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Optimization of the emittance meter for the CSNS C-band photocathode test facility

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To enhance the performance of the next generation of X-ray free electron lasers (XFEL), it is essential to produce a high quality electron beam with a low emittance, for instance, below 0.2 mm mrad for a 100 pC bunch charge. In order to demonstrate the fundamental techniques required for future FEL facilities, a C-band photoinjector test facility has been constructed at the CSNS. A emittance meter based on the consecutive double-slit-scan method has been developed for the purpose of determining the emittance of such small beams. It has been demonstrated that this emittance meter could achieve a satisfactory accuracy when compared to an emittance meter developed using the single-slit-scan method. The primary parameters of the emittance meter have been optimized by numerical simulations with respect to the measured step motor motion accuracy and the expected resolution of the optical observation system.

Footnotes

Funding Agency

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Yes

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