DSB Portfolio 2

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1 Fourier Transform method

Mathematica functions:

$$
\begin{aligned}
t &= 67; \\
m &= \frac{t-1}{2}; \\
cH &:= \frac{2\pi 1800}{8000}; \\
cL &:= \frac{2\pi 800}{8000}; \\
h[0] &:= \frac{cH - cL}{\pi}; \\
h[n\_] &:= \frac{Sin[cH \cdot n]}{n \cdot \pi} - \frac{Sin[cL \cdot n]}{n \cdot \pi};
\end{aligned}
\tag{1}
$$

I get the results h[n] with n ranging from $-m$ to m:

$$Table[h[i], i, -m, m, 1]$$

This gives a large table of values which I copy into the MathLab program (Program 7.1 for example 7.3 in the book) and get the following graph:

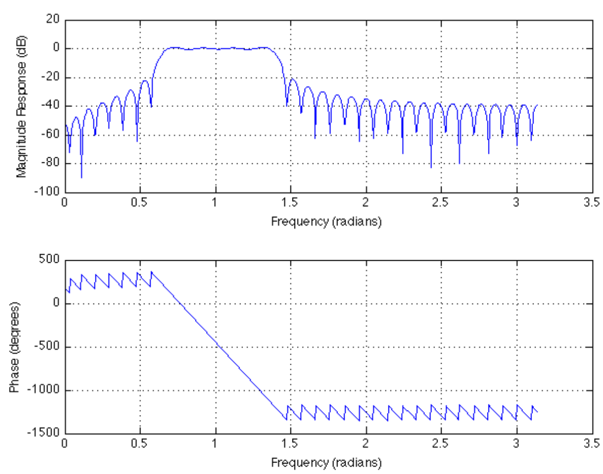

Figure 1: Fourier Transform method: Magnitude response and Phase.

2 Window Method

2.1 Rectangular Window

Mathematica function for the rectangular window:

$$rectangularWindow[n\_] := 1;$$

Not overly exciting. For each value in the set from Section 1 I multiply it with the corresponding value from the window function. Here is a plot of the "new" graphs. Not surprisingly both Figure 1 and Figure 2 looks quite similar.

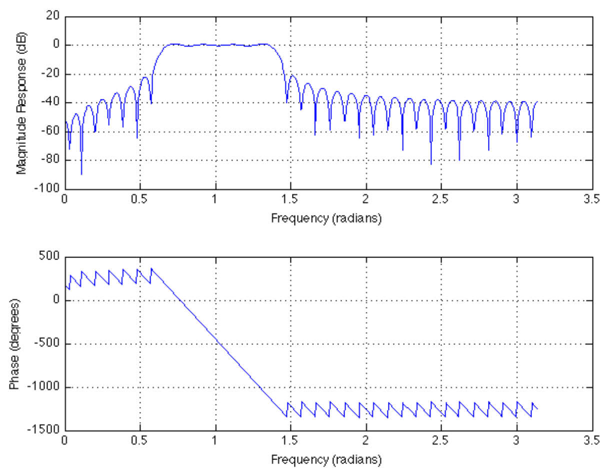

Figure 2: Rectangular window: Magnitude response and Phase.

2.2 Hamming Window

Mathematica function for the Hamming Window:

$$hammingWindow[n\_] := 0.54 + 0.46Cos[\frac{n \cdot \pi}{m}];$$

Same procedure as with the Rectangular window. As can be seen there are some changes on this graph.

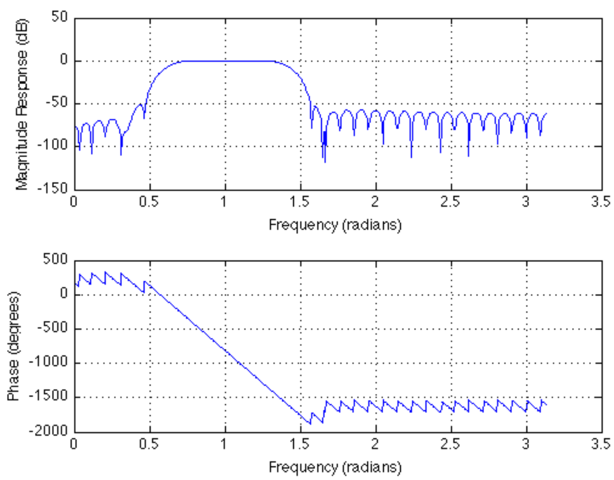

Figure 3: Hamming window: Magnitude response and Phase.

2.3 Kaiser Window

Mathlab has a build-in Kaiser-function, so I use that to generate the Kaiser window-values:

$$\begin{aligned} beta &= 0.5842 * (50-21)^{0.4} + 0.07886 * (50-21); \\ wkaiser &= kaiser(67, beta); \end{aligned} \tag{2}$$

THat particular equation for the Kaiser window is chosen because the specification calls for a stopband attenuation at 50dB. Again the values are multiplied and graphed.

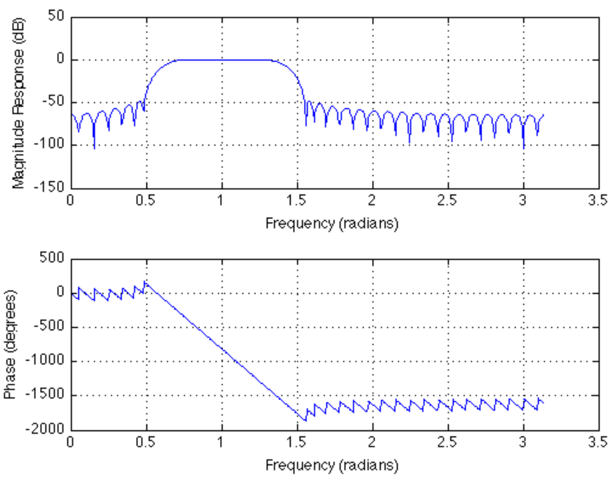

Figure 4: Kaiser window: Magnitude response and Phase.