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(G*) Exotic MOTS in the Schwarzschild Kruskal Extension

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For the last few decades and especially since the first detection of gravitational waves, black hole mergers have been a core research area in general relativity. However, the process by which two black hole horizons merge is only now starting to be well-understood. In numerical studies of apparent horizon evolution, self-intersecting marginally outer-trapped surfaces (MOTS) were found and play a key role [Pook-Kolb et. al. arXiv:1903.05626]. Later an infinite number of self-intersecting MOTSs were found in Painleve-Gullstrand slices of the Schwarzschild solution [Booth et. al., arXiv:2005.05350]. Further work has shown that their existence is robust and not simply an artifact of that coordinate system [Hennigar et. al., arXiv:2111.09373]. This talk presents results found when examining the maximal extension to the Schwarzschild black hole in Kruskal-Szekeres coordinates. In this system, two separate universes dynamically connect through a worm-hole and pass through a moment of time-symmetry before the worm-hole pinches off and they disconnect. In these time slices, self-intersecting MOTS are found which, among other things, straddle the Einstein-Rosen bridge extending into both universes. Of particular interest is the behavior around the moment of time symmetry, as this provides insight into how MOTS evolve in numerical solutions which start from time-symmetric initial data.

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Keyword-2

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Keyword-3

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