

# On the shift of K- edge in absorption spectra of a warm dense aluminum laser- produced plasma

Yu. K. Kurilenkov

<sup>1</sup>Joint Institute for High Temperatures of Russian Academy of Sciences, 13/19  
Izhorskaya Str., 125412 Moscow, Russia ([yukurilenkov@rambler.ru](mailto:yukurilenkov@rambler.ru))

At high plasma densities the coupling effects in absorption are not recognized properly, meanwhile for moderately dense plasmas these effects are manifested still poorly [1]. Nevertheless, recent general progress in experiments represents new opportunities. For example, sophisticated data on X-ray absorption of warm dense aluminum plasma created by ultra-short laser pulse [2] allow clarifying some density effects in spectral opacity. In particular, at the present work we analyze the nature of measured at [2] absorption spectra and some consequences. In fact, besides of “transparency window” –like spectra behavior [3,4] before the edge itself, the “blue” shift of K-edge was registered at considered experiment also. Analysis of plasma absorption in terms of Kubo-Greenwood formula indicates the key role of density of final electron states (influenced by many-particle electron correlations) near the boundary of discrete and continuum states [2]. Approximately, the value of k-edge shift turns out proportional to laser intensity. Qualitatively, this kind of effects in dense laser-produced plasma spectra have been discussed earlier (see fig.1b at [4]), and may represent the non-obvious manifestation of the “shift” of density of final states due to additional (quiver-like) energy of electrons in laser field. The value of quiver energy is the order of thermal energy at experiment [2], and, correspondingly, it provides the estimated value of K-edge blue shift as ~ 10-15 eV.

1. Vitel Y , T.V.Gavrilova et al. *JQSRT*), **83** (2004) 387.
2. L.Lecherbourg, R.Shepherd, P.Audebert et al. *High Energy Density Physics* **3**(2007)175
3. Kobzev G.A.,Kurilenkov Yu.K.,Norman G.A. *High Temperature*, **15** (1977)163;  
*Transport and Optical Properties of Nonideal Plasmas*. Kobzev et al., eds.,  
Plenum Press, New York 1995.
4. Berkovsky M.A., Kurilenkov et al In: *Strongly Coupled Plasmas Physics*. Van Horn H.  
and Ichimaru S., eds., Rochester University Press, 1993, p. 2423.