ENERGY LEVELS OF COLLECTIVE STATES IN EVEN-EVEN NUCLEI WITH QUADRUPOLE AND OCTUPOLE DEFORMATIONS

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The analytical expressions for energy levels, reduced probabilities of the E2-transitions inside levels of positive and negative parities and the E1-transitions between contrary parities of deformable axial-symmetrical even-even nuclei with quadrupole and octupole deformations for potential energy of the surface vibrations

$$V = \frac{V_0}{\sigma^2}(\sigma - \sigma_0)^2$$

are obtained. Here $\sigma^2 = \frac{B_2\beta_2^2}{B_2 + B_3} + \frac{B_3\beta_3^2}{B_2 + B_3}$ and B_2, B_3 – mass parameters for quadrupole and octupole deformations, V_0 and σ_0 – parameters of the potential energy.

The ratio energy of levels with positive parities of ground bands are determined by parameter Δ_ν^+, and with negative parities of octupole bands are determined by two parameters Δ_ν^+ and Δ_ν^-, where $\Delta_\nu^+ < \Delta_\nu^-$ is always fulfilled. The reduced probabilities of E2-transitions are determined by parameters Δ_ν^+ or Δ_ν^-, and E1-transitions are determined by two parameters $\Delta_\nu^+, \Delta_\nu^-$, also E1-transitions direct proportional to polarization electric dipole moment (PEDM) D_0 and inversely proportional to inside quadrupole moment Q_0.

At theoretical calculations of the energy levels the quantum number of vibrations is not integer number, but is a solution of the transcendental equation. At calculations of the reduced probabilities of E2 and E1-transitions it is an integer number. These calculations show, which of these theoretical model satisfactorily describes the energy levels, reduced probabilities of E2 and E1-transitions of deformable axial-symmetries even-even nuclei, including high spin states.

NUCLEAR SPIN STATES AND QUANTUM LOGICAL OPERATIONS

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To build a really functional quantum computer, researchers need to develop logical controllers known as "gates" to control the state of q-bits.

In this work , equal quantum logical operations are examined with the emphasis on 1-, 2-, and 3-q-bit gates.1-q-bit quantum logical operations result in Boolean "NOT"; the "NOT" and "$\sqrt{\ }$ NOT" operations are described from the classical and quantum perspective. For the "NOT" operation to be performed, there must be a means to switch the state of q-bits from <0> to <1>

and vice versa. For this purpose either a light or radio pulse of a certain frequency can be used. If the nucleus has the spin-down <0> state, the spin will absorb a portion of energy from electromagnetic current and switch into the spin-up <1> state, and the radio pulse will force it to switch into <0> state. An operation thus described from purely classical perspective is clearly understood. However, operations not analogous to the classical type may also be performed. If the above mentioned radio pulses are only half the frequency required to cause a state switch in the nuclear spin, the nuclear spin will enter the quantum superposition state of the ground state (↓) and excited states (↑). A recurring radio pulse will then result in an operation equivalent to "NOT", for which reason the described operation is called "$\sqrt{\ }$ NOT". Such an operation allows for the state of quantum superposition in quantum computing, which enables parallel processing of several numbers.

The work also treats the principles of 2-q-bit logical operations of the controlled "NOT" type (CNOT), 2-q-bit (SWAP), and the 3-q-bit "TAFFOLI" gate.

ELASTIC DIFFRACTION INTERACTIONS OF HADRONS AT HIGH ENERGIES

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1. The diffraction theory of elastic and inelastic scattering of hadron-hadron and hadron-nucleus processes is developed. The description of experimental data on differential cross section of elastic scattering p p, $\overline{p}$ p in wide range of transferred momentum is made in the frames of the developed inelastic overlap function model. The investigation of nuclei elastic scattering at the low, middle and high energies is carried out, that allowed to execute quantitative control of efficiency or quantum-field and phenomenological theories and make critical analysis of their utility. The principle of construction of realistic amplitudes of the elastic scattering is confirmed on the basic of the s- and t-channel approaches both conditions stationary of amplitudes. For a wide range of models the comparative analysis of amplitude of inelastic scattering in representation of impact parameter is executed. The expression for effective radius of interaction, effective trajectory Regge and slope of inelastic function of overlapping are analysed. In diffraction approximation the satisfactory description of the data on hadrons interaction at the energy of tens GeV with proton and deuterons is received. The features of spectra of fast particles are analysed. The theory of collective variables S, T, P which characterize a deviation degree of angular distribution of particles from spherical symmetry, the general formula for dispersion of any density of obtained, the particles decays are investigated.[1-2]

2. The solution of Lippman-Schwinger equation investigated within the frameworks of frameworks of high –energy approximation satisfies the generalized Huygens principle used in