FMVSS 208 Flat Frontal Barrier 56.73 km/h

TRC Inc. Test No. 190617

Prepared by:

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Final Report

June 2019

Prepared for:

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Test Performed by: Mike Postle, Engineering Technician

Report Approved June 24, 2019

Kristi Hill-Smith
Project Manager

Table of Contents

Section	Title	Page
1.0	Test Summary	1-1
2.0	Occupant Information	2-1
3.0	Camera Information	3-1
Appendix A	Photographs	A-1
Appendix B	Data Plots	B-1
Appendix C	Dummy Calibration	C-1
Appendix D	Miscellaneous Data	D-1

Section 1.0

Test Summary

Purpose and Test Procedure

Purpose

The purpose of this test was to determine the response of the subject vehicle, a 2019 Chevrolet Silverado, relative to the performance requirements of FMVSS 208, “Occupant Crash Protection,” in the 56.33 kph (target speed) impact test mode and FMVSS 301, “Fuel System Integrity”.

Test Procedure

This test was conducted according to instructions provided by All Terrain Conversions, LLC., using NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP208-14 as a guide. Data was obtained relative to FMVSS 208, "Occupant Crash Protection” and FMVSS 301, “Fuel System Integrity” performance.

Injury Criteria	Maximum Allowable Injury Assessment Values	Driver AM50	Passenger AM50
HIC15	**700**	249	252
N_{te}	**1.0**	0.18	0.37
N_{tf}	**1.0**	0.18	0.14
N_{ce}	**1.0**	0.21	0.11
N_{cf}	**1.0**	0.07	0.15
Neck tension	**4170 N**	842.05	1489.20
Neck compression	**4000 N**	-471.96	-244.84
Chest g	**60 g**	35.28	35.73
Chest displacement	**63 mm**	-22.39	-24.77
Left femur	**10,000 N**	-6277.10	-884.77
Right femur	**10,000 N**	-3022.38	-1738.70

The subject vehicle, a 2019 Chevrolet Silverado, was equipped with a 6-cylinder inline engine and an auto transmission. The vehicle's test weight was 2607.8 kg. The vehicle was impacted into the barrier wall on June 17, 2019. The vehicle's impact speed was 56.73 km/h.

The vehicle was instrumented to record data from seven (7) longitudinal axis accelerometers and one (1) vertical axis accelerometer.

Two (2) Part 572E dummies were seated in the front seating positions of the vehicle by TRC Inc. personnel. The driver dummy was instrumented with accelerometers in the head and chest oriented to measure longitudinal, lateral, and vertical accelerations, with upper neck force and moment load cells, femur load cells for uniaxial force, and a chest potentiometer to measure longitudinal deflection. The passenger dummy was instrumented with accelerometers in the head and chest oriented to measure longitudinal, lateral, and vertical accelerations, with upper neck force and moment load cells, femur load cells for uniaxial force, and a chest potentiometer to measure longitudinal deflection. Each dummy was restrained with airbags and a three-point unibelt. The analog data was digitally sampled at 12,500 samples per second and digitally filtered per SAE J211.

The test was filmed by ten (10) high-speed digital motion picture cameras operating at 1000 frames per second and one (1) real time panning camera operating at 30 frames per second.

There was 100% windshield periphery retention.

There was no penetration of the windshield.

Following the impact, 0 ounces of fluid spilled from the vehicle’s fuel system prior to the static rollover test or during the static rollover test.

Section 1.0 contains the general test, dummy, and vehicle information. Section 2.0 contains the occupant information. Section 3.0 contains the motion picture camera information. Appendix A contains the pre-test and post-test still photographs. Appendix B contains the final data plots. Appendix C contains the dummy calibration information. Appendix D contains the miscellaneous data.

Data Acquisition Explanations

Top of Engine block X X-axis acceleration data channel failed to record any valid data after approximately 74.0 milliseconds.

Crash Test Summary

Test Type:	FMVSS 208 and 301 Flat Frontal			
Test Date:	June 17, 2019			
Test Time:	12:27			
Ambient Temperature at Impact Area:	21.3° C (70.4° F)			
Temperature in Occupant Compartment:	21.0° C (69.8° F)			
Vehicle:	2019 Chevrolet Silverado			
Vehicle Test Weight:[1]	2607.8 kg			
Impact Angle:[2]	0°			
Impact Velocity:[3]	Primary	35.25 mph	56.73 kph	
	Secondary	35.15 mph	56.57 kph	
Test Vehicle Attitudes (all measurements are in millimeters)				
	LF	RF	LR	RR
Delivered Heights:	978	1000	1037	1065
Pre-Test Heights:	966	1030	1011	984
Post-Test Heights:	951	902	1015	1007
Dummies:	**Driver # 616**		**Passenger # 617**	
Type:	H-III 50th		H-III 50th	
Location:	Left Front		Right Front	
Restraint:	Seatbelt and Airbags		Seatbelt and Airbags	
Number of data channels:	15		15	
Number of Cameras:				
High-speed:	10			
Real Time Documentary:	1			

[1] All Terrain Conversions, LLC supplied test weight
[2] With respect to tow track centerline
[3] Speed trap measurement (± .08 km/h accuracy)

Test Vehicle Information

Vehicle Manufacturer:		General Motors LLC		
Year/Make/Model:		2019 Chevrolet Silverado		
Body Style:		Truck		
VIN:		1GCRWAEH5KZ215902		
Color:		White		
Engine Data:				
Type:		V		
Cylinders:		6		
Displacement (L):		4.3		
Transmission Data:		6 Speed Automatic		
		Rear Wheel Drive		
Date vehicle received:		6/10/2019		
Odometer reading (mi):		244		
Accessories:				
Power steering		Yes	Automatic transmission	Yes
Power brakes		Yes	Automatic speed control	No
Power seats		No	Tilting steering wheel	Yes
Power windows		Yes	Telescoping steering wheel	No
Tinted glass		Yes	Air conditioning	Yes
AM/FM Radio		Yes	Anti-lock brakes	Yes
Clock		Yes	Rear window defroster	No
Other:		None		
Certification data from unmodified vehicle's label:				
Vehicle manufactured by:		General Motors LLC		
Date of manufacture:		N/A		
VIN:		1GCRWAEH5KZ215902		
GVWR:		N/A		
GAWR:	Front	N/A		
	Rear:	N/A		

[1] Vehicle does not have a certification data label

Test Vehicle Information, Continued

Tires on vehicle (mfr., line, size):	Front:	General, Grabber, 255/70R17
	Rear:	General, Grabber, 255/70R17
	Spare:	General, Grabber, 255/70R17
Tire pressure with maximum capacity vehicle load (kPa):	Front:	N/A
	Rear:	N/A
Type of seats:	Front:	Bucket
	Rear:	N/A
Type of seat backs:	Front:	Manual Adjustable
	Rear:	N/A
Location of "Recommended Tire Pressure" label:[1]		N/A
Data from unmodified vehicle's "Recommended Tire Pressure" label:		
Recommended tire size:	Front:	N/A
	Rear:	N/A
	Spare:	N/A
Recommended cold tire pressure (kPa):	Front:	N/A
	Rear:	N/A
	Spare:	N/A
Seating capacity:[2]	Front:	N/A
	Rear	N/A
	Total	N/A
"As tested" tire pressure (kPa):	Front:	N/A
	Rear:	N/A
Vehicle capacity weight (kg):[1]	N/A	

[1] Vehicle does not have a recommended tire pressure label

[2] Seating Capacity and Vehicle capacity weight per certification label, All-Terrain Conversions LLC has altered the vehicle to 2 in the front with wheelchair accessibility.

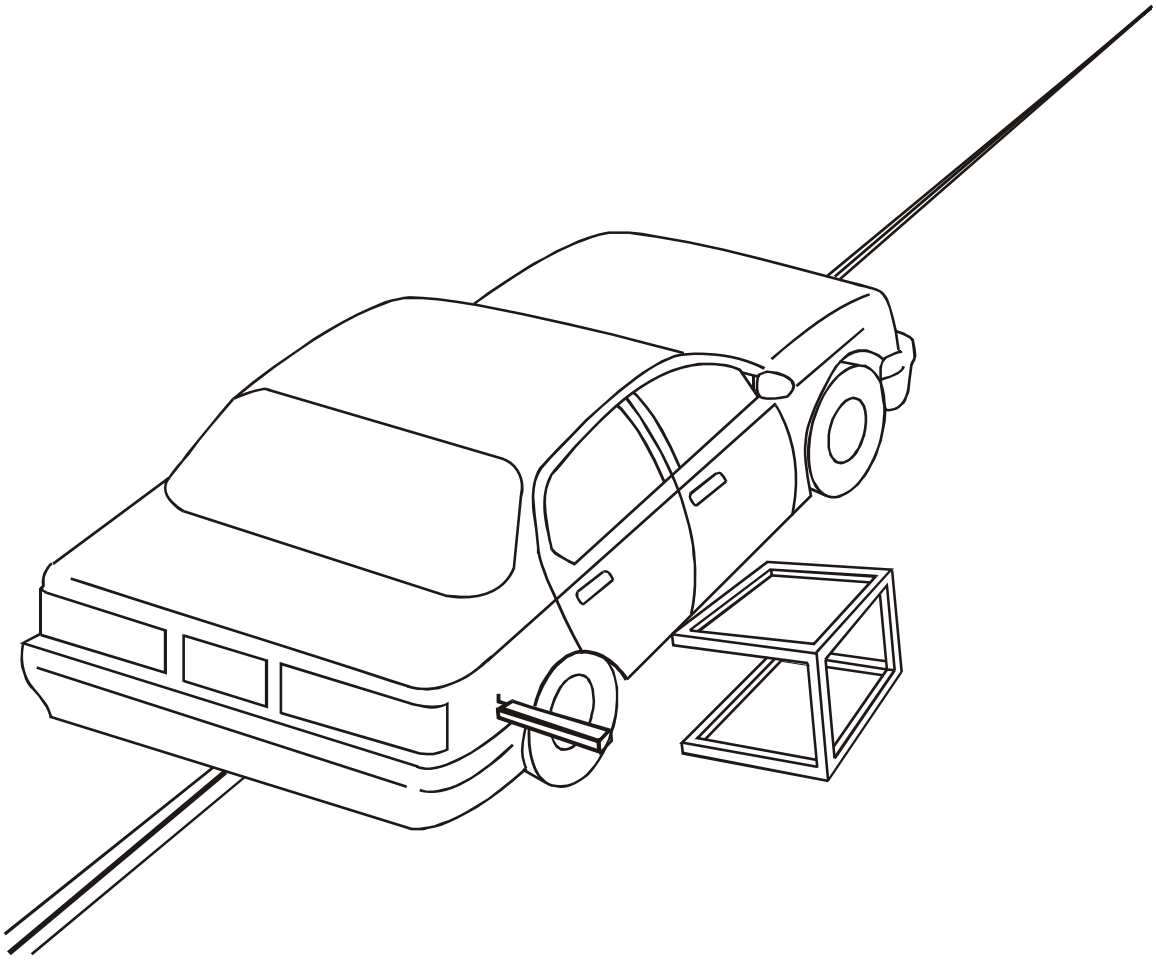
Test Vehicle Information, Continued

Weight of test vehicle as received:			
Right front (kg):	611.4	Right rear (kg):	459.0
Left front (kg):	708.8	Left rear (kg):	533.8
Total front weight (kg):	1320.2	57.1% of total vehicle weight	
Total rear weight (kg):	992.8	42.9% of total vehicle weight	
Total test weight (kg):	2313.0		
Weight of test vehicle with required dummies:			
Right front (kg):	662.0	Right rear (kg):	562.4
Left front (kg):	767.4	Left rear (kg):	616.0
Total front weight (kg):	1429.4	54.8% of total vehicle weight	
Total rear weight (kg):	1178.4	45.2% of total vehicle weight	
Total test weight (kg):	2607.8		
Weight and locations of ballast secured in vehicle:		Steel plate mounted in cargo bed	
Weight of ballast secured in vehicle:		70.0 kg	
Components removed to meet target test weight:		None	

Post-Impact Vehicle Data

Vehicle:	2019 Chevrolet Silverado		
Door Opening:			
	Left	Right	
Front:	No	No	
Rear:	No	No	
Seat Movement:			
	Seat back failure	Seat shift	
Front:	None	None	
Rear:	None	None	
Glazing Damage:			
Windshield:	None		
Side window:	None		
Rear window:	Completely broken out		
Other Notable Impact Effects:	None		
Vehicle Rebound From Flat Barrier:			
Left (mm):	177		
Center (mm):	218		
Right (mm):	281		
Average (mm):	225		
Test Vehicle Static Crush:			
Overall length of test vehicle (mm):	1830		
	Left	Center	Right
Pre-test (mm):	5670	5920	5665
Post-test (mm):	5181	5132	5183
Total crush (mm):	489	788	482
Average crush (mm):	586		

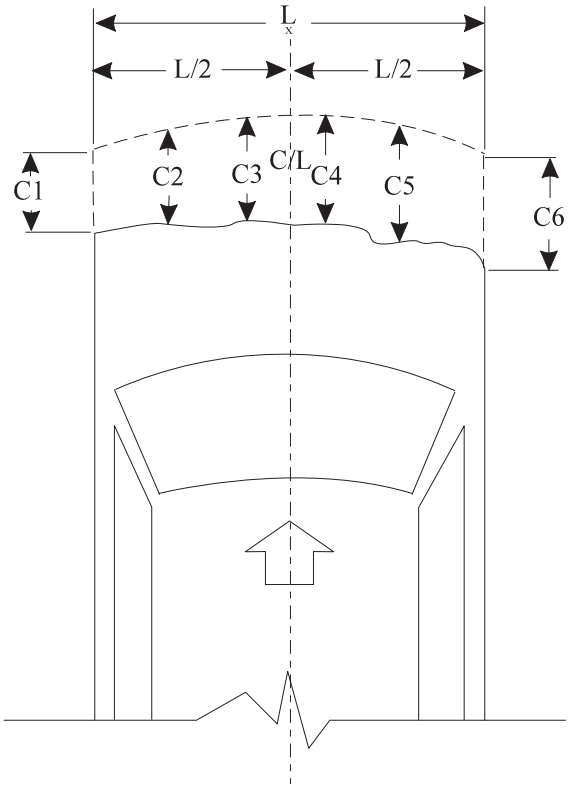
Impact Velocity Measurement System



The vane clears the final emitter/receiver pair 25 millimeters before impact.

The emitter/receiver pairs have a spacing of 685-millimeters.

Vehicle Crush



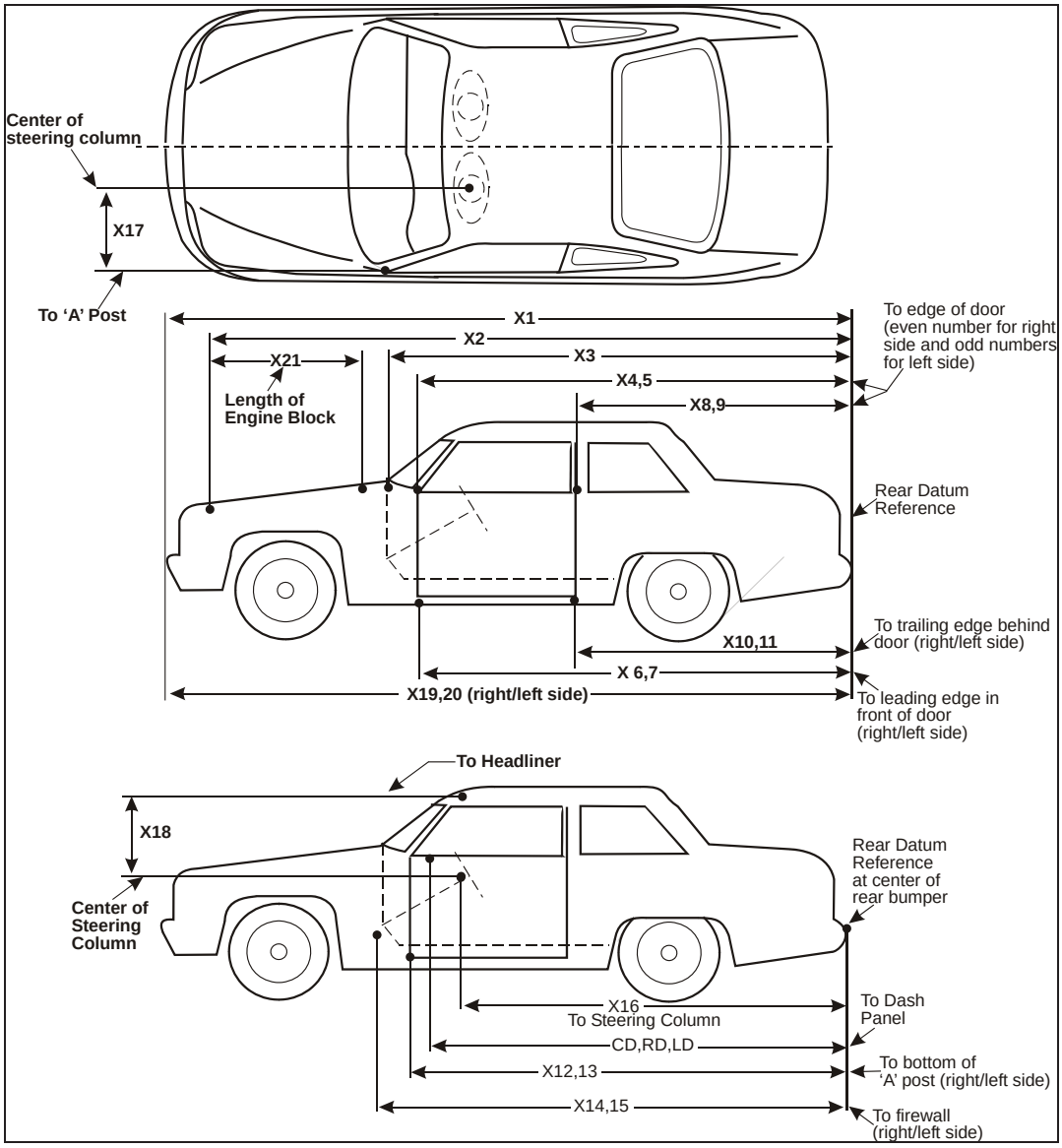
Notes:	L is pre-test length of contact surface. C1 through C6 are spaced equally apart. CL is vehicle centerline.		
Vehicle:	2019 Chevrolet Silverado		
	Pre-test	**Post-test**	**Crush**
L (mm):	1830		
C1 (mm):	5670	5181	489
C2 (mm):	5840	5186	654
C3 (mm):	5900	5160	740
C4 (mm):	5900	5173	727
C5 (mm):	5840	5200	640
C6 (mm):	5665	5183	482
CL (mm):	5920	5132	788

Impacted Vehicle Measurements

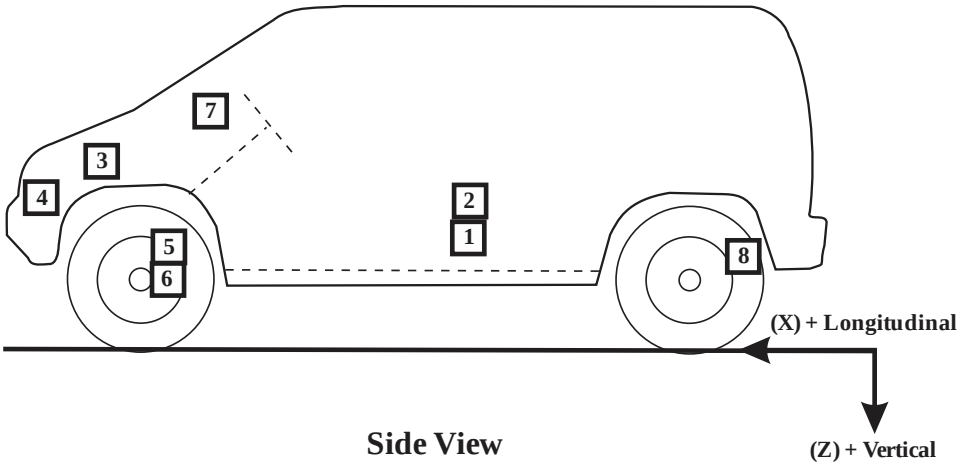
No.	Type of measurement	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
X1	Total Length of Vehicle at Centerline	5920	5132	788
X2	Rear Surface of Vehicle to Front of Engine Block	5270	4842	428
X3	Rear Surface of Vehicle to Firewall	4795	4592	203
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	4375	4330	45
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	4388	4335	53
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	4275	4285	-10
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	4285	4292	-7
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	3243	3200	43
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	3250	3202	48
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	3211	3222	-11
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	3221	3228	-7
X12	Rear Surface of Vehicle to Bottom of " A " Post on Right Side	4343	4300	43
X13	Rear Surface of Vehicle to Bottom of " A " Post on Left Side	4343	4300	43
X14	Rear Surface of Vehicle to Firewall--Right Side	4765	4633	132
X15	Rear Surface of Vehicle to Firewall--Left Side	4670	4691	-21
X16	Rear Surface of Vehicle to Steering Wheel Center	3868	3858	10
X17	Center of Steering Column to “ A “ Post	325	400	-75
X18	Center of Steering Column to Headliner	488	430	58
X19	Rear Surface of Vehicle to Right Side of Front Bumper	5665	5183	482
X20	Rear Surface of Vehicle to Left Side of Front Bumper	5670	5181	489
X21	Length of Engine Block	600	600	0
X26	Firewall to Engine or Transaxle	-250	-678	428
X27	Right Wheelbase	3749	3710	39
X28	Left Wheelbase	3749	3664	85
X30	Rear of Vehicle to Engine Bottom Target	4720	4690	30
X31	Rear of Vehicle to Occupant Compartment Bottom Targets	3550	3550	0
X32	Rear of Vehicle to Front Bumper Bottom Target	5475	5132	343
X33	Rear of Vehicle to Frame Cross member Bottom Target	3890	3865	25

Impacted Vehicle Measurements, Continued

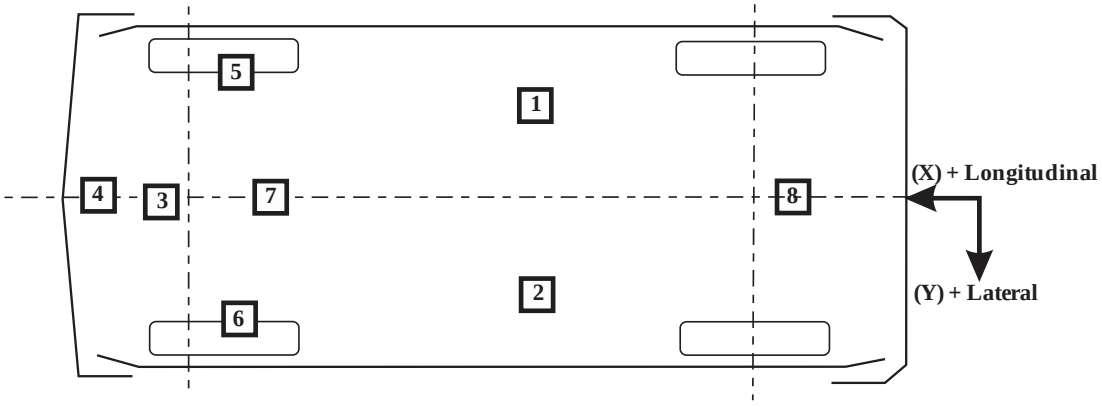
No.	Type of measurement	Pre-Test (mm)	Post-Test (mm)	Difference (mm)
Y29	Maximum Width	2032	2245	-213
Z27	Vertical Distance from Door Sill to Centerline of Steering Column	855	913	-58
RD	Rear of Vehicle to Right Side of Dash Panel	4115	4048	67
CD	Rear of Vehicle to Center of Dash Panel	4075	4003	72
LD	Rear of Vehicle to Left Side of Dash Panel	4105	4053	52
	Left Front Overhang	980	162	818
	Right Front Overhang	980	157	823



Vehicle Accelerometer Placement



Side View



Bottom View

Vehicle Accelerometer Locations and Data Summary

Location		Coordinates (mm)			Positive Direction		Negative Direction	
		X	Y	Z	Max	Time (ms)	Max	Time (ms)
1	Rear Left Seat Cross-member	2375	445	-813				
	Longitudinal (g)				5.39	109.60	-33.37	70.80
2	Rear Right Seat Cross-member	2375	445	-813				
	Longitudinal (g)				5.15	102.16	-31.44	36.16
3	Top of Engine	4850	0	-1108				
	Longitudinal (g)				---[1]	---[1]	---[1]	---[1]
4	Bottom of Engine	4150	25	-340				
	Longitudinal (g)				13.15	71.76	-53.08	52.88
5	Right Front Disc Brake Caliper	4903	767	-320				
	Longitudinal (g)				26.85	63.20	-82.38	51.52
6	Left Front Disc Brake Caliper	4945	767	-320				
	Longitudinal (g)				22.36	59.20	-93.21	49.28
7	Center of Instrument Panel Top	4125	7	-1464				
	Longitudinal (g)				67.73	29.20	-81.43	34.16
8	Longitudinal Center Line In Trunk	1225	0	-890				
	Vertical (g)				53.58	28.32	-50.95	23.76

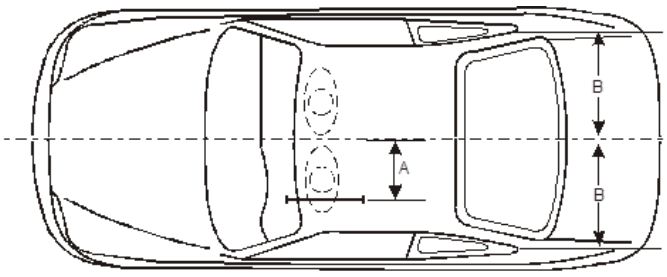
*Reference: X = Rear Bumper (+ Forward)
Y = Vehicle Centerline (+ To Right)
Z = Ground Level (+ Down)

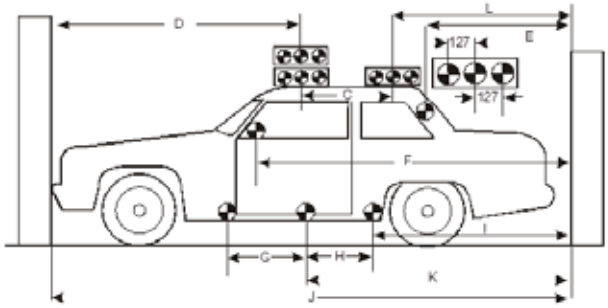
[1] See data acquisition explanations

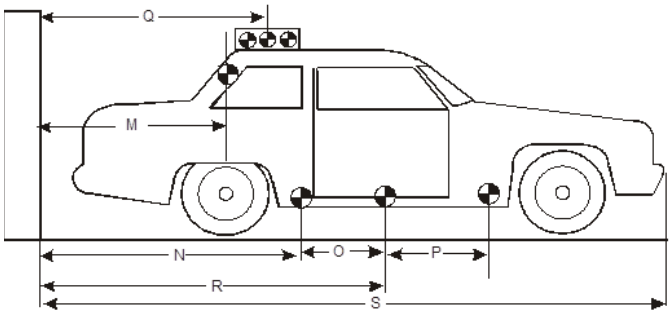
Target Measurements

No.	Type of measurement	Pre-Test (mm)
L	Rear Roof Targets Center (Left) to Measurement Board	2785
E	Left C-Pillar Target to Measurement Board	2372
F	Steering Column Target to Measurement Board	3860
I	Left Rear Sill Target to Measurement Board	2386
J	Front of Vehicle to Measurement Board	5920
K	Left Mid Sill Target to Measurement Board	3069
Q	Rear Roof Targets Center (Right) to Measurement Board	2790
M	Right C-Pillar Target to Measurement Board	2368
N	Right Rear Sill Target to Measurement Board	2370
R	Right Mid Sill Target to Measurement Board	3060
S	Front of Vehicle to Measurement Board	5920
A	Vehicle Centerline to Center of Front Roof Targets on Left Side	440
A	Vehicle Centerline to Center of Front Roof Targets on Right Side	440
B	Vehicle Centerline to Left C-Pillar Target	818
B	Vehicle Centerline to Right C-Pillar Target	818
C	Center of Front Roof Targets to Center of Rear Roof Targets on Left Side	600
C	Center of Front Roof Targets to Center of Rear Roof Targets on Right Side	600
G	Left Front Sill Target to Left Mid Sill Target	1295
H	Left Mid Sill Target to Left Rear Sill Target	682
O	Right Mid Sill Target to Right Rear Sill Target	690
P	Right Front Sill Target to Right Mid Sill Target	1290

* Note all measurements are recorded in mm







Fuel System Data

Fuel system info:	
Make/model/body style:	Chevrolet/Silverado/Truck
Fuel system capacity (liters):[1]	90.8
Required Test volume (liters): (91%-94% of usable capacity)	82.6 to 85.4
Actual test volume (liters):	84.4
Test fluid type:	Stoddard
Specific gravity:	0.764
Kinematic viscosity:	0.99 centistoke
Test fluid color:	Purple
Did electric fuel pump operate with ignition switch "on" and the engine not operating?	Yes
Details of fuel system:	Fuel tank is located in front of rear axle and between left frame rail and prop shaft. Filler neck enters on top of tank. Filler cap is located on left front bed side. Fuel lines run along on inside of left frame rail.

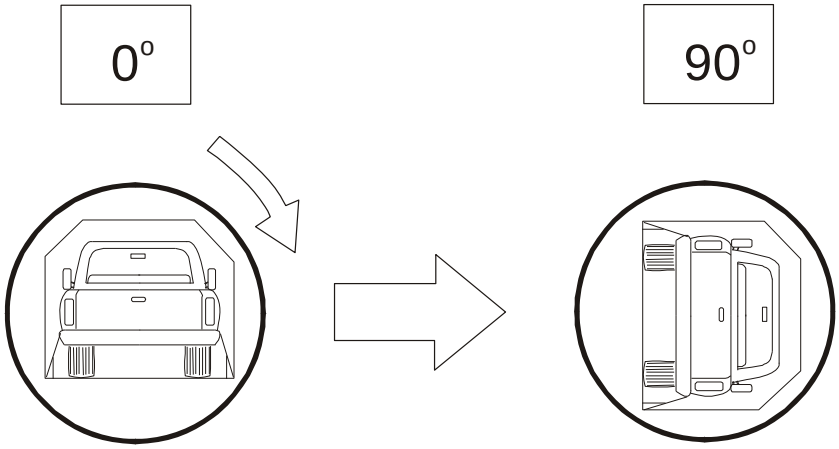
[1] Fuel system capacity was supplied by customer.

FMVSS 301 Post-Impact Test Data

Test Date:		June 17, 2019	
Vehicle:		2019 Chevrolet Silverado	
Test Requirements:		Test vehicle fuel tank filled with 84.4 liters of Stoddard. HIII 50th test dummies located at each front designated seating position.	
Test Vehicle Impact Type:			
X	Frontal (56.73 km/h)		
	Oblique (48 km/h) with barrier face first contacting passenger side		
	Rear moving barrier (81.3 km/h)		
	Lateral rollover (48.5 km/h)		
Fuel System Fluid Spillage Measurements:			
		Test Results	Maximum Allowable Weight
1.	From impact until vehicle motion ceases (g)	0.0	28
2.	5-minute period after vehicle motion ceases (g)	0.0	142
3.	Next 25 minutes after 5-minute period (g/minute)	0.0	28
Fuel System Fluid Spillage Location(s):		None	

FMVSS 301 Test Data

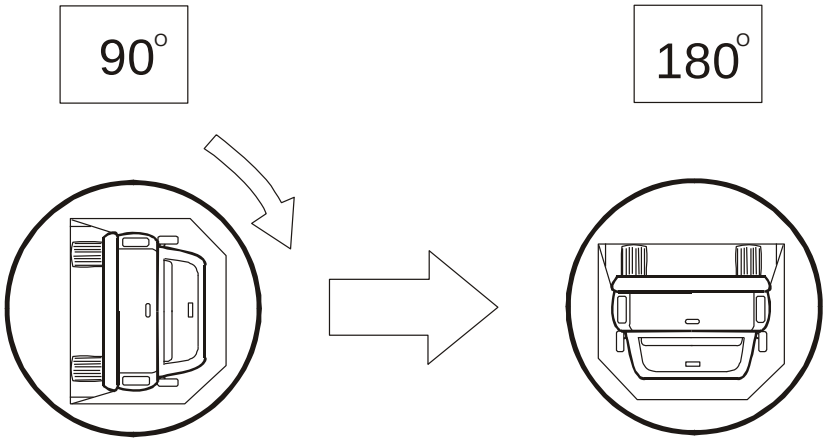
Test phase



Static Rollover Machine Rotation Time Information: (specified range is 1-3 minutes)		
Time required for machine to rotate 90°	2 minutes	0 seconds
FMVSS 301 position hold time	5 minutes	0 seconds
Total	7 minutes	0 seconds
Next whole minute interval	7 minutes	

Fuel System Fluid Spillage Measurements:			
0° to 90° rotation (fuel filler cap down)		Test Results	Maximum Allowable Weight
1.	First five minutes from onset of rotation (g)	0.0	142
2.	Sixth minute from onset of rotation (g)	0.0	28
3.	Seventh minute from onset of rotation (g)	0.0	28
Fuel System Fluid Spillage Location(s):	None		

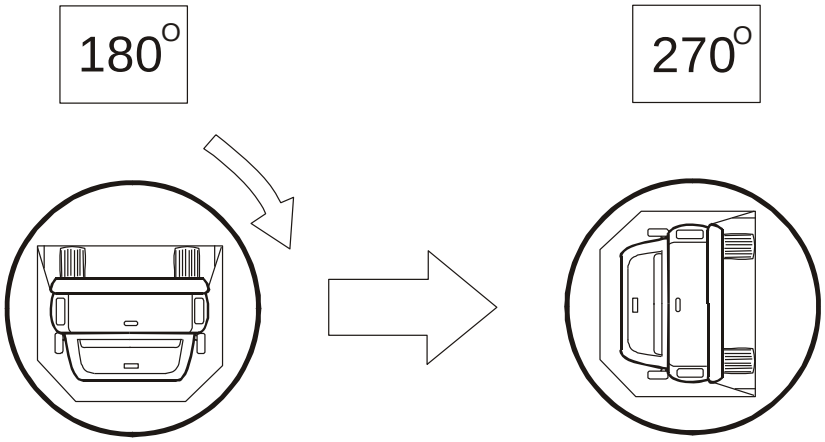
Test phase



Static Rollover Machine Rotation Time Information: (specified range is 1-3 minutes)		
Time required for machine to rotate 90°	2 minutes	0 seconds
FMVSS 301 position hold time	5 minutes	0 seconds
Total	7 minutes	0 seconds
Next whole minute interval	14 minutes	

Fuel System Fluid Spillage Measurements:			
90° to 180° rotation		Test Results	Maximum Allowable Weight
1.	First five minutes from onset of rotation (g)	0.0	142
2.	Sixth minute from onset of rotation (g)	0.0	28
3.	Seventh minute from onset of rotation (g)	0.0	28
Fuel System Fluid Spillage Location(s):	None		

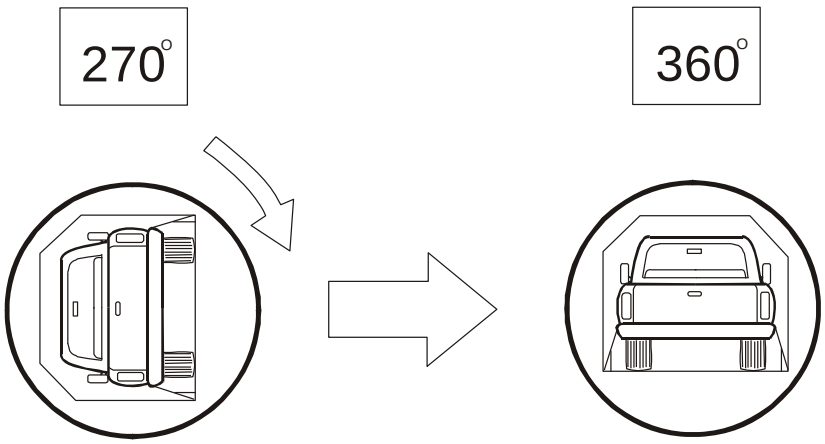
Test phase



Static Rollover Machine Rotation Time Information: (specified range is 1-3 minutes)		
Time required for machine to rotate 90°	2 minutes	0 seconds
FMVSS 301 position hold time	5 minutes	0 seconds
Total	7 minutes	0 seconds
Next whole minute interval	21 minutes	

Fuel System Fluid Spillage Measurements:			
180° to 270° rotation		Test Results	Maximum Allowable Weight
1.	First five minutes from onset of rotation (g)	0.0	142
2.	Sixth minute from onset of rotation (g)	0.0	28
3.	Seventh minute from onset of rotation (g)	0.0	28
Fuel System Fluid Spillage Location(s):	None		

Test phase



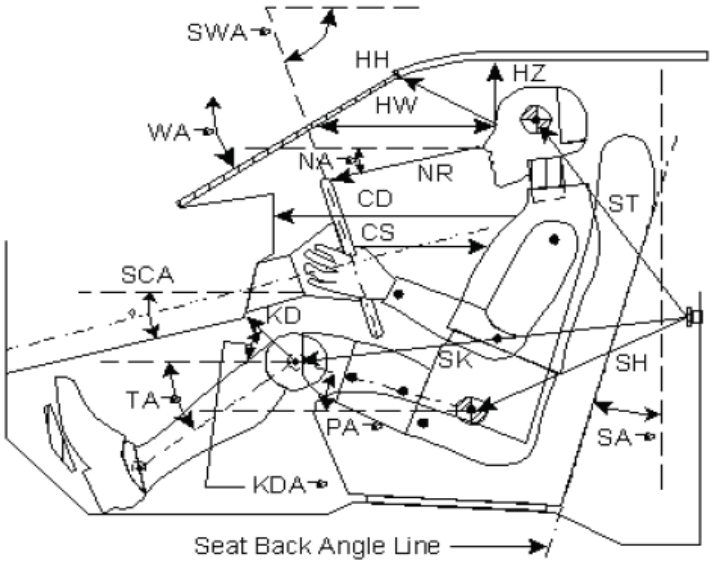
Static Rollover Machine Rotation Time Information: (specified range is 1-3 minutes)		
Time required for machine to rotate 90°	2 minutes	0 seconds
FMVSS 301 position hold time	5 minutes	0 seconds
Total	7 minutes	0 seconds
Next whole minute interval	28 minutes	

Fuel System Fluid Spillage Measurements:			
270° to 360° rotation		Test Results	Maximum Allowable Weight
1.	First five minutes from onset of rotation (g)	0.0	142
2.	Sixth minute from onset of rotation (g)	0.0	28
3.	Seventh minute from onset of rotation (g)	0.0	28
Fuel System Fluid Spillage Location(s):	None		

Section 2.0

Occupant Information

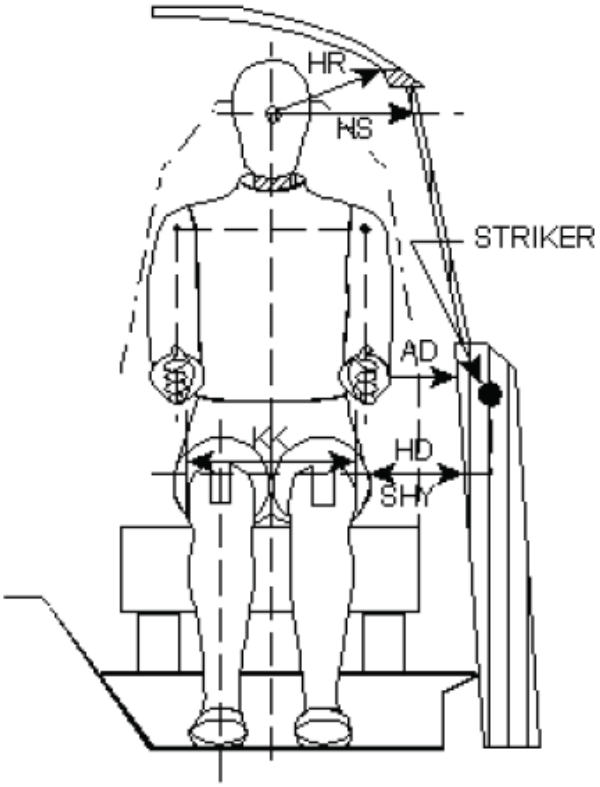
Dummy Longitudinal Clearance Dimensions



Code	Measurement Description	Driver AM50 # 616		Passenger AM50 # 617	
		Length (mm)	Angle(º)	Length (mm)	Angle(º)
WAº	Windshield Angle		34.0		
SWAº	Steering Wheel Angle		67.4		
SCAº	Steering Column Angle		22.6		
SAº	Seat Back Angle (on headrest post)		-10.8		-11.9
HZ	Head to Roof (Z)	261		288	
HH	Head to Header	495		465	
HW	Head to Windshield	771		755	
NR	Nose to Rim	469	10.8		
CD	Chest to Dash	611		582	
CS	Chest to Steering Hub	391			
RA	Rim to Abdomen	255			
KDL	Left Knee to Dash	190	12.6	168	
KDR	Right Knee to Dash	181		174	22.2
PAº	Pelvic Angle		24.2		22.0
TAº	Tibia Angle		57.8		58.1
SK[1]	Striker to Knee	1453	0.4	611	-0.7
ST[1]	Striker to Head	1082	-31.6	572	-79.2
SH	Striker to H-Point	1060	4.7	240	26.8

[1] A negative angle indicates that the measurement point was located above the striker.

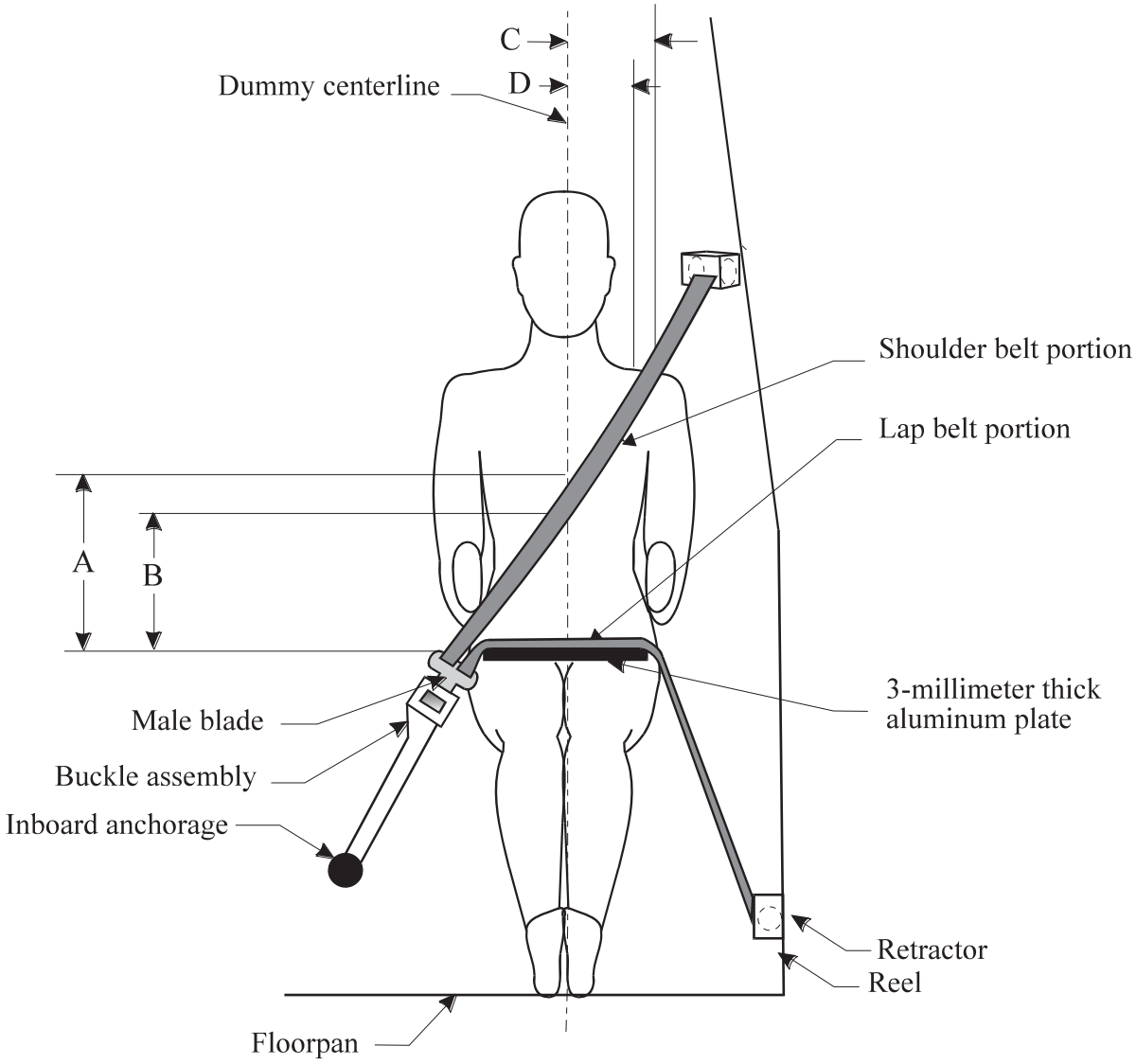
Dummy Lateral Clearance Dimensions



Code	Measurement Description	Driver AM50 # 616	Passenger AM50 # 617
AD	Arm to Door	N/A	57
HD	H-Point to Door	N/A	153
HR	Head to Side Header	210	247
HS	Head to Side Window	341	365
KK	Knee to Knee	321	271
SHY	Striker to H-Point (Y Direction)	N/A	275

* Note all measurements are recorded in mm

Seat Belt Positioning Data



	Measurement Description	Driver	Passenger
A	Top surface of aluminum plate to belt upper edge	331	354
B	Top surface of aluminum plate to belt lower edge	262	260
C	Dummy centerline to outer edge of belt at chest flesh top	133	121
D	Dummy centerline to inner edge of belt at chest flesh top	81	60
E	Dummy centerline to intersection of upper torso belt and lap belt	397	250

* Note all measurements are recorded in mm

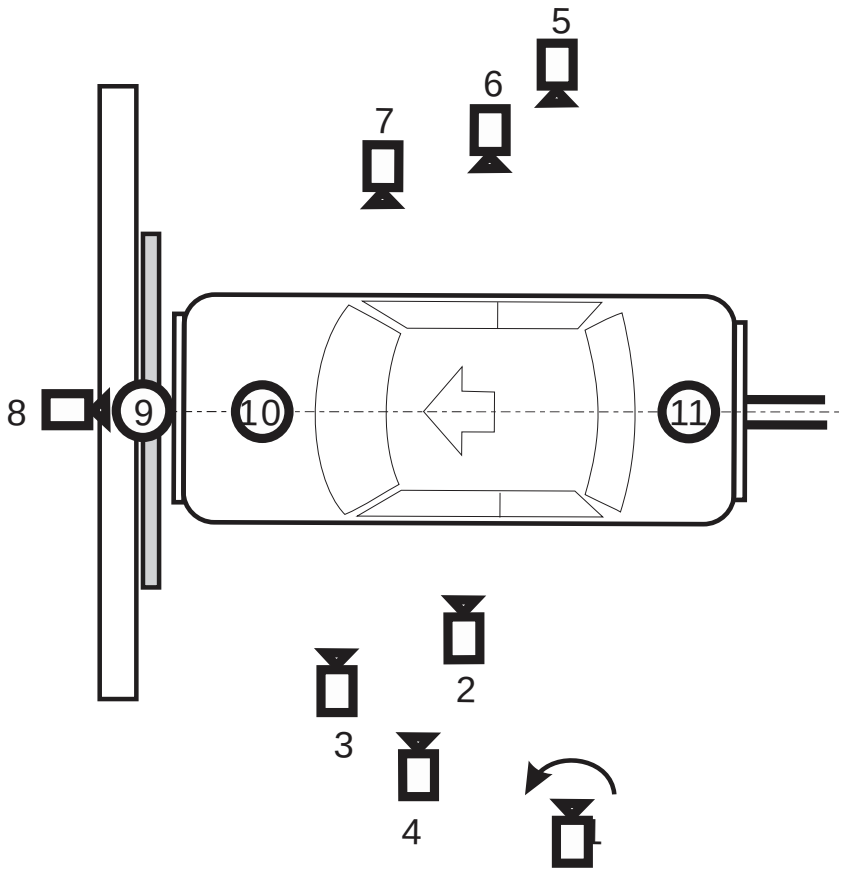
Post-Impact Dummy Data

Visible Dummy Contact Points:		
	Driver	Passenger
Head:	Frontal airbag, Visor and Head rest	Frontal airbag, Side curtain airbag and Head rest
Chest:	Airbag	Airbag
Abdomen:	None	None
Left knee:	Knee bolster	Glove box
Right knee:	Knee bolster	Glove box

Section 3.0

Camera Information

Camera Positions



Camera Information

No.	Location	Type	Lens (mm)	Speed (frames/s)	Purpose of Camera Data
1	Real-time Left Overall	Canon	Zoom	30	Documentary
2	Driver Close-Up	Forza	50	1000	Dummy Kinematics
3	Front Left 3/4 Close-Up	Forza	20	1000	Vehicle Dynamics
4	Left Side Far	Forza	20	1000	Vehicle Dynamics
5	Right Side Far	Forza	20	1000	Vehicle Dynamics
6	Passenger Close-Up	Forza	50	1000	Dummy Kinematics
7	Front Right 3/4 Close-Up	Forza	20	1000	Vehicle Dynamics
8	Windshield	Forza	12.5	1000	Windshield Retention
9	Overhead Front View	Forza	25	1000	Vehicle Crush
10	Pit Front	Forza	25	1000	Vehicle Crush
11	Pit Rear	Forza	12.5	1000	Vehicle Crush

Appendix A

Photographs

List of Photographs

Title	Figure
Pre-Test Front View of Test Vehicle	A-1
Post-Test Front View of Test Vehicle	A-2
Pre-Test Left Front 3-4 View of Test Vehicle	A-3
Post-Test Left Front 3-4 View of Test Vehicle	A-4
Pre-Test Left Side View of Test Vehicle	A-5
Post-Test Left Side View of Test Vehicle	A-6
Pre-Test Left Rear 3-4 View of Test Vehicle	A-7
Post-Test Left Rear 3-4 View of Test Vehicle	A-8
Pre-Test Rear View of Test Vehicle	A-9
Post-Test Rear View of Test Vehicle	A-10
Pre-Test Right Rear 3-4 View of Test Vehicle	A-11
Post-Test Right Rear 3-4 View of Test Vehicle	A-12
Pre-Test Right Side View of Test Vehicle	A-13
Post-Test Right Side View of Test Vehicle	A-14
Pre-Test Right Front 3-4 View of Test Vehicle	A-15
Post-Test Right Front 3-4 View of Test Vehicle	A-16
Pre-Test Windshield View	A-17
Post-Test Windshield View	A-18
Pre-Test Engine Compartment View	A-19
Post-Test Engine Compartment View	A-20
Pre-Test Steering Wheel View	A-21
Post-Test Steering Wheel View	A-22
Pre-Test Steering Column Shear Capsule	A-23
Post-Test Steering Column Shear Capsule – Photo Not Available	A-24
Pre-Test Underhood Steering Shaft and Steering Box	A-25
Post-Test Underhood Steering Shaft and Steering Box	A-26
Pre-Test Steering Column Intersecting Firewall	A-27
Post-Test Steering Column Intersecting Firewall	A-28
Pre-Test Steering Column Intersecting from inside Test Vehicle	A-29
Post-Test Steering Column Intersecting from inside Test Vehicle	A-30

List of Photographs

Title	Figure
Pre-Test Driver Dummy Front View	A-31
Post-Test Driver Dummy Front View	A-32
Pre-Test Driver Dummy Window View	A-33
Post-Test Driver Dummy Window View	A-34
Pre-Test Driver Dummy and Vehicle Interior View	A-35
Post-Test Driver Dummy and Vehicle Interior View	A-36
Pre-Test Driver Dummy Seat Fore-Aft Markings	A-37
Post-Test Driver Dummy Seat Fore-Aft Markings	A-38
Pre-Test Driver Dummy Close-Up View of Seat Back	A-39
Pre-Test Driver Dummy Feet	A-40
Post-Test Driver Dummy Feet	A-41
Pre-Test Driver Dummy Belt Anchorage View	A-42
Post-Test Driver Dummy Belt Anchorage View	A-43
Pre-Test Driver Dummy Floorpan	A-44
Post-Test Driver Dummy Floorpan	A-45
Pre-Test Driver Dummy Knee Bolster	A-46
Post-Test Driver Dummy Knee Bolster	A-47
Post-Test Driver Dummy Contact View 1	A-48
Post-Test Driver Dummy Contact View 2	A-49
Pre-Test Passenger Dummy Front View	A-50
Post-Test Passenger Dummy Front View	A-51
Pre-Test Passenger Dummy Window View	A-52
Post-Test Passenger Dummy Window View	A-53
Pre-Test Passenger Dummy and Vehicle Interior View	A-54
Post-Test Passenger Dummy and Vehicle Interior View	A-55
Pre-Test Passenger Dummy Seat Fore-Aft Markings	A-56
Post-Test Passenger Dummy Seat Fore-Aft Markings	A-57
Pre-Test Passenger Dummy Close-Up View of Seat Back	A-58
Pre-Test Passenger Dummy Feet	A-59
Post-Test Passenger Dummy Feet	A-60

List of Photographs

Title	Figure
Pre-Test Passenger Dummy Belt Anchorage View	A-61
Post-Test Passenger Dummy Belt Anchorage View	A-62
Pre-Test Passenger Dummy Floorpan	A-63
Post-Test Passenger Dummy Floorpan	A-64
Pre-Test Passenger Dummy Knee Bolster	A-65
Post-Test Passenger Dummy Knee Bolster	A-66
Post-Test Passenger Dummy Contact View 1	A-67
Post-Test Passenger Dummy Contact View 2	A-68
Post-Test Passenger Dummy Contact View 3	A-69
Pre-Test Barrier Wall	A-70
Post-Test Barrier Wall	A-71
Post-Test Speed Trap Read-out	A-72
Pre-Test Underbody Front View	A-73
Post-Test Underbody Front View	A-74
Pre-Test Underbody Mid Front View	A-75
Post-Test Underbody Mid Front View	A-76
Pre-Test Underbody Mid View	A-77
Post-Test Underbody Mid View	A-78
Pre-Test Underbody Mid Rear View	A-79
Post-Test Underbody Mid Rear View	A-80
Pre-Test Underbody Rear View	A-81
Post-Test Underbody Rear View	A-82
Pre-Test Fuel Tank View	A-83
Post-Test Fuel Tank View	A-84
Pre-Test Fuel Filler Neck View	A-85
Post-Test Fuel Filler Neck View	A-86
Pre-Test Fuel Filler Cap View	A-87
Post-Test Fuel Filler Cap View	A-88
Pre-Test Ballast View	A-89
Pre-Test Instrumentation View	A-90

List of Photographs

Title	Figure
Vehicle at 0° on Static Rollover Device	A-91
Vehicle at 90° on Static Rollover Device	A-92
Vehicle at 180° on Static Rollover Device	A-93
Vehicle at 270° on Static Rollover Device	A-94
Vehicle at 360° on Static Rollover Device	A-95
Pre-Test Vehicle Certification Label – Photo Not Applicable	A-96
Pre-Test Vehicle Tire Pressure Label – Photo Not Applicable	A-97

Figure A-1 Pre-Test Front View of Test Vehicle

Figure A-2 Post-Test Front View of Test Vehicle

Figure A-3 Pre-Test Left Front 3-4 View of Test Vehicle

Figure A-4 Post-Test Left Front 3-4 View of Test Vehicle

Figure A-5 Pre-Test Left Side View of Test Vehicle

Figure A-6 Post-Test Left Side View of Test Vehicle

Figure A-7 Pre-Test Left Rear 3-4 View of Test Vehicle

Figure A-8 Post-Test Left Rear 3-4 View of Test Vehicle

Figure A-9 Pre-Test Rear View of Test Vehicle

Figure A-10 Post-Test Rear View of Test Vehicle

Figure A-11 Pre-Test Right Rear 3-4 View of Test Vehicle

Figure A-12 Post-Test Right Rear 3-4 View of Test Vehicle

Figure A-13 Pre-Test Right Side View of Test Vehicle

Figure A-14 Post-Test Right Side View of Test Vehicle

Figure A-15 Pre-Test Right Front 3-4 View of Test Vehicle

Figure A-16 Post-Test Right Front 3-4 View of Test Vehicle

Figure A-17 Pre-Test Windshield View

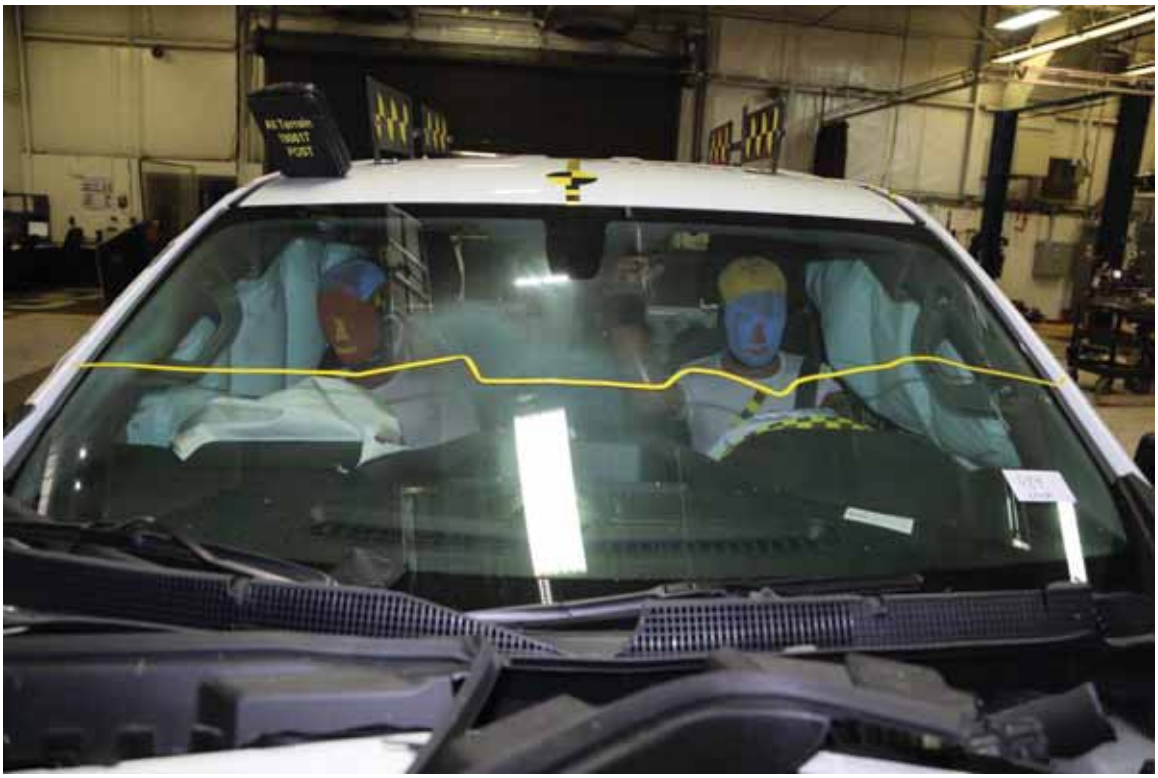


Figure A-18 Post-Test Windshield View

Figure A-19 Pre-Test Engine Compartment View

Figure A-20 Post-Test Engine Compartment View

Figure A-21 Pre-Test Steering Wheel View

Figure A-22 Post-Test Steering Wheel View

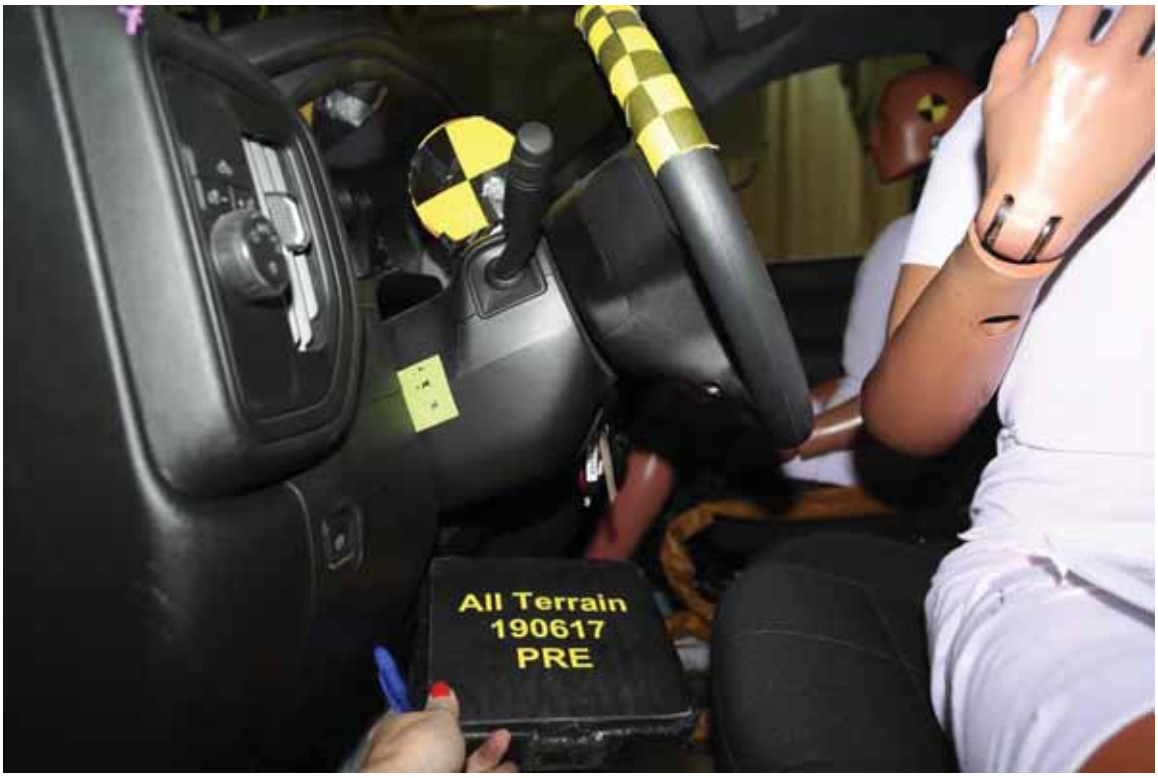


Figure A-23 Pre-Test Steering Column Shear Capsule

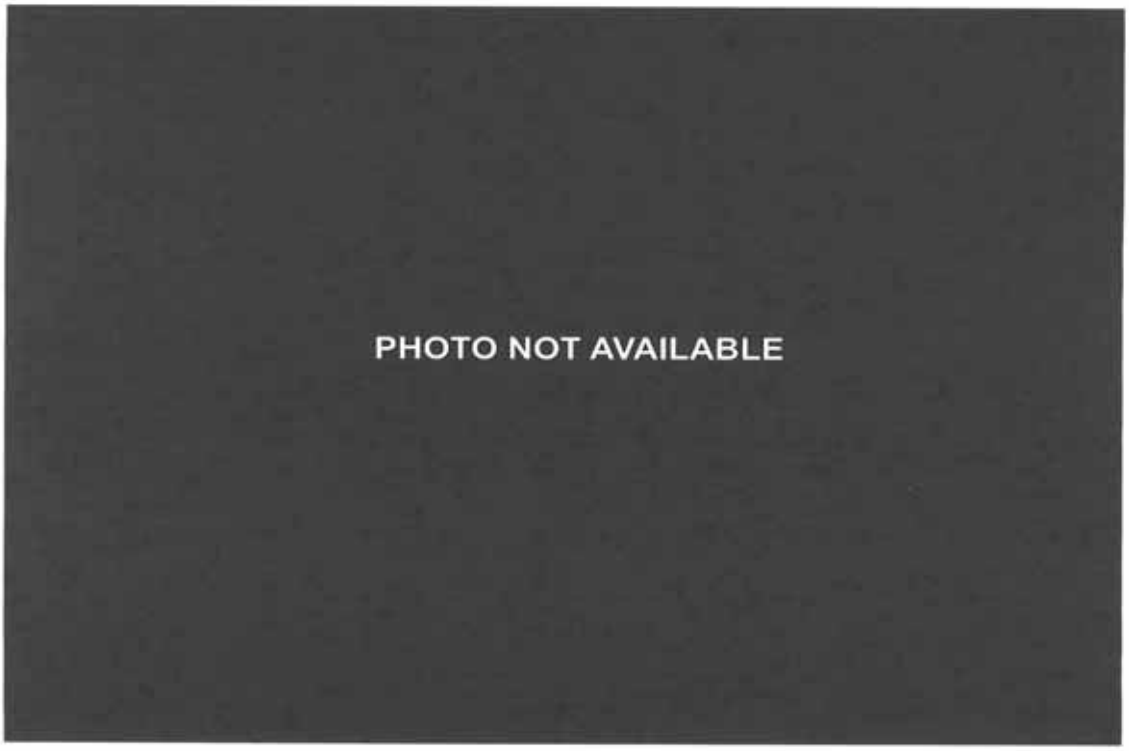


Figure A-24 Post-Test Steering Column Shear Capsule

Figure A-25 Pre-Test Underhood Steering Shaft and Steering Box

Figure A-26 Post-Test Underhood Steering Shaft and Steering Box

Figure A-27 Pre-Test Steering Column Intersecting Firewall

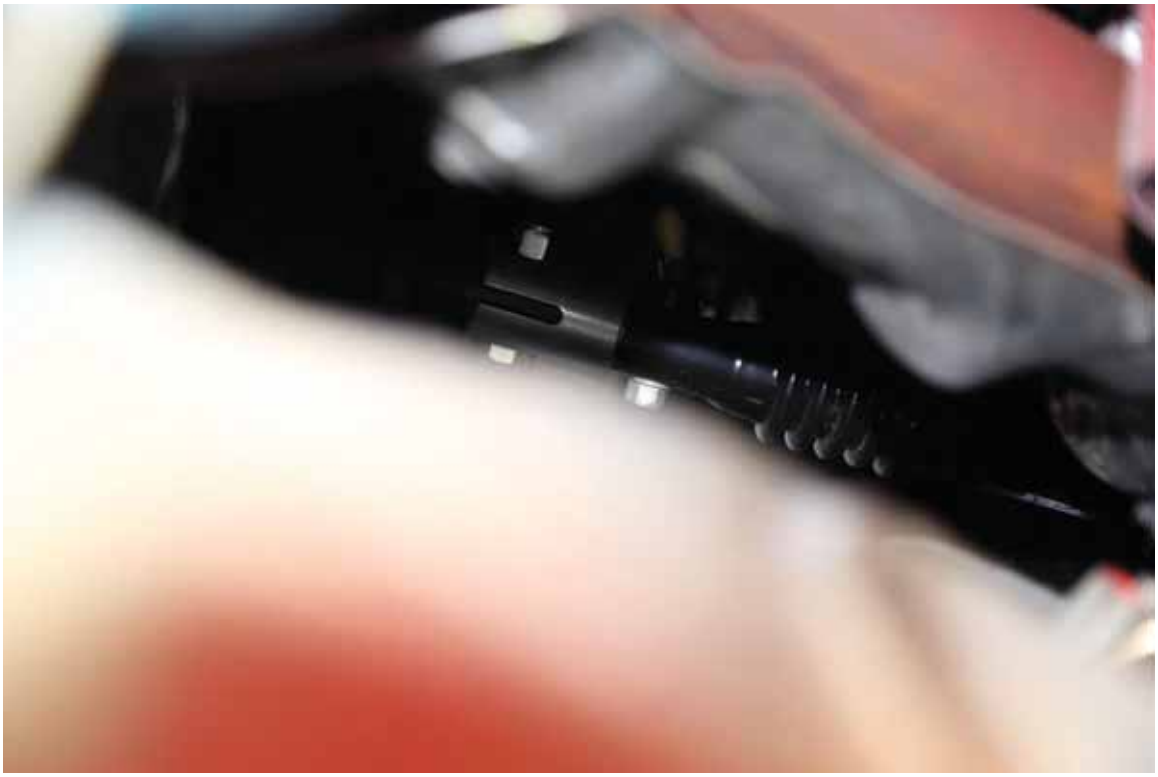


Figure A-28 Post-Test Steering Column Intersecting Firewall

Figure A-29 Pre-Test Steering Column Intersecting from inside Test Vehicle

Figure A-30 Post-Test Steering Column Intersecting from inside Test Vehicle

Figure A-31 Pre-Test Driver Dummy Front View

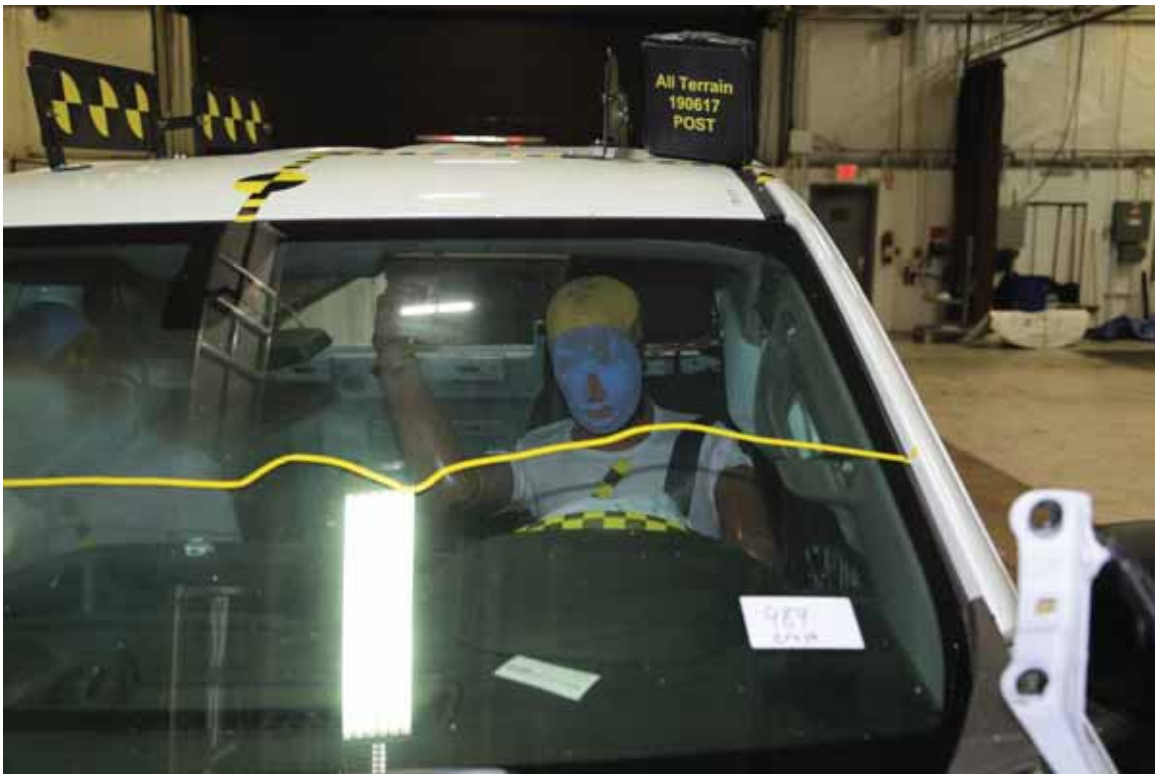


Figure A-32 Post-Test Driver Dummy Front View

Figure A-33 Pre-Test Driver Dummy Window View

Figure A-34 Post-Test Driver Dummy Window View

Figure A-35 Pre-Test Driver Dummy and Vehicle Interior View

Figure A-36 Post-Test Driver Dummy and Vehicle Interior View

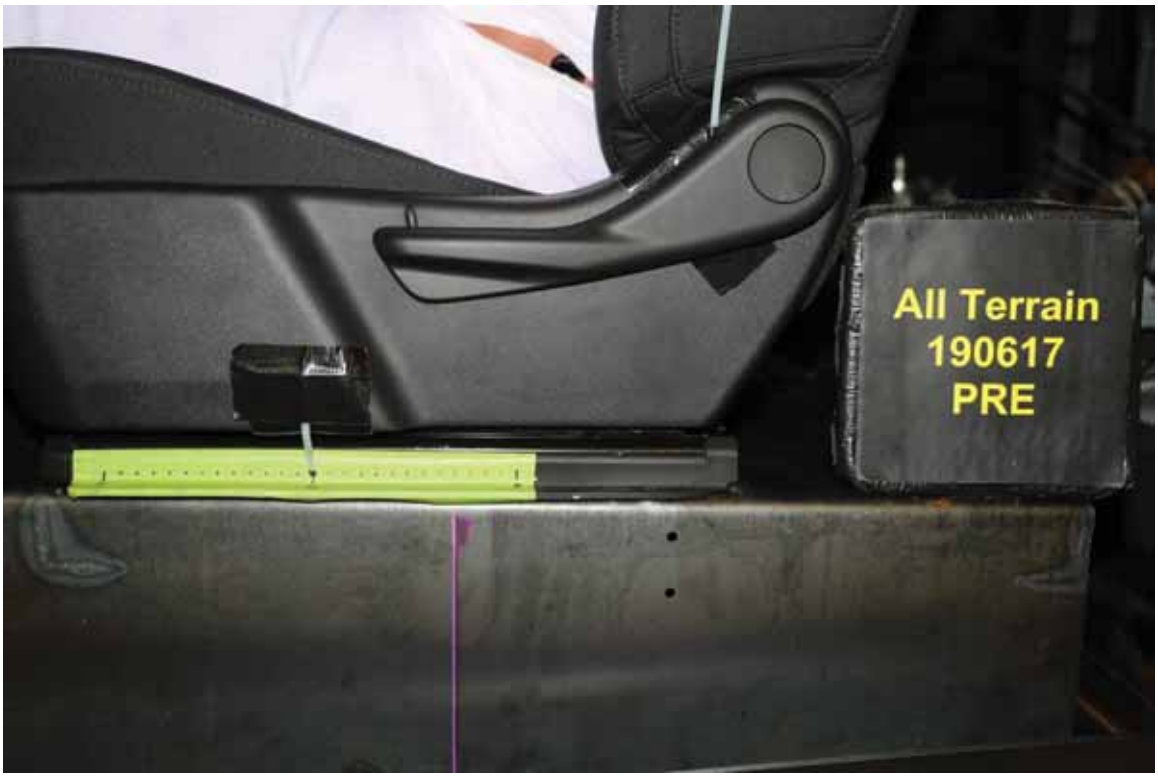


Figure A-37 Pre-Test Driver Dummy Seat Fore-Aft Markings

Figure A-38 Post-Test Driver Dummy Seat Fore-Aft Markings

Figure A-39 Pre-Test Driver Dummy Close-Up View of Seat Back

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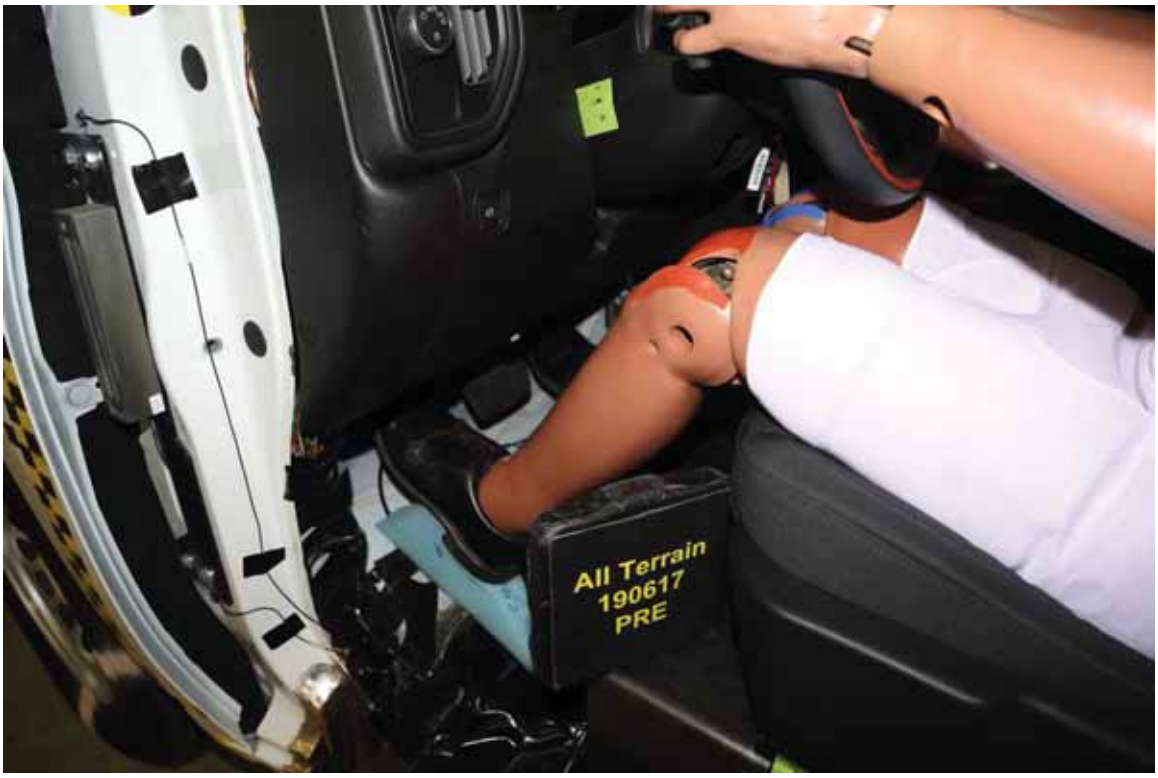


Figure A-40 Pre-Test Driver Dummy Feet

Figure A-41 Post-Test Driver Dummy Feet

Figure A-42 Pre-Test Driver Dummy Belt Anchorage View

Figure A-43 Post-Test Driver Dummy Belt Anchorage View

Figure A-44 Pre-Test Driver Dummy Floorpan

Figure A-45 Post-Test Driver Dummy Floorpan

Figure A-46 Pre-Test Driver Dummy Knee Bolster

Figure A-47 Post-Test Driver Dummy Knee Bolster

Figure A-48 Post-Test Driver Dummy Contact View 1

Figure A-49 Post-Test Driver Dummy Contact View 2

Figure A-50 Pre-Test Passenger Dummy Front View

Figure A-51 Post-Test Passenger Dummy Front View

Figure A-52 Pre-Test Passenger Dummy Window View

Figure A-53 Post-Test Passenger Dummy Window View

Figure A-54 Pre-Test Passenger Dummy and Vehicle Interior View

Figure A-55 Post-Test Passenger Dummy and Vehicle Interior View

Figure A-56 Pre-Test Passenger Dummy Seat Fore-Aft Markings

Figure A-57 Post-Test Passenger Dummy Seat Fore-Aft Markings

Figure A-58 Pre-Test Passenger Dummy Close-Up View of Seat Back

INTENTIONALLY LEFT BLANK

Figure A-59 Pre-Test Passenger Dummy Feet

Figure A-60 Post-Test Passenger Dummy Feet

Figure A-61 Pre-Test Passenger Dummy Belt Anchorage View

Figure A-62 Post-Test Passenger Dummy Belt Anchorage View

Figure A-63 Pre-Test Passenger Dummy Floorpan

Figure A-64 Post-Test Passenger Dummy Floorpan

Figure A-65 Pre-Test Passenger Dummy Knee Bolster

Figure A-66 Post-Test Passenger Dummy Knee Bolster

Figure A-67 Post-Test Passenger Dummy Contact View 1

Figure A-68 Post-Test Passenger Dummy Contact View 2

Figure A-69 Post-Test Passenger Dummy Contact View 3

INTENTIONALLY LEFT BLANK

Figure A-70 Pre-Test Barrier Wall

Figure A-71 Post-Test Barrier Wall

Figure A-72 Post-Test Speed Trap Read-out

INTENTIONALLY LEFT BLANK

Figure A-73 Pre-Test Underbody Front View

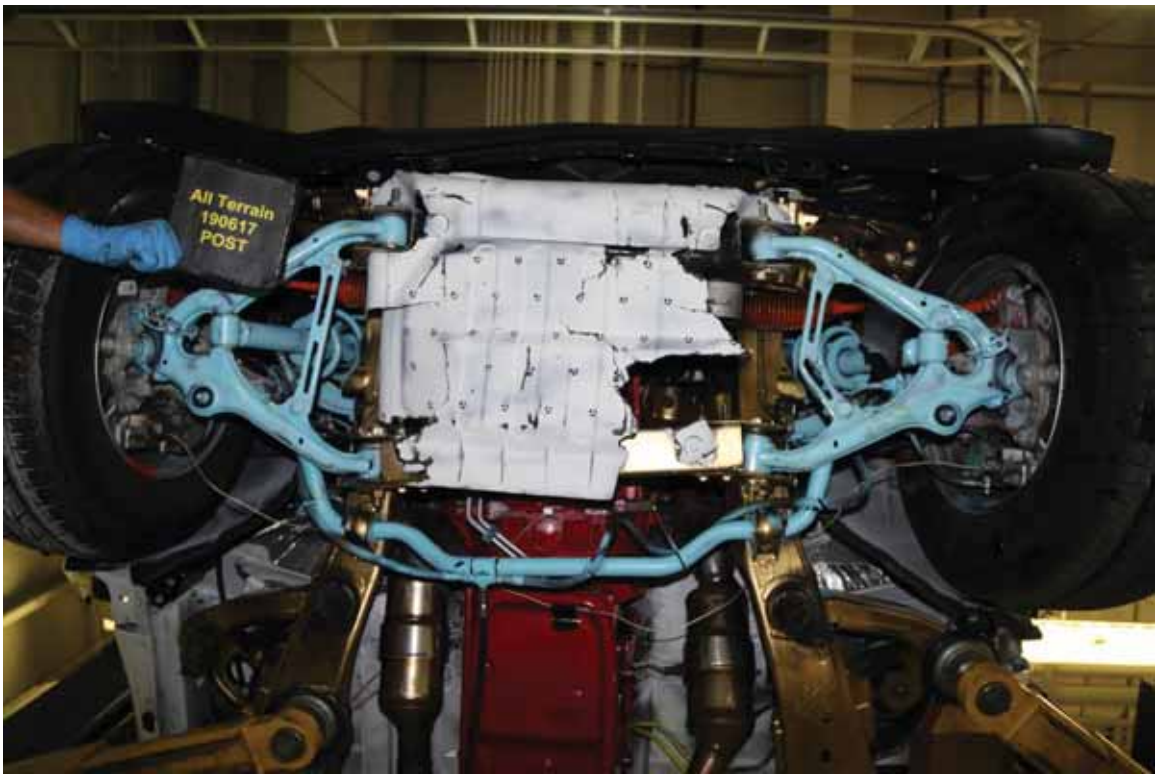


Figure A-74 Post-Test Underbody Front View

Figure A-75 Pre-Test Underbody Mid Front View

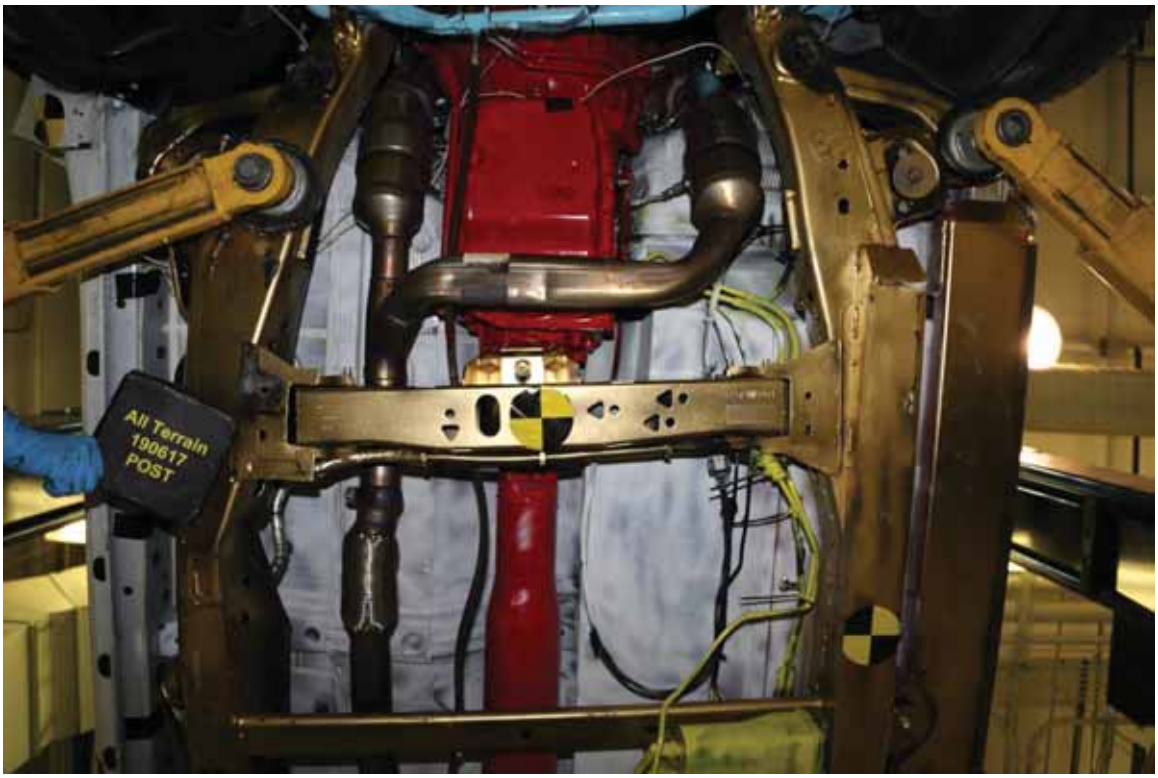


Figure A-76 Post-Test Underbody Mid Front View

Figure A-77 Pre-Test Underbody Mid View

Figure A-78 Post-Test Underbody Mid View

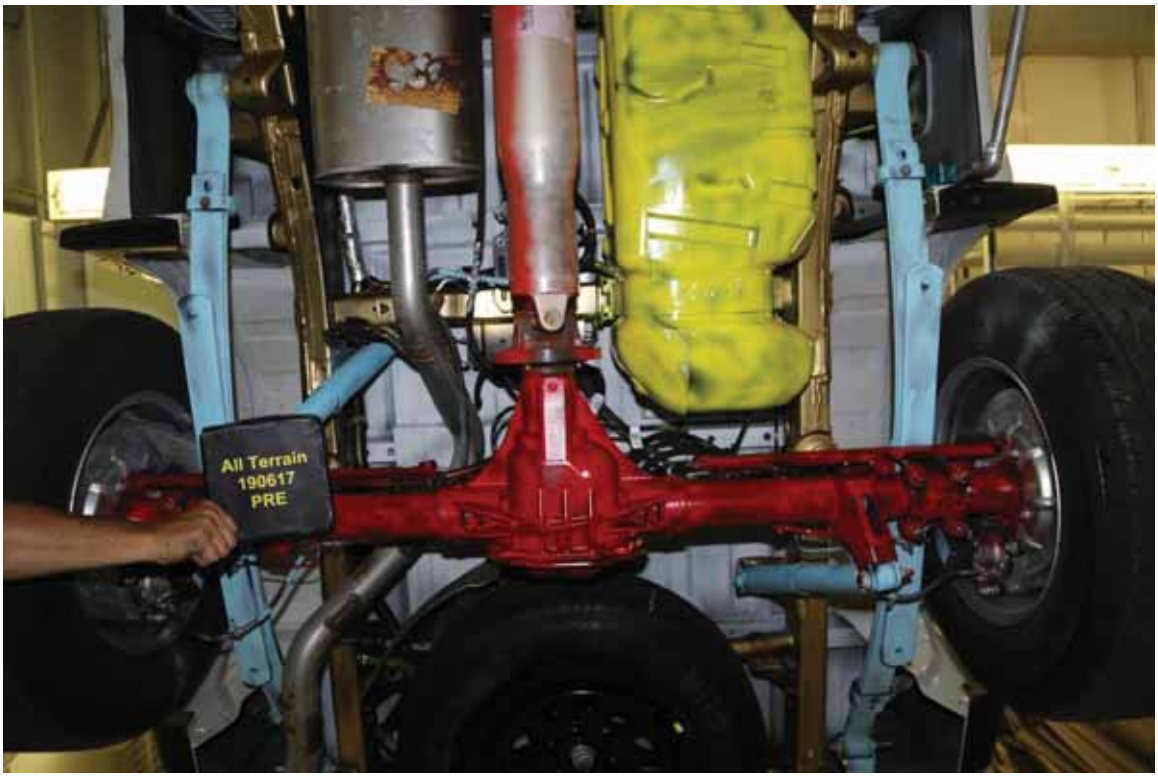


Figure A-79 Pre-Test Underbody Mid Rear View

Figure A-80 Post-Test Underbody Mid Rear View

Figure A-81 Pre-Test Underbody Rear View

Figure A-82 Post-Test Underbody Rear View

Figure A-83 Pre-Test Fuel Tank View

Figure A-84 Post-Test Fuel Tank View

Figure A-85 Pre-Test Fuel Filler Neck View

Figure A-86 Post-Test Fuel Filler Neck View

Figure A-87 Pre-Test Fuel Filler Cap View

Figure A-88 Post-Test Fuel Filler Cap View

Figure A-89 Pre-Test Ballast View

Figure A-90 Pre-Test Instrumentation View

Figure A-91 Vehicle at 0° on Static Rollover Device

Figure A-92 Vehicle at 90° on Static Rollover Device

Figure A-93 Vehicle at 180° on Static Rollover Device

Figure A-94 Vehicle at 270° on Static Rollover Device

Figure A-95 Vehicle at 360° on Static Rollover Device

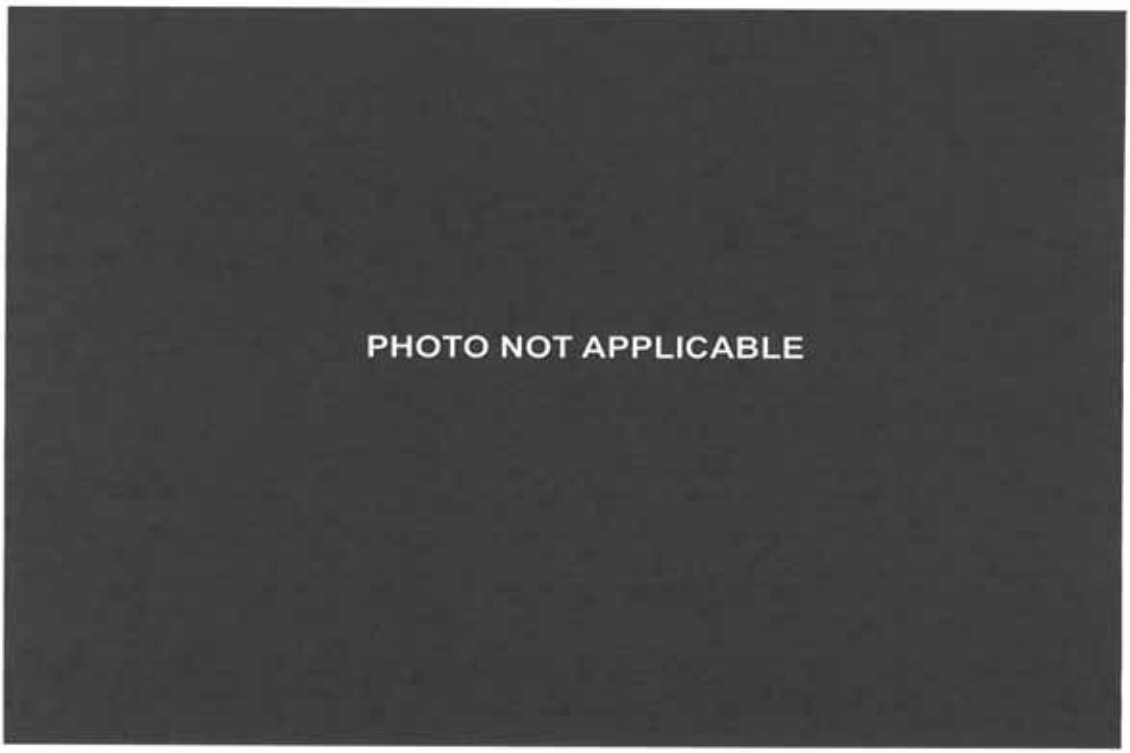


Figure A-96 Certification Label

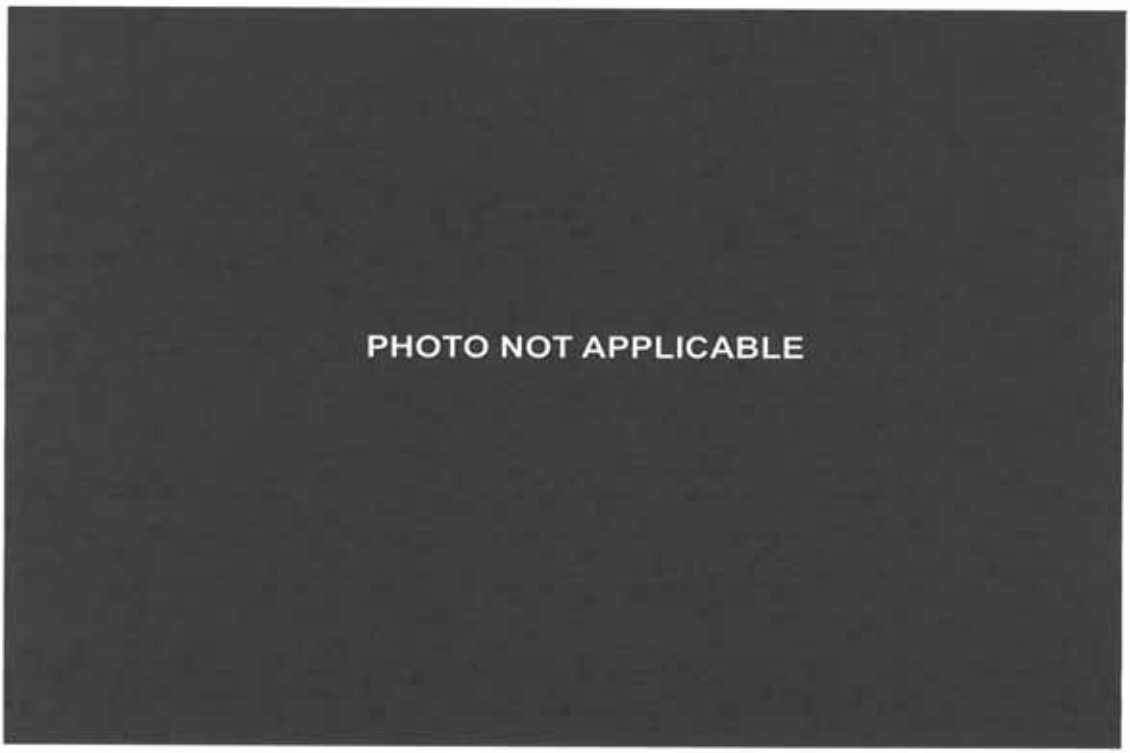


Figure A-97 Tire Placard

Appendix B

Data Plots

All Terrain Conversions FMVSS 208 Flat Frontal

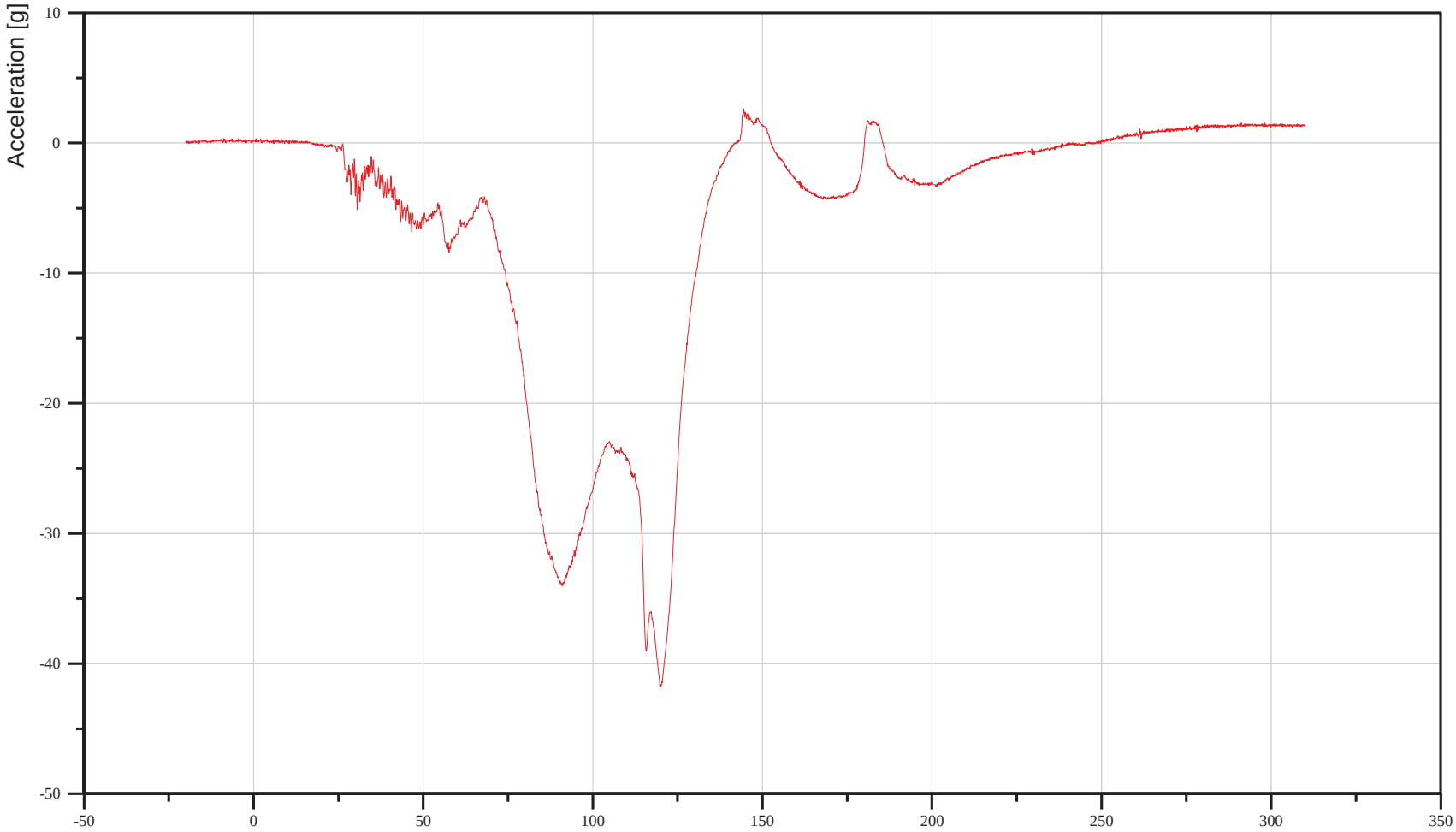
Head Accel X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11HEADCG00H3ACXA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-41.78 g at 119.84 ms

Max. Value
2.65 g at 144.48 ms

All Terrain Conversions FMVSS 208 Flat Frontal

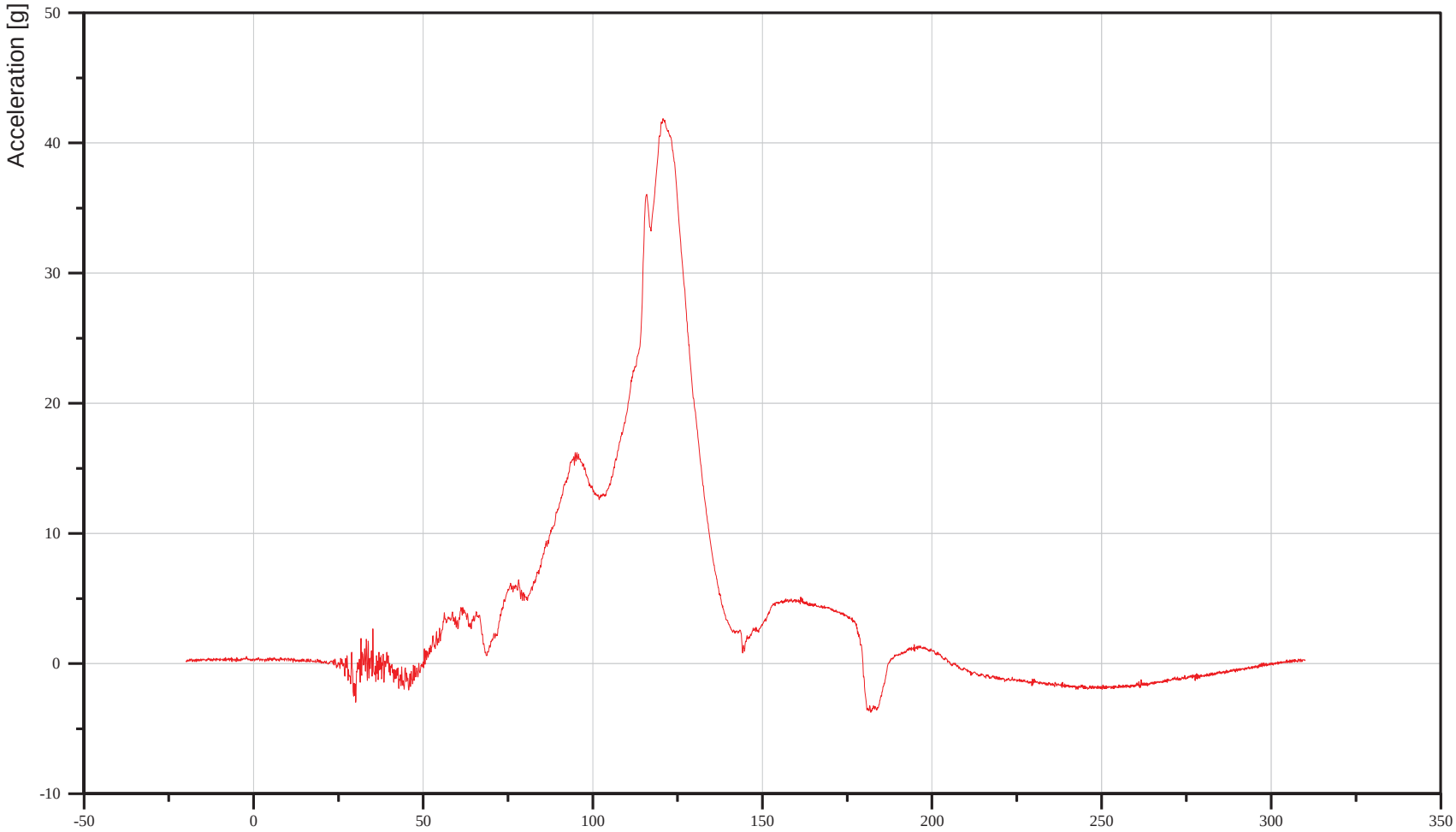
Head Accel Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11HEADCG00H3ACYA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-3.75 g at 181.92 ms

Max. Value
41.89 g at 120.72 ms

All Terrain Conversions FMVSS 208 Flat Frontal

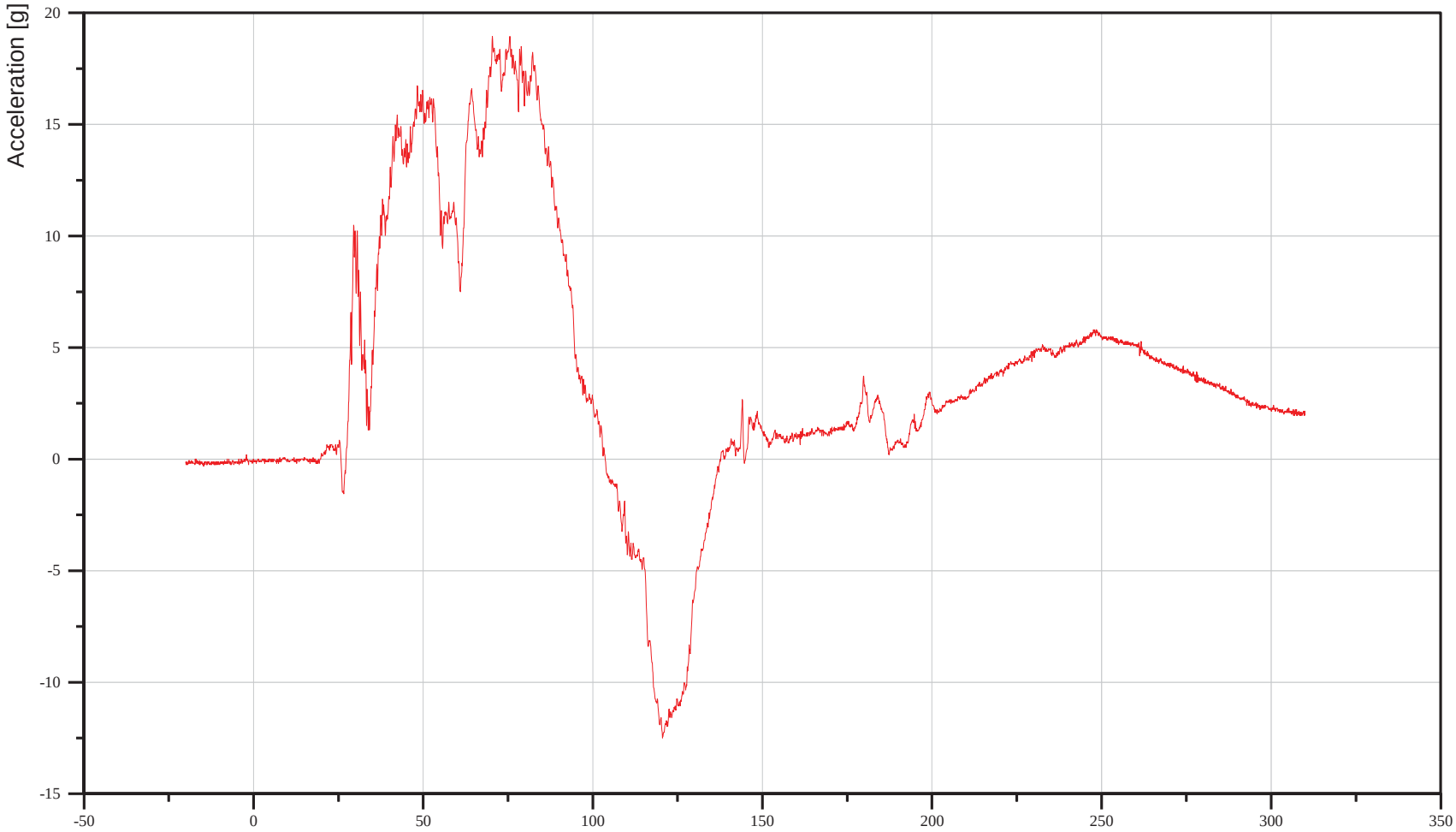
Head Accel Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11HEADCG00H3ACZA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-12.49 g at 120.56 ms

Max. Value
18.95 g at 70.40 ms

All Terrain Conversions FMVSS 208 Flat Frontal

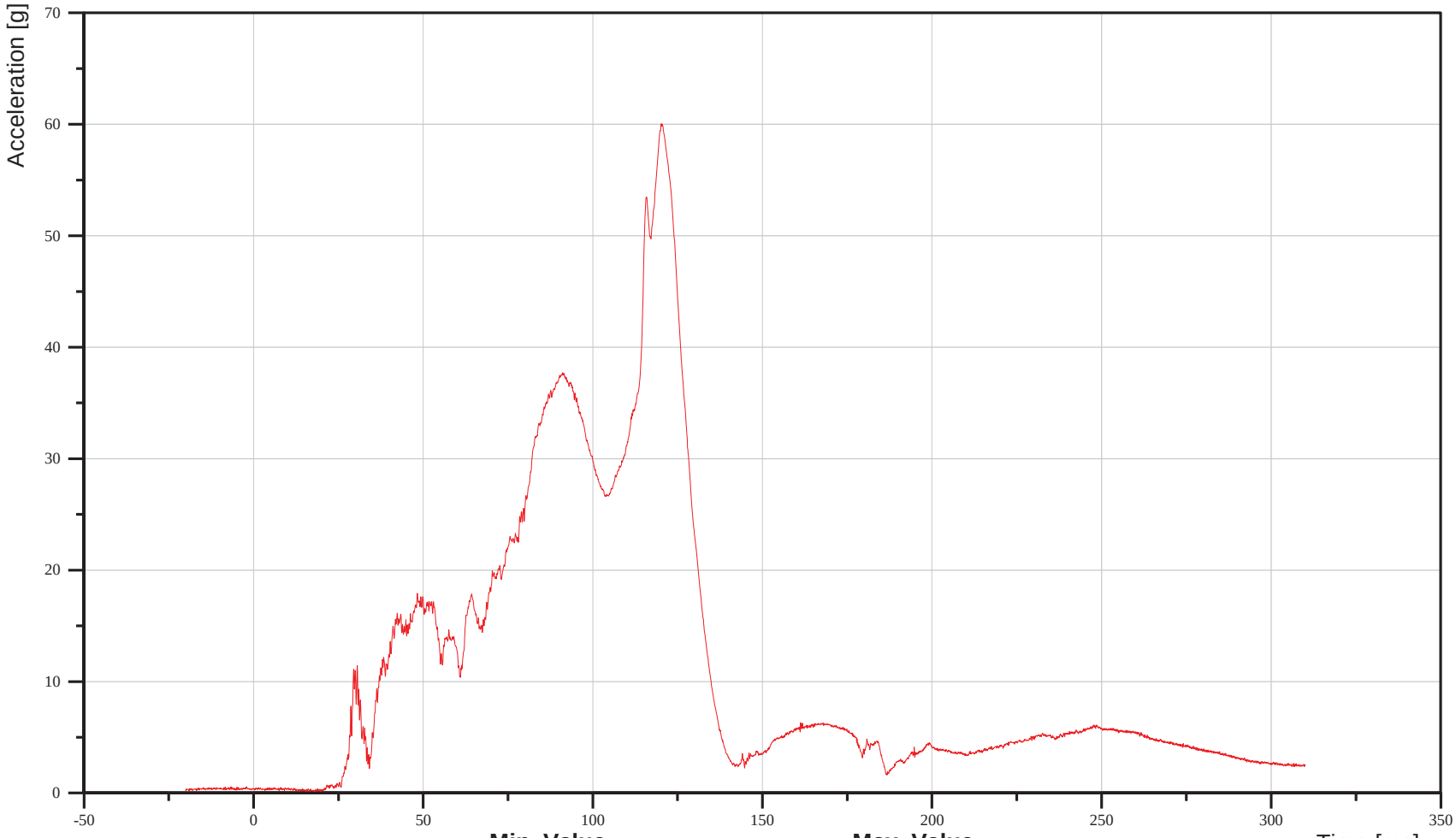
Head Accel Resultant

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11HEADCG00H3ACRA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
0.10 g at 19.76 ms

Max. Value
60.05 g at 120.16 ms

All Terrain Conversions FMVSS 208 Flat Frontal

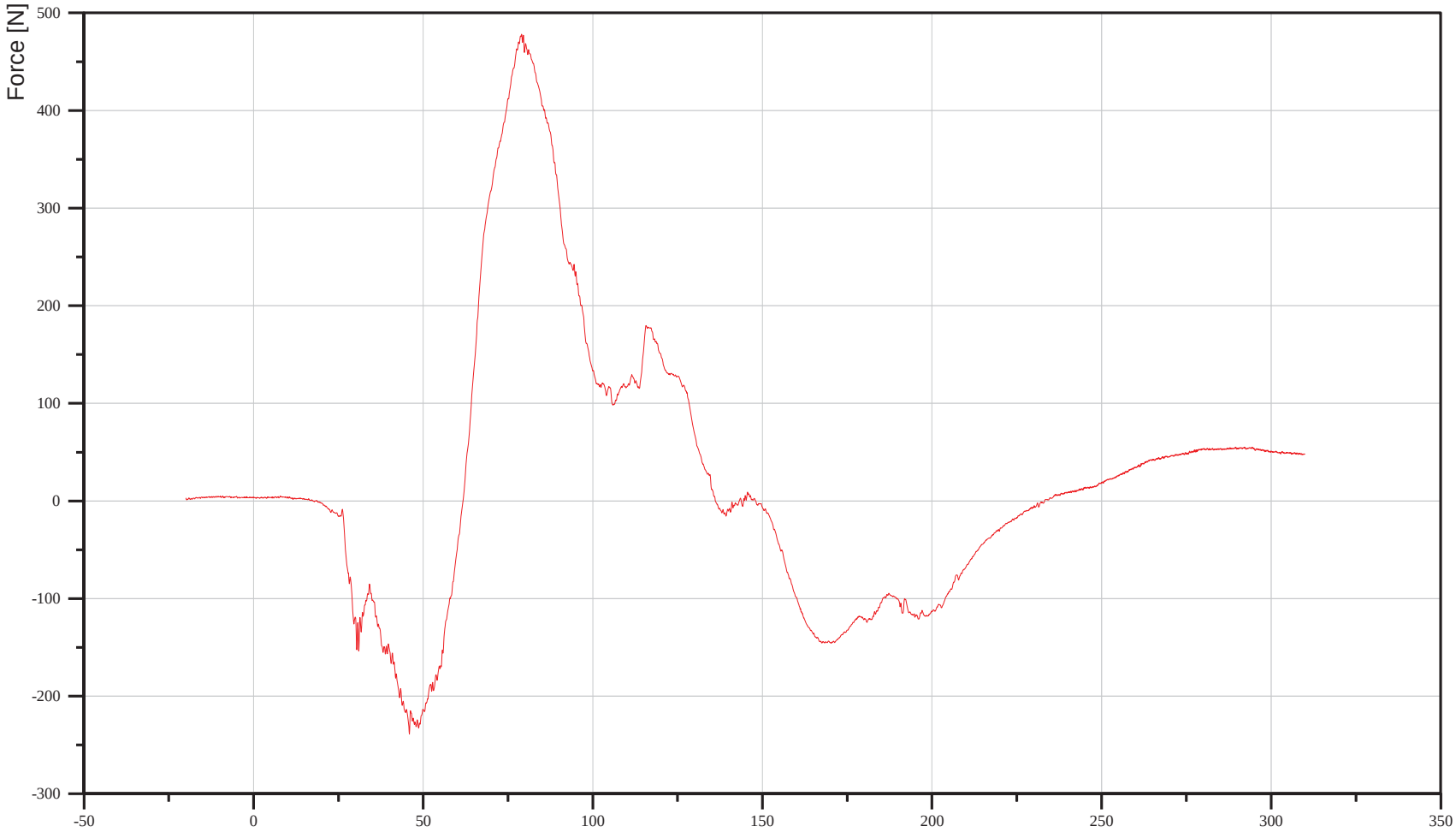
Neck Force X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3FOXA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-238.70 N at 45.92 ms

Max. Value
478.18 N at 78.96 ms

All Terrain Conversions FMVSS 208 Flat Frontal

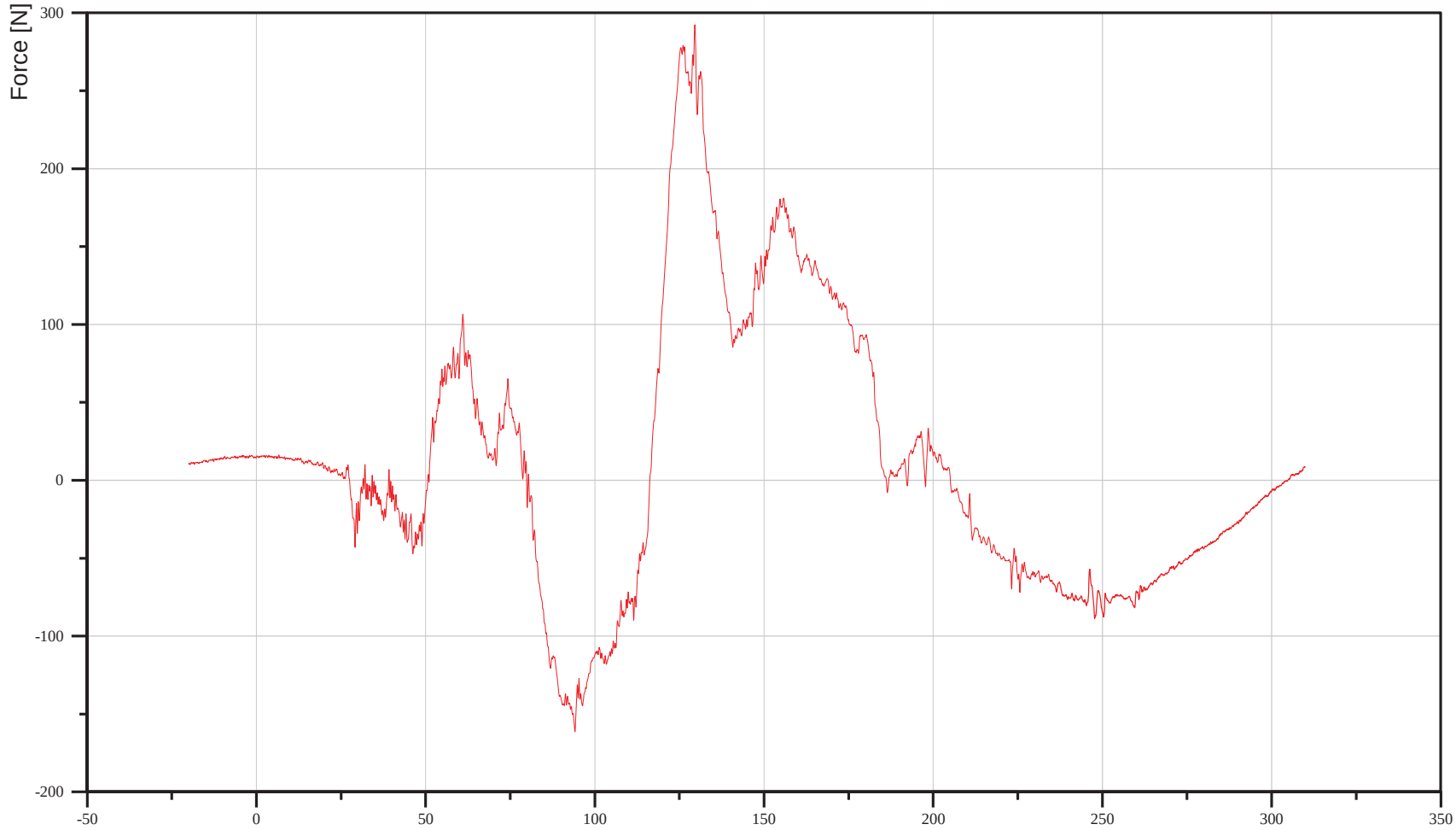
Neck Force Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3FOYA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-161.43 N at 94.08 ms

Max. Value
292.38 N at 129.60 ms

All Terrain Conversions FMVSS 208 Flat Frontal

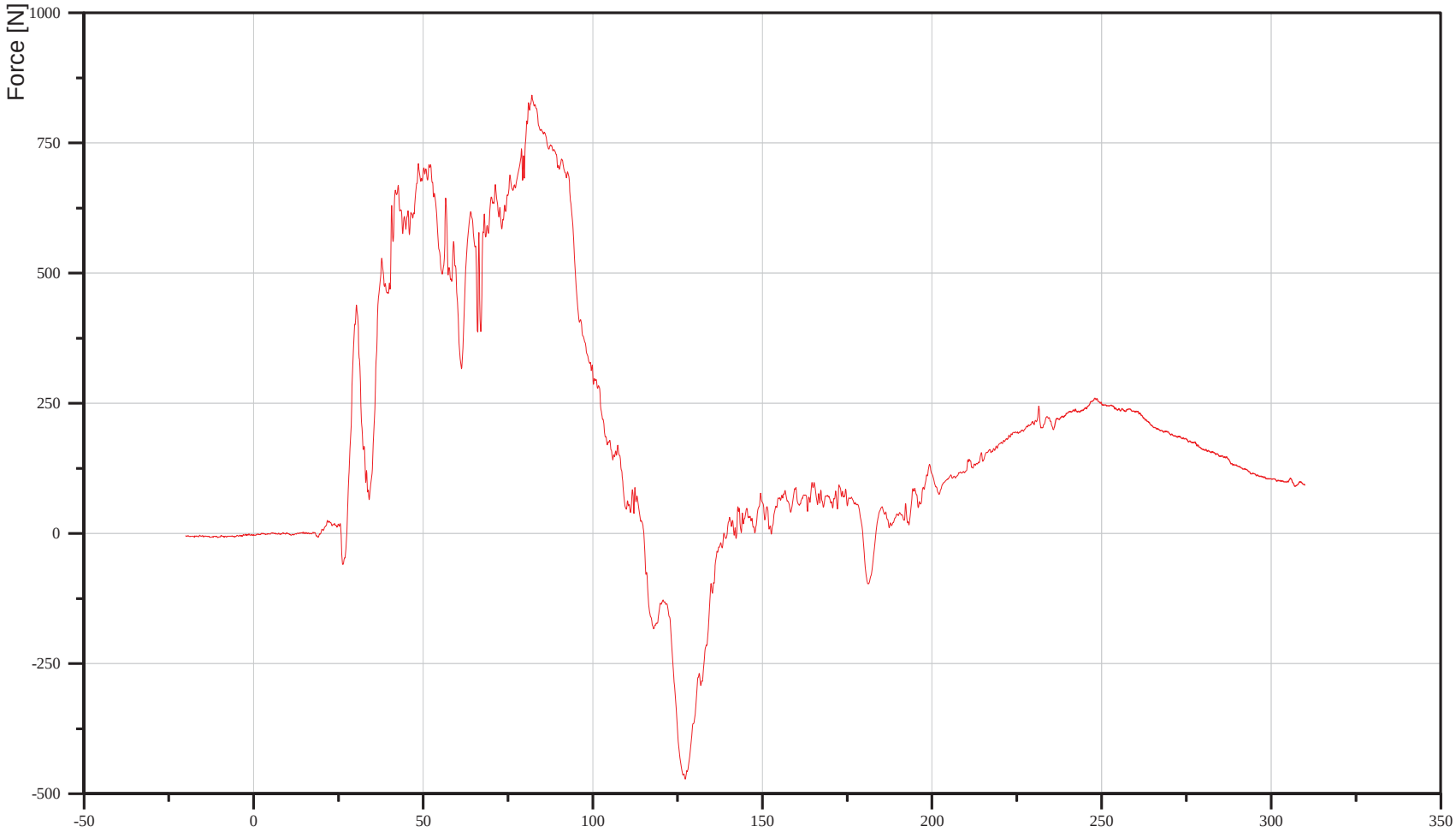
Neck Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3FOZA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-471.96 N at 127.20 ms

Max. Value
842.05 N at 82.00 ms

All Terrain Conversions FMVSS 208 Flat Frontal

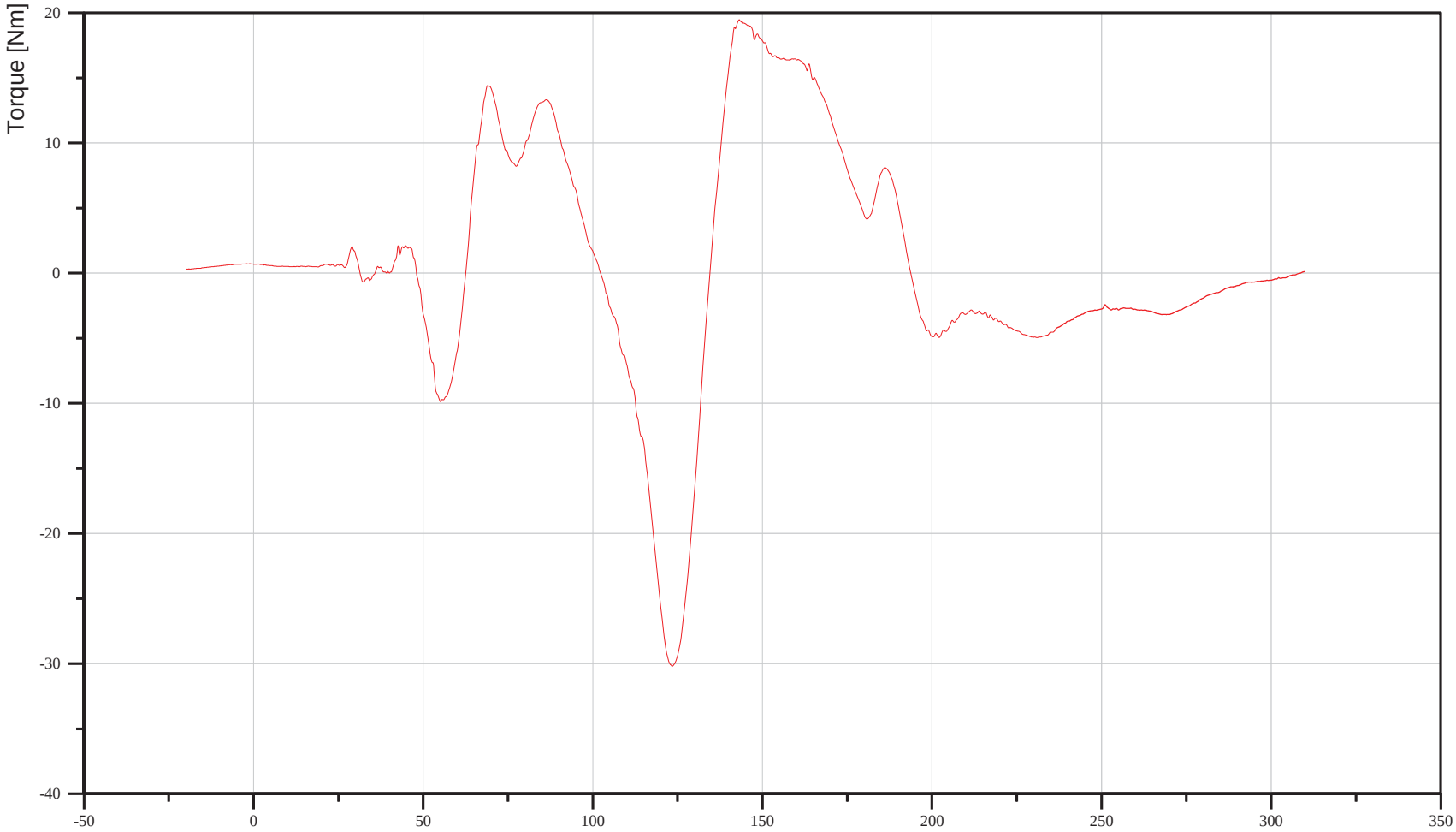
Neck Moment X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3MOXB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-30.19 Nm at 123.44 ms

Max. Value
19.48 Nm at 143.12 ms

All Terrain Conversions FMVSS 208 Flat Frontal

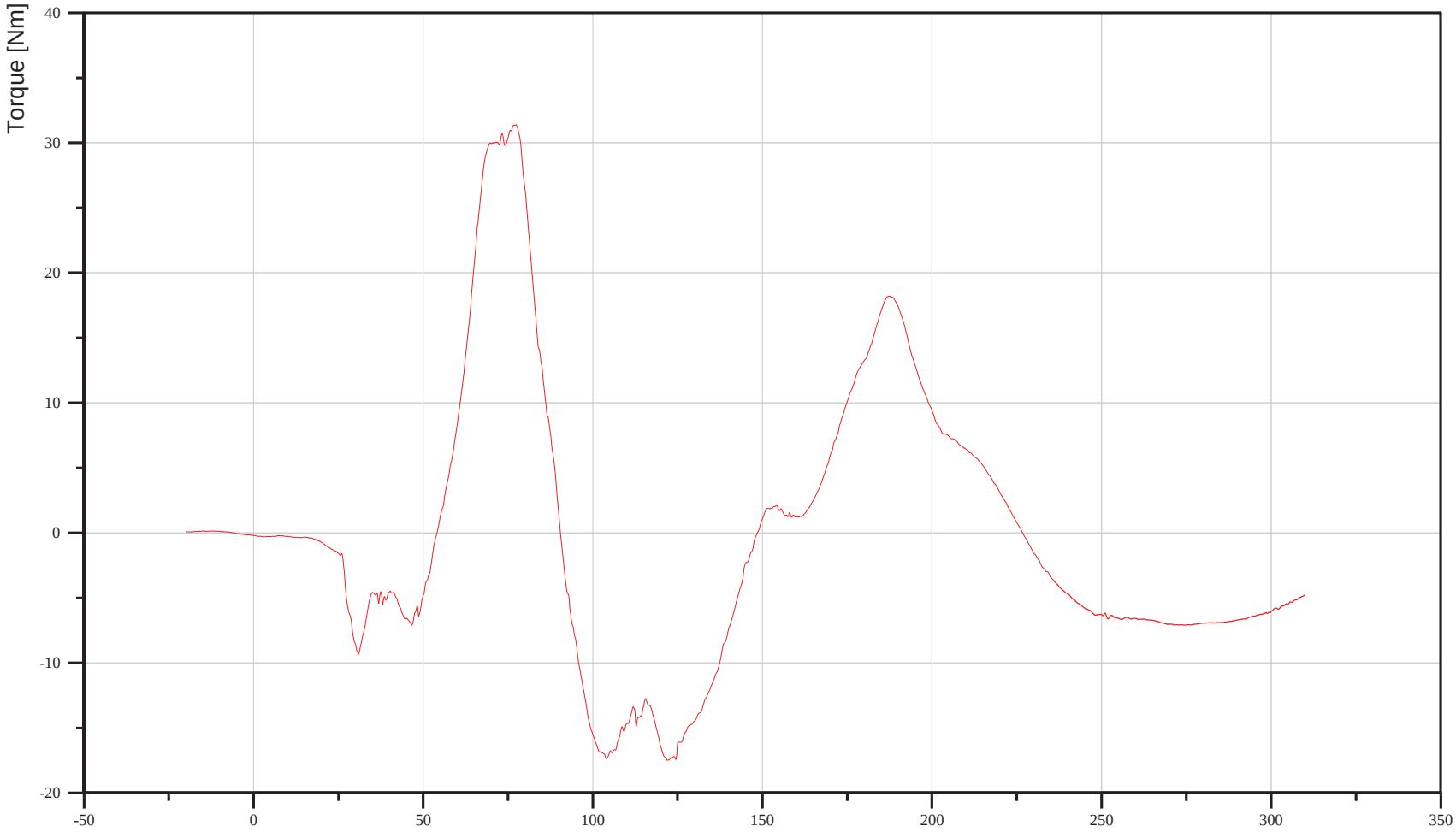
Neck Moment Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3MOYB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-17.48 Nm at 122.16 ms

Max. Value
31.39 Nm at 77.36 ms

All Terrain Conversions FMVSS 208 Flat Frontal

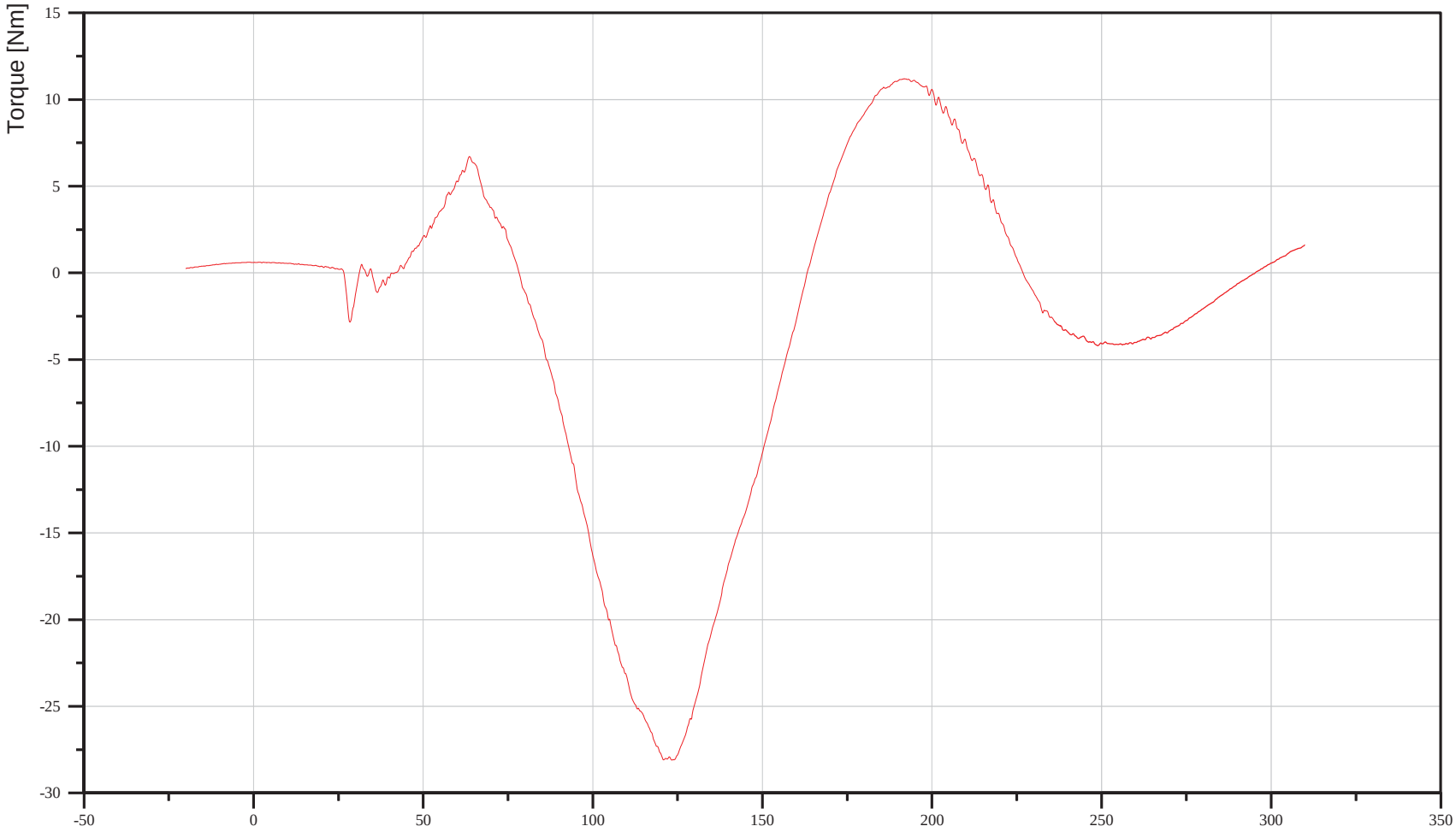
Neck Moment Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11NECKUP00H3MOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-28.10 Nm at 123.36 ms

Max. Value
11.20 Nm at 191.76 ms

All Terrain Conversions FMVSS 208 Flat Frontal

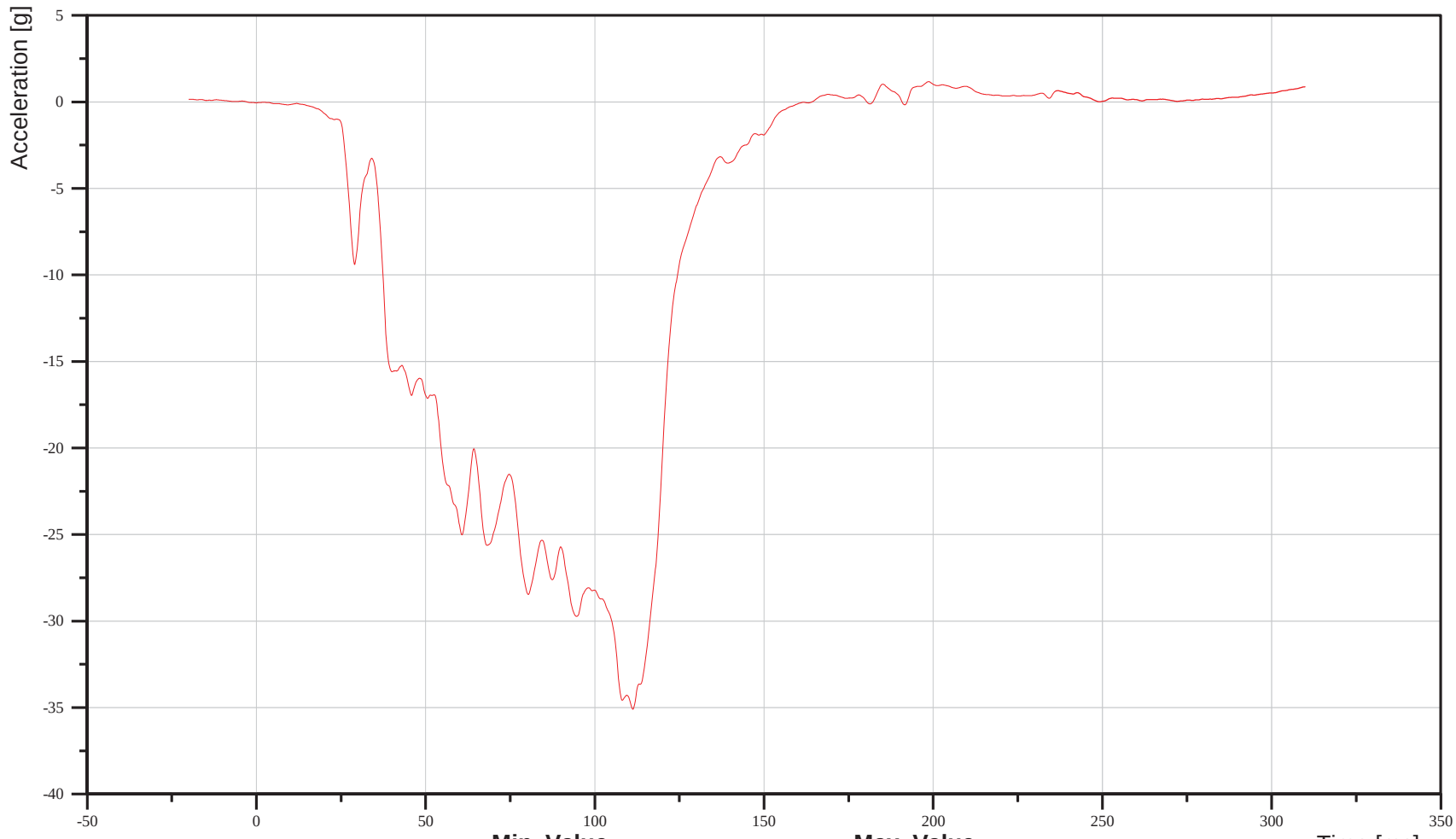
Chest Accel X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11CHSTCG00H3ACXC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-35.09 g at 111.28 ms

Max. Value
1.17 g at 198.64 ms

All Terrain Conversions FMVSS 208 Flat Frontal

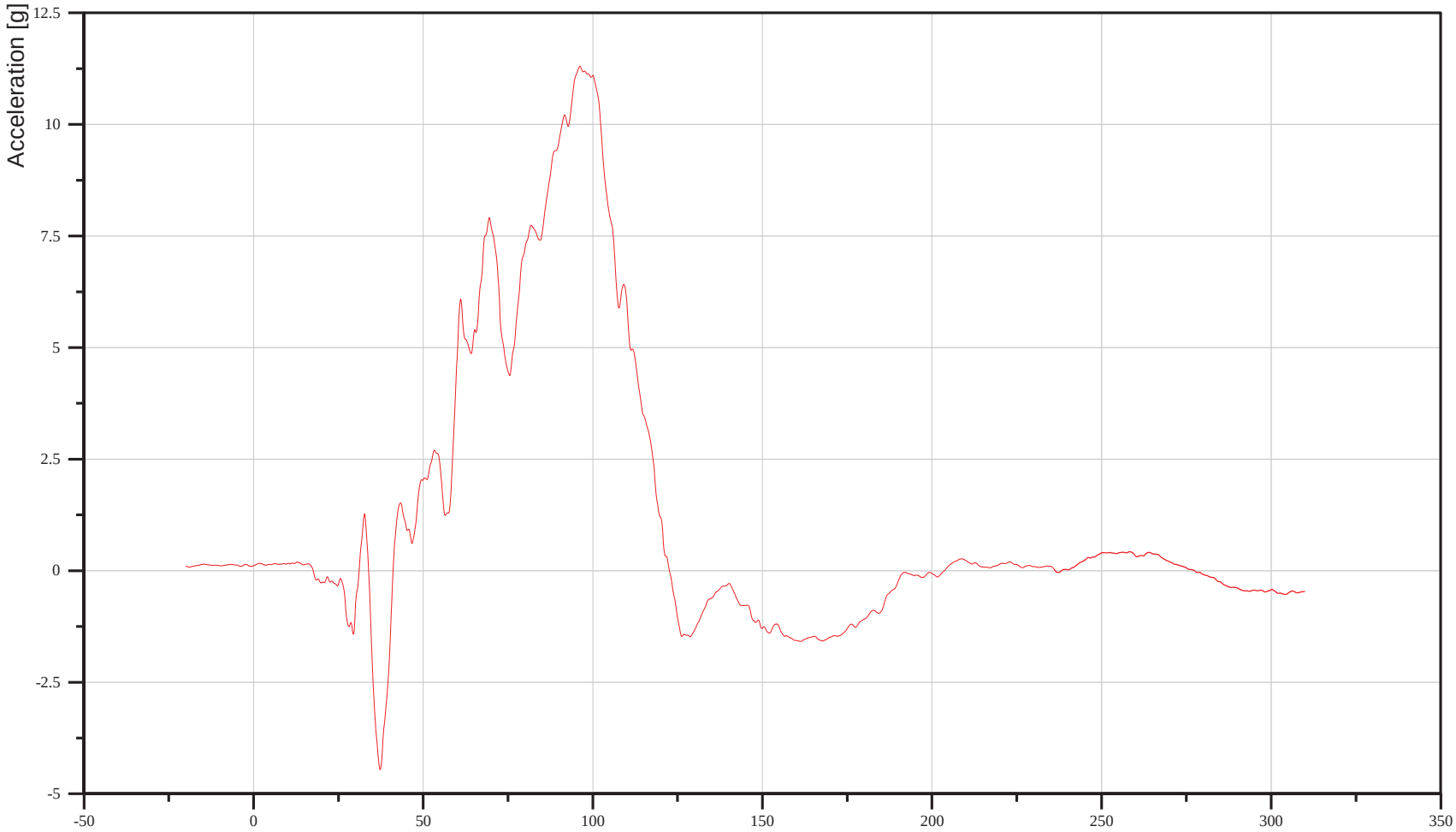
Chest Accel Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11CHSTCG00H3ACYC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-4.46 g at 37.36 ms

Max. Value
11.31 g at 96.24 ms

All Terrain Conversions FMVSS 208 Flat Frontal

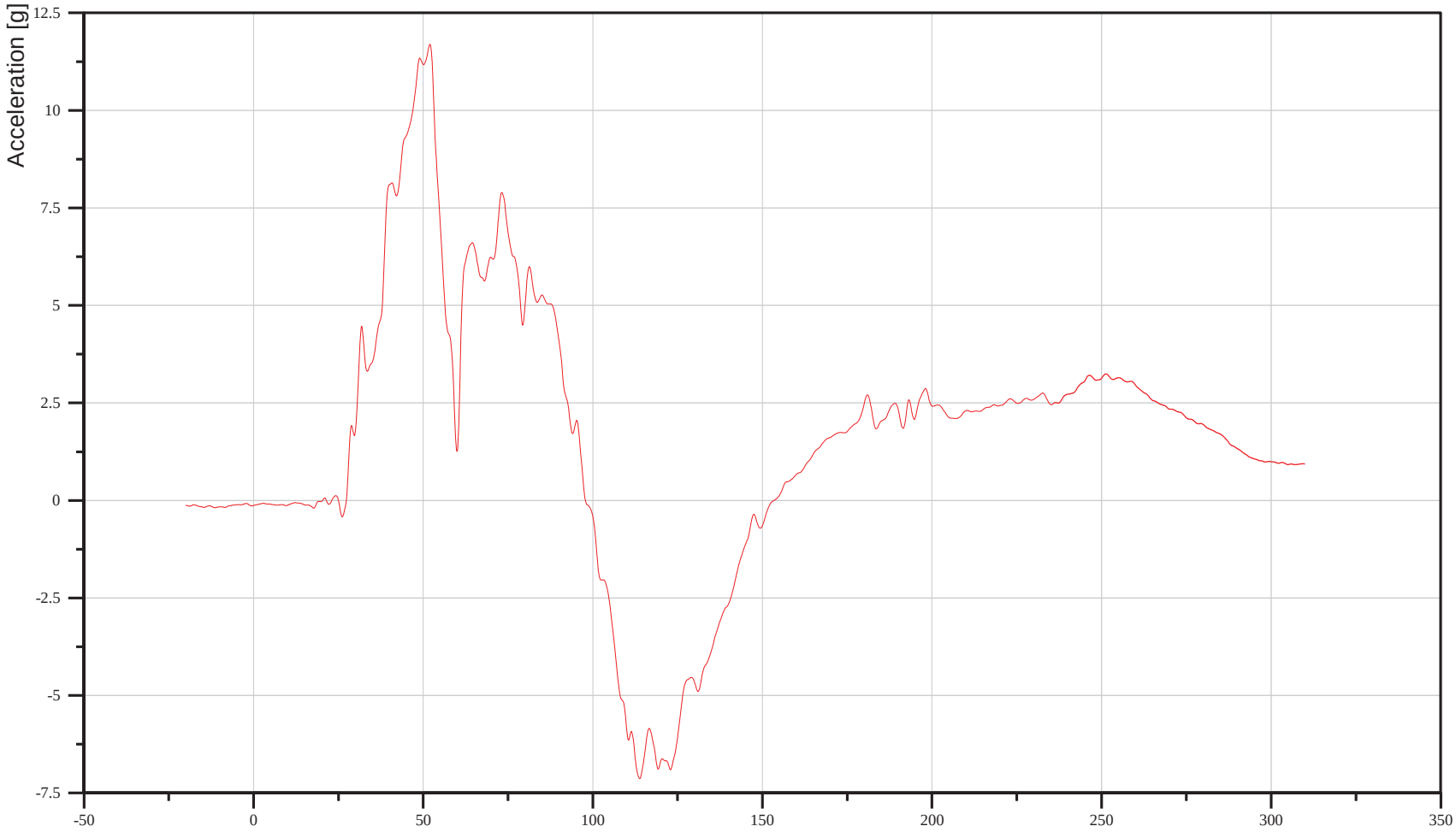
Chest Accel Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11CHSTCG00H3ACZC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-7.13 g at 113.84 ms

Max. Value
11.69 g at 52.00 ms

All Terrain Conversions FMVSS 208 Flat Frontal

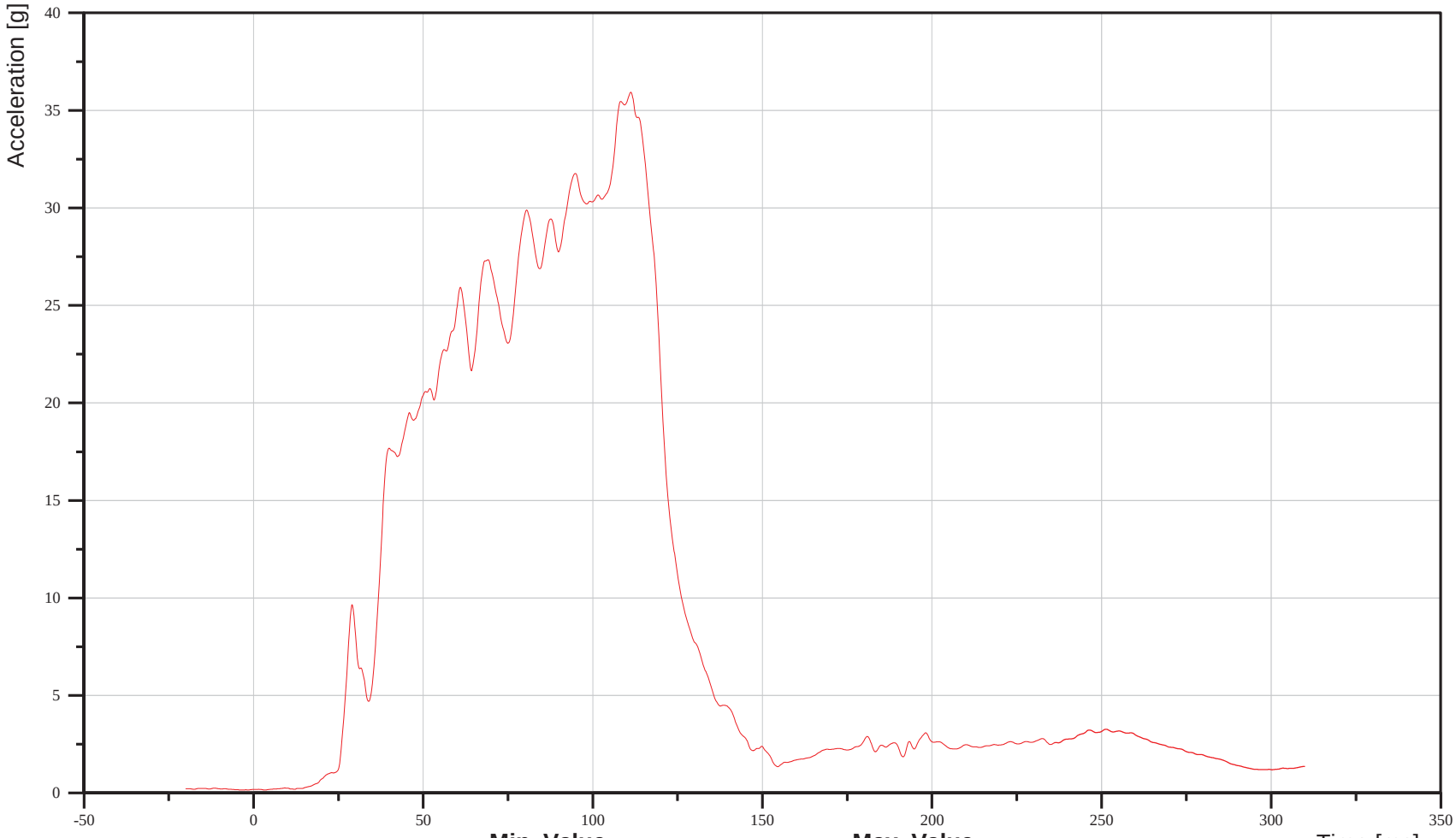
Chest Accel Resultant

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11CHSTCG00H3ACRC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
0.15 g at 3.28 ms

Max. Value
35.93 g at 111.28 ms

All Terrain Conversions FMVSS 208 Flat Frontal

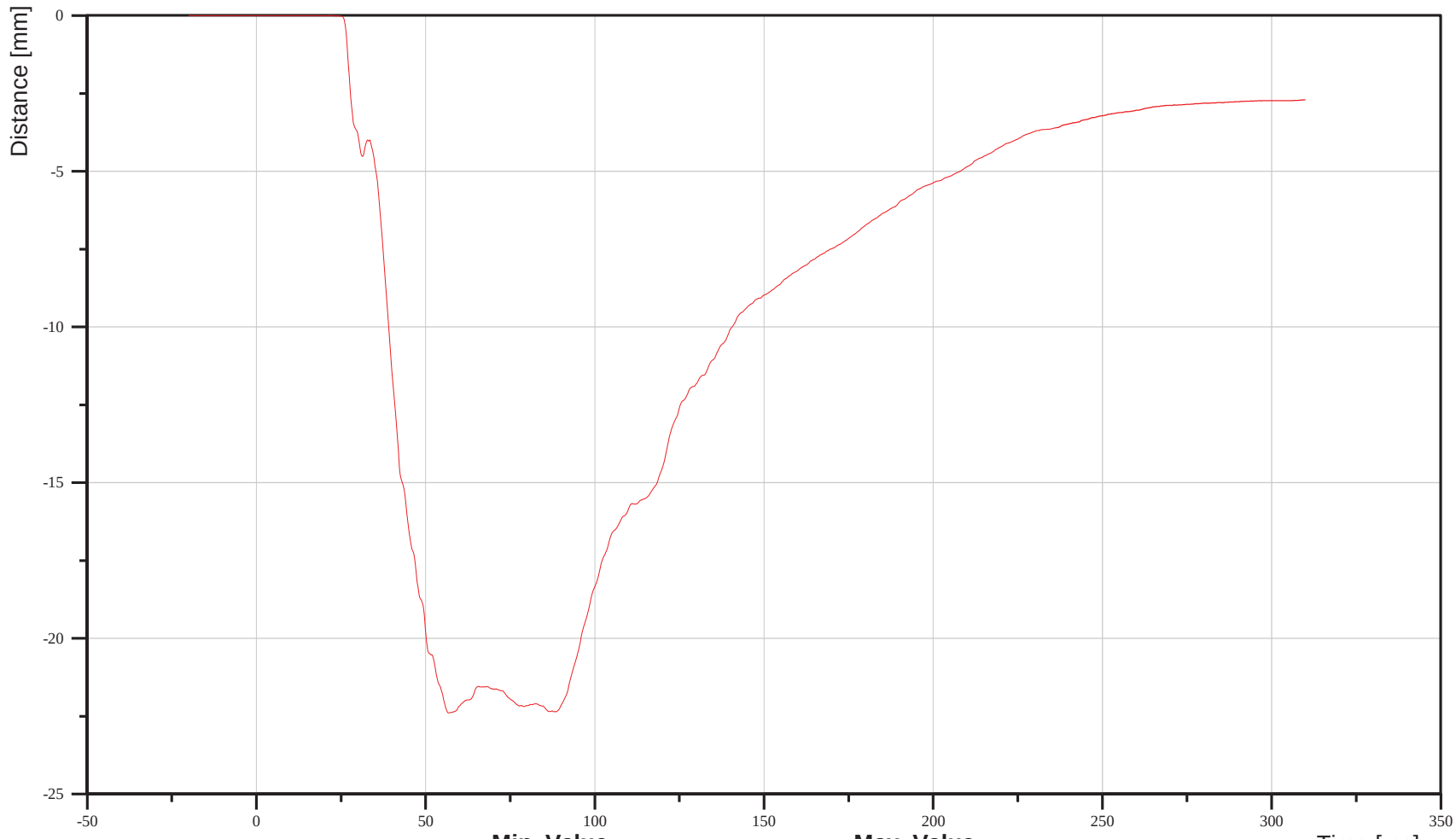
Chest Deflection X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11CHST0000H3DSXB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-22.39 mm at 56.80 ms

Max. Value
0.00 mm at 21.68 ms

All Terrain Conversions FMVSS 208 Flat Frontal

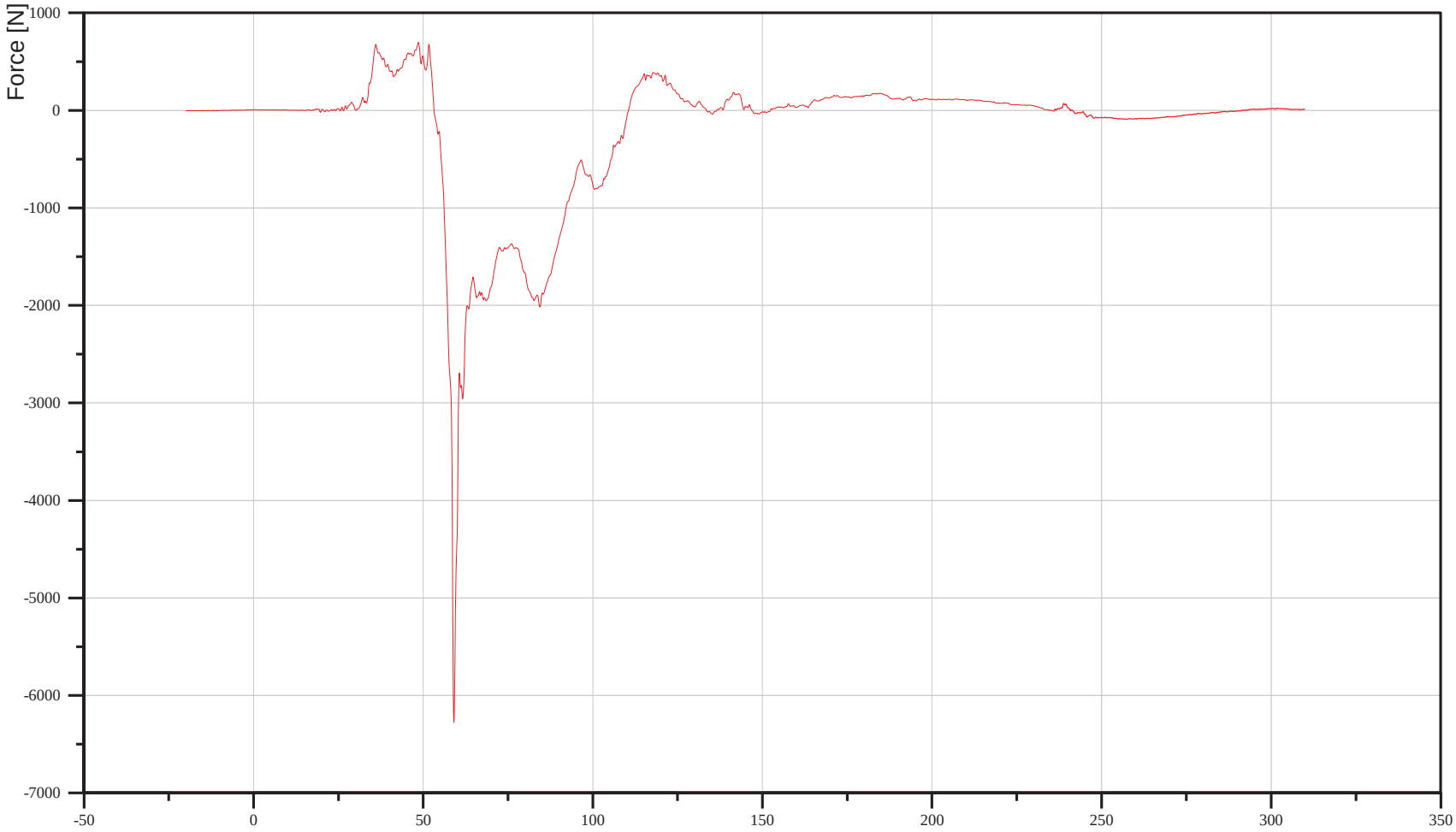
Left Femur Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11FEMRLL00H3FOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-6,277.10 N at 59.04 ms

Max. Value
696.79 N at 48.56 ms

All Terrain Conversions FMVSS 208 Flat Frontal

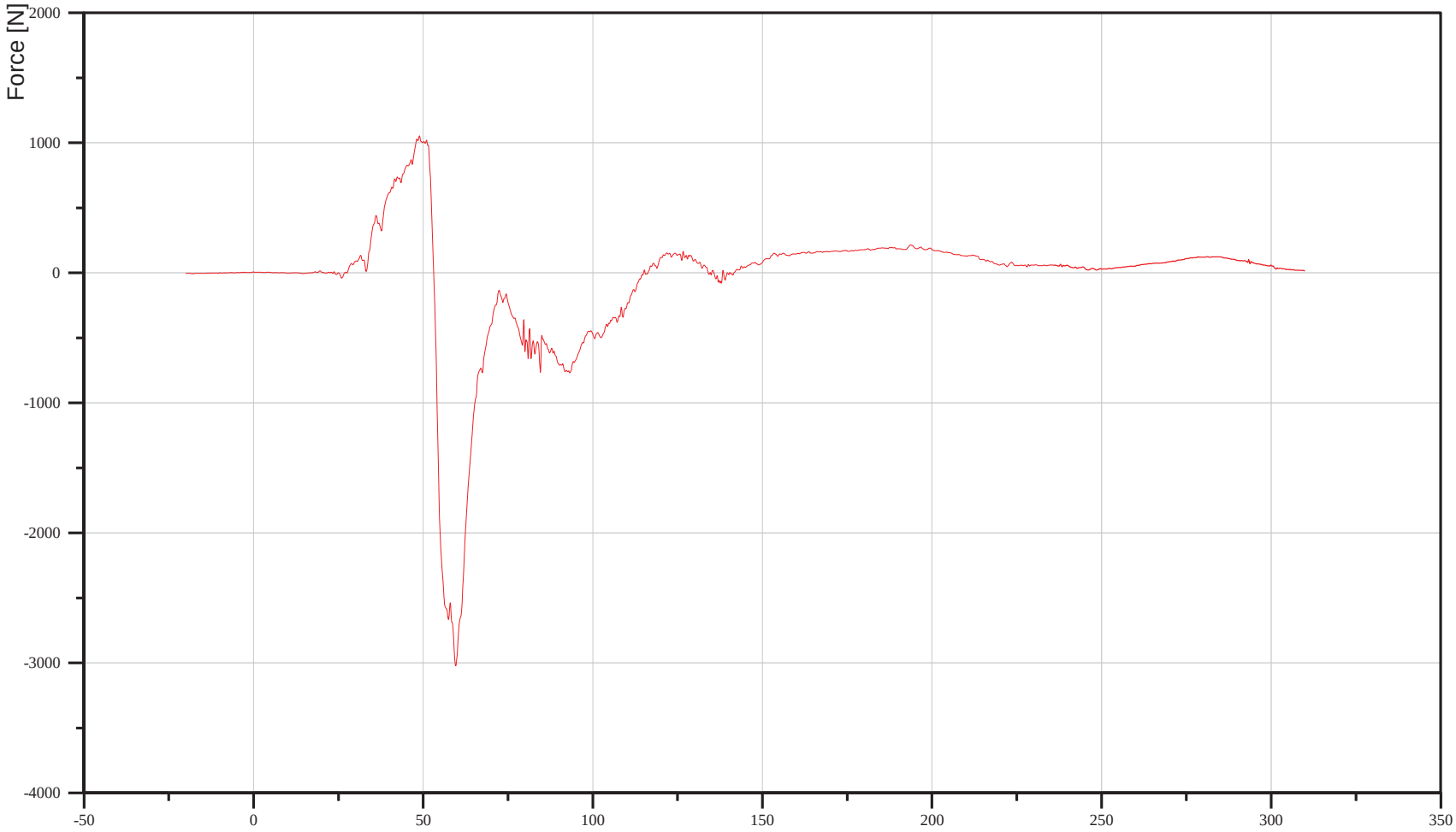
Right Femur Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11FEMRRL00H3FOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-3,022.38 N at 59.60 ms

Max. Value
1,054.88 N at 48.88 ms

All Terrain Conversions FMVSS 208 Flat Frontal

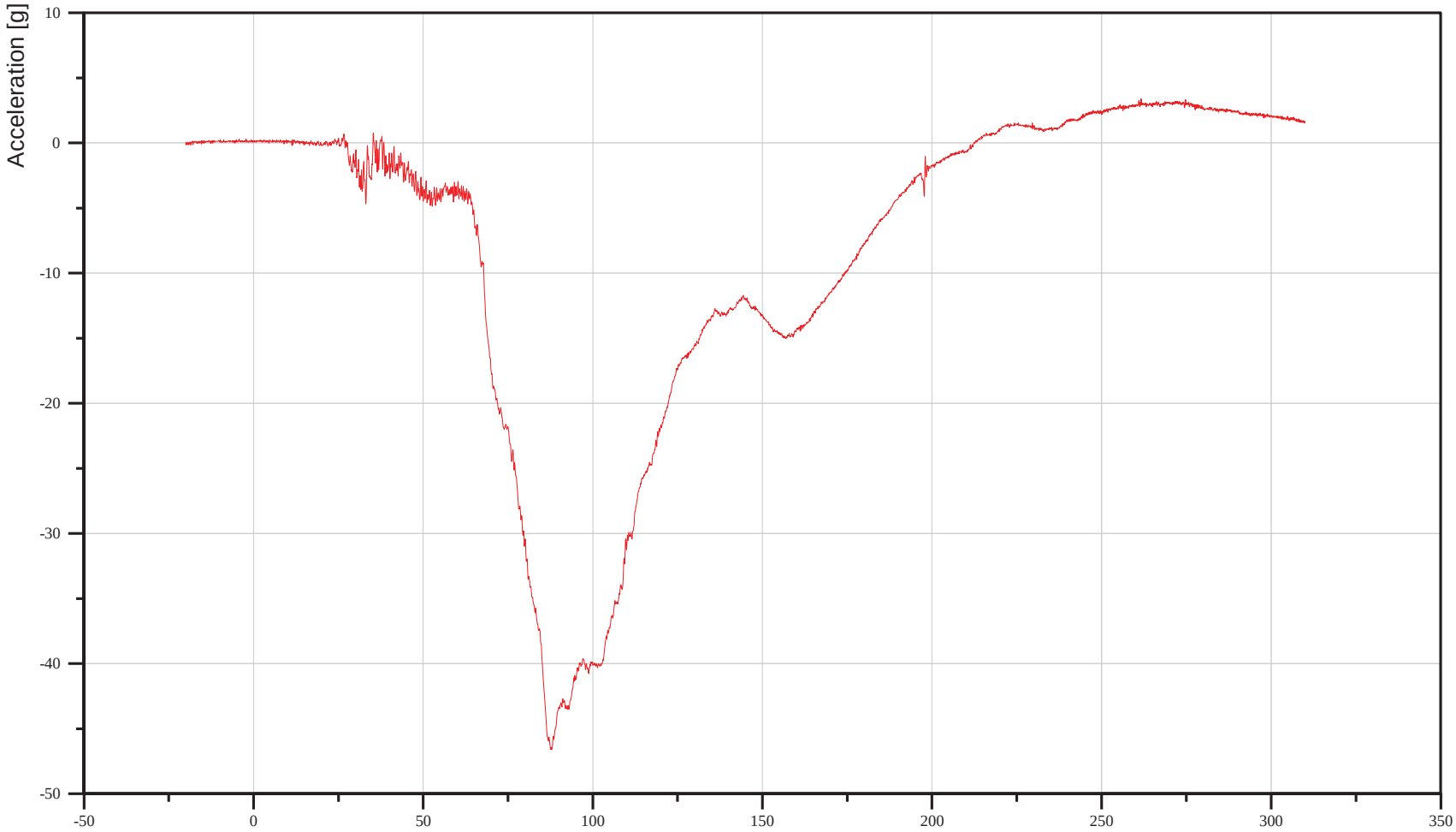
Head Accel X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13HEADCG00H3ACXA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-46.58 g at 87.52 ms

Max. Value
3.38 g at 261.60 ms

All Terrain Conversions FMVSS 208 Flat Frontal

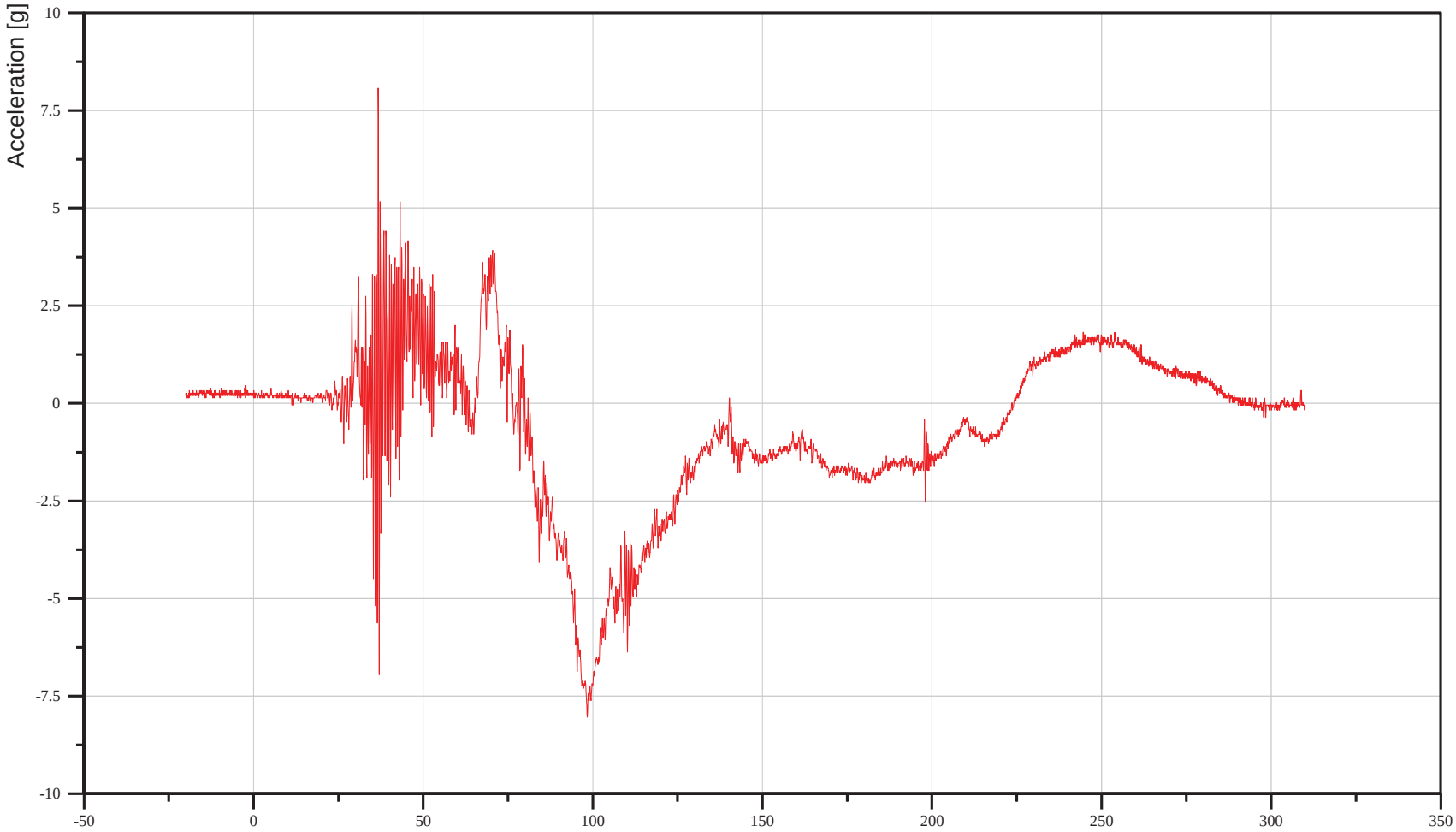
Head Accel Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13HEADCG00H3ACYA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-8.04 g at 98.40 ms

Max. Value
8.08 g at 36.72 ms

All Terrain Conversions FMVSS 208 Flat Frontal

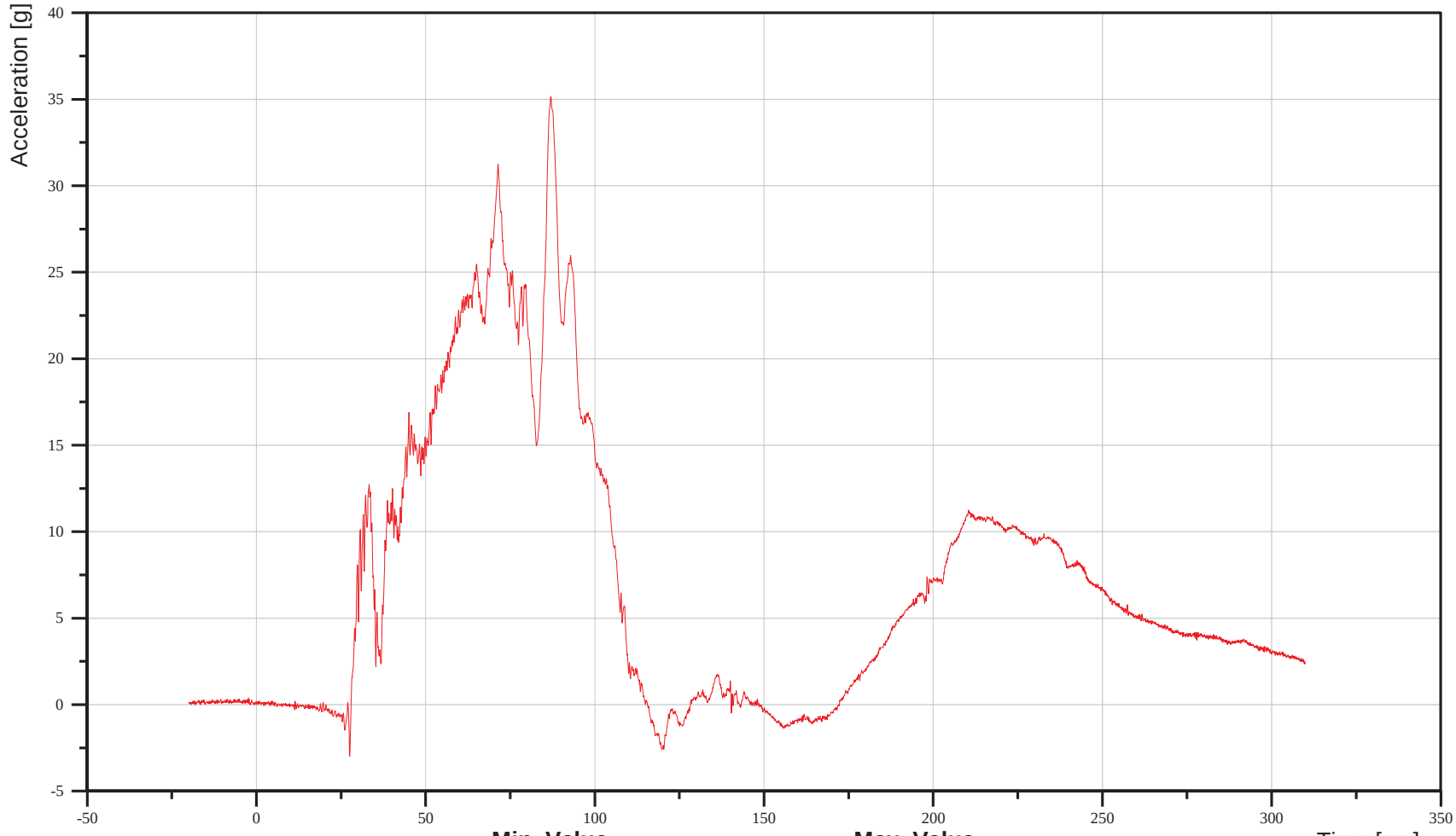
Head Accel Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13HEADCG00H3ACZA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-2.97 g at 27.52 ms

Max. Value
35.16 g at 87.04 ms

All Terrain Conversions FMVSS 208 Flat Frontal

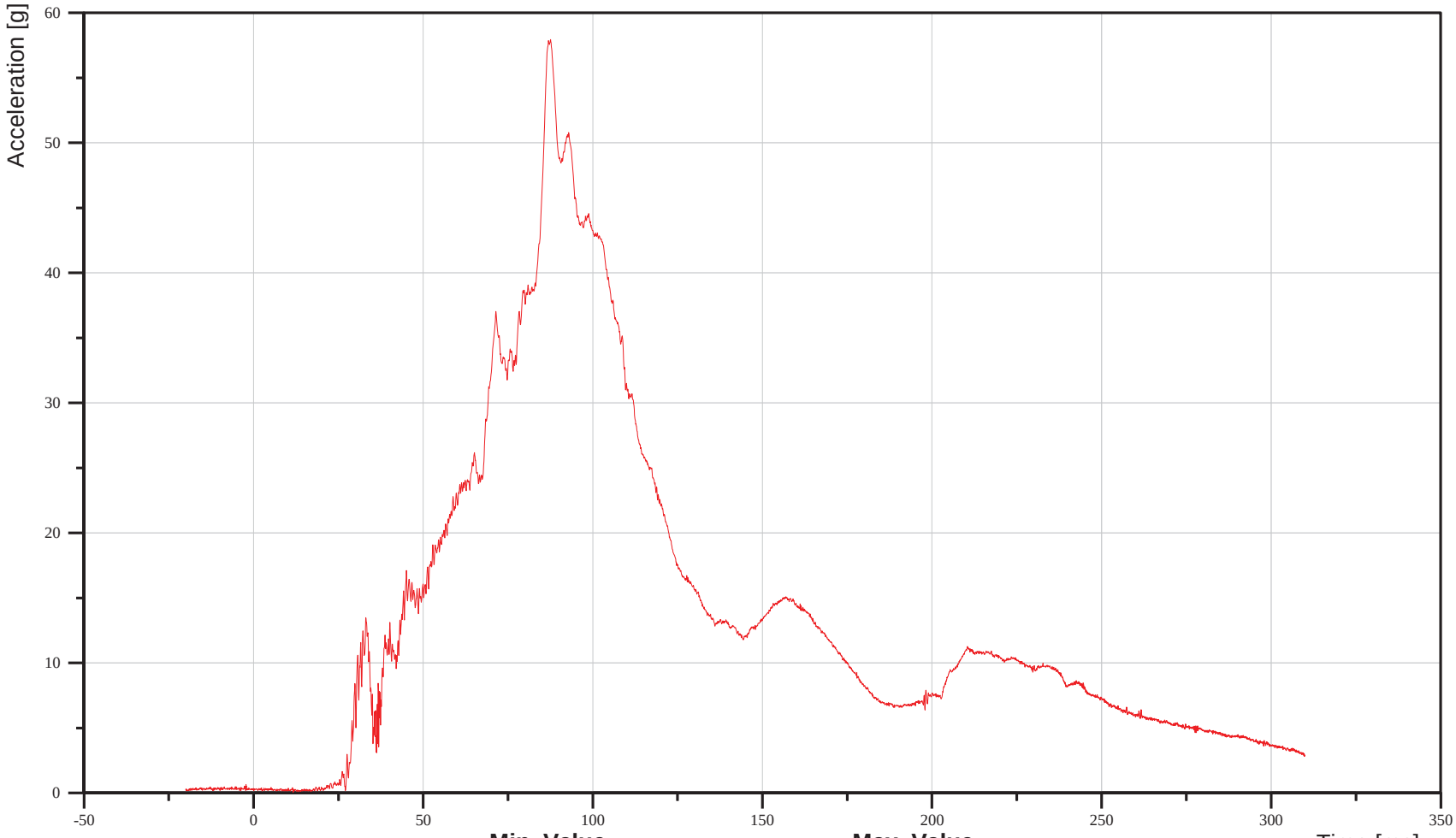
Head Accel Resultant

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13HEADCG00H3ACRA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
0.05 g at 11.60 ms

Max. Value
57.95 g at 87.52 ms

All Terrain Conversions FMVSS 208 Flat Frontal

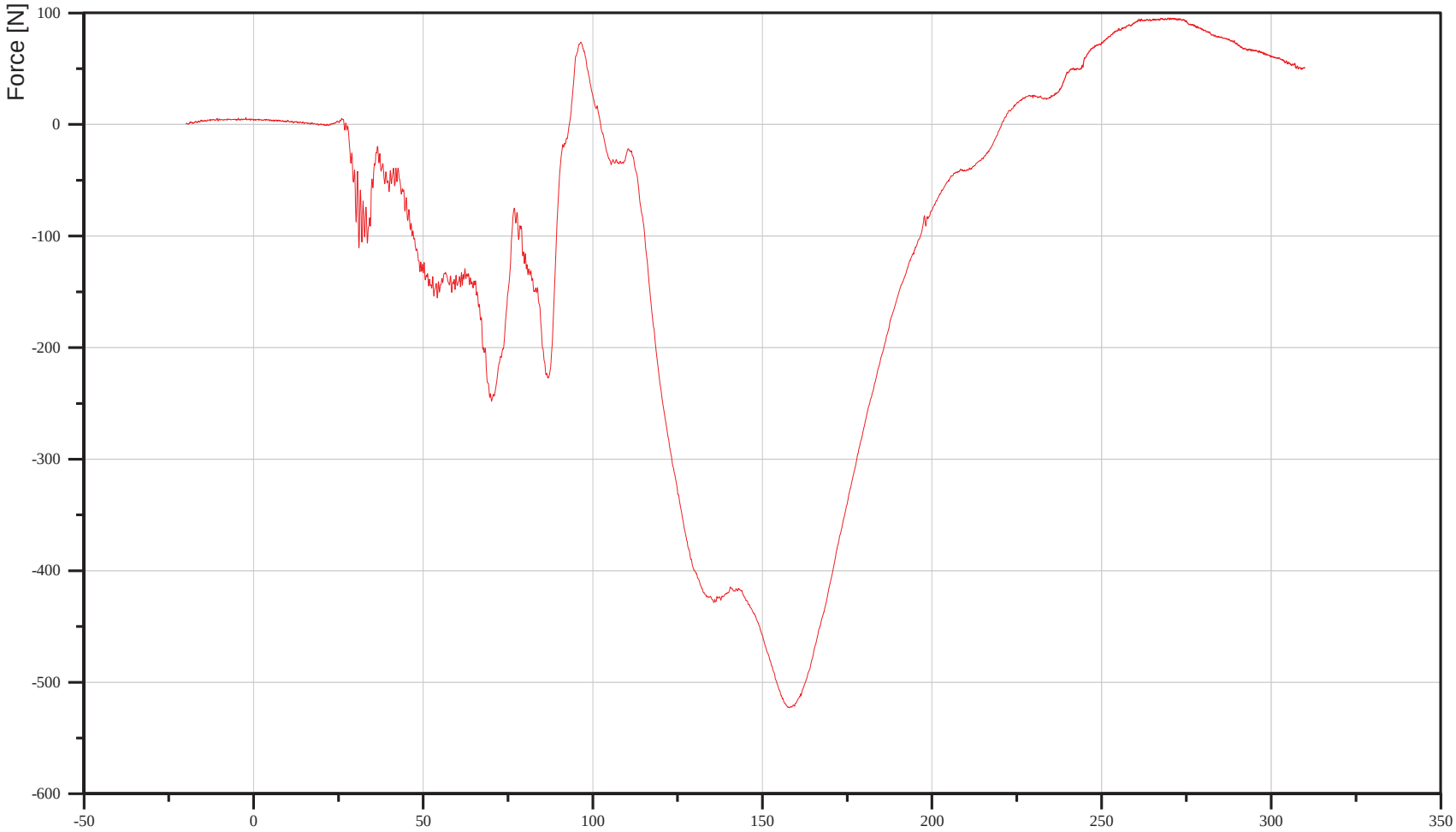
Neck Force X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3FOXA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-522.77 N at 157.68 ms

Max. Value
95.34 N at 269.68 ms

All Terrain Conversions FMVSS 208 Flat Frontal

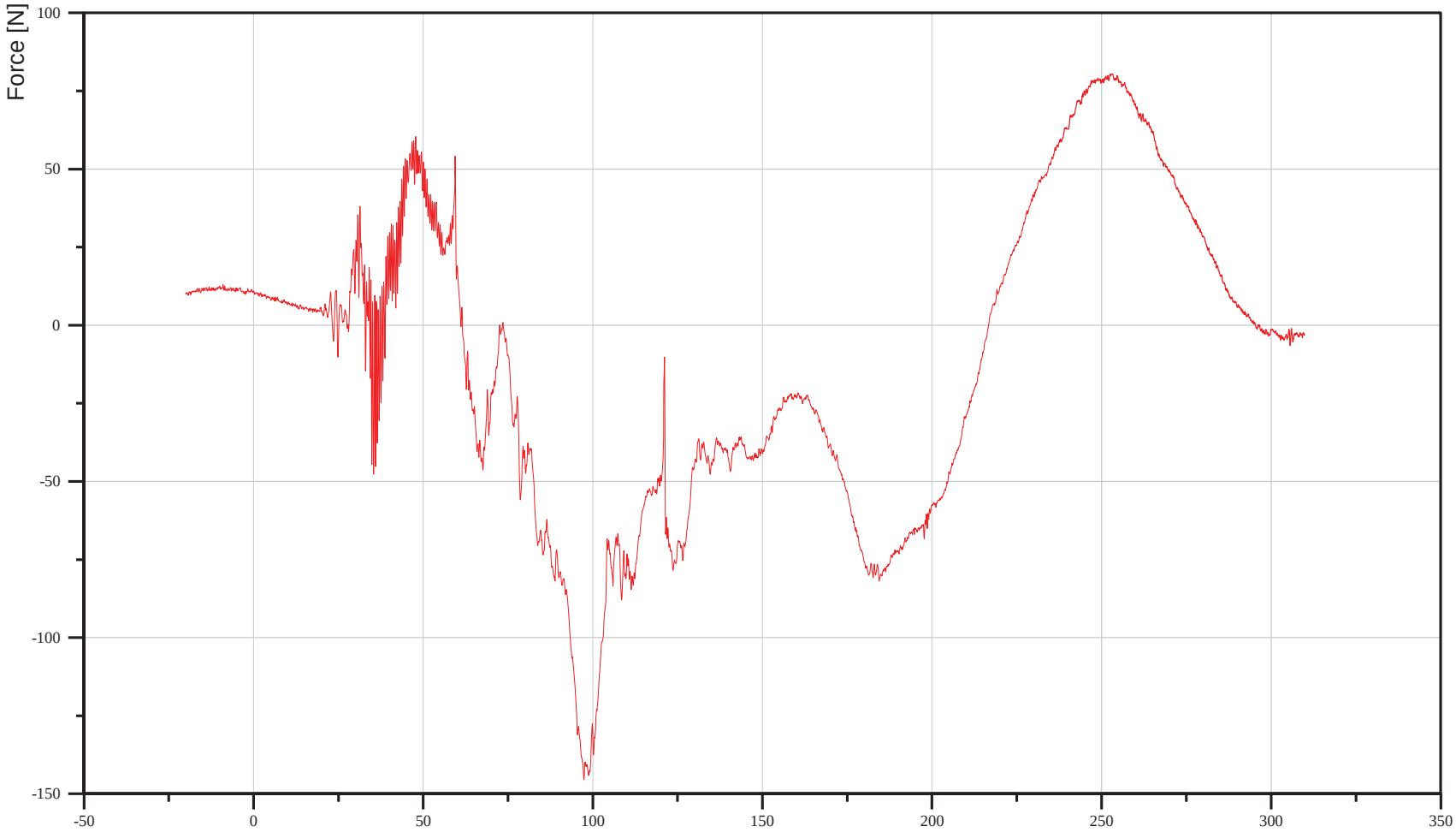
Neck Force Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3FOYA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-145.47 N at 97.36 ms

Max. Value
80.47 N at 252.56 ms

All Terrain Conversions FMVSS 208 Flat Frontal

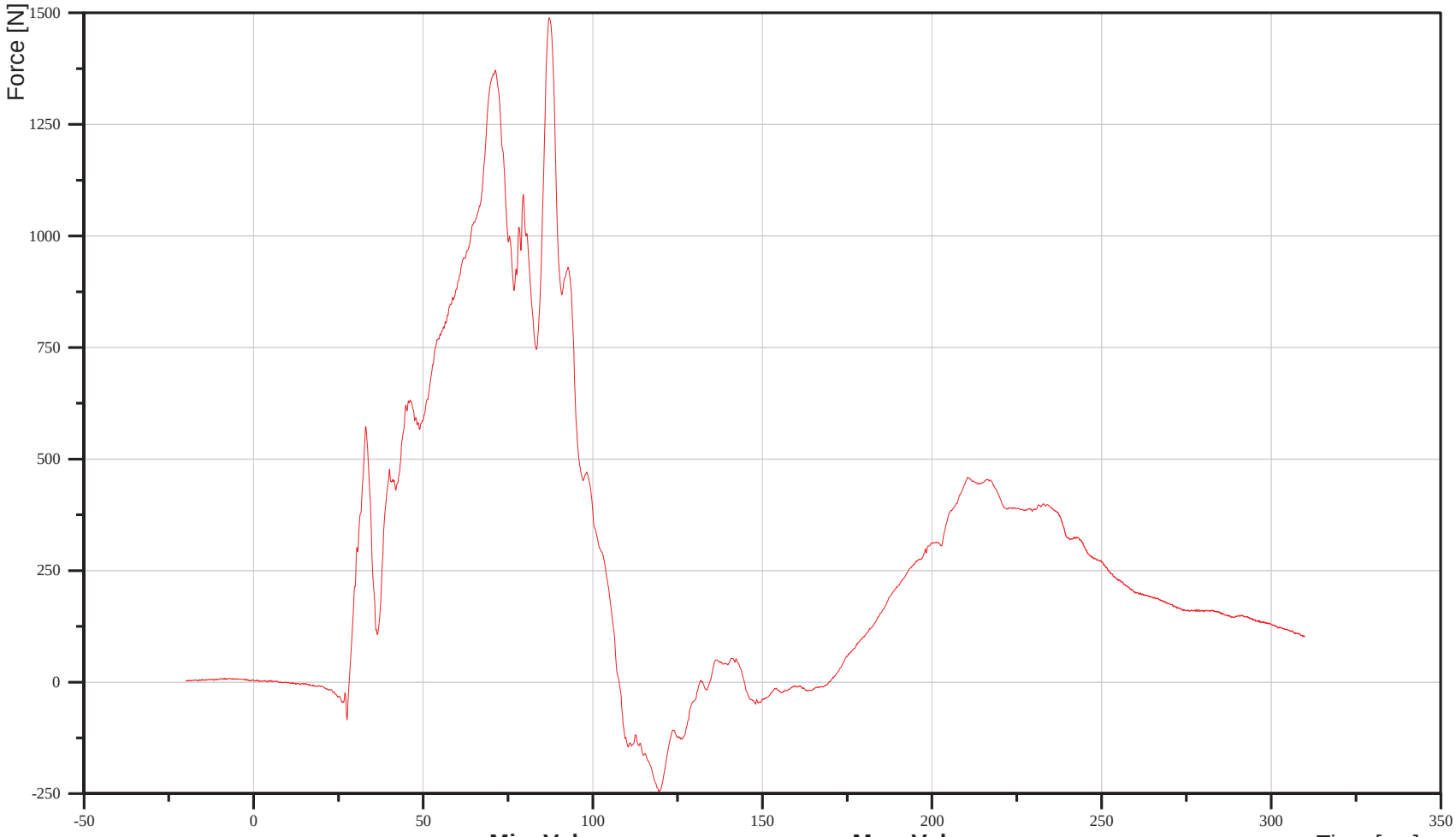
Neck Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3FOZA

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_1000

Min. Value
-244.84 N at 119.44 ms

Max. Value
1,489.20 N at 87.20 ms

All Terrain Conversions FMVSS 208 Flat Frontal

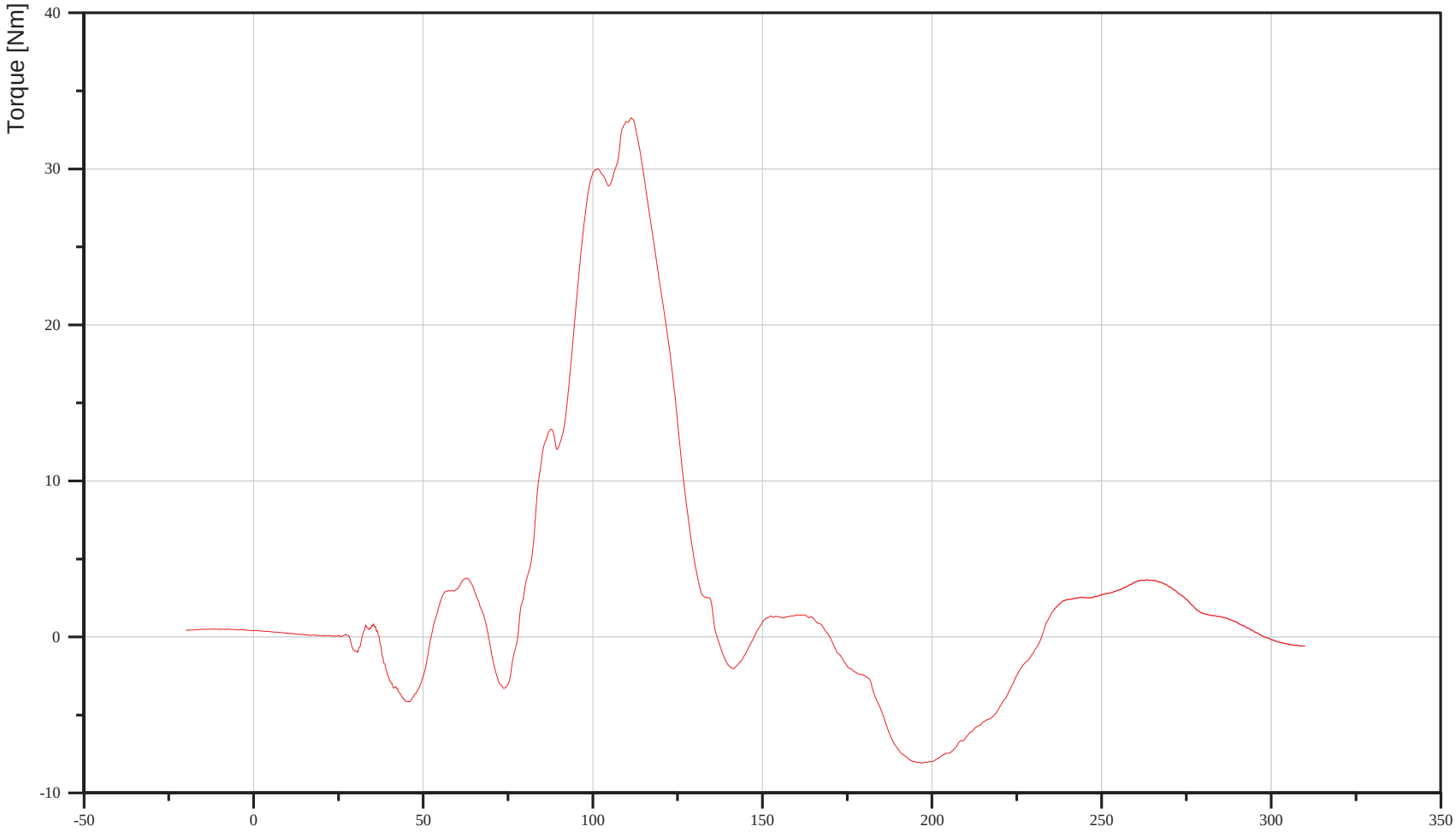
Neck Moment X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3MOXB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-8.09 Nm at 197.04 ms

Max. Value
33.27 Nm at 111.36 ms

All Terrain Conversions FMVSS 208 Flat Frontal

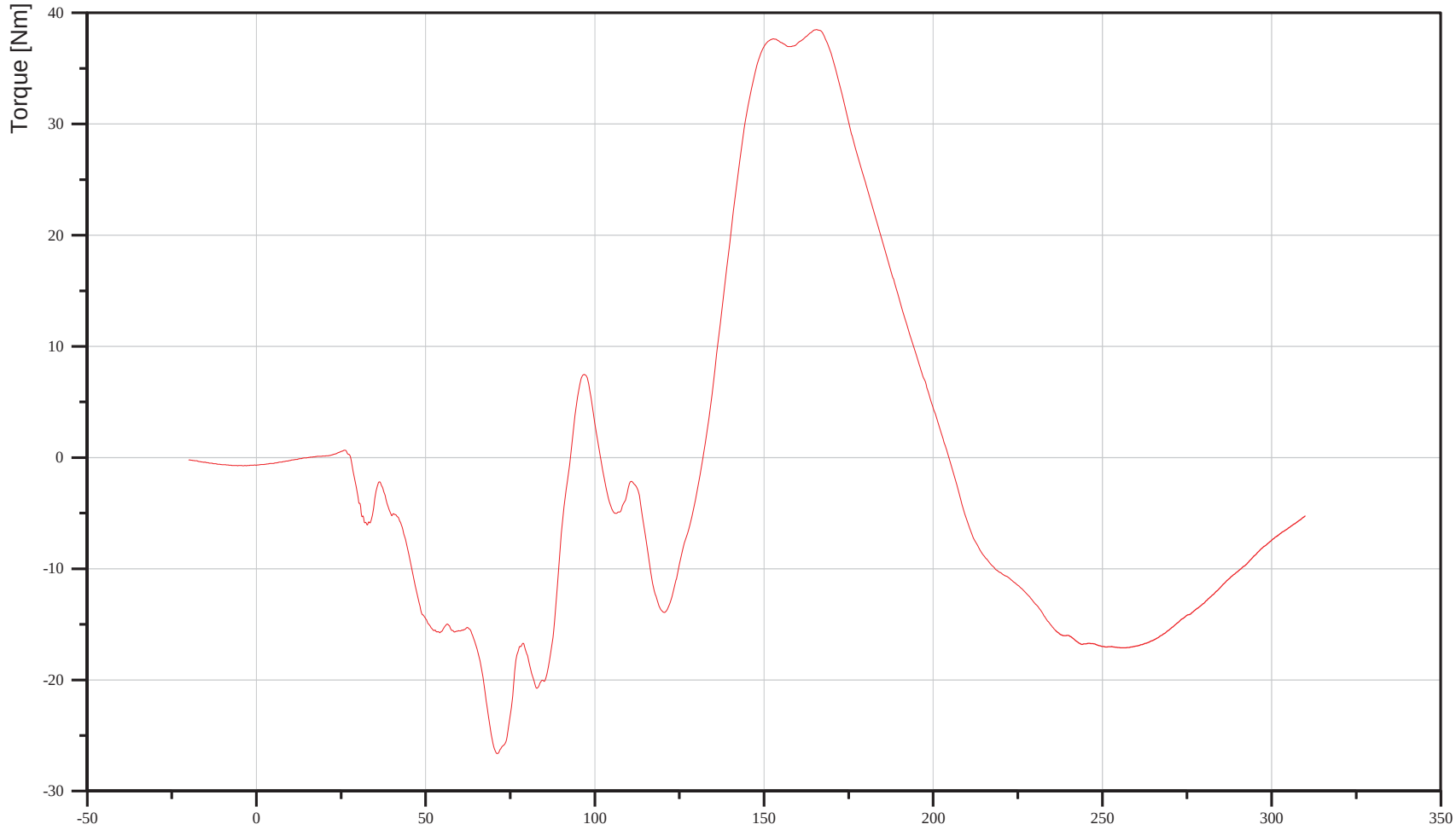
Neck Moment Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3MOYB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-26.62 Nm at 71.20 ms

Max. Value
38.49 Nm at 165.52 ms

All Terrain Conversions FMVSS 208 Flat Frontal

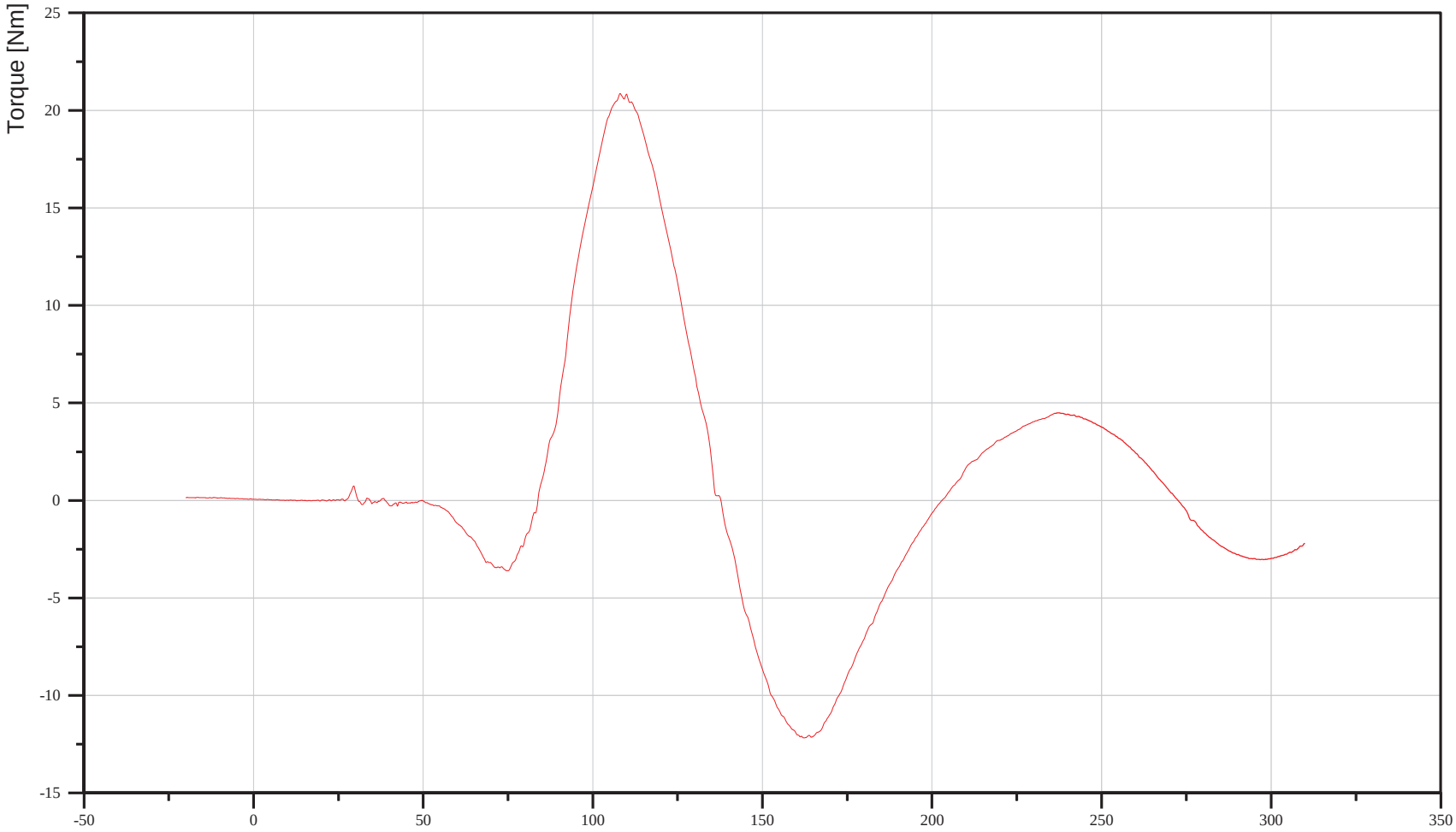
Neck Moment Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13NECKUP00H3MOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-12.17 Nm at 162.24 ms

Max. Value
20.87 Nm at 108.08 ms

All Terrain Conversions FMVSS 208 Flat Frontal

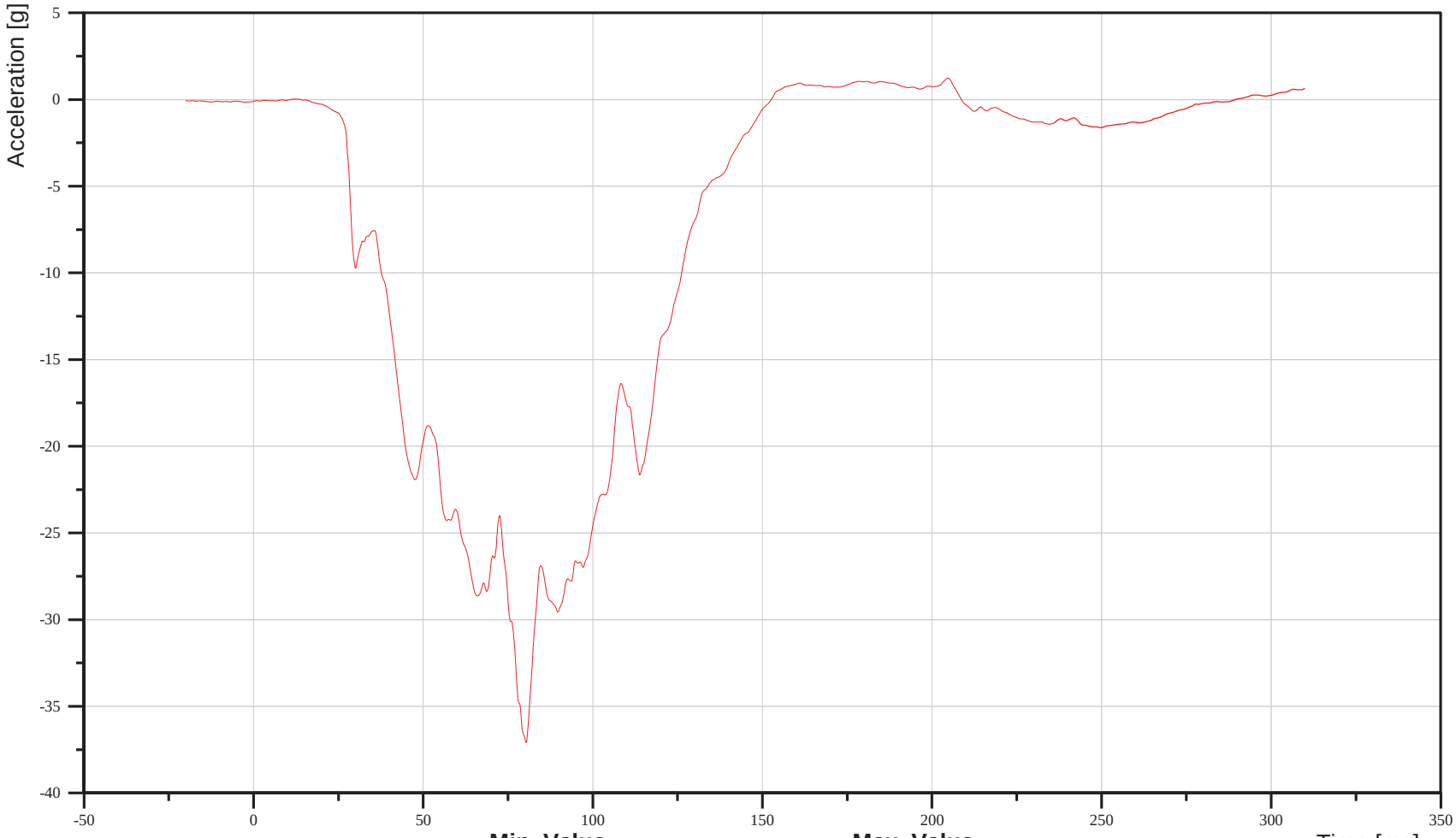
Chest Accel X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13CHSTCG00H3ACXC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-37.09 g at 80.40 ms

Max. Value
1.23 g at 204.64 ms

All Terrain Conversions FMVSS 208 Flat Frontal

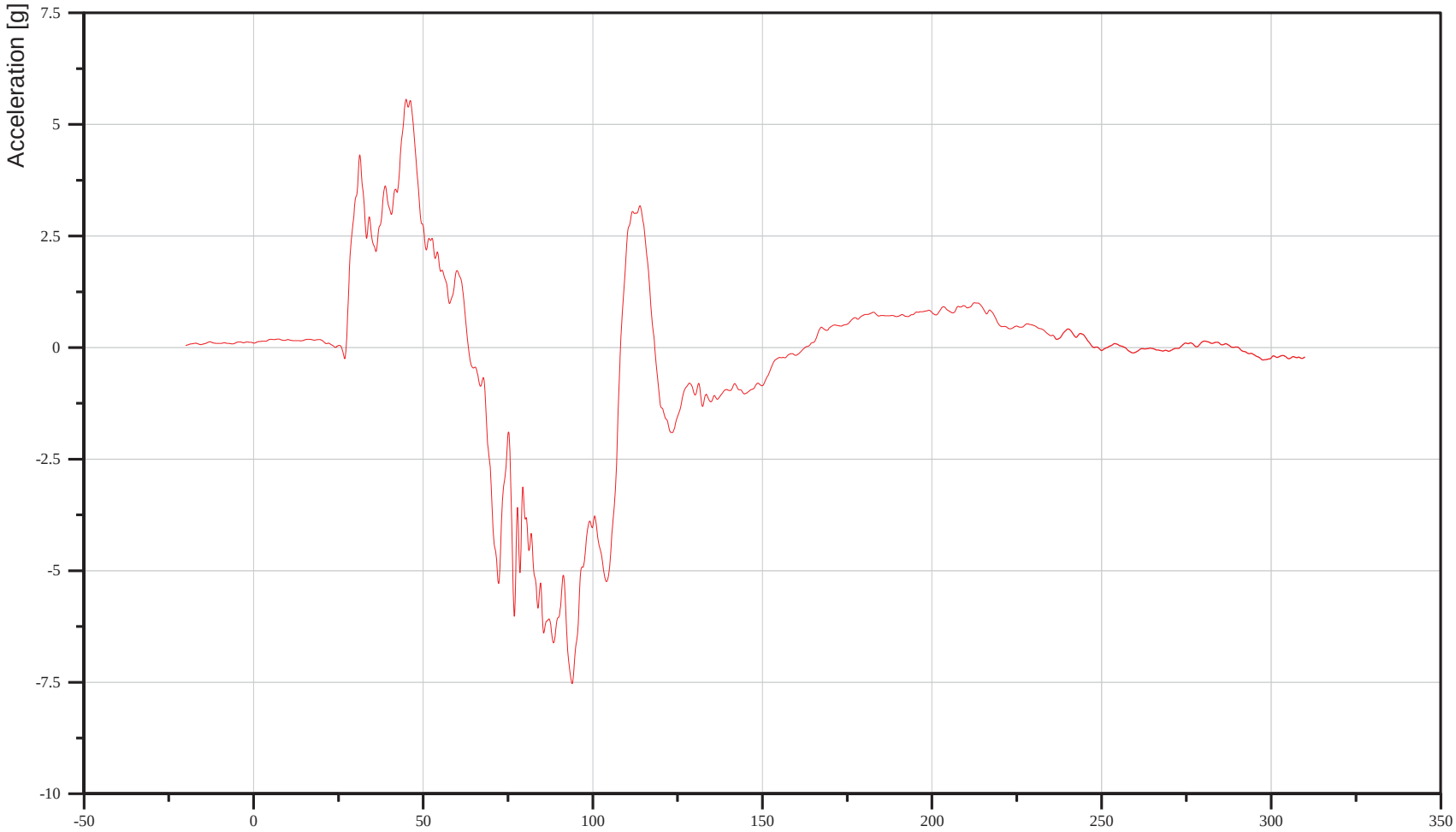
Chest Accel Y

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13CHSTCG00H3ACYC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-7.53 g at 93.92 ms

Max. Value
5.57 g at 44.96 ms

All Terrain Conversions FMVSS 208 Flat Frontal

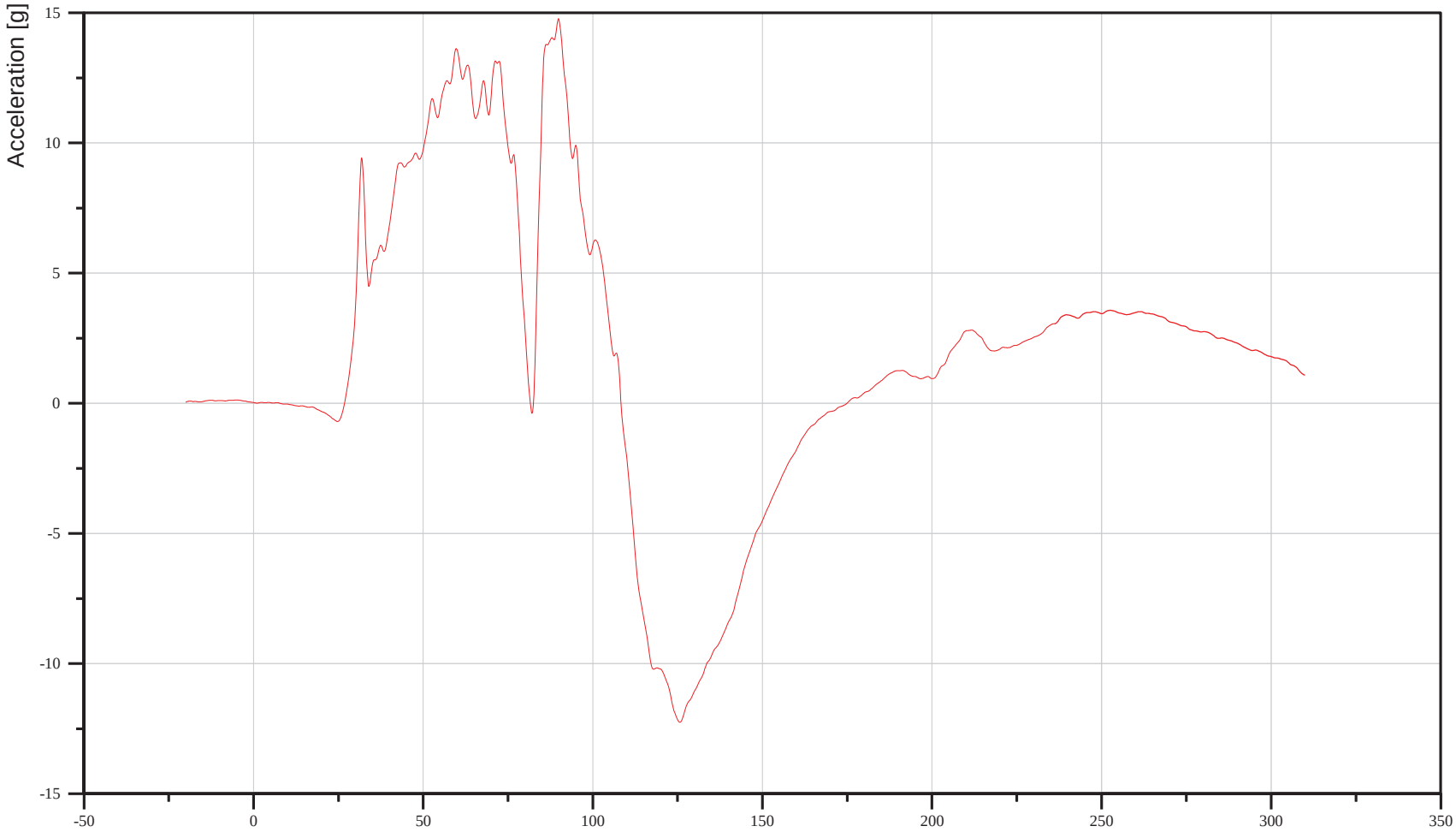
Chest Accel Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13CHSTCG00H3ACZC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
-12.25 g at 125.68 ms

Max. Value
14.78 g at 89.92 ms

All Terrain Conversions FMVSS 208 Flat Frontal

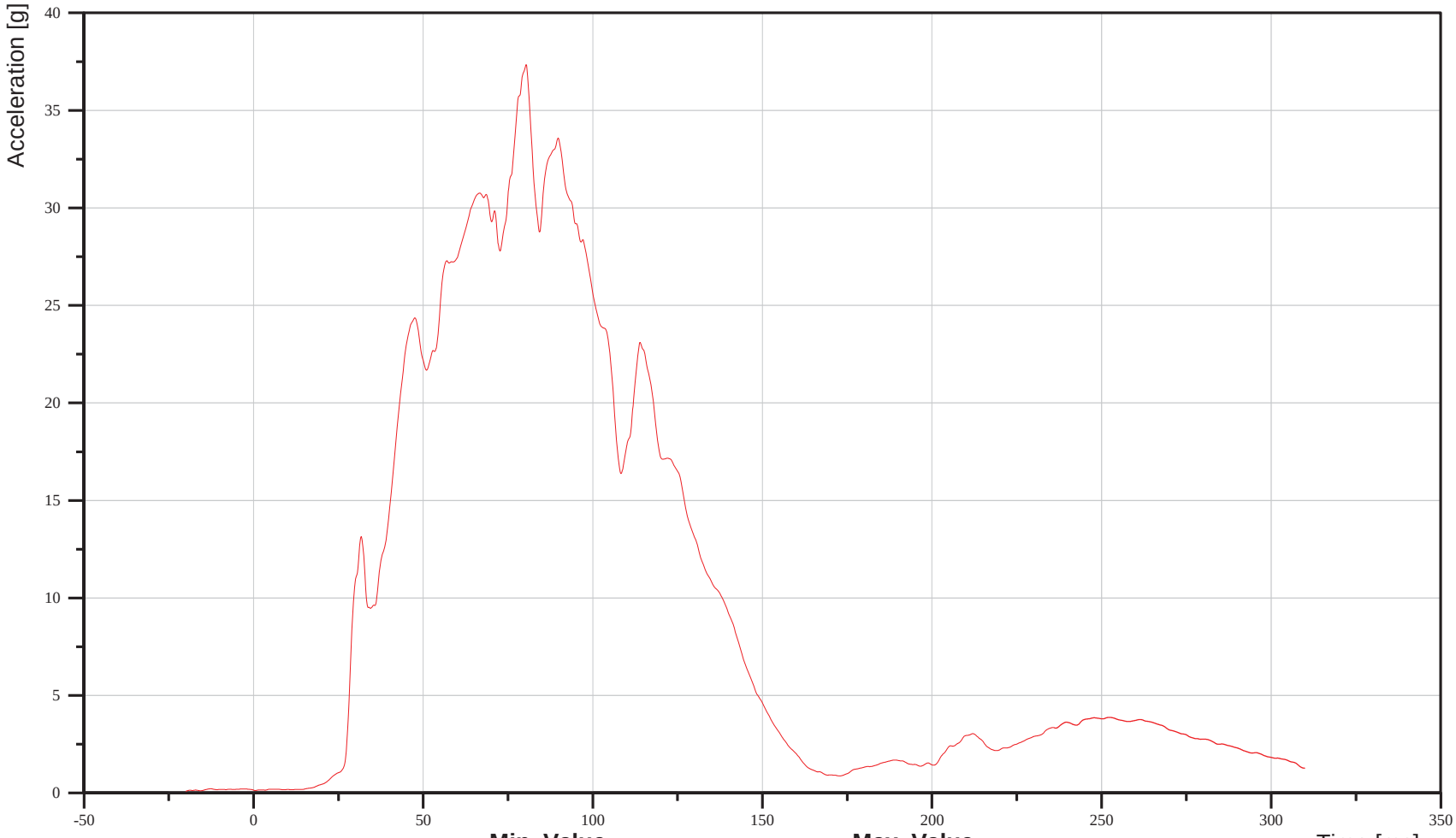
Chest Accel Resultant

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13CHSTCG00H3ACRC

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_180

Min. Value
0.09 g at -20.00 ms

Max. Value
37.34 g at 80.40 ms

All Terrain Conversions FMVSS 208 Flat Frontal

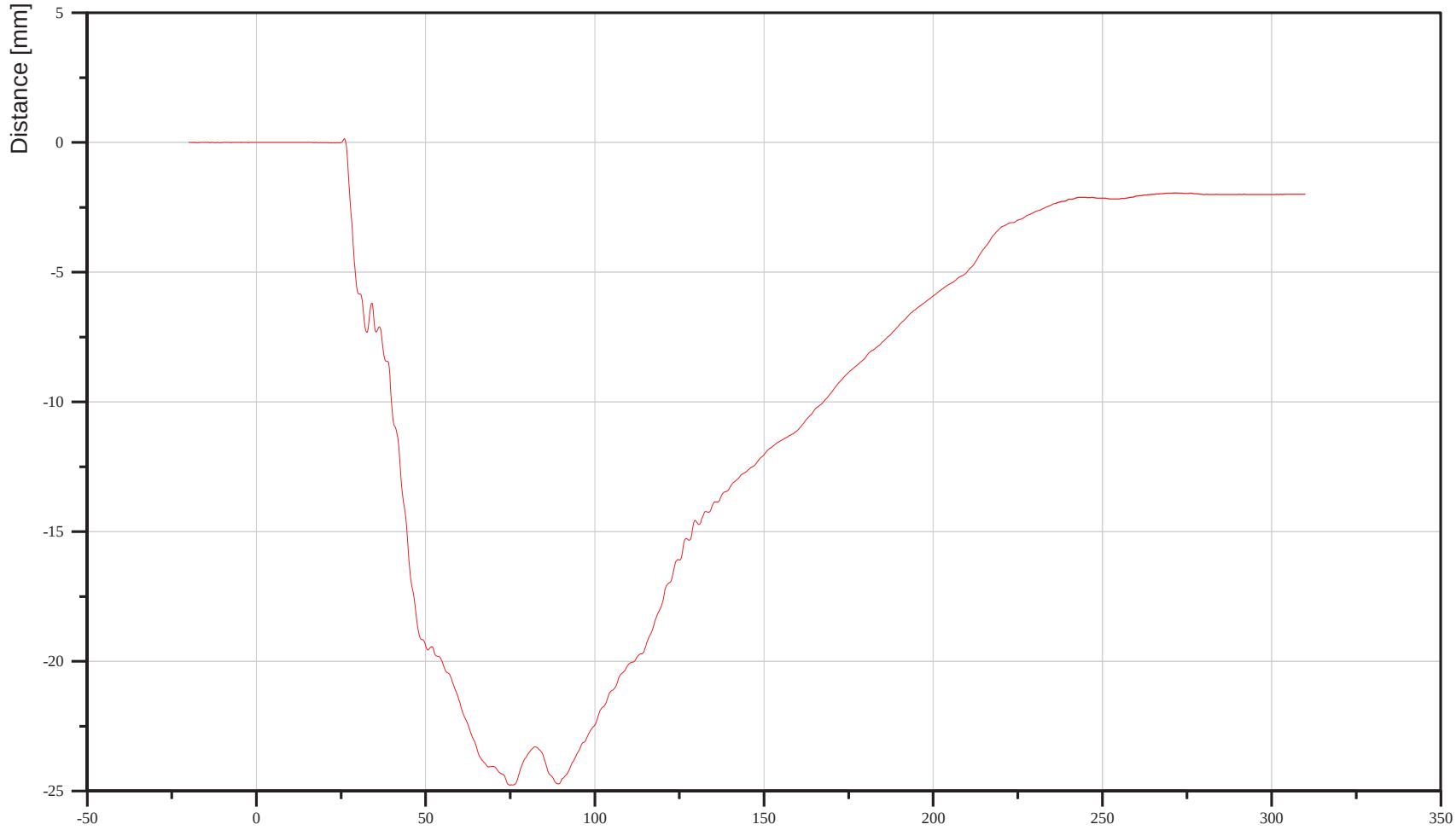
Chest Deflection X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13CHST0000H3DSXB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-24.77 mm at 74.96 ms

Max. Value
0.15 mm at 26.08 ms

All Terrain Conversions FMVSS 208 Flat Frontal

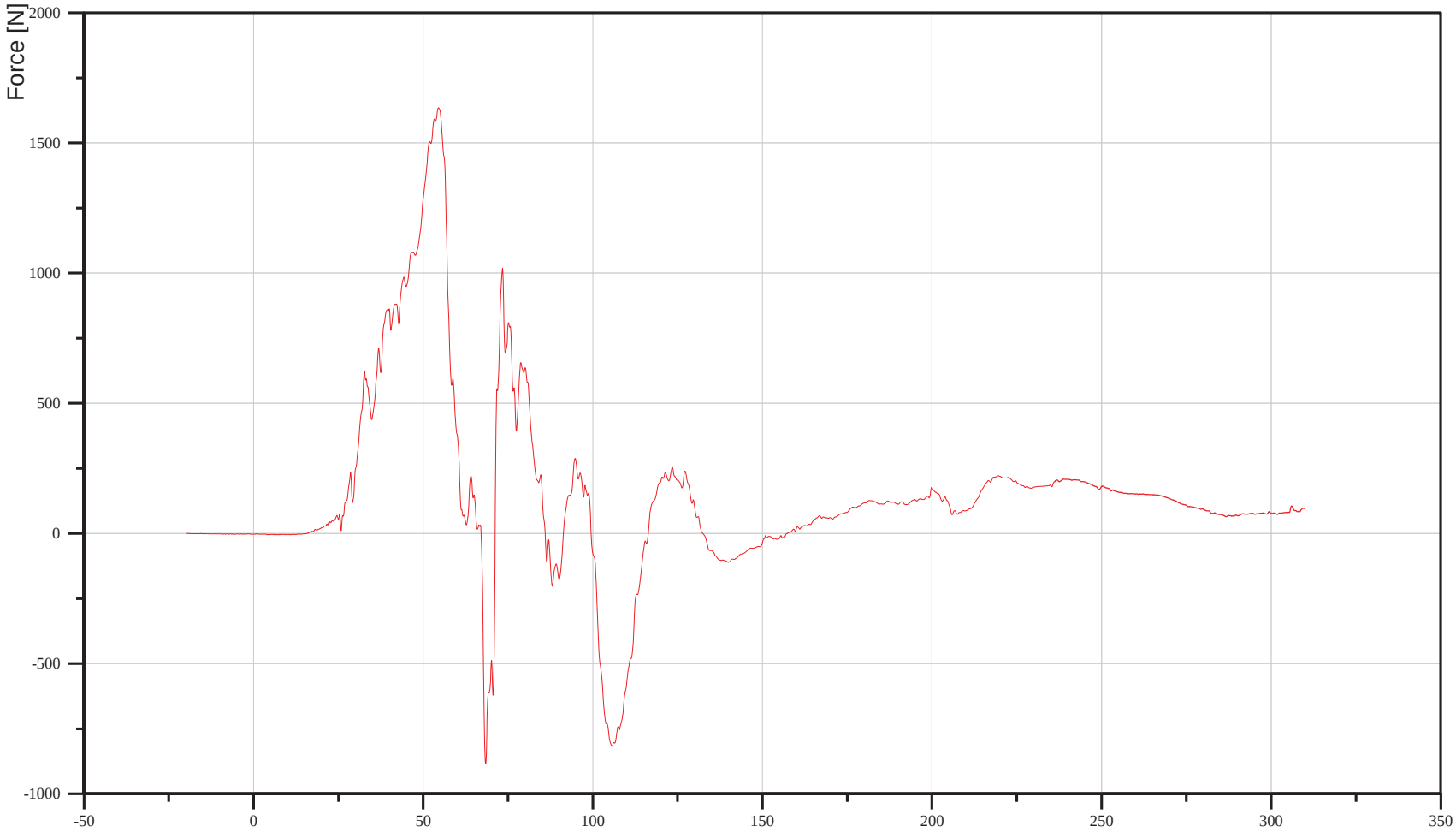
Left Femur Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13FEMRLL00H3FOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-884.77 N at 68.48 ms

Max. Value
1,635.65 N at 54.48 ms

All Terrain Conversions FMVSS 208 Flat Frontal

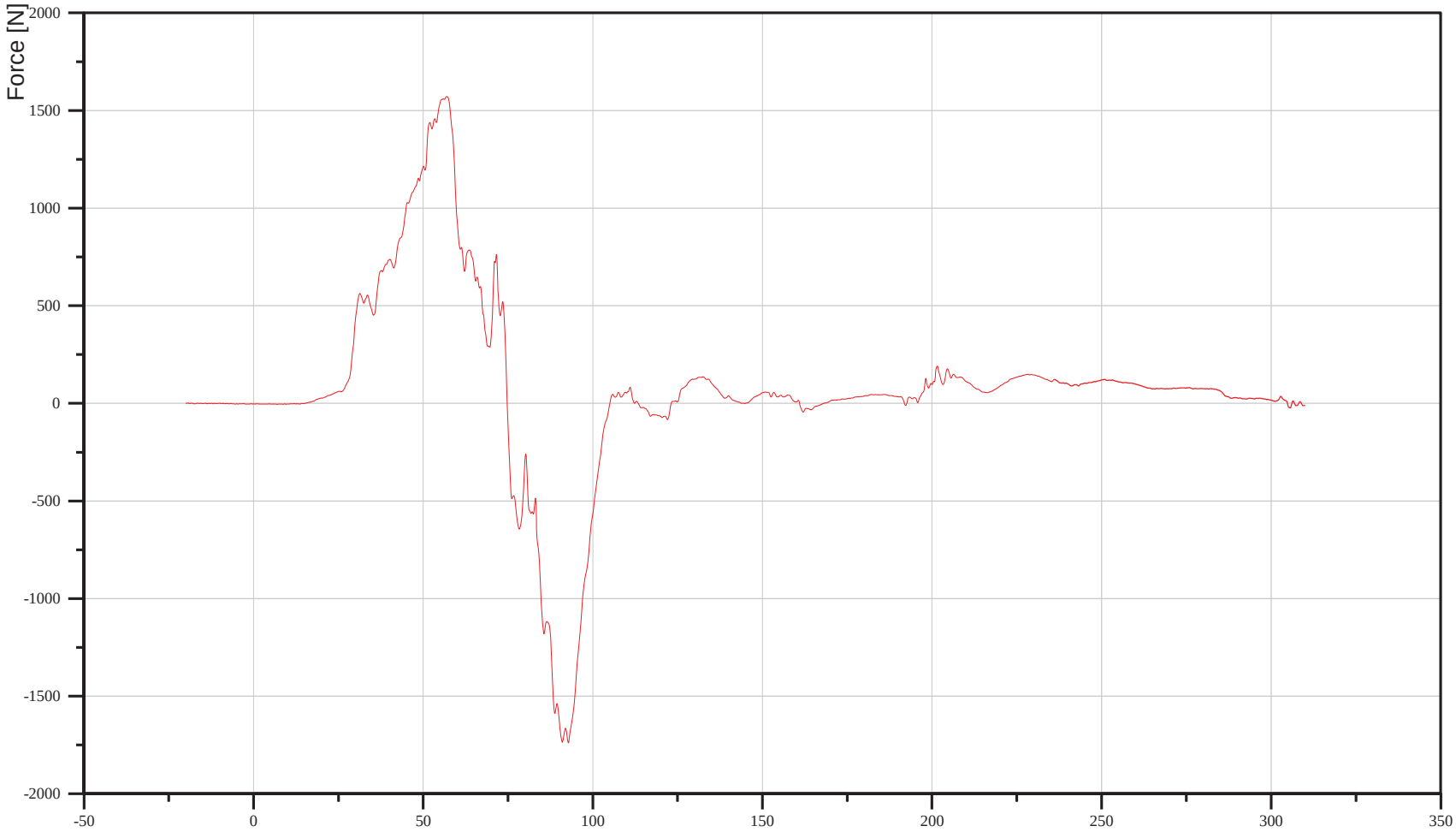
Right Femur Force Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13FEMRRL00H3FOZB

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_600

Min. Value
-1,738.70 N at 92.80 ms

Max. Value
1,571.51 N at 56.88 ms

All Terrain Conversions FMVSS 208 Flat Frontal

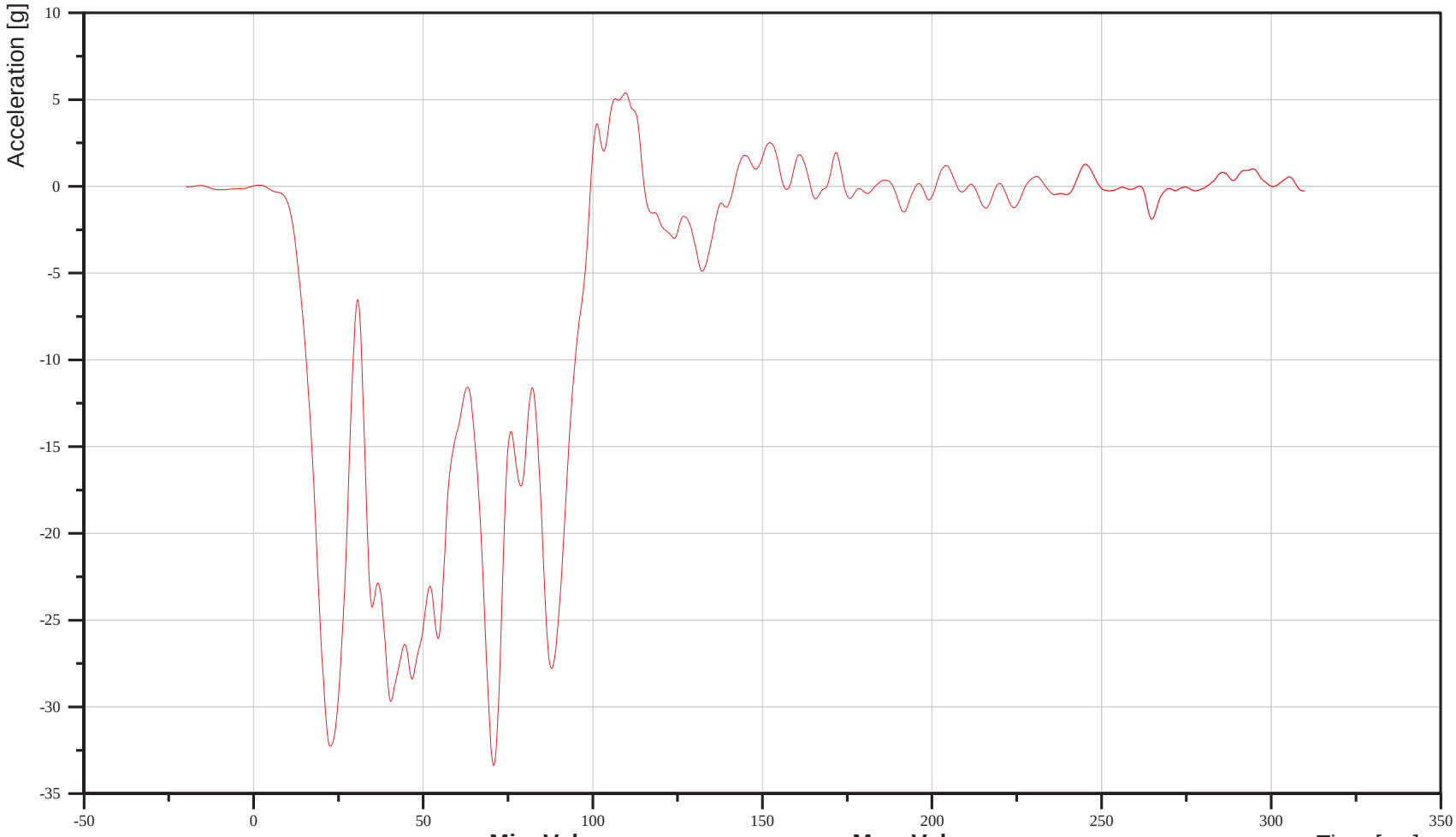
Rear Seat Cross-member on Left Side of Vehicle X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

14SILBLERE00ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-33.37 g at 70.80 ms

Max. Value
5.39 g at 109.60 ms

All Terrain Conversions FMVSS 208 Flat Frontal

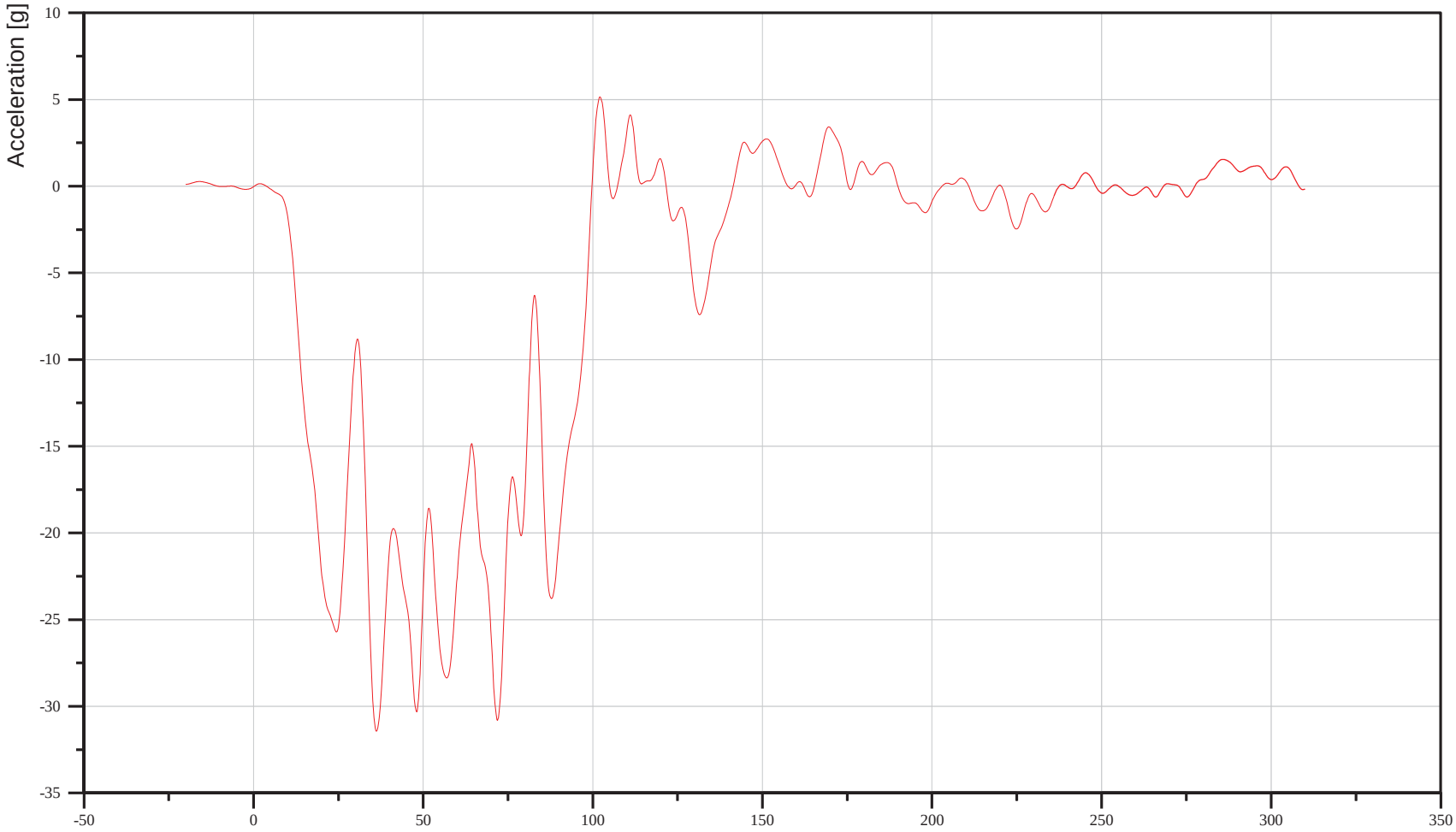
Rear Seat Cross-member on Right Side of Vehicle X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

16SILBRIRE00ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-31.44 g at 36.16 ms

Max. Value
5.15 g at 102.16 ms

All Terrain Conversions FMVSS 208 Flat Frontal

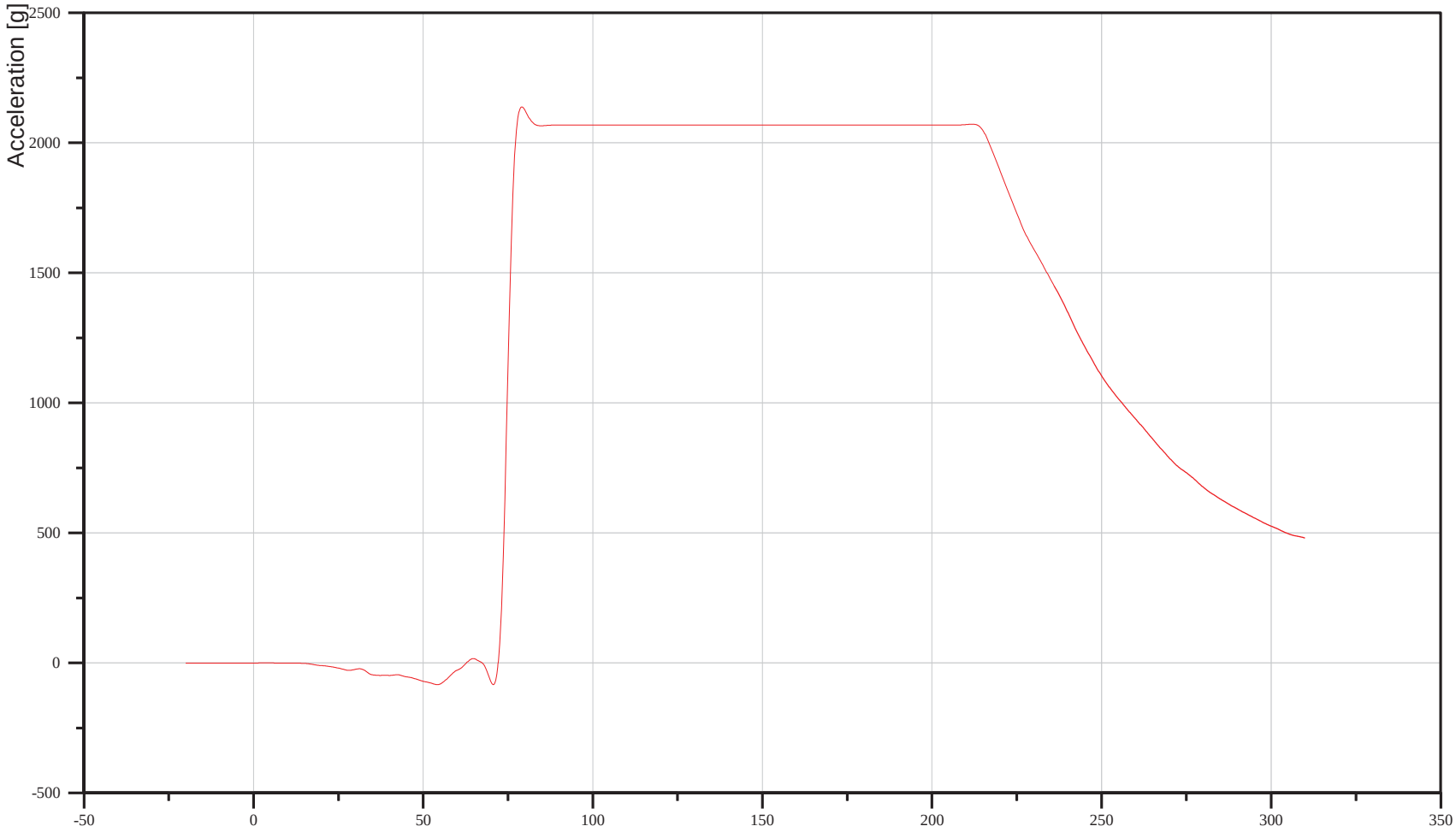
Top of Engine block X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

10ENGNTP0000ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-83.18 g at 70.64 ms

Max. Value
2,138.48 g at 79.04 ms

All Terrain Conversions FMVSS 208 Flat Frontal

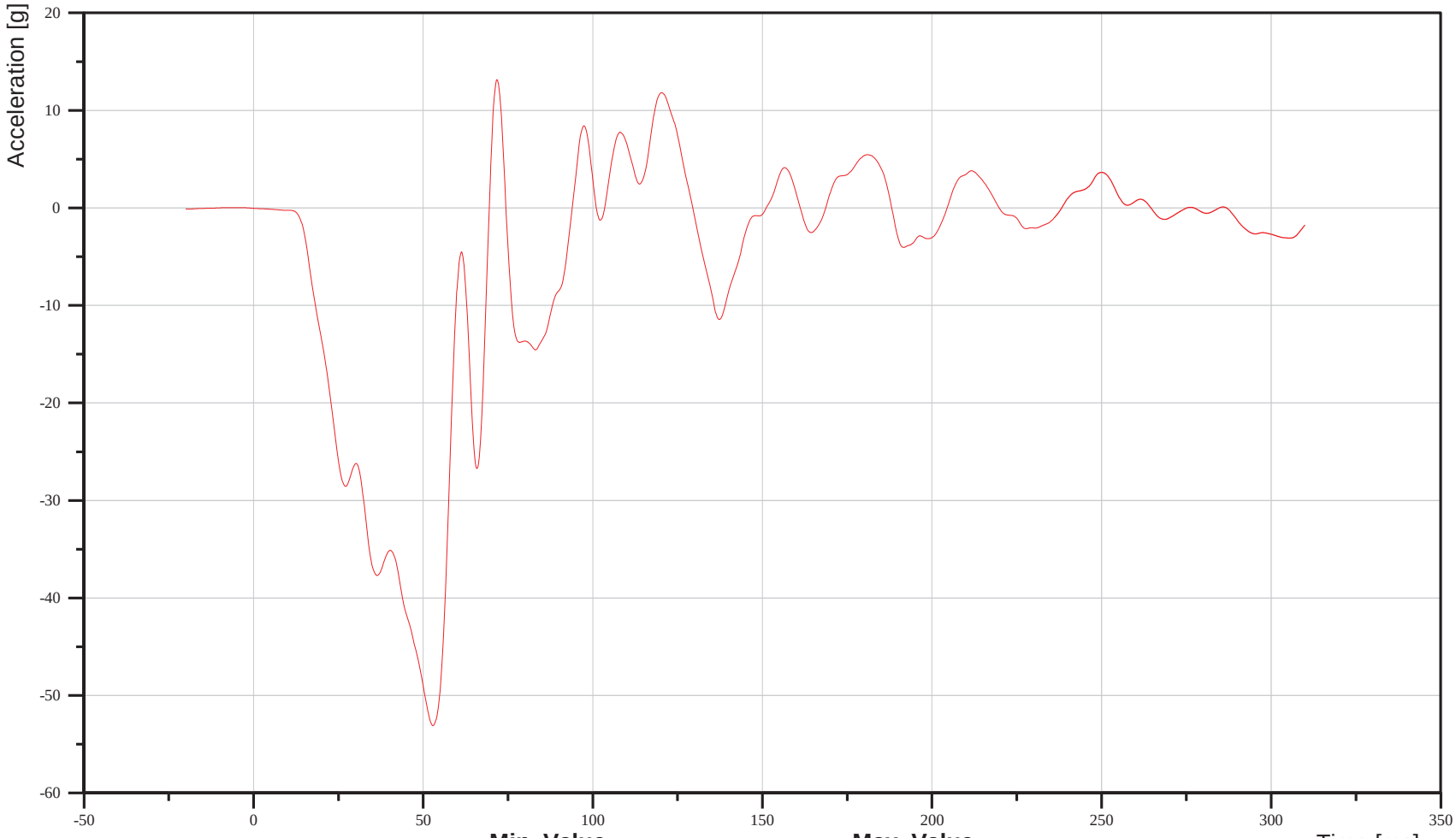
Bottom of Engine X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

10ENGNBO0000ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-53.08 g at 52.88 ms

Max. Value
13.15 g at 71.76 ms

All Terrain Conversions FMVSS 208 Flat Frontal

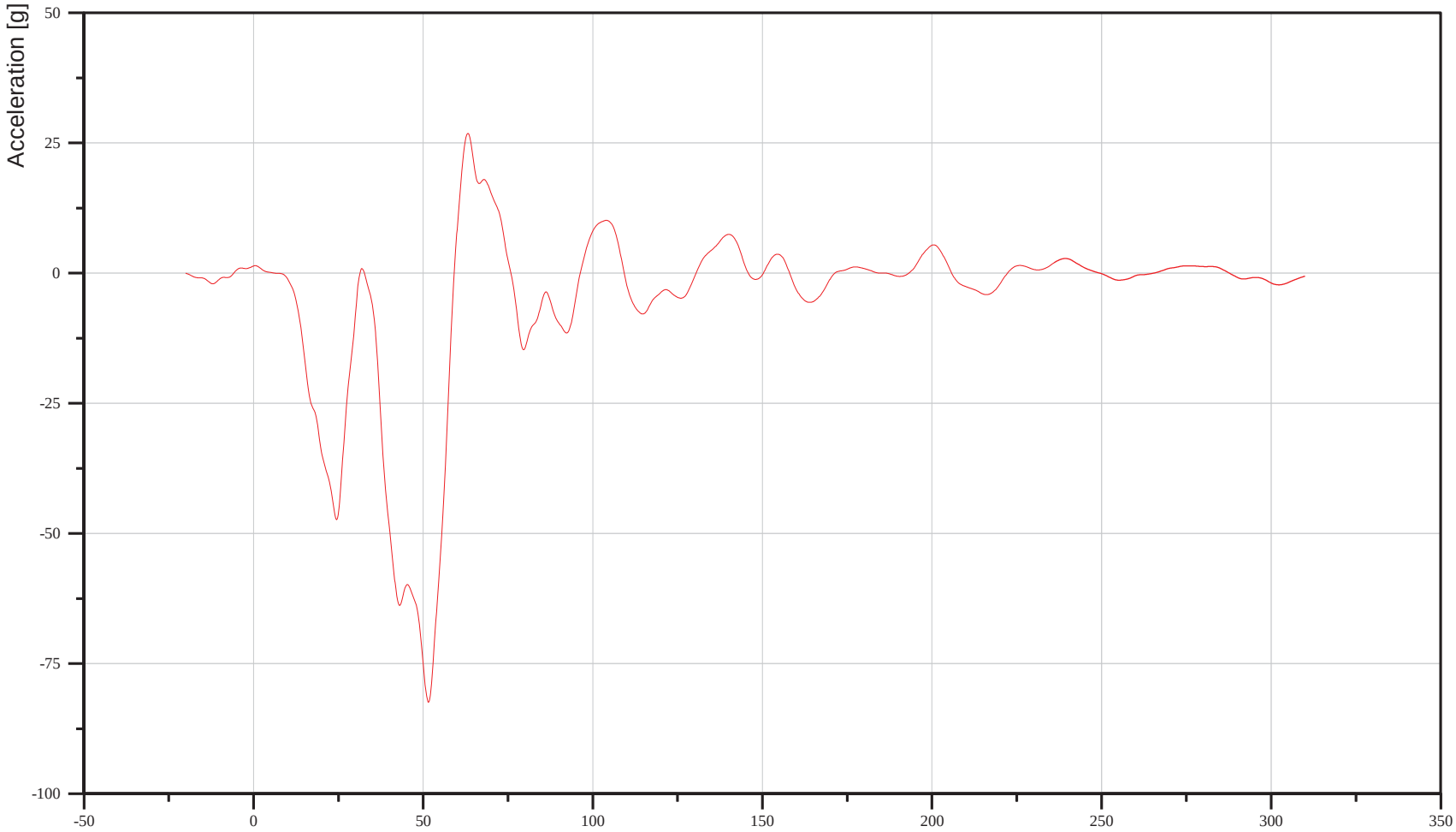
Right Front Disc Brake Caliper X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

13WHEEL00000ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-82.38 g at 51.52 ms

Max. Value
26.85 g at 63.20 ms

All Terrain Conversions FMVSS 208 Flat Frontal

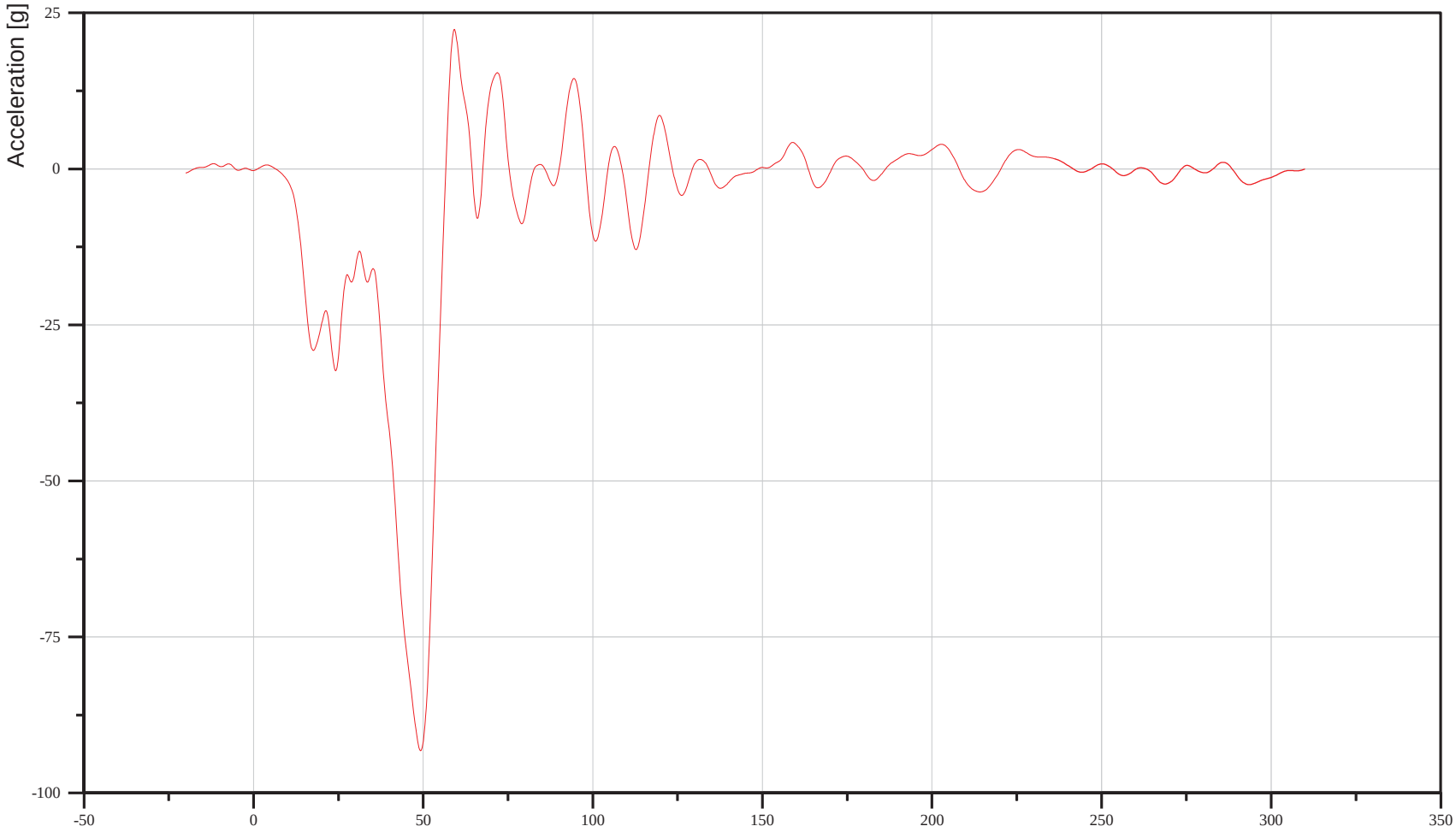
Left Front Disc Brake Caliper X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

11WHEEL00000ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-93.21 g at 49.28 ms

Max. Value
22.36 g at 59.20 ms

All Terrain Conversions FMVSS 208 Flat Frontal

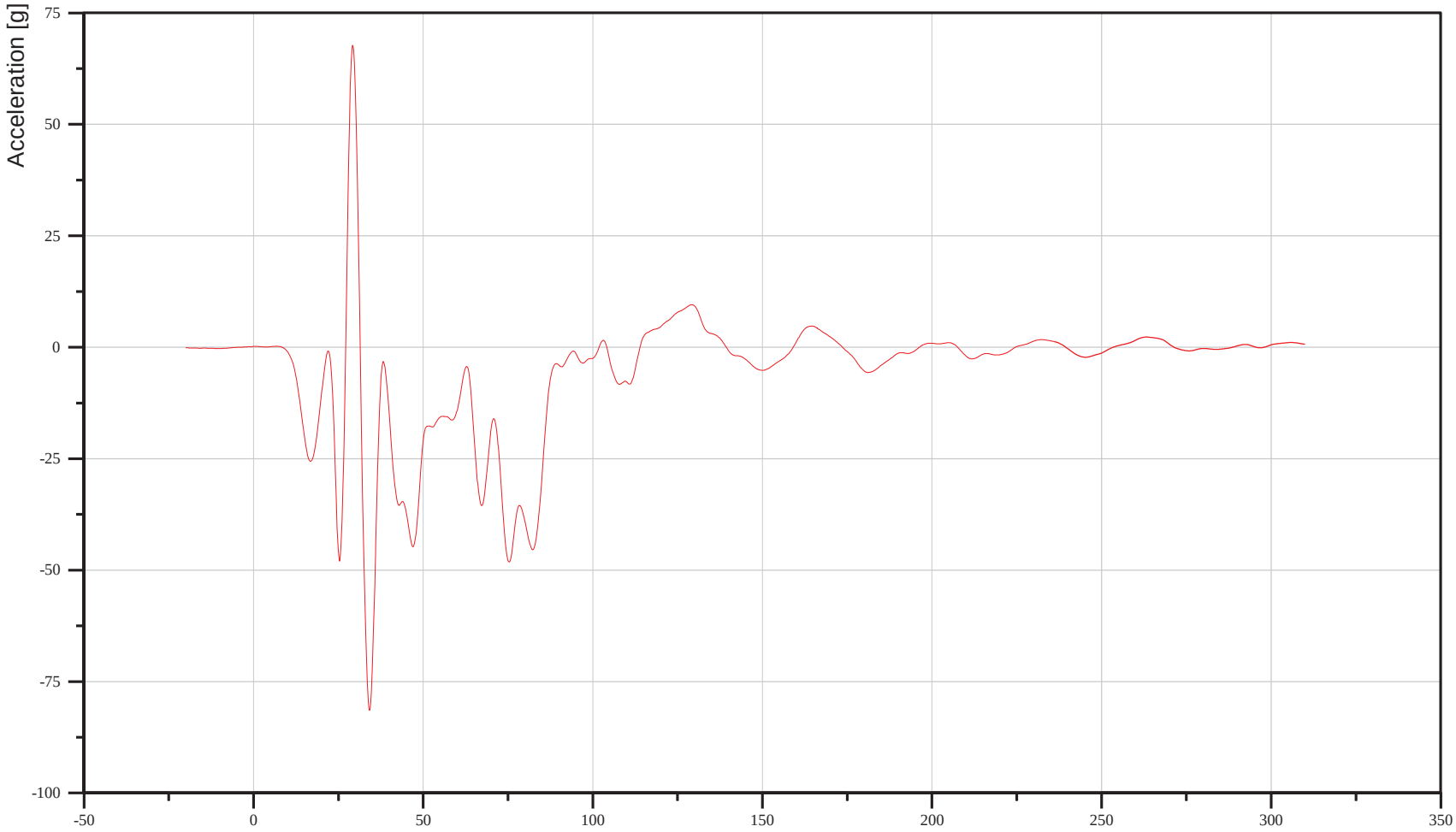
Center of Instrument Panel Top Surface X

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

10DDASB00000ACXD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-81.43 g at 34.16 ms

Max. Value
67.73 g at 29.20 ms

All Terrain Conversions FMVSS 208 Flat Frontal

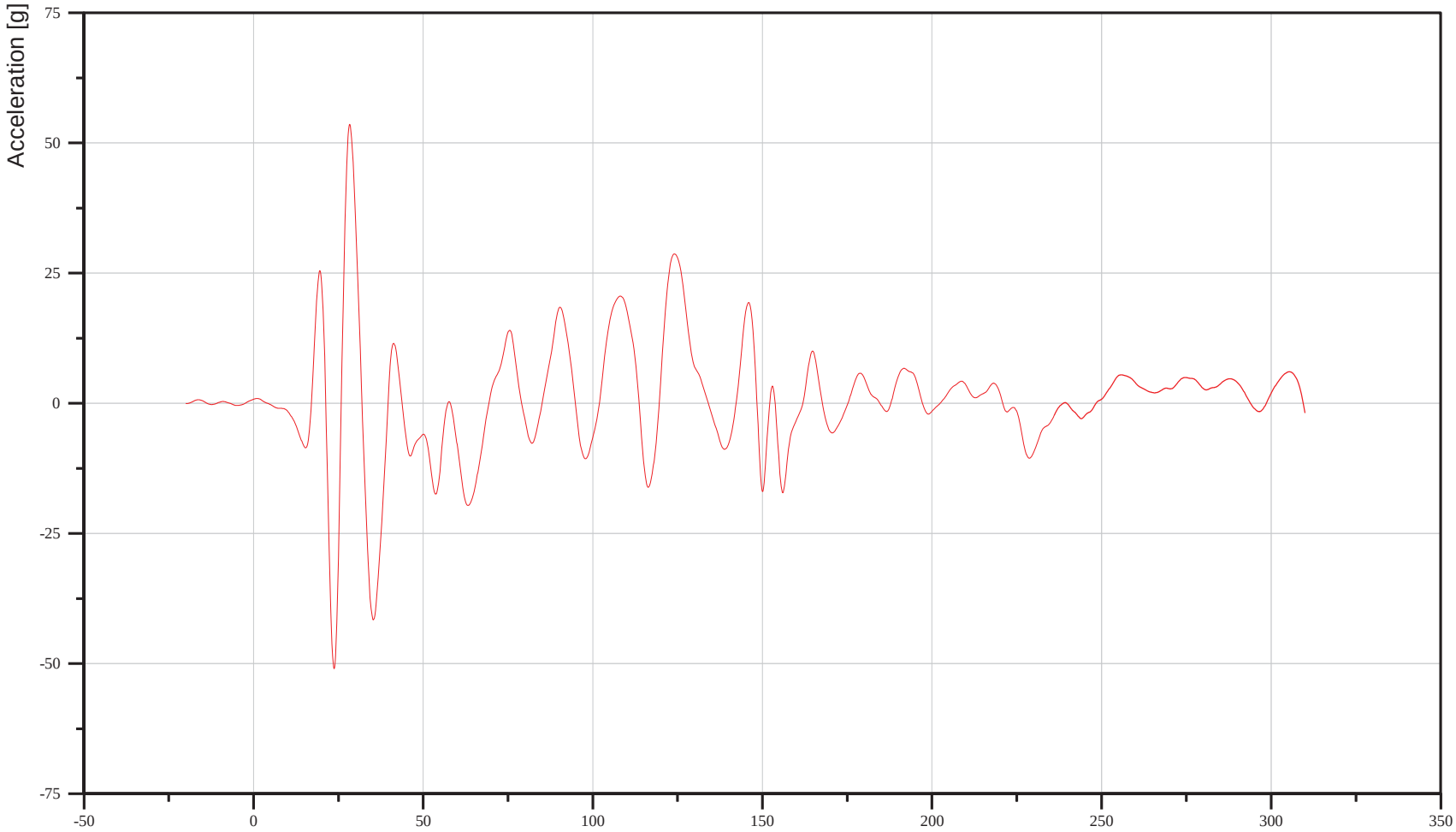
Longitudinal Center Line in the Trunk Z

Date: 06/17/2019
Time: 12:27

Customer: All Terrain Conversions, LLC.

10FORA000000ACZD

TRC Inc. Test Lab: CTF
Test Number: 190617



Filter: CFC_60

Min. Value
-50.95 g at 23.76 ms

Max. Value
53.58 g at 28.32 ms

Appendix C

Dummy Calibration

Driver SN # 616

Transportation Research Center Inc.
ATD Certification Report

Customer:

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Anthropomorphic Device:

Hybrid III 50th Percentile Male
Serial No. 616
Certification No. 210

Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Table of Contents

Introduction Page 3

Appendix A – Incoming Inspection Page 4

Findings Page 5

Photographs Page 6

Summary of Action Items Page 7

Appendix B – Test Results Page 8

Front Head Drop Certification Page 9

Neck Flexion Certification Page 11

Neck Extension Certification Page 14

Front Thorax Certification Page 17

Hip Flexion Left Certification Page 19

Hip Flexion Right Certification Page 20

Left Knee Femur Response Certification Page 21

Right Knee Femur Response Certification Page 23

Appendix C – TRC Inc. Quality Assurance Page 25

Introduction

Customer Name:	TRC
Customer Contact:	Jason Jenkins
Email:	JenkinJ@trcpg.com
Phone:	(937) 666-2011
Date Received:	May 22, 2019
Date Completed:	May 23, 2019

Special Instruction: N/A

This Certification Report meets the requirements set forth by the ANSI-ASQ National Accreditation Board ISO/IEC 17025:2005 accreditation under the scope of Mechanical Testing for Crash Test Dummy Certification Testing (ANAB Certificate #L2187). This testing certification shall not be reproduced, except in full, without written approval of TRC Inc.

The evidence measurements of this Certification Report are traceable by the Serial Number and Certification Number located at the top of the first section for each certification.

Each certification test was conducted by an authorized Transportation Research Center Inc. (TRC Inc.) employee within the requirements of the ISO/IEC 17025:2005 standards and adheres to CFR Part 572 Subparts B, E, N, O, P, R, T, U, V, or SAE J2860; depending on ATD type.

Each component of the ATD to be tested was contained in a temperature controlled environment for a period of at least 4 hours before the test. The temperature in the ATD Certification Laboratory was between 20.6°C and 22.2°C (69.08°F – 71.96°F). The relative humidity in the ATD Certification Laboratory was between 10% and 70%.

Date Testing Requested: 05/22/2019

Testing Completed by: _____ Date: 05/23/2019
Bryce Williams, Engineering Technician I

Testing Approved by: _____ Date: 05/28/2019
Salvatore LoPresti, Supervisor - Calibration Services

Appendix A – Incoming Inspection

TRC ATD Laboratory As Received Inspection Report

Name: Bryce Williams

Date: 5/22/2019

Customer: TRC

ATD S/N: 616

HEAD / NECK

No.	Comments	Photo No.
1	None to report.	
2		
3		

THORAX / ABDOMEN

No.	Comments	Photo No.
4	None to report.	
5		
6		

SHOULDERS / ARMS

No.	Comments	Photo No.
7	None to report.	
8		
9		

PELVIS / LUMBAR

No.	Comments	Photo No.
10	None to report.	
11		
12		

FEMUR / KNEES

No.	Comments	Photo No.
13	None to report.	
14		
15		

LOWER LEGS / FEET

No.	Comments	Photo No.
16	Right lower leg skin has cuts.	1
17		
18		

TRC ATD Laboratory As Received Inspection Photos

Name: Bryce Williams

Date: 5/22/2019

Customer: TRC

ATD S/N: 616

1	
2	
3	
4	
5	
6	

TRC ATD Laboratory Inspection Report Action Items

Name:	Bryce Williams	Date:	5/23/2019
Customer:	TRC	ATD S/N:	616

Action #1	None to report.
Resolution #1	
Action #2	
Resolution #2	
Action #3	
Resolution #3	
Comments	

Appendix B – Test Results

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	22.0 ºC	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	270.9 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	3.0 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

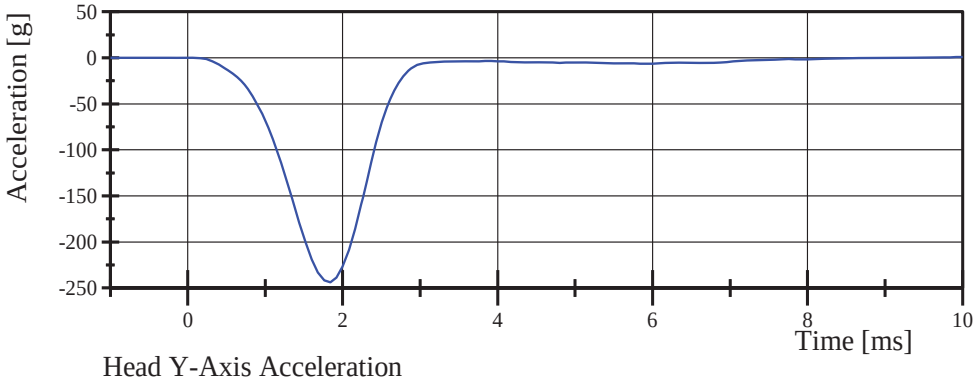
Condition: Used

Comments:
Head Skin S/N: DJ5810

Transportation Research Center Inc.

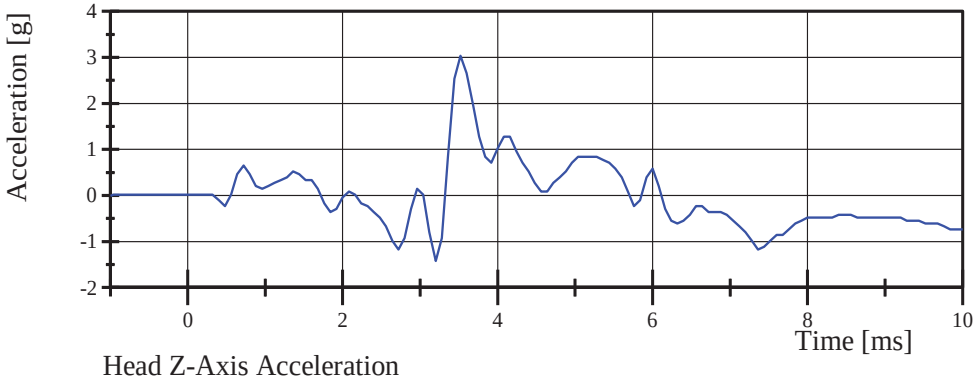
Front Head Drop
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Head X-Axis Acceleration



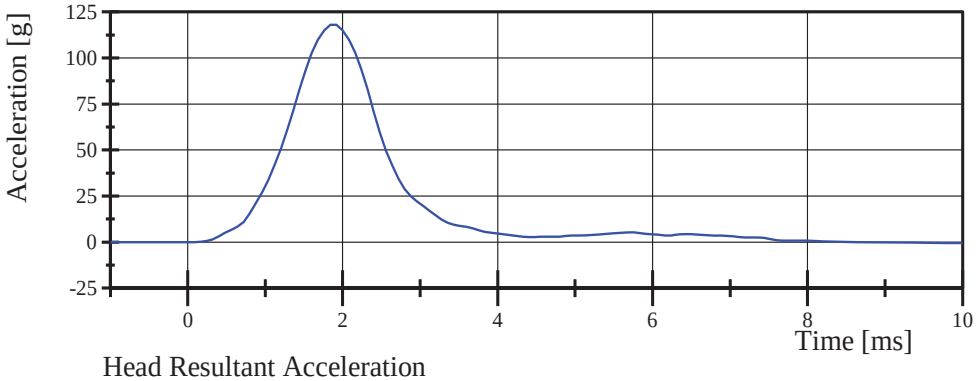
Filter Class: CFC_1000
Max: 0.8 g at 10.0 ms
Min: -243.9 g at 1.8 ms

Head Y-Axis Acceleration



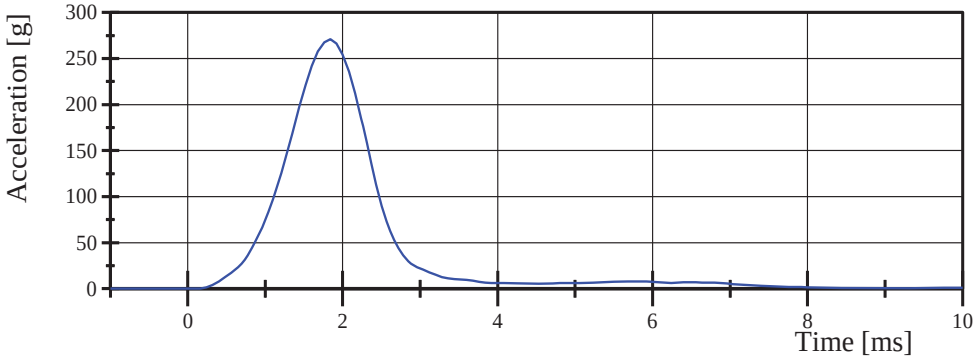
Filter Class: CFC_1000
Max: 3.0 g at 3.5 ms
Min: -1.4 g at 3.2 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 118.1 g at 1.9 ms
Min: -0.5 g at 10.0 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 270.9 g at 1.8 ms
Min: 0.0 g at -0.1 ms

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.1 ºC	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.941 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	40.7 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-23.38 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-19.99 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-14.89 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-14.89 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) º	-74.2 º	Yes
Time of Peak	57 - 64 ms	62.8 ms	Yes
Total Head D-Plane Rotation Decay to 0º	113 - 128 ms	124.4 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	99.21 N·m	Yes
Time of Peak	47 - 58 ms	54.5 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	106.1 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 2059

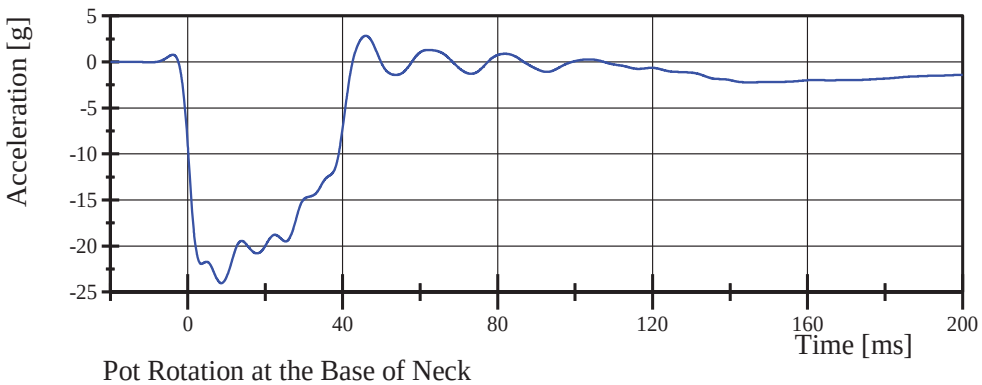
Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 616 Certification No. 210-1

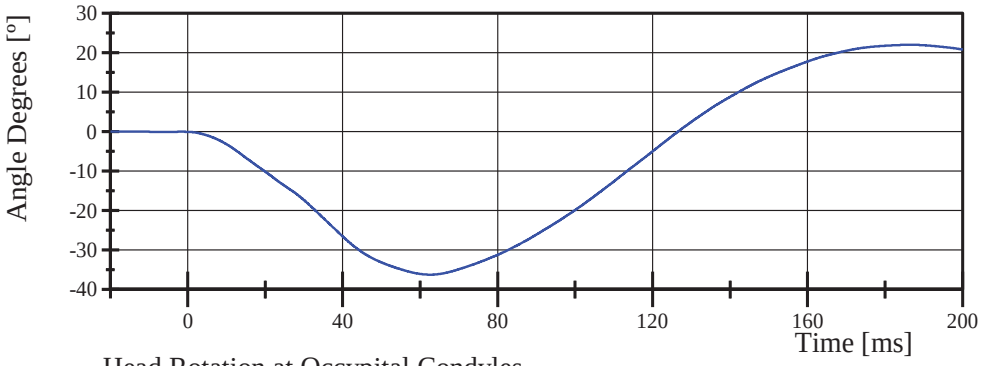
Test Date: 5/22/2019

Pendulum Acceleration



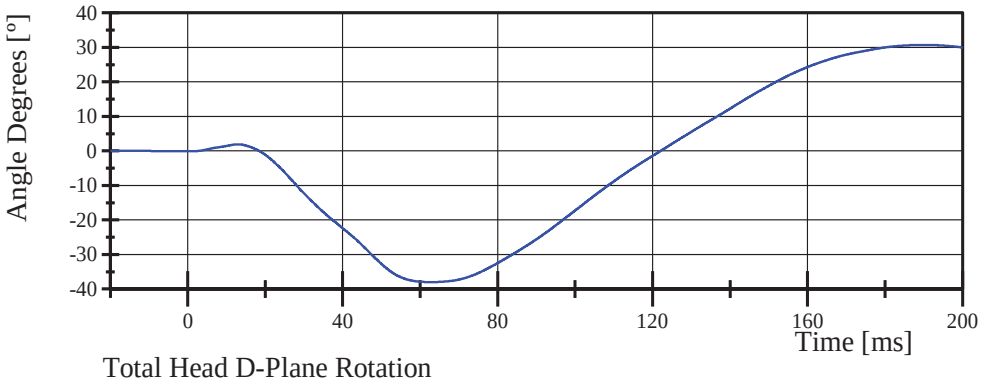
Filter Class: CFC_60
Max: 2.8 g at 46.0 ms
Min: -24.0 g at 8.7 ms

Pot Rotation at the Base of Neck



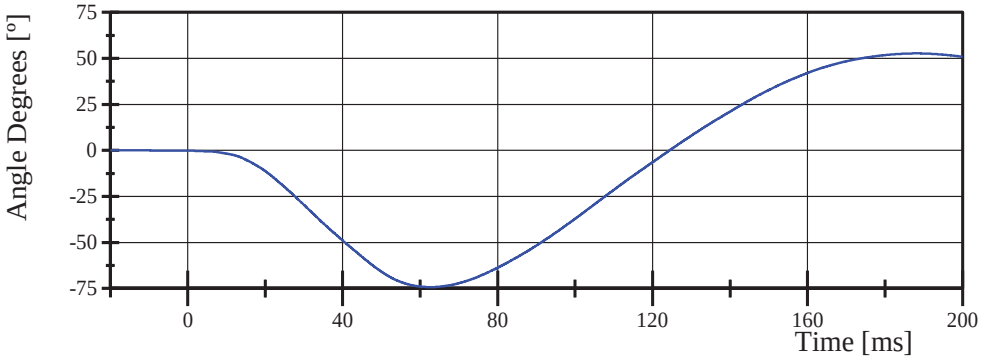
Filter Class: CFC_60
Max: 22.1 ° at 186.6 ms
Min: -36.2 ° at 62.7 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 30.7 ° at 190.1 ms
Min: -38.0 ° at 63.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 52.7 ° at 188.2 ms
Min: -74.2 ° at 62.8 ms

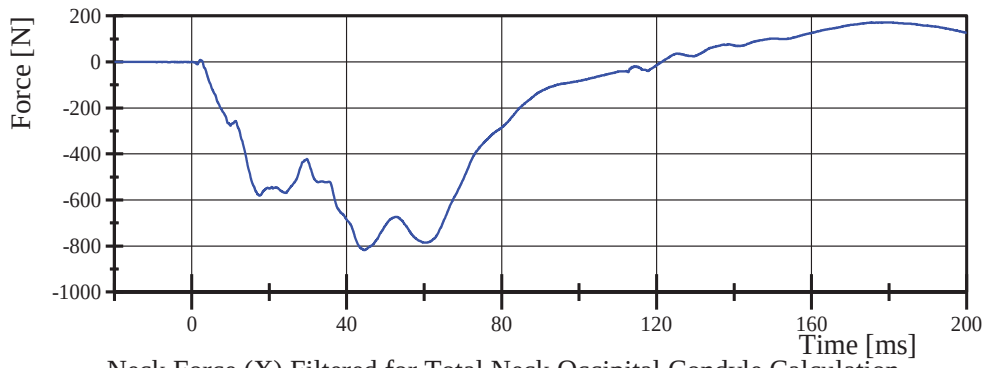
Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 616 Certification No. 210-1

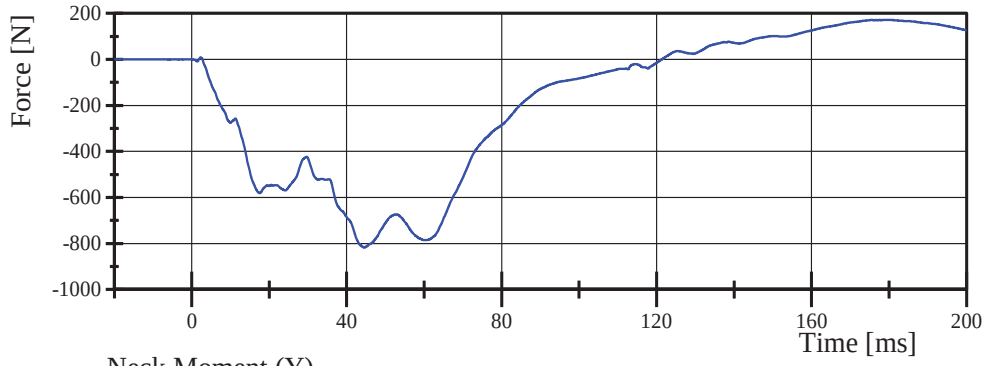
Test Date: 5/22/2019

Neck Force (X)



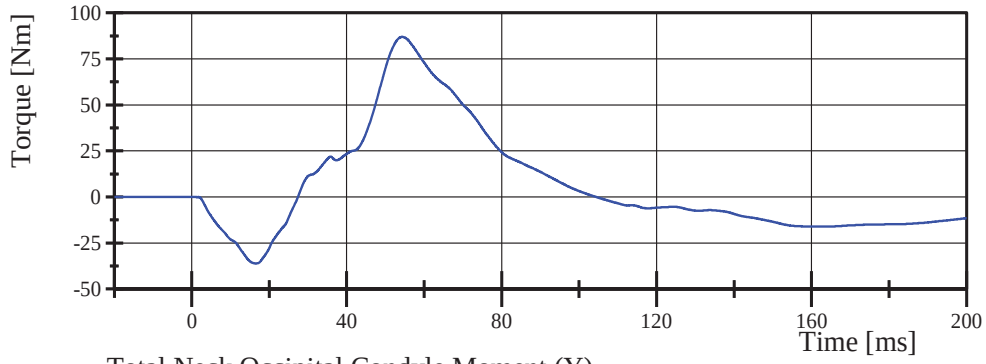
Filter Class: CFC_1000
Max: 172.0 N at 179.6 ms
Min: -816.6 N at 44.4 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



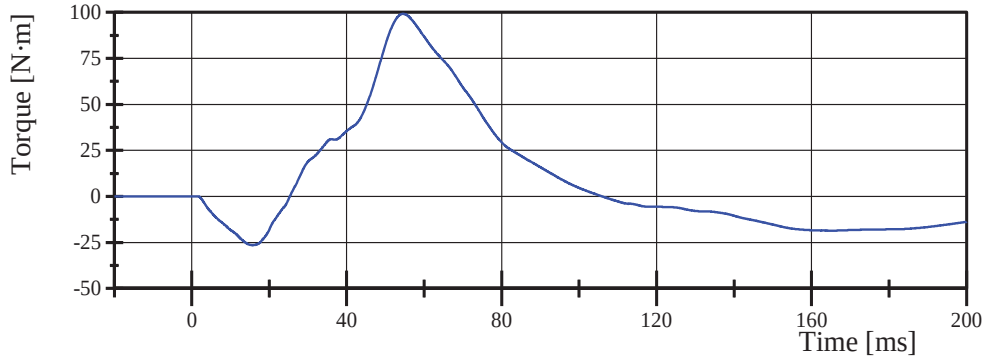
Filter Class: CFC_600
Max: 171.9 N at 179.7 ms
Min: -816.7 N at 44.6 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 87.0 Nm at 54.3 ms
Min: -36.1 Nm at 16.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 99.2 N·m at 54.5 ms
Min: -26.4 N·m at 15.7 ms

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 616 Certification No. 210-2
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.6 ºC	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.966 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	38.3 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	21.20 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	17.46 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.85 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.86 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 º	101.5 º	Yes
Time of Peak	72 - 82 ms	76.6 ms	Yes
Total Head D-Plane Rotation Decay to 0º	147 - 174 ms	159.3 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-52.9) - (-80) N·m	-72.71 N·m	Yes
Time of Peak	65 - 79 ms	72.0 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	140.7 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 2059

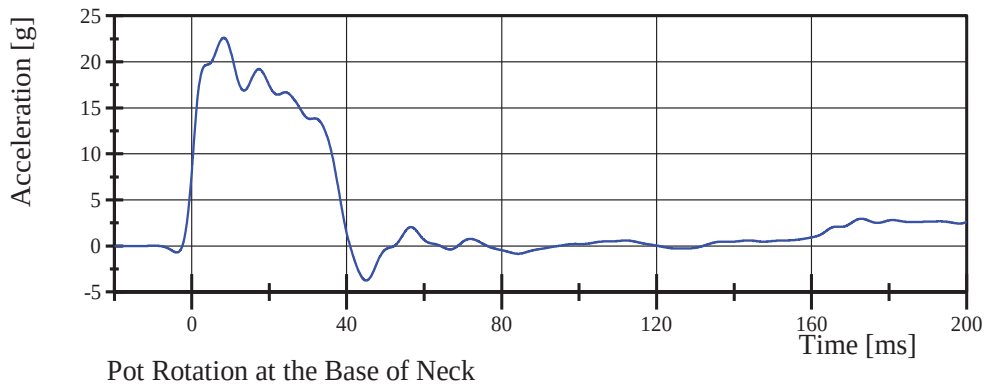
Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 616 Certification No. 210-2

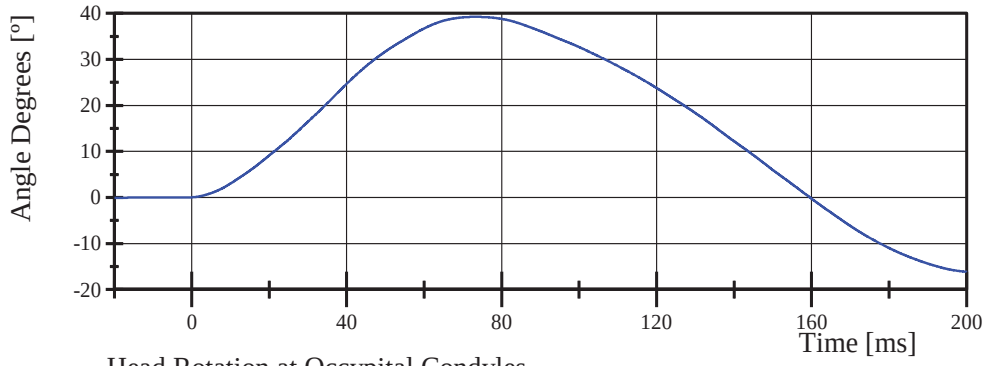
Test Date: 5/22/2019

Pendulum Acceleration



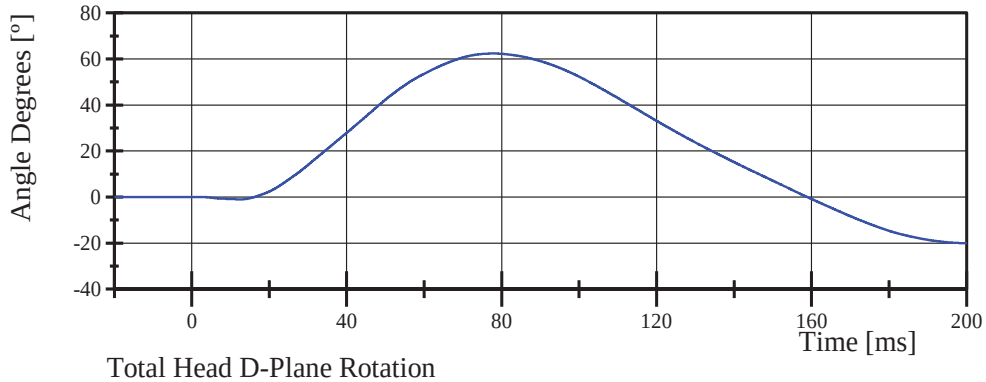
Filter Class: CFC_60
Max: 22.6 g at 8.3 ms
Min: -3.8 g at 45.0 ms

Pot Rotation at the Base of Neck



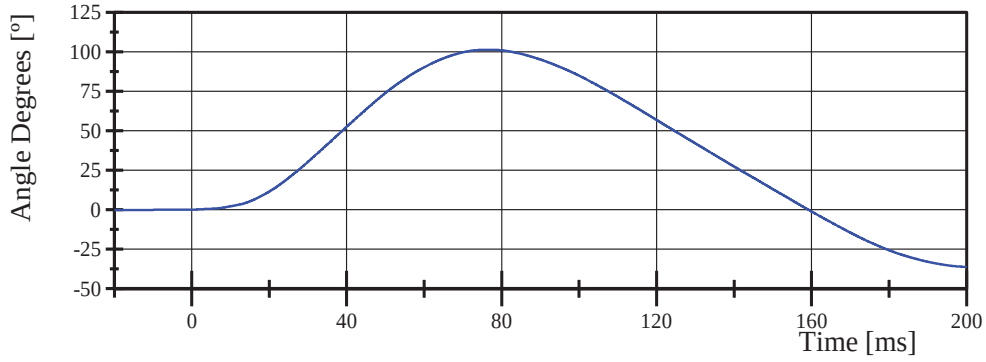
Filter Class: CFC_60
Max: 39.3 ° at 73.2 ms
Min: -16.1 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 62.4 ° at 77.9 ms
Min: -20.1 ° at 200.0 ms

Total Head D-Plane Rotation

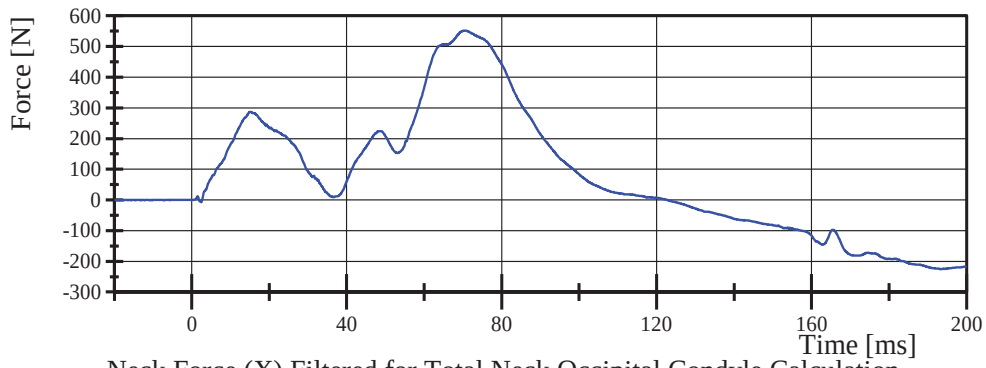


Filter Class: CFC_60
Max: 101.5 ° at 76.6 ms
Min: -36.2 ° at 200.0 ms

Transportation Research Center Inc.

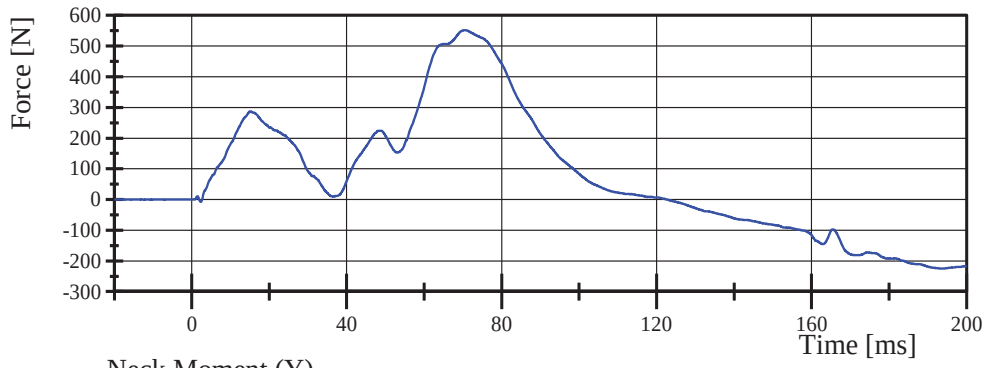
Neck Extension
HIII 50th Serial No. 616 Certification No. 210-2
Test Date: 5/22/2019

Neck Force (X)



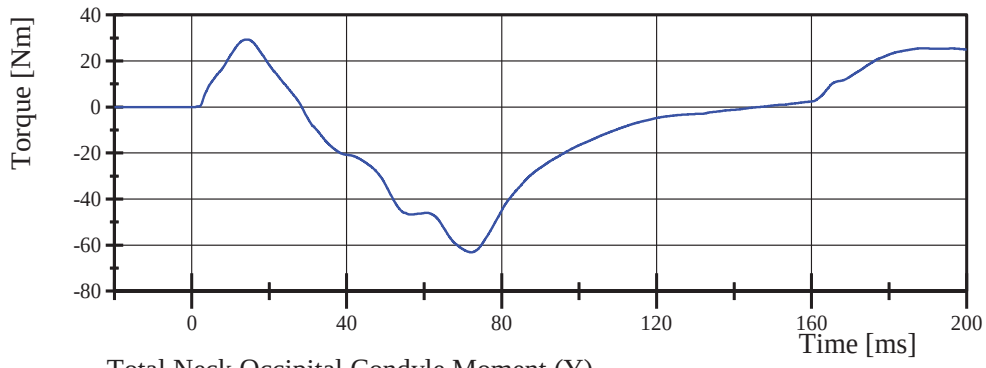
Filter Class: CFC_1000
Max: 552.4 N at 70.7 ms
Min: -225.4 N at 193.3 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



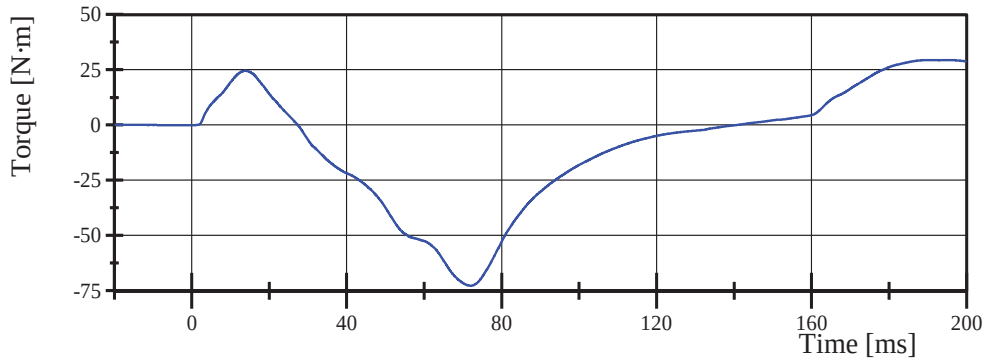
Filter Class: CFC_600
Max: 552.2 N at 70.6 ms
Min: -225.2 N at 193.4 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 29.3 Nm at 14.5 ms
Min: -63.1 Nm at 72.2 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 29.4 N·m at 195.3 ms
Min: -72.7 N·m at 72.0 ms

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 616 Certification No. 210-3
Test Date: 5/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.3 ºC	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.656 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,591.9 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-64.72 mm	Yes
Internal Hysteresis	69 - 85 %	72.7 %	Yes

Test meets specifications.

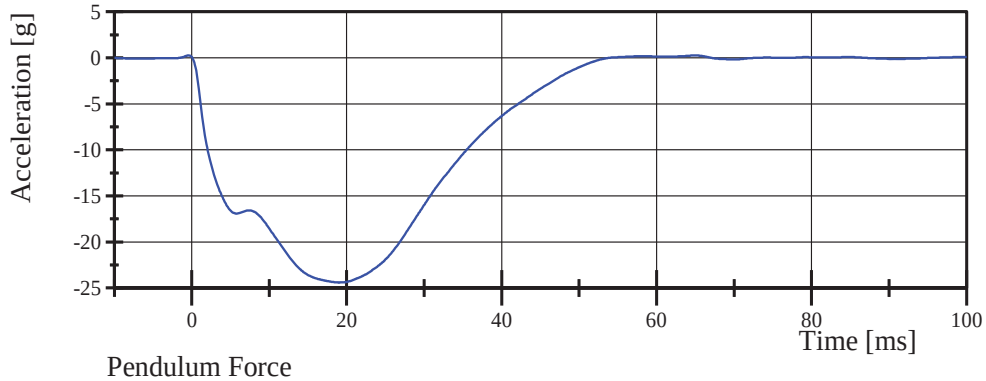
Condition: Used

Comments:
Jacket S/N: 1270
Rib Set S/N: 02031646A

Transportation Research Center Inc.

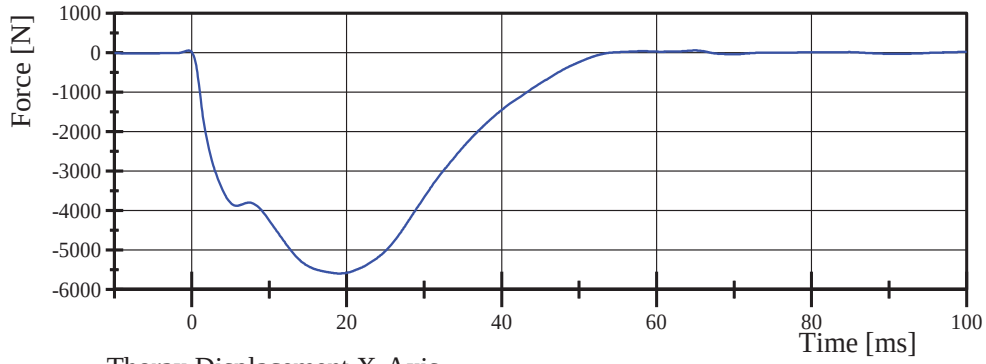
Front Thorax
HIII 50th Serial No. 616 Certification No. 210-3
Test Date: 5/23/2019

Pendulum Acceleration



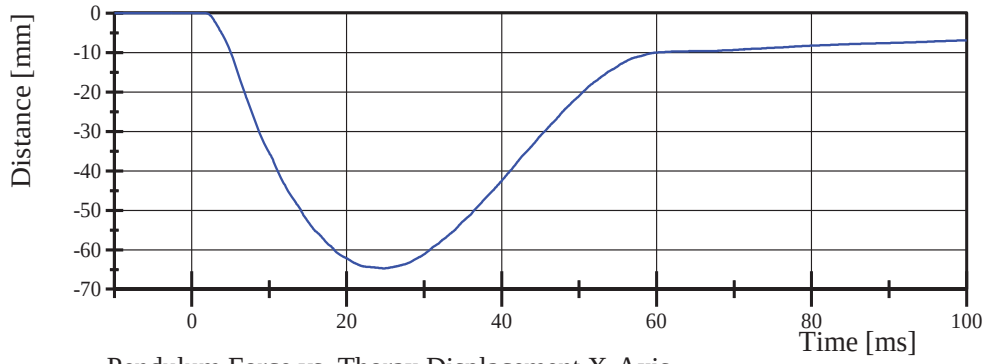
Filter Class: CFC_180
Max: 0.3 g at 65.0 ms
Min: -24.4 g at 19.0 ms

Pendulum Force



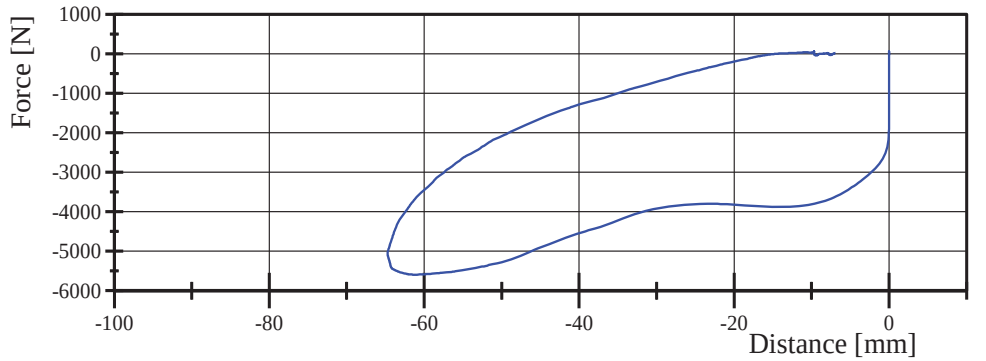
Filter Class: CFC_180
Max: 61.4 N at 65.0 ms
Min: -5,591.9 N at 19.0 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -2.6 ms
Min: -64.7 mm at 24.8 ms

Pendulum Force vs. Thorax Displacement X-Axis



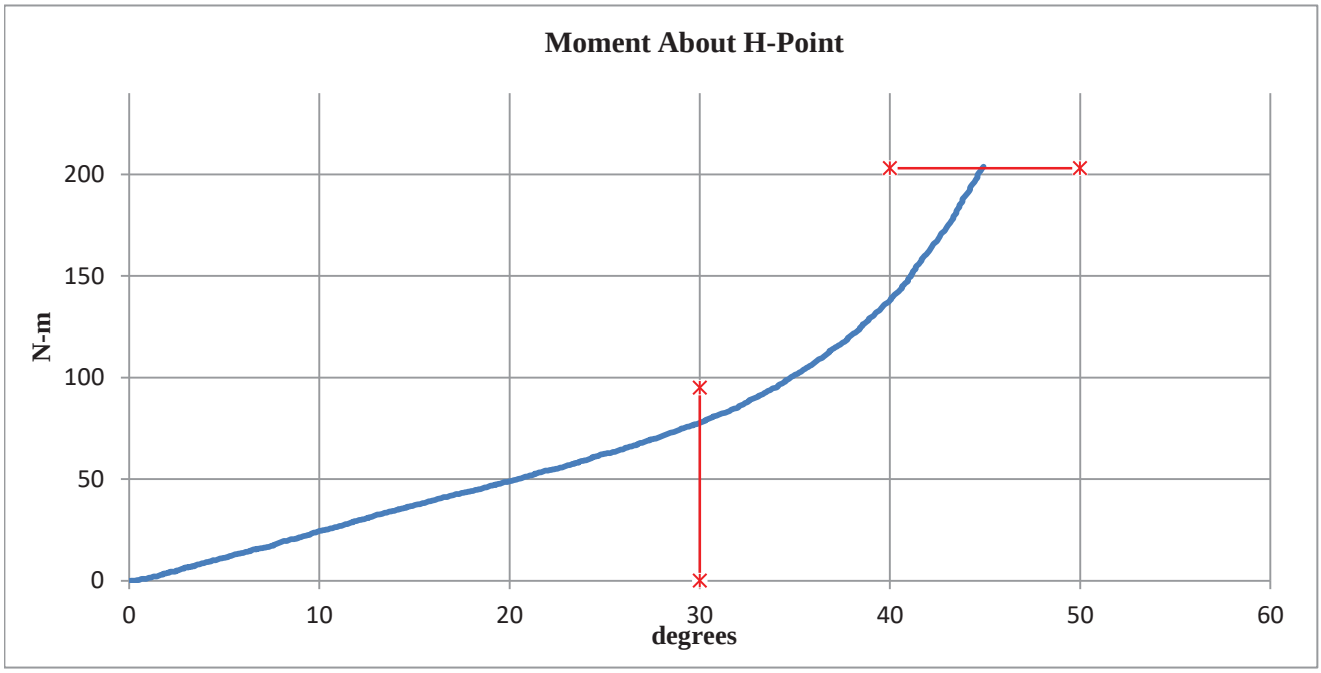
Filter Class: CFC_180
Max: 61.4 N at -9.7 mm
Min: -5,591.9 N at -61.2 mm

Transportation Research Center Inc.

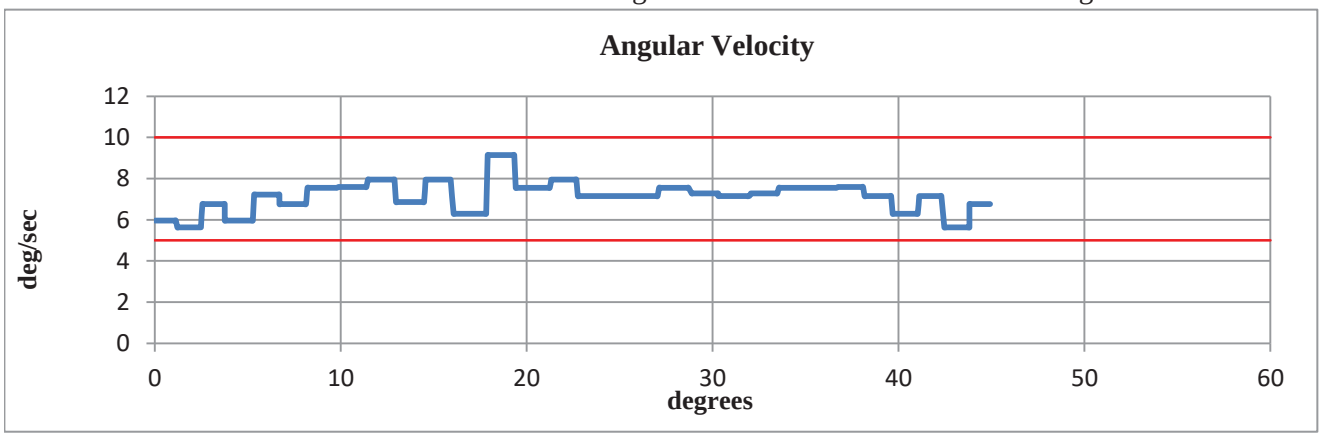
Hybrid III 50th Male Hip Range of Motion

Serial Number:	616	Date:	22-May-2019
Side Tested:	Left Hip	Time:	8:55
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.4	°C	Pass
Humidity	10	-	70	34	%	Pass
Moment at 30°	0	≤	94.9	77.89	N-m	Pass
Angle at 203 Nm	40	-	50	44.92	deg	Pass
Average Velocity	5	-	10	7.12	deg/sec	Pass



Max: 9.14 deg/sec Min: 5.63 deg/sec



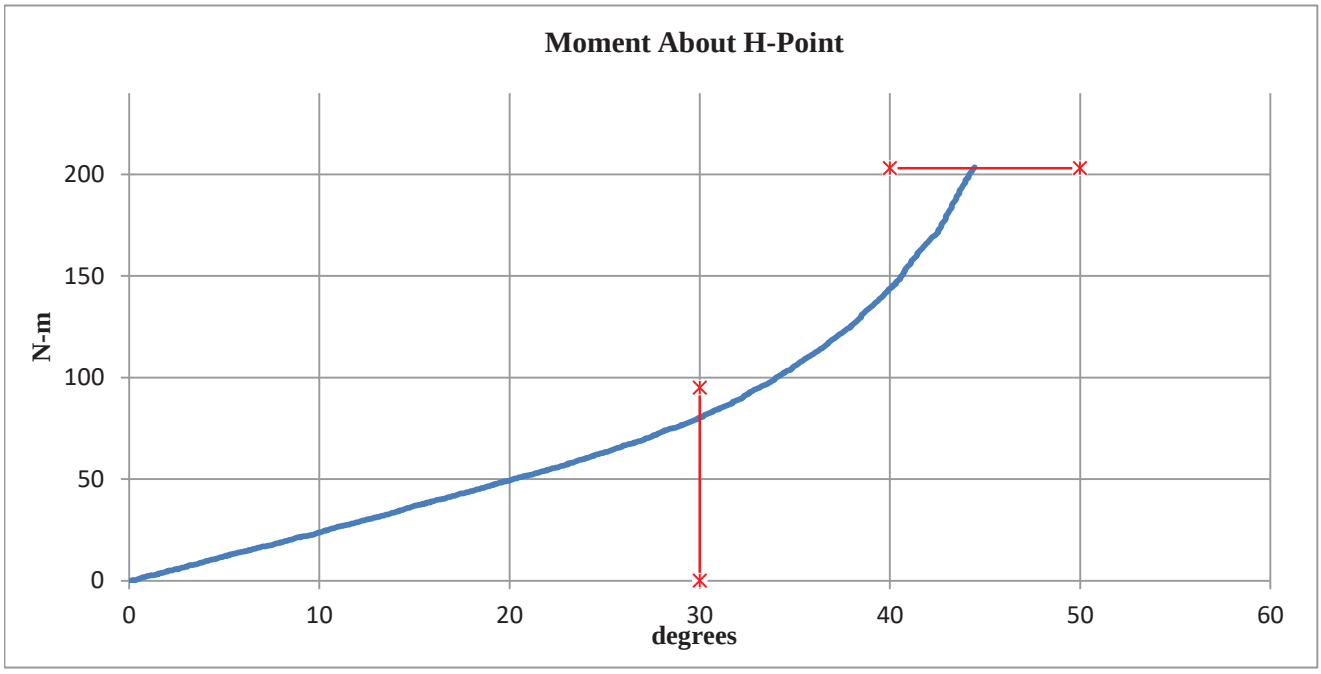
Pelvis Skin S/N: DH9138

Transportation Research Center Inc.

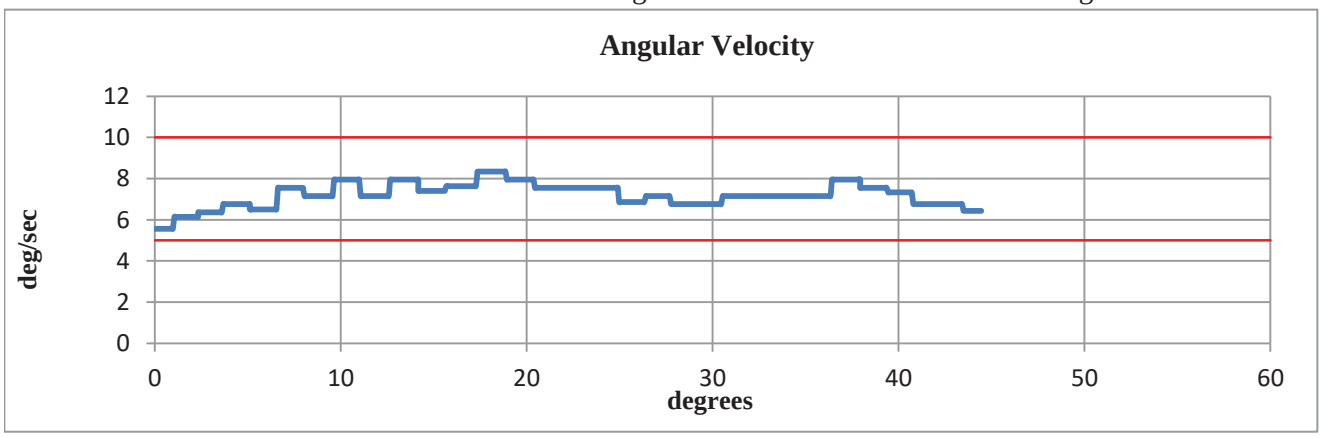
Hybrid III 50th Male Hip Range of Motion

Serial Number:	616	Date:	22-May-2019
Side Tested:	Right Hip	Time:	11:31
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.1	°C	Pass
Humidity	10	-	70	36	%	Pass
Moment at 30°	0	≤	94.9	80.55	N-m	Pass
Angle at 203 Nm	40	-	50	44.45	deg	Pass
Average Velocity	5	-	10	7.17	deg/sec	Pass



Max: 8.34 deg/sec Min: 5.56 deg/sec



Pelvis Skin S/N: DH9138

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 ºC	22.0 ºC	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.083 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,547.69 N	Yes

Test meets specifications.

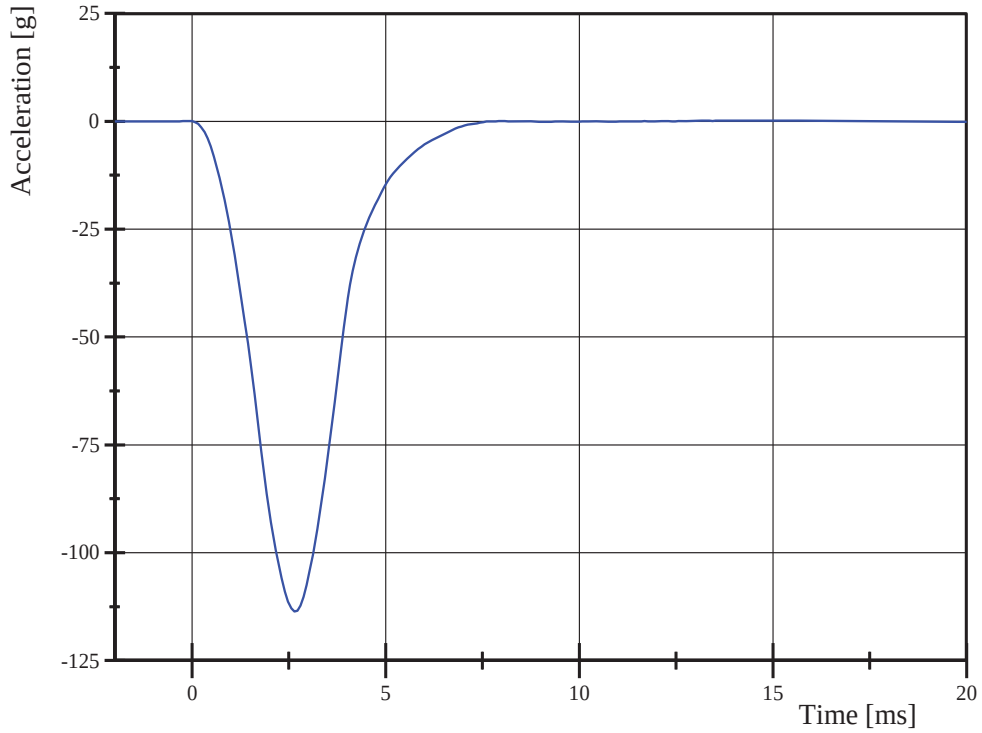
Condition: Used

Comments:
Knee Skin S/N: 1524

Transportation Research Center Inc.

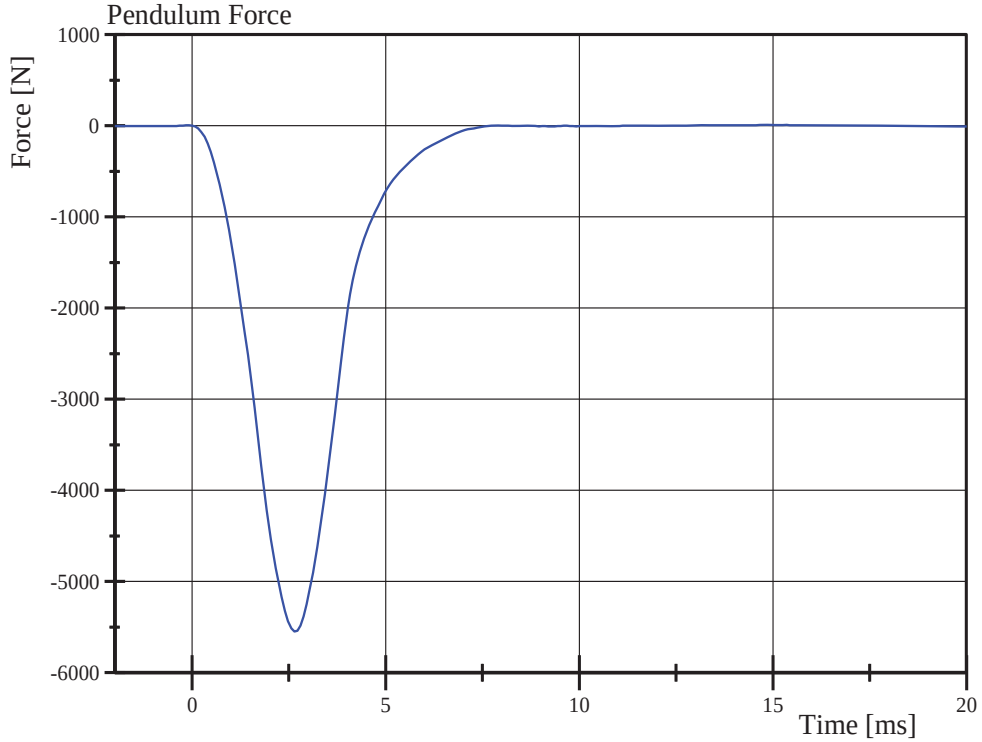
Left Knee Femur Response Test
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 14.8 ms
Min: -113.6 g at 2.6 ms

Pendulum Force



Filter Class: CFC_600
Max: 10.3 N at 14.8 ms
Min: -5,547.7 N at 2.6 ms

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 ºC	21.9 ºC	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.111 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,365.20 N	Yes

Test meets specifications.

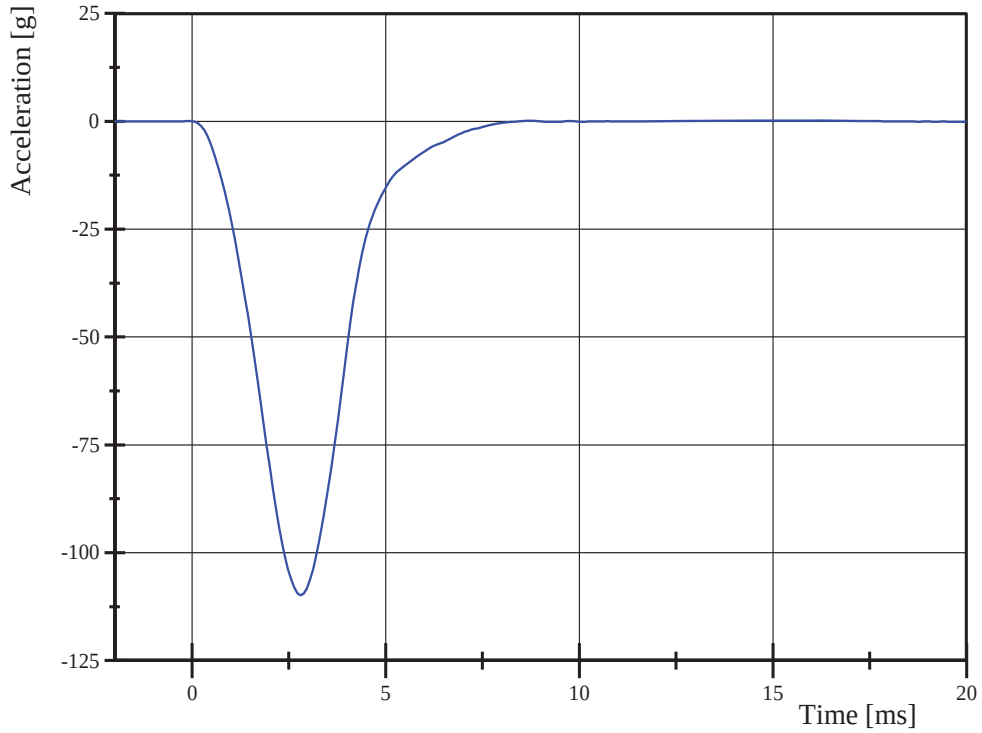
Condition: Used

Comments:
Knee Skin S/N: 1524

Transportation Research Center Inc.

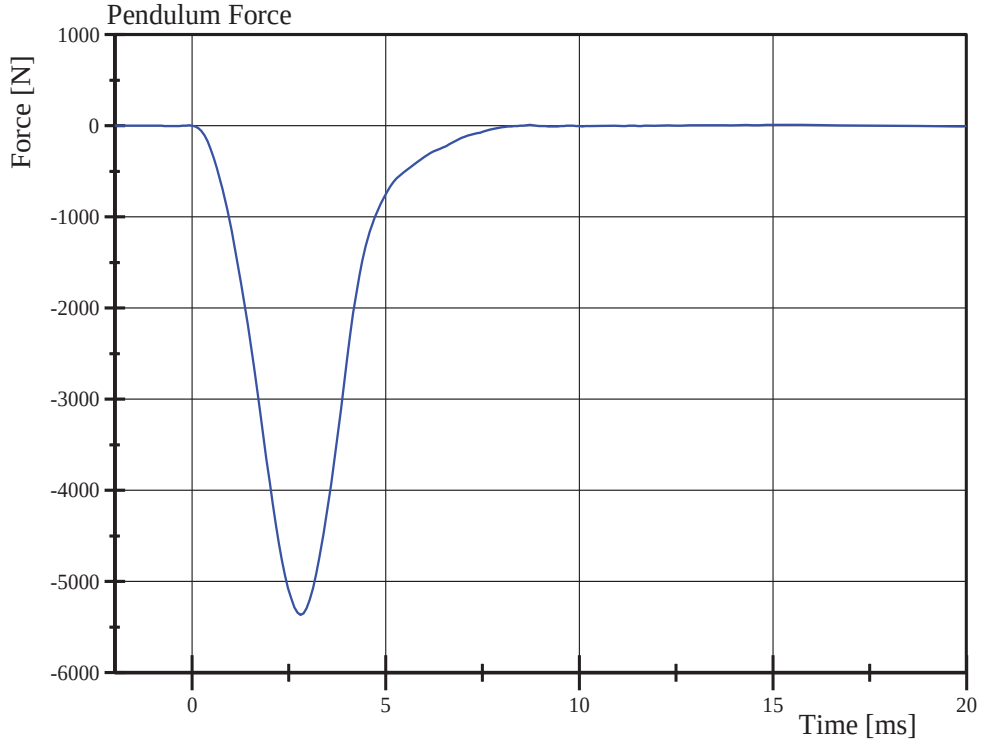
Right Knee Femur Response Test
HIII 50th Serial No. 616 Certification No. 210-1
Test Date: 5/22/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 15.8 ms
Min: -109.9 g at 2.8 ms

Pendulum Force



Filter Class: CFC_600
Max: 10.3 N at 15.8 ms
Min: -5,365.2 N at 2.8 ms

Appendix C – Quality Assurance

Serial Number: 616
Certification No. 210

Quality Assurance

ATD Assembly & Final Inspection

ATD Type:	Hybrid III 50th Percentile Male
ATD Serial Number:	616
Assembled by:	
Inspected by:	
Date Inspected:	05/23/2019

Passenger SN # 617

Transportation Research Center Inc.
ATD Certification Report

Customer:

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Anthropomorphic Device:

Hybrid III 50th Percentile Male
Serial No. 617
Certification No. 178

Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Table of Contents

Introduction Page 3

Appendix A – Incoming Inspection Page 4

- Findings Page 5
- Photographs Page 6
- Summary of Action Items Page 8

Appendix B – Test Results Page 9

- Front Head Drop Certification Page 10
- Neck Flexion Certification Page 12
- Neck Extension Certification Page 15
- Front Thorax Certification Page 18
- Hip Flexion Left Certification Page 20
- Hip Flexion Right Certification Page 21
- Left Knee Femur Response Certification Page 22
- Right Knee Femur Response Certification Page 24

Appendix C – TRC Inc. Quality Assurance Page 26

Introduction

Customer Name:	TRC
Customer Contact:	Jason Jenkins
Email:	JenkinJ@trcpg.com
Phone:	(937) 666-2011
Date Received:	May 22, 2019
Date Completed:	May 22, 2019

Special Instruction: N/A

This Certification Report meets the requirements set forth by the ANSI-ASQ National Accreditation Board ISO/IEC 17025:2005 accreditation under the scope of Mechanical Testing for Crash Test Dummy Certification Testing (ANAB Certificate #L2187). This testing certification shall not be reproduced, except in full, without written approval of TRC Inc.

The evidence measurements of this Certification Report are traceable by the Serial Number and Certification Number located at the top of the first section for each certification.

Each certification test was conducted by an authorized Transportation Research Center Inc. (TRC Inc.) employee within the requirements of the ISO/IEC 17025:2005 standards and adheres to CFR Part 572 Subparts B, E, N, O, P, R, T, U, V, or SAE J2860; depending on ATD type.

Each component of the ATD to be tested was contained in a temperature controlled environment for a period of at least 4 hours before the test. The temperature in the ATD Certification Laboratory was between 20.6°C and 22.2°C (69.08°F – 71.96°F). The relative humidity in the ATD Certification Laboratory was between 10% and 70%.

Date Testing Requested: 05/22/2019

Testing Completed by: _____ Date: 05/22/2019
Robert Benavides, Test Technician III

Testing Approved by: _____ Date: 05/28/2019
Salvatore LoPresti, Supervisor - Calibration Services

Appendix A – Incoming Inspection

TRC ATD Laboratory As Received Inspection Report

Name: Robert Benavides

Date: 5/22/2019

Customer: TRC

ATD S/N: 617

HEAD / NECK

No.	Comments	Photo No.
1	Cut on top of head	1
2		
3		

THORAX / ABDOMEN

No.	Comments	Photo No.
4	Inside jacket foam worn	2
5	Right arm opening inside cut	3
6	Abdomen worn	4

SHOULDERS / ARMS

No.	Comments	Photo No.
7	Left hand near wrist cut	5
8		
9		

PELVIS / LUMBAR

No.	Comments	Photo No.
10	Left leg deep cut	6
11		
12		

FEMUR / KNEES

No.	Comments	Photo No.
13	Left knee small cuts	7
14		
15		

LOWER LEGS / FEET

No.	Comments	Photo No.
16	Right leg upper cut	8
17		
18		

TRC ATD Laboratory As Received Inspection Photos

Name: Robert Benavides

Date: 5/22/2019

Customer: TRC

ATD S/N: 617

1	
2	
3	
4	
5	
6	

TRC ATD Laboratory As Received Inspection Photos

Name: Robert Benavides

Date: 5/22/2019

Customer: TRC

ATD S/N: 617

7	
8	
9	
10	
11	
12	

TRC ATD Laboratory Inspection Report Action Items

Name:	Robert Benavides	Date:	5/22/2019
Customer:	TRC	ATD S/N:	617

Action #1	None to report.
Resolution #1	
Action #2	
Resolution #2	
Action #3	
Resolution #3	
Comments	

Appendix B – Test Results

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.8 ºC	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	261.7 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	6.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

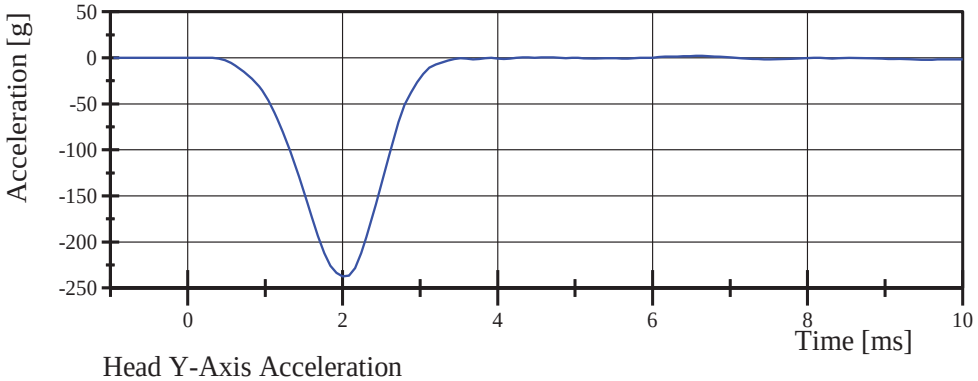
Condition: Used

Comments:
Head Skin S/N: 12041

Transportation Research Center Inc.

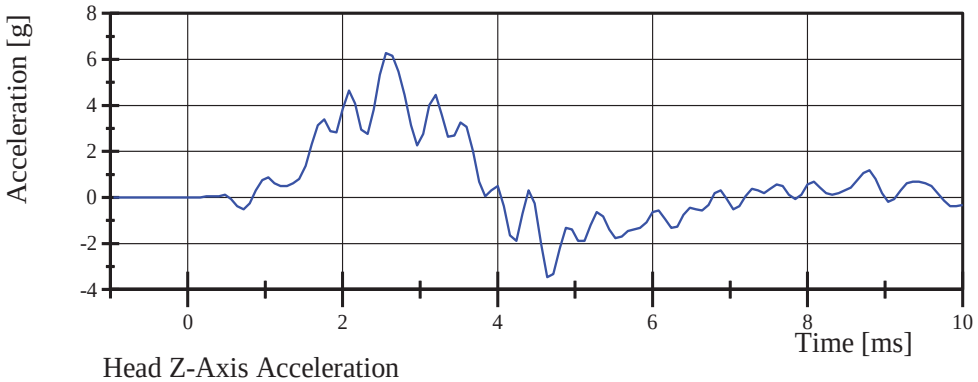
Front Head Drop
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Head X-Axis Acceleration



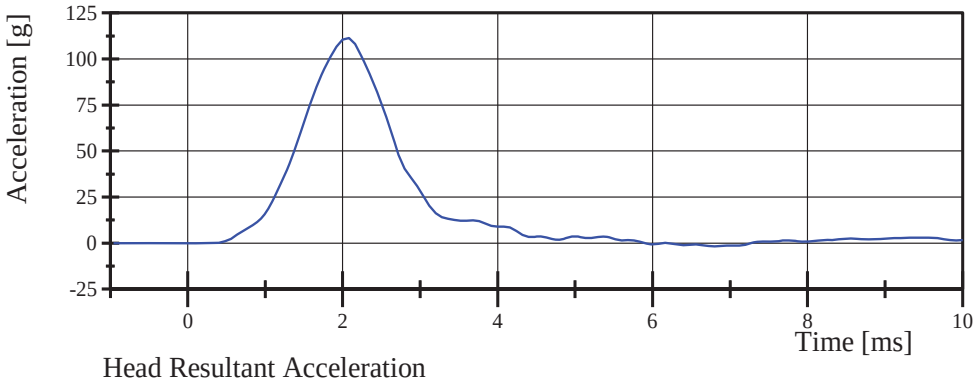
Filter Class: CFC_1000
Max: 2.2 g at 6.6 ms
Min: -237.1 g at 2.0 ms

Head Y-Axis Acceleration



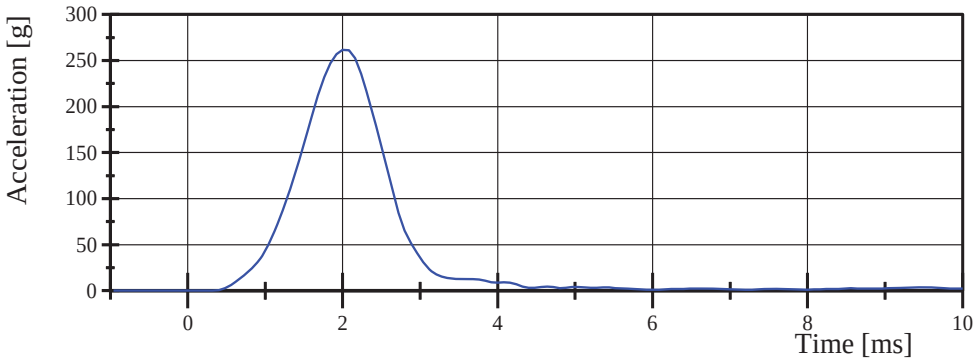
Filter Class: CFC_1000
Max: 6.3 g at 2.6 ms
Min: -3.5 g at 4.6 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 111.3 g at 2.1 ms
Min: -1.8 g at 6.8 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 261.7 g at 2.0 ms
Min: 0.0 g at 0.2 ms

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	20.9 ºC	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.948 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	37.5 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-25.77 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.55 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-16.39 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-16.39 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) º	-65.1 º	Yes
Time of Peak	57 - 64 ms	59.2 ms	Yes
Total Head D-Plane Rotation Decay to 0º	113 - 128 ms	117.0 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	89.67 N·m	Yes
Time of Peak	47 - 58 ms	51.1 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	98.4 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 02020403

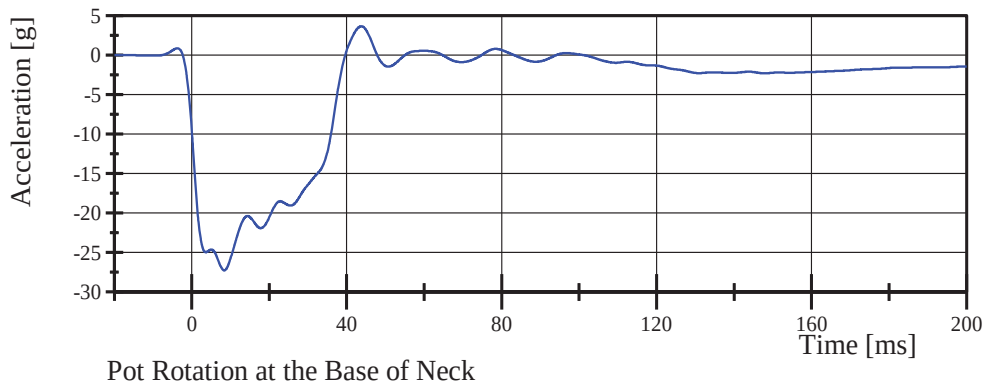
Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 617 Certification No. 178-1

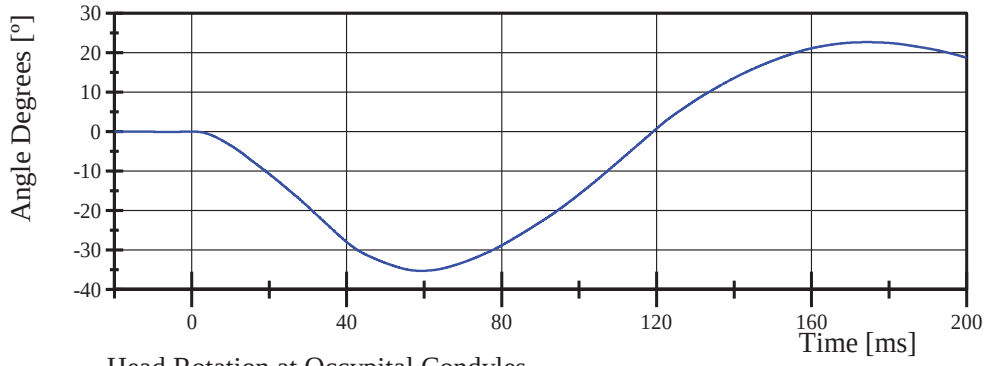
Test Date: 5/22/2019

Pendulum Acceleration



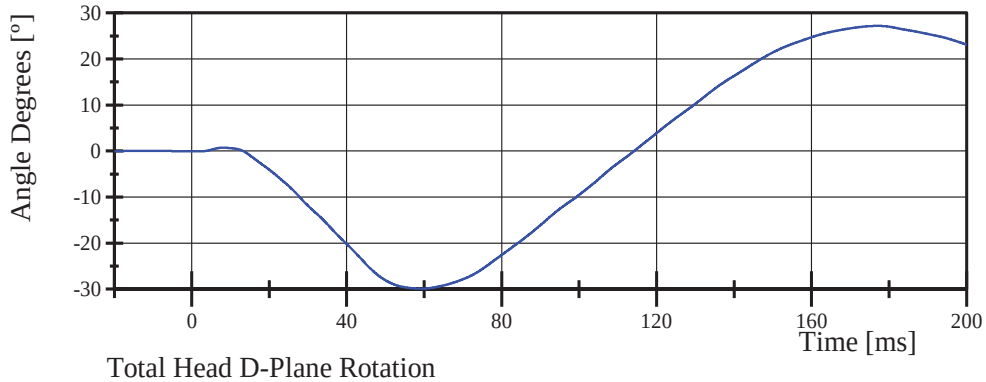
Filter Class: CFC_60
Max: 3.7 g at 43.8 ms
Min: -27.3 g at 8.4 ms

Pot Rotation at the Base of Neck



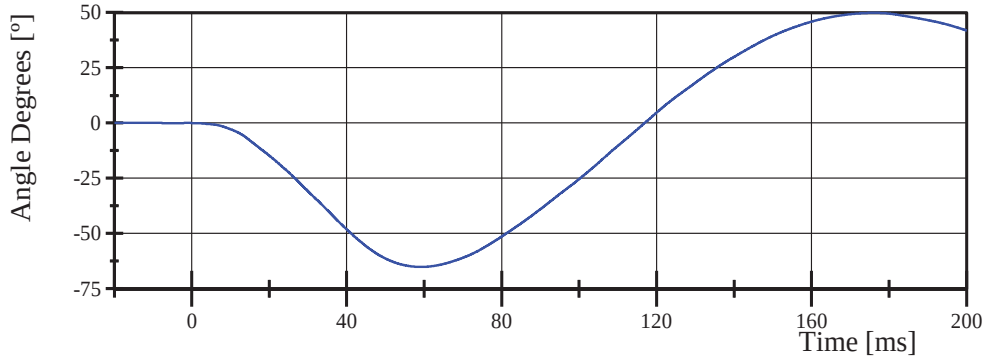
Filter Class: CFC_60
Max: 22.7 ° at 174.3 ms
Min: -35.2 ° at 59.2 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 27.2 ° at 177.0 ms
Min: -29.9 ° at 59.2 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 49.9 ° at 176.1 ms
Min: -65.1 ° at 59.2 ms

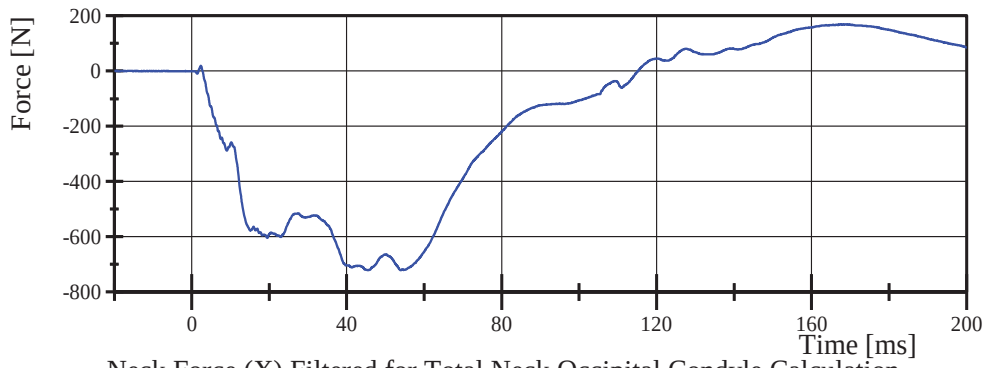
Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 617 Certification No. 178-1

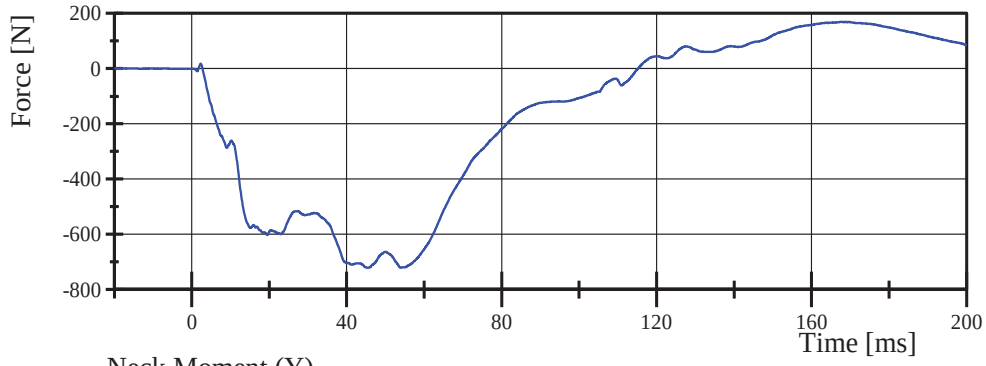
Test Date: 5/22/2019

Neck Force (X)



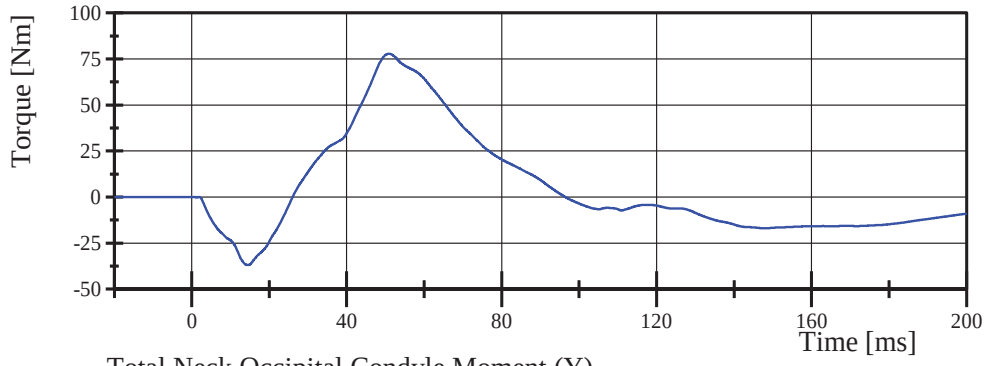
Filter Class: CFC_1000
Max: 169.7 N at 167.9 ms
Min: -721.2 N at 53.9 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



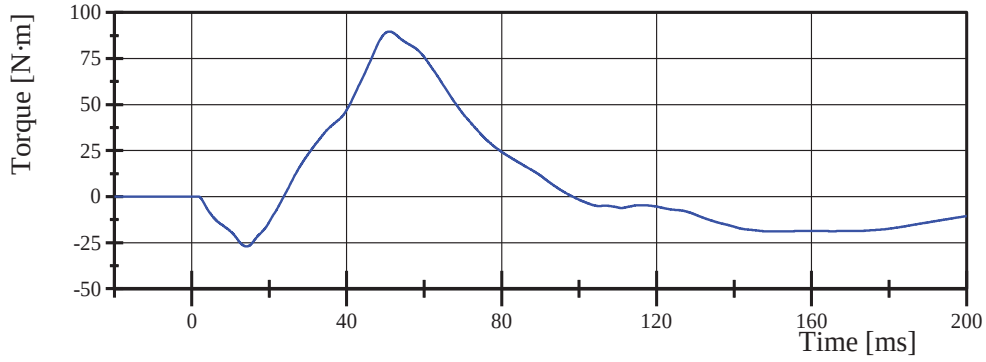
Filter Class: CFC_600
Max: 169.2 N at 167.9 ms
Min: -720.9 N at 54.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 77.8 Nm at 51.0 ms
Min: -36.9 Nm at 14.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 89.7 N·m at 51.1 ms
Min: -27.0 N·m at 14.2 ms

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.3 ºC	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-6.007 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	39.2 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	21.02 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	18.10 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.57 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.57 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 º	90.0 º	Yes
Time of Peak	72 - 82 ms	75.7 ms	Yes
Total Head D-Plane Rotation Decay to 0º	147 - 174 ms	154.8 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-52.9) - (-80) N·m	-59.92 N·m	Yes
Time of Peak	65 - 79 ms	72.0 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	142.5 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 02020403

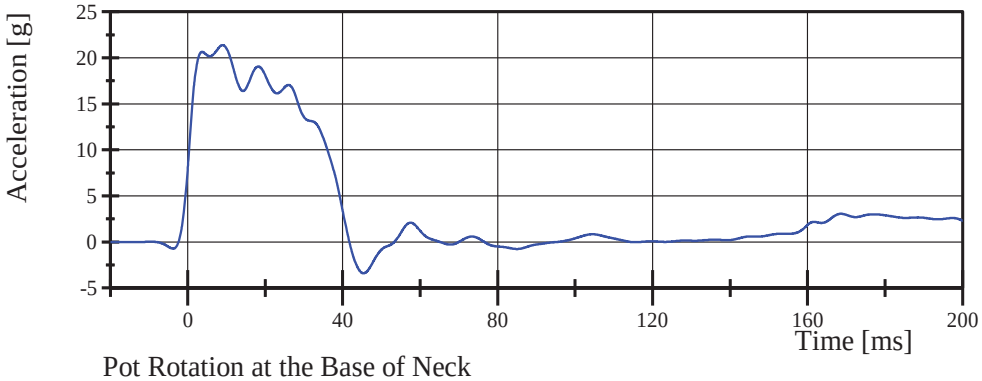
Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 617 Certification No. 178-1

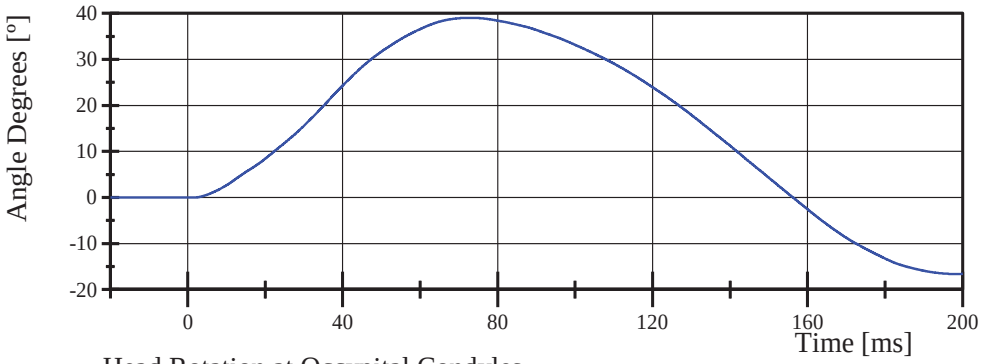
Test Date: 5/22/2019

Pendulum Acceleration



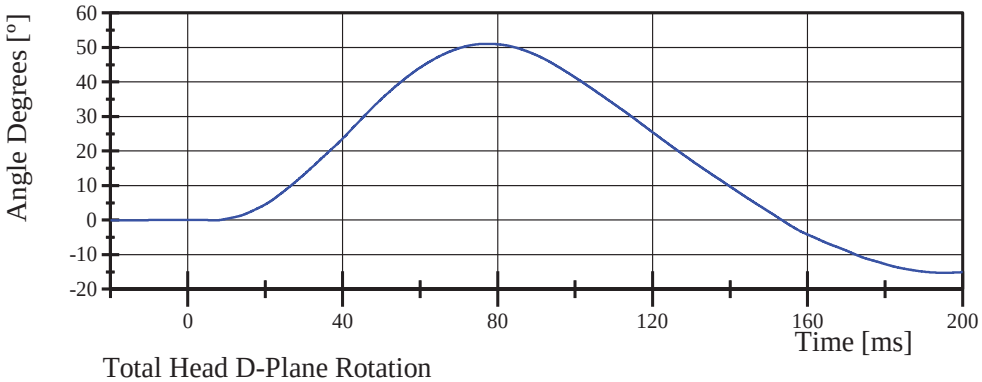
Filter Class: CFC_60
Max: 21.4 g at 9.0 ms
Min: -3.4 g at 45.4 ms

Pot Rotation at the Base of Neck



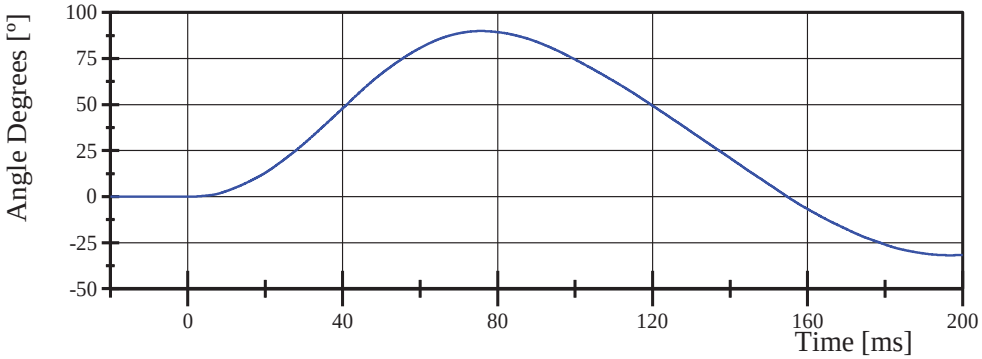
Filter Class: CFC_60
Max: 39.1 ° at 72.9 ms
Min: -16.6 ° at 198.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 51.1 ° at 77.3 ms
Min: -15.2 ° at 195.2 ms

Total Head D-Plane Rotation

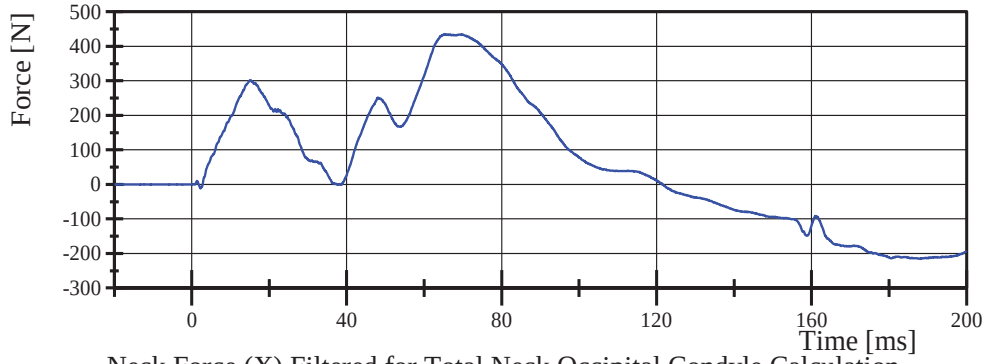


Filter Class: CFC_60
Max: 90.0 ° at 75.7 ms
Min: -31.8 ° at 196.9 ms

Transportation Research Center Inc.

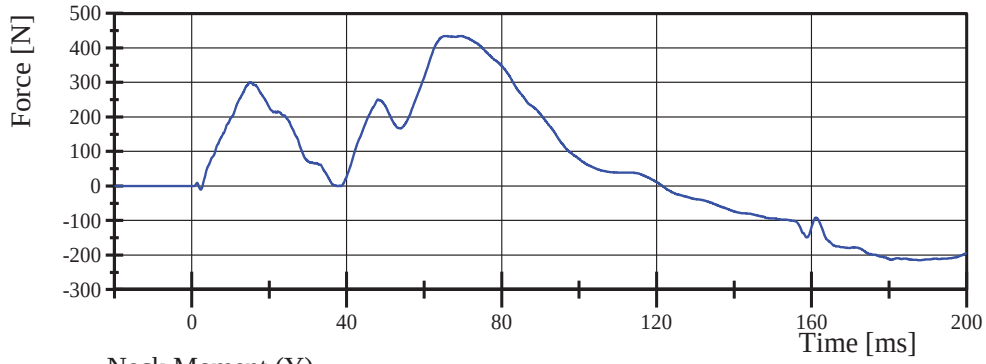
Neck Extension
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Neck Force (X)



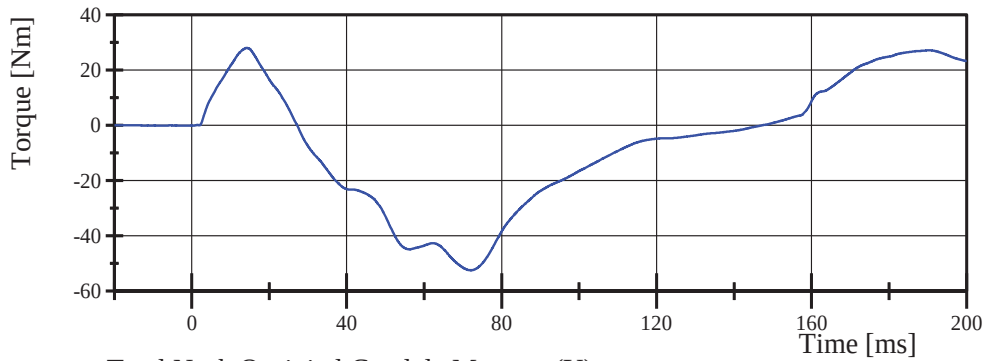
Filter Class: CFC_1000
Max: 435.3 N at 65.2 ms
Min: -215.6 N at 188.2 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



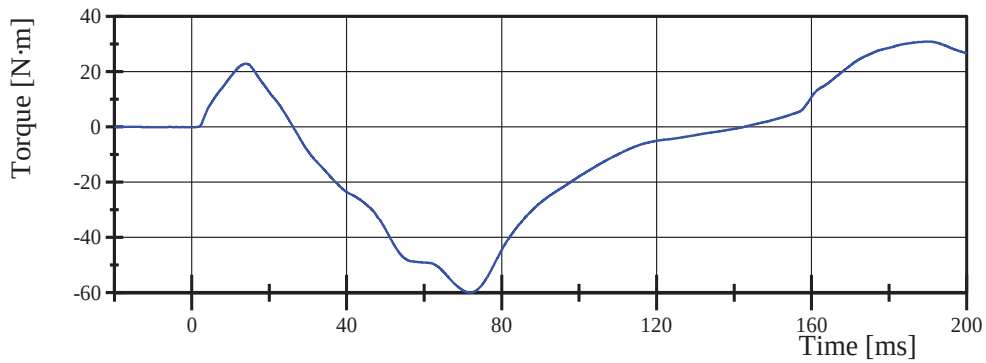
Filter Class: CFC_600
Max: 434.8 N at 65.3 ms
Min: -215.2 N at 188.1 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 28.0 Nm at 14.1 ms
Min: -52.4 Nm at 72.1 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 30.9 N·m at 189.9 ms
Min: -59.9 N·m at 72.0 ms

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 ºC	21.4 ºC	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.827 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,828.7 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-70.84 mm	Yes
Internal Hysteresis	69 - 85 %	71.4 %	Yes

Test meets specifications.

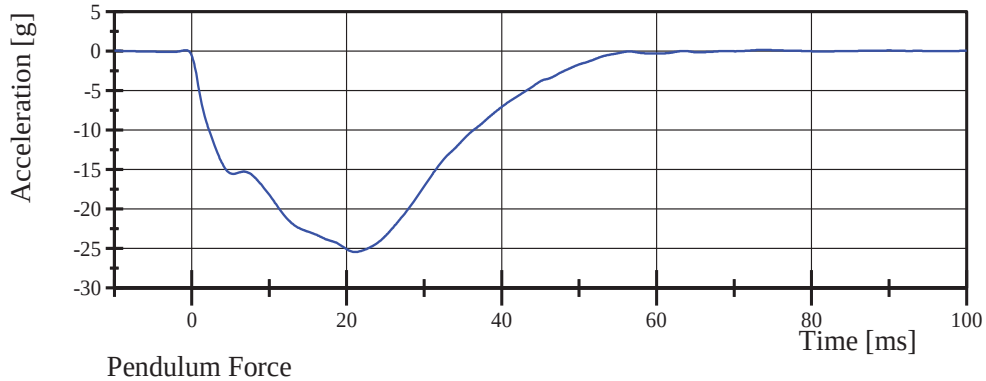
Condition: Used

Comments:
Jacket S/N: 733
Rib #1 S/N: 02032048A
Rib #2 S/N: 02031646A
Rib #3 S/N: 02032048A
Rib #4 S/N: 02031646A
Rib #5 S/N: 02031087
Rib #6 S/N: 02031646A

Transportation Research Center Inc.

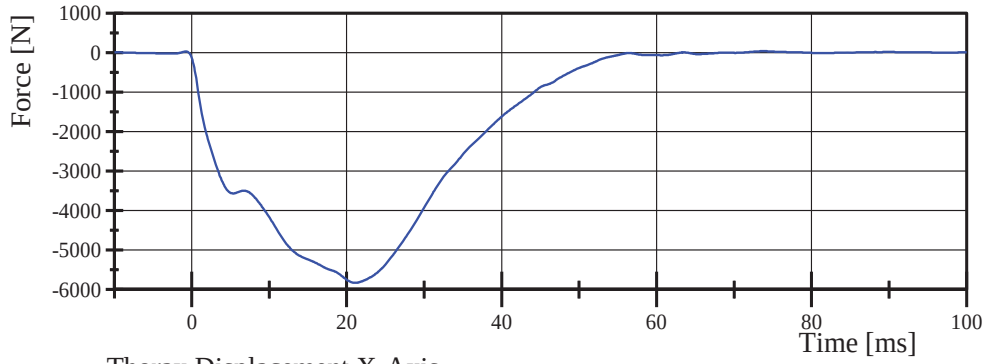
Front Thorax
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/23/2019

Pendulum Acceleration



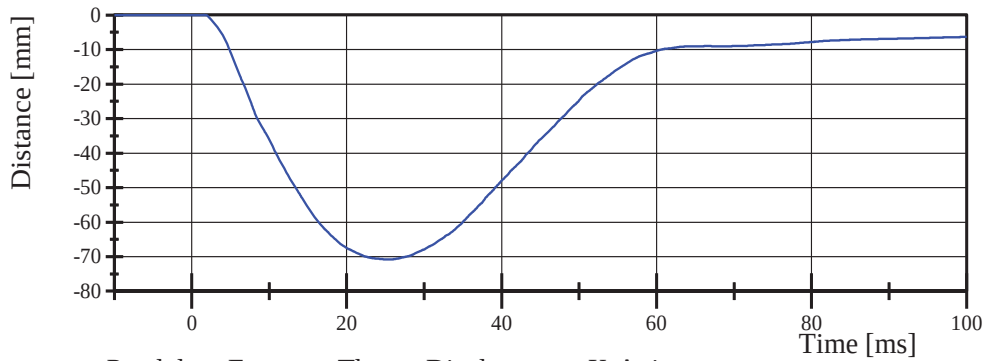
Filter Class: CFC_180
Max: 0.2 g at 73.8 ms
Min: -25.4 g at 21.1 ms

Pendulum Force



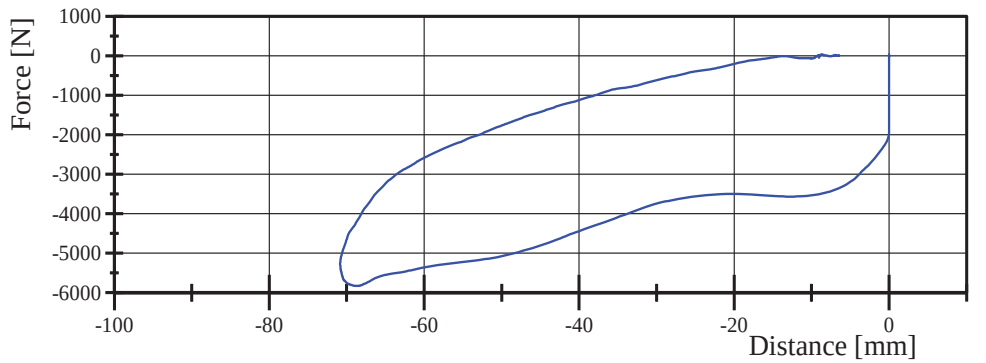
Filter Class: CFC_180
Max: 41.8 N at 73.8 ms
Min: -5,828.7 N at 21.1 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at 1.6 ms
Min: -70.8 mm at 25.4 ms

Pendulum Force vs. Thorax Displacement X-Axis



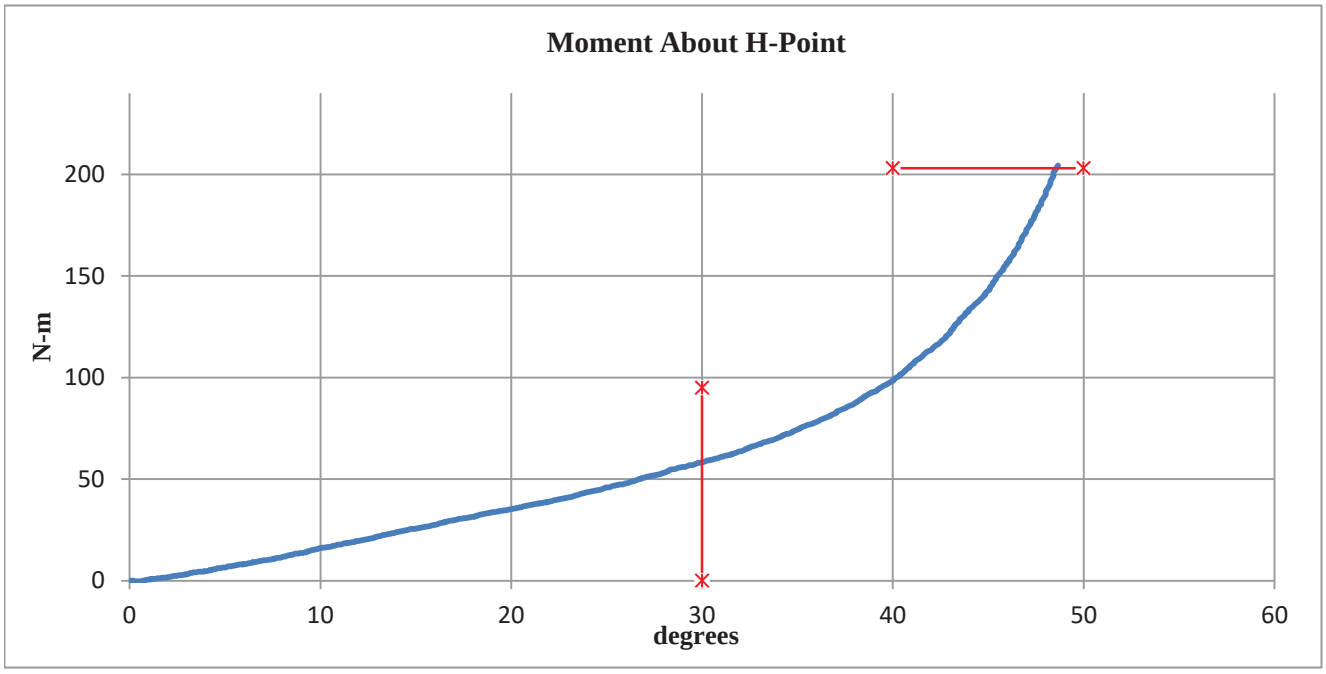
Filter Class: CFC_180
Max: 41.8 N at -8.7 mm
Min: -5,828.7 N at -68.7 mm

Transportation Research Center Inc.

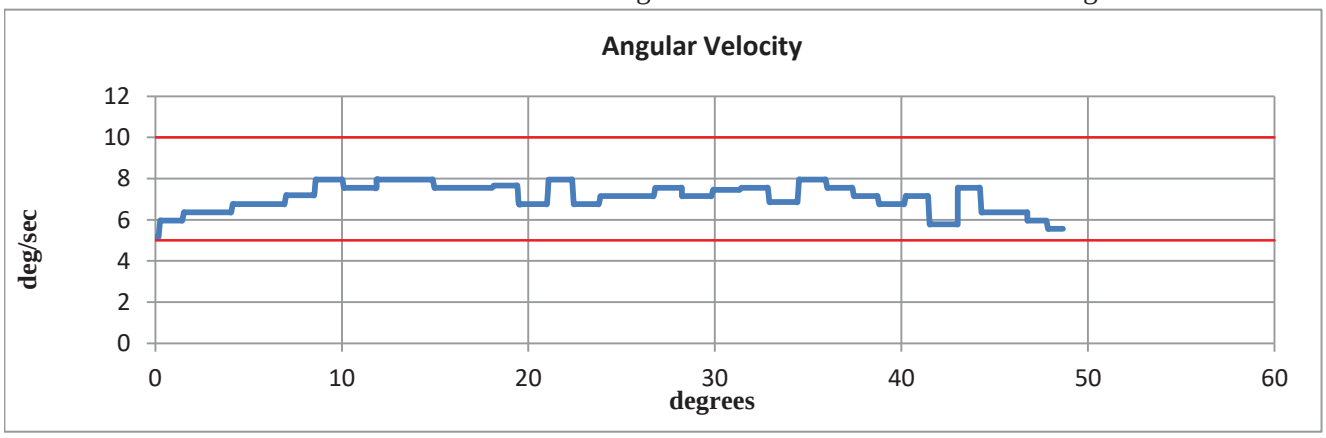
Hybrid III 50th Male Hip Range of Motion

Serial Number:	617	Date:	22-May-2019
Side Tested:	Left Hip	Time:	12:54
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.8	°C	Pass
Humidity	10	-	70	47	%	Pass
Moment at 30°	0	≤	94.9	58.34	N-m	Pass
Angle at 203 Nm	40	-	50	48.66	deg	Pass
Average Velocity	5	-	10	7.06	deg/sec	Pass



Max: 7.95 deg/sec Min: 5.17 deg/sec



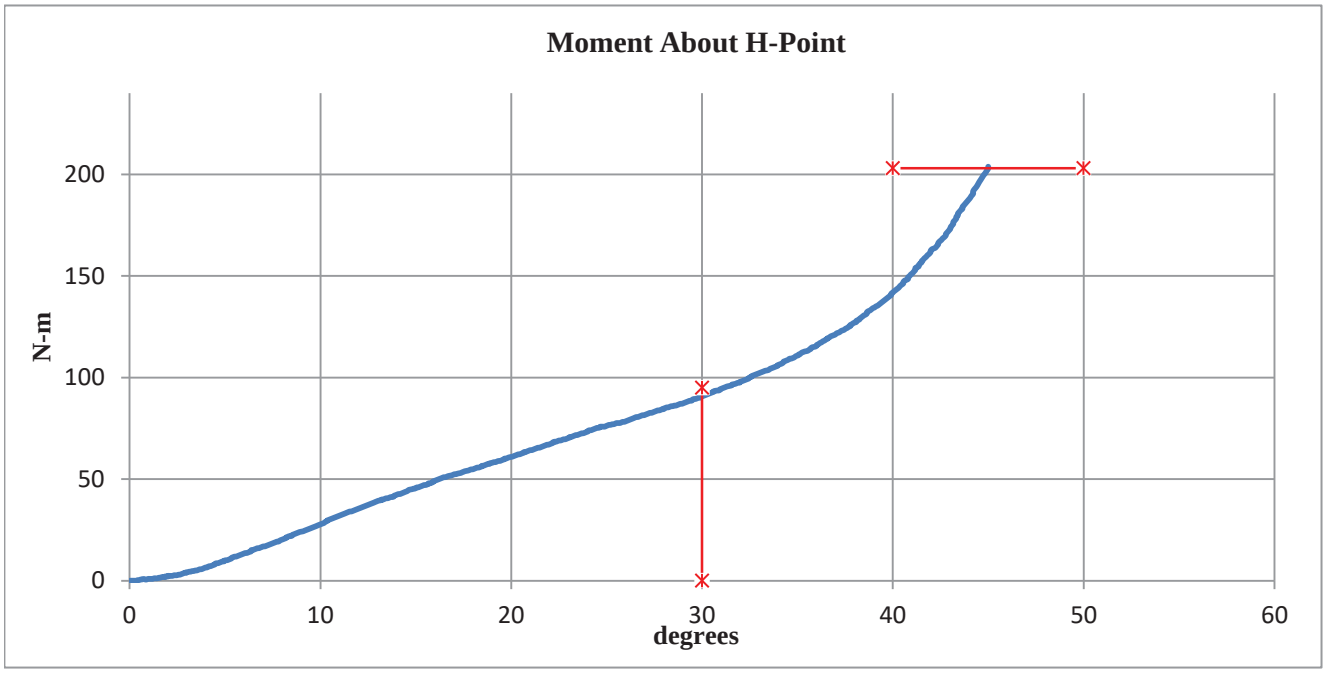
Comments:
Pelvis Skin S/N: 1708

Transportation Research Center Inc.

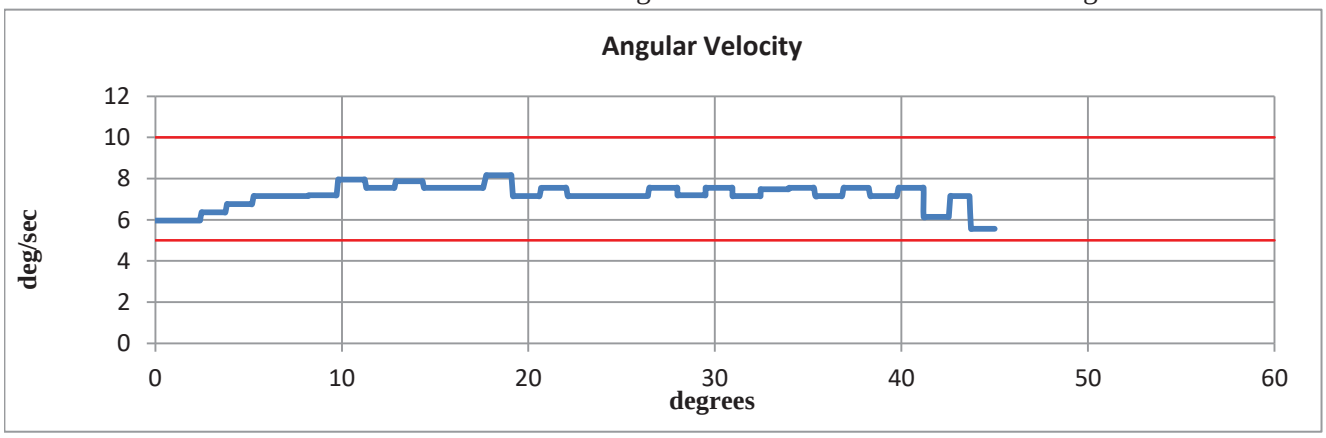
Hybrid III 50th Male Hip Range of Motion

Serial Number:	617	Date:	22-May-2019
Side Tested:	Right Hip	Time:	14:17
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.7	°C	Pass
Humidity	10	-	70	48	%	Pass
Moment at 30°	0	≤	94.9	90.92	N-m	Pass
Angle at 203 Nm	40	-	50	45	deg	Pass
Average Velocity	5	-	10	7.17	deg/sec	Pass



Max: 8.16 deg/sec Min: 5.56 deg/sec



Comments:
Pelvis Skin S/N: 1708

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 ºC	21.4 ºC	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.110 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-4,822.93 N	Yes

Test meets specifications.

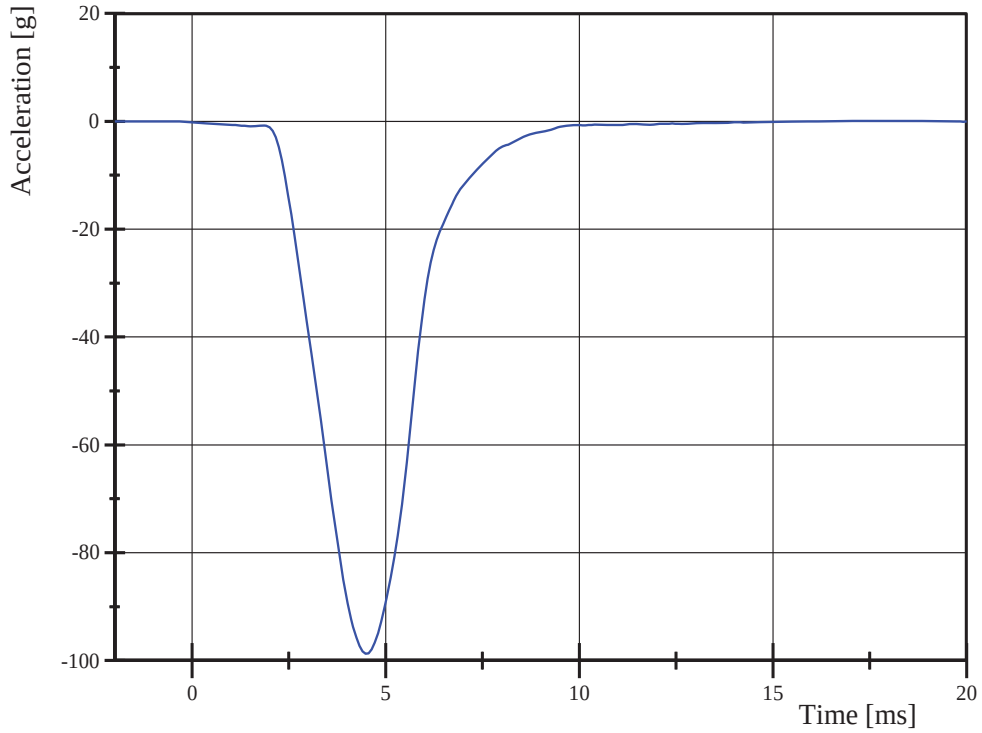
Condition: Used

Comments:
Knee Skin S/N: 1523

Transportation Research Center Inc.

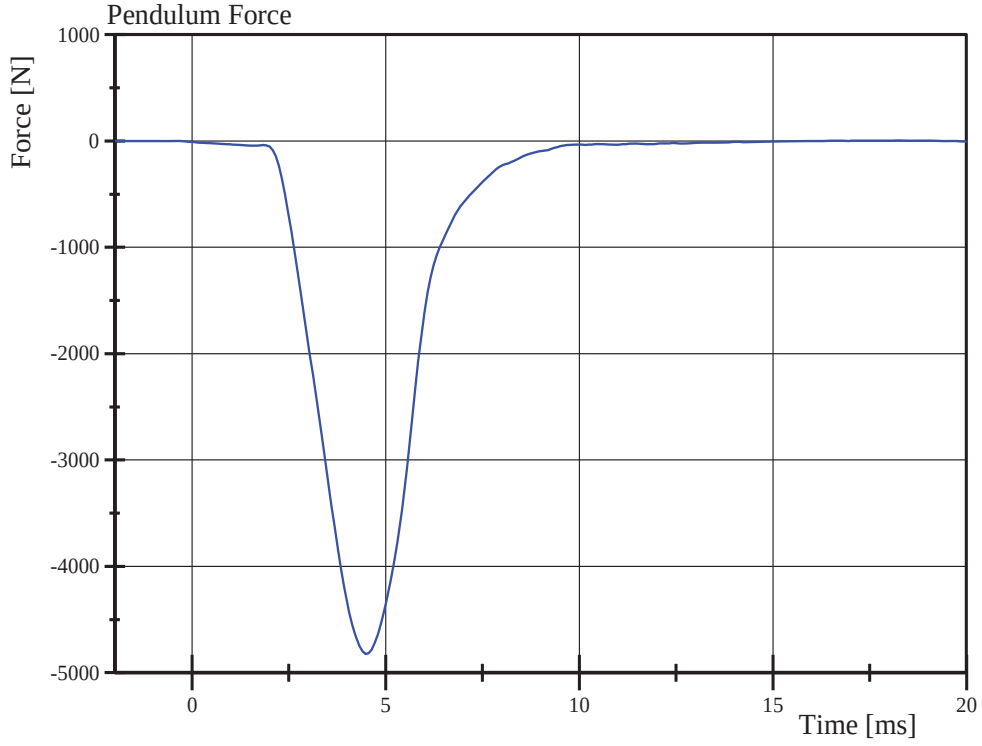
Left Knee Femur Response Test
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.1 g at 18.2 ms
Min: -98.8 g at 4.5 ms

Pendulum Force



Filter Class: CFC_600
Max: 5.6 N at 18.2 ms
Min: -4,822.9 N at 4.5 ms

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 ºC	21.4 ºC	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.109 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-4,735.88 N	Yes

Test meets specifications.

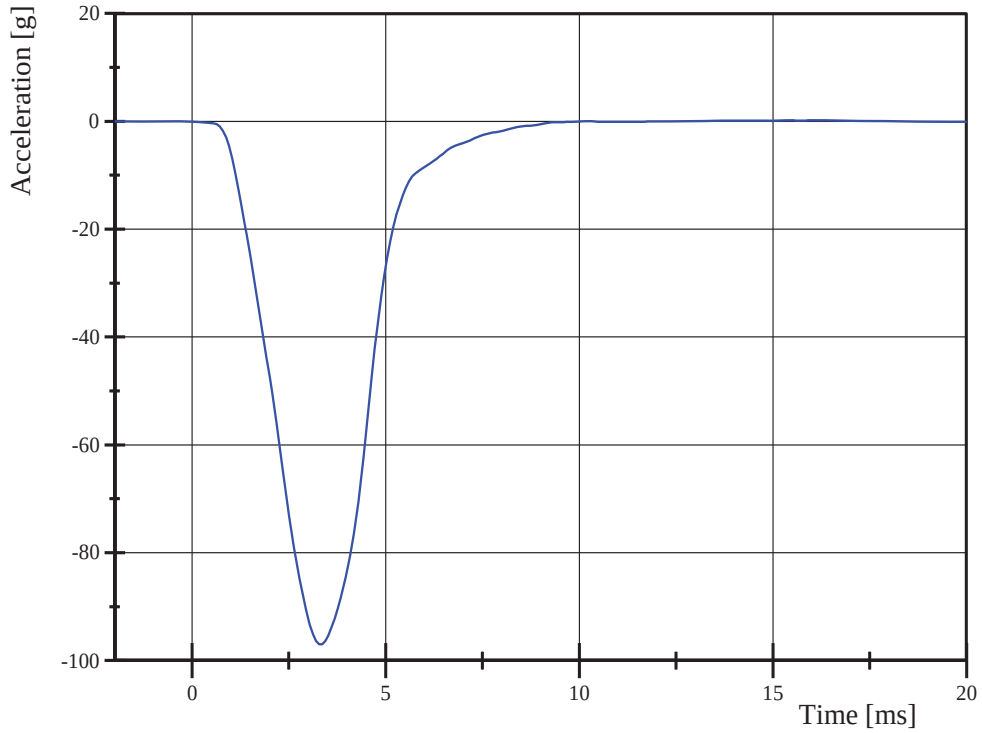
Condition: Used

Comments:
Knee Skin S/N: N/A

Transportation Research Center Inc.

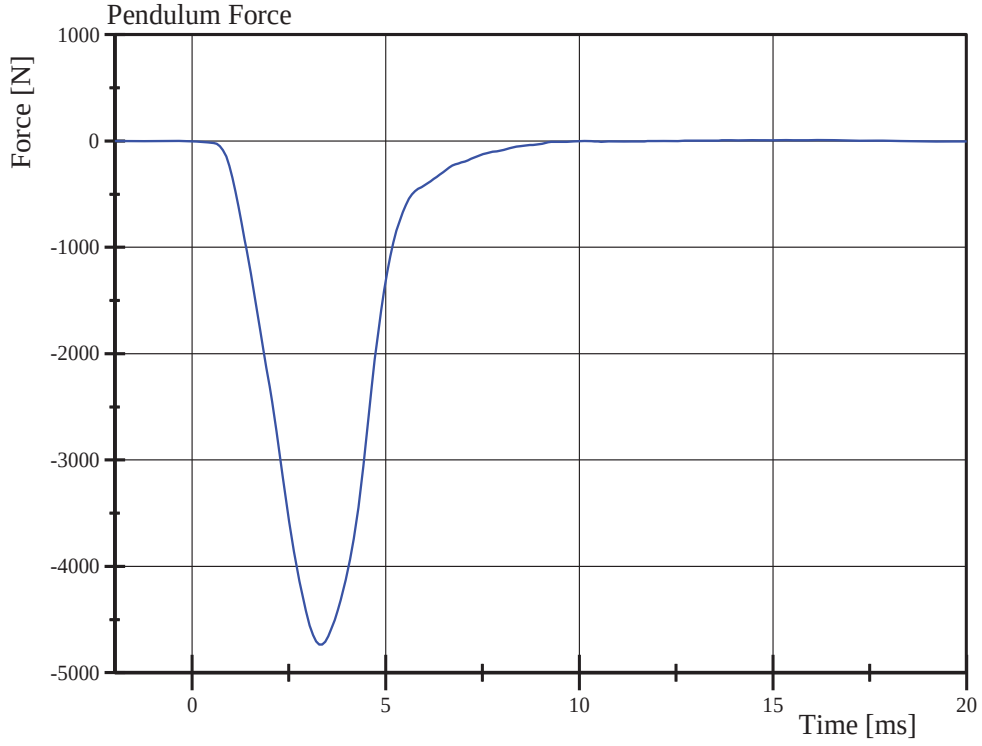
Right Knee Femur Response Test
HIII 50th Serial No. 617 Certification No. 178-1
Test Date: 5/22/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 16.3 ms
Min: -97.0 g at 3.3 ms

Pendulum Force



Filter Class: CFC_600
Max: 9.6 N at 16.3 ms
Min: -4,735.9 N at 3.3 ms

Appendix C – Quality Assurance

Serial Number: 617
Certification No. 178

Quality Assurance

ATD Assembly & Final Inspection

ATD Type:	Hybrid III 50th Percentile Male
ATD Serial Number:	617
Assembled by:	
Inspected by:	
Date Inspected:	05/22/2019

Appendix D

Miscellaneous Data

Filtering Data

SAE J211 MAR95

Vehicle:

Acceleration Class: 60

Velocity (Integrated) Class: 180

Displacement (Integrated) Class: 180

Occupant:

Head Accelerometer Class: 1000

Neck Force Class: 1000

Neck Moment Class: 600

Chest Accelerometer Class: 180

Chest Potentiometer Class: 600

Femur Load Class: 600