## DOI: 10.34854/ICPAF.52.2025.1.1.133 FEATURES OF DIAGNOSTICS OF HIGH-TEMPERATURE DENSE PLASMA BY X-RAY L-SPECTRA OF MULTICHARGED IONS \*)

Pikuz S., Tikikin I., Shelkovenko T.

## P.N. Lebedev Physical Institute of Russian Academy of Sciences, pikuz@mail.ru

X-ray spectroscopy of multicharged ions is a powerful tool for studying high-temperature plasma, which, in principle, allows determining its basic parameters. The foundations of X-ray spectroscopic diagnostics were laid in the 70s - 80s of the last Century with the advent of laser plasma [1]. X-ray spectroscopic diagnostics were further developed in studies of nanosecond Zpinches and their variant with unique parameters - X-pinches [2]. The characteristic features of both sources, despite completely different heating mechanisms, are their small size, high brightness and short lifetime, which determined the creation of a new class of X-ray measuring equipment [3]. The interpretation of spectra is carried out most often on the basis of their modeling using various programs. Comparison of the experimental spectra with the calculated ones makes it possible to determine the plasma parameters. However, the selection of modeling parameters for this purpose is a difficult and time-consuming task. This is especially true for complex spectra, such as the Lspectra of multicharged ions. In this work, mainly X-ray spectra of copper in the wavelength range 6-14 Å are considered, which were modeled using the PrismSPECT program [4]. Analysis of calculated spectra (see Figure) and their comparison with experimental spectra obtained in laser plasma and X-pinch [5] showed that information about plasma parameters is reliable only when taking into account the geometric parameters of the plasma and considering all possible transitions.



This work was supported by the Russian Science Foundation, Project No. 19-79-30086-P.

## References

- V.A. Boiko, A.V. Vinogradov, S.A. Pikuz, I.Yu. Skobelev, A.Ya. Faenov, J. of Sov. Las. Res., 6, 85 (1985).
- [2]. S.A. Pikuz, T.A. Shelkovenko, D.A. Hammer, Plas. Phys. Rep, 41, 291 (2015).
- [3]. S.A. Pikuz, J.D. Douglass, T.A. Shelkovenko, D.B. Sinars, D.A. Hammer, Rev. Sci. Instr., 79, 013106 (2008).
- [4]. J.J. MacFarlane, I.E. Golovkin, P. Wang, P.R. Woodruff, N.A. Pereyra, High Energy Density Phys. 3, 181 (2007).
- [5]. I.N. Tilikin, T.A. Shelkovenko, A.A. Rupasov, A.M. Chekmarev, S.A. Pikuz, Quant. Electron., 54, in press (2024).

<sup>\*)</sup> abstracts of this report in Russian