Effect of Accelerator Impedance on Electron Cloud Instability[1]

BRIAN ALLEN, PATRIC MUGGLI, University of Southern California, WOL-FRAM FISCHER, MICHAEL BLASKIEWICZ, Brookhaven National Laboratory, THOMAS KATSOULEAS, Duke University — Interaction between a beam and electron clouds (e-cloud) present in circular accelerators is known to limit accelerator performances through instabilities, beam loss, beam-blowup, and the resulting reduced luminosity. The RHIC beam is most susceptible to instabilities as it crosses energy transition (γ_t=22.9) and it is posited that ring impedance could play a role in the development of instabilities during this transition. We use the quasi-static particle in cell code QuickPIC to describe the interaction between the RHIC Au beam and the electron cloud. In QuickPIC the electron cloud density is uniform around the ring and the beam has a constant beta function given by the accelerator circumference and the beam tune. We incorporate in the current QuickPIC version the ring impedance for a circular accelerator and we take a first look at the effect this impedance has on the beam and e-cloud interaction for typical RHIC parameters.

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