X08a 系外銀河ハロー内にある中間質量ブラックホールの重力的直接撮像

井上開輝（近畿大）, Valery Rashkov (Univ. of California, Santa Cruz), Joseph Silk (IAP, Paris), Piero Madau (Univ. of California, Santa Cruz)

A galaxy halo may contain a large number of intermediate mass black holes (IMBHs) with masses in the range of 10^2 to 10^6 solar masses. We propose to directly detect these IMBHs by observing multiply imaged QSO-galaxy or galaxy-galaxy strong lens systems in the submillimeter bands with high angular resolution. The silhouette of an IMBH in the lensing galaxy halo would appear as either a monopole-like or a dipole-like variation at the scale of the Einstein radius against the Einstein ring of the dust-emitting region surrounding the QSO. We use a particle tagging technique to dynamically populate a Milky Way-sized dark matter halo with black holes, and show that the surface mass density and number density of IMBHs have power-law dependences on the distance from the center of the host halo if smoothed on a scale of $\sim 1\,\mathrm{kpc}$. Most of the black holes orbiting close to the center are freely roaming as they have lost their dark matter hosts during infall due to tidal stripping. Next generation submillimeter telescopes with high angular resolution ($< 0.3\,\mathrm{mas}$) will be capable of directly mapping such off-nuclear freely roaming BHs with a mass of $< 10^6$ solar mass in a lensing galaxy that harbours a $O(10^9)$ solar mass supermassive black hole in its nucleus.