Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

A complete dataset of copper for investigation of element abundance JIAOLONG ZENG, YANPENG LIU, JIANMIN YUAN, National University of Defense Technology — The abundance of copper plays an important role in the chemical evolution of various stars, such as giant stars and solar-type stars. Accurate determination of its abundance helps to clarify a number of problems including the quite different behavior from other Fe-peak elements both in our Galaxy and extragalactic systems and the [Cu/Fe] ratios in Galactic stars. To accurately determine the copper abundance, it is necessary to include the non-local thermodynamic equilibrium (NLTE) effects, which depend on a complete dataset of atomic data. However, the complexity of electronic structure of copper makes the accurate prediction of a complete set of atomic data difficult. For both atomic Cu and the first ionized Cu II, the energies of 3d and 4s orbitals are very close and their competition results in complex energy levels. The excitation energy of 3d orbital is very low resulting in an opening 3d atomic system which is difficult to deal with theoretically due to the strong electron correlations. We present a complete set of atomic data including the energy levels, oscillator strengths, and photoionization cross sections of Cu I for the NLTE modeling in copper abundance investigation of astrophysical objects. The calculations are performed with the R-matrix method.

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Date submitted: 11 Feb 2014 Electronic form version 1.4