T 18: Flavourphysik (Theorie) 1

Convenor: Tobias Hurth

Zeit: Montag 11:00–13:15 Raum: WIL-B122

T 18.1 Mo 11:00 WIL-B122

General Analysis of $\bar{B} \to \bar{K}^{(*)}\ell^+\ell^-$ Decays at Low Recoil — Christoph Bobeth[1], Gudrun Hiller[2], and •Danny van Dyk[2,3] — [1]Excellence Cluster Universe, Technische Universität München, D-85748 Garching, Germany — [2]Institut für Physik, Technische Universität Dortmund, D-44221 Dortmund, Germany — [3]Theoretische Physik 1, Naturwissenschaftlich-Technische Fakultät, Universität Siegen, Walter-Flex-Straße 3, D-57068 Siegen, Germany

We study the decay $\bar{B} \to \bar{K}^*(\to \bar{K}\pi)\ell^+\ell^-$ for $\ell = e, \mu$ in the most general scenario of effective operators $[\bar{s}\Gamma b][\bar{\ell}\Gamma'\ell]$, including tensor operators. The application of the low recoil framework yields several phenomenologically interesting results. The latter include observables $H_T^{(i)}$, $A_{\rm im}/A_{\rm FB}$, and related CP asymmetries, which are free from hadronic matrix elements in the full basis of operators. They also include short-distance-free observables that allow extraction of the ratio of the hadronic form factors $f_0/f_\parallel$. We further point out means to probe the Operator Product Expansion of the low recoil framework. We find correlations among $\bar{B} \to \bar{K}\ell^+\ell^-$ and $\bar{B} \to \bar{K}^*\ell^+\ell^-$ observables at low recoil which help to constrain New Physics effects, especially when using the latest LHCb measurement of the observable F_H.

T 18.2 Mo 11:15 WIL-B122

Squark Flavor Implications from $\bar{B} \to \bar{K}^{(*)}l^+l^-$ — •Arnd Behring[1], Christian Gross[1,2], Gudrun Hiller[1], and Stefan Schacht[1] — [1]Institut für Physik, Technische Universität Dortmund, D-44221 Dortmund, Germany — [2]Departement Physik, Universität Basel, CH-4056 Basel, Switzerland

We use recent data on the rare decays $\bar{B} \to \bar{K}^{(*)}l^+l^-$ and analyze their impact on flavor violation in the squark sector of the MSSM. We obtain new constraints on the dimensionless flavor mixing parameter $(\delta^u_{23})_{LR}$ and on the rare top decays $t \to cg$, $t \to c\gamma$ and $t \to cZ$.

T 18.3 Mo 11:30 WIL-B122

$B \to K\ell^+\ell^-$ decay at large hadronic recoil — Alex Khodjamirian[1], Thomas Mannel[1], and •Yuming Wang[2] — [1]Siegen University — [2]TUM

We predict the amplitude of the $B \to K\ell^+\ell^-$ decay in the region of the dilepton invariant mass squared $0 < q^2 \leq m^2_{J/\psi}$, that is, at large hadronic recoil. The $B \to K$ form factors entering the factorizable part of the decay amplitude are obtained from QCD light-cone sum rules. The nonlocal effects, generated by the four-quark and penguin operators combined with the electromagnetic interaction, are calculated at $q^2 < 0$, far below the hadronic thresholds. For hard-gluon contributions we employ the QCD factorization approach. The soft-gluon nonfactorizable contributions are estimated from QCD light-cone sum rules. The result of the calculation is matched to the hadronic dispersion relation in the variable q^2, which is then continued to the kinematical region of the decay. The overall effect of nonlocal contributions in $B \to K\ell^+\ell^-$ at large hadronic recoil is moderate. The main uncertainty of the predicted $B \to K\ell^+\ell^-$ partial width is caused by the $B \to K$ form factors. Furthermore, the isospin asymmetry in this decay is expected to be very small. We investigate the deviation of the observables from the Standard Model predictions by introducing a generic new physics contribution to the effective Hamiltonian.

T 18.4 Mo 11:45 WIL-B122

$B \to K\ell^+\ell^-$ decay at large hadronic recoil — Alex Khodjamirian[1], Thomas Mannel[1], and •Yu-Ming Wang[2] — [1]Siegen University — [2]TUM

We predict the amplitude of the $B \to K\ell^+\ell^-$ decay in the region of the dilepton invariant mass squared $0 < q^2 \leq m^2_{J/\psi}$, that is, at large hadronic recoil. The $B \to K$ form factors entering the factorizable part of the decay amplitude are obtained from QCD light-cone sum rules. The nonlocal effects, generated by the four-quark and penguin operators combined with the electromagnetic interaction, are calculated at $q^2 < 0$, far below the hadronic thresholds. For hard-gluon contributions we employ the QCD factorization approach. The soft-gluon nonfactorizable contributions are estimated from QCD light-cone sum rules. The result of the calculation is matched to the hadronic dispersion relation in the variable q^2, which is then continued to the kinematical region of the decay. The overall effect of nonlocal contributions in $B \to K\ell^+\ell^-$ at large hadronic recoil is moderate. The main uncertainty of the predicted $B \to K\ell^+\ell^-$ partial width is caused by the $B \to K$ form factors. Furthermore, the isospin asymmetry in this decay is expected to be very small. We investigate the deviation of the observables from the Standard Model predictions by introducing a generic new physics contribution to the effective Hamiltonian.

T 18.5 Mo 12:00 WIL-B122

Symmetry-violation effects in the decay constants of heavy-light mesons — Patrick Gelhausen, Alexander Khodjamirian, Alexei A. Pivovarov, and •Denis Rosenthal — Universität Siegen, Deutschland

Due to the wealth of information on heavy-flavoured hadron decays provided by B-factories and hadronic colliders in recent years, precise theoretical predictions for the hadronic parameters are required for a comparison between the experiment and the Standard Model with its extensions. We revisit and extend the QCD sum rule analyses of decay constants of heavy bottom and charmed mesons with spin parity $J^P = 0^-$ and 1^- ($B_s^{(*)}$, $D_s^{(*)}$, $B^{(*)}$ and $D^{(*)}$). Predicting the ratios of the corresponding decay constants, we gain access to the violation of various symmetries, such as the SU(3) flavour-breaking, the heavy-quark spin- and flavour-symmetry violating effects. The latter are compared to $1/m_Q$-corrections derived in HQET.

T 18.6 Mo 12:15 WIL-B122

QCD sum rules for radially excited heavy-light mesons — •Patrick Gelhausen, Alexander Khodjamirian, Alexei A. Pivovarov, and Denis Rosenthal — Universität Siegen, Theoretische Physik 1, 57068 Siegen

In the last decades QCD sum rules proved to be a reliable tool for the determination of QCD parameters such as quark masses or vacuum condensates as well as for the calculation of various hadronic matrix elements relevant for flavour physics.
In addition to the decay constants of ground-state heavy-light mesons $B^{(*)}$ and $D^{(*)}$, the phenomenological description of the heavy-light form factors demands knowledge of decay constants of radially excited heavy-light states. Modifying the QCD sum rule method we extract these constants for the first radial excitations with the quantum numbers of $B^{(*)}$ and $D^{(*)}$.

T 18.7 Mo 12:30 WIL-B122

Charm lifetimes within the Heavy Quark Expansion — •Thomas Rauh[1] and Alexander Lenz[2,3] — [1]TU München, Physik Department, Deutschland — [2]IPPP Department of Physics, University of Durham, United Kingdom — [3]CERN - Theory Divison, Geneva, Switzerland

Recent experimental results show an unexpectedly large amount of CP violation in the charm sector. To decide whether this is a sign for new physics, accurate control over the standard model prediction is needed. Charm physics poses considerable theoretical challenges, because the charm mass is neither light nor truly heavy. The Heavy Quark Expansion (HQE) provides a perturbative expansion in the inverse heavy quark mass for inclusive rates. It proved to be very successful in the B sector, yet its validity for charm decays has often been questioned. We present results of a HQE study of charm lifetimes and discuss implications on the HQE in charm.

T 18.8 Mo 12:45 WIL-B122

Semileptonic charm decays $D \to \eta^{(\prime)} l \nu_l$ — •Florian Porkert, Nils Offen, and Andreas Schäfer — University of Regensburg, Germany

We consider the semileptonic $f_+^{D\to\eta^{(\prime)}}(q^2)$ form factor within the light-cone sum rule (LCSR) formalism including gluonic NLO twist-two corrections. Such semileptonic decays of charm and beauty mesons are important for a sound understanding of the involved weak decay mechanisms and the nonperturbative QCD dynamics in particular. The (planned) high precision measurements at Super KEK B, LHCb and especially the future PANDA experiment may produce the statistics needed to constrain the underlying physics. In this context we dis-

cuss the $D_{(s)} \to \eta^{(\prime)} l\nu_l$, $B \to \eta^{(\prime)} l\nu_l$ and $D \to (\pi, K) l\nu_l$ decays within the LCSR formalism emphasizing the possibilities to extract information of the two gluon components of the η, η' mesons up to leading twist accuracy. We will conclude with a comparison of the LCSR data and the latest lattice results for the $D_{(s)} \to \eta^{(\prime)} l\nu_l$ decay.

T 18.9 Mo 13:00 WIL-B122

CP Violation in Charm Meson Decays - A signal of New Physics? — •Philipp Frings — Institut für Theoretische Teilchenphysik (TTP), Karlsruhe, Deutschland

Recent measurements of the observable Delta A_CP deviate significantly from the naive Standard Model expectation and might represent a sign of new physics. It is necessary to evaluate whether this deviation is actually due to new physics or whether it can be accommodated in the Standard Model.

In this talk, we discuss a possible explanation of Delta A_CP within the SM with the diagrammatic approach. Different D Meson decays can be related by the SU(3) flavor symmetry which can be used to express all charm decay amplitudes by a small number of parameters (topologies). We use this approach and will find that it leads us to a framework in which an unexpectedly large value for Delta A_CP arises.