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Broad Band Waveguide to Coaxial Transition for HOM Suppression in RF Cavities for Future Synchrotron Light Sources

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In the modern storage ring light sources, exploiting multi-bunch beams, the longitudinal and transverse coupled bunch instabilities are predominantly driven by higher order modes (HOM) of the accelerator RF cavities. In order to suppress the HOM to a harmless level, we propose using a modified broadband waveguide to coaxial line transitions placed on the cavity body, similar to those used for the DAΦNE collider RF cavities. Such a solution has a simple design that avoids the application of the ferrite materials under the ultra-high vacuum and dissipates the HOM power on the external loadings. Different from DAΦNE with a single cavity per ring, where the damping waveguides are placed laterally on the cavity body, we consider the possibility of allocating the waveguides vertically. Since the modern synchrotron light sources require using more RF cavities to compensate for the synchrotron radiation losses, such a solution helps to save the occupied space when placing the cavities in a row next to each other. This paper describes the design optimization process and discusses the obtained results concerning the effectiveness of the HOM suppression and minimization of the impact of the transitions on the fundamental mode parameters.

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