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Investigations of a potential 5D detector system for a laserwire instrument on the front end test stand

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A laserwire diagnostic capable of measuring 5D phase space is to be installed on the Front End Test Stand (FETS) at the Rutherford Appleton Laboratory. The FETS beamline is a hydrogen ion source and the laserwire operates on the principle of photodetachment. A conventional transverse laserwire is capable of 4D transverse profiling and emittance reconstruction. The FETS laserwire has a pulse duration shorter than the bunch temporal length enabling longitudinal profiling. A detector capable of measuring the laserwire signal is under development. One scheme being considered is a modular detector system. The initial section of the detector would consist of a scintillator to absorb the incoming beam, emitting photons. Following this an optical system will direct the signal to a CCD. Simulations for the photon production for a range of scintillators are compared. A configuration to remove the CCD from the direct line of the accelerator using an optical transport system is considered along with the impact on potential measurements. The expected signal to the CCD and reconstruction of beam size, temporal distribution, and transverse emittance are presented.

Footnotes

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Paper preparation format

LaTeX

Region represented

Europe

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