Digital version

ENGS152 Circuits Lab Section A
RL and RC Frequency Domain Analysis

Mher Saribekyan Nina Prazyan

March 21, 2025

Step 1: Signal Analysis

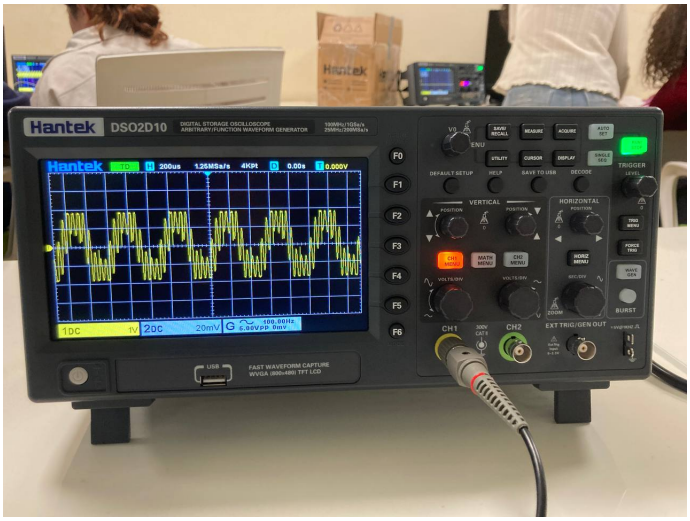

Figure 1: Sound wave on the scope

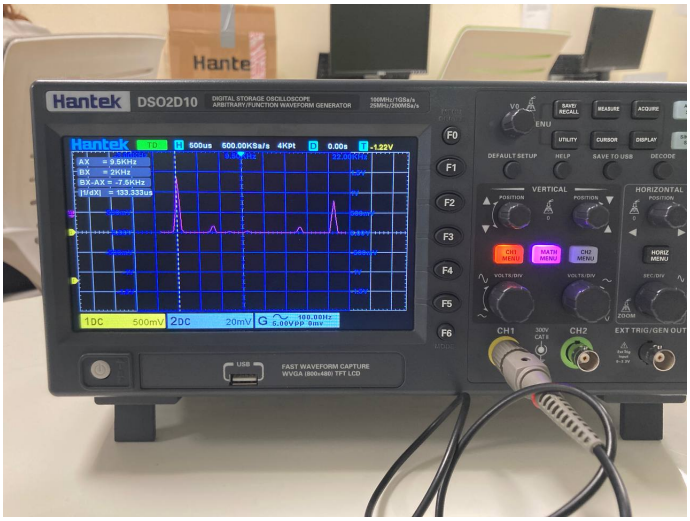

Figure 2: Singnal FFT 2khz peak

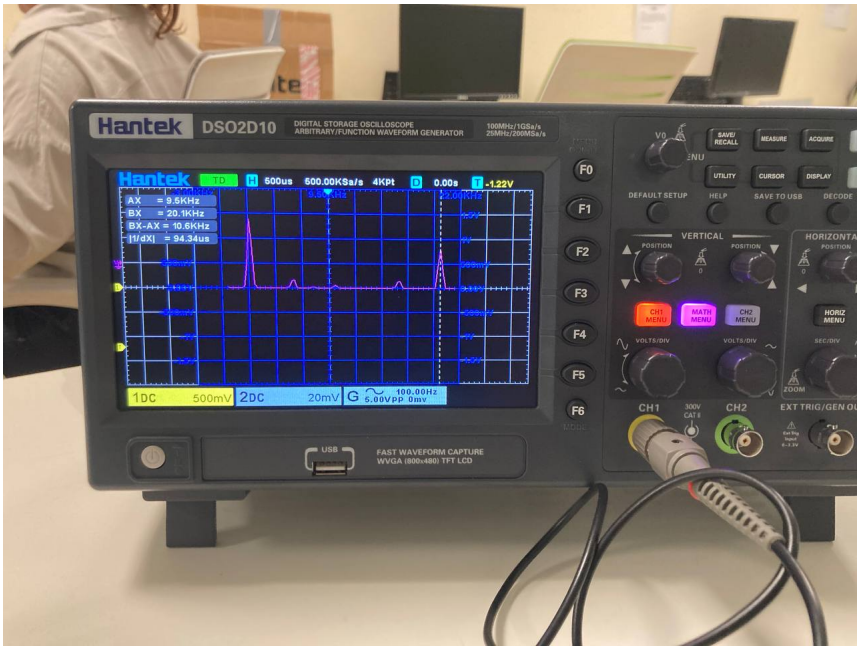

Figure 3: Signal FFT 20khz peak

Step 2: First order low-pass filter

RL low pass was chosen, with a cutoff frequency of about $5 - 6khz$, however due to the limited values of components, $8khz$ was chosen. The calculated values for the resistor and inductor are $R = 5.1k\Omega$ and $I = 100mH$, therefore $f_{\text{cutoff}} = \frac{R}{2\pi L} \approx 8khz$.

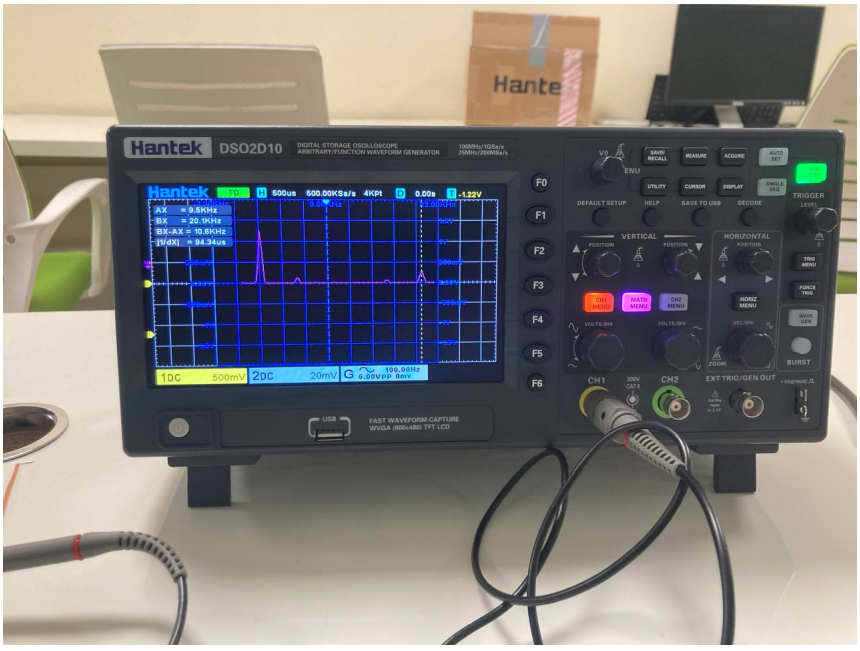

Figure 4: First order low-pass in FFT

The $20khz$ peak is a lot lower than in **Figure 2**, from around $0.9V$ to around $0.3V$.

Step 3: Second order low-pass filter

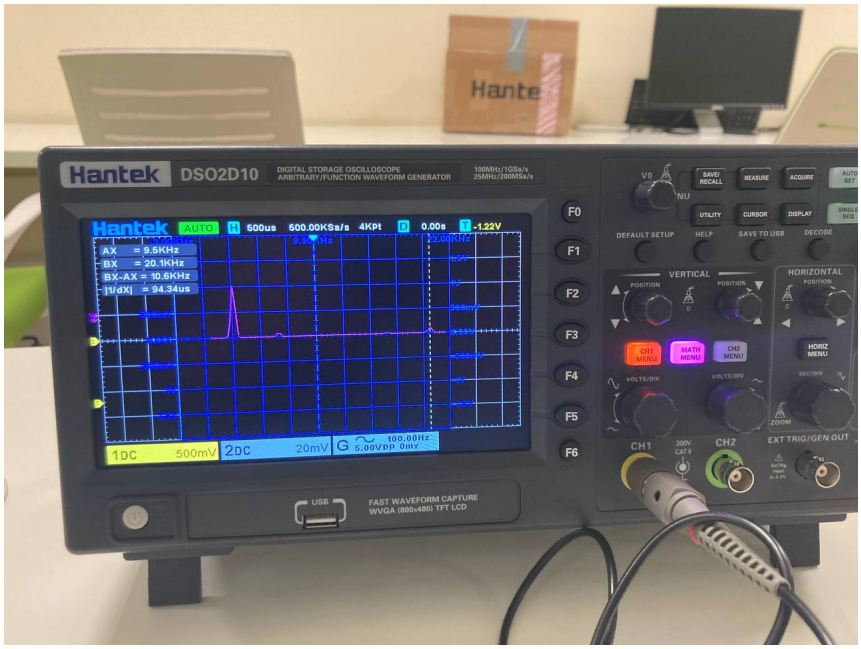

Figure 5: Second order low-pass in FFT

The $20khz$ peak is a lot lower than in **Figure 4**, about $0.1V$, therefore it is a more effective filter.

Step 4: First order high-pass filter

RC high pass was chosen, with a cutoff frequency of about $18khz$, however due to the limited values of components, $16khz$ was chosen. The calculated values for the resistor and capacitor are $R = 10k\Omega$ and $C = 1nF$, therefore $f_{\text{cutoff}} = \frac{1}{2\pi RC} \approx 16khz$.

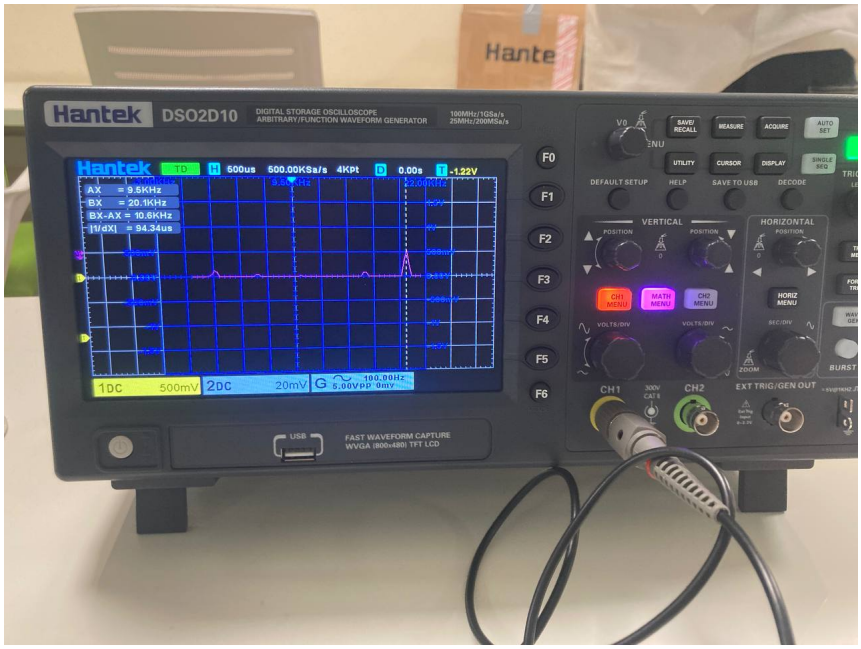

Figure 6: First order high-pass in FFT

The $2khz$ peak is a lot lower than in **Figure 2**, from around $1.4V$ to around $0.2V$.

Step 5: Second order high-pass filter

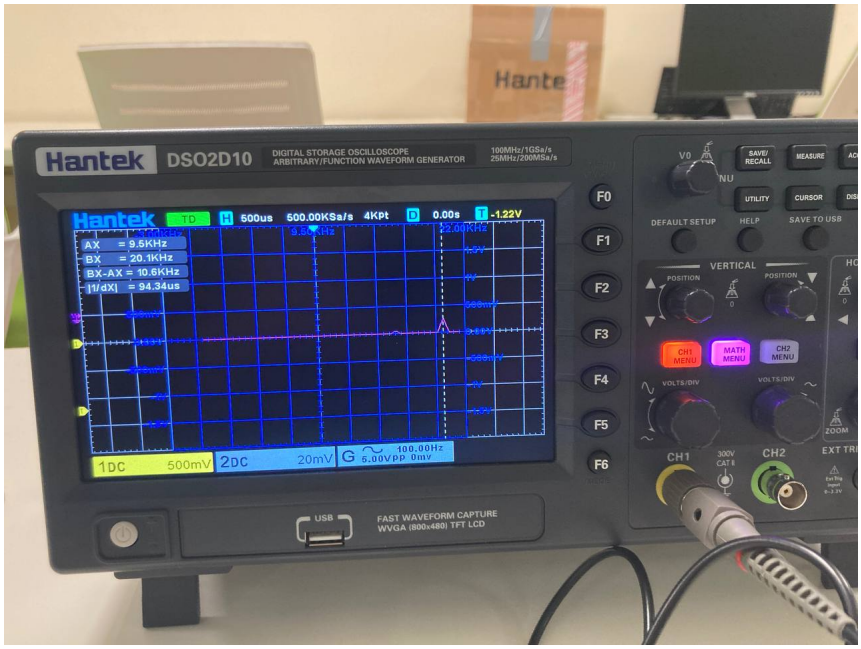

Figure 7: Second order high-pass in FFT

The $2khz$ peak is filtered so much, that it is not measurable, therefore it is a more effective filter.

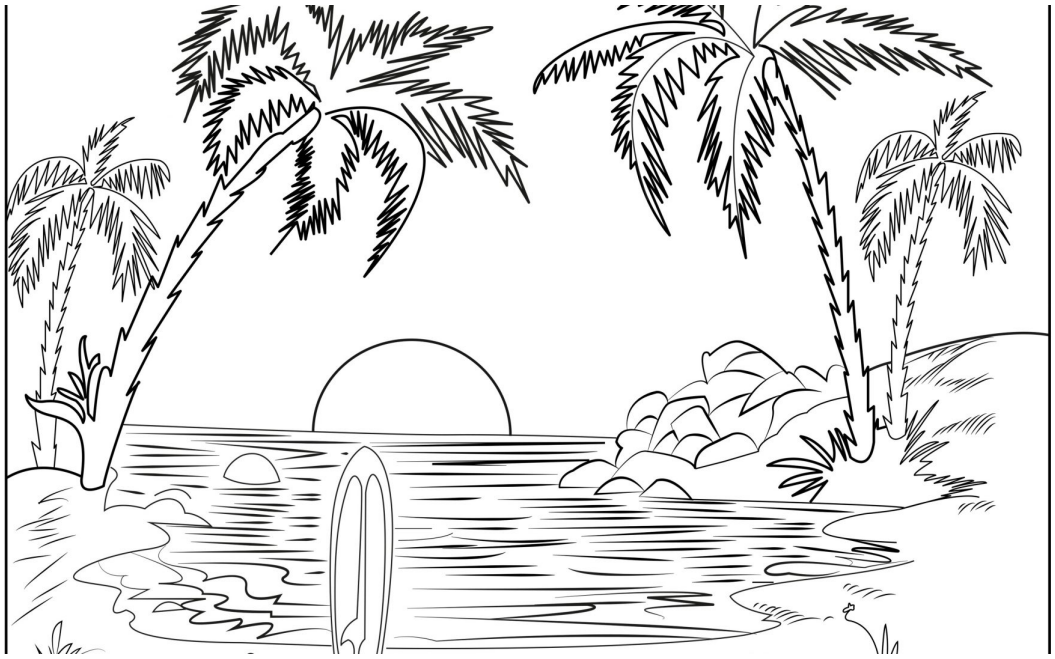

Figure 8: A nice drawing of a sunny beach