Quantum statistics in Bohmian trajectory gravity

T C Andersen
NSCIR, Ontario, Canada
E-mail: tandersen@nscir.ca

Abstract. The recent experimental proposals by Bose et al. and Marletto et al. (BMV) outline a way to test for the quantum nature of gravity by measuring gravitationally induced differential phase accumulation over the superposed paths of two $\sim 10^{-14}kg$ masses. These authors outline the expected outcome of these experiments for semi-classical, quantum gravity and collapse models. It is found that both semi-classical and collapse models predict a lack of entanglement in the experimental results. This work predicts the outcome of the BMV experiment in Bohmian trajectory gravity - where classical gravity is assumed to couple to the particle configuration in each Bohmian path, as opposed to semi-classical gravity where gravity couples to the expectation value of the wave function, or of quantized gravity, where the gravitational field is itself in a quantum superposition. In the case of the BMV experiment, Bohmian trajectory gravity predicts that there will quantum entanglement. This is surprising as the gravitational field is treated classically. The brief talk ends with a discussion of how Bohmian trajectory gravity can induce quantum entanglement for a non superposed gravitational field.

Note: A paper on this subject is due to be published in the Proceedings of DICE2018 in: *Journal of Physics: Conference Series H.-T. Elze, L. Diosi, L. Fronzoni, J.J. Halliwell, C. Kiefer, E. Prati and G. Vitiello (eds.)*