

Stellar ages and star-forming properties of galaxies in a dense group around IC 65

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Abstract. We analyse the star-forming (SF) properties of the two brightest galaxies in the IC 65 group of galaxies and that of the four newly detected dwarf galaxies in the area of the group. The dIrr galaxies around the IC 65 contain a number of HII regions which show a range of stellar ages, and provide an evidence of propagating SF. The two brightest group galaxies show SF rates of $\sim 1 - 2 M_{\odot} \text{ yr}^{-1}$, and can fuel the current SF level for about the next 3 – 7 Gyr.

Keywords. galaxies: dwarf, photometry, stellar content

1. The IC 65 group of galaxies

The IC 65 group of four late-type galaxies (IC 65, UGC 608, UGC 622, and PGC 138291) with systemic velocity $V_{GSR} = 2887 \text{ km s}^{-1}$ has earlier been studied by van Moorsel (1983) in the 21 cm HI line with the WSRT. He found that each of these four galaxies shows asymmetric features in their HI distribution, which could be an evidence of recent interactions. He detected also a HI-rich LSB anonymous galaxy located near to IC 65. We carried out a systematic search for new dwarf member candidates of this particular group on the digitized DSS 2 blue and red frames. As a result, we classified four LSB galaxies as probable new dwarf members of the IC 65 group according to their SB and colour characteristics and morphology. Broad-band B, R, and I CCD frames of all certain and probable members of the group were obtained in 1995 and 1999 with the Calar Alto 1.23 m telescope (field $8.7' \times 8.7'$, scale $0.51''/\text{pix}$). The results of surface photometry of each galaxy are given in Vennik & Hopp (2007).

2. Dwarf galaxy candidates in the area of the IC 65 group (*Fig. 1*)

A 0101+4744: a dIrr member of the group confirmed by its redshift, shows three HII knots (**A**, **B**, **C**) embedded in its warped LSB underlying stellar component. The colours of these knots become redder with the increasing distance from the brightest knot **B** (Tab. 1), which probably implies changes in their stellar population ages and propagating SF.

A 0100+4734: is located in front of the group according to its redshift, obtained with the Hobby-Eberly Telescope. Its optical image shows a comet-like structure of four bright HII regions (**A**, **B**, **C** and **D**), with the brightest and bluest knot **D** at its SE tip, and a diffuse underlying component. The colours of these knots display gradual reddening with the increasing distance from the knot **D** – an evidence of propagating SF and a range of ages between $\leq 10 \text{ Myr}$ (knot **D**) and $\sim 4 \text{ Gyr}$ (knot **A**) (Tab. 1).

The ‘quiescent dwarfs’: A 0100+4756 and A 0101+4752 are amorphous possible dwarf galaxies. Their integral colours ($B - R \approx 0.7$, $R - I \approx 0.2$) nearly correspond to the colours of low metallicity stellar populations of the age 5 – 7 Gyr (Leitherer *et al.* 1999).

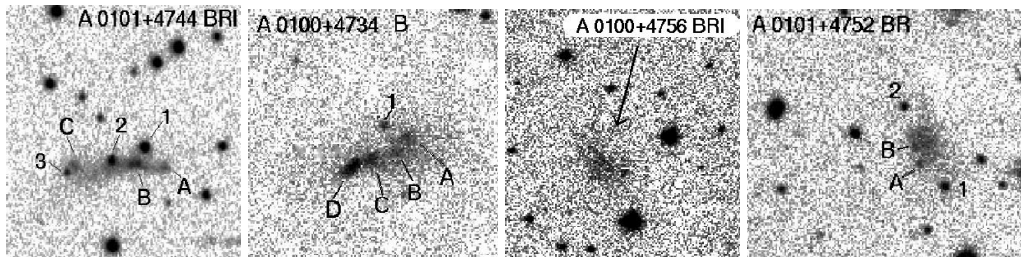


Figure 1. Anonymous (A) dwarf galaxy candidates in area of the IC 65 group of galaxies. The size of each image is $\sim 1.2' \times 1.2'$, the north is at the top and the east is to the left. Galactic stars are labelled with numbers and resolved HII regions in dwarf galaxies are labelled with characters.

Table 1. Colours and the range of probable stellar ages of the SF knots in the A 0101+4744 and in the A 0100+4734. The ages are estimated from the evolutionary synthesis models of Leitherer *et al.* (1999) and Zackrisson *et al.* (2001), assuming low metallicity $Z \approx 0.001$.

A 0101+4744				A 0100+4734			
Knot	$\langle B - R \rangle$ (mag)	$\langle R - I \rangle$ (mag)	$\log(\text{Age})$ (yr)	Knot	$\langle B - R \rangle$ (mag)	$\langle R - I \rangle$ (mag)	$\log(\text{Age})$ (yr)
A	0.92 ± 0.3	0.51 ± 0.3	9.05 - 9.15	A	1.00 ± 0.2	0.45 ± 0.2	9.1 - 9.6
B	0.54 ± 0.23	0.0 ± 0.15	7.8 - 8.1	B	0.70 ± 0.2	0.20 ± 0.2	8.0 - 8.2
C	1.20 ± 0.3	0.51 ± 0.2	9.15 - 9.45	C	0.54 ± 0.15	0.10 ± 0.2	7.3 - 8.1
				D	0.35 ± 0.1	-0.25 ± 0.15	6.6 \pm 0.2

3. Star-forming properties of the brightest galaxies in the group

The current level of SF in the IC 65 and in the UGC 622 has been estimated using the homogenized IRAS flux densities and the 1.4 GHz radio fluxes as given in the NED, and the relations given in Bell (2003). Both luminous galaxies appear currently slowly star-forming with SFR_{cur} in the range of $1 - 2 M_{\odot} \text{ yr}^{-1}$. The mean SFR over the past ~ 12 Gyr (SFR_{past}) has been estimated from the blue and NIR luminosities and the corresponding stellar mass-to-light ratios, as explained in Bell & de Jong (2001). We conclude that the IC 65 (SXbc) appears to have had (exponentially) decreasing SF activity with $b = SFR_{cur}/SFR_{past} \simeq 0.54$ and has gaseous supplies enough to maintain the present SF level during the next ~ 7.5 Gyr. The UGC 622 (Scd) had a nearly constant SFR over its whole history ($b \approx 0.72$) and is now slowly running out of fuel with $\tau_{gas} = M(HI)/SFR_{cur} \approx 2.3$ Gyr.

In conclusion: The IC 65 group is evidently a dynamically young assembly of gas-rich late-type spiral and irregular star-forming galaxies.

Acknowledgements

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