Energy-momentum tensor analysis and formation of trapped surfaces in the spherically symmetric collapse

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Abstract

Quantum effects such as Hawking radiation are fundamental ingredients in black hole physics in that they reconcile with the laws of thermodynamics. However a major consequence of such effects is the infamous information loss paradox. Several solutions to this paradox have been proposed, such as for instance models of compact horizonless objects.

In this talk we will consider a complementary approach to the issue. We will begin by assuming finite-time formation of a trapped surface - according to a distance observer, for a collapsing body in a general spherically symmetric case and we take this assumption to its final outcome.

In particular we will show how assuming finite-time formation of trapped surfaces and regularity conditions require the violation of null energy conditions for the energy-momentum tensor near the Schwarzschild radius. We will also show how this imposes constraints on the metrics that can be used near the Schwarzschild sphere and how quantum energy inequalities bound the extent in which such violations are possible. Finally we will briefly analyse the implications of such conditions on the collapse dynamics for evaporating thin shell models.