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

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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->Z=WeˆW 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:

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Quantum Collision Theory
North Holland, Amsterdam (1975)

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