

Design and analysis of a halo-measurement diagnostics

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A large dynamical-range diagnostics (LDRD) design at Jefferson Lab will be used at the FAST-IOTA injector to measure the transverse distribution of halo associated with a high-charge electron beam. One important aspect of this work is to explore the halo distribution when the beam has significant angular momentum (i.e. is magnetized). The beam distribution is measured by recording radiation produced as the beam impinges a YAG:Ce screen. The optical radiation is split with a fraction directed to a charged-couple device (CCD) camera. The other part of the radiation is reflected by a digital micromirror device (DMD) that masks the core of the beam distribution. Combining the images recorded by the two cameras provides a measurement of the transverse distribution with over a large dynamical range. The design and analysis of the optical system will be discussed including optical simulation using SRW and the result of a mockup experiment to test the performances of the system will be presented.

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