Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

All-optical near-field self-alignment in sub-nanoscale induced by Fano-resonance HUI DONG, ZHENG WANG, University of Texas at Austin, UNIVERSITY OF TEXAS AT AUSTIN TEAM — Fano-resonance of photonic crystal (PC) slabs generally possesses extremely high quality-factor (Q-factor) which indicates large optical force produced via radiation pressure with low input power. Unlike atoms, nano- and micro-particles, periodicity of PC slab creates identical force field in every unit cell, which enables the manipulation of much wider area in millimeter scale. Here we developed a novel mechanism to construct a conservative optical force field to automatically align PC slabs with sub-nanometer resolution, a technique has a potential application in 3D photonic crystal fabrication. The phase response of our system can be predicted after the features of PC slab are precisely depicted using temporal coupled-mode theory. The conservation of optical force is then theoretically demonstrated based on Response Theory of Optical Force (RTOF) which has a perfect agreement with numerical simulation results of Maxwell Stress Tensor (MST) and Kelvin Force. In the end, we show no non-conservative component exists in the force field from Finite-element Method (FEM) simulation after applying Helmholtz-Hodge decomposition to it.

Hui Dong
University of Texas at Austin

Date submitted: 14 Nov 2014 Electronic form version 1.4