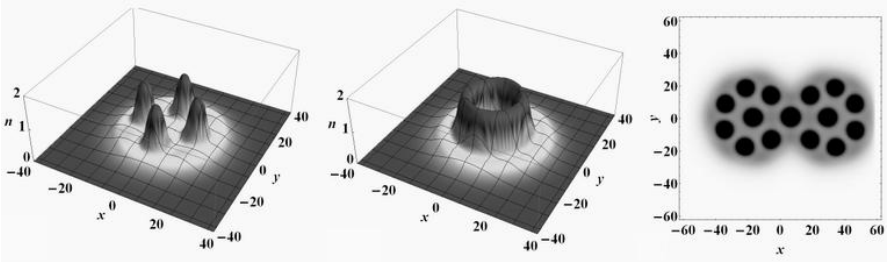
Nanooptics and photonics

The nature and different behavior of the outer and inner exciton rings of luminescence in semiconductor quantum wells

A.A. Chernyuk, V.I. Sugakov, V.V. Tomylko

Institute for Nuclear Research, NAS of Ukraine. Nauki prosp., 47, Kyiv 03680, Ukraine
E-mail: inr@ukr.net

Studies of indirect excitons in GaAs/AlGaAs heterostructures found the emergence of inhomogeneous structures (sometimes periodical) in the exciton density distribution. The emission is located along the ring, which was arranged around the laser spot at a great distance (several hundred microns) from the center of the laser spot [1]. Later besides an outer ring, an inner ring was found, which was observed as the emission from the region in the vicinity of the laser spot [2]. The authors observed the fragmentation of the inner ring and showed that the shapes of the outer and inner rings, created by two laser spots, are significantly different with decreasing the distance between spots. Using a phenomenological model of non-equilibrium phase transition and taking into account the finite value of the exciton lifetime, we explained [3] the appearance of fragmentation of the rings emission observed in Ref. [2]. The periodical distribution of the exciton density along the inner ring occurs, if the region of the laser spot is bigger than a certain value and the intensity of the laser exceeds a certain threshold value. The merging of two inner rings excitation, while their spot centers converge, occurs similar to observation in Ref. [2].



1. *L.V. Butov, A.C. Gossard, D.S. Chemla.* // Nature.-2002.-**418**.-P.751.
2. *M. Remeika, A.T. Hammack, S.V. Poltavtsev et al.* // Phys. Rev. B.-2013.-**88**.-P.125307.
3. *A.A. Chernyuk, V.I. Sugakov, V.V. Tomylko.* // Phys. Rev. B.-2014.-**90**.-P.205308.