

## Quantum Optics of Nonlinear Photonic Crystals Doped With Nanoparticles

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**Venue:** Blk S13, Level M, Room 11, Physics Conference Room,  
Department of Physics, Faculty of Science, NUS

**Date:** 05th July 2007 (Thursday)  
**Time:** 3.00pm – 4.00pm

### Abstract:

There is a considerable interest in studying photonic crystals because they can modulate the propagation of photons and control the properties of electromagnetic light. A significant progress has been made towards the development of photonic crystal applications in the fields of ultrahigh information processing. Here we study the dipole-dipole interaction in a nonlinear photonic crystal doped with an ensemble of nanoparticles. A pump field is applied to change the refractive index of the crystal. When the intensity of the pump field increases the crystal goes from absorption state to the transparent state and remains in the later state. This propriety can be used to makes optical switches, optical memory, optical transistor, optical discriminator, optical limiter, etc.

### Profile:

#### Employment History:

Date	Rank & Position	Department / Institution
1995–present	Professor	Physics & Astronomy, UWO
2000–2006	Director	Centre for Chemical Physics, University of Western Ontario (UWO)

### Chapters in Books:

1. Mahi R. Singh (2007), A study of quantum optical phenomena in polaritonic and photonic crystals doped with atoms. Book: "Recent research activities in chemical physics: from atomic scale to macroscale" edited by E. Paspalakis and A. F. Terzis. (*In press*)
2. Singh, M. (2003) Optical properties of photonic and polaritonic band gap materials: the study of fluorescence due to spontaneous emission. Phonons in Condensed Materials (Singh and Sanyal, eds.) Allied Publishers, Pvt. Limited, p. 418-428.

### PAPERS (1999-2007)

- Mahi R. Singh (2007), Inhibition of two-photon absorption due to dipole-dipole interaction in nanoparticles. *Phys. Lett. (Communicated, 2007)*.
- Mahi R. Singh (2007), Nonlinear effects in doped photonic crystals: the study of dressed states, *J. Phys. B (communicated, 2007)*.
- I. Haque and Mahi R. Singh (2007), A study of the ac Stark effect in doped photonic crystals, *J. Phys. Condensed matter, 19, 156229 (18pp) (2007)*.

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