

**The 7th International  
Workshop on Charm Physics  
(CHARM 2015)**

**Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Implications of SU(3)F on Charm CP Violation

*Thursday, 21 May 2015 09:00 (30 minutes)*

We present recent results on improved predictions for charm CP violation in nonleptonic decays. These are obtained from a fit of a diagrammatic parametrization to branching ratios including linear SU(3)F breaking. The predictions make possible future tests of the Standard Model once improved data is available.

**Primary authors:** Mrs MÜLLER, Sarah (Karlsruhe Institute of Technology); Dr SCHACHT, Stefan (Karlsruhe Institute of Technology); Prof. NIERSTE, Ulrich (Karlsruhe Institute of Technology)

**Presenter:** Dr SCHACHT, Stefan (Karlsruhe Institute of Technology)

**Session Classification:** Mixing and CP-violation I

Contribution ID: 2

Type: **not specified**

## D Leptonic and semi-leptonic decays from BESIII

*Friday, 22 May 2015 10:30 (30 minutes)*

The BESIII experiment has taken 2.92/fb of data at  $\sqrt{s} = 3.773$  GeV which contains the largest sample of  $e^+e^- \rightarrow \psi(3770) \rightarrow D\bar{D}$  in the world to date. We report the result of our branching fraction measurement of  $D^+ \rightarrow \mu^+ \nu$  based on this sample from which we extract its weak decay constant,  $f_{D^+}$ , with  $|V_{cd}|$  determined from a global Standard Model fit as an input. We also obtain  $|V_{cd}|$  from the measured branching fraction together with a Lattice QCD prediction for  $f_{D^+}$ . In addition, we present measurements of  $D^0 \rightarrow (K^-/\pi^-) e^+ \nu$ ,  $D^+ \rightarrow K_L e^+ \nu$ , and  $D^+ \rightarrow (\omega/\phi/K \pi) e^+ \nu$  decays. Based on analysis of  $D^0 \rightarrow (K^-/\pi^-) e^+ \nu$  and  $D^+ \rightarrow K_L e^+ \nu$ , we extract different parameterizations of the form factors together with the CKM matrix elements  $|V_{cs}(d)|$ . These will give a precision test on the LQCD calculation on these form factors and the unitarity of the CKM matrix. Based on analysis of  $D^+ \rightarrow K^- \pi^+ e^+ \nu$ , we perform a partial wave analysis and in return, we determine the S-wave contribution and its phase, the helicity basis form factors of  $D^+ \rightarrow K^{*}(892) e^+ \nu$  based on the SPD model, and we also measure them in a model-independent way. We also report searches for some rare semi-leptonic decays.

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr MA, Hailong (Institute of High Energy Physics, CAS, China)

**Session Classification:** Quark masses, leptonic and semileptonic and rare decays

Contribution ID: 7

Type: **not specified**

## D0 to KsKK and D to omega pi

*Wednesday, 20 May 2015 10:50 (20 minutes)*

Based on  $2.92 \text{ fb}^{-1}$  of  $e^+e^-$  collision data taken at  $\sqrt{s} = 3.773 \text{ GeV}$  with the BESIII detector at BEPCII, we present preliminary results from the analysis of the decay  $D^0 \rightarrow K_S^0 K^+ K^-$ . We measure the branching fraction and investigate the rich substructure in the final state by performing a Dalitz plot analysis.

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** WEIDENKAFF, Peter (JGU)

**Session Classification:** Parallel Session 3

Contribution ID: 8

Type: **not specified**

## D rare/fobidden decays

*Wednesday, 20 May 2015 09:50 (20 minutes)*

Based on the sample taken at  $\sqrt{s} = 3.773$  GeV with 2.92/pb, which corresponds to the largest sample of  $e^+e^- \rightarrow \psi(3770)$  in the world to date, we present our results of searches for flavor changing neutral current and lepton number violation decays of the charged D meson in the final states of;  $D^+ \rightarrow K^+ e^+ \nu$ ,  $K^- e^+ e^+$ ,  $\pi^+ e^+ e^-$ ,  $\pi^- e^+ e^+$ , as well as other searches such as for  $D^0 \rightarrow \gamma \gamma$ .

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr ZHAO, Minggang (Nankai University)

**Session Classification:** Parallel Session 3

Contribution ID: 11

Type: **not specified**

## Mixing/coherence in D mesons

*Wednesday, 20 May 2015 11:10 (20 minutes)*

We report the measurement of the  $D^0$ - $D^0$ bar mixing parameter,  $y_{\text{CP}}$  based on the sample taken at the  $D\bar{D}$ bar mass threshold. Based on the events where we reconstruct one  $D$  decays to CP eigenstates while the other  $D$  decays semi-leptonially, we obtain  $y_{\text{CP}} = (-2.0 \pm 1.3 \pm 0.7)\%$ . We also present results for model independent measurement of the strong phase difference between  $D^0$  and  $D^0$ bar  $\rightarrow K^0 \pi^+ \pi^-$ , through a binned dalitz analysis. These results represent a significant improvement in a previously statistically limited measurement, which will then allow for increased precision in the measurement of unitarity triangle angle  $\gamma/\phi_3$  using the decay  $B^{+-} \rightarrow D (-\rightarrow K_s \pi^+ \pi^-) K^{+-}$  through the GGSZ method.

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** ONUR, Albayrak (Carnegie Mellon University)

**Session Classification:** Parallel Session 3

Contribution ID: **12**

Type: **not specified**

## DD-bar shape

*Wednesday, 20 May 2015 09:10 (20 minutes)*

BESIII collected about 70 pb<sup>-1</sup> e<sup>+</sup>e<sup>-</sup> annihilation data around the nominal mass of  $\psi(3770)$ , based on which we present preliminary results of study on the production line-shape of e<sup>+</sup>e<sup>-</sup> → DDbar. In this study, we take into account the effect of interference due to the non-reconant DDbar production to describe the observed anomalous line-shape.

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr FANG, Yi (IHEP)

**Session Classification:** Parallel Session 4

Contribution ID: 13

Type: **not specified**

## Studies of Charmonium at BESIII

*Tuesday, 19 May 2015 14:00 (20 minutes)*

The BESIII Experiment at the Beijing Electron Positron Collider (BEPC2) has accumulated the world's largest samples of  $e^+e^-$  collisions in the tau-charm region. From these samples – which include  $J/\psi$ ,  $\psi(2S)$ , and  $\psi(3770)$  decays, among others – BESIII has produced many new results in the spectroscopy, transitions, and decays of charmonium. This talk will review the current status of these analyses, which cover a wide range of topics from rare decays to radiative transitions to new precision measurements.

**Primary authors:** Dr PING, Rong-Gang (Institute of High Energy Physics, CAS); Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr PING, Rong-Gang (Institute of High Energy Physics, CAS)

**Session Classification:** Parallel Session 2



Contribution ID: 15

Type: **not specified**

## Hadronic Transitions above 4 GeV at BESIII

*Tuesday, 19 May 2015 14:20 (20 minutes)*

The BESIII Experiment at the Beijing Electron Positron Collider (BEPC2) collected large data samples for electron-positron collisions with center-of-mass above 4 GeV during 2013 and 2014. A number of hadronic transitions have been measured in these data samples, leading to a rather complex picture of the physics of charmonium above 4 GeV. In this talk we will present results for  $e^+e^-$  to  $\pi^0\pi^0J/\psi$  (where the  $Y(4260)$  is seen in the cross section), as well as results for apparently more complex cross sections, such as  $e^+e^-$  to  $\omega\chi_{c0}$  and  $\eta J/\psi$ , where structures are less apparent.

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr LYU, Xiao-Rui (UCAS)

**Session Classification:** Parallel Session 2

Contribution ID: 16

Type: **not specified**

## XYZ radiative transitions

*Tuesday, 19 May 2015 16:20 (20 minutes)*

The BESIII Experiment at the Beijing Electron Positron Collider (BEPC2) collected large data samples for electron-positron collisions with center-of-mass above 4 GeV during 2013 and 2014. In this mass region, there are several states that are yet to be understood. In this talk we will discuss BESIII analyses of radiative transitions among these states, which may improve our understanding of this important mass region. One example is the observation of the process  $e^+e^-$  to gamma  $X(3872)$ .

**Primary author:** Dr LYU, Xiao-Rui (UCAS)

**Presenter:** Dr PRASAD, Vindhyaasini (Post-doctoral Fellow)

**Session Classification:** Parallel Session 2

Contribution ID: 17

Type: **not specified**

## Recent results on violation of discrete symmetries in charm decays at BaBar and Belle

*Thursday, 21 May 2015 11:30 (30 minutes)*

The status of CP violations in charm sector is still unsettled.

According to SM, the predicted asymmetries are small, but often affected by large uncertainties due to long-distance effects. However, it is possible to build observables which SM predicts to be CP conserving, so that any measured asymmetry is, with no doubts, a sign of New Physics.

We present recent results on charm CP violation at Belle and BaBar. We show the measurement of CP asymmetries in  $D^+ \rightarrow K^+ K^- \pi^+$ ,  $D^+ \rightarrow K_S K^+$ ,  $D_s^+ \rightarrow K_S K^+$ ,  $D_s^+ \rightarrow K_S \pi^+$  at BABAR. Moreover, we show the Belle measurements of indirect CP violation parameters from  $D^0 \rightarrow K_S \pi$  decay.

**Primary author:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Presenter:** Mr PILLONI, Alessandro (Sapienza U.)

**Session Classification:** Mixing and CP-violation I

Contribution ID: 18

Type: **not specified**

## Dalitz plot analysis of three-body charmonium decays in BaBar.

*Monday, 18 May 2015 11:30 (30 minutes)*

We study the reaction  $e^+ e^- \rightarrow \gamma_{\text{ISR}} J/\psi$ , where  $J/\psi \rightarrow \pi^+ \pi^- \pi^0$  and  $J/\psi \rightarrow K^+ K^- \pi^0$ , using events obtained from the Initial State Radiation process. We measure the relative  $J/\psi$  branching fraction and perform a Dalitz plot analysis of both  $J/\psi$  decay modes using the isobar and Veneziano model.

We study the process  $\gamma \gamma \rightarrow K \text{ anti-}K \pi$ . We observe the decays  $\eta_c \rightarrow K_s K^+ \pi^-$  and  $\eta_c \rightarrow K^+ K^- \pi^0$  and perform a Dalitz analysis of both  $\eta_c$  decay modes. We also extract the mass dependent  $K\pi$  amplitude and phase using the model-independent partial wave analysis approach.

**Primary author:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Presenter:** Prof. PALANO, Antimo (INFN and University of Bari, Italy)

**Session Classification:** Spectroscopy I

Contribution ID: 19

Type: **not specified**

## Study of inclusive charmonium production in $e^+e^-$ annihilation and B decays at BaBar

*Monday, 18 May 2015 16:00 (20 minutes)*

In a  $e^+e^-$  B factory charmonium states can be produced through different mechanisms, as in  $e^+e^-$  annihilation, with double charmonium production, and in B-meson decays.

Prompt production of  $J/\psi$  or  $\psi(2S)$  in association with a second charmonium state has been observed by both the BaBar and Belle experiments in  $e^+e^-$  annihilation at a center-of-mass energy of 10.58 GeV. These processes provide an opportunity to study both perturbative and non-perturbative effects in QCD and to search for new charmonium states recoiling against the reconstructed  $J/\psi$  or  $\psi(2S)$ . We present a study of such events using the full BaBar dataset.

We also present measurements of absolute branching fractions of the two-body decays of B mesons  $B(B \rightarrow K X_{cc})$ , where  $X_{cc}$  is a charmonium state. In fact, in events where one B is fully reconstructed, the charmonium spectrum can be observed in an unbiased way, looking at the distribution of the K momentum in the recoiling B rest frame.

**Primary author:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Presenter:** Prof. SOKOLOFF, Michael (University of Cincinnati)

**Session Classification:** Production

Contribution ID: 20

Type: **not specified**

## Search for exotic charmonium at BaBar

*Tuesday, 19 May 2015 14:40 (20 minutes)*

One of the most intriguing puzzles in hadron spectroscopy are the numerous charmonium-like states observed in the last decade, including charged states that are manifestly exotic.

Over the years BaBar has extensively studied these states in B meson decays, initial state radiation processes and two photon reactions. We report on recent studies on some of these states performed using the entire data sample collected by BaBar in  $e^+e^-$  collisions at center of mass energies near  $10.58 \text{ GeV}/c^2$ . Among these, the study of the process  $B \rightarrow J/\psi \phi K$  with a search for the  $X(4140)$  and  $X(4270)$  in their decays to  $J/\psi \phi$ , and a search for charged charmonium-like state  $Z_c(3900)^+ +$  in the decay  $Y(4260) \rightarrow J/\psi \pi^+ \pi^-$ .

**Primary author:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Presenter:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Session Classification:** Parallel Session 2

Contribution ID: 22

Type: **not specified**

## Measurement of the $D \rightarrow \pi^- e^+ \nu$ partial branching fraction, form factor and implications for $V_{ub}$ .

*Wednesday, 20 May 2015 08:50 (20 minutes)*

Precision measurements of the  $D \rightarrow \pi e^+ \nu$  form factor could shed new light on the persistent difference between inclusive and exclusive measurements of  $V_{ub}$ . We report the measurement of the partial branching fraction of  $D \rightarrow \pi e^+ \nu$  in bins of the four-momentum transfer squared of the  $D$  to  $\pi$  system using 347.2 /fb of integrated luminosity of the BaBar data. The  $D \rightarrow \pi$  form factor is extracted with fits to the unfolded partial branching fraction using pole or generalized expansions and the value at zero recoil is determined. These form factors are compared to the current world average, the available lattice predictions, and interpreted with the expectation of a single dominant pole term. The measured form factor is then combined with previous BaBar  $B \rightarrow \pi l \nu$  information to determine a value of  $V_{ub}$ .

**Primary author:** Dr ANULLI, fabio (INFN Sezione di Roma)

**Presenter:** OYANGUREN, Arantza (IFIC-UV-CSIC)

**Session Classification:** Parallel Session 3

Contribution ID: 23

Type: **not specified**

## Open charm spectroscopy

*Wednesday, 20 May 2015 08:30 (20 minutes)*

Excited charm states are studied at LHCb both in the pp collision and in decays of B hadrons. The latter method has the advantage of starting from a clean and well defined initial state with known quantum numbers. LHCb presents the observation of new spin-3 mesons decaying to  $D^{(*)}K$  and  $D\pi$ , as well as many measurements of mass, width and spin of already known mesons.

**Primary author:** LEROY, Olivier (CPPM, Aix-Marseille Université CNRS/IN2P3, Marseille, France)

**Presenter:** Dr WHITEHEAD, Mark (University of Warwick)

**Session Classification:** Parallel Session 4



Contribution ID: 24

Type: **not specified**

## Measurements of mixing and indirect CP violation

*Wednesday, 20 May 2015 11:50 (20 minutes)*

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to search for indirect CP violation in charm, and to measure  $D^0$  mixing parameters. New measurements from several decay modes are presented.

**Primary author:** LEROY, Olivier (CPPM, Aix-Marseille Université CNRS/IN2P3, Marseille, France)

**Presenter:** Ms REICHERT, Stefanie (The University of Manchester)

**Session Classification:** Parallel Session 3

Contribution ID: 25

Type: **not specified**

## Measurements of time-integrated CP and other asymmetries

*Tuesday, 19 May 2015 17:20 (20 minutes)*

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to search for direct CP violation in charm. New updated measurements from several decay modes, including  $\Delta A_{CP}$  from  $D^0 \rightarrow hh$  decays, are presented. The talk also focuses on measurements of production and detection asymmetries.

**Primary author:** LEROY, Olivier (CPPM, Aix-Marseille Université CNRS/IN2P3, Marseille, France)

**Presenter:** Dr GERSABECK, Marco (The University of Manchester)

**Session Classification:** Parallel Session 2

Contribution ID: 26

Type: **not specified**

## Measurements of T-odd observables

*Wednesday, 20 May 2015 12:10 (20 minutes)*

The study of T-odd observables using four-body hadronic final states of charm meson decays provides complementary insight to measuring CP asymmetries via decay rate asymmetries. New results based on the full LHCb dataset are presented.

**Primary author:** LEROY, Olivier (CPPM, Aix-Marseille Université CNRS/IN2P3, Marseille, France)

**Presenter:** Dr MARTINELLI, Maurizio (École Polytechnique Fédérale de Lausanne)

**Session Classification:** Parallel Session 3

Contribution ID: **30**

Type: **not specified**

## $\tau$ physics at LHCb

*Wednesday, 20 May 2015 09:30 (20 minutes)*

The observation of neutrino oscillations has re-opened the case for searches of lepton-flavour violating decays. We report on recent results and prospects on lepton-flavour violating  $\tau$  decays.

**Primary author:** LEROY, Olivier (CPPM, Aix-Marseille Université CNRS/IN2P3, Marseille, France)

**Presenter:** Dr HARRISON, Jonathan (University of Manchester)

**Session Classification:** Parallel Session 4

Contribution ID: **31**

Type: **not specified**

**TBD**

Contribution ID: **32**

Type: **not specified**

**TBD**

Contribution ID: **33**

Type: **not specified**

**TBD**

Contribution ID: **34**

Type: **not specified**

**TBD**



Contribution ID: 35

Type: **not specified**

## **Charmonium and exotics on the continuum**

*Monday, 18 May 2015 09:30 (30 minutes)*

**Presenter:** Dr PICCININI, Fulvio (istituto nazionale di fisica nucleare, sezione di Pavia)

**Session Classification:** Spectroscopy I

Contribution ID: **36**

Type: **not specified**

## **Lattice studies of charmonia and exotics**

*Monday, 18 May 2015 10:00 (30 minutes)*

**Presenter:** Prof. PRELOVSEK, Sasa (University of Ljubljana)

**Session Classification:** Spectroscopy I

Contribution ID: **38**

Type: **not specified**

## **Charmonia and exotics from BES III**

*Monday, 18 May 2015 11:00 (30 minutes)*

**Presenter:** Dr KORNICER, Mihajlo (University of Hawaii)

**Session Classification:** Spectroscopy I

Contribution ID: 40

Type: **not specified**

## J/psi Upsilon production

*Tuesday, 19 May 2015 15:00 (20 minutes)*

The talk is devoted to theoretical description of J/psi Upsilon production at LHC. This process is interesting since at LO color-singlet approximation it is forbidden, so investigation of this reaction allows one to probe alternative mechanisms, such as color-octet production, double parton scattering, etc.

**Primary author:** Dr LUCHINSKY, Alexey (IHEP, Protvino)

**Co-authors:** Prof. LIKHODED, Anatoly (IHEP, Protvino); Dr POSLAVSKY, Stanislav (IHEP, Prtovino)

**Presenter:** Dr LUCHINSKY, Alexey (IHEP, Protvino)

**Session Classification:** Parallel Session 2

Contribution ID: 41

Type: **not specified**

## A New Dynamical Picture for Production and Decay of the XYZ Mesons

*Monday, 18 May 2015 14:30 (30 minutes)*

I introduce an entirely new dynamical description for tetraquark mesons, based upon the competing effects of the strong attraction between quarks in a diquark, and the inability of the diquark to hadronize on its own due to being a color nonsinglet. This mechanism naturally explains, for example, the strong preference of the  $Z(4475)$  to decay to  $\psi(2S)$  rather than the  $J/\psi$ , the existence of a state  $Y(4630)$  that decays to  $\Lambda_c$  baryon pairs, and why some but not all exotics lie near hadronic thresholds. Owing to high-energy constituent counting rules, the four-quark nature of the states produces major changes to both the high- $s$  scaling of cross sections for producing such states and to the potency of the cusp effect of attracting resonances to pair-production thresholds.

**Primary author:** Prof. LEBED, Richard (Arizona State University)

**Presenter:** Prof. LEBED, Richard (Arizona State University)

**Session Classification:** Spectroscopy II

Contribution ID: 42

Type: **not specified**

## **Studies of associated charmonium production at ATLAS**

*Thursday, 21 May 2015 14:00 (30 minutes)*

We present new measurements of the production of a charmonium state in association with a W boson, Z boson, or another charmonium state (covering  $d\bar{d}\psi$ ,  $Z+J/\psi$ ,  $W+J/\psi$ ).

These rare production modes provide novel insight into the mechanisms of charmonium production and the impact of proton structure on these observables.

**Primary author:** ATLAS COLLABORATION, d (CERN)

**Presenter:** Dr YABSLEY, Bruce (University of Sydney)

**Session Classification:** High energy charm

Contribution ID: 43

Type: **not specified**

## D± production asymmetry at the LHC from heavy quark recombination mechanism

*Wednesday, 20 May 2015 08:50 (20 minutes)*

The asymmetry in the forward region production cross section of D± is calculated using the heavy quark recombination mechanism for pp collisions at 7 TeV. By suitable choices of four nonperturbative parameters, our calculated results can reproduce those obtained at LHCb. We find  $A_p \sim -1\%$  when integrated over  $2.0 \text{ GeV} < p_T < 18 \text{ GeV}$  and  $2.2 < \eta < 4.75$ , which agrees with  $A_p = -0.96 \pm 0.26 \pm 0.18\%$  as measured by LHCb. Furthermore, the calculated distributions in  $\eta$  and  $p_T$  agree reasonably well with those obtained at LHCb. Predictions on production asymmetry of heavy baryons are also made in the same formalism.

**Primary authors:** Prof. LEBOVICH, Adam (University of Pittsburgh); Prof. PETROV, Alexey (Wayne State University / MCTP); Mr LAI, Wai Kin (University of Pittsburgh)

**Presenter:** Mr LAI, Wai Kin (University of Pittsburgh)

**Session Classification:** Parallel Session 4

Contribution ID: 44

Type: **not specified**

## Search for B decays to final states with the eta\_c meson

Wednesday, 20 May 2015 09:50 (20 minutes)

We report a search for B decays to selected final states with the eta\_c meson:  $B \rightarrow K \eta_c \pi^+ \pi^-$ ,  $B \rightarrow K \eta_c \omega$ ,  $B \rightarrow K \eta_c \eta$  and  $B \rightarrow K \eta_c \pi^0$ . The analysis is based on 772 millions of BB pairs collected at the Upsilon (4S) resonance with the Belle detector at the KEKB asymmetric-energy e+e- collider. We set 90% confidence level upper limits on the branching fractions of the studied B decay modes, independent of intermediate resonances, in the range  $(0.6 - 5.3) \cdot 10^{-4}$ . We also search for molecular-state candidates for the  $D(0)$  combinations, neutral partners of the  $Z(3900)^+$  and  $Z(4020)^+$ , and a poorly understood state  $X(3915)$  as possible intermediate states in the decay chain, and set 90% confidence level upper limits on the product of branching fractions to X and decay branching fractions of X in the range  $(0.6 - 0.9) \cdot 10^{-5}$ .

**Primary author:** Ms VINOKUROVA, Anna (Budker Institute of Nuclear Physics)

**Presenter:** Ms VINOKUROVA, Anna (Budker Institute of Nuclear Physics)

**Session Classification:** Parallel Session 4



Contribution ID: 45

Type: **not specified**

## Conventional and exotic charmonium production at the ATLAS experiment

*Monday, 18 May 2015 16:40 (20 minutes)*

We present detailed precision measurements of the prompt and non-prompt differential production cross sections for the  $J/\psi$ ,  $\psi(2S)$ ,  $\chi_c$  and  $X(3872)$  charmonium states at  $\sqrt{s}=8$  TeV, covering  $J/\psi$  and  $\psi(2S) \rightarrow \mu\mu$ ,  $\psi(2S) \rightarrow J/\psi \pi\pi$  and  $\chi_c$ . The results are compared with leading theoretical models.

**Primary author:** KATZY, Judith (DESY)

**Presenter:** Dr YABSLEY, Bruce (University of Sydney)

**Session Classification:** Production

Contribution ID: 46

Type: **not specified**

## Rare Semileptonic Charm Decays

*Wednesday, 20 May 2015 09:30 (20 minutes)*

We present a study of  $c \rightarrow u\ell\ell$  transitions.

In the Standard Model these semileptonic charm decays are induced via Flavor Changing Neutral Currents and, thus are rare.

This opens possibilities for potential Beyond Standard Model physics searches.

We estimate phenomenological observables within the SM and effects due to BSM physics.

**Primary author:** DE BOER, Stefan (TU Dortmund)

**Presenter:** DE BOER, Stefan (TU Dortmund)

**Session Classification:** Parallel Session 3

Contribution ID: 48

Type: **not specified**

## **Experimental aspects of quarkonia production and suppression in cold and hot nuclear matter**

*Tuesday, 19 May 2015 08:30 (30 minutes)*

**Presenter:** Dr FRAWLEY, Anthony (Florida State University)

**Session Classification:** Charm in media

Contribution ID: 49

Type: **not specified**

## **Theory aspects of quarkonia production and suppression in cold and hot nuclear matter**

*Tuesday, 19 May 2015 09:00 (30 minutes)*

**Presenter:** Prof. QIU, Jianwei (Brookhaven National Laboratory)

**Session Classification:** Charm in media

Contribution ID: 50

Type: **not specified**

## **Experimental aspects of open heavy flavor production and suppression in cold and hot nuclear matter**

*Tuesday, 19 May 2015 09:30 (30 minutes)*

**Presenter:** DAINESE, Andrea (INFN - Padova, Italy)

**Session Classification:** Charm in media

Contribution ID: 51

Type: **not specified**

## **Theory aspects of open heavy flavor production and suppression in cold and hot nuclear matter**

*Tuesday, 19 May 2015 10:00 (30 minutes)*

**Presenter:** NAHRGANG, Marlene (Duke University)

**Session Classification:** Charm in media

Contribution ID: 52

Type: **not specified**

## **Theoretical aspects of quarkonia production in vacuum**

*Monday, 18 May 2015 15:30 (30 minutes)*

**Presenter:** Dr BODWIN, Geoffrey (Argonne National Laboratory)

**Session Classification:** Production

Contribution ID: 53

Type: **not specified**

**TBA**



Contribution ID: 54

Type: **not specified**

## Higgs and EW decays to charm

*Thursday, 21 May 2015 13:30 (30 minutes)*

**Presenter:** Prof. PETRIELLO, Frank (University of Wisconsin)

**Session Classification:** High energy charm

Contribution ID: 56

Type: **not specified**

## Theory summary

*Friday, 22 May 2015 15:05 (40 minutes)*

**Presenter:** Prof. SILVESTRINI, Luca (INFN, Rome)

**Session Classification:** Summary

Contribution ID: 57

Type: **not specified**

## Experimental summary

*Friday, 22 May 2015 15:45 (40 minutes)*

**Presenter:** Dr SCHWARTZ, Alan (University of Cincinnati)

**Session Classification:** Summary

Contribution ID: 58

Type: **not specified**

## Measuring the CP content of D decays to multibody self-conjugate final states

*Tuesday, 19 May 2015 17:40 (20 minutes)*

Quantum-correlated  $\psi(3770)$  to  $D\bar{D}$  decays collected by the CLEO-c experiment are used to perform first measurements of  $F_+$ , the fractional CP-even content of the self-conjugate decays  $D \rightarrow \pi^+\pi^-\pi^0$  and  $D \rightarrow K^+K^-\pi^0$ . Values of  $0.968 \pm 0.017 \pm 0.006$  and  $0.731 \pm 0.058 \pm 0.021$  are obtained for  $\pi^+\pi^-\pi^0$  and  $K^+K^-\pi^0$ , respectively. It is demonstrated how modes of this sort can be cleanly included in measurements of the unitarity triangle angle  $\gamma/\phi_3$  using  $B^+ \rightarrow DK^+$  decays. The high CP-even content of  $D \rightarrow \pi^+\pi^-\pi^0$ , in particular, makes this a promising mode for improving the precision on  $\gamma/\phi_3$ . Prospects with other modes are also discussed.

### Summary

This abstract is based on Phys. Lett. B740 (2015) 1.

**Primary author:** Prof. LIBBY, Jim (Indian Institute of Technology Madras)

**Presenter:** Prof. LIBBY, Jim (Indian Institute of Technology Madras)

**Session Classification:** Parallel Session 2

Contribution ID: 59

Type: **not specified**

## A new method for measuring CPV in charm decays and the first measurement of $F_+$ in $D \rightarrow$ $\pi^+\pi^+\pi^-\pi^-$ decays

*Tuesday, 19 May 2015 18:00 (20 minutes)*

A first measurement of  $F_+$ , the CP-even content of the decay  $D \rightarrow 4\pi$  using quantum correlated  $\psi(3770)$  to  $D\bar{D}$  decays collected by the CLEO-c experiment is presented. A high value is obtained, which makes the decay mode particularly suitable for both measurements of the CKM angle  $\gamma$  and charm CP violation in a model independent way.

This novel approach to studying indirect CP violation in charm decays is based on the time-dependent inclusive analysis of multibody self-conjugate states. These final states can be used to determine the indirect CP-violating observable  $A_\Gamma$  and the mixing observable  $y_{CP}$ , provided that  $F_+$  is known. This approach can yield significantly improved sensitivity compared with the conventional method that relies on decays to CP eigenstates. Extensions including direct CP violation are also presented.

### Summary

This abstract is based on the work in arXiv:1502.04560 and the upcoming measurement of  $F_+$  in  $D \rightarrow 4\pi$ .

**Primary author:** Dr MALDE, Sneha (University of Oxford)

**Presenter:** Dr MALDE, Sneha (University of Oxford)

**Session Classification:** Parallel Session 2

Contribution ID: **60**

Type: **not specified**

## **Search for CP violation in $D^0 \rightarrow \pi^0 \pi^0$ and $\pi^0 \pi^0$ decays at Belle**

*Wednesday, 20 May 2015 10:30 (20 minutes)*

**Primary author:** Mr NELLIKUNNUMMEL, Nisar (Tata Institute of Fundamental Research, Mumbai)

**Presenter:** NANUT, Tara (Jozef Stefan Institute)

**Session Classification:** Parallel Session 3

Contribution ID: **61**

Type: **not specified**

## **Open charm + exotics (expt)**

Contribution ID: **62**

Type: **not specified**

## **Open charm + exotics (theory)**

**Presenter:** Dr MOHLER, Daniel (Fermilab)



Contribution ID: **63**

Type: **not specified**

**TBA**

Contribution ID: **64**

Type: **not specified**

**TBA**

Contribution ID: 65

Type: **not specified**

## Open-charm and exotics states from LHC

*Monday, 18 May 2015 13:30 (30 minutes)*

**Presenter:** Prof. PALANO, Antimo (INFN and University of Bari, Italy)

**Session Classification:** Spectroscopy II

Contribution ID: **66**

Type: **not specified**

## **Open charm and exotics on the lattice**

*Monday, 18 May 2015 14:00 (30 minutes)*

**Presenter:** Dr MOHLER, Daniel (Fermilab)

**Session Classification:** Spectroscopy II

Contribution ID: **68**

Type: **not specified**

**TBA**

Contribution ID: **69**

Type: **not specified**

## **Charm mixing and CP-violation**

*Thursday, 21 May 2015 08:30 (30 minutes)*

**Presenter:** Prof. KAGAN, Alexander (University of Cincinnati)

**Session Classification:** Mixing and CP-violation I

Contribution ID: 71

Type: **not specified**

## **C, P, and CP asymmetry observables based on triple product asymmetries**

*Thursday, 21 May 2015 10:00 (30 minutes)*

**Presenter:** Dr BEVAN, Adrian (Queen Mary University of London)

**Session Classification:** Mixing and CP-violation I

Contribution ID: 72

Type: **not specified**

## **LHCb results/serches for CP-violation in charm**

*Thursday, 21 May 2015 11:00 (30 minutes)*

**Presenter:** Dr NAIK, Paras (University of Bristol)

**Session Classification:** Mixing and CP-violation I



Contribution ID: 73

Type: **not specified**

**TBA**

Contribution ID: 74

Type: **not specified**

## **Charm and bottom quark masses on the lattice**

*Friday, 22 May 2015 08:30 (30 minutes)*

**Presenter:** Dr LYTTLE, Andrew (University of Glasgow)

**Session Classification:** Quark masses, leptonic and semileptonic and rare decays

Contribution ID: 75

Type: **not specified**

## **Charm and bottom quark masses off the lattice**

*Friday, 22 May 2015 09:00 (30 minutes)*

**Presenter:** Dr MATEU, Vicent (University of Vienna)

**Session Classification:** Quark masses, leptonic and semileptonic and rare decays

Contribution ID: 76

Type: **not specified**

## **Lattice perspective on leptonic and semileptonic decays**

*Friday, 22 May 2015 09:30 (30 minutes)*

**Presenter:** Dr GAMIZ, Elvira (Fermilab)

**Session Classification:** Quark masses, leptonic and semileptonic and rare decays

Contribution ID: 77

Type: **not specified**

## Leptonic and semileptonic charm decays at Belle

*Friday, 22 May 2015 10:00 (30 minutes)*

We describe recent developments in experimental studies of D and Ds meson leptonic decays at the BaBar, Belle, BESIII and CLEO-c detectors and their implications for the determination of charm meson decay constants as well as searches for charged Higgs. Also discussed are semileptonic decays of D and Ds mesons and their relevance to hadronic form factors.

**Presenter:** Prof. EIDELMAN, Simon (BINP)

**Session Classification:** Quark masses, leptonic and semileptonic and rare decays

Contribution ID: 78

Type: **not specified**

## **Theoretical perspective on rare and radiative charm decays**

*Tuesday, 19 May 2015 11:00 (30 minutes)*

**Presenter:** Prof. FAJFER, Sijetlana (University of Ljubljana and J. Stefan Institute)

**Session Classification:** Rare and radiative decays and CP-violation

Contribution ID: 79

Type: **not specified**

## **Searches for rare and radiative charm decays**

*Tuesday, 19 May 2015 11:30 (30 minutes)*

**Presenter:** Prof. GÖBEL, Carla (PUC-Rio)

**Session Classification:** Rare and radiative decays and CP-violation

Contribution ID: **80**

Type: **not specified**

## **Future prospects at LHCb**

*Friday, 22 May 2015 14:00 (30 minutes)*

**Presenter:** Prof. PARKES, Chris (University of Manchester)

**Session Classification:** Future experimental facilities



Contribution ID: **81**

Type: **not specified**

## **Future prospects at Belle II**

*Friday, 22 May 2015 14:30 (30 minutes)*

**Presenter:** Prof. STARIC, Marko (J. Stefan Institute)

**Session Classification:** Future experimental facilities

Contribution ID: 82

Type: **not specified**

## **Future prospects for charm physics at BES III and beyond**

*Friday, 22 May 2015 12:00 (30 minutes)*

**Presenter:** Prof. ZHENG, Yangheng (University of Chinese Academy of Sciences)

**Session Classification:** Future experimental facilities I

Contribution ID: **83**

Type: **not specified**

## Novosibirsk project

*Friday, 22 May 2015 11:30 (30 minutes)*

We present the concept design of Novosibirsk tau-charm factory: physics case, detector and machine. Status of its construction is discussed. Also briefly described is a similar project currently discussed at the University of Science and Technology of China (USTC) in Hefei.

**Presenter:** Prof. EIDELMAN, Simon (BINP)

**Session Classification:** Future experimental facilities I

Contribution ID: 84

Type: **not specified**

## New Physics Models Facing Lepton Flavor Violating Higgs Decays

*Tuesday, 19 May 2015 16:40 (20 minutes)*

We speculate about the possible interpretations of the recently observed excess in the  $h$  to  $\tau\mu$  decay. We derive a robust lower bound on the Higgs boson coupling strength to a tau and a muon, even in presence of the most general new physics affecting other Higgs properties. Then we reevaluate complementary indirect constraints coming from low energy observables as well as from theoretical considerations. In particular, the tentative signal should lead to  $\tau$  to  $\mu$  gamma at rates which could be observed at Belle II. In turn we show that, barring fine-tuned cancellations, the effect can only be accommodated within models with an extended scalar sector. These general conclusions are demonstrated using a number of explicit new physics models. Finally we show how, given the  $h$  to  $\tau\mu$  signal, the current and future searches for  $\mu$  to  $e$  gamma and  $\mu$  to  $e$  nuclear conversions unambiguously constrain the allowed rates for  $h$  to  $\tau e$ .

**Primary author:** KOŠNIK, Nejc (Department of Physics, University of Ljubljana)

**Presenter:** KOŠNIK, Nejc (Department of Physics, University of Ljubljana)

**Session Classification:** Parallel Session 1

Contribution ID: **86**Type: **not specified**

## Measurements of rare charm decays at LHCb

*Wednesday, 20 May 2015 09:10 (20 minutes)*

Following the intriguing hints of deviations from the Standard Model in rare B meson decays, searches for rare and forbidden decays of charm hadrons become a hot topic again. We present recent results on penguin  $D \rightarrow \mu\mu h'$  and lepton-flavour violating  $D \rightarrow e\mu$  decays.

These results are presented on behalf of the LHCb collaboration.

**Primary author:** Ms VACCA, Claudia (Università degli Studi di Cagliari-INFN Cagliari)

**Presenter:** Ms VACCA, Claudia (Università degli Studi di Cagliari-INFN Cagliari)

**Session Classification:** Parallel Session 3

Contribution ID: 88

Type: **not specified**

## Probing the nature of $Z_c$ states via the $\eta_c$ rho decay

*Tuesday, 19 May 2015 16:40 (20 minutes)*

The nature of the so-called XYZ states is a long-standing problem. It has been suggested that such particles may be described as compact four-quark states or loosely bound meson molecules. In the present work we analyze the  $Z_c^{(\prime)} \rightarrow \eta_c \rho$  decay using both approaches. Such channel might provide useful insights on the nature of the  $Z_c^{(\prime)}$ , helping discriminating between the two different models.

### Summary

This work is based on arXiv:1409.3551 [hep-ph] plus some further developments.

We study the branching ratios for the decays of the  $Z_c(3900)$  and  $Z_c'(4020)$  into  $\eta_c \rho$  under both the assumptions of a compact 4-quark (tetraquark) and of a loosely bound meson molecule. In the tetraquark picture we adopt the both the so-called type-I and type-II pictures (see Maiani et al. hep-ph/0412098 and 1412.2049[hep-ph]) and also with and without a model for the internal dynamics recently developed by Brodsky et al. (see 1406.7281).

For the molecular picture, instead, we employ the well-known Non-Relativistic Effective Field Theory (see e.g. 1301.6461 [hep-ph]).

Including proper theoretical errors, we compute the branching ratios for the decays into  $\eta_c \rho$  and show that, in almost all cases, the predictions of the tetraquark model and of the molecular one are different with a 2 sigma C.L. Therefore, this channel might provide a valuable insight to determine the nature of these resonances.

We also show that the molecular interpretation might be in contrast with the current data on the decays of  $Z_c$  and  $Z_c'$  into  $J/\psi \pi$ .

**Primary authors:** Mr PILLONI, Alessandro (Sapienza U.); Mr GUERRIERI, Andrea (University "Tor Vergata" in Rome); Mr ESPOSITO, Angelo (Columbia University)

**Presenter:** Mr ESPOSITO, Angelo (Columbia University)

**Session Classification:** Parallel Session 2

Contribution ID: 89

Type: **not specified**

## Study of $B \rightarrow \chi_{cJ} X$ at Belle

*Wednesday, 20 May 2015 10:30 (20 minutes)*

In spite of the fact that the two-body  $B$  decays into  $\chi_{c2}$  such as  $B \rightarrow \chi_{c2} K^{(*)}$  are suppressed by the QCD factorization effect, the inclusive  $B \rightarrow \chi_{c2} X$  branching fraction amounts to one third of the non-suppressed  $B \rightarrow \chi_{c1} X$  decays because of the decay modes to the multi-body final states. Using a large statistics  $\Upsilon(4S)$  data sample corresponding to 772 million  $B$  meson pairs accumulated by the Belle detector at the KEKB  $e^+e^-$  collider, precise measurements of inclusive  $B \rightarrow \chi_{c1}$  and  $\chi_{c2}$  branching fractions are carried out. The multi-body final states such as  $\chi_{cJ} K\pi$ ,  $\chi_{cJ} K\pi\pi$  and so on are also investigated to look for new charmonium-like resonance.

**Primary author:** BHARDWAJ, Vishal (University of South Carolina)

**Presenter:** BHARDWAJ, Vishal (University of South Carolina)

**Session Classification:** Parallel Session 4

Contribution ID: 90

Type: **not specified**

## Dalitz plot analysis of B -> D D K decays

Wednesday, 20 May 2015 10:50 (20 minutes)

We present Dalitz plot analyses for the decays of B mesons to D- D0 K+ and D0-bar D0 K+. We report the observation of the  $D_{s1}^{*}(2700)^{+}$  resonance in these two channels and obtain measurements of the mass

$M(D_{s1}^{*}(2700)^{+}) = 2699^{+14}_{-}$  MeV/c<sup>2</sup> and of the width

$\Gamma(D_{s1}^{*}(2700)^{+}) = 127^{+24}_{-1}$  MeV, including statistical and

systematic uncertainties. In addition, we observe an enhancement in the

D0 K+ invariant mass around 2350–2500 MeV/c<sup>2</sup> in both decays

B0 to D- D0 K+ and B+ to D0bar D0 K+, which we are not able to interpret. The results are based

on 429 fb<sup>-1</sup> of data containing 471 × 10<sup>6</sup> BB-bar pairs collected at the Y(4S) resonance with the BaBar detector at the SLAC National Accelerator Laboratory.

**Primary author:** Prof. PUROHIT, Milind (University of South Carolina)

**Presenter:** Prof. PUROHIT, Milind (University of South Carolina)

**Session Classification:** Parallel Session 4



Contribution ID: 91

Type: **not specified**

## Search for H->gamma\*gamma and H->Jpsi/gamma decays at CMS

A search for a Higgs boson decaying into two photons, one of which has an internal conversion to a muon or an electron pair will be described. Events are required have an opposite-sign muon or electron pair and a high transverse momentum photon. Additionally, upper limits on the branching fraction of a Higgs boson decays to a Jpsi and a photon will be reported.

**Primary author:** CMS EXPERIMENT, CMS experiment (CMS experiment)

**Presenter:** CMS EXPERIMENT, CMS experiment (CMS experiment)

Contribution ID: 92

Type: **not specified**

## Search for stop decays to charm + LSP at CMS

*Tuesday, 19 May 2015 17:00 (20 minutes)*

The supersymmetric partner of the top quark, the stop, is among the best candidates for stabilizing the Higgs mass against large radiative corrections. In the scenario where the dark matter candidate is close in mass to the stop, the decay stop  $\rightarrow$  charm, LSP is an important search channel. This talk describes the application of a monojet search topology to hunt for this decay with the CMS detector at the LHC.

**Primary author:** CMS EXPERIMENT, CMS experiment (CMS experiment)

**Presenter:** Dr WU, Zhenbin (Baylor University)

**Session Classification:** Parallel Session 1

Contribution ID: 94

Type: **not specified**

## Charmonium and exotics from Belle

*Monday, 18 May 2015 10:30 (30 minutes)*

Studies of many charmonium(-like) states including exotic candidates performed at Belle experiment are presented. Besides the candidates of conventional charmonium states, more and more charged charmonium-like states are found. The charged charmonium-like states look like forming a new spectroscopy.

**Primary author:** Dr WANG, Xiaolong (Virginia Tech)

**Presenter:** Dr WANG, Xiaolong (Virginia Tech)

**Session Classification:** Spectroscopy I

Contribution ID: 96

Type: **not specified**

## **Semileptonic D-decays at BESIII**

*Wednesday, 20 May 2015 08:30 (20 minutes)*

**Presenter:** Ms AN, Fenfen (Institute of High Energy Physics)

**Session Classification:** Parallel Session 3

Contribution ID: 99

Type: **not specified**

## LHCb High Level Trigger design issues for post Long Stop 1 running

*Tuesday, 19 May 2015 17:40 (20 minutes)*

The LHCb High Level Trigger uses two stages of software running on an Event Filter Farm (EFF) to select events for offline reconstruction and analysis. In LHC runs 1 & 2 the first stage (Hlt1) processes approximately 1 MHz of events accepted by a hardware trigger. In 2012, the second stage (Hlt2) wrote 5 kHz to permanent storage for later processing. Following the LHC's Long Stop 1, the machine energy will increase from 8 TeV in the center-of-mass to 13 TeV. The cross sections for beauty and charm are expected to grow proportionately. We plan to increase the Hlt2 output to 12.5 kHz, ~10 kHz for offline processing and ~ 2.5 kHz ready for immediate analysis. By increasing the absolute computing power of the EFF, buffering data for processing between machine fills, and improving algorithms, we should be able to significantly increase the efficiency for signal while improving signal-to-background ratios. Hlt1 will use a boosted decision tree to increase efficiency at that stage. We will determine calibration and alignment constants between Hlt1 and Hlt2, allowing Hlt2 to use reconstruction very close to that used offline, including RICH and calorimetric information. Post Long Stop 2 we will read out the front-end electronics at 40 MHz and move to a full software trigger while operating at higher luminosity. The implications for increasing charm yields are emphasized.

**Primary author:** Prof. SOKOLOFF, Michael (University of Cincinnati)

**Presenter:** Prof. SOKOLOFF, Michael (University of Cincinnati)

**Session Classification:** Parallel Session 1

Contribution ID: **100**

Type: **not specified**

## **An exclusive approach on DDbar mixing**

*Wednesday, 20 May 2015 11:30 (20 minutes)*

I will show an exclusive approach on calculating the DDbar mixing parameters  $y$  and  $x$ . We will sum up the contributions from the hadronic decays, based on the factorization-assisted topological-amplitude approach in which most SU(3) breaking effects are involved.

**Primary author:** Dr YU, Fu-Sheng (Lanzhou University)

**Presenter:** Dr YU, Fu-Sheng (Lanzhou University)

**Session Classification:** Parallel Session 3

Contribution ID: 101

Type: **not specified**

## Study of B $\rightarrow$ X(3872) K pi at Belle

*Wednesday, 20 May 2015 11:10 (20 minutes)*

We report the first observation of  $B^0 \rightarrow X(3872)(K^+\pi^-)$  and evidence for  $B^+ \rightarrow X(3872)(K^0\pi^+)$ . We measure the product of branching fractions for the former to be  $\text{cal}B(B^0 \rightarrow X(3872)(K^+\pi^-)) \times \text{cal}B(X(3872) \rightarrow J/\psi\pi^+\pi^-) = (7.9 \pm 1.3(\text{stat.}) \pm 0.4(\text{syst.})) \times 10^{-6}$  and find that  $B^0 \rightarrow X(3872)K^*(892)^0$  does not dominate the  $B^0 \rightarrow X(3872)K^+\pi^-$  decay mode in contrast to other charmonium states like  $\psi'$ . We also measure  $\text{cal}B(B^+ \rightarrow X(3872)(K^0\pi^+)) \times \text{cal}B(X(3872) \rightarrow J/\psi\pi^+\pi^-) = (10.6 \pm 3.0(\text{stat.}) \pm 0.9(\text{syst.})) \times 10^{-6}$ . This study is based on the full data sample of  $711 \text{ fb}^{-1}$  ( $772 \times 10^6 B\bar{B}$  pairs) collected at the  $\Upsilon(4S)$  resonance with the Belle detector at the KEKB collider.

**Primary authors:** Ms BALA, Anu (Panjab University (Belle Collaboration)); Mr BHARDWAJ, Vishal (University of South Carolina (Belle Collaboration))

**Presenter:** Mr BHARDWAJ, Vishal (University of South Carolina (Belle Collaboration))

**Session Classification:** Parallel Session 4

Contribution ID: **102**

Type: **not specified**

## **B\_c spectroscopy at ATLAS**

*Wednesday, 20 May 2015 11:50 (20 minutes)*

We present latest results from the ATLAS experiment on B\_c spectroscopy, including branching fraction measurements of  $B_c^{+-} \rightarrow J/\psi \pi$  and  $B_c \rightarrow J/\psi D_s^*$  and observation of the B\_c(2S) state.

**Primary author:** WANG, Rui (Argonne national laboratory)

**Presenter:** WANG, Rui (Argonne national laboratory)

**Session Classification:** Parallel Session 4



Contribution ID: 103

Type: **not specified**

## Strategies for an accurate determination of the X(3872) energy from QCD lattice simulations

*Tuesday, 19 May 2015 16:00 (20 minutes)*

We develop a method to determine accurately the binding energy of the X(3872) from lattice data for the  $D\bar{D}^*$  interaction. We show that, because of the small difference between the neutral and charged components of the X(3872), it is necessary to differentiate them in the energy levels of the lattice spectrum if one wishes to have a precise determination of the the binding energy of the X(3872). The analysis of the data requires the use of coupled channels. Depending on the number of levels available and the size of the box, we determine the precision needed in the lattice energies to finally obtain a desired accuracy in the binding energy.

**Primary authors:** Dr GARZON, Eugenio Javier (IFIC, University of Valencia); Prof. OSET, Eulogio (IFIC, University of Valencia); Dr MOLINA, Raquel (The George Washington University)

**Presenter:** Dr MOLINA, Raquel (The George Washington University)

**Session Classification:** Parallel Session 2

Contribution ID: **104**

Type: **not specified**

## **Hadronic decays of charmed mesons from BES**

*Thursday, 21 May 2015 14:30 (30 minutes)*

**Presenter:** Dr MURAMATSU, Hajime (U. of Minnesota)

**Session Classification:** Mixing and CP-violation II

Contribution ID: **105**

Type: **not specified**

## **Hadronic decays of Charmed mesons from Belle**

Contribution ID: **106**

Type: **not specified**

## **Charmed baryons on the lattice**

*Thursday, 21 May 2015 15:30 (30 minutes)*

**Presenter:** Dr PADMANATH, M (Graz U.)

**Session Classification:** Charmed baryons

Contribution ID: **107**

Type: **not specified**

## **Charmed baryons from LHCb**

*Thursday, 21 May 2015 16:00 (30 minutes)*

**Presenter:** OGILVY, Stephen (University of Glasgow)

**Session Classification:** Charmed baryons

Contribution ID: **108**

Type: **not specified**

## **Lambda\_c decays**

*Thursday, 21 May 2015 16:30 (30 minutes)*

**Presenter:** Dr LYU, Xiao-Rui (UCAS)

**Session Classification:** Charmed baryons

Contribution ID: **109**Type: **not specified**

## Open heavy-flavour measurements in Pb-Pb collisions with ALICE at the LHC

*Tuesday, 19 May 2015 15:20 (20 minutes)*

The ALICE experiment at the LHC studies Pb-Pb, p-Pb, and pp collisions to investigate the properties of the high energy-density state of strongly-interacting matter, produced in Pb-Pb collisions, the so-called quark-gluon plasma (QGP).

Heavy quarks (charm and beauty) are unique probes, since they are produced in the initial hard scattering processes in the earliest phase of the collisions and interact strongly with the medium carrying trace of its properties to the final state. In particular, heavy quarks lose less energy than light quarks and gluons and exhibit a harder fragmentation.

The main results from LHC-Run 1 data related to open heavy-flavour production in Pb-Pb collisions will be discussed. Open heavy flavours are measured in ALICE via the full reconstruction of the charged decay particles of D mesons at mid-rapidity or via semi-electronic and semi-muonic decays of charm and beauty hadrons at mid-rapidity and forward rapidity, respectively. The measurements of the suppression of heavy-flavour particles with respect to pp collisions (nuclear modification factor) and of the elliptic flow bring insights into the energy loss mechanisms in the medium and the possible thermalization of charm quark.

The perspectives on open heavy-flavour measurements will be also presented.

**Primary author:** BIANCHIN, Chiara (Wayne State University)

**Presenter:** BIANCHIN, Chiara (Wayne State University)

**Session Classification:** Parallel Session 1

Contribution ID: 110

Type: **not specified**

## Resolving charm and bottom quark masses in precision Higgs boson analyses

*Tuesday, 19 May 2015 16:20 (20 minutes)*

Masses of the charm and bottom quarks are important inputs to precision calculations of Higgs boson observables, such as its partial widths and branching fractions. They constitute a major source of theory uncertainties that needs to be better understood and reduced in light of future high-precision measurements. Conventionally, Higgs boson observables are calculated in terms of  $m_c$  and  $m_b$ , whose values are obtained by averaging over many extractions from low-energy data. This approach may ultimately be unsatisfactory, since  $m_c$  and  $m_b$  as single numbers hide various sources of uncertainties involved in their extractions some of which call for more careful estimations, and also hide correlations with additional inputs such as  $\alpha_s$ . Aiming at a more detailed understanding of the uncertainties from  $m_c$  and  $m_b$  in precision Higgs boson analyses, we present a calculation of Higgs boson observables in terms of low-energy observables, which reveals concrete sources of uncertainties that challenge sub-percent-level calculations of Higgs boson partial widths.

**Primary authors:** Prof. PETROV, Alexey (Wayne State University / MCTP); Prof. WELLS, James (University of Michigan); Prof. POKORSKI, Stefan (University of Warsaw); ZHANG, Zhengkang (Michigan Center for Theoretical Physics, University of Michigan)

**Presenter:** ZHANG, Zhengkang (Michigan Center for Theoretical Physics, University of Michigan)

**Session Classification:** Parallel Session 1



Contribution ID: 111

Type: **not specified**

## Open heavy-flavour measurements in pp and p-Pb collisions with ALICE

*Tuesday, 19 May 2015 14:20 (20 minutes)*

The ALICE detector is dedicated to the study of the high energy-density QCD matter produced in heavy-ion collisions. Important probes of this matter are heavy quarks (charm and beauty), as they are produced in the early stage of the collision via initial hard scatterings. Thus measurements of their production offer important information on the early stage of the collision and the parton-medium interaction. To quantify the measurements performed in Pb-Pb collisions it is necessary that the production in pp and p-Pb collisions is studied. In pp collisions, the measurement of heavy-flavour production cross sections not only provides the reference for heavy-ion studies, but also delivers critical tests of perturbative QCD. In p-Pb collisions, initial-state effects, due to the presence of a nucleus, can be accessed. Such effects include the modification of parton densities and  $k_T$  broadening, which can result from multiple soft scatterings of partons. In addition, the existence of possible final-state effects can also be investigated.

In this contribution we present the results of open heavy-flavour production measurements in pp and p-Pb collisions with ALICE. These results will include the measurement of D-meson production as a function of charged-particle multiplicity. The D mesons are reconstructed via hadronic decay channels at mid-rapidity, and the yields are measured in specific transverse-momentum intervals for various multiplicity ranges. We compare the transverse-momentum dependent evolution of the per-event yield of D mesons in different multiplicity intervals in the two collision systems to gain an understanding of the interplay between hard and soft contributions to particle production and to possibly obtain insight into the role of multiple hard partonic interaction. In addition, we present the D-meson nuclear modification factor in different multiplicity ranges, which is defined as the ratio of the D-meson yield in p-Pb and pp collisions scaled by the number of binary nucleon-nucleon collisions. Finally, the azimuthal correlation of D mesons and charged hadrons, and electrons from heavy-flavor hadron decays and charged hadrons at mid-rapidity will be discussed as a function of transverse momentum.

**Primary author:** LAPOINTE, Sarah (INFN Torino)

**Presenter:** LAPOINTE, Sarah (INFN Torino)

**Session Classification:** Parallel Session 1

Contribution ID: 112

Type: **not specified**

## Search for di-muon decays of a low-mass Higgs boson in the radiative decay of $J/\psi$

*Tuesday, 19 May 2015 17:20 (20 minutes)*

We search for di-muon decays a light Higgs boson ( $A^0$ ) in the radiative decay of  $J/\psi$ :  $J/\psi \rightarrow \gamma A^0$ ,  $A^0 \rightarrow \mu^+ \mu^-$ . Here  $A^0$  is the hypothetical CP-odd light Higgs boson predicted by many extensions of the Standard Model (SM), including Next-to-Minimal Supersymmetric Standard Model (NMSSM). This study is based on 225 million  $J/\psi$  events collected in 2009 by the BESIII experiment at the Institute of High Energy Physics, Beijing, China. We are studying the process and we will report the preliminary results of the work in this talk.

**Primary author:** Dr PRASAD, Vindhyaasini (Post-doctoral Fellow)

**Co-authors:** Prof. LI, Haibo (Institute of High Energy Physics, Beijing, China); Prof. LOU, Xinchou (Institute of High Energy Physics, Beijing, China)

**Presenter:** Dr PRASAD, Vindhyaasini (Post-doctoral Fellow)

**Session Classification:** Parallel Session 1

Contribution ID: 113

Type: **not specified**

## $J/\psi$ longitudinal double spin asymmetry measurement at forward rapidity in $p + p$ collisions at $\sqrt{s} = 510$ GeV

*Tuesday, 19 May 2015 16:00 (20 minutes)*

The polarized gluon distribution, as described by the polarized parton distribution function  $\Delta g(x)$ , is an important part of the spin structure of the nucleon; however the current data have very limited constraints on  $\Delta g(x)$  for  $x < 0.01$ . During the 2013 RHIC run, the PHENIX experiment collected  $146 \text{ pb}^{-1}$  of longitudinally polarized  $p + p$  data at  $\sqrt{s} = 510$  GeV with an average beam polarization of 52%. At this energy,  $J/\psi$  particles are predominantly produced through gluon-gluon interactions and thus the longitudinal double spin asymmetry,  $A_{LL}^{J/\psi}$ , is sensitive to the gluon polarization inside the proton. We measure the  $J/\psi$   $A_{LL}$  in the rapidity range  $1.2 < |\eta| < 2.4$  by detecting the decay  $\mu^+\mu^-$  pairs using the PHENIX muon detector arms. In this kinematic range,  $A_{LL}$  is sensitive to the polarized gluon distribution at small  $x \sim 2 \times 10^{-3}$  as well as at moderate  $x \sim 0.05$  where recent RHIC data on jet and  $\pi^0$  production show possible evidence for significant gluon polarization. Compared to previous measurements in 2005 and 2006, the Run 2013 data set has roughly twenty times more statistics and will allow us to measure  $A_{LL}^{J/\psi}$  with a statistical uncertainty at  $\sim 1\%$  level. The preliminary result of this analysis will be presented.

**Primary author:** Mr YU, HAIWANG (Peking University)

**Presenter:** Mr YU, HAIWANG (Peking University)

**Session Classification:** Parallel Session 1

Contribution ID: 114

Type: **not specified**

## Charmonium Production in Asymmetric Nuclear Collisions by the PHENIX Experiment at RHIC

*Tuesday, 19 May 2015 15:00 (20 minutes)*

The measurement of quarkonia production in relativistic heavy ion collisions provides a powerful tool for studying the properties of the hot and dense matter created in these collisions.

To be really useful, however, such measurements must cover a wide range of quarkonia states and colliding species.

The PHENIX experiment at RHIC has successfully measured J/psi, psi-prime, chi\_c and Upsilon states in p+p, d+Au and Au+Au collisions.

In this talk I will present recent results from the PHENIX collaboration on charmonium production in Cu+Au and U+U collisions at 200 GeV/c.

**Primary author:** Dr LEBEDEV, Alexandre (Iowa State University)

**Presenter:** Dr LEBEDEV, Alexandre (Iowa State University)

**Session Classification:** Parallel Session 1

Contribution ID: 115

Type: **not specified**

## Comments on CP-violation in charm

*Tuesday, 19 May 2015 12:00 (30 minutes)*

**Presenter:** Prof. ZUPAN, Jure (University of Cincinnati)

**Session Classification:** Rare and radiative decays and CP-violation

Contribution ID: **116**

Type: **not specified**

## **CDF results on CP-violation in charm**

*Thursday, 21 May 2015 09:30 (30 minutes)*

**Presenter:** Dr LEO, Sabato (University of Illinois at Urbana Champaign)

**Session Classification:** Mixing and CP-violation I

Contribution ID: 117

Type: **not specified**

## Charm contributions in B to K\* l+l-

*Wednesday, 20 May 2015 11:30 (20 minutes)*

The rare semileptonic  $B_d \rightarrow K^* l+l^-$  decay has been extensively studied within the Standard Model and beyond. Significant efforts from Lattice QCD groups have reduced theoretical errors in the form-factors to tractable limits in the high  $q^2$  regime while arguments from LCSR can be used for the same in the low  $q^2$  regime. However, hadronic contributions coming primarily from charm loops still plague the predictions of many observables in this channel. While the intricacies of QCD prevent exact estimation of these hadronic contributions, experimental analysis will be reaching a point where these can be determined from data.

We present in this work a Bayesian analysis of the decay in the full range of  $q^2$ , in which we extract these charm loop hadronic contributions from available data. We also make well-motivated arguments about the size of the hadronic contributions and ultimately show the compatibility of the currently available experimental data with the Standard Model predictions.

**Primary author:** Mr PAUL, Ayan (INFN, Sezione di Roma)

**Presenter:** Mr PAUL, Ayan (INFN, Sezione di Roma)

**Session Classification:** Parallel Session 4

Contribution ID: 118

Type: **not specified**

## A case for SU(3) in D to P P decays

*Tuesday, 19 May 2015 17:00 (20 minutes)*

The question of the validity of analyzing charmed meson decays to pairs of hadrons within the SU(3) framework has been long and often debated. While there are convincing arguments that small breaking of this symmetry can accommodate for the current experimental results, the inability to compute QCD effects in these modes render it quite impossible to justify with complete authority the physical interpretations of the parameters extracted from experimental data. In our work we explore the SU(3) framework for its strengths and weaknesses and cross-examine it with arguments derived from a diagrammatic approach. We show that isospin non-universality of QCD should be considered within this framework. We also consider  $\eta - \eta'$  mixing in our attempt to build a complete analysis of these modes.

**Primary author:** Mr PAUL, Ayan (INFN, Sezione di Roma)

**Presenter:** Mr PAUL, Ayan (INFN, Sezione di Roma)

**Session Classification:** Parallel Session 2



Contribution ID: 120

Type: **not specified**

## Exotic meson studies at CMS

*Tuesday, 19 May 2015 18:00 (20 minutes)*

CMS has accumulated large amount of dimuon events at 7 and 8 TeV center-mass-energy. Fruitful results have been produced using these datasets. This talk will cover the observation of two structures in  $j\psi+\phi$  mass spectrum via exclusive  $B^{+-} \rightarrow j\psi \phi K^+$  decays, while the first one confirms a previous observation from CDF experiment, and the second one has been observed for the first time. A related decay channel  $B^{+-} \rightarrow \psi(2S) \phi K^+$  has been observed by CMS for the first time and will be reported.

**Primary author:** CMS EXPERIMENT, CMS experiment (CMS experiment)

**Presenter:** NACHTMAN, Jane (University of Iowa)

**Session Classification:** Parallel Session 1

Contribution ID: 121

Type: **not specified**

## Charmonia and exotics from BaBar

**Presenter:** Prof. PALANO, Antimo (INFN and University of Bari, Italy)

Contribution ID: 122

Type: **not specified**

## J/ψ azimuthal anisotropy in Au+Au collisions at 200 GeV

*Tuesday, 19 May 2015 14:40 (20 minutes)*

In relativistic heavy-ion collisions, J/ψ can be produced via different mechanisms and the large mass of the charm quark makes it a valuable probe to the thermalization of the medium. The study of J/ψ azimuthal anisotropy can allow for the disentangling of a few interesting dynamic processes, e.g., J/ψ produced from direct pQCD processes, and J/ψ produced from recombination of charm quarks within the medium. J/ψ produced from direct pQCD processes have little azimuthal anisotropy due to the lack of collectivity and initial emitting azimuthal preference, while J/ψ produced from recombination of charm quarks are expected to inherit considerable azimuthal anisotropy if charm quarks have finite elliptic flow.

In this talk, we will present J/ψ azimuthal anisotropy in Au+Au collisions at 200 GeV, from data taken by STAR during RHIC operation in year 2010 and 2011. The result will be presented as a function of centrality of Au+Au collisions and J/ψ transverse momentum.

**Primary author:** Mr FENG, Zhao (Central China Normal University)

**Presenter:** Mr FENG, Zhao (Central China Normal University)

**Session Classification:** Parallel Session 1

Contribution ID: 123

Type: **not specified**

## Studies of P-wave and S-wave quarkonium production with the CMS detector

*Monday, 18 May 2015 16:20 (20 minutes)*

Precise measurement of S-wave quarkonium cross-sections and polarizations performed at LHC helped clarifying the experimental scenario in the field of quarkonium production. From the theoretical point of view, the most promising framework to explain such phenomena has been, for almost 20 years, NRQCD. However, the interpretation of the latest results in this framework is not straight-forward, and might require the revision of some of the assumptions that were so far made. The scientific community has come to realize that a thorough understanding must encompass a broader view, and that the study of P-wave states plays a fundamental role. The CMS collaboration has provided some of the most precise P-wave charmonium and bottomonium measurements to date. In this contribution, such results will be presented and discussed. The studies of heavy quarkonium prompt-production and polarization at the LHC are becoming crucial to solve the puzzle of hadron formation. A dedicated dimuon trigger strategy combined with the energy and luminosity provided by the LHC allowed the CMS experiment to collect large samples of quarkonium states decaying in the dimuon channel. This contribution presents the most recent CMS quarkonium production results including rapidity-integrated production cross sections extended up to  $\sim 120\text{GeV}$  for  $J/\Psi$  and  $\sim 100\text{GeV}$  for  $\psi(2S)$  and  $Y(nS)$  with  $n=1,2,3$ .

**Primary author:** CMS EXPERIMENT, CMS experiment (CMS experiment)

**Presenter:** Dr YI, Kai (University of Iowa)

**Session Classification:** Production

Contribution ID: 124

Type: **not specified**

## Factorized power expansion for high $p_T$ heavy quarkonium production

*Tuesday, 19 May 2015 15:20 (20 minutes)*

From the Tevatron and the LHC data, it is clear that current models for the heavy quarkonium production are not able to explain the polarization of heavy quarkonia produced at large transverse momentum  $p_T$  in p-p collision. A new approach to evaluate the heavy quarkonium production, by expanding the cross section in powers of  $1/p_T$  before the expansion in powers of  $\alpha_s$ , was proposed recently. In terms of the QCD factorization, it is proved that both the leading-power (LP) and next-to-leading power (NLP) terms in  $1/p_T$  for the cross sections can be systematically factorized to all orders of  $\alpha_s$ . The predictive power of this new QCD factorization formalism depends on several unknown but universal fragmentation functions (FFs) at an input scale of the order of heavy quarkonium mass  $m_Q$ . Inspired by the fact that  $m_Q \gg \Lambda_{\text{QCD}}$ , we apply the NRQCD factorization formalism to further separate the perturbative and non-perturbative interactions. With our calculations, all the input polarization-summed FFs are expressed as complicated functions with a few unknown NRQCD long-distance matrix elements (LDMEs). In addition, by general symmetry arguments, we successfully generalize the polarized NRQCD four-fermion operators to  $d$  dimensions and calculate the polarized FFs with conventional dimensional regularization. In the first application, we find those non-relativistic QCD channels, which are expected to be important in the  $J/\psi$  polarization, are actually dominated by the NLP term in the  $p_T$  expansion at current collider energies. Therefore the QCD factorization is very promising to solve the long standing heavy quarkonium polarization puzzle.

**Primary authors:** Prof. STERMAN, George (C.N. Yang Institute for Theoretical Physics and Department of Physics and Astronomy, Stony Brook University); Dr ZHANG, Hong (The Ohio State University); Prof. QIU, Jianwei (Brookhaven National Laboratory); Dr MA, Yan-Qing (University of Maryland)

**Presenter:** Dr ZHANG, Hong (The Ohio State University)

**Session Classification:** Parallel Session 2

Contribution ID: 125

Type: **not specified**

## **Shadowing Effects on Open and Hidden Heavy Flavor Production at the LHC**

*Tuesday, 19 May 2015 14:00 (20 minutes)*

**Primary author:** VOGT, Ramona (LLNL and UC Davis)

**Presenter:** VOGT, Ramona (LLNL and UC Davis)

**Session Classification:** Parallel Session 1

Contribution ID: 126

Type: **not specified**

## **Welcome to Wayne State!**

*Monday, 18 May 2015 09:00 (10 minutes)*

**Presenter:** Prof. LANIER, Stephen (Vice President for Research, Wayne State University)

**Session Classification:** Welcome

Contribution ID: 127

Type: **not specified**

## Welcome to CHARM 2016

*Friday, 22 May 2015 15:00 (5 minutes)*

**Presenter:** Mr CARBONE, Angelo (INFN and University of Bologna)

**Session Classification:** Summary