华侨大学系统科学研究所
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Seminar

Quantum-mechanical origin of statistical mechanics: related to hidden gauge structure

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Abstract:

Statistical mechanics is related to quantum mechanics at the root. Classical statistical mechanics has several problems such as ergodic hypothesis, Gibbs factor, necessity of Planck constant, principle of a priori probability and correspondence between classical and quantum related to temperature.

Our purpose is to find one of the argument which lead from quantum mechanics to statistical mechanics. In this research, microcanonical and canonical ensemble are derived from stationary Schrödinger equation for boson and fermion. The important aims are to realize perfect decoherence and a priori probability for isolated system. However, these require special condition for entanglement of stationary. For the sake of generation such entanglement, it is necessary to introduce interactions between the particles. The concept of classical ideal gas also includes weak interactions which disappear after carrying out thermodynamic limit. Thus, this discussion starts from determination of interaction Hamiltonian. The hidden gauge structure plays central role, here. We adopt the phase operator of special type as introduction of gauge transformation. This phase operator come into play abelian gauge field. We set coupling constant of this interaction to vanishing at thermodynamic limit. By doing this, the situation which is similar to random phase appear, moreover, perfect decoherence for isolated system and a priori probability is realized. Once the above is accomplished, it is possible that a microcanonical ensemble for isolated system is constructed. Furthermore, we constitute canonical ensemble theory from thus obtained microcanonical ensemble theory.

时间：2:30-3:30 pm, Oct. 24, 2017

地点：Room B430, Mechatronics Building
（机电信息实验大楼B430）