# MODE SPLITTING IN A SPHERICAL MICROCAVITY UNDER RADIATION PRESSURE

K.I. Rusakov [1], A.A. Gladyshchuk [1] , S.V. Chugunov [1] , Y. P. Rakovich [1,2], M. Gerlach [2], J.F. Donegan [2]

[1] Brest State Technical University, Brest
[2] School of Physics, Centre for Research on Adaptive Nanostructures and Nanodevices, Trinity College Dublin, Dublin

The radiation pressure created by a focused laser beam can be used to trap, levitate and manipulate micro- or nanometer-sized dielectric particles and biological cells [1, 2].

Although photons are massless particles, they can transfer their momentum to the particle. The strong gradient of the electro-magnetic field intensity in the region of the beam waist gives rise to the so-called gradient force, which when working against the gravitational force provides a method for optical binding and manipulation of ultra-fine particles and mesoscopic systems. In addition, a beam of light can exert sufficient radiation pressure to move a microstructured object along the direction of the beam propagation under the effect of the scattering force. This radiation-pressure-induced opto-mechanical interaction shows great promise for a variety of applications in the field of optically actuated micro-optical-electromechanical systems (MOEMS), laser cooling, spectrum analysis, optical information processing and quantum informatics.

In this work, we present a method to reveal azimuthal whispering gallery modes (WGMs) in a spherical microcavity coated with a nano-meter thick polyelectrolyte (PE) shell and one monolayer of CdTe semiconductor quantum dots. The PE shell deformability was increased through contact of the shell with a salt-containing solution, which changes the mechanical properties of the PE multilayer.

The new approach in this experiment is based on the deformation of the spherical shape in a non-contact way using the radiation pressure from a laser beam, which causes the lifting of the degeneracy of the WGMs. Applying radiation pressure results in localized shell shape distortion and splitting of the resonance peaks. The peak shape was modeled on analytical expressions for a distorted sphere demonstrating very good agreement with the measurements. The resonance peak linewidth and splitting parameters can be efficiently controlled by the strength of the radiation pressure and the elastic properties of the surface shell.

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2. Molloy J. E., Padgett M. J. // Contemp. Phys. 2002. Vol. 43, P. 241-258.