T 15: Flavourphysik (Theorie) II

Convenor: Alexander Lenz

Zeit: Freitag 14:00–16:05 Raum: 30.23: 3-1

T 15.1 Fr 14:00 30.23: 3-1

How much charm can PANDA create? — •Christoph Klein, Alexander Khodjamirian, Thomas Mannel, and Yu-Ming Wang — Theoretische Physik 1, Universität Siegen

At the future PANDA experiment at the FAIR facility in Darmstadt, proton-antiproton collisions will be studied at an energy up to $\simeq 5.5\,GeV$, which suffices to produce charmed hadron pairs like $D\bar{D}$ or $\Lambda_c\bar{\Lambda}_c$. Their yet unknown production cross sections are of special interest: If they are high enough, they could provide higher statistics for the investigation of CP violation and rare decays of charmed hadrons.

It is a difficult task to predict these cross sections, since the energy here is still slightly above the production threshold and so not easily accesable to perturbative QCD. We describe the process by a model based on the exchange of intermediating hadrons according to Regge theory, which is known to give accurate predictions for hadronic processes in this kinematical region.

An important ingredient are process-dependent coupling constants between the hadrons, which we calculate using the method of QCD light-cone sum rules. As a byproduct we also obtain semileptonic decay widths for heavy baryons, like e.g. $\Lambda_b \to p\ell\nu_\ell$. Making use of the Regge model we give an improved estimate of the cross sections for exclusive open charm production at PANDA energies.

T 15.2 Fr 14:15 30.23: 3-1

D^0 mixing and CP violation — •Markus Bobrowski[1] and Alexander Lenz[2] — [1]Karlsruher Institut für Technologie (KIT), Institut für Theoretische Teilchenphysik — [2]Universität Regensburg, Institut für Theoretische Physik

We report the results of a recent study on D^0–$\bar{D}^0$ mixing and argue that currently a CP violating weak phase of the order of some per mille can not be excluded in the Standard Model. Our work relies on a short-distance analysis of the $\Delta C = 2$ Hamiltonian, using the framework of Heavy Quark Expansion (HQE), an expansion in powers of the inverse charm quark mass. We demonstrate that, as expected, the dominant contribution is related to effects of SU(3) flavour symmetry breaking present in higher orders of the HQE: they appear for the first time in meson-antimeson transitions with an intermediate state coupling to the sea quark background of the meson, associated with operators of dimension 10 and 12. A factorisation approach is used to simplify the operator basis. Due to a lifting of GIM suppression by one power of m_s/m_c, the contribution to $y = \Delta\Gamma/2\Gamma$ is found to exceed that of the formally leading dimension six by a factor close to ten.

Gruppenbericht T 15.3 Fr 14:30 30.23: 3-1

Randall-Sundrum Corrections to the Width Difference and CP-Violating Phase in B_s^0-Meson Decays — Florian Goertz and •Torsten Pfoh — Institut für Physik, JGU Mainz

In many new physics scenarios, one expects big corrections to the B_s^0-$\bar{B}_s^0$ mixing amplitude M_{12}^s. This gives rise to a new CP violating phase, which tends to suppress the width difference of the heavy and the light meson state, given that there is no large enhancement of the decay amplitude Γ_{12}^s. In this talk, I will discuss corrections to both M_{12}^s and Γ_{12}^s for Randall-Sundrum models with a brane-localized Higgs sector. The implications on the width difference, as well as the time-dependent asymmetry $S_{\psi\phi}$, and the semileptonic CP asymmetry $A_{\rm SL}^s$ are investigated.

T 15.4 Fr 14:50 30.23: 3-1

From Flavour to SUSY Flavour Models — Stefan Antusch[1], Lorenzo Calibbi[1], •Vinzenz Maurer[1], and Martin Spinrath[2] — [1]Max-Planck-Institut fuer Physik, Muenchen, Deutschland — [2]SISSA, Trieste, Italy

If supersymmetry (SUSY) will be discovered, models of flavour have to provide not only an explanation for the flavour structure of the Standard Model fermions but also of their scalar superpartners. In this talk we show how a conventional flavour model might be extended in this context to a SUSY flavour model. As an example, we analyse a new class of flavour models realised in a SU(5) Grand Unified Theory where the $\bar{5}$ representation fields are unified in a real triplet representation of a family symmetry group such as SO(3) or A_4, which is then extended into a SUSY flavour model. We take into account important SUSY specific corrections such as 1-loop SUSY threshold corrections and canonical normalisation effects. Using this we fit the model to the data of fermion masses and mixings. From this we make predictions for the SUSY spectrum as well as for the neutrino sector which can be tested by ongoing and future experiments.

T 15.5 Fr 15:05 30.23: 3-1

Flavour Symmetry in the Lepton Sector — •Andreas Joseph — Technische Universität München, T 31, Munich, Germany

Masses of fermions, i.e. Yukawa couplings, extend about a range of 5 orders of magnitude and show a pronounced hierarchy. On the other hand, mixing in the quark and lepton sector show very different patterns. Motivated by the minimal (lepton) flavour hypothesis, we address these issues by promoting SM Yukawa couplings and a symmetric dim-5 neutrino mass term to scalar spurion fields. These fields transform accordingly under a global flavour symmetry. Above the electroweak scale, the spurion fields acquire VEVs in a stepwise fashion to accommodate the observed hierarchies among fermions. Especially, the possibilities of an normal, inverted or degenerate neutrino spectrum can be accounted for. This has to be understood as bottom-up approach to the flavour structure of the SM.

T 15.6 Fr 15:20 30.23: 3-1

Fourth Generation: Effects of heavy right-handed neutrinos — Markus Bobrowski, •Thomas Neder, and Ulrich Nierste — Karlsruher Institut für Technologie (KIT), Institut für Theoretische Teilchenphysik

In the presence of a sequential fourth generation the additional neutrino states must be sufficiently heavy to comply with the measured invisible width of the Z-boson. This can be achieved in the see-saw framework if only three out of the heavy right-handed neutrinos have masses far above the electroweak scale. An effective theory is constructed in which the three heaviest neutrinos are integrated out. The light left-handed neutrinos become Majorana fermions, new FCNC arise and new interactions of the pseudo-Goldstone bosons occur. We discuss rare flavor-violating lepton decays.

T 15.7 Fr 15:35 30.23: 3-1

Einschränkung von Massen und CKM-Elementen aus direkten Suchen nach Quarks vierter Generation — •Fabian Spettel[1], Heiko Lacker[1], Peter Uwer[2] und Andreas Menzel[1] — [1]Institut fuer Physik — AG EEP II, Humboldt-Universität zu Berlin, Newtonstraße 15, 12489 Berlin — [2]Institut für Physik — AG PEP, Humboldt-Universität zu Berlin, Newtonstrasse 15, 12489 Berlin

Direkte Suchen von CDF und D0 nach Quarks einer vierten Generation, benutzen die vereinfachende Annahme, dass die Verzweigungsverhältnisse für die in der Suche betrachteten Endzustände 100 % betragen. Diese Annahmen sind aber für bestimmte Bereiche im Parameterraum nicht, beziehungsweise nur eingeschränkt gültig.

In der vorgestellten Analyse, die mit dem CKMfitter-Paket durchgeführt werden, werden diese Annahmen aufgegeben und die erlaubten Bereiche für die Massen und CKM-Elemente gewonnen, indem die direkten Suchresultate mit Flavour- und elektroschwachen Präzisionsobservablen verknüpft werden.

T 15.8 Fr 15:50 30.23: 3-1

Tetraquark Interpretation aus $e^+e^- \to \Upsilon(1S)\pi^+\pi^-$ Belle Daten nahe $\Upsilon(5S)$ — Ahmed Ali[1], Satoshi Mishima[2] und •Christian Hambrock[1] — [1]DESY, Hamburg — [2]INFN-Frascati

Wir haben die partiellen Wirkungsquerschnitte und Helizitäts- und invariante Massen-Verteilungen für die Prozesse $e^+e^- \to \Upsilon(1S)(\pi^+\pi^-, K^+K^-, \eta\pi^0)$ nahe der $\Upsilon(5S)$ Resonanz in einem Tetraquark basierten Modell berechnet. Dieses wird benutzt um die von Belle verfügbaren Daten für den Prozess $e^+e^- \to \Upsilon(1S)\pi^+\pi^-$ zu analysieren und mit Hilfe des Resultats Vorhersagen für die Verteilungsfunktionen der Endzustände $\Upsilon(1S)K^+K^-$ und $\Upsilon(1S)\eta\pi^0$ zu geben. Die Fits an die Belle Daten köennen das gemessene Spektrum reproduzieren und die Vorhersagen sind vielversprechend.

In meinem Vortrag gebe ich eine Einführung in unser Tetraquark Modell und präsentiere unsere Ergebnisse.