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The Orbital Period Evolution of X2127+119 in Globular Cluster M15

X2127+119 is a dipping low mass X-ray binary system located at the globular cluster M15 with an orbital period of 0.713 day. To refine the orbital ephemeris, we analyzed the light curves collected by HEAO-1, EXOSAT, Ginga, ASCA, BeppoSAX, XMM-Newton, RXTE, Chandra, and MAXI, with a total time span of 47 years from 1977 to 2024. The orbital modulation profiles, obtained by folding the light curves with the linear ephemeris proposed by Homer et al. (1998), exhibit a clear dip and marginal partial eclipse feature. A significant drift in the evolution of dip minimum phases can be observed, indicating that the orbital period needs updating. A linear model fit applied to the phase evolution yields a revised orbital period of 0.71302139(32) days. Furthermore, a quadratic model was also applied to assess any significant changes in the orbital period over time. However, in comparison to the linear fit, the F-test results in a p-value of 0.3, suggesting no obvious improvement with the quadratic model. We therefore conclude that the orbital period has remained stable over the 47-year time span, with a 2σ upper limit of $|\dot{P}| < 2 \times 10^{-7-1}$ for orbital period derivative.

Section

High Energy

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