PROGRESS IN MEASUREMENT AND MODELING OF ELECTRON CLOUD EFFECTS AT CESR-TA

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Abstract
The synchrotron-radiation-induced buildup of low-energy electron densities in positron and proton storage rings limits performance by causing betatron tune shifts and incoherent emittance growth. The Cornell Electron Storage Ring (CESR) Test Accelerator project includes extensive measurement and modeling programs to quantify such effects and apply the knowledge gained to the design of future accelerator projects. We report on improved measurements of betatron tune shifts along a train of positron bunches, now accurate in both horizontal and vertical planes. Improved electron cloud buildup modeling uses detailed information on photoelectron production properties obtained from recently developed simulations and successfully describes the measurements after determining ring-wide secondary-yield properties of the vacuum chamber by fitting the model to data with a multi-objective optimizer. Cloud splitting in dipole magnetic fields is seen to be the source of horizontal tune shifts decreasing at higher bunch populations.

Tune Shift Measurements

Electron Cloud Simulations

Comparison

Summary

Future Work

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