AGN SURVEYS
ASP Conference Series, Vol. 284, 2002
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The orientation of the Seyfert nucleus in Mrk 348

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Abstract. We present new data on Mrk348: 5 GHz data with MERLIN and infrared data with ISO. The radio properties of Mrk 348 are unusual among Seyfert galaxies, and we discuss the orientation of the AGN axis with respect to the line of sight.

1. Introduction

Mrk 348 is a nearby object, hosted by a giant spiral galaxy (Antón 2000 and references therein). The optical total intensity spectrum shows narrow emission lines, while spectropolarimetric observations reveal a hidden broad line region (Tran 1995). Mrk 348 has a linear triple radio structure $0.2''$ in size at 5 GHz, and the core is variable on scales of months (Neff & de Bruyn 1983). Two VLBA epochs show that the components are expanding at sub-relativistic speeds (Ulvestad et al. 1999). Recently, H_20 megamaser emission was detected (Falcke et al. 2000). In order to further discuss the properties of Mrk 348, we gathered new data to (1) analyse the spectral energy sistribution (SED) of the nuclear emission and (2) search for polarised radio emission. Here we present ISOPHOT photometry at 170, 90, 60, 25 μm, radio 5 GHz maps with MERLIN, and photometry at 1350 μm from the JCMT-SCUBA archive.

2. Results

The SED reveals that Mrk 348 has a flat spectrum up to the millimetre band ($S\sim \nu^{0.09}$) – see Figure 1 Left – suggesting that the emission up to that band is synchrotron in origin. A 5 GHz MERLIN polarisation map reveals that only the southern component is polarised – see Figure 1 Right – with P=5%. The polarisation seen in the southern component is unusual as most Seyferts show little polarisation.

3. Discussion

The peculiarity of Mrk 348 comes from the SED and the polarisation seen in the southern component: both are unusual among radio-quiet objects, but compa-

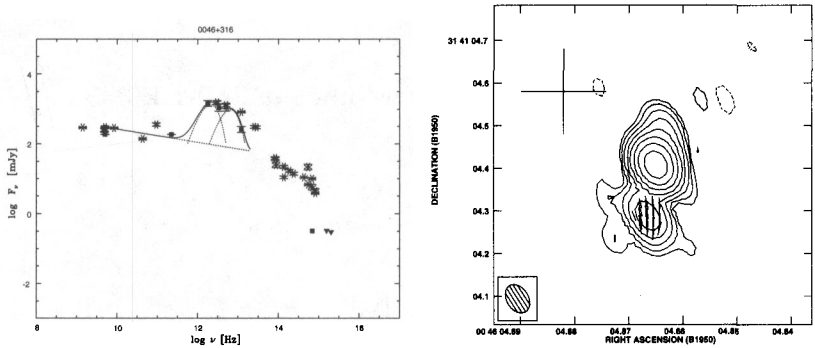

Figure 1. Left – SED. Flux densities from the literature are shown as star symbols. Our data are represented by square symbols. Inverted triangles represent upper limits. The solid line represents the sum of a power law spectrum with two greybody spectra of temperatures $\sim$ 20 K and $\sim$ 62 K (each component is represented by dashed lines). Right – Naturally–weighted 5 GHz map. The root-mean-square noise level (σ) is 0.158 mJy/beam. The contour levels are chosen as $6\sigma\times$(-2,-1,1,2,4,8,16,32,64,128). Polarisation vectors with a scale of 1 mJy/beam to 0.015 arcsec are overlayed.

rable to properties of low-luminosity radio-loud objects. The flatness of the SED is very similar to that of objects in which the radio emission is related to the presence of a relativistic jet. A key problem is the orientation of the system with respect to the line of sight. The evidence points in different directions: some observations (spectropolarimetric observations, megamaser studies, sub-luminal motions of the radio components) are consistent with the axis of the system being at a large ($\geq 45°$) angle to the l.o.s, whereas other observations (flatness of the SED, core-dominated radio structure, radio variability, polarisation asymmetry; see Antón 2000) are consistent if the radio jet axis makes a small angle ($\leq 10°$) to the l.o.s. If the radio emission in Mrk348 is beamed, then Mrk 348 is intrinsically a radio-quiet object. But if the angle to the line of sight is large and the Doppler beaming is not a dominant factor, Mrk 348 is close to, but slightly above, the radio-loud/radio-quiet boundary. In this case, the peculiarity of Mrk 348 comes from the combination of a radio-loud object and a spiral host galaxy.

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https://doi.org/10.1017/S0252921100030840 Published online by Cambridge University Press