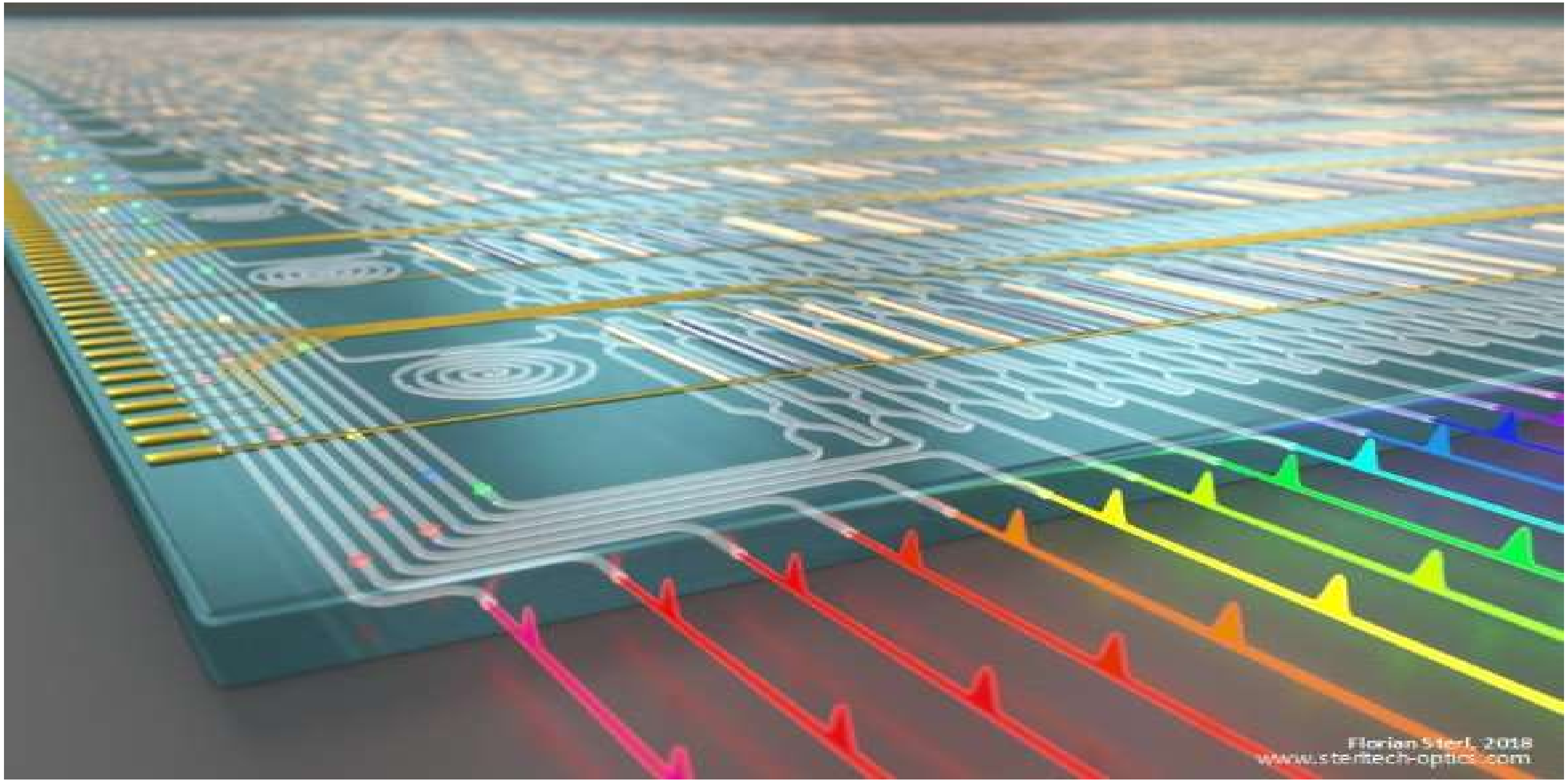
QuiX B.V.

THE FASTEST WAY TO A QUANTUM FUTURE



Dr. J.J.Renema
j.j.renema@quix.nl

Who am I?

- U Leiden 2003-2015 (Bsc MSc Phd)

- University of Oxford 2015-2018 JRF

- Universiteit Twente 2018 postdoc 2019 CTO QuiX

QuiX BV

Mission statement: deliver quantum technology solutions based on silicon nitride photonic integrated circuits

Spin-off of University of Twente (Jan 2019). Focused on development and commercialization of Quantum Technology solutions based on silicon nitride PICs.

QuiX BV

Mission statement: deliver quantum technology solutions based on silicon nitride photonic integrated circuits

Started Jan 2019

Management: JR & Hans van den Vlekkert

Shareholders: academic photonics community in Twente + UT + Raph2Invest

Photonic quantum technology

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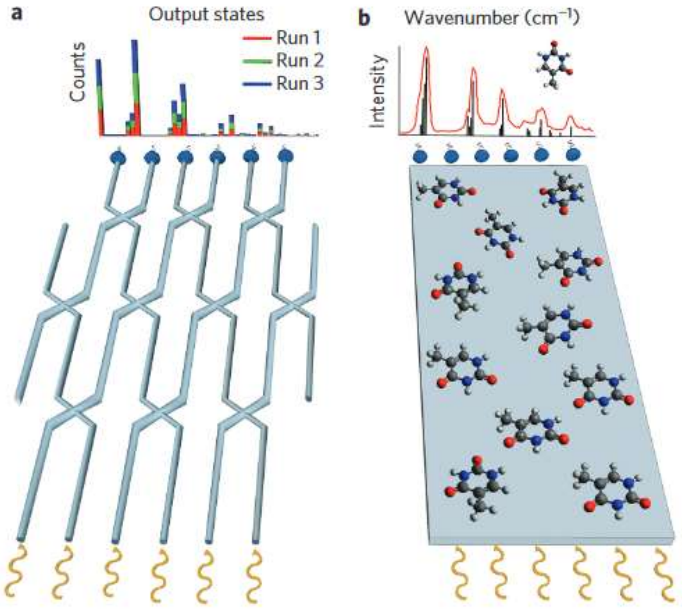
- Non-universal quantum computing
- Main applications:
  - machine learning
  - quantum simulation
- Advantages:
  - No cryo
  - High integration with photonic technologies

nature photonics ARTICLES
PUBLISHED ONLINE: 24 AUGUST 2015 | DOI: 10.1038/NPHOTON.2015.153

Boson sampling for molecular vibronic spectra

Joonsuk Huh*, Gian Giacomo Guerreschi, Borja Peropadre, Jarrod R. McClean and Alán Aspuru-Guzik*



Principle

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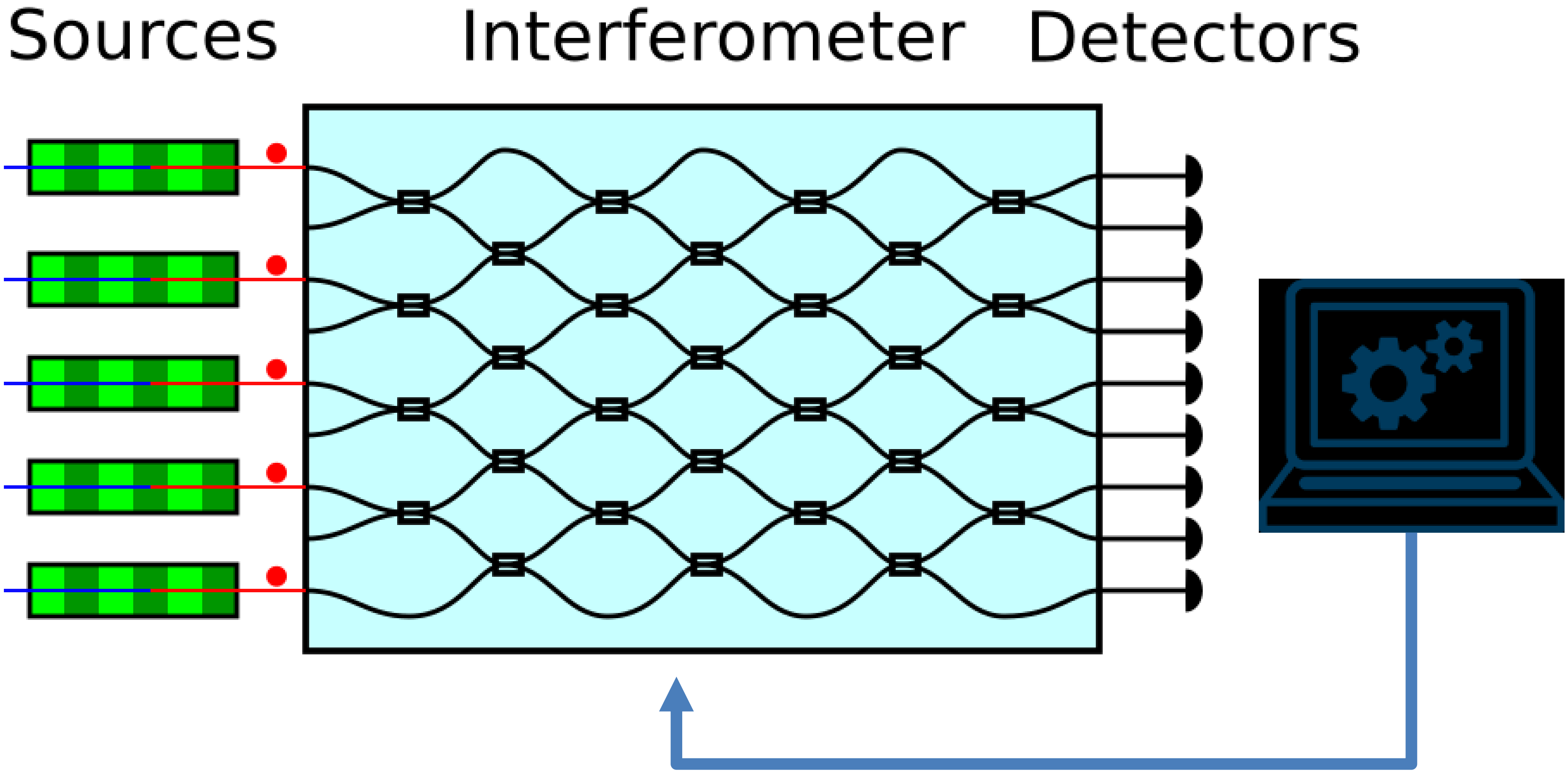
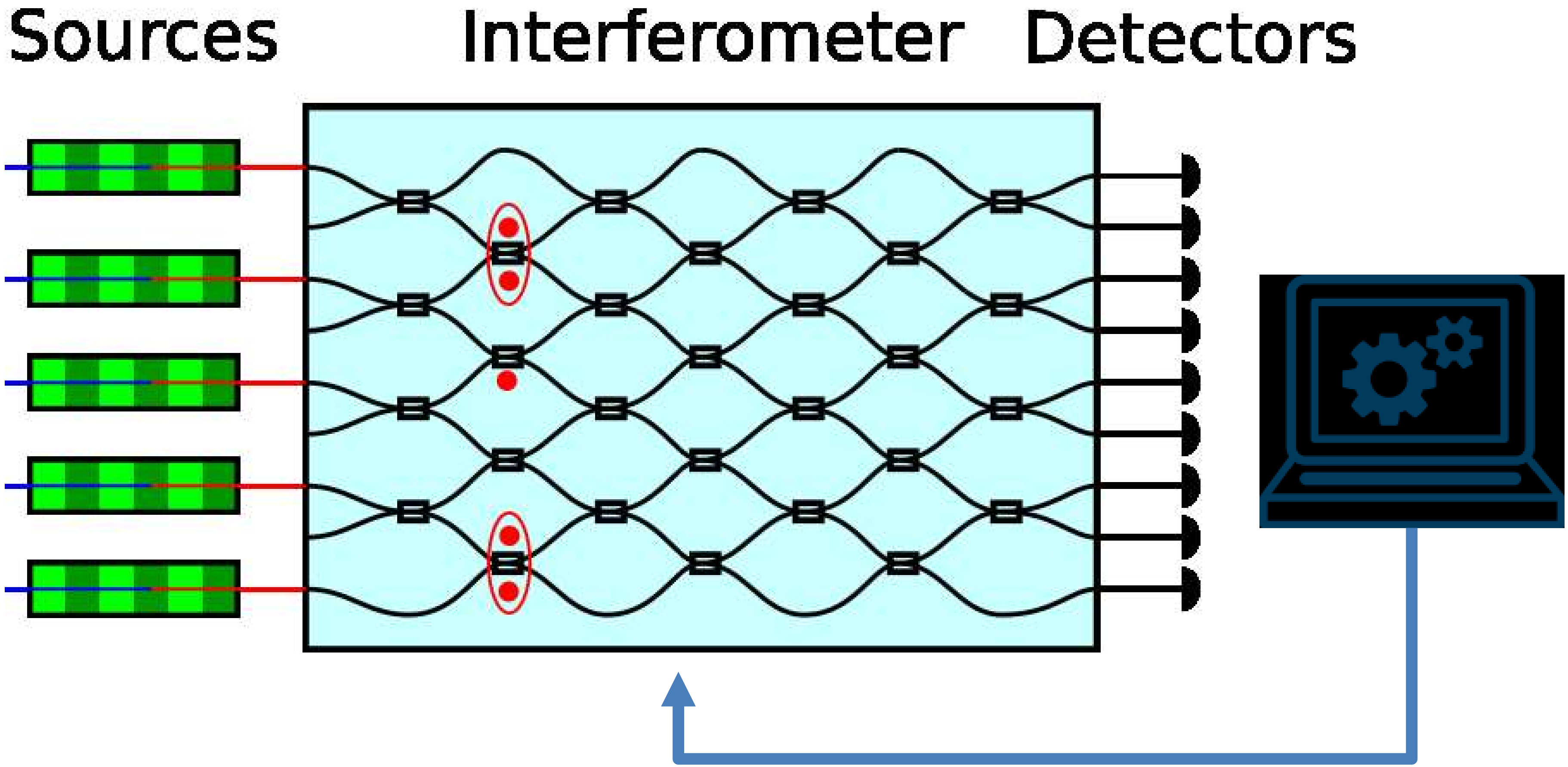
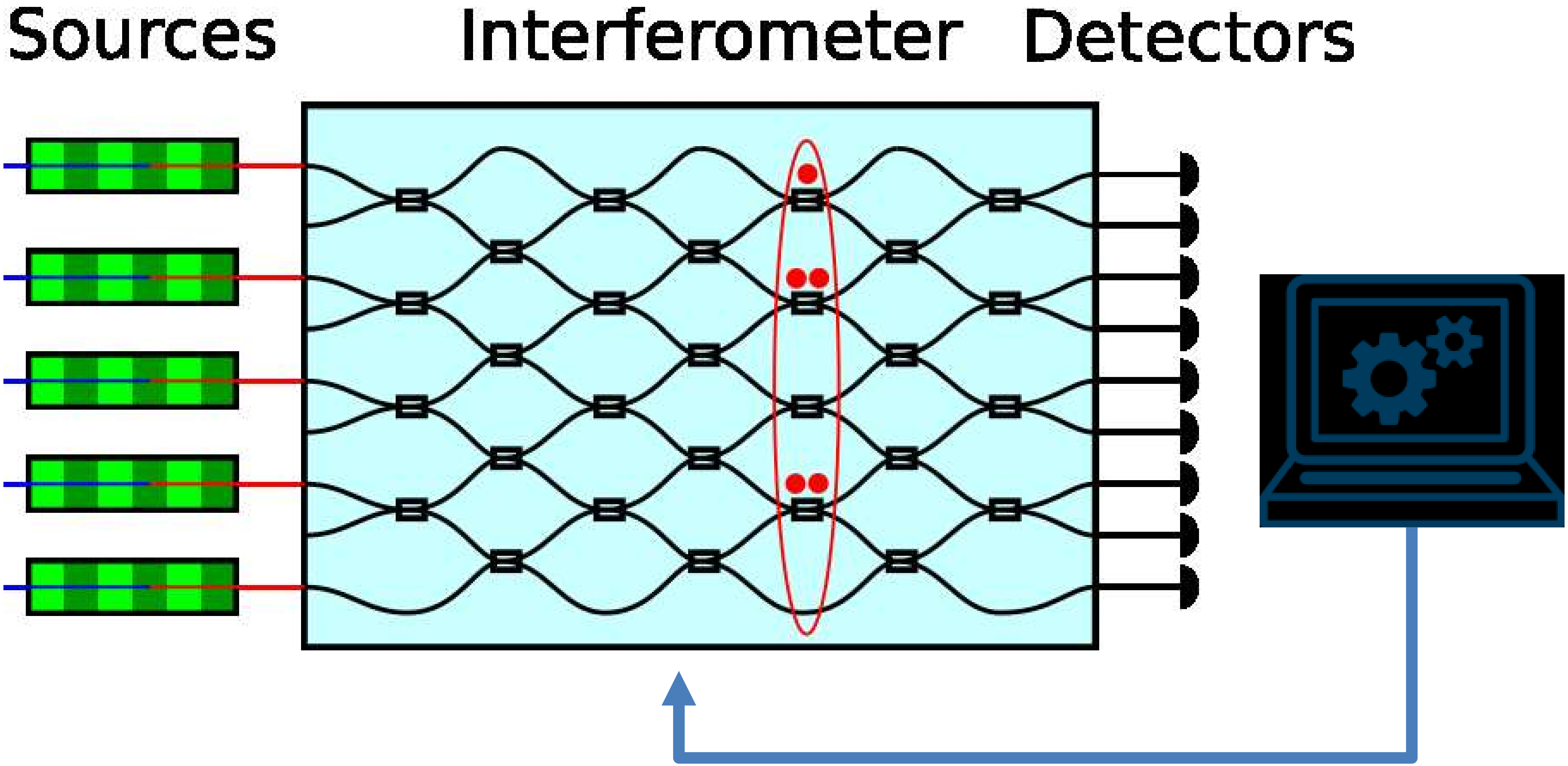


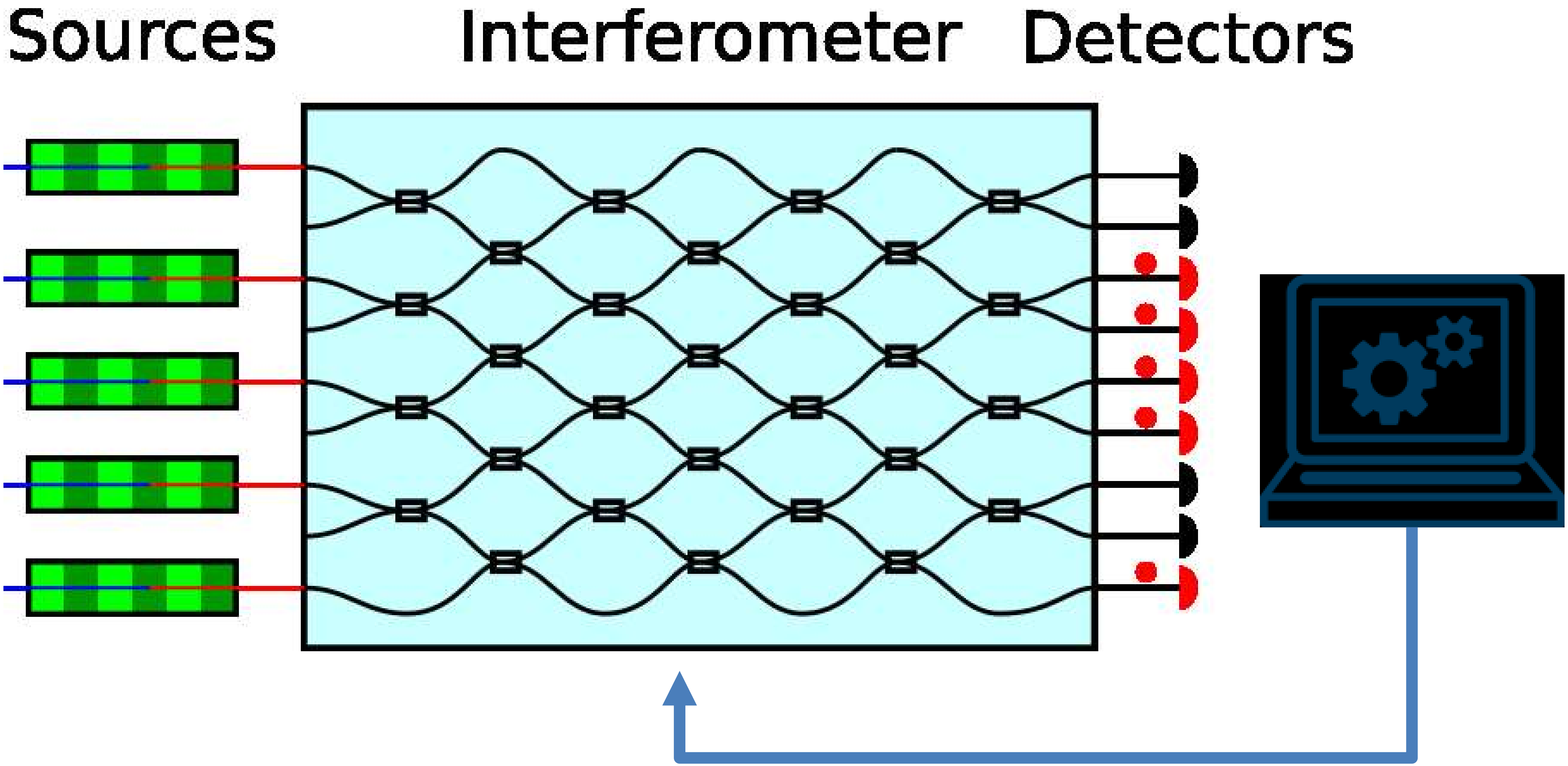
Principle



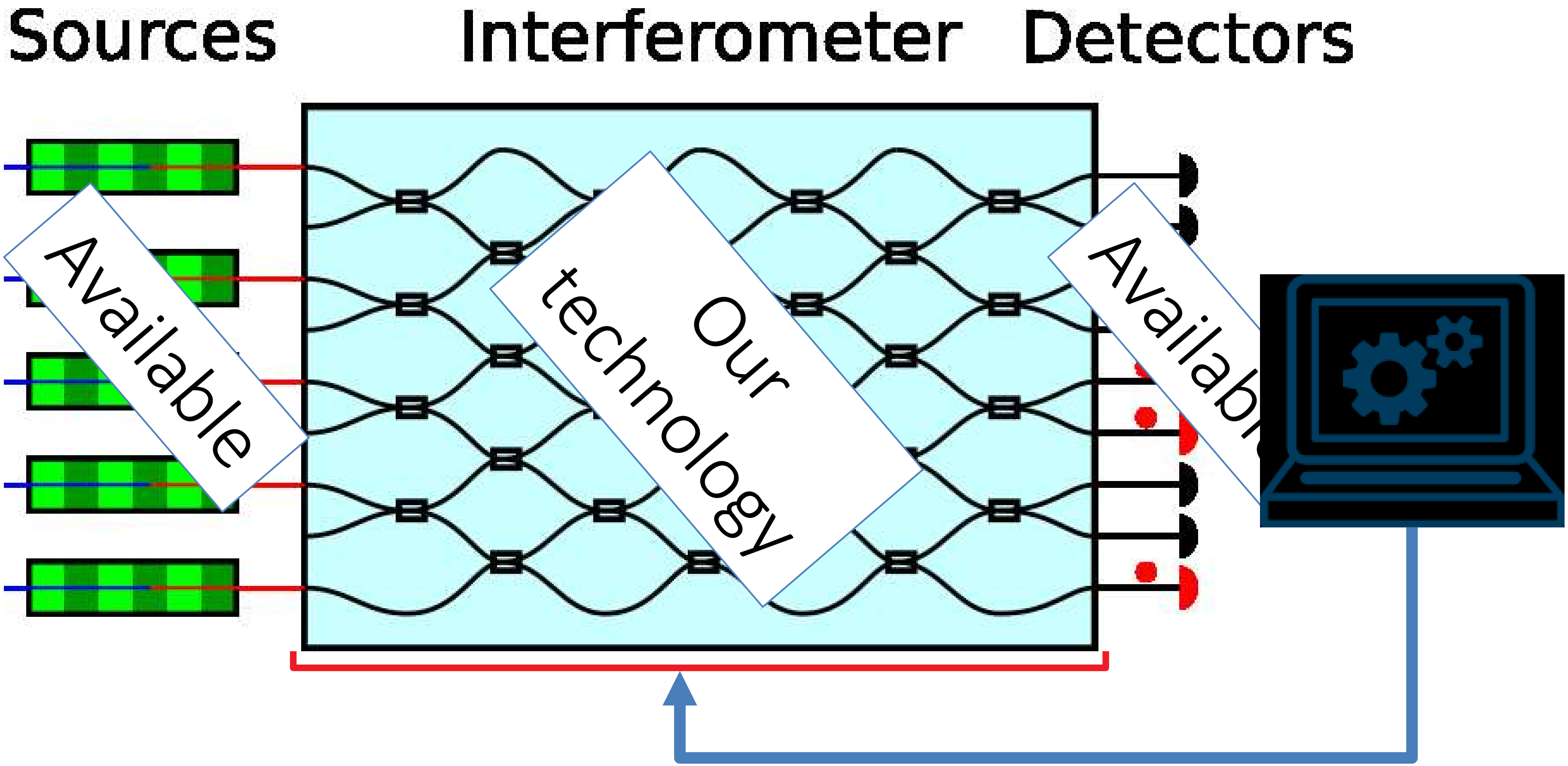
Principle



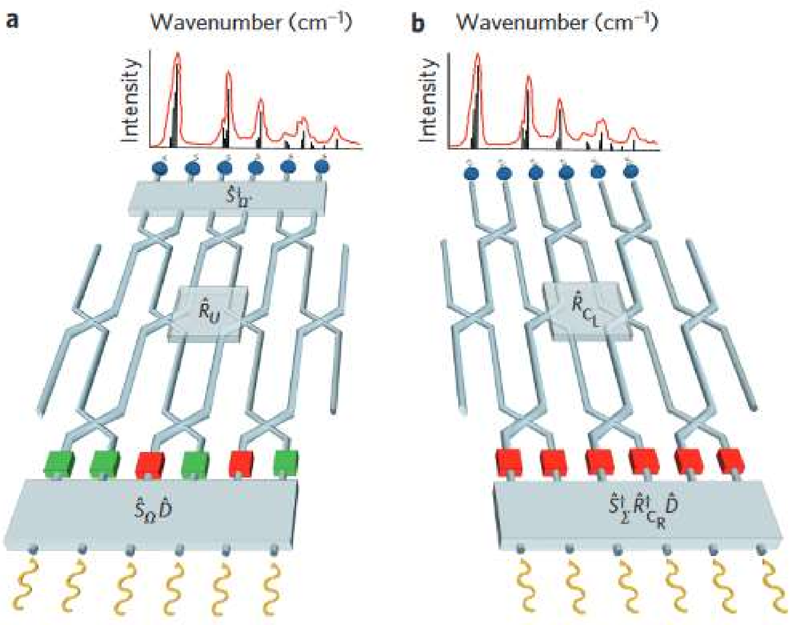
Principle



Principle

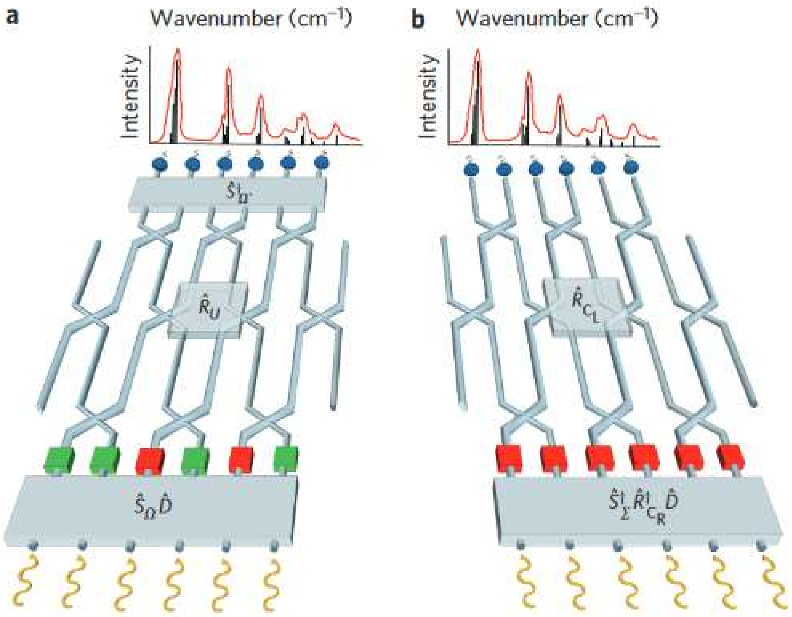

Sources
Interferometer
Detectors
Available
Our technology
Availab

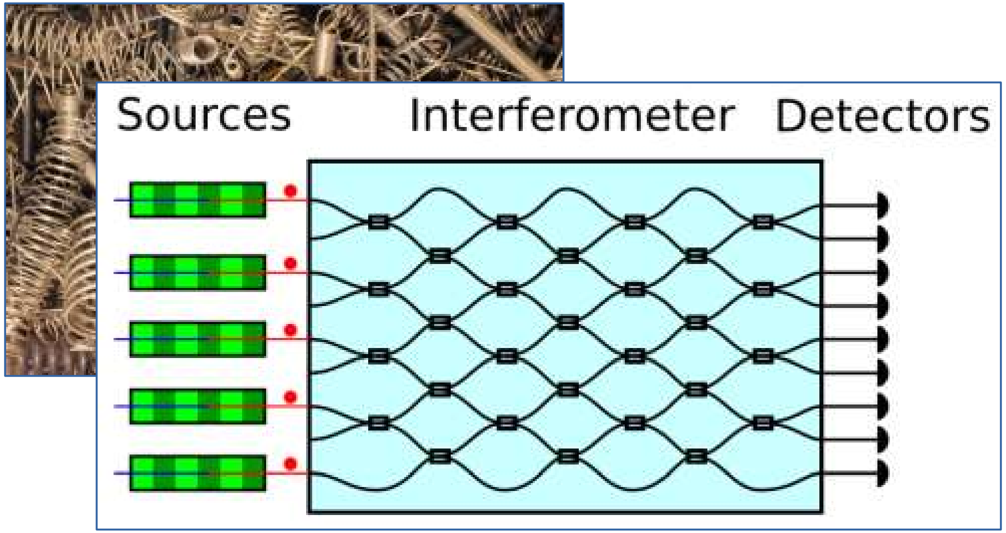
Quantum simulation with photonics



Huh et al, Nat. Phot. 2015

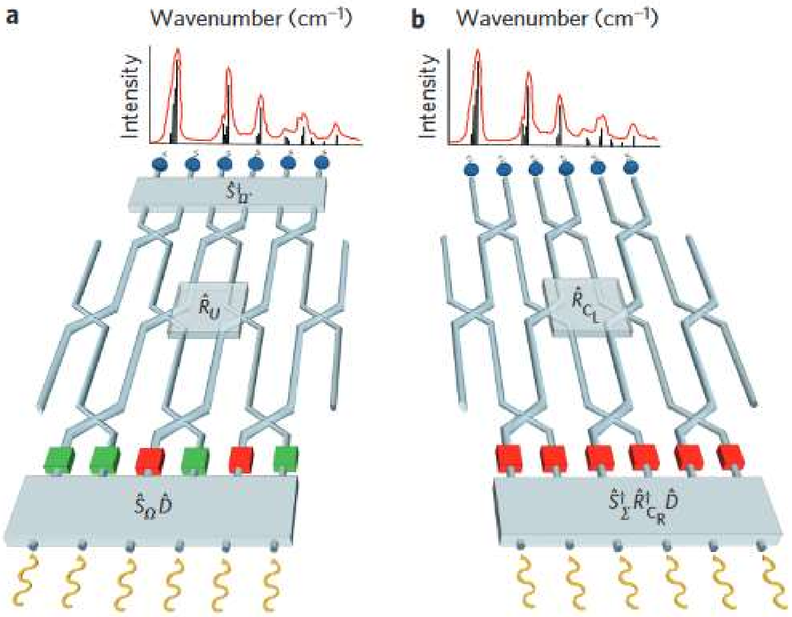
Quantum simulation with photonics

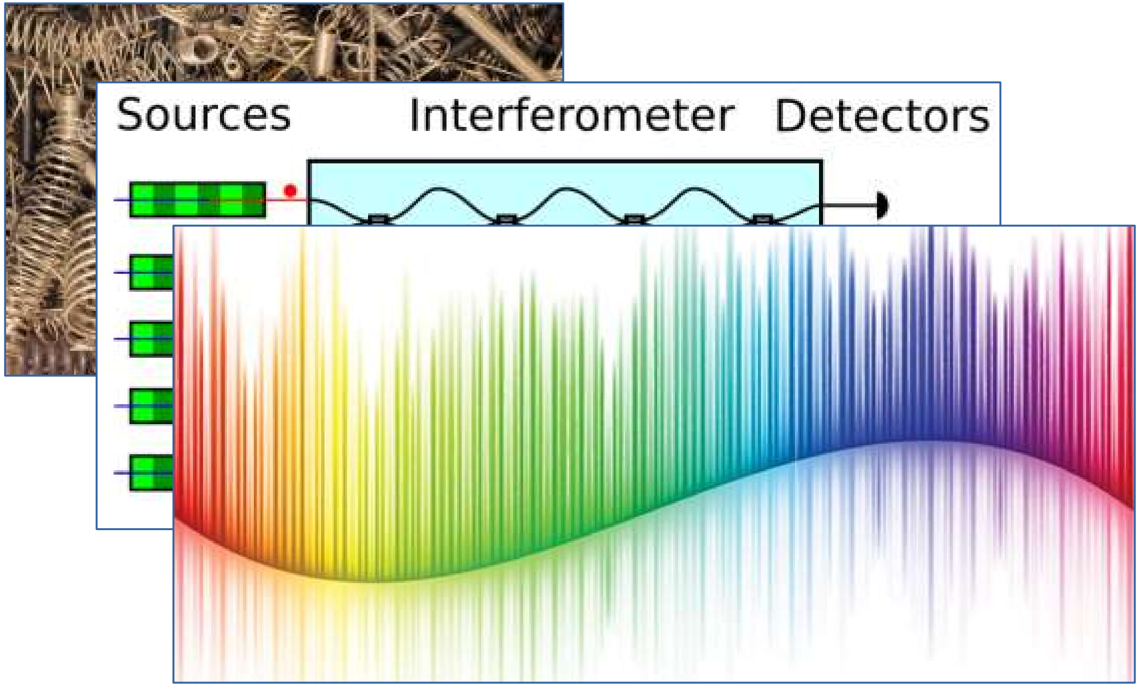




Huh et al, Nat. Phot. 2015

Quantum simulation with photonics



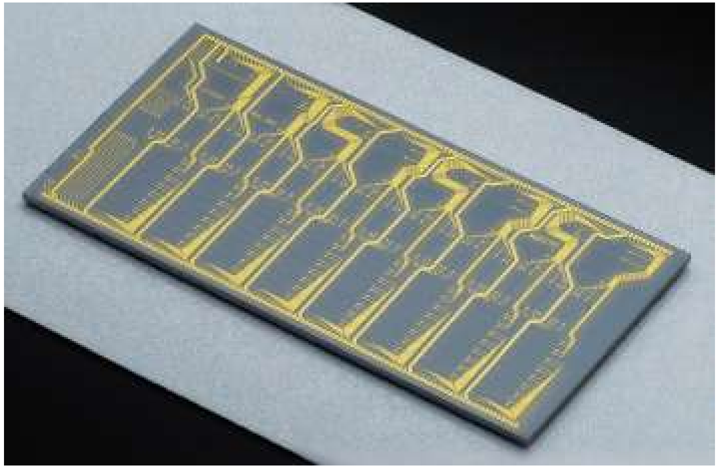


Huh et al, Nat. Phot. 2015

The product

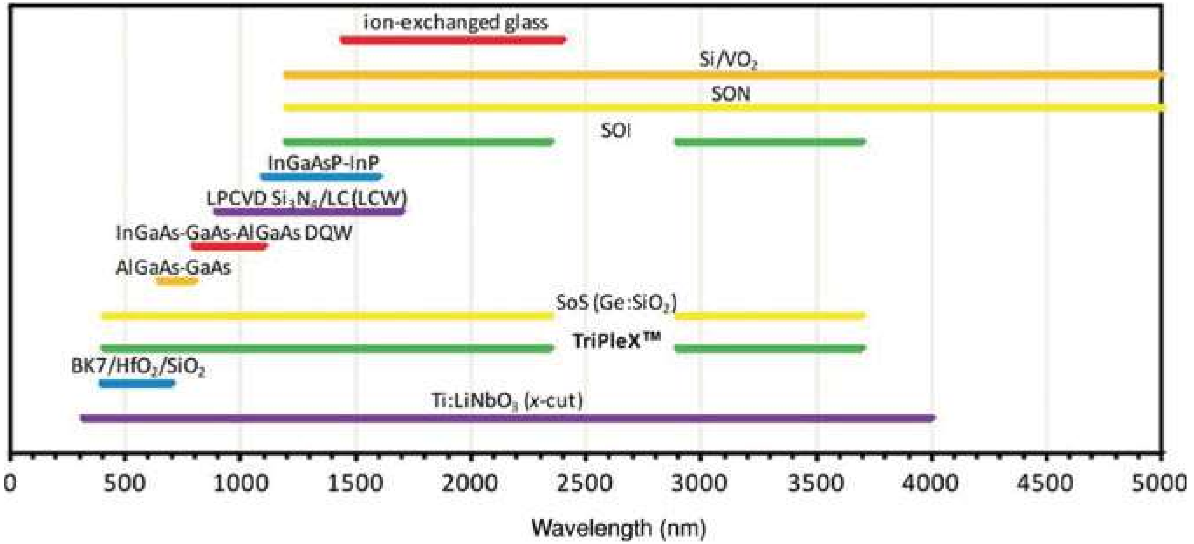
A box with a power cord, USB cable and fiber sockets

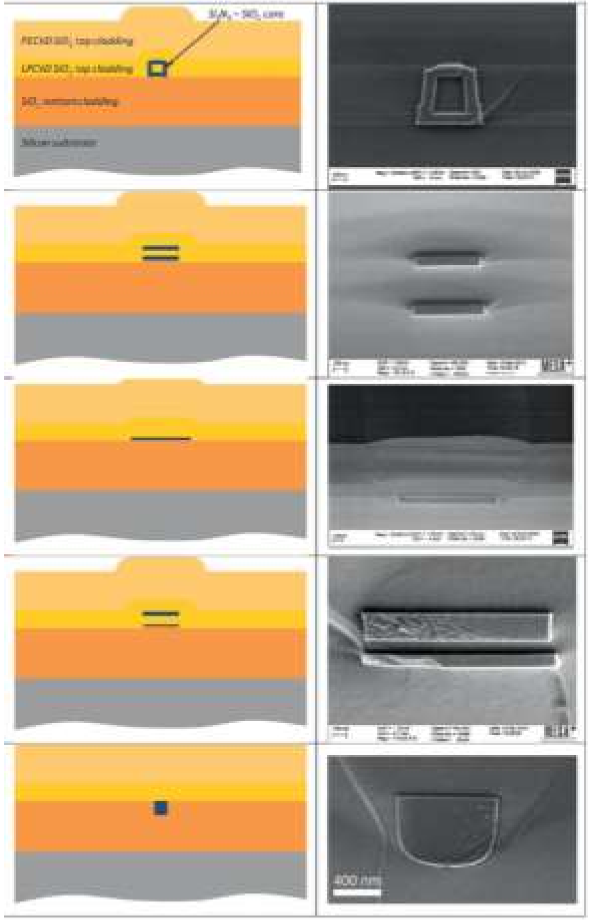
You plug in the box, dial a transformation via USB and the software makes it happen



Why silicon nitride?

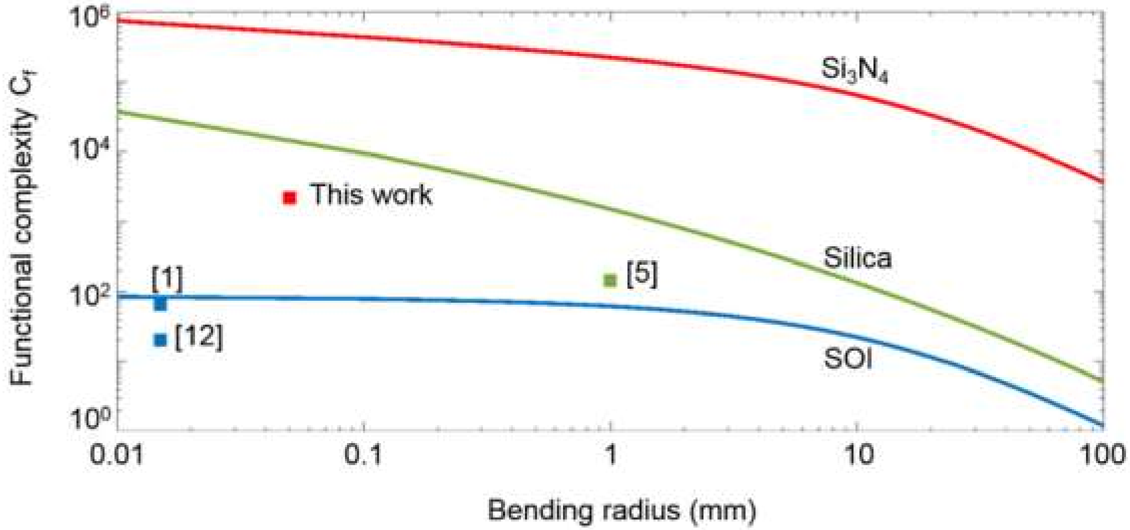
- Low loss (0.1 dB/cm)
- Wide transparency window (425 – 3700 nm)
- Mature technology (Lionix)





Competing photonic technologies

- Key parameter is optical loss
- SiN wins in elements per loss length



Track record

8×8 Programmable Quantum Photonic Processor based on Silicon Nitride Waveguides

Caterina Taballione[1], Tom A. W. Wolterink[2], Jasleen Lugani[2], Andreas Eckstein[2], Bryn A. Bell[2], Robert Grootjans[3], Ilka Visscher[3], Dimitri Geskus[3], Chris G. H. Roeloffzen[3], Jelmer J. Renema[4], Ian A. Walmsley[2], Pepijn W. H. Pinkse[4] and Klaus-Jochen Boller[1]

[1]*Laser Physics and Nonlinear Optics (LPNO), University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands. Tel: +31 53 489 5278, e-mail: c.taballione@utwente.nl*

[2]*Ultrafast Quantum Optics and Optical Metrology, University of Oxford, Clarendon Laboratory, Parks Road, Oxford OX1 3PU, UK*

[3]*Lionix International BV, PO Box 456, 7500 AL Enschede, The Netherlands*

[4]*Complex Photonic Systems (COPS), University of Twente, PO Box 217, 7500 AE Enschede, The Netherlands*

Started 1/4/2019 as first employee

arXiv:1805.10999
Accepted for publication in optics express

Proof of principle experiments

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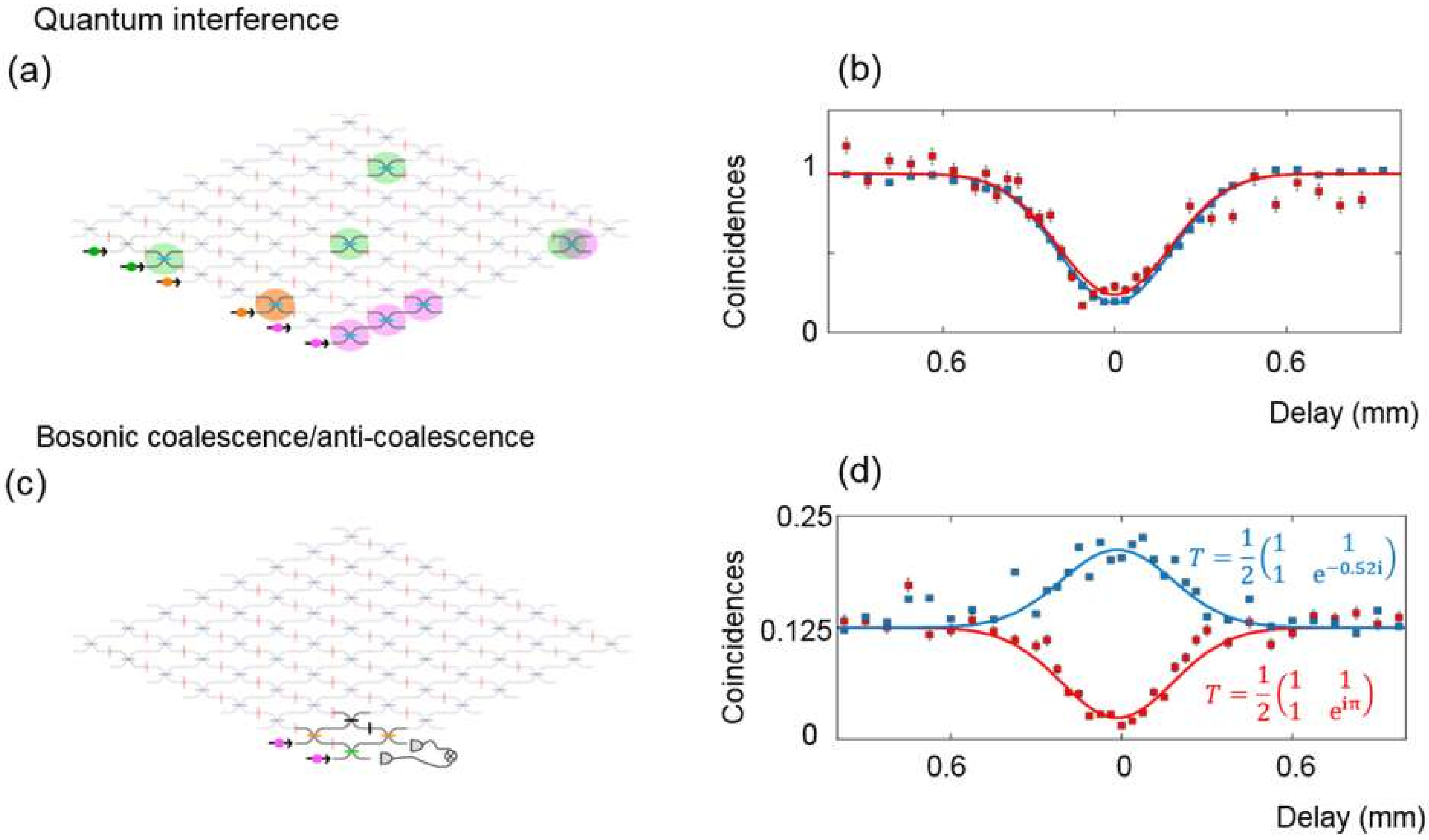
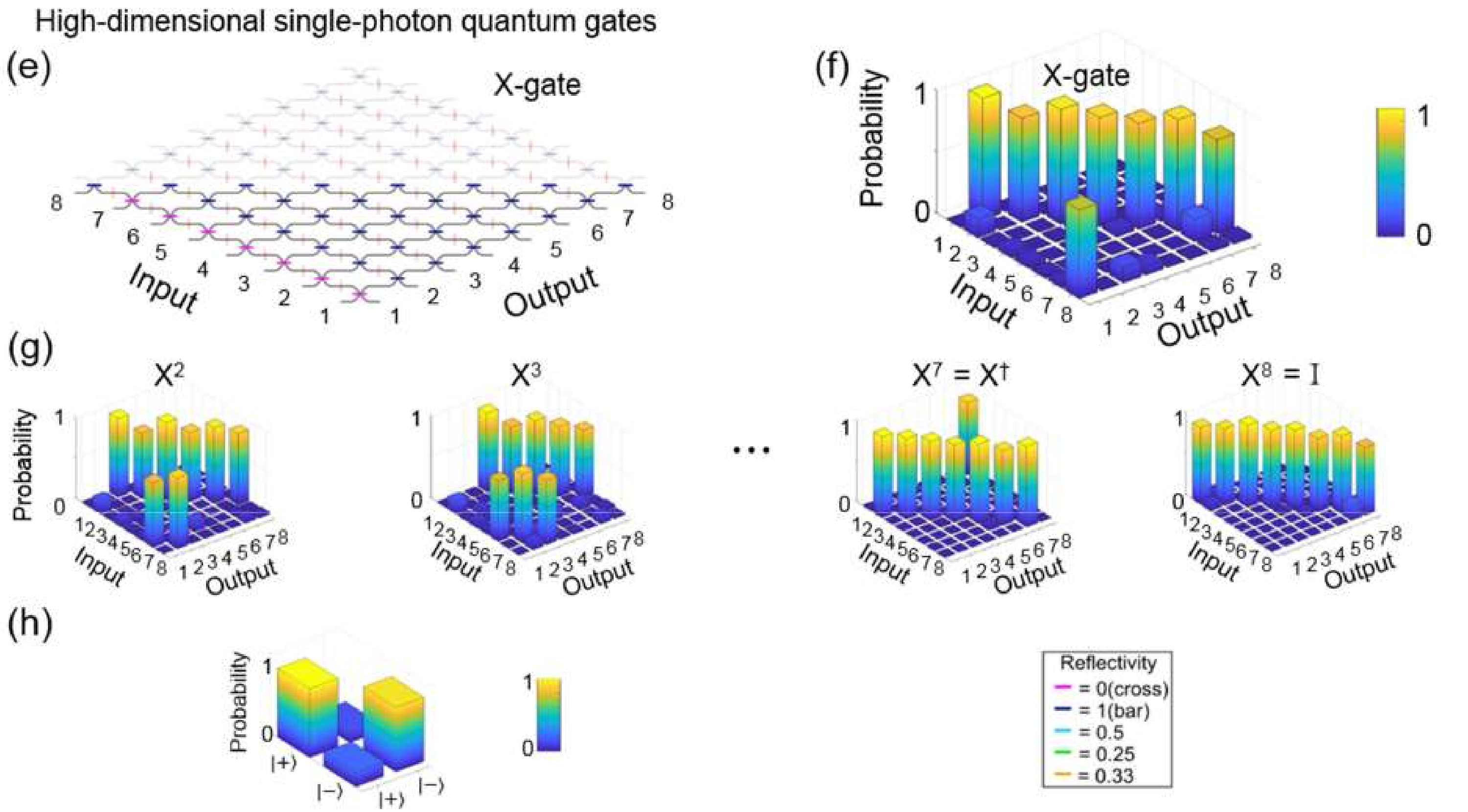


Proof of principle experiments



Metrics / goals

of photons -> quantum computational power

# of modes -> number of photons you can support

Optical loss -> degree of ‘quantumness’ of the computation

Technological development plan

- Push on 3 fronts:
  - Transmission: up from 40% to >80%
  - # of modes: up from 8 to 20 to 50
  - Programmability: from partial to full

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