NARROW BAND IMAGING AND LONG SLIT SPECTROSCOPY OF UGC 5101

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ABSTRACT

UGC 5101 ($z = 0.04$; D $\simeq$ 240 Mpc) is one of the so called *Ultraluminous* IRAS sources. Two important properties of the members of this group are 1) their $L_{IR} \geq 10^{12}$ $L_{\odot}$, and 2) their space density in the universe up to $z \leq 0.1$ is equal or even larger than the space density of the quasars. Further noteworthy features of the *Ultraluminous* IRAS sources are their being morphologically peculiar, and the fact that they all seem to host active nuclei in their center.

We have observed UGC 5101 in an effort to study the interplay between the gas ionized by the central active nucleus and that gas ionized by other processes which may hold important clues to the understanding of the entire picture of this object. In particular these other ionizing processes could well be massive stars formed recently after the galactic encounter, and shocks possibly also related to the galaxy collision.

The data that we discuss were obtained between December 1989 and January, 1992 with the WHT 4.2m telescope on the island of La Palma, using the two-arm spectrograph ISIS. Several spectral frames were obtained at three different position angles: P.A. 84, along the tail of the galaxy; P.A. 32, along the dust lane; and P.A. 110. The blue spectra are centered on the Hβ line, while the red spectra are centered on the Hα line. In the configuration we used for the long slit spectra, the spectral scale was 0.74 A per pixel, and the spatial scale was .37 arcsec per pixel; we also observed the Hα region with a spectral scale of .37 A per pixel, at position angle 84.

The narrow band images were obtained at the auxiliary port of ISIS, with a scale of .2 arcsec per pixel, and were centered at the Hα wavelength, and on the adjacent continuum.

The Hα images and the spectra support the following model.

UGC 5101 hosts an active nucleus; the NLR extends up to about 1.5 kpc and shows a complex velocity field, superimposed on the rotation curve of the galaxy. Besides the NLR, in the Hα image are visible two bright cones that

extend up to 3 kpc along P.A. 32. The long slit spectra at P.A. 32 show that the velocity field of the gas in these regions is peculiar, while the ionization structure of the gas is similar to that of the NLR.

Around the nucleus, at a distance of about 3 kpc there is a ring-like structure made up by giant HII regions. In this ring an intense activity of star formation is taking place, as is testified by the estimated large number of O stars required to keep the HII region ionized.

The simultaneous presence of the GEHR's, that cannot be older than a few generations of O stars, opens the question whether a single event triggered the onset of all of them. Still uncertain is the answer to the question whether there is any relation between the GEHR's and the active nucleus. The presence of the central disk of clouds of ionized gas with a complex velocity field might be a hint that gas is flowing from the HII region ring to the center of the galaxy.