

Modeling the Scattered Light from the Circumbinary Disk of KH 15D

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The observed light from the pre-main-sequence binary star, KH 15D, periodically decreases by ~ 3.5 magnitudes for ~ 19 days of the ~ 48.4 day orbital period (*Kearns and Herbst*, 1998; *Johnson et al.*, 2004). The long eclipses are believed to occur when the binary orbit causes one of the stars to move behind an optically thick circumbinary disk which is viewed nearly edge-on (*Winn et al.*, 2004; *Chiang and Murray-Clay*, 2004). Even when both stars are eclipsed by the circumbinary disk, KH 15D is observed to have a brightness of $\sim 4\%$ of the uneclipsed light. We have constructed numerous models for the circumbinary disk that can reproduce the observed light curve, including the current duration of eclipse and the current duration of ingress and egress. Then, we calculate the amount of light scattered by this circumbinary disk during the eclipsed state using the single scattering approximation. We identify the subset of disk models that can also explain the current depth of the eclipses.

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