

# Abstracta

Ano XX - N. 01

**Fev-16**



Trabalhos publicados em 2015 - P342-2015 à P387-2015

Proceedings publicados em 2015 - P388-2015 à P390-2015

Capítulos de Livros - Ca002-2015 à Ca003-2015

Trabalhos publicados em 2016 - P001-2016 à P014-2016

Defesas de Dissertações do IFGW - D001-2016 à D002-2016

Defesas de Teses do IFGW - T001-2016 à T004-2016

## Trabalhos publicados em 2015

### [P342-2015] “Aberrant topological patterns of brain structural network in temporal lobe epilepsy”

Yasuda, C. L.; Chen, Z.; Beltramini, G. C.\*; Coan, A. C.; Morita, M. E.; Kubota, B.; Bergo, F.; Beaulieu, C.; Cendes, F.; Gross, D. W.

Objective Although altered large-scale brain network organization in patients with temporal lobe epilepsy (TLE) has been shown using morphologic measurements such as cortical thickness, these studies, have not included critical subcortical structures (such as hippocampus and amygdala) and have had relatively small sample sizes. Here, we investigated differences in topological organization of the brain volumetric networks between patients with right TLE (RTLE) and left TLE (LTLE) with unilateral hippocampal atrophy. Methods We performed a cross-sectional analysis of 86 LTLE patients, 70 RTLE patients, and 116 controls. RTLE and LTLE groups were balanced for gender ( $p = 0.64$ ), seizure frequency (Mann-Whitney U test,  $p = 0.94$ ), age ( $p = 0.39$ ), age of seizure onset ( $p = 0.21$ ), and duration of disease ( $p = 0.69$ ). Brain networks were constructed by thresholding correlation matrices of volumes from 80 cortical/subcortical regions (parcellated with Freesurfer v5.3) that were then analyzed using graph theoretical approaches. Results We identified reduced cortical/subcortical connectivity including bilateral hippocampus in both TLE groups, with the most significant interregional correlation increases occurring within the limbic system in LTLE and contralateral hemisphere in RTLE. Both TLE groups demonstrated less optimal topological organization, with decreased global efficiency and increased local efficiency and clustering coefficient. LTLE also displayed a more pronounced network disruption. Contrary to controls, hub nodes in both TLE groups were not distributed across whole brain, but rather found primarily in the paralimbic/limbic and temporal association cortices. Regions with increased centrality were concentrated in occipital lobes for LTLE and contralateral limbic/temporal areas for RTLE. Significance These findings provide first evidence of altered topological organization of the whole brain volumetric network in TLE, with disruption of the coordinated patterns of cortical/subcortical morphology.

EPILEPSIA 56[12], 1992-2002, 2015. DOI: 10.1111/epi.13225

### [P343-2015] “Angular coefficients of Z bosons produced in pp collisions at root S=8 TeV and decaying to $\mu^{+}\mu^{-}$ as a function of transverse momentum and rapidity”

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

Measurements of the five most significant angular coefficients,  $A(0)$  through  $A(4)$ , for Z bosons produced in pp collisions at root S = 8 TeV and decaying to  $\mu^{+}\mu^{-}$  are presented as a function of the transverse momentum and rapidity of the Z boson. The integrated luminosity of the dataset collected with the CMS detector at the LHC corresponds to 19.7 fb<sup>-1</sup>. These measurements provide comprehensive information about the Z boson production mechanisms, and are compared to the QCD predictions at leading order, next-to-leading order, and next-to-next-to-leading order in perturbation theory.

PHYSICS LETTERS B 750, 154-175, 2015. DOI: 10.1016/j.physletb.2015.08.061

### [P344-2015] “Centrality dependence of high-p(T) D meson suppression in Pb-Pb collisions at root s(NN)=2.76 TeV”

Adam, J.; Adamova, D.; Aggarwal, M. M.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; et al.

The nuclear modification factor, R-AA, of the prompt charmed mesons D<sup>0</sup>, D<sup>+</sup> and D<sup>+</sup>, and their antiparticles, was measured with the ALICE detector in Pb-Pb collisions at a centre-of-mass energy root s(NN) = 2.76 TeV in two transverse momentum intervals,  $5 < p(T) < 8$  GeV/c and  $8 < p(T) < 16$  GeV/c, and in six collision centrality classes. The R-AA shows a maximum suppression of a factor of 5.6 in the 10% most central collisions. The suppression and its centrality dependence are compatible within uncertainties with those of charged pions. A comparison with the R-AA of non-prompt J/psi from B meson decays, measured by the CMS Collaboration, hints at a larger suppression of D mesons in the most central collisions.

JOURNAL OF HIGH ENERGY PHYSICS 11, 205, 2015. DOI: 10.1007/JHEP11(2015)205

### [P345-2015] “Centrality dependence of inclusive J/psi production in p-Pb collisions at root S-NN=5.02TeV”

Adam, J.; Adamova, D.; Aggarwal, M.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*,  
ALICE Collaboration

We present a measurement of inclusive J/psi production in p-Pb collisions at root S-NN = 5.02 TeV as a function of the centrality of the collision, as estimated from the energy deposited in the Zero Degree Calorimeters. The measurement is performed with the ALICE detector down to zero transverse momentum, p(T), in the backward ( $-4.46 < y(\text{cms}) < -2.96$ ) and forward ( $2.03 < y(\text{cms}) < 3.53$ ) rapidity intervals in the dimuon decay channel and in the mid-rapidity region ( $-1.37 < y(\text{cms}) < 0.43$ ) in the dielectron decay channel. The backward and forward rapidity intervals correspond to the Pb-going and p-going direction, respectively. The p(T)-differential J/psi production cross section at backward and forward rapidity is measured for several centrality classes, together with the corresponding average p(T) and p(T)<sup>2</sup> values. The nuclear modification factor is presented as a function of centrality for the three rapidity intervals, and as a function of p(T) for several centrality classes at backward and forward rapidity. At mid-and forward rapidity, the J/psi yield is suppressed up to 40% compared to that in pp interactions scaled by the number of binary collisions. The degree of suppression increases towards central p-Pb collisions at forward rapidity, and with decreasing p(T) of the J/psi. At backward rapidity, the nuclear modification factor is compatible with unity within the total uncertainties, with an increasing trend from peripheral to central p-Pb collisions.

JOURNAL OF HIGH ENERGY PHYSICS 11, 127, 2015. DOI: 10.1007/JHEP11(2015)127

### [P346-2015] “Coherent psi (2S) photo-production in ultra-peripheral Pb-Pb collisions at root s(NN)=2.76TeV”

Adam, J.; Adamova, D.; Aggarwal, M. M.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; et al.  
ALICE Collaboration

We have performed the first measurement of the coherent psi(2S) photo-production cross section in ultraperipheral Pb-Pb collisions at the LHC. This charmonium excited state is reconstructed via the  $\psi(2S) \rightarrow l^{+}l^{-}$  and  $\psi(2S) \rightarrow J/\psi \pi^{+}\pi^{-}$  decays, where the J/psi decays into two leptons. The analysis is based on an event sample corresponding to an integrated luminosity of about 22 mu b<sup>-1</sup>. The cross section for coherent psi(2S) production in the rapidity interval  $-0.9 < y < 0.9$  is  $d\sigma(\text{coh})(\psi(2S))/dy = 0.83 \pm 0.19$  (stat+syst) mb. The  $\psi(2S)$  to J/psi coherent cross section ratio is  $0.34(-0.07)(+0.08)$ (stat+syst). The obtained results are compared to predictions from theoretical models.

PHYSICS LETTERS B 751, 358-370, 2015. DOI: 10.1016/j.physletb.2015.10.040

[P347-2015] "Contact interaction in a unitary ultracold Fermi gas"

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

An ultracold Fermi atomic gas at unitarity presents universal properties that in the dilute limit can be well described by a contact interaction. By employing a guiding function with correct boundary conditions and making simple modifications to the sampling procedure we are able to calculate the properties of a true contact interaction with the diffusion Monte Carlo method. The results are obtained with small variances. Our calculations for the Bertsch and contact parameters are in reasonable agreement with published experiments. The possibility of using a more faithful description of ultracold atomic gases can help uncover additional features of ultracold atomic gases. In addition, this work paves the way to perform quantum Monte Carlo calculations for other systems interacting with contact interactions, where the description using potentials with finite effective range might not be accurate.

PHYSICAL REVIEW A 92[6] 063625, 2015. DOI: 10.1103/PhysRevA.92.063625

[P348-2015] "Development of zero trans/low sat fat systems structured with sorbitan monostearate and fully hydrogenated canola oil"

de Oliveira, G. M.; Stahl, M. A.; Badan Ribeiro, A. P.; Grimaldi, R.; Cardoso, L. P.\*; Kieckbusch, T. G.

Currently, lipid scientists are searching for alternatives or solutions to a concern widely discussed by health organizations around the world, namely, the demand to limit the amount of saturated fat intake by the population. The present work considers the development of a lipid system with zero trans fat and low contents of saturated fatty acids (low sat). Palm oil (PO) was used as zero trans fat basis and canola oil (CO) as a source of low sat lipids. The functional attributes of these mixtures were adjusted by the incorporation of a structuring agent (sorbitan monostearate-SMS) and a crystallization modifier (fully hydrogenated canola oil-FHCO). Blends of PO with CO were formulated and the effects of adding 6% of a mixture of FHCO and SMS (50: 50 w/w) to the samples were evaluated measuring the solid fat content by NMR, the thermal events by DSC and the polymorphism by XRD. Result for the oil blend (50: 50 PO: CO) indicated a reduction of 40.52% in the content of saturated fatty acids compared to the original sample (100: 0 PO: CO). The additives increased the consistency and the thermal resistance of the samples and proved to be effective in forming a homogeneous structural network, ensuring the continuity of the liquid oil inside the lipid matrix. Practical applications: This research on oleogels systems has demonstrated the great potential of structuring agents for a wide variety of applications. The oil-based fats development can be used to replace high saturated fats or hydrogenated oils in formulation of margarines, shortenings, spreads, and other specific applications.

EUROPEAN JOURNAL OF LIPID SCIENCE AND TECHNOLOGY 117[11], SI, 762-1771, 2015. DOI: 10.1002/ejlt.201400559

[P349-2015] "Distinct regulation of hypothalamic and brown/beige adipose tissue activities in human obesity"

Rachid, B.; van de Sande-Lee, S.; Rodvalho, S.; Folli, F.; Beltramini, G. C.\*; Morari, J.; Amorim, B. J.; Pedro, T.; Ramalho, A. F.; Bombassaro, B.; Tincani, A. J.; Chaim, E.; Pareja, J. C.; Geloneze, B.; Ramos, C. D.; Cendes, F.; Saad, M. J. A.; Velloso, L. A.

BACKGROUND/OBJECTIVES: The identification of brown/beige adipose tissue in adult humans has motivated the search for methods aimed at increasing its thermogenic activity as an approach to treat obesity. In rodents, the brown adipose tissue is under the control of sympathetic signals originating in the hypothalamus. However, the putative connection between the depots of brown/beige adipocytes and the hypothalamus in humans has never been explored. The objective of this study was to evaluate the response of the hypothalamus and brown/beige adipose tissue to cold stimulus in obese subjects undergoing body mass reduction following gastric bypass. SUBJECTS/METHODS: We evaluated twelve obese, non-diabetic subjects undergoing Roux-in-Y gastric bypass and 12 lean controls. Obese subjects were evaluated before and approximately 8 months after gastric bypass. Lean subjects were evaluated only at admission. Subjects were evaluated for hypothalamic activity in response to cold by functional magnetic resonance, whereas brown/beige adipose tissue activity was evaluated using a (F 18) fluorodeoxyglucose positron emission tomography/computed tomography scan and real-time PCR measurement of signature genes. RESULTS: Body mass reduction resulted in a significant increase in brown/beige adipose tissue activity in response to cold; however, no change in cold-induced hypothalamic activity was observed after body mass reduction. No correlation was found between brown/beige adipose tissue activation and hypothalamus activity in obese subjects or in lean controls. CONCLUSIONS: In humans, the increase in brown/beige adipose tissue activity related to body mass reduction occurs independently of changes in hypothalamic activity as determined by functional magnetic resonance.

INTERNATIONAL JOURNAL OF OBESITY 39[10], 1515-1522, 2015. DOI: 10.1038/ijo.2015.94

[P350-2015] "Effect of Low Temperature Nitriding of 100Cr6 Substrates on TiN Coatings Deposited by IBAD"

Vales, S. dos S.; Ochoa Becerra, E. A.\*; Brito, P. P.; Droppa Junior, R.; Garcia, J. L.; Alvarez, F.\*; Pinto, H. C.

In this paper we studied the influence of pre-treating the surface of 100Cr6 steel by ion beam nitriding at low temperature (380 degrees C) on the surface topography and wear resistance of thin TiN coatings deposited by reactive ion beam assisted deposition. The specimens were characterized by grazing incidence X-ray diffraction, scanning electron microscopy and atomic force microscopy. The wear resistance of the TiN-coated specimens was evaluated by means of ball on disc tests. The results showed that application of a preliminary ion beam nitriding treatment slightly increased the surface roughness but improved the wear resistance of the 100Cr6 steel due to the formation of a diffusion zone containing the gamma'-Fe4N nitride combined with the TiN coating.

MATERIALS RESEARCH-IBERO-AMERICAN JOURNAL OF MATERIALS 18[1] 54-58, 2015. DOI: 10.1590/1516-1439.266514

[P351-2015] "Energy dependence of acceptance-corrected dielectron excess mass spectrum at mid-rapidity in Au plus Au collisions at root(NN)-N-S=19.6 and 200 GeV"

Adamczyk, L.; Adkins, J. K.; Agakishiev, G.; Takahashi, J.\*; et al.  
STAR Collaboration



The acceptance-corrected dielectron excess mass spectra, where the known hadronic sources have been subtracted from the inclusive dielectron mass spectra, are reported for the first time at mid-rapidity vertical bar  $Y_{ee}$  vertical bar  $<1$  in minimum-bias Au + Au collisions at  $\sqrt{s_{NN}}$ -N-S and 200 GeV. The excess mass spectra are consistently described by a model calculation with a broadened  $p$  spectral function for  $M_{ee} < 1.1$  GeV/c<sup>2</sup>. The integrated dielectron excess yield at  $\sqrt{s_{NN}}$ -N-S = 19.6 GeV for  $0.4 < M_{ee} < 0.75$  GeV/c<sup>2</sup>, normalized to the charged particle multiplicity at mid-rapidity, has a value similar to that in In + In collisions at  $\sqrt{s_{NN}}$ -N-S = 17.3 GeV. For  $\sqrt{s_{NN}}$ -N-S = 200 GeV, the normalized excess yield in central collisions is higher than that at  $\sqrt{s_{NN}}$ -N-S = 17.3 GeV and increases from peripheral to central collisions. These measurements indicate that the lifetime of the hot, dense medium created in central Au + Au collisions at  $\sqrt{s_{NN}}$ -N-S = 200 GeV is longer than those in peripheral collisions and at lower energies.

**PHYSICS LETTERS B 750, 64-71, 2015. DOI: 10.1016/j.physletb.2015.08.044**

**[P352-2015] "Equilibrium and Nonequilibrium Features in a Warm He+H<sub>2</sub>O Microwave Plasma at Atmospheric Pressure"**

Ridenti, M. A.\*; de Amorim, J.\*; Dal Pino, A., Jr.

A microwave surface-wave discharge at atmospheric pressure was generated using a He/H<sub>2</sub>O mixture and studied by optical emission spectroscopy. The main plasma parameters were determined based on the analysis of the spectra when partial thermodynamic equilibrium could be verified. The analysis showed that the system can be classified as a warm plasma with an average gas temperature of  $1.7 \times 10(3)$  K, an axially averaged electron density of  $2.4 \times 10(13)$  cm<sup>-3</sup>, and a semiempirically estimated average electron temperature of  $15 \times 10(3)$  K. The experimental evidence and theoretical arguments suggest that the main source of ionization in this plasma is the electronic impact ionization of water molecules. An abnormal intensity in the O I [  $3p(3)P(0,1,2)$  ] -> [  $3s(3)S(1)$ degrees] transition was observed, revealing an overpopulation of the  $3p(3)P(0,1,2)$  states. This observation-which may be explored to obtain stimulated emission-was explained as an effect of the reabsorption of photons generated in the plasma by the H I Ly beta emission by oxygen atoms ( O (IP2)-P-3 ->  $3d(3)D(1,2,3)$ degrees transition), an effect generally known as photoexcitation by accidental resonance.

**IEEE TRANSACTIONS ON PLASMA SCIENCE 43[12] 4066-4076, 2015. DOI: 10.1109/TPS.2015.2496870**

**[P353-2015] "Excitation of vibrational quanta in furfural by intermediate-energy electrons"**

Jones, D. B.; Neves, R. F. C.; Lopes, M. C. A.; da Costa, R. F.\*; Varella, M. T. do N.; Bettega, M. H. F.; Lima, M. A. P.\*; Garcia, G.; Blanco, F.; Brunger, M. J.

We report cross sections for electron-impact excitation of vibrational quanta in furfural, at intermediate incident electron energies (20, 30, and 40 eV). The present differential cross sections are measured over the scattered electron angular range 10 degrees-90 degrees, with corresponding integral cross sections subsequently being determined. Furfural is a viable plant-derived alternative to petrochemicals, being produced via low-temperature plasma treatment of biomass. Current yields, however, need to be significantly improved, possibly through modelling, with the present cross sections being an important component of such simulations. To the best of our knowledge, there are no other cross sections for vibrational excitation of furfural available in the literature, so the present data are valuable for this important molecule.

**JOURNAL OF CHEMICAL PHYSICS 143[22] 224304, 2015. DOI: 10.1063/1.4936631**

**[P354-2015] "Exploring Crystal Phase Switching in GaP Nanowires"**

Assali, S.; Gagliano, L.; Oliveira, D. S.\*; Verheijen, M. A.; Pissard, S. R.; Feiner, L. F.; Bakkers, E. P. A. M.

The growth of wurtzite/zincblende (WZ and ZB, respectively) superstructures opens new avenues for band structure engineering and holds the promise of digitally controlling the energy spectrum of quantum confined systems. Here, we study growth kinetics of pure and thus defect-free WZ/ZB homostructures in GaP nanowires with the aim to obtain monolayer control of the ZB and WZ segment lengths. We find that the Ga concentration and the supersaturation in the catalyst particle are the key parameters determining growth kinetics. These parameters can be tuned by the gallium partial pressure and the temperature. The formation of WZ and ZB can be understood with a model based on nucleation either at the triple phase line for the WZ phase or in the center of the solid liquid interface for the ZB phase. Furthermore, the observed delay/offset time needed to induce WZ and ZB growth after growth of the other phase can be explained within this framework.

**NANO LETTERS 15[12] 8062-8069, 2015. DOI: 10.1021/acs.nanolett.5b03484**

**[P355-2015] "Fiber-optic Monitoring of Spinal Cord Hemodynamics in Experimental Aortic Occlusion"**

Kogler, A. S.; Bilfinger, T. V.; Galler, R. M.; Mesquita, R. C.\*; Cutrone, M.; Schenkel, S. S.; Yodh, Arjun G.; Floyd, Thomas F.

Background: Spinal cord ischemia occurs frequently during thoracic aneurysm repair. Current methods based on electrophysiology techniques to detect ischemia are indirect, non-specific, and temporally slow. In this article, the authors report the testing of a spinal cord blood flow and oxygenation monitor, based on diffuse correlation and optical spectroscopies, during aortic occlusion in a sheep model. Methods: Testing was carried out in 16 Dorset sheep. Sensitivity in detecting spinal cord blood flow and oxygenation changes during aortic occlusion, pharmacologically induced hypotension and hypertension, and physiologically induced hypoxia/hypercarbia was assessed. Accuracy of the diffuse correlation spectroscopy measurements was determined via comparison with microsphere blood flow measurements. Precision was assessed through repeated measurements in response to pharmacologic interventions. Results: The fiber-optic probe can be placed percutaneously and is capable of continuously measuring spinal cord blood flow and oxygenation preoperatively, intraoperatively, and postoperatively. The device is sensitive to spinal cord blood flow and oxygenation changes associated with aortic occlusion, immediately detecting a decrease in blood flow (-65 32%; n = 32) and blood oxygenation (-17 +/- 13%, n = 11) in 100% of trials. Comparison of spinal cord blood flow measurements by the device with microsphere measurements led to a correlation of  $R^2 = 0.49$ ,  $P < 0.01$ , and the within-sheep coefficient of variation was 9.69%. Finally, diffuse correlation spectroscopy is temporally more sensitive to ischemic interventions than motor-evoked potentials. Conclusion: The first-generation spinal fiber-optic monitoring device offers a novel and potentially important step forward in the monitoring of spinal cord ischemia.

**ANESTHESIOLOGY 123[6] 1362-1373, 2015. DOI: 10.1097/ALN.0000000000000883**

**[P356-2015] "Flat-band ferromagnetism and spin waves in topological Hubbard models"**

Doretto, R. L.\*; Goerbig, M. O.

We study the flat-band ferromagnetic phase of a topological Hubbard model within a bosonization formalism and, in particular, determine the spin-wave excitation spectrum. We consider a square lattice Hubbard model at 1/4-filling whose free-electron term is the p-flux model with topologically nontrivial and nearly flat energy bands. The electron spin is introduced such that the model either explicitly breaks time-reversal symmetry (correlated flat-band Chern insulator) or is invariant under time-reversal symmetry (correlated flat-band Z(2) topological insulator). We generalize for flat-band Chern and topological insulators the bosonization formalism [R. L. Doretto, A. O. Caldeira, and S. M. Girvin, Phys. Rev. B 71, 045339 (2005)] previously developed for the two-dimensional electron gas in a uniform and perpendicular magnetic field at filling factor  $\nu = 1$ . We show that, within the bosonization scheme, the topological Hubbard model is mapped to an effective interacting boson model. We consider the boson model at the harmonic approximation and show that, for the correlated Chern insulator, the spin-wave excitation spectrum is gapless while, for the correlated topological insulator, gapped. We briefly comment on the possible effects of the boson-boson (spin-wave-spin-wave) coupling.

PHYSICAL REVIEW B 92[24] 245124, 2015. DOI: 10.1103/PhysRevB.92.245124

[P357-2015] “Gravitational induction with Weber’s force”

Tajmar, M.; Assis, A. K. T.\*

According to Faraday’s law of induction, when we change the current intensity in a primary electric circuit we can induce a current in a secondary circuit under appropriate conditions. An electric current means charges in motion. Microscopically we can express Faraday’s law by saying that when we accelerate charges in the primary circuit, a force is exerted on charges of the secondary circuit, which can accelerate them. A similar effect also exists in gravity with accelerated masses, but of course with much less intensity. The phenomenon is called frame dragging and can be derived from general relativity theory. Here we present an alternative way to calculate such gravitational induction forces based on Weber’s law that only involves simple mathematics and incorporates other fundamental concepts, such as Newton’s third law, and Mach’s principle as the origin of inertia. It therefore summarizes all low-velocity gravitationally relevant effects into a single equation.

CANADIAN JOURNAL OF PHYSICS 93[12], 1571-1573, 2015. DOI: 10.1139/cjp-2015-0285

[P358-2015] “Higher-order generalized hydrodynamics of carriers and phonons in semiconductors in the presence of electric fields: Macro to nano”.

Rodrigues, C. G.; Castro, A. R. B.\*; Luzzi, R.\*

The hydrodynamics of carriers (charge and heat motion) and phonons (heat motion) in semiconductors is analyzed in the presence of constant electric fields. This is done in terms of the so-called higher-order generalized hydrodynamics (HOGH), also referred to as mesoscopic hydro-thermodynamics (MHT), that is, covering phenomena involving motions displaying variations short in space and fast in time and being arbitrarily removed from equilibrium, as it is the case in modern electronic devices. The particular case of an MHT of order 1 is described, covering wire samples from macro to nano sizes. Electric and thermal conductivities are obtained. As the size decreases toward the nanometric scale, the MHT of order 1 produces results that in some cases greatly differ from those of the usual hydro-thermodynamics. The so-called Maxwell times associated to the different fluxes present in MHT are evidenced and analyzed; they have a quite relevant role in determining the characteristics of the motion.

PHYSICA STATUS SOLIDI B-BASIC SOLID STATE PHYSICS 252[12] 2802-2819, 2015. DOI: 10.1002/pssb.201552309

[P359-2015] “Magnetic characterization of chitosan-magnetite nanocomposite films”

Kloster, G. A.; Muraca, D.\*; Meiorin, C.\*; Pirota, K. R.\*; Marcovich, N. E.; Mosiewicki, M. A.

Magnetic nanocomposites using chitosan as a matrix and magnetite nanoparticles (MNP) generated “in situ” were prepared and magnetically characterized. The content of nanoparticles on the composites was varied from 2 to 10 wt.% and their effects, as well as the addition of 30 wt.% of glycerol as plasticizer in the formulation, were analyzed. The magnetization properties were evaluated using the zero field cooling/field cooling (ZFC/FC) measurements and magnetization loops obtained at different temperatures. The results showed that magnetization at high field (20 KOe) and coercivity increase with magnetite content. Super-paramagnetic behavior was observed for all non-plasticized samples with exception of the film with 2 wt.% of magnetite. Glycerol affected significantly the composite magnetization values and the magnetic interactions between particles, which are reflected in the blocking and irreversibility temperatures of the different systems. Moreover, the size of the precipitated magnetic nanoparticles depends on their concentration as well as on the addition of plasticizer to the formulation, as was corroborated by TEM and SAXS measurements.

EUROPEAN POLYMER JOURNAL 72, 202-211, 2015. DOI: 10.1016/j.eurpolymj.2015.09.014

[P360-2015] “Measurement of charged jet production cross sections and nuclear modification in p-Pb collisions at root s(NN)=5.02 TeV”

Adam, J.; Adamova, D.; Aggarwal, M. M.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; et al.  
ALICE Collaboration

Charged jet production cross sections in p-Pb collisions at root s(NN) = 5.02 TeV measured with the ALICE detector at the LHC are presented. Using the anti-k(T) algorithm, jets have been reconstructed in the central rapidity region from charged particles with resolution parameters  $R = 0.2$  and  $R = 0.4$ . The reconstructed jets have been corrected for detector effects and the underlying event background. To calculate the nuclear modification factor,  $R_{pPb}$ , of charged jets in p-Pb collisions, a pp reference was constructed by scaling previously measured charged jet spectra at root s = 7 TeV. In the transverse momentum range  $20 \leq p(T, \text{chjet}) \leq 120$  GeV/c,  $R_{pPb}$  is found to be consistent with unity, indicating the absence of strong nuclear matter effects on jet production. Major modifications to the radial jet structure are probed via the ratio of jet production cross sections reconstructed with the two different resolution parameters. This ratio is found to be similar to the measurement in pp collisions at root s = 7 TeV and to the expectations from PYTHIA pp simulations and NLO pQCD calculations at root s(NN) = 5.02 TeV.

PHYSICS LETTERS B 749, 68-81, 2015. DOI: 10.1016/j.physletb.2015.07.054

[P361-2015] “Measurement of the cosmic ray spectrum above  $4 \times 10^{18}$  eV using inclined events detected with the Pierre Auger Observatory”

Aab, A.; Abreu, P.; Aglietta, M.; 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\*; Santos, E.\*; Theodoro, V. M.\*; et al.  
Pierre Auger Collaboration

A measurement of the cosmic-ray spectrum for energies exceeding  $4 \times 10^{18}$  eV is presented, which is based on the analysis of showers with zenith angles greater than 60 degrees detected with the Pierre Auger Observatory between 1 January 2004 and 31 December 2013. The measured spectrum confirms a flux suppression at the highest energies. Above  $5.3 \times 10^{18}$  eV, the “ankle”, the flux can be described by a power law  $E^{-\gamma}$  with index  $\gamma = 2.70 \pm 0.02$  (stat)  $\pm 0.1$  (sys) followed by a smooth suppression region. For the energy ( $E_s$ ) at which the spectral flux has fallen to one-half of its extrapolated value in the absence of suppression, we find  $E_s = (5.12 \pm 0.25$  (stat)  $(-1.2)(+1.0)$  (sys))  $\times 10^{19}$  eV.

**JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS 8, 049, 2015. DOI: 10.1088/1475-7516/2015/08/049**

**[P362-2015] “Measurement of the differential cross section for top quark pair production in pp collisions at root s=8TeV”**

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

The normalized differential cross section for top quark pair ( $t$  ( $\bar{t}$ ) over  $\bar{b}$ ) production is measured in pp collisions at a centre-of-mass energy of 8 TeV at the CERN LHC using the CMS detector in data corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup>. The measurements are performed in the lepton+jets ( $e/\mu$ +jets) and in the dilepton ( $e^+e^-$ ,  $\mu^+\mu^-$ , and  $e^{+/-}\mu^{-/+}$ ) decay channels. The  $t$  ( $\bar{t}$ ) over  $\bar{b}$  cross section is measured as a function of the kinematic properties of the charged leptons, the jets associated to  $b$  quarks, the top quarks, and the  $t$  ( $\bar{t}$ ) over  $\bar{b}$  system. The data are compared with several predictions from perturbative quantum chromodynamic up to approximate next-to-next-to-leading-order precision. No significant deviations are observed relative to the standard model predictions.

**EUROPEAN PHYSICAL JOURNAL C 75[11] 542, 2015. DOI: 10.1140/epjc/s10052-015-3709-x**

**[P363-2015] “Measurement of the Z boson differential cross section in transverse momentum and rapidity in proton-proton collisions at 8 TeV”**

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

We present a measurement of the Z boson differential cross section in rapidity and transverse momentum using a data sample of pp collision events at a centre-of-mass energy  $\sqrt{s} = 8$  TeV, corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup>. The Z boson is identified via its decay to a pair of muons. The measurement provides a precision test of quantum chromodynamics over a large region of phase space. In addition, due to the small experimental uncertainties in the measurement the data has the potential to constrain the gluon parton distribution function in the kinematic regime important for Higgs boson production via gluon fusion. The results agree with the next-to-next-to-leading-order predictions computed with the *fewz* program. The results are also compared to the commonly used leading-order MADGRAPH and next-to-leading-order POWHEG generators.

**PHYSICS LETTERS B 749, 187-209, 2015. DOI: 10.1016/j.physletb.2015.07.065**

**[P364-2015] “Measurements of the Upsilon(1S), Upsilon(2S), and Upsilon(3S) differential cross sections in pp collisions at root s=7 TeV”**

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

Differential cross sections as a function of transverse momentum  $p(T)$  are presented for the production of Upsilon( $nS$ ) ( $n = 1, 2, 3$ ) states decaying into a pair of muons. Data corresponding to an integrated luminosity of 4.9 fb<sup>-1</sup> in pp collisions at  $\sqrt{s} = 7$  TeV were collected with the CMS detector at the LHC. The analysis selects events with dimuon rapidity  $|\eta| < 2.4$  and dimuon transverse momentum in the range  $10 < p(T) < 100$  GeV. The measurements show a transition from an exponential to a power-law behavior at  $p(T)$  approximate to 20 GeV for the three Upsilon states. Above that transition, the Upsilon(3S) spectrum is significantly harder than that of the Upsilon(1S). The ratios of the Upsilon(3S) and Upsilon(2S) differential cross sections to the Upsilon(1S) cross section show a rise as  $p(T)$  increases at low  $p(T)$ , then become flatter at higher  $p(T)$ .

**PHYSICS LETTERS B 749, 14-34, 2015. DOI: 10.1016/j.physletb.2015.07.037**

**[P365-2015] “Mid-infrared optical frequency combs based on difference frequency generation for molecular spectroscopy”**

Cruz, F. C.\*; Maser, D. L.; Johnson, T.; Ycas, G.; Klose, A.; Giorgetta, F. R.; Coddington, I.; Diddams, S. A.

Mid-infrared femtosecond optical frequency combs were produced by difference frequency generation of the spectral components of a near-infrared comb in a 3-mm-long MgO:PPLN crystal. We observe strong pump depletion and 9.3 dB parametric gain in the 1.5  $\mu\text{m}$  signal, which yields powers above 500 mW (3  $\mu\text{W}/\text{mode}$ ) in the idler with spectra covering 2.8  $\mu\text{m}$  to 3.5  $\mu\text{m}$ . Potential for broadband, high-resolution molecular spectroscopy is demonstrated by absorption spectra and interferograms obtained by heterodyning two combs.

**OPTICS EXPRESS 23[20] 26814-26824, 2015. DOI: 10.1364/OE.23.026814**

**[P366-2015] “MRI Texture Analysis Reveals Bulbar Abnormalities in Friedreich Ataxia”**

Santos, T. A.\*; Maistro, C. E. B.\*; Silva, C. B.; Oliveira, M. S.\*; Franca, M. C., Jr.; Castellano, G.\*

**BACKGROUND AND PURPOSE:** Texture analysis is an image processing technique that can be used to extract parameters able to describe meaningful features of an image or ROI. Texture analysis based on the gray level co-occurrence matrix gives a second-order statistical description of the image or ROI. In this work, the co-occurrence matrix texture approach was used to extract information from brain MR images of patients with Friedreich ataxia and a control group, to see whether texture parameters were different between these groups. A longitudinal analysis was also performed. **MATERIALS AND METHODS:** Twenty patients and 21 healthy controls participated in the study. Both groups had 2 sets of T1-weighted MR images obtained 1 year apart for every subject. ROIs chosen for analysis were the medulla oblongata and pons. Texture parameters were obtained for these ROIs for every subject, for the 2 sets of images. These parameters were compared longitudinally within groups and transversally between groups. **RESULTS:** The comparison between patients and the control group showed a significant differences for the medulla oblongata ( $t$  test,  $P < .05$ , Bonferroni-corrected) but did not show a statistically significant difference for the pons.



Longitudinal comparison of images obtained 1 year apart did not show differences for either patients or for controls, in any of the analyzed structures. CONCLUSIONS: Gray level co-occurrence matrix based texture analysis showed statistically significant differences for the medulla oblongata of patients with Friedreich ataxia compared with controls. These results highlight the medulla as an important site of damage in Friedreich ataxia.

**AMERICAN JOURNAL OF NEURORADIOLOGY 36[12] 2214-2218, 2015. DOI: 10.3174/ajnr.A4455**

**[P367-2015] "Multiband electronic characterization of the complex intermetallic cage system Y1-xGdxCo2Zn20"**

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

A detailed microscopic and quantitative description of the electronic and magnetic properties of Gd<sup>3+</sup>-doped YCo<sub>2</sub>Zn<sub>20</sub> single crystals (Y<sub>1-x</sub>Gd<sub>x</sub>Co<sub>2</sub>Zn<sub>20</sub>, 0.002 less than or similar to x <= 1.00) is reported through a combination of temperature-dependent electron spin resonance (ESR), heat capacity, and dc magnetic susceptibility experiments, plus first-principles density functional theory (DFT) calculations. The ESR results indicate that this system features an exchange bottleneck scenario wherein various channels for the spin-lattice relaxation mechanism of the Gd<sup>3+</sup> ions can be identified via exchange interactions with different types of conduction electrons at the Fermi level. Quantitative support from the other techniques allows us to extract the exchange interaction parameters between the localized magnetic moments of the Gd<sup>3+</sup> ions and the different types of conduction electrons present at the Fermi level (J(fs), J(fp), and J(fd)). Despite the complexity of the crystal structure, our combination of experimental and electronic structure data establish GdCo<sub>2</sub>Zn<sub>20</sub> as a model RKKY system by predicting a Curie-Weiss temperature theta(C) = -1.2(2) K directly from microscopic parameters, in very good agreement with the bulk value from magnetization data. The successful microscopic understanding of the electronic structure and behavior for the two end compounds YCo<sub>2</sub>Zn<sub>20</sub> and GdCo<sub>2</sub>Zn<sub>20</sub> means they can be used as references to help describe the more complex electronic properties of related materials.

**PHYSICAL REVIEW B 92[21] 214414, 2015. DOI: 10.1103/PhysRevB.92.214414**

**[P368-2015] "On the viability of minimal neutrinophilic two-Higgs-doublet models"**

Machado, P. A. N.; Perez, Y. F.; Sumensari, O.; Tabrizi, Z.\*; Zukanovich Funchal, R.

We study the constraints that electroweak precision data can impose, after the discovery of the Higgs boson by the LHC, on neutrinophilic two-Higgs-doublet models which comprise one extra SU(2) x U(1) doublet and a new symmetry, namely a spontaneously broken Z(2) or a softly broken global U(1). In these models the extra Higgs doublet, via its very small vacuum expectation value, is the sole responsible for neutrino masses. We find that the model with a Z(2) symmetry is basically ruled out by electroweak precision data, even if the model is slightly extended to include extra right-handed neutrinos, due to the presence of a very light scalar. While the other model is still perfectly viable, the parameter space is considerably constrained by current data, specially by the T parameter. In particular, the new charged and neutral scalars must have very similar masses.

**JOURNAL OF HIGH ENERGY PHYSICS 12, 160, 2015. DOI: 10.1007/JHEP12(2015)160**

**[P369-2015] "One-dimensional pion, kaon, and proton femtoscopy in Pb-Pb collisions at root(sNN)=2.76 TeV"**

Adam, J.; Adamova, D.; Aggarwal, M. M.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; et al.  
ALICE Collaboration

The size of the particle emission region in high-energy collisions can be deduced using the femtoscopic correlations of particle pairs at low relative momentum. Such correlations arise due to quantum statistics and Coulomb and strong final state interactions. In this paper, results are presented from femtoscopic analyses of pi(+/-) pi(+/-), K+/- K+/-, K-S(0) K-S(0), pp, and (pp) over bar correlations from Pb-Pb collisions at root s(NN) = 2.76 TeV by the ALICE experiment at the LHC. One-dimensional radii of the system are extracted from correlation functions in terms of the invariant momentum difference of the pair. The comparison of the measured radii with the predictions from a hydrokinetic model is discussed. The pion and kaon source radii display a monotonic decrease with increasing average pair transverse mass m(T) which is consistent with hydrodynamic model predictions for central collisions. The kaon and proton source sizes can be reasonably described by approximate m(T) scaling.

**PHYSICAL REVIEW C 92[5] 054908, 2015. DOI: 10.1103/PhysRevC.92.054908**

**[P370-2015] "Optimal synchronization of Kuramoto oscillators: A dimensional reduction approach"**

Pinto, R. S.\*; Saa, A.

A recently proposed dimensional reduction approach for studying synchronization in the Kuramoto model is employed to build optimal network topologies to favor or to suppress synchronization. The approach is based in the introduction of a collective coordinate for the time evolution of the phase locked oscillators, in the spirit of the Ott-Antonsen ansatz. We show that the optimal synchronization of a Kuramoto network demands the maximization of the quadratic function omega(T) L omega, where omega stands for the vector of the natural frequencies of the oscillators and L for the network Laplacian matrix. Many recently obtained numerical results can be reobtained analytically and in a simpler way from our maximization condition. A computationally efficient hill climb rewiring algorithm is proposed to generate networks with optimal synchronization properties. Our approach can be easily adapted to the case of the Kuramoto models with both attractive and repulsive interactions, and again many recent numerical results can be rederived in a simpler and clearer analytical manner.

**PHYSICAL REVIEW E 92[6] 062801, 2015. DOI: 10.1103/PhysRevE.92.062801**

**[P371-2015] "Production of leading charged particles and leading charged-particle jets at small transverse momenta in pp collisions at root s=8 TeV"**

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

The per-event yield of the highest transverse momentum charged particle and charged-particle jet, integrated above a given p(T)(min) threshold starting at p(T)(min) = 0.8 and 1 GeV, respectively, is studied in pp collisions at root s = 8 TeV. The particles and the jets are measured in the pseudorapidity ranges vertical bar n vertical bar < 2.4 and 1.9, respectively. The data are sensitive to the momentum scale at which parton densities saturate in the proton, to multiple partonic interactions, and to other key aspects of the transition between the soft and hard QCD regimes in hadronic collisions.

PHYSICAL REVIEW D 92[11] 112001, 2015. DOI: 10.1103/PhysRevD.92.112001

[P372-2015] "Pseudorapidity distribution of charged hadrons in proton-proton collisions at  $\sqrt{s}=13\text{TeV}$ "

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

The pseudorapidity distribution of charged hadrons in pp collisions at  $\sqrt{s} = 13$  TeV is measured using a data sample obtained with the CMS detector, operated at zero magnetic field, at the CERN LHC. The yield of primary charged long-lived hadrons produced in inelastic pp collisions is determined in the central region of the CMS pixel detector ( $|\eta| < 2$ ) using both hit pairs and reconstructed tracks. For central pseudorapidities ( $|\eta| < 0.5$ ), the charged-hadron multiplicity density is  $dN(\text{ch})/d\eta$  (vertical bar  $\eta$  vertical bar  $< 0.5$ ) =  $5.49 \pm 0.01$  (stat)  $\pm 0.17$  (syst), a value obtained by combining the two methods. The result is compared to predictions from Monte Carlo event generators and to similar measurements made at lower collision energies.

PHYSICS LETTERS B 751, 143-163, 2015. DOI: 10.1016/j.physletb.2015.10.004

[P373-2015] "Reviewing recent results from the Pierre Auger Observatory"

Dobrigkeit, C.\*;  
Pierre Auger Collaboration

The Pierre Auger Observatory addresses the most fundamental questions about the nature and origin of the highest-energy cosmic rays. The results obtained by the Auger Observatory have already led to a number of major breakthroughs in the field contributing to the advance of our understanding of these extremely energetic particles. The spectrum and the arrival direction distribution are key observables to search for sources or source regions of ultra-high energy cosmic rays, and to understand the transition from Galactic to extragalactic cosmic rays. We present the latest results on the energy spectrum, and on the studies of anisotropies performed on the ten-year dataset of arrival directions of cosmic rays at large and small angular scales. We also address the plans and motivations for the future upgrade of the Pierre Auger Observatory.

ASTRONOMISCHE NACHRICHTEN 336[8-9] 778-784, 2015. DOI: 10.1002/asna.201512227

[P374-2015] "Scalar dark matter in light of LEP and proposed ILC experiments"

Rossi-Torres, F.\*; Moura, C. A.

In this work we investigate a scalar field dark matter model with mass on the order of 100 MeV. We assume dark matter is produced in the process  $e(-) + e(+) \rightarrow \phi + \phi^* + \gamma$  which, in fact, could be a background for the standard process  $e(-) + e(+) \rightarrow \nu + (\bar{\nu}) + \gamma$  extensively studied at LEP. We constrain the chiral couplings CL and C-R of the dark matter with electrons through an intermediate fermion of mass  $m(F) = 100$  GeV and obtain  $C-L = 0.1(0.25)$  and  $C-R = 0.25(0.1)$  for the best-fit point of our  $\chi^2$  analysis. We also analyze the potential of the International Linear Collider to constrain this scalar dark matter for two configurations: (i) a center-of-mass energy  $\sqrt{s} = 500$  GeV and luminosity  $L = 250 \text{ fb}^{-1}$ , and (ii) a center-of-mass energy  $\sqrt{s} = 1$  TeV and luminosity  $L = 500 \text{ fb}^{-1}$ .

The differences of polarized beams are also explored to better understand the chiral couplings.

PHYSICAL REVIEW D 92[11] 115022, 2015. DOI: 10.1103/PhysRevD.92.115022

[P375-2015] "Search for a charged Higgs boson in pp collisions at  $\sqrt{s}=8$  TeV"

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

A search for a charged Higgs boson is performed with a data sample corresponding to an integrated luminosity of  $19.7 \pm 0.5 \text{ fb}^{-1}$  collected with the CMS detector in proton-proton collisions at  $\sqrt{s} = 8, \text{TeV}$ . The charged Higgs boson is searched for in top quark decays for  $m(H^{+/-}) < m(t) - m(b)$ , and in the direct production  $pp \rightarrow t(b)H^{+/-}$  for  $m(H^{+/-}) > m(t) - m(b)$ . The  $H^{+/-} \rightarrow \tau^{+/-}\nu(\tau)$  and  $H^{+/-} \rightarrow tb$  decay modes in the final states  $\tau(h)+\text{jets}$ ,  $\mu\tau(h)$ ,  $l+\text{jets}$ , and  $l'l'$  ( $l = e, \mu$ ) are considered in the search. No signal is observed and 95% confidence level upper limits are set on the charged Higgs boson production. A model-independent upper limit on the product branching fraction  $B(t \rightarrow H^{+/-}b) B(H^{+/-} \rightarrow \tau^{+/-}\nu(\tau)) = 1.2-0.15\%$  is obtained in the mass range  $m(H^{+/-}) = 80-160$  GeV, while the upper limit on the cross section times branching fraction  $\sigma(pp \rightarrow t(b)H^{+/-}) B(H^{+/-} \rightarrow \tau^{+/-}\nu(\tau)) = 0.38-0.025 \text{ pb}$  is set in the mass range  $m(H^{+/-}) = 180-600$  GeV. Here,  $\sigma(pp \rightarrow t(b)H^{+/-})$  stands for the cross section sum  $\sigma(pp \rightarrow (t) \text{ over bar } H^{+/-}) + \sigma(pp \rightarrow t(b) \text{ over bar } H^{-})$ . Assuming  $B(t \rightarrow H^{+/-}b) = 1$ , an upper limit on  $\sigma(pp \rightarrow t(b)H^{+/-})$  of  $2.0-0.13 \text{ pb}$  is set for  $m(H^{+/-}) = 180-600$  GeV. The combination of all considered decay modes and final states is used to set exclusion limits in the  $m(H^{+/-})$ - $\tan\beta$  parameter space in different MSSM benchmark scenarios.

JOURNAL OF HIGH ENERGY PHYSICS 11, 018, 2015. DOI: 10.1007/JHEP11(2015)018

[P376-2015] "Search for diphoton resonances in the mass range from 150 to 850 GeV in pp collisions at  $\sqrt{s}=8$  TeV"

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

Results are presented of a search for heavy particles decaying into two photons. The analysis is based on a  $19.7 \text{ fb}^{-1}$  sample of proton-proton collisions at  $\sqrt{s} = 8$  TeV collected with the CMS detector at the CERN LHC. The diphoton mass spectrum from 150 to 850 GeV is used to search for an excess of events over the background. The search is extended to new resonances with natural widths of up to 10% of the mass value. No evidence for new particle production is observed and limits at 95% confidence level on the production cross section times branching fraction to diphotons are determined. These limits are interpreted in terms of two-Higgs-doublet model parameters.

PHYSICS LETTERS B 750, 494-519, 2015. DOI: 10.1016/j.physletb.2015.09.062

[P377-2015] "Search for lepton-flavour-violating decays of the Higgs boson"

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



The first direct search for lepton-flavour-violating decays of the recently discovered Higgs boson (H) is described. The search is performed in the  $H \rightarrow \mu \tau(e)$  and  $H \rightarrow \mu \tau(h)$  channels, where  $\tau(e)$  and  $\tau(h)$  are tau leptons reconstructed in the electronic and hadronic decay channels, respectively. The data sample used in this search was collected in pp collisions at a centre-of-mass energy of  $\sqrt{s} = 8$  TeV with the CMS experiment at the CERN LHC and corresponds to an integrated luminosity of  $19.7 \text{ fb}^{-1}$ . The sensitivity of the search is an order of magnitude better than the existing indirect limits. A slight excess of signal events with a significance of 2.4 standard deviations is observed. The p-value of this excess at  $M_H = 125$  GeV is 0.010. The best fit branching fraction is  $\text{beta}(H \rightarrow \mu \tau) = (0.84(-0.37)(+0.39))\%$ . A constraint on the branching fraction,  $\text{beta}(H \rightarrow \mu \tau) < 1.51\%$  at 95% confidence level is set. This limit is subsequently used to constrain the mu-tau Yukawa couplings to be less than  $3.6 \times 10^{-3}$ .

**PHYSICS LETTERS B 749, 337-362, 2015. DOI: 10.1016/j.physletb.2015.07.053**

**[P378-2015] "Search for neutral MSSM Higgs bosons decaying into a pair of bottom quarks"**

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

A search for neutral Higgs bosons decaying into a  $b \bar{b}$  quark pair and produced in association with at least one additional  $b$  quark is presented. This signature is sensitive to the Higgs sector of the minimal supersymmetric standard model (MSSM) with large values of the parameter  $\tan \beta$ . The analysis is based on data from proton-proton collisions at a center-of-mass energy of 8 TeV collected with the CMS detector at the LHC, corresponding to an integrated luminosity of  $19.7 \text{ fb}^{-1}$ . The results are combined with a previous analysis based on 7 TeV data. No signal is observed. Stringent upper limits on the cross section times branching fraction are derived for Higgs bosons with masses up to 900 GeV, and the results are interpreted within different MSSM benchmark scenarios,  $m(h)(\text{max})$ ,  $m(h)(\text{mod}+)$ ,  $m(h)(\text{mod}-)$ , light-stau and light-stop. Observed 95% confidence level upper limits on  $\tan \beta$ , ranging from 14 to 50, are obtained in the  $m(h)(\text{mod}+)$  benchmark scenario.

**JOURNAL OF HIGH ENERGY PHYSICS 11, 1-43(071), 2015. DOI: 10.1007/JHEP11(2015)071**

**[P379-2015] "Search for resonant pair production of Higgs bosons decaying to two bottom quark-antiquark pairs in proton-proton collisions at 8TeV"**

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

A model-independent search for a narrow resonance produced in proton-proton collisions at  $\sqrt{s} = 8$ TeV and decaying to a pair of 125GeV Higgs bosons that in turn each decays into a bottom quark-antiquark pair is performed by the CMS experiment at the LHC. The analyzed data correspond to an integrated luminosity of  $17.9 \text{ fb}^{-1}$ . No evidence for a signal is observed. Upper limits at a 95% confidence level on the production cross section for such a resonance, in the mass range from 270 to 1100 GeV, are reported. Using these results, a radion with decay constant of 1 TeV and mass from 300 to 1100 GeV, and a Kaluza-Klein graviton with mass from 380 to 830 GeV are excluded at a 95% confidence level.

**PHYSICS LETTERS B 749, 560-582, 2015. DOI: 10.1016/j.physletb.2015.08.047**

**[P380-2015] "Search for supersymmetry in the vector-boson fusion topology in proton-proton collisions at  $\sqrt{s}=8\text{TeV}$ "**

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

The first search for supersymmetry in the vector-boson fusion topology is presented. The search targets final states with at least two leptons, large missing transverse momentum, and two jets with a large separation in rapidity. The data sample corresponds to an integrated luminosity of  $19.7 \text{ fb}^{-1}$  of proton-proton collisions at  $\sqrt{s} = 8$ TeV collected with the CMS detector at the CERN LHC. The observed dijet invariant mass spectrum is found to be consistent with the expected standard model prediction. Upper limits are set on the cross sections for chargino and neutralino production with two associated jets, assuming the supersymmetric partner of the tau lepton to be the lightest slepton and the lightest slepton to be lighter than the charginos. For a so-called compressed-mass-spectrum scenario in which the mass difference between the lightest supersymmetric particle ( $\chi$ ) over  $\bar{0}(1)$  and the next lightest, mass-degenerate, gaugino particles ( $\chi$ ) over  $\bar{0}(2)$  and ( $\chi$ ) over  $\bar{+}(1)$  is 50 GeV, a mass lower limit of 170 GeV is set for these latter two particles.

**JOURNAL OF HIGH ENERGY PHYSICS 11, 189, 2015. DOI: 10.1007/JHEP11(2015)189**

**[P381-2015] "Slow light in semiconductor quantum dots: Effects of non-Markovianity and correlation of dephasing reservoirs"**

Mogilevtsev, D.; Reyes-Gomez, E.\*; Cavalcanti, S. B.; Oliveira, L. E.

A theoretical investigation on slow light propagation based on electromagnetically induced transparency in a three-level quantum-dot system is performed including non-Markovian effects and correlated dephasing reservoirs. It is demonstrated that the non-Markovian nature of the process is quite essential even for conventional dephasing typical of quantum dots leading to significant enhancement or inhibition of the group velocity slowdown factor as well as to the shifting and distortion of the transmission window. Furthermore, the correlation between dephasing reservoirs may also either enhance or inhibit non-Markovian effects.

**PHYSICAL REVIEW B 92[23] 235446, 2015. DOI: 10.1103/PhysRevB.92.235446**

**[P382-2015] "Spin polarization of carriers in resonant tunneling devices containing InAs self-assembled quantum dots"**

Nobrega, J. A. E.; Gordo, V. O.; Galeti, H. V. A.; Galvao Y. G.; Brasil, M. J. S. P.\*; Taylor, D.; Orlita, M.; Henini, M.

In this work, we have investigated transport and optical properties of  $n$ - $i$ - $n$  resonant tunneling diodes (RTDs) containing a layer of InAs self-assembled quantum dots (QDs) grown on a (311)B oriented GaAs substrate. Polarization-resolved photoluminescence (PL) and magneto-transport measurements were performed under applied voltage and magnetic fields up to 15 T at 2 K under linearly polarized laser excitation. It was observed that the QD circular polarization degree depends strongly on the applied voltage. Its voltage dependence is explained by the formation of excitonic complexes such as positively ( $X^+$ ) and negatively ( $X^-$ ) charged excitons in the QDs. Our results demonstrate an effective electrical control of an ensemble of InAs QD properties by tuning the applied voltage across a RID device into the resonant tunneling condition.

**SUPERLATTICES AND MICROSTRUCTURES 88, 574-581, 2015.** DOI:10.1016/j.spmi.2015.10.018

**[P383-2015] “Study of W boson production in pPb collisions at root(NN)-N-S=5.02 TeV”**

Adam, W.; Bergauer, T.; Dragicevic, M.; Chinellato, J. A.\*; Tonelli Manganote, E. J.\*; et al.  
CMS Collaboration

The first study of W boson production in pPb collisions is presented, for bosons decaying to a muon or electron, and a neutrino. The measurements are based on a data sample corresponding to an integrated luminosity of 34.6 nb<sup>-1</sup> at a nucleon-nucleon centre-of-mass energy of root(NN)-N-S = 5.02 TeV, collected by the CMS experiment. The W boson differential cross sections, lepton charge asymmetry, and forward-backward asymmetries are measured for leptons of transverse momentum exceeding 25 GeV/c, and as a function of the lepton pseudorapidity in the vertical bar eta(lab)vertical bar < 2.4 range. Deviations from the expectations based on currently available parton distribution functions are observed, showing the need for including W boson data in nuclear parton distribution global fits.

**PHYSICS LETTERS B 750, 565-586, 2015.** DOI: 10.1016/j.physletb.2015.09.057

**[P384-2015] “Synthesis of Low-Density, Carbon-Doped, Porous Hexagonal Boron Nitride Solids”**

Gautam, C.; Tiwary, C. S.; Lose, S.; Brunetto, G.\*; Ozden, S.; Vinod, S.; Raghavan, P.; Biradar, S.; Galvao, D. S.\*; Ajayan, P. M.

Here, we report the scalable synthesis and characterization of low-density, porous, three-dimensional (3D) solids consisting of two-dimensional (2D) hexagonal boron nitride (h-BN) sheets. The structures are synthesized using bottom-up, low-temperature (similar to 300 degrees C), solid-state reaction of melamine and boric acid giving rise to porous and mechanically stable interconnected h-BN layers. A layered 3D structure forms due to the formation of h-BN, and significant improvements in the mechanical properties were observed over a range of temperatures, compared to graphene oxide or reduced graphene oxide foams. A theoretical model based on Density Functional Theory (DFT) is proposed for the formation of h-BN architectures. The material shows excellent, recyclable absorption capacity for oils and organic solvents.

**ACS NANO 9[12] 12088-12095, 2015.** DOI: 10.1021/acsnano.5b05847

**[P385-2015] “Temperature measurement and phonon number statistics of a nanoelectromechanical resonator”**

Neto, O. P. D.\*; Oliveira, M. C.\*; Milburn, G. J.

Measuring thermodynamic quantities can be easy or not, depending on the system that is being studied. For a macroscopic object, measuring temperatures can be as simple as measuring how much a column of mercury rises when in contact with the object. At the small scale of quantum electromechanical systems, such simple methods are not available and invariably detection processes disturb the system state. Here we propose a method for measuring the temperature on a suspended semiconductor membrane clamped at both ends. In this method, the membrane is mediating a capacitive coupling between two transmission line resonators (TLR).

The first TLR has a strong dispersion, that is, its decaying rate is larger than its drive, and its role is to pump in a pulsed way the interaction between the membrane and the second TLR. By averaging the pulsed measurements of the quadrature of the second TLR we show how the temperature of the membrane can be determined. Moreover the statistical description of the state of the membrane, which is directly accessed in this approach is significantly improved by the addition of a Josephson junction coupled to the second TLR.

**NEW JOURNAL OF PHYSICS 17, 093010, 2015.** DOI: 10.1088/1367-2630/17/9/093010

**[P386-2015] “Track structure modeling in liquid water: A review of the Geant4-DNA very low energy extension of the Geant4 Monte Carlo simulation toolkit”**

Bernal, M. A.\*; Bordage, M. C.; Brown, J. M. C.; Davidkova, M.; Delage, E.; El Bitar, Z.; Enger, S. A.; Francis, Z.; Guatelli, S.; Ivanchenko, V. N.; Karamitros, M.; Kyriakou, I.; Maigne, L.; Meylan, S.; Murakami, K.; Okada, S.; Payno, H.; Perrot, Y.; Petrovic, I.; Pham, Q. T.; Ristic-Fira, A.; Sasaki, T.; Stepan, V.; Tran, H. N.; Villagrasa, C.; Incerti, S.

Understanding the fundamental mechanisms involved in the induction of biological damage by ionizing radiation remains a major challenge of today's radiobiology research. The Monte Carlo simulation of physical, physicochemical and chemical processes involved may provide a powerful tool for the simulation of early damage induction. The Geant4-DNA extension of the general purpose Monte Carlo Geant4 simulation toolkit aims to provide the scientific community with an open source access platform for the mechanistic simulation of such early damage. This paper presents the most recent review of the Geant4-DNA extension, as available to Geant4 users since June 2015 (release 10.2 Beta). In particular, the review includes the description of new physical models for the description of electron elastic and inelastic interactions in liquid water, as well as new examples dedicated to the simulation of physicochemical and chemical stages of water radiolysis. Several implementations of geometrical models of biological targets are presented as well, and the list of Geant4-DNA examples is described.

**PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS 31[8] 861-874, 2015.** DOI: 10.1016/j.ejmp.2015.10.087

**[P387-2015] “Understanding the pointer states”**

Brasil, C. A.\*; de Castro, L. A.

In quantum mechanics, pointer states are eigenstates of the observable of the measurement apparatus that represent the possible positions of the display pointer of the equipment. The origin of this concept lies in attempts to fill the blanks in Everett's relative-state interpretation, and to make it a fully valid description of physical reality. To achieve this, it was necessary to consider not only the main system interacting with the measurement apparatus (like von Neumann and Everett did) but also the role of the environment in eliminating correlations between different possible measurements when interacting with the measurement apparatus. The interaction of the environment with the main system (and the measurement apparatus) is the core of the decoherence theory, which followed Everett's thesis. In this article, we review the measurement process according to von Neumann, Everett's relative state interpretation, the purpose of decoherence and some of its follow-up until Wojciech Zurek's primordial paper that consolidated the concept of pointer states, previously presented by Heinz Dieter Zeh. Employing a simple physical model consisting of a pair of two-level systems-one representing the main system, the other the measurement apparatus-and a thermal bath-representing the environment-we show how pointer states emerge,

explaining its contributions to the question of measurement in quantum mechanics, as well as its limitations. Finally, we briefly show some of its consequences. This paper is accessible to readers with elementary knowledge about quantum mechanics, on the level of graduate courses.

EUROPEAN JOURNAL OF PHYSICS 36[6] 065024, 2015. DOI: 10.1088/0143-0807/36/6/065024

## Proceedings publicados em 2015

[P388-2015] “1HH-MRS in mesial temporal lobe epilepsy with and without hippocampal atrophy”

Pimentel, L. R.; Casseb, R. F.; Barbosa, R.; Koutsodontis, M. M. A.; Castellano, G.\*; Cendes, F.

EPILEPSIA, p0925, 56[SI], 227-228, Supl. 1, 2015. 31st International Epilepsy Congress, SEP 05-09, 2015, Istanbul, TURKEY.

[P389-2015] “ALR - Laser altimeter for the ASTER deep space mission. Simulated operation above a surface with crater”

de Brum, A. G. V.; da Cruz, F. C.\*; Hetem, A., Jr.

To assist in the investigation of the triple asteroid system 2001-SN263, the deep space mission ASTER will carry onboard a laser altimeter. The instrument was named ALR and its development is now in progress. In order to help in the instrument design, with a view to the creation of software to control the instrument, a package of computer programs was produced to simulate the operation of a pulsed laser altimeter with operating principle based on the measurement of the time of flight of the travelling pulse. This software Simulator was called ALR\_Sim, and the results obtained with its use represent what should be expected as return signal when laser pulses are fired toward a target, reflect on it and return to be detected by the instrument. The program was successfully tested with regard to some of the most common situations expected. It constitutes now the main workbench dedicated to the creation and testing of control software to embark in the ALR. In addition, the Simulator constitutes also an important tool to assist the creation of software to be used on Earth, in the processing and analysis of the data received from the instrument. This work presents the results obtained in the special case which involves the modeling of a surface with crater, along with the simulation of the instrument operation above this type of terrain. This study points out that the comparison of the wave form obtained as return signal after reflection of the laser pulse on the surface of the crater with the expected return signal in the case of a flat and homogeneous surface is a useful method that can be applied for terrain details extraction.

Journal of Physics Conference Series 641, UNSP 012007, 2015. DOI: 10.1088/1742-6596/641/1/012007  
XVII BRAZILIAN COLLOQUIUM ON ORBITAL DYNAMICS, CBDO 2014.

[P390-2015] “INTRODUCTION”

Teranishi, R. T.; Pazich, L. B.; Knobel, M.\*; Allen, W. R.

MITIGATING INEQUALITY: HIGHER EDUCATION RESEARCH, POLICY, AND PRACTICE IN AN ERA OF MASSIFICATION AND STRATIFICATION, *Advances in Education in Diverse Communities-Research Policy and Praxis*, 11, XI-XIII, 2015. 5th Achieving Diversity in Tertiary and Higher Education Conference, 2014, Univ Estadual Campinas, Sao Paulo, BRAZIL.

## Capítulos de Livros

[Ca002-2015] “Light dispersion in space”

Barbosa, L. C.\*  
Roychoudhuri, C.; Kracklauer, A.; De Raedt, H. (Ed.)

Considering an idea of F. Arago in 1853 regarding light dispersion through the light ether in the interstellar space, this paper presents a new idea on an alternative interpretation of the cosmological red shift of the galaxies in the universe. The model is based on an analogy with the temporal material dispersion that occurs with light in the optical fiber core. Since intergalactic space is transparent, according to the model, this phenomenon is related to the gravitational potential existing in the whole space. Thus, it is possible to find a new interpretation to Hubble’s constant. In space, light undergoes a dispersion process in its path, which is interpreted by a red shift equation of the type  $\Delta z = HL$ , since  $H = (d(2)n/d \lambda(2) \Delta v \Delta \lambda)$ , where  $H$  means the Hubble constant,  $n$  is the refractive index of the intergalactic space,  $\Delta \lambda$  is the spectral width of the extragalactic source, and  $\Delta v$  is the variation of the speed of light caused by the gravitational potential. We observe that this “constant” is governed by three new parameters. Light traveling the intergalactic space undergoes red shift due to this mechanism, while light amplitude decreases with time, and the wavelength always increases, thus producing the same type of behavior given by Hubble’s Law. It can be demonstrated that the dark matter phenomenon is produced by the apparent speed of light of the stars on the periphery of the galaxies, without the existence of dark energy. Based on this new idea, the model of the universe is static, lacking expansion. Other phenomena may be interpreted based on this new model of the universe. We have what we call temporal gravitational dispersion of light in space produced by the variations of the speed of light, due to the presence of the gravitational potential in the whole space.

NATURE OF LIGHT: WHAT ARE PHOTONS? VI Série de livros: Proceedings of SPIE 9570, 95700B, 2015. DOI: 10.1117/12.2186711.

[Ca003-2015] “Structure, configuration and sizing of Ni nanoparticles generated by ultrafast laser ablation in different media”

Muneton, A. D.; Santillan, J. M. J.; Mendoza Herrera, L. J.; Fernandez van Raap, M. B.; Muraca, D.\*; Schinca, D. C.; Scaffardi, L. B.  
Boardman, A. D.; Tsai, D. P. (Ed.)

In recent years, nickel nanoparticles (NPs) have increased scientific interest because of their extensive prospects in catalysts, information storage, large-scale batteries and biomedicine. Several works on Ni NPs generation by laser ablation have appeared in the literature in the last years, using different pulsed laser regimes and different media have been published recently. In this work we analyze the characteristics of species, structure (bare core or core-shell), configuration and size distribution of NPs generated by fs pulse laser ablation over a Ni solid target in n-heptane and water. We explore the presence of NiO-Ni core-shell and hollow Ni (or air-Ni) NPs in the colloids obtained. These were experimentally characterized using AFM and TEM microscopy, as well as Optical Extinction Spectroscopy (OES). Extinction spectra were modeled using Mie theory through an appropriate modification of the complex experimental dielectric function, taking into account a size-dependent corrective term for each free and bound electron contribution. Experimental UV-visible-NIR spectra were reproduced considering a size distribution of bare core, hollow and core-shell structures NPs. In both media, Ni NPs shape and size distribution agrees with that derived from TEM and AFM analysis.



## Trabalhos publicados em 2016

[P001-2016] “A stochastic model for magnetic dynamics in single-molecule”

Lopez-Ruiz, R.\*; Almeida, P. T.\*; Vaz, M. G. F.; Novak, M. A.; Beron, F.\*; Pirota, K. R.\*

Hysteresis and magnetic relaxation curves were performed on double well potential systems with quantum tunneling possibility via stochastic simulations. Simulation results are compared with experimental ones using the Mn12 single-molecule magnet, allowing us to introduce time dependence in the model. Despite being a simple simulation model, it adequately reproduces the phenomenology of a thermally activated quantum tunneling and can be extended to other systems with different parameters. Assuming competition between the reversal modes, thermal (over) and tunneling (across) the anisotropy barrier, a separation of classical and quantum contributions to relaxation time can be obtained.

JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 403, 188-192, 2016. DOI: 10.1016/j.jmmm.2015.11.070

[P002-2016] “ARCHITECTURED MATERIALS Straining expand entanglements”

Baughman, R. H.; Fonseca, A. F.\*

Porous solids comprising a self-entangled coiled polymer fibre or metal wire reversibly increase their volume when either stretched or compressed in an axial direction, possibly providing a new type of mechanical behaviour for tuning functional properties.

NATURE MATERIALS 15[1] 7-8, 2016. DOI: 10.1038/nmat4436

[P003-2016] “Cultivation of yeast in diffusion-based microfluidic device”

Oliveira, A. F.; Pelegati, V. B.\*; Carvalho, H. F.; Cesar, C. L.\*; Bastos, R. G.; de la Torre, L. G.

The capacity to create a diffusive chemical concentration gradient in microfluidic systems has the potential to improve the study of microbial processes. These tools allow the evaluation of microbial cell performance under different and controlled conditions. Diffusion-based gradient generators, in particular, have the capacity to maintain spatiotemporally constant gradient concentrations necessary to evaluate cell behavior in a precise environment. This work uses a known microfluidic device capable of generating a diffusive glucose concentration gradient to evaluate for the first time the behavior of *Saccharomyces cerevisiae* ATCC 7754 inside a microchannel. The cell growth along the microfluidic microchambers was observed and the kinetic parameters determined, with values statistically similar to those of conventional batch cultivation. Monod kinetic parameters could also be determined in the microfluidic device using small substrate concentrations. These results show the potential of this micro-bioreactor to investigate yeast growth with microliter samples and to evaluate experiments in triplicate performed and in parallel. The diffusive concentration gradient in a microfluidic device allowed the acquisition of results in a more practical way when compared to conventional techniques.

[P004-2016] “Hydrodynamic approaches in relativistic heavy ion reactions”

Derradi de Souza, R.\*; Koide, T.; Kodama, T.

We review several facets of the hydrodynamic description of the relativistic heavy ion collisions, starting from the historical motivation to the present understandings of the observed collective aspects of experimental data, especially those of the most recent RHIC and LHC results. In this report, we particularly focus on the conceptual questions and the physical foundations of the validity of the hydrodynamic approach itself. We also discuss recent efforts to clarify some of the points in this direction, such as the various forms of derivations of relativistic hydrodynamics together with the limitations intrinsic to the traditional approaches, variational approaches, known analytic solutions for special cases, and several new theoretical developments. Throughout this review, we stress the role of coarse-graining procedure in the hydrodynamic description and discuss its relation to the physical observables through the analysis of a hydrodynamic mapping of a microscopic transport model. Several questions to be answered to clarify the physics of collective phenomena in the relativistic heavy ion collisions are pointed out.

PROGRESS IN PARTICLE AND NUCLEAR PHYSICS 86, 35-85, 2016. DOI: 10.1016/j.ppnp.2015.09.002

[P005-2016] “Magnetic and magnetocaloric properties of La<sub>0.6</sub>Ca<sub>0.4</sub>MnO<sub>3</sub> tunable by particle size and dimensionality”

Andrade, V. M.; Vivas, R. J. C.; Pedro, S. S.; Tedesco, J. C. G.; Rossi, A. L.; Coelho, A. A.\*; Rocco, D. L.; Reis, M. S.

Manganites have been attracted considerable attention due to some intriguing magnetic properties, such as magnetoresistance, spin glass behavior and superparamagnetism. In recent years, some studies point to the effect of particle size and dimensionality of these compounds in their magnetic features. Particularly, LaCaMnO material research is well explored concerning the bulk material. To overcome the lack of the information we successfully produced advanced nanostructures of La<sub>0.6</sub>Ca<sub>0.4</sub>MnO<sub>3</sub> manganites, namely nanotubes and nanoparticles by using a sol gel modified method, to determine the size particle effect on the magnetism. The manganites crystal structure, magnetic and magnetocaloric properties were studied in a broad temperature range. Transmission electron microscopy revealed nanoparticles with sizes from 45 up to 223 nm, depending on the calcination temperature. It was found that the magnetic and magnetocaloric properties can be optimized by tuning the particle size; for instance, the magnetic transition broadening by decreasing the particle size. We report the relative cooling power (RCP) of these samples; it was found that the best RCP was observed for the 223 nm particle (508 J/Kg). Finally, this work contributes to the research on the magnetic properties and magnetocaloric potentials in nanostructured systems with distinct morphologies.

ACTA MATERIALIA 102, 49-55, 2016. DOI: 10.1016/j.actamat.2015.08.080

[P006-2016] “Magnetic hyperthermia in brick-like Ag@Fe<sub>3</sub>O<sub>4</sub> core-shell nano particles”

Brollo, M. E. F.\*; Orozco-Henao, J. M.\*; Lopez-Ruiz, R.\*; Muraca, D.\*; Dias, C. S. B.; Pirota, K. R.\*; Knobel, M.\*

Heating efficiency of multifunctional Ag@Fe<sub>3</sub>O<sub>4</sub> brick-like nanoparticles under alternating magnetic field was investigated by means of specific absorption rate (SAR) measurements, and compared with equivalent measurements for plain magnetite and dimer heteroparticles. The samples were synthesized by thermal decomposition reactions and present narrow size polydispersity and high degree of crystallinity. The SAR values are analyzed using the superparamagnetic theory, in which the basic morphology, size and dispersion of sizes play key roles. The results suggest that these novel brick-like nanoparticles are good candidates for hyperthermia applications, displaying heating efficiencies comparable with the most efficient plain nanoparticles.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 397, 20-27, 2016. DOI: 10.1016/j.jmmm.2015.08.081**

**[P007-2016] “Magnetocaloric effect of the ternary Dy, Ho and Er platinum gallides”**

Franca, E. L. T.; dos Santos, A. O.; Coelho, A. A.\*; da Silva, L. M.

Magnetic and magnetocaloric properties of equiatomic ternary gallides RPtGa (R=Dy, Ho and Er) compounds have been reported. All these compounds are iso-structural and order antiferromagnetically below 20 K. External applied magnetic field induces metamagnetic transition from antiferromagnetic to ferromagnetic state. Adiabatic entropy change ( $-\Delta S_M$ ) shows negative contribution for magnetic field changes up to 10 kOe (for R=Ho and Er) and 30 kOe (for R=Dy) due to disordering of antiparallel spins with the external applied field. As the field change increases, only a positive asymmetric peak is observed. A broad  $-\Delta S_M$  peak is observed for HoPtGa, evidencing characteristics of a table-like behavior. HoPtGa and ErPtGa present the largest magnetocaloric effect (EMC) compared with DyPtGa, indicating that the nature of metamagnetic transition affects the magnetocaloric properties. The maximum value of adiabatic temperature change ( $\Delta T_{ad(max)}$ ) obtained for R=Dy, Ho and Er was respectively 4.1 K, 4.9 K and 6.7 K for  $\Delta H=50$  kOe. These values are comparable with the respective  $\Delta T_{ad(max)}$  reported for other RTX compounds in the same range of temperature and suggest that RPtGa compounds are attractive candidates for magnetic refrigeration in low temperature range (<20 K) with the advantage of not presenting hysteresis loss.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 401, 1088-1092, 2016. DOI: 10.1016/j.jmmm.2015.10.138**

**[P008-2016] “Nanofilms of hyaluronan/chitosan assembled layer-by-layer: An antibacterial surface for Xylella fastidiosa”**

Hernandez-Montelongo, J.\*; Nascimento, V. F.; Murillo, D.\*; Taketa, T. B.; Sahoo, P.\*; de Souza, A. A.; Beppu, M. M.; Cotta, M. A.\*

In this work, nanofilms of hyaluronan/chitosan (HA/CHI) assembled layer by layer were synthesized; their application as a potential antimicrobial material was demonstrated for the phytopathogen *Xylella fastidiosa*, a gram-negative bacterium, here used as a model. For the synthesis, the influence of pH and ionic strength of these natural polymer stem-solutions on final characteristics of the HA/CHI nanofilms was studied in detail. The antibacterial effect was evaluated using wide-field fluorescence microscopy. These results were correlated with the chemical properties of the nanofilms, studied by FTIR and Raman spectroscopy, as well as with their morphology and surface properties characterized using SEM and AFM.

The present findings can be extended to design and optimize HA/CHI nanofilms with enhanced antimicrobial behavior for other type of phytopathogenic gram-negative bacteria species, such as *Xanthomonas citri*, *Xanthomonas campestris* and *Ralstonia solanacearum*.

**CARBOHYDRATE POLYMERS 136, 1-11, 2016. DOI: 10.1016/j.carbpol.2015.08.076**

**[P009-2016] “Nonequilibrium free-energy calculation of solids using LAMMPS”**

Freitas, R.; Asta, M.; de Koning, M.\*

This article describes nonequilibrium techniques for the calculation of free energies of solids using molecular dynamics (MD) simulations. These methods provide an alternative to standard equilibrium thermodynamic integration methods and often present superior efficiency. Here we describe the implementation in the LAMMPS (Large-scale Atomic/Molecular Massively Parallel Simulator) code of two specific nonequilibrium processes that allow the calculation of the free-energy difference between two different system Hamiltonians as well as the free-energy temperature dependence of a given Hamiltonian, respectively. The theory behind the methods is summarized, and we describe (including fragments of LAMMPS scripts) how the process parameters should be selected to obtain the best-possible efficiency in the calculations of free energies using nonequilibrium MD simulations. As an example of the application of the methods we present results related to polymorphic transitions for a classical potential model of iron.

**COMPUTATIONAL MATERIALS SCIENCE 112, 333-341, 2016. DOI: 10.1016/j.commatsci.2015.10.050**

**[P010-2016] “Probing the accuracy of reactive and non-reactive force fields to describe physical and chemical properties of graphene-oxide”**

Fonseca, A. F.\*; Liang, T.; Zhang, D. F.; Choudhary, K.; Sinnott, S. B.

Graphene-oxide (GO) has been shown to be a promising material for numerous technological applications. Extensive computational work has been devoted to elucidate the structure, stability and properties of different GO species. As some applications require large GO sizes, classical molecular dynamics simulations are necessary to fully investigate GO properties and behavior. There are few classical force fields parameterized to examine oxidized hydrocarbon compounds, and not all of them are able to simulate GO structures. Here, we present the first comparative study of some GO properties between three classical force fields: Reactive Empirical Bond Order for carbon, hydrogen and oxygen (REBO-CHO), third generation of the Charge Optimized Many Body (COMB3) and Chemistry at HARvard Macromolecular Mechanics (CHARMM) force field. The chemical and physical properties tested include key binding energies, carbon-oxygen bond distances and elastic modulus. When compared to density functional theory calculations or experimental data, the COMB3 reactive force field is shown to provide the best overall results, while REBO-CHO and CHARMM provide good results for certain properties of most GO-systems.

**Computational Materials Science 114, 236-243, 2016. DOI: 10.1016/j.commatsci.2015.12.030**

**[P011-2016] “Rh-decorated PtIrOx nanoparticles for glycerol electrooxidation: Searching for a stable and active catalyst”**

Zanata, C. R.; Fernandez, P. S.; Troiani, H. E.; Soldati, A. L.; Landers, R.\*; Camara, G. A.; Carvalho, A. E.; Martins, C. A.

We report a fast method of producing rhodium-decorated platinum nanoparticles (NPs) containing iridium oxides (IrOx) to be used in the glycerol electrooxidation reaction. We synthesize PtIrOx/C electrocatalysts of different atomic compositions dispersed on Carbon Vulcan XC-72R (R) by using the fast polyol method assisted by microwaves. Afterwards, PtIrOx/C was potentiodynamically decorated by Rh (Rh/PtIrOx/C). The NPs are characterized by energy dispersive X-ray analysis, X-ray diffraction, X-ray photoelectron spectroscopy and transmission electron microscopy. The electrooxidation of glycerol was investigated in acid medium by cyclic voltammetry and chronoamperometry. The electrochemical stability of Rh/PtIrOx/C NPs was evaluated by following a degradation test protocol, which consists in exhaustive cyclic voltammeteries. Our results show that the presence of iridium oxides in the architecture of platinum enhances the electrochemical stability of the catalyst by avoiding agglomeration effects. Moreover, the presence of rhodium catalyzes the glycerol electrooxidation reaction. These results help understanding the role of Rh and IrOx in the glycerol electrooxidation and provide new insights for designing nanomaterials with improved stability and activity.

**APPLIED CATALYSIS B-ENVIRONMENTAL 181, 445-455, 2016.** DOI: 10.1016/j.apcatb.2015.08.021

**[P012-2016] “Search for resonant  $t\bar{t}$  production in proton-proton collisions at root  $s=8$  TeV”**

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

A search is performed for the production of heavy resonances decaying into top-antitop quark pairs in proton-proton collisions at root  $s = 8$  TeV. Data used for the analyses were collected with the CMS detector and correspond to an integrated luminosity of 19.7 fb<sup>-1</sup>. The search is performed using events with three different final states, defined by the number of leptons (electrons and muons) from the  $t\bar{t}$  decay. The analyses are optimized for reconstruction of top quarks with high Lorentz boosts, where jet substructure techniques are used to enhance the sensitivity. Results are presented for all channels and a combination is performed. No significant excess of events relative to the expected yield from standard model processes is observed. Upper limits on the production cross section of heavy resonances decaying to  $t\bar{t}$  are calculated. A narrow leptophobic topcolor  $Z'$  resonance with a mass below 2.4 TeV is excluded at 95% confidence level. Limits are also derived for a broad  $Z'$  resonance with a 10% width relative to the resonance mass, and a Kaluza-Klein excitation of the gluon in the Randall-Sundrum model. These are the most stringent limits to date on heavy resonances decaying into top-antitop quark pairs.

**PHYSICAL REVIEW D 93[1] 012001, 2016.** DOI: 10.1103/PhysRevD.93.012001

**[P013-2016] “The NuMI neutrino beam”**

Adamson, P.; Anderson, K.; Andrews, M.; Coelho, J. A. B.\*; Crane, D.\*

This paper describes the hardware and operations of the Neutrinos at the Main Injector (NuMI) beam at Fermilab. It elaborates on the design considerations for the beam as a whole and for individual elements. The most important design details of individual components are described. Beam monitoring systems and procedures, including the tuning and alignment of the beam and NuMI long-term performance, are also discussed.

**NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 806, 279-306, 2016.** DOI: 10.1016/j.nima.2015.08.063

**[P014-2016] “Torsional “superplasticity” of graphyne nanotubes”**

de Sousa, J. M.\*; Brunetto, G.\*; Coluci, V. R.; Galvao, D. S.\*

Graphyne is a planar two-dimensional carbon allotrope formed by atoms in sp, sp(2), and sp(3) hybridized states. Topologically graphyne nanotubes (GNTs) can be considered as cylindrically rolled up graphyne sheets, similarly as carbon nanotubes (CNTs) can be considered rolled up graphene sheets. Due to the presence of single, double, and triple bonds, GNTs exhibit porous side-walls that can be exploited in many diverse applications. In this work, we investigated the mechanical behavior of GNTs under torsional strains through reactive molecular dynamics simulations. Our results show that GNTs are more flexible than CNTs and exhibit “superplasticity”, with fracture angles that are up to 35 times higher than the ones reported to CNTs. This GNT “superplastic” behavior can be explained in terms of irreversible reconstruction processes (mainly associated with the triple bonds) that occur during torsional strains.

**CARBON 96, 14-19, 2016.** DOI: 10.1016/j.carbon.2015.09.039

\*Autores da comunidade IFGW

## Defesas de Dissertações

**[D001-2016] “Distribution of assisted measures of entanglement and correlation”**

Aluno: Marina Vasques  
Orientador: Prof. Dr. Marcos Cesar de Oliveira  
Data: 28/01/2016

**[D002-2016] “Estados de impureza no modelo de Ising quântico”**

Aluno: Fabio Hernandez Hernandez  
Orientador: Prof. Dr. Guillermo Gerardo Cabrera Oyarzun  
Data: 19/02/2016

## Defesas de Teses

**[T001-2016] “Vortex Bound States in Superconducting Topological Matter”**

Aluno: Pedro Leopoldo e Silva Lopes  
Orientador: Prof. Dr. Amir Ordacgi Caldeira  
Data: 18/02/2016

**[T002-2016] “Estudos de Sistemas Quânticos Fortemente Desordenados”**

Aluno: Victor Luiz Quito  
Orientador: Prof. Dr. Eduardo Miranda  
Data: 22/02/2016

**[T003-2016] “Alternativas para o Crescimento de Nanofios Semicondutores III-V”**

Aluno: Douglas Soares de Oliveira  
Orientador: Prof. Dra. Mônica Alonso Cotta  
Data: 26/02/2016



[T004-2016] “Simulações Atomísticas de Materiais Bidimensionais: Siliceno, Grafeno e Nitreto de Carbono”

Aluno: Tiago Botari

Orientador: Prof. Dr. Douglas Soares Galvão

Data: 29/02/2016

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

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

Acesse o portal Abstracta e faça seu cadastro como leitor, para receber em seu e-mail a notificação de cada novo número publicado:

<http://abstracta.ifi.unicamp.br>

## Abstracta

Instituto de Física

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  
<http://portal.ifi.unicamp.br/biblioteca>

Diretora Técnica: Sandra Maria Carlos Cartaxo  
Coordenador da Comissão de Biblioteca: Prof. Dr. Sandro Guedes de Oliveira

Elaboração  
Maria Graciele Trevisan (Bibliotecária)  
contato: [infobif@ifi.unicamp.br](mailto:infobif@ifi.unicamp.br)