

Validation Activities of Spectroscopic Diagnostic Techniques in the EUV Wavelength Ranges by Laboratory Plasma Experiments

*Hirohisa Hara¹, Nozomi Ono^{2,1}, Nobuyuki Nakamura³, Naoki Numadate³, Izumi Murakami⁴

1. National Astronomical Observatory of Japan, 2. The University of Tokyo, 3. The University of Electro-Communications, 4. National Institute for Fusion Science

We report the verification activities for spectroscopic diagnostic methods in the extreme ultraviolet (EUV) range, which have been conducted through laboratory plasma experiments. Conventional methods for evaluating the electron temperature and electron density of the plasma using the emission line ratio primarily use the results from theoretical model calculations. We have been confirming the intensity ratio of emission lines used in the Hinode EUV Imaging Spectrometer (EIS) through the laboratory plasma experiments. For plasmas having the electron density of 10^9 - 10^{12} cm⁻³, an electron beam ion trap (EBIT) in which an element ionized by a high-density electron beam of controlled incident energy is trapped under a strong magnetic field is used. For the electron density of about 10^{13} cm⁻³, spectral measurements of emission lines from the fusion plasma in the NIFS Large Helical Device are used. We show the comparison between the experimental results and the model atomic spectra, and report examples of application for the solar EUV observations by EIS. We also introduce on-going research activities for the Solar-C_EUVST project, such as the preparation of an improved EBIT instrument with higher performance and verification of spectroscopic diagnostic techniques in the wide EUVST wavelength ranges.

Keywords: EUV Spectroscopy, Solar atmosphere, Plasma diagnosis