Contribution ID: **391** Type: **Poster**

Search for sterile neutrinos in low-energy double-cascade events with the IceCube Neutrino Observatory: a first expected sensitivity

Tuesday 7 September 2021 19:07 (1 minute)

Sterile neutrinos are a well motivated facet of the new physics landscape. From their role in the mechanism through which Standard Model (SM) neutrinos acquire mass, to their potential explanation of anomalies in oscillation experiments and even as Dark Matter candidates, these hypothetical particles are thought to play a central part in the near future of particle physics. Many models of sterile neutrinos exist, in some of which they are allowed to decay to SM particles. If the sterile neutrino production and subsequent decay happens inside the IceCube detector, this would lead to a double-cascade signature similar to the one known from tau neutrino charged current interactions. However, the lifetime of the sterile neutrino is potentially much longer than that of the tau lepton, depending on its mass. This opens the possibility for a spatial resolution of a double-cascade topology at atmospheric neutrino energies, as opposed to searches for high energy tau neutrinos from astrophysical sources. In this talk, I will present the results of a first study of the IceCube-DeepCore detector sensitivity to such a signal, using simulation only. The strategy of this analysis is to study the topology of such double-cascade events and design a classifier that would help us isolate a sample of signal events over the background from SM processes. We study the sensitivity as a function of the signal parameters to determine in what conditions could IceCube see such a signal. Scanning the two-dimensional tau-sterile mixing parameter and sterile neutrino mass phase-space, we conclude that with the current state of the analysis tools, this search will have to wait for the IceCube Upgrade or a major improvement of the analysis tools in order for a signal to be isolated from the very large neutrino background.

Primary author: VANNEROM, David (MIT)

Co-authors: Prof. CONRAD, Janet M. (Massachusetts Institute of Technology); Dr ARGÜELLES DELGADO, Carlos A. (Harvard University); BLOT, Summer (DESY-Zeuthen); FISCHER, Leander (DESY-Zeuthen)

Presenter: VANNEROM, David (MIT)

Session Classification: Poster Session II

Track Classification: Neutrino physics