

Tidal Love Numbers of Black Holes and Neutron Stars in the Presence of Higher Dimensions: Implications of GW170817

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We calculate the tidal Love numbers of black holes and neutron stars in the presence of higher dimensions. The perturbation equations around an arbitrary static and spherically symmetric metric for the even parity modes are presented in the context of an effective four-dimensional theory on the brane. This subsequently leads to the sought expression for the tidal Love number for black holes in the presence of extra spatial dimensions. Surprisingly, these numbers are non-zero and, more importantly, negative. We extend our method to determine the tidal Love number of neutron stars in a spacetime inheriting extra dimensions and show that, in the context of effective gravitational theory on the brane, how their values differ from those in general relativity. Finally, by combining results from gravitational-wave observations of GW170817 and neutron star universality relations we constrain the parameters related to extra spatial dimensions. [Based partly on <https://arxiv.org/abs/1811.11364> and <https://arxiv.org/abs/1710.05188>.]

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