<table>
<thead>
<tr>
<th>Time</th>
<th>ID</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30</td>
<td>301</td>
<td>Search for a Higgs-like Boson decaying into bottom quarks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Philipp Eller, ETH Zürich, Schaffmattstrasse 20, CH-8093 Zürich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After the discovery of a Higgs-like Boson with a mass close to 125 GeV at the LHC in summer 2012, we are updating the analysis in the VH channel to the full 7+8 TeV dataset. In this channel the Higgs-like Boson is produced in association with a vector boson and decaying into b-quarks. This talk will show the complete results including Z to leptons, Z to invisible decays and the W-boson mode. The general analysis strategy will be outlined and the main points will focus on the jet energy regression we apply and our signal to background discrimination using MVA techniques as well as certainly our most recent results on the full 5 + 19 fb⁻¹ dataset.</td>
</tr>
<tr>
<td>13:45</td>
<td>302</td>
<td>Search for long lived charged and massive particles at LHCb detector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thi Viet Nga La, LPHE, EPFL, BSP - Cubotron, CH-1015 Lausanne</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We present the method used and results obtained in a search for long-lived charged and massive particle, the stau, produced in pp collisions at sqrt(s) = 7 and 8 TeV with the LHCb spectrometer. The data corresponding to an integrated luminosity of 1 fb⁻¹ at sqrt(s) = 7 TeV and of 2 fb⁻¹ at sqrt(s) = 8 TeV was analysed. We used a Neural Network to distinguish staus from muons by their signals in various detectors. No excess of the signal is observed. The upper limits on the cross section for stau pair production are computed.</td>
</tr>
<tr>
<td>14:00</td>
<td>303</td>
<td>Cancelled</td>
</tr>
<tr>
<td>14:15</td>
<td>304</td>
<td>Search for Higgs boson production in supersymmetric cascades using fully hadronic final states</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mario Masciovecchio, Institute for Particle Physics, ETH Zürich, Schafmattstr. 20, CH-8093 Zürich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We present a search for light Higgs boson (h0) production in supersymmetric cascades using data collected by the CMS experiment at the LHC, corresponding to an integrated luminosity of ~20/fb of 8 TeV pp collisions. Fully hadronic states are selected, where the Higgs boson decays into b-bbart. We use hemisphere division algorithms and the stransverse mass variable.</td>
</tr>
<tr>
<td>14:30</td>
<td>305</td>
<td>Search for supersymmetry in hadronic final states with MT2 at CMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hannsjörg Weber, Institut für Teilchenphysik, ETH Zürich, Schafmattstr. 20, HPK, CH-8093 Zürich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We present the results of a search for supersymmetry (SUSY) using data collected by the CMS experiment during the 8 TeV pp running at the LHC. Fully hadronic final states are selected based on the stransverse mass variable MT2 and analyzed separately for different jet and b-jet multiplicities. The results are interpreted in various supersymmetric scenarios.</td>
</tr>
<tr>
<td>14:45</td>
<td>306</td>
<td>Cancelled</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
<td>Title</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>15:00</td>
<td>307</td>
<td>Application of CMS and ATLAS Simplified Models Results to Theories Beyond the Standard Model (BSM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Both CMS and ATLAS have pursued large programs searching for physics beyond the standard model. In the context of searches for signatures predicted by supersymmetric models it has become standard practice for the experimental collaborations to interpret their results in the context of simplified models spectra (SMS). In this talk, a generic procedure is presented that can decompose BSM theories into their simplified models components. Based on this decomposition procedure a framework has been developed that allows a fully automated comparison between a fundamental theory with the plethora of LHC simplified models results published to date. An application to one specific BSM model will be shown.</td>
</tr>
<tr>
<td>15:15</td>
<td>308</td>
<td>Measurement of quarkonium polarization at CMS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Studies of the production of quarkonium states are very important to improve our understanding of QCD and hadron formation, given that the heavy quark masses allow the application of theoretical tools less sensitive to nonperturbative effects. This talk presents recent CMS measurements of the polarizations of the Psi and Upsilon states produced in proton-proton collisions at sqrt(s)=7 TeV, in a dimuon sample collected in 2011. The results are measured in bins of dimuon transverse momentum and rapidity, significantly extending the pT and rapidity ranges probed by previous experiments. At high transverse momenta the observations for the Y(3S) and Ψ(2S) are in disagreement with theoretical predictions.</td>
</tr>
<tr>
<td>15:30</td>
<td></td>
<td>Coffee Break</td>
</tr>
<tr>
<td>16:00</td>
<td>311</td>
<td>Neutron Capture Measurements on $^{62}$Ni, $^{63}$Ni and $^{197}$Au and their Relevance for Stellar Nucleosynthesis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The slow neutron capture process (s-process) in stars produces about half of the overall elemental abundances between Fe and Bi. The key nuclear physics input for studying the s-process are neutron capture cross sections at stellar neutron energies. I will present recent measurements of stellar neutron capture cross sections on $^{62}$Ni, $^{63}$Ni and $^{197}$Au performed at the nTOF facility at CERN via the time-of-flight technique and discuss the implications on stellar nucleosynthesis. Furthermore, I will present experiments related to the complementary activation technique to measure stellar cross sections.</td>
</tr>
<tr>
<td>16:30</td>
<td>312</td>
<td>Latest Results of Searches for Point and Extended Sources with Time Independent and Time Dependent emissions of Neutrinos with the IceCube Neutrino Observatory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combining multiple years of data collected by the IceCube detector, we have performed a variety of searches for neutrino emission from astrophysical sources. The analyses use data collected between April 2008 and May 2011 by the partially-completed IceCube detector, as well as the first year of data from the completed 86-string detector. An unbinned maximum likelihood method is used to distinguish astrophysical signals from atmospheric backgrounds, utilizing spatial, energy and time information. We performed a generic search anywhere in the sky for individual point and spatially extended sources, as well as searches for catalogues of individual sources and stacked ensembles of similar sources. Another set of searches utilizing the neutrino arrival time information to enhance the discovery potential for sources with non-steady emission have been carried out. An untriggered scan was done over separate years of IceCube data seeking to identify any high-energy neutrino events.</td>
</tr>
</tbody>
</table>
events significantly clustered both in space and time. Then a search targeting a selection of flaring gamma ray sources observed by the Fermi experiment and other TeV telescopes for neutrino events coinciding with the gamma-ray light curves was carried out. Finally a search for periodic emissions from a selected catalog of microquasars and binary systems with known periodicities from X-Ray, Gamma Ray and Radio observations was performed. These analyses are sensitive to TeV–PeV energy neutrinos in the northern sky and PeV–EeV neutrinos in the southern sky. Limits on extraterrestrial neutrino fluxes are compared to model predictions. The expected performance with multiple years of data from the full IceCube detector is discussed.

17:00 313  High resolution 3D-simulations of galactic cosmic ray propagation using GALPROP

Michael Werner 1, Olaf Reimer 1, Ralf Kissmann 1, Andrew W. Strong 2
1 Inst. für Astro- und Teilchenphysik, Universität Innsbruck, Technikerstraße 25/8, AT-6020 Innsbruck
2 Max-Planck-Institut für extraterrestrische Physik, Postfach 1312, DE-85741 Garching
Modelling the propagation of cosmic rays in our Galaxy is still far from explaining key observational results from cosmic rays and their secondaries. Utilizing the GALPROP framework, we investigate, for the first time, galactic propagation scenarios using high resolution sub-kpc scale 3-dimensional simulations. To validate this approach we compare 2D and 3D simulations. Using high performance computing techniques we investigate non-axisymmetrical source distributions by adopting a spiral arm pattern and quantify the effects on the galactic cosmic ray distribution and the cosmic ray spectrum observed from Earth. We find that changes from 2D to 3D spirals alter the expected cosmic ray flux and spectrum significantly.

17:15 314  The cosmological constant puzzle: Vacuum energies from QCD to dark energy

Steven Bass, Theoretical Physics, University of Innsbruck, Technikerstrasse 25, AT-6020 Innsbruck

The accelerating expansion of the Universe points to a small positive vacuum energy density and negative vacuum pressure. A strong candidate is the cosmological constant in Einstein’s equations of General Relativity. The vacuum dark energy density extracted from astrophysics is $10^{56}$ times smaller than the value expected from the Higgs potential in Standard Model particle physics and $10^{44}$ times smaller than the contribution expected from QCD condensates. The dark energy scale is however close to the range of possible values expected for the light neutrino mass. We discuss the cosmological constant puzzle and (new) ideas how to solve it.

17:30 315  Numerical 3D-hydrodynamic modelling of colliding winds in massive star binaries: particle acceleration and gamma-ray emission

Klaus Reitberger, Olaf Reimer, Ralf Kissmann, Anita Reimer
Institut für Astro- und Teilchenphysik, Universität Innsbruck, Technikerstraße 25, AT-6020 Innsbruck

Massive stars in binary systems (as WR140, WR147 or Eta Carinae) have long been regarded as potential sources of high-energy gamma-rays. The emission is thought to arise in the region where the stellar winds collide; thereby producing accelerated particles which subsequently emit gamma-rays. This scenario is supported by recent observations of Eta Carinae with the Fermi Large Area Telescope. To address the underlying emission mechanisms in a quantitative way, we present a 3D-hydrodynamical model with the aim of describing the spatial and temporal structure of the stellar winds, the distribution of accelerated particles and different components of gamma-ray emission.

17:45 316  High precision tests of the Pauli Exclusion Principle for Electrons at LNGS

Johann Marton, Stefan Meyer Institute, Boltzmanngasse 3, AT-1090 Vienna
on behalf of the VIP2 Collaboration

The Pauli Exclusion Principle (PEP) is one of the fundamental rules of nature. The experiment VIP at the Gran Sasso underground laboratory (LNGS) is searching for possible small violations of PEP for electrons leading to forbidden X-ray transitions in copper atoms. VIP is aiming at a test of the Pauli Exclusion Principle for electrons with high accuracy, down to the level of $10^{-29}$, thus greatly improving the previous limit. The experimental method, results obtained so far and new developments of a follow-up experiment VIP2 at Gran Sasso to further increase the precision by 2 orders of magnitude will be presented.
Search of neutrinoless double beta decay with the GERDA experiment

Giovanni Benato, University of Zürich, Winterthurerstrasse 190, CH-8057 Zürich, on behalf of the GERDA Collaboration

The GERDA experiment, searching for the neutrinoless double beta decay in $^{76}$Ge, has reached its phase I aimed exposure of 20 years. The discovery of this very rare nuclear decay process would imply the existence of new physics beyond the Standard Model through total lepton number violation. 15.5 kg of $^{76}$Ge enriched Germanium diodes are used both as source and detector. They are immersed in a liquid argon cryostat, which is surrounded by a water Cherenkov shield for further background suppression. The main result of the phase I data taking period is presented, with emphasis on the background model and on the statistical method used for the analysis.

qBounce: A quantized frequency reference with gravity-resonance-spectroscopy

Gunther Cronenberg ¹, Thomas Bittner ¹, Hanno Filter ¹, Peter Geltenbort ², Tobias Jenke ¹, Martin Thalhammer ¹, Hartmut Abele ¹

¹ Atominstitut, Technische Universität Wien, Stadionallee 2, AT-1020 Vienna
² Institut Laue-Langevin, 6, rue Jules Horowitz, FR-38042 Grenoble

We present transitions between quantum states of gravitationally bound neutrons using a Rabi resonance spectroscopy method. In our previous experiment ultra-cold neutrons were trapped in the gravitational field. Quantum interferences between different states have been observed by inducing transitions by mechanical vibration. The latest improvement, omitting the upper confining mirror, allows the shift from a frequency reference to a frequency standard, where the transition frequency depends solely on the neutrons mass, Plancks constant and Earth's gravity. This tests Newton's Inverse Square Law of Gravity at the micrometer regime which are sensitive to hypothetical Fifth Forces and potential large extra dimensions of submillimetre size of space-time.

Postersession and Apéro

Public Lecture

Thursday, 05.09.2013, HS 6

Spectroscopy apparatus for the measurement of the hyperfine structure of antihydrogen

Chloe Malbrunot, SMI, Boltzmanngasse 3, AT-1090 Wien

The ASACUSA CUSP collaboration at the Antiproton Decelerator of CERN is planning to measure the ground-state hyperfine splitting of antihydrogen using an atomic spectroscopy beamline. Antihydrogen is the simplest atom consisting entirely of antimatter. Since its matter counterpart is one of the most precisely measured atoms in physics, a comparison of antihydrogen and hydrogen could provide one of the most sensitive tests of CPT symmetry. The setup consists of a source of partially polarized antihydrogen atoms [1,2] emitted toward a radiofrequency spin-flip cavity with its resonance frequency tuned to the hyperfine transition. A superconducting sextupole magnet serves as spin analyser before the detection of the atoms in an antihydrogen detector [3]. Monte Carlo simulations show that the antihydrogen ground-state hyperfine splitting can be determined in such a beam setup at a relative precision of 0.1ppm which would already provide one of the best test of CPT. My talk will present the latest developments on the spectroscopy apparatus downstream of the antihydrogen polarizing source, the coming years program to achieve the above mentioned precision as well as a short overview of the atomic hydrogen beamline developed to test the performance of the spectroscopy apparatus during the CERN accelerator shutdown LS1.

## 14:00 322

**A progress report on detector and analysis development for the Hbar-HFS experiment within the ASACUSA collaboration**

Clemens Sauerzopf, Peter Caradonna, Martin Diermaier, Nazli Dilaver, Bernadette Kolbinger, Chloé Malbrunot *, Oswald Massiczek, Michael Wolf, Barbara Wünschek, Johann Zmeskal, Eberhard Widmann

Stefan-Meyer-Institut für subatomare Physik, ÖAW, Boltzmanngasse 3, AT-1090 Wien

* and CERN, CH-1211 Genève

Charge, Parity and Time (CPT) symmetry is the most fundamental theoretical concepts in particle physics. The ASACUSA-Hbar collaboration aims to test this property by measuring the hyperfine structure in ground state antihydrogen. Due to the big challenge in producing an antihydrogen beam the main background for this measurement are cosmics. To discriminate against cosmic rays we need a sophisticated analysis system together with a tracking detector for pions. In this talk I will report the progress in detector and analysis development during the long CERN shutdown and give an outlook on the planned activities until the beamtime 2014 starts.

## 14:15 323

**Beamline Simulations for cold Antihydrogens**

Bernadette Kolbinger 1, Peter Caradonna 1, Martin Diermaier 1, Nazli Dilaver 1, Chloé Malbrunot 1,2, Oswald Massiczek 1, Yugo Nagata 3, Balint Radics 3, Clemens Sauerzopf 1, Minori Tajima 4, Simon Van Gorp 3, Michael Wolf 1, Barbara Wünschek 1, Johann Zmeskal 1, Eberhard Widmann 1

1 Stefan-Meyer-Institut für subatomare Physik, ÖAW, Boltzmanngasse 3, AT-1090 Vienna

2 CERN, CH-1211 Genève

3 RIKEN Advanced Science Institute, 2-1 Hirosawa, Wako, Jp-3510199 Saitama

4 Graduate School of Arts and Sciences, University of Tokyo, Komaba, Meguro, JP-1538902 Tokyo

The aim of the ASACUSA collaboration at the Antiproton Decelerator of CERN is to measure the ground-state hyperfine structure of antihydrogen using a Rabi-like experimental setup. The CPT symmetry will be tested by this experiment. In order to predict the results and properties of this measurement, simulations of the setup are being done using the particle physics toolkit Geant4 which we modified to support neutral particle tracking through magnetic fields with atomic transitions in a microwave cavity. In this talk, structure, results and problems of our simulation program will be discussed.

## 14:30 324

**Gravitational interaction of antihydrogen: the AEgIS experiment at CERN**

Michael Doser, CERN EP, CH-1211 Genf

The AEgIS experiment aims to directly measure the gravitational acceleration g on a pulsed beam of cold antihydrogen atoms. Rydberg antihydrogen atoms produced by mixing of antiprotons with positronium atoms laser-excited into a Rydberg state (Ps*) will be accelerated horizontally. The minute vertical deflection and the flight time will be measured using a moiré deflectometer similarly to what has been done with Ar atoms. The experimental apparatus has been completed and commissioned in 2012 with antiprotons and positrons. A description of the experimental setup, of results of the 2012 data taking and of the on-going studies as well as future perspectives will be presented.

## 14:45 325

**Design of the downstream interface in the AEgIS beamline**

Sebastian Lehner, Stefan Meyer Institut, Boltzmanngasse 3, AT-1090 Wien

The AEgIS collaboration at CERN’s antiproton decelerator aims at investigating the gravitational free fall and hyperfine splitting of antihydrogen. This puts the weak equivalence principle and CPT symmetry to the test. Both measurements use an antihydrogen beam from the same source. The beamline contains an interface after the source in order to allow exchanging the following parts where the measurements take place without warming up the nearby superconducting magnets. This drastically shortens the procedure of switching between gravity and hyperfine splitting measurements. This talk reports on the design of this interface and the overall status of AEgIS.
Ultracold neutrons (UCN) are so slow that they can be confined in special material or magnetic bottles where they can be observed until they undergo beta decay with a lifetime of ~880 s. Therefore UCN are ideally suited to conduct studies on the fundamental properties of the neutrons, e.g. the search for a permanent neutron electric dipole moment. The new UCN source at the Paul Scherrer Institute (PSI) started its operation in mid 2011 with the goal to provide the highest intensity of UCN to experiments. The performance in the first two operating seasons and the present status of the facility is discussed.

SNF support via #200020_137664 is acknowledged.

Comparison of the Larmor precession frequencies of $^{199}$Hg and ultracold neutrons in the nEDM experiment at PSI

Beatrice Franke, Paul Scherrer Institut, WMSA B12, CH-5232 Villigen, on behalf of the nEDM collaboration at PSI

The neutron electric dipole moment (nEDM) experiment at the Paul Scherrer Institut (PSI) measures the Larmor precession frequencies of ultracold neutrons (UCN) in parallel and antiparallel magnetic and electric fields. Nuclear spin polarized $^{199}$Hg atoms are utilized as cohabiting magnetometer and monitor changes of the magnetic field within the same volume as the UCN. Due to the different velocities of the two species and the effect of gravity, the magnetic field of the precession volume is sampled differently by UCN (~4 m/s) and $^{199}$Hg (~170 m/s), respectively. Thus, in presence of vertical magnetic field gradients, the two species will systematically measure different fields. I will present measurements of the ratio of the two precession frequencies as function of vertical gradients performed with the nEDM apparatus in 2012. This quantity is an important tool to investigate systematic effects and also physical properties of the involved species.

Vector Cesium Magnetometer for the nEDM Experiment

Samer Afach, Georg Bison, Paul Scherrer Institut, CH-5232 Villigen

We use optical pumping combined with magnetic resonance in a Cesium vapor cell in order to measure the magnetic field. A Vector Cs Magnetometer uses multiple laser beams to follow the dynamics of the spin in 3D. The 3D signal is used to extract the Larmor frequency of the spins, and to extract the direction of the magnetic field through the path of the spins. The magnetometer was successfully tested in a proof of principle experiment. Its measured performance is ~50 pT/Hz$^{1/2}$ for the directions perpendicular to the magnetic field, and ~500 fT/Hz$^{1/2}$ for the direction parallel to the magnetic field.

The future neutron beta decay facility PERC

Jacqueline Erhart, Atominstitut, TU Wien, Stadionallee 2, AT-1020 Wien, for the PERC collaboration

High precision experiments in neutron beta decay can solve open questions in particle physics and cosmology. Main emphasis lies on the search for evidence of possible extensions of the Standard Model. The new user facility 'Proton and Electron Radiation Channel' is designed to provide an intense beam of charged neutron decay products, under well-defined and precisely variable conditions. That way, we can measure energy spectra and angular correlations of the decay products with unprecedented precision. The Vienna group focuses on the instrument design, and energy and momentum spectroscopy of the decay products. The current status of PERC will be presented.
**Tailoring of polarised neutron beams**
*by means of spatial magnetic spin resonance*

*Erwin Jericha, Christoph Gösselsberger, Michael Bacak, Stefan Baumgartner, Bernhard Berger, Dominic Blöch, Roman Gergen, Andreas Hawlik, Bernhard Hinterleitner, Robert Raab, Matthias Schmidtmyar, Maximilian Zach, Gerald Badurek*

TU Wien, Atominstitut, Stadionallee 2, AT-1020 Wien

We present a novel type of neutron spin resonator for precise wavelength selection and definition of the time structure of neutron beam. Thereby the temporal structure is completely decoupled from the wavelength resolution and allows for almost arbitrarily shaped neutron pulses by purely electronic means. We designed prototypes consisting of individually ultra-fast switchable stages for the generation of neutron pulses in the microsecond regime. These resonators have been installed at a polarised neutron beamline at the 250 kW TRIGA reactor of the Vienna University of Technology and at the VCN beam line at the ILL, Grenoble. Here, we present the related measurements.

**Flavour GUT models with $\theta_{13}^{\text{PMNS}} = \theta_3 / \sqrt{2}$**

*Constantin Sliuka, Stefan Antusch, Christian Gross, Vinzenz Maurer,*

*Department Physik, Universität Basel, Klingelbergstrasse 82, CH-4056 Basel*

We discuss supersymmetric SU(5) GUT models with an A4 flavour symmetry -- including a full flavon- and messenger sector -- which, in the spirit of our recent paper "Nucl.Phys. B866 (2013) 255-269", realize the relation $\theta_{13}^{\text{PMNS}} = \theta_3 / \sqrt{2}$. In addition to predictions for the neutrino sector, the models feature quark CP violation with a right-angled unitarity triangle and light quark masses which result from a specific set of Clebsch factors from GUT symmetry breaking. We present detailed Monte Carlo Markov Chain fits and highlight the model predictions.

**Angular analysis of $B_d \rightarrow K^*\mu^+\mu^-$ with the ATLAS detector**

*Emmerich Kneringer, Patrick Jussel, Anna Usanova*

Institute for Astro and Particle Physics, University of Innsbruck, Technikerstr. 25, AT-6020 Innsbruck

Besides the rare decay $B_d \rightarrow \mu^+\mu^-$ also the semi-rare decay $B_d \rightarrow K^*(K,\pi)\mu^+\mu^-$ has some potential to show deviations from the Standard Model. Therefore we analysed this four charged particle final state using data that has been recorded by the ATLAS experiment at the LHC. Results will be presented and compared with similar analyses done by other LHC experiments as well as with the expectations from the Standard Model.

**Measurement of $B$ ($B^+_s \rightarrow \not J/\psi \phi$), $B$ ($B^+_s \rightarrow \not J/\psi f_2(1525)$) and $B$ ($B^+ \rightarrow \not J/\psi K^+ K^-$) and a determination of the $B^+_s \rightarrow \not J/\psi \phi$ polarization at the Belle experiment**

*Felicitas Thorne, Christoph Schwanda*

Inst. of High Energy Physics, Austrian Academy of Science, Nikolsdorfergasse 18, AT-1050 Vienna

We study the decays $B^+_s \rightarrow J/\psi \phi$, $B^+_s \rightarrow J/\psi f_2(1525)$ and $B^+_s \rightarrow J/\psi K^+ K^-$ using a 121.4 fb$^{-1}$ data sample collected at the $Y(5S)$ resonance with the Belle detector at the KEKB asymmetric-energy e$^+$e$^-$ collider. The decay $B^+_s \rightarrow J/\psi \phi$ is an important mode for measuring the CP violating phase $\beta_s$ in the $B_s \bar{B}_s$ mixing, which is is expected to be sensitive to physics beyond the Standard Model. In this context, a more detailed understanding of contributions to the decay $B^+_s \rightarrow J/\psi K^+ K^-$ is of particular interest. Besides the measurement of the absolute branching ratios of the above mentioned decays, we also calculate the S-wave contribution within the $\phi$ mass region by separating the final states $B^+_s \rightarrow J/\psi \phi$ and $B^+_s \rightarrow J/\psi K^+ K^-$ and determine the polarization of the decay $B^+_s \rightarrow J/\psi \phi$.

**Measurement of $|V_{cb}|$ through exclusive semileptonic $B \rightarrow D l\nu$ decays with a tagged fully reconstructed $B$ meson at the Belle experiment**

*Robin Glattauer, Christoph Schwanda*

Institute of High Energy Physics, Nikolausdorfer Gasse 18, AT-1050 Vienna

The weak transition of quarks into each other is determined by the CKM matrix. In order to measure the entry $V_{cb}$, which governs decays of bottom quarks to charm quarks, we study the decay $B \rightarrow D l\nu$ ($l = e, \mu$) at the $Y(4S)$ resonance at the Belle experiment. $Y(4S)$, being only slightly above two masses of B, grants high numbers of events with B meson pairs. To highly reduce the background of our study we reconstruct not only the signal, but the second B as well. Through a fit of the decay rate for different kinematic regions we determine $|V_{cb}|$.  

81
Monte Carlo simulation for Kaonic deuterium studies

Carolina Berucci, Michael Cargnelli, Tomoichi Ishiwatari, Johann Marton, Eberhard Widmann,
Johann Zmeskal
Stefan-Meyer-Institut für subatomare Physik, ÖAW, Boltzmanngasse 3, AT-1090 Vienna

The SIDDHARTA experiment at the DAFNE collider measured the shift and width of the ground level in kaonic hydrogen caused by the strong interaction between the kaons and protons. The measurement of the X-ray transitions to the 1s level in kaonic deuterium will allow, together with the available results from kaonic hydrogen, to extract the isospin-dependent antikaon-nucleon scattering lengths. I will present the Monte Carlo simulation of the SIDDHARTA-2 setup, in the framework of GEANT4. The program is used to optimize the critical parameters of the setup in order to perform the kaonic deuterium measurement.

Measurement of Charged Particle Multiplicities with the ATLAS detector at the LHC

Wolfgang Lukas, Universität Innsbruck, Institut für Astro- und Teilchenphysik, Technikerstraße 25/8, AT-6020 Innsbruck

Measurements of charged-particle distributions provide essential insights into the understanding of soft QCD phenomena at LHC experiments. The results of charged-particle multiplicity measurements at the center-of-mass energy $\sqrt{s} = 8$ TeV, depending on transverse momentum and pseudorapidity, are presented for the ATLAS experiment. These results are compared to Monte Carlo models, particularly the Pythia8 tune, and combined with previous measurements from 900 GeV to 7 TeV, in order to improve the extrapolation the central charged-particle multiplicity per event and unit of pseudorapidity for tracks with $p_T > 100$ MeV and $p_T > 500$ MeV. The violation of KNO scaling that has been observed at lower energies is discussed.

The Readout System of the Belle II Silicon Vertex Detector

Richard Thalmeier, Thomas Bergauer, Markus Friedl, Immanuel Gfall, Christian Irmler,
Siegfried Schmid, Helmut Steininger, Manfred Valentin
HEPHY Vienna, Nikolsdorfer Gasse 18, AT-1050 Vienna

At the High Energy Accelerator Research Organization (KEK) in Tsukuba, Japan, the Belle II experiment will explore the asymmetry between matter and antimatter and search for new physics beyond the standard model. Therefore, the collision products of electrons and positrons are measured, among others, by 172 double-sided silicon strip detectors which are arranged cylindrically around the collision point. The sensor strips on opposite sides are orthogonal in order to obtain both coordinates. A total of 1748 radiation-hard APV25 chips read out 128 strips and send the analog signals by time-division multiplexing to Flash Analog Digital Converters (FADC) over an approximately 12 meter long copper cable. Up to 48 APV25 chips can be connected to one FADC module. In each FADC module there are 48 analog-to-digital converters (ADC), one per APV25-chip, and a Field Programmable Gate Array (FPGA), namely an Altera Stratix IVGX. It compensates line signal distortions using a digital FIR filter, recognized data frames from the incoming stream, extracts the analog strip signals and reorders them to reflect the physical arrangement correctly. Then, the usual strip detector treatment follows inside the FPGA: Pedestal Subtraction, Common Mode Correction to eliminate DC offsets and then a threshold is applied for Zero Suppression, discarding empty strip data. Finally, the peak timing and amplitude will be extracted from a set of several data points for each heat, using a lookup table. Eventually, the processed data are sent to a computing farm for high-level analysis.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
<th>Institution/Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:15</td>
<td>344</td>
<td>Interstrip capacitance of double sided silicon strip detectors</td>
<td>Bernhard Leitl, Manfred Valentin, Marko Dragicevic, Thomas Bergauer</td>
<td>Institute of High Energy Physics (HEPHY), Nikolsdorfer Gasse 18, AT-1050 Wien</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For the new Belle II detector at the KEK-B collider in Tsukuba (Japan) double-sided silicon strip sensors are used to achieve a low material budget in the active volume. This sensors are made out of n-bulk material. On the p-side the isolation between the strips is inherently given, but on the n-side an additional p-stop area between the strips must be implanted. The geometry of this p-stop area influences the capacity between two strips, which in turn affects the Signal-to-noise ratio. As known from other works a lower capacity leads to a higher Signal-to-noise ratio. To obtain the optimal design, three test structures with different p-stop designs have been produced. To test, which parameter of the geometry influences the interstrip capacity most, the strips on the test structures have been divided into four different zones. In each zone, the distance from the p-stop implant to the n-implant strip was varied. For additional research an extra test structure was produced, where the p-implant was uniformly embedded on the whole sensor area. In this talk a short overview of silicon strip detectors and their interstrip capacities will be given. Also the measurement results of the different p-stop areas will be presented and compared.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:30</td>
<td>345</td>
<td>Over Saturation Behaviour of SiPMs at High Photon Exposure</td>
<td>Lukas Gruber, Stefan Brunner, Ken Suzuki, Johann Marton</td>
<td>Stefan Meyer Institute for Subatomic Physics, Austrian Academy of Sciences, Boltzmannagasse 3, AT-1090 Vienna</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The response curve of various Silicon Photomultiplier (SiPMs) was determined by exposing the sensors to short laser pulses (~ 30 ps) with varying light intensity. We came across to observe a signal output reaching up to twice the expected maximum, i.e. single photon pulse height times the total number of pixels, and a significant deviation from the response curve predicted by model calculations and simulations. We present experimental results and possible explanations for this utterly unexpected behaviour, which seems not to be compatible with the fundamental understanding that each SiPM pixel fires once whether only one or more photons have entered.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:45</td>
<td>346</td>
<td>FLUKA studies of hadron-irradiated scintillating crystals for calorimetry at the High-Luminosity LHC</td>
<td>Milena Quittnat, Günther Dissertori, Francesca Nessi-Tedaldi, Felicitas Pauss, David Luckey, Rainer Wallny, IPP, ETH Zürich, Schafmattstrasse 20, CH-8093 Zürich</td>
<td>Calorimetry at the upgraded High-Luminosity LHC will have to perform in a harsh radiation environment and high hadron fluences. The calorimeter design and suitable scintillating materials are a focus of research. In this talk, first simulation results using the Monte Carlo simulation program FLUKA are compared to measurements on proton irradiated LYSO, YSO and cerium fluoride crystals. Characteristic parameters as the induced ambient dose, fluence spectra of different particle types and the residual nuclei are discussed, and the suitability of these materials for a future calorimeter is surveyed. Particular attention is given to the creation of isotopes that would contribute with a prohibitive background to the measured signal.</td>
</tr>
<tr>
<td>15:00</td>
<td>347</td>
<td>Studies of radiation hardness of diamond strip trackers.</td>
<td>Felix Bachmair, Dmitry Hits, Lukas Băni</td>
<td>Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, CH-8093 Zürich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The tracker in many high energy particle physics experiments is the inner-most part of the detector and thererfore has the highest particle flux. As a result, the tracker materials experience large doses of radiation. Therefore a radiation-hard material is required. Chemical-Vapor-Deposition (CVD) diamond is a potential sensor material for use near the interaction region, where the most extreme radiation conditions will exist. The RD42 collaboration constructed, irradiated, and tested poly-crystalline and single-crystalline CVD diamond detectors to fluencies measuring up to $17 \times 10^{15}$ p/cm$^2$. The analysis of beam test results for irradiated diamond strip detectors are presented here.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Irradiation Studies with the New Digital Readout Chip for the Phase I Upgrade of the CMS Pixel Detector

Jan Hoss, Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, CH-8093 Zürich

The LHC Phase I running conditions with a center of mass energy of 14 TeV and a peak luminosity of about 2 \cdot 10^{34} \text{cm}^{-2} \text{s}^{-1} pose more stringent demands on the detectors of the LHC experiments, mainly in terms of radiation hardness, track density and readout speed. As the innermost component of the CMS experiment, the pixel detector will need to be replaced in 2016 to guarantee high performance under these conditions. As a central aspect of this upgrade, a new readout chip (ROC) with a lower comparator threshold, digital readout, and increased readout speed of up to 400 Mb/s has been developed. As an important qualification criteria for the chip towards the final design submission, a broad irradiation campaign has been performed during the summer 2013. Samples of the ROC have been irradiated with 25 MeV protons at the ZAG Zyklotron AG Karlsruhe with several fluences between 6 \cdot 10^{14} and 3 \cdot 10^{15} \text{n}_{\text{eq}}/\text{cm}^{2} to study radiation effects. This talk presents results of detailed electric qualification before and after irradiation of the ROCs and summarizes observed effects of the irradiation concerning steering parameters and efficiency of the chip.

Measurement of the thermal neutron flux at the source for ultracold neutrons at the Paul Scherrer Institute

Dieter Ries, Paul Scherrer Institut, WMSA / B14, CH-5232 Villigen PSI

Ultracold neutrons (kinetic energies below 300 neV, UCN) are a unique tool for fundamental high precision experiments. The source for UCNs at the Paul Scherrer Institute uses the 1.3 MW high intensity proton beam in several seconds long pulses on a dedicated spallation target. Spallation neutrons are moderated in heavy water, further cooled and down-scattered to the ultracold regime in solid D_2. We have investigated gold foil activation inside the shielding next to and along the full height of the thermal moderator tank. The gold activation depends on the fast, epithermal and thermal neutron flux produced by the system and therefore tests its neutronic performance. Results of the measurements will be presented and compared to a full Monte Carlo simulation using MCNPX.

An uncompensated magnetic field drifts in a search for an electric dipole moment of the neutron (nEDM) carrying out at Paul Scherrer Institute (PSI).

N Prashanth Pataguppi 1,2, Philipp Schmidt-Wellenburg 1, Nathal Severijns 2, for the nEDM Collaboration

1 Paul Scherrer Institute, CH-5232 Villigen
2 Nuclear and Radiation Physics Section, K U Leuven, Celestijnenlaan 200d - box 2418, BE-3001 Leuven

In order to reach the desired sensitivity goal 5\times 10^{-27} \text{e-cm} (95\% C.L.), the systematic uncertainties must be smaller than 1.3\times 10^{-27} \text{e-cm}. The uncompensated field drift is one of the major systematic error in the nEDM experiment. Charging current of electric field reversals may cause a change in the magnetic field gradient which might result in a false EDM signal. A set of cesium magnetometers are used to measure the change in the vertical magnetic field gradients. This effect was experimentally studied in December 2012 during 20 days. More than a thousand electric field reversals were used for the analysis presented in this talk.

High-volume production of Silicon strip detectors for particle physics experiments

Thomas Bergauer, Axel König, Marko Dragicevic, Wolfgang Treberspurg
HEPHY Vienna, Nikolsdorfer Gasse 18, AT-1050 Wien

Most modern particle physics experiments use Silicon based strip sensors for their tracking systems. So far only a few vendors were capable of producing those sensors with the needed quality. Together with the European-based semiconductor manufacturer Infineon Technologies AG we developed planar silicon strip sensors in p-on-n technology. This poster presents the design, production, electrical characterization and beam test performance of the first sensors produced by Infineon. This cooperation offers the possibility to establish Infineon as a high quality vendor for particle physics detectors capable of a high volume production required by future particle physics experiments.
Bethe–Salpeter Description of Light Pseudoscalar Mesons

Wolfgang Lucha

Institute for High Energy Physics, Austrian Academy of Sciences, Nikolsdorfergasse 18, AT-1050 Vienna

In theoretical elementary particle physics, light pseudoscalar mesons play a twofold rôle: they may be regarded as bound states of fundamental degrees of freedom of QCD and as (pseudo-) Goldstone bosons of spontaneously broken chiral symmetries of QCD. We combine these two aspects in a single novel approach relying on the Bethe–Salpeter formalism in instantaneous approximation: the form of the pseudoscalar-meson Bethe–Salpeter wave functions dictated by chiral symmetry is inserted into the Bethe–Salpeter equation for bound states of vanishing mass, in order to deduce analytically the underlying interactions. In this way, we manage to derive exact Bethe–Salpeter solutions for pseudoscalar mesons, in the sense of establishing a rigorous relationship between interactions and bound-state Bethe–Salpeter amplitudes.

Lock-in based detection scheme for a hydrogen beam

Michael Wolf, Peter Caradonna, Martin Diermaier, Nazli Dilaver, Bernadette Kolbinger, Chloé Malbrunot *, Oswald Massiczek, Clemens Sauerzopf, Eberhard Widmann, Barbara Wünschek, Johann Zmeskal
Stefan-Meyer-Institut für subatomare Physik, ÖAW, Boltzmanngasse 3, AT-1090 Wien
* and CERN, CH-1211 Genève

In this work we present the data acquisition for a atomic hydrogen beamline that will be used to simulate an antihydrogen beam. Single particle detection of the hydrogen atoms will be done using a quadrupole mass spectrometer. Since a high background count of hydrogen is expected, special treatment of the data is necessary. Therefore a tuning-fork chopper will be used to produce a bunched hydrogen beam. Afterwards the noise will be removed with a software based lock-in amplifier.

Spin polarized atomic hydrogen beam source

Martin Diermaier, Peter Caradonna, Michael Wolf, Oswald Massiczek, Johann Zmeskal, Clemens Sauerzopf, Chloé Malbrunot *, Nazli Dilaver, Bernadette Kolbinger, Barbara Wünschek, Eberhard Widmann
Stefan-Meyer Institut für subatomare Physik, ÖAW, Boltzmannasse 3, AT-1090 Wien
* and CERN, CH-1211 Genève

In this work we present an apparatus that we use to produce a spin polarized beam consisting of atomic hydrogen. Hydrogen molecules are dissociated by a microwave induced discharge. The particles enter a differentially pumped vacuum system consisting of four chambers. With the help of a skimmer and apertures a beam is formed. This beam is polarized with permanent sextupole magnets. For the detection of the formed hydrogen we use a cross beam quadrupole mass spectrometer with a lock in amplifier.

A neutron interferometric measurement and calculation of a phase shift induced by Laue transmission

Thomas Potocar, Michael Zawisky, Josef Springer, Hartmut Lemmel, Martin Suda
Institute of Atomic and Subatomic Physics, Vienna University of Technology, Stadionallee 2, AT-1020 Vienna

Our group was the first who found a theoretical description of the phase shift induced by Laue transmission in a perfect Si crystal blade in the vicinity of the Bragg condition. We measured this ‘Laue phase’ at two wavelengths within a neutron interferometer. It reveals an extreme angular sensitivity, which allows the detection of beam deflections of the order of $10^{-6}$ s of arc. We also searched for further influences on this phase and found a sensitive dependence on the rocking angle, monochromator function and beam divergence. The measurements are compared with a new simulation tool, which is also presented here.

Development of a novel muon beam line for next generation precision experiments

Kim Siang Khaw 1, Aldo Antognini 1, Florian Piegsa 1, David Taqu 1, Andreas Eggenberger 1, Gunther Wichmann 1, Klaus Kirch 1, Yu Bao 2, Angela Papa 2
1 Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, CH-8093 Zürich
2 Paul Scherrer Institute, CH-5232 Villigen PSI

Several next generation precision measurements like muonium (Mu=$\mu^+$e-) spectroscopy, $(g-2)_\mu$, searches for $\mu$e oscillations and muon ($\mu^+$) electric dipole moment can be conceived with improved $\mu^+$ and Mu beams. The principle of the novel $\mu^+$ beam line proposed in PRL 97, 194801 (2006) is to stop a standard $\mu^+$ beam in He gas at cryogenic temperatures, and to compress the $\mu^+$ swarm using electric and magnetic fields and gradients of gas densities. Results of the longitudinal compression measured at πE1 beam line of PSI together with the proposed test of transverse compression will be presented.
<table>
<thead>
<tr>
<th>359</th>
<th>Measurements and simulations of magnetic field inside the ASACUSA Antihydrogen spin-flip cavity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nazli Dilaver, Peter Caradonna, Martin Diermaier, Bernadette Kolbinger, Chloé Malbrunot *, Oswald Massiczek, Clemens Sauerzopf, Michael Wolf, Barbara Wünschek, Johann Zmeskal, Eberhard Widmann</td>
</tr>
<tr>
<td></td>
<td>Stefan Meyer Institute for Subatomic Physics, ÖAW, Boltzmanngasse 3, AT-1090 Vienna</td>
</tr>
<tr>
<td></td>
<td>* and CERN, CH-1211 Genève</td>
</tr>
<tr>
<td></td>
<td>The ASACUSA-Hbar collaboration at CERN is planning to measure the hyperfine splitting of groundstate antihydrogen to do precession tests on the CPT-Theorem (Charge, Parity and Time). To achieve this we constructed a radio frequency spin-flip cavity with a static, homogeneous and weak magnetic guiding field that is generated by pairs of Helmholtz coils. In this work we will present a comparison between measured field inside the cavity with simulations done by different commercially available software packages. Our aim is to find the ideal design to reach the best possible homogeneity inside the full active cavity volume.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>360</th>
<th>Neutron Reflectometry as Matura project - Verifying the Wave-Particle Dualism at the NARZISS Instrument at the Paul Scherrer Institut.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carla Kreis, Paul Scherrer Institut, CH-5232 Villigen</td>
</tr>
<tr>
<td></td>
<td>In the framework of my Matura project I investigated the wave characteristics of neutrons. These predict an interference pattern in the reflected neutron intensity of a neutron beam interacting with a suited sample. Furthermore quasi-bound states can occur in case of multiple layers of different neutron-optical potentials [M. Mâaza et al, Phys Lett A 223, 145-148 (1996)]. I investigated single- and three-layer samples at the NARZISS cold neutron reflectometer. With help of the Parratt Formalism I was able to calculate the expected angle-dependent reflected intensities and compare those to the measured ones. My Matura project about the outcome of these measurements and the comparison to the theoretical model will be presented on my poster. This work was supported by the Paul Scherrer Institut.</td>
</tr>
</tbody>
</table>