Launch of the European Quantum Pilot "P4Q" to Scale Photonic Chips for Real-World Applications

The ?50M pilot line aims to accelerate reliable, large-scale production of Quantum Photonic Chips

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A major new European initiative is set to accelerate the transition of quantum technologies from laboratory research to industrial deployment with the launch of Photonics for Quantum (P4Q) in 2026. Funded with a total investment of ?50 million, divided between the European Union and national governments across 12 countries, the project brings together 29 leading partners to improve the reliability and scalability of photonic chips for quantum applications. Coordinated by Pepijn Pinkse of the University of Twente, the initiative aims to ensure that quantum devices can move beyond one-off demonstrations toward consistent, large-scale use.

The **Photonics for Quantum (P4Q) Pilot Line** is a European initiative designed to help quantum photonics technologies transition from research laboratories into reliable, scalable industrial

production. P4Q focuses on developing the standards, design tools, and manufacturing techniques needed to produce quantum photonic chips that perform reliably in real-world environments. The consortium aims to accelerate the development of practical quantum technologies to unlock a wide range of applications, from ultra-sensitive sensors and advanced medical diagnostics to large-scale quantum computing and ultra-secure communication networks based on entangled photons.

The P4Q initiative is designed to tackle some of the key manufacturing challenges that have so far limited the large-scale deployment of quantum photonic technologies. Among its priorities are reducing light loss in photonic chips and optical fibers, improving the stability of components operating at ultra-low temperatures, standardizing photonic chip production processes, and enabling the integration of quantum photonic devices into larger, more complex systems. By improving these factors such as light loss, thermal stability, and system integration, the project targets technologies reaching high levels of industrial maturity, Technology Readiness Level (TRL) 8 and Manufacturing Readiness Level (MRL) 8 (TRL-8/MRL-8).

A key contributor to this effort is ICFO, a leading photonics institute with broad expertise spanning quantum communication, sensing, and computation. With more than ten research groups involved in quantum technologies, ICFO plays a central role in advancing photonic integrated circuits (PICs), from design and fabrication to packaging and testing. Its experience in neutral atom quantum computing and quantum PICs, positions it as a strategic partner within the consortium.

Within P4Q, the research groups at ICFO led by ICREA Professors Valerio Pruneri and Leticia Tarruell, will help define system requirements and design PIC-based subsystems for neutral atom and ion-based quantum computing platforms, while contributing to the development of advanced photonic chips as thin-film lithium niobate (TFLN) on aluminum nitride or aluminum oxide for short-wavelength applications. The institute will also support the design of critical photonic components, lead testing and assembly activities, and contribute to real-world demonstrations.

The initiative is expected to play an important role in strengthening Europe's position in the global quantum technology sector and supporting the region's long-term technological sovereignty.

Consortium Partners

AIT, Aluvia, AMIRES, AQT, C2N, CEA-Leti, Delft Networks, ICFO, IMEC, IMS CHIPS, Leonardo, Ligentec, LioniX Internationaal, New Origin, PlanQC GmbH, Q*bird, QphoX, QuiX Quantum, Sintef, Sparrow Quantum, Thales Alenia Space, Thales R&T, TNO, TU Delft, TU Eindhoven, Tyndall National Institute, University of Twente (coordinator), VTT, Quandela

Consortium partners over Europe