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LUXE: A new experiment to study non-perturbative QED in electron-LASER and photon-LASER collisions

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The LUXE experiment (LASER Und XFEL Experiment) is an experiment in planning at DESY Hamburg using the electron beam of the European XFEL. LUXE is intended to study collisions between a high-intensity optical laser pulse and 16.5 GeV electrons from the XFEL electron beam, as well as collisions between the LASER pulse and high-energy secondary photons. This will elucidate Quantum Electrodynamics (QED) at the strong-field frontier, where the electromagnetic field of the laser is above the Schwinger limit. In this regime, QED is non-perturbative. This manifests itself in the creation of physical electron-positron pairs from the QED vacuum, similar to Hawking radiation from black holes. LUXE intends to measure the positron production rate in an unprecedented LASER intensity regime. The experiment received a stage 0 critical approval (CD0) from the DESY management and is in the process of preparing its technical design report (TDR). It is expected to start running in 2024/5. An overview of the LUXE experimental setup and its challenges and progress will be given, along with a discussion of the expected physics reach in the context of testing QED in the non-perturbative regime.

In-person participation

Yes

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