東北大学　宇宙創成物理学国際共同大学院プログラム

GP-PU (Graduate Program on Physics for the Universe）Seminar

“Quantum tunneling and dissipation in heavy-ion fusion reactions”

by Masaaki Tokieda (INRIA)

Time and Date: 16:00-18:00, October 12th, 2022

Registration: https://us02web.zoom.us/meeting/register/tZ0odu-vrzIqHd1PUjiLCF-O48WBoimat7ae

- Abstract

Heavy-ion fusion reactions transmute one chemical element into another and understanding their physics helps answer various fundamental questions, such as how the chemical elements in the universe are created and how far we can go in the periodic table.
In order to understand the dynamics of heavy-ion fusion reactions, there are at least two ingredients that must be considered.
One is quantum tunneling, as heavy-ion fusion reactions take place only through quantum tunneling at low incident energies because of the repulsive Coulomb force.
The other is the internal excitations during the process. Atomic nuclei have various types of internal modes and their excitations cause a huge difference in the reaction rate.
When many nucleons are involved in the reaction, these excitations lead to dissipation of the kinetic energy. It is similar to an everyday-life situation where a moving object loses its kinetic energy due to friction.
In this talk, I will discuss the effects of internal excitations, particularly energy dissipation, on the dynamics of heavy-ion fusion reactions.
By applying a quantum dissipation model to a fusion problem, I will explain why nuclear fusion is a unique and interesting playground to study dissipative quantum tunneling.

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