Synthesizing and Processing of Quantum States

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For realization of quantum information processing, it is important to study how well we can prepare an arbitrary state of qubit(s) and manipulate the state with realistic (= non-ideal) sources, devices, and detectors. As a research group of JST-CREST Research Team for Interacting Carrier Electronics, we are investigating quntum state synthesis and processing with PDC (parametric down conversion), linear devices (such as beam splitters and polarization beam splitters) and photon detectors (including not only commercially available ones but also possible future photon counters) for practical quantum information processing. We describe such schemes as quantum scissors devices and entanglement manipulation, and discuss what can be done and can be improved in the near future.