

Übungsaufgaben Serie 9

(bitte zur 13. Übung am 19.01.2015 die Ergebnisse mitbringen, auch zum Vorrechnen und Zeigen an der Tafel)

Home work related to Chapter Master Equation

AUFGABEN:

1. Consider the one-step decay process in a finite system $n = 0, 1, \dots, N$ with closed boundaries. Write down the set of master equations for the unknown quantities $p(n, t)$ including initial condition.
2. Specify the transition rate $w_-(n)$ as a constant for the dissolution of a traffic jam of size n . Solve the three-level system $n = 0, 1, 2$ exactly. The initial probability distribution is $p(n, t = 0) = \delta_{n, n_0=2}$. The delta-function means that at the beginning the vehicular queue consists of exactly $n_0 = 2$ cars.
3. Specify the transition rate $w_-(n)$ as a linear dependence for the decay of a (atomic or molecular) cluster of size n . Solve the three-level system $n = 0, 1, 2$ exactly. The initial probability distribution is $p(n, t = 0) = \delta_{n, n_0=2}$. The delta-function means that at the beginning the cluster consists of exactly $n_0 = 2$ monomers.
4. Compare both processes by computing the probability distribution functions $p(n, t)$. Show the differences by calculating the mean $\langle n \rangle(t)$ and variance $\langle \langle n \rangle \rangle = \langle (n - \langle n \rangle)^2 \rangle = \langle n^2 \rangle - \langle n \rangle^2$ for both processes.