11th International Workshop on Thin Films and New Ideas for Pushing the Limits of RF Superconductivity - TFSRF2024

Contribution ID: **69** Type: **not specified**

Microwave Vortex-dynamics Characterization in Nb3Sn under High Magnetic Fields

Tuesday 17 September 2024 12:41 (23 minutes)

"Nb3Sn coatings in accelerating cavities have been proposed as an alternative to drastically reduce the overall cryogenic cost in modern SRF complex accelerators. Furthermore, Nb3Sn films are among the candidates conceived to cover the interior of superconducting cavities for the search of axions (haloscopes). Thus, there is noticeable interest in assessing the superconducting properties of Nb3Sn films in very different conditions: while the SRF cavity operates in the vortex-free (Meissner) state, the vortex (mixed) state is unavoidable in haloscopes, where the axion-photon power conversion benefits from high magnetic fields.

In this work, the microwave (~[8-27] GHz) vortex-motion in high static magnetic fields (up to ~12 T) is thoroughly studied in Nb3Sn samples grown with different techniques: high isostatic pressure sintering (HIP), vapor diffusion (VD), and DC magnetron sputtering (DCMS). Using dielectric loaded resonators, dual frequency surface impedance measurements are exploited to obtain both the transport properties of the finite-thickness coatings and the main vortex parameters.

The results lead to discrete conclusions: the polycrystalline HIP bulk sample presents clear signs of collective pinning. In the VD sample, the collective pinning regime is exceeded at relatively low fields, above which the flux line lattice sets into motion against the weak opposition of point pins, as described by the phenomenological Dew-Hughes model. In the DCMS sample, the preliminary results show an exponential increase of the surface resistance from the vortex penetration, whose characteristic field is seen as the dephasing field of the Josephson junction network of grain boundaries.
This work has been supported by:
- INFN CSN5 project SAMARA;
- European Union's IFAST collaboration H2020 Research and Innovation Programme under Grant Agreement no.101004730;
- the United States Department of Energy, Office of Science under Contracts DE-AC05-06OR23177 and DE-AC02-07CH11359."

Presenter: Dr VIDAL GARCIA, Pablo (Roma Tre University)

Session Classification: Beyond Nb: Alternate materials and mulilayer structures

Track Classification: Beyond Nb: Alternate materials and multilayer structures