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Plasma Processing of C100 SRF cavities at Jefferson Lab: Experimental Results and Simulation Insights

Wednesday 13 August 2025 16:00 (2 hours)

Plasma processing of superconducting radio frequency (SRF) cavities has been an active research effort at Jefferson Lab (JLab) since 2019, aimed at enhancing cavity performance by removing contaminants and reducing field emission. The work includes plasma treatment of single-cell cavities, cavity pairs, and in-situ processing of cryomodules. Compared to earlier CEBAF cavities (C20/50 and C75), the C100s provide significantly higher accelerating gradients, typically around 19.2 MV/m per cavity. A robust and repeatable plasma processing procedure has been developed for the C100, resulting in significant energy gain, averaging around 2.7 MV/m per cavity.

Ongoing simulations are helping to understand the plasma–surface interactions and the fundamental physics behind the process. These simulations, combined with experimental studies, guide the optimization of key parameters such as gas type, RF power, and pressure to ignite plasm using selected higher-order mode (HOM) frequencies. Different processing gases are being evaluated to improve plasma uniformity and cleaning effectiveness.

This paper presents experimental data from Argon-Oxygen C100 processing, along with results from simulation studies. These combined efforts support the continued development and refinement of plasma processing techniques for SRF cavity performance enhancement.

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No

Would you like to submit this poster in student poster session on Sunday (August 10th)

No

Footnotes

Funding Agency

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Yes

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