

OBSERVATIONAL STUDIES OF CLOSE BINARY CENTRAL STARS OF PLANETARY NEBULAE: HFG 1 AND A 63

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We have made spectroscopic and photometric observations of two close binary central stars of planetary nebulae HFG 1 (V 664 Cas) and A 63 (UU Sge), using the UH 2.2-m telescope (Mauna Kea Observatory) and the NAO 1.9-m and 0.9-m telescopes (Okayama Astrophysical Observatory).

Photometry (in B_{42} and V_{53}) of V664 Cas reveals sinusoidal variations with a period of 0.58167 days, confirming the result of Grauer et al. (1987). No eclipses have been detected, indicating small orbital inclination. The spectrum in blue region shows strong emission lines of HI, HeI, HeII, CIII and NIII. In addition, the $H\beta$ emission line shows multiple peak. Variation along the orbital phase is found both in radial velocity (amplitude of 35 km.s^{-1}) and strength of all lines. We interpret that the emission lines originate from the illuminated part of the secondary atmosphere, since radial velocity motions of these lines coincide with the expected motion of the secondary component. Analysis of the light curves of V664 Cas results in orbital inclination of $50^\circ - 60^\circ$ and T_{eff} (primary) of around 100,000 K. A model of V664 Cas based on spectroscopic observations includes: (a) Extreme UV radiation from the primary component, (b) Outer layer (optically thin) reprocessed component, and (c) Deeper layer (optically thin) reprocessed component.

Spectroscopic observations of UU sge reveal radial velocity variations with the period of 0.465 days and an amplitude of 84 km.s^{-1} . The deduced mass function is $0.028 M_\odot$. Absolute parameters of UU Sge are obtained as: $M_1 = 0.55 - 1.44 M_\odot$ (assumed), $R_1 = 0.3 - 0.4 R_\odot$, $M_2 = 0.3 - 0.5 M_\odot$ and $R_2 = 0.5 - 0.7 R_\odot$. Both component are separated by $3.0 R_\odot$. The nebular radial velocity has been determined to be 52 km.s^{-1} from the [OIII] line.

A full account of this work will be published elsewhere.

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