

Some unconventional enhanced black hole symmetries with physical implications

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Exact continuous symmetries play a central role in constraining black hole dynamics. In this talk, I will discuss two examples of non-exact or non-continuous enhanced black hole symmetries that also have physical implications. One is the manifestation of $SL(2, \mathbb{R})$ symmetries within the near-zone region, a region that extends beyond the near-horizon regime and has a non-empty overlap with the far region. This near-zone (“Love”) symmetry, albeit approximate in its nature, has the ability to address instances of magic zeroes in the black hole response problem: it outputs the vanishing of the static Love numbers as a selection rule. The other symmetry I will talk about emerges for some asymptotically flat extremal black holes and comes in the form of spatial inversions. First identified by Couch & Torrence, these spatial inversions conformally map the degenerate event horizon onto null infinity, and vice versa. This mapping enforces matching conditions between near-horizon and near-null-infinity data, a direct consequence being the identification between infinite towers of conserved quantities: the near-horizon Aretakis constants and the near-null-infinity Newman-Penrose constants.

Orateur: CHARALAMBOUS, Panagiotis