REPORT NUMBER: SINCAP-KAR-19-032

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

FCA US LLC

2019 JEEP GRAND CHEROKEE LAREDO 5-DOOR MPV

NHTSA No: M20190320

PREPARED BY:

APPLUS IDIADA KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

JUNE 28, 2019

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF CRASHWORTHINESS STANDARDS

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Approval Date: June 28, 2019

FINAL REPORT ACCEPTANCE BY OCWS:

_____

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

Date: _____

_____

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

Date: _____

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Final Report of New Car Assessment Program Side Impact MDB Testing of a 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320	June 28, 2019
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15. Supplementary Notes

16. Abstract

A 55 / 28 km/h 90° Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2019 Jeep Grand Cherokee Laredo 5-door MPV in accordance with the specifications of the Office of Crash Worthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on June 14, 2019.

The impact velocity of the Moving Deformable Barrier was 62.07 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 36.7°C. The target vehicle's maximum post-test static crush was 155 mm located at level 2. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})		1000	36.5
Maximum Thoracic Rib Deflection	mm	44	20
Total Abdominal Force	N	2500	559
Pubic Symphysis Force	N	6000	629

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})		1000	120.8
Resultant Lower Spine Acceleration	g	82	40
Total Pelvic Force (Sum of Acetubular and Iliac Forces)	N	5525	3063
Maximum Thoracic Rib Deflection	mm	38*	15
Maximum Abdominal Rib Deflection	mm	45*	25

Both the left front driver and left rear passenger doors were jammed shut. The doors on the struck side of the vehicle did not separate from the body at the hinges or latches. The opposite side doors did not open during the side impact event.

** Proposed IARV*

17. Key Words		18. Distribution Statement	
New Car Assessment Program (NCAP) Side Impact Moving Deformable Barrier (MDB) ES-2re SID-IIs		Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave., SE Washington, DC 20590	
19. Security Classification of this report	**20. Security Classification of this page**	**21. No. of Pages**	**22. Price**
UNCLASSIFIED	UNCLASSIFIED	155	

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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2019 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00355L. The purpose of this test is to generate comparative side impact performance in a 2019 Jeep Grand Cherokee Laredo 5-door MPV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

SECTION 2
SUMMARY OF TEST RESULTS

A 2019 Jeep Grand Cherokee Laredo 5-door MPV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 62.07 km/h (38.57 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by Applus IDIADA KARCO Engineering, LLC. in Adelanto, California, on June 14, 2019. Pre- and post-test photographs of the test vehicle, the MDB and the dummy (ES-2re and SID-IIs) are included in Appendix A of this report.

The dummies were placed in the driver and left rear designated seating position according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 11 cameras. Camera locations are included in Data Sheet No. 5 of this report.

The dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (12) tri-axial accelerometers
Pubic symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

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

Dummy injury readings were recorded as follows:

Measurement Description	Units	Driver ATD (ES-2re)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	36.5
Maximum Thoracic Rib Deflection	mm	44	20
Combined Abdominal Force	N	2500	559
Pubic Symphysis Force	N	6000	629

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC_{36})		1000	120.8
Lower Spine (T12) Resultant Acceleration	g	82	40
Total Pelvic Force (sum of acetabular and iliac forces	N	5525	3063
Maximum Thoracic Rib Deflection	mm	38*	15
Maximum Abdominal Rib Deflection	mm	45*	25

**Proposed IARV*

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	

GENERAL COMMENTS

The doors on the struck side of the vehicle remained closed and latched. There was no separation at the hinges or latches. The doors on the non-struck side remained closed and latched. There was no ATD value that exceeded its limit. Each of the MDB CG Ax, Ay, and Az channels failed and no data was collected for the channels. The Right MDB contact channel recorded questionable data.

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

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: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20190320
Model Year	2019
Make	Jeep
Model	Grand Cherokee Laredo
Body Style	5-Door MPV
VIN	1C4RJEAG1KC681140
Body Color	Red
Odometer Reading (km / mi)	85 / 53
Engine Displacement (L)	3.6
Type / No. of Cylinders	V6
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	RWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	No
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	No

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

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	Feb-19
Vehicle Type	MPV

GVWR (kg)	2949
GAWR Front (kg)	1452
GAWR Rear (kg)	1679

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				476.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				135.8	*A-B*

VEHICLE SEAT TYPE

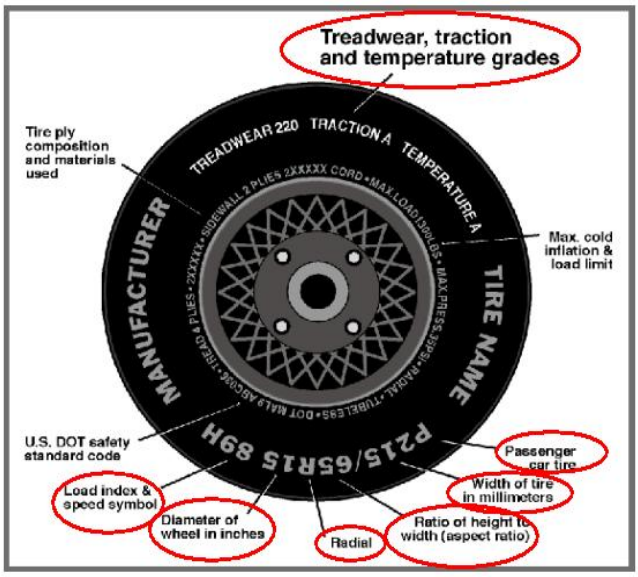
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						w/ Lever	w/ Knob
Front Seat	Yes					Yes	
Rear or Second Row Seat			Yes		Yes		
Third Row Seat							

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	350	350
Cold Pressure (kPa)	230	230
Recommended Tire Size	245/70R17	245/70R17
Tire Size on Vehicle	245/70R17	245/70R17
Tire Manufacturer	GoodYear	GoodYear
Tire Model	Fortera	Fortera
Treadware	540	540
Traction Grade	A	A
Temperature Grade	B	B
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester + 2 Steel	2 Polyester + 2 Steel
Load Index/Speed Symbol	108T	108T
Tire Material	Polyester, Steel	Polyester, Steel
DOT Safety Code Left	4B83 JD1R 5018	4B83 JD1R 5018
DOT Safety Code Right	4B83 JD1R 5018	4B83 JD1R 5018

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	230	230	230	230
Tire Placard	kPa	230	230	230	230
Owner's Manual	kPa	230	230	230	230
As Tested	kPa	230	230	230	230

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/60R16	P205/60R16	P205/60R16	P205/60R16	P205/60R16
Tire Pressure	kPa	230 ± 21	230	230	230	230

TEST VEHICLE AXLE WEIGHTS

		As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
	Units	Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	529.5	487.5		546.0	626.0		607.5	595.0	
Right	kg	523.5	505.5		505.0	622.5		526.0	575.0	
Ratio	%	51.5%	48.5%	100.0%	45.7%	54.3%	100.0%	49.2%	50.8%	100.0%
Total	kg	1053.0	993.0	2046.0	1051.0	1248.5	2299.5	1133.5	1170.0	2303.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2046.0	A
Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Wt (RCLW)	kg	135.8	C
Calculated Vehicle Target Wt (TVTW)	kg	2306.8	A+B+C

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight -4.5 kg to -9.0 kg)? ☒ **Yes** ☐ **No**

TEST VEHICLE ATTITUDE AND CG

Measurement Description	Units	Fully Loaded	As Tested	Meets Requirement***
LF	mm	848	852	Yes
RF	mm	867	860	Yes
LR	mm	897	890	Yes
RR	mm	881	875	Yes
Vehicle CG (Aft of Front Axle)	mm	1483	1585	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	36	16	

***The "As Tested" vehicle attitude measurements must be equal to or within ±10 mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirement"

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Spare Tire, Tool, Trim	16.0
Ballast / Equipment Added	144.5

Test Height Adjustable Setting (If Applicable)	

DATA SHEET NO. 2

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	Fixed	Fixed	Fixed
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	Fixed	262	Max			
			Mid	246	262	280
			Min			
Front Passenger Seat	Fixed	257	Max			
			Mid	243	257	272
			Min			
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 … (CONTINUED)

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

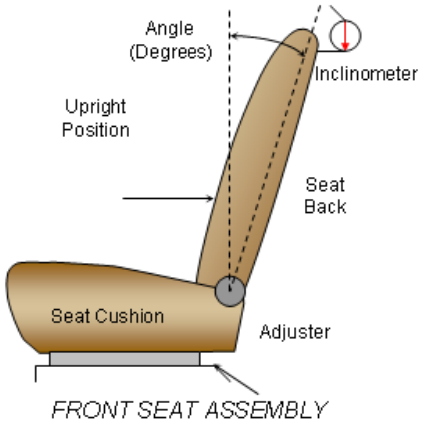
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	282	42	141	22
Front Passenger Seat	233	34	117	17
Front Center Seat				
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

*Detent zero (0) is the forward most detent

SEAT BACK ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. The right front passenger's seat back is positioned in a similar manner as the driver's seat back. The struck side rear seat back is fixed. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck side rear seat back. Seat back angle is measured using the outboard head restraint post.



SEAT BACK POSITION

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/ Seated Dummy	58.4	30	6.9	10
Front Passenger Seat	58.6	30	6.9	10
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	Fixed		Fixed	
Non-Struck Side Rear Seat	Fixed		Fixed	
Rear Center Seat	Fixed		Fixed	

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 … (CONTINUED)

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. The positions are marked H, M3, M2, M1, L from top to bottom.

	Total No. of Positions	Placed in Position
Driver Seat	5	H
Rear Seat	Fixed	Fixed

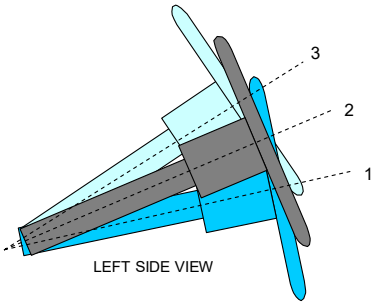
HEAD RESTRAINT ADJUSTMENT

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

	Total No. of Positions	Placed in Position
Driver Seat	3	H
Rear Seat	Fixed	Fixed

STEERING COLUMN ADJUSTMENT

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



STEERING COLUMN ASSEMBLY

	Degrees	Fore-Aft Position (mm)
Lowermost - Position 1	19.4	100
Geometric Center - Position 2	21.6	128
Uppermost - Position 3	23.7	155
Telescoping Steering Wheel Travel		55
Test Position	21.6	155

DATA SHEET NO. 2 … (CONTINUED)

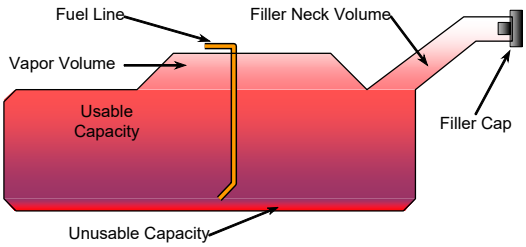
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The fuel pump starts when the key is in the "ON" position.



VEHICLE FUEL TANK ASSEMBLY

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	93.49
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	93.49
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	86.95
Actual amount of Solvent Used in Test	87.06
1/3 of Usable Capacity	31.16

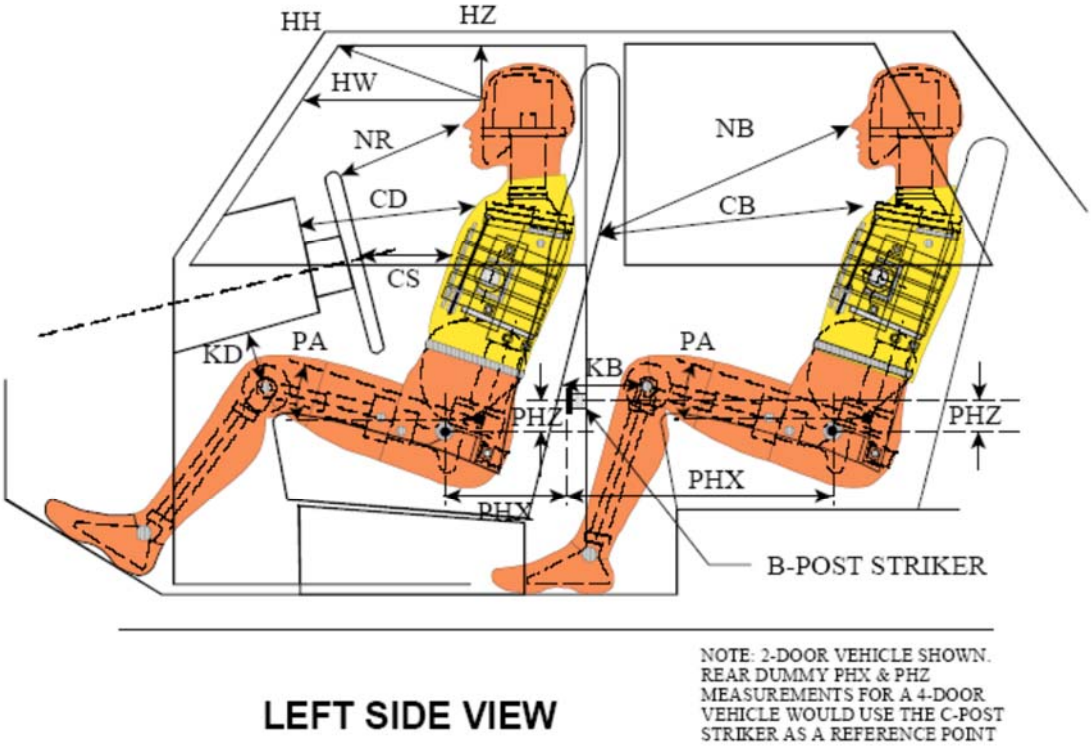
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? ☒ **Yes** ☐ **No**

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



LEFT SIDE VIEW

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

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

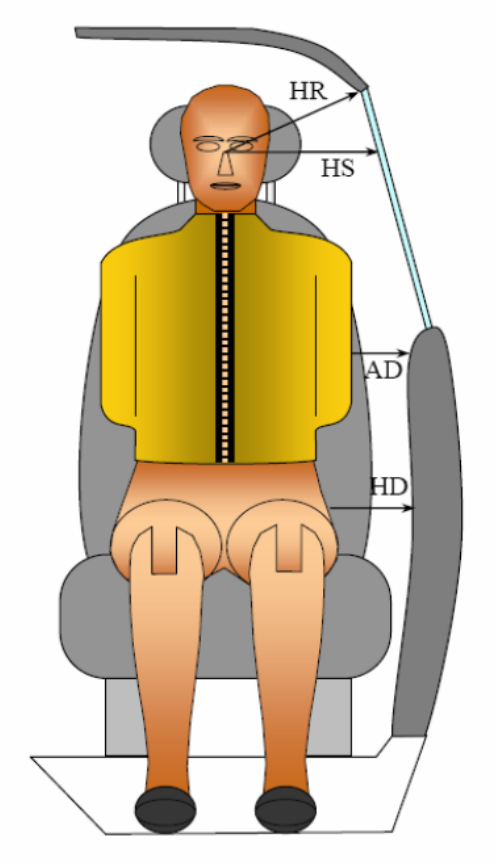
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (º)	Length (mm)	Angle (º)
HH		Head to Header	328			
HW		Head to Windshield	519			
HZ	HZ	Head to Roof	164		300	
NR	NB	Nose to Rim/Seat Back	358		535	
CD	CB	Chest to Dash/Seat Back	532		554	
CS		Chest to Steering Wheel	325			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	194	44.9	296	8.1
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	162	26.4	285	7.8
PAX°	PAX°	Pelvic Tilt Angle X		8.8		17.8
	PAY°	Pelvic Tilt Angle Y		0.3		0.2
PHX	PHX	Hip Point to Striker (x-axis)	170		216	
PHZ	PHZ	Hip Point to Striker (z-axis)	70		197	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

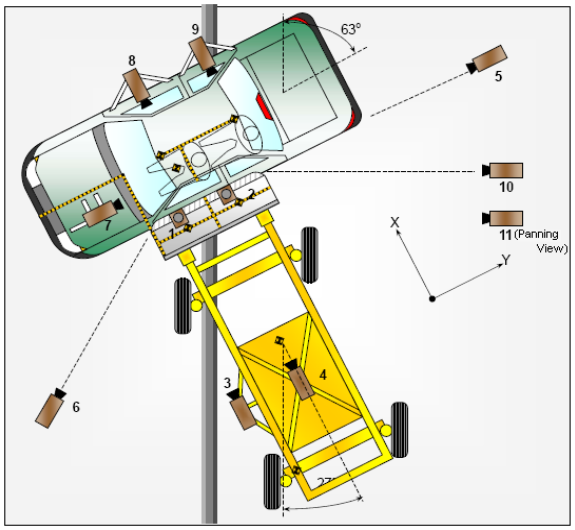
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	219	281
HS	Head to Side Window	mm	370	396
AD	Arm to Door	mm	106	145
HD	H-Point to Door	mm	171	154

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



CAMERA LOCATIONS AND DATA

No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1220	2287	-5486	14	1000
2	Overhead Close-Up	609	2287	-5102	35	1000
3	Left Impact Point (MDB)	-2134	0	-1143	25	1000
4	Side Overall (MDB)	-3912	838	-1829	12.5	1000
5	Rear	-64	2485	-1348	85	1000
6	Left Front	-2266	-3564	-1475	24	1000
7	Driver Front (On-Board)	574	-431	674	12.5	1000
8	Driver Side (On-Board)	1789	819	412	8.5	1000
9	Passenger Side (On-Board)	1784	1687	438	8.5	1000
10	Real Time Overall				Zoom	30
11	Real Time Inrun				Zoom	30

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

*All measurements accurate to ±6 mm

Camera Views 1,2,5, and 6 failed.

INSTRUMENTATION

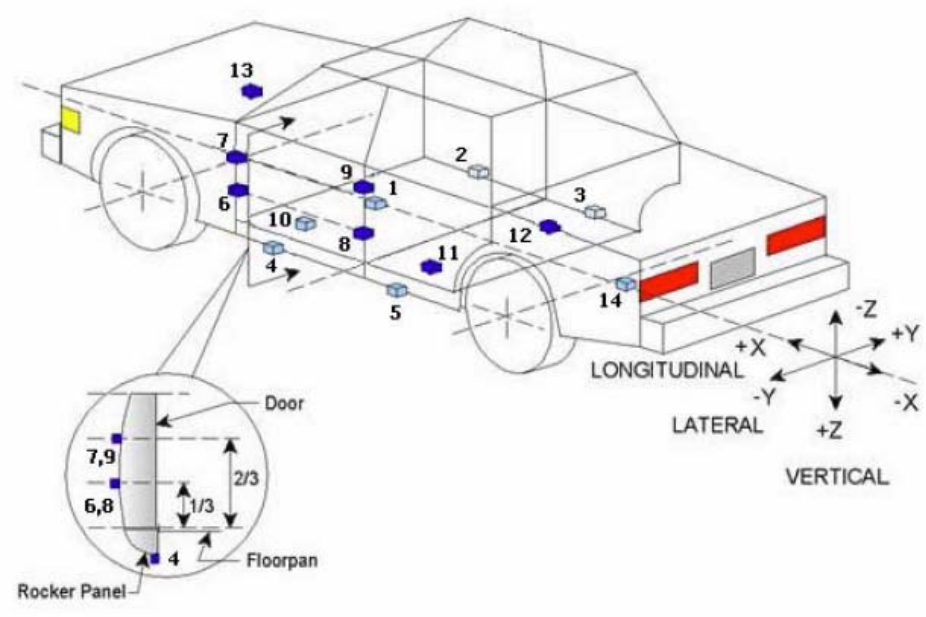
Driver Dummy Channels	16
Passenger Dummy Channels	19
Vehicle Structure Accelerometers	23
MDB Channels	7
Total	65

DATA SHEET NO. 6

TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2125	0	-570
2	Right Sill at Front Seat	2960	720	-510
3	Right Sill at Rear Seat	1810	730	-520
4	Left Sill at Front Door	3200	-760	-510
5	Left Sill at Rear Door	1710	-770	-520
6	A-Pillar Lower	3230	-840	-715
7	A-Pillar Middle	3230	-835	-1070
8	B-Pillar Lower	2160	-745	-700
9	B-Pillar Middle	2160	-735	-1060
10	Front Seat Track	2300	-580	-550
11	Rear Seat Structure	1860	-420	-540
12	Right Rear Occupant Compartment	1860	-420	-540
13	Engine Block	3720	0	-1080
14	Rear Floorpan Above Axle	1200	0	-770

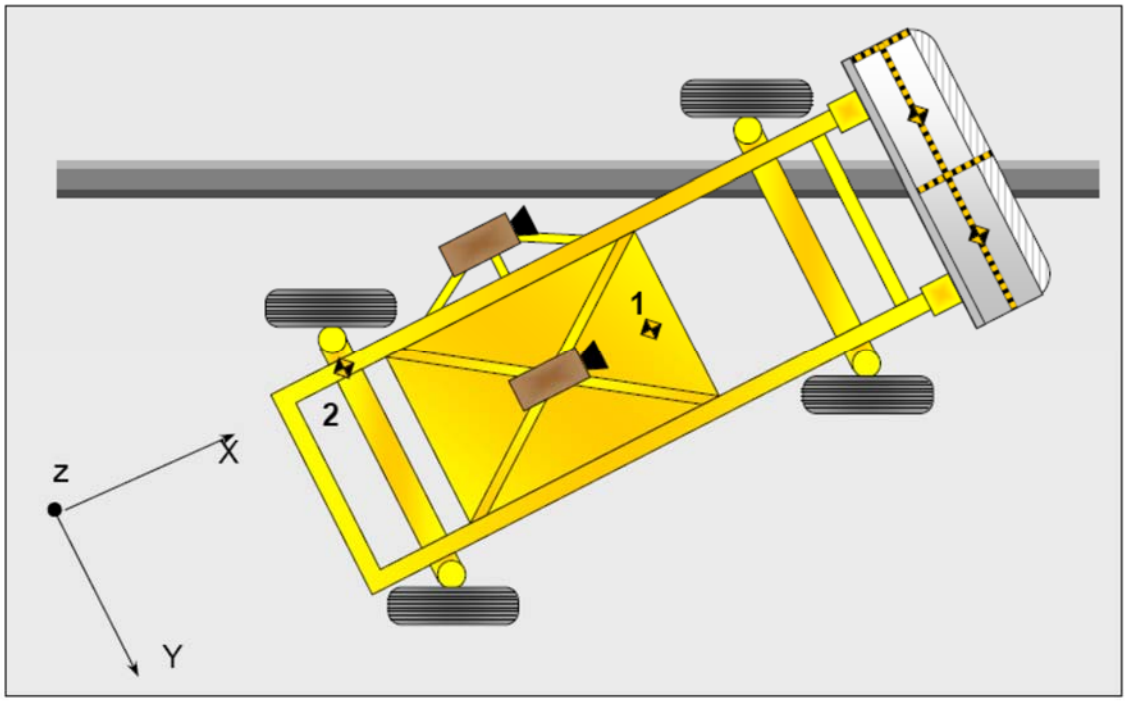
Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Measurement		
		X	Y	Z
1	MDB CG	-1195	0	-430
2	MDB Rear	-2642	-593	-608

Reference: X – Face of MDB (+ forward)
Y – MDB centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 8

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Airbag, Side Header	Curtain Airbag
Top of Head	Side Header	Curtain Airbag
Left Side of Head	Curtain Airbag, Side Header	Curtain Airbag
Back of Head	Headrest, Curtain Airbag, Side Header	Curtain Airbag, Center Headrest
Left Shoulder	Curtain Airbag	Door Panel
Upper Torso	Side Airbag, Seat	Door Panel
Lower Torso	Side Airbag, Seat	Door Panel
Left Hip	Side Airbag	Door Panel
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/Other
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge System Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	N/A	N/A	N/A	N/A	N/A

DATA SHEET NO. 8 … (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No		No	
Seat Disengagement from Floor Pan	No		No	
Seat Back Movement from Initial Position	No		No	
Seat Back Collapse	No		No	

POST-TEST STRUCTURAL OBSERVATIONS

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

DATA SHEET NO. 8 … (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No	No	
Knee Airbag	Yes	No	No	
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	No	
Seat Belt Load Limiter	Yes	Yes	No	

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2920
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		509
Actual Impact Point (Aft of Front Axle)	mm		521
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	-12
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	8

DATA SHEET NO. 9

MDB SUMMARY OF RESULTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1251
Overall Length including Honeycomb Face	4115
Wheel Base of Framework Carriage	2595
CG location aft of Front Axle	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	402.0	297.5	699.5
Right	kg	377.0	290.0	667.0
Ratio	%	57.0%	43.0%	100.0%
Totals	kg	779.0	587.5	1366.5

SPEED AND IMPACT DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.07
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.05
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forw ard Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed Angle to MDB Forw ard Line of Motion	degrees	26.0 to 28.0	27.0

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

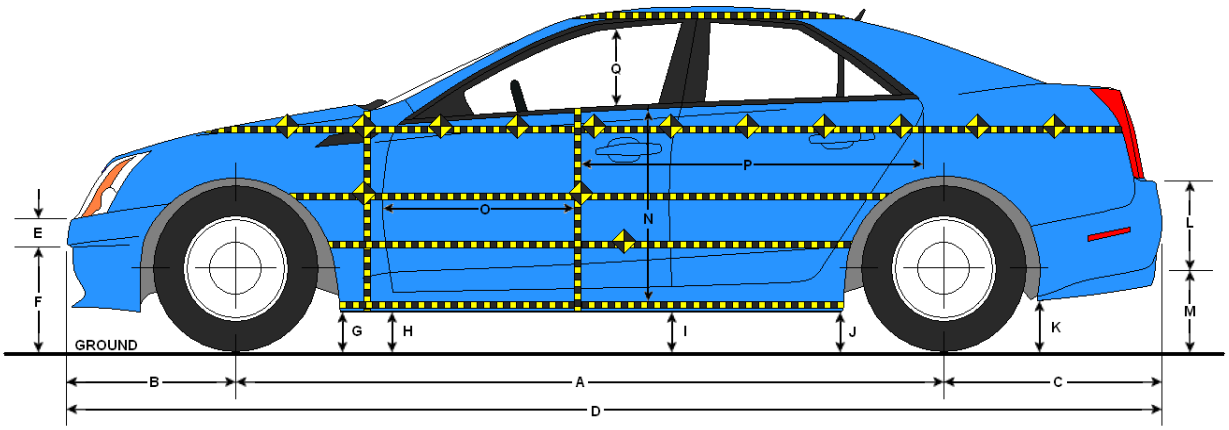
Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	302
B	Top of Bumper	533	800	Left	235
C	Mid Level	686	800	Left	237
D	Top of Stack	813	800	Left	270

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2920	2916	-4
B	Front Axle to FSOV	898	879	-19
C	Rear Axle to RSOV	1022	1036	14
D	Total Length at Centerline	4840	4832	-8
E	Front Bumper Thickness	265	265	0
F	Fromt Bumper Bottom to Ground	460	466	6
G	Sill Height at Front Wheel Well	366	388	22
H	Sill Height at Front Door Leading Edge	332	354	22
I	Sill Height at B-Pillar	346	375	29
J1	Sill Height at Rear Wheel Well	301	336	35
J2	Pinch Weld Height at Rear Wheel Well	286	305	19
K	Sill Height Aft of Rear Wheel Well	502	527	25
L	Rear Bumper Thickness	127	129	2
M	Rear Bumper Bottom to Ground	591	591	0
N	Sill Height to Bottom of Front Window Sill	774	714	-60
O	Front Door Leading Edge to Impact CL	717	698	-19
P	Rear Door Trailing Edge to Impact CL	1348	1330	-18
Q	Front Window Opening	433	445	12
R	Right Side Length	3520	3522	2
S	Left Side Length	3519	3511	-8
T	Vehicle Width at B-Pillar	1909	1814	-95

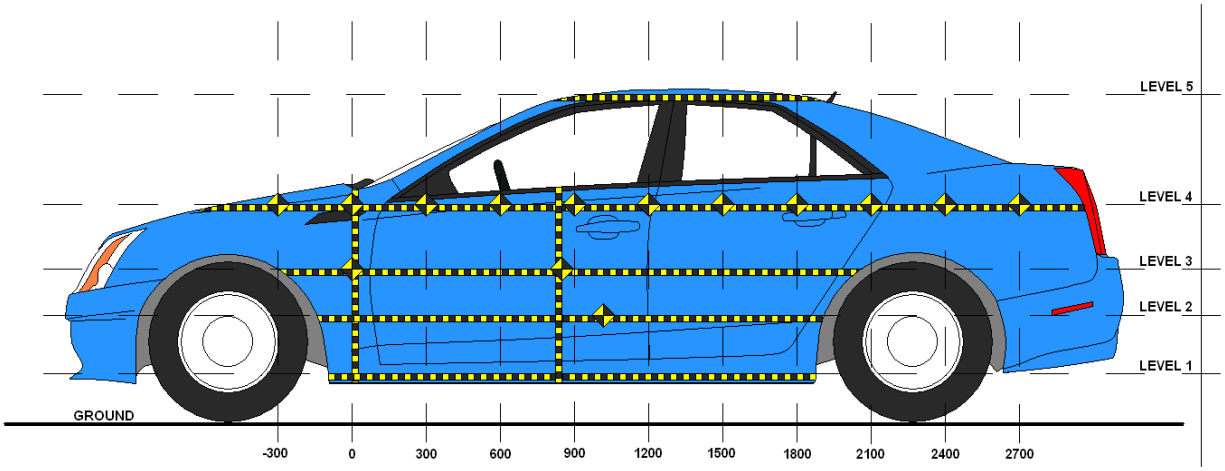
All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	367	27	600
2	Occupant H-Point	786	155	750
3	Mid-Door	845	135	900
4	Window Sill	1159	28	1350
5	Window Top	1688	-16	1350

DATA SHEET NO. 11 … (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

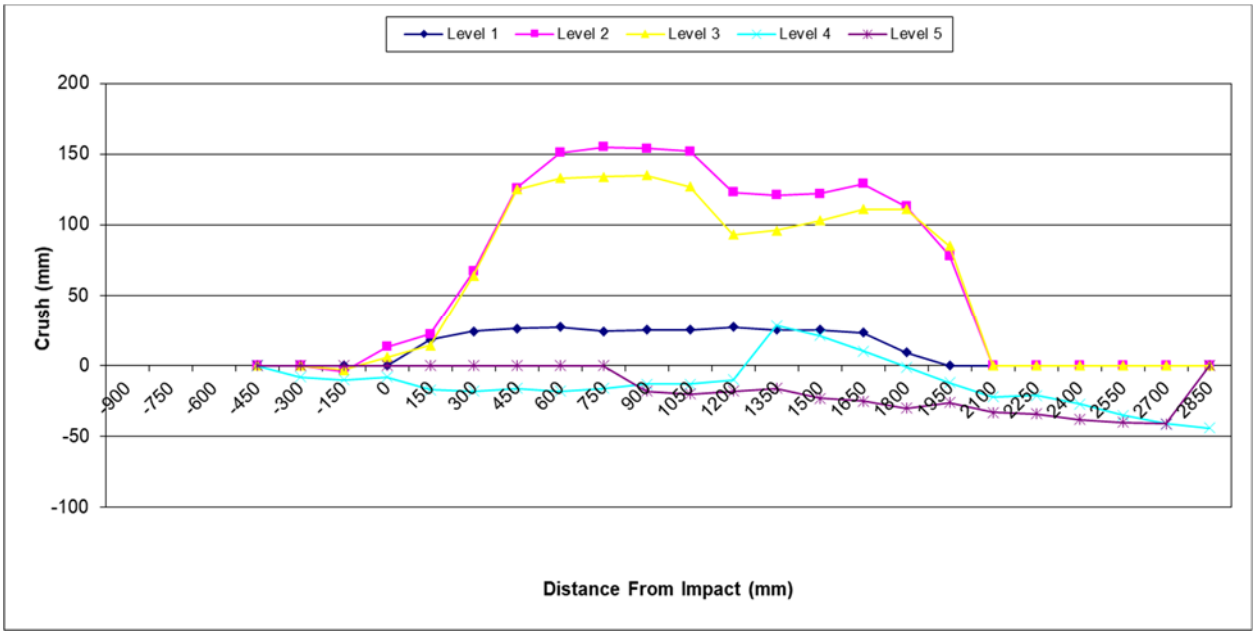
	Pre-Test (mm)					Post-Test (mm)					Difference (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300				693					685					-8	
-150		536	534	668			532	531	658			-4	-3	-10	
0		546	549	646			559	555	638			13	6	-8	
150	607	565	562	633		625	587	576	616		18	22	14	-17	
300	613	564	559	621		637	631	623	603		24	67	64	-18	
450	611	562	557	608		637	688	682	592		26	126	125	-16	
600	610	560	555	600		637	711	688	582		27	151	133	-18	
750	613	559	555	594		637	714	689	578		24	155	134	-16	
900	612	560	555	588	836	637	714	690	575	818	25	154	135	-13	-18
1050	613	561	556	587	831	638	713	683	574	811	25	152	127	-13	-20
1200	612	563	558	583	830	639	686	651	573	812	27	123	93	-10	-18
1350	616	569	565	586	827	641	690	661	614	811	25	121	96	28	-16
1500	617	576	570	584	828	642	698	673	605	805	25	122	103	21	-23
1650	621	582	576	586	828	644	711	687	596	803	23	129	111	10	-25
1800	610	571	571	588	829	619	684	682	587	799	9	113	111	-1	-30
1950		541	544	559	825		619	629	547	799		78	85	-12	-26
2100				567	831				545	798				-22	-33
2250				591	833				570	799				-21	-34
2400				594	838				567	800				-27	-38
2550				601	842				566	802				-35	-40
2700				609	855				568	814				-41	-41
2850				623					579					-44	

DATA SHEET NO. 11 … (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

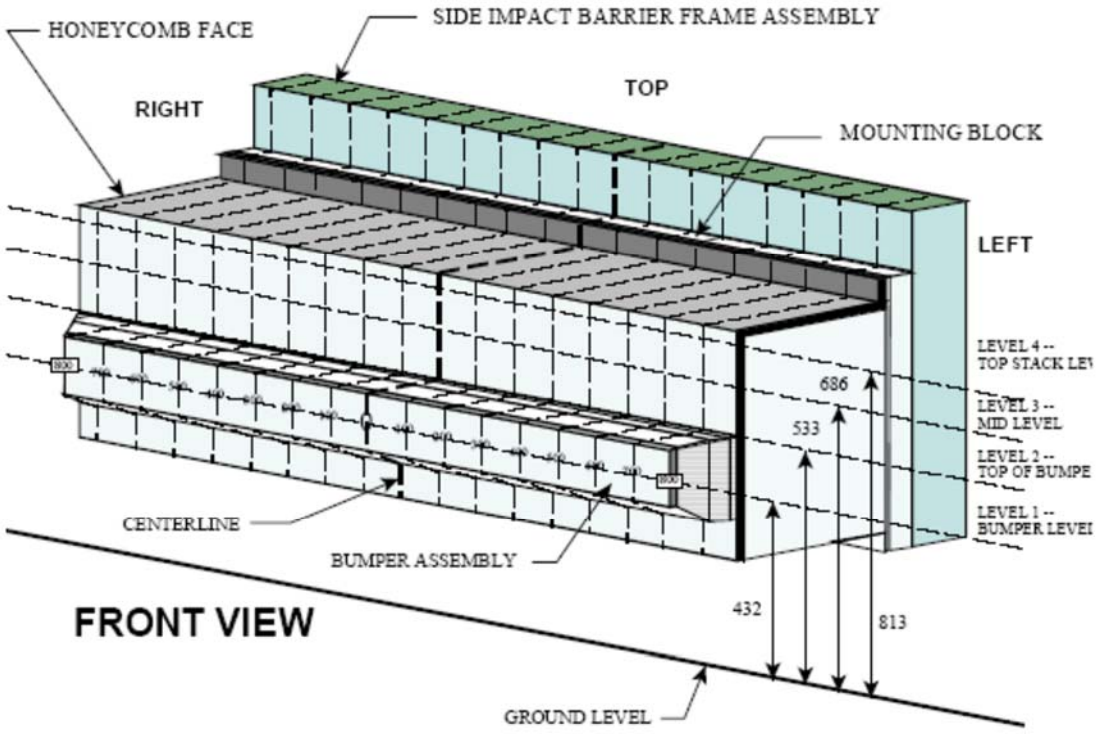


DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	302	279	277	274	269	272	267	267	264	262	259	259	256	254	252	255	266
2	217	217	213	200	187	187	214	182	185	190	195	194	192	189	188	189	235
3	174	137	127	136	157	187	174	149	134	140	145	135	126	115	136	182	237
4	184	147	152	157	157	170	142	117	112	110	112	117	131	146	182	226	270

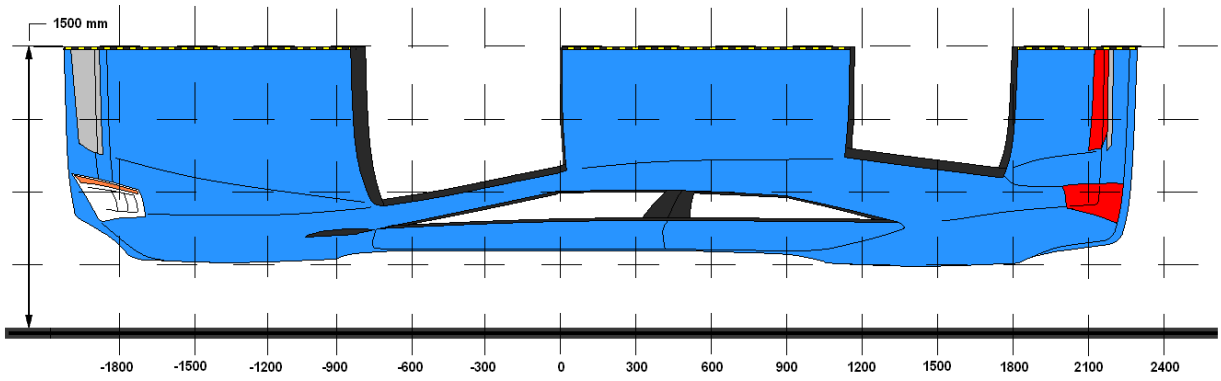
All dimensions in millimeters.

DATA SHEET NO. 13

VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2850	4	623	579	-44
2	2100	4	567	545	-22
3	1500	2	576	698	122
4	1050	2	561	713	152
5	450	2	562	688	126
6	-300	4	693	685	-8

MDB DAMAGE PROFILE DISTANCES

DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	4	270
2	500	Left	1	254
3	200	Left	1	259
4	200	Right	1	267
5	500	Right	1	274
6	800	Right	1	302

DATA SHEET NO. 14

FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19

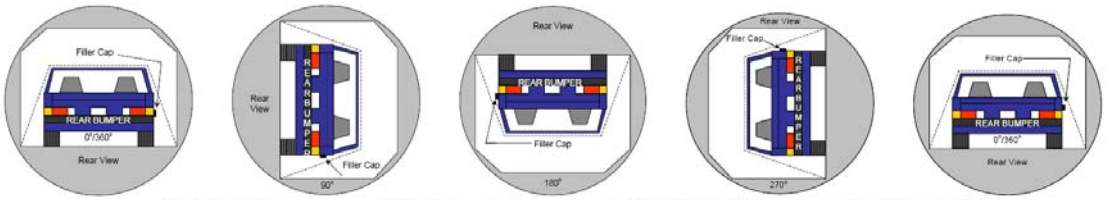
Temperature at Time of Impact: 21.3 °C Test Time: 11:01 A.M.

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 Details: There was no Stoddard solvent spillage.



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

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	83	300	383
90° To 180°	78	300	378
180° To 270°	91	300	391
270° To 360°	81	300	381

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

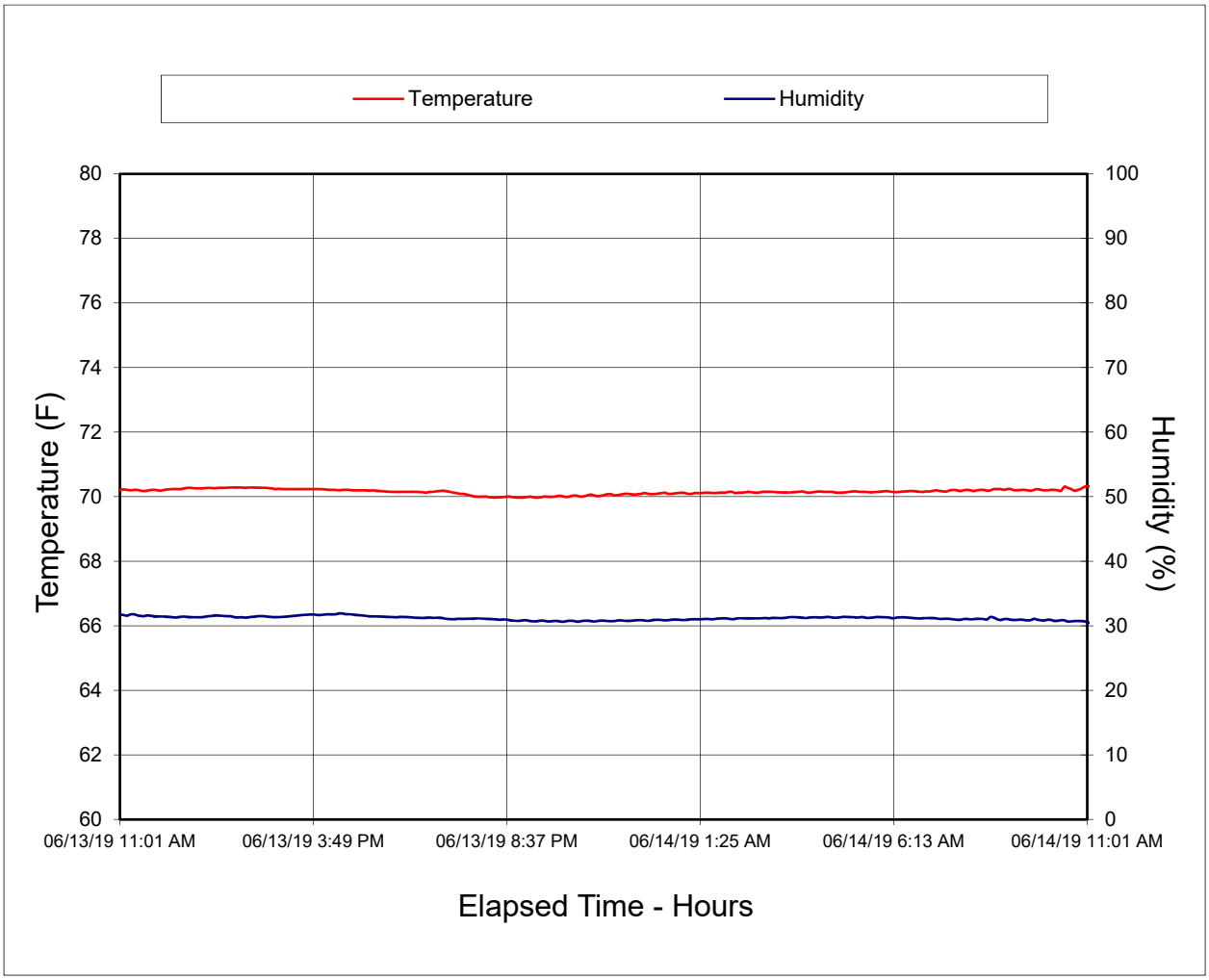
Test Phase	Spillage Location
0° To 90°	N/A
90° To 180°	N/A
180° To 270°	N/A
270° To 360°	N/A

DATA SHEET NO. 15

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV NHTSA No. M20190320

Test Program: NCAP MDB Side Impact Test Test Date: 06/14/19



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

FIGURE 1. As-Delivered Right Front ¾ View of Test Vehicle

FIGURE 2. As-Delivered Left Rear ¾ View of Test Vehicle

FIGURE 3. Pre-Test Frontal View of Test Vehicle

FIGURE 4. Post-Test Frontal View of Test Vehicle

FIGURE 5. Pre-Test Left Front ¾ View of Test Vehicle

FIGURE 6. Post-Test Left Front ¾ View of Test Vehicle

FIGURE 7. Pre-Test Left Side View of Test Vehicle

FIGURE 8. Post-Test Left Side View of Test Vehicle

FIGURE 9. Pre-Test Left Rear ¾ View of Test Vehicle

FIGURE 10. Post-Test Left Rear ¾ View of Test Vehicle

FIGURE 11. Pre-Test Rear View of Test Vehicle

FIGURE 12. Post-Test Rear View of Test Vehicle

FIGURE 13. Pre-Test Right Side View of Test Vehicle

FIGURE 14. Post-Test Right Side View of Test Vehicle

FIGURE 15. Pre-Test Overhead View of Test Area

FIGURE 16. Post-Test Overhead View of Test Area

FIGURE 17. Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle

FIGURE 18. Pre-Test Right Side View of MDB Positioned Against Side of Test Vehicle

FIGURE 19. Pre-Test Close-Up View of Impact Point Target

FIGURE 20. Post-Test Close-Up View of Impact Point Target

FIGURE 21. Pre-Test Left Front Door Latch Close-Up

FIGURE 22. Post-Test Left Front Door Latch Close-Up

FIGURE 23. Pre-Test Left Rear Door Latch Close-Up

FIGURE 24. Post-Test Left Rear Door Latch Close-Up

FIGURE 25. Pre-Test Front Close-Up View of Driver Dummy

FIGURE 26. Post-Test Front Close-Up View of Driver Dummy

FIGURE 27. Pre-Test Left Side View of Driver Dummy
Showing Belt and Chalking

FIGURE 28. Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 29. Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

FIGURE 30. Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning

FIGURE 31. Pre-Test Frontal View of Driver Dummy Head
and Shoulders in Relation to Head Restraint

FIGURE 32. Pre-Test Overhead View of Driver Seat Pan Prior to Dummy Positioning

FIGURE 33. Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan

FIGURE 34. Pre-Test Placement of Driver Dummy's Feet

FIGURE 35. Pre-Test View of Belt Anchorage for Driver Dummy

FIGURE 36. Pre-Test Left Side View of Steering Wheel

FIGURE 37. View of Disengaged Parking Brake

FIGURE 38. Pre-Test View of Parking Brake

FIGURE 39. Pre-Test Close-Up Left Side View of Driver Seat Track

FIGURE 40. Pre-Test Close-Up Left Side View of Driver Seat Back

FIGURE 41. Pre-Test Close-Up View of Driver Seat Back or Head Restraint

FIGURE 42. Pre-Test Driver Dummy and Door Clearance View

FIGURE 43. Post-Test Driver Dummy and Door Clearance View

FIGURE 44. Pre-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment

FIGURE 45. Post-Test Right Side View of Driver Dummy
and Front Seat Occupant Compartment

FIGURE 46. Pre-Test Driver Inner Door Panel View

FIGURE 47. Post-Test Driver Inner Door Panel View
Showing Driver Dummy Contact Locations

FIGURE 48. Post-Test Driver Dummy Close-Up Head Contact
with Vehicle Interior View

FIGURE 49. Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View

FIGURE 50. Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View

FIGURE 51. Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View

FIGURE 52. Post-Test Driver Dummy Close-Up Pelvis Contact
with Vehicle Interior View

FIGURE 53. Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View

FIGURE 54. Post-Test Driver Dummy Close-Up Knee Contact View

FIGURE 55. Pre-Test Left Side View of Rear Passenger Dummy
Showing Belt and Chalking

FIGURE 56. Pre-Test Left Side View of Rear Passenger Dummy
Shoulder and Door Top View

FIGURE 57. Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

FIGURE 58. Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning

FIGURE 59. Pre-Test Frontal View of Rear Passenger Dummy
Head and Shoulders in Relation to Head Restraint

FIGURE 60. Pre-Test Overhead View of Rear Passenger
Seat Pan Prior to Dummy Positioning

FIGURE 61. Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

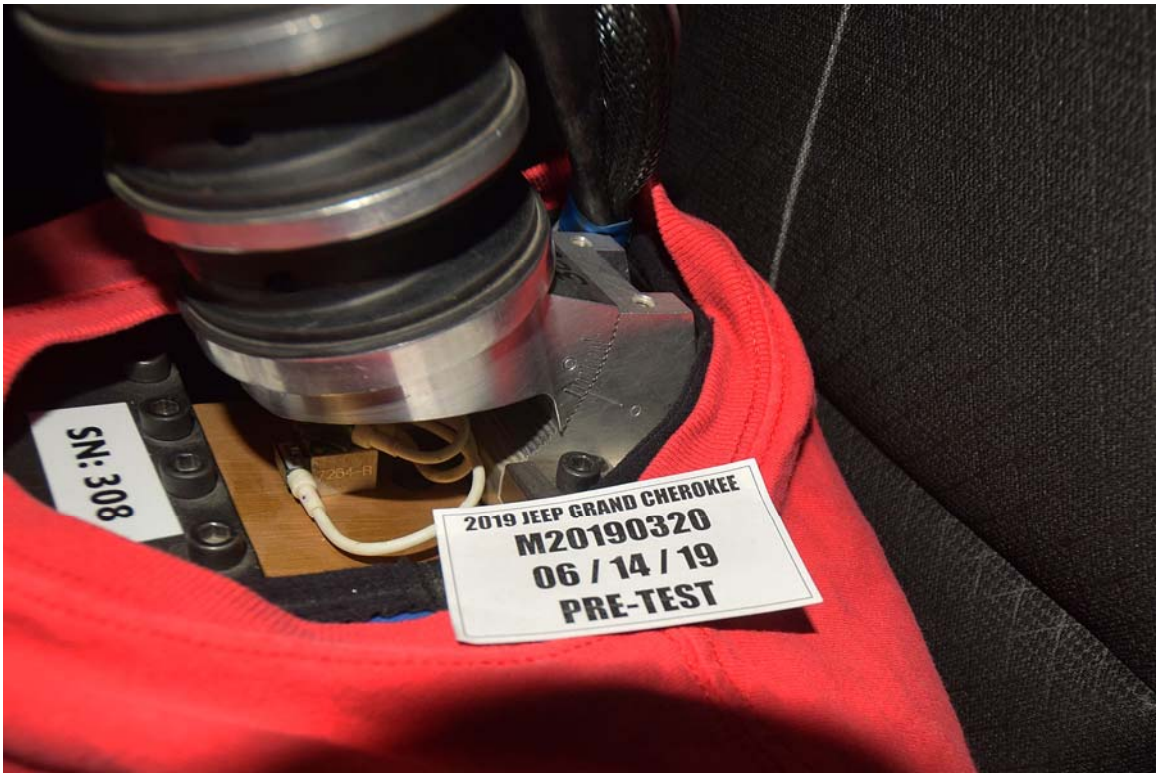


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket

FIGURE 63. Pre-Test View of Rear Passenger Dummy's Head
Showing Dummy’s Head is Level

FIGURE 64. Pre-Test Placement of Rear Passenger Dummy's Feet

FIGURE 65. Pre-Test View of Belt Anchorage for Rear Passenger Dummy

FIGURE 66. Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

FIGURE 67. Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

FIGURE 68. Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

FIGURE 69. Pre-Test Rear Passenger Dummy and Door Clearance View

FIGURE 70. Post-Test Rear Passenger Dummy and Door Clearance View

FIGURE 71. Pre-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment

FIGURE 72. Post-Test Right Side View of Rear Passenger Dummy
and Rear Seat Occupant Compartment

FIGURE 73. Pre-Test Rear Passenger Inner Door Panel View

FIGURE 74. Post-Test Rear Passenger Inner Door Panel View
Showing Rear Passenger Dummy Contact Locations

FIGURE 75. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Vehicle Interior View

FIGURE 76. Post-Test Rear Passenger Dummy Close-Up
Head Contact with Side Airbag View

FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with
Rear Passenger Side Airbag

FIGURE 78. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Side Airbag View

FIGURE 79. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Vehicle Interior View

Photograph Not Applicable

Vehicle Not Equipped with Rear Passenger Side Airbag

FIGURE 80. Post-Test Rear Passenger Dummy Close-Up
Pelvis Contact with Side Airbag View

FIGURE 81. Post-Test Rear Passenger Dummy Close-Up Knee Contact View

FIGURE 82. Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 83. Post-Test View of Fuel Filler Cap or Fuel Filler Neck

FIGURE 84. Pre-Test Front View of MDB Impactor Face

FIGURE 85. Post-Test Front View of MDB Impactor Face

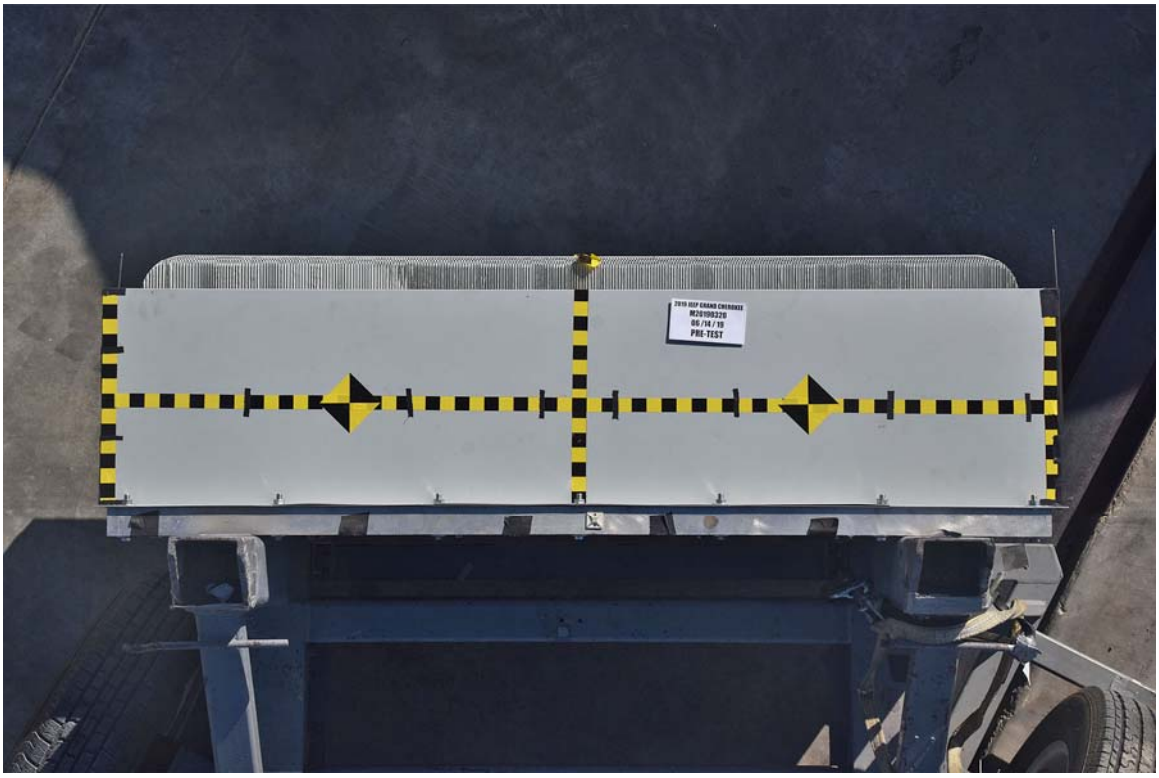


FIGURE 86. Pre-Test Top View of MDB Impactor Face

FIGURE 87. Post-Test Top View of MDB Impactor Face

FIGURE 88. Pre-Test Left Side View of MDB Impactor Face

FIGURE 89. Post-Test Left Side View of MDB Impactor Face

FIGURE 90. Pre-Test Right Side View of MDB Impactor Face

FIGURE 91. Post-Test Right Side View of MDB Impactor Face

FIGURE 92. Close-Up View of Vehicle's Certification Label

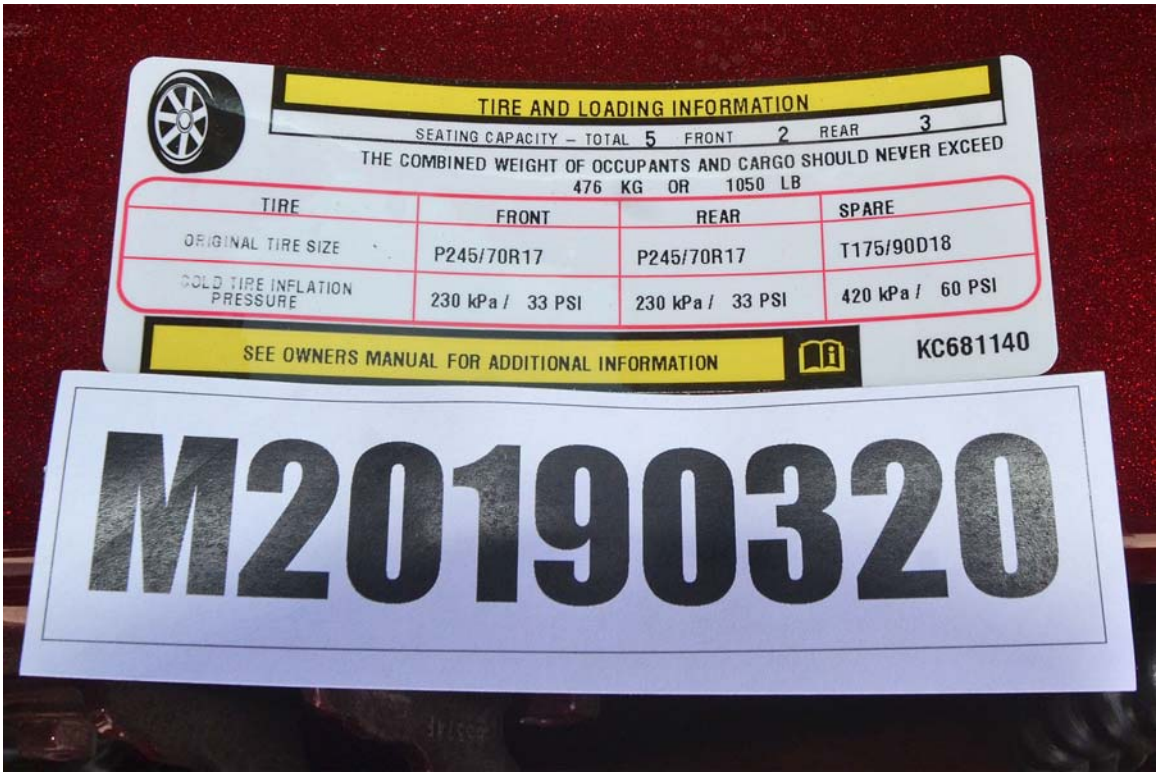


FIGURE 93. Close-Up View of Vehicle's Tire Information Placard or Label

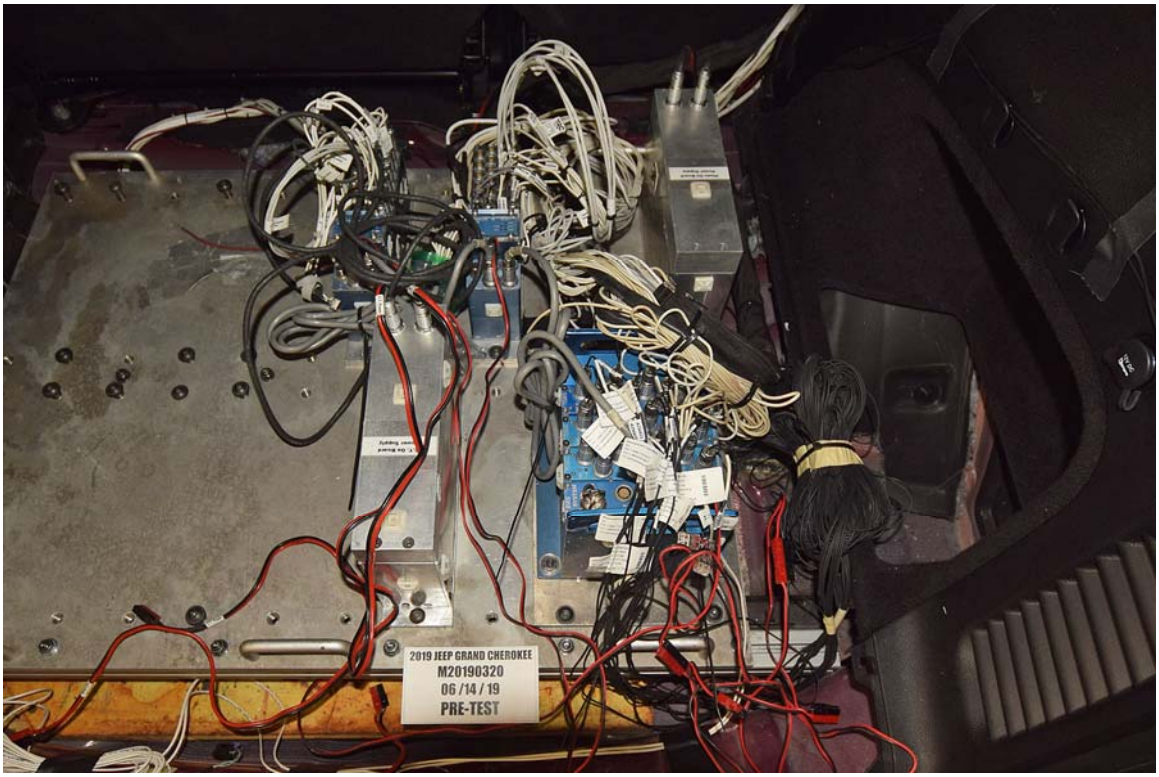


FIGURE 94. Pre-Test Ballast View

FIGURE 95. Post-Test Primary and Redundant Speed Trap Read-Out

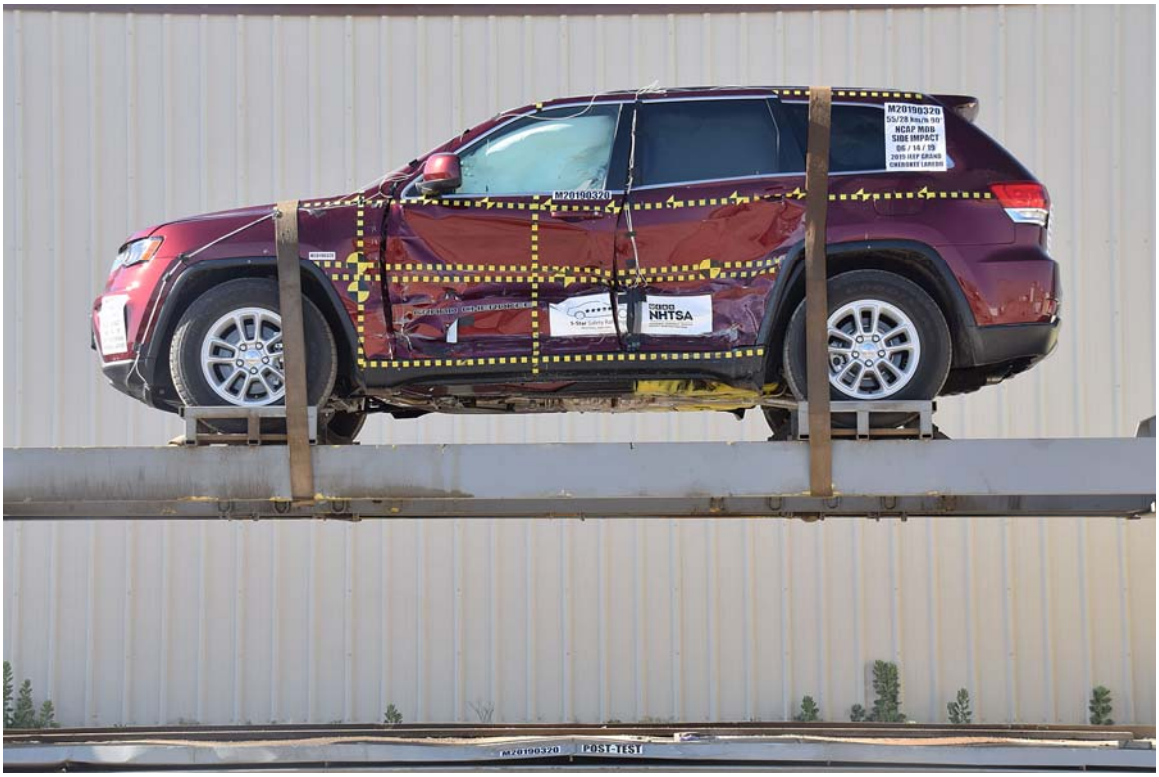


FIGURE 96. FMVSS No. 301 Static Rollover 0 Degrees

FIGURE 97. FMVSS No. 301 Static Rollover 90 Degrees

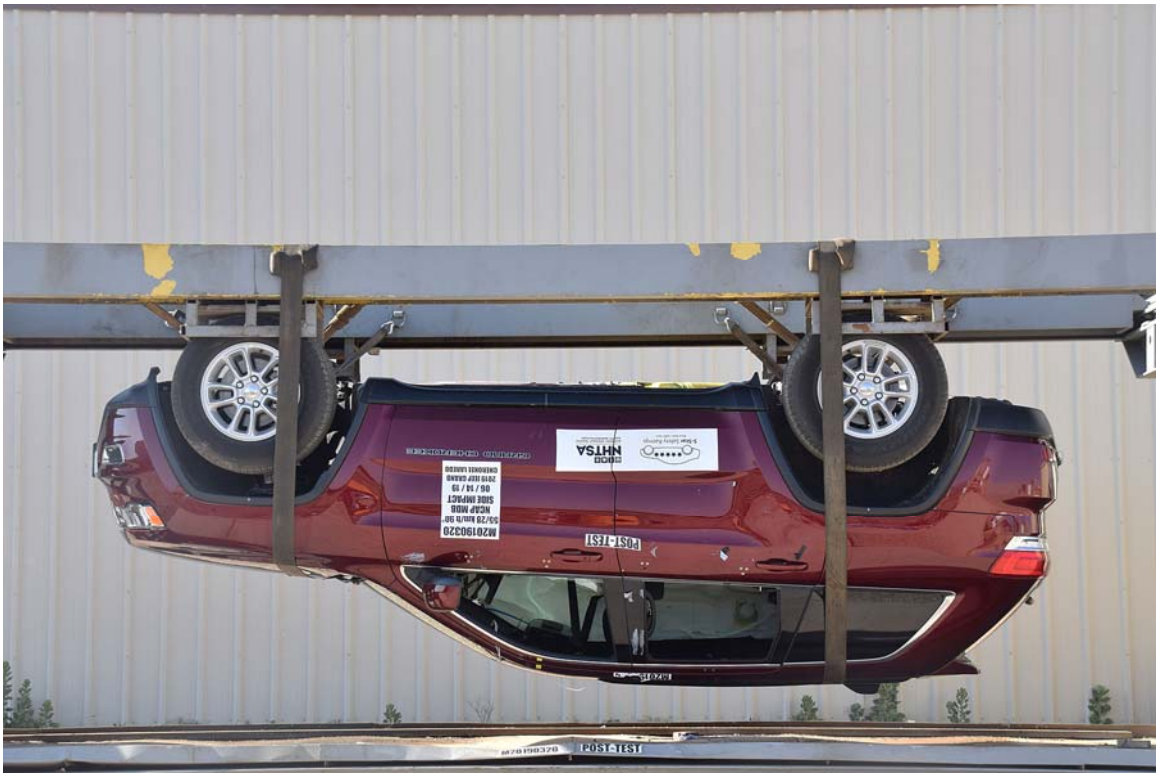


FIGURE 98. FMVSS No. 301 Static Rollover 180 Degrees

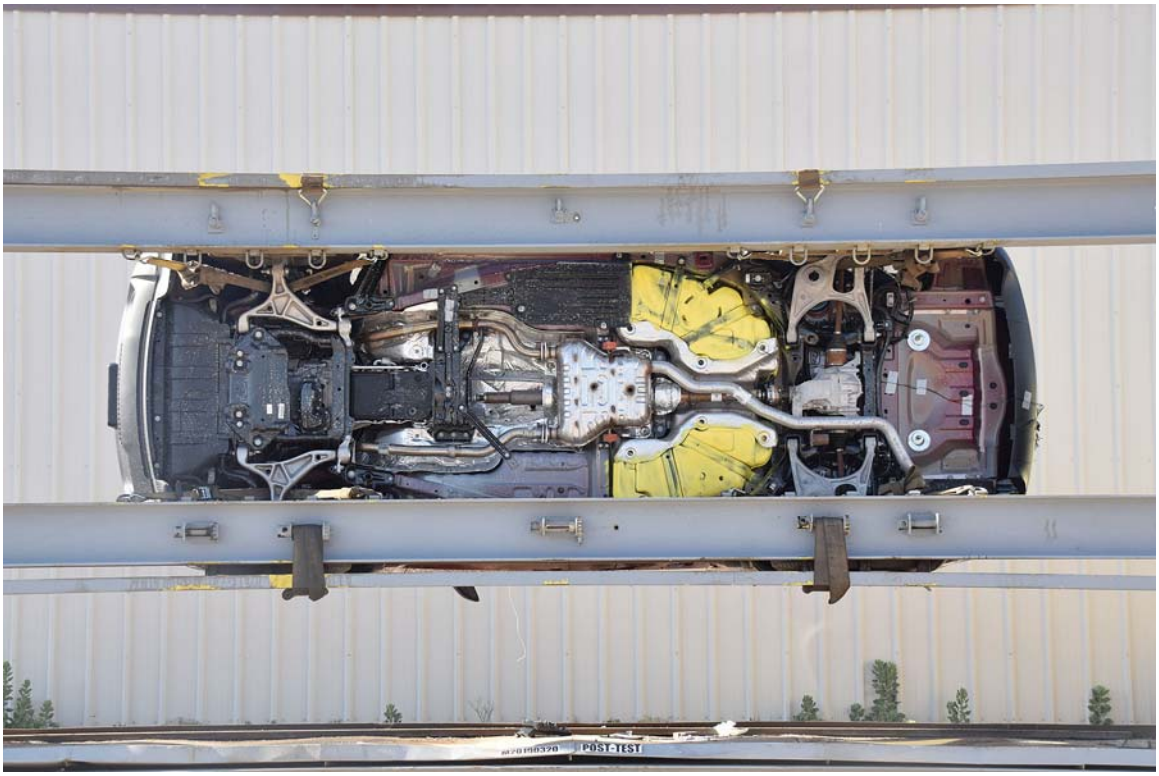


FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees

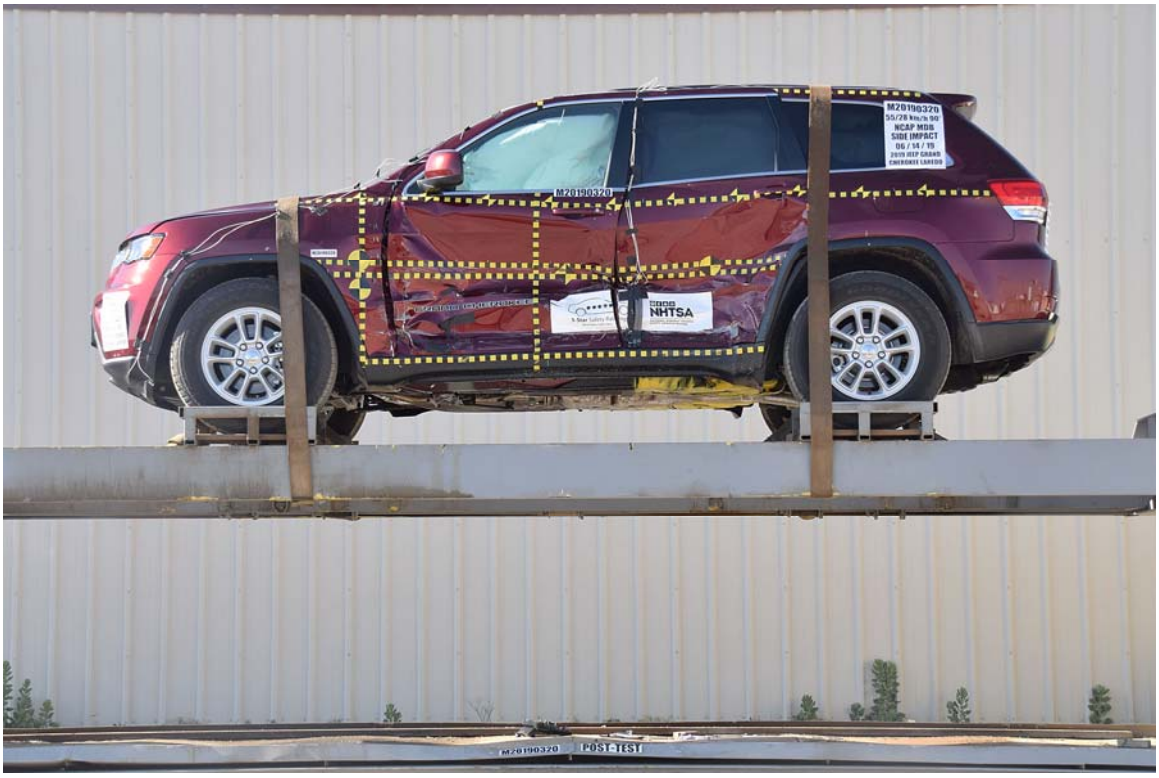


FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees

Photograph Not Available

FIGURE 101. Impact Event

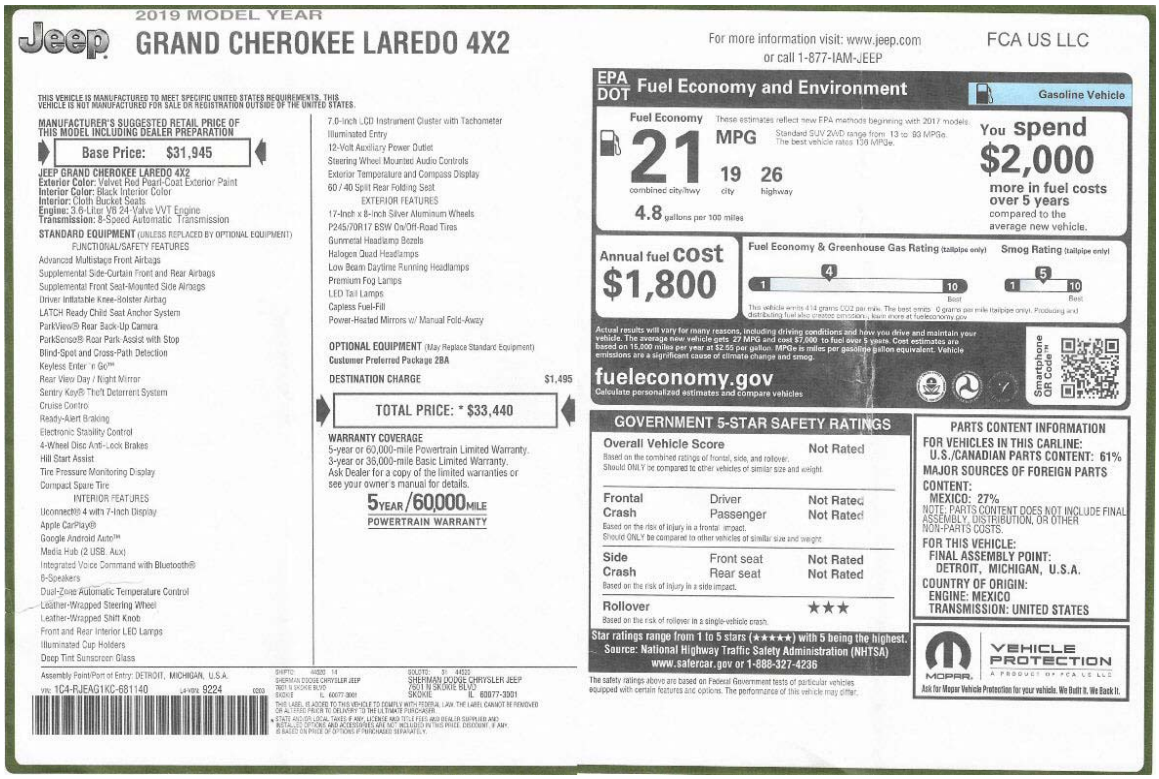


FIGURE 102. Monroney Label

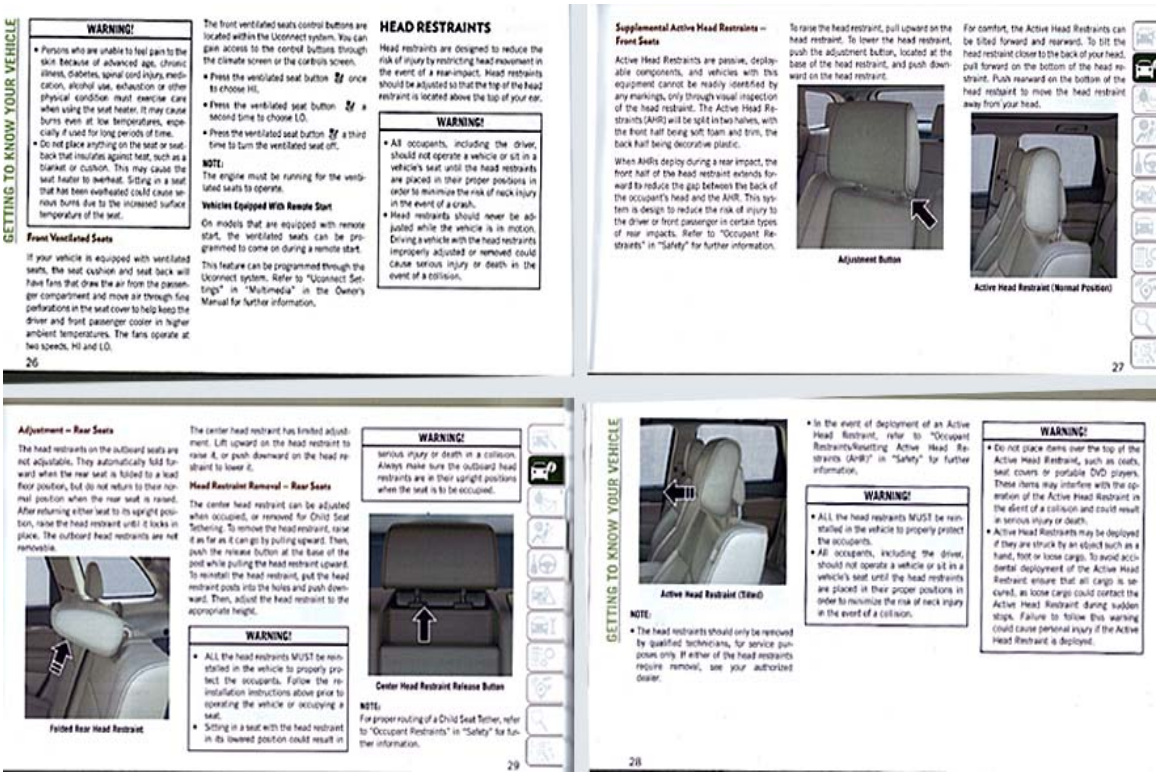


FIGURE 103. Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

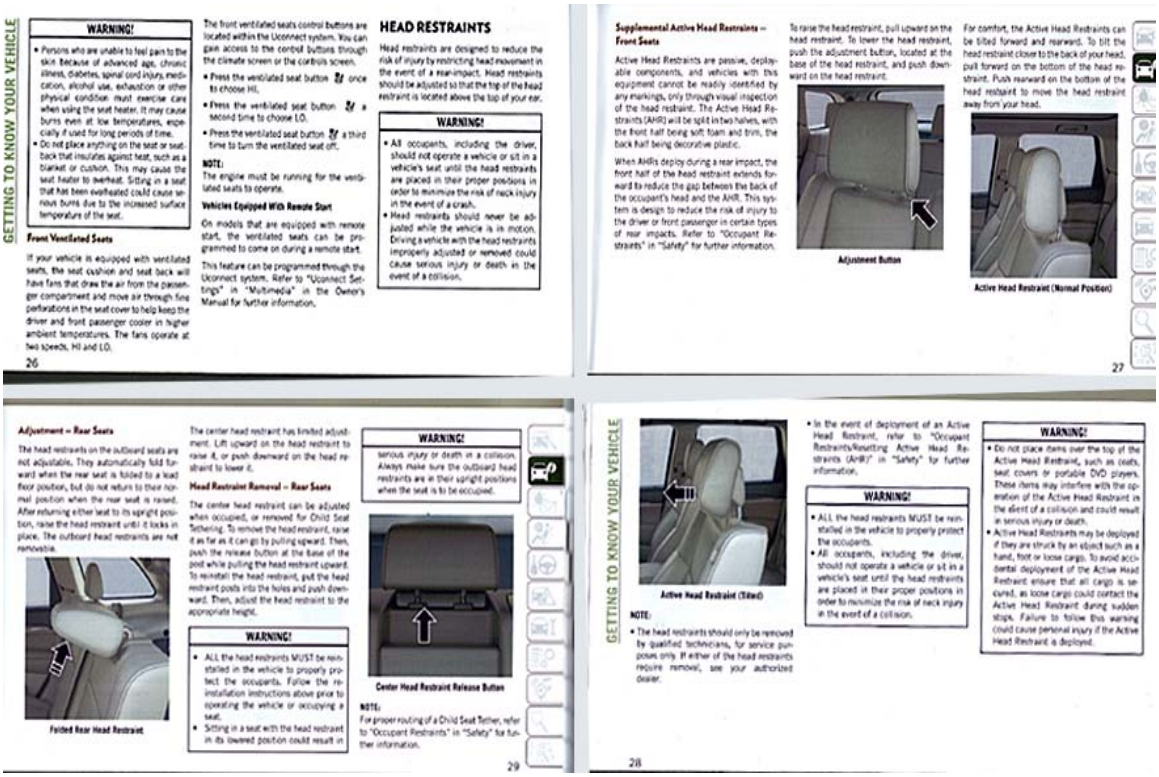


FIGURE 104. Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

APPENDIX B
DUMMY RESPONSE DATA

TABLE OF DATA PLOTS

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website (www.NHTSA.gov)

Additional Driver & Passenger Dummy Instrumentation Data

Driver Lower Spine T12 Acceleration (X)

Driver Lower Spine T12 Acceleration (Y)

Driver Lower Spine T12 Acceleration (Z)

Driver Head Acceleration Redundant (X)

Driver Head Acceleration Redundant (Y)

Driver Head Acceleration Redundant (Z)

Passenger Head Acceleration Redundant (X)

Passenger Head Acceleration Redundant (Y)

Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)

Vehicle Center of Gravity Acceleration (Y)

Vehicle Center of Gravity Acceleration (Z)

Right Side Sill at Front Seat Acceleration (X)

Right Side Sill at Front Seat Acceleration (Y)

Right Side Sill at Front Seat Acceleration (Z)

Right Side Sill at Rear Seat Acceleration (X)

Right Side Sill at Rear Seat Acceleration (Y)

Right Side Sill at Rear Seat Acceleration (Z)

Left Side Sill at Front Seat Acceleration (Y)

Left Side Sill at Rear Seat Acceleration (Y)

Lower A-Post Acceleration (Y)

Middle A-Post Acceleration (Y)

Lower B-Post Acceleration (Y)

Middle B-Post Acceleration (Y)

Front Seat Track Acceleration (Y)

Rear Seat Structure Acceleration (Y)

Right Rear Occupant Compartment Acceleration (Y)

Engine Block (X)

Engine Block (Y)

Rear Floorpan Above Axle Acceleration (X)

Rear Floorpan Above Axle Acceleration (Y)

Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)

MDB Center of Gravity Acceleration (Y)

MDB Center of Gravity Acceleration (Z)

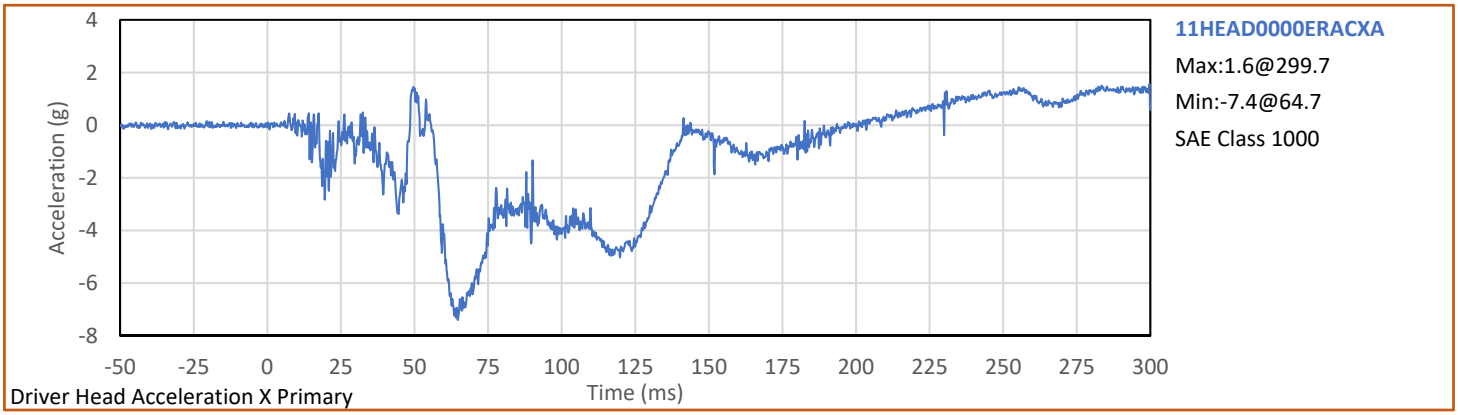
MDB Rear Acceleration (X)

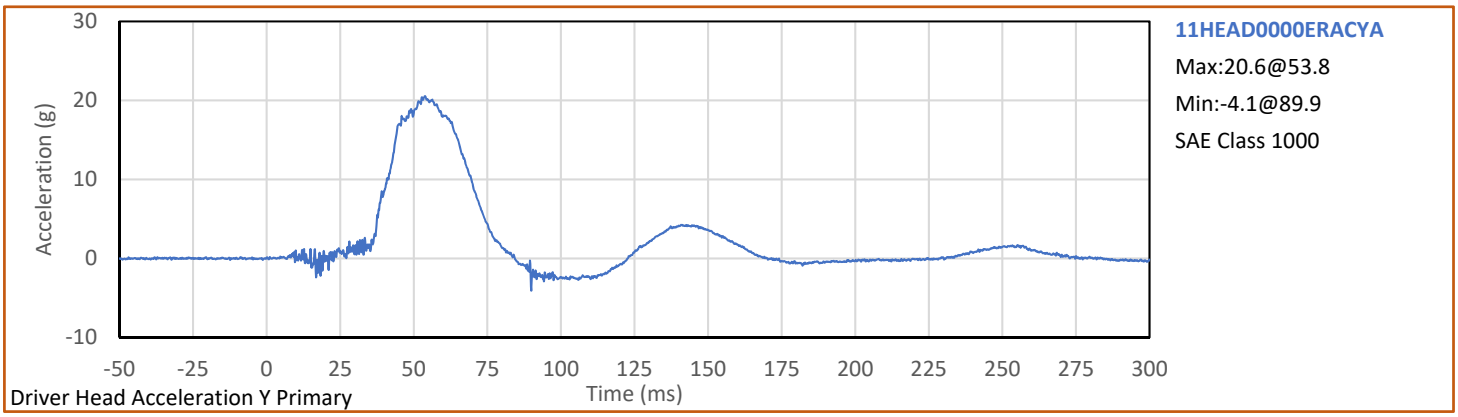
MDB Rear Acceleration (Y)

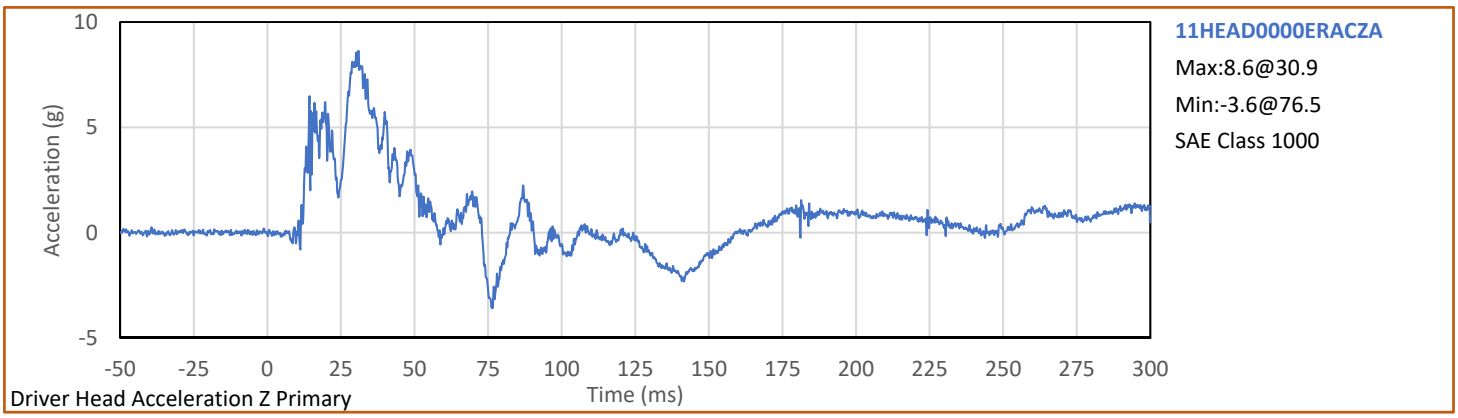
Left MDB Contact Switch

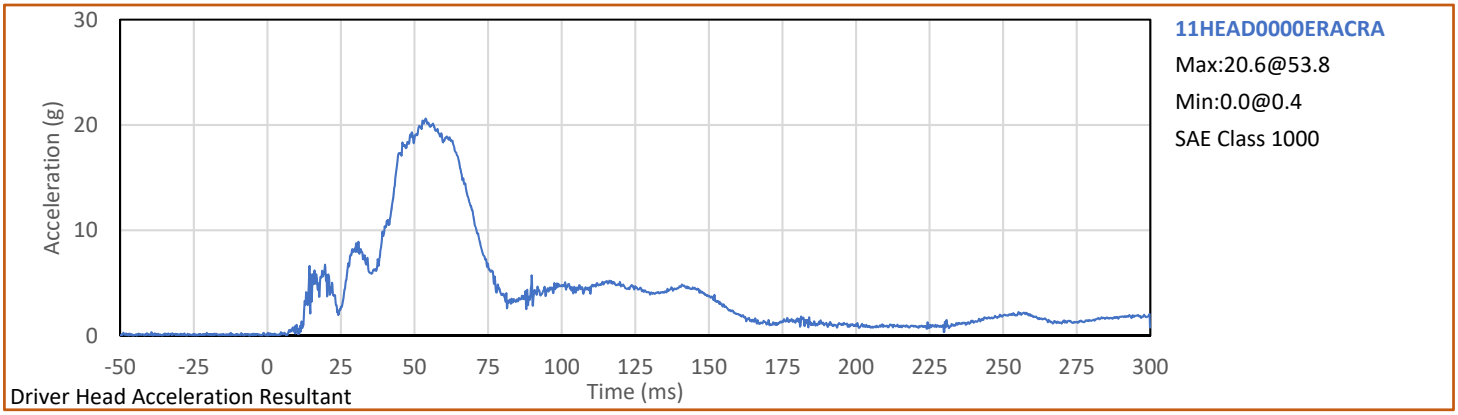
Right MDB Contact Switch

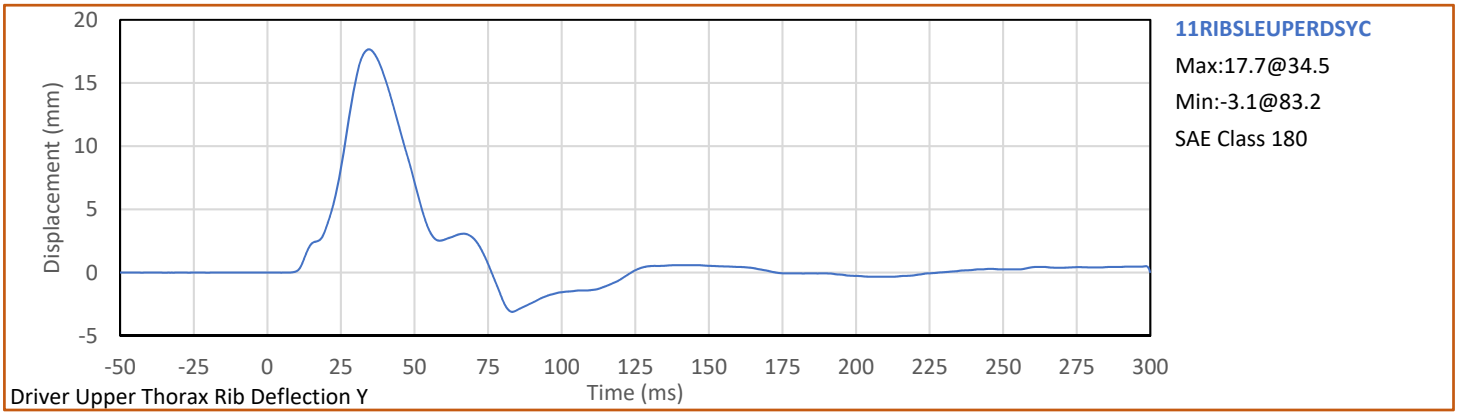
Test Vehicle:	2019 Jeep Grand Cherokee Laredo 5-Door MPV	NHTSA No.:	M20190320
Test Program:	NCAP MDB Side Impact Test	Test Date:	6/14/2019



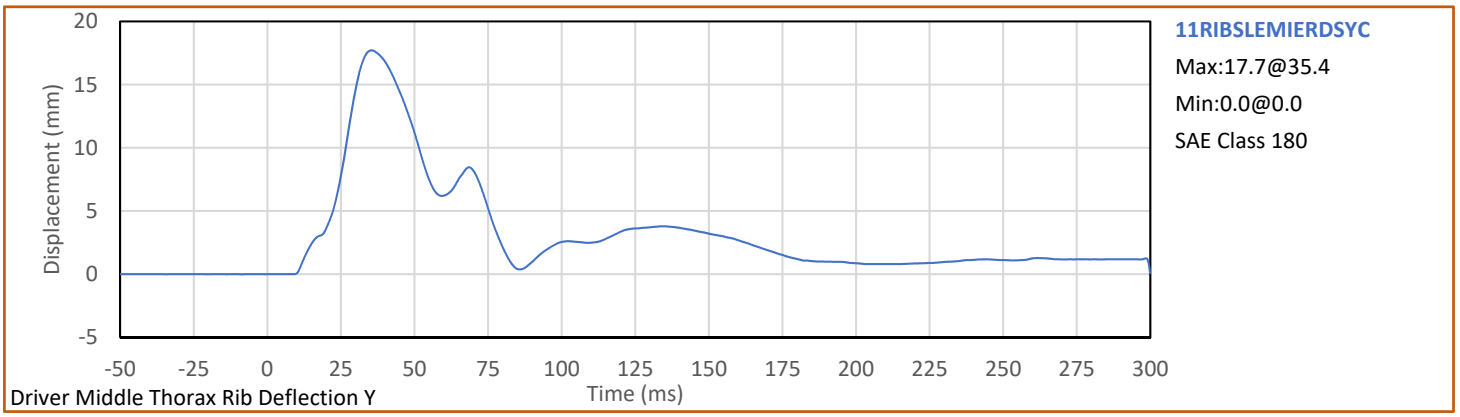




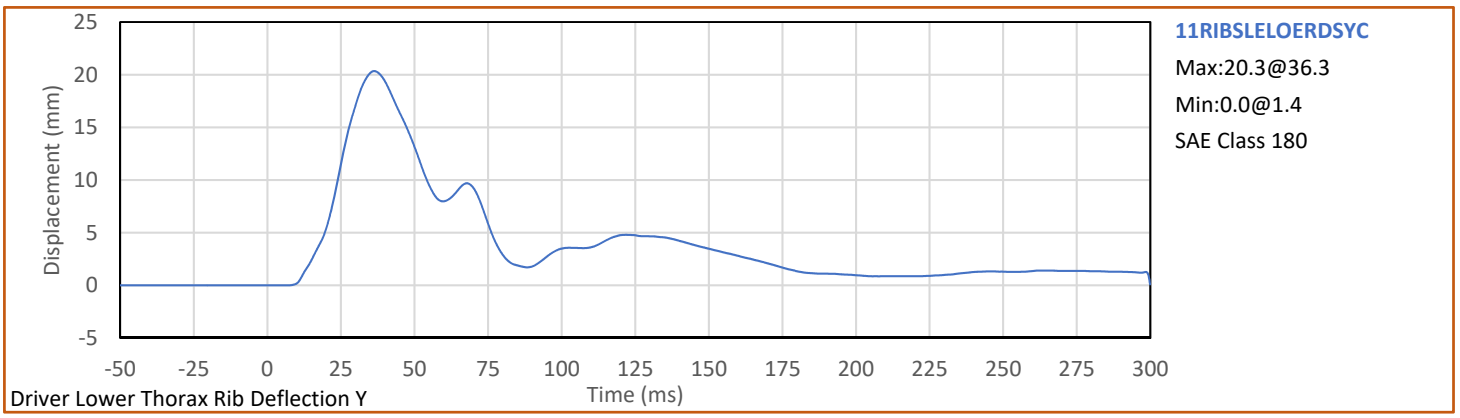




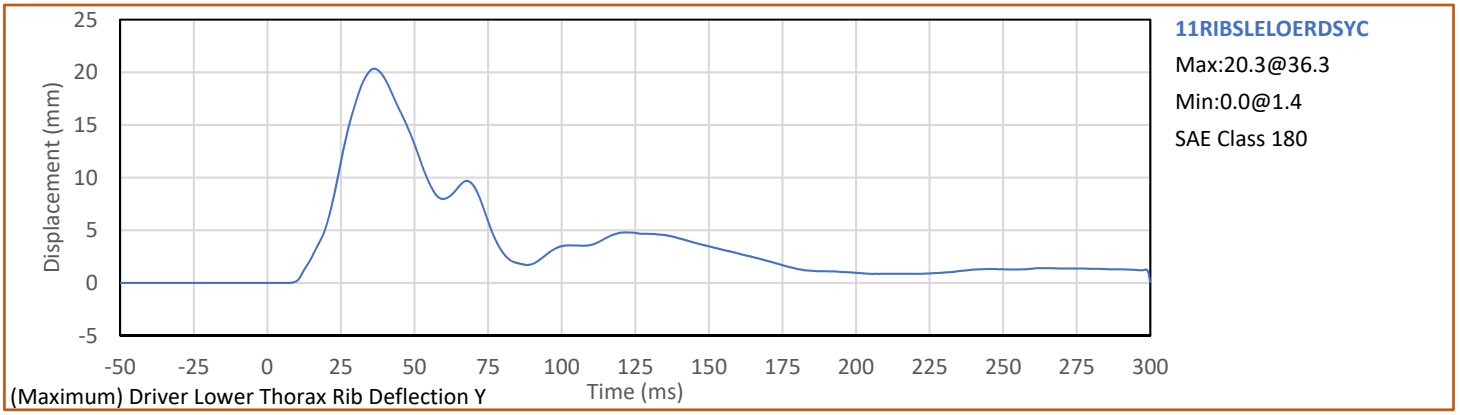
Driver Upper Thorax Rib Deflection Y



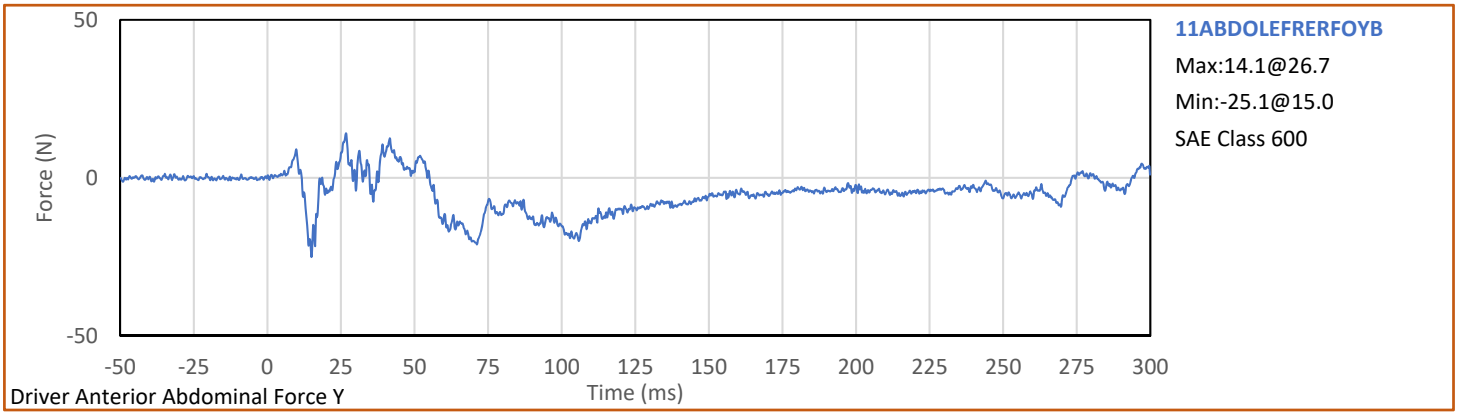
Driver Middle Thorax Rib Deflection Y



Driver Lower Thorax Rib Deflection Y

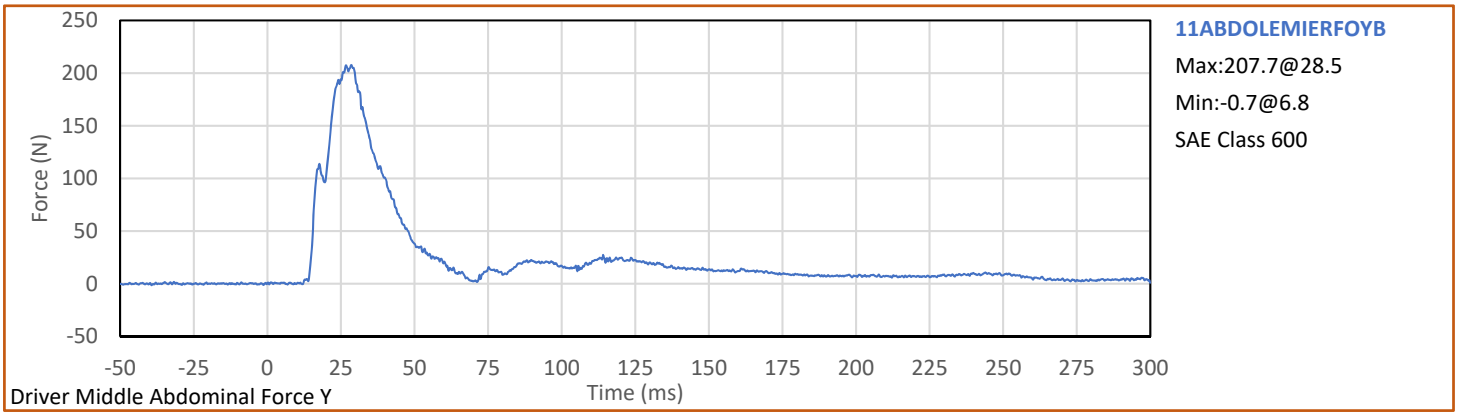


(Maximum) Driver Lower Thorax Rib Deflection Y



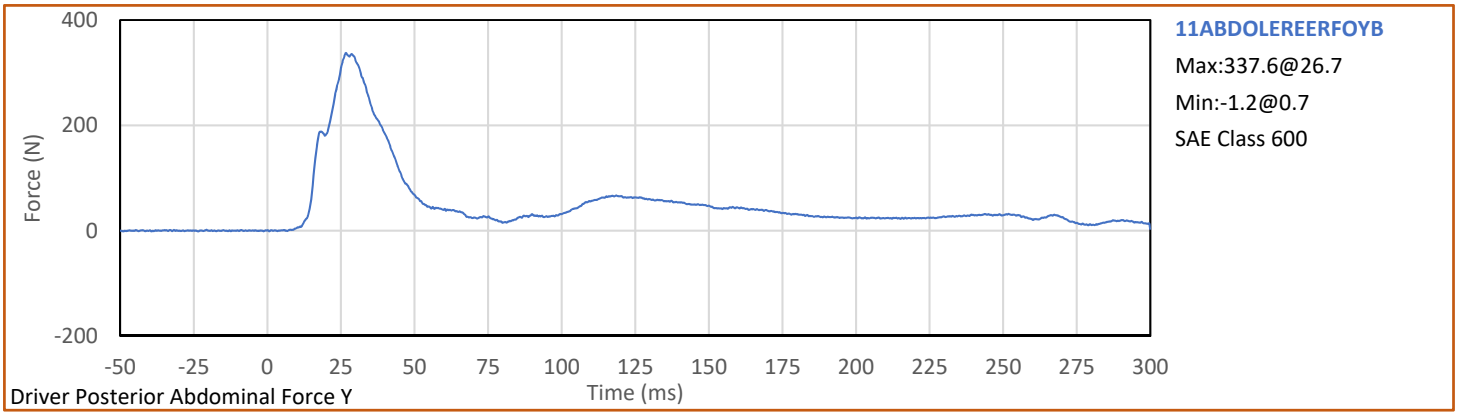
11ABDOLEFRERFOYB
Max:14.1@26.7
Min:-25.1@15.0
SAE Class 600

Driver Anterior Abdominal Force Y



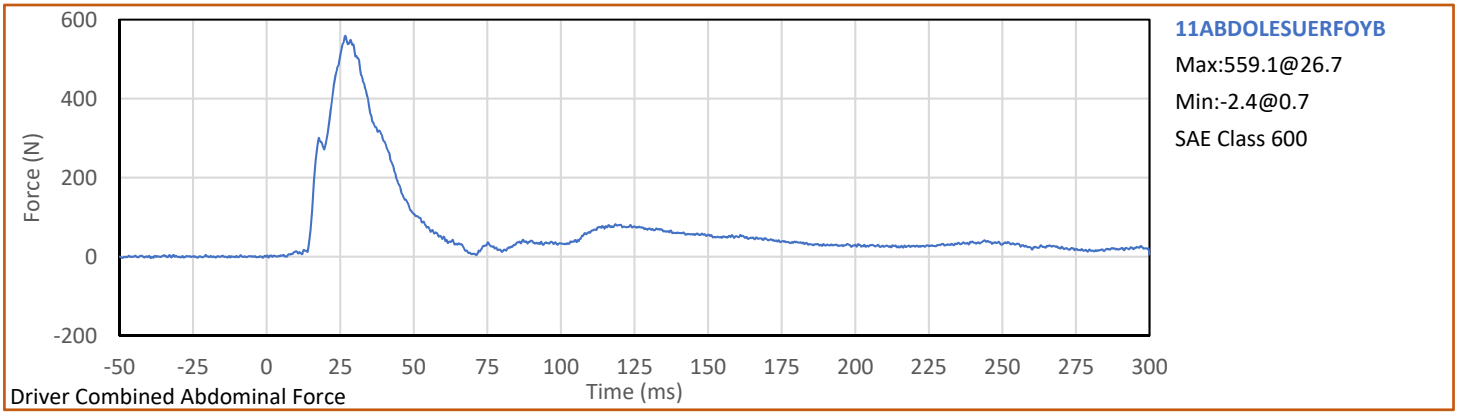
11ABDOLEMIERFOYB
Max:207.7@28.5
Min:-0.7@6.8
SAE Class 600

Driver Middle Abdominal Force Y



11ABDOLEREERFOYB
Max:337.6@26.7
Min:-1.2@0.7
SAE Class 600

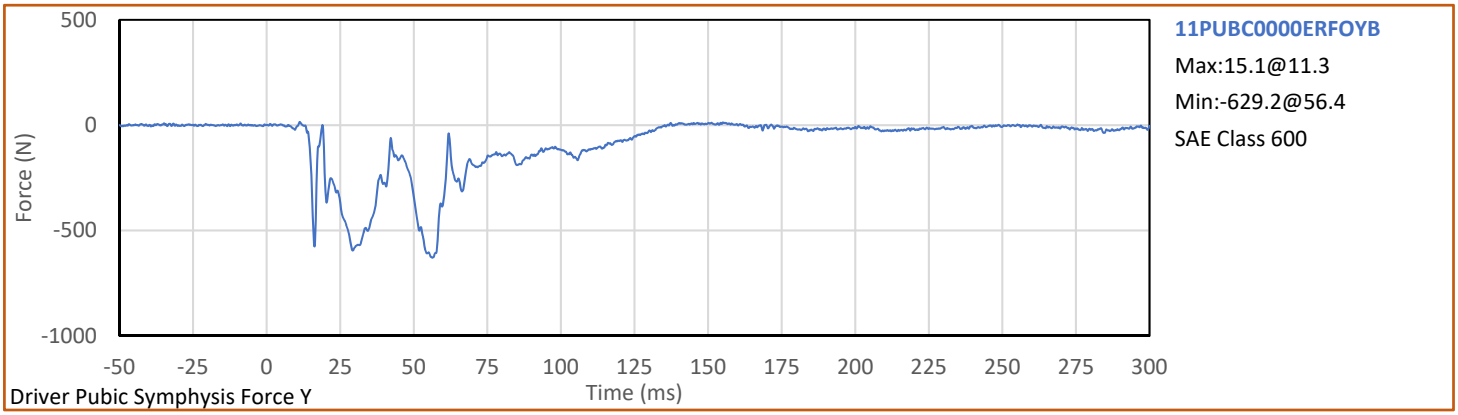
Driver Posterior Abdominal Force Y



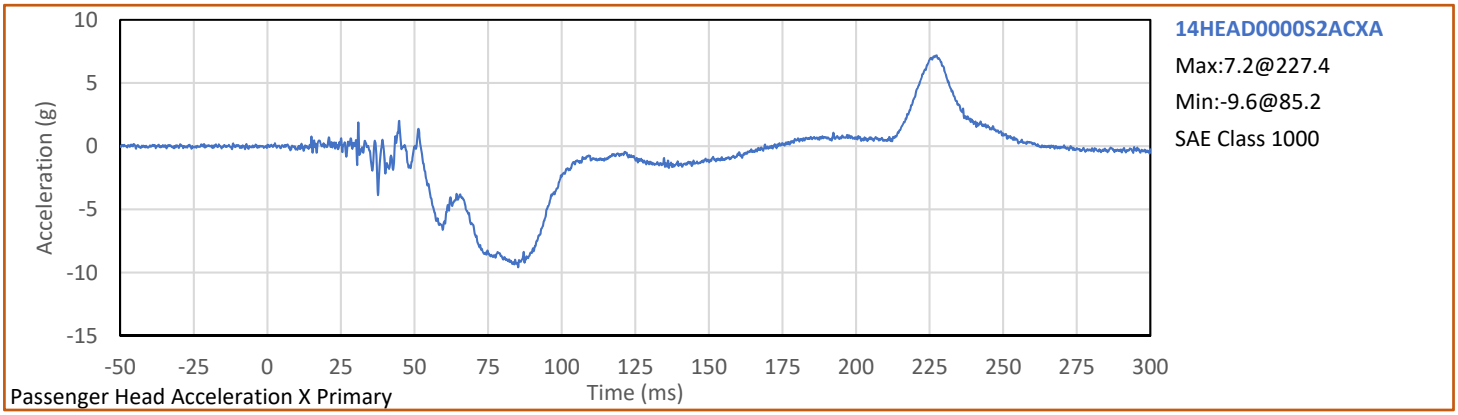
11ABDOLESUERFOYB
Max:559.1@26.7
Min:-2.4@0.7
SAE Class 600

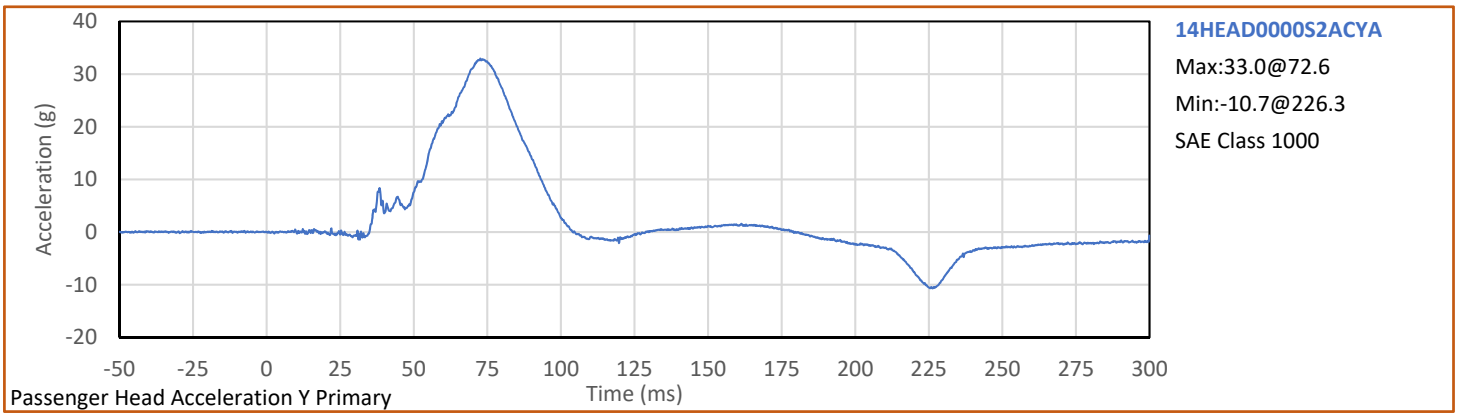
Driver Combined Abdominal Force

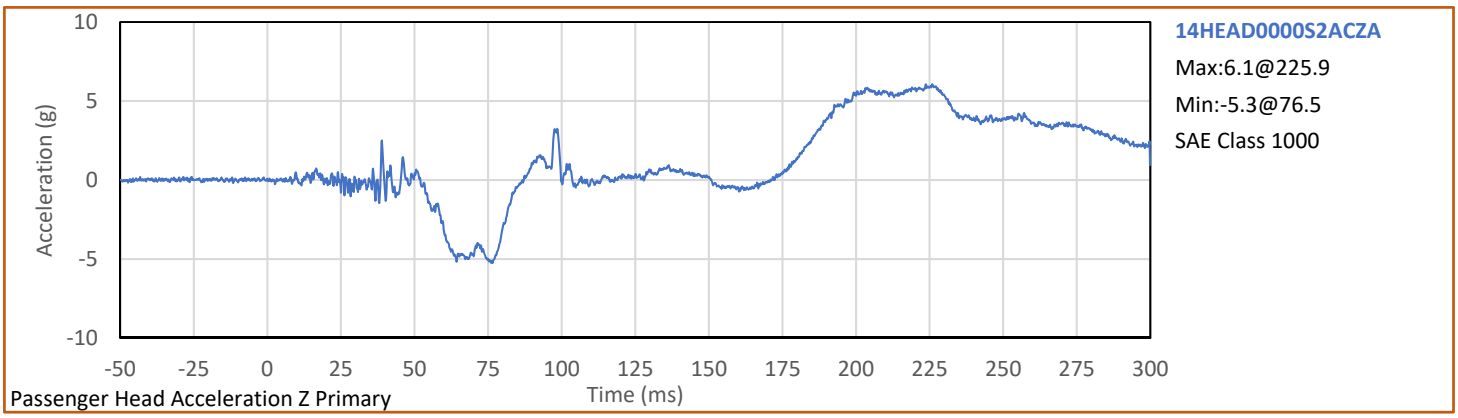
Test Vehicle:	2019 Jeep Grand Cherokee Laredo 5-Door MPV	NHTSA No.:	M20190320
Test Program:	NCAP MDB Side Impact Test	Test Date:	6/14/2019

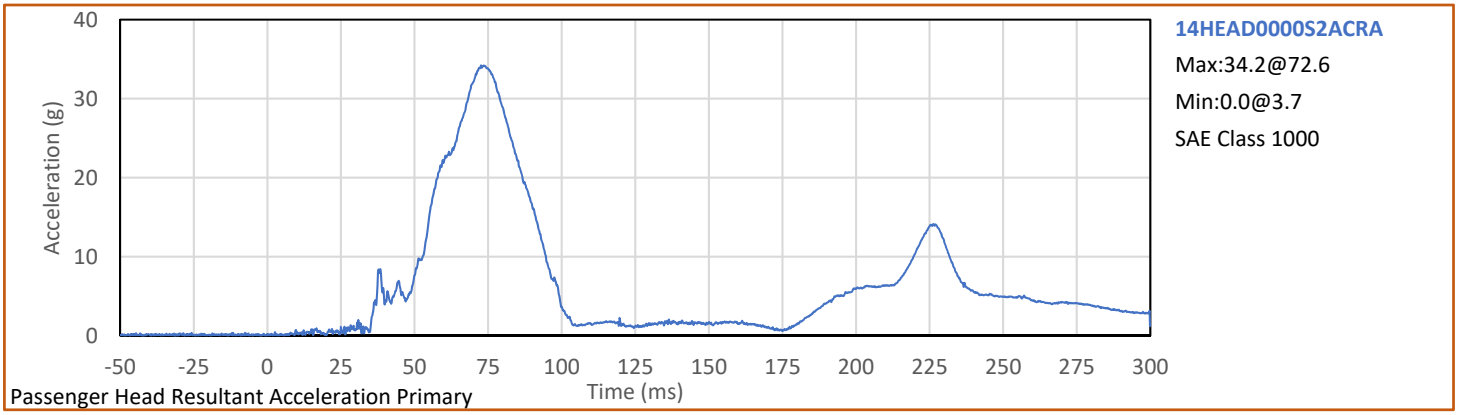


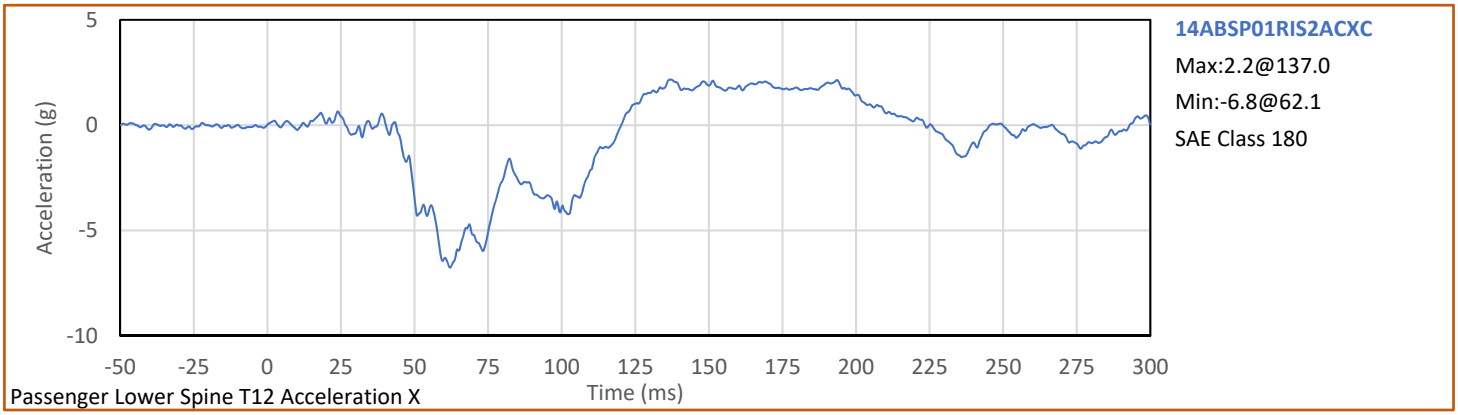
Driver Pubic Symphysis Force Y

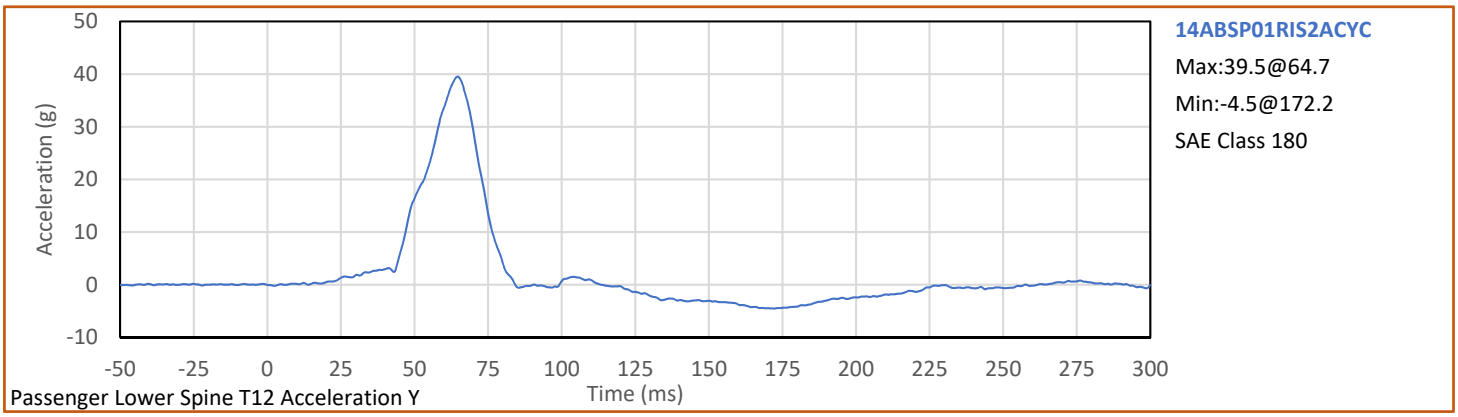

14HEAD0000S2ACXA
Max:7.2@227.4
Min:-9.6@85.2
SAE Class 1000
Acceleration (g)
Time (ms)
Passenger Head Acceleration X Primary

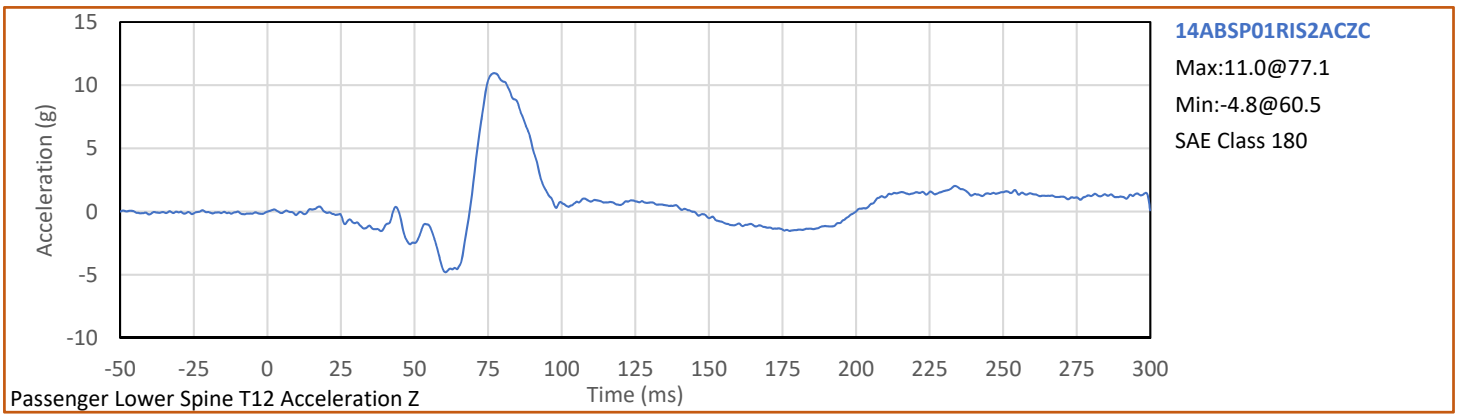

14HEAD0000S2ACYA
Max:33.0@72.6
Min:-10.7@226.3
SAE Class 1000
Acceleration (g)
Time (ms)
Passenger Head Acceleration Y Primary

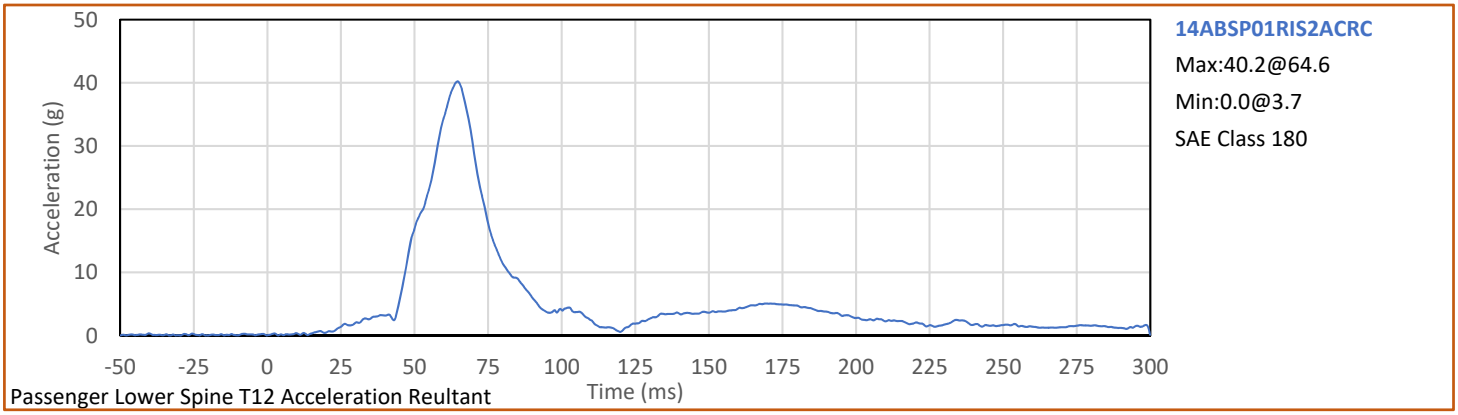

14HEAD0000S2ACZA
Max:6.1@225.9
Min:-5.3@76.5
SAE Class 1000
Acceleration (g)
Time (ms)
Passenger Head Acceleration Z Primary

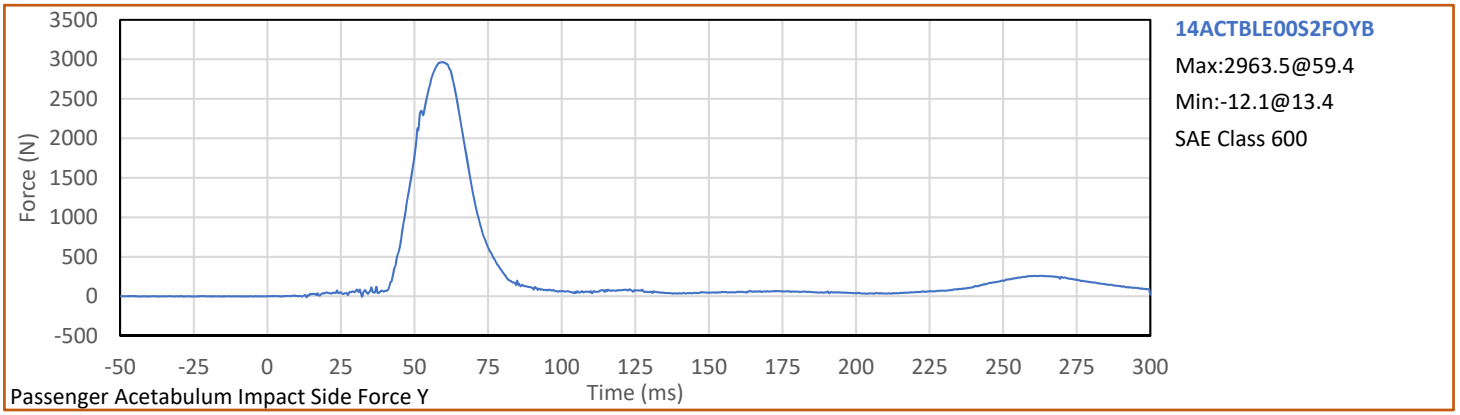

14HEAD0000S2ACRA
Max:34.2@72.6
Min:0.0@3.7
SAE Class 1000
Acceleration (g)
Time (ms)
Passenger Head Resultant Acceleration Primary


Acceleration (g)
Time (ms)
14ABSP01RIS2ACXC
Max:2.2@137.0
Min:-6.8@62.1
SAE Class 180
Passenger Lower Spine T12 Acceleration X

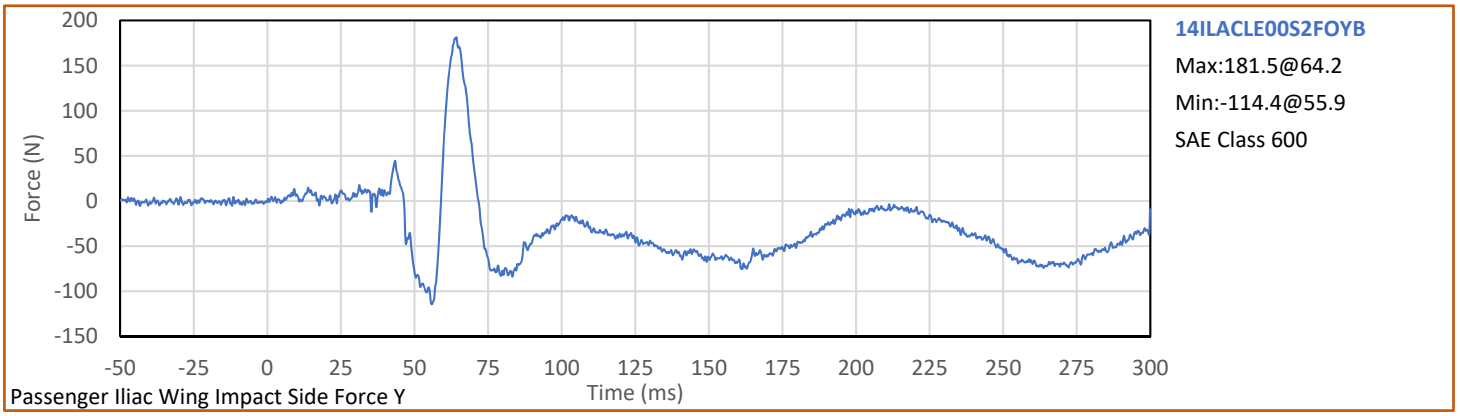

Acceleration (g)
Time (ms)
14ABSP01RIS2ACYC
Max:39.5@64.7
Min:-4.5@172.2
SAE Class 180
Passenger Lower Spine T12 Acceleration Y


Acceleration (g)
Time (ms)
14ABSP01RIS2ACZC
Max:11.0@77.1
Min:-4.8@60.5
SAE Class 180
Passenger Lower Spine T12 Acceleration Z

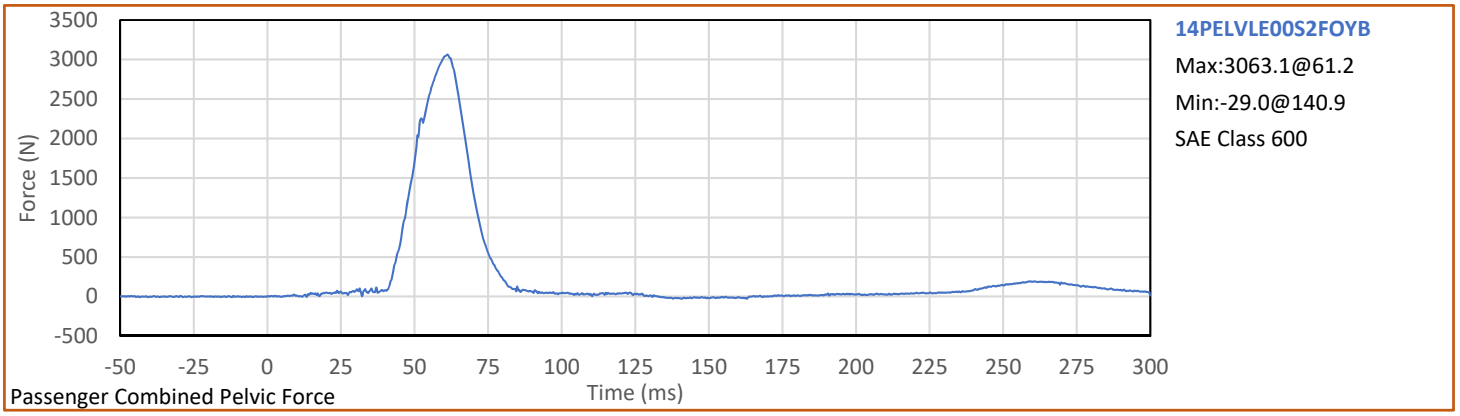

Acceleration (g)
Time (ms)
14ABSP01RIS2ACRC
Max:40.2@64.6
Min:0.0@3.7
SAE Class 180
Passenger Lower Spine T12 Acceleration Reultant



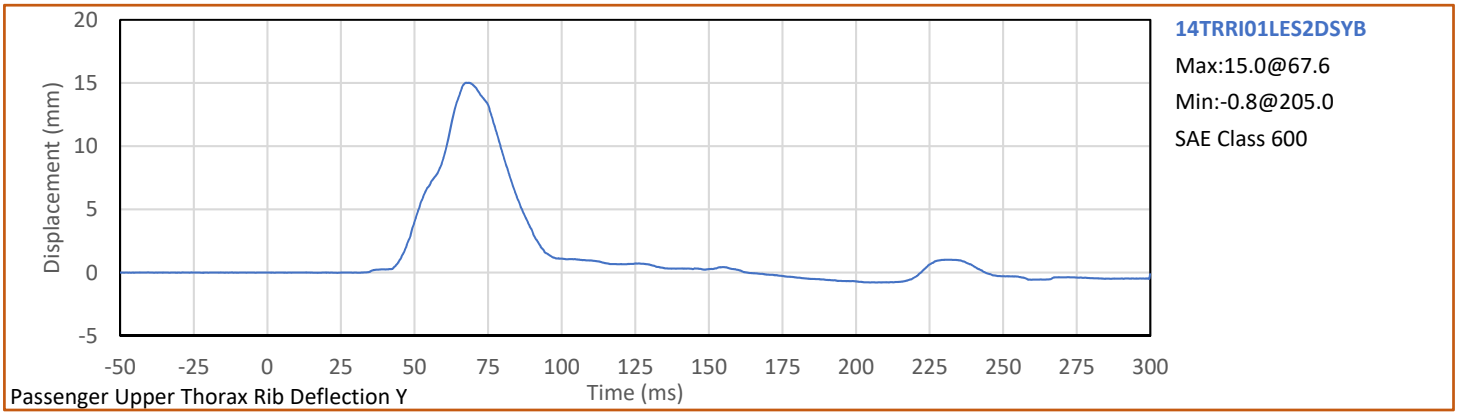
Passenger Acetabulum Impact Side Force Y

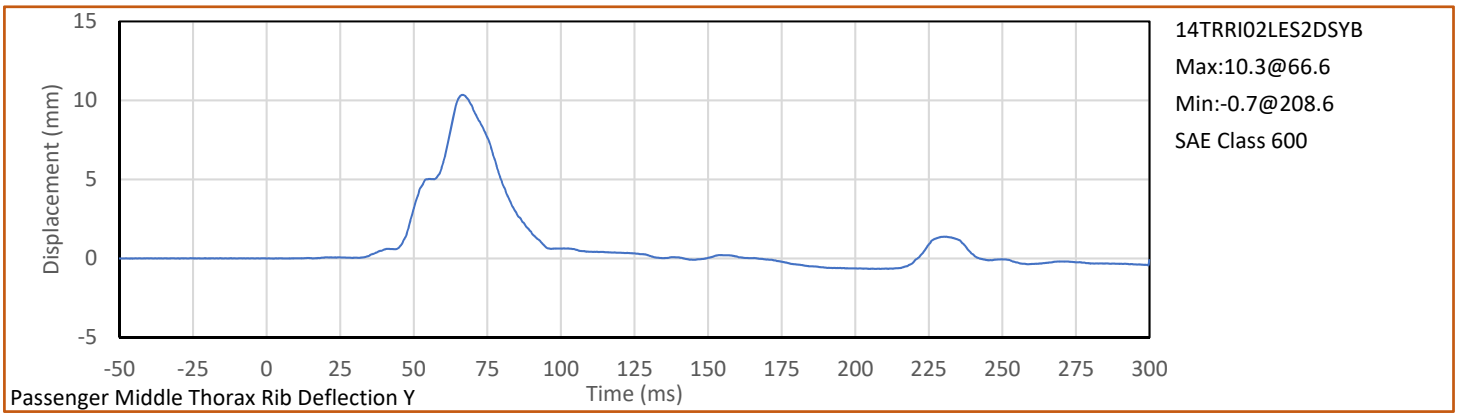


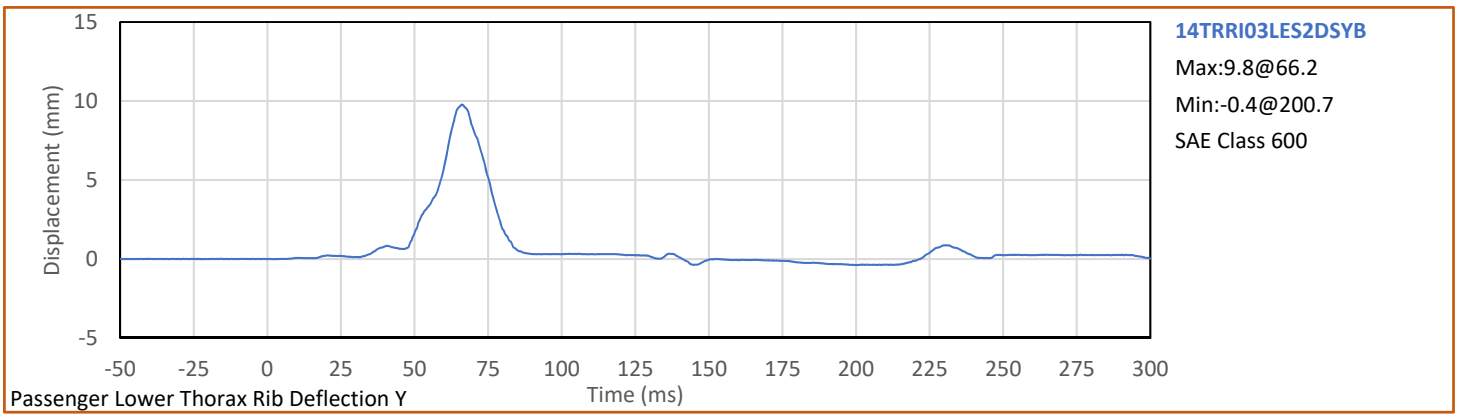
Passenger Iliac Wing Impact Side Force Y

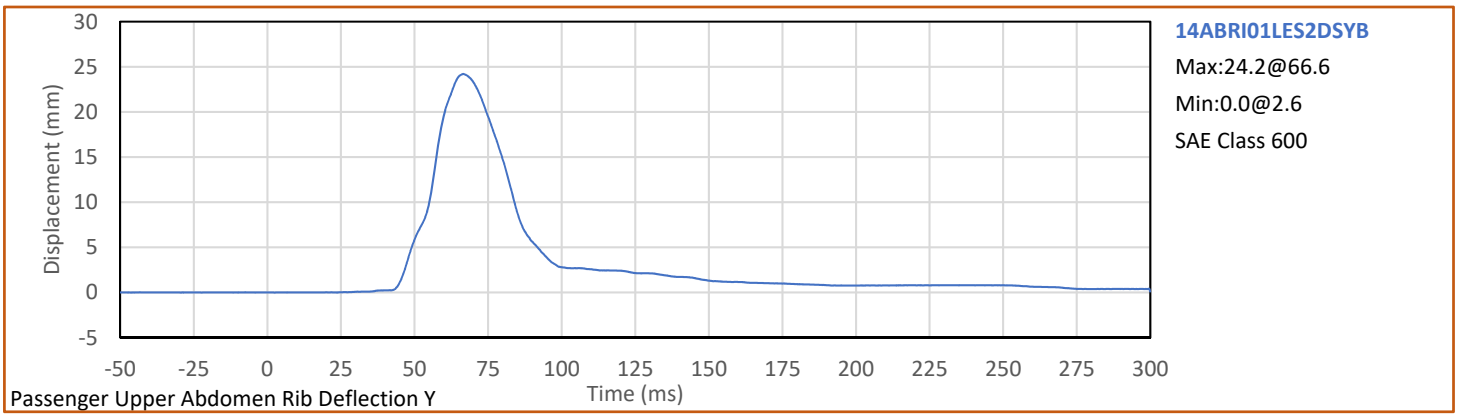


Passenger Combined Pelvic Force


Displacement (mm)
Time (ms)
Passenger Upper Thorax Rib Deflection Y
14TRRI01LES2DSYB
Max:15.0@67.6
Min:-0.8@205.0
SAE Class 600


Displacement (mm)
Time (ms)
Passenger Middle Thorax Rib Deflection Y
14TRRI02LES2DSYB
Max:10.3@66.6
Min:-0.7@208.6
SAE Class 600


Displacement (mm)
Time (ms)
Passenger Lower Thorax Rib Deflection Y
14TRRI03LES2DSYB
Max:9.8@66.2
Min:-0.4@200.7
SAE Class 600

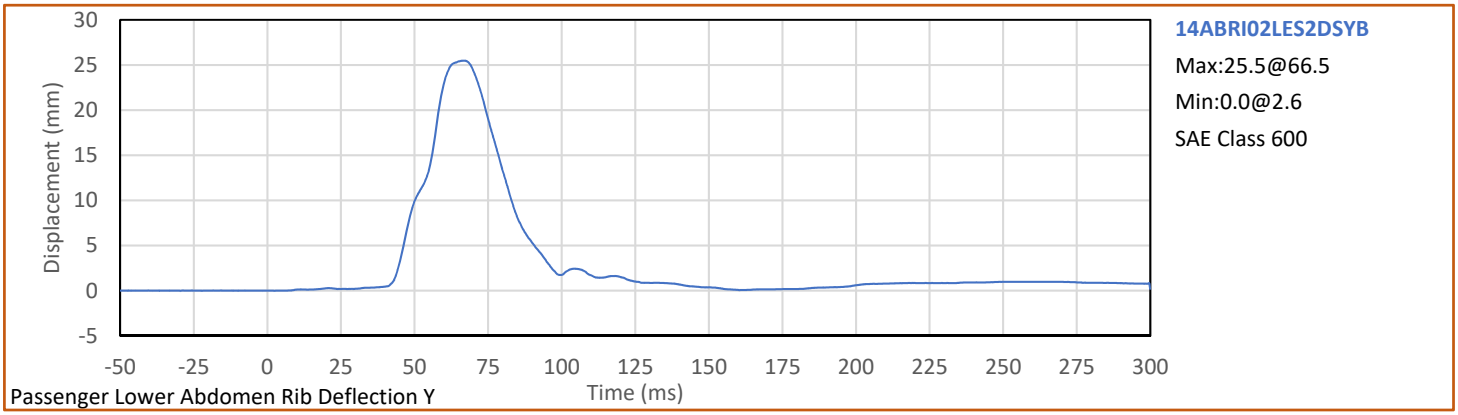

Displacement (mm)
Time (ms)
Passenger Upper Abdomen Rib Deflection Y
14ABRI01LES2DSYB
Max:24.2@66.6
Min:0.0@2.6
SAE Class 600

Test Vehicle: 2019 Jeep Grand Cherokee Laredo 5-Door MPV

Test Program: NCAP MDB Side Impact Test

NHTSA No.: M20190320

Test Date: 6/14/2019



Passenger Lower Abdomen Rib Deflection Y

APPENDIX C
ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
Pre-Test ATD Configuration And Performance Verification Data
ES-2re 50th Male Side Impact ATD
S/N: F035

Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
External Measurements

ATD Serial No.: F035 Test Date: 2019-06-03

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
1 - Sitting Height	mm	900	918	907	Pass
2 - Seat to Shoulder Joint	mm	558	572	569	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	351	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	98	Pass
5 - Sole to Seat, Sitting	mm	433	451	442	Pass
6 - Head Width	mm	152	158	155	Pass
7 - Shoulder/Arm Width	mm	461	479	473	Pass
8 - Thorax Width	mm	322	332	326	Pass
9 - Abdomen Width	mm	273	287	277	Pass
10 - Pelvis Lap Width	mm	359	373	364	Pass
11 - Head Depth	mm	196	206	202	Pass
12 - Thorax Depth	mm	262	272	269	Pass
13 - Abdomen Depth	mm	194	204	197	Pass
14 - Pelvis Depth	mm	235	245	239	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	157	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	609	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

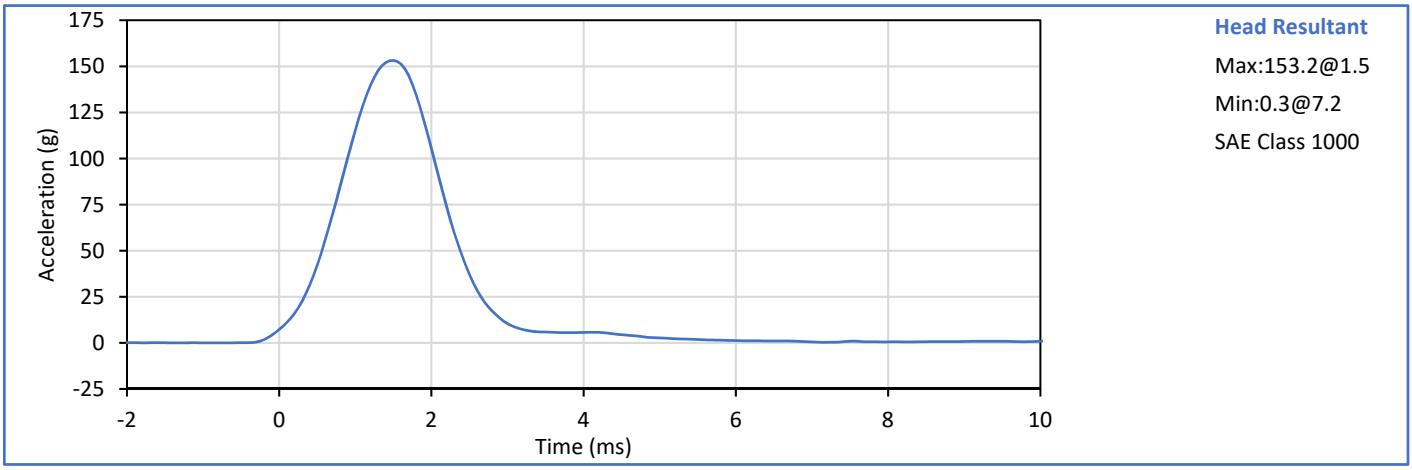
Approved By: P. Puzzuto

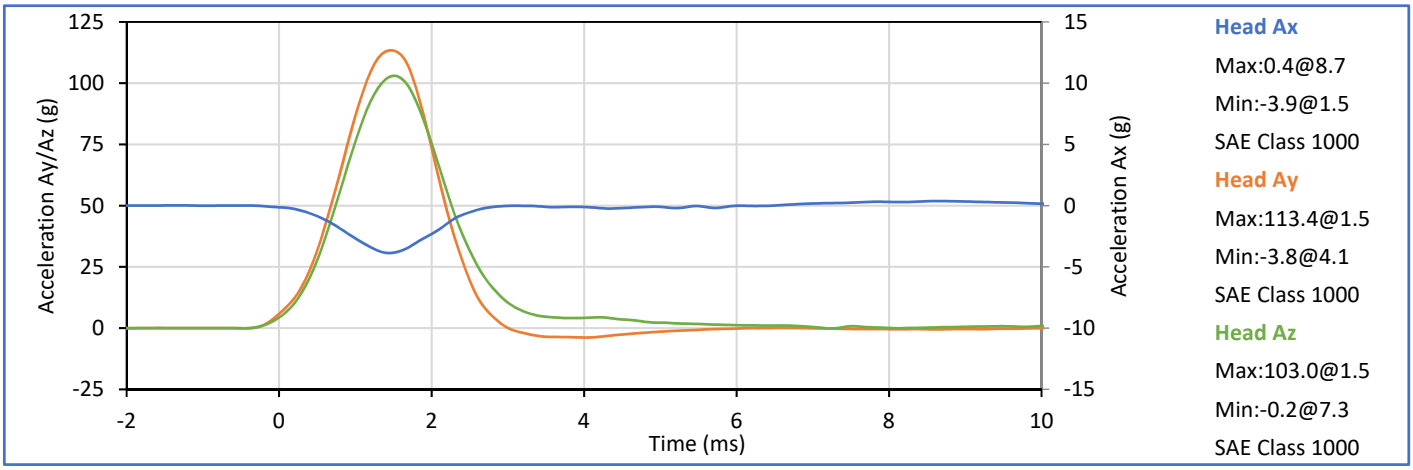
Applus IDIADA KARCO

ES-2re 50th Male Side Impact ATD
Head Drop

ATD Serial No.: F035 Test Date: 2019-06-03

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Peak Resultant Acceleration	g	125.0	155.0	153.2	Pass
Peak Head Ax	g	-15.0	15.0	0.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

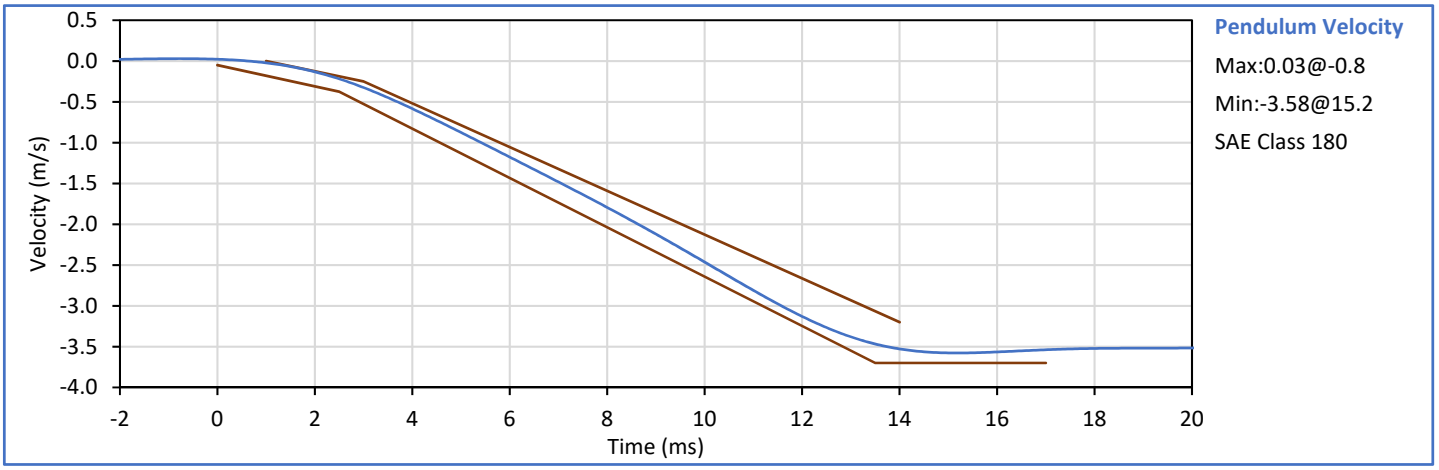
Approved By: P. Puzzuto

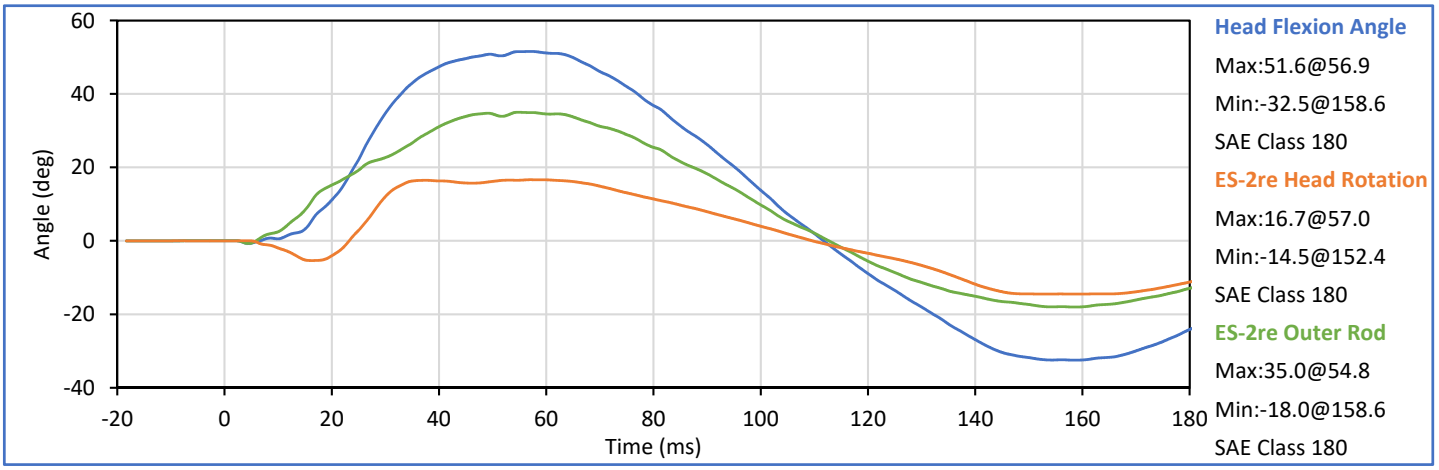
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Neck Flexion

ATD Serial No.: F035 Test Date: 2019-06-03

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Pendulum Velocity	m/s	3.30	3.50	3.47	Pass
Peak Headform Flexion	deg	49.0	59.0	51.6	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	56.9	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	54.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

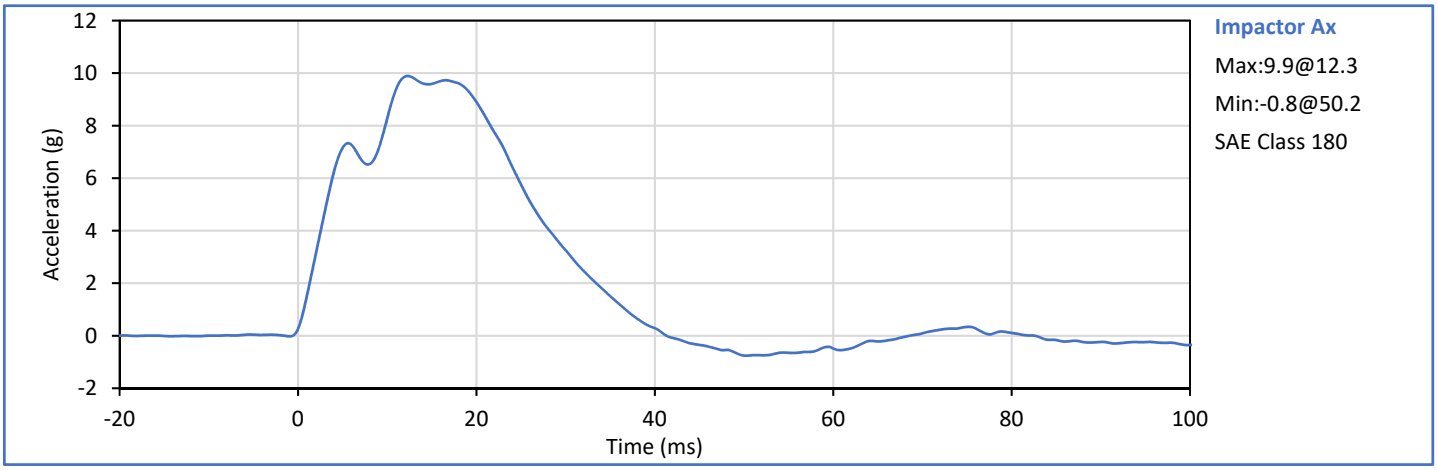
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Shoulder Impact Test

ATD Serial No.: F035

Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Ax	g	7.5	10.5	9.9	Pass
			Overall Test Results		Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

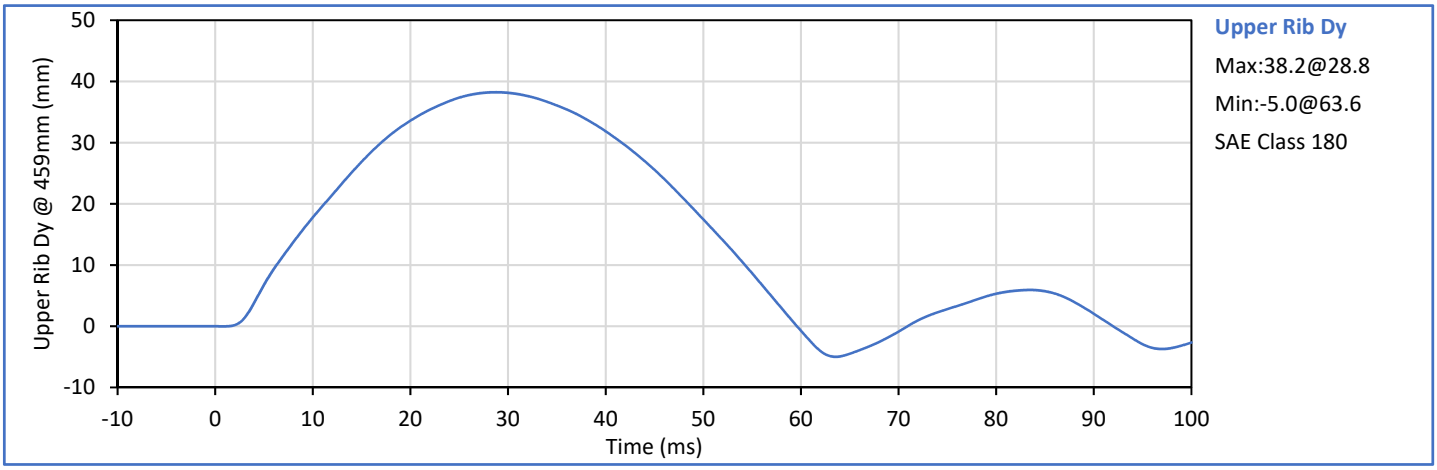
Applus IDIADA
KARCO

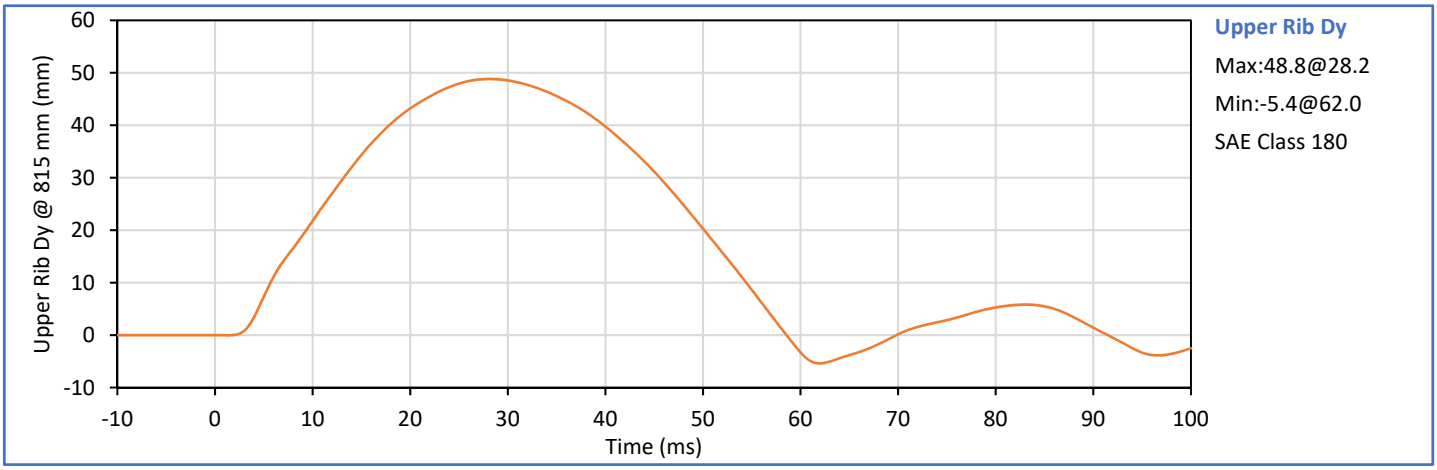
ES-2re 50th Male Side Impact ATD
Upper Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	34	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.2	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.8	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

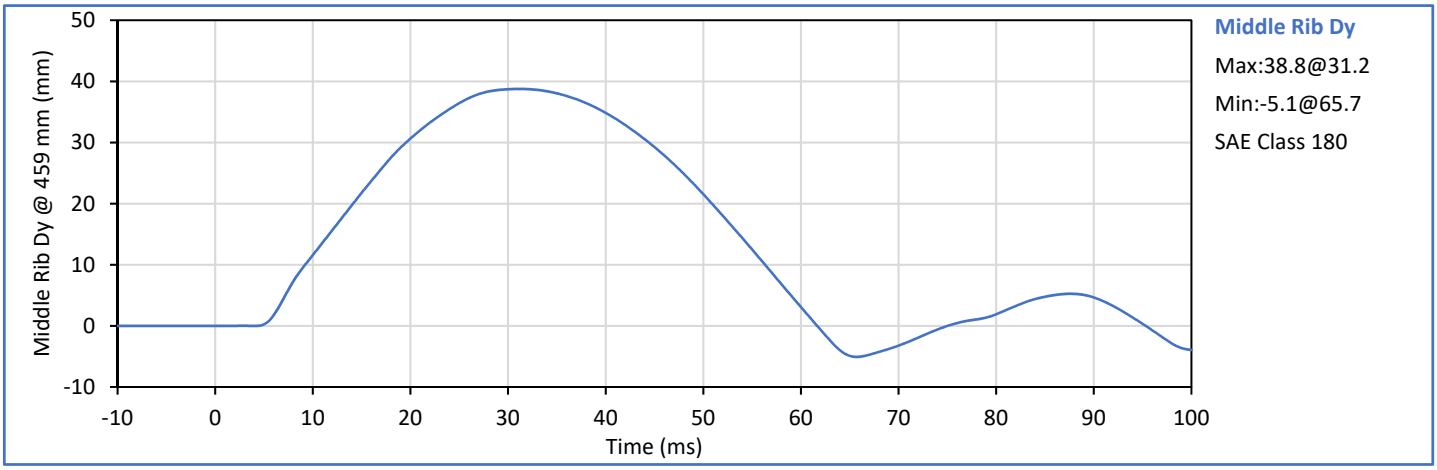
Approved By: P. Puzzuto

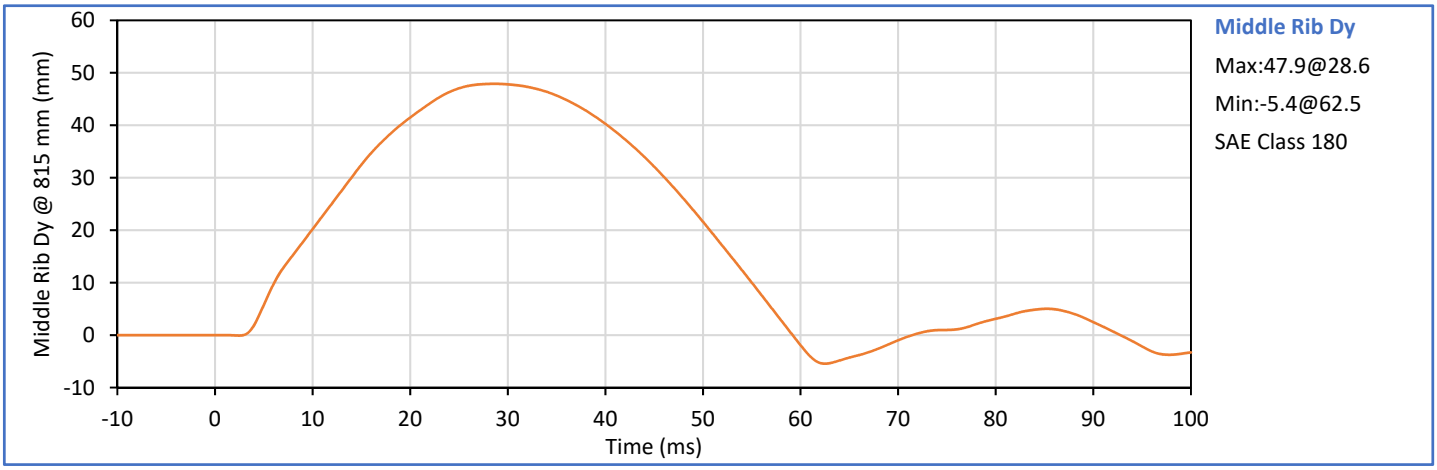
Applus IDIADA KARCO

ES-2re 50th Male Side Impact ATD
Middle Rib Drop Test

ATD Serial No.: F035 Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	34	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	38.8	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	47.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

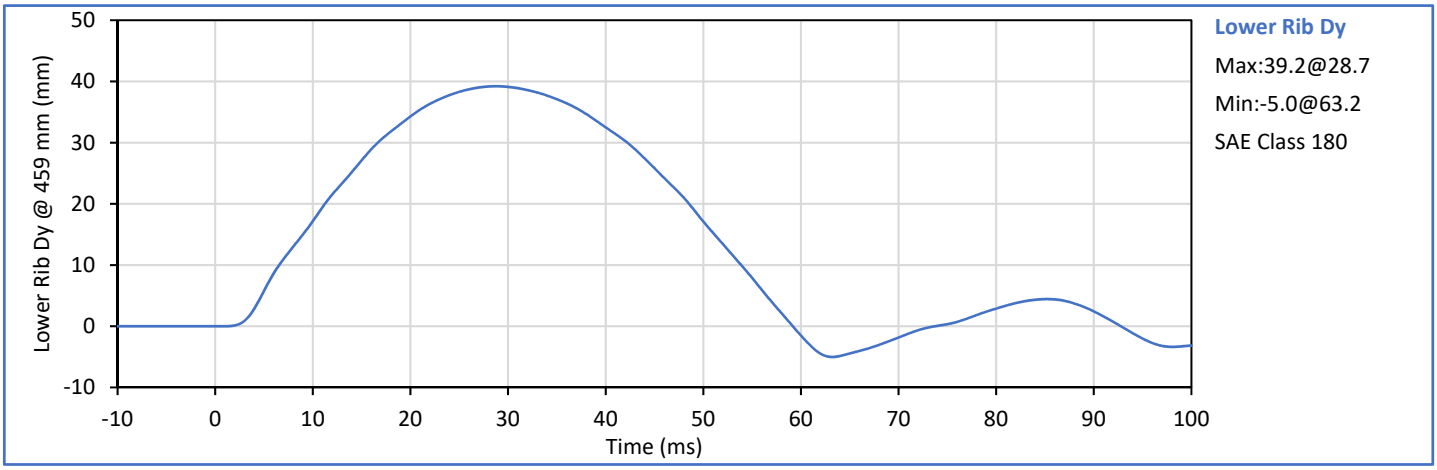
Approved By: P. Puzzuto

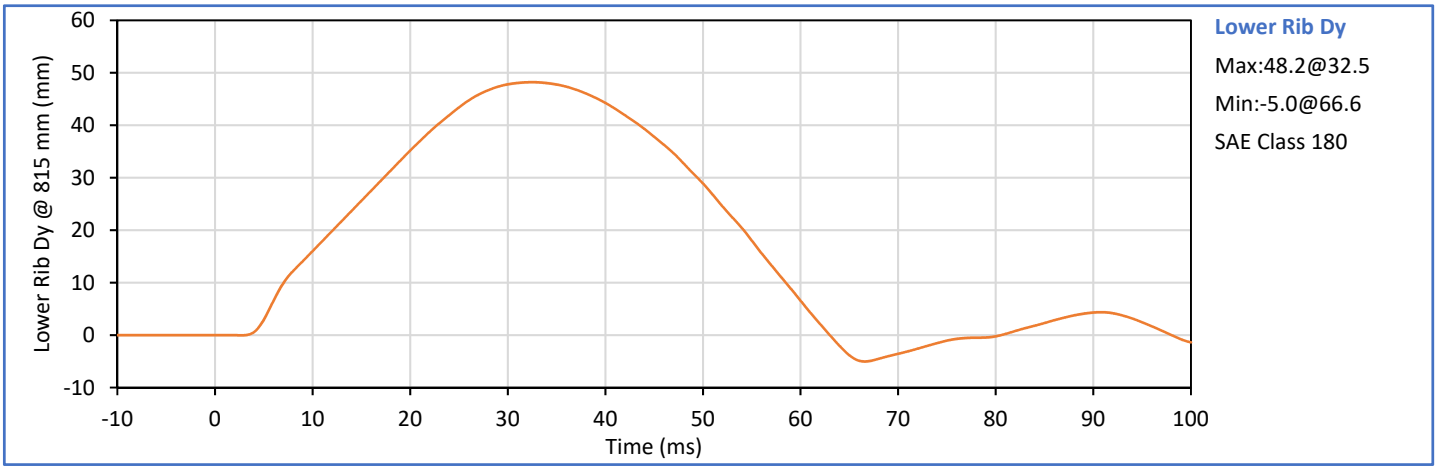
Applus IDIADA KARCO

ES-2re 50th Male Side Impact ATD
Lower Rib Drop Test

ATD Serial No.: F035 Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	34	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	39.2	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	48.2	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

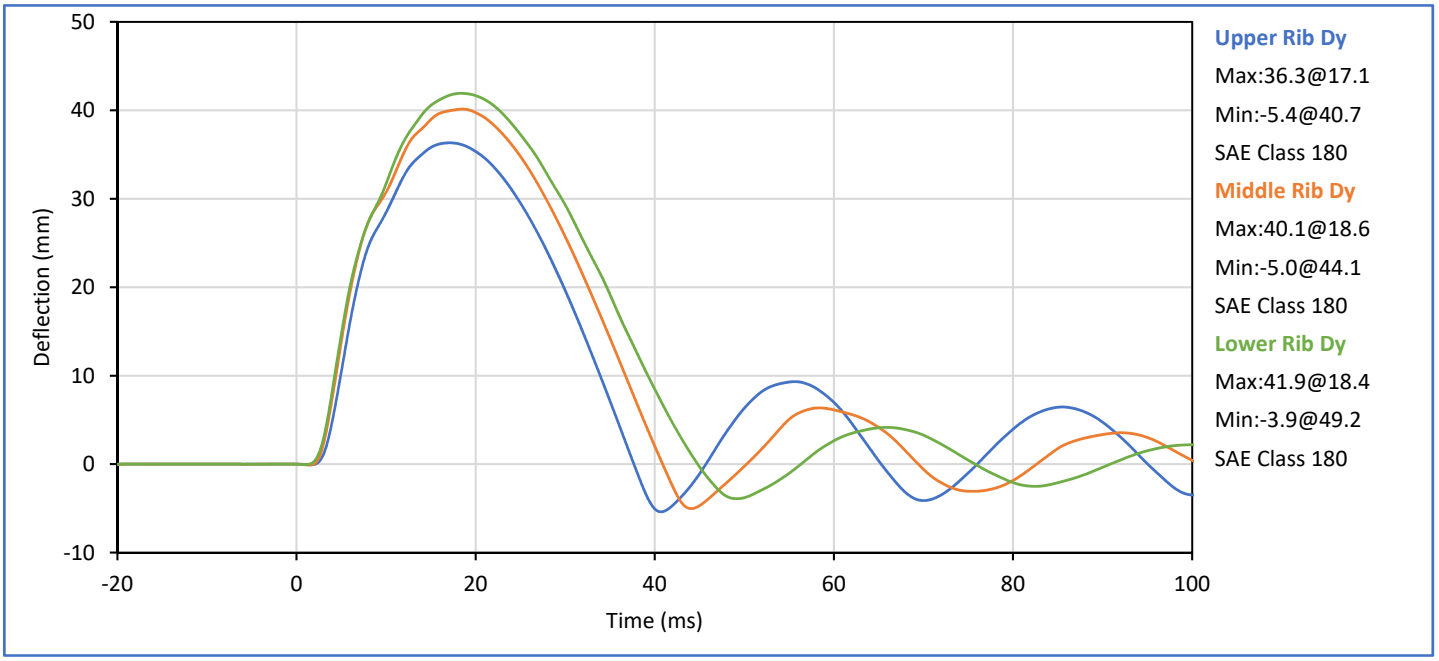
Approved By: P. Puzzuto

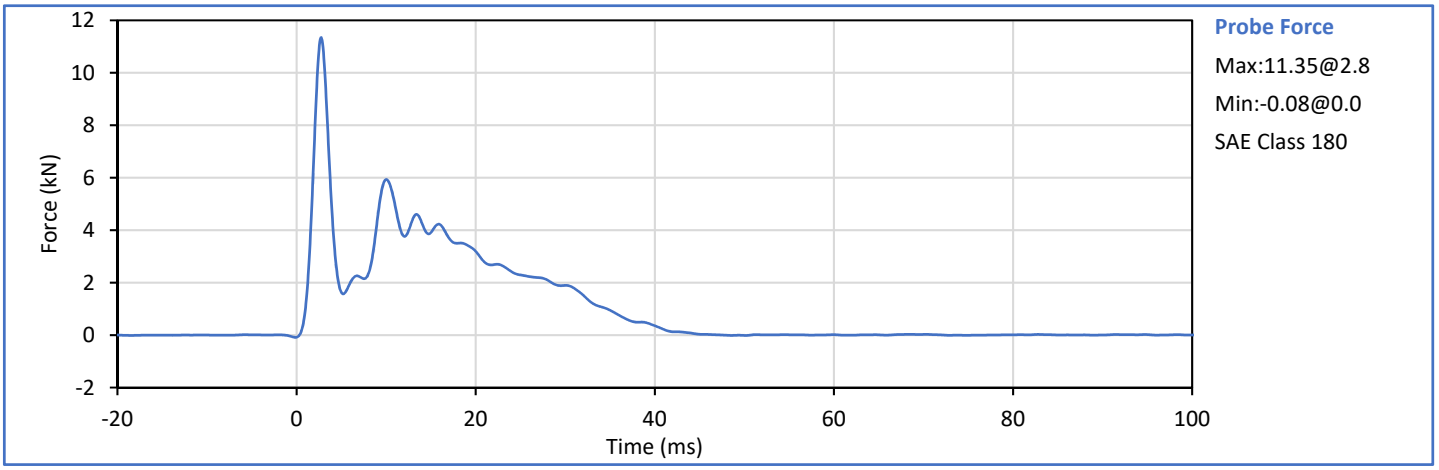
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Thorax Impact (Full Body)

ATD Serial No.: F035 Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	5.40	5.60	5.49	Pass
Peak Upper Rib Dy	mm	34.0	41.0	36.3	Pass
Peak Middle Rib Dy	mm	37.0	45.0	40.1	Pass
Peak Lower Rib Dy	mm	37.0	44.0	41.9	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.93	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

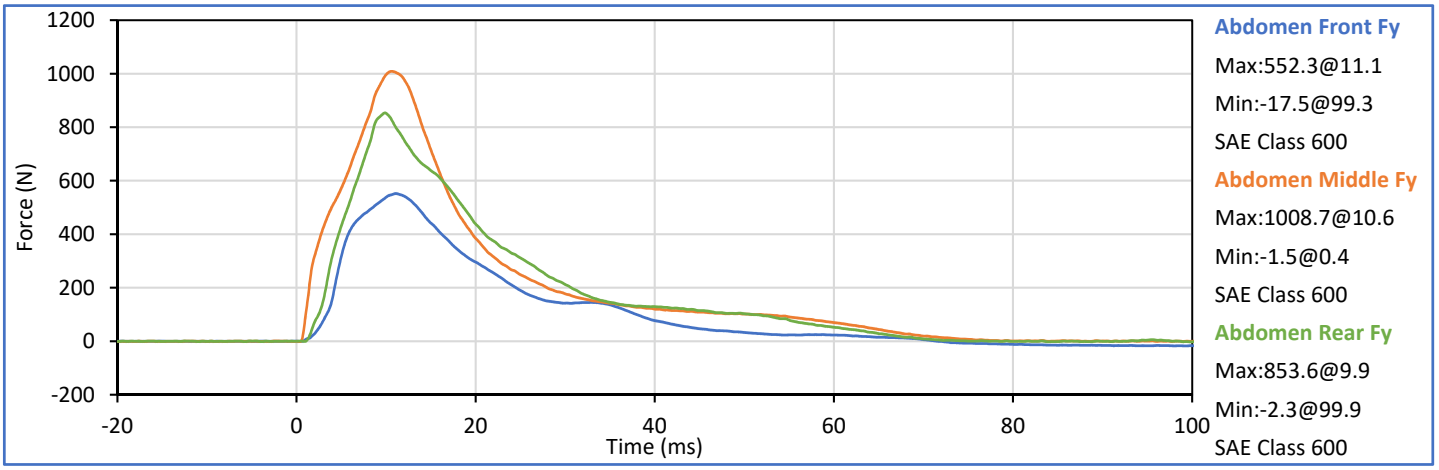
Approved By: P. Puzzuto

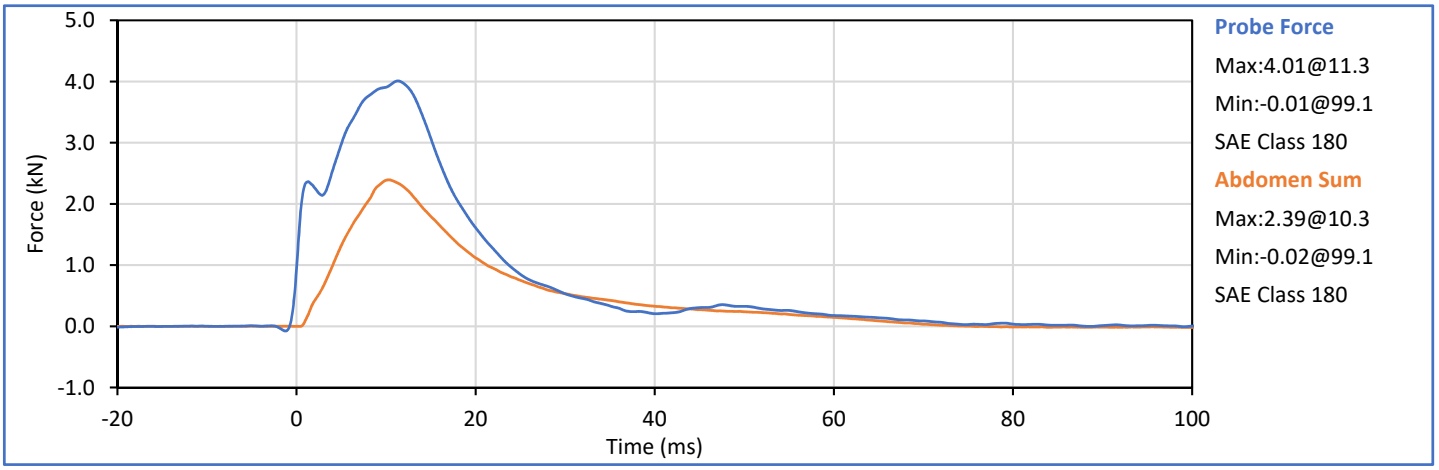
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Abdomen Impact

ATD Serial No.: F035 Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	3.90	4.10	4.02	Pass
Peak Impactor Force	kN	4.00	4.80	4.01	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.3	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.39	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

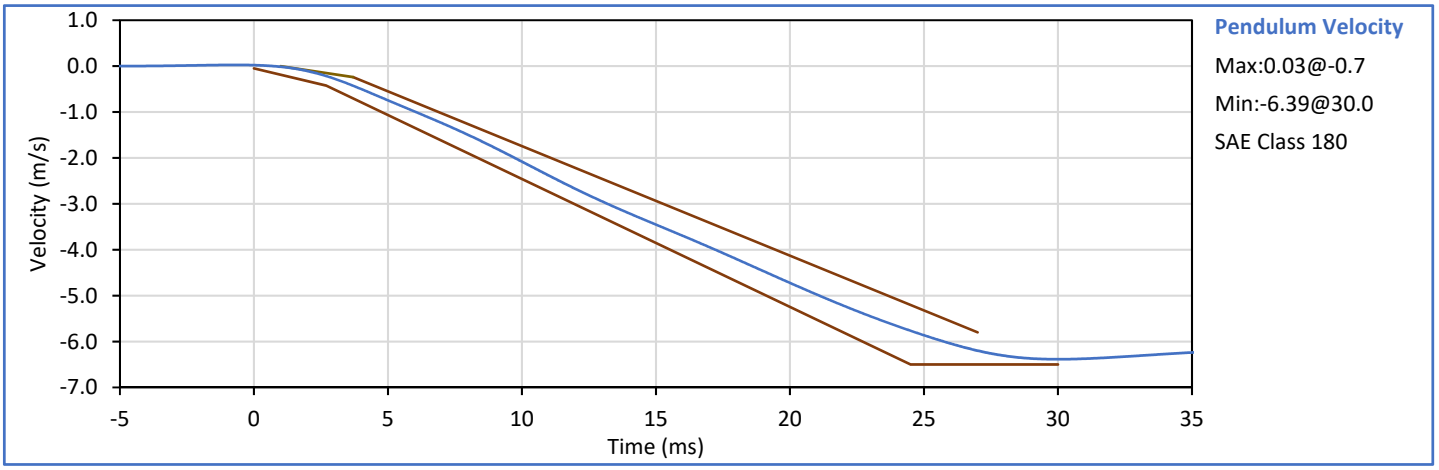
Approved By: P. Puzzuto

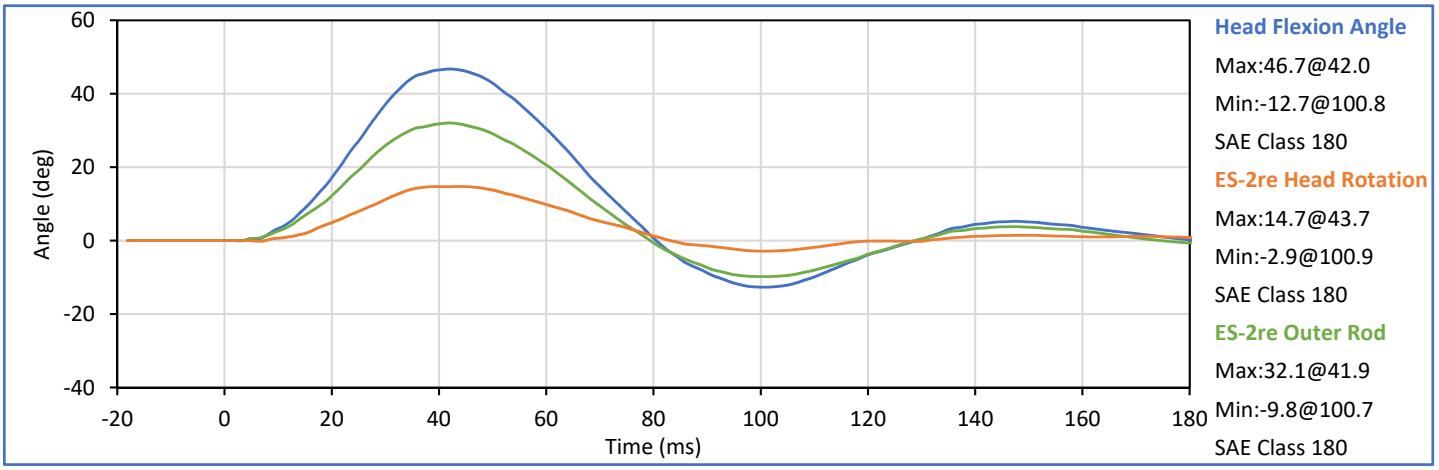
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Lumbar Spine Flexion

ATD Serial No.: F035 Test Date: 2019-06-03

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Pendulum Velocity	m/s	5.95	6.15	6.08	Pass
Peak Headform Flexion	deg	45.0	55.0	46.7	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	42.0	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	38.5	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

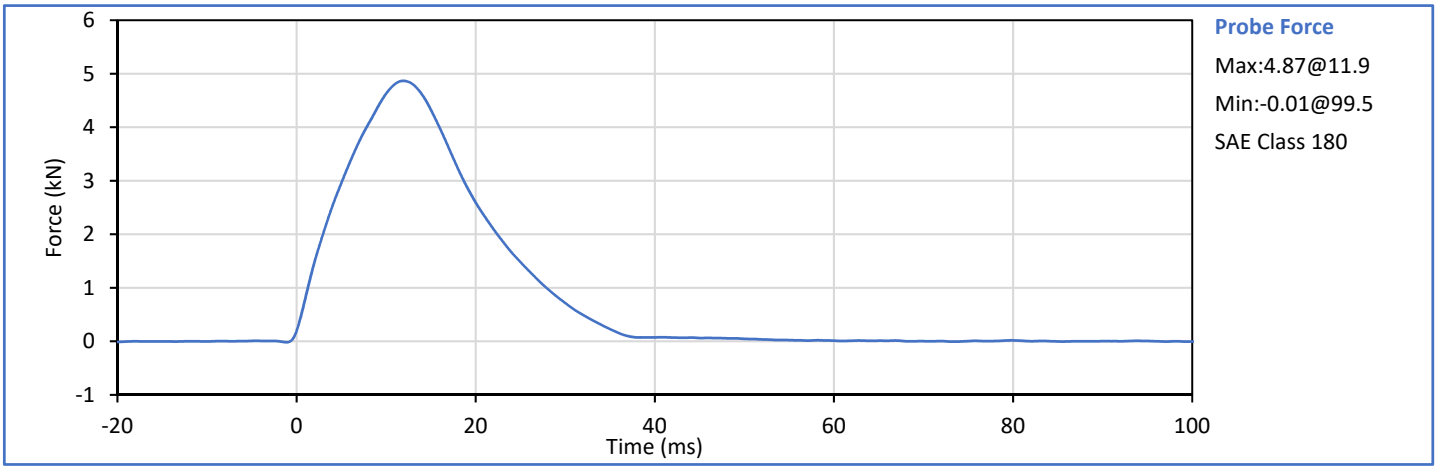
Approved By: P. Puzzuto

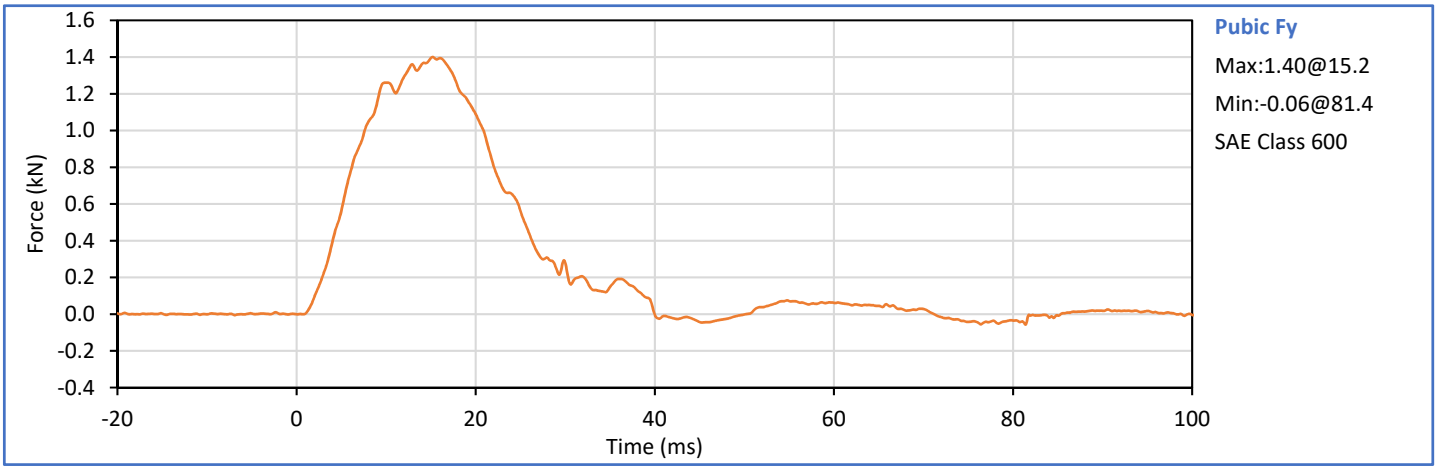
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Pelvis Impact

ATD Serial No.: F035 Test Date: 2019-06-04

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	4.87	Pass
Time of Peak Impactor Force	ms	11.8	16.1	11.9	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.40	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	15.2	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Pre-Test ATD Configuration And Performance Verification Data
SID-IIs Small Side Impact ATD
S/N: 308

Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
External Measurements

ATD Serial No.: 308 Test Date: 2019-06-06

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	34	Pass
A - Sitting Height	mm	772	788	781	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	84	Pass
D - H Point From Seatback	mm	141	151	150	Pass
E - Shoulder Pivot From Backline	mm	97	107	106	Pass
F - Thigh Clearance	mm	119	135	123	Pass
G - Head Breadth	mm	140	148	142	Pass
H - Head Back From Backline	mm	40	46	42	Pass
I - Head Depth	mm	178	188	186	Pass
J - Head Circumference	mm	541	551	546	Pass
K - Buttock To Knee Length	mm	514	540	519	Pass
L - Popliteal Height	mm	343	369	359	Pass
K - Knee Pivot To Floor Height	mm	392	409	402	Pass
N - Buttock Popliteal Length	mm	416	442	430	Pass
O - Chest Depth W/O Jacket	mm	195	211	205	Pass
P - Foot Length	mm	216	232	226	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	318	Pass
R - Arm Length	mm	249	259	254	Pass
S - Knee Joint To Seatback	mm	477	493	489	Pass
V - Shoulder Width	mm	341	357	346	Pass
W - Foot Width	mm	78	94	86	Pass
Y - Chest Circumference W/Jacket	mm	851	881	858	Pass
Z - Waist Circumference	mm	761	791	784	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

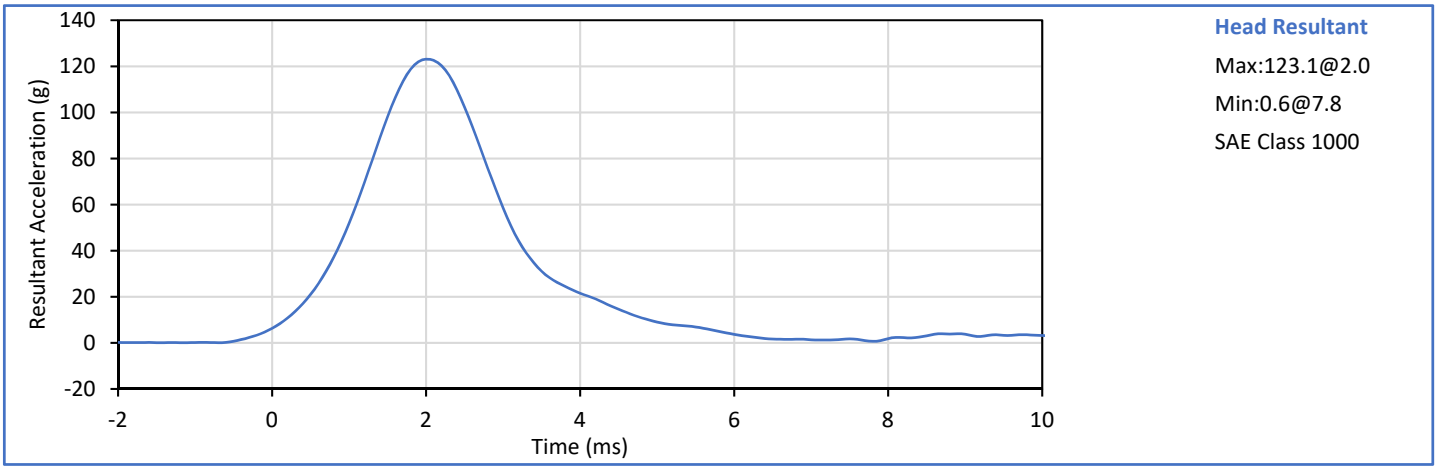
Approved By: P. Puzzuto

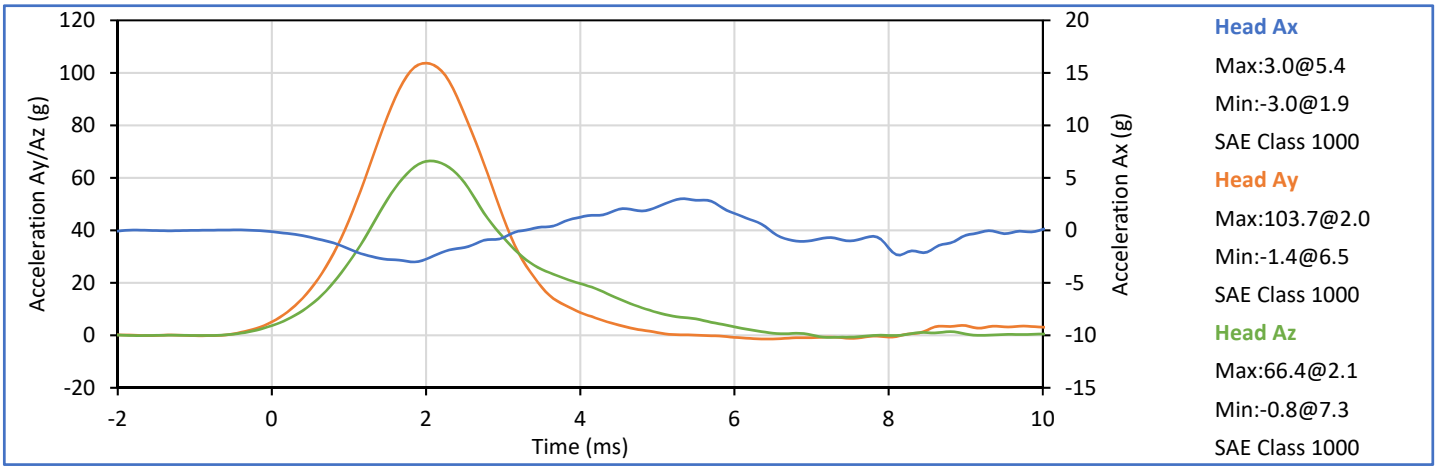
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Head Drop

ATD Serial No.: 308 Test Date: 2019-06-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	115.0	137.0	123.1	Pass
Peak Head Ax	g	-15.0	15.0	-3.0	Pass
Oscillations After Main Pulse	%	0.0	15.0	3.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

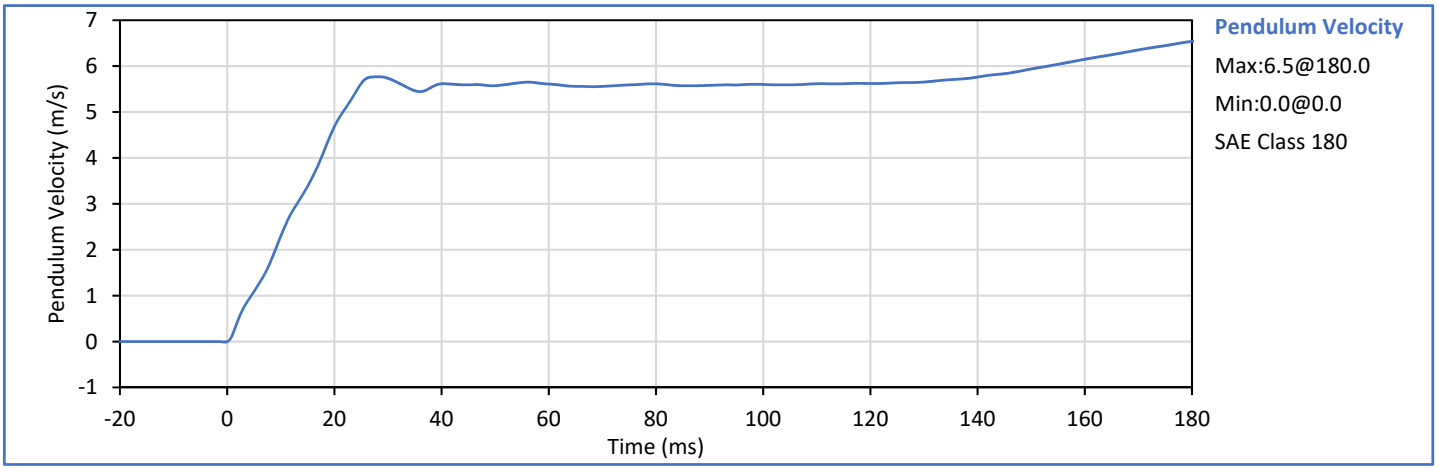
Approved By: P. Puzzuto

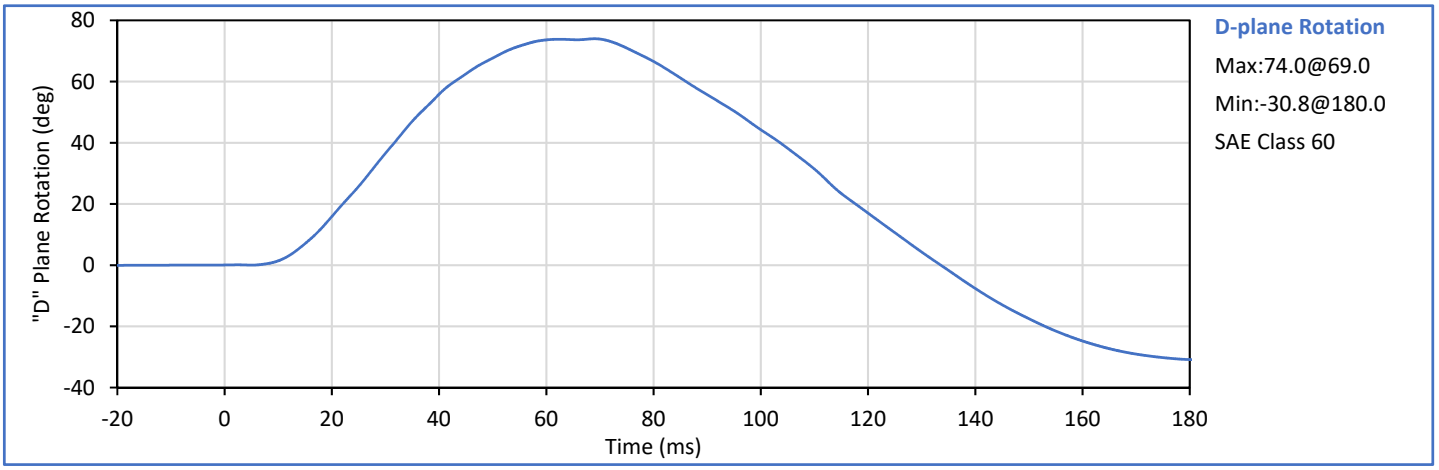
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Neck Flexion

ATD Serial No.: 308 Test Date: 2019-06-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.51	5.63	5.56	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.29	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.38	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.68	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.62	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.77	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.0	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	69.0	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-41.2	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	116.3	Pass
			Overall Test Results		Pass





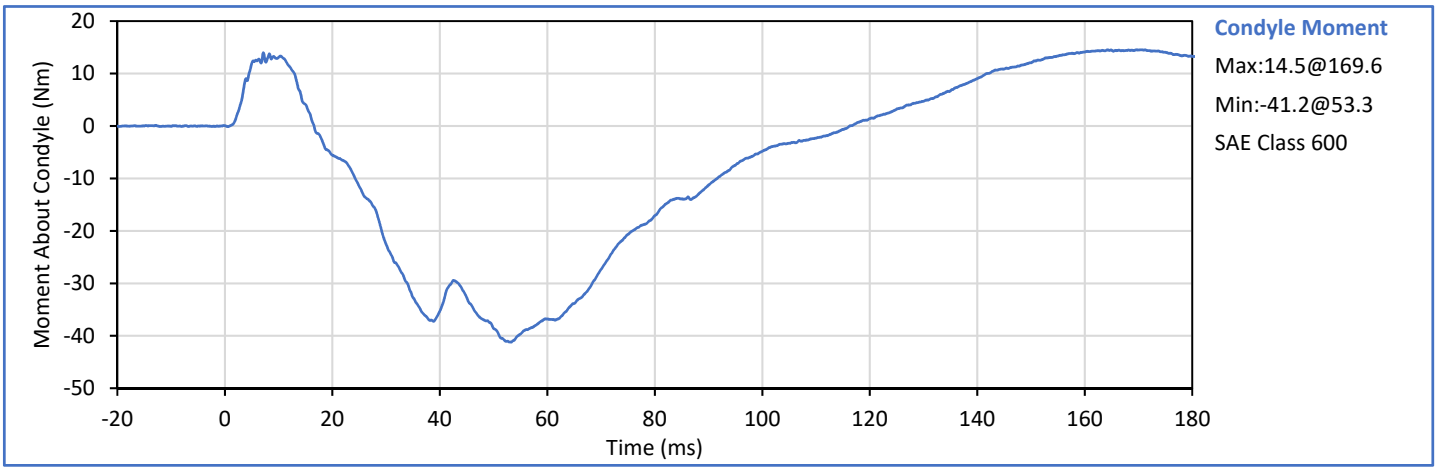
Technician: J. Hernandez

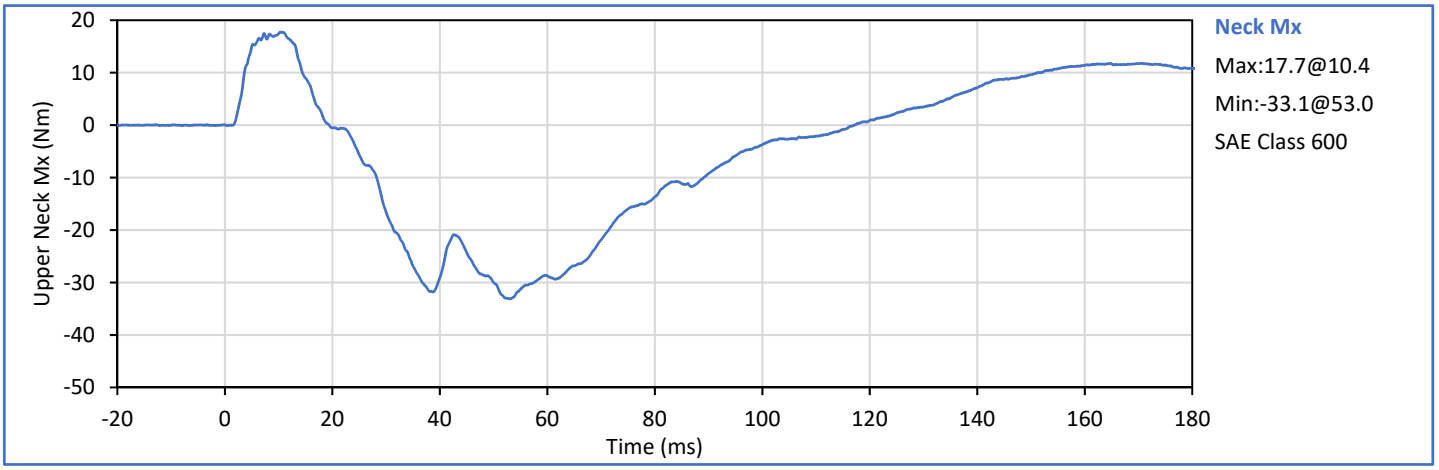
Approved By: P. Puzzuto

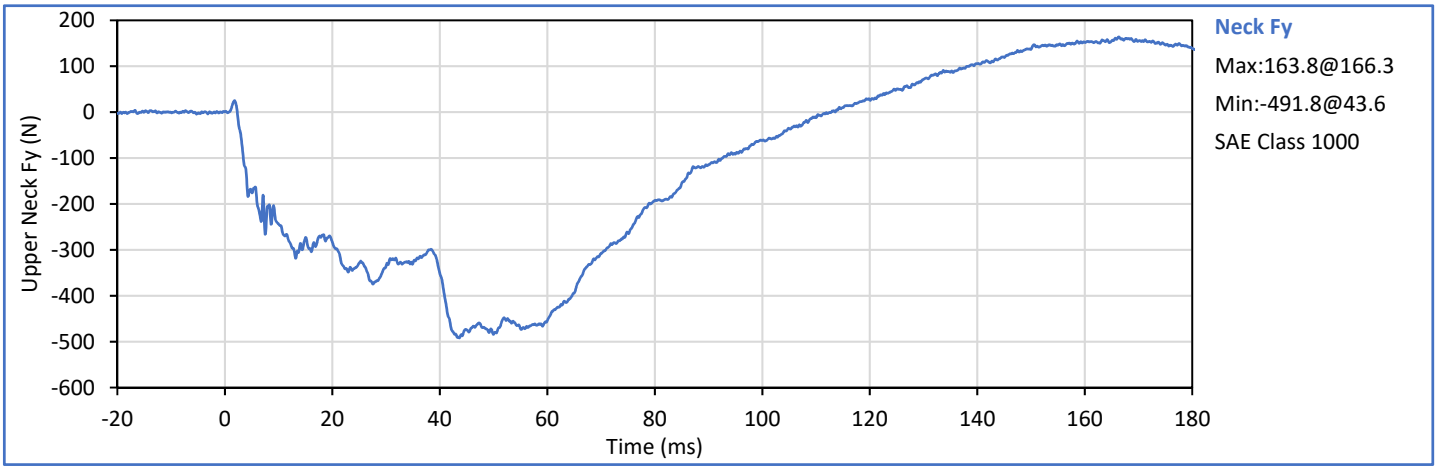
Applus IDIADA KARCO

SID-IIs Small Side Impact ATD
Neck Flexion

ATD Serial No.: 308 Test Date: 2019-06-07





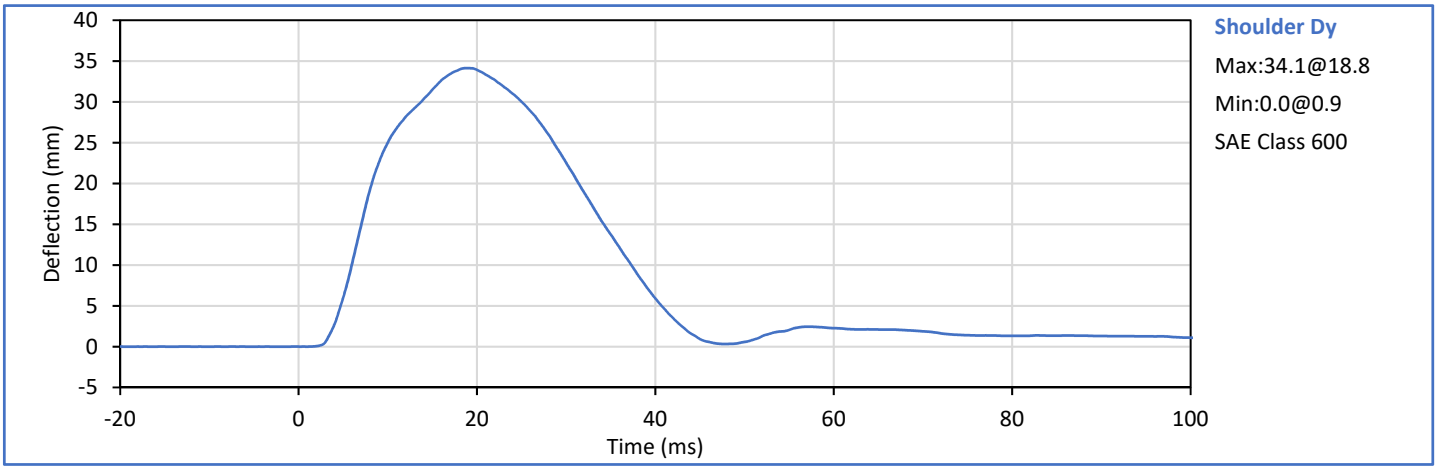


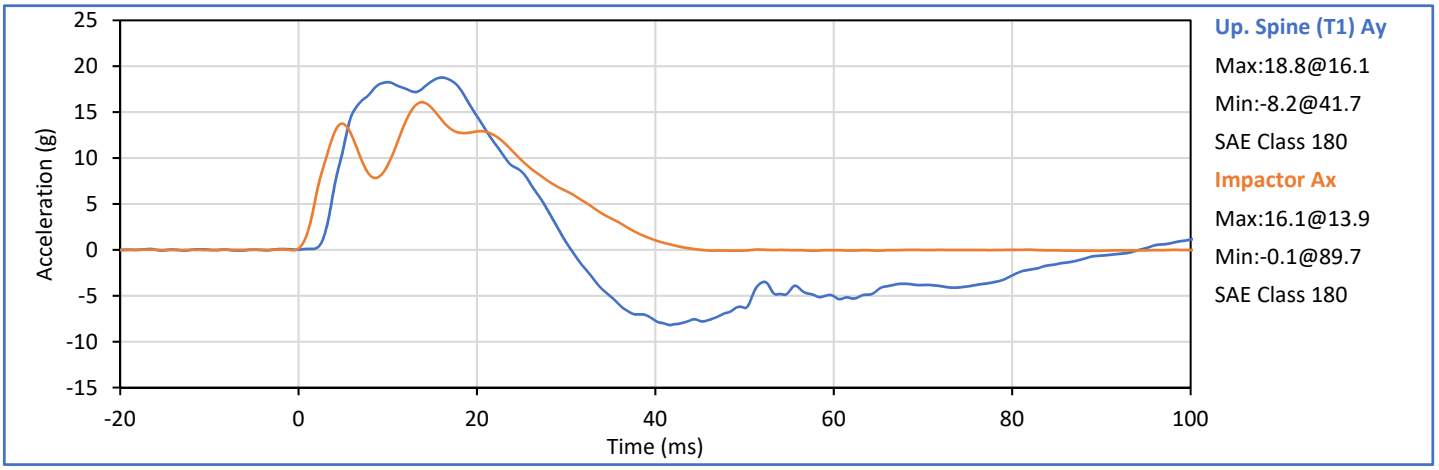
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Shoulder Impact Test

ATD Serial No.: 308 Test Date: 2019-06-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	34.1	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.8	Pass
Peak Impactor Ax	g	13.0	18.0	16.1	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

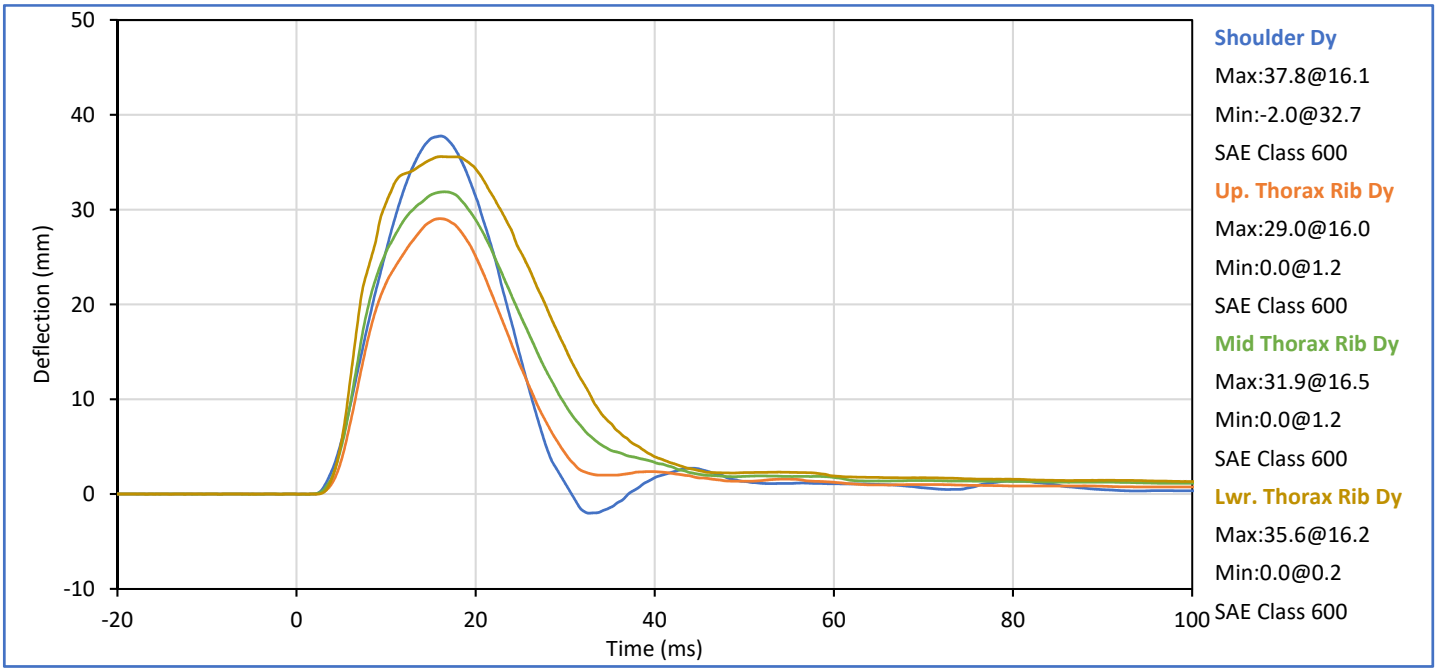
Approved By: P. Puzzuto

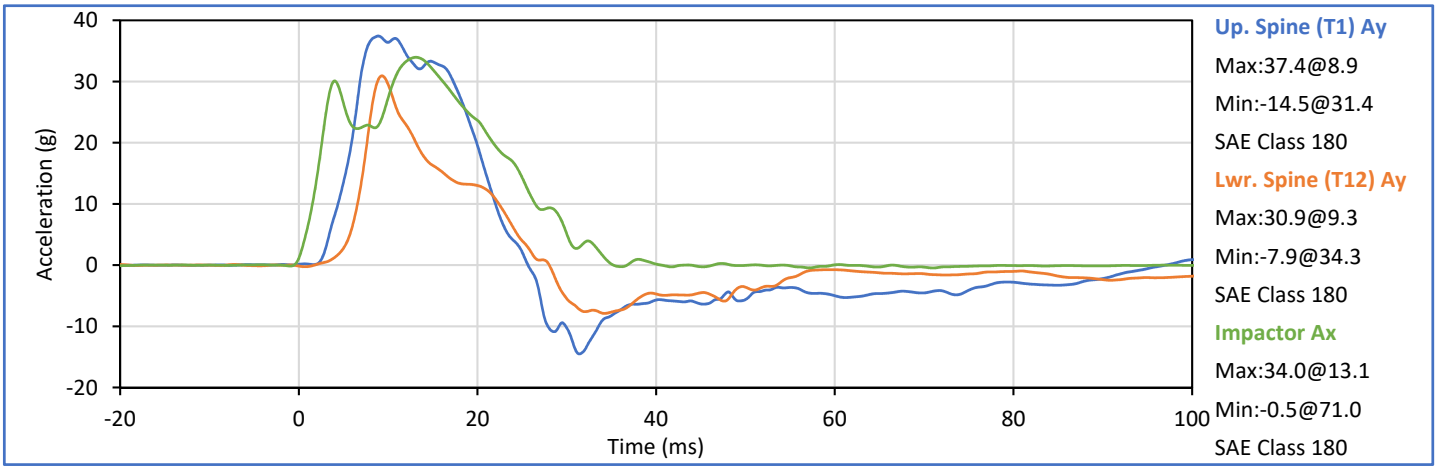
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Thorax (With Arm)

ATD Serial No.: 308 Test Date: 2019-06-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	6.60	6.80	6.65	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.8	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.0	Pass
Peak Middle Rib Dy	mm	30.0	36.0	31.9	Pass
Peak Lower Rib Dy	mm	32.0	38.0	35.6	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.4	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	30.9	Pass
Peak Impactor Ax	g	30.0	36.0	34.0	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

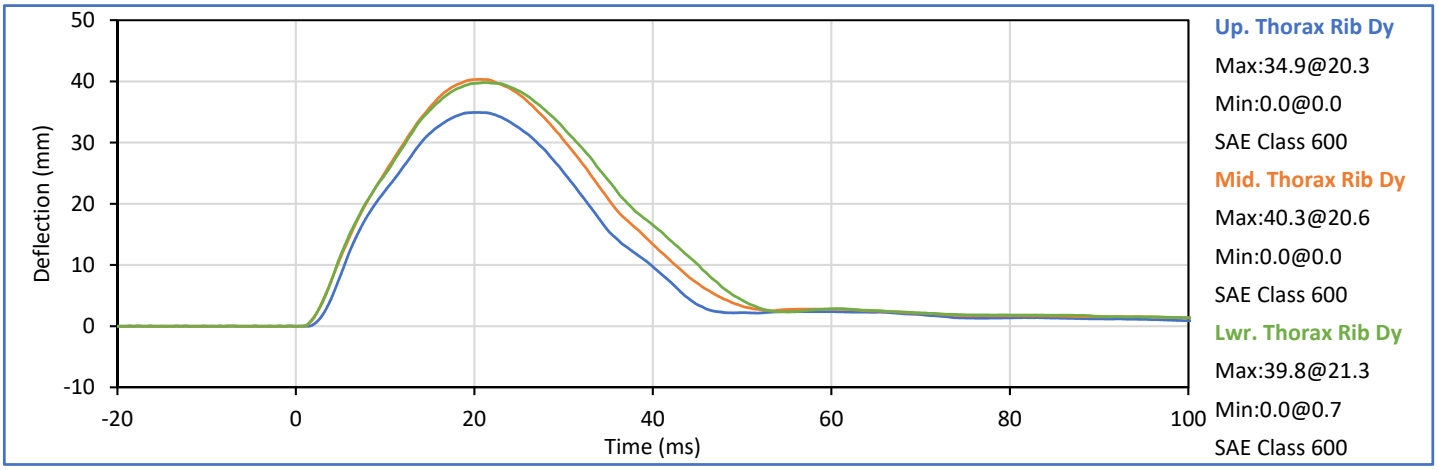
Approved By: P. Puzzuto

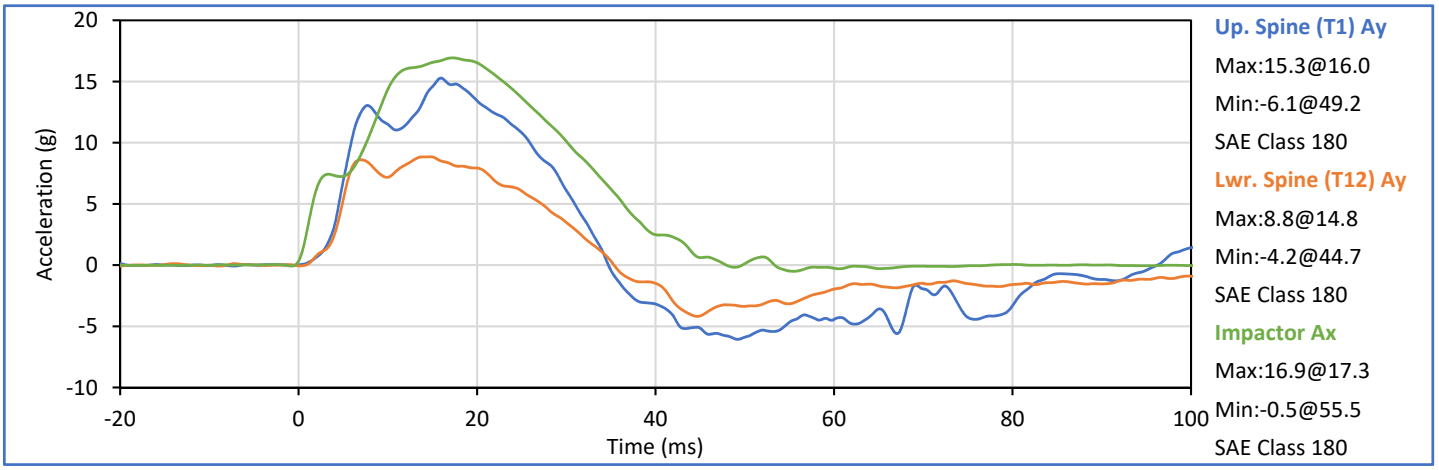
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Thorax (No Arm)

ATD Serial No.: 308 Test Date: 2019-06-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.28	Pass
Peak Upper Rib Dy	mm	32.0	40.0	34.9	Pass
Peak Middle Rib Dy	mm	39.0	45.0	40.3	Pass
Peak Lower Rib Dy	mm	35.0	43.0	39.8	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	15.3	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	8.8	Pass
Peak Impactor Ax	g	14.0	18.0	16.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

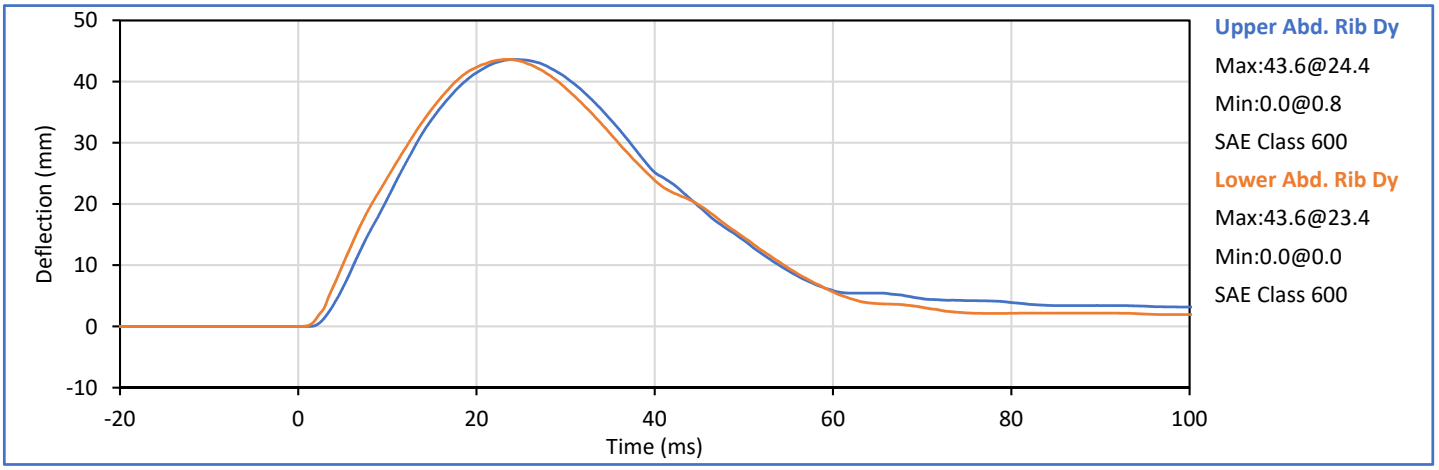
Approved By: P. Puzzuto

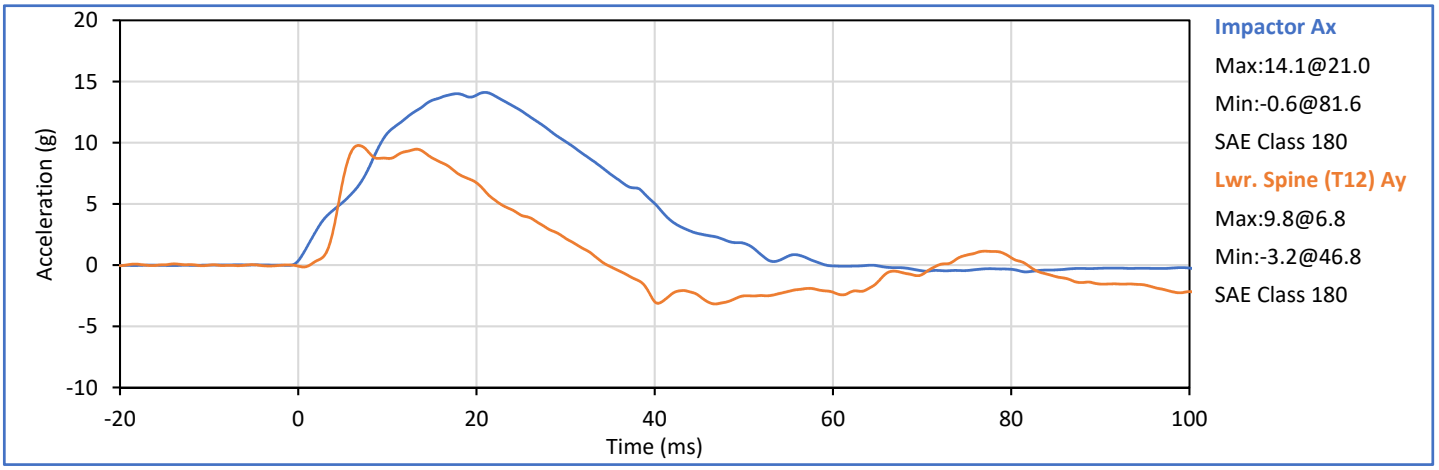
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Abdomen Impact

ATD Serial No.: 308 Test Date: 2019-06-08

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	43.6	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	43.6	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	9.8	Pass
Peak Impactor Ax	g	12.0	16.0	14.1	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

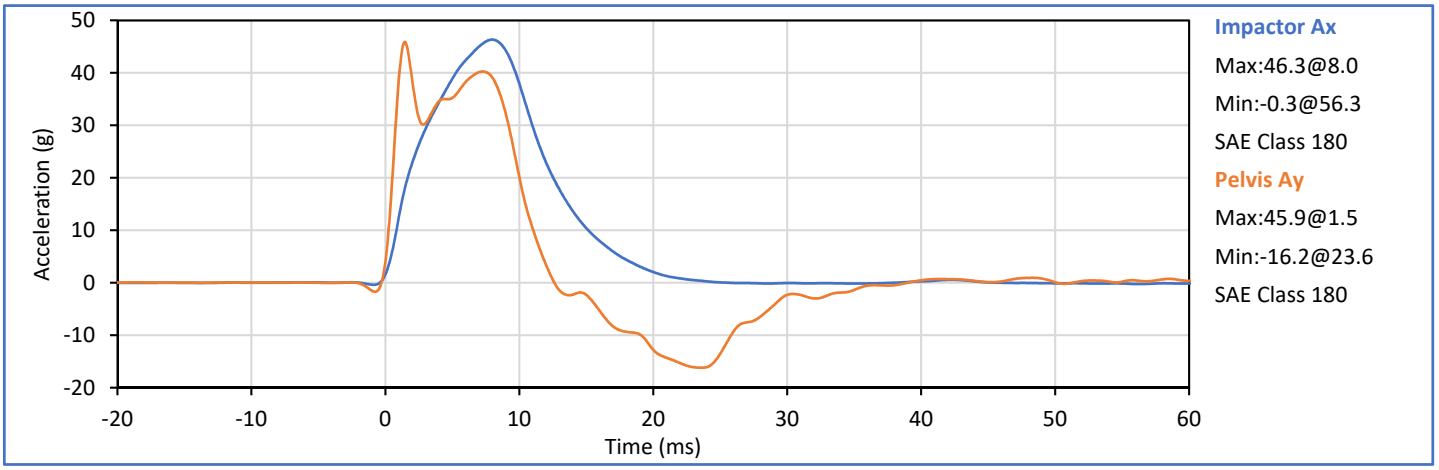
Applus IDIADA
KARCO

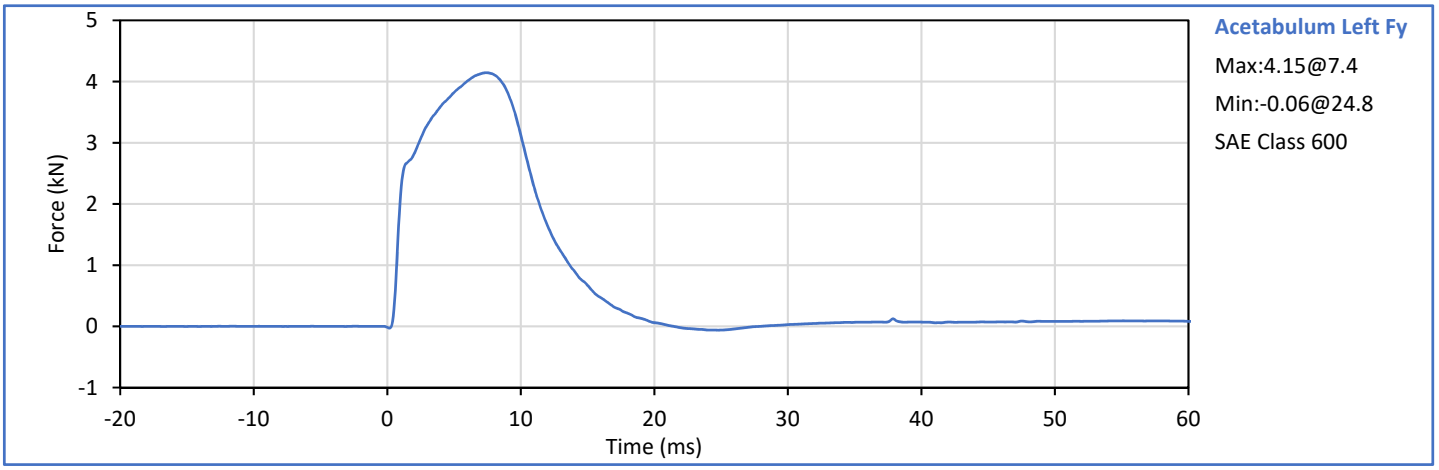
SID-IIs Small Side Impact ATD
Pelvis Acetabulum Impact

ATD Serial No.: 308 Test Date: 2019-06-08

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.15	Pass
Pelvis Ay after 6ms	g	34.0	42.0	40.3	Pass
Peak Impactor Ax	g	38.0	47.0	46.3	Pass
			Overall Test Results		Pass

Pelvis Plug S/N: 11767 (SACO)





Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: 308 Test Date: 2019-06-08

Pelvis Plug S/N: 11767 (SACO)

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 11767
Test Number 5846
Report Number 5862
Test Date 1/16/2018 12:36:49 PM

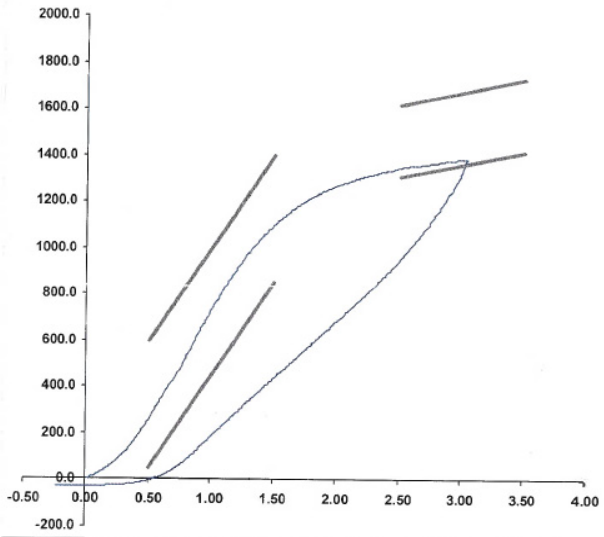
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	260.74	50.00	600.00
Force @ 1.5 mm (N)	1,097.40	850.00	1,400.00
Force @ 2.5 mm (N)	1,345.09	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,383.31	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 16-Jan-18
SACO Research

By : DC Date : 1/16/18

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

Applus IDIADA
KARCO

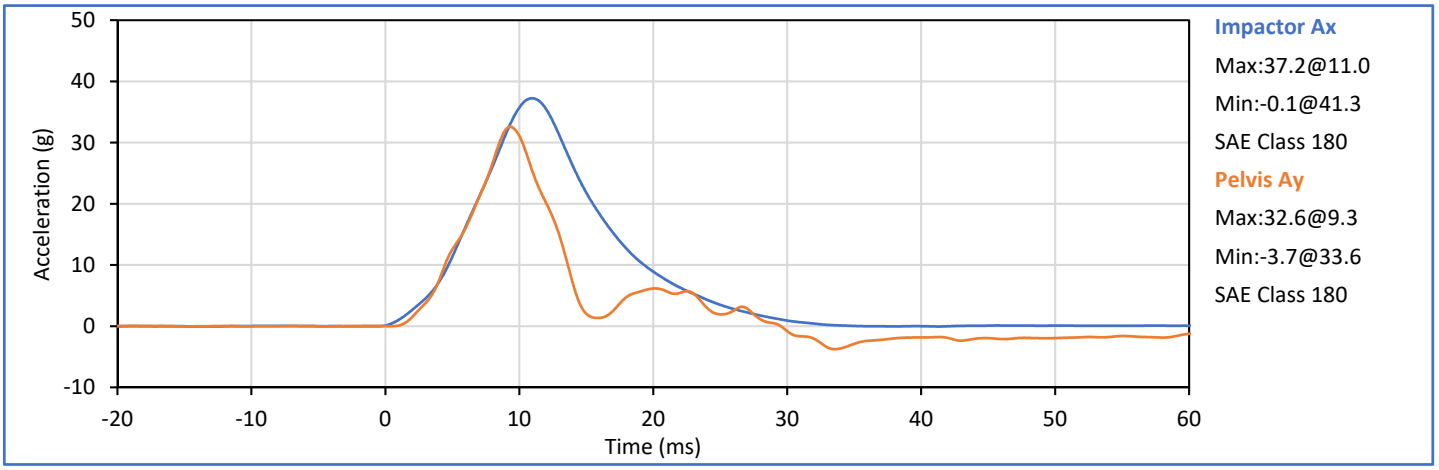
SID-IIs Small Side Impact ATD
Pelvis Iliac Impact

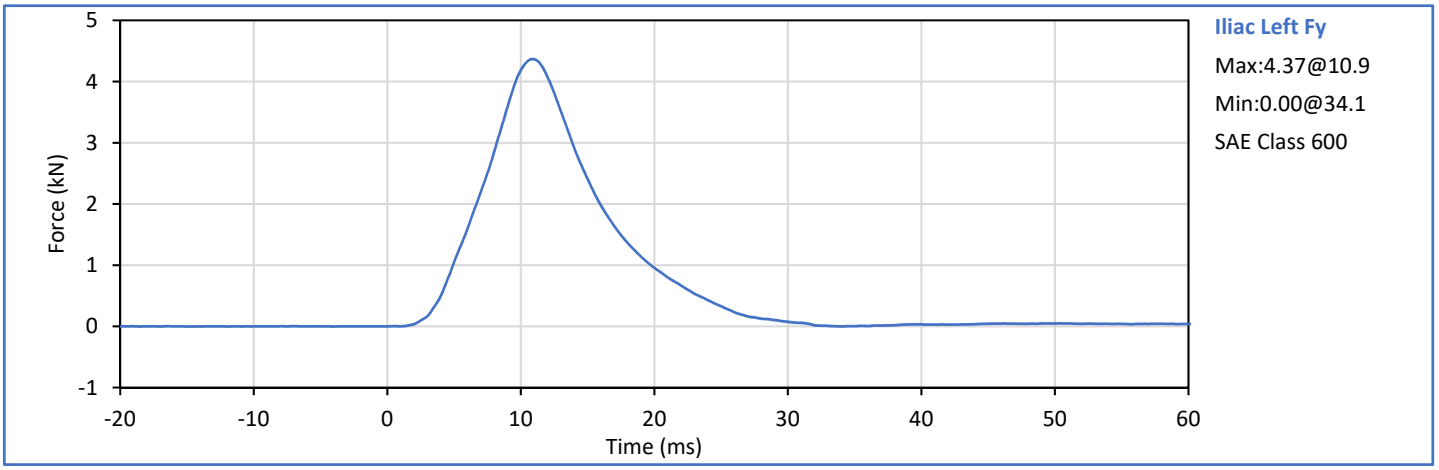
ATD Serial No.: 308 Test Date: 2019-06-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	32	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.37	Pass
Pelvis Ay after 6ms	g	28.0	39.0	32.6	Pass
Peak Impactor Ax	g	36.0	45.0	37.2	Pass
			Overall Test Results		Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-Test ATD Configuration And Performance Verification Data
ES-2re 50th Male Side Impact ATD
S/N: F035

Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
External Measurements

ATD Serial No.: F035 Test Date: 2019-06-20

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
1 - Sitting Height	mm	900	918	911	Pass
2 - Seat to Shoulder Joint	mm	558	572	565	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	349	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	100	Pass
5 - Sole to Seat, Sitting	mm	433	451	440	Pass
6 - Head Width	mm	152	158	154	Pass
7 - Shoulder/Arm Width	mm	461	479	473	Pass
8 - Thorax Width	mm	322	332	327	Pass
9 - Abdomen Width	mm	273	287	280	Pass
10 - Pelvis Lap Width	mm	359	373	368	Pass
11 - Head Depth	mm	196	206	198	Pass
12 - Thorax Depth	mm	262	272	265	Pass
13 - Abdomen Depth	mm	194	204	200	Pass
14 - Pelvis Depth	mm	235	245	241	Pass
15 - Back of Buttocks to Hip Joint (bolt Center)	mm	150	160	158	Pass
16 - Back of Buttocks to Front Knee	mm	597	615	610	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

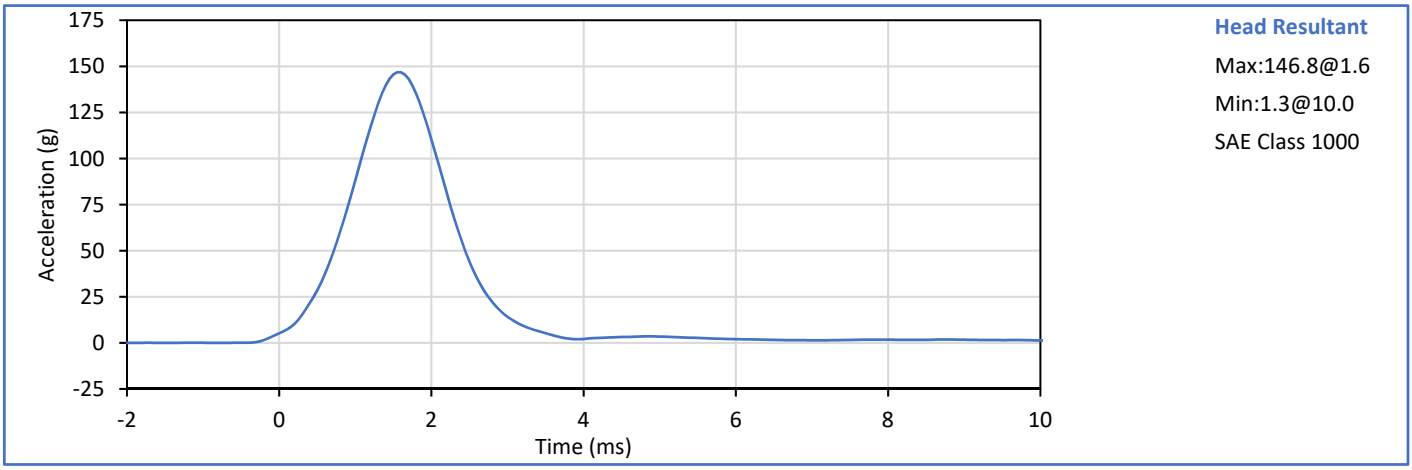
Approved By: P. Puzzuto

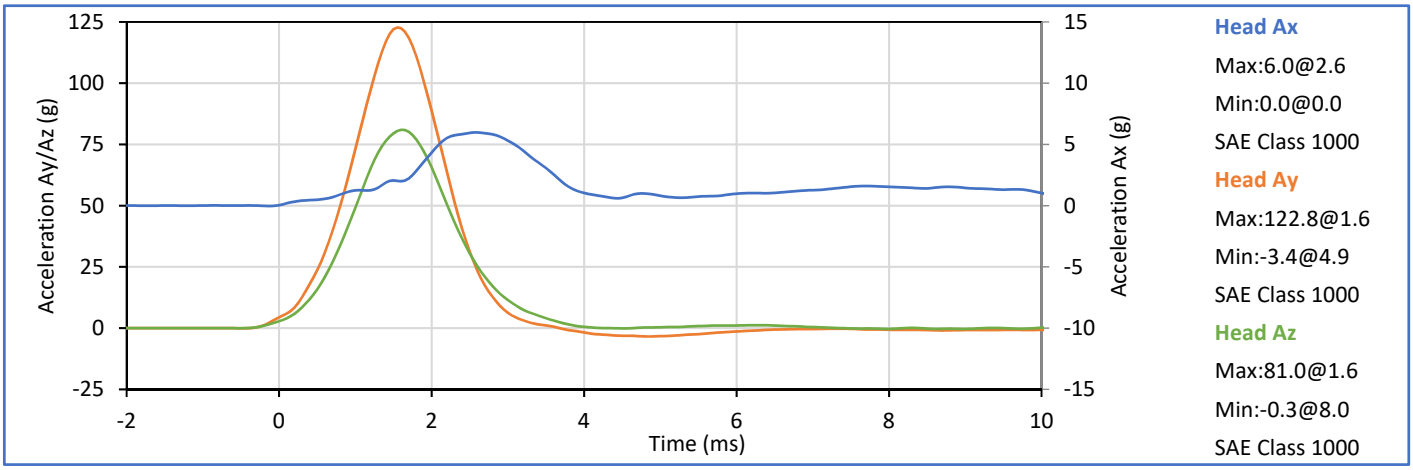
Applus IDIADA KARCO

ES-2re 50th Male Side Impact ATD
Head Drop

ATD Serial No.: F035 Test Date: 2019-06-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Humidity	%	10	70	35	Pass
Peak Resultant Acceleration	g	125.0	155.0	146.8	Pass
Peak Head Ax	g	-15.0	15.0	6.0	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

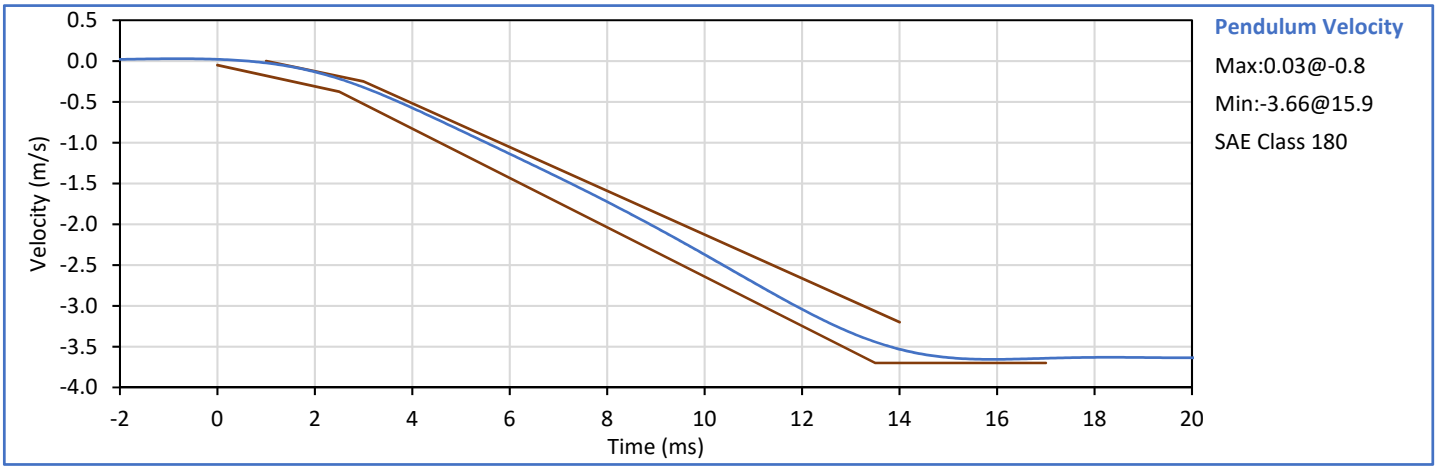
Approved By: P. Puzzuto

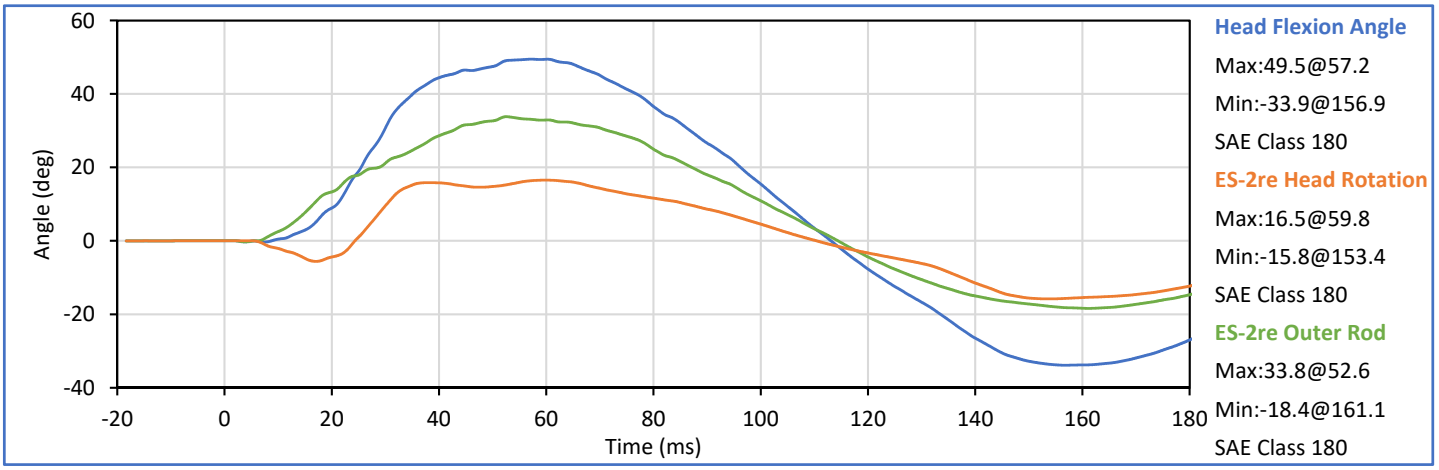
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Neck Flexion

ATD Serial No.: F035 Test Date: 2019-06-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	33	Pass
Pendulum Velocity	m/s	3.30	3.50	3.47	Pass
Peak Headform Flexion	deg	49.0	59.0	49.5	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	57.2	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	55.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

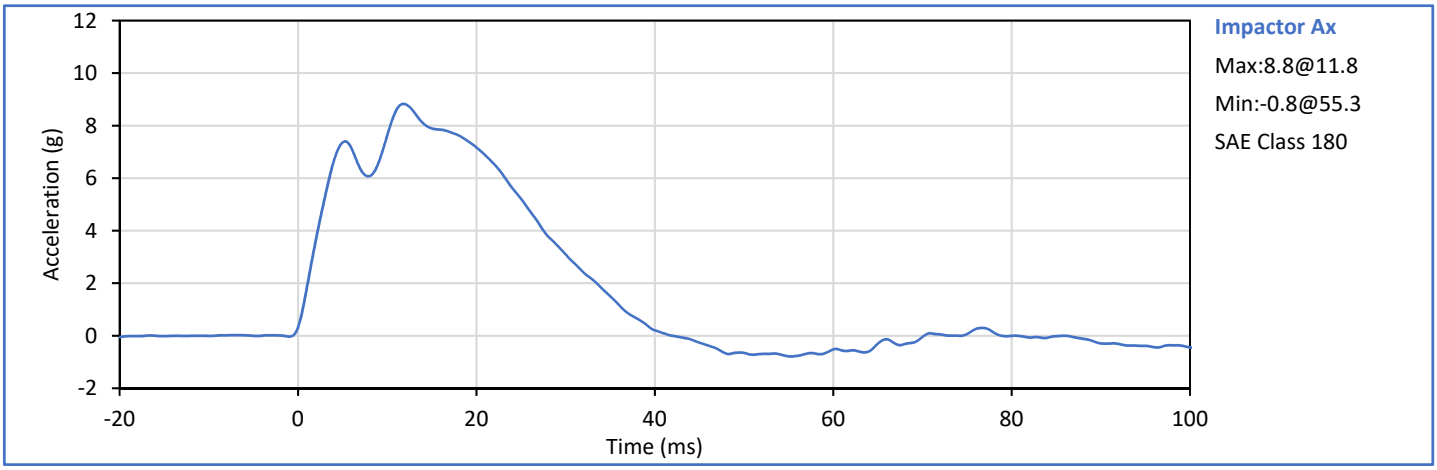
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Shoulder Impact Test

ATD Serial No.: F035

Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	38	Pass
Impactor Velocity	m/s	4.20	4.40	4.33	Pass
Peak Impactor Ax	g	7.5	10.5	8.8	Pass
			Overall Test Results		Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

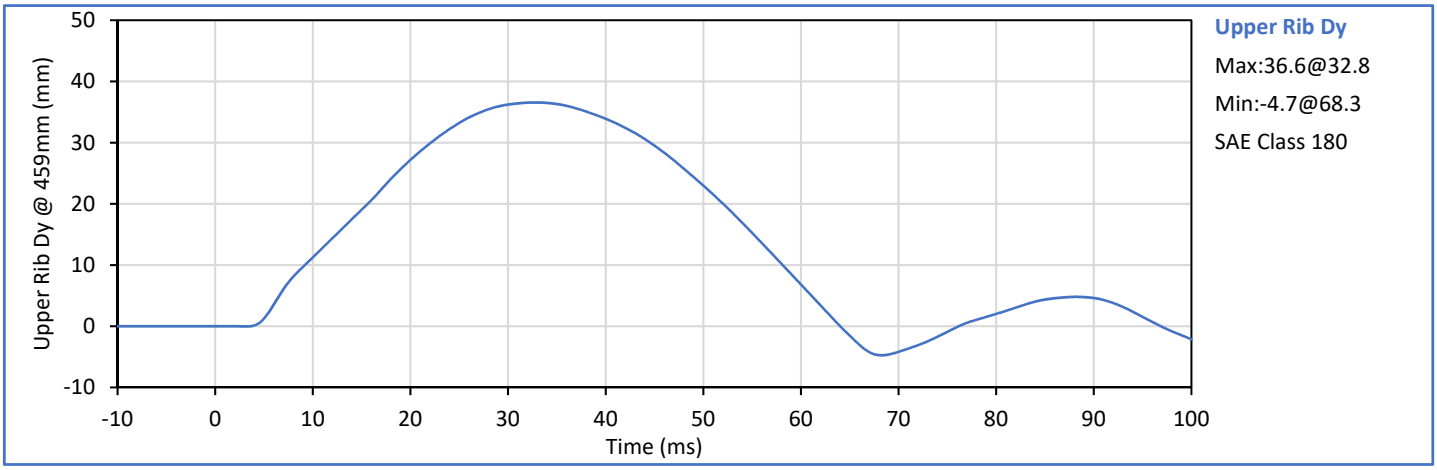
Applus IDIADA KARCO

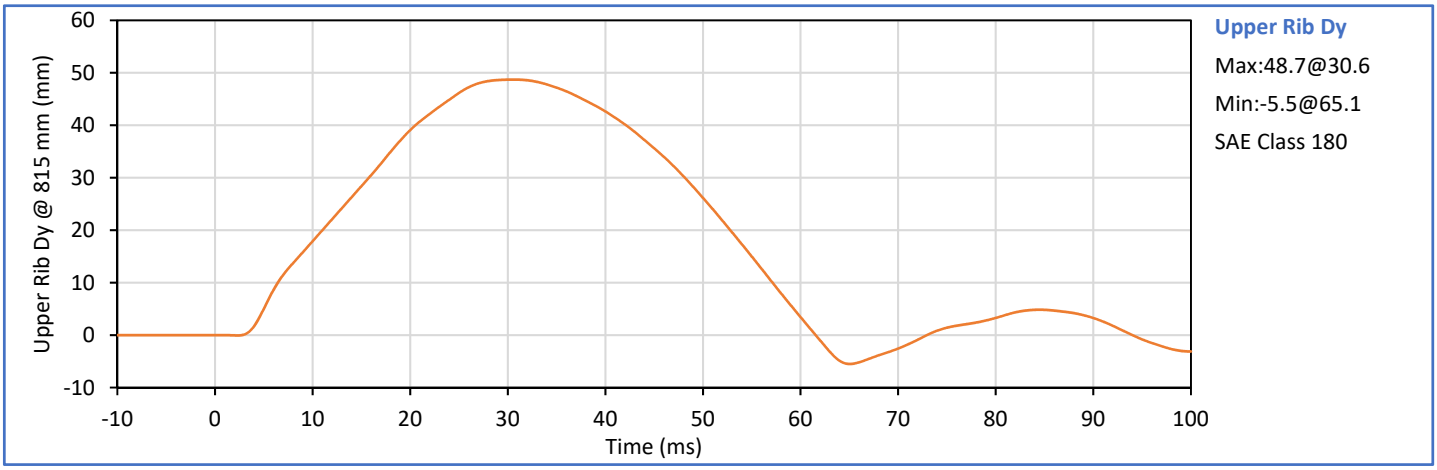
ES-2re 50th Male Side Impact ATD
Upper Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	38	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	36.6	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	48.7	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

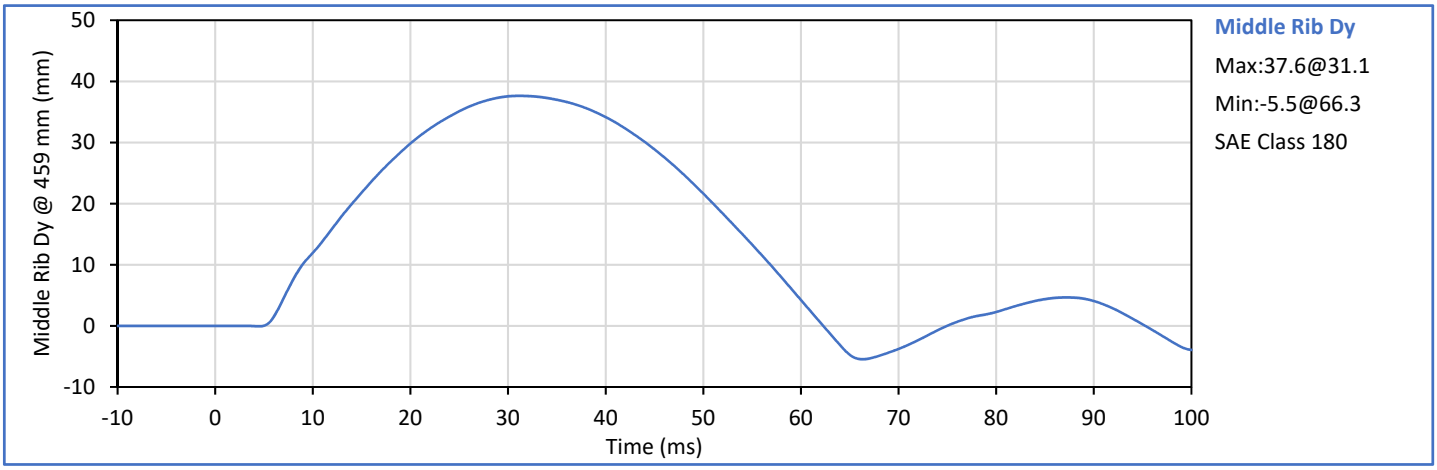
Approved By: P. Puzzuto

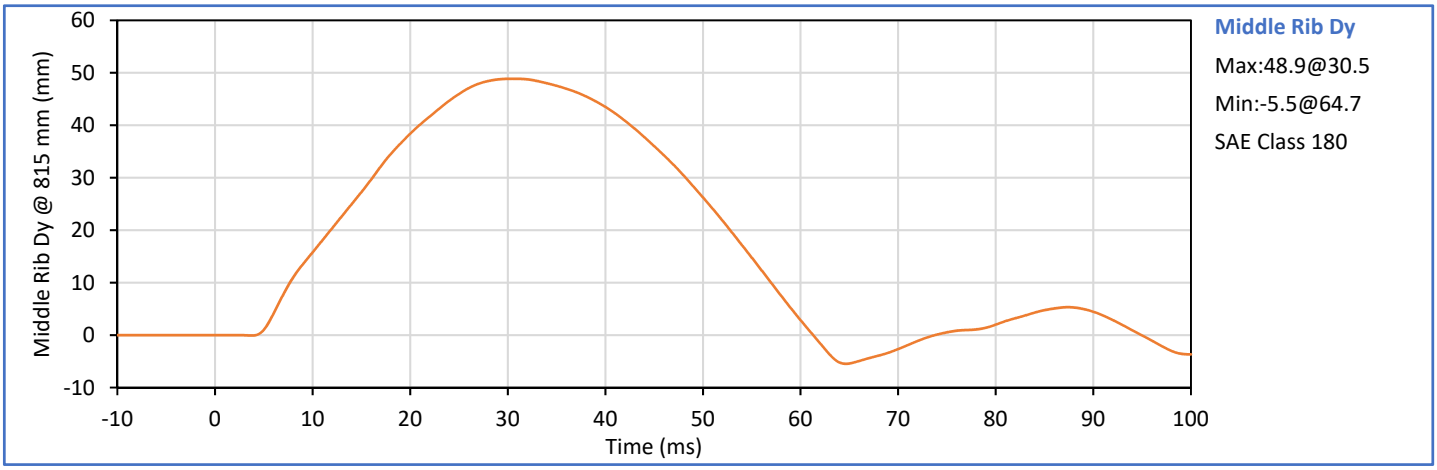
Applus IDIADA KARCO

ES-2re 50th Male Side Impact ATD
Middle Rib Drop Test

ATD Serial No.: F035 Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	38	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	37.6	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

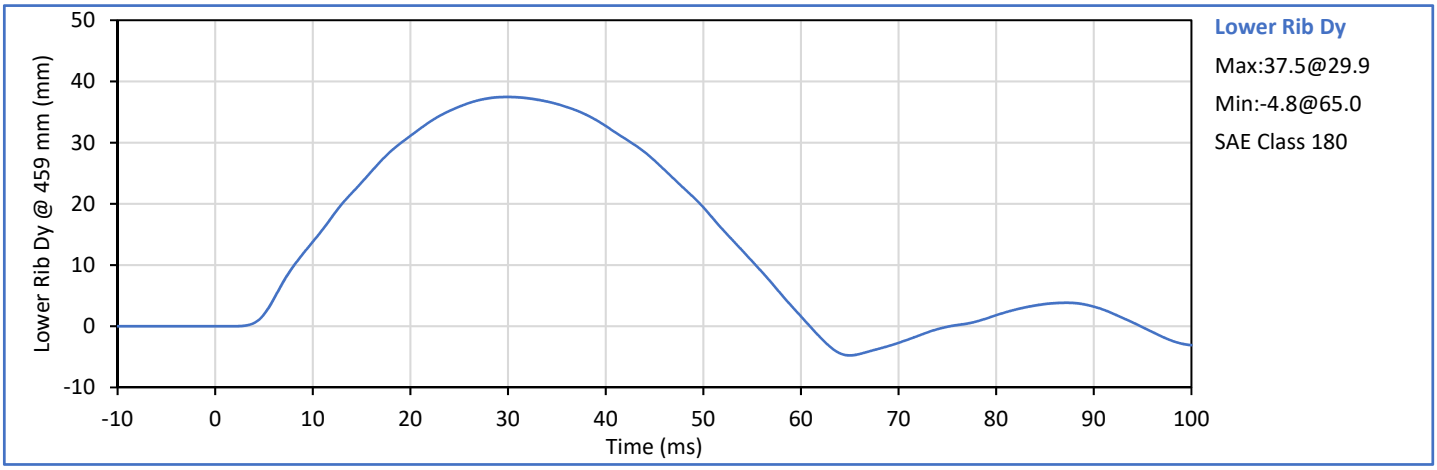
Applus IDIADA KARCO

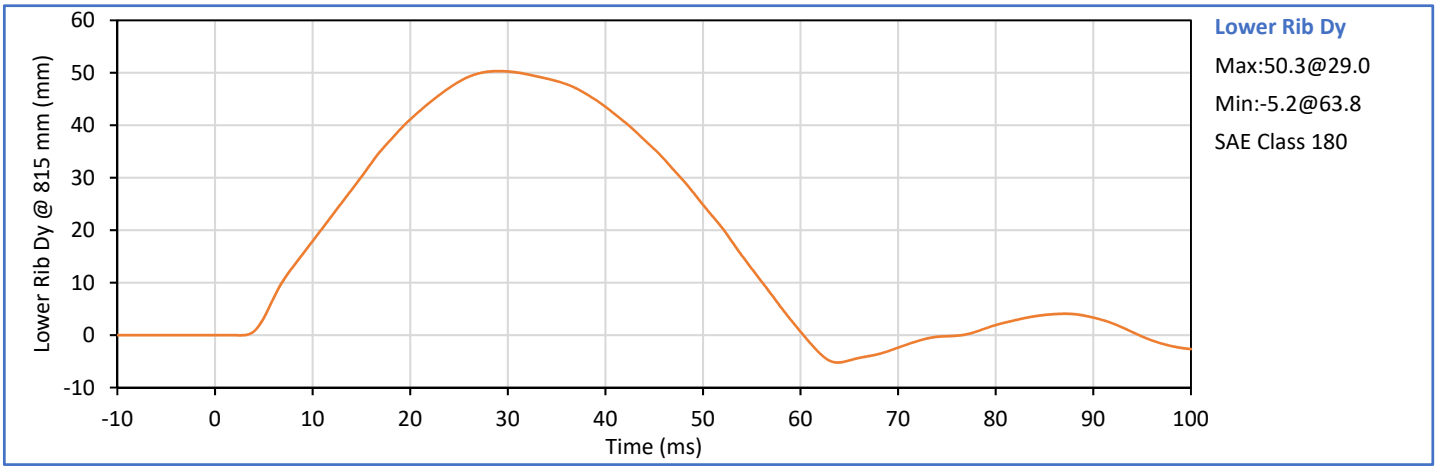
ES-2re 50th Male Side Impact ATD
Lower Rib Drop Test

ATD Serial No.: F035

Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	38	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.5	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	50.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

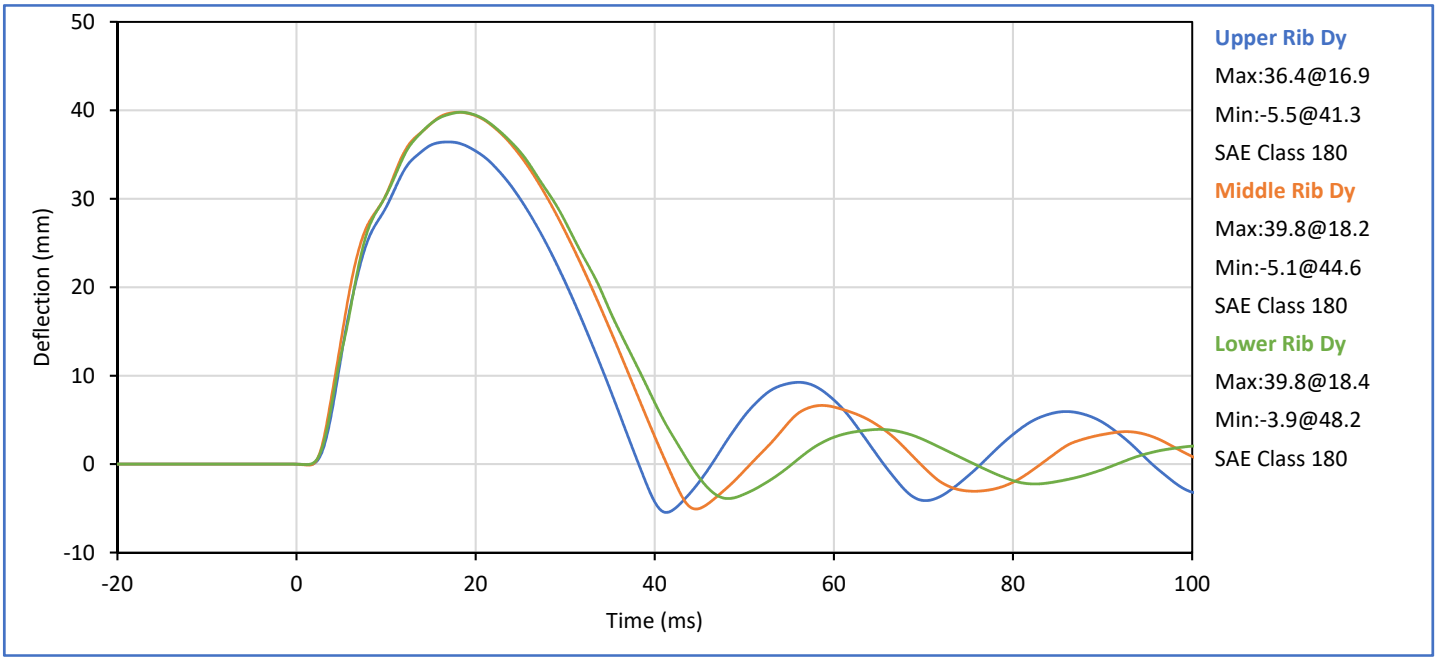
Applus IDIADA
KARCO

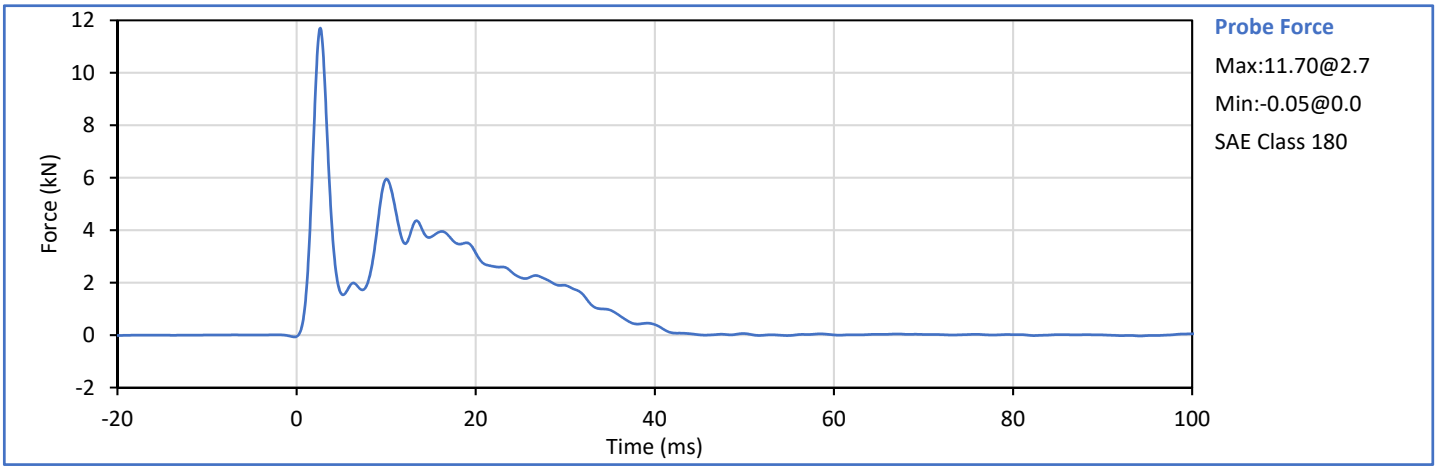
ES-2re 50th Male Side Impact ATD
Thorax Impact (Full Body)

ATD Serial No.: F035

Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	38	Pass
Impactor Velocity	m/s	5.40	5.60	5.52	Pass
Peak Upper Rib Dy	mm	34.0	41.0	36.4	Pass
Peak Middle Rib Dy	mm	37.0	45.0	39.8	Pass
Peak Lower Rib Dy	mm	37.0	44.0	39.8	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.95	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

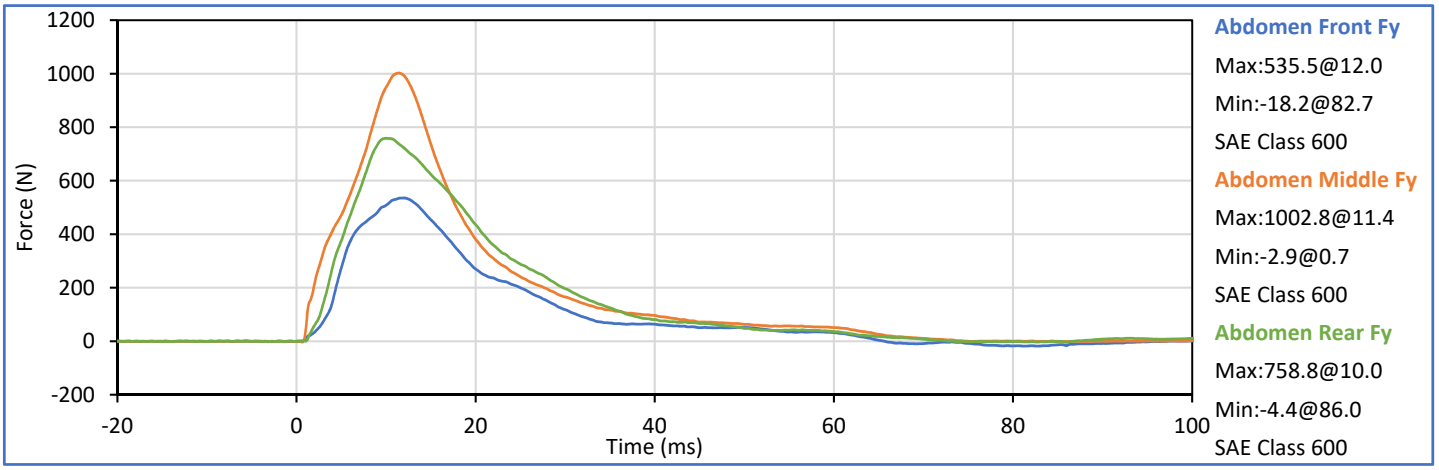
Approved By: P. Puzzuto

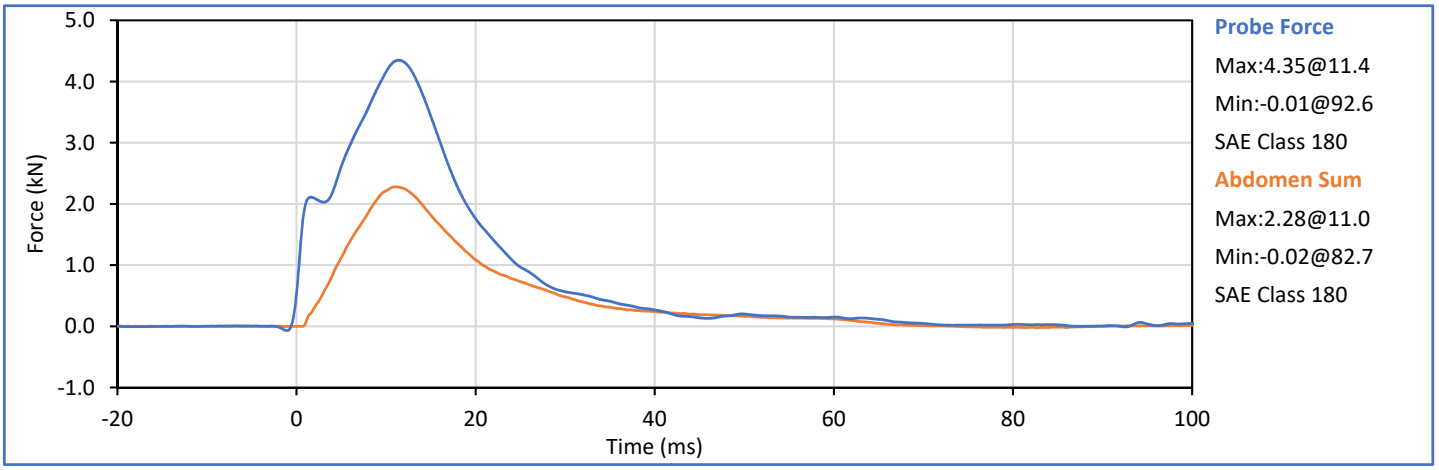
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Abdomen Impact

ATD Serial No.: F035 Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	3.90	4.10	4.02	Pass
Peak Impactor Force	kN	4.00	4.80	4.35	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.4	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.28	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	11.0	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

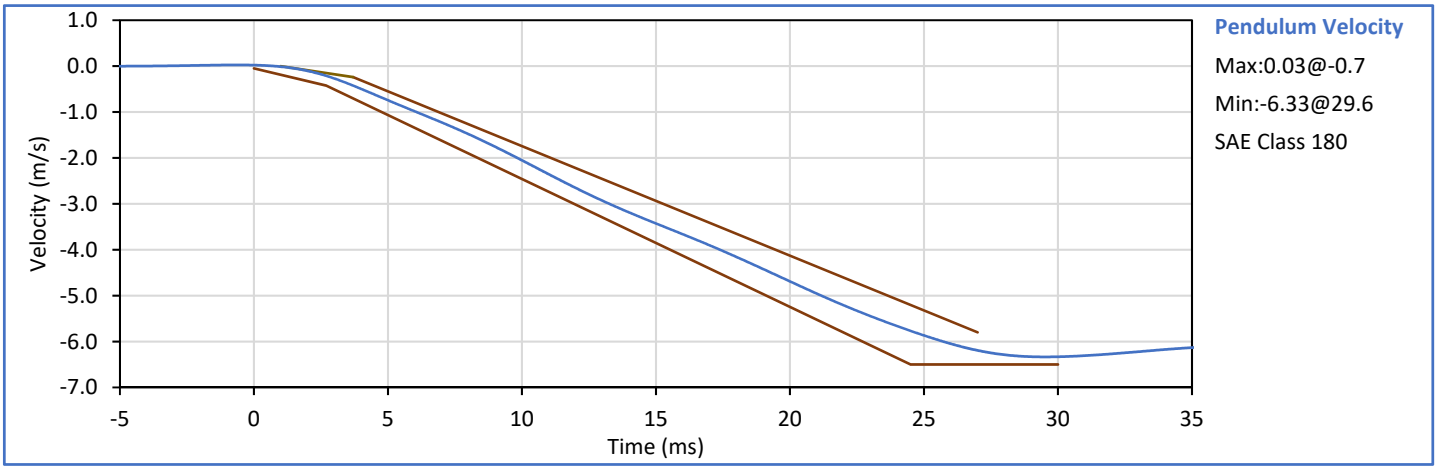
Approved By: P. Puzzuto

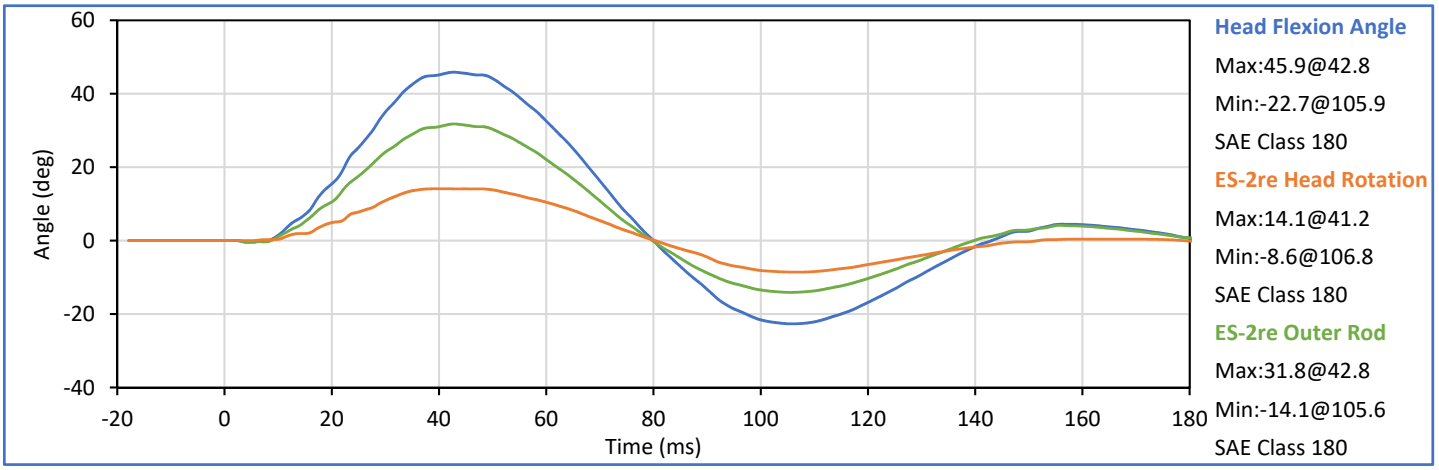
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Lumbar Spine Flexion

ATD Serial No.: F035 Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	35	Pass
Pendulum Velocity	m/s	5.95	6.15	6.08	Pass
Peak Headform Flexion	deg	45.0	55.0	45.9	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	42.8	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	37.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

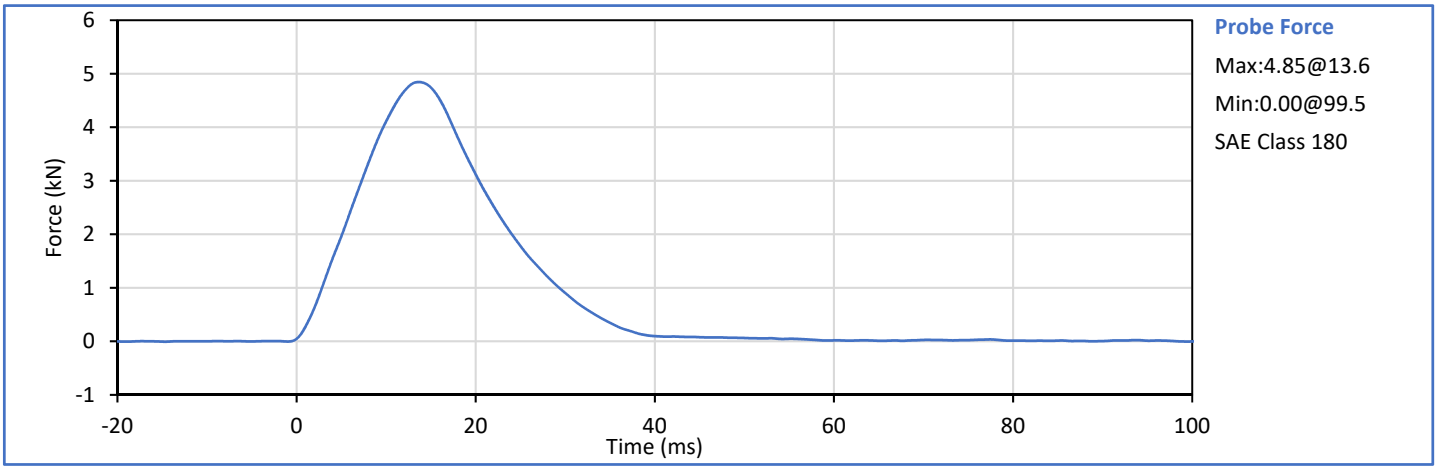
Approved By: P. Puzzuto

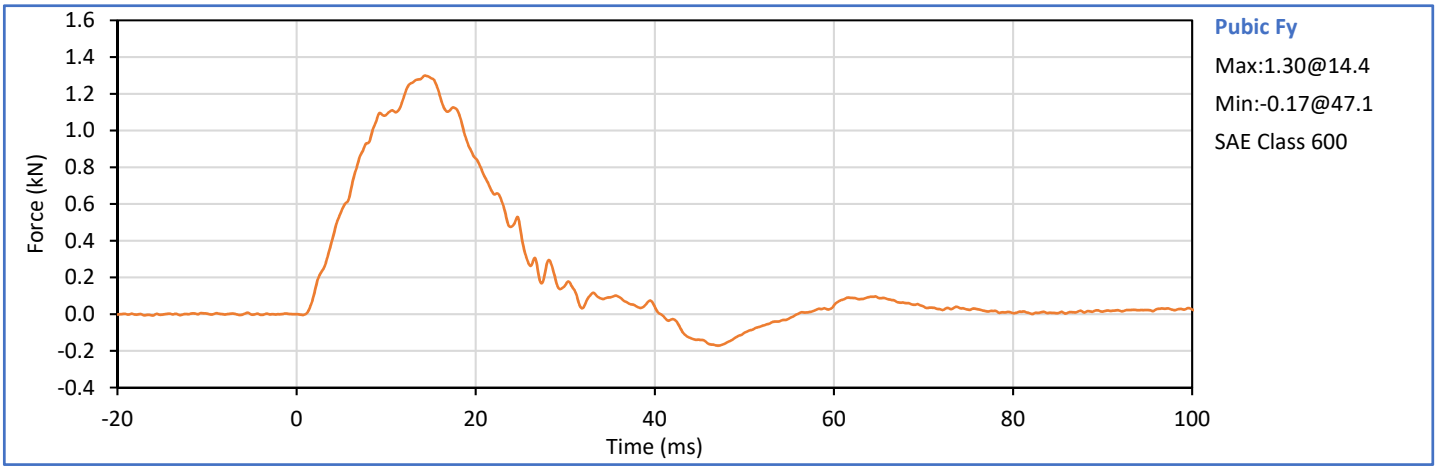
Applus IDIADA
KARCO

ES-2re 50th Male Side Impact ATD
Pelvis Impact

ATD Serial No.: F035 Test Date: 2019-06-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.33	Pass
Peak Impactor Force	kN	4.70	5.40	4.85	Pass
Time of Peak Impactor Force	ms	11.8	16.1	13.6	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.30	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-Test ATD Configuration And Performance Verification Data
SID-IIs Small Side Impact ATD
S/N: 308

Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
External Measurements

ATD Serial No.: 308 Test Date: 2019-02-17

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	44	Pass
A - Sitting Height	mm	772	788	783	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	81	Pass
D - H Point From Seatback	mm	141	151	148	Pass
E - Shoulder Pivot From Backline	mm	97	107	103	Pass
F - Thigh Clearance	mm	119	135	127	Pass
G - Head Breadth	mm	140	148	146	Pass
H - Head Back From Backline	mm	40	46	42	Pass
I - Head Depth	mm	178	188	187	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	531	Pass
L - Popliteal Height	mm	343	369	353	Pass
K - Knee Pivot To Floor Height	mm	392	409	399	Pass
N - Buttock Popliteal Length	mm	416	442	439	Pass
O - Chest Depth W/O Jacket	mm	195	211	206	Pass
P - Foot Length	mm	216	232	222	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	316	Pass
R - Arm Length	mm	249	259	253	Pass
S - Knee Joint To Seatback	mm	477	493	482	Pass
V - Shoulder Width	mm	341	357	351	Pass
W - Foot Width	mm	78	94	86	Pass
Y - Chest Circumference W/Jacket	mm	851	881	863	Pass
Z - Waist Circumference	mm	761	791	780	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

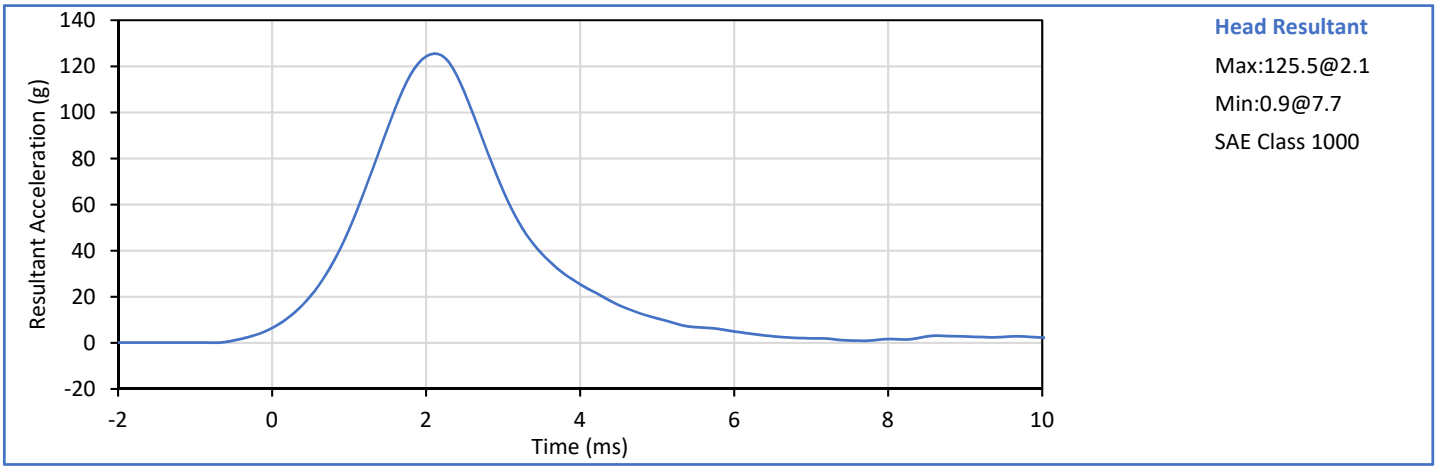
Approved By: P. Puzzuto

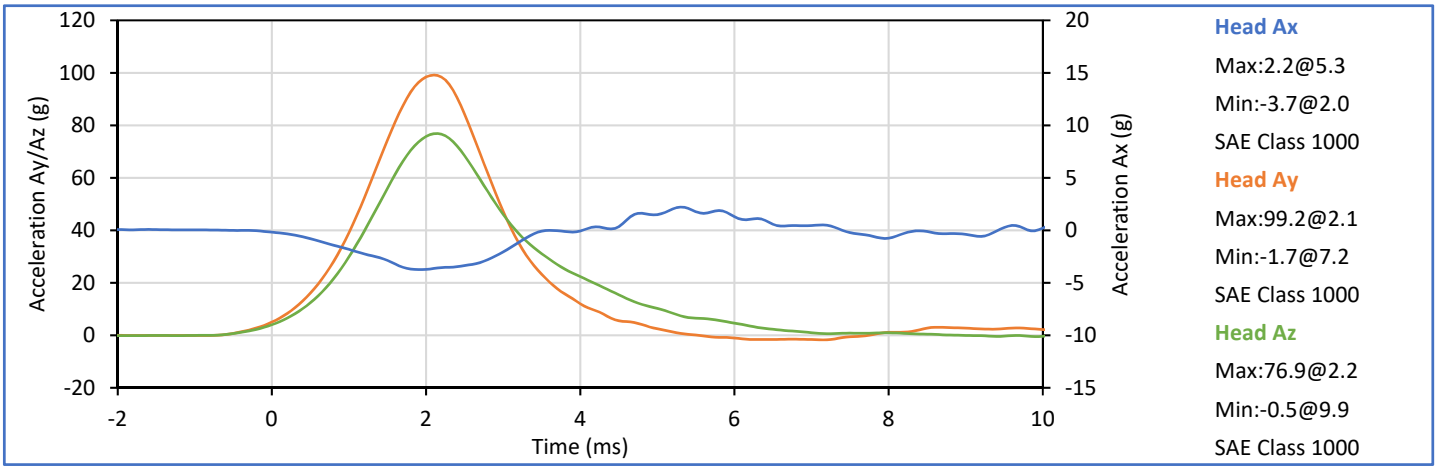
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Head Drop

ATD Serial No.: 308 Test Date: 2019-06-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	125.5	Pass
Peak Head Ax	g	-15.0	15.0	-3.7	Pass
Oscillations After Main Pulse	%	0.0	15.0	3.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

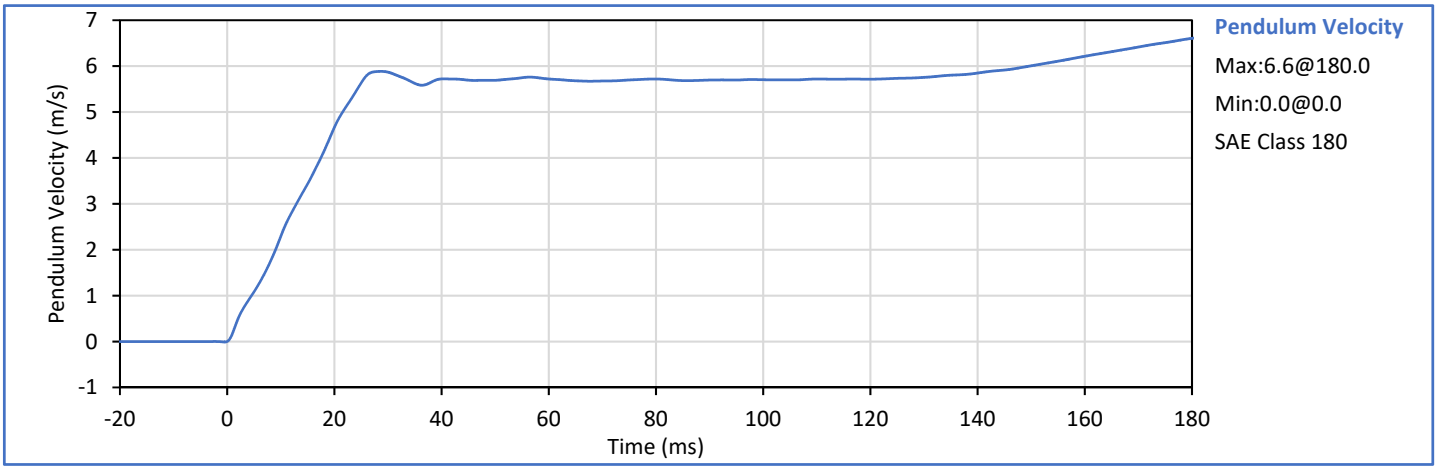
Approved By: P. Puzzuto

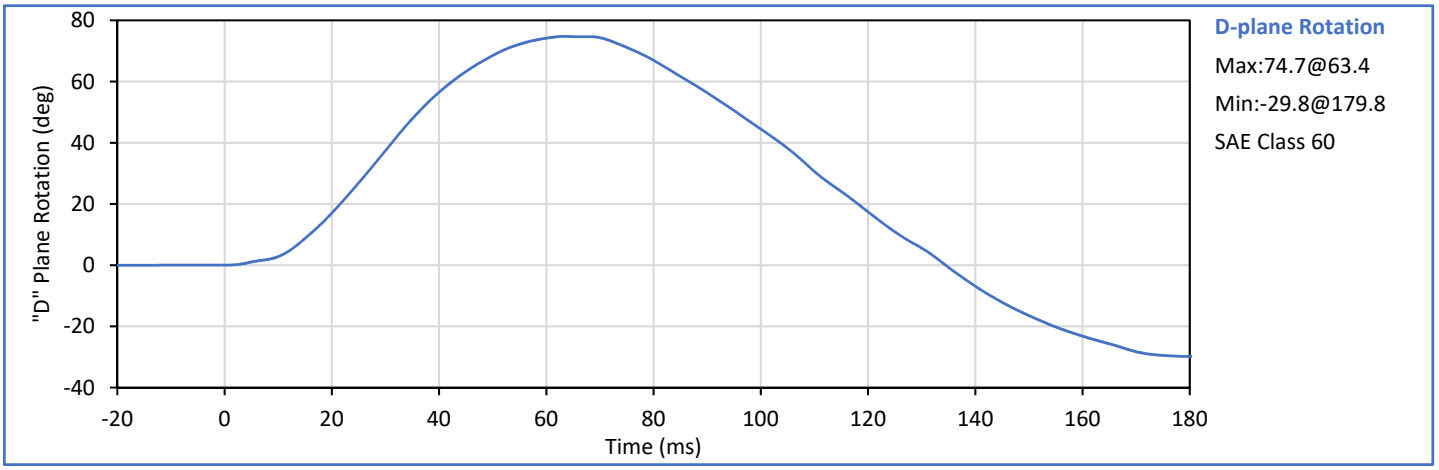
Applus IDIADA KARCO

SID-IIs Small Side Impact ATD
Neck Flexion

ATD Serial No.: 308 Test Date: 2019-06-18

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	32	Pass
Pendulum Velocity	m/s	5.51	5.63	5.60	Pass
Pendulum Decel at 10 ms	m/s	2.20	2.80	2.29	Pass
Pendulum Decel at 15 ms	m/s	3.30	4.10	3.43	Pass
Pendulum Decel at 20 ms	m/s	4.40	5.40	4.66	Pass
Pendulum Decel at 25 ms	m/s	5.40	6.10	5.63	Pass
Pendulum Decel from 25-100 ms	m/s	5.50	6.20	5.89	Pass
Peak "D" Plane Rotation	deg	71.0	81.0	74.7	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	63.4	Pass
Peak Occ. Condyle Moment	Nm	-44.0	-36.0	-40.0	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	114.7	Pass
			Overall Test Results		Pass



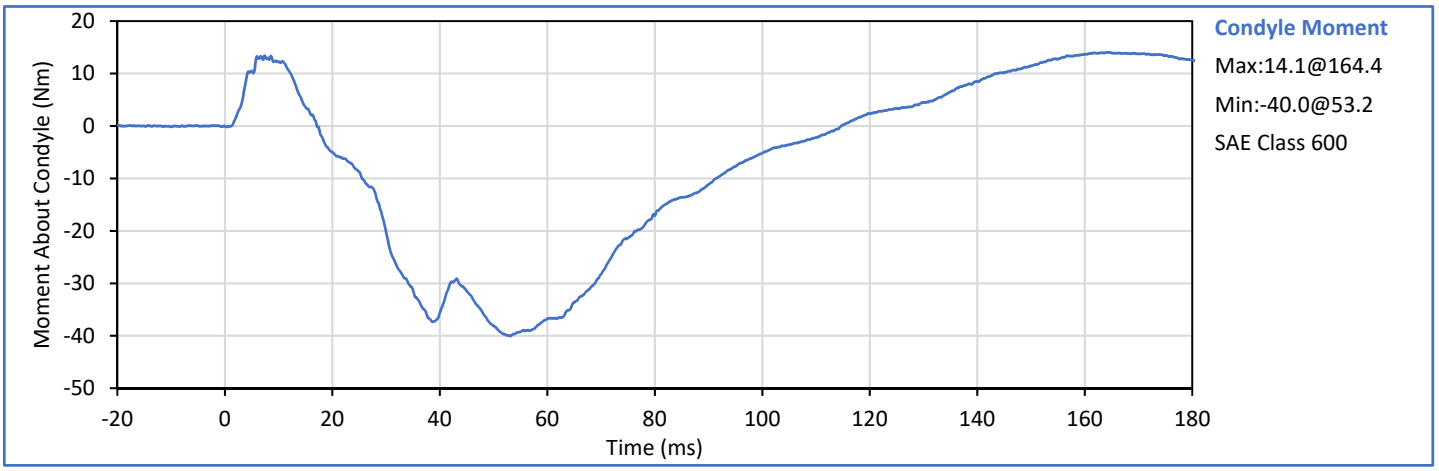


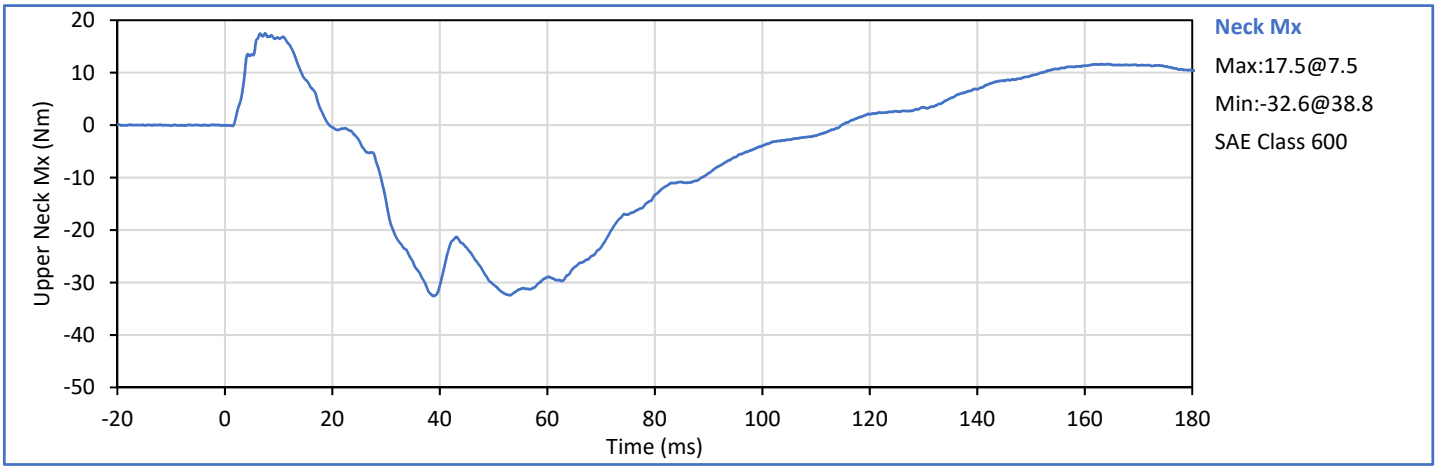
Technician: J. Hernandez

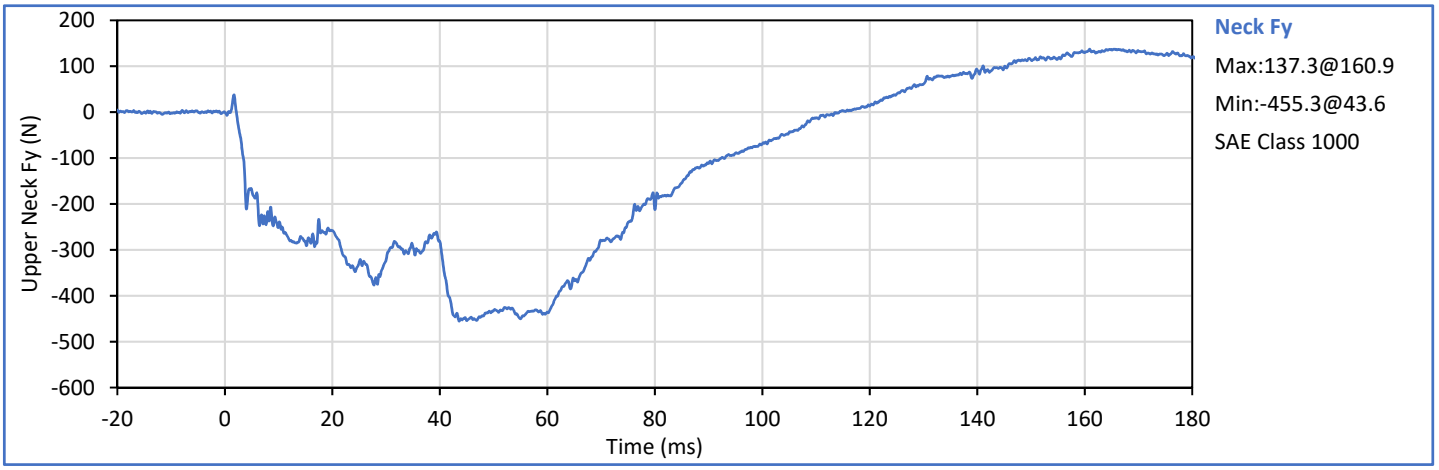
Approved By: P. Puzzuto

SID-IIs Small Side Impact ATD
Neck Flexion

ATD Serial No.: 308 Test Date: 2019-06-18





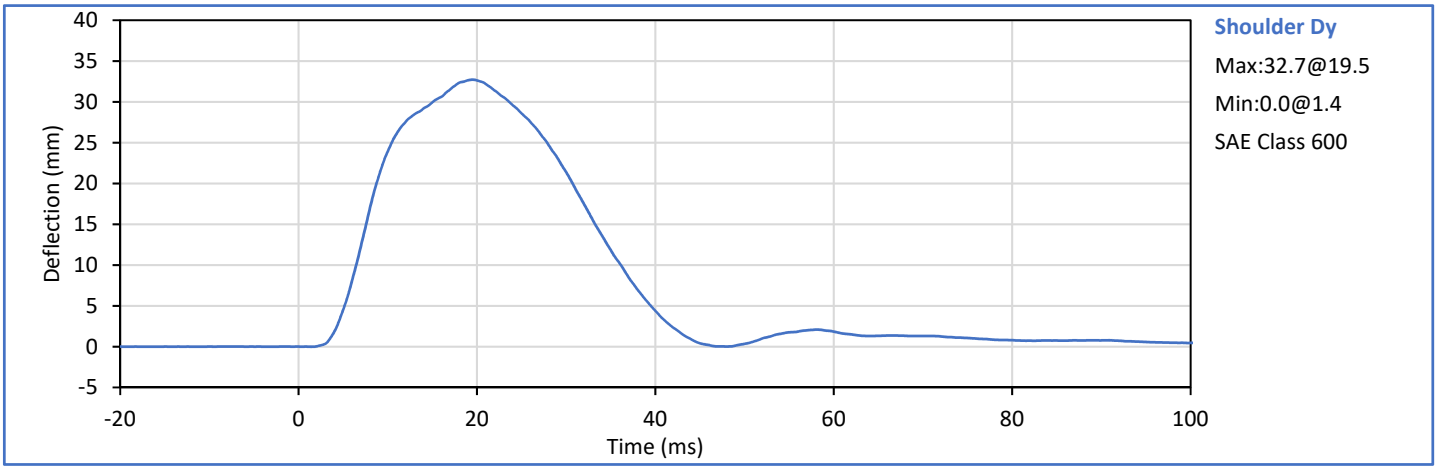


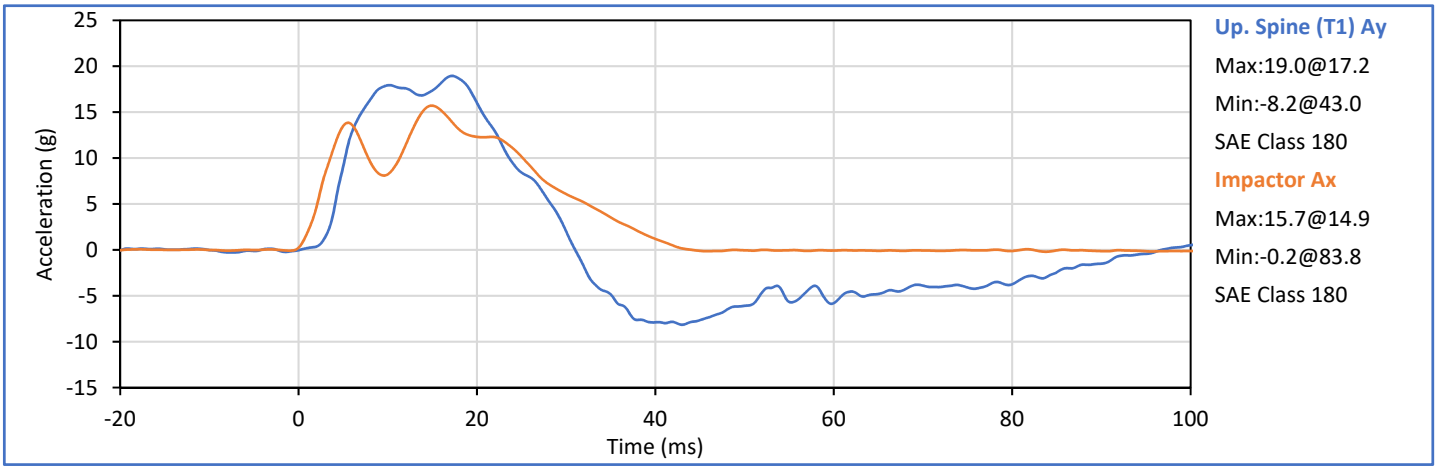
Applus IDIADA KARCO

SID-IIs Small Side Impact ATD
Shoulder Impact Test

ATD Serial No.: 308 Test Date: 2019-06-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Impactor Velocity	m/s	4.20	4.40	4.28	Pass
Peak Shoulder Dy	mm	28.0	37.0	32.7	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	19.0	Pass
Peak Impactor Ax	g	13.0	18.0	15.7	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

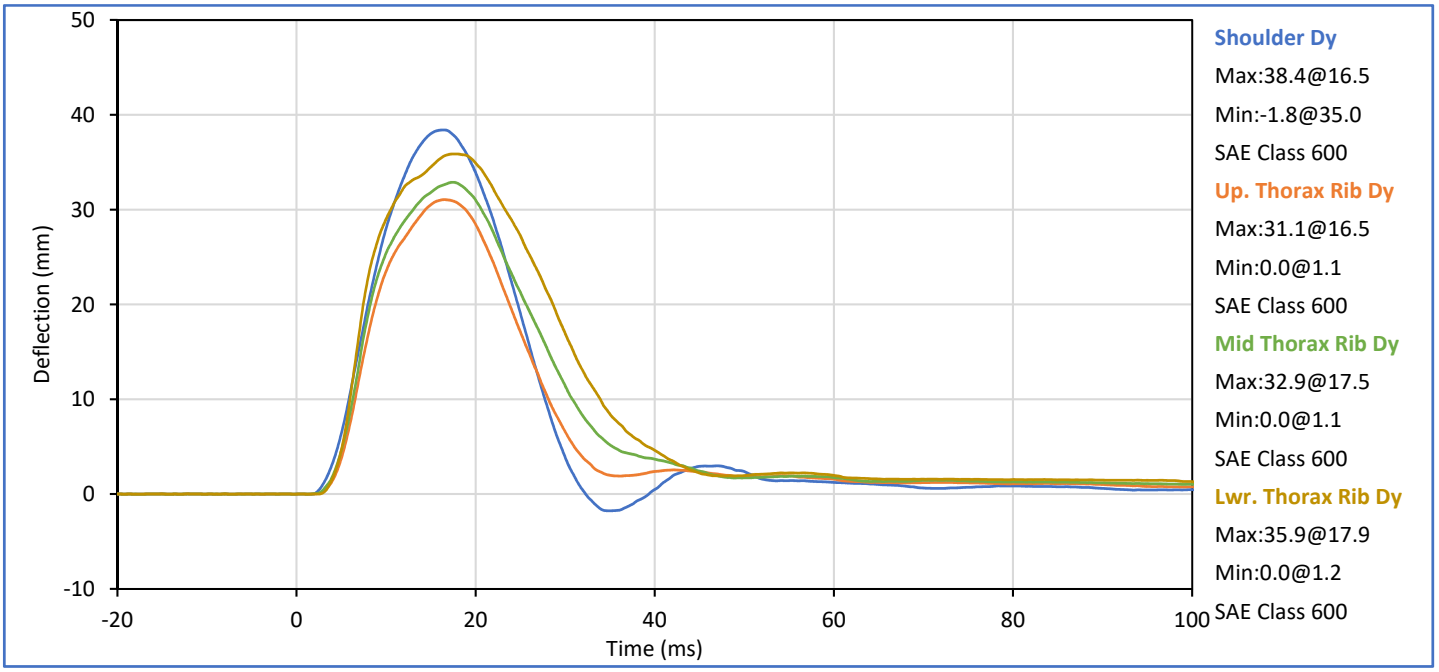
Applus IDIADA
KARCO

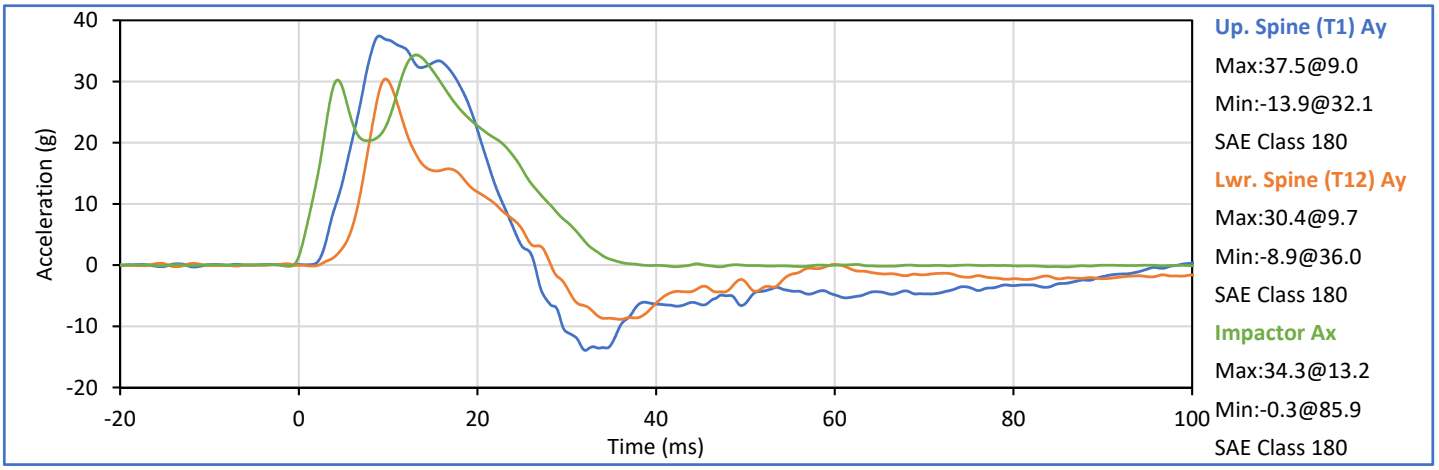
SID-IIs Small Side Impact ATD
Thorax (With Arm)

ATD Serial No.: 308

Test Date: 2019-06-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	6.60	6.80	6.65	Pass
Peak Shoulder Dy	mm	31.0	40.0	38.4	Pass
Peak Upper Rib Dy	mm	25.0	32.0	31.1	Pass
Peak Middle Rib Dy	mm	30.0	36.0	32.9	Pass
Peak Lower Rib Dy	mm	32.0	38.0	35.9	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.5	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	30.4	Pass
Peak Impactor Ax	g	30.0	36.0	34.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

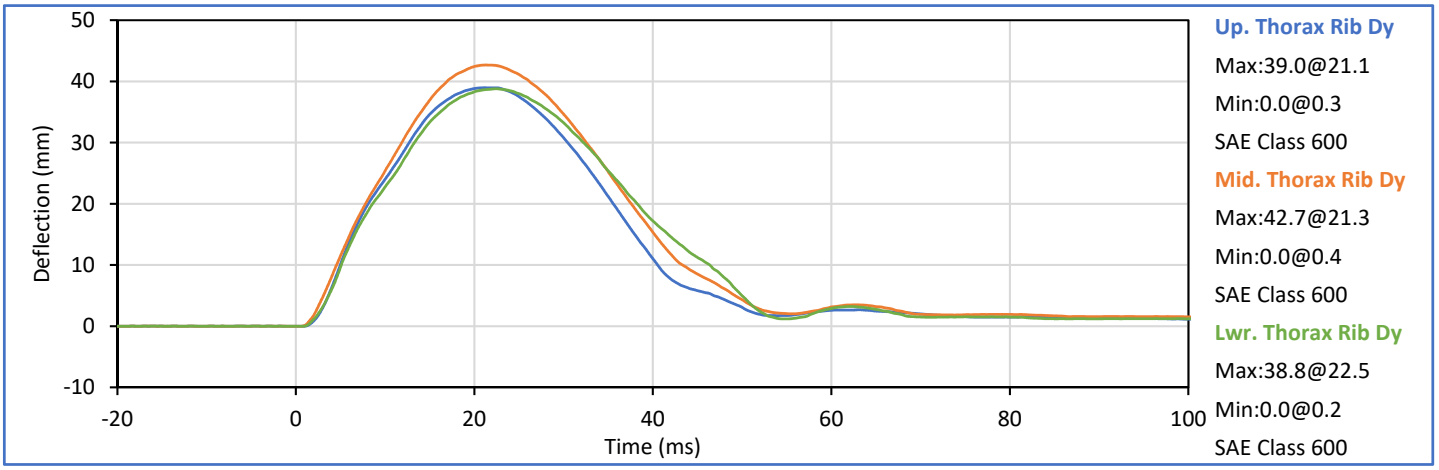
Applus IDIADA
KARCO

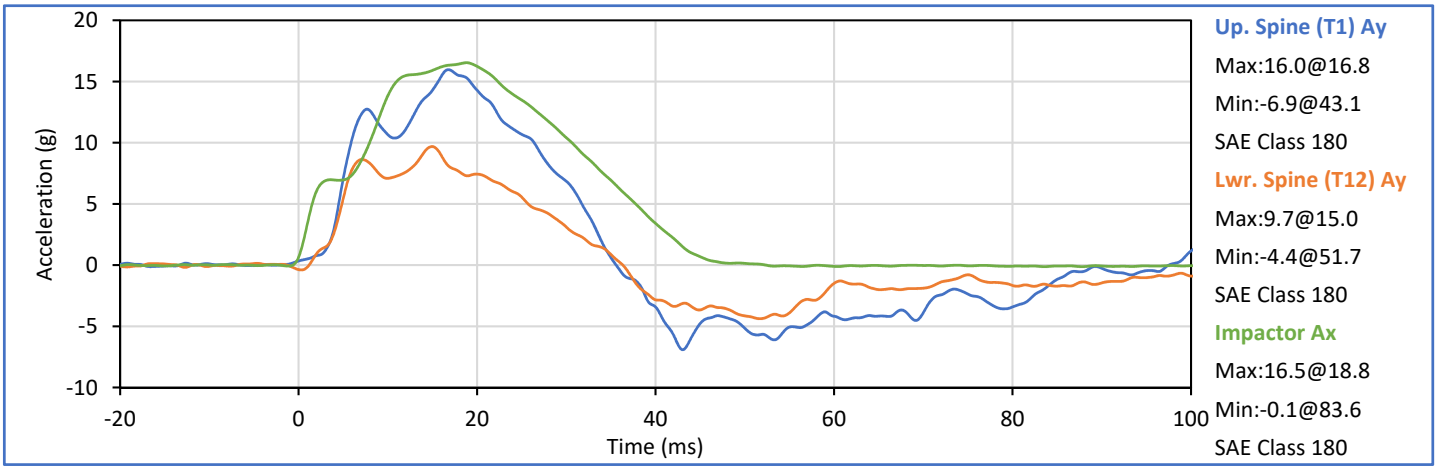
SID-IIs Small Side Impact ATD
Thorax (No Arm)

ATD Serial No.: 308

Test Date: 2019-06-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.30	Pass
Peak Upper Rib Dy	mm	32.0	40.0	39.0	Pass
Peak Middle Rib Dy	mm	39.0	45.0	42.7	Pass
Peak Lower Rib Dy	mm	35.0	43.0	38.8	Pass
Peak Upper Spine (T1) Ay	g	13.0	17.0	16.0	Pass
Peak Lower Spine (T12) Ay	g	7.0	11.0	9.7	Pass
Peak Impactor Ax	g	14.0	18.0	16.5	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

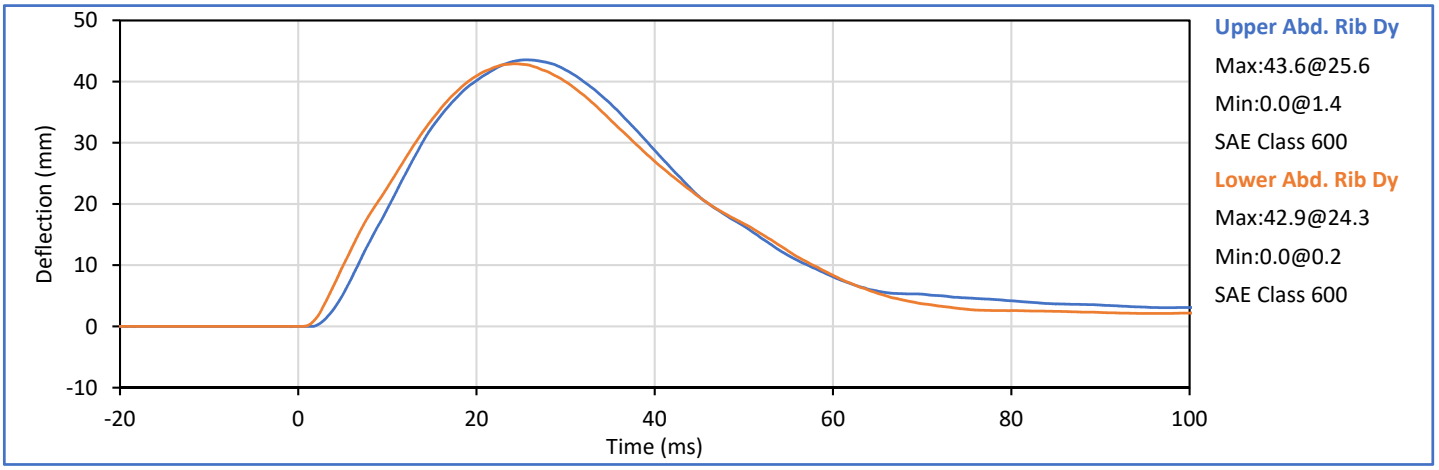
Approved By: P. Puzzuto

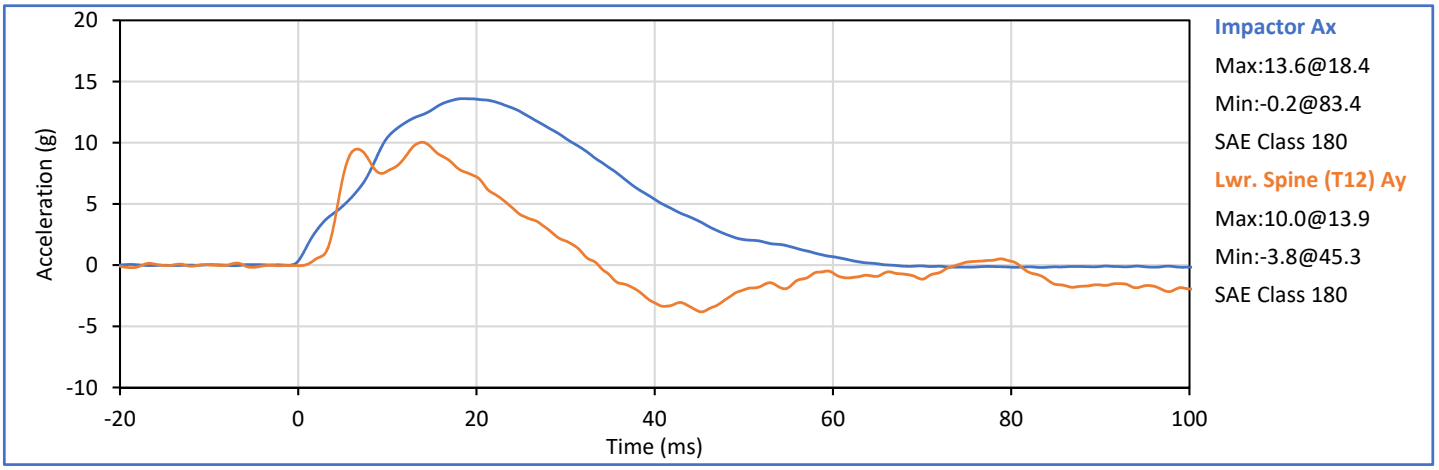
Applus IDIADA
KARCO

SID-IIs Small Side Impact ATD
Abdomen Impact

ATD Serial No.: 308 Test Date: 2019-06-19

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.36	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	43.6	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	42.9	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	10.0	Pass
Peak Impactor Ax	g	12.0	16.0	13.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

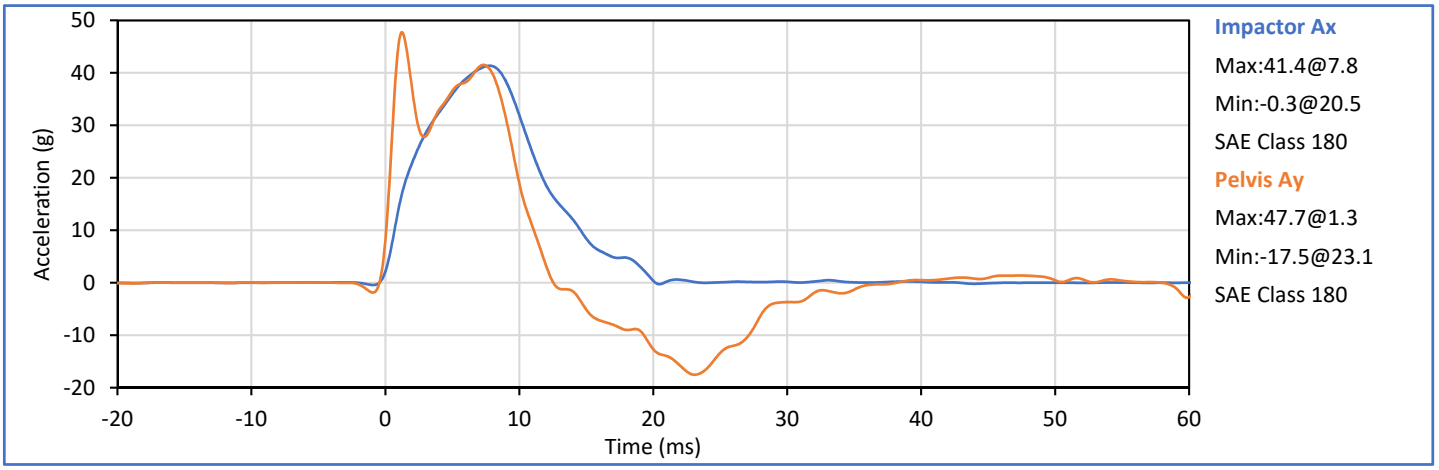
Applus IDIADA
KARCO

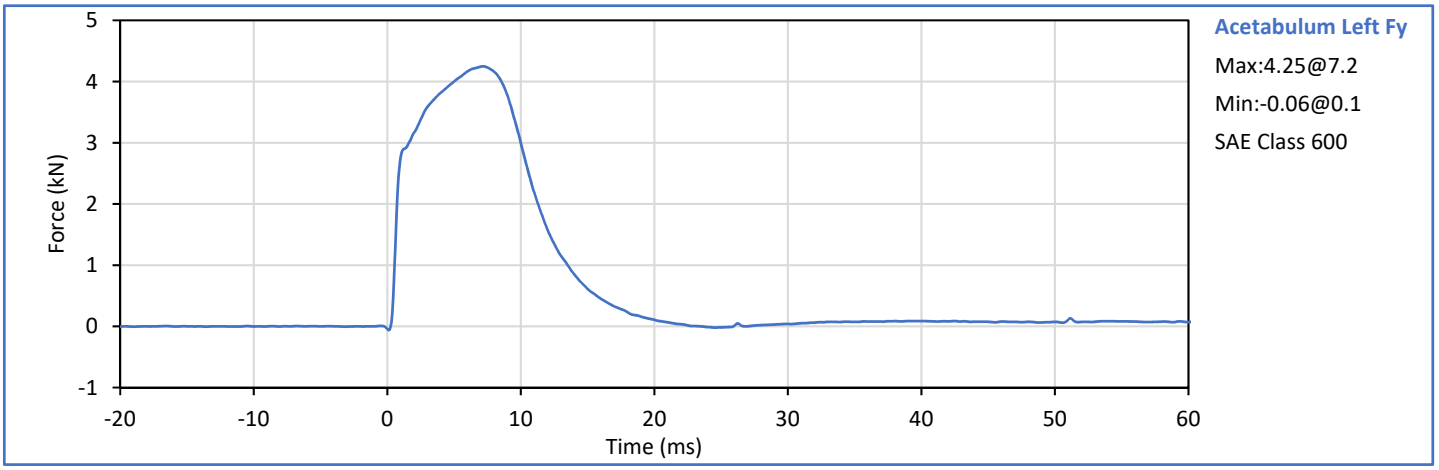
SID-IIs Small Side Impact ATD
Pelvis Acetabulum Impact

ATD Serial No.: 308 Test Date: 2019-06-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Impactor Velocity	m/s	6.60	6.80	6.71	Pass
Peak Acetabulum Fy	kN	3.60	4.30	4.25	Pass
Pelvis Ay after 6ms	g	34.0	42.0	41.5	Pass
Peak Impactor Ax	g	38.0	47.0	41.4	Pass
			Overall Test Results		Pass

Pelvis Plug S/N: 12509 (SACO)





Technician: J. Hernandez

Approved By: P. Puzzuto

SID-IIs Small Side Impact ATD
Pelvis Acetabulum Impact

ATD Serial No.: 308 Test Date: 2019-06-20

Pelvis Plug S/N: 12509 (SACO)

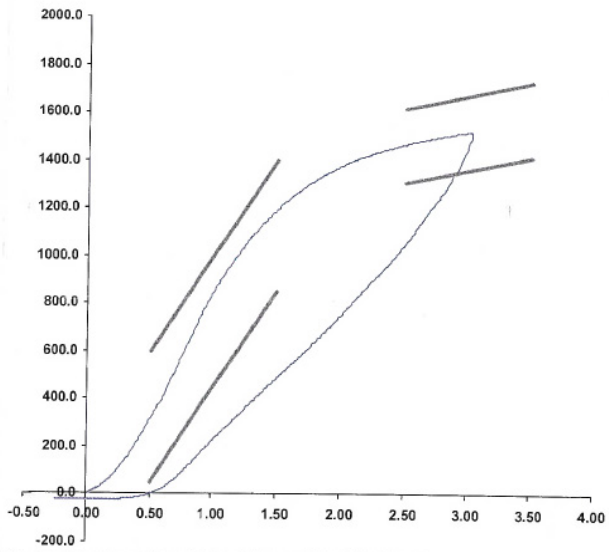
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 12509
Test Number 7436
Report Number 7450
Test Date 10/2/2018 8:15:24 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	318.07	50.00	600.00
Force @ 1.5 mm (N)	1,197.42	850.00	1,400.00
Force @ 2.5 mm (N)	1,468.60	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,521.03	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator DC

Part Number 180-4450

Template No 107 02-Oct-18
SACO Research

By : DC Date : 10/2/18

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

Applus IDIADA
KARCO

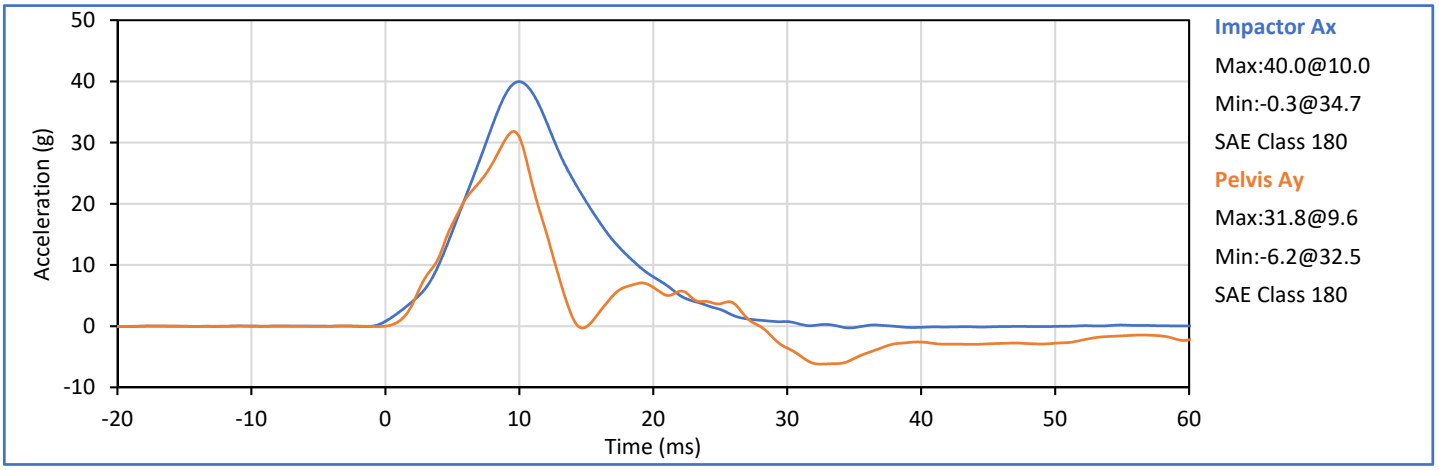
SID-IIs Small Side Impact ATD
Pelvis Iliac Impact

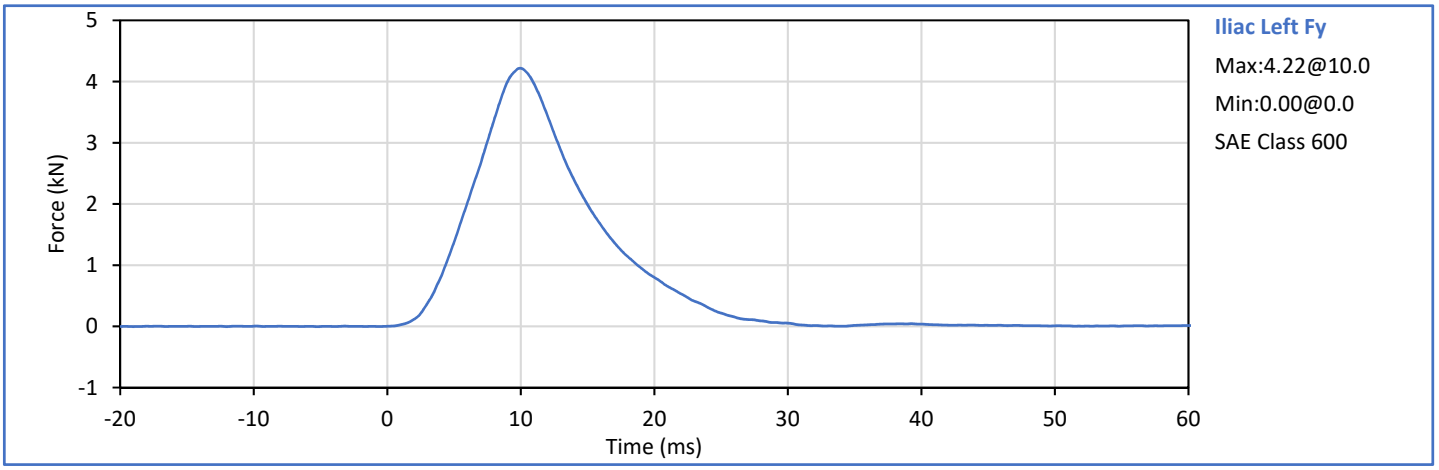
ATD Serial No.: 308 Test Date: 2019-06-20

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	34	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Iliac Fy	kN	4.10	5.10	4.22	Pass
Pelvis Ay after 6ms	g	28.0	39.0	31.8	Pass
Peak Impactor Ax	g	36.0	45.0	40.0	Pass
			Overall Test Results		Pass

Pelvis Plug S/N: 12228 (SACO) *

* Plug is not impacted and remains certified





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Position:	Driver
ATD Type:	ES-2re
ATD S\N:	F035

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Due
Head Acceleration X Primary	P58760	Endevco	7264C-2k	2020-03-24
Head Acceleration Y Primary	P58763	Endevco	7264C-2k	2020-03-24
Head Acceleration Z Primary	P52093	Endevco	7264C-2k	2020-03-24
Head Acceleration X Redundant	P52072	Endevco	7264C-2k	2020-03-24
Head Acceleration Y Redundant	P58768	Endevco	7264C-2k	2020-03-24
Head Acceleration Z Redundant	P52074	Endevco	7264C-2k	2020-03-24
Upper Thorax Rib Deflection Y	180 (ES-2 Rib)	Honeywell	F38000203	2019-07-24
Middle Thorax Rib Deflection Y	177 (ES-2 Rib)	Honeywell	F38000203	2019-07-24
Lower Thorax Rib Deflection Y	186 (ES-2 Rib)	Honeywell	F38000203	2019-07-24
Anterior Abdominal Force Y	1504 Fy	R.A. Denton	2631J	2019-10-11
Middle Abdominal Force Y	1505 Fy	R.A. Denton	2631J	2019-10-11
Posterior Abdominal Force Y	1506 Fy	R.A. Denton	2631J	2019-10-11
Lower Spine T12 Acceleration X	P45011	Endevco	7264C-2k	2020-03-24
Lower Spine T12 Acceleration Y	P58992	Endevco	7264C-2k	2020-03-24
Lower Spine T12 Acceleration Z	P51700	Endevco	7264C-2k	2020-03-24
Pubic Symphysis Force Y	DG6784 Fy	FTSS	IF-556	2019-10-11

Position:	Rear Pass.
ATD Type:	SID-IIs
ATD S\N:	308

Table 2a - Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Due
Head Acceleration X Primary	P63980	Endevco	7264C-2k	2019-09-14
Head Acceleration Y Primary	P58861	Endevco	7264C-2k	2019-09-14
Head Acceleration Z Primary	P51261	Endevco	7264C-2k	2019-09-14
Head Acceleration X Redundant	P58808	Endevco	7264C-2k	2019-09-14
Head Acceleration Y Redundant	P63310	Endevco	7264C-2k	2019-09-14
Head Acceleration Z Redundant	P49189	Endevco	7264C-2k	2019-09-14
Upper Thorax Rib Deflection Y	1172	Servo	08TCI-3725	2019-09-13
Middle Thorax Rib Deflection Y	1219	Servo	08TCI-3725	2019-09-13
Lower Thorax Rib Deflection Y	1221	Servo	08TCI-3725	2019-09-13
Upper Abdomen Rib Deflection Y	1252	Servo	08TCI-3725	2019-09-13
Lower Abdomen Rib Deflection Y	1283	Servo	08TCI-3725	2019-09-13
Lower Spine T12 Acceleration X	P52108	Endevco	7264C-2k	2019-09-14
Lower Spine T12 Acceleration Y	P63970	Endevco	7264C-2k	2019-09-14
Lower Spine T12 Acceleration Z	P51712	Endevco	7264C-2k	2019-09-14
Iliac Wing Impact Side Force Y	284 Fy (Iliac)	R.A. Denton	3228J	2019-06-21
Acetabulum Impact Side Force Y	272 Fy (Acetabulum)	R.A. Denton	3249J	2019-06-21

Table 2b - Passenger ATD Optional Instrumentation (Research Data Only)

Sensor Location	Sensor S\N	Mfr	Model	Cal Due
Head Rotation Rate X	ARS15066	DTS	ARS PRO-8k (2000Hz)	2019-09-06
Head Rotation Rate Y	ARS15067	DTS	ARS PRO-8k (2000Hz)	2019-09-06
Head Rotation Rate Z	ARS15068	DTS	ARS PRO-8k (2000Hz)	2019-09-06

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Due	
Vehicle CG Ax	A265945	MSI	52F-2000	2019-07-05	
Vehicle CG Ay	A265902	MSI	52F-2000	2019-07-05	
Vehicle CG Az	A265949	MSI	52F-2000	2019-07-05	
Right Side Sill at Front Seat Ax	A265950	MSI	52F-2000	2019-07-05	
Right Side Sill at Front Seat Ay	A265947	MSI	52F-2000	2019-07-05	
Right Side Sill at Front Seat Az	A266323	MSI	52F-2000	2019-07-05	
Right Side Sill at Rear Seat Ax	A254855	MSI	52F-2000	2019-06-19	✘
Right Side Sill at Rear Seat Ay	A254932	MSI	52F-2000	2019-06-19	✘
Right Side Sill at Rear Seat Az	A254933	MSI	52F-2000	2019-06-19	✘
Left Side Sill at Front Seat Ay	A273033	MSI	52F-2000	2019-09-12	
Left Side Sill at Rear Seat Ay	A273035	MSI	52F-2000	2019-09-12	
Left Lower A-Pillar Ay	A273453	MSI	52F-2000	2019-09-11	
Left Middle A-Pillar Ay	A273444	MSI	52F-2000	2019-09-11	
Left Lower B-Pillar Ay	A273045	MSI	52F-2000	2019-09-12	
Left Middle B-Pillar Ay	A273034	MSI	52F-2000	2019-09-12	
Driver Seat Track at H-Point Ay	A273026	MSI	52F-2000	2019-09-12	
Rear Seat Structure Ay	A273441	MSI	52F-2000	2019-09-11	
Right Rear Occupant Comp. Ay	A273446	MSI	52F-2000	2019-09-11	
Engine Block Top Ax	A273388	MSI	52F-2000	2019-09-17	
Engine Block Top Ay	A273390	MSI	52F-2000	2019-09-17	
Rear Floopan Above Axle Ax	10420	Endevco	757F-2k	2019-09-04	
Rear Floopan Above Axle Ay	10375	Endevco	757F-2k	2019-09-04	
Rear Floopan Above Axle Az	A254886	MSI	52F-2000	2019-06-18	✘

Table 4 - Moving Deformable Barrier (MDB) Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Due
MDB CG Ax	10390	Endevco	757F-2k	2019-09-04
MDB CG Ay	10405	Endevco	757F-2k	2019-09-04
MDB CG Az	10421	Endevco	757F-2k	2019-09-05
MDB Left Side at Rear Axle Ax	A224516	MSI	52F-2000	2019-09-21
MDB Left Side at Rear Axle Ay	A160734	MSI	52F-2000	2019-11-28