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Jets separated by a large pseudorapidity gap at the Tevatron and at the LHC

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We present a phenomenological analysis of events with two high transverse momentum jets separated by a large (pseudo-)rapidity interval void of particle activity, also known as jet-gap-jet events. In the limit where the collision energy is much larger than any other momentum scale, the jet-gap-jet process is described in terms of perturbative pomeron exchange between partons within the Balitsky–Fadin–Kuraev–Lipatov (BFKL) limit of perturbative quantum chromodynamics (QCD). The BFKL pomeron exchange amplitudes, with resummation at the next-to-leading logarithmic approximation, have been embedded in the PYTHIA8 Monte Carlo event generator. Standard QCD dijet events are simulated at next-to-leading order in αs\alpha_sαs matched to parton showers with POWHEG+PYTHIA8. We compare our calculations to measurements by the CDF, D0, and CMS experiments at center-of-mass energies of 1.8, 7 and 13 TeV. The impact of the theoretical scales, the parton densities, final- and initial-state radiation effects, multiple parton interactions, and p_T thresholds and multiplicities of the particles in the rapidity gap on the jet-gap-jet signature is studied in detail. With a strict gap definition (no particle allowed in the gap), the shapes of most distributions are well described except for the CMS azimuthal-angle distribution at 13 TeV.

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