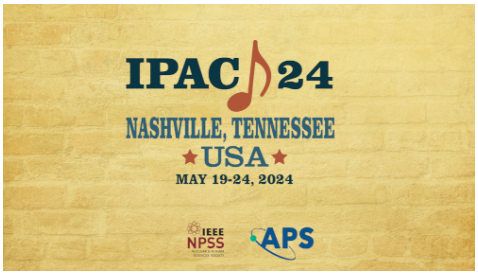

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Impedance evaluation, mitigation, and measurement of ALS-U vacuum components.

Tuesday, 21 May 2024 16:00 (2 hours)

The Advanced Light Source Upgrade (ALS-U) is a 4th generation diffraction-limited soft x-ray radiation source. Coupling-impedance-driven instabilities have been carefully evaluated to ensure meeting the machine's high-performance goals during the design stage. At present, the focus of impedance modeling efforts primarily revolves around supporting beam tests of key components at ALS beamlines and the fabrication of various components. This paper presents impedance measurements of the main RF bellows with the Goubau-Line, as well as thermal evaluations on beam-induced heating on the RF bellows and the booster-to-accumulator ferrite (BTA) kicker on the ALS beamline. One challenge in the impedance modeling of the BTA kicker arises from a 4-micrometer-thick TiN coating, rendering direct modeling in CST challenging. To address this, we employed the ImpedanceWake2D (IW2D) code as an initial step to validate the efficacy of RF shielding. Subsequently, an equivalent model was constructed in CST to calculate the total impedance. We also show the impedance evaluation results and reduction strategies for the keyhole bellows and photon absorbers, incorporating thermal expansion considerations. Notably, the work is essential for successfully commissioning the ALS-U project.

Footnotes

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