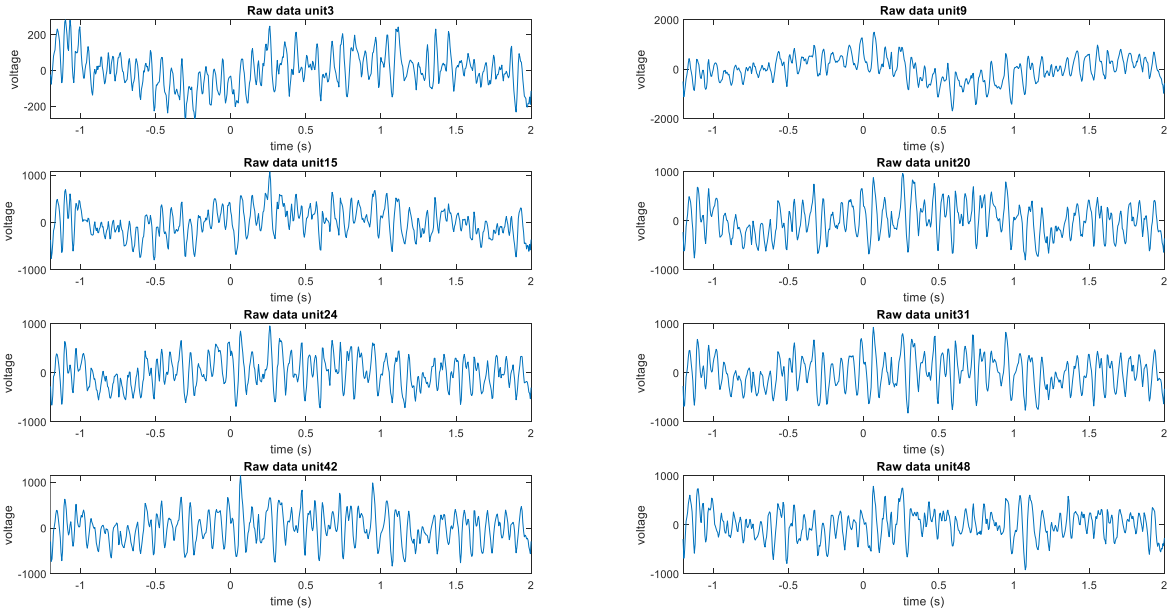
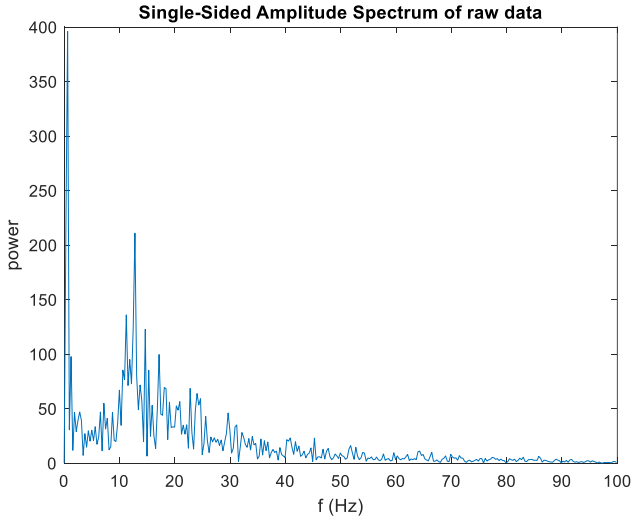
LFP analysis

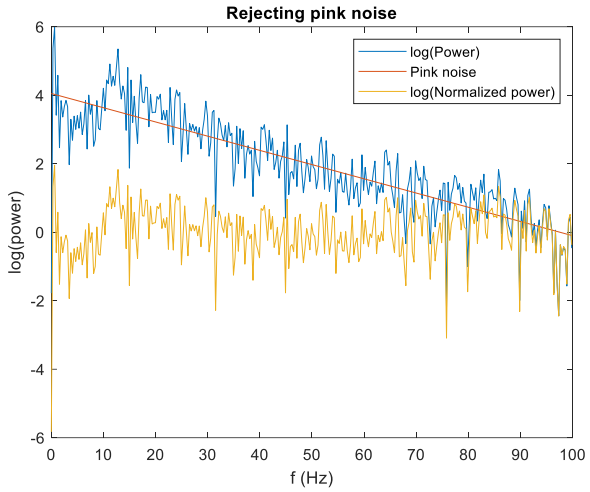
a) At first let's take a look to the voltage of different units through time:



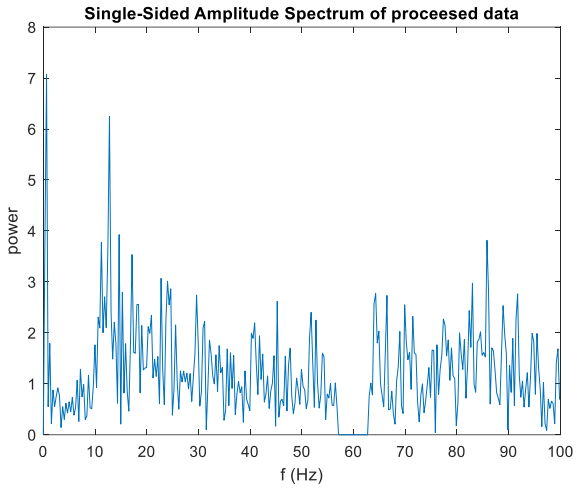
Now we will show the steps of preprocessing the data in frequency domain:



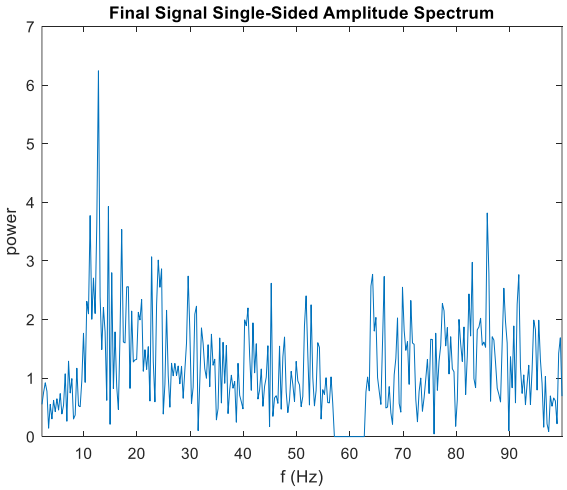
After reaching the spectrum we reject the pink noise:



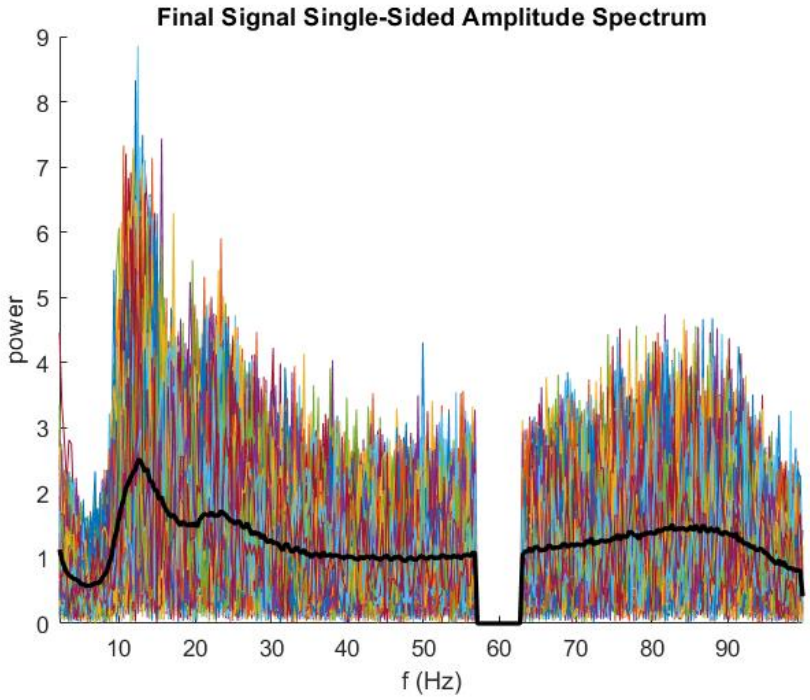
Then we reject the utility frequency from the spectrum:



To avoid the values, remain from the DC amount of data and also low frequency fluctuations it would be better to start plotting from frequencies greater than 2Hz:

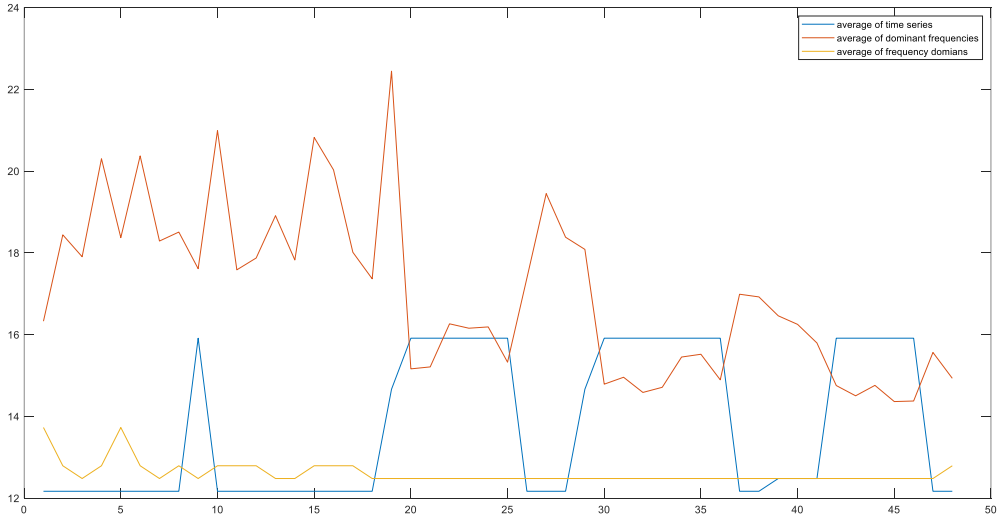


Now let's find the dominant frequency of each unit:

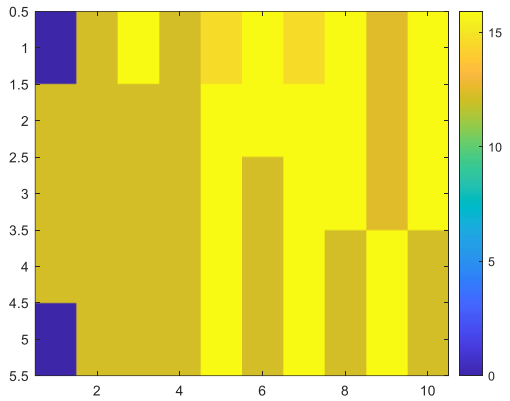


the black line indicates the average spectrum and the colored lines are all trials of a random unit.

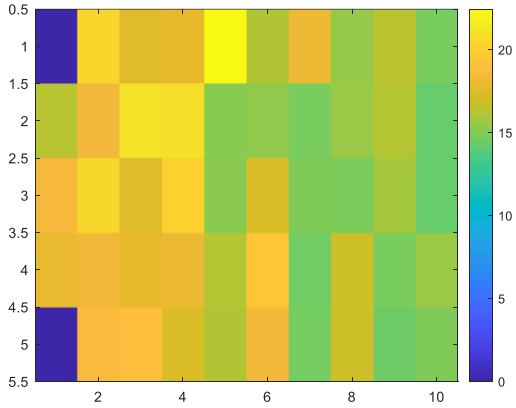
The dominant frequency for all units:



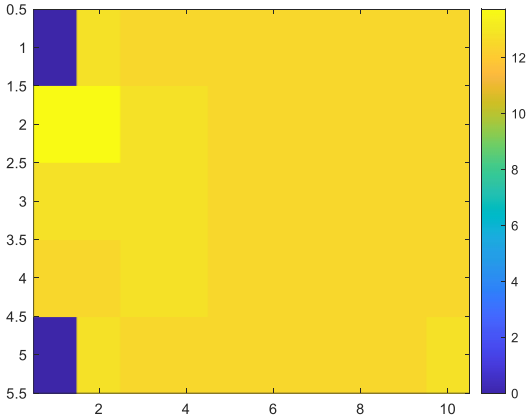
b) In this part we try to find the topography of the dominant frequency:
In the first figure we try to plot the contour and find the dominant frequencies by calculating the **time domain trials' average and reach the max frequency** from that amount:



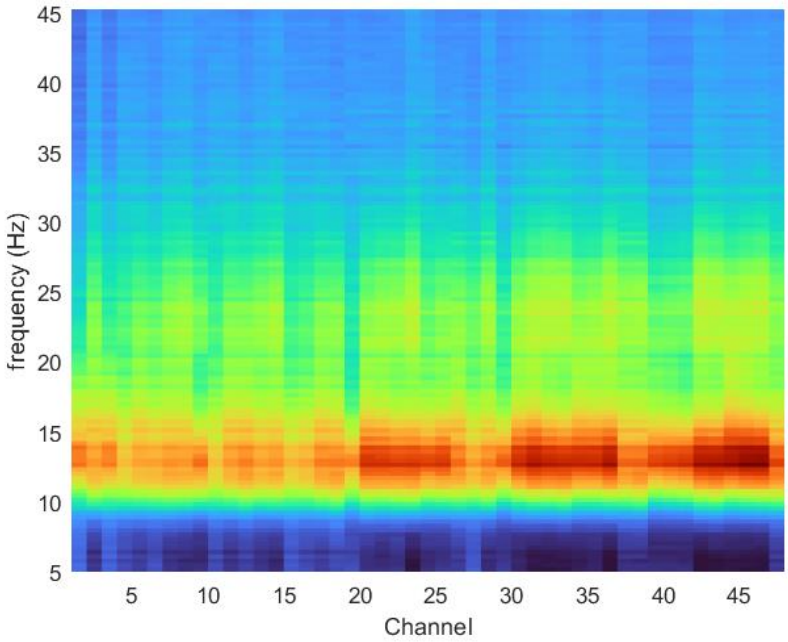
In the second figure we find out the values by **averaging the dominant frequency through all trials**:



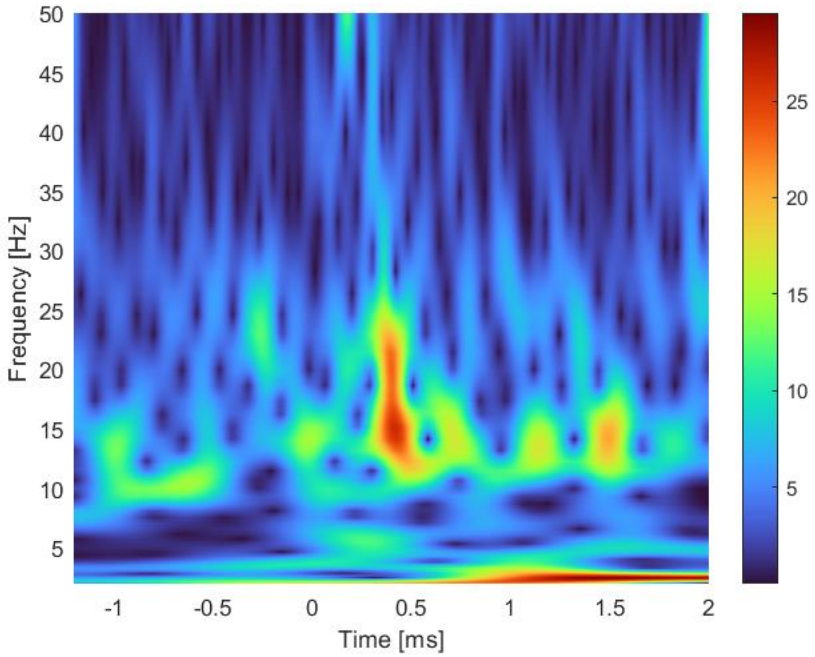
In the third figure we investigate the dominant frequency from the **average of frequency domain signals of all trials**:



c) At first we try to plot the channels frequency domain signals (consider that the signals are filtered and the dc parts are omitted)



Now let's plot frequency through time plot:



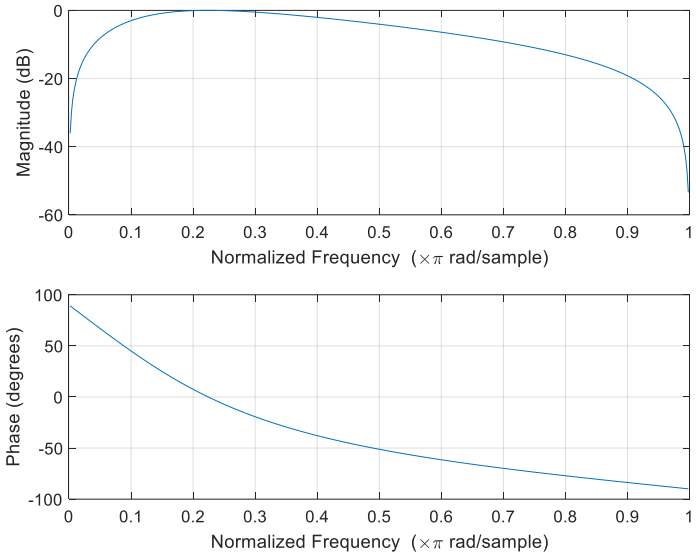
Raw data:

d) As it is shown in plots before the strongest band after filtering data is beta band (between 12-30 Hz).

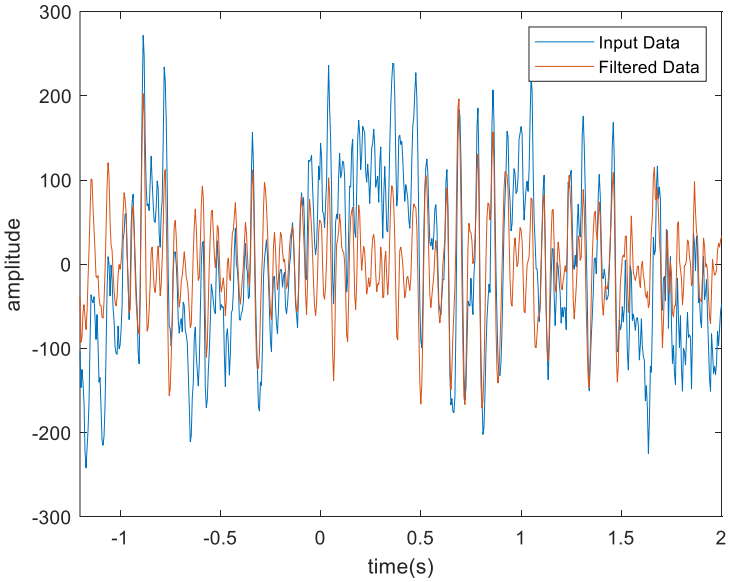
Phase propagation (Traveling waves)

a) In this section we first show how the butter worth filter applies to the data, indicating the effect on a random trial of a random unit:

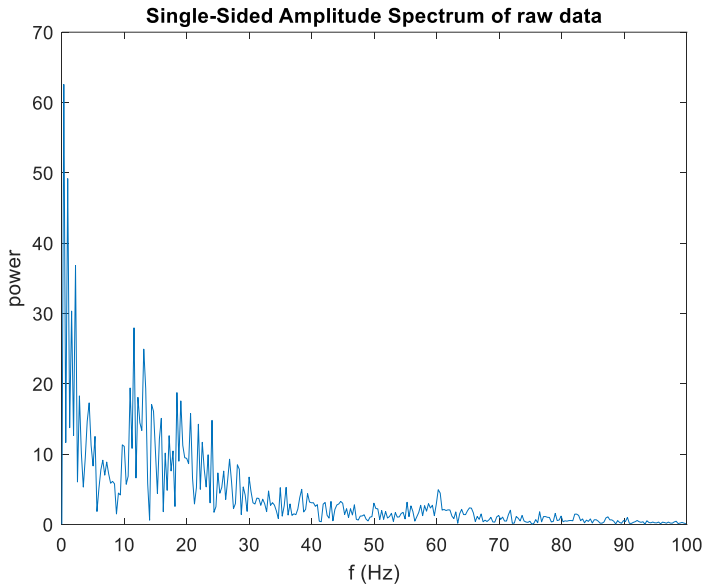
The filter:



The data:



The Fourier transform of original data:



The Fourier transform of filtered data: