

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 collaboration:

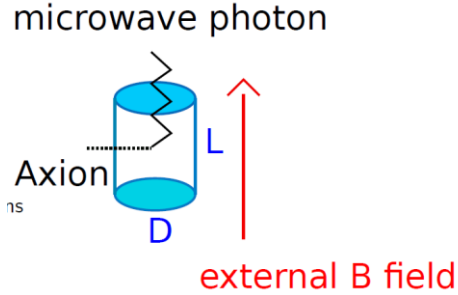
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RADES: Axion haloscope

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 →
superconducting
coating

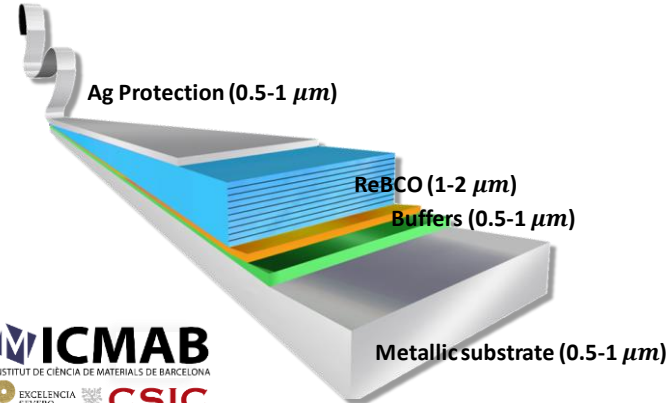
Requirement:
High quality factor
in a high magnetic
field

Coating material/
methods:

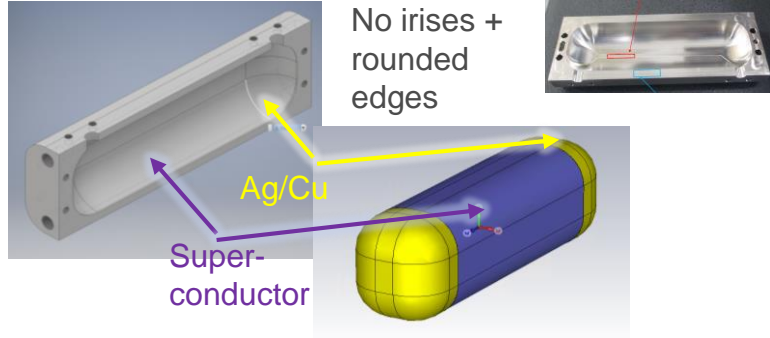
Nb₃Sn coating

ReBCO coating
→ first test with coating by THEVA in
10/2020

ReBCO tape → 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



Investigations:

- Characterization of 3 cavities with sc coating down to 4 K
- Characterization in magnetic fields up to 11 T

Improvement:

- Expected improvement of the Q up to a factor of 5 in a 9 T magnetic field compared to copper

Technology would be relevant for:

- axion haloscopes as it increase the sensitivity
- for accelerators using superconducting magnets, for example FCC

