PhD Module
Electronic Noise: Theory and Practice

Assignment 2
March 25, 2021

Filtered noise - hands on (in groups)

a) Normalization

Normalize the frequency axis and the amplitude axis of the spectral voltage density estimated in assignment 2. Hint: the integral of the spectral voltage density for all frequencies is equal to the signal variance and this can also be estimated using the time sequence.

b) Filtered noise

In the folder "assignment-3-data" there are 32 realization (about 65 k samples each) of a filtered noisy voltage measured with a digital scope. An analog band-pass filter is used with 455 kHz center frequency and about 10 kHz, -3 dB bandwidth. Assuming stationarity and ergodicity perform the following exercises.

1. Can the filtered noise be still approximated by a gaussian process?
2. Estimate the spectral voltage density S(f) expressed in V^2/Hz and the corresponding autocorrelation function R(t). Correctly normalize both the frequency and the amplitude axis.
3. Discuss the results and the methods used to obtain them with a few slides (max. 6 minutes per group).

All the groups will perform the same assignment

Use Matlab, python, Java, Excel or whatever software you want to perform the computations.