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Detector Challenges of the strong-field QED experiment LUXE at the European XFEL

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The LUXE experiment aims at studying high-field QED in electron-laser and photon-laser interactions, with the 16.5 GeV electron beam of the European XFEL and a laser beam with power of up to 350 TW. The experiment will measure the spectra of electrons, positrons and photons in expected ranges of 10^{-3} to 10^9 per 1 Hz bunch crossing, depending on the laser power and focus. These measurements have to be performed in the presence of low-energy high radiation-background. To meet these challenges, for high-rate electron and photon fluxes, the experiment will use Cherenkov radiation detectors, scintillator screens, sapphire sensors as well as lead-glass monitors for backscattering off the beam-dump. A four-layer silicon-pixel tracker and a compact electromagnetic tungsten calorimeter with GaAs sensors will be used to measure the positron spectra. The layout of the experiment and the expected performance under the harsh radiation conditions will be presented. Beam tests for the Cherenkov detector and the electromagnetic calorimeter were performed at DESY recently and results will be presented. 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.

Collaboration

LUXE

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