



## Elementary Particles' Entanglement as a Possible Foundation For The Quantum Theory's Probabilistic Nature?

Mario De Marchi

CNR – IRCrES, Via dei Taurini, 19, 00185 Roma, Italy

### Correspondence

Mario De Marchi

CNR – IRCrES, Via dei Taurini, 19, 00185 Roma, Italy

- Received Date: 02 Sep 2025
- Accepted Date: 08 Sep 2025
- Publication Date: 10 Sep 2025

- Quantum physics shows aspects which have never stopped puzzling both common people and even the academic cadre. Such characteristics could be summed up into two complementary classes:
  - A. the surprising - somewhat opposite to common sense – counterintuitive (even though confirmed) predictions often derived from the theory at microscopic level in connection with its *probabilistic nature*;
  - B. the amazing, action at a distance stated by entanglement, insofar this phenomenon is no less disturbing than those alluded at within (A).
- Perhaps, through a “Metaphysical” - in the Popperian sense of “*at least tentatively, not falsifiable*” – thesis, it could be argued that (A) may be a consequence of (B).

Indeed, assertions concerning particles' entanglement do not state an upper empirical limit to those particles entangled with that particular one studied. Therefore, it could be possible that such unknown, potentially unlimited set of particles will exert an influence on the analyzed particle that in principle cannot be predicted. As a consequence, it would only appear to be inevitable that uncountable entanglements throughout the universe entail an always non-deterministic (statistical) set of observations on each of the elementary particle involved.

- If this line of reasoning was tenable, then the two conundrums generated by (A) and (B) might perhaps boil down to just one, which in the end would mark a significant progress with respect to the present situation.

### Copyright

© 2025 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

**Citation:** De Marchi M. Elementary Particles' Entanglement as a Possible Foundation For The Quantum Theory's Probabilistic Nature?. Japan J Res. 2025;6(11):164.