A search for unvirialized axions in ADMX run 1b

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Shriram Jois (for the ADMX collaboration)

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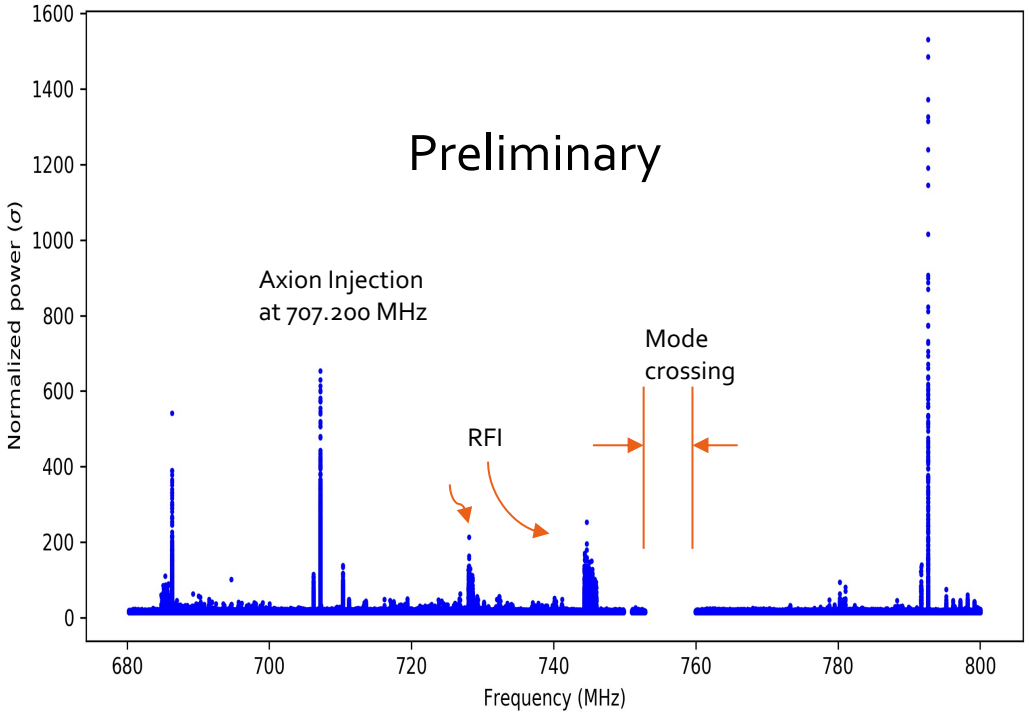
Run 1b analysis review

14σ cut on power $\longrightarrow$ produced 429,978 triggers from 91,328 scans.



Removed data with a Q < 10,000 and Q>120,000.

Data with frequency less than 677.9 MHz and 808.1 MHz were removed.

Removed the synthetic axion injections and RFI signals

Triggers that persisted in at least 30% of the scan were either at 686.6 MHz or 792 MHz, neither of these followed a Lorentzian line shape and therefore removed.

Alex Hipp gave a detailed overview of HiRes and run 1c yesterday

Exclusion plot

Power due to axion conversion can be related to noise power measured,

$$P_E \varepsilon = g^2{}_{a\gamma\gamma} \frac{\rho_a}{m_a} B_0{}^2 V C_{010} Q_L$$

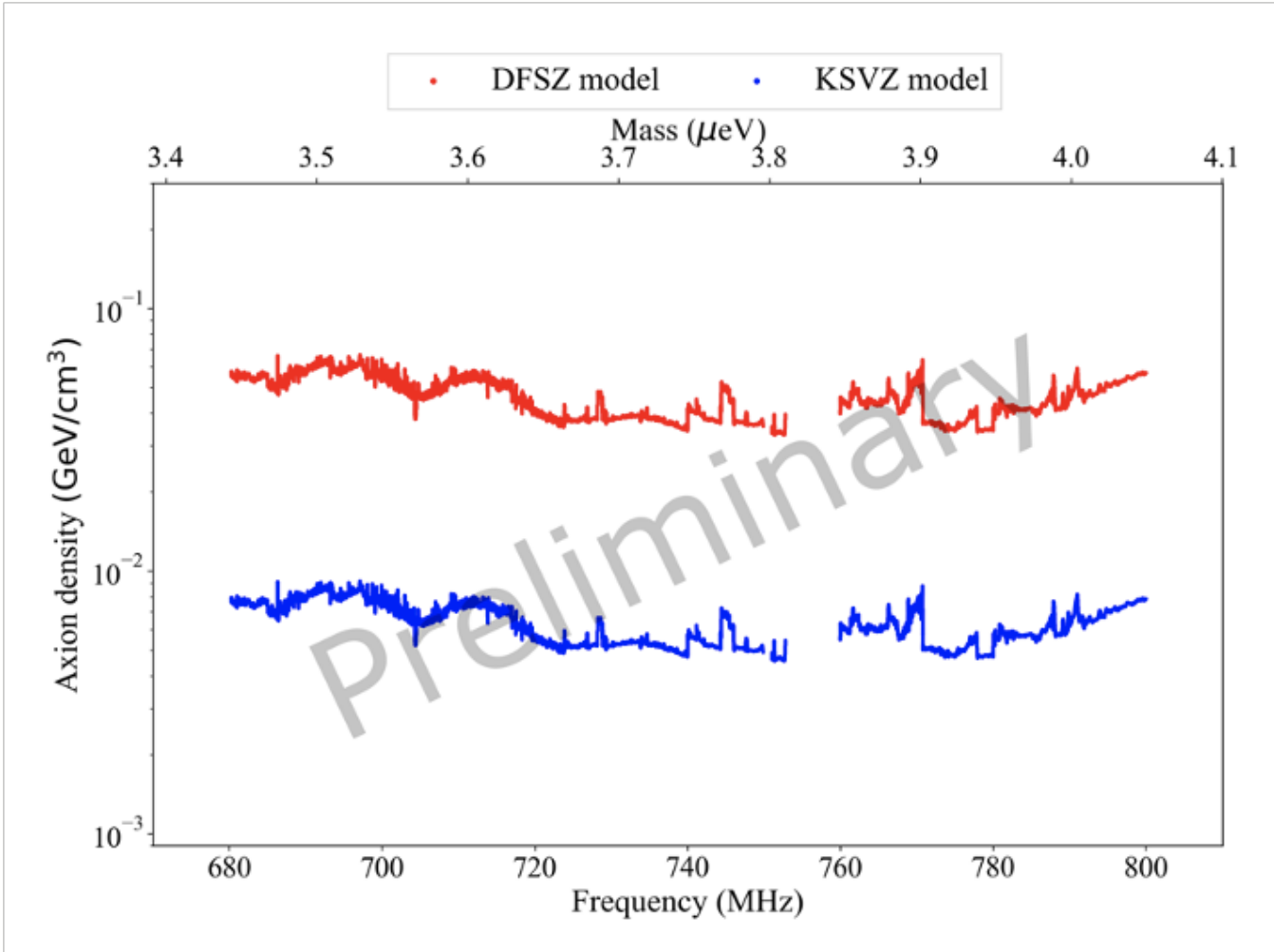
ε is the effective contribution. This includes,

- 50 % of the power gets deposited in the walls
- All the axion power is not in a single bin
- Axion signal moves as the cavity frequency is tuned

I set the limit on the axion density using,

$$\frac{\rho}{\rho_a} = \left(\frac{12\varepsilon kTb}{3.3\times 10^{-23}\mathrm{W}}\right)\left(\frac{0.4}{C_{010}}\right)\left(\frac{0.36}{g_\gamma}\right)^2\left(\frac{740\,\mathrm{MHz}}{f}\right)\left(\frac{45000}{Q}\right).$$

Exclusion plot



Summary

- HiRes looks for axion flows that are due to late in-fall into the galaxy and are not sufficiently thermalized.
- Run 1b high resolution search covered 677.9 MHz and 808.1 MHz. Alex Hipp is working on run 1c at UF. (yesterday's talk).
- We included the effect of doppler shift on the axion signal in run 1b analysis.
- The exclusion limit for the hires data was set on the fraction of the axion flow that are not virialized.

circa 2018