Improved numerical generalization of Bethe- Weizsacker Mass Formula by taking interaction of the electron shell and nucleus

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In this paper is presented explicit improved numerical generalization of Bethe-Weizsacker mass formulae which describes the values of measured 2654 nuclear mass in AME2012 nuclear database with accuracy less than 2 MeV, starting from the number of protons and number of neutrons .

In the obtained generalization of the Bethe-Weizsacker formula the influence of magic numbers and boundaries of their influence between them is defined for nine protons (2, 8, 14, 20, 28, 50, 82, 108, 124), ten neutrons (2, 8, 14, 20, 28, 50, 82, 124, 152, 202) and electrons (2, 10, 18, 36, 54, 86, 118) magic numbers.

The effect of dynamic and chemical polarization of electrons and nucleus are known many years and are used in medicine, chemistry, physics, etc. Interaction between electrons and shells and nucleus takes place at excitation by magnetic field and radio-frequency radiation (NMR) and at chemical reaction. Formation of the chemical compound leads to spin-spin interaction of the nucleus one to another and each nucleus with electrons. Such interaction may change lifetime of the radioactive isotopes and theoretical and experimental study of this phenomena may be very important. The first known to us experimental observation of strong dependence of the nuclear decay rate on the environment described in Th isotope. In the obtained generalization of the Bethe-Weizsacker formula the influence of magic numbers and boundaries of their influence between them is defined for nine protons (2, 8, 14, 20, 28, 50, 82, 108, 124), ten neutrons (2, 8, 14, 20, 28, 50, 82, 124, 152, 202) and electrons (2, 10, 18, 36, 54, 86, 118) magic numbers.

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