Channel Filtering FIRs (Interpolate Between Rate 1/2 Filters)

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$jx := 2 \cdot \pi \cdot \sqrt{-1}$

$N := 35$ Number of Taps to Use in FIR

$pp := 0 .. N - 1$

$\beta := 1.5$ $I0const := I0(\beta)$ Kaiser Filter Parameter

$fc := \frac{N}{2}$

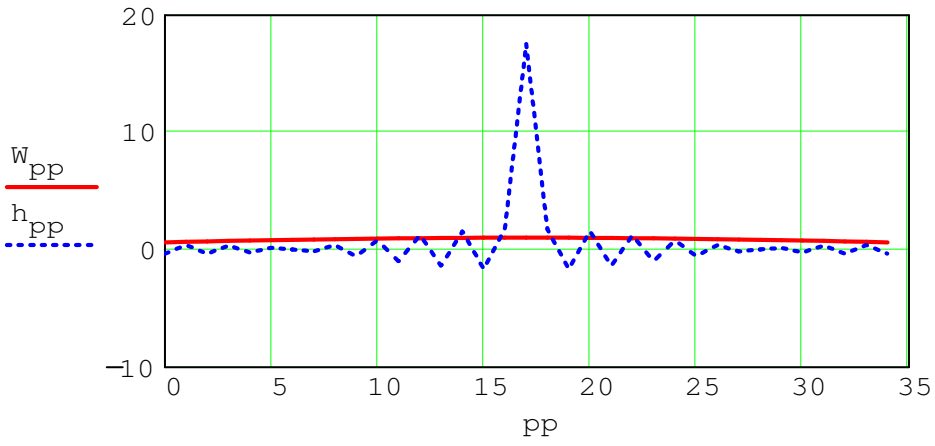
$Nx := \frac{N}{2 \cdot 0.9091}$ Bandwidth Determining Factor > N/2

$ni_{pp} := -\frac{N-1}{2} + pp + 0.0001$

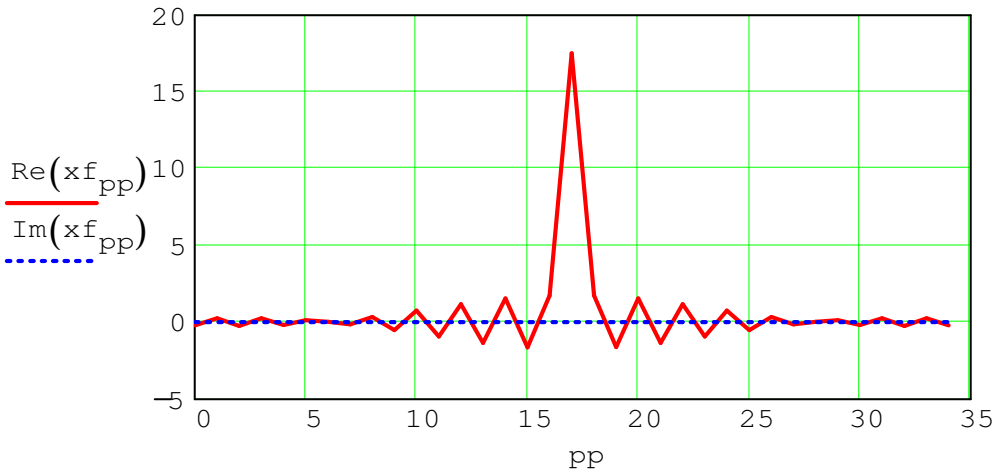
$W_{pp} := \frac{I0\left[\beta \cdot \sqrt{1 - \left[\frac{2 \cdot ni_{pp}}{(N-1)}\right]^2}\right]}{I0const}$

$h_{pp} := \frac{\sin\left(\pi \cdot fc \cdot \frac{ni_{pp}}{Nx}\right)}{\pi \cdot \frac{ni_{pp}}{Nx}}$

$h_{\left|\frac{N-1}{2}\right|} := fc$



$xf_{pp} := W_{pp} \cdot h_{pp}$ Apply Kaiser window to desired response



$mm := 0 .. N - 1$

$$FT_{pp} := \sum_{mm} \left[xf_{mm} \cdot e^{\left(\frac{jx \cdot mm \cdot pp}{N} \right) \cdot (-1)} \right]$$

$Mag_{pp} := |FT_{pp}|$

$mmax := max(Mag)$ $mmax = 20.16035$

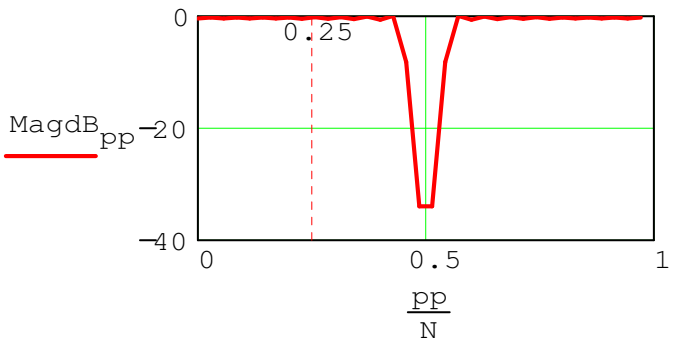
$$Mag_{pp} := \left(\frac{|FT_{pp}|}{mmax} \right)^2 \qquad MagdB_{pp} := 10 \cdot \log(Mag_{pp})$$

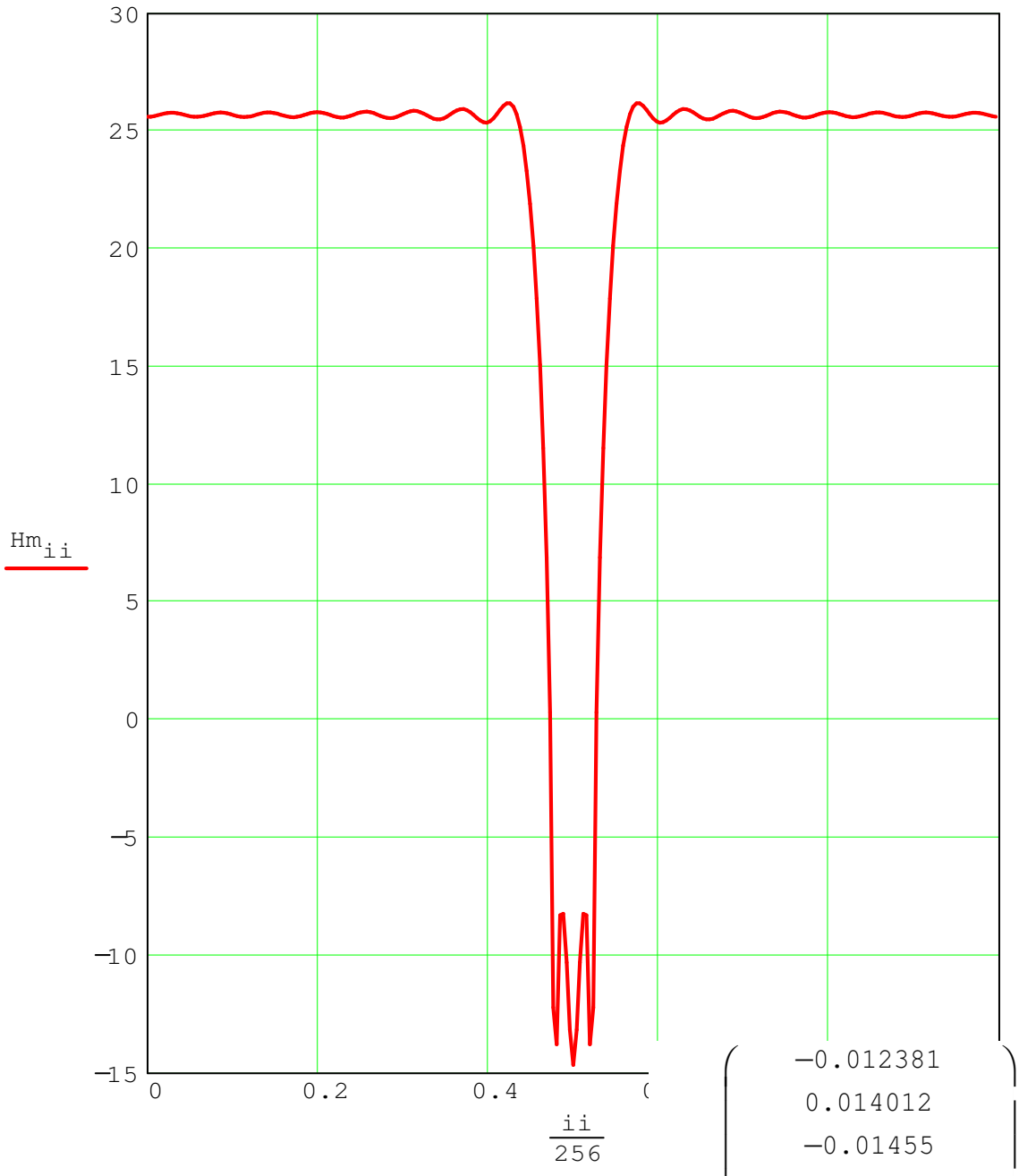
$ii := 0 .. 255$

$$z_{ii} := e^{jx \cdot \frac{ii}{256}}$$

$$H_{ii} := \sum_{pp} \left[xf_{pp} \cdot (z_{ii})^{-pp} \right]$$

$Hm_{ii} := 10 \cdot \log\left[(|H_{ii}|)^2 \right]$





$$\begin{pmatrix} -0.012381 \\ 0.014012 \\ -0.01455 \\ 0.01365 \end{pmatrix}$$

$$\begin{vmatrix} -0.01103 \\ 6.502236 \times 10^{-3} \\ 7.478101 \times 10^{-7} \\ -8.40528 \times 10^{-3} \end{vmatrix}$$

Look at Noise Bandwidth

$$BW := \frac{\sum_{pp} Mag_{pp}}{N}$$

$BW = 0.819138$

$xfmax := max(xf)$

$xf_{pp} := \frac{xf_{pp}}{xfmax}$

$$xf = \begin{pmatrix} 0.018491 \\ -0.029893 \\ 0.042124 \\ -0.054597 \\ 0.066666 \\ -0.077675 \\ 0.087 \\ -0.094103 \\ 0.098589 \\ 1 \\ 0.098377 \\ -0.09401 \\ 0.086951 \\ -0.077651 \\ 0.066658 \\ -0.054599 \\ 0.042134 \\ -0.029907 \\ 0.018507 \\ -8.421405 \times 10^{-3} \\ 1.570525 \times 10^{-5} \\ 6.489422 \times 10^{-3} \\ -0.01102 \\ 0.013643 \\ -0.014546 \\ 0.014011 \\ -0.012381 \end{pmatrix}$$