

Quantum effects in cosmological perturbation theory

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LECTURE 1:

I will review the cosmological perturbation theory. This includes canonical quantization of the graviton field on de Sitter,

which was originally done by Alexei Starobinsky [JETP Lett. 30 (1979) 682], and of scalar cosmological perturbations in inflation (Chibisov, Mukhanov 1981).

These latter perturbations are widely believed to be responsible for the observed CMB temperature fluctuations and they seed the Universe's large scale structure.

Even though tensor perturbations have not yet been observed, they are considered to be the smoking gun of inflationary cosmology.

LECTURE 2:

I will explain the problems we are facing when attempting to go beyond tree level in cosmological perturbation theory and what constitutes the problem of observables in cosmology. Next, I will outline a program on how to overcome these difficulties. In the last part of the lecture, I will quote some of the known results regarding the quantum corrections to cosmological perturbations during inflation and what are the prospects of detecting them.