Contribution ID: **8** Type: **not specified**

High-precision prediction for multi-scale processes at the LHC

Tuesday 5 November 2024 10:15 (45 minutes)

Comparisons of higher-order predictions within the Standard Model of Particle Physics (SM) to data are central to high-energy collider experiments like the Large Hadron Collider (LHC). Processes with multiple kinematic scales, such as multi-jet and prompt photon production, provide a unique possibility for probing Quantum Chromodynamics (QCD). These processes directly test perturbative QCD and can be used to extract fundamental parameters like the strong coupling constant and to search for BSM physics. Recent developments enabled lifting three-jet, photon plus two-jet, photon-pair plus jet, three-photon and other two-to-three cross-sections to QCD's next-to-next-to-leading order (NNLO). In this talk, I will give an overview of the phenomenology for such processes and the calculational techniques used in their computation.

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