II Coloquio

Premio Rubio de Francia

Rapid mixing in dissipative many-body quantum systems

Angelo Lucia

California Institute of Technology, USA

Premio Rubio de Francia 2017

Viernes 5 de octubre de 2018, 11:30

Seminario del Departamento de Matemáticas, aula C-17-520

Facultad de Ciencias, U. Autónoma de Madrid

Resumen. The evolution of non-isolated quantum systems which interact weakly with an environment can be described by a semigroup of trace-preserving completely positive maps, an approach known as Markovian approximation. In this talk I will consider the case of many quantum particles arranged on a lattice, when the evolution converges to a unique steady state. A very natural quantity to study in this setting is the so-called mixing time, i.e. the time it takes for any initial state to reach a neighborhood of the fixed point. In particular, I will discuss the scaling of the mixing time as a function of the number of particles. If the mixing time scales sub-linearly, we will call the evolution rapidly mixing.

I will show that in the rapid mixing regime a number of very interesting properties of the system can be obtained. First of all, the evolution is stable, in the appropriate sense, under weak but extensive perturbations. Secondarily, the unique fixed point of the evolution has only short-ranged correlations, and it satisfies an area law for the mutual information. I will also comment on how the spectrum of the generator of the evolution does not contain enough information to determine whether a given system is rapidly mixing, and how one can use a quantum version of the log-Sobolev inequality to show it instead.

El conferenciante. Angelo Lucia (Scafati (SA) Italy), ganador del Premio José Luis Rubio de Francia 2017, es Doctor en Matemáticas por la U. Complutense de Madrid. Recibió en 2017 el Premio Vicent Caselles de investigación matemática de la RSME y la Fundación BBVA.

Una vez finalizada su tesis doctoral en 2016 bajo la dirección de David Pérez García y Toby S. Cubitt, realizó una estancia posdoctoral en la University de Copenhagen. Actualmente es Sherman Fairchild Fellow en el California Institute of Technology, USA. Su campo de investigación está relacionado con sistemas cuánticos y la teoría cuántica de la información.