

JHK AND 3.3 μm PAH IMAGING OF THE STARBURST RING IN THE TYPE 1 SEYFERT GALAXY NGC 7469

J. M. MAZZARELLA

*Infrared Processing and Analysis Center, California Institute of Technology,
Jet Propulsion Laboratory, Pasadena, CA 91125*

G. M. VOIT, B. J. SOIFER, K. MATTHEWS, L. ARMUS and D. L. SHUPF
Palomar Observatory, California Institute of Technology, Pasadena, CA 91125

and

J. R. GRAHAM

Department of Astronomy, University of California, Berkeley, CA 94720

Abstract.

Imaging of NGC 7469 in the J, H, & K bands shows that the starburst 'ring' is a tight inner spiral with arms that extend 4" NW and SE from the nucleus, as well as distinct infrared hotspots associated with the radio continuum sources. Imaging in the 3.28 μm dust emission feature shows extended PAH emission that is roughly aligned with published 12.5 μm continuum emission (PA $\sim 75^\circ$), consistent with small dust grains heated by vigorous star formation in the inner spiral.

Key words: NGC 7469 starburst infrared spiral - PAH emission

1. Observations

Images were obtained through J (1.27 μm), H (1.65 μm), and K (2.20 μm) filters on 1992 July 17 UT using the Cassegrain infrared camera on the 200 inch Hale telescope of Palomar Observatory; the detector was a 58x62 element InSb array manufactured by SBRC. The average seeing was 0".8 FWHM at K. The 3.28 μm PAH feature was imaged with a circular variable filter ($\Delta\lambda/\lambda \sim 1.5\%$) tuned to the redshifted dust feature, 3.33 μm , and on a continuum wavelength of 3.20 μm .

2. Summary

Direct high-resolution images of NGC 7469 in the J, H, and K bands show a relatively smooth intensity distribution, with no firm evidence for a stellar bar larger than about 2.50 pt. Image enhancement techniques including adaptive hi-pass filtering, Richardson-Lucy restoration, and subtraction of smooth galaxy models from the direct images, show that the starburst 'ring,' (diameter 3", 1 kpc) first detected in radio continuum emission (Wilson et al. 1991) is a tight inner spiral similar to that observed in the nearby Seyfert 2 galaxy NGC 1068. As shown in Fig. 1, the infrared spiral has arms that extend 4" NW and SE from the nucleus, as well as distinct infrared hotspots associated with peaks in the published 6 cm radio continuum image.

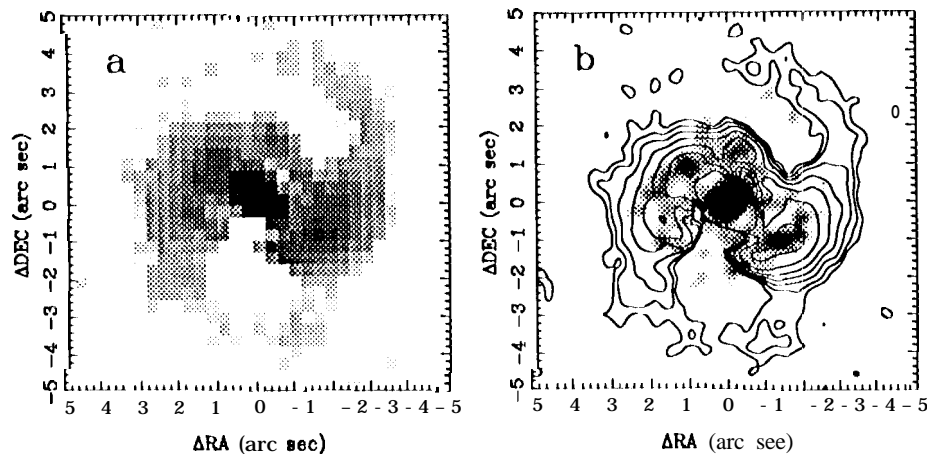


Fig. 1. (a) Gray-scale of K-band image after subtraction of a smooth model derived from ellipse fitting; (b) contours of the same K-band image superposed on a gray-scale of the 6 cm VLA image from Wilson et al. (1991).

Narrow band ($\Delta\lambda/\lambda \sim 1.5\%$) imaging in the $3.28 \mu\text{m}$ dust emission feature and surrounding continuum shows PAH emission throughout the inner starburst region, confirming the $3''$ diameter $3.28 \mu\text{m}$ emission region detected by Cutri et al. (1984) using multi-aperture photometry. The extended PAH emission is slightly elongated and aligned with the [0 11] emission and the axis of the two brightest radio continuum knots (Wilson et al. 1991), and the $12.5 \mu\text{m}$ mid-infrared emission (Keto et al. 1992).

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References

- Cutri, R. M., Rudy, R. J., Rieke, G. H., Tokunaga, A. T., & Wilner, S. P.: 1984, *ApJ* **280**, 521
 Keto, E., Ball, R., Arens, J., Jernigan, G., & Meixner, M.: 1992, *ApJ* **389**, 223
 Wilson, A. S., Helfer, T. T., Haniff, C. A., & Ward, M. J.: 1991, *ApJ* **381**, 79