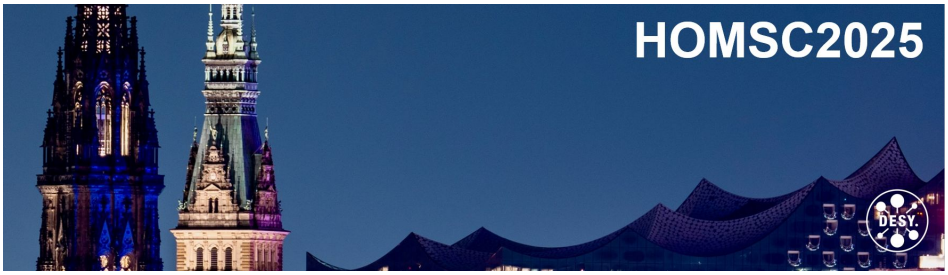

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Design of HOM damped SRF Cavities for CW Operation in Storage Rings

Tuesday 7 October 2025 10:30 (30 minutes)

Currently, superconducting RF (SRF) systems for high-current storage rings are generally limited to low-frequency, moderate voltage, and single-cell cavities. For a new class of cavities to be used in longitudinal beam phase-space manipulation, high-voltage third harmonic multi-cell cavities are required, resulting in very challenging impedance considerations and higher-order mode (HOM) powers of the order of several kW per cavity. Thus, cavity design requires far more attention on the HOM spectrum to be off-resonance with circulating beam harmonics. Special techniques have been developed to analyze the HOM spectrum and damping beyond the standard frequency range, which typically lies at a few GHz, as required by the VSR Demo project. The design of a four-cell 1.5 GHz SRF cavity including end-groups with multi-waveguide damping for a space-saving design capable of handling over 2.5 kW of HOM power per cavity will be presented. These cavities are designed for high-voltage operation with beam currents of at least 300 mA. The advanced optimization technique will be presented covering the control of broadband HOM spectrum as a fundamental part of the SRF cavity design specifications, which is essential for stable operation in storage rings and Linacs with high repetition rates.

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