PhD Day 2

Rapport sur les contributions

https://indico.in2p3.fr/e/29583

ID de Contribution: **1** Type: **Non spécifié**

Quasinormal mode applications in the epoch of gravitational-wave astronomy

jeudi 27 avril 2023 10:00 (30 minutes)

In the wake of a perturbation, a black hole will radiate gravitational waves (GWs). After an initial response to the external stimulus, the GW spectrum of the perturbed black hole is dominated by a discrete set of complex quasinormal frequencies (QNFs) whose values depend exclusively on characteristic black hole properties. With the advent of GW astronomy, we can test theoretical and numerical quasinormal mode (QNM) models against GW data and search for evidence of new physics. In this talk, I shall discuss some of these possibilities. In particular, I shall focus on how we can quantify the detectability of the QNMs through the computation of "quasinormal excitation factors" and introduce the question of whether QNMs can be used in the search for signatures of extra dimensions. To do so, I shall outline a possible means by which we can combine numerical computations of QNFs with tests for deviations from general relativity predictions in GW data to place a model-agnostic "detectability bound"beyond which extra dimensions cannot be detected using QNMs.

Orateur: CHRYSOSTOMOU, Anna

ID de Contribution: **2** Type: **Non spécifié**

Study and development of new detectors for the search of light dark matter with CRYOSEL

jeudi 27 avril 2023 10:30 (30 minutes)

The EDELWEISS collaboration performs light Dark Matter (DM) particle searches with high-purity germanium bolometers collecting both charge and phonon signals. As is the case for most cryogenic dark matter experiments, the sensitivity of EDW's detectors is limited by unknown low-energy backgrounds. But recent results (PhysRevD.106.062004) obtained thanks to detectors equipped with NbSi Transition Edge Sensor (TES) operated underground at the Laboratoire Souterrain de Modane (LSM) have shown the high relevance of this technology for better understanding and constraining of these backgrounds. In this context, the EDELWEISS collaboration, as part of its Sub-GeV program, is working on a new design of germanium bolometers using NbSi TES : CRYOSEL. These innovative TES phonon sensors called Superconducting Single Electron Device (SSED) will be sensitive to the athermal phonons induced by the amplification of a single charge drifting in the strong electric field generated in the detector and hence, will be able to discriminate against our main low-energy background, which is not affected by this amplification.

Orateur: GUY, Elsa

ID de Contribution: **3** Type: **Non spécifié**

Enhancing In-Beam Gamma-Ray Spectroscopy with Machine Learning: Study of Nuclear Structure and Shape Coexistence in Neutron-Rich Niobium Isotopes

jeudi 27 avril 2023 11:00 (30 minutes)

In-beam gamma-ray spectroscopy using the state-of-the-art Advanced GAmma Tracking Array (AGATA) provides unprecedented quality in Doppler correction for high-velocity recoil nuclei studies. The Pulse Shape Analysis (PSA) algorithm, crucial to AGATA's analysis, processes gamma-ray interaction signals by comparing them to a database of simulated signals. To improve PSA capabilities, experimental data is used to build databases instead of simulated ones. Although a database has been created in Strasbourg, the current algorithm used to analyze it is time-consuming. This work presents a new machine learning-based approach to enhance the existing analysis, improving precision in determining gamma-ray interaction positions within AGATA's high-purity higly-segmented germanium crystals.
Focusing on exotic nuclei, particularly neutron-rich Nb isotopes, AGATA is combined with the large acceptance VAMOS++ and EXOGAM spectrometers to investigate sudden shape transitions, shape coexistence, and nuclear deformation. Through transfer and fusion-induced fission experiments at GANIL, the level schemes of 99, 102, 104, 105, 106Nb have been substantially revised, and a level scheme for 107Nb is presented for the first time. The discovery of a novel spherical/deformed shape coexistence in 99Nb and the progression of nuclear deformation with increasing neutron number contribute to an improved understanding of complex nuclear structures in the island of deformation region.

Orateur: ABUSHAWISH, Mojahed (Lyon-IP2I)

ID de Contribution: **4** Type: **Non spécifié**

Relativistic Hartree-Fock Chiral Lagrangians with confinement, nucleon finite size and short-range effects

jeudi 27 avril 2023 15:00 (30 minutes)

Understanding dense matter presents a big challenge at the actual time. On one hand, QCD, the fun-
damental interaction of nuclear matter is known to be non-perturbative at such low energy regimes, and on the other hand relying on numerical approaches to solve QCD, also known as lattice QCD, is blocked by what is known as the "sign problem".
Thus effective nuclear modeling may be employed to tackle the problem and efforts have been made
to connect those descriptions to the fundamental theory of QCD.
In this talk, I present a relativistic approach to study nuclear matter with the specificity that it incorporates two main aspects of QCD at low energy: chiral symmetry breaking and color confinement. In addition, we consider the nucleon finite size and the interaction short range effects.

Orateur: CHAMSEDDINE, Mohamad (UCBL1)

ID de Contribution: **5** Type: **Non spécifié**

Charged-particle pseudorapidity density in proton-proton collisions in ALICE Run 3 using MFT

Charged-particle pseudorapidity density measurements help to understand the particle production mechanisms in high-energy hadronic collisions, from proton-proton to heavy-ion systems. Performing such measurements at forward rapidity, in particular, allows one to access the details of the phenomena associated with particle production close to the fragmentation region of the colliding nuclei. In ALICE, these measurement are performed in the LHC Run~3 exploiting the Muon Forward Tracker (MFT), a newly installed detector extending the inner tracking pseudorapidity coverage of ALICE in the range $-3.6 < \eta < -2.5$. The performance of the ALICE MFT will be presented for the pilot beam data taking of October 2021 for proton-proton collisions at $\sqrt{s}$= 900 GeV, together with a preliminary MFT result for the charged-particle pseudorapidity density.

Orateur: HERRMANN, Sarah (IP2I Lyon)

ID de Contribution: **6** Type: **Non spécifié**

Simulations atomistiques de l'UO2 dopé au chrome, nouveau combustible dit tolérant aux accidents nucléaires (ATF)

jeudi 27 avril 2023 15:30 (30 minutes)

Framatome développe un concept de combustible ATF (accident tolerant fuel) basé sur le dopage à l'oxyde de chrome du dioxyde d'uranium. L'objectif de ma thèse est d'examiner l'impact du chrome sur les mécanismes de diffusion de deux produits de fission, césium et molybdène, connus pour leur volatilité et pour leur influence sur la chimie du combustible, notamment sur le relâchement de l'iode en conditions accidentelles. Les études sont réalisées à l'échelle atomique par dynamique moléculaire avec le code LAMMPS et nous utilisons le nouveau potentiel SMTB-QB pour décrire le comportement de l'UO2 dopé chrome. Dans un premier temps, nous avons vérifié nos paramétrisations pour les liaisons Cr-O et U-O sur différentes propriétés du Cr2O3 et de l'UO2. Dans un deuxième temps, nous pourrons étudier les mécanismes de diffusion du Cs et du Mo dans l'UO2±x dopé au chrome, en comparaison à l'UO2±x non-dopé afin d'établir l'impact du chrome. Nous pourrons ainsi déterminer les coefficients de diffusion de ces espèces dans ces nouveaux combustibles ce qui permettra d'enrichir le code de relâchement de l'IRSN (MFPR-F) et de préparer à l'évaluation de sûreté de ces futurs combustibles.

Orateur: ROUBILLE, Théo

ID de Contribution: **7** Type: **Non spécifié**

Searches for CP symmetry violation in the top quark sector with CMS at the LHC, and the tracker Endcap upgrade for the High Luminosity LHC

jeudi 27 avril 2023 16:00 (30 minutes)

The Standard Model (SM) is unable to explain the predominance of matter over antimatter in our present universe. Matter and antimatter are linked by a CP-symmetry transformation, and current explanations involve a new source of CP symmetry breaking. An effective field theory (EFT) will be used to describe CP-symmetry violation, which will be searched for by analyzing the production and decay of single top quark in the t-channel. A Phenomelogy study is conducted to asses the impact of the EFT on the production and decay of the single top quark. This analysis is based on full LHC Run2 dataset of proton-proton collisions at a center-of-mass energy of 13 TeV, collected at the Compact Muon Solenoid (CMS) experiment.

The CMS tracker Endcap will be upgraded to sustain the high radiation environment of the High Luminosity LHC (HL-LHC), a project called TEDD (Tracker Endcap Double-Discs). The TEDD is composed of several Dees, which are the mechanical structures that holds the detection modules. In this work, we analyze metrological properties of the Dees and prepare for the future Dee production.

Orateur: GREENBERG, Christopher (IP2I)

ID de Contribution: **8** Type: **Non spécifié**

Café

jeudi 27 avril 2023 09:30 (30 minutes)

ID de Contribution: **9** Type: **Non spécifié**

Discussion Informelle (autour Café)

jeudi 27 avril 2023 14:00 (1 heure)

Orateur: Prof. AUGIER, Corinne (UCB Lyon 1 - IP2I)