

О сдвиге К – порога в спектрах поглощения плотной алюминиевой лазерной плазмы

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

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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.

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