



Contribution ID: 148

Type: **not specified**

New approach to cosmological perturbation theory from an effective action

Wednesday 9 September 2015 11:10 (20 minutes)

The large scale structure of the Universe will become the leading observational probe in cosmology in the near future. However, the proper analysis of structure formation at small scales requires non-linear effects to be taken into account. Straightforward attempts to do so within perturbation theory faced several problems such as the appearance of non-physical infra-red (IR) enhancements from soft modes at each given loop correction. These spurious IR - enhancements, although cancelled out upon summing over all loop corrections, complicate tremendously the analysis of physical IR - effects at higher loop order.

In my talk I will propose a new method to account for the non-linear clustering of dark matter. This method is based on the ideas of effective action, path integral and RG flow. I will show that our approach is free of spurious IR - enhancements and makes possible to resum the physical effects of long-wavelength perturbations that are crucial for the BAO peaks. I will compare our IR - resummation method to the other known techniques and test it against N-body data for the power-spectrum and the correlation function.

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Session Classification: CMB, LSS and cosmological parameters