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Geometry of the black-to-white hole transition

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The Oppenheimer-Snyder model is the prototypical example of black hole formation by gravitational collapse. It predicts that a black hole horizon is formed once a star collapses to within its own Schwarzschild radius. After that, the collapsing matter reaches Planckian densities in a short proper time. What happens next is outside the reach of general relativity, as it involves the quantum behavior of the gravitational field in the strong field regime.
By considering quantum corrections coming from loop quantum gravity I will show how the quantum-corrected Oppenheimer-Snyder model predicts a 'bounce' of the collapsing star and a non-singular black hole interior where the trapped region smoothly transitions into the anti-trapped region of a white hole. A natural assumption is then that, at the end of the evaporation process, the horizon of the black hole undergoes a quantum transition from trapping to anti-trapping consistently with the transition of geometry taking place in the interior of the hole. In this scenario, known as the black-to-white hole transition, the black hole evolves into a white hole 'remnant' living in the future of the parent black hole, in its same asymptotic region and location. I will construct the effective metric describing this spacetime in a single coordinate patch and discuss the resulting geometry of the black-to-white hole transition.

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