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NEAR SIMULTANEOUS POLARIMETRY AND PHASE-RESOLVED SPECTROSCOPY OF THE AM Her SYSTEM H0538 + 608

We have obtained nearly simultaneous polarimetry and time-resolved spectroscopy of the recently discovered AM Her system H0538+608, also catalogued as 4U 0541+60 (Forman et al. 1978) and 1H 0533+607 (Wood et al. 1984). Time-resolved spectroscopy was obtained using the Multiple Mirror Telescope on 1986 December 22 UT just 7 orbits before circular polarization data was obtained with the Steward Observatory 90 in. telescope. This object exhibits rapid flickering in the optical light curve and circular polarization phase modulations. Circular polarization behavior is shown to change on time scales as short as 7 binary periods. We derive a more precise orbital period of 3.262 ± 0.036 hours. However, the variations in the binary phase modulations of the circular polarization, and the relative paucity of such data, preclude presentation of a precise long-term ephemeris.

H0538+608 is one of eight AM Her type systems discovered from its X-ray emission. It has exhibited a wide range of optical luminosity variation. Harvard plates indicate that the B magnitude of this object has dropped below 17 (Remillard et al. 1986), while at times it has been as bright as 14. In addition H0538+608 exhibits other features typical of AM Her objects. These include strongly modulated photometric variations, strong circular polarization, intense optical emission features of HI and HeII, and optical flickering on time scales of seconds (Liebert and Stockman 1985). These features, noted by Remillard et al. (1986), left no doubt about the classification of H0538+608 as an AM Her type magnetic binary, but the binary period and other system parameters remained very uncertain.

Circular polarization measurements of H0538+608 were made at various times from 1985 August 19 to 1987 September 12. These observations were made at the Steward Observatory 90 in. telescope with the OCTOPOL polarimeter. Circular polarization variations between about 0 and 10 % were observed to modulate with the binary period. No linear polarization observations were obtained. We confirm the existence of an irregular circular polarization cycle as noted by Remillard et al. (1986). In addition the sign of the circular polarization changed from negative to positive within a period of about 20 orbital cycles.

The usual hydrogen and helium emission lines and an inverted Balmer decrement are present. A total of four emission-line components are observed. These include broad and narrow components as well as a transient and an asymmetric component. Each of the components, with the exception of the transient feature, are shown to modulate with the orbital period. The broad and narrow components are separated by 0.4 phase. The broad component has a velocity amplitude K $\simeq$ 504 km/s ± 60km/s and a systemic velocity $\gamma \simeq$ +42 km/s ± 40 km/s. The narrow component has K and γ velocities of $\simeq$ 215 km/s ± 20 km/s and +29 km/s ± 15 km/s, respectively. In addition, the accretion stream apparently

remains unthreaded by the white dwarf's magnetic field well after passing near the inner Lagrangian point. We determine that this object is definitely one of only three AM Her type systems with periods greater than the 2 to 3 hour period gap which means that it is an important system in need of extensive study.

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