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Probing self-interacting dark matter through neutron stars

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Compact stellar objects such as neutron stars (NS) are ideal places for capturing dark matter (DM) particles. We study the effect of self-interacting DM captured by the nearby NS that can reheat it to an appreciated surface temperature through absorbing the energy released due to DM annihilation. When DM-nucleon cross section $\sigma_{\chi n}$ is small enough, DM self-interaction will take over the capture process and make the number of captured DM particles increased as well as the DM annihilation rate. The corresponding NS surface temperature resulted from DM self-interaction is about hundreds of Kelvin and is potentially detectable by the future infrared telescopes. Such observations could act as the complementary probe on DM properties to the current DM direct searches.

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