Contribution ID: **61** Type: **Contributed Talk**

Astrophysical Neutrinos as Probes of Dark Matter around AGN

Thursday 18 September 2025 11:45 (15 minutes)

The fundamental nature of dark matter (DM), which constitutes a significant fraction of the universe's mass-energy budget, remains one of the foremost challenges in modern astrophysics and particle physics. Due to their weak interactions and cosmological origins, high-energy neutrinos serve as sensitive probes for potential neutrino-DM scattering processes. Specifically, dense accumulations of DM around supermassive black holes (known as DM spikes) in active galactic nuclei (AGN) are theorized to attenuate the neutrino flux emitted by these astrophysical sources. Recent IceCube observations of four point-like neutrino emitters, viz. TXS 0506+056, NGC 1068, PKS 1424+240 and NGC 4151, provide unprecedented opportunities to detect signatures of neutrino-DM interactions beyond conventional astrophysical explanations. In this work, we utilize publicly available IceCube data from these prominent sources to place stringent constraints on the neutrino-DM scattering cross-section, thereby advancing our understanding of potential dark matter signatures. We provide constraints on the neutrino-DM scattering cross-section from the individual sources, as well as from the stacking analysis, by combining the data from all sources.

Authors: Dr DIXIT, Khushboo (Centre for Astro-Particle Physics, University of Johannesburg); RAZZAQUE, Soebur; MOHLABENG, Gopolang (University of California, Irvine)

Presenter: Dr DIXIT, Khushboo (Centre for Astro-Particle Physics, University of Johannesburg)

Session Classification: Astroparticle & Other High-Energy Sources

Track Classification: Multi-Messenger Astrophysics and Astro-Particle Physics