

Michel Brune: Quantum trajectory of a field stored in a cavity, the past quantum state approach

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We perform experiments where photons are trapped in a nearly ideal “photon box” as discussed by Einstein and Bohr in one of the gedanken experiments they introduced for emphasizing the unbelievable strangeness of quantum theory. Our photon box consists in a high Q cavity trapping microwave photons between superconducting mirrors.

In the experiments, we probe and manipulate the trapped microwave field with Rydberg atoms, which act as extremely sensitive and even non-destructive probes of the cavity field. We will show various methods for reconstructing the quantum state of the field and of its evolution. We will introduce the past quantum state method, which consists in reconstruction the field state at a given time, using knowledge obtained by measurement performed both before and after this time.