blinking QDs (20-120 nm). Experimental samples were fabricated by spin-casting of diluted solution of QDs and polymer onto coverslips. Scanning electron microscopy confirmed the presence of single isolated pairs even at low QD's surface concentration. The proposed technique was based on statistical studies of localization coordinate distributions [4], obtained in a series of experiments. To find limitations and estimate precision of the technique the task was numerically simulated for QDs separated by a distance in the range from 20 nm to 120 nm for different types of QD's blinking dynamics. The developed method allows us to recover distances between single emitters in pairs in real experiment with CdSeS/ZnS colloidal QDs embedded inside a thin polymer film. Fig. Th16C(C)-5 (inset) shows an example of a super-resolution image of a single QD pair, i.e. the spatial distribution of the recovered coordinate's density and its projection on the line connecting QDs image centers. The distance (50nm) between QDs was evaluated from analysis of the two-peak distribution (see Fig. Th16C(C)-5). The numerical simulations reveal that achieved values are underestimated and must be improved. In the present example the correct value is close to 62 nm (with 1nm standard deviation). The study was supported by Russian Science Foundation (№ 17-72-20266).

[1] M. Nirmal, B.O. Dabbousi, M.G. Bawendi, et al, Nature, 383, 802-804 (1996).

[2] M. J. Fernee, P. Tamarat, B. Lounis, Chem. Soc. Rev., 43, 1311 (2014).

[3] Y. Park, J. Lim, N. Makarov, V. Klimov, Nano Lett., 17, 5607–5613 (2017).

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COFFEE BREAK 16:00-16:30

EVENING SESSION

Th16D 16:30-18:00

Trapped atoms II – Hall A
16:30-18:00 Chairman: I. Ryabtsev

16:30-17:00 **Th16D(A)-1** (invited)

A few dipolar bosons in a ring trap

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Physics of quantum gases is very rich. Most results are based on a simplified mean field approach. Recently we have studied a system of small number of bosonic atoms interacting via log range dipolar forces and confined to a thin torus or a ring. The symmetry of the problem makes numerics tractable. On the other hand it makes the relation between the eigenstates and the observation intriguing. We studied dark solitons [1], rotons [2] and most recently quantum droplets in this system.

[1] R. Ołdziejewski, W. Górecki, K. Pawłowski, and K. Rzążewski, Many-body solitonlike states of the bosonic ideal gas Phys. Rev. A , 97, 063617 (2018) DOI: 10.1103/PhysRevA.97.063617.

[2] R. Ołdziejewski, W. Górecki, K. Pawłowski, and K. Rzążewski,Roton in a few-body dipolar system, New J. Phys.20,(2018)123006, New J. Phys. 20(2018)

17:00-17:30 **Th16D(A)-2** (invited)

On a theory of Raman sideband cooling of single atom in an optical dipole trap

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In the paper we clarify the optimal conditions for the protocol of Raman sideband cooling (RSC) of a single atom confined with a tightly focused far-off-resonant optical dipole trap (optical tweezers). The proposed protocol ultimately pursues cooling to a three-dimensional ground state of the confining potential. We show that the RSC protocol has to fulfil a set of critical requirements for the parameters of cooling beams and the excitation geometry to be effective in a most general three-dimensional configuration and for an atom, having initial temperature between the recoil and the Doppler bounds. We perform a supporting numerical simulation of the Raman passage for an example of an 85Rb atom taking into account the full level structure and all possible transition channels.

biphotons or completely incoherent thermal light do not maximize the information, while the optimal correlation (coherence) length should be approximately equal to the smallest object features to be resolved. To check the prediction experimentally, the second-order correlation function was measured for imaging with a pseudo-thermal source with varying coherence length. The actual reconstruction error clearly shows the expected minimum for the optimal coherence length.

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[2] M. Tsang, R. Nair, and X.-M. Lu, Phys. Rev. X 6, 031033 (2016); R. Nair and M. Tsang, Phys. Rev. Lett. 117, 190801 (2016); L. Motka, et al., The European Physical Journal Plus, 131, 130 (2016); J. Rehacek, et al., Phys. Rev. A 96 062107 (2017).

15:40-16:00 **Th16C(C)-5**

Fluorescence Nanoscopy of Single Quantum Dot Pairs

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Semiconductor colloidal quantum dots (QD) are artificial luminophores with size-dependent spectral properties, high photostability and quantum yield. In this sense QDs are promising objects for laser gain media, single photon sources, single fluorescent labels, for development of effective light emitting diodes, solar cells, etc. QDs ensemble properties have been investigated since early 1980-s. Whereas at single particle level the research activities have been started since the pioneer work in 1996 [1] and many intriguing effects have been discovered. It includes stochastic switching between bright and dark states - fluorescence blinking, spectral diffusion and others (see review [2] and references therein). The nature of blinking is still the matter of discussion [3]. Super-resolution localization-based microscopy is a very promising tool for material science. It utilizes an idea that accuracy for single emitting site localization can be as small as several Angstroms and is usually limited only by a single emitter photostability and its quantum yield. Implementation of fluorescence localization nanoscopy for single QDs and small QD clusters create a range of opportunities for investigation of underlying processes, which determine fluorescence and spectral properties of such artificial "atoms" and "molecules". In this sense reconstruction of emitter's spatial coordinates with the nanometer accuracy in such a cluster is an essential step in this type of experimental studies. In the present work we consider the case when a cluster is represented by a pair of closely spaced

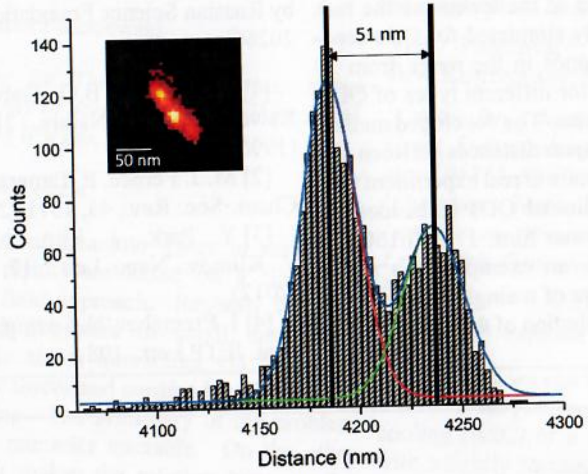

Figure Th16C(C)-5

Super-resolution image (inset) of single CdSe/ZnS quantum dot pair in a thin polymeric film. Distribution of the recovered coordinate along the line through quantum dot supper-resolution image centers and distance evaluation.