Windowing filter coefficients

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$N := 128$ Number of filter coefficients

$n := 0 .. N - 1$ Coefficient index

$Fc := 0.125$ Filter cutoff frequency

$k := 0 .. \frac{N}{2}$ Frequency index

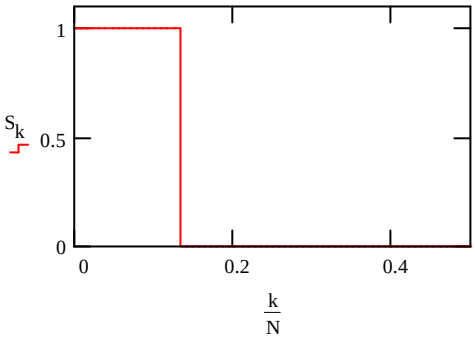
Ideal low-pass filter

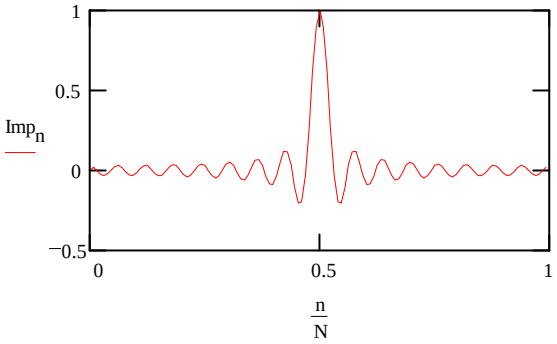
$S_k := 0 \quad i := 0 .. N \cdot Fc \quad S_i := 1.0$

Impulse response

$I := IFFT(S) \quad j := 0 .. \frac{N}{2} - 1 \quad Imp_j := \frac{I_{j+\frac{N}{2}}}{I_0} \quad Imp_{j+\frac{N}{2}} := \frac{I_j}{I_0}$

$Imp_0 := 0$

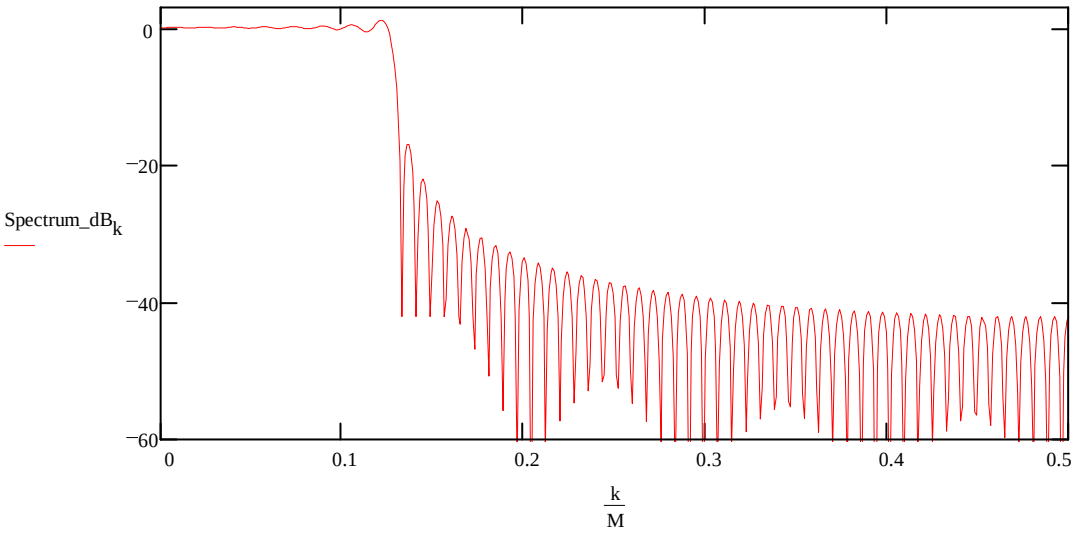




Extend the impulse response with zeros to simulate a non-repeating impulse response:

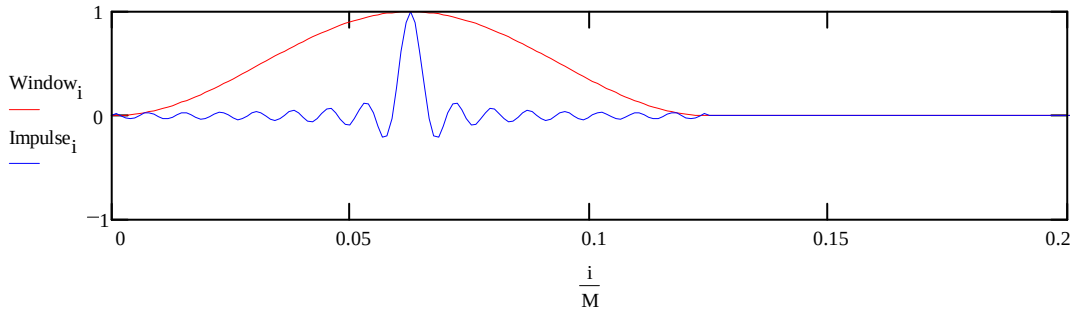
$M := 1024 \quad i := 0 .. M - 1 \quad Impulse_i := 0 \quad Impulse_n := Imp_n$

$Spectrum := FFT(Impulse) \quad k := 0 .. \frac{M}{2} \quad Spectrum\_dB_k := 20 \cdot \log\left(\frac{|Spectrum_k|}{|Spectrum_0|} + 0.0000001\right)$



Window the impulse response:

$$Window_i := \frac{1}{2}\cdot\left[1 - \cos\left[2\cdot\pi\cdot\left(\frac{1}{N}\cdot i\right)\right]\right] \qquad j := N .. M - 1 \qquad Window_j := 0$$



$$Windowed_i := Window_i \cdot Impulse_i$$

$$SpecWin := FFT(Windowed) \qquad k := 0 .. \frac{M}{2} \qquad SpecWin\_dB_k := 20\cdot\log\left(\frac{|SpecWin_k|}{|SpecWin_0|} + 0.0000001\right)$$