T 2: Flavor I

Time: Monday 16:30–18:00 Location: HSZ/0004

T 2.1 Mon 16:30 HSZ/0004

Search for $^3\overline{\mathrm{He}}$ and $^3_{\overline{\Lambda}}\overline{\mathrm{H}}$ at LHCb — •Hendrik Jage[1], Razvan-Daniel Moise[1], Gediminas Sarpis[2], Valery Zhukov[1], and Stefan Schael[1] — [1]I. Physikalisches Institut B, RWTH Aachen University — [2]University of Edinburgh

In recent presentations, AMS-02 has reported the observation of several anti-helium candidates in cosmic rays. In 2020, it has been suggested by M. Winkler and T. Linden that dark matter annihilation into b-quarks could produce a detectable $^3\overline{\mathrm{He}}$ flux in cosmic rays via $\overline{\Lambda}_b^0$ decays.

The LHCb detector at CERN is an experiment dedicated to the study of b-hadrons, which are abundantly produced in the proton-proton collisions at the Large Hadron Collider (LHC). Therefore, the large sample of Λ_b^0 decays, collected by LHCb until 2018, provides a unique opportunity to study the potential displaced production of ^{3}He via Λ_b^0 decays.

While prompt ^{3}He from proton-proton collisions as well as from $^3_\Lambda\mathrm{H} \to {}^3\mathrm{He}\pi^-$ decays has already been observed at the LHC by the ALICE Collaboration in the central region ($|y| < 0.5$), prompt and displaced ^{3}He has not previously been searched for at LHCb ($2 < \eta < 5$). In this talk, the possibility of identifying ^{3}He with the LHCb tracking system is discussed and the status of the on-going analysis is presented.

T 2.2 Mon 16:45 HSZ/0004

Taming New Physics in $b \to c\bar{u}d(s)$ with $\tau(B^+)/\tau(B_d)$ and a_{sl}^d — Alexander Lenz, •Jakob Müller, Maria Laura Piscopo, and Aleksey V. Rusov — Center for Particle Physics Siegen, Theoretische Teilchenphysik, Universität Siegen

Inspired by the recently observed tensions between the experimental data and the theoretical predictions, based on QCD factorisation, for several colour-allowed non-leptonic B-meson decays, we study the potential size of new physics (NP) effects in the decay channels $b \to c\bar{u}d(s)$. Starting from the most general effective Hamiltonian describing the $b \to c\bar{u}d(s)$ transitions, we compute NP contributions to the theoretical predictions of B-meson lifetime and of B-mixing observables. The well-known lifetime ratio $\tau(B^+)/\tau(B_d)$ and the experimental bound on the semi-leptonic CP asymmetry a_{sl}^d, provide strong, complementary constraints on some of the NP Wilson coefficients.

T 2.3 Mon 17:00 HSZ/0004

Flavour tagging, $B_s \to D_sK$, and $B^0 \to J/\psi K_S$ — Quentin Führing, Vukan Jevtic, Gerwin Meier, •Sophie Hollitt, and Johannes Albrecht — TU Dortmund University, Dortmund, Germany

The amount of CP violation in the Standard Model is insufficient to explain the universe's matter-antimatter asymmetry. Precision measurements of CP violation in decays–including measurements of the angles of the 'CKM triangle' to test for unitarity–are crucial to further understand CP violation in the Standard Model and reveal any possible hints of new physics. Determining the flavour of the B meson at the time of production with flavour tagging is a key part of this process.

In this talk we consider analyses for two of the three CKM angles: the angle γ using the decay $B_s^0 \to D_sK$, and the angle β using the channel $B^0 \to J/\psi K_S$. The LHCb experiment provides a large number of B_s meson decays with an excellent decay time resolution, that can be used to measure $B_s \to D_sK$ and provide an additional constraint on γ. For $\sin(2\beta)$, the statistical significance of previous measurements of $B^0 \to J/\psi K_S$ can be improved by including additional track reconstruction types and more decay channels in this updated analysis.

T 2.4 Mon 17:15 HSZ/0004

***CP* violation measurement in $B^0 \to D^+D^-$ and $B_s^0 \to D_s^+D_s^-$ decays at the LHCb experiment** — Johannes Albrecht, •Louis Gerken, Philipp Ibis, and Antje Mödden — TU Dortmund University, Dortmund, Germany

Time dependent measurements of *CP* violation are a major part of the research at the LHCb experiment. They provide access to important Standard Model parameters such as the *CP*-violating mixing phases $\sin 2\beta$ and ϕ_s. These can be measured in $B^0 \to D^+D^-$ and $B_s^0 \to D_s^+D_s^-$ decays, respectively. The *CP* violation in these decays arises in the interference between the direct decay and the decay after mixing. Due to the similarities of these decays, the two measurements are performed in parallel.

In this talk, the current status of the analysis is presented. The analysis uses data collected by the LHCb detector during 2015 to 2018 at a centre-of-mass energy of 13 TeV corresponding to an integrated luminosity of 6 fb^{-1}.

T 2.5 Mon 17:30 HSZ/0004

CP violation in $\tau \to K_S\pi\nu_\tau$ decays at Belle* — •Katarina Dugic, Daniel Greenwald, and Stephan Paul for the Belle II-Collaboration — Technical University Munich

In 2012, BaBar measured a CP-violating decay-rate asymmetry in $\tau \to \pi K_S^0(\geq 0\pi^0)\nu_\tau$ that deviates from the standard-model prediction by 2.8σ. We present initial studies for measuring the same asymmetry using data from the Belle experiment, which is twice as large.

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T 2.6 Mon 17:45 HSZ/0004

Minimal Models for Radiative Fermion Masses — •Zachary Wüthrich[1,2] and Andreas Crivellin[3,4] — [1]Universität Siegen — [2]ETH, Zürich — [3]PSI — [4]UZH

There has been a long history of attempts to generate fermion masses from loops of heavier particles. This would be an elegant theory, as it provides a simple and natural explanation of the observed fermion mass hierarchy through the loop hierarchy.

This work investigates a class of minimal renormalizable models using scalar leptoquarks and other new scalar particles to generate the fermion masses at the loop level. We provide for the first time a classification of the different representations of a scalar field that allows for a chirally enhanced radiative generation of fermion masses. Constraints from observables give bounds on the scalar particle masses and their couplings, with special emphasis given to the effect of the new models on the anomalous magnetic moment of the muon.