

Scientific Analysis of the Cycling Leg in the 2005 Hawaii Ironman Triathlon

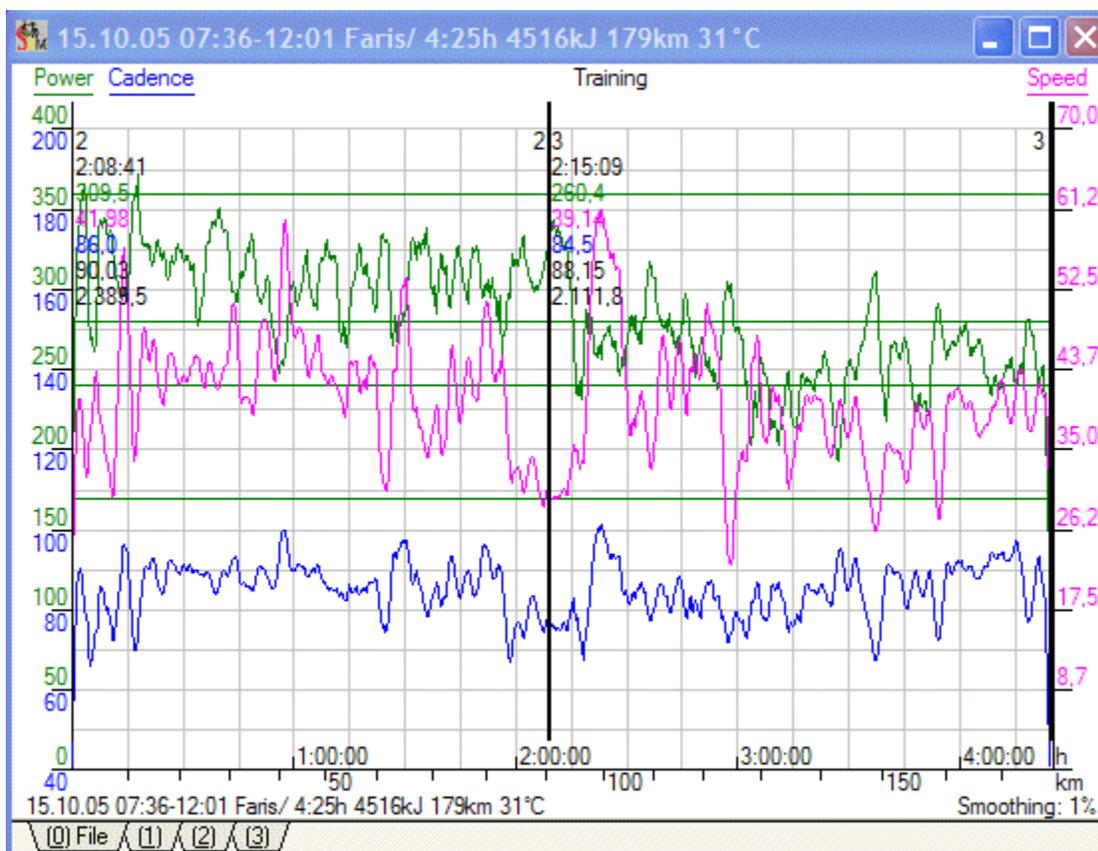
Power Output, Cadence, and Speed

The data below was gathered using an SRM power meter. The information obtained indicates the physiological requirements of cycling in the ironman triathlon, demands of the course, and the training required for elite performance. This information is used as a basis for developing an ironman training program.

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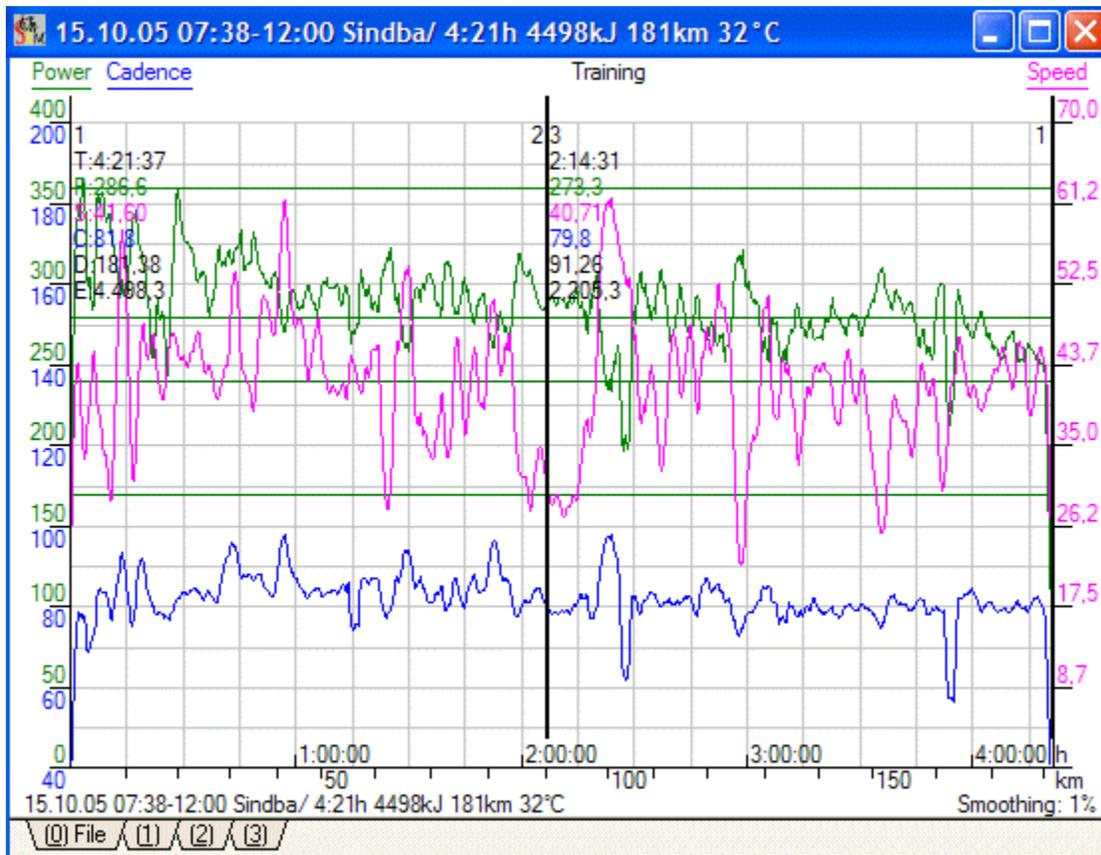
Faris Al-Sultan, Ironman World Champion 2005



Data from the champion: The graph shows power (green), speed (pink) and cadence (blue) from the Bavarian pro Faris Al Sultan. The power output over the bike leg averaged 283 watts, the average speed: 40.45 km/h, the average cadence was around 85 rpm. Faris, who had the third best swim split, got himself ahead and leading the field after just 14 minutes and produced an average of 324 watts until the first split was taken. Herewith he started

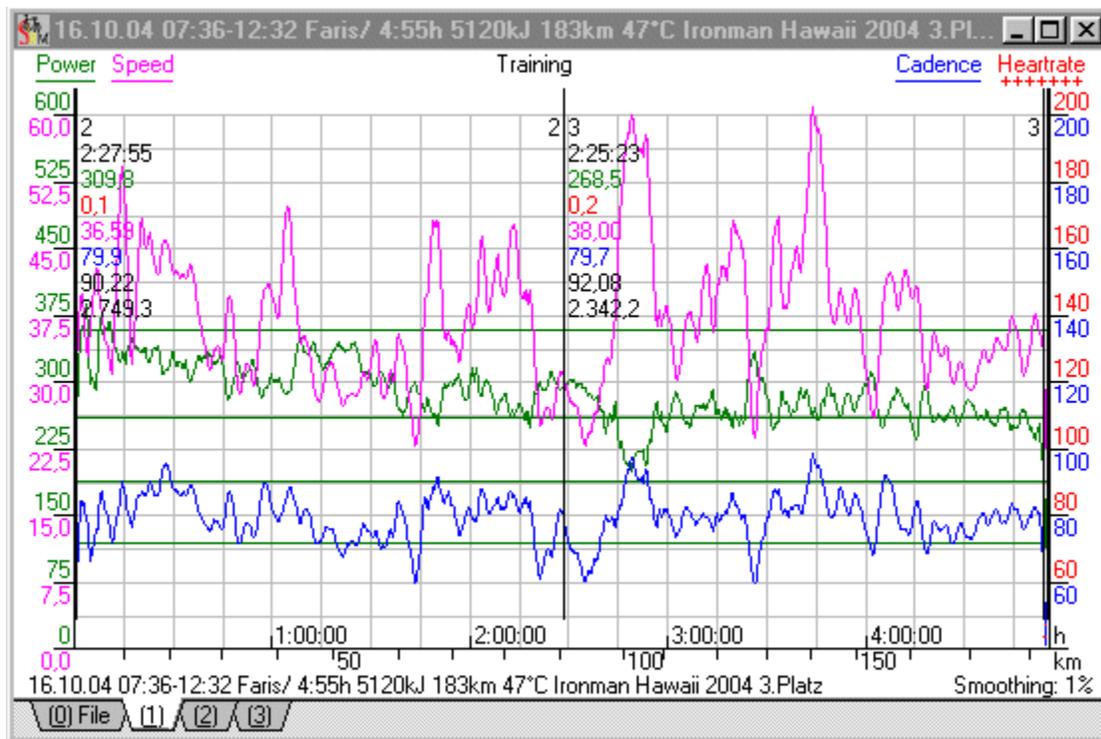
much more conservatively than last year when he averaged 343 watts for the same split. His bike race can be seen in two halves, at least when his power output is concerned, and they are marked by the turnaround point in Hawi. During the first 90 km he kept his power always very close to the average of 309 watts. In the second half however, he had a few weaknesses, but the rest of the field must have had a very similar problem, as he was able to defend his advantage. Just by the end of the bike leg he got passed by Torbjörn Sindballe, of which data can be seen below as well.

Torbjorn Sindballe (sets a new bike leg record in Kona)

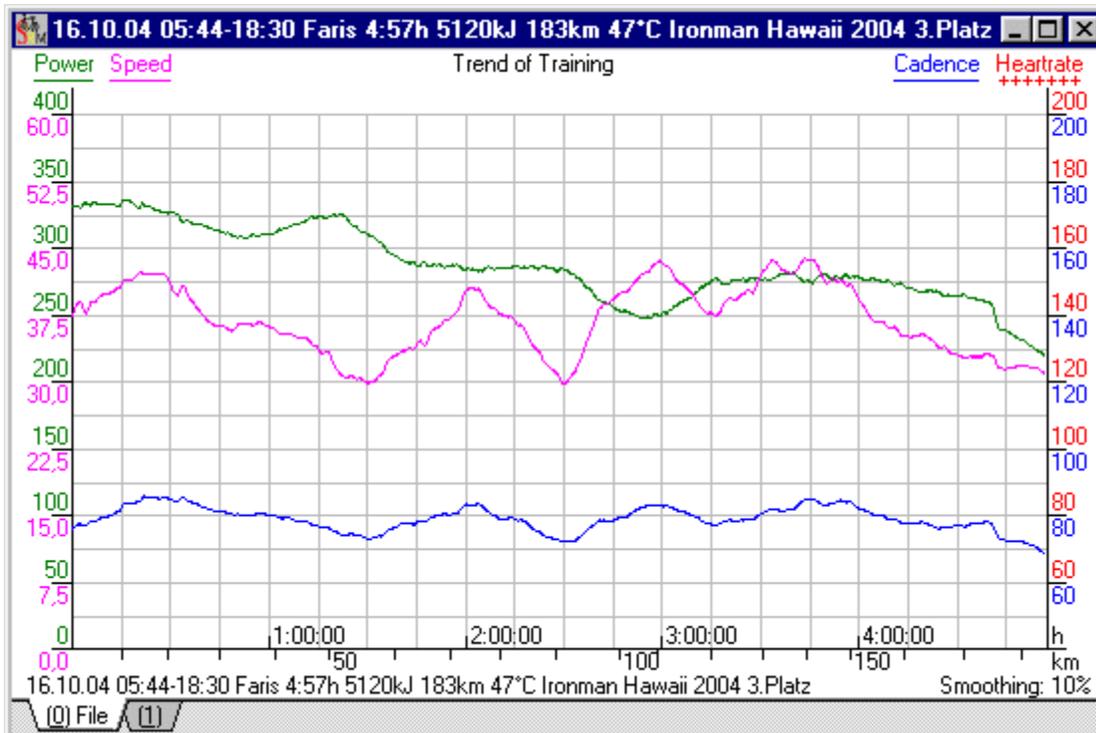


New record: 4:21:57 hours with hot but pretty calm wind conditions. Torbjorn Sindballe breaks the record that Thomas Hellriegel established in the distant 1996 Ironman and was set at 4:24:50. The graph shows how Torbjorn has paced himself very well. His average power output of 300 watts in the first half of the bike leg is only slightly higher than in the second half when the Danish express produced an average of 273 watts. With his consistent and strong effort, he managed to pass Faris with 10km to go after having spent most of the race just 3:00 behind. It is pretty obvious that he sits with an excellent aerodynamic position. Despite his 10km in surplus of Faris that he needed to houl up at Hawi, he managed to spend on average only 3 more watts than the champion to hold the same speed. We can assume the difference lays in his chase to pass Faris (286 watts).

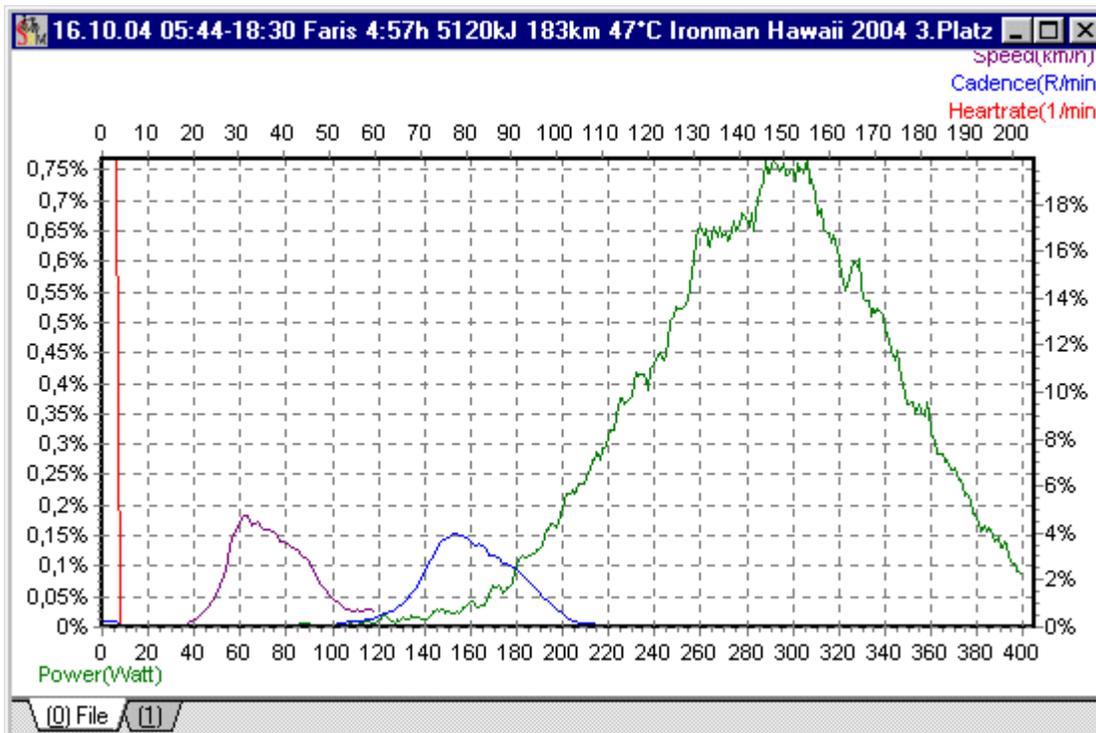
2004 World Championship Data - Faris Al Sultan, 3rd place overall



The graph shows the power (green), speed (pink) and rpm (blue) of German Pro Faris al Sultan. Faris averaged 286.9 W and 37.0 km/h on the windy and difficult course. The interval marks (vertical lines) show average data for the first and second half of the race. Average power dropped from 309 to 268.5 in the second half. Faris started out very fast, hammering way above 300 watts for the first 1.5 hours. After this fearless wild phase he remains pretty constant at a slightly lower level. Ups and downs in the speed graph indicate all the climbs and descents. Speed is generally higher in the second half. Look how Faris keeps his power output even in the descents by using a huge gear. Beside the descents, where he reaches 100 rpm, he is pedaling at a steady 80 rpm.



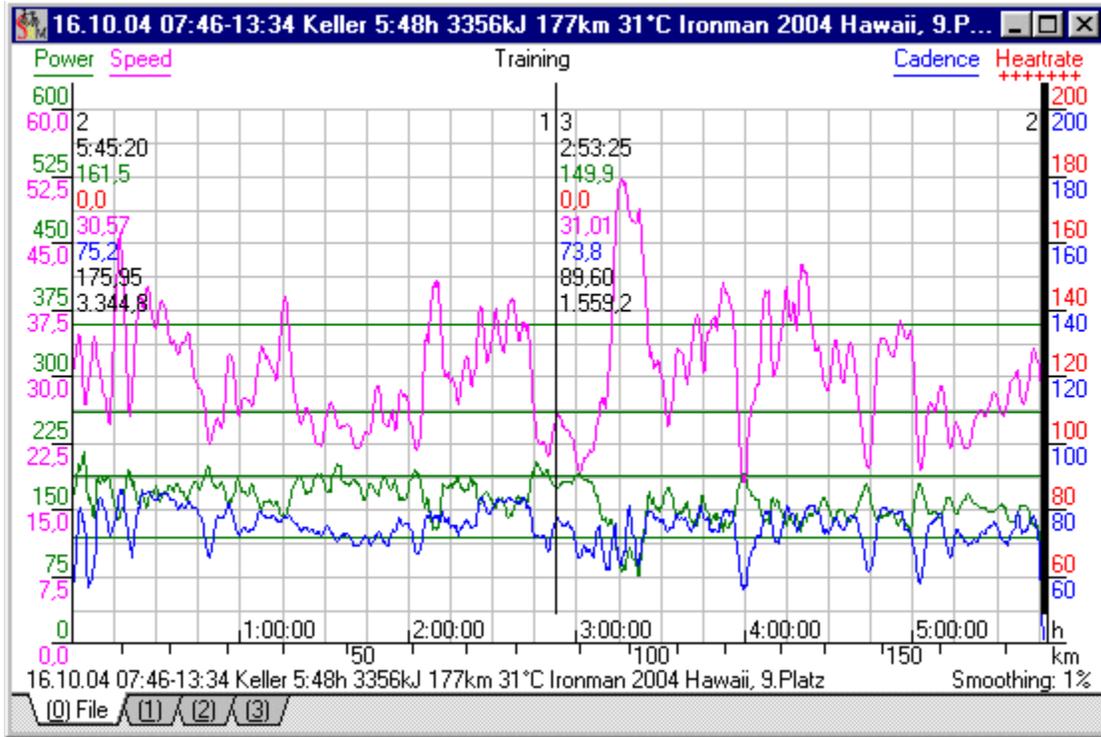
Smoothed signal: The average power output is better visible in this graph. The sharp drop in the last 20 minutes is mainly due to the smoothing.



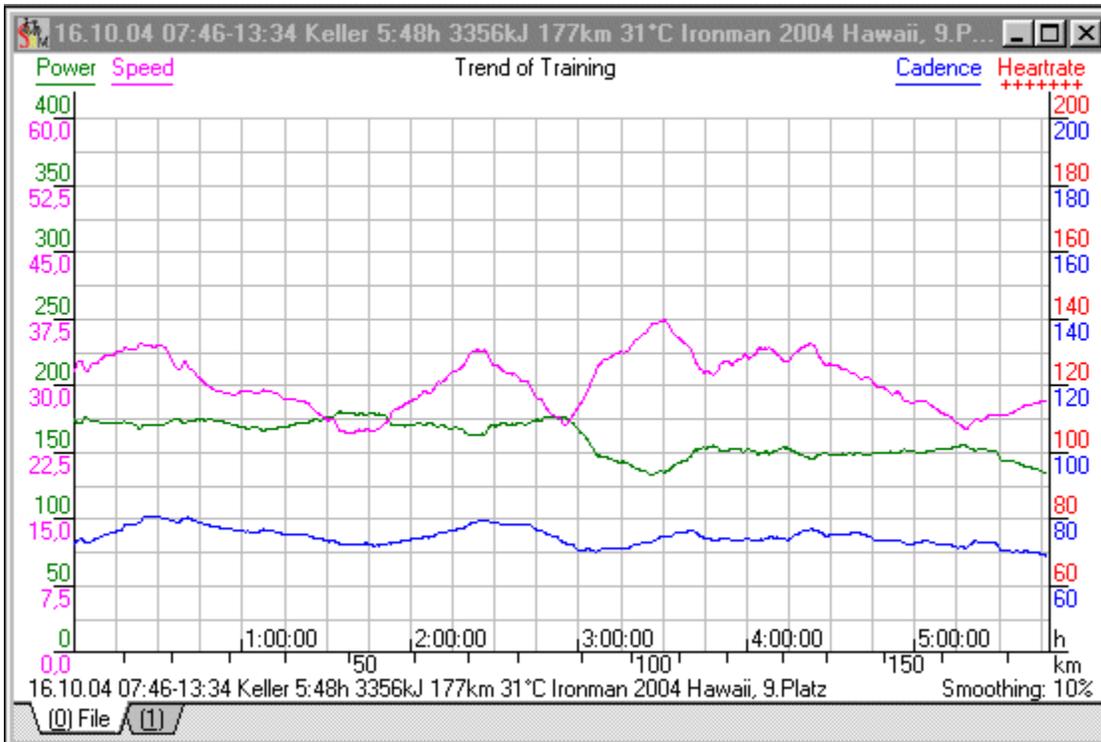
Distribution of the data: This graph shows how much time Faris spend at which power/speed/rpm. Most frequent speed (highest peak in the pink curve) is 30 km/h - the total range reaches from 20

to 60. His power band is broad reaching from 180 to 400 W. Most frequent power is around 300 watts.

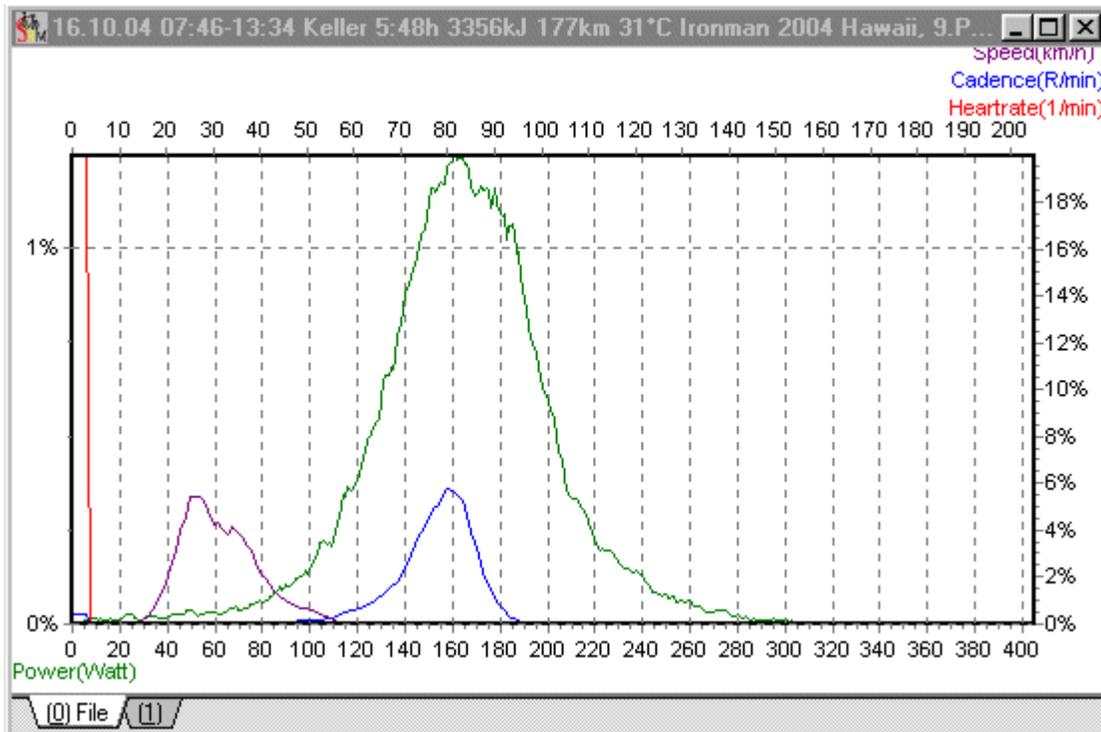
Data from Fernanda Keller, 9th place



Fernanda's speed signal is similar to Faris' but on a lower level due to the lower power. Fernanda averages 161 Watts and 30.6 km/h. Taking her light weight into account she has a power/weight ratio of 3.22 W/kg - approx. 20% less than the top men.

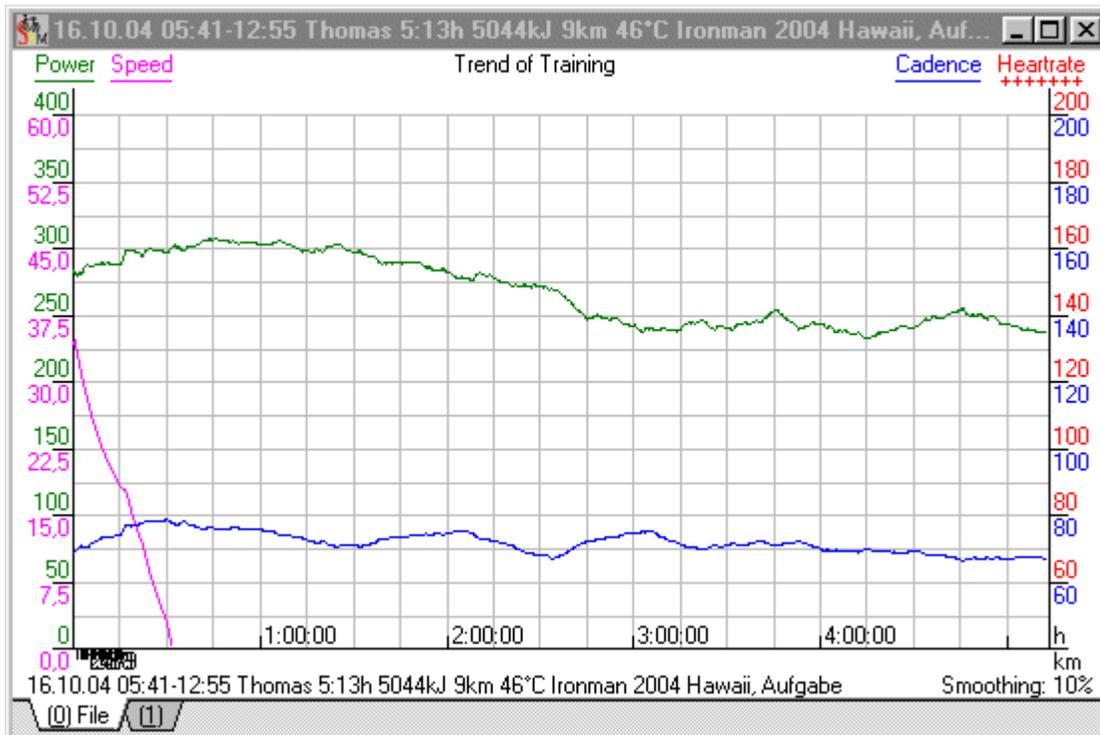


Smoothed graph: look how constant she is pedaling! After 3:11 hours something happened: Power dropped to a lower level.

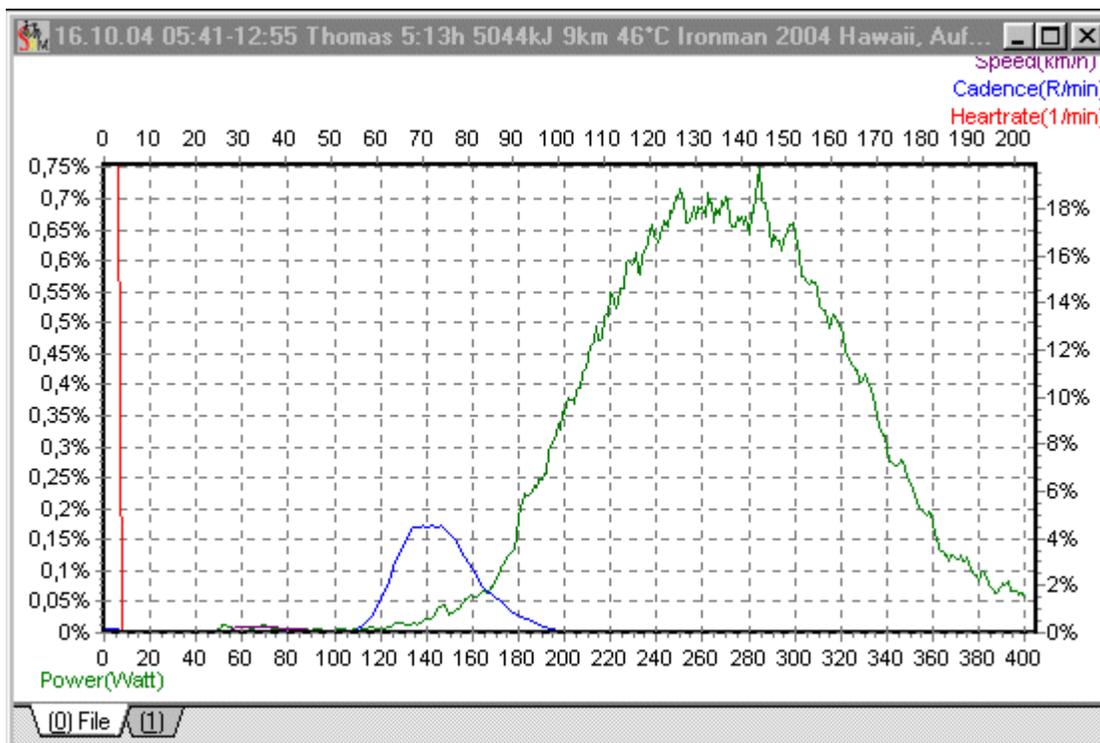


Power distribution: compared to the men the power curve is shifted to the left and it is less broad because of the more controlled and constant style of riding.

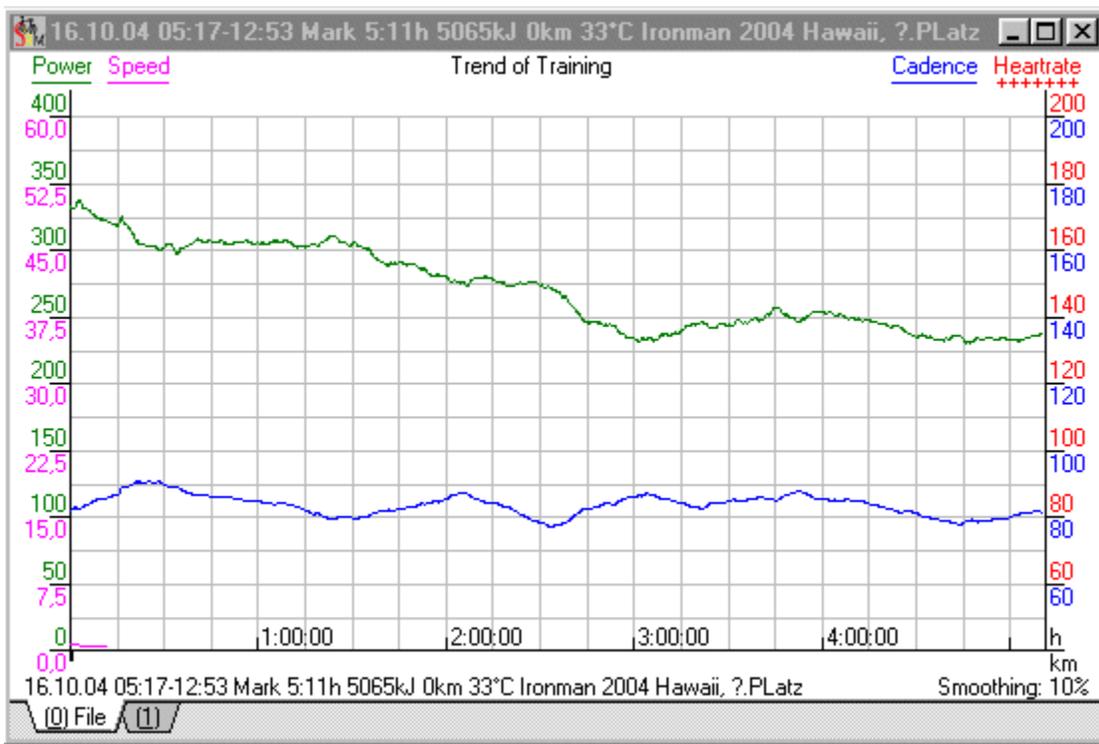
Data from Thomas Hellriegel (DNF)



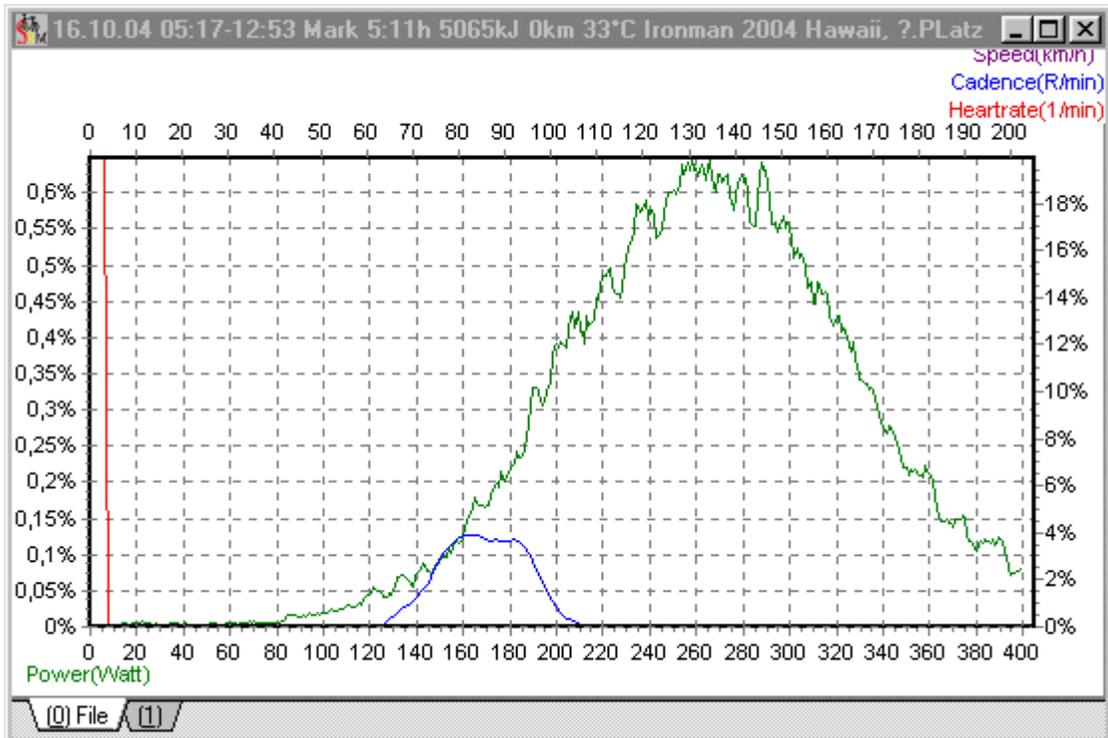
Not a good day for the champion: Although Thomas started controlled he couldn't maintain the desired power level of 300W. In the end he averaged 268 Watt (no speed signal).



Power distribution
Data from Markus Forster, 27th Place



Too fast in the beginning: Markus started with 400W, averaged 312.5 in the first 1.5 hours (first split only 2 minutes down to the winner) but had to pay for his effort later. In the last 2 hours he averaged 243 Watts.



Fluent style: Markus pedals at a cadence between 80 and 90 RPMS. His powerband is broad reaching from 140 to 400 W.

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Reference

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