

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Experimental demonstration of photon-dipole interactions in quantum dot emission YIKUAN WANG¹, School of Physics & Electric Engineering, Yancheng Teachers University 224002 China, TIANYU YAN, MARK T. TUOMINEN, Physics Department, University of Massachusetts Amherst, Amherst, MA 01003 — Light emission occurs spontaneously when electrons at excited states transit to ground state. One may wonder if there is an interaction at play between the atom and the radiation field during light emission. Although theoretical attempts were made as early as 1927, so far this interaction has not been taken into account in the calculation of emission properties of matter because of the lack of recognizable photon-atom interaction in a decisive experiment. Here we show that photoluminescence decay rates of semiconductor quantum dots affected by surface plasmons are dependent on detection angle and polarization of photons, as a result of photon-dipole interactions. Our results demonstrate how a dipole emitter interact with the photon field in the spontaneous emission process, thus provide a basis for controlling light emission through dipole orientation of molecules. This work will directly influence the future design of molecular emitting devices.

¹This work was partly done at the Department of Physics, University of Massachusetts Amherst.

Yikuan Wang
Yancheng Teachers University

Date submitted: 25 Oct 2013

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