A search for unvirialized axions in ADMX run 1b

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Run 1b analysis review

14σ cut on power → 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
Power due to axion conversion can be related to noise power measured,

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

\(\varepsilon\) 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,

\[
\frac{\rho}{\rho_a} = \left( \frac{12\varepsilon kT b}{3.3 \times 10^{-23} \text{W}} \right) \left( \frac{0.4}{C_{010}} \right) \left( \frac{0.36}{g_\gamma} \right)^2 \left( \frac{740 \text{MHz}}{f} \right) \left( \frac{45000}{Q} \right).
\]
Exclusion plot

[Graph showing exclusion plot with two models: DFSZ and KSVZ. The x-axis represents frequency (MHz) ranging from 680 to 800, and the y-axis represents axion density (GeV/cm$^3$) on a logarithmic scale from $10^{-3}$ to $10^{-1}$.]
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.