

Abstracta

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Trabalhos Publicados - P102-2015 à P153-2015

Proceedings - P154-2015 à P160-2015

Correções - C003-2015

Defesas de Dissertações do IFGW - D005-2015 à D010-2015

Defesas de Teses do IFGW - T004-2015 à T006-2015

Patente - Pa002-2015 à Pa003-2015

Trabalhos Publicados

[P102-2015] "Ag nanoparticles formed by femtosecond pulse laser ablation in water: self-assembled fractal structures"

Santillan, J. M. J.; Fernandez van Raap, M. B.; Mendoza Zelis, P.; Coral, D.; Muraca, D.*; Schinca, D. C.; Scaffardi, L. B.

We report for the first time on the formation of self-assembled fractals of spherical Ag nanoparticles (Nps) fabricated by femtosecond pulse laser ablation of a solid silver target in water. Fractal structures grew both in two and three Euclidean dimensions (d). Ramified-fractal assemblies of 2 nm height and 5-14 μm large, decorated with Ag Nps of 3 nm size, were obtained in a 2d geometry when highly diluted drops of colloidal suspension were dried at a fast heating rate over a mica substrate. When less-diluted drops were dried at slow heating rate, isolated single Nps or rosette-like structures were formed. Fractal aggregates about 31 nm size in 3d geometry were observed in the as-prepared colloidal suspension. Electron diffraction and optical extinction spectroscopy (OES) analyses performed on the samples confirmed the presence of Ag and Ag₂O. The analysis of the optical extinction spectrum, using the electrostatic approximation of Mie theory for small spheres, showed the existence of Ag bare core, Ag-Ag₂O and air-Ag core-shell Nps, Ag-Ag₂O being the most frequent type [69 % relative abundance (r. a.)]. Core-size and shell-thickness distribution was derived from OES. In situ scattering-measurements of the Ag colloidal suspension, carried out by small-angle X-ray scattering, indicate a mass fractal composed of packaged $< \text{DSAXS} = (5 \pm 1) \text{ nm}$ particles and fractal dimension $d_f = 2.5$. Ex situ atomic force microscopy imaging displayed well-ramified structures, which, analyzed with box-counting method, yield a fractal dimension $d(f) = 1.67$. The growing behavior of these 2d and 3d self-assembled fractals is consistent with the diffusion-limited aggregation model.

JOURNAL OF NANOPARTICLE RESEARCH 17[2] 86, 2015.
DOI: 10.1007/s11051-015-2894-8

[P103-2015] "Axial dependence of optical weak measurements in the critical region"

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

The interference between optical beams of different polarizations plays a fundamental role in reproducing the optical analog of the electron spin weak measurement. The extraordinary point in optical weak measurements is represented by the possibility of estimating with great accuracy the Goos-Hanchen (GH) shift by measuring the distance between the peaks of the outgoing beams for two opposite rotation angles of the polarizers located before and after the dielectric block. Starting from the numerical calculation of the GH shift, which clearly shows a frequency crossover for incidence near the critical angle, we present a detailed study of the interference between s and p polarized waves in the critical region. This makes it possible to determine in which conditions axial deformations can be avoided and the GH curves reproduced. In view of a possible experimental implementation, we give the expected weak measurement curves for Gaussian lasers of different beam waist sizes propagating through borosilicate (BK7) and fused silica dielectric blocks.

JOURNAL OF OPTICS 17[3] 035608, 2015. DOI:
10.1088/2040-8978/17/3/035608

[P104-2015] "Charged-to-neutral correlation at forward rapidity in Au plus Au collisions at root s(NN)=200 GeV"

Adamczyk, L.; Adkins, J. K.; Agakishiev, G.; Derradi de Souza, R.*; Takahashi, J.*; Vasconcelos, G. M. S.*; et al.
STAR Collaboration

Event-by-event fluctuations of the multiplicities of inclusive charged particles and photons at forward rapidity in Au + Au collisions at $\sqrt{s(\text{NN})} = 200 \text{ GeV}$ have been studied. The dominant contribution to such fluctuations is expected to come from correlated production of charged and neutral pions. We search for evidence of dynamical fluctuations of different physical origins. Observables constructed out of moments of multiplicities are used as measures of fluctuations. Mixed events and model calculations are used as base lines. Results are compared to the dynamical net-charge fluctuations measured in the same acceptance. A nonzero statistically significant signal of dynamical fluctuations is observed in excess to the model prediction when charged particles and photons are measured in the same acceptance. We find that, unlike dynamical net-charge fluctuation, charge-neutral fluctuation is not dominated by correlation owing to particle decay. Results are compared to the expectations based on the generic production mechanism of pions owing to isospin symmetry, for which no significant ($< 1\%$) deviation is observed.

PHYSICAL REVIEW C 91[3] 034905, 2015. DOI: 10.1103/PhysRevC.91.034905

[P105-2015] "Combined external pressure and Cu-substitution studies on BaFe₂As₂ single crystals"

Piva, M. M.*; Besser, M.; Mydeen, K.; Garitez, T. M.*; Rosa, P. F. S.*; Adriano, C.*; Grant, T.; Fisk, Z.; Urbano, R. R.*; Nicklas, M.; Pagliuso, P. G.*

We report a combined study of external pressure and Cu-substitution on BaFe₂As₂ single crystals grown by the in-flux technique. At ambient pressure, the Cu-substitution is known to suppress the spin density wave (SDW) phase in pure BaFe₂As₂ (T-SDW approximate to 140 K) and to induce a superconducting (SC) dome with a maximum transition temperature T_c(max) similar or equal to 4.2 K. This T_c(max) is much lower than the T_c similar to 15-28 K achieved in the case of Ru, Ni and Co substitutions. Such a lower T_c is attributed to a Cu₂⁺ magnetic pair-breaking effect. The latter is strongly suppressed by applied pressure, as shown herein, T_c can be significantly enhanced by applying high pressures. In this work, we investigated the pressure effects on Cu₂⁺ magnetic pair-breaking in the BaFe_{2-x}Cu_xAs₂ series. Around the optimal concentration (x_{opt}) = 0.11, all samples showed a substantial increase of T_c as a function of pressure. Yet for those samples with a slightly higher doping level (over-doped regime), T_c presented a dome-like shape with maximum T_c similar or equal to 8K. Remarkably interesting, the under-doped samples, e.g. x = 0.02 display a maximum pressure induced T_c similar or equal to 30 K which is comparable to the maximum T_c's found for the pure compound under external pressures. Furthermore, the magnetoresistance effect as a function of pressure in the normal state of the x = 0.02 sample also presented an evolution consistent with the screening of the Cu₂⁺ local moments. These findings demonstrate that the Cu₂⁺ magnetic pair-breaking effect is completely suppressed by applying pressure in the low concentration regime of Cu₂⁺ substituted BaFe₂As₂.

JOURNAL OF PHYSICS-CONDENSED MATTER 27[14] 145701, 2015. DOI: 10.1088/0953-8984/27/14/145701

[P106-2015] "Decrease of the decay rate of the entanglement of a system of two entangled qubits by increasing the temperature of the thermal bath"

Gonzalez-Henao, J. C.*; Roversi, J. A.*

We have investigated the effects of indirect coupling between a nonlinear system of two qubits, initially prepared in an entangled state, and a thermal bath. We obtained an analytical solution for this system that allowed us to analyze the effects of high temperature on the entanglement. We found a nonintuitive behavior: Higher thermal reservoir temperatures imply smaller decay rates of entanglement. The indirect coupling between the two-qubit system and a thermal bath, via a third qubit that is also a two-level system acting as a structured reservoir, it is capable of slowing down of the losses of entanglement, despite the destructive effects of the environment. This third qubit is responsible for substantially suppressing the decoherence effects on the degree of entanglement of the two-qubit system.

QUANTUM INFORMATION PROCESSING 14[4] 1377-1385, 2015. DOI: 10.1007/s11128-015-0925-0

[P107-2015] “Degenerate optimal paths in thermally isolated systems”

Acconcia, T. V.*; Bonanca, M. V. S.*

We present an analysis of the work performed on a system of interest that is kept thermally isolated during the switching of a control parameter. We show that there exists, for a certain class of systems, a finite-time family of switching protocols for which the work is equal to the quasistatic value. These optimal paths are obtained within linear response for systems initially prepared in a canonical distribution. According to our approach, such protocols are composed of a linear part plus a function which is odd with respect to time reversal. For systems with one degree of freedom, we claim that these optimal paths may also lead to the conservation of the corresponding adiabatic invariant. This points to an interesting connection between work and the conservation of the volume enclosed by the energy shell. To illustrate our findings, we solve analytically the harmonic oscillator and present numerical results for certain anharmonic examples.

PHYSICAL REVIEW E 91[4] 042141, 2015. DOI: 10.1103/PhysRevE.91.042141

[P108-2015] “Differential cross sections for electron impact excitation of the electronic bands of phenol”

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

We report results from a joint theoretical and experimental investigation into electron scattering from the important organic species phenol (C₆H₅OH). Specifically, differential cross sections (DCSs) have been measured and calculated for the electron-impact excitation of the electronic states of C₆H₅OH. The measurements were carried out at energies in the range 15-40 eV, and for scattered-electron angles between 10 degrees and 90 degrees. The energy resolution of those experiments was typically similar to 80 meV. Corresponding Schwinger multichannel method with pseudo-potentials calculations, with and without Born-closure, were also performed for a sub-set of the excited electronic-states that were accessed in the measurements. Those calculations were conducted at the static exchange plus polarisation (SEP)-level using a minimum orbital basis for single configuration interaction (MOBSCI) approach. Agreement between the measured and calculated DCSs was typically fair, although to obtain quantitative accord, the theory would need to incorporate even more channels into the MOBSCI.

JOURNAL OF CHEMICAL PHYSICS 142[10] 104305, 2015. DOI: 10.1063/1.4913825

[P109-2015] “Diffusion limited aggregation of particles with different sizes: Fractal dimension change by anisotropic growth”

Braga, F. L.*; Mattos, O. A.; Amorin, V. S.; Souza, A. B.

Clusters formation models have been extensively studied in literature, and one of the main task of this research area is the analysis of the particle aggregation processes. Some work support that the main characteristics of these processes are strictly correlated to the cluster morphology, for example in DLA. It is expected that in the DLA clusters formation with particles containing different sizes the modification of the aggregation processes can be responsible for changes in the DLA morphology. The present article is going to analyze the formation of DLA clusters of particles with different sizes and show that the aggregates obtained by this approach generate an angle selection mechanism on dendritic growth that influences the shielding effect of the DLA edge and affect the fractal dimension of the clusters.

PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS 429, 28-34, 2015. DOI: 10.1016/j.physa.2015.02.050

[P110-2015] “Dynamical Response of Networks Under External Perturbations: Exact Results”

Chinellato, D. D.*; Epstein, I. R.; Braha, D.; Bar-Yam, Y.; de Aguiar, M. A. M.*

We give exact statistical distributions for the dynamic response of influence networks subjected to external perturbations. We consider networks whose nodes have two internal states labeled 0 and 1. We let nodes be frozen in state 0, in state 1, and the remaining nodes change by adopting the state of a connected node with a fixed probability per time step. The frozen nodes can be interpreted as external perturbations to the subnetwork of free nodes. Analytically extending and to be smaller than 1 enables modeling the case of weak coupling. We solve the dynamical equations exactly for fully connected networks, obtaining the equilibrium distribution, transition probabilities between any two states and the characteristic time to equilibration. Our exact results are excellent approximations for other topologies, including random, regular lattice, scale-free and small world networks, when the numbers of fixed nodes are adjusted to take account of the effect of topology on coupling to the environment. This model can describe a variety of complex systems, from magnetic spins to social networks to population genetics, and was recently applied as a framework for early warning signals for real-world self-organized economic market crises.

JOURNAL OF STATISTICAL PHYSICS 159[2] 221-230, 2015. DOI: 10.1007/s10955-015-1189-x

[P111-2015] “Effect of event selection on jetlike correlation measurement in d plus Au collisions at root s(NN)=200 GeV”

Adamczyk, L.; Adkins, J. K.; Agakishiev, G.; de Souza, R. Derardi*; Takahashi, J.*; Vasconcelos, G. M. S.*; et al.

Dihadron correlations are analyzed in root s(NN) = 200 GeV d + Au collisions classified by forward charged particle multiplicity and zero-degree neutral energy in the Au-beam direction. It is found that the jetlike correlated yield increases with the event multiplicity. After taking into account this dependence, the non-jet contribution on the away side is minimal, leaving little room for a back-to-back ridge in these collisions.

PHYSICS LETTERS B 743, 333-339, 2015. DOI: 10.1016/j.physletb.2015.02.068

[P112-2015] “Electron collisions with phenol: Total, integral, differential, and momentum transfer cross sections and the role of multichannel coupling effects on the elastic channel”

da Costa, R. F.*; de Oliveira, E. M.*; Bettega, M. H. F.; Varella, M. T. do N.; Jones, D. B.; Brunger, M. J.; Blanco, F.; Colmenares, R.; Limao-Vieira, P.; Garcia, G.; Lima, M. A. P.*

We report theoretical and experimental total cross sections for electron scattering by phenol (C₆H₅OH). The experimental data were obtained with an apparatus based in Madrid and the calculated cross sections with two different methodologies, the independent atom method with screening corrected additivity rule (IAM-SCAR), and the Schwinger multichannel method with pseudopotentials (SMCPP). The SMCPP method in the N-open-channel coupling scheme, at the static-exchange-plus-polarization approximation, is employed to calculate the scattering amplitudes at impact energies ranging from 5.0 eV to 50 eV. We discuss the multichannel coupling effects in the calculated cross sections, in particular how the number of excited states included in the open-channel space impacts upon the convergence of the elastic cross sections at higher collision energies. The IAM-SCAR approach was also used to obtain the elastic differential cross sections (DCSs) and for correcting the experimental total cross sections for the so-called forward angle scattering effect. We found a very good agreement between our SMCPP theoretical differential, integral, and momentum transfer cross sections and experimental data for benzene (a molecule differing from phenol by replacing a hydrogen atom in benzene with a hydroxyl group). Although some discrepancies were found for lower energies, the agreement between the SMCPP data and the DCSs obtained with the IAM-SCAR method improves, as expected, as the impact energy increases. We also have a good agreement among the present SMCPP calculated total cross section (which includes elastic, 32 inelastic electronic excitation processes and ionization contributions, the latter estimated with the binary-encounter-Bethe model), the IAM-SCAR total cross section, and the experimental data when the latter is corrected for the forward angle scattering effect [Fuss et al., Phys. Rev. A 88, 042702 (2013)].

JOURNAL OF CHEMICAL PHYSICS 142[10] 104304, 2015. DOI: 10.1063/1.4913824

[P113-2015] “Electronic and structural ground state of heavy alkali metals at high pressure”

Fabbris, G.; Lim, J.; Veiga, L. S. I.*; Haskel, D.; Schilling, J. S.

Alkali metals display unexpected properties at high pressure, including emergence of low-symmetry crystal structures, which appear to occur due to enhanced electronic correlations among the otherwise nearly free conduction electrons. We investigate the high-pressure electronic and structural ground state of K, Rb, and Cs using x-ray absorption spectroscopy and x-ray diffraction measurements together with ab initio theoretical calculations. The sequence of phase transitions under pressure observed at low temperature is similar in all three heavy alkalis except for the absence of the oC84 phase in Cs. Both the experimental and theoretical results point to pressure-enhanced localization of the valence electrons characterized by pseudogap formation near the Fermi level and strong spd hybridization. Although the crystal structures predicted to host magnetic order in K are not observed, the localization process appears to drive these alkalis closer to a strongly correlated electron state.

PHYSICAL REVIEW B 91[8] 085111, 2015. DOI: 10.1103/PhysRevB.91.085111

[P114-2015] “Emission tunability and local environment in europium-doped OH--free calcium aluminosilicate glasses for artificial lighting applications”

Farias, A. M.; Sandrini, M.; Viana, J. R. M.; Baesso, M. L.; Bento, A. C.; Rohling, J. H.; Guyot, Y.; De Ligny, D.; Nunes, L. A. O.; Gandra, F. G.*; Sampaio, J. A.; Lima, S. M.; Andrade, L. H. C.; Medina, A. N.

The relationship between emission tunability and the local environment of europium ions in OH--free calcium aluminosilicate glasses was investigated, focusing on the development of devices for artificial lighting. Significant conversion of Eu³⁺ to Eu²⁺ was obtained by means of melting the glasses under a vacuum atmosphere and controlling the silica content, resulting in broad, intense, and tunable luminescence ranging from blue to red. Electron spin resonance and X-ray absorption near edge structure measurements enabled correlation of the luminescence behavior of the material with the Eu²⁺/Eu³⁺ concentration ratio and changes in the surrounding ions' crystal field. The coordinates of the CIE 1931 chromaticity diagram were calculated from the spectra, and the contour maps showed that the light emitted from Eu²⁺ presented broad bands and enhanced color tuning, ranging from reddish-orange to blue. The results showed that these Eu doped glasses can be used for tunable white lighting by combining matrix composition and the adjustment of the pumping wavelength.

MATERIALS CHEMISTRY AND PHYSICS 156, 214-219, 2015. DOI: 10.1016/j.matchemphys.2015.03.002

[P115-2015] “Evidence of delayed light emission of tetraphenyl-butadiene excited by liquid-argon scintillation light”

Segreto, E.*

Tetraphenyl-butadiene is the wavelength shifter most widely used in combination with liquid argon. The latter emits scintillation photons with a wavelength of 127 nm that need to be downshifted to be detected by photomultipliers with glass or quartz windows. Tetraphenyl-butadiene has been demonstrated to have an extremely high conversion efficiency, possibly higher than 100% for 127 nm photons, while there is no precise information about the time dependence of its emission. It is usually assumed to be exponentially decaying with a characteristic time of the order of one ns, as an extrapolation from measurements with exciting radiation in the near UV. This work shows that tetraphenyl-butadiene, when excited by 127 nm photons, re-emits photons not only with a very short decay time, but also with slower ones due to triplet states de-excitations. This fact can strongly contribute to clarifying the anomalies in liquid-argon scintillation light reported in the literature since the 1970s, namely, the inconsistency in the measured values of the long decay time constant and the appearance of an intermediate component. Similar effects should be also expected when the TPB is used in combination with helium and neon, which emit scintillation photons with wavelengths shorter than 127 nm.

PHYSICAL REVIEW C 91[3] 035503, 2015. DOI: 10.1103/PhysRevC.91.035503

[P116-2015] “Explosive synchronization with partial degree-frequency correlation”

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

Networks of Kuramoto oscillators with a positive correlation between the oscillators frequencies and the degree of their corresponding vertices exhibit so-called explosive synchronization behavior, which is now under intensive investigation. Here we study and discuss explosive synchronization in a situation that has not yet been considered, namely when only a part, typically a small part, of the vertices is subjected to a degree-frequency correlation. Our results show that in order to have explosive synchronization, it suffices to have degree-frequency correlations only for the hubs, the vertices with the highest degrees.

Moreover, we show that a partial degree-frequency correlation does not only promotes but also allows explosive synchronization to happen in networks for which a full degree-frequency correlation would not allow it. We perform a mean-field analysis and our conclusions were corroborated by exhaustive numerical experiments for synthetic networks and also for the undirected and unweighed version of a typical benchmark biological network, namely the neural network of the worm *Caenorhabditis elegans*. The latter is an explicit example where partial degree-frequency correlation leads to explosive synchronization with hysteresis, in contrast with the fully correlated case, for which no explosive synchronization is observed.

PHYSICAL REVIEW E 91[2] 022818, 2015. DOI: 10.1103/PhysRevE.91.022818

[P117-2015] “Femtosecond laser ablation of gold interdigitated electrodes for electronic tongues”

Manzoli, A.; de Almeida, G. F. B.; Filho, J. A.; Mattoso, L. H. C.; Riul, A., Jr.*; Mendonca, C. R.; Correa, D. S.

Electronic tongue (e-tongue) sensors based on impedance spectroscopy have emerged as a potential technology to evaluate the quality and chemical composition of food, beverages, and pharmaceuticals. E-tongues usually employ transducers based on metal interdigitated electrodes (IDEs) coated with a thin layer of an active material, which is capable of interacting chemically with several types of analytes. IDEs are usually produced by photolithographic methods, which are time-consuming and costly, therefore, new fabrication technologies are required to make it more affordable. Here, we employed femtosecond laser ablation with pulse duration of 50 fs to microfabricate gold IDEs having finger width from 2.3 μm up to 3.2 μm . The parameters used in the laser ablation technique, such as light intensity, scan speed and beam spot size have been optimized to achieve uniform IDEs, which were characterized by optical and scanning electron microscopy. The electrical properties of gold IDEs fabricated by laser ablation were evaluated by impedance spectroscopy, and compared to those produced by conventional photolithography. The results show that femtosecond laser ablation is a promising alternative to conventional photolithography for fabricating metal IDEs for e-tongue systems.

OPTICS AND LASER TECHNOLOGY 69, 148-153, 2015. DOI: 10.1016/j.optlastec.2014.12.02

[P118-2015] “Fundamental oscillation modes of neutron stars: Validity of universal relations”

Chirenti, C.; de Souza, G. H.*; Kastaun, W.

We study the f -mode frequencies and damping times of non-rotating neutron stars (NS) in general relativity by solving the linearized perturbation equations, with the aim to establish “universal” relations that depend only weakly on the equations of state (EOS). Using a more comprehensive set of EOSs, we re-examine some proposed empirical relations that describe the f -mode parameters in terms of mass and radius of the NS, and we test a more recent proposal for expressing the f -mode parameters as quadratic functions of the effective compactness. Our extensive results for each equation of state considered allow us to study the accuracy of each proposal. In particular, the empirical relation proposed in the literature for the damping time in terms of the mass and radius deviates considerably from our results. We introduce a new universal relation for the product of the f -mode frequency and damping time as a function of the (ordinary) compactness, which proved to be more accurate. The more recently proposed relations using the effective compactness, on the other hand, also fit our data accurately.

Our results show that the maximum oscillation frequency depends strongly on the EOS, such that the measurement of a high oscillation frequency would rule out several EOSs. Lastly, we compare the exact mode frequencies to those obtained in the Cowling approximation, and also to results obtained with a nonlinear evolution code, validating the implementations of the different approaches.

PHYSICAL REVIEW D 91[4] 044034, 2015. DOI: 10.1103/PhysRevD.91.044034

[P119-2015] “Hyperhoneycomb Iridate beta-Li2IrO3 as a Platform for Kitaev Magnetism”

Takayama, T.; Kato, A.; Dinnebier, R.; Nuss, J.; Kono, H.; Veiga, L. S. I.*; Fabbris, G.; Haskel, D.; Takagi, H.

A complex iridium oxide beta-Li₂IrO₃ crystallizes in a hyperhoneycomb structure, a three-dimensional analogue of honeycomb lattice, and is found to be a spin-orbital Mott insulator with $J(\text{eff}) = 1/2$ moment. Ir ions are connected to the three neighboring Ir ions via Ir-O-2-Ir bonding planes, which very likely gives rise to bond-dependent ferromagnetic interactions between the $J(\text{eff}) = 1/2$ moments, an essential ingredient of Kitaev model with a spin liquid ground state. Dominant ferromagnetic interaction between $J(\text{eff}) = 1/2$ moments is indeed confirmed by the temperature dependence of magnetic susceptibility $\chi(T)$ which shows a positive Curie-Weiss temperature $\theta(\text{CW})$ similar to +40 K. A magnetic ordering with a very small entropy change, likely associated with a noncollinear arrangement of $J(\text{eff}) = 1/2$ moments, is observed at $T_c = 38$ K. With the application of magnetic field to the ordered state, a large moment of more than 0.35 $\mu\text{B}/\text{Ir}$ is induced above 3 T, a substantially polarized $J(\text{eff}) = 1/2$ state. We argue that the close proximity to ferromagnetism and the presence of large fluctuations evidence that the ground state of hyperhoneycomb beta-Li₂IrO₃ is located in close proximity of a Kitaev spin liquid.

PHYSICAL REVIEW LETTERS 114[7] 077202, 2015. DOI: 10.1103/PhysRevLett.114.077202

[P120-2015] “Implication for the core-collapse supernova rate from 21 years of data of the large volume detector”

Agafonova, N. Y.; Aglietta, M.; Antonioli, P.; Kemp, E.*; et al. LVD Collaboration

The Large Volume Detector (LVD) has been continuously taking data since 1992 at the INFN Gran Sasso National Laboratory. The LVD is sensitive to neutrino bursts from gravitational stellar collapses with full detection probability over the Galaxy. We have searched for neutrino bursts in LVD data taken over 7,335 days of operation. No evidence of neutrino signals has been found between 1992 June and 2013 December. The 90% C.L. upper limit on the rate of core collapse and failed supernova explosions out to distances of 25 kpc is found to be 0.114 yr^{-1} .

ASTROPHYSICAL JOURNAL 802[1] 47, 2015. DOI: 10.1088/0004-637X/802/1/47

[P121-2015] “Isolation of flow and nonflow correlations by two- and four-particle cumulant measurements of azimuthal harmonics in root $s(\text{NN})=200$ GeV Au+Au collisions”

Abdelwahab, N. M.; Adamczyk, L.; Adkins, J. K.; de Souza, R. Derradi*; Takahashi, J.*; Vasconcelos, G. M. S.*; et al. STAR Collaboration

A data-driven method was applied to Au+Au collisions at root S-NN = 200 GeV made with the STAR detector at RHIC to isolate pseudorapidity distance $\Delta\eta$ -dependent and $\Delta\eta$ -independent correlations by using two- and four-particle azimuthal cumulant measurements. We identified a $\Delta\eta$ -independent component of the correlation, which is dominated by anisotropic flow and flow fluctuations. It was also found to be independent of $\Delta\eta$ within the measured range of pseudorapidity vertical bar $\Delta\eta$ vertical bar < 1. In 20-30% central Au+Au collisions, the relative flow fluctuation was found to be 34% +/- 2%(stat.) +/- 3%(sys.) for particles with transverse momentum $p(T)$ less than 2 GeV/c. The $\Delta\eta$ -dependent part, attributed to nonflow correlations, is found to be 5% +/- 2%(sys.) relative to the flow of the measured second harmonic cumulant at vertical bar $\Delta\eta$ vertical bar > 0.7.

PHYSICS LETTERS B 745, 40-47, 2015. DOI: 10.1016/j.physletb.2015.04.033

[P122-2015] “K*(892)(0) and phi(1020) production in Pb-Pb collisions at root s(NN)=2.76 TeV”

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

The yields of the K*(892)(0) and phi(1020) resonances are measured in Pb-Pb collisions at root s(NN) = 2.76 TeV through their hadronic decays using the ALICE detector. The measurements are performed in multiple centrality intervals at mid-rapidity (vertical bar y vertical bar < 0.5) in the transverse-momentum ranges 0.3 < $p(T)$ < 5 GeV/c for the K*(892)(0) and 0.5 < $p(T)$ < 5 GeV/c for the phi(1020). The yields of K*(892)(0) are suppressed in central Pb-Pb collisions with respect to pp and peripheral Pb-Pb collisions (perhaps due to rescattering of its decay products in the hadronic medium), while the longer-lived phi(1020) meson is not suppressed. These particles are also used as probes to study the mechanisms of particle production. The shape of the $p(T)$ distribution of the phi(1020) meson, but not its yield, is reproduced fairly well by hydrodynamic models for central Pb-Pb collisions. In central Pb-Pb collisions at low and intermediate $p(T)$, the $p/\phi(1020)$ ratio is flat in $p(T)$, while the p/π and $\phi(1020)/\pi$ ratios show a pronounced increase and have similar shapes to each other. These results indicate that the shapes of the $p(T)$ distributions of these particles in central Pb-Pb collisions are determined predominantly by the particle masses and radial flow. Finally, phi(1020) production in Pb-Pb collisions is enhanced, with respect to the yield in pp collisions and the yield of charged pions, by an amount similar to the Lambda and Xi.

PHYSICAL REVIEW C 91[2] 024609, 2015. DOI: 10.1103/PhysRevC.91.024609

[P123-2015] “Large scale distribution of ultra high energy cosmic rays detected at the pierre auger observatory with zenith angles up to 80 degrees”

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

We present the results of an analysis of the large angular scale distribution of the arrival directions of cosmic rays with energy above 4 EeV detected at the Pierre Auger Observatory including for the first time events with zenith angle between 60 degrees and 80 degrees. We perform two Rayleigh analyses, one in the right ascension and one in the azimuth angle distributions, that are sensitive to modulations in right ascension and declination, respectively.

The largest departure from isotropy appears in the $E > 8$ EeV energy bin, with an amplitude for the first harmonic in right ascension $r(1)(\alpha) = (4.4 \pm 1.0) \times 10^{-2}$, that has a chance probability $P(= r(1)(\alpha)) = 6.4 \times 10^{-5}$, reinforcing the hint previously reported with vertical events alone.

ASTROPHYSICAL JOURNAL 802[2] 111, 2015. DOI: 10.1088/0004-637X/802/2/111

[P124-2015] “Long-range two-particle correlations of strange hadrons with charged particles in pPb and PbPb collisions at LHC energies”

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

Measurements of two-particle angular correlations between an identified strange hadron (K-S(0) or A/(A) over bar) and a charged particle, emitted in pPb collisions, are presented over a wide range in pseudorapidity and full azimuth. The data, corresponding to an integrated luminosity of approximately 35 nb⁻¹, were collected at a nucleon-nucleon center-of-mass energy (root s(NN)) of 5.02 TeV with the CMS detector at the LHC. The results are compared to semi-peripheral PbPb collision data at root s(NN) = 2.76 TeV, covering similar charged-particle multiplicities in the events. The observed azimuthal correlations at large relative pseudorapidity are used to extract the second-order ($v(2)$) and third-order ($v(3)$) anisotropy harmonics of K-S(0) and A/(A) over bar particles. These quantities are studied as a function of the charged-particle multiplicity in the event and the transverse momentum of the particles. For high-multiplicity pPb events, a clear particle species dependence of $v(2)$ and $v(3)$ is observed. For $p(T) < 2$ GeV, the $v(2)$ and $v(3)$ values of K-S(0) particles are larger than those of A/(A) over bar particles at the same $p(T)$. This splitting effect between two particle species is found to be stronger in pPb than in PbPb collisions in the same multiplicity range. When divided by the number of constituent quarks and compared at the same transverse kinetic energy per quark, both $v(2)$ and $v(3)$ for K-S(0) particles are observed to be consistent with those for A/(A) over bar particles at the 10% level in pPb collisions. This consistency extends over a wide range of particle transverse kinetic energy and event multiplicities.

PHYSICS LETTERS B 742, 200-224, 2015. DOI: 10.1016/j.physletb.2015.01.034

[P125-2015] “Measurement of the Hydrodynamic Radius of Quantum Dots by Fluorescence Correlation Spectroscopy Excluding Blinking”

de Thomaz, A. A.*; Almeida, D. B.*; Pelegati, V. B.*; Carvalho, H. F.; Cesar, C. L.*

One of the most important properties of quantum dots (QDs) is their size. Their size will determine optical properties and in a colloidal medium their range of interaction. The most common techniques used to measure QD size are transmission electron microscopy (TEM) and X-ray diffraction. However, these techniques demand the sample to be dried and under a vacuum. This way any hydrodynamic information is excluded and the preparation process may alter even the size of the QDs. Fluorescence correlation spectroscopy (FCS) is an optical technique with single molecule sensitivity capable of extracting the hydrodynamic radius (HR) of the QDs. The main drawback of FCS is the blinking phenomenon that alters the correlation function implicating in a QD apparent size smaller than it really is. In this work, we developed a method to exclude blinking of the FCS and measured the HR of colloidal QDs. We compared our results with TEM images, and the HR obtained by FCS is higher than the radius measured by TEM.

We attribute this difference to the cap layer of the QD that cannot be seen in the TEM images.

JOURNAL OF PHYSICAL CHEMISTRY B 119[11] 4294-4299, 2015. DOI: 10.1021/jp512214p

[P126-2015] “Measurement of the production cross section ratio $\sigma(\chi_{b2}(1P))/\sigma(\chi_{b1}(1P))$ in pp collisions at root $s=8\text{TeV}$ ”

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

A measurement of the production cross section ratio $\sigma(\chi_{b2}(1P))/\sigma(\chi_{b1}(1P))$ is presented. The $\chi_{b1}(1P)$ and $\chi_{b2}(1P)$ bottomonium states, promptly produced in pp collisions at root $s = 8\text{TeV}$, are detected by the CMS experiment at the CERN LHC through their radiative decays $\chi_{b1,2}(1P) \rightarrow \Upsilon(1S) + \gamma$. The emitted photons are measured through their conversion to $e^{+}e^{-}$ pairs, whose reconstruction allows the two states to be resolved. The $\Upsilon(1S)$ is measured through its decay to two muons. An event sample corresponding to an integrated luminosity of 20.7 fb^{-1} is used to measure the cross section ratio in a phase-space region defined by the photon pseudorapidity, vertical bar $\eta(\gamma)$ vertical bar < 1.0 ; the $\Upsilon(1S)$ rapidity, vertical bar $y(\Upsilon)$ vertical bar < 1.5 ; and the $\Upsilon(1S)$ transverse momentum, $7 < p_T(\Upsilon) < 40 \text{ GeV}$. The cross section ratio shows no significant dependence on the $\Upsilon(1S)$ transverse momentum, with a measured average value of 0.85 ± 0.07 (stat + syst) ± 0.08 (BF), where the first uncertainty is the combination of the experimental statistical and systematic uncertainties and the second is from the uncertainty in the ratio of the χ_b branching fractions.

PHYSICS LETTERS B 743, 383-402, 2015. DOI: 10.1016/j.physletb.2015.02.048

[P127-2015] “Measurement of the Z gamma production cross section in pp collisions at 8 TeV and search for anomalous triple gauge boson couplings”

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

The cross section for the production of Z gamma in proton-proton collisions at 8 TeV is measured based on data collected by the CMS experiment at the LHC corresponding to an integrated luminosity of 19.5 fb^{-1} . Events with an oppositely-charged pair of muons or electrons together with an isolated photon are selected. The differential cross section as a function of the photon transverse momentum is measured inclusively and exclusively, where the exclusive selection applies a veto on central jets. The observed cross sections are compatible with the expectations of next-to-next-to-leading-order quantum chromodynamics. Limits on anomalous triple gauge couplings of ZZ gamma and Z gamma gamma are set that improve on previous experimental results obtained with the charged lepton decay modes of the Z boson.

JOURNAL OF HIGH ENERGY PHYSICS 4, 164, 2015. DOI: 10.1007/JHEP04(2015)164

[P128-2015] “Measurements of jet multiplicity and differential production cross sections of Z plus jets events in proton-proton collisions at root $s=7 \text{TeV}$ ”

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

Measurements of differential cross sections are presented for the production of a Z boson and at least one hadronic jet in proton-proton collisions at root $s = 7 \text{TeV}$, recorded by the CMS detector, using a data sample corresponding to an integrated luminosity of 4.9 fb^{-1} . The jet multiplicity distribution is measured for up to six jets. The differential cross sections are measured as a function of jet transverse momentum and pseudorapidity for the four highest transverse momentum jets. The distribution of the scalar sum of jet transverse momenta is also measured as a function of the jet multiplicity. The measurements are compared with theoretical predictions at leading and next-to-leading order in perturbative QCD.

PHYSICAL REVIEW D 91[5] 052008, 2015. DOI: 10.1103/PhysRevD.91.052008

[P129-2015] “Morphology dependent polymeric capillary optical resonator hydrostatic pressure sensor”

Gouveia, M. A.*; Duber P. A.; Marques, T. H. R.*; Cesar Torres, M.; Cordeiro, C. M. B.*

A hydrostatic pressure sensor based on morphology dependent resonances in a polymeric tube is presented. By internal pressurization, normal tensions will increase the device's size and shrink its wall thickness, inducing a shift in the resonant wavelengths of the resonator. Numerical simulations indicate that there are two modal regimes of sensitivity and a maximum achievable sensitivity, related to the device's geometry, constitutive material and analysed mode order. A sensitivity as high as $0.36 \pm 0.01 \text{ nm/bar}$ has been experimentally found for a 1.8mm diameter PMMA tube with wall thickness of $80 \mu\text{m}$.

OPTICS EXPRESS 23[8] 10643-10652, 2015. DOI: 10.1364/OE.23.010643

[P130-2015] “Non-unitary neutrino propagation from neutrino decay”

Berryman, J. M.; de Gouvea, A.; Hernandez, D.; Oliveira, R. L. N.*

Neutrino propagation in space-time is not constrained to be unitary if very light states-lighter than the active neutrinos-exist into which neutrinos may decay. If this is the case, neutrino flavor-change is governed by a handful of extra mixing and “oscillation” parameters, including new sources of CP-invariance violation. We compute the transition probabilities in the two-and three-flavor scenarios and discuss the different phenomenological consequences of the new physics. These are qualitatively different from other sources of unitarity violation discussed in the literature.

PHYSICS LETTERS B 742, 74-79, 2015. DOI: 10.1016/j.physletb.2015.01.002

[P131-2015] “Performance of the CMS missing transverse momentum reconstruction in pp data at root $s=8 \text{TeV}$ ”

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

The performance of missing transverse energy reconstruction algorithms is presented using root $s = 8 \text{TeV}$ proton-proton (pp) data collected with the CMS detector. Events with anomalous missing transverse energy are studied, and the performance of algorithms used to identify and remove these events is presented.

The scale and resolution for missing transverse energy, including the effects of multiple pp interactions (pileup), are measured using events with an identified Z boson or isolated photon, and are found to be well described by the simulation. Novel missing transverse energy reconstruction algorithms developed specifically to mitigate the effects of large numbers of pileup interactions on the missing transverse energy resolution are presented. These algorithms significantly reduce the dependence of the missing transverse energy resolution on pileup interactions. Finally, an algorithm that provides an estimate of the significance of the missing transverse energy is presented, which is used to estimate the compatibility of the reconstructed missing transverse energy with a zero nominal value.

JOURNAL OF INSTRUMENTATION 10, 02006, 2015. DOI: 10.1088/1748-0221/10/02/P02006

[P132-2015] “Probing Lorentz invariance violation with neutrino factories”

Rossi-Torres, F.*

In this article we show the modification of the number of neutrino events ($\nu(\mu) + \bar{\nu}(\mu)$) caused by Lorentz invariant violation (LIV), $\sigma = 5 \times 10^{-24}$ and 10^{-23} , in neutrino oscillations for a neutrino factory at a distance of 7500 km. The momentum of the muons can vary from 10-50 GeV and we consider 2×10^{20} decays per year. The modifications in the number of events caused by this σ LIV parameter could be a strong signal of new physics in a future neutrino factory.

JOURNAL OF PHYSICS G-NUCLEAR AND PARTICLE PHYSICS 42[5] 055003, 2015. DOI: 10.1088/0954-3899/42/5/055003

[P133-2015] “Protecting the root SWAP operation from general and residual errors by continuous dynamical decoupling”

Fanchini, F. F.; Napolitano, R. D. J.; Cakmak, B.*; Caldeira, A. O.*

We study the occurrence of errors in a continuously decoupled two-qubit state during a root SWAP quantum operation under decoherence. We consider a realization of this quantum gate based on the Heisenberg exchange interaction, which alone suffices for achieving universal quantum computation. Furthermore, we introduce a continuous-dynamical-decoupling scheme that commutes with the Heisenberg Hamiltonian to protect it from the amplitude damping and dephasing errors caused by the system-environment interaction. We consider two error-protection settings. One protects the qubits from both amplitude damping and dephasing errors. The other features the amplitude damping as a residual error and protects the qubits from dephasing errors only. In both settings, we investigate the interaction of qubits with common and independent environments separately. We study how errors affect the entanglement and fidelity for different environmental spectral densities.

PHYSICAL REVIEW A 91[4] 042325, 2015. DOI: 10.1103/PhysRevA.91.042325

[P134-2015] “Search for a standard model-like Higgs boson in the $\mu^+\mu^-$ and e^+e^- decay channels at the LHC”

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

A search is presented for a standard model-like Higgs boson decaying to the $\mu^+\mu^-$ or e^+e^- final states based on proton-proton collisions recorded by the CMS experiment at the CERN LHC.

The data correspond to integrated luminosities of 5.0 fb⁻¹ at a centre-of-mass energy of 7 TeV and 19.7 fb⁻¹ at 8 TeV for the $\mu^+\mu^-$ search, and of 19.7 fb⁻¹ at 8 TeV for the e^+e^- search. Upper limits on the production cross section times branching fraction at the 95% confidence level are reported for Higgs boson masses in the range from 120 to 150 GeV. For a Higgs boson with a mass of 125 GeV decaying to $\mu^+\mu^-$, the observed (expected) upper limit on the production rate is found to be 7.4 (6.5(-1.9)(+2.8)) times the standard model value. This corresponds to an upper limit on the branching fraction of 0.0016. Similarly, for e^+e^- , an upper limit of 0.0019 is placed on the branching fraction, which is approximate to 3.7×10^5 times the standard model value. These results, together with recent evidence of the 125 GeV boson coupling to tau-leptons with a larger branching fraction consistent with the standard model, confirm that the leptonic couplings of the new boson are not flavour-universal.

PHYSICS LETTERS B 744, 184-207, 2015. DOI: 10.1016/j.physletb.2015.03.048

[P135-2015] “Search for Displaced Supersymmetry in Events with an Electron and a Muon with Large Impact Parameters”

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

A search for new long-lived particles decaying to leptons is presented using proton-proton collisions produced by the LHC at $\sqrt{s} = 8$ TeV. Data used for the analysis were collected by the CMS detector and correspond to an integrated luminosity of 19.7 fb⁻¹. Events are selected with an electron and muon with opposite charges that both have transverse impact parameter values between 0.02 and 2 cm. The search has been designed to be sensitive to a wide range of models with nonprompt e- μ final states. Limits are set on the “displaced supersymmetry” model, with pair production of top squarks decaying into an e- μ final state via R-parity-violating interactions. The results are the most restrictive to date on this model, with the most stringent limit being obtained for a top squark lifetime corresponding to $c\tau = 2$ cm, excluding masses below 790 GeV at 95% confidence level.

PHYSICAL REVIEW LETTERS 114[6] 061801, 2015. DOI: 10.1103/PhysRevLett.114.061801

[P136-2015] “Search for long-lived neutral particles decaying to quark-antiquark pairs in proton-proton collisions at $\sqrt{s}=8$ TeV”

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

A search is performed for long-lived massive neutral particles decaying to quark-antiquark pairs. The experimental signature is a distinctive topology of a pair of jets, originating at a secondary vertex. Events were collected with the CMS detector at the CERN LHC in proton-proton collisions at a center-of-mass energy of 8 TeV. The data analyzed correspond to an integrated luminosity of 18.5 fb⁻¹. No significant excess is observed above standard model expectations. Upper limits at 95% confidence level are set on the production cross section of a heavy neutral scalar particle, H, in the mass range of 200 to 1000 GeV, decaying promptly into a pair of long-lived neutral X particles in the mass range of 50 to 350 GeV, each in turn decaying into a quark-antiquark pair. For X with mean proper decay lengths of 0.4 to 200 cm, the upper limits are typically 0.5-200 fb. The results are also interpreted in the context of an R-parity-violating supersymmetric model with long-lived neutralinos decaying into a quark-antiquark pair and a muon.

For pair production of squarks that promptly decay to neutralinos with mean proper decay lengths of 2-40 cm, the upper limits on the cross section are typically 0.5-3 fb. The above limits are the most stringent on these channels to date.

PHYSICAL REVIEW D 91[1], 2015. DOI: 10.1103/PhysRevD.91.012007

[P137-2015] “Search for long-lived particles that decay into final states containing two electrons or two muons in proton-proton collisions at root $s=8\text{TeV}$ ”

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

A search is performed for long-lived particles that decay into final states that include a pair of electrons or a pair of muons. The experimental signature is a distinctive topology consisting of a pair of charged leptons originating from a displaced secondary vertex. Events corresponding to an integrated luminosity of 19.6 (20.5) fb⁻¹ in the electron (muon) channel were collected with the CMS detector at the CERN LHC in proton-proton collisions at root s TeV. No significant excess is observed above standard model expectations. Upper limits on the product of the cross section and branching fraction of such a signal are presented as a function of the long-lived particle’s mean proper decay length. The limits are presented in an approximately model-independent way, allowing them to be applied to a wide class of models yielding the above topology. Over much of the investigated parameter space, the limits obtained are the most stringent to date. In the specific case of a model in which a Higgs boson in the mass range 125-1000 GeV/c(2) decays into a pair of long-lived neutral bosons in the mass range 20-350 GeV=c(2), each of which can then decay to dileptons, the upper limits obtained are typically in the range 0.2-10 fb for mean proper decay lengths of the long-lived particles in the range 0.01-100 cm. In the case of the lowest Higgs mass considered (125 GeV/c(2)), the limits are in the range 2-50 fb. These limits are sensitive to Higgs boson branching fractions as low as 10(-1).

PHYSICAL REVIEW D 91[5] 052012, 2015. DOI: 10.1103/PhysRevD.91.052012

[P138-2015] “Search for Monotop Signatures in Proton-Proton Collisions at root $s=8\text{ TeV}$ ”

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 new decaying massive particles whose presence is inferred from an imbalance in transverse momentum and which are produced in association with a single top quark that decays into a bottom quark and two light quarks. The measurement is performed using 19.7 fb(-1) of data from proton-proton collisions at a center-of-mass energy of 8 TeV, collected with the CMS detector at the CERN LHC. No deviations from the standard model predictions are observed and lower limits are set on the masses of new invisible bosons. In particular, scalar and vector particles, with masses below 330 and 650 GeV, respectively, are excluded at 95% confidence level, thereby substantially extending a previous limit published by the CDF Collaboration.

PHYSICAL REVIEW LETTERS 114[10] 101801, 2015. DOI: 10.1103/PhysRevLett.114.101801

[P139-2015] “Search for resonances and quantum black holes using dijet mass spectra in proton-proton collisions at root $s=8\text{ TeV}$ ”

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

A search for resonances and quantum black holes is performed using the dijet mass spectra measured in proton-proton collisions at root $s = 8$ TeV with the CMS detector at the LHC. The data set corresponds to an integrated luminosity of 19.7 fb(-1). In a search for narrow resonances that couple to quark-quark, quark-gluon, or gluon-gluon pairs, model-independent upper limits, at 95% confidence level, are obtained on the production cross section of resonances, with masses above 1.2 TeV. When interpreted in the context of specific models the limits exclude string resonances with masses below 5.0 TeV; excited quarks below 3.5 TeV; scalar diquarks below 4.7 TeV; W' bosons below 1.9 TeV or between 2.0 and 2.2 TeV; Z' bosons below 1.7 TeV; and Randall-Sundrum gravitons below 1.6 TeV. A separate search is conducted for narrow resonances that decay to final states including b quarks. The first exclusion limit is set for excited b quarks, with a lower mass limit between 1.2 and 1.6 TeV depending on their decay properties. Searches are also carried out for wide resonances, assuming for the first time width-to-mass ratios up to 30%, and for quantum black holes with a range of model parameters. The wide resonance search excludes axigluons and colorons with mass below 3.6 TeV, and color-octet scalars with mass below 2.5 TeV. Lower bounds between 5.0 and 6.3 TeV are set on the masses of quantum black holes.

PHYSICAL REVIEW D 91[5] 052009, 2015. DOI: 10.1103/PhysRevD.91.052009

[P140-2015] “Search for stealth supersymmetry in events with jets, either photons or leptons, and low missing transverse momentum in pp collisions at 8 TeV”

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

The results of a search for new physics in final states with jets, either photons or leptons, and low missing transverse momentum are reported. The study is based on a sample of proton-proton collisions collected at a center-of-mass energy root $s = 8$ TeV with the CMS detector in 2012. The integrated luminosity of the sample is 19.7 fb(-1). Many models of new physics predict the production of events with jets, electroweak gauge bosons, and little or no missing transverse momentum. Examples include stealth models of supersymmetry (SUSY), which predict a hidden sector at the electroweak energy scale in which SUSY is approximately conserved. The data are used to search for stealth SUSY signatures in final states with either two photons or an oppositely charged electron and muon. No excess is observed with respect to the standard model expectation, and the results are used to set limits on squark pair production in the stealth SUSY framework.

PHYSICS LETTERS B 743, 503-525, 2015. DOI: 10.1016/j.physletb.2015.03.017

[P141-2015] “Search for supersymmetry using razor variables in events with b-tagged jets in pp collisions at root $s=8\text{ TeV}$ ”

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

An inclusive search for supersymmetry in events with at least one b-tagged jet is performed using proton-proton collision data collected by the CMS experiment in 2012 at a center-of-mass energy of 8 TeV. The data set size corresponds to an integrated luminosity of 19.3 fb(-1). The two-dimensional distribution of the razor variables R-2 and M-R is studied in events with and without leptons.

The data are found to be consistent with the expected background, which is modeled with an empirical function. Exclusion limits on supersymmetric particle masses at a 95% confidence level are derived in several simplified supersymmetric scenarios for several choices of the branching fractions. By combining the likelihoods of a search in events without leptons and a search that requires a single lepton (electron or muon), an improved bound on the top-squark mass is obtained. Assuming the lightest supersymmetric particle to be stable and weakly interacting, and to have a mass of 100 GeV, the branching-fraction-dependent (-independent) production of gluinos is excluded for gluino masses up to 1310 (1175) GeV. The corresponding limit for top-squark pair production is 730 (645) GeV.

PHYSICAL REVIEW D 91[5] 052018, 2015. DOI: 10.1103/PhysRevD.91.052018

[P142-2015] "Searches for anisotropies in the arrival directions of the highest energy cosmic rays detected by the Pierre Auger observatory"

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

We analyze the distribution of arrival directions of ultra-high-energy cosmic rays recorded at the Pierre Auger Observatory in 10 years of operation. The data set, about three times larger than that used in earlier studies, includes arrival directions with zenith angles up to 80 degrees, thus covering from -90 degrees to +45 degrees in declination. After updating the fraction of events correlating with the active galactic nuclei (AGNs) in the Veron-Cetty and Veron catalog, we subject the arrival directions of the data with energies in excess of 40 EeV to different tests for anisotropy. We search for localized excess fluxes, self-clustering of event directions at angular scales up to 30 degrees, and different threshold energies between 40 and 80 EeV. We then look for correlations of cosmic rays with celestial structures both in the Galaxy (the Galactic Center and Galactic Plane) and in the local universe (the Super-Galactic Plane). We also examine their correlation with different populations of nearby extragalactic objects: galaxies in the 2MRS catalog, AGNs detected by Swift-BAT, radio galaxies with jets, and the Centaurus A (Cen A) galaxy. None of the tests show statistically significant evidence of anisotropy. The strongest departures from isotropy (post-trial probability similar to 1.4%) are obtained for cosmic rays with $E > 58$ EeV in rather large windows around Swift AGNs closer than 130 Mpc and brighter than $10(44)$ erg s⁻¹ (18 degrees radius), and around the direction of Cen A (15 degrees radius).

ASTROPHYSICAL JOURNAL 804[1] 15, 2015. DOI: 10.1088/0004-637X/804/1/15

[P143-2015] "Searches for supersymmetry based on events with b jets and four W bosons in pp collisions at 8 TeV"

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

Five mutually exclusive searches for supersymmetry are presented based on events in which b jets and four W bosons are produced in proton-proton collisions at $\sqrt{s} = 8$ TeV. The data, corresponding to an integrated luminosity of 19.5 fb⁻¹, were collected with the CMS experiment at the CERN LHC in 2012. The five studies differ in the leptonic signature from the W boson decays, and correspond to all-hadronic, single-lepton, opposite-sign dilepton, same-sign dilepton, and ≥ 3 lepton final states.

The results of the five studies are combined to yield 95% confidence level limits for the gluino and bottom-squark masses in the context of gluino and bottom-squark pair production, respectively. In the limit when the lightest supersymmetric particle is light, gluino and bottom squark masses are excluded below 1280 and 570 GeV, respectively.

PHYSICS LETTERS B 745, 5-28, 2015. DOI: 10.1016/j.physletb.2015.04.002

[P144-2015] "Searches for supersymmetry using the M-T2 variable in hadronic events produced in pp collisions at 8 TeV"

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

Searches for supersymmetry (SUSY) are performed using a sample of hadronic events produced in 8 TeV pp collisions at the CERN LHC. The searches are based on the M-T2 variable, which is a measure of the transverse momentum imbalance in an event. The data were collected with the CMS detector and correspond to an integrated luminosity of 19.5 fb⁻¹. Two related searches are performed. The first is an inclusive search based on signal regions defined by the value of the M-T2 variable, the hadronic energy in the event, the jet multiplicity, and the number of jets identified as originating from bottom quarks. The second is a search for a mass peak corresponding to a Higgs boson decaying to a bottom quark-antiquark pair, where the Higgs boson is produced as a decay product of a SUSY particle. For both searches, the principal backgrounds are evaluated with data control samples. No significant excess over the expected number of background events is observed, and exclusion limits on various SUSY models are derived.

JOURNAL OF HIGH ENERGY PHYSICS 5, 078, 2015. DOI: 10.1007/JHEP05(2015)078

[P145-2015] "Spatiotemporal distribution of different extracellular polymeric substances and filamentation mediate Xylella fastidiosa adhesion and biofilm formation"

Janissen, R.*; Murillo, D. M.*; Niza, B.; Sahoo, P. K.*; Nobrega, M. M.; Cesar, C. L.*; Temperini, M. L. A.; Carvalho, H. F.; de Souza, A. A.; Cotta, M. A.*

Microorganism pathogenicity strongly relies on the generation of multicellular assemblies, called biofilms. Understanding their organization can unveil vulnerabilities leading to potential treatments; spatially and temporally-resolved comprehensive experimental characterization can provide new details of biofilm formation, and possibly new targets for disease control. Here, biofilm formation of economically important phytopathogen *Xylella fastidiosa* was analyzed at single-cell resolution using nanometer-resolution spectro-microscopy techniques, addressing the role of different types of extracellular polymeric substances (EPS) at each stage of the entire bacterial life cycle. Single cell adhesion is caused by unspecific electrostatic interactions through proteins at the cell polar region, where EPS accumulation is required for more firmly-attached, irreversibly adhered cells. Subsequently, bacteria form clusters, which are embedded in secreted loosely-bound EPS, and bridged by up to ten-fold elongated cells that form the biofilm framework. During biofilm maturation, soluble EPS forms a filamentous matrix that facilitates cell adhesion and provides mechanical support, while the biofilm keeps anchored by few cells. This floating architecture maximizes nutrient distribution while allowing detachment upon larger shear stresses; it thus complies with biological requirements of the bacteria life cycle. Using new approaches, our findings provide insights regarding different aspects of the adhesion process of *X. fastidiosa* and biofilm formation.

[P146-2015] “Strong power transfer between photonic bandgaps of hybrid photonic crystal fibers”

Arismar Cerqueira, S., Jr.; do Nascimento, A. R., Jr.; Bonomini, I. A. M.; Franco, M. A. R.; Serrao, V. A.; Cordeiro, C. M. B.*

This work reports the strong nonlinear power transfer between two adjacent photonic bandgaps of hybrid photonic crystal fibers. The nonlinear phenomenon originates from the generation of a resonant radiation in a particular bandgap, which is ensured by launching a femtosecond pulse near the zero-dispersion wavelength of a lower-order adjacent bandgap, where its correspondent soliton is formed. A theoretical description based on fiber dispersion properties and phase-matching conditions is presented to contribute to the interpretation and understanding of the highly efficient energy transference. Furthermore, various experimental results are reported, including the resonant radiation that peaks at 8.5 dB above that of the initial pulse, which represents a significant enhancement in the nonlinear efficiency compared to previous published works in the literature.

OPTICAL FIBER TECHNOLOGY 22, 36-41, 2015. DOI: 10.1016/j.yofte.2015.01.006

[P147-2015] “Study of Z production in PbPb and pp collisions at root s(NN)=2.76 TeV in the dimuon and dielectron decay channels”

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

The production of Z bosons is studied in the dimuon and dielectron decay channels in PbPb and pp collisions at root s(NN) = 2.76 TeV, using data collected by the CMS experiment at the LHC. The PbPb data sample corresponds to an integrated luminosity of about 166 μb^{-1} , while the pp data sample collected in 2013 at the same nucleon-nucleon centre-of-mass energy has an integrated luminosity of 5.4 pb^{-1} . The Z boson yield is measured as a function of rapidity, transverse momentum, and collision centrality. The ratio of PbPb to pp yields, scaled by the number of inelastic nucleon-nucleon collisions, is found to be 1.06 \pm 0.05 (stat) \pm 0.08 (syst) in the dimuon channel and 1.02 \pm 0.08 (stat) \pm 0.15 (syst) in the dielectron channel, for centrality-integrated Z boson production. This binary collision scaling is seen to hold in the entire kinematic region studied, as expected for a colourless probe that is unaffected by the hot and dense QCD medium produced in heavy ion collisions.

JOURNAL OF HIGH ENERGY PHYSICS 3, 022, 2015. DOI: 10.1007/JHEP03(2015)022

[P148-2015] “Surface effects on the mechanical elongation of AuCu nanowires: De-alloying and the formation of mixed suspended atomic chains”

Lagos, M. J.*; Autreto, P. A. S.*; Bettini, J.; Sato, F.; Dantas, S. O.; Galvao, D. S.*; Ugarte, D.*

We report here an atomistic study of the mechanical deformation of AuCu(1-x) atomic-size wires (nanowires (NWs)) by means of high resolution transmission electron microscopy experiments. Molecular dynamics simulations were also carried out in order to obtain deeper insights on the dynamical properties of stretched NWs. The mechanical properties are significantly dependent on the chemical composition that evolves in time at the junction; some structures exhibit a remarkable de-alloying behavior. Also, our results represent the first experimental realization of mixed linear atomic chains (LACs) among transition and noble metals; in particular, surface energies induce chemical gradients on NW surfaces that can be exploited to control the relative LAC compositions (different number of gold and copper atoms).

The implications of these results for nanocatalysis and spin transport of one-atom-thick metal wires are addressed.

JOURNAL OF APPLIED PHYSICS 117[9] 094301, 2015. DOI: 10.1063/1.4913625

[P149-2015] “Surface-Altered Protonation Studied by Photoelectron Spectroscopy and Reactive Dynamics Simulations”

da Silva, A. M.; Mocellin, A.; Monti, S.; Li, Cui; Marinho, R. R. T.; Medina, A.; Agren, H.; Carravetta, V.; de Brito, A. N.*

The extent to which functional groups are protonated at aqueous interfaces as compared to bulk is deemed essential to several areas in chemistry and biology. The origin of such changes has been the source of intense debate. We use X-ray photoelectron spectroscopy and all-atom reactive molecular dynamics simulations as two independent methods to probe, at the molecular scale, both bulk and surface distributions of protonated species of cysteine in an aqueous solution. We show that the distribution of the cysteine species at the surface is quite different from that in the bulk. We argue that this finding, however, cannot be simply related to a change in the extent of proton sharing between the two conjugate acid/base pairs that may occur between these two regions. The present theoretical simulations identify species at the surface that are not present in the bulk.

JOURNAL OF PHYSICAL CHEMISTRY LETTERS 6[5] 807-811, 2015. DOI: 10.1021/acs.jpcllett.5b00131

[P150-2015] “Susceptibility of a two-level atom near an isotropic photonic band edge: Transparency and band edge profile reconstruction”

Prataviera, G. A.; de Oliveira, M. C.*

We discuss the necessary conditions for a two-level system in the presence of an isotropic band edge to be transparent to a probe laser field. The two-level atom is transparent whenever it is coupled to a reservoir constituted of two parts a flat and a non-flat density of modes representing a PBG structure. A proposal on the reconstruction of the band edge profile from the experimentally measured susceptibility is also presented.

PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS 425, 34-40, 2015. DOI: 10.1016/j.physa.2015.01.044

[P151-2015] “Theoretical and experimental investigation of electron collisions with dimethyl sulfide”

Homem, M. G. P.; Iga, I.; Ferraz, J. R.; dos Santos, A. S.; Machado, L. E.; de Souza, G. L. C.; Brescansin, L. M.*; Lucchese, R. R.; Lee, M. -T.

We report a joint theoretical-experimental investigation of elastic electron scattering by dimethyl sulfide in the low-and intermediate-energy regions. More specifically, experimental differential, integral, and momentum-transfer cross sections are given in the 30-800 eV and 10 degrees-130 degrees ranges. Theoretical cross sections are reported in the 1-500 eV interval. The experimental differential cross sections were determined using a crossed electron-beam-molecular-beam geometry, whereas the absolute values of the cross sections were obtained using the relative-flow technique. Theoretically, a complex optical potential was used to represent the collision dynamics, and a single-center expansion method combined with the Pade approximant method was used to solve the scattering equations. Our experimental data are in good agreement with the present calculated data but strongly disagree with those reported in a previous investigation.

PHYSICAL REVIEW A 91[1] 012713, 2015. DOI: 10.1103/PhysRevA.91.012713

[P152-2015] “Two-pion femtoscopy in p-Pb collisions at $\sqrt{s_{NN}}=5.02$ TeV”

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

We report the results of the femtoscopic analysis of pairs of identical pions measured in p-Pb collisions at $\sqrt{s_{NN}}=5.02$ TeV. Femtoscopic radii are determined as a function of event multiplicity and pair momentum in three spatial dimensions. As in the pp collision system, the analysis is complicated by the presence of sizable background correlation structures in addition to the femtoscopic signal. The radii increase with event multiplicity and decrease with pair transverse momentum. When taken at comparable multiplicity, the radii measured in p-Pb collisions, at high multiplicity and low pair transverse momentum, are 10%-20% higher than those observed in pp collisions but below those observed in A-A collisions. The results are compared to hydrodynamic predictions at large event multiplicity as well as discussed in the context of calculations based on gluon saturation.

PHYSICAL REVIEW C 91[3] 034906, 2015. DOI: 10.1103/PhysRevC.91.034906

[P153-2015] “Yang-Mills two-point functions in linear covariant gauges”

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

In this paper we use two different but complementary approaches in order to study the ghost propagator of a pure SU(3) Yang-Mills theory quantized in the linear covariant gauges, focusing on its dependence on the gauge-fixing parameter ξ in the deep infrared. In particular, we first solve the Schwinger-Dyson equation that governs the dynamics of the ghost propagator, using a set of simplifying approximations, and under the crucial assumption that the gluon propagators for $\xi > 0$ are infrared finite, as is the case in the Landau gauge ($\xi = 0$). Then we appeal to the Nielsen identities, and express the derivative of the ghost propagator with respect to ξ in terms of certain auxiliary Green's functions, which are subsequently computed under the same assumptions as before. Within both formalisms we find that for $\xi > 0$ the ghost dressing function approaches zero in the deep infrared, in sharp contrast to what happens in the Landau gauge, where it is known to saturate at a finite (nonvanishing) value. The Nielsen identities are then extended to the case of the gluon propagator, and the ξ -dependence of the corresponding gluon masses is derived using as input the results obtained in the previous steps. The result turns out to be logarithmically divergent in the deep infrared; the compatibility of this behavior with the basic assumption of a finite gluon propagator is discussed, and a specific Ansatz is put forth, which readily reconciles both features.

PHYSICAL REVIEW D 91[8] 085014, 2015. DOI: 10.1103/PhysRevD.91.085014

Proceedings

[P154-2015] “3d magnetism in ThCo₂Sn₂ single crystals”

Rosa, P. F. S.*; Garitezi, T. M.*; Fisk, Z.; Pagliuso, P. G.*

Intense efforts have been made in order to synthesize new tetragonal ternary intermetallic compounds with low-temperature ground states on the border of magnetism. Here we report the synthesis of ThCo₂Sn₂ single crystals, which crystallize in the tetragonal CaBe₂Ge₂-type structure, using the flux technique. Further investigation of the physical properties by magnetic susceptibility and pressure-dependent electrical resistivity measurements confirm the presence of antiferromagnetic ordering associated with the Co ions, but with a higher ordering temperature of $T_N = 78$ K when compared to $T_N = 65$ K of the polycrystalline counterpart. Our results show that both Cu-substitution and applied pressure up to 22 kbar are not able to induce superconductivity in this system. Nevertheless, our analyses point out to a putative quantum critical point at higher pressures.

INTERNATIONAL CONFERENCE ON STRONGLY CORRELATED ELECTRON SYSTEMS 2014 (SCES2014), Journal of Physics Conference Series 592, 012053, 2015. DOI: 10.1088/1742-6596/592/1/012053

[P155-2015] “Effect of Ion Irradiation on the Structural Properties and Hardness of a-C:H:Si:O:F Films”

Range, E. C.; da Cruz, N. C.; Range, R. C. C.; Landers, R.*; Durrant, S. F.

Amorphous carbon-based thin films, a-C:H:Si:O:F, were obtained by plasma immersion ion implantation and deposition (PIID) from mixtures of hexamethyldisiloxane, sulfur hexafluoride and argon. For PIID the sample holder was biased with negative 25 kV pulses at 60 Hz. The main system parameter was the proportion of SF₆ in the reactor feed, R-SF. To allow comparison to growth without intentional ion implantation, some films were also grown by plasma enhanced chemical vapor deposition (PECVD). The objectives were to investigate the effects of fluorine incorporation and ion implantation on the film's chemical structure, and principally on the surface contact angle, hardness and friction coefficient. Infrared and X-ray photo-electron spectroscopic analyses revealed that the films are essentially amorphous and polymer-like, and that fluorine is incorporated for any non-zero value of R-SF. Choice of R-SF influences film composition and structure but ion implantation also plays a role. Depending on R-SF, hydrophilic or hydrophobic films may be produced. Ion implantation is beneficial while fluorine incorporation is detrimental to hardness. For ion implanted films the friction coefficient falls about one third as R-SF is increased from 0 to 60%. Films prepared by PIID without fluorine incorporation present fairly low friction coefficients and hardnesses greater than those of conventional polymers.

15TH LATIN AMERICAN WORKSHOP ON PLASMA PHYSICS (LAWPP 2014) AND 21ST IAEA TM ON RESEARCH USING SMALL FUSION DEVICES (RUSFD), Journal of Physics Conference Series 591, 012044, 2015. DOI: 10.1088/1742-6596/591/1/012044

[P156-2015] “Electron Spin resonance of Gd³⁺ in three dimensional topological insulator Bi₂Se₃”

Garitezi, T. M.*; Lesseux, G. G.*; Jesus, C. B. R.*; Grant, T.; Fisk, Z.; Urbano, R. R.*; Rettori, C.*; Pagliuso, P. G.*

Bi₂Se₃ has been claimed to be a three dimensional topological insulator (TI) with topologically protected metallic surface states with exotic properties. We have performed electron spin resonance (ESR) measurements on Gd³⁺ doped (x approximate to 0.01) Bi₂Se₃ single crystal grown from stoichiometric melt. For the studied crystals, our preliminary results revealed a partly resolved Gd³⁺ fine structure spectrum with Dysonian (metallic character) lines. At room temperature, the central line has a g approximate to 1.98, a linewidth ΔH approximate to 95 G and the spectra have a overall splitting of roughly 1300 Oe.

As the temperature is decreased, the Gd³⁺ ESR Delta H of the central line presents a very small Korringa-like behavior $b = \Delta H / \Delta T$ approximate to 0.013 Oe/K and nearly T-independent g-value. However, for T less than or similar to 40 K, Delta H shows a stronger narrowing effect evolving to Korringa-like behavior (b approximate to 0.15 Oe/K) for T less than or similar to 30 K. Concomitantly with the change in Delta H behavior, the Gd³⁺ central line g value starts to decrease reaching a value of 1.976 at T less than or similar to 4.2 K. The ESR results are discussed in terms of possible effects of protected topological surface states enlightened by complementary data from macroscopic measurements.

INTERNATIONAL CONFERENCE ON STRONGLY CORRELATED ELECTRON SYSTEMS 2014 (SCES2014), Journal of Physics Conference Series 592, 012125, 2015. DOI: 10.1088/1742-6596/592/1/012125

[P157-2015] "High pressure and high magnetic field studies of the electronic transport properties of the antiferromagnet Eu₃Ir₄Sn₁₃"

Mendonca-Ferreira, L.; Bittar, E. M.; Bianchi, I. K. E.; Rosa, P. F. S.*; Fisk, Z.; Pagliuso, P. G.*

In this work we report the effects of hydrostatic pressure and magnetic field on the electronic transport properties of the antiferromagnetic compound Eu₃Ir₄Sn₁₃ (T-N similar to 10 K). Single crystals of Eu₃Ir₄Sn₁₃ were synthesized using the Sn self-flux technique. DC electrical resistivity measurements as a function of temperature were performed by means of the four-probe technique. The high-temperature anomaly at T* similar to 57 K attributed to a structural distortion of the Sn₁Sn₂(12) cages in Eu₃Ir₄Sn₁₃ is rapidly decreased to lower temperatures at a rate $dT^*/dP = 2$ K/kbar, while the antiferromagnetic transition due to the Eu²⁺ ions is only weakly affected. Our data do not indicate any magnetoelastic effect associated with the structural instability at T*. Furthermore, the suppression of the lattice distortion by application of external pressure is not accompanied by the emergence of superconductivity, possibly due to strong magnetic correlations between the Eu²⁺ localized magnetic moments.

INTERNATIONAL CONFERENCE ON STRONGLY CORRELATED ELECTRON SYSTEMS 2014 (SCES2014), Journal of Physics Conference Series 592, 012046, 2015. DOI: 10.1088/1742-6596/592/1/012046

[P158-2015] "Modified Beer-Lambert law for blood flow"

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

The modified Beer-Lambert law is among the most widely used approaches for analysis of near-infrared spectroscopy (NIRS) reflectance signals for measurements of tissue blood volume and oxygenation. Briefly, the modified Beer-Lambert paradigm is a scheme to derive changes in tissue optical properties based on continuous-wave (CW) diffuse optical intensity measurements. In its simplest form, the scheme relates differential changes in light transmission (in any geometry) to differential changes in tissue absorption. Here we extend this paradigm to the measurement of tissue blood flow by diffuse correlation spectroscopy (DCS). In the new approach, differential changes of the intensity temporal auto-correlation function at a single delay-time are related to differential changes in blood flow. The key theoretical results for measurement of blood flow changes in any tissue geometry are derived, and we demonstrate the new method to monitor cerebral blood flow in a pig under conditions wherein the semi-infinite geometry approximation is fairly good. Specifically, the drug dinitrophenol was injected in the pig to induce a gradual 200% increase in cerebral blood flow, as measured with MRI velocity flow mapping and by DCS.

The modified Beer-Lambert law for flow accurately recovered these flow changes using only a single delay-time in the intensity auto-correlation function curve. The scheme offers increased DCS measurement speed of blood flow. Further, the same techniques using the modified Beer-Lambert law to filter out superficial tissue effects in NIRS measurements of deep tissues can be applied to the DCS modified Beer-Lambert law for blood flow monitoring of deep tissues.

FOPTICAL TOMOGRAPHY AND SPECTROSCOPY OF TISSUE XI Proceedings of SPIE 9319, 931919, 2015. DOI: 10.1117/12.2080185

[P159-2015] "Surface analysis of alumina ceramic exposed to shock waves produced by plasma expander"

Mota, R. P.; Campos, E.; Santos, C. N.; Lucena, E. F.; Machida, M.*; Melo, F. C. L.

Material surface treatment by plasma expander is relatively recent. Plasma expander is based on the inverse pinch effect. The shock waves produced by plasma expander may also promote modifications in ceramic materials exposed to the expander. These modifications are mainly made by ablation phenomenon. This work was intended to verify the shock wave effects on the ionic ceramic samples with high dielectric constant. The alumina ceramic samples were formed by both uniaxial and isostatic pressing methods and sintered at 1650 degrees C. They were also produced with addition 0.15 wt% of MgO in order to obtain a high densification. The ceramic samples were divided in groups and exposed to 700, 1000 and 1440 pulses during 20 min. These pulses were generated by nitrogen plasma expander at 13.0 Pa and 6 kV. After plasma exposure, there was an increase in roughness parameter values of Al₂O₃ ceramic surface. The treatment by plasma expander did not modify the hydrophilic characteristic of the alumina ceramic samples. The results of hardness test presented no significant changes on hardness mean values.

15TH LATIN AMERICAN WORKSHOP ON PLASMA PHYSICS (LA-WPP 2014) AND 21ST IAEA TM ON RESEARCH USING SMALL FUSION DEVICES (RUSFD), Journal of Physics Conference Series 591, 012059, 2015. DOI: 10.1088/1742-6596/591/1/012059

[P160-2015] "The role of Ni vacancies on the physical properties of Ce_{Ni}xBi₂-y single crystals"

Rosa, P. F. S.*; Jesus, C. B. R.*; Adriano, C.*; Fisk, Z.; Pagliuso, P. G.*

The search for new superconductors (SC) represents an exciting field in condensed matter physics. Recently, CeNi Bi-0:8(2) has been reported as a new bulk SC (T_c similar to 4:2K) in which Ni vacancies play an essential role for the emergence of superconductivity. Here we report experiments of magnetic susceptibility and heat capacity combined with energy dispersive X-ray spectroscopy analysis on Ce_{Ni}xBi₂-y (x = 0:62;0:70;0:74;0:78) single crystals. Our data show a systematic enhancement of the antiferromagnetic transition temperature (T-N) with x, as well as the low temperature Ce³⁺ magnetic anisotropy. In particular, we find that the crystal-field ground state doublet becomes more isolated from the excited states as one approaches the Ni-rich end. As a consequence of such subtle crystal-field evolution, our analyses suggest that both the magnetic frustration and the hybridization between Ce³⁺ 4f and conduction electrons are decreasing along the series. In addition, SC transitions are observed in both La and Ce members with no bulk signature, strongly indicating the presence of impurity SC phases.

INTERNATIONAL CONFERENCE ON STRONGLY CORRELATED ELECTRON SYSTEMS 2014 (SCES2014), Journal of Physics Conference Series 592, 012063, 2015. DOI: 10.1088/1742-6596/592/1/012063

Correções

[C003-2015] “Suppression of Upsilon production in d + Au and Au + Au collisions at root s(NN) = 200 GeV (vol 735, pg 127, 2014)”

Adamczyk, L.; Adkins, J. K.; Agakishiev, G.; Derradi de Souza, R.*; Takahashi, J.*; Vasconcelos, G. M. S.*; et al.
Star Collaboration

PHYSICS LETTERS B 743, 537-541, 2015. DOI: 10.1016/j.physletb.2015.01.046

*Autores da comunidade IFGW

Defesas de Dissertações

[D005-2015] “The representations of HOM(2) and SIM (2) in the contexto of Very Special Relativity”

Aluno: Gustavo Salinas de Souza
Orientador: Prof. Dr. Dharam Vir Ahluwalia
Data: 01/06/2015

[D006-2015] “Entropia Estatística de Sistemas Abertos”

Aluno: Lisan Marcos Marques Durão
Orientador: Prof. Dr. Amir Ordacgi Caldeira
Data: 17/06/2015

[D007-2015] “Brillouin scattering in sílica microwires”

Aluno: Omar Enrique Florez Peñaloza
Orientador: Prof. Dr. Paulo Clóvis Dainese Junior
Data: 17/06/2015

[D008-2015] “Estados Transportadores de Corrente em “Moléculas” Simples”

Aluno: Thaís Victa Trevisan
Orientador: Prof. Dr. Amir Ordacgi Caldeira
Data: 19/06/2015

[D009-2015] “Caminhos Ótimos Degenerados em sistemas termicamente isolados”

Aluno: Thiago Vaz Acconcia
Orientador: Prof. Dr. Marcus Vinicius Segantini Bonança
Data: 24/06/2015

[D010-2015] “O Modelo de Uhlenbeck-Ford e Cálculos de Energia Livre de Sistemas na Fase Fluida”

Aluno: Rodolfo Paula Leite
Orientador: Prof. Dr. Maurice de Koning
Data: 26/06/2015

Defesas de Teses

[T004-2015] “Aspectos Dinâmicos de Sistemas Astrofísicos Discoidais”

Aluno: Ronaldo Savioli Sumé Vieira
Orientador: Prof. Dr. Alberto Saa
Data: 22/05/2015

[T005-2015] “O Deslocamento de Goos-Hänchen e os Fenômenos da Quebra de Simetria para Feixes Gaussianos”

Aluno: Manoel Pedro de Araújo
Orientador: Prof. Dr. Stefano de Leo
Data: 08/06/2015

[T006-2015] “Transporte quântico em nano-estruturas magnéticas”

Aluno: Imara Lima Fernandes
Orientador: Prof. Dr. Guillermo Cabrera
Data: 30/06/2015

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

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

Patente

[Pa002-2015] “Processo para melhorar a aderência de filmes finos depositados pelo processo PECVD em embalagens PET e embalagem resultante”

Gisella Maria Zanin, Sandra Andréa Cruz, Mario Antonio Bica de Moraes*

Número da Patente ou Registro: Agência INOVA: PI0500712-7

Tipo: Patente de Invenção

Mês/Ano de Conclusão: 05/2015 - INPI/BBRASIL

[Pa003-2015] “Processo de preparação do material cerâmico eletricamente condutor $SiO_2/ZrO_2/C$ -Grafite e material cerâmico eletricamente condutor $SiO_2/ZrO_2/C$ -Grafite”

Yoshitaka Gushikem, Alzira Maria Serpa Lucho, Eduardo Marafon, Maria Suzana Pratavieira Francisco, Richard Landers*

Número da Patente ou Registro: Agência INOVA: PI0506395-7

Tipo: Patente de Invenção

Mês/Ano de Conclusão: 06/2015 - INPI/BBRASIL

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

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