Landau-Zener Transitions, Hawking Radiation and Number Theory

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Landau–Zener-transitions are an essential tool in atom optics, and in particular, in accelerated optical lattices. It is amazing that despite its simplicity, the derivation of the well-known Landau-Zener-formula for the transition probability amplitude is rather involved, independent of the approach pursued. In the present talk, we employ the Markov approximation and the well-known Fresnel-integral to derive [1] in ''one-line" the familiar expression for the Landau-Zener-formula. Moreover, we provide numerical as well as analytical justifications for our approach, and identify three characteristic motions of the probability amplitude in the complex plane. In addition, we make the connection to Hawking radiation [2] and number theory, in particular, the Riemann hypothesis [3].

References

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