Quantum aspects of Stimulated Hawking radiation in an analog Optical White-Black hole pair

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This work introduces a synergistic combination of analytical and numerical methods to study the Hawking effect in optical systems containing the analog of a pair white-black hole. Our analytical treatment, based on techniques from quantum Gaussian information, provides a simple and efficient model to describe all aspects of the out state, including the entanglement between any bi-partition. We complement the study with a numerical analysis, and apply our tools to analyze the influence that ambient thermal noise and detector inefficiencies have on the out state. We find that aspects of the Hawking effect that are of quantum origin, i.e. quantum entanglement, are extremely fragile to the influence of inefficiencies and noise. We propose a protocol to amplify and observe these quantum aspects, based on seeding the process with a single-mode squeezed input, opening the door to new possibilities of experimental verification of the Hawking effect.

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