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Hadronic Cross Sections in Cosmic Antiproton Production & Diquark Capture of Seaquarks in Hadrons

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Bringing collider-based QCD observables to the observed astrophysical excess of antiprotons in cosmic rays appears to be a useful cross-disciplinary venture. Astrophysical observations require a precise calculation of the cross sections for direct proton-proton to antiproton production vs. indirect production (in which the protons first produce an antineutron that decays down to an antiproton with branching fraction 1). Cross section calculations using PDFs and fragmentation functions for both 17.2 and 8000 GeV center-of-mass energies (i.e., NA49 and LHCb) tentatively find a significant discrepancy between the claimed ~30% difference in direct and indirect antiproton production and the predictions from the numerical studies. In addition to this study, and somewhat at right angles to it, the effects of the “diquark capture” model on higher Fock states of the proton will be discussed, particularly the mass and spin effects in the strange quark sector.

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