

Abstracta

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Artigos publicados

[P379-2019] “3D Printed Graphene Electrodes Modified with Prussian Blue: Emerging Electrochemical Sensing Platform for Peroxide Detection”

Katic, V.; dos Santos, P. L.; dos Santos, M. F.; Pires, B. M.; Loureiro, H. C.; Lima, A. P.; Queiroz, J. C. M.; Landers, R.*; Munoz, R. A. A.; Bonacin, J. A.

3D printing technologies have been considered an important technology due to the ease manufacturing of objects, freedom of design, waste minimization, and fast prototyping. In chemistry, this technology potentializes the fabrication of conductive electrodes in large scale for sensing applications. Herein, we reported the modification of a 3D printed graphene electrode with Prussian blue. The modified electrode (3DGrE/PB) was characterized by microscopy (SEM and AFM) and spectroscopic techniques, and its electrochemical properties were compared to the traditional electrodes: glassy carbon, gold, and platinum. The 3DGrE/PB was used in the sensing of hydrogen peroxide in real-world samples of milk and mouthwash, and the results obtained according to the technique of batch-injection analysis were satisfactory for the concentration range typically found in such samples. Thus, 3DGrE/PB can be used as a new platform for sensing of molecular targets.

ACS APPLIED MATERIALS & INTERFACES 11[38], 35068-35078, 2019. DOI: 10.1021/acsami.9b09305

[P380-2019] “3D Printed Tubulanes as Lightweight Hypervelocity Impact Resistant Structures”

Sajadi, S. M.; Woellner, C. F.; Ramesh, P.; Eichmann, S. L.; Sun, Q.; Boul, P. J.; Thaemlitz, C. J.; Rahman, M. M.; Baughman, R. H.; Galvao, D. S.*; Tiwary, C. S.; Ajayan, P. M.

Lightweight materials with high ballistic impact resistance and load-bearing capabilities are regarded as a holy grail in materials design. Nature builds these complementary properties into materials using soft organic materials with optimized, complex geometries. Here, the compressive deformation and ballistic impact properties of three different 3D printed polymer structures, named tubulanes, are reported, which are the architectural analogues of cross-linked carbon nanotubes. The results show that macroscopic tubulanes are remarkable high load-bearing, hypervelocity impact-resistant lightweight structures. They exhibit a lamellar deformation mechanism, arising from the tubulane ordered pore structure, manifested across multiple length scales from nano to macro dimensions. This approach of using complex geometries inspired by atomic and nanoscale models to generate macroscale printed structures allows innovative morphological engineering of materials with tunable mechanical responses.

SMALL 1904747, 2019. DOI: 10.1002/sml.201904747

[P381-2019] “A correntropy-based classifier for motor imagery brain-computer interfaces”

Uribe, L. F. S.; Stefano, C. A.*; de Oliveira, V. A.; Costa, T. B. D.; Rodrigues, P. G.; Soriano, D. C.; Boccato, L.; Castellano, G.*; Attux, R.

Objective. This work aims to present a deeper investigation of the classification performance achieved by a motor imagery (MI) EEG-based brain-computer interface (BCI) using functional connectivity (FC) measures as features. The analysis is performed for two different datasets and analytical setups, including an information-theoretic based FC estimator (correntropy).

Approach. In the first setup, using data acquired by our group, correntropy was compared to Pearson and Spearman correlations for FC estimation followed by graph-based feature extraction and two different classification strategies: linear discriminant analysis (LDA) and extreme learning machines (ELMs) - coupled with a wrapper for feature selection in the μ (7-13 Hz) and β (13-30 Hz) frequency bands. In the second setup, the BCI competition IV dataset 2a was considered for a broader comparison. Main results. For our own data-base the correntropy / degree centrality / ELM approach resulted in the most solid framework, with overall classification error as low as 5%. When using the BCI competition dataset, our best result provided a performance comparable to those of the top three competitors. Significance. Correntropy was shown to be the best FC estimator in all analyzed situations in the first experimental setup, capturing the signal temporal behavior and being less sensitive to outliers. The second experimental setup showed that the inclusion of different frequency bands can bring more information and improve the classification performance. Finally, our results pointed towards the importance of the joint use of different graph measures for the classification.

BIOMEDICAL PHYSICS & ENGINEERING EXPRESS 5[6], UNSP 065026, 2019. DOI: 10.1088/2057-1976/ab5145

[P382-2019] “A DECam Search for Explosive Optical Transients Associated with IceCube Neutrino Alerts”

Morgan, R.; Bechtol, K.; Kessler, R.; Sobreira, F.*; et. al.

In this work, we investigate the likelihood of association between real-time, neutrino alerts with teraelectronvolt to petaelectronvolt energy from IceCube and optical counterparts in the form of core-collapse supernovae (CC SNe). The optical follow-up of IceCube alerts requires two main instrumental capabilities: (1) deep imaging, since 73% of neutrinos would come from CC SNe at redshifts $z > 0.3$, and (2) a large field of view (FoV), since typical IceCube muon neutrino pointing accuracy is on the order of similar to 1 deg. With Blanco/DECam (gri to 24th magnitude and 2.2 deg diameter FoV), we performed a triggered optical follow-up observation of two IceCube alerts, IC170922A and IC171106A, on six nights during the three weeks following each alert. For the IC170922A (IC171106A) follow-up observations, we expect that 12.1% (9.5%) of coincident CC SNe at z less than or similar to 0.3 are detectable, and that, on average, 0.23 (0.07) unassociated SNe in the neutrino 90% containment regions also pass our selection criteria. We find two candidate CC SNe that are temporally coincident with the neutrino alerts in the FoV, but none in the 90% containment regions, a result that is statistically consistent with expected rates of background CC SNe for these observations. If CC SNe are the dominant source of teraelectronvolt to petaelectronvolt neutrinos, we would expect an excess of coincident CC SNe to be detectable at the 3 sigma confidence level using DECam observations similar to those of this work for similar to 60 (similar to 200) neutrino alerts with (without) redshift information for all candidates.

ASTROPHYSICAL JOURNAL 883[2], 125, 2019. DOI: 10.3847/1538-4357/ab3a45

[P383-2019] “Anisotropic hole drift velocity in 4H-SiC”

Vasconcelos, J. L.; Rodrigues, C. G.; Luzzi, R.*

A theoretical study on the nonlinear transport of holes in the transient and steady state of p-doped 4H-SiC under the influence of high electric fields is presented. It is based on a nonlinear quantum kinetic theory which provides a clear description of the dissipative phenomena that are evolving in the system. The hole drift velocity and the nonequilibrium temperature are obtained, and their dependence on the electric field strength is derived and analyzed.

MATERIALS SCIENCE AND ENGINEERING B-ADVANCED FUNCTIONAL SOLID-STATE MATERIALS 249, 114426, 2019. DOI: 10.1016/j.mseb.2019.114426

[P384-2019] “Azimuthal separation in nearly back-to-back jet topologies in inclusive 2-and 3-jet events in pp collisions at root s=13TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al; CMS Collaboration

A measurement for inclusive 2- and 3-jet events of the azimuthal correlation between the two jets with the largest transverse momenta, $\Delta\phi(12)$, is presented. The measurement considers events where the two leading jets are nearly collinear (“back-to-back”) in the transverse plane and is performed for several ranges of the leading jet transverse momentum. Proton-proton collision data collected with the CMS experiment at a center-of-mass energy of 13 TeV and corresponding to an integrated luminosity of 35.9 fb⁻¹ are used. Predictions based on calculations using matrix elements at leading-order and next-to-leading-order accuracy in perturbative quantum chromodynamics supplemented with leading-log parton showers and hadronization are generally in agreement with the measurements. Discrepancies between the measurement and theoretical predictions are as large as 15%, mainly in the region 177 degrees < $\Delta\phi(12)$ < 180 degrees. The 2- and 3-jet measurements are not simultaneously described by any of models.

EUROPEAN PHYSICAL JOURNAL C 79[9], 773, 2019. DOI: 10.1140/epjc/s10052-019-7276-4

[P385-2019] “Bounding the Sets of Classical and Quantum Correlations in Networks”

Pozas-Kerstjens, A.; Rabelo, R.*; Rudnicki, L.; Chaves, R.; Cavalcanti, D.; Navascues, M.; Acin, A.

We present a method that allows the study of classical and quantum correlations in networks with causally independent parties, such as the scenario underlying entanglement swapping. By imposing relaxations of factorization constraints in a form compatible with semidefinite programming, it enables the use of the Navascues-Pironio-Acin hierarchy in complex quantum networks. We first show how the technique successfully identifies correlations not attainable in the entanglement-swapping scenario. Then we use it to show how the nonlocal power of measurements can be activated in a network: there exist measuring devices that, despite being unable to generate nonlocal correlations in the standard Bell scenario, provide a classical-quantum separation in an entanglement swapping configuration.

PHYSICAL REVIEW LETTERS 123[14], 140503, 2019. DOI: 10.1103/PhysRevLett.123.140503

[P386-2019] “Brown dwarf census with the Dark Energy Survey year 3 data and the thin disc scale height of early L types”

Rosell, A. C.; Santiago, B.; dal Ponte, M.; Sobreira, F.*; et. al.; DES Collaboration

In this paper we present a catalogue of 11 745 brown dwarfs with spectral types ranging from L0 to T9, photometrically classified using data from the Dark Energy Survey (DES) year 3 release matched to the Vista Hemisphere Survey (VHS) DR3 and Wide-field Infrared Survey Explorer (WISE) data, covering approximate to 2400 deg(2) up to $i(AB) = 22$. The classification method follows the same phototype method previously applied to SDSS-UKIDSS-WISE data. The most significant difference comes from the use of DES data instead of SDSS,

which allow us to classify almost an order of magnitude more brown dwarfs than any previous search and reaching distances beyond 400 pc for the earliest types. Next, we also present and validate the GalmodBD simulation, which produces brown dwarf number counts as a function of structural parameters with realistic photometric properties of a given survey. We use this simulation to estimate the completeness and purity of our photometric LT catalogue down to $i(AB) = 22$, as well as to compare to the observed number of LT types. We put constraints on the thin disc scale height for the early L (L0-L3) population to be around 450 pc, in agreement with previous findings. For completeness, we also publish in a separate table a catalogue of 20 863M dwarfs that passed our colour cut with spectral types greater than M6. Both the LT and the late M catalogues are found at DES release page <https://des.ncsa.illinois.edu/releases/other/y3-mlt>.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 489[4], 5301-5325, 2019. DOI: 10.1093/mnras/stz2398

[P387-2019] “Cerebral Blood Flow Response During Bolus Normal Saline Infusion After Ischemic Stroke”

Mullen, M. T.; Parthasarathy, A. B.; Zandieh, A.; Baker, W. B.; Mesquita, R. C.*; Loomis, C.; Torres, J.; Wensheng, F.; Christopher G.; Messe, S. R.; Yodh, A. G.; Detre, J. A.; Kasner, S. E.

Goals: We quantified cerebral blood flow response to a 500 cc bolus of 0.9% normal saline (NS) within 96 hours of acute ischemic stroke (AIS) using diffuse correlation spectroscopy (DCS). Materials and Methods: Subjects with AIS in the anterior, middle, or posterior cerebral artery territory were enrolled within 96 hours of symptom onset. DCS measured relative cerebral blood flow (rCBF) in the bilateral frontal lobes for 15 minutes at rest (baseline), during a 30-minute infusion of 500 cc NS (bolus), and for 15 minutes after completion (post-bolus). Mean rCBF for each time period was calculated for individual subjects and median rCBF for the population was compared between time periods. Linear regression was used to evaluate for associations between rCBF and clinical features. Results: Among 57 subjects, median rCBF (IQR) increased relative to baseline in the ipsilesional hemisphere by 17% (-2.0%, 43.1%), $P < 0.001$, and in the contralateral hemisphere by 13.3% (-4.3%, 36.0%), $P < .004$. No significant associations were found between ipsilesional changes in rCBF and age, race, infarct size, infarct location, presence of large vessel stenosis, NIH stroke scale, or symptom duration. Conclusion: A 500 cc bolus of .9% NS produced a measurable increase in rCBF in both the affected and nonaffected hemispheres. Clinical features did not predict rCBF response.

JOURNAL OF STROKE & CEREBROVASCULAR DISEASES 28[11] 104294, 2019. DOI: 10.1016/j.jstrokecerebrovasdis.2019.07.010

[P388-2019] “Charged-particle angular correlations in XeXe collisions at root s(NN)=5.44 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

Azimuthal correlations of charged particles in xenon-xenon collisions at a center-of-mass energy per nucleon pair of root s(NN) = 5.44 TeV are studied. The data were collected by the CMS experiment at the LHC with a total integrated luminosity of 3.42 mu b⁻¹. The collective motion of the system formed in the collision is parametrized by a Fourier expansion of the azimuthal particle density distribution. The azimuthal anisotropy coefficients $v(2)$, $v(3)$, and $v(4)$ are obtained by the scalar-product, two-particle correlation, and multiparticle correlation methods. Within a hydrodynamic picture, these methods have different sensitivities to noncollective and fluctuation effects. The dependence of the Fourier coefficients on the size of the colliding system is explored by comparing the xenon-xenon results with equivalent lead-lead data.

Model calculations that include initial-state fluctuation effects are also compared to the experimental results. The observed angular correlations provide new constraints on the hydrodynamic description of heavy ion collisions.

PHYSICAL REVIEW C 100[4], 044902, 2019. DOI: 10.1103/PhysRevC.100.044902

[P389-2019] “Charged-particle production as a function of multiplicity and transverse spherocity in pp collisions at root s=5.02 and 13 TeV”

Acharya, S.; Acosta, F. T.; Adam, J.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et. al.; ALICE Collaboration

We present a study of the inclusive charged-particle transverse momentum ($p(T)$) spectra as a function of charged-particle multiplicity density at mid-pseudorapidity, $dN_{ch}/d\eta$, in pp collisions at root $s = 5.02$ and 13TeV covering the kinematic range $|\eta| < 0.8$ and $0.15 < p(T) < 20\text{GeV}/c$. The results are presented for events with at least one charged particle in $|\eta| < 1$ ($INEL > 0$). The $p(T)$ spectra are reported for two multiplicity estimators covering different pseudorapidity regions. The $p(T)$ spectra normalized to that for $INEL > 0$ show little energy dependence. Moreover, the high- $p(T)$ yields of charged particles increase faster than the charged-particle multiplicity density. The average $p(T)$ as a function of multiplicity and transverse spherocity is reported for $p(T)$ collisions at root $s = 13\text{TeV}$. For low- (high-) spherocity events, corresponding to jet-like (isotropic) events, the average pT is higher (smaller) than that measured in $INEL > 0$ pp collisions. Within uncertainties, the functional form of $\langle p(T) \rangle (N_{ch})$ is not affected by the spherocity selection. While EPOS LHC gives a good description of many features of data, PYTHIA overestimates the average $p(T)$ in jet-like events.

EUROPEAN PHYSICAL JOURNAL C 79[10], 857, 2019. DOI: 10.1140/epjc/s10052-019-7350-y

[P390-2019] “Coherent J/psi photoproduction at forward rapidity in ultra-peripheral Pb-Pb collisions at root s(NN)=5.02 TeV”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; DeSouza, R. D.*; Takahashi, J.*; et. al.; ALICE Collaboration

The ALICE collaboration performed the first rapidity-differential measurement of coherent J/psi photoproduction in ultra-peripheral Pb-Pb collisions at a center-of-mass energy root $s(NN) = 5.02\text{TeV}$. The J/psi is detected via its dimuon decay in the forward rapidity region ($-4.0 < y < -2.5$) for events where the hadronic activity is required to be minimal. The analysis is based on an event sample corresponding to an integrated luminosity of about $750 \mu\text{b}^{-1}$. The cross section for coherent J/psi production is presented in six rapidity bins. The results are compared with theoretical models for coherent J/psi photoproduction. These comparisons indicate that gluon shadowing effects play a role in the photoproduction process. The ratio of psi' to J/psi coherent photoproduction cross sections was measured and found to be consistent with that measured for photoproduction off protons.

PHYSICS LETTERS B 798, UNSP 134926, 2019. DOI: 10.1016/j.physletb.2019.134926

[P391-2019] “Combination of CMS searches for heavy resonances decaying to pairs of bosons or leptons”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A statistical combination of searches for heavy resonances decaying to pairs of bosons or leptons is presented. The data correspond to an integrated luminosity of 35.9fb^{-1} collected during 2016 by the CMS experiment at the LHC in proton-proton collisions at a center-of-mass energy of 13TeV . The data are found to be consistent with expectations from the standard model background. Exclusion limits are set in the context of models of spin-1 heavy vector triplets and of spin-2 bulk gravitons. For mass degenerate W' and Z' resonances that predominantly couple to the standard model gauge bosons, the mass exclusion at 95% confidence level of heavy vector bosons is extended to 4.5TeV as compared to 3.8TeV determined from the best individual channel. This excluded mass increases to 5.0TeV if the resonances couple predominantly to fermions.

PHYSICS LETTERS B 798, UNSP 134952, 2019. DOI: 10.1016/j.physletb.2019.134952

[P392-2019] “Dark Energy Survey Year 1 results: constraints on intrinsic alignments and their colour dependence from galaxy clustering and weak lensing”

Samuroff, S.; Blazek, J.; Troxel, M. A.; Sobreira, F.*; DES Collaboration

We perform a joint analysis of intrinsic alignments and cosmology using tomographic weak lensing, galaxy clustering, and galaxy-galaxy lensing measurements from Year 1 (Y1) of the Dark Energy Survey. We define early- and late-type subsamples, which are found to pass a series of systematics tests, including for spurious photometric redshift error and point spread function correlations. We analyse these split data alongside the fiducial mixed Y1 sample using a range of intrinsic alignment models. In a fiducial non-linear alignment model analysis, assuming a flat Lambda cold dark matter cosmology, we find a significant difference in intrinsic alignment amplitude, with early-type galaxies favouring $A(IA) = 2.38(-0.31)(+0.32)$ and late-type galaxies consistent with no intrinsic alignments at $0.05(-0.09)(+0.10)$. The analysis is repeated using a number of extended model spaces, including a physically motivated model that includes both tidal torquing and tidal alignment mechanisms. In multiprobe likelihood chains in which cosmology, intrinsic alignments in both galaxy samples and all other relevant systematics are varied simultaneously, we find the tidal alignment and tidal torquing parts of the intrinsic alignment signal have amplitudes $A(1) = 2.66(-0.66)(+0.67)$, $A(2) = -2.94(-1.83)(+1.94)$, respectively, for early-type galaxies and $A(1) = 0.62(-0.41)(+0.41)$, $A(2) = -2.26(-1.16)(+1.30)$ for late-type galaxies. In the full (mixed) Y1 sample the best constraints are $A(1) = 0.70(-0.38)(+0.41)$, $A(2) = -1.36(-1.41)(+1.08)$. For all galaxy splits and IA models considered, we report cosmological parameter constraints consistent with the results of the main DES Y1 cosmic shear and multiprobe cosmology papers.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 489[4], 5453-5482, 2019. DOI: 10.1093/mnras/stz2197

[P393-2019] “Dark Energy Survey Year 1 results: validation of weak lensing cluster member contamination estimates from P(z) decomposition”

Varga, T. N.; DeRose, J.; Gruen, D.; Sobreira, F.*; et. al.; DES Collaboration

Weak lensing source galaxy catalogues used in estimating the masses of galaxy clusters can be heavily contaminated by cluster members, prohibiting accurate mass calibration. In this study, we test the performance of an estimator for the extent of cluster member contamination based on decomposing the photometric redshift $P(z)$

of source galaxies into contaminating and background components. We perform a full scale mock analysis on a simulated sky survey approximately mirroring the observational properties of the Dark Energy Survey Year One observations (DES Y1), and find excellent agreement between the true number profile of contaminating cluster member galaxies in the simulation and the estimated one. We further apply the method to estimate the cluster member contamination for the DES Y1 redMaPPer cluster mass calibration analysis, and compare the results to an alternative approach based on the angular correlation of weak lensing source galaxies. We find indications that the correlation based estimates are biased by the selection of the weak lensing sources in the cluster vicinity, which does not strongly impact the $P(z)$ decomposition method. Collectively, these benchmarks demonstrate the strength of the $P(z)$ decomposition method in alleviating membership contamination and enabling highly accurate cluster weak lensing studies without broad exclusion of source galaxies, thereby improving the total constraining power of cluster mass calibration via weak lensing.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 489[2], 2511-2524, 2019. DOI: 10.1093/mnras/stz2185

[P394-2019] “DarkSide status and prospects”

Sanfilippo, S.; Agnes, P.; Albuquerque, I. F. M.; Machado, A. A.*; Segreto, E.*; et. al.

DarkSide uses a dual-phase Liquid Argon Time Projection Chamber to search for WIMP dark matter. The current detector, DarkSide-50, is running since mid 2015 with a target of 50 kg of Argon from an underground source. Here it is presented the latest results of searches of WIMP-nucleus interactions, with WIMP masses in the GeV-TeV range, and of WIMP-electron interactions, in the sub-GeV mass range. The future of DarkSide with a new generation experiment, involving a global collaboration from all the current Argon based experiments, is presented.

NUOVO CIMENTO C-COLLOQUIA AND COMMUNICATIONS IN PHYSICS 42[2-3], 79, 2019. DOI: 10.1393/ncc/i2019-19079-8

[P395-2019] “Data-driven estimation of the invisible energy of cosmic ray showers with the Pierre Auger Observatory”

Aab, A.; Abreu, P.; Aglietta, M.; Chinellato, J. A.*; Daniel, B.*; Diaz Castro, M. L.*; Dobrigkeit, C.*; Fauth, A. C.*; Muller, M. A.*; Pereira, L. A. S.*, et. al.; Pierre Auger Collaboration

The determination of the primary energy of extensive air showers using the fluorescence detection technique requires an estimation of the energy carried away by particles that do not deposit all their energy in the atmosphere. This estimation is typically made using Monte Carlo simulations and thus depends on the assumed primary particle mass and on model predictions for neutrino and muon production. In this work we present a new method to obtain the invisible energy from events detected by the Pierre Auger Observatory. The method uses measurements of the muon number at ground level, and it allows us to significantly reduce the systematic uncertainties related to the mass composition and the high energy hadronic interaction models, and consequently to improve the estimation of the energy scale of the Pierre Auger Observatory.

PHYSICAL REVIEW D 100[8], 082003, 2019. DOI: 10.1103/PhysRevD.100.082003

[P396-2019] “Dynamics of graphene/Al interfaces using COMB3 potentials”

Zhang, D. F.; Fonseca, A. F.*; Liang, T.; Phillpot, S. R.; Sinnott, S. B.

This paper describes the development of a third-generation charge optimized many-body (COMB3) potential for Al-C and its application to the investigation of aluminum/graphene nanostructures. In particular, the new COMB3 potential was used to investigate the interactions of aluminum surfaces with pristine and defective graphene sheets. Classical molecular dynamics simulations were performed at temperatures of 300-900 K to investigate the structural evolution of these interfaces. The results indicate that, although the interfaces between Al and graphene are mostly weakly bonded, aluminum carbide can form under the right conditions, including the presence of vacancy defects in graphene, undercoordinated Al in surface regions with sharp boundaries, and at high temperatures. COMB3 potentials were further used to examine a new method to transfer graphene between Al surfaces as well as between Al and Cu surfaces by controlling the angle of graphene between the two surfaces. The findings indicate that, by controlling the peeling angles, it is possible to transfer graphene without any damage from the surface having greater graphene/surface adhesion to another surface with less adhesion.

PHYSICAL REVIEW MATERIALS 3[11], 114002, 2019. DOI: 10.1103/PhysRevMaterials.3.114002

[P397-2019] “Elastic properties of graphyne-based nanotubes”

De Sousa, J. M.; Bizaio, R. A.; Sousa Filho, V. P.; Aguiar, A. L.; Coluci, V. R.; Pugno, N. M.; Girao, E. C.; Souza Filho, A. G.; Galvao, D. S.*

Graphyne nanotubes (GNTs) are nanostructures obtained from rolled up graphyne sheets, in the same way carbon nanotubes (CNTs) are obtained from graphene ones. Graphynes are 2D carbon-allotropes composed of atoms in sp and sp(2) hybridized states. Similarly to conventional CNTs, GNTs can present different chiralities and electronic properties. Because of the acetylenic groups (triple bonds), GNTs exhibit large sidewall pores that influence their mechanical properties. In this work, we studied the mechanical response of GNTs under tensile stress using fully atomistic molecular dynamics simulations and density functional theory (DFT) calculations. Our results show that GNTs mechanical failure (fracture) occurs at larger strain values in comparison to corresponding CNTs, but paradoxically with smaller ultimate strength and Young's modulus values. This is a consequence of the combined effects of the existence of triple bonds and increased porosity/flexibility due to the presence of acetylenic groups.

COMPUTATIONAL MATERIALS SCIENCE 170, UNSP 109153, 2019. DOI: 10.1016/j.commatsci.2019.109153

[P398-2019] “Electron transport in bulk n-doped 3C-SiC by using a non-equilibrium quantum kinetic theory”

Correa, A. M. D.; Rodrigues, C. G.; Luzzi, R.*

In this paper we present a study on the charge transport in bulk n-type doped semiconductor 3C-SiC (in both, transient and steady state) using a non-equilibrium quantum kinetic theory derived from the method of nonequilibrium statistical operator (NSO), which furnishes a clear description of the irreversible phenomena that occur in the evolution of the analyzed system. We obtain theoretically the dependence on the applied electric field of the basic macrovariables: the “electron drift velocity” and the “non-equilibrium temperature”. The “peak points” in time evolution of this macrovariables are derived and analyzed.

EUROPEAN PHYSICAL JOURNAL B 92[11], 261, 2019. DOI: 10.1140/epjb/e2019-100316-0

[P399-2019] “Event-shape and multiplicity dependence of freeze-out radii in pp collisions at root s=7 TeV”

Acharya, S.; Adamova, D.; Adam, J.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et. al.; ALICE Collaboration

Two-particle correlations in high-energy collision experiments enable the extraction of particle source radii by using the Bose-Einstein enhancement of pion production at low relative momentum q proportional to $1/R$. It was previously observed that in pp collisions at root $s = 7$ TeV the average pair transverse momentum $k(T)$ range of such analyses is limited due to large background correlations which were attributed to mini-jet phenomena. To investigate this further, an event-shape dependent analysis of Bose-Einstein correlations for pion pairs is performed in this work. By categorizing the events by their transverse sphericity $S-T$ into spherical ($S-T > 0.7$) and jet-like ($S-T < 0.3$) events a method was developed that allows for the determination of source radii for much larger values of $k(T)$ for the first time. Spherical events demonstrate little or no background correlations while jet-like events are dominated by them. This observation agrees with the hypothesis of a mini-jet origin of the non-femtoscopic background correlations and gives new insight into the physics interpretation of the $k(T)$ dependence of the radii. The emission source size in spherical events shows a substantially diminished $k(T)$ dependence, while jet-like events show indications of a negative trend with respect to $k(T)$ in the highest multiplicity events. Regarding the emission source shape, the correlation functions for both event sphericity classes show good agreement with an exponential shape, rather than a Gaussian one.

JOURNAL OF HIGH ENERGY PHYSICS 9, 108, 2019. DOI: 10.1007/JHEP09(2019)108

[P400-2019] “Evidence for light-by-light scattering and searches for axion-like particles in ultraperipheral PbPb collisions at root s(NN)=5.02 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

Evidence for the light-by-light scattering process, $\gamma\gamma \rightarrow \gamma\gamma$, in ultraperipheral PbPb collisions at a centre-of-mass energy per nucleon pair of 5.02 TeV is reported. The analysis is conducted using a data sample corresponding to an integrated luminosity of 390 μb^{-1} recorded by the CMS experiment at the LHC. Light-by-light scattering processes are selected in events with two photons exclusively produced, each with transverse energy $E_T(\gamma) > 2$ GeV, pseudorapidity vertical bar $\eta(\gamma)$ vertical bar < 2.4 , diphoton invariant mass $m(\gamma\gamma) > 5$ GeV, diphoton transverse momentum $p_T(\gamma\gamma) < 1$ GeV, and diphoton acoplanarity below 0.01. After all selection criteria are applied, 14 events are observed, compared to expectations of 9.0 ± 0.9 (theo) events for the signal and 4.0 ± 1.2 (stat) for the background processes. The excess observed in data relative to the background-only expectation corresponds to a significance of 3.7 standard deviations, and has properties consistent with those expected for the light-by-light scattering signal. The measured fiducial light-by-light scattering cross section, $\sigma(\text{fid})(\gamma\gamma \rightarrow \gamma\gamma) = 120 \pm 46(\text{stat}) \pm 28(\text{syst}) \pm 12(\text{theo}) \text{ nb}$, is consistent with the standard model prediction. The $m(\gamma\gamma)$ distribution is used to set new exclusion limits on the production of pseudoscalar axion-like particles, via the $\gamma\gamma \rightarrow a \rightarrow \gamma\gamma$ process, in the mass range $m(a) = 5-90$ GeV.

PHYSICS LETTERS B 797, UNSP 134826, 2019. DOI: 10.1016/j.physletb.2019.134826

[P401-2019] “Evidence for the formation of metallic In after laser irradiation of InP”

Cabral, L.; Andres, J.; Machado, T. R.; Picinin, A.; Rino, J. P.; Lopez-Richard, V.; Longo, E.; Gouveia, A. F.; Marques, G. E.; da Silva, E. Z.*; San-Miguel, M. A.

Structural and electronic changes induced by laser irradiation are currently of interest owing to the possibility to tune the mechanical, optical, and transport properties of the irradiated materials. In this work, we investigate the effects of laser irradiation on indium phosphide, InP, by modifying the electronic temperature, T_e , of the system within the density functional theory framework and performing molecular dynamics simulations to prove that the laser irradiation also provokes a local thermalization effect. We found that the process can be described by a two-stage mechanism. First, at low T_e values (0-1.0 eV), the laser energy induces electronic transitions, while the InP lattice remains undisturbed and cool. In the second stage (with T_e in the range of 1.0-4.0 eV), both electron-electron scattering and electron-phonon coupling processes are triggered, increasing the energy of the lattice so as to provoke a Coulomb explosion, which changes some physical chemical properties of InP. The close agreement between the simulations helps explain the formation of metallic In as it is observed in the transmission electron microscopy images.

JOURNAL OF APPLIED PHYSICS 126[2], 025902, 2019. DOI: 10.1063/1.5109230

[P402-2019] “Exploring the mechanisms of graphene oxide behavioral and morphological changes in zebrafish”

Clemente, Z.; Silva, G. H.; de Souza Nunes, M. C.; Teodoro Martinez, D. S.; Maurer-Morelli, C. V.; Thomaz, A. A.*; Scherholz S. C., V. L.

The presence of natural organic matter such as humic acid (HA) can influence the behavior of graphene oxide (GO) in the aquatic environment. In this study, zebrafish embryos were analyzed after 5 and 7 days of exposure to GO (100 mg L⁻¹) and HA (20 mg L⁻¹) alone or together. The results indicated that, regardless of the presence of HA, larvae exposed to GO for 5 days showed an increase in locomotor activity, reduction in the yolk sac size, and total length and inhibition of AChE activity, but there was no difference in enzyme expression. The statistical analysis indicated that the reductions in total larval length, yolk sac size, and AChE activity in larvae exposed to GO persisted in relation to the control group, but there was a recovery of these parameters in groups also exposed to HA. Larvae exposed to GO for 7 days did not show significant differences in locomotor activity, but the RT-PCR gene expression analysis evidenced an increase in the AChE expression. Since the embryos exposed to GO showed a reduction in overall length, they were submitted to confocal microscopy and their muscle tissue configuration investigated. No changes were observed in the muscle tissue. The results indicated that HA is associated with the toxicity risk modulation by GO and that some compensatory homeostasis mechanisms may be involved in the developmental effects observed in zebrafish.

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH 26[29], 30508-30523, 2019. DOI: 10.1007/s11356-019-05870-z

[P403-2019] “Gluon mass scale through nonlinearities and vertex interplay”

Aguilar, A. C.*; Ferreira, M. N.*; Figueiredo, C. T.*; Papavasiliou, J.

We present a novel analysis of the gluon gap equation, where its full nonlinear structure is duly taken into account.

In particular, while in previous treatments the linearization of this homogeneous integral equation introduced an indeterminacy in the scale of the corresponding mass, the current approach determines it uniquely, once the value of the gauge coupling at a given renormalization point is used as input. A crucial ingredient for this construction is the “kinetic term” of the gluon propagator, whose form is not obtained from the complicated equation governing its evolution, but is rather approximated by suitable initial Ansatz, which are subsequently improved by means of a systematic iterative procedure. The multiplicative renormalization of the central equation is carried out following an approximate method, which is extensively employed in the studies of the standard quark gap equation. This approach amounts to the effective substitution of the vertex renormalization constants by kinematically simplified form factors of the three- and four-gluon vertices. The resulting numerical interplay, exemplified by the infrared suppression of the three-gluon vertex and the mild enhancement of the four-gluon vertex, is instrumental for obtaining positive-definite and monotonically decreasing running gluon masses. The resulting gluon propagators, put together from the gluon masses and kinetic terms obtained with this method, match rather accurately the data obtained from large-volume lattice simulations.

PHYSICAL REVIEW D 100[9], 094039, 2019. DOI: 10.1103/PhysRevD.100.094039

[P404-2019] “H-3(Lambda) and (3)((Lambda)over-bar)(H) over-bar lifetime measurement in Pb-Pb collisions at root s(NN)=5.02 TeV via two-body decay”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et.al.; ALICE Collaboration

An improved value for the lifetime of the (anti-)hypertriton has been obtained using the data sample of Pb-Pb collisions at root s(NN) = 5.02 TeV collected by the ALICE experiment at the LHC. The (anti-)hypertriton has been reconstructed via its charged two-body mesonic decay channel and the lifetime has been determined from an exponential fit to the dN/d(ct) spectrum. The measured value, tau = 242(-38)(+34) (stat.) +/- 17 (syst.) ps, is compatible with representative theoretical predictions, thus contributing to the solution of the longstanding hypertriton lifetime puzzle.

PHYSICS LETTERS B 797, UNSP 134905, 2019. DOI: 10.1016/j.physletb.2019.134905

[P405-2019] “H0LiCOW-X. Spectroscopic/imaging survey and galaxy-group identification around the strong gravitational lens system WFI 2033-4723”

Sluse, D.; Rusu, C. E.; Fassnacht, C. D.; Sobreira, F.*; et.al.;

Galaxies and galaxy groups located along the line of sight towards gravitationally lensed quasars produce high-order perturbations of the gravitational potential at the lens position. When these perturbations are too large, they can induce a systematic error on H-0 of a few per cent if the lens system is used for cosmological inference and the perturbers are not explicitly accounted for in the lens model. In this work, we present a detailed characterization of the environment of the lens system WFI 2033-4723 (z(src) = 1.662, z(lens) = 0.6575), one of the core targets of the H0LiCOW project for which we present cosmological inferences in a companion paper. We use the Gemini and ESO-Very Large telescopes to measure the spectroscopic redshifts of the brightest galaxies towards the lens, and use the ESO-MUSE integral field spectrograph to measure the velocity-dispersion of the lens (sigma(los) = 250(-21)(+15) km s(-1)) and of several nearby galaxies.

In addition, we measure photometric redshifts and stellar masses of all galaxies down to i < 23 mag, mainly based on Dark Energy Survey imaging (DR1). Our new catalogue, complemented with literature data, more than doubles the number of known galaxy spectroscopic redshifts in the direct vicinity of the lens, expanding to 116 (64) the number of spectroscopic redshifts for galaxies separated by less than 3 arcmin (2 arcmin) from the lens. Using the flexion-shift as a measure of the amplitude of the gravitational perturbation, we identify two galaxy groups and three galaxies that require specific attention in the lens models. The ESO MUSE data enable us to measure the velocity-dispersions of three of these galaxies. These results are essential for the cosmological inference analysis presented in Rusu et al.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 490[1], 613-633, 2019. DOI: 10.1093/mnras/stz2483

[P406-2019] “Heavy Metal/Toxins Detection Using Electronic Tongues”

Shimizu, F. M.; Braunger, M. L.*; Riul Jr, A.*

The growing concern for sustainability and environmental preservation has increased the demand for reliable, fast response, and low-cost devices to monitor the existence of heavy metals and toxins in water resources. An electronic tongue (e-tongue) is a multisensory array mostly based on electroanalytical methods and multivariate statistical techniques to facilitate information visualization in a qualitative and/or quantitative way. E-tongues are promising analytical devices having simple operation, fast response, low cost, easy integration with other systems (microfluidic, optical, etc) to enable miniaturization and provide a high sensitivity for measurements in complex liquid media, providing an interesting alternative to address many of the existing environmental monitoring challenges, specifically relevant emerging pollutants such as heavy metals and toxins.

CHEMOSENSORS 7[3], 36, 2019. DOI: 10.3390/chemosensors7030036

[P407-2019] “Imaging Ion Pairs Forming Structural Arrangements in Interfacial Regions”

Teschke, O.*; de Castro, J. R.*; Soares, D. M.*

A technique to image ion pairs in solution is reported. We investigated structural and dynamic properties of ion-pair distributions deposited on highly oriented pyrolytic graphite (HOPG) surfaces in electrolyte solutions. Atomic force microscopy images of HOPG immersed in NaCl and KCl solutions display regular arrangements on top of the hexagonal carbon rings forming the HOPG atomic structure. These arrangements are the result of the low value of the aqueous interfacial dielectric constant (epsilon(r) approximate to 3-11). The measured ion-pair radius is a function of the salt present in the solution; for KCl, the ion-pair radius is equal or smaller than 0.42 nm; for NaCl, the ion-pair radius is 0.36 nm. A comparison of these values with their crystalline lattice dimensions indicates that both KCl and NaCl ion pairs in solution at the HOPG/solution interfacial region exist as tight contact ion pairs in quasistationary distributions. The NaCl ion-pair distribution forms an aligned arrangement, and the KCl distribution is formed by intercalated pairs.

ACS OMEGA 4[13], 15684-15693, 2019. DOI: 10.1021/acsomega.9b02299

[P408-2019] “In situ electron microscopy observation of the redox process in plasmonic heterogeneous-photo-sensitive nanoparticles”

Muraca, D.*; Scaffardi, L. B.; Santillan, J. M. J.; Arboleda, D. Muneton; S., Daniel C.; Bettini, J.

Resumo: Observation of relevant phenomena related with dynamical redox process in a plasmonic heterogeneous-photocatalyst system composed by silver nanoparticles (NPs) around and in contact with amorphous silver chloride NPs are reported by in situ transmission electron microscopy. During this process, nanobubbles are initially produced inside the silver chloride NPs, which immediately begin to move within the amorphous phase. Besides, silver atoms inside the silver chloride NPs start to migrate out the occupied volume leaving a space behind, which is filled by crystalline regions of silver chloride located between the pre-existing silver NPs. During the observation time, fast-nucleation, movement, growth, and fast-dissolution of silver NPs take place. Specific space correlation with silver mass loss (or gain) when a new NP is formed (or dissolved), was detected in different regions during the reaction. This mass loss (or gain) takes place on certain places of pre-existing silver NPs. All these phenomena were observed for a configuration comprising at least two silver NPs separated few nanometers apart by a silver chloride NP.

NANOSCALE ADVANCES 1[10], 3909-3917, 2019. DOI: 10.1039/c9na00469f

[P409-2019] “Inclusive J/psi production at mid-rapidity in pp collisions at root s=5.02 TeV”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et.al.; ALICE Collaboration

Inclusive J/psi production is studied in minimum-bias proton-proton collisions at a centre-of-mass energy of root s = 5.02 TeV by ALICE at the CERN LHC. The measurement is performed at mid-rapidity (vertical bar y vertical bar < 0.9) in the dielectron decay channel down to zero transverse momentum p(T), using a data sample corresponding to an integrated luminosity of L-int = 19.4 +/- 0.4 nb(-1). The measured p(T)-integrated inclusive J/psi production cross section is d sigma/dy = 5.64 +/- 0.22(stat.) +/- 0.33(syst.) +/- 0.12(lumi.) mu b. The p(T)-differential cross section d(2)sigma/dp(T)dy is measured in the p(T) range 0-10 GeV/c and compared with state-of-the-art QCD calculations. The J/psi < p(T)> and < p(T)(2)> are extracted and compared with results obtained at other collision energies.

JOURNAL OF HIGH ENERGY PHYSICS 10, 084, 2019. DOI: 10.1007/JHEP10(2019)084

[P410-2019] “Influence of the Metal Ion on the Topology and Interpenetration of Pyridylvinyl(benzoate) Based Metal-Organic Frameworks”

Dezotti, Y.; Ribeiro, M. A.; Pirotta, K. R.*; Barros, W. P.

A family of four M(II)-metal-organic frameworks of general formula {[M-x(pvb)(2x)]y(dmf)}(n) (M = Cu, 1; M = Co, 2; M = Ni, 3; M = Mn, 4), based on the bis{4-[2-(4-pyridyl)ethenyl]} benzoic acid (Hpvb) ligand, were obtained. 1 exhibits a 5-fold interpenetrated lvt framework, 2 and 3 a 7-fold interpenetrating dia framework, and 4 a 2-fold interpenetrated dmc framework. Magnetic properties of 1-4 have been investigated. 1 was analyzed by a Curie-Weiss model, while 2 and 3 were analyzed by a zero-field splitting model due to the very long metal-metal distances, which results in very weak antiferromagnetic interactions. The coupling pathway in 4 was done by carboxylate bridges instead of the pvb pathway, affording a short metal-metal separation that was analyzed by an isotropic Heisenberg spin Hamiltonian for a linear trinuclear Mn(II) cluster. The different metal coordination modes and geometries, along with template effects induced by the solvent, play an important role in the formation of distinctive structural topologies.

CRYSTAL GROWTH & DESIGN 19[10], 5592-5603, 2019. DOI: 10.1021/acs.cgd.9b00552

[P411-2019] “Infrared frequency comb generation and spectroscopy with suspended silicon nanophotonic waveguides”

Nader, N.; Kowligy, A.; Chiles, J.; Stanton, E. J.; Timmers, H.; Lind, A. J.; Cruz, F. C.*; Lesko, D. M. B.; Briggman, K. A.; Nam, S. W.; Diddams, S. A.; Mirin, R. P.

Nanophotonic waveguides with sub-wavelength mode confinement and engineered dispersion are an excellent platform for application-tailored nonlinear optical interactions at low pulse energies. We present fully air-clad suspended silicon waveguides for infrared frequency comb generation with optical bandwidth limited only by the silicon transparency. Precise lithographic control over the waveguide dispersion enables tailored infrared frequency comb generation across a bandwidth of 2.0-8.8 mu m (1130-5000 cm(-1)), with the broadest simultaneous bandwidth covering 2.0-7.7 mu m. Novel fork-shaped couplers provide efficient input coupling with only 1.5 dB loss. The coherence, brightness, and stability of the generated light are highlighted in a dual-frequency comb setup in which individual comb lines are resolved with 30 dB extinction ratio and 100 MHz spacing in the wavelength range of 4.9-8.8 mu m (1130-2050 cm(-1)) using three different waveguide widths. These sources are used for broadband gas- and liquid-phase dual-comb spectroscopy with 100 MHz comb line resolution. We achieve a peak spectral signal-to-noise ratio of 10 root Hz across a simultaneous bandwidth of 6.3-8.2 mu m (1220-1590 cm(-1)) containing 112,200 comb lines. These results provide a pathway to further integration with the developing high-repetition-rate frequency comb lasers for compact sensors with applications in chip-based chemical analysis and spectroscopy.

OPTICA 6[10], 1269-1276, 2019. DOI: 10.1364/OPTICA.6.001269

[P412-2019] “Investigations of Anisotropic Flow Using Multiparticle Azimuthal Correlations in pp, p-Pb, Xe-Xe, and Pb-Pb Collisions at the LHC”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et.al.; A Large Ion Collider Expt Collabor

Measurements of anisotropic flow coefficients v(n) and their cross-correlations using two- and multiparticle cumulant methods are reported in collisions of pp at root S = 13 TeV, p-Pb at a center-of-mass energy per nucleon pair root S-NN = 5.02 TeV, Xe-Xe at = 5.44 TeV, and Pb-Pb at root S-NN = 5.02 TeV recorded with the ALICE detector. The multiplicity dependence of v(n) is studied in a very wide range from 20 to 3000 particles produced in the midrapidity region vertical bar eta vertical bar < 0.8 for the transverse momentum range 0.2 < p(T) < 3.0 GeV/c. An ordering of the coefficients v(2) > v(3) > v(4) is found in pp and p-Pb collisions, similar to that seen in large collision systems, while a weak v(2) multiplicity dependence is observed relative to nucleus-nucleus collisions in the same multiplicity range. Using a novel subevent method, v(2) measured with four-particle cumulants is found to be compatible with that from six-particle cumulants in pp and p-Pb collisions. The magnitude of the correlation between v(n)(2) and v(m)(2) evaluated with the symmetric cumulants SC(m, n) is observed to be positive at all multiplicities for v(2) and v(4), while for v(2) and v(3) it is negative and changes sign for multiplicities below 100, which may indicate a different v(n) fluctuation pattern in this multiplicity range. The observed long-range multiparticle azimuthal correlations in high multiplicity pp and p-Pb collisions can neither be described by PYTHIA 8 nor by impact-parameter Glasma, muslc, and ultra-relativistic quantum molecular dynamics model calculations,

and hence, provide new insights into the understanding of collective effects in small collision systems.

PHYSICAL REVIEW LETTERS 123[14], 142301, 2019. DOI: 10.1103/PhysRevLett.123.142301

[P413-2019] “Lateral shifts and angular deviations of Gaussian optical beams reflected by and transmitted through dielectric blocks: a tutorial review”

De Leo, S.*; Maia, G. G.

In this work, we summarize the current state of understanding of lateral displacement and angular deviations of an optical beam propagating through dielectric blocks. In part I, the analytical formulas, found for critical incidence, are compared with numerical calculations and, when possible, extended from Gaussian to more general angular distributions. Angular deviations are discussed both for the critical and for the Brewster incidence. The combined effect, known as the composite Goos-Hanchen shift, shows an interesting axial dependence and, under particular circumstances, the intriguing phenomenon of the light oscillation. In part II, the weak measurement technique is discussed in detail and compared with direct optical measurements.

JOURNAL OF MODERN OPTICS 66[21], 2142-2194, 2019. DOI: 10.1080/09500340.2019.1696995

[P414-2019] “Lead Iodide and Perovskite Films Obtained by Iodination of PbS Thin Films”

Silva Filho, J. M. C. da*.; Landers, R.*; Marques, F. C.*

Here we demonstrate a low-temperature process for the synthesis of pinhole-free lead iodide and perovskite (CH₃NH₃PbI₃) films. The approach consists in converting amorphous sputtered lead sulfide films onto lead iodide (PbI₂) films through an iodination process. The following step consists of the conversion of PbI₂ into CH₃NH₃PbI₃ through dipping into methylammonium iodide (CH₃NH₃I) solution. The effectiveness of this new route was investigated through X-ray diffraction, optical transmittance, scanning electron microscopy and X-ray photoelectron spectroscopy. This method is comprehensibly compatible with large-scale and large-area deposition and provides a convenient and highly reproducible route for the preparation of perovskite thin films.

JOURNAL OF INORGANIC AND ORGANOMETALLIC POLYMERS AND MATERIALS 29[6], 2161-2167, 2019. DOI: 10.1007/s10904-019-01175-3

[P415-2019] “Limiting fragmentation as an initial-state probe in heavy ion collisions”

Goncalves, K. J.*; Giannini, A. V.; Chinellato, D. D.*; Torriero, G.*

We discuss limiting fragmentation within a few currently popular phenomenological models. We show that popular Glauber-inspired models of particle production in heavy ion collisions, such as the two-component model, generally fail to reproduce limiting fragmentation when all energies and system sizes experimentally available are considered. This is due to the energy dependence of number of participants and number of collisions. We quantify this violation in terms of the model parameters. We also make the same calculation within a color glass condensate scenario and show that the dependence of the saturation scale on the number of participants generally leads to violation of limiting fragmentation. We further argue that wounded parton models,

provided the nucleon size and parton density vary predominantly with Bjorken x , could in principle reproduce both multiplicity dependence with energy and limiting fragmentation. We suggest, therefore, that an experimental measurement of deviation from limiting fragmentation in heavy ion collisions, for different system sizes and including the experimentally available range of energies, is a powerful test of initial-state models.

PHYSICAL REVIEW C 100[5], 054901, 2019. DOI: 10.1103/PhysRevC.100.054901

[P416-2019] “Macrobending SMS fiber-optic anemometer and flow sensor”

Costa, J. W.; Franco, M. A. R.; Serrao, V. A.; Cordeiro, C. M. B.*; Giraldo, M. T. R.

We report a simple, high sensitivity, good resolution and low-cost fiber-optic anemometer and flow sensor based on reflective single mode-multimode-single mode structure bent by air flow. The dragging force on the multi-mode section causes it to bend resulting in multimodal interference (MMI) effects which are related to the fluid velocity and flow rate. Bending effects on the output power profile are investigated and numerical simulation combined with experimental data demonstrate that the output power intensity may increase or decrease with the rise of curvature, depending on MMI conditions and field deformation. The sensor behavior with air flow velocity is evaluated by spectral analysis using a variety of methods as wavelength shifting of a selected peak and output power intensity of selected wavelength and output power intensity of selected points. Experimental tests using air stream inside a wind tunnel provided a reliable dynamic range from 4 to 10 m/s. Peak sensitivities of 435.13 pm/(m/s) with resolution of 17.4×10^{-3} m/s for wavelength shifting and 2.62 dB/(m/s) for output power intensity are obtained. These results assure that the sensor can be effectively used in a wide variety of applications, such as anemometer and flow rate meter.

OPTICAL FIBER TECHNOLOGY 52, 101981, 2019. DOI: 10.1016/j.yofte.2019.101981

[P417-2019] “Magnetic domain size tuning in asymmetric Pd/Co/W/Pd multilayers with perpendicular magnetic anisotropy”

Dugato, D. A.; Brandao, J.; Seeger, R. L.; Beron, F.*; Cezar, J. C.; Dorneles, L. S.; Mori, T. J. A.

Magnetic multilayers presenting perpendicular magnetic anisotropy (PMA) have great potential for technological applications. On the path to develop further magnetic devices, one can adjust the physical properties of multilayered thin films by modifying their interfaces, thus determining the magnetic domain type, chirality, and size. Here, we demonstrate the tailoring of the domain pattern by tuning the perpendicular anisotropy, the saturation magnetization, and the interfacial Dzyaloshinskii-Moriya interaction (iDMI) in Pd/Co/Pd multilayers with the insertion of an ultrathin tungsten layer at the top interface. The average domain size decreases around 60% when a 0.2 nm thick W layer is added to the Co/Pd interface. Magnetic force microscopy images and micromagnetic simulations were contrasted to elucidate the mechanisms that determine the domain textures and sizes. Our results indicate that both iDMI and PMA can be tuned by carefully changing the interfaces of originally symmetric multilayers, leading to magnetic domain patterns promising for high density magnetic memories.

APPLIED PHYSICS LETTERS 115[18], 182408, 2019. DOI: 10.1063/1.5123469

[P418-2019] “Magnetic, electronic, structural, and thermal properties of the Co₃O₂B₃ ludwigite in the paramagnetic state”

Galdino, C. W.*; Freitas, D. C.; Medrano, C. P. C.; Tartaglia, R.*; Rigitano, D.*; Oliveira, J. F.; Mendonca, A. A.; Ghivelder, L.; Continentino, M. A.; Sanchez, D. R.; Granado, E.*

The mixed-valent homometallic ludwigite (Co²⁺Co³⁺)₂B₃O₃ is investigated above the ferrimagnetic ordering temperature $T_c = 43$ K through structural, thermal, magnetic, electric, and spectroscopic probes. X-ray absorption at the Co L_{2,3} edges is consistent with the coexistence of Co²⁺ and Co³⁺ ions, as expected by the sample stoichiometry. Magnetic susceptibility shows a relatively large net paramagnetic moment per Co³⁺ ion above room temperature, $\mu = 4.87$, indicating that the Co³⁺ ions are not in a pure low-spin configuration at high temperatures, also showing a non-Curie-Weiss behavior below 300 K. Electrical conductivity and differential scanning calorimetry measurements on single crystals indicate two phase transitions at similar to 475 and similar to 495 K. X-ray powder diffraction shows substantial lattice parameter anomalies below 500 K. These results indicate phase transitions associated with changes in the Co oxidation state in each of its four crystallographic sites. Such transitions are possibly dictated by a competition between (i) an ordered ground state with all Co³⁺ ions occupying the same crystallographic site and (ii) either partially or totally charge-disordered states that are favored at high temperatures due to their higher entropy.

PHYSICAL REVIEW B 100[16], 165138, 2019. DOI: 10.1103/PhysRevB.100.165138

[P419-2019] “Measurement of charged jet cross section in pp collisions at root s=5.02 TeV”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; Takahashi, J.*; et. al.; Large Ion Collider Expt Collaborat

The cross section of jets reconstructed from charged particles is measured in the transverse momentum range of $5 < p(T) < 100$ GeV/c in pp collisions at the center-of-mass energy of root s = 5.02 TeV with the ALICE detector. The jets are reconstructed using the anti-k(T) algorithm with resolution parameters $R = 0.2, 0.3, 0.4,$ and 0.6 in the pseudorapidity range $|\eta| < 0.9 - R$. The charged jet cross sections are compared with the leading-order (LO) and to next-to-leading-order (NLO) perturbative quantum chromodynamics (pQCD) calculations. It is found that the NLO calculations agree better with the measurements. The cross section ratios for different resolution parameters are also measured. These ratios increase from low p(T) to high p(T) and saturate at high p(T), indicating that jet collimation is larger at high p(T) than at low p(T). These results provide a precision test of pQCD predictions and serve as a baseline for the measurement in Pb-Pb collisions at the same energy to quantify the effects of the hot and dense medium created in heavy-ion collisions at the LHC.

PHYSICAL REVIEW D 100[9], 092004, 2019. DOI: 10.1103/PhysRevD.100.092004

[P420-2019] “Measurement of the average very forward energy as a function of the track multiplicity at central pseudorapidities in proton-proton collisions at root s=13 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

The average total energy as well as its hadronic and electromagnetic components are measured with the CMS detector at pseudorapidities $-6.6 < \eta < -5.2$ in proton-proton collisions at a centre-of-mass energy root s = 13 TeV. The results are presented as a function of the charged particle multiplicity in the region $|\eta| < 2$. This measurement is sensitive to correlations induced by the underlying event structure over a very wide pseudorapidity region. The predictions of Monte Carlo event generators commonly used in collider experiments and ultra-high energy cosmic ray physics are compared to the data. All generators considered overestimate the fraction of energy going into hadrons.

EUROPEAN PHYSICAL JOURNAL C 79[11], 893, 2019. DOI: 10.1140/epjc/s10052-019-7402-3

[P421-2019] “Measurement of the inclusive isolated photon production cross section in pp collisions at root s=7 TeV”

Acharya, S.; Acosta, F. T.; Adam, J.; Albuquerque, D. S. D.*; Chinellato, D. D.*; DeSouza, R. D.*; Takahashi, J.*; et. al.; ALICE Collaboration

The production cross section of inclusive isolated photons has been measured by the ALICE experiment at the CERN LHC in pp collisions at a centre-of-momentum energy of root s = 7 TeV. The measurement is performed with the electromagnetic calorimeter EMCal and the central tracking detectors, covering a range of $|\eta| < 0.27$ in pseudorapidity and a transverse momentum range of $10 < p(T) < 60$ GeV/c. The result extends the pT coverage of previously published results of the ATLAS and CMS experiments at the same collision energy to smaller pT. The measurement is compared to next-to-leading order perturbative QCD calculations and to the results from the ATLAS and CMS experiments. All measurements and theory predictions are in agreement with each other.

EUROPEAN PHYSICAL JOURNAL C 79[11], 896, 2019. DOI: 10.1140/epjc/s10052-019-7389-9

[P422-2019] “Measurement of the top quark polarization and t(t)over-barspin correlations using dilepton final states in proton-proton collisions at root s=13 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

Measurements of the top quark polarization and top quark pair (t(t)over-bar) spin correlations are presented using events containing two oppositely charged leptons (e(+)e(-), e(+/-)mu(-/+), or mu(+)mu(-)) produced in proton-proton collisions at a center-of-mass energy of 13 TeV. The data were recorded by the CMS experiment at the LHC in 2016 and correspond to an integrated luminosity of 35.9 fb⁻¹. A set of parton-level normalized differential cross sections, sensitive to each of the independent coefficients of the spin-dependent parts of the t(t)over-bar production density matrix, is measured for the first time at 13 TeV. The measured distributions and extracted coefficients are compared with standard model predictions from simulations at next-to-leading-order (NLO) accuracy in quantum chromodynamics (QCD), and from NLO QCD calculations including electroweak corrections. All measurements are found to be consistent with the expectations of the standard model. The normalized differential cross sections are used in fits to constrain the anomalous chromomagnetic and chromoelectric dipole moments of the top quark to $-0.24 < C\text{-}tG/\Lambda^2 < 0.07$ TeV⁻² and $-0.33 < C\text{-}tG(I)/\Lambda^2 < 0.20$ TeV⁻², respectively, at the 95% confidence level.

PHYSICAL REVIEW D 100[7], 072002, 2019. DOI: 10.1103/PhysRevD.100.072002

[P423-2019] “Measurement of the top quark Yukawa coupling from $t(\bar{t})$ over-bar kinematic distributions in the lepton plus jets final state in proton-proton collisions at $\sqrt{s}=13$ TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

Results are presented for an extraction of the top quark Yukawa coupling from top quark-antiquark ($t(\bar{t})$ over bar) kinematic distributions in the lepton plus jets final state in proton-proton collisions, based on data collected by the CMS experiment at the LHC at $\sqrt{s} = 13$ TeV, corresponding to an integrated luminosity of 35.8 fb^{-1} . Corrections from weak boson exchange, including Higgs bosons, between the top quarks can produce large distortions of differential distributions near the energy threshold of $t(\bar{t})$ over bar production. Therefore, precise measurements of these distributions are sensitive to the Yukawa coupling. Top quark events are reconstructed with at least three jets in the final state, and a novel technique is introduced to reconstruct the $t(\bar{t})$ over bar system for events with one missing jet. This technique enhances the experimental sensitivity in the low invariant mass region, $M_{t(\bar{t}) \text{ over bar}}$. The data yields in $M_{t(\bar{t}) \text{ over bar}}$, the rapidity difference $y(t) - y(\bar{t})$, and the number of reconstructed jets are compared with distributions representing different Yukawa couplings. These comparisons are used to measure the ratio of the top quark Yukawa coupling to its standard model predicted value to be $1.07(-0.43)(+0.34)$ with an upper limit of 1.67 at the 95% confidence level.

PHYSICAL REVIEW D 100[7], 072007, 2019. DOI: 10.1103/PhysRevD.100.072007

[P424-2019] “Measurement of Upsilon(1S) Elliptic Flow at Forward Rapidity in Pb-Pb Collisions at $\sqrt{s_{NN}}=5.02$ TeV”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; DeSouza, R. D.*; Takahashi, J.*; et. al.; A Large Ion Collider Expt Collabor

The first measurement of the Upsilon(1S) elliptic flow coefficient (v_2) is performed at forward rapidity ($2.5 < y < 4$) in Pb-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV with the ALICE detector at the LHC. The results are obtained with the scalar product method and are reported as a function of transverse momentum (p_T) up to $15 \text{ GeV}/c$ in the 5%-60% centrality interval. The measured Upsilon(1S) v_2 is consistent with 0 and with the small positive values predicted by transport models within uncertainties. The v_2 coefficient in $2 < p_T < 15 \text{ GeV}/c$ is lower than that of inclusive J/ψ mesons in the same p_T interval by 2.6 standard deviations. These results, combined with earlier suppression measurements, are in agreement with a scenario in which the Upsilon(1S) production in Pb-Pb collisions at LHC energies is dominated by dissociation limited to the early stage of the collision, whereas in the J/ψ case there is substantial experimental evidence of an additional regeneration component.

PHYSICAL REVIEW LETTERS 123[19], 192301, 2019. DOI: 10.1103/PhysRevLett.123.192301

[P425-2019] “Optical Fiber Anemometer Based on a Multi-FBG Curvature Sensor”

Fujiwara, E.; Hayashi, J. G.*; Delfino, T. da S.*; Jorge, P. A. S.; Cordeiro, C. M. de B.*

An optical fiber anemometer based on a flexible multi-FBG curvature sensor is reported. The probe is comprised of a structured polymer shell with embedded single-mode fibers with written fiber Bragg gratings. When the sensor is bent, the different spectral shift of the Bragg wavelengths allows the determination of the mechanical stimulus.

Moreover, the probe was also used as a cantilever sensor for assessing the airflow speed in a wind tunnel. The sensor presented sensitivities of $0.8 \text{ nm}/\text{m}^{-1}$ and $1.05 \text{ pm}/(\text{m}/\text{s})$ for curvature and square speed measurements, respectively, and the sensing characteristics can be improved by simply changing the material and the geometry of the bulk polymer shell, providing a versatile and feasible probe for the mechanical and flow measurements.

IEEE SENSORS JOURNAL 19[19], (SI), 8727-8732, 2019. DOI: 10.1109/JSEN.2019.2923046 Publicado: OCT 1 2019

[P426-2019] “Optical Fiber Specklegram Chemical Sensor Based on a Concatenated Multimode Fiber Structure”

Fujiwara, E.; da Silva, L. E.*; Cabral, T. D.*; de Freitas, H. E.*; Wu, Y. T.; Cordeiro, C. M. de B.*

An optical fiber specklegram chemical sensor based on a concatenated multimode-no-core-multimode structure is reported. The 30 mm-no-core section is immersed in the analyzed liquid so the number of excited modes is modulated by the surrounding refractive index value, affecting the interference of the several propagating modes and consequently the output specklegram, whose changes are quantified by the zero mean normalized cross-correlation coefficient. The sensor was evaluated on the measurement of ethanol-water solutions, resulting in 18.7 RIU^{-1} sensitivity (5×10^{-4} resolution) for the 1.33 to 1.36 refractive index interval, besides 0.07 degrees C $^{-1}$ temperature sensitivity within the 26-32. C range. Moreover, the system was also tested on liquid level measurements, yielding 0.05 mm^{-1} sensitivity and 0.2 mm resolution. The results are comparable to previously reported multimodal interferometers based on more complicated interrogation schemes, indicating that the specklegram sensor is a feasible alternative for the sensitive and straightforward measurement of liquid samples.

JOURNAL OF LIGHTWAVE TECHNOLOGY 37[19], 5041-5047, 2019. DOI: 10.1109/JLT.2019.2927332

[P427-2019] “Particle production between isometric frames on a Poincare patch of AdS(2)”

Pitelli, J. P. M.; Barroso, V. S.*

In a recent paper [J. P. M. Pitelli, Phys. Rev. D 99, 108701 (2019)], one of us showed that the vacuum state associated with conformal fields on a Poincare patch of anti-de Sitter spacetime is not AdS invariant for fields satisfying nontrivial boundary conditions (by nontrivial, we mean neither Dirichlet nor Neumann) at the conformal boundary. In this way, two isometrically related observers in anti-de Sitter space have different notions of no particle content. Therefore, an observer who is suddenly transported to a different (but isometrically related) frame will feel a bath of particles. This process contradicts our intuitive notion based on our experience in Minkowski spacetime, where the vacuum is Lorentz invariant, and no particle is produced between boosted frames. We show that the total number of produced particles is finite but grows without limit when we approach (via isometric transformation) Dirichlet or Neumann boundary conditions since in these cases the vacuum is invariant.

JOURNAL OF MATHEMATICAL PHYSICS 60[9], 092301, 2019. DOI: 10.1063/1.5117832

[P428-2019] “Phenotypic redshifts with self-organizing maps: A novel method to characterize redshift distributions of source galaxies for weak lensing”

Buchs, R.; Davis, C.; Gruen, D.; Sobreira, F.*; et.al.; DES Collaboration

Wide-field imaging surveys such as the Dark Energy Survey (DES) rely on coarse measurements of spectral energy distributions in a few filters to estimate the redshift distribution of source galaxies. In this regime, sample variance, shot noise, and selection effects limit the attainable accuracy of redshift calibration and thus of cosmological constraints. We present a new method to combine wide-field, few-filter measurements with catalogues from deep fields with additional filters and sufficiently low photometric noise to break degeneracies in photometric redshifts. The multiband deep field is used as an intermediary between wide-field observations and accurate redshifts, greatly reducing sample variance, shot noise, and selection effects. Our implementation of the method uses self-organizing maps to group galaxies into phenotypes based on their observed fluxes, and is tested using a mock DES catalogue created from N-body simulations. It yields a typical uncertainty on the mean redshift in each of five tomographic bins for an idealized simulation of the DES Year 3 weak-lensing tomographic analysis of $\sigma(\Delta z) = 0.007$, which is a 60 per cent improvement compared to the Year 1 analysis. Although the implementation of the method is tailored to DES, its formalism can be applied to other large photometric surveys with a similar observing strategy.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 489[1], 820-841, 2019. DOI: 10.1093/mnras/stz2162

[P429-2019] “Pion and kaon structure at the electron-ion collider”

Aguilar, A. C.*; Ahmed, Z.; Aidala, C.; et al.

Understanding the origin and dynamics of hadron structure and in turn that of atomic nuclei is a central goal of nuclear physics. This challenge entails the questions of how does the roughly 1 GeV mass-scale that characterizes atomic nuclei appear; why does it have the observed value; and, enigmatically, why are the composite Nambu-Goldstone (NG) bosons in quantum chromodynamics (QCD) abnormally light in comparison? In this perspective, we provide an analysis of the mass budget of the pion and proton in QCD; discuss the special role of the kaon, which lies near the boundary between dominance of strong and Higgs mass-generation mechanisms; and explain the need for a coherent effort in QCD phenomenology and continuum calculations, in exa-scale computing as provided by lattice QCD, and in experiments to make progress in understanding the origins of hadron masses and the distribution of that mass within them. We compare the unique capabilities foreseen at the electron-ion collider (EIC) with those at the hadron-electron ring accelerator (HERA), the only previous electron-proton collider; and describe five key experimental measurements, enabled by the EIC and aimed at delivering fundamental insights that will generate concrete answers to the questions of how mass and structure arise in the pion and kaon, the Standard Model's NG modes, whose surprisingly low mass is critical to the evolution of our Universe.

EUROPEAN PHYSICAL JOURNAL A 55[10], 190, 2019. DOI: 10.1140/epja/i2019-12885-0

[P430-2019] “Power oscillations induced by the relative Goos-Hanchen phase”

Araujo, M. P.*; De Leo, S.; Maia, G. G.; Martino, M.

By using an optical interferometer composed of a dielectric laser ellipsometer, to change the optical response of transverse electric and magnetic incident radiation, and two polarisers, to trigger the interference pattern induced by the relative Goos-Hanchen phase, we show under which conditions it is possible to optimize the laser power oscillations induced by the relative phase difference between orthogonal polarised states.

The Goos-Hanchen interference can then be used to sense rotation, to test optical components, and to simulate quarter and half wave plates.

EUROPEAN PHYSICAL JOURNAL D 73[10], 213, 2019. DOI: 10.1140/epjd/e2019-90571-8

[P431-2019] “Probing the Defect-Induced Magnetocaloric Effect on Ferrite/Graphene Functional Nanocomposites and their Magnetic Hyperthermia”

Prabhakaran, T.*; Udayabhaskar, R.; Mangalaraja, R. V.; Sahlevani, S. F.; Freire, R. M.; Denardin, J. C.; Beron, F.*; Varaprasad, K.; Pinilla, M. A. G.; Araujo, M. V.; Bakuzis, A. F.

Recently, the development of an alternative magnetic refrigerant for the conventional fossil fuels attracts the researchers. We discussed the structural defect-induced magnetocaloric effect (MCE) in Ni_{0.3}Zn_{0.7}Fe₂O₄/graphene (NZF/G) nanocomposites for the first time. Single-phase spinel ferrite nanocomposites with an average size of 7-11.4 nm were achieved by using the microwave-assisted coprecipitation method. The effect of graphene loading on the structural and magnetism of NZF/G nanocomposites was elaborated. Raman analysis proved that the interface interaction between NZF and graphene yielded different densities of structural defects. In view of magnetism, superparamagnetic NZF nanoparticles showed a magnetic entropy change ($-\Delta S-M(\max)$) of $-0.678 \text{ J.kg}^{-1} \text{ K}^{-1}$ at 135 K, whereas the NZF/G nanocomposites exhibited superior $-\Delta S-M(\max)$ at cryogenic temperatures and the defect-induced MCE change was indeed similar to the I-D/I-G intensity ratio. The nanocomposites exhibited different magnetic orderings between 5 and 295 K, and it was varying for I-D/I-G, $1.83 > 1.68 > 1.57$ as antiferromagnetic (AFM) > AFM/ferrimagnetic (FiM) > FiM, respectively. Till now, NZF/G nanocomposites showed an inverse MCE of $4.378 \text{ J.kg}^{-1} \text{ K}^{-1}$ at 35 K and a refrigerant capacity of 88 J.kg^{-1} for 40 kOe, which was greater than the ferrites reported so far. Finally, MCE and magnetic hyperthermia were correlated at ambient conditions. These results pave the way for ferrite/graphene nanocomposites for cooling applications.

JOURNAL OF PHYSICAL CHEMISTRY C 123[42], 25844-25855, 2019. DOI: 10.1021/acs.jpcc.9b07076

[P432-2019] “Producing a BOSS CMASS sample with DES imaging”

Lee, S.; Huff, E. M.; Ross, A. J.; Sobreira, F.*; et. al.; DES Collaboration

We present a sample of galaxies with the Dark Energy Survey (DES) photometry that replicates the properties of the BOSS CMASS sample. The CMASS galaxy sample has been well characterized by the Sloan Digital Sky Survey (SDSS) collaboration and was used to obtain the most powerful redshift-space galaxy clustering measurements to date. A joint analysis of redshift-space distortions (such as those probed by CMASS from SDSS) and a galaxy-galaxy lensing measurement for an equivalent sample from DES can provide powerful cosmological constraints. Unfortunately, the DES and SDSS-BOSS footprints have only minimal overlap, primarily on the celestial equator near the SDSS Stripe 82 region. Using this overlap, we build a robust Bayesian model to select CMASS-like galaxies in the remainder of the DES footprint. The newly defined DES-CMASS (DMASS) sample consists of 117 293 effective galaxies covering 1244 deg^2 . Through various validation tests, we show that the DMASS sample selected by this model matches well with the BOSS CMASS sample, specifically in the South Galactic cap (SGC) region that includes Stripe 82. Combining measurements of the angular correlation function and the clustering-z distribution of DMASS,

we constrain the difference in mean galaxy bias and mean redshift between the BOSS CMASS and DMASS samples to be $\Delta b = 0.010(-0.052)(+0.045)$ and $\Delta z = (3.46(-5.55)(+5.48)) \times 10^{-3}$ for the SGC portion of CMASS, and $\Delta b = 0.044(-0.043)(+0.044)$ and $\Delta z = (3.51(-5.91)(+4.93)) \times 10^{-3}$ for the full CMASS sample. These values indicate that the mean bias of galaxies and mean redshift in the DMASS sample are consistent with both CMASS samples within 1 sigma.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 489[2], 2887-2906, 2019. DOI: 10.1093/mnras/stz2288

[P433-2019] "Proposal for a Quantitative F-18-FDG PET/CT Metabolic Parameter to Assess the Intensity of Bone Involvement in Multiple Myeloma"

Takahashi, M. E. S.*; Mosci, C.; Souza, E. M.; Brunetto, S. Q.; Etchebehere, E.; Santos, A. O.; Camacho, M. R.; Miranda, E.; Lima, M. C. L.; Amorim, B. J.; de Souza, C.; Pericole, F. V.; Lorand-Metze, I.; Ramos, C. D.

Many efforts have been made to standardize the interpretation of F-18-FDG PET/CT in multiple myeloma (MM) with qualitative visual analysis or with quantitative metabolic parameters using various methods for lesion segmentation of PET images. The aim of this study was to propose a quantitative method for bone and bone marrow evaluation of F-18-FDG PET/CT considering the extent and intensity of bone F-18-FDG uptake: Intensity of Bone Involvement (IBI). Whole body F-18-FDG PET/CT of 59 consecutive MM patients were evaluated. Compact bone tissue was segmented in PET images using a global threshold for HU of the registered CT image. A whole skeleton mask was created and the percentage of its volume with F-18-FDG uptake above hepatic uptake was calculated (Percentage of Bone Involvement - PBI). IBI was defined by multiplying PBI by mean SUV above hepatic uptake. IBI was compared with visual analysis performed by two experienced nuclear medicine physicians. IBI calculation was feasible in all images (range:0.00-1.35). Visual analysis categorized PET exams into three groups (negative/mild, moderate and marked bone involvement), that had different ranges of IBI (multi comparison analysis, $p < 0.0001$). There was an inverse correlation between the patients' hemoglobin values and IBI ($r = -0.248; p = 0.02$). IBI score is an objective measure of bone and bone marrow involvement in MM, allowing the categorization of patients in different degrees of aggressiveness of the bone disease. The next step is to validate IBI in a larger group of patients, before and after treatment and in a multicentre setting.

SCIENTIFIC REPORTS 9, 16429, 2019. DOI: 10.1038/s41598-019-52740-2

[P434-2019] "Search for a Light Charged Higgs Boson Decaying to a W Boson and a CP-Odd Higgs Boson in Final States with $e \mu \mu$ or $\mu \mu \mu$ in Proton-Proton Collisions at root $s=13$ TeV"

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al; CMS Collaboration

A search for a light charged Higgs boson (H^+) decaying to a W boson and a CP-odd Higgs boson (A) in final states with $e \mu \mu$ or $\mu \mu \mu$ is performed using data from pp collisions at root $s = 13$ TeV, recorded by the CMS detector at the LHC and corresponding to an integrated luminosity of 35.9 fb⁻¹. In this search, it is assumed that the H^+ boson is produced in decays of top quarks, and the A boson decays to two oppositely charged muons. The presence of signals for H^+ boson masses between 100 and 160 GeV and A boson masses between 15 and 75 GeV is investigated. No evidence for the production of the H^+ boson is found.

Upper limits at 95% confidence level are obtained on the combined branching fraction for the decay chain, $t \rightarrow bH^+ \rightarrow bW^+A \rightarrow bW^+\mu^+\mu^-$, of 1.9×10^{-6} to 8.6×10^{-6} , depending on the masses of the H^+ and A bosons. These are the first limits for these decay modes of the H^+ and A bosons.

PHYSICAL REVIEW LETTERS 123[13], 131802, 2019. DOI: 10.1103/PhysRevLett.123.131802

[P435-2019] "Search for anomalous electroweak production of vector boson pairs in association with two jets in proton-proton collisions at 13 TeV"

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search for anomalous electroweak production of WW, WZ, and ZZ boson pairs in association with two jets in proton-proton collisions at root $s = 13$ TeV at the LHC is reported. The data sample corresponds to an integrated luminosity of 35.9 fb⁻¹ collected with the CMS detector. Events are selected by requiring two jets with large rapidity separation and invariant mass, one or two leptons (electrons or muons), and a W or Z boson decaying hadronically. No excess of events with respect to the standard model background predictions is observed and constraints on the structure of quartic vector boson interactions in the framework of dimension-8 effective field theory operators are reported. Stringent limits on parameters of the effective field theory operators are obtained. The observed 95% confidence level limits for the S0, M0, and T0 operators are $-2.7 < f(S0)/A(4) < 2.7$, $-1.0 < f(M0)/A(4) < 1.0$, and $-0.17 < f(T0)/A(4) < 0.16$, in units of TeV⁻⁴. Constraints are also reported on the product of the cross section and branching fraction for vector boson fusion production of charged Higgs bosons as a function of mass from 600 to 2000 GeV. The results are interpreted in the context of the Georgi-Machacek model.

PHYSICS LETTERS B 798, UNSP 134985, 2019. DOI: 10.1016/j.physletb.2019.134985

[P436-2019] "Search for dark photons in decays of Higgs bosons produced in association with Z bosons in proton-proton collisions at root $s=13$ TeV"

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search is presented for a Higgs boson that is produced in association with a Z boson and that decays to an undetected particle together with an isolated photon. The search is performed by the CMS Collaboration at the Large Hadron Collider using a data set corresponding to an integrated luminosity of 137 fb⁻¹ recorded at a center-of-mass energy of 13 TeV. No significant excess of events above the expectation from the standard model background is found. The results are interpreted in the context of a theoretical model in which the undetected particle is a massless dark photon. An upper limit is set on the product of the cross section for associated Higgs and Z boson production and the branching fraction for such a Higgs boson decay, as a function of the Higgs boson mass. For a mass of 125 GeV, assuming the standard model production cross section, this corresponds to an observed (expected) upper limit on this branching fraction of 4.6 (3.6)% at 95% confidence level. These are the first limits on Higgs boson decays to final states that include an undetected massless dark photon.

JOURNAL OF HIGH ENERGY PHYSICS 10, 139, 2019. DOI: 10.1007/JHEP10(2019)139

[P437-2019] “Search for Higgs and Z boson decays to J/psi or Y pairs in the four-muon final state in proton-proton collisions at root s=13 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search for decays of the Higgs and Z boson to pairs of J/psi or Y(nS)(n = 1, 2, 3) mesons, with their subsequent decay to mu(+)mu(-) pairs, is presented. The analysis uses data from proton-proton collisions at root s = 13 TeV, collected with the CMS detector at the LHC in 2017 and corresponding to an integrated luminosity of 37.5 fb(-1). While an observation of such a decay with this sample would indicate the presence of physics beyond the standard model, no significant excess is observed. Upper limits at 95% confidence level are placed on the branching fractions of these decays. In the J/psi pair channel, the limits are 1.8 x 10(-3) and 2.2 x 10(-6) for the Higgs and Z boson, respectively, while in the combined Y(nS) pair channel, the limits are 1.4 x 10(-3) and 1.5 x 10(-6), respectively, when the mesons from the Higgs and Z boson decay are assumed to be unpolarized. When fully longitudinal and transverse polarizations are considered the limits reduce by about 22-29% and increase by about 10-13%, respectively.

PHYSICS LETTERS B 797, UNSP 134811, 2019. DOI: 10.1016/j.physletb.2019.134811

[P438-2019] “Search for long-lived particles using non-prompt jets and missing transverse momentum with proton-proton collisions at root s=13 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search for long-lived particles decaying to displaced, non-prompt jets and missing transverse momentum is presented. The data sample corresponds to an integrated luminosity of 137 fb(-1) of proton-proton collisions at a center-of-mass energy of 13 TeV collected by the CMS experiment at the CERN LHC in 2016-2018. Candidate signal events containing non-prompt jets are identified using the timing capabilities of the CMS electromagnetic calorimeter. The results of the search are consistent with the background prediction and are interpreted using a gauge-mediated supersymmetry breaking reference model with a gluino next-to-lightest supersymmetric particle. In this model, gluino masses up to 2100, 2500, and 1900 GeV are excluded at 95% confidence level for proper decay lengths of 0.3, 1, and 100 m, respectively. These are the best limits to date for such massive gluinos with proper decay lengths greater than similar to 0.5 m.

PHYSICS LETTERS B 797, UNSP 134876, 2019. DOI: 10.1016/j.physletb.2019.134876

[P439-2019] “Search for MSSM Higgs bosons decaying to mu(+)mu(-) in proton-proton collisions at root s=13TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search is performed for neutral non-standard-model Higgs bosons decaying to two muons in the context of the minimal supersymmetric standard model (MSSM). Proton-proton collision data recorded by the CMS experiment at the CERN Large Hadron Collider at a center-of-mass energy of 13 TeV were used, corresponding to an integrated luminosity of 35.9 fb(-1). The search is sensitive to neutral Higgs bosons produced via the gluon fusion process or in association with a b (b) over bar quark pair. No significant deviations from the standard model expectation are observed. Upper limits at 95% confidence level are set in the context of the m(h)(mod+)

and phenomenological MSSM scenarios on the parameter tan beta as a function of the mass of the pseudoscalar A boson, in the range from 130 to 600 GeV. The results are also used to set a model-independent limit on the product of the branching fraction for the decay into a muon pair and the cross section for the production of a scalar neutral boson, either via gluon fusion, or in association with b quarks, in the mass range from 130 to 1000 GeV.

PHYSICS LETTERS B 798, UNSP 134992, 2019. DOI: 10.1016/j.physletb.2019.134992

[P440-2019] “Search for new physics in top quark production in dilepton final states in proton-proton collisions at root s=13 TeV”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J.A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

A search for new physics in top quark production is performed in proton-proton collisions at 13 TeV. The data set corresponds to an integrated luminosity of 35.9 fb(-1) collected in 2016 with the CMS detector. Events with two opposite-sign isolated leptons (electrons or muons), and b quark jets in the final state are selected. The search is sensitive to new physics in top quark pair production and in single top quark production in association with a W boson. No significant deviation from the standard model expectation is observed. Results are interpreted in the framework of effective field theory and constraints on the relevant effective couplings are set, one at a time, using a dedicated multivariate analysis. This analysis differs from previous searches for new physics in the top quark sector by explicitly separating tW from t (t) over bar events and exploiting the specific sensitivity of the tW process to new physics.

EUROPEAN PHYSICAL JOURNAL C 79[11], 886, 2019. DOI: 10.1140/epjc/s10052-019-7387-y

[P441-2019] “Search for pair production of vectorlike quarks in the fully hadronic final state”

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et. al.; CMS Collaboration

The results of two searches for pair production of vectorlike T or B quarks in fully hadronic final states are presented, using data from the CMS experiment at a center-of-mass energy of 13 TeV. The data were collected at the LHC during 2016 and correspond to an integrated luminosity of 35.9 fb(-1). A cut-based analysis specifically targets the bW decay mode of the T quark and allows for the reconstruction of the T quark candidates. In a second analysis, a multiclassification algorithm, the “boosted event shape tagger,” is deployed to label candidate jets as originating from top quarks, and W, Z, and H. Candidate events are categorized according to the multiplicities of identified jets, and the scalar sum of all observed jet momenta is used to discriminate signal events from the quantum chromodynamics multijet background. Both analyses probe all possible branching fraction combinations of the T and B quarks and set limits at 95% confidence level on their masses, ranging from 740 to 1370 GeV. These results represent a significant improvement relative to existing searches in the fully hadronic final state.

PHYSICAL REVIEW D 100[7], 072001, 2019. DOI: 10.1103/PhysRevD.100.072001

[P442-2019] “Search for RR Lyrae stars in DES ultrafaint systems: Grus I, Kim 2, Phoenix II, and Grus”

Martinez-Vazquez, C. E.; Vivas, A. K.; Gurevich, M.; **Sobreira, F.***; Swanson, M. E. C.; Tarle, G.; Vikram, V.; et. al.; DES Collaboration

This work presents the first search for RR Lyrae stars (RRLs) in four ultrafaint systems imaged by the Dark Energy Survey using SOAR/Goodman and Blanco/DECam imagers. We have detected two RRLs in the field of Grus I, none in Kim 2, one in Phoenix II, and four in Grus II. With the detection of these stars, we accurately determine the distance moduli for these ultrafaint dwarf satellite galaxies; $\mu(0) = 20.51 \pm 0.10$ mag ($D = 127 \pm 6$ kpc) for Grus I and $\mu(0) = 20.01 \pm 0.10$ mag ($D = 100 \pm 5$ kpc) for Phoenix II. These measurements are larger than previous estimations by Koposov et al. and Bechtol et al., implying larger physical sizes; 5 per cent for Grus I and 33 per cent for Phoenix II. For Grus II, of the four RRLs detected, one is consistent with being a member of the galactic halo ($D = 24 \pm 1$ kpc, $\mu(0) = 16.86 \pm 0.10$ mag), another is at $D = 55 \pm 2$ kpc ($\mu(0) = 18.71 \pm 0.10$ mag), which we associate with Grus II, and the two remaining at $D = 43 \pm 2$ kpc ($\mu(0) = 18.17 \pm 0.10$ mag). Moreover, the appearance of a subtle red horizontal branch in the colour magnitude diagram of Grus II at the same brightness level of the latter two RRLs, which are at the same distance and in the same region, suggests that a more metal-rich system may be located in front of Grus II. The most plausible scenario is the association of these stars with the Chenab/Orphan Stream. Finally, we performed a comprehensive and updated analysis of the number of RRLs in dwarf galaxies. This allows us to predict that the method of finding new ultrafaint dwarf galaxies using two or more clumped RRLs will work only for systems brighter than M_V similar to 6 mag.

MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 490[2], 2183-2199, 2019. DOI: 10.1093/mnras/stz2609

[P443-2019] "Search for supersymmetry in proton-proton collisions at 13 TeV in final states with jets and missing transverse momentum"

Sirunyan, A. M.; Tumasyan, A.; Adam, W.; **Chinellato, J. A.***; **Tonelli Manganote, E. J.***; et. al.; CMS Collaboration

Results are reported from a search for supersymmetric particles in the final state with multiple jets and large missing transverse momentum. The search uses a sample of proton-proton collisions at $\sqrt{s} = 13$ TeV collected with the CMS detector in 2016-2018, corresponding to an integrated luminosity of 137 fb⁻¹, representing essentially the full LHC Run 2 data sample. The analysis is performed in a four-dimensional search region defined in terms of the number of jets, the number of tagged bottom quark jets, the scalar sum of jet transverse momenta, and the magnitude of the vector sum of jet transverse momenta. No significant excess in the event yield is observed relative to the expected background contributions from standard model processes. Limits on the pair production of gluinos and squarks are obtained in the framework of simplified models for supersymmetric particle production and decay processes. Assuming the lightest supersymmetric particle to be a neutralino, lower limits on the gluino mass as large as 2000 to 2310 GeV are obtained at 95% confidence level, while lower limits on the squark mass as large as 1190 to 1630 GeV are obtained, depending on the production scenario.

JOURNAL OF HIGH ENERGY PHYSICS 10, 244, 2019. DOI: 10.1007/JHEP10(2019)244

[P444-2019] "Simultaneous Existence of Confined and Delocalized Vibrational Modes in Colloidal Quantum Dots"

Liu, A.; Almeida, D. B.; Bae, W. K.; **Padilha, L. A.***; Cundiff, S. T.

Coupling to phonon modes is a primary mechanism of excitonic dephasing and energy loss in semiconductors. However, low-energy phonons in colloidal quantum dots and their coupling to excitons are poorly understood because their experimental signatures are weak and usually obscured by the unavoidable inhomogeneous broadening of colloidal dot ensembles. We use multidimensional coherent spectroscopy at cryogenic temperatures to extract the homogeneous nonlinear optical response of excitons in a CdSe/CdZnS core/shell colloidal quantum dot ensemble. A comparison to the simulation provides evidence that the observed lineshapes arise from the coexistence of confined and delocalized vibrational modes, both of which couple strongly to excitons in CdSe/CdZnS colloidal quantum dots.

JOURNAL OF PHYSICAL CHEMISTRY LETTERS 10[20], 6144-6150, 2019. DOI: 10.1021/acs.jpclett.9b02474

[P445-2019] "Spin rotation induced by applied pressure in the Cd-doped Ce2RhIn8 intermetallic compound"

Christovam, D. S.*; **Giles, C.***; Mendonca-Ferreira, L.; Leao, J.; Ratcliff, W.; Lynn, J. W.; Ramos, S.; Hering, E. N.; Hidaka, H.; Baggio-Saitovich, E.; Fisk, Z.; **Pagliuso, P. G.***; **Adriano, C.***

The pressure evolution of the magnetic properties of the Ce₂RhIn_{7.79}Cd_{0.21} heavy fermion compound was investigated by single crystal neutron magnetic diffraction and electrical resistivity experiments under applied pressure. From the neutron magnetic diffraction data, up to $P = 0.6$ GPa, we found no changes in the magnetic structure or in the ordering temperature $T_N = 4.8$ K. However, the increase of pressure induces an interesting spin rotation of the ordered antiferromagnetic moment of Ce₂RhIn_{7.79}Cd_{0.21} into the ab tetragonal plane. From the electrical resistivity measurements under pressure, we have mapped the evolution of T_N and the maximum of the temperature dependent electrical resistivity (T_{MAX}) as a function of the pressure (P less than or similar to 3.6 GPa). To gain some insight into the microscopic origin of the observed spin rotation as a function of pressure, we have also analyzed some macroscopic magnetic susceptibility data at ambient pressure for pure and Cd-doped Ce₂RhIn₈ using a mean-field model including tetragonal crystalline electric field (CEF). The analysis indicates that these compounds have a Γ_6^- type ground state, followed by a Γ_7^+ first excited state at $\Delta(1)$ similar to 80 K and a Γ_6 second excited state at $\Delta(2)$ similar to 270 K for Ce₂RhIn₈ and $\Delta(2)$ similar to 250 K for Ce₂RhIn_{7.79}Cd_{0.21}. The evolution of the magnetic properties of Ce₂RhIn₈ as a function of Cd doping and the rotation of the direction of the ordered moment for the Ce₂RhIn_{7.79}Cd_{0.21} compound under pressure suggest important changes of the single ion anisotropy of Ce³⁺ induced by applying pressure and Cd doping in these systems. These changes are reflected in modifications in the CEF scheme that will ultimately affect the actual ground state of these compounds.

PHYSICAL REVIEW B 100[16], 165133, 2019. DOI: 10.1103/PhysRevB.100.165133

[P446-2019] "Spreading patterns of high velocity nanodroplets impacting on suspended graphene"

Jaques, Y. M.; Galvao, D. S.*

The determination of the wettability of 2D materials is an area of intensive research, as it is decisive on the applications of these systems in nanofluidics. One important part of the wetting characterization is how the spreading of droplets impacting on the surfaces occurs. However, few works address this problem for layered materials. Here, we report a fully atomistic molecular dynamics study on the dynamics of impact of water nanodroplets (100 angstrom of diameter)

at high velocities (from 1 up to 15 angstrom/ps) against graphene targets. Our results show that tuning graphene wettability (through parameter changes) significantly affects the structural and dynamical aspects of the nanodroplets. We identified three ranges of velocities with distinct characteristics, from simple deposition of the droplet to spreading with rebound, and finally droplet fragmentation. We also identify that in an intermediary velocity of 7 angstrom/ps, the pattern of spreading critically changes, due to formation of voids on droplet structure. These voids affect in a detrimental way the droplet spreading on the less hydrophilic surface, as it takes more time to the droplet recover from the spreading and to return to a semi-spherical configuration. When the velocity is increased to values larger than 11 angstrom/ps, the droplet fragments, which reveals the maximum possible spreading.

JOURNAL OF MOLECULAR LIQUIDS 292, UNSP 110429, 2019. DOI: 10.1016/j.molliq.2019.02.028

[P447-2019] “Structural versatility driven by the flexible di(4-pyridyl) sulfide ligand: From cobalt(II) single-ion magnets to sheet-like copper(II) weak antiferromagnets”

Reis, N., V; Marinho, M. V.; Simoes, T. R. G.; Metz, K. C.; Vaz, R. C. A.; Oliveira, W. X. C.; Pereira, C. L. M.; Barros, W. P.; Pinheiro, C. B.; Giese, S. O. K.; Hughes, D. L.; Pirota, K. R.*; Nunes, W. C.; Stumpf, H. O.

The reaction between the ligand di(4-pyridyl)sulfide (dps) and two salts of divalent first row transition metals ($M = Co^{2+}$, and Cu^{2+}) resulted in three new compounds with formula: $[Co(dps)_4(H_2O)_2](ClO_4)_2 \cdot H_2O$ (1), $[Cu(dps)_2(dmsO)_2](n)(ClO_4)_2$ (2) and $\{[Cu(dps)_2(dmsO)_2]\{Cu(dps)_2(dmsO)_2\}(H_2O)\}_n(ClO_4)_4 \cdot 2nH_2O \cdot n(dmsO)$ (3). Crystal structures of 1-3 were determined using single-crystal X-ray diffraction. Crystal structure of 1 consists of a mononuclear complex, in which the dps ligand acts in a monodentate mode through one of the pyridyl nitrogen atoms. Compounds 2 and 3 present the dps ligands bridging metal centers leading to bidimensional coordination polymers. Magnetic properties in the polycrystalline samples of 1-3 in the 300-2 K temperature range were investigated. Complex 1 exhibits a field-induced slow magnetization behavior and behaves as a single-ion magnet with an effective energy barrier for the reversal of magnetization of 22.9 (1.1) K and $\tau(0) = 5.3(1.2) \times 10^{-7}$ s.

POLYHEDRON 171, 203-211, 2019. DOI: 10.1016/j.poly.2019.07.005

[P448-2019] “Study of the Lambda-Lambda interaction with femtoscopy correlations in pp and p-Pb collisions at the LHC”

Acharya, S.; Adamova, D.; Adhya, S. P.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et.al.; ALICE Collaboration

This work presents new constraints on the existence and the binding energy of a possible Lambda-Lambda bound state, the H-dibaryon, derived from Lambda-Lambda femtoscopic measurements by the ALICE collaboration. The results are obtained from a new measurement using the femtoscopy technique in pp collisions at $\sqrt{s} = 13$ TeV and p-Pb collisions at $\sqrt{s(NN)} = 5.02$ TeV, combined with previously published results from pp collisions at $\sqrt{s} = 7$ TeV. The Lambda-Lambda scattering parameter space, spanned by the inverse scattering length $f(0)(-1)$ and the effective range $d(0)$, is constrained by comparing the measured Lambda-Lambda correlation function with calculations obtained within the Lednicky model. The data are compatible with hypernuclei results and lattice computations, both predicting a shallow attractive interaction, and permit to test different theoretical approaches describing the Lambda-Lambda interaction.

The region in the $(f(0)(-1), d(0))$ plane which would accommodate a Lambda-Lambda bound state is substantially restricted compared to previous studies. The binding energy of the possible Lambda-Lambda bound state is estimated within an effective-range expansion approach and is found to be $B\text{-}\Lambda\text{-}\Lambda = 3.2(-2.4)(+1.6)(\text{stat})(-1.0)(+1.8)(\text{syst})$ MeV.

PHYSICS LETTERS B 797, UNSP 134822, 2019. DOI: 10.1016/j.physletb.2019.134822

[P449-2019] “Synthesis of La_{0.5}Ca_{0.5}-xxMnO₃ nanocrystalline manganites by sucrose assisted auto combustion route and study of their structural, magnetic and magnetocaloric properties”

Ben Moumen, S.; Gagou, Y.; Chettab, M.; Mezzane, D.; Amjoud, M.; Fourcade, S.; Hajji, L.; Kutnjak, Z.; El Marssi, M.; El Amraoui, Y.; Kopelevich, Y.*; Luk'yanchuk, Igor A.

Perovskite manganite La_{0.5}Ca_{0.5}-xxMnO₃ (LCMO) nanomaterials were elaborated using the sucrose modified auto combustion method. Rietveld refinements of the X-ray diffraction patterns of the crystalline structure confirm a single-phase orthorhombic state with Pbnm space group (No. 62). The Ca-vacancies were voluntarily created in the LCMO structure in order to study their influence on the magnetic behaviour in the system. The magnetic susceptibility was found to be highly enhanced in the sample with Ca-vacancies. Paramagnetic-to-ferromagnetic phase transition was evidenced in both samples around 254 K. This transition is, characterized by a drastic jump of the susceptibility in the sample with Ca-vacancies. The maximum of entropy change, observed for both compounds at magnetic field of 6 T was 2.30 J kg⁻¹ K⁻¹ and 2.70 J kg⁻¹ K⁻¹ for the parent compound and the lacunar one respectively. The magnetocaloric adiabatic temperature change value calculated by indirect method was 5.6 K and 5.2 K for the non-lacunar and Ca-vacancy compound, respectively. The Ca-lacunar La_{0.5}Ca_{0.5}-xxMnO₃ ($x = 0.05$) reported in this work demonstrated overall enhancement of the magnetocaloric effect over the LCMO. The technique used to elaborate LCMO materials was beneficial to enhance the magnetocaloric effect and magnetic behaviour. Therefore, we conclude that this less costly environmentally friendly system can be considered as more advantageous candidate for magnetic refrigeration applications than the commonly Gd-based compounds.

JOURNAL OF MATERIALS SCIENCE-MATERIALS IN ELECTRONICS 30[23], 20459-20470, 2019. DOI: 10.1007/s10854-019-02392-9

[P450-2019] “The structure of graphene on graphene/C-60/Cu interfaces: a molecular dynamics study”

Fonseca, A. F.*; Dantas, S. O.*; Galvao, D. S.*; Zhang, D.; Sinnott, S. B.

Two experimental studies reported the spontaneous formation of amorphous and crystalline structures of C-60 molecules intercalated between graphene and a surface. The findings observed included interesting phenomena ranging from reaction between fullerene C(60)s ('C(60)s' stands for plural of C-60) under graphene to graphene sheets sagging between C(60)s and control of strain in these sheets. Motivated by this work, we performed fully atomistic reactive molecular dynamics simulations to investigate the formation and thermal stability of graphene sheet wrinkles as well as graphene attachment to and detachment from a surface when the sheet is laid over a previously distributed array of C-60 molecules on a copper surface at different temperatures. As graphene compresses the C(60)s against the surface, and graphene attachment to the surface in between C(60)s depends on the height of the wrinkles in the graphene sheet,

configurations with both frozen and non-frozen fullerenes were investigated in the simulations in order to examine the experimental result of stable, sagged graphene sheets when the distance between C(60)s is about 4 nm and the height of the wrinkles in the sheet is about 0.8 nm. Below a distance of 4 nm between fullerenes, the graphene is predicted to become locally suspended and less strained. The simulations predict that this happens when the fullerenes can deform under the compressive action of the graphene sheet. If the fullerenes are kept frozen, spontaneous 'blanketing' of graphene is predicted only when the distance between neighbouring C(60)s is equal to or greater than about 7 nm. These predictions agree with a mechanical model relating the rigidity of a graphene sheet to the energy of graphene-surface adhesion. This work further reveals the structure of intercalated molecules and the role of stability and sheet wrinkling on the preferred configuration of graphene. This study thus might assist in the development of two-dimensional confined nanoreactors for chemical reactions.

NANOTECHNOLOGY 30[50], 505707, 2019. DOI: 10.1088/1361-6528/ab4431

[P451-2019] "Torsional refrigeration by twisted, coiled, and supercoiled fibers"

Wang, R.; Fang, S.; Xiao, Y.; Fonseca, A. F.*; Galvao, D. S.*; et. al.;

Higher-efficiency, lower-cost refrigeration is needed for both large- and small-scale cooling. Refrigerators using entropy changes during cycles of stretching or hydrostatic compression of a solid are possible alternatives to the vapor-compression fridges found in homes. We show that high cooling results from twist changes for twisted, coiled, or supercoiled fibers, including those of natural rubber, nickel titanium, and polyethylene fishing line. Using opposite chiralities of twist and coiling produces supercoiled natural rubber fibers and coiled fishing line fibers that cool when stretched. A demonstrated twist-based device for cooling flowing water provides high cooling energy and device efficiency. Mechanical calculations describe the axial and spring-index dependencies of twist-enhanced cooling and its origin in a phase transformation for polyethylene fibers.

SCIENCE 366[6462], 216-+, 2019. DOI: 10.1126/science.aax6182

[P452-2019] "Two-particle differential transverse momentum and number density correlations in p-Pb collisions at 5.02 TeV and Pb-Pb collisions at 2.76 TeV at the CERN Large Hadron Collider"

Acharya, S.; Adamova, D.; Adolfsson, J.; Albuquerque, D. S. D.*; Chinellato, D. D.*; De Souza, R. D.*; Takahashi, J.*; et. al.; ALICE Collaboration

We present measurements of two-particle differential number correlation functions R_2 and transverse momentum correlation functions P_2 , obtained from p-Pb collisions at 5.02 TeV and Pb-Pb collisions at 2.76 TeV. The results are obtained by using charged particles in the pseudorapidity range $|\eta| < 1.0$ and transverse momentum range $0.2 < p_T < 2.0$ GeV/c as a function of pair separation in pseudorapidity, $|\Delta\eta|$, azimuthal angle $\Delta\phi$, and for several charged-particle multiplicity classes. Measurements are carried out for like-sign and unlike-sign charged-particle pairs separately and combined to obtain charge-independent and charge-dependent correlation functions. We study the evolution of the width of the near-side peak of these correlation functions with collision centrality. Additionally, we study Fourier decompositions of the correlators in $\Delta\phi$ as a function of pair separation $|\Delta\eta|$.

Significant differences in the dependence of their harmonic coefficients on multiplicity classes are found. These differences can be exploited, in theoretical models, to obtain further insight into charged-particle production and transport in heavy-ion collisions. Moreover, an upper limit of nonflow contributions to flow coefficients $\nu(n)$ measured in Pb-Pb collisions based on the relative strength of Fourier coefficients measured in p-Pb interactions is estimated.

PHYSICAL REVIEW C 100[4], 044903, 2019. DOI: 10.1103/PhysRevC.100.044903

[P453-2019] "Vacuum induced dispersions on the motion of test particles in D+1 dimensions"

Camargo, G. H. S.; De Lorenci, V. A.; Ribeiro, C. C. H.; Rodrigues, F. F.*

When the vacuum state of a scalar or electromagnetic field is modified by the presence of a reflecting boundary, an interacting test particle undergoes velocity fluctuations. Such effect is regarded as a sort of quantum analog of the classical Brownian motion. Several aspects about this system have been recently investigated in the literature, for instance, finite temperature effects, curved spacetime framework, near-boundary regime, late time behavior, and subvacuum phenomena. Here, further steps are given in this analysis by considering the effect of vacuum fluctuations of a scalar field in the presence of a perfectly reflecting flat boundary over the motion of a scalar test particle when the background field does not satisfy the Huygens' principle. Specifically, the background field is allowed to have mass and the system is studied in $D + 1$ dimensions. A method of implementing a smooth transition between distinct states of the field is also developed, rendering regularized analytic expressions describing the velocity fluctuations of the test particle. This method is applied to study some special behaviors of the system. Possible applications include fields known to occur in nature as, for instance, the massive Higgs' field, for which the velocity fluctuations are here predicted to acquire a characteristic oscillation, thus behaving differently from their electromagnetic counterparts.

PHYSICAL REVIEW D 100[6], 065014, 2019. DOI: 10.1103/PhysRevD.100.065014

[P454-2019] "Validation of Multi-Foci Segmentation method for Measuring Metabolic Tumor Volume in Hodgkin's Lymphoma"

Camacho, M. R. F.; Etchebere, E.; Ramos, C.; Vercosa, A.; Tardelli, N.; Delamain, M.; Takahashi, M.*; Brunetto, S.; Metz, I.; Souza, C.; Cerci, J.

Quantification of metabolic tumor volume (MTV) and total lesion glycolysis (TLG) can be time-consuming. We evaluated the performance of an automatic multi-foci segmentation method of quantification (MFS) in patients with different stages of Hodgkin's Lymphoma, using the multiple VOI method (MV) as reference. Methods: This prospective bicentric study included 50 patients with Hodgkin's Lymphoma who underwent staging 18F-FDG PET/CT. The exams were centrally reviewed and processed with commercial MFS software in order to obtain MTV and TLG utilizing two fixed relative thresholds (40% and 20% of the maximum standardized uptake value) of each lesion. All PET/CTs were processed using the MV and MFS methods. Inter-class correlation coefficient and Bland & Altman plots were used for statistical analysis. Repeated calculations of MTV and TLG values by two observers with different degrees of PET/CT imaging experience were used to access interobserver agreement of the MFS method. Results: The mean and standard deviation values obtained for the MTV with MV and MFS were respectively $736\text{mL} \pm 856\text{mL}$ and $660\text{mL} \pm 699\text{mL}$ for the 20% threshold, and $313\text{mL} \pm 359\text{mL}$ and $372\text{mL} \pm 434\text{mL}$ for the 40% threshold.

The time spent calculating the MTV was much shorter with the MFS than with the MV method (median time: 11.6 min. [1-30 min] and 64.4min. [1-240 min], respectively), especially in patients with advanced disease. Time spent was similar in patients with localized disease. There were no statistical differences between the MFS values obtained by the two different observers. Conclusion: MTV and TLG calculations using MFS are reproducible, generate similar results to those obtained with MV and are much less timing consuming. Main differences between the two methods were related to difficulties in avoiding overlay of VOIs in the MV technique. MV and MFS perform equally well in in patients with small number of lesions.

EUROPEAN JOURNAL OF NUCLEAR MEDICINE AND MOLECULAR IMAGING EP-0398, 46[SUPPL 1],[SI], S564-S565, 2019 32nd Annual Congress of the European-Association-of-Nuclear-Medicine (EANM), OCT 12-16, 2019, Barcelona, SPAIN

Journal of Nuclear Medicine Technology 47[4], 305-308, 2019. DOI: 10.2967/jnmt.119.229153

[P455-2019] “Zero-range Fermi gas along the BCS-BEC crossover”

Pessoa, R.; Vitiello, S. A.*; Schmidt, K. E.

Properties of the ground state of an unpolarized ultracold Fermi gas along the BCS-BEC crossover are investigated by the variational and diffusion Monte Carlo methods. We apply the Wigner-Bethe-Peierls boundary condition in our calculations to avoid any bias from using an interatomic potential with finite effective range. Properties for several values of the scattering length are studied in the range $-8 \leq 1/ak(F) \leq 4$, including the unitary limit. The contact parameters as a function of scattering length are obtained by fitting the pair distribution functions for particles with different spins. The energies and contact parameters are in very good agreement with experimental data reported in the literature.

PHYSICAL REVIEW A 100[5], 053601, 2019. DOI: 10.1103/PhysRevA.100.053601

*Autores da comunidade IFGW

Fonte: Web of Science on-line (WOS)

Patentes 2019

[Pa001-2019] “Sistema Óptico para Caracterização de Escoamento Multifásico em Tubulações e Processo de Análise de Tubulações para a Caracterização de Escoamento Multifásico”

Cristiano Monteiro de Barros Cordeiro*; Fabiano Fruett; Marco César Prado Soares; Stênio Aristilde; Eric Fujiwara; Gildo Santos Rodrigues

Número da Patente ou Registro: Agência INOVA: BR 10 2019 020966-6

Tipo: Patente de Invenção

Mês/Ano de Conclusão: 10/2019 - INPI/BBRASIL

[Pa002-2019] “Dispositivo para Geração de Jatos de Plasma por Descarga de Barreira Dielétrica”

Munemasa Machida*; Fellype do Nascimento; Stanislav Mochkalev

Número da Patente ou Registro: Agência INOVA: BR 10 2019 010197 0

Tipo: Patente de Invenção

Mês/Ano de Conclusão: 05/2019 - INPI/BBRASIL

Fonte: Sistema de Informação de Pesquisa e Extensão da Unicamp - SIPEX

Defesas de Teses do IFGW

[T015-2019] “Implicações Cosmológicas de Extensões do Modelo Padrão”

Aluno: Cesar Peixoto Ferreira

Orientador: Prof. Dr. Marcelo Moraes Guzzo

Data: 01/11/2019

[T016-2019] “Novos materiais complexos sob pressão”

Aluno: Mario Moda Piva

Orientador: Prof. Dr. Pascoal José Giglio Pagliuso

Data: 06/12/2019

[T017-2019] “Impacto do tempo de vida dos elétrons na separação de chuviscos eletromagnéticos”

Aluno: Mônica Soares Nunes

Orientador: Prof. Dr. Ernesto Kemp

Data: 12/12/2019

Defesas de Dissertações do IFGW

[D022-2019] “Geração de terceiro harmônico em microcavidades ópticas”

Aluno: Jorge Henrique Soares

Orientador: Prof. Dr. Thiago Pedro Mayer Alegre

Data: 22/11/2019

[D023-2019] “Extinções, fusões e reversões de especiação a partir de modelos baseados em indivíduos”

Aluno: Larissa Lubiana Botelho

Orientador: Prof. Dr. Marcus Aloizio Martinez de Aguiar

Data: 02/12/2019

[D024-2019] “Estudo das propriedades estruturais da série $\text{Eu}_3\text{Ir}_4\text{Sn}_{13}\text{-xGax}$ ”

Aluno: Rogério Murilo Grossi

Orientador: Profa. Dra. Cris Adriano

Data: 06/12/2019

[D025-2019] “Efeitos da modelagem da PSF em estimativas cosmológicas usando lentes gravitacionais fracas”

Aluno: Andres Alejandro Navarro Alsina

Orientador: Profa. Dra. Flávia Sobreira

Data: 10/12/2019

[D026-2019] “Investigando propriedades eletrônicas de filmes ultrafinos de óxido de grafeno reduzindo”

Aluno: Marcos Luiz Ferreira Gomes

Orientador: Prof. Dr. Antonio Riul Junior

Data: 11/12/2019

[D027-2019] “Limiting fragmentation como uma prova do estado inicial em colisões de íons pesados”

Aluno: Kayman Jhosef Carvalho Gonçalves

Orientador: Prof. Dr. Donato Giorgio Torrieri

Data: 13/12/2019

Fonte: Portal IFGW/Pós-graduação - Agenda de Colóquios, Defesas e Seminários.

Disponível em: <http://portal.ifi.unicamp.br/pos-graduacao>

*Nestes meses não há Defesas de Dissertações e Teses do PECIM com Orientadores do IFGW.

A Equipe da BIF deseja a todos
Feliz Natal e um próspero 2020!



Abstracta

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