Nonlinear Backscattering Enhanced by Quantum Coherence for Real-Time Detection of Airborne Particles by Dr. C. H. Raymond Ooi

Biography

Dr. Raymond Ooi was born in Penang and attended Penang Free School. After earning his Bachelor degree in Physics, he joined Hewlett-Packard (Malaysia) as an engineer. He obtained Master in Engineering degree from Nanyang Technological University in the field of photonic crystal. After earning his doctorate degree (Dr.rer.nat.) from Universitaet Konstanz, Germany in the field of laser cooling of molecules, he joined Texas A&M University as a Research Associate with Burgess Distinguished Professor Dr. Marlan O. Scully. He was also a visiting scientist in Princeton University and Max-Planck-Institut fuer Quantenoptik and has been working on various problems on quantum coherence and correlation, nonlinear optics, Bose-Einstein condensation and nonlinear backscattering of particles. Dr. Ooi is now a Research Professor in Korea Advanced Institute of Science and Technology (KAIST).

Abstract:

Airborne microparticles such as bacterial spores are hard to detect from distance. Fast and sensitive detection technique which carries the spectroscopic fingerprint of characteristic chemical compounds would be a very useful tool when incorporated into a LIDAR system. This requires real time detection of backscattered signal which is too weak with existing techniques such as laser induced fluorescence and Raman spectroscopy. Coherent anti-Stokes Raman spectroscopy (CARS) is probably one of the nonlinear techniques that comes closest for the purpose. I will show that the CARS signal can be enhanced via quantum coherence using carefully shaped and delayed pulses. The theory goes beyond the usual perturbative regime and takes into account the focusing effect of the microparticle. A large backscattered signal shows that this technique could be promising for LIDAR system. Extension of the theory to particles composed of complex molecules is possible using transform theory.

Date: Friday, 3 Nov 2006
Time: 10.30am to 11.30am
Venue: PAP Meeting Room (SBS B3n-19)