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Implications of astrophysical neutrino detections for TeV-PeV gamma-rays

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Since its first detection by the IceCube Neutrino Observatory in 2013, the diffuse flux of astrophysical neutrinos has been confirmed in several channels with increasing significance and precision. With a decade of IceCube data, we have now gained a solid picture of the astrophysical neutrino flux from the TeV up to the PeV range. Another significant milestone was the announcement of the first source of astrophysical neutrinos - the gamma-ray bright Blazar TXS 0506+056 in 2018. Although the origin of a large fraction of the astrophysical neutrino flux remains unknown, it is expected that neutrinos and gamma rays are produced in close connection at nearly the same energies. In this talk, I review the current searches that connect astrophysical neutrinos to gamma rays from different source populations. Furthermore, I will cover physical and experimental challenges, as well as the role of current and future experiments.

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