Colloquium – Monday, January 11, 2016
Speaker – Wladyslaw Trzaska from University of Jyvaskyla, Finland
Where: Cyclotron Seminar Room – 228 3:30 refreshment; 3:45 talk begins

The Title:

"**The Hunt for Neutrino Mass Hierarchy and CP Violation**"

Abstract:

Neutrinos are the only particles known to disobey the predictions of the Standard Model. Over the past two decades neutrino studies have produced a wide range of important data and new discoveries: neutrino oscillations provided indirect evidence for non-zero neutrino mass, detection of supernova and geo neutrinos stimulated interest in stellar evolution and Earth structure, spectroscopy of solar neutrinos gave a new insight into the physics of the Sun. These findings, in turn, stir up expectations of a major breakthrough in physics that could have similar impact on science as the quantum theory and relativity brought about a century ago.
The importance and relevance of the neutrino physics was very well illustrated by the recent race to measure the missing oscillation parameter (θ_{13}). Although the costs and complexity of the required experiments is very high, five major experiments (T2K [1], MINOS [2], Double Chooz [3], Daya Bay [4] and Reno [5]) have embarked on this fierce race and all have published their first, preliminary results within the period of nine months of operation. Already now a new race has started for the determination of the neutrino mass hierarchy and the phase of the CP violation in the leptonic sector. In Japan designs are made for Hyper Kamiokande experiment that would increase 25-times the size of the highly successful SuperK [6] water Cherenkov detector. US has commenced the DUNE project. In China the construction has started for the JUNO experiment. In Europe, Borexino SOX experiment will utilise PBq – strength radioactive sources to verify the hypothesis of sterile neutrinos. In my talk I'll try to give a brief review of this rapidly developing field based on my experience from LENA, LAGUNA, LAGUNA-LBNO, WA105, DUNE, and JUNO.

References:
[1] K. Abe et al., Phys. Rev. Lett. 107, 041801 (2011).
[2] P. Adamson et al., Phys. Rev. Lett. 107.021801(2011).
[3] Y. Abe et al., Phys. Rev. Lett. 108, 131801 (2012).
[4] F.P.An et al., http://arxiv.org/abs/1210.6327v1.
[5] Soo-Bong Kim et al. (RENO), Phys. Rev. Lett. 108 (2012) 191802.
[6] SuperK, Collaboration, Nucl. Instrum. Meth. A501(2003)418-462.