

Multiscale numerical modeling of superconducting RF cavities

- **Need:**
 - Accurate modeling of, for example, cavities with Nb3Tn coating (e.g., via sputtering)
 - Requires micrometer-scale resolution for capturing surface roughness
 - > Use boundary element method to avoid costly volumetric meshing and since the relevant RF losses are governed by surface current densities
- **Status:**
 - Our current 2D formulation resolves multiscale PEC cavity geometries with micrometer-scale surface features
- **We are missing:**
 - Modeling of the superconducting material properties
 - Connection of magnetic flux-trapping and surface roughness
- **Proposal:**
 - Extend our boundary element formulation with suitable surface boundary conditions developed by TU Darmstadt (TEMF) group
 - Collaborate with the TEMF group on incorporating magnetic flux trapping and investigating its relation to surface roughness