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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 a new 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 and 16.5 GeV electrons from the XFEL electron beam, as well as collisions between the optical LASER and high-energy secondary photons. The physics objective of LUXE are processes of 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. An overview of the LUXE experimental setup is given, in the context within the field of high-intensity particle physics. The foreseen detector systems and their sensitivity are presented. Finally, the prospects for studying BSM physics are also discussed.

Primary author: MELONI, Federico (Deutsches Elektronen-Synchrotron (DE))

Presenter: MELONI, Federico (Deutsches Elektronen-Synchrotron (DE))

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