Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Electron Temperature Measurement of Atmospheric-pressure Non-equilibrium Ar Plasma by Line Intensities with CR Model and by Continuum Emissivity HIROSHI AKATSUKA, HIROSHI ONISHI, FUMINORI YAMAZAKI, ATSUSHI NEZU, Tokyo Institute of Technology — Atmospheric-pressure non-equilibrium plasmas are being applied to various practical fields. The objective of this study is to examine their electron temperature T_e of Ar DBD plasma with several methods of optical emission spectroscopy (OES) measurements, i.e., with line-intensity measurement and with continuum emission measurement. With the help of Ar collisional-radiative (CR) model of low-temperature argon plasma of atmospheric pressure, the relationship between T_e and the excitation temperature T_{ex}(4p-5p) of 4p-5p levels is numerically surveyed over some ranges of the electron density and the gas temperature. It is found that T_e is uniquely determined with the parameter T_{ex}(4p-5p) under low T_e conditions. Consequently, T_e of the DBD plasma is estimated to be about $0.6 - 1.0$ eV. Meanwhile, T_e is also determined by the OES of continuum spectrum due to the Bremsstrahlung, where the Maxwell and Druyvesteyn electron energy distribution functions (EEDFs) are assumed for the theoretical analysis of the OES data. It is found that the latter EEDF gives reasonable results that agree well with the line-intensity OES measurement with the Ar CR model. Future possibility to find the EEDF of this kind of plasmas is briefly discussed.

Hiroshi Akatsuka
Tokyo Institute of Technology

Date submitted: 19 May 2019 Electronic form version 1.4