



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
COLLOQUIUM

**A Novel Ultra-cold Rydberg Plasma:
from Wigner Crystallisation to a Degenerate Bose Gas?**

by

Professor Klaus Müller-Dethlefs
Founding Director of The Photon Science Institute
and School of Chemistry
The University of Manchester, UK

Date: April 21, 2011 (Thursday)

Time: 4:30 - 5:30 p.m.

Place: L5, Science Centre, CUHK

(Light refreshments will be served 20 minutes prior to the colloquium.)

ALL INTERESTED ARE WELCOME

Abstract

We produce an ultra-cold, very long lifetime Rydberg plasma by two-photon resonant excitation into the ionization threshold region, via the A-state ($N_A=0$), in the expansion region of a supersonic jet close to the nozzle. Collisions in the jet expansion cool the ions in the plasma to ca. 0.2K thus avoiding disorder heating as in MOT Rydberg plasma experiments.

This plasma has a very long lifetime and after ca 310 μ s, when the plasma hits a 4mm diam. aperture, a dramatic increase in density is observed experimentally just behind this aperture. These observations can be explained by a compression of the plasma, which exhibits the properties of a sponge like material, i.e. a plasma crystal.

A possible explanation is the formation of a Wigner crystal. A possible route towards the formation of a degenerate Bose gas of the $^{14}\text{N}^{16}\text{O}^+$ cations, that is a *molecular Bose-Einstein Condensate* will be discussed.

Enquiries: 2609 6339