

Contribution submission to the conference Dortmund 2021

LUXE: A new experiment to study non-perturbative QED in e^- -LASER and γ -LASER collisions — OLEKSANDR BORYSOV¹, MARYNA BORYSOVA¹, JOHN HALLFORD^{1,2}, BEATE HEINEMANN^{1,3}, LOUIS HELARY¹, MARIUS HOFFMANN¹, •RUTH JACOBS¹, JENNY LIST¹, RAJENDRA PRASAD¹, and MATTHEW WING^{1,2} — ¹Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany — ²University College London, London, United Kingdom — ³Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

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. This group report gives an overview of the LUXE experimental setup and its context within the field of high-intensity particle physics. The foreseen detector systems and their sensitivity are presented. Finally, the prospects of a modified LUXE setup for studying BSM physics are discussed.

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