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[back to namelist](#)

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Mechanism for the Suppression of Quantum Noise at Large Scales on Expanding Space

According to inflationary cosmology, the temperature anisotropies in the cosmic microwave background have a quantum origin in the very early universe (ultimately they can be traced back to the vacuum fluctuations of the inflation field). Recent results reported by the Planck team suggest that there is an anomalous large-scale power deficit in the cosmic microwave background. I will present an exactly-solvable model of such a suppression in the de Broglie-Bohm pilot-wave theory. This theory is a formulation of quantum theory that allows the additional existence of 'quantum nonequilibrium' in the early universe, from which quantum equilibrium (the Born law) arises dynamically (a process referred to as relaxation to quantum equilibrium). More specifically, the case of a single field mode on expanding space will be considered, whose evolution is equivalent to that of a standard harmonic oscillator with a 'retarded time', which depends on the wavelength of the mode. For super-Hubble modes, the relaxation to quantum equilibrium is strongly retarded and this relaxation retardation could result in a large-scale power deficit in the cosmic microwave background. Based on a recent work with Antony Valentini [arXiv: 1306.1579].

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