

# Abstracta

Ano XXI - N. 02

**Abr-17**



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## Artigos publicados 2016

### [P385-2016] "Analytic and Experimental Analysis of Magnetic Force Equations"

Gama, S.; Ferreira, L. D. R.; Bessa, C.V. X.; Horikawa, O.; Coelho, A. A.\*; Gandra, F. C.\*; Araujo, R.; Egolf, P. W.

The design of magnetic devices requires a precise estimation of magnetic forces. In previous works, we presented a general approach to estimate these forces based upon thermodynamically closed systems, resulting in four different forms of the force equations. This paper presents a complete theoretical model analysis tested by experiments, using arrangements of permanent magnets and a device for measuring the force induced on a soft magnetic material according to its position with respect to the permanent magnets. The results of analytical formulation, Finite Element Method numerical analysis, and experiments are compared with each other. This enabled the identification of two forms of the force equations that most precisely describe the magnetic forces. A follow-up experiment is then proposed and executed, identifying the correct form of the magnetic force equations. The resulting equation can be used to analytically estimate the magnetic force in many practical problems.

IEEE TRANSACTIONS ON MAGNETICS 52[7], 9401504, 2016. DOI: 10.1109/TMAG.2016.2517127

### [P386-2016] "Architecting new diffraction-resistant light structures and their possible applications in atom guidance"

Pachon, E. G. P.\*; Zamboni-Rached, M.\*; Dorrah, A. H.; Mojahedi, M.; Gesualdi, M. R. R.; Cabrera, G. G.\*

In this work we extend the so called frozen wave method in order to obtain new diffraction resistant light structures that can be shaped on demand, with possible applications in atom guidance. The resulting beams and the corresponding optical dipole potentials exhibit a strong resistance to diffraction effects and their longitudinal and transverse intensity patterns can be chosen a priori. Besides the theoretical development, we also present the experimental confirmation of our approach; specifically, by generating three different beam profiles using a spatial light modulator that is addressed by a computer-generated hologram. In addition to its many potential applications in atom guiding, the method developed here can also lead to many new developments in optics and photonics in general.

OPTICS EXPRESS 24[22], 25403-25408, 2016. DOI: 10.1364/OE.24.025403

### [P387-2016] "Current status of the dark matter experiment DarkSide-50"

Marini, L.; Pagani, L.; Agnes, P.; Rinkel, J.\*; et al. DarkSide Collaboration

DarkSide-50 is a dark matter direct search experiment at LNGS, searching for rare nuclear recoils possibly induced by WIMPs. It has two nested vetoes and a dual phase liquid argon TPC as dark matter detector. Key features of this experiment are the use of underground argon as radio-pure target and of muon and neutron active vetoes to suppress the background. The first data-taking campaign was running from November 2013 to April 2015 with an atmospheric argon target and a reduced efficiency neutron veto due to internal contamination. However, an upper limit on the WIMP-nucleon cross section of  $6.1 \times 10^{-44} \text{ cm}^2$  at 90% CL was obtained for a WIMP mass of 100 GeV/c<sup>2</sup> and an exposure of (1422 +/- 67) kg.d. At present DarkSide-50 started a 3 years run,

intended to be background-free because the neutron veto was successfully recovered and underground argon replaced the atmospheric one. Additionally calibration campaigns for both the TPC and the neutron veto were completed. Thanks to the good performance of the background rejection, the results obtained so far suggest the scalability of DarkSide-50 to a ton-scale detector, which will play a key role into the dark matter search scenario.

NUOVO CIMENTO C-COLLOQUIA AND COMMUNICATIONS IN PHYSICS 39[1], 247, 2016. DOI: 10.1393/ncc/i2016-16247-4

### [P388-2016] "Detective quantum efficiency for photon-counting hybrid pixel detectors in the tender X-ray domain: application to Medipix3RX"

Rinkel, J.\*; Magalhaes, D.; Wagner, F.; Meneau, F.; Vicentin, F. C.

Synchrotron-radiation-based X-ray imaging techniques using tender X-rays are facing a growing demand, in particular to probe the K absorption edges of low-Z elements. Here, a mathematical model has been developed for estimating the detective quantum efficiency (DQE) at zero spatial frequency in the tender X-ray energy range for photon-counting detectors by taking into account the influence of electronic noise. The experiments were carried out with a Medipix3RX ASIC bump-bonded to a 300 mm silicon sensor at the Soft X-ray Spectroscopy beamline (D04A-SXS) of the Brazilian Synchrotron Light Laboratory (LNLS, Campinas, Brazil). The results show that Medipix3RX can be used to develop new imaging modalities in the tender X-ray range for energies down to 2 keV. The efficiency and optimal DQE depend on the energy and flux of the photons. The optimal DQE values were found in the 7.9-8.6 keV photon energy range. The DQE deterioration for higher energies due to the lower absorption efficiency of the sensor and for lower energies due to the electronic noise has been quantified. The DQE for 3 keV photons and  $1 \times 10^4$  photons pixel<sup>-1</sup> s<sup>-1</sup> is similar to that obtained with 19 keV photons. Based on our model, the use of Medipix3RX could be extended down to 2 keV which is crucial for coming applications in imaging techniques at modern synchrotron sources.

JOURNAL OF SYNCHROTRON RADIATION 23, 206-213, 2016. DOI: 10.1107/S1600577515020226

### [P389-2016] "Higher harmonic flow coefficients of identified hadrons in Pb-Pb collisions at root sNN=2.76 TeV"

Adam, J.; Adamova, D.; Aggarwal, M. M.; Albuquerque, D. S. D.\*; Chinellato, D. D.\*; De Souza, R. D.\*; Takahashi, J.\*; et al.

ALICE Collaboration

The elliptic, triangular, quadrangular and pentagonal anisotropic flow coefficients for pi(+/-), K+/- and p+p in Pb-Pb collisions at root sNN = 2.76 TeV were measured with the ALICE detector at the Large Hadron Collider. The results were obtained with the Scalar Product method, correlating the identified hadrons with reference particles from a different pseudorapidity region. Effects not related to the common event symmetry planes (non-flow) were estimated using correlations in pp collisions and were subtracted from the measurement. The obtained flow coefficients exhibit a clear mass ordering for transverse momentum (pT) values below approximate to 3 GeV/c. In the intermediate pT region (3 < pT < 6 GeV/c), particles group at an approximate level according to the number of constituent quarks, suggesting that coalescence might be the relevant particle production mechanism in this region. The results for pT < 3 GeV/c are described fairly well by a hydrodynamical model (iEBE-VISHNU) that uses initial conditions generated by a Multi-Phase Transport model (AMPT)

and describes the expansion of the fireball using a value of 0.08 for the ratio of shear viscosity to entropy density ( $\eta/s$ ), coupled to a hadronic cascade model (UrQMD). Finally, expectations from AMPT alone fail to quantitatively describe the measurements for all harmonics throughout the measured transverse momentum region. However, the comparison to the AMPT model highlights the importance of the late hadronic rescattering stage to the development of the observed mass ordering at low values of  $p_T$  and of coalescence as a particle production mechanism for the particle type grouping at intermediate values of  $p_T$  for all harmonics.

**JOURNAL OF HIGH ENERGY PHYSICS [9], 164, 2016. DOI: 10.1007/JHEP09(2016)164**

**[P390-2016] "Influence of substrate pre-treatments by Xe+ ion bombardment and plasma nitriding on the behavior of TiN coatings deposited by plasma reactive sputtering on 100Cr6 steel"**

Vales, S.; Brito, P.; Pineda, F. A. G.; Ochoa, E. A.\*; Droppa, R.; Garcia, J.; Morales, M.\*; Alvarez, F.\*; Pinto, H.

In this paper the influence of pre-treating a 100Cr6 steel surface by Xe+ ion bombardment and plasma nitriding at low temperature (380 degrees C) on the roughness, wear resistance and residual stresses of thin TiN coatings deposited by reactive IBAD was investigated. The Xe+ ion bombardment was carried out using a 1.0 keV kinetic energy by a broad ion beam assistance deposition (IBAD, Kaufman cell). The results showed that in the studied experimental conditions the ion bombardment intensifies nitrogen diffusion by creating lattice imperfections, stress, and increasing roughness. In case of the combined pre-treatment with Xe+ ion bombardment and subsequent plasma nitriding, the samples evolved relatively high average roughness and the wear volume increased in comparison to the substrates exposed to only nitriding or ion bombardment.

**MATERIALS CHEMISTRY AND PHYSICS 177, 156-163, 2016. DOI: 10.1016/j.matchemphys.2016.04.010**

**[P391-2016] "Layer-by-layer assembly of functionalized reduced graphene oxide for direct electrochemistry and glucose detection"**

Mascagni, D. B. T.; Miyazaki, C. M.; da Cruz, N. C.; de Moraes, M. L.; Riul, A.\*; Ferreira, M.

We report an electrochemical glucose biosensor made with layer-by-layer (LbL) films of functionalized reduced graphene oxide (rGO) and glucose oxidase (GOx). The LbL assembly using positively and negatively charged rGO multilayers represents a simple approach to develop enzymatic biosensors. The electron transport properties of graphene were combined with the specificity provided by the enzyme. rGO was obtained and functionalized using chemical methods, being positively charged with poly(diallyldimethylammonium chloride) to form GPDDA, and negatively charged with poly(styrene sulfonate) to form GPSS. Stable aqueous dispersions of GPDDA and GPSS are easily obtained, enabling the growth of LbL films on various solid supports. The use of graphene in the immobilization of GOx promoted Direct Electron Transfer, which was evaluated by Cyclic Volt-ammetry. Amperometric measurements indicated a detection limit of 13.4  $\mu\text{mol.L}^{-1}$  and sensitivity of 2.47  $\mu\text{A.cm}^{-2}$ .  $\text{mmol}^{-1}$ .L for glucose with the (GPDDA/GPSS)(1)/(GPDDA/GOx)(2) architecture, whose thickness was 19.80  $\pm$  0.28 nm, as determined by Surface Plasmon Resonance (SPR). The sensor may be useful for clinical analysis since glucose could be detected even in the presence of typical interfering agents and in real samples of a lactose-free milk and an electrolyte solution to prevent dehydration.

**MATERIALS SCIENCE & ENGINEERING C-MATERIALS FOR BIOLOGICAL APPLICATIONS 68, 739-745, 2016. DOI: 10.1016/j.msec.2016.06.001**

**[P392-2016] "Neutrino decay and solar neutrino seasonal effect"**

Picoreti, R.\*; Guzzo, M. M.\*; de Holanda, P. C.\*; Peres, O. L. G.\*

We consider the possibility of solar neutrino decay as a sub-leading effect on their propagation between production and detection. Using current oscillation data, we set a new lower bound to the  $\nu_2$  neutrino lifetime at  $\tau_2/m_2 \geq 7.2 \times 10^{-4}$  s.eV $^{-1}$  at 99% C.L. Also, we show how seasonal variations in the solar neutrino data can give interesting additional information about neutrino lifetime.

**PHYSICS LETTERS B 761, 70-73, 2016. DOI: 10.1016/j.physletb.2016.08.007**

**[P393-2016] "Search for new physics in final states with two opposite-sign, same-flavor leptons, jets, and missing transverse momentum in pp collisions at TeV"**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

A search is presented for physics beyond the standard model in final states with two opposite-sign, same-flavor leptons, jets, and missing transverse momentum. The data sample corresponds to an integrated luminosity of 2.3 fb $^{-1}$  of proton-proton collisions at TeV collected with the CMS detector at the LHC in 2015. The analysis uses the invariant mass of the lepton pair, searching for a kinematic edge or a resonant-like excess compatible with the Z boson mass. Both search modes use several event categories in order to increase the sensitivity to new physics. These categories are based on the rapidity of the leptons, the multiplicity of jets and b jets, the scalar sum of jet transverse momenta, and missing transverse momentum. The observations in all signal regions are consistent with the expectations from the standard model, and the results are interpreted in the context of simplified models of supersymmetry.

**JOURNAL OF HIGH ENERGY PHYSICS [12], 013, 2016. DOI: 10.1007/JHEP12(2016)013**

**[P394-2016] "Search for supersymmetry in pp collisions at root s=13 TeV in the single-lepton final state using the sum of masses of large-radius jets"**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Results are reported from a search for supersymmetric particles in proton-proton collisions in the final state with a single, high transverse momentum lepton; multiple jets, including at least one b-tagged jet; and large missing transverse momentum. The data sample corresponds to an integrated luminosity of 2: 3 fb $^{-1}$  at root s = 13TeV, recorded by the CMS experiment at the LHC. The search focuses on processes leading to high jet multiplicities, such as gluino pair production with (g) over tilde -> t (t) over bar(chi) over tilde (0)(1). The quantity M-J, defined as the sum of the masses of the large-radius jets in the event, is used in conjunction with other kinematic variables to provide discrimination between signal and background and as a key part of the background estimation method.

The observed event yields in the signal regions in data are consistent with those expected for standard model backgrounds, estimated from control regions in data. Exclusion limits are obtained for a simplified model corresponding to gluino pair production with three-body decays into top quarks and neutralinos. Gluinos with a mass below 1600 GeV are excluded at a 95% confidence level for scenarios with low ( $\chi$ ) over tilde (0)(1) mass, and neutralinos with a mass below 800 GeV are excluded for a gluino mass of about 1300 GeV. For models with two-body gluino decays producing on-shell top squarks, the excluded region is only weakly sensitive to the top squark mass.

**JOURNAL OF HIGH ENERGY PHYSICS [8], 122, 2016. DOI: 10.1007/JHEP08(2016)122**

**[P395-2016] “Searches for R-parity-violating supersymmetry in pp collisions at root s=8 TeV in final states with 0-4 leptons”**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Results are presented from searches for R-parity-violating supersymmetry in events produced in pp collisions at root s = 8 TeV at the LHC. Final states with 0, 1, 2, or multiple leptons are considered independently. The analysis is performed on data collected by the CMS experiment corresponding to an integrated luminosity of 19.5 fb<sup>-1</sup>. No excesses of events above the standard model expectations are observed, and 95% confidence level limits are set on supersymmetric particle masses and production cross sections. The results are interpreted in models featuring R-parity-violating decays of the lightest supersymmetric particle, which in the studied scenarios can be either the gluino, a bottom squark, or a neutralino. In a gluino pair production model with baryon number violation, gluinos with a mass less than 0.98 and 1.03 TeV are excluded, by analyses in a fully hadronic and one-lepton final state, respectively. An analysis in a dilepton final state is used to exclude bottom squarks with masses less than 307 GeV in a model considering bottom squark pair production. Multilepton final states are considered in the context of either strong or electroweak production of superpartners and are used to set limits on the masses of the lightest supersymmetric particles. These limits range from 300 to 900 GeV in models with leptonic and up to approximately 700 GeV in models with semileptonic R-parity-violating couplings.

**PHYSICAL REVIEW D 94[11], 112009, 2016. DOI: 10.1103/PhysRevD.94.112009**

**[P396-2016] “Upsilon (nS) polarizations versus particle multiplicity in pp collisions at root s=7 TeV”**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

The polarizations of the Upsilon(1S), Upsilon(2S), and Upsilon(3S) mesons are measured as a function of the charged particle multiplicity in proton-proton collisions at root s = 7 TeV. The measurements are performed with a dimuon data sample collected in 2011 by the CMS experiment, corresponding to an integrated luminosity of 4.9fb<sup>-1</sup>. The results are extracted from the dimuon decay angular distributions, in two ranges of Upsilon(nS) transverse momentum (10-15 and 15-35 GeV), and in the rapidity interval  $|y| < 1.2$ . The results do not show significant changes from low-to high-multiplicity pp collisions, although large uncertainties preclude definite statements in the Upsilon(2S) and Upsilon(3S) cases.

**PHYSICS LETTERS B 761, 31-52, 2016. DOI: 10.1016/j.physletb.2016.07.065**

## Eventos publicados 2016

**[P397-2016] “Simulation and Fabrication of Silicon Nitride Microring Resonator by DUV Lithography”**

Cirino, G. A.; Barea, L. A.; von Zuben, A. A.\*; L'hermite, H.; Beche, B.; De Sagazan, O.; Frateschi, N.\*; M-Brahim, T.  
IEEE

This work reports the design and fabrication of silicon nitride-based microresonators by employing DUV optical lithography and ICP-RIE plasma etching. Microring devices with high Q factors provide high sensitivity and low detection limit, enabling their use in biochemical sensing applications. With these properties, the devices can be used to detect and quantify the biomolecules present in a homogeneous solution, by detecting an effective refractive index change, without using fluorescent labels.

**31st Symposium on Microelectronics Technology and Devices (SBMicro). AUG 29-SEP 03, 2016. Belo Horizonte, BRAZIL. 31ST SYMPOSIUM ON MICROELECTRONICS TECHNOLOGY AND DEVICES (SBMICRO), 2016.**

**[P398-2016] “THz Solar Observations on Board of a Trans-Antarctic Stratospheric Balloon Flight”**

Kaufmann, P.; Abrantes, A.; Bortolucci, E. C.; Caspi, A.; Fernandes, L. O. T.; Kropotov, G.; Kudaka, A. S.; Laurent, G.; Machado, N.; Marcon, R.\*; Marun, A.; Nicolaev, V.; Hidalgo Ramirez, R. F.; Raulin, J. P.; Saint-Hilaire, P.; Shih, A.; Silva, C. M.; Timofeevsky, A.  
IEEE

A new system of two photometers was built to observe the Sun at 3 and 7 THz from space, named SOLAR-T. It has been flown coupled to U.C. Berkeley GRIPS experiment on a NASA stratospheric balloon flight over Antarctica, 19-30 January 2016. The mission was successfully accomplished. We describe the system performance, solar brightness determination and the first THz impulsive burst detected.

**41st International Conference on Infrared, Millimeter, and Terahertz Waves (IRMMW-THz). SEP 25-30, 2016. Copenhagen, DENMARK.**

**41ST INTERNATIONAL CONFERENCE ON INFRARED, MILLIMETER, AND TERAHERTZ WAVES (IRMMW-THZ). International Conference on Infrared Millimeter and Terahertz Waves, 2016.**

**[P399-2016] “The use of DBD plasmas for treatment of PDMS surfaces and adhesion improvement”**

do Nascimento, F.; Moshkalev, S.; Machida, M.\*  
IEEE

In this work we used an atmospheric pressure dielectric barrier discharge plasma to perform treatments of poly(dimethylsiloxane) (PDMS) surfaces in order to improve the adhesion between the samples. The results show that different conditions of plasma treatment can lead to a better adhesion between the PDMS surfaces. If the power delivered to the plasma is increased, the adhesion is better, but the best results are obtained if the vibrational temperature of the nitrogen molecules in the plasma is increased.

**31st Symposium on Microelectronics Technology and Devices (SBMicro). AUG 29-SEP 03, 2016. Belo Horizonte, BRAZIL. 2016 31ST SYMPOSIUM ON MICROELECTRONICS TECHNOLOGY AND DEVICES (SBMICRO), 2016.**

## Artigos publicados 2017

### [P008-2017] "A new type of magnetocaloric composite based on conductive polymer and magnetocaloric compound"

Imamura, W.; Coelho, A. A.\*; Kupfer, V. L.; Carvalho, A. M. G.; Zago, J. G.; Rinaldi, A. W.; Favaro, S. L.; Alves, C. S.

We introduce a processing route of the first magnetocaloric composite with conductive polymer - wherein the magnetocaloric reinforcement is a compound  $Gd_{5.09}Ge_{2.03}Si_{1.88}$  and the ductile matrix is a conductive polymer polyaniline doped by camphorsulfonic acid (PAni-CSA). This new type of composite combines mechanical, electrical and magnetocaloric properties that can be applied in thermomagnetic machines.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 425, 65-71, 2016. DOI: 10.1016/j.jmmm.2016.10.120**

### [P009-2017] "A simple capacitive method to evaluate ethanol fuel samples"

Vello, T. P.; de Oliveira, R. F.; Silva, G. O.; de Camargo, D. H. S.; Bufon, C. C. B.\*

Ethanol is a biofuel used worldwide. However, the presence of excessive water either during the distillation process or by fraudulent adulteration is a major concern in the use of ethanol fuel. High water levels may cause engine malfunction, in addition to being considered illegal. Here, we describe the development of a simple, fast and accurate platform based on nanostructured sensors to evaluate ethanol samples. The device fabrication is facile, based on standard microfabrication and thin-film deposition methods. The sensor operation relies on capacitance measurements employing a parallel plate capacitor containing a conformational aluminum oxide ( $Al_2O_3$ ) thin layer (15 nm). The sensor operates over the full range water concentration, i. e., from approximately 0% to 100% vol. of water in ethanol, with water traces being detectable down to 0.5% vol. These characteristics make the proposed device unique with respect to other platforms. Finally, the good agreement between the sensor response and analyses performed by gas chromatography of ethanol biofuel endorses the accuracy of the proposed method. Due to the full operation range, the reported sensor has the technological potential for use as a point-of-care analytical tool at gas stations or in the chemical, pharmaceutical, and beverage industries, to mention a few.

**SCIENTIFIC REPORTS 7, 43432, 2017. DOI: 10.1038/srep43432**

### [P010-2017] "A Targeted Search for Point Sources of EeV Photons with the Pierre Auger Observatory"

Aab, A.; Abreu, P. Chinellato, J. A.\*; Daniel, B.\*; Diaz Castro, M. L.\*; Dobrigkeit, C.\*; Fauth, A. C.\*; Kemp, E.\*; Muller, M. A.\*; Pereira, L. A. S.\*; Theodoro, V. M.\*; et al.

Simultaneous measurements of air showers with the fluorescence and surface detectors of the Pierre Auger Observatory allow a sensitive search for EeV photon point sources. Several Galactic and extragalactic candidate objects are grouped in classes to reduce the statistical penalty of many trials from that of a blind search and are analyzed for a significant excess above the background expectation. The presented search does not find any evidence for photon emission at candidate sources, and combined p-values for every class are reported. Particle and energy flux upper limits are given for selected candidate sources. These limits significantly constrain predictions of EeV proton emission models from non-transient Galactic and nearby extragalactic sources, as illustrated for the particular case of the Galactic center region.

**ASTROPHYSICAL JOURNAL LETTERS 837[2], L25, 2017. DOI: 10.3847/2041-8213/aa61a5**

### [P011-2017] "Ag Nanoparticles-Based Zinc Hydroxide-Layered Hybrids as Novel and Efficient Catalysts for Reduction of 4-Nitrophenol to 4-Aminophenol"

Quites, F. J.; Azevedo, C. K. S.; Alves, E. P. P.; Germino, J. C.\*; Vinhas, R. C. G.\*; Landers, R.\*; Terezo, A. J.; Atvars, T. D. Z.\*

Silver nanoparticles and zinc hydroxide-layered hybrid materials (AgNPs/ZHL) have been successfully developed as efficient catalysts for the reduction of 4-nitrophenol (4-NP) to 4-aminophenol (4-AP) with sodium borohydride. A facile and rapid visible-light assisted green route was used for the deposition of silver nanoparticles (AgNPs) on the external surface of ZHL material. The resulting AgNPs/ZHL hybrids contained AgNPs with spherical morphology and uniform size distribution. Moreover, the AgNPs/ZHL compounds exhibited excellent catalytic performance (the reduction reaction was finished within 4 min) and reusability (three cycles) toward the reduction of 4-NP to 4-AP in presence of sodium borohydride. The reduction reaction obeyed the pseudo-first-order kinetics. The rate constants increased with the increase of amount of the AgNPs deposited into the hybrid materials. These results suggest that the as-prepared catalysts (AgNPs/ZHL) have great potential for heterogeneous catalytic applications.

**JOURNAL OF THE BRAZILIAN CHEMICAL SOCIETY 28[1], 106-115, 2017. DOI: 10.5935/0103-5053.20160152**

### [P012-2017] "Azimuthal instabilities of the Gribov-Levin-Ryskin equation"

Gambini, G.\*; Torrieri, G.\*

We introduce the phenomenology of elliptic flow in nuclear collisions, and argue that its scaling across energies, rapidities and system sizes could be suggestive of a QCD-based rather than a hydrodynamical explanation. As a hypothesis for such an explanation, we show that the GLR equation develops unstable modes when the parton distribution function is generalized to depend on azimuthal angle. This generally means that the structure function acquires an azimuthal dependence. We argue that this process is a plausible alternative explanation for the origin of elliptic flow, one that naturally respects the scaling experimentally observed.

**EUROPEAN PHYSICAL JOURNAL A 53[1], 17, 2017. DOI: 10.1140/epja/i2017-12205-x**

### [P013-2017] "Barriers to gene flow and ring species formation"

Martins, A. B.\*; de Aguiar, M. A. M.\*

Ring species are groups of organisms that dispersed along a ring-shaped region in such a way that the two ends of the population that meet after many generations are reproductively isolated. They provide a rare opportunity to understand the role of spatial structuring in speciation. Here, we simulate the evolution of ring species assuming that individuals become sexually isolated if the genetic distance between them is above a certain threshold. The model incorporates two forms of dispersal limitation: exogenous geographic barriers that limit the population range and endogenous barriers that result in genetic structuring within the population range. As expected, species' properties that reduce gene flow within the population range facilitate the evolution of reproductive isolation and ring species formation.

However, if populations are confined to narrow ranges by geographic barriers, ring species formation increases when local mating is less spatially restricted. Ring species are most likely to form if a population expands while confined to a quasi-unidimensional range but preserving high mobility in the direction of the range expansion. These conditions are unlikely to be met or persist in real populations and may explain why ring species are rare.

**EVOLUTION** 71[2], 442-448, 2017. DOI: 10.1111/evo.13121

**[P014-2017] "Bragg gratings in surface-core fibers: Refractive index and directional curvature sensing"**

**Osorio, J. H.\*; Oliveira, R.\*; Aristilde, S.\*; Chesini, G.\*; Franco, M. A. R.; Nogueira, R. N.; Cordeiro, C. M. B.\***

In this paper, we report, to our knowledge, the first extended study of the inscription of Bragg gratings in surface-core fibers and their application in refractive index and directional curvature sensing. The research ranges from fiber fabrication and grating inscription in untapered and tapered fibers to the performance of simulations and sensing measurements. Maximum sensitivities of 40 nm/RIU and 202.7 pm/m (1) were attained in refractive index and curvature measurements respectively. The obtained results compares well to other fiber Bragg grating based devices. Ease of fabrication, robustness and versatility makes surface-core fibers an interesting platform when exploring fiber sensing devices.

**OPTICAL FIBER TECHNOLOGY** 34, 86-90, 2017. DOI: 10.1016/j.yofte.2017.01.007

**[P015-2017] "Brillouin Optomechanics in Coupled Silicon Microcavities"**

**Espinel, Y. A. V.\*; Santos, F. G. S.\*; Luiz, G. O.\*; Alegre, T. P.\*; Wiederhecker, G. S.\***

The simultaneous control of optical and mechanical waves has enabled a range of fundamental and technological breakthroughs, from the demonstration of ultra-stable frequency reference devices, to the exploration of the quantum-classical boundaries in optomechanical laser-cooling experiments. More recently, such an optomechanical interaction has been observed in integrated nano-waveguides and microcavities in the Brillouin regime, where short-wavelength mechanical modes scatter light at several GHz. Here we engineer coupled optical microcavities to enable a low threshold excitation of mechanical travelling-wave modes through backward stimulated Brillouin scattering. Exploring the backward scattering we propose silicon microcavity designs based on laterally coupled single and double-layer cavities, the proposed structures enable optomechanical coupling with very high frequency modes (11 to 25 GHz) and large optomechanical coupling rates ( $g(0)/2\pi$ ) from 50 kHz to 90 kHz.

**SCIENTIFIC REPORTS** 7, 43423, 2017. DOI: 10.1038/srep43423

**[P016-2017] "Building block magneto-luminescent nanomaterials of iron-oxide/ZnS@LaF3:Ce3+,Gd3+,Tb3+ with green emission"**

**Shrivastava, N.; Khan, L. U.; Khan, Z. U.; Vargas, J. M.; Moscoso-Londono, O.\*; Ospina, C.; Brito, H. F.; Javed, Y.; Felinto, M. C. F. C.; Menezes, A. S.; Knobel, M.\*; Sharma, S. K.\***

The preparation of novel triply-doped bifunctional Fe<sub>3</sub>O<sub>4</sub>/ZnS@LaF<sub>3</sub>:xCe(3+),xGd(3+),yTb(3+) (x = 5; y = 5, 10 and 15 mol%) nanocomposites with efficient optical and magnetic features has been reported. The ZnS semiconductor functionalized Fe<sub>3</sub>O<sub>4</sub> particles were coated with LaF<sub>3</sub>:RE<sub>3+</sub> materials via a chitosan-assisted co-precipitation method.

The size of iron oxide similar to 7.2 nm and trigonal structures of bifunctional nanostructures were confirmed through X-ray diffraction and high-resolution transmission electron microscopy. The static magnetic measurements supported and manifested the superparamagnetic behavior of the materials at 300 K. A broad emission band was observed in the blue region (400-550 nm) due to the sulphur vacancy on the surface of the Fe<sub>3</sub>O<sub>4</sub>/ZnS nanocomposite. For a triply doped bifunctional nano-structure, the excitation spectra revealed broad absorption bands centered at around 270 nm, which were attributed to the 4f(F-7(7/2)) -> 5d interconfigurational transition of the Ce<sup>3+</sup> ion accompanied by narrow absorption lines arising from the 4f-4f intraconfigurational transitions of the Tb<sup>3+</sup> ion. The emission spectra of the nanocomposites showed characteristic narrow emission lines assigned to the D-5(4) - F-7(J) transitions (J = 6-0) of the Tb<sup>3+</sup> ion. The energy transfer process from the Ce<sup>3+</sup> -> Gd<sup>3+</sup> -> Tb<sup>3+</sup> ions has also been presented and discussed. Furthermore, the structural, photoluminescence and magnetic properties of Fe<sub>3</sub>O<sub>4</sub>/ZnS@LaF<sub>3</sub>:RE<sub>3+</sub> suggested that it may be an efficient candidate for magnetic light-converting molecular devices (MLMCDs) and high energy radiation detection.

**JOURNAL OF MATERIALS CHEMISTRY C** 5[9], 2282-2290, 2017. DOI: 10.1039/c6tc05053k

**[P017-2017] "Comparison Between Conventional and Transferred DBD Plasma Jets for Processing of PDMS Surfaces"**

**do Nascimento, F.; Machida, M.\*; Canesqui, M. A.; Moshkalev, S. A.**

This paper studies the processing of poly(dimethylsiloxane) (PDMS) surfaces using dielectric barrier discharge (DBD) plasma in two different assemblies, one using the primary plasma jet obtained from a conventional DBD and the other using a DBD plasma jet transfer. The evolution of water contact angle in the function of plasma processing time and in the function of aging time as well as the changes in the surface roughness of PDMS samples for both plasma treatments have been studied. The vibrational and rotational temperatures are compared for both plasmas and for the first time the vibrational temperature (T<sub>vib</sub>) for the transferred plasma jet has been shown to be higher as compared with the primary jet. The increment in the T<sub>vib</sub> value seems to be the main reason for the improvements in adhesion properties and surface wettability for the transferred plasma jet. Possible explanations for the increase in the vibrational temperature are presented.

**IEEE TRANSACTIONS ON PLASMA SCIENCE** 45[3], 346-355, 2017. DOI: 10.1109/TPS.2017.2655266

**[P018-2017] "Comparison of activation energies for the electrical conductivity of silicate glasses obtained by dc and ac techniques"**

**Ziemath, E. C.; Escanhoela, C. A.; Braunger, M. L.\***

The electrical conductivity of glasses with composition (mol%) 22Na<sub>2</sub>O center dot 8CaO center dot 65SiO<sub>2</sub> center dot 5MO<sub>2</sub> (M = Si, Ti, Ge, Zr, Sn, Ce) was evaluated by two different experimental methods: low-voltage ac impedance and high-voltage dc resistivity. The ac measurements were carried out by the traditional impedance spectroscopy between 90 and 415 degrees C. In the dc method, a steady-state electric field of about 1 MV/m was applied during 5 s at temperatures between 100 and 210 degrees C, and the onset current, I-0, was measured. Activation energies between 0.71 and 0.81 eV were obtained. The differences between the values obtained by the dc and the ac methods are within experimental errors. The high electric field does not influence the concentration nor the mobility of the charge carriers for these experimental conditions and glass compositions.

The dc method applied showed to be a suitable alternative to determine the temperature dependence of the electric conductivity of glasses to further calculation of the activation energy.

**SOLID STATE IONICS** 301, 146-151, 2017. DOI: 10.1016/j.ssi.2017.01.025

**[P019-2017] “Computational Exploration of the Water Concentration Dependence of the Proton Transport in the Porous UiO-66(Zr)-(CO<sub>2</sub>H)(2) Metal-Organic Framework”**

Borges, D. D.\*; Semino, R.; Devautour-Vinott, S.; Jobic, H.; Paesani, F.; Maurin, G.

The UiO-66(Zr)-(CO<sub>2</sub>H)(2) metal-organic framework has been recently revealed as a promising proton conducting material under humidification. Here, aMS-EVB3 molecular dynamics simulations are performed to reveal at the molecular level the structure, thermodynamics, and dynamics of the hydrated proton in three-dimensional (3D)-cages MOF as a function of the water loading. It is found that the most stable proton solvation structure corresponds to a H<sub>7</sub>O<sub>3</sub><sup>+</sup> cation and that a transition between this complex and a Zundel cation likely governs the proton transport in this MOF occurring via a Grotthuss-type mechanism. It is further shown that the formation of a H<sub>2</sub>O hydrogen-bonded bridge that connects the cages occurs only at high water concentration and this creates a path allowing the excess proton to jump from one cage to another. This leads to a faster self-diffusivity of proton at high water concentration, thereby supporting the increase of the proton conductivity with the water loading as experimentally evidenced.

**CHEMISTRY OF MATERIALS** 29[4], 1569-1576, 2017. DOI: 10.1021/acs.chemmater.6b04257

**[P020-2017] “Conduction electrons mediating the evolution from antiferromagnetic to ferromagnetic ordering in Gd(Co<sub>1-y</sub>Fe<sub>y</sub>)(2)Zn-20 (0 ≤ y ≤ 1)”**

Cabrera-Baez, M.; Naranjo-Urbe, A.; Osorio-Guillen, J. M.; Rettori, C.\*; Avila, M. A.

GdFe<sub>2</sub>Zn<sub>20</sub> is a complex cage-like compound with an unusually high ferromagnetic ordering temperature (T<sub>C</sub> = 86 K) for a very diluted Gd<sup>3+</sup> magnetic sublattice, embedded in a matrix that features strong electron-electron correlations. Here, we report on a magnetic and electronic study of the substitutional intermetallic system Gd(Co<sub>1-y</sub>Fe<sub>y</sub>)(2)Zn-20 combining magnetization measurements plus first-principles density functional theory (DFT) calculations with temperature-dependent electron spin resonance (ESR). After accounting for electron-electron correlations and itinerant molecular field effects, the ESR results indicate that the exchange interaction between the Gd<sup>3+</sup> is processed via a single band of d-type electrons at the Fermi level and the exchange interaction is covalent in nature [ $J(0)(fd) < 0$ ] with a strong conduction electron (ce) momentum transfer dependence [ $Jfd(q)$ ]. The DFT calculations support this scenario by indicating a major contribution of d-type ce at the Fermi level and a spin polarization in (Y, Gd) Fe<sub>2</sub>Zn<sub>20</sub> wherein the most stable configuration is antiferromagnetic between Gd<sup>3+</sup> and ce spins. Our results demonstrate that the standard Ruderman-Kittel-Kasuya-Yosida mechanism cannot explain the ferromagnetic behavior of GdFe<sub>2</sub>Zn<sub>20</sub> and a superexchange-like mechanism is proposed for this magnetic interaction. An “extended phase diagram” for the double substitution sequence YCo<sub>2</sub>Zn<sub>20</sub>, GdCo<sub>2</sub>Zn<sub>20</sub>, GdFe<sub>2</sub>Zn<sub>20</sub> is presented and discussed.

**PHYSICAL REVIEW B** 95[10], 104407, 2017. DOI: 10.1103/PhysRevB.95.104407

**[P021-2017] “Different approaches to analyze the dipolar interaction effects on diluted and concentrated granular superparamagnetic systems”**

MoscOSO-Londono, O.\*; Tancredi, P.; Muraca, D.\*; Mendoza Zelis, P.; Coral, D.; Fernandez van Raap, M. B.; Wolff, U.; Neu, V.; Damm, C.; de Oliveira, C. L. P.; Pirota, K. R.\*; Knobel, M.\*; Socolovsky, L. M.

Controlled magnetic granular materials with different concentrations of magnetite nanoparticles immersed in a non-conducting polymer matrix were synthesized and, their macroscopic magnetic observables analyzed in order to advance towards a better understanding of the magnetic dipolar interactions and its effects on the obtained magnetic parameters. First, by means of X-ray diffraction, transmission electron microscopy, small angle X-ray scattering and X-ray absorption fine structure an accurate study of the structural properties was carried out. Then, the magnetic properties were analyzed by means of different models, including those that consider the magnetic interactions through long-range dipolar forces as: the Interacting Superparamagnetic Model (ISP) and the Vogel-Fulcher law (V-F). In systems with larger nanoparticle concentrations, magnetic results clearly indicate that the role played by the dipolar interactions affects the magnetic properties, giving rise to obtaining magnetic and structural parameters without physical meaning. Magnetic parameters as the effective anisotropic constant, magnetic moment relaxation time and mean blocking temperature, extracted from the application of the ISP model and V-F Law, were used to simulate the zero-field-cooling (ZFC) and field-cooling curves (FC). A comparative analysis of the simulated, fitted and experimental ZFC/FC curves suggests that the current models depict indeed our dilute granular systems. Notwithstanding, for concentrated samples, the ISP model infers that clustered nanoparticles are being interpreted as single entities of larger magnetic moment and volume, effect that is apparently related to a collective and complex magnetic moment dynamics within the cluster.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS** 428, 105-118, 2017. DOI: 10.1016/j.jmmm.2016.12.019

**[P022-2017] “Effect of low electric fields on alpha scintillation light yield in liquid argon”**

Agnes, P.; Albuquerque, I. F. M.; Segreto, E.\*; et al.

Measurements were made of scintillation light yield of alpha particles from the Rn-222 decay chain within the DarkSide-50 liquid argon time projection chamber. The light yield was found to increase as the applied electric field increased, with alphas in a 200 V/cm electric field exhibiting a similar to 2% increase in light yield compared to alphas in no field.

**JOURNAL OF INSTRUMENTATION** 12, P01021, 2017. DOI: 10.1088/1748-0221/12/01/P01021

**[P023-2017] “Estimating carrier relaxation times in the Ba<sub>8</sub>Ga<sub>16</sub>Ge<sub>30</sub> clathrate in the extrinsic regime”**

Gonzalez-Romero, R. L.\*; Antonelli, A.\*

We used a semi-empirical method to extract carrier relaxation times at different temperatures ( $\tau(T)$ ) in thermoelectric materials from a combination of experimental results and first-principles calculations. The methodology is based on the Boltzmann transport equation formalism within the relaxation time approximation. It can be applied to single crystals and polycrystalline materials. We applied the method to investigate the electronic transport properties of the clathrate compound Ba<sub>8</sub>Ga<sub>16</sub>Ge<sub>30</sub> type-I.

The calculations indicate that the carrier relaxation process in single crystals is dominated by electron-phonon scattering ( $\tau$  proportional to  $T^{-3/2}$ ), while in polycrystalline materials scattering at grain boundaries dominates ( $\tau$  similar to cte). The Seebeck coefficient, electrical conductivity, and electron heat conduction are in consistent agreement with experiment. Furthermore, the Slack relation for lattice heat conductivity was successfully applied to the material. The calculated figure of merit is in good agreement with experimental results.

**PHYSICAL CHEMISTRY CHEMICAL PHYSICS 19[4], 3010-3018, 2017. DOI: 10.1039/c6cp08026j**

**[P024-2017] "Evidence for collectivity in pp collisions at the LHC"**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Measurements of two- and multi-particle angular correlations in pp collisions at  $\sqrt{s} = 5, 7, \text{ and } 13 \text{ TeV}$  are presented as a function of charged-particle multiplicity. The data, corresponding to integrated luminosities of  $1.0 \text{ pb}^{-1}$  ( $5 \text{ TeV}$ ),  $6.2 \text{ pb}^{-1}$  ( $7 \text{ TeV}$ ), and  $0.7 \text{ pb}^{-1}$  ( $13 \text{ TeV}$ ), were collected using the CMS detector at the LHC. The second-order ( $v(2)$ ) and third-order ( $v(3)$ ) azimuthal anisotropy harmonics of unidentified charged particles, as well as  $v(2)$  of  $K_S(0)$  and  $\Lambda/\Lambda$  over bar particles, are extracted from long-range two-particle correlations as functions of particle multiplicity and transverse momentum. For high-multiplicity pp events, a mass ordering is observed for the  $v(2)$  values of charged hadrons (mostly pions),  $K_S(0)$ , and  $\Lambda/\Lambda$  over bar, with lighter particle species exhibiting a stronger azimuthal anisotropy signal below  $p_T$  approximate to  $\text{GeV}/c$ . For  $13 \text{ TeV}$  data, the  $v(2)$  signals are also extracted from four- and six-particle correlations for the first time in pp collisions, with comparable magnitude to those from two-particle correlations. These observations are similar to those seen in pPb and PbPb collisions, and support the interpretation of a collective origin for the observed long-range correlations in high-multiplicity pp collisions.

**PHYSICS LETTERS B 765, 193-220, 2017. DOI: 10.1016/j.physletb.2016.12.009**

**[P025-2017] "Fabrication and Optical Properties of Strain-free Self-assembled Mesoscopic GaAs Structures"**

da Silva, S. F. C.; Mardegan, T.; de Araujo, S. R.; Ramirez, C. A. O.; Kiravittaya, S.; Couto, O. D. D.\*; Iikawa, F.\*; Deneke, C.

We use a combined process of Ga-assisted deoxidation and local droplet etching to fabricate unstrained mesoscopic GaAs/AlGaAs structures exhibiting a high shape anisotropy with a length up to  $1.2 \mu\text{m}$  and a width of  $150 \text{ nm}$ . We demonstrate good controllability over size and morphology of the mesoscopic structures by tuning the growth parameters. Our growth method yields structures, which are coupled to a surrounding quantum well and present unique optical emission features. Microscopic and optical analysis of single structures allows us to demonstrate that single structure emission originates from two different confinement regions, which are spectrally separated and show sharp excitonic lines. Photoluminescence is detected up to room temperature making the structures the ideal candidates for strain-free light emitting/detecting devices.

**NANOSCALE RESEARCH LETTERS 12, 61, 2017. DOI: 10.1186/s11671-016-1782-1**

**[P026-2017] "Facile and innovative method for bioglass surface modification: Optimization studies"**

Lopes, J. H.; Fonseca, E. M. B.; Mazali, I. O.; Magalhaes, A.; Landers, R.\*; Bertran, C. A.

In this work it is presented a facile and novel method for modification of bioglass surface based on (Ca-molten salt batry(2+) vertical bar Na-glass(+)) ion exchange by immersion in molten salt bath. This method allows changing selectively the chemical composition of a surface layer of glass, creating a new and more reactive bioglass in a shell that surrounds the unchanged bulk of the original BG45S5 bioglass (core-shell type system). The modified bioglass conserves the non-crystalline structure of BG45S5 bioglass and presents a significant increase of surface reactivity in comparison with BG45S5. Melt-derived bioactive glasses BG45S5 with the nominal composition of  $46.1 \text{ mol\% SiO}_2$ ,  $24.4 \text{ mol\% Na}_2\text{O}$ ,  $26.9 \text{ mol\% CaO}$ , and  $2.6 \text{ mol\% P}_2\text{O}_5$  have been subjected to ion exchange at  $480 \text{ degrees C}$  in molten mixture of  $\text{Ca}(\text{NO}_3)_2$  and  $\text{NaNO}_3$  with molar ratio of  $70:30$  for different time periods ranging from to  $60 \text{ min}$ . The optimization studies by using XRF and XRD showed that ion exchange time of  $30 \text{ min}$  is enough to achieve higher changes on the glass surface without alters its non-crystalline structure. The chemical composition, morphology and structure of BG45S5 and bioglass with modified surface were studied by using several analytical techniques. FOR and O-1s XPS results showed that the modification of glass surface favors the formation of Si-O-NBO groups at the expense of Si-O-BO-Si bonds. Si-29 MAS-NMR studies showed that the connectivity of (Si)Q(n) species decreases from cross-linked (Si)Q(3) units to chain-like (Si)Q(2) units and finally to depolymerized (Si)Q(1) and (Si)Q(0) units after ion exchange. This result is consistent with the chemical model based on the enrichment with calcium ions of the bioglass surface such that the excess of positive charges is balanced by depolymerization of silicate network. The pH changes in the early steps of reaction of bioactive glasses BG45S5 and BG45Ca30, in deionized water or solutions buffered with HEPES were investigated. BG-45Ca30 bioactive glass exhibited a significant increase in the pH during the early steps of the reaction compared to BG45S5.

**MATERIALS SCIENCE & ENGINEERING C-MATERIALS FOR BIOLOGICAL APPLICATIONS 72, 86-97, 2017. DOI: 10.1016/j.msec.2016.11.044**

**[P027-2017] "Highly sensitive temperature sensor using a Sagnac loop interferometer based on a side-hole photonic crystal fiber filled with metal"**

Reyes-Vera, E.; Cordeiro, C. M. B.\*; Torres, P.

A highly sensitive temperature sensor based on an all-fiber Sagnac loop interferometer combined with metal-filled side-hole photonic crystal fiber (PCF) is proposed and demonstrated. PCFs containing two side holes filled with metal offer a structure that can be modified to create a change in the birefringence of the fiber by the expansion of the filler metal. Bismuth and indium were used to examine the effect of filler metal on the temperature sensitivity of the fiber-optic temperature sensor. It was found from measurements that a very high temperature sensitivity of  $-9.0 \text{ nm/degrees C}$  could be achieved with the indium-filled side-hole PCF. The experimental results are compared to numerical simulations with good agreement. It is shown that the high temperature sensitivity of the sensor is attributed to the fiber microstructure, which has a significant influence on the modulation of the birefringence caused by the expansion of the metal-filled holes.

**APPLIED OPTICS 56[2], 156-162, 2017. DOI: 10.1364/AO.56.000156**

**[P028-2017] "Hybrid confinement of optical and mechanical modes in a bullseye optomechanical resonator"**



Santos, F. G. S.\*; Espinel, Y. A. V.\*; Luiz, G. O.\*; Benevides, R. S.\*; Wiederhecker, G. S.\*; Alegre, T. P. M.\*

Optomechanical cavities have proven to be an exceptional tool to explore fundamental and applied aspects of the interaction between mechanical and optical waves. Here we demonstrate a novel optomechanical cavity based on a disk with a radial mechanical bandgap. This design confines light and mechanical waves through distinct physical mechanisms which allows for independent control of the mechanical and optical properties. Simulations foresee an optomechanical coupling rate  $g(0)$  reaching  $2\pi \times 100$  kHz for mechanical frequencies around 5 GHz as well as anchor loss suppression of 60 dB. Our device design is not limited by unique material properties and could be easily adapted to allow for large optomechanical coupling and high mechanical quality factors with other promising materials. Finally, our devices were fabricated in a commercial silicon photonics facility, demonstrating  $g(0)/2\pi = 23$  kHz for mechanical modes with frequencies around 2 GHz and mechanical Q-factors as high as 2300 at room temperature, also showing that our approach can be easily scalable and useful as a new platform for multimode optomechanics.

OPTICS EXPRESS 25[2], 508-529, 2017. DOI: 10.1364/OE.25.000508

[P029-2017] “Impact of atmospheric effects on the energy reconstruction of air showers observed by the surface detectors of the Pierre Auger Observatory”

Aab, A.; Abreu, P.; Chinellato, J. A.\*; Daniel, B.\*; Diaz Castro, M. L.\*; Dobrigkeit, C.\*; Escobar, C. O.\*; Fauth, A. C.\*; Kemp, E.\*; Muller, M. A.\*; Selmi-Dei, D. Pakk\*; Pereira, L. A. S.\*; Theodoro, V. M.\*; et al.  
Pierre Auger Collaboration

Atmospheric conditions, such as the pressure (P), temperature (T) or air density ( $\rho$  proportional to  $P/T$ ), affect the development of extended air showers initiated by energetic cosmic rays. We study the impact of the atmospheric variations on the reconstruction of air showers with data from the arrays of surface detectors of the Pierre Auger Observatory, considering separately the one with detector spacings of 1500m and the one with 750m spacing. We observe modulations in the event rates that are due to the influence of the air density and pressure variations on the measured signals, from which the energy estimators are obtained. We show how the energy assignment can be corrected to account for such atmospheric effects.

JOURNAL OF INSTRUMENTATION 12, P02006, 2017. DOI: 10.1088/1748-0221/12/02/P02006

[P030-2017] “Inclusive search for supersymmetry using razor variables in pp collisions at  $\sqrt{s}=13$  TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

An inclusive search for supersymmetry using razor variables is performed in events with four or more jets and no more than one lepton. The results are based on a sample of proton-proton collisions corresponding to an integrated luminosity of 2.3 fb<sup>-1</sup> collected with the CMS experiment at a center-of-mass energy of  $\sqrt{s} = 13$  TeV. No significant excess over the background prediction is observed in data, and 95% confidence level exclusion limits are placed on the masses of new heavy particles in a variety of simplified models. Assuming that pair-produced gluinos decay only via three-body processes involving third-generation quarks plus a neutralino, and that the neutralino is the lightest supersymmetric particle with a mass of 200 GeV, gluino masses below 1.6 TeV are excluded for any branching fractions for the individual gluino decay modes.

For some specific decay mode scenarios, gluino masses up to 1.65 TeV are excluded. For decays to first- and second-generation quarks and a neutralino with a mass of 200 GeV, gluinos with masses up to 1.4 TeV are excluded. Pair production of top squarks decaying to a top quark and a neutralino with a mass of 100 GeV is excluded for top squark masses up to 750 GeV.

PHYSICAL REVIEW D 95[1], 012003, 2017. DOI: 10.1103/PhysRevD.95.012003

[P031-2017] “J/Psi suppression at forward rapidity in Pb-Pb collisions at  $\sqrt{s_{NN}}=5.02$  TeV”

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

The inclusive J/Psi production has been studied in Pb-Pb and pp collisions at the centre-of-mass energy per nucleon pair  $\sqrt{s_{NN}} = 5.02$  TeV, using the ALICE detector at the CERN LHC. The J/Psi meson is reconstructed, in the centre-of-mass rapidity interval  $2.5 < y < 4$  and in the transverse-momentum range  $p(T) < 12$  GeV/c, via its decay to a muon pair. In this Letter, we present results on the inclusive J/Psi cross section in pp collisions at  $\sqrt{s} = 5.02$  TeV and on the nuclear modification factor R-AA. The latter is presented as a function of the centrality of the collision and, for central collisions, as a function of the transverse momentum  $p(T)$  of the J/Psi. The measured R-AA values indicate a suppression of the J/Psi in nuclear collisions and are then compared to our previous results obtained in Pb-Pb collisions at  $\sqrt{s_{NN}} = 2.76$  TeV. The ratio of the R-AA values at the two energies is also computed and compared to calculations of statistical and dynamical models. The numerical value of the ratio for central events (0-10% centrality) is  $1.17 \pm 0.04$  (stat)  $\pm 0.20$  (syst). In central events, as a function of  $p(T)$ , a slight increase of R-AA with collision energy is visible in the region  $2 < p(T) < 6$  GeV/c. Theoretical calculations qualitatively describe the measurements, within uncertainties.

PHYSICS LETTERS B 766, 212-224, 2017. DOI: 10.1016/j.physletb.2016.12.064

[P032-2017] “Jet energy scale and resolution in the CMS experiment in pp collisions at 8 TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Improved jet energy scale corrections, based on a data sample corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup> collected by the CMS experiment in proton-proton collisions at a center-of-mass energy of 8 TeV, are presented. The corrections as a function of pseudorapidity  $\eta$  and transverse momentum ( $p_T$ ) are extracted from data and simulated events combining several channels and methods. They account successively for the effects of pileup, uniformity of the detector response, and residual data-simulation jet energy scale differences. Further corrections, depending on the jet flavor and distance parameter (jet size)  $R$ , are also presented. The jet energy resolution is measured in data and simulated events and is studied as a function of pileup, jet size, and jet flavor. Typical jet energy resolutions at the central rapidities are 15-20% at 30 GeV, about 10% at 100 GeV, and 5% at 1 TeV. The studies exploit events with dijet topology, as well as photon+jet, Z+jet and multijet events. Several new techniques are used to account for the various sources of jet energy scale corrections, and a full set of uncertainties, and their correlations, are provided. The final uncertainties on the jet energy scale are below 3% across the phase space considered by most analyses ( $p(T) > 30$  GeV and vertical bar  $\eta$  vertical bar  $< 5.0$ ).

In the barrel region ( $\eta$  vertical bar  $< 1.3$ ) an uncertainty below 1% for  $p(T) > 30$  GeV is reached, when excluding the jet flavor uncertainties, which are provided separately for different jet flavors. A new benchmark for jet energy scale determination at hadron colliders is achieved with 0.32% uncertainty for jets with  $p(T)$  of the order of 165-330 GeV, and  $\eta$  vertical bar  $< 0.8$ .

**JOURNAL OF INSTRUMENTATION 12, P02014, 2017. DOI: 10.1088/1748-0221/12/02/P02014**

**[P033-2017] “Magnetic and magnetocaloric properties of DyMn2Si2 compound with multiple magnetic phase transition”**

dos Reis, D. C.; Franca, E. L. T.; de Paula, V. G.\*; dos Santos, A. O.; Coelho, A. A.\*; Cardoso, L. P.\*; da Silva, L. M.

Structural, magnetic and magnetocaloric properties of the ternary intermetallic compound DyMn2Si2 are studied by X-ray diffraction and magnetization measurements. It is found that DyMn2Si2 crystalizes with tetragonal ThCr2S2-type structure and exhibits four successive magnetic transitions at low temperature, around 20 K, 31 K, 38 K and 82 K, named respectively as T-1, T-2, T-3 and T-4 transitions. Large values of magnetic field ( $> 35$  kOe) favor antiferromagnetic clusters and give rise to exchange bias effect. The different responses of T-2 and T3 to field change, induces two non-identical isothermal entropy change ( $-\Delta S_M$ ) peaks. The maximum values of  $-\Delta S_M$  occur in temperatures around T-3 and reaches 8.2 J/kgK, for a magnetic field change of 50 kOe. Also, the presence of transitions T-2 and T-3 close to each other induces a table-like magnetocaloric effect (MCE) in a wide temperature range. Thus, the peculiar magnetic properties observed for DyMn2Si2 compound are interesting for low temperature magnetic refrigeration.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 424, 84-88, 2017. DOI: 10.1016/j.jmmm.2016.10.019**

**[P034-2017] “Magnetic Gold Confined in Ordered Mesoporous Titania Thin Films: A Noble Approach for Magnetic Devices”**

Granja, L. P.; Martinez, E. D.\*; Troiani, H.; Sanchez, C. ; Illia, G. J. A. A. S.

In the, past decade, the surprising, magnetic behavior of gold nanoparticles has been reported. This unexpected-property is mainly attributed both to size and surface effects. Mesoporous thin films are ideal matrices for metallic nanoparticles inclusion, because of their highly accessible and tailorable pore systems that lead to completely tunable chemical environments. Exploiting these features, we synthesized Au nanoparticles within mesoporous titania thin films (film thickness of similar to 150 nm and pore diameter of similar to 5nm), and we studied their magnetic properties under confinement. Here, we present the results of the magnetization as a function of temperature and magnetic field for this system, which ate consistent with the previously reported for free (unconfined) thiol-capped gold nanoparticles. The successful inclusion of stable magnetic Au nanoparticles within transparent mesoporous thin films opens the gates for the application of these nanocomposites in two-dimensional (2D) microdevices technology and magneto-optical devices.

**ACS APPLIED MATERIALS & INTERFACES 9[1], 965-971, 2017. DOI: 10.1021/acsami.6b15189**

**[P035-2017] “Maxwell times in higher-order generalized hydrodynamics: Classical fluids, and carriers and phonons in semiconductors”**

Rodrigues, C. G.; Silva, C. A. B.; Ramos, J. G.\*; Luzzi, R.\*

A family of what can be so-called Maxwell times which arises in the context of higher-order generalized hydrodynamics (HOGH; also called mesoscopic hydrothermodynamics) is evidenced. This is done in the framework of a HOGH built within a statistical formalism in terms of a nonequilibrium statistical ensemble formalism. It consists in a description in terms of the densities of particles and energy and their fluxes of all orders, with the motion described by a set of coupled non-linear integro-differential equations involving them. These Maxwell times have a fundamental role in determining the type of hydrodynamic motion that the system would display in the given conditions and constraints. They determine a Maxwell viscous force not present in the usual hydrodynamic equations, for example, in Navier-Stokes equation.

**PHYSICAL REVIEW E 95[2], 022104, 2017. DOI: 10.1103/PhysRevE.95.022104**

**[P036-2017] “ Measurement of the transverse momentum spectra of weak vector bosons produced in proton-proton collisions at root s=8TeV”**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

The transverse momentum spectra of weak vector bosons are measured in the CMS experiment at the LHC. The measurement uses a sample of proton-proton collisions at  $\sqrt{s} = 8\text{TeV}$ , collected during a special low-luminosity running that corresponds to an integrated luminosity of  $18.4 \pm 0.5 \text{ pb}^{-1}$ . The production of W bosons is studied in both electron and muon decay modes, while the production of Z bosons is studied using only the dimuon decay channel. The ratios of  $W^-$  to  $W^+$  and Z to W differential cross sections and ratios are compared with theoretical predictions up to next-to-next leading order in QCD.

**JOURNAL OF HIGH ENERGY PHYSICS [2], 096, 2017. DOI: 10.1007/JHEP02(2017)096**

**[P037-2017] “Measurements of differential cross sections for associated production of a W boson and jets in proton-proton collisions at root s=8 TeV”**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Differential cross sections for a W boson produced in association with jets are measured in a data sample of proton-proton collisions at a center-of-mass energy of 8 TeV recorded with the CMS detector and corresponding to an integrated luminosity of  $19.6 \text{ fb}^{-1}$ . The W bosons are identified through their decay mode  $W \rightarrow \mu \nu$ . The cross sections are reported as functions of jet multiplicity, transverse momenta, and the scalar sum of jet transverse momenta ( $H_T$ ) for different jet multiplicities. Distributions of the angular correlations between the jets and the muon are examined, as well as the average number of jets as a function of  $H_T$  and as a function of angular variables. The measured differential cross sections are compared with tree-level and higher-order recent event generators, as well as next-to-leading-order and next-to-next-to-leading-order theoretical predictions. The agreement of the generators with the measurements builds confidence in their use for the simulation of  $W^+$  jets background processes in searches for new physics at the LHC.

**PHYSICAL REVIEW D 95[5], 052002, 2017. DOI: 10.1103/PhysRevD.95.052002**

[P038-2017] “Measurements of the  $t(\bar{t})$  production cross section in lepton plus jets final states in pp collisions at 8 and ratio of 8 to 7 cross sections”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

A measurement of the top quark pair production ( $t\bar{t}$ ) cross section in proton-proton collisions at the centre-of-mass energy of 8 is presented using data collected with the CMS detector at the LHC, corresponding to an integrated luminosity of 19.6. This analysis is performed in the decay channels with one isolated, high transverse momentum electron or muon and at least four jets, at least one of which is required to be identified as originating from hadronization of a  $b$  quark. The calibration of the jet energy scale and the efficiency of  $b$  jet identification are determined from data. The measured cross section is  $\sigma_{t\bar{t}}$ . This measurement is compared with an analysis of 7 data, corresponding to an integrated luminosity of 5.0, to determine the ratio of 8 to 7 cross sections, which is found to be  $R_{8/7}$ . The measurements are in agreement with QCD predictions up to next-to-next-to-leading order.

EUROPEAN PHYSICAL JOURNAL C 77[1], 1-27, 15, 2017. DOI: 10.1140/epjc/s10052-016-4504-z

[P039-2017] “Measuring the leptonic CP phase in neutrino oscillations with nonunitary mixing”

Ge, S. F.; Pasquini, P.\*; Tortola, M.; Valle, J. W. F.

Non-unitary neutrino mixing implies an extra CP violating phase that can fake the leptonic Dirac CP phase  $\delta(\text{CP})$  of the simplest three-neutrino mixing benchmark scheme. This would hinder the possibility of probing for CP violation in accelerator-type experiments. We take T2K and T2HK as examples to demonstrate the degeneracy between the “standard” (or “unitary”) and “nonunitary” CP phases. We find, under the assumption of nonunitary mixing, that their CP sensitivities severely deteriorate. Fortunately, the T2K proposal of supplementing T2(H)K with a  $\mu$  DAR source for better measurement of  $\delta(\text{CP})$  can partially break the CP degeneracy by probing both  $\cos \delta(\text{CP})$  and  $\sin \delta(\text{CP})$  dependences in the wide spectrum of the  $\mu$  DAR flux. We also show that the further addition of a near detector to the  $\mu$  DAR setup can eliminate the degeneracy completely.

PHYSICAL REVIEW D 95[3], 033005, 2017. DOI: 10.1103/PhysRevD.95.033005

[P040-2017] “Molecular Chessboard Assemblies Sorted by Site-Specific Interactions of Out-of-Plane  $d$ -Orbitals with a Semimetal Template”

Wackerlin, A.; Fatayer, S.\*; Nijs, T.; Nowakowska, S.; Mousavi, S. F.; Popova, O.; Ahsan, A.; Jung, T. A.; Wackerlin, C.

We show that highly ordered two-dimensional (2D) chessboard arrays consisting of a periodic arrangement of two different molecules can be obtained by self-assembly of unsubstituted metal-phthalocyanines (metal-Pcs) on a suitable substrate serving as the template. Specifically, CuPc + MnPc and CuPc + CoPc mixtures sort into highly ordered Cu/Mn and Cu/Co chessboard arrays on the square  $p(10 \times 10)$  reconstruction of bismuth on Cu(100). Such created birrionuclear chessboard assemblies emerge from the site-specific interactions between the central transition-metal ions and the periodically reconstructed substrate. This work provides a conceptually new approach to induce 2D chessboard patterns in that no functionalization of the molecules is needed.

NANO LETTERS 17[3], 1956-1962, 2017. DOI: 10.1021/acs.nanolett.6b05344

[P041-2017] “Multimodal evaluation of ultra-short laser pulses treatment for skin burn injuries”

dos Santos, M. O.; Latrive, A.; de Castro, P. A. A.; de Rossi, W.; Zorn, T. M. T.; Samad, R. E.; Freitas, A. Z.; Cesar, C. L.\*; Vieira, N. D.; Zzell, D. M.

Thousands of people die every year from burn injuries. The aim of this study is to evaluate the feasibility of high intensity femtosecond lasers as an auxiliary treatment of skin burns. We used an in vivo animal model and monitored the healing process using 4 different imaging modalities: histology, Optical Coherence Tomography (OCT), Second Harmonic Generation (SHG), and Fourier Transform Infrared (FTIR) spectroscopy. 3 dorsal areas of 20 anesthetized Wistar rats were burned by water vapor exposure and subsequently treated either by classical surgical debridement, by laser ablation, or left without treatment. Skin burn tissues were non-invasively characterized by OCT images and biopsied for further histopathology analysis, SHG imaging and FTIR spectroscopy at 3, 5, 7 and 14 days after burn. The laser protocol was found as efficient as the classical treatment for promoting the healing process. The study concludes to the validation of femtosecond ultra-short pulses laser treatment for skinburns, with the advantage of minimizing operator trauma.

BIOMEDICAL OPTICS EXPRESS 8[3], 1575-1588, 2017. DOI: 10.1364/BOE.8.001575

[P042-2017] “Multiparameter POF Sensing Based on Multimode Interference and Fiber Bragg Grating”

Oliveira, R.; Marques, T. H. R.\*; Bilro, L.; Nogueira, R.; Cordeiro, C. M. B.\*

We report the fabrication of a multimode interferometer (MMI), based on a multimode polymer optical fiber (POF), sandwiched between two single-mode silica fibers. The POF used in this work is a step-index fiber with core and cladding composed of a cycloolefin polymer (COP) and PMMA, respectively. The low moisture absorption of the COP material and the benefit of having an exposed core for refractive index measurements in MMI devices lead us to perform an etching of the PMMA layer. Additionally, we report the inscription of a Bragg grating in the COP core material of an etched single-mode-multimode-single-mode (SMS) structure. The two fiber structures were simultaneously characterized to strain, temperature, humidity, and refractive index. The ability to detect refractive index by using a POF-based SMS structure is reported for the first time in this paper. Additionally, the capability for dual parameter measurement was discussed using both FBG and SMS structures.

JOURNAL OF LIGHTWAVE TECHNOLOGY 35[1], 3-9, 2017. DOI: 10.1109/JLT.2016.2626793

[P043-2017] “Non-thermal atmospheric pressure plasma jet applied to inactivation of different microorganisms”

Nishime, T. M. C.; Borges, A. C.; Koga-Ito, C. Y.; Machida, M.\*; Hein, L. R. O.; Kostov, K. G.

Non-thermal atmospheric pressure, plasma jets (APPJs) are capable of generating cold plasma plumes that are not confined by electrodes, which makes them very attractive for biomedical applications. In the present work, the inactivation efficiency of cold APPJ was evaluated against three pathogenic microorganisms with different cell wall characteristics.

The Gram-positive bacterium *Enterococcus faecalis* (ATCC 29212), the Gram-negative bacterium *Pseudomonas aeruginosa* (ATCC 15442) and the fungus *Candida albicans* (SC 5314) were plated on standard Petri dishes filled with specific culture media. The plasma jet with mean power of 1.8 W was directed perpendicularly on agar plates and the system was flushed with pure helium at two different flows, 2.0 and 4.0 SLM. During the treatments, time and distance between nozzle and agar were varied. The presence of excited reactive species was confirmed by optical emission spectroscopy. Scanning electron microscopy (SEM) was applied for investigation of cell morphology. The microbicidal efficiency was evaluated by measuring the area of inhibition zone (where there was no cell growth). For different flows of helium, no significant difference of inhibition zone size was noted for the same microbial species. However, high flows led to formation of non-homogenous inhibition zones, presenting microcolonies distributed through the inactivated region. The Gram-positive bacterium was more susceptible to the plasma antimicrobial effects than the other microorganisms.

**SURFACE & COATINGS TECHNOLOGY** [312], 19-24, 2017. DOI: 10.1016/j.surfcoat.2016.07.076

**[P044-2017] "Observation of Charge-Dependent Azimuthal Correlations in p-Pb Collisions and Its Implication for the Search for the Chiral Magnetic Effect"**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Charge-dependent azimuthal particle correlations with respect to the second-order event plane in p-Pb and PbPb collisions at a nucleon-nucleon center-of-mass energy of 5.02 TeV have been studied with the CMS experiment at the LHC. The measurement is performed with a three-particle correlation technique, using two particles with the same or opposite charge within the pseudorapidity range broken vertical bar  $\eta$  broken vertical bar < 2.4, and a third particle measured in the hadron forward calorimeters (4.4 < broken vertical bar  $\eta$  broken vertical bar < 5). The observed differences between the same and opposite sign correlations, as functions of multiplicity and gap between the two charged particles, are of similar magnitude in p-Pb and PbPb collisions at the same multiplicities. These results pose a challenge for the interpretation of charge-dependent azimuthal correlations in heavy ion collisions in terms of the chiral magnetic effect.

**PHYSICAL REVIEW LETTERS** 118[12], 122301, 2017. DOI: 10.1103/PhysRevLett.118.122301

**[P045-2017] "Observation of the decay  $B^+ \rightarrow \psi(2S) \phi(1020)K^+$  in pp collisions at root s=8 TeV"**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

The decay  $B^+ \rightarrow \psi(2S) \phi(1020) K^+$  is observed for the first time using data collected from pp collisions at root s = 8 TeV by the CMS experiment at the LHC, corresponding to an integrated luminosity of 19.6 fb<sup>-1</sup>. The branching fraction of this decay is measured, using the mode  $B^+ \rightarrow \psi(2S) K^+$  as normalization, to be (4.0 +/- 0.4 (stat)+/- 0.6 (syst)+/- 0.2 (B)) x 10<sup>-6</sup>, where the third uncertainty is from the measured branching fraction of the normalization channel.

**PHYSICS LETTERS B** 764, 66-86, 2017. DOI: 10.1016/j.physletb.2016.11.001

**[P046-2017] "One-step electrodeposited 3D-ternary composite of zirconia nanoparticles, rGO and polypyrrole with enhanced supercapacitor performance"**

Alves, A. P. P.; Koizumi, R.; Samanta, A.; Machado, L. D.\*; Singh, A. K.; Galvao, D. S.\*; Silva, G. G.; Tiwary, C. S.; Ajayan, P. M.

Supercapacitor electrodes consisting of conjugated polymers (CP), metal oxides and graphene nanosheets have been explored as a strategy to achieve high specific capacitance, power, energy density, and stability. In this work, we synthesized a 3D structure composed of zirconia oxide nanoparticles (ZrO<sub>2</sub>), reduced graphene oxide (rGO) and polypyrrole (PPy), using a simple and easily scalable one-step chronopotentiometry method. Detailed characterization revealed that the addition of rGO and ZrO<sub>2</sub> modified the morphology of the electrode material. The capacitance of the resulting architecture improved by up to a 100%. The ternary composite featured high stability, with an increase of 5% in capacitance after a thousand cycles. DFT and MD simulations were carried out in order to provide further insight on the role of zirconia.

**NANO ENERGY** 31, 225-232, 2017. DOI: 10.1016/j.nanoen.2016.11.018

**[P047-2017] "Partial Quenching of the Magnetic Moments in Polycrystalline Co(Al (x) Co1-x )(2)O-4 Samples (0 < x < 0.35)"**

Oliveira, M. P.; Silva, L. S.; Mercena, S. G.; Coelho, A. A.\*; Meneses, C. T.; Duque, J. G. S.\*

In this work, the effect of Al<sup>3+</sup>-doping in polycrystalline Co(Al (x) Co<sub>1-x</sub> )<sub>2</sub>O<sub>4</sub> samples (< x < 0.35) was studied. Samples have been synthesized via conventional state solid method. X-ray diffraction (XRD) measurements carried out at room temperature reveal that a single cubic phase has been successfully obtained for all samples. Magnetization measurements as function of temperature (2 < T < 300 K) were collected in a commercial DC superconducting quantum interference device magnetometer. The observation of an antiferromagnetic transition for all samples confirms that Co<sup>3+</sup> ions located on octahedral sites are low spin (S = 0). On the other hand, the transition temperatures are unaffected by the Co<sup>3+</sup>-doping indicating that the empty e (g) orbitals does not play an important role in the antiferromagnetic interaction between Co<sup>2+</sup> sited on tetrahedral sites. Besides, the evaluation of effective magnetic moment from T-dependence of magnetic susceptibility reveals that the effective moment is not totally quenched. This fact confirms both of the crystal field effects experimented by the Co ions is site-dependent and it is stronger for Co ions located in octahedral sites than tetrahedral ones.

**JOURNAL OF SUPERCONDUCTIVITY AND NOVEL MAGNETISM** 30[3], 587-591, 2017. DOI: 10.1007/s10948-016-3834-2

**[P048-2017] "Perovskite-Inspired Photovoltaic Materials: Toward Best Practices in Materials Characterization and Calculations"**

Hoye, Robert L. Z.; Schulz, P.; Schelhas, L. T.; Holder, A. M.; Stone, K. H.; Perkins, J. D.; Vigil-Fowler, D.; Siol, S.; Scanlon, D. O.; Zakutayev, A.; Walsh, A.; Smith, I. C.; Melot, B. C.; Kurchin, R. C.; Wang, Y.; Shi, J.; Marques, F. C.\*; Berry, J. J.; Tumas, W.; Lany, S.; Stevanovic, V.; Toney, M. F.; Buonassisi, T.

Recently, there has been an explosive growth in research based on hybrid lead halide perovskites for photovoltaics owing to rapid improvements in efficiency. The advent of these "materials for solar applications has led to widespread interest in understanding the key enabling properties of these materials.

This has resulted in renewed interest in related compounds and a search for materials that may replicate the defect-tolerant properties and long lifetimes of the hybrid lead-halide perovskites. Given the rapid pace of development of the field, the rises in efficiencies of these systems have outpaced the more basic understanding of these materials. Measuring or calculating the basic properties, such as crystal/electronic structure and composition, can be challenging because some of these materials have anisotropic structures, and/or are composed of both heavy metal cations and volatile, mobile, light elements. Some consequences are beam damage during characterization, composition change under vacuum, or compound effects, such as the alteration of the electronic structure through the influence of the substrate. These effects make it challenging to understand the basic properties integral to optoelectronic operation. Compounding these difficulties is the rapid pace with which the field progresses. This has created an ongoing need to continually evaluate best practices with respect to characterization and calculations, as well as to identify inconsistencies in reported values to determine if those inconsistencies are rooted in characterization methodology or materials synthesis. This article describes the difficulties in characterizing hybrid lead halide perovskites and new materials and how these challenges may be overcome. The topic was discussed at a seminar at the 2015 Materials Research Society Fall Meeting & Exhibit. This article highlights the lessons learned from the seminar and the insights of some of the attendees, with reference to both recent literature and controlled experiments to illustrate the challenges discussed. The focus in this article is on crystallography, composition measurements, photoemission spectroscopy, and calculations on perovskites and new, related absorbers. We suggest how the reporting of the important artifacts could be streamlined between groups to ensure reproducibility as the field progresses.

**CHEMISTRY OF MATERIALS** 29[5], 1964-1988, 2017. DOI: 10.1021/acs.chemmater.6b03852

[P049-2017] “Schwinger mechanism in linear covariant gauges”

Aguilar, A. C.\*; Binosi, D.; Papavassiliou, J.

In this work we explore the applicability of a special gluon mass generating mechanism in the context of the linear covariant gauges. In particular, the implementation of the Schwinger mechanism in pure Yang-Mills theories hinges crucially on the inclusion of massless bound-state excitations in the fundamental nonperturbative vertices of the theory. The dynamical formation of such excitations is controlled by a homogeneous linear Bethe-Salpeter equation, whose nontrivial solutions have been studied only in the Landau gauge. Here, the form of this integral equation is derived for general values of the gauge-fixing parameter, under a number of simplifying assumptions that reduce the degree of technical complexity. The kernel of this equation consists of fully dressed gluon propagators, for which recent lattice data are used as input, and of three-gluon vertices dressed by a single form factor, which is modeled by means of certain physically motivated Ansatz. The gauge-dependent terms contributing to this kernel impose considerable restrictions on the infrared behavior of the vertex form factor; specifically, only infrared finite Ansatz are compatible with the existence of nontrivial solutions. When such Ansatz are employed, the numerical study of the integral equation reveals a continuity in the type of solutions as one varies the gauge-fixing parameter, indicating a smooth departure from the Landau gauge. Instead, the logarithmically divergent form factor displaying the characteristic “zero crossing,” while perfectly consistent in the Landau gauge, has to undergo a dramatic qualitative transformation away from it, in order to yield acceptable solutions. The possible implications of these results are briefly discussed.

**PHYSICAL REVIEW D** 95[3], 034017, 2017. DOI: 10.1103/PhysRevD.95.034017

[P050-2017] “Search for anomalous  $Wtb$  couplings and flavour-changing neutral currents in  $t$ -channel single top quark production in  $pp$  collisions at  $\sqrt{s}=7$  and  $8$  TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Single top quark events produced in the  $t$  channel are used to set limits on anomalous  $Wtb$  couplings and to search for top quark flavour-changing neutral current (FCNC) interactions. The data taken with the CMS detector at the LHC in proton-proton collisions at  $\sqrt{s}=7$  and  $8$  TeV correspond to integrated luminosities of  $5.0$  and  $19.7$  fb $^{-1}$ , respectively. The analysis is performed using events with one muon and two or three jets. A Bayesian neural network technique is used to discriminate between the signal and backgrounds, which are observed to be consistent with the standard model prediction. The 95% confidence level (CL) exclusion limits on anomalous right-handed vector, and left- and right-handed tensor  $Wtb$  couplings are measured to be  $\bar{f}(V)$  vertical bar  $< 0.16$ ,  $\bar{f}(T)$  vertical bar  $< 0.057$ , and  $-0.049 < f(T)$  vertical bar  $< 0.048$ , respectively. For the FCNC couplings  $\kappa_{tug}$  and  $\kappa_{tcg}$ , the 95% CL upper limits on coupling strengths are  $\bar{\kappa}_{tug}$  vertical bar  $> < 4.1 \times 10^{-3}$  TeV $^{-1}$  and  $\bar{\kappa}_{tcg}$  vertical bar  $> < 1.8 \times 10^{-2}$  TeV $^{-1}$ , where  $\bar{\kappa}_{tug}$  is the scale for new physics, and correspond to upper limits on the branching fractions of  $2.0 \times 10^{-5}$  and  $4.1 \times 10^{-4}$  for the decays  $t \rightarrow ug$  and  $t \rightarrow cg$ , respectively.

**JOURNAL OF HIGH ENERGY PHYSICS** 2, 028, 2017. DOI: 10.1007/JHEP02(2017)028

[P051-2017] “Search for CP violation in  $t(\bar{t})$  production and decay in proton-proton collisions at  $\sqrt{s}=8$  TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

The results of a first search for CP violation in the production and decay of top quark-antiquark ( $t(\bar{t})$ ) pairs are presented. The search is based on asymmetries in T-odd, triple-product correlation observables, where T is the time-reversal operator. The analysis uses a sample of proton-proton collisions at  $\sqrt{s}=8$  TeV collected by the CMS experiment, corresponding to an integrated luminosity of  $19.7$  fb $^{-1}$ . Events are selected having one electron or muon and at least four jets. The T-odd observables are measured using four-momentum vectors associated with  $t(\bar{t})$  production and decay. The measured asymmetries exhibit no evidence for CP-violating effects, consistent with the expectation from the standard model.

**JOURNAL OF HIGH ENERGY PHYSICS** [3], 101, 2017. DOI: 10.1007/JHEP03(2017)101

[P052-2017] “Search for Dark Matter and Supersymmetry with a Compressed Mass Spectrum in the Vector Boson Fusion Topology in Proton-Proton Collisions at  $\sqrt{s}=8$  TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

A first search for pair production of dark matter candidates through vector boson fusion in proton-proton collisions at  $\sqrt{s}=8$  TeV is performed with the CMS detector. The vector boson fusion topology enhances missing transverse momentum, providing a way to probe supersymmetry, even in the case of a compressed mass spectrum. The data sample corresponds to an integrated luminosity of  $18.5$  fb $^{-1}$ , recorded by the CMS experiment. The observed dijet mass spectrum is consistent with the standard model expectation.

In an effective field theory, dark matter masses are explored as a function of contact interaction strength. The most stringent limit on bottom squark production with mass below 315 GeV is also reported, assuming a 5 GeV mass difference with respect to the lightest neutralino.

PHYSICAL REVIEW LETTERS 118[2], 021802, 2017. DOI: 10.1103/PhysRevLett.118.021802

[P053-2017] “Search for dark matter and unparticles in events with a Z boson and missing transverse momentum in proton-proton collisions at root s=13 TeV”

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

A search for dark matter and unparticle production at the LHC has been performed using events containing two charged leptons (electrons or muons), consistent with the decay of a Z boson, and large missing transverse momentum. This study is based on data collected with the CMS detector in 2015, corresponding to an integrated luminosity of 2.3 fb<sup>-1</sup> of proton-proton collisions at the LHC, at a center-of-mass energy of 13 TeV. No excess over the standard model expectation is observed. Compared to previous searches in this topology, which exclusively relied on effective field theories, the results are interpreted in terms of a simplified model of dark matter production for both vector and axial vector couplings between a mediator and dark matter particles. The first study of this class of models using CMS data at root s = 13 TeV is presented. Additionally, effective field theories of dark matter and unparticle production are used to interpret the data.

JOURNAL OF HIGH ENERGY PHYSICS [3], 061, 2017. DOI: 10.1007/JHEP03(2017)061

[P054-2017] “Search for flavor-changing nonstandard neutrino interactions using nu(e) appearance in MINOS”

Adamson, P.; Anghel, I.; Escobar, C. O.\*; et al.  
MINOS Collaboration

We report new constraints on flavor-changing nonstandard neutrino interactions from the MINOS long-baseline experiment using nu(e) and (nu) over bar (e) appearance candidate events from predominantly nu(mu) and (nu) over bar (mu) beams. We used a statistical selection algorithm to separate nu(e) candidates from background events, enabling an analysis of the combined MINOS neutrino and antineutrino data. We observe no deviations from standard neutrino mixing, and thus place constraints on the nonstandard interaction matter effect, vertical bar epsilon(e tau)vertical bar, and phase, (delta(CP) + delta(e tau)), using a 30-bin likelihood fit.

PHYSICAL REVIEW D 95[1], 012005, 2017. DOI: 10.1103/PhysRevD.95.012005

[P055-2017] “Search for heavy neutrinos or third-generation leptoquarks in final states with two hadronically decaying tau leptons and two jets in proton-proton collisions at root s=13 TeV”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

A search for new particles has been conducted using events with two high transverse momentum (pT) T leptons that decay hadronically, at least two high-pT jets, and missing transverse energy from the T lepton decays.

The analysis is performed using data from proton-proton collisions, collected by the CMS experiment in 2015 at root s = 13 TeV, corresponding to an integrated luminosity of 2.1 fb<sup>-1</sup>. The results are interpreted in two physics models. The first model involves heavy right-handed neutrinos, N-l (l = e, mu, T), and right-handed charged bosons, WR, arising in a left-right symmetric extension of the standard model. Masses of the W-R boson below 2.35 (1.63) TeV are excluded at 95% confidence level, assuming the N-tau mass is 0.8 (0.2) times the mass of the W-R boson and that only the NT flavor contributes to the WR decay width. In the second model, pair production of third-generation scalar leptoquarks that decay into (TT)bb is considered. Third-generation scalar leptoquarks with masses below 740 GeV are excluded, assuming a 100% branching fraction for the leptoquark decay to a T lepton and a bottom quark. This is the first search at hadron colliders for the third-generation Majorana neutrino, as well as the first search for third-generation leptoquarks in the final state with a pair of hadronically decaying T leptons and jets.

JOURNAL OF HIGH ENERGY PHYSICS [3], 077, 2017. DOI: 10.1007/JHEP03(2017)077

[P056-2017] “Search for heavy resonances decaying to tau lepton pairs in proton-proton collisions at root s=13 TeV”

Ruiz Vargas, J. C.; Battilana, C.; Chinellato, J. A.\*; et al.

A search for heavy resonances that decay to tau lepton pairs is performed using proton-proton collisions at root s = 13 TeV. The data were collected with the CMS detector at the CERN LHC and correspond to an integrated luminosity of 2.2 fb<sup>-1</sup>. The observations are in agreement with standard model predictions. An upper limit at 95% confidence level on the product of the production cross section and branching fraction into tau lepton pairs is calculated as a function of the resonance mass. For the sequential standard model, the presence of Z' bosons decaying into tau lepton pairs is excluded for Z' masses below 2.1 TeV, extending previous limits for this final state. For the topcolor-assisted technicolor model, which predicts Z' bosons that preferentially couple to third-generation fermions, Z' masses below 1.7 TeV are excluded, representing the most stringent limit to date.

JOURNAL OF HIGH ENERGY PHYSICS [2], 048, 2017. DOI: 10.1007/JHEP02(2017)048

[P057-2017] “Search for high-mass diphoton resonances in proton-proton collisions at 13 TeV and combination with 8 TeV search”

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

A search for the resonant production of high-mass photon pairs is presented. The search focuses on spin-0 and spin-2 resonances with masses between 0.5 and 4.5 TeV, and with widths, relative to the mass, between 1.4 x 10<sup>-4</sup> and 5.6 x 10<sup>-2</sup>. The data sample corresponds to an integrated luminosity of 12.9 fb<sup>-1</sup> of proton-proton collisions collected with the CMS detector in 2016 at a center-of-mass energy of 13 TeV. No significant excess is observed relative to the standard model expectation. The results of the search are combined statistically with those previously obtained in 2012 and 2015 at root s = 8 and 13 TeV, respectively, corresponding to integrated luminosities of 19.7 and 3.3 fb<sup>-1</sup>, to derive exclusion limits on scalar resonances produced through gluon-gluon fusion, and on Randall-Sundrum gravitons. The lower mass limits for Randall-Sundrum gravitons range from 1.95 to 4.45 TeV for coupling parameters between 0.01 and 0.2. These are the most stringent limits on Randall-Sundrum graviton production to date.

PHYSICS LETTERS B 767, 147-170, 2016. DOI: 10.1016/j.physletb.2017.01.027

[P058-2017] "Search for high-mass Z gamma resonances in  $e^+e^- \rightarrow \gamma$  and  $\mu^+\mu^- \rightarrow \gamma$  final states in proton-proton collisions at  $\sqrt{s}=8$  and 13 TeV"

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

This paper describes the search for a high-mass narrow-width scalar particle decaying into a Z boson and a photon. The analysis is performed using proton-proton collision data recorded with the CMS detector at the LHC at center-of-mass energies of 8 and 13 TeV, corresponding to integrated luminosities of 19.7 and 2.7 fb<sup>-1</sup>, respectively. The Z bosons are reconstructed from opposite-sign electron or muon pairs. No statistically significant deviation from the standard model predictions has been found in the 200-2000 GeV mass range. Upper limits at 95% confidence level have been derived on the product of the scalar particle production cross section and the branching fraction of the Z decaying into electrons or muons, which range from 280 to 20 fb for resonance masses between 200 and 2000 GeV.

JOURNAL OF HIGH ENERGY PHYSICS [1], 076, 2017. DOI: 10.1007/JHEP01(2017)076

[P059-2017] "Search for top quark decays via Higgs-boson-mediated flavor-changing neutral currents in pp collisions at  $\sqrt{s}=8$  TeV"

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMC Collaboration

A search is performed for Higgs-boson-mediated flavor-changing neutral currents in the decays of top quarks. The search is based on proton-proton collision data corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup> at a center-of-mass energy of 8 TeV collected with the CMS detector at the LHC. Events in which a top quark pair is produced with one top quark decaying into a charm or up quark and a Higgs boson (H), and the other top quark decaying into a bottom quark and a W boson are selected. The Higgs boson in these events is assumed to subsequently decay into either dibosons or difermions. No significant excess is observed above the expected standard model background, and an upper limit at the 95% confidence level is set on the branching fraction  $B(t \rightarrow Hc)$  of 0.40% and  $B(t \rightarrow Hu)$  of 0.55%, where the expected upper limits are 0.43% and 0.40%, respectively. These results correspond to upper limits on the square of the flavor-changing Higgs boson Yukawa couplings  $|\lambda_{Htc}| < 6 \cdot 9 \times 10^{-3}$  and  $|\lambda_{Htu}| < 9 \cdot 8 \times 10^{-3}$ .

JOURNAL OF HIGH ENERGY PHYSICS [2], 079, 2017. DOI: 10.1007/JHEP02(2017)079

[P060-2017] "Search for top squark pair production in compressed-mass-spectrum scenarios in proton-proton collisions at  $\sqrt{s}=8$  TeV using the  $\alpha(T)$  variable"

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

An inclusive search is performed for supersymmetry in final states containing jets and an apparent imbalance in transverse momentum,  $(p_T)_{\text{miss}}$ , due to the production of unobserved weakly interacting particles in pp collisions at a centre-of-mass energy of 8 TeV.

The data, recorded with the CMS detector at the CERN LHC, correspond to an integrated luminosity of 18.5 fb<sup>-1</sup>. The dimensionless kinematic variable  $\alpha(T)$  is used to discriminate between events with genuine  $(p_T)_{\text{miss}}$  associated with unobserved particles and spurious values of  $(p_T)_{\text{miss}}$  arising from jet energy mismeasurements. No excess of event yields above the expected standard model backgrounds is observed. The results are interpreted in terms of constraints on the parameter space of several simplified models of supersymmetry that assume the pair production of top squarks. The search provides sensitivity to a broad range of top squark  $(\tilde{t})$  decay modes, including the two-body decay  $\tilde{t} \rightarrow c\tilde{\chi}_0$ , where c is a charm quark  $\tilde{\chi}_0$  and is the lightest neutralino, as well as the four-body decay  $\tilde{t} \rightarrow b\tilde{f}\tilde{f}'$ , where b is a bottom quark and f and f' are fermions produced in the decay of an intermediate off-shell W boson. These modes dominate in scenarios in which the top squark and lightest neutralino are nearly degenerate in mass. For these modes, top squarks with masses as large as 260 and 225 GeV are excluded, respectively, for the two- and four-body decays.

PHYSICS LETTERS B 767, 403-430, 2017. DOI: 10.1016/j.physletb.2017.02.007

[P061-2017] "Searches for invisible decays of the Higgs boson in pp collisions at  $\sqrt{s}=7, 8,$  and 13 TeV"

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

Searches for invisible decays of the Higgs boson are presented. The data collected with the CMS detector at the LHC correspond to integrated luminosities of 5.1, 19.7, and 2.3 fb<sup>-1</sup> at centre-of-mass energies of 7, 8, and 13 TeV, respectively. The search channels target Higgs boson production via gluon fusion, vector boson fusion, and in association with a vector boson. Upper limits are placed on the branching fraction of the Higgs boson decay to invisible particles, as a function of the assumed production cross sections. The combination of all channels, assuming standard model production, yields an observed (expected) upper limit on the invisible branching fraction of 0.24 (0.23) at the 95% confidence level. The results are also interpreted in the context of Higgs-portal dark matter models.

JOURNAL OF HIGH ENERGY PHYSICS [2], 135, 2017. DOI: 10.1007/JHEP02(2017)135

[P062-2017] "Simplified fabrication of integrated microfluidic devices using fused deposition modeling 3D printing"

Gaal, G.\*; Mendes, M.\*; de Almeida, T. P.; Piazzetta, M. H. O.; Gobbi, A. L.; Riul, A.\*; Rodrigues, V.\*

Microfluidic devices based on polydimethylsiloxane shown a plethora of experimental possibilities due to good transparency, flexibility and ability to adhere reversibly and irreversibly to distinct materials. Though PDMS is a milestone in microfluidic developments, its cost and handling directed the field to search for new options. 3D printing technology nowadays starts a revolution offering materials and possibilities that can contribute positively to current methodologies. Here we explored the fused deposition modeling 3D printing technique to obtain integrated, transparent and sealed microchannels made with polylactic acid, a cheap alternative material to set up microfluidic systems. Using a home-made 3D printer, devices could be assembled in a simplified process, enabling the integration of different materials such as paper, glass, wire and polymers within the microchannel.

To demonstrate the efficacy of this approach, a 3D-printed electronic tongue sensor was built, enabling the distinction of basic tastes below the human threshold.

**SENSORS AND ACTUATORS B-CHEMICAL 242, 35-40, 2017.** DOI: 10.1016/j.snb.2016.10.110

**[P063-2017] “Size Control of Silver-Core/Silica-Shell Nanoparticles Fabricated by Laser-Ablation-Assisted Chemical Reduction”**

Ermakov, V. A.\*; Jimenez-Villar, E.; Clemente da Silva Filho, J. M.\*; Yassitepe, E.; Mogili, N. V. V.; Iikawa, F.\*; Sa, G. F.; Cesar, C. L.\*; Marquest, F. C.\*

Aqueous colloidal silver nanoparticles have substantial potential in biological application as markers and antibacterial agents and in surface-enhanced Raman spectroscopy applications. A simple method of fabrication and encapsulation into an inert shell is of great importance today to make their use ubiquitous. Here we show that colloids of silver-core/silica-shell nanoparticles can be easily fabricated by a laser-ablation-assisted chemical reduction method and their sizes can be tuned in the range of 2.5 to 6.3 nm by simply choosing a proper water ethanol proportion. The produced silver nanoparticles possess a porous amorphous silica shell that increases the inertness and stability of colloids, which decreases their toxicity compared with those without silica. The presence of a thin 2 to 3 nm silica shell was proved by EDX mapping. The small sizes of nanoparticles achieved by this method were analyzed using optical techniques, and they show typical photoluminescence in the UV-vis range that shifts toward higher energies with decreasing size.

**LANGMUIR 33[9], 2257-2262, 2017.** DOI: 10.1021/acs.langmuir.6b04308

**[P064-2017] “Speciation in the Derrida-Higgs model with finite genomes and spatial populations”**

de Aguiar, M. A. M.\*

The speciation model proposed by Derrida and Higgs demonstrated that a sexually reproducing population can split into different species in the absence of natural selection or any type of geographic isolation, provided that mating is assortative and the number of genes involved in the process is infinite. Here we revisit this model and simulate it for finite genomes, focusing on the question of how many genes it actually takes to trigger neutral sympatric speciation. We find that, for typical parameters used in the original model, it takes the order of 105 genes. We compare the results with a similar spatially explicit model where about 100 genes suffice for speciation. We show that when the number of genes is small the species that emerge are strongly segregated in space. For a larger number of genes, on the other hand, the spatial structure of the population is less important and the species distribution overlap considerably.

**JOURNAL OF PHYSICS A-MATHEMATICAL AND THEORETICAL 50[8], 085602, 2017.** DOI: 10.1088/1751-8121/aa5701

**[P065-2017] “Surface analysis and shear bond strength of zirconia on resin cements after non-thermal plasma treatment and/or primer application for metallic alloys”**

Vechiato, A. J.; Matos, A. O.; Landers, R.\*; Goiato, M. C.; Rangel, E. C.; De Souza, G. M.; Barao, V. A. R.; dos Santos, D. M.

There is no established protocol for bonding zirconia (Y-TZP) with resin cements. Non-thermal plasma (NTP) may be an alternative for the clinical problems related to adhesion.

The purpose of the present study was to characterize the surface of Y-TZP exposed to methane (CH<sub>4</sub>) NTP or coated with a layer of primer for metal alloys and the association between the two methods and to evaluate the effect of NTP treatment on bond strength between Y-TZP and two resin cements. A total of 235 Y-TZP discs (8 x 2 mm) were distributed into five groups: Co (no surface treatment), Pr (primer), NTP (methane plasma), Pr + NTP and NTP + Pr. The effect of the treatment type on the surface free energy, morphology, topography and chemical composition of the Y-TZP discs was investigated. The discs were cemented to composite resin substrates using Panavia F2.0 or RelyX U200. Shear bond strength (n = 10) analyses were performed (1 mm/min) before and after thermocycling (5-55 degrees C, 2000 cycles) on the bonded specimens. The data were analyzed with one and three-way ANOVAs and Bonferroni tests (alpha = 0.05). NTP reduced the surface energy and roughness of the Y-TZP discs. SEM-EDS and XPS analyses showed the presence of the organic thin film, which significantly improved the bond strength results when Rely X U200 was used, whereas the primer treatment was more effective with Panavia F2.0. Thermocycling significantly reduced the bond strength results of the NIP and Pr + NTP groups cemented with Rely X U200 and the Pr and NTP + Pr groups cemented with Panavia F2.0. Nonthermal plasma improves the bond strength between Rely X U200 and Y-TZP and also seems to have water-resistant behavior, whereas Panavia F2.0 showed better results when associated with primer.

**MATERIALS SCIENCE & ENGINEERING C-MATERIALS FOR BIOLOGICAL APPLICATIONS 72, 284-292, 2017.** DOI: 10.1016/j.msec.2016.11.033

**[P066-2017] “The CMS trigger system”**

Khachatryan, V.; Sirunyan, A. M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

This paper describes the CMS trigger system and its performance during Run 1 of the LHC. The trigger system consists of two levels designed to select events of potential physics interest from a GHz (MHz) interaction rate of proton-proton (heavy ion) collisions. The first level of the trigger is implemented in hardware, and selects events containing detector signals consistent with an electron, photon, muon, tau lepton, jet, or missing transverse energy. A programmable menu of up to 128 object-based algorithms is used to select events for subsequent processing. The trigger thresholds are adjusted to the LHC instantaneous luminosity during data taking in order to restrict the output rate to 100 kHz, the upper limit imposed by the CMS readout electronics. The second level, implemented in software, further refines the purity of the output stream, selecting an average rate of 400 Hz for offline event storage. The objectives, strategy and performance of the trigger system during the LHC Run 1 are described.

**JOURNAL OF INSTRUMENTATION 12, P010120, 2017.** DOI: 10.1088/1748-0221/12/01/P01020

**[P067-2017] “The DarkSide experimente”**

Bottino, B.; Aalseth, C. E.; Machado, A. A.\*; Segreto, E.\*; et al.

DarkSide is a dark matter direct search experiment at Laboratori Nazionali del Gran Sasso (LNGS). DarkSide is based on the detection of rare nuclear recoils possibly induced by hypothetical dark matter particles, which are supposed to be neutral, massive ( $m > 10$  GeV) and weakly interactive (WIMP). The dark matter detector is a two-phase time projection chamber (TPC) filled with ultra-pure liquid argon.



The TPC is placed inside a muon and a neutron active veto to suppress the background. Using argon as active target has many advantages, the key features are the strong discriminant power between nuclear and electron recoils, the spatial reconstruction and easy scalability to multi-tons size. At the moment DarkSide-50 is filled with ultra-pure argon, extracted from underground sources, and from April 2015 it is taking data in its final configuration. When combined with the preceding search with an atmospheric argon target, it is possible to set a 90% CL upper limit on the WIMP-nucleon spin-independent cross section of  $2.0 \times 10^{-44}$  cm<sup>2</sup> for a WIMP mass of 100 GeV/c<sup>2</sup>. The next phase of the experiment, DarkSide-20k, will be the construction of a new detector with an active mass of similar to 20 tons.

**NUOVO CIMENTO C-COLLOQUIA AND COMMUNICATIONS IN PHYSICS 40[1], 52, 2017. DOI: 10.1393/ncc/i2017-17052-3**

**[P068-2017] “Theoretical investigation on the magnetostatic interaction between two wire-tube nanostructures”**

Riveros, A.; Salazar-Aravena, D.\*; Escrig, J.

In this paper we have calculated analytically the magnetostatic interaction between two wire-tube nanostructures as a function of their magnetic and geometric parameters. As expected, the interaction energy increases as the nanostructures approach, but interestingly when the nanostructures are close enough, a nonmonotonic behavior with the wire-tube portions is reported. Besides, we investigate the hysteresis loop for two interacting Ni<sup>81</sup>Fe<sup>19</sup> wire-tube nanostructures by micromagnetic simulations in order to study how the interaction affects the magnetic properties of these nanostructures. This work allows for the study of magnetostatic interactions between wire-tube nanostructures that have been proposed as an interesting alternative to store information or even perform logic functions, because to their ability to pin a domain wall.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 428, 452-456, 2016. DOI: 10.1016/j.jmmm.2016.12.127**

**[P069-2017] “Transport through hybrid superconducting/ferromagnetic double-path junction”**

Facio, T. J. S.; Orellana, P. A.; Jurelo, A. R.; Figueira, M. S.; Cabrera, G. G.\*; Siqueira, E. C.

In this paper we study a double-path junction formed by a ferromagnetic and a superconductor lead. The first path connects the superconductor and ferromagnet directly while the second path connects these metals through a quantum dot. The whole system works as an Aharonov-Bohm interferometer allowing the study of the interference between these two paths under the presence of spin imbalance and Andreev bound states. We considered the effect of Fano interference on the electronic transmittance through the quantum dot and observed two regimes of conduction depending on the strength of the direct coupling. For the weak coupling regime, the transmittance presented the usual four resonances due to the Andreev bound states whereas for the strong coupling regime the profile was inverted and resonances became anti-resonances. However, even in the strong coupling regime it was possible to observe a central resonance due to the interference between the Andreev bound states. We have also studied the signatures of Fano interference on the average occupation within the quantum dot. The spin accumulation was analyzed and how it depends on the direct coupling and an external magnetic field applied to the system. The results obtained may be used in a possible experimental implementation of this system in order to probe spin related effects in ferromagnetic superconductor nanostructures.

**PHYSICS LETTERS A 381[5], 529-534, 2017. DOI: 10.1016/j.physleta.2016.11.038**

**[P070-2017] “W and Z boson production in p-Pb collisions at TeV  $\sqrt{s(NN)}=5.02$  TeV”**

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

The W and Z boson production was measured via the muonic decay channel in proton-lead collisions at  $\sqrt{s(NN)} = 5.02$  TeV at the Large Hadron Collider with the ALICE detector. The measurement covers backward ( $4.46 < y(\text{cms}) < 2.96$ ) and forward ( $2.03 < y(\text{cms}) < 3.53$ ) rapidity regions, corresponding to Pb-going and p-going directions, respectively. The Z-boson production cross section, with dimuon invariant mass of  $60 < m(\mu\mu) < 120$  GeV/c<sup>2</sup> and muon transverse momentum ( $p(T)(\mu)$ ) larger than 20 GeV/c, is measured. The production cross section and charge asymmetry of muons from W-boson decays with  $p(T)(\mu) > 10$  GeV/c are determined. The results are compared to theoretical calculations both with and without including the nuclear modification of the parton distribution functions. The W-boson production is also studied as a function of the collision centrality: the cross section of muons from W-boson decays is found to scale with the average number of binary nucleon-nucleon collisions within uncertainties.

**JOURNAL OF HIGH ENERGY PHYSICS [2], 077, 2017. DOI: 10.1007/JHEP02(2017)077**

\*Autores da comunidade IFGW  
Fonte: Web of Science on-line.

## Defesas de Dissertações

**[D001-2017] “Teoria de grafos aplicada ao estudo da conectividade funcional de pacientes com comprometimento cognitivo leve e doença de Alzheimer”**

Aluno: Sofia Isabel Coto Guzmán  
Orientador: Profa. Dra. Gabriela Castellano  
Data: 28/04/2017

## Defesas de Teses

**[T004-2017] “Extended Tomography: From Basics to Mapping Mouse Brain”**

Aluno: Rafael Ferreira da Costa Vescovi  
Orientador: Prof. Dr. Mateus Borba Cardoso  
Data: 04/04/2017

**[T005-2017] “Photoluminescence of Tb<sup>3+</sup> in a-Si<sub>3</sub>N<sub>4</sub>:H prepared by reactive RF- Sputtering and ECR PECVD”**

Aluno: Giacomo Bizinoto Ferreira Bosco  
Orientador: Prof. Dr. Leandro Russovski Tessler  
Data: 07/04/2017

[T006-2017] “Multiconfigurational trajectory-guided quantum dynamics with generalized coherent states”

Aluno: Adriano Grigolo

Orientador: Prof. Dr. Marcus Aloizio Martinez de Aguiar

Data: 08/05/2017

[T007-2017] “Vibrational modes as an external environment for the dynamics of molecules”

Aluno: Kellen Manoela Siqueira

Orientador: Prof. Dr. Marcus Aloizio Martinez de Aguiar

Data: 10/05/2017

[T008-2017] “Ressonância Magnética Nuclear e Eletrônica em Sistemas de Elétrons Fortemente Correlacionados”

Aluno: Guilherme Gorgen Lesseux

Orientador: Prof. Dr. Ricardo Rodrigues Urbano

Data: 25/05/2017

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

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

## Patentes

[Pa001-2017] “Método e dispositivo de detecção de hidrogênio, após difundir-se através de camadas metálicas, por medidas de impedância eletroquímica”

Célia Marina de Alvarenga Freire; José Roberto Pereira Rodrigues; Margarita Ballester Cardona

Número da Patente ou Registro: Agência INOVA:

PI0501705-0

Tipo: Patente de Invenção

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Diretor: Prof. Dr. Newton Cesario Frateschi

Diretor Associado: Prof. Dr. Luís Eduardo

Evangelista de Araujo

Universidade Estadual de Campinas - UNICAMP

Cidade Universitária Zeferino Vaz

13083-859 - Campinas - SP - Brasil

e-mail: [secdir@ifi.unicamp.br](mailto:secdir@ifi.unicamp.br)

## Publicação

Biblioteca do Instituto de Física Gleb Wataghin  
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Diretora Técnica: Sandra Maria Carlos Cartaxo  
Coordenador da Comissão de Biblioteca: Prof. Dr. André Koch Torres de Assis

Elaboração

Maria Graciele Trevisan (Bibliotecária)

Ará K. Kedikian (Estagiário)

contato: [infobif@ifi.unicamp.br](mailto:infobif@ifi.unicamp.br)