Information Theoretic Study of the Confined Harmonic Oscillator in Position, Momentum and Phase-Space HUMBERTO LAGUNA[1], ROBIN SAGAR[2], Universidad Autonoma Metropolitana Iztapalapa — The confined quantum harmonic oscillator (CHO) is an intermediate model which lies between the particle-in-a-box (PIAB), where the free particle is confined, and the quantum harmonic oscillator (HO) where the particle is not confined but is under the influence of a harmonic potential. Position and momentum space densities, and phase-space Wigner functions, are obtained for this system and analyzed using tools from information theory. Shannon entropies are used to gain insights into the localization of the particle in position, momentum and phase-space. The statistical correlation between the position and momentum of the particle is examined using the Wigner function and its mutual information. The analysis is performed as a function of the quantum number and of the box length, and the calculated quantities are compared to those of the PIAB and HO models. Our interests lie in determining similarities or differences among the different models and if there are regimes where the behavior of the CHO model more closely resembles either that of the PIAB or HO model.

[1]Departamento de Quimica
[2]Departamento de Quimica

Humberto Laguna
Universidad Autonoma Metropolitana Iztapalapa