

Some Recent Developments in Statistical Mechanical Description of Galaxy Clustering

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Cluster expansion method of statistical mechanics has proved to be a useful tool in describing gravitational galaxy clustering as a cosmological many body problem. The method yields a spatial galaxy distribution function, a generalized Poisson, in excellent agreement with observations and N-body simulation results. Some recent developments include distribution function for a multi component system, galaxy clustering as a phase transition, a rigorous derivation of the clustering parameter, distribution function for the system of galaxies for any ratio of gravitational potential to kinetic energies, studies on the critical phenomena in the cosmological many-body problem, derivation of the fundamental form of two point correlation function etc. This paper elucidates these recent developments and their implication for cosmology.

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