Wide Field X-ray Imaging Spectrometer (WFXIS) Summary

Reviewed by CST and Support Team

Overview

The Wide Field X-ray Imaging Spectrometer (WFXIS) is intended to perform high resolution imaging spectroscopy over a wide field of view, enabling detailed study of clusters of galaxies, individual galaxies, SNRs, ISM features and the composition of the X-ray background. The primary instrumentation consists of a ROSAT-like mirror with a wide field design (1 degree field of view) and a 500x500 pixel calorimeter (100 mm pixels). The mirror would have bandpass and effective area comparable to ROSAT (0.1 to 2.5 keV, with 1000 cm^2 at 0.2 keV and 400 cm^2 at 1 keV) and 2.4 m focal length, and be manufactured using the same approach (grinding/polishing of thick glass shells). However, the design would be optimized to carry the 10" angular resolution out to offsets of 0.25 degrees, and perhaps out to 0.5 degrees. Imaging spectroscopy with high spectral resolution (~5 eV) and high angular resolution would then be performed over the entire field of view. There is little quantitative information about mission implementation and cost, but the WFXIS is characterized as "Delta-class."

This RFI submission clearly dates from the 1990's (e.g., referencing "AXAF" and "Astro-E" as future missions), and IXO objectives are not directly addressed. The technology description does not take into account recent work. Only reasonably satisfactory optical designs had been found when this paper was written, and a trade between calorimeters and STJs is discussed, despite the essential abandonment of STJs.

Nevertheless, it is clear that an observatory with WFXIS characteristics would have powerful uses, from deep surveys to mapping of extended sources, and it would address some of the IXO and decadal priorities.

What happens close to a Black Hole?

Concept	Measurement
n/a	n/a

Not discussed. This mission would not be sensitive in the Fe K band.

When and how did super massive Black Holes grow?

Concept	Measurement
wide field, deep surveys can count AGN at high z	60 pointings of 2e5 sec will detect 50000 sources

Not discussed explicitly, but WFXIS's capability for deep surveys would make possible the detection of many distant black holes. Its capability for such discoveries, in particular the highest redshifts accessible, would need to be quantified via simulation.

How does large scale structure evolve?

Concept	Measurement
n/a	n/a

Not addressed. Modest effective area and 5 eV resolution could make WHIM studies challenging.

What is the connection between supermassive black hole formation and evolution of large scale structure (i.e., cosmic feedback)?

Concept	Measurement
elemental abundances in clusters indicate merger and evloutionary history	Measure the metallicity and velocity structure of hot gas in galaxies and nearby z<0.2 clusters

Given the date this response was written, it addresses this topic remarkably well. The angular resolution, spectral resolution (both comparable to IXO), and large field of view would allow WFXIS to make substantial strides in this through detailed spatially resolved spectroscopy of clusters, allowing measurements of abundances and bulk velocities.

How does matter behave at very high density?

Concept	Measurement
n/a	n/a

Not addressed. No mention of fast timing capability.