

## **EXIST: A High Sensitivity Hard X-ray Imaging Sky Survey Mission for ISS**

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An imaging survey of the hard x-ray ( $\sim 5\text{-}600$  keV) sky has never been conducted despite the enormous potential of this frontier band linking the predominantly thermal (x-ray) and non-thermal (gamma-ray) universe. The 1994 New Mission Concept (NMC) studies selected by NASA included the Energetic X-ray Imaging Survey Telescope (EXIST), which was studied for both an intermediate-class free flyer mission and a MIDEX implementation. The scientific requirements for a deep hard x-ray (HX) survey mission have now increased so that a larger telescope and instrument complement is needed to accomplish updated scientific objectives. EXIST is now envisioned as an array of 8 telescopes, each with imaging detector (CZT) area of  $\sim 1\text{m}^2$ , as the readout of a coded aperture telescope with 40 deg (FWHM) field of view, and mutually offset for a combined total survey field of view (FOV) 40deg x 160deg. This large total payload ( $\sim 3000\text{kg}$ ), with its fixed local-zenith pointing, is then an ideal candidate for an attached payload on ISS. With the long axis of the combined FOV aligned perpendicular to the orbital vector and the offset fields thus aligned along the main Truss, the telescope completes an all-sky image each orbit and over  $\sim 1$  year can achieve a sensitivity of  $\sim 0.05\text{mCrab}$  (10-100 keV;  $\sim 0.5\text{mCrab}$ , 100-500 keV), or nearly 1000X better than the only previous (non-imaging) HX survey, HEAO-A4 (1979). A 2-3 year mission would enable the sky to be imaged and catalogued for variability on time scales from microseconds to months, and would make possible fundamental studies of active galaxies, quasars, and obscured AGN; gamma-ray bursts in distant galaxies and SGRs in local galaxies; accreting black holes and compact objects in our Galaxy; and hidden supernova remnants in the Galaxy. An overview of the science goals and mission concept will be presented.