In The Name Of God

HW04

Advanced Neuroscience

MohammadAmin Alamalhoda

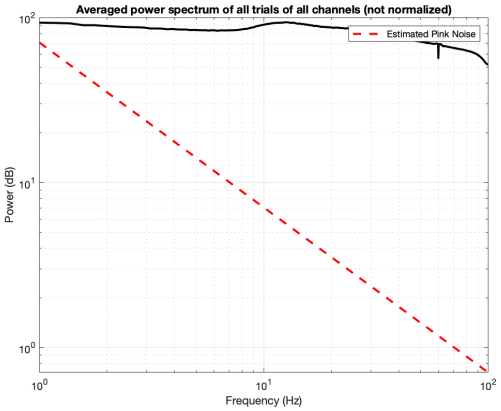
97102099

■ LFP analysis

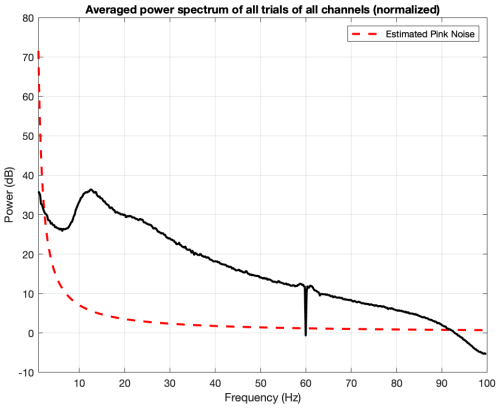
□ Part a - Removing Pink Noise

Pink Noise

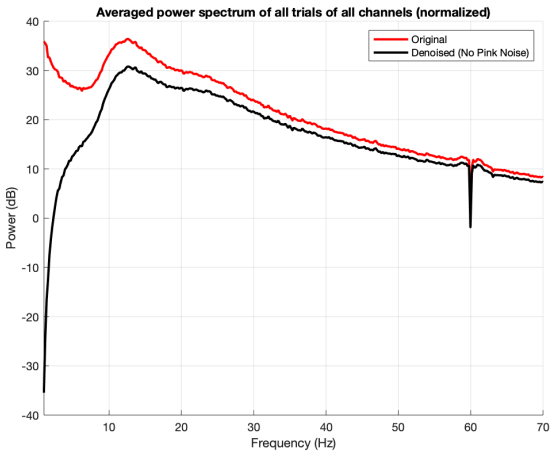
Pink noise or $\frac{1}{f}$ noise is a signal or process with a frequency spectrum such that the power spectral density (power per frequency interval) is inversely proportional to the frequency of the signal. In pink noise, each octave interval (halving or doubling in frequency) carries an equal amount of noise energy. In order to removing pink noise, I fitted a line with slope equal to -1 to log-log FFT of the signal and then subtracted this line from the FFT. You can see the fitted line and original and denoised power spectrums of the signal in the figure 1.



(a) Averaged Power Spectrum (Log-Log)



(b) Averaged Power Spectrum



(c) Original and Denoised Power Spectrum

Figure 1: Pink noise, Original Power Spectrum, and Denoised Power Spectrum

As can be seen in the Figure 1, dominant frequency is in the $10 - 15$Hz frequency band.

□ Part b - Dominant Frequency

In order to cluster the electrodes based on their dominant frequency, I calculated FFT of each trial of channels and then plotted the average power spectrum of trials of each channel in Figure 2.

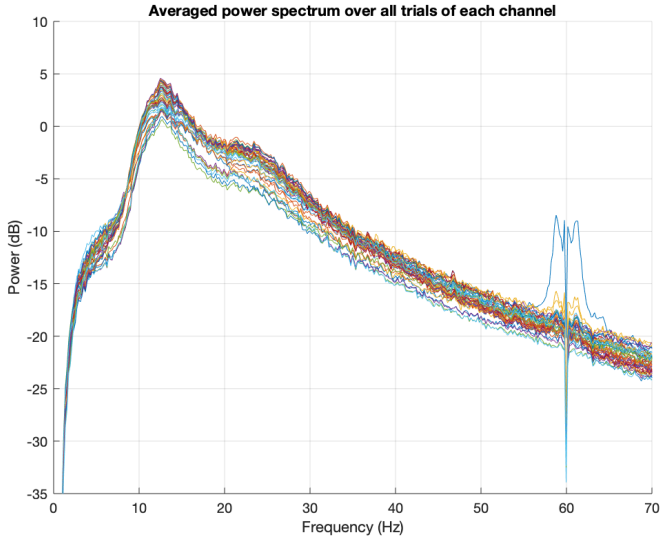


Figure 2: Average Power Spectrum of each Channel

As can be seen in the Figure 2, dominant frequency of all the channels is between $10 - 15$Hz.

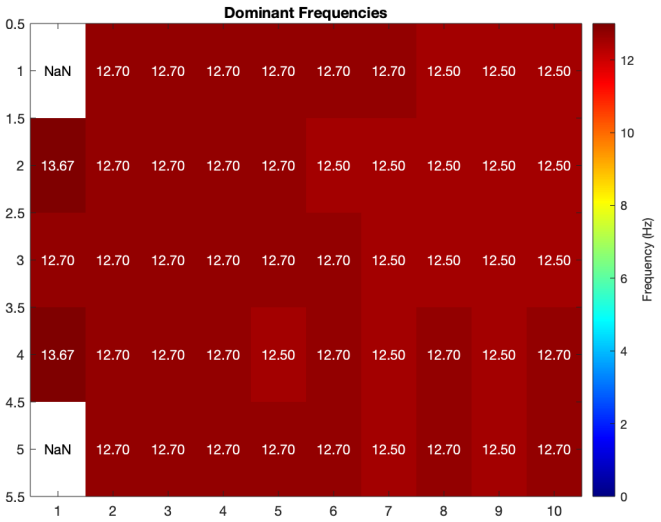


Figure 3: Dominant Frequency of each Channel

As mentioned in the last part, dominant frequency of all of the channels is about 12.5Hz which is in $10 - 15$Hz frequency band.

□ Part c - Time-Frequency Analysis