



Contribution ID: 72

Type: Oral

Beta-neutrino correlation measurements with LPCTrap

Thursday, 24 May 2012 14:50 (20 minutes)

The precise measurement of the beta-neutrino angular correlation coefficient “ a ” in nuclear beta decay is a sensitive tool to search for exotic couplings presently excluded by the V-A theory of the weak interaction. For instance, the study of a pure Gamow-Teller (GT) transition enables to probe tensor-type couplings while a pure Fermi (F) transition is sensitive to scalar-type interactions. Moreover, in the case of mirror transitions, a precise measurement of “ a ” also allows the determination of the mixing ratio between the GT and F contributions. This constitutes an important input for the database of nuclear mirror transitions, leading to the extraction of the V_{ud} element of the CKM matrix [1].

In a beta-neutrino correlation measurement, the most relevant observable is the energy of the recoiling daughter nucleus. In the LPCTrap device, the radioactive nuclei are confined in a Paul trap, allowing the detection of the recoil ions in coincidence with the beta particles [2]. The set-up is presently installed at LIRAT, the low energy beam line of the SPIRAL facility at GANIL. The correlation measurement in the pure GT ^6He decay has already reached a relative statistical precision of 0.5%. Particular attention is continuously being devoted to the study of systematic effects. For instance, the detection set-up is sensitive to the charge state distributions of the recoiling ions, allowing the determination of the shake-off probabilities in the decay of $1+$ ions.

As the Paul trap enables to confine any radioactive species, an experiment with ^{35}Ar , which essentially decays through a mirror transition with a large Fermi component (>90%), is also ongoing.

These first experiments have clearly shown that LPCTrap is well suited for precise correlation measurements. The next step is a significant upgrade of the whole set-up to improve, on one hand, the statistical precision to the 0.1% level and, on the other hand, to perform relevant experiments with the future radioactive beams soon available at GANIL in the framework of the SPIRAL/GANISOL initiative, and later at the SPIRAL2/DESIR facility.

These different aspects will be discussed during the conference.

[1] O. Naviliat-Cuncic and N. Severijns, Phys. Rev. Lett. 102 (2009) 142302

[2] X. Flécharde et al., J. Phys. G: Nucl. Part. Phys. 38 (2011) 055101

Primary authors: Ms COURATIN, Claire (LPC Caen); Dr LIENARD, Etienne (LPC Caen); Dr FLECHARD, Xavier (LPC Caen)

Co-authors: Dr MERY, Alain (CIMAP); Dr RODRIGUEZ, Daniel (Universidad de Granada); Dr DURAND, Dominique (LPC Caen); Prof. BAN, Gilles (LPC Caen); Dr QUEMENER, Gilles (LPC Caen); Dr THOMAS, Jean-Charles (GANIL); Dr BREITENFELDT, Martin (IKS-KUL); Prof. SEVERIJNS, Nathal (IKS-KUL); Prof. NAVILIAT-CUNCIC, Oscar (NSCL-MSU); Dr DELAHAYE, Pierre (GANIL); Mr VAN GORP, Simon (IKS-KUL); Mr POROBIC, Tomica (IKS-KUL)

Presenter: Dr LIENARD, Etienne (LPC Caen)

Session Classification: Fundamental Interactions

Track Classification: Fundamental interactions