The High Energy X-Ray Probe (HEX-P)

Sensitive broadband X-ray observations of transient phenomena in the 2030s

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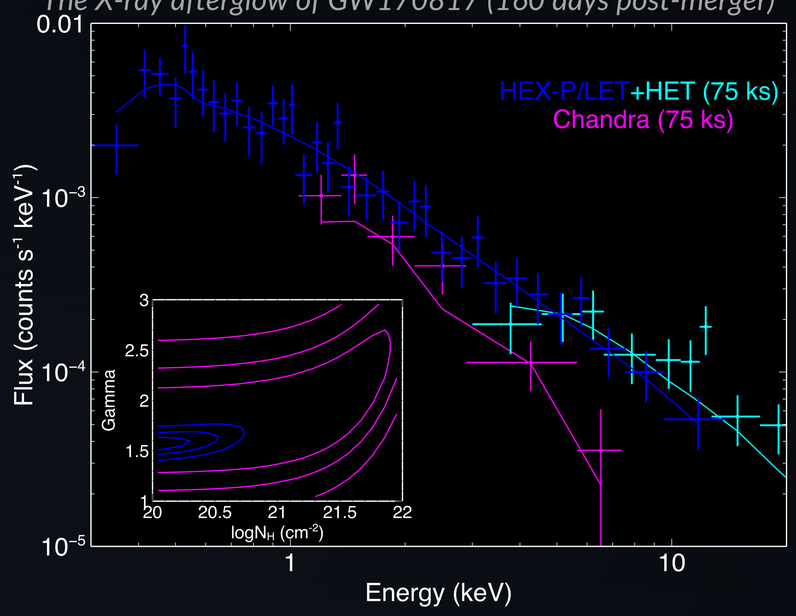
Overview:

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 will launch at a time when the sky is being routinely scanned for transient gravitational wave, electromagnetic and neutrino phenomena that will require the capabilities of a sensitive, broadband X-ray telescope for follow up studies. These include the merger of compact objects such as neutron stars and black holes, and transient phenomena in galaxy nuclei, such as tidal disruption events, quasi-periodic eruptions, and extreme AGN variability. Observations with HEX-P will probe the accretion and ejecta from these transient phenomena through the study of relativistic outflows and reprocessed emission, provide unique capabilities for jet physics, and potentially reveal the nature of the central engine. More information on HEX-P, including the full team list, is available at hexp.org.

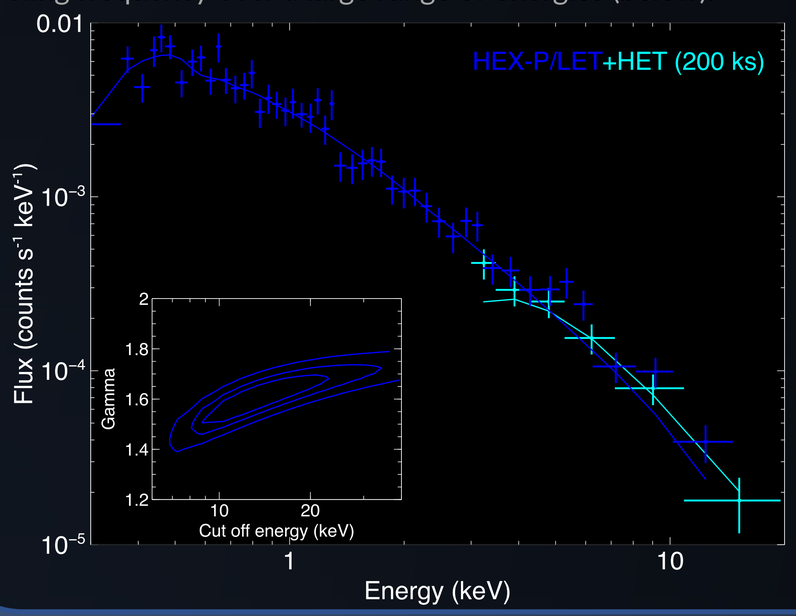
Gravitational Wave Follow-up

With its wide bandpass (0.1-150 keV), high resolution imaging (<10 arcsec FWHM), large effective area and response time of <24 hours, HEX-P will be the ideal versatile instrument to follow up transients in the X-ray band. This includes follow up of gravitational wave sources such as the neutron star merger GW 170817.

The X-ray afterglow of GW170817 (160 days post-merger)



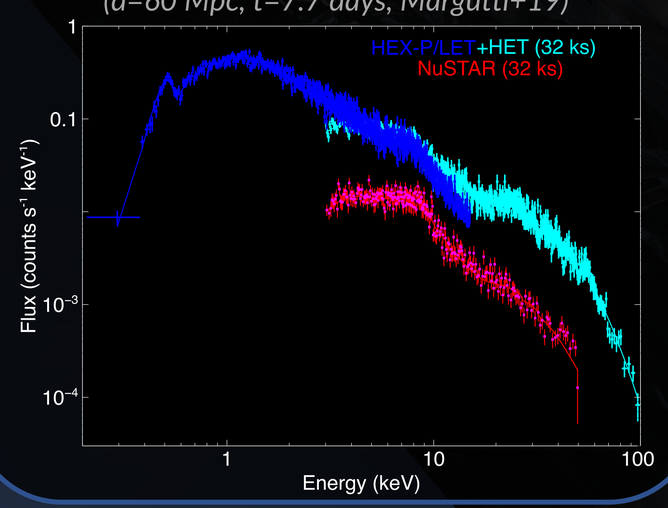
Had HEX-P observed the X-ray afterglow of GW 170817, it would have yielded a spectrum over an order-of-magnitude greater in energy than Chandra did, and provided far better spectral constraints (above). With its large bandpass, HEX-P will probe the cooling frequency over a large range of energies (below).



Fast Blue Optical Transients

Had HEX-P observed the X-ray emission from AT 2018cow, it would have yielded a spectrum with signal-to-noise 15x better than NuSTAR. HEX-P will provide the S/N=15 of AT2018cow of NuSTAR up to 4x further (240 Mpc), and 60x the volume.

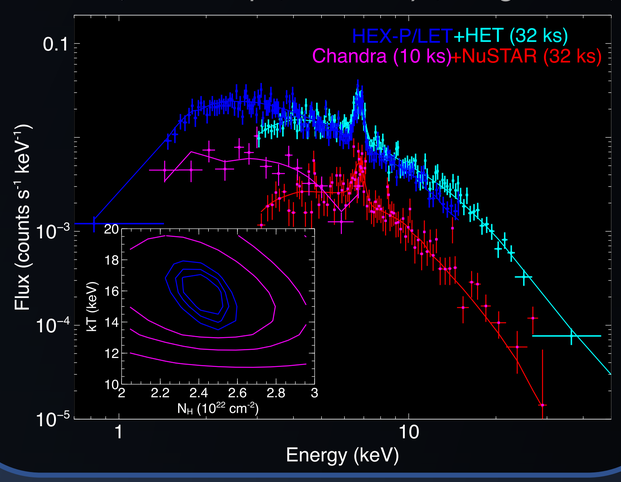
The X-ray emission from the FBOT AT2018cow (d=60 Mpc, t=7.7 days, Margutti+19)



Supernovae

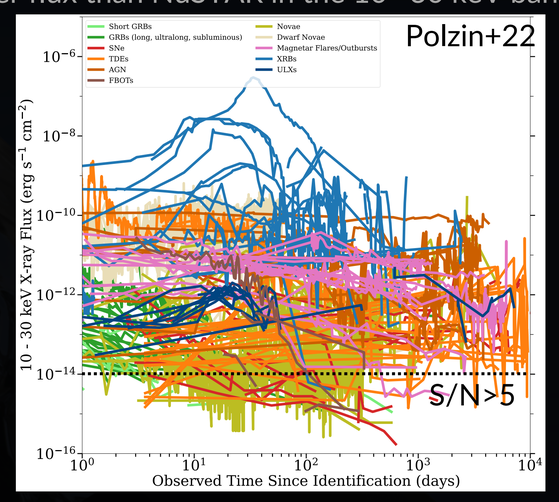
Had HEX-P observed the X-ray emission from SN 2014C, it would have yielded a spectrum with signal-to-noise 5x better than Chandra+NuSTAR, and would have provided better constraints on the shock temperature and absorption.

The X-ray emission from the interacting type IIn SN 2014C (d=14.7 Mpc, t=396 days, Margutti+17)



Other X-ray Transients

HEX-P will provide good signal-to-noise spectra (S/N>5) of almost all other known X-ray transients, from at least 1 day post-discovery. HEX-P will provide good signal-to-noise spectra in the 0.3--10 keV band at least an order of magnitude lower flux than XMM-Newton and an order of magnitude lower flux than NuSTAR in the 10--30 keV band.



Do you have ideas for how HEX-P would revolutionize your science? Get in touch!

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HEX-P
HIGH ENERGY X-RAY PROBE

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