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Tau neutrinos from GeV to EeV

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Tau neutrinos are the least known of the active neutrinos. As such, by studying them even far from the precision regime, we stand to gain new insight into their properties and their sources. Doing so endows us with novel probes of fundamental physics and astrophysics that are particularly valuable at high, barely trodden energies. Because tau neutrinos are hard to make and detect, they remain poorly studied experimentally—though maybe not for much longer. Fortunately, there is a host of experiments, active today and planned for the near future, that target the detection of tau neutrinos across a broad range of energies. They range from GeV energies—in short-baseline, long-baseline, and atmospheric experiments—through TeV energies—in forward-physics experiments—up to PeV energies—using high-energy cosmic neutrinos—and EeV energies—using the long-sought ultra-high-energy neutrinos. I will give a brief overview of the status, challenges, recent developments, and future hopes for tau neutrinos, focusing on those of cosmic origin.

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