

**JASON WILLIAMS**

2021-01-20 16:03

**RIDER**

Jason Williams  
Age: 43  
Male  
J.Williams@specialized.com

**SITE**

Retül Headquarters - Specialized Boulder  
Experience Center  
5600 Airport Blvd  
Boulder, Colorado 80301  
www.retul.com -- www.specializedboulder.com

**BIKE**

**MAKE/MODEL:** Specilized , Epic  
**SIZE:** LG  
**YEAR:** 2021  
**TYPE:** Mtn Bike

**FITTER**

Jason Williams  
Jason.williams@specialized.com

**SUMMARY OF SESSION**



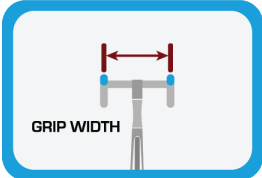
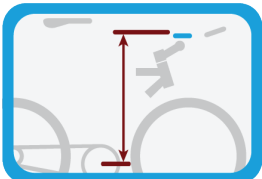
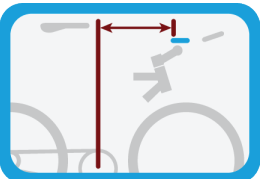
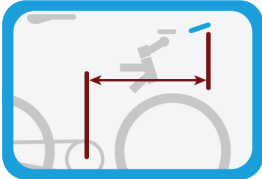
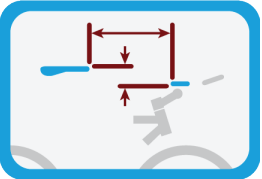
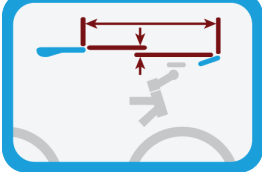

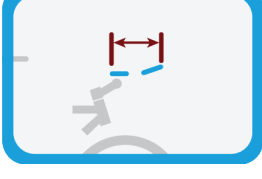
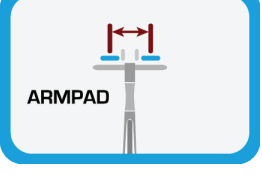
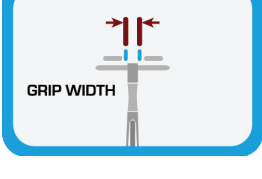


# BICYCLE MEASUREMENT DEFINITIONS

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
<b>Common Bike Definitions (used on all reports)</b>			
	<p><b>Frame Stack and Reach</b> The horizontal and vertical distance from the center of the bottom bracket to the center of the top of the headtube.</p>		<p><b>Handlebar Stack &amp; Reach</b> The horizontal and vertical distance from the center of the bottom bracket to the center of the handlebar.</p>
	<p><b>Handlebar Reach</b> The horizontal distance from the front tip of the saddle to the center of the handlebar.</p>		<p><b>Effective Seat Tube Angle</b> The angle between horizontal and the saddle height axis defined in saddle height.</p>
	<p><b>Handlebar Drop</b> The vertical distance from the center point of the saddle profile to the top of the handlebar. A negative value signifies the handlebar being lower than the saddle.</p>		
	<p><b>Saddle Height</b> The distance from the center of the bottom bracket to the horizontal midpoint of the saddle profile.</p> <p><b>Saddle Angle</b> The angle between horizontal and the line tangent to the top of the saddle. A negative value signifies the nose of the saddle being lower than the rear of the saddle.</p>		<p><b>Saddle Setback</b> The horizontal distance from the front tip of the saddle to the center of the bottom bracket. A negative value signifies the saddle being rearward of the bottom bracket.</p>
<b>Road Bike Definitions (used on road reports)</b>			
	<p><b>BB to Grip Reach</b> The horizontal distance from the center of the bottom bracket to the trough of the grip.</p>		<p><b>Grip Reach</b> The horizontal distance from the front tip of the saddle to the trough of the grip.</p>
	<p><b>Grip Drop</b> The vertical distance from the center point of the saddle profile to the trough of the grip. A negative value signifies the grip being lower than the saddle.</p>		<p><b>Grip Drop</b> The vertical distance from the center point of the saddle profile to the trough of the grip. A negative value signifies the grip being lower than the saddle.</p> <p><b>Bar Reach</b> The horizontal distance from the top of the handlebar to the rearmost point of the grip.</p>
	<p><b>Grip Angle</b> The angle between horizontal and the flat segment of the grip. A positive value signifies the front of the grip being higher than the rear.</p>		





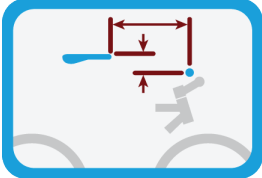

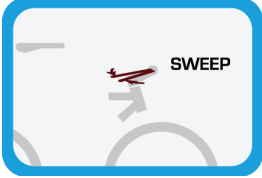
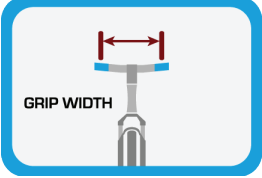
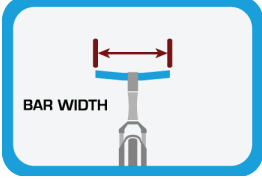
# BICYCLE MEASUREMENT DEFINITIONS

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
 <p><b>GRIP WIDTH</b></p>	<p><b>Grip Width</b> The 3D distance between the midpoints of the grip contours if both grips traced. Otherwise, two times the distance perpendicular from the plane of the bike to the midpoint of the single traced grip contour.</p>		
<b>Tri Bike Definitions (used on tri/tt reports)</b>			
	<p><b>Arm Pad Stack BB</b> The vertical distance from the center of the bottom bracket to the top of the arm pad.</p>		<p><b>Arm Pad Reach BB</b> The horizontal distance from the center of the bottom bracket to the back of the arm pad.</p>
	<p><b>BB to Grip Reach</b> The horizontal distance from the center of the bottom bracket to the frontmost point of the grip.</p>		<p><b>Arm Pad Reach</b> The horizontal distance from the front tip of the saddle to the back of the arm pad.</p>
	<p><b>Grip Reach</b> The horizontal distance from the front tip of the saddle to the frontmost point of the grip.</p>		<p><b>Arm Pad Drop</b> The vertical distance from the center point of the saddle profile to the top of the arm pad. A negative value signifies the arm pad being lower than the saddle.</p>
	<p><b>Grip Drop</b> The vertical distance from the center point of the saddle profile to the frontmost point of the grip. A negative value signifies the grip being lower than the saddle.</p>		<p><b>Grip Angle</b> The angle between horizontal and the best fit line to the traced grip contour. A positive value signifies the front of the grip being higher than the rear.</p>
	<p><b>Arm Pad to Grip Reach</b> The horizontal distance from the back of the arm pad to the frontmost point of the grip.</p>	 <p><b>ARMPAD</b></p>	<p><b>Arm Pad Width</b> The 3D distance between the midpoints of the arm pad contours if both arm pads traced. Otherwise, two times the distance perpendicular from the plane of the bike to the midpoint of the single traced arm pad contour.</p>
 <p><b>GRIP WIDTH</b></p>	<p><b>Grip Width</b> The 3D distance between the midpoints of the grip contours if both grips traced. Otherwise, two times the distance perpendicular from the plane of the bike to the midpoint of the single traced grip contour.</p>		





# BICYCLE MEASUREMENT DEFINITIONS

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
<b>Mountain Bike Definitions (used on mountain reports)</b>			
	<p><b>Grip Reach</b> The horizontal distance from the front tip of the saddle to the midpoint of the grip contour.</p> <p><b>Grip Drop</b> The vertical distance from the center point of the saddle profile to the midpoint of the grip contour. A negative value signifies the grip being lower than the saddle.</p>		<p><b>Bar Rise</b> The vertical distance from the top of the handlebar to the midpoint of the grip contour.</p>
	<p><b>Bar Sweep Angle</b> The top view angle between the handlebar clamp axis and the line from the center of the handlebar to the midpoint of the grip contour.</p>		<p><b>Grip Width</b> The 3D distance between the midpoints of the grip contours if both grips traced. Otherwise, two times the distance perpendicular from the plane of the bike to the midpoint of the single traced grip contour.</p>
	<p><b>Bar Width</b> The 3D distance between the widest endpoints of the grip contours if both grips traced. Otherwise, two times the distance perpendicular from the plane of the bike to the widest endpoint of the single traced grip contour.</p>		





# CYCLIST MEASUREMENT DEFINITIONS

## Stroke Intelligence/Averaging

A process developed by Retül to isolate each pedal stroke within a capture period and average our measurements across those pedal strokes. All lower limb measurements have stroke intelligence while our upper limb and torso measurements represent averages of the entire capture period.

## Vantage 3D Motion Capture

The Vantage system uses a technique called Motion Capture to record the dynamic movements of riders through digitization of anatomical markers. The Vantage 3D Motion Capture System is the world's only cycling-specific, 3D motion capture system featuring real-time data. The 3D generated body angles, alignments and movements patterns are considered the gold standard of accuracy in sports science as well as other fields such as video gaming, film, and clinical medicine.

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
	<b>Ankle Minimum</b> Maximum dorsiflexion at any point in the pedal stroke defined by the knee-ankle line and the heel-foot-line.		<b>Ankle Range</b> The difference between ankle maximum and ankle minimum.
	<b>Ankle Maximum</b> Maximum plantarflexion at any point in the pedal stroke defined by the knee-ankle line and the heel-foot-line.		<b>Ankle Angle at Front</b> The ankle angle at the front of the pedal stroke (90 degrees).
	<b>Ankle Angle at Top</b> The ankle angle at the top of the pedal stroke (0 degrees).		<b>Ankle Angle at Rear</b> The ankle angle at the rear of the pedal stroke (270 degrees).
	<b>Ankle Angle at Bottom</b> The ankle angle at the bottom of the pedal stroke (180 degrees).		<b>Knee Angle Range</b> The difference between knee angle flexion and knee angle extension.
	<b>Maximum Knee Flexion</b> Maximum flexion of the knee joint at any point in the pedal stroke defined by the hip-knee line and the knee-ankle line		<b>Maximum Knee Extension</b> Maximum extension of the knee joint at any point in the pedal stroke defined by the hip-knee line and the knee-ankle line
	<b>Hip Angle Closed</b> The most closed angle of the hip joint defined by the knee, hip and shoulder marker.		<b>Back Angle</b> The angle of the back relative to the horizon defined by the hip and shoulder marker
	<b>Hip Angle Open</b> The most open angle of the hip joint defined by the knee, hip and shoulder marker.		<b>Elbow Angle</b> The angle of the elbow joint defined by the shoulder, elbow, and wrist marker
	<b>Hip Angle Range</b> The difference between hip angle open and closed.		
	<b>Shoulder Angle to Wrist</b> The angle of the shoulder joint defined by the hip, shoulder, and wrist markers.		
	<b>Shoulder Angle to Elbow</b> The angle of the shoulder joint defined by the hip, shoulder, and elbow markers.		

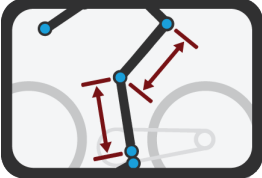
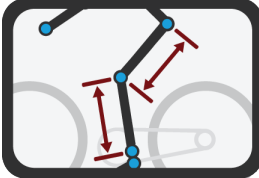
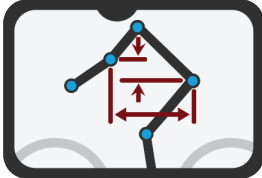
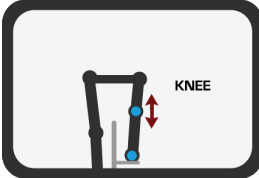
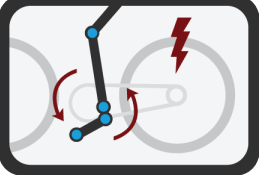


# CYCLIST MEASUREMENT DEFINITIONS

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
	<b>Forearm Angle</b> The angle of the forearm relative to the horizon defined by the elbow and wrist markers. A positive number indicates the wrist is higher than the elbow		<b>Knee Forward of Foot</b> The fore/aft offset of the knee marker relative to the foot marker captured at the forward part of the pedal stroke (3 o'clock or 90 degrees down). A negative number indicates a knee that is aft of neutral.
	<b>Knee Forward of Spindle</b> The fore/aft offset of the knee marker relative to the pedal spindle at 3 o'clock in the pedal stroke (90 degrees in the downstroke).		<b>Knee Varus/Valgus (prior KFLO)</b> The lateral offset between the knee and foot markers. A negative number indicates the knee is in valgus. A positive number indicates the knee is in varus.
	<b>Hip to Foot Lateral Offset</b> The lateral offset between the hip and foot marker. A negative number indicates the hip is outside the foot. A positive number indicates that the hip is inside the foot.		<b>Shoulder to Wrist Lateral Offset</b> The lateral offset between the shoulder and wrist markers. A negative number indicates the wrist is inside the shoulder (TT bike). A positive number indicates the wrist is outside the shoulder (MTB).
	<b>Foot from Level Mean</b> The angle of the foot relative to the horizon defined by the heel and forefoot marker		<b>Foot Rotation Minimum</b> The minimum rotational angle of the foot relative to the bike plane defined by the heel and forefoot marker. A negative number indicates that the foot is externally rotated (heel closer to the bike than the forefoot). A positive number indicates the foot is internally rotated (forefoot closer to the bike than the heel).
	<b>Foot Rotation Maximum</b> The maximum rotational angle of the foot relative to the bike plane defined by the heel and forefoot marker. A negative number indicates that the foot is externally rotated (heel closer to the bike than the forefoot). A positive number indicates the foot is internally rotated (forefoot closer to the bike than the heel)		<b>Foot Rotation Mean</b> The average rotational angle of the foot relative to the bike plane defined by the heel and foot marker. A negative number indicates that the foot is externally rotated (heel closer to the bike than the forefoot). A positive number indicates that the foot is internally rotated (forefoot closer to the bike than the heel)
	<b>Knee Travel Tilt</b> The frontal plane angle of the tracing created by the moving knee marker with respect to vertical. A positive number indicates a knee that tracks away from the bike in the upstroke. A negative number represents a knee that tracks towards the bike in the upstroke. See the front view of the knee path for visual representation of this measurement.		<b>Knee Lateral Travel</b> The magnitude of the lateral movement of the knee
	<b>Hip Vertical Travel</b> The magnitude of the vertical movement of the hip		<b>Hip Lateral Travel</b> The magnitude of the lateral movement of the hip



# CYCLIST MEASUREMENT DEFINITIONS

KEY	DESCRIPTION/DEFINITION	KEY	DESCRIPTION/DEFINITION
	<p><b>Thigh Length</b> The length of the hip/knee segment</p> <p><b>Shin Length</b> The length of the knee/ankle segment</p>		<p><b>Hip to Wrist Vertical</b> The vertical offset of the wrist relative to the hip marker</p> <p><b>Hip to Wrist Horizontal</b> The horizontal offset of the wrist relative to the hip marker</p>
	<p><b>Hip to Elbow Vertical</b> The vertical offset of the elbow relative to the hip marker.</p> <p><b>Hip to Elbow Horizontal</b> The horizontal offset of the elbow relative to the hip marker</p>		<p><b>Front View of Knee Path</b> Knee tracking measurement; green is downstroke; red is upstroke. The blue cone represents +/- 3 degrees on the knee travel tilt angle.</p>
	<p><b>Power Output</b> The average and maximum calculated power or user input power during the recording time.</p> <p><b>Speed</b> The average and maximum calculated rear wheel speed during the recording time.</p> <p><b>Cadence</b> The average and maximum calculated number of strokes per minute defined by the foot of every body measurement index.</p>		