

NIR Spectroscopy of IRAS 16115-5044

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IRAS 16115-5044 has been identified as a possible post-AGB star on the basis of its position in the IRAS 2-colour diagram (van der Veen et al. 1989). A study by Van de Steene and Pottasch (1993) failed to detect any radio-continuum flux from the object, suggesting it is still in the pre-planetary nebula phase, that is, the central star is not yet hot enough to ionize the circumstellar shell.

The central star is bright in the infrared ($K=4.9$) but faint in the visible which we attribute to an optically thick circumstellar shell ($J-K=2.61$, van der Veen et al. 1989). Oudmaijer et al. (1995) obtained a K-band spectrum of IRAS 16115-5044 longward of 2.2 microns, and did not detect any discernable features.

We have obtained near-infrared I, J, H and K-band spectra of IRAS 16115-5044 at a resolution $\lambda/\Delta\lambda$ of 1100, using CASPIR attached to the ANU 2.3m telescope at Siding Spring Observatory. The K-band spectrum is shown in Figure 1. IRAS 16115-5044 clearly displays emission lines from the hydrogen Paschen and Brackett series as well as from the metal ions FeII, MgII and NaI. This we attribute to the presence of a stellar wind. The P-Cygni profiles of the emission lines indicate an outflow velocity of $V_{\text{exp}} \sim 300 \text{ km s}^{-1}$. From the H-band Paschen photospheric absorption lines, we deduce a spectral type B4I. The width of these photospheric lines is typical of luminosity class I, a result which seems to confirm the post-AGB nature of this object.

$P\beta$ imaging displays no extension down to an effective size of $0.3''$, allowing upper limits on the effective size of the outflow region to be made. Assuming an intrinsic luminosity of $5000 L_{\odot}$, typical of post-AGB stars at this stage in their evolution, a distance of 2 kpc is derived. The line emission region is therefore very compact ($< 9 \times 10^{15} \text{ cm}$): the stellar wind would pass through this region in $< 10 \text{ yr}$.

The initial conclusion is that this object is an extremely young and compact post-AGB star just beginning the process of planetary nebula formation. Further observations will be carried out at higher resolution, to fully understand the nature of this object.

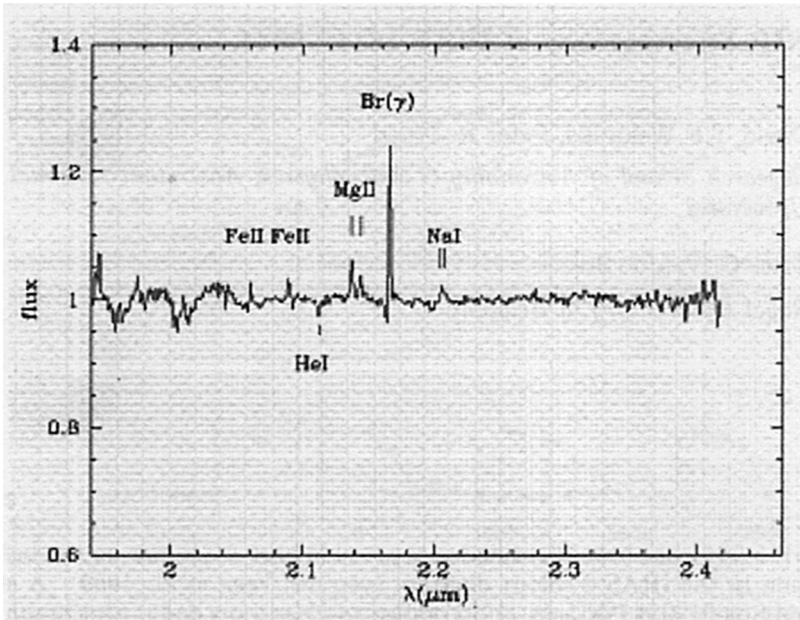


Figure 1. The K-band spectrum for IRAS 16115-5044, displaying emission lines of $\text{Br}\gamma$, FeII , MgII and NaI .

References

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