

Computational Quantum Physics – Exercise 1

Problem 1 *Solve the one dimensional quantum scattering problem of a particle on a potential barrier using the Numerov algorithm.*

Proceed as described in the lecture notes in section 3.1.2. You can use a constant potential ($V = 1$) in the interval $[0, a]$.

Observe the tunneling effect for energies $E \in [0, V]$, where the transmission probability $T = 1/|A|^2$ is non-vanishing.

Plot T versus the barrier width a and observe the exponential decay.

This dependency $T(a)$ plays a crucial role for the realization of the scanning tunneling microscope (STM). (Review of Modern Physics 59, 615 (1987). Nobel prize 1986).