IST AUSTRIA
Institute of Science and Technology

4th year colloquium

Quantum angular momentum — from molecules to ultrafast magnetism

Mikhail Lemeshko (IST Austria)

Host: Robert Seiringer

Angular momentum is a property inherent to a plethora of everyday phenomena, from spinning top toys to curved football trajectories to rotating planets and galaxies.

In the microscopic world governed by quantum mechanics, rotations are described by non-commuting operators. This makes the angular momentum theory extremely involved even for very small systems, such as a molecule, an atom, or an atomic nucleus.

Furthermore, in most experiments the behavior of quantum particles is inevitably altered by a many-body environment of some kind. Just to name a few examples, molecular rotation — and therefore reactivity — depends on the presence of a solvent, and electronic angular momentum in solids – the quantum bit of some of the future quantum computers – is coupled to crystal lattice vibrations. If approached in a brute-force fashion, understanding angular momentum in such systems is an impossible task, since a macroscopic (~10^{23}) number of particles is involved.

In my talk I will present a novel technique to deal with angular momentum in quantum many-body systems, based on the concept of “angulon” quasiparticles. These new quasiparticles were theoretically proposed by our group a few years ago, and were later shown to exist in experiments on molecules rotating in superfluid helium.

I will tell you about the peculiar physics of angulons and their potential applications, both to chemical processes involving molecules, as well as to understanding ultrafast magnetic processes required to design next generation memory registers and switches.

Friday, November 9, 2018 10:00am - 11:00am

IST Austria Campus Raiffeisen Lecture Hall

This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage: http://ist.ac.at/fileadmin/user_upload/pdfs/IST_shuttle_bus.pdf The IST Shuttle bus is marked IST Shuttle (#142) and has the Institute Logo printed on the side.