



INDIA'S QUANTUM SATELLITE INITIATIVE – SCIENCE & TECHNOLOGY

NEWS: India is on the verge of joining the elite group of nations (China, the US, and Europe) with quantum satellite capabilities. This will bolster India's communication networks against hacking and cyber-attacks.

- The satellite will play a pivotal role in the National Quantum Mission (NQM)'s quantum communications network.

WHAT'S IN THE NEWS?

Planned Quantum Satellite Launch

- The Department of Space aims to launch a quantum satellite within 2–3 years for quantum communication.
- Ajai Chowdhry, Cofounder of HCL and Chairman of the Mission Governing Board for NQM, emphasized the significance of satellite-based secure communication for both domestic and international purposes.

Verticals of National Quantum Mission (NQM)

- The NQM has established four Section 8 companies focusing on key verticals:
 - **Quantum Computing**
 - **Quantum Communication**
 - **Quantum Measurement**
 - **Quantum Sensing**
- The communication vertical is particularly focused on creating quantum-safe communication systems to counter the threat posed by advanced quantum computers.

Photon Pathways: Satellite vs. Optical Fibre

- Satellite-based quantum communication complements the optical fibre network, which is limited to a range of 100–250 km due to photon energy loss.
- Optical fibres require trusted node boxes every 150 km, making long-distance communication costly and less practical.
- Satellites have a broader communication footprint, making them ideal for transmitting quantum data across large distances.

Role of Quantum Key Distribution (QKD)

- Quantum satellites use QKD technology to securely transfer encrypted information across vast distances.
- This technology addresses the energy loss issue in photons during transmission.



Government's Vision for Quantum Communication

- The government plans to develop satellite-based secure quantum communication between two ground stations over a 2,000 km range.
- Minister of State Jitendra Singh recently emphasized this initiative in Parliament.



Challenges in Satellite-Based Quantum Communication

- Satellites in low Earth orbit (LEO) provide limited coverage of only 15–20 minutes daily due to their movement.
- To ensure seamless communication, a constellation of 4–7 satellites is required.
- Gupta from QNu Labs stressed the need for ISRO or private players like Dhruva to prioritize launching such constellations.

Urgency to Accelerate Timelines

- The emergence of advanced technologies like Google's Willow computing chip necessitates speeding up the NQM's timeline.
- Gupta highlighted the critical need for quicker implementation to stay ahead in the quantum technology race.

Funding and Confidence in NQM's Progress



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- The Union Cabinet has approved an outlay of ₹6,003.65 crore for the eight-year National Quantum Mission.
- Ajai Chowdhry expressed confidence in the mission's progress and India's ability to achieve its objectives.

Conclusion

India's quantum satellite initiative represents a significant step toward establishing secure communication networks and enhancing national security. While challenges such as satellite constellations and timeline acceleration persist, the government's strategic focus and investment provide a strong foundation for success.

Source: [https://www.thehindubusinessline.com/info-tech/india-set-to-join-quantum-satellite-race-for-a-hack-proof-communication-network/article68980419.ece#:~:text=India%20is%20set%20to%20join,National%20Quantum%20Mission%20\(NQM\).](https://www.thehindubusinessline.com/info-tech/india-set-to-join-quantum-satellite-race-for-a-hack-proof-communication-network/article68980419.ece#:~:text=India%20is%20set%20to%20join,National%20Quantum%20Mission%20(NQM).)

