

# Bike fitting (body & floor)

Sports 3DMA 2020.0 Version 2020.0 -BETA- | Powered by STT SYSTEMS



<b>FULL NAME</b> <b>Sports, Samples</b>	<b>REPORT DATE</b> <b>17/1/2020</b>	<b>STUDY PERFORMED BY:</b> 
<b>ANALYSIS PROTOCOL</b> <b>Bike fitting (body &amp; floor)</b>	<b>BIKE</b> -	

## 3D Motion Capture: Technical details

<b>Recording date</b> 2015/10/15	<b>Data sampling rate</b> 50 Hz (frames/s)	<b>Recording time</b> 8.02 s	<b>Average cadence</b> 92 rpm Min: 92 rpm   Max: 93 rpm
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## Bike info

<b>Manufacturer</b>	<b>Frame model</b>	<b>Frame size</b>	<b>Stem length</b> - mm	<b>Handlebar</b>	<b>Saddle</b>	<b>Crank length</b> 175 mm	<b>Pedal type</b>
-	-	-	-	-	-	-	-

## Main adjustments

<b>Handlebar height</b> - mm	<b>Saddle height</b> - mm	<b>Saddle setback</b> - mm
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## Fitter notes

<b>Notes</b> -	<b>Bike size assessment</b> -/5	<b>Bike adjustments assessment</b> -/5	<b>Cycling performance</b> -/5
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## Lower Limb Kinematics – Feet & Ankles

### FOOT ROTATION



Left foot external rotation (min angle with bike)

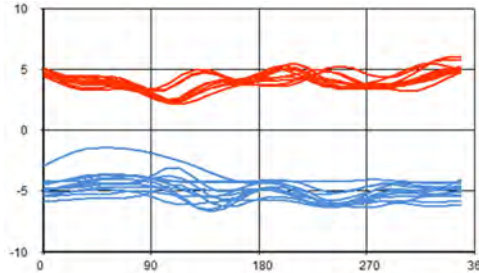
**3°**

Left foot internal rotation (max angle with bike)

**5°**

Total rotation range

**2°**



Right foot external rotation (min angle with bike)

**-6°**

Right foot internal rotation (max angle with bike)

**-4°**

Total rotation range

**2°**

### FOOT ANGLE TO HORIZONTAL



Left foot min/max angle to horizontal

**0° / 49°**

Crank @ left min/max angle to horizontal

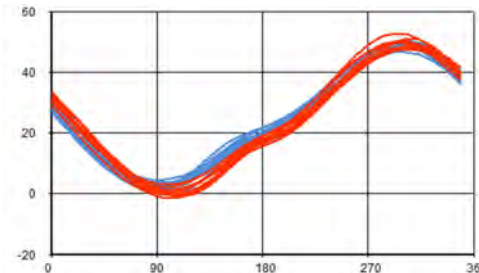
**87° / 293°**

Left foot angle to horizontal range

**49°**

Left foot angle to horizontal - Crank @90°/@270°

**1° / 48°**



Left foot angle to horizontal @ maximum knee flexion

**16°**

Right foot angle to horizontal @ maximum knee flexion

**18°**

Right foot min/max angle to horizontal

**2° / 49°**

Crank @ right min/max angle to horizontal

**101° / 290°**

Right foot angle to horizontal range

**47°**

Right foot angle to horizontal - Crank @90°/@270°

**2° / 47°**

### ANKLE FLEXION



Left ankle flexion

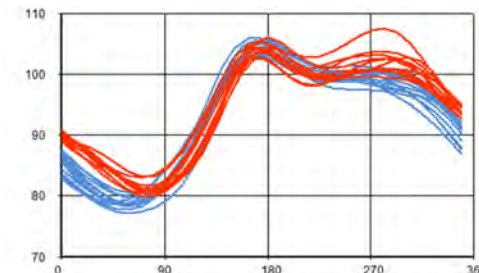
**81°**

Left ankle extension

**104°**

Range of motion

**23°**



Right ankle flexion

**79°**

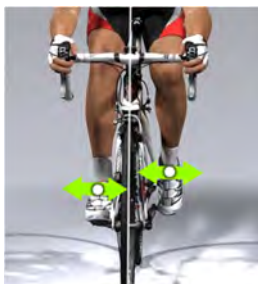
Right ankle extension

**104°**

Range of motion

**25°**

### ANKLE LATERAL OSCILLATION

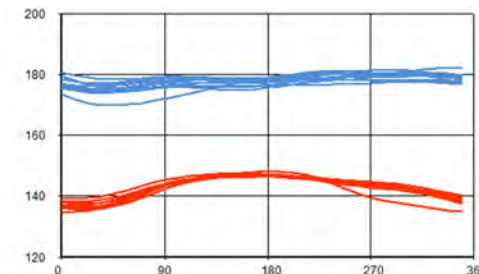


Left ankle position in relation to bike (mean)

**143 mm**

Total swing range

**23 mm**



Right ankle position in relation to bike (mean)

**178 mm**

Total swing range

**14 mm**

# Bike fitting (body & floor)

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## Lower Limb Kinematics – Knees

### KNEE FLEXION



Left knee flex/extension

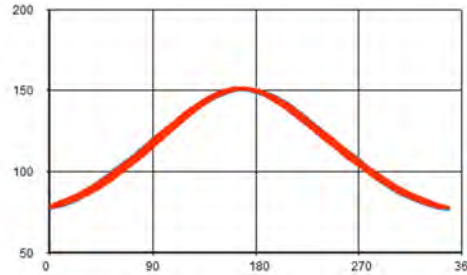
**77° / 152°**

Crank @ left knee flexion/extension

**347° / 164°**

Range of motion

**75°**



Right knee flex/ext

**77° / 151°**

Crank @ right knee flexion/extension

**346° / 165°**

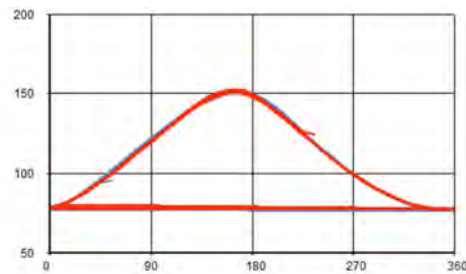
Range of motion

**74°**

### KNEE ANGLE IN RELATION TO CRANK ANGLE



This graph is used for symmetry assessment. The relationship between knee and crank angle would ideally describe overlapped curves.



### KNEE LATERAL OSCILLATION

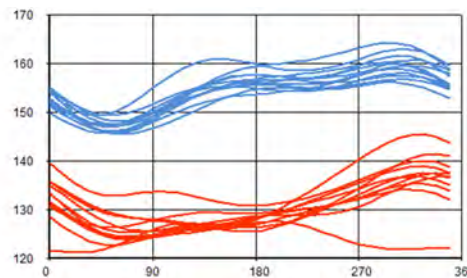


Left knee position in relation to bike (mean)

**130 mm**

Total swing range

**12 mm**



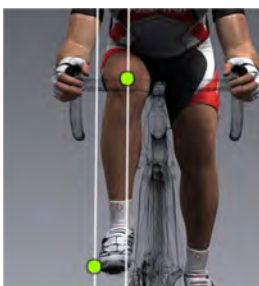
Right knee position in relation to bike (mean)

**154 mm**

Total swing range

**14 mm**

### KNEE TO M5 LATERAL OSCILLATION

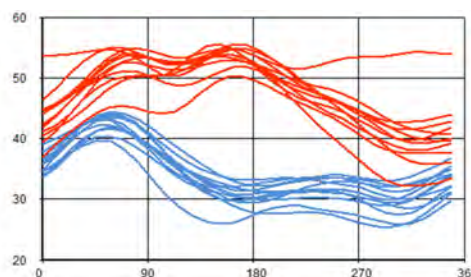


Mean left foot position in relation to left knee

**48 mm**

Total distance range

**23 mm**



Mean right foot position in relation to right knee

**34 mm**

Total distance range

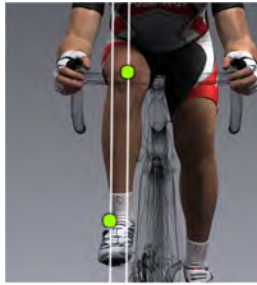
**19 mm**

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## ANKLE TO KNEE LATERAL DISTANCE

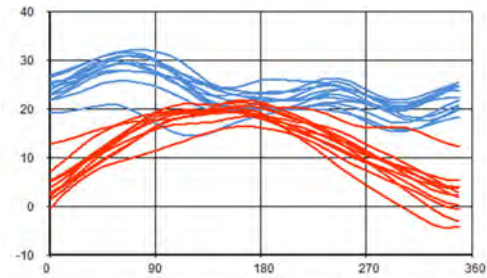


Mean left ankle position in relation to knee

**13 mm**

Total distance range

**18 mm**



Mean right ankle position in relation to knee

**23 mm**

Total distance range

**8 mm**

## KOPS (KNEE OVER PEDAL SPINDLE) DISTANCE



Mean left KOPS

**-35 mm**

KOPS is defined as the average distance between the tibial tuberosity and the pedal axle in the antero-posterior direction, with a crank angle of 90°. As for the interpretation of the sign (positive or negative):

- ✓ When the knee is ahead of the pedal axle, the KOPS is positive.
- ✓ When the knee is behind the pedal axle, the KOPS is negative.

Mean right KOPS

**-53 mm**

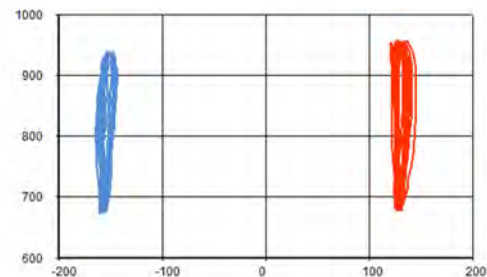
## KNEE TRAJECTORIES (FRONT VIEW)



■ Left ■ Right

Left knee angle with vertical

**0°**



Right knee angle with vertical

**1°**

# Bike fitting (body & floor)

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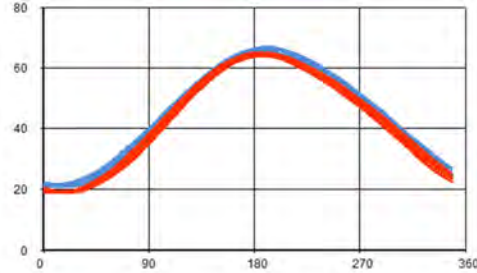
## Lower Limb Kinematics – Thighs

### THIGH TILT



■ Left ■ Right

Left thigh min angle  
**19°**  
Left thigh max angle  
**65°**  
Range of motion  
**46°**



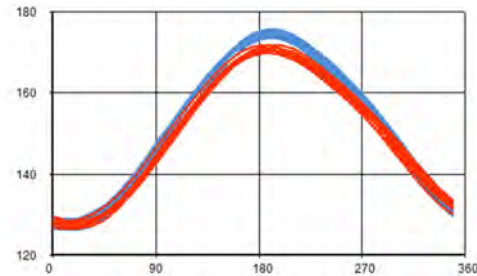
Right thigh min angle  
**21°**  
Right thigh max angle  
**67°**  
Range of motion  
**46°**

## Lower Limb Kinematics – Hips & Pelvis

### HIP FLEXION



Left hip flex/extension  
**128° / 171°**  
Crank @ left hip  
flexion/extension  
**14° / 181°**  
Range of motion  
**43°**

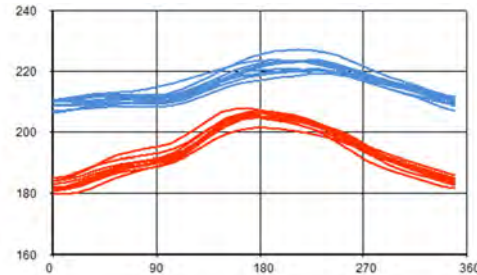


Right hip flex/extension  
**127° / 174°**  
Crank @ left hip  
flexion/extension  
**11° / 184°**  
Range of motion  
**47°**

### HIPS CENTER TO BOTTOM BRACKET AP DISTANCE

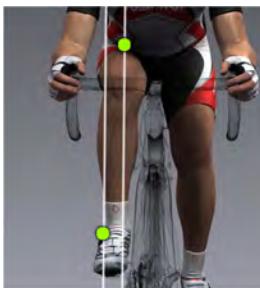


Left minimum distance  
**182 mm**  
Left maximum distance  
**206 mm**

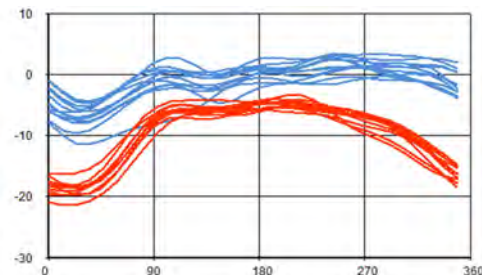


Right minimum distance  
**209 mm**  
Right maximum distance  
**222 mm**

### ANKLE TO HIP LATERAL DISTANCE



Mean left ankle position  
in relation to left hip  
**-10 mm**  
Total distance range  
**13 mm**



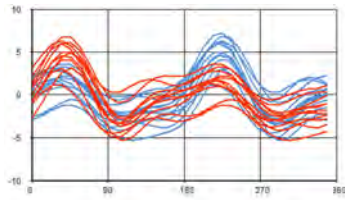
Mean right ankle position  
in relation to right hip  
**-1 mm**  
Total distance range  
**8 mm**

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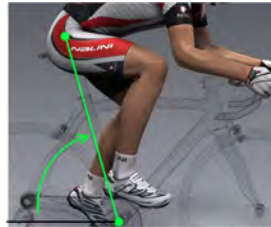


## HIPS CENTER VERTICAL TRAVEL



Total vertical travel (range of motion)  
**6 mm**

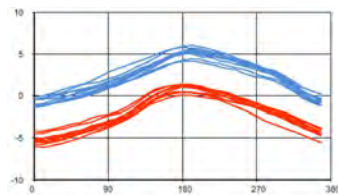
## HIP SETBACK



Mean hips center setback

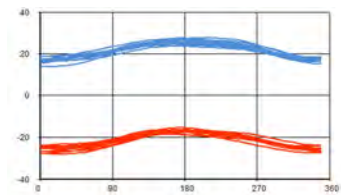
**74 °**

## PELVIS ROTATION



Left/right rotation (mean)  
**-1 ° / 5 °**  
Total rotation (range of motion)  
**6 °**

## PELVIS LATERAL OSCILLATION



Left swing (mean)  
**17 mm**  
Right swing (mean)  
**26 mm**  
Total swing (range of motion)  
**9 mm**  
Pelvis position in relation to bike  
**21 mm**

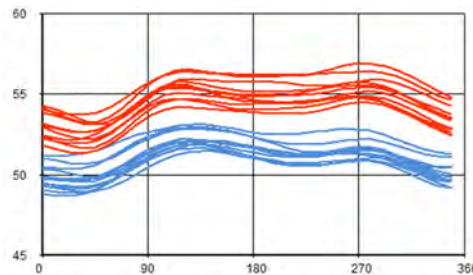
## Trunk Kinematics

### HIP TO SHOULDER TILT



■ Left ■ Right

Minimum left hip-shoulder angle  
**52 °**  
Maximum left hip-shoulder angle  
**55 °**  
Range of motion  
**3 °**



Minimum right hip-shoulder angle  
**49 °**  
Maximum right hip-shoulder angle  
**52 °**  
Range of motion  
**3 °**

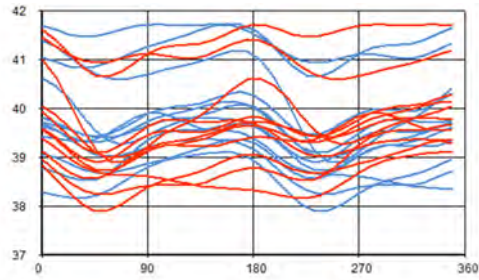
### TRUNK TILT (SACRUM-NECK)

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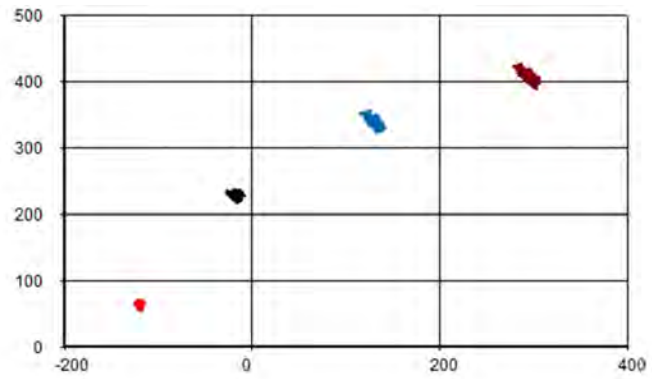


Average trunk angle to horizontal (Sacrum to neck segment)  
**40°**  
 Range of motion  
**23°**



## Back & Shoulders Kinematics

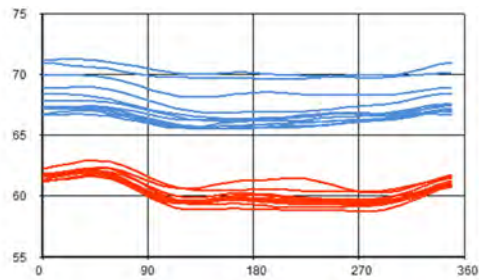
### BACK VERTICAL OSCILLATION



### HIP - SHOULDER - ELBOW



Minimum left hip-shoulder-elbow  
**60°**  
 Maximum left hip-shoulder-elbow  
**62°**  
 Range of motion  
**2°**

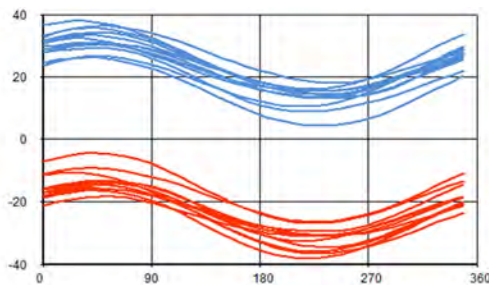


Minimum right hip-shoulder-elbow  
**66°**  
 Maximum right hip-shoulder-elbow  
**68°**  
 Range of motion  
**2°**

### SHOULDER LATERAL OSCILLATION



Left swing (mean)  
**13 mm**  
 Right swing (mean)  
**32 mm**  
 Total swing (range of motion)  
**19 mm**



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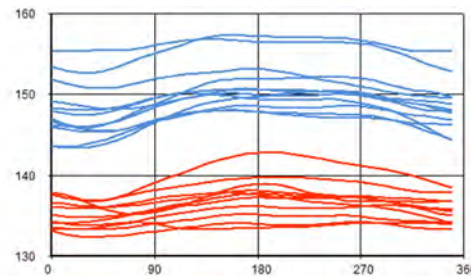
Average shoulder position in relation to bike  
**23 mm**

## Arms Kinematics

### ELBOW FLEXION



Average left elbow flexion  
**137°**  
Range of motion  
**10°**

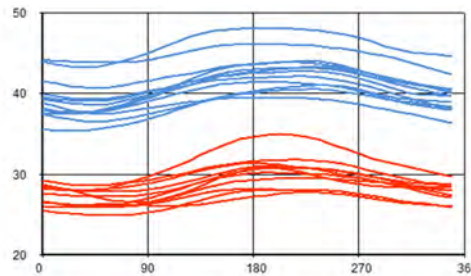


Average right elbow flexion  
**149°**  
Range of motion  
**14°**

### FOREARM TILT



Min left forearm angle to horizontal  
**27°**  
Max left forearm angle to horizontal  
**31°**  
Range of motion  
**4°**

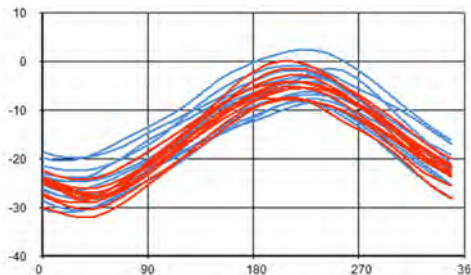


Min right forearm angle to horizontal  
**39°**  
Max right forearm angle to horizontal  
**43°**  
Range of motion  
**4°**

### SHOULDER TO WRIST LATERAL DISTANCE



Mean lateral distance between left shoulder and wrist  
**-16 mm**  
Range of motion  
**32 mm**



Mean lateral distance between right shoulder and wrist  
**-15 mm**  
Range of motion  
**33 mm**



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## Automated anthropometry measures



**Upper arm length**  
(Shoulder to elbow segment)

**337 mm 287 mm**

**Forearm length**  
(Elbow to wrist segment)

**242mm 261mm**

**Spine length**  
(Sacrum to neck segment)

**557 mm**

**Shoulder distance**  
(Right shoulder to left shoulder segment)

**374 mm**

**Thigh length**  
(Hip to knee segment)

**398 mm 409 mm**

**Tibia length**  
(Knee to ankle segment)

**388 mm 398 mm**

**Hip to wrist - vertical**  
(Mean distance from hip to wrist)

**69 mm 86 mm**

**Hip to wrist - horizontal**  
(Mean distance from hip to wrist)

**588 mm 589 mm**

Notes: