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Overview of Cherenkov Telescope onboard EUSO-SPB2 for the Detection of Ultra-High Energy Neutrinos

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Astrophysical Ultra-High Energy (UHE) neutrinos probe the accelerators of Ultra-High Energy Cosmic Rays (UHECR), the composition of UHECR, and neutrino physics at the highest energies. UHE-tau neutrinos (E > 10 PeV) skimming the Earth produce tau leptons which can emerge from the ground, decay, and initiate an upward-going particle shower in the atmosphere. By measuring the Cherenkov emission from these extensive air showers, the particle shower energy and incident neutrino direction can be reconstructed. By using a Cherenkov telescope in the Extreme Universe Space Observatory Super Pressure Balloon 2 (EUSO-SPB2) instrument, we will classify known and unknown sources of backgrounds for future space-based neutrino detectors. Furthermore, we will search for UHE-tau neutrinos below the limb and observe air showers from cosmic rays above the limb. EUSO-SPB2 is an approved NASA ultra-long-duration balloon mission that is planned to fly in 2023 and is a precursor of the Probe of Extreme Multi-Messenger Astrophysics (POEMMA), a candidate for an Astrophysics probe-class mission. The 0.785 m^2 Cherenkov telescope is equipped with a 512-pixel SiPM camera covering a 12.8° x 6.4° (Horizontal x Vertical) field of view. The camera signals are digitized with a 100 MS/s readout system. In this presentation, we discuss the status of the telescope development, the camera integration, and simulation studies of the camera response.

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Collaboration

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Primary author: BAGHERI, Mahdi (Georgia Institute of Technology)

Co-authors: JUDD, Eleanor (Space Sciences Laboratory, UC Berkley); GAZDA, Eliza (Georgia Institute of Technology); KUZNETSOV, Evgeny (The University of Alabama in Huntsville); FONTANE, Ivan (The University of Alabama in Huntsville); NACHTMAN, Jane (University of Iowa); KRIZMANIC, John (4NASA/Goddard Space Flight Center); Prof. WIENCKE, Lawrence (Colorado School of Mines); CHRISTL, Mark (Marshall Space Flight Center); MILLER, Michael (University of Iowa); OTTE, Nepomuk (Georgia Institute of Technology); ROMERO MATAMALA, Oscar (Georgia Institute of Technology); REARDON, Patrick; ONEL, Yaser (University of Iowa); FOR THE JEM-EUSO COLLABORATION

Presenter: BAGHERI, Mahdi (Georgia Institute of Technology)

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