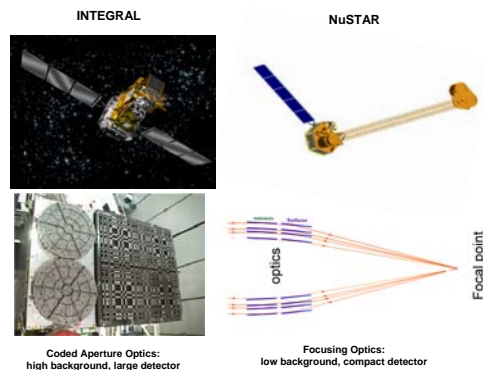


NuSTAR: The Nuclear Spectroscopic Telescope Array

Greg Madejski (KIPAC/SLAC) for the NuSTAR Team

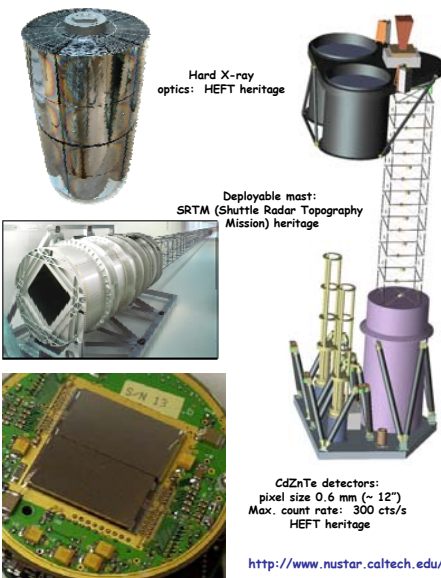
NuSTAR, or Nuclear Spectroscopic Array, the first focusing high energy satellite sensitive in the hard X-ray (6-79 keV) band, is planned for a launch in August 2011. Its hundred-fold + improvement in sensitivity will allow answering the fundamental questions about the Universe, relevant to the origin of the Cosmic X-ray background, formation of elements in supernovae, and structure / content of relativistic jets.

- * NuSTAR will be the first satellite-based focusing X-ray telescope operating in the hard X-ray band
- * Leading institution is Caltech (Fiona Harrison, PI)
- * It will be sensitive in the 6 - 79 keV range
- * It is scheduled for launch in August 2011 into a low-Earth, nearly equatorial orbit, resulting in a low background
- * It is a part of NASA's Small Explorer program



NuSTAR will feature three key novel technologies:

- Co-aligned multi-coated focusing hard X-ray telescopes
- Pixelated CdZnTe detectors
- Deployable mast connecting the two with ~ 10 m focal length



Primary NuSTAR science goals in the 2-yr baseline mission



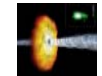
Objective #1: How are black holes distributed through the cosmos, and how do they affect the formation of galaxies?



Objective #2: How are stellar remnants distributed within the Galaxy and near the Galactic center?



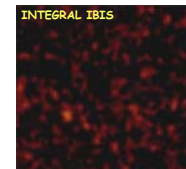
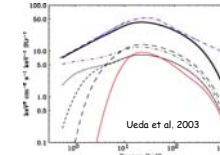
Objective #3: How do stars explode and forge the elements that compose the Earth?



Objective #4: What powers the most extreme, jet-dominated active galactic nuclei?

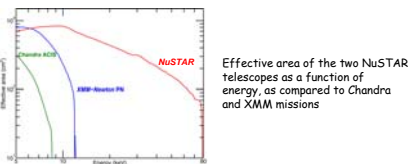
Plus ~6 months of unallocated science observing time in first 2 years: for ToO's, additional programs, and/or to respond to primary program

Distribution of black Holes in the Universe:
Resolving the Cosmic X-ray Background

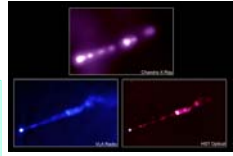
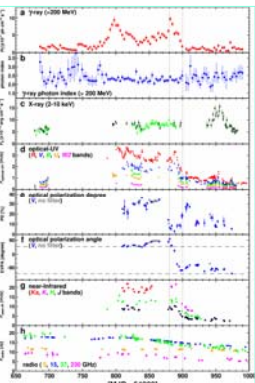


Key mission parameters

Energy range	6 - 79 keV
Angular resolution	45" Half Power Diameter
Field of View	12 arc min x 12 arc min
Spectral resolution	1.2 keV at 68 keV 0.6 keV at 6 keV
Sensitivity	2×10^{-15} erg/cm ² /s (6-10 keV) 1×10^{-14} erg/cm ² /s (10-30 keV)
Timing resolution	< 1 millisecond
ToO response	< 24 hour
Launch date	August 2011
Orbit	6° inclination, 550 x 600 km
Mission lifetime	> 2 years
Orbit lifetime	> 7 years



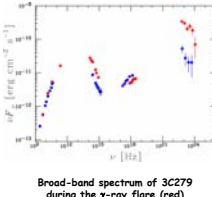
Jet-dominated AGN & NuSTAR: working together with Fermi



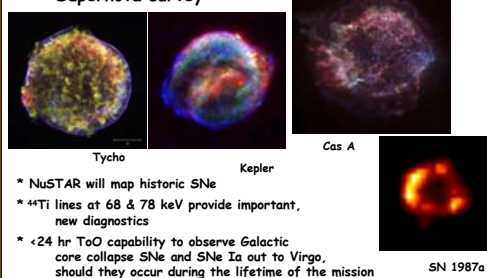
Hot off-the-press result for blazar 3C279: Fermi-detected γ -ray flare is associated with rotation of optical polarization angle (see talk by M. Hoshida):

X-ray flare *not* coincident with the optical / γ -ray flare!

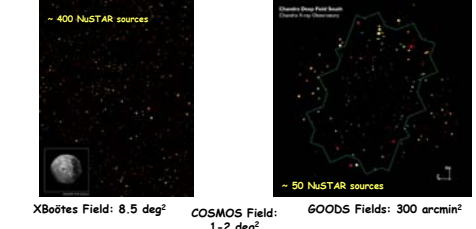
What is the evolution of the hard X-ray spectrum during the isolated flare? -> NuSTAR



Supernova survey



Extragalactic surveys



Galactic surveys

Goal: locate remnants of collapsed stars (white dwarfs, neutron stars, black holes) to study the endpoints of stellar evolution

