



DYNAMIC CRR FOR POWERPOD
VELOCOMP

Newton⁺

 **PowerPod**

OVERVIEW



- PowerPod measures power by opposing forces
 - Wind, hills, acceleration, friction
- When road roughness increases, it takes more effort to pedal (i.e. more friction)
- In PowerPod, friction (rolling resistance) is assumed to be constant. This is equivalent to saying that road surface roughness does not change
- So, PowerPod tends to read low watts whenever road roughness is severe (i.e. chip-seal, gravel, chopped concrete)

ERRORS CAUSED BY ROUGHNESS CHANGES



ERRORS CAUSED BY ROUGHNESS CHANGES



0:00:05 Show english dist Full Ride Fit Plots

Ride: No Crr correction Note

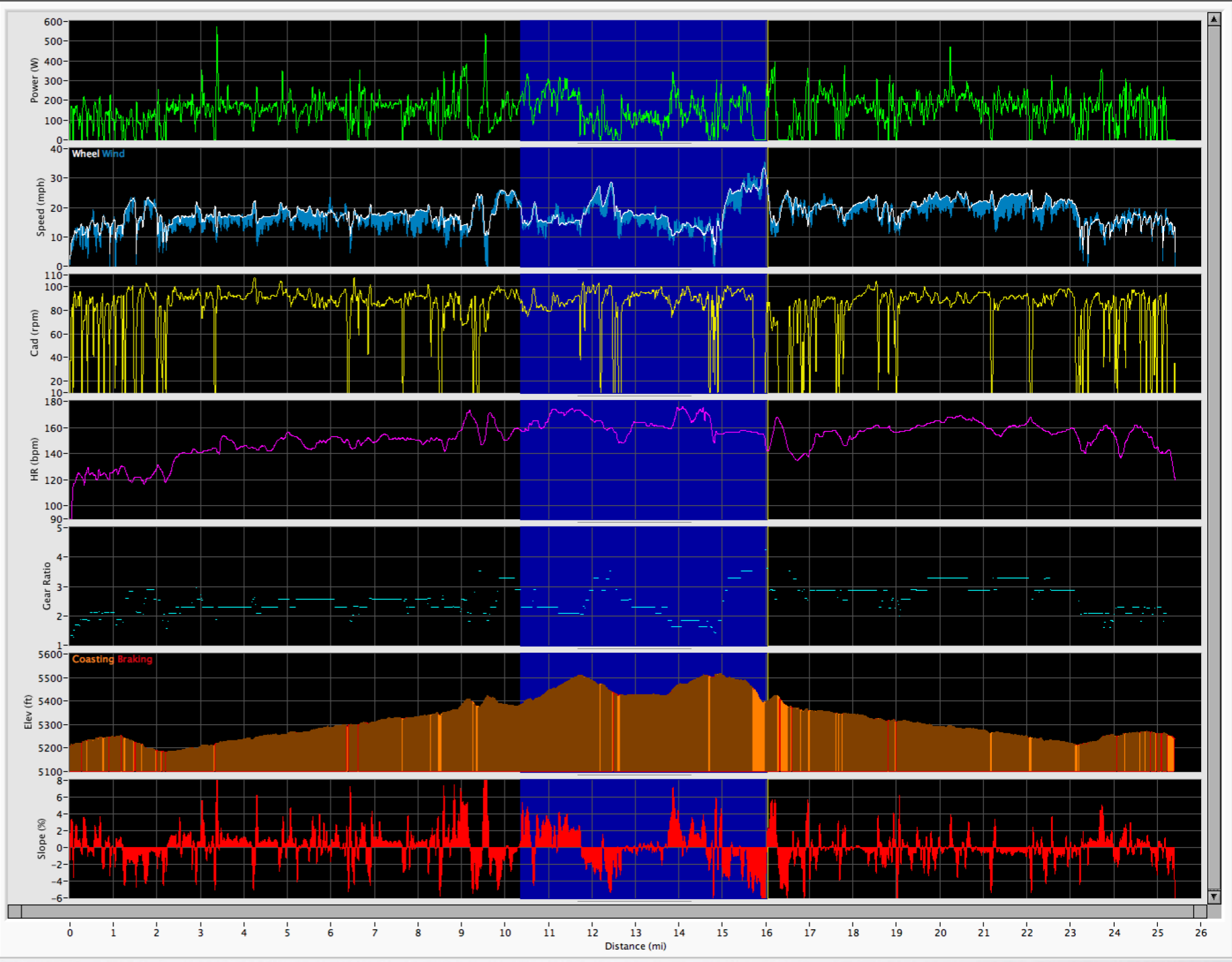
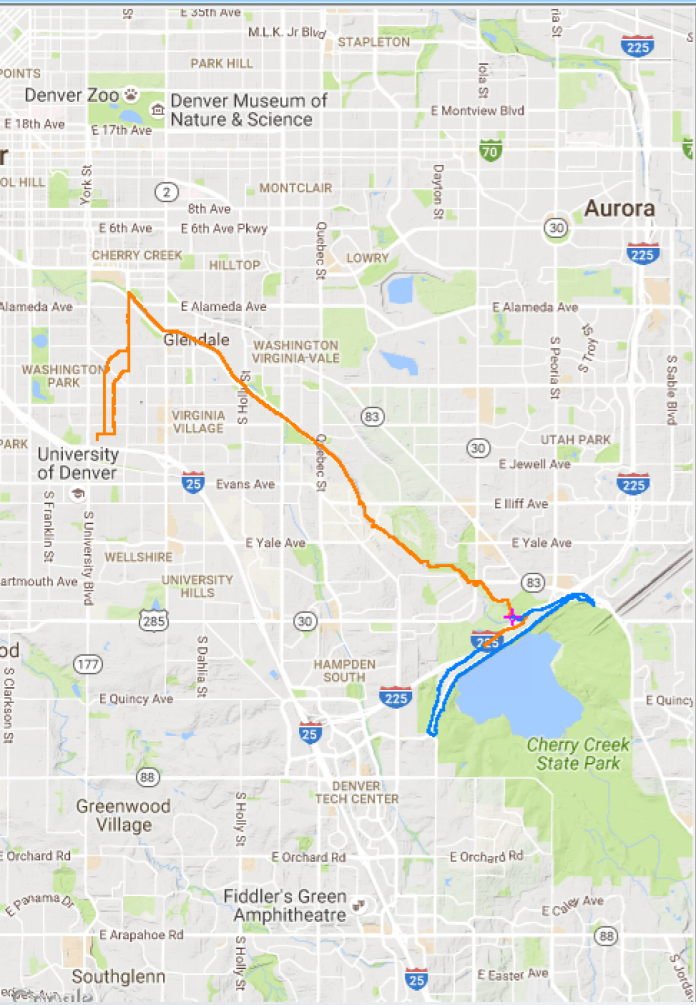
-----Selection Stats-----
 Distance: 5.69 mi (0:20:15)
 Energy: 181.8 kJ
 Cals Burn: 173.8 kcal
 Climbing: 247 ft
 Braking: -9.1 kJ (-5.0%)

	Min	Avg	Max	
Power	0	149.6	345	W
Aero	0	84.4	534	W
Rolling	8	42.5	84	W
Gravity	-1399	-3.5	359	W
Speed	3.0	16.9	33.6	mi/h
Wind	0.0	15.6	36.7	mi/h
Elev	5384	5461	5519	ft
Slope	-10.8	-0.05	7.5	%
Cadence	31	88.7	138	xpm
HR	142	163.3	176	bpm

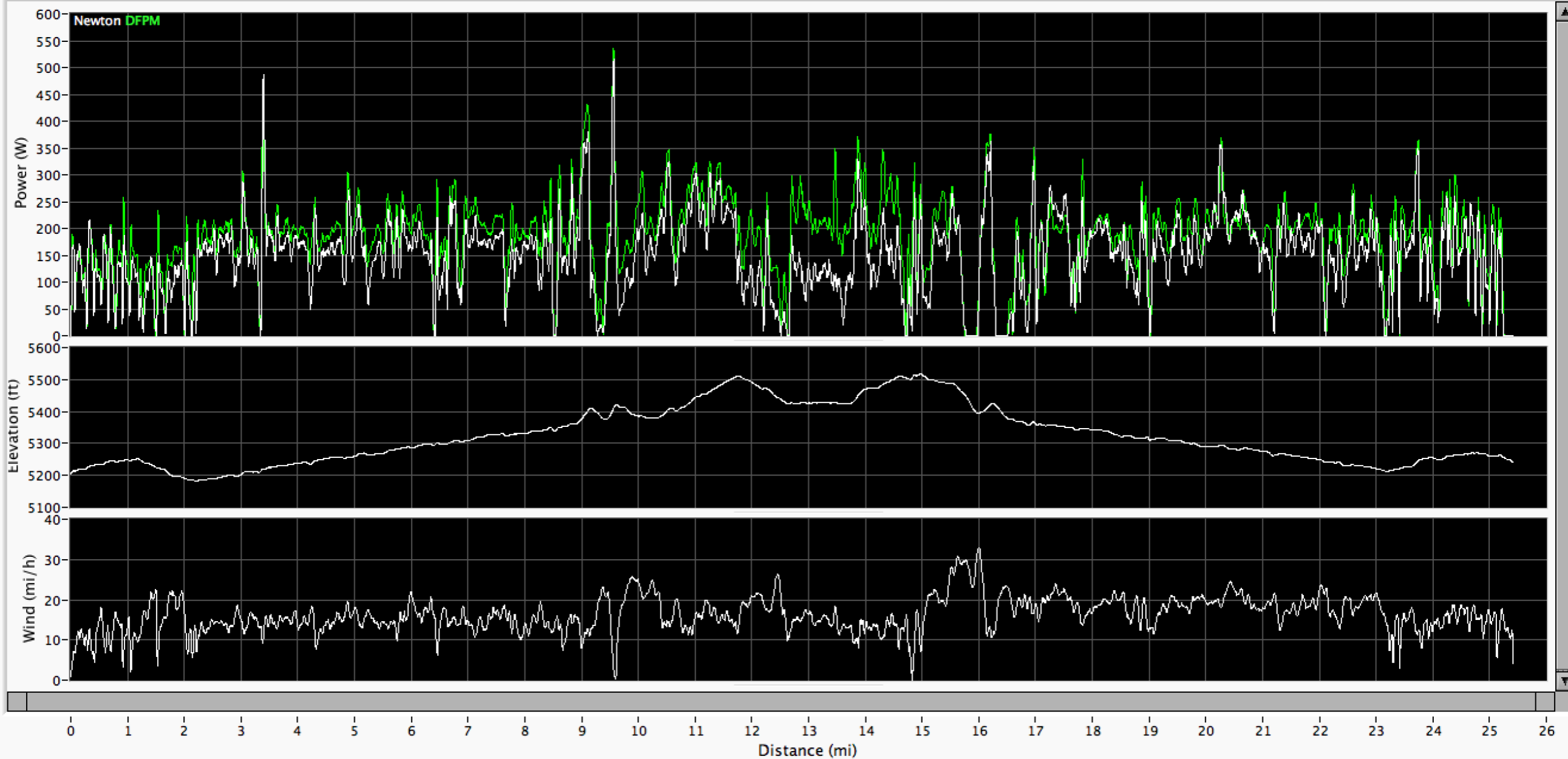
NP 186 W
 CdA: 0.400 m²; Crr: 0.0065
 195 lb; 5/6/16 9:15 PM
 82 degF; 1005 mbar

View DFPM

Laps Peaks GPS



ERRORS CAUSED BY ROUGHNESS CHANGES



ERRORS CAUSED BY ROUGHNESS CHANGES








-----Selection Stats-----

Distance: 3.25 mi (0:12:23)
Energy: 90.1 kJ
Cals Burn: 86.1 kcal
Climbing: 105 ft
Braking: -8.3 kJ (-9.2%)

	Min	Avg	Max	
Power	0	121.2	345	W
Aero	0	60.0	369	W
Rolling	8	39.7	73	W
Gravity	-634	-4.5	302	W
Speed	3.0	15.8	28.9	mi/h
Wind	0.0	14.0	27.4	mi/h
Elev	5424	5465	5515	ft
Slope	-6.9	-0.07	7.5	%
Cadence	31	89.7	138	rpm
HR	148	163.7	176	bpm

NP 153 W
CdA: 0.400 m²; Crr: 0.0065
195 lb; 5/6/16 1:20 PM
82 degF; 1005 mbar

View DFPM     






Ride:

-----Selection Stats-----

Distance: 3.25 mi (0:12:23)
Energy: 151.8 kJ
Cals Burn: 145.1 kcal
Climbing: 105 ft
Braking: -8.3 kJ (-5.5%)

	Min	Avg	Max	
DFPM Pow	0	204.3	385	W
Aero	0	60.0	369	W
Rolling	8	39.7	73	W
Gravity	-634	-4.5	302	W
Speed	3.0	15.8	28.9	mi/h
Wind	0.0	14.0	27.4	mi/h
Elev	5424	5465	5515	ft
Slope	-6.9	-0.07	7.5	%
Cadence	31	89.7	138	rpm
HR	148	163.7	176	bpm

NP 229 W
CdA: 0.400 m²; Crr: 0.0065
195 lb; 5/6/16 1:20 PM
82 degF; 1005 mbar

View DFPM     

83 Watt Difference

PowerPod reads low when roads are sufficiently rough

WHAT IS DCRR?



- DCRR = **D**ynamic **C**oefficient of **R**olling **R**esistance
- New, proprietary Velocomp technology
 - Measure vertical road vibration
 - Interpret vibration measurements as road roughness
 - Convert road roughness measurements into rolling resistance
 - Dynamically adjust coefficient of road resistance (C_{rr}) based on measurements

DCRR benefit is improved watts accuracy

ROAD ROUGHNESS MEASUREMENT (HR)



0:00:05 Show english dist Full Ride Fit Plots

Ride: Note

Distance: 24.68 mi (1:32:05)
 Energy: 789.8 kJ
 Cals Burn: 755.1 kcal
 Climbing: 596 ft
 Braking: -55.3 kJ (-7.0%)

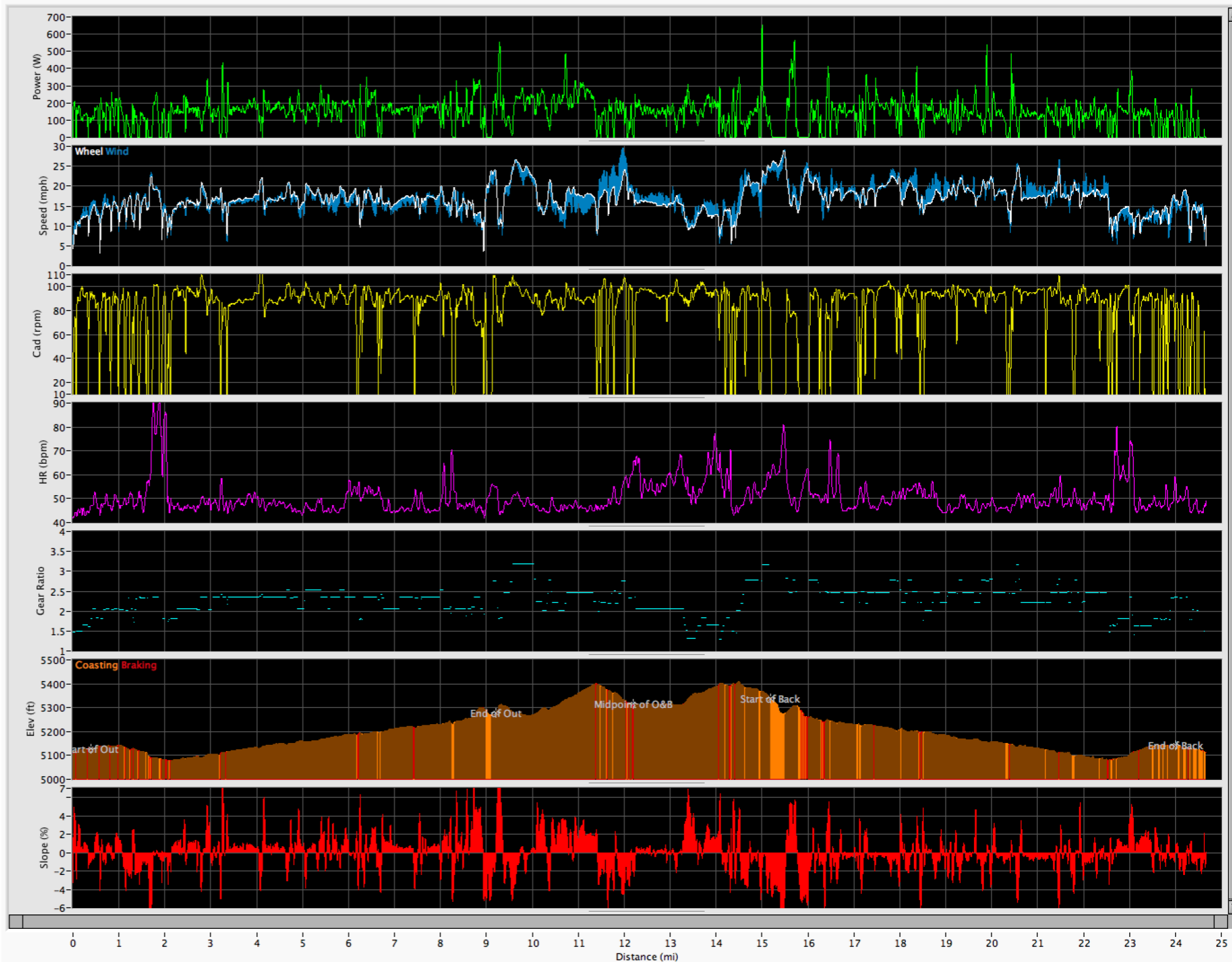
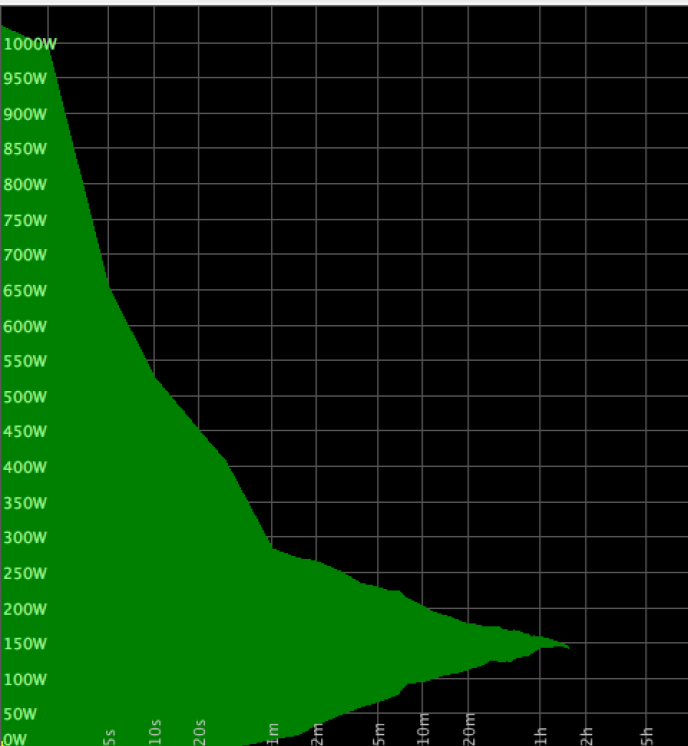
	Min	Avg	Max
Power	0	143.0	654 W
Aero	0	79.7	375 W
Rolling	0	40.5	73 W
Gravity	-899	-0.7	498 W
Speed	0.0	16.1	29.1 mi/h
Wind	5.3	16.1	30.4 mi/h
Elev	5077	5208	5410 ft
Slope	-8.8	-0.01	12.3 %
Cadence	0	89.4	120 rpm
HR	41	50.5	96 bpm

NP 174 W
 CdA: 0.400 m²; Crr: 0.0065
 195 lb; 7/30/16 3:29 PM
 70 degF; 1009 mbar

View DFPM

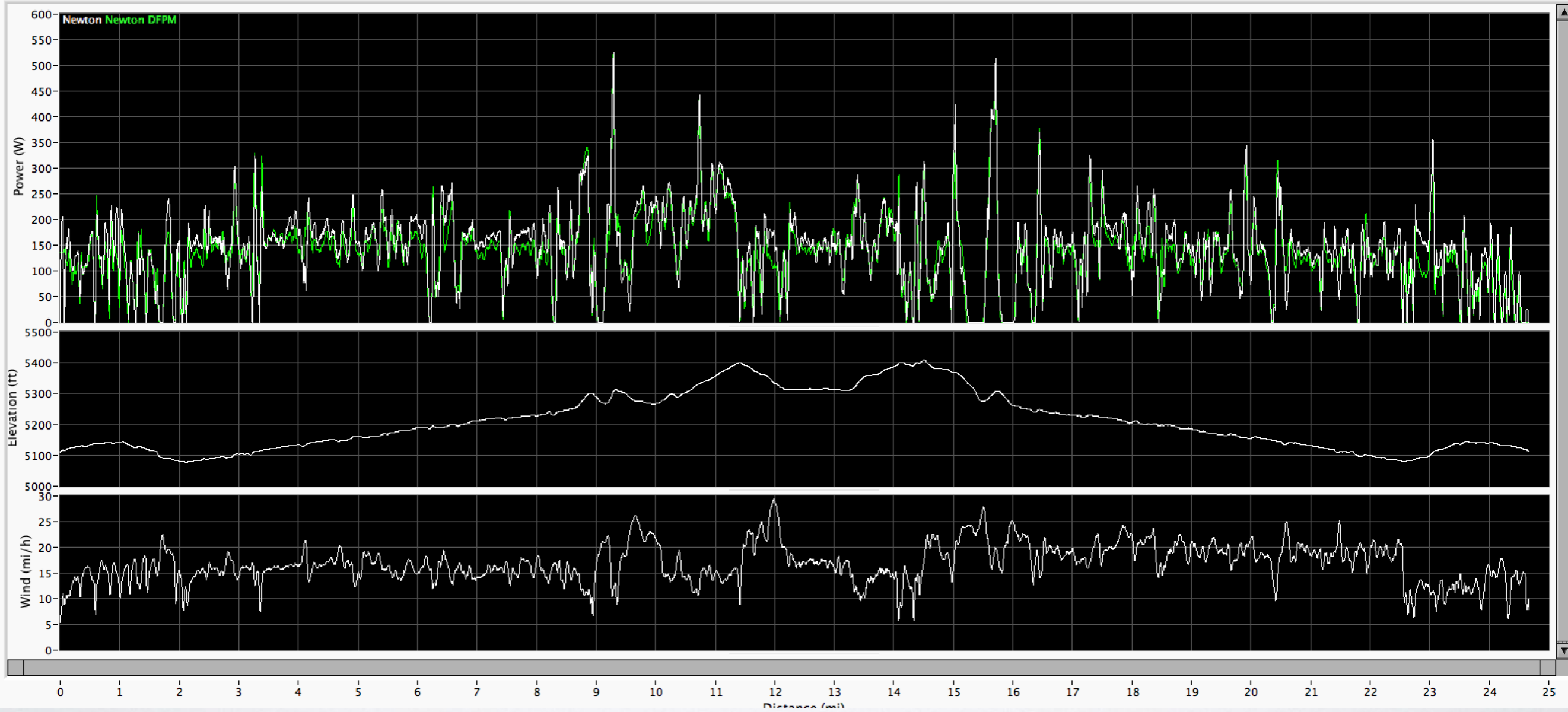
Laps Peaks GPS

0:00:05 653.5 W
 0:00:10 525.6 W
 0:00:20 450.7 W
 0:00:30 405.5 W
 0:01:00 283.9 W
 0:02:00 266.5 W
 0:05:00 229.4 W
 0:10:00 202.7 W
 0:20:00 177.3 W
 0:30:00 173.3 W
 1:00:00 157.9 W



Profile: IH Fuji Cross tweaked: rec rate = 1 s






DCRR POWER COMPARISON



DCRR WORKS!








```
-----Selection Stats-----
Distance: 4.81 km (0:12:35)
Energy: 108.6 kJ
Cals Burn: 103.8 kcal
Climbing: 24 m
Braking: -9.8 kJ (-9.0%)
      Min   Avg   Max
Power      0 143.8 308 W
Aero        0  75.5 375 W
Rolling     12  36.0  61 W
Gravity    -437  -1.3 257 W
Speed       7.4 23.0 39.3 km/h
Wind        8.7 25.8 48.9 km/h
Elev       1618 1631 1647 m
Slope      -6.8 -0.02  7.3 %
Cadence     30  92.7 109 rpm
HR          43  56.3  79 bpm
NP 161 W
CdA: 0.400 m^2; Crr: 0.0065
88 kg; 7/30/16 8:12 AM
23 degC; 1009 hPa
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View DFPM     

PowerPod

```
-----Selection Stats-----
Distance: 4.81 km (0:12:35)
Energy: 106.6 kJ
Cals Burn: 101.9 kcal
Climbing: 24 m
Braking: -9.8 kJ (-9.2%)
      Min   Avg   Max
DFPM Pow   0 141.2 361 W
Aero        0  75.5 375 W
Rolling     12  36.0  61 W
Gravity    -437  -1.3 257 W
Speed       7.4 23.0 39.3 km/h
Wind        8.7 25.8 48.9 km/h
Elev       1618 1631 1647 m
Slope      -6.8 -0.02  7.3 %
Cadence     30  92.7 109 rpm
HR          43  56.3  79 bpm
NP 162 W
CdA: 0.400 m^2; Crr: 0.0065
88 kg; 7/30/16 8:12 AM
23 degC; 1009 hPa
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View DFPM     

DFPM

2 Watt difference

VERY ROUGH CONCRETE



0:00:05 Show english dist Full Ride Fit P

Ride: Note

Distance: 28.62 mi (1:42:40)
 Energy: 863.3 kJ
 Cals Burn: 825.3 kcal
 Climbing: 1012 ft
 Braking: -119.4 kJ (-13.8%)

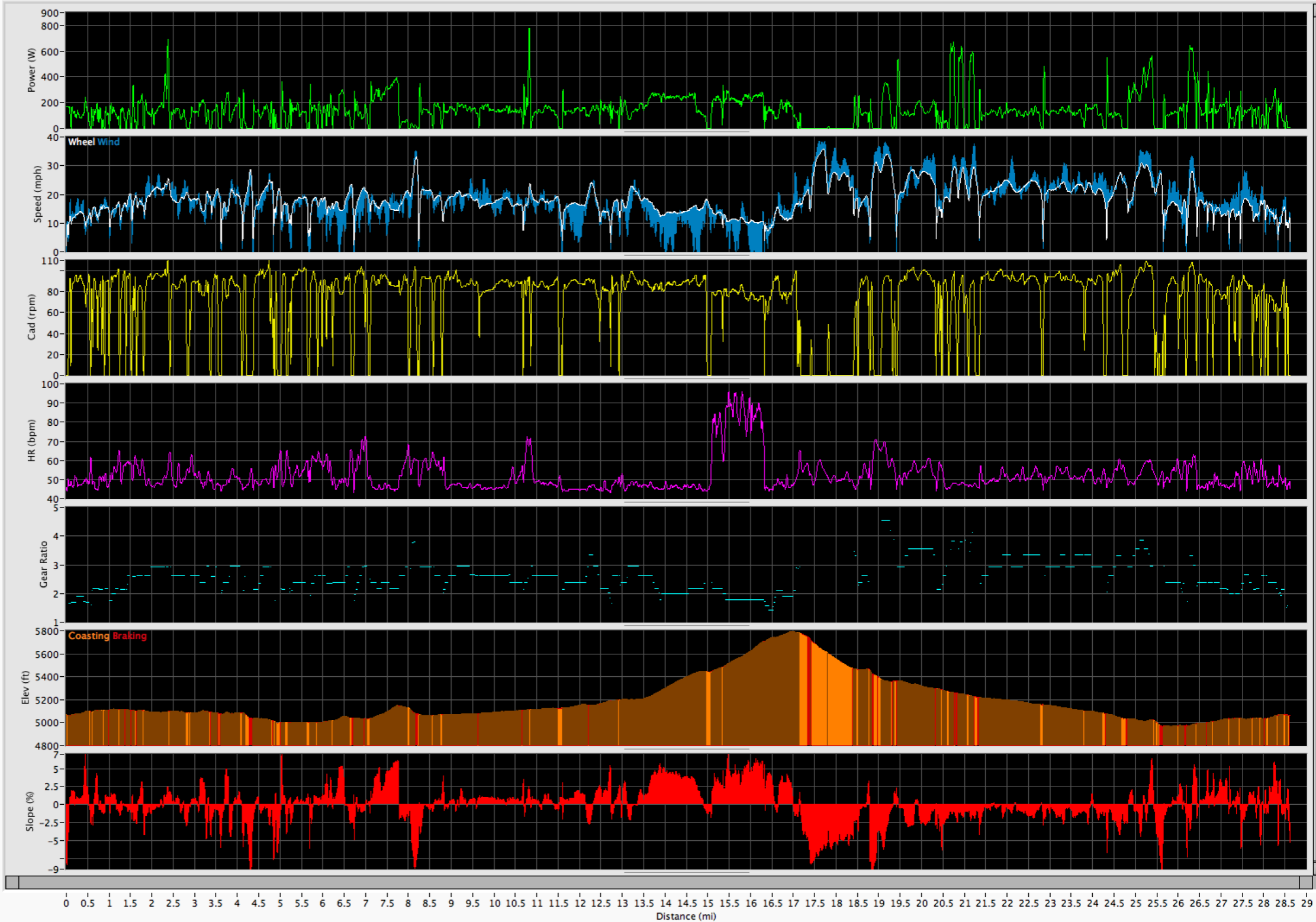
	Min	Avg	Max	
DFPM Pow	0	140.1	779	W
Aero	0	103.7	943	W
Rolling	0	25.3	54	W
Gravity	-1189	-2.8	584	W
Speed	0.0	16.7	35.8	mi/h
Wind	0.0	16.0	40.3	mi/h
Elev	4968	5196	5793	ft
Slope	-11.2	-0.04	9.4	%
Cadence	0	84.4	113	rpm
HR	43	52.6	98	bpm

NP 190 W
 CdA: 0.380 m²; Crr: 0.0040
 190 lb; 8/20/16 10:34 PM
 78 degF; 1006 mbar

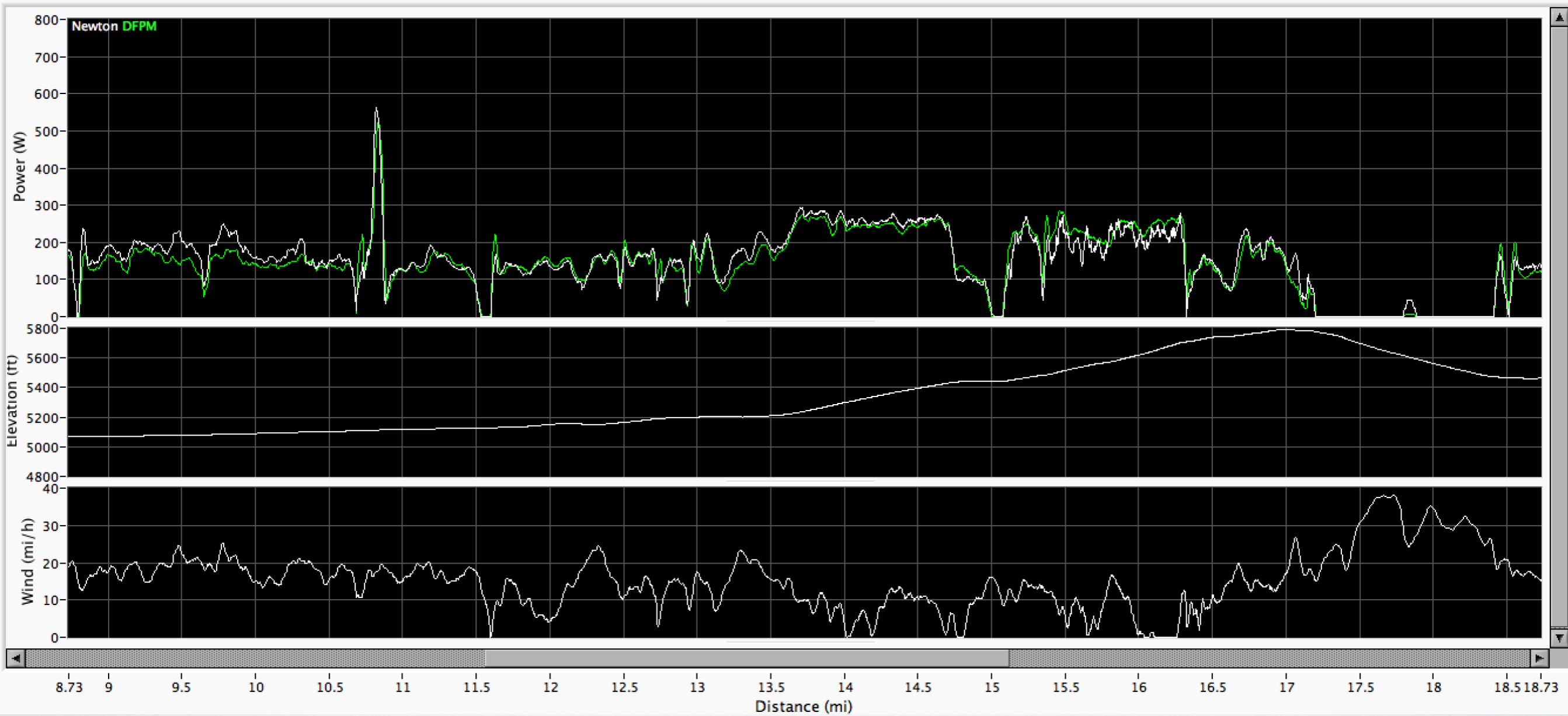
View DFPM

Laps Peaks GPS

Time	Power (W)
0:00:05	778.7 W
0:00:10	636.4 W
0:00:20	567.6 W
0:00:30	479.2 W
0:01:00	366.9 W
0:02:00	312.5 W
0:05:00	242.8 W
0:10:00	214.5 W
0:20:00	191.0 W
0:30:00	174.0 W
1:00:00	152.8 W



VERY ROUGH CONCRETE



IN SUMMARY



- DCRR ADDS ACCURACY TO POWERPOD IN ROUGH-ROADS SITUATIONS
- FREE FIRMWARE UPGRADE FOR ALL POWERPOD USERS