

T 88: Flavorphysik III

Zeit: Donnerstag 16:00–18:35

Raum: S15

Gruppenbericht

T 88.1 Do 16:00 S15

The Tau Physics Program at Belle II — ●THOMAS KRAETZSCHMAR for the Belle 2-Collaboration — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München, Deutschland

The Belle II experiment at the SuperKEKB collider is a next-generation B factory, with a rich program of Standard Model and Beyond the Standard Model physics. The large database to be collected thanks to the world-record luminosity of the machine will allow measurements with unprecedented precision. In the area of tau physics, this will enable new and/or more precise measurement of Standard Model processes as well as Beyond the Standard Model searches. Because of its well understood electroweak production and decay mechanisms and its high-mass of above 1.7 GeV the tau lepton is an excellent probe for physics beyond the standard model and provides clean samples for studying QCD at the 1 GeV energy level. This contribution will give a compact overview of the tau physics programme at Belle II, with a particular emphasis on decay modes with significant potential already in the upcoming first physics run.

T 88.2 Do 16:20 S15

Search for the lepton flavour violating decay $B^0 \rightarrow \tau^\pm l^\mp$ — ●NATHALIE EBERLEIN and THOMAS KUHR — Ludwig-Maximilians-Universität München

An observation of $B^0 \rightarrow \tau^\pm l^\mp$ decays with ($l = e/\mu$) would be a clear sign for new physics. The search for this decay is experimentally challenging due to the multiple neutrinos in the final state.

At B factories one can identify the decay by fully reconstructing the other B meson in $e^+e^- \rightarrow \Upsilon(4S) \rightarrow B\bar{B}$ events.

In my talk I will present studies of $B^0 \rightarrow \tau^\pm l^\mp$ decays with Belle 2 Monte Carlo data using the Full Event Interpretation algorithm for the tagged B.

T 88.3 Do 16:35 S15

Search for the lepton flavour violating decays $B^+ \rightarrow K^+ e^\pm \mu^\mp$ at the LHCb experiment — JOHANNES ALBRECHT, ●GERWIN MEIER, TITUS MOMBÄCHER, and STEFANIE REICHERT — Experimentelle Physik 5, TU Dortmund

Lepton flavour number is conserved in the Standard Model, but this conservation was found violated in neutrino oscillations. The current measurements of R_K and R_{K^*0} hint at a violation of lepton flavour universality. Most New Physics models, that explain lepton flavour universality violation predict also lepton flavour violation. One of the most promising decay channels to observe lepton flavour violation in B-decays is $B^+ \rightarrow K^+ e^\pm \mu^\mp$.

In this talk the current status of the search for the lepton flavour violating decays $B^+ \rightarrow K^+ e^\pm \mu^\mp$ with the LHCb Run 1 data corresponding to 3 fb^{-1} will be presented.

T 88.4 Do 16:50 S15

Search for the lepton flavour violating decay $B^0 \rightarrow K^{*0} e^\pm \mu^\mp$ with the LHCb detector — ●ANDREAS GÜTH, JAN-MARC BASELS, CHRISTOPH LANGENBRUCH, and STEFAN SCHAEEL — I. Physikalisches Institut B, RWTH Aachen University

The conservation of the individual lepton flavour quantum numbers in interactions involving charged leptons is an important prediction of the Standard Model (SM) of particle physics, making searches for charged lepton flavour violation (LFV) a promising probe for physics beyond the SM. With its ability for the precise study of the decays of B-mesons, that are copiously produced in proton-proton collisions at the Large Hadron Collider (LHC), the LHCb detector is a powerful tool to search for LFV in $b \rightarrow s \ell^\pm \ell'^\mp$ transitions. An additional motivation for such searches arises from recent tensions in tests of lepton universality in rare $b \rightarrow s \ell^+ \ell^-$ decays, as lepton non-universality generally implies the existence of LFV decays.

In this talk, the status of a search for the LFV decay $B^0 \rightarrow K^{*0} e^\pm \mu^\mp$ with the LHCb detector is presented, including the analysis strategy, signal selection, and the study of background processes affecting this search.

T 88.5 Do 17:05 S15

Search for the Lepton Flavour Violating decay $B_s^0 \rightarrow \phi e^\pm \mu^\mp$ — ●JAN-MARC BASELS, ANDREAS GÜTH, CHRISTOPH LANGENBRUCH,

and STEFAN SCHAEEL — I. Physikalisches Institut B, RWTH Aachen University, Germany

In the Standard Model (SM) of particle physics the coupling of gauge bosons to leptons is independent of their flavour, which is known as lepton flavour universality. Thus, the branching fraction ratios R_h of rare semileptonic B decays, defined as $R_h = \mathcal{B}(B \rightarrow h\mu^+\mu^-)/\mathcal{B}(B \rightarrow h e^+e^-)$, are precisely predicted to be unity in the SM. The most precise measurements of the R_h ratios so far are performed by the LHCb experiment showing deviations of up to 2.6 standard deviations (σ) from the SM prediction. Lepton flavour non-universality would generally imply lepton flavour violation, which could be explained by several theories beyond the SM.

This talk will present the analysis strategy of a search for the lepton flavour violating decay $B_s^0 \rightarrow \phi e^\pm \mu^\mp$ with particular focus on the study and control of backgrounds.

T 88.6 Do 17:20 S15

Search for heavy Majorana neutrinos in semileptonic B meson decays at the LHCb experiment — ●LEON CARUS, ELUNED SMITH, and CHRISTOPH LANGENBRUCH — RWTH Aachen

The origin of neutrino masses is still one of the most puzzling unsolved problems of modern particle physics. The Standard Model (SM) assumes neutrinos to be Dirac fermions. Alternative models trying to explain the observation of neutrino oscillations are including neutrinos that are Majorana fermions, meaning that they are their own anti-particles. A striking experimental signature of Majorana neutrinos would be lepton number violating (LNV) processes, which are forbidden in the Standard Model. A search for LNV B meson decays with two same-sign leptons in the final state could be sensitive to new heavy Majorana neutrinos. The LHCb experiment is an ideal environment for these measurements, due to the large $b\bar{b}$ acceptance, and excellent tracking and particle identification capabilities. This talk presents the current status of the search for the LNV decays $B^+ \rightarrow \mu^+\mu^+\pi^-$ and $B_c^+ \rightarrow \mu^+\mu^+\pi^-$ using Run 1 and 2 data, which probes different Majorana neutrino lifetimes and masses up to 6 GeV.

T 88.7 Do 17:35 S15

Measurement of the branching ratio of $B_s^0 \rightarrow D^{*\pm} D^\mp$ with the LHCb experiment — PHILIPP IBIS, ●ANTJE MÖDDEN, and MARGARETE SCHELLENBERG — Experimentelle Physik 5, TU Dortmund

Precision measurements testing the Standard Model are performed at the LHCb experiment, two important goals of which are the observation of new decays and measurements of their branching ratios. Although the decay $B_s^0 \rightarrow D^{*\pm} D^\mp$ has not yet been experimentally observed, an excess of $B_s^0 \rightarrow D^{*\pm} D^\mp$ candidates has been seen in the measurement of CP violation in the $B^0 \rightarrow D^{*\pm} D^\mp$ decay. By measuring the branching ratio relative to the decay $B^0 \rightarrow D^{*\pm} D^\mp$, most uncertainties cancel due to the similarity of both decay channels.

The talk will cover the current status of the analysis of the branching ratio of the decay $B_s^0 \rightarrow D^{*\pm} D^\mp$ using the full dataset of the LHCb experiment corresponding to an integrated luminosity of 9 fb^{-1} .

T 88.8 Do 17:50 S15

Search for the decay $D_{s0}(2317)^\pm \rightarrow D_s^{*\pm} \gamma$ — JOHANNES ALBRECHT¹, ●LUKAS CALEFICE¹, and RICARDO VÁZQUEZ GÓMEZ² — ¹Experimentelle Physik 5, TU Dortmund — ²CERN

The surprising discoveries of the $D_{s0}(2317)^\pm$ and $D_{s1}(2460)^\pm$ mesons by the BaBar and CLEO Collaborations in 2003 aroused new interest in the field of heavy-light meson spectroscopy. Their low masses and decay widths allow for decays that are isospin violating or radiative. Although theoretical predictions claim that radiative decays should be sizeable, they have not been seen yet.

The search for the decay $D_{s0}(2317)^\pm \rightarrow D_s^{*\pm} \gamma$ is performed by measuring the ratio $\mathcal{B}(D_{s0}(2317)^\pm \rightarrow D_s^{*\pm} \gamma)/\mathcal{B}(D_{s0}(2317)^\pm \rightarrow D_s^\pm \pi^0)$ on the full Run II data set recorded by the LHCb experiment. The talk will cover the current status of the analysis.

T 88.9 Do 18:05 S15

Test of lepton flavour universality with $b \rightarrow s \ell \ell$ decays at the LHCb experiment — JOHANNES ALBRECHT und ●ALEX SEUTHE —

Technische Universität Dortmund

Current measurements of the LHCb experiment hint to deviations from Standard Model predictions in tests of lepton flavour universality. An example for this is the measurement of $R_{K^{*0}}$, the ratio of the branching fractions of the decays $B^0 \rightarrow K^{*0} \mu^+ \mu^-$ and $B^0 \rightarrow K^{*0} e^+ e^-$. This measurement was performed with the a dataset corresponding to an integrated luminosity of 3/fb. For conclusive results the measurements have to include the extended LHCb dataset. In this talk the updated measurement of $R_{K^{*0}}$, which is currently under preparation, is presented.

T 88.10 Do 18:20 S15

Measurement of the ratio $R_{K\pi\pi}$ with the LHCb experiment — CHRISTOPH LANGENBRUCH, JOHANNES HEUEL, and STEFAN SCHAEEL — I. Physikalisches Institut B, RWTH Aachen University

In the Standard Model (SM) of particle physics, the coupling of elec-

trouweak gauge bosons to all leptons is universal. Stringent tests of this lepton flavour universality are possible by measuring ratios of rare $b \rightarrow s\ell\ell$ decays with different leptons in the final state. These decays are loop-suppressed in the SM and therefore sensitive to new heavy particles beyond the SM.

The LHCb experiment is ideally suited for the study of rare b hadron decays due to its large acceptance, the high trigger efficiencies and the excellent tracking and particle identification. First measurements of $b \rightarrow s\ell\ell$ ratios published by the LHCb collaboration show tensions with the SM predictions of up to 2.6 standard deviations. Therefore, further studies of lepton universality tests using other rare B decay channels are crucial.

The current status of the ongoing measurement of the ratio $R_{K\pi\pi}$ of the branching fractions of the decays $B^+ \rightarrow K^+ \pi^+ \pi^- \mu^+ \mu^-$ and $B^+ \rightarrow K^+ \pi^+ \pi^- e^+ e^-$ is presented. The measurement is experimentally challenging as the hadronic system is measured inclusively.