Notebook Screen Capture

Example: Pulse Train PSD

The power spectrum for a pulse train of the form

$$x(t) = A \sum_{k=-\infty}^{\infty} \Pi\left(\frac{t - kT_0}{\tau}\right),\ f_0 = 1/T_0$$

has Fourier coefficients $X_n = f_0\, P(nf_0)$, where since $p(t) = A\Pi(t/\tau)$, $P(f) = A\tau\text{sinc}(f\tau)$. So

$$P_x(f) = \sum_{n=-\infty}^{\infty} |X_n|^2 \delta(f - nf_0) = A^2\tau^2 f_0 \sum_{n=-\infty}^{\infty} |\text{sinc}(n\tau f_0)|^2\, \delta(f - nf_0)$$

- Plot the power spectrum for $f_0 = 100$ kHz, $A = 10$, and $\tau f_0 = 0.25$, for $-5 \leq f \leq 5$ MHz

```
n_PT = arange(0,50+1) #
# Just need to load n >= 0 spectrum values
Sx = (10**2)*(.25**2)*1/100e3*(sinc(n_PT*0.25)**2)
# Sx[0] = ? # Load the proper DC value if needed
f_PT = n_PT/10 # units of MHz since harmonics multiples of 100 kHz
#ssd.line_spectra(f_PT,Sx,'mag',lwidth=1,fsize=(7,2))
ssd.line_spectra(f_PT,Sx,'magdB',lwidth=1,floor_dB=-160,fsize=(7,2))
title(r'Pulse Train Power Spectrum for $A=10$, and $f_0 = 100$KHz')
xlim([-5,5])
ylabel(r'PSD (dB)');
xlabel(r'Frequency (MHz)');
```