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Computational Methods for High-Precision Electron Emission[1]
ALISTER TENCATE, BELA ERDELYI, Northern Illinois University — Electron microscopy has demonstrated high quality beams from a single nanotip emitter, and cathodes of structured nanoscale arrays show promise as high-brightness electron sources. These cathodes can additionally be used to produce patterned beams. Optimization of the cathode design for precision applications necessitates a detailed study of the interplay between the structure geometry, quantum mechanical emission mechanism, and electromagnetic interactions between the emitted electrons and with the boundary interface. We are developing a novel computational framework to simulate these processes with the precision to handle the ultracold regime. In this study, we show benchmarking tests of the high-precision emission (HiPE) computational model, including electron generation and emission processes and electromagnetic potential and field calculations due to electrons near the cathode boundary. Simulated emission currents are compared to a nave Fowler-Nordheim model, and to experimentally observed values.

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