

# Abstracta

Ano XIX - N. 01

**Fev-15**



**Trabalhos Publicados**  
P001-2015 à P054-2015

**Proceedings**  
P055-2015

**Defesas de Dissertações do IFGW**  
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**Defesas de Teses do IFGW**  
T001-2015 à T003-2015

## Trabalhos Publicados

[P001-2015] "Analytical solutions of Landau (1+1)-dimensional hydrodynamics"

Wong, C.Y.; Sen, A.; Gerhard, J.; Torrieri, G.\*; Read, K.

To help guide our intuition, summarize important features, and point out essential elements, we review the analytical solutions of Landau (1+1)-dimensional hydrodynamics and discuss the full evolution of the dynamics from the very beginning. Special emphasis is placed on the matching and the interplay between the Khalatnikov solution and the Riemann simple wave solution, at the earliest times and in the edge regions at later times. These analytical solutions collected and developed here serve well as a useful guide and cross-check in the development of complicated numerically intensive relativistic hydrodynamical Monte Carlo simulations.

PHYSICAL REVIEW C 90[6], 064907, 2014. DOI: 10.1103/PhysRevC.90.064907

[P002-2015] "Beauty production in pp collisions at root s=2.76 TeV measured via semi-electronic decays"

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

The ALICE Collaboration at the LHC reports measurement of the inclusive production cross section of electrons from semi-leptonic decays of beauty hadrons with rapidity  $|y| < 0.8$  and transverse momentum  $1 < p(T) < 10$  GeV/c, in pp collisions at root s = 2.76 TeV. Electrons not originating from semi-electronic decay of beauty hadrons are suppressed using the impact parameter of the corresponding tracks. The production cross section of beauty decay electrons is compared to the result obtained with an alternative method which uses the distribution of the azimuthal angle between heavy-flavour decay electrons and charged hadrons. Perturbative QCD predictions agree with the measured cross section within the experimental and theoretical uncertainties. The integrated visible cross section,  $\sigma(b \rightarrow e) = 3.47 \pm 0.40(\text{stat})(+1.12)(-1.33)(\text{sys}) \pm 0.07(\text{norm}) \mu b$ , was extrapolated to full phase space using Fixed Order plus Next-to-Leading Log (FONLL) calculations to obtain the total  $b \rightarrow e$  production cross section,  $\sigma(b \rightarrow e) = 130 \pm 15.1(\text{stat})(+42.1)(-49.8)(\text{sys})(+3.4)(-3.1)(\text{extr}) \pm 2.5(\text{norm}) \pm 4.4(\text{BR}) \mu b$ .

PHYSICS LETTERS B 738, 97-108, 2014. DOI: 10.1016/j.physletb.2014.09.026

[P003-2015] "Connection between Lense-Thirring precession, Ernst potential and Thorne multipoles"

Zimbres, M.\*

For stationary axially symmetric spacetimes we find a simple expression for the Lense-Thirring precession in terms of two scalar quantities, the real and imaginary parts of the Ernst potential. Its weak-field approximation is expressed in terms of Thorne multipoles and used to compute the major non-spherical contributions to the precession of a gyroscope orbiting around the Earth. We reproduce previously known results and give a new estimation for non-spherical contributions. We believe the present work has important applications in the interpretation of approximate as well as exact solutions of Einstein field equations.

CLASSICAL AND QUANTUM GRAVITY 31[21], 215006, 2014. DOI: 10.1088/0264-9381/31/21/215006

[P004-2015] "Continuous-variable phase estimation with unitary and random linear disturbance"

de Souza, D. D.\*; Genoni, M. G.; Kim, M. S.

We address the problem of continuous-variable quantum phase estimation in the presence of linear disturbance at the Hamiltonian level by means of Gaussian probe states. In particular we discuss both unitary and random disturbance by considering the parameter which characterizes the unwanted linear term present in the Hamiltonian as fixed (unitary disturbance) or random with a given probability distribution (random disturbance). We derive the optimal input Gaussian states at fixed energy, maximizing the quantum Fisher information over the squeezing angle and the squeezing energy fraction, and we discuss the scaling of the quantum Fisher information in terms of the output number of photons,  $n(\text{out})$ . We observe that, in the case of unitary disturbance, the optimal state is a squeezed vacuum state and the quadratic scaling is conserved. As regards the random disturbance, we observe that the optimal squeezing fraction may not be equal to one and, for any nonzero value of the noise parameter, the quantum Fisher information scales linearly with the average number of photons. Finally, we discuss the performance of homodyne measurement by comparing the achievable precision with the ultimate limit imposed by the quantum Cramer-Rao bound.

PHYSICAL REVIEW A 90[4], 042119, 2014 DOI: 10.1103/PhysRevA.90.042119

[P005-2015] "Cranial reconstruction: 3D biomodel and custom-built implant created using additive manufacturing"

Lambert, C. S.\*

Additive manufacturing (AM) technology from engineering has helped to achieve several advances in the medical field, particularly as far as fabrication of implants is concerned. The use of AM has made it possible to carry out surgical planning and simulation using a three-dimensional physical model which accurately represents the patient's anatomy. AM technology enables the production of models and implants directly from a 3D virtual model, facilitating surgical procedures and reducing risks. Furthermore, AM has been used to produce implants designed for individual patients in areas of medicine such as craniomaxillofacial surgery, with optimal size, shape and mechanical properties. This work presents AM technologies which were applied to design and fabricate a biomodel and customized implant for the surgical reconstruction of a large cranial defect. A series of computed tomography data was obtained and software was used to extract the cranial geometry. The protocol presented was used to create an anatomic biomodel of the bone defect for surgical planning and, finally, the design and manufacture of the patient-specific implant.

JOURNAL OF CRANIO-MAXILLOFACIAL SURGERY 42[8],1877-1884, 2014. DOI: 10.1016/j.jcms.2014.07.006

[P006-2015] "Description and performance of track and primary-vertex reconstruction with the CMS tracker"

Chatrchyan, S.; Chinellato, J.\*; Manganote, E. J. Tonelli.\*; CMS Collaboration; et al.

A description is provided of the software algorithms developed for the CMS tracker both for reconstructing charged-particle trajectories in proton-proton interactions and for using the resulting tracks to estimate the positions of the LHC luminous region and individual primary-interaction vertices. Despite the very hostile environment at the LHC, the performance obtained with these algorithms is found to be excellent. For  $t \bar{t}$  events under typical 2011 pileup conditions,

the average track-reconstruction efficiency for promptly-produced charged particles with transverse momenta of  $p(T) > 0.9\text{GeV}$  is 94% for pseudorapidities of vertical bar  $\eta$  vertical bar  $< 0.9$  and 85% for  $0.9 < \text{vertical bar } \eta \text{ vertical bar} < 2.5$ . The inefficiency is caused mainly by hadrons that undergo nuclear interactions in the tracker material. For isolated muons, the corresponding efficiencies are essentially 100%. For isolated muons of  $p(T) = 100\text{GeV}$  emitted at vertical bar  $\eta$  vertical bar  $< 1.4$ , the resolutions are approximately 2.8% in  $p(T)$ , and respectively, 10  $\mu\text{m}$  and 30  $\mu\text{m}$  in the transverse and longitudinal impact parameters. The position resolution achieved for reconstructed primary vertices that correspond to interesting pp collisions is 10-12  $\mu\text{m}$  in each of the three spatial dimensions. The tracking and vertexing software is fast and flexible, and easily adaptable to other functions, such as fast tracking for the trigger, or dedicated tracking for electrons that takes into account bremsstrahlung.

**JOURNAL OF INSTRUMENTATION 9, P10009, 2014. DOI: 10.1088/1748-0221/9/10/P1000**

**[P007-2015] "Dielectron azimuthal anisotropy at mid-rapidity in Au plus Au collisions at root s(NN)=200 GeV"**

Adamczyk, L.; Derradi de Souza, R.\*; Takahashi, J.\*; STAR Collaboration; et al.

We report on the first measurement of the azimuthal anisotropy ( $v(2)$ ) of dielectrons ( $e^+e^-$  pairs) at mid-rapidity from root s(NN) = 200 GeV Au + Au collisions with the STAR detector at the Relativistic Heavy Ion Collider (RHIC), presented as a function of transverse momentum ( $p_T$ ) for different invariant-mass regions. In the mass region  $M_{ee} < 1.1 \text{ GeV}/c(2)$  the dielectron  $v(2)$  measurements are found to be consistent with expectations from  $\pi(0)$ ,  $\eta$ ,  $\omega$ , and  $\phi$  decay contributions. In the mass region  $1.1 < M_{ee} < 2.9 \text{ GeV}/c(2)$ , the measured dielectron  $v(2)$  is consistent, within experimental uncertainties, with that from the  $c\bar{c}$  contributions.

**PHYSICAL REVIEW C 90[6] 064904, 2014. DOI: 10.1103/PhysRevC.90.064904**

**[P008-2015] "Effects of a nearby Mn delta layer on the optical properties of an InGaAs/GaAs quantum well"**

Balanta, M. A. G.\*; Brasil, M. J. S. P.\*; Iikawa, F.\*; Brum, J. A.\*; Mendes, Udson C.\*; Danilov, Yu. A.; Dorokhin, M. V.; Vikhrova, Olga V.; Zvonkov, Boris N.

We investigated the effects of nearby Mn ions on the confined states of a InGaAs/GaAs quantum well through circularly polarized and magneto-optical measurements. The addition of a Mn delta-doping layer at the barrier close to the well gives rise to surprisingly narrow absorption peaks in the photoluminescence excitation spectra. The peaks become increasingly stronger for decreasing spacer-layer thicknesses between the quantum well and the Mn layer. Most of the peaks were identified based on self-consistent calculations; however, we observed additional peaks that cannot be identified with quantum well transitions, which origin we attribute to an enhanced exciton-phonon coupling. Finally, we discuss possible effects related to the exciton magneto-polaron complex in the reinforcement of the photoluminescence excitation peaks.

**JOURNAL OF APPLIED PHYSICS 116[20] 203501, 2014. DOI: 10.1063/1.4902857**

**[P009-2015] "Electron collisions with ammonia and formamide in the low- and intermediate-energy ranges"**

**Brescansin, L. M.\*.**

We report an investigation on electron collisions with two nitrogen-containing compounds, namely ammonia ( $\text{NH}_3$ ) and formamide ( $\text{NH}_2\text{CHO}$ ). For ammonia, both theoretical and experimental differential, integral, and momentum-transfer cross sections, as well as calculated grand-total and total absorption cross sections, are reported in the 50-500 eV incident energy range. Calculated results of various cross sections are also reported for energies below 50 eV. Experimentally, angular distributions of the scattered electrons were measured using a crossed electron beam-molecular beam geometry and then converted to absolute differential cross sections using the relative flow technique. Absolute integral and momentum-transfer cross sections for elastic  $e^-$ -ammonia scattering were also derived from the measured differential cross sections. For formamide, only theoretical cross sections are presented in the 1-500 eV incident energy range. A single-center-expansion technique combined with the method of Pade was used in our calculations. For both targets, our calculated cross sections are compared with the present measured data and with the theoretical and experimental data available in the literature and show generally good agreement. Moreover, for formamide, two shape resonances located at 3.5 eV and 15 eV which correspond to the continuum  $(2)A''$  and  $(2)A'$  scattering symmetries, respectively, are identified. The former can be associated to the B-2(1) shape resonance in formaldehyde located at around 2.5 eV, whereas the latter can be related to the E-2 resonance in ammonia at about 10 eV. Such correspondence is very interesting and so supports the investigation on electron interaction with small building blocks, instead of with larger biomolecules.

**PHYSICAL REVIEW A 90 [6], 062704, 2014. DOI: 10.1103/PhysRevA.90.062704**

**[P010-2015] "Electron collisions with ethylene: The role of multichannel-coupling effects"**

da Costa, R. F.\*; Bettega, M. H. F.; Varella, M. T. do N.; de Oliveira, E. M.\*; Lima, M. A. P.\*

We report integral and differential cross sections for elastic and electronically inelastic  $X(1)A(g) \rightarrow (a) \text{ over tilde } B-3(1u)$  electron scattering by ethylene. The Schwinger multichannel method with pseudopotentials in the N-open-channel-coupling scheme at the static-exchange-plus-polarization approximation is employed to calculate the scattering amplitudes at impact energies ranging from 5.7 to 50 eV. We discuss the multichannel-coupling effects in the calculated cross sections, in particular, how the number of excited states included in the open-channel space impacts the convergence of the elastic and the  $X(1)A(g) \rightarrow (a) \text{ over tilde } B-3(1u)$  excitation cross sections at higher collision energies. We found good agreement between the present calculated total cross section (which includes elastic, inelastic, and ionization contributions, the latter estimated with the binary-encounter-Bethe model) and the experimental data.

**PHYSICAL REVIEW A 90[5], 052707, 2014. DOI: 10.1103/PhysRevA.90.052707**

**[P011-2015] "Event-by-event mean  $p(T)$  fluctuations in pp and Pb-Pb collisions at the LHC"**

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

Event-by-event fluctuations of the mean transverse momentum of charged particles produced in pp collisions at root s = 0.9, 2.76 and 7 TeV, and Pb-Pb collisions at root S-NN = 2.76 TeV are studied as a function of the charged-particle multiplicity using the ALICE detector at the LHC.

Dynamical fluctuations indicative of correlated particle emission are observed in all systems. The results in pp collisions show little dependence on collision energy. The Monte Carlo event generators PYTHIA and PHOJET are in qualitative agreement with the data. Peripheral Pb-Pb data exhibit a similar-multiplicity dependence as that observed in pp. In central Pb-Pb, the results deviate from this trend, featuring a significant reduction of the fluctuation strength. The results in Pb-Pb are in qualitative agreement with previous measurements in Au-Au at lower collision energies and with expectations from models that incorporate collective phenomena.

EUROPEAN PHYSICAL JOURNAL C 74[10], 3077, 2014. DOI: 10.1140/epjc/s10052-014-3077-y

[P012-2015] "Evidence of b-Jet Quenching in PbPb Collisions at root S-NN=2.76 TeV"

Chatrchyan, S.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; CMS Collaboration; et al.

The production of jets associated to bottom quarks is measured for the first time in PbPb collisions at a center-of-mass energy of 2.76 TeV per nucleon pair. Jet spectra are reported in the transverse momentum ( $p(T)$ ) range of 80-250 GeV/c, and within pseudorapidity vertical bar  $\eta$  vertical bar < 2. The nuclear modification factor ( $R_{AA}$ ) calculated from these spectra shows a strong suppression in the b-jet yield in PbPb collisions relative to the yield observed in pp collisions at the same energy. The suppression persists to the largest values of  $pT$  studied, and is centrality dependent. The  $R_{AA}$  is about 0.4 in the most central events, similar to previous observations for inclusive jets. This implies that jet quenching does not have a strong dependence on parton mass and flavor in the jet  $p(T)$  range studied.

PHYSICAL REVIEW LETTERS 113[13], 132301, 2014. DOI: 10.1103/PhysRevLett.113.132301

[P013-2015] "Exclusive J/psi Photoproduction off Protons in Ultraperipheral p-Pb Collisions at root s(NN)=5.02 TeV"

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

We present the first measurement at the LHC of exclusive J/psi photoproduction off protons, in ultraperipheral proton-lead collisions at root s(NN) = 5.02 TeV. Events are selected with a dimuon pair produced either in the rapidity interval, in the laboratory frame,  $2.5 < y < 4$  (p-Pb) or  $-3.6 < y < -2.6$  (Pb-p), and no other particles observed in the ALICE acceptance. The measured cross sections  $\sigma(\gamma + p \rightarrow J/\psi + p)$  are  $33.2 \pm 2.2(\text{stat}) \pm 3.2(\text{syst}) \pm 0.7(\text{theor})$  nb in p-Pb and  $284 \pm 36(\text{stat}) \pm 32(\text{syst}) \pm 26(\text{theor})$  nb in Pb-p collisions. We measure this process up to about 700 GeV in the gamma p center of mass, which is a factor of two larger than the highest energy studied at HERA. The data are consistent with a power law dependence of the J/psi photoproduction cross section in gamma p energies from about 20 to 700 GeV, or equivalently, from Bjorken x scaling variable between similar to  $2 \times 10^{-2}$  and similar to  $2 \times 10^{-5}$ , thus indicating no significant change in the gluon density behavior of the proton between HERA and LHC energies.

PHYSICAL REVIEW LETTERS 113[23], 232504, 2014. DOI: 10.1103/PhysRevLett.113.232504

[P014-2015] "Freeze-out radii extracted from three-pion cumulants in pp, p-Pb and Pb-Pb collisions at the LHC"

Grigoryan, A.; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

In high-energy collisions, the spatio-temporal size of the particle production region can be measured using the Bose-Einstein correlations of identical bosons at low relative momentum. The source radii are typically extracted using two-pion correlations, and characterize the system at the last stage of interaction, called kinetic freeze-out. In low-multiplicity collisions, unlike in high-multiplicity collisions, two-pion correlations are substantially altered by background correlations, e. g. mini-jets. Such correlations can be suppressed using three-pion cumulant correlations. We present the first measurements of the size of the system at freeze-out extracted from three-pion cumulant correlations in pp, p-Pb and Pb-Pb collisions at the LHC with ALICE. At similar multiplicity, the invariant radii extracted in p-Pb collisions are found to be 5-15% larger than those in pp, while those in Pb-Pb are 35-55% larger than those in p-Pb. Our measurements disfavor models which incorporate substantially stronger collective expansion in p-Pb as compared to pp collisions at similar multiplicity.

PHYSICS LETTERS B 739, 139-151, 2014. DOI: 10.1016/j.physletb.2014.10.034

[P015-2015] "From 1D to 3D Ru Nanostructures on a Pt Stepped Surface as Model Systems in Electrocatalysis: UHV-STM and XPS Study"

Carbonio, E. A.\*; Prieto, M. J.\*; de Siervo, A.\*; Landers, R\*.

A Ru-decorated Pt single crystal vicinal to the (111) plane was studied using scanning tunneling microscopy (STM) and X-ray photoemission spectroscopy (XPS) in ultrahigh-vacuum environment. Pt(332) vicinal surface was used, and different coverages of Ru ( $\theta(\text{Ru})$ ) were deposited. STM images show that Ru initial growth is highly influenced by the stepped nature of the surface. For instance, 1D and 2D nanostructures grow decorating the steps at low coverage ( $\theta = 0.34$ ), while at higher coverage a second layer is stabilized and bilayer (3D) growth sets in. The size and shape of the Ru nanostructures differ from those reported for Ru on Pt(111) due to the high density of steps that induces anisotropic growth and delays the monolayer to bilayer growth transition. Sample annealing at 623 K promotes further anisotropy and an increase in the amount of 3D structures. XPS suggests that no bulk alloying (bulk diffusion) of Ru occurs at this temperature. Additionally, our findings are used to discuss the different electrocatalytic behavior reported for some PtRu systems and to explain tendencies observed for Ru-decorated Pt nanoparticles toward the CH<sub>3</sub>OH and CO electrooxidation reactions.

JOURNAL OF PHYSICAL CHEMISTRY C 118[49], 28679-28688, 2014. DOI: 10.1021/jp509574s

[P016-2015] "Hybrid silicon/P3HT solar cells based on an interfacial modification with a molecular thiophene layer"

Freitas, F. S.; Merlo, R. B.\*; Marques, F. C.\*; Nogueira, A. F.

Hybrid photovoltaic (PV) devices based on a poly(3-hexylthiophene) (P3HT) layer and chemically modified silicon wafers with thiophene groups are reported for the first time. The chemical modification was performed by linking thiophene units directly onto silicon atoms at the n-type silicon wafer surface. To achieve the silicon modification, two-step, chlorination/alkylation reactions were used to convert Si-H into Si-thiophene bonds. Such interfacial modification increased the compatibility and the physical contact between the organic and inorganic phases as well as it promoted a more favorable alignment of band-edge energies. Thus, the hybrid photovoltaic devices based on n-Si/thiophene/P3HT achieved a power conversion efficiency of 8.0% (under simulated air mass 1.5 solar irradiation at 100mWcm<sup>-2</sup>), which was higher than the device containing the silicon wafer with terminal Si-H bonds.

PHYSICA STATUS SOLIDI A-APPLICATIONS AND MATERIALS SCIENCE 211[11], 2657-2661, 2014 DOI: 10.1002/pssa.201431568

[P017-2015] "Influence of Substrate Steps on the Catalytic Properties of Pt Layers: The Ethanol Electrooxidation Reaction"

Prieto, M. J.\*; Tremiliosi-Filho, G.

The ethanol oxidation reaction (EOR) is investigated on Pt/Au(hkl) electrodes. The Au(hkl) single crystals used belong to the  $[n(111)x(110)]$  family of planes. Pt is deposited following the galvanic exchange of a previously deposited Cu monolayer using a  $Pt^{2+}$  solution. Deposition is not epitaxial and the defects on the underlying Au(hkl) substrates are partially transferred to the Pt films. Moreover, an additional (100)-step-like defect is formed, probably as a result of the strain resulting from the Pt and Au lattice mismatch. Regarding the EOR, both vicinal Pt/Au(hkl) surfaces exhibit a behavior that differs from that expected for stepped Pt; for instance, the smaller the step density on the underlying Au substrate, the greater the ability to break the CC bond in the ethanol molecule, as determined by in situ Fourier transform infrared spectroscopy measurements. Also, we found that the acetic acid production is favored as the terrace width decreases, thus reflecting the inefficiency of the surface array to cleave the ethanol molecule.

CHEMPHYSICHEM 15,[17], 3864-3870, 2014. DOI: 10.1002/cphc.201402377

[P018-2015] "Internal decoherence of a Gaussian wave packet in a harmonic potential"

Cidrim, A.; dos Santos, F. E. A.; Caldeira, A. O.\*

We have studied the quantum dissipative problem of a Gaussian wave packet under the influence of a harmonic potential. A phenomenological approach to dissipation is adopted in the light of the well-known model in which the environment is composed of a bath of noninteracting harmonic oscillators. As one of the effects of the coupling to the bath is the evolution of an initially pure wave packet into a statistical mixture, we estimate the characteristic time elapsed for this to occur for different regimes of temperature, damping, and also different initial states.

PHYSICAL REVIEW A 90[5], 052102, 2014. DOI: 10.1103/PhysRevA.90.052102

[P019-2015] "J/psi polarization in p plus p collisions at root s=200 GeV in STAR"

Adamczyk, L.; de Souza, R Derradi\*; Takahashi, J.\*; Vasconcelos, G. M. S.\*;

We report on a polarization measurement of inclusive J/psi mesons in the di-electron decay channel at mid-rapidity at  $2 < p(T) < 6$  GeV/c in p + p collisions at root s = 200 GeV. Data were taken with the STAR detector at RHIC. The J/psi polarization measurement should help to distinguish between different models of the J/psi production mechanism since they predict different p(T) dependences of the J/psi polarization. In this analysis, J/psi is studied in the helicity frame. The polarization parameter  $\lambda(\theta)$  measured at RHIC becomes smaller towards high p(T), indicating more longitudinal J/psi polarization as p(T) increases. The result is compared with predictions of presently available models.

PHYSICS LETTERS B 739, 180-188, 2014. DOI: 10.1016/j.physletb.2014.10.049

[P020-2015] "Lanthanide Orthoantimonate Light Emitters: Structural, Vibrational, and Optical Properties"

Siqueira, K. P. F.; Lima, P. P.; Ferreira, F.; Rute A. S.; Carlos, L. D.; Bittar, E. M.; Granado, E.\*; Gonzalez, J. C.; Abelenda, A.; Moreira, R. L.; Dias, A.

Lanthanide orthoantimonates represented by the chemical formula  $LnSbO(4)$  (Ln are all the lanthanides elements with exception of cerium and promethium) were synthesized via solid-state reactions. The crystalline structures of  $LnSbO(4)$  were determined by high-resolution Synchrotron X-ray diffraction and the Rietveld method. The samples exhibited monoclinic structures with two different arrangements as a function of the ionic radius of the lanthanide metal. For compounds with the largest ionic radii (Ln = La and Pr), the P21/n space group was determined, while compounds with intermediate and smallest ionic radii (Ln = NdLu) were described under the P2(1)/c setting. Raman spectroscopy was employed to study the vibrational features of all compounds, allowing us to determine the characteristic phonons for each structure and, consequently, to establish the relationship between chemical environment and vibrational properties. Optical features of typical  $SmSbO_4$  and  $TbSbO_4$  were thoroughly investigated, and the results indicate that the orthoantimonates are promising luminescent inorganic materials. The photoluminescence spectra (emission and excitation) of both compounds were obtained as a function of temperature under ultraviolet radiation, showing strong orange (Sm) and green (Tb) emissions, respectively. Chromaticity diagrams (CIE) were also determined for all  $LnSbO(4)$  series, aiming to bring forward the color coordinates for these emitters tuned by the chemical environment and temperature.

CHEMISTRY OF MATERIALS 26[22] 6351-6360, 2014. DOI: 10.1021/cm502504b

[P021-2015] "Maximal breaking of symmetry at critical angles and a closed-form expression for angular deviations of the Snell law"

Araujo, M. P.\*; Carvalho, S. A.; De Leo, S.

A detailed analysis of the propagation of laser Gaussian beams at critical angles shows under which conditions it is possible to maximize the breaking of symmetry in the angular distribution and for which values of the laser wavelength and beam waist it is possible to find an analytic formula for the maximal angular deviation from the optical path predicted by the Snell law. For beam propagation through N dielectric blocks and for a maximal breaking of symmetry, a closed expression for the Goos-Hanchen shift is obtained. The multiple-peak phenomenon clearly represents additional evidence of the breaking of symmetry in the angular distribution of optical beams. Finally, the laser wavelength and beam-waist conditions to produce focal effects in the outgoing beam are also briefly discussed.

PHYSICAL REVIEW A 90[3], 033844, 2014. DOI: 10.1103/PhysRevA.90.033844

[P022-2015] "Measurement of differential cross sections for the production of a pair of isolated photons in pp collisions at root s=7TeV"

Chatrchyan, S.; Chinellato, J.\*; Manganote, E. J. Tonelli\*; CMS Collaboration; et al.

A measurement of differential cross sections for the production of a pair of isolated photons in proton-proton collisions at root s = 7 TeV is presented. The data sample corresponds to an integrated luminosity of 5.0 fb<sup>-1</sup> collected with the CMS detector. A data-driven isolation template method is used to extract the prompt diphoton yield.

The measured cross section for two isolated photons, with transverse energy above 40 and 25 GeV respectively, in the pseudorapidity range vertical bar eta vertical bar < 2.5, vertical bar eta vertical bar (sic) [1.44, 1.57] and with an angular separation  $\Delta R > 0.45$ , is  $17.2 \pm 0.2$  (stat)  $\pm 1.9$  (syst)  $\pm 0.4$  (lumi) pb. Differential cross sections are measured as a function of the diphoton invariant mass, the diphoton transverse momentum, the azimuthal angle difference between the two photons, and the cosine of the polar angle in the Collins-Soper reference frame of the diphoton system. The results are compared to theoretical predictions at leading, next-to-leading, and next-to-next-to-leading order in quantum chromodynamics.

EUROPEAN PHYSICAL JOURNAL C 74[11], 3129, 2014. DOI:10.1140/epjc/s10052-014-3129-3

[P023-2015] "Measurement of Laser Frequencies from CD3OH and CD3OD up to 8.6 THz"

Vasconcellos, E. C. C.\*; Evenson, K. M.; Hockel, H.; Lauters, M.; Zink, L. R.; Jackson, M.

Twenty two laser frequencies, whose values range from 1.6 to 8.6 THz, have been measured for the first time using heterodyne techniques. These laser emissions were generated by an optically pumped molecular laser that used either CD3OH or CD3OD as its lasing medium. At least three of the observed laser emissions generated by CD3OH were discovered during this investigation and the first laser frequencies measured for CD3OH above 8 THz are reported. The laser frequencies were measured with fractional uncertainties up to  $\pm 2 \times 10^{-7}$ , of sufficient accuracy to confirm two proposed far-infrared laser assignments. The offset frequency of the CO2 pump laser with respect to its center frequency was also measured for nearly all laser emissions generated by CD3OH.

JOURNAL OF INFRARED MILLIMETER AND TERAHERTZ WAVES 35[11], 881-890, 2014. DOI: 10.1007/s10762-014-0108-6

[P024-2015] "Measurement of Prompt D-Meson Production in p-Pb Collisions at root s(NN)=5.02 TeV"

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

The p(T)-differential production cross sections of the prompt charmed mesons D-0, D+, D\*(-), and D-s(+) and their charge conjugate in the rapidity interval  $-0.96 < y(\text{cms}) < 0.04$  were measured in p-Pb collisions at a center-of-mass energy  $\sqrt{s(\text{NN})} = 5.02$  TeV with the ALICE detector at the LHC. The nuclear modification factor R-pPb, quantifying the D-meson yield in p-Pb collisions relative to the yield in pp collisions scaled by the number of binary nucleon-nucleon collisions, is compatible within the 15%-20% uncertainties with unity in the transverse momentum interval  $1 < p(\text{T}) < 24$  GeV/c. No significant difference among the R-pPb of the four D-meson species is observed. The results are described within uncertainties by theoretical calculations that include initial-state effects. The measurement adds experimental evidence that the modification of the momentum spectrum of D mesons observed in Pb-Pb collisions with respect to pp collisions is due to strong final-state effects induced by hot partonic matter.

PHYSICAL REVIEW LETTERS 113[23] 232301, 2014. DOI: 10.1103/PhysRevLett.113.232301

[P025-2015] "Measurement of pseudorapidity distributions of charged particles in proton-proton collisions at root s=8 TeV by the CMS and TOTEM experiments"

Chatrchyan, S.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; CMS Collaboration; TOTEM Collaboration; et al.

Pseudorapidity (eta) distributions of charged particles produced in proton-proton collisions at a centre-of-mass energy of 8 TeV are measured in the ranges vertical bar eta vertical bar < 2.2 and  $2.2 < \text{vertical bar eta vertical bar} < 6.4$  covered by the CMS and TOTEM detectors, respectively. The data correspond to an integrated luminosity of  $L = 45 \mu\text{b}^{-1}$ . Measurements are presented for three event categories. The most inclusive category is sensitive to 91-96 % of the total inelastic proton-proton cross section. The other two categories are disjoint subsets of the inclusive sample that are either enhanced or depleted in single diffractive dissociation events. The data are compared to models used to describe high-energy hadronic interactions. None of the models considered provide a consistent description of the measured distributions.

EUROPEAN PHYSICAL JOURNAL C 74[10], 3053, 2014. DOI: 10.1140/epjc/s10052-014-3053-6

[P026-2015] "Measurement of the t(t)over-bar production cross section in pp collisions at root s=8 TeV in dilepton final states containing one tau lepton"

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

The top-quark pair production cross section is measured in final states with one electron or muon and one hadronically decaying tau lepton from the process  $t(\bar{t}) \rightarrow (l \nu(l)) (\tau \nu(\tau)) b(\bar{b})$ , where  $l = e, \mu$ . The data sample corresponds to an integrated luminosity of  $19.6 \text{ fb}^{-1}$  collected with the CMS detector in proton-proton collisions at  $\sqrt{s} = 8$  TeV. The measured cross section  $\sigma(t(\bar{t})) = 257 \pm 3$  (stat)  $\pm 24$  (syst)  $\pm 7$  (lumi) pb, assuming a top-quark mass of 172.5 GeV, is consistent with the standard model prediction.

PHYSICS LETTERS B 739, 23-43, 2014. DOI: 10.1016/j.physletb.2014.10.032

[P027-2015] "Measurement of visible cross sections in proton-lead collisions at root s(NN)=5.02 TeV in van der Meer scans with the ALICE detector"

Abelev, B.; Dash, A.\*; Takahashi, J.\*; Alice Collaboration; et al.

In 2013, the Large Hadron Collider provided proton-lead and lead-proton collisions at the center-of-mass energy per nucleon pair  $\sqrt{s(\text{NN})} = 5.02$  TeV. Van der Meer scans were performed for both configurations of colliding beams, and the cross section was measured for two reference processes, based on particle detection by the T0 and V0 detectors, with pseudo-rapidity coverage  $4.6 < \eta < 4.9$ ,  $-3.3 < \eta < -3.0$  and  $2.8 < \eta < 5.1$ ,  $-3.7 < \eta < -1.7$ , respectively. Given the asymmetric detector acceptance, the cross section was measured separately for the two configurations. The measured visible cross sections are used to calculate the integrated luminosity of the proton-lead and lead-proton data samples, and to indirectly measure the cross section for a third, configuration-independent, reference process, based on neutron detection by the Zero Degree Calorimeters.

JOURNAL OF INSTRUMENTATION 9, P11003, 2014. DOI: 10.1088/1748-0221/9/11/P11003

[P028-2015] "Modified Beer-Lambert law for blood flow"

Baker, W. B.; Parthasarathy, A. B.; Busch, D. R.; Mesquita, R. C.\*; Greenberg, J. H.; Yodh, A. G.

We develop and validate a Modified Beer-Lambert law for blood flow based on diffuse correlation spectroscopy (DCS) measurements. The new formulation enables blood flow monitoring from temporal intensity autocorrelation function data taken at single or multiple delay-times. Consequentially, the speed of the optical blood flow measurement can be substantially increased. The scheme facilitates blood flow monitoring of highly scattering tissues in geometries wherein light propagation is diffusive or non-diffusive, and it is particularly well-suited for utilization with pressure measurement paradigms that employ differential flow signals to reduce contributions of superficial tissues.

**BIOMEDICAL OPTICS EXPRESS** 5[11], 4053-4075, 2014. DOI: 10.1364/BOE.5.004053

**[P029-2015] “Multiparticle azimuthal correlations in p-Pb and Pb-Pb collisions at the CERN Large Hadron Collider”**

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

Measurements of multiparticle azimuthal correlations (cumulants) for charged particles in p-Pb at  $\sqrt{s(NN)} = 5.02$  TeV and Pb-Pb at  $\sqrt{s(NN)} = 2.76$  TeV collisions are presented. They help address the question of whether there is evidence for global, flowlike, azimuthal correlations in the p-Pb system. Comparisons are made to measurements from the larger Pb-Pb system, where such evidence is established. In particular, the second harmonic two-particle cumulants are found to decrease with multiplicity, characteristic of a dominance of few-particle correlations in p-Pb collisions. However, when a vertical bar  $\Delta\eta$  vertical bar gap is placed to suppress such correlations, the two-particle cumulants begin to rise at high multiplicity, indicating the presence of global azimuthal correlations. The Pb-Pb values are higher than the p-Pb values at similar multiplicities. In both systems, the second harmonic four-particle cumulants exhibit a transition from positive to negative values when the multiplicity increases. The negative values allow for a measurement of  $v(2)\{4\}$  to be made, which is found to be higher in Pb-Pb collisions at similar multiplicities. The second harmonic six-particle cumulants are also found to be higher in Pb-Pb collisions. In Pb-Pb collisions, we generally find  $v(2)\{4\}$  similar or equal to  $v(2)\{6\}$  not equal 0 which is indicative of a Bessel-Gaussian function for the  $v(2)$  distribution. For very high-multiplicity Pb-Pb collisions, we observe that the four- and six-particle cumulants become consistent with 0. Finally, third harmonic two-particle cumulants in p-Pb and Pb-Pb are measured. These are found to be similar for overlapping multiplicities, when a vertical bar  $\Delta\eta$  vertical bar  $> 1.4$  gap is placed.

**PHYSICAL REVIEW C** 90[5], 054901, 2014. DOI: 10.1103/PhysRevC.90.054901

**[P030-2015] “Neutral pion production at midrapidity in pp and Pb-Pb collisions at  $\sqrt{s(NN)} = 2.76$  TeV”**

Abelev, B.; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

Invariant yields of neutral pions at midrapidity in the transverse momentum range  $0.6 < p_T < 12$  GeV/c measured in Pb-Pb collisions at  $\sqrt{s(NN)} = 2.76$  TeV are presented for six centrality classes. The pp reference spectrum was measured in the range  $0.4 < p_T < 10$  GeV/c at the same center-of-mass energy. The nuclear modification factor,  $R_{AA}$ , shows a suppression of neutral pions in central Pb-Pb collisions by a factor of up to about 8-10 for 5 less than or similar to  $p(T)$  less than or similar to 7 GeV/c. The presented measurements are compared with results at lower center-of-mass energies and with theoretical calculations.

**EUROPEAN PHYSICAL JOURNAL C** 74[10], 3108, 2014. DOI: 10.1140/epjc/s10052-014-3108-8

**[P031-2015] “New experimental setup for metallic clusters production based on hollow cylindrical magnetron sputtering”**

Domingues, A.\*; de Sa, T.\*; Toshiyuki, V.\*; Oiko, A.\*; di Domenicantonio, G.\*; Rodrigues, V.\*

Nanoscale structures have been widely studied because their properties differ greatly from their bulk counterpart systems, raising both a fundamental and technological interest. Despite the great advances that have been made, the domain still presents great challenges. The development of dedicated instrumentation, in particular, is an essential issue since the well established techniques used for atomic size and for macroscopic systems are often not suited for the study of nanoaggregates. In this article, the authors present the development of a new cluster source aimed to produce pure or alloy metallic clusters ranging from two up to thousands atoms in a controllable way. The setup is based on the design of Haberland et al. [J. Vac. Sci. Technol. 12, 2925 (1994)] with the implementation of a hollow cylindrical sputtering as atoms source that enhances the control over the production of alloy clusters and also improves target usage.

**JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B** 32[6], 061804, 2014. DOI: 10.1116/1.4900847

**[P032-2015] “Nonlinear light-induced absorption in Bi<sub>2</sub>TeO<sub>5</sub> photorefractive crystals”**

de Oliveira, I.; Capovilla, D. A.; Timoteo, V. S.; Carvalho, J. F.; Frejlich, J.\*

We report on the light-induced absorption in undoped photorefractive Bi<sub>2</sub>TeO<sub>5</sub> (BTeO) crystal. The so-called “two-center” model is shown to adequately describe the present material behavior. We demonstrate that nonlinear light-induced absorption occurs for high light intensities. The theoretical model allowed us to find out some material parameters from experimental data. We also investigate the effect of intensity and wavelength on the light-induced absorption.

**JOURNAL OF THE OPTICAL SOCIETY OF AMERICA B-OPTICAL PHYSICS** 31[11], 2677-2680, 2014. DOI: 10.1364/JOSAB.31.002677

**[P033-2015] “Observation of the diphoton decay of the Higgs boson and measurement of its properties”**

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

Observation of the diphoton decay mode of the recently discovered Higgs boson and measurement of some of its properties are reported. The analysis uses the entire dataset collected by the CMS experiment in proton-proton collisions during the 2011 and 2012 LHC running periods. The data samples correspond to integrated luminosities of 5.1 fb<sup>-1</sup> at  $\sqrt{s} = 7$  TeV and 19.7 fb<sup>-1</sup> at 8 TeV. A clear signal is observed in the diphoton channel at a mass close to 125 GeV with a local significance of 5.7 sigma, where a significance of 5.2 sigma is expected for the standard model Higgs boson. The mass is measured to be 124.70 +/- 0.34 GeV = 124.70 +/- 0.31 (stat) +/- 0.15 (syst) GeV, and the best-fit signal strength relative to the standard model prediction is 1.14(-0.23)(+0.26) = 1.14 +/- 0.21 (stat) (-0.05)(+0.09) (syst) (+0.13)(-0.09) (theo). Additional measurements include the signal strength modifiers associated with different production mechanisms, and hypothesis tests between spin-0 and spin-2 models.

**EUROPEAN PHYSICAL JOURNAL C** 74[10], 3076, 2014. DOI: 10.1140/epjc/s10052-014-3076-z

**[P034-2015] "On the consistency of Monte Carlo track structure DNA damage simulations"**

Bernal, M. A\*.

Purpose: Monte Carlo track structures (MCTS) simulations have been recognized as useful tools for radiobiological modeling. However, the authors noticed several issues regarding the consistency of reported data. Therefore, in this work, they analyze the impact of various user defined parameters on simulated direct DNA damage yields. In addition, they draw attention to discrepancies in published literature in DNA strand break (SB) yields and selected methodologies. Methods: The MCTS code Geant4-DNA was used to compare radial dose profiles in a nanometerscale region of interest (ROI) for photon sources of varying sizes and energies. Then, electron tracks of 0.28 keV-220 keV were superimposed on a geometric DNA model composed of  $2.7 \times 10^6$  nucleosomes, and SBs were simulated according to four definitions based on energy deposits or energy transfers in DNA strand targets compared to a threshold energy ETH. The SB frequencies and complexities in nucleosomes as a function of incident electron energies were obtained. SBs were classified into higher order clusters such as single and double strand breaks (SSBs and DSBs) based on inter-SB distances and on the number of affected strands. Results: Comparisons of different nonuniform dose distributions lacking charged particle equilibrium may lead to erroneous conclusions regarding the effect of energy on relative biological effectiveness. The energy transfer-based SB definitions give similar SB yields as the one based on energy deposit when E-TH approximate to 10.79 eV, but deviate significantly for higher E-TH values. Between 30 and 40 nucleosomes/ Gy show at least one SB in the ROI. The number of nucleosomes that present a complex damage pattern of more than 2 SBs and the degree of complexity of the damage in these nucleosomes diminish as the incident electron energy increases. DNA damage classification into SSB and DSB is highly dependent on the definitions of these higher order structures and their implementations. The authors' show that, for the four studied models, different yields are expected by up to 54% for SSBs and by up to 32% for DSBs, as a function of the incident electrons energy and of the models being compared. Conclusions: MCTS simulations allow to compare direct DNA damage types and complexities induced by ionizing radiation. However, simulation results depend to a large degree on user-defined parameters, definitions, and algorithms such as: DNA model, dose distribution, SB definition, and the DNA damage clustering algorithm. These interdependencies should be well controlled during the simulations and explicitly reported when comparing results to experiments or calculations.

MEDICAL PHYSICS 41[12], 121708, 2014. DOI: 10.1118/1.4901555

**[P035-2015] "P-31-MRS Using Visual Stimulation Protocols with Different Durations in Healthy Young Adult Subjects"**

Barreto, F. R.; Costa, T. B. S.\*; Landim, R. C. G.\*; Castellano, G.\*.

Phosphorus magnetic resonance spectroscopy (P-31-MRS) combined with visual stimulation in functional experiments allows the non-invasive dynamic study of brain energy metabolism. P-31-MRS has been applied to several diseases and to healthy subjects, but works have shown variable findings and non-reproducible results, possibly caused by low numbers of subjects combined with different stimulation paradigms. In the present work, we used P-31-MRS at 3 T with two different visual stimulation protocols with different block duration ("short" and "long") to evaluate metabolic changes under different workloads in 38 healthy subjects. We found a 15 % (short protocol-blocks of 1.5 min stimulation) and 3 % (long protocol-blocks of 5 min stimulation) increase in the inorganic phosphate (Pi) to alpha-adenosine triphosphate (alpha-ATP) ratio,

and a 5 % (short protocol) and 2 % (long protocol) decrease in the nicotinamide adenine nucleotide (NADH + NAD(+)) to alpha-ATP ratio. The NADH + NAD(+) results are, to the best of our knowledge, the first functional magnetic resonance spectroscopy in vivo assessment of these compounds, but their interpretation is difficult since they cannot be separately quantified at 3 T. Our results show that longer stimulations produce smaller concentration changes in Pi/alpha-ATP and (NADH + NAD(+))/alpha-ATP ratios, which suggests a possible adaptation effect during longer stimulations that leads metabolic concentrations towards the initial equilibrium.

NEUROCHEMICAL RESEARCH 39[12] 2343-2350, 2014. DOI: 10.1007/s11064-014-1433-9

**[P036-2015] "PEDOT:PSS self-assembled films to methanol crossover reduction in Nafion (R) membranes"**

Almeida, T. P.; Miyazaki, C. M.; Paganin, V. A.; Ferreira, M.; Saeki, M. J.; Perez, J.; Riul, A.\*

Alternative energy sources are on a global demand, with fuel cells as promising devices from mobile to stationary applications. Nafion (R) is at the heart of many of these appliances, being mostly used due to its high proton conduction and good chemical stability at ambient temperature in proton exchange membranes (PEM). Therefore, methanol permeation throughout Nafion (R) films reduces drastically the performance of direct methanol fuel cells (DMFC). We present here the deposition of layer-by-layer (LbL) nanostructured thin films of poly(allylamine hydrochloride) (PAH) and poly(3,4-ethylenedioxythiophene)poly(styrenesulfonate) (PEDOT:PSS) onto commercial Nafion (R) 212 membranes. It was observed a good adherence of the LbL films onto Nafion (R) 212, with UV-vis results displaying a linear characteristic growth, indicative that the same amount of material was deposited at each deposition step during the layer-by-layer assembly. In addition, the LbL films also act as a good barrier to avoid methanol crossover, with an observed reduction in the methanol permeation from  $5.5 \times 10^{-6}$  cm<sup>2</sup> s<sup>-1</sup> to  $3.2 \times 10^{-6}$  cm<sup>2</sup> s<sup>-1</sup>, respectively to pristine Nafion (R) 212 and a 5-bilayer PAH/PEDOT:PSS LbL film deposited on Nafion (R) 212. The measured power density in a DMFC set-up was not significantly changed (similar to 12 mW cm<sup>-2</sup>) due to the LbL films, since the PAH/PEDOT:PSS nanostructure is impeding water and ion transport, consequently affecting the proton conduction throughout the membrane.

APPLIED SURFACE SCIENCE 323, 7-12, 2014. DOI: 10.1016/j.apsusc.2014.08.056

**[P037-2015] "Physical properties and magnetic structure of the intermetallic CeCuBi2 compound"**

Adriano, C.\*; Rosa, P. F. S.\*; Jesus, C. B. R.\*; Mardegan, J. R. L.\*; Garitezi, T. M.\*; Urbano, R. R.\*; Giles, C.\*; Pagliuso, P.G.\*

In this work we combine magnetization, pressure dependent electrical resistivity, heat capacity, Cu-63 nuclear magnetic resonance (NMR), and x-ray resonant magnetic scattering experiments to investigate the physical properties of the intermetallic CeCuBi<sub>2</sub> compound. Our single crystals show an antiferromagnetic ordering at T-N = 16 K and the magnetic properties indicate that this compound is an Ising antiferromagnet. In particular, the low temperature magnetization data revealed a spin-flop transition at T = 5 K when magnetic fields of about 5.5 T are applied along the c axis. Moreover, the x-ray magnetic diffraction data below TN revealed a commensurate antiferromagnetic structure with propagation wave vector (001/2) with the Ce<sup>3+</sup> moments oriented along the c axis.

Furthermore, our heat capacity, pressure dependent resistivity, and temperature dependent Cu-63 NMR data suggest that CeCuBi<sub>2</sub> exhibits a weak heavy fermion behavior with strongly localized Ce<sup>3+</sup> 4f electrons. We thus discuss a scenario in which both the anisotropic magnetic interactions between the Ce<sup>3+</sup> ions and the tetragonal crystalline electric field effects are taking into account in CeCuBi<sub>2</sub>.

**PHYSICAL REVIEW B 90[23] 235120, 2014. DOI: 10.1103/PhysRevB.90.235120**

**[P038-2015] "Probing large extra dimensions with IceCube"**

**Esmaili, A.\*; Peres, O. L. G.\*; Tabrizi, Z.\***

In models with Large Extra Dimensions the smallness of neutrino masses can be naturally explained by introducing gauge singlet fermions which propagate in the bulk. The Kaluza-Klein modes of these fermions appear as towers of sterile neutrino states on the brane. We study the phenomenological consequences of this picture for the high energy atmospheric neutrinos. For this purpose we construct a detailed equivalence between a model with large extra dimensions and a (3 + n) scenario consisting of three active and n extra sterile neutrino states, which provides a clear intuitive understanding of Kaluza-Klein modes. Finally, we analyze the collected data of high energy atmospheric neutrinos by IceCube experiment and obtain bounds on the radius of extra dimensions.

**JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS 12, 002, 2014. DOI: 10.1088/1475-7516/2014/12/002**

**[P039-2015] "Quantum oscillations in EuFe<sub>2</sub>As<sub>2</sub> single crystals"**

**Rosa, P. F. S.\*; Zeng, B.; Adriano, C.\*; Garitezi, T. M.\*; Grant, T.; Fisk, Z.; Balicas, L.; Johannes, M. D.; Urbano, R. R.\*; Pagliuso, P. G.\***

Quantum oscillation measurements provide relevant information about the Fermi surface (FS) properties of strongly correlated metals. Here, we report on the Shubnikov-de Haas effect via high-field resistivity measurements of EuFe<sub>2</sub>As<sub>2</sub> (Eu122) and BaFe<sub>2</sub>As<sub>2</sub> (Ba122) single crystals. Although both pnictide compounds are isovalent with similar effective masses and density of states, at the Fermi level, our results reveal subtle changes in their fermiology. Remarkably, although the spin-density-wave (SDW) ordering temperature is higher in the Eu-rich end, Eu122 displays a much more isotropic and three-dimensional-like FS when compared with Ba122, in agreement with band structure calculations. Our experimental results suggest an anisotropic contribution of the Fe 3d orbitals to the FS in Ba122. We speculate that this orbital differentiation may be responsible for the suppression of the SDW phase in the FeAs-based compounds.

**PHYSICAL REVIEW B 90[19] 195146, 2014. DOI: 10.1103/PhysRevB.90.195146**

**[P040-2015] "Red-Green Emitting and Superparamagnetic Nanomarkers Containing Fe<sub>3</sub>O<sub>4</sub> Functionalized with Calixarene and Rare Earth Complexes"**

**Khan, L. U.; Brito, H. F.; Holsa, J.; Pirota, K. R.\*; Muraca, D.\*; Felinto, M. C. F. C.; Teotonio, E. E. S.; Malta, O. L.**

The design of bifunctional magnetic luminescent nanomaterials containing Fe<sub>3</sub>O<sub>4</sub> functionalized with rare earth ion complexes of calixarene and beta-diketonate ligands is reported. Their preparation is accessible through a facile one-pot method.

These novel Fe<sub>3</sub>O<sub>4</sub>@calix-Eu(TTA) (TTA = thenoyltrifluoroacetate) and Fe<sub>3</sub>O<sub>4</sub>@calix-Tb(ACAC) (ACAC = acetylacetonate) magnetic luminescent nanomaterials show interesting superparamagnetic and photonic properties. The magnetic properties (M-H and ZFC/FC measurements) at temperatures of 5 and 300 K were explored to investigate the extent of coating and the crystallinity effect on the saturation magnetization values and blocking temperatures. Even though magnetite is a strong luminescence quencher, the coating of the Fe<sub>3</sub>O<sub>4</sub> nanoparticles with synthetically functionalized rare earth complexes has overcome this difficulty. The intramolecular energy transfer from the T1 excited triplet states of TTA and ACAC ligands to the emitting levels of Eu<sup>3+</sup> and Tb<sup>3+</sup> in the nanomaterials and emission efficiencies are presented and discussed, as well as the structural conclusions from the values of the 4f-4f intensity parameters in the case of the Eu<sup>3+</sup> ion. These novel nanomaterials may act as the emitting layer for the red and green light for magnetic light-converting molecular devices (MLCMDs).

**INORGANIC CHEMISTRY 53[24], 12902-12910, 2014. DOI: 10.1021/ic5018856**

**[P041-2015] "Room Temperature Multiferroic Behavior in Pb(Fe<sub>1/2</sub>Nb<sub>1/2</sub>)O<sub>3</sub> Ceramics"**

**Fraygola, B.; Frizon, N.; Nascimento, W. J.; Coelho, A. A.\*; Garcia, D.; Eiras, J. A.**

The co-existence of ferroelectric and ferromagnetic properties at room temperature is very rarely observed. In multiferroics, microscopic coupling interaction between the ferroelectric and magnetic order results in the macroscopic correlation between the dielectric and magnetic properties, which is defined as magnetodielectric effect. In this paper, the magnetic behavior of the Pb(Fe<sub>1/2</sub>Nb<sub>1/2</sub>)O<sub>3</sub> ceramics at high temperature has been extensively studied, showing that PFN exhibits ferroelectric and ferromagnetic ordering at room temperature, converting ferroelectric PFN into a multiferroic material at this temperature.

**FERROELECTRICS 470[1] SI, 221-226, 2014. DOI: 10.1080/00150193.2014.923682**

**[P042-2015] "Search for excited quarks in the gamma plus jet final state in proton-proton collisions at root s=8 TeV"**

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

A search for excited quarks decaying into the gamma + jet final state is presented. The analysis is based on data corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup> collected by the CMS experiment in proton-proton collisions at root s = 8 TeV at the LHC. Events with photons and jets with high transverse momenta are selected and the gamma + jet invariant mass distribution is studied to search for a resonance peak. The 95% confidence level upper limits on the product of cross section and branching fraction are evaluated as a function of the excited quark mass. Limits on excited quarks are presented as a function of their mass and coupling strength; masses below 3.5 TeV are excluded at 95% confidence level for unit couplings to their standard model partners.

**PHYSICS LETTERS B 738, 274-293, 2014. DOI: 10.1016/j.physletb.2014.09.048**

**[P043-2015] "Search for heavy neutrinos and W bosons with right-handed couplings in proton-proton collisions at root s=8TeV"**

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

A search for heavy, right-handed neutrinos,  $N$ - $l$  ( $l = e, \mu$ ), and right-handed  $W$ - $R$  bosons, which arise in the left-right symmetric extensions of the standard model, has been performed by the CMS experiment. The search was based on a sample of two lepton plus two jet events collected in proton-proton collisions at a center-of-mass energy of 8 TeV corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup>. For models with strict left-right symmetry, and assuming only one  $N$ - $l$  flavor contributes significantly to the  $WR$  decay width, the region in the two-dimensional ( $M$ - $WR$ ,  $M$ - $Nl$ ) mass plane excluded at a 95% confidence level extends to approximately  $M$ - $WR = 3.0$  TeV and covers a large range of neutrino masses below the  $W$ - $R$  boson mass, depending on the value of  $M$ - $WR$ . This search significantly extends the ( $M$ - $WR$ ,  $M$ - $Nl$ ) exclusion region beyond previous results.

EUROPEAN PHYSICAL JOURNAL C 74[11] 3149, 2014. DOI: 10.1140/epjc/s10052-014-3149-z

[P044-2015] "Search for neutral MSSM Higgs bosons decaying to a pair of tau leptons in pp collisions"

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

A search for neutral Higgs bosons in the minimal supersymmetric extension of the standard model (MSSM) decaying to tau-lepton pairs in pp collisions is performed, using events recorded by the CMS experiment at the LHC. The dataset corresponds to an integrated luminosity of 24.6 fb<sup>-1</sup>, with 4.9 fb<sup>-1</sup> at 7 TeV and 19.7 fb<sup>-1</sup> at 8 TeV. To enhance the sensitivity to neutral MSSM Higgs bosons, the search includes the case where the Higgs boson is produced in association with a b-quark jet. No excess is observed in the tau-lepton-pair invariant mass spectrum. Exclusion limits are presented in the MSSM parameter space for different benchmark scenarios,  $m(h)(\text{max})$ ,  $m(h)(\text{mod+})$ ,  $m(h)(\text{mod-})$ , light-stop, light-stau, T-ophobic, and low- $m(H)$ . Upper limits on the cross section times branching fraction for gluon fusion and b-quark associated Higgs boson production are also given.

JOURNAL OF HIGH ENERGY PHYSICS 10, 160, 2014. DOI: 10.1007/JHEP10(2014)

[P045-2015] "Search for pair production of third-generation scalar leptoquarks and top squarks in proton-proton collisions at  $\sqrt{s} = 8$  TeV"

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

A search for pair production of third-generation scalar leptoquarks and supersymmetric top quark partners, top squarks, in final states involving tau leptons and bottom quarks is presented. The search uses events from a data sample of proton-proton collisions corresponding to an integrated luminosity of 19.7 fb<sup>-1</sup>, collected with the CMS detector at the LHC with  $\sqrt{s} = 8$  TeV. The number of observed events is found to be in agreement with the expected standard model background. Third-generation scalar leptoquarks with masses below 740 GeV are excluded at 95% confidence level, assuming a 100% branching fraction for the leptoquark decay to a tau lepton and a bottom quark. In addition, this mass limit applies directly to top squarks decaying via an R-parity violating coupling,  $\lambda_{333}$ . The search also considers a similar signature from top squarks undergoing a chargino-mediated decay involving the R-parity violating coupling,  $\lambda_{3jk}$ . Each top squark decays to a tau lepton, a bottom quark, and two light quarks. Top squarks in this model with masses below 580 GeV are excluded at 95% confidence level.

The constraint on the leptoquark mass is the most stringent to date, and this is the first search for top squarks decaying via  $\lambda_{3jk}$ .

PHYSICS LETTERS B 739, 229-249, 2014. DOI: 10.1016/j.physletb.2014.10.063

[P046-2015] "Search for standard model production of four top quarks in the lepton plus jets channel in pp collisions at  $\sqrt{s} = 8$  TeV"

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

A search is presented for standard model (SM) production of four top quarks (WO in pp collisions in the lepton + jets channel. The data correspond to an integrated luminosity of 19.6 fb<sup>-1</sup> recorded at a centre-of-mass energy of 8 TeV with the CMS detector at the CERN LHC. The expected cross section for SM  $t(t)$  over  $\text{bart}(t)$  over  $\text{bar}$  production is  $\sigma(\text{SM})t(t)$  over  $\text{bart}(t)$  over  $\text{bar}$  approximate to 1 fb. A combination of kinematic reconstruction and multivariate techniques is used to distinguish between the small signal and large background. The data are consistent with expectations of the SM, and an upper limit of 32 fb is set at a 95% confidence level on the cross section for producing four top quarks in the SM, where a limit of 32 + 17 fb is expected.

JOURNAL OF HIGH ENERGY PHYSICS 11[154] 154, 2014. DOI: 10.1007/JHEP11(2014)154

[P047-2015] "Search for supersymmetry with razor variables in pp collisions at  $\sqrt{s} = 7$  TeV"

Chatrchyan, S.; Chinellato, J.\*; Tonelli Manganote, E. J.\*; CMS Collaboration; et al.

The razor approach to search for R-parity conserving supersymmetric particles is described in detail. Two analyses are considered: an inclusive search for new heavy particle pairs decaying to final states with at least two jets and missing transverse energy, and a dedicated search for final states with at least one jet originating from a bottom quark. For both the inclusive study and the study requiring a bottom-quark jet, the data are examined in exclusive final states corresponding to all-hadronic, single-lepton, and dilepton events. The study is based on the data set of proton-proton collisions at  $\sqrt{s} = 7$  TeV collected with the CMS detector at the LHC in 2011, corresponding to an integrated luminosity of 4.7 fb<sup>-1</sup>. The study consists of a shape analysis performed in the plane of two kinematic variables, denoted  $M$ - $R$  and  $R$ -2, that correspond to the mass and transverse energy flow, respectively, of pair-produced, heavy, new-physics particles. The data are found to be compatible with the background model, defined by studying event simulations and data control samples. Exclusion limits for squark and gluino production are derived in the context of the constrained minimal supersymmetric standard model (CMSSM) and also for simplified-model spectra (SMS). Within the CMSSM parameter space considered, squark and gluino masses up to 1350 GeV are excluded at 95% confidence level, depending on the model parameters. For SMS scenarios, the direct production of pairs of top or bottom squarks is excluded for masses as high as 400 GeV.

PHYSICAL REVIEW D 90[11], 112001, 2014. DOI: 10.1103/PhysRevD.90.112001

[P048-2015] "Searches for electroweak neutralino and chargino production in channels with Higgs, Z, and W bosons in pp collisions at 8 TeV"

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

Searches for supersymmetry (SUSY) are presented based on the electroweak pair production of neutralinos and charginos, leading to decay channels with Higgs, Z, and W bosons and undetected lightest SUSY particles (LSPs). The data sample corresponds to an integrated luminosity of about  $19.5 \text{ fb}^{-1}$  of proton-proton collisions at a center-of-mass energy of 8 TeV collected in 2012 with the CMS detector at the LHC. The main emphasis is neutralino pair production in which each neutralino decays either to a Higgs boson (h) and an LSP or to a Z boson and an LSP, leading to hh, hZ, and ZZ states with missing transverse energy (E-T(miss)). A second aspect is chargino-neutralino pair production, leading to hW states with E-T(miss). The decays of a Higgs boson to a bottom-quark pair, to a photon pair, and to final states with leptons are considered in conjunction with hadronic and leptonic decay modes of the Z and W bosons. No evidence is found for supersymmetric particles, and 95% confidence level upper limits are evaluated for the respective pair production cross sections and for neutralino and chargino mass values.

PHYSICAL REVIEW D 90[9] 092007, 2014. DOI: 10.1103/PhysRevD.90.092007

[P049-2015] "Suppression of Upsilon(1S) at forward rapidity in Pb-Pb collisions at  $\sqrt{s(\text{NN})}=2.76 \text{ TeV}$ "

Abelev, B.; Chinellato, D. D.\*; Dash, A.\*; Takahashi, J.\*; ALICE Collaboration; et al.

We report on the measurement of the inclusive Upsilon(1S) production in Pb-Pb collisions at  $\sqrt{s(\text{NN})} = 2.76 \text{ TeV}$  carried out at forward rapidity ( $2.5 < y < 4$ ) and down to zero transverse momentum using its  $\mu^{+}\mu^{-}$  decay channel with the ALICE detector at the Large Hadron Collider. A strong suppression of the inclusive Upsilon(1S) yield is observed with respect to pp collisions scaled by the number of independent nucleon-nucleon collisions. The nuclear modification factor, for events in the 0-90% centrality range, amounts to  $0.30 \pm 0.05(\text{stat}) \pm 0.04(\text{syst})$ . The observed Upsilon(1S) suppression tends to increase with the centrality of the collision and seems more pronounced than in corresponding mid-rapidity measurements. Our results are compared with model calculations, which are found to underestimate the measured suppression and fail to reproduce its rapidity dependence.

PHYSICS LETTERS B 738, 361-372, 2014. DOI: 10.1016/j.physletb.2014.10.001

[P050-2015] "Synthesis and characterization of alpha-nickel (II) hydroxide particles on organic-inorganic matrix and its application in a sensitive electrochemical sensor for vitamin D determination"

Canevari, T. C.; Cincotto, F. H.; Landers, R.\*; Machado, S. A. S.

This paper describes the synthesis, characterization and application of amorphous nickel (II) hydroxide particles,  $\alpha\text{-Ni}(\text{OH})_2$ , onto a hybrid material composed of silica and graphene oxide,  $\text{SiO}_2/\text{GO}$ . The sol-gel process using HF as the catalyst was used to obtain this organic-inorganic matrix. The  $\text{Ni}(\text{OH})_2$  were prepared directly on the surface of the matrix using nickel (II) acetate and N, N-dimethylformamide (DMF) as a solvent. The  $\text{SiO}_2/\text{GO}/\text{Ni}(\text{OH})_2$  material was characterized by scanning electron microscopy (SEM), high-resolution transmission electron microscopy (HR-TEM), energy-dispersive X-ray (EDX), X-ray photoelectron spectroscopy (XPS) and electrochemical techniques. A glassy carbon electrode modified with the  $\text{SiO}_2/\text{GO}/\text{Ni}(\text{OH})_2$  material was used in the development of a sensitive electrochemical sensor for the determination of vitamin D-3 by pulse differential voltammetry.

A well-defined electro-oxidation peak of vitamin D-3 was observed in sodium hydroxide at pH 13. The results indicated that the resultant  $\text{SiO}_2/\text{GO}/\text{Ni}(\text{OH})_2$  modified electrode is highly selective and very sensitive with a limit of detection, in pure laboratory solutions of  $3.26 \times 10^{-9} \text{ mol dm}^{-3}$ ; therefore, it can be used to detect vitamin D3 in real samples.

ELECTROCHIMICA ACTA 147, 688-695, 2014. DOI: 10.1016/j.electacta.2014.10.012

[P051-2015] "Tapered GRIN fiber microsensor"

Beltran-Mejia, F.\*; Biazoli, C. R.\*; Cordeiro, C. M. B.\*

The sensitivity of an optical fiber microsensor based on inter-modal interference can be considerably improved by tapering a short extension of the multimode fiber. In the case of Graded Index fibers with a parabolic refractive index profile, a meridional ray exhibits a sinusoidal path. When these fibers are tapered, the period of the propagated beam decrease down-taper and increase up-taper. We take advantage of this modulation along with the enhanced overlap between the evanescent field and the external medium to substantially increase the sensitivity of these devices by tuning the sensor's maximum sensitivity wavelength. Moreover, the extension of this device is reduced by one order of magnitude, making it more propitious for reduced space applications. Numerical and experimental results demonstrate the success and feasibility of this approach.

OPTICS EXPRESS 22[25], 30432-30441, 2014. DOI: 10.1364/OE.22.030432

[P052-2015] "Temperature sensibility of the birefringence properties in side-hole photonic crystal fiber filled with Indium"

Reyes-Vera, E.; Gomez-Cardona, N. D.; Chesini, G.\*; Cordeiro, C. M. B.\*; Torres, P.

We report on the temperature sensitivity of the birefringence properties of a special kind of photonic crystal fiber containing two side holes filled with Indium metal. The modulation of the fiber birefringence is accomplished through the stress field induced by the expansion of the metal. Although the fiber was made at low gas pressures during the indium infiltration process, the birefringence showed anomalous property at a relatively low temperature value, which is completely different from those reported in conventional-like fibers with two holes filled with metal. By modeling the anisotropic changes induced by the metal expansion to the refractive index within the fiber, we are able to reproduce the experimental results. Our results have practical relevance for the design of devices based on this technology.

APPLIED PHYSICS LETTERS 105[20] 20110, 2014. DOI: 10.1063/1.4902157

[P053-2015] "THz photometers for solar flare observations from space"

Kaufmann, P.; Marcon, R.\*; Abrantes, A.; Bortolucci, E. C.; Fernandes, L. O. T.; Kropotov, G. I.; Kudaka, A. S.; Machado, N.; Marun, A.; Nikolaev, V.; Silva, A.; da Silva, C. S.; Timofeevsky, A.

This research for the still unrevealed spectral shape of the mysterious THz solar flare emissions is one of the current most challenging research issues. The concept, fabrication and performance of a double THz photometer system, named SOLAR-T, is presented.

Its innovative optical setup allows observations of the full solar disk and the detection of small burst transients at the same time. The detecting system was constructed to observe solar flare THz emissions on board of stratospheric balloons. The system has been integrated to data acquisition and telemetry modules for this application. SOLAR-T uses two Golyay cell detectors preceded by low-pass filters made of rough surface primary mirrors and membranes, 3 and 7 THz band-pass filters, and choppers. Its photometers can detect small solar bursts (tens of solar flux units) with sub second time resolution. Tests have been conducted to confirm the entire system performance, on ambient and low pressure and temperature conditions. An artificial Sun setup was developed to simulate performance on actual observations. The experiment is planned to be on board of two long-duration stratospheric balloon flights over Antarctica and Russia in 2014-2016.

**EXPERIMENTAL ASTRONOMY 37[3], 579-598, 2014 DOI: 10.1007/s10686-014-9389-y**

**[P054-2015] "VHMPID RICH prototype using pressurized C4F8O radiator gas and VUV photon detector"**

Acconcia, T. V.; Agocs, A. G.; Dash, A. K.\*; Takahashi, J\*.

A small size prototype of a new Ring Imaging Cherenkov (RICH) detector using for the first time pressurized C4F8O radiator gas and a photon detector consisting of MWPC equipped with a CsI photocathode has been built and tested at the PS accelerator at CERN. It contained all the functional elements of the detector proposed as Very High Momentum Particle Identification (VHMPID) upgrade for the ALICE experiment at LHC to provide charged hadron track-by-track identification in the momentum range starting from 5 potentially up to 25 GeV/c. In the paper the equipment and its elements are described and some characteristic test results are shown.

**NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT 767, 50-60, 2014 DOI:10.1016/j.nima.2014.08.005**

## Proceedings

**[P055-2015] "Study on the influence of CR-39 detector size on radon progeny detection in indoor environments"**

Pereira, L. A.\*; Hadler, J. C.\*; Lixandrao, A. L. F.\*; Guedes, S.\*; Takizawa, R. H.\*

It is well known that radon daughters up to Po-214 are the real contaminants to be considered in case of indoor radon contamination. Assemblies consisting of 6 circular bare sheets of CR-39, a nuclear track detector, with radius varying from 0.15 to 1.2 cm were exposed far from any material surface for periods of approximately 6 months in 13 different indoor rooms (7 workplaces and 6 dwellings), where ventilation was moderate or poor. It was observed that track density was as greater as smaller was the detector radius. Track density data were fitted using an equation deduced based on the assumption that the behavior of radon and its progeny in the air was described by Fick's Law, i.e., when the main mechanism of transport of radon progeny in the air is diffusion. As many people spend great part of their time in closed or poorly ventilated environments, the confirmation they present equilibrium between radon and its progeny is an interesting start for dosimetric calculations concerning this contamination.

**XXXVI BRAZILIAN WORKSHOP ON NUCLEAR PHYSICS AIP Conference Proceedings 1625, 135-139, 2014. DOI: 10.1063/1.4901779**

\*Autores da comunidade IFGW

## Defesas de Dissertações

**[D001-2015] "Estudo de Descritores para distribuição Heterogênea de Dose"**

Aluno: Herminiane Luiza de Vasconcellos  
Orientador: Prof. Dr. Sandro Guedes de Oliveira  
Data: 27/02/2015

**[D002-2015] "Geometria dos defeitos topológicos em materiais esméticos sobre superfícies curvas"**

Aluno: Iberê Oliveira Kuntz de Souza  
Orientador: Prof. Dr. Ricardo Antonio Mosna  
Data: 04/03/2015

## Defesas de Teses

**[T001-2015] "Sistemas aquosos bifásicos de polietilenoglicol e sais inorgânicos: modelo estatístico"**

Aluno: Filipe Leôncio Braga  
Orientador: Prof. Dr. Mário N. Tamashiro  
Data: 20/02/2015

**[T002-2015] "Efeitos da hibridização (4f,5f)/(5d,6d) no magnetismo de compostos intermetálicos"**

Aluno: Ricardo Donizeth dos Reis  
Orientador: Prof. Dr. Narcizo Marques de Souza  
Data: 20/02/2015

**[T003-2015] "Estrutura eletrônica e magnética sob altas pressões: metais de transição 3d/5d e terras raras"**

Aluno: Larissa Sayuri Ishibe Veiga  
Orientador: Prof. Dr. Narcizo Marques de Souza  
Data: 30/03/2015

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

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