Stability of Optical Trapped Nonspherical Particles

Yongyin Cao[1,2], Jack Ng[1,3]*

[1]Department of Physics, Hong Kong Baptist University, Hong Kong

[2] Harbin University, Harbin, China

[3]Institute of Computational and Theoretical Studies, Hong Kong Baptist University, Hong Kong

**Email of Presenting Author: jacktfng@hkbu.edu.hk*

Optical trapping refers to the spatial confinement of small particles by using light induced forces. It is an extremely useful tool in almost any area that involves small particle.

Most studies in optical trapping are restricted to spherical particle, but in reality, no particle is perfectly spherically. We shall show that being nonspherical is qualitatively different in optical trapping. For example, let a and b be the restoring force for the translation and rotational degree of freedom, the vibrational modes of a circular cylinder trapped by a linearly polarized Gaussian beam can be harmonic oscillator type of modes when a-b is large, but a type growing unstable mode when a-b is small

The small vibration behavior of the optically trapped nonspherical particle can be termed the “generalized harmonic oscillator for nonspherical particle and nonconservative forces”. We remark that the physics is not limited to optical trapping, but also apply to other nonconservative forces.

Finally, the role of parity and time symmetry in optical trapping will be discussed.