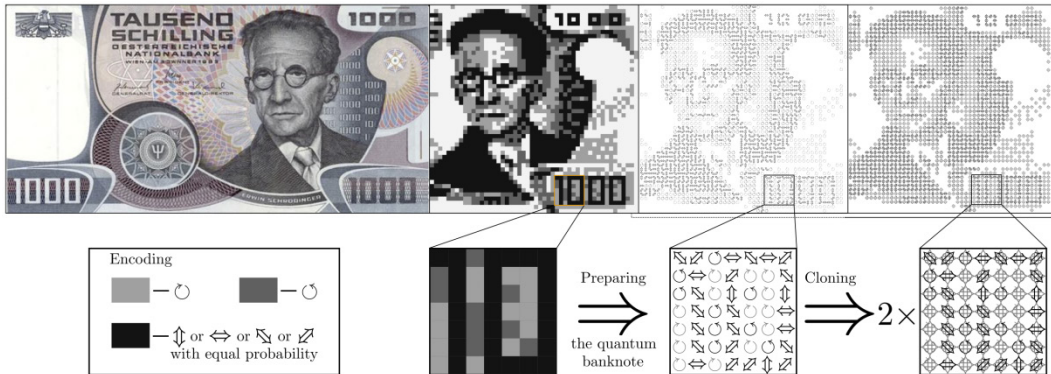


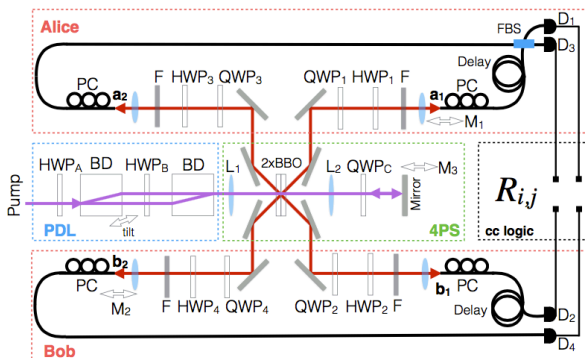
QUANTUM-CORRELATED LIGHT

Our research topics include exploring the nonlinear quantum properties of light in the context of emerging quantum communication and information processing technologies. These technologies include quantum key distribution protocols, quantum secured payment methods, quantum machine learning algorithms, and quantum sensing. We also investigate methods of measuring the quantum properties of photons (including quantum correlations, e.g., entanglement) via complete state tomography and other specialized methods based on multiphoton interference and nonlinear effects.



<https://www.nature.com/articles/s41534-017-0010-x>

QUANTUM COMMUNICATION TECHNOLOGIES

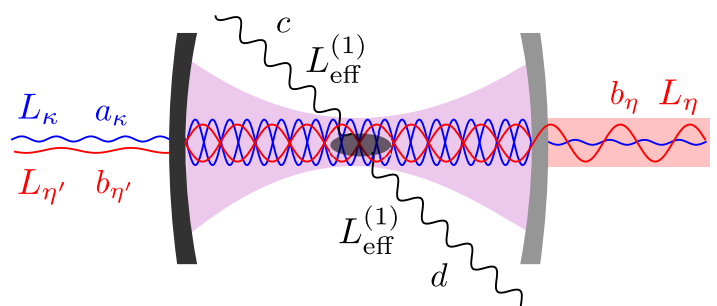


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In order to make secure quantum communication available for everyone, we need to build a quantum counterparts of classical communication devices as repeaters (relays), and routers. Moreover, quantum networks require also elements that have no classical counterparts. These are for example qubit amplifiers, quantum cloners, nonemolition photon detectors, and sources of quantum entangled light. We investigate the possible designs of such elements and implement proof of principle experiments with quantum optical technologies. These experiments are performed in collaboration with international experimental groups.

QUANTUM CAVITY ELECTRODYNAMICS

We theoretically investigate the behaviour of groups of atoms stored in optical cavities and their interaction via optical or microwave fields. Within this framework we are able to study the physics of various regimes of light-particle interactions. This versatile framework allows for searching of new physical phenomena and their applications in emerging quantum technologies.



NONLINEAR OPTICS

We research both quantum and classical nonlinear optical problems, continuing the work of Prof. Stanisław Kielich, the founder of the Nonlinear Optics Division at Faculty of Physics of AMU.



NONLINEAR OPTICS DIVISION

