Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

A generalized model of atomic processes in dense plasmas HYUN-KYUNG CHUNG, Intl Atom Energy Agcy, M. CHEN, Lawrence Livermore National Laboratory, O. CIRICOSTA, S. VINKO, J. WARK, University of Oxford, R.W. LEE, Institute for Material Dynamics at Extreme Conditions, University of California, Berkeley — A generalized model of atomic processes in plasmas, FLYCHK, has been developed over a decade to provide experimentalists fast and simple but reasonable predictions of atomic properties of plasmas. For a given plasma condition, it provides charge state distributions and spectroscopic properties, which have been extensively used for experimental design and data analysis and currently available through NIST web site. In recent years, highly transient and non-equilibrium plasmas have been created with X-ray free electron lasers (XFEL). As high intensity x-rays interact with matter, the inner-shell electrons are ionized and Auger electrons and photo electrons are generated. With time, electrons participate in the ionization processes and collisional ionization by these electrons dominates photoionization as electron density increases. To study highly complex XFEL produced plasmas, SCFLY, an extended version of FLYCHK code has been used. The code accepts the time-dependent history of x-ray energy and intensity to compute population distribution and ionization distribution self-consistently with electron temperature and density assuming an instantaneous equilibration. The model and its applications to XFEL experiments will be presented as well as its limitations.

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Date submitted: 17 Aug 2015 Electronic form version 1.4