



[conjecture]

Diamond Open Access

# Entanglement of Superposition and Superposition of Entanglement

Open Mathematics Collaboration\*†

August 7, 2020

## Abstract

We consider that the superposition of space is given by the Bell states and that those states are in superposition themselves.

keywords: entanglement, superposition, Bell states, quantum information

*The most updated version of this paper is available at*

<https://osf.io/zjdrm/download>

## Introduction

1. [1]
2. This article is an example/application of [2].

---

\*All authors with their affiliations appear at the end of this paper.

†Corresponding author: [mplobo@uft.edu.br](mailto:mplobo@uft.edu.br) | Join the Open Mathematics Collaboration

# The electron

3. Suppose that an electron is in a superposition of space from  $x = 0$  and  $x = a$ .
4. Let  $A, B, C, D, E, F, G, \dots$  be points between  $x = 0$  to  $x = a$ .

# Entanglement of superposition

5. Conjecture 1: *Two points in space are entangled.*
6.  $|AB\rangle = a|10\rangle_{AB} + b|01\rangle_{AB}$
7.  $|10\rangle_{AB}$  = the electron collapsed at  $A$
8.  $|01\rangle_{AB}$  = the electron collapsed at  $B$
9. The meaning of the first (second) ket is the presence (1) or absence (0) of the electron at a specific point in space.

# Superposition of entanglement

10. Conjecture 2: *All pairs of entangled spatial points are in a quantum superposition.*
11. The quantum state of the electron, according to (5) and (10), is then given by

$$|\Psi\rangle = \alpha_1|AB\rangle_{AB} + \alpha_2|AC\rangle_{AC} + \alpha_3|AD\rangle_{AD} + \dots + \beta_1|BC\rangle_{BC} + \beta_2|BD\rangle_{BD} + \dots + \gamma_1|CD\rangle_{CD} + \dots$$

# Discussion

12. According to our approach, the mathematical definition of [2] is given by

$$|\Psi\rangle = x_1|1000\dots 0\rangle + x_2|0100\dots 0\rangle + x_3|0010\dots 0\rangle + \dots$$

## Final Remarks

13. We presented two conjectures stating that two points in space are entangled and also that all pairs of entanglement are in a quantum superposition.
14. The quantum nature of the interplay between objects and spacetime is somewhere between (5) and (12).

## Open Invitation

*Review, add content, and **co-author** this paper [3, 4].*

*Join the **Open Quantum Collaboration** (<https://bit.ly/ojmp-slack>).*

*Send your contribution to [mplobo@uft.edu.br](mailto:mplobo@uft.edu.br).*

## Open Science

The **latex file** for this paper together with other *supplementary files* are available [5].

## Ethical conduct of research

This original work was pre-registered under the OSF Preprints [6], please cite it accordingly [7]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

## Acknowledgement

+ **Center for Open Science**

<https://cos.io>

## + Open Science Framework

<https://osf.io>

## References

- [1] Susskind, Leonard, and Art Friedman. *Quantum mechanics: the theoretical minimum*. Basic Books, 2014.
- [2] Lobo, Matheus P. “Quantum Superposition as Entanglement.” *OSF Preprints*, 25 Dec. 2019. <https://doi.org/10.31219/osf.io/m2ajq>
- [3] Lobo, Matheus P. “Microarticles.” *OSF Preprints*, 28 Oct. 2019. <https://doi.org/10.31219/osf.io/ejrct>
- [4] Lobo, Matheus P. “Simple Guidelines for Authors: Open Journal of Mathematics and Physics.” *OSF Preprints*, 15 Nov. 2019. <https://doi.org/10.31219/osf.io/fk836>
- [5] Lobo, Matheus P. “Open Journal of Mathematics and Physics (OJMP).” *OSF*, 21 Apr. 2020. <https://doi.org/10.17605/osf.io/6hzyp>
- [6] COS. *Open Science Framework*. <https://osf.io>
- [7] Lobo, Matheus P. “Entanglement of Superposition and Superposition of Entanglement.” *OSF Preprints*, 13 July 2020. <https://doi.org/10.31219/osf.io/zjdrm>

## The Open Quantum Collaboration

Matheus Pereira Lobo (lead author, [mplobo@uft.edu.br](mailto:mplobo@uft.edu.br))<sup>1,2</sup>

<https://orcid.org/0000-0003-4554-1372>

<sup>1</sup>Federal University of Tocantins (Brazil)

<sup>2</sup>Universidade Aberta (UAb, Portugal)