Atomic number similarity law in inner electron shells of atoms [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.101

Shpatakovskaya G.V.

KIAM RAS, RF, Moscow, [shpagalya@yandex.ru](mailto:shpagalya@yandex.ru)

Experimental data on electron binding energies in the inner shells of natural elements [1] are analyzed using semi-classical relations for electron levels in the spherical Thomas-Fermi atom. The analysis accouns for relativistic effects and shows an atomic number similarity different from the Moseley law. Most measurements in an electron single shell processed according to the algorithm (1) form monotone dependences. The dependence examples are demonstrated in figures 1 and 2 for the *K*, *L*, *N* shells.

 (1)

Deviation from the general dependence for the *K* and *L* x-ray terms (Fig.1) [2] does not exceed 1% and so a greater deviation indicates measurement error. More complex dependencies manifest themselves in other shells, illustrating the features of transition elements (see Fig.2). In this case, deviations are also likely to indicate experimental errors.

Theoretical computation results analysis demonstrates similar patterns but in this case their violations are associated with the features of filling  and states in the transition elements.

|  |  |
| --- | --- |
|  |  |
| Fig.1 | Fig.2 |

References

1. A. Tompson et al, *X-RAY DATA BOOKLET*, Center for X-ray Optics and Advanced Light Source (Lawrence Berkeley National Laboratory, update October 2009); <http://xdb.lbl.gov/>
2. G.V. Shpatakovskaya *JETP Lett.* **108** 768 (2018)

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Lt/ru/EC-Shpatakovskaya.docx) [↑](#footnote-ref-1)