

IRAS 21282+5050: A Transitional Planetary Nebula

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IRAS 21282+5050 is very compact planetary nebula¹ with a substantial molecular shell². It is carbon-rich and exhibits infrared features attributed to PAH molecules³. It has a far infrared color temperature higher than almost all other planetary nebulae, with IRAS flux ratios similar to low color temperature evolved stars. We present VLA images of IRAS 21282 at wavelengths of 2 and 6 cm (with FWHM beamsizes of 0.5" and 0.9", respectively).

The images show rather clumpy optically thin emission, with a ring-like appearance. The ionized region is slightly elliptical, with a full extent of about 4.5" by 3.4" at both wavelengths. Assuming a distance of 2 kpc, the ionized region extends to a radius of about 6×10^{16} cm, and CO ($J = 1-0$) is observed out to about 15×10^{16} cm. The data give an emission measure of about 3×10^5 ; this implies an electron density of about 3000 cm^{-3} . This is larger than that deduced from optical data¹; since the optical size is smaller than the radio size, this suggests that the mass loss rate has declined. The measured electron density implies a mass loss rate of about $10^{-6} M_{\odot}/\text{year}$, which is somewhat smaller than the mass loss rate deduced from CO observations. This suggests that the mass loss rate has either declined since the formation of the H II region or the mass loss rate deduced from CO observations is overestimated, perhaps because of the neglect of heating of the molecular gas by shocks associated with the H II region. The ionized mass (assuming $T_e = 10^4$ and $D = 2$ kpc) is $0.003 M_{\odot}$, which is very low for a planetary nebula. We interpret this as an indication of its extreme youth.

References:

- ¹Cohen, M. and Jones, B. 1987, Ap. J. Lett. 321, L151.
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³de Muizon, m., Geballe, T.R., D'Hendecourt, L.B., and VBaas, F. 1986, Astrophys. J. Letters 306, L105.