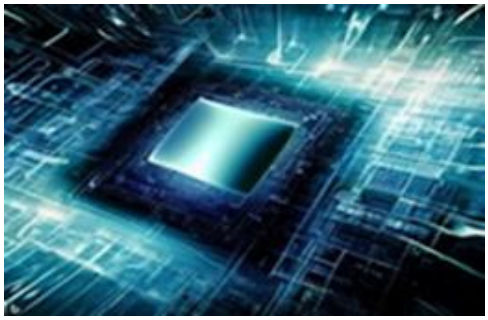
BF Quantum Leap Project

Preliminary plan for discussion with companies



Join the Quantum Revolution

The Business Finland Quantum Leap Project is an ambitious initiative dedicated to showcase quantum power in real word computational problems and demonstrate quantum advantage in component level. Our mission is to create **strategic research collaboration with Australian** research partners to combine our research efforts and leverage the ecosystem capability to next level.

Motivation

The quantum race is intensifying as real-world technologies emerge in the market. Many companies are contemplating how could they apply quantum computing and whether their competitors have plans to do so. Small and medium companies face challenges competing with larger firms that have substantial resources. Collaboration is key to leveraging limited resources and enhancing Finnish quantum ecosystem. Australian research partners provide high quality research and complementary knowledge base for the international collaboration.

Australian research collaboration partners include

- CSIRO, Australia's national science agency
- University of Queensland
- Queensland University of Technology

What is BF Quantum Leap?

- Co-Research project for BF Quantum campaign call
- Indicative budget 5 M€ (to match Australian 5M funding)
- Company co-funding 500 k€ (10%)
- Duration 2 years
- Application submission Q4/2025, project start Q1/2026

Project research tasks

- **Quantum Robotics:** Machine learning of simulated and real robots by maximizing a reward function of agent-environment loop in VTT quantum computer.

- **Quantum Simulation for Material Science:** Optimizing materials for superconductivity using quantum computer modeling.
- **Quantum Chemistry:** Accurately predicting the ionization potential of helium using VTT's quantum computer.
- **Quantum SW Stack:** Implementing the CSIRO quantum stack with the VTT Q5 computer and benchmarking it for further development.
- **Quantum Error Correction:** Improving fault-tolerant quantum computing with underexplored qLDPC codes.
- **Quantum Battery/Memory:** High Q resonant circuit design and fab.
- **Superconducting amplifiers for ultrafast signal output from cryogenics:** Superconducting QCs that with modifications supports readout of optical QCs.
- **Ultra-fast photon detection for scaling up quantum computers:** Surface plasmons can be leveraged to achieve unprecedented levels of speed, or sensitivity.
- **Next-generation superconducting circulators for large-scale quantum computing:** Superconducting switches based on JoFETs and tunable, magnetic-field-free circulators based on gated Josephson junctions.
- **Leverage quantum expertise in international collaboration:** Researcher exchange, common roadmap discussions, white papers, conferences, etc.

Interested?

If any of the topics/ideas raised interest, please contact Project Manager for further discussion:

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