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Probing gluon saturation via diffractive jets in nucleus-nucleus UPCs

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We argue that diffractive photo-production of jets in coherent nucleus-nucleus ultra-peripheral collisions (UPCs) at high energy is a golden channel to study gluon saturation. By "coherent" we mean elastic processes in which both nuclei emerge unbroken after the collision and the final state exhibits large rapidity gaps. We study such processes within the colour glass condensate effective theory, where the elastic photon-nucleus interactions are described as a colourless, multi-gluon, exchange, a.k.a. the Pomeron. We show that the dominant channel is the diffractive production of three jets in an asymmetric configuration. Two of the jets are hard and propagate at nearby pseudo-rapidities. The third jet is semi-hard, with transverse momentum comparable to the nuclear saturation momentum, and is well separated in pseudo-rapidity from the hard dijets. Such configurations allow for strong scattering and probe the unintegrated parton distributions of the Pomeron in the high gluon density regime. We show that gluon saturation controls the cross-section and leave its imprints on the structure of the final state, notably on the rapidity distribution of the three jets.

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