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THE UNIVERSITY of WISCONSIN MADISON

PHYSICS COLLOQUIUM

Trapping & Counting Photons Without Destroying Them

A New Way to Look at Light

Serge Haroche

Ecole Normale Supérieure and
Collège de France, Paris

Host: Yavuz

Abstract: While usual photo-detection destroys light quanta, we have developed a new way to count photons trapped in a cavity without absorbing them, making it possible to measure the same field repeatedly. We use as detectors atoms prepared in Rydberg states which cross the cavity one at a time and behave as microscopic clocks whose ticking rate is affected by light. By measuring the clocks' delay, information is extracted without energy absorption and the field progressively collapses into a well-defined photon number state. Quantum jumps between decreasing photon numbers are recorded as the cavity field subsequently relaxes towards vacuum. This new way to look at light also generates coherent superpositions of photonic states with different phases called "Schrödinger cats". By monitoring the evolution of these states, we directly observe the process of decoherence in experiments opening new avenues for the exploration of the boundary between the quantum and classical worlds.

2241 Chamberlin Hall • Friday, April 11, 2008 • 4:00 P.M.