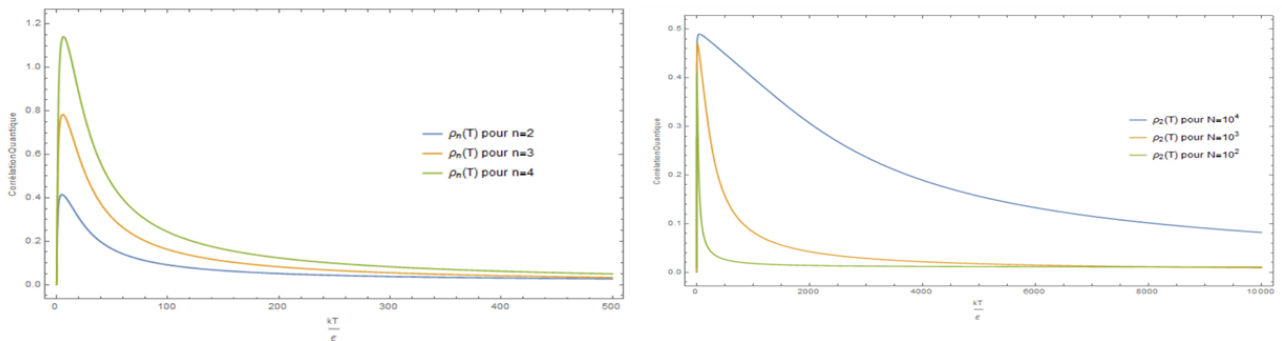


Bosonics systems in the Canonical Ensemble

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Quantum systems with infinite number of levels are difficult to treat with the canonical ensemble because of the difficulties in calculating the partition function of these systems[1]. We get to calculate the canonical partition function for these systems. We can then deduce the thermodynamic quantities such as the average energy. We have studied boson systems formed by N boson distributed over a small number of energy levels. We have considered situations where the energy levels are arbitrary and then cases where the levels are equidistant [2]. We deduced the average energy in each case. Comparing with the classical case we have given an expression of the quantum correlation for the average energy for these systems. We have plotted this correlation as a function of temperature, for different number of levels and different number of particles. We found in particular that this correlation increases with the number of levels and also with the number of particles.



References

- [1] K. Huang, *Statistical Mechanics*, John Wiley, 1987.
- [2] S.K. Mehdi, N. Daoudi, S. Kessal, *Acta Physica Polonica B*, 44, N10 (2013).