

# HI BUBBLES SURROUNDING WOLF-RAYET STARS

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The observations of neutral gas in the neighbourhood of some Wolf-Rayet stars show bubbles blown by the strong winds of these stars. In an attempt to examine how commonly WR stars are surrounded by HI bubbles, we have studied the HI distribution in the vicinity of this type of stars in the section of our galaxy between  $l = 302$  and  $l = 312$  deg. In our study we have used the survey data of Strong et al. and data obtained with the 30 m single-dish antenna of Instituto Argentino de Radioastronomia.

We find that almost all WR stars located at galactic latitudes  $|b|$  higher than 2 deg. appear associated with HI bubbles. The parameters of these bubbles are listed in Table 1. The fact that we do not see HI bubbles around WR stars close to the galactic plane, is most probably a selection effect, since due to the greatly increased gas density, these bubbles would be smaller than our spatial resolution. Thus, our results seem to indicate that most WR stars are surrounded by HI bubbles.

The two Wolf-Rayet stars of WN type with associated bubbles, namely WR54 and WR61, are located nearly centrally within their bubbles. In contrast, the WC stars all appear off-center, close to the highest density border of the bubble. This was also the case for the previously studied bubbles around WR17, of spectral type WC5, (AJ 92,1414); and the one surrounding WR90, of spectral type WC7 (AJ 96, 1671). On the other hand, the HI bubbles associated with the WN stars also appear to have larger sizes.

In all cases, the expansion velocities of the HI bubbles appear to be less than 10 km/s. Consequently, the dynamical ages of these bubbles become a few million years, being always larger than the lifetime of the WR stage of the star. Therefore, the progenitors of the now WR stars have greatly contributed to the formation of the bubbles.

TABLE 1. PARAMETERS OF HI BUBBLES AROUND WR STARS

Associated star	WR48	WR52	WR54	WR57	WR61
Spectral type	WC6	WC4	WN4.5	WC8	WN6
LSR Velocity of gas (km/s)	-23	-26	-32	-40	-16
Kinematical distance (kpc)	1.8	2.0	7.6	4.0	10.0
Radius of the Bubble (pc)	45	60	172	35:	95
Swept up mass (1000Mo)	8.5	13	29	3	23
Ambient gas density (cm <sup>-3</sup> )	0.9	0.4	0.1	0.7:	0.3

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*K. A. van der Hucht and B. Hidayat (eds.).*

*Wolf-Rayet Stars and Interrelations with Other Massive Stars in Galaxies*, 424.

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