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Probe triple partons interaction through three quarkonia associated production at LHC

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We propose that the process of triple prompt J/ψ hadroproduction is a very clean hard probe of multiple-parton scatterings at high-energy hadron colliders, especially the least known triple-parton scattering. A first complete study is carried out by considering single-, double-, and triple-parton scatterings coherently. Our calculation shows that it is a golden channel to probe double- and triple-parton scatterings, as the single-parton scattering is strongly suppressed. The predictions of the (differential) cross sections in proton-proton collisions at the LHC and future higher-energy hadron colliders are given. Our study shows that its measurement is already feasible with the existing data collected during the period of the LHC run 2. A method is proposed to extract the triple-parton scattering contribution, and therefore it paves a way to study the possible triple-parton correlations in a proton.

Primary author: Prof. ZHANG, Yu-Jie (Beihang University)

Presenter: Prof. ZHANG, Yu-Jie (Beihang University)

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