

Quantum Technology Roadmap

Updated as of 11 March 2024

OVERALL STRATEGIES

Facilities and Services

- Establishment of Quantum Tech R&D Center
- Establishment of Connectivity Infrastructure to a remote Quantum Computer
- Establishment of Design, а Characterization Fabrication, and Facility for materials
- Expansion of existing metrology to accommodate quantum communication and sensing

Human Resources

- Fortify Theoretical foundation in Quantum Mechanics and Quantum Technology
- Two-phase Capacity Building: (1) Core Group, (2) Local Scientists
- Implement a call for Balik Scientists

R&D Technologies

- Quantum Communication
- Quantum memory storage device & repeater
- Quantum random number generator Quantum Network
- algorithm development
- Quantum cryptography
- Autonomous quantum key distribution system over metropolitan distances
- Satellites and high-altitude platform stations for long-distance quantum networks
- software Quantum and secure quantum web / internet / search engines development

Quantum Computation

- HPC for Quantum Circuit Simulation
- Quantum processor architectures
- Error-corrected logical gubits with fault-tolerant gates

Republic of the Philippines

DEPARTMENT OF SCIENCE AND TECHNOLOGY

Local quantum computer

Quantum Materials and Simulation Create experimental platforms for quantum simulation Prototype devices simulating

- quantum systems
- Development of validation and verification tools for quantum simulators

Quantum Optics and Sensing Prototyping of quantum-•

enhanced sensors Development of quantum optimal control

S&T Policies

- Development of protocols and • certifications for quantum security Development of certification
- and standards for quantum devices and systems Development of industry standards for quantum metrology

50 M

- Quantum Algorithm Simulation (HPC);
- Capacity Building of Local Scientists by
- Core Group

50M Quantum Circuit Simulation using HPC: Initial

Capacity building (Core Group): Establishment of Quantum Innovation Lab

PHILIPPINE COUNCIL FOR INDUSTRY, ENERGY AND EMERGING TECHNOLOGY RESEARCH AND DEVELOPMENT

2022

- Buildup of collaboration and network Training of Core Group
- with partners outside the country.

Center: Establish a connectivity infrastructure for remote Quantum Computer: Development of quantum processor

architectures: Creating experimental platforms for quantum simulation

100 M

Establishment of

Quantum Tech R&D

2024

2023 Quantum

Algorithm Simulation in HPC through textbook

- algorithm Capacity
- Building for local scientists and engineers

- 100 M Establishment of a Design, Fabrication, and **Characterization Facility** for materials; Prototyping of quantum memory storage device, quantum repeater, quantum random number generator, quantum simulators, and quantumenhanced sensors
 - 2025

R&D SOLUTIONS

- High-speed connectivity to a remote quantum
- computer. Quantum processor architectures (e.g.,
- trapped ions. superconducting circuits.
- semiconductor qubits, etc.)
- Quantum simulation platforms (e.g.
- polariton condensates.
- quantum dots, etc.)

algorithms for quantum networks; Application of quantum cryptography; Implementation of error-corrected logical qubits with fault-tolerant gates

2026

150 M

Development of

Quantum Tech **R&D** Center Algorithms for

- Quantum memory quantum Quantum repeater networks (e.g., Quantum random oblivious data
 - number generator on mobile phone
- Quantum simulators (e.g., static,
- dynamical, quantum
- annealers) Quantum sensors
- (e.g., photonic, atomic, quantum clocks, quantum
- imaging, spin-qubit,

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for quantum communication and sensing: Development of satellites and high-altitude platform stations; Development of quantum

Ongoing



2027

- Autonomous quantum key
 - distribution system over metropolitan

300 M

Design and prototyping

Development of

distribution system;

of a local quantum

verification tools for

guantum simulators

Development of

quantum key

computer;

- distances Local prototype of
- quantum computer Validation and
- verification tools for quantum simulators

MILESTONES

OVERALL OUTCOME

- based verification)
- Use cases of

sharing, position-

- quantum
- cryptography
- Logical gubits

- optomechanical
- sensors)



Legend

(Text Font):

Expansion of metrology

software and quantum web: Development of protocols and standards

by developing its own quantum computer. network, simulator, and metrology.

VISION

By 2030, the

Philippines will

have a quantum-

enabled economy

BAGONG PILIPINAS

Done

Target

 Metrology facility for quantum communication and sensing

altitude platform stations

Quantum software, web,

Protocols and standards

internet, and search

for quantum security,

Locally-developed technologies at all stages of maturity

from blue skies academic research to late-stage product

development for real-world spin-off applications

devices, systems, and

for long-distance quantum

Satellites and High-

networks

engines

metrology

List of Quantum Technology Projects (for the whole duration of the roadmap)

R&D Technologies	Project Title	Budget Allocation ('000)							Status
		2022	2023	2024	2025	2026	2027	2028	
Quantum	Establishment of Quantum Innovation Laboratory: Optimizing a Decision Diagram-based Free and Open-Source Quantum Circuit Simulator for Benchmarking in an HPC Environment using Entanglement, Random Circuits, and Quantum Algorithms Benchmark Datasets	25,52,0393.60	33,640,393.60						Ongoing
	Quantum Computing-Based Forecasting and Optimization Applied to Electric Grid (MECO- TECO)								



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