**Dynamic Ferroelectricity of Trojan Matter on Regular Lattices**

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**Abstract**

Some time ago we have discovered that the mutual interaction between the core electron in the Helium atom in a tiny so called elliptical state being the quantum analog of the elliptical Kepler orbit with the outer electron in the Trojan Wave Packet states is capable to maintain the dynamical polarization of the atom potentially eternally if small radiative friction effects are first neglected [1]. Such atom therefore as possessing a giant time dependent permanent dipole moment implements the dynamically ferroelectric Rutherford atom.

We discover that several types of regular two dimensional lattices like square, Honeycomb or face centered Honeycomb lattices are also capable to support stable ferroelectric or anti-ferroelectric ordering of rotating dipole moments by a strong short-range dipole interactions collectively generating a local Circularly Polarized electromagnetic fields self-consistently supporting Trojan or anti-Trojan Wave Packets.

Several parallel layers of such 2D lattices either with atoms perpendicularly aligned or symmetrically space shifted between the neighboring parallel layers like in case of the face centered (FCC) cubic lattice building the three dimensional lattices are also capable to maintain the ferroelectric or anti-ferroelectric order of all atoms coherently carrying circulating persistent currents in the Trojan Wave Packet or the anti-Trojan state.

We solve the system of the time-dependent Hartree equations within the nearest-neighbors Bethe-Peierls-Weiss approximation [2].

We obtain the following effective Gross-Pitaevskii-like equation for any lattice node



where the summation is made over , either the nearest neighbors positions within a single lattice or nearest neighbors within the parallel lattices surrounding a given Trojan atom.

***Keywords:*** *Quantum Mechanics, Strong Laser Fields, Trojan Wave Packets, Quantum Dots, Quantum State Engineering, Quantum Control, Dynamic Ferroelectricity*

**References**

[1] M. Kalinski, J. H. Eberly, J. A. West and C. R. Stroud, Jr., “Rutherford Atom in Quantum Theory”, Phys. Rev. A 67, 032503 (2003).

[2] P. R. Weiss , “The Application of the Bethe-Peierls method to Ferromagnetism”, Phys. Rev. 74, 1493 (1948).

**Biography**

**Matt Kalinski** (born 1968) is US theoretical physicist who discovered Trojan wave packets, squeezed, coherent and intrinsically coordinate-entangled states of electrons in true atoms solving the long standing problem of interstellar rocket propulsion by extending the positron or positronium lifetime and control the arbitrary slowdown of the recombination process of antimatter in positronic rocket engine. Kalinski earned his PhD from the University of Rochester. The broad applications of his discovery of coherent non-dispersing electrons are important and not limited to photonic superconductivity, laser centrifugal isotope separation of Deuterium, detection of ultra-weak magnetic fields with Aharonov-Bohm effect and Berry’s phase, observation of Unruh-Davies effect as well as the detection of gravitoelectromagnetic force and precise engineering of complex quantum dot systems.