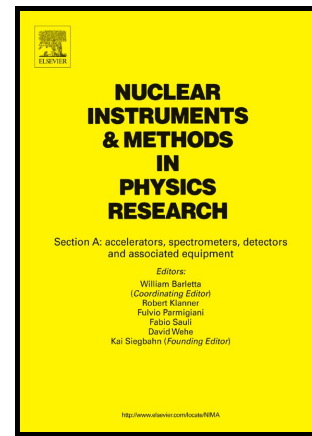


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Investigating the effect of electron emission pattern on RF gun Beam Quality

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Abstract:

Thermionic radio frequency gun is one of the most promising choices to gain a high quality electron beam, used in the infrared free electron lasers and synchrotron radiation injectors. To study the quality of the beam in a compact electron source, the emission pattern effect on the beam dynamics should be investigated. In the presented work, we developed a 3D simulation code to model the real process of thermionic emission and to investigate the effect of emission pattern, by considering geometrical constraints, on the beam dynamics. According to the results, the electron bunch emittance varies considerably with the emission pattern. Simulation results have been validated via comparison with the well-known simulation codes such as ASTRA simulation code and CST microwave studio, as well as other simulation results in the literature. It was also demonstrated that by using a continuous wave laser beam for heating the cathode, the emission pattern full width at half maximum (FWHM) of the transverse emission distribution is proportional to FWHM of the Gaussian profile for the laser beam.

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