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(POS-79) Scalar cosmological perturbations from quantum-gravitational entanglement

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A major challenge at the interface between quantum gravity and cosmology is to understand how cosmological structures can emerge from physics at the Planck scale. In this talk, I will provide a concrete example of such an emergence process by extracting the physics of scalar and isotropic cosmological perturbations from full quantum gravity, as described by a causally complete Barrett-Crane group field theory model. From the perspective of the underlying quantum gravity theory, cosmological perturbations will be associated with (relational) nearest-neighbor two-body entanglement, providing crucial insights into the potentially purely quantum-gravitational nature of cosmological perturbations. I will also show that at low energies the emergent relational dynamics of these perturbations are perfectly consistent with those of general relativity, while at trans-Planckian scales quantum effects become important. Finally, I will comment on the implications of these quantum effects for the physics of the early universe and outline future research directions.

Keyword-1

Quantum Gravity

Keyword-2

Cosmology

Keyword-3

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