Comment on “Violation of Bell’s inequality under strict Einstein locality conditions”

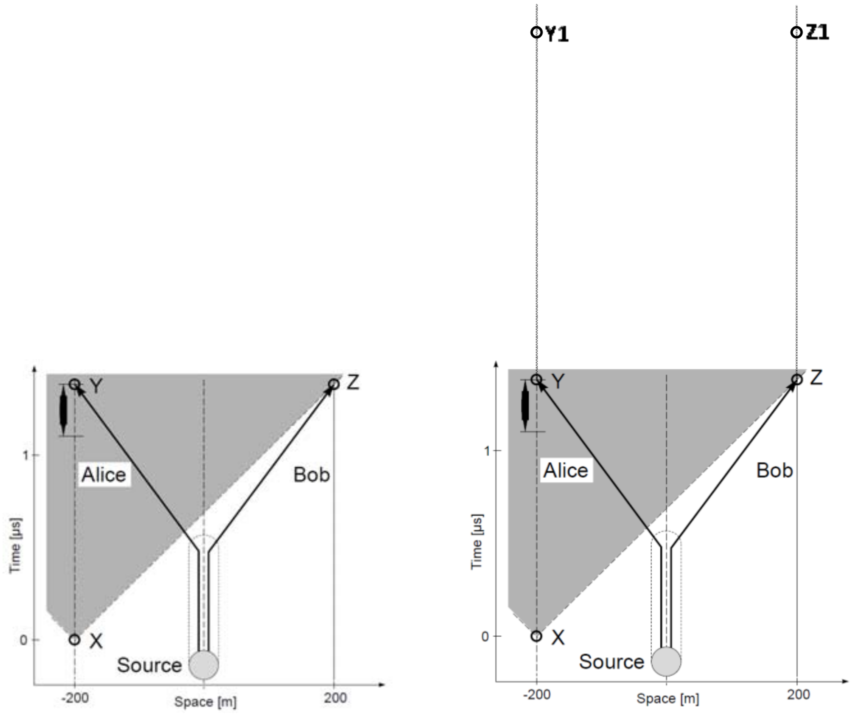
In the work of “Violation of Bell’s inequality under strict Einstein locality conditions” [1], Weihs et al write “We for the first time fully enforce the condition of locality, a central assumption in the derivation of Bell’s theorem”. But their work does not close the locality loophole, their work has two problems.

First, they write “Selection of an analyzer direction has to be completely unpredictable, which necessitates a physical random number generator. A pseudo-random-number generator cannot be used, since its state at any time is predetermined”. But who can sure that the state of a physical random number generator is not predetermined? According to their very strict logic, we think the locality loophole can never be closed. But we do not believe that this reason results in violation of Bell's inequality.

In order to explain the second problem, we proposed a possible idea: When a photon contacts a measurement device, it does not have significant effect on the measurement device instantaneous, but it may have no effect or slight effect on the measurement device during a period of time. We propose a measurement mechanism of photon, this mechanism may not be real, but it can figuratively explain our idea: in the non-vacuum condition, single photon is not a point in the transmission process, and when the photon contacts the measurement device, it has slight effect on the measurement device because the energy is not concentrated. During a period of time, the photon is absorbed competitively at multiple locations, and then the photon has significant effect on a location of the measurement device. In the closed interferometer configuration of Jacques's experiment [2], a single-photon pulse is split and travels through two paths and then is recombined to realize interference. Many experiments with different path were done. We think that the two parts of most photons in the experiments cannot reach the interference location at the same time through two paths, that is to say that some information may arrive ahead before the occurrence of the interference. While the final measurement result is determined by the interference, if a photon has significant effect on the measurement device instantaneous when it contacts the measurement device, it is not easy to explain that the information before the occurrence of the interference has no effect on the measurement in all cases of the experiments.

Fig.1 a is the original spacetime diagram of the paper of Weihs et al [1]. They think that a photon has significant effect on the measurement device instantaneous when it contacts the measurement device at spacetime points "Y" and "Z". But according to our preceding analysis about Jacques's experiment [2], it may be wrong. Fig.1 b is a modified schematic spacetime diagram. The photons contact the measurement devices at spacetime points "Y" and "Z", respectively. But the photons have significant effect on the measurement devices at spacetime points "Y1" and "Z1", respectively. So the measurement can affect each other. Compared with common photon, the photon in entangled state may have different time during which the photon has not significant effect on the measurement device. For example, supposing photon is not a point in the transmission process, the shape of the photon may be affected by each other, and then the time may be affected. In our opinion, Jacques's experiment [2] may illustrate that a photon is not a point in the transmission process.

Because the published work of Weihs et al cannot exclude the possibility of Fig.1 b, it does not close the locality loophole. For detailed analysis and how to verify the problem by experiment, please refer to Ref. [3].



(a) (b)

FIG. 1. (a) Original spacetime diagram of Weihs' Bell experiment. (b) Modified schematic spacetime diagram.

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