

Accretion of self-interacting dark matter onto neutron stars

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Accumulation of a sizable amount of dark matter in the interiors of neutron stars can significantly modify their observational properties and merger dynamics. If caused by accretion onto a neutron star, rate of such an accumulation is controlled by the strength of non-gravitational interaction of the dark matter particles with the neutron star matter. While the strength of interaction with baryonic matter is strongly constrained by the terrestrial experiments, self-interaction of dark matter is only limited by the numerical simulations of the Bullet Cluster combined with the results from X-ray, strong lensing, weak lensing, and optical observations. It is demonstrated that self-interaction of dark matter crucially impacts its accretion onto neutron stars and is able to provide a sizable amount of dark matter about a few percent of the total mass of a neutron star. More specifically, two models of self-interacting dark matter, which are consistent with the mentioned constraint on the corresponding cross-section, are considered. Modification of the neutron star properties due to the accretion of self-interacting dark matter is also discussed.

Primary authors: IVANYTSKYI, Oleksii (University of Wrocław); Dr SAGUN, Violetta (University of Coimbra)

Presenter: IVANYTSKYI, Oleksii (University of Wrocław)