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Spectroscopy of magnetized black holes and topological stars

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Among the various BH mimickers, fuzzballs provide a picture of classical BHs where the horizon emerges as a coarse-grained description of regular and horizonless microstates. However, the study of their stability and the corresponding spectral analysis is still rather involved.
On the other hand, Einstein-Maxwell theory in five dimensions admits magnetized black strings and topological solitons, that upon four-dimensional compactification reduce to magnetized black holes ad topological stars (TSs). These solutions, while containing several ingredients of the aforementioned microstate geometries, are more tractable than the latter and constitute a useful toy model. We provide an analytical and numerical study of the stability and spectroscopy of these solutions under gravitational, electromagnetic and scalar perturbations, computing the quasi-normal modes (QNMs) spectrum in the full parameter space. We find that ultracompact topological stars exhibit long-lived trapped modes that give rise to echoes in the time-domain response.

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