

T 15: Flavorphysik (Theorie) 2

Convenor: Gerhard Buchalla

Zeit: Mittwoch 16:45–19:00

Raum: M001

T 15.1 Mi 16:45 M001

$\Delta F=2$ Observables and Fine-Tuning in a Warped Extra Dimension with Custodial Protection — MONIKA BLANKE^{1,2}, ANDRZEJ BURAS¹, ●BJÖRN DULING¹, STEFANIA GORI^{1,2}, and ANDREAS WEILER³ — ¹TU München, Physikdepartment, Garching — ²Max Planck Institut für Physik, München — ³Cornell University, Ithaca, NY

After a brief theoretical introduction of the warped extra-dimensional (WED) model with custodial protection the results of arXiv:0809.1073 are presented. In this work we analyze the impact of Kaluza-Klein (KK) gauge boson modes on $\Delta F = 2$ observables, for the first time considering the full operator basis and including NLO RG running. It is pointed out that the dominant contribution in the B-system does not come from the KK gluon, but that contributions from KK excitations of the weak gauge bosons are competitive. In a numerical analysis we assess the amount of fine tuning necessary for obtaining realistic values for quark masses and mixings and at the same time realistic values for ϵ_K , the measure for indirect CP violation in K meson mixing. We are able to show that a mass of the lightest KK gauge boson of 2-3 TeV, and hence in the reach of the LHC, is still possible for moderate fine tuning. These results enable us to predict ranges for not yet measured $\Delta F = 2$ observables, such as $S_{\psi\phi}$ and A_{SL}^s , which can differ significantly from their SM values.

T 15.2 Mi 17:00 M001

Phenomenology of CP violation in a Flavor Blind MSSM — ●WOLFGANG ALTMANNSHOFER, ANDRZEJ BURAS, and PARIDE PARADISI — Physik Department, TU München, Germany

We present an analysis of CP violating effects in a supersymmetric scenario, where the CKM matrix remains the only source of flavor violation but new CP violating phases are introduced in the soft sector. Such a scenario can be probed not only through flavor conserving observables like EDMs, but also through several flavor changing and CP violating processes, like the CP asymmetries in $b \rightarrow s\gamma$ and $B \rightarrow \phi K_S$.

We find strong correlations among these observables. In particular, the desire to reproduce the measured non-standard value of the CP asymmetry in $B \rightarrow \phi K_S$ unambiguously implies large effects in the CP asymmetry of $b \rightarrow s\gamma$ as well as lower bounds of the EDMs of the electron and the neutron.

T 15.3 Mi 17:15 M001

Rare decays in a Randall Sundrum model with custodial protection — MONIKA BLANKE^{1,2}, ANDRZEJ BURAS¹, BJOERN DULING¹, ●KATRIN GEMMLER¹, and STEFANIA GORI^{1,2} — ¹Technische Universität München, München — ²Max Planck Institut für Physik, München

Warped extra dimensions with bulk fields provide a natural solution to both the gauge hierarchy problem and the hierarchies in fermion masses and weak mixing angles. On the other hand one now has to deal with flavour non-diagonal couplings which make FCNC studies interesting.

In this talk a model with enlarged bulk gauge group $SU(3)_c \times SU(2)_L \times SU(2)_R \times U(1)_X \times P_{LR}$ will be discussed. In this framework, the inherent custodial symmetry allows the Kaluza-Klein particles to be light enough to be accessible at the Large Hadron Collider, but still guarantees consistency with electroweak precision observables. Especially, I will present the results of our recent study on rare K and B decays. In addition to the SM one loop contributions these processes receive new tree level contributions not only from the heavy Kaluza-Klein gauge bosons Z_H and Z' but also from the Z .

T 15.4 Mi 17:30 M001

Flavour-changing neutral currents in the flavour-blind MSSM at large $\tan\beta$ — LARS HOFER, ULRICH NIERSTE, and ●DOMINIK SCHERER — Institut f. Theoretische Teilchenphysik, Universität Karlsruhe

A popular way to avoid too large FCNC in supersymmetric models is the assumption of minimal flavour violation (MFV), where SUSY is broken by a flavour-blind mechanism. We study how loop effects which are enhanced at large $\tan\beta$ can circumvent the MFV constraint to generate new FCNCs. We show that these effects can be resummed to all orders in perturbation theory in analogy to the $\tan\beta$ -enhanced

corrections to the bottom mass.

This procedure yields new Feynman rules which automatically contain the enhanced effects without resorting to the decoupling limit. We also include the enhanced bottom-mass corrections and clarify their dependence on the input scheme. Finally, we study contributions to FCNC observables in B physics resulting from the new Feynman rules.

T 15.5 Mi 17:45 M001

$b \rightarrow s$ transitions in a SUSY GUT model — MARKUS KNOPF, ●WALDEMAR MARTENS, ULRICH NIERSTE, CHRISTIAN SCHERRER, and SÖREN WIESENFELDT — Universität Karlsruhe Institut für Theoretische Teilchenphysik

There are quite a few theoretical reasons for considering supersymmetric GUT models on the one hand and the hypothesis called minimal flavor violation on the other hand. We investigate the flavor-motivated SUSY GUT model proposed by Chang, Masiero and Murayama, which has the peculiarity of potentially large SUSY contributions in $b \rightarrow s$ transitions and present some results of our extensive analysis of the model.

T 15.6 Mi 18:00 M001

$B \rightarrow K^*\mu^+\mu^-$ – A Gold Mine of Observables to Probe New Physics — WOLFGANG ALTMANNSHOFER¹, PATRICIA BALL², AOIFE BHARUCHA², ANDRZEJ BURAS¹, ●DAVID STRAUB¹, and MICHAEL WICK¹ — ¹T31, Physik-Department, Technische Universität München — ²IPPP, Department of Physics, University of Durham

The rare decay $B \rightarrow K^*(\rightarrow K\pi)\mu^+\mu^-$ is regarded as one of the crucial channels for B physics since its angular distribution gives access to many observables that offer new important tests of the Standard Model and its extensions. We study these observables in detail, identifying those with small to moderate dependence on hadronic quantities and large impact of New Physics. We point out a number of correlations between various observables which will allow a clear distinction between different New Physics scenarios.

T 15.7 Mi 18:15 M001

Observables in $b \rightarrow s\nu\bar{\nu}$ Decays in the Standard Model and Beyond — ●MICHAEL WICK¹, WOLFGANG ALTMANNSHOFER¹, PATRICIA BALL², AOIFE BHARUCHA², ANDRZEJ BURAS¹, and DAVID STRAUB¹ — ¹Physik-Department, Technische Universität München — ²IPPP, Department of Physics, University of Durham

The rare decay $B \rightarrow K^*\nu\bar{\nu}$ is considered as one of the important channels in B physics as it allows a transparent study of Z penguin effects in New Physics scenarios in the absence of dipole operator contributions and Higgs penguin contributions. We study all possible observables in $B \rightarrow K^*\nu\bar{\nu}$ and the related b to s transitions $B \rightarrow K\nu\bar{\nu}$ and $B \rightarrow X_s\nu\bar{\nu}$ in the context of the Standard Model and various New Physics models. In particular we analyse the effect of right handed currents on these observables.

T 15.8 Mi 18:30 M001

Precision Physics with $B_s^0 \rightarrow J/\psi\phi$ at the LHC: The Quest for New Physics — ●SVEN FALLER¹, THOMAS MANNEL¹, and ROBERT FLEISCHER² — ¹Theoretische Physik 1, Fachbereich Physik, Universität Siegen — ²Theory Division, Department of Physics, CERN, CH-1211 Geneva 23, Switzerland

CP-violating effects in the time-dependent angular distribution of the $B_s^0 \rightarrow J/\psi[\rightarrow \ell^+\ell^-]\phi[\rightarrow K^+K^-]$ decay products play a key rôle for the search of new physics. The hadronic Standard-Model uncertainties are related to doubly Cabibbo-suppressed penguin contributions and are usually assumed to be negligibly small. In view of recent results from the Tevatron and the quickly approaching start of the data taking at the LHC, we have a critical look at the impact of these terms, which could be enhanced through long-distance QCD phenomena, and explore the associated uncertainty for the measurement of the CP-violating $B_s^0-\bar{B}_s^0$ mixing phase. We point out that these effects can actually be controlled by means of an analysis of the time-dependent angular distribution of the $B_s^0 \rightarrow J/\psi[\rightarrow \ell^+\ell^-]\bar{K}^{*0}[\rightarrow \pi^+K^-]$ decay products, and illustrate this through numerical studies. Moreover, we discuss $SU(3)$ -breaking effects, which limit the theoretical accuracy of our method, and suggest internal consistency checks of $SU(3)$.

T 15.9 Mi 18:45 M001

The golden modes $B^0 \rightarrow J/\psi K_{S,L}$ in the Era of Precision Flavour Physics — SVEN FALLER¹, ROBERT FLEISCHER², ●MARTIN JUNG¹, and THOMAS MANNEL¹ — ¹Universität Siegen, Germany — ²CERN, Switzerland

CP violation is a major challenge of contemporary particle physics. It has been discovered in kaon decays and appears also in B decays, where the $B^0 \rightarrow J/\psi K_{S,L}$ channels are considered to be clean probes of this phenomenon. Recent B -factory data challenge the description of

CP violation in the Standard Model of particle physics, showing some “tension” with theoretical predictions. We have a detailed look at certain Standard-Model contributions, which are usually neglected, and point out that they can be included unambiguously through measurements of the $B^0 \rightarrow J/\psi \pi^0$ observables. Using the most recent data, we show that the tension with the Standard Model is softened, and constrain a possible new-physics phase in B^0 – \bar{B}^0 mixing.

Our strategy is crucial to fully exploit the accuracy for the search for this kind of new physics at the LHC and future super-flavour factories.