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Simulation study of nanostructured plasmonic copper photocathodes

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We present an electromagnetic characterization and beam dynamics study of nanostructured plasmonic copper photocathodes for electron gun applications. The study concentrates on photocathodes operated at ultraviolet and infrared wavelengths. Various types of nanopatterns are explored in order to understand how different geometrical parameters affect light reflectance. Optimized nanostructure geometries show significant plasmonic field enhancement, leading to improved photon absorption and increased quantum efficiency at the target laser wavelength. The results of electromagnetic simulation are used to obtain quantum efficiency spatial distribution on the structured cathode surface. The resulting distribution is used for optically induced emission simulation. Beam dynamics simulation results of the photoemitted electron bunch in the vicinity of the nanostructured cathode are presented, analyzed, and compared to those of a flat photocathode.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

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