

# Complexity function of jammed configurations of Rydberg atoms\*

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## Abstract

In this article, we determine the complexity function (configurational entropy) of jammed configurations of Rydberg atoms on a one-dimensional lattice. Our method consists of providing asymptotics for the number of jammed configurations determined by direct combinatorial reasoning. In this way we reduce the computation of complexity to solving a constrained optimization problem for the Shannon's entropy function. We show that the complexity can be expressed explicitly in terms of the root of a certain polynomial of degree  $b$ , where  $b$  is the so-called blockade range of a Rydberg atom. Our results are put in a relation with the model of irreversible deposition of  $k$ -mers on a one-dimensional lattice.

*Keywords:* Dynamic lattice systems, equilibrium lattice systems, complexity function, configurational entropy, jammed configuration, maximal packing, Rydberg atoms.

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# Kompleksnostna funkcija zataknjenih konfiguracij Rydbergovih atomov\*

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## Povzetek

V tem članku določimo kompleksnosto funkcijo (konfiguracijsko entropijo) zataknjenih konfiguracij Rydbergovih atomov na enodimenzionalni mreži. Naša metoda sestoji iz določitve asimptotike za število zataknjenih konfiguracij, ki jo določimo z neposrednim kombinatoričnim sklepanjem. Na ta način reduciramo računanje kompleksnosti na reševanje omejenega optimizacijskega problema za Shannonovo entropijsko funkcijo. Pokažemo, da se da kompleksnost izraziti eksplicitno v smislu ničel določenega polinoma stopnje  $b$ , kjer je  $b$  t.i. razpon blokade Rydbergovega atoma. Naši rezultati so postavljeni v zvezo z modelom nereverzibilnega odlaganja  $k$ -merov na enodimenzionalni mreži.

*Ključne besede: Dinamični mrežni sistemi, ravnovesni mrežni sistemi, kompleksnostna funkcija, konfiguracijska entropija, zataknjena konfiguracija, maksimalno pakiranje, Rydbergovi atomi.*

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