

Review of: "On Purported Physical Realizations of So-called Quantum Information Technologies"

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In the third version of the manuscript, a new principle called “general principle of measurements” is proved as a mathematical theorem. Because qubits allegedly violate this theorem, they do not exist in the physical world. Accordingly, it is concluded that quantum information has no physical carriers, and all quantum information technologies are not physically realizable.

Fortunately for quantum information technologies, such pessimism is without basis.

To demonstrate this, let us restate the theorem put forward in the manuscript in terms of set theory.

Proposition 1. Values of a coordinate of a physical system are elements of the set

$$\{q \in \mathbb{R} : d\}$$

where \mathbb{R} is the set of real numbers, d is the distance function between the centre x and any real number q such that d is less than or equal to R , the radius of some open ball.

Proposition 2. A result obtained by measuring a coordinate of a physical system *in a precise manner* is a singleton $\{q\}$, i.e., a set with exactly one element q .

Proposition 3. There is no singleton $\{q\}$.

Therefore, precise coordinates are unattainable by measurements.

However, proposition 3 is false, and so is the conclusion of the theorem.

In set theory, the existence of singletons is a consequence of *the axiom of pairing*, which is saying that, given two objects A and B , we can find a set C whose members are exactly A and B . Being able to construct a singleton is necessary to construct the natural numbers: For example, the number 1 is defined as the singleton $\{0\}$. For this reason, to deny the existence of singletons means to forgo the natural numbers and, in consequence, mathematics as it is known today.

The rest does not matter since, without the aforesaid theorem, the manuscript is groundless.