

Development of (high-temperature) superconducting radio frequency cavities and their performance in high magnetic fields

Publications:

Axion searches with microwave filters: the RADES project

<https://iopscience.iop.org/article/10.1088/1475-7516/2018/05/040>

Scalable haloscopes for axion dark matter detection in the 30 μeV range with RADES

<https://inspirehep.net/files/729c41e4d1255ccec0d577220dee65be>

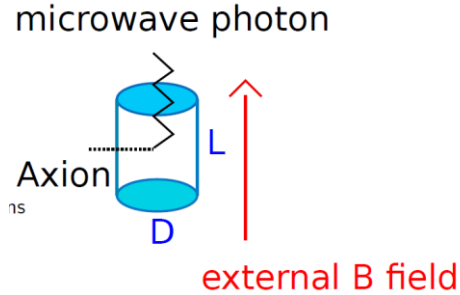
Presenter on behalf of the RADES group:

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RADES: Axion haloscope

search for Dark Matter Axions with a cavity + strong magnetic field



$$\mathcal{F} \sim g_{Ay}^4 Q T_{sys}^{-2} V^2 G^4 m_A^2 B^4$$

Increase Q
copper coating \rightarrow
superconducting
coating

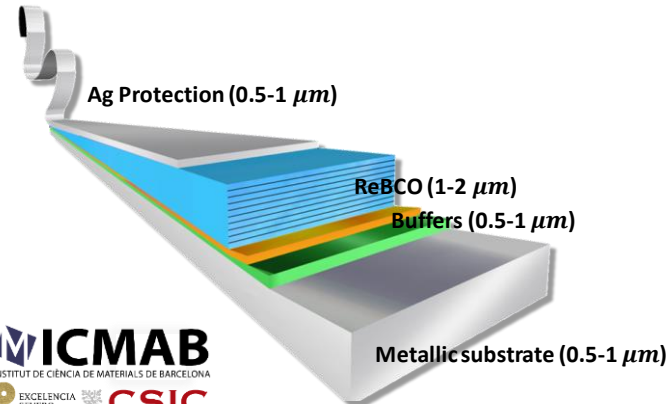
Requirement:
High quality factor
in a high magnetic
field

Coating material/
methods:

Nb₃Sn coating

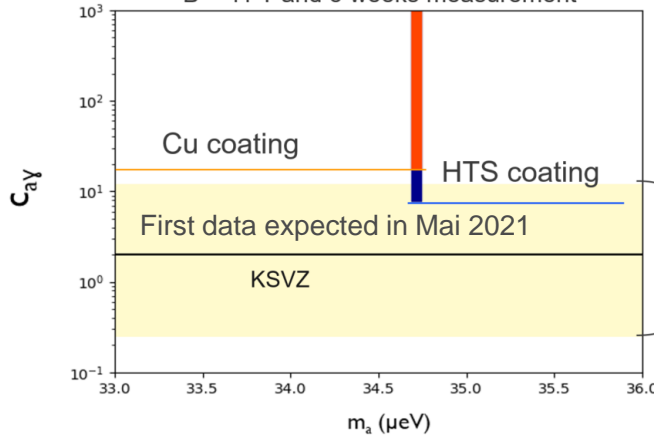
ReBCO coating
 \rightarrow first buffer layer successful applied

ReBCO tape \rightarrow scalable
ICMAB technology to strip of Cu and Ag layers
REBCO layer is exposed to the RF fields

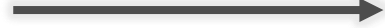


New cavity design optimized for superconducting coatings

Sensitivity RADES improved cavity
B = 11 T and 5 weeks measurement

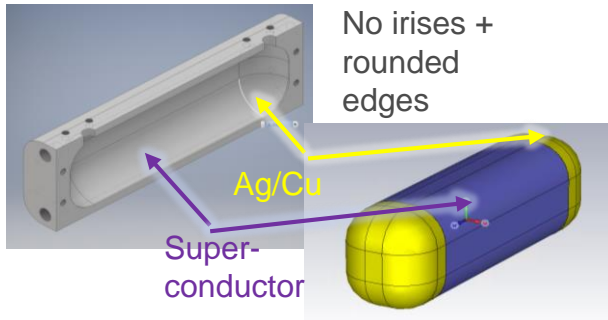
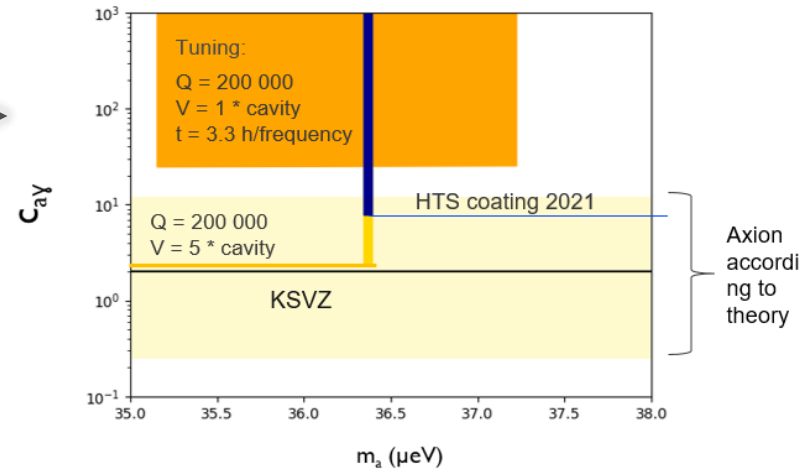


Plans during current
PBC mandate



- Tuning 500 MHz
- Increase volume
- Improve coating techniques

Sensitivity RADES improved cavity
B = 11 T and 5 weeks measurement



Technology would be relevant for:

- axion haloscopes as it increase the sensitivity
- accelerators using superconducting magnets, for example FCC
- HTS radio frequency accelerating cavities for pulsed linacs