158μm [CII] IMAGES OF SPIRAL GALAXIES

A. POGLITSCH[1], N. GEIS[1], G. STACEY[2], J. JACKSON[1],
R. GENZEL[1], C.H. TOWNES[2]
[1] Max-Planck-Institut für Extraterrestrische Physik
8046 Garching, West Germany
[2] University of California, Dept. of Physics
Berkeley, CA, 94720, U.S.A.

ABSTRACT We report 55" resolution images of the 158μm [CII] fine structure line from the spiral galaxies M83, M51, and NGC6946. We drive variations in the global star formation activity within and between these galaxies.

OBSERVATIONS AND RESULTS

Using the MPE/UCB Far-infrared Imaging Fabry-Perot Interferometer (FIFI) on board NASA's Kuiper Airborne Observatory, we have mapped three nearby, face-on galaxies in the 157.74 μm [CII] fine structure line: M83 (SABc), M51 (ScI), and NGC6946 (Scd).

In M83 the most prominent feature is the bar region. For the length of the bar we find approximately 120" (3kpc) which also roughly matches its extent in the ^{12}CO(1→0) line. The surface brightness of [CII] is found to be 20×10^{-5} erg $s^{-1}cm^{-2}sr^{-1}$. The [CII]/^{12}CO(1→0) line intensity ratio is 6000 along the bar and about 3000 in the disk. A value of 6000 is typical of Galactic star formation regions.

M51 shows a peak of only 8×10^{-5}erg $s^{-1}cm^{-2}sr^{-1}$, dropping off more slowly toward the disk than in the case of M83. The [CII]/^{12}CO(1→0) line intensity ratio is ~2000 in the center but higher in the HII-complex region 2'NE of the nucleus, indicating enhanced star formation there.

The NGC6946 map shows an extension in the N-S direction and a sharp drop-off toward the west, in good agreement with dust FIR emission. The peak brightness is 15×10^{-5} erg $s^{-1}cm^{-2}sr^{-1}$. The [CII]/^{12}CO(1→0) line intensity ratio is ~2000 and nearly constant as a function of radial distance from the nucleus.

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