Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Spatially-sculpted aberrated optical tweezers for delivery of nanoparticles onto cells SHIVARANJANI SHIVALINGAIAH, SUYASH CHHAJED, SAMARENDRA MOHANTY, UT Arlington — Nanoparticles (NP) are emerging as photochemical and photothermal agents for delivery of drugs and heat onto the targeted cells. Here, we report spatially-sculpting of transverse potential landscape by introducing aberration in the optical tweezers beam for delivery of therapeutic NP on to the prostate cancer PC3 cells. A tunable Ti-Sapphire laser beam was focused to a diffraction limited spot by use of a high numerical aperture microscope objective for optical trapping. A cylindrical lens was used to create the beam profile astigmatic, which led to spatially extended potential landscape. In order to facilitate transport of NP, Comatic potential was created by tilting of the astigmatic beam with respect to the optic axis. NPs were attracted towards the potential minima, transported along the major axis of the elliptic spot and ejected out along the direction having lower stiffness. The Carbon NPs as well as Poly Lactic-*co*-Glycolic Acid NPs were efficiently transported and concentrated near the PC3 cells *in-vitro*. The direction and the speed of transport of nano-particles could be reversed by change in tilt direction and angle. Further, by utilizing the scattering force with the asymmetric gradient force, three-dimensional transport of nanoparticles was achieved. The effect of laser beam power and size / refractive index of the nano-particles on the speed of transport will be presented.

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Date submitted: 19 Nov 2010 Electronic form version 1.4