THE DISCOVERY OF BLAZAR-TYPE NUCLEI IN TWO NEARBY RADIO ELLIPTICALS

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Near infrared polarimetry of Centaurus A and IC5063 has revealed the existence of a steep spectrum highly polarized source in the nuclei of both galaxies. The position angle of polarization is perpendicular to the radio position angle. We interpret this polarized emission as synchrotron radiation. This, together with a luminosity of 5 x 10^{41}erg s^{-1}, suggests the galaxies are low luminosity blazars and that such nuclei may be common in elliptical galaxies.

Low luminosity BL Lac objects (e.g. Mkn 421, 501) are clearly associated with the nuclei of elliptical galaxies. Many nearby E/SO galaxies have similar flat radio spectra suggesting they too may contain blazar type nuclei. Axon, Baily and Hough (1982) reported the discovery of a very red near infrared source in the nucleus of IC5063, however it was not then possible to distinguish between thermal and non-thermal radiation mechanisms. Polarimetric observations offer the chance to do this, since high polarization is the main characteristic of blazar type objects. By going into the infrared, the behaviour may be followed as the contribution from starlight falls. All observations were made with the Hatfield Optical-IR Polarimeter (Bailey and Hough 1982) on the 3.9-m Anglo-Australian Telescope. Figures 1 and 2 present polarization levels and position angles for various aperture sizes and as a function of wavelength for the two galaxies.

1. Centaurus A: The results are described in detail in Bailey et al. (1986). The data are readily understood if the nucleus has its own intrinsic polarization with a different p.a. to that caused by the dust lane. A good fit is obtained with a power-law nucleus (dominant at longer wavelengths) with wavelength independent polarization of 9% in p.a. 147 degrees, spectral index -5.3 and flux 3mJy at J, together with

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a stellar component and polarization due to the dust lane applied to both (a standard interstellar law).

2. IC5063: The polarization decreases from B to J and then rises sharply towards longer wavelengths. In the smaller apertures, the polarization increases at H and K, and the p.a. of polarization is wavelength independent and perpendicular to the east-west extension of the radio source centred on the galaxy (Danziger et al. 1981). The spectral index as calculated using the polarized flux between H and K is -4.6 ± 0.4, the same as from photometry alone (Axon et al. 1982). We therefore conclude that the infrared excess arises from a non-thermal source whose intrinsic polarization is $(17.4 \pm 1.3)\%$, typical for a BL Lac object. The origin of the optical polarization is unknown although a reasonable fit may be obtained by polarization due to the passage of radiation through aligned grains (see Fig. 2).

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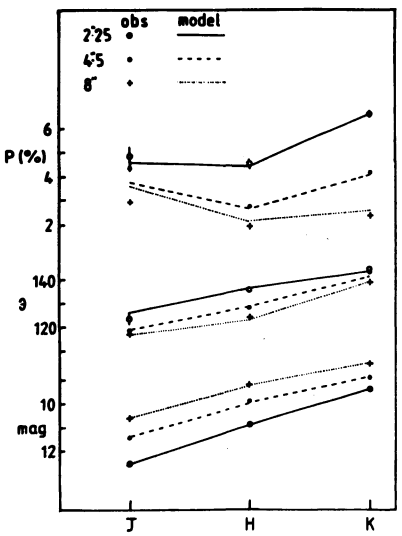

Fig. 1. Polarization, position angle and magnitude of NGC5128 (Cen A) compared to the model described in the text.

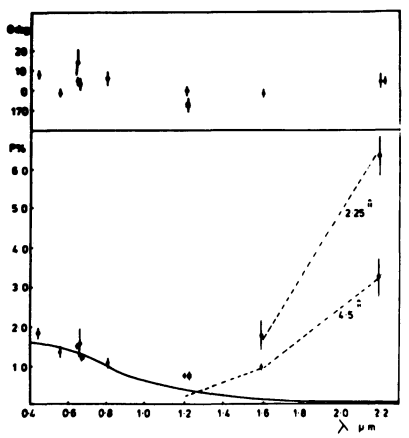

Fig. 2. Polarization and position angle for IC5063. Solid line is an interstellar curve with maximum polarization 1.5% at 0.40μm. Dashed line connects polarization levels calculated for a non-thermal source with spectral index -4.5, polarization 17.4% and flux 4.5mJy at K.

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