

Time dependent perturbation theory in matrix mechanics and time averaging

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Abstract

The time-dependent quantum perturbation theory developed by Born, Heisenberg and Jordan in 1926 is revisited. We show that it not only reproduces the standard theory formulated in the interaction picture, but also allows one to construct more accurate approximations if time averaging techniques are employed. The theory can be rendered unitary even if the expansion is truncated by using a transformation previously suggested by Heisenberg. We illustrate the main features of the procedure on a simple example which clearly shows its advantages in comparison with the standard perturbation theory of quantum mechanics.