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Schottky Diagnostics I

Tuesday 25 November 2025 08:30 (1 hour)

This lecture introduces the theoretical foundations of Schottky spectra as a non-invasive diagnostic method in circular accelerators. Starting from the statistical origin of Schottky noise in coasting and bunched beams, we derive how uncorrelated particle motion gives rise to characteristic spectral structures in the vicinity of revolution harmonics. The formation of synchrotron and betatron sidebands is explained, together with their dependence on fundamental beam parameters such as tune, momentum spread, and chromaticity. Emphasis is placed on the linear, single-particle description of beam dynamics and on how the measured frequency-domain signatures emerge directly from microscopic fluctuations. The lecture aims to provide a clear, self-contained theoretical framework for interpreting Schottky spectra in practical accelerator diagnostics.

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