

Discussion #14

1. We wish to use the Kaiser window method to design a real-valued causal FIR filter with generalized linear phase that meets the following specifications:

$$\begin{aligned} 0.9 < |H(\omega)| < 1.1, \quad 0 \leq |\omega| \leq 0.2\pi \\ |H(\omega)| < 0.06, \quad 0.3\pi \leq |\omega| \leq 0.475\pi \\ 1.9 < |H(\omega)| < 2.1, \quad 0.525\pi \leq |\omega| \leq \pi \end{aligned}$$

This specification is to be met by applying the Kaiser window to the ideal real-valued impulse response associated with the ideal frequency response $H_d(\omega)$ with its magnitude given by:

$$|H_d(\omega)| = \begin{cases} 1, & 0 \leq |\omega| \leq 0.25\pi \\ 0, & 0.25\pi \leq |\omega| \leq 0.5\pi \\ 2 & 0.5\pi \leq |\omega| \leq \pi \end{cases}$$

- (a) What is the maximum value of δ that can be used to meet this specification?
What is the corresponding value of β ?
- (b) What is the maximum value of $\Delta\omega$ that can be used to meet the specification?
What is the corresponding value of M ?
- (c) Determine the ideal impulse response $h_d[n]$.

2. Optimum approximations of FIR filters