T 16: Flavorphysik (Theorie) 3

Convenor: Gerhard Buchalla

Zeit: Donnerstag 16:45–19:00 Raum: M001

T 16.1 Do 16:45 M001

CP Violation in the Neutral Kaon System — •Joachim Brod[1] and Martin Gorbahn[2] — [1]TTP, Uni Karlsruhe — [2]TU München, IAS

The parameter ϵ_K describes CP violation in the mixing of neutral K-Mesons. It is an important ingredient in the standard analysis of the unitarity triangle.

Recent progress in the lattice calculation of B_K, parameterising the long distance effects in neutral Kaon mixing, have made a NNLO calculation of the short distance contributions mandatory.

I will discuss this calculation and present first results.

T 16.2 Do 17:00 M001

Electroweak corrections to $K^+ \to \pi^+\overline{\nu}\nu$ and $K_L \to \pi^0\overline{\nu}\nu$ — •Emmanuel Stamou — Techniche Universität München, Boltzmannstraße 2, 85748 Garching

The rare decays $K^+ \to \pi^+\overline{\nu}\nu$ and $K_L \to \pi^0\overline{\nu}\nu$ are strongly suppressed in the standard model. The sensitivity to high energy phenomena makes these processes prime candidates to test the standard model and discriminate various scenarios of new physics. Recent theoretical progress together with the smallness of hadronic uncertainties allows for a precise theory prediction. However, one of the dominant uncertainty arising from the two-loop electroweak corrections from top quark contributions is still unknown. In this talk I shall discuss the calculation of these corrections.

T 16.3 Do 17:15 M001

Standardmodellvorhersage für D_0-Mischung — •Markus Bobrowski und Alexander Lenz — Universität Regensburg

Die Oszillationen im D_0-System wurden 2007 bei BaBar, Belle und CDF (sowie bei CLEO, FOCUS und E791) gemessen. Jedoch fehlt immer noch eine verlässliche Standardmodellvorhersage. In diesem Vortrag untersuchen wir im charm-System die Konvergenz der "Heavy Quark Expansion", die im B-System sehr verlässliche Vorhersagen liefert.

T 16.4 Do 17:30 M001

Korrekturen zur Lepton-Downquark-Vereinigung in einer supersymmetrischen SO(10)-GUT — Stéphanie Trine, •Susanne Westhoff und Sören Wiesenfeldt — Institut für Theoretische Teilchenphysik, Universität Karlsruhe

Die Theorie einer Vereinheitlichung von Quarks und Leptonen bei hohen Energien hat bemerkenswerte Konsequenzen in der Flavourphysik. Die Vereinigung der Yukawa-Kopplungen von Down-Quarks und geladenen Leptonen der dritten Generation ist in Einklang mit den gemessenen Bottom- und Tau-Massen. Bei den leichteren Fermionen gibt es jedoch Abweichungen von dieser Vereinheitlichung. In der Lagrangedichte einer Großen Vereinheitlichten Theorie werden solche Korrekturen durch höherdimensionale Operatoren beschrieben, die durch Potenzen der inversen Planck-Masse unterdrückt sind.

Wir untersuchen die Flavourstruktur der Korrekturterme anhand eines supersymmetrischen SO(10)-Modells, das von Chang, Masiero und Murayama (CMM) vorgeschlagen wurde. Durch die direkte Verbindung des großen atmosphärischen Neutrino-Mischungswinkels zur Flavourmischung rechtshändiger b- und s-Squarks treten in diesem Modell starke SUSY-Effekte in b-s-Übergängen auf. Die Korrekturen zur Down-Lepton-Vereinigung sind unabhängig davon in Observablen der Kaon-Mischung sichtbar. Besonders die CP-verletzende Größe eK liefert starke Einschränkungen an die Flavourstruktur höherdimensionaler Operatoren. Diese Einschränkungen erlauben Rückschlüsse auf CMM-Effekte in der Bd- und Bs-Mischung und sind überdies in einer breiteren Klasse Vereinheitlichter Theorien gültig.

T 16.5 Do 17:45 M001

Alternative Quark and Lepton Yukawa coupling relations at the GUT scale — Stefan Antusch and •Martin Spinrath — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, D-80805 München, Germany

In supersymmetric models the coupling of the bottom quarks to the Higgs fields can be changed significantly compared to the SM. These changes are due to SUSY threshold corrections, which are enhanced by $\tan\beta$ and affect the Yukawa couplings. This type of corrections does not only affect the bottom quarks, but all down type quarks and the charged leptons as well. So the question arises, how strongly these threshold corrections change the Yukawa couplings at the GUT scale. We especially discuss here the effect on certain ratios of GUT scale Yukawa couplings and show that they can open up new possibilities in GUT model building beyond third family unification and Georgi Jarlskog relations.

T 16.6 Do 18:00 M001

Theoretical constraints on the rare tau decays in the MSSM — Alejandro Ibarra[1], Tetsuo Shindou[2], and •Cristoforo Simonetto[1] — [1]TU München, 85748 Garching, Germany — [2]DESY, 22603 Hamburg, Germany

The Minimal Supersymmetric Standard Model contains in general sources of tau lepton flavour violation which induce the rare decays $\tau \to \mu\gamma$ and $\tau \to e\gamma$. We argue that the observation of both rare processes would imply a lower bound on the radiative muon decay of the form $\mathrm{BR}(\mu \to e\gamma) \gtrsim C \times \mathrm{BR}(\tau \to \mu\gamma)\mathrm{BR}(\tau \to e\gamma)$. We estimate the size of the constant C without specifying the origin of the tau flavour violation in the supersymmetric model and we discuss the implications of our bound for future searches of rare lepton decays. In particular, we show that, for a wide class of models, present B-factories could discover either $\tau \to \mu\gamma$ or $\tau \to e\gamma$, but not both. We also derive for completeness the constant C in the most general setup, pursuing an effective theory approach.

T 16.7 Do 18:15 M001

General Conditions for Lepton Flavour Violation — •Alexander Merle — Max-Planck-Institut für Kernphysik, Heidelberg

Necessary and sufficient conditions, a theory has to fulfill in order to ensure general lepton flavour conservation, are compiled. It is also shown that a handful of very easy criteria can be applied to a wide class of models, even if this may not be obvious at the first sight.

T 16.8 Do 18:30 M001

The Cabibbo angle in D_14 — •Alexander Blum[1] and Claudia Hagedorn[2] — [1]Max-Planck-Institut für Kernphysik, Heidelberg — [2]Scuola Internazionale Superiore di Studi Avanzati, Trieste, Italien

A supersymmetric model with the flavor symmetry D_{14} is presented, which predicts the value of the CKM matrix element $|V_{ud}|$ and thus the Cabibbo angle θ_C to be $|V_{ud}| = \cos\left(\frac{\pi}{14}\right) \approx 0.97493$ and $\sin(\theta_C) \approx |V_{us}| = \sin\left(\frac{\pi}{14}\right) \approx 0.2225$. D_{14} is spontaneously broken by flavons, which are scalar gauge singlets. The prediction of $|V_{ud}|$ (θ_C) is based on the fact that different Z_2 subgroups of D_{14} are conserved in the up and the down quark sector. In order to achieve this D_{14} is accompanied by a Z_3 symmetry. The quark mass hierarchy is partly due to the flavor symmetry D_{14} and partly due to a Froggatt-Nielsen symmetry $U(1)_{FN}$ under which only the right-handed quarks transform. The model is completely natural in the sense that all hierarchies observed among the quark masses and mixing angles are generated with the help of symmetries. The crucial issue of the vacuum alignment of the flavons is solved (up to a small number of degeneracies). A study of the next-to-leading order corrections shows that results achieved at the lowest order are only slightly perturbed. This fact also allows $|V_{ud}|$ (θ_C) to be well inside the small experimental error bars.

T 16.9 Do 18:45 M001

Flavor symmetries from Physics Beyond Standard Model — •adisorn adulpravitchai — Max-Planck-Institut für Kernphysik, Heidelberg*Germany

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