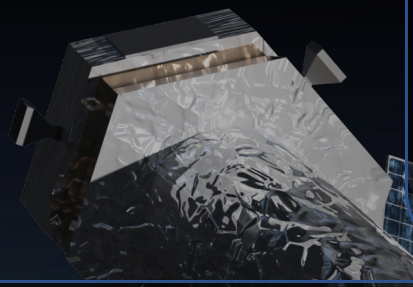
The High Energy X-Ray Probe (HEX-P): Resolving the X-ray background at its peak



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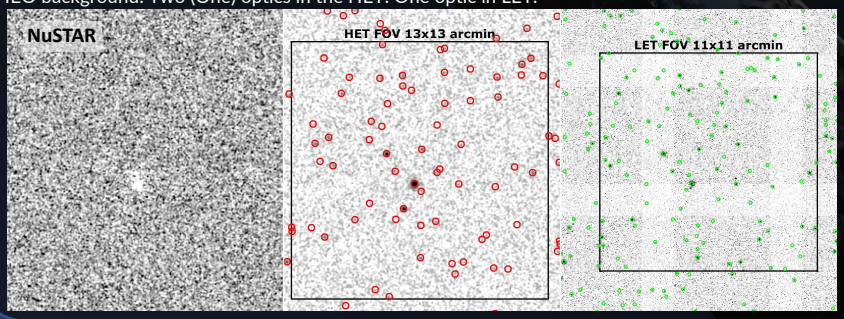
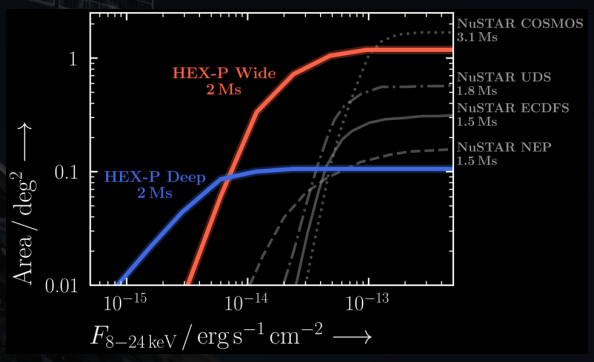
Black holes are a critical component for the formation of structures in the Universe, and yet, despite their confirmed ubiquity in large galaxy centers, we still do not have a complete understanding of their growth and evolution across cosmic time. HEX-P will detect, for the first time, the Seyfert-luminosity (~10^{43} erg/s in the 10-40 keV band) AGN population in hard X-rays at cosmic noon and resolve 80% of the accreting supermassive black holes contributing to the Cosmic X-ray background.

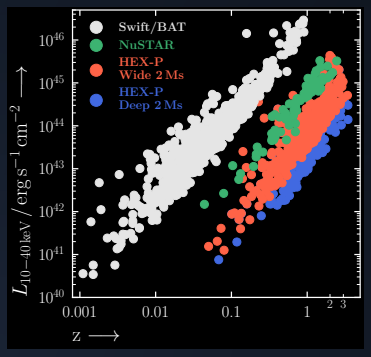
From this:

Survey strategy:
Wide: 2 Ms, 1.2 deg2, 9x9 pointing, 25 ks each, half-shift tiling; Deep: 2 Ms, 0.11 deg2, 2x2 pointing, 500 ks each, half-shift tiling.
Below: Zoom in of the SIXTE simulation of wide survey with Effective Area as in poster #108.03 and HEO background. Two (One) optics in the HET. One optic in LET.



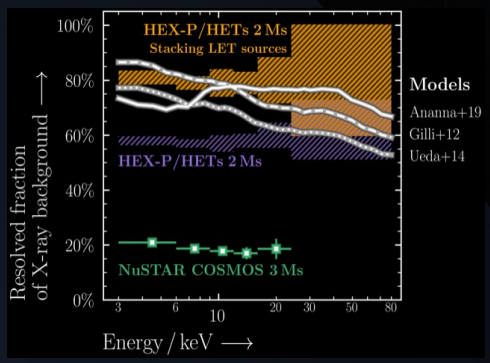


Through this:



	Survey	Area deg^2	Total # sources	Sources in 24-40 keV
NuSTAR	COSMOS	2	92	0
HET	Wide	1.2	1361	79
HET	Deep	0.11	75	58
LET	Wide		2484	
LET	Deep		489	

To this:



The three models in the figure are for a flux limit of 10^{-15} in the 8-24 keV, band which can be reached by stacking the HET signal at the position of the LET detected sources.

NuSTAR, focusing hard X-rays for the first time, was able to resolve 20% of the sources contributing to the the cosmic X-ray background (CXB) at energies above 8 keV in the wide COSMOS survey (Hickox+ in prep.).

HEX-P will directly resolve 60% of the CXB through direct detections and 80% through stacking of the lower energy detected sources in the LET for the first time around the peak of the CXB.

The comparison with population synthesis models will allow to re-calibrate these and eventually constrain the fraction of the missed population of obscured AGN in the hard X-rays and connect this with models of black hole and galaxy co-evolution.

HEX-P will complement cosmological surveys planned with next-generation instruments such as the 4-meter Multi-Object Spectroscopic Telescope, the James Webb Space Telescope and the Nancy Grace Roman Space Telescope.

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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