

Einladung  
zum Laser- und Quantenoptikseminar

**Freitag, 15.06.2018, um 10:00 Uhr**

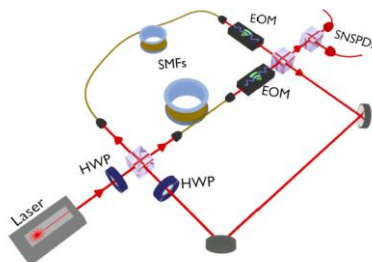
**Raum 46-387/388**

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## Quantum Simulations with Time-Multiplexed Photonic Quantum Walks

Photonic quantum walk systems can be considered as a standard model to describe the dynamics of quantum particles in a discretized environment and serve as a simulator for complex quantum systems, which are not as readily accessible. However, their experimental realization requires setups with increasing complexity in terms of number of modes and control of the system parameters.



Setup scheme of the loop architecture  
of the time-multiplexed quantum walk

Here, we employ an optical feedback loop (see figure), which provides high homogeneity, precise control of the system parameters and optimal resource efficiency [1–3]. In this time-multiplexing scheme the walker's position is mapped into the time domain including the requisite interference effects. By introducing static and dynamic disorder using fast electro-optic modulators (EOM) we demonstrate localisation effects and present the evolution on a two-dimensional graph simulating 2-walker dynamics. The realisation of dynamic sinks in the walker's dynamics by applying a deterministic in- and outcoupling enables us to study measurement induced effects and recurrence probabilities [4].

### References

1. A. Schreiber et al. "Photons Walking the Line: A QuantumWalk with Adjustable Coin Operations," PRL **104**, 050502 (2010).
2. A. Schreiber et al. "A 2D Quantum Walk Simulation of Two-Particle Dynamics," Science **336**/6077, 55–58 (2012).
3. T. Nitsche et al. "Quantum walks with dynamical control," New Journal of Physics **18**, 063017 (2016).
4. T. Nitsche et al. "Probing Measurement Induced Effects in Quantum Walks via Recurrence," to appear in Science Advances (2018).

Der Gast wird betreut von Prof. Dr. H. Ott  
GÄSTE SIND HERZLICH WILLKOMMEN!