Photonics 4 Quantum

Arlesheim, April 7, 2025

Christian Bosshard, Managing Director Swissphotonics

QuantumBasel

SWISS PHOTONICS

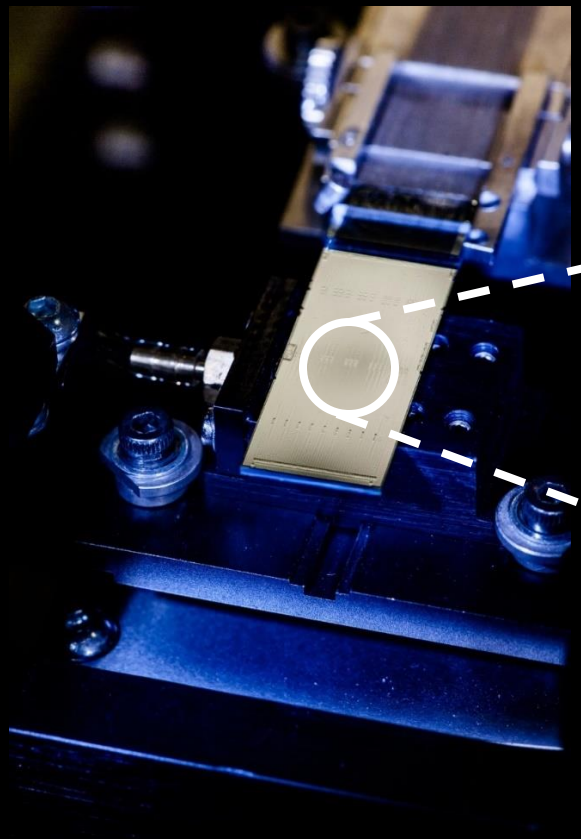
WelQome

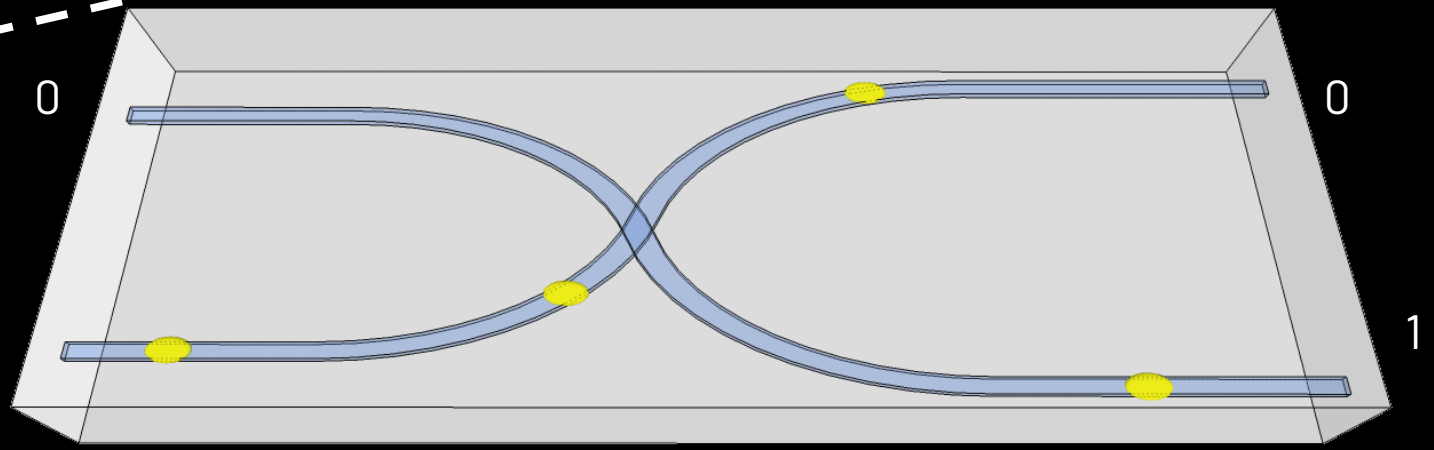
April 7th, 2025

Dr. Frederik F. Flöther, Chief Quantum Officer, QuantumBasel
frederik.floether@quantumbasel.com

QuantumBasel

WHO DOES NOT LOVE QUANTUM PHOTONICS?





QuantumBasel

SOME OF QUANTUMBASEL'S PROJECTS AND COLLABORATIONS

VINCI ENERGIES
HVAC Quantum Optimization

Hermes
Quantum-Enhanced Delivery Efficiency

MOONLIGHT AI
QML in Computational Pathology

MERIAN ISELIN Klinik für Orthopädie und Chirurgie
LLMs for Emergency Wards

Swiss Retail Bank
Quantum Applications in Financial Services

Pfizer
Optimization Applications in Pharma

Zürcher Hochschule für Angewandte Wissenschaften zhaw
Quantum Machine Learning (QML)

CGC
LLMs for Genomic Reports

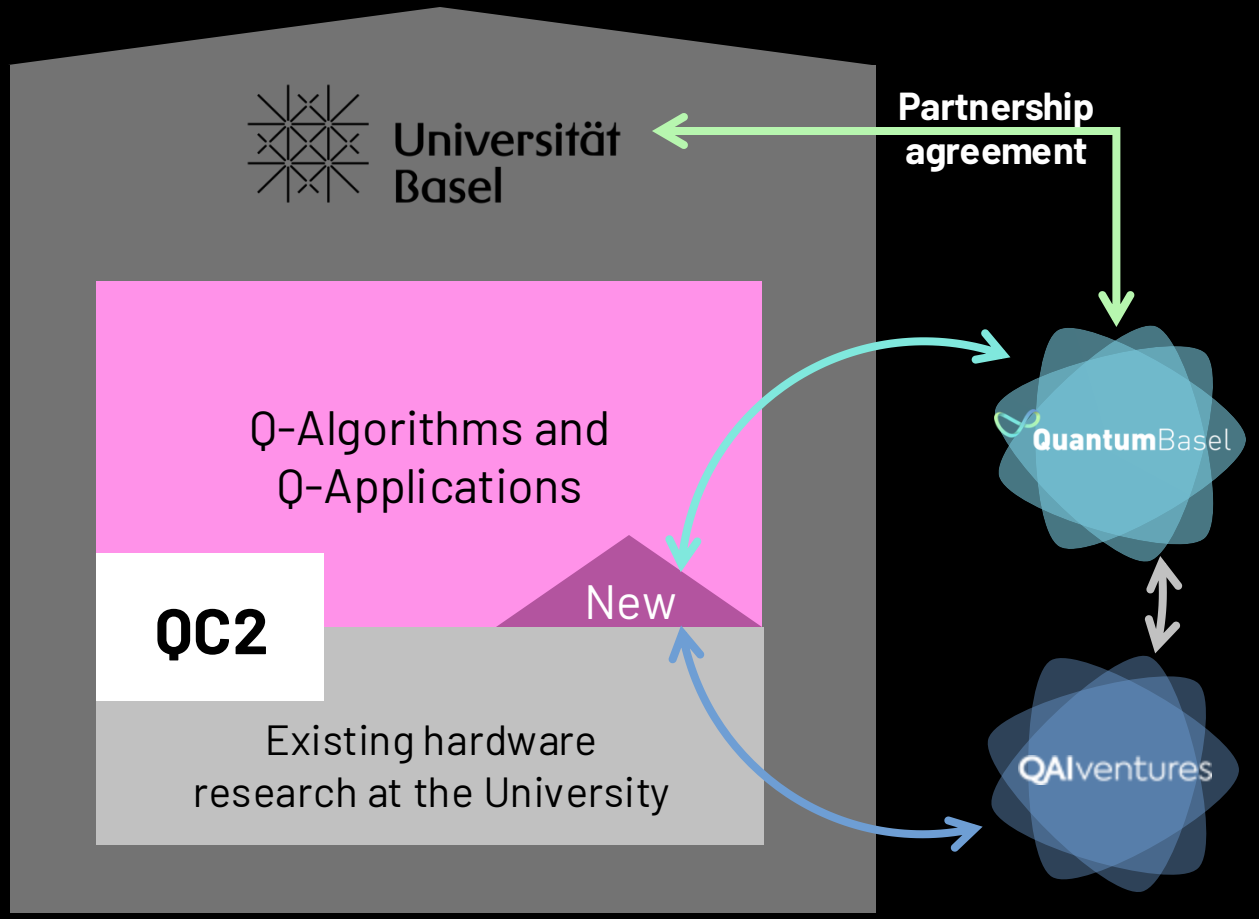
Leitha A Company of the Unipol Group
Insurance Portfolio Optimization

n|w Fachhochschule Nordwestschweiz
Quantum-Enhanced NMR for Molecular Modelling

ARTIDIS
QML in Tissue Analysis

XITRUST THE E-SIGNATURE COMPANY
LLMs on Quantum Computers

QC2: SCALING A SWISS QUANTUM COMPUTING INSTITUTE



RECENT QUANTUMBASEL PAPERS

How quantum computing can enhance biomarker discovery for multi-factorial diseases

Frederik F. Flöther[1,2*], Daniel Blankenberg[3], Maria Demidik[4,5], Karl Jansen[4,5], Rajiv Krishnakumar[1,2], Nouamane Laanait[6], Laxmi Parida[7], Carl Saab[3], Filippo Utro[7]

Release Note – VBFNLO 3.0

Julien Baglio[1], Francisco Campanario[2], Heiko Dietrich-Siebert[4], Terrance Figy[3], Matthias Kerner[4], Michael Kub, Duc Ninh Le[6], Maximilian Löschner[7], Simon Plätzer[8,9], Michael Rauch[4], Ivan Rosario[2], Robin Roth[4], Dieter Zeppenfeld[4]

[1] QuantumBasel Schorenweg 44B, CH-4144 Arlesheim, Switzerland
[2] Theory Division, IFIC, University of Valencia-CSIC, Parque Científico, C/Catedrático José Beltrán, 2, E-46980 Pat Spain
[3] Department of Mathematics, Statistics and Physics, Wichita State University, 1845 Fairmount Street, Wichita, KS 6

Data augmentation experiments with style-based quantum generative adversarial networks on trapped-ion and superconducting-qubit technologies

Julien Baglio
QuantumBasel, Schorenweg 44B,
E-mail: julien.baglio@quantum

Threats Posed by Quantum Computers to State-of-the-Art Encryption Schemes

Rajiv Krishnakumar

9 Quantencomputing in der Medizin – neue Möglichkeiten für komplexe Herausforderungen im digitalen Krankenhaus von morgen?

Frederik F. Flöther und Christian Elsner

Karlsruhe Institute of Technology (KIT), 76128 Karlsruhe, Germany
physik und Kosmologie, RWTH Aachen University, D52056 Aachen, Germany
tudy, Phenikaa University, Hanoi 12116, Vietnam
DESY, Notkestr. 85, 22607 Hamburg, Germany
University of Graz, Universitätsplatz 5, A-8010 Graz, Austria
s, University of Vienna, Boltzmanngasse 5, 1090 Wien, Austria.

Research Directions: Quantum Technologies

The state of quantum computing applications in health and medicine

Frederik F. Flöther

IBM Quantum, IBM Research, Rüschlikon, Switzerland and QuantumBasel, uptownBasel Infinity Corp., Arlesheim, Switzerland

Quantum Computing in Precision Medicine

Frederik F. Flöther

A Quantum State of Mind

Towards quantum-enabled cell-centric therapeutics

Saugata Basu[1], Jannis Born[2], Aritra Bose[3], Sara Capponi[4,5], Dimitra Chalkia[6], Timothy A Chan[7,8], Hakan Doga[9], Frederik F. Flöther[10], Gad Getz[11,12,13,14], Mark Goldsmith[15], Tanvi

Research Directions: Quantum Technologies

www.cambridge.org/qut

Question

How can quantum technologies be applied in healthcare, medicine and the life sciences?

Frederik F. Flöther[1,2] and Paul F. Griffin[3]

[1]IBM Quantum, IBM Research, Säumerstrasse 4, CH-8803 Rüschlikon, Switzerland; [2]QuantumBasel, uptownBasel Infinity Corp., Schorenweg 44, CH-4144 Arlesheim, Switzerland and [3]Department of Physics, University of Strathclyde, Glasgow G4 0NG, United Kingdom

Cite this article: Flöther FF and Griffin PF (2023). How can quantum technologies be applied in healthcare, medicine and the life sciences? *Research Directions: Quantum Technologies*. **1**, e7, 1–2. https://doi.org/10.1017/qut.2023.1

Received: 30 January 2023
Accepted: 2 February 2023

Author for correspondence:
Frederik F. Flöther,
Email: frederik.floether@uptownbasel.ch

Context

Quantum technologies, including computing, communication/security and sensing, have significantly advanced over the last years. Industry-specific applications are now being intensely researched and healthcare, medicine and the life sciences represent one of the focus areas.

For medical quantum computing, the initial focus was on biochemical and computational biology problems (Emani et al., 2021; Fedorov and Gelfand, 2021; Outeiral et al., 2021; Marchetti et al., 2022; Cordier et al., 2022; Santagati et al., 2023); recently, clinical quantum computing experiments have increasingly drawn interest (Prousalis and Konofaos, 2019; Abbott, 2021; Moradi et al., 2022). In the last few years alone, over 40 studies on medical proof-of-concept quantum computing applications have been conducted, spanning genomics, clinical research

Why Business Adoption of Quantum and AI Technology Must Be Ethical

Christian Hugo Hoffmann

House of Lab Science AG, Garstligweg 8, 8634 Hombrechtikon, Switzerland

Technopark Zurich, Technoparkstrasse 1, 8005 Zurich, Switzerland

Centre for Ethics of the University of Zurich, Zollikerstrasse 117, 8008 Zurich, Switzerland

Frederik F. Flöther

QuantumBasel, Schorenweg 44b, 4144 Arlesheim, Switzerland

Artificial intelligence (AI) recently had its "iPhone moment" and adoption has drastically

Eur. Phys. J. C (2023) 83:826
https://doi.org/10.1140/epjc/s10052-023-11957-2

THE EUROPEAN PHYSICAL JOURNAL C

Regular Article - Theoretical Physics

Full NLO QCD predictions for Higgs-pair production in the 2-Higgs-doublet model

J. Baglio[1,2,a], F. Campanario[3,b], S. Glaus[4,5], M. Mühlleitner[4,c], J. Ronca[6,d], M. Spira[7,e]

Regulatory measures on goods and services in the quantum computing industry

Amin Alavi and Yelena Guryanova[1,2]

[1]QuantumBasel, Schorenweg 44b, 4144 Arlesheim, Switzerland
[2]Center for Quantum Computing and Quantum Coherence (QC2), University of Basel, Petersplatz 1, Basel, 4001, Switzerland

Sources:

https://arxiv.org/abs/2411.10511
https://www.mwv-berlin.de/produkte/!/title/das-digitale-krankenhaus/id/843
https://doi.org/10.1017/qut.2023.1
https://doi.org/10.1017/qut.2023.4
https://arxiv.org/abs/2403.02733
https://arxiv.org/abs/2307.05734
https://doi.org/10.1017/qut.2024.5
https://link.springer.com/article/10.1140/epjc/s10052-023-11957-2
https://arxiv.org/abs/2405.04401
https://arxiv.org/pdf/2405.06990

THE uptown Basel QUANTUM & AI ECOSYSTEM*

QuantumBasel

4+ Quantum hardware partners

15+ Quantum & AI collaborators / projects

50+ Professionals within Q & AI

10+ Q & AI publications

10+ Academia initiatives / programs / partners

500+ NVIDIA H100 GPUs / IBM AIU chips (Phoenix Technologies)

QuantumBasel

1 Security operations center (Axians)

15+ Q & AI startup investments

1 AI hologram

1 Private Investor T. + M. Staehelin

Thousands of visitors per year

1 Extraordinary roof terrace ;)

D-Wave · IONQ · Phoenix Technologies · IBM · FANKHAUSER · Moth · MOONLIGHT AI · QAIventures

**The figures represent estimates at the end of 2024.*

SWISS PHOTONICS: Mission

Mission:
Improve competitiveness of our members by strengthening the innovation forces to secure and grow industrial workplaces

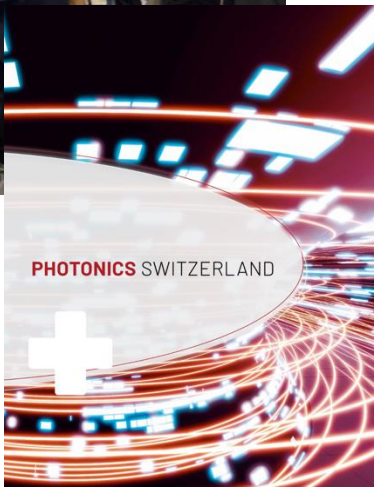
>200 members

Interactive workshops and lunch chats

- **Physical events**
- **Partner events**
- **Lunch chats, Tuesdays at noon**
  - Open to everybody
  - Around 40 chats per year

Further activities

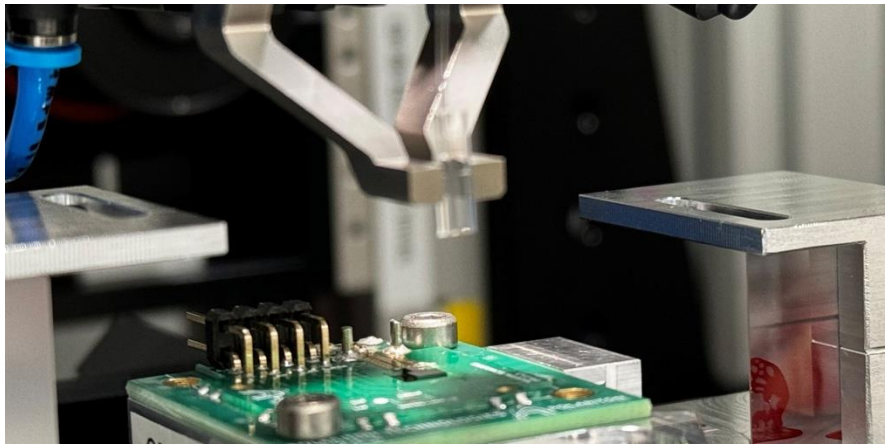
- Networking Aperos : Photonics West, San Francisco and Laser World of Photonics, Munich
- EU projects for international collaborations
- Photonics Switzerland Brochure 2022 & 2025
- Swissphotonics prize : For excellent EPFL master thesis in Optics or Photonics
- Support of quantum initiative:
  - 18 % of the Swissphotonics industry members are active in Quantum
  - Dedicated information on webpage

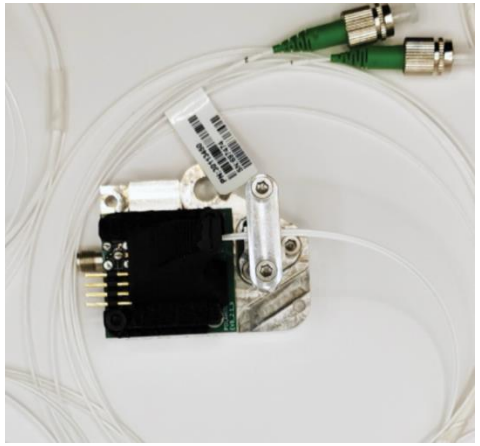


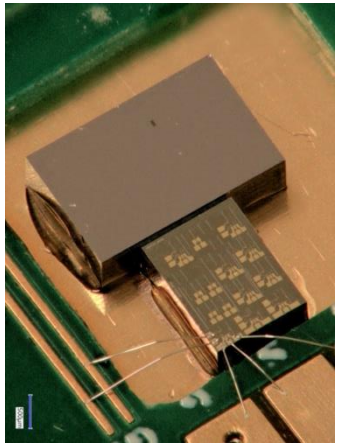
Swiss PIC – Photonic Integration Center

Sub-micron precision assembly of micro-optical systems as a service

- **Packaging as a service**
  - Optical fiber & array attach
  - Sub-µm precision alignment
  - Wire & die bonding
- **One-off to pilot series**
- **Interface design consulting**
- **Process development and knowledge transfer**



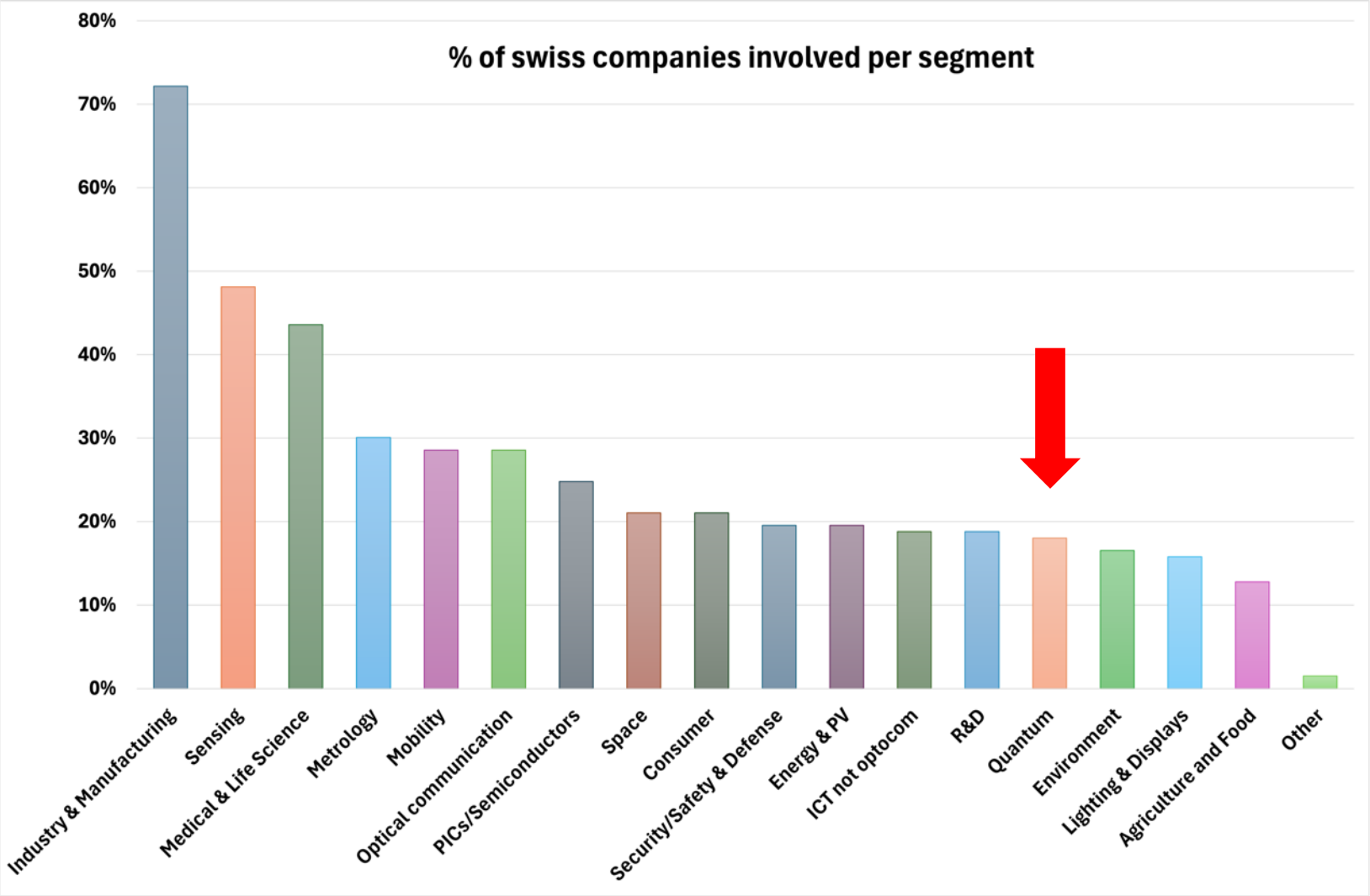




Advanced Manufacturing
Technology Transfer Centers

pic

Markets addressed by Swissphotonics members



SWISS PHOTONICS

We thank our sponsors and partners

COMSOL

HAMAMATSU
PHOTON IS OUR BUSINESS

DIAMOND
the fiber meeting

LUXTELLIGENCE

⟨S|Q|I⟩
Swiss Quantum Initiative

ZuriQ

SWISSMEM

LIGENTEC

pic
Swiss Photonics
Integration Center

QuantumBasel

IDQ

Photonics 4 Quantum, Arlesheim, April 7, 2025

Program

Time	Program	Speaker/Moderator
09:30	Registration, Coffee	
10:00	Welcome & Introduction	Dr. Christian Bosshard, Swissphotonics and Dr. Frederik Flöther, Quantum Basel
10:15	Converging on the ideal laser for quantum	Dr. Basil Garabet, NKT
10:30	Quantum photonics with a solid-state emitter in a microcavity	Dr. Yannik Fontana, University of Basel
10:45	Chip-Scale Technology Development for Trapped-Ion Quantum Computer Systems	Dr. Kai Hudek, IonQ
11:00	Q&A	Dr. Christian Bosshard, Swissphotonics
11:15	Panel: Bubble or revolution: how do established companies react to the hype?	Dr. Cornelius Hempel; Dr. Ann-Kathrin Michel, Swissmem; Dr. Ian Bland, Huber+Suhner; Dr. Frederik Flöther, Quantum Basel
12:00	Lunch / Labtour: During the labtour organised by IonQ you will have the possibility to have a look at the first commercial quantum computer in Switzerland	Dr. Kai Hudek, IonQ
13:00	Deploying Future-Proof Secure National Networks	Dr. Gregoire Ribordy, ID Quantique
13:15	Integrated photonics requirements for a large scale trapped-ion quantum computer	Dr. Cornelius Hempel, PSI
13:30	Lumerical qINTERCONNECT for simulating quantum photonic systems	Steven Jones, Cadfem
13:45	Q&A	Dr. Christoph Harder, Swissphotonics
14:00	Panel: Swiss Quantum Industry Landscape: from academia to start-ups?	Dr. Rebekka Garreis; Dr. Tobias Denzler, QAI Ventures; Dr. Mathieu Munsch, Qnami; Dr. Pavel Hrmo, ZuriQ
14:45	Coffee Break	
15:15	Integrated photonics for quantum	Dr. Anton Stroganov, Ligentec
15:30	Photonics as key enabler for last generation atomic clocks	Dr. Steve Lecomte, CSEM
15:45	3D glass microdevices for Quantum Applications	Dr. Cesare Alfieri, Femtoprint
16:00	Towards fault tolerant Photonic QC	Dr. Nicolas Maring, Quandela
16:15	Q&A	Prof. Dr. Kirsten Moselund
16:45	Closing remarks	Dr. Christian Bosshard, Swissphotonics
17:00	Networking Apero	
19:00	Close	