

POEMMA: Probe Of Extreme Multi-Messenger Astrophysics

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The Probe Of Extreme Multi-Messenger Astrophysics (POEMMA) has been developed with the science goals of identifying the sources of ultra-high energy cosmic rays (UHECRs) and transient sources of cosmic neutrinos. The POEMMA observatory consists of two spacecraft flying in a loose formation in 525 km altitudes orbits, providing full-sky coverage for astrophysical sources. Each spacecraft hosts a large area, wide-FoV Schmidt telescope with a hybrid focal plane optimized to observe both the UV fluorescence signal from extensive air showers (EAS) and the beamed, optical Cherenkov signals from EAS. In UHECR stereo fluorescence mode, the POEMMA telescopes are oriented to view a common atmospheric volume to optimize the measurement of the UHECR spectrum, composition, and full-sky distribution of the UHECRs above 20 EeV, while having remarkable sensitivity to UHE neutrinos and photons. The POEMMA telescopes will slew to re-orientate to the direction of transient astrophysical sources in an Earth-limb viewing, Target-of-Opportunity (ToO) neutrino mode to observe cosmic tau neutrinos by using the upward-moving EAS induced from tau neutrinos interacting in the Earth. This ToO mode provides exceptional neutrino flux sensitivity to a variety of neutrino transient events, including short-gamma-ray bursts and binary neutron star mergers. Key technologies and experimental methodologies will be tested with the EUSO-SPB2 ULDB mission scheduled for 2023. POEMMA's science goals, instrument designs, and UHECR and neutrino measurement capabilities will be presented with context to EUSO-SPB2.

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