CONCEPT NOTE V0.2 • HORIZON EUROPE CLUSTER 4 RIA

Advanced Silicon photonic quantum circuits for ultra-low-power consuming processor

A collaborative proposal integrating single-photon sources, silicon photonic quantum circuits, superconducting detectors, cryogenics, and system-level control.

Call: HORIZON-CL4-2027-05-DIGITAL-EMERGING-03 03

TOTAL EU contribution: €25M

Basis for collaborator discussion • Call opens 17 Nov 2026 • Deadline 18 Mar 2027

Proposal focus: a unified European platform that makes photonic quantum processors scalable, energy-efficient, and experimentally demonstrable.

The proposal links Europe’s photonics strengths to the energy challenge in quantum computing

Why now

AI, high-performance computing, and quantum workloads are increasing demand for platforms that deliver much higher performance while sharply reducing energy consumption.

CORE PROGRAMME THEME

1. **Exploit photonic advantages**
   High-speed information transfer, low decoherence, and circuit-level scalability through photonic integrated circuits.

2. **Build a unified quantum photonics platform**
   Integrate photon generation, quantum circuits, detection, cryogenics, packaging, control, calibration, and data acquisition.

3. **Demonstrate a prototype processor**
   Move from enabling technologies to a demonstrable quantum photonic processor for scalable information processing.

Strategic objective: establish a European collaborative platform for scalable, energy-efficient silicon photonic quantum processors.

Source: Concept Note v0.2, sections 1–2

Six work packages form an integrated device-to-demonstrator route

WP1 • Management & requirements
Coordination, architecture, risk management, system requirements

WP2 • Photon sources
Emitter materials, nanophotonic engineering, fabrication, characterization

WP3 • Quantum circuits
Architecture, algorithms, chip design, fabrication, validation

WP4 • SNSPD & cryogenics
Detector development, packaging, cryogenic engineering, integration

WP5 • System integration
Integrated platform, automated measurement, data acquisition, quantum state characterization, optimization

WP6 • Demonstration & exploitation
Prototype demonstration, publications, technology transfer, industrial engagement

Integration logic
Technology streams converge in WP5, where measurement automation and characterization convert components into an integrated platform.

Our research team lead contribution
Quantum photonic circuit design, photonic algorithms, silicon chip design, fabrication coordination, characterization, and optimization.

Source: Concept Note v0.2, section 3

CONSORTIUM DESIGN

The consortium should combine five complementary capability groups

Our research team anchors the quantum photonic circuit layer

Core contributions: circuit design, algorithm implementation, chip design, fabrication coordination, characterization, and system optimization.

LEAD ROLE: SILICON PHOTONIC CIRCUITS

Single-photon source partners

Quantum emitter materials, nanophotonic engineering, fabrication, and characterization.

Detector and cryogenic partners

SNSPD development, cryogenic packaging, measurement infrastructure, and detector integration.

Advanced fabrication partners

Silicon photonic process access, heterogeneous integration, and performance optimization support.

Industrial exploitation partners

Application requirements, technology transfer routes, industrial engagement, and dissemination channels.

System control and integration partners

Automated measurement, calibration, data acquisition, quantum state characterization, and system-level validation software.

Recruit around capabilities
Define each partner’s non-overlapping technical role.

Protect the integration chain
Prioritize partners who can connect devices into a cryogenic photonic platform.

Clarify ownership early
Confirm WP leadership, milestones, and exploitation expectations.

Source: Concept Note v0.2, section 4

Current Participants and their pages

Quantum Enhancement Inc. Wonmin Son : https://www.quen.ai/

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