The Breakdown of Microcausality in Quantum Gravity via Purely Virtual Particles

Damiano Anselmi

Abstract:

I review the concept of purely virtual particles and their crucial role in ensuring unitarity and renormalizability in quantum gravity. I then discuss key predictions in cosmology, including the constraint $0.4 < 1000r < 3$ on the tensor-to-scalar ratio. Next, I will describe the causality violations expected at small scales and explain why they remain consistent with current experimental and observational data. Finally, I argue that imposing absolute causality in the universe is both unnecessary and incompatible with a proper approach to investigating nature.
