



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 2177

Type: Oral (Non-Student) / Orale (non-étudiant(e))

An Analytic Approach for the Energy Eigenvalues Solutions in a Double-Well Potential

Tuesday 12 June 2018 08:00 (15 minutes)

Studies on scattering of longitudinally and transversely incident beam of electrons by hollow cylindrical potential and coaxial cylindrical potentials have shown the presence of quasi bound “whispering” modes [1,2]. The realization of Levinson’s theorem [3,4] has been studied for some scattering potentials and results are widely available.

Roberts and Valluri [5] presented a geometric analytic technique, which utilizes conformal mapping $W \rightarrow Z = We^W$ between two complex domains to solve the 1-dimensional finite square well potential. The symmetry of the hollow cylindrical potential can be used to solve the Schrodinger equation as a 1-dimensional finite square well potential in the radial direction. This leads to the possible generalization to a concentric double walled cylindrical potential by considering it as a double well finite potential in the radial direction. The number of bound states of such a potential can be counted using the Lambert W formalism, as it is a geometric method, and the relation to the scattering phase shift can be established.

References:

- 1) Vivishek Sudhir and P. C. Deshmukh
Scattering of electrons off hollow cylindrical potentials
J. Comput. Theor. Nanosci. 7, 2036 (2010)
- 2) Vivishek Sudhir and P. C. Deshmukh
Scattering of electrons by multi-walled cylindrical potentials
J. Comput. Theor. Nanosci. 8, 2321 - 2326 (2011)
- 3) N. Levinson
On the uniqueness of the potential in a Schrodinger equation for a given asymptotic phase
Danske Vid. Selsk. Mat.-Fys. Medd. 25:9 (1949)
- 4) C.J. Joachain
Quantum Collision Theory
North Holland, Amsterdam (1975)
- 5) Roberts and S.R. Valluri
The quantum finite square well and the Lambert W Function
Can. J. Phys. 95: 105-110 (2017)

Authors: Prof. VALLURI, Sree Ram (University of Western Ontario); Dr ROBERTS, Ken (University of Western Ontario); Dr DESHMUKH, Pranawa (Indian Institute of Technology, Tirupati); Mr NAROLA, Harsh (Indian Institute of Science Education Research, Tirupati.); Dr SCOTT, Rob (University of Brest); Dr BASU, Shantanu (University of Western Ontario)

Presenter: Prof. VALLURI, Sree Ram (University of Western Ontario)

Session Classification: T1-4 Mathematical Physics (DTP) | Physique mathématique (DPT)

Track Classification: Theoretical Physics / Physique théorique (DTP-DPT)