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THE INTERSTELLAR MEDIUM IN STAR BURST GALAXIES

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We report far-infrared observations of [O I], [C II] and [O III] fine structure emission lines toward the nuclei of M82 and 7 other galaxies with a high rate of star formation. The far-infrared line emission is bright, contains about 0.5% of the bolometric luminosity in the central 60", and is spatially concentrated toward the nuclei. In these galaxies between 10 and 30% of the interstellar gas near the nuclei is contained in a warm, atomic component. This atomic gas is probably located at the UV photodissociated surfaces of molecular clouds. The neutral gas in M82 has a temperature of $\sim$ 200 K, hydrogen density of $\sim 3 \times 10^4$ cm^{-3} and is very clumpy, indicating that the interstellar medium in this star burst galaxy is very different from that in the disk of our own galaxy. We discuss the implications of the infrared observations for the interpretation of mm molecular lines and for star formation at the nuclei of star burst galaxies.

A 200 pc RING OF MOLECULAR GAS AND AN OUTBURST IN THE GALAXY M82

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ABSTRACT. The CO (J=1-0) emission in M82 has been mapped with the Nobeyama 45-m telescope. The CO intensity distribution in the central re-

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