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Abstract. We present *Chandra* high resolution imaging of the circumnuclear regions of two nearby active galaxies, namely the starburst/AGN composite Seyfert 1.8 NGC 1365 and the archetypal Seyfert 1 NGC 4151. In NGC 1365, the X-ray morphology shows a biconical soft X-ray-emission region extending ∼5 kpc in projection from the nucleus, coincident with the optical high-excitation outflows. *Chandra* HRC imaging of the NGC 4151 nucleus resolves X-ray emission from the 4 arcsec radio jet and the narrow line region (NLR) clouds. Our results demonstrate the unique power of spatially resolved spectroscopy with *Chandra*, and support previous claims that frequent jet-ISM interaction may explain why jets in Seyfert galaxies appear small, slow, and thermally dominated.

Keywords: X-rays: galaxies – galaxies: individual (NGC 4151) – galaxies: individual (NGC 1365)
PACS: 98.54.-h, 98.58.-w, 98.62.Js

INTRODUCTION

Chandra X-ray Observatory delivers sub-arcsecond resolution images of the nearby Seyfert galaxies and offers unique opportunities to examine the X-ray emission from the active galaxies in much greater detail than at high redshifts, complementary to the large multiwavelength surveys sampling the distant universe.

We present new results from *Chandra* observations of two active galaxies, the Seyfert 1.8 NGC 1365 (D∼19 Mpc, Lindblad 1999) and the Seyfert 1.5 NGC 4151 (D∼13.2 Mpc, Mundell et al. 1999), showing that the circumnuclear region in a Seyfert galaxy at high resolution can be very complex with presence of high excitation gas, collimated radio outflow, and star forming regions, besides the active nucleus.

NGC 1365: A PRIME EXAMPLE OF AN AGN IN A STARBURST

The X-ray morphology of the extended emission shows a biconical soft X-ray emission region extending ∼5 kpc in projection from the nucleus (Wang et al. 2009a; see Figure 1 left panel), coincident with the high excitation outflow cones seen in optical emission lines particularly to the northwest. Harder X-ray emission is detected from a kpc-diameter circumnuclear ring, coincident with the star-forming ring, partially obscured by the central dust lane of NGC 1365.

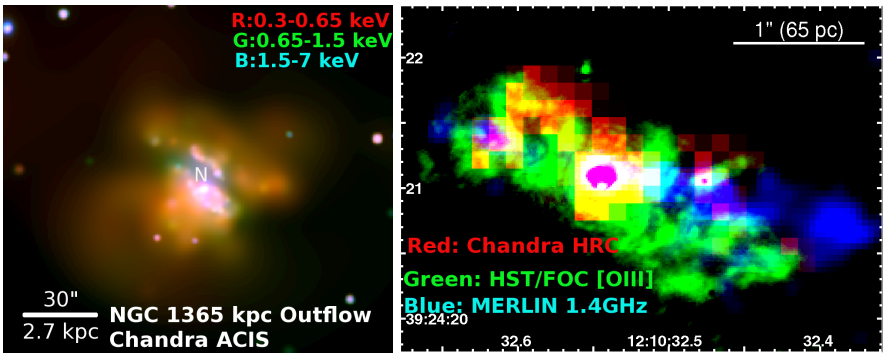

FIGURE 1. Left: Adaptively smoothed, *Chandra* 3-color images of the kpc-scale outflows in NGC 1365. Right: X-ray, optical, and radio composite image of the NGC 4151 nuclear region.

Spectral fitting indicates a thermal plasma origin for the soft extended X-ray emission ($kT = 0.57$ keV). Only a small amount of this emission can be due to photoionization by the nuclear source. Detailed comparison with [OIII]λ5007 observations shows the ISM is spatially anticorrelated with the [OIII] emitting clouds. The abundance ratios of the hot interstellar medium (ISM) are fully consistent with the theoretical values for enrichment from Type II supernovae, suggesting an origin of wind from the starburst circumnuclear ring.

NGC 4151: PHOTOIONIZED GAS AND JET-ISM INTERACTION

The *Chandra*/HRC imaging of the 4 arcsec radio jet and the NLR in NGC 4151 (Wang et al. 2009b; see Figure 1 right panel), resolves the emission on spatial scales of 0.5 arcsec, $\sim$30 pc. X-ray enhancements closely match the substructures seen in the HST [OIII] image and prominent knots in the radio jet. We find evidence that indicates a density decreasing as r^{-2}, as expected for a nuclear wind scenario. Our results favor thermal emission from the interaction between radio outflow and NLR gas clouds as the origin for the X-ray emission associated with the jet. Analysis of newly obtained 200 ks ACIS imaging of NGC 4151 confirms the overall morphology of the soft X-ray emission and shows rich structures in the extended NLR (Wang et al. 2010, in prep.).

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