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"Update on multi-objective genetic optimizations of the photoinjector for CARIE

Wednesday 4 June 2025 16:00 (2 hours)

We present updated simulation results on the maximum brightness achievable by a 1.6-cell cold copper C-band photoinjector, designed for testing and commissioning as part of the Cathodes and RF in Extremes project at Los Alamos National Laboratory. Previous simulations highlighted the high brightness attainable with a 250 pC bunch charge, attributed to the high accelerating gradients and the benefits of a radially symmetrized photoinjector design. However, these earlier simulations relied on idealized temporal beam profiles, overlooked the temporal evolution of the gradients, and did not account for the influence of cathode plug geometry on the gradients—factors that significantly affect the maximum achievable brightness. In this work, we report the results of Multi-Objective Genetic Optimizations that incorporate more realistic temporal beam profiles and gradients, accounting for both the cathode plug geometry and the effects of time-dependent gradient evolution.

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