Generation-X: A Large Area and High Resolution X-Ray Mission for Science Beyond Chandra and Constellation-X

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Abstract

Chandra is capable of detecting and imaging normal galaxies ($L_x \sim 10^{40}$ ergs/cm^2/s) to a redshift of $z \sim 0.2$ and active galaxies ($L_x \gtrsim 10^{44}$ ergs/cm^2/s) to $z \sim 3$. The upcoming Constellation-X mission will perform spectroscopic studies of normal galaxies to $z \sim 0.1$ and active galaxies to $z \sim 5$. To push the frontier of X-ray astronomy much beyond $z \sim 5$ so as to study the first quasars, which are believed to be stellar mass black holes formed around $z \sim 10$, would require an X-ray mission with a good angular resolution($\sim 1''$ half-power diameter) and a large effective area(~ 150m^2). We will present a mission concept, called Generation-X, that will address astrophysical issues beyond Chandra and Constellation-X. It represents an order magnitude improvement in angular resolution and two orders of magnitude in effective area from Constellation-X. It will have an imaging limit of $\sim 10^{-20}$ ergs/cm^2/s and a spectroscopic limit of $\sim 10^{-18}$ ergs/cm^2/s. As such it is capable of detecting a 10^3 solar mass black hole at $z \sim 10$ and performing spectroscopic studies of normal galaxies beyond $z = 1$.

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