

The Einstein-Podolsky-Rosen Paradox

Quantum Entanglement

Quantum entanglement is defined as a physical phenomenon in which the quantum states of two or more objects (particles) have to be described with reference to each other, even though the individual objects may be spatially separated. Which means, when a group or pair of particles produced from the same basis interact the quantum state of each particle is dependent to one another.

Ex: If a particle is split up into an electron and a positron (conjugate) and one measures the spin of the electron with respect to y-axis and is found to be upwards then quantum entanglement says that the spin of the positron with respect to y-axis is downwards.

Therefore, measurement of physical properties such as position, momentum, spin, polarization, etc, performed on entangled particles are found to be perfectly interrelated.

The Einstein-Podolsky-Rosen Paradox (EPR) is a paper published in May 1935 questioning can quantum mechanics' description of reality be considered complete? Which means can entangled particles really interact with each other such that the measurements of physical properties are perfectly interrelated?

Let's assume that the laws of Quantum Mechanics are absolute

If a pair of entangled particles are separated by a large distance (say different universes), measurement of the physical quantities such as momentum, position, spin, etc are interrelated. Therefore, measurement of a quantity in one particle influences the result in another. Which means that the particles are communicating with each

other. For this to happen the information must reach the other particle instantaneously no matter what the distance between the entangled particles are. But for this to be true the information must travel greater than the Universe speed limit i.e. the speed of light ($3 \times 10^8 \text{ m/s}$) which in turn disproves Einstein's Special Relativity that nothing can go faster than the universe speed limit. This concludes that the assumption is wrong.

Conclusion

The conclusion is that either we must agree Einstein's Special Relativity is true and nothing can travel greater than the speed of light and accept Quantum mechanics is false or Accept Quantum mechanics and dispose the theory of special relativity.

Basically, EPR tries to prove that Quantum Mechanics is Wrong.