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The KM3NeT Ultra-High Energy Neutrino and its Possible Astrophysical Origins

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High-energy astrophysical neutrinos, first discovered by the IceCube Neutrino Observatory, are key messengers for the understanding of hadronic acceleration processes in the Universe, with the potential to unveil the sources of ultra-high energy cosmic rays. The KM3NeT Collaboration is building two neutrino detectors in the Mediterranean Sea by instrumenting large volumes of seawater with photomultiplier tubes, sensitive to the Cherenkov light induced by secondary particles produced in neutrino interactions. KM3NeT has recently reported the observation of an ultra-high energy neutrino in the tens of PeV range, possibly the most energetic neutrino observed to date. The particle's incoming direction points slightly below the horizon, where atmospheric backgrounds are negligible, indicating a most likely cosmic origin. This talk will report on the KM3NeT detection of this exceptional event and its implications for our knowledge of astrophysical neutrinos. The talk will explore the neutrino's potential origins, including the search and characterisation of candidate extragalactic astrophysical counterparts.

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