

SYDM 2: Session 2

Time: Tuesday 14:30–16:30

Location: C/gHS

Invited Talk SYDM 2.1 Tue 14:30 C/gHS
The experimental search for the neutron electric dipole moment — ●KLAUS KIRCH — ETH Zürich, Switzerland — Paul Scherrer Institut, Villigen, Switzerland

For 60 years, searches for the electric dipole moment (EDM) of the neutron have covered some six orders of magnitude in sensitivity improvement. Yet, the result is still consistent with zero. Time reversal symmetry forbids a finite EDM but the CP violation of the electroweak Standard Model will cause it to be non-zero. This finite value is tiny and out of reach for current and foreseeable future neutron EDM experiments. However, due to CP-violation expected in the strong interaction or in some new physics, the EDM could be much larger - with major implications if found. New experimental efforts aim at catching up with the long-time average of one order of magnitude sensitivity gain per decade. Recent progress and related physics measurements will be presented.

Invited Talk SYDM 2.2 Tue 15:10 C/gHS
The muon $g-2$: where we are, what does it tell us? — ●FRIEDRICH JEGERLEHNER — DESY Zeuthen, Platanenallee 6, 15738 Zeuthen

The anomalous magnetic moment of the muon provides stringent tests for the electroweak Standard Model (SM) and is an excellent monitor for new physics. Being one of the most precisely measured and at the same time very precisely predictable observable in elementary particle physics, the present persisting deviation between theory and experiment is likely the best established indication of physics beyond the SM. I present a summary of the status and on recent progress of the theoretical prediction, emphasizing problems and possible solutions in the determination of the hadronic contributions: vacuum polarization and light-by-light scattering. They represent the challenge in reducing theoretical uncertainties to match the precision of forthcoming experiments, expected to go into operation within the next few years at Fermilab. The impact of recent LHC results for the interpretation of the observed 3-4 sigma "discrepancy" in the muon $g-2$ is discussed.

Group Report SYDM 2.3 Tue 15:50 C/gHS
The hadronic light-by-light contribution to the anomalous

magnetic moment of the muon in a dispersive approach — ●VLADYSLAV PAUK and MARC VANDERHAEGHEN — JGU Mainz, Germany

The keen interest to the anomalous magnetic moment of muon is motivated by its high potential for probing physics beyond Standard Model. However, the interpretation of the quantity is undermined by large hadronic uncertainties. In view of the new muon ($g-2$) experiments at Fermilab and at J-PARC, a new dispersive formalism for evaluating the hadronic light-by-light (HLbL) scattering contribution to the muon's anomalous magnetic moment will be presented. We provide a first realistic application of the proposed formalism to the case of pseudoscalar meson pole exchanges. Moreover, it allows for a more straightforward implementation of the experimental data. The ongoing measurements by the BES-III Collaboration will be a crucial input into the presented dispersive formalism.

Group Report SYDM 2.4 Tue 16:10 C/gHS
Measurement of Electric Dipole Moments of Charged Particles at Storage Rings — ●VOLKER HEJNY for the JEDI-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich, Germany

Electric Dipole Moments (EDM) of elementary particles are considered to be one of the most powerful tools to investigate CP violation beyond the Standard Model and to find an explanation for the dominance of matter over antimatter in our universe. Up to now experiments concentrated on neutral systems (neutrons, atoms, molecules). Storage rings offer the possibility to measure EDMs of charged particles by observing the influence of the EDM on the spin motion.

The Cooler Synchrotron COSY at the Forschungszentrum Jülich provides polarized protons and deuterons up to a momentum of 3.7 GeV/c and, thus, is an ideal starting point for such an experimental program. The JEDI (Jülich Electric Dipole moment Investigations) Collaboration has been formed to exploit the COSY facility to demonstrate the feasibility of such a measurement and to perform all the necessary R&D towards the design of a dedicated storage ring.

In this talk, the current status of the project will be presented and recent achievements together with the future plans will be discussed.