

A multi-wavelength study of the radio-loud Narrow-line Seyfert 1 (NLS1) galaxy RX J23149+22

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Introduction

While, as a class, NLS1 galaxies are more radio-quiet than broad-line Seyfert 1s, a few of them are radio-loud and share properties with blazars (e.g., Komossa et al. 2006, Zhou et al. 2007, Yuan et al. 2008). Here, we present a multi-wavelength analysis of the radio-loud narrow-line Seyfert 1 galaxy RXJ23149+22, including optical spectroscopic and monitoring observations, Swift UV and X-ray data, and radio observations obtained at the Effelsberg telescope.

Optical spectroscopic and monitoring observations

• Optical spectroscopy

We took spectra of RX J23149+22 at the Xinglong 2.16-m telescope. A remarkably strong and broad blue wing is confirmed in the [OIII] λ 5007Å line. The broad blue wing, which has FWHM= 1560 km s⁻¹ is blueshifted by 1260 km s⁻¹ from the narrow core.

• Optical monitoring

Unlike other gamma-NLS1s, which show repeated optical flaring, neither long-term variations nor intra night variability were detected so far, during our optical monitoring campaign at the 80cm telescope at Xinglong observatory.

Swift observations

- The X-ray spectrum can be fit with an absorbed powerlaw. We obtained a photon index of $\Gamma_x = 1.98 \pm 0.12$ (0.2-10 keV), and excess cold absorption. The Swift UV measurements imply a very steep UV spectrum.

Effelsberg radio observations

- We carried out radio observations of RX J2314.9+22 with the Effelsberg telescope, with measurements at different frequencies. The radio spectrum obtained from the lower frequency detections is steep with a spectral index of -0.76 ($S \propto \nu^{-0.76}$).

The nature of RX J23149+22

- RXJ23149+22 is a radio-loud NLS1 galaxy (Komossa et al. 2006), with a recent tentative report of a gamma-ray detection. We obtained multi-wavelength observations to better understand its NLS1-blazar nature. RXJ13149+22 exhibits unusual multi-wavelength characteristics, including a flat X-ray spectrum, optical [OIII] emission that is exceptionally blueshifted, and luminous infrared emission. The flat X-ray emission likely indicates the dominance of a jet component, rather than the accretion disk. Its steep UV spectrum is likely intrinsic, since we do not find evidence for reddening from the optical emission lines. The particularly high blueshift of its broad [OIII] emission-line component could be understood in terms of a face-on view into an outflow, with the jet (and outflow) pointing almost toward us. In summary, overall, RXJ23149+22 shares the dual properties of blazars and NLS1s exhibited by the few other known radio-loud gamma-NLS1s.

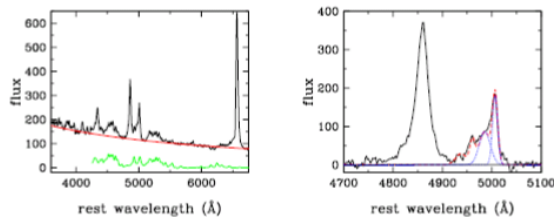


Fig. 1. *Left:* Optical spectrum, best-fit power-law continuum and FeII complexes. *Right:* Zoom onto the HB-[OIII] region. The dashed line shows our double-Gaussian fit to [OIII] λ 4959, 5007Å. The dotted lines represent the narrow and broad components of [OIII] 5007Å.