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Electromagnetic design of a quadrupole resonator for SRF materials at IMP

Monday 22 September 2025 14:30 (3 hours)

Comprehensive RF characterization of superconducting materials in a large range of multiparameters plays a pivotal role in research both on exploring material limits and understanding RF loss mechanism. This is particularly critical for emerging thin-film superconductors such as Nb_3Sn and superconducting-insulator-superconducting (SIS) heterostructures (e.g., NbTiN-AlN-Nb). The Quadrupole Resonator (QPR), originally developed at CERN, employing RF-DC compensation technique to measure surface resistance in a high resolution. A QPR operating at a fundamental frequency of 325MHz is under development at Institute of Modern Physics, CAS, the lower frequency means higher residual resistance sensitivity compared to existing systems at CERN and HZB. In this paper, the electromagnetic optimization following some crucial figure of merits will be showed, including avoiding (Δf = f_QPR –f_dipole >5 MHz), multipacting suppression (SEY > 1), and field emission control (B_pk/E_pk). Designs for P_in (input) and P_t (pick-up) couplers are detailed, alongside the cavity fabrication process.

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Footnotes

Funding Agency

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