ELECTRON MASS AS THE BASE PARAMETER OF THE STANDARD MODEL

S.I. Sukhoruchkin

Petersburg Nuclear Physics Institute NRC "Kurchatov Institute" 188300 Gatchina

Analysis of nonstatistical effects in neutron resonances of heavy nuclei was presented in [1]. In Fig. 1 distribution of resonance positions of all nuclei known in the 1966 is shown. The maximum at 5.5 eV=$4\varepsilon''$ (where ε''=1.34 eV is a stable interval in ^{137}Nd spectrum) was considered in [2] as a result of the influence of the physical condensate (vacuum), which manifests itself as a radiative correction to the electron mass: $8\varepsilon'' = 11\,\mathrm{eV} = (\alpha/2\pi)^2 \times \delta$, where $\delta = 16m_e$=8.176 MeV equal to twice the pion mass difference [2].

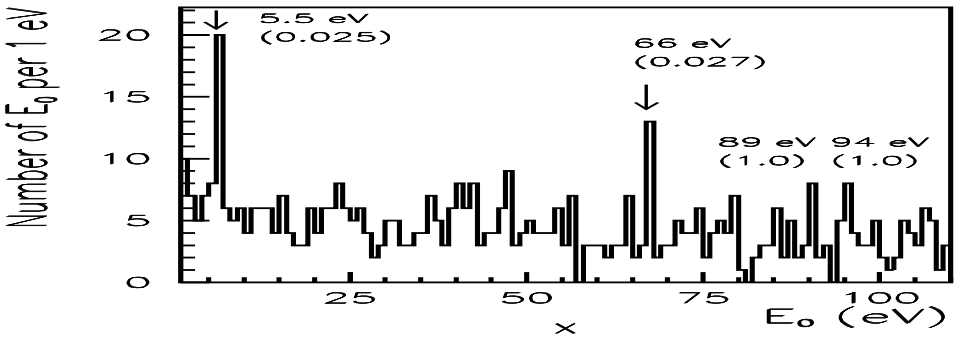

Figure 1: Distribution of resonance positions known in the 1966. The selection of one strongest resonance in the interval 10 eV was used (in parentheses is a random probability).

The pion parameters, parameters of the Constituent Quark Model and baryon masses contain an empirical discreteness parameter $16m_e = \delta$: $f_\pi = 130\,\mathrm{MeV}=16\delta$, $m_\pi = 140\,\mathrm{MeV}=17\delta$ and $\Delta M_\Delta = 147\,\mathrm{MeV}=18\delta$, $M_q = 3\Delta M_\Delta = 441\,\mathrm{MeV}=54\delta$, $M_q^\omega = 3f_\pi = 391\,\mathrm{MeV}=48\delta$ and $m_N = 115\delta$ -m_e + (1/9 or 8/9 of the nucleon mass difference). The 3:1 ratio between the electron mass m_e and the scalar boson mass times the square of the QED correction to the electron mass $M_{H^\circ}(\alpha/2\pi)^2$ is considered. It was found out that the mass of the third lepton m_τ=1777 MeV differs from the masses of two muons by exactly four M_q^ω.

A symmetry motivated approach to the problem of the particle mass spectrum was used to show the distinguishing role of the electron, its symmetry, and the radiative correction to its mass. The ratio of the electron and nucleons masses is very accurately estimated in the CODATA review. The representation of the nucleon masses in terms of the period $16m_e = \delta$ close to the doubled value of the pion β-decay allows one to check the same representation in the masses of other particles [2].

1. S.I. Sukhoruchkin, Z.N. Soroko, M.S. Sukhoruchkina. Grouping of neutron resonance positions. These abstracts.
2. S.I. Sukhoruchkin. Electron-based Constituent Quark Model. Nucl. Part. Phys. Proc. **318 - 323** (2022) 142.