*Wolf-Rayet Phenomena in Massive Stars and Starburst Galaxies*
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# Wolf-Rayet stars in extragalactic star-forming regions

Maximilien Pindao

*Geneva Observatory, 1290 Sauverny, Switzerland*

**Abstract.** We performed a search of Wolf-Rayet stars features in optical spectra of two large samples of H II regions and H II galaxies. The main results are a list of galaxies/regions containing WR stars (of which seven are new WR galaxies) and a second list of possible WR galaxies/regions with WR stars.

## 1. Introduction

We performed a search of Wolf-Rayet stars using the broad emission-line feature at $\sim 4686$ Å in optical spectra of two large samples of H II regions and H II galaxies:

- 207 spectra of H II regions in nearby early-type galaxies were kindly made available for re-analysis by M.S. Oey. Part of these data have been previously used to derive chemical abundances (Oey & Kennicutt 1993).

- 732 spectra of more than 550 H II galaxies from the "Spectrophotometric Catalog of H II Galaxies" (SCHG, Terlevich *et al.* 1991) were kindly made available for re-analysis by R. Terlevich.

The main results are a list of 25 WR galaxies (including seven new WR galaxies) and a list of 45 possible ones. In the sample of H II regions, 15 spectra show clearly the WR feature (regions not identified yet), while 24 others could contain WR stars too.

These samples also allowed a study of the metallicity dependence of the WR population. Indeed, it has been possible to study this dependence over a large range of metallicities, the H II regions of the early-type galaxies covering the high-metallicity range ($0.5\,Z_\odot \lesssim Z \lesssim 2\,Z_\odot$), and the H II galaxies the low-metallicity range ($0.05\,Z_\odot \lesssim Z \lesssim 0.5\,Z_\odot$).

Note that a similar search in the SCHG catalog has already been performed by Masegosa *et al.* (1991), but to keep a good coherence in the analysis, we performed it again to be able to use both results from the two samples. A complete study of both samples will be published soon (Pindao *et al.* in preparation).

## 2. Physical properties of the star-forming regions

Many population-synthesis models have shown that the WR phase life-times are drastically dependent on the metallicity: starbursts with $Z = 0.05\,Z_\odot$ show WR phases up to 6 times shorter than starbursts with $Z = 2\,Z_\odot$ do (see for example Schaerer & Vacca 1998). These predictions seem to be confirmed, at least for the low-metallicity galaxies/regions: there is no detection at $Z < 0.1\,Z_\odot$. At higher



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Table 1. Col.(1): * marks the new WR galaxies, Col.(2),(3): Position (equinoxe 1950), Col.(5): Hβ flux ($10^{-16}$ erg $s^{-1}$ $cm^{-2}$), Col.(6): Hβ equivalent width (Å), Col.(7): log O/H as calculated from the O III λλ5007,4959 lines.

| galaxy (1) | R.A (2) | Declination (3) | redshift (4) | Hβ flux (5) | Hβ *EW* (6) | log O/H (7) |
|---|---|---|---|---|---|---|
| UM 228 | 00 18 26.0 | +00 36 04 | 9.83e−02 | 113 | 95 | −3.79 |
| UM 311 | 01 13 00.5 | −01 07 22 | 5.82e−03 | 912 | 241 | −3.66 |
| Tol 0121-376 | 01 21 55.8 | −37 37 55 | 3.47e−02 | 65 | 52 | −3.60 |
| Tol 0226-390 | 02 26 10.0 | −39 02 39 | 4.70e−02 | 585 | 186 | −3.76 |
| Tol 0242-387 | 02 42 39.2 | −38 47 17 | 1.25e−01 | 372 | 136 | −3.64 |
| Mrk 598 W * | 02 43 52.2 | +07 11 34 | 2.23e−02 | 114 | 23 | −3.29 |
| NGC 1614 * | 04 31 35.5 | −08 40 56 | 1.55e−02 | 638 | 34 | −3.10 |
| Mrk 1210 | 08 01 27.0 | +05 15 22 | 1.32e−02 | 886 | 76 | - |
| Arp 252 | 09 42 38.5 | −19 29 18 | 3.24e−02 | 330 | 67 | −3.48 |
| Mrk 710 | 09 52 10.2 | +09 30 32 | 4.74e−03 | 653 | 47 | −2.90 |
| Tol 1004-296 SE | 10 04 17.7 | −29 41 29 | 3.71e−03 | 680 | 57 | −3.67 |
| Tol 1004-296 NW | 10 04 17.7 | −29 41 29 | 3.65e−03 | 1273 | 94 | −3.73 |
| Tol 1025-284 * | 10 25 12.0 | −28 26 00 | 3.17e−02 | 166 | 94 | −3.69 |
| Mrk 1304 | 11 39 38.5 | +00 36 42 | 1.83e−02 | 920 | 73 | −3.56 |
| Pox 4 | 11 48 39.0 | −20 19 17 | 1.18e−02 | 1457 | 240 | −3.78 |
| Tol 1235-350 * | 12 35 48.0 | −35 02 00 | 1.00e−02 | 1982 | 80 | −3.63 |
| Tol 1247-232 | 12 47 39.0 | −23 17 38 | 4.84e−02 | 1575 | 94 | −3.72 |
| Tol 1324-276 | 13 24 20.0 | −27 41 48 | 6.33e−03 | 869 | 117 | −3.76 |
| NGC 5253 | 13 37 05.1 | −31 23 13 | 1.00e−03 | 4874 | 229 | - |
| NGC 5398 | 13 58 26.0 | −32 49 20 | 2.92e−03 | 1205 | 326 | −3.65 |
| VIII Zw 355 * | 14 02 46.4 | +09 30 36 | 7.09e−02 | 47 | 183 | −3.35 |
| Tol 1457-262 A | 14 57 29.6 | −26 15 20 | 1.73e−02 | 1864 | 165 | −3.76 |
| Tol 1457-262 B * | 14 57 29.6 | −26 15 20 | 1.70e−02 | 371 | 68 | −3.75 |
| Tol 1924-416 * | 19 24 28.7 | −41 40 39 | 8.77e−03 | 1361 | 73 | −3.72 |
| NGC 7714 | 23 33 40.6 | +01 52 42 | 8.82e−03 | 2572 | 31 | −3.36 |

metallicities, the detection rate varies from less than 10 to about 20 %, which is too low compared to what is expected from the models. In order to get an upper limit to these detection rates, we added the candidates galaxies/regions with WR stars as if they all contained WR stars; the resulting rates are in better agreement with the models.

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