

Prize Talk

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Chiral Quantum Networks with Photons and Atoms —

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Recent experiments have achieved trapping of atoms close to photonic nanostructures. A unique feature of such setups is the chiral character

of emission of photons by atoms into the waveguide, i.e. broken left-right symmetry due to spin-orbit coupling of light. This chirality of photon exchange between atoms, and corresponding photon-mediated interactions between the atoms give rise to a novel quantum optical many-body system. We discuss from a theory perspective the quantum optics of such "chiral quantum circuits of photons and atoms" as a laser driven-dissipative quantum many-body system. This includes a discussion of novel non-equilibrium quantum phases, and new opportunities for implementation of quantum information protocols.