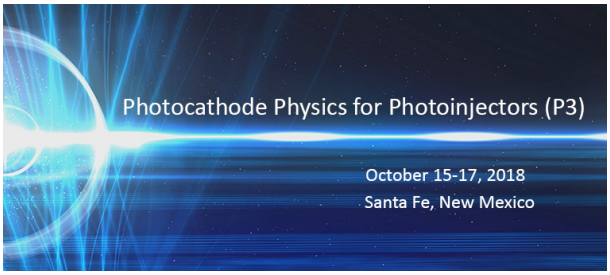

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Modeling quantum yield, emittance and surface roughness effects from metallic photocathodes

Wednesday, 17 October 2018 11:15 (20 minutes)

The thermal limit of the intrinsic emittance of photocathodes represents an important property to measure experimentally and to understand theoretically. Detailed measurements of intrinsic emittance have become possible in momentatron experiments. Moreover, recent developments in material design have allowed growing photoemissive layers with controlled surface roughness. Although analytical formulations of the effects of roughness have been developed, a full theoretical model and experimental verification are lacking. We aim to bridge this gap by developing realistic models for different materials in the three-dimensional VSim particle-in-cell code. We have recently implemented modeling of electron photo-excitation, transport, and emission from photoemissive layers grown on a substrate. We report results from simulations with these models on electron emission from antimony and gold. We consider effects due to surface roughness, density of states, photoemissive layer thickness, and how they affect the spectral response of quantum yield and intrinsic emittance.

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