

Abstracta

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Trabalhos Publicados

[P161-2015] "Acoustic Detection of the Magnetocaloric Effect in Gadolinium Thin Films: Influence of the Substrate"

Nogal, U.*; Mansanares, A. M.*; Gandra, F. C. G.*; Soffner, M. E.; Guimaraes, A. O.; da Silva, E. C.; Vargas, H.; Marin, E.; Calderon, A.

The magnetocaloric effect (temperature change) in gadolinium thin films is investigated as a function of the external magnetic field using the magnetoacoustic technique. The measured signal evidences the magnetic anisotropy of the sample, and it is in good agreement with results obtained from magnetization measurements. The thermal coupling of the film with the substrate invalidates the adiabatic condition usually achieved when measuring bulk magnetic samples using the magnetoacoustic technique. The influence of the substrate on the temperature of the film is therefore investigated using a simple model for the heat diffusion within the sample. The temperature distribution is calculated as a function of the thermal parameters of the substrate and the results compared to the magnetoacoustic measurements.

INTERNATIONAL JOURNAL OF THERMOPHYSICS 36[5-6], SI, 1099-1105, 2015. DOI: 10.1007/s10765-014-1820-0

[P162-2015] "ALR-a laser altimeter for the first Brazilian deep space mission. Modeling and simulation of the instrument and its operation"

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

Among the scientific instruments that will fly on the upcoming mission ASTER, the first Brazilian deep space mission, the laser altimeter will play an important role in the surveys regarding shapes, topographies and masses of the asteroids of the triple system. The development of the instrument in partnership among universities (UNICAMP, UFABC) and companies of the Brazilian aerospace sector is in progress. This paper describes and presents the set of studies that were conducted aiming at the creation of software to embark on the control and signal processing unit of the instrument, with respect to the modeling and simulation of its operation and regarding the emission of laser pulses along with the detection and processing of return pulses. As the main result, a package of computer programs was created to simulate the operation of a pulsed laser altimeter with principle of operation based on the measurement of the pulse time of flight. The simulator software was named ALR_Sim. The results obtained with the ALR_Sim helped to better understand some key features and parameters of the operation of the future instrument, such as the sampling time of the detected signal and the definition of the type of detector suitable for the expected intensity of the return signal. The simulator software was successfully tested with respect to the most common expected situations.

COMPUTATIONAL & APPLIED MATHEMATICS 34[2], 557-569, 2015. DOI: 10.1007/s40314-014-0145-8

[P163-2015] "Ambient solid-state mechano-chemical reactions between functionalized carbon nanotubes"

Kabbani, M. A.; Tiwary, C. S.; Autreto, P. A. S.; Brunetto, G.; Som, A.; Krishnadas, K. R.; Ozden, S.; Hackenberg, K. P.; Gong, Y.; Galvao, D. S.*; Vajtai, R.; Kabbani, A. T.; Pradeep, T.; Ajayan, P. M.

Carbon nanotubes can be chemically modified by attaching various functionalities to their surfaces, although harsh chemical treatments can lead to their break-up into graphene nanostructures. On the other hand, direct coupling between functionalities bound on individual nanotubes could lead to, as yet unexplored, spontaneous chemical reactions. Here we report an ambient mechano-chemical reaction between two varieties of nanotubes, carrying predominantly carboxyl and hydroxyl functionalities, respectively, facilitated by simple mechanical grinding of the reactants. The purely solid-state reaction between the chemically differentiated nanotube species produces condensation products and unzipping of nanotubes due to local energy release, as confirmed by spectroscopic measurements, thermal analysis and molecular dynamic simulations.

NATURE COMMUNICATIONS 6, 7291, 205. DOI: 10.1038/ncomms8291

[P164-2015] "Application of a semi-empirical model for the evaluation of transmission properties of barite mortar"

Santos, J. C.; Tomal, A.*; Mariano, L.; Costa, P. R.

The aim of this study was to estimate barite mortar attenuation curves using X-ray spectra weighted by a workload distribution. A semi-empirical model was used for the evaluation of transmission properties of this material. Since ambient dose equivalent, $H^*(10)$, is the radiation quantity adopted by IAEA for dose assessment, the variation of the $H^*(10)$ as a function of barite mortar thickness was calculated using primary experimental spectra. A CdTe detector was used for the measurement of these spectra. The resulting spectra were adopted for estimating the optimized thickness of protective barrier needed for shielding an area in an X-ray imaging facility.

APPLIED RADIATION AND ISOTOPES 100, 38-42, 2015. DOI: 10.1016/j.apradiso.2015.01.007

[P165-2015] "Blood group antigen studies using CdTe quantum dots and flow cytometry"

Cabral Filho, P. E.; Pereira, M. I. A.; Fernandes, H. P.; de Thozmaz, A. A.*; Cesar, C. L.*; Santos, B. S.; Barjas-Castro, M. L.; Fontes, A.

New methods of analysis involving semiconductor nanocrystals (quantum dots [QDs]) as fluorescent probes have been highlighted in life science. QDs present some advantages when compared to organic dyes, such as size-tunable emission spectra, broad absorption bands, and principally exceptional resistance to photobleaching. Methods applying QDs can be simple, not laborious, and can present high sensibility, allowing biomolecule identification and quantification with high specificity. In this context, the aim of this work was to apply dual-color CdTe QDs to quantify red blood cell (RBC) antigen expression on cell surface by flow cytometric analysis. QDs were conjugated to anti-A or anti-B monoclonal antibodies, as well as to the anti-H (Ulex europaeus I) lectin, to investigate RBCs of A(1), B, A(1) B, O, A(2), and A(weak) donors. Bioconjugates were capable of distinguishing the different expressions of RBC antigens, both by labeling efficiency and by flow cytometry histogram profile. Furthermore, results showed that RBCs from Aweak donors present fewer amounts of A antigens and higher amounts of H, when compared to A(1) RBCs. In the A group, the amount of A antigens decreased as $A(1) > A(3) > A(X) = A(el)$, while H antigens were $A(X) = A(el) > A(1)$. Bioconjugates presented stability and remained active for at least 6 months. In conclusion, this methodology with high sensibility and specificity can be applied to study a variety of RBC antigens, and, as a quantitative tool, can help in achieving a better comprehension of the antigen expression patterns on RBC membranes.

[P166-2015] "Burning Graphene Layer-by-Layer"

Ermakov, V. A.; Alaferdov, A. V.; Vaz, A. R.; Perim, E.*; Autreto, P. A. S.*; Paupitz, R.; Galvao, D. S.*; Moshkalev, S. A.

Graphene, in single layer or multi-layer forms, holds great promise for future electronics and high-temperature applications. Resistance to oxidation, an important property for high-temperature applications, has not yet been extensively investigated. Controlled thinning of multi-layer graphene (MLG), e.g., by plasma or laser processing is another challenge, since the existing methods produce non-uniform thinning or introduce undesirable defects in the basal plane. We report here that heating to extremely high temperatures (exceeding 2000 K) and controllable layer-by-layer burning (thinning) can be achieved by low-power laser processing of suspended high-quality MLG in air in "cold-wall" reactor configuration. In contrast, localized laser heating of supported samples results in non-uniform graphene burning at much higher rates. Fully atomistic molecular dynamics simulations were also performed to reveal details of oxidation mechanisms leading to uniform layer-by-layer graphene gasification. The extraordinary resistance of MLG to oxidation paves the way to novel high-temperature applications as continuum light source or scaffolding material.

SCIENTIFIC REPORTS 5, 11546, 2015. DOI: 10.1038/srep11546

[P167-2015] "Centrality dependence of particle production 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

We report measurements of the primary charged-particle pseudorapidity density and transverse momentum distributions in p-Pb collisions at root s(NN) = 5.02 TeV and investigate their correlation with experimental observables sensitive to the centrality of the collision. Centrality classes are defined by using different event-activity estimators, i.e., charged-particle multiplicities measured in three different pseudorapidity regions as well as the energy measured at beam rapidity (zero degree). The procedures to determine the centrality, quantified by the number of participants (N-part) or the number of nucleon-nucleon binary collisions (N-coll) are described. We show that, in contrast to Pb-Pb collisions, in p-Pb collisions large multiplicity fluctuations together with the small range of participants available generate a dynamical bias in centrality classes based on particle multiplicity. We propose to use the zero-degree energy, which we expect not to introduce a dynamical bias, as an alternative event-centrality estimator. Based on zero-degree energy-centrality classes, the N-part dependence of particle production is studied. Under the assumption that the multiplicity measured in the Pb-going rapidity region scales with the number of Pb participants, an approximate independence of the multiplicity per participating nucleon measured at mid-rapidity of the number of participating nucleons is observed. Furthermore, at high-pT the p-Pb spectra are found to be consistent with the pp spectra scaled by N-coll for all centrality classes. Our results represent valuable input for the study of the event-activity dependence of hard probes in p-Pb collisions and, hence, help to establish baselines for the interpretation of the Pb-Pb data.

PHYSICAL REVIEW C 91[6], 064905, 2015. DOI: 10.1103/PhysRevC.91.064905

[P168-2015] "Characterisation of Apatites as Potential Uranium Reference Materials for Fission-track Dating by LA-ICP-MS"

Soares, C. J.*; Mertz-Kraus, R.; Guedes, S.*; Stockli, D. F.; Zack, T.

We report homogeneity tests on large natural apatite crystals to evaluate their potential as U reference materials for apatite fission-track (AFT) thermochronology by laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). The homogeneity tests include the measurements of major element concentrations by electron probe microanalysis (EPMA), whereas for U concentration, isotope dilution (ID) ICP-MS and laser ablation (LA) ICP-MS were employed. Two apatite crystals are potential reference materials for LA-ICP-MS analysis: a 1cm(3) fraction of a Durango crystal (7.5gg(-1)U) and a 1cm(3) Mud Tank crystal (6.9gg(-1)U). The relative standard deviation (1 RSD) of the U concentration determined by ID-ICP-MS of both apatite crystals was 1.5%, whereas 1 RSD for the LA-ICP-MS results was better than 4%, providing sufficient homogeneity for fission-track dating. The results on the U homogeneity for two different apatite samples are an important step towards establishing in situ dating routines for AFT analysis by LA-ICP-MS.

GEOSTANDARDS AND GEOANALYTICAL RESEARCH 39[3], 305-313, 2015. DOI: 10.1111/j.1751-908X.2014.00301.x

[P169-2015] "Characterization of the magnetic interactions of multiphase magnetocaloric materials using first-order reversal curve analysis"

Franco, V.*; Beron, F.*; Pirola, K. R.*; Knobel, M.*; Willard, M. A.

In order to understand the magnetocaloric response of materials, it is important to analyze the interactions between the different phases present in them. Recent models have analyzed the influence of these interactions on the magnetocaloric response of composites, providing an estimate value of the interaction field that is consistent with experimental results. This paper analyzes to which extent magnetization first-order reversal curve (FORC) method can be used to calculate these interactions. It is shown that the different field ranges that are explored using these techniques (inside the hysteretic region for FORC; close to magnetic saturation for magnetocaloric effect) produce interaction field values that differ in order of magnitude, with FORC being sensitive to the lower values of the interaction field and magnetocaloric analysis accounting for the larger interactions.

JOURNAL OF APPLIED PHYSICS 117[17] 17C124, 2015. DOI: 10.1063/1.4919121

[P170-2015] "Charged jet cross sections and properties in proton-proton collisions at root s=7 TeV"

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

The differential charged jet cross sections, jet fragmentation distributions, and jet shapes are measured in minimum bias proton-proton collisions at center-of-mass energy root s = 7 TeV using the ALICE detector at the LHC. Jets are reconstructed from charged particle momenta in the midrapidity region using the sequential recombination k(T) and anti-k(T) as well as the SIScone jet finding algorithms with several resolution parameters in the range R = 0.2-0.6. Differential jet production cross sections measured with the three jet finders are in agreement in the transverse momentum (p(T)) interval 20 < p(T) (jet,ch) < 100 GeV/c. They are also consistent with prior measurements carried out at the LHC by the ATLAS Collaboration.

The jet charged particle multiplicity rises monotonically with increasing jet $p(T)$, in qualitative agreement with prior observations at lower energies. The transverse profiles of leading jets are investigated using radial momentum density distributions as well as distributions of the average radius containing 80% ($\langle R-80 \rangle$) of the reconstructed jet $p(T)$. The fragmentation of leading jets with $R = 0.4$ using scaled $p(T)$ spectra of the jet constituents is studied. The measurements are compared to model calculations from event generators (PYTHIA, PHOJET, HERWIG). The measured radial density distributions and $\langle R-80 \rangle$ distributions are well described by the PYTHIA model (tune Perugia-2011). The fragmentation distributions are better described by HERWIG.

PHYSICAL REVIEW D 91[11] 112012, 2015. DOI: 10.1103/PhysRevD.91.112012

[P171-2015] “Combined Measurement of the Higgs Boson Mass in pp Collisions at $\sqrt{s}=7$ and 8 TeV with the ATLAS and CMS Experiments”

Aad, G.; Abbott, B.; Abdallah, J.; Chinellato, J. A.*; Tonelli Manganote, E. J.*; et al.
ATLAS Collaboration; CMS Collaboration

A measurement of the Higgs boson mass is presented based on the combined data samples of the ATLAS and CMS experiments at the CERN LHC in the $H \rightarrow \gamma\gamma$ and $H \rightarrow ZZ \rightarrow 4l$ decay channels. The results are obtained from a simultaneous fit to the reconstructed invariant mass peaks in the two channels and for the two experiments. The measured masses from the individual channels and the two experiments are found to be consistent among themselves. The combined measured mass of the Higgs boson is $m(H) = 125.09 \pm 0.21$ (stat) ± 0.11 (syst) GeV.

PHYSICAL REVIEW LETTERS 114[19] 191803, 2015. DOI: 10.1103/PhysRevLett.114.191803

[P172-2015] “Conduction electron spin resonance in the α -Yb $_x$ Fe $_x$ AlB $_4$ ($0 \leq x \leq 0.50$) and α -LuAlB $_4$ compounds”

Holanda, L. M.*; Lesseux, G. G.*; Magnavita, E. T.; Ribeiro, R. A.; Nakatsuji, S.; Kuga, K.; Fisk, Z.; Oseroff, S. B.; Urbano, R. R.*; Rettori, C.*; Pagliuso, P. G.*

beta-YbAlB $_4$ has become one of the most studied heavy fermion systems since its discovery due to its remarkable physical properties. This system is the first reported Yb-based heavy-fermion superconductor (HFS) for which the low-T superconducting state emerges from a non-fermi-liquid (NFL) normal state associated with quantum criticality Nakatsuji et al 2008 Nature 4 603. Additionally, it presents a striking and unprecedented electron spin resonance (ESR) signal which behaves as a conduction electron spin resonance (CESR) at high temperatures and acquires features of the Yb $^{3+}$ local moment ESR at low temperatures. The latter, also named Kondo quasiparticles spin resonance (KQSR), has been defined as a 4f-ce strongly coupled ESR mode that behaves as a local probe of the Kondo quasiparticles in a quantum critical regime, Holanda et al 2011 Phys. Rev. Lett. 107 026402. Interestingly, beta-YbAlB $_4$ possesses a previously known structural variant, namely the α -YbAlB $_4$, phase which is a paramagnetic Fermi liquid (FL) at low temperatures Macaluso et al 2007 Chem. Mater. 19 1918. However, it has been recently suggested that the α -YbAlB $_4$ phase may be tuned to NFL behavior and/or magnetic ordering as the compound is doped with Fe. Here we report ESR studies on the α -Yb $_x$ Fe $_x$ AlB $_4$ ($0 \leq x \leq 0.50$) series as well as on the reference compound α -LuAlB $_4$. For all measured samples, the observed ESR signal behaves as a CESR in the entire temperature range

(10K less than or similar to T less than or similar to 300 K) in clear contrast with what has been observed for beta-YbAlB $_4$. This striking result indicates that the proximity to a quantum critical point is crucial to the occurrence of a KQSR signal.

JOURNAL OF PHYSICS-CONDENSED MATTER 27[25] 255601
DOI: 10.1088/0953-8984/27/25/255601

[P173-2015] “Confronting the stochastic neutrino mixing mechanism with the sterile neutrino hypothesis as a solution to the short baseline neutrino anomalies”

Zavanin, E. M.*; Guzzo, M. M.*; de Holanda, P. C.*; Peres, O. L. G.*

We compare the solutions to the short baseline neutrino anomaly based on oscillations to sterile neutrinos and the stochastic neutrino mixing mechanism (SNMM) through an analysis of the present neutrino data. The SNMM suggests worse fits than a 3 + 1 sterile neutrino model, although it cannot be discarded by present data. We propose an experiment to distinguish between both solutions, based on placing a Li-8 source inside a 5 kton-yr detector (like SNO). We studied the sensitivity of such an experiment, which makes it possible to discriminate within 2 sigma the SNMM from the 3 + 1 sterile hypothesis for some particular values of the relevant parameters in 5 kton-yr of running.

PHYSICAL REVIEW D 91[11], 113009, 2015. DOI: 10.1103/PhysRevD.91.113009

[P174-2015] “Dielectrophoretic manipulation of individual nickel nanowires for electrical transport measurements”

Puydinger dos Santos, M. V.*; Lima, L. P. B.; Mayer, R. A.*; Beron, F.*; Pirota, K. R.*; Diniz, J. A.

Nanowires (NW) have received much attention due to their high aspect ratio, shape anisotropy, relatively large surface area and particular electron transport properties. In addition, since NW present low current levels and high sensitivity, they can be used as sensor devices for several applications. One of the major challenges when dealing with transport measurements in NW is to trap them between electrodes, which allow electrical characterization and therefore fabrication of nanowire-based devices. Electrically neutral NW can be deposited by dielectrophoresis (DEP) method, which requires the application of an alternating electric field between electrodes. In this work, properly dispersed Ni nanowires (NiNW) (length = $4 \pm 1 \mu\text{m}$, diameter = $35 \pm 5 \text{nm}$) were deposited on top of Pt electrodes using the DEP method. The effects of electrodes geometry and electric field frequency on DEP efficiency were evaluated. For optimized DEP parameters, the process efficiency is up to 85%. The deposited NiNW exhibit a Schottky-like current versus voltage behavior due to the high contact resistance between NiNW and electrode. Its reduction down to two orders of magnitude, reaching value less than the NiNW resistance (similar to $6k \Omega$), was achieved by depositing a 10 nm-thick Pt layer over the NW extremities. Therefore, this method presents a selection of adequate electrical DEP parameters and electrode geometry, making it a suitable process of NW deposition and electrical characterization. This can be used for investigation of electrical transport properties of individual NW and fabrication of NW-based devices, like sensors and field effect transistors.

JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B 33[3] 031804, 2015. DOI: 10.1116/1.4918732

[P175-2015] “Effective response theory for zero-energy Majorana bound states in three spatial dimensions”

Lopes, P. L. S.*; Teo, J. C. Y.; Ryu, S.

We propose a gravitational response theory for point defects (hedgehogs) binding Majorana zero modes in $(3 + 1)$ -dimensional superconductors. Starting in $4 + 1$ dimensions, where the point defect is extended into a line, a coupling of the bulk defect texture with the gravitational field is introduced. Diffeomorphism invariance then leads to an $SU(2)_2$ Kac-Moody current running along the defect line. The $SU(2)_2$ Kac-Moody algebra accounts for the non-Abelian nature of the zero modes in $3 + 1$ dimensions. It is then shown to also encode the angular momentum density which permeates throughout the bulk between hedgehog-antihedgehog pairs.

PHYSICAL REVIEW B 91[18], 184111, 2015. DOI: 10.1103/PhysRevB.91.184111

[P176-2015] “Enhanced Mechanical Stability of Gold Nanotips through Carbon Nanocone Encapsulation”

Cano-Marquez, A. G.; Schmidt, W. G.; Ribeiro-Soares, J.; Cancado, L. G.; Rodrigues, W. N.; Santos, A. P.; Furtado, C. A.; Autreto, P. A. S.*; Paupitz, R.; Galvao, D. S.*; Jorio, A.

Gold is a noble metal that, in comparison with silver and copper, has the advantage of corrosion resistance. Despite its high conductivity, chemical stability and biocompatibility, gold exhibits high plasticity, which limits its applications in some nanodevices. Here, we report an experimental and theoretical study on how to attain enhanced mechanical stability of gold nanotips. The gold tips were fabricated by chemical etching and further encapsulated with carbon nanocones via nanomanipulation. Atomic force microscopy experiments were carried out to test their mechanical stability. Molecular dynamics simulations show that the encapsulated nanocone changes the strain release mechanisms at the nanoscale by blocking gold atomic sliding, redistributing the strain along the whole nanostructure. The carbon nanocones are conducting and can induce magnetism, thus opening new avenues on the exploitation of transport, mechanical and magnetic properties of gold covered by sp^2 carbon at the nanoscale.

SCIENTIFIC REPORTS 5, 10408, 2015. DOI: 10.1038/srep10408

[P177-2015] “Enhancement of the luminescence intensity by co-doping Mn^{2+} into Er^{3+} -doped $SrAl_2O_4$ ”

de Herval, L. K. S.; Arslanlar, Y. T.; Ayvacikli, M.; Iikawa, F.*; Nobrega, J. A.; Pizani, P. S.; Galvao G., Y.; Can, N.; Henini, M.; de Godoy, M. P. F.

Structural and optical properties of erbium- and manganese-doped strontium aluminates ($SrAl_2O_4$) phosphor materials synthesized by a solid state reaction were investigated. The samples presented the fundamental optical transitions due to Er^{3+} and Mn^{2+} which are typical features of the well-diluted doping process. A significant enhancement of the Er^{3+} optical emission band at 1530 nm was observed when the matrix is co-doped with Mn. Photoluminescence intensity under ultraviolet excitation was three times larger as compared to samples without Mn content. A model of energy transfer mechanism from Mn^{2+} to Er^{3+} ions due to optical energy matching is proposed to explain the experimental results. This result, presented first time, can be applied as useful tool for developments in optical communications.

JOURNAL OF LUMINESCENCE 163, 17-20, 2015. DOI: 10.1016/j.jlumin.2015.02.031

[P178-2015] “Error catastrophe in populations under similarity-essential recombination”

de Aguiar, M. A. M.*; Schneider, D. M.*; do Carmo, E.; Campos, P. R. A.; Martins, A. B.*

Organisms are often more likely to exchange genetic information with others that are similar to themselves. One of the most widely accepted mechanisms of RNA virus recombination requires substantial sequence similarity between the parental RNAs and is termed similarity-essential recombination. This mechanism may be considered analogous to assortative mating, an important form of non-random mating that can be found in animals and plants. Here we study the dynamics of haplotype frequencies in populations evolving under similarity-essential recombination. Haplotypes are represented by a genome of B biallelic loci and the Hamming distance between individuals is used as a criterion for recombination. We derive the evolution equations for the haplotype frequencies assuming that recombination does not occur if the genetic distance is larger than a critical value G and that mutation occurs at a rate μ per locus. Additionally, uniform crossover is considered. Although no fitness is directly associated to the haplotypes, we show that frequency-dependent selection emerges dynamically and governs the haplotype distribution. A critical mutation rate μ_c can be identified as the error threshold transition, beyond which this selective information cannot be stored. For $\mu < \mu_c$, the distribution consists of a dominant sequence surrounded by a cloud of closely related sequences, characterizing a quasispecies. For $\mu > \mu_c$ the distribution becomes uniform, with all haplotypes having the same frequency. In the case of extreme assortativeness, where individuals only recombine with others identical to themselves ($G=0$), the error threshold results $\mu_c = 1/4$, independently of the genome size. For weak assortativity ($G = B-1$) $\mu_c = 2/(B+1)$ and for the case of no assortativity ($G=B$) $\mu_c = 0$. We compute the mutation threshold for $0 < G < B$ and show that, for large B , it depends only on the ratio G/B . We discuss the consequences of these results for recombination in viruses and for speciation.

JOURNAL OF THEORETICAL BIOLOGY 374, 48-53, 2015. DOI: 10.1016/j.jtbi.2015.03.028

[P179-2015] “Evaluation of characteristic-to-total spectrum ratio: Comparison between experimental and a semi-empirical model”

Gonzales, A. H. Lopez; Tomal, A.*; Costa, Costa, P. R.

Primary X-ray spectra were measured in the range of 80-150 kV in order to validate a computer program based on a semi-empirical model. The ratio between the characteristic and total air Kerma was considered to compare computed results and experimental data. Results show that the experimental spectra have higher first HVL and mean energy than the calculated ones. The ratios between the characteristic and total air Kerma for calculated spectra are in good agreement with experimental results for all filtrations used.

APPLIED RADIATION AND ISOTOPES 100, 27-31, 2015. DOI: 10.1016/j.apradiso.2015.01.011

[P180-2015] “Evidence for Collective Multiparticle Correlations in p-Pb Collisions”

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

The second-order azimuthal anisotropy Fourier harmonics, $\nu(2)$, are obtained in p-Pb and PbPb collisions over a wide pseudorapidity (η) range based on correlations among six or more charged particles. The p-Pb data, corresponding to an integrated luminosity of 35 nb $^{-1}$,

were collected during the 2013 LHC p-Pb run at a nucleon-nucleon center-of-mass energy of 5.02 TeV by the CMS experiment. A sample of semiperipheral PbPb collision data at root S-NN = 2.76 TeV, corresponding to an integrated luminosity of 2.5 μb^{-1} and covering a similar range of particle multiplicities as the p-Pb data, is also analyzed for comparison. The six- and eight-particle cumulant and the Lee-Yang zeros methods are used to extract the $\nu(2)$ coefficients, extending previous studies of two- and four-particle correlations. For both the p-Pb and PbPb systems, the $\nu(2)$ values obtained with correlations among more than four particles are consistent with previously published four-particle results. These data support the interpretation of a collective origin for the previously observed long-range (large...) correlations in both systems. The ratios of $\nu(2)$ values corresponding to correlations including different numbers of particles are compared to theoretical predictions that assume a hydrodynamic behavior of a p-Pb system dominated by fluctuations in the positions of participant nucleons. These results provide new insights into the multiparticle dynamics of collision systems with a very small overlapping region.

PHYSICAL REVIEW LETTERS 115 [1], 012301, 2015. DOI: 10.1103/PhysRevLett.115.012301

[P181-2015] "Forward-backward multiplicity correlations in pp collisions at root s=0.9, 2.76 and 7 TeV"

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

The strength of forward-backward (FB) multiplicity correlations is measured by the ALICE detector in proton-proton (pp) collisions at $\sqrt{s} = 0.9, 2.76$ and 7 TeV. The measurement is performed in the central pseudorapidity region ($|\eta| < 0.8$) for the transverse momentum $p_T > 0.3$ GeV/c. Two separate pseudorapidity windows of width ($\Delta\eta$) ranging from 0.2 to 0.8 are chosen symmetrically around $\eta = 0$. The multiplicity correlation strength ($b(\text{corr})$) is studied as a function of the pseudorapidity gap ($\eta(\text{gap})$) between the two windows as well as the width of these windows. The correlation strength is found to decrease with increasing $\eta(\text{gap})$ and shows a non-linear increase with $\Delta\eta$. A sizable increase of the correlation strength with the collision energy, which cannot be explained exclusively by the increase of the mean multiplicity inside the windows, is observed. The correlation coefficient is also measured for multiplicities in different configurations of two azimuthal sectors selected within the symmetric FB η -windows. Two different contributions, the short-range (SR) and the long-range (LR), are observed. The energy dependence of $b(\text{corr})$ is found to be weak for the SR component while it is strong for the LR component. Moreover, the correlation coefficient is studied for particles belonging to various transverse momentum intervals chosen to have the same mean multiplicity. Both SR and LR contributions to $b(\text{corr})$ are found to increase with p_T in this case. Results are compared to PYTHIA and PHOJET event generators and to a string-based phenomenological model. The observed dependencies of $b(\text{corr})$ add new constraints on phenomenological models.

JOURNAL OF HIGH ENERGY PHYSICS 5, 097, 2015. DOI: 10.1007/JHEP05(2015)097

[P182-2015] "Fragility of ferromagnetic double exchange interactions and pressure tuning of magnetism in 3d-5d double perovskite Sr2FeOsO6"

Veiga, L. S. I.*; Fabbris, G.; van Veenendaal, M.; Souza-Neto, N. M.; Feng, H. L.; Yamaura, K.; Haskel, D.

The ability to tune exchange (magnetic) interactions between 3d transition metals in perovskite structures has proven to be a powerful route to discovery of novel properties. Here we demonstrate that the introduction of 3d-5d exchange pathways in double perovskites enables additional tunability, a result of the large spatial extent of 5d wave functions. Using x-ray probes of magnetism and structure at high pressure, we show that compression of Sr2FeOsO6 drives an unexpected continuous change in the sign of Fe-Os exchange interactions and a transition from antiferromagnetic to ferrimagnetic order. We analyze the relevant electron-electron interactions, shedding light into fundamental differences with the more thoroughly studied 3d-3d systems.

PHYSICAL REVIEW B 91[23], 235135, 2015. DOI: 10.1103/PhysRevB.91.235135

[P183-2015] "Grazing-incidence XRF analysis of layered samples: Detailed study of amplitude calculation"

Miqueles, E. X.; Perez, C. A.; Suarez, V. I.; Vescovi, R. F. C.*

In this article, we propose a new mathematical approach for the computation of electromagnetic wave amplitudes in grazing incidence X-ray fluorescence (GIXRF)-an analytical method for surface and near-surface layer analysis. The new contribution comes from an applied point of view, in order to have stable and fast algorithms to simulate the fluorescence intensity from a stacking of thin layer films. The calculation of transmitted/reflected amplitudes is an important part of the direct and/or inverse problem. An analysis of the amplitude versus layer thickness is also given.

COMPUTER PHYSICS COMMUNICATIONS 194, 33-42, 2015. DOI: 10.1016/j.cpc.2015.03.025

[P184-2015] "Hard fats as additives in palm oil and its relationships to crystallization process and polymorphism"

de Oliveira, G. M.; Ribeiro, A. P. B.; dos Santos, A. O.; Cardoso, L. P.*; Kieckbusch, T. G.

The application of palm oil in fat-based product can be inappropriate due to its low crystallization rates and formation of crystalline clusters in post-processing stages. The adjustment of these properties can be achieved with the addition of hard fats, which are low-cost industrial products resulting from the process of total catalytic hydrogenation of liquid oils. During the crystallization of palm oil, these components can act as preferential nuclei in a crystalline ordering process, and may induce or stabilize specific polymorphic habits. The present work evaluated the addition of hard fats from palm kernel (PKO), palm (PO), soybean (SO), cottonseed (CO) and crambe oils (CR), at concentrations of 1 g, 3 g, and 5 g/100 g of oil blend, on the crystallization behavior of palm oil. The study involves the crystallization kinetics, thermal behavior and polymorphism. The addition of hard fats provided a significant decrease of the induction time for nucleation in all blends, except with PKO. All blends showed a preference for crystallization in the polymorphic habit β' , but blends with SO and CR, however, formed a miscellany of $\beta' + \beta$ crystals. Adding hard fats to palm oil increase its compatibility for uses in formulations of cocoa butter alternatives and fat-based products.

LWT-FOOD SCIENCE AND TECHNOLOGY 63[2], 1163-1170, 2015. DOI: 10.1016/j.lwt.2015.04.03

[P185-2015] "Higher-order generalized hydrodynamics: Foundations within a nonequilibrium statistical ensemble formalism"

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

Construction, in the framework of a nonequilibrium statistical ensemble formalism, of a higher-order generalized hydrodynamics, also referred to as mesoscopic hydrothermodynamics, that is, covering phenomena involving motion of fluids displaying variations short in space and fast in time-unrestricted values of Knudsen numbers, is presented. In that way, an approach is provided enabling the coupling and simultaneous treatment of the kinetics and hydrodynamic levels of descriptions. It is based on a complete thermostatical approach in terms of the densities of matter and energy and their fluxes of all orders covering systems arbitrarily driven away from equilibrium. The set of coupled nonlinear integrodifferential hydrodynamic equations is derived. They are the evolution equations of the Gradlike moments of all orders, derived from a generalized kinetic equation built in the framework of the nonequilibrium statistical ensemble formalism. For illustration, the case of a system of particles embedded in a fluid acting as a thermal bath is fully described. The resulting enormous set of coupled evolution equations is of unmanageable proportions, thus requiring in practice to introduce an appropriate description using the smallest possible number of variables. We have obtained a hierarchy of Maxwell times, associated to the set of all the higher-order fluxes, which have a particular relevance in the process of providing criteria for establishing the contraction of description.

PHYSICAL REVIEW E 91[6], 063011, 2015. DOI: 10.1103/PhysRevE.91.063011

[P186-2015] “Improved limit to the diffuse flux of ultrahigh energy neutrinos from the Pierre Auger Observatory”

Aab, A.; Abreu, P.; Aglietta, M.; Chinellato, J. A.*; Daniel, B.*; Castro, M. L. Diaz*; 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

Neutrinos in the cosmic ray flux with energies near 1 EeV and above are detectable with the Surface Detector array (SD) of the Pierre Auger Observatory. We report here on searches through Auger data from 1 January 2004 until 20 June 2013. No neutrino candidates were found, yielding a limit to the diffuse flux of ultrahigh energy neutrinos that challenges the Waxman-Bahcall bound predictions. Neutrino identification is attempted using the broad time structure of the signals expected in the SD stations, and is efficiently done for neutrinos of all flavors interacting in the atmosphere at large zenith angles, as well as for “Earth-skimming” neutrino interactions in the case of tau neutrinos. In this paper the searches for downward-going neutrinos in the zenith angle bins 60 degrees-75 degrees and 75 degrees-90 degrees as well as for upward-going neutrinos, are combined to give a single limit. The 90% C.L. single-flavor limit to the diffuse flux of ultrahigh energy neutrinos with an E-2 spectrum in the energy range 1.0×10^{17} eV- 2.5×10^{19} eV is $E(\nu)(2)dN(\nu)/dE(\nu) < 6.4 \times 10^{-9}$ GeV cm⁻² s⁻¹ sr⁻¹.

PHYSICAL REVIEW D 91[9], 092008, 2015. DOI: 10.1103/PhysRevD.91.092008

[P187-2015] “Inclusive photon production at forward rapidities in proton-proton collisions at root s=0.9, 2.76 and 7 TeV”

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

The multiplicity and pseudorapidity distributions of inclusive photons have been measured at forward rapidities

($2.3 < \eta < 3.9$) in proton-proton collisions at three center-of-mass energies, $\sqrt{s} = 0.9, 2.76$ and 7 TeV using the ALICE detector. It is observed that the increase in the average photon multiplicity as a function of beam energy is compatible with both a logarithmic and a power-law dependence. The relative increase in average photon multiplicity produced in inelastic pp collisions at 2.76 and 7 TeV center-of-mass energies with respect to 0.9 TeV are $37.2 \pm 0.3\%$ (stat) $\pm 8.8\%$ (sys) and $61.2 \pm 0.3\%$ (stat) $\pm 7.6\%$ (sys), respectively. The photon multiplicity distributions for all center-of-mass energies are well described by negative binomial distributions. The multiplicity distributions are also presented in terms of KNO variables. The results are compared to model predictions, which are found in general to underestimate the data at large photon multiplicities, in particular at the highest center-of-mass energy. Limiting fragmentation behavior of photons has been explored with the data, but is not observed in the measured pseudorapidity range.

EUROPEAN PHYSICAL JOURNAL C 75[4], 146, 2015. DOI: 10.1140/epjc/s10052-015-3356-2

[P188-2015] “Intermediate energy electron impact excitation of composite vibrational modes in phenol”

Neves, R. F. C.; Jones, D. B.; Lopes, M. C. A.; Nixon, K. L.; de Oliveira, E. M.*; da Costa, R. F.; Varella, M. T. do N.; Bettega, M. H. F.; Lima, M. A. P.*; da Silva, G. B.; Brunger, M. J.

We report differential cross section results from an experimental investigation into the electron impact excitation of a number of the low-lying composite (unresolved) vibrational modes in phenol (C₆H₅OH). The measurements were carried out at incident electron energies in the range 15-40 eV and for scattered-electron angles in the range 10-90 degrees. The energy resolution of those measurements was typically similar to 80 meV. Calculations, using the GAMESS code, were also undertaken with a B3LYP/aug-cc-pVDZ level model chemistry, in order to enable us to assign vibrational modes to the features observed in our energy loss spectra. To the best of our knowledge, the present cross sections are the first to be reported for vibrational excitation of the C₆H₅OH molecule by electron impact.

JOURNAL OF CHEMICAL PHYSICS 142[19], 194302, 2015. DOI: 10.1063/1.4921038

[P189-2015] “Investigation of Biodiesel Through Photopyroelectric and Dielectric-Constant Measurements as a Function of Temperature: Freezing/Melting Interval”

Zanelato, E. B.; Machado, F. A. L.; Rangel, A. B.; Guimares, A. O.; Vargas, H.; da Silva, E. C.; Mansanares, A. M.*

Biodiesel is a promising option for alternative fuels since it derives from natural and renewable materials; it is biodegradable and less polluting than fossil fuels. A gradual replacement of diesel by biodiesel has been adopted by many countries, making necessary the investigation of the physical properties of biodiesel and of its mixture in diesel. Photothermal techniques, specifically the photopyroelectric technique (PPE), have proved to be suitable in the characterization of biodiesel and of its precursor oils, as well as of the biodiesel/diesel mixtures. In this paper, we investigate thermal and electrical properties of animal fat-based biodiesel as a function of temperature, aiming to characterize the freezing/melting interval and the changes in the physical properties from the solid to the liquid phase. The samples were prepared using the transesterification method, by the ethylic route. Optical transmittance experiments were carried out in order to confirm the phase transition interval. Solid and liquid phases present distinct thermal diffusivities and conductivities, as well as dielectric constants. The PPE signal amplitude is governed by the changes in the thermal diffusivity/conductivity.

As a consequence, the amplitude of the signal becomes like a step function, which is smoothed and sometimes delayed by the nucleation processes during cooling. A similar behavior is found in the dielectric constant data, which is higher in the liquid phase since the molecules have a higher degree of freedom. Both methods (PPE/dielectric constant) proved to be useful in the characterization of the freezing/melting interval, as well as to establish the distinction in the physical properties of solid and liquid phases. The methodology allowed a discussion of the cloud point and the pour point of the samples in the temperature variation interval.

INTERNATIONAL JOURNAL OF THERMOPHYSICS 36[5-6][SI] 924-931, 2015. DOI: 10.1007/s10765-014-1656-7

[P190-2015] “Linear Carbon Chains under High-Pressure Conditions”

Andrade, N. F.; Aguiar, A. L.; Kim, Y. A.; Endo, M.; Freire, P. T. C.; Brunetto, G.*; Galvao, D. S.*; Dresselhaus, M. S.; Souza Filho, A. G.

A high-pressure resonance Raman spectroscopy study of linear carbon chains encapsulated inside multiwalled carbon nanotubes (MWCNTs) is reported. While the frequencies of the tangential modes of carbon nanotubes (G band) harden as the pressure increases, the vibrational frequencies of the chain modes (around 1850 cm^{-1}) decrease, thus indicating a softening of the carbon-carbon bonds in this 1D solid. Pressure-induced irreversible structural changes in the linear carbon chains are unveiled by the red shift in the vibrational modes when pressure is released. These results have been interpreted as being due to a coalescence of carbon chains, and this hypothesis is supported by state-of-the-art atomistic reactive molecular dynamics simulations.

JOURNAL OF PHYSICAL CHEMISTRY C 119[19], 10669-10676, 2015. DOI: 10.1021/acs.jpcc.5b00902

[P191-2015] “Low-temperature phase transformation studies in the stearic acid: C form”

de Sousa, F. F.; Freire, P. T. C.; de Menezes, A. S.; Pinheiro, G. S.; Cardoso, L. P.*; Alcantara, P., Jr.; Moreira, S. G. C.; Melo, F. E. A.; Mendes Filho, J.; Saraiva, G. D.

This paper reports the temperature-dependent measurements in the C form of stearic acid. Raman scattering, X-ray diffraction, and differential scanning calorimetry measurements were performed at low temperatures. The polarized Raman spectra were measured for temperatures ranging from 8 to 300 K over the spectral range of 30-3000 cm^{-1} . The spectral changes observed in both the lattice vibrational modes and the internal vibrational modes regions of the Raman spectrum, allowed to identify a phase transition undergone by the stearic acid crystal occurring between 210 and 170 K and a change in the structure continues to be observed down to 8 K. The anharmonicity of some vibrational modes and the possible space groups presented by the crystal at low temperatures were also discussed. Low-temperature X-ray diffraction measurements were performed from 290 to 80 K and the results showed slight changes in the lattice parameters at similar to 200 K. Furthermore, the evidence of the phase transformation was provided by the differential scanning calorimetry measurements, which identified an enthalpic anomaly at about 160 K.

SPECTROCHIMICA ACTA PART A-MOLECULAR AND BIOMOLECULAR SPECTROSCOPY 148, 280-288, 2015. DOI: 10.1016/j.saa.2015.04.003

[P192-2015] “Magnetic dimers and trimers in the disordered $S=3/2$ spin system BaTi1/2Mn1/2O3 ”

Garcia, F. A.; Kaneko, U. F.*; Granado, E.*; Sichelschmidt, J.; Hoelzel, M.; Duque, J. G. S.; Nunes, C. A. J.; Amaral, R. P.; Marques-Ferreira, P.; Lora-Serrano, R.

We report a structural-magnetic investigation by x-ray absorption spectroscopy (XAS), neutron diffraction, dc susceptibility (X-dc), and electron spin resonance (ESR) of the 12R-type perovskite BaTi1/2Mn1/2O3 . Our structural analysis by neutron diffraction supports the existence of structural trimers with chemically disordered occupancy of Mn^{4+} and Ti^{4+} ions, with the valence of the Mn ions confirmed by the XAS measurements. The magnetic properties are explored by combining dc-susceptibility and X-band (9.4 GHz) electron spin resonance, both in the temperature interval of $2 \leq T \leq 1000$ K. A scenario is presented under which the magnetism is explained by considering magnetic dimers and trimers, with exchange constants $J(a)/k(B) = 200$ (2) K and $J(b)/k(B) = 130$ (10) K, and orphan spins. Thus, BaTi1/2Mn1/2O3 is proposed as a rare case of an intrinsically disordered $S = 3/2$ spin gap system with a frustrated ground state.

PHYSICAL REVIEW B 91[22] 224416, 2015. DOI: 10.1103/PhysRevB.91.224416

[P193-2015] “Magnetic properties of nearly stoichiometric CeAuBi2 heavy fermion compound”

Adriano, C.*; Rosa, P. F. S.*; Jesus, C. B. R.*; Grant, T.; Fisk, Z.; Garcia, D. J.; Pagliuso, P. G.*

Motivated by the interesting magnetic anisotropy found in the heavy fermion family CeTX2 (T = transition metal and X = pnictogen), here, we study the novel parent compound CeAu1-Bi-x(2)-(y) by combining magnetization, pressure dependent electrical resistivity, and heat-capacity measurements. The magnetic properties of our nearly stoichiometric single crystal sample of CeAu1-Bi-x(2)-(y) ($x = 0.92$ and $y = 1.6$) revealed an antiferromagnetic ordering at $T-N = 12$ K with an easy axis along the c -direction. The field dependent magnetization data at low temperatures reveal the existence of a spin-flop transition when the field is applied along the c -axis ($H-c$ similar to 7.5 T and $T = 5$ K). The heat capacity and pressure dependent resistivity data suggest that CeAu0.92Bi1.6 exhibits a weak heavy fermion behavior with strongly localized $\text{Ce}^{3+} 4f$ electrons. Furthermore, the systematic analysis using a mean field model including anisotropic nearest-neighbors interactions and the tetragonal crystalline electric field (CEF) Hamiltonian allows us to extract a CEF scheme and two different values for the anisotropic $J(\text{RKKY})$ exchange parameters between the Ce^{3+} ions in this compound. Thus, we discuss a scenario, considering both the anisotropic magnetic interactions and the tetragonal CEF effects, in the CeAu1-Bi-x(2)-(y) compounds, and we compare our results with the isostructural compound CeCuBi2 .

JOURNAL OF APPLIED PHYSICS 117[17] 17C103, 2015. DOI: 10.1063/1.4906279

[P194-2015] “Measurement of dijet $k(T)$ in p-Pb collisions at root $s(\text{NN})=5.02$ TeV”

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

A measurement of dijet correlations in p-Pb collisions at root $s(\text{NN}) = 5.02$ TeV with the ALICE detector is presented. Jets are reconstructed from charged particles measured in the central tracking detectors and neutral energy deposited in the electromagnetic calorimeter.

The transverse momentum of the full jet (clustered from charged and neutral constituents) and charged jet (clustered from charged particles only) is corrected event-by-event for the contribution of the underlying event, while corrections for underlying event fluctuations and finite detector resolution are applied on an inclusive basis. A projection of the dijet transverse momentum, $k(T_y) = p(T, \text{jet})(\text{ch}+\text{ne}) \sin(\Delta\phi(\text{dijet}))$ with $\Delta\phi(\text{dijet})$ the azimuthal angle between a full and charged jet and $p(T, \text{jet})(\text{ch}+\text{ne})$ the transverse momentum of the full jet, is used to study nuclear matter effects in p-Pb collisions. This observable is sensitive to the acoplanarity of dijet production and its potential modification in p-Pb collisions with respect to pp collisions. Measurements of the dijet $k(T_y)$ as a function of the transverse momentum of the full and recoil charged jet, and the event multiplicity are presented. No significant modification of $k(T_y)$ due to nuclear matter effects in p-Pb collisions with respect to the event multiplicity or a PYTHIA8 reference is observed.

PHYSICS LETTERS B 746, 385-395, 2015. DOI: 10.1016/j.physletb.2015.05.033

[P195-2015] "Measurement of electroweak production of two jets in association with a Z boson in proton-proton collisions at root s=8 TeV"

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

The purely electroweak (EW) cross section for the production of two jets in association with a Z boson, in proton-proton collisions at root s = 8 TeV, is measured using data recorded by the CMS experiment at the CERN LHC, corresponding to an integrated luminosity of 19.7 fb⁻¹. The electroweak cross section for the lljj final state (with l = e or mu and j representing the quarks produced in the hard interaction) in the kinematic region defined by $M_{ll} > 50$ GeV, $M_{jj} > 120$ GeV, transverse momentum $p(T_j) > 25$ GeV, and pseudorapidity $|\eta(j)| < 5$, is found to be $\sigma(\text{EW})(lljj) = 174 \pm 15$ (stat) ± 40 (syst) fb, in agreement with the standard model prediction. The associated jet activity of the selected events is studied, in particular in a signal-enriched region of phase space, and the measurements are found to be in agreement with QCD predictions.

EUROPEAN PHYSICAL JOURNAL C 75[2], 66, 2015. DOI: 10.1140/epjc/s10052-014-3232-5

[P196-2015] "Measurement of J/psi and psi(2S) Prompt Double-Differential Cross Sections in pp Collisions at root s=7 TeV"

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

The double-differential cross sections of promptly produced J/psi and psi(2S) mesons are measured in pp collisions at root s = 7 TeV, as a function of transverse momentum p(T) and absolute rapidity |y|. The analysis uses J/psi and psi(2S) dimuon samples collected by the CMS experiment, corresponding to integrated luminosities of 4.55 and 4.90 fb⁻¹, respectively. The results are based on a two-dimensional analysis of the dimuon invariant mass and decay length, and extend to p(T) = 120 and 100 GeV for the J/psi and psi(2S), respectively, when integrated over the interval |y| < 1.2. The ratio of the psi(2S) to J/psi cross sections is also reported for |y| < 1.2, over the range 10 < p(T) < 100 GeV. These are the highest p(T) values for which the cross sections and ratio have been measured.

PHYSICAL REVIEW LETTERS 114[19], 191802, 2015. DOI: 10.1103/PhysRevLett.114.191802

[P197-2015] "Measurement of jet suppression in central 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.
ALICE Collaboration

The transverse momentum p(T) spectrum and nuclear modification factor (R-AA) of reconstructed jets in 0-10% and 10-30% central Pb-Pb collisions at root s(NN) = 2.76 TeV were measured. Jets were reconstructed using the anti-k(T) jet algorithm with a resolution parameter of R = 0.2 from charged and neutral particles, utilizing the ALICE tracking detectors and Electromagnetic Calorimeter (EMCal). The jet p(T) spectra are reported in the pseudorapidity interval of $|\eta(\text{jet})| < 0.5$ for 40 < p(T), jet < 120 GeV/c in 0-10% and for 30 < p(T), jet < 100 GeV/c in 10-30% collisions. Reconstructed jets were required to contain a leading charged particle with p(T) > 5 GeV/c to suppress jets constructed from the combinatorial background in Pb-Pb collisions. The leading charged particle requirement applied to jet spectra both in pp and Pb-Pb collisions had a negligible effect on the R-AA. The nuclear modification factor R-AA was found to be 0.28 \pm 0.04 in 0-10% and 0.35 \pm 0.04 in 10-30% collisions, independent of p(T), jet within the uncertainties of the measurement. The observed suppression is in fair agreement with expectations from two model calculations with different approaches to jet quenching.

PHYSICS LETTERS B 746, 1-14, 2015. DOI: 10.1016/j.physletb.2015.04.039

[P198-2015] "Measurement of pion, kaon and proton production in proton-proton collisions at root s=7 TeV"

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

The measurement of primary pi(+/-), K+/-, p and (p) over bar production at mid-rapidity (|y| < 0.5) in proton-proton collisions at root s = 7 TeV performed with a large ion collider experiment at the large hadron collider (LHC) is reported. Particle identification is performed using the specific ionisation energy-loss and time-of-flight information, the ring-imaging Cherenkov technique and the kink-topology identification of weak decays of charged kaons. Transverse momentum spectra are measured from 0.1 up to 3 GeV/c for pions, from 0.2 up to 6 GeV/c for kaons and from 0.3 up to 6 GeV/c for protons. The measured spectra and particle ratios are compared with quantum chromodynamics-inspired models, tuned to reproduce also the earlier measurements performed at the LHC. Furthermore, the integrated particle yields and ratios as well as the average transverse momenta are compared with results at lower collision energies.

EUROPEAN PHYSICAL JOURNAL C 75[5], 226, 2015. DOI: 10.1140/epjc/s10052-015-3422-9

[P199-2015] "Measurement of the cross section ratio sigma(t(t) over bar b(b) over bar)/sigma(t(t) over bar jj) in pp collisions at root s=8 TeV"

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

The first measurement of the cross section ratio $\sigma(t(t) \text{ over bar } b(b) \text{ over bar})/\sigma(t(t) \text{ over bar } jj)$ is presented using a data sample corresponding to an integrated luminosity of 19.6 fb⁻¹ collected in pp collisions at root s = 8 TeV with the CMS detector at the LHC. Events with two leptons (e or mu) and four reconstructed jets, including two identified as b quark jets, in the final state are selected.

The ratio is determined for a minimum jet transverse momentum $p(T)$ of both 20 and 40 GeV/c. The measured ratio is 0.022 ± 0.003 (stat) ± 0.005 (syst) for $p(T) > 20$ GeV/c. The absolute cross sections $\sigma(t \text{ over bar } (b \text{ over bar}))$ and $\sigma(t \text{ over bar } jj)$ are also measured. The measured ratio for $p(T) > 40$ GeV/c is compatible with a theoretical quantum chromodynamics calculation at next-to-leading order.

PHYSICS LETTERS B 746, 132-153, 2015. DOI: 10.1016/j.physletb.2015.04.060

[P200-2015] "Measurement of the inclusive 3-jet production differential cross section in proton-proton collisions at 7 TeV and determination of the strong coupling constant in the TeV range"

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

This paper presents a measurement of the inclusive 3-jet production differential cross section at a proton-proton centre-of-mass energy of 7 TeV using data corresponding to an integrated luminosity of 5 fb⁻¹ collected with the CMS detector. The analysis is based on the three jets with the highest transverse momenta. The cross section is measured as a function of the invariant mass of the three jets in a range of 445-3270 GeV and in two bins of the maximum rapidity of the jets up to a value of 2. A comparison between the measurement and the prediction from perturbative QCD at next-to-leading order is performed. Within uncertainties, data and theory are in agreement. The sensitivity of the observable to the strong coupling constant $\alpha(S)$ is studied. A fit to all data points with 3-jet masses larger than 664 GeV gives a value of the strong coupling constant of $\alpha(S)(M-Z) = 0.1171 \pm 0.0013$ (exp) $(+0.0073)(-0.0047)$ (theo).

EUROPEAN PHYSICAL JOURNAL C 75[5], 186, 2015. DOI: 10.1140/epjc/s10052-015-3376-y

[P201-2015] "Measurements of differential and double-differential Drell-Yan cross sections in proton-proton collisions at root s=8 TeV"

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

Measurements of the differential and double-differential Drell-Yan cross sections in the dielectron and dimuon channels are presented. They are based on proton-proton collision data at root s = 8 TeV recorded with the CMS detector at the LHC and corresponding to an integrated luminosity of 19.7 fb⁻¹. The measured inclusive cross section in the Z peak region (60-120 GeV), obtained from the combination of the dielectron and dimuon channels, is 1138 ± 8 (exp) ± 25 (theo) ± 30 (lumi) pb, where the statistical uncertainty is negligible. The differential cross section $d\sigma/dm$ in the dilepton mass range 15-2000 GeV is measured and corrected to the full phase space. The double-differential cross section $d^2\sigma/dm dy$ is also measured over the mass range 20 to 1500 GeV and absolute dilepton rapidity from 0 to 2.4. In addition, the ratios of the normalized differential cross sections measured at root s = 7 and 8 TeV are presented. These measurements are compared to the predictions of perturbative QCD at next-to-leading and next-to-next-to-leading (NNLO) orders using various sets of parton distribution functions (PDFs). The results agree with the NNLO theoretical predictions computed with FEWZ 3.1 using the CT10 NNLO and NNPDF2.1 NNLO PDFs. The measured double-differential cross section and ratio of normalized differential cross sections are sufficiently precise to constrain the proton PDFs.

EUROPEAN PHYSICAL JOURNAL C 75[4], 147, 2015. DOI: 10.1140/epjc/s10052-015-3364-2

[P202-2015] "Monte Carlo Calculations for Fermi Gases in the Unitary Limit with a Zero-Range Interaction"

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

An ultracold Fermi gas with a zero-range attractive potential in the unitary limit is investigated using variational and diffusion Monte Carlo methods. Previous calculations have used a finite-range interaction and extrapolate the results to zero-range. Here we extend the quantum Monte Carlo method to directly use a zero-range interaction without the need of an extrapolation. We employ a trial wave function with the correct boundary conditions and modify the sampling procedures to handle the zero-range interaction. The results are reliable and have low variance.

JOURNAL OF LOW TEMPERATURE PHYSICS 180[1-2] 168-179, 2015. DOI: 10.1007/s10909-015-1283-0

[P203-2015] "Monte Carlo simulation of the response functions of CdTe detectors to be applied in x-ray spectroscopy"

Tomal, A.*; Santos, J. C.; Costa, P. R.; Lopez Gonzales, A. H.; Poletti, M. E.

In this work, the energy response functions of a CdTe detector were obtained by Monte Carlo (MC) simulation in the energy range from 5 to 160 keV, using the PENELOPE code. In the response calculations the carrier transport features and the detector resolution were included. The computed energy response function was validated through comparison with experimental results obtained with Am-241 and Eu-152 sources. In order to investigate the influence of the correction by the detector response at diagnostic energy range, x-ray spectra were measured using a CdTe detector (model XR-100T, Amptek), and then corrected by the energy response of the detector using the stripping procedure. Results showed that the CdTe exhibits good energy response at low energies (below 40 keV), showing only small distortions on the measured spectra. For energies below about 80 keV, the contribution of the escape of Cd- and Te-K x-rays produce significant distortions on the measured x-ray spectra. For higher energies, the most important correction is the detector efficiency and the carrier trapping effects. The results showed that, after correction by the energy response, the measured spectra are in good agreement with those provided by a theoretical model of the literature. Finally, our results showed that the detailed knowledge of the response function and a proper correction procedure are fundamental for achieving more accurate spectra from which quality parameters (i.e., half-value layer and homogeneity coefficient) can be determined.

APPLIED RADIATION AND ISOTOPES 100, 32-37, 2015. DOI: 10.1016/j.apradiso.2015.01.008

[P204-2015] "Non-Bragg-gap solitons in one-dimensional Kerr-metamaterial Fibonacci heterostructures"

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

A detailed study of non-Bragg-gap solitons in one-dimensional Kerr-metamaterial quasiperiodic Fibonacci heterostructures is performed. The transmission coefficient is numerically obtained by combining the transfer-matrix formalism in the metamaterial layers with a numerical solution of the nonlinear differential equation in the Kerr slabs, and by considering the loss effects in the metamaterial slabs.

A switching from states of no transparency in the linear regime to high-transparency states in the nonlinear regime is observed for both zero-order and plasmon-polariton gaps. The spatial localization of the non-Bragg-gap solitons is also examined, and the symmetry properties of the soliton waves are briefly discussed.

PHYSICAL REVIEW E 91[6] 063205, 2015. DOI: 10.1103/PhysRevE.91.063205

[P205-2015] “Nuclear effects on the transverse momentum spectra of charged particles in pPb collisions at root s(NN)=5.02 TeV”

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

Transverse momentum spectra of charged particles are measured by the CMS experiment at the CERN LHC in pPb collisions at root s(NN) = 5.02 TeV, in the range $0.4 < p_T < 120$ GeV/c and pseudorapidity $|\eta(\text{CM})| < 1.8$ in the proton-nucleon center-of-mass frame. For $p(T) < 10$ GeV/c, the charged-particle production is asymmetric about $\eta(\text{CM}) = 0$, with smaller yield observed in the direction of the proton beam, qualitatively consistent with expectations from shadowing in nuclear parton distribution functions (nPDF). A pp reference spectrum at root s = 5.02 TeV is obtained by interpolation from previous measurements at higher and lower center-of-mass energies. The p(T) distribution measured in pPb collisions shows an enhancement of charged particles with $p(T) > 20$ GeV/c compared to expectations from the pp reference. The enhancement is larger than predicted by perturbative quantum chromodynamics calculations that include antishadowing modifications of nPDFs.

EUROPEAN PHYSICAL JOURNAL C 75[5], UNSP237, 2015. DOI: 10.1140/epjc/s10052-015-3435-4

[P206-2015] “Observation of seasonal variation of atmospheric multiple-muon events in the MINOS Near and Far Detectors”

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

We report the first observation of seasonal modulations in the rates of cosmic ray multiple-muon events at two underground sites, the MINOS Near Detector with an overburden of 225 mwe, and the MINOS Far Detector site at 2100 mwe. At the deeper site, multiple-muon events with muons separated by more than 8 m exhibit a seasonal rate that peaks during the summer, similar to that of single-muon events. In contrast and unexpectedly, the rate of multiple-muon events with muons separated by less than 5-8 m, and the rate of multiple-muon events in the smaller, shallower Near Detector, exhibit a seasonal rate modulation that peaks in the winter.

PHYSICAL REVIEW D 91[11] 112006, 2015. DOI: 10.1103/PhysRevD.91.112006

[P207-2015] “Observation of the rare B-s(0)->mu(+)-mu(-) decay from the combined analysis of CMS and LHCb data”

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

The standard model of particle physics describes the fundamental particles and their interactions via the strong, electromagnetic and weak forces. It provides precise predictions for measurable quantities that can be tested experimentally.

The probabilities, or branching fractions, of the strange B meson (B-s(0)) and the B-0 meson decaying into two oppositely charged muons (mu(+) and mu(-)) are especially interesting because of their sensitivity to theories that extend the standard model. The standard model predicts that the B-s(0)->mu(+)mu(-) and B-0 ->mu(+)mu(-) decays are very rare, with about four of the former occurring for every billion B-s(0) mesons produced, and one of the latter occurring for every ten billion B-0 mesons(1). A difference in the observed branching fractions with respect to the predictions of the standard model would provide a direction in which the standard model should be extended. Before the Large Hadron Collider (LHC) at CERN2 started operating, no evidence for either decay mode had been found. Upper limits on the branching fractions were an order of magnitude above the standard model predictions. The CMS (Compact Muon Solenoid) and LHCb(Large Hadron Collider beauty) collaborations have performed a joint analysis of the data from proton-proton collisions that they collected in 2011 at a centre-of-mass energy of seven teraelectronvolts and in 2012 at eight teraelectronvolts. Here we report the first observation of the B-s(0)->mu(+)mu(-) decay, with a statistical significance exceeding six standard deviations, and the best measurement so far of its branching fraction. Furthermore, we obtained evidence for the B-0 ->mu(+)mu(-) decay with a statistical significance of three standard deviations. Both measurements are statistically compatible with standard model predictions and allow stringent constraints to be placed on theories beyond the standard model. The LHC experiments will resume taking data in 2015, recording proton-proton collisions at a centre-of-mass energy of 13 teraelectronvolts, which will approximately double the production rates of B-s(0) and B-0 mesons and lead to further improvements in the precision of these crucial tests of the standard model.

NATURE 522[7554], 68-U146, 2015. DOI: 10.1038/nature14474

[P208-2015] “Photoluminescence and compositional-structural properties of ion-beam sputter deposited Er-doped TiO2-xNx films: Their potential as a temperature sensor”

Scoca, D.*; Morales, M.*; Merlo, R.*; Alvarez, F.*; Zanatta, A. R.

Er-doped TiO2-xNx films were grown by Ar+ ion-beam sputtering a Ti + Er target under different N-2 + O-2 high-purity atmospheres. The compositional-structural properties of the samples were investigated after thermal annealing the films up to 1000 degrees C under a flow of oxygen. Sample characterization included x-ray photoelectron spectroscopy, grazing incidence x-ray diffraction, Raman scattering, and photoluminescence experiments. According to the experimental data, both composition and atomic structure of the samples were very sensitive to the growth conditions and annealing temperature. In the as-deposited form, the N-rich TiO2-xNx films presented TiN crystallites and no photoluminescence. As the thermal treatments proceed, the films were transformed into TiO2 and Er3+-related light emission were observed in the visible and near-infrared ranges at room-temperature. Whereas the development of TiO2 occurred due to the insertion-diffusion of oxygen in the films, light emission originated because of optical bandgap widening and/or structural-chemical variations in the vicinity of the Er3+ ions. Finally, the photoluminescence results in the visible range suggested the potential of the present samples in producing an optically based temperature sensor in the similar to 150-500K range.

JOURNAL OF APPLIED PHYSICS 117[20] 205304, 2015. DOI: 10.1063/1.4921809

[P209-2015] “Precise determination of the mass of the Higgs boson and tests of compatibility of its couplings with the standard model predictions using proton collisions at 7 and 8 TeV”

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

Properties of the Higgs boson with mass near 125 GeV are measured in proton-proton collisions with the CMS experiment at the LHC. Comprehensive sets of production and decay measurements are combined. The decay channels include gamma gamma, ZZ, WW, tau tau, bb, and mu mu pairs. The data samples were collected in 2011 and 2012 and correspond to integrated luminosities of up to 5.1 fb(-1) at 7 TeV and up to 19.7 fb(-1) at 8 TeV. From the high-resolution gamma gamma and ZZ channels, the mass of the Higgs boson is determined to be 125.02(-0.27)(+0.26) (stat)(-0.15)(+0.14) (syst) GeV. For this mass value, the event yields obtained in the different analyses tagging specific decay channels and production mechanisms are consistent with those expected for the standard model Higgs boson. The combined best-fit signal relative to the standard model expectation is 1.00 +/- 0.09 (stat)(-0.07)(+0.08) (theo) +/- 0.07 (syst) at the measured mass. The couplings of the Higgs boson are probed for deviations in magnitude from the standard model predictions in multiple ways, including searches for invisible and undetected decays. No significant deviations are found.

EUROPEAN PHYSICAL JOURNAL C 75[5] UNSP212, 2015. DOI: 10.1140/epjc/s10052-015-3351-7

[P210-2015] “Rapidity and transverse-momentum dependence of the inclusive J/psi nuclear modification factor 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

We have studied the transverse-momentum (p(T)) dependence of the inclusive J/psi production in p-Pb collisions at root s(NN) = 5.02 TeV, in three center-of-mass rapidity (y(cms)) regions, down to zero p(T). Results in the forward and backward rapidity ranges (2.03 < y(cms) < 3.53 and -4.46 < y(cms) < -2.96) are obtained by studying the J/psi decay to mu(+)(-), while the mid-rapidity region (-1.37 < y(cms) < 0.43) is investigated by measuring the e(+)(-) decay channel. The p(T) dependence of the J/psi production cross section and nuclear modification factor are presented for each of the rapidity intervals, as well as the J/psi mean p(T) values. Forward and mid-rapidity results show a suppression of the J/psi yield, with respect to pp collisions, which decreases with increasing p(T). At backward rapidity no significant J/psi suppression is observed. Theoretical models including a combination of cold nuclear matter effects such as shadowing and partonic energy loss, are in fair agreement with the data, except at forward rapidity and low transverse momentum. The implications of the p-Pb results for the evaluation of cold nuclear matter effects on J/psi production in Pb-Pb collisions are also discussed.

JOURNAL OF HIGH ENERGY PHYSICS 6, 055, 2015. DOI: 10.1007/JHEP06(2015)055

[P211-2015] “Search for a standard model Higgs boson produced in association with a top-quark pair and decaying to bottom quarks using a matrix element method”

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

A search for a standard model Higgs boson produced in association with a top-quark pair and decaying to bottom quarks is presented. Events with hadronic jets and one or two oppositely charged leptons are selected from a data sample corresponding to an integrated luminosity of 19.5 fb(-1) collected by the CMS experiment at the LHC in pp collisions at a centre-of-mass energy of 8 TeV.

In order to separate the signal from the larger t (t) over bar + jets background, this analysis uses a matrix element method that assigns a probability density value to each reconstructed event under signal or background hypotheses. The ratio between the two values is used in a maximum likelihood fit to extract the signal yield. The results are presented in terms of the measured signal strength modifier, mu, relative to the standard model prediction for a Higgs boson mass of 125 GeV. The observed (expected) exclusion limit at a 95% confidence level is mu < 4.2 (3.3), corresponding to a best fit value $\langle \mu \rangle = 1.2(-1.5)(+1.6)$.

EUROPEAN PHYSICAL JOURNAL C 75[6] UNSP, 251, 2015. DOI: 10.1140/epjc/s10052-015-3454-1

[P212-2015] “Search for dark matter, extra dimensions, and unparticles in monojet events in proton-proton collisions at root s=8TeV”

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

Results are presented from a search for particle dark matter (DM), extra dimensions, and unparticles using events containing a jet and an imbalance in transverse momentum. The data were collected by the CMS detector in proton-proton collisions at the LHC and correspond to an integrated luminosity of 19.7 fb(-1) at a centre-of-mass energy of 8 TeV. The number of observed events is found to be consistent with the standard model prediction. Limits are placed on the DM-nucleon scattering cross section as a function of the DM particle mass for spin-dependent and spinin-dependent interactions. Limits are also placed on the scale parameter MD in the Arkani-Hamed, Dimopoulos, and Dvali (ADD) model of large extra dimensions, and on the unparticle model parameter Lambda(U). The constraints on ADD models and unparticles are the most stringent limits in this channel and those on the DM-nucleon scattering cross section are an improvement over previous collider results.

EUROPEAN PHYSICAL JOURNAL C 75[5] UNSP235, 2015. DOI: 10.1140/epjc/s10052-015-3451-4

[P213-2015] “Search for decays of stopped long-lived particles produced in proton-proton collisions at root s=8TeV”

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

A search has been performed for long-lived particles that could have come to rest within the CMS detector, using the time intervals between LHC beam crossings. The existence of such particles could be deduced from observation of their decays via energy deposits in the CMS calorimeter appearing at times that are well separated from any proton-proton collisions. Using a data set corresponding to an integrated luminosity of 18.6 fb(-1) of 8 TeV proton-proton collisions, and a search interval corresponding to 281 h of trigger livetime, 10 events are observed, with a background prediction of 13.2(-2.5)(+3.6) events. Limits are presented at 95 % confidence level on gluino and top squark production, for over 13 orders of magnitude in the mean proper lifetime of the stopped particle. Assuming a cloud model of R-hadron interactions, a gluino with mass less than or similar to 1000 GeV and a top squark with mass less than or similar to 525 GeV are excluded, for lifetimes between 1 mu s and 1000 s. These results are the most stringent constraints on stopped particles to date.

EUROPEAN PHYSICAL JOURNAL C 75[4] 151, 2015. DOI: 10.1140/epjc/s10052-015-3367-z

[P214-2015] “Search for patterns by combining cosmic-ray energy and arrival directions at 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.*; Pakk Selmi-Dei, D.*; Santos, E.*; Theodoro, V. M.*; Zimbres Silva, M.*; et al.
Pierre Auger Collaboration

Energy-dependent patterns in the arrival directions of cosmic rays are searched for using data of the Pierre Auger Observatory. We investigate local regions around the highest-energy cosmic rays with $E \geq 6 \times 10^{19}$ eV by analyzing cosmic rays with energies above $E \geq 5 \times 10^{18}$ eV arriving within an angular separation of approximately 15 degrees. We characterize the energy distributions inside these regions by two independent methods, one searching for angular dependence of energy-energy correlations and one searching for collimation of energy along the local system of principal axes of the energy distribution. No significant patterns are found with this analysis. The comparison of these measurements with astrophysical scenarios can therefore be used to obtain constraints on related model parameters such as strength of cosmic-ray deflection and density of point sources.

EUROPEAN PHYSICAL JOURNAL C 75[6], 269, 2015. DOI: 10.1140/epjc/s10052-015-3471-0

[P215-2015] “Search for physics beyond the standard model in dilepton mass spectra in proton-proton collisions at root s=8 TeV”

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

Dimuon and dielectron mass spectra, obtained from data resulting from proton-proton collisions at 8TeV and recorded by the CMS experiment, are used to search for both narrow resonances and broad deviations from standard model predictions. The data correspond to an integrated luminosity of 20.6 (19.7) fb⁻¹ for the dimuon (dielectron) channel. No evidence for non-standard-model physics is observed and 95% confidence level limits are set on parameters from a number of new physics models. The narrow resonance analyses exclude a Sequential Standard Model (SSM) resonance lighter than 2.90TeV, a superstring-inspired Z(psi) lighter than 2.57TeV, and Randall-Sundrum Kaluza-Klein gravitons with masses below 2.73, 2.35, and 1.27TeV for couplings of 0.10, 0.05, and 0.01, respectively. A notable feature is that the limits have been calculated in a model-independent way to enable straightforward reinterpretation in any model predicting a resonance structure. The observed events are also interpreted within the framework of two non-resonant analyses: one based on a large extra dimensions model and one based on a quark and lepton compositeness model with a left-left isoscalar contact interaction. Lower limits are established on M-S, the scale characterizing the onset of quantum gravity, which range from 4.9 to 3.3TeV, where the number of additional spatial dimensions varies from 3 to 7. Similarly, lower limits on Lambda, the energy scale parameter for the contact interaction, are found to be 12.0 (15.2) TeV for destructive (constructive) interference in the dimuon channel and 13.5 (18.3) TeV in the dielectron channel.

JOURNAL OF HIGH ENERGY PHYSICS 4, 025, 2015. DOI: 10.1007/JHEP04(2015)025

[P216-2015] “Search for physics beyond the standard model in events with two leptons, jets, and missing transverse momentum in pp collisions at root s=8 TeV”

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

A search is presented for physics beyond the standard model in final states with two opposite-sign same-flavor leptons, jets, and missing transverse momentum. The data sample corresponds to an integrated luminosity of 19.4 fb⁻¹ of proton-proton collisions at root s = 8TeV collected with the CMS detector at the CERN LHC in 2012. The analysis focuses on searches for a kinematic edge in the invariant mass distribution of the opposite-sign same-flavor lepton pair and for final states with an on-shell Z boson. The observations are consistent with expectations from standard model processes and are interpreted in terms of upper limits on the production of supersymmetric particles.

JOURNAL OF HIGH ENERGY PHYSICS 4, 124, 2015. DOI: 10.1007/JHEP04(2015)124

[P217-2015] “Search for physics beyond the standard model in final states with a lepton and missing transverse energy in proton-proton collisions at root s = 8 TeV”

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

A search for new physics in proton-proton collisions having final states with an electron or muon and missing transverse energy is presented. The analysis uses data collected in 2012 with the CMS detector, at an LHC center-of-mass energy of 8 TeV, and corresponding to an integrated luminosity of 19.7 fb⁻¹. No significant deviation of the transverse mass distribution of the charged lepton-neutrino system from the standard model prediction is found. Mass exclusion limits of up to 3.28 TeV at 95% confidence level for a W0-boson with the same couplings as that of the standard model W-boson are determined. Results are also derived in the framework of split universal extra dimensions, and exclusion limits on Kaluza-Klein Wd(KK)((2)) states are found. The final state with large missing transverse energy also enables a search for dark matter production with a recoiling W-boson, with limits set on the mass and the production cross section of potential candidates. Finally, limits are established for a model including interference between a left-handed W'-boson and the standard model W-boson and for a compositeness model.

PHYSICAL REVIEW D 91[9] UNSP 092005, 2015. DOI: 10.1103/PhysRevD.91.092005

[P218-2015] “Search for quark contact interactions and extra spatial dimensions using dijet angular distributions in proton-proton collisions at root s=8 TeV”

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

A search is presented for quark contact interactions and extra spatial dimensions in proton-proton collisions at root s = 8 TeV using dijet angular distributions. The search is based on a data set corresponding to an integrated luminosity of 19.7 fb⁻¹ collected by the CMS detector at the CERN LHC. Dijet angular distributions are found to be in agreement with the perturbative QCD predictions that include electroweak corrections. Limits on the contact interaction scale from a variety of models at next-to-leading order in QCD corrections are obtained. A benchmark model in which only left-handed quarks participate is excluded up to a scale of 9.0 (11.7) TeV for destructive (constructive) interference at 95% confidence level. Lower limits between 5.9 and 8.4 TeV on the scale of virtual graviton exchange are extracted for the Arkani-Hamed-Dimopoulos-Dvali model of extra spatial dimensions.

PHYSICS LETTERS B 746, 79-99, 2015. DOI: 10.1016/j.physletb.2015.04.042

[P219-2015] "Search for vector-like T quarks decaying to top quarks and Higgs bosons in the all-hadronic channel using jet substructure"

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

A search is performed for a vector-like heavy T quark that is produced in pairs and that decays to a top quark and a Higgs boson. The data analysed correspond to an integrated luminosity of 19.7 fb⁻¹ collected with the CMS detector in proton-proton collisions at $\sqrt{s} = 8\text{TeV}$. For T quarks with large mass values the top quarks and Higgs bosons can have significant Lorentz boosts, so that their individual decay products often overlap and merge. Methods are applied to resolve the substructure of such merged jets. Upper limits on the production cross section of a T quark with mass between 500 and 1000 GeV/c² are derived. If the T quark decays exclusively to tH, the observed (expected) lower limit on the mass of the T quark is 745 (773) GeV/c² at 95% confidence level. For the first time an algorithm is used for tagging boosted Higgs bosons that is based on a combination of jet substructure information and b tagging.

JOURNAL OF HIGH ENERGY PHYSICS 6, UNSP 80, 2015. DOI: 10.1007/JHEP06(2015)080

[P220-2015] "Strong piezoelectricity in single-layer graphene deposited on SiO₂ grating substrates"

Rodrigues, G. C.; Zelenovskiy, P.; Romanyuk, K.; Luchkin, S.; Kopelevich, Y.*; Kholkin, A.

Electromechanical response of materials is a key property for various applications ranging from actuators to sophisticated nanoelectromechanical systems. Here electromechanical properties of the single-layer graphene transferred onto SiO₂ calibration grating substrates is studied via piezoresponse force microscopy and confocal Raman spectroscopy. The correlation of mechanical strains in graphene layer with the substrate morphology is established via Raman mapping. Apparent vertical piezoresponse from the single-layer graphene supported by underlying SiO₂ structure is observed by piezoresponse force microscopy. The calculated vertical piezocoefficient is about 1.4 nm V⁻¹, that is, much higher than that of the conventional piezoelectric materials such as lead zirconate titanate and comparable to that of relaxor single crystals. The observed piezoresponse and achieved strain in graphene are associated with the chemical interaction of graphene's carbon atoms with the oxygen from underlying SiO₂. The results provide a basis for future applications of graphene layers for sensing, actuating and energy harvesting.

NATURE COMMUNICATIONS 6, 7572, 2015. DOI: 10.1038/ncomms8572

[P221-2015] "Study of final-state radiation in decays of Z bosons produced in pp collisions at 7 TeV"

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

The differential cross sections for the production of photons in $Z \rightarrow \mu^{(+)}\mu^{(-)}\gamma$ decays are presented as a function of the transverse energy of the photon and its separation from the nearest muon.

The data for these measurements are collected with the CMS detector and correspond to an integrated luminosity of 4.7 fb⁻¹ of pp collisions at $\sqrt{s} = 7\text{TeV}$ delivered by the CERN LHC. The cross sections are compared to simulations with POWHEG and PYTHIA, where PYTHIA is used to simulate parton showers and final-state photons. These simulations match the data to better than 5%. Fffffffi

PHYSICAL REVIEW D 91[9], 2015. DOI: 10.1103/PhysRevD.91.092012

[P222-2015] "Synthesis of Ni Nanoparticles by Femtosecond Laser Ablation in Liquids: Structure and Sizing"

Muneton Arboleda, D.; Santillan, J. M. J.; Mendoza Herrera, F. van R., Marcela B.; Mendoza Zelis, P.; Muraca, D.*; Schinca, D. C.; Scaffardi, L. B.

Synthesis of nickel (Ni) nanoparticles (NPs) suspensions was performed using a 120 fs (femtosecond) pulse laser to ablate a Ni solid target in n-heptane and water. Analysis of structure, configuration, and sizing was carried out using different independent techniques, such as optical extinction spectroscopy (OES), atomic force microscopy (AFM), transmission electron microscopy (TEM), and electron diffraction (ED), which yield interrelated information. AFM microscopy allows determining the spherical shape and size distribution of the NPs in the obtained colloids, while TEM provides knowledge about shape, structure, and size distribution. ED allows identification of the different metal and metal oxide compositions as well as their crystallographic phase. On the other hand, OES gives information related to size distribution, structure, configuration, and composition. Interpretation of these spectra is based on Mie theory, which, in turn, depends on Ni dielectric function. For NP radii smaller than 3 nm, size-dependent free and bound electron contributions to the dielectric function must be considered. To account for the full size span, complete Mie expansion was used for optical extinction cross-section calculations. A theoretical analysis of the dependence of plasmon resonance of bare core and core-shell Ni NPs with core size and shell thickness provides insight about their spectroscopic features. For n-heptane, species like bare core Ni and hollow Ni NPs are found in the colloid, the latter being reported for the first time in this work. Instead, for water, the colloid contains hollow nickel NPs and nickel oxide in different core-shell configurations: Ni-NiO and NiO-Ni, the latter also being reported for the first time in this paper. In both cases, the size distribution agrees with that derived from TEM and AFM analysis. The formation of the oxide species is discussed in terms of oxidation-reduction processes during ablation. Possible mechanisms for the formation of hollow species are proposed.

JOURNAL OF PHYSICAL CHEMISTRY C 119[23] 13184-13193, 2015. DOI: 10.1021/acs.jpcc.5b03124

[P223-2015] "The Influence of DNA Configuration on the Direct Strand Break Yield"

Bernal, M. A.*; de Almeida, C. E.; Incerti, S.; Champion, C.; Ivanchenko, V.; Francis, Z.

Purpose. To study the influence of DNA configuration on the direct damage yield. No indirect effect has been accounted for. Methods. The GEANT4-DNA code was used to simulate the interactions of protons and alpha particles with geometrical models of the A-, B-, and Z-DNA configurations. The direct total, single, and double strand break yields and site-hit probabilities were determined. Certain features of the energy deposition process were also studied. Results. A slight increase of the site-hit probability as a function of the incident particle linear energy transfer was found for each DNA configuration.

Each DNA form presents a well-defined site-hit probability, independently of the particle linear energy transfer. Approximately 70% of the inelastic collisions and similar to 60% of the absorbed dose are due to secondary electrons. These fractions are slightly higher for protons than for alpha particles at the same incident energy. Conclusions. The total direct strand break yield for a given DNA form depends weakly on DNA conformation topology. This yield is practically determined by the target volume of the DNA configuration. However, the double strand break yield increases with the packing ratio of the DNA double helix; thus, it depends on the DNA conformation.

COMPUTATIONAL AND MATHEMATICAL METHODS IN MEDICINE 417501, 2015. DOI: 10.1155/2015/417501

[P224-2015] “The physical properties of Gd₃Ru: A real candidate for a practical cryogenic refrigerator”

Monteiro, J. C. B.*; dos Reis, R. D.*; Gandra, F. G.*

The magnetization, the specific heat, and the magnetocaloric effect (MCE) for Gd₃Ru are presented as function of temperature at different magnetic fields. The results show a maximum entropy change $-\Delta S = 30 \text{ J/kg K @ 5 T}$, which is the highest value for the R3M compounds. With a non-hysteretic transition of first order type at $T-C = 54 \text{ K}$, it presents a temperature change $\Delta T_{\text{max}} = 5.7\text{K}$ around 59K with a refrigerating cooling power of 700 J/kg and these results are comparable to values found for giant MCE materials. This compound is stable and able to operate at temperatures between 90K and 40K with a minimum $-\Delta S = 5 \text{ J/kg K}$. These figures were obtained by sweeping the magnetic field without using sample preparation routines. This methodology is appropriate to evaluate the MCE for the cycling process of a cryogenic magnetic refrigerator.

APPLIED PHYSICS LETTERS 106[19], 194106, DOI: 10.1063/1.4921143

[P225-2015] “The role of rotational mechanisms in electron swarm parameters at low reduced electric field in N-2, O-2 and H-2”

Ridenti, M. A.*; Alves, L. L.; Guerra, V.; Amorim, J.*

The homogeneous Boltzmann equation for electrons in N-2, O-2 and H-2 is solved under the classical two-term approximation, for reduced electric fields in the interval 10(-4)-10 Td where the electron-neutral encounters are limited to elastic, rotational and vibrational collisions. Rotational excitations/de-excitations are described using the following three different approaches: the discrete inelastic/superelastic collisional operator, written for a number of rotational levels that depends on the molecular gas and the specific rotational cross sections considered; the continuous approximation for rotations; a modified version of the continuous approximation for rotations, including a Chapman-Cowling corrective term proportional to the gas temperature. The expression of the rotational collision operator for this latter approach is deduced here and the results show that it bridges the gap between the discrete and the continuous descriptions at low/intermediate reduced electric fields. The calculations are compared with the measurements for the available swarm parameters to assess the validity of the different approaches and cross sections adopted to describe the rotational mechanisms.

PLASMA SOURCES SCIENCE & TECHNOLOGY 24[3] 035002, 2015. DOI: 10.1088/0963-0252/24/3/035002

[P226-2015] “Thermal Diffusivity of Sandstone Using Photoacoustics”

Guimares, A. O.; de Souza, C. G.; da Silva, E. C.; Soffner, M. E.; Mansanares, A. M.*; Ribeiro, H. J. P. S.; Carrasquilla, A. A. G.; Vargas, H.

An open photoacoustic cell was used to investigate the thermal diffusivity of sandstone taken from the Parana Basin, in Brazil. Although the organic-rich sedimentary rocks represent an important energy source in the Parana Basin, only limited data are reported concerning their thermophysical properties. A sandstone rock sample, from the Botucatu Formation, was investigated. The thermal diffusivity values were determined with uncertainties around 12 %, comparable to other methods. These values consider not only the experimental errors but also take into account the heterogeneity of the materials. It was possible to verify the behavior of the thermal diffusivity of the sandstone under heat treatment. The variation of the thermal diffusivity followed an expected trend, based on the possible variation of porosity which is related to the decomposition of some constituents. The results presented in this work identify the photoacoustic technique as a useful tool for thermal characterization of sedimentary rocks.

INTERNATIONAL JOURNAL OF THERMOPHYSICS 36[5-6][SI] 1093-1098, 2015. DOI: 10.1007/s10765-014-1812-0

[P227-2015] “Transfer of a cold atmospheric pressure plasma jet through a long flexible plastic tube”

Kostov, K. G.; Machida, M.*; Prysiaznyi, V.; Honda, R. Y.

This work proposes an experimental configuration for the generation of a cold atmospheric pressure plasma jet at the downstream end of a long flexible plastic tube. The device consists of a cylindrical dielectric chamber where an insulated metal rod that serves as high-voltage electrode is inserted. The chamber is connected to a long (up to 4 m) commercial flexible plastic tube, equipped with a thin floating Cu wire. The wire penetrates a few mm inside the discharge chamber, passes freely (with no special support) along the plastic tube and terminates a few millimeters before the tube end. The system is flushed with Ar and the dielectric barrier discharge (DBD) is ignited inside the dielectric chamber by a low frequency ac power supply. The gas flow is guided by the plastic tube while the metal wire, when in contact with the plasma inside the DBD reactor, acquires plasma potential. There is no discharge inside the plastic tube, however an Ar plasma jet can be extracted from the downstream tube end. The jet obtained by this method is cold enough to be put in direct contact with human skin without an electric shock. Therefore, by using this approach an Ar plasma jet can be generated at the tip of a long plastic tube far from the high-voltage discharge region, which provides the safe operation conditions and device flexibility required for medical treatment.

PLASMA SOURCES SCIENCE & TECHNOLOGY 24[2] 025038, 2015. DOI: 10.1088/0963-0252/24/2/025038

[P228-2015] “Unstable and elusive superconductors”

Kopelevich, Y.*; da Silva, R. R.*; Camargo, B. C.*

We briefly review earlier and report original experimental results in the context of metastable or possible superconducting materials. We show that applied electric field induces conducting state in Copper Chloride (CuCl) whose characteristics resemble behavior of sliding charge-density-wave(s) (CDW). We discuss whether the sliding CDW or collective transport of similar ordered charge phase(s) may account for the problem of “high-temperature superconductivity” observed in this and other materials, including Cadmium Sulfide (CdS), metal-ammonia solutions, polymers, amorphous carbon and tungsten oxides. We also discuss a local superconductivity that occurs at the surface of graphite and amorphous carbon under deposition of foreign atoms/molecules.

Trabalhos Aceitos

[A001-2015] “Carbon-Based Nanostructures Derived from Bilayer Graphene with Zero Thermal Expansion Behavior”

Muniz, A. R.; Fonseca, A. F.*

J. Phys. Chem. C, 9 de julho de 2015. DOI: 10.1021/acs.jpcc.5b05602

Correções

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*Autores da comunidade IFGW

Defesas de Dissertações

[D011-2015] “Transmitting Atomic Frequency Standards in Optical Fiber Networks”

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[D012-2015] “Estudo das Propriedades Ópticas e de Transporte Eletrônico em Filmes Finos de TiO₂ Dopados com Nitrogênio”

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Data: 28/08/2015

[D019-2015] “Efeitos das Bordas sobre as Propriedades Eletrônicas do Grafeno no Regime Hall Quântico”

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Data: 04/09/2015

Defesas de Teses

[T007-2015] “Transporte quântico em nano-estruturas magnéticas”

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[T008-2015] “Informação Quântica com Estados Coerentes Comprimidos da Luz”

Aluno: Douglas Delgado de Souza

Orientador: Prof. Dr. Antonio Vidiella Barranco

Data: 14/07/2015

[T009-2015] “Estudo da interface sólido/líquido aplicando a microbalança de cristal de quartzo com eletrodos funcionalizados”

Aluno: Wyllerson Evaristo Gomes

Orientador: Prof. Dr. David M. Soares

Data: 30/07/2015

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Orientador: Prof. Dr. Eduardo Granado

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[T011-2015] “Imagens e Microtomografias de Raios-X por Contraste de Fase e Contraste de Espalhamento Harmônicas”

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Orientador: Prof. Dr. Carlos Giles

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