

SEST CO(1→0) line observations of extreme IRAS galaxies

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As part of a multi-wavelength study of IRAS galaxies with large far-infrared-to-blue luminosity ratios, we observed an infrared-complete distance-limited sample of southern extreme IRAS galaxies in the CO(J=1→0) line with the 15 m Swedish-European Submillimeter Telescope (SEST) at the European Southern Observatory in March 1990.

This sample is part of a larger infrared-complete sample which comprises 53 galaxies associated with 42 IRAS sources in a field between R.A. 10^h and 14^h and Dec. -20° and -40° , with 60 and $100 \mu\text{m}$ flux densities exceeding 1 and 2.5 Jy, respectively, and with an L_{FIR}/L_B ratio larger than about 3. We selected galaxies which are relatively bright in the far-infrared, rather than galaxies with extremely high far-infrared luminosities.

About half (55%) of the galaxies are classified as isolated, peculiar, generally barred, objects, but about 30% of the IRAS sources are associated with close interacting pairs, and there are 3 merger candidates in this sample. The majority of the galaxies have HII region-type spectra, indicating star formation as the source of their enhanced far-infrared brightness, but 30% of the galaxies show LINER or Seyfert 2-type spectra, indicating nuclear activity.

For this sample we also obtained CCD images in the B, V, R, and $H\alpha$ bands, low- and high-resolution VLA 6-cm radio maps, and long-slit spectra, besides the CO line spectra, and we plan to collect 21-cm HI line profiles as well.

Since the CO line emission from these objects is rather weak, we restricted ourselves to observations of all 16 objects with redshifts smaller than 6000 km s^{-1} , and 5 other interesting galaxies; observations of two objects were taken from the literature. We detected 10 of the 16 galaxies in the complete, distance-limited sample.

These 10 detected galaxies show a considerable variety in their far-infrared properties: their far-infrared luminosities range from 0.7 to $5 \cdot 10^{10} L_\odot$, and their far-infrared/blue luminosity ratios from 2 to 30. We estimated total H_2 masses ranging from 0.5 to $7 \cdot 10^9 M_\odot$, and far-infrared luminosity/ H_2 -mass ratios L_{FIR}/M_{H_2} between 6 and $30 L_\odot M_\odot^{-1}$.

The L_{FIR}/M_{H_2} ratio, which is considered to be a measure of the 'star formation efficiency', is on average some 4 times higher in our sample of IRAS galaxies than in normal spirals. Such ratios are comparable to the values found for other samples of IRAS galaxies of moderate far-infrared luminosity, and for 'classical' nearby star-burst galaxies such as M82, as well as for the cores of Galactic GMC's.