

Quantum Particles at a Black Hole Horizon

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It is widely believed that quantum particles can cross black hole event horizons. This conclusion based on the assumption that by specific singular coordinate transformations it is possible to remove divergences in the geodesic equations. We note that, while the used singular coordinate transformations do not cause problems on the level of the classical geodesic equations, which contain the first derivatives of particle wavefunctions, they usually lead to the appearance of delta-functions in the equations of quantum particles.

Using physical boundary conditions for the equation of motion of quantum particles close to the black hole event horizon, we had found the real-valued exponentially time-dependent (not harmonic) wavefunctions [1]. This means that quantum particles probably do not enter the Schwarzschild sphere, but are absorbed and some reflected by it [2], what potentially can solve the main black hole mysteries.

References:

[1] M. Gogberashvili, “*Can Quantum Particles Cross a Horizon?*”, arXiv: 1712.02637 [gr-qc].

[2] M. Gogberashvili and L. Pantskhava, “*Black Hole Lensing and Wave Bursts*”, Int. J. Theor. Phys. (2018) accepted.