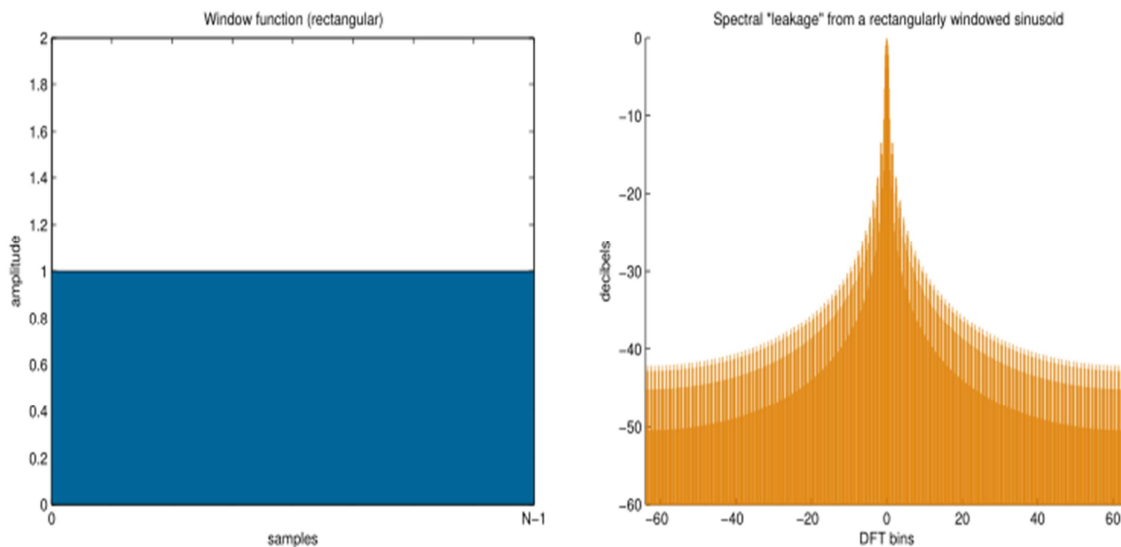


Design of FIR Filter using Rectangular Window

Rectangular window:

The rectangular window is sometimes known as a '*Dirichlet*' window. It is the simplest window, taking a chunk of the signal without any other modification at all, which leads to discontinuities at the endpoints (unless the signal happens to be an exact fit for the window length, as used in multi-tone testing, for instance). The first side-lobe is only 13 dB lower than the main lobe, with the rest falling off at about 6 dB per octave.



$$w(n) = \begin{cases} 1, & 0 \leq n \leq N - 1 \\ 0 & \text{otherwise} \end{cases}$$

Advantages:

Being the simplest window function used, it involves less computational complexity in filter design compared to other window functions.

Disadvantages:

Because of first side lobe being only 13 dB below the main lobe, there will be spectral leakage from the side lobes and the response would show high non zero values outside the desired range of frequencies as well. It introduces high ripple content in the pass band and the stop band.

References:

- CC Studio examples.
- TMS320C6713 Datasheet, User Manual (and supporting documents).
- http://en.wikipedia.org/wiki/Finite_impulse_response.
- http://en.wikipedia.org/wiki/Window_function
- <http://www.labbookpages.co.uk/audio/firWindowing.html>.