µTP4Q: a versatile quantum photonic IC platform through micro-transfer printing

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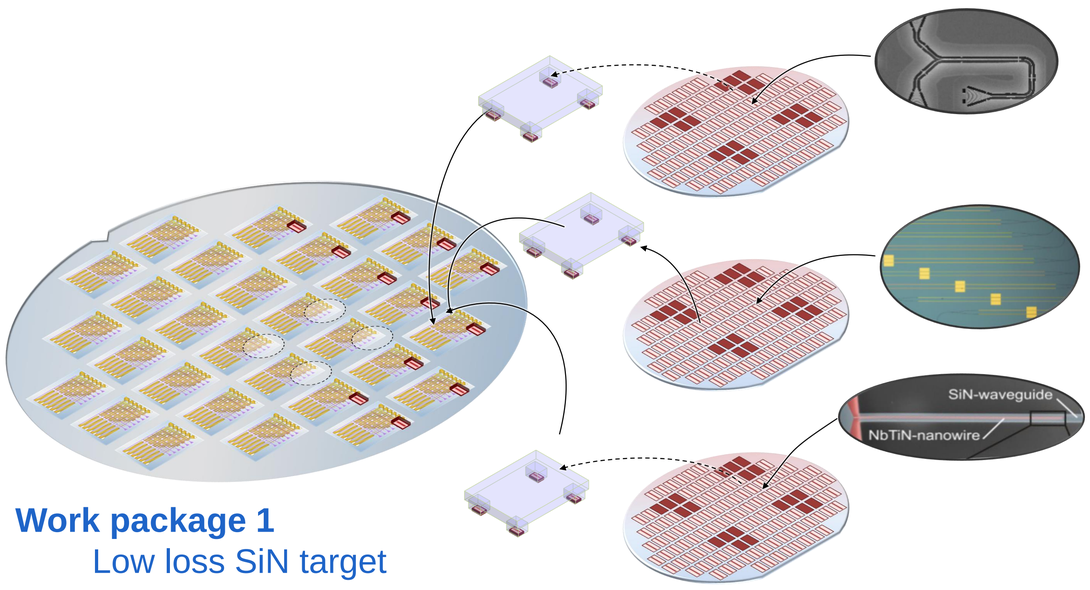
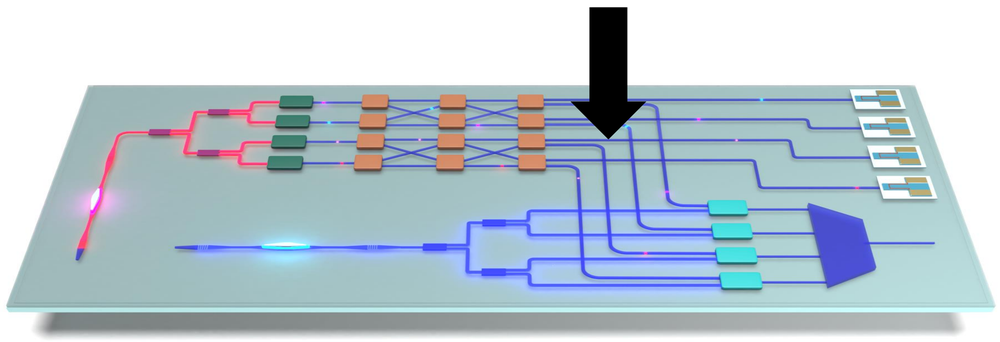
Micro-transfer printing enables a unified platform for quantum photonic integrated circuits



Work package 1
Low loss SiN target



Work package 2

Transfer print quantum dot single photon sources enabling a plug-and-play single-photon source integrated with SiN waveguides

Work package 3

Transfer print Lithium niobate modulators to carve pulses from a CW source to drive the single photon sources

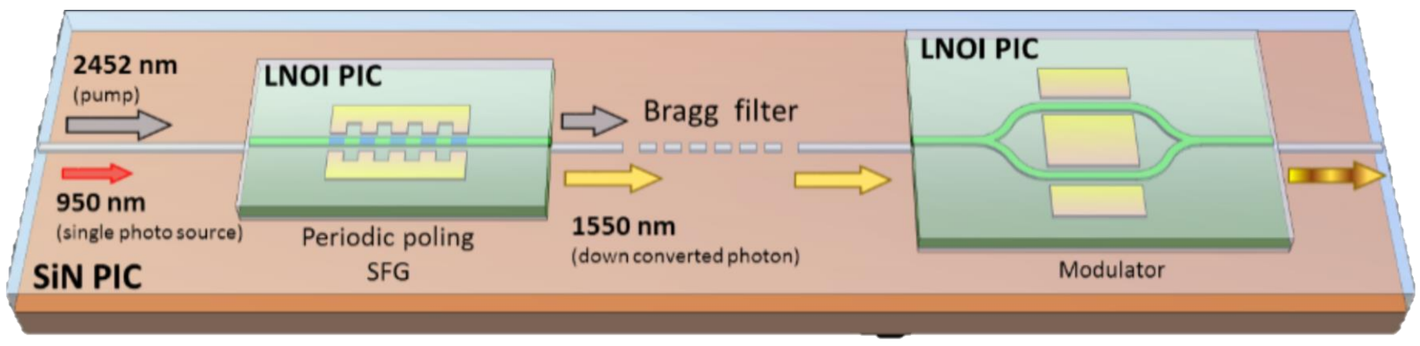
Work package 4

Transfer print super conducting nanowire single photon detectors and combine this with a SiN wavelength multiplexer to fabricate wavelength resolved single photon detectors

Work package 5

Co-integration of plug-and-play single-photon sources with efficient single photon detectors to build a device-independent quantum key distribution apparatus

Strongly nonlinear material for high speed modulation and frequency conversion

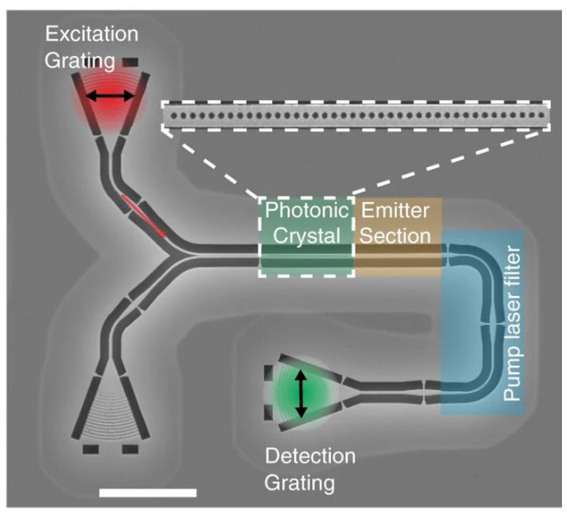


Periodically poled Lithium Niobate

High speed electro-optic modulators (>100 GHz) with very low operating voltages (Vπ<1V)

Highly efficient second harmonic generation ~4600%W-1cm-2

Near deterministic single photon sources



InAs quantum dot emitters

Single photon purity > 99%

Photon indistinguishability > 97%

coupling efficiency > 98.4%

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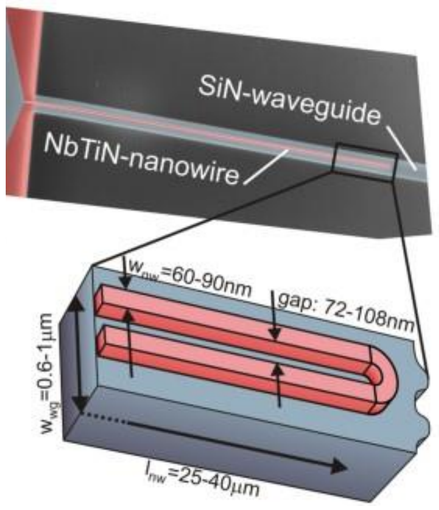
Efficient single photon detectors



Superconducting nanowire single photon detectors

Low dark count rates ~ mHz,

fast recovery times (~ns)

low timing jitter (<10ps).

single-photon detection ~91%