

Atomic and Molecular Data Activities at NIFS in 2017-2019

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NIFS has constructed and developed atomic and molecular numerical database for collision processes [1]. We report the current status of the atomic and molecular database and the development in 2017-2019. In total 822,378 data sets are stored in the databases (as of Sep. 5, 2019). AMDIS ION, one of our sub-database for electron-impact ionization cross sections, have been implemented to VAMDC [2]. Only element as a searching item works for query at the moment and further development is needed.

Various research activities related to the atomic and molecular data have been conducted. Tungsten spectra in wide wavelength region have been measured in plasmas of Large Helical Device with tungsten pellet injection. Visible M1 lines of tungsten ions were measured [3] and a collisional-radiative model with proton-impact excitation has been developed for M1 transitions. Radial profile of W^{24+} - W^{26+} ion densities were obtained using measurement by space-resolved EUV spectrometer [4]. Collisional-radiative model for tungsten ions have been developed with recombination processes [5]. Atomic structure of low charged lanthanide ions are examined for application to astrophysical plasma, “kilonova” [6-8]. The laboratory experiments by Laser Induced Break Down (LIBS) and charge exchange spectroscopy for low charged lanthanide ions have been tried to validate the theoretical calculations.

1. NIFS atomic and molecular numerical database, URL=<http://dbshino.nifs.ac.jp/>
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3. K. Fujii et al., *J. Phys. B: At. Mol. Opt. Phys.* **50**, 055004 (2017)
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6. G. Gaigalas et al., *Astrophys. J. Suppl.* **240**, 29 (2019)
7. M. Tanaka et al., arXiv:1906.08914 (2019)
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