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The peculiar galaxy IC 1182: an ongoing merger?

D. Bettoni[1], G. Fasano[1], M. Moles[2], J. Varela[2], and P. Kiærgaard[3]

[1] INAF, Osservatorio Astronomico di Padova, Padova, Italy
[2] Instituto de Matematicas y Fisica Fundamental, CSIC, Madrid, Spain
[3] Copenhagen University Observatory, Copenhagen, Denmark

Abstract. High resolution broad band images, and long slit spectroscopy of the peculiar galaxy IC 1182 are presented. The broad band images show a distorted morphology with a heavily obscured central region, multiple central knots and two jet-like structures extending well beyond the main body of the galaxy. The second jet and several knots are reported here for the first time. The data presented suggest that IC 1182 is a very powerful star-burst system, comparable to Arp 220. The overall aspect and the peculiarities can be explained in term of a merging process still going on. The low metallicity would suggest that the process involves a gas rich galaxy, or that it is accompanied by accretion of fresh gas from the neighborhood.

Key words. galaxies individual: IC 1182 – galaxies: peculiar

1. The galaxy: IC 1182

IC 1182 (Mrk 298) is a bright, early type galaxy (S0p) in the Hercules cluster. It is placed at the end of the central stream of galaxies running from the brightest object, NGC 6041A,B, to the East. Visual inspection of the Palomar Sky Survey Prints reveals a peculiar morphology, with a long and knotty linear structure emerging form the galaxy main body to the East. The galaxy is in a rather dense neighborhood but no close, luminous companions can be seen. A deep image by Arp (1972) shows the presence, other than that linear feature, of arcs and plumes to the north of the nucleus and the jet-like structure. Bothun et al. (1981) called attention on the very unusual properties of the galaxy. Its global aspect and integrated colors correspond to those of an early type galaxy. However, its H I content is, for its luminosity, at least a factor of 30 bigger than in E or S0 galaxies, but similar to what is found among late type spirals. A H I low resolution map by Salpeter & Dickey (1985) evidenced the contribution to the H I measured by Bothun et al. (1981) by a close, faint and H I-rich companion located at 72 arcsec west of IC 1182.

There are several hints for the presence of an active nuclei in IC 1182. Khachikian

Send offprint requests to: D. Bettoni
Correspondence to: INAF, Osservatorio Astronomico di Padova, Vicolo dell'Osservatorio 5, I-35122 Padova, Italy

& Weedman (1974) first classified it as a Seyfert 2 galaxy. The simultaneous presence of rather intense lines from species in different ionization states is clearly indicating the existence there of non-thermal excitation. In addition Heckman et al. (1981) had reported that the observed line profiles are due to the superposition of several components that are spatially, kinematically and spectroscopically distinct. Véron et al. (1997) classify it as a composite spectrum object. The same conclusion was reached by Rafanelli et al. (1997), who concluded that the observed nuclear spectra would indicate that thermal (bursts of star formation) and non-thermal mechanisms would coexist in the central region of IC 1182 which also contains different knots. Here we present data (imaging and spectroscopy), obtained at the NOT telescope, that let us to identify three knots and a dust feature covering a large fraction of the central area.

2. Discussion and conclusions

The global morphology of IC 1182 is reminiscent of an S0 galaxy, but with important peculiarities. Beside the well known jet emerging to the East, 57 kpc long, we have detected a new, apparently old jet running almost perpendicular to the previous one, and stretching for 20 kpc from the center: It is continued by a diffuse, large S-shaped structure toward the NW, already visible in the photographic picture by Arp (1972). All together, those characteristics would suffice to classify IC 1182 as a merger galaxy. Surprisingly, IC 1182 has not been detected by IRAS as a strong IR emitter. The line ratios do indicate a very high excitation temperature and low density. The galaxy has color indices of an early type object except $U - B$ that is too blue. The observed Hα flux correspond to a total luminosity of $3.47{\times}10^{41}$ erg s^{-1}. The SFR rate that would correspond to that Hα luminosity would amount to $\sim$30 M$_\odot$. This induces to consider IC 1182 a very powerful star-bust galaxy.

The narrow band images centered in the main emission lines show a galactic size distribution of ionized gas, with plumes and filaments stretching several kpc from the central regions. Both broad and narrow band images have revealed the presence of several bright knots in the central region, bordering the north limit of a big, elongated dust structure, several kpc in size. Some of those knots are powerful emitting regions with typical sizes of 1 kpc. The brightest knot would correspond to the center of one of the merging galaxies. The low metallicity we have measured in the two central knots indicates either that the merging process involves a gas rich galaxy that provides the fuel for the star formation we see, or even that the system is accreting gas from the neighborhood. In the main body of the galaxy, besides the reported knots, the distribution of the ionised gas can be interpreted as corresponding to an inclined, rotating disk with a major axis of almost 17 kpc length. The rotation curve indicates that, this gas is rotating at a maximum velocity of 280 km s^{-1}. However superimposed to the overall rotation, there are strong non circular motions of the order of 150 km s^{-1} that adds to the idea of IC 1182 as a merging system.

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