Contribution ID: **1398** Type: **Talk**

Rigorous predictions for prompt neutrino fluxes in view of VLVnT upgrades

Monday 12 July 2021 18:00 (12 minutes)

The existence of a flux of prompt atmospheric neutrinos from the decay of heavy hadrons resulting from the interaction of cosmic rays with the atmospheric nuclei is predicted by theory. Very Large Volume Neutrino Telescopes, like Icecube, KM3NeT and Baikal-GVD, should be sensitive to this neutrino component, that represents a background for the neutrinos from far astrophysical sources. However, no clear experimental evidence of prompt neutrino fluxes has been found, at least so far. In particular, the prompt neutrino component well fits to zero even in the most recent analysis of High Energy Starting Events by the IceCube collaboration, published last autumn. On the other hand, the analysis of through-going muon tracks, more sensitive to prompt neutrinos than the previous one, has established an upper limit on prompt neutrino fluxes.
Our collaboration has been active in providing accurate predictions for prompt neutrino fluxes in the last few years, on the basis of rigorous QCD calculations, and in assessing many of the uncertainties related to these predictions. We discuss our most recent results and their uncertainties, which we believe constitute the most accurate and comprehensive prediction of prompt neutrino fluxes available at present, and show how they challenge the present experimental limits. We are confident that, increasing the experimental capabilities and statistical sample, as possible through e.g. the IceCube-Gen2 upgrade, will help in sharing further light on the prompt neutrino issues.

Keywords

atmospheric neutrinos, prompt neutrino fluxes, QCD, Very Large Volume Neutrino Telescopes,

Collaboration

other (fill field below)

other Collaboration

PROSA

Subcategory

Theoretical Results

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Session Classification: Discussion

Track Classification: Scientific Field: NU | Neutrinos & Muons