AXIS A High Spatial Resolution X-ray Probe Mission Study

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AXIS is a probe-class concept under study for submission to the 2020 Decadal survey. AXIS will extend and enhance the science of high angular resolution x-ray imaging and spectroscopy in the next decade with ~0.4" angular resolution over a 7" radius field of view and an order of magnitude more collecting area than Chandra in the 0.3-12 keV band with a cost consistent with a probe.

These capabilities are enabled by new technology x-ray optics utilizing lightweight single-crystal silicon optics with high angular resolution and large collecting area and next generation silicon detectors with small pixels, to sample the point spread function, and with high read-out rate to allow timing science and prevent pile-up. We have selected a low earth orbit to enable rapid target of opportunity response, similar to Swift, with a high observing efficiency, low detector background and long detector life.

The combination opens a wide variety of new and exciting science such as: (1) measuring the event horizon scale structure in AGN accretion disks and the spins of supermassive black holes through observations of gravitationally-microlensed quasars; (ii) determining AGN and starburst feedback in galaxies and galaxy clusters through direct imaging of winds and interaction of jets and via spatially resolved imaging of galaxies at high-z; (iii) fueling of AGN by probing the Bondi radius of over 20 nearby galaxies; (iv) hierarchical structure formation and the SMBH merger rate through measurement of the occurrence rate of dual AGN and occupation fraction of SMBHs; (v) advancing SNR physics and galaxy ecology through large detailed samples of SNR in nearby galaxies; (vi) measuring the Cosmic Web through its connection to cluster outskirts; (vii) a wide variety of time domain science including rapid response to targets of opportunity.

With a nominal 2029 launch, AXIS benefits from natural synergies with the ELTs, LSST, ALMA, WFIRST and ATHENA. The AXIS team welcomes input and feedback from the community in preparation for the 2020 Decadal review.