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Quantum computing approaches for simulating parton showers in high energy collisions

Monday 1 August 2022 18:00 (10 minutes)

The interpretation of measurements from high energy collisions at experiments like the Large Hadron Collider (LHC) relies heavily on the performance of full event generators, specifically their accuracy and speed in simulating complex multi-particle final states. With the rapid and continuous improvement in quantum computers, these devices present an exciting opportunity for high energy physics. Dedicated quantum algorithms are needed to exploit the potential that quantum computers can provide. In this talk, I will present general and extendable quantum computing algorithms for the simulation of the parton shower in a high energy collision. The algorithms utilise the quantum characteristics of the quantum device to efficiently perform the parton shower simulation. Furthermore, I will show that, by reframing the parton shower in the quantum walk framework dramatically improves the performance of the parton shower simulation, increasing the number of shower steps that can be simulated, whilst reducing the required Quantum Volume required on the device. These algorithms are the first step towards simulating a full and realistic high energy collision event on a quantum computer.

On behalf of collaboration?

Attending in-person?

Yes

Subfield

HEP theory

Preferred track

Primary authors: WILLIAMS, Simon (Imperial College London); WILLIAMS, Simon (CERN)

Presenter: WILLIAMS, Simon (Imperial College London)

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