GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
LOK SABHA
UNSTARRED QUESTION NO. 1794
ANSWERED ON 29/07/2026

DEVELOPMENT OF QUANTUM ALGORITHMS BY INDIAN RESEARCH INSTITUTIONS

1794. PROF. SOUGATA RAY:

Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether an Indian research laboratory has recently developed a quantum algorithm that demonstrates a computational advantage over conventional classical computing methods, and if so, the details thereof;

(b) the details of the research institution(s), the nature of the quantum algorithm developed, its key applications and the extent to which it has been validated by independent experts or international benchmarking platforms;

(c) the measures being taken by the Government to promote indigenous development of quantum hardware, quantum algorithms, skilled manpower and industry-academia collaboration to strengthen India's global competitiveness in quantum technologies; and

(d) the details of roadmap by the Government for translating research outcomes in quantum computing into practical applications in strategic sectors such as defence, healthcare, pharmaceuticals, cybersecurity, finance, climate modelling and advanced materials research, along with the expected timelines for commercialization?

ANSWER
MINISTER OF STATE (INDEPENDENT CHARGE) OF THE MINISTRY OF SCIENCE AND TECHNOLOGY AND EARTH SCIENCES
(DR. JITENDRA SINGH)

(a) to (b): Research groups at Indian academic and research institutions have developed quantum algorithms that demonstrates a computational advantage over conventional classical methods. The details are as follows:

Research Institution	Quantum Algorithm Developed	Key Applications	Validation / Benchmarking
Birla Institute of Technology and Sciences, Pilani (Goa Campus) in collaboration with IBM Research	Quantum algorithm for simulating the strong nuclear force	High-energy physics and nuclear force simulations	Demonstrated on a 120-qubit IBM quantum processor, where a 20-second quantum simulation outperformed a classical supercomputer that required about two hours for the same computation. The algorithm has been selected by IBM for its Quantum Advantage Tracker.
Indian Institute of Science (IISc), Bengaluru	(i) Quantum key generation algorithms (ii) Quantum walk algorithm for Dirac equation simulation	Secure cryptography, quantum simulations, quantum computing subroutines	(i) Validated on IISc photonic quantum hardware. (ii) Experimentally validated on an ion-trap quantum computer by the University of Maryland.

(c) The Department of Science and Technology (DST) is implementing the National Quantum Mission (NQM) to promote research, development, and innovation in quantum technologies with an outlay of ₹6003.65 crore for a period of eight years. Under the Mission, four Thematic Hubs (T-Hubs), each focusing on a specific domain of quantum technologies—Quantum Computing, Quantum Communication, Quantum Sensing & Metrology, and Quantum Materials & Devices. The major mandates of the T-Hubs include Technology Development, Human Resource Development, Entrepreneurship Development & Industry Collaboration and International Collaborations. Following activities are being undertaken by NQM to promote indigenous development of quantum hardware, quantum algorithms, skilled manpower and industry-academia collaborations:

i. **Establishment of advanced fabrication and central facilities at Indian Institute of Science (IISc) Bengaluru, Indian Institute of Technology Bombay, Indian Institute of Technology Kanpur and Indian Institute of Technology Delhi, to support indigenous development of quantum processors, sensors, materials and devices.**
ii. **Technology development through four Thematic Hubs, comprising 14 Technical Groups and 17 Project Teams, involving 152 researchers from 43 institutions across the country and bringing together academia, national laboratories, industry and startups.**
iii. **Development of indigenous quantum algorithms and software through 17 Project Teams under the Quantum Algorithms Technical Group.**
iv. **Capacity building and skilled manpower development through AICTE-supported UG Minor and M.Tech programmes in Quantum Technologies and the establishment of 23 Quantum Teaching Laboratories.**
v. **Development of national guidelines for supporting startups in the area of quantum technologies. Seventeen startups have been supported under the Mission.**

The Ministry of Electronics and Information Technology (MeitY) has developed Qniverse, a unified quantum computing platform integrated with High-Performance Computing (HPC) systems. The platform enables students, researchers and startups to design, simulate and execute quantum algorithms across multiple quantum hardware.

(d) The NQM aims to translate research outcomes into deployable technologies and commercial products through technology development, prototype demonstration, validation, and industry-led commercialization. The Mission targets development of quantum computers with 20–50 physical qubits in 3 years, 50–100 qubits in 5 years, and 50–1000 qubits over 8 years across multiple hardware platforms. The technologies being developed under the Mission are expected to find applications in defence, healthcare, pharmaceuticals, cybersecurity, finance, climate modelling and advanced materials research as they attain the required Technology Readiness Levels (TRLs) during the Mission period ending in 2030–31.

*****