



Digital Signal Processing

Major task

Names:

1. Khaled Mohamed	20P9263
2. Ali Hossam	14p1062
3. Mostafa Elhawary	19P9995

Introduction

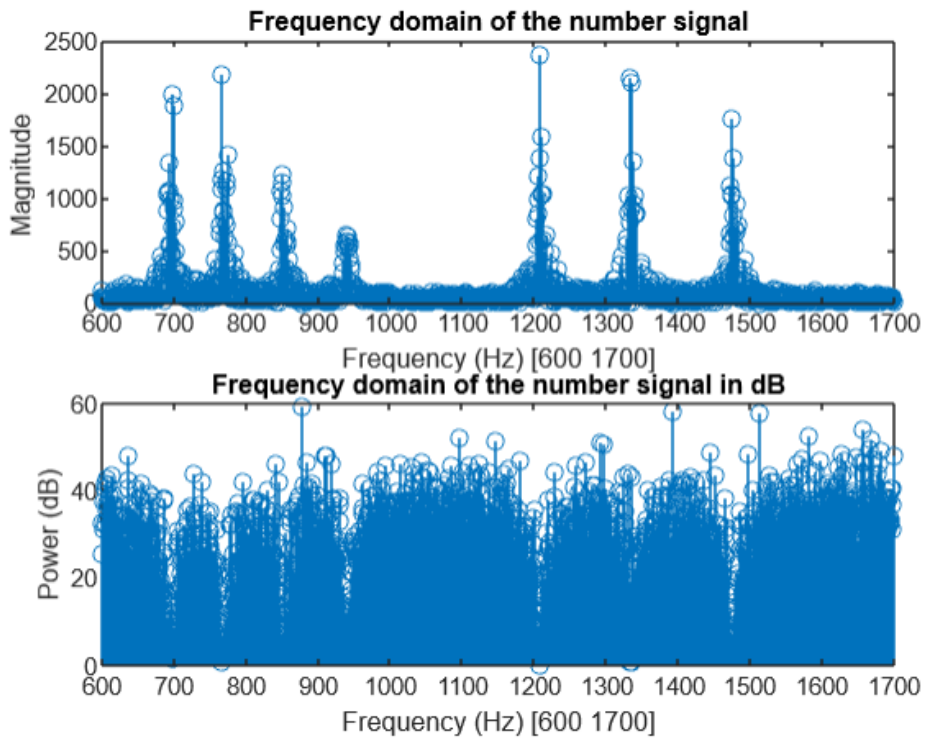
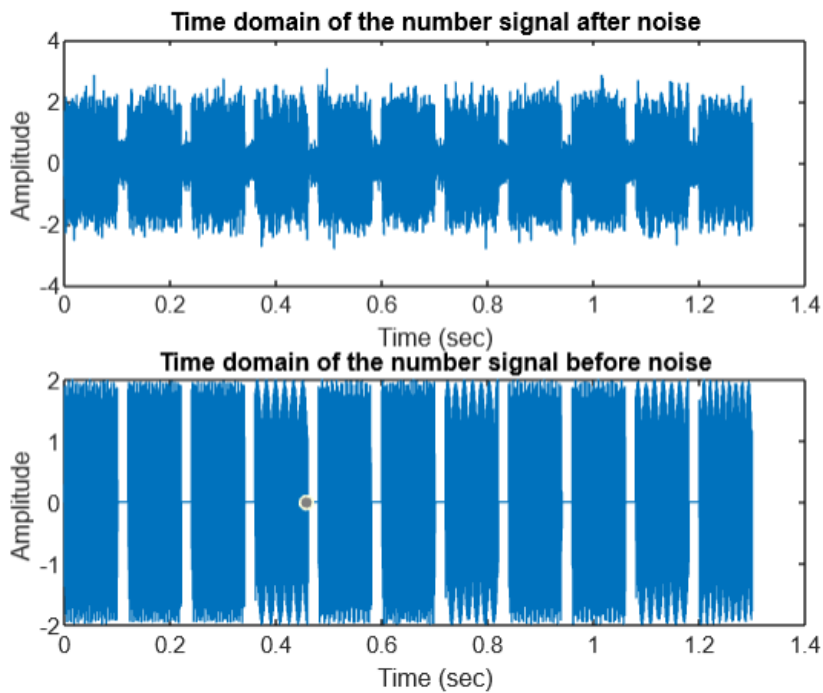
The goertzel function in Matlab computes the DFT at a specified chosen frequency to obtain the frequency response of the signal at precisely the desired frequency without having to compute the DFT for the entire signal. It accepts two inputs of an original time domain signal.

The syntax is `Goertzel(x,k)`, where `x` is the original time domain signal and `k` is a frequency bin index that identifies the desired frequency that we are attempting to analyse. `k` is easily computed by adding the length of the original signal to the product of `f` (the intended signal) divided by `fs` (the sampling frequency).

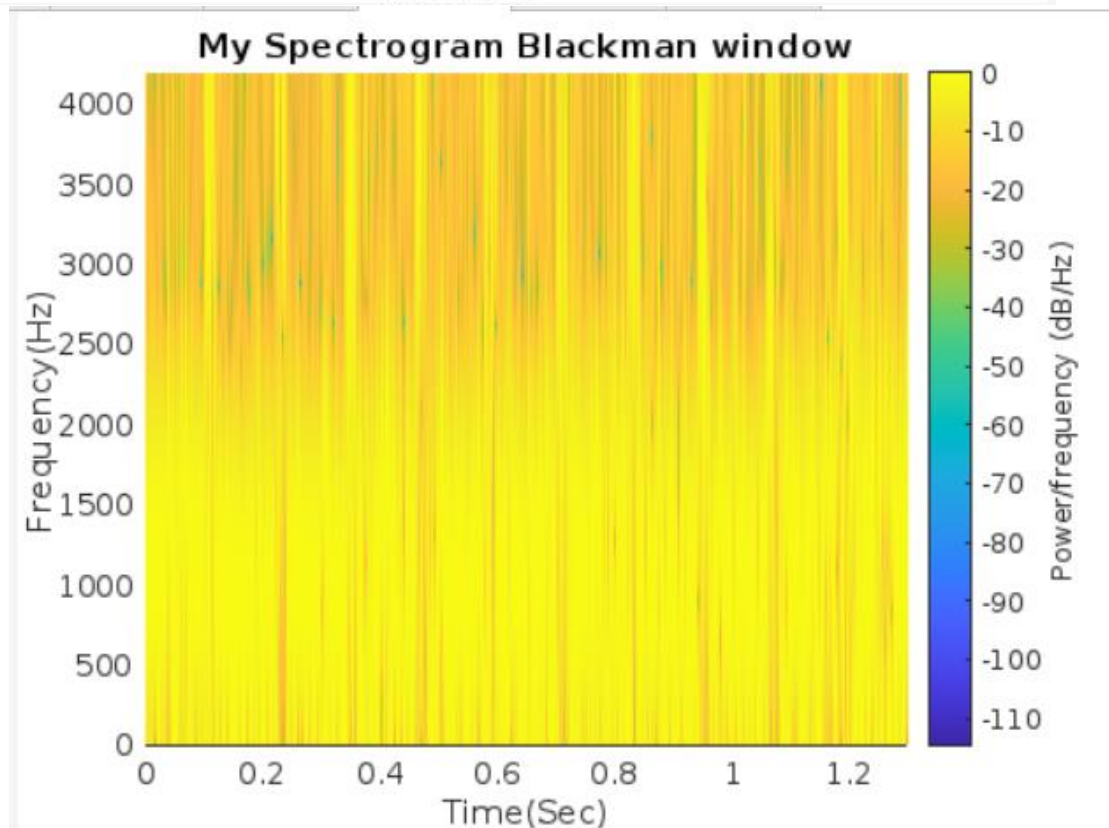
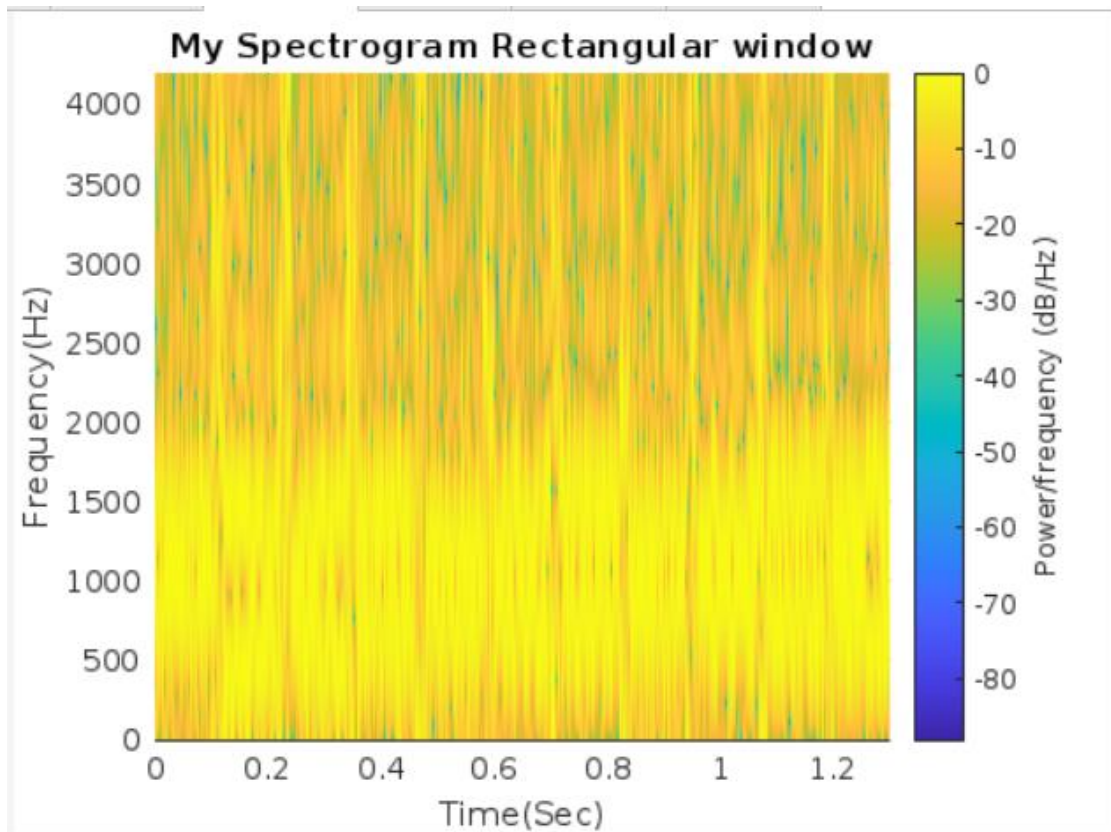
Following that, the output is the size and phase of the frequency response of The signal's frequency response at the precise target frequency is then output together with its magnitude and phase.

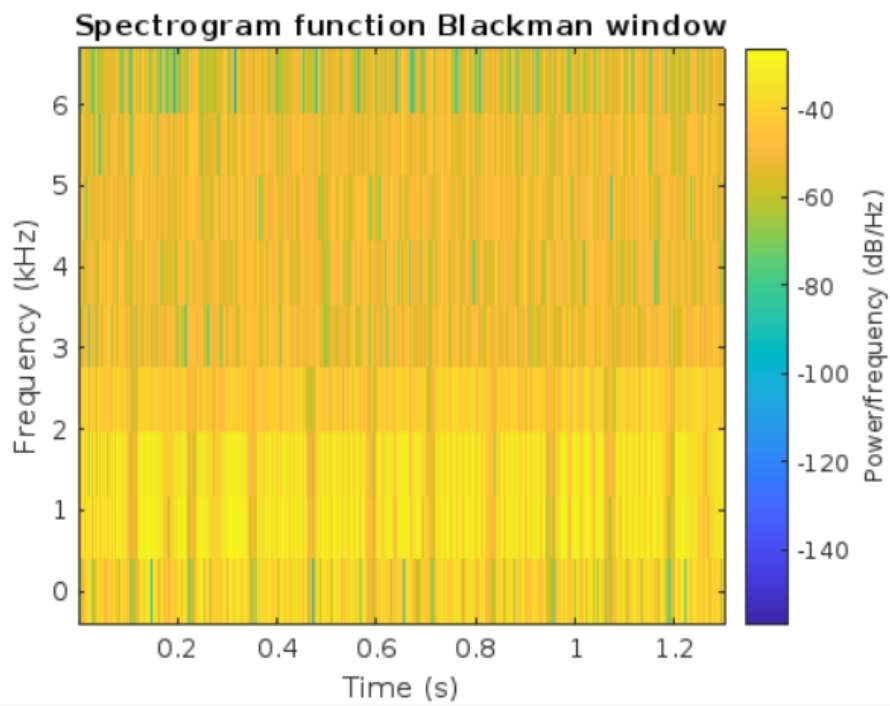
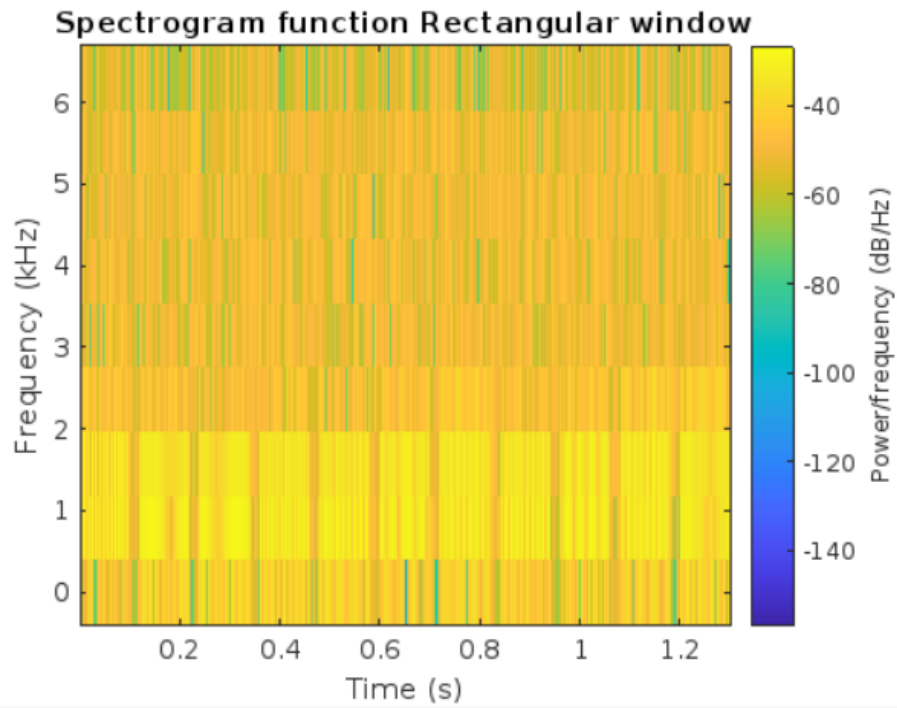
In order to identify which DTMF frequency is present, we use the goertzel function to isolate and analyze one of the two tones from the original signal at eight different DTMF frequencies.

Waveforms and Spectra

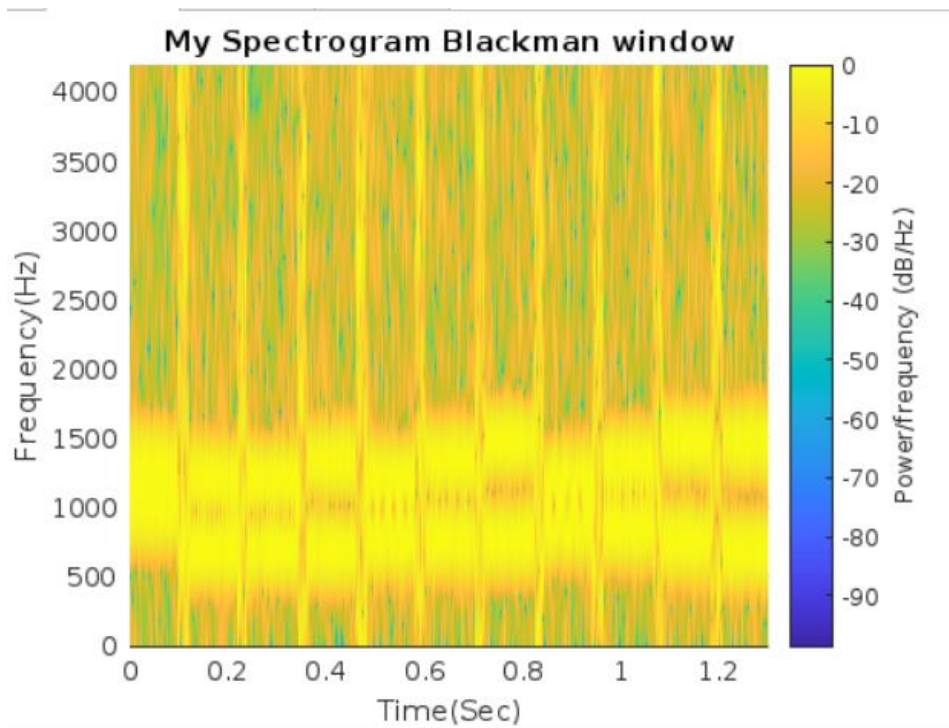
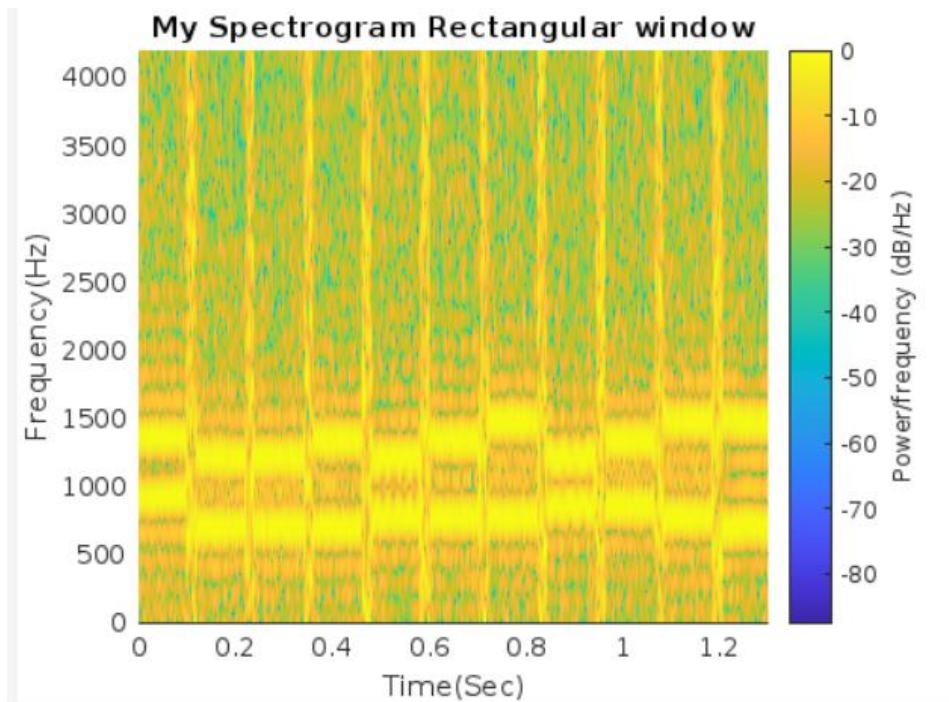


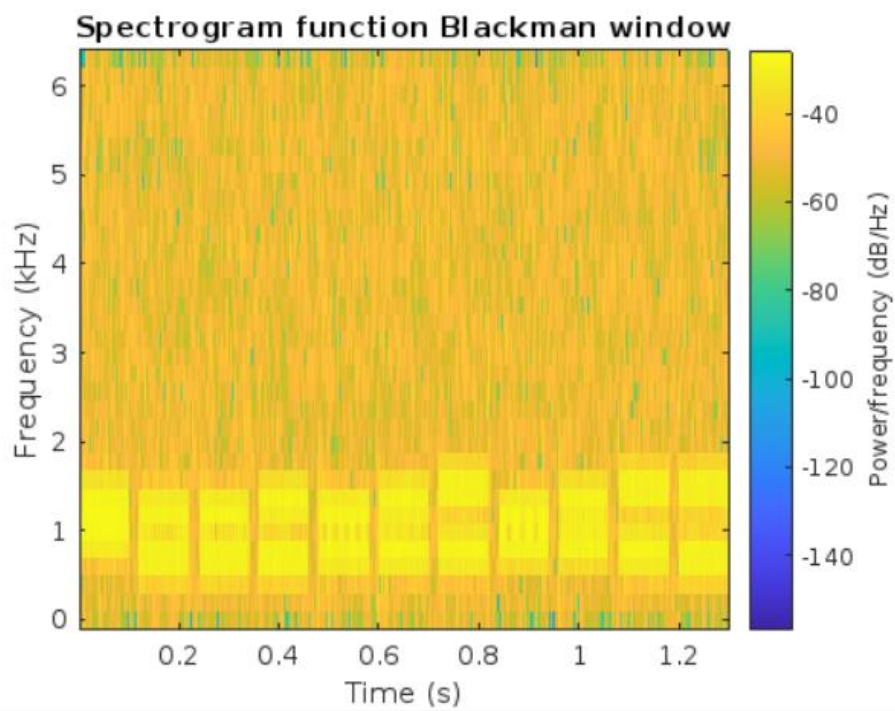
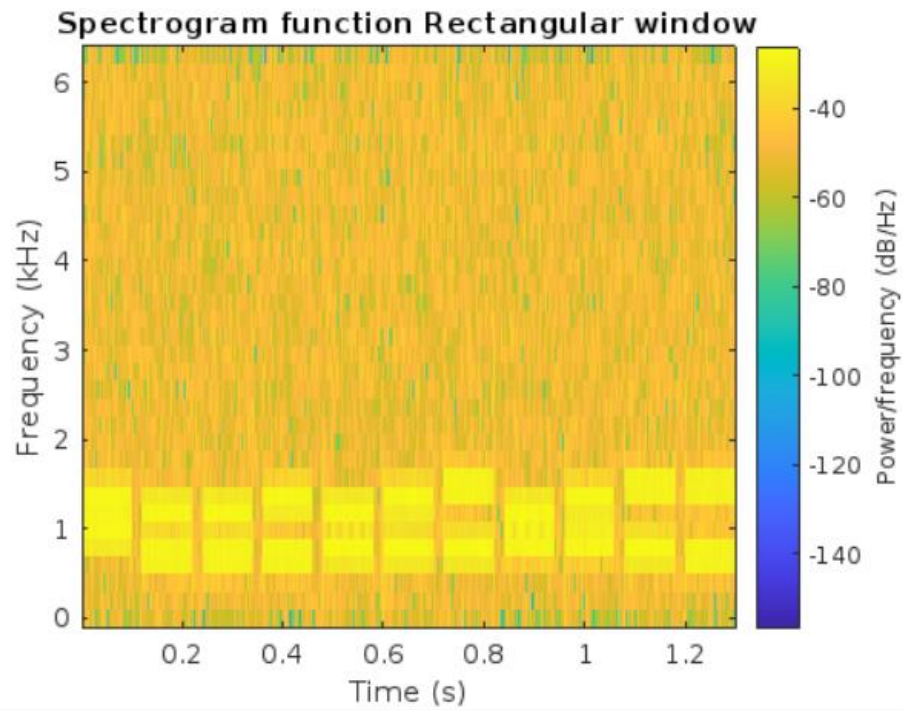
For Window size equal 16



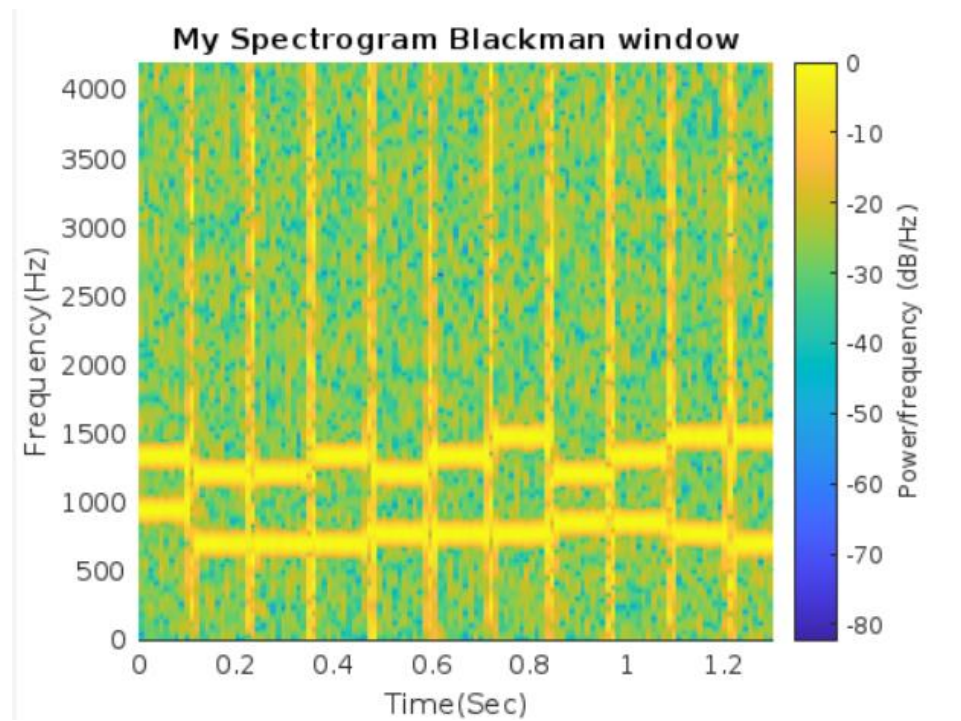
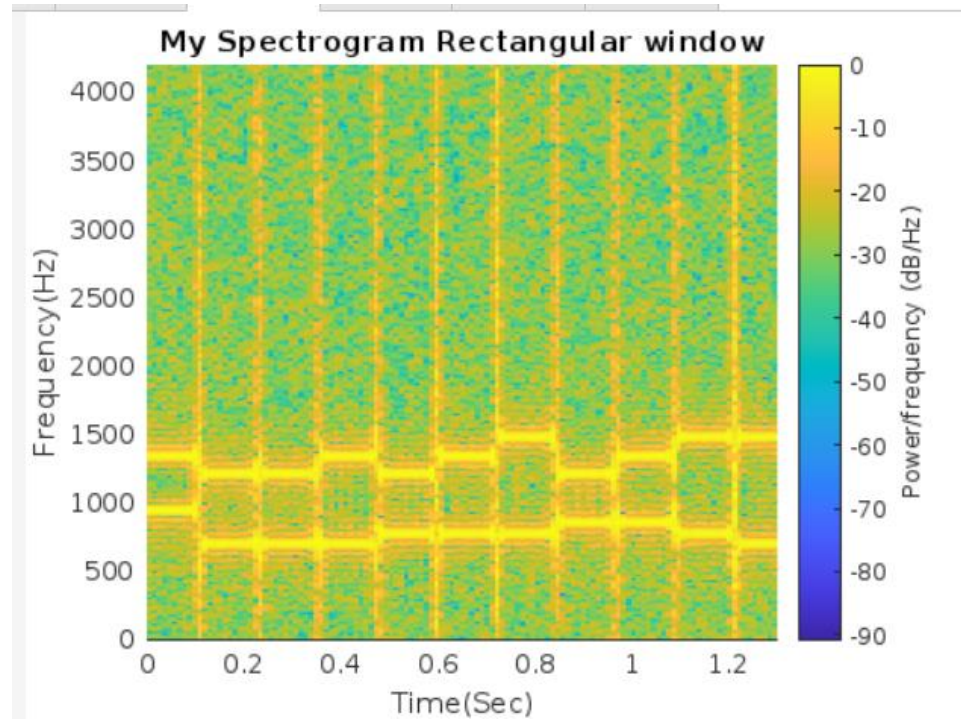


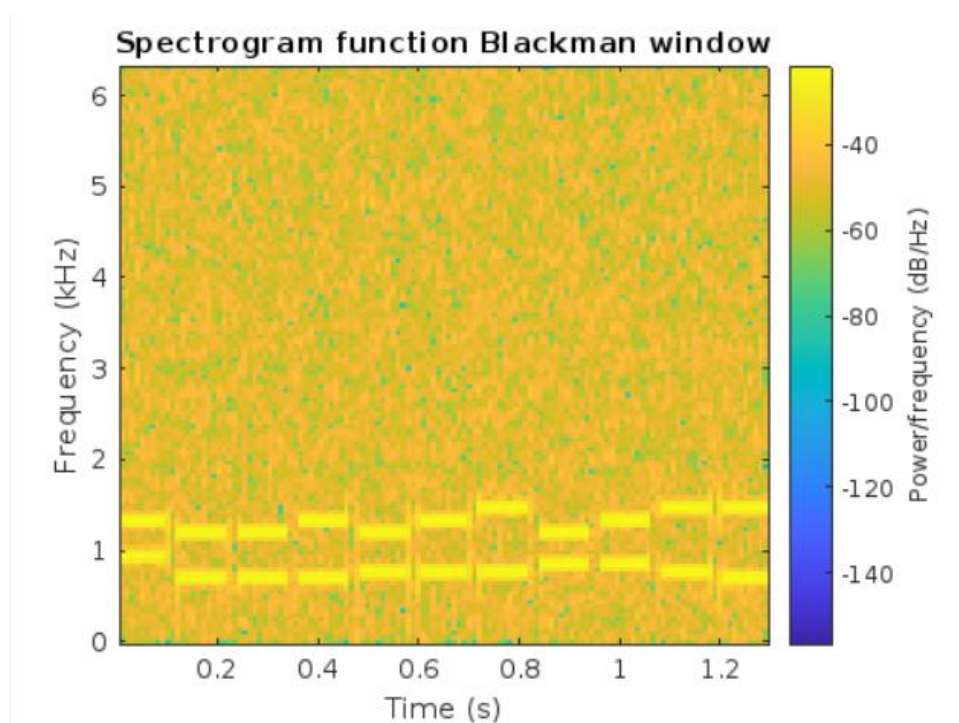
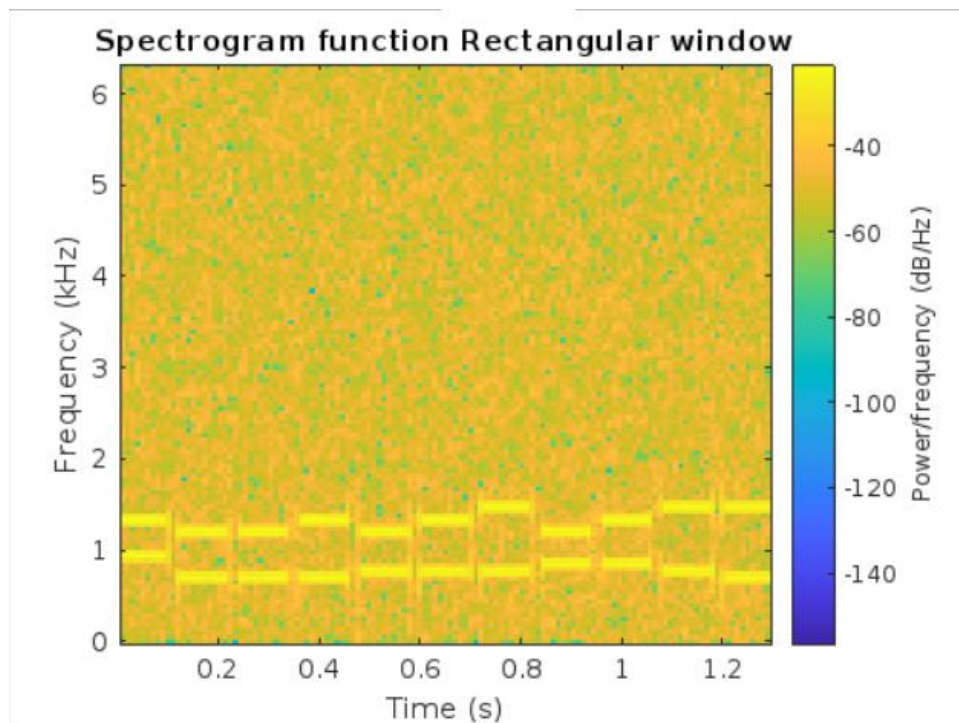
For window size equal 64



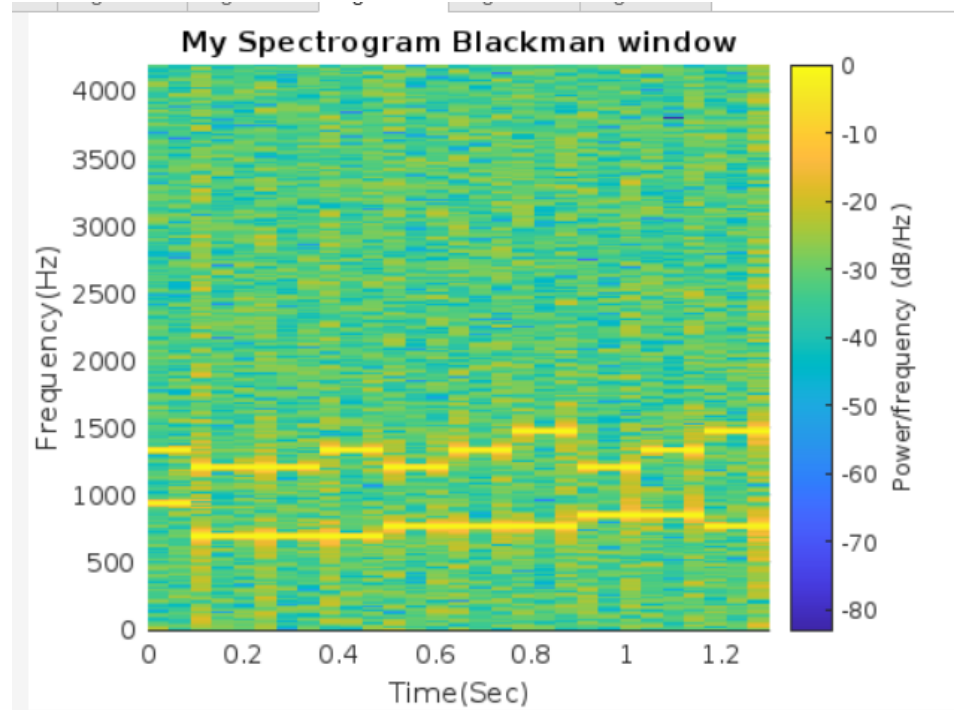
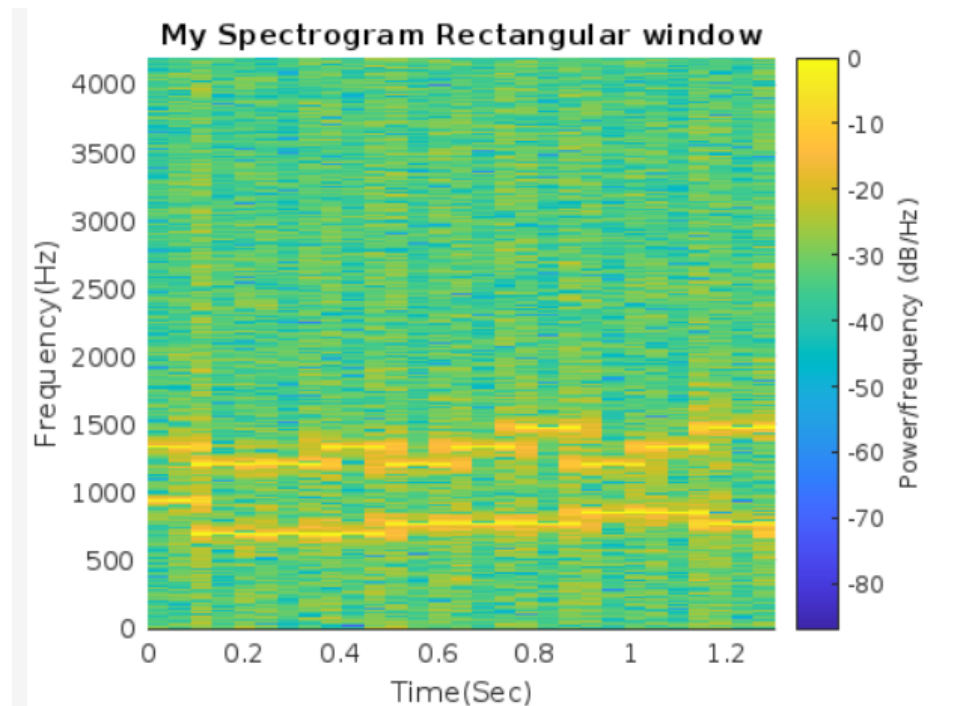


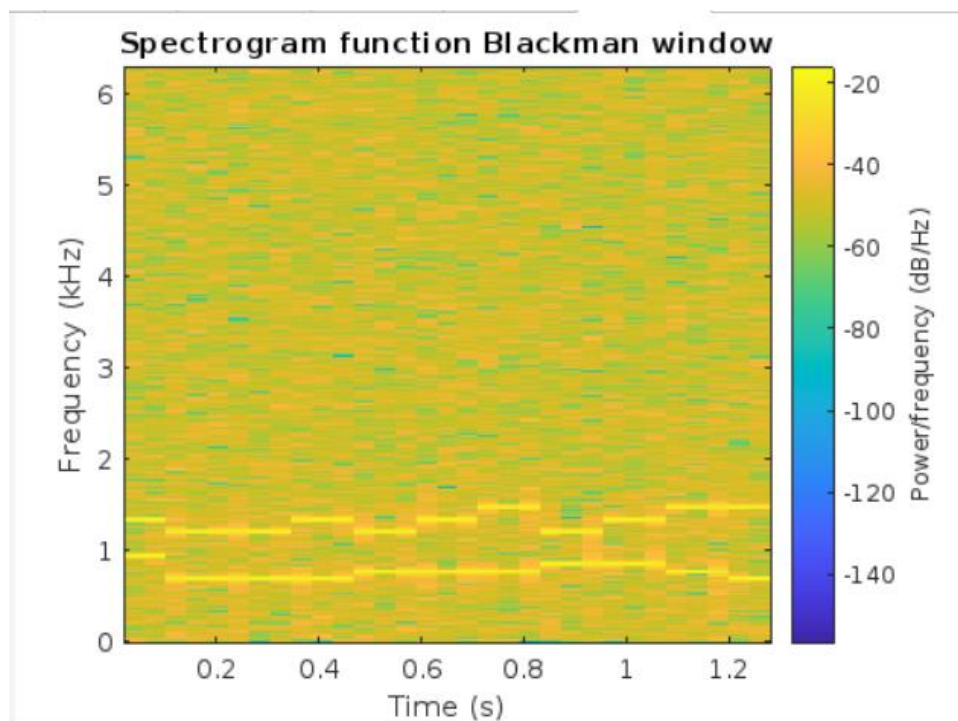
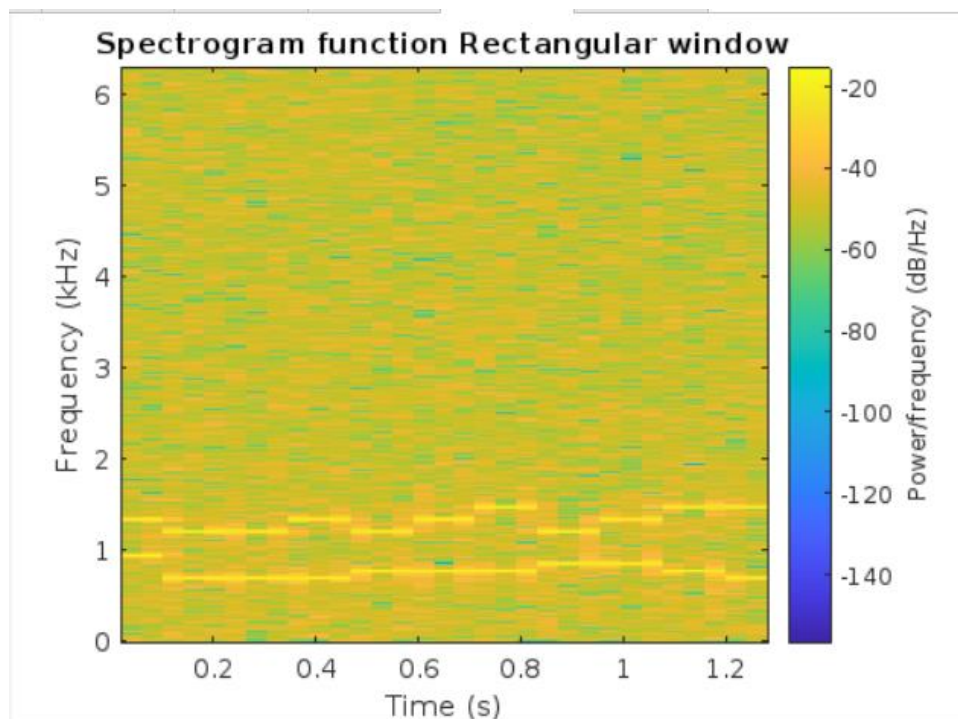
For window size equal 256



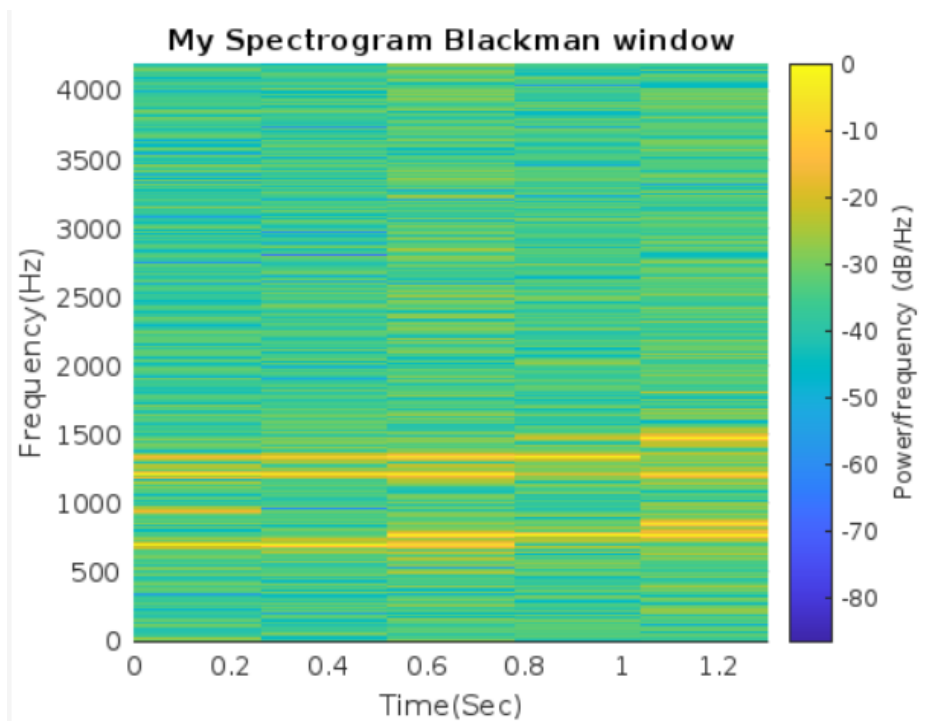
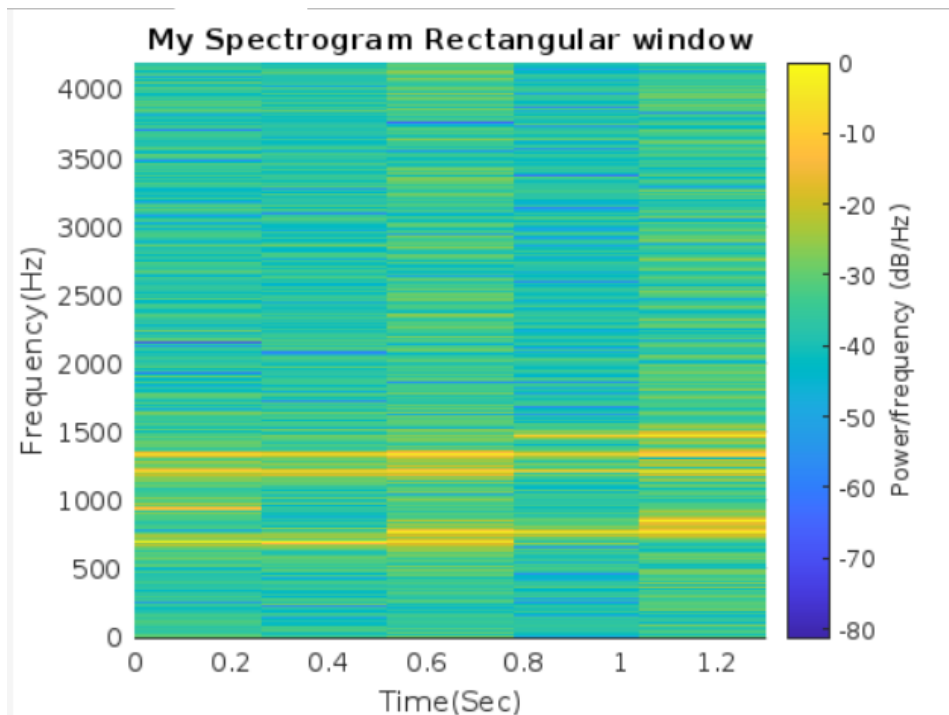


For window size equal 1024

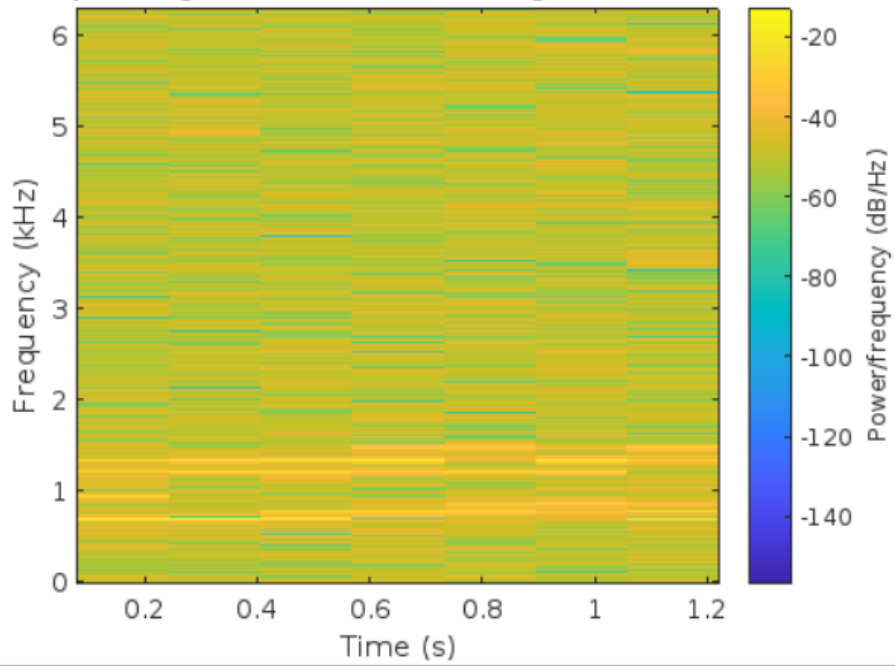




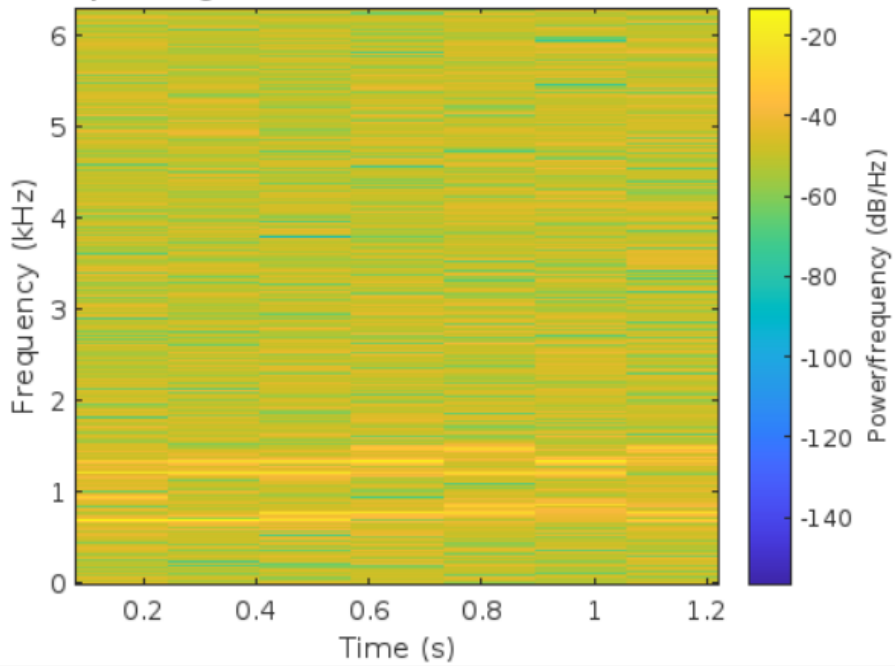
For window size equal 4096



Spectrogram function Rectangular window



Spectrogram function Blackman window



Window size that provides the worst time-domain resolution: 4096

Window size that provides the worst frequency-domain resolution: 16

Window size that provides a kind-of optimal trade-off between time and frequency resolutions: 256

Window type that provides a better frequency resolution: blackman window

Thank you

Submitted to Dr.Michael Ibrahim

20/5/20323