Bull. Astr. Soc. India (1993) **21**, 455-456

Evidence for nonthermal radiation from the nuclei of Seyfert galaxies

M. R. Deshpande and U. C. Joshi
Physical Research Laboratory, Navrangpura, Ahmedabad 380 009

Abstract. We report the detection of nonthermal radiation from the nuclei of four Seyfert galaxies through polarization studies. Our investigations on four galaxies (NGC 3081, NGC 4388, NGC 3227 and NGC 2992) show evidence of nonthermal radiation, indicating the generation of the energy in these Seyfert galaxies, by synchrotron process. Thus, these observations indicate that relativistic electrons are produced in the nuclei of these galaxies.

Key words : Seyfert galaxies—polarization

1. Introduction

Seyfert galaxies which form a subclass of active galaxies are characterised by bright nucleus, with most of their energy being radiated in the infrared region. Some of the Seyfert (type 2) show broad permitted emission lines, tens of thousand km/sec in width. Also there is evidence of nonthermal radiation in some Seyfert galaxies (Rieke 1978; Rieke *et al.* 1982). We have detected the nonthermal radiation from four Seyfert galaxies through a new approach described in the next section. We propose to observe several Seyfert galaxies next year from 1.2 m IR telescope from Gurushikhar, Mt. Abu.

2. Observations and discussions

The observations were made on VBT (2.3 m aperture) at Kavalur with PRL polarimeter (Deshpande *et al.* 1985) using different apertures. If the radiation from the nuclei of Seyfert galaxies is of thermal origin, one expects blackbody distribution with low or no polarization. On the other hand if the radiation is of synchrotron origin one expects large degree of polarization, but in actual practice we observe the mixture of the above two radiations. The thermal radiation usually dominates the entire galaxy and is produced due to stellar light scattered by the atoms, molecules and dust in the galaxy. On the other hand the synchrotron radiation mainly originates from the nucleus. To decide which of the two mechanisms prevail it is important to do polarization measurements with different apertures. If one observes increase in polarization with the decrease in aperture then synchrotron radiation mechanism is operative. On the other hand if there is not much change in polarization with aperture variation one expects thermal radiation to dominate. With above facts in mind we have taken up the programme of Seyfert galaxies. In the galaxies NGC 2992, NGC 3081, NGC 3227 and NGC 4388 we have detected

a strong evidence for synchrotron radiation. Figure 1 shows variation of percentage polarization (P) with aperture. (On VBT 1 mm of aperture corresponds to 6.5 arcsec in the sky). One can clearly see that the degree of polarization decreases with the increase in aperture size. The degree of polarization is about 4 percent in case of NGC 3081 and 2992 (error ±0.1 percent) for 0.5 mm aperture. Such a high degree of polarization cannot be explained without the help of synchrotron mechanism. We propose to undertake an exhaustive work on several Seyfert galaxies with photometric observations to substract the galactic contributions, once our 1.2 m telescope at Gurushikhar is operational.

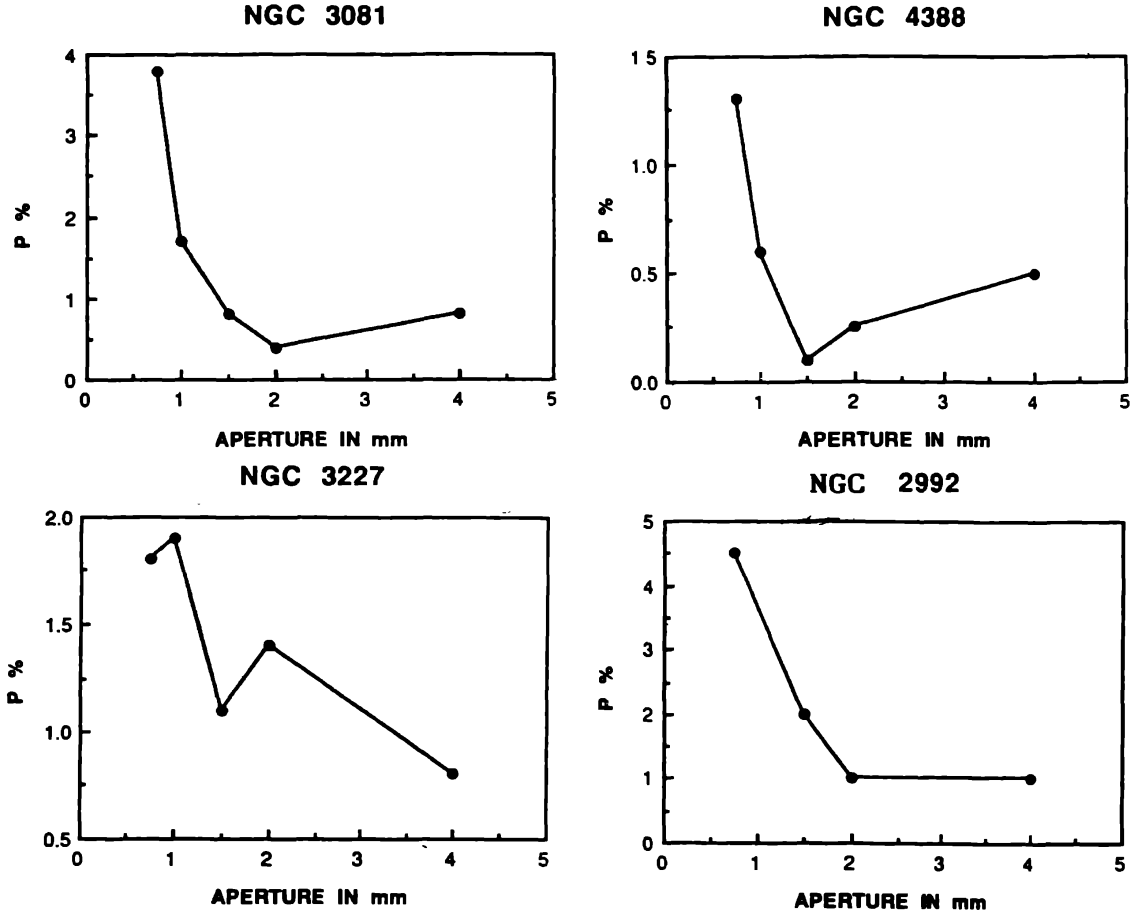

Figure 1. The figure shows polarization in Seyfert Galaxies for different apertures. As the aperture is decreased, the relative contribution from the galaxy, compared to nucleus, decreases. This shows enhancement in polarization indicating the generation of Synchrotron radiation from the nuclei of the galaxies.

Acknowledgements

We wish to thank Prof. R. K. Varma and Prof. P. V. Kulkarni for encouragement and Prof. N. K. Rao for time on VBT. The financial support was given by DOS, Govt. of India.

References

Deshpande M. R., Joshi U. C., Kulshrestha A. K., Banshidhar Vadher N. M., Mazumdar H. S., Pradhan S. N., Chayya R. Shah, 1985, BASI, 13, 157.

Rieke G. H., 1978, ApJ, 226, 550.

Rieke G. H., Lebofsky M. J., Wisniewski W. Z., 1982, ApJ, 263, 73.