FAKULTÄT für PHYSIK
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PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
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Garchinger Maier-Leibnitz-Kolloquium

Donnerstag, 06.11.2025, 16^{15} Uhr

Hörsaal der LMU in Garching, Am Coulombwall 1
Treffen zum gemeinsamen Kaffee 16 Uhr

Dr. Aleksey Rusov

(Physik Department T31, Technische Universität München)

Theoretical Status of b-Hadron Lifetimes and Neutral B-Meson Mixing

The lifetimes of hadrons are one of the most fundamental properties of these composite systems. Their determination provides rigorous tests of the Standard Model (SM) - a very successful theory of elementary particles describing their electromagnetic, weak and strong interactions. In this talk the lifetimes of weakly decaying hadrons containing one b-quark, the so-called b-hadrons, including B-mesons and b-baryons will be discussed. Experimentally, their lifetimes are measured very precisely. From the theory side, the b-hadron lifetimes can reliably be predicted using the method of heavy quark expansion (HQE). Accurate theory predictions of the lifetimes requires a careful control of the hadronic binding effects both on the perturbative and the non-perturbative side. Mixing of neutral B-mesons is a quantum effect, that is governed by the weak interaction via the so-called box diagrams in the SM. Accurate theory studies of the mixing observables, including the decay width and mass differences, also require a rigorous control of both perturbative and non-perturbative hadronic effects. This talk will provide the current status of theoretical studies of both the b-hadron lifetimes and neutral B-meson mixing. After a basic introduction to the topic and providing motivation for studying of these objects, the current theory status is presented, highlighting the recent progress and comparing SM predictions with experimental data. Finally, a brief outlook to future theoretical improvements is given.

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gez. Peter Thirolf
Tel. 289-14064

gez. Norbert Kaiser
Tel. 289-12367