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

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

$N := 31$ Number of Taps to Use in FIR

$pp := 0 .. N - 1$

$\beta := 4.0$ $I0const := I0(\beta)$ Kaiser Filter Parameter

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

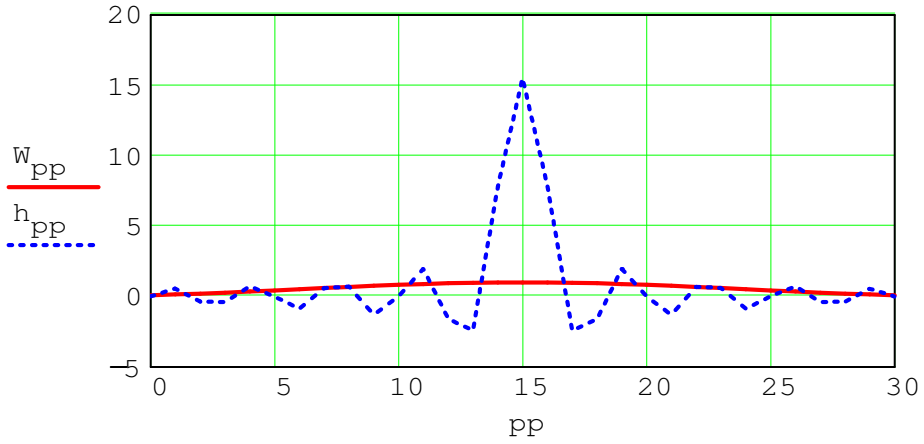
$Nx := \frac{N}{2 \cdot 0.6}$ Bandwidth Determining Factor > N/2

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

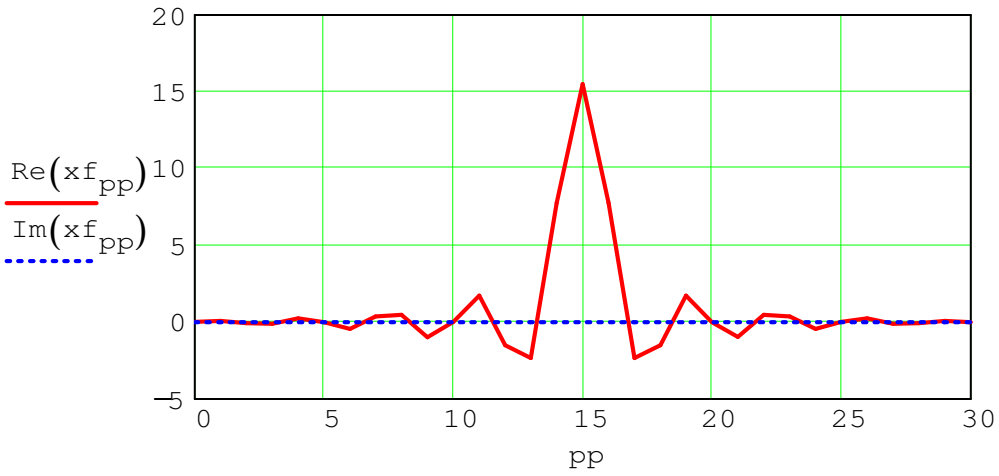
$W_{pp} := \frac{I0\left[\beta \cdot \sqrt{1 - \left[\frac{2 \cdot ni_{pp}}{(N-1)}\right]^2}\right]}{I0const}$

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

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



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



$mm := 0 .. N - 1$

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

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

$mmax := max(Mag)$ $mmax = 25.897055$

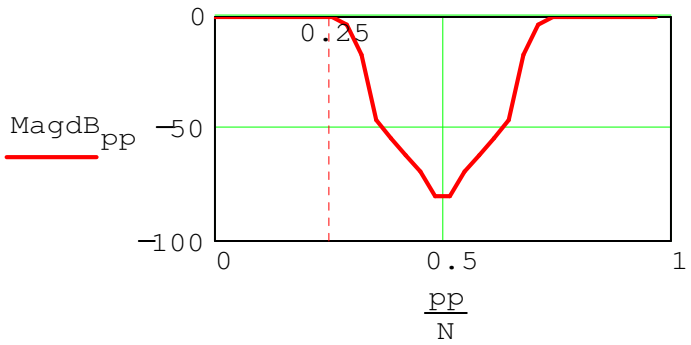
$$Mag_{pp} := \left(\frac{|FT_{pp}|}{mmax} \right)^2 \qquad MagdB_{pp} := 10 \cdot \log(Mag_{pp})$$

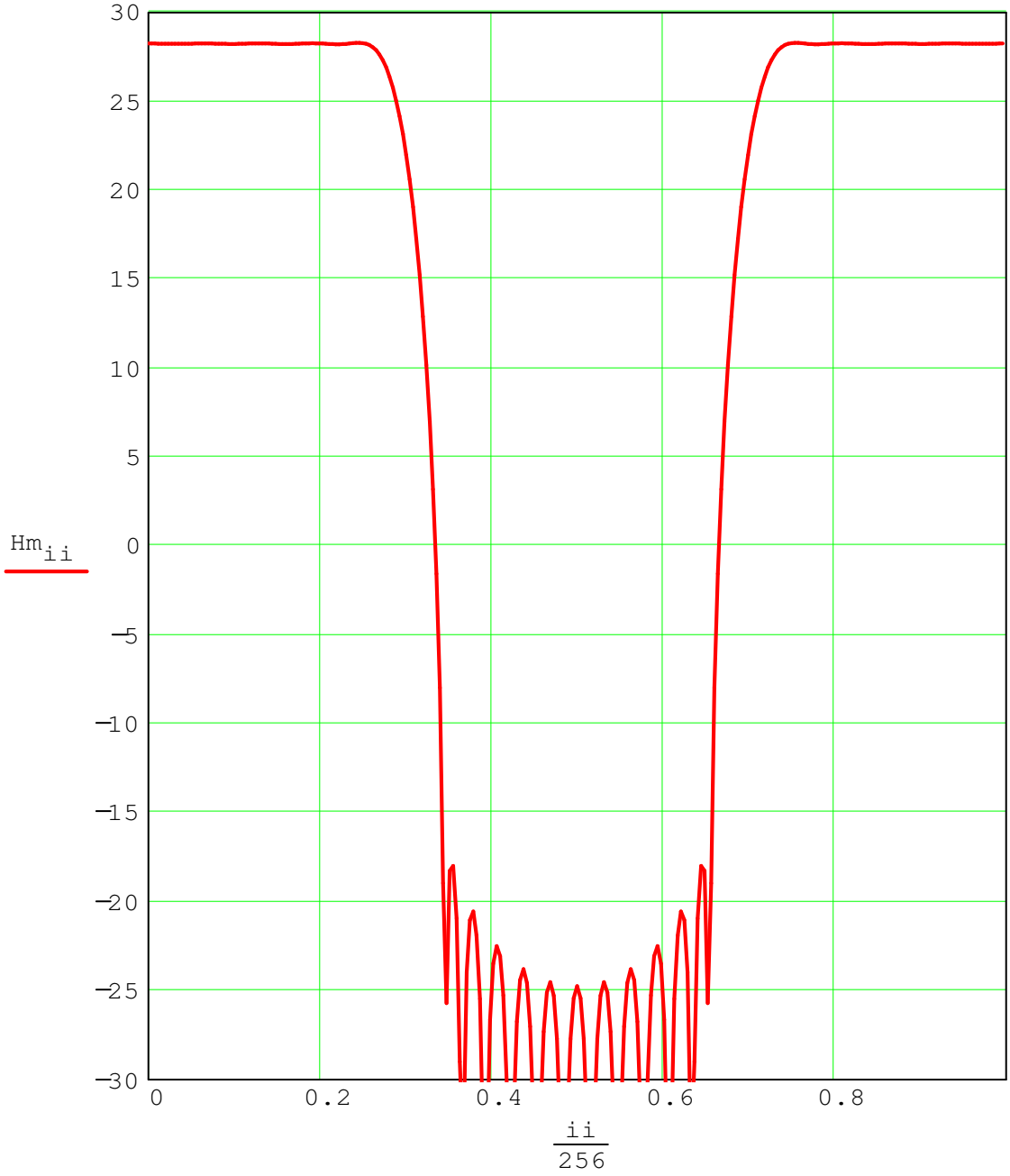
$ii := 0 .. 255$

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

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

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




30
25
20
15
10
5
0
−5
−10
−15
−20
−25
−30
Hm ii
0
0.2
0.4
0.6
0.8
ii
256

Look at Noise Bandwidth

$Hm_{ii} := |H_{ii}|$

$Hmax := \max(Hm)$

$$BW := \frac{\sum_{ii} (|H_{ii}|)^2}{256 \cdot Hmax^2}$$

$BW = 0.571279$

$$xft := \sum_{pp} |xf_{pp}|$$

$$xfn_{pp} := \frac{xf_{pp}}{xft}$$

Absolute Sum = 1
for Coefficients