

Peer Review

# Review of: "The Measurement of Superpositions"

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A disclaimer: I am a mathematician and have no appropriate background to judge the merits of this paper regarding measurement theory or quantum mechanics. I am fascinated with quantum mechanics (who is not?) so I read it with great interest.

My issues are with the set theory/mathematical logic aspects, which, if I understood it correctly, would be the main content of the paper.

Some terminology from mathematics (set theory, mathematical logic, topology) is used that is not in conformity with the standard usage. In particular, ordinal, cardinal, and limit have formal definitions. The exact meaning used should be explicitly stated and fixed. If it is not the standard definition, then there should be a good reason for this, explicitly stated and argued for. I would suggest looking at the introductory sections of some textbook – for example, the first three sections of J.T. Jech: Set Theory is standard.

A few more concrete issues:

The problem is that at the beginning, set theory (as proposed by Cantor) was inconsistent, as the paradoxes mentioned in this paper have shown. These are avoided in any formal treatments – there are a few; Zermelo–Fraenkel set theory with choice (ZFC) is more or less standard. (This is the one used in Jech's book.)

Whether a cardinal is limit or not (which also has an exact definition) has nothing to do with the problem of paradoxes.

The fact that the collection of cardinal numbers is not a set is a theorem proven in ZFC.

Limits are defined for ordinals and cardinals, but that is a different beast, may not be the one you need here (if I understand Figure 1. correctly). Again, limits are defined in various structures, in particular in orders. It has to be decided which of these is a "right" one for your purposes. It is not clear from the paper

how or why the order structure of ordinals is suitable. This question has to be revisited using exact, current definitions.

About the mathematical logic-related content: Tarski has an undefinability theorem (it is not a requirement). I do not see how this, or Gödel's incompleteness theorems, is relevant here. They might be, but it is not clear from the paper. These are results about the limitations of formal systems in mathematics, so in any case, the formal system should be fixed first.

I believe a thorough rethinking and rewriting of this material is needed to ascertain its merits. As it is, I don't know.

Wish you the best,

Miklós

## **Declarations**

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