The Chinese University of Hong Kong
Department of Physics

Lecture Series

Neutrino Oscillations: an introduction

by

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Date: August 19, 20, 21, 24, 26 & 28, 2009

Time: 5:30 – 7:00 pm

Venue: L2, Science Centre, CUHK, Shatin, N.T.

Contents:

Matter is made of quarks and leptons, and half of the leptons are neutral --- the neutrinos. Thus, these particles form an important class of building blocks; yet they are the least understood. In the last few decades, we have learnt that there are three varieties of neutrinos, that they have a tiny bit of mass, and that they may change from one variety to another, a phenomenon known as neutrino oscillations.

Most parameters describing neutrinos oscillations are known, except for one mixing angle θ_{13}. It turns out that the best place in the world for measuring this very small mixing angle is in Daya Bay, by making use of the anti-neutrinos from the nuclear reactors. Hong Kong physicists are part of a large international effort to measure this angle.

This series of lectures are intended to provide the theoretical background for understanding this experiment, principally for the benefit of graduate students who will be participating in this experiment in one way or another; the lectures may also be of interest to students who have an interest in this project, and in the larger issue of neutrino physics.

The basic physics of neutrinos will be introduced, and the framework for describing oscillations will be presented. The much better studied problem of solar neutrinos, related to θ_{12}, will be discussed in detail. This problem is especially interesting since the current understanding involves particle physics, nuclear physics and astrophysics in a delicate combination.

Knowledge of quantum mechanics will be assumed.

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