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E-320: Current Status and Future Plans

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The experiment E-320 installed at SLAC FACET-II aims to study 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 $\chi = E^*/E_{\text{cr}}$
$gtrsim1$, quantum corrections to classical synchrotron radiation become important and the probability for electron-positron pair production is no longer exponentially suppressed [1-3].
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 $a_0 = eE/(mc\omega)$, while quantum effects are important (i.e., $\chi\sim1$). During this transition, qualitative changes are expected to occur, namely a substantial red-shift of the Compton edges in the photon-emission spectrum and a quasi-continuous spectrum.
We will report on first results from the commissioning run 2022 at $a_0 < 1$ [4], ongoing developments, and future plans.
[1] A. Fedotov et al., Phys. Rep. (2023)
[2] A. Gonoskov et al., Rev. Mod. Phys. (2022)
[3] A. Di Piazza et al., Rev. Mod. Phys. (2012)
[4] C. Clarke et al., LINAC2022 (2022)

Primary authors: Dr KNETSCH, Alexander (SLAC National Accelerator Laboratory (On behalf of the E-320 collaboration)); COLLABORATION, E-320

Presenter: Dr KNETSCH, Alexander (SLAC National Accelerator Laboratory (On behalf of the E-320 collaboration))

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