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Progress update on the FACET-II Strong-Field QED program

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The E-320 experiment at SLAC FACET-II aims to investigate Quantum Electrodynamics (QED) in the strong-field regime.

By colliding 10 GeV, high-quality electron beams with 10 TW NIR laser pulses it is aspired to probe the QED critical (Schwinger) intensity of 10^{29} Wcm^{-2} in the electron rest frame.

In this regime, characterized by $X = E/E_{\text{cr}} > 1$, quantum corrections to classical synchrotron radiation become important and the probability for electron-positron pair production is no longer exponentially suppressed.

A central objective of E-320 is to observe the transition from the perturbative ($a_0^2 \ll 1$) to the non-perturbative regime ($a_0^2 \gg 1$), characterized by the intensity parameter a_0 , while quantum effects are important (i.e., $X \sim 1$).

Here, qualitative changes are expected to be observed, such as e.g. a substantial red shift of the Compton edges in the electron or photon spectrum and eventually a transition to a quasi-continuous spectrum. We will report on recent progress and results in the E-320 research program as well as future plans and development efforts.

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