

LAB1 Report

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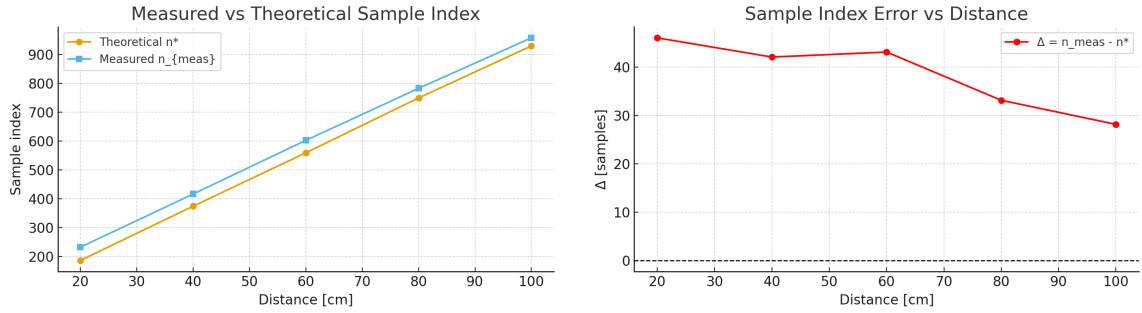
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In lab 1 We explored the basic configuration of e² studio, ultrasound module and the basic signal processing flow of the wireless transmitted signal.

1 Hardware configuration

2 Error Source Analysis



(a) Measured Peak and the theoretical sample (T=25)

(b) Error vs. distance

Figure 1: Comparing robust and non-robust design for linear precoder

We inspect the relative distance

Pair (cm)	n_{theory}^*	n_{meas}	$\Delta n_{\text{theory}}^*$	Δn_{meas}	$\frac{\Delta n_{\text{meas}}}{\Delta n_{\text{theory}}^*}$	Relative Error (%)
20→40	185.97→373.94	232→416	187.97	184	0.979	-2.1
40→60	373.94→558.91	416→602	184.97	186	1.006	+0.6
60→80	558.91→748.88	602→782	189.97	180	0.947	-5.3
80→100	748.88→928.86	782→957	179.98	175	0.972	-2.8

Table 1: Relative Distance Comparison (Measured vs. Theoretical)

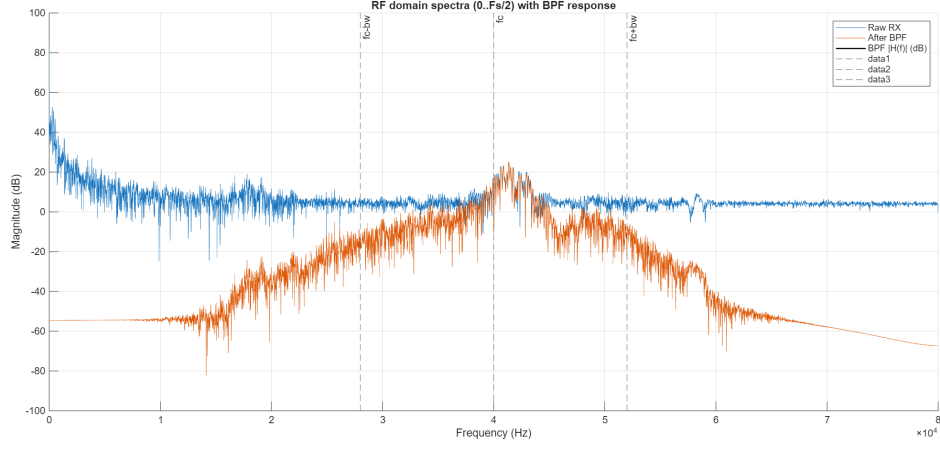


Figure 2: bpf

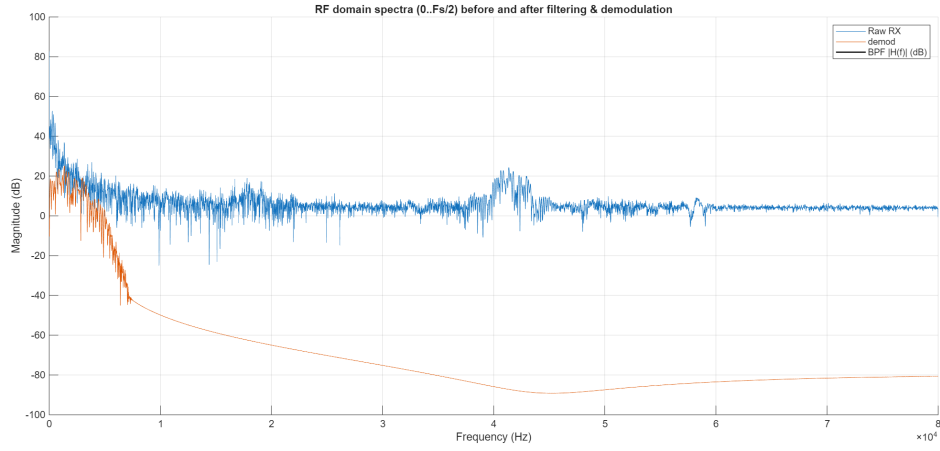


Figure 3: demod

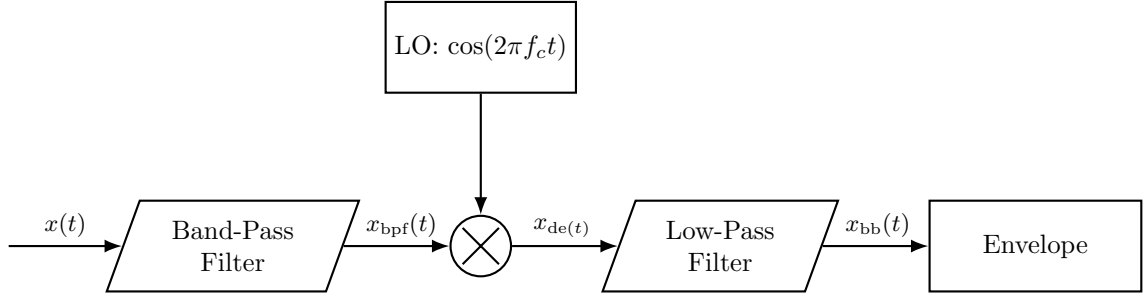


Figure 4: block diagram: signal \rightarrow BPF \rightarrow demod (mixer) \rightarrow LPF \rightarrow envelope.

3 Signal Processing

Algorithm 1: Proposed MM technique for solving (??).

Result: \mathbf{y}^*, δ_H^*

Initialization: Set $\delta_H^{(0)}$ to a feasible solution, $\lambda \geq 0, k = 0$

1 **do**

2 Update $\mathbf{y}^{(k+1)*} \leftarrow \sigma_w^{-2} (\phi_E^T \otimes \mathbf{I}_{N_R}) (\hat{\mathbf{h}} + \delta_H^{(k)})$;

3 Update $\delta^{(k+1)*} = -\frac{1}{\lambda_k} \mathbf{B}^{-1} \nabla f_k(\delta_k^{(k)}, \mathbf{y}^{(k)*}) \in \mathbb{C}^{N_T N_R}$;

4 $k = k + 1$;

5 $\delta_H^{(k)} = \delta_H^*$;

6 **until** $\mathcal{L}_2(\delta_H^*, \lambda)$ converges in (??);

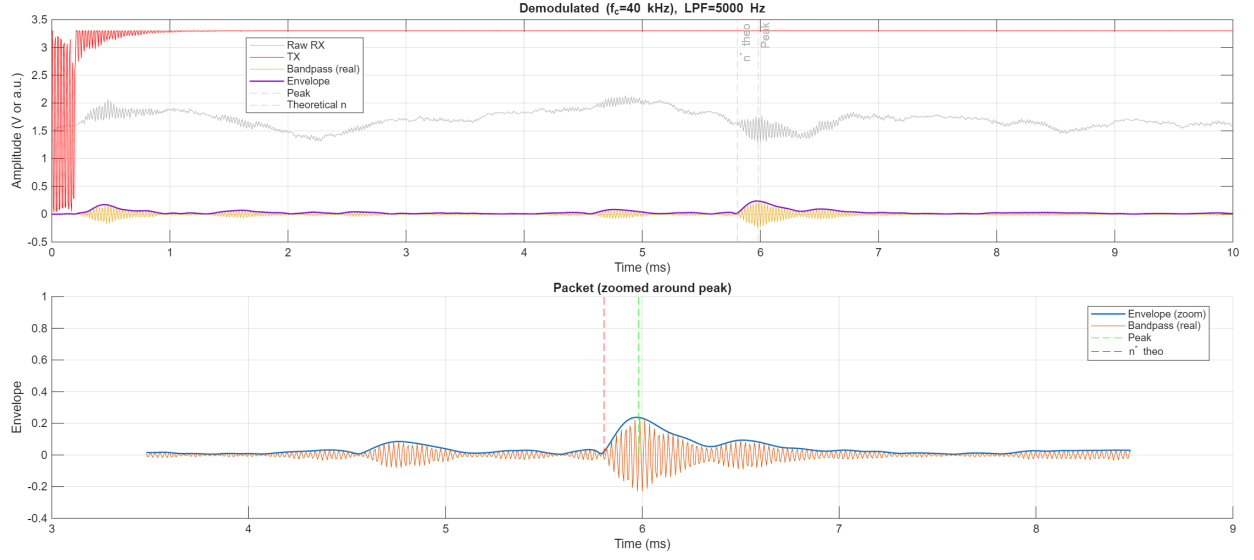


Figure 5: Time domain signal before and after filtering & demodulation

A Gradient of f

References

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