BEACH2022

Report of Contributions

https://indico.fis.agh.edu.pl/e/120

Contribution ID: **9** Type: **not specified**

Measurement of $B- > D^{(*)}\tau\nu$, using semileptonic tag and leptonic τ decays with the $BABAR$ detector (cancelled)

Monday, 6 June 2022 13:30 (25 minutes)

Semileptonic decays of B mesons involving the high-mass τ lepton are sensitive probes for physics beyond the Standard Model. The relative rates of branching fractions $R(D) = \mathcal{B}(B \to D\tau\nu)/\mathcal{B}(B \to Dl\nu)$ and $R(D^*) = \mathcal{B}(B \to D^*\tau\nu)/\mathcal{B}(B \to D^*l\nu)$ $(l = e, \mu)$ are independent of the CKM element $|V_{cb}|$ and of other theoretical uncertainties. Based on the 433 fb^{-1} data collected at the $\Upsilon(4S)$ resonance by the BABAR detector at the PEP-II collider located at the SLAC National Accelerator Laboratory, we report a measurement of $R(D)$ and $R(D^*)$ using semileptonic B-tagging and leptonic τ decays.

Primary author: THE BABAR COLLABORATION, Speaker TBA

Session Classification: Heavy Flavour session

Contribution ID: 10 Type: not specified

Measurement of Beam Polarization at an e^+e^- B-Factory with New Tau Polarimetry Technique

Thursday, 9 June 2022 09:30 (25 minutes)

Belle II is considering upgrading SuperKEKB with a polarized electron beam. The introduction of beam polarization to the experiment would significantly expand the physics program of Belle II in the electroweak, dark , and lepton flavor universality sectors. For all of these future measurements a robust method of determining the average beam polarization is required to maximize the level of precision. The BABAR experiment has developed a new beam polarimetry technique, Tau Polarimetry, capable of measuring the average beam polarization to better than half a percent. Tau Polarimetry strongly motivates the addition of beam polarization to SuperKEKB and could also be used at future e^+e^- colliders such as the ILC.

Primary authors: THE BABAR COLLABORATION, Speaker TBA; Prof. MCKENNA, Janis (University of British Columbia)

Presenter: MILLER, Caleb

Session Classification: New experiment session

Contribution ID: 11 Type: not specified

Search for low-mass New Physics states at BABAR (cancelled)

Thursday, 9 June 2022 14:00 (25 minutes)

We present here the most recent BABAR results on searches for new particles with masses below the electroweak scale predicted by many extensions of the Standard Model (SM). The results are based on the full data set of about 500 fb^{-1} collected at a center-of-mass energy close to 10 GeV by the BABAR detector at the e^+e^- PEP-II collider. They include the search for a light dark-matter bound state (the darkonium, Υ_D) produced in $e^+e^- \to \gamma\Upsilon_D$, with $\Upsilon_D \to A'A'A'$ and the dark photons A' decaying to pair of leptons or pions. We present also a search for an Axion-Like Particle, a, produced in the Flavor-Changing Neutral-Current decay $B \to Ka$, with $a \to \gamma\gamma$, which is expected to be competitive with the corresponding SM electroweak processes. Finally, we show the results of a search for Heavy Neutral Leptons of masses between 100 MeV and 1.3 GeV in τ decays.

Primary authors: THE BABAR COLLABORATION, Speaker TBA; Prof. MCKENNA, Janiis (University of British Columbia)

Presenter: SHUVE, Brian

Session Classification: Supersymmetry and BSM

Contribution ID: 39 Type: not specified

CP violation in D decays to two pseudoscalars: A SM-based calculation

Wednesday, 8 June 2022 10:50 (25 minutes)

In 2019 the LHCb experiment discovered for the first time a clear signal of direct CP violation in the charm meson decays to $\pi^+\pi^-$ and K^+K^-, a result which is expected to be further refined in the upcoming decade. However, the theoretical SM determination of the strong part of those amplitudes remains incomplete up to date. In this work, we make use of dispersion relations to properly treat final-state interactions in the 2-channel case, with the strong mixing matrix being extracted from data on pion and kaon rescattering. The results of our method are then inputted into a global fit to current experimental data on branching fractions and CP asymmetries in order to extract the magnitude of penguin diagrams.

Primary author: SOLOMONIDI, Eleftheria (IFIC (CSIC-Univ. of Valencia))

Co-authors: Prof. PICH ZARDOYA, Antonio (IFIC (CSIC-Univ. of Valencia)); Dr VALE SILVA, Luiz (IFIC (CSIC-Univ. of Valencia))

Presenter: SOLOMONIDI, Eleftheria (IFIC (CSIC-Univ. of Valencia))

Session Classification: QCD theory and experiment

Contribution ID: 40 Type: not specified

Particle Physics with Neutrino Detector in Space

Tuesday, 7 June 2022 09:30 (25 minutes)

The question of what type of new physics could be done if a neutrino detector was able to operate close to the Sun was initially raised in 2015. This idea at the time was completely unexplored but innovative. Since asking this question we have determined how such a detector might be operated in space with little shielding and have explored scientific outcomes: better understanding of the solar interior which is a NASA major goal as stated in the decadal survey and unique new particle physics that could only be done in a close proximity to the sun while changes distance. Preliminary calculations show that such a spacecraft, if properly shielded, can operate in this environment and take data of neutrino interactions which can be distinguished from random background rates of other solar emissions, Galactic charged cosmic-ray and gamma-rays by using a double pulsed signature. A NASA funded study by our group which includes simulations of backgrounds and identifying the neutrino interaction signal, a demonstrator spacecraft detector concept mission and achievable science goals from a space flight missions would enable a whole new type of science investigation to explore and study our Sun, with unique particle physics in details that could not be done with the largest neutrino detectors on Earth nor other spacecrafts that are not capable of neutrino detection.

Primary author: SOLOMEY, Nickolas (Wichita State University)

Presenter: SOLOMEY, Nickolas (Wichita State University)

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 41 Type: not specified

Missing beauty of proton-proton interactions

Wednesday, 8 June 2022 09:55 (25 minutes)

Multiparton interactions in proton-proton collisions have long been a topic of great interest. A new look at them has begun to emerge from work being done to understand the dynamics of 'small systems', a topic that is taking center stage in the physics of relativistic heavy-ion interactions. Numerous studies conducted at the LHC and lower energies reveal that proton-proton collisions at high energy form a system in which final state interactions substantially impact experimentally observable quantities in the soft sector. However, until recently, no evidence was shown that final state interactions could also affect observables produced in the hard scattering processes. Studies performed by the LHC experiments present strong evidence that the final state interactions in proton-proton collisions have a drastic impact on the b-quark bound states production, whose yields may be reduced by more than a factor of two.

Primary authors: MILOV, Alexander (Weizmann Institute of Science); Dr CITRON, Zvi (The Ben Gurion University of the Negev); AIZENBERG, Iakov (Weizmann Institute of Science)

Presenter: MILOV, Alexander (Weizmann Institute of Science)

Session Classification: QCD theory and experiment

Contribution ID: 42 Type: not specified

Semileptonic and rare decays at Belle II

Monday, 6 June 2022 13:55 (25 minutes)

Decays of B mesons that proceed through electroweak and radiative penguin amplitudes attract significant attention due to a number of observed discrepancies between the standard-model predictions and the results. Belle II is expected to perform measurements on channels closely related to those exhibiting anomalies and that are uniquely available to Belle II. We present recent results on $b \to s\ell^+\ell^-$ and $b \to s\nu\nu^-$ transitions. In addition, we present recent results related to semileptonic B decay.

Primary author: LIBBY, Jim (IITM)

Presenter: DORNER, Daniel (HEPHY Vienna)

Session Classification: Heavy Flavour session

Contribution ID: 43 Type: not specified

Hadronic B decay at Belle II

Monday, 6 June 2022 15:40 (25 minutes)

he investigation of B-meson decays to charmed and charmless hadronic final states is a keystone of the Belle II physics program. It allows for theoretically reliable and experimentally precise constraints on the CKM Unitarity Triangle fit, and is sensitive to effects from non-SM physics. Results on branching ratios, direct CP-violating asymmetries, and polarization of various charmless B decays are presented, with particular emphasis on those for which Belle II will have unique sensitivity. Perspectives on the precision achievable on the CKM angles and on the so called "Kπ puzzle" are also discussed.New results from combined analyses of Belle and Belle II data to determine the CKM angle $\phi 3$ (or γ) and time-dependent CP violation measurements are also presented.

Primary author: LIBBY, Jim (IITM)

Presenter: RAIZ, Sebastiano (BELLE (BELLE II Experiment))

Session Classification: Heavy Flavour session

Contribution ID: 44 Type: not specified

Measurements of charm hadron lifetimes at Belle II

Monday, 6 June 2022 14:20 (25 minutes)

Outstanding vertexing performance and low-background environment are key enablers of a systematic Belle II program targeted at measurements of charm hadron lifetimes Recent results from measurements of D0 meson, D+ meson and Λc baryon lifetimes are presented. The results are the most precise to date.

Primary author: LIBBY, Jim (IITM)

Presenter: STARIC, Marko (J. Stefan Institute, Ljubljana, Slovenia)

Session Classification: Heavy Flavour session

Contribution ID: 45 Type: not specified

ATLAS measurements of CP violation and rare decay processes with beauty mesons

Tuesday, 7 June 2022 09:55 (25 minutes)

The ATLAS experiment has performed measurements of B-meson rare decays proceeding via suppressed electroweak flavour changing neutral currents, and of mixing and CP violation in the neutral B_s^0 meson system. This talk will focus on the latest results from the ATLAS collaboration, such as rare processes $B_s^0 \to \mu\mu$ and $B_d^0 \to \mu\mu$ and CP violation in $B_s^0 \to J/\psi\phi$decays. In the latter, the Standard Model predicts the CP violating mixing phase, ϕ_s, to be very small and its SM value is very well constrained, while in many new physics models large ϕ_s values are expected. The latest measurements of ϕ_s and several other parameters describing the $B_s^0 \to \mu\mu$ decays will be reported.

Primary author: ATLAS COLLABORATION

Presenter: BARTON, Adam

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 46 Type: not specified

ATLAS results on charmonium production

Recent results from the proton-proton collision data taken by the ATLAS experiment on charmonium production will be presented. The measurement of J/ψ and $\psi(2S)$ differential cross sections will be reported as measured on the whole Run 2 dataset. Results on associated production of prompt J/ψ and W bosons in the 8 TeV data will be shown.

Primary author: ATLAS COLLABORATION

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 47 Type: not specified

ATLAS results on B_c production and decays

Recent results on B_c production and decays from the proton-proton collision data taken by the ATLAS experiment will be presented. The measurement of the differential ratios of B_c^+ and B^+ production cross sections at 8 TeV will be shown. New results on B_c decays to $J/\psi D_s^{(*)}$ final states obtained with the Run 2 data at 13 TeV will also be reported.

Primary author: ATLAS COLLABORATION

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 48 Type: not specified

ATLAS results on exotic hadronic resonances

Thursday, 9 June 2022 14:55 (25 minutes)

Recent results from the proton-proton collision data taken by the ATLAS experiment on exotic resonances will be presented. A search for $J/\psi p$ resonances in $\lambda_b \to J/\psi p K$ decays with large pK invariant masses will be reported. Searches for exotic resonances in 4 muon final states will be shown.

Primary authors: XU, Yue; ATLAS COLLABORATION

Presenter: XU, Yue

Session Classification: New experiment session

Contribution ID: 49 Type: not specified

ATLAS measurements of correlations between Upsilon mesons and inclusive charged particles

Wednesday, 8 June 2022 09:30 (25 minutes)

This talk presents a new measurement studying the relationship between the production of hard and soft particles through the correlation of Upsilon meson states with the inclusive-charged particle yields in 13 TeV pp collisions. Measurements are made differentially for Upsilon momentum and for different Upsilon states. The analysis is performed using the full-luminosity ATLAS Run-2 13 TeV pp data. This measurement benefits from the heavy-ion style approach to remove the combinatorial and pileup backgrounds leading to increased sensitivity. A description of the technical challenges associated with a heavy-ion style analysis in high-pileup pp data will be shown, as well as the results and their physics implications.

Primary author: ATLAS COLLABORATION

Presenter: AIZENBERG, Iakov (Weizmann Institute of Science)

Session Classification: QCD theory and experiment

Contribution ID: 50 Type: not specified

Searches for Supersymmetry with the ATLAS detector

Thursday, 9 June 2022 13:35 (25 minutes)

Supersymmetry (SUSY) provides elegant solutions to several problems in the Standard Model, and searches for SUSY particles are an important component of the LHC physics program. This talk will present the latest results from SUSY searches conducted by the ATLAS experiment. The searches target multiple final states and different assumptions about the decay mode of the produced SUSY particles, including searches for both R-parity conserving models and R-parity violating models and their possible connections with the recent observation of the favour and muon g-2 anomalies. The talk will also highlight the employment of novel analysis techniques, including advanced machine learning techniques and special object reconstruction, that are necessary for many of these analyses to extend the sensitivity reach to challenging regions of the phase space.

Primary authors: ATLAS COLLABORATION; RIZATDINOVA, Flera (Oklahoma State U)

Presenter: RIZATDINOVA, Flera (Oklahoma State U)

Session Classification: Supersymmetry and BSM

Contribution ID: 51 Type: not specified

Searches for vector-like quarks with the ATLAS detector

Thursday, 9 June 2022 15:20 (25 minutes)

Vector like quarks appear in many theories beyond the Standard Model as a way to cancel the mass divergence for the Higgs boson. The talk will focus on the most recent results using 13 TeV pp collision data collected by the ATLAS detector. This presentation will address the analysis techniques, in particular the selection criteria, the background modelling and the related experimental uncertainties. The results and the complementarity of the various searches, along with the phenomenological implications, will be discussed.

Primary author: ATLAS COLLABORATION

Presenter: HALEY, Joe (Oklahoma State University)

Session Classification: New experiment session

Contribution ID: 52 Type: not specified

A new Scattering and Neutrino Detector at the LHC (SND@LHC)

Thursday, 9 June 2022 11:40 (25 minutes)

SND@LHC is a compact and stand-alone experiment to perform measurements with neutrinos produced at the LHC in a hitherto unexplored pseudo-rapidity region of 7.2 < ⊠ < 8.6, complementary to all the other experiments at the LHC. The experiment is to be located 480 m downstream of IP1 in the unused TI18 tunnel. The detector is composed of a hybrid system based on an 800 kg target mass of tungsten plates, interleaved with emulsion and electronic trackers, followed downstream by a calorimeter and a muon system. The configuration allows efficiently distinguishing between all three neutrino flavours, opening a unique opportunity to probe physics of heavy flavour production at the LHC in the region that is not accessible to ATLAS, CMS and LHCb. This region is of particular interest also for future circular colliders and for predictions of very high-energy atmospheric neutrinos. The detector concept is also well suited to searching for Feebly Interacting Particles via signatures of scattering in the detector target. The first phase aims at operating the detector throughout LHC Run 3 to collect a total of 250 fb−1. The experiment was recently installed in the TI18 tunnel at CERN and has seen its first data. A new era of collider neutrino physics is just starting.

Primary authors: IULIANO, Antonio (Università di Napoli Federico II and INFN); GRAVERINI, Elena

Presenter: IULIANO, Antonio (Università di Napoli Federico II and INFN)

Session Classification: New experiment session

Contribution ID: 53 Type: not specified

CP violation tests of hyperon-antihyperon pairs at BESIII

Monday, 6 June 2022 10:00 (25 minutes)

The hyperons are produced with a non-zero spin polarization that is straight-forward to parameterize in processes involving virtual photons or vector mesons, enable direct and precise CP violation tests.
These CP tests can be performed on e.g. J/psi -> Lambda Lambdabar, J/psi-> Sigma Sigmabar, J/psi -> Xi Xibar and psi(2S) -> Omega Omegabar. For the Xi -> Lambda pi decay the exclusive measurement of the final state particles allows for three independent CP tests and the determination of the strong and weak phase differences. Thanks to the large datasets in the tau-mass region, including the world's largest data samples at the J/psi and psi(2S) resonances collected at the BESIII experiment, the multi-dimensional analyses making use of polarization and entanglement have been performed for these processes. In the presentation an outline of the methods and recent results achieved at BESIII will be discussed.

Primary authors: LIU, Beijiang (Institute of High Energy Physics, Chinese Acedemy of Sciences); BATOZSKAYA, Varvara

Presenter: BATOZSKAYA, Varvara

Session Classification: Heavy Flavour session

Contribution ID: 54 Type: not specified

Time-like Electromagnetic Form Factors of Hyperon at BESIII

Wednesday, 8 June 2022 11:40 (25 minutes)

Hyperons provide an unique avenue to study the strong interaction in baryon structure.
Due to their limited life time, the production in e+e- annihilations is the only viable way to obtain information on the hyperon structure and internal dynamics through their electromagnetic form factors. With the unique data sets obtained by the BESIII collaboration, the pair production cross sections for Lambda, Sigma, Xi, and Lambda_c are studied from threshold, where some abnormal threshold effects are observed. Using the self-analyzing weak decays of the Lambda and Lambda_c, the relative phase between the electric and magnetic form factors is measured. In this presentation the latest results at BESIII are discussed.

Primary authors: LIU, Beijiang (Institute of High Energy Physics, Chinese Acedemy of Sciences); SCHÖNNING, Karin

Presenter: SCHÖNNING, Karin

Session Classification: QCD theory and experiment

Contribution ID: 55 Type: not specified

Charmed hadron decays at BESIII

BESIII has collected 2.93, 6.32, and 4.4 fbˆ-1 of e+e- collision data samples at 3.773, 4.178-4.226, and 4.6-4.7 GeV, respectively. In this talk, we will report the improved measurements of the strong phase differences between D0 and D0-bar into K_S/L h+h-, K-pi+pi0, and K-pi+pi+pi-, which are important inputs for precise determination of the CKM angle of gamma/phi_3. Also, we will report the precision measurements of the decay constant fDs and the CKM matrix element|Vcs|, which are important to test LQCD calculations and CKM matrix unitarity, respectively, and the tests of lepton flavor universality with the (semi-)leptonic decays of charmed mesons. In addition, the first observation of the singly Cabibbo-suppressed decay of Lambda_c+ -> npi+ and the improved measurements of other Lambda_c+ decays will also be reported.

Primary author: LIU, Beijiang (Institute of High Energy Physics, Chinese Acedemy of Sciences)

Session Classification: Heavy Flavour session

Contribution ID: 58 Type: not specified

Prospects of B_c^+ and B^+ to $\tau^+\nu_\tau$ decays at FCC-ee

Thursday, 9 June 2022 09:55 (25 minutes)

The Z-pole operation at FCC-ee presents an unprecedented opportunity for heavy flavor physics, as the production of 5×10^{12} Z bosons will result in about 8×10^{11} b-quark pairs. Among all species of B hadrons produced at FCC-ee, the purely leptonic decays of the B_c^+ and B^+ mesons are the cleanest experimental probes to measure the off-diagonal CKM elements $|V_{cb}|$ and $|V_{ub}|$, and are highly sensitive to test BSM models such as charged Higgs bosons and leptoquarks. A complete feasibility study of the B_c^+ to $\tau^+\nu_\tau$ measurement at FCC-ee is performed and its phenomenological impact on various new physics scenario is explored. Recent develops has also been made on the measurement of the B^+ to $\tau^+\nu_\tau$ decay, demonstrating the feasibility of this measurement with a precision comparable to that of B_c^+. This set of work also showcases the FCC-ee analysis workflow fully based on common software tools from EDM4hep through to final analysis.

Primary author: Dr ZUO, Xunwu (Karlsruhe Institute of Technology)

Co-authors: Dr HELSENS, Clement (Karlsruhe Institute of Technology); Dr HILL, Donal (EPFL); Dr PEREZ, Emmanuel; Dr KLUTE, Markus (Karlsruhe Institute of Technology); Dr SUMENSARI, Olcry; Dr MONTEIL, Stephane; Dr AMHIS, Yasmine

Presenter: Dr ZUO, Xunwu (Karlsruhe Institute of Technology)

Session Classification: New experiment session

Contribution ID: 59 Type: not specified

MUonE experiment at SPS

Thursday, 9 June 2022 10:50 (25 minutes)

MUonE experiment is planned to be operating at the SPS accelerator in 2022-2023 (pilot run) and 2023-27. The MUonE project provides a great potential to search for New Physics in the sector of anomalous muon magnetic moment a_μ, independently from the searches at LHC. The discrepancy between the most accurate determination of a_μ and the Standard Model predictions lies in the 4.2 standard deviations range, being a basis for a series of pioneering experiments expected to improve the precision of a_μ determination by a factor of four. Nevertheless, an analogous improvement is therefore required in the precision of theoretical prediction, dominated by uncertainty related to hadronic contribution, expected to be the main limitation of potential discovery. MUonE experiment will allow for a precise measurement of hadronic contribution to a_μ employing the measurement of shape of the differential cross section for the μe -> μe elastic process. This would help to increase the significance of observed discrepancy to the level of 7 standard deviations.

Primary author: KUCHARCZYK, Marcin (IFJ PAN)

Presenter: KUCHARCZYK, Marcin (IFJ PAN)

Session Classification: New experiment session

Contribution ID: 60 Type: not specified

Charm and beauty production and hadronization with the ALICE experiment

Wednesday, 8 June 2022 11:15 (25 minutes)

Heavy-flavor quarks (charm and beauty) are produced in early partonic processes of high-energy collisions, thus they provide a unique opportunity to probe the entire evolution of the strongly interacting system. Heavy-flavor production in proton-proton collisions serves as fundamental benchmark for QCD calculations and flavor-dependent fragmentation in the mesonic and baryonic sector. Conversely, in heavy-ion collisions it allows for the detailed mapping of transport properties, collective motion and the thermalization of the hot nuclear matter. This contribution will summarize some of the most interesting recent results from the ALICE experiment. Among those we will show the cross-section of heavy-flavor (beauty and D^0-tagged) jets, in pp collisions down to unprecedentedly low momenta, as well as the nuclear modification of b-jets in p-Pb, and D0-jets in Pb-Pb collisions at $\sqrt{s_{NN}}$=5.02 TeV. D-h correlations, addressing charm meson fragmentation at $\sqrt{s}$=13 TeV will also be shown. Comparison of the nuclear modification of non-prompt D^0 to that of prompt D^0 in Pb-Pb collisions at $\sqrt{s_{NN}}$=5.02 TeV, and the the first measurement of non-prompt D-mesons elliptic flow in Pb-Pb collisions will be presented. Heavy-flavor fragmentation into baryons challenges existing theoretical approaches. We present recent results of D^0, D^+ and D_s^+ mesons as well as new final measurements of Λ_c^+, $\Sigma_c^{0,+}$, $\Sigma_c^{0,++}$ and the first measurement of Ω_c^0 baryons, performed with the ALICE detector at midrapidity in pp collisions at $\sqrt{s}$=5.02 and $\sqrt{s}$=13 TeV. Furthermore, we also show new results on the charm fragmentation fractions at $\sqrt{s}$=13 TeV.

Primary author: VERTESI, Robert (Wigner Research Centre for Physics)

Presenter: VERTESI, Robert (Wigner Research Centre for Physics)

Session Classification: QCD theory and experiment

Contribution ID: 61 Type: not specified

CP violation and mixing in charm at LHCb

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to 1) measure direct CP violation in D mesons and charmed baryons, 2) measure D0-D0bar mixing and the first non-zero mass difference, and to 3) search for CP violation in mixing and interference. New measurements from several decay modes are presented, as well as prospects for future sensitivities.

Primary author: OBŁĄKOWSKA-MUCHA, Agnieszka (AGH-UST Krakow)

Contribution ID: 62 Type: not specified

Angular analysis of $B_d^0 \to K^* \mu\mu$ decays at ATLAS

Tuesday, 7 June 2022 14:40 (20 minutes)

The large amount of Heavy Flavour data collected by the ATLAS experiment is potentially sensitive to New Physics, which could be evident in processes that are
naturally suppressed in the Standard Model. The result of the angular distribution parameters describing the decay $B_d^0 \to K^{*0}\mu^+\mu^- \to K^+\pi^-\mu^+\mu^-$ based on full Run-1 data is presented.

Primary author: ATLAS COLLABORATION

Presenter: SYKORA, Martin (Prague CU)

Session Classification: Poster session

Contribution ID: 63 Type: not specified

Precision measurements with Kaons at CERN

Tuesday, 7 June 2022 13:35 (25 minutes)

The NA62 experiment at CERN took data in 2016–2018 with the main goal of measuring the K+ -> pi+ nu nubar decay. The high-intensity fixed-target setup and the detector performance make the NA62 experiment particularly suited to investigate the Standard Model structure and its possible extensions with
precision measurements of charged kaon decays.
Results from studies of the radiative kaon decays K+ ⟶ pi0e+vg (Ke3g) are reported, using a data sample of O(100k) Ke3g candidates with sub-percent background contaminations recorded in 2017-2018. Preliminary results with the most precise measurements of the Ke3g branching ratios and of T-asymmetry in the Ke3g decay are presented.
The flavour-changing neutral current decay K+ -> pi+ mu+ mu- is induced at the one-loop level in the Standard Model. Preliminary results from an analysis of the K+ -> pi+ mu+ mu- decay are reported, using a large sample of about 3x10ˆ12 kaon decays into two muons recorded with a downscaled di-muon trigger operating along with the main trigger. The most precise determination of the K+ -> pi+ mu+ mu- form factor parameters ⊠+ and ⊠+ has been made by NA62 using data collected in 2017 and 2018.
Preliminary results of the K± ⟶ μ ± π0π0ν (Kmu400) decay first observation and analysis based on the NA48/2 data collected in 2003-2004 are also presented

Primary author: CENCI, Patrizia (infn perugia (I))

Presenter: PARKINSON, Chris

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 64 Type: not specified

Measurement of the rare K+ to pi+ nu nubar decay

Tuesday, 7 June 2022 11:15 (25 minutes)

The decay K+⟶π+ νν¯, with a very precisely predicted branching ratio of less than 10-10, is among the best processes to reveal indirect effects of new physics.
The NA62 experiment reports the branching ratio measurement BR(K+⟶π+νν¯) = (10.6+4.0−3.4|stat ± 0.9syst) × 10−11 at 68% CL, based on the observation of 20 signal candidates with an expected background of 7.0 events from the total data sample collected at the CERN SPS during 2016-2018. This provides evidence for the very rare K+⟶π+νν¯ decay, observed with a significance of 3.4σ. The experiment achieves a single event sensitivity of (0.839±0.054) × 10−11, corresponding to 10.0 events assuming the Standard Model branching ratio of (8.4±1.0) × 10−11. This measurement is also used to set limits on BR(K+⟶π+X), where X is a scalar or pseudo-scalar particle. Details are given of the analysis of the 2018 data sample, which corresponds to about 80% of the total data sample.
Future NA62 plans and prospects are also reviewed.

Primary author: CENCI, Patrizia (infn perugia (I))

Presenter: TINTI, Gemma

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 65 Type: not specified

Latest results on rare decays at the NA62 experiment at CERN

Monday, 6 June 2022 15:15 (25 minutes)

The NA62 experiment at CERN collected world's largest dataset of charged kaon decays in 2016-2018, leading to the observation of the ultra-rare K+ –> pi+ nu nu decay based on 20 candidates. Dedicated trigger lines were employed for collection of di-lepton final states, which allowed establishing stringent upper limits on the rates lepton flavor and lepton number violating kaon decays. The dataset is also exploited to search for production of light feebly interacting particles (such as heavy neutral leptons) in kaon decays. Recent NA62 results based on the 2016-2018 dataset, and the prospects of the NA62 experiment, are presented

Primary authors: KLEIMENOVA, Alina (Comenius University, Bratislava); CENCI, Patrizia (infn perugia (I))

Presenter: KLEIMENOVA, Alina (Comenius University, Bratislava)

Session Classification: Heavy Flavour session

Contribution ID: 66 Type: not specified

The physics case for the CP-violation tests in hyperon decays at SCTF

Tuesday, 7 June 2022 13:10 (25 minutes)

A comparison of the hyperon and antihyperon decay parameters allows for tests of direct CP-symmetry violation complementary to the \epsilon'/\epsilon measurements in kaon decays. Importance of the new BESIII result on e+e- ->J/psi->Xi- bar-Xi+, where the final state interaction and weak phase difference are disentangled, is discussed. We show how future measurements at Super Charm-Tau Factories (SCTF) can profit from the longitudinal polarization of the electron beam.

Primary author: SALONE, Nora (National Centre for Nuclear Research)

Presenter: SALONE, Nora (National Centre for Nuclear Research)

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 67 Type: not specified

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Primary author: Dr RACHWAL, Bartek

Contribution ID: 73 Type: not specified

Physics prospects, experimental challenges - LHCb Upgrade 2

Thursday, 9 June 2022 11:15 (25 minutes)

The second upgrade of the LHCb detector is planned for the long shutdown
4 of the LHC. In this upgrade, part of the existing spectrometer will be replaced and new tracking detectors allowing for time measurements will be installed. This upgrade will enable the exploitation of the physics potential of the high-luminosity LHC runs. The corresponding data sets will provide heavy flavour results with unprecedented precision as well as significantly increase the sensitivity of BSM searches with displaced vertices. In this talk, the physics goals of Upgrade 2 will
be reviewed, as well as the detector design and technology options which
will allow for meeting the desired specifications.

Primary author: OBŁĄKOWSKA-MUCHA, Agnieszka (AGH-UST Krakow)

Co-author: BASHIR, Saliha (AGH University of Science and Technology)

Presenter: OBŁĄKOWSKA-MUCHA, Agnieszka (AGH-UST Krakow)

Session Classification: New experiment session

Contribution ID: 74 Type: not specified

Multiplication of simulated events using Machine Learning Technique

Tuesday, 7 June 2022 15:00 (20 minutes)

Nowadays, simulated data, are commonly used in modern high-energy physics experiments. They are used not only for determining certain performance but also in training machine learning algorithms. Generating data, especially rare heavy meson decays, requires enormous computational resources. To simplify this process, we propose a new method to replicate simulated data using existing samples. Preliminary results of the algorithm are presented.

Primary authors: KRUPA, Wojciech (AGH University of Science and Technology); Mr KAROL, Sowa (AGH UST Krakow)

Presenters: KRUPA, Wojciech (AGH University of Science and Technology); Mr KAROL, Sowa (AGH UST Krakow)

Session Classification: Poster session

Contribution ID: 76 Type: not specified

Recent results of measurement of CKM angle gamma and CPV in the beauty sector at LHCb.

Monday, 6 June 2022 11:45 (25 minutes)

The latest studies of beauty-meson decay to open-charm final states from LHCb. It includes recent studies of CKM angle gamma and CPV parameters in the beauty sector, especially the recent measurement of direct CPV in B+ decays. Measurements from several decay modes are presented.

Primary author: KRUPA, Wojciech (AGH University of Science and Technology)

Presenter: KRUPA, Wojciech (AGH University of Science and Technology)

Session Classification: Heavy Flavour session

Contribution ID: 77 Type: not specified

Physics prospects, experimental challenges - LHCb Upgrade 2

The second upgrade of the LHCb detector is planned for the long shutdown
4 of the LHC. In this upgrade, part of the existing spectrometer will be replaced and new tracking detectors allowing for time measurements will be installed. This upgrade will enable the exploitation of the physics potential of the high-luminulosity LHC runs. The corresponding data sets will provide heavy flavor results with unprecedented precision as well as significantly increase the sensitivity of BSM searches with displaced vertices. In this talk, the physics goals of Upgrade 2 will be reviewed, as well as the detector design and technology options which
will allow for meeting the desired specifications.

Primary author: OBŁĄKOWSKA-MUCHA, Agnieszka (AGH-UST Krakow)

Contribution ID: 78 Type: not specified

Charmed baryons at LHCb

Friday, 10 June 2022 09:30 (20 minutes)

The LHCb experiment collected the world's largest sample of charmed hadrons during LHC Run 1 and Run 2. With this data set, LHCb is currently providing the world's most precise measurements of properties (including searches for CP violation) and production of known charmed baryons, as well as discovering many previously unobserved states. The latest results from the LHCb Collaboration on charmed baryons are presented, with focus on searches for CPV.

Primary authors: RYŻKA, Jakub (AGH UST); VOS, Keri (LHCb Speakersbureau)

Presenter: RYŻKA, Jakub (AGH UST)

Session Classification: New experiment session

Contribution ID: 79 Type: not specified

Mixing and indirect CP violation in charm mesons at LHCb:

Monday, 6 June 2022 10:55 (25 minutes)

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to measure $D^0 - \overline{D}^0$ mixing and to search for CP violation in mixing and interference. New measurements from several decay modes are presented, as well as prospects for future sensitivities.e sensitivities.

Primary authors: SHIELDS, Edward; VOS, Keri (LHCb Speakersbureau)

Presenter: SHIELDS, Edward

Session Classification: Heavy Flavour session

Contribution ID: 80 Type: not specified

How Unitarity in CKM Matrix of quark interactions was proven correct

Thursday, 9 June 2022 09:00 (30 minutes)

In 1993 a new Hyperon Beta Decay study was introduced into the KTeV experiment and although it only collected less than a 1000 events it had a major impact, because it was the first to show that the CKM matrix obeyed Unitarity. This new ideas was introduced by a new post-doc just starting his career and the 98% analyzing power of these Hyperon decays allowed us to study beta decay form factors and Branching ratio, which showed that the CKM matrix element Vus that had historically been used for 35 years was wrong and that this correction changed Vus by 6 sigma and brought a new understanding to quark flavor physics proving it obeyed Unitarity. Today this result has been confirmed by two subsequent measurements and Unitarity in the CKM matrix is a guide for a similar matrix in neutrino oscillation and continues to have an important impact on particle physics. This historical perspective shows that small new measurements can still be added to large experiments to produce major new important results.

Primary author: SOLOMEY, Nick (Wichita State University)

Presenter: SOLOMEY, Nick (Wichita State University)

Session Classification: New experiment session

Contribution ID: 81 Type: not specified

The future of Machine Learning in data analysis

Friday, 10 June 2022 09:00 (30 minutes)

New methods for data analysis, including machine learning techniques, will be discussed during this presentation.

Primary author: Prof. SZUMLAK, Tomasz (AGH-UST Kraków)

Presenter: Prof. SZUMLAK, Tomasz (AGH-UST Kraków)

Session Classification: New experiment session

Contribution ID: 82 Type: not specified

Rare decays at LHCb, including tests of lepton flavour universality and lepton flavour violation

Monday, 6 June 2022 09:30 (30 minutes)

Flavour-Changing Neutral-Current processes, such as decays mediated by b->sll transitions, are forbidden at the lowest perturbative order in the Standard Model (SM) and hence might receive comparatively large corrections from new particles in SM extensions. This talk highlights recent measurements from LHCb on b->sll transitions, including tests of lepton flavour universality and lepton flavour violation, as well as measurements of purely leptonic transitions.

Primary author: VOS, Keri (LHCb Speakersbureau)

Presenter: CHRZASZCZ, Marcin (Polish Academy of Sciences)

Session Classification: Heavy Flavour session

Contribution ID: 83 Type: not specified

Direct CPV in charm hadrons at LHCb:

Monday, 6 June 2022 11:20 (25 minutes)

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to measure direct CP violation in D mesons. New measurements from several decay modes are presented, as well as prospects for future sensitivities

Primary authors: VOS, Keri (LHCb Speakersbureau); UKLEJA, Artur (EP/ULB Company)

Presenter: UKLEJA, Artur (EP/ULB Company)

Session Classification: Heavy Flavour session

Contribution ID: 84 Type: not specified

A modern machine learning approach to statistical estimation for particle mass modeling

Tuesday, 7 June 2022 15:20 (20 minutes)

The poster gives an overview of possible new methods in statistical estimation, an alternative to maximum likelihood methods and originating from computational intelligence. Recent advances in the machine learning field, such as Generative Adversarial Networks (GAN), are mentioned, along with their potential role in mass spectrum modeling.

Primary authors: KOPCIEWICZ, Pawel (AGH); Mr KACPRZAK, Michał

Presenters: KOPCIEWICZ, Pawel (AGH); Mr KACPRZAK, Michał

Session Classification: Poster session

Contribution ID: 85 Type: not specified

LHCb physics introductuctory talk

Monday, 6 June 2022 09:00 (30 minutes)

LHCb results

Primary author: PARKES, Chris (University of Manchester (GB) & CERN)

Presenter: PARKES, Chris (University of Manchester (GB) & CERN)

Session Classification: Heavy Flavour session

Contribution ID: 86 Type: not specified

Studies of discrete symmetries in positronium decays using the J-PET tomograph

Tuesday, 7 June 2022 09:00 (30 minutes)

The Jagiellonian Positron Emission Tomograph (J-PET) is the first PET scanner based on plastic scintillators.

It is designed to measure momentum vectors and the polarisation of photons originating from the decays of positronium.

In combination with the newly invented positronium imaging method, J-PET enables the study of discrete symmetries
in positronium without the use of magnetic fields. We will present the latest results of P, T, CP, and CPT symmetry studies (Nature Communication 12, 5658 (2021)) as well as explain the method of positronium imaging (Science Advances 7, eabh4394 (2021)).

Presenter: MOSKAL, Paweł

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 87 Type: not specified

Exploring the QCD phase diagram with heavy-ion collisions

Wednesday, 8 June 2022 09:00 (30 minutes)

QCD introductory talk

Primary author: BZDAK, Adam (AGH UST Kraków)

Presenter: Prof. BZDAK, Adam (AGH-UST Kraków)

Session Classification: QCD theory and experiment

Contribution ID: 88 Type: not specified

Production of enigmatic X(3872) in proton-proton collisions and its structure

Tuesday, 7 June 2022 11:40 (25 minutes)

Primary author: Prof. ANTONI, Szczurek (INP PAS)

Presenter: Prof. ANTONI, Szczurek (INP PAS)

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 89 Type: not specified

Light cone wave functions in the context of space like transition formfactors and prompt hadroproduction of ηc(1S, 2S)

Friday, 10 June 2022 09:50 (25 minutes)

We review results of pseudoscalar S-wave ηc(1S, 2S) quarkonia electromagnetic form factors for the ,(gamma star gamma star)->ηc) couplings
as well as their hadroproduction observables in kt-factorisation using the light-cone (LC) potential approach for the quarkonium wave function. The electromagnetic form factors are presented as functions of both photon virtualities. The light cone quarkonium wave functions are obtained in two steps. Firstly, the radial part of the wave function is obtained as a solution of the Schrödinger equation for five different cc potential models, then using Terentev prescription, they are translated to light-cone "radial" wave functions.We investigate the effects of the so-obtained form factors in the context of proton-proton collision, by taking into account the proper color factors and coupling constants for the off-shell gluon-gluon fusion to the meson. We have collated our findings with LHCb data for prompt production of at 7 TeV„ 8 TeV and 13 TeV.

Presenter: BABIARZ, Izabela

Session Classification: New experiment session

Contribution ID: 90 Type: not specified

Talk 2

Session Classification: New experiment session

Contribution ID: 91 Type: not specified

J-PET tomograph as a novel detector for discrete symmetries studies in charge leptonic system

Tuesday, 7 June 2022 10:50 (25 minutes)

The J- PET tomograph, which consists of inexpensive plastic scintillators, has also demonstrated its
potential in the study of fundamental symmetries [1,2]. It consists of 192 plastic scintillators arranged
in 3 layers optimized for the registration of multiple annihilation photons emitted in the decays of ortho-positronium atoms (o-Ps) [3], a triplet state of a purely charged leptonic system of electron (e-
)
and its antiparticle positron (e+). Due to the constraints imposed by charge conjugation, o-Ps decays
into an odd number of photons, predominantly 3. The J- PET detector can register all annihilation photons simultaneously. Thus, it enables precision testing of the discrete symmetries (C, P, T) in the
decays of o-Ps by measuring the expectation value event-by-event basis of the odd symmetry operators consisting of the momentum vector of photons and the spin of o-Ps [2,4]. Moreover, the geometric acceptance of J- PET allows the measurement of the polarization direction of the photon based on Compton scattering [5], and thus, for the first time, the study of a new set of symmetry operators involving the polarization of photons.
In this work, the key features of the J- PET tomograph as a novel detector and the experimental techniques used to perform the precision tests of the discrete symmetries will be presented and discussed

Presenter: SHARMA, SUSHIL (Jagiellonian University)

Session Classification: Symmetries, hyperon and neutrino session

Contribution ID: 92 Type: not specified

Talk 3

Session Classification: New experiment session

Contribution ID: 93 Type: not specified

SU(3) flavor symmetry breaking in $B \longrightarrow DD^{-}$ decays

Friday, 10 June 2022 10:45 (25 minutes)

The weak interaction of $B \longrightarrow DD^{-}$ decays can be studied in the frame work of heavy flavor Effective Field Theory(EFT). An
alternative approach would be to assume flavor SU(3) symmetry between u,d and s quarks to study such ($b \longrightarrow cc^{-}q^{-}$) decays.
However, due to the mass difference (ms mu, md), in nature one has this flavor symmetry being broken. We calculated the
decay observables for $B \longrightarrow DD^{-}$ considering both exact and broken SU(3) symmetry. We performed numerical fitting of the
observables with the available data (LHCb, Belle, BaBar). We have found that the broken SU(3) picture explain the data
with more accuracy than the unbroken one. The similar SU(3) breaking effect in such decay channel is studied in terms of
topological amplitudes. Also, the sum rules between the decay modes are constructed and checked at the decay-width level
for before and after symmetry breaking.

Presenter: SAMANTA, Rupam (AGH University of Science and Technology)

Session Classification: New experiment session

Contribution ID: 94 Type: not specified

Influence of Pythia parameters on event multiplicity

Friday, 10 June 2022 11:10 (25 minutes)

Pythia 8.3 is an evolving physics event generator tool used in particle physics experiments for the modelling of hadronic events. The events are controlled by various parameters which could be tuned to match the real data. This talk investigates how various parameters in Pythia simulation influence the hadron multiplicities in proton-proton collisions at 14 TeV centre-of-mass-energy.

Presenter: BASHIR, Saliha (AGH University of Science and Technology)

Session Classification: New experiment session

Contribution ID: 95 Type: not specified

J/\psi photoproduction in semi-peripheral heavy-ion collisions

Thursday, 9 June 2022 13:10 (25 minutes)

Primary author: KŁUSEK-GAWENDA, Mariola (INP PAS)

Presenter: KŁUSEK-GAWENDA, Mariola (INP PAS)

Session Classification: Supersymmetry and BSM