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Quenches and quantum fluctuations in a fluid of light

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Hot atomic vapors are widely used in non-linear and quantum optics due to their large Kerr non-linearity. This non-linearity induces effective photon-photon interactions allowing light to behave as a fluid displaying quantum properties such as superfluidity. Quantum fluids of light rely on the analogy between the non-linear Schrödinger equation (NLSE) describing the propagation of light in non-linear media and the Gross-Pitaevskii equation (GPE) describing a weakly interacting Bose gas. By studying the effect of interaction quenches of the nonlinear index term in the fluid, we evidence the dynamical Casimir effect i.e the spontaneous emission of correlated pairs of phonons. This has profound implications for analogue physics since our evolution equation can be mapped onto a space-time metric, it is then possible to reinterpret this emission as the emission of acoustic waves (Sakharov oscillations), similarly to the early universe

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