

## T 98: Topics in flavor physics

Time: Friday 11:00–13:00

Location: H-HS XII

T 98.1 Fri 11:00 H-HS XII

**First Results and Prospects for  $\tau$  lepton Physics at Belle II** — •THOMAS KRAETZSCHMAR for the Belle II-Collaboration — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München, Deutschland

The Belle II experiment at SuperKEKB, an asymmetric  $e^+e^-$  collider, has a rich program of Standard Model and Beyond the Standard Model physics. The collider, a next generation B factory, started operation in 2016 and successfully commissioned with first collisions in April 2018. In 2019 a first physics run with the full Belle II detector has taken place. Ultimately SuperKEKB will reach a world-record luminosity of  $8e35 \text{ cm}^{-2} \text{ s}^{-1}$  and aims to record a database of  $50 \text{ ab}^{-1}$ . 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 over the tau physics programme at Belle II, with a particular emphasis on first results and decay modes with significant potential in the near future.

T 98.2 Fri 11:15 H-HS XII

**Study of tau decay to three charged pions and a neutrino at Belle** — •ANDREI RABUSOV, DANIEL GREENWALD, and STEPHAN PAUL — Technical University of Munich, Munich, Germany

The COMPASS experiment saw a potential new particle, the  $a_1(1420)$ , that does not fit the quark model. They observed it via its production in pion-proton scattering and subsequent decay to three pions. At Belle, we investigate if this particle appears in tau decays to three pions and a neutrino, using partial wave analysis (PWA). For this technique, it is necessary to know the tau direction. We present data selection criteria for obtaining a clean sample of such tau decays in which knowledge of the tau direction is obtainable upto a two-fold ambiguity.

T 98.3 Fri 11:30 H-HS XII

**Measurement of (anti)deuteron production at Belle II** — ELIO MONACO and •NATHALIE EBERLEIN for the Belle II-Collaboration — LMU München

One of the biggest hurdles in our modern understanding of cosmology comes from dark matter. Indirect searches for dark matter in astrophysical sources rely mainly on the detection of cosmic (anti)deuterons. Production mechanisms for (anti)deuterons are mostly modelled using the coalescence model, which is poorly understood.

Our work aims to measure (anti)deuteron production in  $e^+e^-$  collisions and compare its value to theoretical models, as well as the efficiency of particle identification variables, at the Belle II experiment. First, the performance of particle identification variables is investigated with untagged  $\Lambda \rightarrow p\pi$  for different detector components.

Then, cross-section measurements of inclusive  $e^-e^+ \rightarrow d(\bar{d}) + X$  processes are performed at the center of mass energy of 10.58 GeV, for both Monte Carlo generated events and real data.

T 98.4 Fri 11:45 H-HS XII

**Global analysis of  $e^+e^- \rightarrow c\bar{c}$  in a K-matrix formalism** — •STEPHAN KÜRTEEN — TU München

A precise description of the spectrum of vector charmonia close to the open charm threshold is of phenomenological relevance to several open questions relating to the physics of heavy mesons. Examples include the search for exotic states, CP-violation in purely hadronic meson decays, and the prediction of  $b \rightarrow s\mu^+\mu^-$  decays with high-mass dimuons.

At the moment the best determination of the spectral parameters is based on an inclusive measurement by the BES collaboration. Here, I show how to extend the current analysis within the framework of the K-Matrix formalism through a simultaneous description of all the exclusive open charm final states. I will also discuss the effects of two particle thresholds, and the intrinsic probability conservation of the S-Matrix. I will present the results of a fit to all available data for  $e^+e^- \rightarrow$  open charm, and I will discuss further phenomenological

applications of my results.

T 98.5 Fri 12:00 H-HS XII

**Measurement of time-dependent Charge-Parity asymmetries in neutral charm meson decays** — •DANIEL UNVERZAGT<sup>1</sup>, DOMINIK MITZEL<sup>2</sup>, ANGELO DI CANTO<sup>3</sup>, and SASCHA STAHL<sup>2</sup> — <sup>1</sup>PI Heidelberg — <sup>2</sup>CERN — <sup>3</sup>Brookhaven National Laboratory

The measurement of the decay-time-dependent charge-parity (CP) asymmetry in  $D^0 \rightarrow \pi^+\pi^-$  and  $D^0 \rightarrow K^+K^-$  is presented using proton-proton collisions. The data was recorded between 2016 and 2018 at a center-of-mass energy of 13TeV with the LHCb detector at the LHC. Neutral D-mesons which arise from semi-leptonic decays of b-flavoured hadrons are used. The charge of the accompanying muon identifies the flavour of the D-meson at the time of production. The analysis strategy is discussed and final results are shown.

T 98.6 Fri 12:15 H-HS XII

**Measuring lepton flavour universality in W boson decays at the ATLAS experiment** — •NICOLAS KÖHLER — CERN, Meyrin, Schweiz

The universality of the lepton couplings to electroweak gauge bosons (lepton flavour universality) is one of the fundamental ingredients of the Standard Model (SM) of particle physics. At LEP, the branching fractions of the W boson into charged leptons have been measured with a high precision, however the uncertainty on the ratio of  $\mathcal{BR}(W \rightarrow \tau\nu)/\mathcal{BR}(W \rightarrow \mu\nu)$  still remains at approximately 2.4%. The PDG combined measurement of  $\mathcal{BR}(W \rightarrow \tau\nu)/\mathcal{BR}(W \rightarrow \mu\nu)$  shows a significant deviation from the SM prediction of  $2.7\sigma$ , thus motivating an independent measurement of this ratio at the LHC. This analysis focusses on leptonic tau decays due to the significantly larger experimental systematic uncertainties for hadronic tau reconstruction. It exploits a Tag&Probe method on  $t\bar{t}$  events where the leptonic W decay of one top quark is used to trigger the event, allowing the lepton of the second W decay, which is unbiased in transverse momentum, to be used for the actual measurement. Leptonic tau decays are distinguished from prompt muons by requirements on the unsigned impact parameter,  $|d_0(\mu)|$ , and the transverse momentum of the muon. This analysis is expected to achieve a 1% precision which will be a significant improvement over the existing LEP results.

T 98.7 Fri 12:30 H-HS XII

**Untersuchung des  $b \rightarrow u$  Beitrages zur  $V_{cb}$  Bestimmung** — THOMAS MANNEL und •MUSLEM RAHIMI — Theoretische Physik I, Universität Siegen, Walter-Flex-Strasse 3, 57068 Siegen

Zur Bestimmung von  $V_{cb}$  aus inklusiven Zerfällen wird die inklusive Rate  $B \rightarrow X_c \ell \bar{\nu}$  benötigt. Um diese aus der vollständig inklusiven Rate  $B \rightarrow X \ell \bar{\nu}$  zu extrahieren, wird in der aktuellen Analyse der Beitrag von  $B \rightarrow X_u \ell \bar{\nu}$  mittels eines Monte Carlo Generators subtrahiert, der auf einer partonischen Rechnung, verknüpft mit einem Hadronisierungsmodell beruht. Von theoretischer Seite können aber die Beiträge zur totalen Rate und zu den spektralen Momenten des Prozesses  $B \rightarrow X_u \ell \bar{\nu}$  in einer „Heavy Quark Expansion“ berechnet werden. In dieser Arbeit soll diese Rechnung mit den Ergebnissen des Monte Carlo Generators verglichen werden. Dabei ist das Ziel die systematische Unsicherheit zu reduzieren, die durch die Modellierung des  $B \rightarrow X_u \ell \bar{\nu}$  Beitrages entsteht.

T 98.8 Fri 12:45 H-HS XII

**Study of inclusive  $B \rightarrow X_u \ell \nu$  decays at the Belle II experiment** — FLORIAN BERNLOCHNER, LU CAO, JOCHEN DINGFELDER, and •MAXIMILIAN WELSCH — Universität Bonn

The absolute value of the CKM matrix element  $|V_{ub}|$  can be measured from semileptonic B meson decays into either inclusive or exclusive charmless final states. One of the main challenges in studying inclusive  $B \rightarrow X_u \ell \nu$  decays is the presence of the much more abundant semileptonic B decays involving  $b \rightarrow c$  transitions. The required phase space cuts to suppress the  $b \rightarrow c$  background lead to difficulties in the calculation of the partial branching fractions, resulting in significantly larger theoretical uncertainties on  $|V_{ub}|$ . In this talk, I will present the current status of the measurement of inclusive  $B \rightarrow X_u \ell \nu$  decays with the Belle II experiment.