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Entanglement of the Uncertainty Principle

Open Quantum Collaboration*†

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Abstract

We propose that position and momentum in the uncertainty principle are quantum entangled states.

keywords: entanglement, uncertainty principle, quantum gravity

The most updated version of this paper is available at
https://osf.io/9jhwx/download

Introduction

1. [1]

2. Logic leads us to conclude that quantum gravity–the theory of quantum spacetime–is the description of entanglement of the quantum states of spacetime and of the extra dimensions (if they really exist) [2–7].

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Quantum Gravity

3. *quantum gravity = quantum spacetime = entanglement of spacetime*

4. Quantum spacetime might be in a superposition of the extra dimensions [8].

Notation

5. UP = Uncertainty Principle

6. $|\mathrm{UP}\rangle$ = the quantum state of the *uncertainty principle*

Discussion on the notation

7. The **universe** is **mathematical**.

8. The *uncertainty principle* is part of our universe, thus, it is described by *mathematics*.

9. *A physical theory must itself be described within its own notation.*

10. Thereupon, we introduce $|\mathrm{UP}\rangle$.

Entanglement

11. $|\mathrm{UP}\rangle = \alpha_1 |x_1 p_1\rangle + \alpha_2 |x_2 p_2\rangle + \alpha_3 |x_3 p_3\rangle + ...$

12. x_i = uncertainty in position

13. p_i = uncertainty in momentum

14. $|x_i p_i\rangle = |x_i\rangle |p_i\rangle = |x_i\rangle \otimes |p_i\rangle$

Final Remarks

15. Whenever the **uncertainty** in **position** (x_j) collapses, the **uncertainty** in **momentum** (p_j) collapses as well.

16. x_j and p_j are inseparable [9]; one cannot observe both x_i and p_j for $i \neq j$.

17. Hence, the **uncertainties** in *momentum* and *position* are **entangled**.

Open Invitation

Review, *add* content, and **co-author** this paper [10, 11].
Join the **Open Quantum Collaboration** (https://bit.ly/ojmp-slack).
Send your contribution to mplobo@uft.edu.br.

Open Science

The **latex file** for this paper together with other *supplementary files* are available [12].

Ethical conduct of research

This original work was pre-registered under the OSF Preprints [13], please cite it accordingly [14]. This will ensure that researches are conducted with integrity and intellectual honesty at all times and by all means.

Acknowledgement

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