EE 451

Using the Kaiser Window for DFT Analysis of Signals

The Kaiser window of length M is:

$$w_K(n) = \begin{cases} \frac{I_0[\beta(1-[(n-\alpha)/\alpha]^2)^{1/2}]}{I_0(\beta)}, & 0 \leq n \leq M-1. \\ 0, & \text{otherwise.} \end{cases}$$

where $\alpha = (M-1)/2$ and $I_0(\beta)$ is the zeroth-order modified Bessel function of the first kind. In MATLAB, you can calulate $I_0(\beta)$ using the `besselj(0,beta)` function.

β can be found using the equation:

$$\beta = \begin{cases} 0, & A_{sl} < 13.26, \\ 0.76609(A_{sl} - 13.26)^{0.4} + 0.09834(A_{sl} - 13.26), & 13.26 < A_{sl} < 60, \\ 0.12438(A_{sl} + 6.3), & 60 < A_{sl} < 120, \end{cases}$$

where A_{sl} is the ratio in dB of the amplitude of the main lobe to the amplitude of the largest side lobe.

To determine the length M of the filter:

$$M \simeq \frac{24\pi(A_{sl} + 12)}{155\Delta_{ml}} + 1,$$

where Δ_{ml} is the width of the main lobe (the symmetric distance between the central zero-crossings).

In MATLAB you can find the Kaiser window using the function `wk = kaiser(M,beta)`.