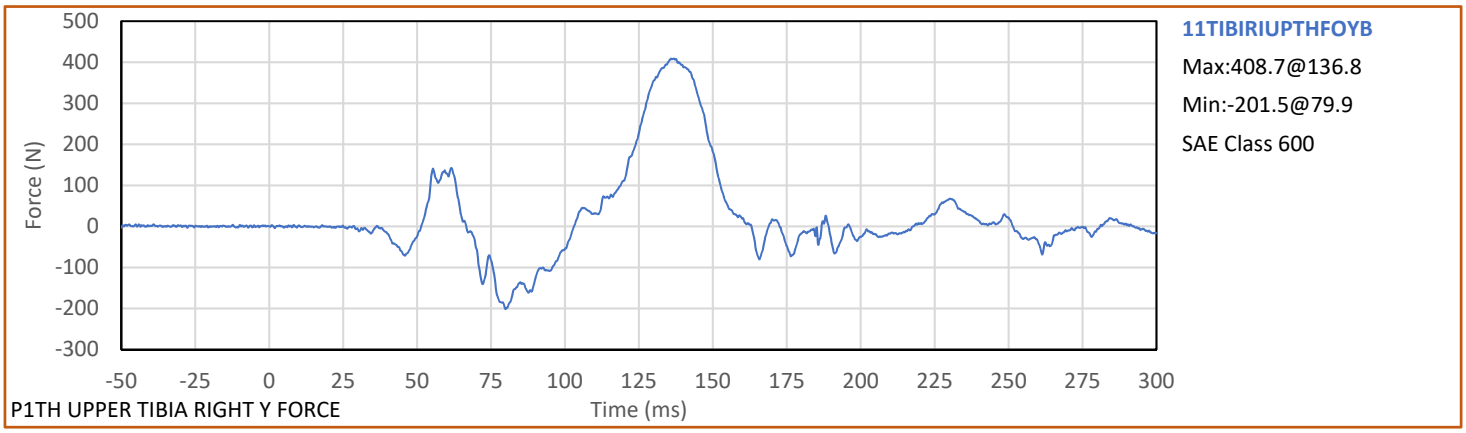

Force (N)
Time (ms)
P1TH UPPER TIBIA LEFT Y FORCE
11TIBILEUPTHFOYB
Max:291.8@78.0
Min:-115.2@207.0
SAE Class 600


Force (N)
Time (ms)
P1TH UPPER TIBIA LEFT Z FORCE
11TIBILEUPTHFOZB
Max:1347.1@243.5
Min:-558.6@64.0
SAE Class 600


Moment (Nm)
Time (ms)
11TIBILEUPTHMOXB
Max:34.6@258.3
Min:-24.9@147.7
SAE Class 600
P1TH UPPER TIBIA LEFT X MOMENT


Moment (Nm)
Time (ms)
11TIBILEUPTHMOYB
Max:113.9@218.8
Min:-71.6@244.3
SAE Class 600
P1TH UPPER TIBIA LEFT Y MOMENT


Force (N)
Time (ms)
11TIBIRIUPTHFOXB
Max:258.3@192.6
Min:-199.7@85.0
SAE Class 600
P1TH UPPER TIBIA RIGHT X FORCE

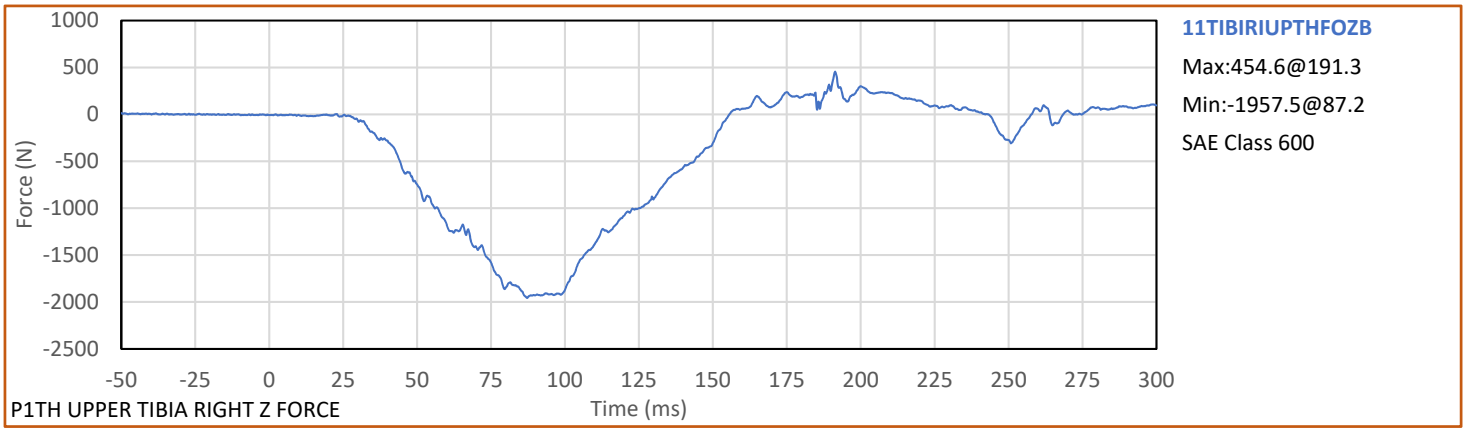

Force (N)
Time (ms)
11TIBIRIUPTHFOYB
Max:408.7@136.8
Min:-201.5@79.9
SAE Class 600
P1TH UPPER TIBIA RIGHT Y FORCE

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

Test Program: Right Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205412

Test Date: 12/7/2020



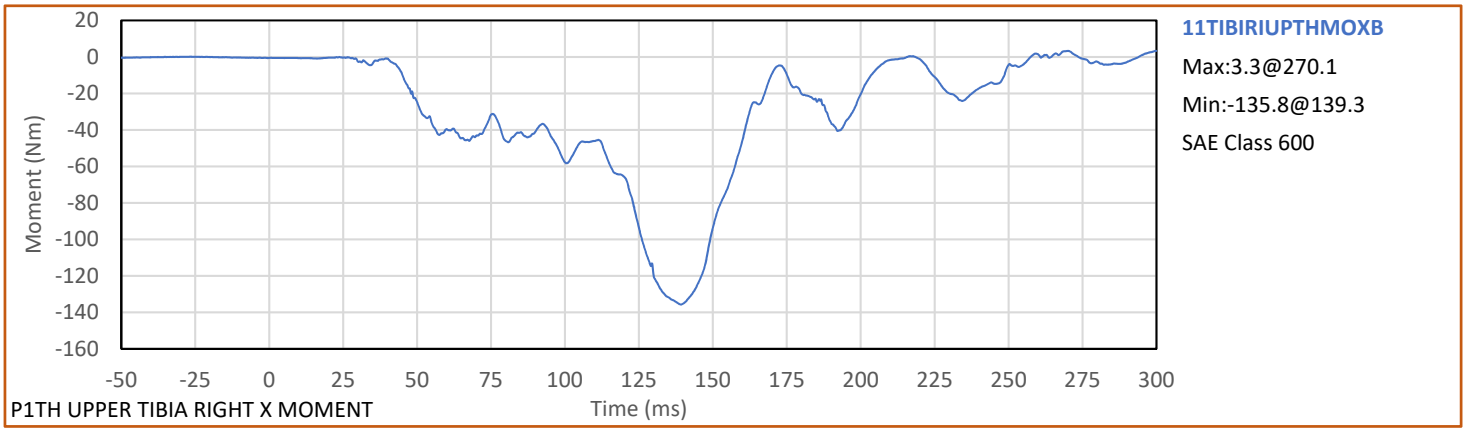
P1TH UPPER TIBIA RIGHT Z FORCE

11TIBIRIUPTHFOZB

Max:454.6@191.3

Min:-1957.5@87.2

SAE Class 600



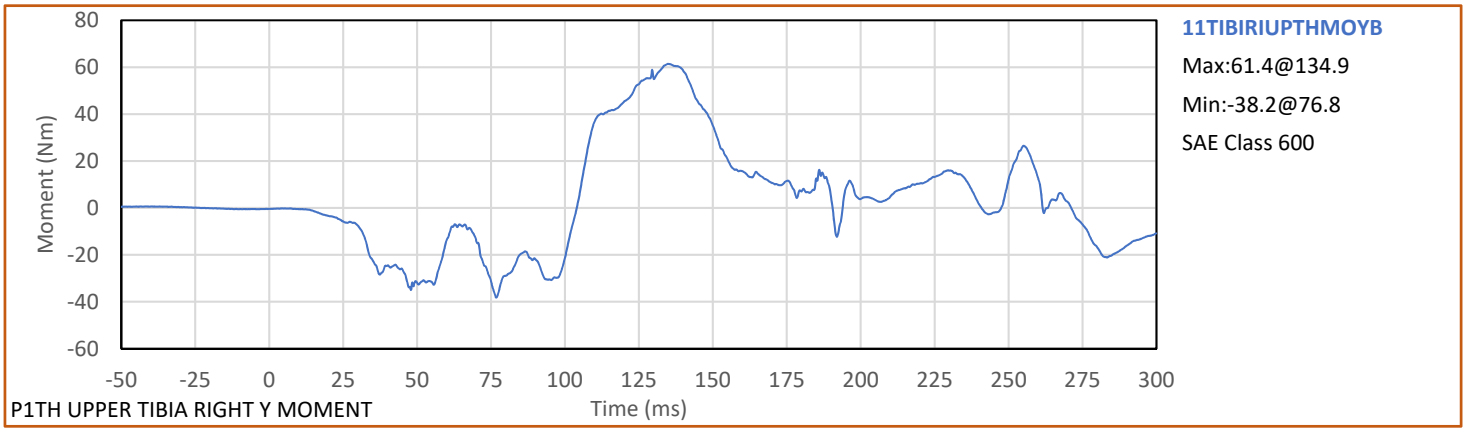
P1TH UPPER TIBIA RIGHT X MOMENT

11TIBIRIUPTHMOXB

Max:3.3@270.1

Min:-135.8@139.3

SAE Class 600



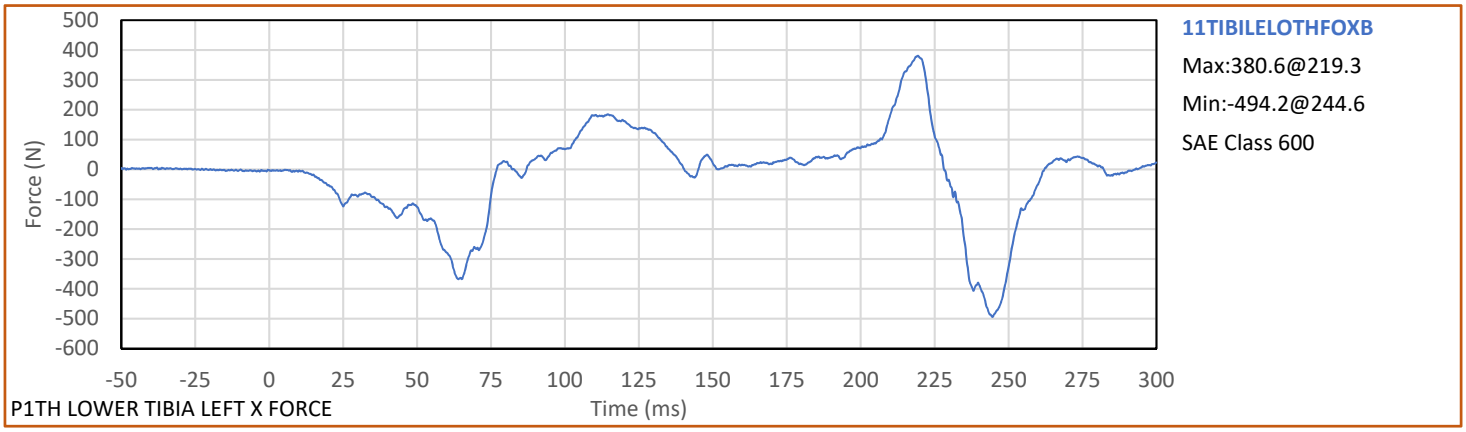
P1TH UPPER TIBIA RIGHT Y MOMENT

11TIBIRIUPTHMOYB

Max:61.4@134.9

Min:-38.2@76.8

SAE Class 600



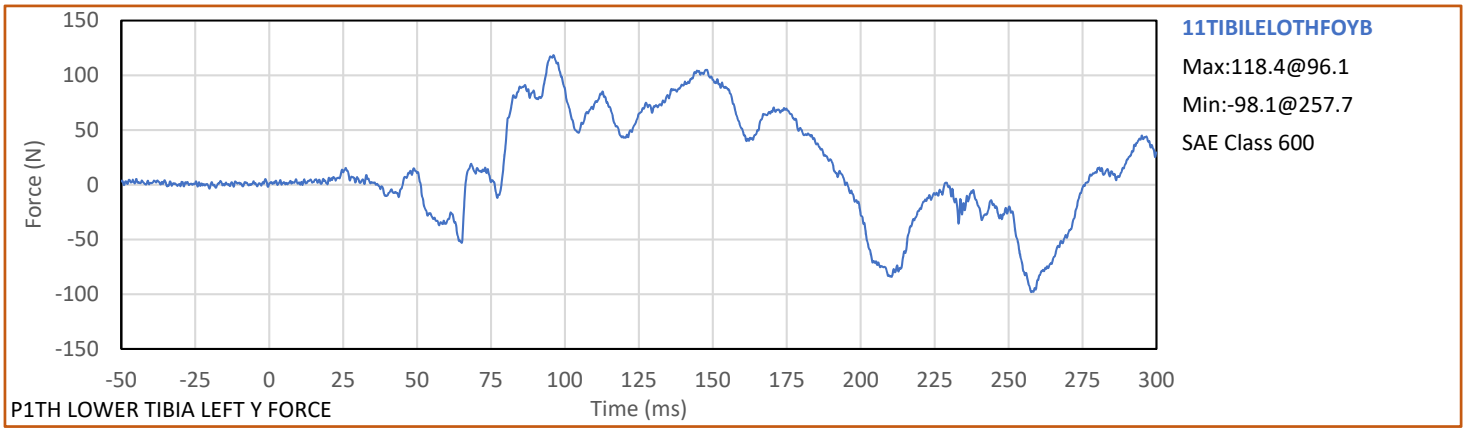
P1TH LOWER TIBIA LEFT X FORCE

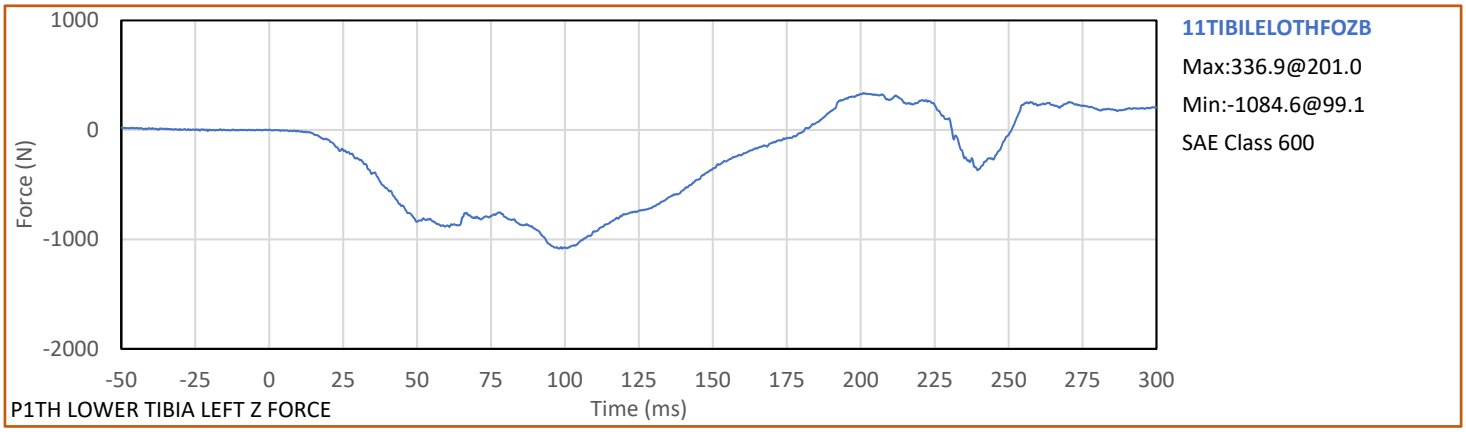
11TIBILELOTHFOXB

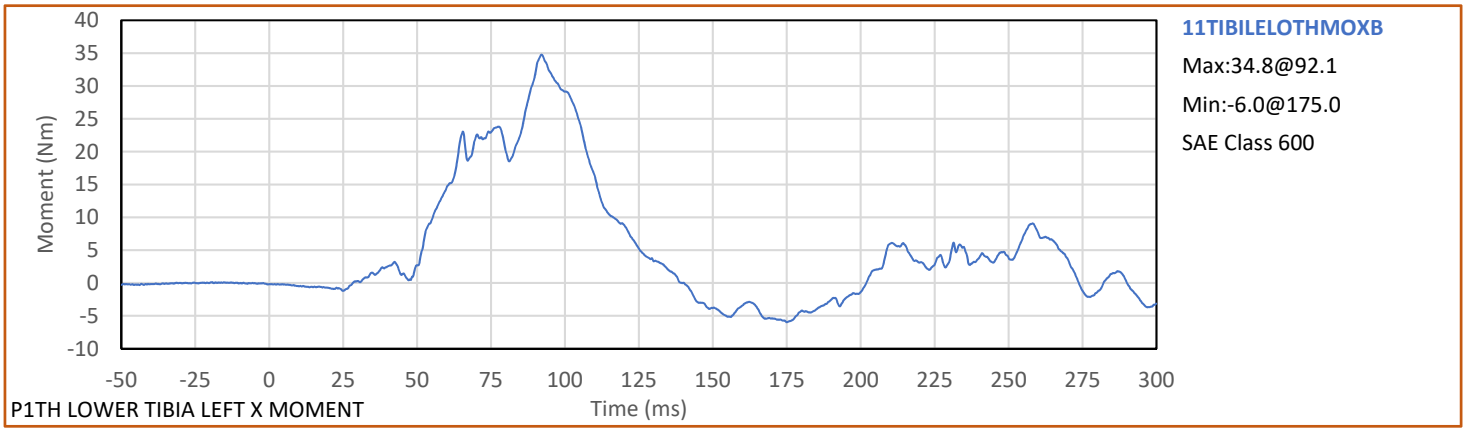
Max:380.6@219.3

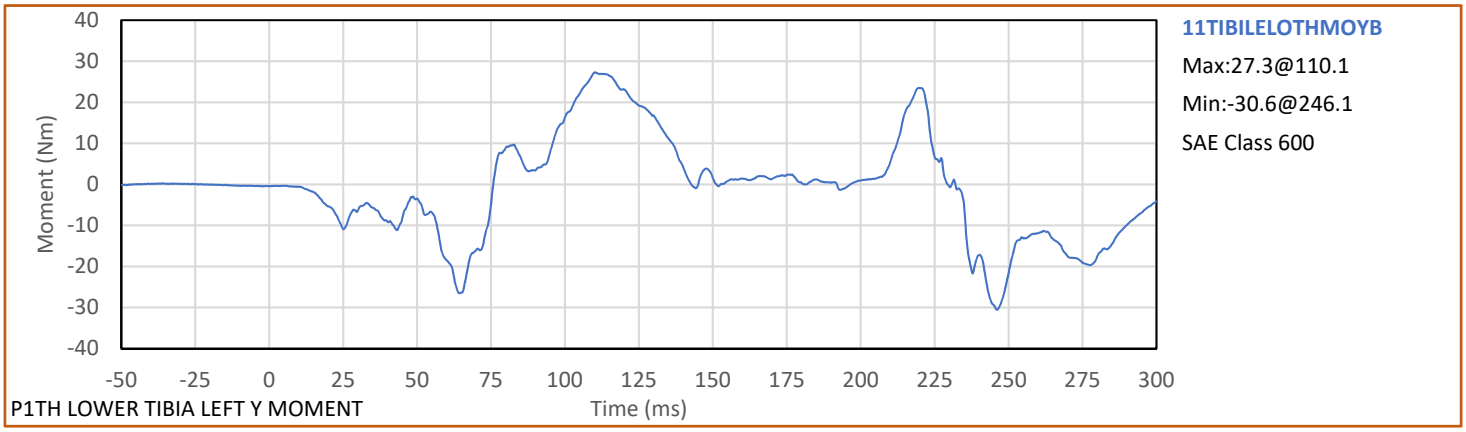
Min:-494.2@244.6

SAE Class 600


Force (N)
Time (ms)
11TIBILELOTHFOYB
Max:118.4@96.1
Min:-98.1@257.7
SAE Class 600
P1TH LOWER TIBIA LEFT Y FORCE


Force (N)
Time (ms)
11TIBILELOTHFOZB
Max:336.9@201.0
Min:-1084.6@99.1
SAE Class 600
P1TH LOWER TIBIA LEFT Z FORCE


Moment (Nm)
Time (ms)
11TIBILELOTHMOXB
Max:34.8@92.1
Min:-6.0@175.0
SAE Class 600
P1TH LOWER TIBIA LEFT X MOMENT

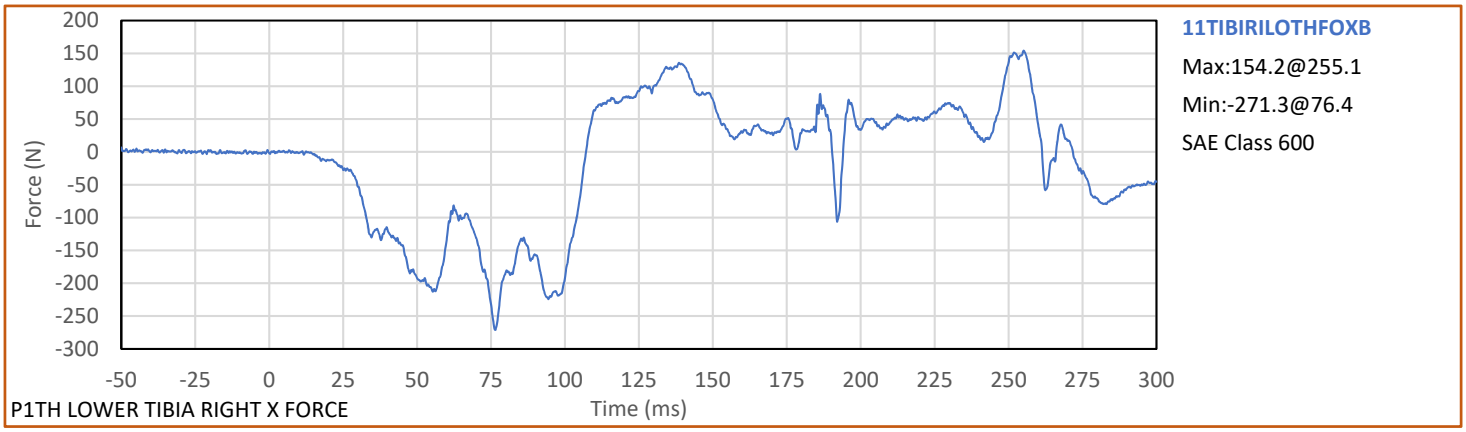

Moment (Nm)
Time (ms)
11TIBILELOTHMOYB
Max:27.3@110.1
Min:-30.6@246.1
SAE Class 600
P1TH LOWER TIBIA LEFT Y MOMENT

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

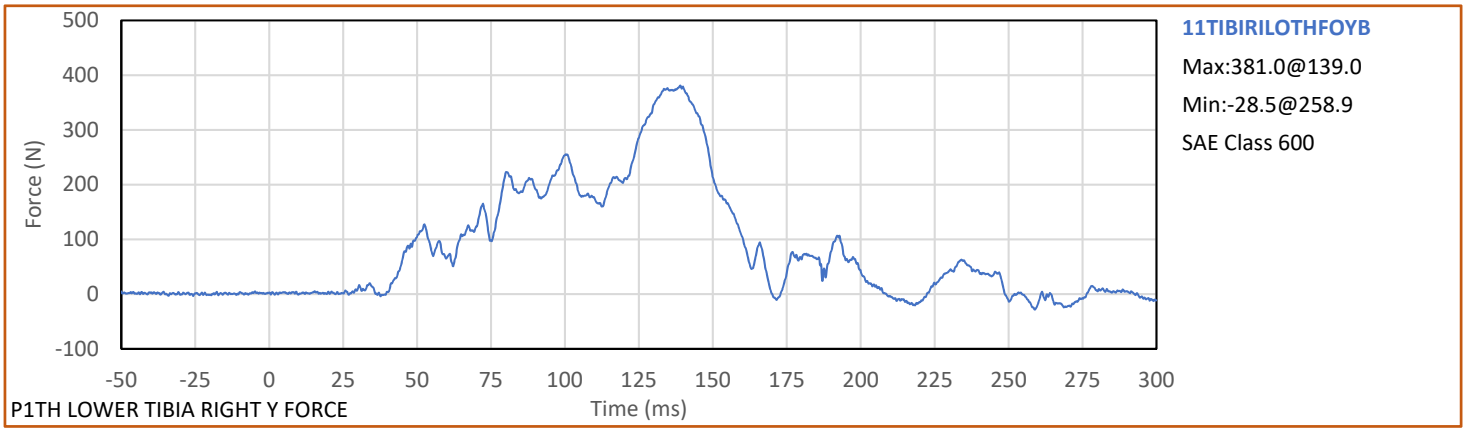
Test Program: Right Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205412

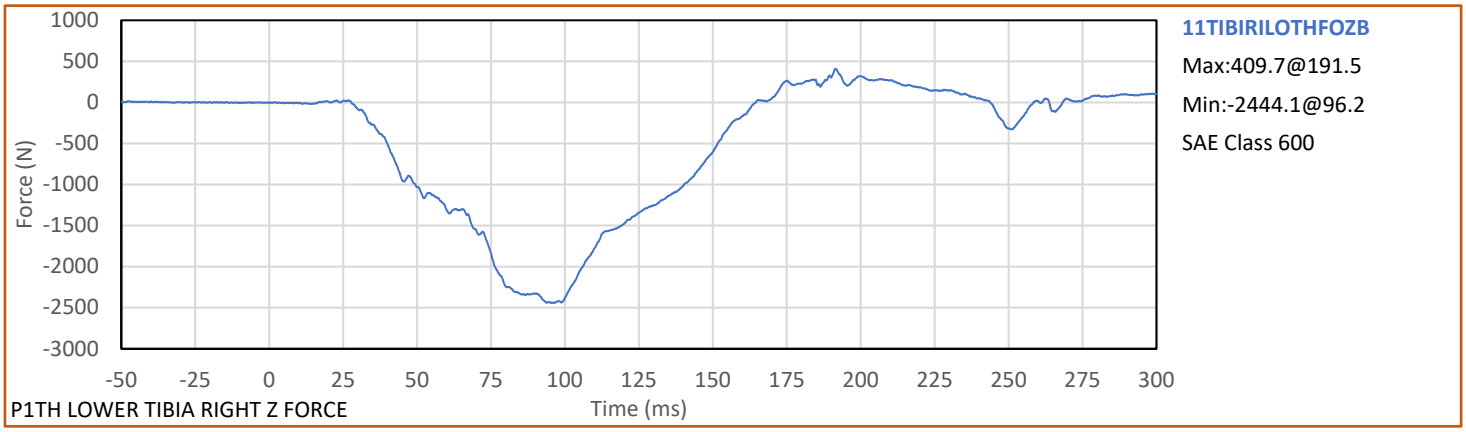
Test Date: 12/7/2020



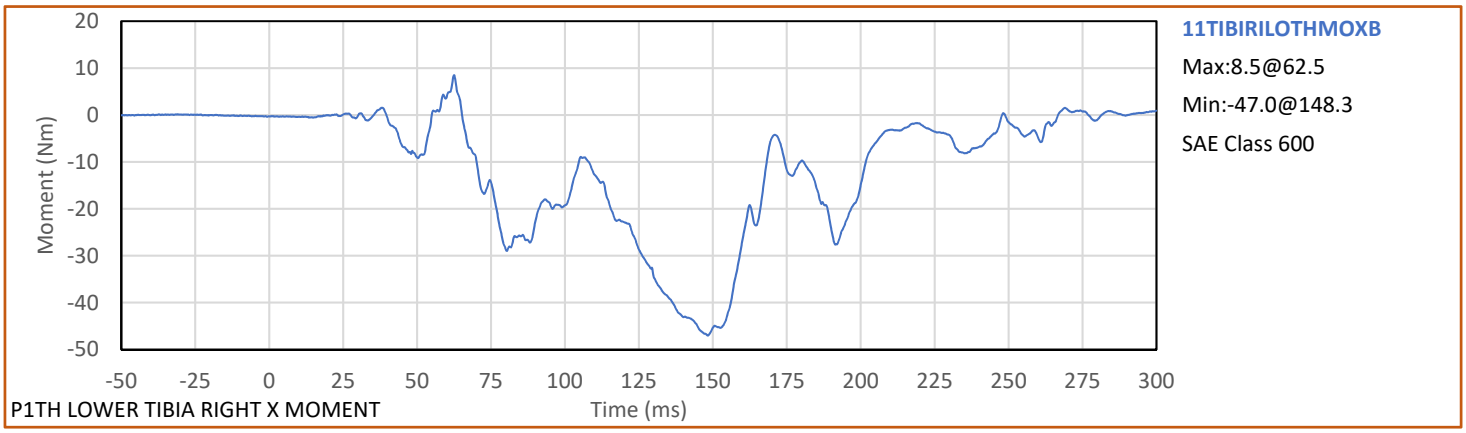
11TIBIRILOTHFOXB
Max:154.2@255.1
Min:-271.3@76.4
SAE Class 600



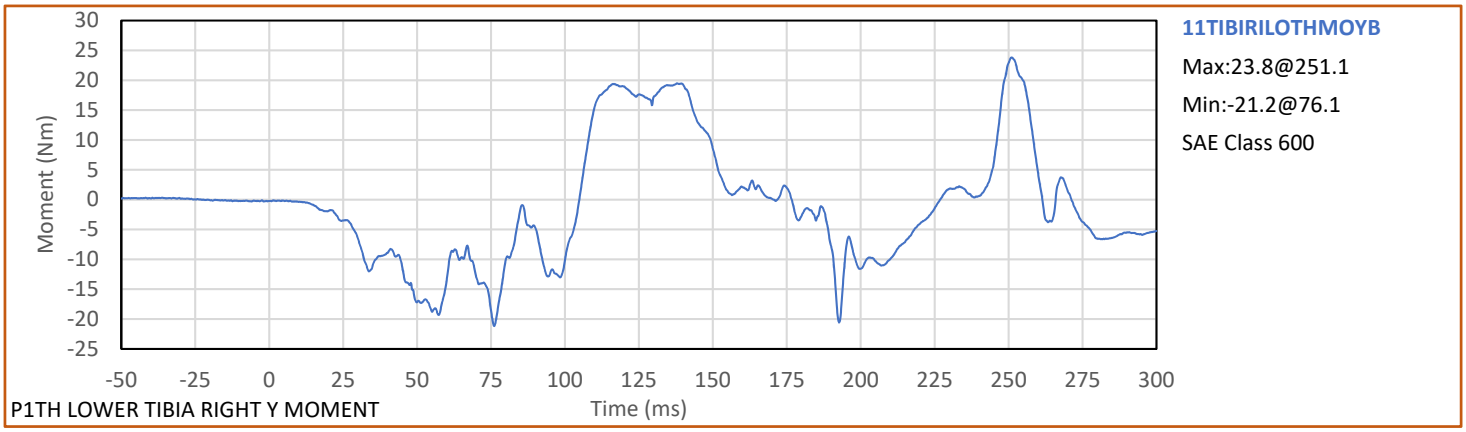
11TIBIRILOTHFOYB
Max:381.0@139.0
Min:-28.5@258.9
SAE Class 600

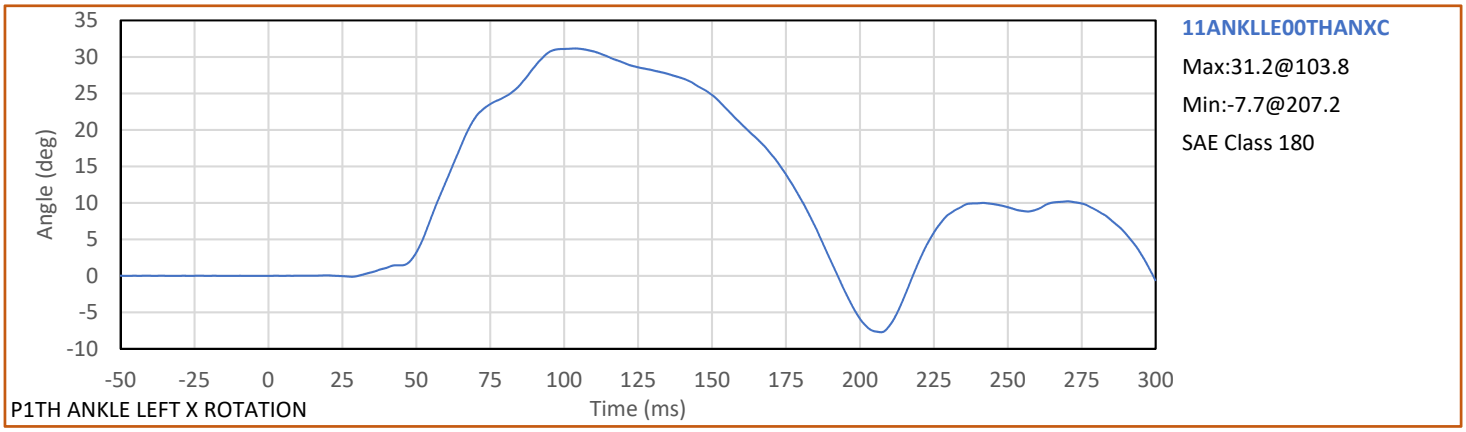


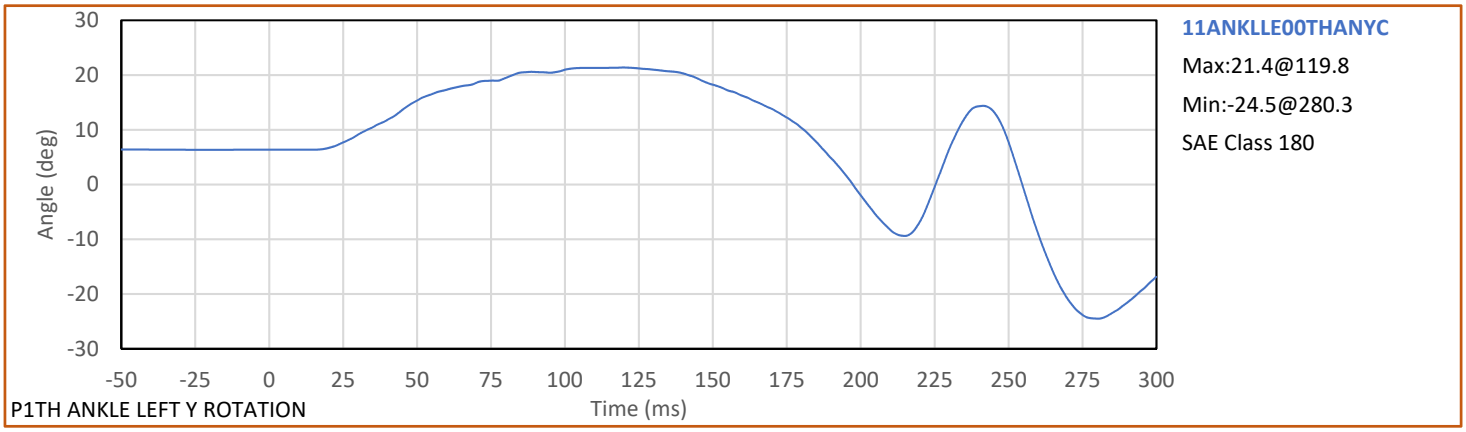
11TIBIRILOTHFOZB
Max:409.7@191.5
Min:-2444.1@96.2
SAE Class 600

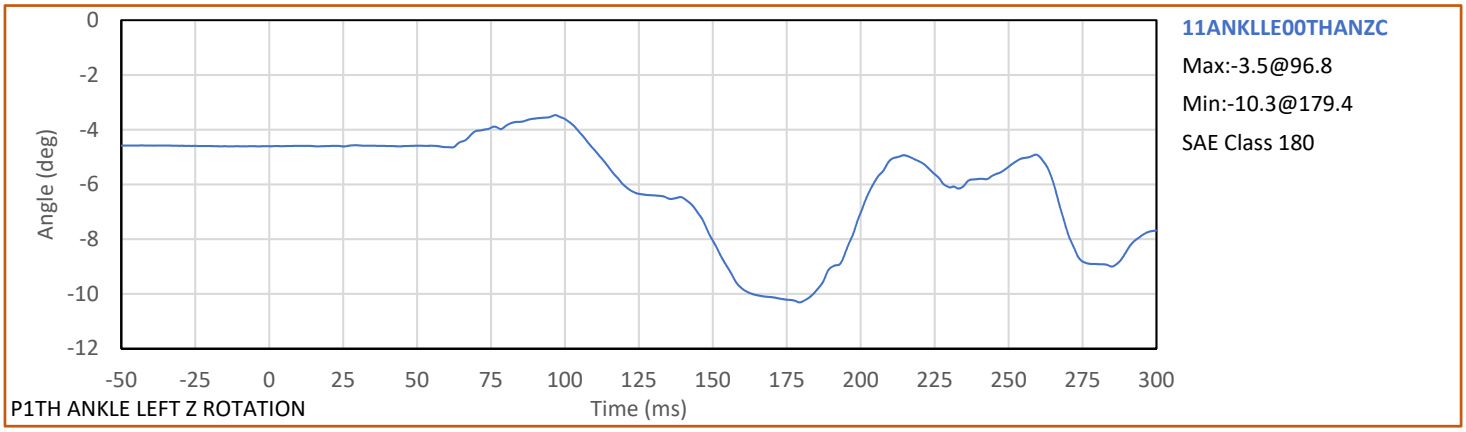


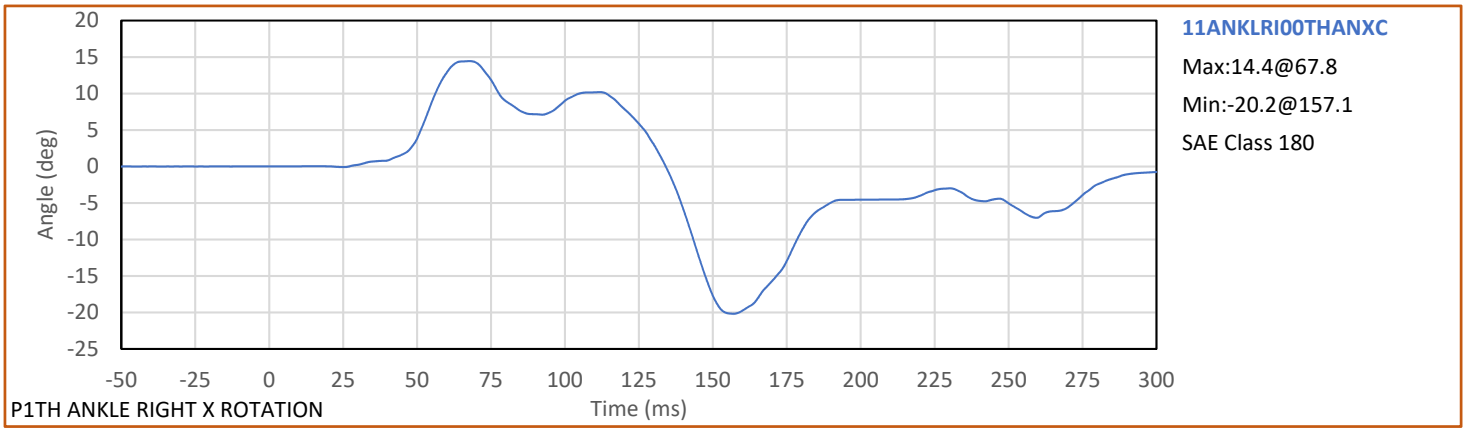
11TIBIRILOTHMOXB
Max:8.5@62.5
Min:-47.0@148.3
SAE Class 600


Moment (Nm)
Time (ms)
P1TH LOWER TIBIA RIGHT Y MOMENT
11TIBIRILOTHMOYB
Max:23.8@251.1
Min:-21.2@76.1
SAE Class 600

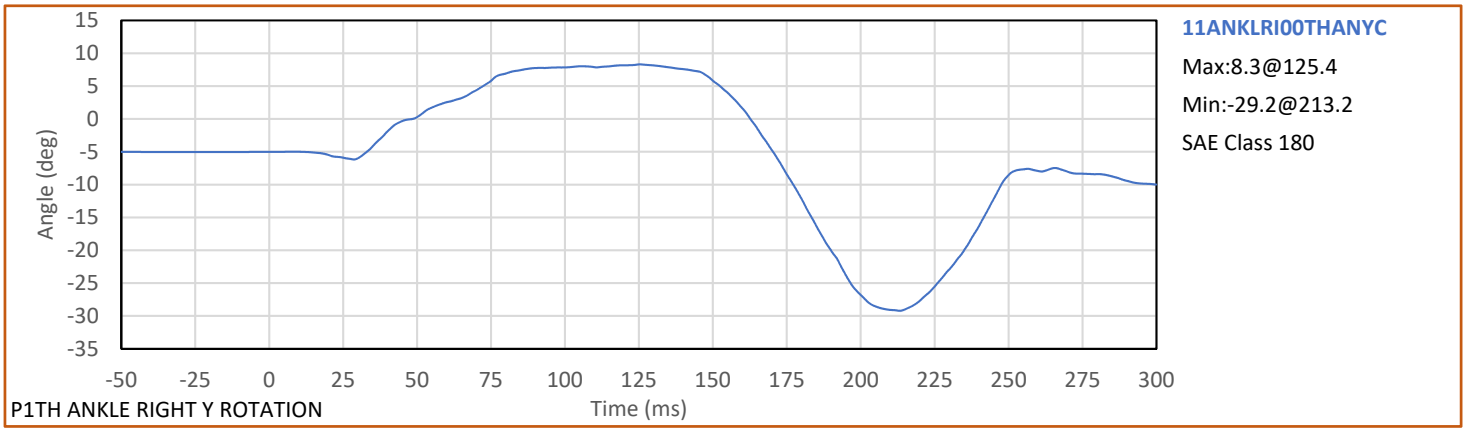

Angle (deg)
Time (ms)
P1TH ANKLE LEFT X ROTATION
11ANKLLE00THANXC
Max:31.2@103.8
Min:-7.7@207.2
SAE Class 180


Angle (deg)
Time (ms)
P1TH ANKLE LEFT Y ROTATION
11ANKLLE00THANYC
Max:21.4@119.8
Min:-24.5@280.3
SAE Class 180

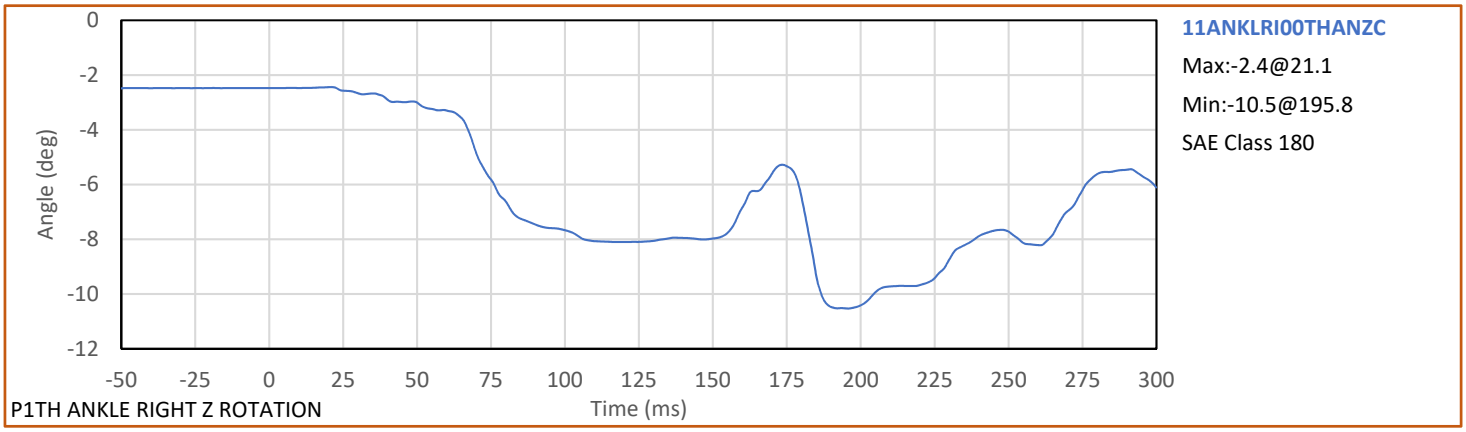

Angle (deg)
Time (ms)
P1TH ANKLE LEFT Z ROTATION
11ANKLLE00THANZC
Max:-3.5@96.8
Min:-10.3@179.4
SAE Class 180



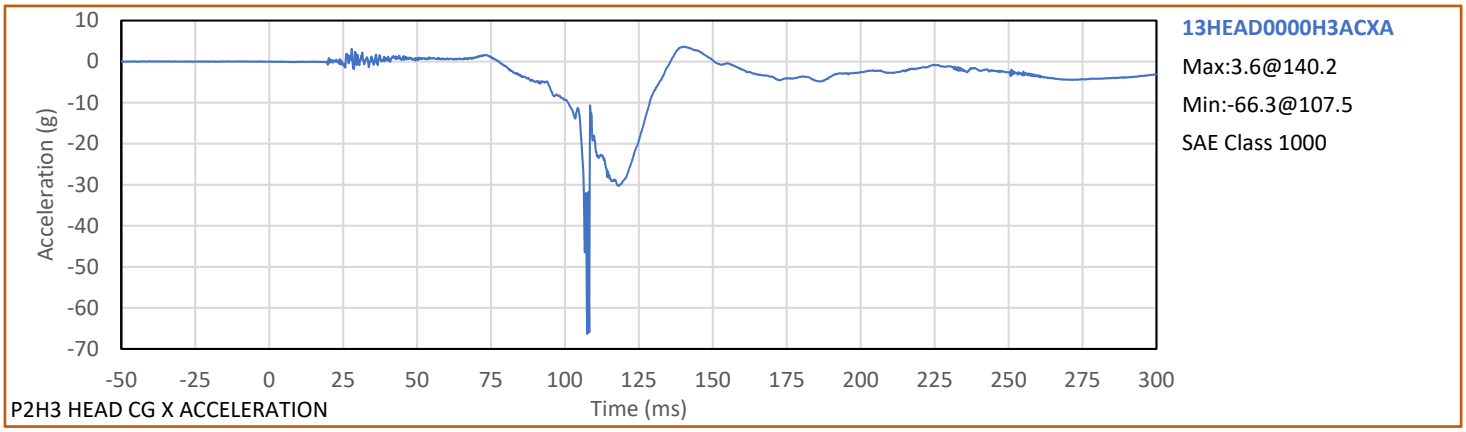
P1TH ANKLE RIGHT X ROTATION

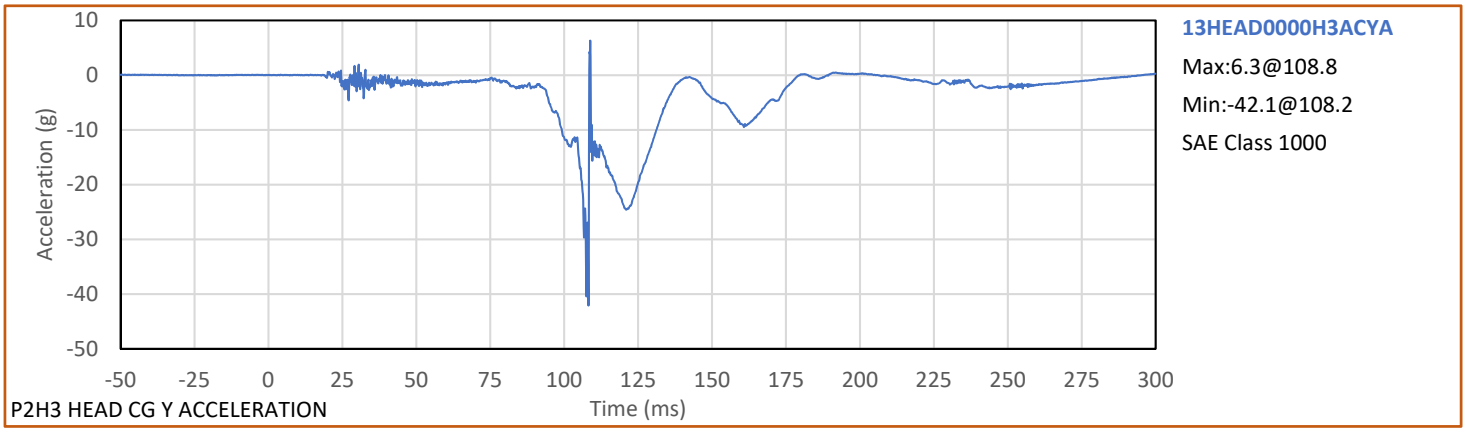


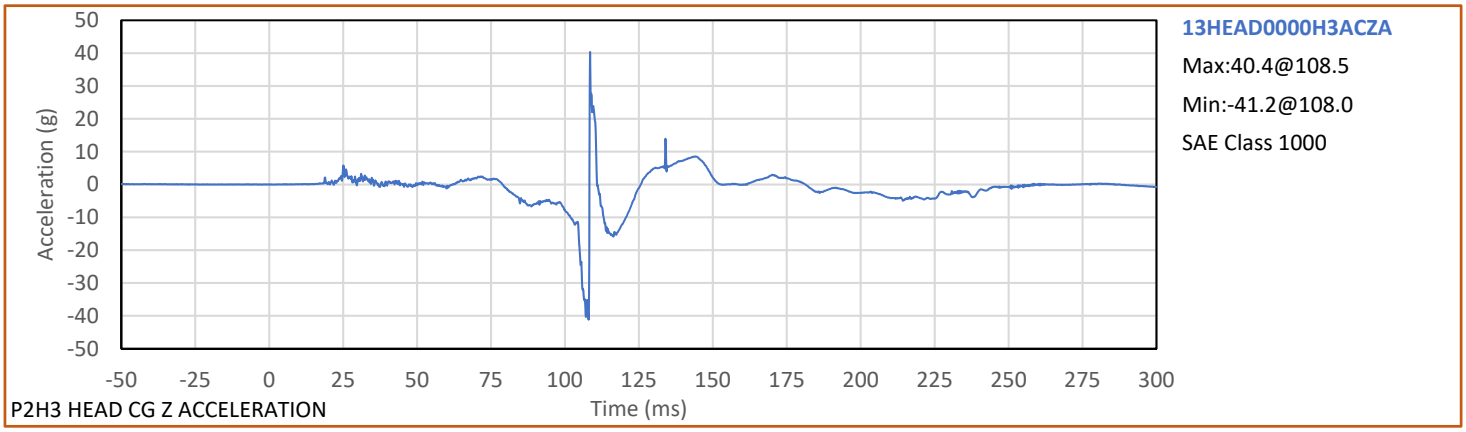
P1TH ANKLE RIGHT Y ROTATION

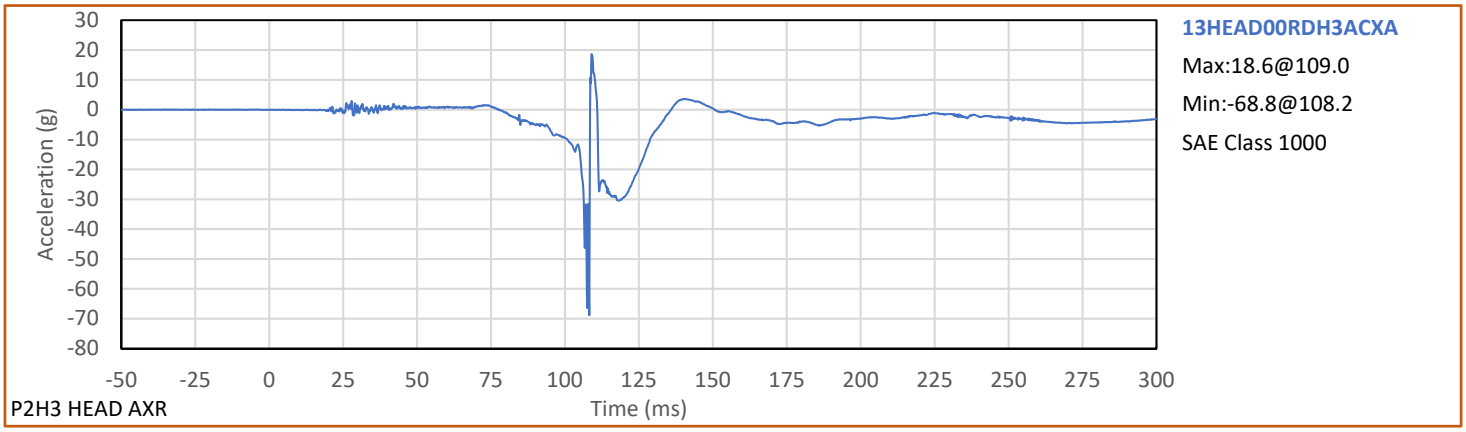


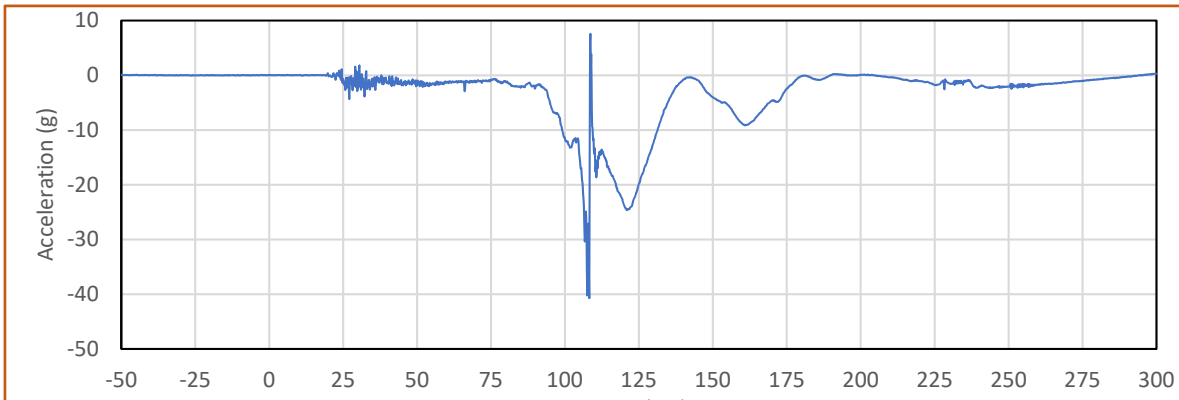
P1TH ANKLE RIGHT Z ROTATION


Acceleration (g)
Time (ms)
P2H3 HEAD CG X ACCELERATION
13HEAD0000H3ACXA
Max:3.6@140.2
Min:-66.3@107.5
SAE Class 1000


Acceleration (g)
Time (ms)
P2H3 HEAD CG Y ACCELERATION
13HEAD0000H3ACYA
Max:6.3@108.8
Min:-42.1@108.2
SAE Class 1000

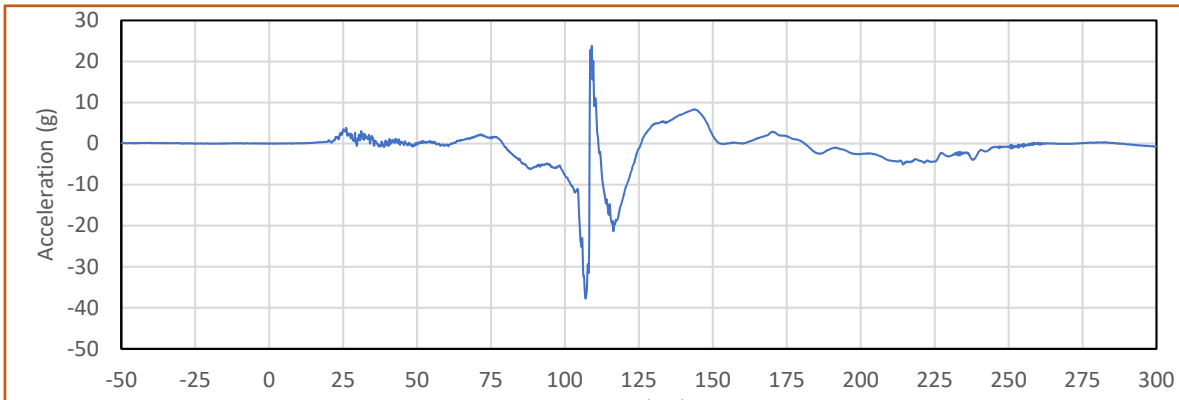

Acceleration (g)
Time (ms)
P2H3 HEAD CG Z ACCELERATION
13HEAD0000H3ACZA
Max:40.4@108.5
Min:-41.2@108.0
SAE Class 1000


Acceleration (g)
Time (ms)
P2H3 HEAD AXR
13HEAD00RDH3ACXA
Max:18.6@109.0
Min:-68.8@108.2
SAE Class 1000



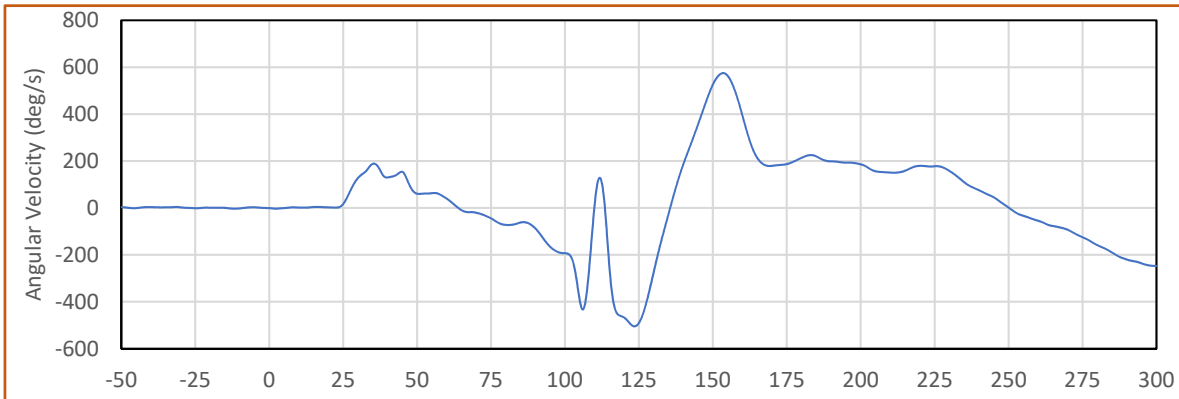
P2H3 HEAD AYR

13HEAD00RDH3ACYA
Max:7.6@108.6
Min:-40.7@108.2
SAE Class 1000



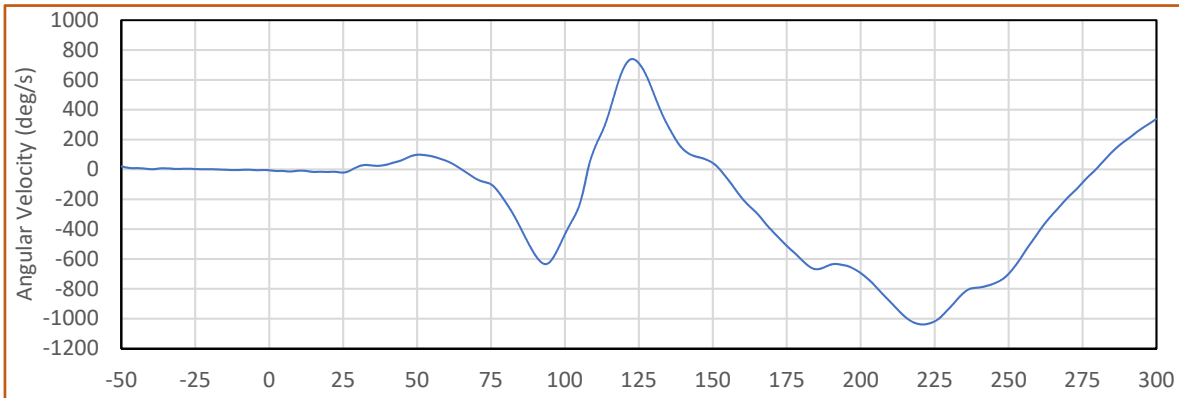
P2H3 HEAD AZR

13HEAD00RDH3ACZA
Max:23.8@109.1
Min:-37.8@107.0
SAE Class 1000



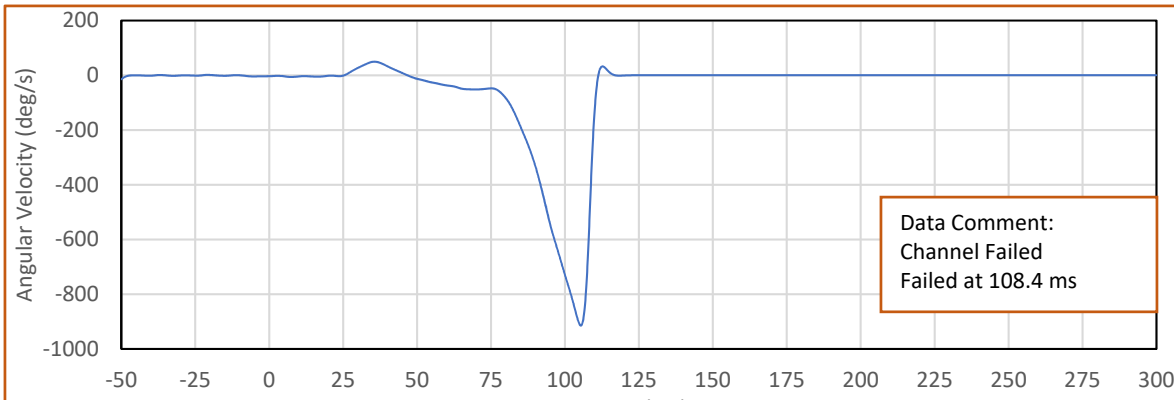
P2H3 HEAD ANGULAR VELOCITY X

13HEAD0000H3AVXD
Max:575.0@153.5
Min:-505.0@123.5
SAE Class 60



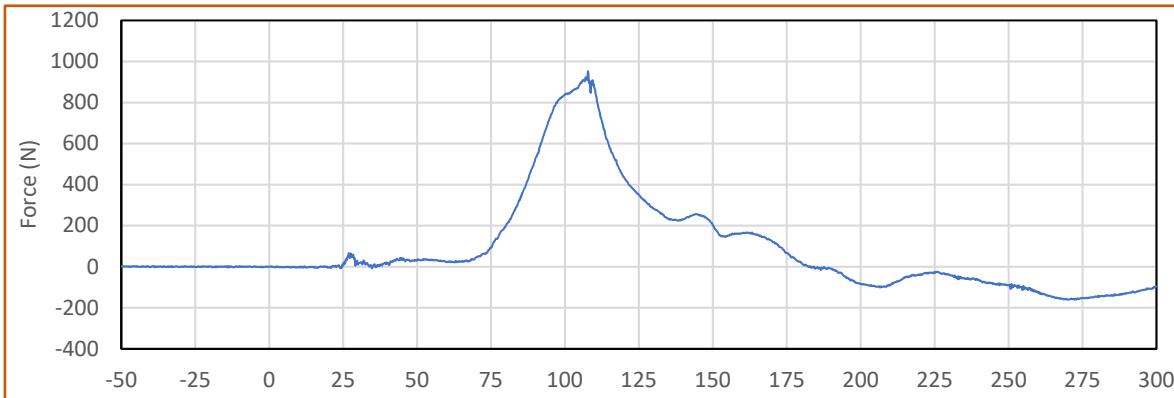
P2H3 HEAD ANGULAR VELOCITY Y

13HEAD0000H3AVYD
Max:739.7@122.8
Min:-1039.0@221.1
SAE Class 60



P2H3 HEAD ANGULAR VELOCITY Z

13HEAD0000H3AVZD
Max:49.6@35.6
Min:-915.0@105.4
SAE Class 60

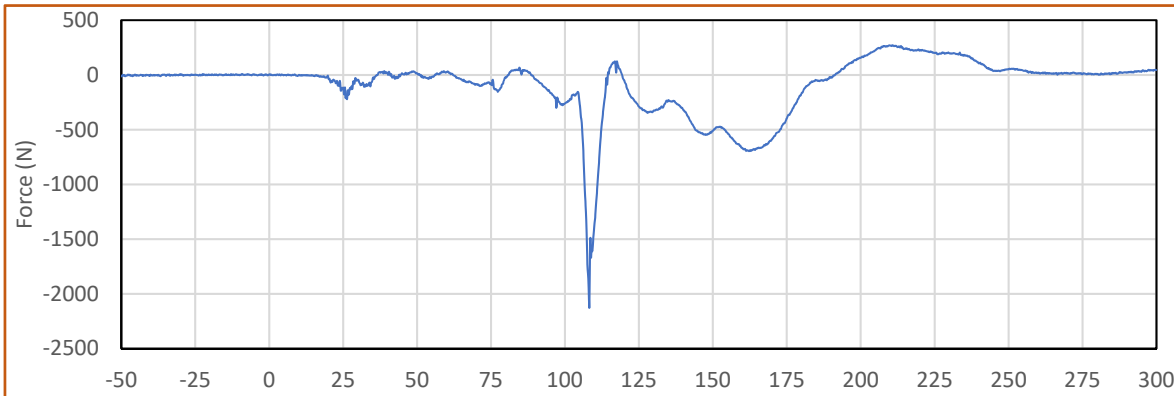


P2H3 UPPER NECK FX

13NECKUP00H3FOXA
Max:952.2@107.8
Min:-160.9@269.8
SAE Class 1000

P2H3 UPPER NECK FY

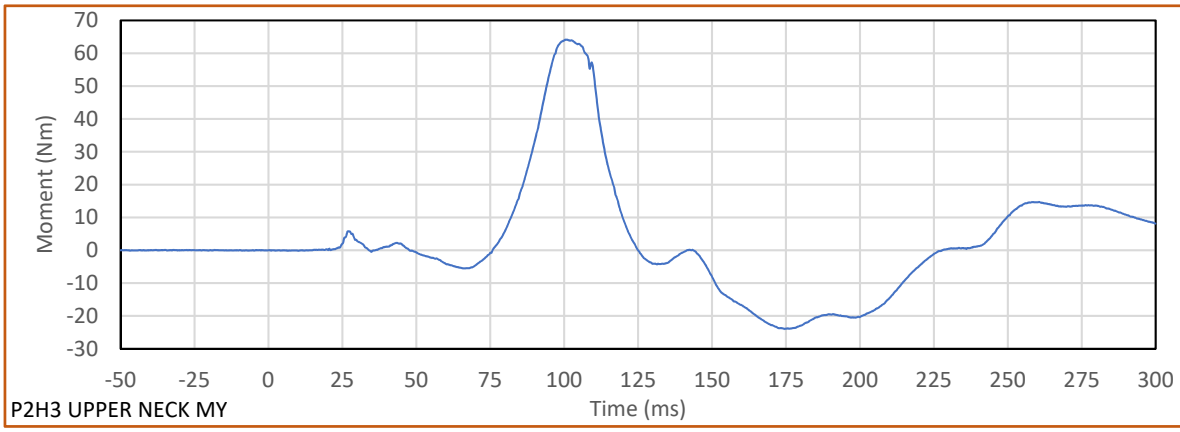
13NECKUP00H3FOYA
Max:683.0@132.6
Min:-98.7@253.0
SAE Class 1000



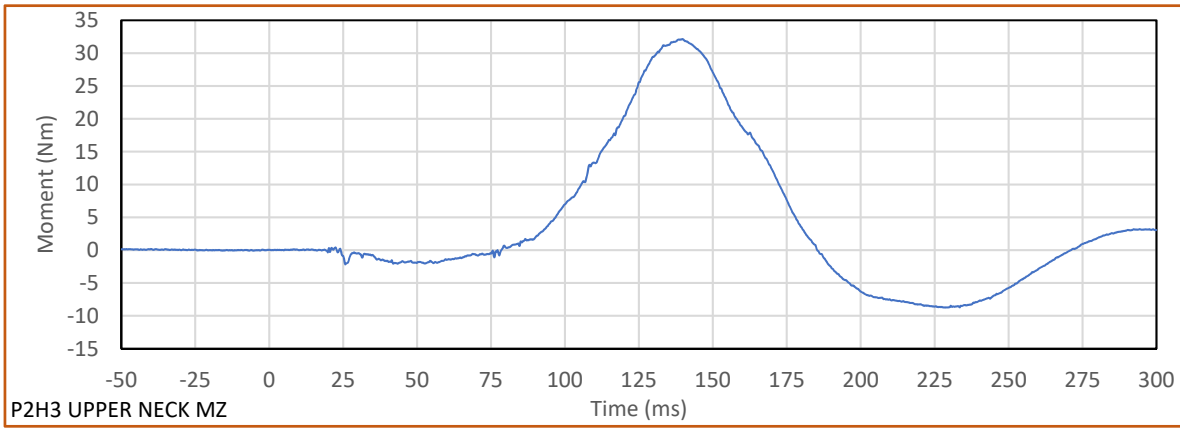
P2H3 UPPER NECK FZ

13NECKUP00H3FOZA
Max:270.8@210.7
Min:-2129.0@108.2
SAE Class 1000

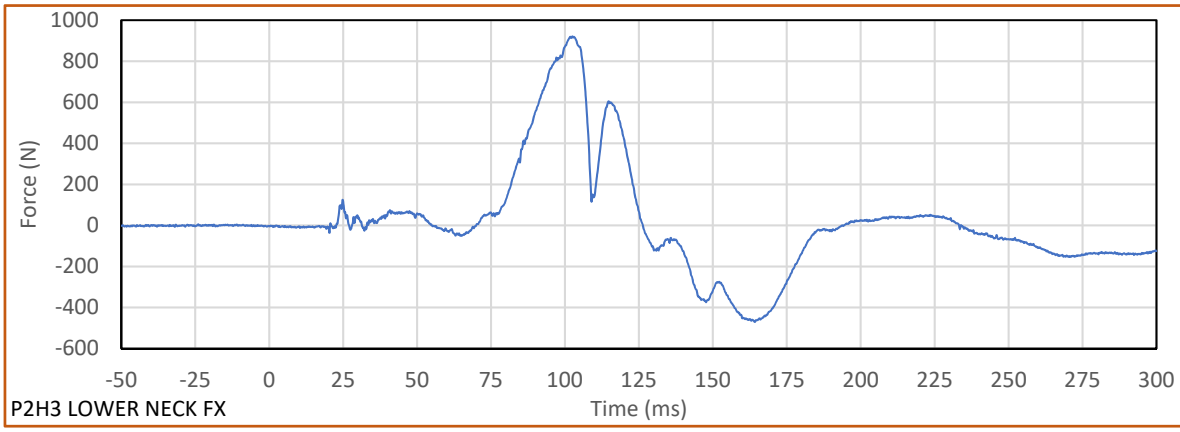
13NECKUP00H3MOXB
Max:31.7@148.6
Min:-5.9@40.0
SAE Class 600



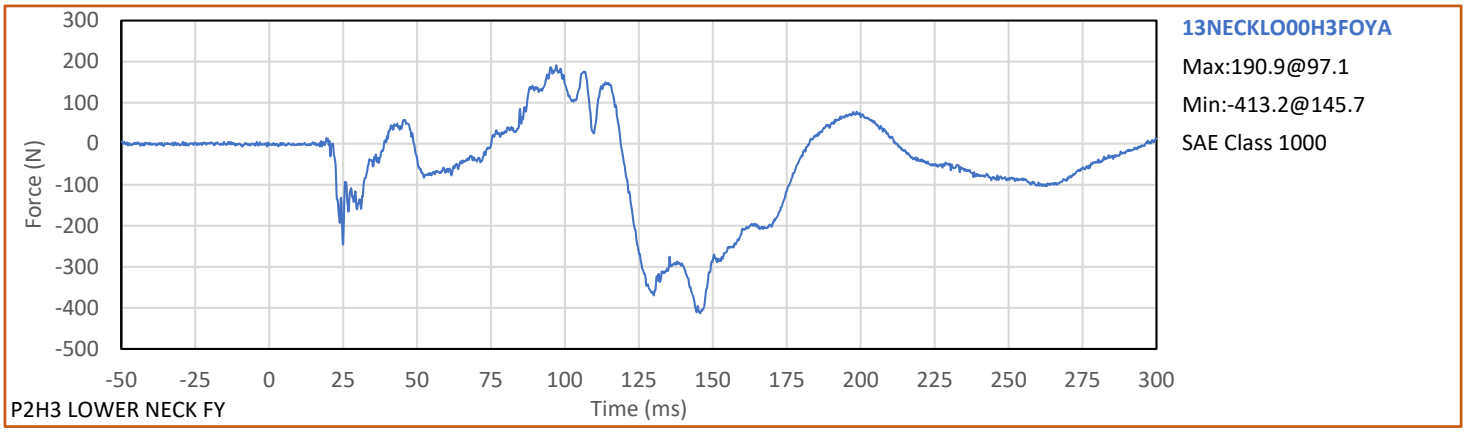
13NECKUP00H3MOYB
Max:64.1@101.0
Min:-23.9@174.5
SAE Class 600

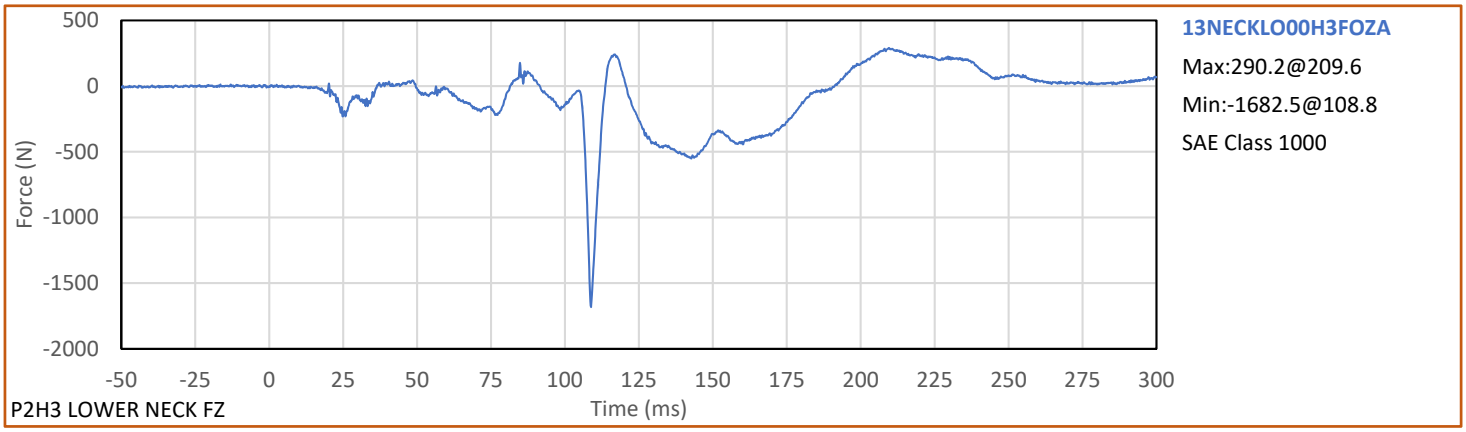


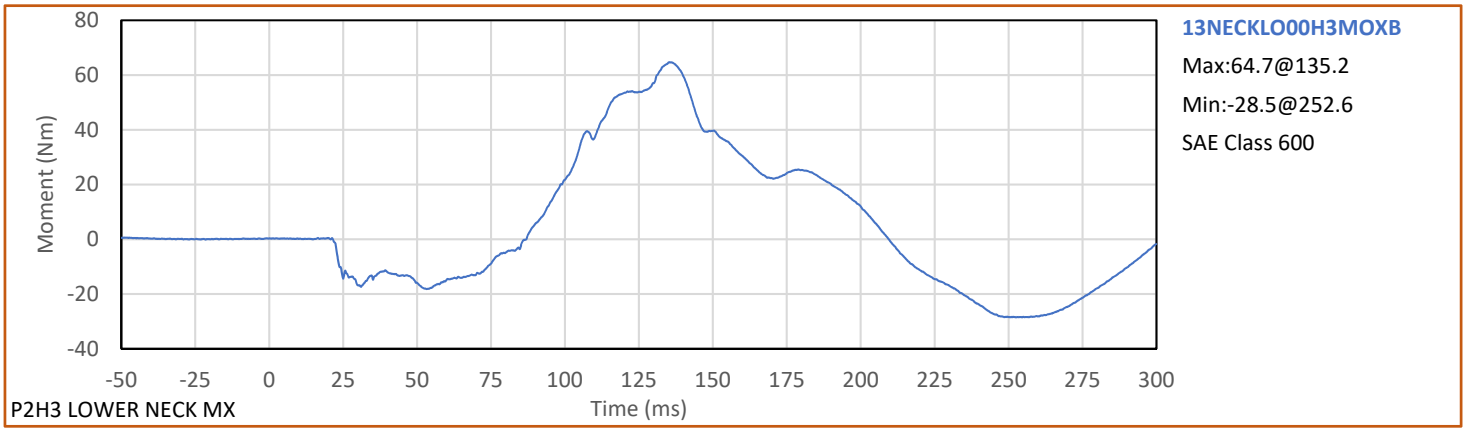
13NECKUP00H3MOZB
Max:32.1@139.7
Min:-8.7@228.6
SAE Class 600

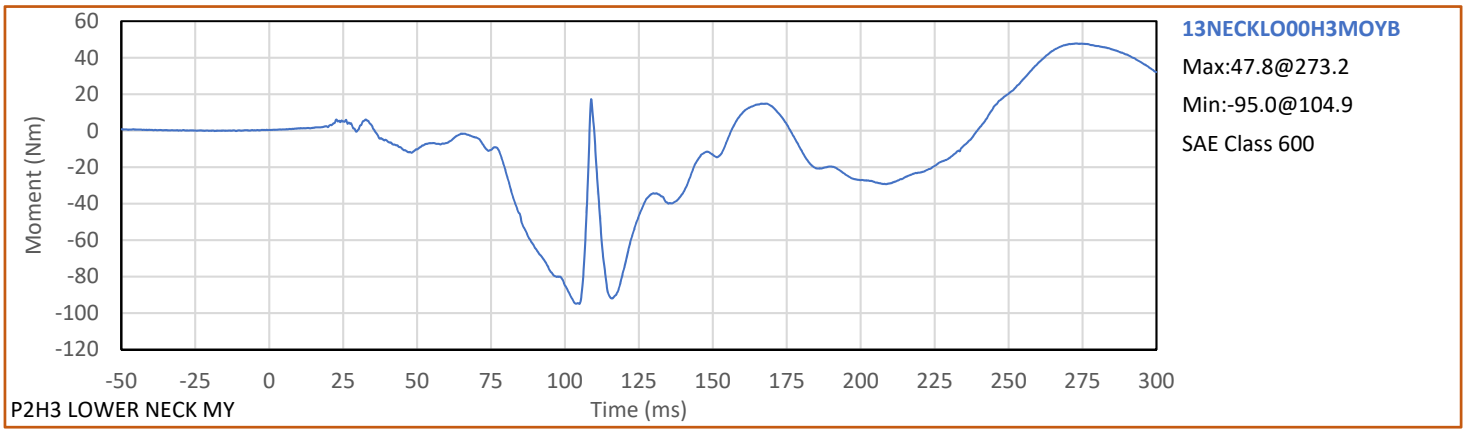


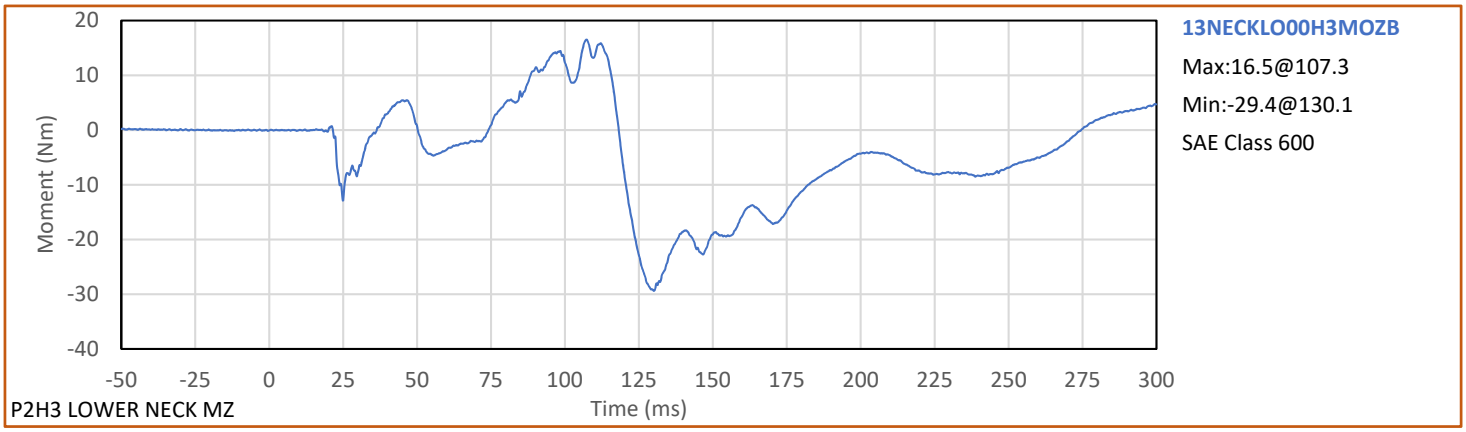
13NECKLO00H3FOXA
Max:921.2@102.5
Min:-470.8@164.2
SAE Class 1000

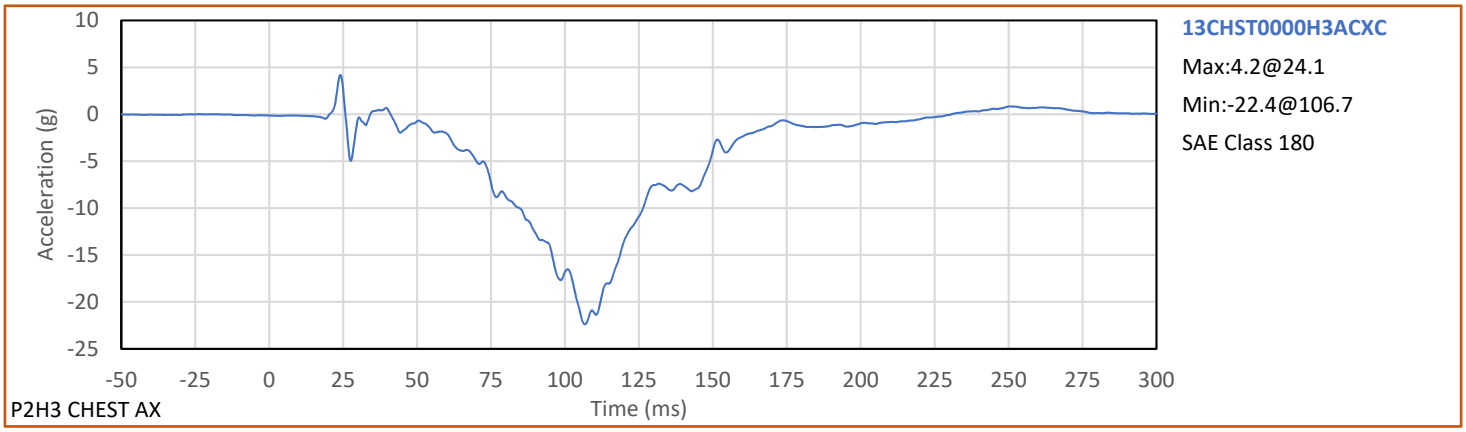

Force (N)
Time (ms)
P2H3 LOWER NECK FY
13NECKLO00H3FOYA
Max:190.9@97.1
Min:-413.2@145.7
SAE Class 1000

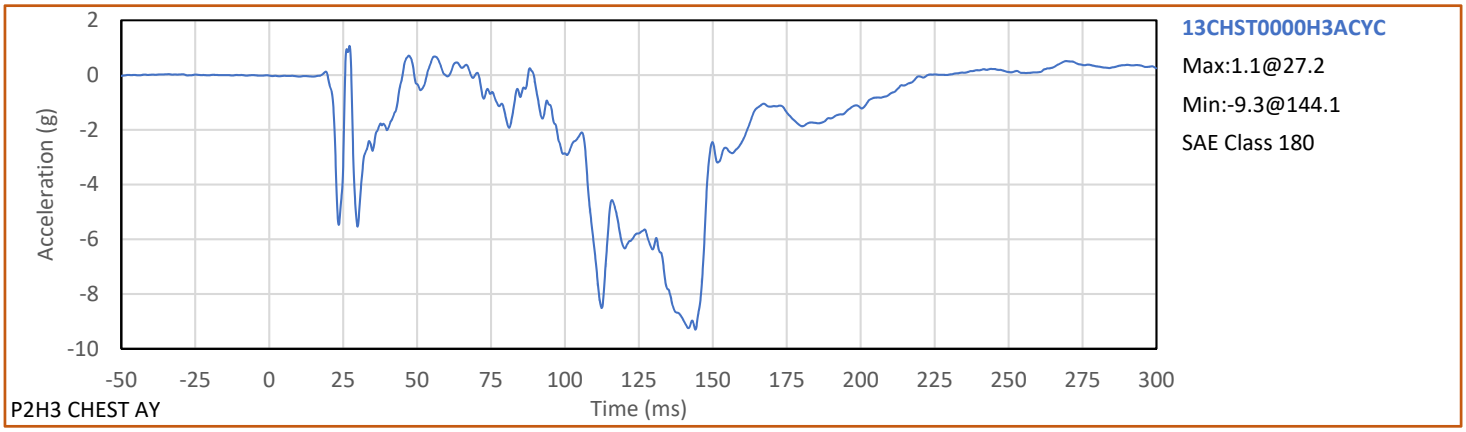

Force (N)
Time (ms)
P2H3 LOWER NECK FZ
13NECKLO00H3FOZA
Max:290.2@209.6
Min:-1682.5@108.8
SAE Class 1000

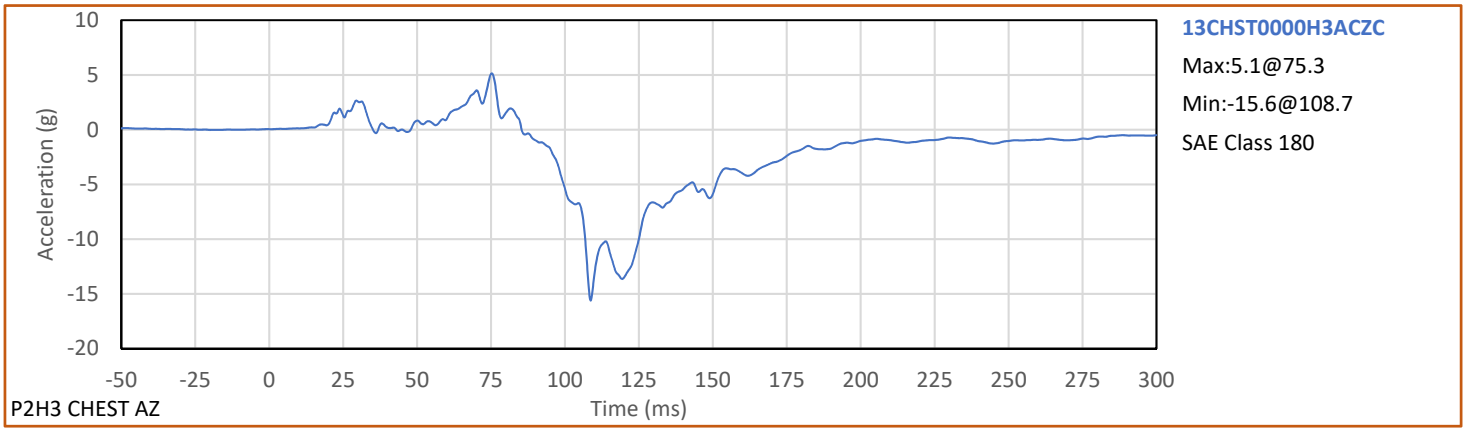

Moment (Nm)
Time (ms)
P2H3 LOWER NECK MX
13NECKLO00H3MOXB
Max:64.7@135.2
Min:-28.5@252.6
SAE Class 600

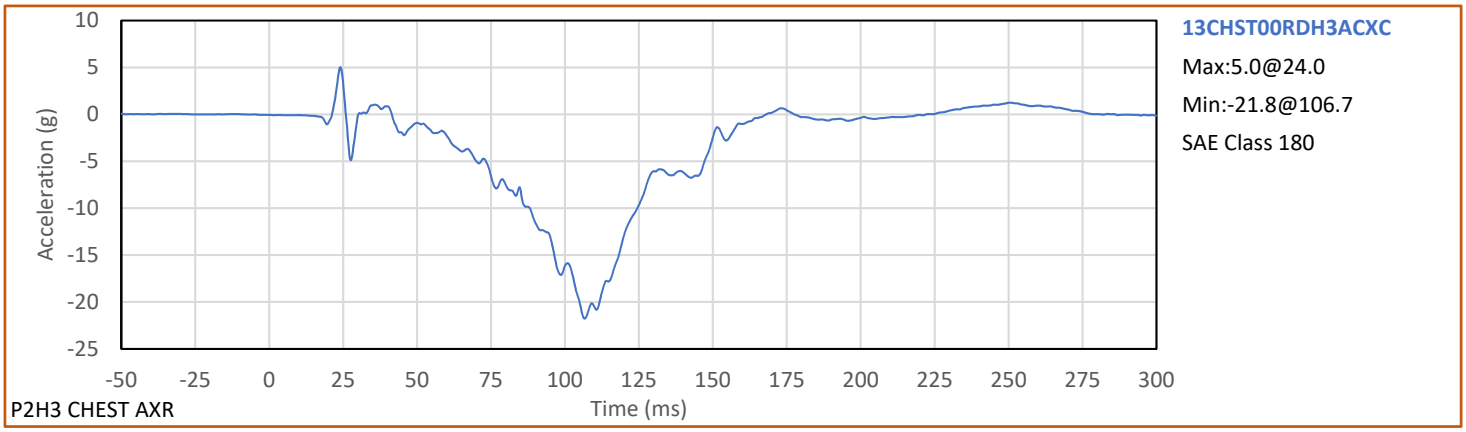

Moment (Nm)
Time (ms)
P2H3 LOWER NECK MY
13NECKLO00H3MOYB
Max:47.8@273.2
Min:-95.0@104.9
SAE Class 600

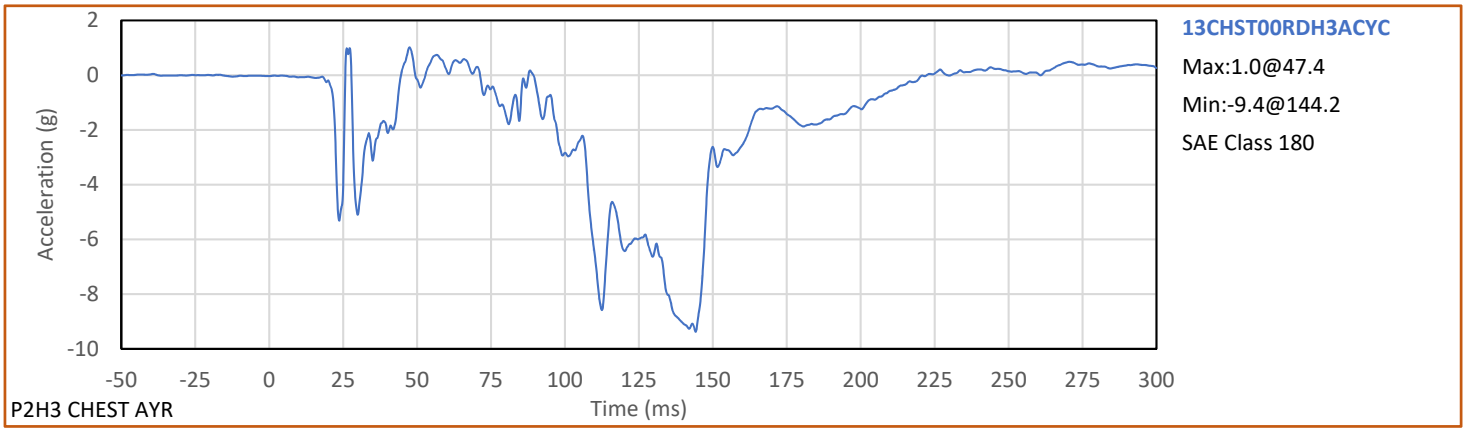

Moment (Nm)
Time (ms)
P2H3 LOWER NECK MZ
13NECKLO00H3MOZB
Max:16.5@107.3
Min:-29.4@130.1
SAE Class 600

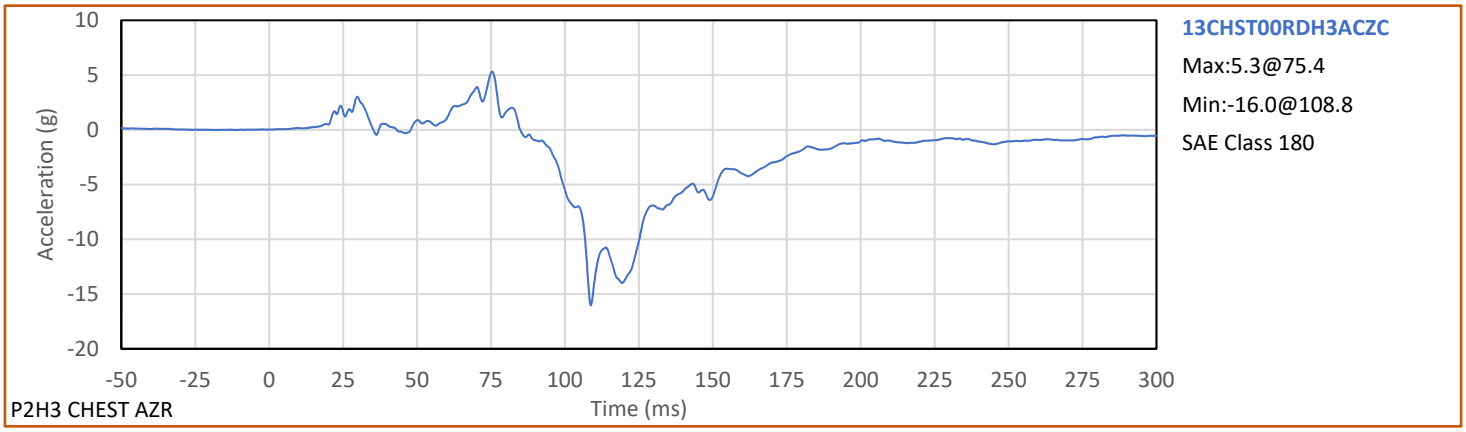

Acceleration (g)
Time (ms)
P2H3 CHEST AX
13CHST0000H3ACXC
Max:4.2@24.1
Min:-22.4@106.7
SAE Class 180

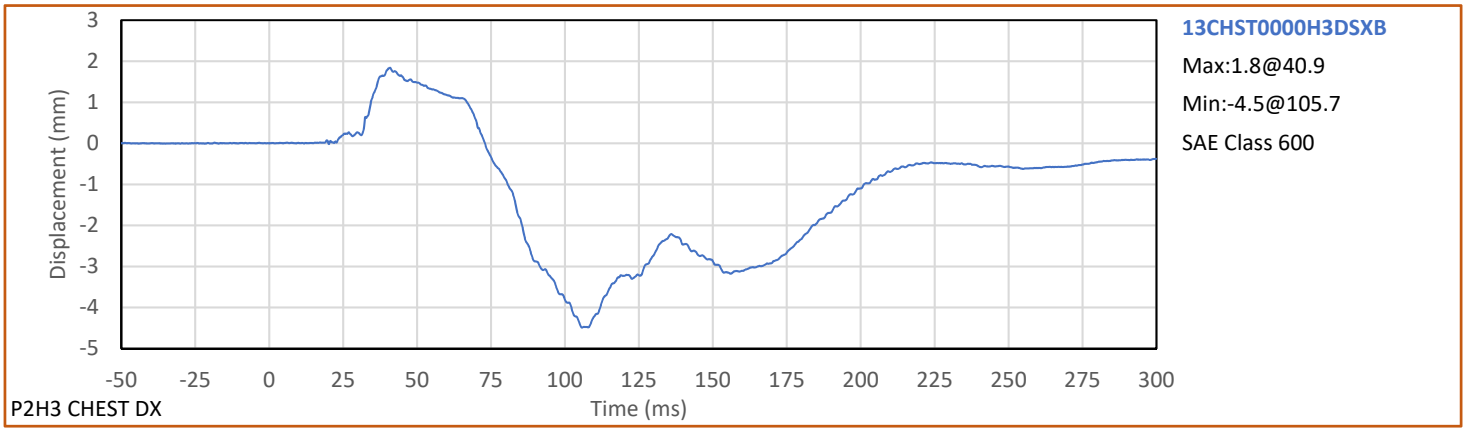

Acceleration (g)
Time (ms)
P2H3 CHEST AY
13CHST0000H3ACYC
Max:1.1@27.2
Min:-9.3@144.1
SAE Class 180


Acceleration (g)
Time (ms)
P2H3 CHEST AZ
13CHST0000H3ACZC
Max:5.1@75.3
Min:-15.6@108.7
SAE Class 180


Acceleration (g)
Time (ms)
P2H3 CHEST AXR
13CHST00RDH3ACXC
Max:5.0@24.0
Min:-21.8@106.7
SAE Class 180


Acceleration (g)
Time (ms)
P2H3 CHEST AYR
13CHST00RDH3ACYC
Max:1.0@47.4
Min:-9.4@144.2
SAE Class 180


Acceleration (g)
Time (ms)
P2H3 CHEST AZR
13CHST00RDH3ACZC
Max:5.3@75.4
Min:-16.0@108.8
SAE Class 180

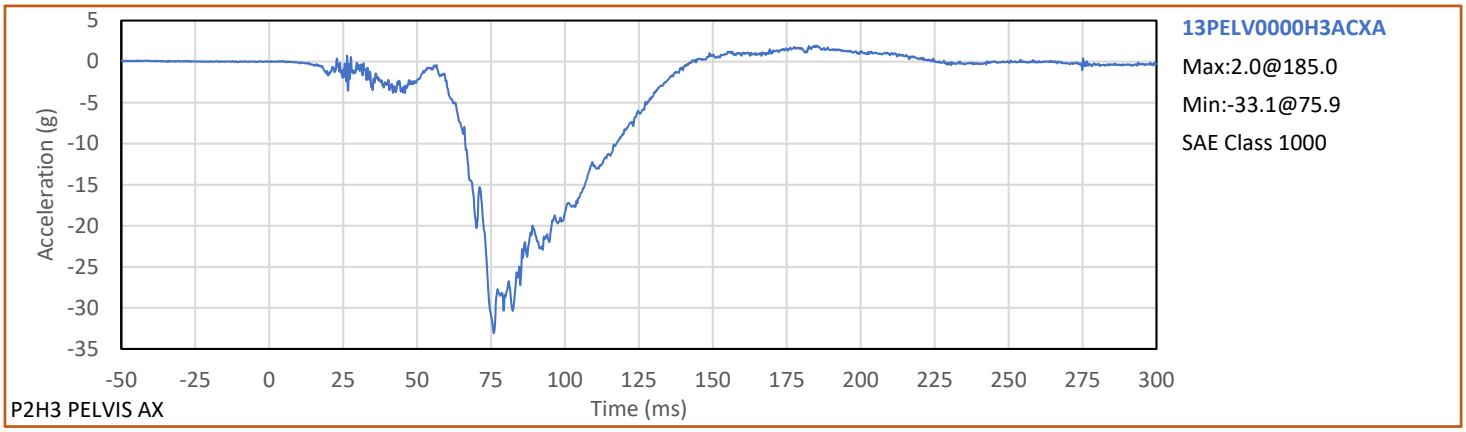

Displacement (mm)
Time (ms)
P2H3 CHEST DX
13CHST0000H3DSXB
Max:1.8@40.9
Min:-4.5@105.7
SAE Class 600

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

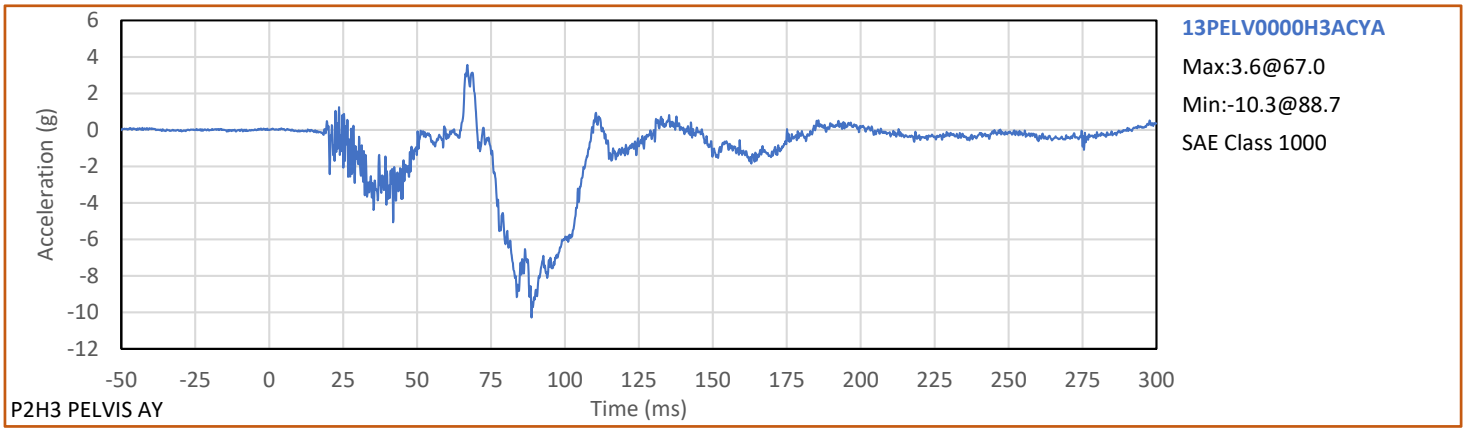
Test Program: Right Side 30° Frontal Rigid Barrier Impact

NHTSA No.: R20205412

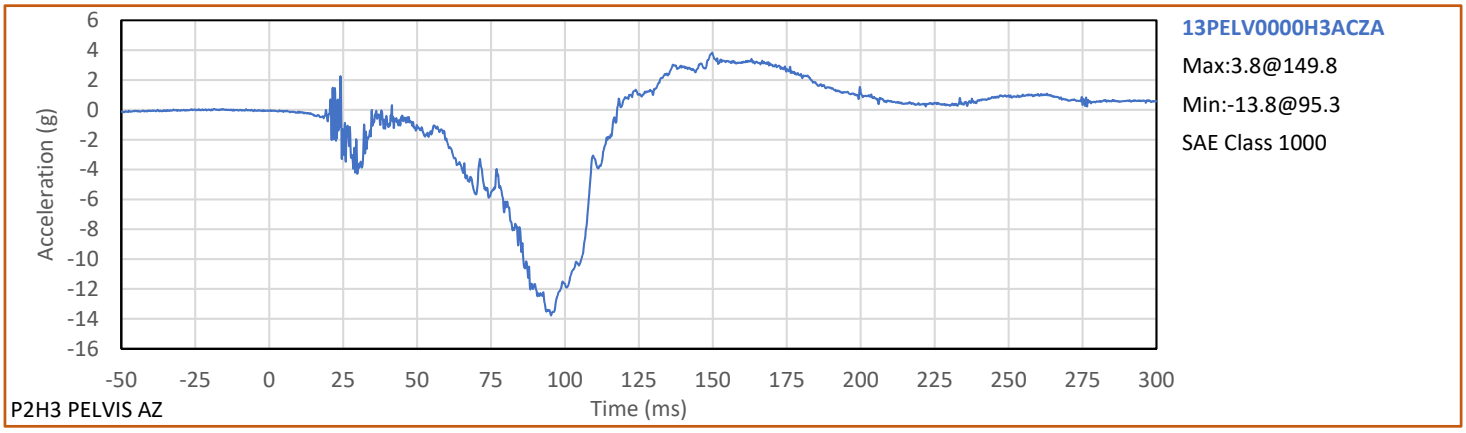
Test Date: 12/7/2020



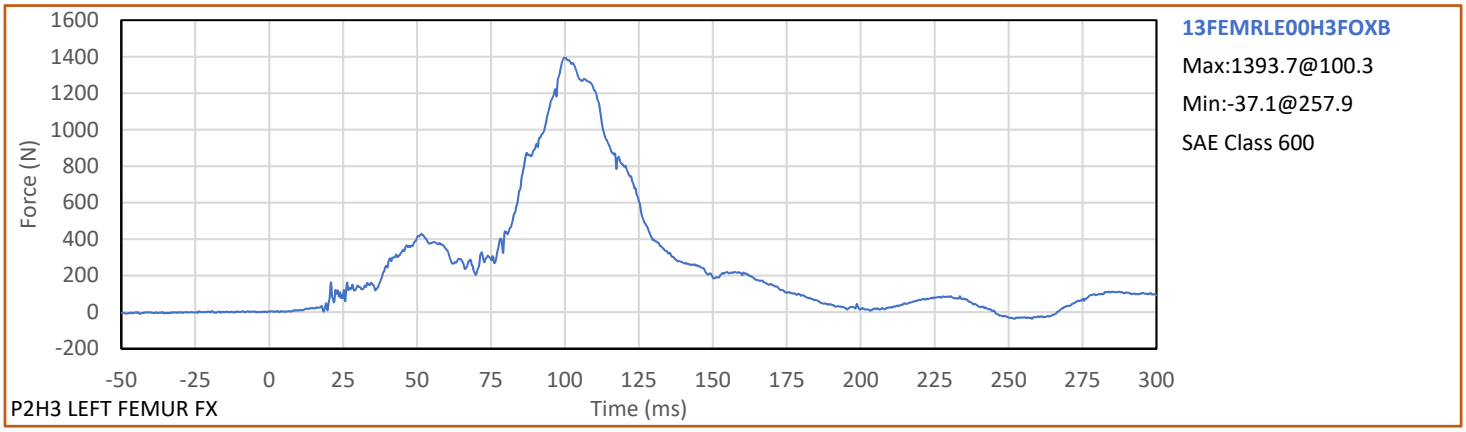
13PELV0000H3ACXA
Max:2.0@185.0
Min:-33.1@75.9
SAE Class 1000



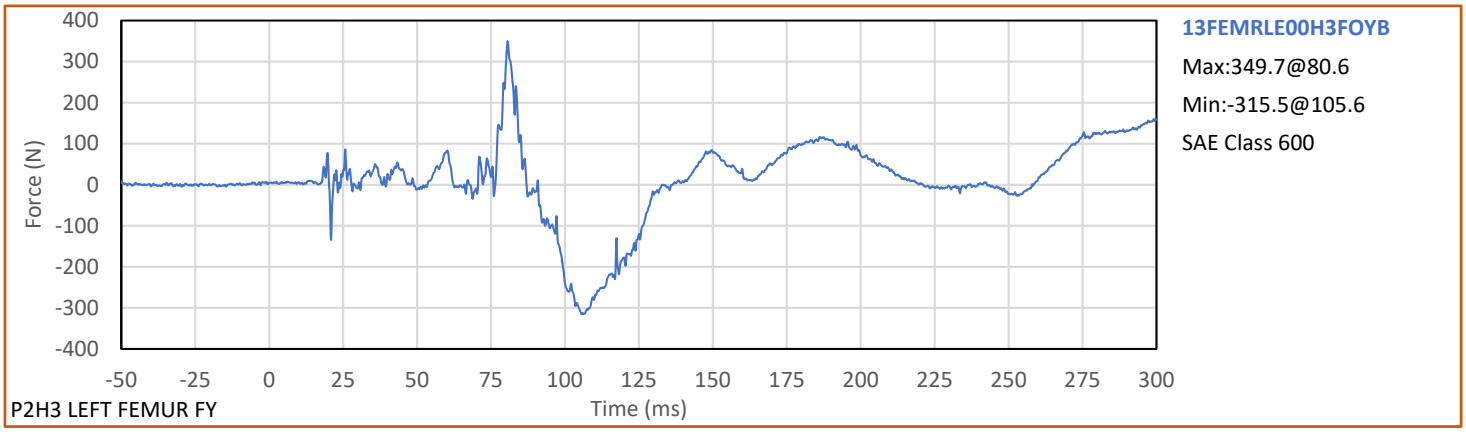
13PELV0000H3ACYA
Max:3.6@67.0
Min:-10.3@88.7
SAE Class 1000

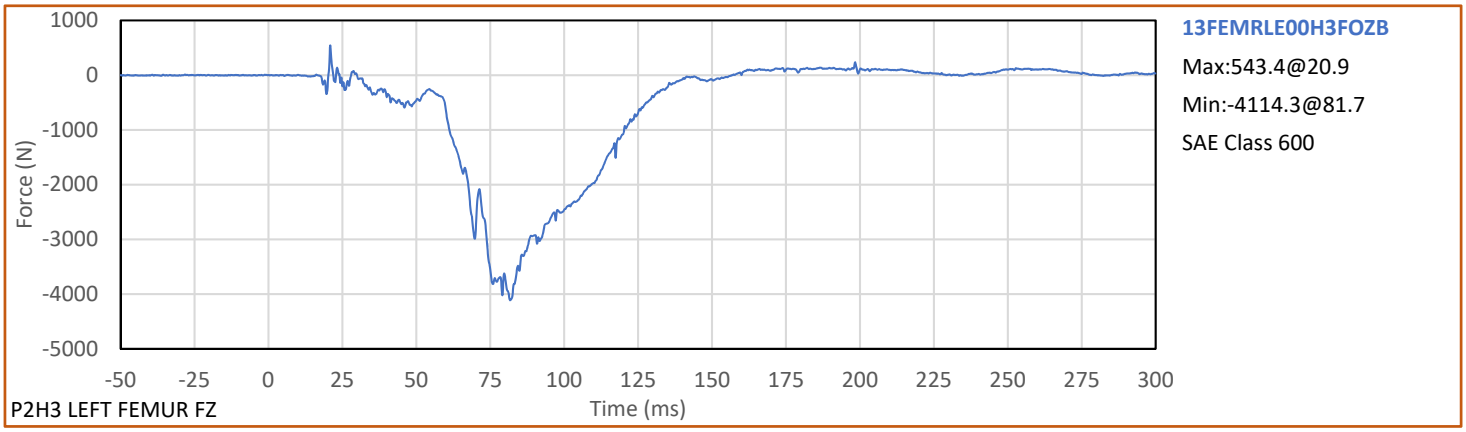


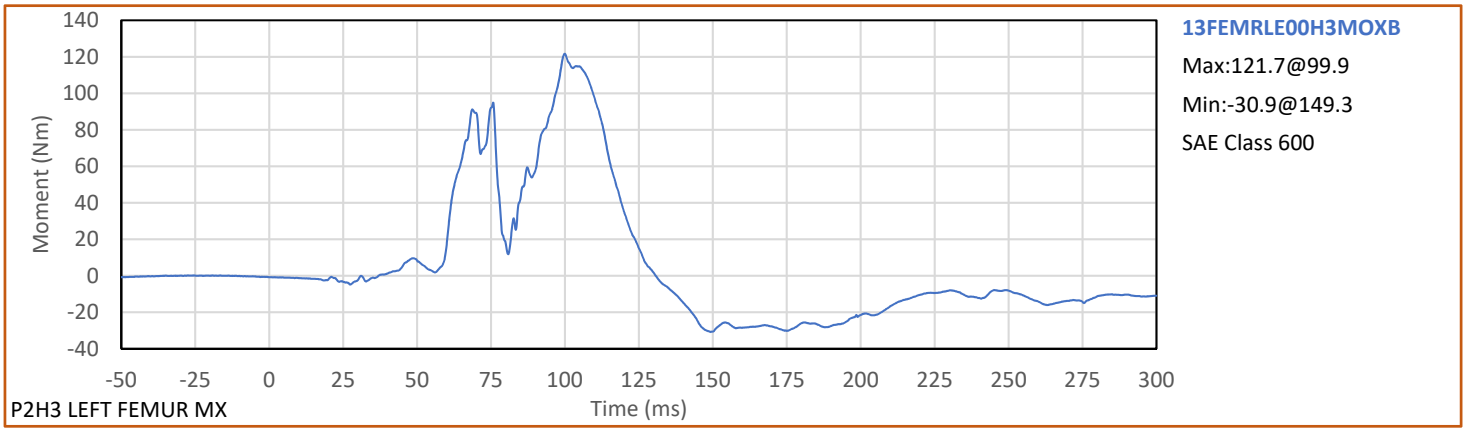
13PELV0000H3ACZA
Max:3.8@149.8
Min:-13.8@95.3
SAE Class 1000

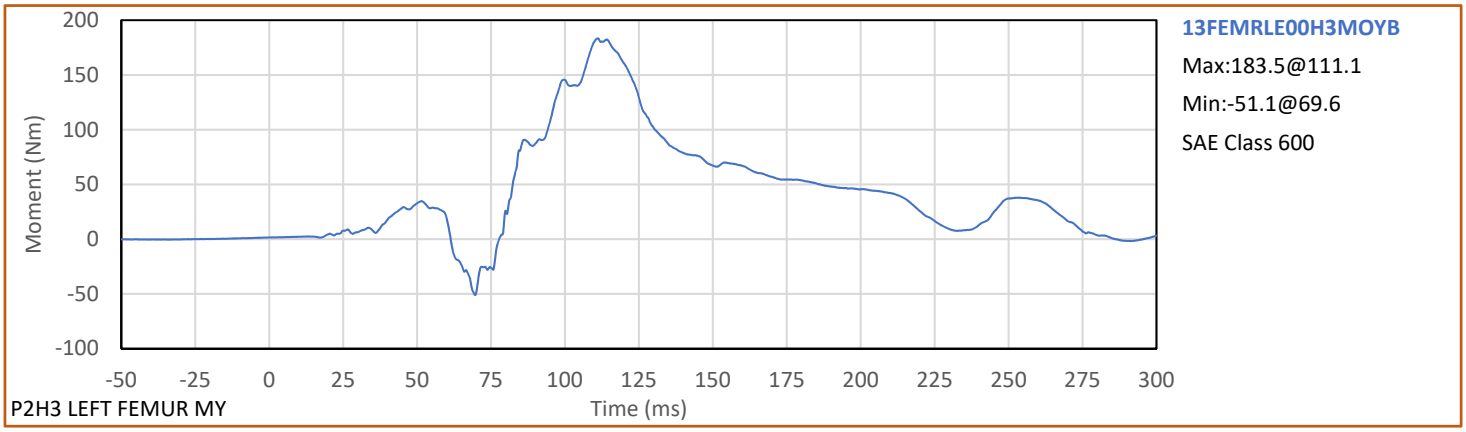


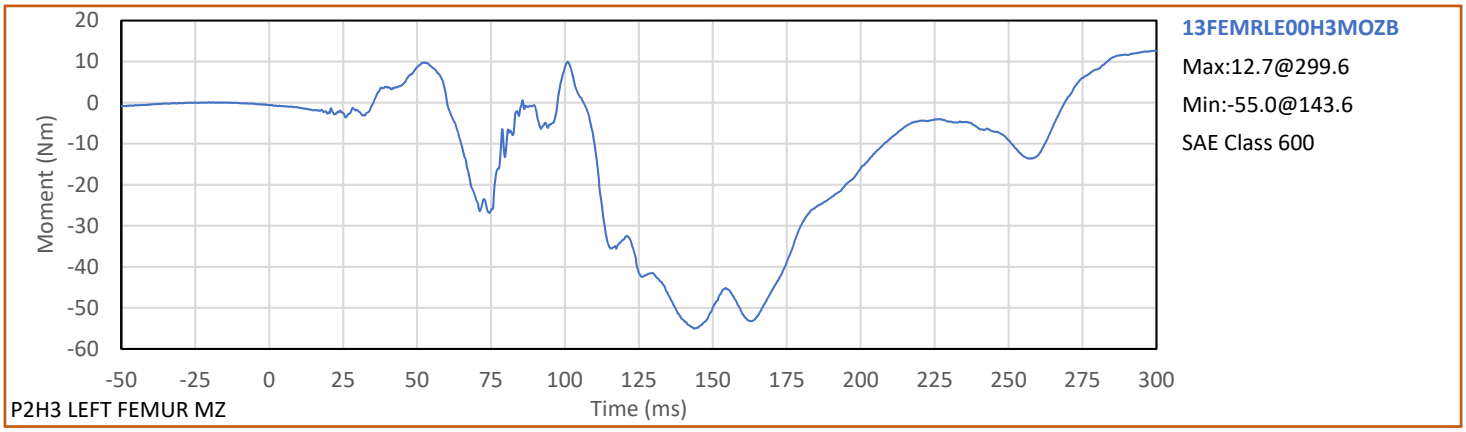
13FEMRLE00H3FOXB
Max:1393.7@100.3
Min:-37.1@257.9
SAE Class 600

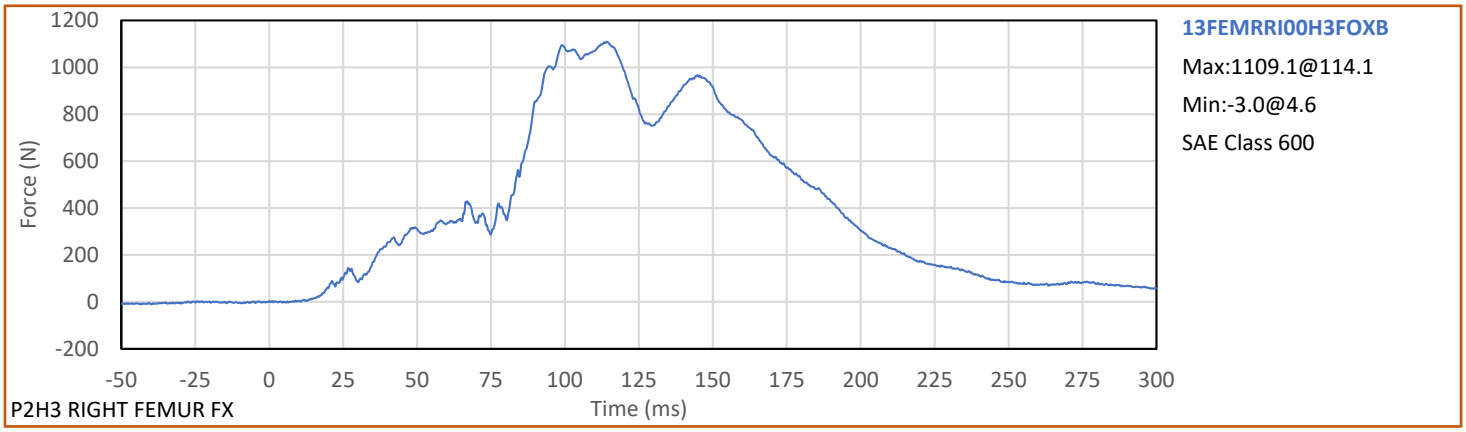

Force (N)
Time (ms)
P2H3 LEFT FEMUR FY
13FEMRLE00H3FOYB
Max:349.7@80.6
Min:-315.5@105.6
SAE Class 600

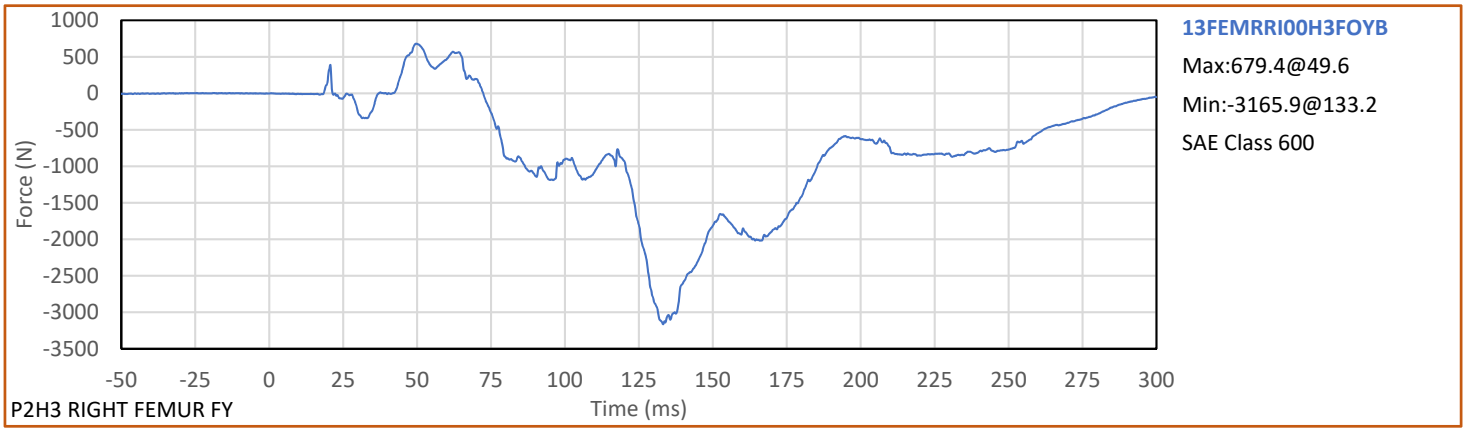

Force (N)
Time (ms)
P2H3 LEFT FEMUR FZ
13FEMRLE00H3FOZB
Max:543.4@20.9
Min:-4114.3@81.7
SAE Class 600

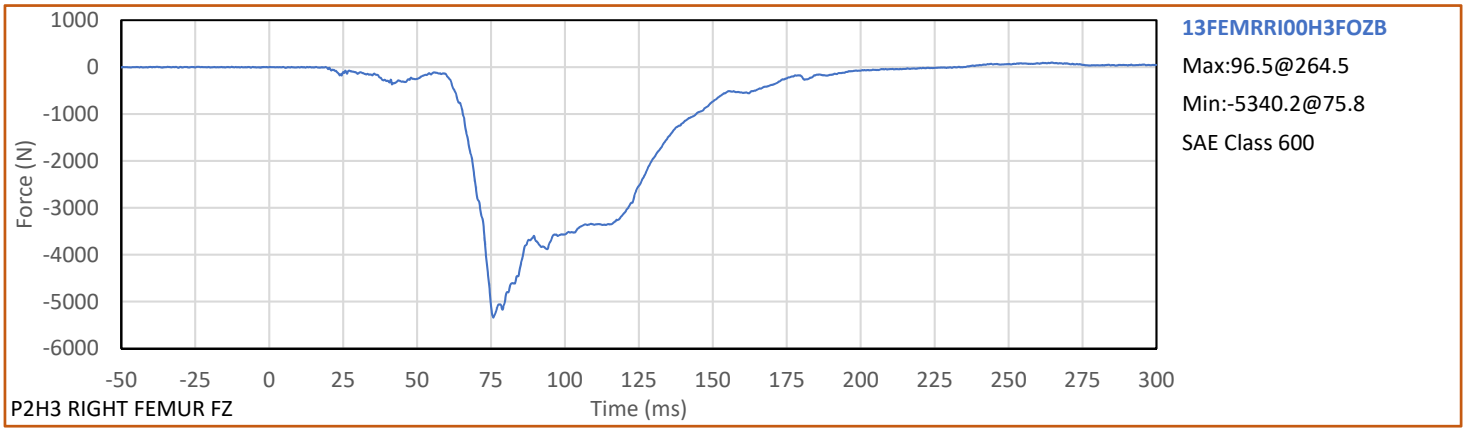

Moment (Nm)
Time (ms)
P2H3 LEFT FEMUR MX
13FEMRLE00H3MOXB
Max:121.7@99.9
Min:-30.9@149.3
SAE Class 600


Moment (Nm)
Time (ms)
P2H3 LEFT FEMUR MY
13FEMRLE00H3MOYB
Max:183.5@111.1
Min:-51.1@69.6
SAE Class 600

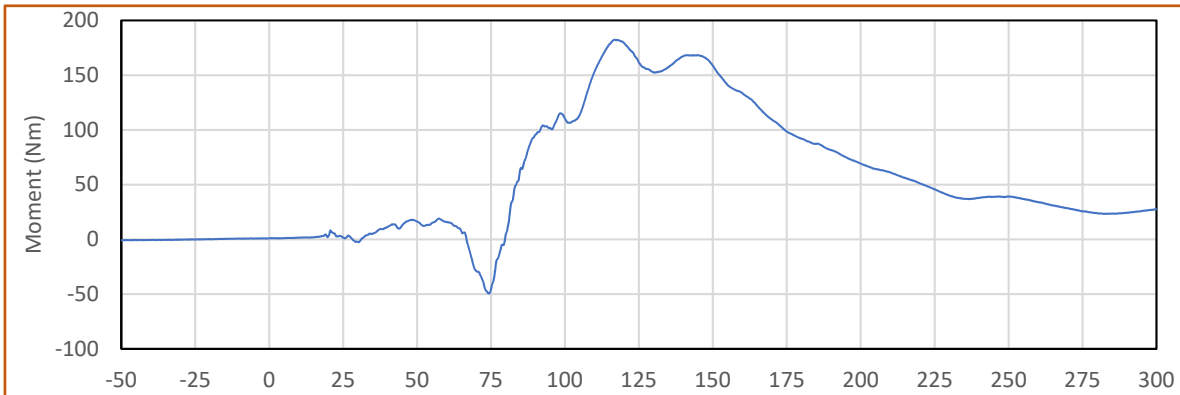

Moment (Nm)
Time (ms)
P2H3 LEFT FEMUR MZ
13FEMRLE00H3MOZB
Max:12.7@299.6
Min:-55.0@143.6
SAE Class 600


Force (N)
Time (ms)
P2H3 RIGHT FEMUR FX
13FEMRRI00H3FOXB
Max:1109.1@114.1
Min:-3.0@4.6
SAE Class 600

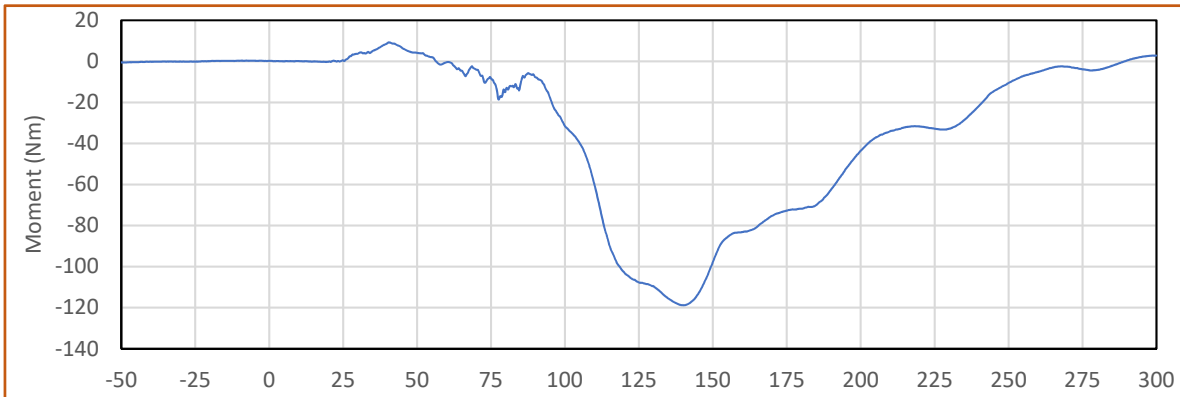

Force (N)
Time (ms)
P2H3 RIGHT FEMUR FY
13FEMRRI00H3FOYB
Max:679.4@49.6
Min:-3165.9@133.2
SAE Class 600


Force (N)
Time (ms)
P2H3 RIGHT FEMUR FZ
13FEMRRI00H3FOZB
Max:96.5@264.5
Min:-5340.2@75.8
SAE Class 600

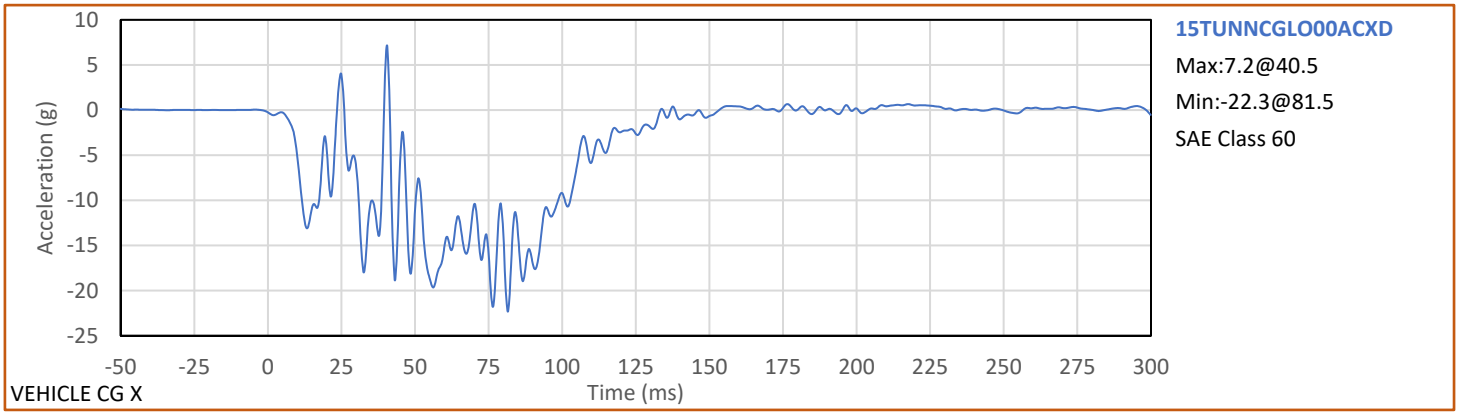
13FEMRRI00H3MOXB
Max:100.2@68.2
Min:-82.3@83.7
SAE Class 600

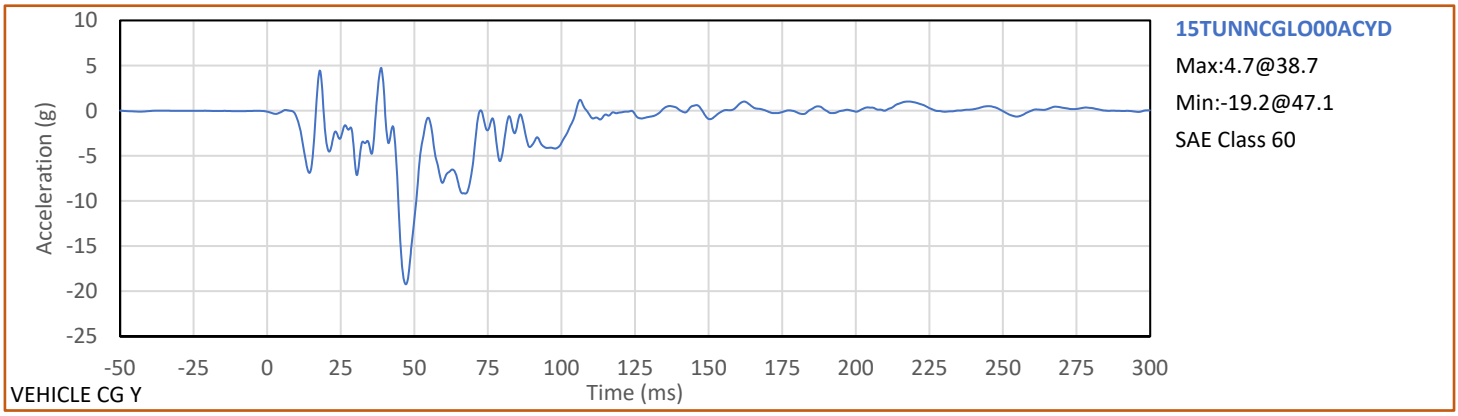


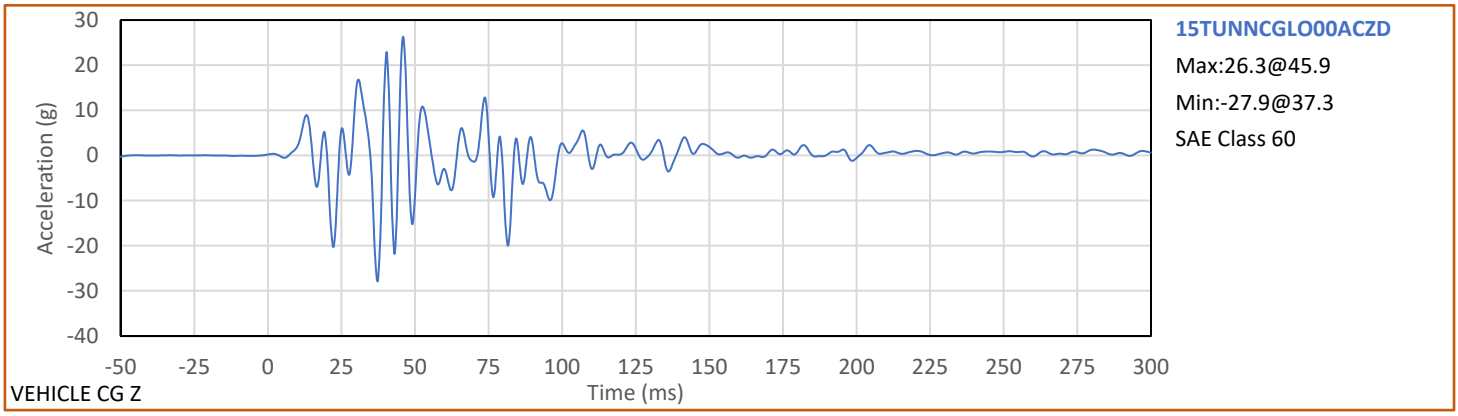
13FEMRRI00H3MOYB
Max:182.4@116.8
Min:-49.5@74.3
SAE Class 600

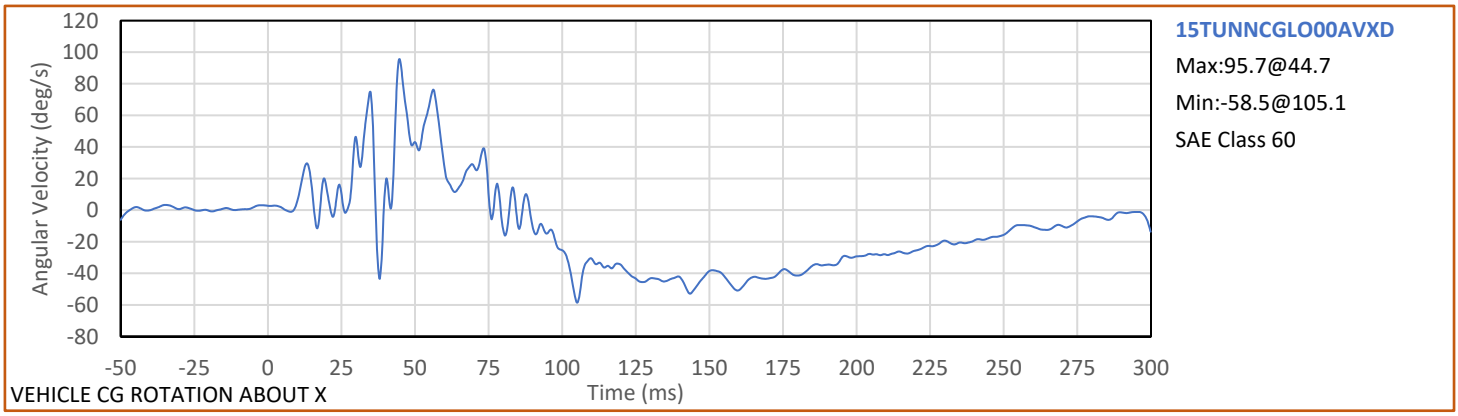


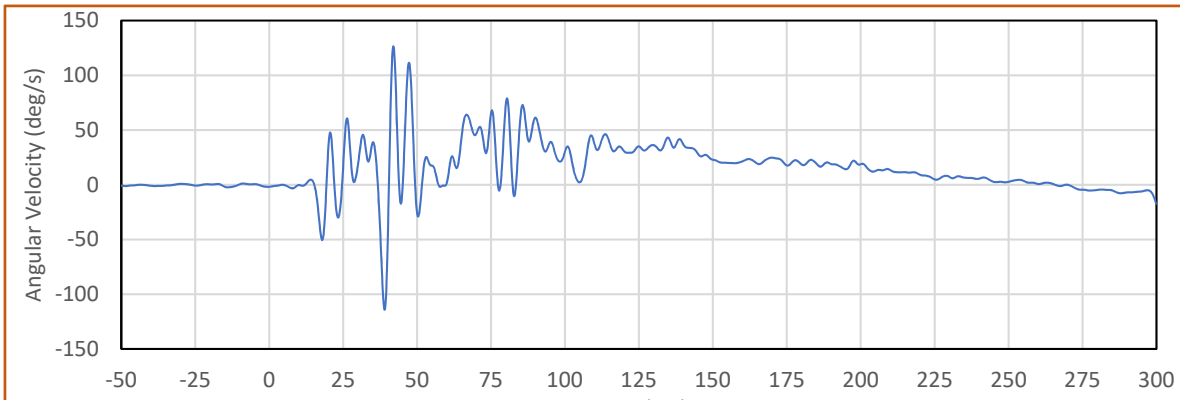
13FEMRRI00H3MOZB
Max:9.3@40.5
Min:-118.8@139.9
SAE Class 600


Acceleration (g)
Time (ms)
VEHICLE CG X
15TUNNCGLO00ACXD
Max:7.2@40.5
Min:-22.3@81.5
SAE Class 60


Acceleration (g)
Time (ms)
VEHICLE CG Y
15TUNNCGLO00ACYD
Max:4.7@38.7
Min:-19.2@47.1
SAE Class 60

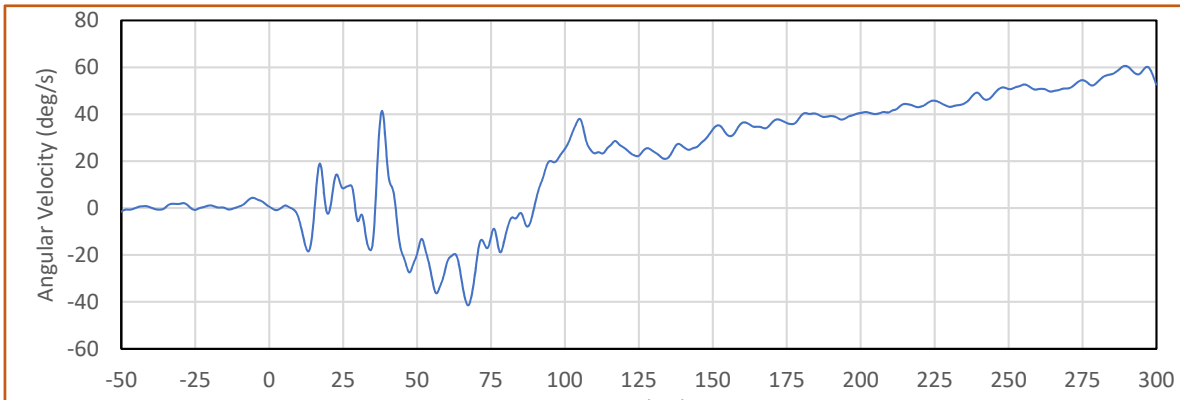

Acceleration (g)
Time (ms)
VEHICLE CG Z
15TUNNCGLO00ACZD
Max:26.3@45.9
Min:-27.9@37.3
SAE Class 60


Angular Velocity (deg/s)
Time (ms)
VEHICLE CG ROTATION ABOUT X
15TUNNCGLO00AVXD
Max:95.7@44.7
Min:-58.5@105.1
SAE Class 60



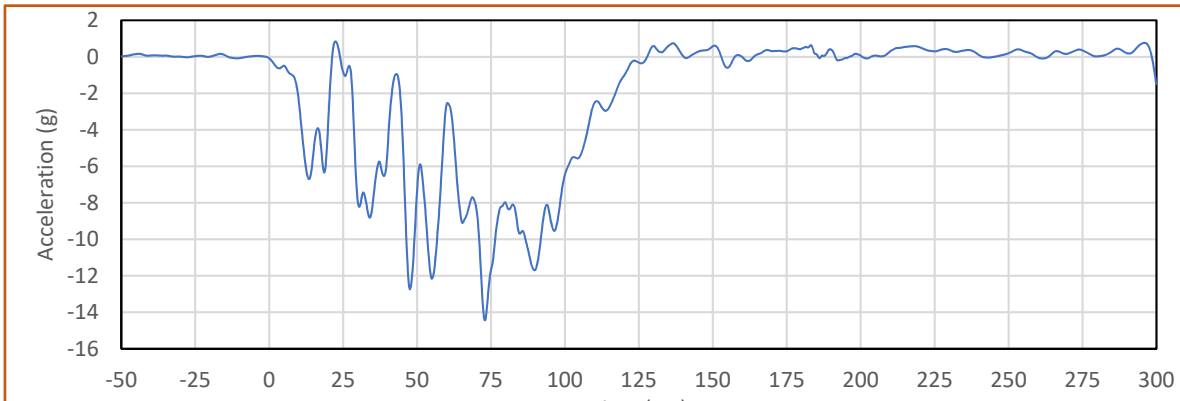
15TUNNCGLO00AVYD
Max:126.5@42.0
Min:-114.3@39.0
SAE Class 60

VEHICLE CG ROTATION ABOUT Y



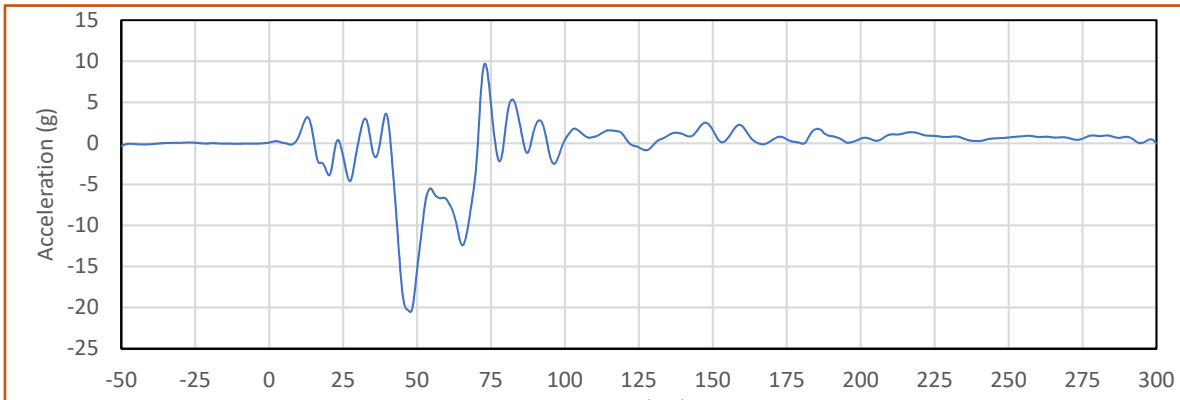
15TUNNCGLO00AVZD
Max:60.6@289.4
Min:-41.5@67.3
SAE Class 60

VEHICLE CG ROTATION ABOUT Z



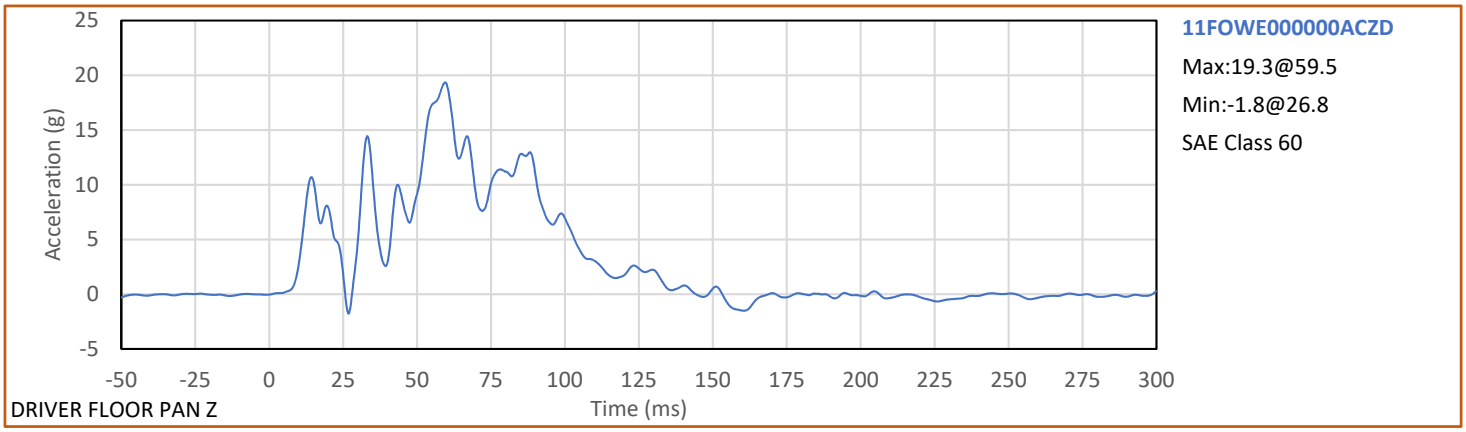
11FOWE000000ACXD
Max:0.8@22.4
Min:-14.4@72.9
SAE Class 60

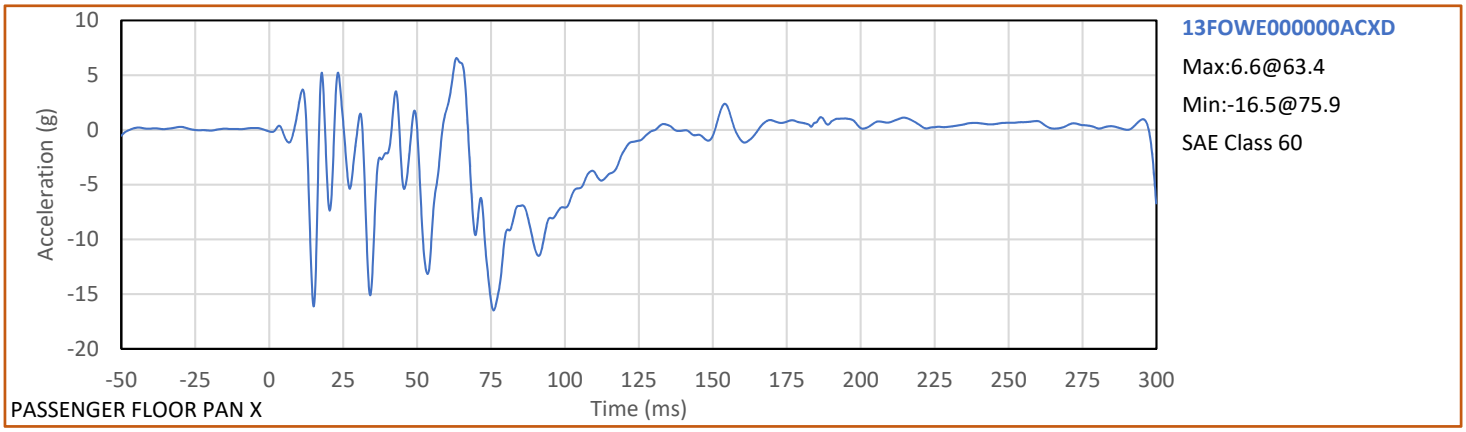
DRIVER FLOOR PAN X

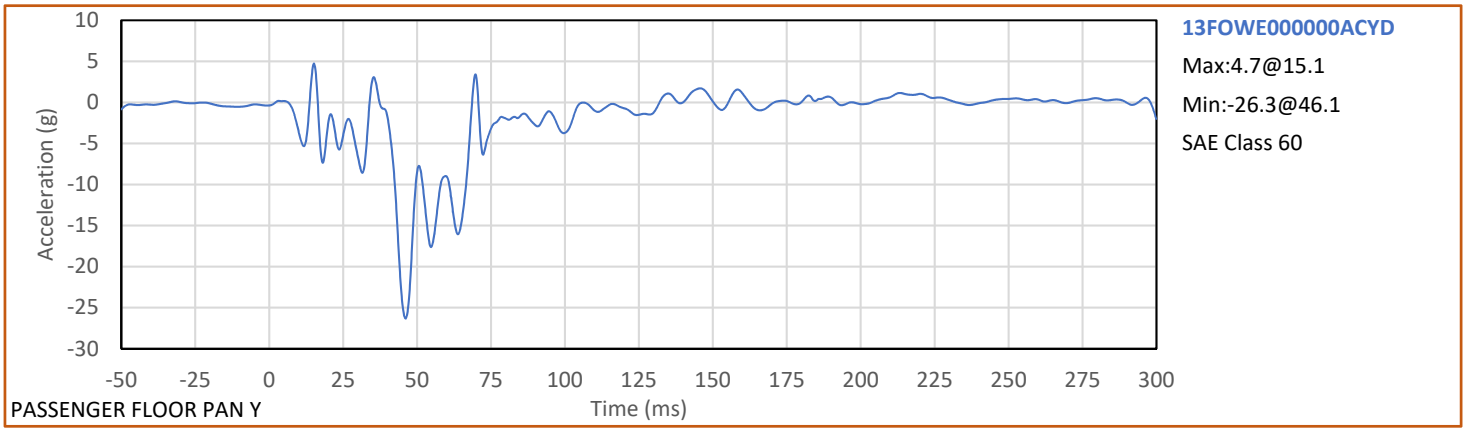


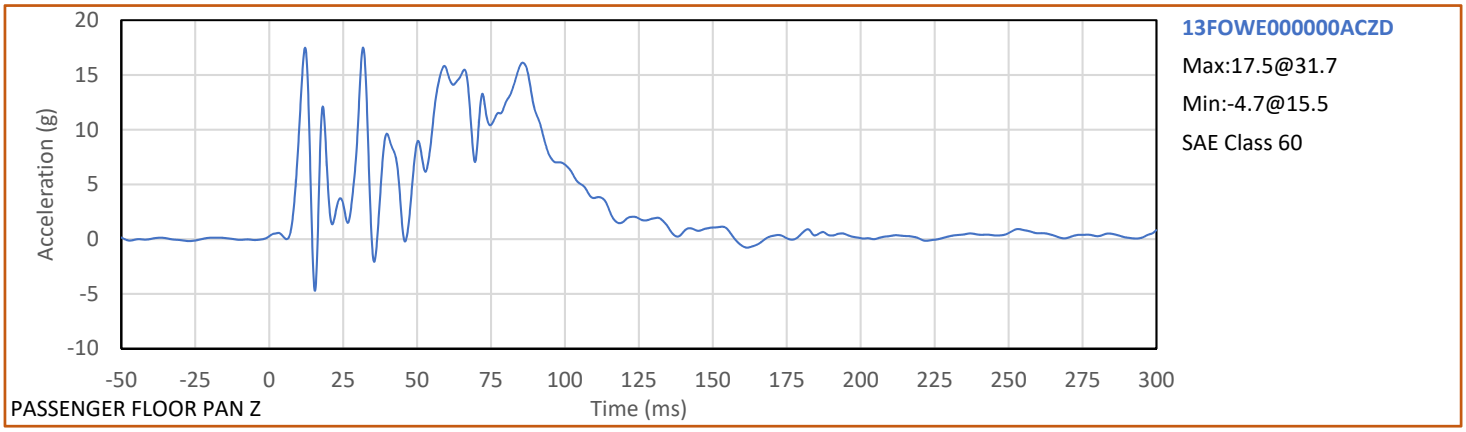
11FOWE000000ACYD
Max:9.7@73.0
Min:-20.5@47.7
SAE Class 60

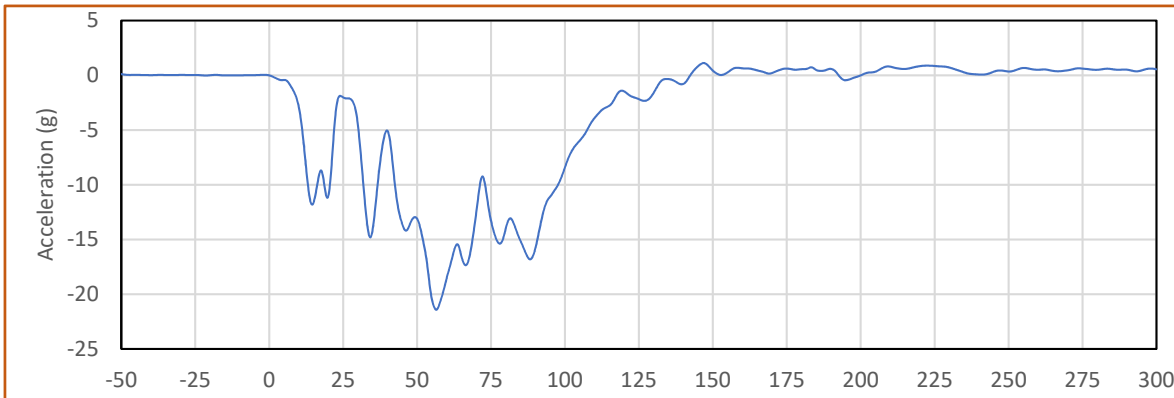
DRIVER FLOOR PAN Y


Acceleration (g)
Time (ms)
DRIVER FLOOR PAN Z
11FOWE000000ACZD
Max:19.3@59.5
Min:-1.8@26.8
SAE Class 60


Acceleration (g)
Time (ms)
PASSENGER FLOOR PAN X
13FOWE000000ACXD
Max:6.6@63.4
Min:-16.5@75.9
SAE Class 60

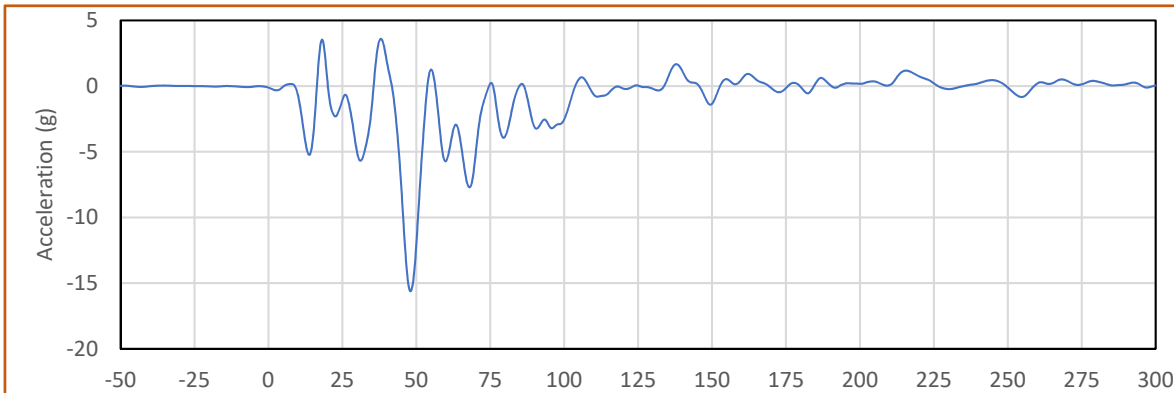

Acceleration (g)
Time (ms)
PASSENGER FLOOR PAN Y
13FOWE000000ACYD
Max:4.7@15.1
Min:-26.3@46.1
SAE Class 60


Acceleration (g)
Time (ms)
PASSENGER FLOOR PAN Z
13FOWE000000ACZD
Max:17.5@31.7
Min:-4.7@15.5
SAE Class 60



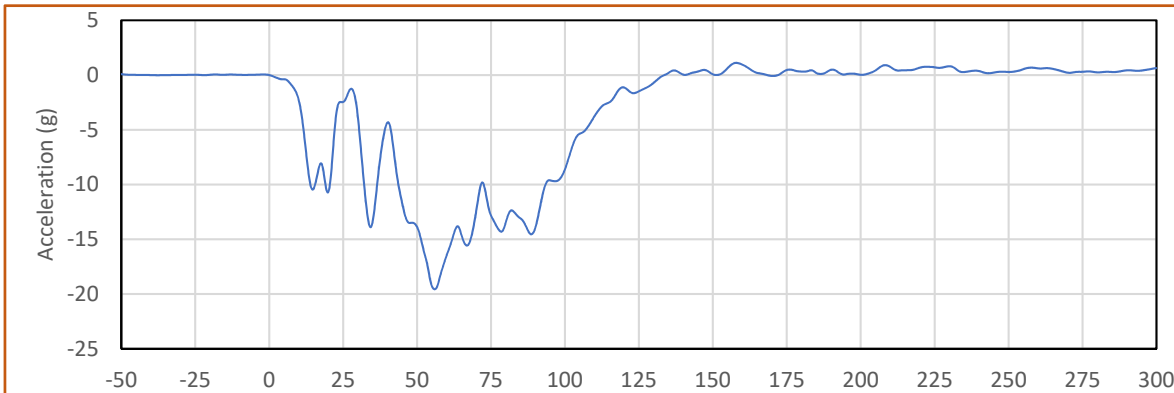
DOOR SILL LR X

14SILL000000ACXD
Max:1.1@146.9
Min:-21.4@56.5
SAE Class 60



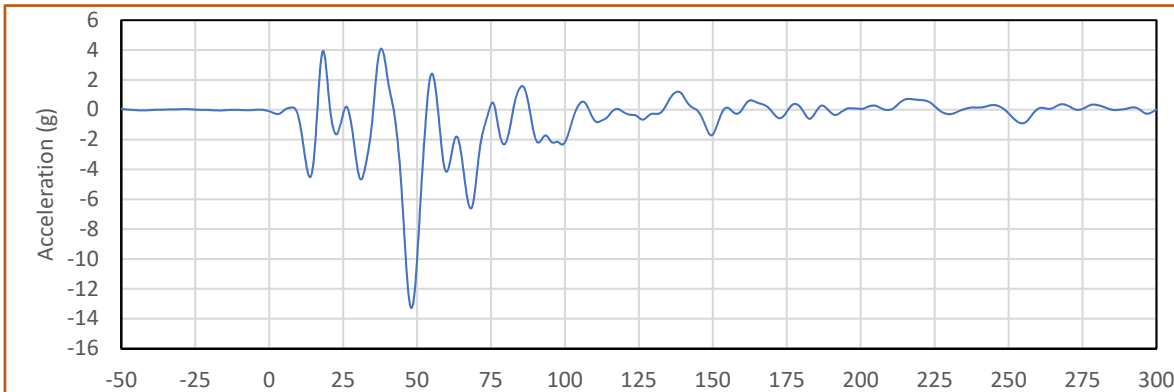
DOOR SILL LR Y

14SILL000000ACYD
Max:3.6@38.0
Min:-15.6@48.0
SAE Class 60



DOOR SILL LR REDUNDANT X

14SILLRD0000ACXD
Max:1.1@157.9
Min:-19.6@55.9
SAE Class 60



DOOR SILL LR REDUNDANT Y

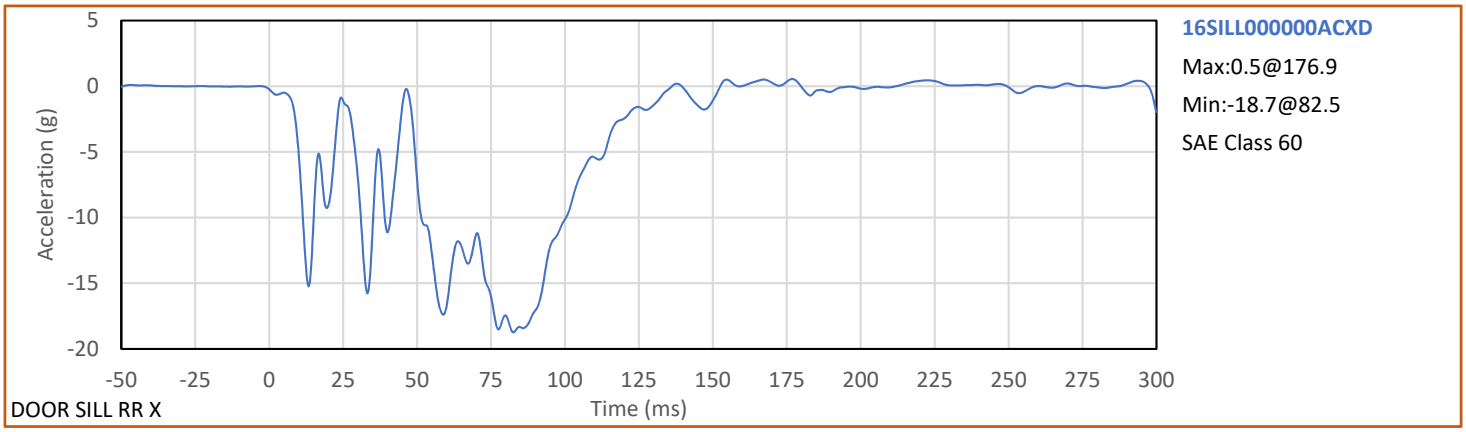
14SILLRD0000ACYD
Max:4.1@37.9
Min:-13.3@48.1
SAE Class 60

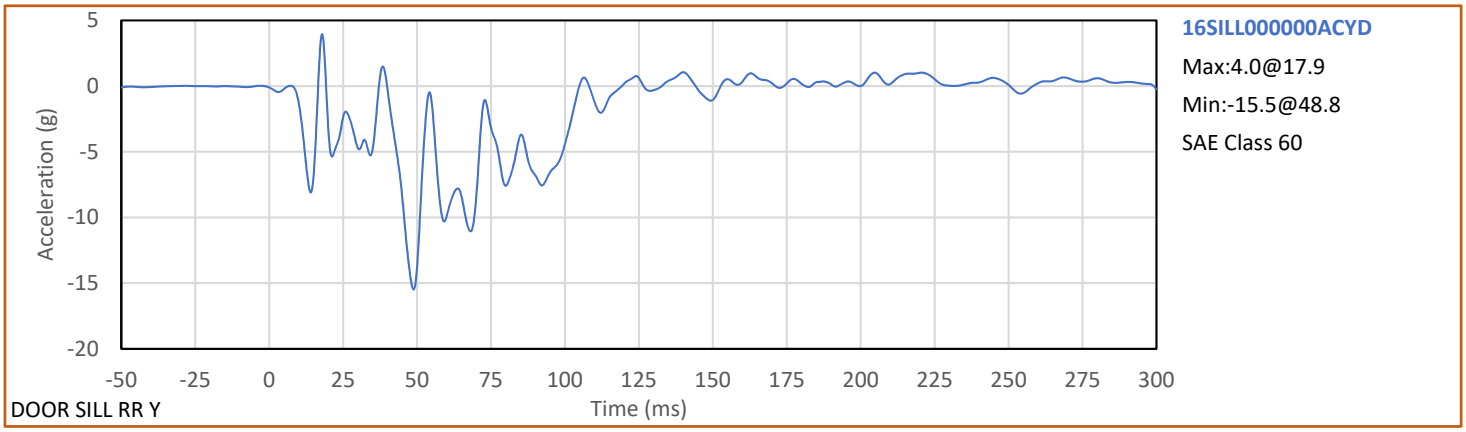
Test Vehicle: 2020 Mazda CX-5 5-Door MPV

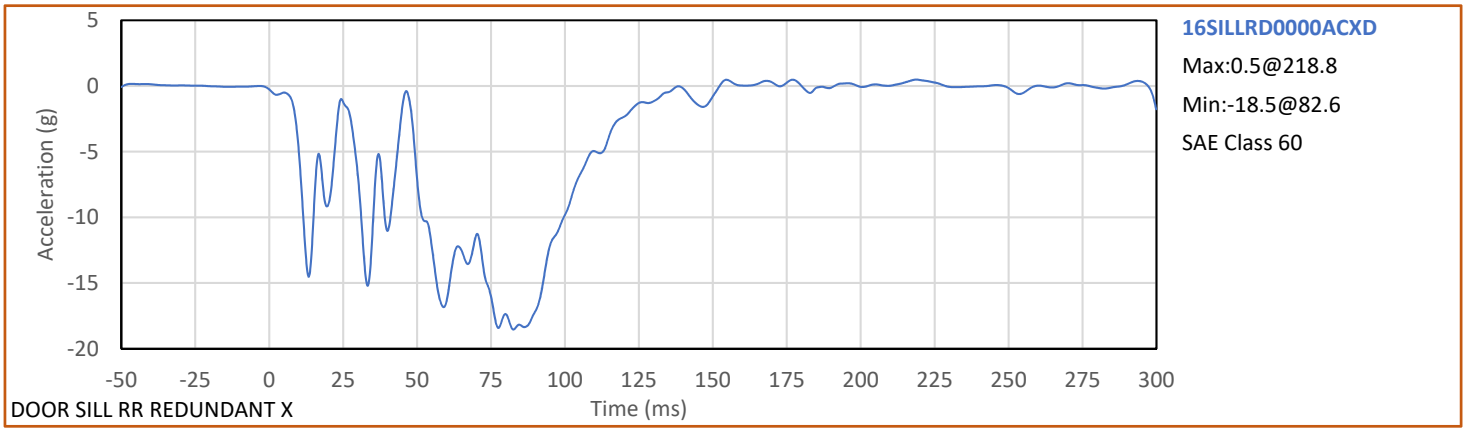
Test Program: Right Side 30° Frontal Rigid Barrier Impact

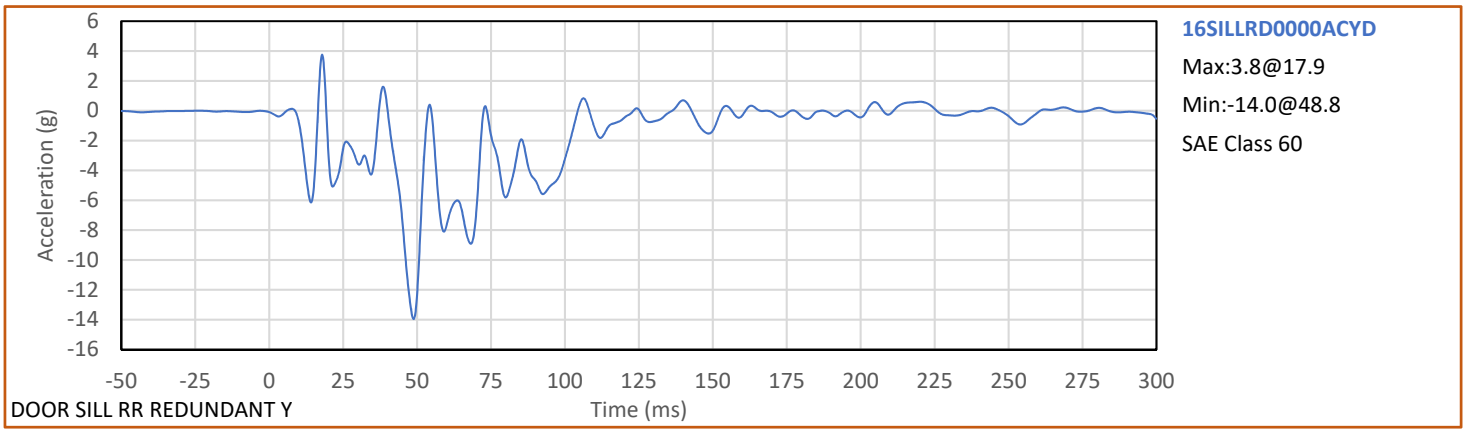
NHTSA No.: R20205412

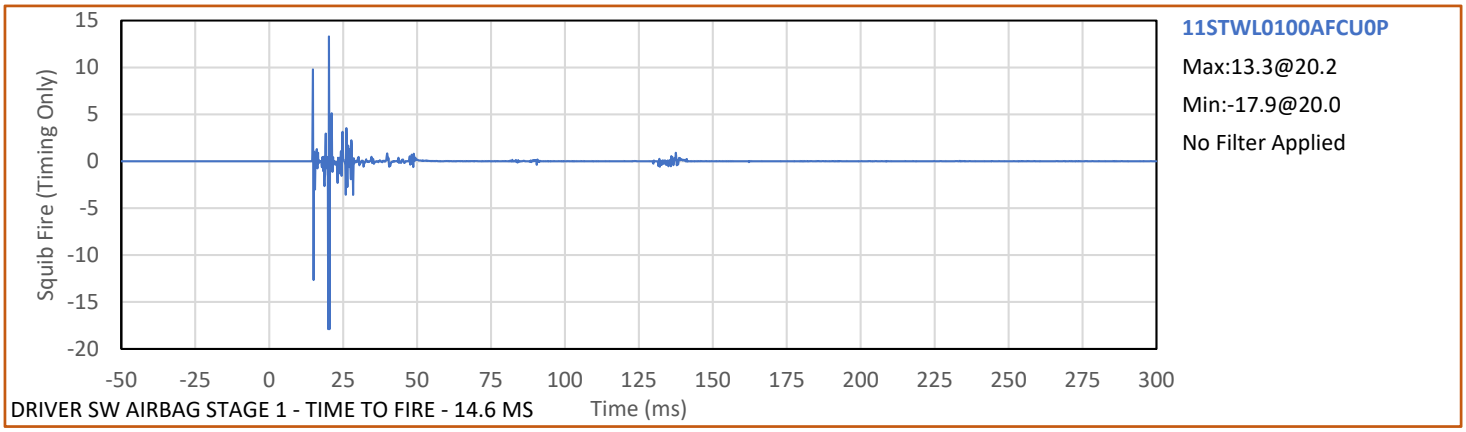
Test Date: 12/7/2020



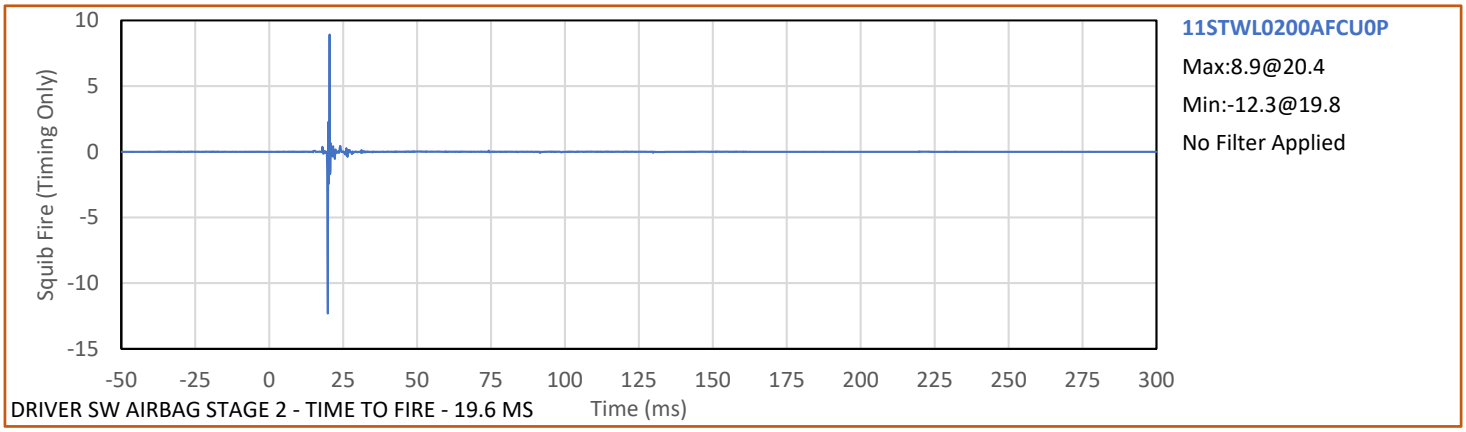




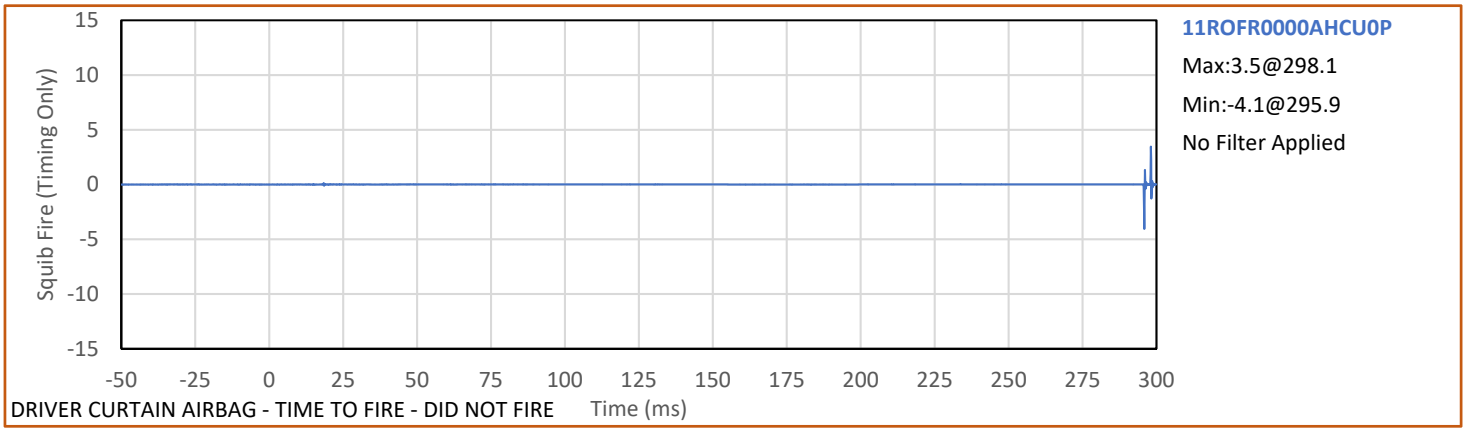




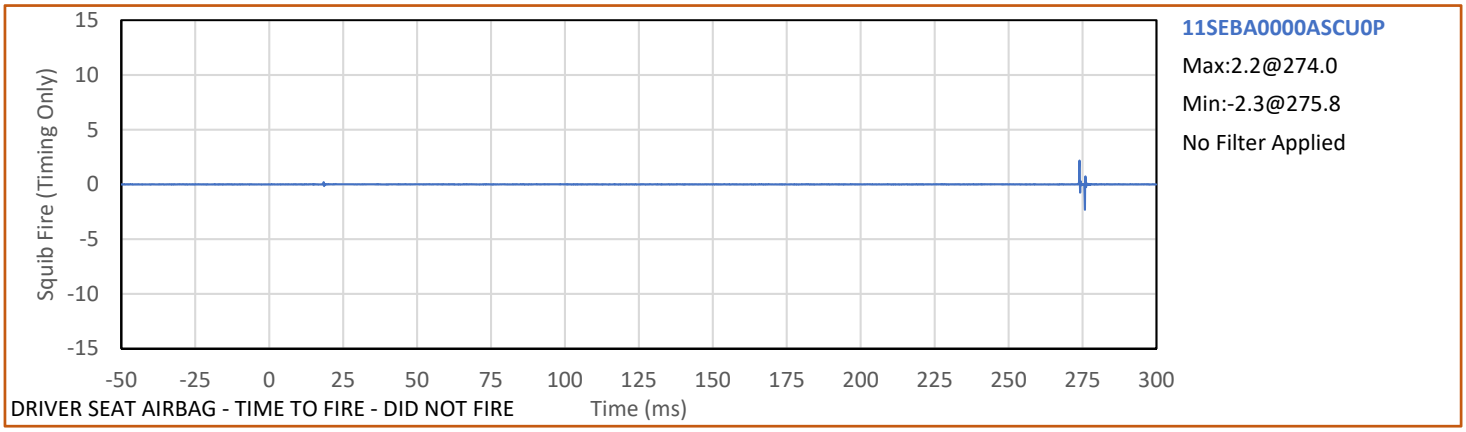
DRIVER SW AIRBAG STAGE 1 - TIME TO FIRE - 14.6 MS



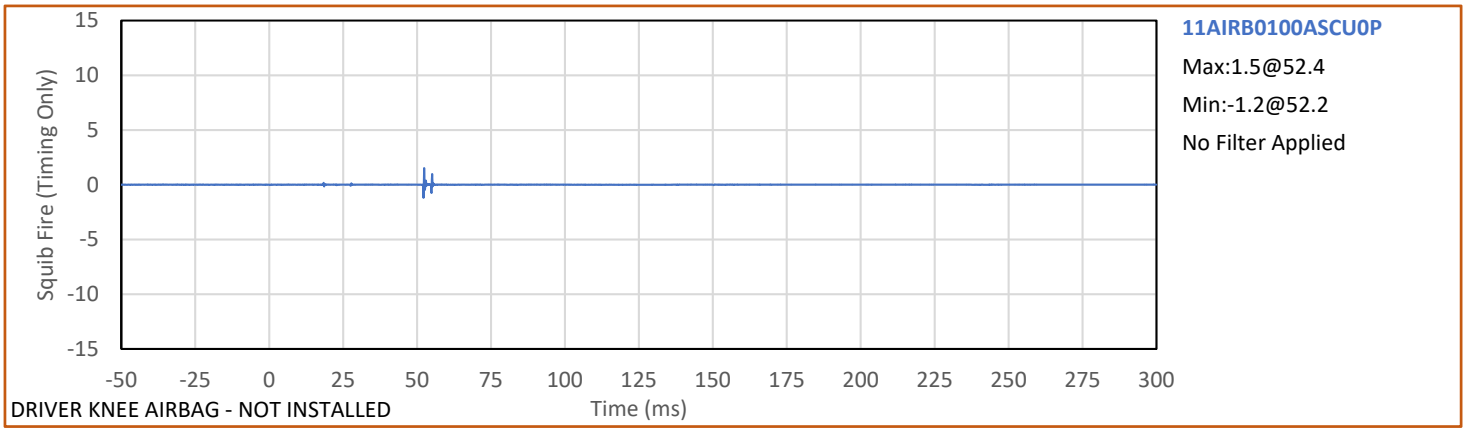
DRIVER SW AIRBAG STAGE 2 - TIME TO FIRE - 19.6 MS



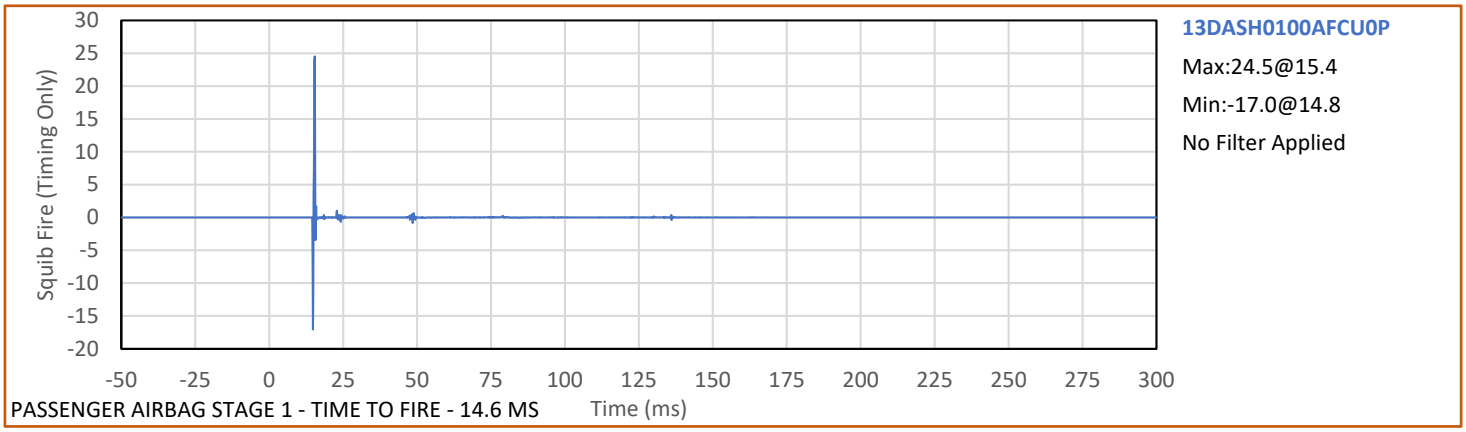
DRIVER CURTAIN AIRBAG - TIME TO FIRE - DID NOT FIRE



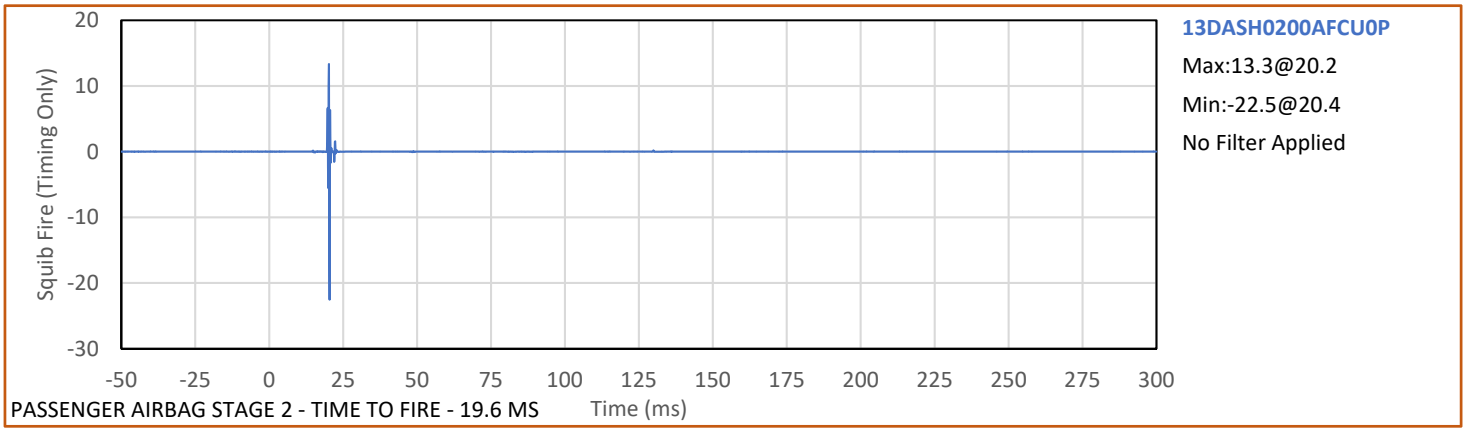
DRIVER SEAT AIRBAG - TIME TO FIRE - DID NOT FIRE



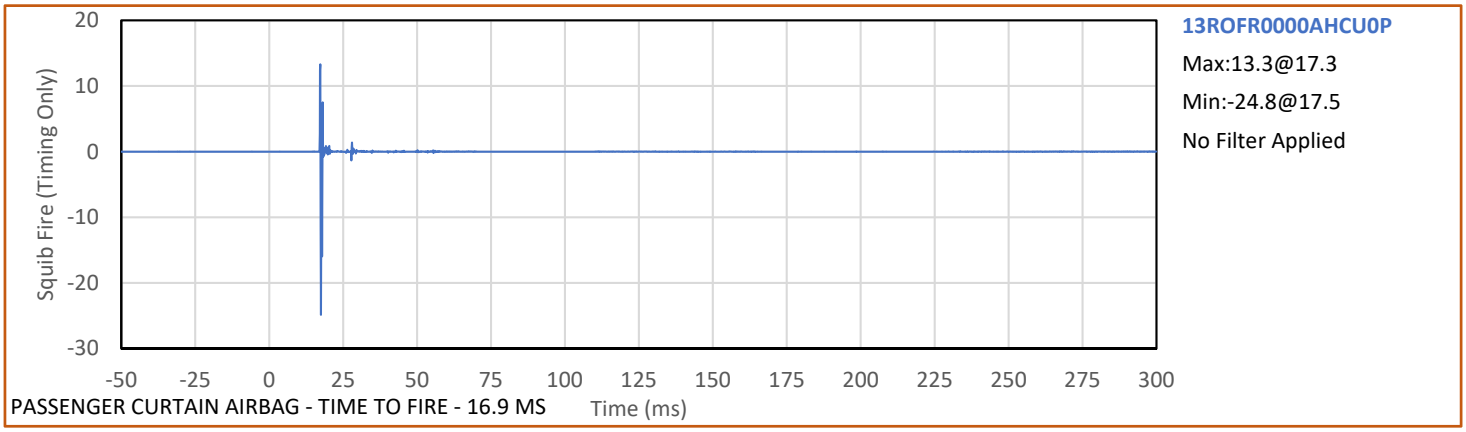
DRIVER KNEE AIRBAG - NOT INSTALLED



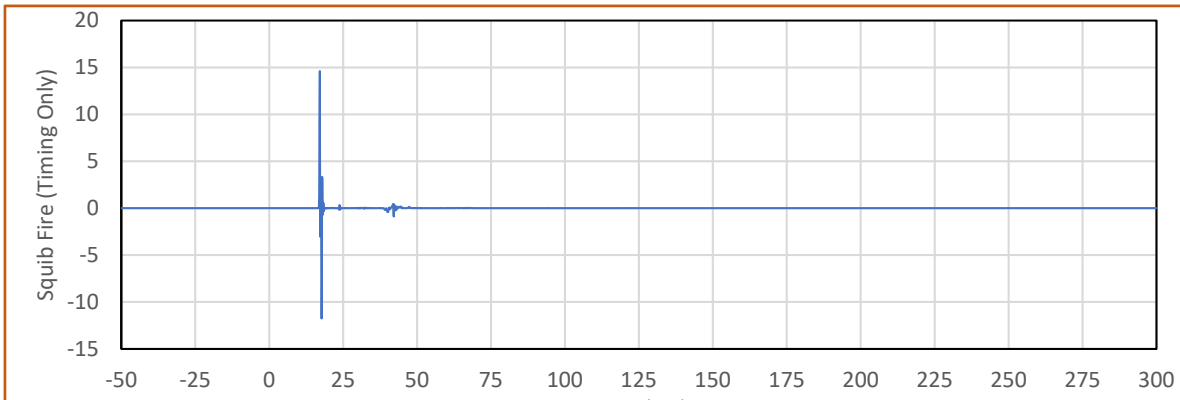
PASSENGER AIRBAG STAGE 1 - TIME TO FIRE - 14.6 MS



PASSENGER AIRBAG STAGE 2 - TIME TO FIRE - 19.6 MS

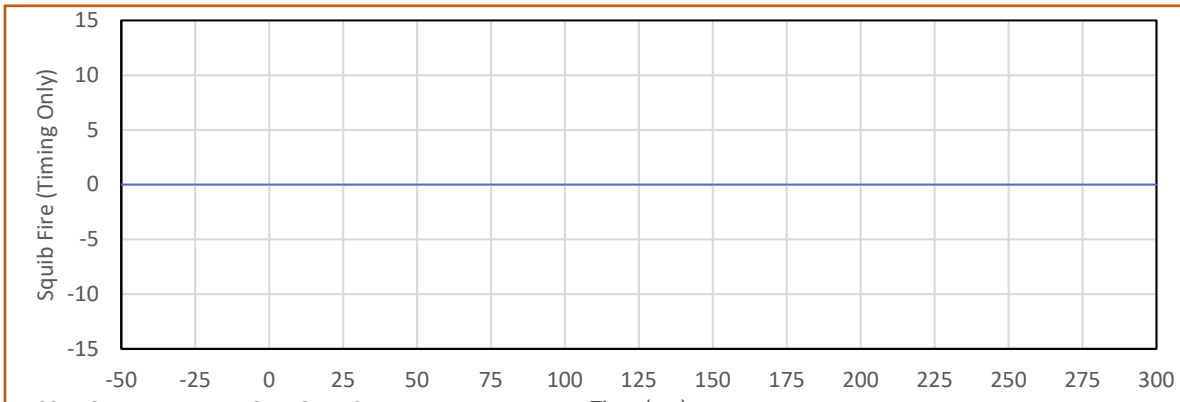


PASSENGER CURTAIN AIRBAG - TIME TO FIRE - 16.9 MS



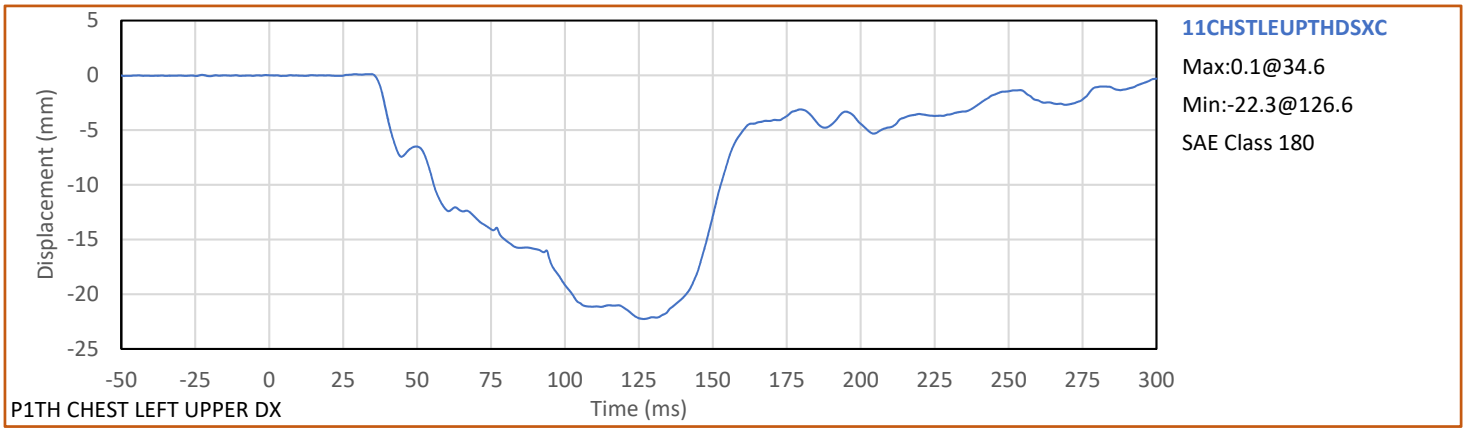
13SEBA0000ASCU0P
Max:14.6@17.1
Min:-11.8@17.7
No Filter Applied

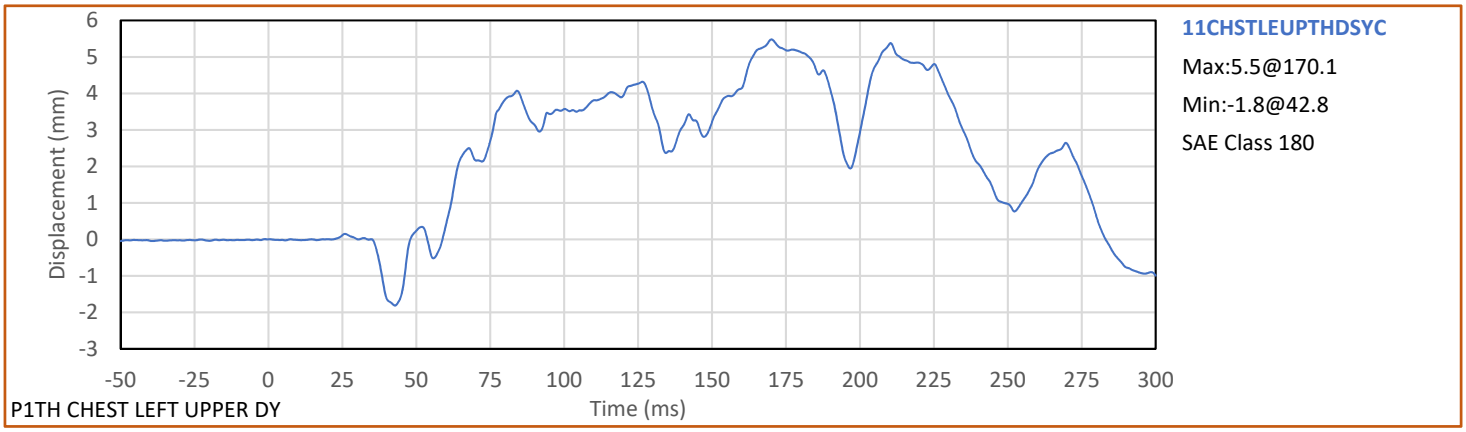
PASSENGER SEAT AIRBAG - TIME TO FIRE - 16.9 MS

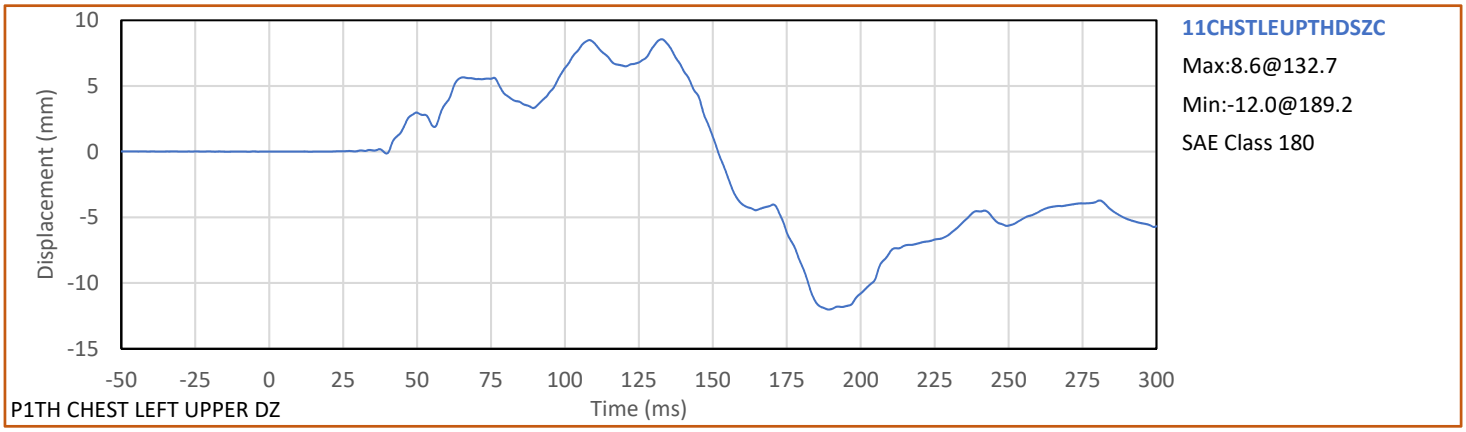


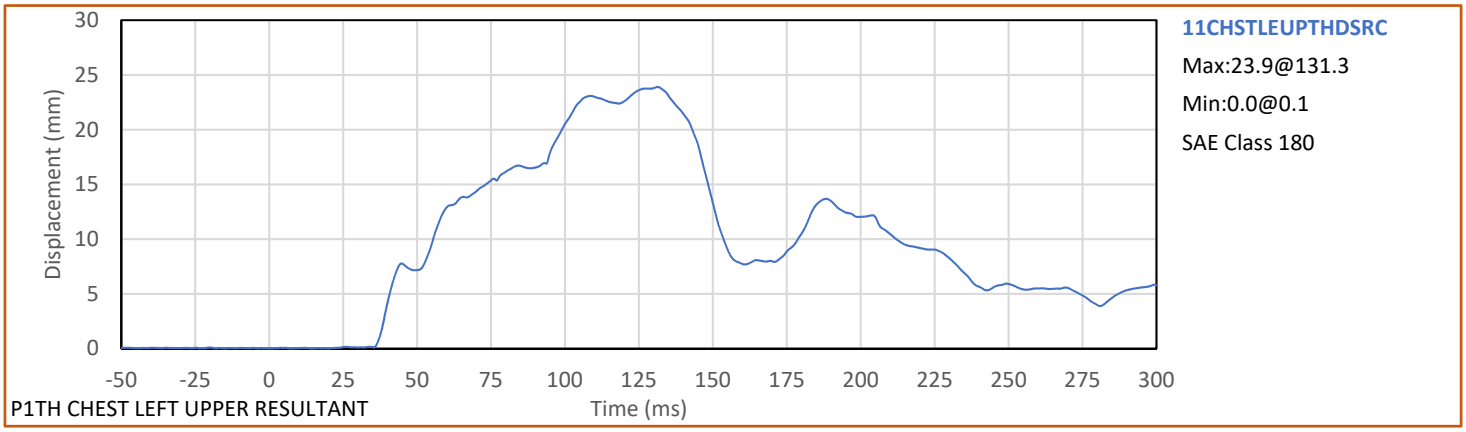
13AIRB0100ASCU0P
Max:0.00@0.1
Min:0.00@0.1
No Filter Applied

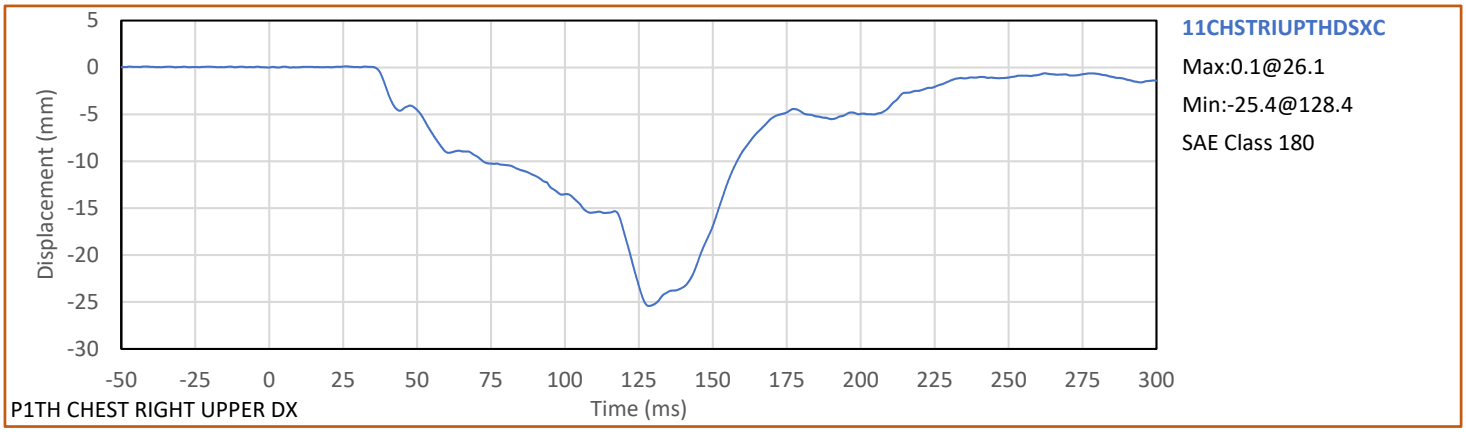
PASSENGER KNEE AIRBAG - NOT INSTALLED

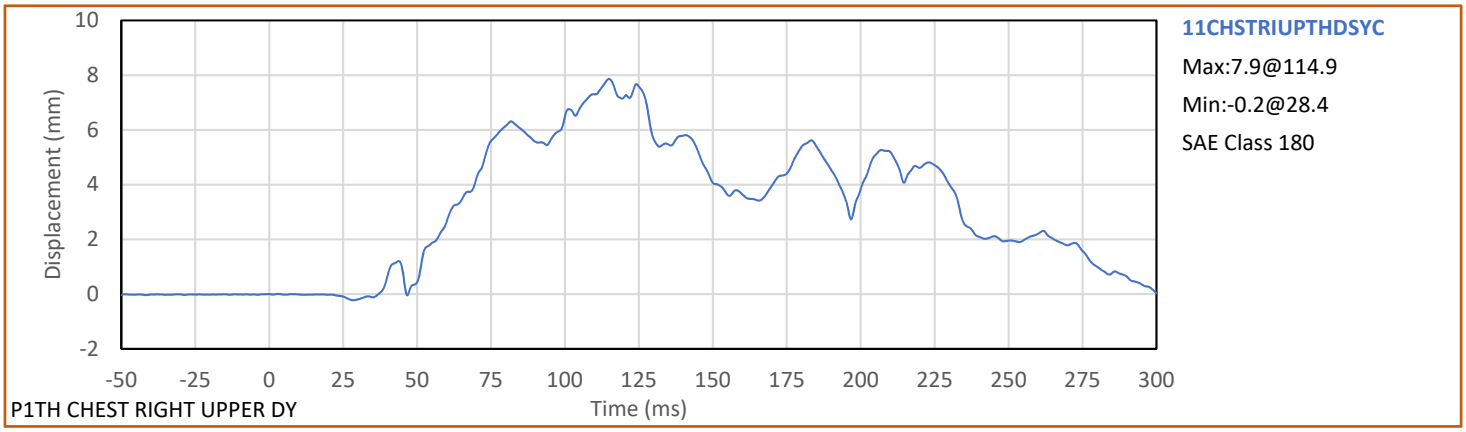

Displacement (mm)
Time (ms)
11CHSTLEUPTHDSXC
Max:0.1@34.6
Min:-22.3@126.6
SAE Class 180
P1TH CHEST LEFT UPPER DX

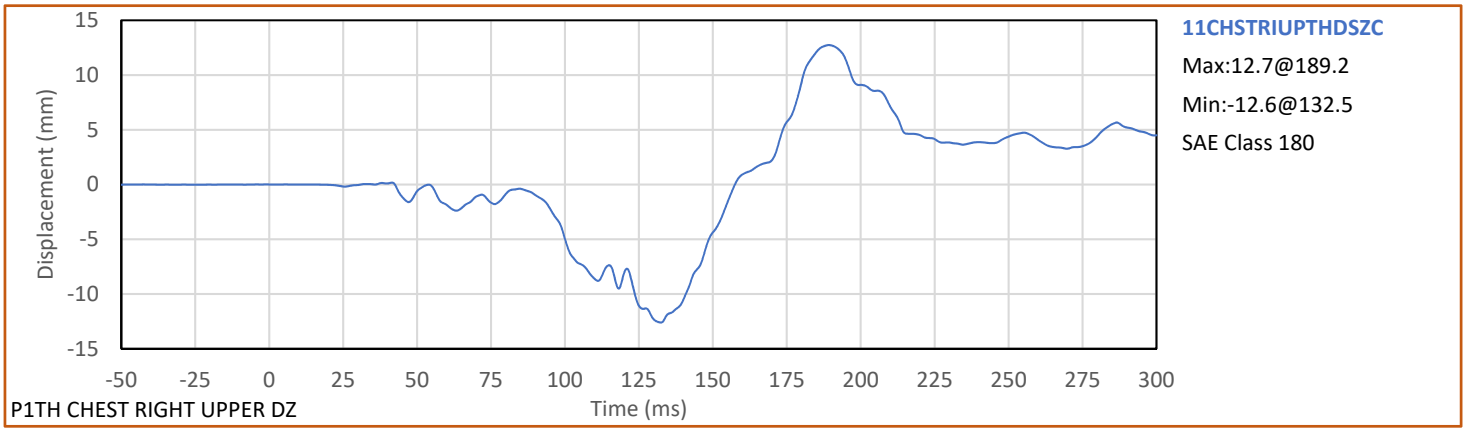

Displacement (mm)
Time (ms)
11CHSTLEUPTHDSYC
Max:5.5@170.1
Min:-1.8@42.8
SAE Class 180
P1TH CHEST LEFT UPPER DY

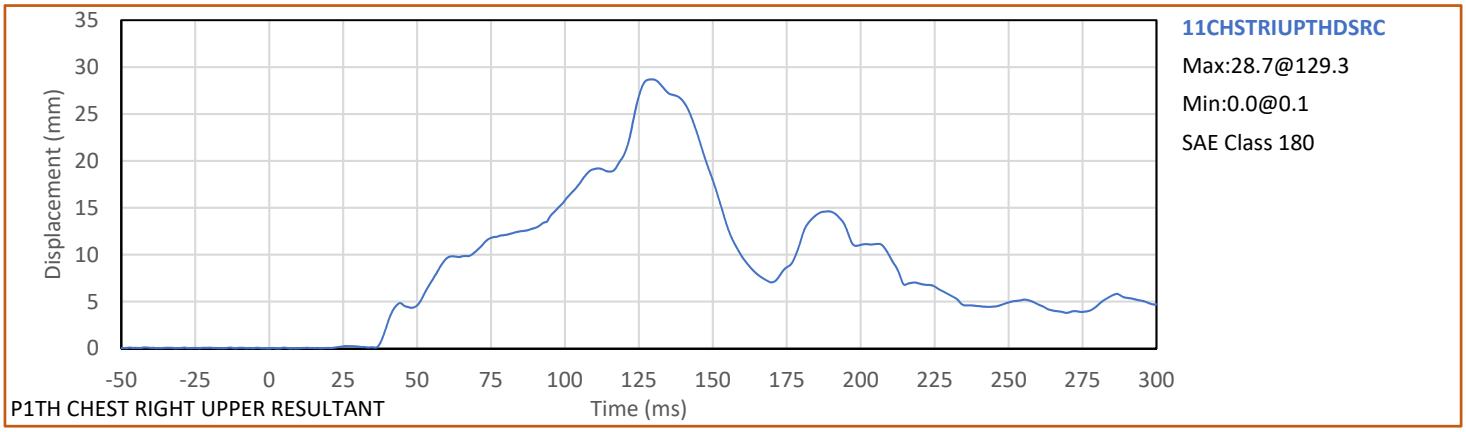

Displacement (mm)
Time (ms)
11CHSTLEUPTHDSZC
Max:8.6@132.7
Min:-12.0@189.2
SAE Class 180
P1TH CHEST LEFT UPPER DZ

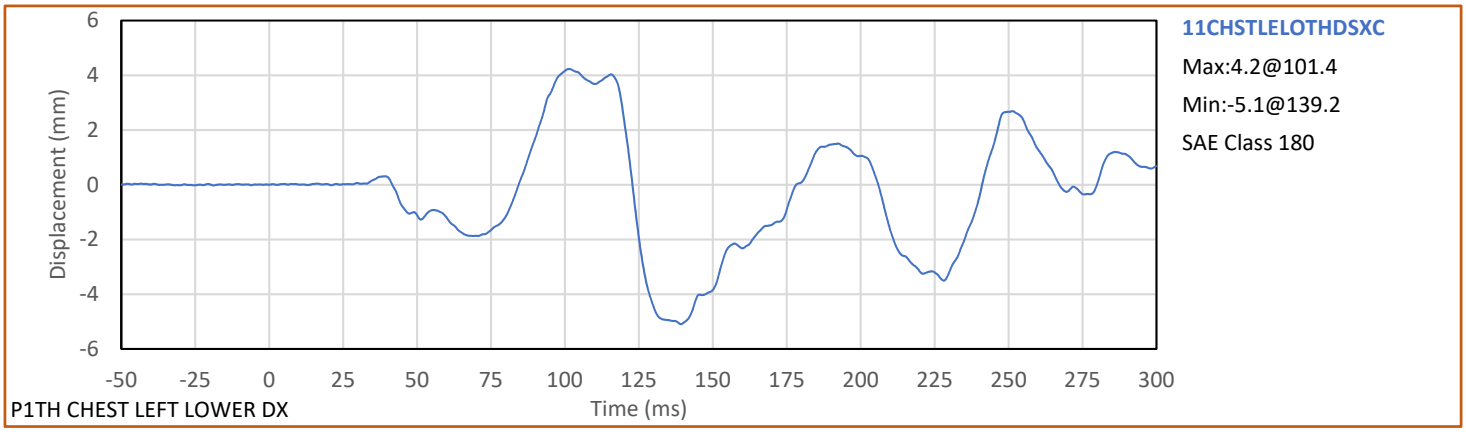

Displacement (mm)
Time (ms)
11CHSTLEUPTHDSRC
Max:23.9@131.3
Min:0.0@0.1
SAE Class 180
P1TH CHEST LEFT UPPER RESULTANT

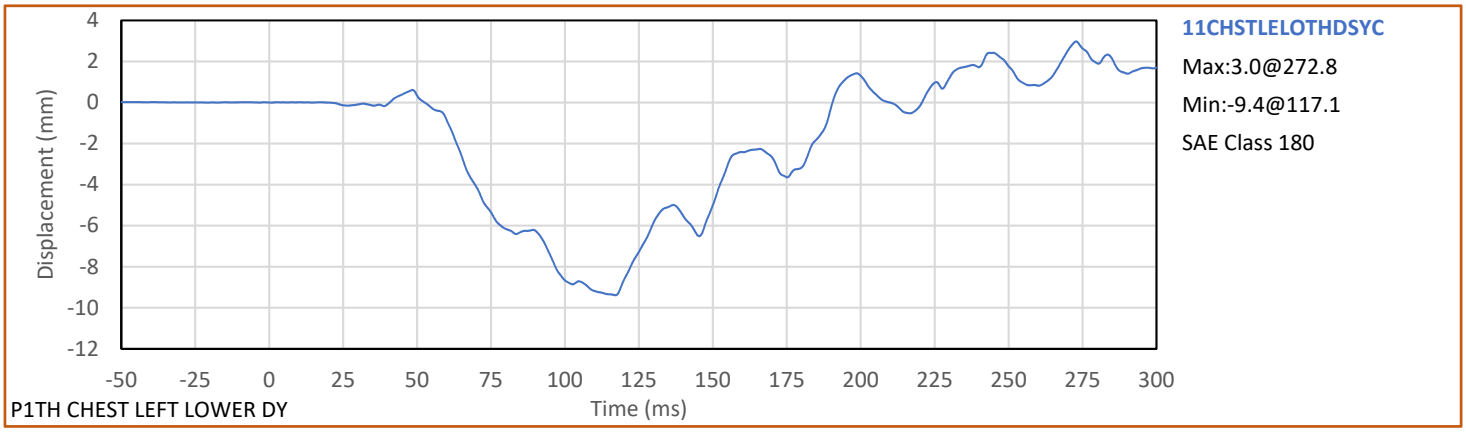

Displacement (mm)
Time (ms)
P1TH CHEST RIGHT UPPER DX
11CHSTRIUPTHDSXC
Max:0.1@26.1
Min:-25.4@128.4
SAE Class 180

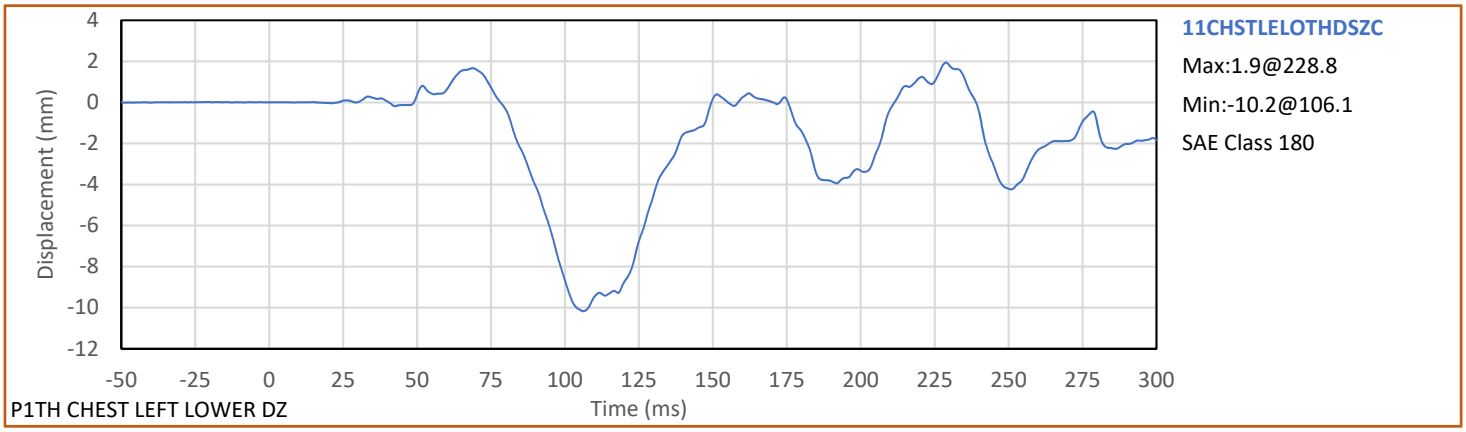

Displacement (mm)
Time (ms)
P1TH CHEST RIGHT UPPER DY
11CHSTRIUPTHDSYC
Max:7.9@114.9
Min:-0.2@28.4
SAE Class 180

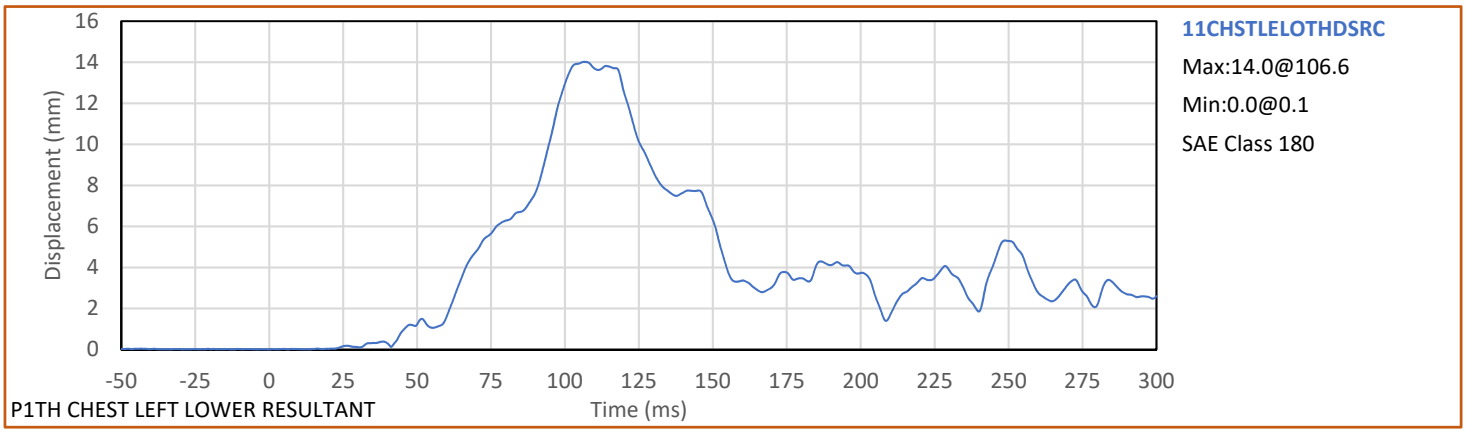

Displacement (mm)
Time (ms)
P1TH CHEST RIGHT UPPER DZ
11CHSTRIUPTHDSZC
Max:12.7@189.2
Min:-12.6@132.5
SAE Class 180

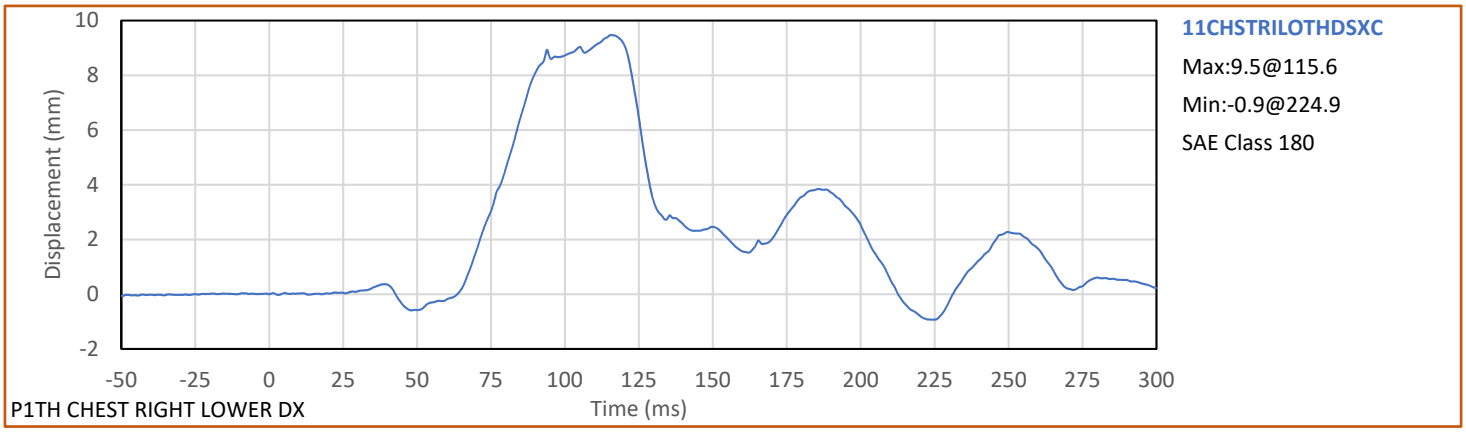

Displacement (mm)
Time (ms)
P1TH CHEST RIGHT UPPER RESULTANT
11CHSTRIUPTHDSRC
Max:28.7@129.3
Min:0.0@0.1
SAE Class 180

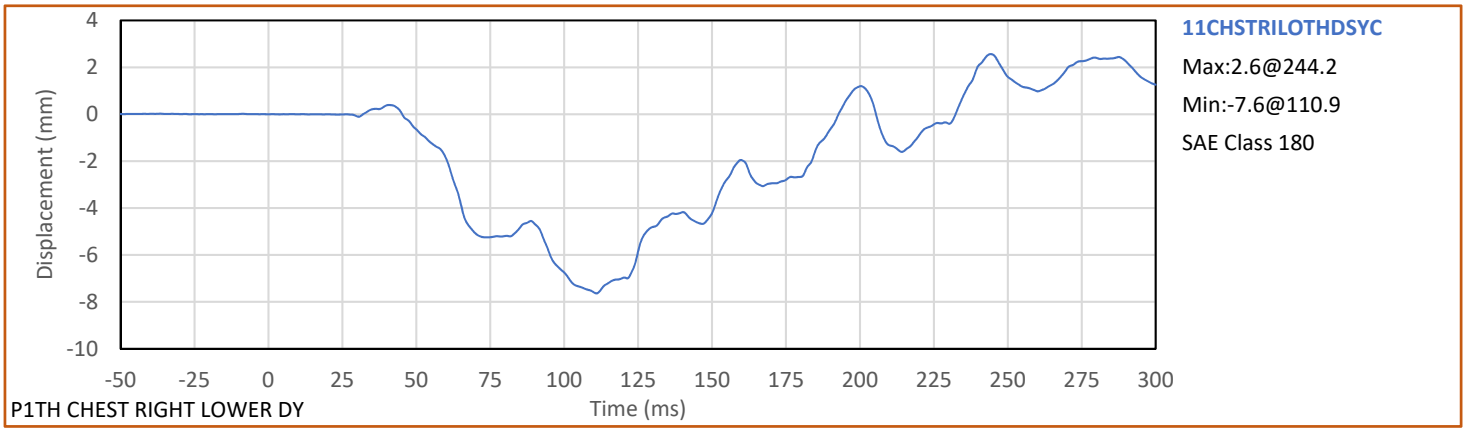

Displacement (mm)
Time (ms)
P1TH CHEST LEFT LOWER DX
11CHSTLELOTHDSXC
Max:4.2@101.4
Min:-5.1@139.2
SAE Class 180

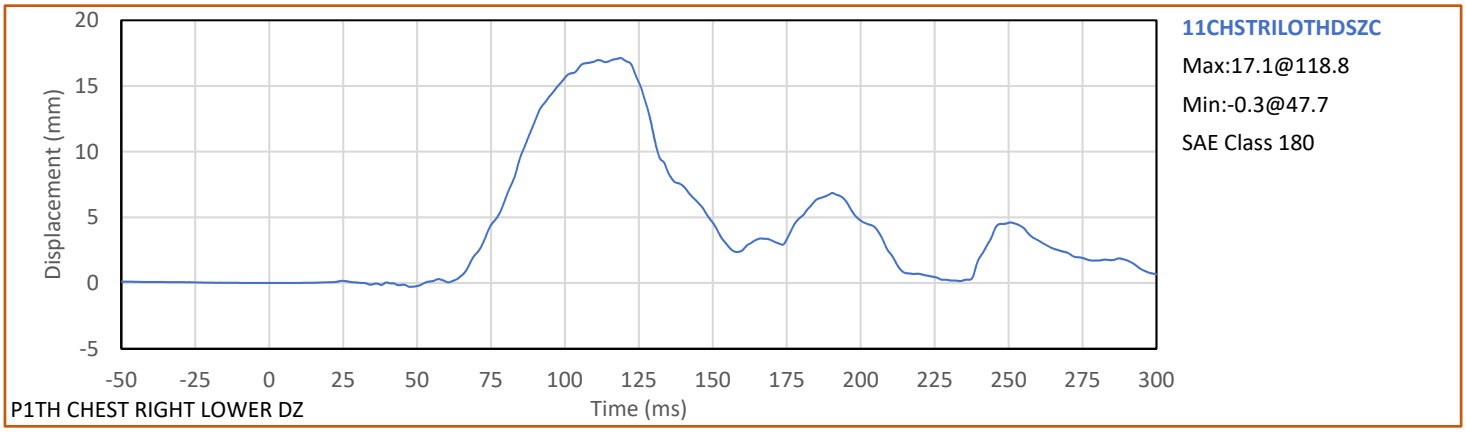

Displacement (mm)
Time (ms)
P1TH CHEST LEFT LOWER DY
11CHSTLELOTHDSYC
Max:3.0@272.8
Min:-9.4@117.1
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST LEFT LOWER DZ
11CHSTLELOTHDSZC
Max:1.9@228.8
Min:-10.2@106.1
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST LEFT LOWER RESULTANT
11CHSTLELOTHDSRC
Max:14.0@106.6
Min:0.0@0.1
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST RIGHT LOWER DX
11CHSTRILOTHDSXC
Max:9.5@115.6
Min:-0.9@224.9
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST RIGHT LOWER DY
11CHSTRILOTHDSYC
Max:2.6@244.2
Min:-7.6@110.9
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST RIGHT LOWER DZ
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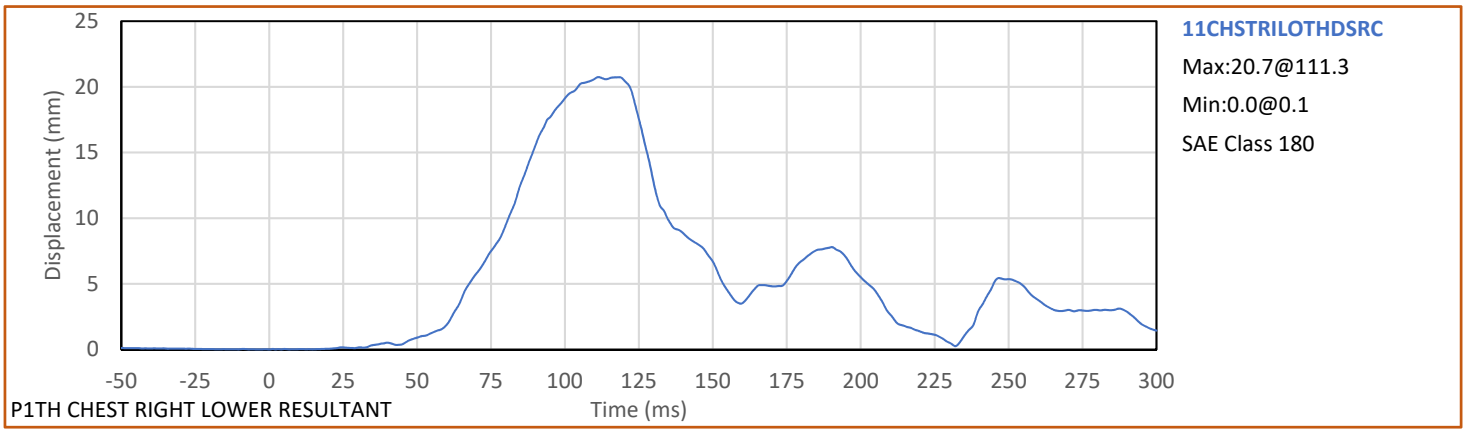
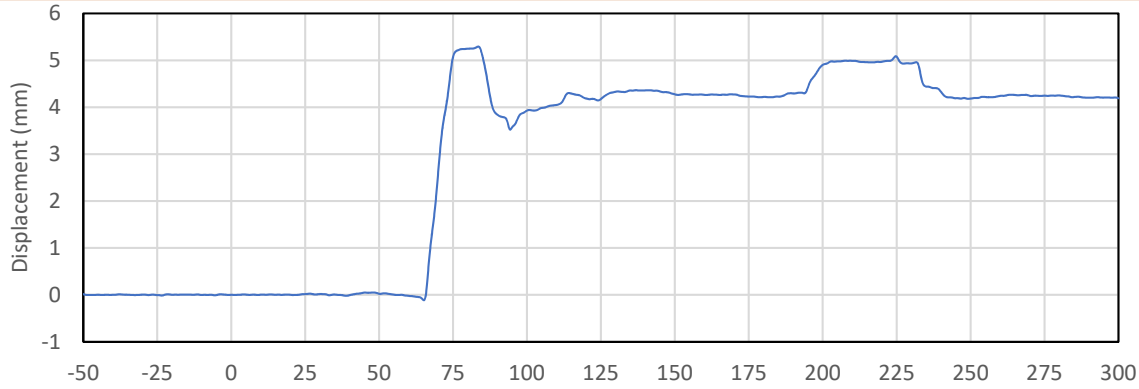
Max:17.1@118.8
Min:-0.3@47.7
SAE Class 180


Displacement (mm)
Time (ms)
P1TH CHEST RIGHT LOWER RESULTANT
11CHSTRILOTHDSRC
Max:20.7@111.3
Min:0.0@0.1
SAE Class 180

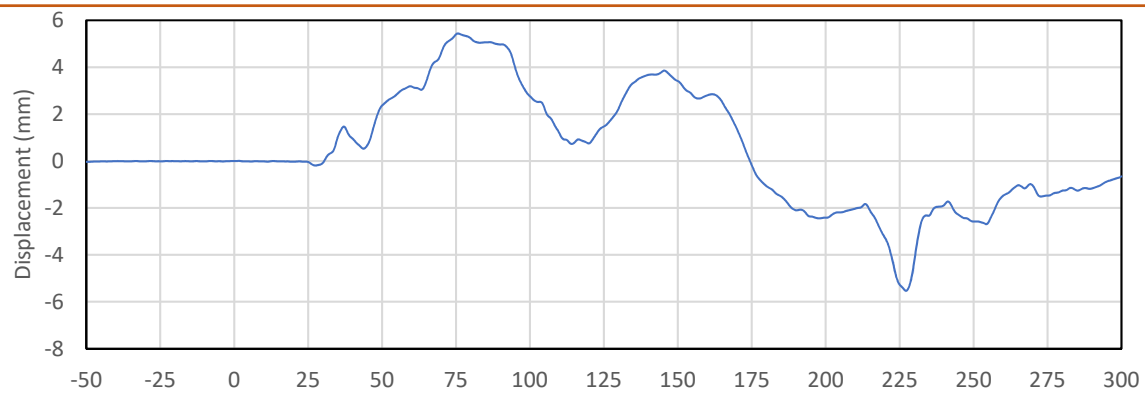
P1TH ABDOMEN LEFT LOWER DX

11ABDOLE00THDSXC
Max:9.2@94.3
Min:-5.5@134.0
SAE Class 180



P1TH ABDOMEN LEFT LOWER DY

11ABDOLE00THDSYC
Max:5.3@83.6
Min:-0.1@65.1
SAE Class 180



P1TH ABDOMEN LEFT LOWER DZ

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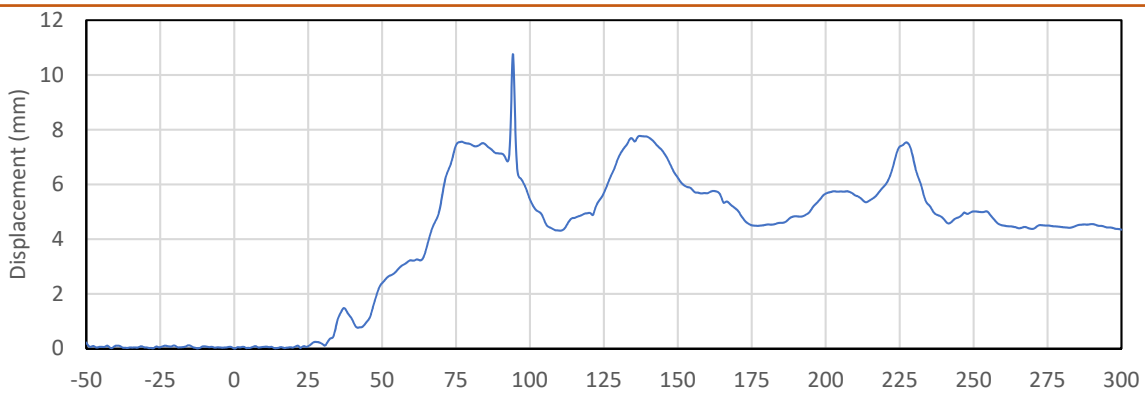
Max:5.4@75.6
Min:-5.5@227.2
SAE Class 180



P1TH ABDOMEN LEFT LOWER RESULTANT

11ABDOLE00THDSRC
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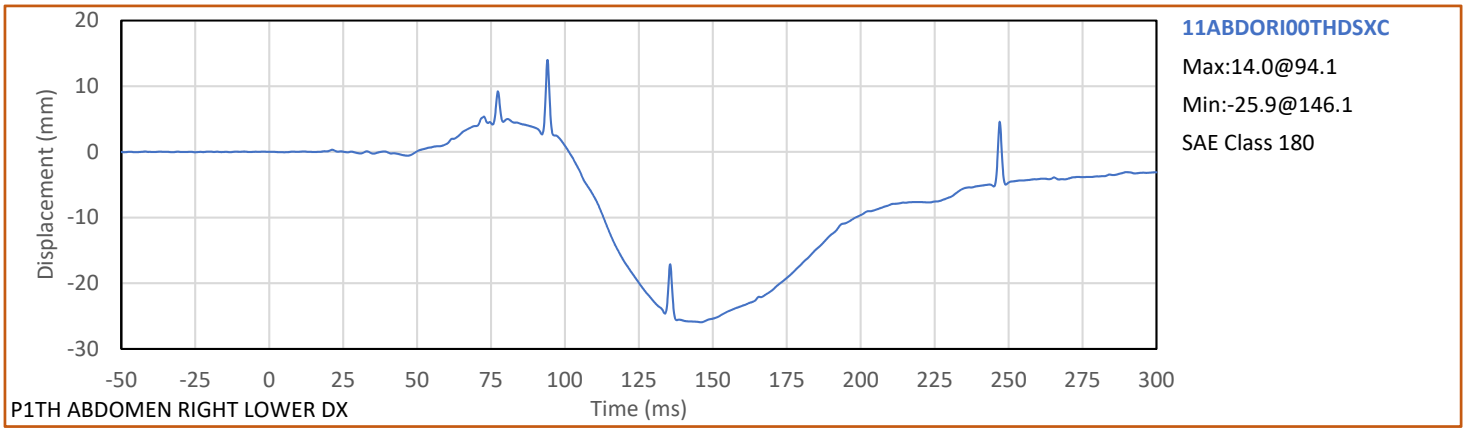
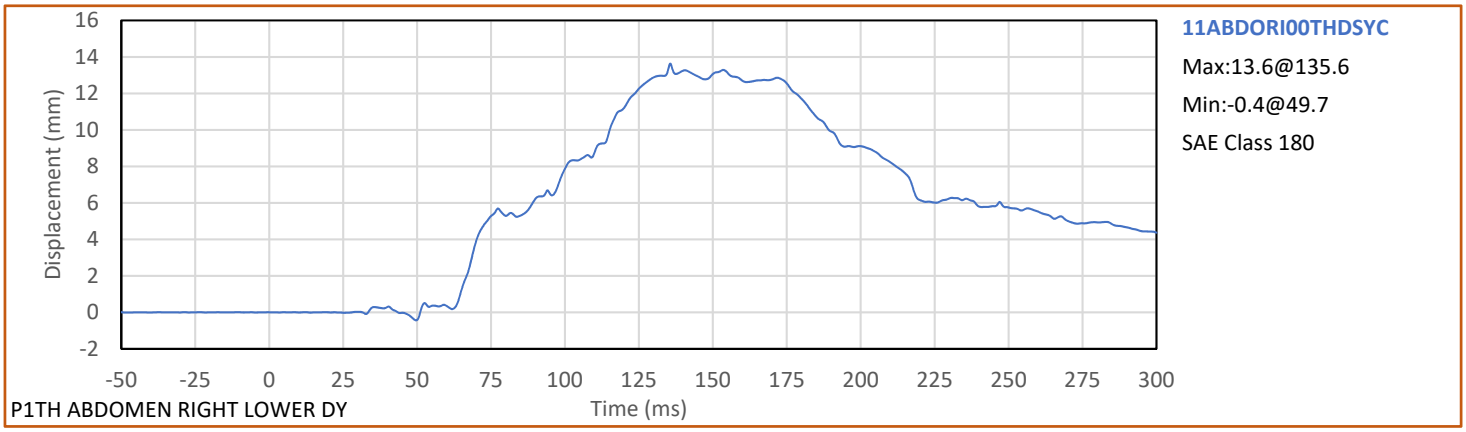
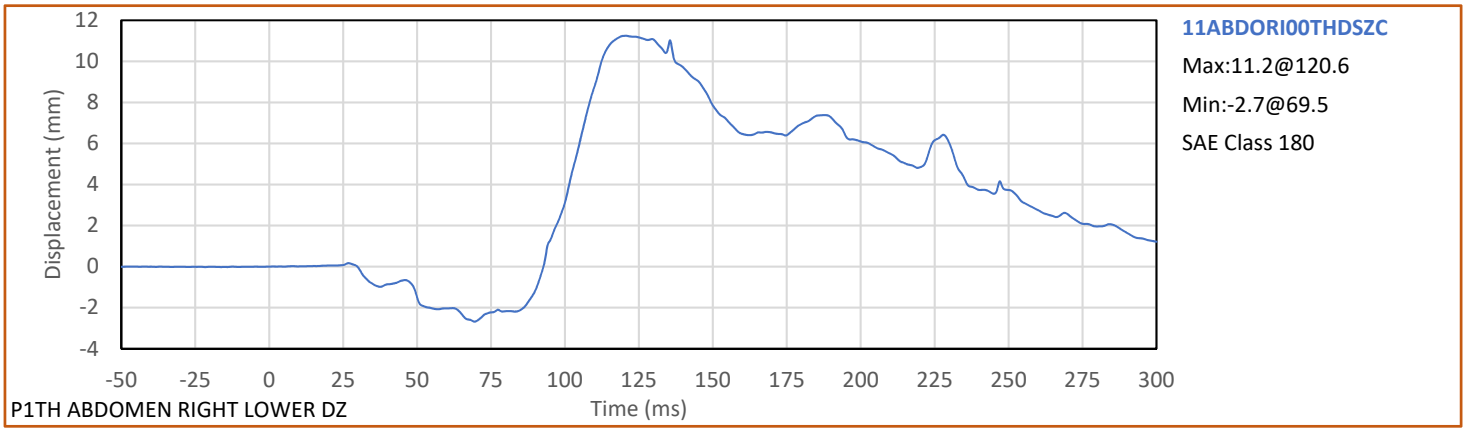
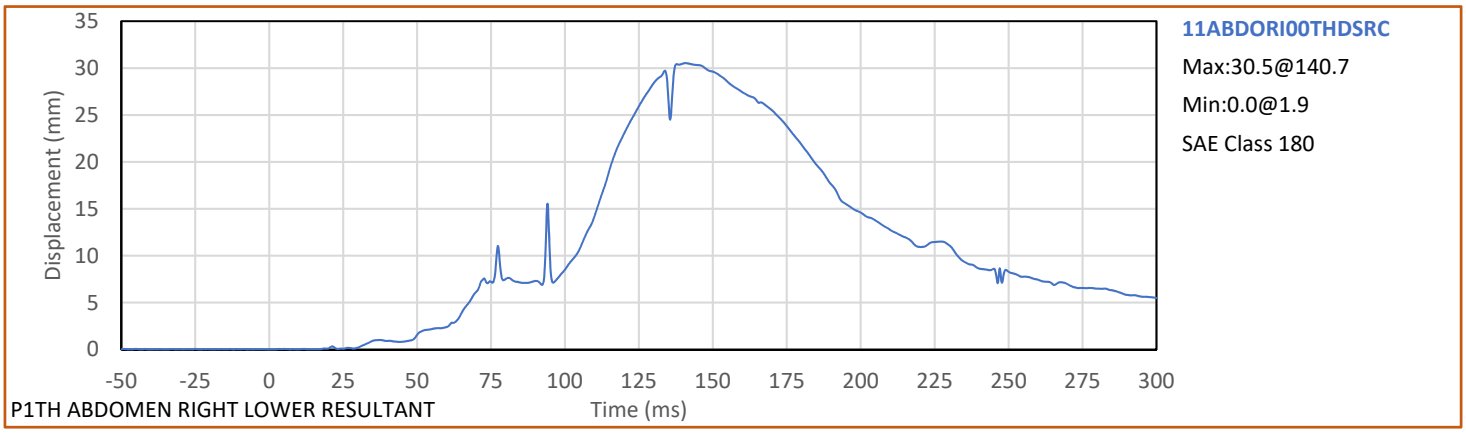
Min:0.0@0.1
SAE Class 180


Displacement (mm)
Time (ms)
P1TH ABDOMEN RIGHT LOWER DX
11ABDORI00THDSXC
Max:14.0@94.1
Min:-25.9@146.1
SAE Class 180


Displacement (mm)
Time (ms)
P1TH ABDOMEN RIGHT LOWER DY
11ABDORI00THDSYC
Max:13.6@135.6
Min:-0.4@49.7
SAE Class 180


Displacement (mm)
Time (ms)
P1TH ABDOMEN RIGHT LOWER DZ
11ABDORI00THDSZC
Max:11.2@120.6
Min:-2.7@69.5
SAE Class 180


Displacement (mm)
Time (ms)
P1TH ABDOMEN RIGHT LOWER RESULTANT
11ABDORI00THDSRC
Max:30.5@140.7
Min:0.0@1.9
SAE Class 180

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA SHEETS

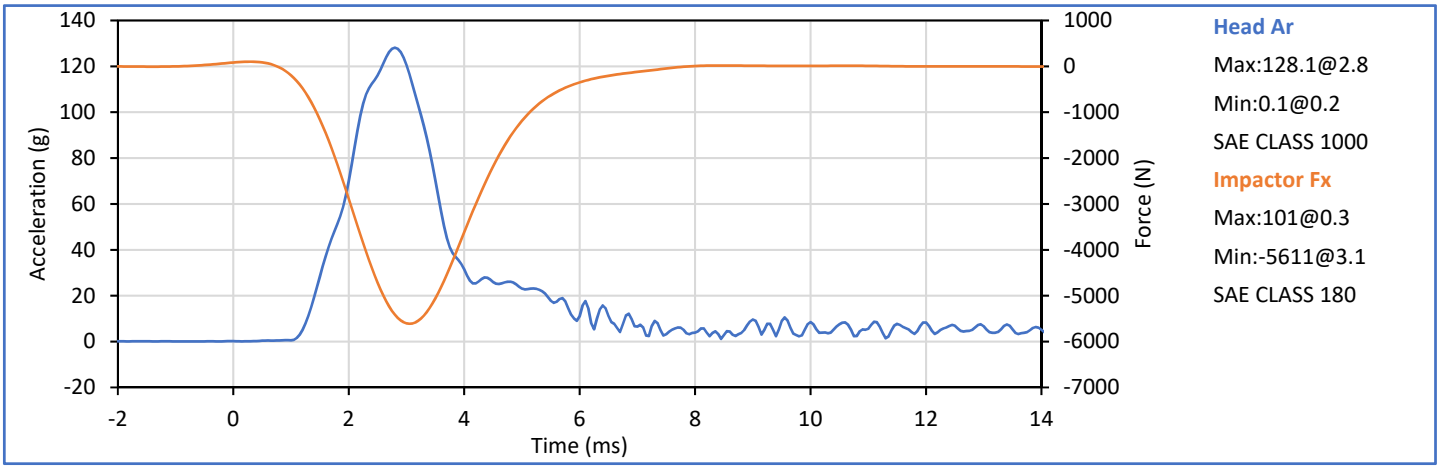
APPENDIX C
Pre-Test ATD Configuration and Performance Verification Data
THOR-50M 50th Percentile Male ATD
S/N: EG2595

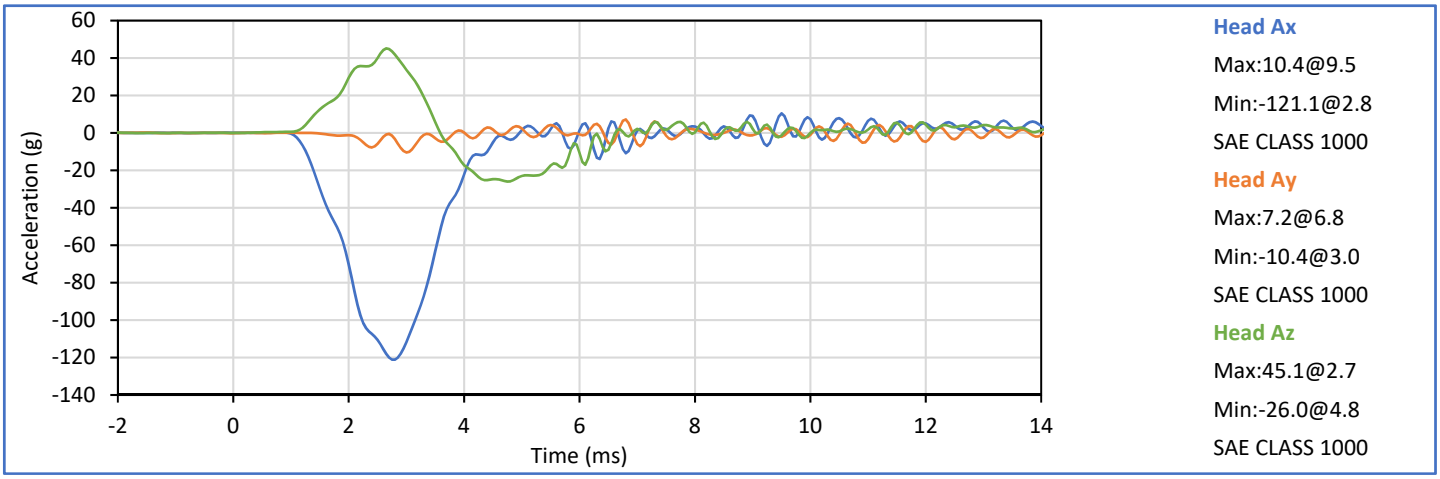
Applus IDIADA
KARCO

THOR-50M 50th Percentile Male ATD
Head Qualification

ATD Serial No.: EG2595 Test Date: 2020-10-14

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	28	Pass
Velocity	m/s	1.95	2.05	1.98	Pass
Peak Probe Force	kN	-6138	-5022	-5611	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	128.1	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

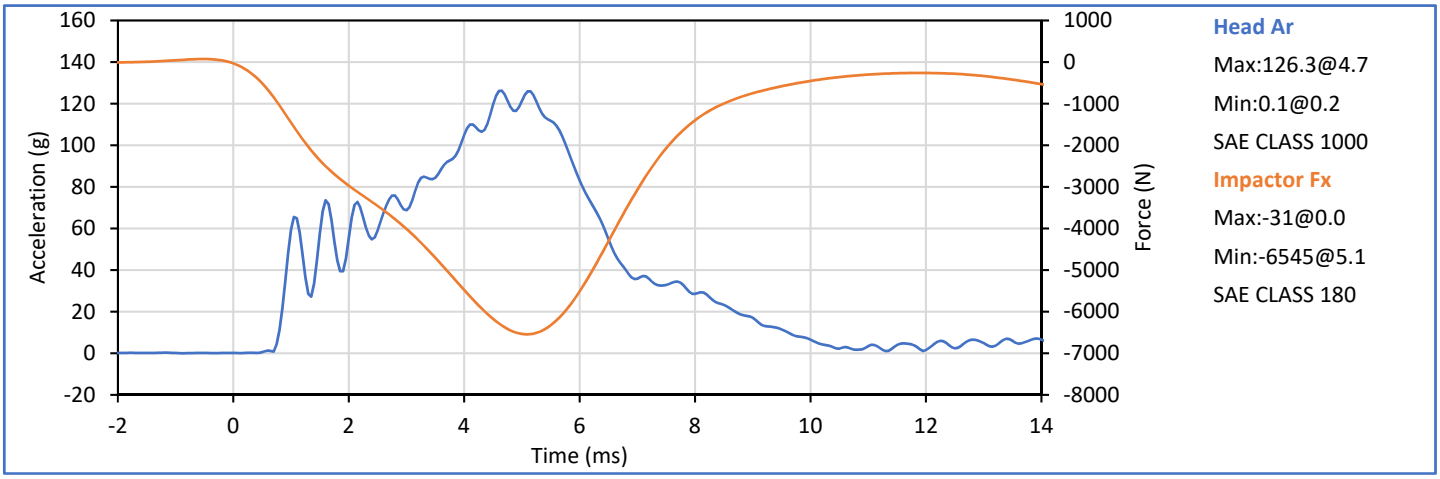
Approved By: P. Puzzuto

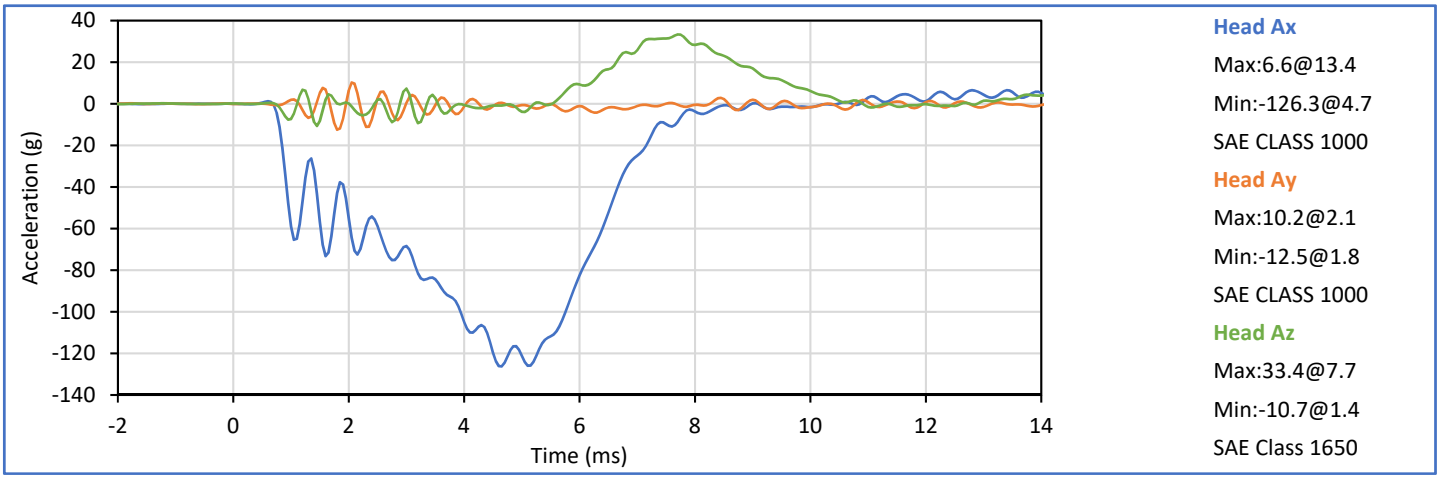
Applus IDIADA
KARCO

THOR-50M 50th Percentile Male ATD
Face Qualification

ATD Serial No.: EG2595 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	26	Pass
Velocity	m/s	6.68	6.78	6.75	Pass
Peak Probe Force	kN	-7796	-6378	-6545	Pass
Peak Head Resultant Acceleration	g	124.0	152.0	126.3	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

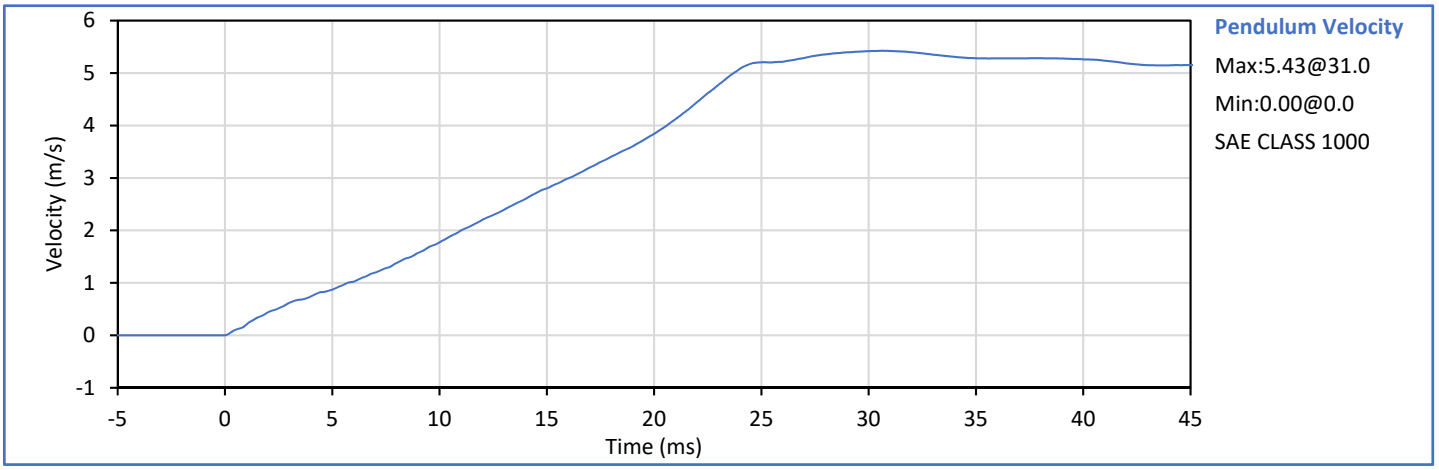
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.8	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	4.95	5.05	5.05	Pass
Pendulum Velocity at 10 ms	m/s	1.71	2.09	1.77	Pass
Pendulum Velocity at 15 ms	m/s	2.57	3.14	2.80	Pass
Pendulum Velocity at 20 ms	m/s	3.46	4.23	3.84	Pass
Pendulum Velocity at 25 ms	m/s	4.27	5.22	5.21	Pass
Peak Upper Neck Mz	Nm	37.3	45.6	43.9	Pass
Peak Head Wz	deg/s	1251	1529	1362	Pass
Peak Neck Fixture Rotation	deg	43.1	52.7	45.7	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



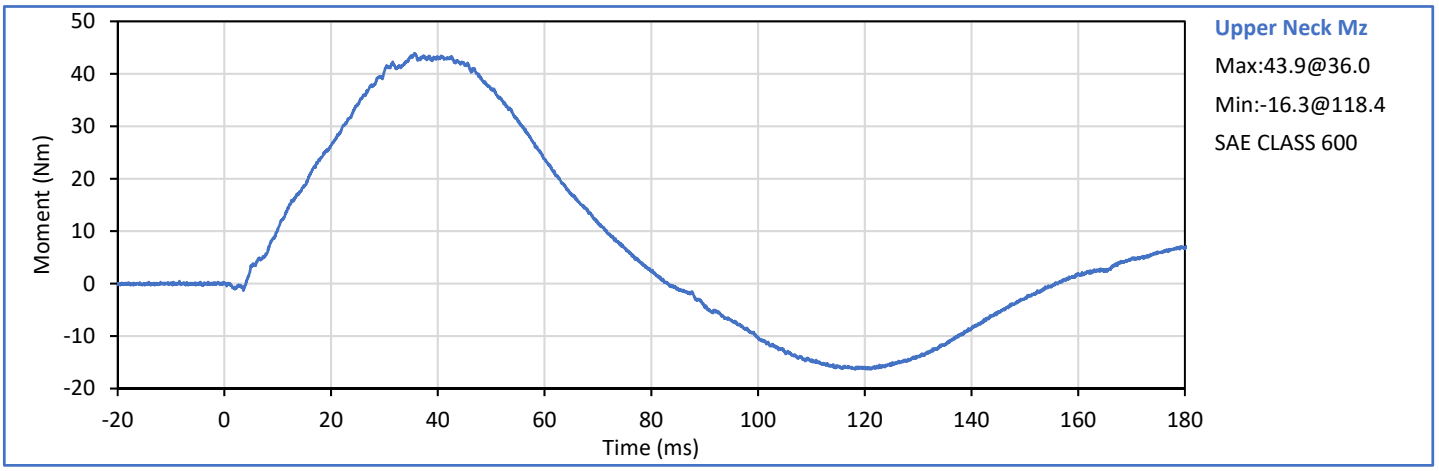
Technician: J. Hernandez

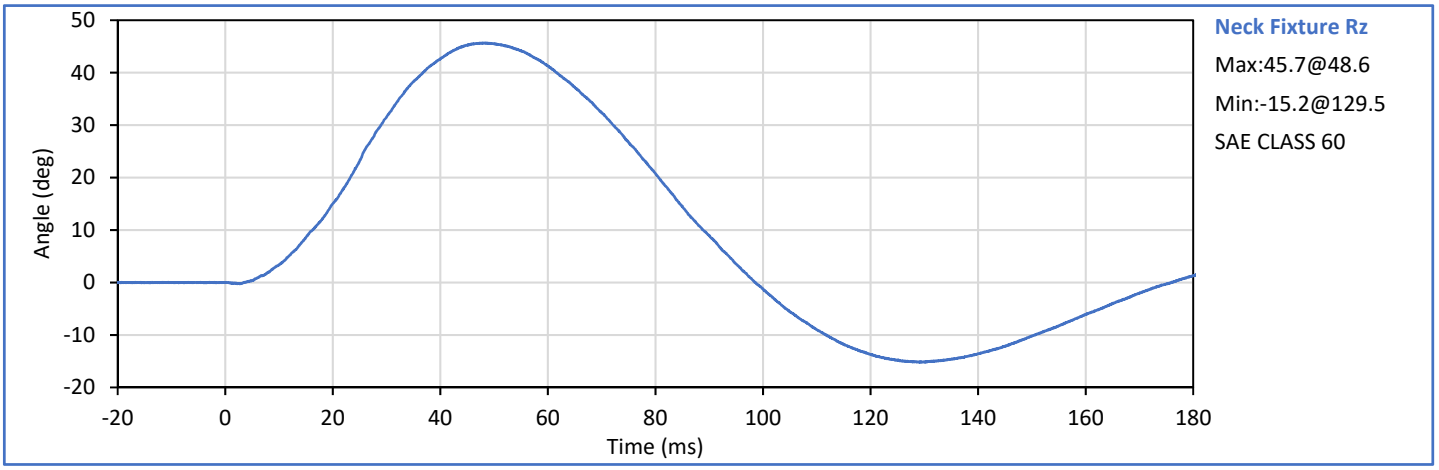
Approved By: P. Puzzuto

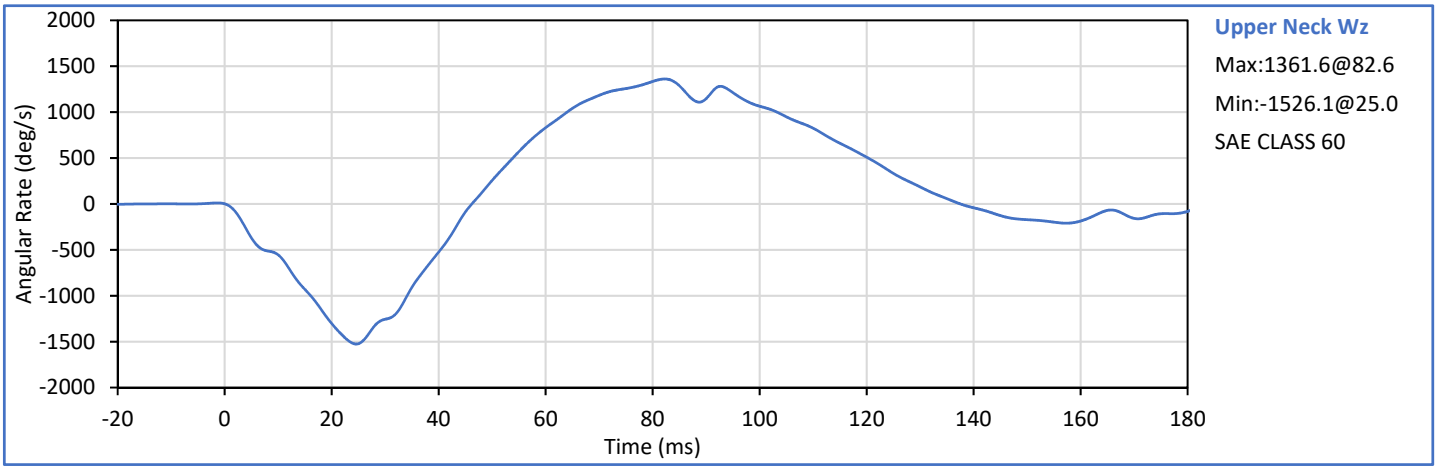
Applus IDIADA
KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-25







Technician: J. Hernandez

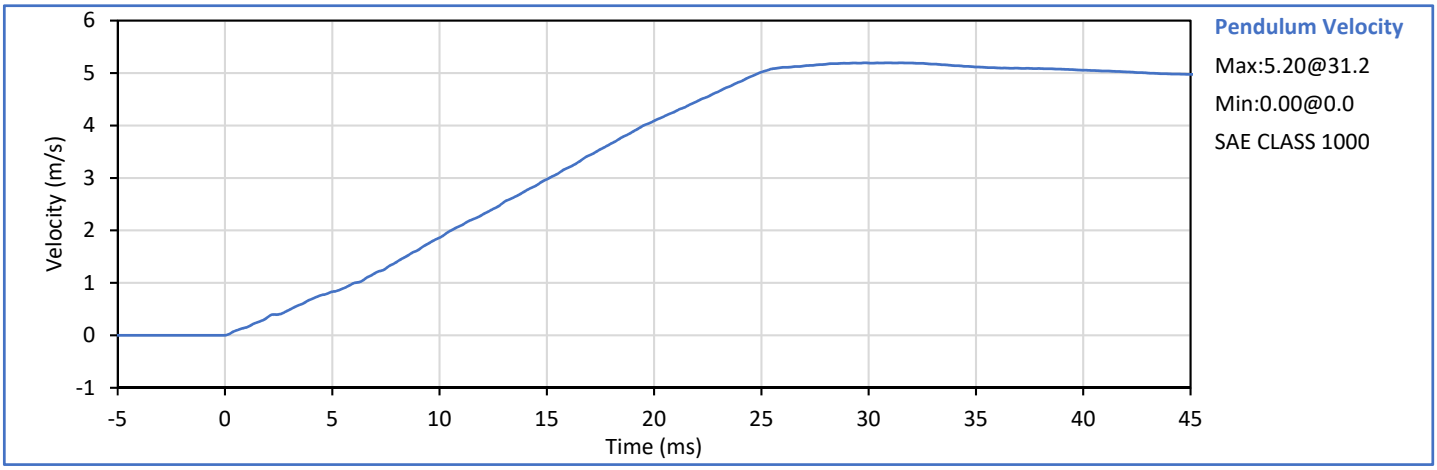
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.8	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	4.95	5.05	5.04	Pass
Pendulum Velocity at 10 ms	m/s	1.71	2.09	1.86	Pass
Pendulum Velocity at 15 ms	m/s	2.57	3.14	2.97	Pass
Pendulum Velocity at 20 ms	m/s	3.46	4.23	4.09	Pass
Pendulum Velocity at 25 ms	m/s	4.27	5.22	5.02	Pass
Peak Upper Neck Mz	Nm	-45.6	-37.3	-41.3	Pass
Peak Head Wz	deg/s	-1529	-1251	-1297	Pass
Peak Neck Fixture Rotation	deg	-52.7	-43.1	-49.0	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



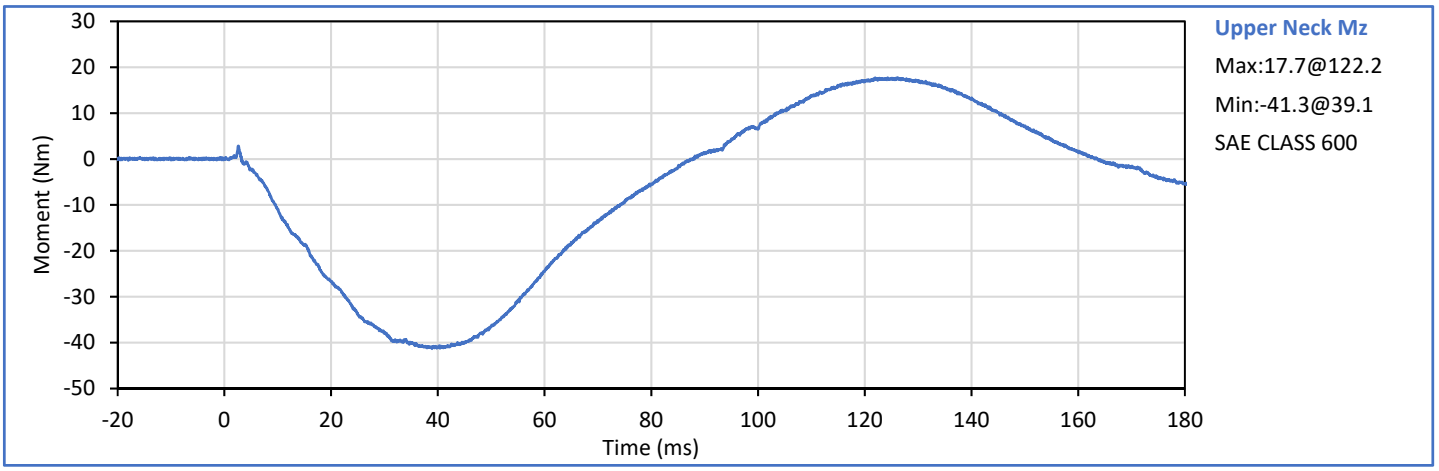
Technician: J. Hernandez

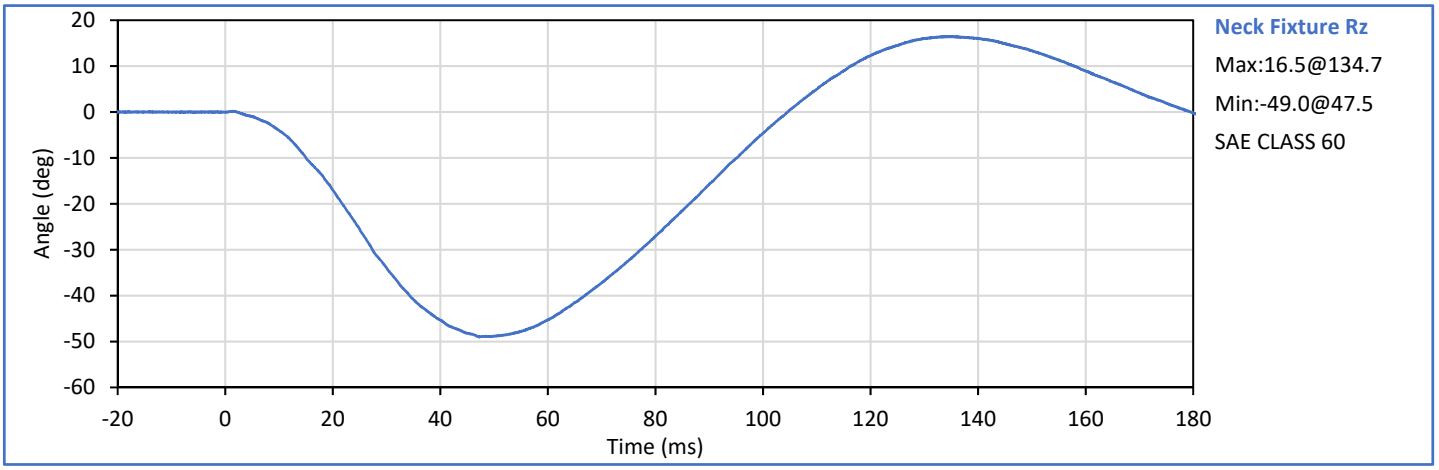
Approved By: P. Puzzuto

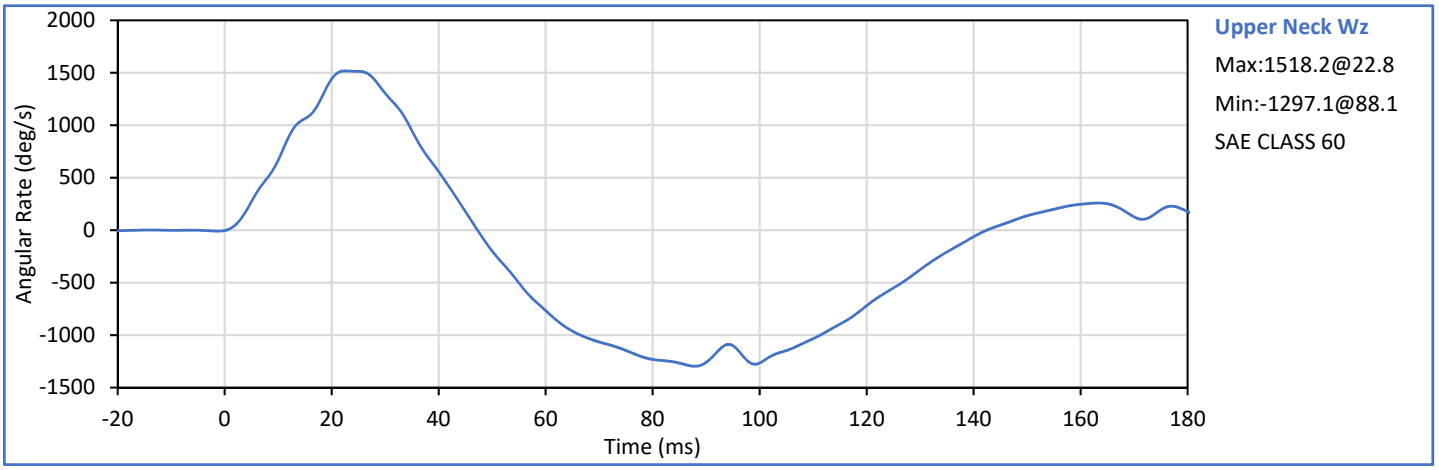
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-25







Technician: J. Hernandez

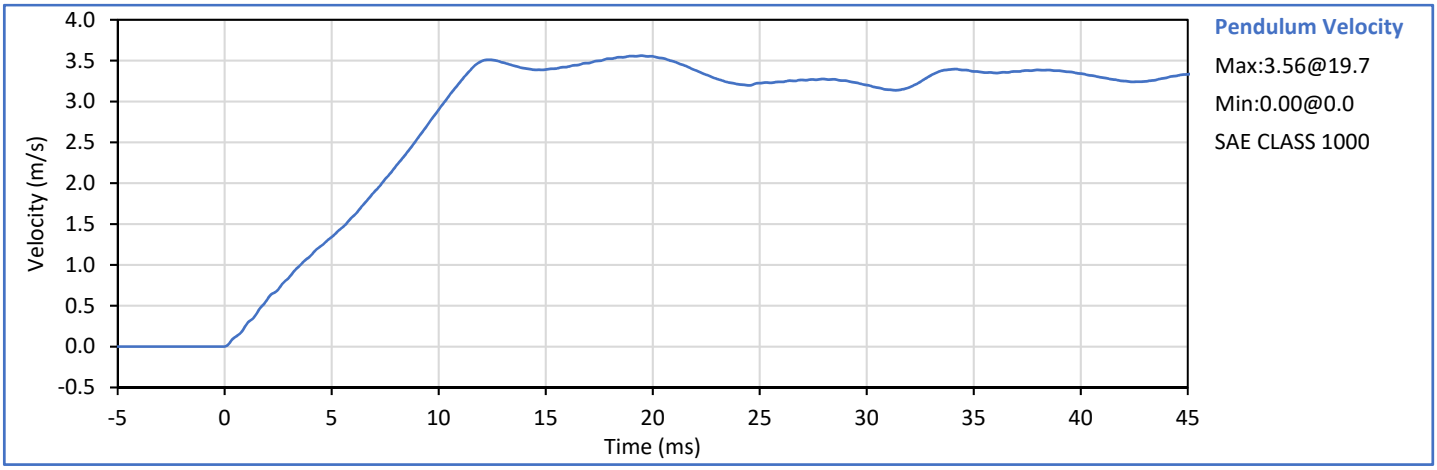
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	3.35	3.45	3.43	Pass
Pendulum Velocity at 4 ms	m/s	1.06	1.30	1.11	Pass
Pendulum Velocity at 8 ms	m/s	2.09	2.55	2.21	Pass
Pendulum Velocity at 12 ms	m/s	3.16	3.86	3.49	Pass
Peak Upper Neck Mx after 40 ms	Nm	44.8	54.7	51.3	Pass
Peak Head Wx	deg/s	-1498	-1226	-1306	Pass
Peak Head Relative Rotation	deg	-45.9	-37.6	-38.2	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



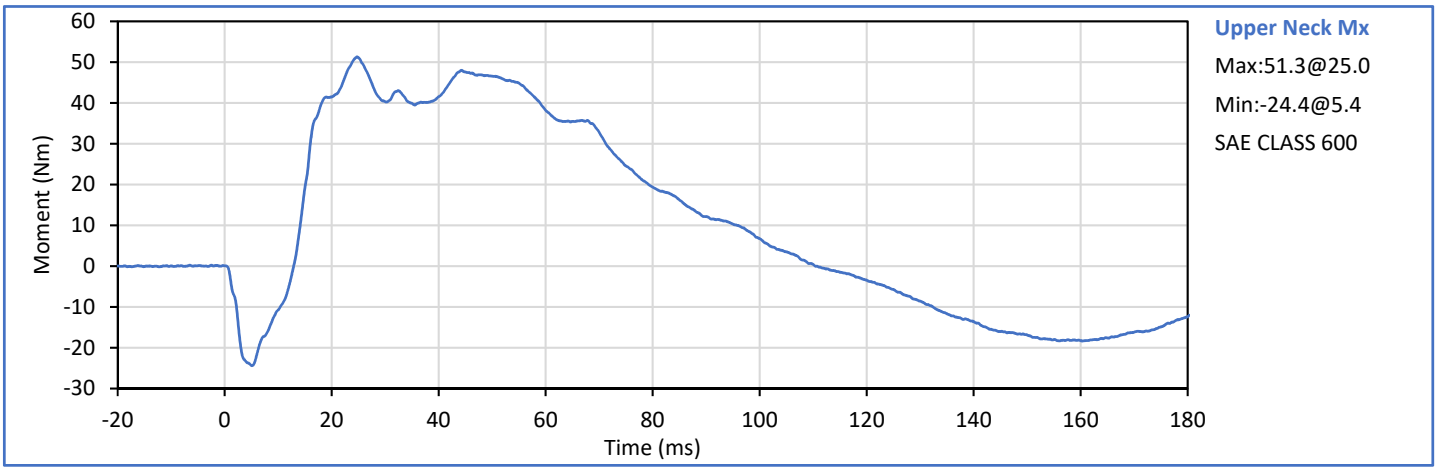
Technician: J. Hernandez

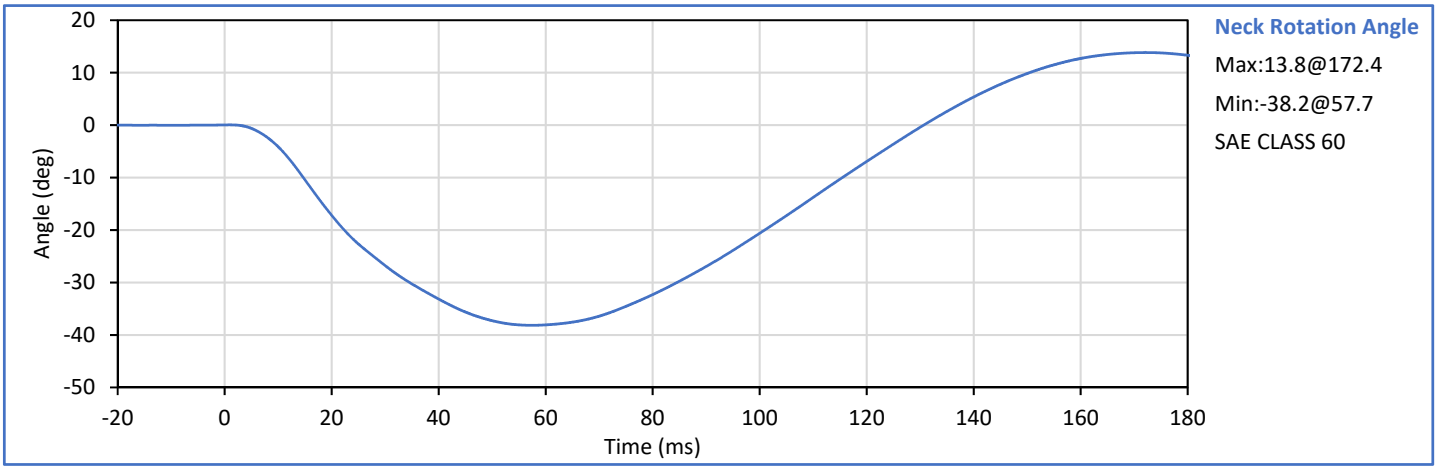
Approved By: P. Puzzuto

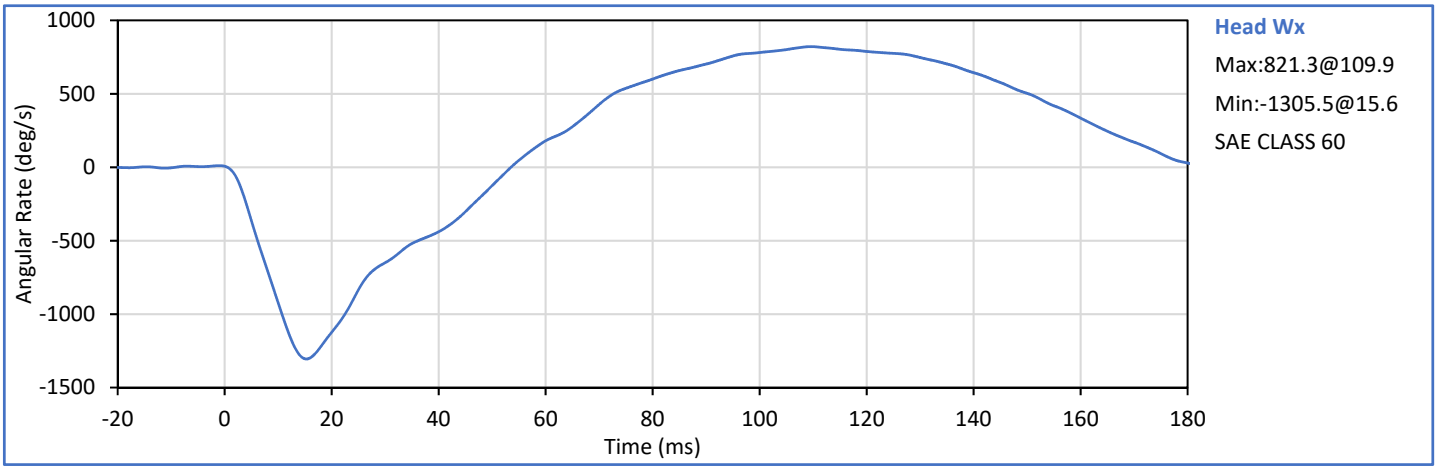
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24







Technician: J. Hernandez

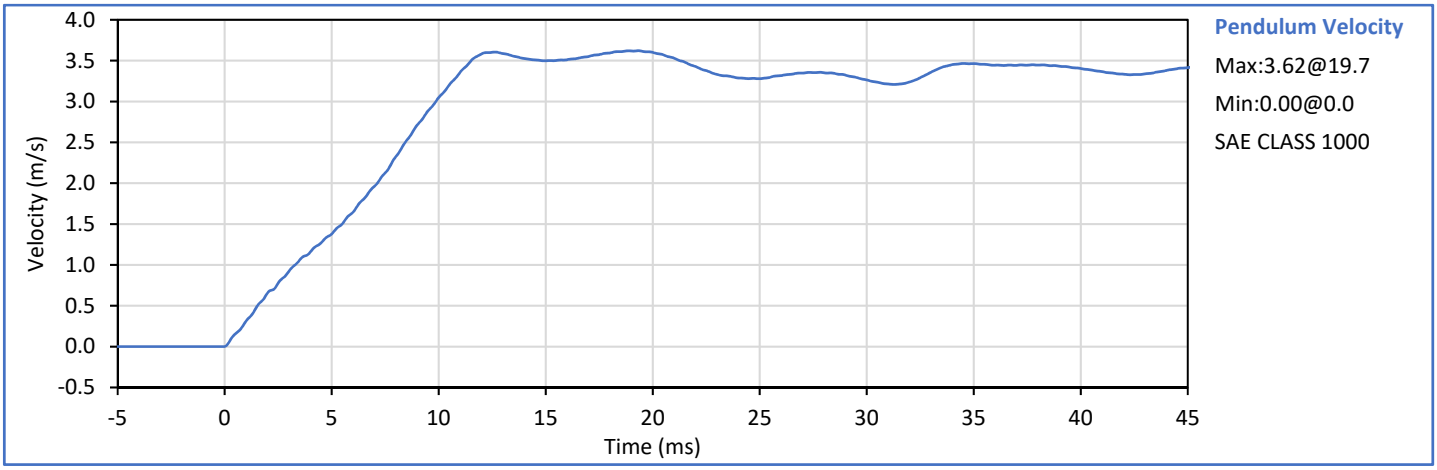
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	3.35	3.45	3.44	Pass
Pendulum Velocity at 4 ms	m/s	1.06	1.30	1.16	Pass
Pendulum Velocity at 8 ms	m/s	2.09	2.55	2.33	Pass
Pendulum Velocity at 12 ms	m/s	3.16	3.86	3.58	Pass
Peak Upper Neck Mx after 40 ms	Nm	-54.7	-44.8	-49.8	Pass
Peak Head Wx	deg/s	1226	1498	1355	Pass
Peak Head Relative Rotation	deg	37.6	45.9	40.7	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass



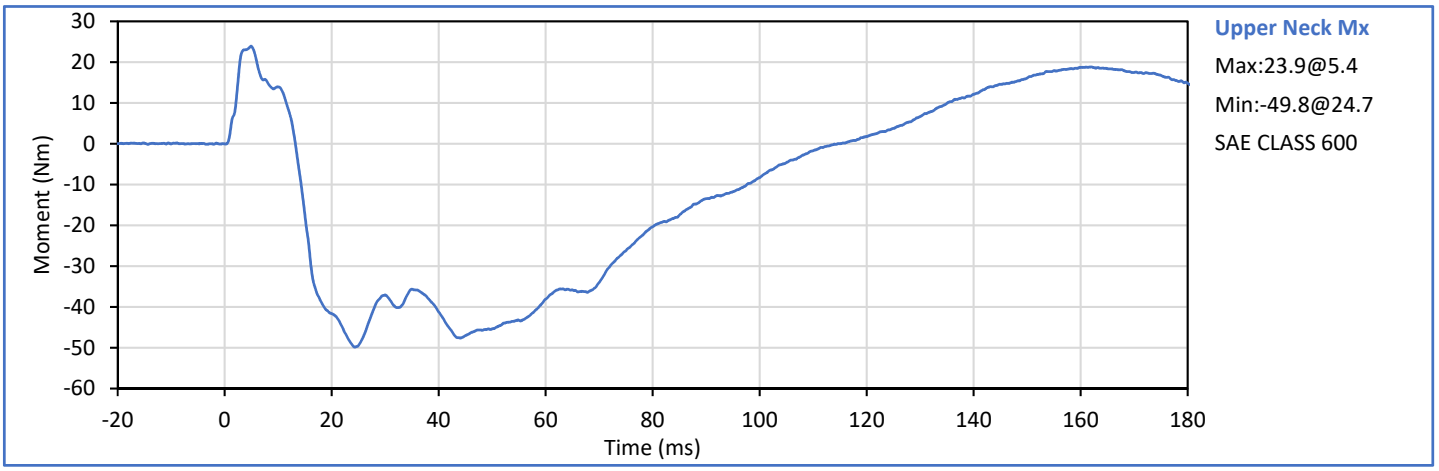
Technician: J. Hernandez

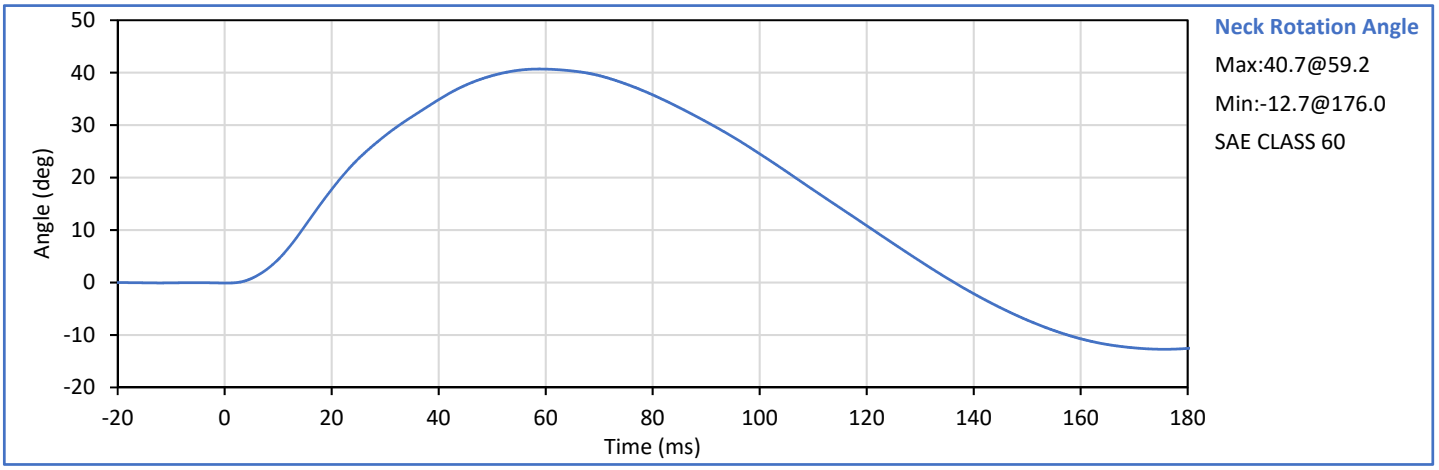
Approved By: P. Puzzuto

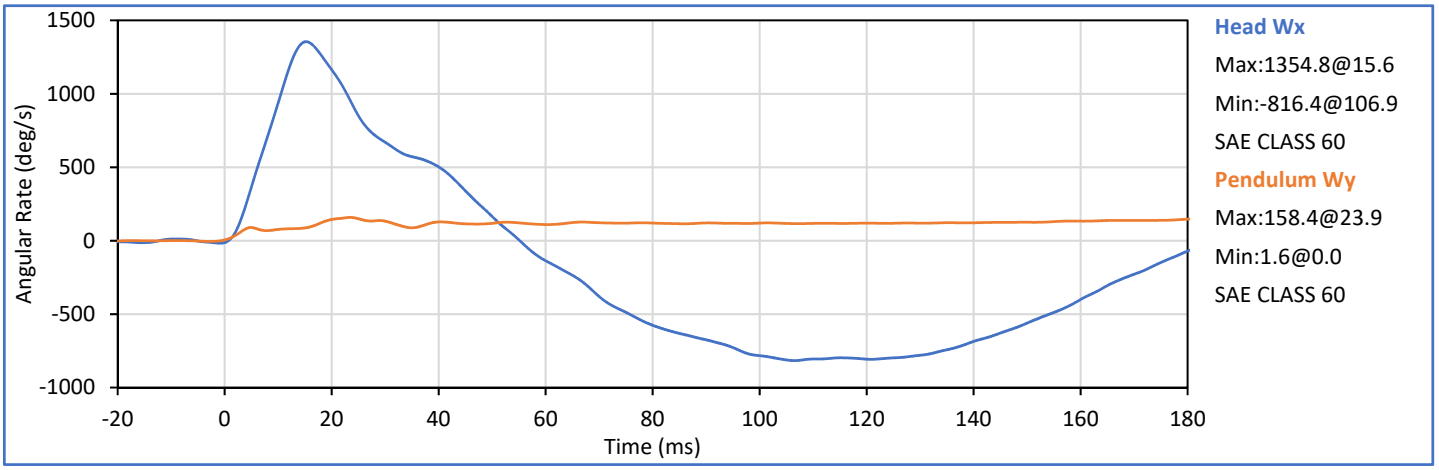
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24







Technician: J. Hernandez

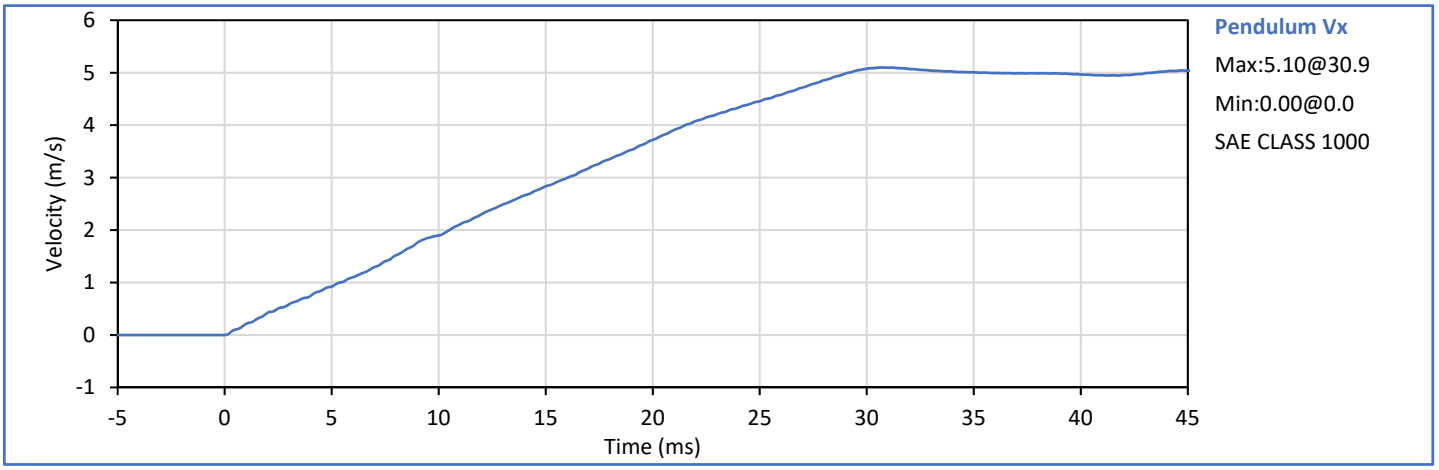
Approved By: P. Puzzuto

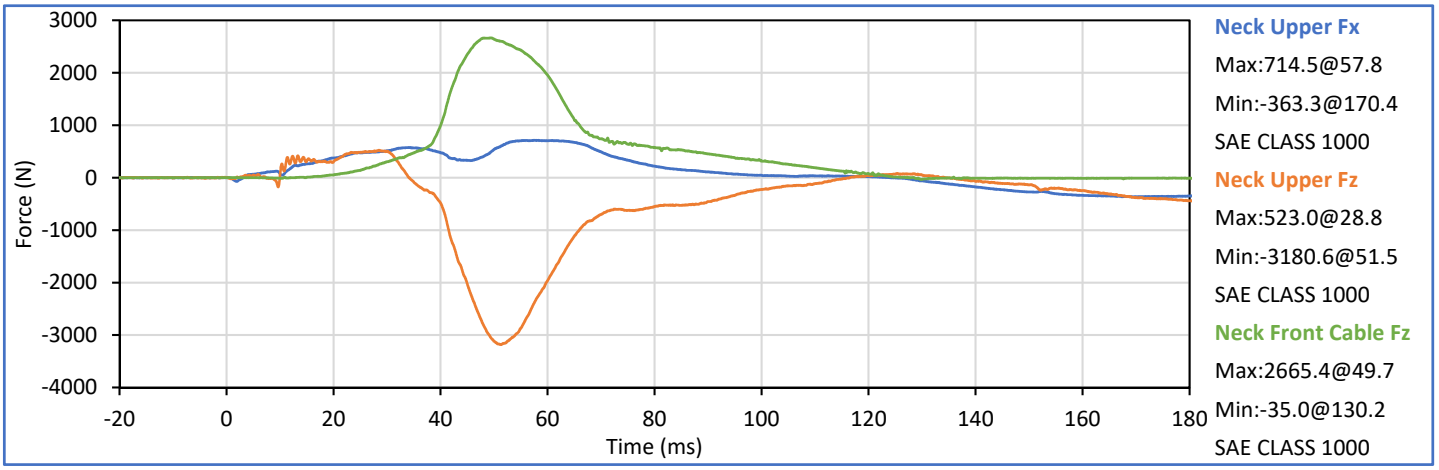
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24

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	1.90	Pass
Pendulum Velocity at 20 ms	m/s	3.30	4.04	3.73	Pass
Pendulum Velocity at 30 ms	m/s	4.53	5.54	5.08	Pass
Peak Upper Neck My	Nm	-25.3	-20.7	-24.4	Pass
Peak Upper Neck Fz	N	-3210	-2626	-3181	Pass
Peak Head Wy	deg/s	1855	2267	2207	Pass
Peak Head Relative Rotation	deg	58.5	71.5	62.9	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass





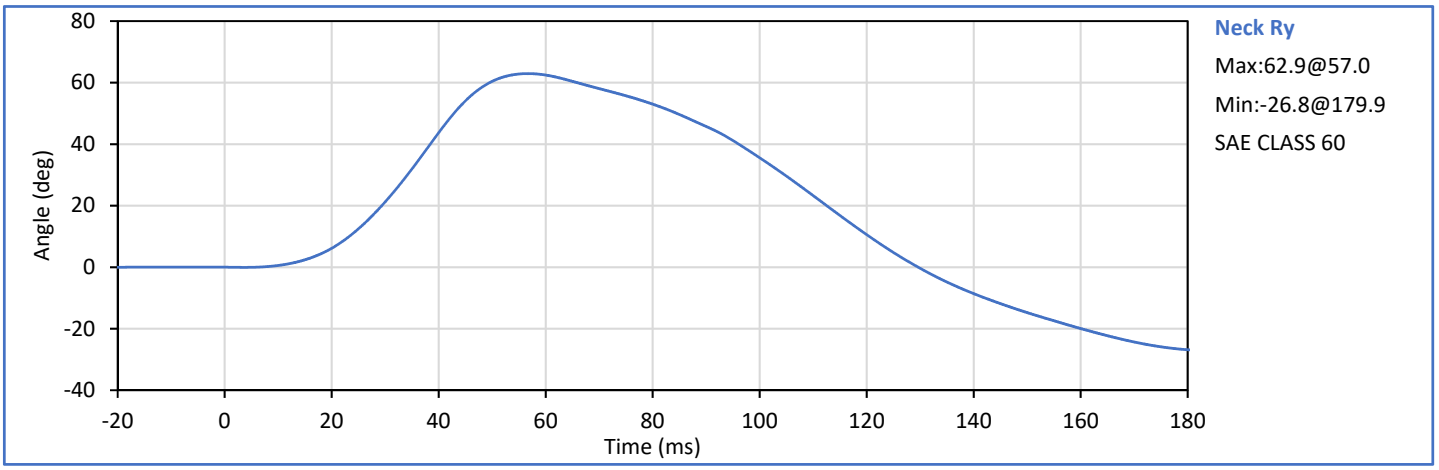
Technician: J. Hernandez

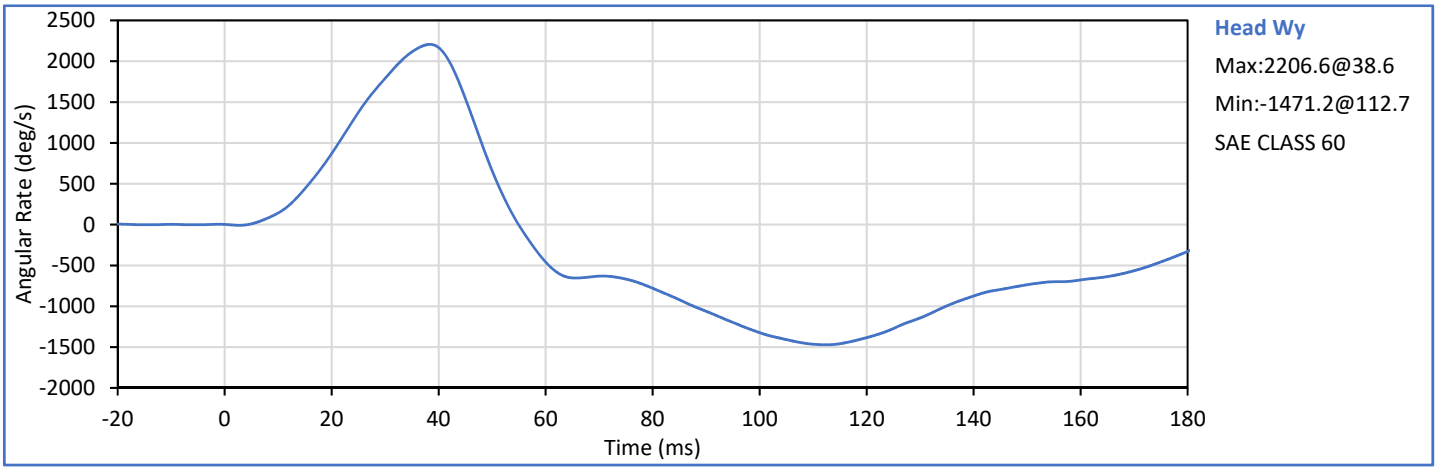
Approved By: P. Puzzuto

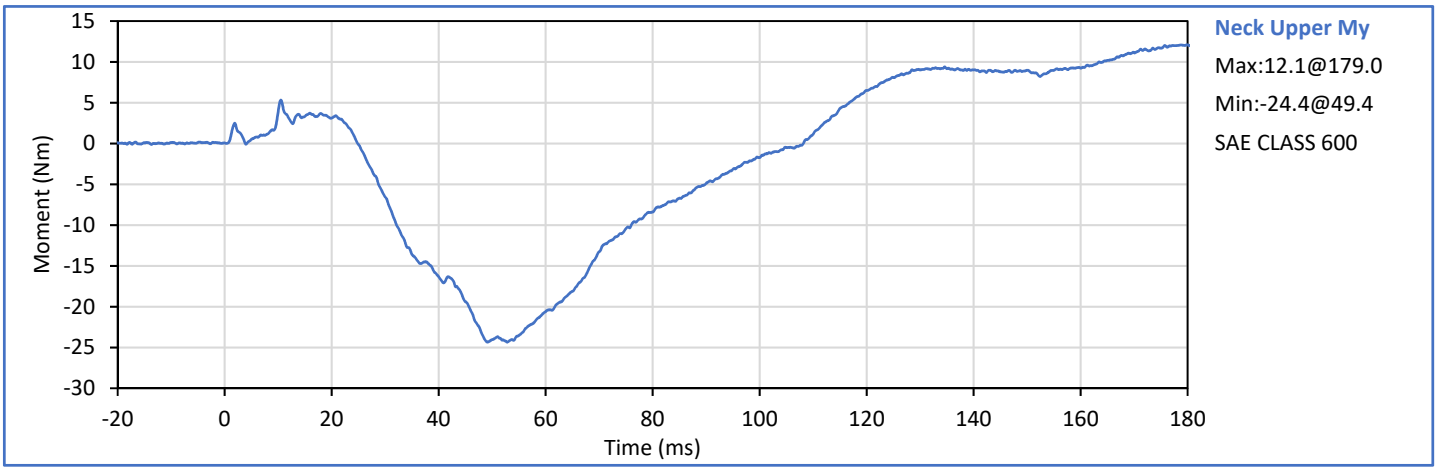
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24







Technician: J. Hernandez

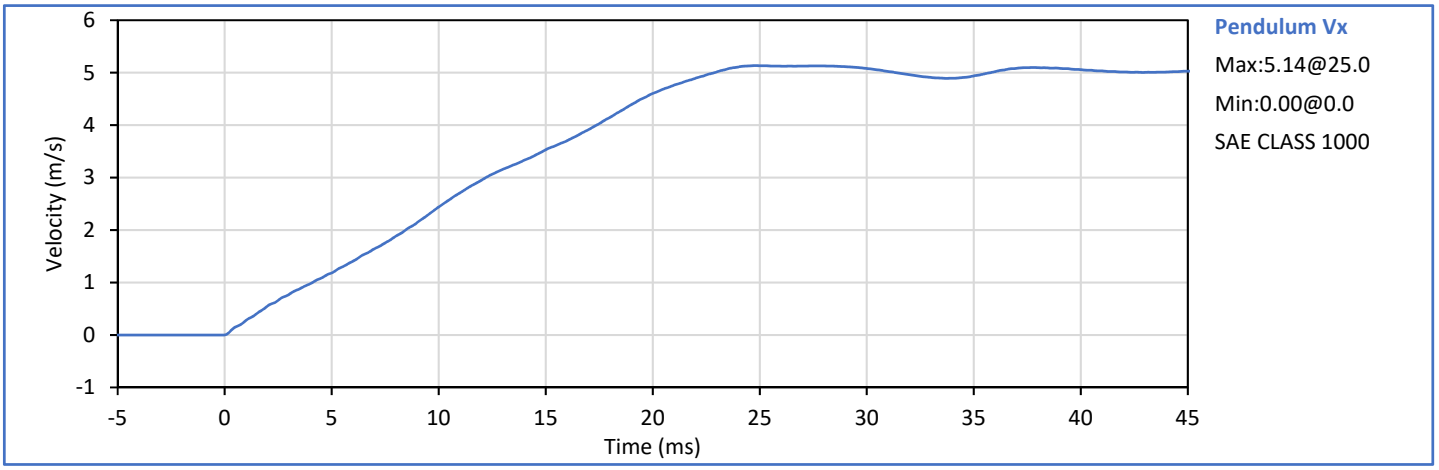
Approved By: P. Puzzuto

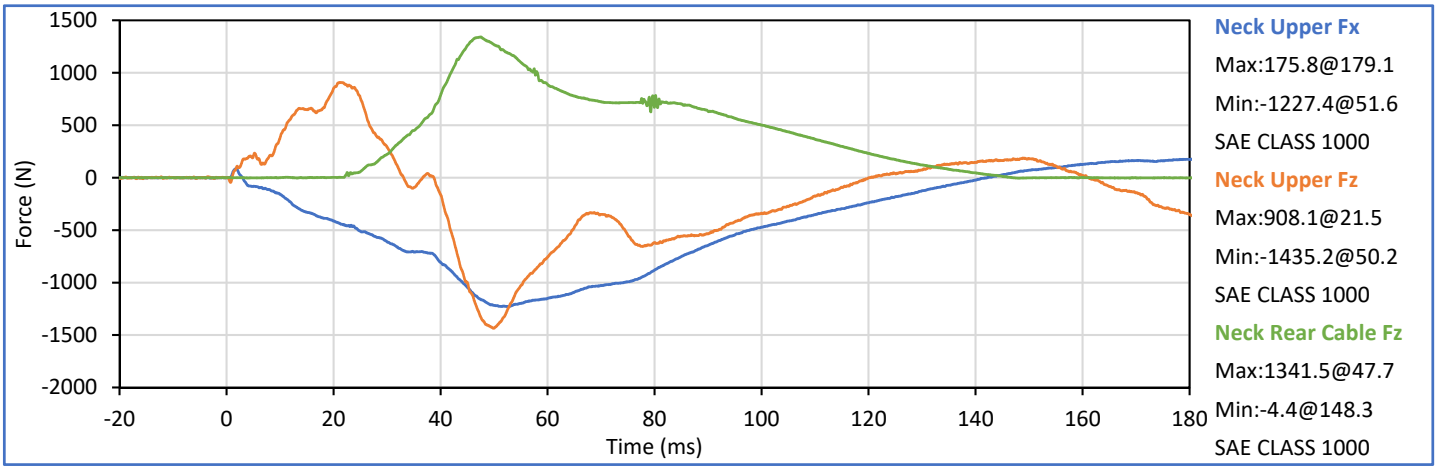
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24

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	22	Pass
Pendulum Velocity	m/s	4.95	5.05	5.01	Pass
Pendulum Velocity at 8 ms	m/s	1.57	1.92	1.88	Pass
Pendulum Velocity at 16 ms	m/s	3.13	3.82	3.70	Pass
Pendulum Velocity at 24 ms	m/s	4.42	5.41	5.11	Pass
Peak Upper Neck My	Nm	27.9	34.1	33.1	Pass
Peak Upper Neck Fz (before 40 ms)	N	774	946	908	Pass
Peak Head Wy	deg/s	-2172	-1777	-2087	Pass
Peak Head Relative Rotation	deg	-71.0	-58.1	-63.1	Pass
NHTSA 2019-05 Corridor			Overall Test Results		Pass





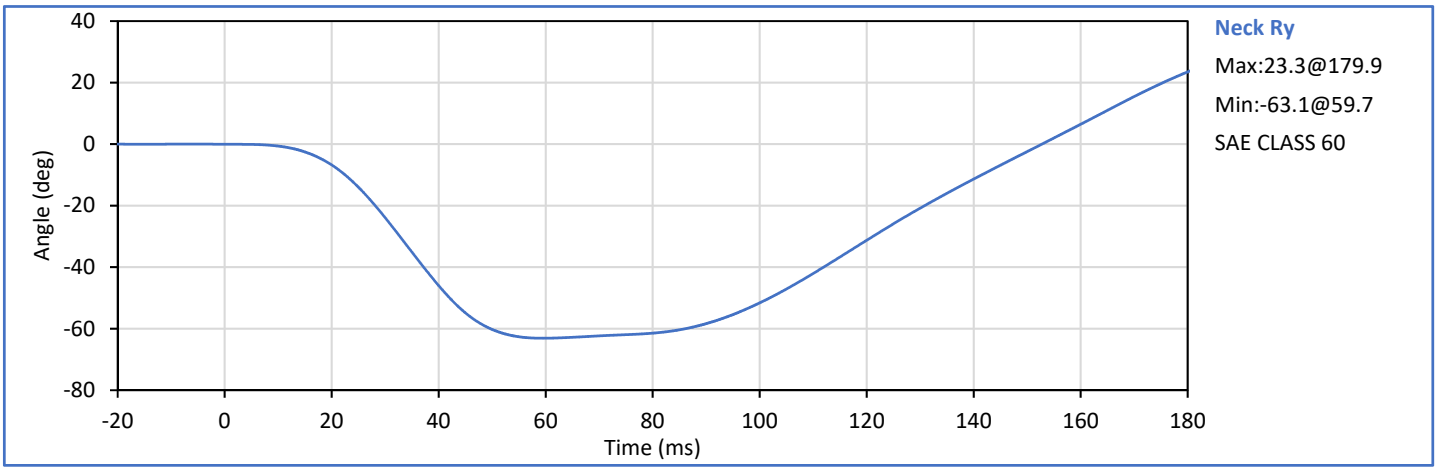
Technician: J. Hernandez

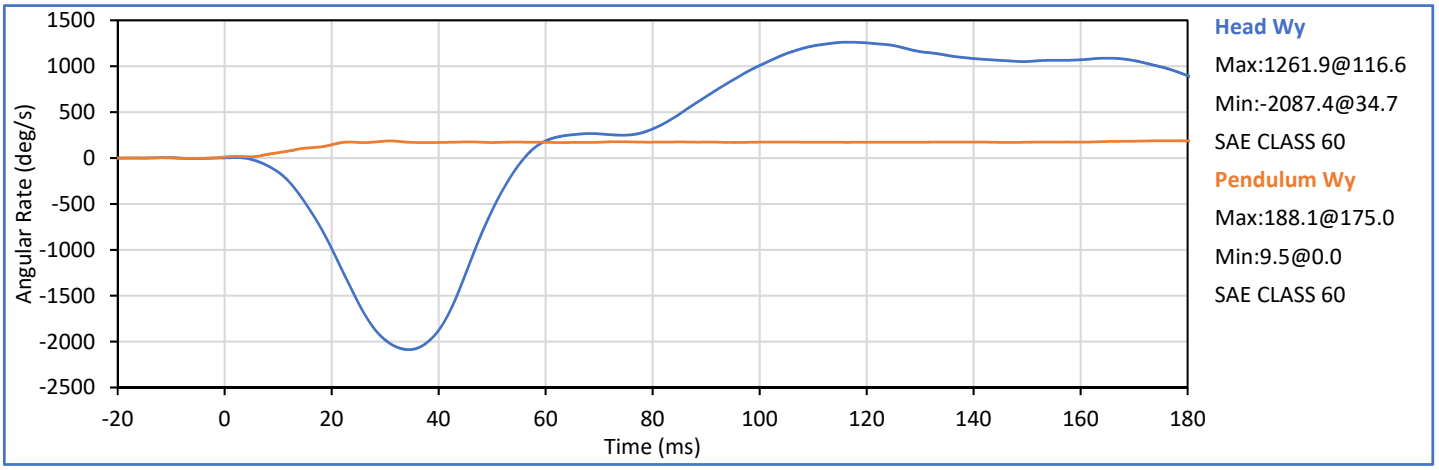
Approved By: P. Puzzuto

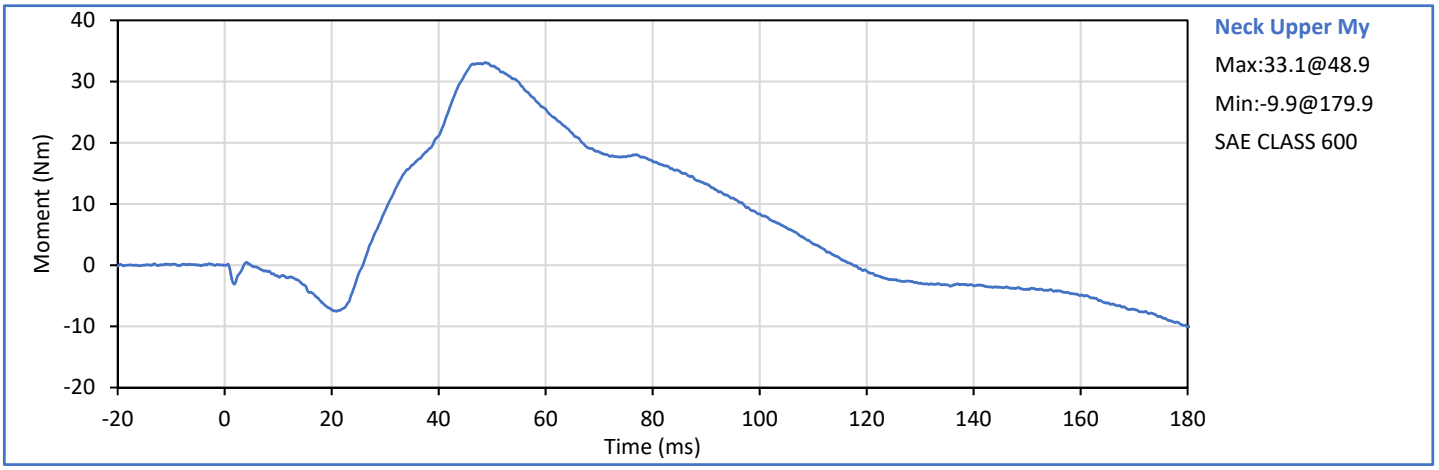
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-24







Technician: J. Hernandez

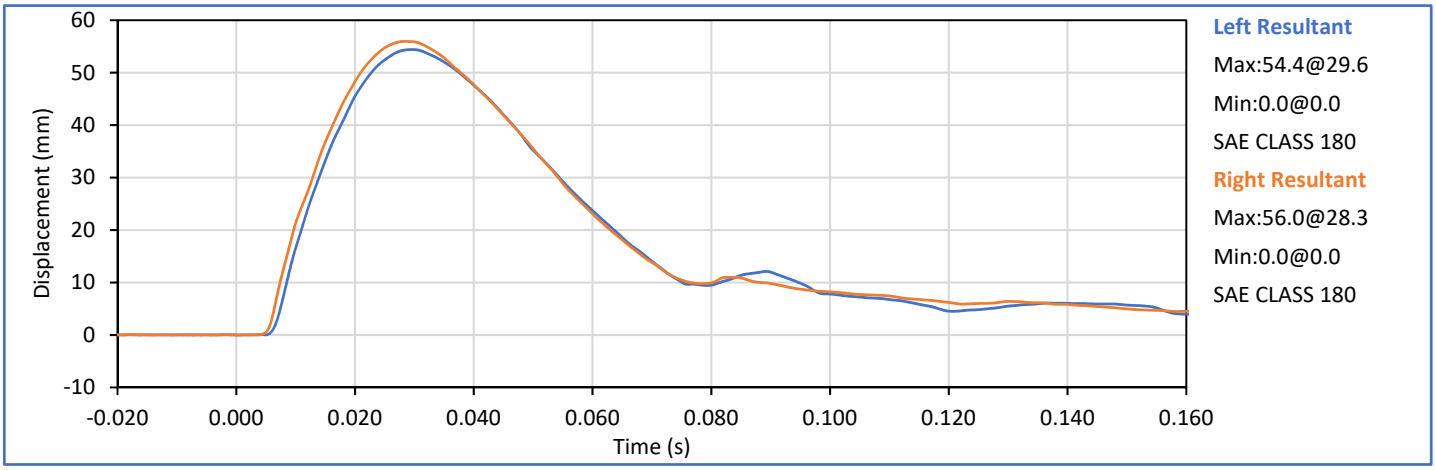
Approved By: P. Puzzuto

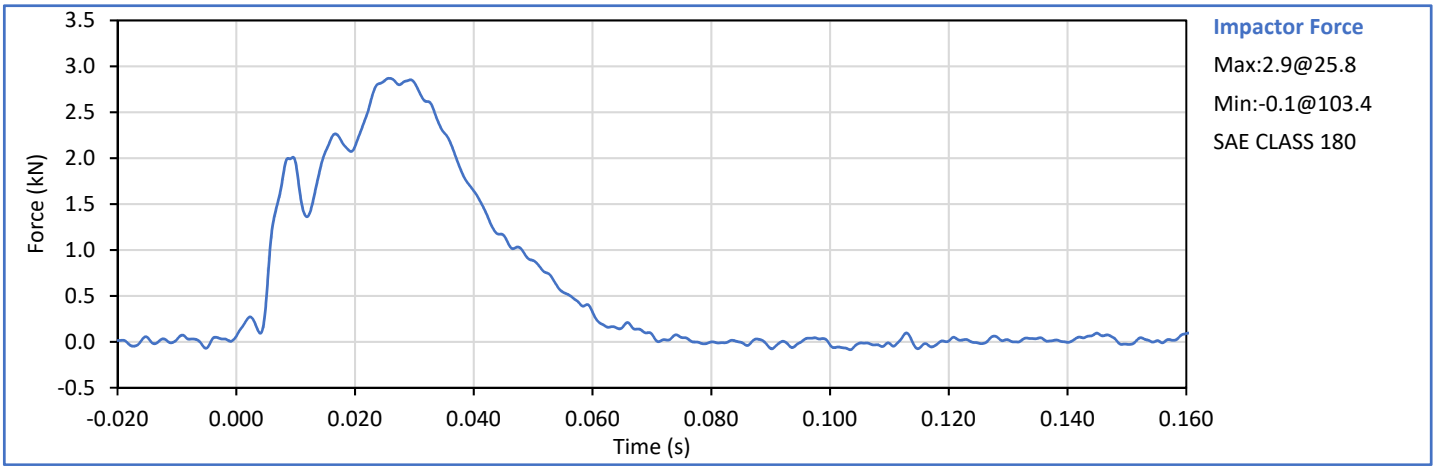
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-10-14

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	2.870	Pass
Peak Upper Left Deflection Resultant	mm	48.3	59.0	54.4	Pass
Peak Upper Right Deflection Resultar	mm			56.0	Pass
Absolute Difference L/R Dx Resultant	mm	0.0	5.0	1.6	Pass
Force at Peak Upper Left Resultant	mm	2.409	2.944	2.851	Pass
Force at Peak Upper Right Resultant	mm			2.834	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

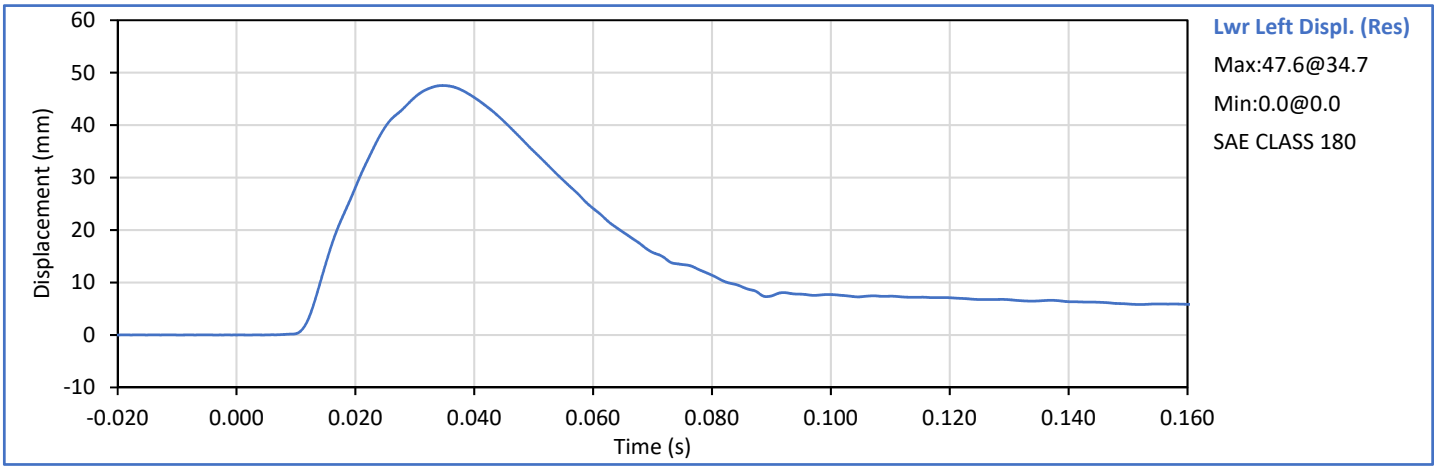
Approved By: P. Puzzuto

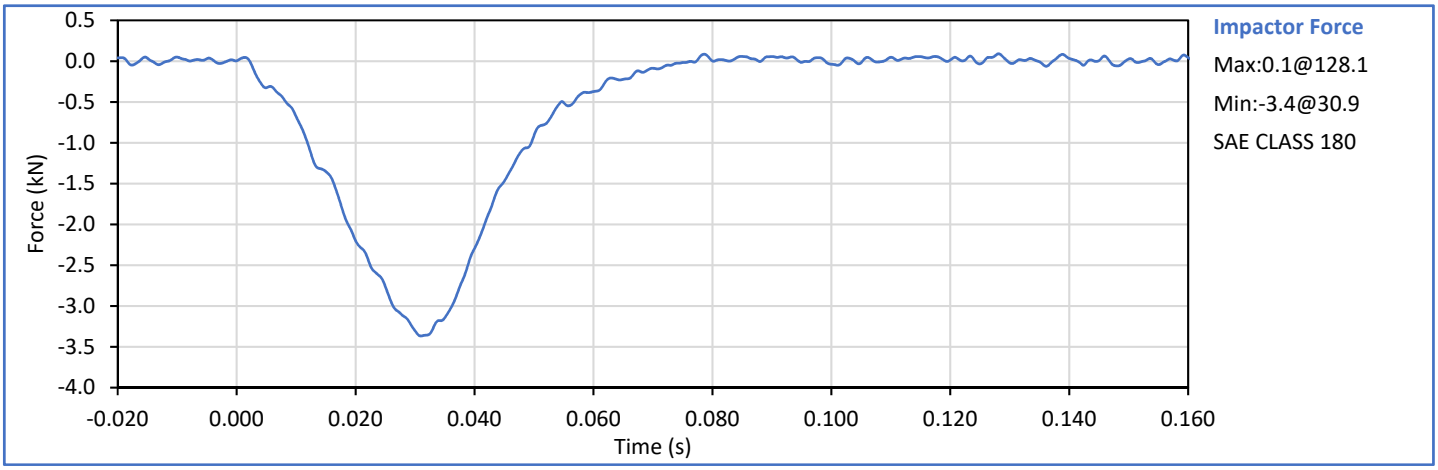
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-10-14

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	36	Pass
Probe Velocity	m/sec	4.25	4.35	4.34	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.368	Pass
Lower Left Resultant Dx at Peak Fx	mm	45.8	56.0	46.2	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

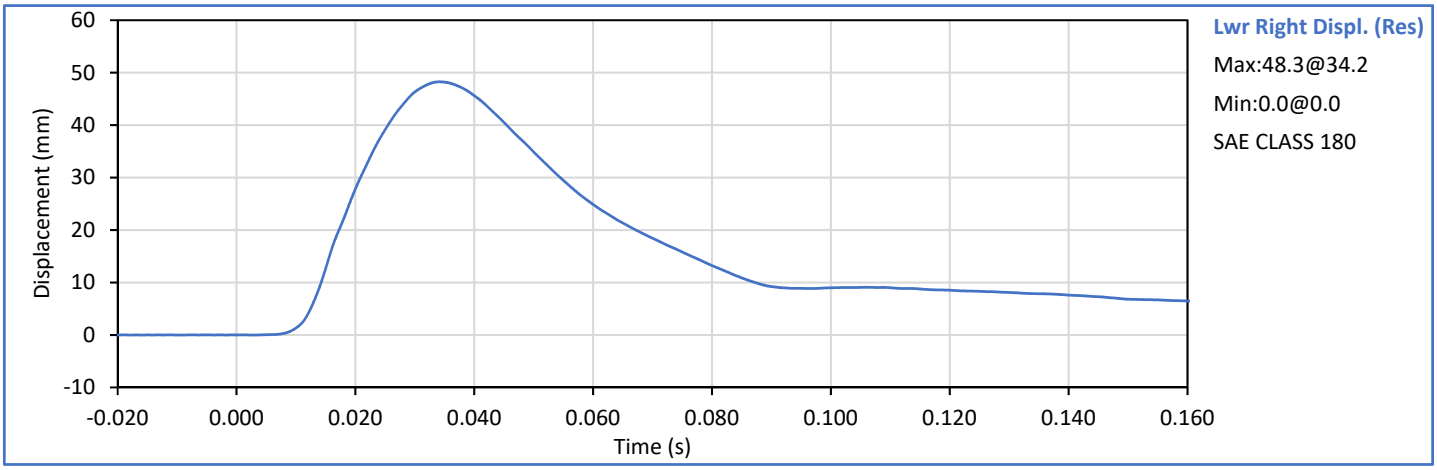
Approved By: P. Puzzuto

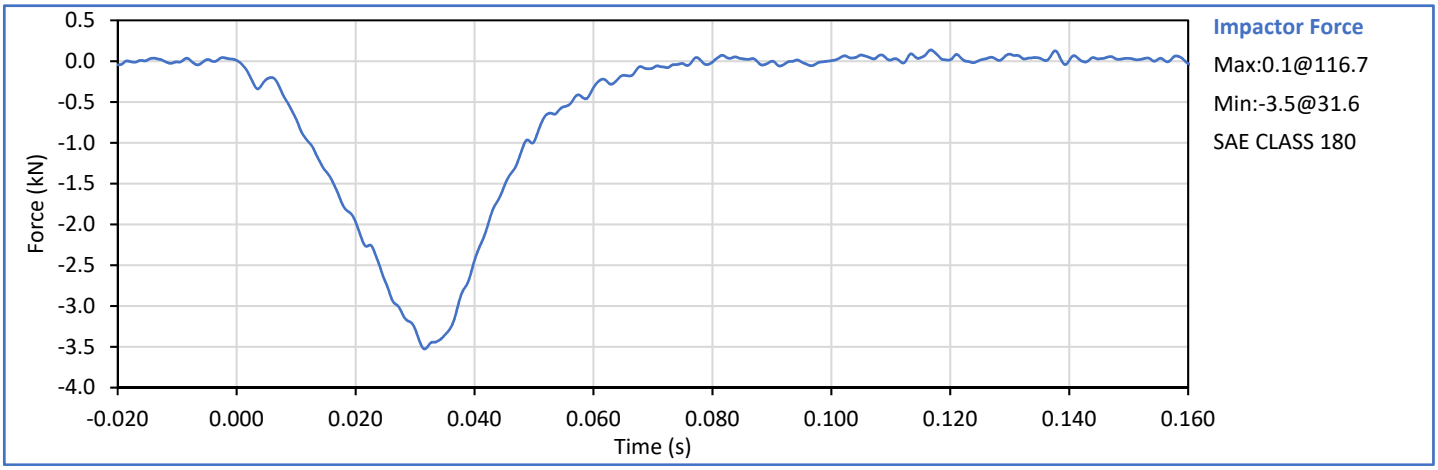
Applus IDIADA
KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-10-14

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	26	Pass
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.526	Pass
Lower Right Resultant Dx at Peak Fx	mm	45.8	56.0	47.5	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

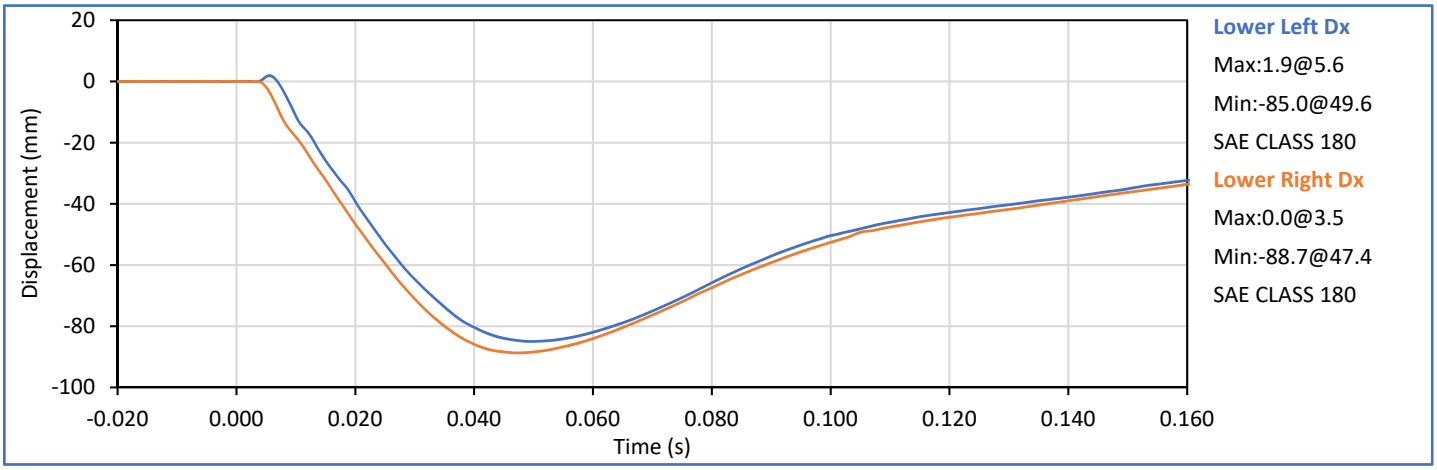
Approved By: P. Puzzuto

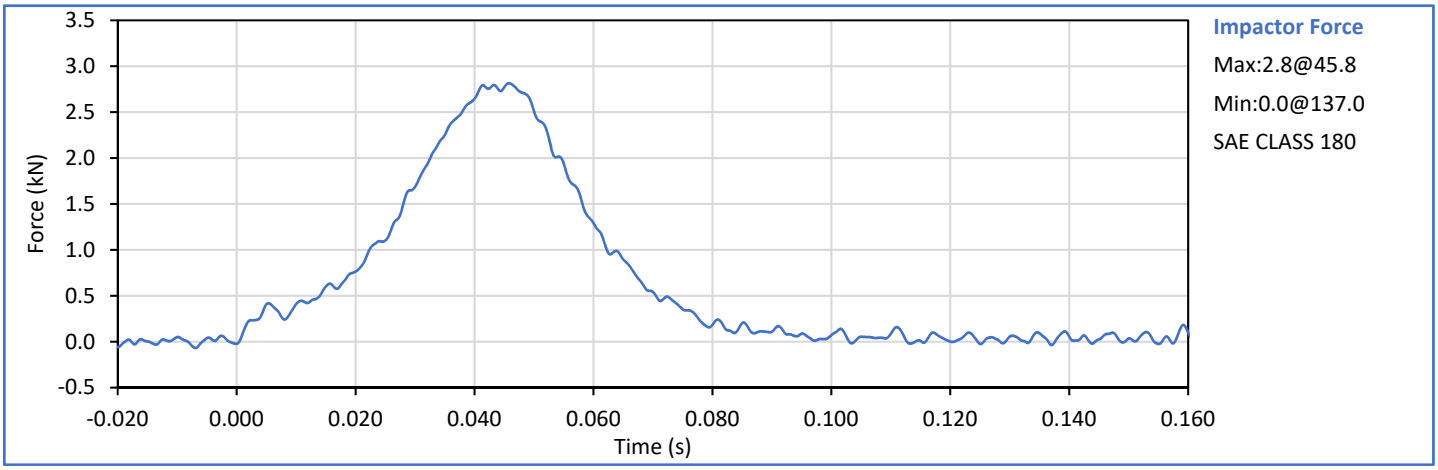
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Abdomen Qualificaion

ATD Serial No.: EG2595 Test Date: 2020-10-15

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	3.25	3.35	3.34	Pass
Peak Probe Force	kN	2.626	3.210	2.815	Pass
Lower Left Dx at Time of Peak Force	mm	-91.3	-74.7	-84.2	Pass
Lower Right Dx at Time of Peak Force	mm			-88.6	Pass
Absolute Difference of Left/Right Dx	mm	0.0	8.0	4.3	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

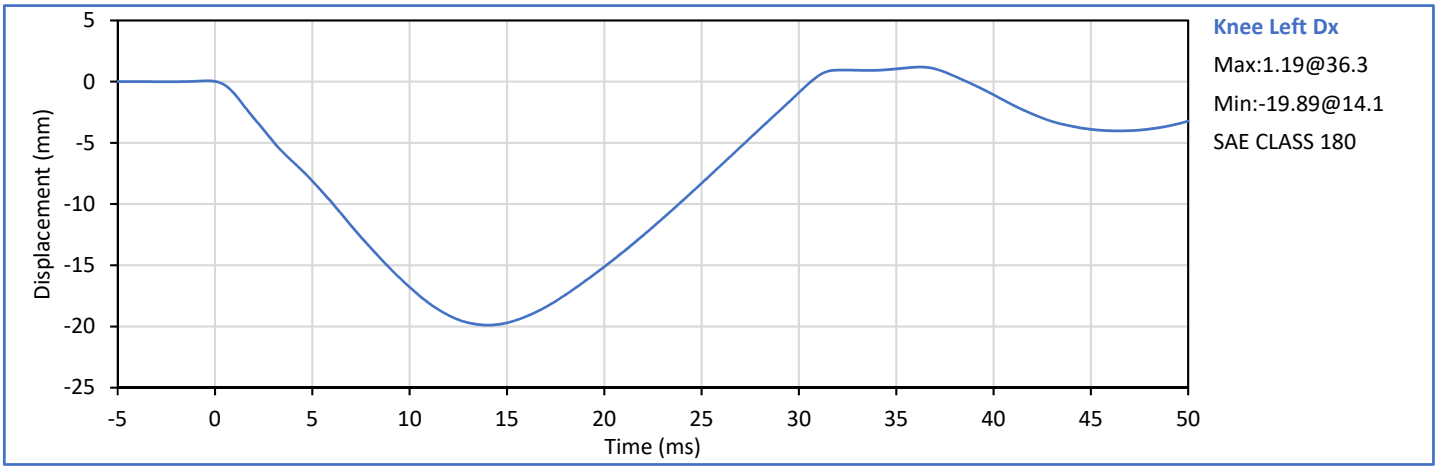
Approved By: P. Puzzuto

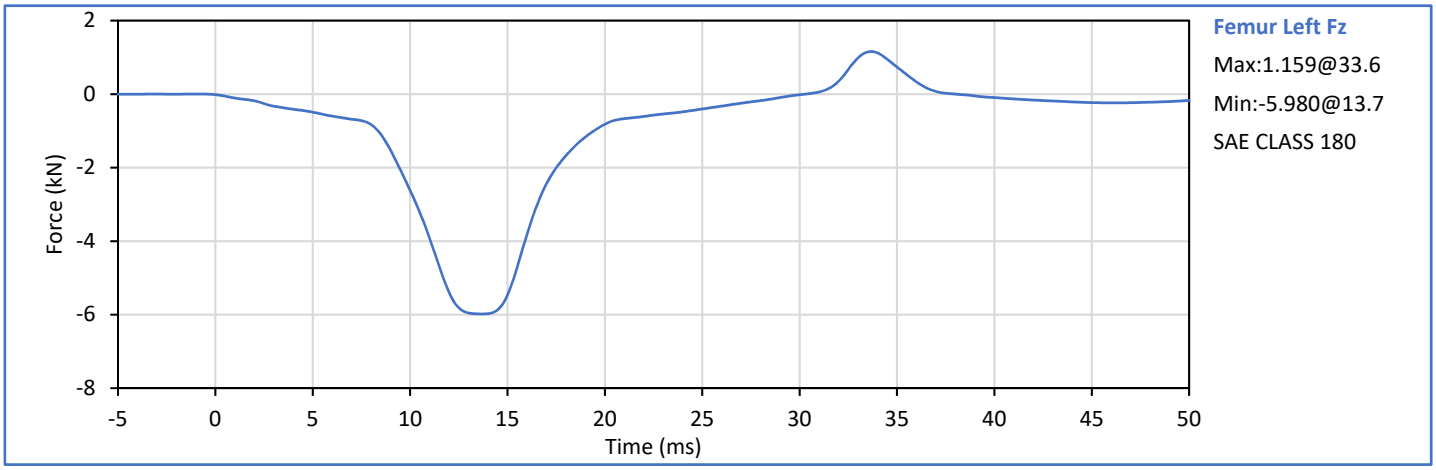
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-18

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	2.15	2.25	2.22	Pass
Peak Femur Fz	kN	-7.156	-5.855	-5.980	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-19.85	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

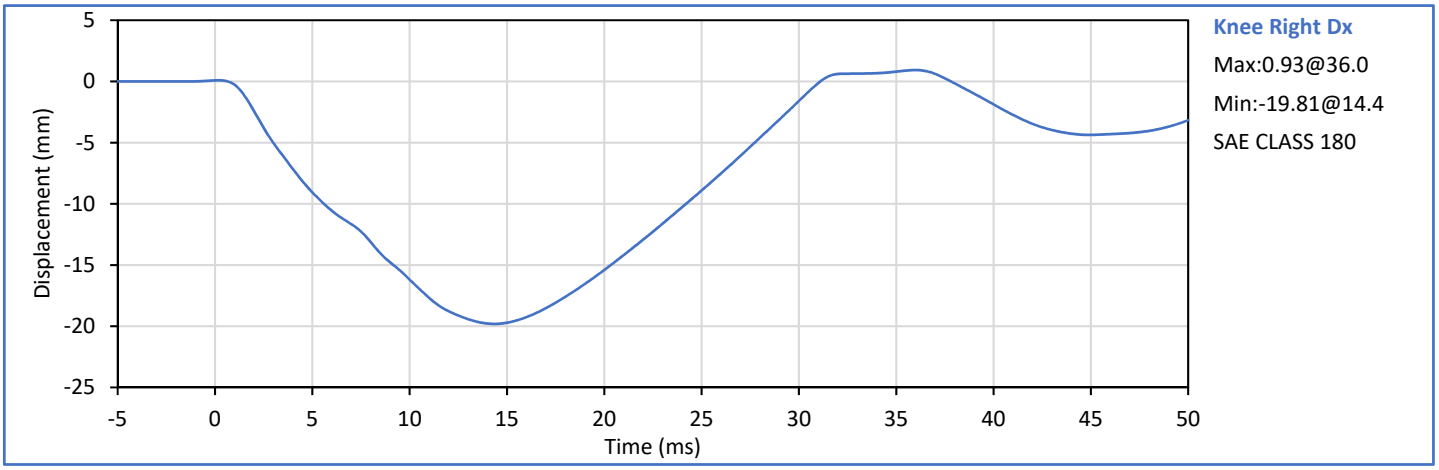
Approved By: P. Puzzuto

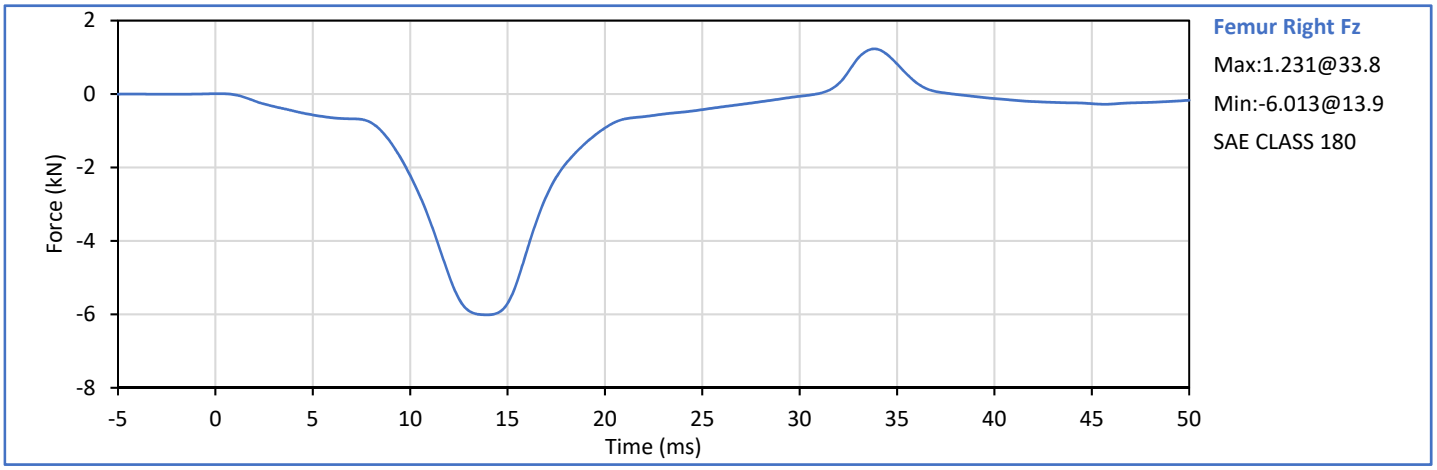
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-18

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	36	Pass
Pendulum Velocity	m/s	2.15	2.25	2.22	Pass
Peak Femur Fz	kN	-7.156	-5.855	-6.013	Pass
Knee Dx at Peak Femur Fz	mm	-22.20	-18.20	-19.73	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

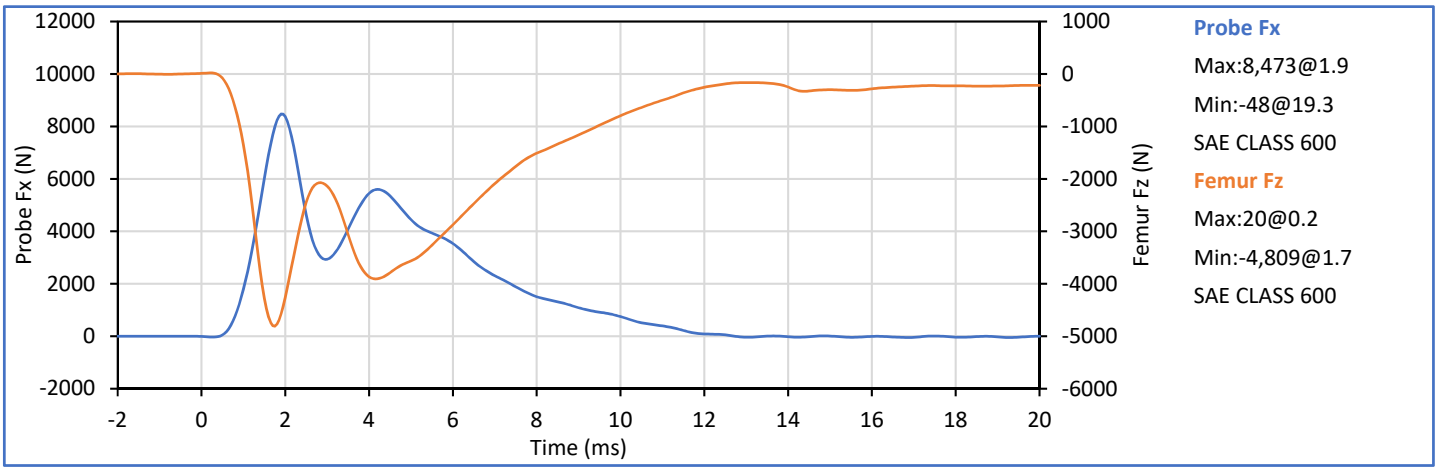
Approved By: P. Puzzuto

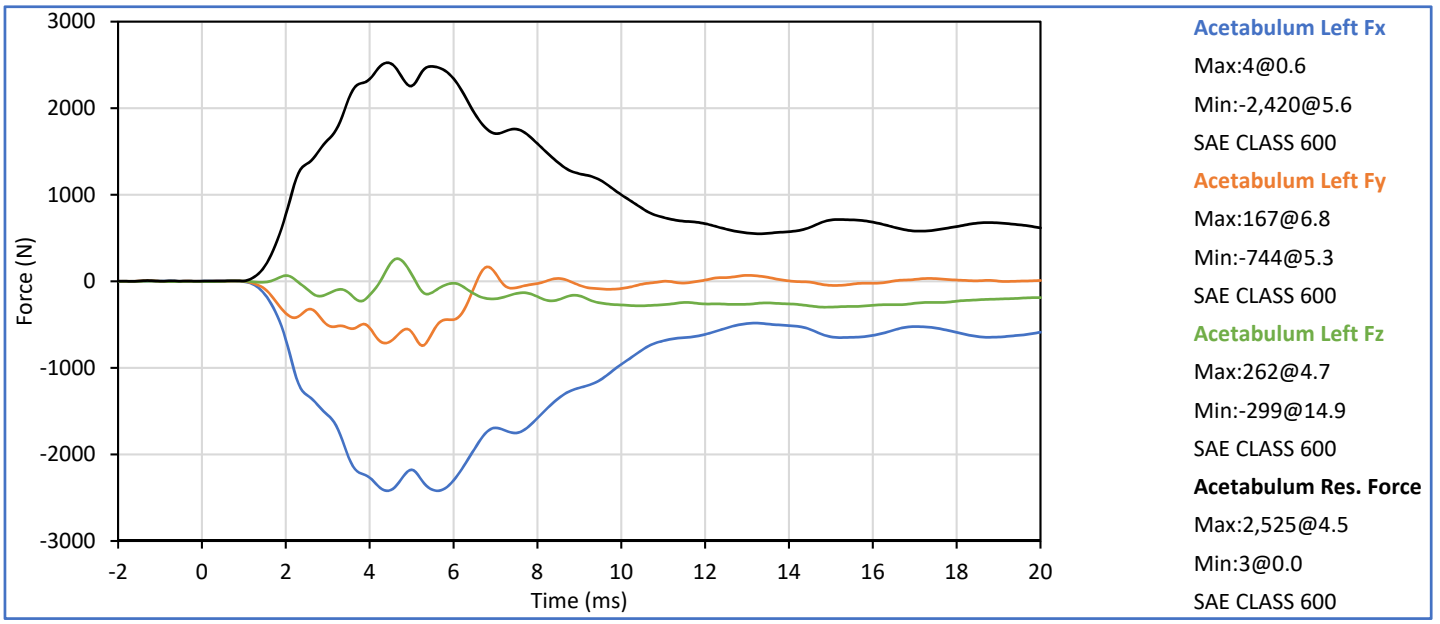
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-11-18

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	19	Pass
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Probe Force	N	*	*	8473	*
Peak Femur Fz	N	*	*	-4809	*
Acetabulum Force Resultant	N	*	*	2525	*
* Research data. No defined P/F corridor			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA KARCO

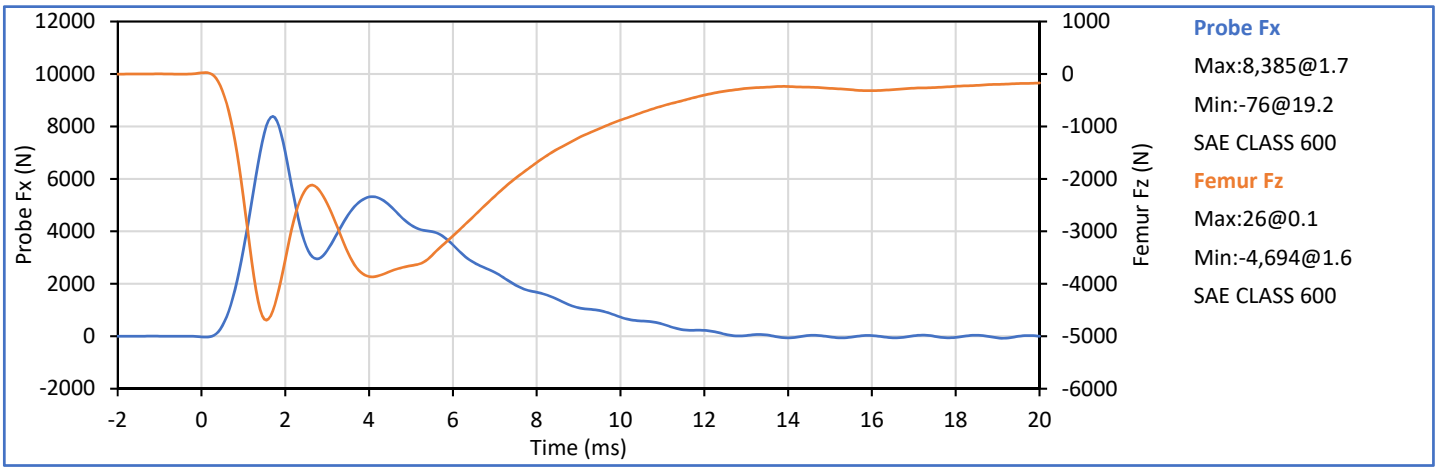
THOR-50M 50th Percentile Male ATD
Upper Leg (Right) Qualification

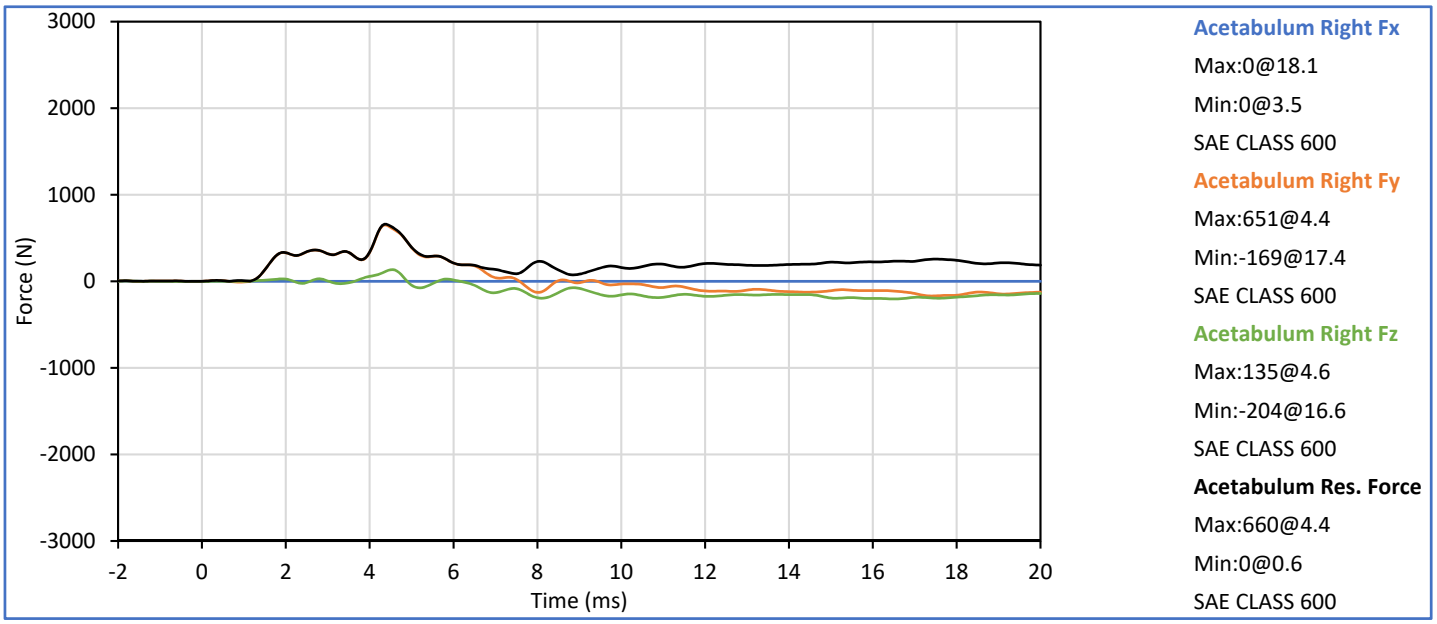
ATD Serial No.: EG2595 Test Date: 2020-11-18

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail	
Laboratory Temperature	°C	20.6	22.2	21.7	Pass	
Laboratory Relative Humidity	%	10	70	28	Pass	
Pendulum Velocity	m/s	3.25	3.35	3.33	Pass	
Peak Probe Force	N	*	*	8385	*	
Peak Femur Fz	N	*	*	-4694	*	
Acetabulum Force Resultant	N	*	*	660	*	**
			Overall Test Results		Pass	

* Research data. No defined P/F corridor

** Acetabulum Fx is not functioning





Technician: J. Hernandez

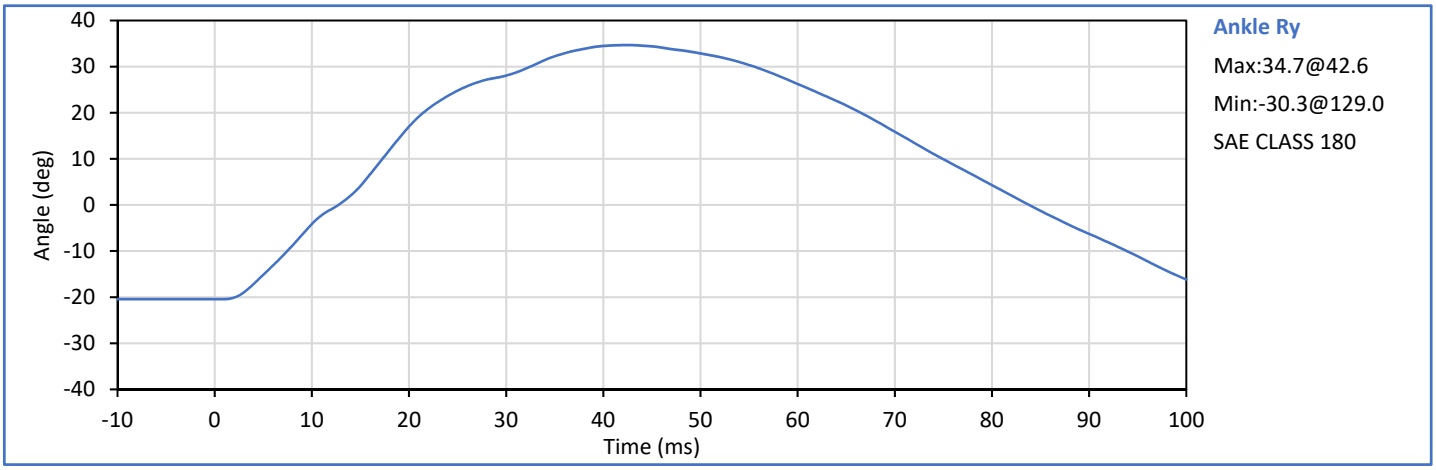
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-03

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	14	Pass
Pendulum Velocity	m/s	4.95	5.05	4.99	Pass
Peak Ankle Ry	deg	30.4	37.2	34.7	Pass
Peak Ankle Resistive Moment	Nm	49.8	60.8	53.5	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-2.876	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



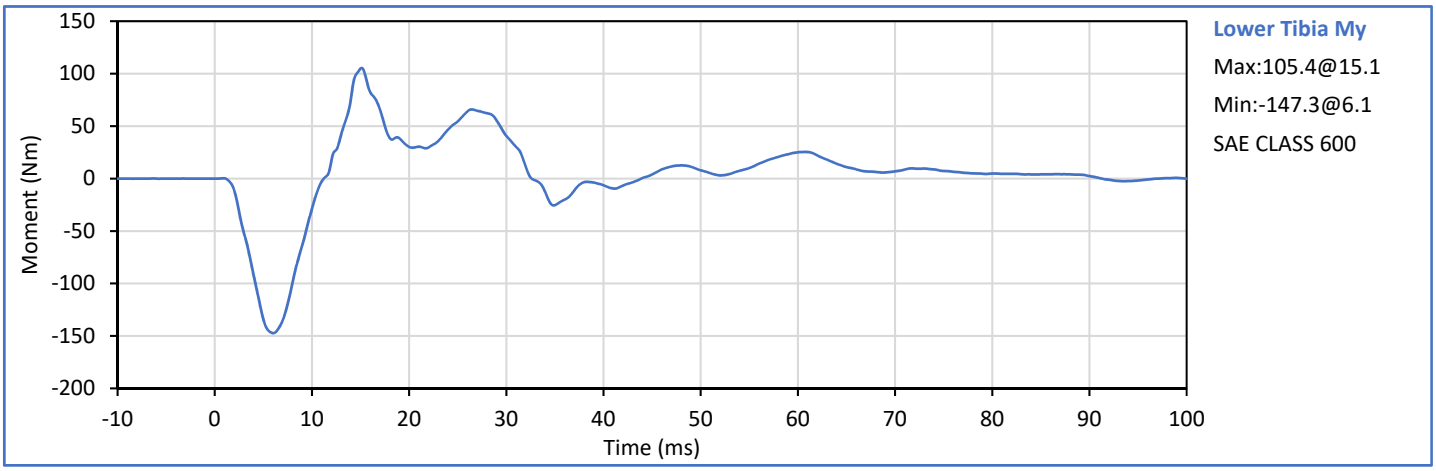
Technician: J. Hernandez

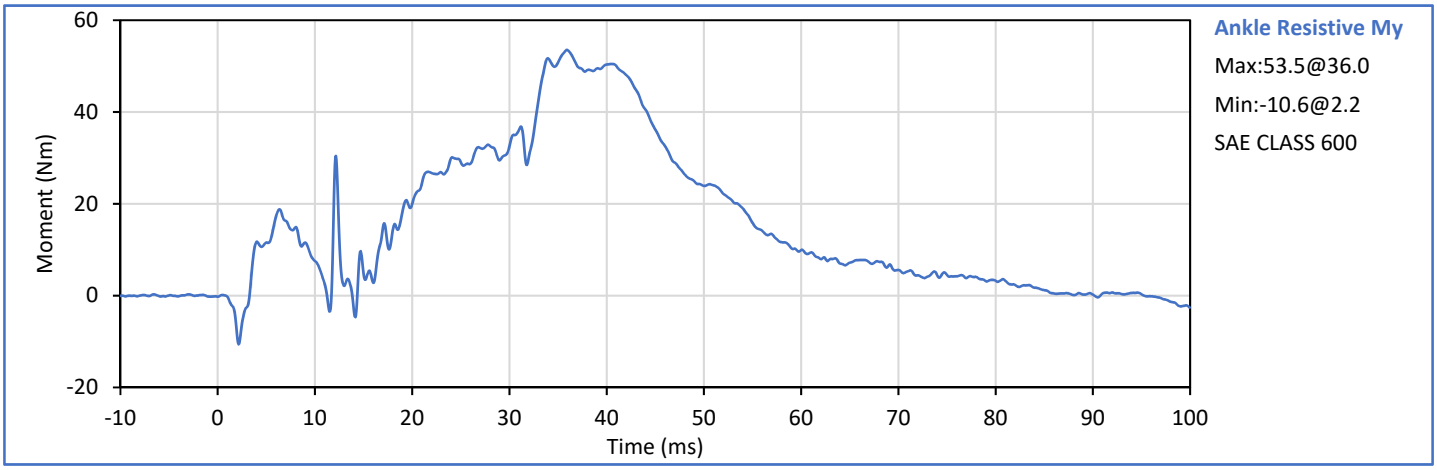
Approved By: P. Puzzuto

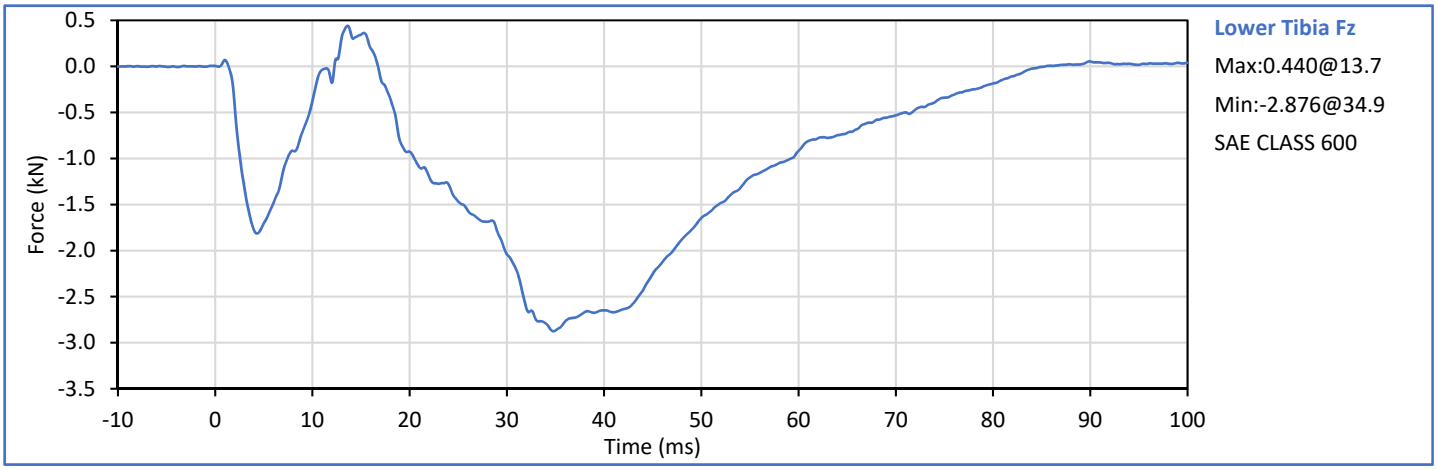
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-03







Technician: J. Hernandez

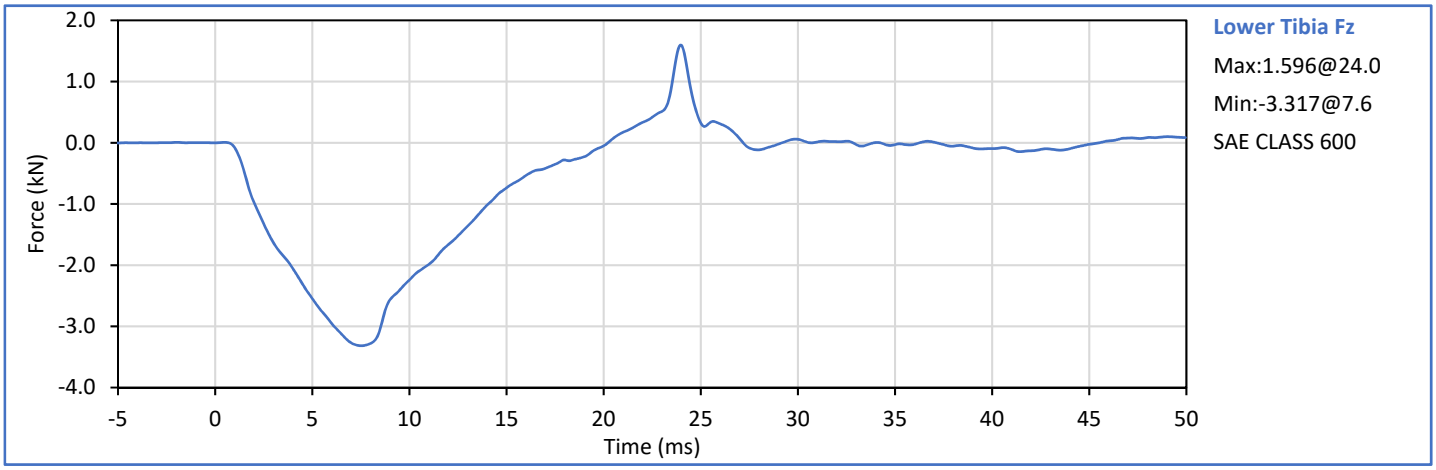
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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
Pendulum Velocity	m/s	3.95	4.05	3.96	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.317	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

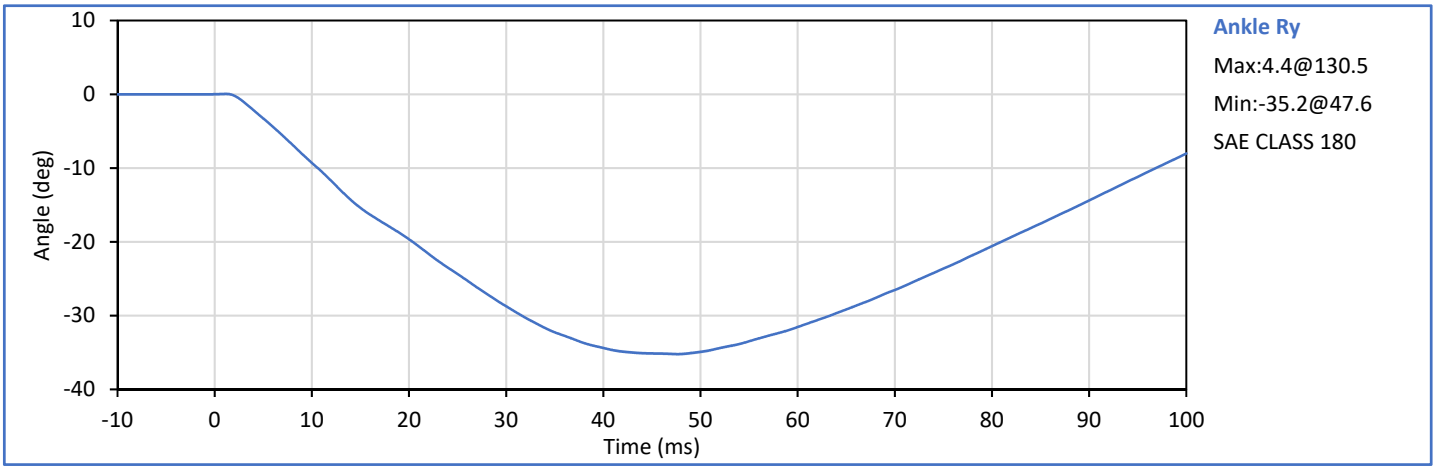
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	-35.2	Pass
Peak Ankle Resistive Mx	Nm	-43.0	-35.2	-38.6	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.529	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



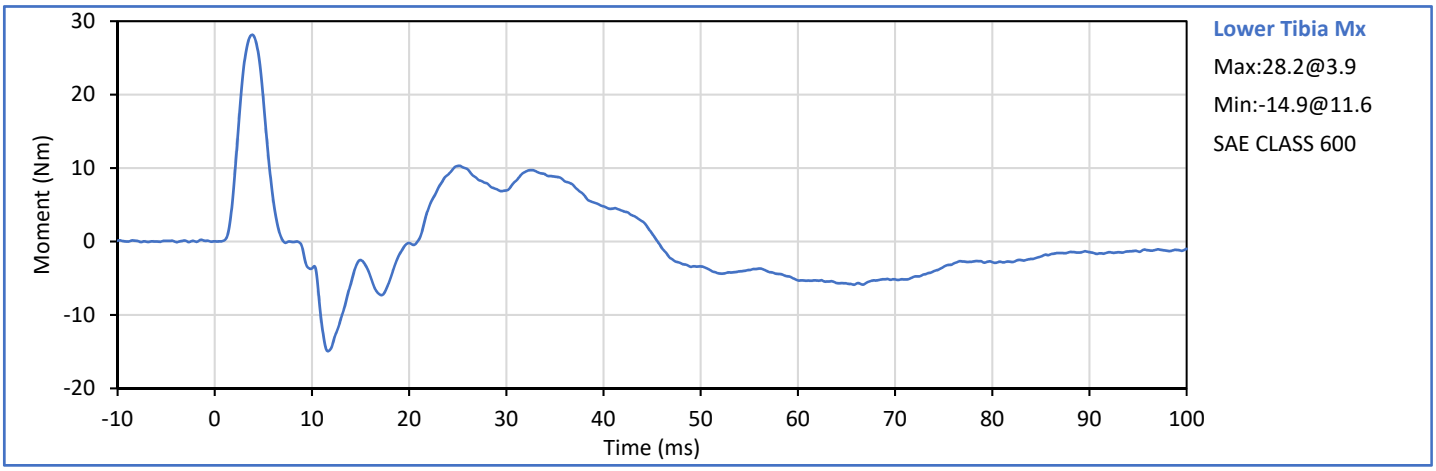
Technician: J. Hernandez

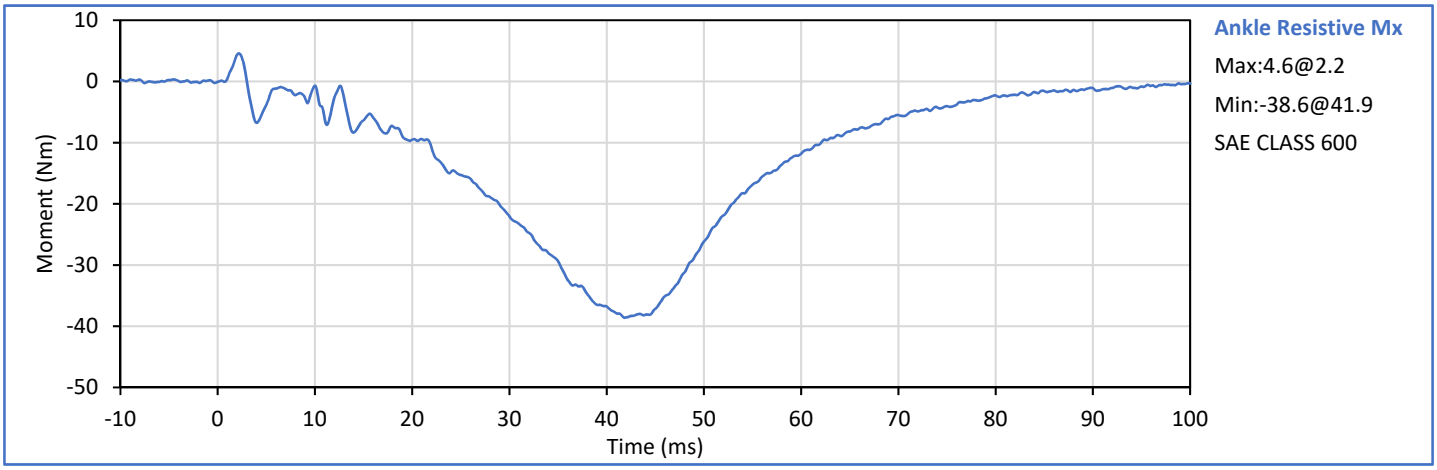
Approved By: P. Puzzuto

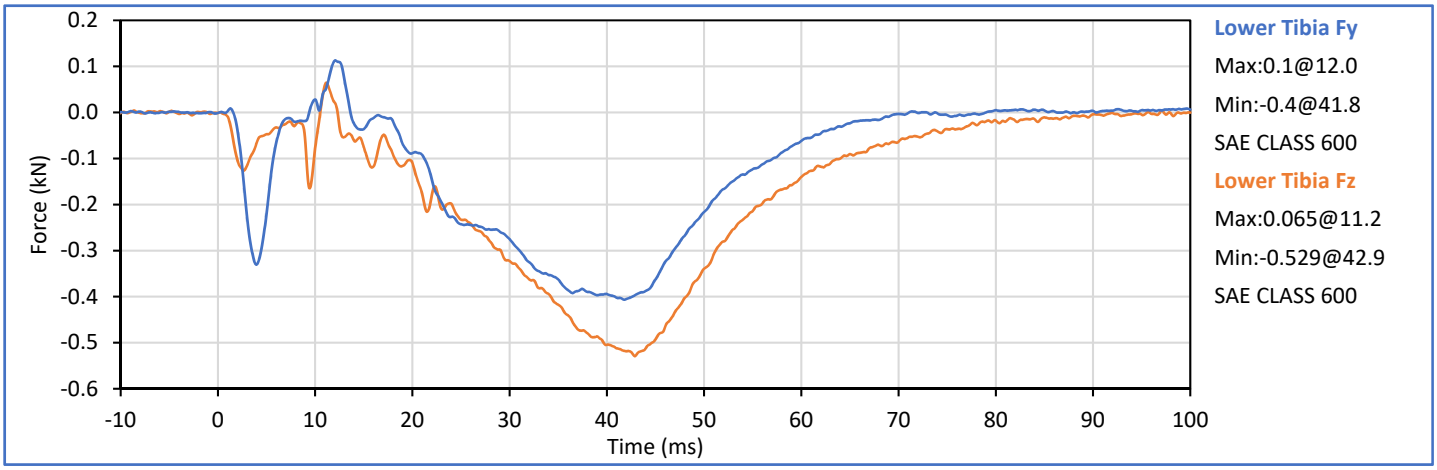
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02







Technician: J. Hernandez

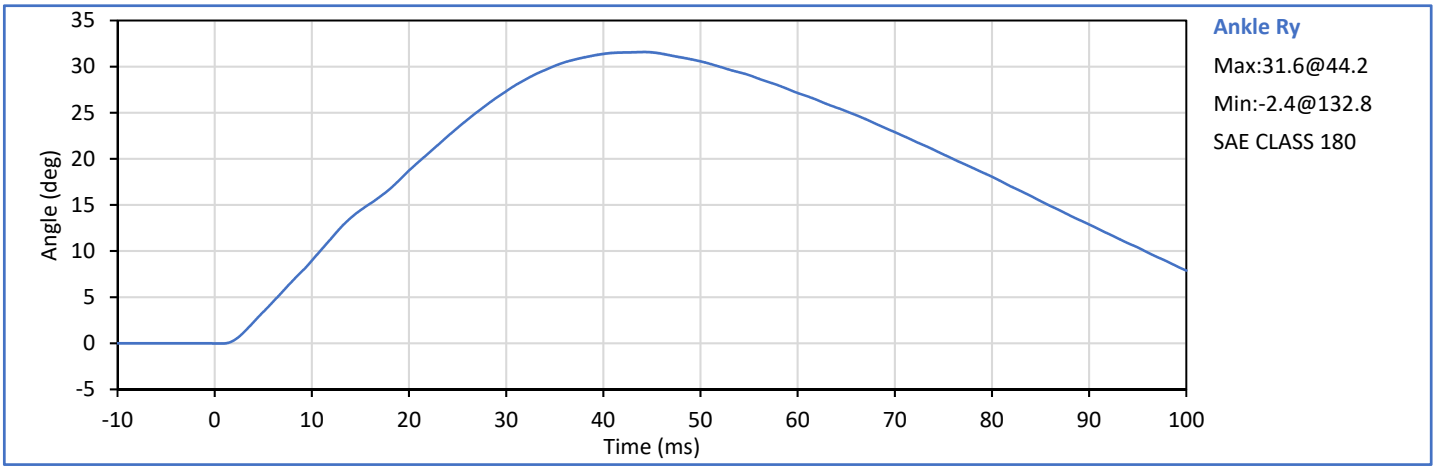
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	20	Pass
Pendulum Velocity	m/s	1.95	2.05	2.03	Pass
Peak Ankle Rx	deg	26.6	32.5	31.6	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	40.4	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.569	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

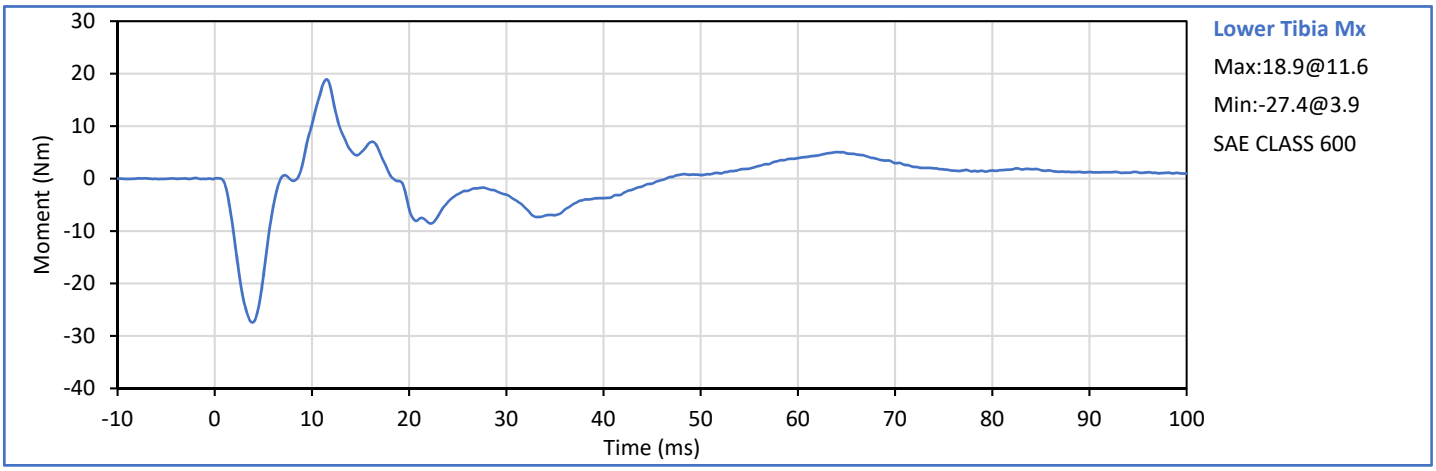
Approved By: P. Puzzuto

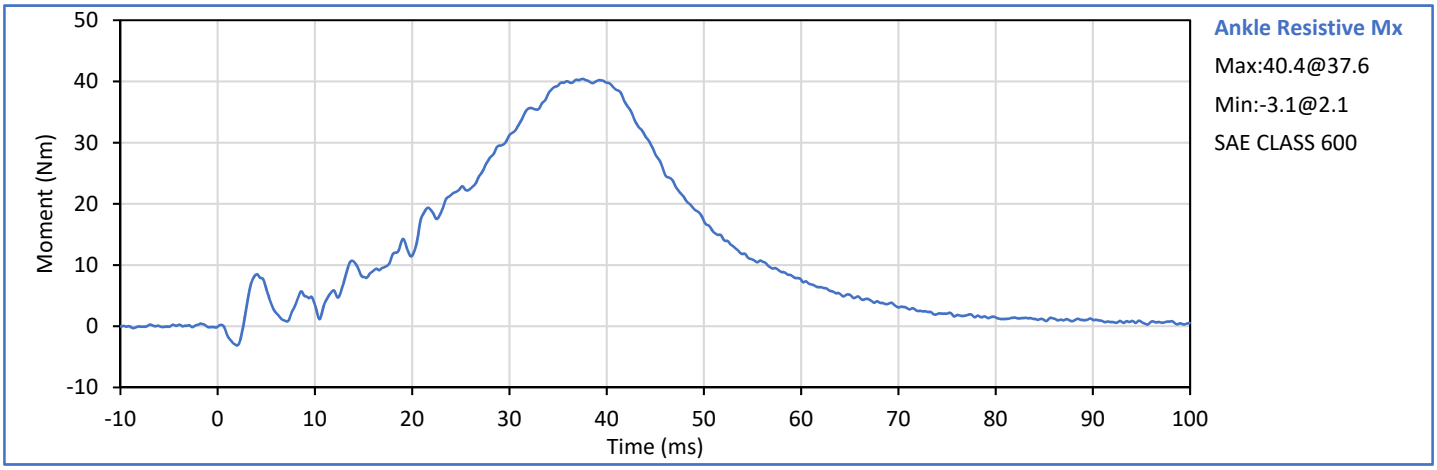
Applus IDIADA KARCO

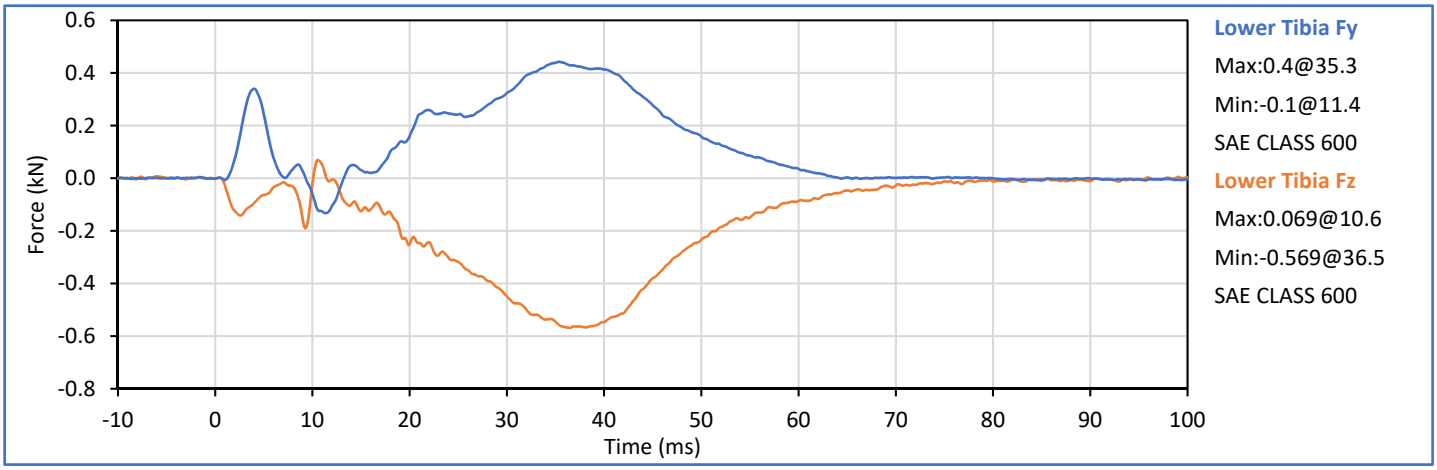
THOR-50M 50th Percentile Male ATD
Ankle Eversion (Left) Qualification

ATD Serial No.: EG2595

Test Date: 2020-12-02







Technician: J. Hernandez

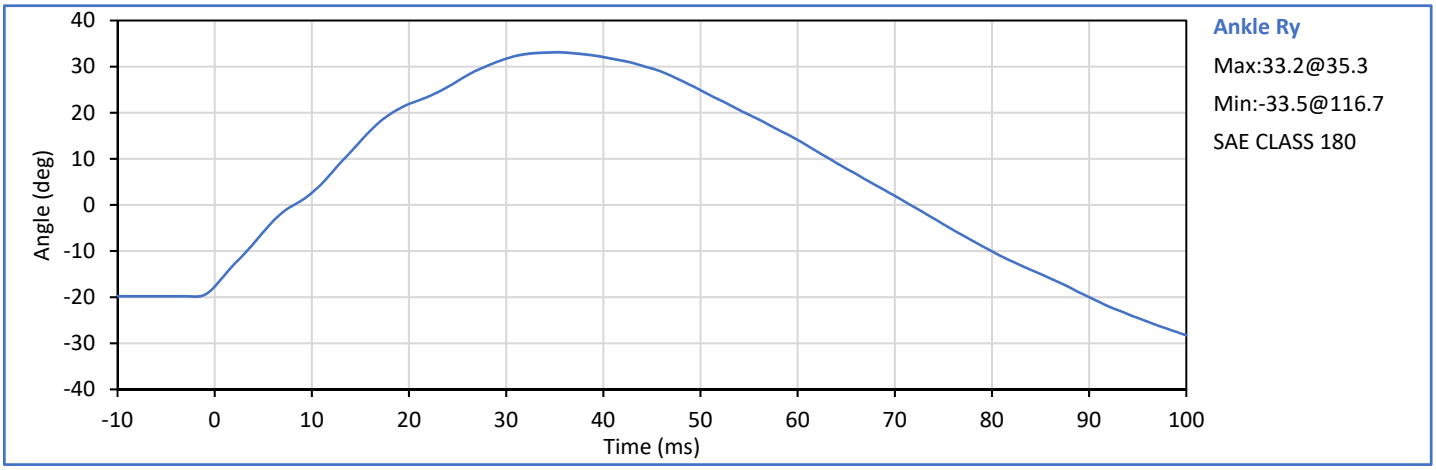
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	13	Pass
Pendulum Velocity	m/s	4.95	5.05	5.02	Pass
Peak Ankle Ry	deg	30.4	37.2	33.2	Pass
Peak Ankle Resistive Moment	Nm	49.8	60.8	53.1	Pass
Peak Lower Tibia Fz	kN	-3.487	-2.853	-2.902	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

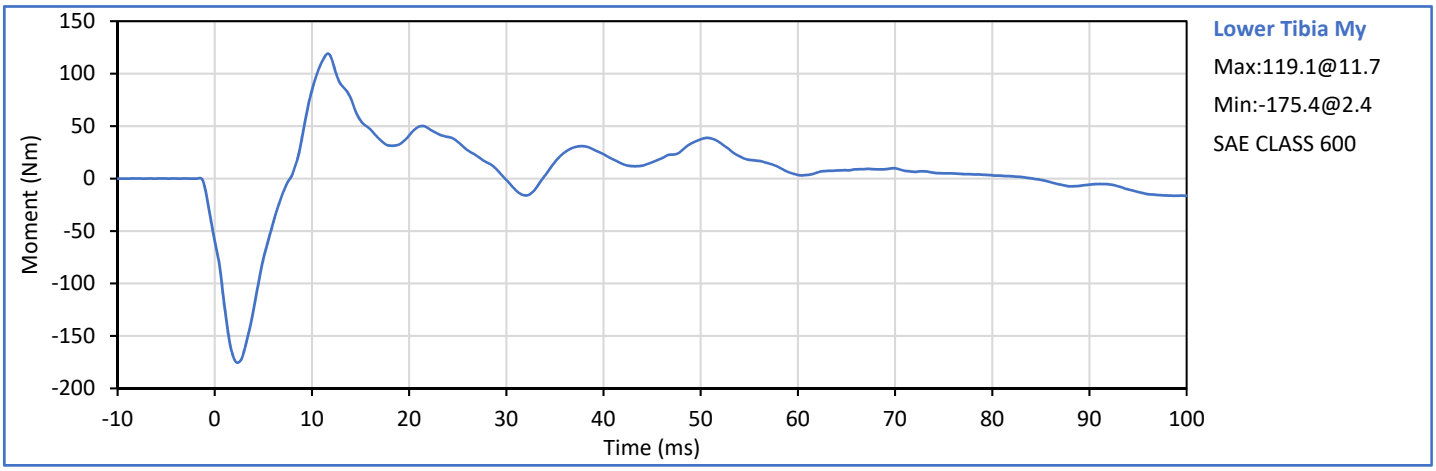
Approved By: P. Puzzuto

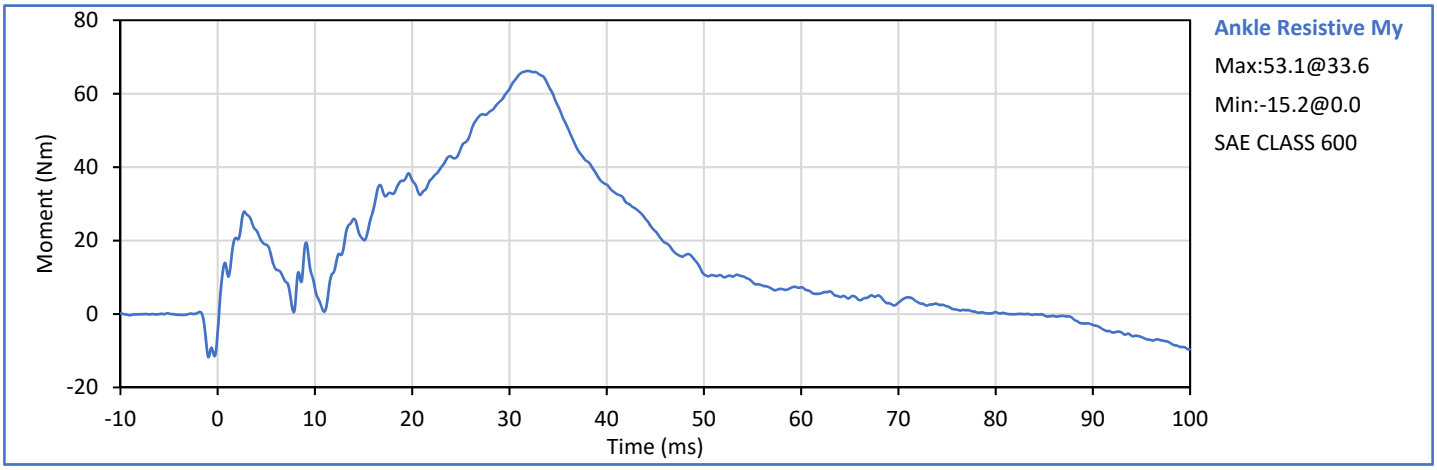
Applus IDIADA KARCO

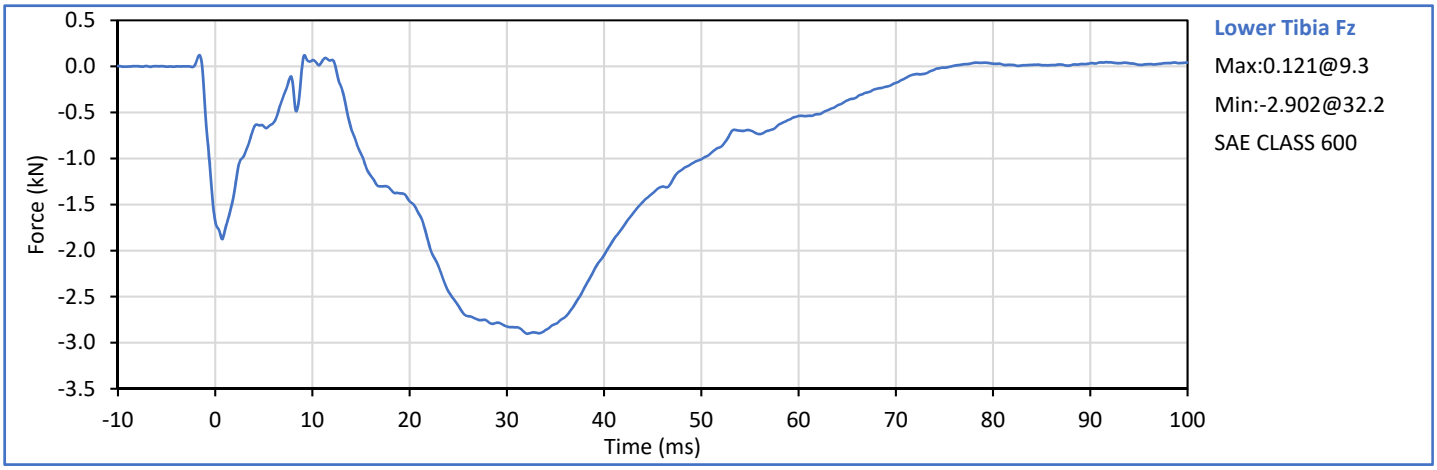
THOR-50M 50th Percentile Male ATD
Ball of Foot (Left) Qualification

ATD Serial No.: EG2595

Test Date: 2020-12-02







Technician: J. Hernandez

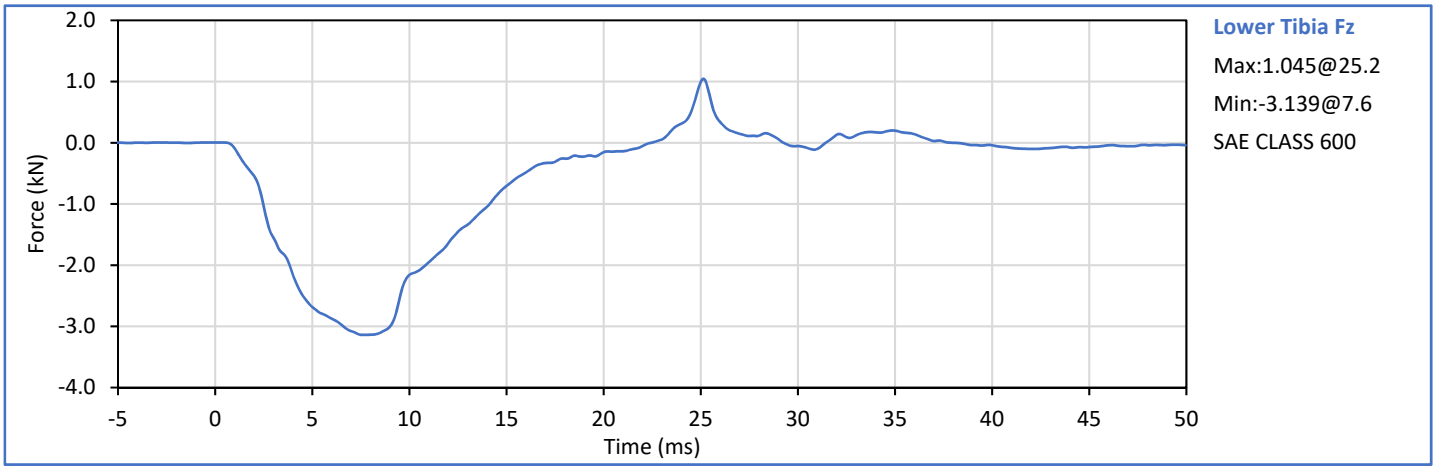
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	3.98	Pass
Peak Lower Tibia Fz	kN	-3.478	-2.846	-3.139	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



Technician: J. Hernandez

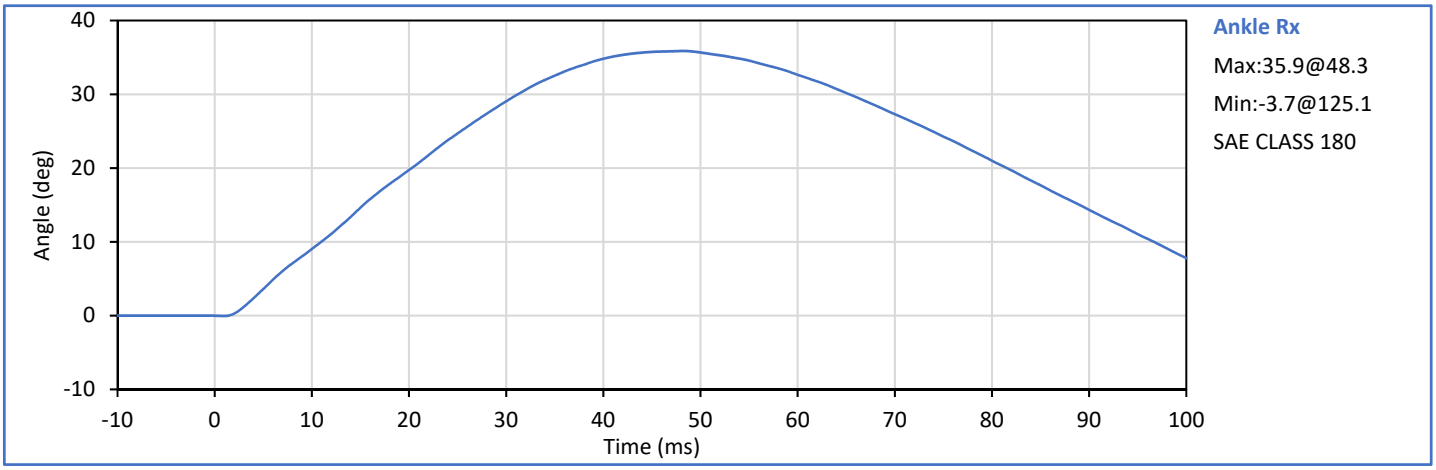
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	19	Pass
Pendulum Velocity	m/s	1.95	2.05	2.00	Pass
Peak Ankle Rx	deg	31.0	37.9	35.9	Pass
Peak Ankle Resistive Mx	Nm	35.2	43.0	35.9	Pass
Peak Lower Tibia Fz	kN	-0.555	-0.454	-0.487	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



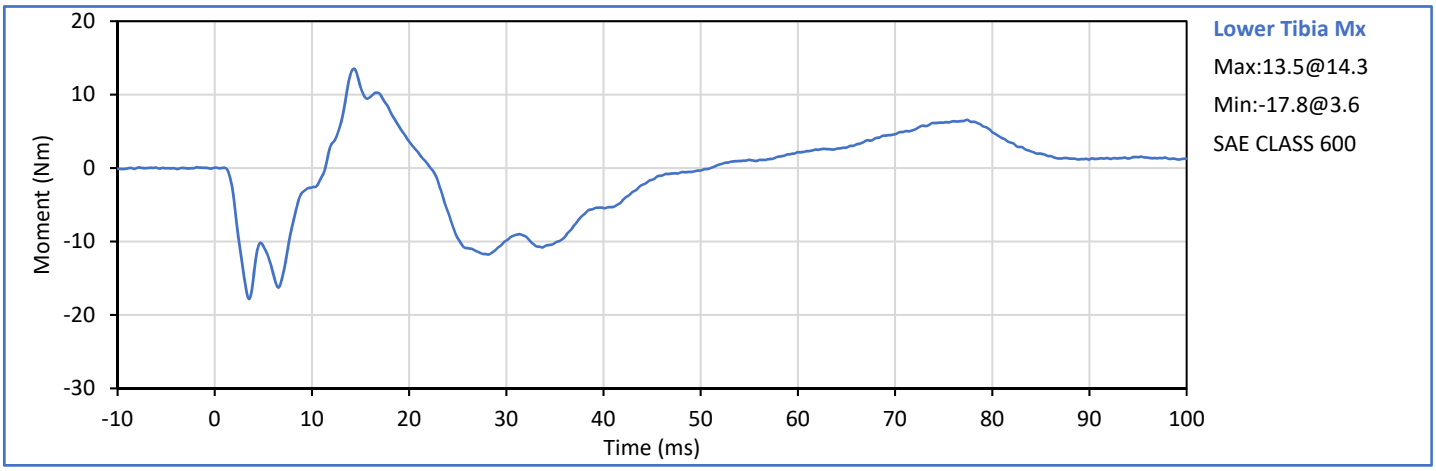
Technician: J. Hernandez

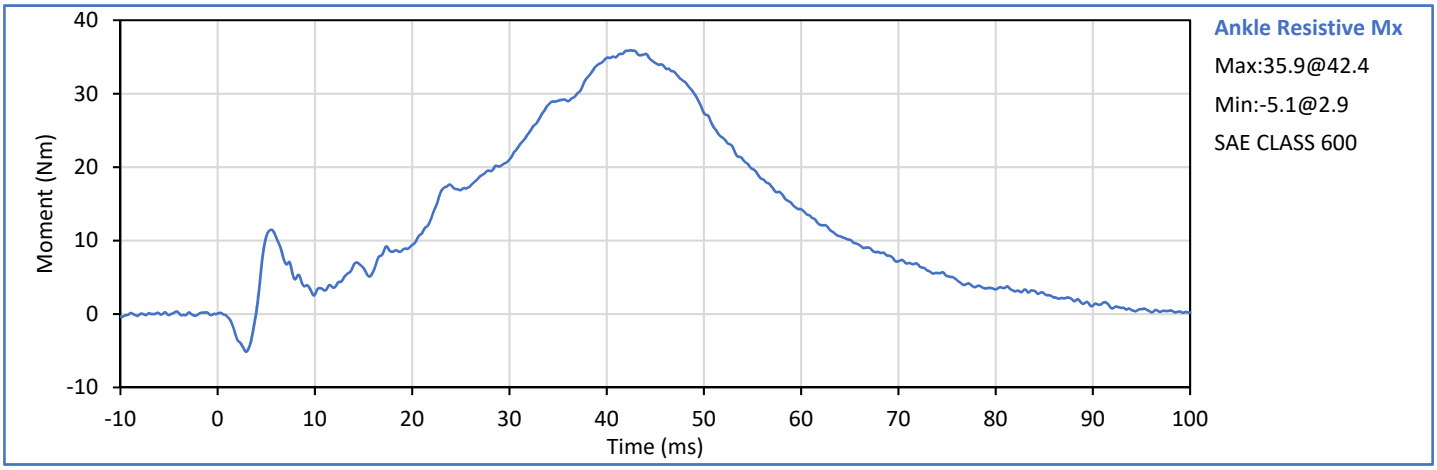
Approved By: P. Puzzuto

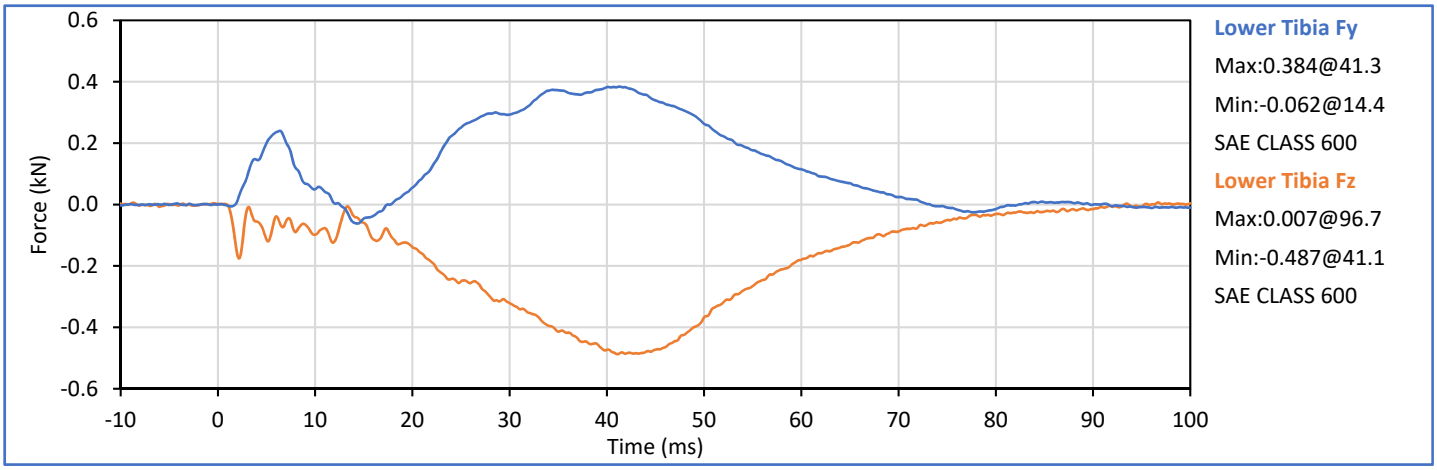
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02







Technician: J. Hernandez

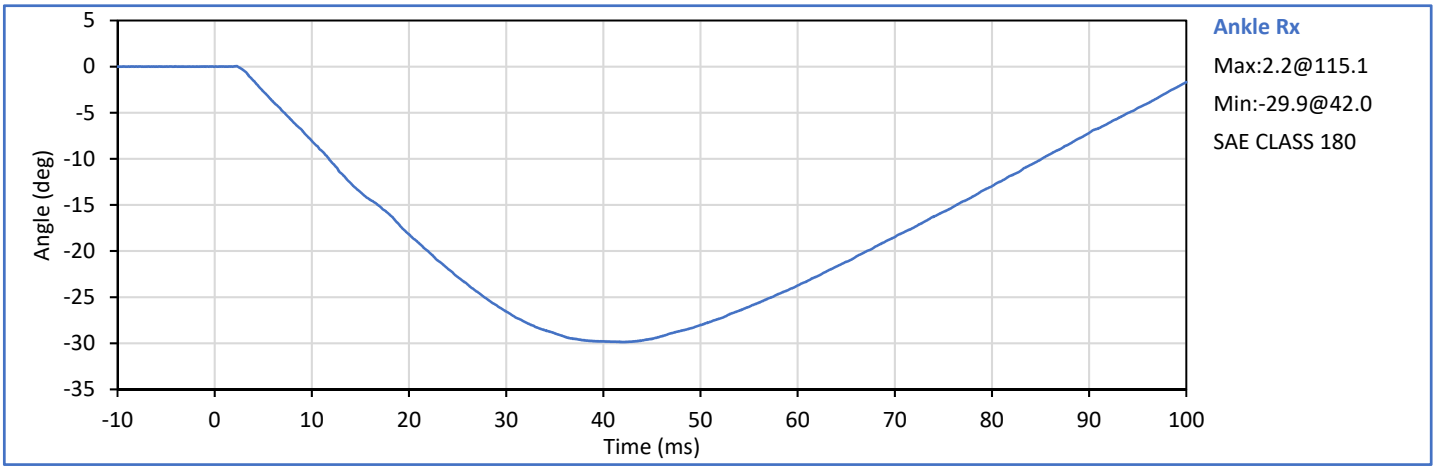
Approved By: P. Puzzuto

Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02

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	29.9	Pass
Peak Ankle Resistive Mx	Nm	38.7	47.3	41.3	Pass
Peak Lower Tibia Fz	kN	-0.629	-0.514	-0.574	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass



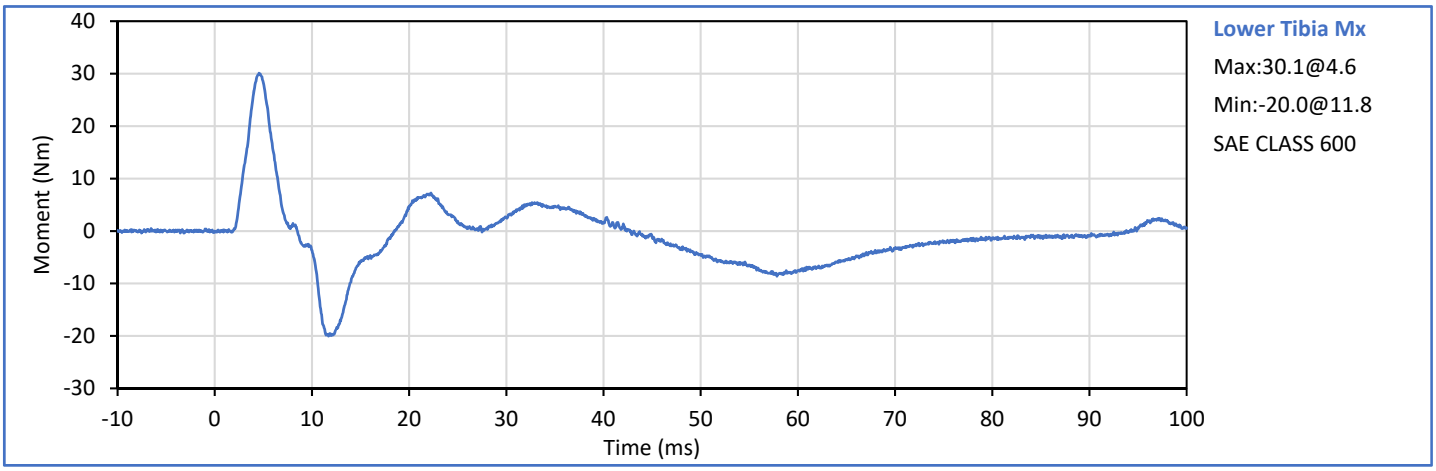
Technician: J. Hernandez

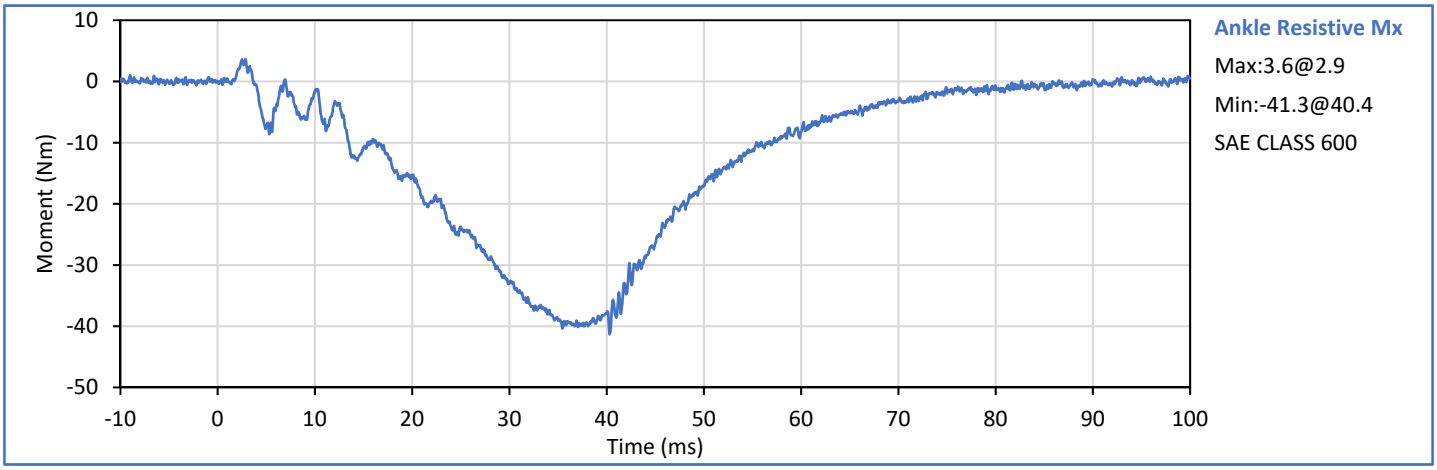
Approved By: P. Puzzuto

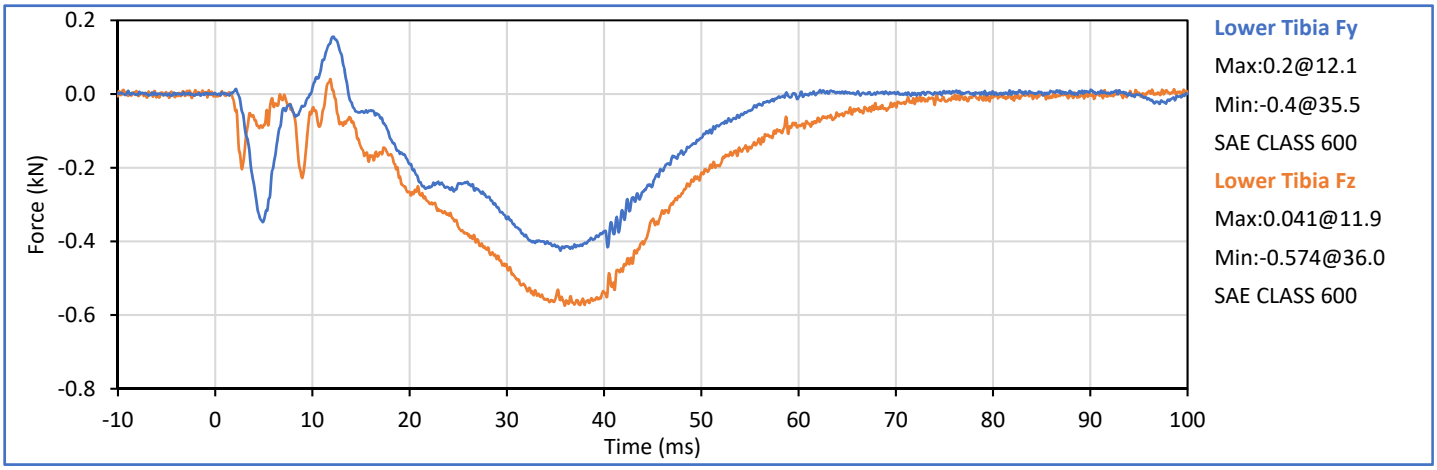
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-02







Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Pre-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: 2020-10-13

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

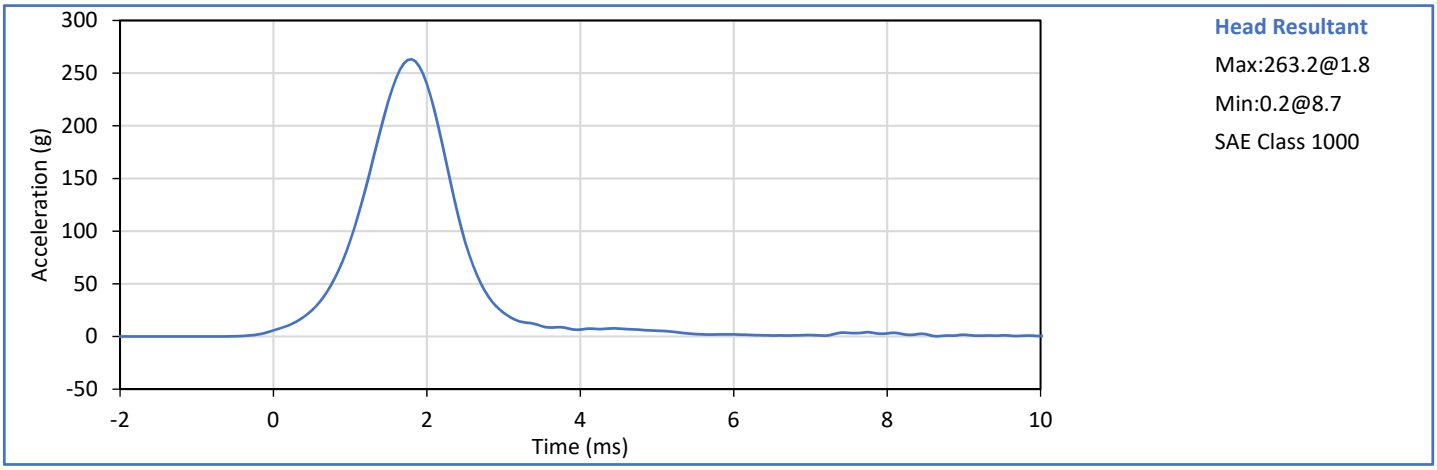
Approved By: P. Puzzuto

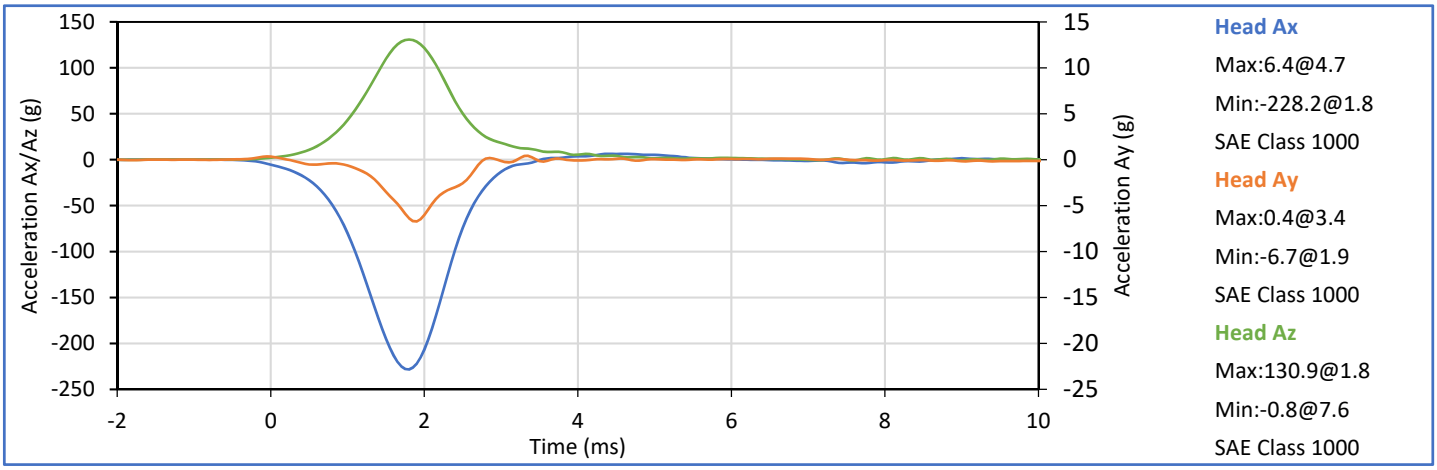
Applus IDIADA
KARCO

Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 168 Test Date: 2020-10-13

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	24	Pass
Peak Resultant Acceleration	g	225.0	275.0	263.2	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-6.7	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

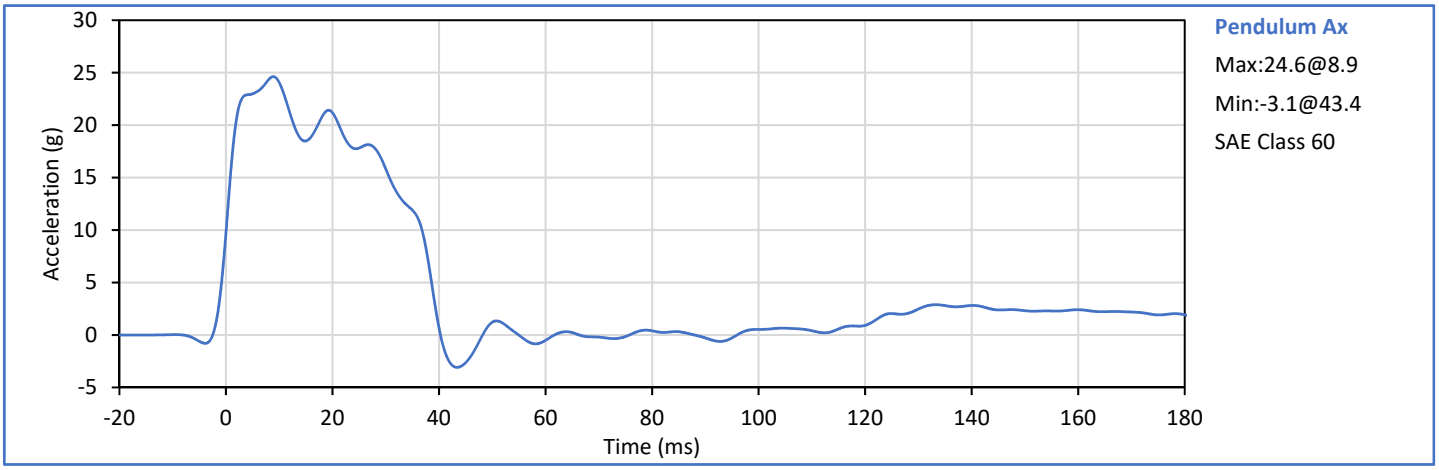
Approved By: P. Puzzuto

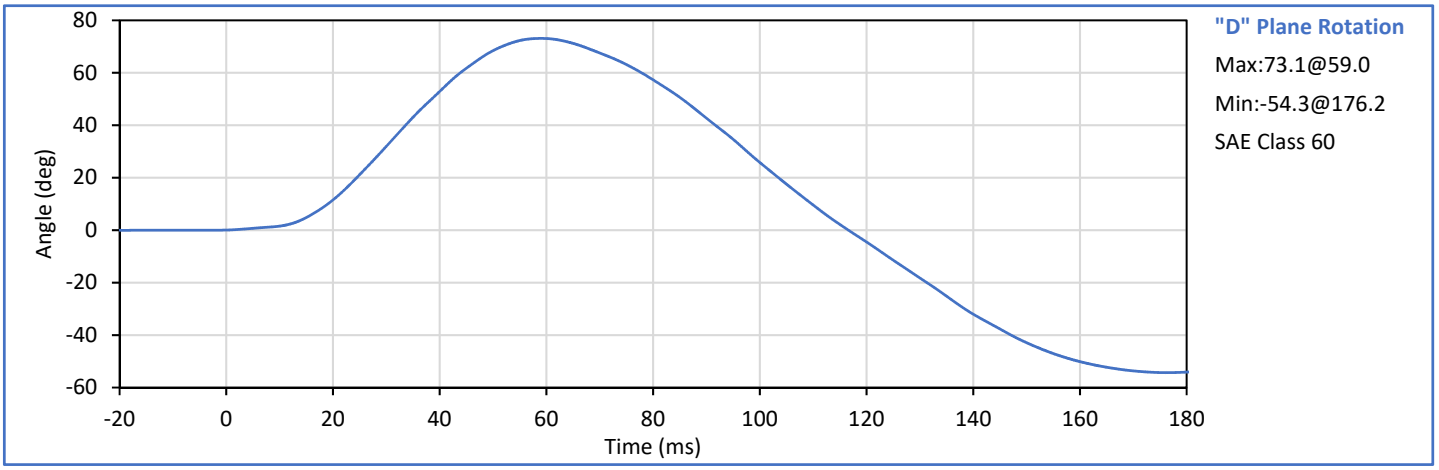
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-10-13

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	29	Pass
Pendulum Velocity	m/s	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.1	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.2	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.8	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.8	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	38.6	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.1	Pass
	ms	57.0	64.0	59.0	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	116.7	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	98.3	Pass
	ms	47.0	58.0	51.9	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	100.0	Pass
			Overall Test Results		Pass



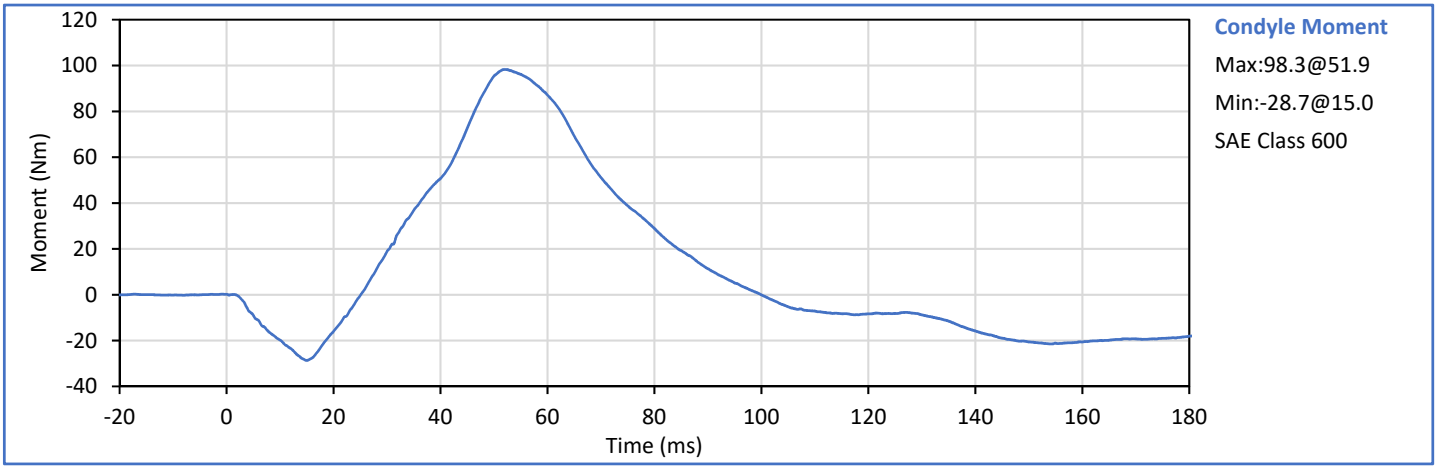


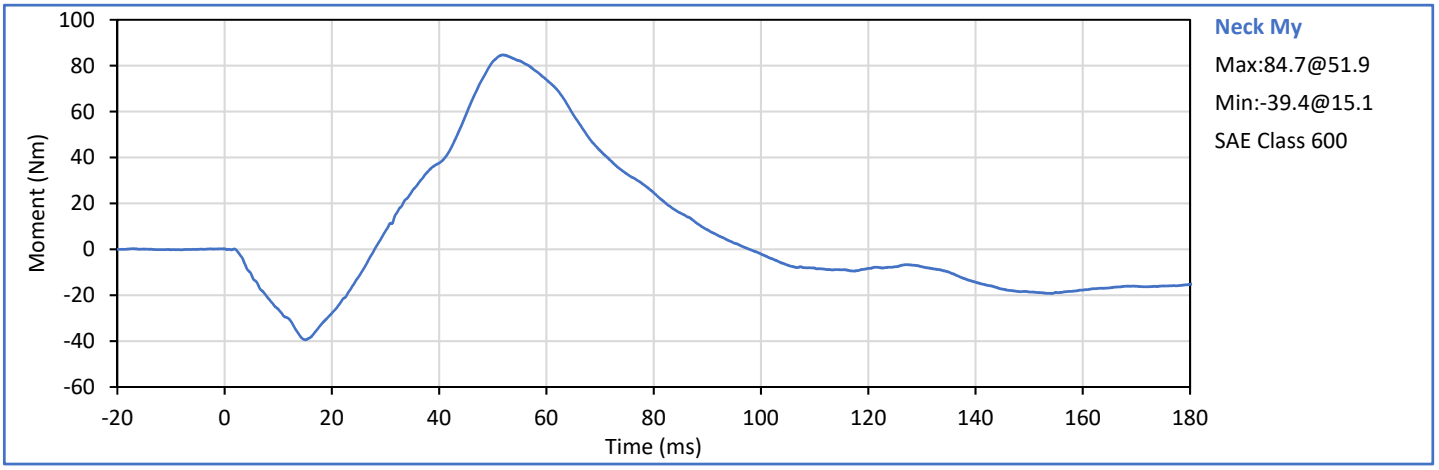
Technician: J. Hernandez

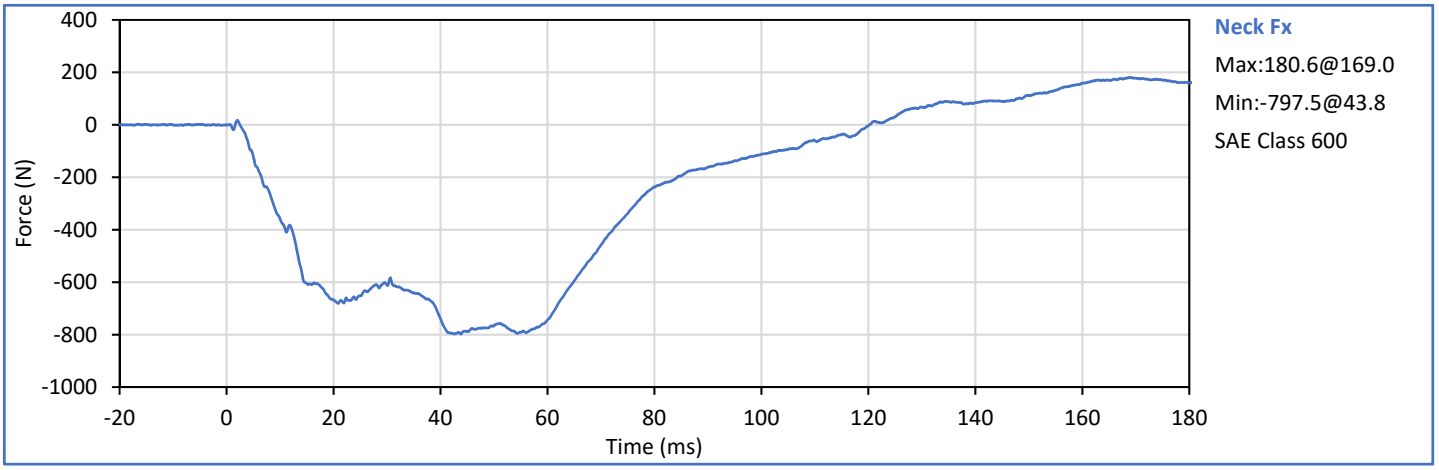
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-10-13





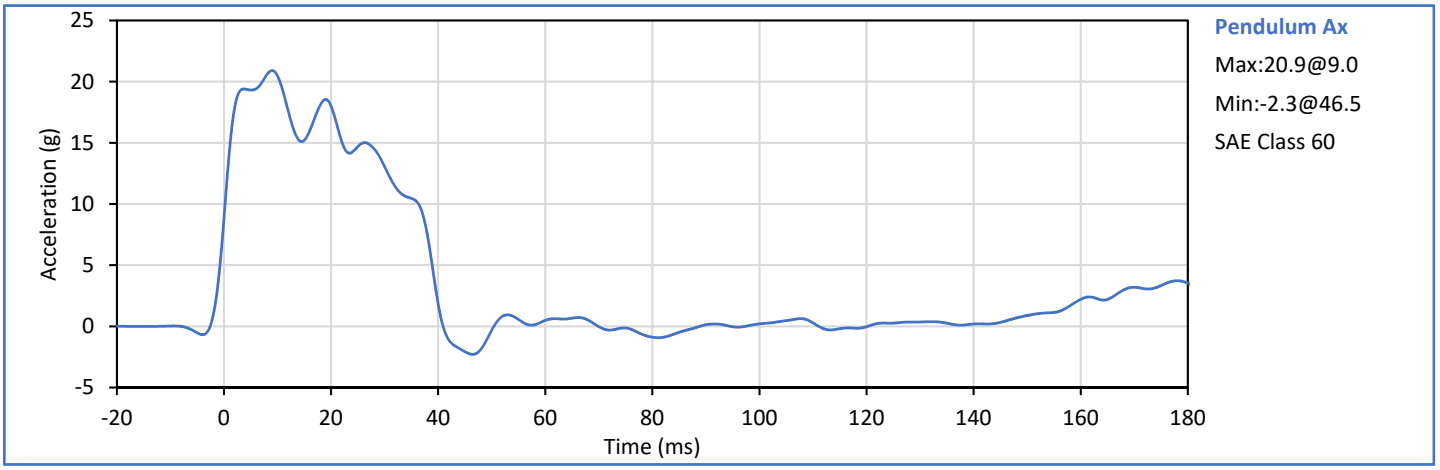


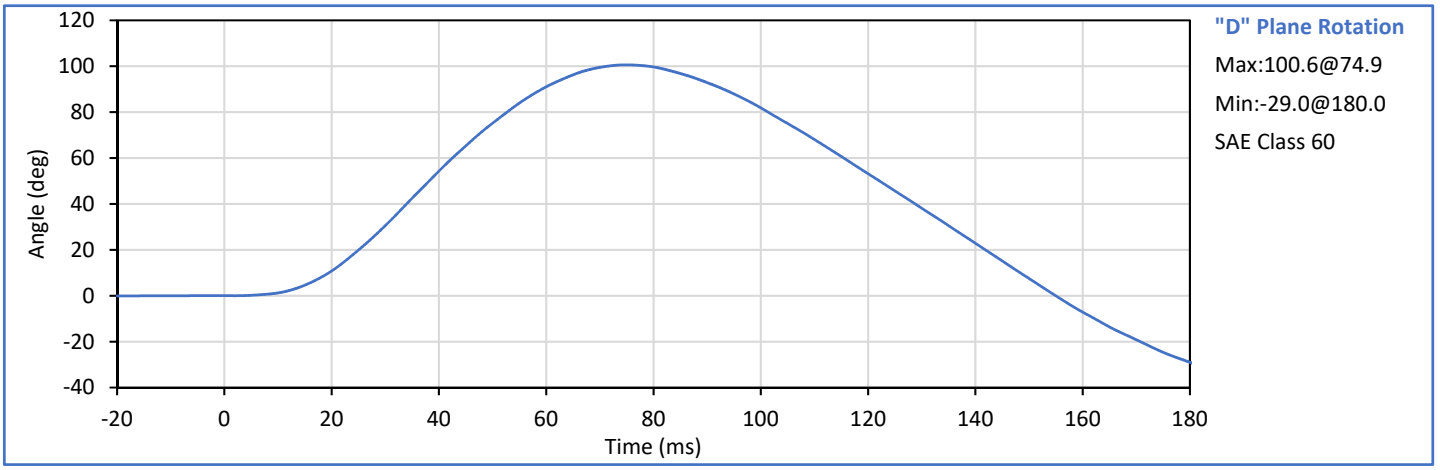
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-10-13

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	29	Pass
Pendulum Velocity	m/s	5.94	6.19	6.07	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.5	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.0	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.1	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.1	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	38.9	Pass
"D" Plane Rotation peak	deg	81.0	106.0	100.6	Pass
	ms	72.0	82.0	74.9	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	155.0	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-73.5	Pass
	ms	65.0	79.0	70.0	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	143.4	Pass
			Overall Test Results		Pass



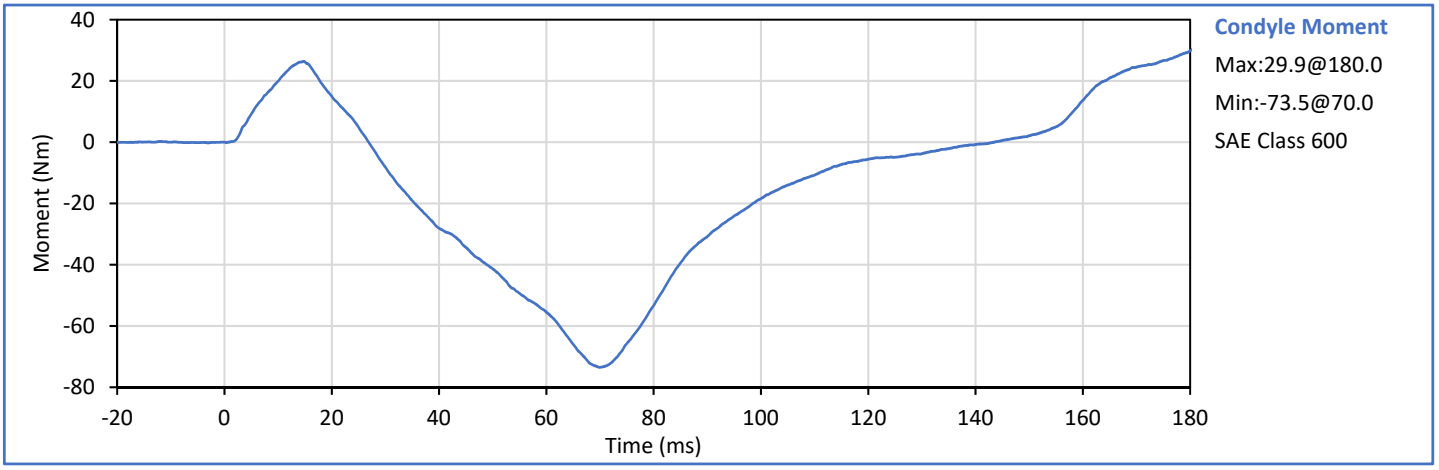


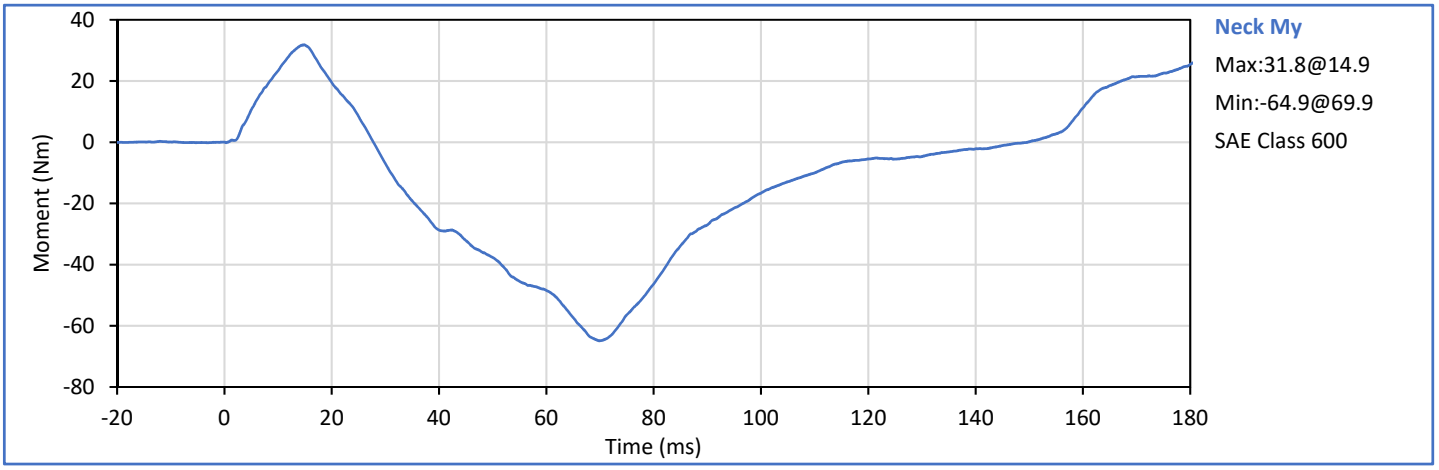
Technician: J. Hernandez

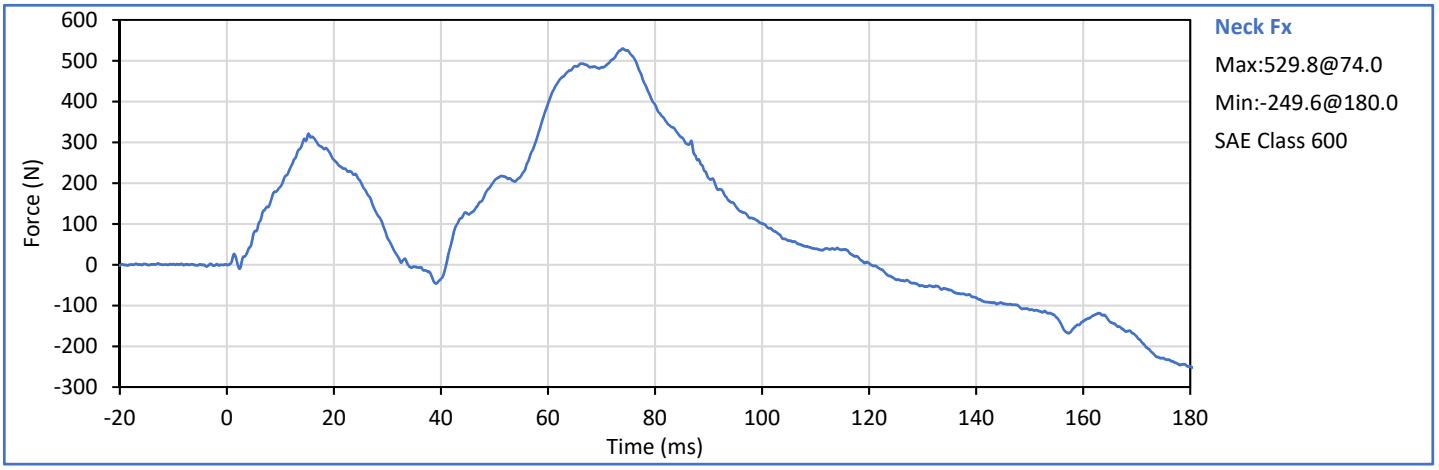
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-10-13





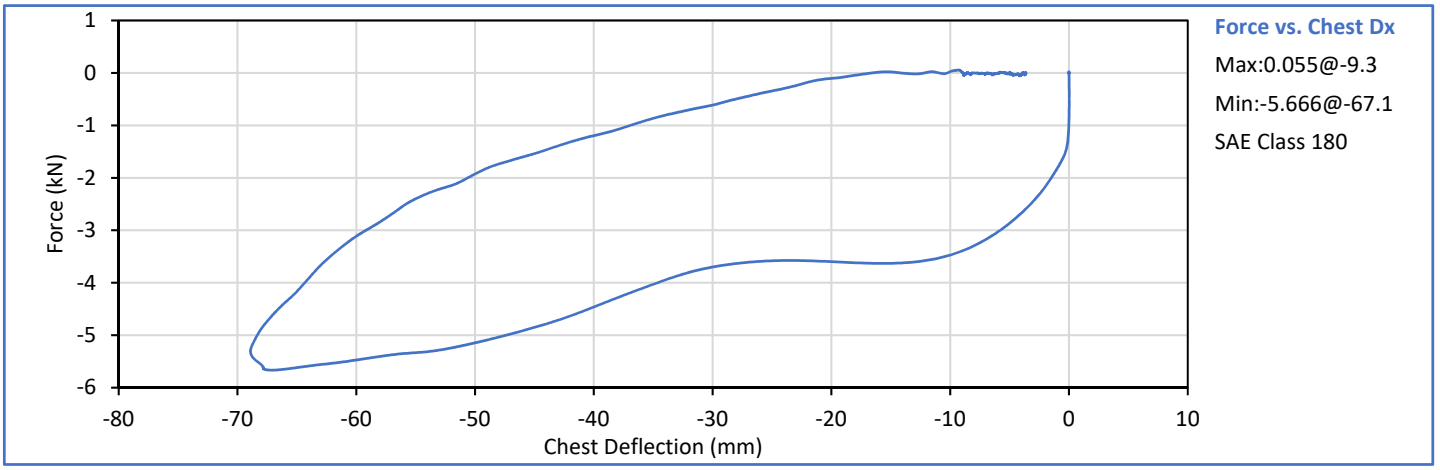


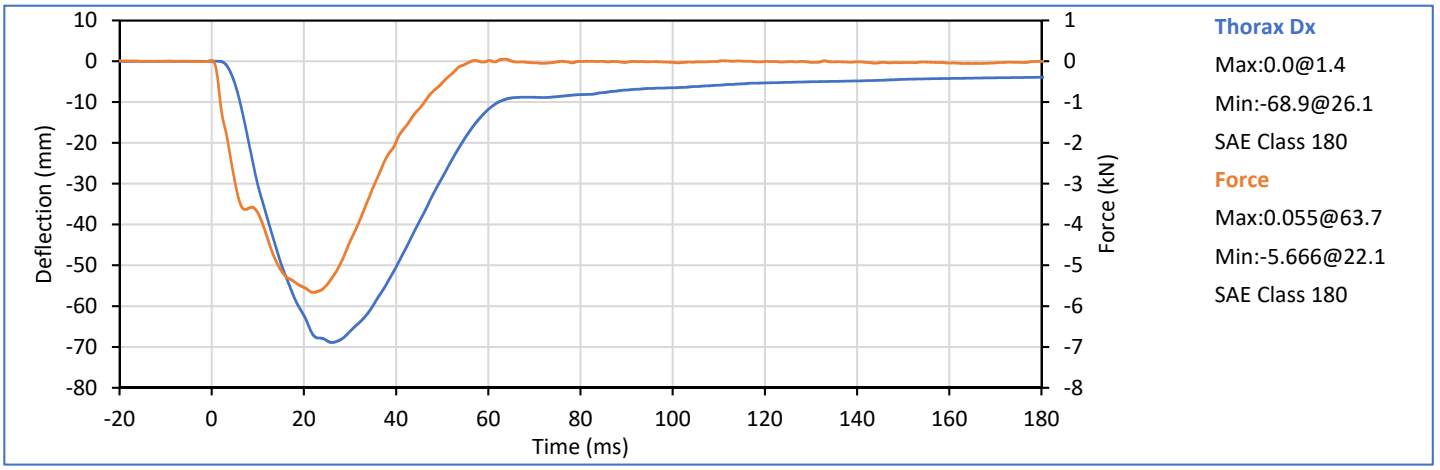
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 168 Test Date: 2020-10-13

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	6.71	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-68.9	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.666	Pass
Internal Hysterisis	%	69.0	85.0	69.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

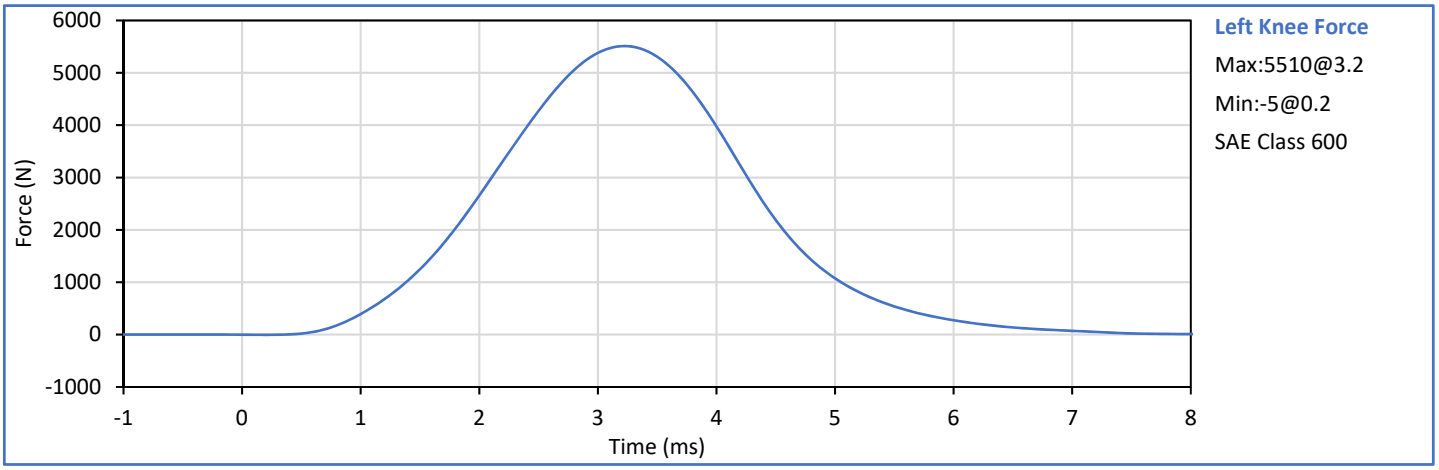
Approved By: P. Puzzuto

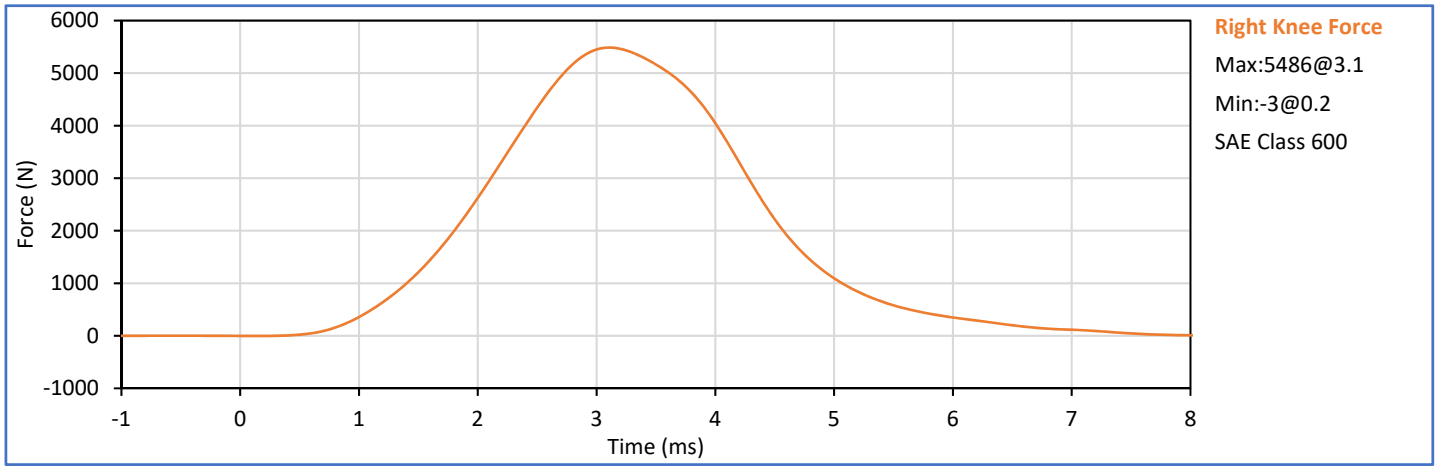
Applus IDIADA KARCO

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

ATD Serial No.: 168 Test Date: 2020-10-16

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	22.2	Pass
	Laboratory Relative Humidity	%	10	70	26	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.078	Pass
	Peak Resistive Force	N	4715	5782	5510	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.099	Pass
	Peak Resistive Force	N	4715	5782	5486	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

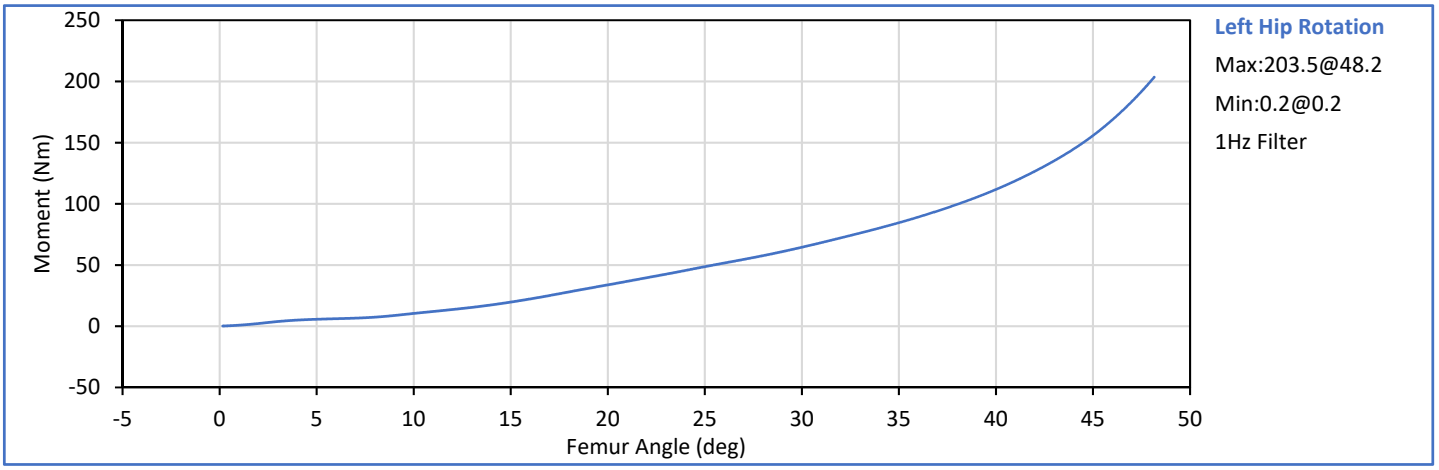
Applus IDIADA
KARCO

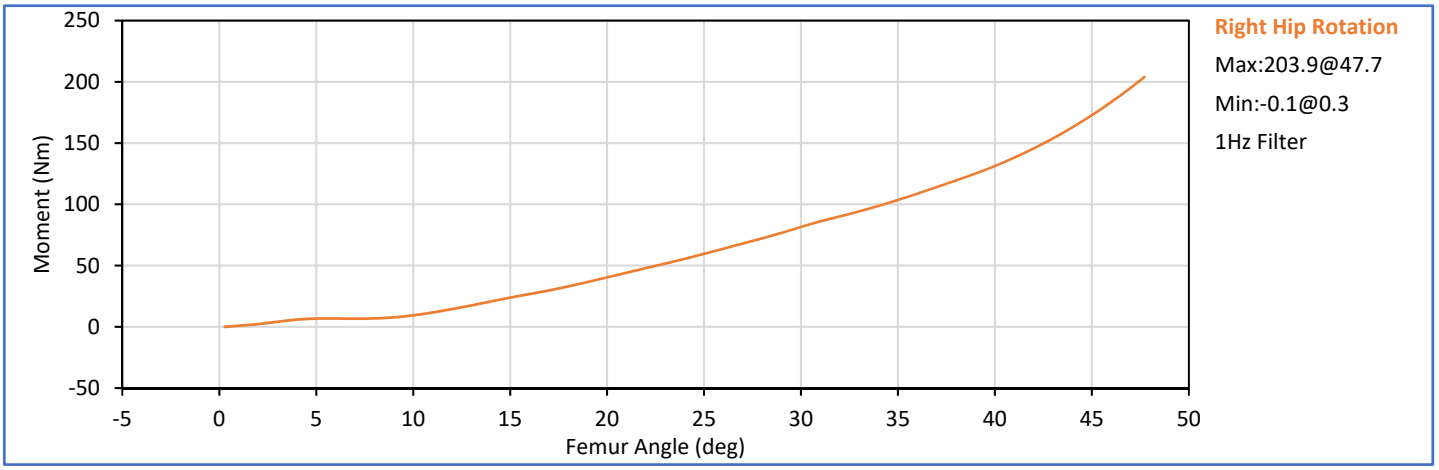
Hybrid III 50th Percentile Male ATD
Hip Flexion (Left/Right)

ATD Serial No.: 168

Test Date: 2020-10-16

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Relative Humidity	%	10	70	25	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.9	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	64.6	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	48.1	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	6.0	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	81.6	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	47.6	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

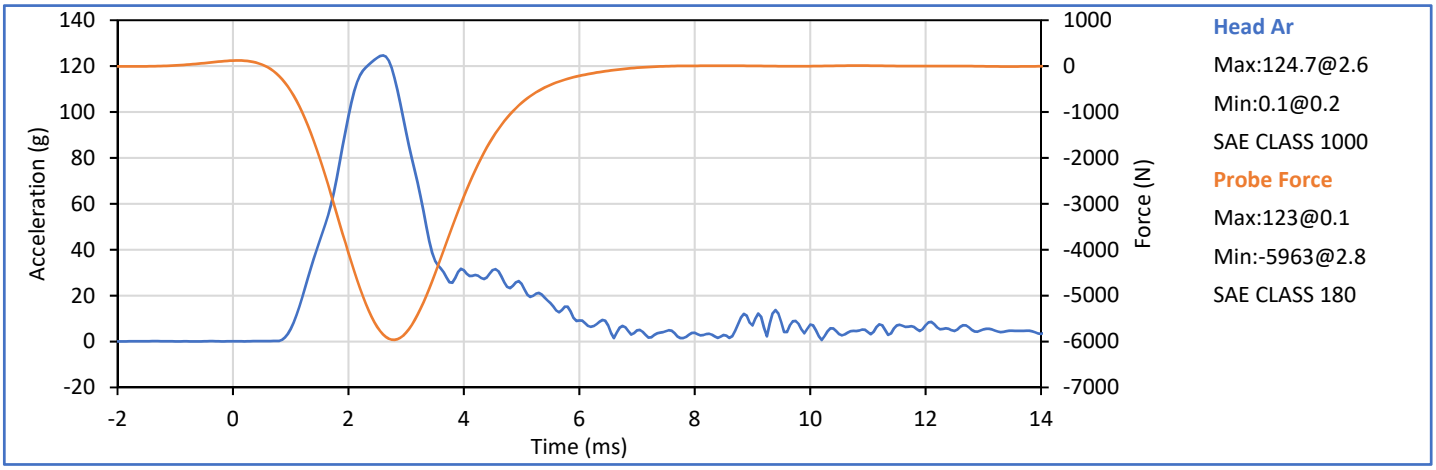
APPENDIX C
Post-Test ATD Qualification and Performance Verification
THOR-50M 50th Percentile Male ATD, (Reduced Certification)
S/N: EG2595

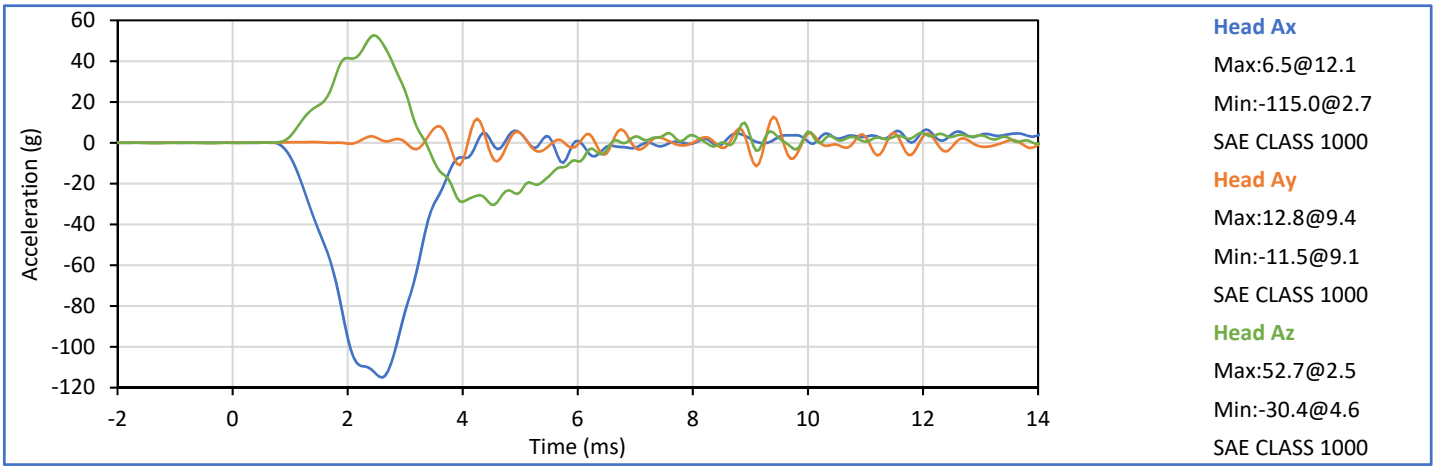
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Head Qualification

ATD Serial No.: EG2595 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	19	Pass
Probe Velocity	m/s	1.95	2.05	2.00	Pass
Peak Probe Force	kN	-6138	-5022	-5963	Pass
Peak Head Resultant Acceleration	g	105.3	128.7	124.7	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

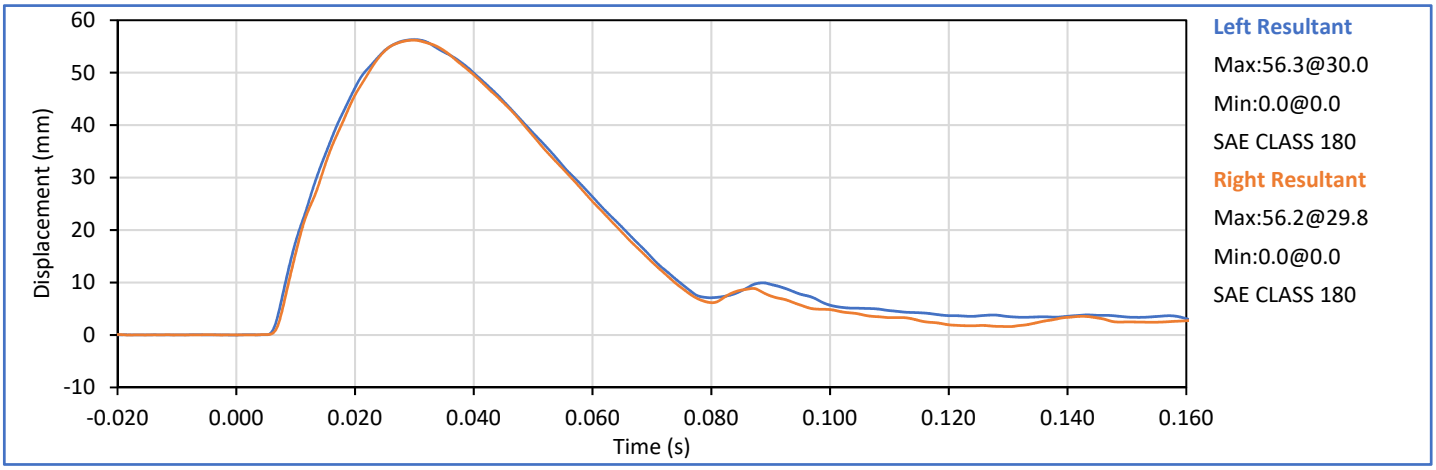
Approved By: P. Puzzuto

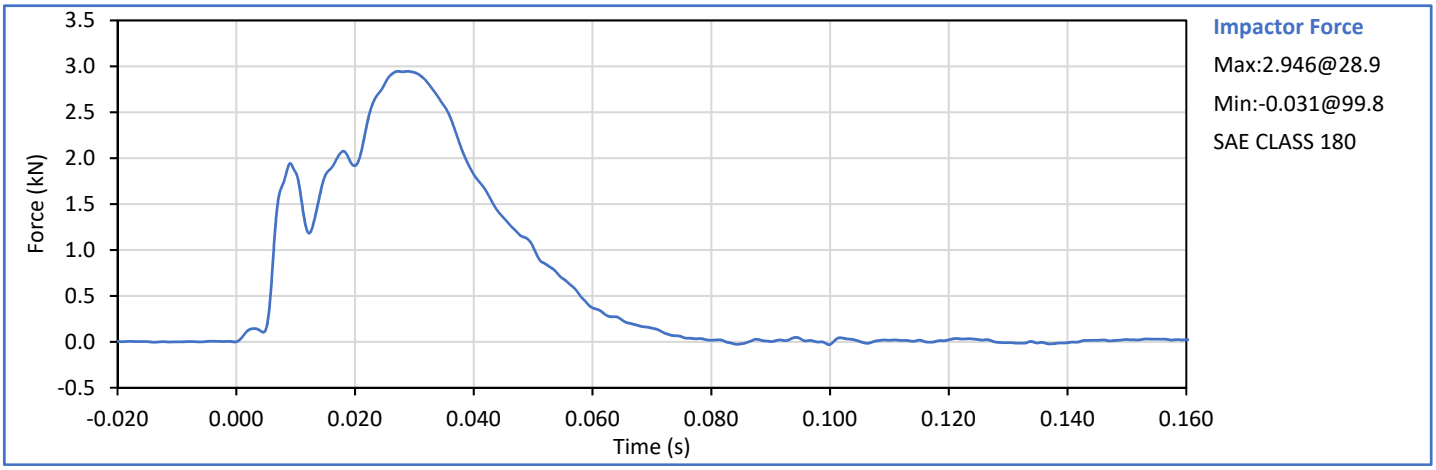
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-16

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	21	Pass
Probe Velocity	m/sec	4.25	4.35	4.28	Pass
Peak Probe Force	kN		3.039	2.946	Pass
Peak Upper Left Deflection Resultant	mm	48.3	59.0	56.3	Pass
Peak Upper Right Deflection Resultar	mm			56.2	Pass
Absolute Difference L/R Dx Resultant	mm	0.0	5.0	0.1	Pass
Force at Peak Upper Left Resultant	mm	2.409	2.944	2.933	Pass
Force at Peak Upper Right Resultant	mm			2.937	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

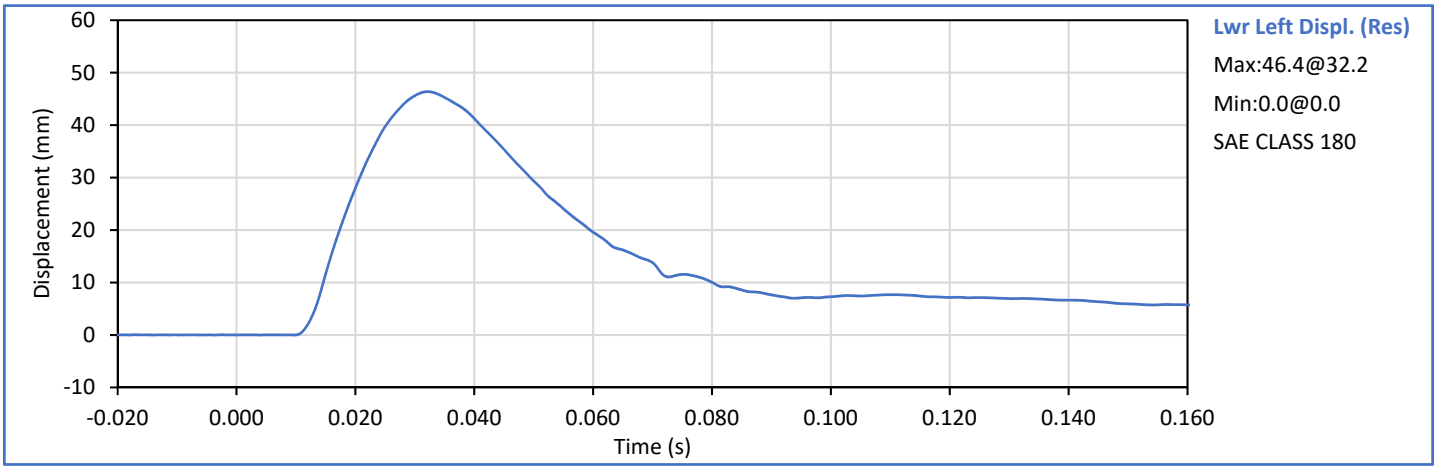
Approved By: P. Puzzuto

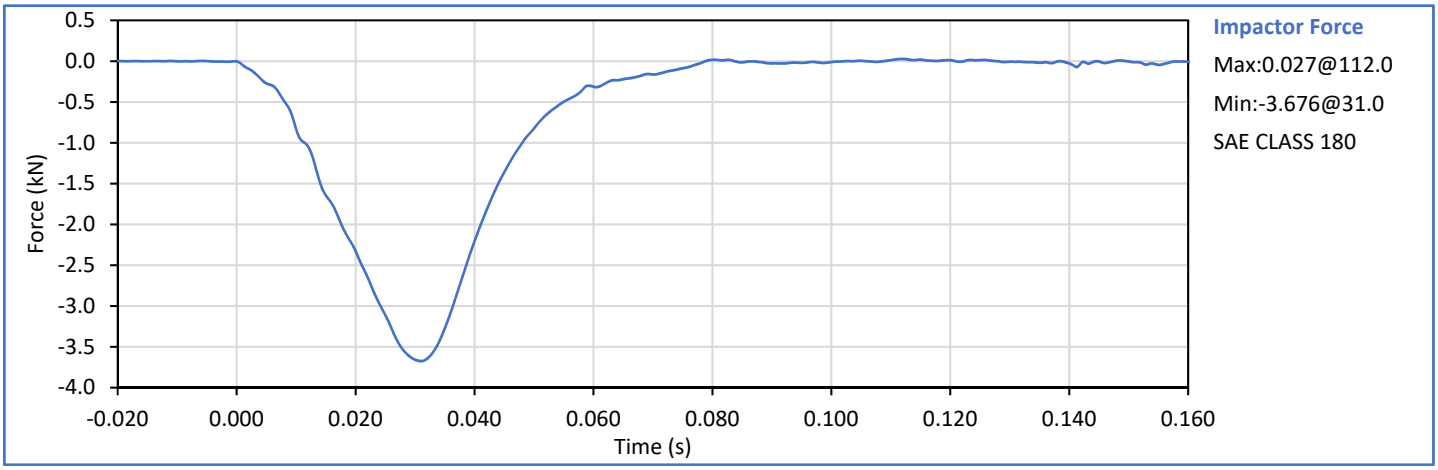
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-17

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	36	Pass
Probe Velocity	m/sec	4.25	4.35	4.31	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.676	Pass
Lower Left Resultant Dx at Peak Fx	mm	45.8	56.0	46.2	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

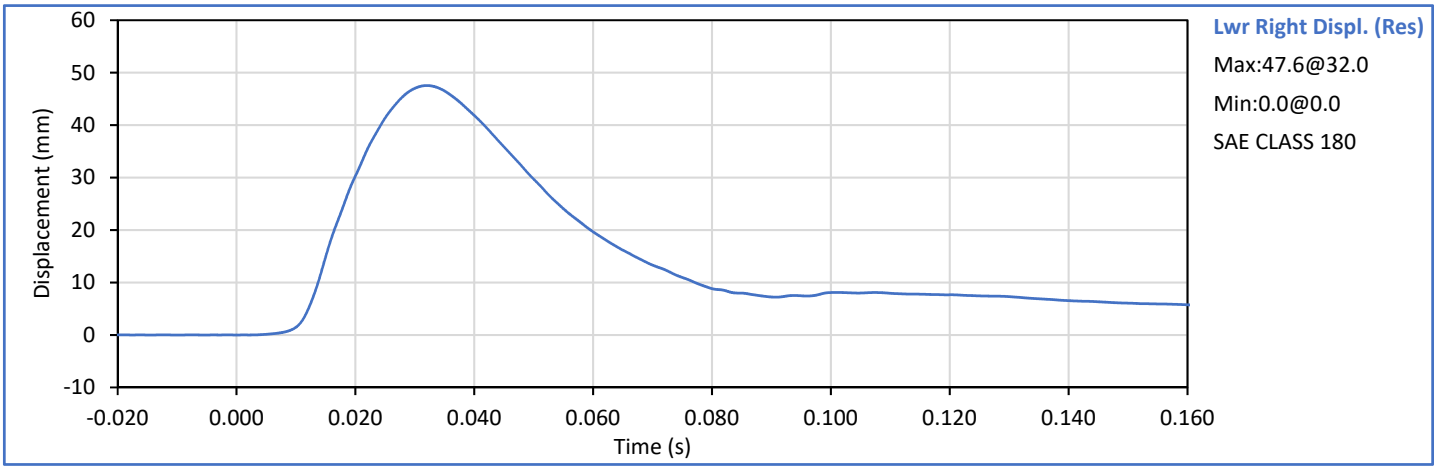
Approved By: P. Puzzuto

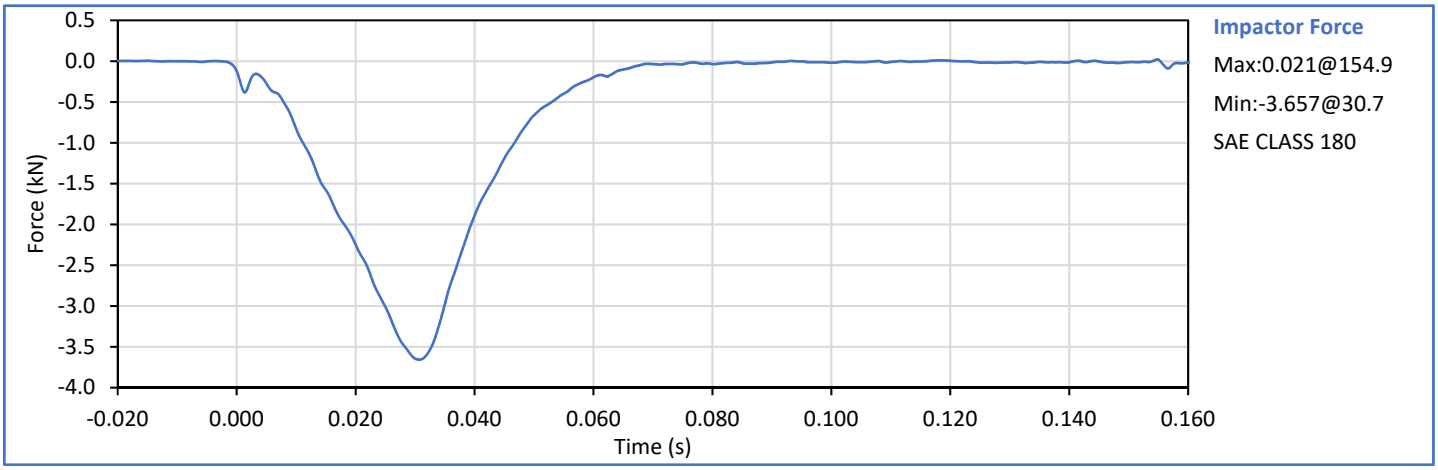
Applus IDIADA KARCO

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

ATD Serial No.: EG2595 Test Date: 2020-12-17

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	26	Pass
Probe Velocity	m/sec	4.25	4.35	4.33	Pass
Peak Probe Force	kN	-3.832	-3.136	-3.657	Pass
Lower Right Resultant Dx at Peak Fx	mm	45.8	56.0	47.3	Pass
NHTSA Corridor 2019-05			Overall Test Results		Pass





Technician: J. Hernandez

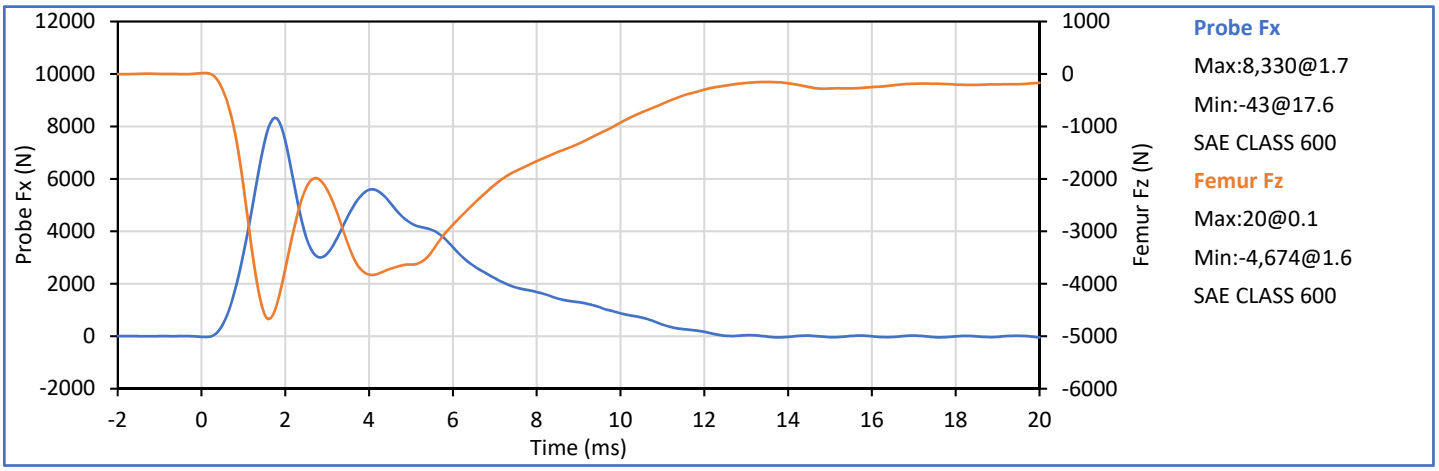
Approved By: P. Puzzuto

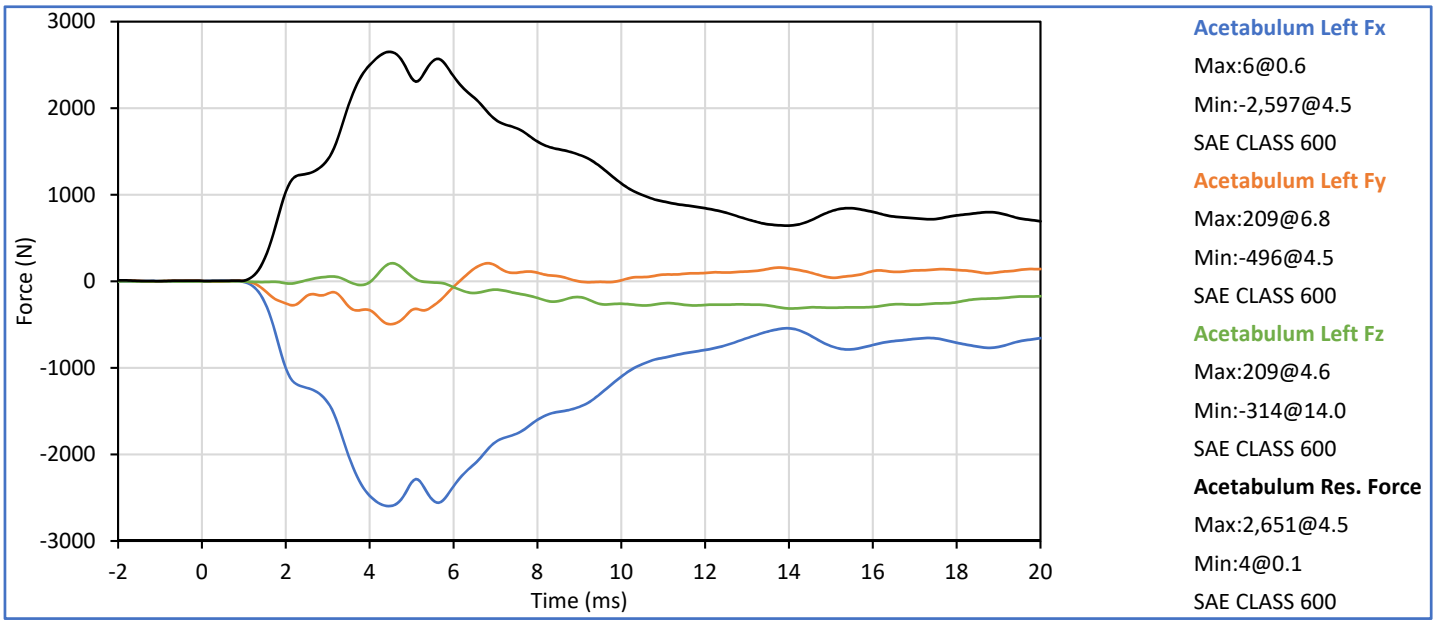
Applus IDIADA KARCO

THOR-50M 50th Percentile Male ATD
Upper Leg (Left) Qualification
TH EG2595 Leg Left

ATD Serial No.: EG2595 Test Date: 2020-12-16

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
Pendulum Velocity	m/s	3.25	3.35	3.30	Pass
Peak Probe Force	N	*	*	8330	*
Peak Femur Fz	N	*	*	-4674	*
Acetabulum Force Resultant	N	*	*	2651	*
* Research data. No defined P/F corridor			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA KARCO

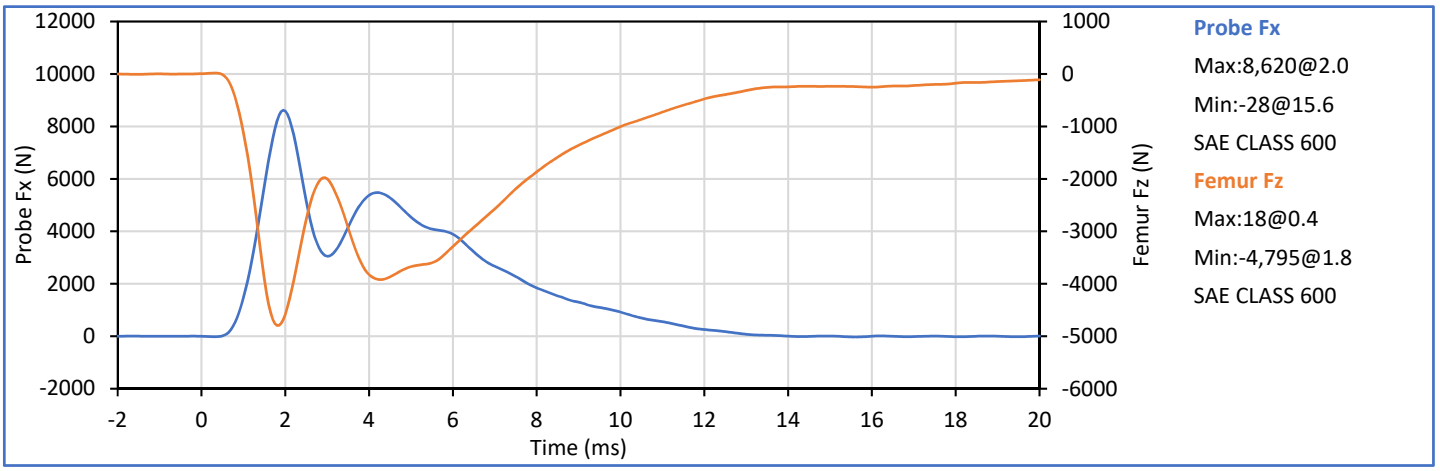
THOR-50M 50th Percentile Male ATD
Upper Leg (Right) Qualification
TH EG2595 Leg Right

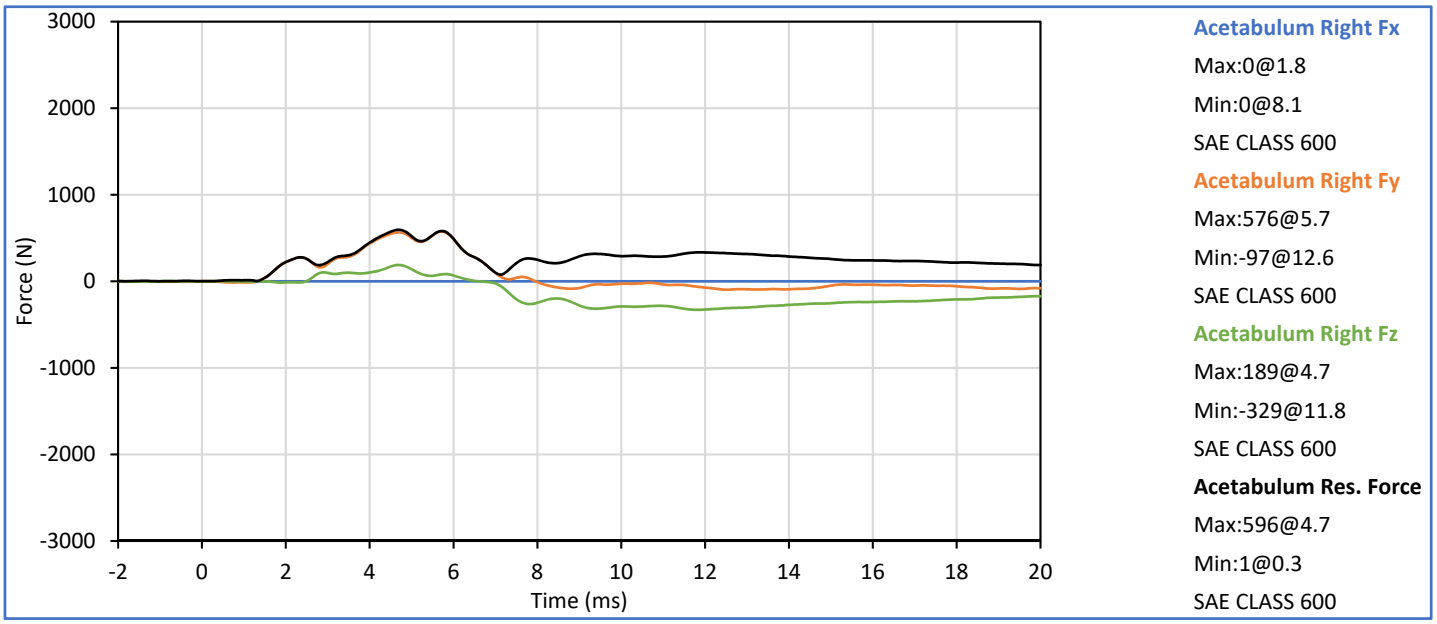
ATD Serial No.: EG2595 Test Date: 2020-12-16

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	
Pendulum Velocity	m/s	3.25	3.35	3.33	Pass	
Peak Probe Force	N	*	*	8620	*	
Peak Femur Fz	N	*	*	-4795	*	
Acetabulum Force Resultant	N	*	*	596	*	**
			Overall Test Results		Pass	

* Research data. No defined P/F corridor

** Acetabulum Fx is not functioning





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-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: 2020-12-10

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

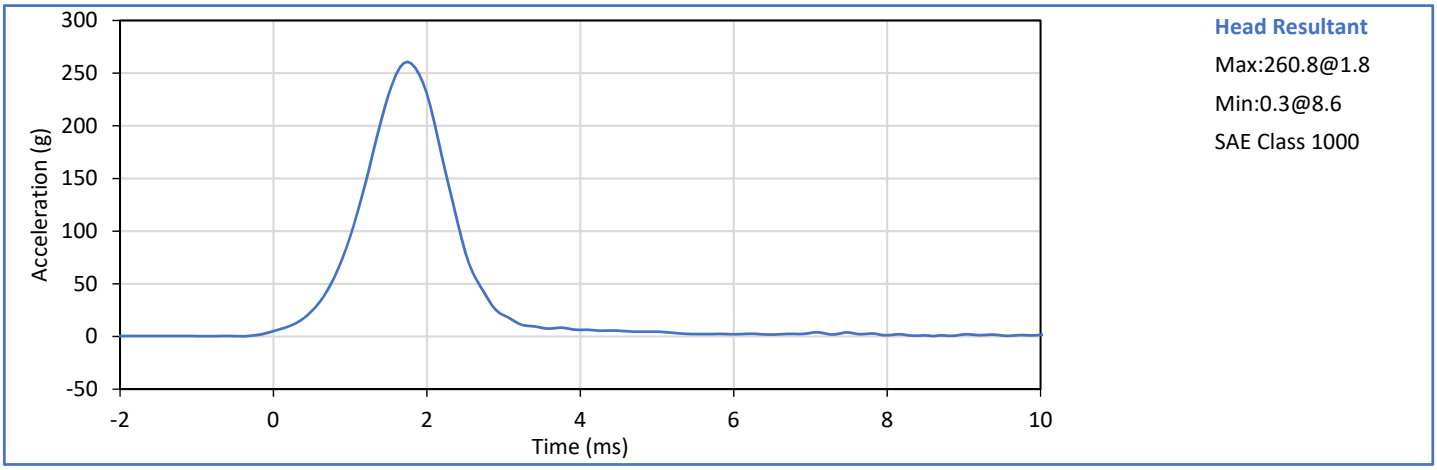
Applus IDIADA
KARCO

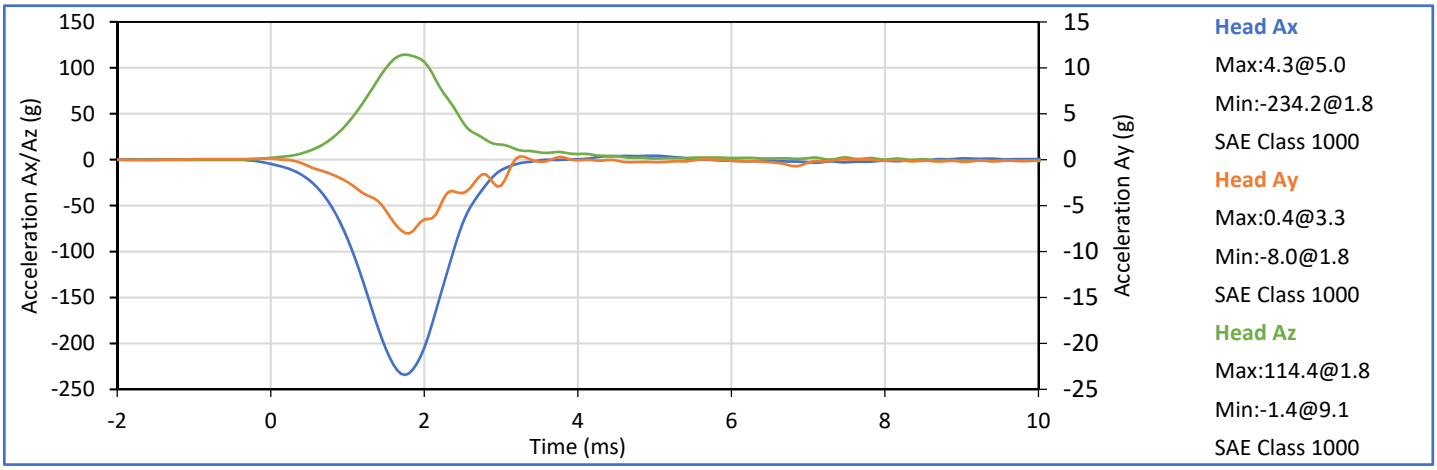
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 168

Test Date: 2020-12-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Relative Humidity	%	10	70	15	Pass
Peak Resultant Acceleration	g	225.0	275.0	260.8	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-8.0	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.5	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

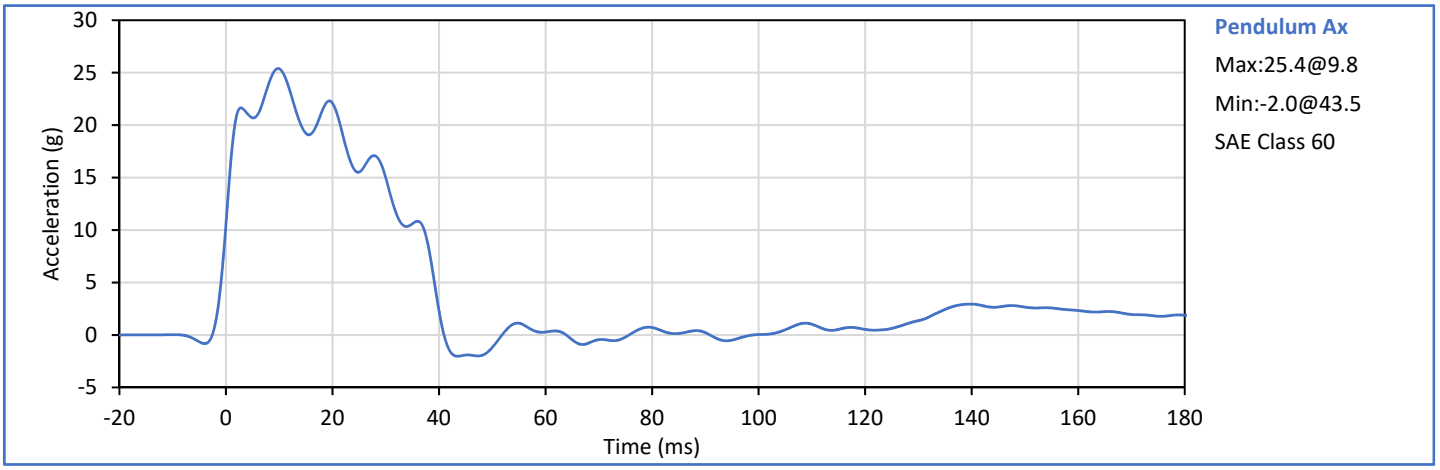
Applus IDIADA KARCO

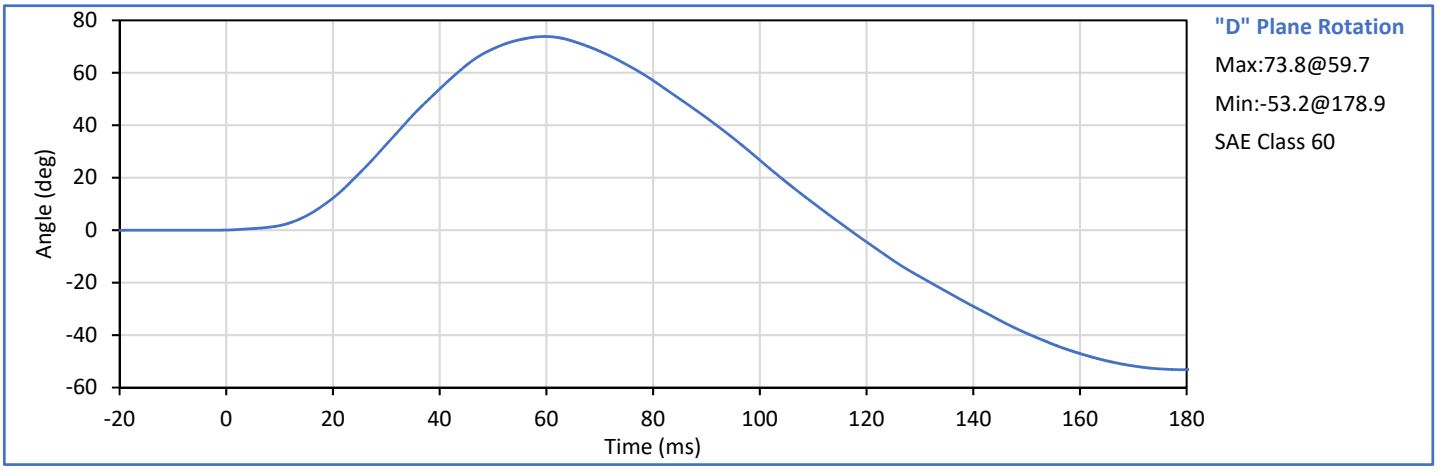
Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168

Test Date: 2020-12-14

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	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	25.4	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	22.1	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.0	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	39.1	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.8	Pass
	ms	57.0	64.0	59.7	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	117.0	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	95.9	Pass
	ms	47.0	58.0	52.8	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	102.5	Pass
			Overall Test Results		Pass



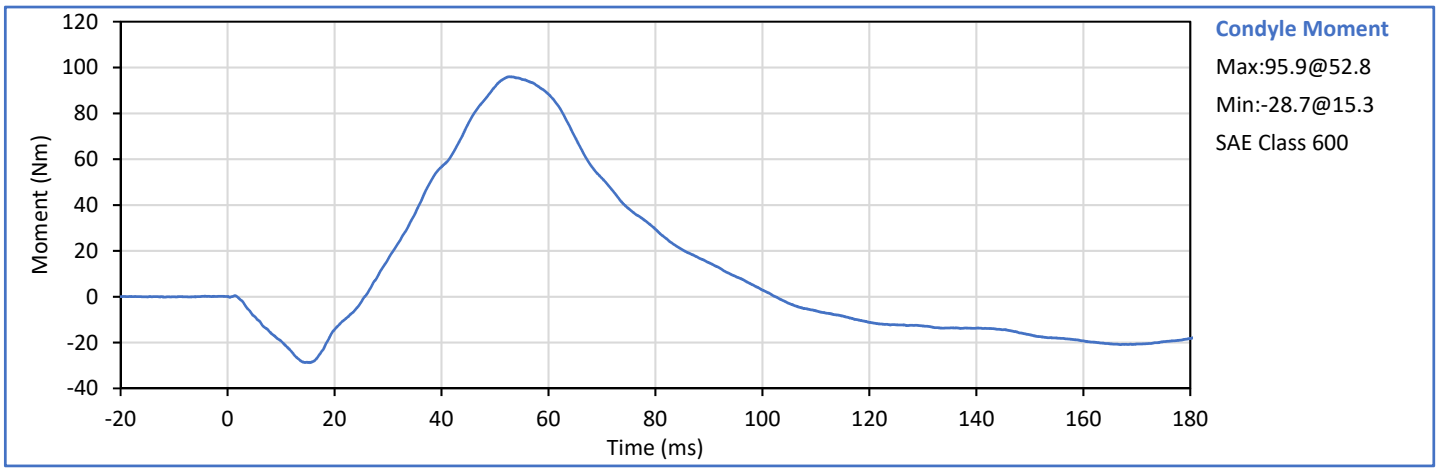


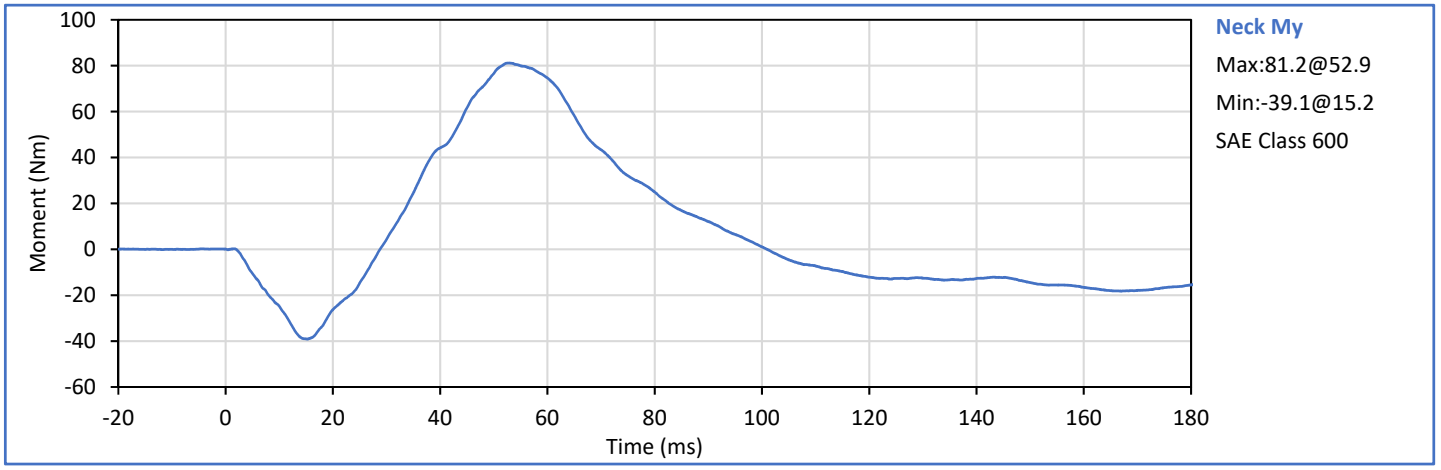
Technician: J. Hernandez

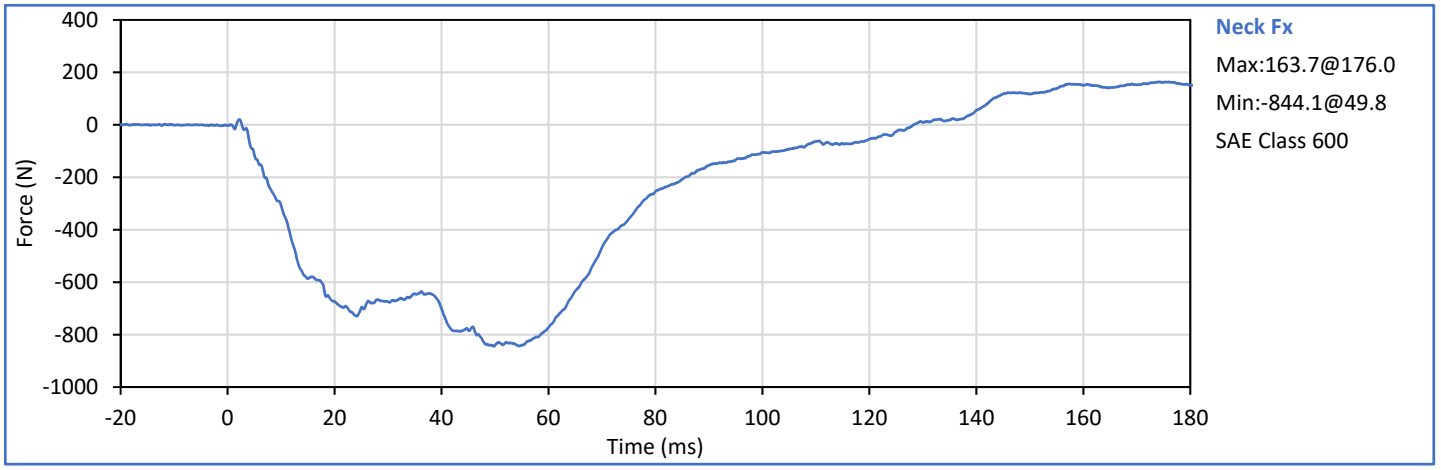
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 168 Test Date: 2020-12-14





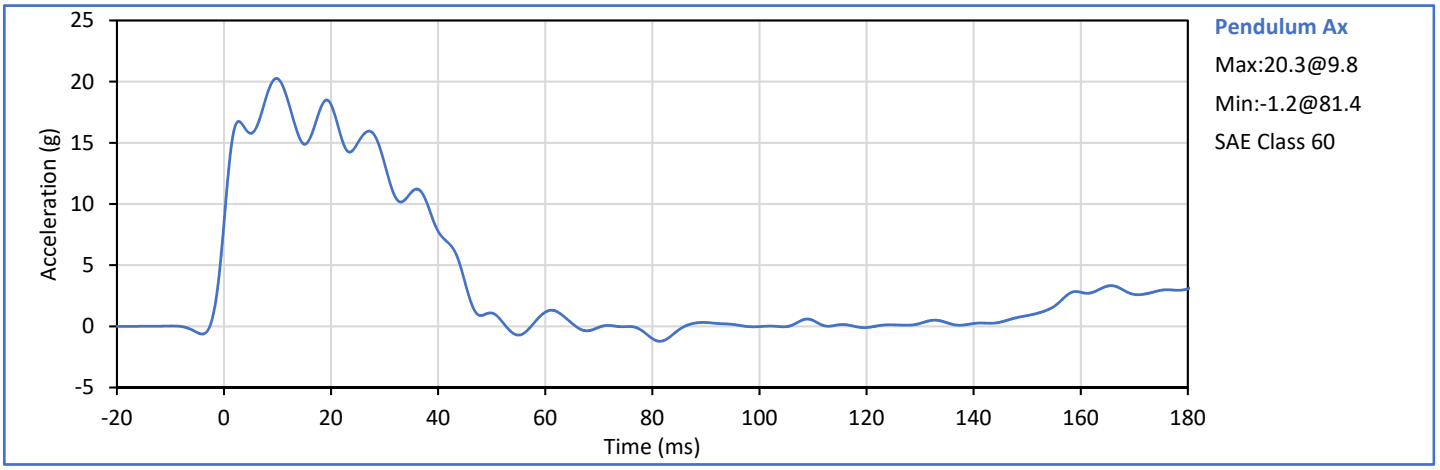


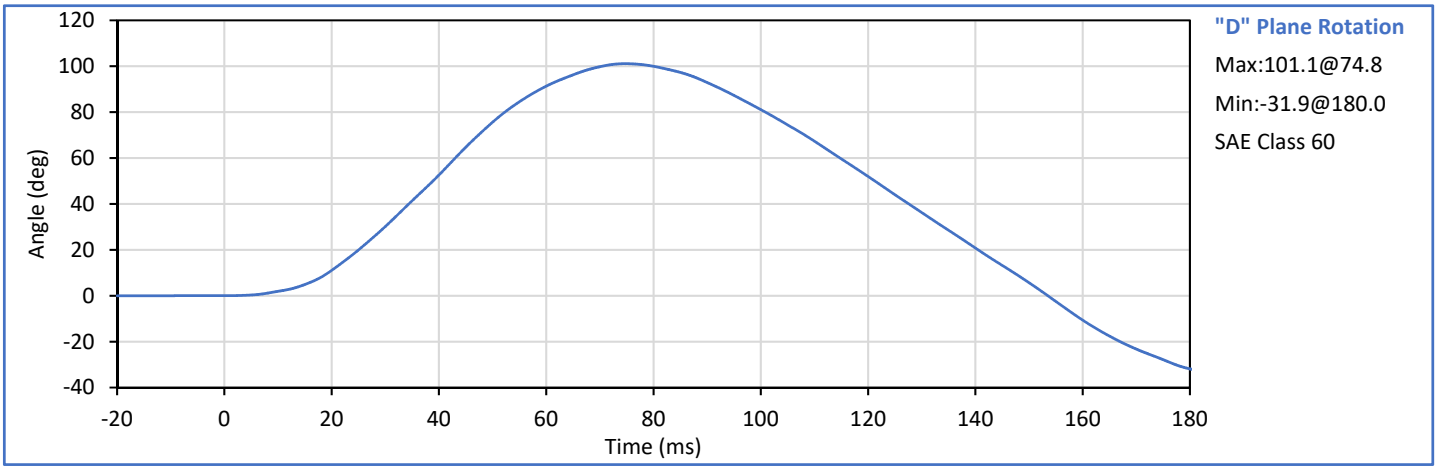
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-12-14

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	6.08	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.2	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.1	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.3	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.3	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	44.1	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.1	Pass
	ms	72.0	82.0	74.8	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	153.6	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-76.0	Pass
	ms	65.0	79.0	69.6	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	140.2	Pass
			Overall Test Results		Pass



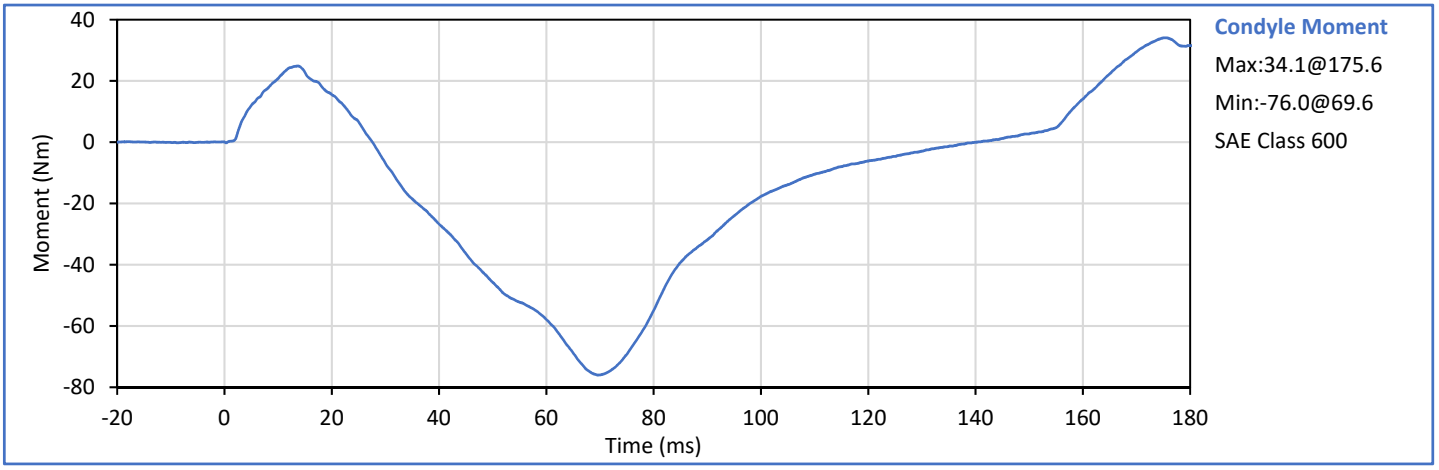


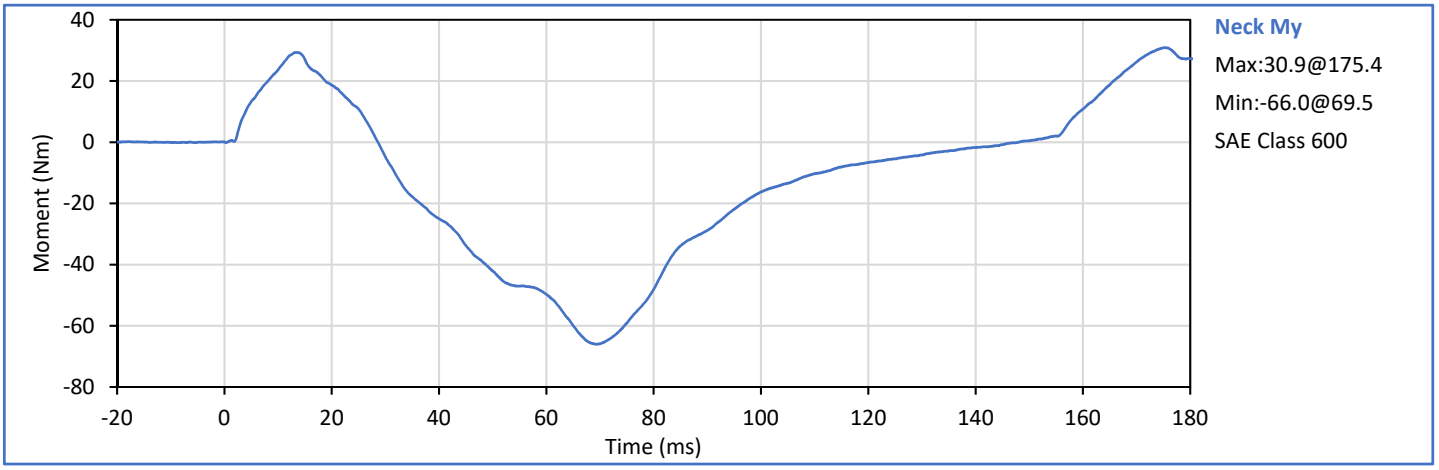
Technician: J. Hernandez

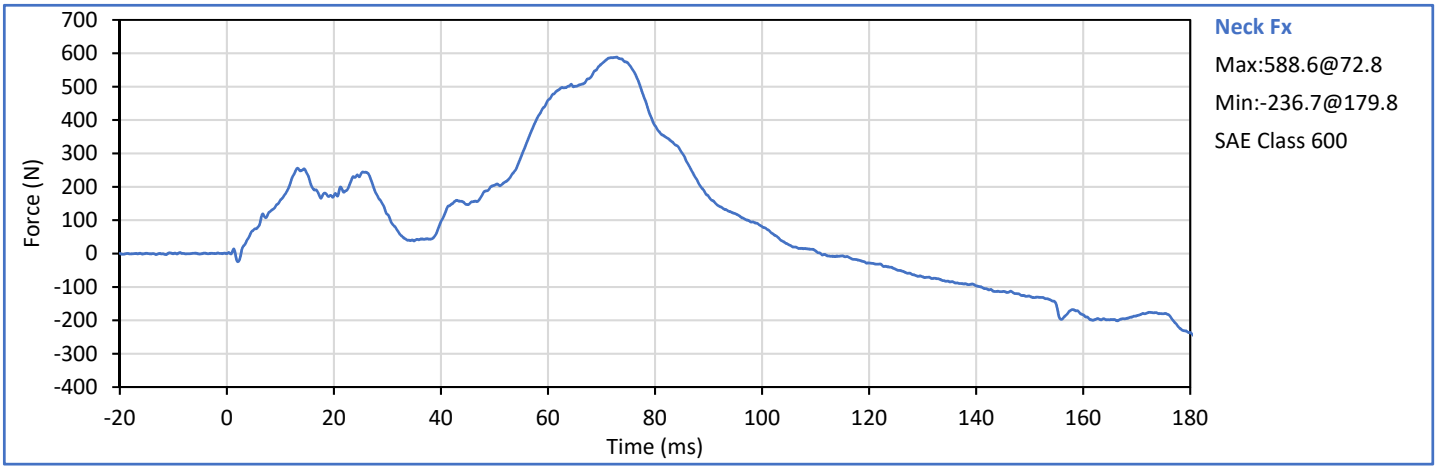
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 168 Test Date: 2020-12-14







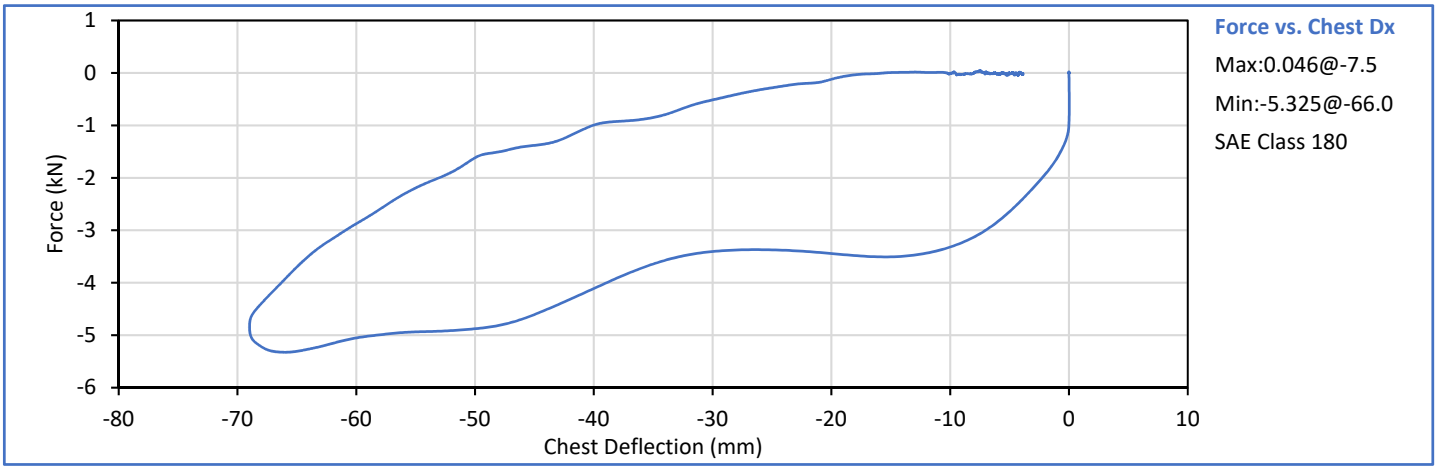
Applus IDIADA
KARCO

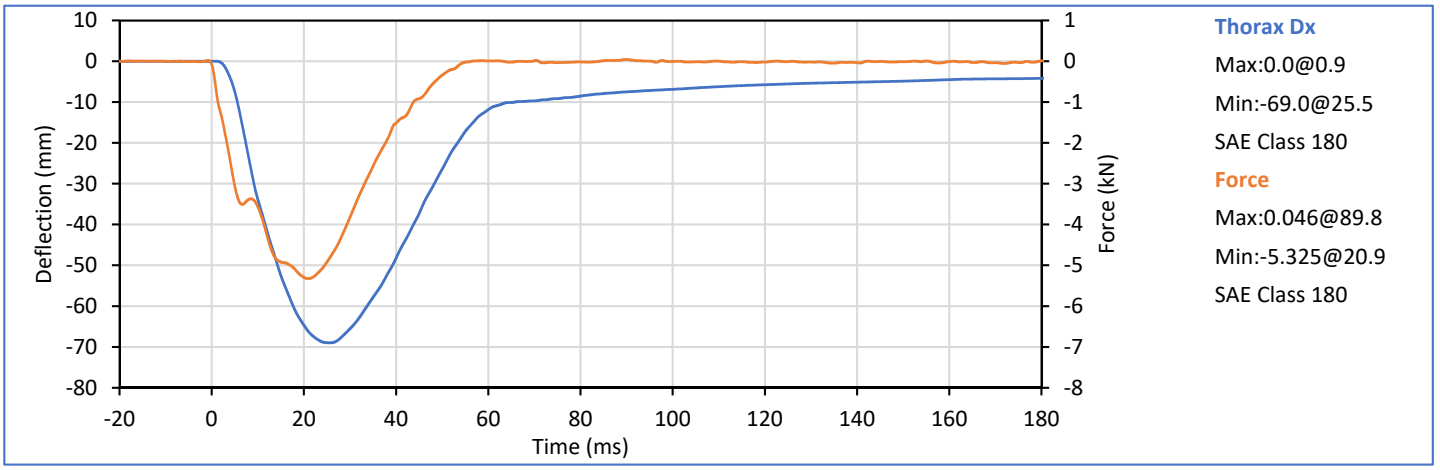
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 168

Test Date: 2020-12-10

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	14	Pass
Probe Velocity	m/s	6.58	6.82	6.73	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-69.0	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.325	Pass
Internal Hysterisis	%	69.0	85.0	70.7	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto