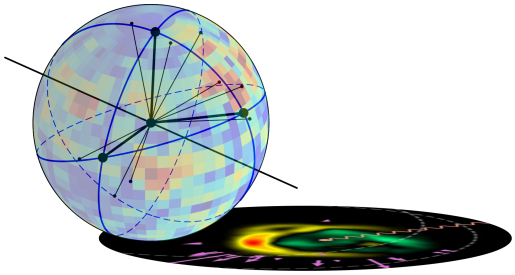

Contribution ID: **52** Type: **not specified**

IOPP colloquium: Imaging the Intrinsic and Emergent Scales of Quantum Chromodynamics with Colliders

Monday, 12 May 2025 15:00 (1 hour)

Abstract: The most powerful means of exploring nature at small length scales is through the use of particle colliders. Colliders smash particles together at high energies, briefly producing new particles through quantum fluctuations, which then decay into complicated sprays of energy in surrounding detectors. Much in analogy with how the details of our cosmic history are imprinted in the cosmic microwave background, the detailed features of the interactions of elementary particles are imprinted into macroscopic correlations in the energy flow of the collision products. Understanding the underlying microscopic physics in collider experiments therefore relies on our ability to decode these complicated correlations in energy flow. In turn, the desire to understand how to compute collider observables from an underlying quantum field theory (QFT) description has been a driver of theoretical developments and insights into the structure of QFT itself.

In this talk I will present some recent highlights in the quest to better understand the strong nuclear force at collider experiments, driven by recent theoretical developments in the understanding of a class of observables called “Energy Correlators” . I will then apply these developments to explore a variety of interesting phenomena in Quantum Chromodynamics, ranging from weighing the heaviest quark, to imaging the most perfect fluid.

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