

# KIDS TALK

## “A Number State Filter for the Pulses of Light”

**Speaker:** Nikolai Lauk, AG Fleischhauer

### Abstract:

States of light field that contain a definite number of photons, so-called Fock states, are of particular interest for quantum information processing, since they can be used as a carrier of discrete bits of quantum information. However, up to now a deterministic source of pulses with definite number of photons is still missing. An extremely useful tool would be a filter that allows to extract different photon-number components of a propagating wave packet.

Here I will present our proposal for such a device based on the cavity induced transparency (CIT). CIT is an effect which occurs in an ensemble of three level atoms in a  $\Lambda$ -type configuration that interacts with two quantized fields. Coupling of one transition to a cavity mode induces transparency for the propagating field on the otherwise opaque transition similar to the well known effect of electromagnetically induced transparency (EIT). This transparency is accompanied by a reduction of the group velocity for the propagating field. We will see that in contrast to EIT the group velocity in CIT depends on the number of incoming photons, i.e. different photon-number components propagate with different velocities leading to spatial separation of different photon-number components after the propagation through the CIT medium. Analytical predictions are compared to numerical simulations of the propagation of few photon wave packets. Finally, I will discuss the requirements for a possible experimental realization.

**When:** Friday, January 29<sup>th</sup> 2016, **10:00 am**

**Where:** Room 46-387/388

All undergraduate and graduate students as well as postdocs are welcome and encouraged to join our discussion!

\*\*\*\*\* COFFEE AND COOKIES WILL BE SERVED \*\*\*\*\*

For questions, comments or suggestions: [schmidt@physik.uni-kl.de](mailto:schmidt@physik.uni-kl.de)

