Laboratoire LEPRINCE-RINGUET
Ecole Polytechnique IN2P3/CNRS

Séminaire LLR

le lundi 16 mars 2015 à 14:00

Salle de conférence du LLR pièce 05-2021

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SUBATECH

Running and Future Experiments with Reactor Antineutrinos

The reactor neutrino experiments: Double Chooz, Daya Bay and Reno conceived for high precision measurement of the leptonic mixing matrix angle θ13. Neutrinos are detected via the robust Inverse Beta Decay (IBD) interaction, providing remarkable control of systematics. The Near/Far setups of these experiments, following the same concept, consists of two detectors for major reduction of correlated systematics upon inter-detector comparison. Unlike Daya Bay and Reno, Double Chooz has been so far running with the far detector only, thus its systematic budget is affected by the dominating flux systematic uncertainties. In this seminar, the new results from these experiments will be shown using the last published results. The spectral measurements shows an unexpected distortion of the measured neutrino spectrum with respect to the predictions based on the conversion method. I'll review in this seminar these results as well as the possible explanations based on the summation method. The search for a 4th neutrino is now a very active topic in the community with many project aiming at establishing the existence of a sterile neutrino by measuring a new oscillation pattern at short baseline. I'll give a brief overview of these projects and I'll present in more details two examples: SoLid and Stereo. Antineutrinos are generated in the decay chains of the of the fission products, thus a survey of the neutrino flux close to a reactor provides information related to the core content and the thermal power. This application arouses the International Atomic Energy Agency (IAEA) interest in using antineutrino detectors as a potential safeguard tool. The detectors included in the safeguard program should be a good compromise between detection performances and design constrains related to safety, low cost and size reduction. After a brief description of the non-proliferation context, I'll present the Nucifer experiment, currently taking data CEA-OSIRIS research reactor (70MW). I'll also present the last Nucifer analysis and results. A final mention will be made on the future of the neutrino physics program with the JUNO experiment and the impact of the present studies for the JUNO measurement.

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