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Status of the PTOLEMY project for CNB detection and directional direct detection of MeV dark matter

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The PTOLEMY project aims to develop a scalable design for a Cosmic Neutrino Telescope, the first of its kind and the only telescope conceived that can look directly at the image encoded in neutrino density fluctuations of the Universe in the first second after the Big Bang. The past two years of developments have established a compelling case to proceed to telescope design. The cryogenic calorimeters aim to reach 0.05eV energy resolution, an order of magnitude beyond the original target and the highest resolution of any calorimeter. The graphene substrate is stable under 40% loading fraction of hydrogen, the highest on record. The Simons prototype at Princeton has become the basis of a new world-wide collaboration consisting of seven countries (Netherlands, Spain, Sweden, Israel, Italy, UAE, USA) and 29 institutions. The scope of work for the next three years is to complete the design of the Cosmic Neutrino Telescope and to to validate with direct measurement that the non-neutrino backgrounds are below the expected signal from the Big Bang by extrapolating broad backgrounds that span over keV into the 0.1eV window of the signal under the operation of a newly designed high stability HV system with MAC-E filter and TES calorimeter. A proposal to install the PTOLEMY prototype at the LNGS is currently under review. By implementing high radio-pure carbon-12 graphene, we will exploit a concurrent program in directional MeV dark matter searches with 2D targets and CNTs. The number and deployment of CNB telescopes around the world will depend on the next phase of PTOLEMY developments.

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