

PLEnuM: A global and distributed monitoring system of high-energy astrophysical neutrinos

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High-energy astrophysical neutrinos, discovered by IceCube, are now regularly observed, albeit at a low rate due to their low flux. As a result, open questions about high-energy neutrino astrophysics and particle physics remain limited by statistics at best, or unanswered at worst. Fortunately, this situation will improve soon: in the next few years, a host of new neutrino telescopes, currently under planning and construction, will come online. It is natural to combine their collected observing power: we propose the Planetary Neutrino Monitoring System (PLEnuM), a concept for a global repository of high-energy neutrino observations, in order to finally give firm answers to open questions. PLEnuM will reach up to four times the exposure available today by combining the exposures of current and future neutrino telescopes distributed around the world – IceCube, IceCube-Gen2, Baikal-GVD, KM3NeT, and P-ONE. Depending on the declination and spectral index, PLEnuM will improve the sensitivity to astrophysical neutrinos by up to two orders of magnitude. We present first estimates on the capability of PLEnuM to discover Galactic and extragalactic sources of astrophysical neutrinos and to characterize the diffuse flux of high-energy neutrinos in unprecedented detail.

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Primary authors: HUBER, Matthias (TU Munich); SCHUMACHER, Lisa (TU Munich/RWTH Aachen); AGOSTINI, Matteo (University College London); BUSTAMANTE, Mauricio (Niels Bohr Institute); OIKONOMOU, Foteini (Norwegian University of Science and Technology); RESCONI, Elisa (TU Munich)

Presenter: SCHUMACHER, Lisa (TU Munich/RWTH Aachen)

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