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ASTRONOMY AND ASTROPHYSICS

The structure and physical conditions characterizing the emission-line galaxy He 2–10*

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Summary. Direct plates taken through interference (Hα + [N II] and [O III]) and broad band (*B*, *R*) filters at the prime focus of the ESO 3.6 m telescope reveal the structure of the emission-line galaxy He 2–10. Three major condensations are definitely present: a bright nucleus near the centre of the galaxy, a fainter condensation located 2"3 westward and a more diffuse one situated at 6"4 eastward. The similarities and differences between the spectral features, physical conditions (n_e, T_e) and abundances characterizing these three condensations are discussed. Furthermore, we confirm that the broad emission band at λ 4660 Å first reported by Allen et al. (1976) essentially originates from the bright central nucleus. We estimate that the number of Wolf-Rayet (WC + WN) stars contributing to this feature is approximately 3.3 10^3 and that the number of early-type stars (mainly O-type) necessary to account for the observed ionization of the emitting gas is of the same order. This result is compared to the stellar content derived for a few other galaxies and giant H II regions known to contain a large population of Wolf-Rayet stars.

Key words: galaxy: He 2–10 – nuclei of galaxy – early-type stars – Wolf-Rayet stars

1. Introduction

Because of its spectral characteristics and structure it exhibits on low-dispersion objective prism and direct plates, the extended object He 2–10 was first classified as a very low-excitation planetary nebula (Henize, 1967; Westerlund and Henize, 1967; Sanduleak and Stephenson, 1972).

Optical, infrared and radio observations of He 2–10 published by Allen et al. (1976) have in fact revealed this object to be a dwarf emission galaxy (assuming that $M_B \sim -18$ mag) with a non-thermal radio continuum.

These authors report the presence of an emission-line spectrum of moderate excitation superimposed on a strong continuum. The detection of a broad emission band at λ 4660 Å led Allen et al. to discuss the first example of an extragalactic object in which there is evidence for a large population of Wolf-Rayet (WR) stars. Furthermore, they find this galaxy to have a high surface density of neutral hydrogen and to radiate most of its energy in the infrared (see also Cohen and Barlow, 1974).

Following Allen et al.'s (1976) suggestion that He 2–10 may contain isolated Strömgren spheres around WN and O-type stars and that some of these might be resolved on an Hα plate taken in good seeing, we discuss in Sect. 2 the structure of this galaxy on the basis of direct plates taken through broad band (*B*, *R*) and interference (Hα + [N II], [O III]) filters at the prime focus of the ESO 3.6 m telescope. The visible spectra of three distinct condensations located at the centre of the galaxy, 2"3 westward and 6"4 eastward are investigated in Sect. 3 and the number of WR stars present in the central nucleus is estimated in Sect. 4. After this article was completed, we became aware of an independent work by D'Odorico et al. (1983) who also performed a spectroscopic investigation of He 2–10. Therefore, in Sect. 5, we briefly confront their results with those derived in the present work. Finally, a general discussion as well as a comparison with other galaxies known to contain a large population of WR stars form the last section.

2. The structure of He 2 – 10

Direct plates of the emission-line galaxy He 2–10 have been taken through interference and broad band filters using the 3.6 m telescope (*f*/3 prime focus, scale = 19"03 mm^{-1}) of the European Southern Observatory (La Silla, Chile). The parameters of the plates are given in Table 1. Figures 1 and 2 illustrate the structure of the galaxy as seen through the Hα + [N II], [O III] interference and *B*-broad band filters, respectively.

On the deep exposure plate shown in Fig. 2, the general aspect of He 2–10 appears quite irregular. The approximate size of the galaxy is 30" × 40". Although it can not be totally excluded that some of the stellar-like knots seen across He 2–10 are associated with the galaxy itself, the observed background of faint stars across plate No. 1227 rather suggests that they are field stars located along the line-of-sight. On medium plate exposures (cf. plate No. 1218), the galaxy displays a noticeable double structure, with a typical separation of 8" between the two main blobs. These could also, however, be the result of absorption by a dust lane crossing the galaxy (Allen et al., 1976[1]). The most remarkable features of He 2–10 appear on the short and narrow band exposures in the light of Hα + [N II] and [O III] (see Fig. 1) where an unresolved bright nucleus is seen near the centre of the galaxy[2] with a fainter

1 Orientation of Plate I in that paper should be entirely reversed!

2 The 1950.0 equatorial and galactic coordinates of He 2–10 are RA = 08^{h}34^{m}07^{s}1, Dec = −26°14'04" and l^{II} = 248°6, b^{II} = 8°6 (Sanduleak and Stephenson, 1972)

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Table 1. List of the direct plates obtained for He 2–10

Plate no.	Date	Plate + filter combination	Exposure (s)	Corresponding illustration	Seeing (a″)
1215	1978 Jan. 18/19	098 – 02 + Hα (1)	*45 × 60*	Fig. 1f	2
1216	1978 Jan. 18/19	IIaO (*B*) + [O III]	*20 × 60*	Fig. 1h	2
1217	1978 Jan. 18/19	098 – 02 + Hα (3)	*2 × 60*	Fig. 1d	2
1218	1978 Jan. 18/19	IIaO (*B*) + GG 385	5 × 60		2
1224	1978 Jan. 19/20	IIIaJ (*B*) + [O III]	*60 × 60*	Fig. 1i	2
1225	1978 Jan. 19/20	098 – 02 + Hα (1)	60		2
1226	1978 Jan. 19/20	098 – 02 + Hα (3)	*15*	Fig. 1b	2
1227	1978 Jan. 19/20	IIIaJ (*B*) + GG 385	*15 × 60*	Fig. 2	2
1236	1978 Jan. 20/21	098 – 02 + Hα (1)	*15 × 60*	Fig. 1e	2
1634	1978 Apr. 13/14	098 – 02 + Hα (2)	*20*	Fig. 1a	1.5
			30		
			60	Fig. 1c	
1635	1978 Apr. 13/14	IIIaJ (*B*) + [O III]	60		1.5
			3 × 60	Fig. 1g	
1673	1978 Apr. 15/16	098 – 02 + RG 630	60 × 60		2
1826	1978 Dec. 20/21	098 – 02 + RG 630	40 × 60		3
1838	1978 Dec. 21/22	IIIaJ (*B*) + GG 385	30 × 60		3

Note: The characteristics (central wavelength/FWHM) of the interference filters are Hα (1): 6563/38 Å, Hα (2): 6573/120 Å, Hα (3): 6563/150 Å and [O III]: 5014/22 Å

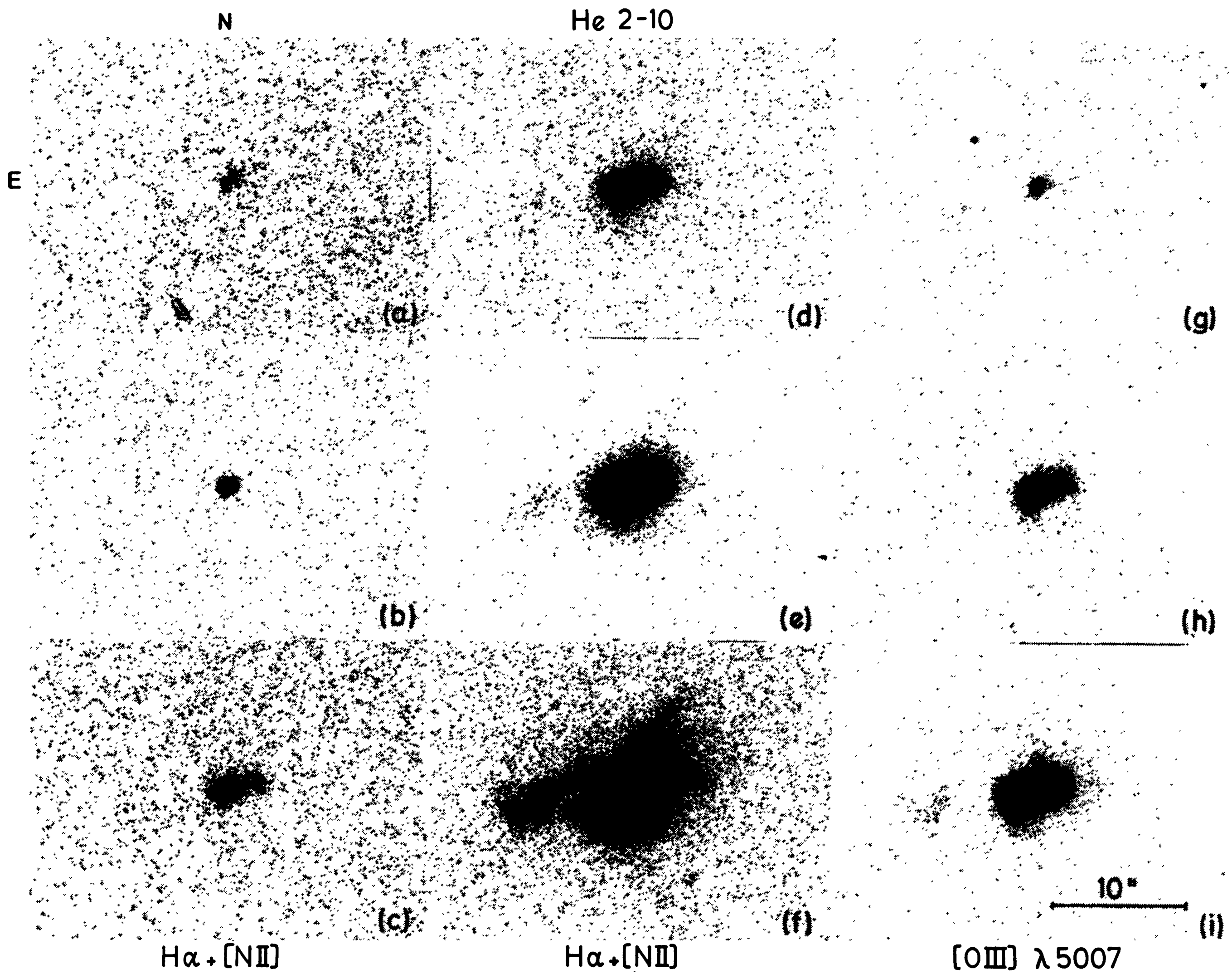

Fig. 1a–g. Direct plates (ESO 3.6 m telescope, P.F.) in the light of Hα + [N II] (first two columns) and [O III] (last column) showing the structure of the emission-line galaxy He 2–10 (see Table 1)

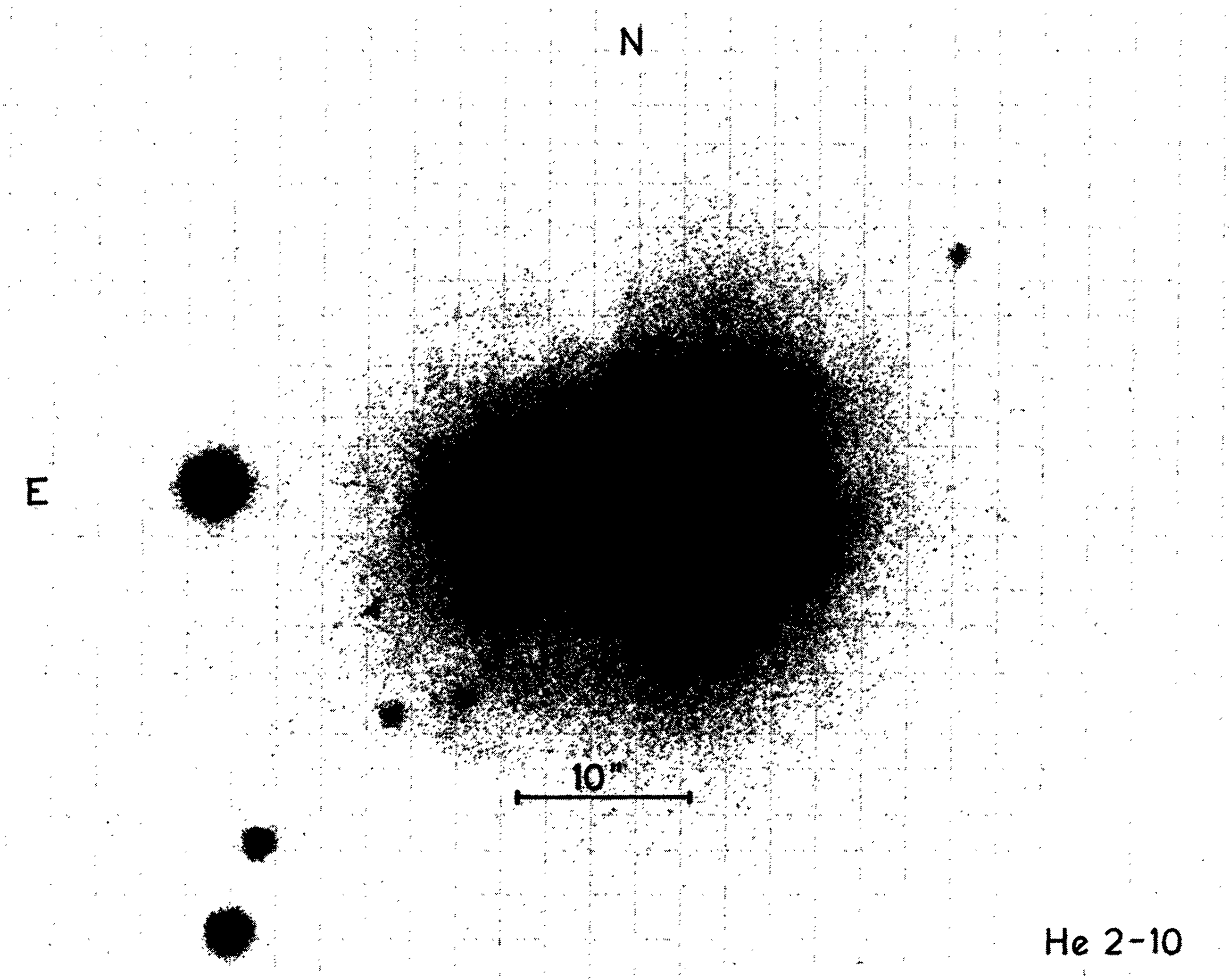

Fig. 2. A 15-min plate (ESO 3.6 m telescope, P.F.) taken through the broad *B*-band (see Table 1)

condensation located approximately 2″.3 west- (and slightly north-) ward. As it will be shown in Sect. 3, the spectrum of this condensation (called hereafter W condensation) looks very much like that of an H II region. Let us finally note in Fig. 1f and i the diffuse appearance ($\sim 5''$ in size) of a condensation located 6″.4 east – (and slightly south-) ward from the central nucleus. The position of this condensation (called hereafter E condensation) coincides with that of the fainter blob seen on medium plate exposures. Adopting an average seeing disk of 2″ (see Table 1), a spatial resolution of ~ 127 pc should be achieved at the distance of He 2–10 in Figs. 1 and 2. It is therefore likely that the E condensation seen in Fig. 1 is a resolved giant ($d > 300$ pc) H II region.

3. The visible spectra of the central nucleus, W and E condensations

On April 1 and 2, 1981 we have obtained two spectra for each of the three condensations located in He 2–10 using an IDS (Image Dissector Scanner) attached behind a Boller and Chivens spectrograph at the $f/8$ Cassegrain focus of the ESO 3.6 m telescope. The integration times were 10 min for each spectrum of the central nucleus and W condensation, 30 and 60 min for those of the faint E condensation. When setting the telescope, a positional accuracy of $\sim 1''$ was achieved. The useful range of the IDS was 20 mm, giving an available spectral range from 3700 to 6700 Å approximately. Using a $2'' \times 2''$ slit, we could achieve a resolution (FWHM) of 9 Å at a reciprocal dispersion near 171 Å mm^{-1}. Reduction of these spectra was performed with the "image handling and processing (IHAP)" system of ESO, at Garching bei München. Wavelength calibration, flat field correction, extinction correction from an average extinction table and flux calibration via two observed standard stars were applied to the data. Due to variable photometric weather conditions, the absolute fluxes were estimated reliable to within 50%. Using different intensity scales, we have illustrated in Fig. 3 the spectra of the three condensations in order to visualize at best the strong emission lines as well as the fainter ones.

The spectra of all three condensations display a strong and blue stellar continuum with emission lines of moderate excitation characteristic of H II regions in general. When referred to the continuum of the central nucleus at λ 5200 Å, we find that the W and E condensations are about 0.7 and 2.1 mag fainter. After correction for the rotation and motion of our galaxy with respect to the Local Group (Gouguenheim, 1969), we derive from the observed positions of well exposed emission lines an identical

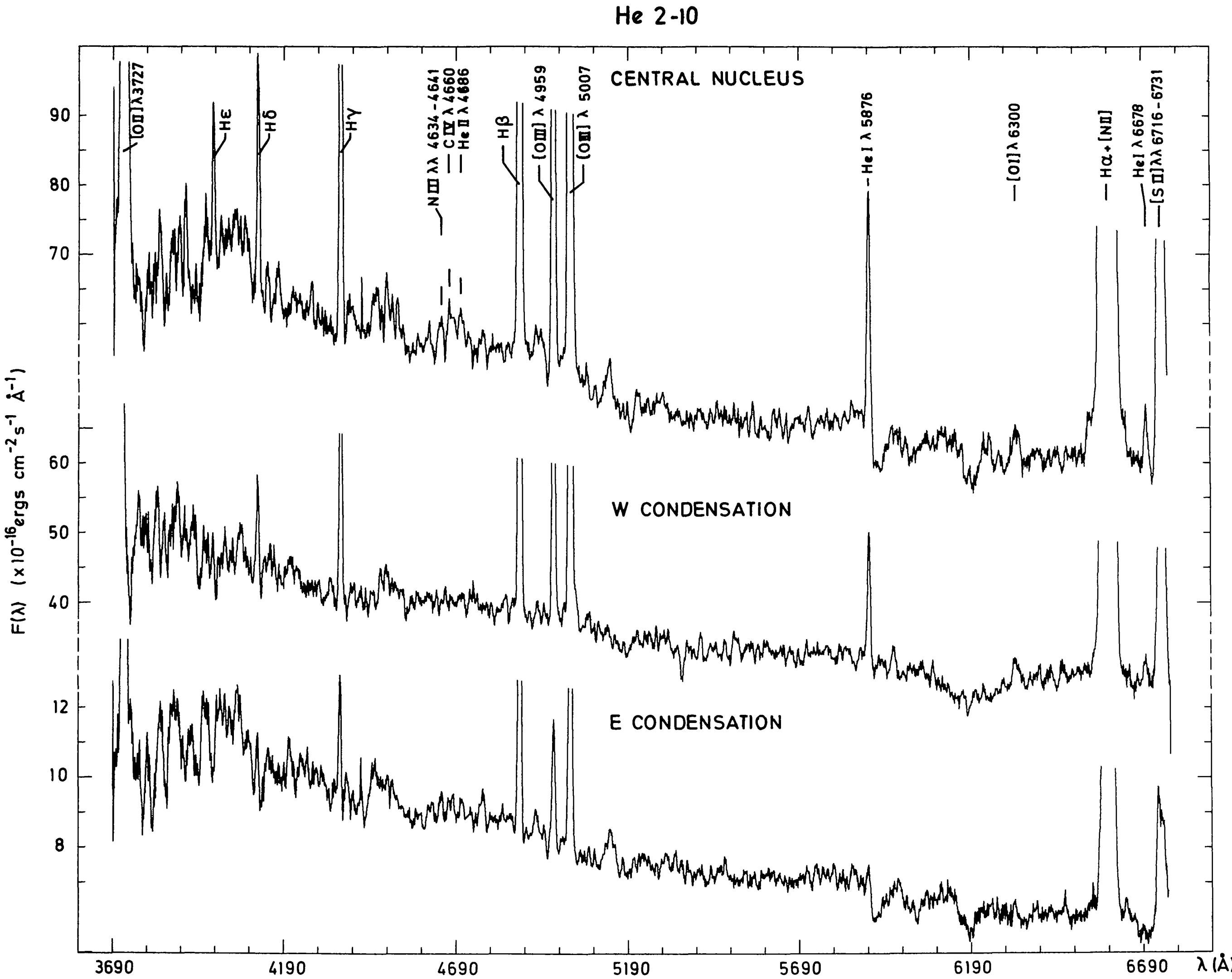

Fig. 3. Spectra of the central nucleus, W and E condensations of He 2–10 between [O II] λ3727 and [S II] λλ6716, 6731

radial velocity $v_r = 654 \pm 140\,\mathrm{km\,s^{-1}}$ for the three condensations. Adopting $m_V = 13.0$ mag for the apparent integrated magnitude of He 2–10, $A_V = 2.0$ mag for the reddening (see below) and $H_0 = 50\,\mathrm{km\,s^{-1}\,Mpc^{-1}}$, we find that the distance to He 2–10 is about 13.1 Mpc, implying an absolute magnitude $M_V \simeq -20.0$ mag, a value which, combined with the amorphous texture observed for the luminous regions of He 2–10, rather suggests an Irr II – or possibly peculiar – type galaxy (see Sandage, 1961), in agreement with the classification proposed by D'Odorico et al. (1983).

The identification of line transitions was made for each of the three condensations on the basis of one set of two recorded spectra. Only those lines having an equivalent width greater than 1.0 Å on two same spectra were considered as definitely present. Whereas the [O III] λ4363 and [N II] λ5755 emission lines are suspected to be definitely present, their measured equivalent widths in Table 2 are uncertain and should, therefore, be taken with caution.

With two exceptions – i.e. He II λ5411 which is not detected but He I λ6678 which is present – we find a very good agreement between the emission lines identified in the spectrum of the central nucleus and those reported by Allen et al. (1976, see their Table 1 and Fig. 1) for the central region of the galaxy. Although most of emission lines present in the central nucleus have their counterparts in the W and E condensations, some differences are noted and these are reported in Table 3.

Let us further note that the strengths of the most conspicuous emission lines seen in the spectra of the W and E condensations are, on the average, about 1.5 and 4.5 times weaker than their counterparts in the central nucleus (see the observed equivalent widths in Table 2).

Better signal to noise data are needed in order to better resolve the blended lines near λ4471 Å and in order to check whether the emission bump seen in the spectrum of the central core, blueward to He I λ5876, could be due to the C IV λλ 5802–5812 WC feature. Alike the spectra observed for the nuclei of NGC 6764 and Mrk 309 (Osterbrock and Cohen, 1982), three peaks – indicated by short vertical lines in Fig. 3 – are distinctly seen in the Wolf-Rayet feature detected around λ4660 Å in the spectrum of the central nucleus of He 2–10. Following Osterbrock and Cohen (1982), we can identify (to an accuracy of ~2 Å) these peaks with contributions due to N III λ4640, C IV λ4658 and He II λ4686. The important consequence of these identifications is that not only WN stars (see Allen et al., 1976) but also WC stars contribute to the broad WR emission blend observed in the nucleus of He 2–10.

Table 2. Relative intensities $[I(\mathrm{H}\beta)=100]$ and equivalent widths of the emission-lines in the central nucleus, W and E condensations of He 2–10

Line	Central nucleus			*W* condensation			*E* condensation		
	Measured	Dereddened	W (Å)	Measured	Dereddened	W (Å)	Measured	Dereddened	W (Å)
[O II] λ 3727	172	367	70.1	170	363	65.2	210	450	16.9
Hε(+[Ne III])	5	10	2.4	–	–	–	–	–	–
Hδ	13	22	5.0	9	15	2.8	–	–	–
Hγ	32	45	13.9	28	40	9.1	28	40	2.1
[O III] λ 4363λ	1.3±0.6	1.8	0.6	1.0±0.4	1.4	0.3	1.1	1.5	0.1
He I λ 4471	3.7±1.0	4.8	1.8	6.2±1.0	8.0	2.1	–	–	–
WR blend ($\lambda\sim$4660 Å)	15±5	–	6.7	–	–	–	–	–	–
Hβ	100	100	48.1	100	100	33.9	100	100	11.1
[O III] λ 4959	46	43	23.2	47	44	16.0	42	39	5.0
[O III] λ 5007	168	153	75.8	156	142	55.0	114	104	14.0
[N III] λ 5755	0.9±0.3	0.6	0.5	1.6±0.4	1.0	0.6	2.1±0.7	1.3	0.3
He I λ 5876	12±1	7.3	7.1	12±4	7.3	4.4	–	–	–
[N II] λ 5755	(41)	(18)	(27)	(76)	(34)	(30)	(45)	(20)	(7.6)
Hα	510	230	329.8	550	250	220.2	670	300	110.1
[N II] λ 6583	160	72	100.2	120	54	47.9	130	58	22.0
He I λ 6678	3.3±2.0	1.4	2.1	6.3±2.0	2.7	2.5	–	–	–
[S II] λ 6716	18±1	7.6	12.1	25	11	9.9	57	24	9.6
[S II] λ 6731	34	14	22.0	37	16	15.1	49	21	8.3

On the basis of these first results we conclude that the central nucleus of He 2–10 contains a rich admixture of early- (WN, WC, O-type, late B and A) as well as late- (G and K giants) type stars. The W condensation shows a somewhat fainter emission-line spectrum without any sign of the presence of WR as well as late-type stars. A still weaker excitation characterizes the emitting gas in the E condensation. Whereas better signal to noise data are needed in order to assess the real detection of the WR emission blend in the spectrum of that faint condensation, the presence of early- (O-type, etc.) as well as late-type stars is well established.

The relative strength and equivalent width of the most conspicuous emission-lines observed in the spectra of the central nucleus, and of the E and W condensations of He 2–10 are listed in Table 2. Let us note that for the partially resolved emission-components of [N II] $\lambda\lambda$ 6548, 6583 and [S II] $\lambda\lambda$ 6716, 6731, the line strengths have been derived by fitting gaussian profiles to the observed ones. The relative line intensities should be accurate to within 20%. However, for the weakest lines, an error estimate has been separately reported.

Comparing the observed Hα/Hβ and Hβ/Hγ ratios to those predicted for the case *B* of Menzel-Baker (Osterbrock, 1974), we derive a reddening of $E(B-V)=0.7$ – corresponding to $A_V\sim 2.0$ mag – assuming a standard galactic reddening curve with a value $R=3$ for the total to selective extinction. The Balmer decrements calculated for each of the three condensations lead to very similar values of the color excess $E(B-V)$. The relative strengths of observed emission lines after correction for reddening are also given in Table 2. We have then determined the physical conditions (T_e, n_e) prevailing in the three condensations of He 2–10 (cf. Osterbrock, 1974). The electron temperatures reported in Table 3 are accurate to ± 2000 K and the electron densities are reliable to $\simeq 30\%$. On the basis of these results, we conclude that the electron temperature appears to be very similar in the three condensations while the electron density is definitely the highest in the central nucleus.

4. The number of WR stars in the central nucleus of He 2–10

As already outlined in Sect. 3, the Wolf-Rayet emission blend observed at λ 4660 Å appears as the most remarkable feature in the spectrum of the central nucleus of He 2–10. Indeed, it is very likely that the WR emission feature arises from stars located in a region of active star formation comparable to giant H II regions (see Sect. 6).

Under the assumptions that the WR stars in the central nucleus of He 2–10 are similar to those in our Galaxy and in the Large Magellanic Cloud and that both WN and WC stars must be involved to give spectra in which N III λ 4640, C IV λ 4658 and He II λ 4686 have approximately equal strengths (see Osterbrock and Cohen, 1982), we estimate hereafter (cf. Allen et al., 1976; D'Odorico and Rosa, 1981; Kunth and Sargent, 1981) the number of WR stars which contribute to the observed λ 4660 emission blend. Following Osterbrock and Cohen (1982), we first determine the mean types of WN and WC stars which represent at best the observed WR lines. On the basis of the criteria N III $\gg$ N IV and N III λ 4640 $\sim$ He II λ 4686 (see van der Hucht et al., 1981), we find that a good mean spectral type for the WN stars is WN 8. Comparing our data with spectrograms of WC stars published by Smith (1968), we then adopt WC 8.5 as the mean spectral type for the most representative WC stars in the central nucleus of He 2–10. Let us remark that these spectral types appear to be very similar to those assigned by Osterbrock and Cohen for the WR stars in the nuclei of Mrk 309 and NGC 6764. Therefore, we also adopt the equivalent width of 50 Å (resp. 225 Å) quoted by these authors for a typical WN 8 (resp. WC 8.5) star. Noticing that the strength of the N III λ 4640 line is about 3/4 that of the C IV λ 4658 emission

Table 3. Observed differences between the spectra and the physical conditions in the nucleus, W and E condensations of He 2–10

	Central nucleus	W condensation	E condensation
a) Emission-line spectrum			
Balmer lines in absorption beyond...	H9[a]	H8	Hδ
He I λλ 4471, 5876, 6678	*p*	*p*	*ND*
N III λλ 4511–35	*p*[a]	*ND*	*ND*
WR blend (λ ~ 4660 Å)	*p*	*ND*	*PD*
Unidentified emission line at $\lambda_{lab} \sim 5121.5 \pm 2.0$ Å	*p*[a]	*ND*	*p*[b]
[N I] λ 5199	*p*	*ND*	*p*
[O I] λ 6300	*p*	*p*	*ND*
b) Absorption-line spectrum			
Ca II H, K	*p*	*p*	*p*
Mg I b	*p*	*PD*	*PD*
Na I D	*p*[c]	*ND*	*p*[c]
c) Physical conditions			
Te ([O III])	13,000 K	12,000 K	13,000 K
Te ([N II])	8,400 K	9,800 K	15,000 K
Ne ([S II])	$1.1\ 10^4$ cm^{-3}	$4.3\ 10^3$ cm^{-3}	$5.8\ 10^2$ cm^{-3}
d) Estimated[d] *deficiency of* He, N, *and* O *abundances*	~3	~3	~30

Explanation of symbols
p: the corresponding line is present; *PD*: the corresponding line is possibly detected; *ND*: the corresponding line is not detected

Additional remarks
[a] See Allen et al. (1976)
[b] Also observed in the spectra of six other gaseous nebulae (Meinel et al., 1968)
[c] See the absorption component blueward to He I λ 5876
[d] The one-layer model of Osterbrock (1974) has been used

component, we can state that for a given population of WN 8 and WC 8.5 stars, approximately 77% (resp. 23%) of the WR continuum radiation at λ 4660 Å comes from the WN 8 (resp. WC 8.5) stars. Using the absolute magnitudes $M_{\lambda 4660} = -7.1$ (resp. $M_{\lambda 4660} = -4.9$) for a WN 8 (resp. WC 8.5) star given by Osterbrock and Cohen (1982), this means that 31% (resp. 69%) of the Wolf-Rayet stars in the central nucleus of He 2–10 are WN (resp. WC) stars. The effective equivalent width of the λ 4660 emission blend that would be observed for such a mixture of WR stars is then found to be 90 Å. From the equivalent width of 6.7 ± 1.5 Å that is actually observed, we can infer that 7.4% of the continuum radiation at λ 4660 Å comes from WR stars in the nucleus of He 2–10. Combining the previous results with $F_{\lambda 4660} = 6.3\ 10^{-15}$ erg cm^{-2} s^{-1} Å^{-1} for the observed continuum flux – corresponding to $m_{\lambda 4660} = 12.8$ mag (see the calibration by Oke and Schild, 1970) after correction for reddening – and $d = 13.1$ Mpc for the distance of the galaxy (see Sect. 3), we find out that the central nucleus of He 2–10 contains approximately 10^3 WN stars and $2.3\ 10^3$ WC stars.

The number of early-type stars required to produce the observed ionization of the gas in the central nucleus of He 2–10 can also be estimated from the observed flux $F_{H\beta} = 2.9\ 10^{-13}$ erg cm^{-2} s^{-1} at Hβ (see Osterbrock, 1974). After correction for the reddening and with the distance quoted above, the luminosity in Hβ amounts to $5.6\ 10^{40}$ erg s^{-1} corresponding to $11.6\ 10^{52}$ ionizing photons absorbed in the gas per second. An equivalent number of $2.6\ 10^3$ O5 stars, or $1.7\ 10^4$ O7 stars or still $6.8\ 10^4$ O9 stars are required in order to produce this amount of ionizing photons. Since the emission-line spectrum of He 2–10 is of moderate excitation and that according to van der Hucht et al. (1981) and Underhill (1981) the contribution of WR stars to the ionization of the gas should be much smaller than that due to O-type stars, we conclude that the WR/O ratio in the central nucleus of He 2–10 is of the order of unity. A similar conclusion is reached if we compare the observed EW(λ 4660)/EW(Hβ) ratio (0.14) for He 2–10 with those (0.09) for Tololo 3 (Kunth and Sargent, 1981) and (0.40 and 0.69) for NGC 6764 and Mrk 309 (Osterbrock and Cohen, 1982) from which the authors have estimated a WR/O ratio of the order of unity. Let us remark that Kunth and Sargent have derived the number of O-type stars as a function of their mass distribution. The WR/O ratio observed in the central nucleus of He 2–10 thus appears to be an order of magnitude larger than that (~0.15) reported by Maeder et al. (1980) in the 7–13 kpc distance interval from our galactic center.

5. Recent spectroscopic investigation of He 2 – 10 by D'Odorico, Rosa, and Wampler

The emission-line galaxy He 2–10 has been included in a search for Wolf-Rayet features in the spectra of giant H II regions by D'Odorico et al. (1983). In that interesting paper, the authors report spectroscopic observations in the wavelength interval λλ 4000–6000 for three distinct regions (the bright central nucleus plus two regions located about 8″ east and north-west, respectively) in He 2–10. They also present spectrophotometric data corrected for reddening; they adopt $A_V \in [2.1 - 3.3]$ mag compared to $A_V \sim 2.0$ mag derived in the present work. Although their spectral (FWHM ~ 14 Å) as well as spatial (slit size 4″ × 4″) resolutions are not as good as ours, they do confirm that the broad emission band at λ 4660 Å essentially originates from the bright central nucleus and that both WC and WN stars contribute to this feature. Furthermore, they estimate that nebular emission lines cannot account for more than 20% of the strength of the WR feature. We conclude that there is essentially a good agreement between the results of D'Odorico et al. (1983) and those we derived here.

6. Conclusions

A careful re-analysis of the WR lines contributing to the observed λ 4660 emission blend leads to the conclusion that the central nucleus of He 2–10 contains approximately 10^3 WN and $2.3\ 10^3$ WC stars. Our observations definitely invalidate the previous statements that no WC stars are present in He 2–10 (Allen et al., 1976) and that, consequently, there could exist noticeable differences in the WR population between giant and dwarf galaxies (Osterbrock and Cohen, 1982). Let us insist on the fact that the numbers quoted above are entirely based on the assumption that WR stars in He 2–10 are similar objects to those in our galaxy (cf. other investigations). Indeed, Wampler (1982) for instance, has reported that in his sample of WC star candidates in M 33 the relative strength of the λ4660 emission blend to C IV λ 5680 is much larger than that observed for galactic WC stars. Whether this discrepancy is physically real or is due to selection effects still remains to be proved. Furthermore, it cannot be excluded either that He 2–10 contains one or several supermassive and luminous objects such as R 136a (Feitzinger et al., 1980; Cassinelli et al., 1981) located within the bright "30 Doradus" H II region in the Large Magellanic Cloud.

Other extragalactic objects known to show the Wolf-Rayet λ4660 emission blend are: the nuclei of NGC 3125 = Tololo 3 and II Zw 40 (Kunth and Sargent, 1981; Kunth, 1982), of NGC 6764 and Mrk 309 = IV Zw 121 (Osterbrock and Cohen, 1982), a knot in the barred spiral galaxy NGC 5430 (Keel, 1982), the core of an H II region in the dwarf, metal poor, irregular galaxy IC 1613 (D'Odorico and Rosa, 1982b), the giant H II regions NGC 604 (D'Odorico and Rosa, 1981, 1982a; Rosa and D'Odorico, 1982a, b; D'Odorico et al., 1983), IC 132 (D'Odorico and Benvenuti, 1982), NGC 588, NGC 592, NGC 595 and IC 135 (Conti and Massey, 1981), all located in the local group galaxy M 33, one H II region in the dust disk of NGC 5128 = Cen A (Möllenhoff, 1981) and, finally some giant H II regions in the galaxies NGC 300 (D'Odorico et al., 1983) and NGC 5457 = M 101 (Rayo, Peimbert, Torres-Peimbert, 1982; D'Odorico et al., 1983). The scenario generally involved in order to account for the presence of WR stars in the above extragalactic objects – including He 2–10 – consists of a single burst of star formation that occured several 10^6 yr ago on a short time scale (see Kunth and Sargent, 1981; D'Odorico and Rosa, 1981). Although it can be that for some of these objects the WR/O ratio is greater than unity and/or only WN stars are present (see D'Odorico and Rosa, 1982a), the present work prompts us to believe that only an homogeneous spectral study of these WR galaxies will definitely permit to derive marked differences between them.

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