Evaluation on Atomic Data and Collisional-Radiative Models for Spectroscopic Diagnostics and Collaboration Network in Japan

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Spectroscopic diagnostics requires an atomic model such as a collisional-radiative (CR) model with atomic data such as electron-impact excitation rate coefficients to get information on plasmas from spectra. These atomic data and models should be reliable. We have evaluated the atomic data and the CR model for some iron ions by comparing available atomic data [1] and comparing calculated spectral line intensities with laboratory measurements [2-7]. The compact electron beam ion traps (CoBITs) and the Large Helical Device (LHD) produce plasmas with different electron densities, i.e., ~10^{10}cm^{-3}, and ~10^{13}-10^{14}cm^{-3}, respectively, and are useful for evaluations. We applied the same CR model to calculate spectral intensity ratios to compare the measured ratios in the CoBITs and the LHD. This method gave us the validity of the CR model and the atomic data included in the model, and we examined Fe XIII [2, 4], Fe XIV [2], Fe XV [2], Fe XVII [6, 7], Fe XXI [3] and Fe XXII [5].

We have organized collaboration network with atomic physicists in Japan. National Institute for Fusion Science has the collaboration programs with some small budget. Using the program, we organize several collaboration projects to study, for example, some atomic data related to fusion science and applied plasmas, spectroscopy on various elements in LHD and CoBIT, spectra after ion bombardment on metals and ceramics, and so on. This program helps to organize collaboration groups and support activities in atomic physics. We also conduct international collaborations via China-Korea-Japan A3 Foresight Program, National Institutes of Natural Science (NINS) Program on International Hubs for Natural Science Research, NINS Program for Cross-Disciplinary Study, and so on, to construct researcher networks with atomic physicist and plasma physicists.

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