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A broken universal relation for neutron stars in a scalar-Gauss-Bonnet gravitational theory

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Modifying general relativity (GR) with a scalar field is a promising attempt to address issues of dark matter and dark energy in astrophysics and cosmology. It can also generate solutions different from those in GR for compact stars. We study the solutions for neutron stars when gravity is modified by a scalar field coupled with the Gauss-Bonnet invariant, causing the remarkable phenomenon of spontaneous scalarization. In this talk, I will first show the spherical solutions for neutron stars in this theory. Then I will present results on tidal deformability and moment of inertia of the scalarized neutron stars. By investigating tidal deformability and moment of inertia under various equations of state (EOSs) for neutron stars, we find that the relation between tidal deformability and moment of inertia for the scalarized neutron stars is not EOS independent. This is the first time that a broken universal relation for neutron stars is found to our knowledge.

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