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Photon propagation in curved space: loss of interference and Bell inequality violation

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Using an exact solution for a two-dimensional scalar field propagating in a variation of the Alcubierre metric, we analyze how apparent horizons affect localized quantized wavepackets. We analyze the loss of fringe visibility in a single-photon interferometer, and the reduction of entanglement between two 2D photons, if one photon travels through a region with spacetime curvature. We also derive an expansion of the field operator in terms of localized modes by means of an over-completeness relation.

Keyword-1

Quantum Field Theory

Keyword-2

General Relativity

Keyword-3

Entanglement

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