

Abstract Submitted
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Self-sustained Trojan Wave Packets on the Honeycomb Lattice

MATT KALINSKI, Utah State University — We have recently showed that counterintuitively to Earnshaw’s theorem of electrostatics the stable configurations of quantum charges may exist in rotating frame forming so called Rutherford atom without any external field support [1] when the single localized semi-classical electron is orbiting tiny core consisting of the nucleus and the second electron which is in elliptical charge state. Here we show the existence of dynamic ferroelectric Rydberg matter when all hydrogen atoms are placed symmetrically on the honeycomb lattice and because of the nonvanishing local field from the nearest neighbors they sustain each other without the external field. This is in the analogy to ferromagnetic phase transition within Bethe-Peierls-Weiss theory. Because the local field due to the nearest dipole rotation is none stationary also in strength in the selected lattice center the whole structure is shape-breathing around the static dipole average. We present both the time-averaged mean-field theory as well as we conduct the numerical simulations using the time-dependent Hartree equation with the effective self interaction.

[1] M. Kalinski, J. H. Eberly, J. A. West, and C. R. Stroud, Jr., “Rutherford atom in quantum theory,” *Phys. Rev. A* 67, 032503 (2005).

Matt Kalinski
Utah State University

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