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Influences of Impedances on Longitudinal Beam Dynamics

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The beam dynamics in a particle accelerator are influenced by its impedances. In particular at high charge densities, the production of coherent synchrotron radiation is governed by the longitudinal impedance. With Inovesa, an in-house developed simulation tool, it is possible to simulate the dynamics of the longitudinal phase space density inside a storage ring by solving the Vlasov-Fokker-Planck equation. A complex example for an impedance induced effect is the micro-bunching instability, driven by the CSR self- interaction. In general, a precise knowledge of real world impedances and their implications is required. In this contribution, we present systematic studies of the effects of various simplified impedances on the observed longitudinal phase space density.

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