

WEEK 2

ASSIGNMENT

EPR PAIRS



Entanglement of two particles

Entanglement occurs when a pair of particles, such as photons, interact physically. Therefore even when the particles are separated by great distances, an action performed on one particle, affects the other. For example, it is possible to prepare two particles in a single quantum state such that when one is observed to be spin-up, the other one will always be observed to be spin-down and vice versa

Einstein famously termed this as “Spooky action at a distance”.

EPR (Einstein Podolsky Rosen) pairs are a particular case of entangled pairs of qubits. In simple terms, an EPR pair is a pair of qubits (or quantum bits) that are in a Bell state together. The Bell states are specific quantum states of two qubits that represent the simplest examples of quantum entanglement.

$$\frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$$

EPR Pair

Elementary cases of use of EPR pairs in quantum computing would be quantum teleportation and super dense coding, and upon those pieces people have built more sophisticated applications.