T 55: Flavor V, Top-BSM

Time: Wednesday 15:50–17:20 Location: HSZ/0401

T 55.1 Wed 15:50 HSZ/0401

Measurement of the isospin asymmetry in $B \to K^*\mu^+\mu^-$ decays with LHCb — Christoph Langenbruch, •Thomas Oeser, and Stefan Schael — I. Physikalisches Institut B, RWTH Aachen

In the Standard Model (SM), $b \to s\ell^+\ell^-$ transitions are forbidden at tree level and can only occur via loop-level and higher-order processes. Precision measurements of these processes therefore constitute powerful tests of the SM, sensitive to various potential New Physics contributions.

The isospin asymmetry $\mathcal{A}_I$ between $B^0 \to K^{*0}\mu^+\mu^-$ and $B^+ \to K^{*+}\mu^+\mu^-$ has a clean SM prediction as many hadronic uncertainties cancel in the calculation. Previous measurements are consistent with SM expectations, within still large uncertainties.

This talk presents an overview of the analysis of the isospin asymmetry in $B \to K^*\mu^+\mu^-$ using the full LHCb dataset, recorded between 2011 and 2018 and corresponding to an integrated luminosity of approximately 9fb^{-1}.

T 55.2 Wed 16:05 HSZ/0401

Inclusive analysis of untagged $B \to Xl^+l^-$ decays at Belle II — •Arul Prakash Sivagurunathan, Sviatoslav Bilokin, and Thomas Kuhr — Ludwig-Maximilians-Universität München

Precision measurements of inclusive $B \to Xl^+l^-$ decays can provide invaluable complementary information to scrutinize anomalies observed in their exclusive $b \to sl^+l^-$ counterparts. However, limited tagging efficiency, small Standard Model signal and very high background rate make these measurements very challenging, with no results being published so far. In our work, we will assess the chances of a 5σ result with data from the Belle and Belle II experiments. We will apply machine learning algorithms to tackle background rejection. We will finally compute the lepton flavour universality ratio $R(X) = B(B \to X\mu^+\mu^-)/B(B \to Xe^+e^-)$ which, together with $R(K)$ and $R(K^*)$, will be key to constrain potential New Physics contributions.

T 55.3 Wed 16:20 HSZ/0401

Testing Lepton Flavour Universality with $B_s^0 \to \phi\ell^+\ell^-$ decays using LHCb data — Christoph Langenbruch, Stefan Schael, and •Sebastian Schmitt — I. Phys. Inst. B RWTH Aachen

In the Standard Model of Particle Physics (SM), $b \to s\ell^+\ell^-$ transitions are forbidden at tree-level and may only occur at the loop-level. The branching fractions of these so-called Flavour Changing Neutral Currents (FCNCs) can thus be significantly affected by New Physics (NP) beyond the SM. While in the SM, the coupling of the electro-weak gauge-bosons is Lepton Flavour Universal (LFU), this universality can be broken in NP scenarios. Ratios of branching fractions of semileptonic rare decays with muons and electrons in the final state constitute clean SM tests.

The LHCb detector is located at the Large Hadron Collider (LHC) at CERN and is optimised to study rare b-hadron decays. For this purpose LHCb features high trigger efficiencies, excellent track reconstruction, and particle identification.

This talk gives an overview of the measurement of lepton universality $R_\phi = \mathcal{B}(B_s^0 \to \phi\mu^+\mu^-)/\mathcal{B}(B_s^0 \to \phi e^+e^-)$, which benefits from the experimentally clean $B_s^0 \to \phi\ell^+\ell^-$ environment. The analysis uses the full Run 1 and Run 2 dataset collected by LHCb which corresponds to $9\,\text{fb}^{-1}$ of integrated luminosity.

T 55.4 Wed 16:35 HSZ/0401

Measurement of the branching fractions and differential kinematic distributions of $B^{+/0} \to XJ/\psi$ with hadronic tagging — Florian Bernlochner[1], Jochen Dingfelder[1], Thomas Kuhr[2], •Martin Angelsmark[1], William Sutcliffe[1], and Sviat Bilokin[2] for the Belle II-Collaboration — [1]Physikalisches Institut der Rheinischen Friedrich-Wilhelms-Universität Bonn — [2]Fakultät für Physik der Ludwig-Maximilians-Universität München

Using data from the Belle II experiment we perform the first measurements of the individual branching fractions $B(B^0 \to XJ/\psi)$ and $B(B^+ \to XJ/\psi)$. The Belle II experiment is located at the superKEKB e^+e^- collider in Japan. The collisions are performed at the $\Upsilon(4S)$ resonance leading to a large amount of produced $B\bar{B}$ pairs. One of the B mesons (tag B meson) is fully reconstructed using the Full Event Interpreter (FEI) algorithm, which then gives full kinematic information about the opposite B (signal candidate). Previous analyses measured the admixture of B^0 and B^+, but using the B tag we can separate B^0 and B^+ candidates. A tagged approach also makes it possible to measure the shape distributions of the kinematic variables X mass, J/ψ momentum and absolute helicity angle. This measurement is also an important background study for a future inclusive $B \to X\ell\ell$ analysis, where XJ/ψ is one of the major backgrounds. This talk will present the current status of the analysis and predicted systematics with 364 fb^{-1} integrated luminosity.

T 55.5 Wed 16:50 HSZ/0401

Search for flavour-changing neutral current couplings between the top-quark and the Higgs boson in the $H \to WW/ZZ$ decay channel with the ATLAS detector at the LHC. — Marvin Geyik, •Oliver Thielmann, and Wolfgang Wagner — Bergische Universität Wuppertal, Germany

A search for flavour-changing neutral current (FCNC) couplings between the top-quark and the Higgs boson in the $H \to WW/ZZ$ decay channel in the tri-lepton final state is presented. The search for FCNC couplings in the top-quark-Higgs-boson sector is a promising search for a theory beyond the SM. Proton-proton collision data produced by the LHC at a centre-of-mass energy of $\sqrt{s} = 13$ TeV and collected by the ATLAS experiment during the years 2015 - 2018, and corresponding to an integrated luminosity of $139fb^{-1}$, are used. Data is analysed in different final states, characterised by three isolated electrons or muons, missing transverse energy and the number of jets where exactly one of them is identified as a b-jets. A machine learning analysis based on neural networks is conducted to improve the discrimination between the signal and the backgrounds. Preliminary results, interpreted in the context of an effective field theory for FCNC, are presented, where additional exclusion limits on the qtH effective coupling are derived.

T 55.6 Wed 17:05 HSZ/0401

Search for FCNC couplings between the top quark and the Higgs boson in dilepton same-charge final states — •Marvin Geyik, Oliver Thielmann, and Wolfgang Wagner — University of Wuppertal, Germany

Flavour-changing neutral current interactions are strongly suppressed in the Standard Model. Still, some extensions of the Standard Model predict tree-level FCNC couplings between the top quark, other up-type quarks and neutral bosons, including the Higgs boson. These anomalous couplings can be parametrised in the framework of effective field theories (EFT). The presented analysis searches for the production of a single top-quark in association with a Higgs boson and for top-quark-antiquark production with one of the top quarks decaying to an up quark or a charm quark and a Higgs boson. Higgs decays to WW*, ZZ* and two taus leading to leptonic final states are considered in the event selection. Two analysis channels are defined: one with two leptons (electrons or muons) of the same electric charge and a second channel with three leptons. This talk focuses on advancements in the dilepton final state and the combination with the trilepton channel. The sensitivity of the analysis in setting limits to relevant coefficients of EFT operators will be presented.