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# GMRT Neutral Hydrogen Observations of the Sombrero Galaxy

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Galaxies have assorted morphologies. Spirals and ellipticals form two major classes. Lenticulars form a bridge between them, having some properties of both the classes: they have a smooth and bright central concentration, the *bulge*, similar to the ellipticals and a *disk* resembling the spirals. In general, ellipticals and spirals have different neutral hydrogen (H I) content: H I is not common amongst ellipticals whereas spirals have a varied amount of H I content. Lenticulars lie somewhere in between. Traditionally they were thought to be devoid of H I and models for their origin and evolution were developed explaining their present gas-poor condition. However, around mid eighties (Wardle & Knapp (1986), Bajaja (1984)), observations showed that some lenticulars do possess substantial amount of H I and, in fact, some of them are as gas rich as spirals. The hydrogen mass to blue band luminosity ratio of lenticulars range between 0.0005 to 0.7, which suggests that they fall in between ellipticals ($\frac{M_H}{L_b} \sim 0.0001$) and spirals ($\frac{M_H}{L_b} \sim 1.0$). This leads to an interesting and open question *viz.*: were these lenticulars once spirals and are now evolving into ellipticals? Often, lenticulars have gas-rich, optically faint companions. Regular infall of gas from such companions on to the galaxy may support such an evolution. We have imaged a lenticular galaxy, 'Sombrero', in H I, with a view to find such companions and/or polar rings around this galaxy. Half of the data has been analysed. We have made the first high resolution ($17'' \times 13''$) H I image of the galaxy. We have tentatively detected a companion but find no evidence for a polar ring of gas. The specifications of the observations using GMRT are tabulated below.

Reportedly, H I in lenticular galaxies is usually distributed in the outer parts of the galaxy, leaving the central region more or less devoid of H I. This absence of central gas has been attributed to either its removal by a galactic wind originating from the bulge or its consumption in forming stars in the bulge. In our H I image too, we find two bright spots at the two extreme ends of the galaxy. This is consistent with the gas being distributed in a ring, surmised in an earlier report of a low resolution H I observation of Sombrero (Bajaja (1988)). We are now trying to confirm

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**Table 1.** GMRT Observations

| Observing details | | Observational Results | |
|---|---|---|---|
| Rest frequency | 1420.4057 Mhz | H I Line Flux | 17.80 Jy km $s^{-1}$ |
| Bandwidth | 8 Mhz | Neutral Hydrogen Mass | $1.45 \times 10^9$ $M_\odot$ |
| Channels | 128 | Max. Rotation Velocity | 382.3 km $s^{-1}$ |
| Frequency Resolution | 62.5 Khz | $M_{HI}/L_b$ ratio | 0.0129 |
| Velocity Resolution | 13.20 km $s^{-1}$ | Central Continuum Flux | 76.5 mJy |
| Observation Date | 24th June, 2002 | Angular extent in H I | 7.5′ (39 kpc @ 18 Mpc) |

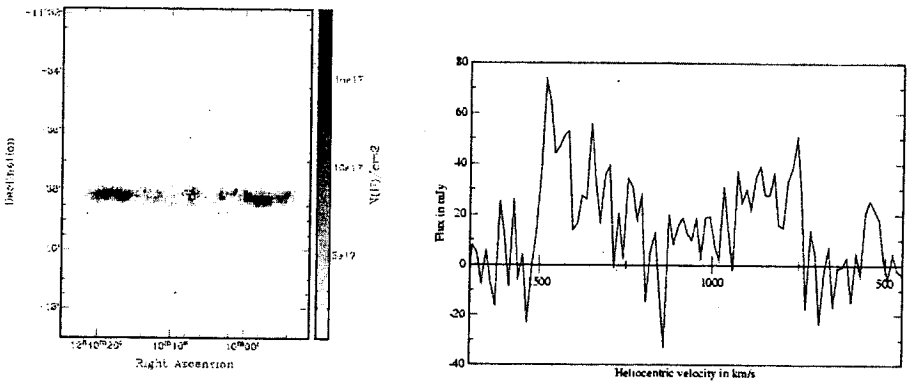


**Figure 1.** (a) *Left:* 17″ × 13″ H I column density (0 to 20× $10^{17}$ $cm^{-2}$) image of the Sombrero galaxy; Contours indicate the continuum source; (b) *Right:* Integrated line profile

this by modelling our high resolution H I spectral cube. We are also reducing the other half of the data to look for LSB features around this galaxy.

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