Ultraluminous Galactic Nuclei at 12.5μm, 0.″6

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Summary

We report on the first sub-arcsecond resolution mid-IR images of the nuclei of galaxies from the IRAS ultraluminous sample. This sample contains galaxies which emit most of their energy in the far-infrared (10-100μm) and have luminosities approaching that of quasars. Previous observations in the mid-IR using single element detectors suggest that the IR luminosity is derived from a region smaller than the instrumental aperture, typically 5″(1.6 kpc at 65 Mpc). Our observations are capable of imaging the morphology of the mid-IR emission region to a factor of eight smaller than previously known.

Our results show that the starburst galaxy NGC 1614 contains a double structure in the nuclear region. Most of the flux, 78% of 655± 50 mJy, is emitted in two unresolved regions of 0.″6 FWHM (190 pc at 64 Mpc)of nearly equal strength separated by 1″(310 pc). Most of the remaining flux is derived from a small arm about 1″(310 pc) in length. The Seyfert 1 galaxy NGC 7469 shows an elongated structure, possibly a bar, unresolved in the minor axis, 1″(320 pc at 66 Mpc), but clearly extended in the major axis, 2.″5 (800 pc). The flux, 350 ±100 mJy, is smooth along the bar so there is no clear signal of a mid-IR point source rising above the flux level of the extended emission.

The observations were made with the Berkeley mid-IR focal plane array detector at the NASA IRTF, allowing us to observe at the telescope diffraction limit (about 1″for a 3m mirror at 12.5μm). A further improvement in resolution, typically a factor of two, is often obtainable using image deconvolution techniques such as maximum entropy.

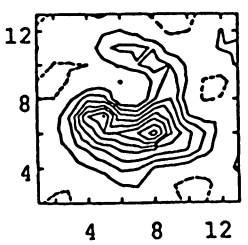

Fig. NGC 1614: Axes are in pixels (0.″25 per pixel). North is up and east is left.

F. Combes and F. Casoli (eds.), Dynamics of Galaxies and Their Molecular Cloud Distributions, 433.