

Dynamics of a scalar field quantized in curved spacetimes

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Dynamics of a scalar field quantized in the curved spacetimes, Conformally Flat Spacetime and in the Interior of a Schwarzschild Black Hole [1] is discussed within a so-called unitary approach. Hamiltonian of the scalar field in both cases is expressed in a form of a system of harmonic oscillators interacting via terms obeying spacetime symmetry properties and corresponding to creation and annihilation pairs of particles. Dynamic properties of the system are studied by converting Heisenberg equations of motion, due to the Bogolyubov transformations, into ordinary differential equations and solved by invoking some approximate methods. Finally, the limiting, exactly solvable case of the scalar field quantized in the flat spacetime, i.e. in the Minkowski spacetime is presented.

[1] P. Gusin, A. Radosz, A.T. Augousti, J. Polonyi, O.B. Zaslavskii and R.J. Ściborski, *Quantum Phenomena Inside a Black Hole: Quantization of the Scalar Field Inside Horizon in Schwarzschild Spacetime*, *Universe* **2023**, 9(7), 299