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Neutron stars in scalar-tensor theories with a massive scalar field

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In the scalar-tensor theories with a massive scalar field the coupling constants, and the coupling functions in general, which are observationally allowed, can differ significantly from those in the massless case. This fact naturally implies that the scalar-tensor neutron stars with a massive scalar field can have rather different structure and properties in comparison with their counterparts in the massless case and in general relativity. In the talk we will present slowly rotating neutron stars in scalar-tensor theories with a massive gravitational scalar. Two examples of scalar-tensor theories are examined - the first example is the massive Brans-Dicke theory and the second one is a massive scalar-tensor theory indistinguishable from general relativity in the weak field limit. In the later case we study the effect of the scalar field mass on the spontaneous scalarization of neutron stars. Our numerical results show that the inclusion of a mass term for the scalar field indeed changes the picture drastically compared to the massless case. It turns out that mass, radius and moment of inertia for neutron stars in massive scalar-tensor theories can differ drastically from the pure GR solutions if sufficiently large masses of the scalar field are considered.

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