Contribution ID: **41** Type: **Poster**

Towards a beta spectrum shape measurement at WISArD

Thursday, 5 December 2019 12:43 (1 minute)

There are indications that the measured number of antineutrinos emerging from reactor fission fragments inside a reactor is lower than theoretically predicted. Moreover, there is an additional anomaly in the energy spectrum of the antineutrinos. These observations are the reactor neutrino anomaly. One of the uncertainties in the theoretical description is the QCD influence on the β-decay of which the weak-magnetism term is the major contribution. Its value is unknown experimentally in the mass range of the reactor fission fragments. [1] A direct measurement is possible with the beta energy spectrum and would be the first of its kind in this mass range. In addition, the performed fit can include the Fierz interference term to probe beyond standard model (BSM) physics, i.e. weak tensor or scalar currents. BSM experiments aim for a precision close to 10ˆ(-3) and, thus, complementarity to high energy experiments, e.g. LHC, within an effective field theory. [2]
Spectrum shapes were measured extensively in the past but only recently attracted renewed interest. The main sources of systematic uncertainties are energy losses in the source (foils), the detector dead layer and the rather high backscattering probability for electrons. Using the progress in Monte Carlo simulation (e.g. Geant4) over the last couple of years it is possible to improve on previous results. [2]
During the long shutdown at CERN we will adapt the existing WISArD set-up at CERN with the objective to measure the beta-spectrum shape of (_ ˆ114)In, a pure Gamow-Teller decay. With two energy detectors along a high magnetic field the set-up has a full solid angle. Moreover, backscattered particles are not lost but spiral towards the other detector. Using Geant4 a feasibility study is completed and first data taking is planned in short notice thus preliminary results might be shown.
[1] A. C. Hayes and P. Vogel. Reactor neutrino spectra. Annual Review of Nuclear and Particle Science, 66(1):219–244, 2016.
[2] M. González-Alonso, O. Naviliat-Cuncic, N. Severijns. New physics searches in nuclear and neutron β decay. Progress in Particle and Nuclear Physics, 104:165-223, 2019.

Primary author: VANLANGENDONCK, Simon (KU Leuven (BE))

Co-authors: BLANK, Bertram (CEN Bordeaux-Gradignan); ZAKOUCKY, Dalibor (Acad. of Sciences of the Czech Rep. (CZ)); ATANASOV, Dinko (CERN); LIENARD, Etienne (Universite de Caen (FR)); QUÉMÉNER, Gilles (LPC Caen CNRS/IN2P3); GIOVINAZZO, Jerome (Centre National de la Recherche Scientifique (FR)); DAUDIN, Laurent (Centre National de la Recherche Scientifique (FR)); HAYEN, Leendert; DE KEUKELEERE, Lennert; GERBAUX, Mathias; ROCHE, Mathieu; VERSTEEGEN, Maud Alice (Centre National de la Recherche Scientifique (FR)); SEVERIJNS, Nathal (KU Leuven (BE)); ASCHER, Pauline (CENBG); ALFAURT, Philippe (Centre National de la Recherche Scientifique (FR)); GREVY, Stéphane; KURTUKIAN-NIETO, Teresa (CEN Bordeaux Gradignan); ARAUJO ESCALONA, Victoria Isabel (KU Leuven (BE)); FLECHARD, Xavier David (Universite de Caen (FR))

Presenter: VANLANGENDONCK, Simon (KU Leuven (BE))

Session Classification: Poster Session