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DRDO Field-Tests Quantum Key Distribution for Unbreakable Military Links

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WHY IN NEWS

On , the **Defence Research and Development Organisation (DRDO)** successfully completed military field trials of an **indigenous fibre-based Quantum Key Distribution (QKD) system**, developed jointly with **Taqbit Labs, Bengaluru**. The system is designed for ultra-secure strategic and military communication and demonstrates India's growing capability in a frontier defence technology.

Secure communication has always been an arms race between code-makers and code-breakers. Today that race faces a looming disruptor: the **quantum computer**, which threatens to crack the mathematical encryption that protects everything from banking to battlefield orders. DRDO's QKD trial is India's practical response to that threat, securing critical military links not with harder mathematics but with the **laws of physics** themselves.

How QKD Works

Conventional encryption is secure only because certain mathematical problems are hard to solve with current computers. **QKD replaces that assumption with the laws of quantum mechanics**. Its security rests on two principles. The **no-cloning theorem** holds that an unknown quantum state cannot be copied perfectly, so an eavesdropper cannot silently duplicate the key. The **measurement-disturbance principle** means that any attempt to observe a quantum particle inevitably alters it, so interception leaves a detectable footprint. If someone taps the line, the legitimate parties know.

Physically, QKD encodes the cryptographic key onto **photons**, using their **polarisation states**, and transmits them over **optical fibre**. Because the security is rooted in physics rather than computational difficulty, QKD is considered **future-proof against quantum-computer attacks**.

The “Harvest-Now, Decrypt-Later” Threat

A critical driver is the **harvest-now, decrypt-later** danger: adversaries may be recording encrypted traffic today, intending to decrypt it once powerful quantum computers arrive. Data that must stay secret for decades, defence, diplomatic and strategic communications, is especially exposed. QKD defends against precisely this threat by generating keys that cannot be intercepted undetected in the first place.

An Important Distinction

CONCEPT	WHAT IT IS
Quantum Key Distribution (QKD)	A secure communication method that uses quantum physics to share encryption keys
Quantum computing (https://ujiyari.com/terms/quantum-computing-term/)	A computing paradigm (https://ujiyari.com/vocab/paradigm/) that uses qubits to solve certain problems far faster
No-cloning theorem	Quantum states cannot be perfectly copied, underpins QKD security
Harvest-now, decrypt-later	Recording encrypted data now to decrypt later with quantum computers

A common confusion must be flagged: **QKD is not quantum computing**. QKD is a communication and cryptography technology; quantum computing is a distinct field of computation. The two are related quantum technologies but serve entirely different purposes.

The Strategic and Policy Context

The trial fits within a wider national push. The **National Quantum Mission** (<https://ujiyari.com/schemes/nqm/>), launched in **2023 with an outlay of Rs 6,003 crore** under the **Department of Science and Technology (DST)**, aims to build India’s quantum capabilities across computing, communication, sensing and materials. DRDO, under the **Ministry of Defence**, brings the military application layer. Equally notable is the **public-private collaboration** with a startup, **Taqbit Labs**, underlining that **indigenisation** (<https://ujiyari.com/vocab/indigenisation/>) of critical defence technology increasingly relies on India’s deep-tech ecosystem rather than public labs alone. Quantum technology is now firmly a **strategic frontier**, where leadership carries direct national-security consequences.

UPSC RELEVANCE

GS Paper 3: Science and technology, developments and applications; indigenisation of technology and developing new technology; awareness in the field of IT, space, computers; internal and external security through communications networks.

Prelims pointers:

- **QKD** field-tested by **DRDO** (Ministry of Defence) with **Taqbit Labs, Bengaluru**; fibre-based, uses **photons/polarisation states** over optical fibre.
- Security rests on the **no-cloning theorem** and **measurement-disturbance principle**, not mathematical complexity.
- Defends against the **harvest-now, decrypt-later** threat; considered **future-proof against quantum computers**.
- **QKD is not quantum computing**.
- **National Quantum Mission**: launched **2023**, outlay **Rs 6,003 crore**, under the **Department of Science and Technology (DST)**.

Mains question: Quantum Key Distribution promises “unbreakable” communication for national security. Discuss its working principles and strategic significance for India, and examine the role of public-private collaboration in indigenising critical defence technology. (15 marks, 250 words)

FACTS CORNER

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QKD secures communication using quantum physics (no-cloning theorem and measurement-disturbance), not mathematical hardness.

Developed by: DRDO (Ministry of Defence) with Taqbit Labs, Bengaluru; field trials completed July 15, 2026.

Medium: photons and their polarisation states transmitted over optical fibre.

Threat countered: harvest-now, decrypt-later; QKD is future-proof against quantum-computer attacks.

Key distinction: QKD is a cryptography technology, not quantum computing.

National Quantum Mission: 2023, Rs 6,003 crore, under the Department of Science and Technology (DST).

Sources: *DRDO* (<https://www.drdo.gov.in/>), *PIB* (<https://pib.gov.in/>), *Department of Science and Technology* (<https://dst.gov.in/>), *The Hindu* (<https://www.thehindu.com/>), *Indian Express* (<https://indianexpress.com/>)

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