

Projeto Final

DCA0118 - PROCESSAMENTO DIGITAL DE SINAIS - T01 (2021.1 - 35M12)

A equipe



Elton Rafael



Hemerson Rafael



Luís Fernando



João Luiz



Dark loops pack 201



Type: Wave (.wav)

Duration: 01:04:000

Filesize: 10.8 MB

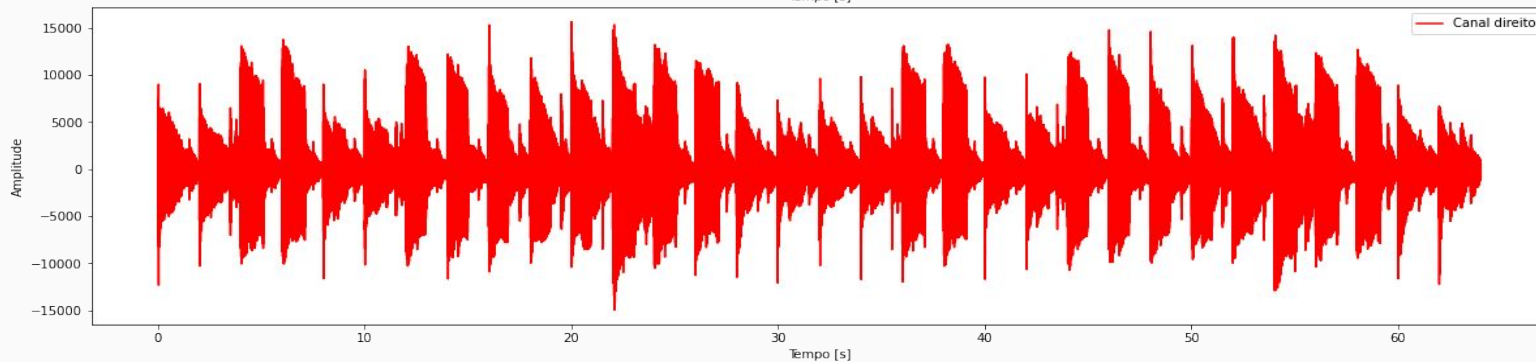
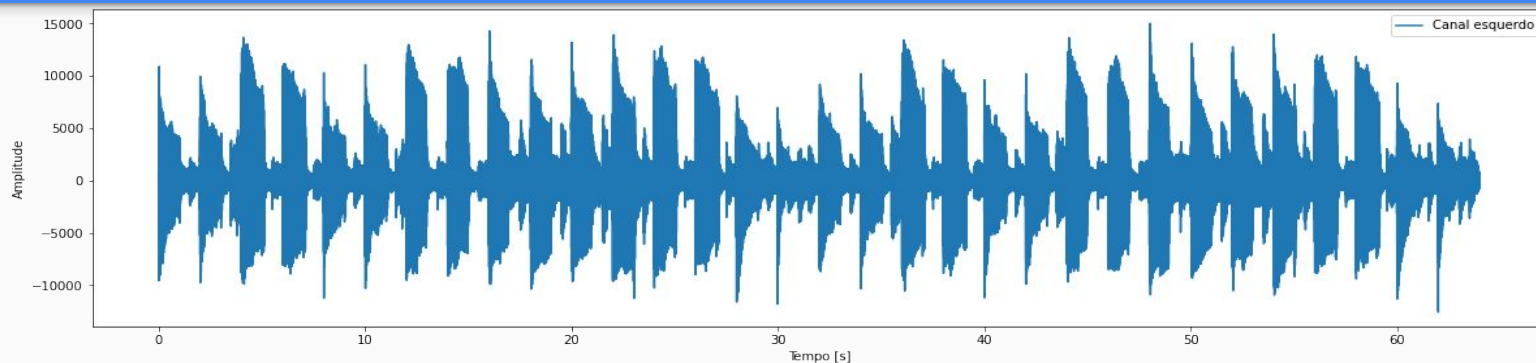
Samplerate: 44100.0 Hz

Bitdepth: 16 bit

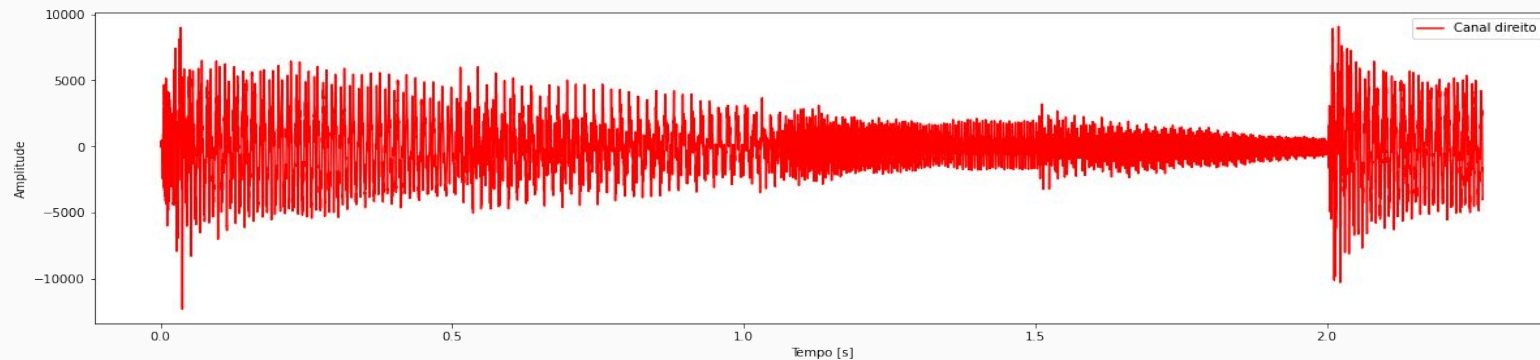
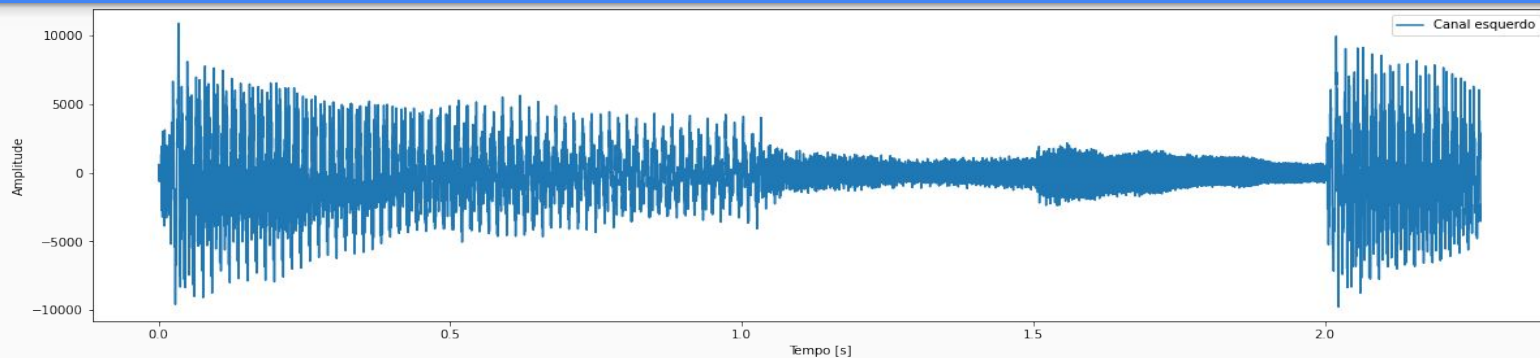
Channels: Stereo



Plote do sinal no domínio do tempo



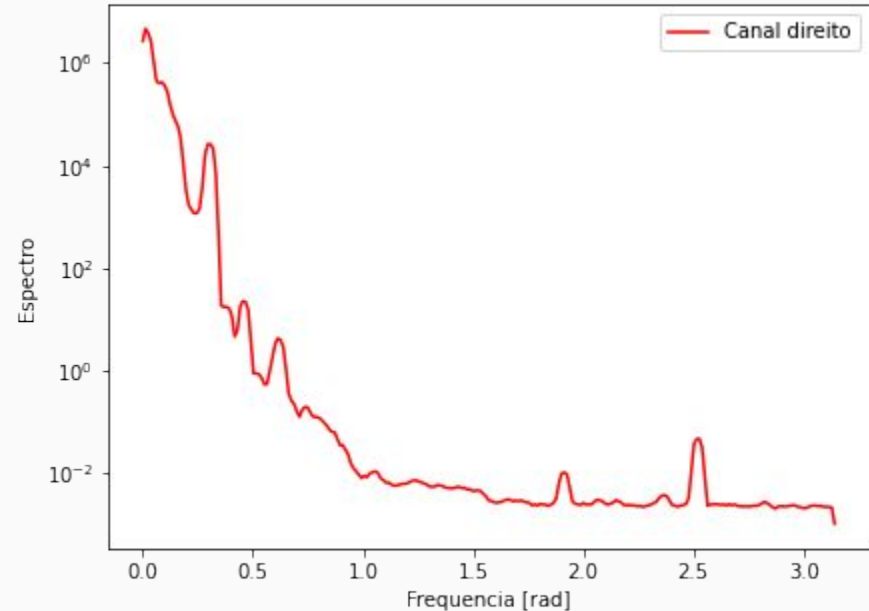
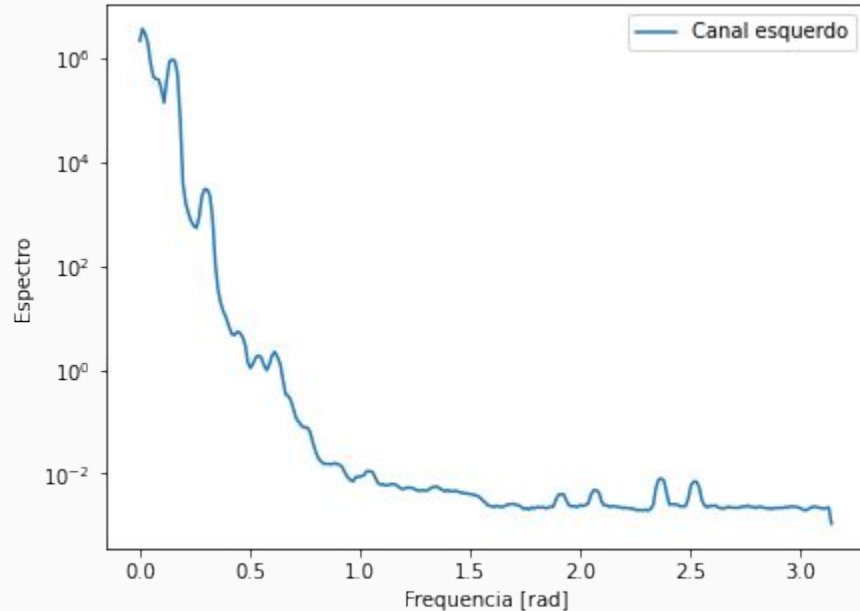
Plote do sinal no domínio do tempo para as primeiras N amostras ($N = 100000$)



Plote do sinal no domínio da frequência para as primeiras N amostras (FFT)

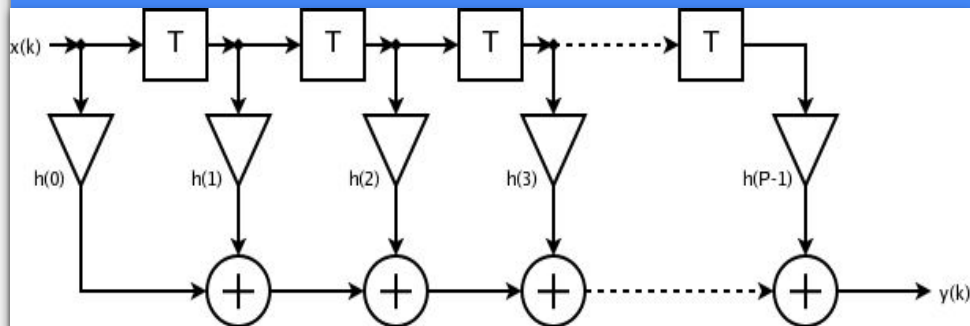


Plote da estimativa de densidade espectral do sinal para as primeiras N amostras (Welch)

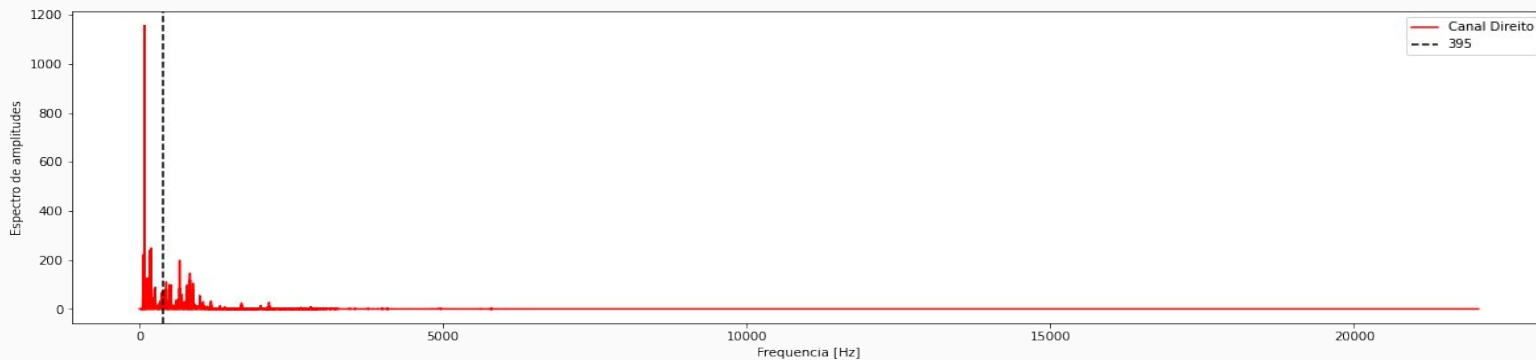
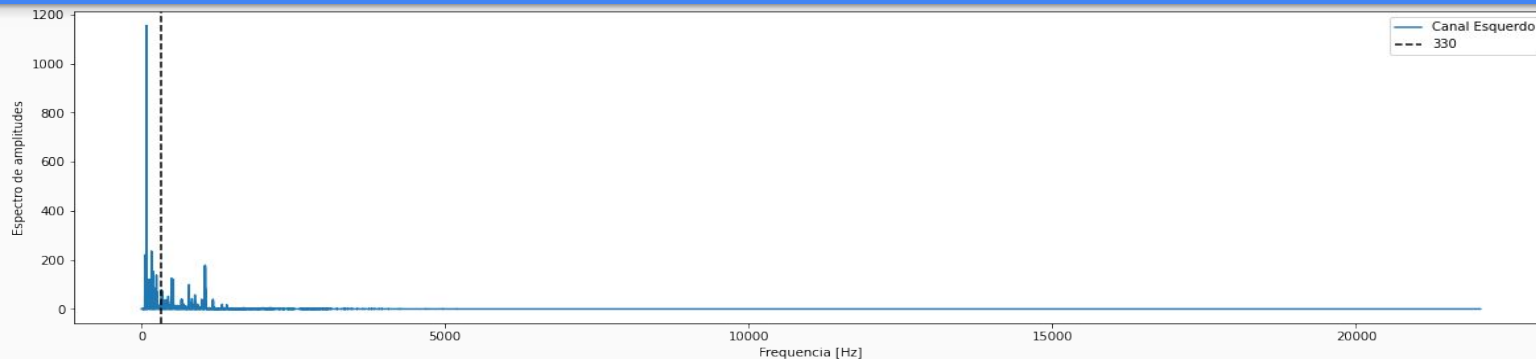


Projeto de um filtro digital passa-baixas

Com resposta ao impulso finita
(FIR) que corta a metade do
conteúdo espectral do arquivo
de áudio.



Frequência de corte obtidas do sinal



Specs b,a P/Z Info Fixpoint

LOAD FILTER SAVE FILTER

Lowpass FIR Equiripple

Grid Density 16

Order: ☒ Minimum $N = 1689$

DESIGN FILTER Quit

Freq. Unit Hz 0...½

$f_s = 4.41\text{e}+04$

Target Specifications

Frequency in Hz	Amplitude in dB
F_{PB} 330	A_{PB} 0.347
F_{SB} 395	A_{SB} 60

Weight Specifications Reset

W_{PB} 1

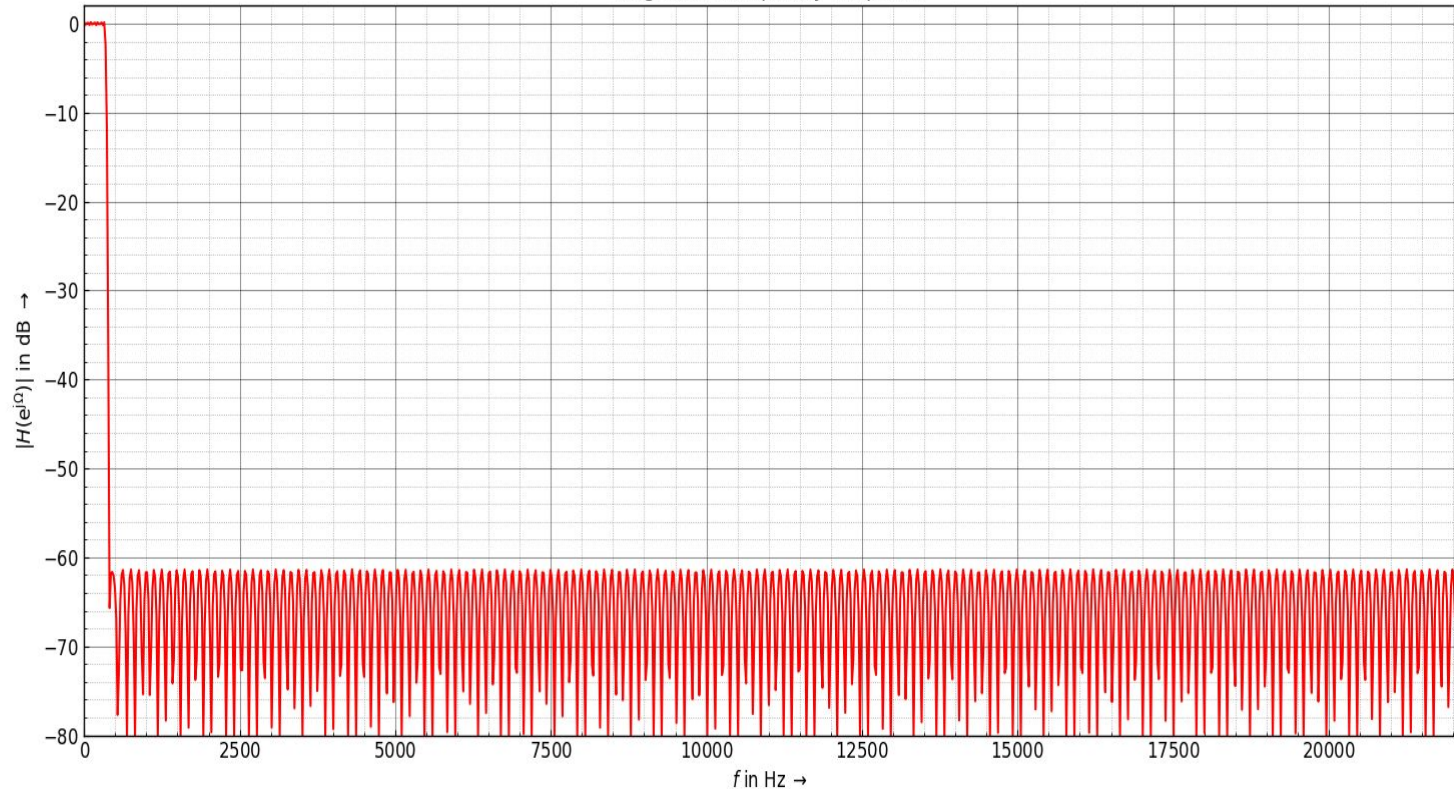
W_{SB} 20

Enter the maximum pass band ripple A_{PB} , minimum stop band attenuation A_{SB} and the corresponding corner frequencies of pass and stop band(s), F_{PB} and F_{SB} .

|H(f)| $\phi(f)$ $\tau(f)$ P/Z y[n] 3D



Magnitude Frequency Response



|H| in dB

Bottom -80.0 dB

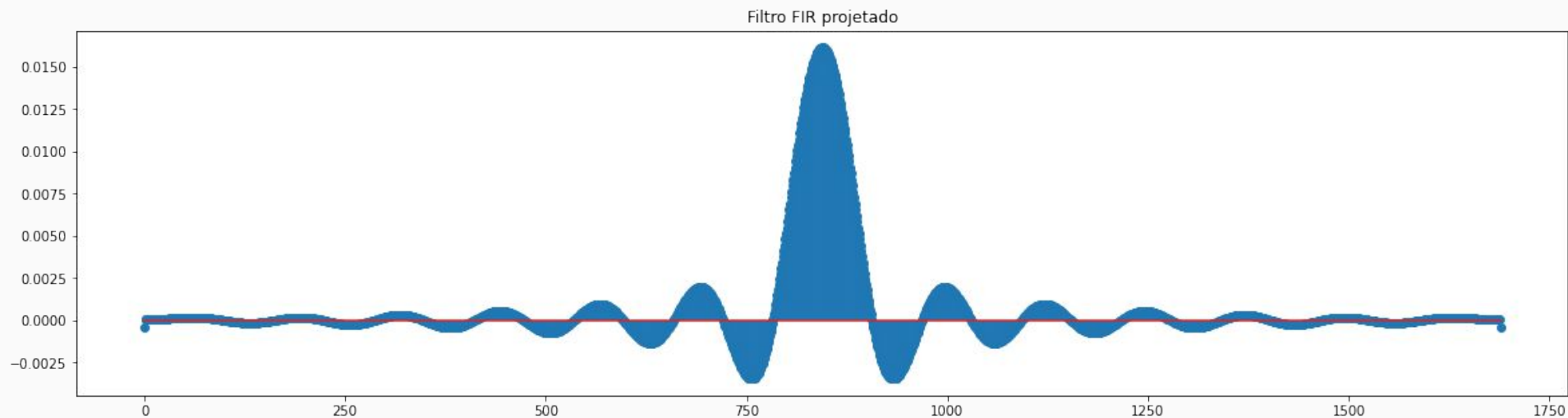
☐ Zero phase

Inset off

☐ Show Specs

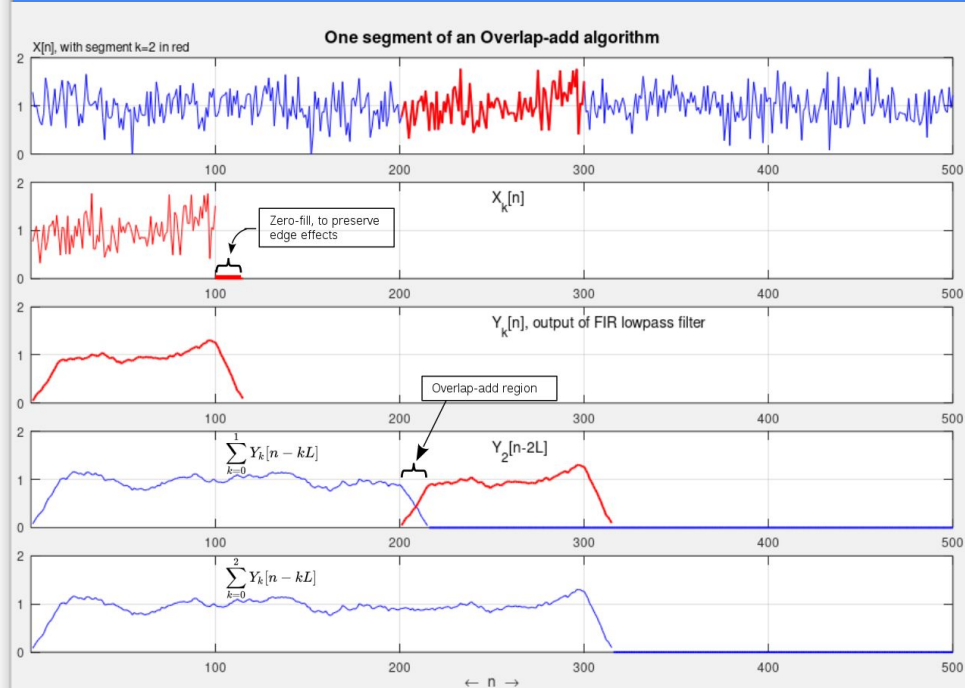
☐ Phase

Plote dos coeficientes do filtro FIR passa baixa



Método de sobreposição e soma

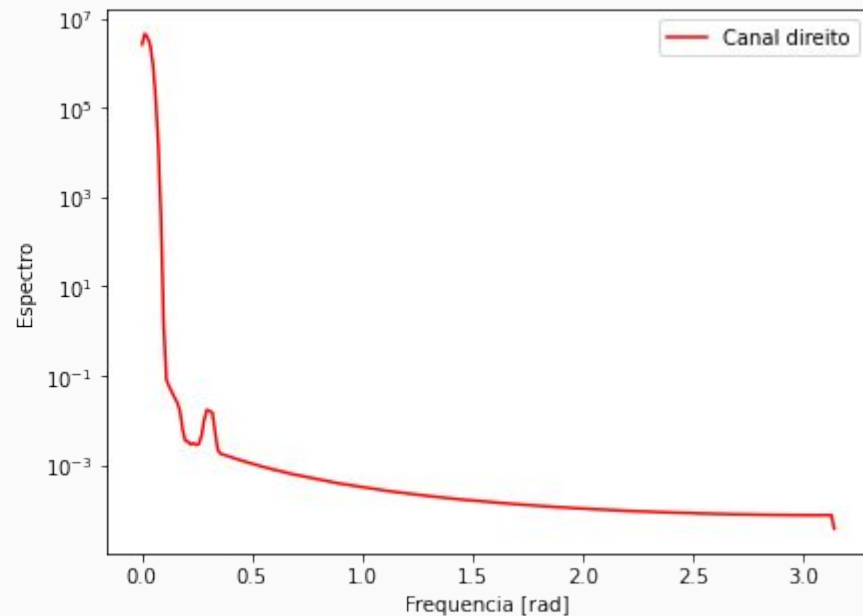
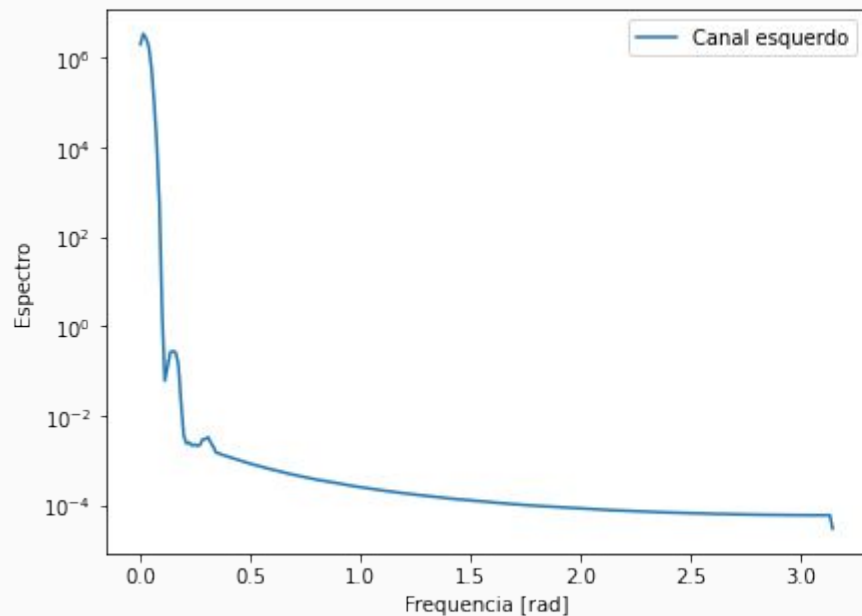
Implementa a filtragem com a operação de convolução no domínio da frequência.



Plote do sinal filtrado no domínio da frequência para as primeiras N amostras (FFT)



Plote da estimativa de densidade espectral do sinal filtrado para as primeiras N amostras (Welch)

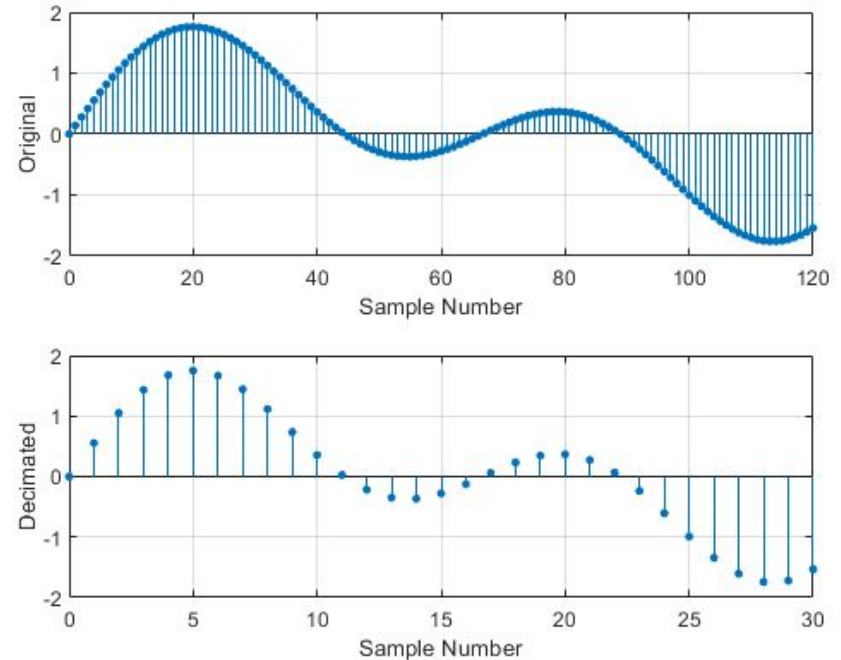


Dizimação

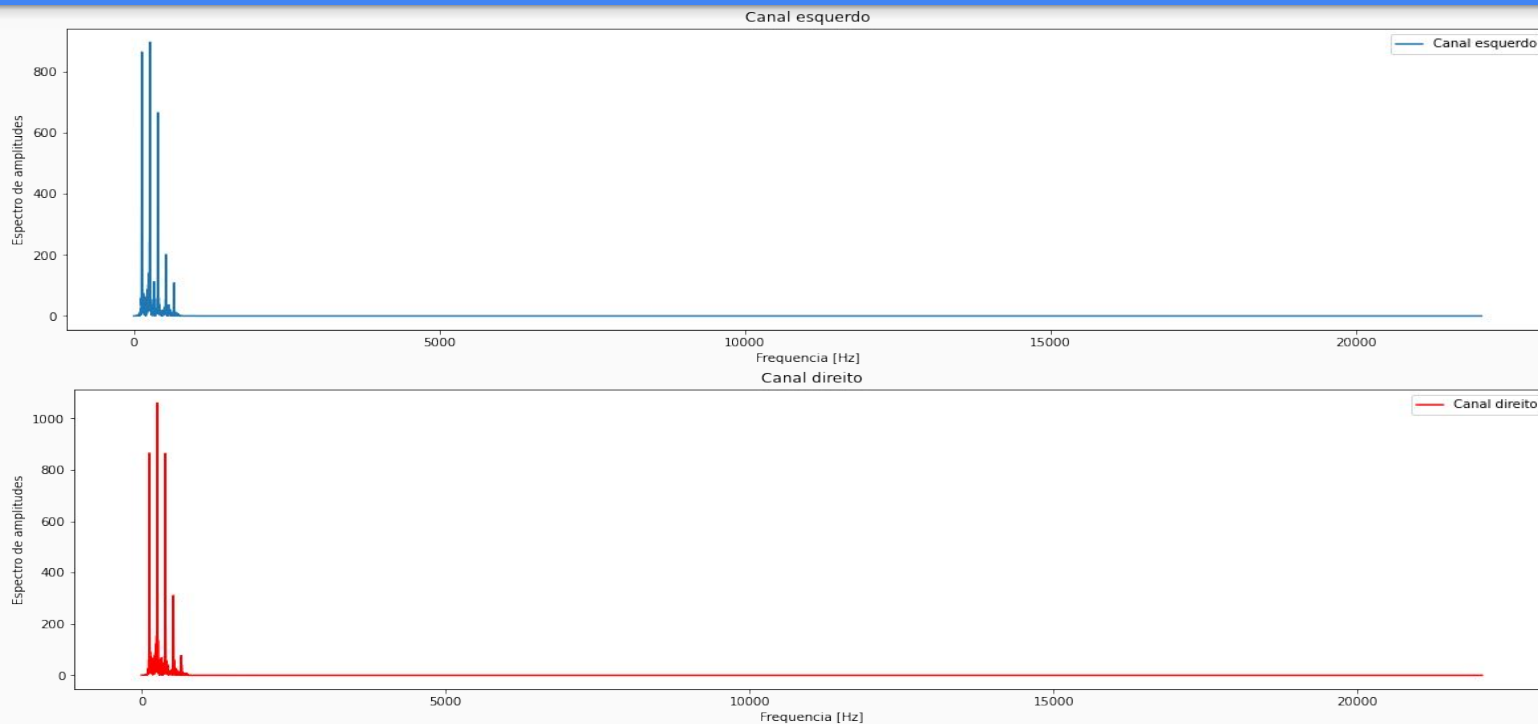
No processo de redução da taxa de amostragem foi utilizado um fator de dizimação igual a 2.

$$M = 2$$

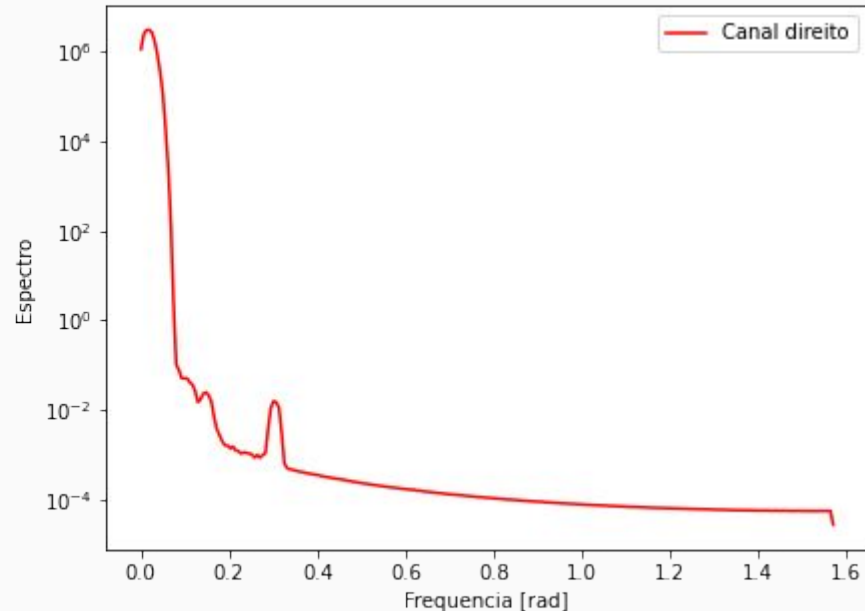
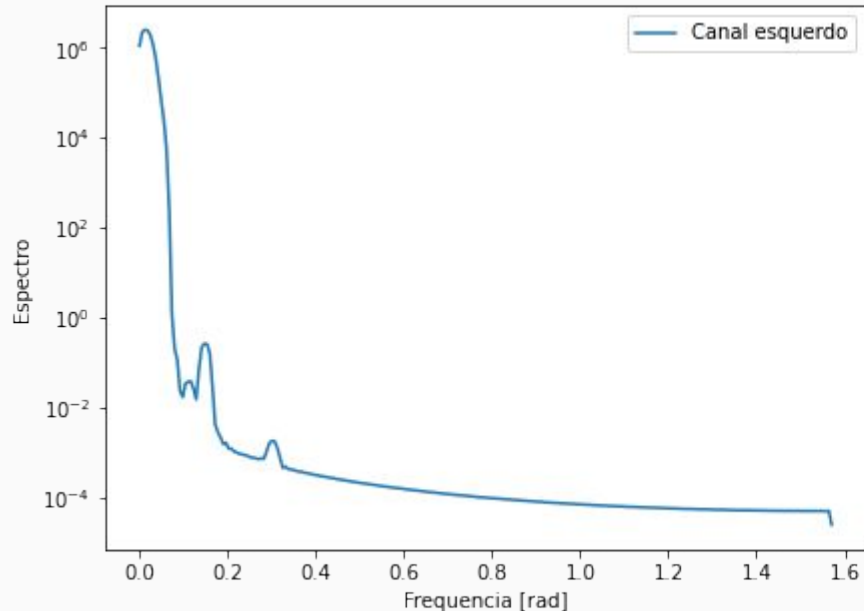
Filtragem -> Redução da resolução



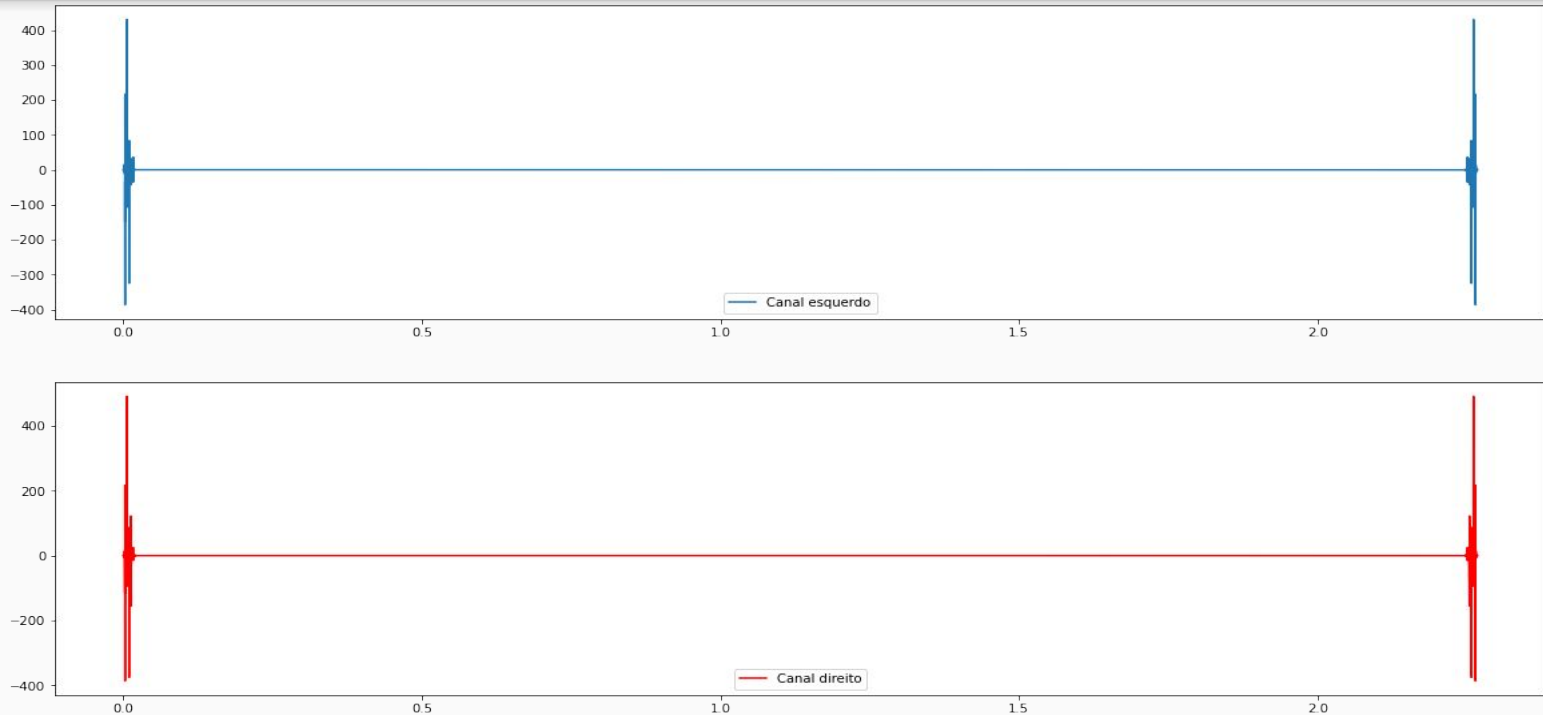
Plote do sinal dizimado no domínio da frequência para as primeiras N amostras (FFT)



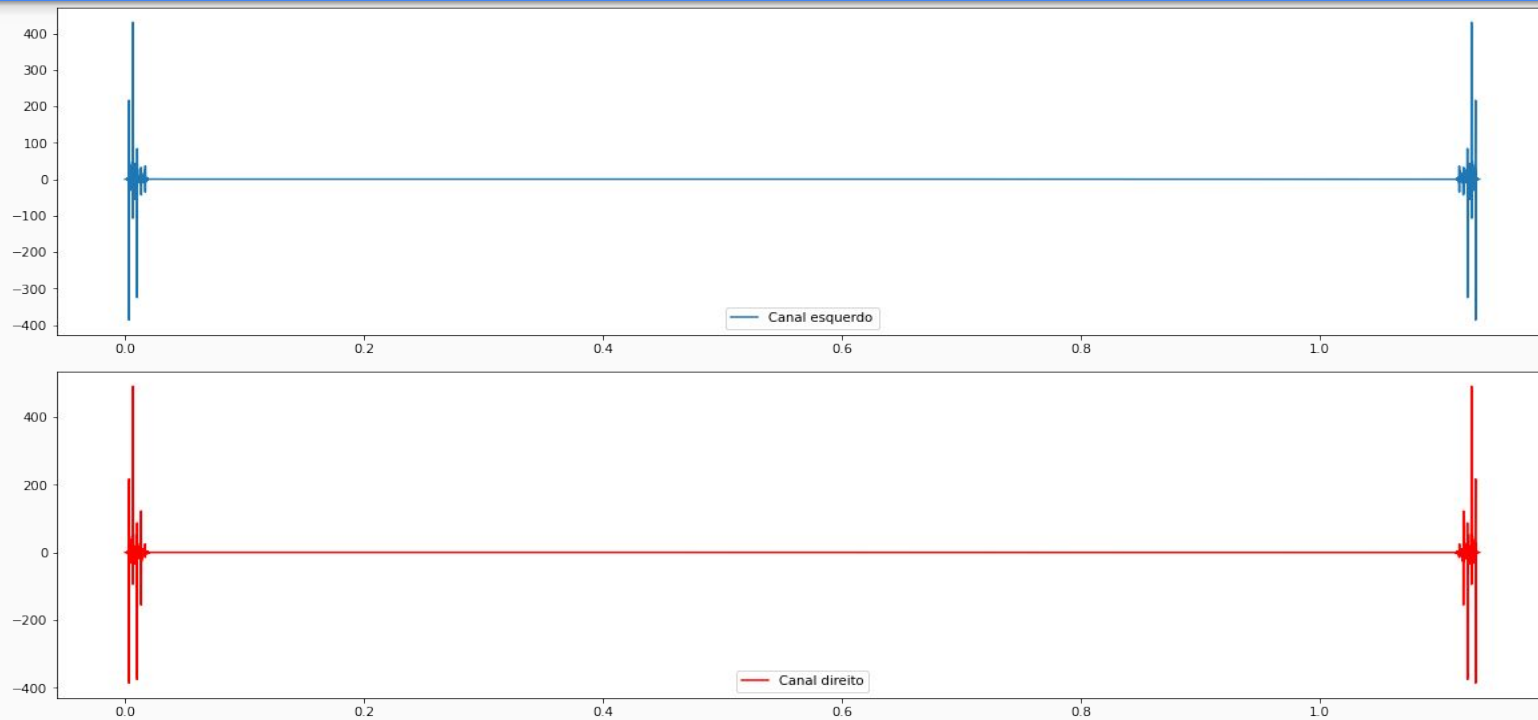
Plote da estimativa de densidade espectral do sinal dizimado para as primeiras N amostras (Welch)

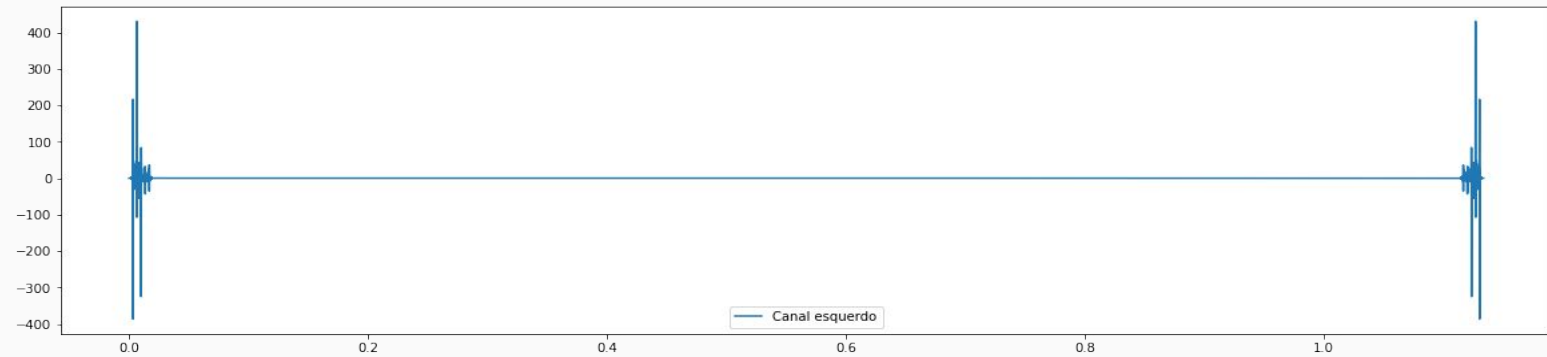
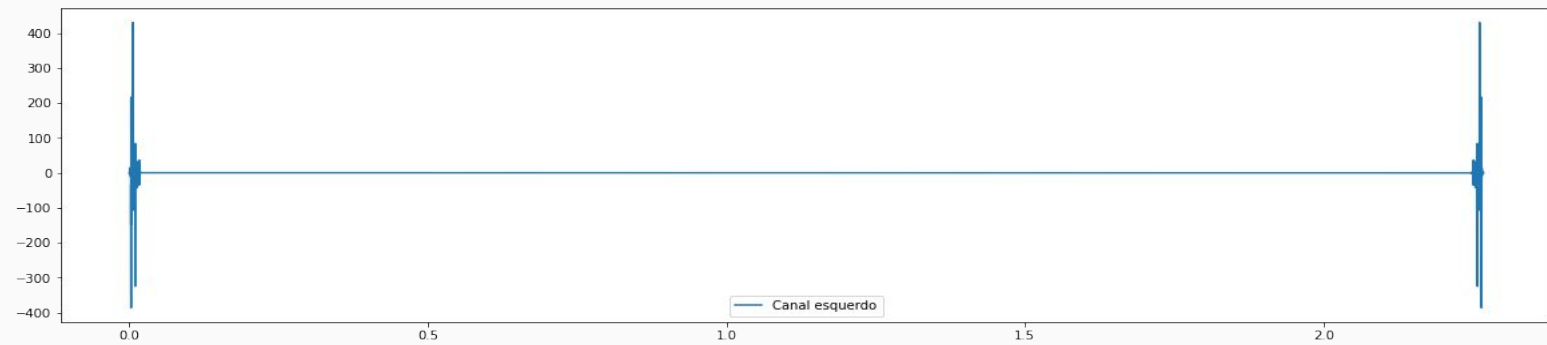
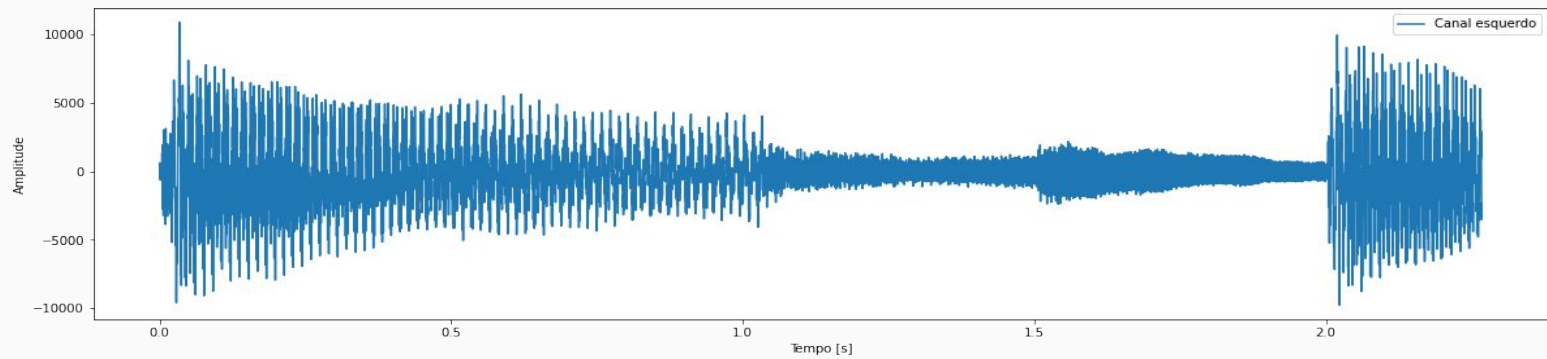


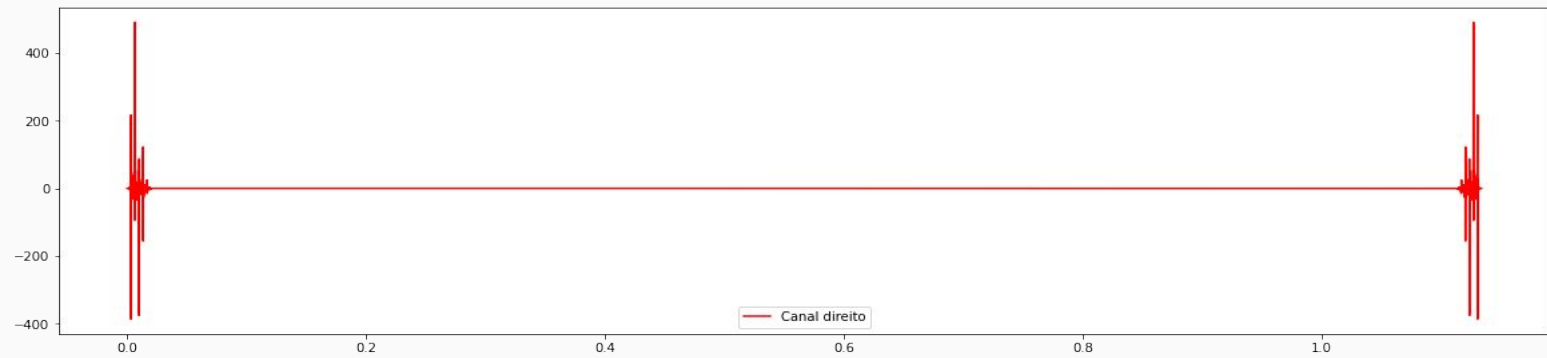
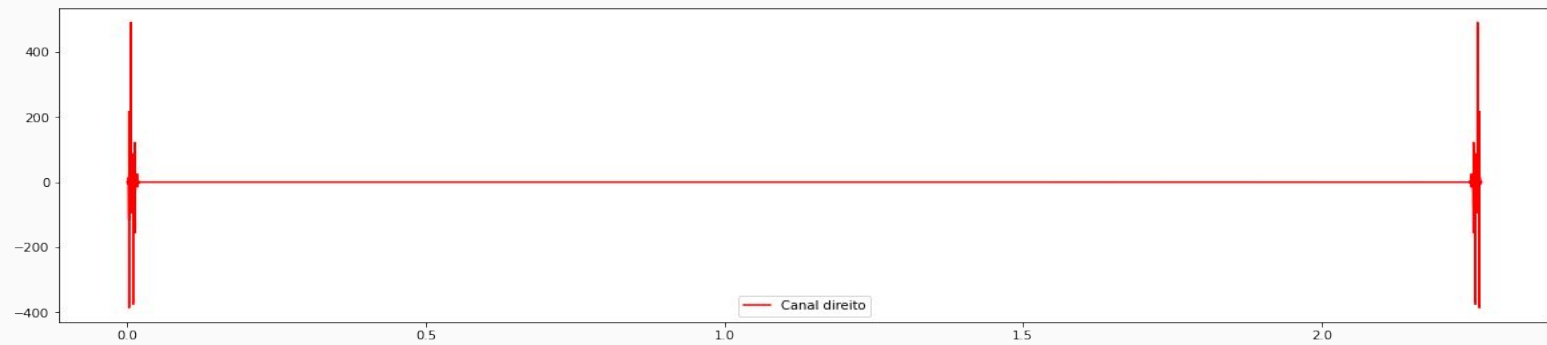
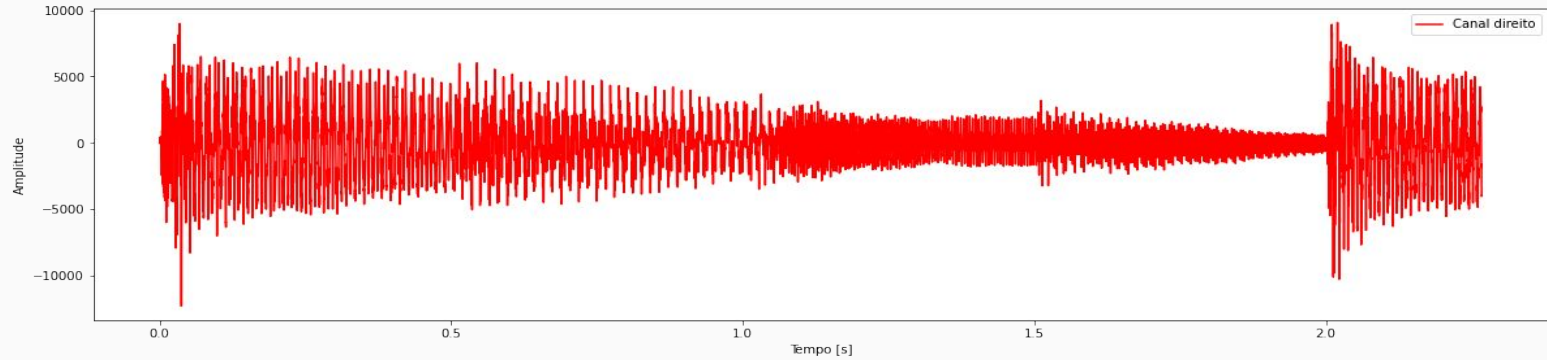
Plote do sinal filtrado no domínio do tempo para as primeiras N amostras

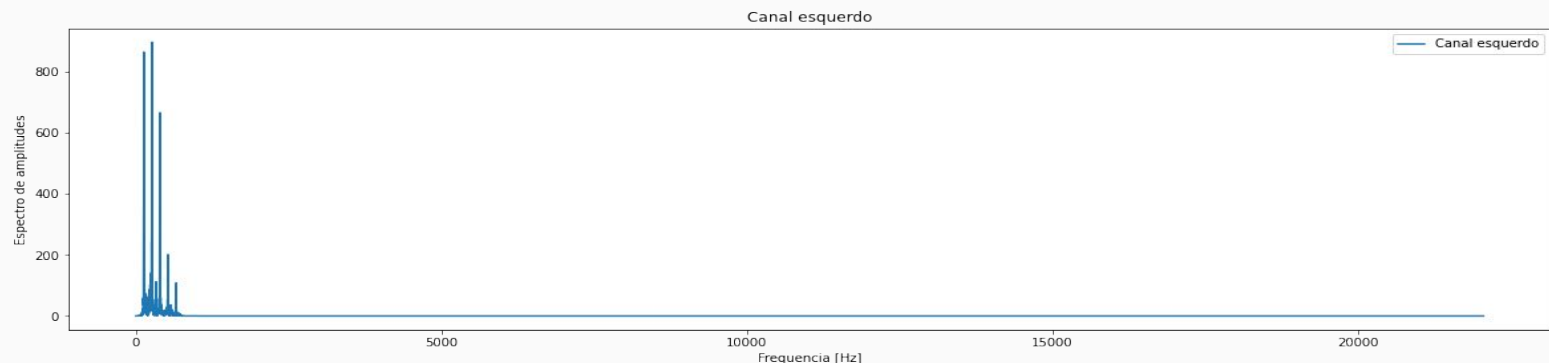
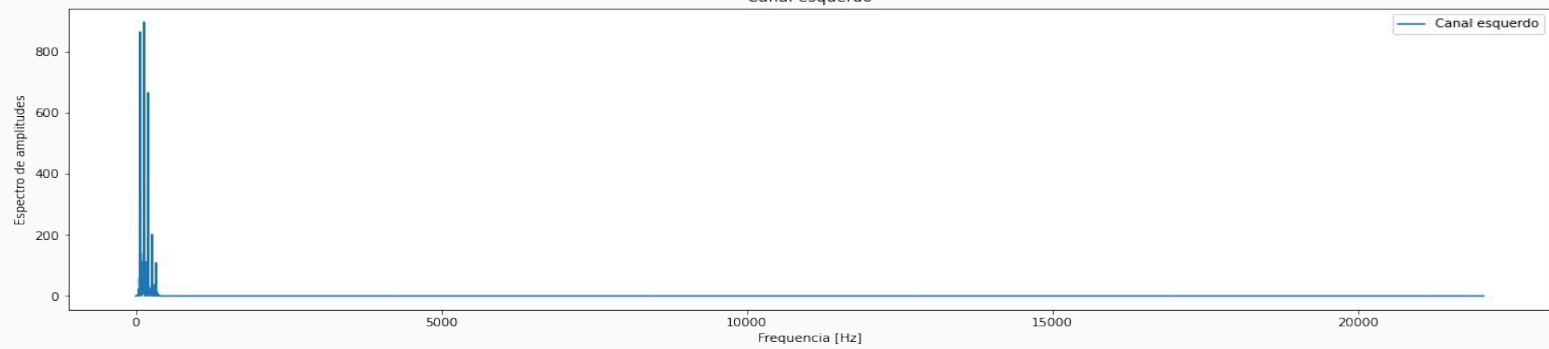
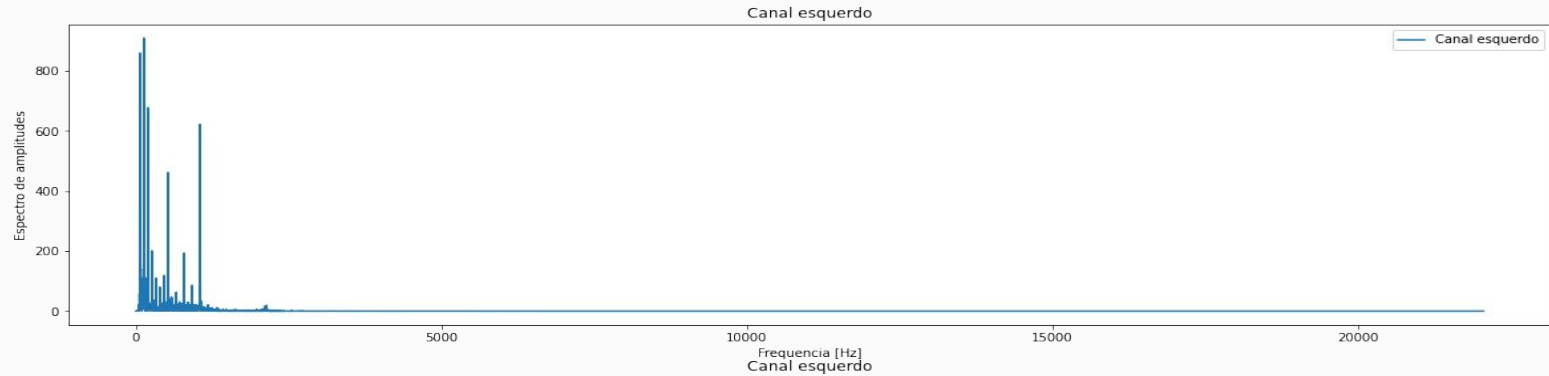


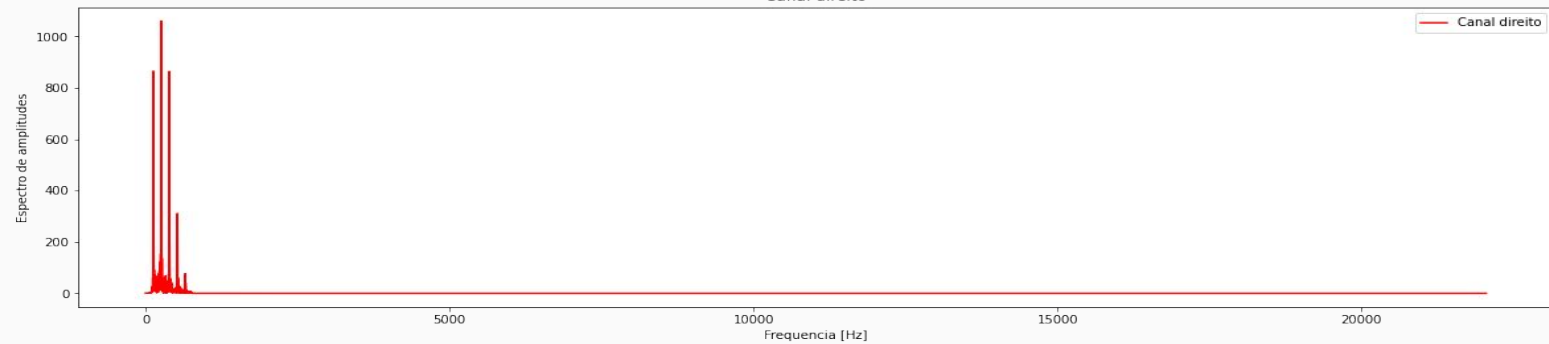
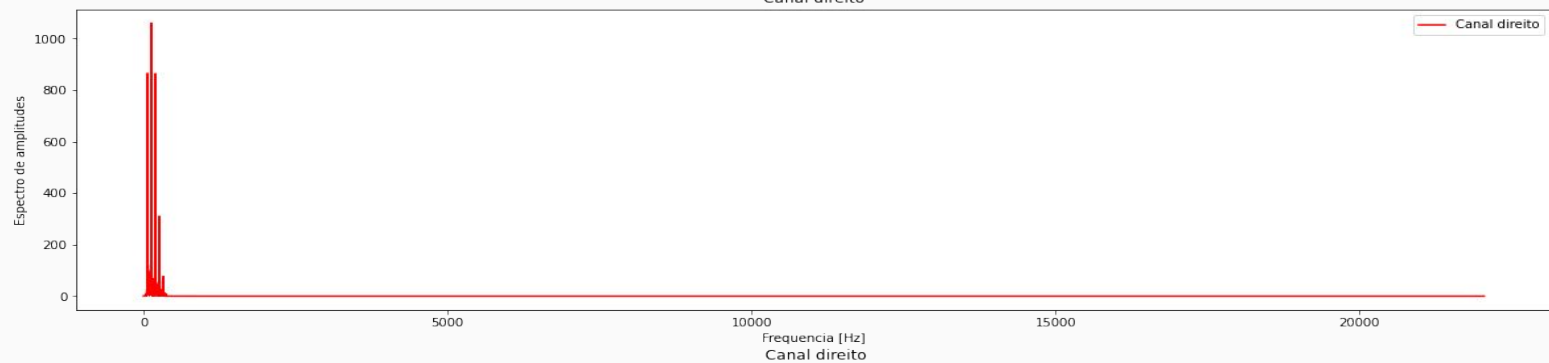
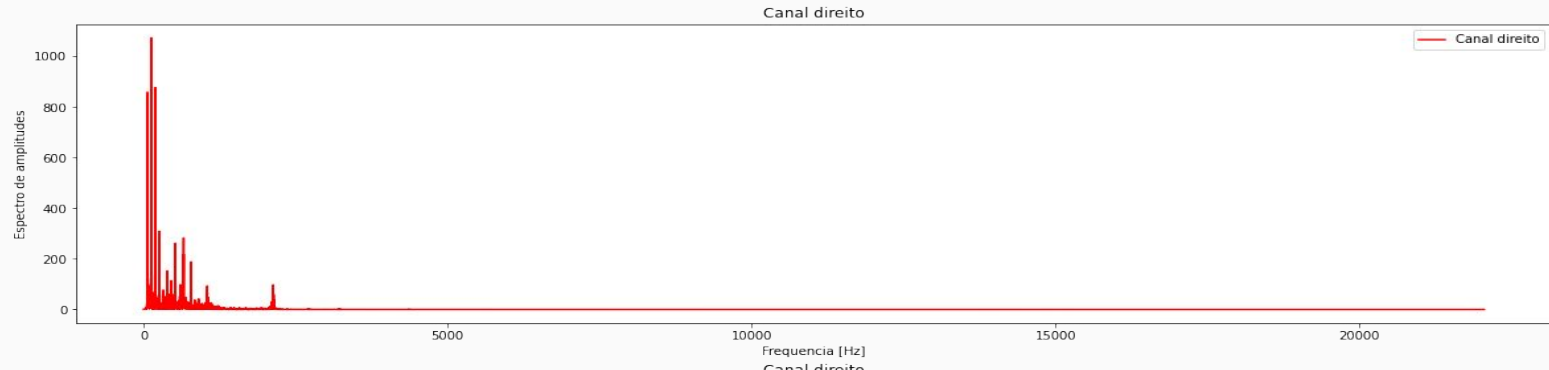
Plote do sinal dizimado no domínio do tempo para as primeiras N amostras

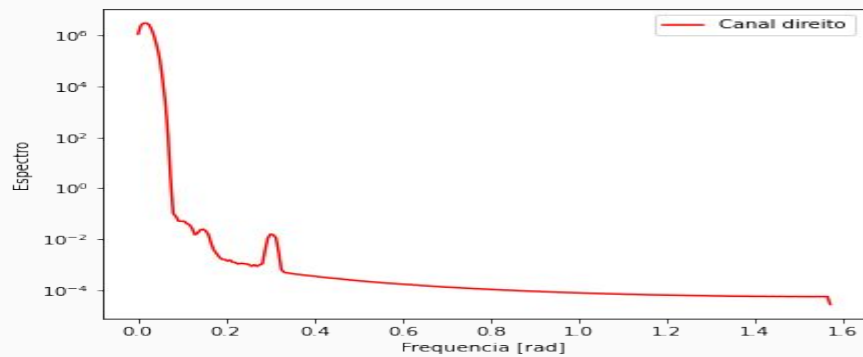
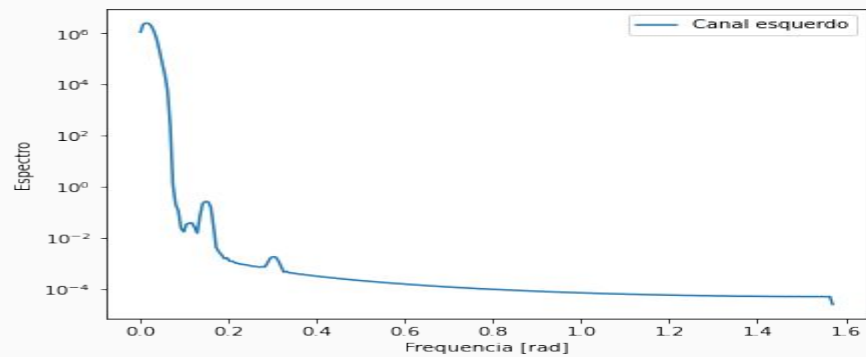
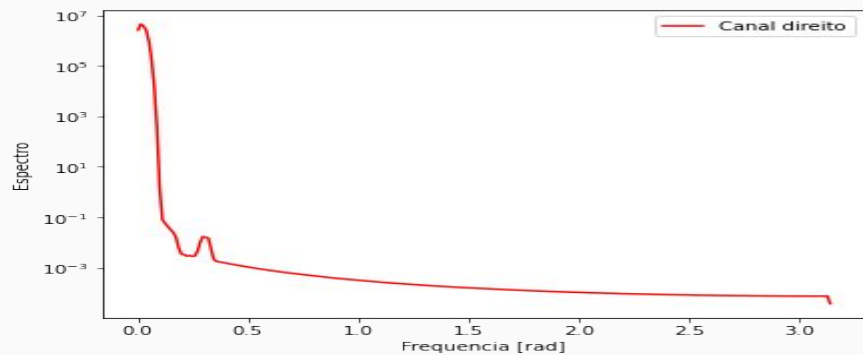
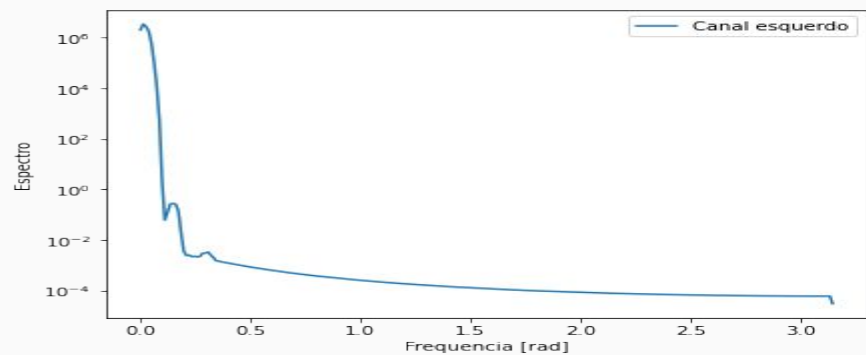
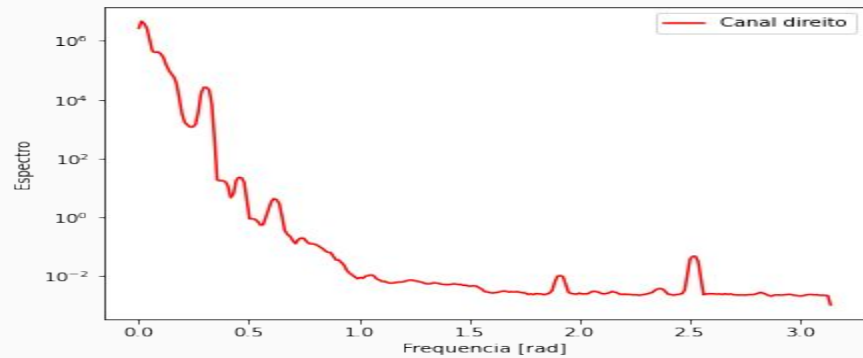
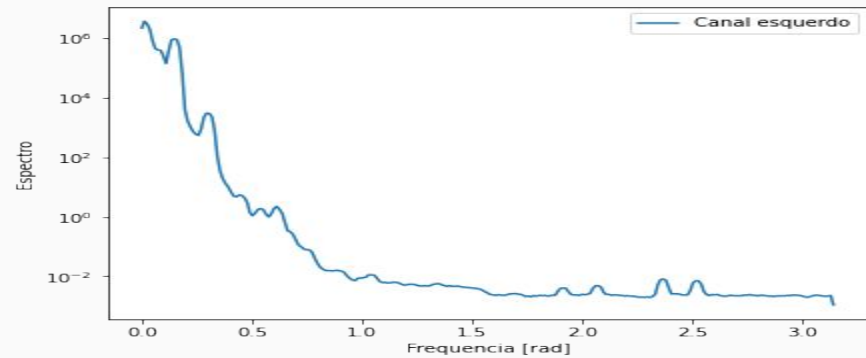












Referências

- OPPENHEIM, Alan V.; SCHAFER, Ronald W; VIEIRA, Daniel. Processamento em tempo discreto de sinais. 3. ed. São Paulo, SP: Pearson, 2012.
- Freesound: <https://freesound.org/browse/>;
- Matplotlib: <https://matplotlib.org/2.0.2/index.html>;
- NumPy: <https://numpy.org/>;
- SciPy: <https://docs.scipy.org/doc/scipy/reference/index.html>;
- pyFDA: <https://pyfda.readthedocs.io/en/latest/index.html#>;