

Controlling photons in cavities

Serge Haroche

Collège de France and Ecole Normale Supérieure, Paris

The founders of quantum theory assumed in thought experiments that they were manipulating isolated quantum systems obeying the counterintuitive laws which they had just discovered. Technological advances have recently turned these virtual experiments into real ones by making possible the actual control of isolated quantum particles. In Paris, we perform such experiments by juggling with photons trapped between superconducting mirrors. We count these photons in a non-destructive way, we observe field quantum jumps and we prepare states of the quantum field reminiscent of the famous cat which Schrödinger imagined to be suspended between life and death. We also learn to use quantum feedback procedures to combat the effects of decoherence phenomena which tend to destroy rapidly the non-classical features of the photonic quantum states. I will give a simple description of these studies, compare them to similar ones performed on other systems and guess about possible applications.