T 15: Flavourphysik (Theorie) I

Convenor: Martin Gorbahn / Sebastian Jäger

Zeit: Mittwoch 14:00–16:15 Raum: HG XIII

T 15.1 Mi 14:00 HG XIII

Charm mixing in the framework of HQE — •Markus Bobrowski and Alexander Lenz — Universität Regensburg

In this talk we issue the quark-level analysis of meson-antimeson mixing in the charm system. Although a naïve application of the heavy-quark-expansion (HQE) approach to D^0 mesons fails to reproduce the experimental width differences by orders of magnitude, we argue that currently there seem to be no indications for a complete breakdown of HQE-based techniques in the leading dimensions 6 and 7. The smallness of current quark-level based theory predictions can be understood as a result of efficient GIM interference between numerically rather large diagrams; any mechanism, which helps to lift this suppression, could possibly serve as a solution to this problem: This may be new physics modifications of CKM couplings or enhancement of $SU(3)_F$ symmetry breaking. Within the Standard Model, GIM lifting is sometimes supposed to come along with the cutting of internal quark loops in dimension 9 and 12 of the HQE. Reliable results for the quark-level expectation could finally provide a test of quark-hadron duality in the charm sector.

T 15.2 Mi 14:15 HG XIII

BLOR - A Monte Carlo generator for radiative corrections in exclusive semileptonic B-meson decays — •Florian Bernlochner and Heiko Lacker — Humboldt Universität zu Berlin

Over the last 10 years an increasing amount of data and better understanding of detector effects lead to very accurate measurements of the CKM matrix elements V_{ub} and V_{cb} from semileptonic B-meson decay rates. In order to match today's experimental precision a good understanding of QED correction effects is important: occurring virtual and real photons couple to all charged particles in the decay process, altering partial and total rates. We present the current progress of the theoretical calculation and simulation of NLO QED corrections for various exclusive semileptonic B-meson decay channels. In addition we compare our simulated corrections from our Monte Carlo generator BLOR with NLL algorithms.

T 15.3 Mi 14:30 HG XIII

Semileptonic charm decays $D \to \pi\ell\nu_\ell$ and $D \to K\ell\nu_\ell$ from QCD light cone sum rules — •Christoph Klein[1], Alexander Khodjamirian[1], Thomas Mannel[1], and Nils Offen[2] — [1]Theoretische Physik 1, Fachbereich Physik, Universität Siegen, D-57068 Siegen — [2]Institut für Theoretische Physik, Universität Regensburg, D-93040 Regensburg

We present a new calculation of the $D \to \pi$ and $D \to K$ weak transition form factors from QCD light-cone sum rules. These form factors describe the hadronic dynamics in semileptonic D-decays, from which the CKM-parameters V_{cd} and V_{cs} can be extracted. As a basis of the calculation we use the sum rules for the $B \to \pi$- and $B \to K$- form factors, for which new higher order corrections recently have been derived. We also update the input parameters.

We calculate the form factors $f^+_{D\pi}(q^2)$ and $f^+_{DK}(q^2)$ at momentum transfer $q^2 = 0$ to an accuracy of $\sim 10 - 15\%$, in a good agreement with lattice QCD results. The ratio $f^+_{D\pi}(0)/f^+_{DK}(0)$ has even a smaller error, since some uncertainties cancel. Combining the calculated form factors with the latest CLEO data, we obtain results for $|V_{cd}|$ and $|V_{cd}|/|V_{cs}|$.

The form factors are not directly calculable from the sum rules in the semileptonic decay region $0 < q^2 < (m_D - m_{\pi/K})^2$. Nevertheless we can predict the form factors for $q^2 < 0$ and use analytic continuation of various parameterizations. In this way the shape of the $D \to \pi, K$ form factors in the whole semileptonic region is reproduced, in a good agreement with experiment.

T 15.4 Mi 14:45 HG XIII

SIMBA - A global fit approach to $|V_{ub}|$ — •Florian Bernlochner[1], Heiko Lacker[1], Zoltan Ligeti[3], Iain Stewart[2], Frank Tackmann[2], and Kerstin Tackmann[4] — [1]Humboldt Universität zu Berlin — [2]Massachusetts Institute of Technology — [3]Lawrence Berkeley National Laboratory — [4]CERN

The parton distribution function for a b quark in the B-meson (called the shape function) plays an important role in the analysis of the $B \to X_s\gamma$ and $B \to X_u l\bar{\nu}$ data, and gives raise to one of the dominant uncertainties in the determination of $|V_{ub}|$. We implement a new model independent framework to treat the shape function with reliable theoretical uncertainties based on an expansion in a suitable complete set of orthonormal basis functions. This is a significant improvement over fits to model functions. We present the current status of combined fits to BaBar and Belle data and extract $|V_{ub}|$.

T 15.5 Mi 15:00 HG XIII

Nicht-perturbative Korrekturen in $B \to X_c\ell\bar{\nu_\ell}$ Zerfällen — •Sascha Turczyk[1], Ikaros Bigi[2], Thomas Mannel[1] und Nikolai Uraltsev[1] — [1]Theoretische Physik 1, Fachbereich Physik, Universität Siegen — [2]Dept. of Physics, University of Notre Dame du Lac

Derzeit wird das zum Test des Standard Modell Flavour Sektors wichtige CKM-Matrixelement V_{cb} mit Hilfe von inklusiven semileptonischen $B \to X_c e^- \bar{\nu}_e$ Zerfällen am präzisesten bestimmt. Zur theoretischen Berechnung dieser Zerfälle ist das Handwerkszeug die „Heavy Quark Expansion", bestehend sowohl aus nicht-perturbativen Korrekturen durch eine Entwicklung in $\Lambda_{\rm QCD}/m_b$, als auch perturbative Korrekturen in α_s zu jeder dieser Ordnungen. Kürzlich wurde festgestellt, dass für $k \geq 3$ die Standard OPE eine Entwicklung in $1/(m_b^k m_c^l)$ enthält, bei denen eine Untergruppe der nicht-perturbativen Parameter aus der formalen Ordnung $1/m_b^{k+l}$ auftritt . Da für die schwere Endzustands-Quark Masse parametrisch $m_c \sim \sqrt{\Lambda_{\rm QCD} m_b}$ gilt, müssen für ein konsistentes Power-Counting partielle Terme höherer Ordnungen ab $1/m_b^4$ berücksichtigt werden. Die starke Zunahme der Parameteranzahl macht die Extraktion aus dem Experiment unmöglich.

Es wird die komplette nicht-perturbative Entwicklung schematisch bis $1/m_b^5$ gezeigt. Um einen Konvergenz-Check der OPE zu erreichen, wird eine Methode vorgeführt, um die unbekannten nicht-perturbativen Parameter abzuschätzen. Der Einfluss verschiedener Ordnungen der Entwicklung auf höhere Momente sowohl in der hadronisch invarianten Masse, als auch der geladenen Leptonenergie wird untersucht.

T 15.6 Mi 15:15 HG XIII

Exclusive decays B to K l l from light-cone sum rules — Alexander Khodjamirian[1], Thomas Mannel[1], Aleksey Pivovarov[2], and •Yuming Wang[1] — [1]University Siegen, D-57068, Siegen, Germany — [2]Institute for Nuclear Research of Russian, 7a,60th October Anniversary prospect, Moscow 117312, Russia

We obtain the B to K l l invariant dilepton mass distribution, employing an improved light-cone sum rule calculation of B to K form factors. The SU(3)-symmetry breaking effects, including those in the K meson distribution amplitudes are updated. Utilizing the z series parameterization, we also investigate the transfer momentum dependence of transition form factors, by matching this parameterization to the light-cone sum rule predictions at small and moderate momentum transfers. Apart from the factorizable contributions of quark-lepton O_9 and chromomagnetic O_7 operators, some nonfactorizable effects in the B to K l l decay amplitude are also included in our analysis.

T 15.7 Mi 15:30 HG XIII

Uncertainties in the $\bar{B} \to X_s\gamma$ Decay due to Subleading Power Corrections — •Michael Benzke[1], Seung J. Lee[2], Matthias Neubert[1], and Gil Paz[3] — [1]Johannes Gutenberg-Universität, Mainz — [2]Weizmann Institute of Science, Rehovot, Israel — [3]University of Chicago, Chicago, U.S.A.

The rare decay $\bar{B} \to X_s\gamma$ is of interest, since it can be used to probe the standard model and constrain possible new physics scenarios. For this it is necessary to theoretically predict the decay rate as precisely as possible and to reliably estimate the uncertainties. Today, the major source of uncertainty is of a non-perturbative nature and originates from the low energy strong interactions within the hadron. It can be systematically dealt with within the framework of SCET. In this talk I will present our estimate on the non-perturbative uncertainties based on an SCET analysis at subleading power.

T 15.8 Mi 15:45 HG XIII

$B \to D^{(*)}$ at the Zero Recoil Point — •Sven Faller, Thomas Mannel, Saba Shafaq, and Sascha Turczyk — Universität Siegen,

Theoretische Physik 1

We allowed New Physics (NP) contributions in the $B \to D^{(*)}$ decays and studied the influence of that contributions for the exclusive $|V_{cb}|$ extraction.

T 15.9 Mi 16:00 HG XIII

Electroweak penguins in isospin-violating B_s decays — Lars Hofer[1], •Dominik Scherer[1], and Leonardo Vernazza[2] — [1]Karlsruher Institut für Technologie — [2]Johannes-Gutenberg-Universität Mainz

During the last decade, experimental data from $B \to K\pi$ decays has caused many discussions about deviations from Standard Model predictions and their possible explanation by New Physics. In particular, models which allow for enhanced electroweak penguins have been investigated in this context since they allow for sizeable isospin-violating effects.

We study the consequences of such enhanced electroweak penguins in the *purely* isospin-violating decays $B_s \to \phi\pi$ and $B_s \to \phi\rho$. The branching fractions of these modes are highly sensitive to New Physics in EW penguins and are thus an interesting topic for LHCb and Super-B-factories, complementary to precise $B \to K\pi$ measurements.