Contribution ID: **43** Type: **Contributed talk**

Simulation study of nanostructured copper photocathodes

Friday, 4 October 2024 11:50 (20 minutes)

In this research, we present a detailed electromagnetic characterization and optimization study of nanostructured photocathodes for electron gun applications. The study concentrates on photocathodes operated at visible to infrared wavelengths, for which an accurate simulation model is constructed. For this, we apply a customized dispersion model for the cathode material, which can describe the measured permittivity data over a broad frequency range. Various geometries for nanopatterns are explored in order to understand how different geometric parameters affect cathode reflectivity. The results reveal an optimized model of nanostructured photocathodes, demonstrating improved absorptance at the target laser wavelength. Additionally, the impact of geometrical uncertainties on the reflectance spectra is examined.

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Session Classification: Sessions in Living Room 1+2

Track Classification: B-1 Light Sources and FELs