



Brookhaven
National Laboratory

FOCUS:

QUANTUM TECHNOLOGIES

Guidance for Determining the ECCN for Quantum Technologies

Purpose

This document provides guidance for identifying the correct Export Control Classification Number (ECCN) for quantum technologies and associated technical data. It focuses on the classification criteria and parameters under the U.S. Department of Commerce Export Administration Regulations (EAR) and, where applicable, the International Traffic in Arms Regulations (ITAR). The guidance helps determine whether quantum equipment, software, or technical information is subject to control, and which ECCNs and reasons for control apply.

What's Controlled? – The Big Picture

Quantum Technologies are considered dual-use because they can serve both peaceful and research purposes such as communication security, computing, sensing, and materials discovery and have significant potential strategic or defense applications.

Because of this dual-use nature, export controls govern items at all levels, applying to both the tangible hardware (such as quantum devices, systems, components, and materials) and the associated intangible elements: the technology, software, or procedures required for their development, production, operation, installation, maintenance, repair, overhaul, or refurbishing.

A Quantum technology item becomes export controlled when its **performance, design, function or capability (e.g., speed, sensitivity, precision or encryption strength) exceeds thresholds, or** when it is “**specially designed**” for controlled **high-performance or secure applications**.

See Appendix A for examples of key export-controlled quantum technologies identified by ECCN. This list is illustrative and not exhaustive. Export controls may also apply to supporting equipment, components, materials, and software used in the development, production, or manufacture of quantum devices and systems.

Quantum Computing and Hardware

Quantum computers and their main components, such as qubit chips, cooling systems, and control electronics may be controlled depending on their performance thresholds and encryption functionality. Software and technical data related to the design, development, or operation of quantum computers are also regulated.

Quantum Communication and Encryption

Technologies enabling secure communication through quantum principles, such as Quantum Key Distribution (QKD), are controlled under Encryption Item (EI) rules. These often require prior review before international collaboration or data transfer. Hardware or software managing encrypted data or communication keys may require an export license.

Quantum Sensing and Metrology

Quantum sensors and imaging systems become controlled when their accuracy or sensitivity surpasses specified performance thresholds. If below these limits, they generally fall under ECCN 6A996, which is less restrictive. Applications include navigation, imaging, and environmental monitoring, both civilian and defense related.

Quantum Materials

Research involving materials such as superconductors, qubit materials, or topological insulators is considered dual use, especially when the materials exhibit exceptional performance or special cryogenic properties that support advanced quantum or defense systems.

Quantum Software and Algorithms

Software designed to simulate, model or optimize quantum systems particularly when linked to encryption, defense, or intelligence simulations is likely to be export controlled.

Quantum Networks and Infrastructure

Projects involving quantum networking, entanglement distribution, or quantum-classical hybrid systems may be controlled for National Security (NS) and Encryption (EI) reasons depending on their encryption and data transmission functionality. Such projects should be reviewed for deemed export implications when foreign collaborators are involved. This includes initiatives related to quantum internet development.

How to Determine the Correct ECCN

Link to EAR Interactive Commerce Control List (CCL):

<https://www.bis.gov/ccl-index>

1. **Confirm the item's purpose and design intent.**
 - Is it designed for encryption, ultra-precision, or high computational speed?
2. **Check performance characteristics.**
 - Does it exceed control thresholds – qubit count, encryption level, sensitivity?
3. **Match to the ECCN criteria**
4. **Determine applicable technology controls.**
5. **When uncertain, consult the Export Control Office** before sharing data or hardware internationally.

Note: If none of the technology parameters are met, then the item is NOT export controlled and would fall under EAR99 and only be restricted for export to embargoed countries and prohibited end users.

Key Terms:

Term	Definition
ECCN	Export Control Classification Number, a code identifying items subject to U.S. export control
Specially Designed	A unique or customized design that makes an item meet control criteria under the EAR (772.1). Items may be excluded if general commercial availability and not configured for restricted applications.
Technology	Information required to develop, produce, or use an item (may include design, manuals, and instructions)
Dual-Use	Items used for both civilian and potentially sensitive or military applications.
Use	Activities that include operation, installation, maintenance repair, overhaul, and refurbishing. To qualify as controlled “use” technology, information must enable all six of these functions. Note: • Full manuals or technical data covering <u>all</u> these aspects are likely controlled • Basic operation instructions alone generally do not meet this definition
Reasons for Control	NS1/NS2 - National Security Levels 1 & 2 MT1 – Missile Technology Level 1 NP1 – Non-Proliferation Level 1 AT1 – Anti-Terrorism Level 1 EI – Encryption Item (for QKD or secure communication technologies)

Key Takeaways:

- **STOP** – Quantum hardware, software, or related technology that are not EAR99 require export licensing authorization.
- Consult your Export Control Office before sharing quantum systems, source code, or detailed technical data internationally or with foreign nationals.
- Document how each ECCN was determined and update classifications when performance, design, or application changes.

References and Contacts:

15 CFR Part 774 Categories 1,3,4,5,6

15 CFR 772.1 (Definitions)

Supplement No. 1 to Part 774 (CCL entries)

For export classification assistance, contact the BNL Export Control Office @ export@bnl.gov

Quantum technologies represent a rapidly evolving global field of innovation. Navigating these developments requires diligence and ongoing awareness of export control requirements. The Export Control Office is available to support review of potentially relevant ECCNs and to discuss any impact these controlled technologies may have on your research or activities.