



## Quantum Entanglement

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### Why in News

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Recently, the scientists from **S.N. Bose National Centre for Basic Sciences (SNBNCBS), Kolkata** have developed a novel protocol to find out whether a pair of electrons is in an entangled state.

This novel protocol to measure the status of entanglement is known as **Device Independent Self Testing (DIST)** method.

### Key Points

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- **Device Independent Self Testing (DIST) Method:**
  - This method can be used to overcome safety concerns in quantum entanglement as it **enables the verification** of entanglement in an unknown quantum state of two photons **without having direct access to the state, or complete trust in the measurement devices.**
  - In several practical situations, one of the parties may be fully trusted, whereas, the other may not be trusted like in the case of server-client relationship in banking transactions.
- **Quantum Entanglement:**
  - It is the **physical phenomenon** that occurs when a pair or group of particles is generated and they interact in such a way that the **quantum state of each particle of the pair or group cannot be described independently** of the state of the others.
  - In this quantum mechanical phenomenon, the quantum states of two or more objects have to be described with reference to each other, even though the individual objects may be spatially separated.
  - This leads to correlations between observable physical properties of the systems.
  - **Albert Einstein** dismissed this idea as a '**spooky action**'.

- **Importance:**
  - Entangled states are **key resources** to facilitate many **quantum information processing tasks** and **quantum cryptographic protocols**.
  - The entangled pairs of electrons can be **safely used as resources for facilitating quantum information processing tasks**.
- **Challenges:**
  - **Fragility:** Entanglement is **fragile and is easily lost** during the transit of photons through the environment. Hence, it is extremely **important to know whether a pair of photons is entangled**, in order to use them as resources.
  - **Safety:** Verification of entanglement requires the use of measurement devices, but such devices may be hacked and cannot be trusted fully.

**Source: PIB**