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Imaging with moving detectors

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The theoretical framework behind modern-day quantum optics has been successful in explaining a number of interesting phenomena. However, since it is traditionally formulated using ordinary quantum mechanics and Fourier optics, it cannot account for relativistic notions such as different reference frames (including non-inertial ones) or curved classical gravitational backgrounds. In an attempt to understand the quantum imaging process within a more complete quantum field theory (QFT) framework, a novel analogy is proposed: so-called Unruh-DeWitt (UDW) detectors can be used to model both the object one wishes to image as well as the pixelated imaging device itself. As an example, after coupling a QFT version of a biphoton state created via spontaneous parametric down-conversion (which is one of the principal processes used to create entangled photons in the laboratory) with arrays of Unruh-DeWitt detectors, we investigate quantum ghost imaging under both inertial and accelerating conditions. Given that the reconstructed images can be discerned better than a pure guess, the formalism appears capable of describing the quantum imaging process in non-trivial reference frames.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

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