HK 19: Hadron Structure and Spectroscopy IV

Time: Wednesday 16:30–18:15 Location: H3

Group Report HK 19.1 Wed 16:30 H3

Search for resonant states with $c\bar{c}s\bar{s}$ quark content at BaBar and Belle — •Elisabetta Prencipe[1], Dmytro Meleshko[1], Ashish Thampi[2], Soeren Lange[1], and James Ritman[2] — [1]JLU - University of Giessen — [2]Forschungszentrum Juelich

The study of exotics with charm- and strange- quark content has recently gained a lot of attention. In fact, the LHCb collaboration has already published on this topic three papers. In the latest submission, LHCb has shown interesting results by analyzing the invariant mass of the $J/\psi\phi$ and $J/\psi K$ systems in B decays. Former studies were conducted by the CDF, D0, CMS and BaBar collaborations, with controversial interpretation regarding possible resonant states in the $J/\psi\phi$ invariant mass. All previous studies were performed by analyzing B meson decays only, *e.g.* $B \to J/\psi\phi K$. We recently started this study with the whole Belle data set collected at the energy in the center of mass of $\Upsilon(4S)$. We decide to perform the analysis to look for $c\bar{c}s\bar{s}$ exotics at B factories, and combine data sets of 2 experiments (BaBar and Belle) to cure problems of insufficient statistics. We perform our study not only through B decays (charged and neutral B modes), but also in the continuum. This offers the possibility to cross-check the presence of such resonant states -if any- in different decay modes and different production mechanisms. The state of the art of the analysis of $B \to J/\psi\phi K$, $e^+e^- \to J/\psi\phi X$ and $e^+e^- \to D_s^- D_s(2317)^+ X$ is here presented. A DFG project has been submitted and approved on this topic for 3 years.

HK 19.2 Wed 17:00 H3

Search for couplings of vector charmonia to the $p\bar{p}\eta'$ final state at BESIII — •Johannes Bloms[1], Nienke Balz[1], Helge Balzen[1], Anja Brüggemann[1], Christopher Fritzsch[1], Titus Heinig[1], Nils Hüsken[2], Sascha Lennartz[1], Frederik Weidner[1], and Alfons Khoukaz[1] for the BESIII-Collaboration — [1]Westfälische Wilhelms-Universität, Münster, Germany — [2]Indiana University, Bloomington, USA

The BESIII experiment at the Beijing Electron Positron Collider (BEPCII) has collected a large amount of high luminosity data sets at various center-of-mass energies between $\sqrt{s} = 3.7\,\mathrm{GeV}$ and $\sqrt{s} = 4.7\,\mathrm{GeV}$, which offers a unique opportunity to study hadron spectroscopy and enables dedicated studies of exotic charmonia. The $\psi(4230)$ with $J^{PC} = 1^{--}$ and a mass around $m_{\psi(4230)} = 4.23\,\mathrm{GeV/c^2}$ is one example for an exotic candidate. Many detailed investigations regarding the $\psi(4230)$ have been made both experimentally and from theory, but there is still no consensus regarding its inner structure. Surprisingly, only a small coupling to open-charm final states has been found. Instead, the $\psi(4230)$ is prominently observed in charmonium transitions like $\psi(4230) \to J/\psi\pi^+\pi^-$, $\psi(4230) \to h_c\pi^+\pi^-$ and $\psi(4230) \to \psi(2S)\pi^+\pi^-$. So far, no observations have been made of charmless decays of the $\psi(4230)$ to light hadrons. In order to search for those possible decays of the $\psi(4230)$, the final state $p\bar{p}\eta'$ is investigated. The current status of the determination of the energy-dependent Born cross section $\sigma^{\mathrm{B}}(e^+e^- \to p\bar{p}\eta')$ will be presented and discussed. This work is funded by the DFG - 269952272, 271236083 and 443159800.

HK 19.3 Wed 17:15 H3

Study of the $B \to J/\psi\phi K$ decay channel at Belle — •Ashish Thampi[1], Elisabetta Prencipe[2], and James Ritman[1] — [1]Forschungszentrum Juelich, Juelich, Germany — [2]JLU-University of Giessen, Giessen, Germany

Even though the $B \to J/\psi\phi K$ process is most likely a three body decay, it can also proceed as a quasi-two body decay where J/ψ and ϕ are daughters of a hybrid or charmonium state. Investigating this decay is important in the search for possible $c\bar{c}s\bar{s}$ exotic states in the $J/\psi\phi$ invariant mass system. The LHCb has found resonant states in the $J/\psi\phi$ and the $J/\psi K$ invariant mass distributions in the charged B decay mode. In order to provide a better understanding of the process and disclose the nature of these enhancements, we analyze the invariant mass systems in both, charged and neutral B meson decays, $B^{\pm} \to J/\psi\phi K^{\pm}$ and $B^0 \to J/\psi\phi K_S^0$. This analysis is performed using the $771 fb^{-1}$ integrated luminosity data collected at the energy in the center of mass of $\Upsilon(4S)$ resonance by the Belle detector. We measure the branching fraction for these B decays and observe resonant states in the $J\psi\phi$ and the $J/\psi K$ invariant mass systems. This analysis is a part of the DFG project no. 389090153.

HK 19.4 Wed 17:30 H3

Search for the X17 boson at the BESIII experiment — •Saskia Plura, Achim Denig, and Christoph Redmer for the BESIII-Collaboration — Institut für Kernphysik, Johannes Gutenberg-Universität Mainz, Deutschland

In 2016, the ATOMKI collaboration proposed the existence of a new neutral boson with a mass of 17 MeV to explain their observation of a significant enhancement in the angular correlations of $e^+\,e^-$ pairs in nuclear transitions of ^{8}Be and ^{4}He. This particle is referred to as the X17 boson, which sparked interest in the particle physics community.

As the X17 should couple to nucleons, we developed a Monte Carlo generator to evaluate the possibility to search for the X17 boson in $J/\psi \to p\,\bar{p}\,e^+\,e^-$ decays, where the (anti-)proton radiates off an X17. J/ψ decays provide a clean source of nucleon-antinucleon pairs at $e^+\,e^-$-colliders. We considered both possibilities of the X17 being either a pseudoscalar or an axial vector particle, as well as the QED background.

In this talk, we discuss the feasibility of searching for the X17 at BESIII, located at the BEPC-II collider in Beijing, China, using a collected data sample of 10^{10} J/ψ events. - Supported by DFG.

HK 19.5 Wed 17:45 H3

Studies on Midrapidity J/ψ Production as a Function of Charged-Particle Multiplicity with ALICE — •Ailec de la Caridad Bell Hechavarria and Tabea Eder — Institut für Kernphysik, WWU. Wilhelm-Klemm-Straße 9, 48149 Münster

Previous ALICE studies have shown a stronger than linear relative increase of the inclusive J/ψ production at mid-rapidity as a function of the mid-rapidity charged-particle multiplicity in proton-proton collisions at the LHC. Studies on Monte Carlo simulations with PYTHIA 8 attributed this behavior to autocorrelation effects. In this regard, interesting results were obtained studying the correlation of the J/ψ production with the charged-particle multiplicity in different regions of the azimuthal angle with respect to the flight direction of the J/ψ meson.

With experimental data on pp collisions at $\sqrt{s}$=13 TeV TeV and pPb collisions at $\sqrt{s}$=5.02 TeV, collected with ALICE during Run 2 of data taking at the LHC, current results of the relative J/ψ yield as a function of the charged-particle multiplicity, measured at mid-rapidity (|y|<0.9) in the di-electron decay channel, will be shown and compared to theoretical predictions from the PYTHIA8 Monte Carlo event generator.

HK 19.6 Wed 18:00 H3

Hypertriton production in 13 TeV pp collisions — •Michael Hartung — Institut für Kernphysik, Goethe Universität, Frankfurt, Germany

The ${}^3_\Lambda$H is a bound state of proton, neutron and lambda. Studying its characteristics provides insights about the strong interaction between the lambda and ordinary nucleons. In particular, the ${}^3_\Lambda$H is an extremely loosely bound object, with a large wave-function. As a consequence, the (anti-)${}^3_\Lambda$H production yields in pp collisions are extremely sensitive to the nucleosynthesis models. Significant hypertriton yields have so far only been measured in Pb−Pb collisions at the LHC. Due to the excellent particle identification through the energy-loss measurement in the Time Projection Chamber in combination with the capabilities to separate primary particles from those from secondary decays, provided by the Inner Tracking System, it is possible to identify the hypertriton in pp collisions. With the precision of the presented production yields some configurations of the Statistical Hadronisation and Coalescence models can be excluded leading to tighter constraints to available theoretical models. Supported by BMBF and the Helmholtz Association.