Problem of Self-adjoint extension of the Landau levels

Teimuraz Nadareishvili [a,b]

Anzor Khelashvili [b]

e-mail: teimuraz.nadareishvili@tsu.ge

[a] Faculty of Exact and Natural Sciences, Ivane Javakhishvili Tbilisi State University, I.Chavchavadze av 3, Tbilisi

[b] High Energy Institute of TSU, University st 9, Tbilisi

In three dimensions we show that there appear additional solutions in the Shrodinger equation for inverse square type potentials at the origin[1-2]. These solutions obey to all requirements of quantum mechanical general principles (the time independence of the norm, ortogonallity and so on) and so it is necessary to perform Self-adjoint extension procedure.

In this talk the same problem is considered for axial symmetric potentials and is investigated in which cases is necessary to consider additional solutions. As an example it is shown, that in a uniform magnetic field it is necessary to preserve additional solutions in the Shrodinger equation and is performed Self-adjoint extension procedure for Landau levels for $m = 0$ magnetic quantum number. In this case is generalized formula for Landau levels, in which in additive form exists term which depends on the Self-adjoint parameter. It is also studied problem of ortogonallity of the wave functions

References

[1] A.Khelashvili and T.Nadareishvili. Am.J.Phys. 79,668 (2011).

[2]   A.Khelashvili and T.Nadareishvili. Physics of Particles and Nuclei Letters.Vol.12.No 1,pp 11-25 (2015).