中央大學物理學系

Department of Physics, National Central University

Prof. Tu-nan Chang 張圖南 教授

美國南加州大學物理系榮休教授
美國物理學會會士

Redshift of the isolated atomic emission line in dense plasma environment

Date: 2023/04/07 (Fri)
Venue: S4-209
Time: 10:00-12:00

Abstract:

The determination of the temperature and density of the magnetically confined high temperature dense plasma in Tokamak is of critical importance for the fusion energy generation. We have shown recently that the redshifts of the isolated emission lines of the H-like and He-like atomic ions subject to outside dense plasma environment could be estimated by carefully examining the spatial and temporal criteria of the classical Maxwell-Boltzmann statistics based on the Debye-Hückel (HD) approximation with the nucleus charge Z approximately between 6 and 18.

Qualitatively, starting from the quasi-hydrogenic picture, we are able to show that the redshifts of these emission lines could be expressed in terms of a general expression as a function of an ad hoc parameter η, i.e., reduced Debye length which, in turn, is linked directly to the ratio between the electron density and the temperature of the dense plasma. The results of our theoretically estimated redshifts are in good agreement with the most recent experimental measurements.