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Orthogonal dual-slit emittance meter for the C-band photocathode RF-gun

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To enhance the performance of next-generation X-ray Free Electron Lasers (XFELs), it is crucial to produce high-quality electron beams with low emittance, particularly for attaining emittances below 0.2 mm.mrad for 100 pC bunch charges. This study introduces an emittance measurement method using an orthogonal dual-slit technique, aimed at enhancing measurement efficiency and achieving the necessary measurement accuracy for such small emittances. An emittance meter based on this method has been designed for a C-band photocathode RF gun at the CSNS campus. Finally, we present numerical simulations to optimize the primary parameters of the emittance meter, focusing on beam drift distance, combined with the motion accuracy of the stepper motor and the expected resolution of the optical observation system to ensure the accuracy of the emittance measurement.

Footnotes

Paper preparation format

LaTeX

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