The Xe-EDM Experiment

Priv. Doz. Dr. Ulrich Schmidt
Physikalisches Institut, Universität Heidelberg

The existence of electric dipole moments (EDMs) of atoms or the neutron would imply a breakdown of both parity P and time-reversal symmetry T and, through the CPT theorem, a breakdown in CP, the combined symmetries of charge conjugation C and parity P. P violation is a well-known feature of the weak interaction. Standard Model contributions to particle EDMs in particular the neutron EDM are of second order in the weak interaction coupling constants and hence are very small being of order 10^{-31} to 10^{-33} *e* cm. The predicted EDMs are at least four orders of magnitude below the present experimentally established limits and a search for a permanent EDM is still hailed as an unambiguous test of CP violation beyond the SM. Extensions to the SM, such as additional Higgs fields, right handed currents, or super symmetric partners, give rise to dipole contributions which are of first order. These are necessarily much larger and for the neutron EDM typically of the order 10^{-27} to 10^{-26} *e* cm.

In this talk I want to report on the ^{129}Xe-EDM project, launched last year. While we still in the design phase of setup an ^{129}Xe-EDM, we used our ^{3}He/^{129}Xe-Comagnetometer setup to search for new physics beyond the SM. We could establish a new limit for axion like particles, a candidate for dark matter and for Lorentz violating interactions. Beside searching for new physics, these measurements allows us to demonstrate the sensitivity of our ^{3}He/^{129}Xe-Comagnetometer setup, study systematic effects and develop data analysis tools.