

CAST-CAPP DETECTOR PROJECT

15TH PATRAS WORKSHOP ON AXIONS, WIMPS AND WISPs

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ON BEHALF OF CAST COLLABORATION



THE CAST DIPOLE MAGNET

LHC prototype

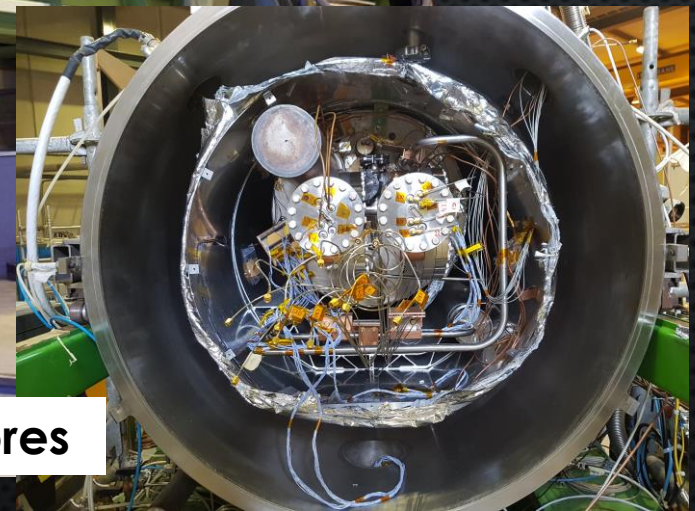
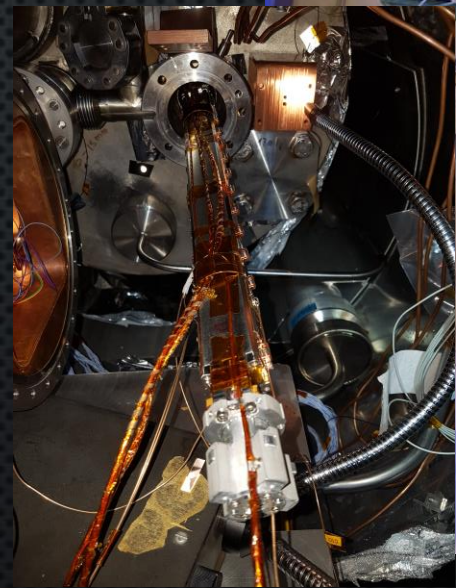
9T magnetic field

1.8K temperature

9.25m magnetic length

$$P \approx g_{agg}^2 \left(\frac{r_a}{m_a} \right) B^2 \cdot Q \cdot V \cdot C$$

~43mm twin bores



CAST-CAPP RF CAVITIES

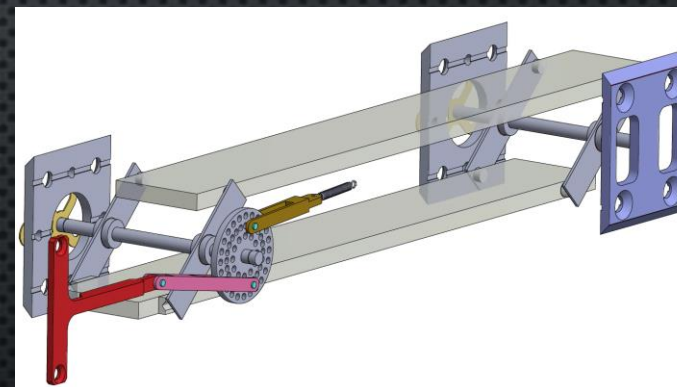
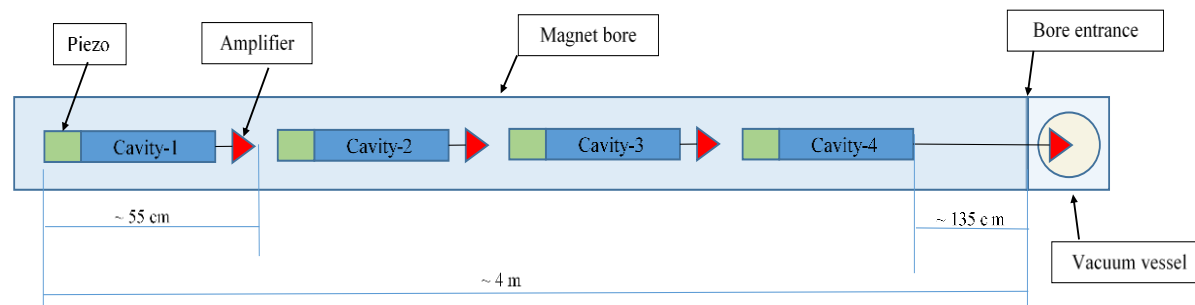
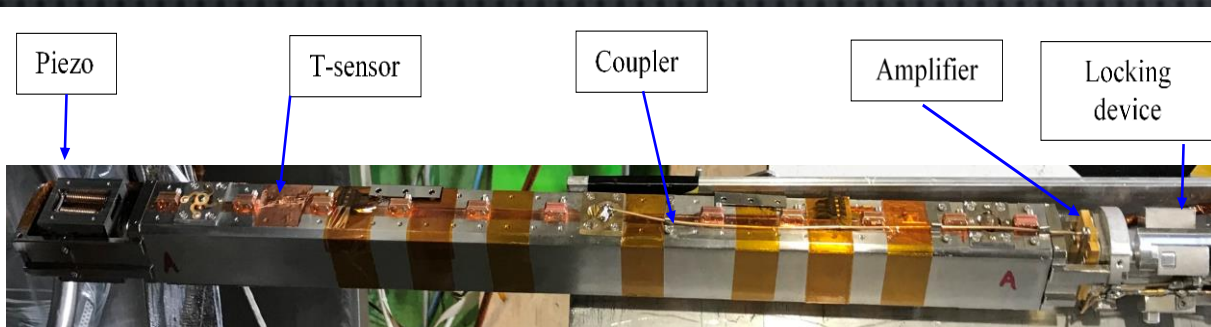
CAVITIES:

4 tunable rectangular stainless steel cavities 25x24x390mm
electroplated with $\sim 30\mu\text{m}$ copper ($Q_L \sim 10000$)

TUNING:

Sapphire tuning plates moving through a stepper motor

Range: $\sim 400\text{MHz}$ (5.1 – 5.5GHz)



STREAMING DARK MATTER AXIONS

Flux can be temporally enhanced due to solar gravitation lensing by up to 10^{11}

Method 1:

Fast Resonant Frequency Tuning

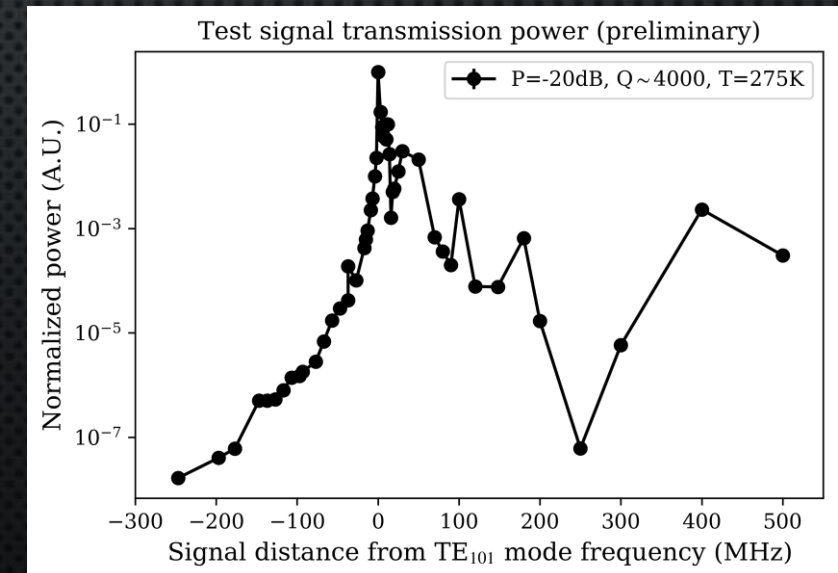
- The faster the scanning the shorter dense axion burst can be utilized
- 30sec/5MHz \rightarrow 40min/400MHz



Method 2:

Wide Band Scanning

- Lorentzian shape of resonance
- Sensitivity away from resonance is decreased by factor Q^2



FIRST RESULTS – FUTURE PLANS

Fixed Frequency:

- 134h (2018 run)
- 27h (2019 test run)

Frequency Tuning:

- 240MHz within 260min (2019 test run)

- 4 Phase marched cavities with fast scanning mode
- Simultaneous search for conventional & streaming DM axions
- Sensitivity limit is shown for ~2yrs of data-taking

