Atomphysik-Seminar

Wednesday, December 20, 13:15, KBW Lecture Hall Side Room

nEXO – Searching for Neutrinoless Double-Beta Decay in ^{136}Xe

Thomas Brunner, McGill

Despite tremendous progress in understanding the fundamental properties of neutrinos over the past decades, several key questions remain unanswered. In particular, we do not yet know if neutrinos are Majorana particles (i.e., Are neutrinos and antineutrinos identical?). The most sensitive experimental probe of the Majorana nature of the neutrino is to search for the lepton-number violating neutrinoless double-beta decay ($0\nu\beta\beta$). A positive observation of this decay mode would confirm that neutrinos are Majorona particles and demonstrate physics that is not explained by the Standard Model. The EXO-200 collaboration is currently searching for $0\nu\beta\beta$ decays in ^{136}Xe in a detector filled with ~175kg of enriched liquid Xe, and has provided one of the most sensitive limits on the half-life of this decay ($T_{1/2}>1.8 \times 10^{25}$ yr at 90% C.L.).

In order to increase the sensitivity to $0\nu\beta\beta$ decays by almost two orders of magnitude, we are developing a new detector, called nEXO, which will deploy 5 tons of liquid xenon, enriched in the isotope ^{136}Xe. To push nEXO's limit of sensitivity, new technologies, such as Silicon PhotoMultiplier (SiPM), are being developed. In addition, innovative methods, such as radio-frequency ion funnels and laser spectroscopy, are being investigated to extract and identify the ^{136}Xe $\beta\beta$-decay daughter ^{136}Ba, which would allow an almost background free measurement of $0\nu\beta\beta$.

The latest results from EXO-200 will be presented in this talk along with future prospects and developments of nEXO.

Find it on Indico: http://indico.gsi.de/e/AP_Seminar_Brunner