

Entanglement and the information paradox

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ABSTRACT

The Hawking radiation leads to evaporation of a black hole. This process generated an intense controversy regarding its potential conflict with the local quantum field theory (QFT) near the black hole horizon. The information paradox is related to the evaporation process and is expressed in a so-called Hawking "theorem" [1]. If one assumes that near the horizon: i) no quantum gravity effects occur and ii) local QFT and the Hamiltonian evolution are valid, then the evaporation of the black hole leads to two possibilities: a) mixed states [non-unitary evolution] or b) remnants [states which have finite energy and size but have infinity degeneracy].

Here we propose that the problem of the non-unitary evolution (mixed states) can be resolved by the disentanglement. And the non-unitary evolution for the observer at infinity is apparent. However in this proposal we encounter the "firewall" problem.

References

[1] S. D. Mathur: *The information paradox: A pedagogical introduction*, *Class.Quant.Grav.*26:224001, 2009 [arXiv:090.1038]