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Track reconstruction with quantum computers at LUXE

Tuesday 30 November 2021 18:40 (20 minutes)

The LUXE experiment (LASER Und XFEL Experiment) is a new experiment in planning at DESY Hamburg that will study Quantum Electrodynamics (QED) at the strong-field frontier. In this regime, QED is non-perturbative. This manifests itself in the creation of physical electron-positron pairs from the QED vacuum. LUXE intends to measure the positron production rate in this unprecedented regime by using, among others, a silicon tracking detector. The large number of expected positrons (up to $O(10^4)$) traversing the sensitive detector layers results in an extremely challenging combinatorial problem which can become computationally very hard for classical computers. After an overview of the LUXE experimental setup and simulation, this talk will present a preliminary study to explore the potential of quantum computers to solve this problem and to reconstruct the positron trajectories from the detector energy deposits. The reconstruction problem is formulated in terms of a quadratic unconstrained binary optimisation. Finally the results from the quantum simulations are discussed and compared with traditional classical track reconstruction algorithms.

Significance

References

Speaker time zone

Compatible with Europe

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Session Classification: Track 2: Data Analysis - Algorithms and Tools

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