T 54: Flavor IV

Time: Wednesday 15:50–17:20 Location: HSZ/0304

T 54.1 Wed 15:50 HSZ/0304

Systematic Parametrization of the B-meson Light-Cone Distribution Amplitude — Thorsten Feldmann[1], •Philip Lüghausen[1], and Danny van Dyk[2] — [1]Theoretische Physik 1, Universität Siegen, Walter-Flex-Straße 3, D-57068 Siegen, Germany — [2]Institute for Particle Physics Phenomenology, Durham University, Durham DH1 3LE, UK

The light-cone distribution amplitude (LCDA) of the B meson provides the essential non-perturbative input in the QCD factorization approach to calculate, for example, the $B \to \gamma\ell\nu$ decay amplitude.
While previous phenomenological analyses were based on specific model assumptions for the LCDA, we propose a systematic parametrization with suitable properties: (1) to extract information about the LCDA from experimental data, (2) to perform analytical calculations in QCD-based approaches, and (3) to obtain numerical estimates for observables with controlled theoretical uncertainties.

T 54.2 Wed 16:05 HSZ/0304

New Physics Studies in $B_q^0 - \bar{B}_q^0$ Mixing — Kristof De Bruyn[1,5], Robert Fleischer[1,2], •Eleftheria Malami[3,1], and Philine van Vliet[4] — [1]Nikhef, Science Park 105, 1098 XG Amsterdam, Netherlands — [2]Vrije Universiteit Amsterdam, 1081 HV Amsterdam, Netherlands — [3]Center for Particle Physics Siegn (CPPS), Theoretische Physik 1, Universität Siegen, D-57068 Siegen, Germamy — [4]Deutsches Elektronen-Synchrotron DESY, Notkestr. 85, 22607 Hamburg, Germany — [5]Van Swinderen Institute for Particle Physics and Gravity, University of Groningen, 9747 Groningen, Netherlands

Neutral $B_q - \bar{B}_q$ mixing (where $q = d, s$) is a powerful probe for testing the Standard Model and searching for New Physics. Focusing on the analyses of the different determinations of the Unitarity Triangle apex, we explore how much room for New Physics is left through the available experimental data. We discuss the discrepancies between inclusive and exclusive $|V_{ub}|$ and $|V_{cb}|$ CKM matrix elements and the determination of the angle γ. Presenting future scenarios, we discuss the application of our findings to leptonic rare B decays, allowing us to minimise the CKM parameters impact in the New Physics searches. We explore the impact of increased precision on key input measurements, performing future projections. It will be exciting to see how the data will evolve in the high-precision era of flavour physics.

T 54.3 Wed 16:20 HSZ/0304

Flavour Tagging in Run 3 at LHCb — •Micol Olocco[1], Claire Prouve[2], Biljana Mitreska[1], and Johannes Albrecht[1] — [1]TU Dortmund University, Dortmund, Germany — [2]University of Santiago de Compostela, Santiago, Spain

The knowledge of the B meson flavour at time of production is crucial for measurements of time-dependent CP violation and flavour oscillations. Flavour tagging algorithms exploit correlations between the B meson flavour and features of the global event in order to tag the candidate as B or $\overline{B}$ with a corresponding efficiency and mistag probability. Beside the information that is saved in real time, it is fundamental to optimize the tagging power of the algorithm since it heavily affects the uncertainty on the CP asymmetry factor.

In the Run 3 of the LHC, the LHCb experiment will operate at the average non-empty bunch crossing rate of 30 MHz with an upgraded detector and a solely software-based trigger. The current status and challenges in flavour tagging algorithms for Run 3 are presented, together with their estimated performance at trigger level.

T 54.4 Wed 16:35 HSZ/0304

Automation of the Flavor tagging calibration software in the ATLAS experiment — •Marawan Barakat for the ATLAS-Collaboration — Platanenallee 6, 15738 Zeuthen

Particle cascades originating from quarks and gluons decays (jets) are omnipresent in proton-proton collisions at the LHC. The identification of jet flavors is essential for many physics searches at the ATLAS experiment. This is achieved using machine learning algorithms (taggers) trained with simulated Monte Carlo events. Due to simulations imperfections, the taggers performance need to be measured in data in order to extract correction factors for the simulation predictions. ATLAS is using a set of calibration software for different jets flavors, which are complicated to use, specially for non-experts. In order to make the software easier, more flexible and more time efficient, automation workflows are defined. This study shows the framework used to automate the calibration of the flavor tagging software using REANA platform. The results are compared to the official results from ATLAS calibration with 139 fb^-1 of 13 TeV collisions data from ATLAS. Same technique can be extended to RUN III of ATLAS and other analyses beyond Flavor Tagging.

T 54.5 Wed 16:50 HSZ/0304

Light Separation with the Topological Track Reconstruction in an idealised water-based liquid scintillator detector as study for Theia — Daniel Bick, Caren Hagner, and •Malte Stender — Universität Hamburg, Institut für Experimentalphysik

In neutrino physics, large unsegmented liquid scintillator or water Cherenkov detectors are often the tool of choice. Where the scintillation type excels in energy reconstruction, shower identification via the $\mathrm{d}E/\mathrm{d}x$ and a low detection threshold, the water Cherenkov detectors perform very well in direction reconstruction, particle identification via the fuzziness of the Cherenkov rings and background reduction with the number of rings. Experiments like the proposed Theia plan to combine the detection capabilities of both detector types and use water-based liquid scintillator (WbLS) as active volume. In order to unlock the full potential of these new detectors, a successful separation of Cherenkov and scintillation photons is of vital importance.
The Cherenkov scintillation photon separation is the focus of this work. Different light separation algorithms are implemented and studied in the context of a simulated idealised WbLS detector, which has a maximum optical coverage of Large Area Picosecond Photodetectors. These photodetectors feature a good spatial resolution of $\sim 1\,\mathrm{mm}$ and an excellent time resolution of $\sim 0.1\,\mathrm{ns}$ compared to the few nanoseconds PMTs typically achieve.
This contribution introduces the detector simulation, discusses the used light separation algorithms including the Topological Track Reconstruction and shows first results.

T 54.6 Wed 17:05 HSZ/0304

Sensitivity Studies for the Theia Experiment at LBNF — •Wei-Chieh Lee, Caren Hagner, and Daniel Bick — Institut für Experimentalphysik, Universität Hamburg, Hamburg, Germany

Theia is a next-generation neutrino detector, which can achieve great precision in neutrino event reconstruction and background rejection by exploiting both Cherenkov radiation and scintillation light. With this type of detectors, the nature of neutrinos may be further investigated to provide answers to unsolved questions in physics, especially those considering the mass ordering and the possible CP violation of neutrinos. For this purpose, the detector is proposed to be constructed at the Long-Baseline Neutrino Facility (LBNF) in the United States, alongside the Deep Underground Neutrino Experiment (DUNE) far detectors. The General Long Baseline Experiment Simulator (GLoBES) software package is utilized for the detector performance simulation. In this talk, studies of Theia's ability to discover CP violation will be presented with details, including effects from variations in oscillation parameters and systematic uncertainties. With conservative assumptions and 7 years of data, Theia can ultimately have $> 3\sigma$ ($> 5\sigma$) sensitivity to CP violation for 60% (20%) of δ_{CP} parameter space in the case of normal (inverted) mass ordering.