## Nuclear, Particle- and Astroparticle Physics (TASK)

*This session has been organised in conjunction with CHIPP.*

***Monday, 30.06.2014, Room 002***

| Time | ID | |
|---|---|---|
| | | **CHIPP Plenary Meeting (Non-Scientific Topics)** *Chair: Olivier Schneider, EPFL* |
| 13:45 | 31 | **Welcome, News from Board and EB** |
| 14:00 | 32 | **Elections** |
| 14:15 | 33 | **CHIPP outreach** |
| 14:30 | 34 | **CHIPP computing** |
| 14:45 | 35 | **CERN council** |
| 15:00 | 36 | **ACCU** |
| 15:15 | 37 | **ECFA** |
| 15:30 | 38 | **NuPEC** |
| 15:45 | 39 | **ApPEC** |
| 16:00 | | ***Coffee Break*** |
| | | ⟹ ***Combined session see*** **Atomic Physics and Quantum Optics** |
| | | **I: Astrophysics I** *Chair: Teresa Montaruli, Uni Genève* |
| 17:00 | 301 | **The Alpha Magnetic Spectrometer on the International Space Station**<br><br>*Mercedes Paniccia, Martin Pohl, Divic Rapin, Maurice Bourquin, Catherine Leluc, Pierre Saouter, Marion Habiby Alaoui*<br>*Département de Physique Nucleaire et Corpusculaire, Université de Genève, 24, quai E-Ansermet, 1211 Genève 4*<br><br>The Alpha Magnetic Spectrometer is a large-acceptance particle detector which was successfully deployed on the International Space Station in 2011. It is a unique long duration (20 years) experiment in space performing precision measurements of cosmic rays composition and flux. To date, the detector has collected over 45 billion cosmic rays of energies ranging from several hundred MeV up to few TeV. Among the physics objectives of AMS are a search for the understanding of Dark Matter, Antimatter and the origin of cosmic rays. This contribution overviews the scientific results based on data collected during the first years of operations in space. |
| 17:15 | 302 | **The extragalactic gamma-ray sky seen by MAGIC**<br><br>*Elisa Prandini , ISDC - UNIGE, Chemin d'Ecogia 16, 1290 Versoix*<br><br>The MAGIC Collaboration is successfully operating two 17 m diameter imaging atmospheric Cherenkov telescopes at the Observatorio del Roque de los Muchachos, in the Canary island of La Palma at 2200 m asl. The MAGIC telescopes cover the energy range from 50 GeV to 50 TeV with focus on the energy range below 1 TeV. I will present recent MAGIC scientific highlights with a particular emphasis on detailed multi-wavelength studies of flaring blazars. The possibility of cosmological measurements, such as constraining the extragalactic background light and the intergalactic magnetic field with these observations will be also outlined. |

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| **17:30** | **303** | **The First G-APD Cherenkov Telescope: Status and Results**<br><br>*Gareth Hughes, Institute for Particle Physics, ETH Zürich, Otto-Stern-Weg 5, 8093 Zürich*<br><br>The current generation of Cherenkov telescopes relies on technology that was developed in the 1960s. Whilst these systems are well understood there are limitations. Geiger-mode Avalanche Photo Diodes (G-APDs/SiPMs) offer an excellent alternative to Photo-multiplier tubes. The first working telescope to use G-APDs is FACT (First G-APD Cherenkov Telescope), which has been in operation since October 2011. Observations are for the first time routinely carried out remotely. FACT regularly monitors the bright TeV blazars Mrk421 and Mrk501. We present here the current status of the telescope, including the lessons learnt and the result from 2.5 years of monitoring. |
| **17:45** | **304** | **The SST-1M telescope for CTA**<br><br>*Juan Antonio Aguilar Sánchez, Département de physique nucléaire et corpusculaire, Université de Genève, 24, Quai Ernest-Ansermet, 1211 Genève*<br><br>The Cherenkov Telescope Array (CTA) is the next-generation gamma-ray observatory aiming to detect very-high-energy gamma-rays on a energy range from a few tens of GeV to a few hundreds of TeV. In order to cover this wide energy range three arrays of telescopes with different detectors sizes are proposed. The high energy extension will be covered by the Small Size Telescopes (SSTs). In this contribution I will review a design of a SST using a Davies-Cotton geometry. This design involves innovative features such as using Silicon Photomultipliers as the active sensors in the photo-detector plane and coated light funnels. |
| **18:00** | **305** | **How to measure dark matter with XENON1T**<br><br>*Lukas Bütikofer, Laboratory for High Energy Physics, University of Bern, Sidlerstrasse 5, 3012 Bern*<br><br>Today there is strong evidence that ordinary matter only accounts for ~5% of our Universe, while almost 27% of the remaining part is made of the yet unknown dark matter. Many experiments are aiming at the direct detection of dark matter in the form of weakly interacting massive particles (WIMPs). Among them is XENON1T, currently under commissioning at LNGS, Italy. This talk will introduce the experiment and address the challenges of data taking with this first liquid xenon time projection chamber with a target mass at the ton scale. |
| **18:15** | | ***Postersession and Apéro*** |
| **20:15** | | ***Public Lecture*** |

## *Tuesday, 01.07.2014, Room 002*

| Time | ID | II: LHC Experiments I<br>*Chair: Olivier Schneider, EPFL* |
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| **13:45** | **25** | ***Winner of the CHIPP Prize*** |
| | | *Chair: Christoph Grab, ETH Zürich* |
| **14:15** | **311** | **Overview of LHC Run-I results from ATLAS, CMS, and LHCb**<br><br>*Caterina Doglioni, University of Geneva, 24, Quai Ernest-Ansermet, 1211 Genève*<br><br>The Large Hadron Collider (LHC) has been delivering proton-proton collisions since March 2010, at center-of-mass energies of 7 and 8 TeV. This talk presents a selection of measurements, searches and discoveries from the ATLAS, CMS and LHCb experiments during this first LHC run, highlighting the excellent agreement with the Standard Model in precision measurements, the historical discovery of a new scalar particle, consistent with the long-sought Higgs boson, the recent observation of a candidate for a new exotic meson and the strong constraints placed on New Physics models. |

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| **14:45** | **312** | **The ATLAS insertable B-layer for LHC Run-II**<br><br>*Maria Elena Stramaglia, AEC/LHEP Bern University, Sidlerstrasse 5, 3012 Bern*<br><br>During the current LHC shut down (LS1) the ATLAS detector upgrade efforts are focused on the construction and installation of a new, innermost pixel detector layer. This Insertable B-Layer (IBL) represents a new frontier in terms of detector technologies (including 3D sensors) and a new generation read-out electronics. This talk gives a general overview of ATLAS Pixel detector upgrade and aims at summarising the construction and testing phases and present an outlook on the commissioning. |
| **15:00** | **313** | **CMS pixel phase 1 upgrade**<br><br>*Philipp Eller, IPP ETHZ, 8093 Zürich*<br><br>The Phase I Upgrade of the CMS pixel detector includes changes in the readout electronics, the geometry of the detector and the cooling system. Each of this aspects will be summarized in this talk and the resulting improvements in physics performance discussed. Changes in the readout chip and the resulting performance will be highlighted. Ongoing work anticipating the production of the detector elements (pixel modules) including a pre-production of a limited amount of modules and the assessment of their performance and quality will be shown. |
| **15:15** | **314** | **A SciFi Tracker for the LHCb Upgrade**<br><br>*Mark Tobin, Laboratoire de Physique des Hautes Energies, EPFL, BSP - Cubotron, 1015 Lausanne*<br><br>The LHCb detector will be upgraded during the LHC LS2 to enable the experiment to collect data at instantaneous luminosities up to ten times the original design value. The current hardware trigger will be replaced by a trigger-less read-out system that allows the data to be read out at 40 MHz. The current tracking detectors downstream of the LHCb dipole magnet will be replaced by the Scintillating Fibre Tracker [1]. The SciFi Tracker will be constructed from 2.5 m long fibres and read out by silicon photomultipliers located outside the acceptance. The design of the detector and latest R&D results will be presented.<br><br>[1] LHCb Tracker Upgrade TDR, CERN/LHCC 2014-001 |
| **15:30** | **315** | **Measurement of the $t\bar{t}\gamma$ production cross section in the single lepton channel at $\sqrt{s}$ = 7 TeV in 4.7 fb$^{-1}$ of *pp* collision data collected with the ATLAS detector.**<br><br>*Gaetano Barone, DPNC, University of Geneva, 24, Quai Ernest-Ansermet, 1211 Geneva*<br><br>The couplings of the top quark to the neutral electroweak gauge bosons have not been measured yet. A search is performed for $t\bar{t}$ pairs produced together with a photon in the semi-leptonic channel with a dataset corresponding to an integrated luminosity of 4.66 fb$^{-1}$ of proton-proton collisions at $\sqrt{s}$ = 7 TeV recorded by the ATLAS detector at the CERN Large Hadron Collider. The measurement of the fiducial ($p_T(\gamma)$ >20 GeV and $\lvert\eta\rvert(\gamma) < 2.37$) $t\bar{t}\gamma$ production cross section is presented. This is the most accurate measurement to date for this process. The significance for the $t\bar{t}\gamma$ process is also reported. |
| **15:45** | **316** | **Study of $B_s^0 \to \pi^+\pi^-\mu^+\mu^-$ decays at LHCb.**<br><br>*Ilya Komarov [1], Mirco Dorigo [1], Tatsuya Nakada [1], Nikolai Nikitin [2]*<br>*[1] EPFL-SB-IPEP-LPHE BSP - Cubotron, 1015 Lausanne*<br>*[2] MSU, GSP-1 Lenenskiye Gory, 1/2 SINP MSU, RU-119991 Moscow*<br><br>Rare $B_s^0 \to \pi^+\pi^-\mu^+\mu^-$ decays proceed through loop processes which are suppressed in the standard model (SM), but can be enhanced in several new physics scenarios. Measurement of the branching fraction represents the first step towards the search for non-SM physics in this decay mode. Experimental sensitivity sufficient to measure the branching fraction expected by the SM becomes available only recently with the large data set collected by the LHCb experiment during the 2011-2012 operation. We present the first search for the decay mode and the measurement of the branching fraction. |

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| **16:00** | **317** | **Observation of photon polarization in the $b \to s\gamma$ transition**<br><br>*Giovanni Veneziano, EPFL, 1015 Lausanne*<br><br>The polarization of photons in radiative penguin decays remains unexplored experimentally. Probing the photon polarization constitutes an essential test of the Standard Model and plays a complementary role to direct searches of right-handed charged gauge bosons at the LHC. We present the first experimental observation of photon polarization in $b \to s\gamma$ transitions, obtained from the angular distribution of the photon in $B^{\pm} \to K^{\pm}\pi^{\mp}\pi^{\pm}\gamma$ decays at LHCb. The coefficients describing this distribution are calculated to allow the determination of the value of the photon polarization when theoretical calculations become available. |
| **16:15** | **318** | **Search for associated $t\bar{t}H$ production in the $H \to b\bar{b}$ channel at CMS using the Matrix Element Method**<br><br>*Daniel Salerno*<br>*University of Zürich, Winterthurerstr. 190, 8057 Zürich, on behalf of the CMS conference committee*<br><br>The $t\bar{t}H$ production channel provides direct insight to the Higgs coupling to the top quark. However, it is a challenging process due to its small cross section and high background rates. The matrix element method is used in the $t\bar{t}\,H(\to b\bar{b})$ channel at CMS to provide an effective discriminant between signal and background. Its goal is to maximally exploit both experimental information and the theoretical model to assign weights to events under the competing hypotheses. In this talk I will provide an overview of our current matrix element methodology. |
| **16:30** | | ***Coffee Break*** |
| | | **III: LHC Experiments II**<br>*Chair: Florencia Canelli, Uni Zürich* |
| **17:00** | **321** | **Performance of the LHCb Silicon Tracker during LHC Run I**<br><br>*Christian Elsasser, Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich*<br><br>The LHCb Silicon Tracker (ST) consists of a tracking station upstream of the LHCb dipole magnet as well as of the inner part of three tracking stations downstream of the magnet. During the LHC Run I the ST was operated with a high fraction of working read-out channels and showed a very good performance in terms of Signal-to-Noise ratio and hit finding efficiency. The talk focusses on the measured performance of the detector, on lessons learned about the operation of the detector during the LHC Run I as well as on results of its radiation damage monitoring. |
| **17:15** | **322** | **The ATLAS Insertable B-Layer (IBL) production and integration.**<br><br>*Javier Bilbao de Mendizabal*<br>*Department of physics, University of Geneva, 24, quai Ernest-Ansermet, 1211 Genève*<br><br>After a successful period (2010-2013) of collecting data from the Large Hadron Collider (LHC), the ATLAS inner tracker needs to be prepared for the high luminosity LHC. The first step in this process consists of the construction of a new innermost Pixel Detector layer, the so-called "Insertable B-Layer" (IBL), the purpose of which is to improve the physics performance at the new LHC operating conditions at a design luminosity of ($2 \times 10^{34}$) and a center-of-mass energy of ($\sqrt{s}$ = 14 TeV). In this talk, the IBL production and integration process will be reviewed, and emphasis placed on detector performance and final quality assurance. |
| **17:30** | **323** | **ATLAS Insertable B-Layer (IBL) module QA**<br><br>*Stefania Stucci (ATLAS Bern group), AEC/LHEP Bern University, Sidlerstrasse 5, 3012 Bern*<br><br>The Insertable B-Layer (IBL) is the fourth layer added to the ATLAS Pixel detector. IBL is also the first silicon layer with a "Mixed Scenario": planar and 3D sensor modules technologies cohexist with teir different characteristics. This presentation will give a brief overview of the IBL electrical and functional module performances highlighted during the QA reception tests, the stave QA testing and the final integration of the 14 final staves into the new pixel layer. |

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| **17:45** | **324** | **CMS Upgrade Phase I: pixel modules testing**<br><br>*Vittorio Raoul Tavolaro, Institute for Particle Physics, ETH Zürich, Otto-Stern-Weg 5, 8093 Zürich*<br><br>CMS pixel detector will be rebuilt in coming years and is planned to be installed during an extended LHC winter shutdown in 2016-17. A recap of the testing setup for new pixel detector modules will be shown. Emphasis will be put on the setup used to perform quality and calibration tests of pixel modules under temperature and humidity control and for thermal stress tests. A review about specific test procedures will be given, including results from performance and quality tests on the pre-production of Phase I Upgrade pixel detector modules. |
| **18:00** | **325** | **Characterization of SiPM detector for LHCb upgrade**<br><br>*Zhirui Xu, Guido Haefeli, Mark Tobin, Sebastiana Giani, Axel Kuonen*<br>*LPHE, EPFL, BSP, 1015 Lausanne*<br><br>Two SiPM manufacturers, Hamamatsu and KETEK have developed customized devices for the SciFi Tracker application in the context of the LHCb tracker upgrade. These devices were optimised for high photon detection efficiency (PDE), low cross-talk and after-pulsing and a large temperature operation range. New devices with the latest technology including different optical isolation between pixels (trenches), pixel sizes and structures to improve the spectral response were tested. We present the results on PDE, cross-talk, and noise before and after neutron irradiation at various temperatures. A cosmic ray telescope based on scintillating fibres was built to measure the hit detection efficiency and spatial resolution of the modules. |
| **18:15** | **326** | **Dedicated Trigger for Highly Ionising Particles at ATLAS**<br><br>*Akshay Katre, University of Geneva, 24, Quai Ernest-Ansermet, 1211 Geneva*<br><br>Searches for Highly Ionising Particles (HIPs), such as magnetic monopoles,have been made with the ATLAS Experiment at $\sqrt{s}$ = 7 TeV proton-proton collision energies. With $\sqrt{s}$ = 8 TeV proton-proton collision energy a dedicated trigger designed to detect the ionising signature of HIPs using the Transition Radiation Tracker (TRT) was developed. The new trigger is capable of probing higher monopole masses and charges, as well as other HIPs such as QBalls and dyons. In this talk, we describe the motivation and working of this novel trigger and compare its performance with triggers in previous searches. We also discuss future plans for the trigger for $\sqrt{s}$ = 14 TeV collisions. |
| **18:30** | **327** | **Search for new physics in events with same-sign dileptons and jets in *pp* collisions at $\sqrt{s}$ = 8 TeV**<br><br>*Marc Dünser, Institute for Particle Physics, ETH Zürich, Otto-Stern-Weg 5, 8093 Zürich*<br><br>A search for new physics is performed based on events with jets and a pair of isolated, same-sign leptons. The results are obtained using a sample of proton-proton collision data collected by the CMS experiment at a centre-of-mass energy of 8 TeV at the LHC, corresponding to an integrated luminosity of 19.5 $fb^{-1}$. In order to be sensitive to a wide variety of possible signals beyond the standard model, multiple search regions defined by the missing transverse energy, the hadronic energy, the number of jets and b-quark jets, and the transverse momenta of the leptons in the events are considered. No excess above the standard model background expectation is observed and constraints are set on a number of models for new physics, as well as on the same-sign top-quark pair and quadruple-top-quark production cross sections. Information on event selection efficiencies is also provided, so that the results can be used to confront an even broader class of new physics models. |
| **18:45** | **328** | **Jet production in association with a Z boson at CMS**<br><br>*Andrea Carlo Marini, ETH Zürich & CERN, 1211 Genève 23*<br>*on behalf of the CMS conference committee*<br><br>The associated production of jets and vector bosons allows for stringent tests of perturbative QCD calculations and is sensitive to the possible presence of new physics beyond the Standard Model. Measurements of jet production rates in association with a Z boson, in proton-proton collisions at a 7 TeV center-of-mass energy is presented, using data collected with the CMS detector. In particular, we compare data to the theory predictions on jet rates, angular correlations and event shapes distributions. |

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| **19:00** | **329** | **Charmless B decays at LHCb**<br><br>*Jessica Prisciandaro, EPFL, BSP 612 - Route de la Sorge- Cubotron, 1015 Lausanne*<br><br>Decays of b-hadrons without charmed particles in the final state offer rich opportunities to test the Standard Model. In particular, penguin-dominated non-leptonic B decays and CP-violating processes can reveal the presence of new physics. The CP-violating charge asymmetry in $B^{\pm} \to \phi K^{\pm}$ decays is measured in a sample of pp collisions collected by the LHCb experiment. In addition, a search for the unseen $B^{\pm} \to \phi\pi^{\pm}$ and $B^{\pm} \to \eta'\eta'$ decay modes is performed, using the $B^{\pm} \to \phi K^{\pm}$ decay and the $B^{\pm} \to \eta' K^{\pm}$ rate for normalization. |
| **19:15** | **330** | **Measurement of the differential isolated diphoton production cross section at CMS**<br><br>*Marco Peruzzi, ETH Zürich & CERN, 1211 Genève 23,*<br>*on behalf of the CMS Conference Committee*<br><br>Diphoton production in hadronic collisions represents an important benchmark for QCD predictions. A measurement of the isolated diphoton production cross section in pp collisions at 7 TeV is presented, based on a dataset corresponding to 5.0 inverse femtobarns, collected by the CMS experiment at the LHC in the year 2011. A data-driven method to extract the prompt diphoton yield has been developed, making use of the photon component of the Particle-Flow isolation variable in a template fit. The cross section is measured differentially as a function of different kinematic variables of the diphoton system, and compared to theoretical predictions, including the latest NNLO calculations.<br>*moved to talk 25* |
| **19:30** | | |
| **19:45** | | ***Conference Dinner*** |

## *Tuesday, 01.07.2014, Room C 230*

| Time | ID | **IV: LHC Experiments III and Astrophysics II**<br>*Chair: Ulrich Straumann, Uni Zürich* |
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| **17:00** | **331** | **Search for exotic particles in the LHCb experiment**<br><br>*Bastien Muster, Ecole Polytechnique de Lausanne, 1015 Lausanne*<br><br>Searches of particles predicted by theories beyond the Standard Model are presented using LHC data recorded by the LHCb detector, in 2011 and 2012, corresponding to 3 $fb^{-1}$ of integrated luminosity. Different approaches are shown to detect long-lived particles predicted by Hidden Valley models, RPV supersymmetry, mGMSB,... The production cross-section upper limits for these processes are presented. |
| **17:15** | **332** | **Search for Displaced Supersymmetry in Dilepton Final States at CMS**<br><br>*Quentin Python, Vrije Universiteit Brussel, VUB-DNTK, Pleinlaan 2, BE-1050 Brussel*<br>*on behalf of the CMS conference committee*<br><br>We present a search for new physics producing final-state leptons whose trajectories are displaced from the interaction region. This search uses a data sample obtained from pp collisions at $\sqrt{s}$ = 8 TeV, with an integrated luminosity of 19.7 $fb^{-1}$, recorded by the CMS detector at the LHC. Many models of new physics predict new particles with lifetimes on the scale that would produce macroscopic displacements of the decay products on the order of 100 micron - 1 cm. We target a particular model called ``Displaced Supersymmetry'' but have designed the search to remain sensitive to a wide variety of such theoretical scenarios. The number of observed events is in agreement with the background expectation, and limits are placed on the pair production of stop squarks decaying to final states including an electron and muon, for a range of stop lifetimes between 100 micron/c and 10 cm/c. |

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| **17:30** | **333** | **Point-source searches with the IceCube detector**<br><br>*Asen Christov, Teresa Montaruli, Juan Antonio Aguilar, Mohamed Rameez*<br>*DPNC, Université de Genève, 24, Quai Ernest-Ansermet, 1211 Genève*<br><br>We performed searches for neutrino emissions from astrophysical sources. We used unbinned maximum likelihood method to distinguish astrophysical signals from atmospheric backgrounds. Time integrated searches include point and extended sources all sky scan, searches for catalogs of sources and stacked ensembles of sources. We carried out time dependent searches for sources with non-steady emission. We performed untriggered scan seeking neutrino events clustered in space and time, triggered searches considering catalogs of selected sources from the Fermi Monitored List based on flux and variability and search for periodic emissions from selected catalog of microquasars and binary systems with known periodicities. |
| **17:45** | **334** | **Dark matter searches with the IceCube detector.**<br><br>*Mohamed Rameez, Juan A. Aguilar, Sofia Vallecorsa, Teresa Montaruli*<br>*Universite de Geneve, 24, Quai Ernest Ansermet, 1211 Geneva*<br><br>We look for evidence of a neutrino flux from self annihilation of dark matter particles gravitationally captured in the Sun using data from the first year of the completed IceCube detector. Sensitivity has been improved from previous analyses using better background rejection techniques and an unbinned maximum likelihood ratio analysis method. We present and interpret the results considering the effect of the radiation of electro-weak bosons which modifies the expected neutrino spectra, and compare with results from direct DM searches and collider searches. We also summarize the results from all other dark matter searches performed with IceCube. Finally, we discuss the potential of PINGU within the context of these searches. |
| **18:00** | **335** | **Sparse On/Off data: an objective Bayesian analysis**<br><br>*Max Ludwig Knoetig, ETH Zürich, Otto-Stern-Weg 5, 8093 Zürich*<br><br>The On/Off problem is a statistical problem where a measured rate is the sum of two parts. The first is due to a signal and the second due to a background, both of which are unknown. Frequentist solutions have been proposed, but they are only adequate for high count numbers. I will present a universal Bayesian solution that depends only on the initial three parameters of the On/Off problem: the number of events in the respective regions and their ratio-of-exposure. With a two-step approach it is possible to infer the signal's significance, strength, uncertainty or upper limit in a unified a way. I apply the method to GRB data. |
| **18:15** | **336** | **The Space-borne Gamma-Ray Burst Polarimeter POLAR**<br><br>*Silvio Orsi, DPNC, Université de Genève, quai Ernest-Ansermet 24, 1211 Geneva,*<br>*on behalf of the POLAR collaboration*<br><br>POLAR is a joint European-Chinese experiment aimed at a precise measurement of hard X-ray polarization (50-500 keV) coming from the prompt emission of Gamma-Ray Bursts. The main objective is a better understanding of the geometry of astrophysical sources and of the X-ray emission mechanisms. POLAR is a compact Compton polarimeter, which consists of 1600 low-Z plastic scintillator bars read out by 25 flat-panel multi-anode photomultipliers. The flight model of POLAR is currently under construction in Geneva. The POLAR instrument will be placed onboard the Chinese spacelab TG-2, scheduled for launch in low Earth orbit in 2015. Results from the calibration of a flight prototype with synchrotron radiation will be shown. |

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| **18:30** | **337** | **FlashCam: a Camera with Continuous Signal Digitization for CTA**<br><br>*Arno Gadola, Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich, on behalf of the FlashCam collaboration and the CTA consortium.*<br><br>The Cherenkov Telescope Array (CTA) is the next generation ground-based observatory for cosmic gamma rays [1]. The FlashCam [2] is a novel camera developed for the mid-size CTA telescopes. Its architecture permits a wide flexibility. The physical separation of the readout electronics and the photodetectors facilitates a flexible mechanical arrangement of both parts and an easy adaption of different sensors (e.g. PMT, SiPM) to the readout system. The FlashCam features a continuous digitization of the sensor's signal with processing on FPGAs. The trigger logic is implemented on FPGAs using the full digitized waveform information. The current status and future plans will be presented.<br><br>[1] DOI/10.1016/j.astropartphys.2013.01.007<br>[2] arXiv:1211.3684v1 [astro-ph.IM] |
| **18:45** | **338** | **Response of liquid xenon to low energy electronic and nuclear recoils**<br><br>*Payam Pakarha, Physics institute, University of Zürich, Winterthurerstrasse 190, 8057 Zürich*<br><br>Liquid xenon is widely used for direct dark matter searches, where the detection method is based on the interaction of WIMPs with atomic nuclei. The Xurich detector, a small time-projection- chamber (TPC), was built and successfully used for studying the response of liquid xenon to electronic recoils down to 1.5 keV. An upgrade of the detector is currently under construction and aims to measure the response to the nuclear recoils down to 2-3 keV. The results of the measurements with Xurich detector will be presented, together with the status and plans with the new TPC. |
| **19:00** | **339** | **Photon Detectors for the XENON1T Dark Matter Experiment.**<br><br>*Daniel Mayani, Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich*<br><br>The XENON1T experiment is currently under construction at the Gran Sasso Laboratory in Italy. Its aim is to detect dark matter particles through their interaction with liquid xenon (LXe). When an interaction occurs in the LXe, VUV scintillation light is emitted and subsequently observed with photomultiplier tubes (PMTs). I will present results of performance studies of the XENON1T PMTs at cryogenic temperatures, in similar conditions as operated in a liquid xenon dark matter experiment. |
| **19:15** | **340** | ~~**Material screening for XENON1T dark matter experiment**~~<br><br>~~*Francesco Piastra, Physik-Institut, Universität Zürich, Winterthurerstr. 190, 8057 Zürich*~~<br><br>~~The XENON1T experiment will start soon to take data to search signals from WIMPs scattering off Xe nuclei with cross section sensitivity down to 2·10$^{-47}$ cm$^2$ with an exposure of 2 ton · year. This implies a background lower than 1·10$^{-4}$ events/kg · day · keV in the signal region. In order to fulfill this requirement a material screening campaign is being carried on with several high sensitive techniques. In this talk such techniques will be presented as well as the preliminary results of the screening campaign and the preliminary background predictions.~~ *cancelled* |
| **19:30** | | |
| **19:45** | | ***Conference Dinner*** |

## *Wednesday, 02.07.2014, Room 002*

| Time | ID | *60 Years CERN Ceremony* |
|---|---|---|
| **13:00 - 15:00** | | ***Details see p. 2*** |

| Time | ID | V: LHC Physics<br>*Chair: Hans Peter Beck, Uni Bern* |
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| 15:15 | 341 | **Measurements of the properties of the Higgs-like boson in the four lepton decay channel with the ATLAS detector**<br><br>*Eleonora Benhar Noccioli, Université de Genève*<br><br>In this talk I will present the latest search results and property measurements of the observed Higgs-like boson in the decay channel H→ZZ→4l [1]. Based on the entire dataset collected by the ATLAS experiment at the LHC in 2011 at 7 TeV, corresponding to 4.6 $fb^{-1}$, and in 2012 at 8 TeV, corresponding to 20.7 $fb^{-1}$, measurements of the new particle's mass, couplings and spin-parity properties will be shown.<br><br>[1] ATLAS Collaboration, "Measurements of the properties of the Higgs-like boson in the four lepton decay channel with the ATLAS detector using 25 $fb^{-1}$ of proton-proton collision data", ATLAS-CONF-2013-013. |
| 15:30 | 342 | **Search for heavy resonances dacaying into a pair of Higgs bosons in the $\tau\bar{\tau}b\bar{b}$ final state at CMS**<br><br>*Camilla Galloni, Ben Kilminster*<br>*University of Zürich, Winterthurerstr. 190, 8057 Zürich, on behalf of the CMS conference committee*<br><br>A search for heavy resonances decaying into a pair of Higgs bosons is presented. Resonance masses between 1 and 3 TeV are considered. The final state where one of the two Higgs boson decays into bottom quarks and the other one into tau leptons is investigated. This final state benefits from comparably high statistics due to the high branching ratio of the Higgs boson into b quarks. Furthermore, the presence of the two tau leptons helps to discriminate signal from various backgrounds such as QCD multi-jet events. For the resonance mass range considered the decay products are mostly highly energetic, such that the Higgs decay products can be very collimated. |
| 15:45 | 343 | **Search for SUSY in hadronic final states using MT2 with the CMS detector at the LHC**<br><br>*Mario Masciovecchio, ETH Zürich & CERN, 1211 Genève 23*<br>*on behalf of the CMS conference committee*<br><br>A search for new physics is presented, using a sample with 19.5/fb integrated luminosity of √s = 8 TeV proton-proton collisions collected by the CMS experiment, at the LHC. Two different approaches are pursued. Inclusive MT2 analysis is based on fully hadronic final states. Events are selected using the stransverse mass variable, MT2, and analyzed separately for different jet and b-jet multiplicities. MT2 Higgs analysis targets SUSY models with a Higgs boson produced within SUSY cascades and exploits the dominant decay channel to a b-pair, where a signal is searched for in the invariant mass distribution of the selected b pairs and MT2 is used to reject Standard Model background. |
| 16:00 | 344 | **Measurements of CP violation in the $B_s^0$ system at LHCb**<br><br>*Mirco Dorigo, EPFL, LPHE, BSP 621 (Cubotron UNIL), 1015 Lausanne*<br><br>The study of CP violation in $B_s^0$ oscillations is one of the key goals of the LHCb experiment. Effects are predicted to be very small in the Standard Model, but can be significantly enhanced in many models of new physics. We present the world's best measurements of the CP-violating phase $\varphi_s$ in $B_s^0 \to J/\Psi hh$ decays (h = K, π). |

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| **16:15** | **345** | **Higgs coupling studies at a High Luminosity-LHC with ATLAS detector**<br><br>*Reina Camacho, Université de Genève, 24, Quai Ernest-Ansermet, 1211 Genève, on behalf of the ATLAS collaboration*<br><br>Following the discovery of a Higgs boson with mass equal to 125 GeV by the ATLAS and CMS Collaborations, it is useful to understand the prospects for measuring Standard Model Higgs boson processes with the High Luminosity (HL) LHC. Studies are presented on the prospects of measuring Higgs boson properties (coupling properties, spin and parity) in 14 TeV proton-proton collisions at the LHC with 300 $fb^{-1}$ and at the HL-LHC with 3000 $fb^{-1}$. Generator-level Monte Carlo events are used to perform these studies, with parameterised efficiencies and smearings applied to approximate the expected detector performance under HL-LHC conditions. |
| **16:30** | | ***Coffee Break*** |
| | | **VI: Neutrinos**<br>*Chair: André Rubbia, ETH Zürich* |
| **17:00** | **351** | **The GERDA Experiment for the Search of Neutrinoless Double Beta Decay**<br><br>*Manuel Walter, Physik Institut, Universität Zürich, Winterthurerstr. 190, 8057 Zürich*<br><br>GERDA is designed to search for the lepton number violating neutrinoless double beta ($0\nu\beta\beta$) decay. It employs bare high purity germanium diodes directly immersed in liquid argon. Phase~I operated till May 2013 with a mean background near the Q-value of $1{\cdot}10^{-2}$ cts/(keV · kg · yr). GERDA sets a new lower limit of $T_{½} > 2.1{\cdot}10^{25}$ yr (90 % C.L.) disfavouring the long standing claim of signal observation. For Phase II, exploring half-lifes up to $1.5{\cdot}10^{26}$ yr, additional 20 kg of broad-energy Ge detectors will be installed in summer 2014. An order of magnitude less background will be achieved with an active liquid Ar veto and pulse shape analysis. |
| **17:15** | **352** | **Hadron production measurement from NA61/SHINE**<br><br>*Alexander Korzenev, University of Geneva, DPNC, 24, Quai Ernest-Ansermet, 1211 Genève*<br><br>Results from the NA61/SHINE experiment on the determination of charged hadron yields in proton-carbon interactions are presented. They aim to improve predictions of the neutrino flux in the T2K experiment. The analysis is based on the dataset collected by NA61/SHINE in 2009. Data were recorded using a secondary-proton beam of 31 GeV/c momentum from CERN SPS which impinges on a graphite target. The production cross section spectra for charged pions, kaons and protons are presented. They are used in the T2K beam simulation program to reweight hadron yields at the interaction vertex. All measured spectra are compared to predictions of hadron production models. |
| **17:30** | **353** | **Current Status of the MicroBooNE Experiment**<br><br>*Matthias Lüthi, LHEP, Universität Bern, Sidlerstrasse 5, 3012 Bern*<br><br>MicroBooNE is a short baseline neutrino experiment in the Booster Neutrino Beam (BNB) at Fermilab, it will investigate the low energy electron-like excess signal observed in MiniBooNE. Furthermore detailed studies of neutrino cross sections will be performed. The detector is a liquid argon time projection chamber (LAr TPC) chosen for its fine grain tracking and the calorimetry, which allow for particle identification to a high precision. Additionally the experiment is a technology test and a step toward design and operation of a large scale LAr TPC. |
| **17:45** | **354** | **Multi-nucleon interaction model to answer the low energy neutrino CCQE cross-section discrepancy.**<br><br>*Asmita Redij, Albert Einstein Center for Fundamental Physics, Univ. of Bern, Sidlerstr. 5, 3012 Bern*<br><br>The MiniBooNE experiment reported a larger value of the charged current quasi-elastic (CCQE) cross-section than all measurements before. This enhancement could be explained by incorporating two-body currents which give rise to a multi-nucleon interaction, where two or more nucleons are knocked out. In a detector that do not tag protons, these events mimic CCQE. Lepton kinematics of multi-nucleon interactions are different from that of CCQE and would lead to wrong-reconstruction of neutrino energy when the event is mis-identified as CCQE. I worked on implementing Nieves multi-nucleon model in neutrino generator. This work will facilitates testing these models with available data and reducing the cross-section systematics in oscillation analysis. |

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| **18:00** | **355** | **Dark Matter and Neutrino Physics with the DARWIN Experiment**<br><br>*Alex Kish, Physik-Institut UZH, Winterthurerstr. 190, 8057 Zürich*<br><br>In present understanding, most of the matter in the Universe is in a form of 'dark matter', with the best motivated candidate being a Weakly Interacting Massive Particle (WIMP). The exploration of the entire experimentally accessible WIMP parameter space, down to $10^{-49}$ cm$^2$, a region where solar neutrino interactions become an irreducible background is foreseen with an ultimate liquid xenon-based experiment at the 20 ton scale. The design and R&D works for such a project were initiated by the DARWIN consortium. This talk will be focused on the background assessment and sensitivity studies for various physics goals (WIMP and neutrino detection, and $0\nu\beta\beta$-decay of $^{136}$Xe) with detailed Monte Carlo simulations. |
| **18:15** | | ***END*** |

## *Wednesday, 02.07.2014, Room C 230*

| Time | ID | **VII: Low-Energy Precision Physics**<br>*Chair: Klaus Kirch, ETH Zürich & PSI Villigen* |
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| **17:00** | **361** | ~~**Polarization Observables *T* and *F* in Single $\pi^0$ and $\eta$-Photoproduction off Quasi-Free Nucleons**~~<br><br>~~*Thomas Strub, Departement Physik, Universität Basel, Klingelbergstrasse 82, 4056 Basel*~~<br><br>~~Meson photoproduction is a powerful tool to study the nucleons excitation spectrum and test effective quark models which operate in the non-perturbative regime of QCD. An insight into the $J^P$ configurations and isospin decompositions of the contributing resonances is gained by measuring a minimal set of polarization observables on both the proton and the neutron. Single $\pi^0$ and $\eta$ photoproduction off a transversally polarized D-butanol target has been measured with the Crystal Ball/TAPS setup (A2@MAMI) using circularly polarized bremsstrahlung photons. The double polarization observable *F* and the target asymmetry *T* is extracted for the first time for polarized, quasi-free neutrons.~~ *cancelled* |
| **17:15** | **362** | **A Dedicated Calibration Tool for the MEG & MEGII Positron Spectrometer**<br><br>*Giada Rutar, Paul Scherrer Institut & ETH Zürich, 5232 Villigen, on behalf of the MEG Collaboration*<br><br>The MEG experiment has recently set a new upper limit of $5.7\times10^{-13}$ (90% C.L.) on the branching ratio of the $\mu^+ \to e^+\gamma$ decay, making use of one of the most intense continuous surface muon beams in the world, at PSI Villigen. High resolutions in terms of energy, timing and relative opening angle of the $e^+$ and $\gamma$ are necessary, requiring careful calibration and monitoring of the experimental apparatus. A new calibration method involving Mott scattering of a monochromatic positron beam at energies close to the MEG signal energy and allowing an independent study of the positron spectrometer properties will be presented. |
| **17:30** | **363** | **A Compact Muon Beam Line for the Mu3e Experiment**<br><br>*Felix Berg, Paul Scherrer Institut, OFLC/005, 5232 Villigen*<br><br>The Mu3e Experiment is aiming for a sensitivity of $10^{-16}$ in the search for the charged lepton flavour violating decay $\mu^+ \to e^+ e^+ e^-$. This requires both a continuous muon beam and a, to date unprecedented intensity, a factor which predestines the Paul Scherrer Institut as its location. Phase A of the experiment shares one of the world's most intense muon beams with the MEG experiment, so placing strong spatial restrictions on the beam line layout. A compact beam line solution, meeting these requirements and utilizing various simulation tools will be presented. |

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| **17:45** | **364** | **Simulation of the performance of the scintillation fibres for the Mu3e experiment**<br><br>*Roman Gredig, Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich*<br><br>Mu3e is a proposed experiment for the search of the lepton flavour violating decay $\mu^+ \rightarrow e^+e^-e^+$ aiming for a sensitivity of $10^{-16}$. Background rejection at a muon decay rate of $10^9$ muons per second needs high vertex and time resolution. This presentation shows detailed studies on a fibre timing system mainly done with GEANT4 to optimize the fibre geometry and staggering. It has been focused on photon yield and time resolution. The results are also used to optimize a simulation covering the whole detector geometry where an individual photon tracking was not feasible anymore. |
| **18:00** | **365** | **A New High Intensity Muon Beamline at the Paul Scherrer Institut**<br><br>*Zachary Hodge, Felix Berg, Laurent Desorgher, Albert Fuchs, Wojciech Hajdas, Peter-Raymond Kettle, Andreas Knecht, Roland Lüscher, Angela Papa, Giada Rutar, Michael Wohlmuther, Paul Scherrer Institut, 5232 Villigen PSI*<br><br>The Paul Scherrer Institut produces the most intense DC source of positive muons in the world and to fulfill the demands of next-generation charged lepton-flavor violating decay experiments and materials science applications, novel muon beam production and transport concepts are required. The High Intensity Muon Beam line (HiMB) project is undertaking a feasibility study to assess the possibility of increasing the muon rates by using the target window of the SINQ spallation neutron source as a surface muon production target. This contribution will present the current status of the study and efforts to improve the existing muon production target. |
| **18:15** | | ***END*** |

| ID | Nuclear, Particle- and Astrophysics Poster |
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| **371** | **Measurements in Association with Electroweak Bosons at LHCb**<br><br>*Christian Elsasser, Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich*<br><br>The detector of the LHCb experiment has been designed as a single-arm forward spectrometer giving it a unique opportunity among the LHC experiments to measure the production of electroweak bosons in the forward direction. Such measurements are of particular interest as they probe small fractional momenta (Bjorken-x) of the partons of the hard scattering process. The talk discusses recent measurements in context of the production of electroweak bosons including also the measurement of the Z boson production in proton-lead collisions at LHCb serving as a first direct constraint of nuclear PDFs at low values of x. |
| **372** | **Searches for New Physics in hadronic final states at the ATLAS detector with LHC Run-I data**<br><br>*Caterina Doglioni, University of Geneva, 24, Quai Ernest-Ansermet, 1211 Genève*<br><br>New particles and fundamental states, as well as further structure of known particles and new forces, are predicted by numerous extensions of the Standard Model at energy scales of the order of the TeV. Over the course of its first data run, the Large Hadron Collider (LHC) has provided an impressive amount of proton-proton collisions producing particles interacting with quarks and gluons: hadronic jets therefore represent a window to new phenomena that could occur at the highest energy scales ever reached by a particle collider. This contribution presents a summary of searches for new resonances, dark matter particles and extra dimensions involving hadronic jets performed at the ATLAS detector. |
| **373** | **Large area SiPM characterization**<br><br>*Matthieu Heller, Elisa Prandini, Teresa Montaruli, Domenico della Volpe, Juan Antonio Aguilar Sanchez, Mohamed Rameez, Asen Christov, Uni Genève, 24 quai Ernest Ansermet, 1211 Geneva*<br><br>Photo-multipliers are the standard devices used for photodetection. The semiconductor technique has the potential to surpass these almost artisanal detectors given the mass producibility and industrial manufacture. We investigate the properties of large area silicon photomultipliers operated in Geiger Avalanche mode custom produced by Hamamatsu for the University of Geneva. In particular, we measure their responses having in mind their application for gamma-astronomy and their application for the small-size telescopes of the Cherenkov Telescope Array (CTA). |

## 374 Muonium production for fundamental physics experiments

*Kim Siang Khaw [1], Aldo Antognini [1], Florian Piegsa [1], Paolo Crivelli [1], Klaus Kirch [1], Thomas Prokscha [2], Kamil Sedlak [2], Elvezio Morenzoni [2]*
*[1] Institute for Particle Physics, ETH Zürich, Otto-Stern-Weg 5, 8093 Zürich*
*[2] Paul Scherrer Institute, 5232 Villigen PSI*

Muonium ($Mu=\mu^+e^-$) is used in Mu spectroscopy for extracting fundamental constants ($m_\mu$, $\alpha$, $R_\infty$), and testing bound state QED theory. However, the precision is limited by the lack of a high quality Mu source, in terms of vacuum yield, low energy and reliability. To achieve the 3 basic requirements above, we have been working on optimizing $\mu^+ \rightarrow$ Mu conversion efficiency by using mesoporous silica, where our first results show that cold Mu can be produced with high efficiency. We will present our progress and analysis of the data taken at the PSI LEM beamline.
This work is supported by the SNF under grant number 200020_146902.

## 375 Towards a novel muon beamline for next generation precision experiments

*Andreas Eggenberger [1], Aldo Antognini [1], Yu Bao [2], Ivana Belosevic [1], Malte Hildebrandt [2], Kim Siang Khaw [1], Klaus Kirch [1], Andreas Knecht [2], Angela Papa [2], Claude Petitjean [2], Florian Piegsa [1], Stefan Ritt [2], Kamil Sedlak [2], Alexey Stoykov [2], David Taqqu [1], Gunther Wichmann [1]*
*[1] Institute for Particle Physics, ETH Zürich, Otto-Stern Weg 5, 8093 Zürich*
*[2] Paul Scherrer Institute, 5232 Villigen PSI*

Next generation low-energy particle physics experiments such as measurements of the muon g-2, Muonium ($Mu=\mu^+e^-$) spectroscopy or searches for the muon edm require a brilliant muon source. We are developing a tertiary beamline to decrease the phase space of a $\mu^+$ beam by a factor of $10^{10}$ with an efficiency of $10^{-3}$. The idea is to stop MeV $\mu^+$ in helium gas at cryogenic temperatures and compress the $\mu^+$ swarm by means of a gas density gradient and electric and magnetic fields. The cryogenic target is presented in detail including simulations of electromagnetic fields and thermal properties.
This work is supported by the SNF grant 200020_146902.

## 376 Neutron radiography of a helium gas density gradient at cryogenic temperatures for a novel muon beam line

*Gunther Wichmann, Aldo Antognini, Andreas Eggenberger, Kim Siang Khaw, Klaus Kirch, Florian Piegsa, Karsten Schuhmann, David Taqqu, Institute of Particle Physics, ETH Zürich, Otto-Stern Weg 5, 8093 Zürich*

A novel tertiary muon beam line was proposed [PRL97,194801(2006)]. The method uses positive muons stopped in $^4$He gas and exposed to electromagnetic fields. The muon stop distribution is sequentially compressed transversely and longitudinally with respect to a strong magnetic field. A density gradient has been realized and investigated at cryogenic temperatures. Results of a neutron radiography of a density gradient using $^3$He from 5 K to 20 K will be presented. We have demonstrated the feasibility of building a target with a stationary helium gas density gradient exceeding a factor of three in density between bottom and top of the target cell.
This work is supported by SNF 200020_146902.

## 377 Characterisation of the source for ultracold neutrons at the Paul Scherrer Institute (PSI)

*Dieter Ries, Paul Scherrer Institut, 5232 Villigen PSI*

Ultracold neutrons (UCN), having kinetic energies below ~300 neV and thus being storable, are a unique tool for fundamental physics experiments. The high intensity source for UCNs at PSI started its regular operation in 2012. Since then, its performance has been continuously improved due to better control and better understanding of its subsystems. Efforts to independently characterise every subsystem have been going on, including studies of:

- production of neutrons in the spallation target and their thermalisation;
- cold moderation of thermal neutrons in the solid deuterium moderator;
- transport of UCNs to experiments

Results of these measurements as well as detailed comparisons to Monte Carlo simulations will be presented and discussed.
This work is supported by the SNF-grant 2000_20_149813.

**378** **Schnelle Auslese des HV-MAPS Trackers des Mu3e Experiments**

*Simon Corrodi, Institute for Particle Physics, ETH Zürich, Wolfgang-Pauli-Strasse 15, 8093 Zürich*

Das Mu3e Experiment sucht nach dem Lepton-Flavour-verletzenden Zerfall $\mu^+ \rightarrow e^+e^-e^+$ mit einer Sensitivität von besser als 1 in $10^{16}$ -Zerfällen. Um diese Sensitivität zu erreichen, sind 2 Milliarden Zerfälle pro Sekunde notwendig. Alle O(5000) Pixel-Sensoren generieren gemeinsam O(1 Tbit/s) Null-unterdrückte Daten. Diese Daten werden über Aluminium Kapton Flexprints bei 800 Mbit/s aus der aktiven Region gesandt und weiter durch optische Verbindungen bei 6.4 Gbit/s in eine Filterfarm gebündelt. Die Auslese des Mu3e Detektors ist so konstruiert, dass jeder Knoten der auf Grafikprozessoren basierenden Filterfarm die Daten des gesamten Detektors einer ausgewählten Zeitspanne erhält.