

Abstracta

Ano XXX - N. 02

Abr-26



INSTITUTO DE FÍSICA
GLEB WATAGHIN



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Artigos publicados

[P057-2026] “ (Σ) over-bar \pm production in pp and p-Pb collisions at $\sqrt{s_{NN}}=5.02$ TeV with ALICE”

Abualrob, I. J.; Acharya, S.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

The transverse momentum spectra and integrated yields of anti-Sigma hyperons ((Σ) over bar (+/-)) have been measured in pp and p-Pb collisions at $\sqrt{s(NN)} = 5.02$ TeV with the ALICE experiment. Measurements are performed via the newly accessed decay channel (Σ) over bar (+/-) \rightarrow (n) over bar pi(+/-). A new method of antineutron reconstruction with the PHOS electromagnetic spectrometer is developed and applied to this analysis. The p(T) spectra of (Σ) over bar (+/-) are measured in the range $0.5 < p(T) < 3$ GeV/c and compared to predictions of the PYTHIA 8, DPMJET, PHOJET, EPOS LHC and EPOS4 models. The EPOS LHC and EPOS4 models provide the best descriptions of the measured spectra both in pp and p-Pb collisions, while models which do not account for multiparton interactions provide a considerably worse description at high p(T). The total yields of (Σ) over bar (+/-) in both pp and p-Pb collisions are compared to predictions of the Thermal-FIST model and dynamical models PYTHIA 8, DPMJET, PHOJET, EPOS LHC and EPOS4. All models reproduce the total yields in both colliding systems within uncertainties. The nuclear modification factors R-pPb for both (Σ) over bar (+) and (Σ) over bar (-) are evaluated and compared to those of protons, Lambda and Xi hyperons, and predictions of EPOS LHC and EPOS4 models. No deviations of R-pPb for (Σ) over bar (+/-) from the model predictions or measurements for other hadrons are found within uncertainties.

EUROPEAN PHYSICAL JOURNAL C 86[2], 132, 2026. DOI: 10.1140/epjc/s10052-025-15129-2. Acesso em: <https://doi.org/10.1140/epjc/s10052-025-15129-2>

[P058-2026] “A concise review of recently synthesized 2D carbon allotropes: Amorphous carbon, graphynes, biphenylene and fullerene networks”

Paupitz, R.; Fonseca, A. F.*; Bessa, M.; Fabris, G. S. L.*; Cunha, W. F. da; Machado, L. D.; Pereira Junior, M. L.; Ribeiro Junior, L. A.; Galvao, D. S.*

Two-dimensional (2D) carbon allotropes have received considerable attention due to their unique properties and potential applications in several fields, including electronics, catalysis, energy storage, and sensing. Following the experimental realization of graphene, numerous other 2D carbon structures have been proposed and, in some cases, successfully synthesized. This work presents a concise review of the recently experimentally realized 2D carbon allotropes beyond graphene, including monolayer amorphous carbon, graphynes, biphenylene-, and fullerene-based networks. For each class, we discuss structural characteristics, theoretical predictions, and synthesis methods, with emphasis on the interplay between theory and experiment. We also highlight instances where experimental studies overlooked relevant theoretical contributions. Finally, we identify theoretically predicted structures that remain unexplored experimentally, suggesting opportunities for synthesis-driven investigations.

CARBON 252, 121320, 2026. DOI: 10.1016/j.carbon.2026.121320. Acesso em: <https://doi.org/10.1016/j.carbon.2026.121320>

[P059-2026] “A model-independent measurement of the CKM angle γ in the decays $B_{\pm} \rightarrow [K+K-\pi+\pi-]Dh_{\pm}$ and $B_{\pm} \rightarrow [\pi+\pi-\pi+\pi-]Dh_{\pm}$ ($h = K, \pi$)”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; et al.
LHCb Collaboration

A model-independent determination of the CKM angle γ is presented, using the $B_{\pm} \rightarrow [K+K-\pi(+)\pi(-)](D)h(+/-)$ and $B_{\pm} \rightarrow [\pi(+)\pi(-)\pi(+)\pi(-)](D)h(+/-)$ decays, with $h = K, \pi$. This measurement is the first phase-space binned study of these decay modes, and uses a sample of proton-proton collision data collected by the LHCb experiment, corresponding to an integrated luminosity of 9 fb⁻¹. The phase-space bins are optimised for sensitivity to γ , and in each bin external inputs from the BESIII experiment are used to constrain the charm strong-phase parameters. The result of this binned analysis is $\gamma = (53.9(-8.9)(+9.5))^\circ$, where the uncertainty includes both statistical and systematic contributions. Furthermore, when combining with existing phase-space integrated measurements of the same decay modes, a value of $\gamma = (52.6(-6.4)(+8.5))^\circ$ is obtained, which is one of the most precise determinations of γ to date.

JOURNAL OF HIGH ENERGY PHYSICS [1], 62, 2026. DOI: 10.1007/JHEP01(2026)062. Acesso em: [https://doi.org/10.1007/JHEP01\(2026\)062](https://doi.org/10.1007/JHEP01(2026)062)

[P060-2026] “Ability of entanglement and purity to help to detect systematic experimental errors”

Freund, J.; Basset, F. B.; Krieger, T. M.; Laneve, A.; Beccaceci, M.; Rota, M. B.; Buchinger, Q.; Silva, S. F. C. da*; Stroj, S.; Höfling, S.; Huber-Loyola, T.; Kueng, R.; Rastelli, A.; Trotta, R.; Günhe, O.

Measurements are central in all quantitative sciences, and a fundamental challenge is to make observations without systematic measurement errors. This holds in particular for quantum information processing, where other error sources, such as noise and decoherence, are unavoidable. Consequently, methods for detecting systematic errors have been developed, but the required quantum state properties are yet unexplored. We theoretically develop a direct and efficient method to detect systematic errors in quantum experiments and demonstrate it experimentally using quantum state tomography of photon pairs emitted from a semiconductor quantum dot. Our method can be scaled to multiqubit systems, and we find that entanglement and quantum states with high purity can help identify systematic errors.

PHYSICAL REVIEW A 113[2], 022422, 2026. DOI: 10.1103/b74j-xxv2. Acesso em: <https://doi.org/10.1103/b74j-xxv2>

[P061-2026] “Amorphous Hydrogenated Silicon Carbide Interlayers: Chemical, Optical, and Tribological Behavior for Improving Adhesion of Carbon-Based Films to Ferrous Alloy”

Pirolì, V.; Goldbeck, M. C.; Weber, J. S.; Cemin, F.*; Perotti, B. L.; Boeira, C. D.; Alvarez, F.*; Fukumasu, N. K.; Zanatta, A. R.; Michels, A. F.; Figueroa, C. A.

Diamond-like carbon thin films have been gaining attention in the last years due to their unique properties, such as low friction coefficient and high wear resistance. However, the lack of adhesion between DLC coatings and ferrous alloys complicates their wider industrial application. Amorphous hydrogenated silicon carbide (a-SiCx:H) interlayers can be used as a solution for adhesion issues. Nonetheless, for interlayers produced with tetramethylsilane, deposition temperatures higher than 300 degrees C may degrade the previous heat treatment of the substrate. This work aims to verify the influence of chemical, optical, morphological, and tribological properties in the adhesion of a-C:H/a-SiCx:H/AISI 4140 steel structures deposited with 0.8 Pa as background pressure and low interlayer deposition temperatures ($T \leq 200$ degrees C).

The results showed that both chemical and morphological properties strongly modify the adhesion behavior at low deposition temperatures. The optical absorption edge of the samples takes place in energies around 3.5 (or similar to 350 nm) and similar to 1.5 eV (or similar to 850 nm) for the a-SiCx:H interlayer (mainly deposited at 150 degrees C) and a-C:H film deposited for 60 min, respectively. When the a-SiCx:H temperature increased from 85 degrees C to 200 degrees C, the oxygen content at the interfaces and in the interlayer decreased as well as the density of defects observed in the a-C:H surface.

SURFACE AND INTERFACE ANALYSIS 58[4], p. 246-261, 2026. DOI: 10.1002/sia.70047. Acesso em: <https://doi.org/10.1002/sia.70047>

[P062-2026] “Comparative coherent control of SPPs with Al, Ag, and Au in a double-layer of metal/uniaxial dielectric medium structure”

Khan, J.; Sohail, A.*; Alharbi, F. H.; Ali, H.

The application of anisotropic surface plasmon polaritons (SPPs) in optical systems has attracted significant interest due to the directional properties of the dielectric permittivity tensor. This influences polarization states and the coupling strength of SPPs in anisotropic double-layer systems. We propose a structure of multiple layers of uniaxial dielectric media intercalated either with Al, Ag, or Au. Control is achieved by varying the frequency of the control field (Ω), probe detuning (Δ), and the metal fraction ratios ($f_1:f_2$). The analysis shows that Ω broadens the effect without influencing maximum values, while different $f_1:f_2$ ratios notably impact dispersion and absorption, affecting the SPPs' wavelength and propagation distance. The largest wavelengths obtained are 0.737 μm for gold, 0.492 μm for silver, and 0.592 μm for aluminum, and the corresponding propagation lengths along the tangential direction (x-axis) of 74 μm , 80 μm , and 26 μm , respectively.

JOURNAL OF OPTICS 28[3], 035001, 2026. DOI: 10.1088/2040-8986/ae4885. Acesso em: <https://iopscience.iop.org/article/10.1088/2040-8986/ae4885>

[P063-2026] “De Gennes scaling breakdown in the RT Bi2 (R = Ce, Pr, Nd; T = Cu, Au) series: The role of crystal field effects and anisotropic magnetic interactions”

Freitas, G. S.*; Mercena, S. G.*; Jesus, C. B. R.*; Adriano, C.*; Piva, M. M.*; Souza, J. C.*; Pizzi, H. B.*; Caffer, A. M.*; Carneiro, F. B.; Carvalho, M. H.*; Gratens, X.; Bauer, E. D.; Ronning, F.; Thompson, J. D.; Thomas, S. M.; Oliveira Jr., N. F.; Rosa, P. F. S.; Pagliuso, P. G.*

We performed a comprehensive study of the crystalline electric field (CEF) effects on the macroscopic magnetic properties of the RT Bi2 (R = Ce, Pr, Nd; T = Cu, Au) intermetallic compounds. A mean-field model that includes anisotropic magnetic interactions between the nearest R-neighbors and tetragonal CEF effects was employed to simultaneously fit the magnetic susceptibility, magnetization, and heat capacity data from previously reported characterizations of synthesized single crystals. Through our CEF fits, we systematically show that the de Gennes breakdown and consequent magnetic anisotropies and interactions are intrinsically connected to the evolution of the CEF effects inside the family.

JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 644, 173949, 2026. DOI: 10.1016/j.jmmm.2026.173949. Acesso em: <https://doi.org/10.1016/j.jmmm.2026.173949>

[P064-2026] “Decoding inner speech with functional connectivity”

Abreu, E.*; Vazquez, P. F.*; Castellano, G.*

Background: Inner-Speech (IS) based Brain-Computer Interfaces (BCIs) offer potential communication solutions for individuals with disabilities by decoding brain signals generated during speech imagination. While most IS-BCI systems rely on time-frequency EEG features, this study investigates functional connectivity—specifically, motif synchronization (MS)—to determine whether interactions between brain regions improve the discrimination of imagined words. Methods: We analyzed Electroencephalography (EEG) data from the ‘Thinking Out Loud’ dataset by Nieto et al 2022, involving 10 participants mentally simulating four Spanish words (‘Up,’ ‘Down,’ ‘Left,’ ‘Right’). Connectivity matrices were derived using the MS method, and node metrics (strength, PageRank) were calculated across 11 frequency bands. A two-stage classification framework was implemented: a support vector machine (SVM) ranked features by discriminatory power, followed by 5-fold cross-validation to identify optimal feature combinations. Results: The proposed approach achieved an average classification accuracy of 43.7%, comparable to previously reported results on the same dataset. Conclusions: Motif synchronization-based functional connectivity and graph metrics provide informative features for imagined speech BCIs by capturing cross-regional brain interactions. Further work is needed to improve robustness and generalization across sessions and subjects.

BIOMEDICAL PHYSICS & ENGINEERING EXPRESS 12[2], 025019, 2026. DOI: 10.1088/2057-1976/ae451b. Acesso em: <https://iopscience.iop.org/article/10.1088/2057-1976/ae451b>

[P065-2026] “Delayed specialization and social inclusion: lessons from Brazilian higher education innovations”

Knobel, M.*

Brazil's higher education landscape, the largest in Latin America, is undergoing a quiet revolution. This essay examines two pioneering innovations that are reshaping access and learning: the Interdisciplinary Higher Education Formation Program (ProFIS) at the University of Campinas (Unicamp) and the implementation of Interdisciplinary Bachelor's Degrees (Bacharelados Interdisciplinares) at federal universities nationwide. These programmes demonstrate that structural flexibility and social inclusion can advance together, offering actionable models for system-wide transformation. By analyzing their design, outcomes, and scalability, this essay advocates for policy shifts that embed general education cycles, promote new institutional types, and restructure governance to foster permeability, experimentation, and inclusion across Brazil's tertiary sector.

POLICY REVIEWS IN HIGHER EDUCATION, 2026. DOI: 10.1080/23322969.2026.2632857 Early Access Date: FEB 2026. Acesso em: <https://doi.org/10.1080/23322969.2026.2632857>

[P066-2026] “DFT Investigation of Two-Dimensional Borospherene for Sensing and Capture of Toxic Gases”

Martins, N. F.; Laranjeira, J. A. S.; Lima, K. A. L.*; Ribeiro, L. A.; Sambrano, J. R.

Two-dimensional (2D) boron-based materials have gained increasing interest due to their exceptional physicochemical properties and potential technological applications. In this way, borospherene, a 2D Boron-based fullerene-like lattice (2D-B40), is explored due to its potential for capturing and detecting toxic gases, such as CO, NO, NH₃, and SO₂. Therefore, density functional theory (DFT) simulations were carried out to explore the adsorption energy and the distinct interaction regimes, where CO exhibits weak physisorption (-0.16 eV), while NO (-2.24 eV), NH₃ (-1.47 eV), and SO₂ (-1.51 eV) undergo strong chemisorption.

Bader charge analysis reveals significant electron donation from 2D-B40 to NO and electron acceptance from SO₂. These interactions cause measurable shifts in work function, with SO₂ producing the most significant modulation ($\Delta\Phi = +14.6\%$). Remarkably, ab initio molecular dynamics simulations (AIMD) reveal spontaneous SO₂ decomposition at room temperature, indicating dual functionality for both sensing and environmental remediation. Compared to other boron-based materials, such as chi 3-borophene, beta 12-borophene, and B40 fullerene, 2D-B40 exhibits superior gas affinity, positioning it as a versatile platform for the detection and capture of toxic gases. Our findings therefore contribute to the advancement of research on low-dimensional boron-based materials aimed at multifunctional applications.

ACS APPLIED NANO MATERIALS 9[11], p. 5045-5053, 2026. DOI: 10.1021/acsnm.5c05740. Acesso em: <https://doi.org/10.1021/acsnm.5c05740>

[P067-2026] “Diagnostic brain-to-liver [¹⁸F]fdg uptake ratio predicts survival in multiple myeloma: A retrospective study”

Takahashi, M. E. S.*; Santos, T. P. dos; Cralcev, C.; Miranda, E.; Silva, M. P. D. S.*; Souza, F. C.*; Carvalheira, J. B. C.; Souza, C. A. de; Ramos, C. D.

Purpose[¹⁸F]FDG PET/CT has been widely used in oncology for diagnosis and treatment monitoring. Reduced cerebral [¹⁸F]FDG uptake has been observed in patients with disseminated malignancies, potentially associated with the Warburg effect and elevated lactate levels. This study investigated the prognostic relevance of the brain-to-liver [¹⁸F]FDG uptake ratio (BLR) in MM patients who underwent PET/CT at diagnosis. MethodsBLR was calculated as the ratio between the mean standardized uptake value (SUV) of the whole brain and that of the liver. A total of 72 patients were retrospectively included in the study (58% male; median age 65 years (IQR55;70); 67% were classified as ISS stage III). ResultsBLR, as a continuous variable, showed a statistically significant difference between groups according to sex ($p = 0.004$), overweight status ($p = 0.005$), and ISS stage ($p = 0.03$), and was negatively correlated with beta(2)-microglobulin ($r = -0.42$, $p < 0.001$). With a median follow-up of 23 months (IQR 8; 65), 74% patients had died from MM-related causes. Patients with BLR > 2.7 demonstrated superior 60-month overall survival (52%vs.10%, $p = 0.002$) and progression-free survival (19%vs.3%, $p = 0.003$), respectively. Multivariate Cox regression confirmed BLR (HR 1.86 95%CI: 1.03-3.33, $p = 0.038$ (OS); HR 1.93 95%CI: 1.13-3.29, $p = 0.016$ (PFS)) as an independent factor and the use of autologous hematopoietic cell transplantation (HCT) as consolidation for both OS and PFS. In addition, ISS stage III was also a prognostic factor for OS. ConclusionHigher brain-to-liver [¹⁸F]FDG uptake ratio (> 2.7) at diagnosis predicts better clinical outcomes in multiple myeloma. BLR is significantly associated with established clinical markers of tumor burden in multiple myeloma. These findings suggest that BLR is a feasible and reproducible metric with potential prognostic value in multiple myeloma.

EUROPEAN JOURNAL OF NUCLEAR MEDICINE AND MOLECULAR IMAGING, 2026. DOI: 10.1007/s00259-026-07844-z Early Access Date: MAR 2026. Acesso em: <https://doi.org/10.1007/s00259-026-07844-z>

[P068-2026] “Disorder-induced damping of spin excitations in Cr-doped BaFe₂As₂”

Cantarino, M. R.; Teixeira, R. M. P.; Pakuszewski, K. R.; Silva Neto, W. R. da; Abrantes, J. G. de; Garcia-Fernandez, M.; Pagliuso, P. G.*; Adriano, C.; Monney, C.; Schmitt, T.; Andrade, E. C.; Garcia, F. A.

In doped Hund's metals, such as the iron-based superconductors, effects like charge doping and chemical pressure are often considered the dominant factors. Partial chemical substitution, however, inevitably introduces disorder. Here, we investigate spin excitations in Ba(Fe_{1-x}Cr_x)₂As₂ (CrBFA) by high-resolution resonant inelastic x-ray scattering for samples with $x = 0, 0.035$, and 0.085 . In CrBFA, Cr acts as a hole dopant, but also introduces localized spins that compete with Fe-derived magnetic excitations. We found that the Fe-derived magnetic excitations are softened and damped, becoming overdamped for $x = 0.085$. At this doping level, complementary angle-resolved photoemission spectroscopy measurements show increased electronic localization and a suppression of the nematic dx_z/dy_z band splitting present in the parent compound. We thus propose a localized spin model that explicitly incorporates substitutional disorder and Cr local moments, successfully reproducing our key observations. Our findings reveal a case where disorder dominates over charge doping in the case of a Hund's metal.

PHYSICAL REVIEW RESEARCH 8[1], L012028, 2026. DOI: 10.1103/rkjm-hf7z. Acesso em: <https://doi.org/10.1103/rkjm-hf7z>

[P069-2026] “Electronic screening effects on the crystal electric field in the Er(Cu_{1-x}Fe_x)₄Al₈ solid solution”

Santos, B. J.; Mercena, S. G.; Resplandes, A. R.; Silva, L. S.; Bittar, E. M.; Carvalho, M. H.*; Pagliuso, P. G.*; Lima, A. F.; Meneses, C. T.; Duque, J. G. S.

In this work, we investigate crystalline electric field (CEF) effects in the continuous solid solution Er(Cu_{1-x}Fe_x)₄Al₈ across the full investigated compositional range. The samples were synthesized by arc furnace melting and characterized by x-ray diffraction, confirming the stabilization of the tetragonal ThMn₁₂-type structure (space group I4/mmm) without structural transitions upon Fe substitution. The lattice parameters and inter-ionic distances exhibit only minor variations with composition. However, analysis of magnetization data using a theoretical spin model including CEF contributions reveals a clear composition-dependent evolution of the CEF parameters. Since the crystallographic symmetry remains unchanged, these variations are attributed to electronic effects induced by transition metal substitution. Spin density functional theory calculations indicate that Fe-derived 3d states contribute at the Fermi level, enhancing electronic screening and modifying the magnitude of the CEF parameters and the corresponding energy level scheme. These results demonstrate that electronic structure modulation within a solid solution can significantly influence magnetic anisotropy in the absence of structural phase transitions.

JOURNAL OF PHYSICS AND CHEMISTRY OF SOLIDS 213, 113625, 2026. DOI: 10.1016/j.jpccs.2026.113625. Acesso: <https://doi.org/10.1016/j.jpccs.2026.113625>

[P070-2026] “Essential Role of Icosahedral Symmetry in the 3D Shape of AuAg Plasmonic Nanostars With High Aspect-Ratio Legs”

Corrêa, L. M.*; Fairclough, S. M.; Scher, K. M. R.; Atta, S.; Santos, D. P. Dos; Ducati, C.; Fabris, L.; Ugarte, D.*

Plasmonic nanoparticles play an essential role in improving the sensitivity of different optical methods, and multibranch nanostars are predicted to show the highest enhancement factor for several applications in the near infrared region. The structural complexity of these particles represents a serious challenge with respect to gathering precise knowledge of atomic arrangement and 3D star morphology, making it difficult to accurately predict their optical response and to devise new synthetic methods addressing various applications.

Here, we have used 4D-STEM diffraction mapping and a thorough crystallographic analysis to determine leg configuration in space, so that a better understanding of plasmonic properties and growth mechanism can be obtained. Our results show that although electron microscopy images may show a certain shape diversity with stars displaying 4- 5- or 6 branches, the orientation of these legs in space follows the positions associated with the apexes of an icosahedral core. The direct application of the measured star structures has been used as quantitative structural input in optical simulations, which show excellent agreement with experimental measurements. This evidence confirms the crucial role of icosahedral symmetry for explaining the growth mechanism and plasmonic response of gold nanostars with high-aspect-ratio legs.

SMALL, 2026. DOI: [10.1002/sml.73216](https://doi.org/10.1002/sml.73216) Early Access Date: MAR 2026. Acesso em: <https://doi.org/10.1002/sml.73216>

[P071-2026] “Evidence of medium response to hard probes using correlations of Z bosons with hadrons in heavy ion collisions”

Chekhovsky, V.; Hayrapetyan, A.; Chinellato, J. A.*; et al.
CMS Collaboration

The first measurement of pseudorapidity and azimuthal angle distributions relative to the momentum vector of a Z boson for low transverse momentum ($p(T)$) charged hadrons in lead-lead (PbPb) collisions is presented. By studying the hadrons produced in an event with a high- $p(T)$ Z boson ($40 < p(T) < 350$ GeV), the analysis probes how the quark-gluon plasma (QGP) medium created in these collisions affects the parton recoiling opposite to the Z boson. Utilizing PbPb data at a nucleon-nucleon center-of-mass energy $\sqrt{s(NN)} = 5.02$ TeV from 2018 with an integrated luminosity of 1.67 nb^{-1} and proton-proton (pp) data at the same energy from 2017 with 301 pb^{-1} , the distributions are examined in bins of charged-hadron $p(T)$. A significant modification of the distributions for charged hadrons in the range $1 < p(T) < 2$ GeV in PbPb collisions is observed when compared to reference measurements from pp collisions. The data provide new information about the correlation between hard and soft particles in heavy ion collisions, which can be used to test predictions of various jet quenching models. When compared with theoretical predictions, the results are consistent with expectations of a hydrodynamic wake created when the QGP is depleted of energy by the parton propagating through it. Therefore, this Letter presents the first evidence of probe-induced energy depletion and the resulting response by the QGP medium.

PHYSICS LETTERS B 874, 1 40120, 2026. DOI: [10.1016/j.physletb.2025.140120](https://doi.org/10.1016/j.physletb.2025.140120). Acesso em: <https://doi.org/10.1016/j.physletb.2025.140120>

[P072-2026] “Extension of the SAFE-PML method for modal analysis of 3D multiphysics waveguides in infinite porous media”

Claro, D. S.*; Heimfarth, T.; Batista, P. D.; Treysède, F.; Couto Jr., O. D. D.*

Fast and accurate numeric simulation of wave propagation in sonic well logging is of extreme practical interest. We present the extension of the Semi-Analytical Finite Element (SAFE) method combined with Perfectly Matched Layers (PML) to model wave propagation in fluid-filled bore-holes surrounded by infinite porous formations. The borehole system is treated as a multilayered and multiphysics 3D waveguide. Biot's poroelastic theory is incorporated using the (us, w) formulation to accurately capture fluid-porous solid interactions. The SAFE-PML approach enables the simulation of both trapped and leaky modes under open and closed porous boundary conditions.

Validation is performed using analytical solutions, demonstrating excellent agreement. A sonic logging tool is also explicitly included in the model, allowing the analysis of its eccentricity on the dispersion characteristics. In particular, we show how the tool eccentricity breaks the radial symmetry of the trapped modes (like the Stoneley), lowering their phase velocity and breaking higher-order modes degeneracy. Our numerical results demonstrate the method's ability to capture key effects relevant to borehole acoustics, especially those associated with symmetry breaking, which can be challenging to treat analytically. It also demonstrates that the SAFE-PML method can serve as an efficient and accurate modeling framework for realistic borehole acoustic scenarios involving poroelastic formations.

JOURNAL OF SOUND AND VIBRATION 633, 119754, 2026. DOI: [10.1016/j.jsv.2026.119754](https://doi.org/10.1016/j.jsv.2026.119754). Acesso em: <https://doi.org/10.1016/j.jsv.2026.119754>

[P073-2026] “First evidence of violation in beauty baryon to charmonium decays”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; e al.

LHCb Collaboration

A study of the difference in the CP asymmetries between $\Lambda_b(0)(b) \rightarrow J/\psi p \pi(-)$ and $\Lambda_b(0)(b) \rightarrow J/\psi p K(-)$ decays, $\Delta A(\text{CP})$, is performed using proton-proton collision data collected by the LHCb experiment in the years 2015-2018, corresponding to an integrated luminosity of 6fb^{-1} . This quantity is measured to be $\Delta A(\text{CP}) = (4.03 \pm 1.18 \pm 0.23)\%$, where the first uncertainty is statistical and the second is systematic. When combined with the previous LHCb result, a value of $\Delta A(\text{CP}) = (4.31 \pm 1.06 \pm 0.28)\%$ is obtained, corresponding to a significance of 3.9σ against the CP symmetry hypothesis. Studies of triple-product asymmetries, which provide an additional probe of CP violation, show no significant deviation from CP symmetry. (c) 2025 The Authors. Published by Elsevier B.V. and Science China Press. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

SCIENCE BULLETIN 71[3], p. 547-557, 2026. DOI: [10.1016/j.scib.2025.12.028](https://doi.org/10.1016/j.scib.2025.12.028). Acesso em: <https://doi.org/10.1016/j.scib.2025.12.028>

[P074-2026] “First Exclusive Reconstruction of the B^{*+} , B^{*0} , and B_s^{*0} Mesons and Precise Measurement of Their Masses”

Hayrapetyan, A.; Makarenko, V.; Chinellato, J. A.*; et al.
CMS Collaboration

Using proton-proton collision data collected by the CMS experiment at $\sqrt{s} = 13$ TeV in 2016-2018, corresponding to an integrated luminosity of 140 fb^{-1} , the first full reconstruction of the three vector B meson states, B^{*+} , B^{*0} , and B_s^{*0} , is performed. The mass differences between the excited mesons and their corresponding ground states are measured to be $m(B^{*+}) - m(B^+) = 45.277 \pm 0.039 \pm 0.027$ MeV, $m(B^{*0}) - m(B^0) = 45.471 \pm 0.056 \pm 0.028$ MeV, and $m(B_s^{*0}) - m(B_s^0) = 49.407 \pm 0.132 \pm 0.041$ MeV, where the first uncertainties are statistical and the second are systematic. These results improve on the precision of previous measurements by an order of magnitude.

PHYSICAL REVIEW LETTERS 136[3], 2026. DOI: [10.1103/njfv.2025.136033](https://doi.org/10.1103/njfv.2025.136033). Acesso em: <https://doi.org/10.1103/njfv.2025.136033>

[P075-2026] “First Observation of CP Violation and Measurement of Polarization in $B^+ \rightarrow \rho(770)0K^*(892)^+$ Decays”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; et al.

LHCb Collaboration

An amplitude analysis of the $B^+ \rightarrow (\pi^+\pi^-\pi^0)(K^*S(0)\pi^+)$ decay is performed in the mass regions $0.30 < m(\pi^+\pi^-\pi^0) < 1.10 \text{ GeV}/c^2$ and $0.75 < m(K^*)(\pi^+\pi^0) < 1.20 \text{ GeV}/c^2$, using pp collision data recorded with the LHCb detector corresponding to an integrated luminosity of 9 fb^{-1} . The polarization fractions and CP asymmetries for $B^+ \rightarrow \rho(770)K^*(892)^+$ decays are measured. Violation of the CP symmetry in the decay $B^+ \rightarrow \rho(770)K^*(892)^+$ is observed for the first time, with a significance exceeding 9 standard deviations. The CP asymmetry is measured to be $A(\text{CP}) = 0.507 \pm 0.062(\text{stat}) \pm 0.024(\text{syst})$ and the CP-averaged longitudinal polarization fraction of $f(L) = 0.720 \pm 0.028(\text{stat}) \pm 0.009(\text{syst})$. The measurements help to shed light on the polarization puzzle of B mesons decaying to two vector mesons.

PHYSICAL REVIEW LETTERS 136[2], 021803, 2026. DOI: 10.1103/9zhl-kkww. Acesso em: <https://doi.org/10.1103/9zhl-kkww>

[P076-2026] “First Observation of the $(B)_{\text{over-bar}}0_s \rightarrow \Lambda_c^+(\Lambda)_{\text{over-bar}}c$ Decay and Evidence for the $(B)_{\text{over-bar}}0 \rightarrow \Lambda_c^+(\Lambda)_{\text{over-bar}}c$ Decay”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; e al.
LHCb Collaboration

A search is presented for the two-body charmed baryonic decays, $(B)_{\text{over-bar}}(0)(s) \rightarrow \Lambda_b^+(\Lambda)_{\text{over-bar}}(c)$, using a data sample collected by the LHCb experiment during 2011-2012 and 2015-2018, corresponding to an integrated luminosity of 9 fb^{-1} . The first observation of the $(B)_{\text{over-bar}}(0)(s) \rightarrow \Lambda_b^+(\Lambda)_{\text{over-bar}}(c)$ decay is reported with 6.2 sigma significance along with 4.3 sigma evidence for the $(B)_{\text{over-bar}}(0) \rightarrow \Lambda_b^+(\Lambda)_{\text{over-bar}}(c)$ decay. The branching fractions are measured to be $B((B)_{\text{over-bar}}(0) \rightarrow \Lambda_b^+(\Lambda)_{\text{over-bar}}(c)) = (1.01(-0.28)(+0.27) \pm 0.08 \pm 0.15) \times 10^{-5}$ and $B((B)_{\text{over-bar}}(0)(s) \rightarrow \Lambda_b^+(\Lambda)_{\text{over-bar}}(c)) = (5.0 \pm 1.3 \pm 0.5 \pm 0.8) \times 10^{-5}$, where the first uncertainty is statistical, the second systematic, and the third due to external inputs. These results provide novel experimental inputs for the theoretical framework describing two-body baryonic decays of B mesons via W-emission and W-exchange mechanisms.

PHYSICAL REVIEW LETTERS 136[6], 061802, 2026. DOI: 10.1103/cxn3-8t4g. Acesso em: <https://doi.org/10.1103/cxn3-8t4g>

[P077-2026] “Goldene monolayer as a highly effective catalyst for polysulfide anchoring and conversion”

Martins, N. F.; Laranjeira, J. A. S.; Huacarpuma, B. D. A.; Lima, K. A. L.*; Ribeiro, L. A.; Sambrano, J. R.

First-principles density functional theory (DFT-D3) calculations were performed using the GGA-PBE approach to investigate how lithium sulfide and polysulfide clusters (Li_2S , Li_2S_2 , Li_2S_4 , Li_2S_6 , Li_2S_8 , and S_8) bind to goldene, a new two-dimensional gold allotrope. All Li-S species exhibit robust binding to goldene. The adsorption energies range from -4.29 to -1.90 eV. S_8 that is alone interacts much less strongly. Charge density difference and Bader analyses indicate that substantial charge is transferred to the substrate, with a maximum 0.92e for Li-rich clusters. This transfer induces polarization at the interface and shifts the work function to 5.30-5.52 eV. Projected density-of-states calculations indicate that Au-d and S-p states strongly mix near the Fermi level.

This hybridization indicates that the electronic coupling is strong. Based on these results, the reaction free-energy profile for the stepwise conversion of S_8 to Li_2S on goldene is thermodynamically favorable. The overall stabilization is -3.64 eV, and the rate-determining barrier for the $\text{Li}_2\text{S}_2 \rightarrow \text{Li}_2\text{S}$ step is 0.47 eV. This shows that goldene is an effective surface for anchoring and mediating lithium polysulfide reactions.

JOURNAL OF MATERIALS CHEMISTRY A, 2026. DOI: 10.1039/d6ta00772d Early Access Date: MAR 2026. Acesso em: <https://doi.org/10.1039/D6TA00772D>

[P078-2026] “Graphydiene: A new mixed sp²/sp² 2D carbon allotrope for optimal hydrogen storage”

Laranjeira, J. A. S.; Lima, K. A. L.*; Ribeiro Jr., L. A.; Galvao, D. S.*; Sambrano, J. R.; Chen, X. H.

A new two-dimensional carbon allotrope, graphydiene (GPYD), is proposed and studied by DFT simulations. GPYD consists of Dewar-anthracene fragments bridged by acetylenic bonds, generated by an ordered 4-6-8-22 carbon ring network. Phonon spectra free of imaginary modes and ab initio molecular dynamics (AIMD) simulations at 300 K confirm dynamical and thermal stability, while elastic constants satisfy the Born-Huang criteria. Optical calculations reveal strong in-plane infrared absorptivity, suggesting applications in flexible IR photodetectors. Na-decorated GPYD (Na@GPYD) accommodates up to 32 H₂ molecules (8.25 wt%) with average adsorption energies from -0.24 up to -0.19 eV, entirely within the reversible physisorption window. Charge analysis shows negligible charge transfer to H₂ (-0.01 |e|/H₂), indicating an induced dipole van der Waals interaction mechanism. These results establish Na@GPYD as a high-capacity candidate for solid-state hydrogen storage and related energy applications.

COMPUTATIONAL CONDENSED MATTER 47, e01276, 2026. DOI: 10.1016/j.cocom.2026.e01276. Acesso em: <https://doi.org/10.1016/j.cocom.2026.e01276>

[P079-2026] “Hybrid integration of two-dimensional dichalcogenides for low-power saturable absorption in photonic integrated circuits”

Volpato, M. C.*; Magro, G. H.*; von Zuben, A. A. G.*; Barea, L. A. M.; Assis, P. L. de*; Frateschi, N. C.*

Silicon photonics provides a versatile platform for large-scale integration of optical functions, but its weak intrinsic nonlinear response limits the realization of active, intensity-dependent functionalities. Hybrid integration of two-dimensional (2D) materials has emerged as a promising strategy to overcome these limitations by enabling strong light-matter interaction and broadband absorption. Here, we demonstrate saturable absorption in a comintegrated with an exfoliated monolayer of 1T'-MoTe₂. Transmission measurements under varying input powers reveal a clear nonlinear absorption response, with a saturation power as low as $2 \pm 1 \mu\text{W}$. A phenomenological model accurately reproduces the experimental results, confirming the nonlinear behavior induced by the hybrid MoTe₂ integration. These findings establish a proof-of-concept for ultracompact, low-power saturable absorbers in photonic integrated circuits (PICs), paving the way for applications in integrated lasers, ultrafast optical signal processing, and neuromorphic photonics. (c) 2026 Optica Publishing Group. All rights, including for text and data mining (TDM), Artificial Intelligence (AI) training, and similar technologies, are reserved.

JOURNAL OF THE OPTICAL SOCIETY OF AMERICA B-OPTICAL PHYSICS 43[3], p. A200-A205, 2026. DOI: 10.1364/JOSAB.577972. Acesso em: <https://doi.org/10.1364/JOSAB.577972>

[P080-2026] “Increases in cell-wall homogalacturonan but decreases in xylogalacturonan accompany transition from dormant to vegetative stages in *Chrysoleaena obovata* rhizophores”

Martins, M. C. M.; Kretzschmar, F. dos S.; Carpita, N. C.; Hayashi, A. H.; Carvalho, M. A. M. de; Leite, B.*; Braga, M. R.

The rhizophores of *Chrysoleaena obovata*, a perennial herb native to the Brazilian Cerrado, are underground storage organs that accumulate fructans and support vegetative propagation. Here, we investigated how the content of fructans and the composition of rhizophore cell wall polysaccharides change across developmental stages and contribute to seasonal adaptation. In addition to the accumulation of fructans in vacuoles (similar to 26-55% of the dry mass according to the developmental stage), cell-wall polysaccharide composition changed throughout the growth cycle, reflecting structural adjustments linked to developmental and environmental cues. These cell walls have a type I architecture, typical of eudicots. Although total pectin content remained stable, homogalacturonans increased in proportion during the transition from dormant to vegetative stages, whereas amounts of xylogalacturonans decreased. Xylogalacturonans accumulate within the middle lamella during the dormant phase and are potentially associated with flexibility and water retention. Hemicelluloses consisted mainly of low-substituted arabinoxylans and xyloglucan, consistent with a secondary cell wall profile. Xylans decreased slightly in the transition from the dormant to vegetative stage, while xyloglucan proportions increased. Overall, our findings show that seasonal metabolic changes in *C. obovata* involve dynamic modifications of rhizophore cell wall polysaccharides, which contribute to organ development and drought adaptation throughout the seasonal cycle.

CARBOHYDRATE POLYMERS 380, 125086, 2026. DOI: 10.1016/j.carbpol.2026.125086. Acesso em: <https://doi.org/10.1016/j.carbpol.2026.125086>

[P081-2026] “Ising Quantum Spin-Orbital Liquids: An Introduction”

Natori, W. M. H.*

Quantum spin liquids (QSLs) are magnetically frustrated phases characterized by spin fractionalization, emergent gauge fields, and long-range entanglement. Quantum spin-orbital liquids (QSOLs) form a subset of QSLs with fluctuating orbital degrees of freedom, normally adding a layer of complexity to an already involved research field. This topical review provides guidelines for understanding a specific type of QSOL in which the orbital operators facilitate the analysis of quantum liquids, thereby providing adequate starting points for exploring these phases. Such models are extensions of the spin-1/2 Kitaev honeycomb model (KHM), in the sense that their exact solutions depend on an extensive number of conserved quantities, combined with a mapping to a problem of Majorana fermions hopping on a static gauge field. The starting points to understand such models are classical Hamiltonians characterized by bond-dependent Ising interactions. Such classical models are exactly solvable in spin basis thanks to their extensive symmetries and can be directly connected to classical spin ice (CSI) systems that satisfy a Z(2) Gauss law. QSOLs are easily stabilized in these models by applying a transverse field or introducing other exchange mechanisms that preserve the conserved local operators. The theory of such Ising QSOLs bridges the KHM to specific types of CSIs, thus providing further insight into paradigmatic forms of spin liquids. Furthermore, bond-dependent Ising models are related to minimal Hamiltonians describing Rydberg-atom simulations, which provide experimental grounds for investigating them.

ANNALEN DER PHYSIK 538[2], e00559, 2026. DOI: 10.1002/andp.202500559. Acesso em: <https://doi.org/10.1002/andp.202500559>

[P082-2026] “Kagome Electride Superconductors Under Extreme Conditions”

Silva, E. Z. da*; Pereira, Z. S.*; Cabral, L.

We investigate pressure-induced superconductivity in the electride compound Li5C and in elemental omega-Hf using density functional theory (DFT) combined with Migdal-Eliashberg theory. Despite their distinct chemistry, both systems become superconducting under compression and share a key ingredient: an electride state in which interstitial anionic electrons organize into a two-dimensional kagome topology embedded in the ionic lattice. Li5C has been proposed as a kagome-electride superconductor in the pressure range 50 GPa-210 GPa, reaching a maximum transition temperature of $T_c = 48.3\text{K}$ at 210 GPa, whereas pure Hf develops electride character in the 40 GPa-60 GPa regime of the high-pressure omega phase. Motivated by these developments, we first revisit Li5C and emphasize the importance of the electride state for its superconducting response. We then identify analogous kagome-electride features in omega-Hf and analyze their role in the superconductivity of compressed Hf. For omega-Hf, we show that spin-orbit coupling (SOC), which is significant in this d-band transition metal, acts in concert with electride-derived states near the Fermi level to enhance the electron-phonon coupling. This interplay provides a consistent microscopic picture of the superconducting phase and yields transition temperatures in very good agreement with previously reported experimental data.

BRAZILIAN JOURNAL OF PHYSICS 56[3], 129, 2026. DOI: 10.1007/s13538-026-02060-4. Acesso em: <https://doi.org/10.1007/s13538-026-02060-4>

[P083-2026] “Laser-Pumped Drilling Carbon Nanotube Vortex Shock Waves in Optical Fibers”

Silva, R. E. da*; Franco, M. A. R.

We experimentally demonstrate laser-induced vortex shock waves formed by carbon nanotubes drilling optical fibers for the first time. Three samples of standard single-mode optical fibers (SMF) are individually inserted in a syringe loaded with a 1 mL solution of single-walled carbon nanotubes (CNT) and methanol, and a high-power laser is injected into the fibers for 5 (SMF 1), 10 (SMF 2), and 20 (SMF 3) minutes. The CNT solution thermally expands and generates vortex acoustic flows, which are confined in the syringe cavity, significantly increasing the velocity and impact of nanotubes at the fiber tip. The resulting shock waves achieve estimated hypersonic velocities (5742 m/s) and high pressures (6.7 GPa), overcoming the silica tensile strength and ablating structured vortices in the fibers. The material, geometry, and depth profile of the vortices are characterized, providing details of mixing carbon and silica layers, increasing radially from the fiber core center and in thickness to the cladding for longer laser periods (850 nm to 10 & micro;m thickness). The cross-sections of the measured vortices are compared to analytical simulations, revealing unprecedented Fibonacci helices drilling holes in the fiber core with a 5 & micro;m maximum depth, while depositing nanoscale CNT-silica layers following Fibonacci spirals. These results reveal novel contributions compared to previous studies, such as fabrication of nano-to-micro scale CNT-silica Fibonacci vortices in SMFs with controlled radial and thickness dimensions, laser-induced CNT shock waves with significantly higher velocities, pressures, and ablating properties, and a highly efficient and low-cost syringe technique. These achievements are significant to deposit other nanoparticles besides CNTs (e.g., silver and gold) and fabrication of all-fiber vortex spatial phase modulators for optical communications, quantum optics, micromanipulation, fiber sensors for chemical, biological, and gas substances, efficient modulation of mode-locked fiber lasers using evanescent fields, and high-resolution biomedical ultrasonic neurotransmitters.

IEEE ACCESS 14, p. 28320-28336, 2026. DOI: 10.1109/ACCESS.2026.3666181. Acesso em: https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=11399891&utm_source=clarivate&getft_integrator=clarivate

[P084-2026] “Long-Range Transverse-Momentum Correlations and Radial Flow in Pb-Pb Collisions at the LHC”

Acharya, S.; Rinella, G. A.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

This Letter presents measurements of long-range transverse-momentum correlations using a new observable, $v(0)(p(T))$, serving as a probe of event-by-event radial-flow fluctuations, the underlying radial expansion, and the medium's properties in heavy-ion collisions. Results are reported for inclusive charged particles, pions, kaons, and protons across various centrality intervals in Pb-Pb collisions at root $s(NN) = 5.02$ TeV, recorded by the ALICE detector. A pseudorapidity-gap technique, similar to that used in anisotropic-flow studies, is employed to suppress short-range correlations. At low pT , a characteristic mass ordering consistent with hydrodynamic collective flow is observed. At higher pT (> 3 GeV= c), protons exhibit larger $v(0)(p(T))$ than pions and kaons, in agreement with expectations from quark-recombination models. Comparisons to viscous hydrodynamic calculations with varying bulk viscosity and equation of state demonstrate the sensitivity of the $v(0)(p(T))$ observable to these key medium properties. The findings establish $v(0)(p(T))$ as a valuable addition to the set of observables used in Bayesian analyses for extracting the transport properties and constraining the equation of state of strongly interacting matter, while also helping to systematically explore its sensitivity and impact within such global studies.

PHYSICAL REVIEW LETTERS 136[3], 032302, 2026. DOI: 10.1103/l36g-6f46. Acesso em: <https://doi.org/10.1103/l36g-6f46>

[P085-2026] “Mapping nonlinear mode interactions in coupled Kerr resonators”

Trinchao, L. O.*; Peres, L.*; Gonçalves, E. S.*; Nienstedt, M.*; Santos, L. F. dos; Jarschel, P. F.*; Alegre, T. P. M.*; Tomazio, N. B.; Wiederhecker, G. S.*

We present a method for resolving spatial mode overlaps in coupled microresonators based on Kerr and thermal cross-phase modulation. Through a pump-probe setup, we measure the experimental overlap in a three-ring resonator with good agreement with analytical theory. Our technique can be generalized for describing nonlinear interactions in more complex multi-and coupled-mode systems. (c) 2026 Optica Publishing Group. All rights, including for text and data mining (TDM), Artificial Intelligence (AI) training, and similar technologies, are reserved.

OPTICS LETTERS 51[6], p. 1387-1390, 2026. DOI: 10.1364/OL.586517. Acesso em: <https://doi.org/10.1364/OL.586517>

[P086-2026] “Measurement of CP asymmetry in $D^0 \rightarrow K_S^0 K^0$ decays with Run 3 data”

Aaij, R.; Abdeltoteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; et al.
LHCb Collaboration

A measurement of CP asymmetry in $D^0 \rightarrow (K_S^0)K^0$ decays is reported, based on a data sample of proton-proton collisions collected with the LHCb detector in 2024 at a centre-of-mass energy of 13.6TeV,

corresponding to an integrated luminosity of 6.2 fb⁻¹). The $D^0 \rightarrow K^0 S^0 \pi^+ \pi^-$ decay is used as calibration channel to cancel residual detection and production asymmetries. The time-integrated CP asymmetry for the $D^0 \rightarrow (K_S^0)K^0$ mode is measured to be $A(CP) (D^0 \rightarrow (K_S^0)K^0) = (1.86 \pm 1.04 \pm 0.41)\%$, where the first uncertainty is statistical, and the second is systematic. This measurement represents the most precise single-experiment determination of this quantity to date.

JOURNAL OF HIGH ENERGY PHYSICS [2], 253, 2026. DOI: 10.1007/JHEP02(2026)253. Acesso em: [https://doi.org/10.1007/JHEP02\(2026\)253](https://doi.org/10.1007/JHEP02(2026)253)

[P087-2026] “Measurement of the p - Σ^+ correlation function in pp collisions at $\sqrt{s}=13$ TeV”

Abualrob, I. J.; Acharya, S.; Rinella, G. A.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

In this letter, the first measurement of the femtoscopic correlation of protons and Σ^+ hyperons is presented and used to study the p - Σ^+ interaction. The measurement is performed with the ALICE detector in high-multiplicity triggered pp collisions at root $s = 13$ TeV. The Σ^+ hyperons are reconstructed using a missing-mass approach in the decay channel to $p + \pi^0$ with $\pi^0 \rightarrow \gamma \gamma$, while both Σ^+ and protons are identified using a machine learning approach. These techniques result in a high reconstruction efficiency and purity, which allows the measurement of the p - Σ^+ correlation function for the first time. Thanks to the high significance achieved in the p - Σ^+ correlation signal, it is possible to discriminate between the predictions of different models of the N - Σ interaction and to accomplish a first determination of the p - Σ^+ scattering parameters.

PHYSICS LETTERS B 874, 140252, 2026. DOI: 10.1016/j.physletb.2026.140252. Acesso em: <https://doi.org/10.1016/j.physletb.2026.140252>

[P088-2026] “Measurements of the inclusive W and Z boson production cross sections and their ratios in proton-proton collisions at $\sqrt{s}=13.6$ TeV”

Chekhovsky, V.; Hayrapetyan, A.; Chinellato, J. A.*; et al.
CMS Collaboration

Measurements are presented of the W and Z boson production cross sections in proton-proton collisions at a center-of-mass energy of 13.6TeV. Data collected in 2022 and corresponding to an integrated luminosity of 5.01 fb⁻¹ with one or two identified muons in the final state are analyzed. The results for the products of total inclusive cross sections and branching fractions for muonic decays of W and Z bosons are 11.93 \pm 0.08 (syst) \pm 0.17 (lumi)(-0.07)(+0.07) (acceptance) nb for W⁺ boson production, 8.86 \pm 0.06 (syst) \pm 0.12 (lumi)(-0.06)(+0.05) (acceptance) nb for W⁻ boson production, and 2.021 \pm 0.009 (syst) \pm 0.028 (lumi)(-0.013)(+0.011) (acceptance) nb for the Z boson production in the dimuon mass range of 60-120 GeV, all with negligible statistical uncertainties. Furthermore, the corresponding fiducial cross sections, as well as cross section ratios for both fiducial and total phase space, are provided. The ratios include charge-separated results for W boson production (W⁺ and W⁻) and the sum of the two contributions (W^{+/-}), each relative to the measured Z boson production cross section. Additionally, the ratio of the measured cross sections for W⁺ and W⁻ boson production is reported. All measurements are in agreement with theoretical predictions, calculated at next-to-next-to-leading order accuracy in quantum chromodynamics.

JOURNAL OF HIGH ENERGY PHYSICS [1], 047, 2026. DOI: 10.1007/JHEP01(2026)047. Acesso em: [https://doi.org/10.1007/JHEP01\(2026\)047](https://doi.org/10.1007/JHEP01(2026)047)

[P089-2026] “Multicomponent 2D quasicrystals as robust photocatalysts for antibiotic degradation: Mechanistic insights via in situ TEM and atomistic simulations”

Manzoor, Z.; Chowdhury, S.; Fabris, G. da S. L.*; Ipaves, B.*; Galvao, D. S.*; Tiwary, C. S.

The persistent contamination of aquatic environments by antibiotics, such as sulfamethoxazole (SMX) and tetracycline (TC), presents a serious threat to environmental safety and public health. This study reports an aluminum-based multicomponent alloy in the form of two-dimensional quasicrystals (2D QCs) as an efficient and reusable photocatalyst for the visible light-driven degradation of SMX and TC. The 2D QCs achieved degradation efficiencies of approximately 94% for SMX and 89% for TC within 2 h of irradiation. Photocatalytic performance was systematically investigated under varying operational conditions, including pH, catalyst dosage, initial pollutant concentration, and the presence of common inorganic ions. The catalyst demonstrated excellent stability, retaining high activity over multiple reuse cycles with negligible metal leaching. Notably, substantial degradation efficiencies were maintained in real water matrices, including tap water, pond water, and municipal wastewater, highlighting the environmental relevance of the system. In situ liquid-phase transmission electron microscopy provided direct, real-time visualization of molecular degradation occurring on the QC surface. Complementary density functional tight-binding simulations revealed strong adsorption interactions and molecular fragmentation of the antibiotics, corroborating the experimental observations. Furthermore, phytotoxicity assessments using *Vigna radiata* confirmed that the treated effluents were non-toxic, with seed germination rates and radicle growth comparable to those of control samples. Collectively, these results demonstrate the potential of 2D QCs as robust and environmentally compatible photocatalysts for removing antibiotics from complex water systems, addressing an issue of growing global concern.

JOURNAL OF HAZARDOUS MATERIALS 507, 141638, 2026. DOI: 10.1016/j.jhazmat.2026.141638. Acesso em: <https://doi.org/10.1016/j.jhazmat.2026.141638>

[P090-2026] “Multiplicity dependence of $f_0(980)$ production in pp collisions at $\sqrt{s}=13$ TeV”

Abualrob, I. J.; Acharya, S.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

The dependence of $f_0(980)$ production on the final-state charged-particle multiplicity is reported for proton-proton (pp) collisions at the centre-of-mass energy, $\sqrt{s} = 13$ TeV. The production of $f_0(980)$ is measured with the ALICE detector via the $f_0(980) \rightarrow \pi^+\pi^-$ decay channel in a midrapidity region of $|\eta| < 0.5$. The evolution of the integrated yields and mean transverse momentum of $f_0(980)$ as a function of charged-particle multiplicity measured in pp at $\sqrt{s} = 13$ TeV follows the trends observed in pp at $\sqrt{s} = 5.02$ TeV and in proton-lead (p-Pb) collisions at $\sqrt{s(NN)} = 5.02$ TeV. Particle yield ratios of $f_0(980)$ to p and $K^*(892)^0$ are found to decrease with increasing charged-particle multiplicity. These particle ratios are compared with calculations from the canonical statistical thermal model as a function of charged-particle multiplicity. The thermal model calculations provide a better description of the decreasing trend of particle ratios when no strange or antistrange quark composition for $f_0(980)$ is assumed, which suggests that the data do not support significant hidden strangeness in the $f_0(980)$.

EUROPEAN PHYSICAL JOURNAL C 86[1], 76, 2026. DOI: 10.1140/epjc/s10052-025-15205-7. Acesso em: <https://doi.org/10.1140/epjc/s10052-025-15205-7>

[P091-2026] “Multiplicity dependence of $K^*(892)^\pm$ production in pp collisions at $\sqrt{s}=13$ TeV”

Abualrob, I. J.; Acharya, S.; Rinella, G. A.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

The first results of $K^*(892)^{(\pm)}$ production at midrapidity ($|\eta| < 0.5$) in pp collisions at $\sqrt{s} = 13$ TeV as a function of the event multiplicity are presented. The $K^*(892)^{(\pm)}$ has been reconstructed via its hadronic decay channel $K^*(892)^{(\pm)} \rightarrow \pi^+ + K^-(0)$ using the ALICE detector at the LHC. For each multiplicity class, the differential transverse momentum ($p(T)$) spectrum, the mean transverse momentum $\langle p(T) \rangle$, the $p(T)$ -integrated yield (dN/dy), and the ratio of the $K^*(892)^{(\pm)}$ to $K^-(0)$ yields are reported. These are consistent with previous $K^*(892)^0$ resonance results with a higher level of precision. Comparisons with phenomenological models such as PYTHIA6, PYTHIA8, EPOS-LHC, and DIPSY are also discussed. For the first time, a significant $K^*(892)^{(\pm)}/K^-(0)$ suppression in pp collisions is observed at a 7% level passing from low to high multiplicity events. The ratios of the $p(T)$ -differential yields of $K^*(892)^{(\pm)}$ and $K^-(0)$ in high and low multiplicity events are also presented along with their double ratio. For $p(T)$ less than or similar to 2 GeV/c this double ratio persists below unity by more than 3 sigma suggesting that the suppression affects mainly low $p(T)$ resonances. The measured decreasing trend of the $K^*(892)^{(\pm)}/K^-(0)$ ratio with increasing multiplicity, which in heavy-ion collisions is typically attributed to the rescattering of decay particles of the short-lived resonances, is reproduced by the EPOS-LHC model without the use of hadronic afterburners.

PHYSICS LETTERS B 874, 140253, 2026. DOI: 10.1016/j.physletb.2026.140253. Acesso em: <https://doi.org/10.1016/j.physletb.2026.140253>

[P092-2026] “Muon trident process at far-forward LHC detectors”

Francener, R.*; Gonçalves, V. P.; Rabelo-Soares, G.*

The electromagnetic production of a dilepton pair in the muon-ion scattering, usually denoted muon trident process, is investigated considering the feasibility of studying processes induced by muons at LHC using its far-forward detectors. The total and differential cross-sections are estimated taking into account of the Bethe-Heitler and bremsstrahlung channels, and predictions for the event rates expected for muon-tungsten (μW) collisions at the LHC energies are presented. Our results indicate that the observation of the muon trident process is feasible at FASER nu. In particular, our results indicate that the electromagnetic production of $\tau^+\tau^-$ pairs in the μW scattering can, in principle, be observed for the first time ever at the LHC. In addition, we present our predictions for the production of QED bound states. Finally, results for the trident process at the FASER nu 2 detector are also presented.

NUCLEAR PHYSICS B 1025, 117396, 2026. DOI: 10.1016/j.nuclphysb.2026.117396. Acesso em: <https://doi.org/10.1016/j.nuclphysb.2026.117396>

[P093-2026] “Observation of $B_c^+ \rightarrow D^+ h^-$ Decays”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; et al.
LHCb Collaboration

Searches are presented for $B_c^+ \rightarrow D^+ h^-$ decays, where D is a charmed meson and $h^{(\pm)}$ is a charged pion or kaon, using pp collision data collected by the LHCb experiment corresponding to an integrated luminosity of 9 fb⁻¹. The decays $B_c^+ \rightarrow D^+ K^-\pi^+$, $B_c^+ \rightarrow D^+ K^+\pi^0$, and $B_c^+ \rightarrow D^+ K^0\pi^+$ are observed for the first time.

Their branching fractions, expressed as ratios relative to that of the $B\text{-}c(+)\rightarrow B\text{-}s(0)\pi(+)$ decay, are determined to be $R(B\text{-}c(+)\rightarrow D+K\pi(-)) = (1.96 \pm 0.23 \pm 0.08 \pm 0.10) \times 10^{-3}$, $R(B\text{-}c(+)\rightarrow D^*K\pi(-)) = (3.67 \pm 0.55 \pm 0.24 \pm 0.20) \times 10^{-3}$, $R(B\text{-}c(+)\rightarrow D\text{-}s(+)K+K^-) = (1.61 \pm 0.35 \pm 0.13 \pm 0.07) \times 10^{-3}$, where the first uncertainty is statistical, the second is systematic, and the third is due to the limited precision on the D-meson branching fractions. The decay channels proceed primarily through excited K^0 or D^0 resonances or ϕ mesons, and open a new avenue for studies of charge-parity violation in beauty mesons.

PHYSICAL REVIEW LETTERS 136[2], 021804, 2026. DOI: 10.1103/fsj9-89jt. Acesso em: <https://doi.org/10.1103/fsj9-89jt>

[P094-2026] “Observation of Purcell effect in electrically coupled cavity-magnet system”

Andrade, I. L. S.*; Pirota, K.*; Caldeira, A. O.*; Rouxinol, F.*

We report the observation of the Purcell effect in a cavity-metallic-magnet hybrid system using electric field mediated coupling. In this configuration, microwave-induced axial currents in the microwire induce circular magnetic fields that drive the ferromagnetic resonance (FMR) of the magnetized microwire. Field-dependent transmission and reflection spectroscopies reveal a clear cavity perturbation consistent with the Purcell regime, in which the magnetic loss rate exceeds the light-matter coupling strength. Despite the small magnetic volume (similar to $10\text{-}13\text{ m}^3$), measurements performed at both room temperature and $T = 7\text{ mK}$ show coupling rates as high as $g/2\pi = 56\text{ MHz}$, one order of magnitude stronger than the one expected from conventional coupling at the magnetic antinode. Time-domain ringdown measurements directly show the magnetic field-dependent modification of the cavity photon lifetime, in agreement with theoretical predictions. These results establish a versatile approach for coupling microwave fields to metallic magnets via geometric and electric field mediated interactions, opening new opportunities for hybrid cavity-magnet systems.

PHYSICAL REVIEW B 113[9], 094447, 2026. DOI: 10.1103/s5xt-j8wv. Acesso em: <https://doi.org/10.1103/s5xt-j8wv>

[P095-2026] “Observation of the Rare Baryonic Decay $B^+ \rightarrow p(\Lambda)$ and Measurement of its Weak Decay Parameter”

Aaij, R.; Abdelmotteleb, A. S. W.; Camargo Magalhaes, P.*; Lopes, F. C. L.*; et al.
LHCb Collaboration

The first observation of the decay $B^+ \rightarrow p(\Lambda)$ is presented using proton-proton collision data collected by the LHCb experiment between 2016 and 2018 at a center-of-mass energy of 13 TeV , corresponding to an integrated luminosity of 5.4 fb^{-1} . The signal significance exceeds seven standard deviations. Using the $B^+ \rightarrow K^0\pi^+$ decay as a normalization channel, the branching fraction is measured and combined with previous LHCb results based on data collected at 7 and 8 TeV in 2011 and 2012, yielding $\mathcal{B}(B^+ \rightarrow p(\Lambda)) = (1.24 \pm 0.17 \pm 0.05 \pm 0.03) \times 10^{-7}$; where the first uncertainty is statistical, the second is systematic, and the third comes from the uncertainty on the branching fraction of the normalization channel. The $B^+ \rightarrow p(\Lambda)$ weak decay parameter is measured to be $\alpha(B) = 0.87(-0.29)(+0.26) \pm 0.09$, indicating the presence of comparable S-wave and P-wave decay amplitudes.

PHYSICAL REVIEW LETTERS 136[5], 051802, 2026. DOI: 10.1103/fj4q-t8jg. Acesso em: <https://doi.org/10.1103/fj4q-t8jg>

[P096-2026] “Observation of tWZ Production at the CMS Experiment”

Hayrapetyan, A.; Makarenko, V.; Tumasyan, A.; Chinellato, J. A.*; et al.
CMS Collaboration

The first observation of single top quark production in association with a W and a Z boson in proton-proton collisions is reported. The analysis uses data at center-of-mass energies of 13 and 13.6 TeV recorded with the CMS detector at the CERN LHC, corresponding to a total integrated luminosity of 200 fb^{-1} . Events with three or four charged leptons, which can be electrons or muons, are selected. Advanced machine-learning algorithms and improved reconstruction methods, compared to an earlier analysis, result in an unprecedented sensitivity to tWZ production. The measured cross sections for tWZ production are $248 \pm 52\text{ fb}$ and $242 \pm 77\text{ fb}$ for $\sqrt{s} = 13$ and 13.6 TeV , respectively. The signal is established with a statistical significance of 5.8 standard deviations, with 3.5 expected, compared to the background-only hypothesis.

PHYSICAL REVIEW LETTERS 136[8], 081802, 2026. DOI: 10.1103/rk6w-1pcl. Acesso em: <https://doi.org/10.1103/rk6w-1pcl>

[P097-2026] “On the Electronic, Mechanical and Optical Properties of Superhard Cross-Linked Carbon Nanotubes (Tubulanes)”

Tromer, R. M.; Ipaves, B.*; Pereira Jr., M. L.; Woellner, C. F.; Cai, K.; Galvao, D. S.*

We have investigated the electronic, optical, and mechanical properties of six structures belonging to the Tubulanes-cross-linked carbon nanotube family, using Density Functional Theory (DFT) with the Generalized Gradient Approximation (GGA) and the Perdew-Burke-Ernzerhof (PBE) functional. Our results highlight the remarkable anisotropic mechanical behavior of these materials, distinguishing them from isotropic structures, such as diamond. Notably, the 8-tetra-22 structure has a higher Young's modulus (Y) along the z-direction compared to diamond. Unlike diamonds, the mechanical properties of Tubulanes are direction-dependent, exhibiting significant variations in Young's Modulus (2.3 times). Additionally, the Poisson's ratio is highly anisotropic, with at least one direction exhibiting a value close to zero. The inherent anisotropy of these materials enables tunable mechanical properties that depend on the direction of applied stress. Regarding their electronic properties, all Tubulane structures studied possess indirect electronic band gaps, dominated by 2p orbitals. The band dispersion is relatively high, with band gaps ranging from 0.46 to 2.74 eV , all of which are smaller than that of diamond. Notably, the 16-tetra-22 structure exhibits the smallest bandgap (0.46 eV), making it particularly interesting for electronic applications. Additionally, these structures exhibit porosity, which offers advantages over denser materials, such as diamond. Given recent advances in the synthesis of 3D carbon-based materials, the synthesis of tubulane-like structures is within current technological capabilities.

JOURNAL OF PHYSICAL CHEMISTRY C 130[9], p. 3624-3631, 2026. DOI: 10.1021/acs.jpcc.5c08652. Acesso em: <https://doi.org/10.1021/acs.jpcc.5c08652>

[P098-2026] “Perturbative input-output theory of floquet cavity magnonics and magnon energy shifts”

Aguiar, T.*; Oliveira, M. C. De*

We develop a perturbative input-output formalism to compute the reflectance and transmittance spectra of cavity magnonics systems subject to a Floquet modulation.

The method exploits the strong hierarchy between the magnetic-dipole couplings transverse (drive field) and parallel (modulation field) to the static bias field, which naturally introduces the small parameter $\epsilon = (2Ns)^{-1/2}$ associated with the total spin Ns of the ferromagnet. By organizing the cavity and magnon fields in a systematic expansion in ϵ , we obtain compact analytic expressions for the spectra up to second order. Using these results, we reproduce the characteristic sideband structure observed in recent Floquet cavity electromagnonics experiments (Xu et al 2020 Phys. Rev. Lett. 125 237201). Furthermore, accounting for the Zeeman interaction between the modulation field and the fully polarized ground state—a contribution typically neglected in previous treatments—we predict an additional magnon detuning of approximately 0.8GHz, independent of both modulation frequency and sample size and determined solely by the spatial volume occupied by the modulation field and the saturation magnetization of the material sample M_s . This identifies a measurable and previously overlooked shift relevant for the interpretation and design of cavity magnonics experiments.

NEW JOURNAL OF PHYSICS 28[4], 043501, 2026. DOI: 10.1088/1367-2630/ae537d. Acesso em: <https://iopscience.iop.org/article/10.1088/1367-2630/ae537d>

[P099-2026] “Phototribology of copper surfaces”

Weber, J. S.; Perotti, B. L.; Boeira, C. D.*; Leidens, L. M.*; Alvarez, F.*; Michels, A. F.; Figueroa, C. A.

A comprehensive understanding of the factors influencing friction is essential for advancing surface engineering technologies aimed at optimizing tribological performance. However, the effect of light exposure on the friction coefficient behavior of metallic surfaces remains insufficiently explored in tribological research. This work investigates the phototribological behavior of copper surfaces under different illumination conditions (dark, UV, and green light). Analyses of the experimental results indicate a significant increase in the substrate friction force when exposed to green illumination, while UV illumination condition produced negligible changes, both compared to dark either micro- or nanoscale. The increase in friction force under green illumination is attributed to electronic excitations modifying surface electronic structure, representing a novel observation in the relatively unexplored field of phototribology applied to this promising material. Substrate characterization was performed using spectroscopic and diffraction techniques to assess the physicochemical properties. The friction response was evaluated using nano-scratch testing and lateral force microscopy, allowing assessment through different methods and at multiple scales. XPS analyses performed on copper substrates subjected to different illumination conditions show that only exposure to UV illumination induces significant chemical changes on the surface, leading to increased oxidation of the substrate. Accordingly, higher concentrations of metallic copper are observed under green illumination, resulting in a temporary increase in the friction force between the tip and the substrate. These findings demonstrate the potential for active friction control via phototribology, with implications for surface engineering and the optimization of tribological systems across various scales.

APPLIED SURFACE SCIENCE ADVANCES 33, 100975, 2026. DOI: 10.1016/j.apsadv.2026.100975. Acesso em: <https://doi.org/10.1016/j.apsadv.2026.100975>

[P100-2026] “Search for b-hadron decays to long-lived particles in the CMS endcap muon detectors”

Hayrapetyan, A.; Makarenko, V.; Chinellato, J. A.*; et al. CMS Collaboration

A search for long-lived particles originating from the decay of b hadrons produced in proton-proton collisions with a center-of-mass energy of 13 TeV at the LHC is presented. The analysis is performed on a dataset recorded in 2018, corresponding to an integrated luminosity of 41.6 fb⁻¹. Interactions of the long-lived particles in the CMS endcap muon system would create hadronic or electromagnetic showers, producing clusters of detector hits. Selected events contain at least one such high-multiplicity cluster in the muon endcaps and require the presence of a displaced muon. The most stringent upper limits to date on the branching fraction $B(B \rightarrow K \Phi)$, where the long-lived particle Φ decays to a pair of hadrons, are obtained for Φ masses of 0.3–3.0 GeV and Φ mean proper decay lengths in the range of 1–500 cm.

PHYSICAL REVIEW D 113[1], 012009, 2026. DOI: 10.1103/7ldn-snzn. Acesso em: <https://doi.org/10.1103/7ldn-snzn>

[P101-2026] “Search for nonresonant new physics signals in high-mass dilepton events produced in association with b-tagged jets in proton-proton collisions at $\sqrt{s}=13$ TeV”

Chekhovsky, V.; Hayrapetyan, A.; Chinellato, J. A.*; et al. CMS Collaboration

A search for nonresonant new physics phenomena in high-mass dilepton events produced in association with b -tagged jets is performed using proton-proton collision data collected in 2016–2018 by the CMS experiment at the CERN LHC, at a center-of-mass energy of 13 TeV corresponding to an integrated luminosity of 138 fb⁻¹. The analysis considers two effective field theory models with dimension-six operators; involving four-fermion contact interactions between two leptons (ll , electrons or muons) and b or s quarks ($bb ll$ and $bs ll$). Two lepton flavor combinations (ee and $\mu\mu$) are required and events are classified as having 0, 1, or ≥ 2 b -tagged jets in the final state. No significant excess is observed over the standard model backgrounds. Upper limits are set on the production cross section of the new physics signals. These translate into lower limits on the energy scale, of 6.9 to 9.0 TeV in the $bb ll$ model, depending on model parameters, and on the ratio of energy scale and effective coupling, Λ^2/g^* , of 2.0 to 2.6 TeV in the $bs ll$ model. Lepton flavor universality is also tested by comparing the dielectron (ee) and dimuon ($\mu\mu$) mass spectra for different b -tagged jet multiplicities. No significant deviation from the standard model expectation of unity is observed.

JOURNAL OF HIGH ENERGY PHYSICS [2], 141, 2026. DOI: 10.1007/JHEP02(2026)141. Acesso em: [https://doi.org/10.1007/JHEP02\(2026\)141](https://doi.org/10.1007/JHEP02(2026)141)

[P102-2026] “Search for resonances decaying to an anomalous jet and a Higgs boson in proton-proton collisions at $\sqrt{s}=13$ TeV”

Hayrapetyan, A.; Makarenko, V.; Chinellato, J. A.*; et al. CMS Collaboration

This paper presents a search for new physics through the process where a massive particle, X , decays into a Higgs boson and a second particle, Y . The Higgs boson subsequently decays into a bottom quark-antiquark pair, which is reconstructed as a single large-radius jet. The decay products of Y are also assumed to produce a single large-radius jet. The identification of the Y particle is enhanced by computing the anomaly score of its candidate jet using an autoencoder, which measures deviations from typical quark- or gluon-induced jets. This allows a simultaneous search for multiple Y decay scenarios within a single analysis. In the main benchmark process, Y is a scalar particle that decays into a W boson pair. Two other scalar Y decay processes are also considered as benchmarks: decays to a light quark-antiquark pair, and decays to a top quark-antiquark pair.

A fourth benchmark process considers Y as a hadronically decaying top quark, arising from the decay of a vector-like quark into a top quark and a Higgs boson. Data recorded by the CMS experiment at a center-of-mass energy of 13 TeV in 2016-2018, corresponding to an integrated luminosity of 138 fb⁻¹, are analyzed. The search covers X masses between 1.4 and 3.0 TeV and Y masses between 90 and 400 GeV, with all simulated signals produced in the narrow-width approximation. No significant excess above the standard model background expectation is observed. The most stringent upper limits to date are placed on benchmark signal cross sections for various masses of X and Y particles.

EUROPEAN PHYSICAL JOURNAL C 86[2], 137, 2026. DOI: 10.1140/epjc/s10052-025-15176-9. Acesso em: <https://doi.org/10.1140/epjc/s10052-025-15176-9>

[P103-2026] “Simultaneous Probe of the Charm and Bottom Quark Yukawa Couplings Using $t(\bar{t})$ Events”

Hayrapetyan, A.; Makarenko, V.; Chinellato, J. A.*; et al. CMS Collaboration

A search for the standard model Higgs boson decaying to a charm quark-antiquark pair, $H \rightarrow c(\bar{c})$, produced in association with a top quark-antiquark pair ($t(\bar{t})$) is presented. The search is performed with data from proton-proton collisions at $\sqrt{s} = 13$ TeV, corresponding to an integrated luminosity of 138 fb⁻¹. Advanced machine learning techniques are employed for jet flavor identification and event classification. The Higgs boson decay to a bottom quark-antiquark pair is measured simultaneously and the observed $t(\bar{t})$ over $\bar{H}(H \rightarrow b(\bar{b}))$ event rate relative to the standard model expectation is $0.91(+0.26)(-0.22)$. The observed (expected) upper limit on the product of production cross section and branching fraction $\sigma(t(\bar{t})\bar{H}(H \rightarrow c(\bar{c})))$ is $0.11(0.13)$ pb at 95% confidence level, corresponding to 7.8 (8.7) times the standard model prediction. When combined with the previous search for $H \rightarrow c(\bar{c})$ over \bar{H} via associated production with a W or Z boson, the observed (expected) 95% confidence interval on the Higgs-charm Yukawa coupling modifier, $\kappa(c)$, is $|\kappa(c)| < 3.5(2.7)$, the most stringent constraint to date.

PHYSICAL REVIEW LETTERS 136[1], 011801, 2026. DOI: 10.1103/9nwb-splk. Acesso em: <https://doi.org/10.1103/9nwb-splk>

[P104-2026] “Structural stability and electronic properties of a novel three-dimensional carbon allotrope: 3D-dodecaphenylene”

Lima, K. A. L.*; Laranjeira, J. A. dos S.; Huacarpuma, B. D. A.; Martins, N. F.; Sambrano, J. R.; Galvao, D. S.*; Ribeiro Jr., L. A.

We introduce 3D-DPhyne, a novel three-dimensional (3D) carbon allotrope derived from the dodecaphenylene framework, and investigate its structural, electronic, optical, and mechanical properties using first-principles calculations. The proposed structure forms a tetragonal, topologically complex network of four-, six-, and twelve-membered carbon rings with mixed sp²/sp³ hybridization and a formation energy of -7.87 eV/atom, comparable to other stable carbon allotropes. Phonon dispersion calculations show no imaginary modes, and ab initio molecular dynamics simulations at 1000 K confirm robust thermal stability without bond breaking. Electronic structure analysis reveals metallic character, with multiple bands crossing the Fermi level and dominant contributions from carbon p orbitals, consistent with pi-conjugation. The optical response is anisotropic, exhibiting strong absorption in the visible and ultraviolet regions and low reflectivity across a broad range of photon energies.

Mechanical analysis reveals pronounced elastic anisotropy, with Young's modulus varying from approximately 37 to 474 GPa depending on direction. Poisson's ratio displays unconventional directional behavior, including auxetic-like responses.

DIAMOND AND RELATED MATERIALS 164, 113535, 2026. DOI: 10.1016/j.diamond.2026.113535. Acesso em: <https://doi.org/10.1016/j.diamond.2026.113535>

[P105-2026] “Structure, vibrational modes, and surface electronic states of two-dimensional valentinite antimony oxide”

Soares, T. C.*; Oliveira, W. K. C. de*; Merchán, C. R.; Souza, A. C. R.; Chacham, H.*; Mazzoni, M. S. C.; Cadore, A. R.; Zagonel, L. F.*; Barcelos, I. D.

We report a comprehensive study of two-dimensional (2D) valentinite antimony oxide (beta-Sb₂O₃) exfoliated from its natural bulk form. The flakes exhibit well-defined morphology, low surface roughness, and preserved orthorhombic structure. Raman and infrared nano-spectroscopy reveal distinct vibrational modes, confirming the crystallinity and vibrational anisotropy of the material. Conductive atomic force microscopy shows dielectric breakdown at similar to 0.18 V/nm, consistent with insulating out-of-plane behavior. However, scanning tunneling spectroscopy reveals a near-zero surface gap at room temperature. First-principles calculations highlight strong surface band modulation, including full bandgap closure for specific surface terminations. These calculations also indicate a wide indirect bulk gap (similar to 2.82 eV) while cathodoluminescence measurements reveal broad defect-related emission, yielding an estimated lower bound for the optical bandgap of approximately 3 eV. These results establish beta-Sb₂O₃ as a unique 2D material with strong bulk-surface electronic contrast, offering potential for applications in wide-bandgap electronics, surface-state engineering, and optoelectronic nanodevices.

JOURNAL OF APPLIED PHYSICS 139[12], 124303, 2026. DOI: 10.1063/5.0312539. Acesso em: <https://doi.org/10.1063/5.0312539>

[P106-2026] “Study of the interaction between Ξ baryons and light mesons via femtoscopy at the LHC”

Abualrob, I. J.; Acharya, S.; Rinella, G. A.; Jahnke, C.*; Livera, G. S. S.*; Takahashi, J.*; et al. ALICE Collaboration

Meson-baryon systems with strangeness content provide a unique laboratory for investigating the strong interaction and testing theoretical models of hadron structure and dynamics. In this work, the measured correlation functions for oppositely charged Xi-K and Xi-pi pairs obtained in high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV at the LHC are presented. For the first time, high-precision data on the Xi-K interaction are delivered at small relative momenta. The scattering lengths, extracted via the Lednicky-Lyuboshits expression of the pair wavefunction, indicate a repulsive and a shallow attractive strong interaction for the Xi-K and Xi-pi systems, respectively. The Xi(1620) and Xi(1690) states are observed in the Xi-pi correlation function and their properties, mass and width, are determined. These measurements are in agreement with other available results. Such high-precision data can help refine the understanding of these resonant states, provide stronger constraints for chirally motivated potentials, and address the key challenge of describing the coupled-channel dynamics that may give rise to molecular configurations.

PHYSICS LETTERS B 874, 140227, 2026. DOI: 10.1016/j.physletb.2026.140227. Acesso em: <https://doi.org/10.1016/j.physletb.2026.140227>

[P107-2026] “Synergistic Charge Redistribution and Structural Evolution in Three-Dimensionally Printed Mn-Prussian Blue Analogue-Based Electrodes for Energy Storage”

Borges, P. H. S.; Silva, M. V. C. O. da; Stefano, J. S.; Barreto, R. R.*; Siervo, A. de*; Richter, E. M.; Munoz, R. A. A.; Bonacin, J. A.; Nossol, E.

Three-dimensional (3D) printing offers a versatile route to fabricate multifunctional electrodes by integrating key components within a single structure. Herein, we developed polylactic acid/carbon black/reduced graphene oxide/manganese hexacyanoferrate (PLA/CB/rGO/MnHCF) electrodes and evaluated their structural and electrochemical behavior to understand the cooperative dynamics governing their performance. Scanning electron microscopy and energy-dispersive X-ray spectroscopy analyses confirmed the homogeneous dispersion of MnHCF microcubes and carbonaceous additives within the PLA matrix. PLA/CB/rGO electrodes exhibited predominantly capacitive behavior, whereas MnHCF incorporation introduced distinct redox features associated with Fe²⁺/Fe³⁺ and Mn²⁺/Mn³⁺ transitions. Galvanostatic cycling revealed enhanced capacitance and high reversibility, with long-term testing over 3,500 cycles showing a remarkable increase in capacitance. Postcycling characterization indicated expansion of the electroactive surface area, activation of previously inaccessible MnHCF sites, and reduction of rGO/CB functional groups. Raman and FTIR analyses confirmed persistence of Mn³⁺ and Fe³⁺ centers after cycling. These findings support a cooperative mechanism in which the insulating PLA matrix imposes localized electron bottlenecks, redirecting the charge toward rGO/CB sites for reduction while sustaining MnHCF oxidation. This synergistic redistribution progressively enhances redox activity and conductivity, turning the PLA host's insulating nature into a driver of long-term activation. Overall, the 3D-printed PLA/CB/rGO/MnHCF electrodes demonstrate stability, progressive activation, and promise for scalable and tunable energy storage applications.

ACS NANOSCIENCE AU, 2026. DOI: 10.1021/acsnanoscienceau.5c00167 Early Access Date: MAR 2026. Acesso em: <https://doi.org/10.1021/acsnanoscienceau.5c00167>

[P108-2026] “Synergistic Electronic Modulation in Nitrogen, Sulfur, and Boron-Doped Graphene Nanoribbons for Enhanced Oxygen Reduction Electrocatalysis”

Dias, G. S.; Labbe, M.; He, A. Q.; Landers, R.*; Costa, J. M.; Almeida Neto, A. F. de; Ivey, D. G.

The sluggish kinetics of the oxygen reduction reaction (ORR) remains one of the main challenges in the development of efficient and sustainable metal-free catalysts for energy conversion and storage devices. Multielement doping of carbon materials has emerged as an effective strategy to tailor their electronic properties and enhance ORR activity. In this study, graphene nanoribbons codoped with nitrogen, sulfur, and boron (NSB-GNR) were prepared via a facile hydrothermal route, comprehensively characterized and evaluated for ORR catalysis. Characterization by EELS, FTIR, XPS, and ICP-OES confirmed successful heteroatom incorporation and revealed that boron was mainly located in the inner layers of NSB-GNR. Raman analysis suggested that boron incorporation may have induced defect reconstruction within the carbon lattice. Nitrogen adsorption-desorption and zeta potential analyses indicated that the acidic environment generated by boric acid during hydrothermal synthesis partially neutralized surface charges, leading to reduced BET surface area (176 m² g⁻¹) and pore volume (0.23 cm³ g⁻¹) compared with the N,S-doped counterpart. Despite this reduction, NSB-GNR exhibited superior ORR performance with an onset potential of 0.805 V, half-wave potential of 0.658 V vs RHE, and a limiting current density of -3.24 mA cm⁻², following an efficient four-electron transfer pathway. These findings demonstrate that the synergistic interactions among nitrogen,

sulfur, and boron dominate over textural effects, providing new insights into the cooperative electronic modulation of heteroatoms and offering a scalable strategy for designing advanced metal-free carbon electrocatalysts.

ACS OMEGA 11[9], p. 15377-15388, 2026. DOI: 10.1021/acsomega.5c12983. Acesso em: <https://doi.org/10.1021/acsomega.5c12983>

[P109-2026] “Tau neutrino as a probe of charged nonstandard interactions at DUNE”

Cherchiglia, A.*; Peres, O. L. G.*; Souza, E. S.*

In this work, we study the influence of charged-current nonstandard interactions (CC-NSI) at a DUNE-like experiment. We are particularly interested in the tau neutrino channel accessible at DUNE, given the higher energy neutrino flux expected to be achieved by the experiment. We focus on CC-NSI that may affect the pion decay, the primary source of neutrinos for DUNE. We show that the expected sensitivity at the near detector may supersede the present bounds coming directly from pion decay by one order of magnitude.

PHYSICAL REVIEW D 113[3], 035037, 2026. DOI: 10.1103/83n7-c72r. Acesso em: <https://doi.org/10.1103/83n7-c72r>

[P110-2026] “Theoretical characterization of α -, β - and γ -Ag₂WO₄ polymorphs: Uncovering structural and electronic properties”

Cabral, L.; Lemos, S. C. S.; Añez, R.; Andrés, J.; Longo, E.; Marques, G. E.; San-Miguel, M. A.; Silva, E. Z. da*

Ag₂WO₄ exhibits multiple polymorphs- α (orthorhombic), β (hexagonal), and γ (cubic)-that are of interest for a broad range of functional applications. Here, first-principles calculations within density functional theory (DFT) are used to benchmark the performance of eight exchange-correlation functionals in describing the structural and electronic properties of these phases: LDA; GGA (PBE, PW91, and PBEsol); dispersion-inclusive approaches (PBE-D3 and vdW-DF); and the meta-GGA functionals TPSS and SCAN. The computed lattice parameters and volumes are generally in good agreement with experiment for all polymorphs, whereas the predicted energetic ordering and band-gaps display a stronger functional dependence. In particular, PBE and PW91 yield accurate equilibrium geometries but perform less consistently for relative stability and substantially underestimate the band-gaps, a limitation shared by semilocal DFT. The band-gap underestimation is mitigated by higher-level approaches: TPSS and SCAN increase the band-gaps and improve the description for the α and γ phases, and G₀W₀ quasiparticle calculations provide band-gaps in closer agreement with experiment. These results offer practical guidance for selecting exchange-correlation functionals for Ag₂WO₄ polymorphs when structural, energetic, and electronic descriptors must be considered simultaneously.

COMPUTATIONAL CONDENSED MATTER 47, e01282, 2026. DOI: 10.1016/j.cocom.2026.e01282. Acesso em: <https://doi.org/10.1016/j.cocom.2026.e01282>

[P111-2026] “Ultra-faint Milky Way Satellites Discovered in Carina, Phoenix, and Telescopium with DELVE Data Release 3”

Tan, C. Y.; Cerny, W.; Pace, A. B.; Sobreira, F.*; et al. DELVE; DES Collaborations

We report the discovery of three Milky Way satellite candidates: Carina IV, Phoenix III, and DELVE 7, in the third data release of the DECam Local Volume Exploration survey (DELVE).

The candidate systems were identified by cross-matching results from two independent search algorithms. All three are extremely faint systems composed of old, metal-poor stellar populations (tau greater than or similar to 10 Gyr, [Fe/H] less than or similar to -1.4). Carina IV ($M-V = -2.8$; $r(1/2) = 40$ pc) and Phoenix III ($M-V = -1.2$; $r(1/2) = 19$ pc) have half-light radii that are consistent with the known population of dwarf galaxies, while DELVE 7 ($M-V = 1.2$; $r(1/2) = 2$ pc) is very compact and seems more likely to be a star cluster, though its nature remains ambiguous without spectroscopic follow-up. The Gaia proper motions of stars in Carina IV ($M\text{-star} = 2250(-830)(+1180)$ M(circle dot)) indicate that it is unlikely to be associated with the LMC, while DECam CaHK photometry confirms that its member stars are metal poor. Phoenix III ($M\text{-star} = 520(-290)(+660)$ M(circle dot)) is the faintest known satellite in the extreme outer stellar halo ($D\text{-GC} > 100$ kpc), while DELVE 7 ($M\text{-star} = 60(-40)(+120)$ M(circle dot)) is the faintest known satellite with $D\text{-GC} > 20$ kpc.

ASTROPHYSICAL JOURNAL 1000[1], 46, 2026. DOI: 10.3847/1538-4357/ae43e2. Acesso em: <https://iopscience.iop.org/article/10.3847/1538-4357/ae43e2>

[P112-2026] “Unveiling Zn Incorporation in CuInS2 Quantum Dots: X-ray and Optical Analysis of Doping Effects, Structural Modifications, and Surface Passivation”

Burgos-Caminal, A.; Vale, B. R. C.*; Fonseca, A. F. V.; Hidalgo, J. F.; Collet, E. P. P.; Garcia, L.; Vega-Mayoral, V.; Garcia-Orrit, S.; Arnay, I.; Cabanillas-Gonzalez, J.; Simonelli, L.; Nogueira, A. F.; Schiavon, M. A.; Penfold, T. J.; Padilha, L. A.*; Gawelda, W.

CuInS2 quantum dots (QDs) have gained significant attention owing to their remarkable broadband emission, making them desirable for various optoelectronic applications requiring efficient luminescent nanomaterials. However, maximizing radiative recombination in CuInS2 QDs necessitates minimizing intragap trap states. A common approach involves the introduction of Zn during the synthesis, which typically promotes the formation of a ZnS shell that passivates the QD surface. Despite its importance, the characterization and quantification of Zn incorporation using conventional techniques, such as optical spectroscopy or electron microscopy, remains challenging. In this study, we utilized X-ray absorption spectroscopy, in both X-ray absorption near-edge structure and extended X-ray absorption fine structure spectral ranges, to investigate Zn incorporation into CuInS2 QDs, probing at the Zn, S, and Cu K-edges. This approach allowed us to detect the formation of a ZnS surface shell, tentatively quantifying its thickness, and to distinguish between Zn as a substituent at the shell or as an interstitial defect. Additionally, we explored the dynamical properties of CuInS2 QDs using time-resolved optical spectroscopies, particularly in the presence of electron and hole acceptors (benzoquinone and phenothiazine), observing that hole transfer is highly sensitive to shell thickness. These results provide deeper insights into the Zn-induced shell.

CHEMISTRY OF MATERIALS 38[6], p. 2601-2612, 2026. DOI: 10.1021/acs.chemmater.5c01878. Acesso em: <https://doi.org/10.1021/acs.chemmater.5c01878>

[P113-2026] “Vacancy-Driven Electronic Effects in Few-Layer HfS2 Probed by Scanning Tunneling Microscopy and Spectroscopy”

Rodrigues-Fontenele, G.; Fontenele, G.; Polesi, L.; Barreto, R. R.*; Soares, G. H. R.; Baggio, B. F.; Ribeiro, A. L.; Malachias, A.; Magalhaes-Paniago, R.

Vacancy-driven electronic effects in bulk and few-layer hafnium disulfide (HfS2) were investigated using scanning tunneling microscopy/spectroscopy and density functional theory simulations.

Fermi level variations associated with sulfur vacancies were observed in spectroscopic data carried out on both bulk and nanoflakes of HfS2. Atomically resolved imaging revealed structural sulfur vacancies, which locally induce a pronounced shift in the Fermi level. Stoichiometric regions exhibit p-type semiconducting behavior, whereas defective regions display clear n-type doping. A noticeable reduction in the average band gap was also observed near sulfur vacancies, decreasing from 1.28 to 1.19 eV in bulk material. Finally, a thickness-dependent evolution of the electronic band gap was observed, ranging from 1.48 eV for the 3-layer to 1.28 eV for bulk HfS2.

JOURNAL OF PHYSICAL CHEMISTRY C 130[11], p. 4134-4140, 2026. DOI: 10.1021/acs.jpcc.5c08105. Acesso em: <https://doi.org/10.1021/acs.jpcc.5c08105>

[P114-2026] “ Σ^+ production in pp collisions at $\sqrt{s}=13$ TeV”

Abualrob, I. J.; Acharya, S.; Jahnke, C.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

The measurement of Σ^+ production in pp collisions at $\sqrt{s} = 13$ TeV is presented. The measurement is performed at midrapidity in both minimum-bias and high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV. The Σ^+ is reconstructed via its weak-decay topology in the decay channel $\Sigma^+ \rightarrow p + \pi^0$ with $\pi^0 \rightarrow \gamma + \gamma$. In a novel approach, the neutral pion is reconstructed by combining photons that convert in the detector material with photons measured in the calorimeters. The transverse-momentum ($p(T)$) distributions of the Σ^+ and its rapidity densities dN/dy in both event classes are reported. The $p(T)$ spectrum in minimum-bias collisions is compared to QCD-inspired event generators. The ratio of Σ^+ to previously measured Λ baryons is in good agreement with calculations from the Statistical Hadronization Model. The high efficiency and purity of the novel reconstruction method for Σ^+ presented here will enable future studies of the interaction of Σ^+ with protons in the context of femtosopic measurements, which could be crucial for understanding the equation of state of neutron stars.

EUROPEAN PHYSICAL JOURNAL C 86[2], 101, 2026. DOI: 10.1140/epjc/s10052-025-15095-9. Acesso em: <https://doi.org/10.1140/epjc/s10052-025-15095-9>

Material Editorial

[E002-2026] “Special Topic on Brillouin Scattering and Optomechanics”

Merklein, M.; Alegre, T. P. M.*

APL PHOTONICS 11[2], 020402, 2026. DOI: 10.1063/5.0309275. Acesso em: <https://doi.org/10.1063/5.0309275>

*Autores da comunidade IFGW

Fonte: Web of Science on-line (WOS)

Correções

[Co-2026] “Common femtoscopic hadron-emission source in pp collisions at the LHC (vol 85, 198, 2025)”

Acharya, S.; Adamová, D.; Chinellato, D. D.*; Guardiano, G. G.*; Liveraro, G. S. S.*; Takahashi, J.*; et al.
ALICE Collaboration

EUROPEAN PHYSICAL JOURNAL C 86[1], 12, 2026. DOI: 10.1140/epjc/s10052-025-15143-4. Acesso em: <https://doi.org/10.1140/epjc/s10052-025-15143-4>

*Autores da comunidade IFGW

Fonte: Web of Science on-line (WOS)

Defesas de dissertações do IFGW

[D006-2026] “Análise de Risco de Hipertensão Através de Modelos de Aprendizado de Máquina”

Aluno: Augusto Bubenik

Orientador: Prof. Dr. Leandro Russovski Tessler

Data: 12/03/2026

[D007-2026] “Supercondutividade não convencional baseada em orbitais 3d”

Aluno: Derick Luiz Santos Passos Silva

Orientador: Prof. Dr. Pascoal José Giglio Pagliuso

Data: 27/03/2026

[D008-2026] “Geração de Pulsos Ultracurtos no Ultravioleta de Vácuo para Aplicações em Espectroscopias e Microscopias de Fotoemissão”

Aluno: Jose Otavio Rosa

Orientador: Prof. Dr. Jonathas de Paula Siqueira

Data: 01/04/2026

Defesas de teses do IFGW

[T003-2026] “Dinâmica de Éxitons em Nanomateriais Heteroestruturados à Base de CdSe com Engenharia de Forma”

Aluno: Jonathan Cotrino Lemus

Orientador: Prof. Dr. Lázaro Aurélio Padilha Júnior

Data: 23/04/2026

[T004-2026] “Hidrodinâmica Relativística: Uma Proposta de Formalismo Gaussiano com Covariância Geral”

Aluno: Guilherme Moisés Sampaio

Orientador: Prof. Dr. Donato Giorgio Torrieri

Data: 30/04/2026

*Fonte: Portal IFGW/Eventos

Acesso em: <https://portal.ifi.unicamp.br/a-instituicao/eventos/month.calendar>

Cadastre-se no site do Boletim Abstracta como leitor, e receba os avisos da publicação de novos números por e-mail.

Abstracta

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Publicação

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