

A multi-messenger probe of the nature of neutrino mass

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Whether neutrinos are Majorana or Dirac particles is an open question. Theoretically, it is also possible that neutrinos are pseudo-Dirac, which are fundamentally Majorana fermions, but essentially act like Dirac fermions in most experimental settings, due to extremely small active-sterile mass splitting. Such small values of mass splitting can only be accessed via active-sterile oscillations over an astrophysical baseline. We show that the recent identification of high energy neutrino sources by the IceCube Neutrino Observatory provides us with such an astrophysical baseline, thus improving the reach of terrestrial experiments by up to a billion for the active-sterile mass-squared difference.

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