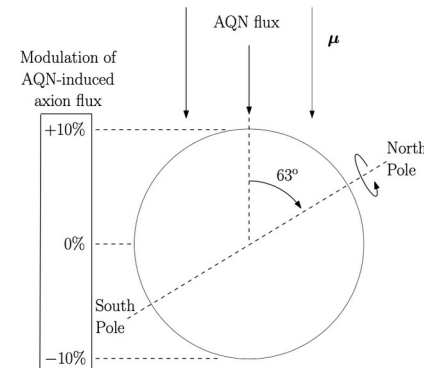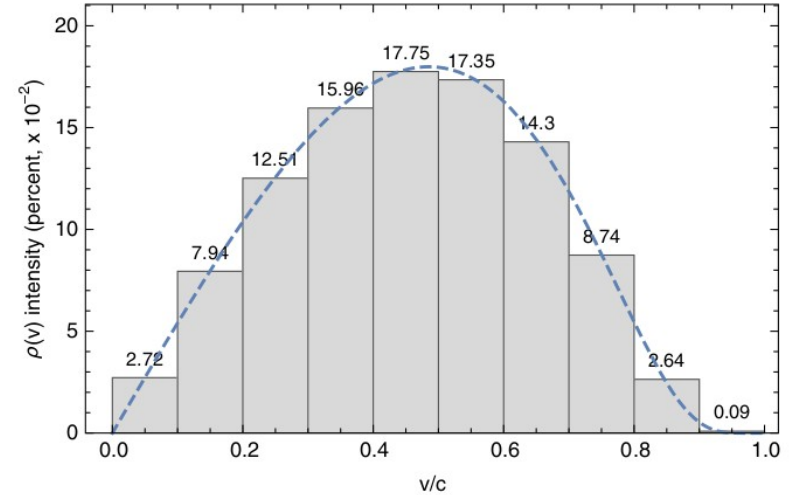- Axions Quark Nuggets are a version of the quark nugget model proposed by Zhitnitsky (2003)

- Can explain why $\Omega_{DM} \approx \Omega_{vis}$

- These axions have much broader spectral distribution $v_{avg} \approx 0.5\,c$

- Composite nature of AQN's means that as they pass through the earth Axion production rate will change and this leads to daily modulation

Axion Cavity Simulation

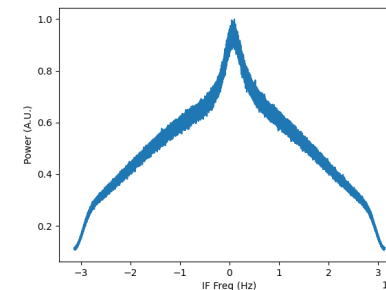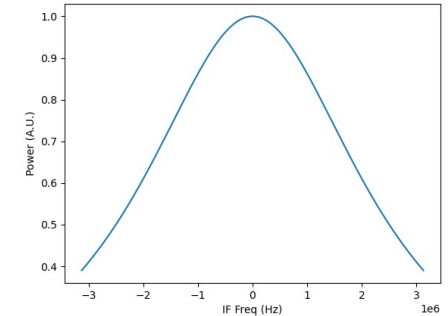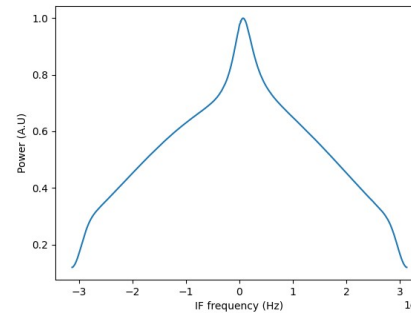Spectra are created by first generating the no signal spectra

Then the expected axion signal in the cavity is added.

The signal is modulated by a cosine factor for the day to simulate daily modulation
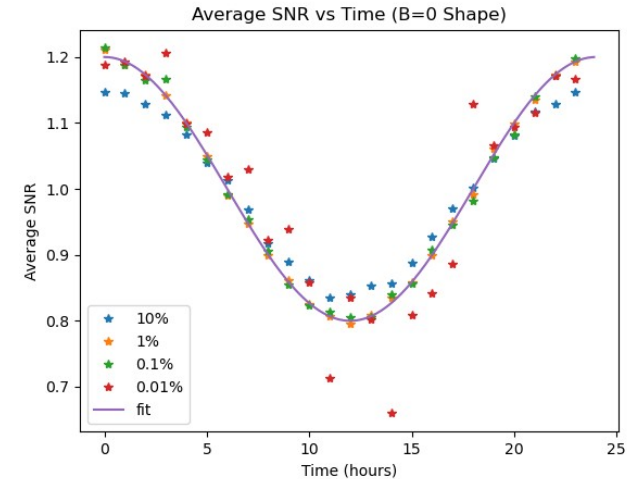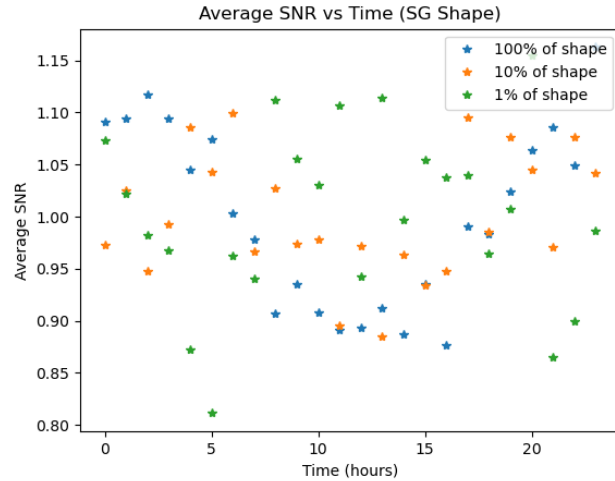

$$P_{cav} = U_0 \left(\nu_{ci} \frac{\beta_i}{1 + \beta_i} C_i \frac{Q}{1 + [2(\nu_{ij} - \nu_{ci})/\Delta\nu_{ci}]^2} \right)$$

$$P_{mod} = A\cos(2\pi t/T - \phi) + C$$

$$P_{tot} = P_{cav} G_p(f_a, \Delta f_a) P_{mod} + P_{shape}\sigma(1, 1/\sqrt{t\Delta\nu})$$

Simulation Results

Average SNR vs Time (SG Shape)

Average SNR vs Time (B=0 Shape)

Key take away: SG fit degrades signal quality
rapidly
B=0 Cavity Shape retains signal quality