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Dynamical tidal Love numbers of Kerr-like compact objects

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We develop a framework to compute the tidal response of a Kerr-like compact object in terms of its reflectivity, compactness, and spin, both in the static and the frequency-dependent case. Here we focus on the low-frequency regime, which can be solved fully analytically. We highlight some remarkable novel features, in particular: i) Even in the zero-frequency limit, the tidal Love numbers (TLNs) depend on the linear-in-frequency dependence of the object's reflectivity in a nontrivial way. ii) Intriguingly, the static limit of the frequency-dependent TLNs is discontinuous, therefore the static TLNs differ from the static limit of the (phenomenologically more interesting) frequency-dependent TLNs. This shows that earlier findings regarding the static TLNs of ultracompact objects correspond to a measure-zero region in the parameter space, though the logarithmic behavior of the TLNs in the black hole limit is retained.

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