

# APPLICATION OF THE REAL CLIFFORD AND SO(8) ALGEBRAS TO THE INVESTIGATION OF THE HIDDEN PROPERTIES OF THE DIRAC EQUATION

V. M. Simulik<sup>1</sup> and I. O. Gordievich<sup>2</sup>

<sup>1</sup>Institute of Electron Physics of NAS of Ukraine, Uzhgorod,  
Ukraine

<sup>2</sup>MIRTEK Ltd, Stavropol, Russia

*vsimulik@gmail.com, penetrator.born@gmail.com*

The 64-dimensional representations of the Clifford algebras  $C\ell^{\mathbb{R}}(4,2)$  and  $C\ell^{\mathbb{R}}(0,6)$  in the terms of Dirac  $\gamma$  matrices are considered. The gamma matrix representation of 28-dimensional SO(8) algebra, which contains the standard and additional spin operators, is under consideration as well. The SO(8) and Clifford algebras are determined as the algebras over the field of real numbers. The relationships between the suggested representations of the SO(8) and Clifford algebras are investigated.

The role of matrix representations of such algebras in the quantum field theory is discussed. The investigation of the hidden properties of the Dirac equation is started. The hidden Bose symmetries, solutions of the free Dirac equations and the Bose conservation laws for the free spinor field are found. The hidden symmetries of the Dirac equation in the external Coulomb field are found as well.

The preliminary consideration of the subject can be found in the articles [1–4].

1. Simulik V. M., Krivsky I. Yu. Bosonic symmetries of the Dirac equation. *Phys. Lett. A*, 2011, 375, 2479–2483.
2. Simulik V. M., Krivsky I. Yu., Lamer I. L. Bosonic symmetries, solutions and conservation laws for the Dirac equation with nonzero mass. *Ukr. J. Phys.*, 2013, 58, 523–533.
3. Simulik V. M. On the gamma matrix representations of SO(8) and Clifford algebras. *Adv. Appl. Clifford Algebras*, 2018, 28, 93(1–15).
4. Simulik V. M. On the hidden symmetries of relativistic hydrogen atom. arXiv: 1906.07018 [math-ph] 14 Jun 2019, 11 p.