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Probing non-perturbative QED and new physics with a LUXE-type experiment at the ILC

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The proposed LUXE experiment (LASER Und XFEL Experiment) at DESY, Hamburg, using the 16.5 GeV electron beam from the European XFEL, aims to probe QED in the non-perturbative regime created in collisions between high-intensity laser pulses and high-energy electron or photon beams. In this strong-field regime, where the electromagnetic field of the laser is above the Schwinger limit, physical electron-positron pairs will be created from the QED vacuum, similar to Hawking radiation from black holes. LUXE intends to measure the positron production rate in an unprecedented intensity regime, in and beyond the regime expected in the beam-beam interaction of future electron-positron colliders. This setup also provides a unique opportunity to probe physics beyond the standard model by leveraging the large photon flux generated at LUXE, probing axion-like-particles (ALPs) at a reach comparable to FASER2 and NA62. In this contribution we will give an overview of the LUXE experimental setup and its challenges, and explore the sensitivity of a LUXE-type experiment using the ILC's or another future Higgs factory's electron beam instead of the EUXFEL one.

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