Singlet, spin and clock.

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A simple explanation is given for the continuation of the singlet state over large distances in an EPRBA experiment. The paper answers this question with clocks ticking in synchronized frequencies that can be carried by the particles.

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I. INTRODUCTION

The discussion about the explanation of entanglement started with the EPR paradox[1]. Key in the discussion was and is: how is it possible that particles remain connected over long distances. Subsequent to Einstein, David Bohm changed the EPR paradox into entanglement of spins arising from a singlet state[2]. Then, Bell[3] asked if the entanglement between spins can be explained with the use of classical statistics. From Bells formula, inequalities were derived and experiments were proposed[4], fine-tuned to experiment[5] and performed[6]. The experiments showed that the selected inequality can be violated in nature. Recently, the present author questioned the mathematical validity of the argument behind the Bell inequalities[7].

In the present short communication the author is, hence, no longer bound to explain the connection over long distances by referring to a Bell inequality. In the following section a short *conceptual* explanation will be given for the continuation of the singlet state over long distances.

II. CLOCKS

A simple conceptual solution to the paradoxical correlation is the following. When the particles split, two independent spins arise from the singlet state. Keep in the back of your mind that simultaneity is key in, for instance, the CHSH experiments. So why not have a clock mechanism changing each dt unit of time, the direction of spin. E.g at t, spin up, at $t + dt$, spin down etc.

Suppose, the spin going towards A starts, with spin up. The one to B, down. This is a singlet state that can e.g. be found in positronium. Suppose the spin carrying particles are still in a bounded singlet. Suppose they are a dt time unit away from leaving the singlet. Then, dt later, they separate. There is no longer a bond between them.

This means only the carried clock can drive the change in dt. In one dt from singlet, the spin to A changes to down and the spin to B changes to up. Then looking at the next dt. This gives, the spin to A becomes up again and to B becomes down etc. This continues until both spins are measured simultaneously at A and B. No need for incompatibility nonlocality or multiple universes to explain the correlation or "why do the spins of the separated particles

remain connected". The spins are not connected. The synchronized frequency maintains the singlet.

The measurement parameters, a and b, for A and B respectively, therefore produce correlated measurement results. The distance traveled is translated to ticks of the clock. So the up-down are synchronized. If the spin of the particles started in the up-down singlet relation the synchronized clock fequencies will keep them in the singlet, via, each dt a spin change.

III. CONCLUSION

In this short communication it was demonstrated that a conceptual simple explanation for the existence of the singlet condition over long distances, can be given with synchronized clocks. This simple conceptual explanation suffices because Bell inequalities are flawed[7]. However, even if one refuses unreasonably to believe the mathematical truth of that claim[7], then still the synchronized clocks driving the spin flips, thereby maintaining the singlet, can be accepted.

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