Science Advances with the NASA concept Advanced X-ray Imaging Satellite

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ABSTRACT: AXIS is a probe-class concept under study to the 2020 Decadal survey. AXIS will greatly extend and enhance the science of high angular resolution x-ray imaging, timing and spectroscopy in the next decade with ~0.3" angular resolution over a 7' radius field of view, more than an order of magnitude more collecting area than Chandra over the 0.3-12 keV band, a much faster read-out rate, a rapid response capability and a much lower background all with a cost consistent with a probe.

These capabilities enable major advances in a wide range of 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 spatially resolved imaging of galaxies at high-z; (iii) fueling of AGN by probing the Bondi radius of over 20 nearby galaxies; (iv) measuring 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 and the detailed physics of shocks; (vi) measuring the Cosmic Web through its connection to cluster outskirts (vii) determining precise positions and spectral and timing behavior of transient and time variable sources.

With a nominal 2028 launch, AXIS benefits from natural synergies with the ELTs, LSST, ALMA, WFIRST and ATHENA. AXIS utilizes breakthroughs in the construction of lightweight X-ray optics from mono-crystalline silicon blocks, and developments in the fabrication of large format, small pixel, high readout rate detectors allowing a robust and cost effective design. The AXIS team welcomes input and feedback from the community in preparation for the 2020 Decadal review.