

Contribution ID: 512

Type: Parallel

## Extensions of MadGraph5\_aMC@NLO for QCD studies

Friday 11 July 2025 09:30 (20 minutes)

In this talk, I will present our recent developments in MadGraph5\\_aMC@NLO for elementary-particle production in asymmetric systems, including photoproduction and proton-nucleus collisions. I will also discuss the first implementation of bound-state production, specifically quarkonia, the simplest bound states in QCD. Indeed, we have extended the support of radiative corrections at Next-to-Leading Order (NLO) to simulations of asymmetric collisions, such as electron-nucleus, proton-nucleus, pion-hadron and nucleus-nucleus collisions. I will present extensive validation results for charm and beauty production, Drell–Yan, and electroweak boson production, along with predictions for various observables across the multiple collision systems that are relevant for measurements at the LHC and the future Electron–Ion Collider. I will also report on our ongoing efforts regarding the extension of MadGraph5\\_aMC@NLO to quarkonium states. I will outline our results to extend its capabilities for inclusive and associated quarkonium production, starting at Leading-Order (LO). I will present a comprehensive benchmarking of our LO tool against HELAC-Onia, followed by a demonstration of its expanded capabilities, enabling studies going beyond the current state-of-the-art phenomenology. This work provides the community with an all-encompassing tool for quarkonium-production studies in QCD, delivering reliable, efficient and fast automated computations and lays the foundation for our future NLO extensions.

## Secondary track

Author: COLPANI SERRI, Alice (Warsaw University of Technology)Presenter: COLPANI SERRI, Alice (Warsaw University of Technology)Session Classification: T05

Track Classification: T05 - QCD and Hadronic Physics