Contribution ID: **33** Type: **not specified**

Radio detection of ultra-high energy neutrinos

Tuesday 24 November 2020 15:00 (15 minutes)

Ultra-high energy (UHE) neutrinos (E > 1e16 eV) are connected to the most energetic phenomena in our universe and neutrino astronomy is a powerful tool to study the high-energy universe. Neutrinos can escape dense source environments and point back to their sources with sub-degree accuracy. In particular, multi-messenger analyses that combine neutrino detection with electromagnetic (e.g. gamma ray) and gravitational-wave observations bear huge potential to probe the sources of neutrinos and cosmic rays. The detection of neutrinos is challenging because of their small flux and cross-section, and requires the instrumentation of huge volumes. UHE neutrinos present a yet uncharted energy region. They can be efficiently measured with a sparse array of radio detectors, and the cold (ant-)arctic ice is an optimal target material.
I will report on the pilot radio neutrino detectors installed on the Ross ice shelf and at the South Pole, and the plans for the RNO-G detector in Greenland with deployment starting in 2021. I will discuss how neutrinos can be measured with a radio detector and how their properties can be reconstructed from the short radio flash. I will present plans for a large-scale radio neutrino detector as part of the IceCube-Gen2 project and discuss its prospects.

Abstract Track

Astroparticle physics

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Session Classification: Tuesday afternoon