NEUTRON RESONANCES IN THE GLOBAL CONSTITUENT QUARK MODEL

S.I. Sukhoruchkin, D.S. Sukhoruchkin, M.S. Sukhoruchkina

Petersburg Nuclear Physics Institute NRC "Kurchatov Institute" 188300 Gatchina

Neutron resonance spectroscopy is a part of Nuclear Physics based on the Standard Model (SM) as a theory of all interactions. We continue presentation at ISINN meetings the symmetry motivated and electron-based approach to the SM development.

The high accuracy in determining the neutron resonance energy, achieved by the time-of-flight method, allowed to consider together the problems of the mass spectrum (the distinguished character of the electron mass m_e=511 keV) and empirical correlations in nuclear data, the existence of fine and superfine structures, respectively, with periods ε' =1.2 keV and ε''=1.4 eV=5.5 eV/4, equal to the first and second QED radiative correction to the empirically found period of 1022 keV=$\varepsilon_\circ = 2m_e$ in few-particle excitations and binding energies. Recently observed correlations in the particle mass spectrum (with parameters $\delta = 16m_e$ and $M_q = 54\delta$) are given in Figure.

In these works, we consider additional empirical observation of the particle mass spectrum and nuclear data, including the important role of neutron resonance data in confirming the QED correction, which are used for the further SM development. We show that the masses of the fundamental fields $M_Z = m_\mu(\alpha/2\pi)^{-1}$ and $M_{H^\circ} = m_e/3(\alpha/2\pi)^{-2}$, as well as the main parameter of the ECQM and NRCQM models, $M_q = m_e(\alpha/2\pi)^{-1}$, are interconnected by symmetry motivated relations and the common QED correction, which can be investigated within neutron resonance spectroscopy.

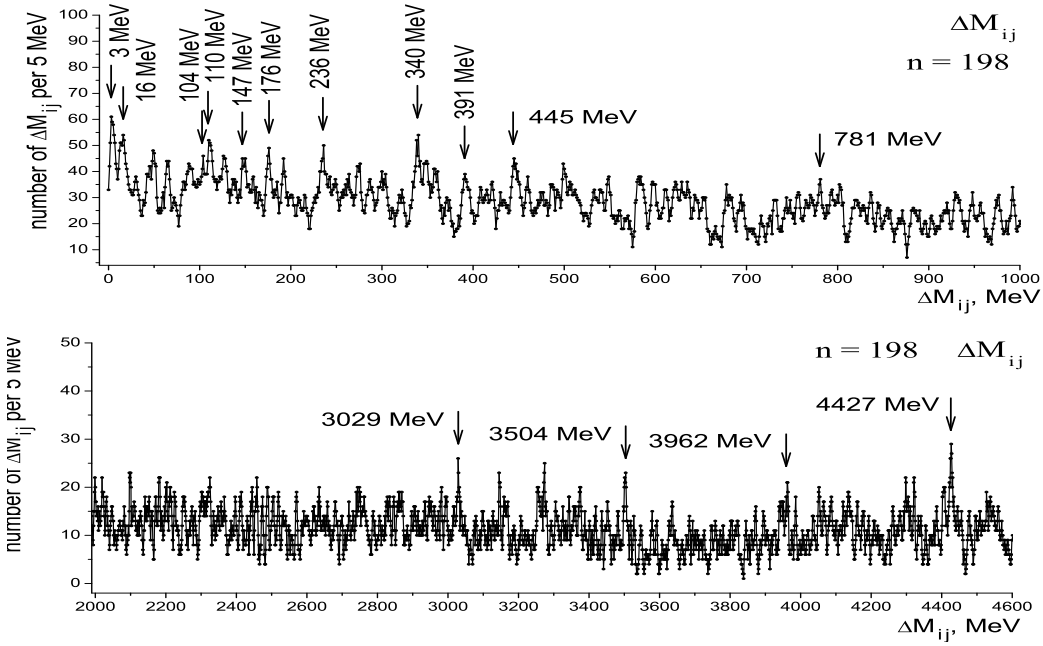

Figure. *Top:* ΔM distribution of all differences between particle masses from compilation PDG-2020 (interval of the averaging 5 MeV) for the energy region 0–1000 MeV. Maxima at 16 MeV= $2\delta = 2 \times 16m_e$, 391 MeV=$m_\omega/2$, 445 MeV=M_q, 781 MeV=m_ω are considered in text. *Bottom:* The same for energy region 2000–4600 MeV. Maxima are at 3504 MeV$\approx 8M_q = \delta^\circ/2$, 3962 MeV$\approx 9M_q$ and 4427 MeV$\approx 10M_q$.