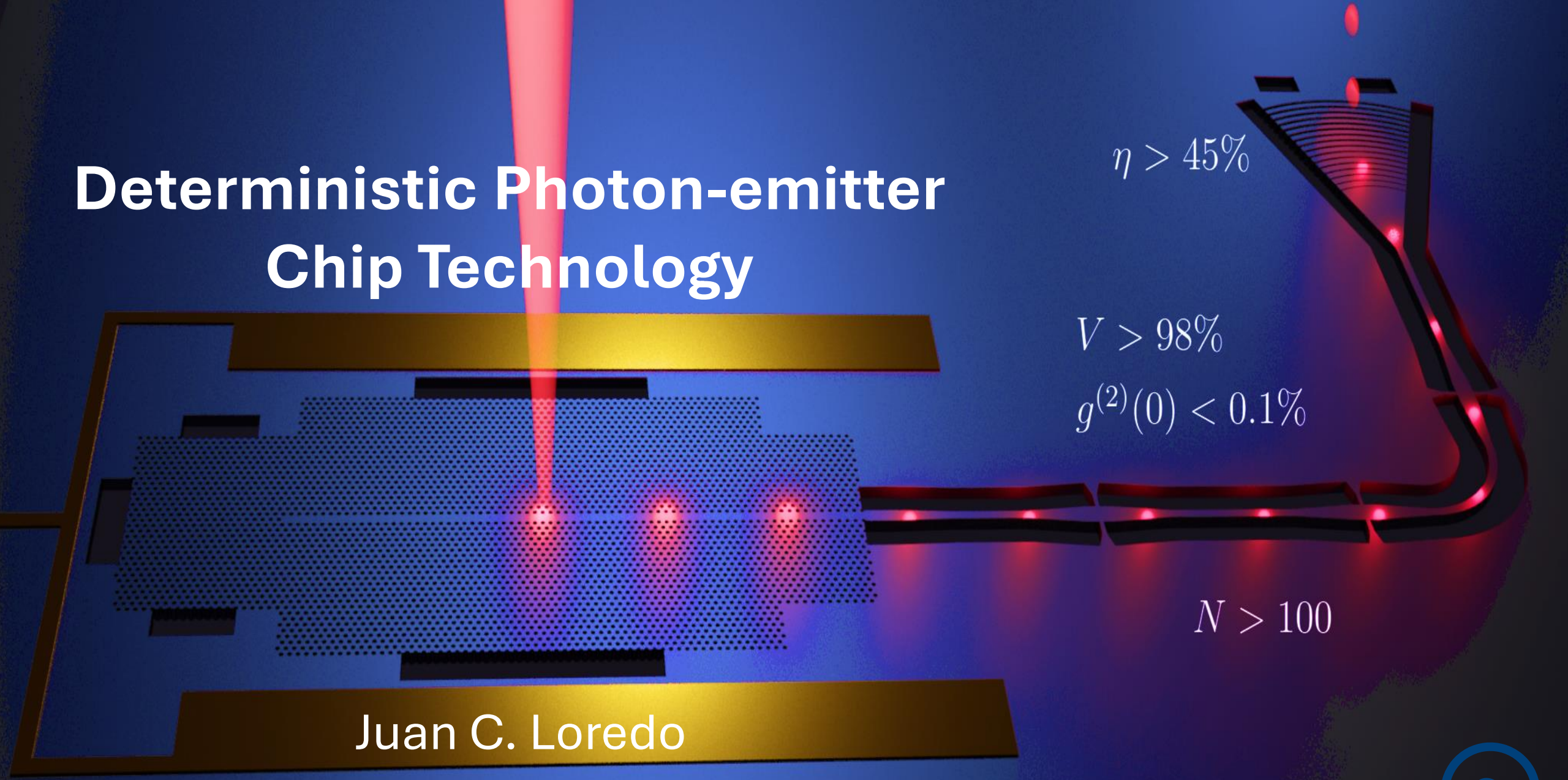
Deterministic Photon-emitter Chip Technology



Juan C. Loredo

EPIC Technology Meeting on Photonics for Quantum Technology

Sparrow Quantum

Technical teams

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CQO

Kurt Stokbro, PhD
CEO

Business team

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Finance

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Marketing & Comms.

Gitte Schüler
Administration

Product & process development

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Sofus Budtz

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Zhe Liu, PhD

Xiaojing Zhao, PhD

Moritz Fischer, PhD

Jeppe Roulund

Interns

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Sissel Bay Nielsen, PhD

Rasmus H Jensen, PhD

Iyad Suleiman, PhD

Benjamin

R&D – Future technologies

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Lucio Stefan, PhD

Ming Lai Chan, PhD
Industry Postdoc

Erik van Heijst , MsC

Jan Heiden, MsC
Industry PhD

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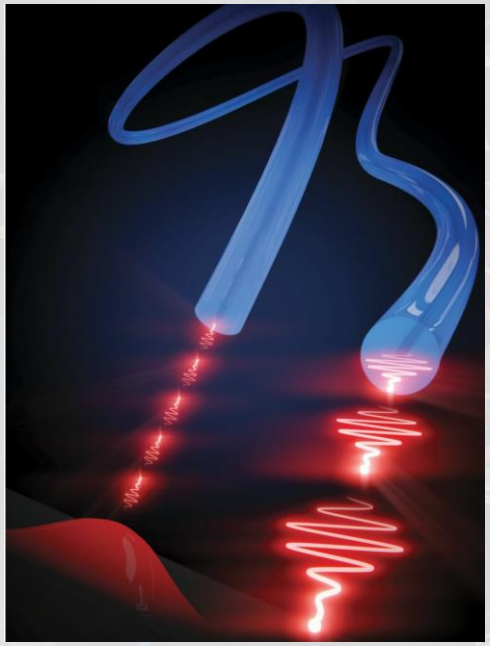
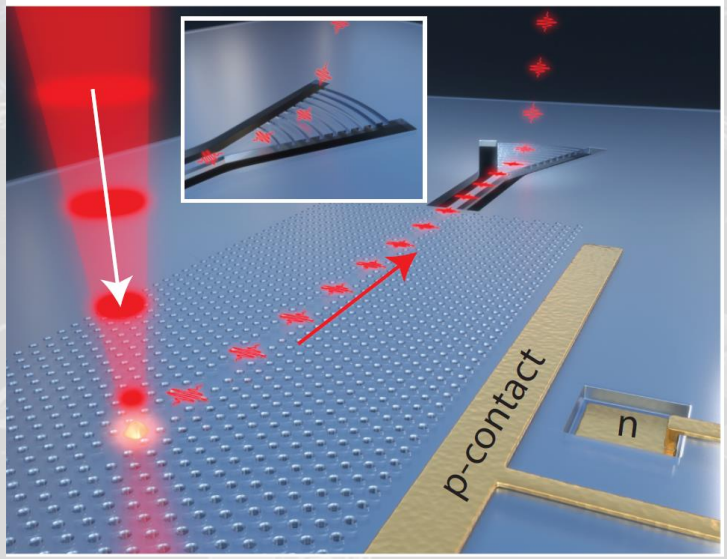
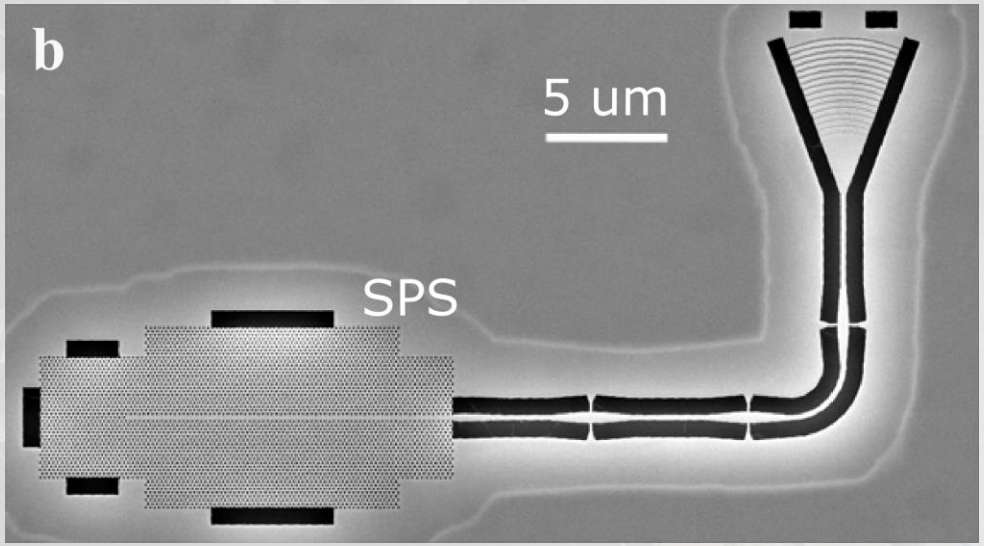
We commercialize sources of non-classical light



Quantum emitter delivers single photons



Semiconductor quantum dots in photonic crystal waveguides



- >99% single-photon purity
- >95% raw indistinguishability (ID)
- Strings of >1000 ID photons
- Clock rate up to 1 GHz

Uppu et al. Science Adv. 6, eabc8268 (2020)

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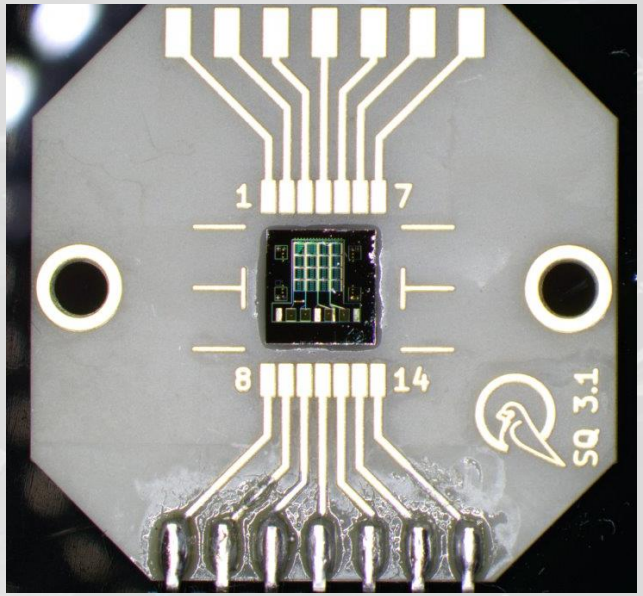
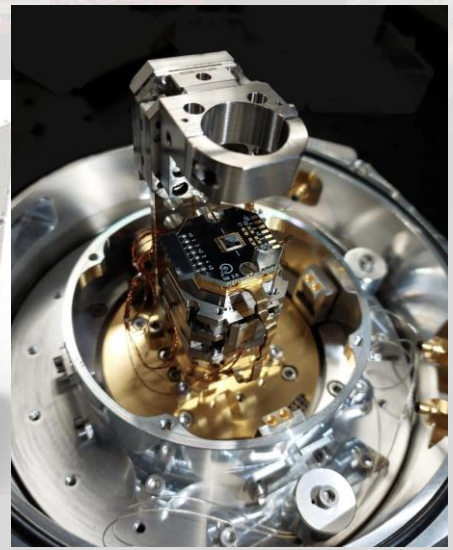
Photonic chip



With electrical contacts for wavelength tuneability and charge noise cancellation

Cryostats

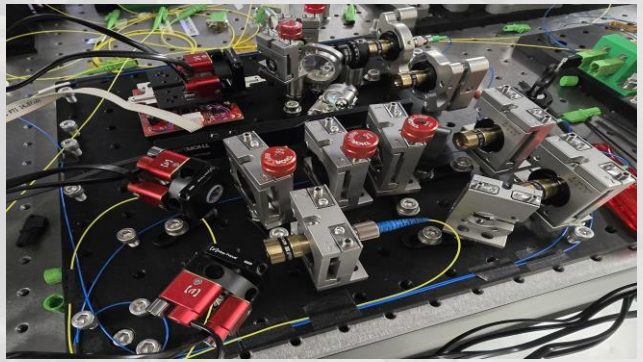
CMC



AttoDry

For research laboratories as well as compact solutions

Optical setups



From prototypes to field-ready optical modules

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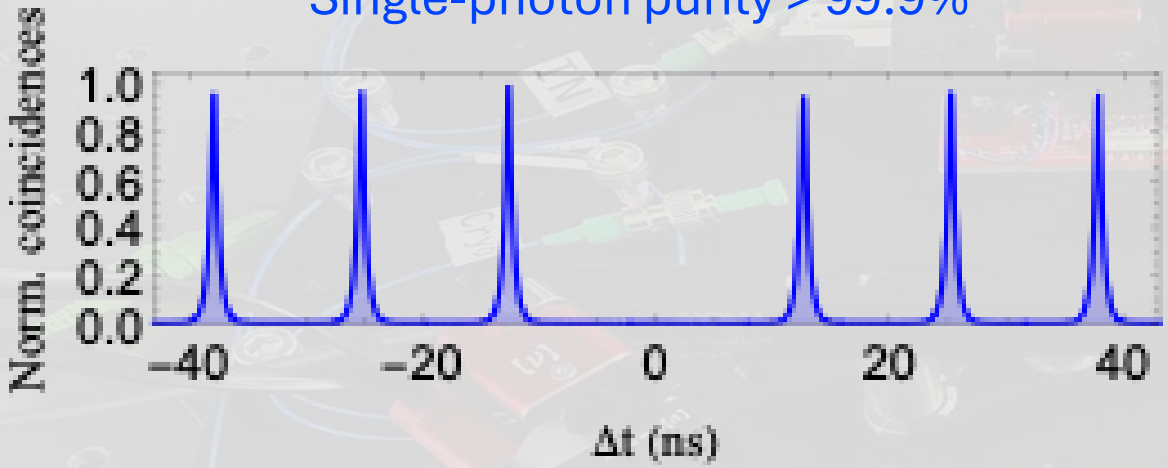
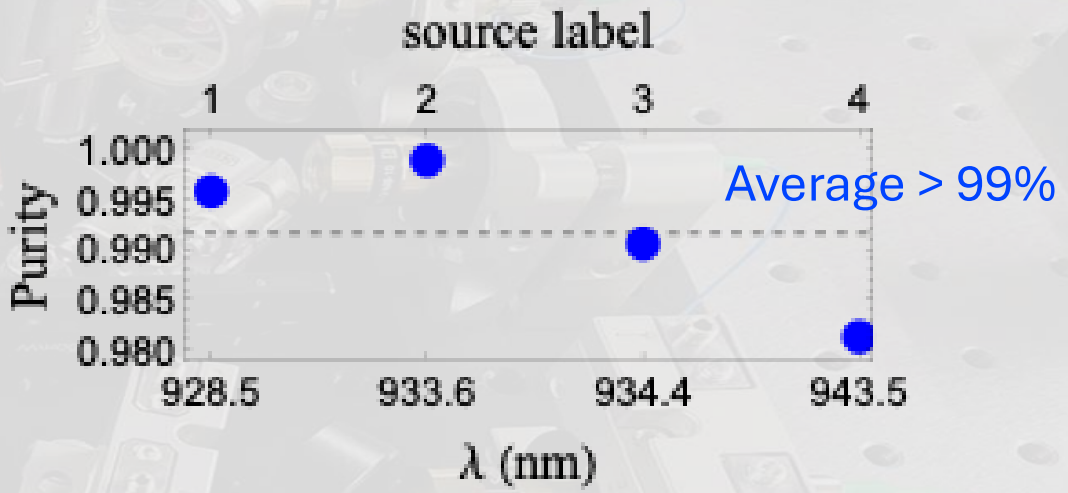
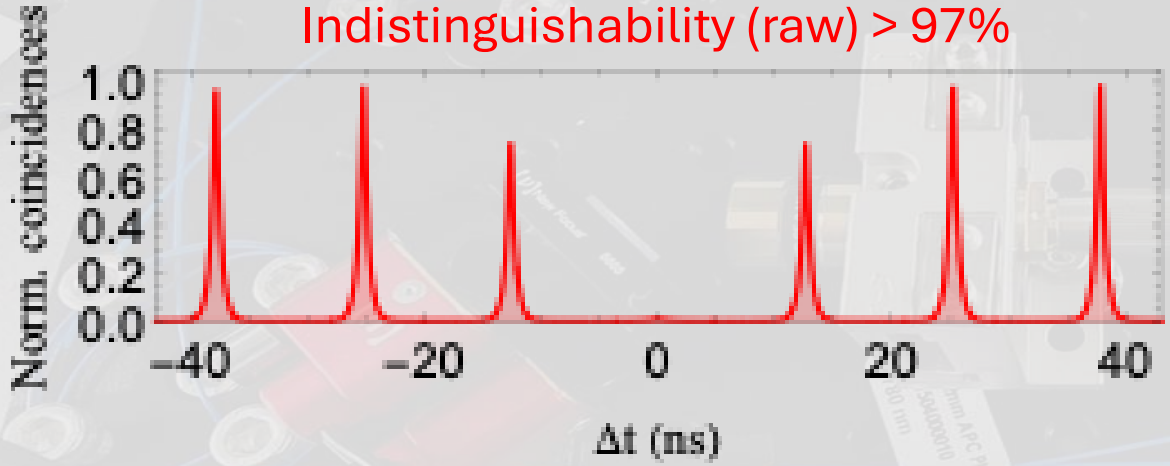
Single-photon purity > 99.9%

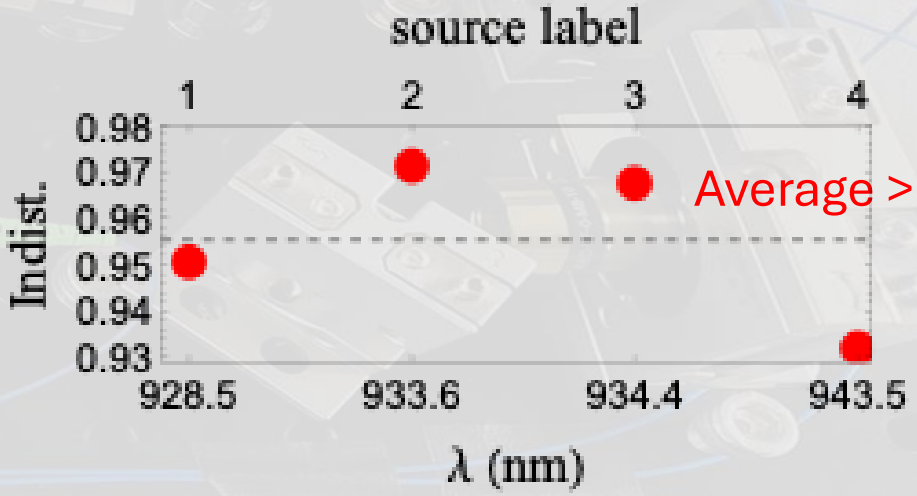




Average > 99%

Indistinguishability (raw) > 97%





Average > 95%

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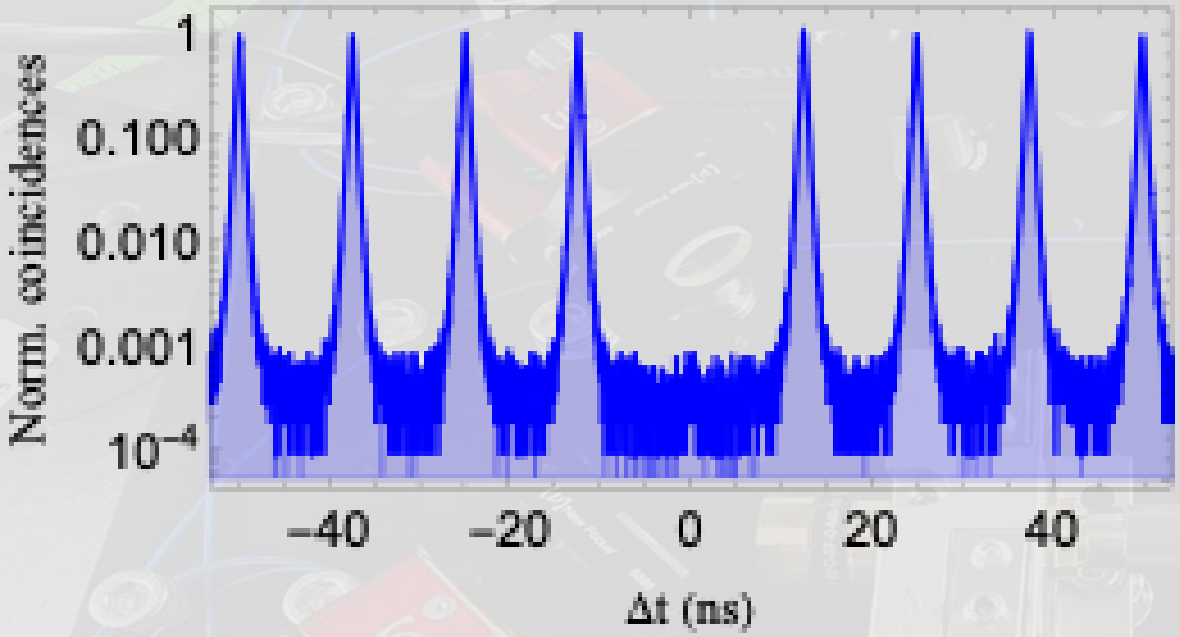
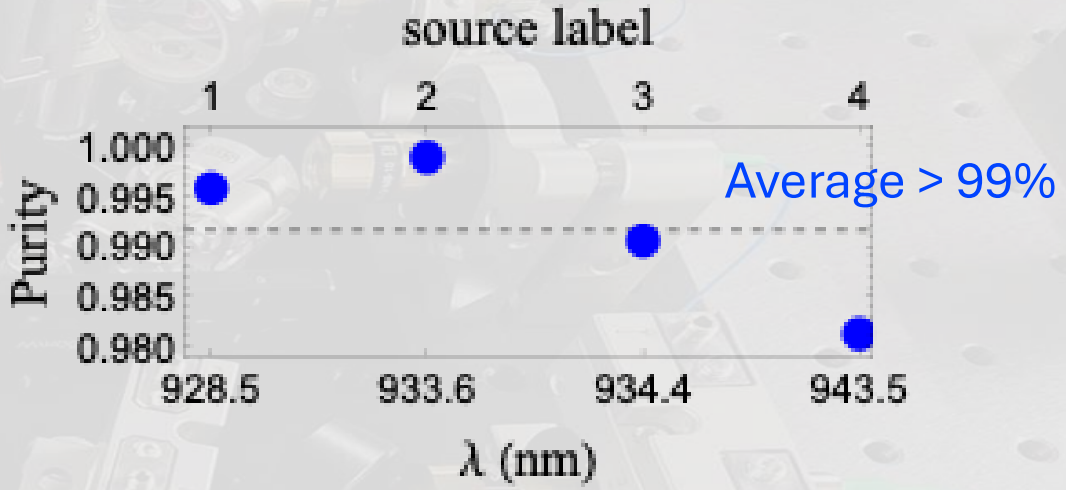
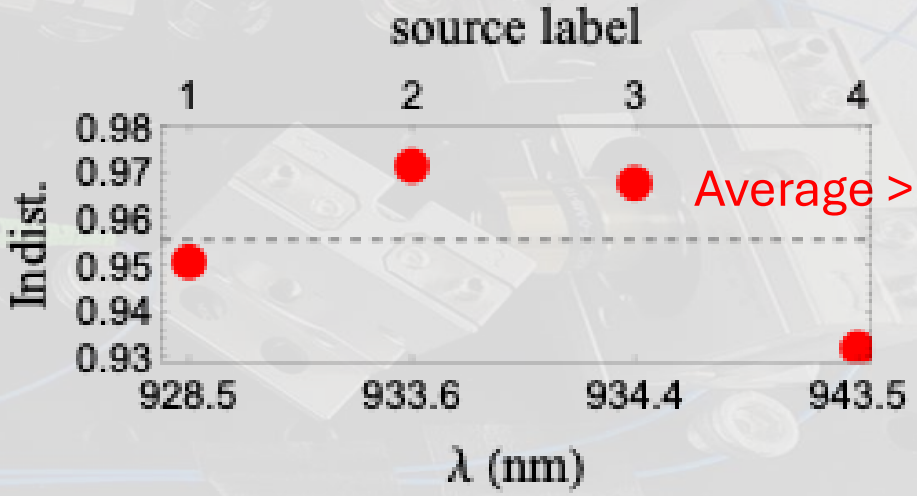
Single-photon purity > 99.99%





Average > 99%



Average > 95%

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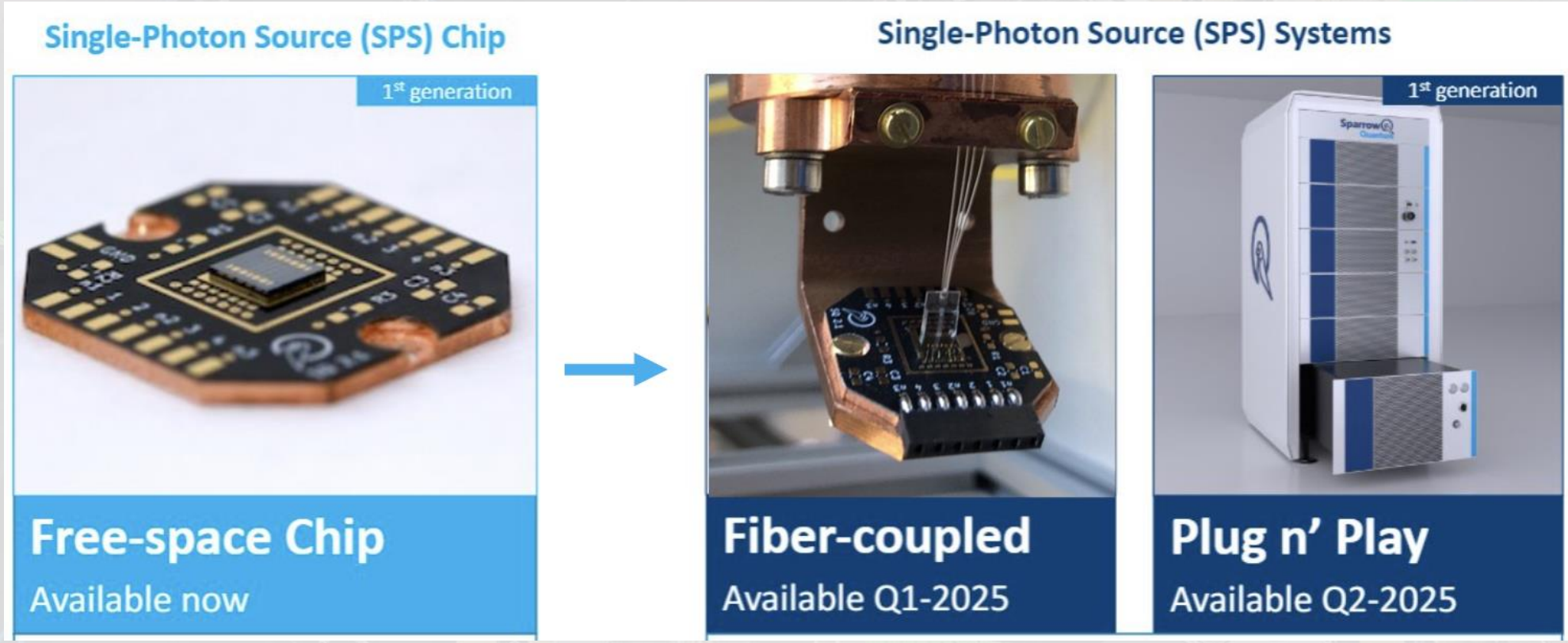

Delivered to Quix Quantum, University of Vienna, Warsaw University

Challenge: Achieve same performance in plug and play device

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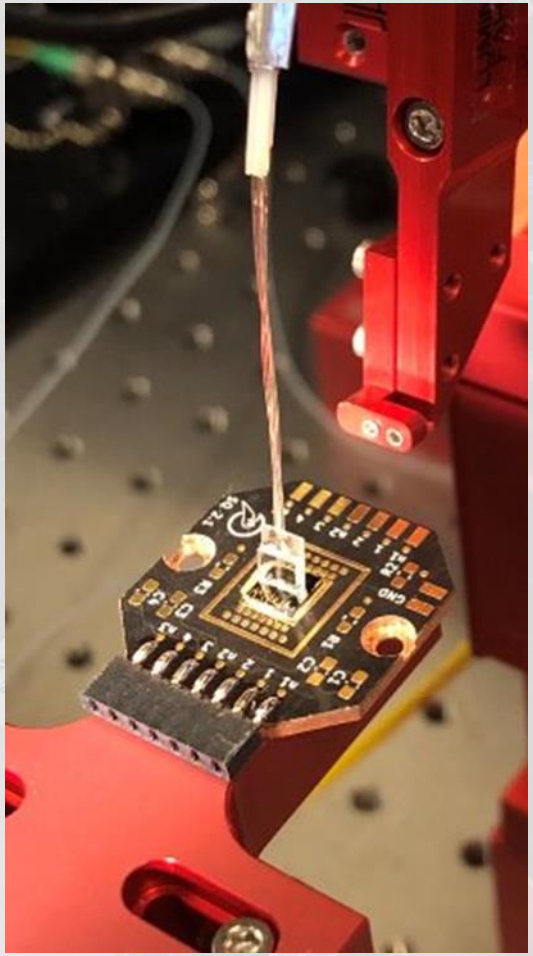
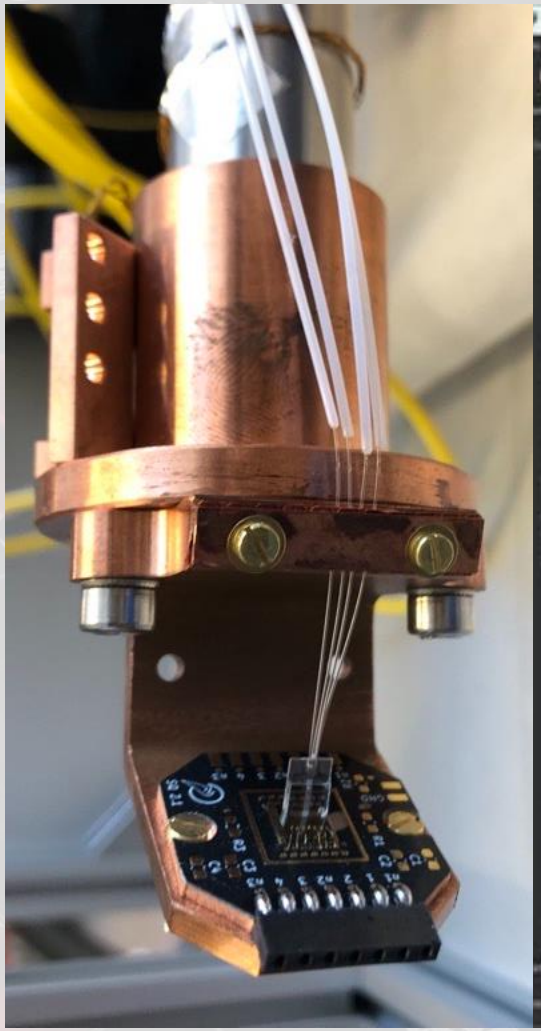
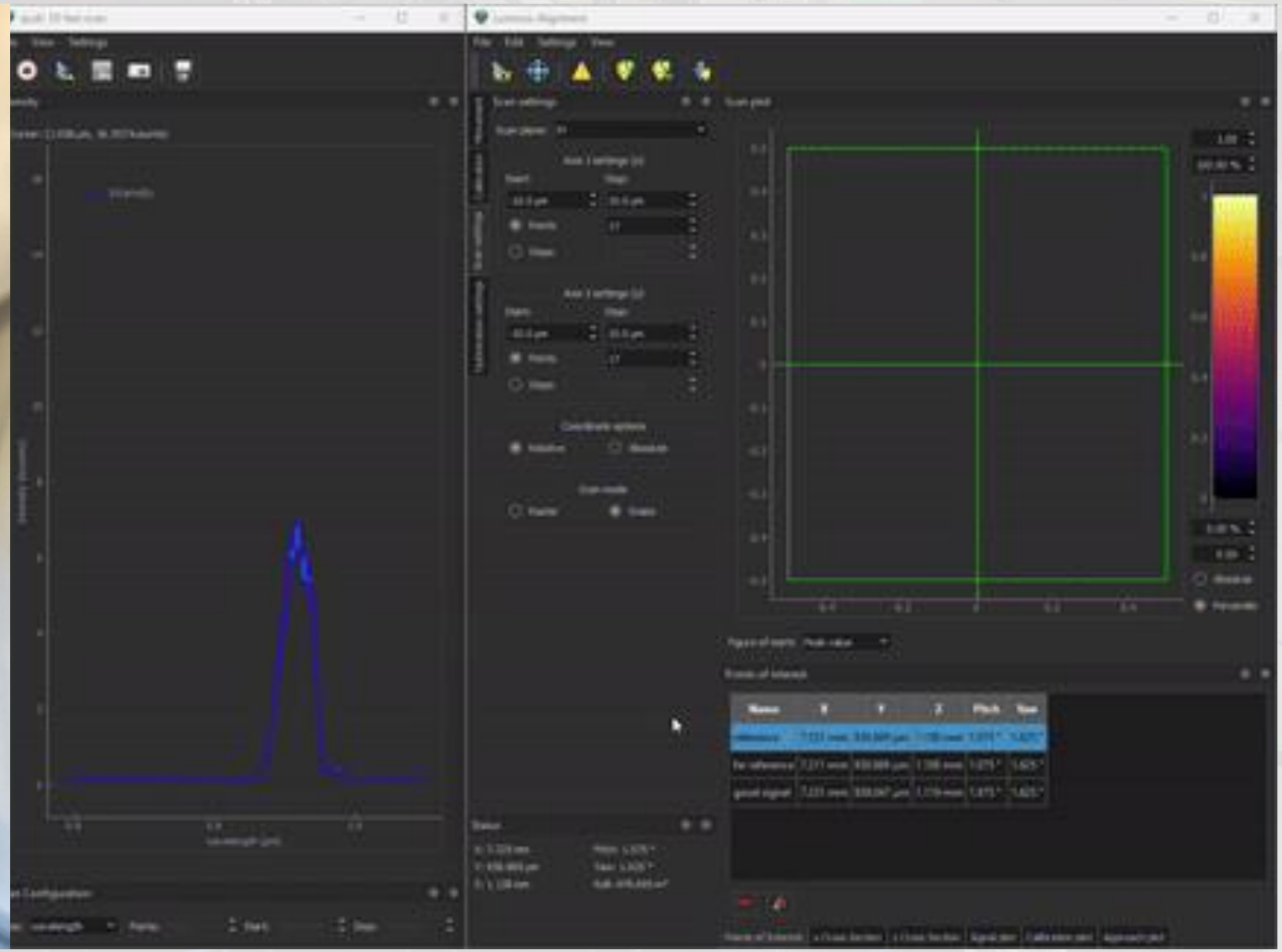


Luminos setup





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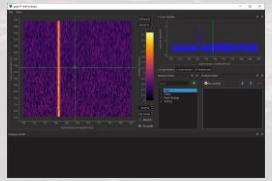
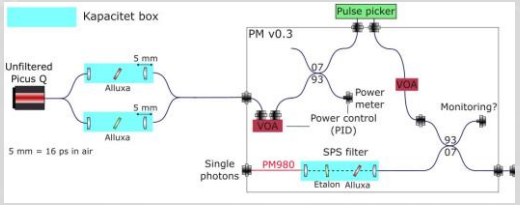
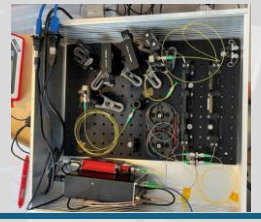
Excitation Laser
PiCUSQ – Refined Laser Systems

Electrical module
Voltage source + computer



Optical module (excitation setup , spectral filter and PID)





Fiber coupled single-photon source

Cryostat ATTOCMC + compressor

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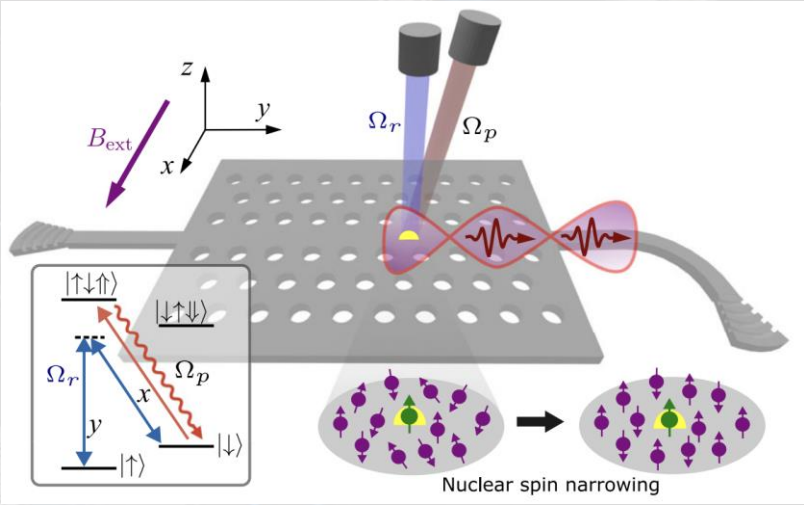
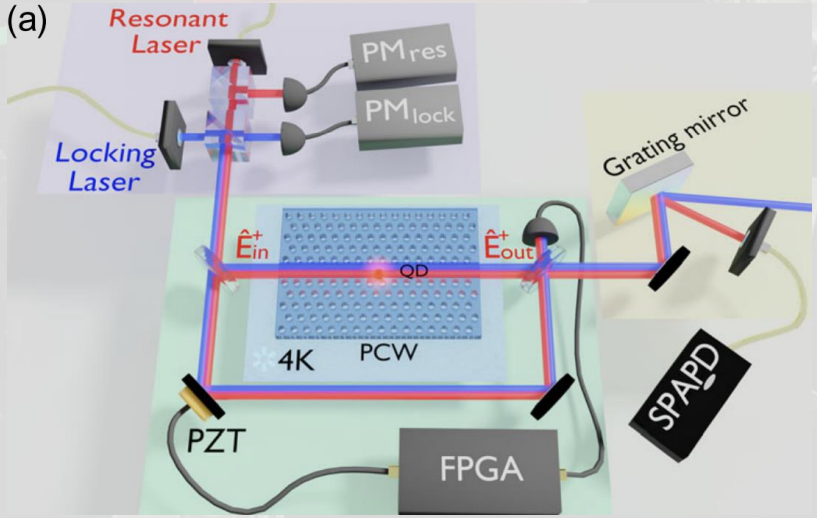
Future devices based on cutting edge research



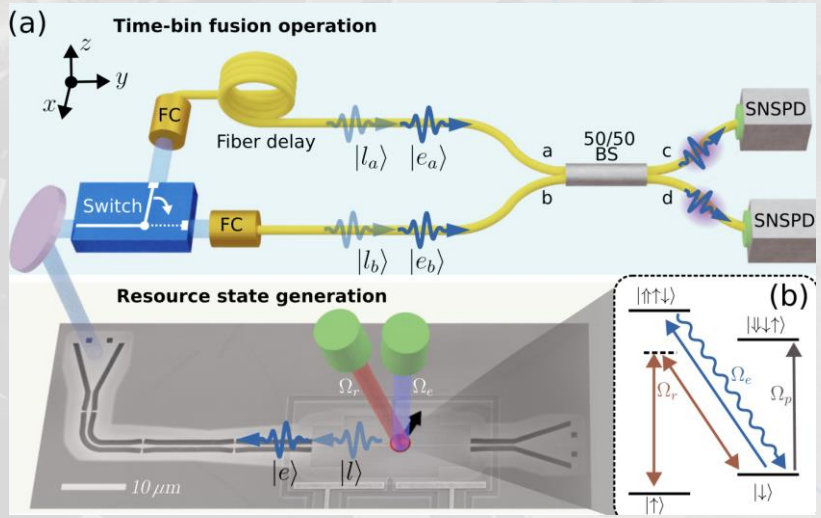
Deterministic generation of GHZ states

Nature Communications 15, 7774 (2024)



Deterministic photon-photon gates

Nature Communications 15, 7583 (2024)



Photon fusion operations

arXiv:2312.09070 (2023)

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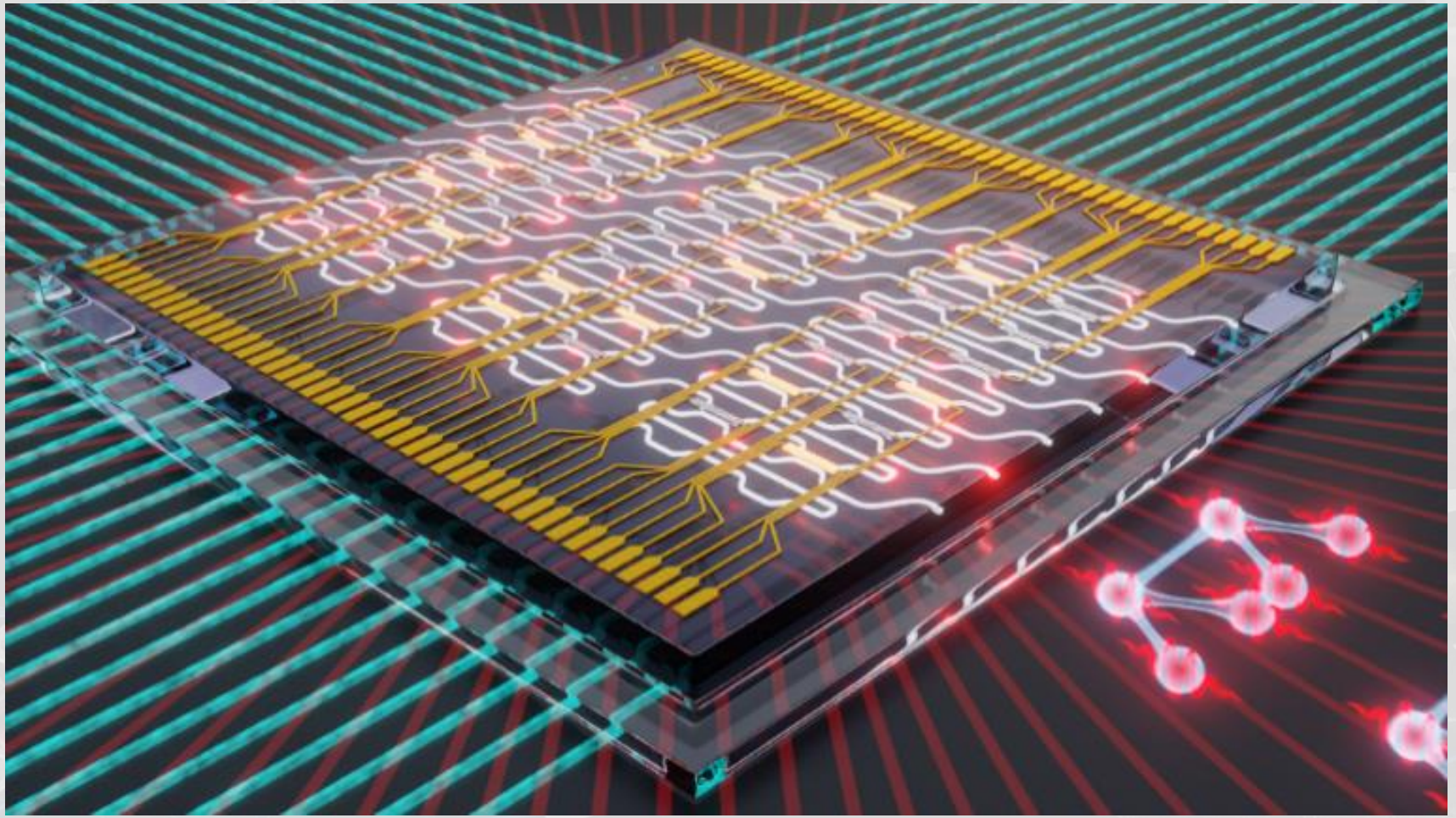
To always deliver advanced sources of non-classical light



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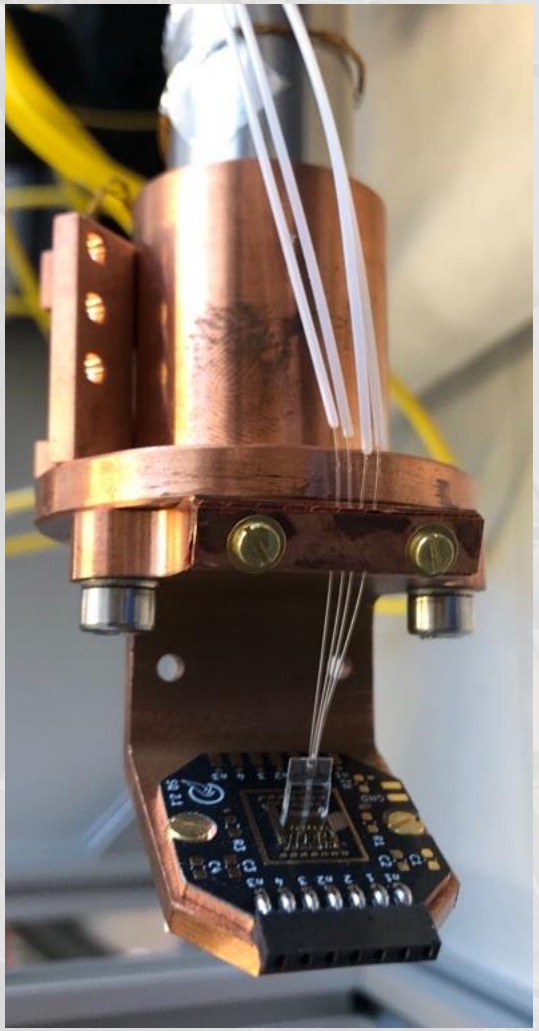
Collaborations to have

What would help our technology:

Having access to fiber arrays with tunable positioning



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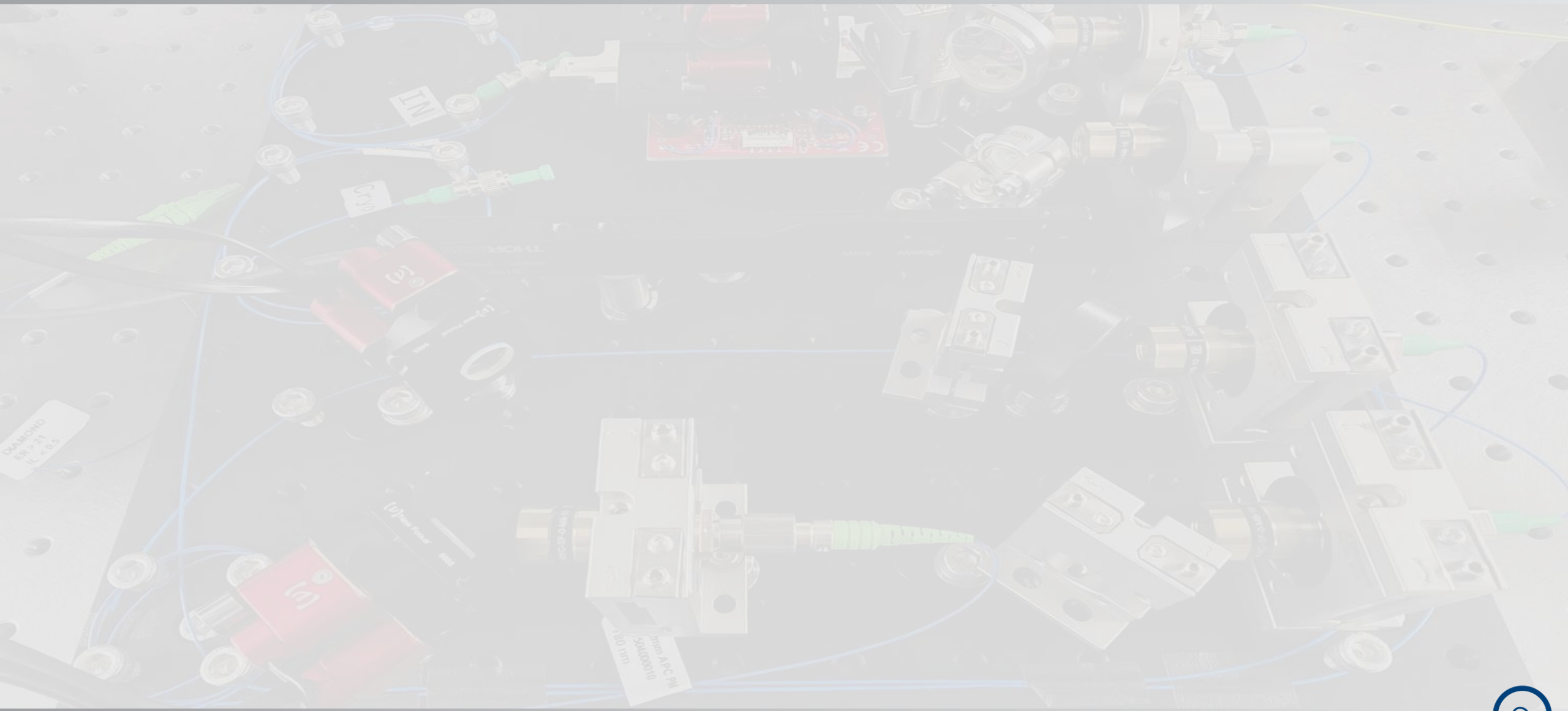

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