



$$i := 0 \dots \text{npoints} - 1 \quad N \equiv 20$$

$$x_i := \frac{1}{2^{N-1}} \text{round} \left(0.5 \cdot \sin \left(2 \cdot \pi \cdot \frac{f}{F_s} \cdot i \right) \cdot 2^{N-1} \right)$$

$$a = \begin{pmatrix} 0.006666 \\ 0.819361 \\ 0.319279 \\ 0.068318 \\ 0.006666 \end{pmatrix} \xrightarrow{a := \text{round} \left(\frac{a}{a_4} \cdot 2^{N-1} \right)} a = \begin{pmatrix} 524288 \\ 64447641 \\ 25113165 \\ 5373592 \\ 524288 \end{pmatrix}$$

$$\text{sigmaDelta}(x) := \left| \begin{array}{l} R \leftarrow \text{stack}(0,0,0,0) \\ \text{for } k \in 0 \dots \text{last}(x) \\ \quad y_k \leftarrow \text{signum}(R_3) \\ \quad R \leftarrow \begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix} \cdot R + \begin{pmatrix} a_0 & -a_4 \\ 0 & -a_3 \\ 0 & -a_2 \\ 0 & -a_1 \end{pmatrix} \cdot \begin{pmatrix} x_k \\ y_k \end{pmatrix} \end{array} \right| y$$

$$y := \text{sigmaDelta}(x)$$

$$k := 0 \dots \text{nfft} - 1 \quad v_k := y_k$$

$$sp := \text{CFFT}(v)$$

$$sp := \text{submatrix} \left(sp, 0, \frac{\text{last}(sp) - 1}{8} - 1, 0, 0 \right)$$

$$k := 0 \dots \text{last}(sp) - 1 \quad \text{peak} := 20 \log(|sp|) \quad \text{peak} = -11.194$$

$$a_k := 20 \log(|sp_k| + 10^{-15}) - \text{peak}$$

