

SEARCH FOR HI BUBBLES AROUND WR STARS: WR 149

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1. Introduction

The interaction of strong stellar winds with the interstellar medium creates large cavities or **interstellar bubbles** surrounded by expanding outer shells. 21-cm line (HI) observations have revealed the presence of such neutral gas bubbles around several WR stars (*e.g.* Niemela & Cappa de Nicolau 1991 and references therein; Dubner *et al.* 1992).

Continuing our search for HI bubbles around WR stars, we have analyzed the neutral hydrogen distribution in the vicinity of the Wolf-Rayet star WR 149, a highly reddened WN6-7 star located at 6.5 kpc in the direction $(l, b) = (89.^{\circ}53, +0.^{\circ}65)$.

2. Observations and Results

We have observed the surroundings of WR 149 at the $\lambda 21$ -cm line during January 1992 with the Effelsberg 100-m radiotelescope of the Max-Planck-

Institut für Radioastronomie in Bonn (Germany).

TABLE 1. Main parameters of the observed HI bubbles

	Bubble A	Bubble B
Geometric Center (l, b)	89.°5,+0.°5	90.°25,+0.°5
Systemic Velocity (km s ⁻¹)	-47±2	-47±2
Kinematical Distance (kpc)	6.5±0.5	6.5±0.5
Radius of the Void (pc)	50	45
Radius of the Envelope (pc)	70	74
Expansion Velocity (km s ⁻¹)	≈7	≈6
HI mass Deficiency (10 ³ M _⊙)	5.6	7.6
HI mass in the Envelope (10 ³ M _⊙)	8.7	19.0
Swept-up HI Mass (10 ³ M _⊙)	7.1	13.3
Ambient Gas Density (cm ⁻³)	0.2	0.3
Kinetic Energy (10 ⁴⁸ erg)	3.5	3.8

The observed HI column density distribution within the velocity interval -54 to -42 km s⁻¹ is characterized by the presence of two voids partially surrounded by concentrations which form an almost complete envelope. We will refer to these structures as Bubbles A and B. WR 149 appears inside Bubble A. No obvious optical counterpart was found related to Bubble B.

The main observed and derived parameters of the bubbles are listed in Table 1. The swept-up HI mass was assumed to be a mean value between the HI mass deficiency and the HI mass in the envelope. The original ambient density was obtained by distributing the swept-up HI mass within the volume of the cavity. We note that the kinetic energy of Bubble A is less than 10% of the kinetic energy of the powerful stellar wind of the associated WR star. The parameters of these bubbles are similar to others observed around WR and O type stars.

WN6-7 type stars, as is WR 149, are often found as brightest stars in OB associations. Taking into account the high reddening of WR 149, fainter OB stars at the same distance would remain undetected. Therefore, we suggest that *both observed HI bubbles are related to undetected OB associations at the far side of the Perseus spiral arm.*

References

- Dubner, G., Giacani, E., Cappa de Nicolau, C., Reynoso, E. (1992) *Astron. Astrophys. Suppl.* 96, 505.
 Niemela, V.S., Cappa de Nicolau, C. (1991) *Astron. J.*, 101, 572.