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Bethe Colloquium

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Precision hadron physics

To answer physics questions at both the highest and lowest energy scales, hadron physics plays a central and connecting role. In many questions at the forefront of particle physics, atomic physics, and nuclear astrophysics, the progress is limited by a missing quantitative knowledge of the strong interaction in the non-perturbative domain of Quantum Chromo Dynamics (QCD). On the other hand, precision measurement e.g. in atomic and particle physics lead to new insights on the structure of hadrons, as well as to the question how hadrons emerge out of their constituent quarks and gluons.

In this talk, I will survey several examples of this fruitful interplay. In the field of particle physics, the most precise measurement worldwide of the weak mixing angle in electron-proton scattering will open a window on searches for new physics. Furthermore, I will illustrate how measurements and theoretical calculations will lead to an improved knowledge of the anomalous magnetic moment of the muon. In the interplay with atomic physics, new measurement campaigns of nucleon form factors and polarizabilities, combined with more refined theoretical analyses, will allow to importantly improve on the limiting factors in the interpretation of high precision tests of the Lamb shift in muonic atoms and to shed light on the proton radius puzzle. In the interplay with nuclear astrophysics, measurements in nuclear systems will allow to study the nuclear equation of state, and address important questions in astrophysics, such as the detailed structure of neutron stars.

Lecture Hall 1

Physikalisches Institut · Nussallee 12 · 53115 Bonn

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