

QSIT Talk, at ETH Zurich, 3. Aug. 2017, 16:45h

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Title:

Parameter and State Estimation in Open Quantum Systems: Applications in Quantum Dots and Cavity QED

Abstract:

In quantum optics, a quantum system is often measured continuously over time and the post-processing of the measured signal is then used to characterise the parameters and/or underlying quantum state.

In this talk I will present the so-called past quantum state, a general technique that helps us determine outcome of measurements in the case when a system is being continuously monitored. As a general technique developed using basic building blocks of quantum measurement theory it can be (and has been) applied to a variety of experimental systems and led to the improvement of existing parameter estimation techniques.

I will discuss in more detail the application of the method in two example scenarios: (1) electron spin and population dynamics of a quantum dot and (2) quantum teleportation protocol in a cavity/circuit QED setting. As an outlook, I will compare routinely used parameter estimation techniques with new approaches that we are developing based on neural networks and machine learning.