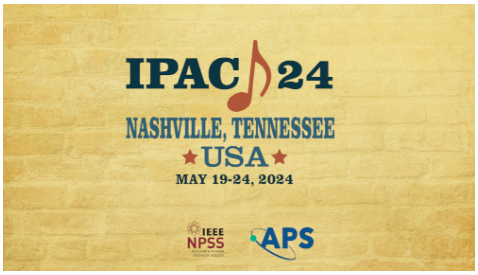

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Investigation of onset field variations in diversely fabricated samples through field emission scanning microscopy

Thursday, 23 May 2024 16:00 (2 hours)

Current superconducting radio frequency (SRF) cavities are predominantly constructed from high purity niobium which is pushed to its theoretical limit. To enhance future cavity performance by minimizing operational power losses and increasing accelerating field strength, the focus of research must shift to alternative cavity materials. An effective strategy involves depositing superconducting thin films like NbTiN or Nb3Sn on the cavity inner walls. Heat treating NbTiN may further optimize film properties, while modifying the grain size of bulk niobium using fine grained niobium could also improve cavity characteristics.
In this study various samples, including as deposited NbTiN, annealed NbTiN and fine grained Nb are analyzed via a Field Emission Scanning Microscopy (FESM). Current voltage curves allow the determination of onset fields for parasitic field emission. Mapping these fields, at e.g. 1 nA, reveals lateral variations due to thin film inhomogeneities defects or surface contaminations. Additionally, assessing long term surface stability through constant current measurements over an extended
period is crucial for practical cavity applications.

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