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Measurement of EUV Emission and its Plasma Parameters Generated from the Coaxial Plasma Focus of Mather and Hypocycloidal Pinched Electrodes

Sunghee Lee, Kyung Ae Lee, Young June Hong, Hansup Uhm, Eun Ha Choi

Charged Particle Beam and Plasma Laboratory/PDP Research Center, Department of Electrophysics, Kwangwoon University

The extreme ultraviolet (EUV) radiation, whose wavelength is from 120 nm down to 10 nm, and the energy from 10 eV up to 124 eV, is widely utilized such as in photoelectron spectroscopy, solar imaging, especially in lithography and soft x-ray microscopy. In this study, we have investigated the plasma diagnostics as well as the debris characteristics between the two types of dense plasma focusing devices with coaxial electrodes of Mather and hypocycloidal pinch (HCP), respectively. The EUV emission intensity, electron temperature and plasma density have been investigated in these cylindrical focused plasma along with the debris characteristics. An input voltage of 5 kV has been applied to the capacitor bank of 1.53 uF and the diode chamber has been filled with Ar gas at pressure ranged from 1 mTorr and 180 mTorr. The inner surface of the cathode was covered by polyacetal insulator. The central anode electrode has been made of tin. The wavelength of the EUV emission has been measured to be in the range of 6～16 nm by a photo-detector (AXUV-100 Zr/C, IRD). The visible emission has also been measured by the spectrometer with the wavelength range of 200～1,100 nm. The electron temperature and plasma density have been measured by the Boltzmann plot and Stark broadening methods, respectively, under the assumption of local thermodynamic equilibrium (LTE).

Keywords: Electron Temperature, EUV (Extreme Utraviolet), Focused Plasma, Debris measurement