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Thomson scattering and simulation study of electron energy distribution near the dielectric plate of a planar surface wave plasma source
A. KONO, T. OTSUKI, R. LEE, J. KOBAYASHI, M. ARAMAKI, Nagoya University — Planar surface wave plasma (SWP) is expected to be a promising plasma source producing large-area low-electron-temperatures plasma for materials processing. To clarify the electron heating mechanism in SWP, Thomson scattering measurements and Monte-Carlo simulation study are carried out. A mechanism believed to be responsible for electron heating is the existence of a thin resonance layer near or in the sheath region where the local electron plasma frequency equals the microwave frequency and hence the microwave electric field is enhanced. In the simulation, first the microwave electric field is estimated by solving the fluid equations for electron motion and then carrying out Monte-Carlo simulation in the estimated electric field to obtain the electron energy distribution. The results of simulation indicate that average energy increases near the dielectric plate as observed in Thomson scattering measurements. The electron energy distribution obtained in the simulation (with the effect of Coulomb collision included) is nearly Maxwellian and does not show a high energy hump as reported in some probe studies. (Work supported by 21st Century COE Program from MEXT Japan)

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