Week 7 - Week commencing 14/3/2022

Week Outline

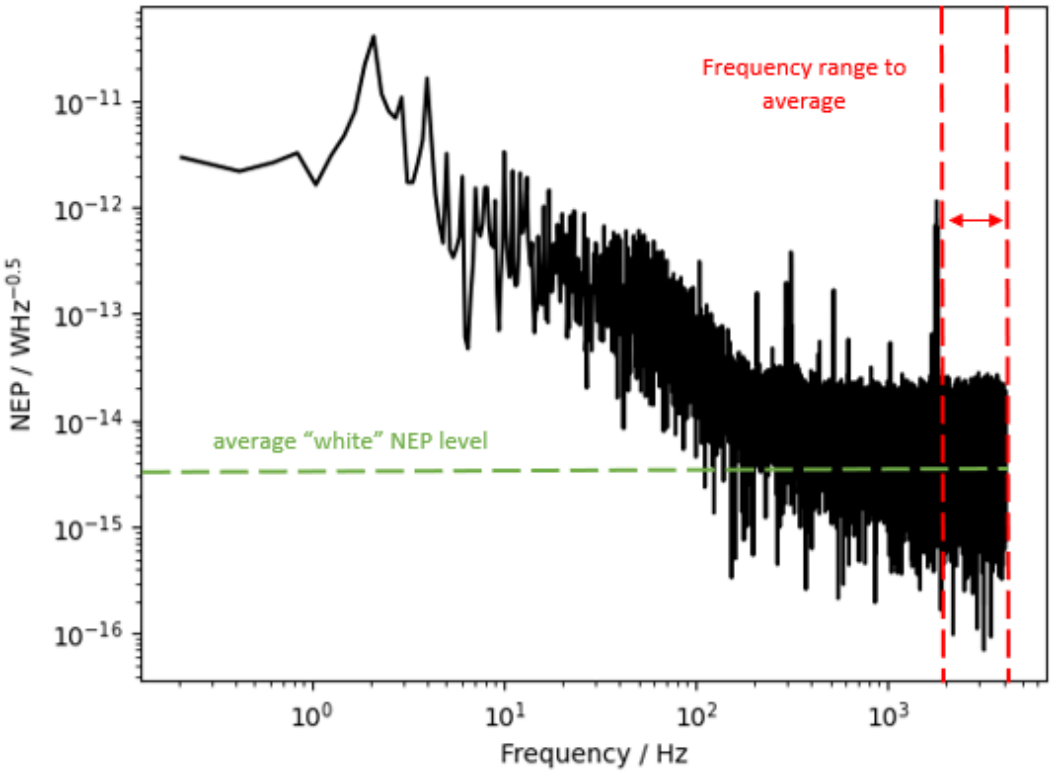
Online meeting discussing the next steps of the project. To recap, the aims of this project is to look at the SFAB detector array and characterize it in terms of its detector properties. The detector properties that we have calculated so far is the response, noise spectral density and the NEP. However, we want to do this for the whole array. This week focuses on obtaining a distribution of NEPs for the whole array

Task Outline

- Find the responsivity of the whole KID array
- Use the responsivity to find the NEP
- Find average "white" NEP for all KIDs in the array
- Plot a histogram of the NEPs of the array

Methodology

So, this week focuses on taking the previously found NEP and using it to find the closest approximation of the photon noise limited NEP to compare with the photon noise limit. This is done by taking the average of the NEP over a higher frequency range:



This figure is of KID 2, where the green is the average NEP level with a "white" feature and the red is the frequency range we are averaging over. The reason we do this is because the photon noise limit

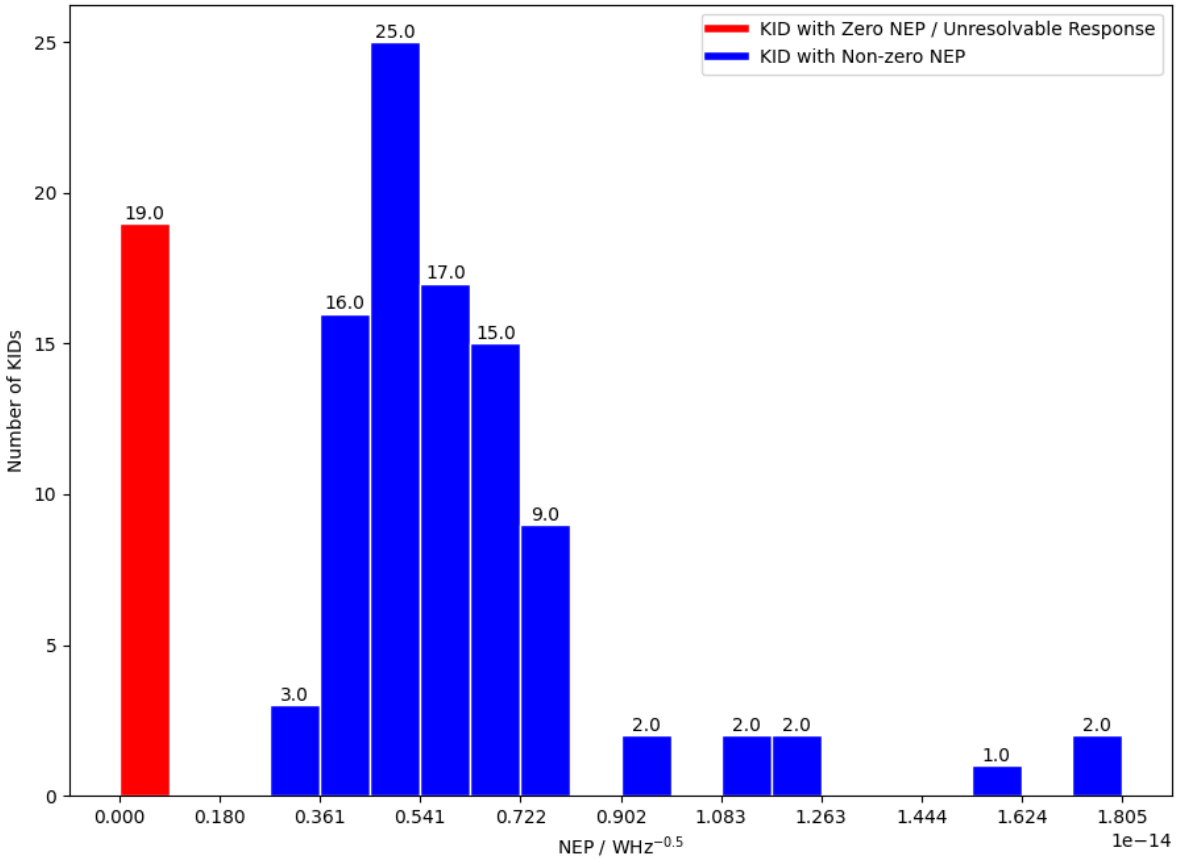
has a “white” feature, meaning it is a constant spectral density over all frequencies. This averaging allows us to find that same feature. This gave an average NEP of:

$$NEP_{ave} = 2.50 \times 10^{-15}\, WHz^{-0.5}$$

This was for KID 2. The responsivity of all KIDs can be found and the same procedures for finding the average NEP can be done. Once all the NEPs are found, a histogram can be plotted of the distribution of NEPs of the array.

PYTHON CODE AT END OF DIARY

Histogram Plot



The histogram plot was created. The red bars denote the KIDs that had responsivities that could not be found. Essentially, their hot bar peaks of dF0 was masked by the excess noise of the system. This could be due to interference, but there is no concrete evidence of this.