



Erasmus Mundus internship

Characterization of particle detectors for precision measurements in nuclear beta decay

The group “Interactions FOnamentales et nature du Neutrino” (GRIFON) is currently working on several projects whose main goal is the test of several aspects of the Standard Model of elementary particles. The common point of these projects is the use of precision measurements in nuclear beta decay as a probe of the electroweak interaction. Such measurements are complementary to the search for new particles carried out at high energy colliders. The LPCTrap[1] (GANIL) and WISArD[2] (ISOLDE-CERN) projects focus on the measurement of the angular correlation between the two leptons emitted during the decay to search for Scalar and Tensor exotic contributions in the weak interaction. The project b-Fierz follows a similar goal but is based on the precise study of the shape of the beta energy spectrum. A fourth project named MORA[3] (JYFL) is dedicated to the search of a Time Reversal violation in nuclear beta decay as a potential source of the matter-antimatter asymmetry observed in the universe.

All these projects require a careful characterization and calibration of particle detectors for ions, beta particles and protons (in the case of WISArD). This work requests tests and measurements using radioactive calibration sources, as well as dedicated calibration campaigns at the electron accelerator ATRON in Cherbourg. Simulations of the detectors with specific tools such as GEANT4 are also mandatory for a perfect understanding of their response functions.

The trainee will be in charge of one of these detectors during the internship. He (she) will work closely with one of our post-doc, and will share his (her) time between experimental activities (calibrations on test-bench) and simulations. The final aim is to obtain the complete response function of the detector and prepare its implementation in one of the final experimental setups.

[1] G. Ban et al., Ann. Phys. (Berlin) 525 (2013) 576

[2] B. Blank et al., CERN-INTC-2016 (2016).

[3] P. Delahaye et al., arXiv:1812.02970

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