Abstract Submitted
for the GEC09 Meeting of
The American Physical Society

Sheath Effects on Electron Density Measurements in Frequency Shift Probe and their Application to Electron Temperature Measurements KEIJI NAKAMURA, QI ZHANG, HIDEO SUGAI, Chubu University — Technologies of plasma monitoring are important for accurate plasma control. We have developed a frequency shift probe, and the probe enables us to measure an electron density from variation of resonance frequency of the probe head similarly to the hairpin probe. A plane structure of the probe head make it possible to minimizes disturbance to the processing plasma, and the probe is applicable to a reactive polymer-deposition plasmas since the polymer has no significant effects on the resonance frequency. The electron density is usually obtained from a plasma-induced shift of the probe resonance frequency, however influences of a sheath around the probe should been considered for more precise density measurements. In this work, sheath effects on the frequency shift probe were investigated, and the frequency shift probe was applied to measure a electron temperature using the sheath effects. As the sheath thickness increased, the resonance frequency decreased, and the sheath effect is enhanced depending on probe structure. Since the sheath width is proportional to Debye length, the probe resonance frequency depends on electron density and electron temperature, suggesting that resonance frequencies obtained in two probes having different sheath dependence gives an unique solution of the density and temperature of electrons.

Keiji Nakamura
Chubu University

Date submitted: 09 Jun 2009 Electronic form version 1.4