Reply to 'Comment on 'Kepler problem in Dirac theory for a particle with position-dependent mass''

2005 J. Phys. A: Math. Gen. 38 6859

(http://iopscience.iop.org/0305-4470/38/30/N02)

INSTITUTE OF PHYSICS PUBLISHING JOURNAL OF PHYSICS A: MATHEMATICAL AND GENERAL

J. Phys. A: Math. Gen. **38** (2005) 6859 doi:10.1088/0305-4470/38/30/N02

REPLY TO COMMENT

Reply to 'Comments on 'Kepler problem in Dirac theory for a particle with position-dependent mass"

I O Vakarchuk

Department for Theoretical Physics, Ivan Franko National University of Lviv, 12 Drahomanov Street, Lviv UA-79005, Ukraine

E-mail: chair@ktf.franko.lviv.ua

Received 6 June 2005
Published 13 July 2005
Online at stacks.iop.org/JPhysA/38/6859

PACS numbers: 03.65.Fd, 03.65.Pm

It is obvious that the first two items are multiplied by 4×4 unit matrices, which are dropped for simplicity. We hope that, as is usual, this does not cause any misunderstanding. For instance, in the kinetic term of the Pauli equation the unit 2×2 matrix is not traditionally written explicitly although the second term describing the interaction of spin with the magnetic field contains Pauli matrices and is a 2×2 matrix.

Equation (2.9) is not an original Schrödinger equation, but it has the form of the Schrödinger equation. As an example, one can refer to well-known works in which the spin–orbital interactions (containing spin operators) are taken into account within the Schrödinger equation.

It is clear that the operator in square brackets in equation (3.1) depends also on the internal degrees of freedom (spin) and on the angular variables. Our statement that this operator depends only on angular variables was meant to stress the possibility to separate the angular variables and the radial one. The statement was written only in this context.

Equation (3.5) formally does coincide with the non-relativistic radial Schrödinger equation with the Coulomb field, although l^*, E^* have different sense and this is well discussed in our work. An effective quantum number l^* is widely used in textbooks (see, e.g., *Quantum Mechanics* by Landau and Lifshitz, problem in the section *Motion in the Coulomb Field*).

Acknowledgment

I would like to thank A S de Castro for the comments.