Pulsar Dispersion Modeling

Sample Frequency = $Fs := 400000$ $N := 2000$

$DM := 56.79$ $BW := Fs$ $BW = 4 \cdot 10^5$

$n := 0, 1 .. N - 1$

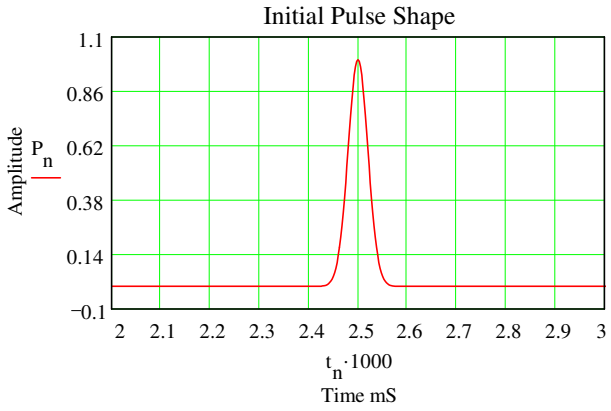
Create a normal distributed pulse shape

$t_n := \frac{n}{Fs}$

$Width := .0001$

$\sigma := \frac{Fs \cdot Width}{5}$ $\sigma = 8$

$P_n := \sqrt{2 \cdot \pi} \cdot \sigma \cdot dnorm\left(n, \frac{N}{2}, \sigma\right)$



Add ISM Dispersion

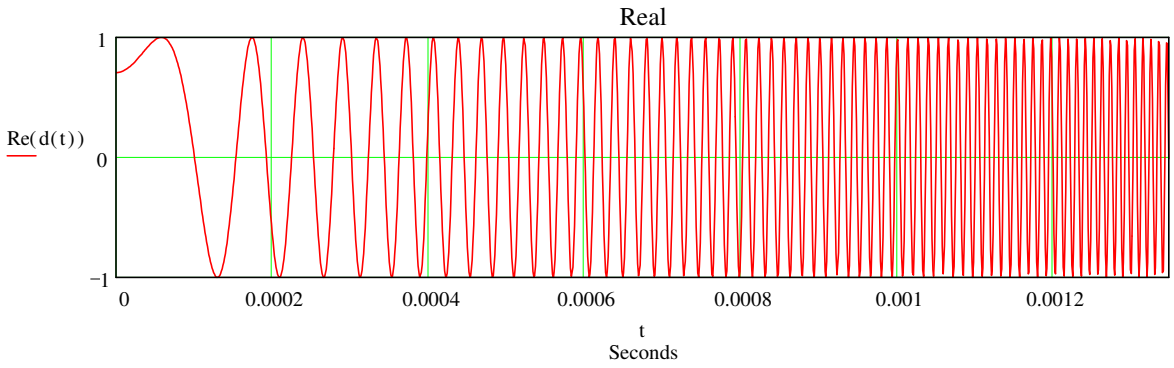
Observation Center Freq $fc := 327000000$

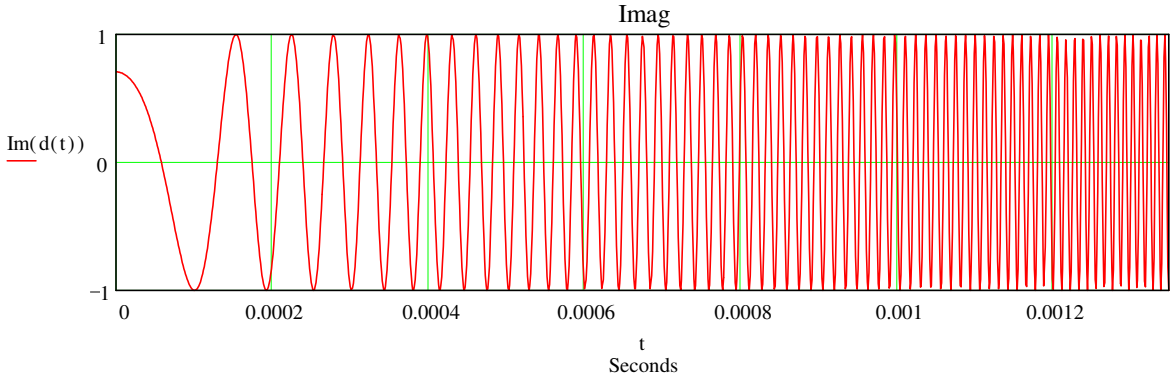
$$\alpha := -\frac{fc^3 \cdot 10^6}{8.3 \cdot 10^{-6} \cdot DM \cdot 10^{27}} \qquad \alpha = -7.41811 \cdot 10^7 \qquad Tmax := \frac{BW}{|4 \cdot \alpha|} \qquad Tmax = 0.00135$$

$t := 0, .000001 .. Tmax$

ISM Chirp Impulse Response Dispersion Model("Chirp", D.C. Backer,1997)

$$d(t) := \exp\left[j \cdot \left(\pi \cdot \alpha \cdot t^2 + \frac{\pi \cdot \alpha^2 \cdot t^3}{fc} + \frac{\pi}{4} \right) \right]$$





Create Dispersed Pulse by Convolving P with D

$KMAX := floor(Tmax \cdot Fs)$ $\quad k := 0, 1 .. KMAX - 1$ $\quad KMAX = 539$

$$D_k := \frac{d\left(\frac{k \cdot Tmax}{KMAX - 1}\right)}{\left(\frac{KMAX}{10}\right)}$$

$m := KMAX .. N - 1$

$$PD_m := \sum_k P_{m-k} \cdot (D_k)$$

$$t_m := \frac{m}{Fs}$$