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Siegert's curse and redemption: Taming and domesticating divergent wave functions

Metastable states of quantum systems can be evaluated as complex-valued eigen solutions of the time-independent Schrődinger equation if complex boundary conditions are applied. Such resonance boundary conditions have been formulated in the early days of quantum mechanics but, initially few calculations have been performed utilizing this concept because the corresponding wave functions diverge asymptotically. Subsequent advances in the computation of energies and widths of metastable states will be discussed when Siegert boundary conditions are applied to achieve the necessary analytic continuation onto the complex energy plane as well as schemes to sidestep the divergences altogether. Examples including potential resonances and multiply excited electronic states of atoms and ions illustrate the wide applicability of this approach.

Biography

Peter Winkler has obtained his Dr. rer.nat. degree (PhD) in Nuclear Physics and later his Dr. rer. nat. habil. degree from the University Erlangen in Germany. In 1979, he joined the Physics Department of the University of Nevada at Reno for teaching and research. His research interests focused on atomic many-body theory. He obtained tenure in 1985 and became Emeritus Professor in 2013 after having directed 12 students in their dissertation research. He is a Fellow of the American Physical Society.

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