ABSTRACT

Electron density is one of the important parameters in nuclear fusion reactors, as it determines the extent to which the plasma can achieve sustainable fusion conditions. This study aims to obtain the results of the duration of gas filling into Thailand Tokamak-1 (Gas Puffing (GP)) and the optimal Heating Field Voltage (HFV) to obtain the highest electron density. In this study, hot plasma theory and double-fluid model are used to analyze the interaction between electrons and ions in plasma heated to high temperature. In addition, this study also examines the principles of magnetohydrodynamics (MHD) and the safety factor, namely the comparison of Torodial Field Voltage (TFV) and Vertical Field Voltage (VFV) values, to analyze the maximum electron density that can be achieved. Electron density measurements are made using the HCN interferometer laser, where the phase of the laser beam passing through the plasma will shift according to the change in refractive index which is influenced by electron density. The results of this study are when (TFV = 3400 V, VFV = 1800 V) and (TFV = 3500 V, VFV = 1900 V), the optimum GP is 20 ms; then when (TFV = 3400 V, VFV = 1900 V), the optimum GP is 21 ms. The greater the HFV value, the greater the maximum electron density value achieved. The configuration that produces the highest electron density value is TFV = 3400 V, VFV = 1900 V, HFV = 4300 V and GP = 21 ms, that is 9.15835×10^{18} m^{-3}.

***Keywords** : electron density, TFV, VFV, HFV, GP, Thailand Tokamak-1*