T 40: Flavorphysik I

Zeit: Dienstag 16:00–18:30 Raum: S15

T 40.1 Di 16:00 S15

Search for the Rare Decay B → μν with the Belle Experiment — •Markus Prim, Florian Bernlochner, Michael Feindt, and Pablo Goldenzweig — ETP, KIT, Karlsruhe

The Belle experiment at the Japanese research facility KEK recorded a data sample of 772 million $B\overline{B}$ decays of the $\Upsilon(4S)$ resonance. Studying rare modes of these B mesons is interesting, because the influence of new physics on the branching ratios can be large. One such rare decay, which is helicity suppressed in the Standard Model, is the leptonic decay $B \to \mu\nu$, with a muon and a muon-neutrino in the final state. We present the result of the search for this decay with an inclusive reconstruction of the tag B, with an emphasis on the calibration of the inclusive tag and an improved background modeling of $B \to X_u l\nu$ processes. In addition, the search for a heavy sterile neutrino with the same final state is presented.

T 40.2 Di 16:15 S15

Search for the rare decays B± -> $l^{\pm}l^{\mp}l^{\pm}\nu$ at the Belle experiment — •Gabriel Seitz, Florian Bernlochner, Pablo Goldenzweig, Moritz Gelb, and Felix Metzner for the Belle 2-Collaboration — ETP, KIT, Karlsruhe

The leptonic B Meson decay with light charged leptons in the final state is strongly helicity suppressed in the Standard Model. This suppression can in principle be lifted if a real or virtual photon is emitted from the quark-lines before the decay, what enhances the branching fraction. The decays B± -> $l^{\pm}l^{\mp}l^{\pm}\nu$, where two of the leptons result from an emitted $\gamma^{(*)}$, presents the opportunity to study this effect of the cancellation of the helicity suppression in detail. The branching fraction itself also depends on the first inverse moment of the light-cone distribution, λ_B, which is a non-perturbative parameter important for QCD factorization. The parameter λ_B cannot be calculated from first principles and a measurement of the branching fraction of B± -> $l^{\pm}l^{\mp}l^{\pm}\nu$ allows its determination. This talk presents the current status of the search for this decay signature using the full Belle dataset of 711 fb^{-1} of integrated luminosity. The simulated and recorded collisions were converted with the B2BII tool to allow the analysis to take place in the Belle II software framework.

T 40.3 Di 16:30 S15

Studies for the measurement of $B^0_{s,d} \to \mu^+\mu^-$ using the full dataset of the LHCb experiment — Johannes Albrecht and •Titus Mombächer — Experimentelle Physik 5, TU Dortmund

The successful observation of the decay $B^0_s \to \mu^+\mu^-$ by a single experiment was achieved by the LHCb collaboration using a dataset corresponding to $5\,\text{fb}^{-1}$. It confirmed once more the predictions of the Standard Model and strongly constrained models for mechanisms beyond the Standard Model. However, the measurement is still statistically limited with a precision of 22 %. Also the decay $B^0_d \to \mu^+\mu^-$ could not be measured yet.

This talk presents first studies to measure the decays $B^0_{s,d} \to \mu^+\mu^-$ on the full Run 1 and Run 2 dataset recorded by the LHCb experiment corresponding to $9\,\text{fb}^{-1}$.

T 40.4 Di 16:45 S15

Search for the rare decay $B^0_{(s)} \to e^+e^-$ with the LHCb experiment — Johannes Albrecht, •Alexander Battig, Titus Mombächer, and Stefanie Reichert — TU Dortmund

The search for decays of the type $B^0_{(s)} \to l^+l^-$, which are strongly suppressed in the Standard Model, provide an ideal environment for searches for New Physics. Tests of lepton flavour universality ($\mathcal{R}_K$, $\mathcal{R}_{K^*}$) hint at a difference in the bahaviour of muons and electrons. In addition to the measurement of the branching ratio of the decay $B^0_s \to \mu^+\mu^-$, which has been measured to be compatible with the Standard Model, the decay $B^0_{(s)} \to e^+e^-$ provides an additional stringent test for the Standard Model.

In this talk the search for $B^0_{(s)} \to e^+e^-$ with the LHCb experiment is presented. The analysed data set has been recorded during Run 1 and Run 2 of the LHC and corresponds to an integrated luminosity of $5\,\text{fb}^{-1}$.

T 40.5 Di 17:00 S15

Measurement of the differential branching fraction of $B^0_s \to \phi\mu^+\mu^-$ using LHCb data — •Sophie Kretzschmar, Christoph Langenbruch, and Eluned Smith — RWTH Aachen

The LHCb detector at CERN is an experiment optimized to study b-quarks, which are produced copiously in the proton-proton collisions at the Large Hadron Collider (LHC). The flavour-changing neutral current (FCNC) process $b \to s\ell^+\ell^-$ is of particular interest since it occurs only via higher order loop corrections in the Standard Model (SM), and thus can be significantly affected by new heavy particles beyond the SM.

The rare decay $B^0_s \to \phi\mu^+\mu^-$ has been previously analysed by the LHCb collaboration using data taken in 2011 and 2012 during Run 1. The $B^0_s \to \phi\mu^+\mu^-$ branching fraction was measured to be more than $3\,\sigma$ below the SM expectation. An update will be performed using the additional data collected by the LHCb experiment since 2015. This further analysis will provide more insight on the nature of this discrepancy with the SM.

This talk will give an overview of the analysis strategy used to measure the branching fraction of the decay $B^0_s \to \phi\mu^+\mu^-$. In addition, the possibility of the first observation of the rare decay $B^0_s \to f'_2(1525)\mu^+\mu^-$ will be discussed. The current status of the on-going analysis of the combined Run 1 and 2 LHCb data sample will be presented.

T 40.6 Di 17:15 S15

Angular analysis of $B^0_s \to \phi\mu^+\mu^-$ decays — •Marcel Materok, Christoph Langenbruch, and Eluned Smith — RWTH Aachen

The LHCb experiment at the LHC is dedicated to the search for new phenomena beyond the Standard Model (SM) through precision measurements of heavy flavour decays. Rare semileptonic $b \to s\ell^+\ell^-$ decays are particularly interesting as they constitute flavour-changing neutral currents that are forbidden at tree-level in the SM and are only allowed at loop-level. Theses processes are thus rare and the theoretically clean angular observables are sensitive to the effects of new, heavy particles beyond the SM.

The rare decay $B^0_s \to \phi\mu^+\mu^-$ has been previously analysed by the LHCb collaboration using data taken in 2011 and 2012, during Run 1 of the LHC. Further studies of this mode are particularly motivated by recent tensions with SM predictions seen in other rare $b \to s\ell^+\ell^-$ processes.

This talk will show the progress of the measurement of the angular observables in the $B^0_s \to \phi\mu^+\mu^-$ decay using Run 1 and 2 LHCb Data. The focus of this talk will be on the validation of the angular fit.

T 40.7 Di 17:30 S15

Search for rare $B^0 \to (\pi^0, \eta, \eta')l^+l^-$ decays at Belle — •Maryam Salehi and Thomas Kuhr — Ludwig-Maximilians-Universität München,Munich, Germany

The decay $B^0 \to (\pi^0, \eta, \eta')l^+l^-, (l = e, \mu)$ proceeds through the flavor changing neutral current (FCNC) $b \to dl^+l^-$. In the Standard Model (SM), these decays are forbidden at tree level and can only occur in higher orders. Therefore the predicted branching fractions in the SM are of the order of 10^{-8}. The $b \to dl^+l^-$ transition provides a promising avenue to search for New Physics (NP). Amplitudes from these NP contributions can interfere with those from the SM, and significantly enhance the branching fractions from the SM predictions. I will present a search for rare neutral current decays $B^0 \to (\pi^0, \eta, \eta')l^+l^-$, using a sample of $772 \times 10^6 B\overline{B}$ pairs collected with the Belle detector at the e^+e^- asymmetric collider KEKB.

T 40.8 Di 17:45 S15

Search for $B \longrightarrow K\nu\nu$ at Belle II — •Johannes Kainz for the Belle 2-Collaboration — Ludwig-Maximilians-Universität, München

There have been deviations from the standard model expectation observed in $B \longrightarrow K^*l^+l^-$ in experiments such as LHCb. They are in particular present in lepton flavour universality tests. To further investigate this behaviour, the Belle II Collaboration will collect data that allows us to study $B \longrightarrow K\nu\nu$ decays. These processes are challenging to analyze, since the neutrinos are not detected directly. Therefore it is necessary to reconstruct the second B decay in $e^+e^- \longrightarrow Y(4S) \longrightarrow B\bar{B}$ events completely, in order to get hints on the missing momentum due to the neutrinos and to separate signal from background events.

T 40.9 Di 18:00 S15

Messung des inklusiven $B \to X_s\gamma$ Verzweigungsverhältnisses und spektraler Momente mit dem Belle-Datensatz — •Mario Arndt, Luis Pesantez und Jochen Dingfelder für die Belle 2-Kollaboration — Rheinische Friedrich-Wilhelms-Universität Bonn

Mit dem am KEKB, einem asymmetrischen e^+e^--Kollider, gelegenen Belle-Detektor wurden 770 x 106 $B\bar{B}$ Paare bei einer Schwerpunktenergie von 10.58 GeV aufgenommen. Die hier vorgestellte Analyse befasst sich mit der Messung der radiativen B-Zerfälle $B \to X_s\gamma$. Diese Zerfälle sind im Standardmodell unterdrückt und nur durch Prozesse höherer Ordnung möglich, die sensitiv auf Beiträge neuer Physik sind. Das vermessene Verzweigungsverhältnis liefert z.B. Einschränkungen auf Modelle mit geladenen Higgs-Bosonen (2HDM). Es werden die Ergebnisse der Analyse vorgestellt: die Messung des E_γ-Spektrums, der spektralen Momente und der partiellen Verzweigungsverhältnisse, sowie die Extraktion der HQE-Parameter m_b und μ_π^2.

T 40.10 Di 18:15 S15

Amplituden Analyse von $\Lambda_b \to D^0pK$ — •Harald Viemann — Institut für Physik - Uni Rostock, Rostock, Deutschland

Messungen zur CP Verletzung werden aktuell von Mesonen-Zerfällen dominiert. Zerfälle mit baryonischem Beitrag enden im Augenblick mit der Bestimmung der Asymmetrie, weshalb es die Messung der CKM-Phasen bei Baryonen noch nicht gibt und somit äußert interessant wäre. Der Zerfall $\Lambda_b \to D^0pK$ könnte über den Zerfall des D^0 Zugang zu der CKM-Phase Gamma erlauben. Präsentiert wird die Selektion der wichtigen D^0 Moden in $K\pi$, KK und $\pi\pi$ sowie die ersten Schritte zum Verständnis des Dalitz-Plots.