T 14: Flavorphysik (Theorie) 1

Convenor: Gerhard Buchalla

Zeit: Dienstag 16:45–19:00 Raum: M001

T 14.1 Di 16:45 M001

Calculation of heavy meson decay form factors using QCD light cone sum rules — •Christoph Klein[1], Sven Faller[1], Alexander Khodjamirian[1], Thomas Mannel[1], and Nils Offen[2] — [1]Theoretische Physik 1, Fachbereich Physik, Universität Siegen, D-57068 Siegen — [2]Laboratoire de Physique Theorique CNRS/Univ. Paris-Sud 11, F-91405 Orsay, France

For the determination of CKM-matrix elements from exclusive semileptonic heavy meson decays it is important to know the corresponding form factors, which describe the hadronic dynamics. Since the form factors need some theoretical input, it is crucial to have a few independent calculations to extract the CKM-parameters from experimental data. One of these is the method of QCD sum rules, which will be applied here.

In this talk we present our results from the use of different versions of the method of light cone sum rules (LCSR) for the determination of the $B \to D^{(*)}$- as well as the $D \to \pi$ and $D \to K$-form factors. For $B \to D^{(*)}$ we use the new version of LCSR with B-meson-distribution amplitudes, which is applicable in the kinematical region of high recoil of the produced meson. The results are compared with recent experimental data and their expansion in the heavy quark mass is discussed. Concerning $D \to \pi, K$ we employ and update the conventional LCSR with π/K-distribution amplitudes. With the calculated form factors we determine the ratio $|V_{cd}|/|V_{cs}|$ from new experimental data.

T 14.2 Di 17:00 M001

Korrekturen höherer Ordnung in $B \to X_c \ell \bar{\nu}_\ell$ Zerfällen — •Sascha Turczyk, Thomas Mannel und Nikolai Uraltsev — Theoretische Physik 1, Fachbereich Physik, Universität Siegen

Derzeit wird das CKM-Matrixelement $V_{\rm cb}$ 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 (HQE)“, bestehend sowohl aus nichtperturbativen Korrekturen durch eine Entwicklung in $\Lambda_{\rm QCD}/m_b$, als auch Strahlungskorrekturen zu jeder dieser Ordnungen.

Kürzlich wurden die α_s^2, sowie ein Teil der kombinierten α_s/m_b^2 und die $1/m_b^4$ Korrekturen berechnet, sowie die Beiträge von “intrinsic-charm” diskutiert. Die neuesten experimentellen Analysen beinhalten weder die Beiträge der Ordnung $1/m_b^4$ noch die von “intrinsic Charm”. Daher ist es möglich durch Einschluss dieser Ergebnisse den theoretischen Fehler weiter zu reduzieren.

“Intrinsic charm” kann entweder durch ein neues, unbekanntes Matrixelement oder aber im Rahmen einer $1/(m_b^3 m_c^n)$ Entwicklung beschrieben werden. Die möglichen Parametrisierungen werden im Vortrag vorgestellt und mögliche Observablen zur Bestimmung von “intrinsic charm” Beiträgen diskutiert.

T 14.3 Di 17:15 M001

QED radiative corrections to semileptonic B decays — •Florian Bernlochner and Heiko Lacker — Humboldt Universität zu Berlin, Berlin, Deutschland

Over the last 10 years an increasing amount of data and a better understanding of detector effects lead to a very accurate picture of physics at the Y(4s) threshold at the B-factory experiments BABAR and Belle. One core task of these sites lies in the determination of the b to u and b to c quark transition elements of the Cabibbo-Kobayashi-Maskawa matrix, Vub and Vcb respectively, from semileptonic B decay rates. In order to match today's precision on the experimental side, one needs a good understanding of photonic correction effects: Occurring virtual and real photons can couple to all charged particles of the initial and final states of the decay process, leading to an overall change of the decay kinematics, shape and rate. These effects usually are studied applying approximative all-purpose algorithms to allready simulated decays, which determine process independent kinematic corrections on the final states. All of these algorithms are based on factorizations of the photonic corrections in the vanishing photon energy limit. This approach is unsatisfying in two ways: first it allows no clear way to determine the accuracy of the algorithm. Second the overall rate and shape changes are neglected. We present the current progress of the theoretical calculations and simulations of the order alpha QED corrections for various semileptonic B to pseudoscalar and B to vector decays, which circumnavigate these issues by an accurate treatment of the photonic corrections.

T 14.4 Di 17:30 M001

Applications of SCET to B meson decays — •Ben Pecjak — Johannes Gutenberg-Universitaet, Mainz, Germany

I briefly review some applications of soft-collinear effective theory to inclusive and exclusive B meson decays.

T 14.5 Di 17:45 M001

Factorization at Subleading Power for the $\bar{B} \to X_s \gamma$ Decay — •Michael Benzke — Johannes-Gutenberg-Universität Mainz

Soft-collinear effective theory is a useful tool to analyse the factorization properties of the $\bar{B} \to X_s \gamma$ decay rate in the endpoint region $M_B - 2E_\gamma \ll M_B$. In order to better estimate the hadronic uncertainties in the calculation of the $\bar{B} \to X_s \gamma$ branching ratio, higher orders in the $1/m_b$ expansion should be considered. As is the case for the leading power, these contributions also factorize into hard, jet and shapefunctions. In this talk the structure of this factorization formula at subleading power will be discussed.

T 14.6 Di 18:00 M001

$b \to s \ell^+ \ell^-$ in the high q^2 region at two-loop — Christoph Greub, •Volker Pilipp, and Christof Schüpbach — Center for Research and Education in Fundamental Physics, Bern, Switzerland

In the search for new physics the inclusive decay mode $b \to s \ell^+ \ell^-$, which is induced by flavour changing neutral currents, plays an important role. Operator product expansion allows a precise prediction of this mode in the region, where the invariant mass squared of the leptons q^2 is far away from the $c\bar{c}$ resonances. Whereas the two-loop corrections in the region below the resonances have been available for a couple of years (Asatryan et. al. 2002), I will talk about a recent two-loop calculation of the high q^2 region. In this context I will present the application of modern techniques to evaluate Feynman integrals.

T 14.7 Di 18:15 M001

B → Vectormeson Vectormeson Decays and CP Violation — •Matthäus Bartsch — Ludwig-Maximilians-Universität München, Fakultät für Physik, Arnold Sommerfeld Center for Theoretical Physics, D-80333 München, Germany

The aim of using exclusive hadronic decays of a B–meson into two light mesons is the determination of CKM parameters and the detection of New Physics entering in these decays. Within the framework of QCD factorization the dominant corrections from QCD are calculated in a systematic way. After a short introduction into the framework I will discuss the hadronic uncertainties in comparison to the case of pseudoscalar final states and show the implications on CKM observables. The talk will focus on some chosen applications to specific decay modes and the precision of CKM observables that can be extracted from them. An application is the discussion of a New Physics scenario which will be testable with high precision in future experiments.

T 14.8 Di 18:30 M001

NNLO QCD corrections to charmless hadronic B decays — •Guido Bell — Institut für Theoretische Teilchenphysik, Universität Karlsruhe

B decays into a pair of light mesons reveal important information on the underlying four-quark interactions, which can used to test the CKM mechanism of flavour mixing and CP violation. While experimental measurements at current and future B physics experiments will reach unprecedented precision, the main obstacle for precise theoretical predictions are the complicated strong interaction effects related to the three hadrons.

In recent years factorization theorems have been established which systematically disentangle perturbative from non-perturbative effects. This in particular allows to improve the theoretical predictions by computing higher order radiative corrections. I will report on the current effort to compute NNLO QCD corrections to charmless hadronic B decays and illustrate their impact in the $B \to \pi\pi$ channels.

T 14.9 Di 18:45 M001

Precision predictions for two-body hadronic B decays — •Tobias Huber, Martin Beneke, and Xin-Qiang Li — Institut f. Theoretische Physik E, RWTH Aachen

We describe the calculation of the two-loop vertex corrections to the topological tree amplitudes in the QCD Factorization framework for hadronic two-body B decays.

We will start by briefly introducing the theoretical framework of the effective Hamiltonian and QCD Factorization, and will then motivate the need for the two-loop NNLO calculation for precision predictions of branching ratios and CP asymmetries.

We will then describe some techniques that are applied in the completely analytical computation of the amplitudes. Among these techniques are the Laporta reduction of scalar integrals to master integrals, and several methods to evaluate the latter.