

A Census of Variable and Transient Radio Sources within IceCube Neutrino Fields

Abstract

The origin of high-energy cosmic neutrinos detected by the IceCube observatory is a hotly debated topic in astroparticle physics. Neutrinos can be produced via interactions of high-energy protons with photons: there are multiple candidate source classes which can accelerate cosmic particles to the energies required to emit high-energy cosmic neutrinos and which have in common that they lead to variable/transient radio emissions. However, so far only one blazar and one nearby AGN could be associated with high confidence with IceCube neutrinos. The bulk of the diffuse IceCube neutrino flux must be emitted from a rather faint and numerous source population. The sub-mJy low-frequency radio sky may harbor these neutrino emitters that have gone unnoticed in previous searches. We request deep triggered MeerKAT continuum observations of IceCube neutrino fields at UHF-band to perform a census of coincident transient and variable radio sources. Only the high sensitivity of MeerKAT together with its large field of view of ~ 5 square degrees at UHF-band opens the possibility to detect all possible classes of neutrino emitters inside the 90% localization region of individual IceCube neutrino events with a high likelihood of an astrophysical origin.