Call 2021
Final Evaluation

QUANTERA
DECADE OF IMPACT 2016-2026

uTP4Q

A versatile quantum photonic IC platform through micro-transfer printing

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COLLABORATION (overview)



GEOGRAPHICAL BREADTH
Mostly central European countries: Denmark, Belgium, Germany, Switzerland, Slovenia (widening country)



VARIETY OF SECTORS, DISCIPLINES – nanophotonics, materials science, nonlinear and quantum optics, and superconductivity. Industrial partner SQ provides the market perspective.



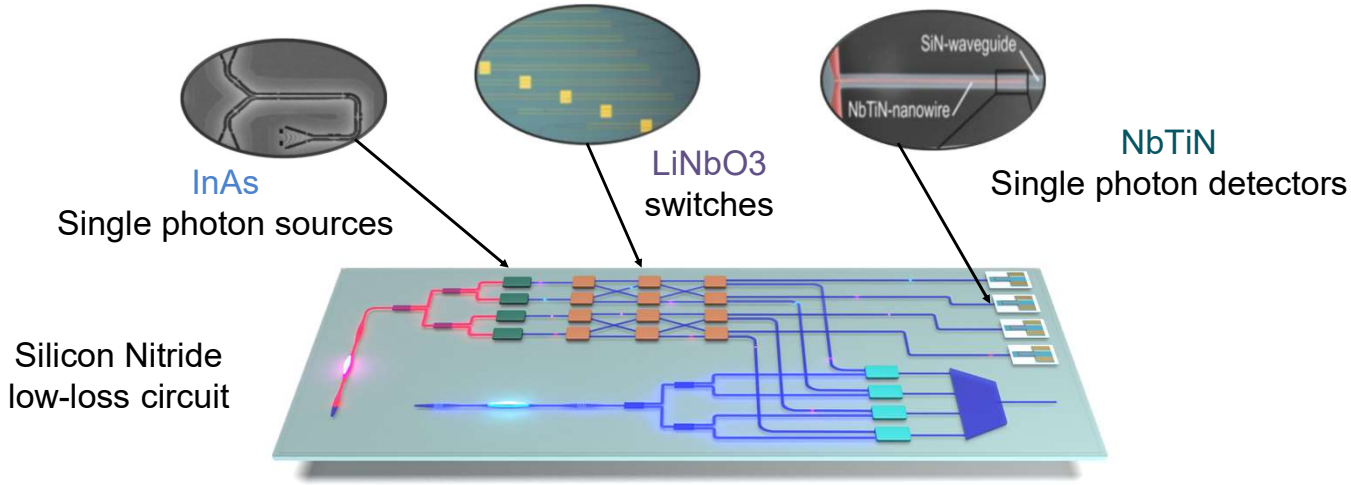
QUALITY OF COOPERATION – General in-person meetings (6M, 8 in total), frequent online WP meetings to discuss developments, multiple short (4) & long exchanges (2), co-organized public workshop, lead to participation in a policy brief



INFRASTRUCTURE SHARING – on-site cleanroom usage with visiting introductions to visiting partners, similar to on-site measurement capabilities leading to 2 partners (UG, UL) that performed measurements on-site of (NBI, SQ)

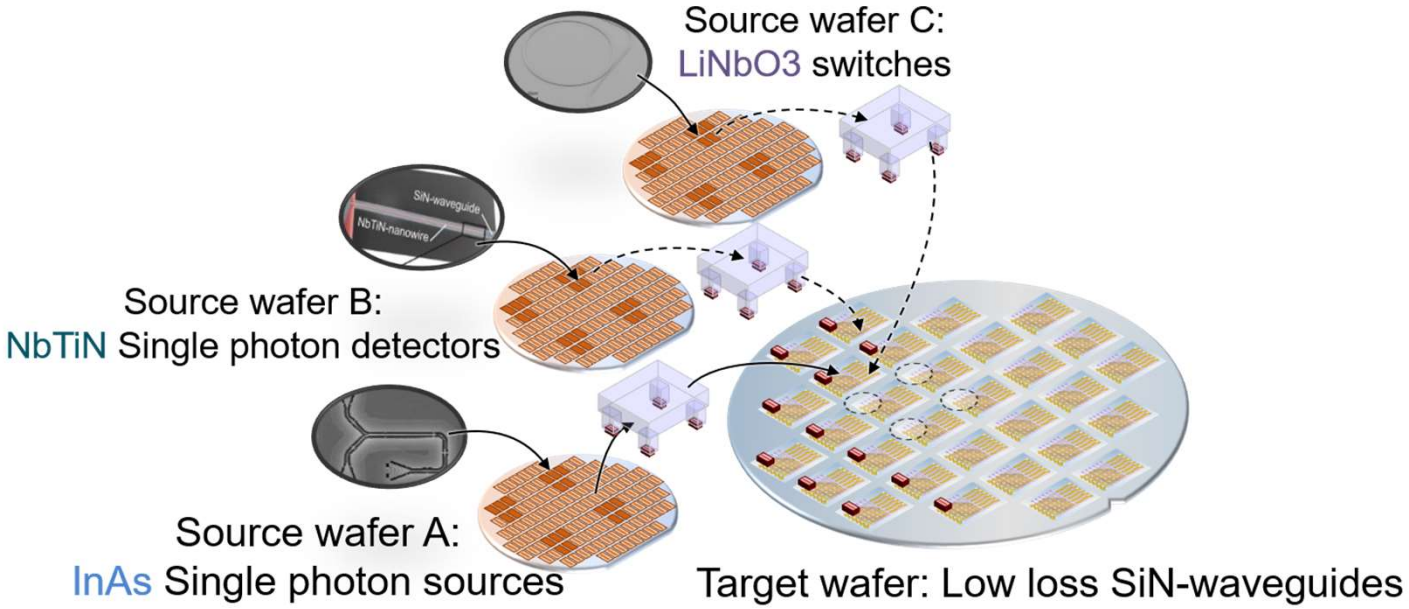
SUCCESS STORY (highlights)

CHALLENGE – the aim of your research



SUCCESS STORY (highlights)

SOLUTION – Utilize **micro-transfer printing** to combine the state of the art on-chip single photon sources, nonlinear materials and single photon detectors on a low-loss SiN chip

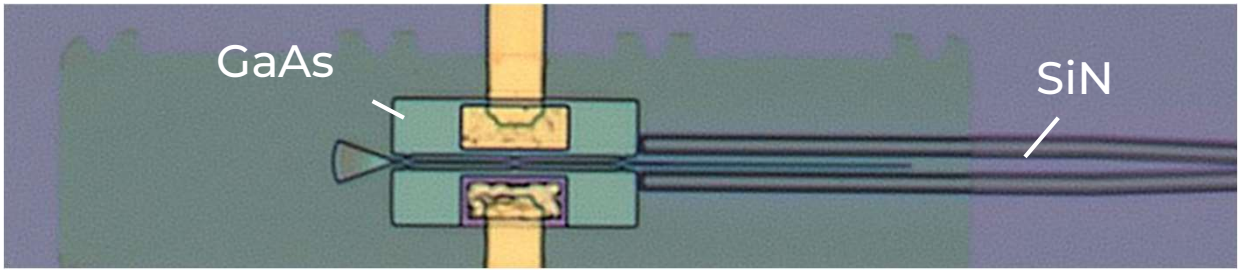


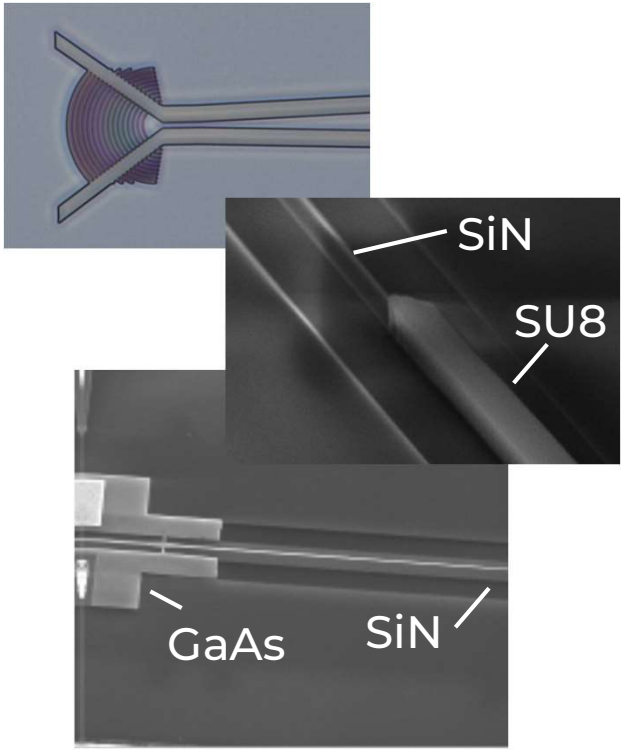
SUCCESS STORY (highlights)

PLANNED AND SURPRISING/UNPLANNED OUTCOMES

1. SiN: developed platform for co-integration with tested photonics toolkit (MMIs, GCs, ..) with efficient fiber coupling

2. GaAs SPS: developed SiN/GaAs integration with 95% yield, confirmed SPS properties, wavelength tuning, charge noise suppression, > 90 % SiN/GaAs coupling





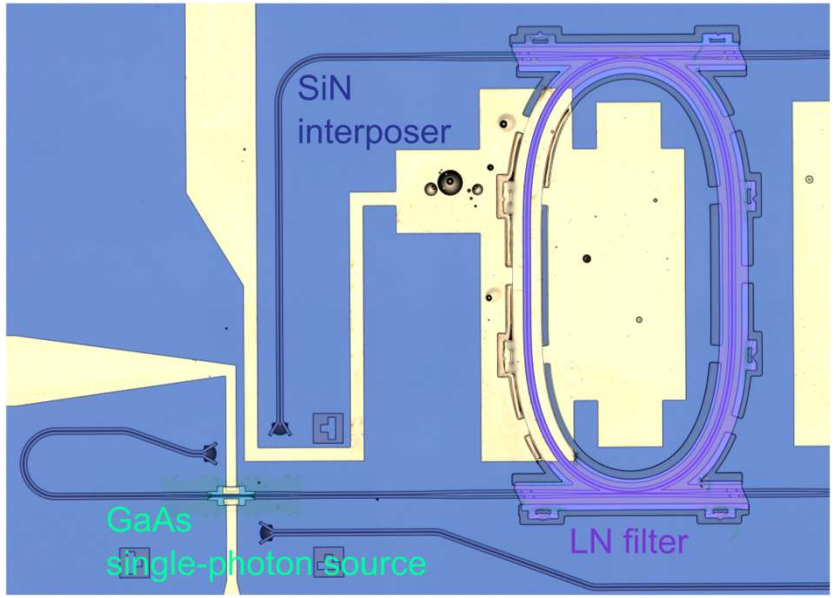
SUCCESS STORY (highlights)

PLANNED AND SURPRISING/UNPLANNED OUTCOMES

3. LN switches: developed SiN/LN integration for predefined LN MZIs resulting in low VpiLpi of 1.65 Vcm

4. NbTiN SNSPDs: SNSPD-ready SiN coupon integration with > 90 % coupling

5. Co-integration of SNSPDs + SPSs and LN filters + GaAs SPSs demonstrated and under test



SCIENTIFIC OUTPUTS

PUBLICATIONS AND PRESENTATIONS (highlights)

- Conferences & workshops: 15
- Journal papers: 3 published, 1 in review, 2 in preparation

NUMBER OF BACHELOR, MASTER AND PhD THESES

Student internships: 1
Master theses: 3
PhD theses: 1 finished, 3 to be submitted soon

IMPACT (potential users)

RELEVANT **INDUSTRY BRANCH**:
2nd gen quantum technology, photonics

KEY COMMERCIALLY RELEVANT **APPLICATIONS**:
Quantum encryption, computing and sensing

EXISTING/POTENTIAL **END USERS**:
Sparrow Quantum, European pilot line, imec, CCRAFT, Pixel Photonics

COOPERATION WITH THE **QUANTUM FLAGSHIP** OR OTHER QUANTUM INITIATIVES: QuantERA strategic conference, QuantERA Horizon Results Booster call – policy brief, Workshop on Quantum Applications in Integrated Photonics

IMPACT (RRI aspects)

GENDER: 5/28 researchers are women; should be improved in future projects

OPEN SCIENCE: All publications have been published as open access, talks on results in multiple conferences

SCIENCE EDUCATION: 50 % young scientists, Master and PhD topics. Master fairs, 5 workshop talks. 1 workshop co-organized,

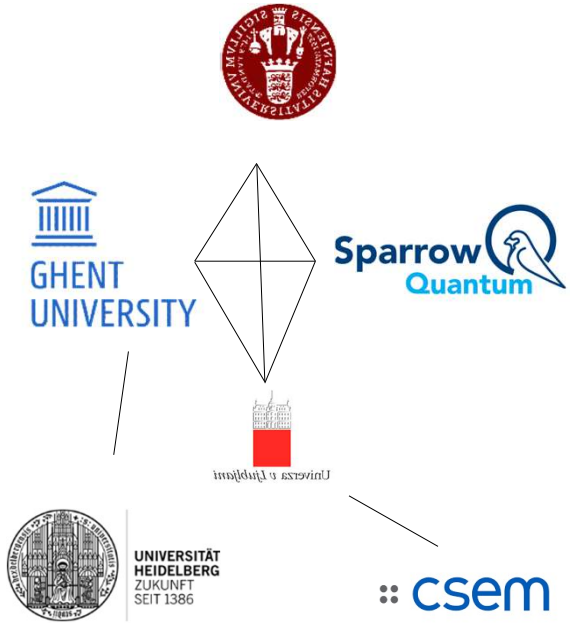
PUBLIC ENGAGEMENT: participation in a policy brief

ETHICS: N/A

WHAT'S NEXT

- 1 proposal granted: Photonics for Quantum Pilot Line (UG, SQ)
- 6 other grants pending (UG, SQ)
- Collaboration with all partners still ongoing, specifically:
  - UG – UH for SNSPD integration
  - UG – SQ – NBI – UL for SPS integration
  - CSEM – UL for LNOI platform development

Generally continued efforts for co-integration of an increasing amount of high performing QPIC components





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