



ITU-T Focus Groups

FG-QIT4N: Focus Group on Quantum Information Technology for Networks

Info session on FG-QIT4N deliverables

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FG-QIT4N D1.4: Standardization outlook and technology maturity: Network aspects of quantum information technologies

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There's nothing standard about standards



Physical standards, test & measurement, characterization



Use Cases



Guidelines, Best practices



Certification & test



Regulatory standards



Architectures



Interface



Benchmarks & metrics

Procurement



Software algorithms & languages

When they work well they



- Are science-based and industry-driven
- Open markets and democratize innovation
- Encourage market adoption of technology
- Provide a fair basis for regulations

And when they don't they

- Close markets and stifle innovation
- Give companies or countries an unfair advantage
- Fragment and confuse the market

Snapshot of current standards efforts

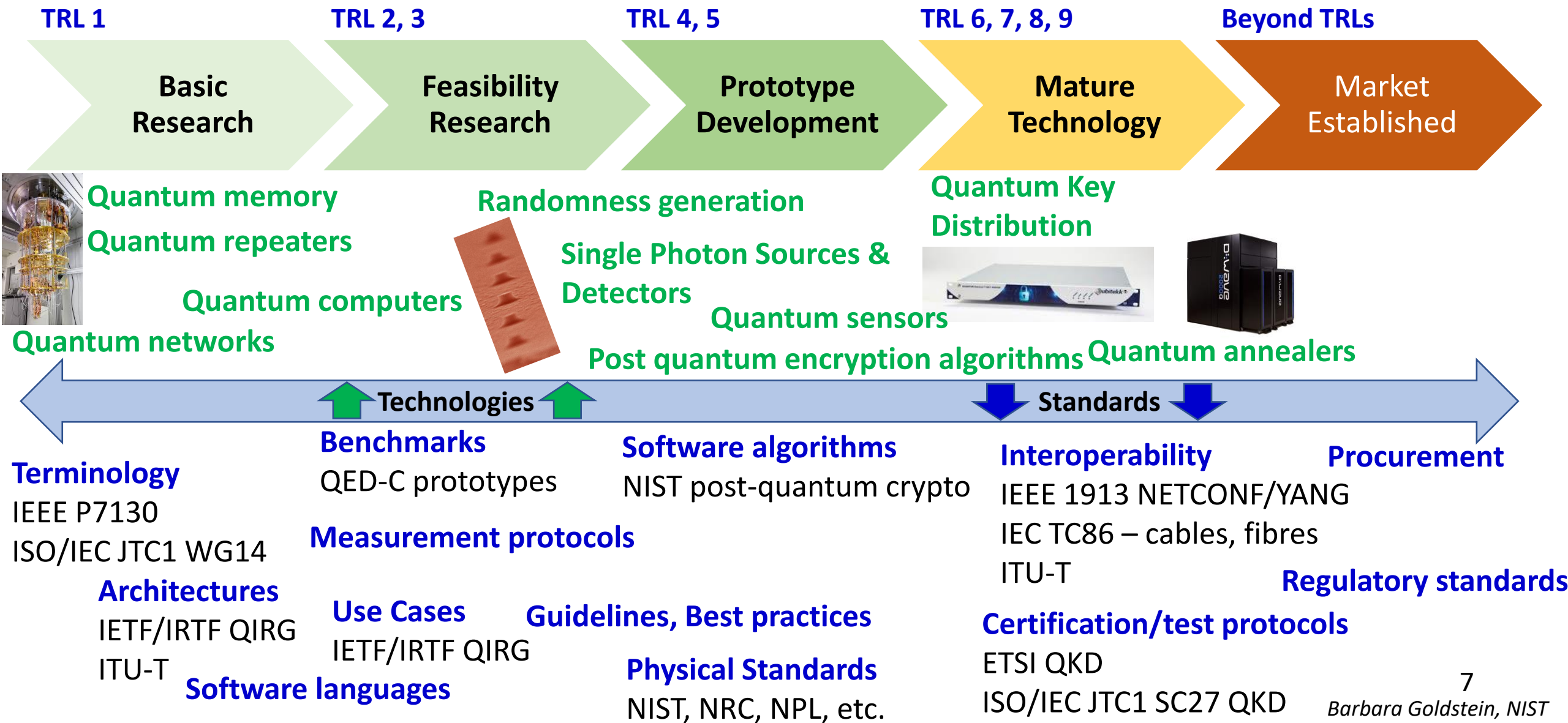
Description of SDO quantum-related activity	Selected deliverable topics	Type of output (e.g., report, interoperability standard, test protocol, procurement specification, etc.)
The European Telecommunications Standards Institute (ETSI)	QKD: Authentication, Components & internal Interfaces, Architectures & Frameworks, Vocabulary, Case Studies, Optical Characterization	Informative: Group Reports, Technical Reports, White Papers, ETSI Guides Normative: Technical Specifications, Group Specifications
The Institute of Electrical and Electronics Engineers (IEEE)	<ul style="list-style-type: none"> • Software-Defined Quantum Communication • Quantum Technologies Definitions • Quantum Computing Performance Metrics & Performance Benchmarking 	Normative: Standards
Internet Research Task Force (IRTF), Quantum Internet Research Group (QIRG) of the IETF	Applications, Use Cases & Architectural Principles for Quantum Internet Transition from Classical to Post-Quantum Cryptography	Informative: Informational Documents Proposed Standards
The International Organization for Standardization (ISO) - International Electrotechnical Commission (IEC) / Joint Technical Committee (JTC) 1: <ul style="list-style-type: none"> • Working Group (WG) 14 quantum computing • Sub-committee (SC) 27 information security 	Terminology Security requirements, test and evaluation methods for quantum key distribution	Normative: International Standards
International Telecommunications Union's Telecommunication Standardization Sector (ITU-T) SG11 (Signalling Requirements), SG13 (Future Networks), SG15 (Transport, Access and Home) and SG17 (Security)	QKD networks - Security, Management, Architecture	Recommendations Normative: International Standards

Standards development & adoption

Challenges include:

- Ensuring adequate industry engagement
- Creating a multi-organizational cohesive suite of standards
- Premature standards development

Standardization readiness & activity



Standardization Readiness Levels – a first pass



SRL	Stage of Technology Development	TRL	Standardization activities to consider beginning
1	Basic research	1: Basic principles observed 2: Concept / application formulated	Identify critical measurements needed
2	Feasibility research <ul style="list-style-type: none"> Multiple independent research groups 	3: Proof of concept	<ul style="list-style-type: none"> Terminology standards Test & measurement standards
3	Prototype development <ul style="list-style-type: none"> Commercial R&D 	4: Component / subsystem validation in lab 5: Component / subsystem validation in relevant environment	<ul style="list-style-type: none"> Characterization and performance standards Metrics & benchmarks
4	Product development <ul style="list-style-type: none"> Multiple companies 	6: System / subsystem prototype demo – relevant environment 7: System demo in relevant environment	Interface standards
5	Commercial products offered by multiple companies	8: System completed & qualified 9: System proven under expected operating conditions	<ul style="list-style-type: none"> Testbeds Certification standards Procurement standards

Standardization Readiness & QIT

- **Most quantum technologies are low SRL and TRL**
 - Exceptions: QRNG, QKD
- **Many components for quantum networks are not commercial-ready**
 - Quantum memories
 - Quantum repeaters
- **Research apparatus is highly custom with in-house components**
- **The sooner the community can agree on interface standards and form factors, the more able suppliers will be to meet demand**
 - But the technology is not yet mature enough

Summary – Standards Landscape

Standards ecosystem

- Quality is much more important than quantity
- Collaboration is essential

Standardization readiness

- Standardization readiness of QIT should be assessed
- International standards are under development for a small subset of quantum technologies

For more information:



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