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Rashba and Dresselhaus spin-orbit coupling effects on the conduction electron Landé g fator in a 2D cylindrical GaAs quantum dot under an axis-parallel applied magnetic field

J. C. González-Henao[(1)*], J. C. Granada E.[(1)]

(1) Departamento de Física, Universidad del Valle, Cali, Colombia, A.A. 25360, fisiloc@hotmail.com
* Corresponding author.

Abstract –

We have performed a theoretical study of the Rashba and Dresselhaus spin-orbit coupling effects on the Landé g factor in a cylindrical GaAs quantum dot under a magnetic field applied parallel to the symmetry axis. We consider the quantum dot as a 2D cylindrical pillbox of GaAs material surrounded by vacuum. In our calculations we use a linear combination of the Kummer confluent hipergeometric functions as a solution of the Dirac equation. Our results are presented as a function of the strengths of the Rashba and Dresselhaus spin-orbit coupling, for different radius of the cylindrical pillbox and by changing the strength of the applied magnetic field. Present calculations are in good agreement with previous theoretical results in the limit corresponding to the geometry of quantum wells.

Table 1. system parameters

Magnitude	Valor
Effective mass of the electron	$5.46*10^{-32}$ Kg
λ_R	3meVnm
λ_D	3meVnm

The following curves were made for the fundamental state

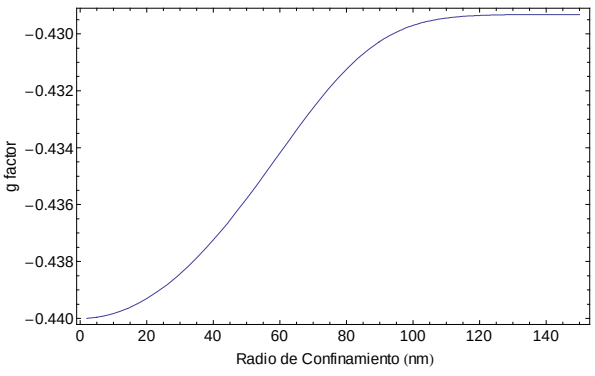

Figure 1:g factor in terms of the radius of confinement for values shown in table 1

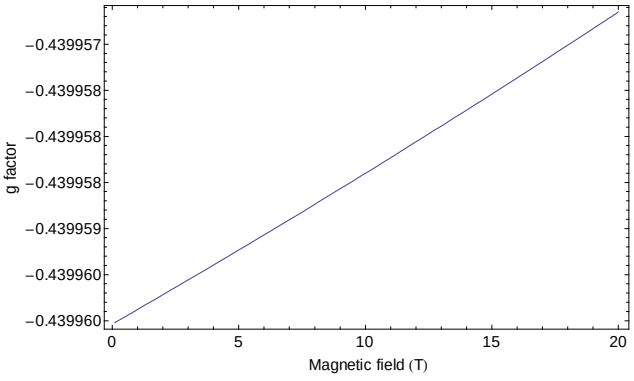

Figure 2: g factor in terms of the magnitude of the field for values shown in table 1

References

[1] E. Lipparini. Spin-orbit effects in GaAs quantum wells: Interplay between Rashba, Dresselhaus, and Zeeman interactions PHYSICAL REVIEW B 74, 115303,2006

[2] N. Porras-Montenegro, C. A. Perdomo-Leiva, E. Reyes-G´omez, H. S. Brandi, L. E. Oliveira, Microelectronics Journal (to be published) xxxx, xxxx(2007).