Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Metasurface-Enabled Anisotropic Quantum Vacuum over Macroscopic Distances PANKAJ JHA, XINGJIE NI, CHIHHUI WU, YUAN WANG, XIANG ZHANG, University of California, Berkeley — Quantum vacuum(QV) of an electromagnetic field has a profound effect of the optical response of a quantum emitter. QV in the vicinity (few tens of nm) of a metallic interface is strongly anisotropic and can be harnessed to induce quantum interference among the spontaneous emission channels from nearly degenerate excited states in a multi-level atom. Unfortunately, trapping an atom within this range is extremely challenging in experiments. Here, utilizing the exceptional light manipulation properties, both phase dependent and polarization selective response, of a metasurface we engineer the reflected field, from the spontaneous emission, back to the atom itself. A strong anisotropy in the decay rate of the atom is induced even when the atom is located at some macroscopic distance from the metasurface. Quantum vacuum engineering with metasurface will create unprecedented opportunities for long-range interaction between quantum emitters, new regime of cavity-free QED, solid-state quantum optics, spintronics etc.

Pankaj Jha
Univ of California - Berkeley

Date submitted: 08 Nov 2014 Electronic form version 1.4