

Dijets with large rapidity separations at the next-to-leading BFKL for search of new physics at colliders

Thursday 3 July 2025 17:40 (20 minutes)

Search for the large extra dimension gravity at collider energies is considered in transplanckian regime [1-3], i. e. when $\sqrt{\hat{s}} \gg \sqrt{-\hat{t}}, M_D$. Here $\hat{s}$ and $\hat{t}$ are the Mandelstam variables of colliding parton-parton system and M_D is the Planck mass scale in the space-time with compactified D extra large dimensions. The main observable of the large extra dimension gravity in transplanckian regime is the high mass ($M_{jj} \sim \sqrt{\hat{s}} \gg M_D$) dijet production with large rapidity separation. In the transplanckian regime the Gribov-Regge limit of QCD ($\sqrt{\hat{s}} \gg \sqrt{-\hat{t}}$) is the main source of the standard model background. The calculation of the QCD background should be done within the next-to-leading logarithmic (NLL) approximation formalism by Lipatov, Fadin, Kuraev and Balitsky (BFKL) [4-7]. In this work the signal of the large extra dimension gravity as well as the NLL BFKL QCD background are estimated for the high luminosity (HL) LHC and future colliders such as FCCpp and CEPCpp.

1. Arkani-Hamed N., Dimopoulos S. and Dvali. G., Phys. Lett. B **429**, 263-272 (1998)
2. Giudice G.F., Rattazzi R. and Wells J.D., Nuclear Physics B **630**, 293–325 (2002)
3. Kim V.T., Oreshkin V.A., Nucl.Phys.B Proc.Suppl. 219-220, 235-238 (2011)
4. Brodsky S.J., Fadin S.V., Kim V.T., Lipatov L.N. and Pivovarov G.B., JETP Lett. **70**, 155-160 (1999)
5. Caporale F., Ivanov D.Yu., Murdaca B. and Papa A., Phys. Rev. D **91**, 114009 (2015)
6. Ducloué B., Szymanowski L. and Wallon S., Phys. Rev. Lett. **112**, 082003 (2014)
7. Egorov A.Iu., Kim V.T., Phys. Rev. D **108**, 014010 (2023)

Primary authors: EGOROV, Anatolii (Petersburg Nuclear Physics Institute of NRC «Kurchatov Institute»); ORE-SHKIN, Vadim (Petersburg Nuclear Physics Institute of NRC «Kurchatov Institute»); KIM, Victor (Petersburg Nuclear Physics Institute of NRC «Kurchatov Institute»); MURZIN, Victor (Petersburg Nuclear Physics Institute of NRC «Kurchatov Institute»)

Presenter: EGOROV, Anatolii (Petersburg Nuclear Physics Institute of NRC «Kurchatov Institute»)

Session Classification: 4. Relativistic nuclear physics, high-energy and elementary particle physics: Theory

Track Classification: Section 4. Relativistic nuclear physics, high-energy and elementary particle physics.