T 25: Flavor II

Time: Tuesday 17:00–18:30 Location: HSZ/0304

T 25.1 Tue 17:00 HSZ/0304

Observation of $B_s^0 \to D^{*+}D^{*-}$ and *CP* violation studies in $B^0 \to D^{*+}D^{*-}$ with the LHCb experiment — Johannes Albrecht, Sophie Hollitt, and •Jan Langer — TU Dortmund University, Dortmund, Germany

At the LHCb experiment, precision measurements are performed to search for physics beyond the Standard Model. One important area of interest is the field of CP violation. This includes direct measurements of CP violation in decays of neutral B mesons as well as the determination of branching fractions to constrain higher order effects in such measurements.

The $B_s^0 \to D^{*+}D^{*-}$ decay was observed with a high significance and its branching fraction was measured relative to the $B^0 \to D^{*+}D^{*-}$ decay. Further, the *CP* violation parameter $\sin(2\beta)$ can be measured by exploiting $b \to c\bar{c}d$ transitions in $B^0 \to D^{*+}D^{*-}$ decays, where the phases arise through the interference between the direct decay of the B^0 meson and the decay after mixing. Due to the topology of the decay, an angular analysis is required.

In this talk, the observation of the $B_s^0 \to D^{*+}D^{*-}$ decay and the current status of the *CP* violation measurement in $B^0 \to D^{*+}D^{*-}$ are presented.

T 25.2 Tue 17:15 HSZ/0304

Search for the $B^0 \to D^0\bar{D}^0$ decay with the LHCb experiment. — Johannes Albrecht, Sophie Hollitt, and •Jonah Blank — TU Dortmund University, Dortmund, Germany

With precise measurements of B-meson decays the LHCb experiment can test the integrity of the Standard Model. In particular $B \to DD$ decays are interesting to examine CP violation. While decays to charged $D^{\pm}$ mesons have already been well measured, the $B^0 \to D^0\bar{D}^0$ decay channel has not yet been observed by any experiment. The branching ratio of this decay mode is a key input to the theoretical prediction of its CP-asymmetry as well as the properties of other doubly charmed decays.
In the analysis presented in this talk, data collected by the LHCb experiment at $\sqrt{s} = 7, 8\,\text{TeV}$ and $13\,\text{TeV}$, corresponding to an integrated luminosity of $9\,fb^{-1}$ is used to search for the $B^0 \to D^0\bar{D}^0$ decay. The $B^0 \to \bar{D}^0\pi^+\pi^-$ decay channel is used as a normalisation mode to cancel systematic uncertainties. The current status of the analysis will be presented.

T 25.3 Tue 17:30 HSZ/0304

Belle II measurement of $B^+ \to K^+\pi^0$ and $B^+ \to \pi^+\pi^0$ decays — •Justin Skorupa, Thibaud Humair, Hans-Günther Moser, Markus Reif, Oskar Tittel, and Benedikt Wach — Max Planck Institute for Physics, Munich, Germany

Charmless hadronic B-meson decays provide sensitive probes for physics beyond the Standard Model, since the contribution of penguin decay amplitudes to their decay is non-negligible. Exploiting isospin symmetry between charmless hadronic B-meson decays allows the construction of null tests of the Standard Model with an accuracy of better than 1%. Moreover, they allow to determine the angle α of the unitary triangle associated with B-meson decays. The Belle II experiment at the SuperKEKB e+ e- accelerator in Tsukuba, Japan, has the unique capability to measure all relevant final states to determine the angle α and to study all isospin-related decays necessary to set stringent limits on null tests. In this talk, a measurement of the decays $B^+ \to K^+\pi^0$ and $B^+ \to \pi^+\pi^0$ using Belle II data is presented.

T 25.4 Tue 17:45 HSZ/0304

On the contribution of the electromagnetic dipole operator to the $B_s \to \mu^+\mu^-$ decay amplitude — Thorsten Feldmann, Nico Gubernari, Tobias Huber, and •Nicolas Seitz — Center for Particle Physics Siegen, Theoretische Teilchenphysik, Universität Siegen

We report on the construction of a factorization theorem that allows to systematically include QCD corrections to the contribution of the electromagnetic dipole operator O_7 to the $\bar{B}_s \to \mu^+\mu^-$ decay amplitude. We elaborate on how the occurring endpoint divergences appearing in individual momentum regions cancel, and show how the resulting rapidity logarithms can be isolated by suitable subtractions applied to the corresponding bare factorization theorem. This allows to include in a straightforward manner the QCD corrections arising from the renormalization-group running of the hard matching coefficient, the hard-collinear scattering kernel, and the B_s-meson distribution amplitude. We estimate the effect numerically using a recently advocated parameterization of the B_s-meson light-cone distribution amplitude.

T 25.5 Tue 18:00 HSZ/0304

enhancing Bs to e+e- to an observable level — •Gilberto Tetlalmatzi-Xolocotzi — Siegen University, Siegen, Germany

As a result of the helicity suppression effect, within the Standard Model the rare decay channel $B_s\rightarrow e^+e^-$ has a decay probability which is extremely suppressed, being five orders of magnitude below current experimental limits. Thus, any observation of this channel within the current or forthcoming experiments will give unambiguous evidence of Physics Beyond the Standard Model. In this work, we present for the first time a New Physics scenario in which the branching fraction $\mathcal{B}r(B_s\rightarrow e^+ e^-)$ is enhanced up to values which saturate the current experimental bounds. More concretely, we study the general Two-Higgs-Doublet Model (2HDM) with a pseudoscalar coupling to electrons unsuppressed by the electron mass. Furthermore, we demonstrate how this scenario can arise from a UV-complete theory of quark-lepton unification that can live at a low scale.

T 25.6 Tue 18:15 HSZ/0304

Analysis of $B \to \mu\nu$ with inclusive tagging at Belle II — Florian Bernlochner, Jochen Dingfelder, •Daniel Jacobi, Peter Lewis, and Markus Prim for the Belle II-Collaboration — Physikalisches Institut der Rheinischen Friedrich-Wilhelms-Universität Bonn

$B\overline{B}$ meson pairs are the dominant decay products of the $\Upsilon(4S)$ resonance, which is produced in large amounts in e^+e^- collisions at the SuperKEKB collider in Japan, and their decays are measured by the Belle II experiment. Leptonic B meson decays such as $B \to \mu\nu$ are highly CKM- and helicity-suppressed. In a two-body decay like $B \to \mu\nu$, the muon momentum is exactly known in the rest frame of the signal-side B meson. By boosting the signal-side muon into that frame, a better signal resolution and improved sensitivity can thus be achieved compared to the center-of-mass frame. This requires a high-precision for the boost vector, which can be determined from the rest of the event that contains the decay products of the second B meson. At the same time, this information can be used to reconstruct the kinematics of the signal-side B meson. Boosted decision trees are trained to deal with model discrepancies, suppress background and increase signal purity. The hadronic $B^- \to D^0[\to K^-\pi^+]\pi^-$ decay can be used to validate different steps in the analysis of the $B \to \mu\nu$ decay. This talk will discuss the current status of the analysis for the measurement of the $B \to \mu\nu$ branching fraction with an integrated luminosity of 364 fb^{-1} at the Belle II experiment.