

EUSO-SPB2: A balloon experiment for UHECR and VHE neutrino observation

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The Extreme Universe Space Observatory on a Super Pressure Balloon 2 (EUSO-SPB2) experiment will make new measurements from suborbital space as a precursor for future space missions that will address the challenge of the extremely low fluxes of ultra-high energy cosmic rays (UHECR) and very high energy (VHE) neutrinos.

The EUSO-SPB2 detector is comprised of two 1m diameter aperture telescopes. The Fluorescence Telescope (FT) will point in nadir and will record fluorescence light from cosmic ray EAS with energies above 1EeV in its field of view of 36 by 12 degrees. The Cherenkov Telescope (CT) features a silicon photomultiplier focal surface with a field of view of 12 by 6 degrees. The CT will switch between two observation modes: one which points the CT above the limb to measure the Cherenkov emission of cosmic ray EAS with energies above 1PeV and one which points the CT below the limb to record the Cherenkov emission produced by PeV scale EAS initiated by neutrino-sourced tau decay. As it is the first time such an instrument has been flown, one of the priorities of the CT will be the study of the optical backgrounds for observing neutrinos in this way.

EUSO-SPB2 is undergoing the final integration steps for launch on a NASA super pressure balloon payload in the spring of 2023 from Wanaka NZ. The CT was field-tested in March 2022 and the field tests for the FT are planned for later this year.

The data collected during the EUSO-SPB2 mission will be essential to advancing the development of a space-based multi-messenger observatory such as the Probe of Extreme Multi-Messenger Astrophysics (POEMMA). In this contribution, we discuss the EUSO-SPB2 science goals, the instruments, the expected performance and the current status.

Primary authors: ESER, Johannes (The University of Chicago); OLINTO, Angela (The University of Chicago); WIENCKE, Lawrence (Colorado School of Mines)

Presenter: CUMMINGS, Austin (Pennsylvania State University)