# Effect of different sampling rate

A report on the effect of different sampling rate when measuring the power of INA219 on Raspberry Pi

## Motivation

We may require different accuracy on the power and energy reading when conducting different experiments. So the analysis on different sampling rate may help researchers find the appropriate sampling rate for a specific experiment, either to increase accuracy (when sampling rate is high) or to avoid overhead (when sampling rate is low).

## Experiment Design

- Set up Python environment on a Raspberry Pi

  `sudo apt-get install python3`
- Install ina219-pi-seelab module on the Pi

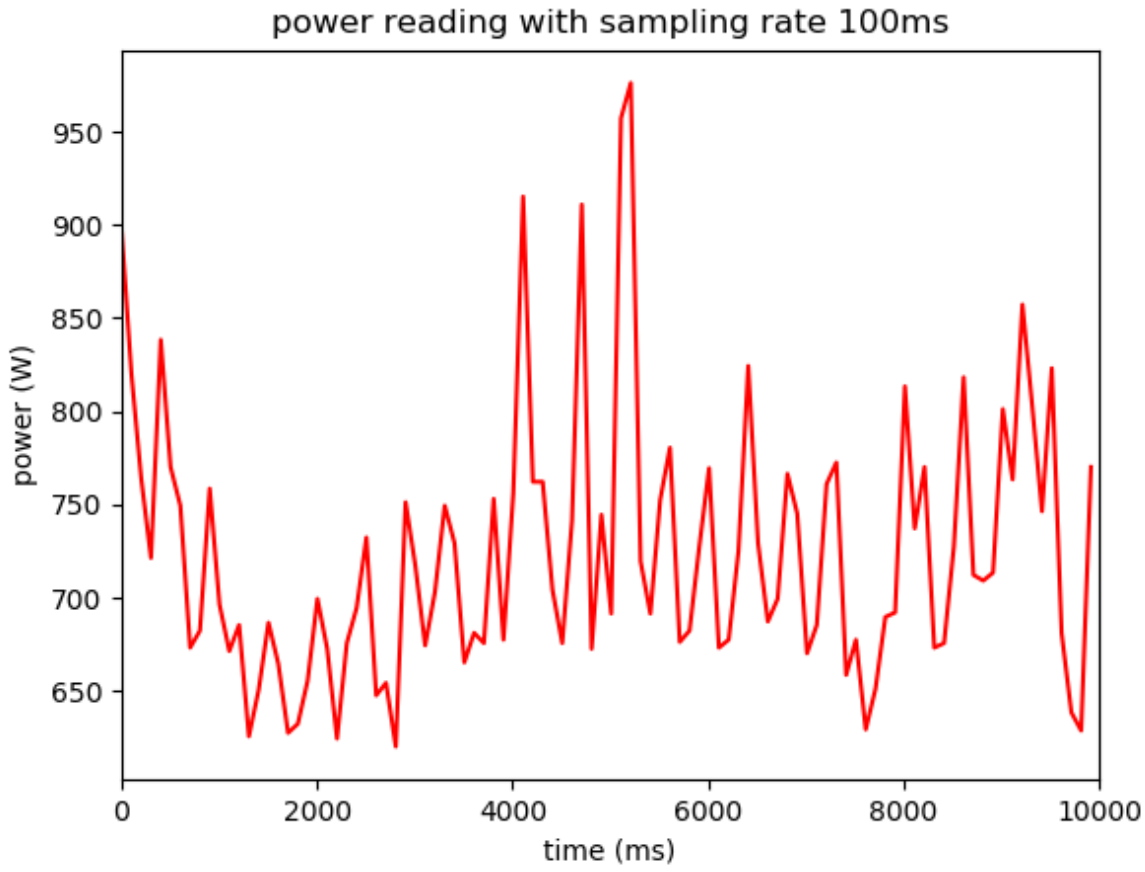
  `cd ina219-pi-seelab`

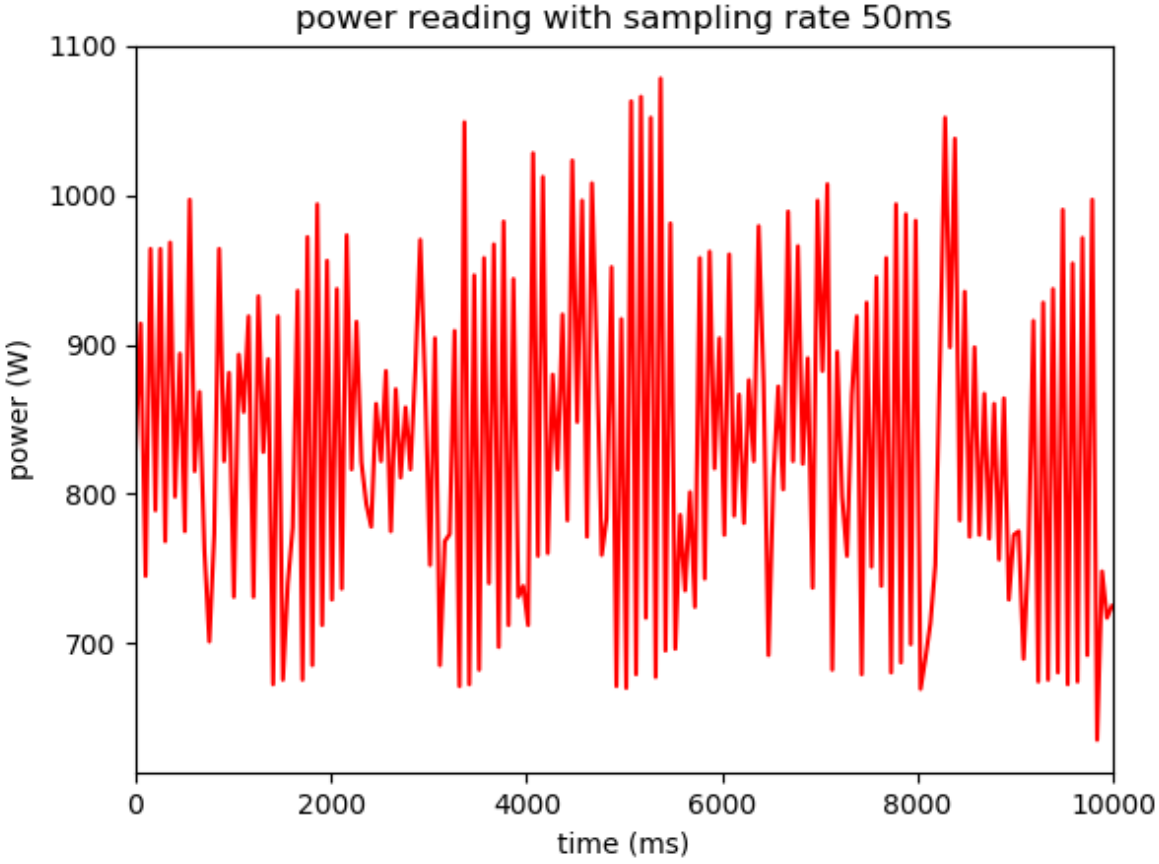
  `pip3 install .`
- Connect a Adafruit INA219 sensor to the Pi.
- Run demo_animation.py under the demo directory

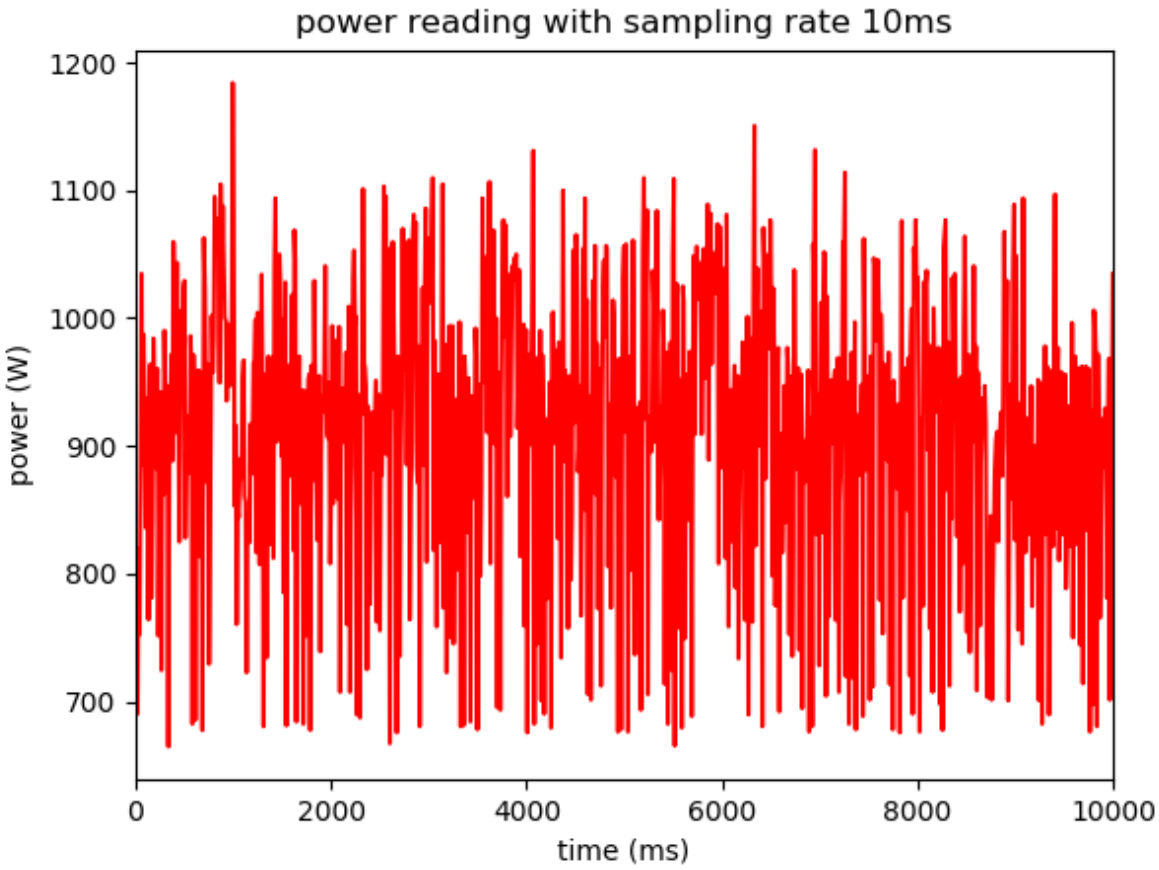
  `python3 demo_animation.py`
- Set the sample interval variable to 0 (continuous sampling), 5, 10, 20, 50, 100 (all in ms)
- Save and compare all the figure with about sampling rate

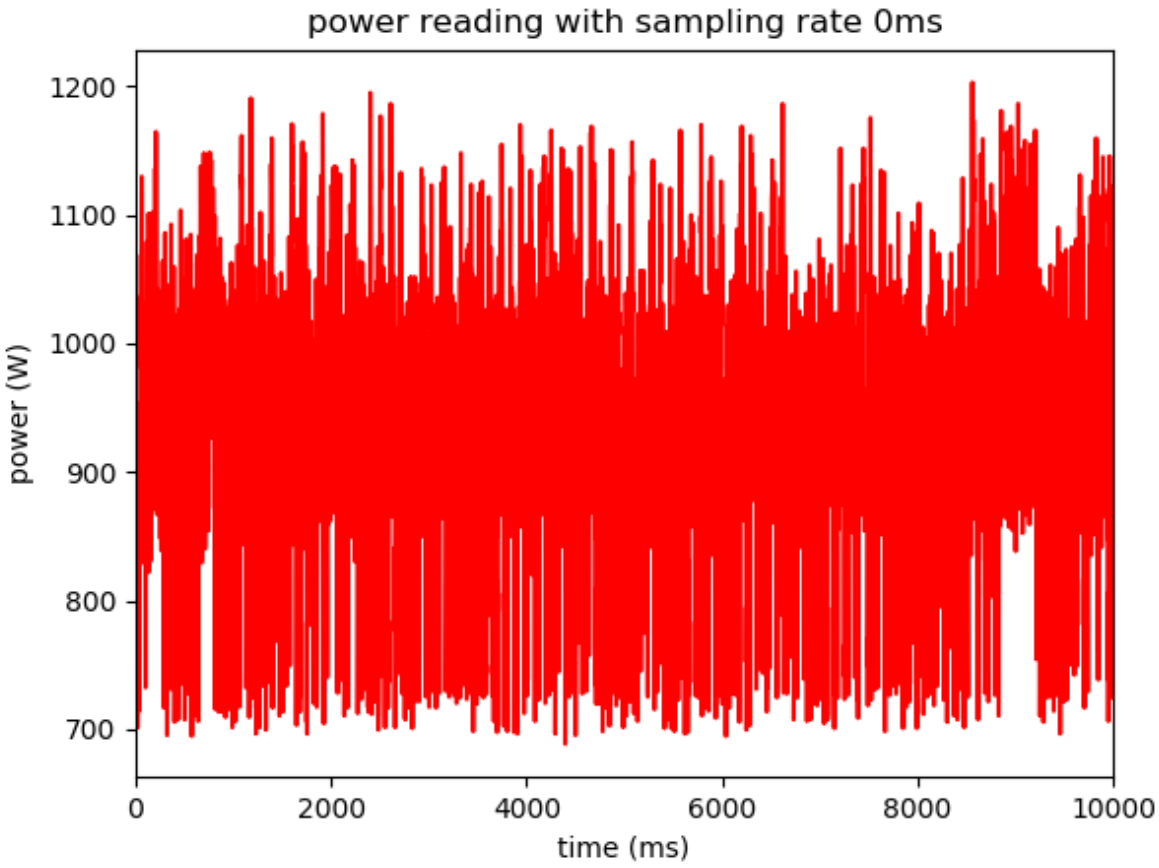
## Results and Analysis

Here are the power reading when setting the sensor to sleep for 10s,  with sampling interval of 100ms, 50ms, 10ms, 0ms.

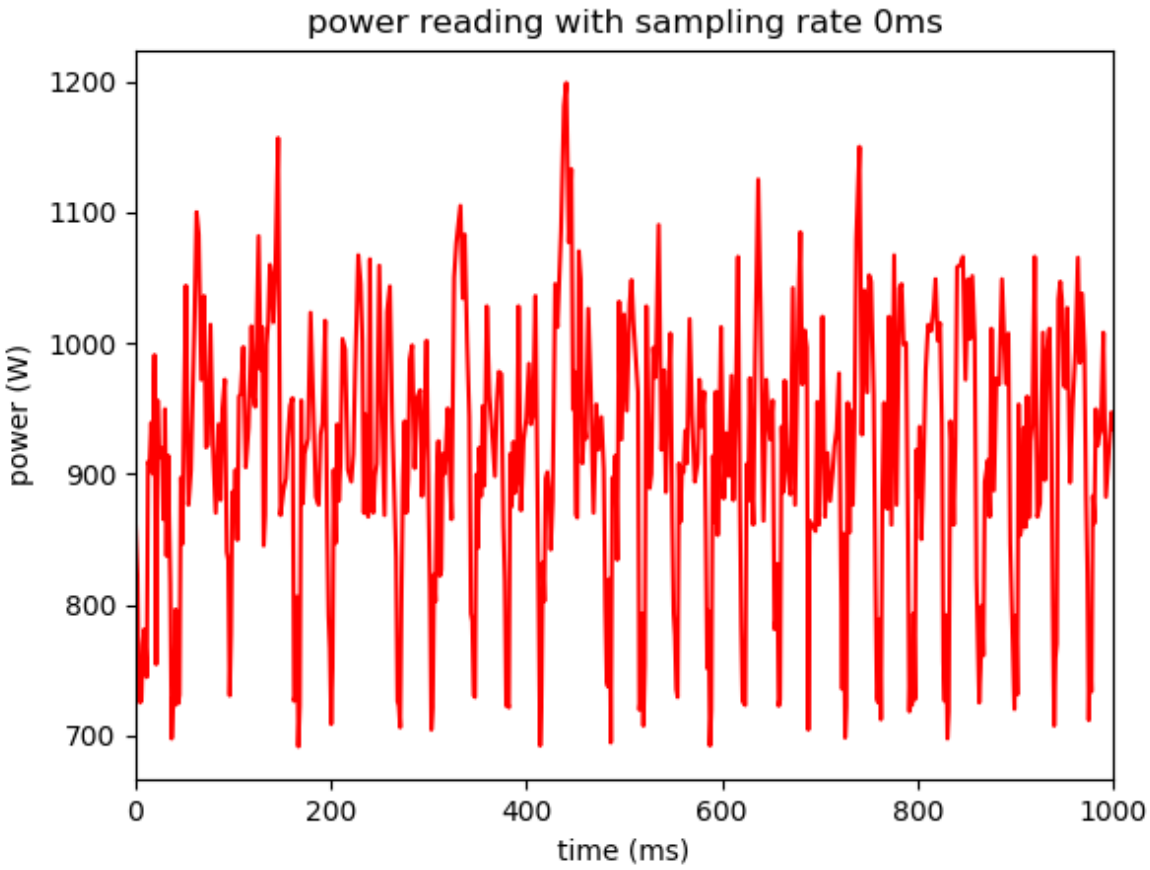

power reading with sampling rate 100ms
power (W)
950
900
850
800
750
700
650
0
2000
4000
6000
8000
10000
time (ms)


power reading with sampling rate 50ms
power (W)
1100
1000
900
800
700
0
2000
4000
6000
8000
10000
time (ms)




Here are the power reading when setting the sensor to sleep for 1s, with sampling interval = 0ms.




As shown in the figures, when the sampling interval is close to 0ms, accuracy increases but with large overhead, and when sampling interval is large, the overhead is not significant but the calculation of average and total power may not be accurate.