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The High Energy X-ray Probe (HEX-P): locations, spectra, and acceleration mechanisms for the highest-energy electrons in supernova remnants and pulsar-wind nebulae

Thursday, 14 September 2023 14:00 (15 minutes)

HEX-P is a probe-class mission concept that will combine high spatial resolution X-ray imaging (<10 arcsec FWHM) and broad spectral coverage (0.1-150 keV) with an effective area far superior to current facilities (including XMM-Newton and NuSTAR) to enable revolutionary new insights into a variety of important astrophysical problems. HEX-P is ideally suited to address important problems in the physics and astrophysics of supernova remnants (SNRs) and pulsar-wind nebulae (PWNe). For shell SNRs, HEX-P can greatly improve our understanding in several areas, including detections of, or limits on, 44Ti in the youngest supernova remnants and better spectral characterization and localization of nonthermal X-ray emission from both nonthermal-dominated SNRs and those containing both thermal and nonthermal components. For PWNe, HEX-P will provide spatially-resolved, broadband X-ray spectral data separately from their pulsar emissions, allowing us to study how particle acceleration, cooling and propagation operate in different evolution stages of PWNe. For Galactic PeVatrons and TeV gamma-ray sources in general, HEX-P will fill in a large gap in the spectral-energy distributions (SEDs) of many objects observed in radio, soft X-rays, and gamma rays, constraining the maximum energies to which electrons can be accelerated, with implications for the nature of the Galactic Pevatrons required by the spectrum of Galactic cosmic rays. We will also discuss HEX-P's unique and complementary roles to the future TeV gamma-ray and neutrino observatories in the 2030s.

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