

Searching for CEsrTA guide field nonlinearities in beam position spectra

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In the positron damping ring for the International Linear Collider, beam lifetime and emittance are limited by the nonlinearity of the magnetic guide field. The nonlinearities are manifested as resonances that can be characterized by studying the spectrum of the beam motion. We have installed 100 precision beam position monitors in the Cornell Electron/Positron Storage Ring (CESR) that allow measurement of the position of the circulating positrons on each of 20,000 successive revolutions. Analysis of the position spectrum yields the strength of the resonances. The relative phase of the spectral components at the beam position monitors that are distributed around the storage give information on the sources of the nonlinear fields. In this project we will analyze the turn by turn beam position data and search for the guide field nonlinearities. We will simulate beam position data in order to develop the analysis. During the CEsrTA machine studies periods scheduled for July, we will collect data. To test our analysis algorithm will introduce nonlinearities and then try to find them in the spectra that we have collect. Finally we will apply the analysis to the unperturbed storage ring.