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Constraining scalar-tensor theories of gravity using neutron star mass-radius relationship observations[1] SEMIH TUNA, FETHI MUBIN RAMAZANOGLU, KIVANC IBRAHIM UNLUTURK, Koc University — We use the mass-radius measurements of neutron stars to constrain the parameters of the spontaneous scalarization scenario in scalar-tensor theories. We first calculate the mass-radius relationship of neutron stars numerically for given parameter values of β and scalar mass m_ϕ using the recently introduced relaxation method of Rosca-Mead et al. Subsequently, we employ Bayesian statistics to construct a probability distribution on the $\beta - m_\phi$ space. It is not possible to conclude whether scalar-tensor theories are preferred to general relativity using this data due to our lack of knowledge of the equation of state of nuclear matter, but we can rule out values of $\beta < -20$. Such high values of β are possible due to the exponential decay of the scalar field away from the star due to the mass term, hence our results provide the best known observational limits to β.

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