

Internship in the NEDM group of the LPC Caen

The search for the electric dipole moment of the neutron

The search for electric dipole moment (EDM) of elementary particles or composite system (electron, neutron, Hg and so on ...) may probe the breaking of the CP symmetry. This symmetry breaking is required to account for the baryogenesis in our universe. It is not present in the standard model with a sufficient strength.

The LPC Caen is involved in an experiment at Paul Scherrer Institute (PSI) in Switzerland aiming at measuring the neutron EDM. The experiment is carried out with the ultra-cold neutrons source at PSI which provides the most intense beam of Ultra Cold Neutrons worldwide. The project has two phases. The first phase (nEDM) is over. A new worldwide limit on the neutron EDM was published in 2020 [Abel]. The phase II (n2EDM) has started and a new highly sensitive spectrometer is under construction. An improvement of one order of magnitude is expected on the statistical and the systematic errors. The experiment commissioning is planned for 2020.

The ongoing developments

The LPC group is involved in the collaboration since 2003. The laboratory is in charge of the neutron detection, the measurement of the neutron polarisation, the manufacturing of the non-magnetic vacuum tank and the design and the manufacturing of the coils system (B0, correcting coils, guiding coils, spin flippers).

The internship topic

The student will work on UCN detection. The neutron detector is gaseous. The gas is a mixture of CF₄ and ³He (~15 mbar). The neutron captures take place on ³He nuclei and are detected through the scintillation light produced by the CF₄. The candidate will participate either to detector tests or to simulation of the spin analyser (spin tracking and neutron transport). For further information, please write an email to lefort@lpccaen.in2p3.fr.

Reference: C. Abel et al., “**Measurement of the permanent electric dipole moment of the neutron**”, Phys. Rev. Lett. 124, 081803 (2020).