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From the charm production asymmetry at LHCb to enhanced prompt atmospheric neutrino flux at IceCube

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We consider unfavoured light quark/antiquark to D meson fragmentation. We discuss nonperturbative effects for small transverse momenta. The asymmetry for D⁺ and D⁻ production measured by the LHCb collaboration provides natural constraints on the parton (quark/antiquark) fragmentation functions. We find that already a fraction of fragmentation probability is sufficient to account for the measured asymmetry. Large D-meson production asymmetries are found for large xF which is related to dominance of light quark/antiquark fragmentation over the standard c → D fragmentation. As a consequence, prompt atmospheric neutrino flux at high neutrino energies can be much larger than for the conventional c → D fragmentation. The latter can constitute a sizeable background for the cosmic neutrinos claimed to be observed recently by the IceCube Observatory.

1. R. Maciula and A. Szczurek, "D meson production asymmetry, unfavored fragmentation, and consequences for prompt atmospheric neutrino production," Phys. Rev. D97, no. 7, 074001 (2018)
2. V.P. Goncalves, R. Maciula and A. Szczurek, "From D_s^\pm production asymmetry at the LHC to prompt ν_τ at IceCube," arXiv:1809.05424 [hep-ph]

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