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External and Dynamic Gauge Fields in Strong-Field QED

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Understanding nonperturbative regimes in Strong-Field Quantum Electrodynamics (SFQED) is essential for exploring fundamental processes in high-intensity laser-matter interactions. Despite significant progress in analyzing the Schwinger model, a systematic comparison of the underlying frameworks remains incomplete. In particular, direct contrasts between U(1) and Z_n models within standard lattice gauge QED, as well as bridging the gap to the semi-classical kinetic approach to Schwinger pair production, remain largely underexplored. Here, we present a parametric exploration of the validity regimes of various SFQED approaches focusing on Schwinger pair-production rate and its connections to related processes. This poster highlights preliminary results from these studies, advancing our understanding of SFQED and informing future theoretical and computational strategies.

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