The X-ray Emitting Components Within a Variety of Early-type Systems

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Abstract

The superb spatial resolution of *Chandra* is providing an unprecedented view of the X-ray emission from galaxies. For the first time, it is possible to separate the gaseous, stellar, and AGN components of early-type systems. Here, we present *Chandra* observations of a variety of early-type systems ranging from elliptical and S0 galaxies to the bulges of Sa and Sb spirals. Of the galaxies studied so far, the bulges of spiral galaxies closely resemble those of a sub-class of ellipticals and S0s that are very X-ray underluminous for their optical luminosity. In these galaxies, the stellar sources (primarily low mass X-ray binaries; LMXBs) are the dominant X-ray emitters. There is some hot gas present, but at much lower levels than in the more famous X-ray bright ellipticals. The gas is also at a lower temperature (0.3 keV) than in more luminous systems. *Chandra* offers the unique opportunity to probe the X-ray luminosity function of LMXBs in galaxies, and we find that the total LMXB X-ray luminosity, once scaled by the optical luminosity of the galaxy, is not uniform from galaxy to galaxy despite the fact that these systems have very similar stellar populations. The difference in LMXB luminosity stems from the fact that some galaxies are missing the most luminous LMXBs found in other galaxies. However, below 10^{38} ergs s^{-1}, the LMXB population appears very similar among galaxies. We illustrate how if this similarity is a common feature of LMXBs in early-type systems, it might be used as a distance indicator to nearby galaxies, one of the very few non-optical methods to determine distances.

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