3 Astro-, Particle and Nuclear Physics (TASK)

Monday, 21.06.2010, Room 117

Time	ID	**TASK I** *Chair: K. Kirch, PSI & ETHZ*
13:15		*Welcome*
13:20	**301**	**The CHIPP Doctoral Program** *Andrew Hamilton, CERN* The Swiss Institute of Particle Physics (CHIPP) Doctoral Program is one of the beginning steps of the larger initiative of the Swiss Universities Council (SUK) to bring together the doctoral programs of Swiss universities. This talk will outline the goals of the CHIPP Doctoral Program, explain what Swiss PhD students gain from the program, and provide an overview of where the CHIPP Doctoral Program fits into the the wider picture of doctoral programs in Swiss universities.
13:30	**302**	**Highlights of recent MAGIC observations** *Dorothee Hildebrand, IPP, ETH Zürich, Schafmattstrasse 20, 8093 Zürich, for the MAGIC Collaboration* The MAGIC Telescopes form one of the main instruments for measuring gamma-rays from celestial objects in the very high energy regime. MAGIC consists of two 17m diameter Imaging Atmospheric Cherenkov Telescopes (IACTs) situated at 2200 m.a.s.l. on the Roque de los Muchachos (European Northern Observatory, La Palma, Canary Islands) reaching the lowest energy threshold of all current IACTs. We present recent results of observations performed with the MAGIC Telescopes emphasizing active galactic nuclei like M87 and NGC1275.
14:00	**303**	**Measurement of the Lamb shift in muonic hydrogen: hydrogen, QED and the proton radius puzzle** *Aldo Antognini, Max Planck Institut für Quantenoptik, Garching, Germany & ETH Zürich, for the CREMA collaboration* At the Paul Scherrer Institute, Switzerland, we have recently measured several 2S –2P transition frequencies (Lamb shift) in muonic hydrogen (μp) and deuterium (μd) with 20 ppm precision by means of laser spectroscopy. The Lamb shift in μp is dominated by QED effects (mainly vacuum polarization) and the proton finite size effect is as large as 2% of the total Lamb shift. Therefore, from our measurements we can extract the proton radius value with a relative accuracy of 10^{-3}. This new value is 10 times more precise than previously obtained. However, it disagrees by 5 standard deviations from the current CODATA value. The origin of this discrepancy is not yet known. It may come from theory of the muonic hydrogen energy levels (used to deduce the new value), or from problems in hydrogen spectroscopy experiments or hydrogen energy level theory (both used to deduce the CODATA value). The decrease of the proton radius uncertainties opens the way to compare the predictions of hydrogen energy levels with high-precision (u_r = $10^{-12...-14}$) measurements in hydrogen to a previously unachievable level of accuracy. This will stimulate progress in the understanding of the simplest atom and its related bound-state QED theory. For example the prediction of the 1S Lamb shift can be tested to

		a relative accuracy of 3×10^{-7}. Additionally this measurement will improve the Rydberg constant (which is the best known fundamental constant) by a factor of six to a relative accuracy of 1×10^{-12}. First, however, the origin of the ”proton radius puzzle” must be understood. Similarly we have improved the deuteron rms charge radius by an order of magnitude. In addition the Zemach radii of both nuclei and the deuteron polarizability will also be determined. The new proton charge radius value is a benchmark for lattice QCD, and the deuteron radius for few-nucleon theories. The impact of muonic atoms spectroscopy on few-nucleon theories will be extended by the planned measurement of the muonic helium Lamb shift. This will improve by an order of magnitude the helion and alpha-particle radius values to a relative accuracy of 3×10^{-4}. Experimental setup, measurements and results will be presented. Additionally the key issues regarding the observed discrepancy will be given together with the impacts of these measurements on bound-state QED tests and fundamental constants.
14:30	**304**	**First results from the CMS experiment** *Simon De Visscher, Uni Zürich* First results of the CMS experiment will be presented, based on the 0.9 and 2.36 TeV runs late in 2009, as well as the ongoing 7 TeV run in 2010. The talk will cover first measurements of properties of minimum bias events, as well as performance results on physics objects such as jets, missing transverse energy, electrons, muons and particle flow.
14:50	**305**	**First Results from the ATLAS detector and Perspectives** *Xin Wu, Uni Genève* This talk will present the status of the ATLAS experiment, as well as highlights of the latest physics results of proton-proton collisions at center of mass energies of 7 TeV, using data samples collected since March 2010 at the CERN Large Hadron Collider (LHC), focusing on areas where Swiss universities groups have made vital contributions.
15:10	**306**	**New results from the OPERA experiment** *Antonio Ereditato, Uni Bern* The OPERA experiment is running since 2008 in the CERN to Gran Sasso CNGS neutrino beam with the aim of the first measurement of neutrino oscillations in direct appearance mode. The experiment uses nuclear emulsion films on an unprecedented scale for the observation of the short lived tau lepton produced by the interaction of tau-neutrinos, in turn generated from the oscillation of the beam muon-neutrinos. Results from the first two years of running will be presented.
15:30		***Coffee Break***

Time	ID	**TASK II A** *Chair: F. Nessi-Tedaldi, CERN*
16:00	**311**	**Studies of jet based triggers for Supersymmetry searches in the ATLAS experiment** *Tobias Kruker* *Albert Einstein Center for Fundamental Physics, LHEP, University of Bern* At the ATLAS experiment at the Large Hadron Collider it is not possible to record all the collision events because of the too large amount and rate of data this would generate. Every second a so called trigger system has to filter about 200 out of about one billion proton-proton collisions. The fraction of events of a certain type that are selected by the trigger system for storage is the so called trigger efficiency. Because of the high mass of the shortlived Supersymmetric particles, their decay products carry high momentum. The online selection of Supersymmetric events can therefore be done by requiring decay products with high transverse momentum. One sort of decay products are collections bundles of bound quark states, so called jets, stemming from the fragmentation and hadronization processes of single high momentum quarks emerging from the collision. In this talk, I will present the studies I have performed in the framework of a my Master's thesis on the trigger efficiency for filtering Supersymmetric events based on jet signatures. As the Large Hadron Collider started operation in fall 2009, all analyzes were performed on simulated data.
16:15	**312** Cancelled	~~**Search for a gravity mediated Supersymmetry-breaking scenario with early data at 7 TeV at the LHC with ATLAS**~~ ~~*Andreas Battaglia*~~ ~~*Albert Einstein Center for Fundamental Physics, LHEP, University of Bern*~~ ~~In this talk, I will present a search for Supersymmetry with the ATLAS experiment at the LHC. A gravity mediated Supersymmetry-breaking scenario will be tested using first data from the LHC providing proton-proton collisions at 7 TeV centre of mass energy. Events containing one lepton, jets and missing transverse energy in the final state and from an integrated luminosity of up to 10^{-1}pb are taken and compared with by Monte Carlo method simulated events. Comparisons of data with Monte Carlo predictions for characteristic variables (as jet pt, effective mass, etc.) will be shown, and existing exclusion limits from Tevatron experiments will tried to be extended.~~
16:30	**313**	**Exclusion of low-mass, high cross-section SUSY scenarios at the LHC with ATLAS at 7 TeV center-of-mass energy** *Cyril Topfel* *Albert Einstein Center for Fundamental Physics, LHEP, University of Bern* Supersymmetry is a theory proposed as an extension to the well-established Standard Model. If it exists, it elegantly solves the hierarchy problem. However, Supersymmetry must necessarily be a broken symmetry, which causes a large set of new parameters introduced by the breaking mechanism. Different models exists which reduce the huge parameter space considerably, among them is mSUGRA with a manageable set of five new parameters, in addition to those of the well established Standard Model. Two of these parameters are the common sfermion and gaugino masses at the gauge unification scale. In this talk, the study of a scan over these two mSUGRA parameters is presented. Early data from proton-proton collisions at a center-of-mass energy of 7 TeV will by analyzed, and an attempt will be made to extend the limits set by Tevatron.

16:45	**314**	**Supersymmetry at CMS with multijet events: an experimental strategy** *Tanja Rommerskirchen, Univ. Zürich* A search strategy for a missing energy signature compatible with a cold dark matter candidate is presented, using event topologies with exactly n (n=2...6) hadronic jets. The presented analysis compares several kinematic variables which can be used to discriminate against the dominant back- ground from QCD multi-jet events. The variables are compared in terms of their signal sensitivity but also their robustness against systematic uncertainties. The main emphasis of this approach is on developing a robust analysis technique that is suited to the early collision data at the LHC. Expected event yields are reported for selected low mass SUSY parameter sets and the Standard Model backgrounds for a data sample of 100/pb at a centre-of-mass energy of 10 TeV.
17:00	**315**	**Measurements of the Lorentz angle in the CMS barrel pixel detector** *Mirena Ivova Rikova, Univ. Zürich* Ionization charges produced by particles traversing the CMS silicon pixel sensors drift under the combined electric and magnetic fields, experiencing the so-called Lorentz force. Their trajectory is deviated at a Lorentz angle, which leads to a systematic shift of the hit position that has to be corrected. The shift depends on various experimental conditions such as bias voltage, temperature and irradiation. Thus, the Lorentz angle has to be measured in-situ. We present the results of Lorentz angle measurements with the CMS barrel pixel detector obtained with two independent techniques and using both cosmic rays and LHC collision data.
17:15	**316**	**Hit resolution measurements with the CMS pixel detector** *Carlotta Favaro, Univ. Zürich* After commissioning with cosmic rays, the performance of the Compact Muon Solenoid (CMS) experiment at CERN have been evaluated with LHC collisions data. In this presentation we show measurements of the hit resolution for the CMS Barrel Pixel detector. To minimize the uncertainty due to track extrapolation, the measurement technique is based on hit pairs in the overlap region between two sensors within a detector layer. The results are compared with the CMS Monte Carlo and detailed sensor simulations.
17:30	**317**	**A Standard Model Higgs boson search strategy with LHC data** *Jürg Eugster, ETH Zürich* The Higgs boson is the remaining missing ingredient of the Standard Model (SM) of particle physics. An analysis for the search of the SM Higgs boson with the CMS detector is presented. The strategy is discussed for low integrated luminosity of the first pp collision data with a centre-of-mass energy of 7 TeV presumably taken within the next two years with the CERN Large Hadron Colider (LHC). The most promising channel is the inclusive production via the so called gluon-gluon fusion process with a subsequent decay of the Higgs boson into WW pairs, which further decay fully leptonically. The expected significance for this analysis is presented using a detailed Monte Carlo simulation (including detector response) of a potential signal and the expected background processes.

17:45	**318**	**LHC Discovery Potential of a Composite Higgs Model** *Pascal Nef [1], Elisabetta Furlan [2], Charalampos Anastasiou [2], Günther Dissertori [1], Filip Moortgat [1]* *[1] Institute for Particle Physics, ETH Zürich, Schafmattstr. 20, 8093 Zürich* *[2] Institute for Theoretical Physics, ETH Zürich, Wolfgang-Pauli-Str. 27, 8093 Zürich* Composite Higgs models provide a natural realization of electroweak symmetry breaking and are well within the reach of the ongoing LHC run. Fine-tuning is avoided with the introduction of one or more multiplets of new quarks. Various aspects of the phenomenology of this model are presented and its discovery potential in multi-lepton channels with the upcoming LHC data is discussed. Moreover, we outline a new method to reconstruct the mass of the introduced 5/3 charged exotic quarks. This method could be used to distinguish this model from various other BSM models.
18:00	**319**	**Hadro-production measurements for the T2K experiment with the NA61/SHINE detector at the CERN SPS** *Claudia Strabel, André Rubbia, Alberto Marchionni, Silvestro Di Luise, Luigi Salvatore Esposito, ETH Zürich, Schafmattstr. 20, 8093 Zürich* In high precision neutrino oscillation experiments a precise characterization of the neutrino flux is essential for lowering systematical uncertainties and improving the experimental sensitivity. Limitations in the neutrino flux predictions mainly come from the poor knowledge of production cross sections of pions and kaons yielding the neutrino beam. Therefore, hadro-production measurements are mandatory. In this talk the NA61/SHINE detector will be presented, which is a large acceptance hadron spectrometer at the CERN SPS. In particular, the ongoing measurements for predicting the neutrino flux of the T2K experiment at J-PARC will be discussed. They are performed using a 31 GeV/c proton beam impinging on Carbon targets of different lengths. A focus will be put on the absolute normalization of the particle production cross-section.
18:15	**320**	**Pion production measurements in NA61/SHINE for the T2K neutrino experiment.** *Sebastien Murphy, University of Geneva, 24 Quai E Ansermet, 1211 Genève* As the intensity of neutrino beams produced at accelerators increases, important systematic errors due to poor knowledge of production cross sections for pions and kaons arise. Among other goals, the NA61/SHINE (SHINE = SPS Heavy Ion and Neutrino Experiment) detector at CERN SPS aims at precision hadro-production measurements to characterize the neutrino beam of the T2K experiment at J-PARC. These measurements are performed using a 30 GeV proton beam produced at the SPS with carbon targets of different thickness, including the T2K replica target. Preliminary spectra of π^+ and π^- inclusive cross section were obtained from pilot data collected in 2007 with a 2 cm thick target. After a description of the SHINE detector and its particle identification capabilities, results from three different analysis are discussed.
18:30		***Postersession, Apéro, Barbecue***

15:30		***Coffee Break***
		TASK II B *Chair: P.-R. Kettle, PSI*
16:00	**321** Cancelled	~~**Gravitational waves from self-ordering scalar fields**~~ ~~*Elisa Fenu, Theoretical Physics Departement, Université de Genève, 24 quai E. Ansermet, 1211 Genève*~~ ~~Gravitational waves were copiously produced in the early Universe whenever the processes taking place were sufficiently violent. The spectra of several of these gravitational wave backgrounds on subhorizon scales have been extensively studied in the literature. In this paper we analyze the shape and amplitude of the gravitational wave spectrum on scales which are superhorizon at the time of production. Such gravitational waves are expected from the self ordering of randomly oriented scalar fields which can be present during a thermal phase transition or during preheating after hybrid inflation. We find that, if the gravitational wave source acts only during a small fraction of the Hubble time, the gravitational wave spectrum at frequencies lower than the expansion rate at the time of production behaves as $\Omega_{GW}(f) \sim f^3$ with an amplitude much too small to be observable by gravitational wave observatories like LIGO, LISA or BBO. On the other hand, if the source is active for a much longer time, until a given mode which is initially superhorizon ($k\eta_* << 1$), enters the horizon, for $k\eta > 1$, we find that the gravitational wave energy density is frequency independent, i.e. scale invariant. Moreover, its amplitude for a GUT scale scenario turns out to be within the range and sensitivity of BBO and marginally detectable by LIGO and LISA. This new gravitational wave background can compete with the one generated during inflation, and distinguishing both may require extra information.~~
16:15	**322**	**An alternative approach to non-commutative inflation** *Massimiliano Rinaldi, Département de Physique Théorique, Université de Genève, 24, quai E. Ansermet, 1211 Genève* We propose an inflationary mechanism inspired by a recent formulation, in terms of coherent states, of non-commutative quantum field theory. In our model, we consider the semiclassical Einstein equations, and we exploit the ultraviolet finiteness of the non-commutative propagator to construct the expectation value of the energy momentum tensor. It turns out that the non-commutative structure of spacetime governs the energy density in such a way that it allows for the violation of the strong energy condition, leading to a bounce and to an inflationary phase, without the need of any ad hoc scalar field. The scale invariance of the perturbation spectrum and the particle production are briefly discussed.

16:30	**323** Cancelled	~~**Velocity Distributions in Titan's Exospheres**~~ ~~*Audrey Schaufelberger [1], Peter Wurz [1], Helmut Lammer [2], Yuri N. Kulikov [3]*~~ ~~*[1] Physikalisches Institut, Universität Bern, Sidlerstrasse 5, 3012 Bern*~~ ~~*[2] Space Research Institute, Austrian Academy of Sciences, Schmiedlstrasse 6, AT-8042 Graz*~~ ~~*[3] Polar Geophysical Institute, Russian Academy of Sciences, Khalturina, 183010 Murmansk, Russian Federation*~~ ~~We present new findings on the velocity distributions of the hydrogen, nitrogen and methane population in Titan's exosphere. The velocity distributions are very well defined at the exobase. However, at higher altitudes gravitational filtering and photo-ionisation start to influence the velocity distributions. To determine the velocity distributions above the exobase, we apply a Monte Carlo code which traces each particle on its ballistic trajectory.~~ ~~Our studies show that almost half of the hydrogen atoms are able to escape Titan's exosphere, while the nitrogen and methane populations only reach up to a few hundred kilometers above the exobase. No nitrogen or methane particle is fast enough to escape Titan's exosphere. Our results are in good agreement with observation data from the Hydrogen Deuterium Absorption Cell (HDAC) instrument on board the Cassini spacecraft but disagree with recent hydrodynamic outflow hypotheses.~~
16:45	**324**	**The Gravitational Wave Signature of Supernova Matter** *Simon Scheidegger, Matthias Liebendörfer, Roger Käppeli, Stuart C. Whitehouse, Departement Physik, Universität Basel, Klingelbergstrasse 82, 4056 Basel* Gravitational wave (GW) astronomy may soon become a reality and allow humankind to address questions about many different astrophysical objects that are hidden from the electromagnetic detection. Ever since the first experimental efforts to detect GWs, stellar core-collapse supernovae have been considered as potential astrophysical emission sites. However, GW astronomy strongly depends on the extensive data processing of the detector output on the basis of reliable GW estimates, which only recently have become feasible with the emerging power of supercomputers. We will report on recent improvements of modeling three-dimensional magneto-hydrodynamical core-collapse supernovae. Furthermore, we will present the gravitational wave analysis of a comprehensive set of 30 3D models. We will focus our discussion on the imprint of 3D nonaxisymmetric features onto the GW signature due to the underlying finite temperature equation of state, strong magnetic fields and the rotation rate.
17:00	**325**	**Model independent constraints from the CMB** *Marc Vonlanthen, Ruth Durrer, Syksy Rasanen, Département de Physique théorique de l'Université de Genève, Quai E. Ansermet 4, 1211 Genève* We analyse CMB data in a manner which is as model-independent as possible. Indeed, the model which best fits the CMB data is the ΛCDM model. This standard model of cosmology assumes a cosmological constant which dominates the energy budjet of the universe today. There are three main problems related to this cosmological constant. There are solutions to these problems, but these solutions require that we assume a specific model for the late time cosmology, and since we do not know which model is the correct one, it is worthwhile to develop a methodology to study the CMB model-independently.

		I will overview the cosmological constant problems to make our motivations clear, explain our methodology and give the results we obtain. Finally, I will conclude with a small discussion of these results.
17:15	**326**	**Quark matter in supernova explosions and the possible site for the synthesis of heavy elements** *Tobias Fischer* *Department of Physics, University of Basel, Klingelbergstrasse 82, 4056 Basel* Heavy ion collision experiments explore the state of matter at high temperatures and baryon densities, conditions which can be found in stellar interiors. Of particular interest in the context of core collapse supernovae is the possibility of the quark-hadron phase transition. We construct a quark equation of state based on the MIT bag model. Due to the high temperatures of tens of MeV and the high iso-spin asymmetry of supernova matter, the critical density for the appearance of quarks is close to nuclear saturation density. The transition is modeled by an extended co-existence region, i.e. the quark-hadron mixed phase, applying Gibbs conditions. The quark equation of state is applied to core collapse simulations of low and intermediate mass progenitor stars. The appearance of quarks triggers not only the explosion, where otherwise no explosion could be obtained, it also releases an additional outburst of neutrinos dominated by electron-antineutrinos. Our core collapse model is based on general relativistic radiation hydrodynamics and three flavour Boltzmann neutrino transport in spherical symmetry. In addition to the quark-hadron phase transition induced explosion, a reasonable amount of neutron-rich material is ejected on a fast expansion timescale. These conditions might favour the production of heavy elements via the rapid capture of neutrons known as the r-process, where the conditions found in neutrino-driven explosions are least favourable.
17:30	**327**	**Search for Dark Matter with the PEBS (Positron Electron Balloon Spectrometer) Detector** *Lesya Shchutska [1], Aurelio Bay [1], Günther Dissertori [2], Alex Gong [3], Oliver Grimm [2], Guido Häfeli [1], Liang Li [3], Changxing Lin [3], Jean-Baptiste Mosset [1], Werner Lustermann [2], Tatsuya Nakada [1], Paola Solevi [2], Fabien Zehr [1]* *[1] Laboratoire de Physique des Hautes Energies, EPFL, 1015 Lausanne* *[2] Institute for Particle Physics, ETH Zürich, 8093 Zürich* *[3] Tsinghua University, Tsinghua University, 100084 Beijing, China* The PEBS project has been inspired by the recent PAMELA data, that show excess in the positron fraction above 10 GeV, and ATIC and FERMI features in the e^+ - e^- spectrum in the 300-800 GeV range. The spectrometer consists of a permanent magnet, a scintillating fiber tracker, a transition radiation detector and an electromagnetic calorimeter and aims to deliver precise measurements of the e^+ - e^- flux up to 2 TeV, of the positron fraction up to 600 GeV and of the antiproton flux up to 100 GeV. PEBS will also provide an entry platform for future balloon programmes which could be equipped differently to suit other physics questions. In order to gain experience for the first flight hoped to take place in 2012, a smaller version of the detector, PERDaix, comprising a magnet, a tracker and a TRD is being prepared and will be launched already in autumn 2010. It will measure proton, He, electron and positron fluxes between 0.5 and 5 GeV which will contribute to the further understanding of charge-sign dependent solar modulation of cosmic rays flux. GEANT4-based simulation of PEBS and PERDaix together with tests of an ECAL prototype performed with CERN PS electron beam are being discussed in detail.

17:45	**328**	**Photoproduction of π^0-Mesons off Quasi-Free Protons and Neutrons** *Manuel Dieterle* *Departement Physik, Universität Basel, Klingelbergstrasse 82, 4056 Basel* Meson photoproduction serves as an ideal tool in order to determine the isospin structure of the electromagnetic transitions. For this purpose the same reactions on the free proton and on the neutron are necessary. Since free neutron targets do not exist, one has to use photoproduction from light nuclei, in particular from the deuteron. As a consequence, the reactions are affected by Fermi motion and possibly by final state interactions. Fortunately, the comparison of the quasi-free reaction measured in coincidence with recoil protons to the reaction on the free proton enables the investigation of such effects. Results from a new high statistics measurement at MAMI of π^0- photoproduction off the deuteron in coincidence with recoil protons and neutrons throughout the second and third resonance regions will be discussed. Furthermore, results of the coherent reaction allows the analysis of the isospin degree of freedom. *Supported by SNF and DFG.*
18:00	**329**	**Nuclear Muon Capture on the Deuteron - the MuSun experiment** *Claude Petitjean, Malte Hildebrandt, Bernhard Lauss* *Paul Scherrer Institut, 5232 Villigen PSI* On behalf of the MuSun collaboration we present a status report on the new μ–d capture experiment at PSI. Like the previous μ–p capture experiment this is a high precision lifetime measurement to determine the doublet capture rate of the μ–d atom. A new Cryo-TPC was developed which operates with ultra-pure deuterium gas at 30K and acts as active muon stopping target and as muon tracker. The physics goal is a measurement of the L_{1A} parameter in effective field theories which calibrates the sun (p + p fusion reaction) and also ν + d scattering for the SNO neutrino detector. We will describe the Cryo-TPC and its performance during the first two test runs with muons.
18:15		
18:30		***Postersession, Apéro, Barbecue***

Tuesday, 22.06.2010, Room 117

Time	ID	**TASK III A** *Chair: H. P. Beck, Uni Bern*
13:15	**331**	**Search for Excited Electron Production in ATLAS at the LHC** *Ahmed Abdelalim, Alain Blondel, Bertrand Martin, DPNC, Section de physique, Université de Genève, 24, Quai Ernest-Ansermet, 1211 Genève* Our analysis is devoted to the search for excited electron (e*) production, whose existence is predicted by compositeness models. In the studied scenario, excited fermions are coupled to Standard Model (SM) fermions via a 4-fermion Contact Interaction (CI) lagrangian, and to Standard Model gauge bosons via a “SM-like” lagrangian. The phenomenology is entirely described by the compositeness scale Λ and the excited electron mass me*. We look for single production of e* (so that a

		larger me* range can be probed), the excited electron decaying to an electron and a photon: pp→ee*→eeγ. Given the current (me*, Λ) limits (from D0), excited electrons are expected to be very massive, thus producing very high pT electrons and photons in the final state. Providing reliable reconstruction and identification efficiencies for high pT e/γ, as well as a robust fake rate estimation at high pT are the main concerns of this analysis.
13:30	**332**	**Measurement of W-bosons in association with jets events in the ATLAS detector at the LHC accelerator** *Nicola Venturi* *Albert Einstein Center for Fundamental Physics, LHEP, University of Bern* I will present studies on the production of W Boson in association with jets done with the ATLAS experiment at the LHC. This process is a major background for beyond the standard model signals like Supersymmetry and also for Standard Model process like top. It also offers the opportunity to probe perturbative QCD at the TeV scale. Moreover, W+jets events with hishave a high cross section and will be one of the first Standard Model electro-weak signal to be seen at the LHC. The focus of the talk will be on measurement of the ratio W plus (n+1)-jets divided by W plus (n)-jets for those events in which the W boson decays in an electron and an undetecteable neutrino. The measurement of ratio has the advantage to be more robust against systematic uncertainties from measurement of luminosity; jet energy scale; and electron trigger and reconstruction efficiencies as these cancel out partially in the ratio. Different predictions from a variety of Monte Carlo generators are compared and the major uncertainties like the jet energy scale are estimated. Whenever possible, collider data at 7 TeV center of mass energy will be compared to Monte Carlo predictions and the QCD Background extracted with data driven methods.
13:45	**333**	**Performance of the CMS silicon pixel detector: results from first data** *Andreas Jäger, Univ. Zürich* The CMS experiment is one of the four detectors measuring the proton-proton collisions delivered by the Large Hadron Collider at CERN. In its innermost region it includes a silicon pixel detector for reconstructing tracks and vertices. A correct understanding of the detector response is crucial for early physics analyses. In this presentation we show the pixel detector performance in terms of charge collection, cluster multiplicity, occupancy and compare them with Monte Carlo simulations. In addition, we introduce the "template technique" for pixel hit reconstruction and discuss its performance.
14:00	**334**	**Study of the Bs-meson with forthcoming data at the CMS detector** *Barbara Millan Mejias, Univ. Zürich* Properties of the Bs-meson can be measured with the first data of the CMS detector at the LHC at the center of mass energy of 7 TeV. The CMS pixel detector allows a precise measurement of the Bs decay vertices which are displaced from the proton-proton interaction point. This facilitates the measurements on the Bs mass and decay time, specifically for the decay channel Bs → (J/ψ)φ → ($\mu^+\mu^-$)K^+K^-. Additionally, prospects for the measurement of the Bs mixing parameters such as the width difference between heavy and light mass eigenstates and the CP violating weak phase, which is sensitive to physics beyond the standard model, will be given.

14:15	**335**	**Jet distributions with first LHC data at the CMS experiment** *Matthias Artur Weber, ETH Zürich* Since the end of 2009 LHC delivers proton-proton collisions to the CMS experiment. We present results on various jet distributions, including event shapes, using the data recently recorded with the CMS detector. The jet distributions are compared with PYTHIA simulation predictions, both inclusively and for dijet events. We show distributions for all three types of jet reconstruction employed by CMS: purely calorimetric jets, jets corrected with tracks and particle flow jets.
14:30	**336**	**Search for Supersymmetry signatures with the CMS detector in events with two same-sign electrons** *Predrag Milenovic, ETH Zürich* Characteristic signatures of supersymmetry with R-parity conservation include isolated same-sign dilepton pairs, accompanied by energetic jets and missing transverse energy. The detection of these signatures relies on the observation of an excess of events over the Standard Model background expectation. In this talk we present the method to estimate from data the rate of Standard Model QCD background for the same-sign dielectron final states. Evaluation of the performance is done with mSUGRA benchmark points, using the full simulation of the CMS detector and for an integrated luminosity of 100 pb^{-1}.
14:45	**337**	**A Tale of Two Ts:** **The Performance of the Tracker Turicensis at the LHCb Experiment** *Michel De Cian* *Physik Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich* LHCb, the dedicated b-physics experiment at the Large Hadron Collider (LHC), will make precision measurements of CP-violating and rare decays in the b-quark sector. The LHCb Silicon Tracker, composed of silicon micro-strips, constitutes a significant part of the LHCb tracking system. The detector has two parts: the Tracker Turicensis (TT), which covers the full acceptance and is located upstream of the LHCb dipole magnet; and the Inner Tracker (IT) which covers the central region of the three tracking stations downstream of the magnet where the particle flux is highest. We present the results of calibration and performance studies of the TT using data collected during LHC proton-proton collisions in 2009 and 2010. Furthermore we will give a short overview of how well the Tracker Turicensis is aligned and present a study using gamma conversions to estimate the material distribution in the detector. The results are compared with expectations from Monte Carlo simulations.
15:00	**338**	**Tracker alignment in LHCb** *Vincent Fave, LPHE, EPFL, BSP, 1015 Lausanne* The results of the alignment of the LHCb Silicon Tacker using Kalman Filter Tracks from collision data are presented. I will discuss the internal alignment of the Inner Tracker and the relative alignment of each sub-element of the tracker system. I will also present the eigenmodes of the alignment and show how the weakmodes can be controlled by the application of a cut on the eigenvalues of the alignment system.

15:15	**339**	**Cosmological and astrophysical bounds on super-weakly interacting dark matter** *Oleg Ruchayskiy, Alexey Boyarsky, EPFL, LPPC ITP BSP FSB, 1015 Lausanne* We consider a class of super-weakly interacting dark matter candidates with the mass in the keV range. We review astrophysical and cosmological bounds on their properties and discuss implications for several particle physics models.
15:30		***Coffee Break***
		TASK IV A *Chair: V. Chiochia, CERN*
16:00	**341**	**Beauty production at LHC** *Lukas Wehrli, ETH Zürich* Beauty production represents a powerful tool to study the theory of strong interactions, Quantum Chromodynamics (QCD). At the Large Hadron Collider (LHC), beauty quarks will be abundantly produced through the strong interaction at the highest energy scale available ever. At previous accelerators, predictions based on perturbative QCD are able to describe the overall features of beauty production in general pretty well, however a couple of open questions remain to be resolved in particular regions of phase space. On the other hand, understanding beauty production in greatest detail is one of the crucial prerequisites for a discovery of new physics, because it will be one of the main sources of background processes for many high precision searches. In this study the long lifetime of the B hadron and the excellent tracking detector of the CMS experiment are exploited to tag one or even two B hadrons in QCD jets, based on reconstructed decay vertices. Detailed investigations on the production and correlations of beauty quarks are presented.
16:15	**342**	**Search for Supersymmetry in Same-Sign Di-Muon Events at the CMS Detector** *Benjamin Stieger, ETH Zürich* The theory of supersymmetry solves several problems of the standard model of particle physics, while predicting yet unobserved particles. A promising channel to search for supersymmetric particles at the CMS detector includes a pair of likewise charged muons, in combination with multiple jets and missing transverse energy. The main background to these kind of events comes from the production of a particle-antiparticle pair of top quarks, where one of the muons comes directly from the decay of a top, and the other appears inside a b-jet. An important aspect of the analysis is therefore to estimate the contribution from these secondary muons to the selected signal events. The method presented here is based on the ratio of muons passing tight and loose isolation selections, and can be studied already with the LHC data expected in the first half of this year.

16:30 | **343**

Status report of the T2K experiment and the magnetic field mapping at its near detector

Eike Frank
Albert Einstein Center for Fundamental Physics, LHEP, University of Bern

In the talk I will present the T2K experiment: the first long baseline off-axis neutrino oscillation experiment. In T2K we aim to refine the measurements of the oscillation parameters Dm_{23} and θ_{23}, discovered by SuperKamiokande with atmospheric neutrinos, respectively at a level of 10% and <1% uncertainties in disappearance neutrino oscillation mode.
The two parameters are fundamental ingredients for the key research item of T2K that is the discovery of θ_{13}, the third angle of the neutrino flavor mixing matrix. θ_{13} has not yet been observed and is needed to understand CP violation in the leptonic sector. The oscillation search in T2K is based on the comparison of the neutrino beam-flux measured at a close detector station (ND280 at a distance of 280m from the neutrino beam source) with the flux measured at a far detector station (295 km), that is the SuperKamiokande detector. The close detector is made of several sub-detectors, among which a TPC, immersed in a magnetic field of 2000 Gauss. The precision of the field map affects directly the precision measurement of the kinematical variables entering in the neutrino oscillation analysis. LHEP, University of Bern, had the responsibility to measure the magnetic field with a precision of 1 Gauss for the transverse components. As a member of LHEP I actively participated in the measurement and it will also be one of the items of my Ph.D. thesis.

16:45 | **344**

Acoustic detection of ultra high energy neutrinos

Mathieu Ribordy, EPFL, LPHE - BSP 626, 1015 Lausanne

The GZK neutrino flux characterization would give insights into cosmological source evolution, source spectra and composition at injection from the partial recovery of the degraded information carried by the ultra high energy cosmic rays. The flux is nevertheless expected to be at levels necessitating much larger instrumented volume (>100 km^3) than currently operating ones (<1 km^3). First suggested by Askaryan, both radio and acoustic detection techniques could render this quest possible thanks to longer wave attenuation lengths (predicted to exceed kilometer but unfortunately recently found to be likely shorter for acoustic waves) as compared to optical allowing for much sparser instrumentation. We present the acoustic R&D activities conducted at the EPFL: We report on the technology, on the sensor performance with a largely improved sensitivity and highlight future plans. Given the acomplished progress, we define the new requirements for the construction of a full scale detector.

17:00 | **345**

Search for a flux of ultra high energy neutrinos with the IceCube neutrino telescope

Shirit Cohen, Mathieu Ribordy, EPFL-SB-IPEP-LPHE, BSP 624, 1015 Lausanne

The IceCube neutrino observatory is nearly finished with 79 out of the planned 86 strings already deployed with an instrumented volume of about 1km^3. In IceCube, optical modules collect Cherenkov light emitted by neutrino-induced charged lepton and hadron showers in the deep ice. Results from Cosmic Ray observatories show a steepening of the flux of Ultra High Energy CRs that could be explained by the GZK effect. The flux composition of the UHECRs is uncertain and therefore UHE neutrino flux predictions from GZK interactions vary depending on proton or iron dominance.

		GZK neutrino flux characterization would give insights into cosmological source evolution, source spectra and composition at injection. We present preliminary results of a search for a diffuse UHE neutrino flux with the IceCube detector in its 40 strings configuration. One of the challenges is the separation of the low rate UHE neutrino signal from the abundant background of HE muon bundles originating from CR interactions in the atmosphere. Background rejection techniques will be discussed and effective area and sensitivities will be presented.
17:15	**346**	**Search for a neutrino signal from LS I +61303 with IceCube based on a time-dependent emission model** *Levent Demirörs, Mathieu Ribordy, LPHE, EPFL, BSP 611, 1015 Lausanne* IceCube is 90% complete and projected to be fully deployed next austral summer. Covering currently 0.9km^3 of deep ice, it tags neutrinos by detecting the Cerenkov light of neutrino-induced showers. We present a model-dependent search for a neutrino signal from LS I +61303. The model considered here is based on MWL observations, notably Fermi, and assumes that the broad band activity of the system is due to high energy protons interacting with the dense matter and radiation field of the massive star. Making basic assumptions on the geometry of the binary system, the model predicts the time-dependence of the neutrino emissions. Assuming its validity, this alternative model-dependent approach has an enhanced discovery potential and is complementary to generic point sources searches. We will describe the search strategy, and present sensitivities and results based on the 22 and 40 string IceCube configurations.
17:30	**347**	**Swiss Activities in Ground-Based Gamma-Ray Astronomy** *Isabel Braun, IPP, ETH Zürich, Schafmattstr. 20, 8093 Zürich* Swiss institutes participate in Very-High-Energy Gamma-Ray Astronomy projects at different stages of development, ranging from design studies for the future CTA observatory to the development of a novel camera type within the FACT project and data taking and analysis at the operating MAGIC telescopes. This presentation will give a short summary on these contributions and the status of the respective Imaging Atmospheric Cherenkov experiments.
17:45	**348**	**The DWARF network of Cherenkov telescopes for long-term monitoring of bright blazars** *Thomas Bretz, EPFL, BSP Cubotron, 1015 Lausanne, for the DWARF/FACT collaboration* Imaging atmospheric Cherenkov telescopes of the second generation are in operation since a few years. Compared to their predecessor experiments they have a lower energy threshold and higher sensitivity. But for long-term monitoring of well known bright sources the observation time of these instruments is too valuable. Consequently, less powerful and inexpensive instruments are the best choice for these kinds of observations. It is planned to coordinate the observation schedule of still existing older instruments and dedicated new instruments. Agreements with the Whipple 10m-Telescope and TACTIC already exist. Furthermore, building new instruments is foreseen to improve time coverage. One of these telescopes is the FACT project (First G-APD Cherenkov Telescope). An overview of these network activities as well as the status of the FACT project are presented.

18:00	**349**	**Semiconductor photosensors for Cherenkov telescopes** *Thomas Krähenbühl, Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, 8093 Zürich, for the FACT Collaboration* For decades, photomultiplier tubes have been the undisputed choice for light detection on the single photon level. The field is now undergoing a revolution as a new semiconductor photodetector named Geiger-mode Avalanche Photodiode (G-APD) is offering a higher photon detection efficiency at similar gain with comparable or even better noise characteristics. Additional advantages of semiconductor sensors are the small size, the ruggedness and the insensitivity to magnetic fields, which make them an interesting candidate for many applications. The evaluation of G-APDs for Cherenkov telescopes is currently being done in the First G-APD Cherenkov Telescope (FACT) project. Special attention is turned on one of the major downsides of G-APDs, the very strong temperature dependence: the operation under outdoor conditions with varying temperature and background light level can be controlled by using a feedback system which regulates the bias voltage. We will present the main parameters of the design of such a feedback system and the experience gained in its operation under outdoor conditions.
18:15	**350**	**The FACT camera: overview and status** *Patrick Vogler, Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, HPK, 8093 Zürich, for the FACT Collaboration* Within the FACT project (First G-APD Cherenkov Telescope), we develop a camera based on Geiger-mode avalanche photodiodes (G-APD) for Imaging Atmospheric Cherenkov Telescopes. Such telescopes are the workhorses in ground-based very high energy gamma-ray astronomy. Compared to the currently used photomultiplier tubes, G-APDs need a much lower operation voltage, are more robust and promise higher photon detection efficiency. The FACT camera is highly integrated and is equipped with 1440 pixels with new solid light concentrators, a pitch of 9.5mm and a field of view of 0.11 degree per pixel. The readout system is based on the DRS4 analog pipeline chip, operated at a sampling rate of 2 GHz, and a data-acquisition based on standard ethernet. The trigger system uses analog sums of 9 pixels and a majority-coincidence logic. In this talk, the FACT camera design and construction status will be presented.
18:30		***END***

Tuesday, 22.06.2010, Room 116

Time	ID	TASK III B *Chair: C. Petitjean, PSI*
13:15	**351**	**The MEG Experiment - Status and First Results** *Peter-Raymond Kettle* *Laboratory for Particle Physics, Paul Scherrer Institut, 5232 Villigen PSI, on behalf of the MEG Collaboration* The search for "New Physics" is not merely restricted to the high-energy frontier of TeV-scale accelerators. The MEG experiment at PSI, is a lepton-flavour violating (LFV) decay search, aiming at a sensitivity of 10^{-13} for the decay $\mu \rightarrow e + \gamma$. Using one of the most intense surface muon beams, together with the world's largest

		liquid xenon photon detector of 900 litres and a special gradient-field superconducting positron spectrometer, the decay of a muon into a positron and photon can be distinguished from normal Michel muon decay and the prompt background process of radiative muon decay. However, the dominant background from overlapping events requires excellent spatial, temporal and energy resolutions for both systems. The current status of the experiment, as well as the performance and results from the first data-taking periods, will be presented.
13:30	**352**	**The MEG Positron Spectrometer** *Jeanine Adam, Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, 8093 Zürich, on behalf of the MEG Collaboration* The goal of the MEG experiment, which is located at the Paul Scherrer Institute (Switzerland), is to search for the lepton flavor violating decay $\mu \rightarrow e+\gamma$ with a sensitivity of 10^{-13} in branching ratio. To reach this goal, precise measurements of position, timing and energy of both the positron and the photon are necessary. Positron information is provided by the innovative MEG positron spectrometer which consists of a special superconducting solenoid magnet to form a gradient magnetic field, drift chambers and a timing counter system. The drift chamber system consists of 16 low-mass drift chambers to ensure precise momentum measurements while the timing counters provide high precision timing measurements. In 2006 and 2007 commissioning runs were performed whereas in 2008 and 2009 the MEG experiment was taking physics data. This talk will focus on the design of the spectrometer, its commissioning and its performance during data taking.
13:45	**353**	**The PSI UCN Source** *Leonard Goeltl, Paul Scherrer Institut, WMSA B14, 5232 Villigen, on behalf of the UCN project team* Ultra-cold neutrons (UCN) are important probes in state of the art fundamental physics experiments, such as the search for the permanent electric dipole moment of the neutron or the precise measurement of the neutron life time. In order to increase sensitivity of these experiments a new, more intense UCN source was built at the Paul Scherrer Institute in Villigen and is presently being commissioned. The source is expected to deliver UCN, exceeding present best densities by 1-2 orders of magnitude. Neutrons will be produced by hitting a Pb/Zr-spallation target with the full PSI proton beam (590 MeV, 2.2 mA) at a 1% duty cycle with pulse lengths in the order of a few seconds. The produced neutrons will be thermalized in a 3.6 m^3 heavy water moderator and further cooled to the cold and ultra-cold regime in a 30 l deuterium crystal. The UCN will then be confined in a 2 m^3 storage volume, before they can be distributed to the experiments via ~8 m long UCN guides. An overview of the working principle, the status and some instrumentation of the UCN source will be given.

14:00	**354**	**Improved search for the neutron electric dipole moment** *Philipp Schmidt-Wellenburg, Paul Scherrer Institut, WMSA/B14, 5232 Villigen, on behalf of the nEDM collaboration* One of the mysteries of our universe is the observed baryon asymmetry which can not be explained using the Standard Model of particle physics. According to Sacharov this implies further, yet unknown, CP violation which will be tested with a refined search for the neutron electric dipole moment. A collaboration of 15 European institutes has been preparing a more sensitive experiment to be operated at the Paul Scherrer Institut, based on the former RAL/Sussex/ILL. In a first step the sensitivity shall be improved to $d_n<5\cdot10^{-27}$ e·cm to be compared with the present experimental limit of $d_n<2.9\cdot10^{-26}$ e·cm. This will be achieved by significantly increased ultracold neutron densities and an according control of systematic effects. In parallel a completely new apparatus is being developed which will push the sensitivity well into the 10^{-28} e·cm range.
14:15	**355**	**Magnetic guiding field optimization for the nEDM apparatus at PSI** *Edgard Pierre* *Paul Scherrer Institut, 5232 Villigen PSI, for the neutron EDM collaboration.* An international collaboration building the nEDM experiment at PSI Switzerland is searching for the neutron electric dipole moment. The latter, if found, would represent a new signature of CP violation beyond the Standard Model. This high precision measurement needs a polarized ultra-cold neutron (UCN) beam as input. A superconducting magnet (SCM) installed in the beamline is used to polarize the UCN with 100% efficiency. During the transportation from polarizer to precession chamber, the high polarization must be preserved by applying a guiding magnetic field. Furthermore, the spin state shall be selectable by an adiabatic spin flipper. We will present recent results on the guiding field optimization including a computer model and test measurements. Test results on the adiabatic spin flipper working with the stray field of the SCM will also be shortly presented.
14:30	**356**	**The AX-PET Demonstrator: Performance and first results** *Chiara Casella, IPP, ETH, Schaftmattstrasse 20, HPK, 8093 Zürich* In recent years there has been a significant progress in PET (Positron Emission Tomography) instrumentation, boosted by the migration of technologies originally developed for high energy physics experiments into prototype PET devices. The AX-PET project is a demonstrator for a high resolution, high sensitivity PET, based on a novel axial geometrical arrangement of the scintillator crystals. The demonstrator consists of two AX-PET modules used in coincidence. Each module is a matrix of 48 long axially oriented LYSO crystals, interleaved by arrays of WLS strips, all read out by Geiger-mode avalanche photodiodes. Two AX-PET modules have been built and fully characterized in dedicated test setups at CERN, with point-like 22Na sources. Their performance in terms of energy and spatial resolution has been assessed, both individually and for the two modules in coincidence (R_{FWMH}~12% at 511 keV; σ_{axial}~0.65 mm). Measurements of the two modules with different phantoms filled with radiotracers will be performed, starting from May 2010, at the ETH Institute of Radio-pharmaceutical Science (in Zürich). The AX-PET detector performance, as well as the very first results from the modules used with the realistic phantoms, will be presented.

14:45	**357**	**Track reconstruction with the electronic detector in the OPERA experiment** *Claudia Lazzaro, Institute for Particle Physics ETH Zürich, HPK/F27, Schafmattstrasse 20, 8093 Zürich* The OPERA experiment (Oscillation Project with Emulsion-tRacking Apparatus) is located in the Gran Sasso underground laboratory (LNGS) near Rome, Italy. Its aim is to obtain evidence of $\nu\tau$ appearance in a pure $\nu\mu$ beam from CERN (CNGS, Cern Neutrinos to Gran Sasso) by detecting the decay of the tau lepton from a nu tau charged current (CC) interaction in the nuclear emulsion/lead target. The neutrino interactions in OPERA are triggered by the electronic detector. The electronic detectors in OPERA are composed of scintillator planes, which interleave the target walls consisting of nuclear emulsion/lead bricks, and the magnetic spectrometers downstream of each target module, which are equipped with drift tubes. The electronic detector data analysis is the first step in the OPERA analysis, and it is used to reconstruct charged particle tracks and to find the muon track from a $\nu\mu$ CC interaction. After the track reconstruction, a Kalman filter is applied to find the origin of the track in the target and to estimate the momentum at this position; these results are used in the brick finding procedure to select the brick, in which the neutrino interaction occurred. Track reconstruction and momentum determination with the electronic detector is also important to have a monitoring of the CNGS beam. The Kalman procedure is briefly described, and a comparison of Monte Carlo results with real data is presented.
15:00	**358**	**Electron reconstruction in the OPERA emulsions.** *Frank Meisel, Physikaisches Institut, Universität Bern, Sidlerstrasse 5, 3012 Bern* The aim of the OPERA experiment is to verify experimentally neutrino oscillations in the appearence mode, more precisely to demonstrate that muon neutrinos oscillate to tau neutrinos. Muon neutrinos from the CERN SPS accelerator are directed toward the OPERA detector in the Gran Sasso laboratory. The OPERA detector is designed to identify tau neutrino interactions: the decay of tau leptons can be observed in the OPERA vertex tracker, made from high spatial resolution photographic emulsions. The tau to electron decay channel has a branching ratio of 17 %. and is important. To exploit it the topology of electron events in the OPERA emulsions must be understood well. We will present the status of the ongoing effort in Bern to identify unambiguously electron events and accurately measure their characteristics, in particular the energy. Special attention is devoted to the electron/pion separation. We will present results of a test beam exposure made at Cern in 2009 and compare them directly with the data taken by OPERA and analyzed in Bern.
15:15	**359**	**Neutrino induced charm production in the OPERA detector** *Thomas Strauss IPP, ETH Zürich, Schaffmattstrasse 20, 8093 Zürich* The goal of the OPERA experiment is to search for $\nu\tau$ appearance in the (almost) pure $\nu\mu$ beam from CERN to the Gran Sasso underground laboratory. In about 5% of the $\nu\mu$ charged current neutrino events charmed particles are produced. Due to their short lifetime, which is in the range of the tau lifetime, these events are important for understanding the performance of the detector. Using the neutrino charm production cross sections measured with the CHORUS experiment,

		the efficiency to find and reconstruct the decay of short-lived particles with OPERA can be investigated. In this talk the Monte Carlo studies of the Opera Charm Working Group, including the background estimation, will be presented. A comparison of the Monte Carlo simulation with the 2008 and the preliminary 2009 data is given, and the projected goals for the current 2010 run are presented.
15:30		***Coffee Break***
		TASK IV B *Chair: B. Lauss, PSI*
16:00	**361**	**η-photoproduction off ^{3}He : Search for η-mesic nuclei** *Francis Pheron* *Departement Physik, Universitat Basel, 82 Klingerbergstrasse , 4056 Basel* Photoproduction of η-mesons off ^{3}He has been studied via $\eta \to 2\gamma$ and $\eta \to 3\pi^0$ decay modes at the tagged photon beam of the Mainz MAMI using the combined 4π Crystal Ball/TAPS calorimeter. In a previous experiment, Pfeiffer et al. [1] had reported evidence for the formation of a quasibound η-^{3}He state. The experiment aimed at an improved statistical quality for both the excitation function of coherent photoproduction on η-mesons off ^{3}He and the peak-like structure in the excitation function of π^0-p back-to-back pairs. The η-mesons have been identified by an invariant mass analysis of 2-photons (respectively 6-photons) events. In both cases also the constraints from the intermediate π^0-invariant masses have been used. The coherent reaction $\gamma + {}^3\text{He} \to \eta\ {}^3\text{He}$ has been selected by the suppression of events with observed recoil nucleons and by a missing energy analysis. Results for the excitation function show an extremely rapid rise at the production threshold similar to what has been observed in hadronic induced reactions at COSY [2]. [1] M. Pfeier et al., Phys. Rev. Lett. 92 (2004) [2] T. Mersmann et al., Phys. Rev. Lett. 98, 242301 (2007)
16:15	**362**	**Quasi-free photoproduction of η-mesons off the deuteron** *Dominik Werthmüller* *Departement Physik, Universität Basel, Klingelbergstrasse 82, 4056 Basel* Studying the structure of hadrons offers the chance to take a glimpse into the complex mechanisms of the strong interaction. In the energy range of the nucleon and its resonances a perturbative approach of the underlying theory (QCD) cannot be used. Instead effective models with distinct degrees of freedom have to be built and constrained by experimental data. Photoproduction of mesons is an excellent tool to obtain such kind of data. Quasi-free photoproduction of η-mesons off the neutron and off the proton has been studied using a deuterium target. The beam of tagged photons was produced via bremsstrahlung of the 1.5 GeV electron beam provided by the MAMI accelerator facility in Mainz (Germany). A fully exclusive measurement was performed i.e. the photons originating from the neutral decay channels of the η-mesons were detected in coincidence with the recoil nucleons in the two calorimeters Crystal Ball and TAPS covering around 94% of full solid angle. Preliminary results show a bump-like structure in the excitation function for the neutron close to W = 1675 MeV which is not seen for the proton. They confirm previous results and lead to the question if this could be the signature of a yet unknown nucleon resonance. Considering the experimental resolution the Breit-Wigner width was approximated below 50 MeV which is very unusual compared to known resonances in this energy range.

16:30	**363**	**Quasi-Free η Photoproduction off ^{3}He** *Lilian Witthauer* *Departement Physik, Universität Basel, Klingelbergstrasse 82, 4056 Basel* The quasi-free η photoproduction off the deuteron in coincidence with recoil neutrons and protons was measured by the CBELSA/TAPS collaboration (I. Jaeglé et al.), the GRAAL collaboration (V.Kuznetsov et al.) and LNS-Sendai (F. Miyahara et al.). In contrast to the resulting cross section on the proton, that on the neutron shows a narrow structure at W ≈ 1.68 GeV with a width < 60 MeV in all experiments. To prove that the structure is not due to any nuclear effects (rescattering of mesons, final state interaction) the same reaction is studied for a nucleon system with different momentum distribution and different neutron/proton ratio, namely ^{3}He. Preliminary results of quasi-free η photoproduction in coincidence with recoil neutrons ans protons obtained at MAMI will be discussed. *Supported by Schweizerischer Nationalfonds and Deutsche Forschungsgemeinschaft.*
16:45	**364**	**Non-metallic electrodes for the neutron electric dipole moment experiment** *Johannes Zenner, Paul Scherrer Institut, WMFA/B13, 5232 Villigen PSI* A non-zero neutron electric dipole moment (nEDM) would violate both time and parity symmetry. The present experimental upper limit is dn < 2.9×10^{-26} e·cm. A collaboration of 15 European institutes aims at a sensitivity of dn < 5×10^{-28} e·cm. This will allow probing much of the parameter space for theories beyond the standard model while it is still far away from the prediction of the electroweak standard model. To reach this goal it is essential to carefully investigate and control systematic effects related with magnetic fields. The experiment needs also an electric field. The previously used electrodes are sources of thermally induced magnetic noise that could be greatly reduced by using non-metallic materials. The development of new electrodes for the nEDM spectrometer is in progress and will be presented.
17:00	**365**	**Laser-driven optically-pumped Cs magnetometer array for a nEDM experiment** *Martin Fertl, Paul Scherrer Institut, WMSA/B12, 5232 Villigen* The Standard Model of Particle Physics predicts a static neutron electric dipole moment (nEDM) which violates both time reversal and parity symmetry. The prediction is several orders of magnitude below the current best experimental limit dn < $2.9\cdot10^{-26}$ ecm (90 % CL). We are currently assembling a new experiment at the new ultra-cold neutron (UCN) source at the Paul Scherrer Institut, Switzerland, with the ultimate goal to improve the sensitivity limit on dn by up to two orders of magnitude. Besides passive and active compensation of external magnetic field fluctuations, we will use an array of laser-driven optically-pumped atomic cesium magnetometers to control and monitor the all-important stability and homogeneity of the magnetic field at the neutron precession chamber. I will present the setup and results of first measurements to map the magnetic field distribution and its time stability over the neutron precession volume on a sub-pT level.

17:15	**366**	**Results from a 3 liter double phase pure argon LEM-TPC** *Devis Lussi, André Rubbia, Alberto Marchionni, Alessandro Curioni, Filippo Resnati, Gustav Natterer, Thierry Viant, Andreas Badertscher, Leo Knecht, Lukas Epprecht* *Institut für Teilchenphysik, ETH Zürich, Schafmattstrasse 20, 8093 Zürich* We present recent results obtained with a 3 liter prototype of a novel kind of liquid argon TPC with a Large Electron Multiplier (LEM) based charge readout system. The LEM-TPC is a complete calorimetric and tracking detector capable of charge multiplication: a constant electric field drifts ionization electrons towards the LAr surface. After the extraction into the gas phase, Townsend Multiplication occurs due to high electric fields in the LEM holes. Finally the multiplied charge is collected on two orthogonal sets of strips of a two dimensional projective anode. Data of cosmic muon tracks has been measured and analyzed. The reconstructed energy loss distribution of long muon tracks was used to characterize the LEM-TPC in terms of gain and argon purity. We believe that this detector finds its application in next generation neutrino physics and proton decay experiments as well as in direct Dark Matter search (ArDM).
17:30	**367**	**Light yield from nuclear recoils in liquid argon** *William Creus* *Physik-Institut der Universität Zürich, Winterthurerstr. 190, 8057 Zürich* The DARWIN dark matter collaboration is designing a large noble liquid detector to detect nuclear recoils from WIMP interactions. A low energy detection threshold is essential and we are therefore investigating the quenching of scintillation light induced by nuclear recoils from neutron scattering in liquid argon. Results obtained with an americium-beryllium neutron source from the 1 t liquid argon ArDM detector will be presented. The recoils can also be produced by scattering monochromatic neutrons from a dd-fusion source. I will describe the experimental setup for liquid argon and xenon and first measurements needed for calibration purposes.
17:45	**368**	**The ArDM Experiment, a Double Phase Argon Calorimeter and TPC for Direct Detection of Dark Matter** *Ursina Degunda* *Institute for Particle Physics, ETH Zürich, Schafmattstrasse 20, 8093 Zürich* The aim of the ArDM (Argon Dark Matter) experiment is the direct detection of WIMPs (weakly interacting massive particles), candidates for Dark Matter, using a one ton double phase argon calorimeter and TPC. The detection is based on the independent read out of the ionisation electrons and scintillation light caused by elastic scattering of the WIMPs on the argon nuclei in the liquid phase. In this talk the detector design as well as scintillation light measurements with cosmic muons and external radioactive sources will be presented. Furthermore, results of a first run with an applied electric drift field of about 1 kV/cm will be shown, including the liquid argon purity, the electron drift velocity and the uniformity of the drift field.

18:00	**369**	**Material Screening for XENON100 with a High Purity Germanium (HPGe) Spectrometer** *Ali Askin, Departement Physik, Universität Zürich, Winterthurerstr. 190, 8057 Zürich* The main goal of the XENON dark matter search is to detect Weakly Interacting Massive Particles (WIMPs), which are compelling dark matter candidates, via their elastic scattering on Xe nuclei. Since dark matter events are expected to be very rare, one of the most important points in this challenging search is to minimize background events, which could be induced either by cosmic radiation or by the residual radiation emitted from the materials used in the construction of the experiment. The XENON100 experiment is currently taking science data at the Laboratori Nazionali del Gran Sasso (LNGS) in Italy, using 65 kg of liquid xenon as active WIMP target mass. The measured background is a factor of 100 lower than the one of the previous phase (XENON10). In order to achieve this low background, the XENON100 detector and shield materials were screened with a high purity germanium spectrometer, named Gator, which had been installed at LNGS in 2007. The results of the activity of the materials in terms of their ^{238}U, ^{232}Th, ^{40}K, ^{60}Co and ^{137}Cs content were used in the gamma and neutron background prediction of the XENON100 detector. A comparison of the simulations to the background data of XENON100 shows a good agreement and thus indicates that the material selection was succesfull. In this talk I will present the Gator detector, its background and sensitivity, as well as the results of the material screening measurements.
18:15	**370**	**Calibration of the Photomultipliers in the XENON100 Experiment** *Annika Behrens* *Physik-Institut, Universität Zürich, Winterthurerstrasse 190, 8057 Zürich* The XENON100 dark matter experiment, located at the Gran Sasso underground laboratory (LNGS), aims at the detection of weakly interacting massive particles (WIMPs) via their elastic scattering off xenon nuclei. The detector consists of a dual-phase xenon TPC with 65 kg of liquid xenon in the active volume. It is instrumented with a total of 242 Hamamatsu R8520 photomultipliers that are used for the detection of the primary scintillation signal (S1) and the ionisation signal via the proportional scintillation mechanism (S2). Two LEDs that are connected to two quartz fibers inside the detector are used for the calibration of the PMTs. During the physics runs calibration data has been taken weekly to monitor the stability of the PMT performance in terms of gain and dark current. In this talk, the calibration method and the results of these calibration studies will be presented.
18:30		***END***

ID	TASK POSTER
381	**Implementation of NA61/SHINE data in T2K** *Nicolas Abgrall, DPNC, University of Geneva, 24 quai Ernest Ansermet, CH-1211 Geneva* The T2K (Tokai to Kamioka) experiment in Japan, JPARC, is the first accelerator based neutrino experiment from the new "super beam" generation. The neutrino beam produced from the collisions of 30 GeV/c protons impinging on a 90 cm long Carbon target will reach unprecedented intensities (0.75 MW) and probe the ν_μ to ν_e oscillation with a high enough sensitivity to measure non-vanishing values of the mixing angle θ_{13}. Such a physics goal implies to know the neutrino beam content very precisely in order to predict signal and background events with the required precision. The NA61/SHINE experiment at CERN, SPS, measured hadrons production cross-sections for both thin and thick (T2K replica target) Carbon targets at the T2K beam energy. After the presentation of neutrino flux predictions from the T2K beam Monte-Carlo, strategies to use the NA61/SHINE data to constrain uncertainties on those predictions are discussed.
382	**Extracting the three- and four-graviton vertices from binary pulsars and gravitational-wave observations of coalescing binaries.** *Umberto Cannella [1], Michele Maggiore [1], Stefano Foffa [1], Hillary Sanctuary [1],* *Riccardo Sturani [2], Emanuele Berti [3]* *[1] Dept. of Theoretical Physics, University of Geneva, 24, quai E. Ansermet, 1211 Genève 4* *[2] Phys. Institute - University of the Studies "Carlo Bo", v. S. Chiara 27, IT-61029 Urbino* *[3] Dept of Physics and Astronomy - University of Mississippi, 108 Lewis Hall, University - Post Office Box 1848, Oxford 38677 - Mississippi, United States* We discuss how various tests of general relativity (GR) can be translated into measurements of its non-linearities from a field theory point of view. We reformulate the post-Newtonian approximation to the two-body problem in terms of Feynman diagrams and we try to constrain the strength of the three- and four-graviton vertices. In problems involving only the conservative dynamics a deviation of the three-graviton vertex from the GR prediction is bounded, to lowest order, by Lunar Laser Ranging experiments at the 0.02% level. A modification of the three-graviton vertex also affects the radiative sector of the theory; the timing of the Hulse-Taylor binary pulsar provides a bound on this correction at the 0.1% level. Tests of the four-graviton vertex would require gravitational-wave observations. Preliminary results on coalescing binaries at interferometers suggest that the proposed modifications are degenerate with other parameters of the system, like the masses and spins.

383	**Active compensation of the magnetic field surrounding a new nEDM apparatus** *Beatrice Franke* *Paul Scherrer Institut & ECU Technische Universität München, WMSA B12, 5232 Villigen* A non-zero neutron electric dipole moment would violate time and parity reversal symmetry. Its detection would be a major discovery, but also improving the current upper limit of $2.9 \cdot 10^{-26}$ e·cm constrains theories beyond the Standard Model of Particle Physics, such as super symmetry. An apparatus is being set up at the Paul Scherrer Institut, Switzerland in order to improve the current sensitivity by two orders of magnitude. This shall be achieved by increasing statistics with a new ultracold neutron source, and by improving control on systematics. Of particular interest are fluctuations of magnetic field inside the experiment. These might be introduced from the environment and shall be actively compensated for by a surrounding field compensation (SFC) coil system. In this talk the working principle of the SFC and its commissioning will be presented along with first results on the investigation of the magnetic environment and SFC peformance.
384	**Experimental determination of absorbed dose to water in a scanned proton beam using a water calorimeter and an ionization chamber** *Solange Gagnebin, METAS, Lindenweg 50, CH-3003 Bern-Wabern* In the clinical environment, the dose delivered by the radiotherapy installation is controlled regularly in order to prevent damage to the healthy patient tissues. On the other hand, a correct dose has to be delivered in order to destroy the tumor in an optimal way. The reference physical quantity for the energy absorbed in tissue is the absorbed dose to water. This quantity is routinely measured with ionization chambers. However, ionization chambers have to be calibrated in order to convert the measured electrical charge into absorbed dose to water. The currently used protocols demand that these conversion factors have to be traceable to a primary standard of absorbed dose to water. The preferred primary standard is a water calorimeter, which determines the dose directly by measuring the temperature increase in water. This thesis presents experimental results of the water calorimeter developed by the Federal Office of Metrology (METAS)exposed to the scanned proton beams at Paul Scherrer Institute (PSI). Ionization chamber measurements are compared with the direct determination of absorbed dose to water from water calorimeter. The agreement of 3.2% of the dose values measured by the two techniques are within their respective statistical uncertainties, and confirm the possibility to use a water calorimeter as primary standard for all types of existing proton therapy system.
385	**The Hg magnetometer in the nEDM-experiment** *Marlon Horras, Paul Scherrer Institut, WMFA B13, 5232 Villigen* An improved experiment searching for the neutron electric dipole moment is currently being set up at the new high-intensity ultracold neutron (UCN) source at the Paul Scherrer Institut, Switzerland. In order to control ambient magnetic field fluctuations, an external field compensation coil system together with a 4-layer high permeability magnetic shield is used. Residual magnetic field fluctuations inside the ultracold neutron storage chamber are measured by a mercury co-magnetometer. With the expected increase in sensitivity due to the increased UCN densities, it has become essential to also improve the mercury co-magnetometer. The Hg magnetometer is sensitive to fluctuations down to 100 fT. The working principle, planned improvements and first results for the mercury co-magnetometer will be presented.

386 ^{3}He magnetometer

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For the PSI nEDM experiment, magnetometry is of the utmost importance, and nuclear free-induction-decay magnetometers, such as polarized ^{3}He are being investigated. However, the precessing nuclear moments can only be reliably detected by a secondary magnetometer of sufficient sensitivity, traditionally a SQUID. Here we present progress in the preparation, manipulation, and detection of precessing ^{3}He nuclear magnetic moments using optically pumped double resonance Cs magnetometers.

387 The fully active calorimeter for the MICE experiment

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The goal of the Muon Ionization Cooling Experiment (MICE) is to demonstrate the ionization cooling of a muon beam and is an important step towards neutrino factories and muon colliders. A fully active calorimeter, the Electron Muon Ranger (EMR), has been designed to provide separation of electrons and muons at the end of the cooling section. The EMR consist of 48 layers of highly segmented scintillating material. Each layer consists of 59 1.1 m long bars with triangular cross section (3.3 times 1.7 cm^2), with 1.2 mm wavelength shifting fibers glued into them. The layers is placed in alternating x-y directions giving a total volume of about 1 m^3 . The fibers from each layer is fed to a 64 channel multi-anode PMT on one side and a single anode PMT on the other. Both the muon range and total energy deposited in the EMR layers can be reconstructed for a single particle. Preliminary tests shows an efficiency of 97 % per layer. The EMR is a possible small scale model for a future fully active scintillator detector to be used in neutrino factories.