

Integrated devices for quantum communication systems

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Recent achievements in the area of integrated quantum optics and quantum information processing have shown impressive progress for the implementation of linear circuits based on monolithic waveguide structures. However, most experiments are based on $\chi^{(3)}$ -media, such as glass, silicon-on insulator or silica-on-silicon. In these platforms the implementation of highly efficient sources, frequency converters and fast active phase shifters and modulators pose severe challenges. The use of advanced waveguide structures, which harness a $\chi^{(2)}$ -non-linearity, allows for the realization various devices with multiple functionalities. These include single- and multi-channel sources with extraordinary brightness, quantum frequency conversion with tailored spectral-temporal properties, and complex circuitries comprising degenerate pair generation in orthogonal polarization, linear elements, and active elements such as polarization rotators or an electro-optically controllable time delay. Here we present our latest progress for the implementation of integrated devices based on $\chi^{(2)}$ -media for quantum circuits and quantum communication systems.