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Pushing the Energy and Cosmic Frontiers with High-Energy Astrophysical Neutrinos

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The astrophysical neutrinos recently discovered by IceCube have the highest detected neutrino energies — from TeV to PeV — and travel the longest distances — up to a few Gpc, the size of the observable Universe. These features make them naturally attractive probes of fundamental particle-physics properties, possibly tiny in size, at energy scales unreachable by any other means. The decades before the IceCube discovery saw many proposals of particle-physics studies in this direction. Today, those proposals have become a reality, in spite of prevalent astrophysical unknowns. I will showcase examples of doing fundamental neutrino physics at these scales, including some of the most stringent tests of physics beyond the Standard Model. In the future, higher neutrino energies — up to tens of EeV, larger detectors, and improved detection techniques will improve our reach.

Content of the contribution

Both

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