Contribution ID: **54** Type: **not specified**

Collider Events on a Quantum Computer

Monday 31 October 2022 14:00 (15 minutes)

In recent years, quantum computing has seen staggering progress, from few-qubit devices to 100+ qubit devices on the cloud that can easily be programmed in a straightforward Python-like API. Since quantum computing can naturally incorporate quantum phenomena, it is a potential game changer for the simulation of particle physics, increasing their physics capabilities and efficiency.

QCD parton showers are crucial statistical components of event generators. We discuss recent advances in simulating the parton showering process, and thus generating collider events, on current quantum devices. Due to the statistical nature of the parton shower process, we find that gate noise (due to measurement errors and decoherence) is – although visible – not a primary concern at this stage, and that the description of LEP data is encouraging.

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Session Classification: Parton shower systematics and TMDs