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Causal consistency requirements for gravity-induced entanglement in systems with internal energy

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I will present the effects of changes in internal energy on gravity-induced entanglement in interference experiments, which in principle allows for faster-than-light communication. By including a change in internal mass-energy due to photon absorption, we show that previous solutions to the thought experiment are insufficient, and we propose new requirements to save causality and complementarity. The nonrelativistic treatment of the problem is expected to neglect the effects that render the gravitational phase shift unobservable. One such effect could be that decoherence destroys the interferometric superposition at a rate that prevents the detection of the phase shift. Such a decoherence effect is expected from the created virtual quadrupole when exciting the superposed particles, and is similar to decoherence from gravitational radiation due to acceleration.

Authors: GROSSARDT, Andre (University of Trieste); VAN MANEN, Linda (Friedrich Schiller University Jena)

Presenter: VAN MANEN, Linda (Friedrich Schiller University Jena)

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