The radio trail from the pulsar wind nebula J163802.6-471358

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Serendipitous discovery with the Giant Metrewave Radio Telescope.



SNR G315·9–0·0 at 2.5 GHz with Australia Telescope Compact Array (Ng et al. 2009ApJ...703L..55C) – the cross indicates the position of the pulsar at the end of the pulsar wind nebula (PWN) trail.



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Giant Metrewave Radio Telescope





GMRT specifications

antenna diameter number of antennas maximum baseline frequencies

resolution

primary beam

45 m 30 ≈ 30 km 151 MHz to 1.4 GHz (5 bands) ≈ 10 arcsec at 330 MHz ≈ 3 arcsec at 1.4 GHz ≈ 85 arcmin at 330 MHz ≈ 27 arcmin at 1.4 GHz







Chandra X-ray observations of CXOU J163802.6–471358, Jakobsen et al. (2014ApJ...787..129J) – compact source (presumed pulsar), plus faint trail extending $\approx 40''$ to the north.

Compact radio source in MGPS, offset 20" to north from compact X-ray source, and possible further extended emission.



GMRT images of CXOU J163802.6-471358 at 1390 MHz, resolution $6 \times 3 \operatorname{arcsec}^2$.



GMRT images of CXOU J163802.6-471358 at 330 MHz, resolution $17 \times 8 \operatorname{arcsec}^2$.



Peak and summed brightness along the radio trail.

Quantitaive analysis limited by lack of identification of any pulsar, so estimates only:

• for a distance d, the 90 arcsec length is a linear size of

2.2 pc
$$\left(\frac{d}{5 \text{ kpc}}\right)$$

• for a speed in the plane of the sky of v, the age is

> 4300 years
$$\left(\frac{d}{5 \text{ kpc}}\right) \left(\frac{500 \text{ km/s}}{v}\right)$$

... but where is the parent supernova remnant?



Wide field radio image (MOST survey at 843 MHz, Murphy et al. 2007MNRAS.382..382M) of region of the Galactic plane around CXOU J163802.6–471358.

Summary

- CXOU J163802.6–471358 has a remarkably linear radio trail
- quantitaive analysis limited by lack of identification of any pulsar
 - would provide age and distance (hence speed, energy etc)
 - but it is in the Galactic plance ($l \approx 337^{\circ}$), so is likely to be highly scattered
- but where is the parent supernova remnant?