

Re: A Look at Quantum "Spookiness"

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A Look at Quantum "Spookiness"

The results of quantum theory were described as "spooky" by Drs. Einstein, Podalsky, and Rosen because quantum theory seemed to reject "objective reality". They believed that all observed effects must be produced by "local" causality. Their conclusion resulted from their firm belief that information could not travel faster than the velocity of light. Indeed, if this were the case, quantum theory would indeed be "spooky". Quantum theory required, for example, that "paired photons" maintain polarizations which were opposite in direction . If the polarization angle of one of the "paired photons" were changed, the polarization angle of the other photon of the pair must instantaneously change to match.

Actually this is not a very accurate description of the

Re: A Look at Quantum "Spookiness"

situation. It is about determining the polarization, not changing it. The key thing is that one can measure the polarization in two directions which are incompatible observables in quantum mechanics, so the results cannot be explained merely by the states the particles started off in. Which direction to measure can be chosen by a central controller communicating simultaneously with each end of the experiment.

If you read the papers about Aspect's experiment (which verified Bell's theorem empirically), as I have, you will see Bell's result is only visible in the statistics, not in any individual measurement. No-one has found any way to use this effect to communicate faster than light, and very few people expect this to ever happen.

Although, they have proven conclusively that the aforementioned effect is real. Not by statistics, but by concrete mathematics. Instead of coupling two photons, they used three photons, and the math became "Always" (Quantum Spookiness) or "Never" (Einstein Hidden Variables). Turns out its "Always"

It is possible my intended meaning was not clear. The effect is in the statistics of the measurements, and can be seen when one collates the experimental data from both (or all three) afterwards, but at the time, there is no way for any of the participants to use the effect to communicate with another at faster than the speed of light.

One article I read on this said that when a participant makes a measurement it "determines an aspect of reality". This aspect of reality is immediately known at another point connected by quantum entanglement. The reason this cannot be used to communicate is that the person who made the measurement did not specify what the aspect of reality was (for example, whether the photon was vertically polarised), he merely measured it. From measurements made at the other end, the other participant cannot determine anything about

Re: A Look at Quantum "Spookiness"

what the first person did. We can only be sure that if the other person measures the vertical polarisation, his measurement will be determined by the measurement that the first person made.

Is this clear now?

Yes... But, what if entangled particles are actually different facets of the same underlying particle? Maybe there is no such thing as "one photon" entangled with another "one photon". Maybe once they are entangled, they actually become a single entity that exists at more than one physical point.

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