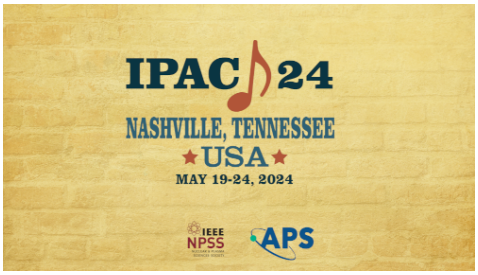

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Monte Carlo study of electron energy losses and stoichiometry effects in thin cesium antimonide photocathodes

Wednesday, 22 May 2024 16:00 (2 hours)

Cesium antimonide photocathodes are known for their ability to generate bright electron beams for various accelerator applications. Lab-grown polycrystalline cesium antimonides as well as Cs1Sb and Cs3Sb crystals are distinguishable; however, it remains unclear how the crystalline and other material properties of each govern the main photocathode properties such as quantum efficiency and mean transverse energy. Furthermore, photoexcited electrons undergo significant energy losses before being emitted from thin cesium antimonide films. This process is not well understood since there is very little room for scattering events within thin films. The generation of ultra-bright electron beams, capable of substantially enhancing the scientific potential of advanced accelerator applications, requires deep understanding of these and other fundamental mechanisms, which constrain photocathode performance and simultaneously determine the maximum attainable beam brightness. The purpose of this work is to use the Monte Carlo approach in a combination with Density Functional Theory to shed light on these mechanisms and provide the guidance for effective photocathode optimization.

Footnotes

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