

# **Conference on Flavor Physics and CP Violation (FPCP 2019)**

## **Report of Contributions**

Contribution ID: 1

Type: **Contributed Oral**

## Holographic QCD predictions for rare B decays

*Wednesday, May 8, 2019 2:55 PM (15 minutes)*

Light-front wavefunctions obtained from holographic AdS/QCD are used to obtain the distributions amplitudes for light mesons. Consequently, alternate predictions for B transition to light mesons form factors are presented. In this talk, I compare our results for rare B decays to those obtained from QCD sum rules.

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NSERC

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**Session Classification:** Parallel session 2

**Track Classification:** Rare Decays of Hadrons and Leptons

Contribution ID: 2

Type: **Contributed Oral**

# Meson-Hybrid Mixing in Vector and Axial Vector Charmonium

*Thursday, May 9, 2019 5:15 PM (15 minutes)*

We investigate mixing between conventional mesons and hybrid mesons in vector and axial vector charmonium using the QCD sum-rules formalism. We compute meson-hybrid cross correlators within the operator product expansion, taking into account condensate contributions up to and including those of dimension-six as well as composite operator renormalization-induced diagrams. Using measured masses of charmonium states as input, we probe known resonances for nonzero coupling to both conventional meson and hybrid meson currents, a signal for meson-hybrid mixing.

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Contribution ID: 3

Type: **Contributed Oral**

## CP Violation in $\bar{B} \rightarrow D^* \ell^- \bar{\nu}$

*Wednesday, May 8, 2019 1:55 PM (15 minutes)*

At present, there are discrepancies with the predictions of the SM in  $\bar{B} \rightarrow D^{(*)} \ell^- \bar{\nu}$  decays, suggesting the presence of new physics (NP) in  $b \rightarrow c \tau^- \bar{\nu}$ . Various NP models have been proposed to explain the data. In this talk, I discuss how the measurement of CP-violating observables in  $\bar{B} \rightarrow D^* \ell^- \bar{\nu}$  can be used to differentiate the NP scenarios.

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**Session Classification:** Parallel session 1

**Track Classification:** CP Violation in Hadrons and Leptons

Contribution ID: 4

Type: **Contributed Oral**

## New Physics in $b \rightarrow c\tau\nu$ : Impact of Polarisation Observables and $B_c \rightarrow \tau\nu$

*Tuesday, May 7, 2019 4:15 PM (15 minutes)*

In this talk I review the status of new physics in  $b \rightarrow c\tau\nu$  transitions in the EFT framework of dimension-six operators. The fit results, including the recent measurement of  $F_L(D^*)$ , are presented for all one- and two-dimensional scenarios resulting from the tree level exchange of a single new particle. Particular emphasis is put on the constraint from the  $B_c \rightarrow \tau\nu$  decay rate. I introduce a sum rule for the branching ratios of  $B \rightarrow D\tau\nu$ ,  $B \rightarrow D^*\tau\nu$  and  $\Lambda_b \rightarrow \Lambda_c\tau\nu$  which holds for any NP contribution to the Wilson coefficients and predicts an enhancement of the latter decay w.r.t. the Standard Model. I discuss correlations between the polarisation observables in  $B \rightarrow D\tau\nu$ ,  $B \rightarrow D^*\tau\nu$  and their model-discriminating prospects. The talk is based on the results published in <https://arxiv.org/abs/1811.09603>.

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Contribution ID: 5

Type: **Contributed Oral**

## Combined explanation of the B-anomalies.

*Tuesday, May 7, 2019 4:45 PM (15 minutes)*

There are four models of tree-level new physics (NP) that can potentially simultaneously explain the  $b \rightarrow s\mu^+\mu^-$  and  $b \rightarrow c\ell^-\bar{\nu}$  anomalies. They are the  $S_3$ ,  $U_3$ , and  $U_1$

leptoquarks, and a triplet of standard-model-like vector bosons (VBs). In this talk, I describe an analysis of these models with general couplings. We find that, even in this most general case,  $S_3$  and  $U_3$  are excluded. For the  $U_1$  model, I discuss the importance of the constraints from lepton-flavor-violating processes. As for the VB model, it is shown to be excluded by the LHC bounds on high-mass resonant dimuon pairs. This conclusion is reached without any assumptions about the NP couplings.

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**Session Classification:** Parallel session 1

**Track Classification:** Rare Decays of Hadrons and Leptons

Contribution ID: 6

Type: **Contributed Oral**

## Angular analysis of $B_{(s)} \rightarrow K_1(\phi)ll$ decay modes

The LHCb experiment has reported discrepancy of  $(2.2 - 2.4)\sigma$  in the  $\mu/e$  ratio of  $\bar{B} \rightarrow \bar{K}^*l^+l^-$  process,  $R_{K^*}$ , which reinforce the hints of lepton nonuniversality observed in  $B^+ \rightarrow K^+l^+l^-$  process. We investigate the analogous lepton non-universality ratios and other asymmetries in  $B \rightarrow K_1l^+l^-$  and  $B_s \rightarrow \phi l^+l^-$  processes both in model dependent and independent approaches. We constrain the new parameter space consistent with experimental limit on  $\text{Br}(B_s \rightarrow ll)$ ,  $\text{Br}(\bar{B} \rightarrow X_s ll)$ ,  $\text{Br}(\bar{B}^0 \rightarrow \bar{K}^0 ll)$ ,  $\text{Br}(\bar{B} \rightarrow K^{(*)}\nu_l\bar{\nu}_l)$ ,  $\text{Br}(\bar{B} \rightarrow X_s\nu_l\bar{\nu}_l)$ ,  $R_K$  and  $R_{K^*}$  parameters. We then show the effects of new parameters on the branching ratios, forward-backward asymmetries, CP violating parameters of  $B_{(s)} \rightarrow K_1(\phi)l^+l^-$  processes. As like  $R_{K^{(*)}}$ , we also check the existence of the violation of lepton universality in these decay modes. We observe that the analysis of  $B$  decays to axial vector mesons can also serve as a good tool to probe physics beyond the SM.

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Contribution ID: 7

Type: **Contributed Oral**

## CP asymmetries in beauty & charm hadrons

*Wednesday, May 8, 2019 2:40 PM (15 minutes)*

CP violations have been established in beauty mesons basically in two-body states, but so far not for charm mesons. Yet it is crucial to measure CP asymmetries in many-body final states – including for beauty & charm baryons!

Non-perturbative QCD gives large impact. [Of course, these results do not help us to understand the matter vs. anti-matter in our Universe.]

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**Track Classification:** CP Violation in Hadrons and Leptons



Contribution ID: 8

Type: **Contributed Oral**

## Results from the CUORE experiment

*Thursday, May 9, 2019 5:00 PM (15 minutes)*

The Cryogenic Underground Observatory for Rare Events (CUORE) is the first bolometric experiment searching for neutrinoless double beta decay ( $0\nu\beta\beta$ ) that has been able to reach the one-ton scale. The detector consists of an array of 988  $\text{TeO}_2$  crystals arranged in a compact cylindrical structure of 19 towers. The construction of the experiment was completed in August 2016 with the installation of all towers in the cryostat. Following a cooldown, diagnostic, and optimization campaign, routine data-taking began in spring 2017. In this talk, we present the  $0\nu\beta\beta$  results of CUORE from examining a total  $\text{TeO}_2$  exposure of 86.3 kg·yr, characterized by an average energy resolution of 7.7 keV FWHM and a background in the region of interest of 0.014 counts/(keV·kg·yr). In this physics run, CUORE placed the current best lower limit on the  $^{130}\text{Te}$   $0\nu\beta\beta$  half-life of  $> 1.3 \times 10^{25}$  yr (90% C.L.). We then discuss the additional improvements in the detector performance achieved in 2018, the latest evaluation of the CUORE background budget, and we finally present the most precise measurement of the  $^{130}\text{Te}$   $2\nu\beta\beta$  half-life to date.

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Contribution ID: 9

Type: **Contributed Oral**

## BESIII plans for the XYZ studies: the case of the Y(4660)

Since few years, a new family of exotic states has been appearing above the open-heavy meson thresholds: the so-called XYZ states. BESIII at the BEPCII  $e^+e^-$  collider plays a unique role in the study of those particles in the charmonium sector. Changing the beam energy, BESIII can collect large data samples by means of scans of the resonant region, accessing directly to all vector states. As part of a larger upgrade program, BESIII has planned to increase the center of mass energy to reach 4.7 GeV: this will allow BESIII to investigate the nature of the Y(4660), that was first observed by Belle and BaBar after Initial State Radiation only in  $\pi\pi\psi(2s)$  and  $\Lambda_c\bar{\Lambda}_c$  final states. The relative branching ratio seems to point toward a baryonium interpretation of the resonance, as expected in Rossi-Veneziano model. BESIII can directly measure the cross sections around the expected peak position and verify this prediction. In this presentation, the status of the XYZ searches at BESIII will be presented, with a focus also on the plans for the newest data taking and for the Y(4660) studies.

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Contribution ID: 10

Type: **Contributed Oral**

# Renormalization Effects on Electric Dipole Moments in Electroweakly Interacting Massive Particle Models

*Tuesday, May 7, 2019 5:15 PM (15 minutes)*

We study the renormalization effects on electric dipole moments in the models with new electroweakly interacting massive fermions. The electric dipole moments are generated by the effective operators which arise from integrating out heavy particles at some scale in the models. We give the renormalization group equation for the Wilson coefficients of the effective operators from the scale where the operators are generated to the electroweak scale. Our numerical studies focus on the electric dipole moments in the mini-split supersymmetric scenario and the electroweakly interacting massive particle dark matter scenario. It turns out that the renormalization effects can give an enhancement factor being of the order of  $O(10)\%$  in the mini-split scenario and being more than two in the minimal dark matter model.

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Contribution ID: 11

Type: **Contributed Oral**

## Production of Lambda\_b baryon and B0s mesons at LHCb

*Tuesday, May 7, 2019 4:30 PM (15 minutes)*

Heavy hadron production is well-suited as a benchmark process for understanding QCD. While b-quark production properties can be estimated within perturbative QCD, the subsequent fragmentation into a b hadron is a non-perturbative process and cannot be calculated from the first principles. Our understanding of fragmentation functions and fractions thus relies solely on experimental input. Recently, LHCb have taken a closer look at the properties of Lambda\_b baryon and B\_s meson production. The new results demonstrate that b-quark fragmentation clearly depends on the kinematics of the hadrons produced, and shed welcome light on B\_s production.

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Contribution ID: 12

Type: **Contributed Oral**

## Test of CP violation and measurement of mixing in charm at LHCb

*Wednesday, May 8, 2019 2:10 PM (15 minutes)*

The copious number of  $D^0$  decays collected by the LHCb experiment during 2011-2018 enables tests for CP violation in charm decays and measurements of the  $D^0$  mixing parameters with unprecedented precision. To take maximum advantage of these statistics, control of systematic uncertainties is becoming more and more important, and will be even more so after the planned upgrades of the LHCb detector. We present the latest LHCb measurements of mixing and indirect CP violation in the decay of  $D^0$  mesons.

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**Track Classification:** CP Violation in Hadrons and Leptons

Contribution ID: 13

Type: **Contributed Oral**

## Search for the forbidden decays $D^0 \rightarrow hh'l'l'$ and observation of $D^0 \rightarrow K^-\pi^+e^+e^-$

*Tuesday, May 7, 2019 4:15 PM (15 minutes)*

Decay modes with two oppositely charged leptons of different flavor correspond to lepton flavor violating (LFV) decays and are essentially forbidden in the Standard Model (SM) because they can occur only through lepton mixing. Decay modes with two leptons of the same charge are lepton-number violating (LNV) decays and are forbidden in the SM. Hence, decays of the form  $D^0 \rightarrow hh'l'l'$  provide sensitive tools to investigate new mediators or couplings in physics beyond the SM.

In this talk, we report on a search for decays of the type  $D^0 \rightarrow hh'l'l'$  (with  $h, h' = K/\pi$  and  $l, l' = e/\mu$ ) using data taken by the BABAR experiment at the PEP-II  $e^+e^-$  collider at the SLAC National Accelerator Laboratory. Upper limits on the branching fractions are improved by up to two orders of magnitude.

We also report on the observation of the flavor-changing neutral current (FCNC) decay  $D^0 \rightarrow K^-\pi^+e^-e^+$ , which is strongly suppressed in the SM because of the Glashow-Iliopoulos-Maiani (GIM) mechanism.

We measure  $\mathcal{B}(D^0 \rightarrow K^-\pi^+e^-e^+) = (4.0 \pm 0.5) \times 10^{-6}$  in the di-lepton mass range  $0.675 < m(e^+e^-) < 0.875$  GeV/ $c^2$ , where the production of the intermediate state  $\rho \rightarrow e^+e^-$  dominates, and set upper limits for decays outside this interval where long-distance effects are not expected to be significant.

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**Session Classification:** Parallel session 1

**Track Classification:** Rare Decays of Hadrons and Leptons



Contribution ID: 15

Type: **Contributed Oral**

## Searching for leptoquarks with the ATLAS detector

*Wednesday, May 8, 2019 2:10 PM (15 minutes)*

Leptoquarks (LQ) are predicted by many new physics theories to describe the similarities between the lepton and quark sectors of the Standard Model and offer an attractive potential explanation for the lepton flavour anomalies observed at flavour factories. The ATLAS experiment has a broad program of direct searches for leptoquarks, coupling to the first-, second- or third-generation particles. This talk will present the most recent 13 TeV results on the searches for pair-produced leptoquarks with the ATLAS detector, covering all three generations, and highlight their complementarity.

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**Session Classification:** Parallel session 2

**Track Classification:** Flavor and the Higgs and Dark Sectors



Contribution ID: 17

Type: **Contributed Oral**

## Measurement of the CKM angle $\gamma$ with Belle II

*Tuesday, May 7, 2019 5:30 PM (15 minutes)*

The CKM angle  $\gamma$  is the least well known of the angles of the unitarity triangle and the only one that is accessible with tree-level decays in a theoretically clean way. The Belle II experiment is a substantial upgrade of the Belle detector and will operate at the SuperKEKB energy-asymmetric  $e^+e^-$  collider. The accelerator has already successfully completed the first phase of commissioning with the first electron positron collisions in Belle II recorded in 2018. The design luminosity of SuperKEKB is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than the Belle experiment. The key method to measure  $\gamma$  is through the interference between  $B^+ \rightarrow D^0 K^+$  and  $B^+ \rightarrow \bar{D}^0 K^+$  decays which occurs if the final state of the charm-meson decay is accessible to both the  $D^0$  and  $\bar{D}^0$  mesons. To achieve the best sensitivity, a large variety of D and B decay modes is required, which is possible at Belle II experiment as almost any final state can be reconstructed including those with photons. With the ultimate Belle II data sample of  $50 \text{ ab}^{-1}$ , a determination of  $\gamma$  with a precision of 1 degree or better is foreseen. This talk will explain the details of the planned measurement at Belle II and include results related to these measurements obtained with the data already collected.

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Contribution ID: 18

Type: **Contributed Oral**

## Exotic Quarkonium Physics Prospects at Belle II

*Thursday, May 9, 2019 5:30 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at KEK in Tsukuba, Japan. It aims to record a factor of 50 times more data than its predecessor. The experiment completed a commissioning run in 2018, and began full operation in early 2019. Belle II is uniquely capable of studying the so-called “XYZ” particles: heavy exotic hadrons consisting of more than three quarks. First discovered by Belle, these now number in the dozens, and represent the emergence of a new category within quantum chromodynamics. This talk will present the prospects of Belle II to explore both exotic and conventional quarkonium physics.

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Contribution ID: 19

Type: **Contributed Oral**

## Dark Sector Physics with Belle II

*Thursday, May 9, 2019 5:00 PM (15 minutes)*

The Belle II experiment is a substantial upgrade of the Belle detector and will operate at the SuperKEKB energy-asymmetric  $e^+e^-$  collider. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July of this year, the machine has completed a commissioning run, achieved a peak luminosity of  $5.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ , and Belle II has recorded a data sample of about  $0.5 \text{ fb}^{-1}$ . Already this data set with specifically designed triggers offers the possibility to search for a large variety of dark sector particles in the GeV mass range complementary to LHC and dedicated low energy experiments but these searches will benefit from more data soon to be accumulated. This talk will review the state of the dark sector searches at Belle II with a focus on the discovery potential of the early data.

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Contribution ID: 20

Type: **Contributed Oral**

## Impacts of QED radiative corrections on $R(D)$ ratios

*Wednesday, May 8, 2019 2:55 PM (15 minutes)*

A recent paper (Phys. Rev. Lett. 120, 261804) presented a new evaluation of radiative corrections in the decay channels involved in the ratios  $\mathcal{R}(D^+)$  and  $\mathcal{R}(D^0)$ , which could explain part of the discrepancy between measurements and SM predictions. Using simulated events we quantify the difference between the results in this paper and Photos, which is used to simulate radiative corrections both by LHCb and the B-factories. In addition, we designed a simplified analysis in LHCb to quantify the effect of neglecting radiative corrections on measurements of  $\mathcal{R}(D^+)$  and  $\mathcal{R}(D^0)$ . A paper on this analysis will be submitted to a journal shortly.

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Contribution ID: 21

Type: **Contributed Oral**

## ATLAS measurements of CP Violation and Rare decays in Beauty mesons

*Thursday, May 9, 2019 5:45 PM (15 minutes)*

The ATLAS experiment has performed accurate measurements of mixing and CP violation in the neutral B mesons, and also of rare processes happening in electroweak FCNC-suppressed neutral B-mesons decays.

This talk will focus on the latest results from ATLAS, such as rare processes:  $B^0_s \rightarrow \mu\mu$  and  $B^0 \rightarrow \mu\mu$ ; and CPV in  $B_s$  to  $J/\psi \Phi$ .

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**Session Classification:** Parallel session 2

Contribution ID: 22

Type: **Contributed Oral**

## Time-dependent CPV in Bs decays at LHCb

*Wednesday, May 8, 2019 2:25 PM (15 minutes)*

Time-dependent CP-violation measurements of beauty mesons allow the determination of the mixing-induced CP-violating phases  $\phi_s$  and  $\beta$ . The measurement of the phase  $\phi_s$  in the Bs-Bsbar system is one of the key goals of the LHCb experiment due to the sensitivity to physics beyond the Standard Model (BSM). The CP-violating phase is of interest in penguin dominated  $b \rightarrow s$  transitions, in addition to that of tree-level decays, which test the flavour changing neutral current interaction describing B mixing. Both are sensitive to BSM phases and provide valuable tests and constraints. We present new results of time-dependent CP violation using data collected at LHCb between 2011 and 2016.

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Contribution ID: 23

Type: **Contributed Oral**

## Early physics prospects for radiative and electroweak penguin decays at Belle II

*Tuesday, May 7, 2019 5:45 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run and the main operation of SuperKEKB has started in March 2019. Recent measurements of B decays proceeding through a flavor changing neutral current transition such as  $b \rightarrow s$  transitions have shown deviations from the Standard Model (SM) prediction. These decays are forbidden at tree-level in the SM and can only occur via suppressed loop level diagrams. Rare decays of B mesons are thus an ideal probe for phenomena beyond the SM, since contributions from new particles can affect the decays at the same level as SM particles. In this presentation we will review the prospects for these decays at Belle II: Early physics goals of the Belle II physics program are to rediscover these rare decays. Especially radiative  $b \rightarrow s\gamma$  decays can be measured on a small dataset and in the near future Belle II can provide independent tests of anomalies in  $b \rightarrow s\ell\ell$  decays. Ultimately, the clean Belle II environment will allow to study modes with large missing energy such as  $B \rightarrow K^*\nu\bar{\nu}$ .

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Contribution ID: 24

Type: **Contributed Oral**

## Semileptonic and leptonic B decay results from early Belle II data

*Wednesday, May 8, 2019 2:25 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of  $5.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ , and Belle II has recorded a data sample of about  $0.5 \text{ fb}^{-1}$ . Main operation of SuperKEKB has started in March 2019. In this presentation we show first results from studying missing energy signatures, such as leptonic and semileptonic B meson decays based on early Belle II data. We report first studies on re-measuring important standard candle processes, such as the abundant inclusive  $B \rightarrow X\ell\nu$  and  $B \rightarrow D^*\ell\nu$  decays, and evaluate the performance of machine learning based tagging algorithms. Furthermore, we will also present an overview of the semileptonic B decays that will be measured in the upcoming years at Belle II and discuss prospects for important B-anomalies like  $R(D)$  and  $R(D^*)$ , as well as other tests of lepton flavor universality.

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Contribution ID: 25

Type: **Contributed Oral**

## Prospects for $\tau$ lepton physics at Belle II

*Tuesday, May 7, 2019 5:00 PM (15 minutes)*

The Belle II experiment is a substantial upgrade of the Belle detector and will operate at the SuperKEKB energy-asymmetric  $e^+e^-$  collider. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run and main operation of SuperKEKB has started in March 2019. Belle II has a broad  $\tau$  physics program, in particular in searches for lepton flavor and lepton number violations (LFV and LNV), benefiting from the large cross section of the pairwise  $\tau$  lepton production in  $e^+e^-$  collisions. We expect that after 5 years of data taking, Belle II will be able to reduce the upper limits on LF and LN violating  $\tau$  decays by an order of magnitude. Any experimental observation of LFV or LNV in  $\tau$  decays constitutes an unambiguous sign of physics beyond the Standard Model, offering the opportunity to probe the underlying New Physics. In this talk we will review the  $\tau$  lepton physics program of Belle II.

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Type: **Contributed Oral**

# First look at time dependent CP violation using early Belle II data

*Tuesday, May 7, 2019 5:00 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of  $5.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ , and Belle II has recorded a data sample of about  $0.5 \text{ fb}^{-1}$ . Main operation of SuperKEKB has started in March 2019. This early data set is used to establish the performance of the detector in terms of reconstruction efficiency of final states of interest for the measurement of time dependent CP violation, such as  $J/\psi K^{(*)0}$ ,  $\eta' K_s$ , and  $\phi K_s$ . A first assessment of the B flavor tagging capabilities of the experiment will be given, along with estimates of the Belle II sensitivity to the CKM angles  $\phi_1/\beta$  and  $\phi_2/\alpha$  and to potential New Physics contributions in penguin amplitudes dominated decays and in  $b \rightarrow s\gamma$  transitions.

## Email

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**Primary author:** Prof. PERUZZI, Ida Marena (INFN-LNF)**Presenter:** Dr LACAPRARA, Stefano (INFN Padova)**Session Classification:** Parallel session 2**Track Classification:** CP Violation in Hadrons and Leptons

Contribution ID: 27

Type: **Contributed Oral**

## **B lifetime and $B^0 - \bar{B}^0$ mixing results from early Belle II data**

*Wednesday, May 8, 2019 2:40 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run, achieved a peak luminosity of  $5.5 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ , and Belle II has recorded a data sample of about  $0.5 \text{ fb}^{-1}$ . Main operation of SuperKEKB has started in March 2019. We use this dataset to characterize the performance of the detector regarding the tracking of charged particles, the reconstruction of known resonances, and the capability of identifying displaced decay vertices. To assess the B Physics capabilities of the experiment, one of the first benchmarks consists in the measurement of the lifetime of B mesons and of the  $B^0 - \bar{B}^0$  mixing frequency. We present the first results, based on samples of B mesons that decay to hadronic and semileptonic final states.

### **Email**

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**Primary author:** Prof. PERUZZI, Ida Marena (INFN-LNF)**Presenter:** KANDRA, Jakub (Charles University)**Session Classification:** Parallel session 2**Track Classification:** Heavy Quark Decays and CKM Metrology

Contribution ID: 28

Type: **Contributed Oral**

## Electric Dipole Moments From Dark Sectors

*Thursday, May 9, 2019 5:15 PM (15 minutes)*

We examine the sensitivity of electric dipole moments (EDMs) as precision observables for new  $CP$ -violating physics in a dark sector. Assuming that the dominant mediation channel is via one or more of the vector, Higgs or neutrino portals, we examine the leading EDM contributions. The dominant contributions arise at two-loop order, and EDMs can provide sensitivity to portal couplings that is complementary to direct probes at the intensity frontier or high energy colliders. In particular, we identify a significant two-loop contribution to the electron EDM, mediated through the singlet (Higgs plus neutrino) portal, for which EDMs already provide new and complementary sensitivity in the regime of large singlet neutrino masses.

### Email

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**Primary author:** Dr OKAWA, Shohei (University of Victoria)**Co-authors:** Dr RITZ, Adam (University of Victoria); Dr POSPELOV, Maxim (University of Victoria & Perimeter Institute)**Presenter:** Dr OKAWA, Shohei (University of Victoria)**Session Classification:** Parallel session 2**Track Classification:** Flavor and the Higgs and Dark Sectors

Contribution ID: 29

Type: **Contributed Oral**

## Sensitivity to the X(3872) total width at the Belle II experiment

*Thursday, May 9, 2019 5:45 PM (15 minutes)*

The Belle II experiment at the SuperKEKB energy-asymmetric  $e^+e^-$  collider is a substantial upgrade of the B factory facility at the Japanese KEK laboratory. The design luminosity of the machine is  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$  and the Belle II experiment aims to record  $50 \text{ ab}^{-1}$  of data, a factor of 50 more than its predecessor. From February to July 2018, the machine has completed a commissioning run and main operation of SuperKEKB has started in March 2019. The X(3872) is an exotic hadron candidate and studying the X(3872) partial widths is a good probe for the internal structure of this hadronic state. However, in order to derive partial widths, a measurement of its total width is needed. The large Belle II data set will provide an ideal environment to measure the X(3872) total width since it will be possible to use the  $X(3872) \rightarrow D^0 \bar{D}^0 \pi^0$  decay, which has a better mass resolution than  $X(3872) \rightarrow J/\psi \pi^+ \pi^-$  used in earlier work. In this presentation, we will give an overview of the analysis and the expected sensitivity to the X(3872) total width

### Email

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**Primary author:** Prof. PERUZZI, Ida Marena (INFN-LNF)**Presenter:** HIRATA, Hikari (Nagoya University)**Session Classification:** Parallel session 1**Track Classification:** Heavy non- $q\bar{q}$  Mesons and Pentaquarks

Contribution ID: 30

Type: **Contributed Oral**

## Observation of several sources of CP violation in $B^+$ $\rightarrow \pi^+\pi^+\pi^-$ decays

*Tuesday, May 7, 2019 4:45 PM (15 minutes)*

Very large CP asymmetries in decays of B mesons to final states containing three charged particles have been observed and attracted much interest. We present new results from a Dalitz plot analysis of  $B \rightarrow 3\pi$  using a data sample corresponding to an integrated luminosity of  $3 \text{ fb}^{-1}$  of pp collisions recorded by the LHCb detector. Significant CP violation from different sources (S-wave, D-wave, S-P wave interference etc.) are established and may shed new light on understanding the underlying dynamics for CP violation in hadronic B decays.

### Email

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**Primary authors:** Dr GOMES DOS SANTOS NETO, Alvaro (UFTM, Brazil); MUELLER, Katharina (University of Zurich)

**Presenter:** Dr GOMES DOS SANTOS NETO, Alvaro (UFTM, Brazil)

**Session Classification:** Parallel session 2

**Track Classification:** CP Violation in Hadrons and Leptons

Contribution ID: 31

Type: **Contributed Oral**

## Higgs boson couplings to leptons at the ATLAS experiment

Testing the couplings of the Higgs boson to leptons is important to understand the origin of lepton masses. The talk presents cross section measurements in Higgs boson decays to two tau leptons, as well as a search for Higgs boson decays to two muons. Both analyses are based on pp collision data collected at 13 TeV.

### Email

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**Primary author:** FERRANDO, James (DESY)

**Presenter:** FERRANDO, James (DESY)

**Track Classification:** Flavor and the Higgs and Dark Sectors

Contribution ID: 32

Type: **Contributed Oral**

## Higgs boson couplings to quarks at the ATLAS experiment

*Thursday, May 9, 2019 5:30 PM (15 minutes)*

Testing the couplings of the Higgs boson to quarks is important to understand the origin of quark masses. The talk presents cross section measurements in Higgs boson decays to two b quarks, as well as a search for Higgs boson decays to two c quarks. It also presents measurements of Higgs boson production in association with a ttbar pair using Higgs boson decays to bbbar pairs, to two Z bosons, to other multi-lepton final states, and to a pair of photons. All analyses are based on pp collision data collected at 13 TeV.

### Email

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**Primary author:** FERRANDO, James (DESY)

**Presenter:** Dr DAVID, Claire (DESY)

**Session Classification:** Parallel session 2

**Track Classification:** Flavor and the Higgs and Dark Sectors



Contribution ID: 33

Type: **Contributed Oral**

## Implications for New Physics in $b \rightarrow smumu$ transitions after recent measurements by Belle and LHCb

*Tuesday, May 7, 2019 4:30 PM (15 minutes)*

We present a Bayesian analysis of the implications for new physics in semileptonic  $b \rightarrow s$  transitions after including new measurements of  $R_K$  at LHCb and new determinations of  $R_{K^*}$  and  $R_{K^*+}$  at Belle. We perform global fits with 2, 4, and 8 input Wilson coefficients, plus one CKM nuisance parameter to take into account uncertainties that are not factorizable. We infer the 68% and 95.4% credibility regions of the marginalized posterior probability density for all scenarios and perform comparisons of models in pairs by calculating the Bayes factor given a common data set. We then proceed to analyzing a few well-known BSM models that can provide a high energy framework for the EFT analysis. These include the exchange of a heavy Z boson in models with heavy vector-like fermions and a scalar field, and a model with scalar leptoquarks. We provide predictions for the BSM couplings and expected mass values.

### Email

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**Primary author:** Dr KUMAR, Dinesh (National Centre for Nuclear Research, Warsaw)**Presenter:** Dr KUMAR, Dinesh (National Centre for Nuclear Research, Warsaw)**Session Classification:** Parallel session 1**Track Classification:** Rare Decays of Hadrons and Leptons

Contribution ID: 34

Type: **not specified**

## **Bottom meson and baryon spectroscopy**

*Wednesday, May 8, 2019 11:00 AM (30 minutes)*

**Primary author:** Dr CAVELLERO, Giovanni

**Presenter:** Dr CAVALLERO, Giovanni (Università degli Studi di Genova)

**Session Classification:** B hadronic 1

Contribution ID: 35

Type: **not specified**

## **Production rates and BFs of heavy hadrons (including onia)**

*Wednesday, May 8, 2019 11:30 AM (30 minutes)*

**Primary author:** Dr RONCHESE, Paolo

**Presenter:** Dr RONCHESE, Paolo

**Session Classification:** B hadronic 1

Contribution ID: 36

Type: **not specified**

## **Multi-body decays and time-integrated CPV**

*Wednesday, May 8, 2019 12:00 PM (30 minutes)*

**Primary author:** Dr SEVIOR, Martin

**Presenter:** Dr SEVIOR, Martin

**Session Classification:** B hadronic 1

Contribution ID: 37

Type: **not specified**

## Future neutrino facilities

*Monday, May 6, 2019 11:10 AM (30 minutes)*

**Primary author:** Prof. HARRIS, Deborah

**Presenter:** HARRIS, Deborah (Fermilab)

**Session Classification:** Neutrinos 1

Contribution ID: **38**

Type: **not specified**

## **LFV in lepton decays**

*Tuesday, May 7, 2019 11:40 AM (25 minutes)*

**Primary author:** Dr GALLI, Luca

**Presenter:** Dr GALLI, Luca

**Session Classification:** Neutrinos 2

Contribution ID: 39

Type: **not specified**

## **Neutrino in the SM and beyond**

Contribution ID: 40

Type: **not specified**

## **LUV in neutral-current B decays - theory**

*Monday, May 6, 2019 2:00 PM (30 minutes)*

**Primary author:** Dr ALONSO, Rodrigo

**Presenter:** Dr ALONSO, Rodrigo

**Session Classification:** Neutral current and leptonic B decays



Contribution ID: 41

Type: **not specified**

## LFU in neutral-current B decays

*Monday, May 6, 2019 2:30 PM (30 minutes)*

**Primary author:** Dr PATEL, Mitesh

**Presenter:** Dr PATEL, Mitesh

**Session Classification:** Neutral current and leptonic B decays

Contribution ID: 42

Type: **not specified**

## **b to sl+l- decays and K\*l+l- angular distributions**

*Monday, May 6, 2019 3:00 PM (30 minutes)*

**Primary author:** Prof. SEVIOR, Martin

**Presenter:** Dr SEVIOR, Martin (University of Melbourne)

**Session Classification:** Neutral current and leptonic B decays

Contribution ID: 43

Type: **not specified**

## **Leptonic B decays - experimental status**

*Monday, May 6, 2019 3:30 PM (30 minutes)*

**Primary author:** Dr CARLI, Ina (Charles University)

**Presenter:** Dr CARLI, Ina (Charles University)

**Session Classification:** Neutral current and leptonic B decays

Contribution ID: 44

Type: **not specified**

## **Kaon physics with Lattice QCD**

Contribution ID: 45

Type: **not specified**

## **Theory perspectives on rare Kaon decays and CPV**

*Monday, May 6, 2019 4:30 PM (30 minutes)*

**Primary author:** Prof. DAMBROSIO, Giancarlo

**Presenter:** Dr D'AMBROSIO, Giancarlo

**Session Classification:** Strange particles

Contribution ID: 46

Type: **not specified**

## Rare strange particle decays

*Monday, May 6, 2019 5:00 PM (30 minutes)*

**Primary author:** Prof. ZAMKOVSKY, Michal

**Presenter:** Mr ZAMKOVSKY, Michal

**Session Classification:** Strange particles

Contribution ID: 47

Type: **not specified**

## **Flavour physics connections to cosmology**

*Tuesday, May 7, 2019 9:00 AM (30 minutes)*

**Primary author:** Dr MCKEEN, David

**Presenter:** MCKEEN, David (TRIUMF)

**Session Classification:** Dark matter and flavour

Contribution ID: 48

Type: **not specified**

## Dark sectors

*Tuesday, May 7, 2019 9:30 AM (30 minutes)*

**Primary author:** Dr SHUVE, Brian

**Presenter:** Dr SHUVE, Brian

**Session Classification:** Dark matter and flavour



Contribution ID: 49

Type: **not specified**

## **Dark sector searches at accelerators**

*Tuesday, May 7, 2019 10:00 AM (30 minutes)*

**Primary author:** Dr ROBERTSON, Steven

**Presenter:** Dr ROBERTSON, Steven

**Session Classification:** Dark matter and flavour

Contribution ID: 50

Type: **not specified**

## Short-baseline neutrino experiments

*Monday, May 6, 2019 11:40 AM (30 minutes)*

**Primary author:** Prof. OCHOA-RICOUX, Pedro

**Presenter:** Dr OCHOA-RICOUX, Pedro

**Session Classification:** Neutrinos 1

Contribution ID: 51

Type: **not specified**

## **Long-baseline and atmospheric neutrino experiments**

*Tuesday, May 7, 2019 11:00 AM (40 minutes)*

**Primary author:** Dr DUNNE, Patrick

**Presenter:** Dr DUNNE, Patrick (Imperial College)

**Session Classification:** Neutrinos 2

Contribution ID: 52

Type: **not specified**

## Neutrino cross sections

*Monday, May 6, 2019 12:10 PM (25 minutes)*

**Primary author:** Prof. MCFARLAND, Kevin

**Presenter:** Dr MCFARLAND, Kevin

**Session Classification:** Neutrinos 1

Contribution ID: 53

Type: **not specified**

## Neutrinoless double beta decay searches

*Tuesday, May 7, 2019 12:05 PM (25 minutes)*

**Primary author:** Dr HALLIN, Aksel

**Presenter:** Dr HALLIN, Aksel

**Session Classification:** Neutrinos 2

Contribution ID: 54

Type: **not specified**

## Exotic mesons

*Tuesday, May 7, 2019 2:00 PM (30 minutes)*

**Primary author:** Dr BENNETT, Jake

**Presenters:** Dr BENNETT, Jake (University of Mississippi); Dr WANG, Xiaolong

**Session Classification:** Exotic hadrons

Contribution ID: 55

Type: **not specified**

## **Pentaquarks**

*Tuesday, May 7, 2019 2:30 PM (30 minutes)*

**Primary author:** Dr CAPRIOTTI, Lorenzo

**Presenter:** Dr CAPRIOTTI, Lorenzo

**Session Classification:** Exotic hadrons

Contribution ID: 56

Type: **not specified**

## **Hot topic: BESIII exotics**

*Tuesday, May 7, 2019 3:00 PM (20 minutes)*

**Primary author:** Dr MEZZADRI, Giulio

**Presenter:** MEZZADRI, Giulio (INFN Ferrara)

**Session Classification:** Exotic hadrons



Contribution ID: 57

Type: **not specified**

## Deciphering the XYZ states

*Tuesday, May 7, 2019 3:20 PM (30 minutes)*

**Primary author:** Prof. VOLOSHIN, Mikhail

**Presenter:** Dr VOLOSHIN, Mikhail

**Session Classification:** Exotic hadrons

Contribution ID: 58

Type: **not specified**

## **Semileptonic B decays with and without LUV**

*Wednesday, May 8, 2019 9:00 AM (25 minutes)*

**Primary author:** Dr ROBINSON, Dean

**Presenter:** Dr ROBINSON, Dean (UC Santa Cruz)

**Session Classification:** Semileptonic B decays

Contribution ID: 59

Type: **not specified**

## **B to D\* $\ell$ nu at non-zero recoil**

*Wednesday, May 8, 2019 9:25 AM (20 minutes)*

**Primary author:** Dr VAQUERO, Alejandro

**Presenter:** Dr VAQUERO, Alejandro

**Session Classification:** Semileptonic B decays

Contribution ID: **60**

Type: **not specified**

## **LFU in charged-current B decays**

*Wednesday, May 8, 2019 9:45 AM (30 minutes)*

**Primary author:** Dr KLAVER, Suzanne

**Presenter:** Dr KLAVER, Suzanne

**Session Classification:** Semileptonic B decays

Contribution ID: **61**

Type: **not specified**

## **Semileptonic B decays - experimental status**

*Wednesday, May 8, 2019 10:15 AM (20 minutes)*

**Primary author:** Dr EIASHA, Waheed

**Presenter:** Ms WAHEED, Eiasha

**Session Classification:** Semileptonic B decays

Contribution ID: 62

Type: **not specified**

## Status of g-2 theory

*Monday, May 6, 2019 9:10 AM (30 minutes)*

**Primary author:** Prof. LEHNER, Christoph

**Presenter:** Dr LEHNER, Christoph

**Session Classification:** Charged leptons

Contribution ID: **63**

Type: **not specified**

## **Electron EDM**

*Monday, May 6, 2019 9:40 AM (30 minutes)*

**Primary author:** Prof. GABRIELSE, Gerald

**Presenter:** Dr GABRIELSE, Gerald

**Session Classification:** Charged leptons

Contribution ID: 64

Type: **not specified**

## Muon g-2 experiments

*Monday, May 6, 2019 10:10 AM (30 minutes)*

**Primary author:** Prof. TRAN, Hoai Nam

**Presenter:** Mr TRAN, Hoai Nam (Boston University)

**Session Classification:** Charged leptons



Contribution ID: 65

Type: **not specified**

## **The impact of flavour physics on high-energy searches**

*Thursday, May 9, 2019 9:00 AM (30 minutes)*

**Primary author:** Dr YOU, Tevong

**Presenter:** Dr YOU, Tevong

**Session Classification:** High-pT physics

Contribution ID: **66**

Type: **not specified**

## **Top flavour physics**

*Thursday, May 9, 2019 9:30 AM (30 minutes)*

**Primary author:** Dr KAREEM, Mohammad

**Presenter:** Dr KAREEM, Mohammad (York University)

**Session Classification:** High-pT physics

Contribution ID: 67

Type: **not specified**

## Higgs flavour physics

*Thursday, May 9, 2019 10:00 AM (30 minutes)*

**Primary author:** Dr DEMERS, Sarah

**Presenter:** Dr DEMERS, Sarah (Yale University)

**Session Classification:** High-pT physics

**Track Classification:** Flavor and the Higgs and Dark Sectors

Contribution ID: 68

Type: **not specified**

## **Tau decay recent results**

*Thursday, May 9, 2019 10:30 AM (20 minutes)*

**Primary author:** Dr EIGEN, Gerald

**Presenter:** Dr EIGEN, Gerald

**Session Classification:** High-pT physics

Contribution ID: **69**

Type: **not specified**

## **Charm mixing and CPV**

*Thursday, May 9, 2019 11:15 AM (30 minutes)*

**Primary author:** Dr FERRARI, Fabio

**Presenter:** Dr FERRARI, Fabio

**Session Classification:** Charm physics

Contribution ID: 70

Type: **not specified**

## Hadronic charm decays and lifetimes

*Thursday, May 9, 2019 11:45 AM (30 minutes)*

**Primary author:** Dr BIANCHI, Fabrizio

**Presenter:** Dr BIANCHI, Fabrizio

**Session Classification:** Charm physics

Contribution ID: 71

Type: **not specified**

## **Charmonium and charm spectroscopy**

*Thursday, May 9, 2019 12:15 PM (30 minutes)*

**Primary author:** Dr HU, Yu

**Presenter:** Dr HU, Yu

**Session Classification:** Charm physics

Contribution ID: 72

Type: **not specified**

## **Leptonic and semileptonic charm decays**

*Thursday, May 9, 2019 12:45 PM (30 minutes)*

**Primary author:** Dr ZHANG, Sifan

**Presenter:** Mr ZHANG, Sifan

**Session Classification:** Charm physics



Contribution ID: 73

Type: **not specified**

## **Time-dependent CPV in B decays**

*Thursday, May 9, 2019 2:35 PM (30 minutes)*

**Primary author:** Dr ANULLI, Fabio

**Presenter:** Dr ANULLI, Fabio

**Session Classification:** B physics

Contribution ID: 74

Type: **not specified**

## **Measurements of gamma from tree-level decays**

*Thursday, May 9, 2019 3:05 PM (30 minutes)*

**Primary author:** Dr BERTOLIN, Alessandro

**Presenter:** Dr BERTOLIN, Alessandro

**Session Classification:** B physics

Contribution ID: 75

Type: **not specified**

## **Lattice QCD: B and D decays and mixing**

*Thursday, May 9, 2019 3:35 PM (30 minutes)*

**Primary author:** Dr MONAHAN, Christopher

**Presenter:** Dr MONAHAN, Christopher

**Session Classification:** B physics

Contribution ID: 76

Type: **not specified**

## **Global constraints on NP including FCNC B decays**

*Thursday, May 9, 2019 4:30 PM (30 minutes)*

**Primary author:** Dr JAEGER, Sebastian

**Presenter:** Dr JAEGER, Sebastian

**Session Classification:** B physics

Contribution ID: 77

Type: **not specified**

## **The need for future colliders**

*Friday, May 10, 2019 9:00 AM (30 minutes)*

**Primary author:** Dr TAIT, Tim

**Presenter:** Dr TAIT, Tim

**Session Classification:** Planning for future facilities

Contribution ID: 78

Type: **not specified**

## **Future high-energy–frontier facilities**

*Friday, May 10, 2019 9:30 AM (30 minutes)*

**Primary author:** Dr RUAN, Manqi

**Presenters:** Dr RUAN, Manqi; Dr SHILTSEV, Vladimir

**Session Classification:** Planning for future facilities

Contribution ID: 79

Type: **not specified**

## **Future intensity-frontier hadron facilities**

*Friday, May 10, 2019 10:00 AM (25 minutes)*

**Primary author:** Dr SHILTSEV, Vladimir

**Presenter:** Dr SHILTSEV, Vladimir

**Session Classification:** Planning for future facilities

Contribution ID: **80**

Type: **not specified**

## **Polarized electron beams at SuperKEKB**

*Friday, May 10, 2019 10:25 AM (20 minutes)*

**Primary author:** Dr RONEY, Mike

**Presenter:** Dr RONEY, Mike

**Session Classification:** Planning for future facilities



Contribution ID: **81**

Type: **not specified**

## **Belle II and SuperKEKB status and progress**

*Friday, May 10, 2019 11:15 AM (30 minutes)*

**Primary author:** Dr ATMACAN, Hulya

**Presenter:** Dr ATMACAN, Hulya

**Session Classification:** Future B physics

Contribution ID: 82

Type: **not specified**

## **LHCb upgrade status and progress**

*Friday, May 10, 2019 11:45 AM (30 minutes)*

**Primary author:** Dr GAMBETTA, Silvia

**Presenter:** Dr GAMBETTA, Silvia

**Session Classification:** Future B physics

Contribution ID: 83

Type: **not specified**

## **What we will, what we might, learn from Belle II and the LHCb upgrade**

*Friday, May 10, 2019 12:15 PM (30 minutes)*

**Primary author:** Dr KOU, Emi

**Presenter:** Dr KOU, Emi

**Session Classification:** Future B physics

Contribution ID: **84**

Type: **not specified**

**TBC**

Contribution ID: **104**

Type: **not specified**

## **Lepton non-universality in B-meson decays in the minimal leptoquark models**

*Wednesday, May 8, 2019 1:55 PM (15 minutes)*

**Presenter:** Dr MALINSKÝ, Michal (IPNP, Charles University in Prague)

**Session Classification:** Parallel session 2

Contribution ID: 118

Type: **Contributed Oral**

# Production of quarkonia and heavy flavour states in ATLAS

*Tuesday, May 7, 2019 5:30 PM (15 minutes)*

Associated production of vector boson with quarkonia is a key observable for understanding the quarkonium production mechanisms, including the separation of single and double parton scattering components. This talk will present the latest differential measurements from ATLAS of associated-quarkonium production. In addition, recent results on heavy flavour production measurements are reported in the Bu and Bc systems.

## Email

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**Primary author:** Dr SEIDEL, Sally (University of New Mexico)

**Presenter:** Dr SEIDEL, Sally (University of New Mexico)

**Session Classification:** Parallel session 2

**Track Classification:** Heavy Quark Decays and CKM Metrology

Contribution ID: **119**

Type: **not specified**

## **Introduction**

*Monday, May 6, 2019 9:00 AM (10 minutes)*

**Presenter:** Prof. KOWALEWSKI, Bob

**Session Classification:** Welcome and introduction

Contribution ID: 120

Type: **not specified**

## **Announcement of FPCP 2020**

*Friday, May 10, 2019 12:45 PM (5 minutes)*

**Presenter:** Dr MARTINEZ SANTOS, Diego

**Session Classification:** Closeout and announcement of FPCP2020



Contribution ID: **121**

Type: **not specified**

## **Final word**

*Friday, May 10, 2019 12:55 PM (5 minutes)*

**Presenter:** Dr KOWALEWSKI, Bob (University of Victoria)

**Session Classification:** Closeout and announcement of FPCP2020

Contribution ID: 122

Type: **not specified**

## News from the IAC

*Friday, May 10, 2019 12:50 PM (5 minutes)*

**Presenter:** Dr LIGETI, Zoltan

**Session Classification:** Closeout and announcement of FPCP2020