Abstract:

Arcus, a Medium Explorer (MIDEX) mission, was selected by NASA for a Phase A study in August 2017. The observatory provides high-resolution soft X-ray spectroscopy in the 12-50Å bandpass with unprecedented sensitivity: effective areas of >350 cm^2 and spectral resolution >2500 at the energies of O VII and O VIII for z=0-0.3. The Arcus key science goals are (1) to measure the effects of structure formation imprinted upon the hot baryons that are predicted to lie in extended halos around galaxies, groups, and clusters, (2) to trace the propagation of outflowing mass, energy, and momentum from the vicinity of the black hole to extragalactic scales as a measure of their feedback and (3) to explore how stars, circumstellar disks and exoplanet atmospheres form and evolve. Arcus relies upon the same 12m focal length grazing-incidence silicon pore X-ray optics (SPO) that ESA has developed for the Athena mission; the focal length is achieved on orbit via an extendable optical bench. The focused X-rays from these optics are diffracted by high-efficiency Critical-Angle Transmission (CAT) gratings, and the results are imaged with flight-proven CCD detectors and electronics. Arcus will be launched into an ~ 7 day 4:1 lunar resonance orbit, resulting in high observing efficiency, low particle background and a favorable thermal environment. There will be capabilities to observe transient sources such as tidal disruption events or supernovae with a ~3 day turnaround. Following the 2nd year of operation, Arcus will transition to a proposal-driven guest observatory facility.