# DESCRIPTION FOR THE GENERAL PUBLIC

The distributed feedback (DFB) based lasers were constructed for the first time 10 years after the ruby laser development. What is characteristic for the DFB lasers and what distinguish them from the other type of lasers, is specific resonator shape. Instead of classical system with two external mirrors, the feedback is provided by periodic structure with modulation of refractive index and/or gain coefficient. Another very interesting way to achieve lasing action called random lasing (RL) is light amplification in disordered systems based on resonant distributed feedback of photons on statistically formed optical resonators.

The main idea of this project, which stands for novelty is to show experimentally as well as with simulations that it is possible to combine two above mentioned mechanisms of light amplification: DFB on periodic structures and feedback due to the multiple light scattering in optically pump organic gain medium. Additionally we want to show that the presence of luminescent dyes in aggregated or crystalline form may lead to expand of the range of lasing tunability. These studies let us to show the correlation between two regimes of optically pumped distributed feedback: coherent on well-defined periodic structures and coherent/incoherent due to the disorder appearance and initiation of constructive scattering on aggregates and nano- and micro crystals. It will be also important for development of a better theoretical framework for describing disorder in photonics, especially with respect to structures that are partially ordered or exhibit long-range correlations, giving new possibilities for fundamental research and engineering of new devices like microlasers for integrated optics: on chip light sources tunable in real time and wide spectral range, light source in/for microfluidic systems, sensors based on changes of light scattering conditions or speckle-free high quality micro and bio imaging and diagnostics.