



Contribution ID: 124

Type: **not specified**

A Possible Cosmological Origin of the KM3-230213A event

Thursday 25 September 2025 17:42 (18 minutes)

We propose a novel cosmological scenario to explain the exceptional KM3-230213A neutrino event reported at an energy scale of $O(100)$ PeV by the KM3NeT collaboration, along with its associated gravitational wave signatures. In our framework, ultra-high-energy neutrinos originate from the decay of a super-heavy sterile neutrino produced via the Hawking evaporation of primordial black holes in the early Universe. While two sterile neutrinos in the model are responsible for generating light neutrino masses as required by oscillation data through the type-I seesaw mechanism, a third sterile neutrino or a heavy neutrino-like fermion with extremely feeble couplings can have a lifetime suitable for producing a neutrino flux consistent with the observed event. Furthermore, our scenario predicts two distinct GW signatures: one arising from gravitons emitted during PBH evaporation and another from the Bremsstrahlung process during the decay of the sterile neutrino. These complementary signals provide a multi-messenger probe of the underlying physics. Our results thus offer a compelling explanation for the KM3-230213A event and open new avenues for investigating the interplay between ultra-high-energy neutrino astronomy and ultra-high-frequency gravitational wave cosmology.

Primary author: LKHAGVADORJ, Erdenebulgan

Presenter: LKHAGVADORJ, Erdenebulgan

Session Classification: Parallel Sessions Thursday Cosmo 2

Track Classification: Cosmology & Astroparticle Physics