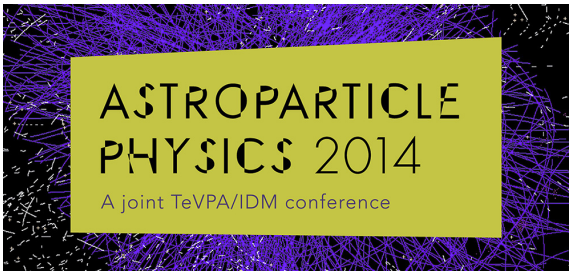

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Models for atmospheric neutrinos and muons, prompt component

Wednesday 25 June 2014 15:20 (20 minutes)

Atmospheric neutrinos and muons are produced in interactions of cosmic rays with Earth's atmosphere. At very high energy, the contribution from semi-leptonic decays of charmed hadrons, known as the prompt flux, dominates over the conventional flux from pion and kaon decays. This is due to the very short lifetime of the charmed hadrons, which therefore do not lose energy before they decay. The calculation of this process is difficult because the Bjorken-x at which the parton distribution functions are evaluated is very small. This is a region where QCD is not well understood, and large logarithms must be resummed. Available parton distribution functions are not known at such small x and extrapolations must be made. Theoretically, the fast rise of the structure functions for small x ultimately leads to parton saturation.

In this talk I will describe calculations of the prompt neutrino flux. In particular I will describe the ERS flux, which includes parton saturation effects in the QCD cross section for charm quarks. This flux prediction is used by e.g. IceCube and Antares as a benchmark background. I will also describe our update of this calculation, using both a fixed-order NLO calculation and an improved saturation calculation, taking into account the recent LHC data on the charm cross section, as well as recent theoretical developments in QCD. We will also provide a newer estimate of the theoretical uncertainties.

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