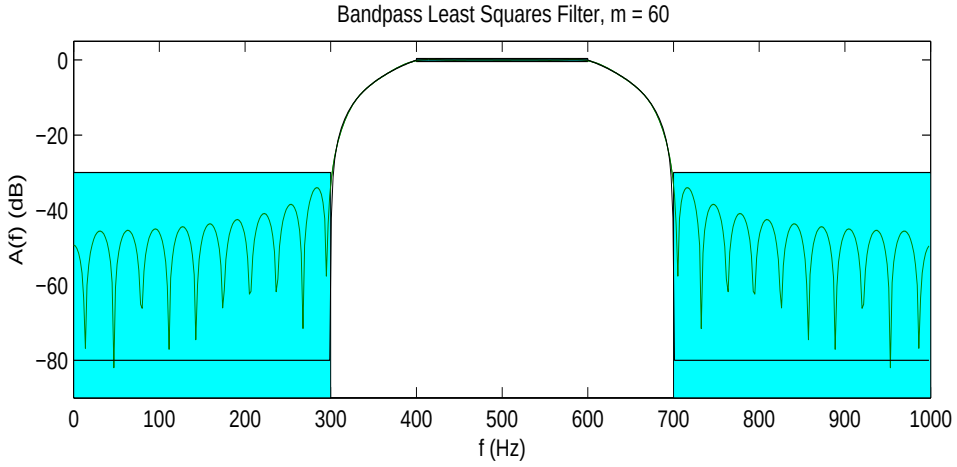
6.18 Use the GUI module *g_fir* to design a least-squares bandpass filter to meet the following specifications. Adjust the filter order to the lowest value that meets the design specifications.

$$\begin{aligned}(f_s, F_{s1}, F_{p1}, F_{p2}, F_{s2}) &= (2000, 300, 400, 600, 700) \text{ Hz} \\ (A_p, A_s) &= (0.4, 30) \text{ dB}\end{aligned}$$

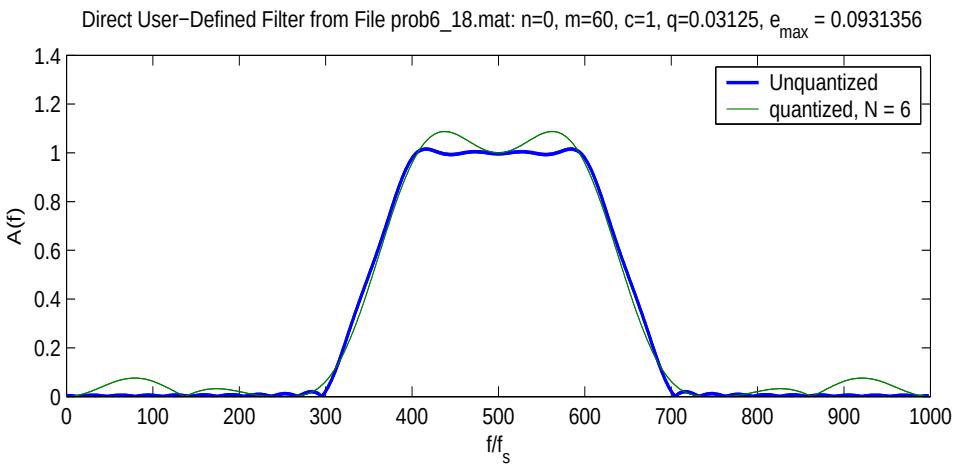
(a) Plot the magnitude response using the dB scale.

(b) Save filter parameters a, b, and fs. Then use GUI module *g_filters* to load these as a user-defined filter. Adjust the number of bits used for coefficient quantization to a level that shows a clear difference between the quantized and unquantized linear magnitude responses using a direct form realization. Plot the linear magnitude responses.

Solution



(a) Least-Squares Magnitude Response Using dB Scale



(b) Quantized Magnitude Response