Q 50 Quanteninformation IV

Zeit: Mittwoch 14:00–15:00 Raum: HI

Q 50.1 Mi 14:00 HI

Quantum estimation of damping — •Hannah Venzl and Matthias Freyberger — Abteilung Quantenphysik, Universität Ulm, 89069 Ulm

It is generally not possible to transmit a signal error free, since there is always a coupling to the external environment due to imperfections of the transmitting medium. This coupling causes dissipation and decoherence effects. It is thus of great interest to get as much information as possible about the unknown damping constant.

We discuss a quantum interferometric approach to the estimation of damping. We study both entangled and separable probe states consisting of superpositions of coherent states, since for those states an analytical description of damping is available. The effect of damping on such states is analysed using a suitable generalised homodyne detection. We investigate whether entanglement can improve the estimation of an unknown damping constant.

Q 50.2 Mi 14:15 HI

Unravelling Entanglement — •Marc Busse, A.R.R. de Carvalho, O. Brodier, C. Viviescas, and A. Buchleitner — Max Planck Institut fuer Physik Komplexer Systeme, Noethnitzer Strasse 38, 01187 Dresden

Entanglement is the crucial resource for quantum information processing. Unfortunately, this invaluable quantum property is very easily lost, due to unavoidable interactions with the environment. Therefore it is of great interest to understand the time evolution of entanglement in open systems. However, this turns out to be a puzzle, since the common definition of mixed state entanglement measures involves an optimisation procedure. We tackle the problem through a quantum trajectory approach, combined with an optimization over different quantum jump operators [1].

[1] *also see Olivier Brodier's talk ("Optimal jump operators for monitoring entanglement") at this conference*

Q 50.3 Mi 14:30 HI

Non-negative discrete Wigner functions — •David Gross — Institute for Mathematical Science, Imperial College London, 48 Prince's Gardens, London 2W7 2PE

We find that, on a Hilbert space of odd dimension, the only pure states to possess a non-negative Wigner function are stabilizer states. The Clifford group is identified as the set of unitary operations which preserve positivity. The result can be seen as a discrete version of Hudson's Theorem. Hudson established that for continuous variable systems, the Wigner function of a pure state has no negative values if and only if the state is Gaussian. Turning to mixed states, it might be surmised that only convex combinations of stabilizer states give rise to non-negative Wigner distributions. We refute this conjecture by means of a counter-example.

Q 50.4 Mi 14:45 HI

Unambiguous quantum parity check — •Hermann Kamermann[1], Matthias Kleinmann[1], Tim Meyer[1], Philippe Raynal[2], Norbert Lütkenhaus[2], and Dagmar Bruss[1] — [1]Heinrich Heine Universität Düsseldorf, Theoretische Physik III — [2]Universität Erlangen-Nürnberg, Institut für Theoretische Physik I

We consider the task to determine without error, whether a string consisting of non-orthogonal quantum states ψ_0 and ψ_1 (with *a priori* probabilities η_0 and η_1) has even or odd parity, i.e. whether it consists of an even or odd number of ψ_1's. As perfect discrimination between non-orthogonal quantum states is impossible, the measurement outcomes, even parity (F_E), odd parity (F_O) or "I don't know" ($F_?$) can occur. Bennett *et al.* [1] solved the task of finding the minimal error probability for the case $\eta_0 = \eta_1$, by relating it to an unambiguous state discrimination problem. We prove that the optimal measurement leads to identical failure rates for a string of $2n-1$ and $2n$ states for $\eta_0 = \eta_1$. We investigate the generalization of this task to arbitrary *a priori* probabilities and its effects on the failure rates.

[1] C.H. Bennett, T. Mor, and J.A. Smolin. *Phys. Rev. A*, 54(4), 2675, (1996)