CO (2-1) OBSERVATIONS OF MAFFEI 2

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Maffei 2 is a highly obscured galaxy, probably of type Sbc, at a distance of 5 Mpc (Allen and Raimond 1972; Spinrad et al. 1973). Since it lies close to the Galactic plane, there is considerable confusion in infrared and 21-cm HI observations due to Galactic emission, but investigations of its structure can be carried out at millimeter wavelengths where the Galaxy contribution is confined to a limited velocity range. The high resolution (30") of our CO J=2-1 observations permits both a detailed examination of Maffei 2 and a study of the nature of the gas in its nucleus, through comparison with the CO J=1-0 observations.

The CO (2-1) observations were made with one of the 10.4 meter telescopes at the Owens Valley Radio Observatory in January, 1983, using an SIS receiver (Sutton 1983) and a 512-channel acousto-optical spectrometer (cf. Masson 1982). The frequency width of each channel was 1.03 MHz, 1.34 km s^{-1} at 230 GHz. The receiver temperature, T_r was 550 K SSB. Spectra, taken at spacings of 0.3' on a grid oriented along the major axis of the galaxy (PA = 30°), are shown in Figure 1. The central position, marked by

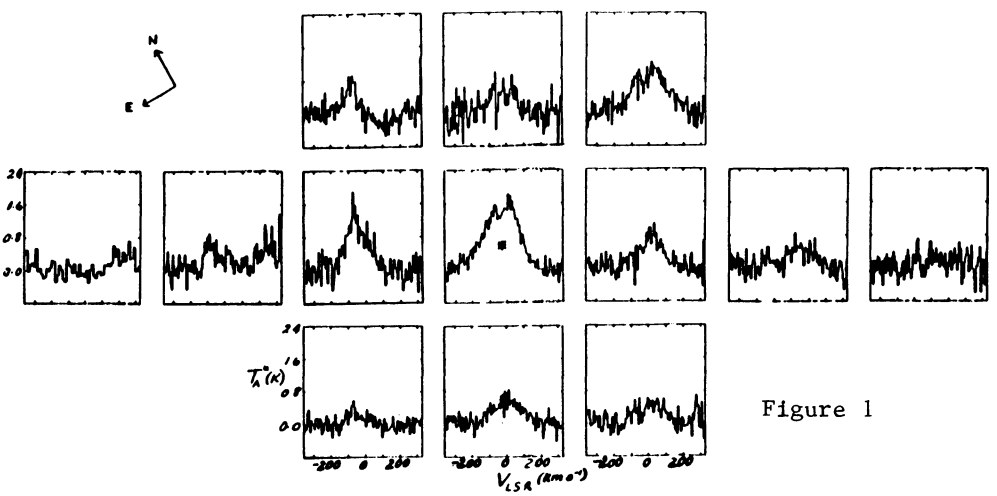

Figure 1

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an asterisk, is α (1950) = $02^h38^m08^s.5$, δ (1950) = +59°23'24". At -7 km s^{-1} and -56 km s^{-1} there is some evidence of Galactic emission in the reference position (see the dip near zero velocity in Figure 2). Assuming the source to be just resolved, a beam coupling efficiency 0.52 was adopted in our determination of the corrected antenna temperature, $T_A^*(2-1)$. While variations in peak velocity are consistent with the rotation curve, CO(2-1) emission is much more confined than CO(1-0) and 21-cm HI radiation (Rickard et al. 1977; Bottinelli et al. 1972).

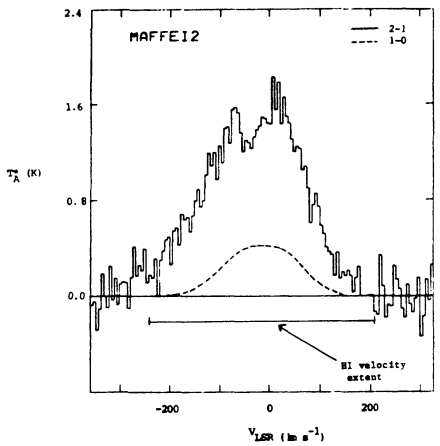

Figure 2

In Figure 2, our central CO(2-1) profile, the CO(1-0) profile from Rickard et al. (1977) and the velocity extent of the 21-cm HI emission from Bottinelli et al. (1972) are reproduced. Published values of $T_A^*(1-0)$ were corrected assuming a beam efficiency of 0.65 (Ulich and Haas 1976) and a source size 1' at CO(1-0). Peak $T_A^*(2-1)$ = 1.6K, significantly higher than peak $T_A^*(1-0)$ = 0.4K. If the nuclear source is ultra-compact, much of this discrepancy could be the effect of beam dilution, but it seems more likely that gas in the nucleus of Maffei 2 is at least partially optically thin, as in the active galaxy, M82 (Sutton et al. 1983).

Nuclear activity is often evident in galaxies with nearby companions. Maffei 1, a giant elliptical, is only 40' from Maffei 2 on the plane of the sky but, assuming a mass-to-light ratio of 30, is at a distance of 1 Mpc (Spinrad et al. 1971). Adopting instead M/L = 6 (Sargent et al. 1978) puts Maffei 1, like Maffei 2, at about 5 Mpc. Thus Maffei 1 and Maffei 2 may be companion galaxies and interaction between them may have influenced star formation in Maffei 2.

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