



ERRATUM

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Erratum: Comment on "On a contextual model refuting Bell's theorem" by Muchowski Eugen

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Eugen Muchowski issued an Erratum modifying his article "On a contextual model refuting Bell's theorem" [1]. Since the changes Muchowski introduced invalidate part of our Comment, a corresponding modification is necessary to clarify its present status.

Muchowski's altered model invalidates the Comment's section "The model's nonlocality". After the modification, the example in ref. [2], showing the notorious nonlocal character of his hidden variable model, no longer applies.

However, the modification has an undesirable consequence. The modified Muchowski's model became irrelevant regarding the local character of the singlet state correlations.

Indeed, for the Bell inequality to be relevant for the local character of the singlet correlations, it is necessary to evaluate $E(\alpha, \beta)$ with particle pairs generated at the source in the same event,

$$E(\alpha,\beta) = \frac{1}{N} \sum_{k} A(\alpha,\lambda_k) B(\alpha,\lambda_k).$$
(1)

The same hidden variable value λ_k in each factor of the different terms appearing in (1) warrants that photon pairs correspond to the same generating event.

Since the modified model evaluates $E(\alpha, \beta)$ with different hidden variables in the same term, it cannot possibly have any bearing on the local or nonlocal character of the singlet correlations. Locality is pertinent only when those correlations build up products of factors arising from the same entangled pairs.

That the new modified model considers results of particles from different entangled pairs is made explicit by the author:

"In the paper [1] it was assumed that matching photons selected by the polarizer PB have to have the same value range of λ as matching photons selected by PA. This is, however, not a necessary assumption as the photon pairs selected by PA are different from photon pairs selected by PB because they have a different polarization." [3]

Experimentalists take special care to evaluate correlations with photons belonging to the same entangled pair. The violation of this rule leads to experimental loopholes [4], allowing a local realistic model to mimic the quantum correlations.

Notice that it is possible to assign different hidden variable values λ_1 and λ_2 to photons of the same entangled pair. In such cases, the global hidden variable generated at the source in the same event is a vector variable $\lambda = (\lambda_1, \lambda_2)$. It is in this global sense that the hidden variable λ is the same for both entangled photons.

As Muchowski's hidden variable model is a scalar parameter, it violates the above locality condition. Besides, he explicitly states that in his modified model "... the photon pairs selected by PA are different from photon pairs selected by PB..." [3].

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Conclusions. – The modification introduced in the issued Erratum to the model presented in [1] invalidates the section "The model nonlocality" in the Comment [2]. However, for the reasons we explained above, such modification does not turn Muchowski's model into a counterexample to the Bell theorem.

The observations made in the other sections of the Comment [2] remain valid without modifications.

REFERENCES

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