

CesrTA Low Emittance Tuning

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Low emittance tuning and characterization of electron cloud phenomena are central to the CesrTA R&D program. A small vertical emittance is required in order to be sensitive to the emittance diluting effects of the electron cloud. We have developed techniques to systematically and efficiently eliminate optical and alignment errors that are the sources of vertical emittance. Beam based measurements are used to center the beam position monitors with respect to the adjacent quadrupoles, determine the relative gains of the BPM button electrodes, and measure the BPM tilts, thus allowing precision measurement of transverse coupling and vertical dispersion. Low emittance also requires that the tune plane be relatively clear of nonlinear coupling resonances associated with sextupoles. We report on tests of a sextupole distribution designed to minimize resonance driving terms. We also report on efforts to measure sextupole strengths. Our standard low emittance tuning procedure typically yields sub 20pm emittance in one or two iterations. With tuning, we achieve a vertical emittance of $\epsilon_v \sim 15$ pm at 2.1 GeV.

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