Qeios

Peer Review

# Review of: "Fundamental Issues and Measurement Problem in Quantum Mechanics"

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The paper discusses the quantum measurement problem, separating directly observable quantities from theoretically inferred ones. The paper also addresses aspects of quantum measurements related to amplification, registration, classicality, and macroscopicity.

Unfortunately, the paper does not connect with the recent literature on this topic. Even more unfortunately, it contains confusing points. Some of them are listed below. It is possible to correct them and also evaluate the paper in the light of the modern literature. Please see, e.g.,

A.E. Allahverdyan, R. Balian, T.M. Nieuwenhuizen, A sub-ensemble theory of ideal quantum measurement processes, Ann. Phys. 376, 324-352 (2017),

where further references on quantum measurements are given.

Here are statements that I find problematic.

1. Page 1 tells

"However, an eigenstate is a theoretical notion irrelevant to a single measurement, and it does not exist in reality after a QJ."

In addition, page 4 repeats:

"Eigenket is not observed by the measurement."

This statement seems confusing to me. Indeed, for a given pure state, there is a set of commuting observables that can be measured together. This measurement leaves the pure state unchanged. It is possible to repeat the measurement with the same result, and the pure state is still there. So the existence of the pure state can be verified and observed in experiments.



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2. On page 4, the author writes:

"After the MIJ, the EV $a$, persists throughout the amplification/accumulation process until it becomes a c-number."

This is not a trivial or obvious point. However, precisely this point is fully resolved by modern approaches to quantum measurements, as shown in the above reference.

3. On page 4, the author writes:

"Real dynamical variables, which are Hermitian operators mathematically, are observables. This is a standard definition. These observables are reality."

The sentence is confusing because the reality was not defined or at least outlined beforehand.

4. On page 4, the author writes:

"It is also noted that a permutation is not a Hermitian operator and does not have a real EV."

This is confusing: standard textbooks show that the permutation operator is Hermitian and has real eigenvalues.

## Declarations

**Potential competing interests:** No potential competing interests to declare.