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The Mass and Radius of Compact Object in 4U 1746-37

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Photospheric radius expansion (PRE) bursts have already been used to constrain the masses and radii of neutron stars. *RXTE* observed three PRE bursts in 4U 1746-37, all with low touchdown fluxes. We discuss here the possibility of low mass neutron star in 4U 1746-37 because the Eddington luminosity depends on stellar mass. With typical values of hydrogen mass fraction and color correction factor, a Monte-Carlo simulation was applied to constrain the mass and radius of neutron star in 4U 1746-37. 4U 1746-37 has a high inclination angle. Two geometric effects, the reflection of the far side accretion disc and the obscuration of the near side accretion disc have also been included in the mass and radius constraints of 4U 1746-37. If the reflection of the far side accretion disc is accounted, a low mass compact object (mass of $0.41 \pm 0.14\ M_{\odot}$ and radius of 8.73 ± 1.54 km at 68% confidence) exists in 4U 1746-37. If another effect operated, 4U 1746-37 may contain an ultra low mass and small radius object ($M = 0.21 \pm 0.06\ M_{\odot}$, $R = 6.26 \pm 0.99$ km at 68% confidence). Combined all possibilities, the mass of 4U 1746-37 is $0.41^{+0.70}_{-0.30}\ M_{\odot}$ at 99.7% confidence. For such low mass NS, it could be reproduced by a self-bound compact star, i.e., quark star or quark-cluster star.

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