

N 66: A HIGH EXCITATION N RICH PLANETARY NEBULA IN THE LMC

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ABSTRACT. Spectrophotometric data of the planetary nebula N 66 (WS 35) has been obtained with the CTIO 4-m telescope equipped with an R-C spectrograph and a 2D-Fruitti detector. The spectral range between 3700 Å and 6800 Å was covered at 4 Å resolution.

The spectral features of N 66 show that it is a very high excitation PN. Collisionally excited lines of Ne IV, Fe VII and Ar V are clearly detected. The strength of He⁺ λ4686, relative to Hβ, permits us to deduce that the effective temperature of the central star is greater than 125 000 K.

The physical conditions derived for this nebula are:

$$T_e [\text{O III}] = 15\,300 \text{ K} \pm 300 \text{ K}, T_e [\text{N II}] = 11\,100 \pm 500 \text{ K}, N_e(\text{FL}) = 1900 \text{ cm}^{-3}.$$

Ionic abundances have been derived for He⁺, He⁺⁺, N⁺, O⁺, O⁺⁺, Ne⁺³, S⁺, S⁺² and Ar⁺³. With these abundances and the usual ionization correction factors, the total abundances calculated for N 66 and $\log \text{He} = 11.09$, $\log \text{N} = 8.37$, $\log \text{O} = 8.34$ and $\log \text{Ne} = 7.57$.

The He, O and Ne abundances are similar to other LMC planetary nebulae abundances. The N appears enriched, like in Type I planetary nebula. However, N 66 does not satisfy the enhanced He criterion and cannot be classified as a typical Type I PN.