

PhD Thesis Project Proposal

INAF – Osservatorio Astrofisico di Arcetri

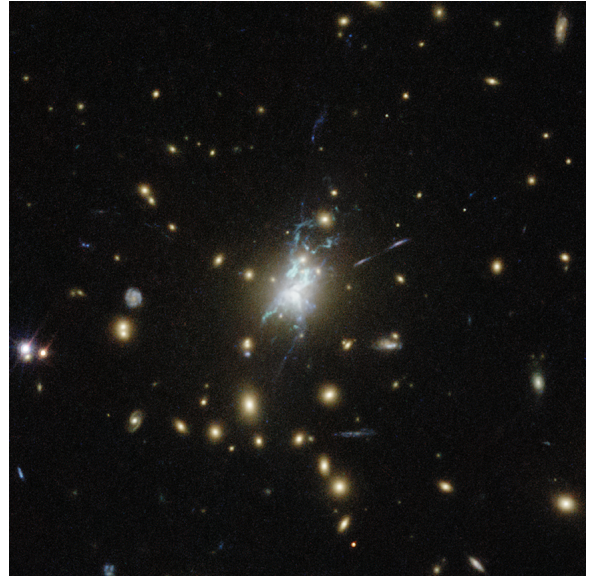
Title – Nuclear Activity in Brightest Central Galaxies and the cycle of baryons in Massive Galaxy clusters

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Period: November 2023 - November 2026

Description –

The PhD project focuses on the nuclear activity, both in the X-ray and in the radio band, observed in the brightest central galaxies (BCGs) in massive galaxy clusters. In particular, the aim is to study the duty cycle of the AGN phase, the accretion onto the supermassive black hole from the cooling Intra Cluster Medium (ICM), and the feedback effects in the ICM itself, during the X-ray and radio phase. The final goal is to show how the X-ray bright and radio bright phase follows each other in a self-organized system, according to the environment (i.e., the properties of the ICM).



The BCG of the Phoenix Cluster in the optical light data from Hubble Space Telescope (Credit: X-ray: NASA/CXC/MIT/M.McDonald et al.; Radio: NRAO/VLA; Optical: NASA/STScI).

Objectives – The practical work consists in the analysis of X-ray (from the Chandra archive and proprietary data) and radio (from the JVLA archive and proprietary data) images to obtain the photometry of the BCG nucleus. The final sample of X-ray and radio images with high angular resolution (required to identify the nuclear emission) amounts to about 400 clusters in the $0.1 < z < 1.3$ redshift range. A statistical population model, accounting for the stellar mass of the BCG, the ICM properties (namely the central cooling time) and the nuclear luminosity, will be used to interpret the data in the context of self-organized systems.