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Globally hyperbolic evaporating black hole and the information loss issue

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The complete gravitational collapse of a body in general relativity will result in the formation of a black hole. Due to quantum effects, the black hole will radiate according to Hawking's calculation (1). Semiclassical arguments strongly suggest that, in the process of black hole formation and complete evaporation, a pure quantum state will evolve to a mixed state, i.e., observers in the far future has less information than those in the far past, violating unitary evolution. This process is the so-called "information loss paradox"and has been source of controversy in the past 50 years (2). Far from paradoxical, the loss of information is a natural consequence of the fact that the corresponding traditional semiclassical spacetime is not globally hyperbolic. In this work, we discuss the information loss issue for completely evaporating black holes in the context of a globally hyperbolic spacetime that maintains unchanged the entire semiclassical picture except for the "last evaporation breath," which pertains to full quantum gravity. Even though observers outside the black hole cannot access information that enters the event horizon, there is no actual loss of information since it is carried over from one Cauchy surface to the next (provided the evolution is unitary).(3)

Palavras-chave: Black hole; Information loss; Global hyperbolicity.

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Referências:

1 HAWKING, S. W. Particle creation by black holes. **Communications in Mathematical Physics**, v. 43, p. 199, 1975.

2 UNRUH W. G.; WALD, R. M. Information loss. **Reports on Progress in Physics**, v. 80, p. 092002, 2017.

3 PÊGAS, J. V. O. *et al*. **Globally hyperbolic evaporating black hole and the information loss issue**. 2024.Available at: https://arxiv.org/pdf/2402.19140. Accessible at: 30 June 2024.