CHANDRA OBSERVATIONS OF MRK 273: UNVEILING THE CENTRAL AGN AND THE EXTENDED HOT GAS HALO

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Abstract

We report X-ray results of the ultraluminous IRAS galaxy Mrk 273 obtained using the ACIS-S3 instrument on board Chandra. The high resolution X-ray image, for the first time, reveals a compact hard X-ray nucleus. Its position is coincident with the northern nucleus identified in the optical, infrared, radio and in molecular CO maps. Its X-ray energy distribution is well described by a heavily obscured AGN spectra with an absorbed power-law plus a narrow FeKα emission line at 6.4 keV. The neutral hydrogen column density is about $4 \times 10^{23} cm^{-2}$, implying an absorption-corrected X-ray luminosity (0.1–10 keV) for the nucleus of $L_x \approx 6.5 \times 10^{43} ergs\ s^{-1}$ for $H_0 = 50 km\ s^{-1}\mathrm{Mpc}^{-1}$. The X-ray properties therefore firmly establishes the northern nucleus of Mrk 273 as a Seyfert 2 active galactic nucleus.

There are also bright soft X-ray clumps and diffuse soft X-ray emissions surrounding the central hard X-ray nucleus within the $10''$ of the nuclear region. Its spectrum can be fitted by a MEKAL thermal model with temperature of about 0.8 keV and high metallicity ($Z \sim 1.5 Z_{\odot}$) plus emission lines from α elements and ions. We find that a soft X-ray clump, about $4''$ (projected separation of about 4 kpc) southwest of the northern hard X-ray nucleus, is coincident with a nebula with strong OIII emissions. Further outside the central region, the Chandra observations reveal a very extended hot halo in Mrk 273. The X-ray halo encompasses the entire optical tidal tail and plume, with a projected size of about $54 kpc \times 34 kpc$. The total soft X-ray luminosity (0.1–2.4 keV) of the hot halo is $L_x \approx 1.9 \times 10^{41} ergs\ s^{-1}$, in the range of the soft X-ray luminosity of bright elliptical galaxies. The temperature of the hot gas is about 0.62 keV with a low metallicity ($Z \sim 0.1 Z_{\odot}$). We discuss the nature of AGN and the implications of our results on the origin of X-ray halos in elliptical galaxies.

CATEGORY: ACTIVE GALAXIES AND QUASARS