COMPACT ELECTRON BEAM ION TRAP FOR SPECTROSCOPY OF MULTIPLE CHARGED IONS

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Abstract. Emission lines from multiple charged ions of heavy elements are useful for diagnostics of laboratory and astronomical plasmas, such as magnetically confined fusion plasmas, solar corona. However, available spectroscopic data are still scarce. Electron beam ion trap (EBIT) can produce and trap multiple charged ions in extreme high vacuum for precise spectroscopic measurements of emission lines. In EBIT, ions produced by a mono-energetic electron beam have a narrow charge state distribution, and primary charge states can be tuned by electron beam energy under suppressed recombination with residual neutral gas. This enables charge state identification of spectra reliable, and direct comparison with spectral modeling becomes much facilitated. In this lecture, a compact EBIT (CoBIT), e.g.: see Nakamura et al. 2008, which is developed for measurements of multiple charged ions formed by electron energies of 0.1 - 1 keV, will be introduced. These energies are relevant to electron temperatures in the solar corona and edge regions of ITER plasmas. A typical electron density of CoBIT is 10^{10} cm^{-3} which lies in between densities of the solar corona and fusion plasmas. Our recent studies on emission line spectra of multiple charged ions with the CoBIT will be reviewed, e.g.: see Kobayashi et al. 2015, Kato et al. 2017, Sakaue et al. 2019.

References

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