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(G*) Marginally Outer-trapped Surfaces Act Up with Inner Horizons in Black Holes

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The advent of gravitational wave detectors had facilitated a constant stream of black hole merger observations. Despite this, black hole mergers are not fully understood. The details of the two apparent horizons becoming one is unclear due to the non-linear nature of the merger process. Recent numerical work had shown that there is an appearance of self-intersecting marginally outer-trapped surfaces (MOTS) during the black hole merger [Pook-Kolb et. al. arXiv:1903.05626]. Following papers have found similarly behaving MOTS in a simpler and static scenario, that of a Schwarzschild black hole, where a seemingly infinite number of self-intersecting MOTS were found [Booth et. al., arXiv:2005.05350]. This talk introduces new phenomena that occur in presence of an inner horizon. For Reissner-Nordstrom and Gauss-Bonnet black holes, we find that the maximum number of self-intersections becomes finite with the MOTS parameter space deeply dependent on the interior structure of the black hole and in particular the stability of the inner horizon [Hennigar et. al., arXiv:2111.09373].

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