Quantum scattering and boundary conditions on classically singular spacetimes

Vitor Barroso Silveira, João Paulo Pitelli Manoel

Universidade Estadual de Campinas, Brazil

Topological defects are believed to be formed during phase transitions in the early universe trough spontaneous symmetry breaking, some of them are cosmic strings, domain walls and global monopoles [1,2]. We revisit quantum scattering by a scalar particle on the spacetime of a global monopole [3] and 2-dimensional cone [4,5,6]. In order to construct self-adjoint extensions for the wave operator, a boundary condition must be prescribed at the classical singularities of the spacetimes [7,8]. These conditions seem to contribute to the scattering amplitudes with purely analytic terms in addition to those coming from topological scattering [6]. Cross-section analysis on our toy model may indicate which boundary condition is favored by Nature.

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