



Physikalisches Kolloquium
Einladung

Physics Colloquium
Invitation

Monday, 21 October 2019

Lecture Hall N24/H13, 16:15

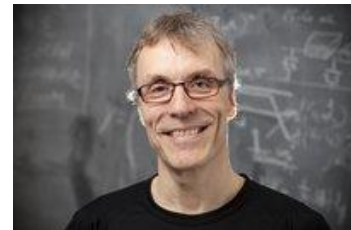
Coffee and cookies will be served in front of the lecture hall from 16:00

Quantum physics with pulses of radiation

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The ability to control quantum systems and prepare special superposition and entangled states of light and matter is pursued with many experimental platforms and forms the basis of strategies for quantum computing, communication and metrology. This, task oriented research, however, confronts us with “blind spots” in our knowledge and capabilities: Important cases are not treated by our text book formalism, or they are dealt with in ad hoc manners that are not consistent and accurate.

In this talk, I shall discuss one such case: the interaction of a quantum system with a travelling pulse of radiation. While crucial for multiple effects in quantum optics and for the entire concept of flying and stationary qubits, quantum optics textbooks do not provide a formal description of this foundational and elementary interaction process. I shall present a new (simple) theoretical formalism that, indeed, accounts for the interaction of travelling pulses of quantized radiation with a local quantum system such as a qubit, a spin or a multi-level atom in a cavity. Our theory provides a master equation where input and output pulses are treated as separate, single oscillator modes that both couple to the local system in a cascaded manner. We discuss applications of our theory to quantum pulses of optical, microwave and acoustic excitations and we show examples of relevance to recent experiments.