A Note on Data Filtering

- High pass Filter

Infinite Impulse Response (IIR) vs. , Finite Impulse Response(FIR)

- Notch Filter

Spur Removal

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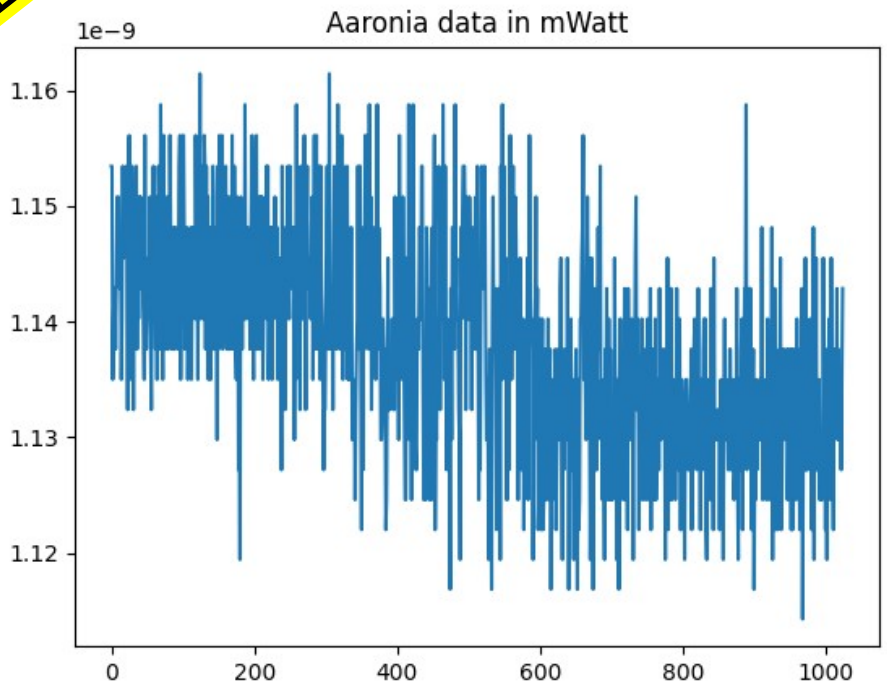
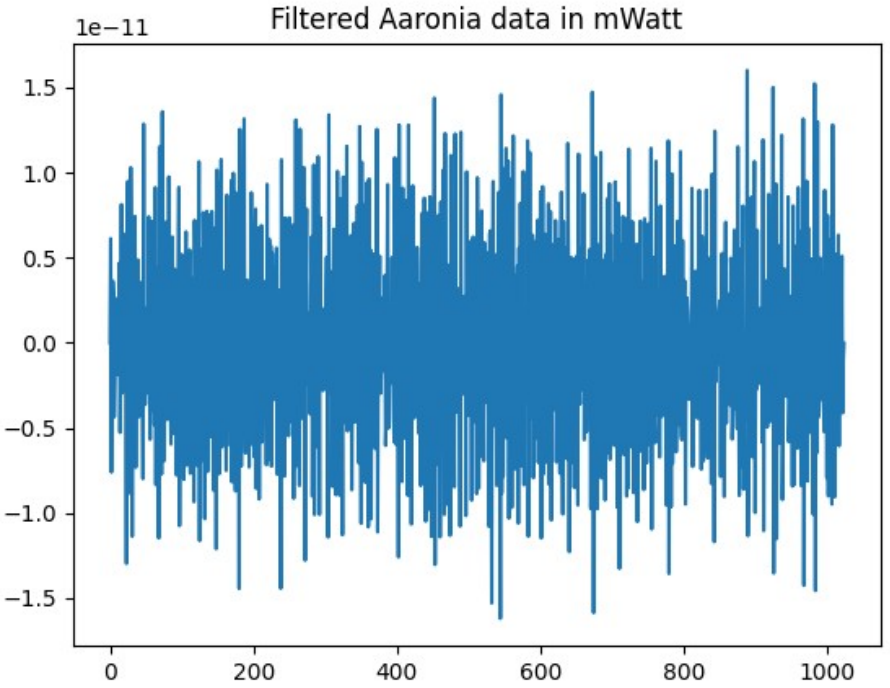
REMINDER

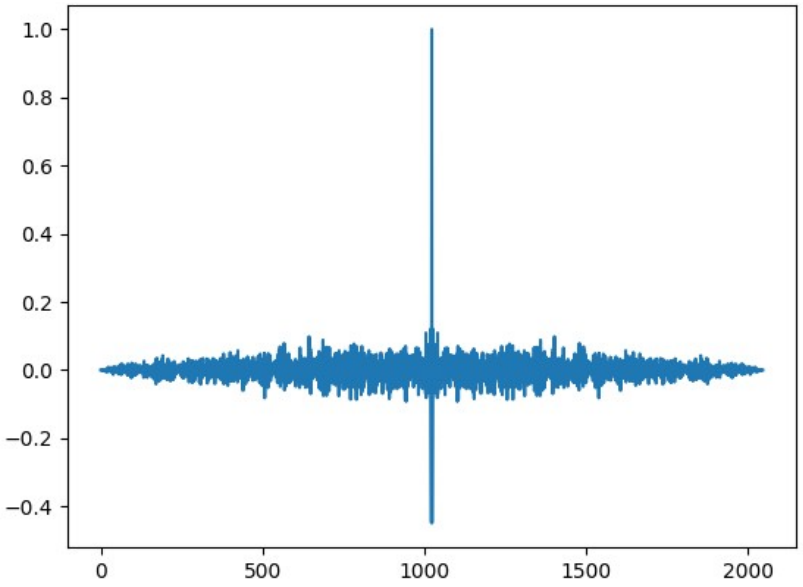
HEPCAT Data – 4GHz (Aaronia SA)
Butterworth, N=8, Fps=48

Mean of the norm of Auto Correlation 2.6E-11

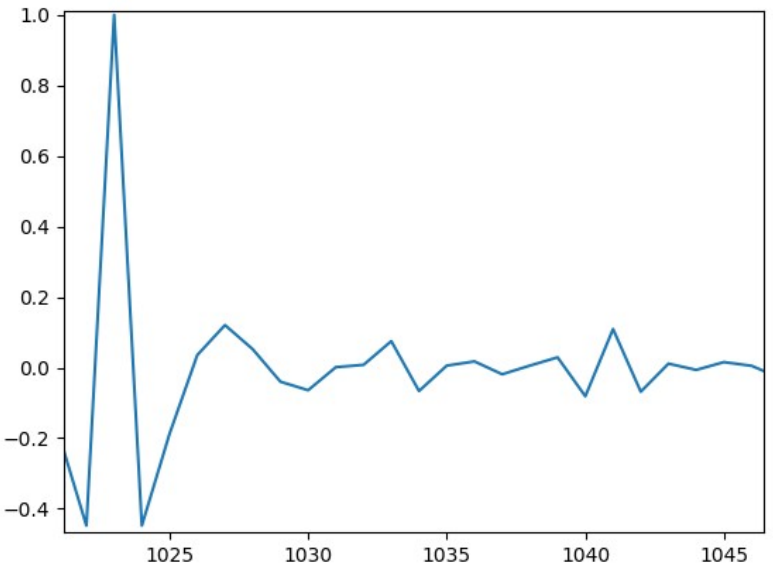




Auto Correlation of Filtered Data

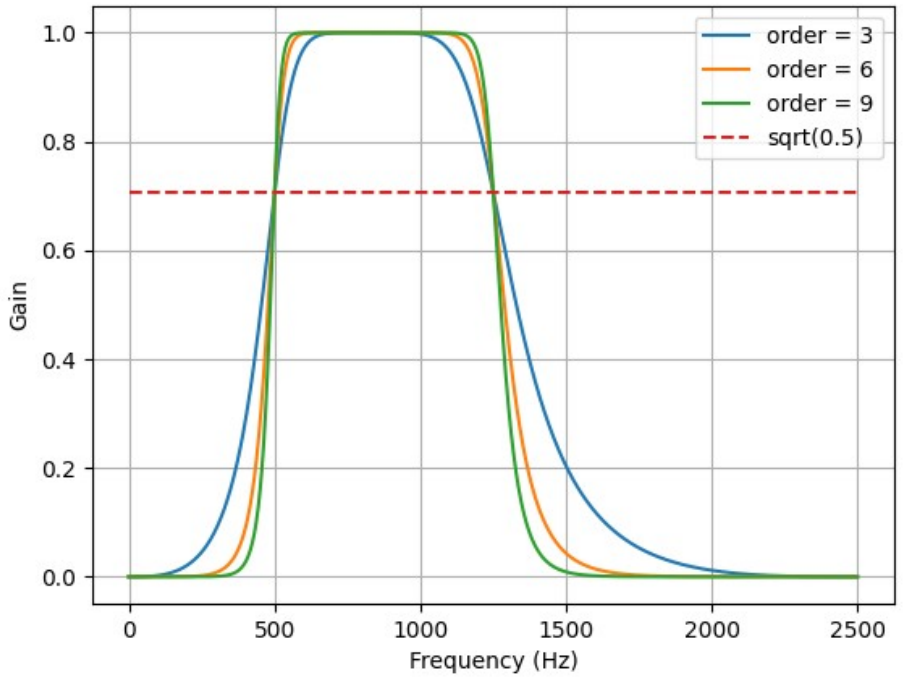


Auto Correlation of Filtered Data Zoomed in

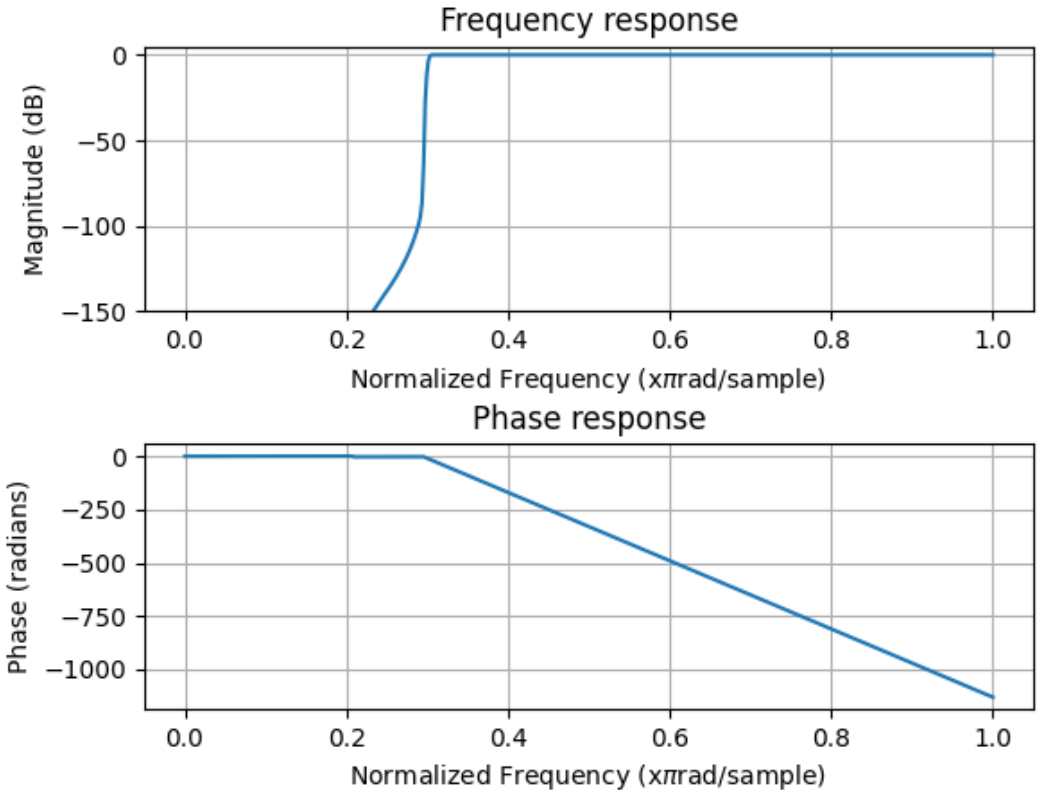


HF-filter-data.py

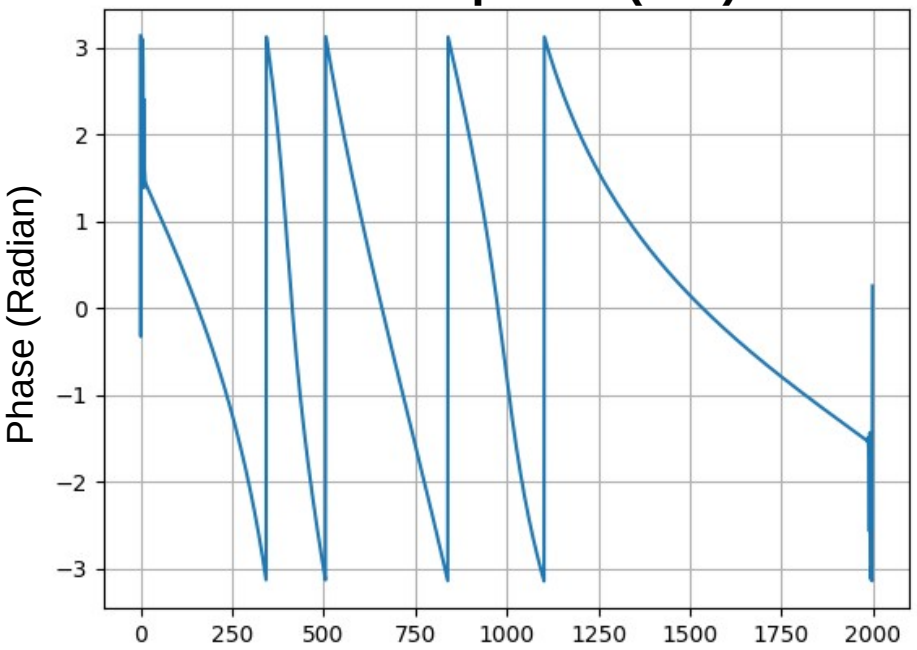
Butterworth (of IIR Type)



FIR (Blackman Window)



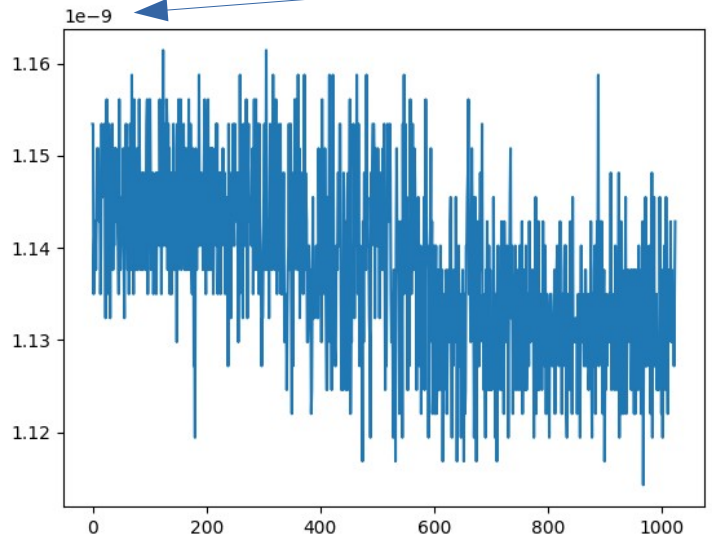
Phase Response (BW)



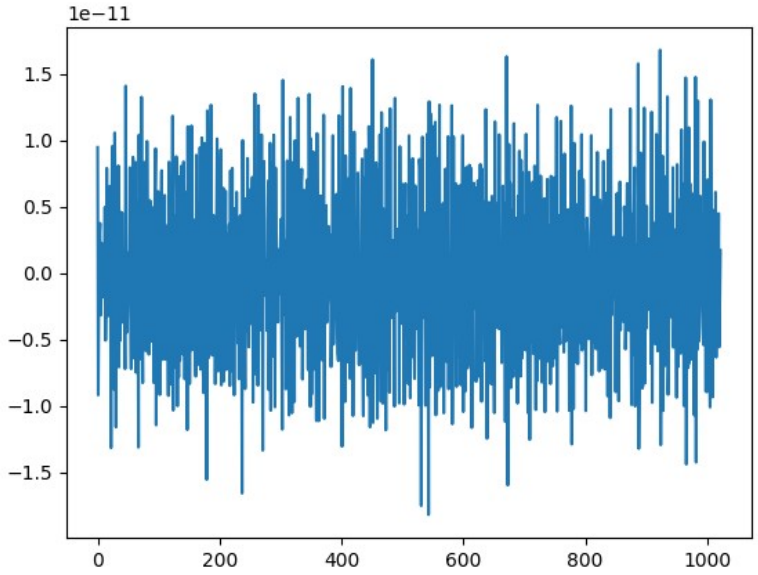
“The Blackman window is a taper formed by using the first three terms of a summation of cosines. It was designed to have close to the minimal leakage possible. It is close to optimal, only slightly worse than a Kaiser window.”

https://numpy.org/doc/stable/reference/generated/numpy.blackman.html
https://notebook.community/pxcandeias/py-notebooks/scipy_signal_windows_demonstration
https://notebook.community/pxcandeias/py-notebooks/scipy_signal_windows_demonstration
https://stackoverflow.com/questions/12093594/how-to-implement-band-pass-butterworth-filter-with-scipy-signal-butter

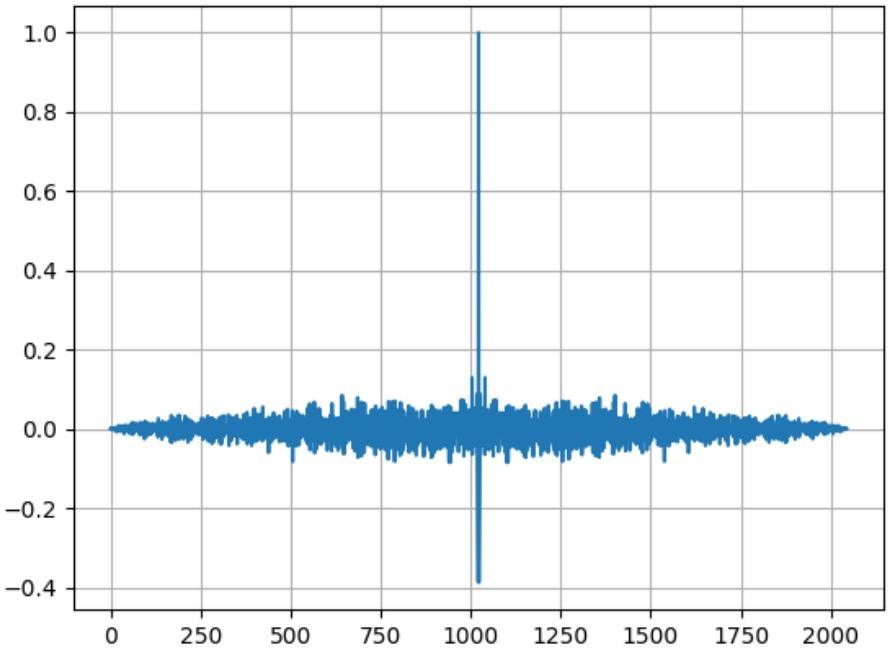
DC Component is removed



HEPCAT Data – 4GHz (Aaronia SA)
Unfiltered



Filtered data using FIR (Blackman Window)

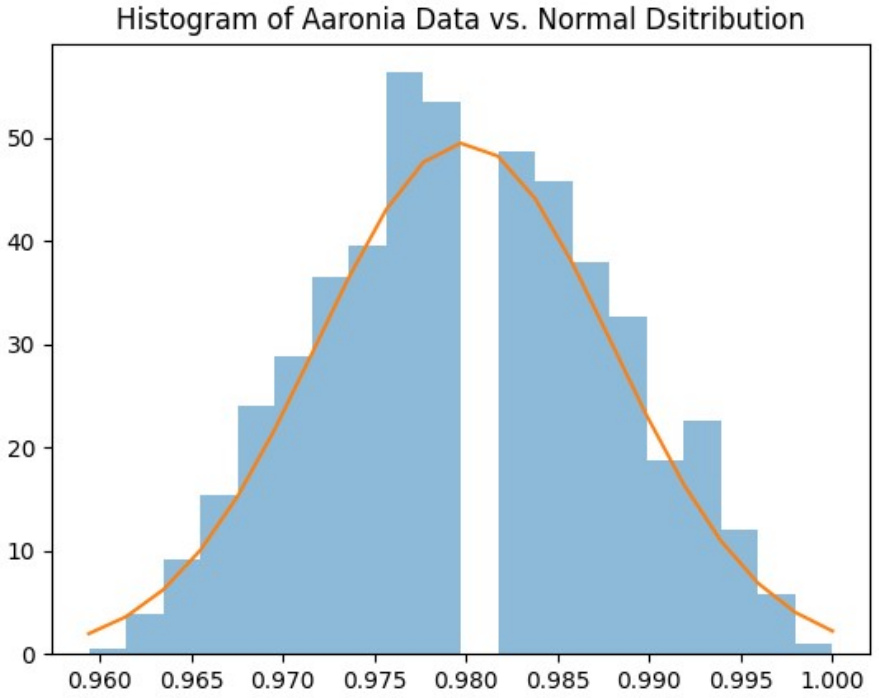


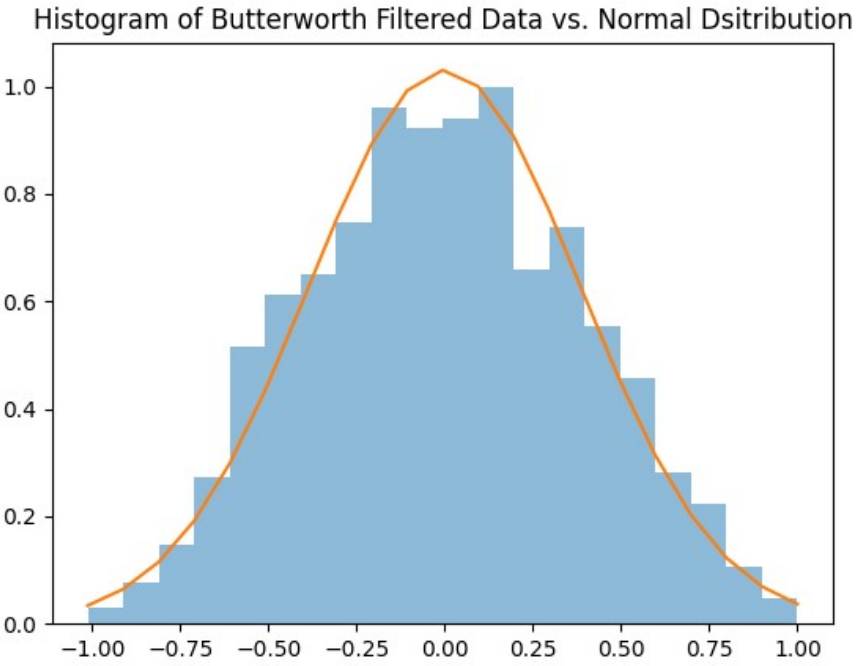
Mean of the norm of Auto Correlation 5.6E-13

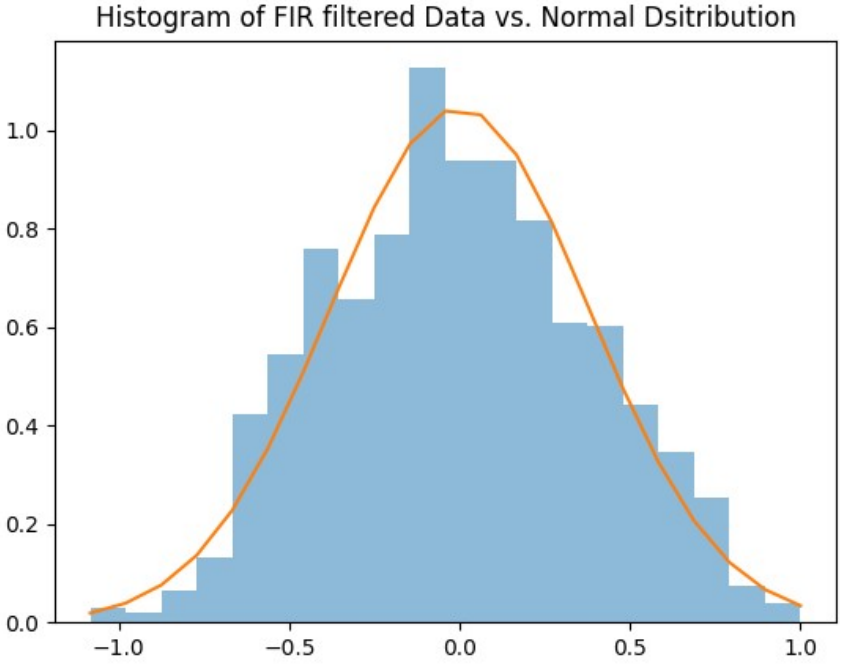
200 Times smaller than A.C. of Butterworth

firf2.py

Histogram of Unfiltered Normalised Data

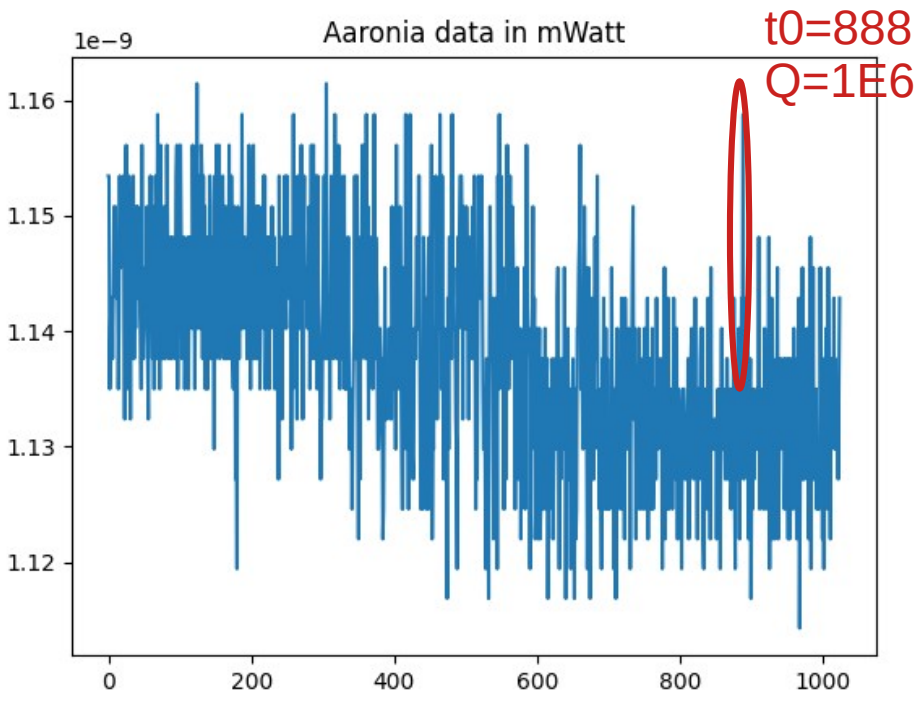


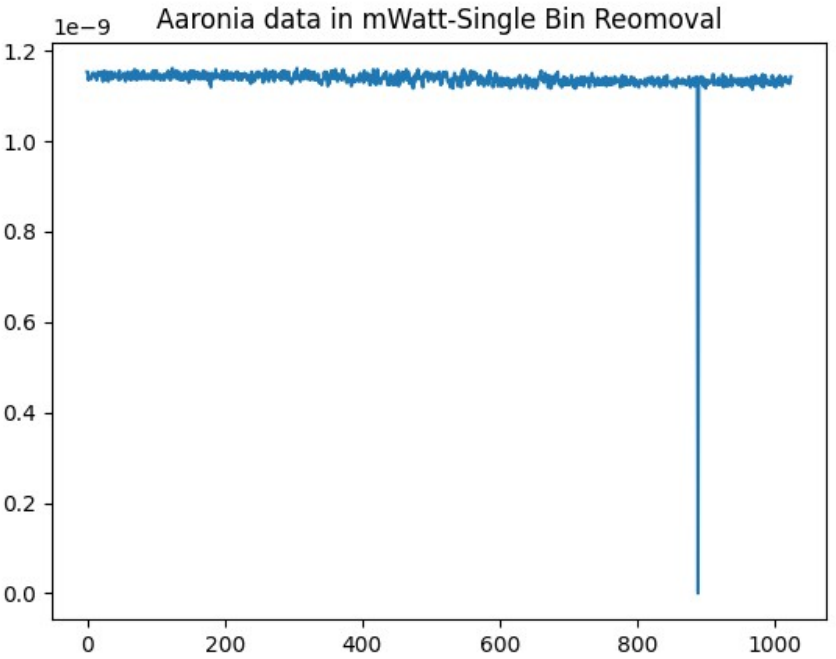


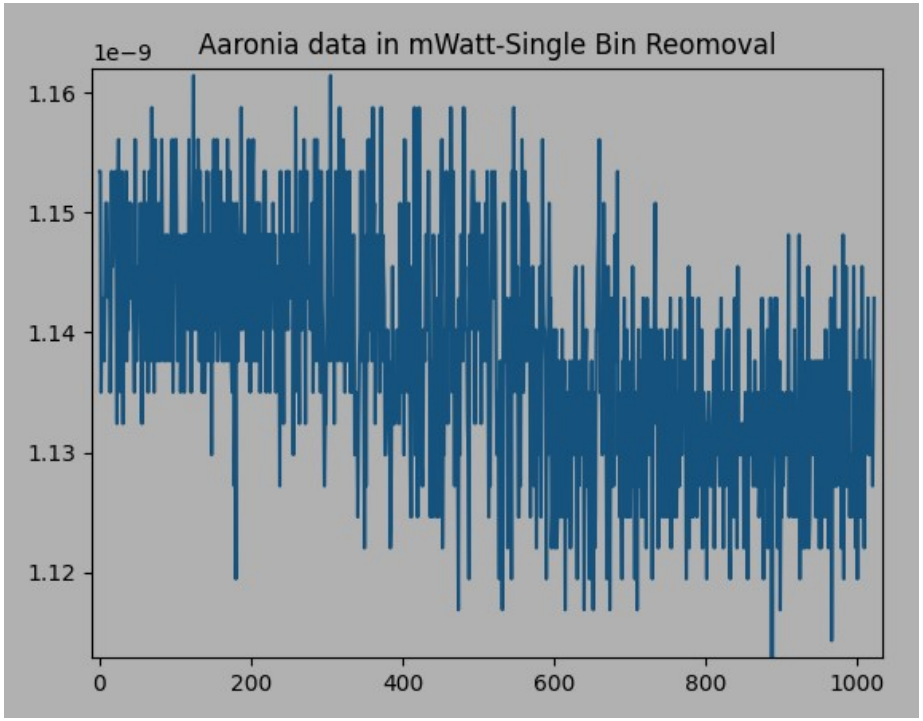


psd4, psd41,psd42.py

Notch Filter for Spurs Removal







Data after single-bin removal

Notch0.py

- **References [Further Work]:**

  https://docs.scipy.org/doc/scipy/reference/generated/scipy.signal.iirnotch.html

  https://docs.scipy.org/doc/scipy/reference/generated/scipy.signal.ellip.html