

Feasibility study for dual higher-order-modes for plasma processing of FRIB superconducting coaxial resonators

Tuesday 27 August 2024 16:00 (2 hours)

In-situ plasma processing is a promising technique to reduce field emission in superconducting radio-frequency cavities and thus maintain maximum accelerator performance for long-term operation. Continuous-wave accelerators such as FRIB are more challenging than pulsed accelerators due to relatively weak coupling ($Q_{\text{ext}} = 2E6$ to $1E7$ for FRIB) via the fundamental power coupler (FPC). This results in an unfavorable mismatch at room temperature and makes fundamental-mode plasma processing difficult. Hence we have investigated the use of higher-order-modes (HOMs) with less FPC mismatch. Several HOMs are promising for lower-mismatch plasma generation. However, HOMs often present a less favorable plasma distribution. To improve the plasma distribution, we are studying techniques to drive the plasma with two HOMs simultaneously. Plasma development results will be presented for FRIB beta = 0.085 quarter wave resonators, including ignition threshold measurements and plasma distribution assessments.

Footnotes

This material is based upon work supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics and used resources of the Facility for Rare Isotope Beams (FRIB) Operations, which is a DOE Office of Science User Facility under Award Number DE-SC0023633.

Funding Agency

Project supported by Department of Energy (DOE) Office of Science User Facility under Award number DE-SC0023633.

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Session Classification: Tuesday Poster Session

Track Classification: MC4: Technology: MC4.8 Superconducting RF