DESCRIPTION FOR GENERAL PUBLIC

Exciton-polaritons (or just polaritons) are half-light half-matter quantum particles being a result of intense light-matter interaction. They are generated in properly designed artificial structures called microcavities, where photons (particles of light) bouncing between two mirrors can interact strongly with the matter component, electron-hole pair from a semiconductor crystal (called also an exciton). These quasiparticles have peculiar property - they can all exist under some circumstances in the same quantum state, which can be macroscopically occupied, forming a condensate. This new state of matter has many fascinating properties that cause direct implications to interactions in the quantum world in the macroscopic level and thus attracts considerable attention through many years of research. Although, some properties of such condensates are known, many of them are still under hot debate. Solving these issues may allow not only for better understanding of interactions in a solid state system on a quantum level, but can also open a route for strategies to design new devices surpassing any of the existing ones, where their operation principle employs the properties of the condensate.

Within the framework of the project macroscopic condensates of abovementioned quasi-particles will be investigated, where the condensates will be created in one-dimensional systems. It means, that the structure of the microcavity is limited to confine the movement of exciton-polaritons to only one direction in space. Hence, the description of observed phenomena is simplified and interpretation is more straightforward in this kind of a trap. The polariton condensate scattering on natural defects present in the structure will be investigated. Due to the spatial limitation of polariton transport, the quasiparticles have not big choice, and they have to jump over the defect or scatter from it. The observed phenomena will be modelled in computer simulations, taking into account processes of changes in the condensate energy caused by interactions with the environment, which is called a relaxation process.