PHENIICS Fest 2018

Rapport sur les contributions

https://indico.ijclab.in2p3.fr/e/4792

ID de Contribution: **3** Type: **Talk**

The High Granularity Timing Detector for the ATLAS experiment

mardi 29 mai 2018 12:20 (20 minutes)

The expected increase of the particle flux at the high luminosity phase of the LHC (HL-LHC) with instantaneous luminosities up to L ≈ 7.5 × 10^{34} cm^{−2} s^{−1} will have a severe impact on the ATLAS deetctor performance. The pile-up is expected to increase on average to 200 interactions per bunch crossing resulting in a vertex density that can be larger than 1.5 per mm.
The reconstruction and performance for electrons, photons, jets and transverse missing energy will be severely degraded in the end-cap and forward region, where the liquid Argon based electromagnetic calorimeter has coarser granularity compared to the central region. The High Granularity Timing Detector (HGTD) is proposed in front of the liquid Argon end-cap calorimeters for pile-up mitigation. Using the high granularity and the excellent timing capabilities of the detector with 30 ps per MIP, electron and jet reconstruction (b tagging) are presented as well as the impact on the pileup jet suppression and missing ET. The expected improvement in performance is particularly relevant for vector-boson processes.

Auteur principal: M. ALLAIRE, Corentin (LAL)

Orateur: M. ALLAIRE, Corentin (LAL)

Classification de Session: Hadronic and Particle Physics - 2

ID de Contribution: **5** Type: **Poster**

Naturalness of a brane-localized electroweak Higgs boson

mardi 29 mai 2018 16:15 (1 heure)

In the Standard Model (SM) of Particle Physics, the electroweak (EW) symmetry breaking pattern is the less known and understood. With the discovery of a Higgs-like boson by the Large Hadron Collider (LHC) experiment in 2012, the Brout-Englert-Higgs (BEH) mechanism, which involves a new scalar field to break the EW gauge symmetry, seems to be at work in Nature. Nevertheless, the origin of the BEH field remains a mystery and it suffers from a technical naturalness puzzle: why the Higgs boson is so light compared to the quantum gravity scale? The Higgs sector can also play an important role to understand the open questions of the SM, like the flavour landscape, the masses of the neutrinos, the dark components of the Universe, the inflation… My PhD subject involves studying models with spatial extra dimensions, which could solve some of these questions. My starting point is the first Randall-Sundrum (RS1) model, where the Universe is a slice of AdS5 with the BEH field localized on a 3-brane at a boundary, and the fermions and gauge bosons propagating in the bulk. This scenario naturally produces a huge hierarchy between the EW and quantum gravity scales, and gives a solution to the flavor puzzle by a geographical mechanism in the extra dimension. In practice, I develop models from which I dig out the first phenomenological consequences.

Auteur principal: M. NORTIER, Florian (Laboratoire de Physique Théorique d'Orsay)

Orateur: M. NORTIER, Florian (Laboratoire de Physique Théorique d'Orsay)

Classification de Session: Poster and coffee

ID de Contribution: **6** Type: **Talk**

Synthesis of (Y, Ti) nano-oxide particles in FeCr alloy by ion implantation

mardi 29 mai 2018 17:40 (20 minutes)

Oxide dispersion strengthened (ODS) ferritic/ martensitic FeCr steels are reinforced by dense and stable metallic (Y,Ti) nano-oxide particles. These ODS steels are known to have very good creep and radiation resistance as well as improved mechanical properties at high temperatures, making them ideal candidates to be used as structural materials for future generation IV (Gen IV) fission and fusion nuclear reactors. Even though significant amount of research has been conducted and continues in the field, the exact mechanism of formation of the nano-particles –important to improve their fabrication, and thus their properties - is yet to be fully established. This study is an attempt at reproducing the various steps and mechanisms of formation of these nano-particles by the use of ion beam synthesis contrary to the conventional ball milling and consolidation techniques used in the industrial fabrication of these steels. The use of ion implantation technique enables to de-correlate the contributions of each of the implantation parameters and if accompanied by appropriate modeling, could provide very useful information to help understand the mechanisms involved in the formation of these nano-oxide particles. At a first step, a high purity FeCr alloy has been sequentially implanted at room temperature with Ti+ and O+ ions at energies of 100 and 37 keV, respectively, and subsequently annealed at various temperatures. The mobility and diffusion of the elements in the matrix has been studied by time-of-flight Secondary Ion Mass Spectroscopy (ToF-SIMS) technique and modeling. The formation of nano-particles has been observed only after annealing at high temperatures. The nature, crystallographic structure and chemical composition have been investigated using conventional and analytical Transmission Electron Microscopy (TEM) techniques. Additional preliminary results also show the formation of nano-particles in (Y,Ti,O)- ion implanted specimens.

Auteurs principaux: M. OWUSU-MENSAH, Martin (CSNSM, Univ Paris-Sud, CNRS/IN2P3, Paris-Saclay, Orsay, France); GENTILS, Aurélie (CSNSM, Univ Paris-Sud, CNRS/IN2P3, Paris-Saclay, Orsay, France); JUBLOT-LE-CLERC, Stéphanie (CSNSM, Univ Paris-Sud, CNRS/IN2P3, Paris-Saclay, Orsay, France); RIBIS, Jöel (CEA, DEN, DMN, SRMA, Paris-Saclay, Gif-sur-Yvette, France); BORODIN, Vladimir (NRC Kurchatov Institute and NRNU MEPhI, Moscow, Russia)

Orateur: M. OWUSU-MENSAH, Martin (CSNSM, Univ Paris-Sud, CNRS/IN2P3, Paris-Saclay, Orsay, France)

Classification de Session: Nuclear Energy

ID de Contribution: **7** Type: **Talk**

Search for the SM (and BSM) production of four top quarks in the ATLAS detector at the LHC

lundi 28 mai 2018 12:05 (20 minutes)

The top quark is the heaviest elementary particle we know. Therefore, it may play a special role in the Standard Model of particle physics. Its Yukawa coupling to
the Higgs boson is close to one, which makes this particle a key element of many theories beyond the Standard Model.

The Large Hadron Collider (LHC), located at CERN (Geneva, Switzerland) is a proton-proton collider with a center-of-mass energy of 13 TeV. The LHC runs at
the highest energy and luminosity ever reached by an accelerator. It is then able to study very rare collision scenarios, such as four top production : $t\bar{t}t\bar{t}$.

The $pp \to t\bar{t}t\bar{t}$ process has a theoretical cross-section of 9.2 fb, so we expect to produce only about 1000 such events in the LHC by 2018, compared to the 40 million events occurring each second !

The production of four top quarks is however very sensitive to several scenarios beyond the Standard Model, which predict an enhancement of its cross-section
that could be detected experimentally.

Therefore, an analysis is performed to identify such events and detect potential deviations from the Standard Model. Events with two leptons of the same charge are selected, for their small background contamination.

Auteur principal: M. CHEVALÉRIAS, Thibault (CEA Saclay)

Orateur: M. CHEVALÉRIAS, Thibault (CEA Saclay)

Classification de Session: Hadronic and Particle Physics - 1

ID de Contribution: **8** Type: **Talk**

Bridging nuclear ab-initio and Energy Density Functional Theories

lundi 28 mai 2018 14:50 (20 minutes)

A density functional is proposed for Fermi systems with anomalously large s-wave scattering length that has no free parameters. The functional is designed to correctly reproduce the unitary limit in Fermi gases together with the leading-order contributions in the s-wave channel at low density. The functional reproduces well static properties of Fermi gas at or close to the unitary limit. By including the effect of the s-wave effective range it can also be applied to neutron systems. For neutron infinite matter, it is shown to be predictive up to densities $\sim 0.01\ \mathrm{fm}^{-3}$ that is much higher densities compared to the Lee-Yang functional, valid for $\rho < 10^{-5}\ \mathrm{fm}^{-3}$.

In this talk, we will explain how the functional was built up and apply it both to unitary gas and neutron matter. The functional is used to obtain in a simple way thermodynamical quantities: pressure, sound velocity, compressibility. For unitary gas, it is in good agreement with experimental observations. Using the functional, we will also discuss the response of Fermi systems with large scattering length to an external field.

[1] D. Lacroix, Phys. Rev. A **94**, 043614 (2016).

[2] D. Lacroix, A. Boulet, M. Grasso, and C.-J. Yang, Phys. Rev. C **95**, 054306 (2017).

[3] A. Boulet and D. Lacroix, Phys. Rev. C **97**, 014301 (2018).

Auteur principal: M. BOULET, Antoine (IPNO)

Orateur: M. BOULET, Antoine (IPNO)

Classification de Session: Nuclear Physics - Theory

ID de Contribution: **9** Type: **Poster**

Implémentation parallèle hybride des simulations PIC en géométrie cylindrique avec décomposition de Fourier dans le code SMILEI

mardi 29 mai 2018 16:15 (1 heure)

Les simulations Particle-in-Cell sont utilisées dans une large variété de problèmes liés à la physique des plasmas. Dans plusieurs cas, une description précise et fiable des effets cinétiques qui se produisent en 3D est requise. Néanmoins, ce type de simulations est très couteux et nécessite beaucoup de ressources de calcul. Ceci est principalement dû à la haute résolution que nécessite les simulations d'interaction laser plasma en général et celles de l'accélération des leptons par sillage laser. Cela implique un nombre de points très important surtout dans la direction longitudinale pour pouvoir décrire le laser en restant fidèle à la réalité physique. Typiquement les simulations d'accélération laser-plasma en 3D nécessitent $10^6 - 10^8$ points. Ce type de simulations demande des codes très parallèlisés et doivent être exécutées sur des grands clusters dans des centres de calcul. La limitation en ressources de calcul nous pousse à chercher des hypothèses simplificatrices qui permettent un gain dans le temps et les ressources nécessaires de calcul. Une des solutions proposées, est la decomposition azimutale des champs en série de Fourier. En pratique cette description peut être limitée aux deux premiers modes. En effet, le sillage du laser, indépendant de θ peut être décrit par le mode 0, le pulse de laser dépend seulement de θ en cas de symétrie cylindrique peut être parfaitement décrit par le mode 1. Ainsi on peut obtenir une description 3D de l'interaction laser plasma avec un coût de 2D. Cette méthode a été vectorisée et adaptée à la parallélisation hybride MPI et OpenMp par patch du code PIC libre SMILEI . Les résultats ont été comparés avec des simulations 3D complètes.

Auteur principal: Mme ZEMZEMI, Imen (Laboratoire Leprince-Ringuet)

Co-auteurs: Dr BECK, Arnaud (Laboratoire Leprince-Ringuet); Prof. SPECKA, Arnd (Laboratoire Leprince-Ringuet); Dr DEROUILLAT, Julien (Maison de la simulation); Dr MASSIMO, Francesco (Laboratoire Leprince-Ringuet); Dr PEREZ, Frédéric (Laboratoire pour l'Utilisation des Lasers Intenses)

Orateur: Mme ZEMZEMI, Imen (Laboratoire Leprince-Ringuet)

Classification de Session: Poster and coffee

ID de Contribution: **10** Type: **Talk**

A microscopic treatment of correlated nucleons: Collective properties in stable and exotic nuclei

lundi 28 mai 2018 14:30 (20 minutes)

Collective excitations are observed and analyzed in several many-body systems such as, for instance, atomic nuclei, trapped atomic gases or metallic clusters. A model which is widely used to describe collective excitations is the random-phase approximation (RPA), where the excited modes are superpositions of 1 particle-1 hole configurations only. The RPA allows in general for a satisfactory description of excited states in nuclei, both low-lying states and giant resonances.

However, being based on a mean-field or independent-particle picture, the RPA model fails in reproducing the fragmentation and the spreading width of the excitations. For example if one wishes to describe the spreading width of resonances, which can be observed experimentally, one has to go beyond this simple mean-field-based model. A possible way to do it is to add 2 particle-2 hole configurations in the model, which is known as Sedond RPA (SRPA). Yet the standard SRPA model presents some severe limitations related to instabilities and ultraviolet divergences. Several directions may be followed to handle and cure such instabilities.

One of them is based on a subtraction procedure that I will describe. The first part of my thesis work consisted in applying the subtracted SRPA model to the dipole resonance in ^{48}Ca and to a systematic study of giant quadrupole resonances in several nuclei. These results will be discussed.

These limitations may also be cured by including correlations in the ground state using fractional occupation numbers. I will present some preliminary results based on fractional occupation numbers computed with the RPA amplitudes, within a renormalized SRPA model.

The perspectives of this thesis work include the addition of pairing and non-zero temperature as well as the study of their effects on the excitation spectra. These effects are expected to have an important impact on the ground state correlations and, consequently, on the renormalized SRPA results.

Auteur principal: M. VASSEUR, Olivier (CNRS - IPN Orsay)

Orateur: M. VASSEUR, Olivier (CNRS - IPN Orsay)

Classification de Session: Nuclear Physics - Theory

ID de Contribution: **11** Type: **Poster**

Laser Plasma Acceleration Generated Electron Bunch Transport for in a Manipulation Line

mardi 29 mai 2018 16:15 (1 heure)

Laser Plasma Acceleration (LPA) enables to generate up to several GeV electron beam with short bunch length and high peak current within centimeters scale via different schemes. However, the generated beam quality (energy spread, divergence) is not sufficient to drive a Free Electron Laser (FEL) and a beam control is required. The COXINEL manipulation line is composed of high gradient variable quadrupoles (QUAPEVA) in conjunction with electromagnetic quadrupoles, a chicane and a 2 m long undulator of 18 mm period. The transverse distribution of the electron bunch can be measured in five different positions along the transport line and the energy distribution can be characterized beforehand in a spectrometer. The electron beam has been properly transported. The experiments and the modeling are presented and they show good agreement. A next step for a better understanding and modeling of the transport via LPA source simulation is foreseen.

Auteur principal: M. OUMBAREK ESPINOS, Driss (Synchrotron SOLEIL)

Orateur: M. OUMBAREK ESPINOS, Driss (Synchrotron SOLEIL)

Classification de Session: Poster and coffee

ID de Contribution: **12** Type: **Poster**

Measurement of the top quark pole mass using double differential cross section with the ATLAS detector at the LHC

mardi 29 mai 2018 16:15 (1 heure)

The top quark mass (m_t) is a key parameter of the Standard Model (SM). Its large size, of the order of the electroweak scale, is associated with a Yukawa coupling of order 1, that gives important contributions, via radiative corrections, to SM observables. After the Higgs boson discovery and the accurate measurement of its mass, the allowed values of the W boson and top quark masses have become strongly correlated, so that an accurate determination of both would lead to a SM test of considerable precision. The top mass value is also critical in the issue of vacuum stability in the SM.

The determination of the top quark pole mass ($m_{t,pole}$) requires the measurement of quantities that can be calculated theoretically, for example the inclusive $t\bar{t}$ production cross section, which depends on $m_{t,pole}$. Therefore, its measurement allows to indirectly measure $m_{t,pole}$.

The huge $t\bar{t}$ samples collected at the LHC with ATLAS detector allow the measurement of differential production cross sections $d_{t\bar{t}}/dX$, where X is a kinematical variable of the $t\bar{t}$ system. The full information available in differential cross sections can be exploited for the determination of $m_{t,pole}$ if theoretical calculation for differential $t\bar{t}$ production cross sections are available for different values of $m_{t,pole}$. This technique has been recently applied by D0 experiment at Tevatron. The $t\bar{t}$ samples available at the LHC after collection of 100 fb^{-1} of collision data will allow the measurement of double-differential $t\bar{t}$ production cross sections. Using these distributions to extract $m_{t,pole}$ has the advantage that possible correlations between variables are automatically taken into account.

The comparison between differential cross section measurements corrected at the parton-level and their theoretical calculations for different m_t values will allow to extract $m_{t,pole}$.

Auteur principal: Mme MOSKALETS, Tetiana (CEA/IRFU/DPhP)

Orateur: Mme MOSKALETS, Tetiana (CEA/IRFU/DPhP)

Classification de Session: Poster and coffee

ID de Contribution: **13** Type: **Talk**

Xavier Timbeau - Economic and social challenges of climate change

lundi 28 mai 2018 15:15 (1h 30m)

Économiste, Directeur de l'Observatoire Français des Conjonctures Économiques (OFCE)

ID de Contribution: **14** Type: **Talk**

Cryogenic Pulsating Heat Pipes

mardi 29 mai 2018 15:45 (20 minutes)

Pulsating Heat Pipes (PHP) are two-phase heat transfer devices consisting of a long capillary tube bent into many U-turns connecting the cold source to the hot source. They are thermally driven by an oscillatory flow of liquid slugs and vapor plugs. Due to their lightness, simple configuration and thermal performance, PHP are excellent candidates to be used as thermal links between superconducting magnets (the hot source) and cryocoolers (the cold source), maintaining an appropriate distance between both sources to keep the cryocooler out of the influence of the magnetic field.

Three 1 m long cryogenic PHP with 36, 24 and 12 parallel tubes have been tested in horizontal position (the closest configuration to non-gravity). So far, two different working fluids have been tested: N2 (operating at temperatures between 75 and 90 K) and Ne (operating between 27 and 32 K). The PHP with 36 parallel tubes was able to transfer a heat load between 5 and 55 W achieving equivalent thermal conductivities of 85 kW/m.K for N2 and 70 kW/m.K for Ne.

A simulation model with ANSYS Fluent is being developed to compare experimental and numerical results in order to determine and understand the operating limits of the system for a future implementation of the device in a superconducting magnet.

Auteur principal: Mme BARBA, Maria

Orateur: Mme BARBA, Maria

Classification de Session: Accelerator Physics

ID de Contribution: **15** Type: **Talk**

Study of baryonic resonances in the reaction $pp \to pp\pi^+\pi^-$ at 3.5 GeV with HADES

mardi 29 mai 2018 12:00 (20 minutes)

Pion production in NN collisions is one of the sources of information on the NN interaction and on the contribution of nucleon resonances. In particular, two-pion production in the few energy range, carries information both on single and double baryon excitation and on $\pi\pi$ dynamics, which are also useful for the interpretation of dielectron production. Baryonic resonances indeed contribute to the dielectron spectra via their Dalitz decay ($R \to Ne^+e^-$) and indirectly as intermediate states for neutral meson Dalitz decays. In addition, the $\pi^+\pi^-$ production channel gives access to the ρ contribution, which, due to its coupling to the baryonic resonances, is a crucial ingredient of calculations of the e^+e^- emissivity in hadronic matter. The possibility to measure simultaneously with HADES pion and e^+e^- production is therefore a great advantage.
Recently, differential and integrated cross sections for the reactions $pp \to pp\pi^0$, $pp \to pn\pi^+$ [1], [2], $pp \to pp\pi^+\pi^-$, $pn \to pn\pi^+\pi^-$ [3], $pn \to d\pi^+\pi^-$ [4] have been investigated with HADES at kinetic energies 1.25, 2.2 and 3.5 GeV. We focus here on the analysis of the $pp \to pp\pi^+\pi^-$ channel at 3,5 GeV, using results from $pp \to pp\pi^0$, $pp \to pn\pi^+$ and $pp \to pK\Lambda$ [3] measured at the same energy by HADES.
[1] G. Agakishiev et al., Eur. Phys. J. A41, 243-277 (2009).
[2] G. Agakishiev et al. Eur.Phys.J. A48 (2012) 74.
[3] G. Agakishiev et al. Eur.Phys.J. A50 (2014) 82.
[4] G. Agakishiev et al. , Eur.Phys.J. A51 (2015), 137.
[5] G. Agakishiev et al., Phys.Lett. B750 (2015) 184.
[6] G. Agakishiev et al. Phys.Lett. B742 (2015) 242-248.

Auteur principal: Mme BELOUNNAS, Amel (PHEN)

Orateur: Mme BELOUNNAS, Amel (PHEN)

Classification de Session: Hadronic and Particle Physics - 2

ID de Contribution: **16** Type: **Talk**

Towards the construction of the new ATLAS inner detector for the HL-LHC upgrade

mardi 29 mai 2018 13:00 (20 minutes)

In the context of High Luminosity phase of LHC (Phase-2), envisaged to start in ∼2026, it's planned to increase the beam luminosity up to $7.5 \cdot 10^{34} cm^{-2} s^{-1}$ and collision energy up to 14 TeV in the center of mass to achieve the high-precision results in the project tasks. These conditions will lead to additional requirements especially on an inner part of the ATLAS detector system. The resulting increase in occupancy levels and integrated radiation doses go beyond the design values for the current tracker. Due to this the replacement of the ATLAS tracker system is foreseen with fully silicon tracker (ITk) based on using of micro-strip and pixel detectors with advanced sensors and readout electronics technologies.\par
This work is dedicated to the characterization of the new n-in-p silicon sensor (active edge and slim edge) designs, which are the promising candidates for the ATLAS pixel detector upgrade to be operated at the HL-LHC, thanks to their radiation hardness, cost-effectiveness, increased active area fraction and low material budget. The results on a test beam characterization of the samples of these designs are presented and discussed in the present work.\par
Another method to characterize the pixel detector modules is a laser test. Using the laser we get the flexible charge injection with well-defined hit position. The laser test bench setup is being developed in the clean room at LAL (Orsay). Current status of the laser test bench setup and the first results are presented in this work.

Auteurs principaux: M. HOHOV, Dmytro (LAL Université Paris-Sud); LOUNIS, ABDENOUR (LAL-CNRS); VAROUCHAS, Dimitris (LAL Orsay); RASHID, Tasneem (LAL)

Orateur: M. HOHOV, Dmytro (LAL Université Paris-Sud)

Classification de Session: Hadronic and Particle Physics - 2

ID de Contribution: **17** Type: **Talk**

Meson-baryon Scattering in Extended-on-mass-shell Scheme at O(p3)

mardi 29 mai 2018 11:40 (20 minutes)

The scattering processes of particles have always been one of the focus of attention. Since the fundamental theory for strong interaction, quantum chromodynamics (QCD), was proposed, people are always very curious and enthusiastic to figure out how particles interact, or in another word, scatter with each other in all energy sector. However, as is known to us all, one critical feature of QCD is its asymptotic freedom, that is, the coupling constant increases extremely fast in the wake of the decreasing of transfer momentum. This means that in the low energy sector, one cannot apply a perturbation theory to treat the scattering processes. To deal with these problem, effective field theory (EFT) is introduced as a substitute of QCD in low energy sector. Taking hadrons, i.e. pions, kaons, eta-mesons, and baryons as the degrees of freedom rather than quarks and gluons, the EFT is formulated in terms of the most general Lagrangian consistent with chiral symmetry as well as the other continuous and discrete symmetries. The corresponding field theoretical formalism is called chiral perturbation theory (ChPT). Organized according to certain power counting rules and absorbing the divergence and other contribution into low energy constants (LECs), the ChPT allows a systematic method to improve the description about the target process. This makes the ChPT extremely advantageous.
The application of ChPT on meson scattering processes turned out to be a huge success. However, since the masses of baryons at chiral limit do not vanish, the powering counting rules for baryons make the Baryon chiral perturbation theory (BChPT) a tough problem. People first proposed a non-relativistic scheme assuming infinite baryon masses, which is now called heavy baryon(HB) ChPT. Soon afterwards, a relativistic scheme called infrared (IR) method was proposed. But the analytic properties are somehow broken. The third one is the so-called Extend-on-mass- shell(EOMS) scheme. In the last few years, the EOMS scheme has been applied to solve many problems such as baryon magnet, baryon sigma terms and so on. Compared to the former two schemes, EOMS scheme seems to converge faster and has fewer LECs at certain order.
In the meson baryon scattering, the EOMS scheme seems to be rather popular. In SU(2) cases, pi-N scattering was calculated up to O(p4) by Deliang Yao et.al. In this work, we try to extend the calculation to SU(3) up to O(pˆ3). Combining the recent scattering data of Kaons and nucleons, we try to fit the LECs in the theory. We investigated the convergence and try to include the contribution from Δ(1232) and resonances like Λ(1405).

Auteurs principaux: M. LU, Junxu (IPNO); Dr REN, Xiulei (Bochom University); Prof. GENG, Lisheng (Beihang University); Dr DU, MENGLIN (Bonn univerisity); Dr MEISSNER, Ulf-G (Helmholtz-Institut f¨ur Strahlen- und Kernphysik and Bethe Center for Theoretical Physics, Universit¨at Bonn,)

Orateur: M. LU, Junxu (IPNO)

Classification de Session: Hadronic and Particle Physics - 2

ID de Contribution: **18** Type: **Talk**

B-mode detection in the Cosmic Microwave Background

lundi 28 mai 2018 09:45 (20 minutes)

According to standard inflationary theories, the origin of cosmological structures is explained by a period of exponential expansion of the Universe induced by the potential of a scalar field and its quantum fluctuations. In addition to these primordial densities, inflation also predicts the existence of a primordial gravitational waves background. The imprint of which would be visible on the spectra of polarisation maps of the Cosmic Microwave Background (CMB) in the form of B-modes. Precise measurements of CMB polarisation and B-modes detection is therefore one of the priorities in modern cosmology.

In the first part, I will make an introduction to the cosmological standard model and how the CMB allows to constrain it. I will discuss more specifically about the inflationary period of the Universe, and how CMB modes B can help us to understand the nature of inflation. In the second part, we will describe the methods and tools necessary for the study of the B modes. I will discuss measurement biases induced by contaminations due to our galaxy, and methods to estimate the B mode signal.

Auteur principal: M. VANNESTE, Sylvain (Laboratoire de l'accélérateur Linéaire, groupe Cosmologie)

Orateur: M. VANNESTE, Sylvain (Laboratoire de l'accélérateur Linéaire, groupe Cosmologie)

Classification de Session: Astrophysics & Cosmology

ID de Contribution: **19** Type: **Talk**

Evidence for Chiral Bands in even even nucleus 136Nd

mardi 29 mai 2018 09:45 (20 minutes)

Evidence for chiral doublet bands has been observed for the first time in the even-even nucleus 136Nd. One chiral band was firmly established and four other candidates for chiral bands have been identified in 136Nd. These bands are interpreted as a multiple chiral doublet bands, which is good agreement with results of calculation based on the constrained and tilted axis cranking covariant density function theory(TAC-CDFT).

Auteur principal: M. LV, Bingfeng

Co-auteur: Prof. PETRACHE, Costel (CSNSM)

Orateur: M. LV, Bingfeng

Classification de Session: Nuclear Physics - Experiments

ID de Contribution: **20** Type: **Talk**

Production of 212Polonium by alpha transfer

mardi 29 mai 2018 10:05 (20 minutes)

212Po has been studied since 19161 and there have been numerous attempts to give a microscopic description of its structure, but with only 4 nucleons more than the doubly-magic 208Pb nucleus, the 212Po structure is still not well understood. Since the use of shell-model configurations failed to reproduce the large alpha-decay rate of the ground state, it has been completed by an alpha-cluster model2,3.
During the Euroball campaign, strong gamma lines have been identified in 212Po, leading to the discovery of several states with non-natural parities. Their very large B(E1) revealed strong dipolar momenta, which can only be explained, until now, by a high alpha-clustering with a vibration of the distance between the α-cluster and the 208Pb core[2] . This very unique situation brought several questions, related to both the origin and the properties of this phenomenon. Among them, the mechanism of alpha-transfer leading to this nucleus and feeding the cluster states needs more investigations.
At high excitation energy 16O and 18O both present alpha-clustering, the corresponding states forming rotational bands. In the particular case of 18O which is not self-conjugate, a strong electric dipolar momentum is associated with such α-core configurations. This led us to study the influence the dipole excitation of the projectile for the population of the 212Po cluster states, in an experiment aiming to compare the 212Po production from 16O (N=Z) and 18O (N≠Z) alpha transfer reactions.
Last year, 212Po has also been studied in inverse kinematic (208Pb beam on 12C target) at GANIL to measure the lifetimes of these levels. A silicon detector registered the alpha-particles from the break-up of the ejected 8Be residues. Even if this experiment was not dedicated to study the reaction mechanism, we extracted the relevant information to prepare an experiment which will take place next Autumn.

[1] E. Rutherford, A.B. Wood, Philos. Mag. 31, 379 (1916)
[2] A. Astier et al. Eur. Phys. J. A 46, 165–185 (2010)

Auteur principal: M. DUPONT, Etienne (CSNSM)

Orateur: M. DUPONT, Etienne (CSNSM)

Classification de Session: Nuclear Physics - Experiments

ID de Contribution: **21** Type: **Talk**

Microstructural evolution of ODS alloys under high helium accumulation rates

mardi 29 mai 2018 18:00 (20 minutes)

In spite of intensive international research on Oxide Dispersed Strengthened (ODS) steels in the last decade, many fundamental issues concerning modification of steel properties under fusion environment are still under debate. The main objective of this research project is to demonstrate the role of the different microstructural components in radiation resistance of ODS steel under high accumulation rate of transmutation gases. Mechanisms of helium accumulation by different types of microstructural defects were investigated by means of ion implantation technique followed by transmission electron microscopy investigations. It was demonstrated that grain boundaries play the main role in the He accumulation independent of the implantation conditions applied. At that, Y2O3 nanoparticles even though act as centers for gas bubble nucleation have a minor effect on suppression of the He accumulation with impact similar to that of carbide precipitates and dislocations. Potential risks of ODS steel performance under the expected operational conditions are discussed.

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Orateur: Mme EMELIANOVA, Olga (CSNSM, Univ Paris-Sud, Univ Paris-Saclay)

Classification de Session: Nuclear Energy

ID de Contribution: **22** Type: **Talk**

Development and Optimization of Mechanical Polishing for Superconducting Accelerating Cavities

mardi 29 mai 2018 14:45 (20 minutes)

Performances of superconducting accelerating cavities, in particular made of bulk Niobium, depend on the purity and crystallographic quality of the material exposed to an intense radio-frequency electromagnetic field. The preparation of the cavity walls has been and is still one of the major challenges in SRF accelerator technology. In order to avoid performance degradation, the damaged layer (~ 100-200 um) induced by Niobium sheets manufacturing and cavity forming and welding (lamination, rolling, deep-drawing ⋯) has to be removed to recover optimal superconducting properties. Buffered chemical polishing (BCP) and electro-polishing (EP) techniques are commonly used but both methods are very expensive, hazardous and don't ensure an optimal surface roughness. This thesis aims at investigating alternative polishing techniques, more particularly mechanical polishing methods, known to produce unsurpassed surface quality which could not only improve nowadays Niobium cavity performances but also produce high quality substrates for thin-film deposition of alternative superconducting materials. The most appropriate polishing method and the optimized recipe will be presented as well as preliminary results of surface characterization. Future work and strategy will finally be detailed.

Auteurs principaux: M. HRYHORENKO, Oleksandr (IPNO); CHABOT, Marin (IPNO); LONGUEVERGNE, David (IPNO)

Orateur: M. HRYHORENKO, Oleksandr (IPNO)

Classification de Session: Accelerator Physics

ID de Contribution: **23** Type: **Poster**

Behaviour of uranium dioxide under irradiation: combined effects of radiation defects induced by ballistic and electronic excitation

mardi 29 mai 2018 16:15 (1 heure)

During in-reactor operation, the nuclear fuel is subjected to simultaneous radiation sources induced by the slowing down of fission fragments, the alpha and beta decay, etc. In addition, fission products incorporation induce chemical effects in the matrix. At the atomic scale radiation, damage is produced by both low-energy particles, leading to the collision cascades formation and high-energy particles inducing electronic excitation and ionisation. Due to this radiation damage, a microstructural evolution of the fuel such as cavities, dislocation lines and loops occurs. These defects can induce a swelling and/or a restructuration, which can affect the nuclear fuel integrity. Although ballistic and electronic-induced effects are separately well-established, the synergistic effects between the two slowing-down processes are not well-known. My PhD is aimed to studying this coupled effects and the associated mechanisms. For that purpose, ion irradiation have been performed at the JANNuS-Saclay facilities, where three ion accelerators can be coupled. Mono and dual-beam irradiation will be performed simultaneously on uranium dioxide crystals. Damage build-up kinetics has been in situ characterized by Raman spectroscopy. First results seem to show a possible recovery of the ballistic damage by intense electronic excitations.

Auteurs principaux: Mme BRICOUT, Marion (CEA Saclay); GUTIERREZ, Gaelle (CEA Saclay); ONOFRI, Claire (CEA Cadarache); BELIN, Renaud (CEA Cadarache); Prof. GARRIDO, Frederico (CSNSM, CNRS-IN2P3, Université Paris Saclay)

Orateur: Mme BRICOUT, Marion (CEA Saclay)

Classification de Session: Poster and coffee

ID de Contribution: **24** Type: **Talk**

Test of Lepton Flavor Universality using b-baryons

lundi 28 mai 2018 12:25 (20 minutes)

In the Standard Model of particle physics, couplings of gauge bosons to leptons of different flavors (electrons, muons and tau leptons) are believed to be identical. However, the recent measurements performed by LHCb Collaboration show hints for Lepton Flavor Universality violation: probabilities of B meson decaying to an (excited) kaon and two muons, and an (excited) kaon and two electrons, look different at about 2.6 sigma level. Several New Physics models were proposed to explain these results. More data is needed to confirm or reject these tensions, and also testing other similar decays would shed more light on this puzzle. One of the prominent ideas is to test the similar observables in the baryonic sector, exploiting a different spin-structure and testing whether possible New Physics effects are spin-dependent.

In this talk, the strategy of the Lepton Universality test using $\Lambda_b \to pKe^+e^-$ and $\Lambda_b \to pK\mu^+\mu^-$ decays will be covered. Preliminary results will be shown on the background studies, signal selection and important cross-checks evaluated before extracting the final result.

Auteur principal: M. LISOVSKYI, Vitalii (LAL)

Orateur: M. LISOVSKYI, Vitalii (LAL)

Classification de Session: Hadronic and Particle Physics - 1

ID de Contribution: **25** Type: **Talk**

Study of key resonances in the 30P(p,g)31S reaction in classical novae

mardi 29 mai 2018 10:45 (20 minutes)

Classical novae outbursts are the third most energetic explosions in the Universe after gamma-ray bursts and supernovae. During this explosive burning, nucleosynthesis takes place and the newly synthesized material is ejected into the interstellar medium. In order to understand these objects, the study of presolar grains and γ-ray emitters are of specific interest since they can give direct insights into the nucleosynthesis processes and isotopic abundances.

The 30P(p,g)31S reaction is one of the few remaining reactions with a rate uncertainty which has a strong impact on classical novae model predictions. Sensitivity studies have shown that it has the largest impact on the predicted elemental abundance ratios of Si/H, O/S, S/Al, O/P and P/Al, which can be used to constrain physical properties of classical novae. The 30Si/28Si isotopic ratio, which is an important signature that helps to identify presolar meteoritic grains of a likely nova origin, depends also strongly on the 30P(p,γ)31S reaction rate.

To reduce the nuclear uncertainties associated to this reaction we performed an experiment at ALTO facility of Orsay using the 31P(3He,t)31S reaction to populate 31S excited states of astrophysical interest. The tritons were momentum analysed using the Enge Split-Pole magnetic spectrometer and the decaying protons were detected in coincidence in an array of DSSSDs (Double Sided Silicon Stripped Detectors). The comparison of the focal plane spectra obtained for single and coincidence events will allow the extraction of the proton branching ratios.

After a presentation of the astrophysical context of this work, the current situation of the 30P(p,g)31S reaction rate will be discussed. Then the experiment set up and the analysis of the single events from the Split-Pole focal plane detector will be presented.

Auteur principal: Mme MEYER, Anne (IPN Orsay)

Orateur: Mme MEYER, Anne (IPN Orsay)

Classification de Session: Nuclear Physics - Experiments

ID de Contribution: **26** Type: **Talk**

MoTI, a mobile gamma camera for therapeutic dose control during targeted radiotherapy

mardi 29 mai 2018 18:50 (20 minutes)

Targeted radionuclide therapy is the most used treatment modality against malign and benign diseases of thyroid. The large heterogeneity of therapeutic doses in patients and the range of effects observed state that an individualized dosimetry is essential for optimizing this therapy. The goal of the project is to strengthen the control of the doses delivered to thyroid during treatment of benign and malign diseases, providing a novel mobile gamma imaging device specifically dedicated to measurements of the bio-distribution and kinetics of the radio-tracer at the patients's bedside. We report the optimization of the detection head of the camera, made by both experiments and Monte Carlo simulations, and the preliminary experimental results obtained with the first fully operational 5×5 cm2 FoV camera prototype. It consists of a 3D printed parallel-hole high-energy tungsten collimator, coupled to a 6 mm thick continuous CeBr3 scintillator, readout by an array of Silicon Photomultiplier detectors. The camera exhibits an intrinsic spatial resolution of 0.8 mm FWHM at 356 keV with very low distortion and an energy resolution of 8%. The optimization of the collimator design, in order to enhance small nodules detectability by reducing scatter and septal penetration, leads to the choice of a 5.5 cm thick collimator with a spatial resolution of 2 mm and an efficiency of 1.24×10−5 for a 5 cm source distance. Preliminary imaging with thyroid phantoms filled with 131-I shows the huge improvement of image quality compared to a standard high-energy gamma-camera. Detailed description of the MoTi camera optimization will be presented.

Auteurs principaux: MENARD, Laurent (IMNC); Mme TRIGILA, Carlotta (University Paris Sud, IMNC); VERDIER, Marc-Antoine (IMNC); BEAUMONT, Tiffany (IRSN)

Orateur: Mme TRIGILA, Carlotta (University Paris Sud, IMNC)

Classification de Session: Medical Physics

ID de Contribution: **28** Type: **Talk**

innovative 4Demittancemeter

mardi 29 mai 2018 15:25 (20 minutes)

The emittance is an essential feature to measure for an accelerator beam. It describes the behavior of the beam at each longitudinal position. For the time, the Alisson scanner is the most used system to qualify the emittance of a proton beam. However, this type of measurement has a default: it is a two-dimensions diagnostic. It means that it can only measure the position and angular repartition of the intensity belong one transverse axis at a time.
The purpose of the 4Demit project is to develop an innovative four dimensions emittance meter (measure the emittance belong the two transverse axis at the same time). The pepper pot principle is the basis of the diagnostics. In addition, the realization of each part has been complex because of the large range of beam to qualify.
After 4 years of development and realization, the prototype of 4Demit has been tested for the first time in March 2018 on the beam injector FAIR.

Auteurs principaux: DUMANCIC, Aurore (CEASaclay); Mme DUMANCIC, Aurore (CEA Saclay/IRFU)

Orateur: Mme DUMANCIC, Aurore (CEA Saclay/IRFU)

Classification de Session: Accelerator Physics

ID de Contribution: **29** Type: **Talk**

Quantum trick to improve the detection of gravitationnal waves

lundi 28 mai 2018 10:05 (20 minutes)

The first gravitational waves signal was detected on the 14th september 2015 by the LIGO observatories. Since then many other detections have been made and especially in August 2017 with the detection in coincidence on both LIGO and Virgo detectors of the coalescence of two neutron stars which position in the sky was precise enough to identify the galaxy host and electromagnetic counterpart.

With this in prospect, it is important to enhance the sensitivity of gravitational waves detectors. Frequency dependent squeezing is a promising improvement which uses the rules of quantum optics to go beyond the standard quantum limit of gravitational waves detector sensitivity. I will present this technique within the framework of an experimental prototype under installation in the CALVA 50 meters cavity at LAL to test its implementation in a detector such as Advanced Virgo.

Auteur principal: Mme LARTAUX (VOLLARD), Angelique (LAL / CNRS)

Orateur: Mme LARTAUX (VOLLARD), Angelique (LAL / CNRS)

Classification de Session: Astrophysics & Cosmology

ID de Contribution: **30** Type: **Poster**

Combining experimental and computational approaches for the understanding of the basic mechanisms of irradiation-defect formation and evolution

mardi 29 mai 2018 16:15 (1 heure)

Ion beams are currently used in numerous fields of material science. It is crucial to have powerful tools to characterize irradiated materials and to have a better understanding of the basic mechanisms of the ion/solid interactions through mastering the technical aspects of the use of ion beams. The aim of the thesis work is to develop new approaches that combine experimental characterization techniques, such as high-resolution X-Ray Diffraction (XRD) and ion channeling with computational methods such as molecular dynamics and rate equation cluster dynamic, to study the generation process of defects and damage in irradiated materials. The method will mainly rely on the cross-checking between experimental and computational irradiation data and between XRD and ion channeling characterization techniques.

Auteur principal: M. JIN, Xin (CSNSM, CNRS)

Co-auteurs: M. DEBELLE, Aurélien (CSNSM, CNRS); M. BOULLE, Alexandre (SPCTS, CNRS)

Orateur: M. JIN, Xin (CSNSM, CNRS)

Classification de Session: Poster and coffee

ID de Contribution: **31** Type: **Poster**

Polarex, a future facility for on line nuclear orientation

mardi 29 mai 2018 16:15 (1 heure)

Low temperature nuclear orientation (LTNO) allows to study polarized exotic nuclei. At very low temperature (~10mK) nuclei can experience a very high polarization in the hyperfine field which exists into a ferromagnetic metal host. The decay products can be observed using proton, alpha or beta-particle detectors fitted within the cryostat and/or external gamma or neutron detectors, providing a very versatile instrument.

Oriented nuclei give access to a wide range of experiments. These include a precise measurement of nuclear moments using the NMR technique and the observation of beta-decay to, and gamma emission from, excited states in the daughter nucleus to study aspects of nuclear structure. As a special feature of LTNO, far-reaching studies of fundamental weak interactions and associated symmetries can be made as well as investigations of parity non conservation.

PolarEx (Polarization of Exotic nuclei) is a facility dedicated to this kind of study through the decay of polarized nuclei that will run on-line at the ALTO facility at Orsay, France. This experimental setup is also designed to give a large access for the detection system: up to eight germanium detectors can be fitted in the plan perpendicular to the orientation axis to study the spatial asymmetry of the gamma radiation.
At PolarEx, long lived nuclei can be studied OFF-line while the direct implantation of the nuclei produced at ALTO into PolarEx will open a wide range of ON-line experiments with exotic nuclei (with typical lifetimes as short as 1 second). In particular, a precise measurement of nuclear moments can be made using the NMR technics. Also, one can reach the level spins in the daughter nucleus, the aspects of nuclear structure based on gamma multi-polarity and the parity non-conservation in nuclear decay. As a special feature of PolarEx, far-reaching studies of fundamental weak interactions and associated symmetries can be done.
In this contribution will be presented the status of Polarex and the on going off-line studies, in particular the new measurements of the multipole mixing ratios in 56Fe.

Auteurs principaux: M. THOËR, Rémy; CLEMENT, Emmanuel (IPN); GAULARD, Carole (CSNSM); IBRAHIM, Fadi (IPN); LE BLANC, François (IPN); ROCCIA, Stéphanie (CSNSM); VERNEY, David (IPN)

Orateur: M. THOËR, Rémy

Classification de Session: Poster and coffee

ID de Contribution: **32** Type: **Poster**

Creation of clinical proton minibeams using magnetic focussing

mardi 29 mai 2018 16:15 (1 heure)

Minibeam radiation therapy (MBRT) is a promising cancer treatment method that can help increase the sparing of healthy tissue while simultaneously allowing for higher doses to be administered, thereby making new types of cancers (hypoxic tumors) accessible to this type of treatment. While MBRT with x-rays is already being put to use in hospitals, the advantages of irradiating with protons and heavier ions could be included in the treatment by considering MBRT with protons (pMBRT) or other hadrons (hMBRT). A particle beam is considered a minibeam when the full width at half maximum of its lateral profile is 1 mm or smaller. Focussing proton beams used for clinical purposes (energies ˜70 to 230 MeV) to such small sizes is a challenging task that until now has been achieved through mechanical collimation (i.e. the beam is routed through a metal block with thin slits or holes). However, this method of mechanical collimation is inefficient, inflexible and creates harmful secondary neutrons. Thus, a method focussing the proton beam only with magnetic fields would present a great improvement.

Auteur principal: M. SCHNEIDER, Tim (IMNC - Université Paris-Sud)

Orateur: M. SCHNEIDER, Tim (IMNC - Université Paris-Sud)

Classification de Session: Poster and coffee

ID de Contribution: **33** Type: **Poster**

Study of beam-surface interactions and dynamic pressure generated by electron clouds and ions for the high luminosity upgrade of the LHC & the Future Circular Collider study

mardi 29 mai 2018 16:15 (1 heure)

The High Luminosity LHC (HL-LHC) is an upgrade of the LHC to achieve instantaneous luminosities a factor of five larger than the LHC nominal value. The Future Circular Collider (FCC) study is developing designs for a higher performance particle collider to extend the research currently being conducted by present colliders. For these two project, the investigation of beam interactions with the environment and the resulting disturbances of beam is a crucial question in particle physics detector technology. Understanding of the beam interactions with the vacuum chamber wall is an essential requirement to provide solutions to mitigate the instabilities and gas desorption due to the electron cloud phenomena, photonic and ionic desorption. For instance ions produced by interactions of the electron cloud with the residual gas generate desorption by striking the surfaces [1], which in some regions of the accelerators can be a limiting factor for the machine performance. Theoretical and experimental studies will be performed at the Linear Accelerator Laboratory (LAL) at France, in collaboration with CERN, in order to understand the influence of these physical phenomena on the gas density distribution inside the beam pipes. First, this research deals with the development of a new software based on an analytical model of gas dynamics, by taking into account the cross-desorption by ions of one gas species of other adsorbed gas species [2] (namely the four dominating gas species H2, CH4, CO and CO2). Desorption engendered by the electron-cloud and the ions will be reviewed and integrated into a simulation of dynamic pressure distribution program: VASCO (VAcuum Stability COde [2]) and PyVASCO ([4]). Experimental tests will be carried out at CERN, on the Vacuum Pilot Sector (VPS) already established on the LHC [3]. VPS allows now to study beam-surface interactions with the nominal beams of the LHC. Measurement and characterization of desorption rate is carried out according to surface, energy of incident particles, irradiation angle, ion species, and nature of vacuum pipe material. The results of these studies could be used as new inputs in the software to determine new thresholds for instability in the present LHC, its high luminosity upgrade and for the FCC study.

[1] THE ION IMPACT ENERGY ON THE LHC VACUUM CHAMBER WALLS
O.B. Malyshev, CERN, Geneva, Switzerland
Proceedings of EPAC 2000, Vienna, Austria

[2] ION DESORPTION VACUUM STABILITY IN THE LHC
THE MULTIGAS MODEL
O.B. Malyshev and A. Rossi, CERN, Geneva, Switzerland
Proceedings of EPAC 2000, Vienna, Austria
EPAC 2000, Vienna, Austria

[3] THE LHC VACUUM PILOT-SECTOR PROJECT
B. Henrist, V. Baglin, G. Bregliozzi, and P. Chiggiato, CERN, Geneva, Switzerland
Proceedings of IPAC2014, Dresden, Germany

[4] ANALYTICAL METHODS FOR VACUUM SIMULATIONS IN HIGH ENERGY ACCELERATORS FOR FUTURE MACHINES BASED ON THE LHC PERFORMANCE
Ida Aichinger, CERN, Geneva, Switzerland, 2017

Auteur principal: Mme BILGEN, Suheyla (LAL)

Co-auteurs: SATTONNAY, Gael (LAL); BAGLIN, Vincent (CERN); MERCIER, Bruno (LAL)

Orateur: Mme BILGEN, Suheyla (LAL)

Classification de Session: Poster and coffee

ID de Contribution: **34** Type: **Talk**

Layer intercalibration of the ATLAS electromagnetic calorimeter

lundi 28 mai 2018 11:45 (20 minutes)

The ATLAS electromagnectic calorimeter allows for a precise measurement of electron and photon energy produced during collisions at the LHC. To get an accurate measurement, the reconstructed energy is calibrated over several steps. One of these steps is the inter-calibration of the 3 layers of the calorimeter to correct for electronic cross-talk among cells and possible residual miscalibrations of the electronics.
The work presented here shows the results of the layer inter-calibration using the 2015 and 2016 datasets, as well as the techniques developed to mitigate the impact of multiple interactions occurring during proton-proton collisions at the LHC.

Auteur principal: M. LAUDRAIN, Antoine (LAL-ATLAS)

Orateur: M. LAUDRAIN, Antoine (LAL-ATLAS)

Classification de Session: Hadronic and Particle Physics - 1

ID de Contribution: **35** Type: **Talk**

Charmonium production using decays to hadronic final states at LHCb

lundi 28 mai 2018 12:45 (20 minutes)

Non Relativistic QCD (NRQCD) provides so far the most successful framework to describe the production of the $J^{PC} = 1^{--}$ quarkonium states. However, a comprehensive description of the production and polarisation of the J/ψ state at Tevatron and LHC in the complete p_T and rapidity range remains a challenge. The heavy quark spin symmetry yields direct links between the long distance matrix elements describing hadroproduction of different charmonium states. The production of linked charmonium states - η_c and J/ψ, $\eta_c(2S)$ and $\psi(2S)$, and the three χ_c states - can thus be described simultaneously.
Experimentally the production of non-1^{--} charmonium states can be studied by reconstructing their decays to fully hadronic final states. The LHCb measurement of the $\eta_c(1S)$ prompt production and production in inclusive b-hadron decays via the decay $\eta_c(1S) \to p\bar{p}$ is discussed together with its strong impact on NRQCD-based theory models. Recent LHCb measurement of the χ_c and $\eta_c(2S)$ states production in inclusive b-hadron decays using their decays to $\phi\phi$ is also presented; the discrepancy with existing theoretical prediction is demonstrated. Prospects of measuring prompt $\eta_c(2S)$ production at the LHCb using 2018 data is discussed.

Auteur principal: M. USACHOV, Andrii (LAL)

Orateur: M. USACHOV, Andrii (LAL)

Classification de Session: Hadronic and Particle Physics - 1

ID de Contribution: **36** Type: **Talk**

Transportation and Manipulation of A Laser Plasma Acceleration Electron Beam

mardi 29 mai 2018 15:05 (20 minutes)

The ERC Advanced Grant COXINEL aims at demonstrating free electron laser amplification, at a resonant wavelength of 200 nm, based on a laser plasma acceleration source. To achieve the amplification, a 8 m long dedicated transport line was designed to manipulate the beam qualities. It starts with a triplet of permanent magnet with tunable gradient quadrupoles (QUAPEVA) that handles the highly divergent electron beam, a demixing chicane with a slit to reduce the energy spread per slice, and a set of electromagnetic quadrupoles to provide a chromatic focusing in a 2 m long cryogenic undulator. Electrons of energy 176 MeV were successfully transported throughout the line, where the beam positioning and dispersion were controlled efficiently thanks to a specific beam based alignment method, as well as the energy range by varying the slit width. Observations of undulator radiation for different undulator gaps are reported.

Auteur principal: M. GHAITH, Amin (Synchrotron SOLEIL)

Orateur: M. GHAITH, Amin (Synchrotron SOLEIL)

Classification de Session: Accelerator Physics

ID de Contribution: **37** Type: **Poster**

Optique et diagnostics faisceaux du projet MYRRHA 100 MeV

mardi 29 mai 2018 16:15 (1 heure)

- Intro
  - Intro sujet MYRRHA 600 MeV avec réacteur nucléaire
  - Nécessité d'avoir un système fiable avec peu d'arrêt de fonctionnement
  - Sûreté d'un pilotage par accélérateur, k_{eff}<1
- Dynamique faisceau
  - Commissioning et test de fiabilité à 100 MeV
  - Photo dynamique faisceau, photo quadupole, dipole
  - Mon travail sur la définition du kicker-septum nécessaire et sur le design des dump
- Détecteurs
  - Design des détecteur, exemple décteurs (1-2) en photo, les plus simple
  - Quelques résultats de sortie de détecteur, harmoniques, signal analogique
  - Petit point sur théorie de traitement du signal et importance de la prise en compte de diag dès la conception de la ligne
- Opera
  - Un mot sur opera 3D, quelques photos de carte de champ de quadrupole/dipole
  - Petit point sur les non linéarité de champ par rapport à un élément premier ordre

Auteur principal: M. KRAFT, Henri (IPNO DA)

Orateur: M. KRAFT, Henri (IPNO DA)

Classification de Session: Poster and coffee

ID de Contribution: **38** Type: **Talk**

The CMS Level-1 Vector Boson Fusion trigger for the LHC Run II

mardi 29 mai 2018 12:40 (20 minutes)

The CMS experiment implements a sophisticated two-level triggering system composed of a Level-1 trigger, instrumented by custom-design hardware boards, and a software High-Level-Trigger. A new Level-1 trigger architecture with improved performance is now being used, allowing complex correlations to be computed online. The implementation of the first dedicated Vector Boson Fusion trigger algorithm is described and the performance on benchmark physics signal is assessed. Several Higgs searches will benefit from the VBF trigger being included in the L1 trigger selection starting from 2017.

Auteur principal: Mme AMENDOLA, Chiara (Laboratoire Leprince-Ringuet, Ecole polytechnique)

Orateur: Mme AMENDOLA, Chiara (Laboratoire Leprince-Ringuet, Ecole polytechnique)

Classification de Session: Hadronic and Particle Physics - 2

ID de Contribution: **39** Type: **Talk**

Searching for neutrinoless double beta decay

lundi 28 mai 2018 10:50 (20 minutes)

In the Standard Model of particle physics (SM), the lepton sector is composed of massive charged particles (electron, muon and tau) and neutral particles, neutrinos, which are massless by construction.
Nevertheless, observations of neutrino oscillations indicate that neutrinos are massive particles.
Given their neutral character, neutrinos can be either Dirac or Majorana particles.
Should neutrinos be Majorana particles, their mass term leads to lepton number violation (LNV) with $\Delta L = 2$, forbidden in the SM.
The best known process able to probe LNV is neutrinoless double beta decay ($0\nu\beta\beta$) proposed in 1939 by W.H. Furry.
This process is beyond the SM and is allowed if neutrinos are Majorana particles, and so far, it has never been observed.
The observation of $0\nu\beta\beta$ could explain the smallness of neutrino masses by the see-saw mechanism, as well as the observed current asymmetry between matter and antimatter via leptogenesis.
The SuperNEMO experiment, in installation at LSM (Laboratoire Souterrain de Modane) is one of the experiment trying to observe such a rare decay.
By coupling a tracker to a calorimeter, SuperNEMO is the unique experiment able to track particles in the detector and to measure the deposited energy when a decay occurs.
But even if neutrinos are Majorana particles, $0\nu\beta\beta$ remains an extremely rare process.
As a consequence, SuperNEMO is built to be an ultra-low background detector.
SuperNEMO could observe the neutrinoless double beta decay of ^{82}Se nuclei, with an available mass of around 7 kg and an acquisition time of 2.5 years, with a half-life sensitivity expected to be $\tau_{1/2}^{0\nu\beta\beta} > 6,5.10^{24}$ years.

Auteur principal: M. GIRARD-CARILLO, Cloé

Orateur: M. GIRARD-CARILLO, Cloé

Classification de Session: Neutrinos

ID de Contribution: **40** Type: **Talk**

Symmetry broken & restored many-body theories in nuclear structure

mardi 29 mai 2018 17:15 (20 minutes)

Methods to solve the N-body Schroedinger equation must cope with two specific attributes of inter-nucleon interactions that are responsible for the non-perturbative character of the nuclear many-body problem. These elements of non-perturbative physics are of ultra-violet and infra-red natures and can be tamed down by pre-processing the nuclear Hamiltonian via Similarity Renormalization Group evolution. Based on the transformed Hamiltonian, dynamical correlations can be treated via standard many-body techniques, such that many-body perturbation theory (MBPT), coupled cluster (CC) or self-consistent green function (SCGF). These methods have been implemented with great success in the last ten years to deal with doubly-closed shell nuclei. Strong, i.e. non-dynamical, correlations induced in singly and doubly open-shell nuclei are of different nature and require specific attention. To proceed one option consists in exploiting the spontaneous breaking of symmetries induced by non-dynamical correlations at the mean-field level. This rationale allows one to incorporate a large part of the non-perturbative physics into a single product state that can serve as a reference for many-body expansions dealing efficiently with dynamical correlations. In practice this is achieved by allowing the reference state to break U(1) global gauge symmetry associated with particle-number conservation and optimized it through the Hartree-Fock-Bogoliubov variational procedure. While traditionally developed within the frame of effective nuclear mean-field (i.e. energy density functional) approaches, this idea has been recently embraced to develop and implement ab initio Bogoliubov MBPT, Bogoliubov CC, Gorkov SCGF to tackle pairing correlations. These methods based on a symmetry breaking reference state are currently allowing a breakthrough in the ab initio description of (singly) open-shell nuclei and are putting state-of-the-art inter-nucleon interactions to the test in medium-mass systems, for which the number of nucleons goes from 20 up to 100.

In this talk, I will motivate the use the symmetry breaking and restoration in many-body theories for nuclear structure. A focus will be made on the breaking of U(1) global gauge symmetry associated with particle-number conservation in order to account for the superfluid character of nuclei. An application of these concepts in the case of the Richardson Hamiltonian will be given.

Auteur principal: Mme RIPOCHE, Julien (CEA/DAM)

Orateur: Mme RIPOCHE, Julien (CEA/DAM)

Classification de Session: Nuclear Physics - Theory

ID de Contribution: **41** Type: **Talk**

LIGO/VIrgo : Run O1, Cosmic string search and upper limits on the cosmic string parameters.

mardi 29 mai 2018 19:15 (20 minutes)

Cosmic strings are topological defects which can be formed in GUT-scale phase transitions in the early universe. They are also predicted to form in the context of string theory. I will present the analysis conducted to specifically search for gravitational-wave bursts from cosmic string loops in the data of Advanced LIGO 2015-2016 observing run (O1).

Auteur principal: Mme BELAHCENE, Imene (LAL)

Orateur: Mme BELAHCENE, Imene (LAL)

Classification de Session: Astrophysics & Cosmology

ID de Contribution: **42** Type: **Poster**

Correction of electromagnetic showers shape in Monte-Carlo modelling of ATLAS calorimeter

mardi 29 mai 2018 16:15 (1 heure)

The electromagnetic calorimeter is one of the key elements of the ATLAS detector at the Large Hadron Collider at CERN. In combination with the inner tracker the calorimeter allows to measure the energy and the momentum of electrons and photons coming out of the interaction point of the detector.
In order to properly reconstruct the physical processes happening after the collision it is crucial to identify the origin of the measured particles and, in particular, to separate the signal electrons, coming from prompt decays, from the background.
Electrons identification is performed by means of multi-variant analysis algorithm, which in turn strongly relies on a number of electromagnetic shower shape characteristics.
It appears that due to material mismodelling of the detector, the Monte-Carlo model provides inaccurate energy distribution in the calorimeter cluster cells.
Correcting the shower shape would allow to improve the electron identification as well as energy measurement accuracy.

Auteur principal: KHANDOGA, Mykola (CEA Saclay)

Orateur: KHANDOGA, Mykola (CEA Saclay)

Classification de Session: Poster and coffee

ID de Contribution: **43** Type: **Poster**

Developments in the Spherical Proportional Counter for NEWS-G

mardi 29 mai 2018 16:15 (1 heure)

The NEWS-G collaboration utilises the novel technology of the Spherical Proportional Counter (SPC) to conduct a direct search for low mass Dark Matter (DM) candidates. The SPC comprises a grounded metallic spherical vessel with a central spherical readout anode. In the ideal geometry, the radial electric field within the detector varies as $1/r^2$, however, the details of the support structure of the anode substantially influence its exact form. The understanding of the electric field is crucial to the successful operation of the detector, as it directly impacts the electron drift times and the uniformity of the detector gain. The detector will be presented with an emphasis on the developments in sensor design to improve electric field uniformity, including studies of the effects of geometry and bias voltage on the electric field.

Auteur principal: M. KNIGHTS, Patrick (CEA Saclay/IRFU)

Co-auteurs: Dr NIKOLOPOULOS, Kostas (University of Birmingham); Dr GIOMATARIS, Ioannis (CEA Saclay/IRFU); Dr KATSIOULAS, Ioannis (CEA Saclay/IRFU)

Orateur: M. KNIGHTS, Patrick (CEA Saclay/IRFU)

Classification de Session: Poster and coffee

ID de Contribution: **44** Type: **Talk**

The Galactic PeVatron Candidates for Very-high-energy Gamma-ray Observation

lundi 28 mai 2018 10:25 (20 minutes)

One of the major scientific objectives of the future Cherenkov Telescope Array (CTA) Observatory is the discovery of PeVatrons, which are able to accelerate charged particle up to 1 PeV (10ˆ15 eV). The determination of efficient criteria to identify PeVatron candidates during the observations is essential in order to trigger deeper observations. Here we use the simulated data, which call Data Challenge One (DC-1) to test which kinds of object in the Galaxy can be PeVatron. By finishing this, we generate the candidates' spectrum and fit the radiative models to see whether they are the PeVatron candidate.

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Classification de Session: Astrophysics & Cosmology

ID de Contribution: **45** Type: **Talk**

Complexation of protactinium(V) with nitrilotriacetic acid

mardi 29 mai 2018 18:25 (20 minutes)

Protactinium, as a ^{235}U decay product, is naturally present in the environment as ^{231}Pa isotope (alpha emitter with a half-life of 32,400 years). Over the years, this isotope is accumulated in uranium tailings and stocks of yellow cake. Modelling the behavior of this element in the geosphere requires thermodynamic and structural data relevant to environmental conditions. The present work concerns a study of the complexation of Pa(V) with nitrilotriacetic acid (NTA, $N(CH_2COOH)_3$)), a chelating agent that can be regarded as a model for polyaminocarboxylic acids.

Because of the strong tendency of Pa(V) towards hydrolysis and polymerization, speciation studies have been conducted with the element at ultra-trace scale (CPa < 10^{-10}M) [1,2]. A systematic study using liquid-liquid extraction with a β-diketone as extractant has been performed at constant ionic strength and temperature. Under these experimental conditions, the variations of the distribution coefficient of ^{233}Pa(V) as a function of NTA and proton concentrations provides information on the stoichiometry of the complexes Pa-NTA in aqueous phase and also on their mean charge (slope method). Results indicate the formation of two successive complexes that are likely to be PaO(NTA) and $PaO(NTA)_2^{3-}$. The formation of complexes (1:1) and (1:2) are observed with actinides at oxidation states +3 and +4. In contrast, only (1:1) complexes are formed with actinides +5 and +6. In addition, capillary electrophoresis inductively coupled plasma mass spectrometry experiments have been performed with several actinides (^{239}Pu(IV), ^{243}Am(III), ^{231}Pa(V)) at tracer scale. Pu(IV) and Am(III) namely are known to form complexes of charge -2 ($Pu^{IV}(NTA)_2^{2-}$)[3] and -3 ($Am^{III}{}_2^{3-}$)
[4]. Comparison of electrophoretic mobility for the complexes Am(III), Pu(IV) and Pa(V) with NTA, confirms the charge -3 for the maximum stoichiometry complex.

The formation constants of PaO(NTA) and $PaO(NTA)_2^{3-}$ have been deduced from solvent extraction experiments. The value obtained for the (1:1) complex is similar to those relative to actinides + 6 whereas the formation constant of the (1:2) complex is close to the ones observed for the actinides at the oxidation state +3. Thus, these results emphasize the distinctive feature of protactinium chemistry as compared to the other actinides.

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[3]L. Bonin, D. Guillaumont, A. Jeanson, C. Den Auwer, M. Grigoriev, J.C. Berthet, C. Hennig, A. Scheinost. P. Moisy, Inorg. Chem., 2009, 48, 3943.

[4]A. Moskvin, Radiokhimiya, 1971, 13, 575.

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Classification de Session: Radiochemistry

ID de Contribution: **46** Type: **Poster**

Characterising turbulence in large scale structures with X-ray satellites.

mardi 29 mai 2018 16:15 (1 heure)

Understanding the baryonic processes taking place in the large scale structures of the Universe is essential both if we want to understand structure formation and the biases they may induce in cosmological studies (e.g. σ8 or ωm). Among those processes, turbulent motions that are induced at various scales, for instance by AGN jets or accretion of matter from intergalactic filaments, are crucial. At those scales, turbulence can potentially be tracked through the X-ray emission & absorption of the gas. We will present our results on the detectability of turbulent motions on the largest scales of the Universe that future X-ray satellites may offer.

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Classification de Session: Poster and coffee

ID de Contribution: **47** Type: **Non spécifié**

Fragmentation of hydrocarbons by collision - AGAT@ANDROMEDE

mardi 29 mai 2018 10:25 (20 minutes)

The purpose of my PhD is to study the collision between hydrocarbon molecules and Helium atoms. The experiment had been done at IPNO with the ANDROMEDE accelerator thanks to the silicon mutidetector AGAT. This work relies on two fundamental studies. The frst one is the modelling of ion atom collision which allows us to predict the cross section of the collision. The second one is the fragmentation. The internal energy of the molecule being known, we want to predict the diferent ways of fragmentation. During this presentation I will describe to you the experiment and its goals.

Auteur principal: M. ID BARKACH, Tijani

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Classification de Session: Nuclear Physics - Experiments

ID de Contribution: **50** Type: **Non spécifié**

PhD associations

mardi 29 mai 2018 09:30 (15 minutes)