Rev. Mexicana Astron. Astrof., **14**, 102 (1987)

HIGH SPATIAL RESOLUTION IR OBSERVATIONS AND VARIABILITY OF THE NUCLEAR REGION OF NGC 1068: STRUCTURE AND NATURE OF THE INNER 100 PARSEC*

Alain Chelli[1,2], Christian Perrier[3]
Irene Cruz-González[1], and Luis Carrasco[1]

1. Instituto de Astronomía, UNAM.
2. On leave from Observatoire de Lyon, France.
3. Observatoire de Lyon, France.

ABSTRACT. Speckle interferometric observations of the Seyfert galaxy NGC 1068 have been carried out at 3.61 μm in two perpendicular directions, at P.A.=45° and P.A.=135°. Three different methods, giving basically the same results, have been used to compute the phase of the spectrum of the object. Also, for each direction, the solutions of three algorithms of object reconstruction are compared.

The reconstructed one-dimensional spatial profiles reveal two distinct zones: (i) a nuclear region composed of an unresolved core, and a component of 0.18±0.06 arcsec in size that emits 0.95±0.15 Jy in the L band; and (ii) an extended region of 0.7x1.5 arcsec in size, contributing 0.75±0.08 Jy in the L band, and elongated at P.A.=45°. The emission of the nuclear region is essentially nonthermal with an unreddened spectral index $\alpha^{\circ}_{K-8.3\mu m} = -1.9$, while the emission of the extended region has probably a thermal origin. The speckle flux together with additional near IR photometry show that the unresolved component is variable, and is confined inside the inner 0.15 pc.

The optical, IR and radio data of the nucleus can be interpreted as follows: a nuclear core, with a maximum size of 0.15 pc and a maximum mass of $5\times10^8 M_{\odot}$, illuminates an optically thick halo of scattering electrons with a diameter of 18 pc and a maximum mass of $10^5 M_{\odot}$, that can be identified with the barely resolved 2 cm radio nucleus. A disk of gas and dust with a scale height of 4 pc and a minimum mass of $10^5 M_{\odot}$ prevents us from a direct view of the visible and UV continua arising from the unresolved nuclear core, the latter being directly seen through dust in the IR. The change in polarization from the visible to the near IR could be explained in terms of scattering by electron clouds and transmission through strongly aligned dust. The extended emission could have its origin in a shock induced starburst.

A full version of this work has been submitted to Astronomy and Astrophysics Main Journal.

Key words: IMAGE PROCESSING — INFRARED RADIATION — INTERFEROMETRY — GALAXIES-SEYFERT — GALAXIES-NUCLEI OF

* Based on observations collected at the European Southern Observatory, La Silla, Chile, and at the Observatorio Astronómico Nacional of San Pedro Mártir, B.C., México.

Luis Carrasco, Irene Cruz-González, and Alain Chelli: Instituto de Astronomía, UNAM, Apartado Postal 70-264, 04510 México, D.F., México.
Christian Perrier: Observatoire de Lyon, 69230 Saint Genis Laval, France.