# Abstracta

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# Artigos publicados

**[P291-2026] "Angular analysis of the B+ --> π+μ+μ- decay"**

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

This paper presents the first measurement of the forward-backward asymmetry, AFB, and the flat term, F-H, that parameterise the angular distribution of the B+ -> pi(+)mu(+)mu(-) decay. The proton-proton collision dataset used in the analysis corresponds to an integrated luminosity of 9 fb(-1), collected with the LHCb experiment between 2011 and 2018. The analysis is performed in two intervals of dimuon mass squared, one above and one below the region containing the J/psi and psi(2S) narrow charmonium resonances. The Standard Model predictions lie within the obtained 68% confidence level interval in the high-mass and within the 99% interval in the low-mass region.

**JOURNAL OF HIGH ENERGY PHYSICS [8], 004, 2026. DOI:** 10.1007/JHEP08(2026)004. Acesso em: **https://doi.org/10.1007/JHEP08(2026)004**

**[P292-2026] "Annealing-controlled spin reorientation in thulium iron garnet thin films"**

**Soares, C. C.*;** Mori, T. J. A.; **Béron, F.*;** Moodera, J. S.; Cezar, J. C.; Brandao, J.; Vilela, G.

Spin-reorientation transition (SRT) is a magnetic phase crossover in which the preferred orientation of the magnetic moments, defined by the easy axis or easy plane, changes due to competing energies. This tunable transition is crucial for controlling magnetic anisotropy, enabling spin-orientation manipulation for magnetic data storage and efficient magnetic switching in spintronic devices. In this work, we demonstrate annealing--controlled SRT in thulium iron garnet (TmIG) films grown on (111)-oriented gadolinium gallium garnet (GGG). Systematic variation of the post-growth annealing temperature from 600 to 900 degrees C drives the magnetic anisotropy from an in-plane to an out-of-plane-favored regime, with the total effective anisotropy energy density, K-eff, changing from -0.71 +/- 0.12 to +2.31 +/- 0.25 kJm(-3). Temperature-dependent magnetometry reveals that the SRT shifts toward ambient conditions with increasing annealing temperature, consistent with lattice expansion in the in-plane direction and compression along the out-of-plane axis. In particular, controlling the SRT in TmIG films is promising for dynamically tuning spin-wave propagation, with potential implications for magnonic information transport.

**JOURNAL OF ALLOYS AND COMPOUNDS 1081, 191020, 2026. DOI:** 10.1016/j.jallcom.2026.191020. Acesso em: **https://www.sciencedirect.com/science/article/pii/S0925838826050899**

**[P293-2026] "Biomaterials Meet Organic Electrochemical Transistors: Materials, Interfaces, and Biosensing Frontiers"**

Nawaz, A.; **Merces, L.*;** Sonar, P.

Organic electrochemical transistors (OECTs) are emerging as powerful biosensing platforms, offering high transduction efficiency, low-voltage operation, and intrinsic compatibility with aqueous and physiological environments. Central to their recent progress is the strategic integration of biomaterials, which govern interfacial charge transfer, doping dynamics, and recognition specificity. A complete understanding of biomaterial--enabled OECTs requires not only insights into intrinsic material chemistry but also interface engineering and device design principles that dictate signal transduction and reproducibility. In this review, we critically examine the full spectrum of biomaterials integrated into OECT biosensors (from natural macromolecules, such as proteins, nucleic acids, and polysaccharides to biocompatible polymers and synthetic engineered interfaces). Particular emphasis is placed on interfacial chemistries, including silanization and click reactions, that control receptor orientation, density, and long-term stability. Beyond materials design, we discuss operating physics, signal transduction mechanisms, and device engineering strategies, thereby linking molecular-scale chemistry with device-level performance. By consolidating these interdisciplinary advances, we provide a timely roadmap for reproducible, scalable, and clinically relevant OECT biosensors. With growing demand for high-performance and sustainable sensing platforms in precision medicine and environmental monitoring, this review highlights both key achievements and outstanding challenges that will shape the next generation of bioelectronic technologies.

**ADVANCED FUNCTIONAL MATERIALS, 2026. DOI:** 10.1002/adfm.77800. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1002/adfm.77800**

**[P294-2026] "Burnout Susceptibility of Silicon Power Diodes When Exposed to 14-MeV Neutrons"**

Parola, G. C.; Palazzo, S.; Busatto, G.; Sanseverino, A.; Martano, E.; **Alberton, S. G.*;** Wyss, J.; Velardi, F.

Neutrons can lead to significant failures in high-voltage power devices; this article investigates the behavior of a silicon power p-i-n diode when exposed to a 14-MeV neutron beam. We present a novel methodology that combines experimental characterization and numerical simulation to examine the effects of ionic species generated by neutron-induced nuclear reactions in semiconductor materials. Experimental measurements were conducted at Frascati neutron generator (FNG) to explore the device's failure under controlled irradiation conditions. Subsequently, to comprehend the failure mechanism, a combined simulation approach was adopted. The G4SEE Monte Carlo toolkit was first employed to simulate the interaction of 14-MeV neutrons with the silicon semiconductor material. The resulting secondary particle data were then utilized in 3-D electrothermal simulations performed using Silvaco TCAD, leveraging the cylindrical symmetry of the unit cell. The numerical model was validated by comparing the simulation results with the experimental data obtained during the neutron irradiation campaigns. Our study revealed that the ( alpha , Mg-25) ion pair is one of the products of the nuclear reaction that interacts most significantly with the electric field within the intrinsic region of the device. This interaction at the critical bias voltage results in a single-event burnout (SEB) of the diode, as confirmed by experimental observations and numerical analysis. Although the demonstration is based on a monoenergetic 14-MeV source, the methodology is general and can be extended to assess device response under realistic atmospheric neutron spectra.

**IEEE TRANSACTIONS ON NUCLEAR SCIENCE 73[8], p. 2865-2872, 2026. DOI:** 10.1109/TNS.2026.3658937. Acesso em: **https://ieeexplore.ieee.org/document/11367075**

**[P295-2026] "Characterization of cutting-edge CMOS active pixel sensors within the CYGNO experiment"**

Almeida, B. D.; Amaro, F. D.; Antonietti, R.; **Kemp, E.***; et al.

Time projection chambers equipped with gas electron multipliers and optical readout by scientific CMOS cameras are a promising technology for low-energy particle detection, as demonstrated by the CYGNO experiment. To help identify an optimal detector configuration, we performed a characterization of two state-of-the-art CMOS sensors focusing on dark signal behavior across different exposure times and on detection sensitivity,

assessed using the x-ray emissions from a 55Fe radioactive source, reproducing the low-light conditions expected in the experiment. CYGNO currently employs a low-noise ORCA-Fusion sensor produced by Hamamatsu for validation of its detection system. However, Hamamatsu has introduced two new sensors that could be of interest for future upgrades. The first is an upgraded model of the current sensor, the ORCA-Fusion-BT, featuring a back-illuminated design that reaches a quantum efficiency of up to 95% at 550 nm. The second is a next-generation sensor referred to as the ORCA-Quest. While its peak quantum efficiency is not as high as that of the ORCA-Fusion--BT, it offers high sensitivity across a broader spectral range, extending into the ultraviolet region, and delivers ultra-low readout noise of 0.27 electrons, about 2.6 times lower than that of the Fusion family. These sensors therefore represent an opportunity to enhance the performance of experiments, including those conducted by the CYGNO collaboration. This document presents a characterization of these sensors to evaluate their relevance in photon-limited environments and their suitability for integration into the CYGNO detector system.

**MEASUREMENT SCIENCE AND TECHNOLOGY 37[38], 385103, 2026. DOI:** 10.1088/1361-6501/aea4d8. Acesso em: **https://iopscience.iop.org/article/10.1088/1361-6501/aea4d8**

**[P296-2026] "Characterization of field cage and cathode for low radioactivity operation with the CYGNO experiment"**

Amaro, F. D.; Antonietti, R.; Baracchini, E.; **Kemp, E.***; et al.

Dark matter, which is considered to account for approximately the 27% of the Universe's energy-mass content, remains an open issue in modern particle physics along with its composition. The CYGNO Experiment aims to exploit an innovative approach applied to the direct detection search of low energy nuclear recoils possibly induced by cold particle-like dark matter candidates. CYGNO employs a directional detector based on a Time Projection Chamber (TPC) filled with a He:CF4 gas mixture and equipped with an optical readout. Currently, the CYGNO Collaboration is constructing the detector demonstrator, CYGNO-04, in Hall F at Laboratori Nazionali del Gran Sasso (LNGS). This 0.4 m3 detector has the goal of proving the scalability of the technology and assessing the physics and radiopurity capabilities. Given the low radioactivity requirements, especially in internal components such as field cage and cathode, the reduction of material while keeping the correct electrical behavior is paramount. In this paper, we present the validation of several internal components, mainly focusing on the field cage material and support structure. The tests included geometrical asymmetries in the electric field response, collection efficiency as well as measurement of known physical quantities. A preferred configuration is found with a structure based on Nylon material which supports a PET or Kapton sheet with copper strips deposited on.

**JOURNAL OF INSTRUMENTATION 21[9], P09034, 2026. DOI:** 10.1088/1748-0221/21/09/P09034. Acesso em: **https://iopscience.iop.org/article/10.1088/1748-0221/21/09/P09034**

**[P297-2026] "Collective turns in spinless flocks"**

**Lizárraga, J.*; Aguiar, M. A. M. de***

Using a minimal aggregation-based model, we address the efficient information transfer observed in natural flocks during collective turns. In our system, the turning signal emitted by a single individual propagates throughout the collective primarily at a constant speed. To characterize the source of this capability, we analyze the system in the continuum limit. Thus, we demonstrate that wave-propagating features arise solely from the nonreciprocal nature of interactions. We explore spectral anomalies that emerge due to this mechanism and provide an explanation through a perturbative analysis. Remarkably, within this scenario, the description of velocity fluctuations is found to follow a structure analogous to a Born approximation. Our model can be extended to study other physical contexts exhibiting polar order, and our arguments can be tested in natural systems.

**PHYSICAL REVIEW E 114[3], 035401, 2026. DOI**: 10.1103/6976-lcw7. Acesso em: **https://doi.org/10.1103/6976-lcw7**

**[P298-2026] "Color Symmetry Breaking in a Nonlinear Optical Microresonator"**

**Trinchao, L. O.***; Ghosh, A.; Pal, A.; Yan, H. C.; Bi, T.; Zhang, S. Y.; Tomazio, N. B.; Kunst, F. K.; Hill, L.; **Wiederhecker, G. S.***; Del'Haye, P.

Spontaneous symmetry breaking leads to diverse phenomena across the natural sciences, from the Higgs mechanism in particle physics to superconductors and collective animal behavior. In photonic systems, the symmetry of light states can be broken when two optical fields interact through the Kerr nonlinearity, as shown in early demonstrations with counterpropagating and cross-polarized modes. Here, we report the first observation of color symmetry breaking in an integrated silicon nitride microring, where spontaneous power imbalance arises between optical mode at different wavelengths, mediated by the Kerr effect. The threshold power for this effect is as low as . By examining the system's homogeneous states, we further demonstrate a Kerr-based nonlinear activation-function generator that produces sigmoid-, quadratic-, and leaky-ReLU-like responses. These findings reveal previously unexplored nonlinear dynamics in dual-pumped Kerr resonators and establish new pathways toward compact, all-optical neuromorphic circuits.

**LASER & PHOTONICS REVIEWS, 2026. DOI:** 10.1002/lpor.71644. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1002/lpor.71644**

**[P299-2026] "Comprehensive Analysis of the B0 --> K*0μ+ μ- Decay"**

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

An analysis of the B-0 -> K*(0) (-> K+ pi(-))mu(+) mu(-) decay is presented using proton-proton collision data collected by the LHCb experiment, corresponding to an integrated luminosity of 8.4 fb(-1). The full set of CP-averaged and CP--asymmetric angular observables is determined in bins of the invariant mass squared of the dimuon system, as well as the branching fraction relative to the B-0 -> J/psi (->mu(+) mu(-) )K+ pi(-) decay. For the first time, the full set of observables pertaining to the K+ pi(-) S-wave contribution to the final state are presented and consideration is given to effects arising from the mass of the muons. The extracted CP-asymmetry observables show no significant deviations from zero. The measurements of the CP-averaged observables and the branching fractions continue to exhibit the pattern of tensions with the standard model predictions that have been seen in previous analyses that use part of the dataset considered in this Letter.

**PHYSICAL REVIEW LETTERS 137[2], 021802, 2026. DOI:** 10.1103/24g9-yn9d. Acesso em: **https://doi.org/10.1103/24g9--yn9d**

**[P300-2026] "Corrections to the Unruh effect from Robin boundary conditions in punctured Minkowski spacetime"**

**Botta, N. P.***; Pitelli, J. P. M.; **Mosna, R. A.***

We consider a real massless scalar field in punctured Minkowski spacetime, endowed at the removed origin with the stable one--parameter family of Robin boundary conditions G(0) - /3G'(0) = 0, /3 >= 0. We obtain the boundary-induced part of the static ground-state Wightman function in closed form and study the response of a uniformly accelerated Unruh-DeWitt detector. The puncture breaks the boost symmetry underlying the stationary Unruh response, so the boundary-induced pullback is nonstationary in proper time. The corresponding subtracted detector contribution can either enhance or suppress the ordinary Minkowski response and depends on the Robin parameter, the detector gap, and the portion of the trajectory sampled. For the unshifted, radially aligned trajectory studied in detail, we prove that the boundary-induced pullback is absolutely integrable in the two proper-time variables. Consequently, as the smooth interaction is extended over the full detector history, this contribution approaches a finite limit and remains O(1), producing no additional term linear in the interaction duration. The formal Neumann limit is singular: the boundary-induced two-point function grows logarithmically because of an infrared singularity in the s-wave sector, and the numerical response exhibits growth consistent with this asymptotic behavior.

**PHYSICAL REVIEW D 114[4], 045027, 2026. DOI:** 10.1103/nym2-pyqq. Acesso em: **https://doi.org/10.1103/nym2-pyqq**

**[P301-2026] "CP Violation Analysis of Local and Nonlocal Amplitudes in the (B)over-bar0 --> (K)over-bar*0μ+μ- Decay"**

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

A search for CP violation in the (B) over bar (0) -> (K) over bar*(0) mu(+)mu(-) decay is performed using proton-proton collision data collected by the LHCb experiment during Run 1 and Run 2, corresponding to an integrated luminosity of 8.4 fb(-1). The analysis exploits the full angular distribution of the decay, providing sensitivity to CP-violating effects in both vector and axial--vector contributions to this flavor-changing neutral-current process. The complex Wilson coefficients are determined within the weak effective theory through an unbinned maximum-likelihood fit to the angular observables, incorporating nonlocal hadronic amplitudes across the full dimuon mass spectrum. The precision of the CP-violation observables is improved by an order of magnitude relative to previous measurements, with the imaginary parts of the Wilson coefficients now determined more precisely than the real parts. No significant CP violation is observed, and the results are consistent with the standard model.

**PHYSICAL REVIEW LETTERS 137[6], 061801, 2026. DOI:** 10.1103/gg5v-mp26. Acesso em: **https://doi.org/10.1103/gg5v-mp26**

**[P302-2026] "Dark Energy Camera All Data Everywhere cosmic shear project. V. Constraints on cosmology and astrophysics from 270 million galaxies across 13,000 deg2 of the sky"**

Anbajagane, D.; Chang, C.; Drlica-Wagner, A.; **Alsina, A. N.***; et al.

We present constraints on models of cosmology and astrophysics using cosmic shear data vectors from three datasets: the northern and southern Galactic cap of the Dark Energy Camera All Data Everywhere (DECADE) project, and the Dark Energy Survey (DES) Year 3. These data vectors combined consist of 270 million galaxies spread across 13,000 deg2 of the sky. We first extract constraints for Lambda CDM cosmology and find S8 = 0.805 & thorn; 0.019-0.019 and Omega m = 0.262 & thorn;0.023-0.036, which is consistent within 1.96 of constraints from the Planck satellite. Extending our analysis to dynamical dark energy models shows that lensing provides some (but still minor) improvements to existing constraints from supernovae and baryon acoustic oscillations. Finally, we study six different models for the impact of baryons on the matter power spectrum. We show the different models provide consistent constraints on baryon suppression, and associated cosmology, once the astrophysical priors are sufficiently wide. Current scale-cut approaches for mitigating baryon contamination result in a residual bias of approximate to 0.36 in the S8, Omega m posterior. Using all scales with dedicated baryon modeling leads to negligible improvement as the new information is used solely to self--calibrate the baryon model on small scales. Additional nonlensing datasets, and/or calibrations of the baryon model, will be required to access the full statistical power of the lensing measurements. The combined dataset in this work represents the largest lensing dataset to date (most galaxies, largest area) and provides an apt testing ground for analyses of upcoming datasets from stage IV surveys. The DECADE shear catalogs, data vectors, likelihoods, etc. are made publicly available.

**ADVANCED MATERIALS INTERFACES, 2026. DOI:** 10.1103/k4lq--2s73. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1103/k4lq-2s73**

**[P303-2026] "Depth of maximum of air-shower profiles above 1017.7 eV measured with the fluorescence detector of the Pierre Auger Observatory"**

Halim, A. A.; Abreu, P.; Aglietta, M.; A**rbeletche, L. B.*; Chinellato, J. A.*; Dobrigkeit, C.*; Fauth, A. C.*; Payeras, A. M.*; Akim, J. V. R.***; et al.
Pierre Auger Collaboration

We present measurements of the depth of shower maximum, Xmax, for cosmic-ray-induced extensive air showers recorded by the fluorescence detector of the Pierre Auger Observatory over 17 years. The dataset covers primary energies from 1017.7 eV to beyond 1019.6 eV. With improved event reconstruction and an exposure 2.4 times larger than in our previous analysis, this work confirms and refines our conclusions on the mass composition at ultrahigh energies. The energy evolution of the mean Xmax exhibits a pronounced break at a cosmic-ray energy of about 1018.4 eV, providing direct, model-independent evidence for a change in the evolution of the mass composition. Independently, the observed decrease of the Xmax fluctuations with energy indicates a transition toward a heavier and less diverse primary mass composition. No statistically significant declination dependence of the Xmax distributions is observed within the exposure of the Observatory, consistent with an isotropic mass composition at the sensitivity of this analysis. The mean and standard deviation of the Xmax distributions, interpreted with air-shower simulations, yield the energy dependence of the average and variance of the logarithmic mass of cosmic rays arriving at Earth. Furthermore, energy-dependent fractional abundances of four representative primary--mass groups (p, He, CNO, Fe) are obtained by fitting the observed Xmax distributions in each energy bin with a weighted sum of elemental templates. These results provide strong evidence against a long-standing assumption that ultrahigh--energy cosmic rays are predominantly protons: above 1018.4 eV, the average cosmic-ray mass increases, accompanied by a steadily decreasing diversity in the elemental composition.

**PHYSICAL REVIEW D 114[4], 043016, 2026. DOI:** 10.1103/n616-15v5. Acesso em: **https://doi.org/10.1103/n616-15v5**

**[P304-2026] "Diamond-to-graphite transformation under hypersonic impact"**

Biswas, A.; Mote, A.; Sahu, R.; **Fabris, G. da S. L.*; Galvao, D. S.***; et al.

Consolidation of diamond particles into high-strength bulk materials and composites is extremely challenging as it requires high sintering temperatures, at which diamond transforms into graphite, making it impossible to retain the sintered diamond phase. Here we report a synthetic approach based on spark plasma sintering that allows the stabilization of micron-scale diamond grains in composites, using cubic boron nitride (cBN) as the matrix and cobalt (Co) particles as a stabilizer, resulting in a hard-to-machine, tough material. We performed hypersonic speed impact tests on the composites using metal projectiles of different sizes. The composite withstands impact from 01 mm metal projectiles (speed Mach 7.5) but breaks apart during the impact from a larger 04 mm metal projectile (speed Mach 8.45). Interestingly, during this microsecond-scale impact and fracture event, embedded diamond particles in the composite undergo near-complete phase transformation to graphite. In-depth micro-structural characterizations of the fractured composite, supported by the molecular dynamics simulations reveal details on the impact-induced phase transformation and the creation of diamondgraphite interfaces, suggesting that the energy absorption is primarily enabled via phase change of diamond. Our findings provide a pathway to stabilize the diamond phase and a new understanding of phase transformation of diamond under extreme conditions.

**MATERIALS TODAY 99, 103477, 2026. DOI:** 10.1016/j.mattod.2026.103477. Acesso em: **https://www.sciencedirect.com/science/article/pii/S1369702126003238**

**[P305-2026] "Dual Modulation of the Buried Interface in Inverted Perovskite Solar Cells With Heteroatom-Conjugated Asymmetric Self-Assembled Molecules"**

Wang, H. X.; Tan, Q.; Zhao, Z. Q.; Liang, Y. C.; Zheng, L. L.; Cai, B.; Wang, L. Q.; Chen, C.; Sun, L. C.; **Padilha, L. A.***; Cheng, M.; Li, L.

Self-assembled molecules (SAMs) have shown considerable promise as hole-selective layers (HSLs) in high-efficiency NiOx--based inverted perovskite solar cells (i-PSCs). However, inhomogeneous HSL formation caused by SAM detachment and intractable buried defects within the perovskite layer exacerbate interfacial energy losses, which limits further improvement in device efficiency and operational stability. Here, we propose a heteroatom-conjugated asymmetric SAM-additive (HASA) strategy that employs two novel SAMs, designated O-AS and S-AS, to address the issues of buried interface synergistically. These asymmetric expanded molecules are deposited on the NiOx surface and introduced into the perovskite precursor to achieve uniform molecular coverage and enhance perovskite crystallinity simultaneously. The dual modulation of the buried interface effectively optimizes the HSL uniformity, improves hole extraction/transfer, mitigates buried defects, and enhances the NiOx stability. Due to minimized interfacial energy loss, iPSCs treated by S-AS achieve a champion power conversion efficiency (PCE) of 26.49% (25.70% for steady-state output) and retain 97.3% of their initial PCE over 1100 h of maximum power point tracking under ISOS-L-2 testing protocol. This study presents an effective molecular synergetic approach to address SAM and buried--interface problems in iPSCs through molecular engineering.

**ADVANCED FUNCTIONAL MATERIALS 36[74], 2026. DOI:** 10.1002/adfm.77712. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1002/adfm.77712**

**[P306-2026] "Event-by-event vortex rings in fixed-target p+Ar collisions"**

**Chinellato, D.*;** Lisa, M.; **Serenone, W.***; Shen, C.; **Takahashi, J.*; Torrieri, G.***

We present event-by-event simulations for central asymmetric p+Ar collisions at √ s NN = 68 GeV to investigate the formation and evolution of vortex-ring structures from the early-stage longitudinal flow velocity profile. Our predictions for their imprints on Lambda hyperon's polarization observables are complementary to those presented in Ref. [Phys.Rev.C 110 (2024) 5, 054908] and can be explored in the future fixed-target collisions at the Large Hadron Collider beauty (LHCb) experiment.

**EPJ WEB OF CONFERENCES 364, p. 03008-03008, 2026. DOI:** 10.1051/epjconf/202636403008. Acesso em: **https://doi.org/10.1051/epjconf/202636403008**

**[P307-2026] "Evidence for J/ψ Suppression in Incoherent Photonuclear Production"**

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

According to quantum chromodynamics, at sufficiently high energy, the structure of hadrons reveals a dynamic equilibrium between gluon splitting and gluon recombination-a phenomenon known as saturation. The process of diffractive photonuclear production of a J/psi vector meson provides a direct insight into the gluon composition of hadrons. The J/psi production as a function of momentum transferred in the interaction, quantified by the Mandelstam-t variable, serves as an excellent probe for studying the structure of hadrons within the impact-parameter plane, because different ranges in t are sensitive to the dynamics of the gluon field at varying spatial size scales. The ALICE Collaboration has measured the energy dependence of incoherent photonuclear production of J/psi mesons off lead ions, at root s(NN) = 5.02 TeV, for three Mandelstam-t intervals. The energy dependence of the photonuclear cross section at the highest vertical bar t vertical bar range measured, (0.81 < vertical bar t vertical bar < 1.44) GeV2, is sensitive to subnucleonic structures of the Pb target. The increase of the cross section with energy at large vertical bar t vertical bar shows evidence of suppression with respect to the increase seen at low vertical bar t vertical bar. The observed pattern of the energy evolution in data is similar to that of gluon saturation models.

**PHYSICAL REVIEW LETTERS 137[5], 052301, 2026. DOI:** 10.1103/jmwb-75m7. Acesso em: **https://doi.org/10.1103/jmwb-75m7**

**[P308-2026] "Evidence for the Rare Decay B+ --> (Λ)overbarpμ+ μ-"**

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

A search for the rare decay B+ -> (Lambda) over barp mu(+) mu(-) is performed using proton-proton collision data recorded by the LHCb experiment at a center-of-mass energy of root s = 13 TeV, corresponding to an integrated luminosity of 5.4 fb(-1). An excess of events is found with respect to the background-only expectation, with a signal significance of 3.5 standard deviations, in the low invariant-mass region of m((Lambda) over barp) < 2.8 GeV/c(2). The branching fraction is measured to be B-low(B+ -> <(Lambda)over bar>p mu(+) mu(-)) = (1.70(-0.56)(+0.65)(stat) +/- 0.17(syst)+/- 0.14(ext)) x 10(-8), where the last uncertainty is due to external inputs on B(B+ -> J/psi(Lambda) over barp) x B(J/psi -> mu(+) mu(-)). With no significant signal observed in the high m((Lambda) over barp) region above 2.8 GeV/c(2), an upper limit is set to be B-high(B+ -> (Lambda) over barp mu(+) mu(-)) < 2.8(3.7) x 10(-9) at the 90% (95%) confidence level.

**PHYSICAL REVIEW LETTERS 137[5], 051801, 2026. DOI:** 10.1103/pl88-4435. Acesso em: **https://doi.org/10.1103/pl88-4435**

**[P309-2026] "f2(1270) --> π plus π as a probe of spin and vorticity in heavy-ion collisions"**

Park, I. W.; Kim, B.; **Torrieri, G.*; Gonçalves, K. J.***; Lim, S.; Lee, S. H.

The correlation between vorticity and spin alignment in heavy--ion collisions can be probed through polarization measurements of hadrons, whose total spin originates from both constituent--quark spins and orbital angular momentum in the quark-model framework. So far, experimental measurements have been limited to Lambda baryons and vector mesons, whose total spins are composed of quark spins in s-wave states within the quark model. Here, as a means to probe the vorticity structure in heavy-ion collisions, we highlight the importance of studying hadrons whose total spin is composed not only of quark spins but also includes contributions from the orbital angular momentum between quarks. To motivate such experimental studies, we calculate the general angular distribution of produced pion in f(2)(1270) - pi + pi using interaction Lagrangian and helicity formalism and check that both methods yield the same result. The distribution is given as a function of angle between pion and initial quantization axis of f(2) and the spin-density matrix element of f(2). Its diagonal entries and rho(20) component were computed assuming local thermal equilibrium and blast-wave model for different centrality classes, hence given as a function of azimuthal angle with respect to the impact parameter. This is to set a baseline for future comparison with experiment, as vorticity and spin will, in general, not be in equilibrium.

**PHYSICAL REVIEW C 114[3], 034907, 2026. DOI:** 10.1103/wlwy-dpj3. Acesso em: **https://doi.org/10.1103/wlwy-dpj3**

**[P310-2026] "Few-Electron Spin Qubits in Quantum Dots Probed Through Nuclear Spin Magnetism"**

Millington-Hotze, P.; Klenovsky, P.; Dyte, H. E.; Gillard, G.; Manna, S.; **Silva, S. F. C. da***; Rastelli, A.; Chekhovich, E. A.

The knowledge of the energy spectrum completely defines the dynamics of a quantum system for a given initial state. This makes spectroscopy a key characterization technique when studying or designing qubits and complex quantum systems. In semiconductor quantum dots, the electronic quantum states can be probed through charge transport or charge sensing, but the technique is practically limited to gatedefined quantum dots. Epitaxial quantum dots benefit from excellent optical properties, but are usually incompatible with charge transport, while alternative spectroscopy techniques provide only limited information. Here we demonstrate a spectroscopy technique which utilizes nuclear spins as a non-invasive probe. By using the cotunneling-assisted transfer of spin angular momentum instead of the charge currents we achieve near-equilibrium probing. Experiments are conducted on low-strain GaAs/AlGaAs epitaxial dots, revealing energy spectra for charge configurations with up to seven electrons and with resolution limited only by the thermal broadening. Beyond the few-electron energy spectroscopy, we apply noninvasive probing via nuclear spins to reveal the subtle many-body physics of the quantized electronic states. We map out the magnetic field dependence of the electron spin lifetimes, revealing an unusual inverse quadratic dependence. The rich variety of further observations includes the long-lived spin-qubit states in the p shell, electron ground-state phase transitions, strong spin-orbit coupling regimes, and an anomalously fast nuclear spin diffusion process. Experiments are backed up by good agreement with the first-principles configuration interaction numerical modeling. Our work uncovers few--electron states as a new operating regime for optically active quantum dots. Accurate control and probing of many-body states offers a test-bed system for fundamental physics studies, while prospective technological applications include electron spin qubits with extended coherence and scalable electrical control.

**PRX QUANTUM 7[3], 033028, 2026. DOI:** 10.1103/j8xw-w72c. Acesso em: **https://doi.org/10.1103/j8xw-w72c**

**[P311-2026] "First Measurement of Neutrino Emissions from Spent Nuclear Fuel by the Double Chooz Experiment"**

Abrahao, T.; Almazan, H.; Anjos, J. C. dos; **Kemp, E.***; et al. Double Chooz Collaboration

Neutrino emission from nuclear reactors provides real-time insights into reactor power and fuel evolution, with potential applications in monitoring and nuclear safeguards. Following reactor shutdown, a low-intensity flux of "residual neutrinos" persists due to the decay of long-lived fission isotopes in the partially burnt fuel remaining within the reactor cores and in spent nuclear fuel stored in nearby cooling pools. The Double Chooz experiment at the Chooz B nuclear power plant in France achieved the first quantitative measurement of this residual flux based on 17.2 days of reactor-off data. In the energy range where the residual signal is most pronounced, the neutrino detector located 400 m from the cores recorded 106 + 18 neutrino candidate events (5.9 sigma significance). This measurement is in excellent agreement with the predicted value of 88 + 7 events derived from detailed reactor simulations modeling the decay activities of fission products and incorporating the best-available models of neutrino spectra.

**PHYSICAL REVIEW LETTERS 137[6], 061803, 2026. DOI:** 10.1103/dr26-j19g. Acesso em: **https://doi.org/10.1103/dr26--j19g**

**[P312-2026] "Fock-state Filtering of Squeezed States: Enhanced Nonclassicality and Effects of a Thermal Bath"**

**Oliveira, J. P. G. de*; Vidiella-Barranco, A.***

The ability to tailor photon-number statistics is central to the generation and control of nonclassical states of light. Here, we investigate how Fock-state filtering of squeezed coherent states can be used to engineer their photon statistics. We consider the selective removal of the and Fock components and show that this process can enhance the sub-Poissonian character of the field, depending on the coherent amplitude. We then analyze the evolution of these engineered states in a thermal environment. Although all states eventually relax toward thermal statistics, the signatures of the filtering process may persist over a significant part of the evolution, while the purity of the filtered states is rapidly degraded by incoherent population redistribution. Our results illustrate both the potential and the limitations of photon-number engineering in realistic, dissipative settings.

**BRAZILIAN JOURNAL OF PHYSICS 56[6], 226, 2026. DOI:** 10.1007/s13538-026-02146-z. Acesso em: **https://doi.org/10.1007/s13538-026-02146-z**

**[P313-2026] "Gleb Wataghin and his mission in Brazil: a memoir"**

**Dobrigkeit, C.***

This contribution, based on a talk delivered at the Workshop Ukrainian Contributions to Particle Physics: History and Prospects, offers a personal memoir of Gleb Wataghin (1899-1986) and his role in the institutional development of modern physics at the University of S & atilde;o Paulo and in Brazil. Born in what is now Ukraine and educated in Turin, Wataghin joined the newly created university in S & atilde;o Paulo in 1934, where he helped establish a physics department and research school. He developed an internationally recognized cosmic-ray program and encouraged exchanges of students and researchers with leading scientific centres abroad. His students included Cesar Lattes, who participated in the discovery of the pion in 1947. After returning to Italy in 1949, Wataghin rebuilt the physics department in Turin while preserving strong ties with Brazil. This memoir is not intended as an archival study in the history of science.

Instead, it is written from the perspective of a physicist who knew Wataghin in Campinas and whose career in ultra-high-energy cosmic rays traces back to him through her PhD advisor, Cesar Lattes. Viewed through this scientific lineage, Wataghin's legacy combines scientific vision, institutional commitment, and intellectual leadership.

**EUROPEAN PHYSICAL JOURNAL H 51[1], 18, 2026. DOI:** 10.1140/epjh/s13129-026-00133-1. Acesso em: **https://doi.org/10.1140/epjh/s13129-026-00133-1**

**[P314-2026] "GLIM-defined malnutrition and cachexia are associated with overall survival in patients with hepatocellular carcinoma treated with sorafenib"**

Silva, A. G. C.; Manuel, Y. J. R. S.; Zarpelao, F. F.; Contriciani, R. E.; Kim, L. V.; Branbilla, S. R.; **Liveraro, G. S. S.*; Takahashi, J.*;** Antunes-Correa, L. de M.; Mendes, M. C. S.; Carvalheira, J. B. C.

BACKGROUND: Hepatocellular carcinoma (HCC) is a leading cause of cancer-related mortality worldwide, and prognosis in advanced stages remains poor despite systemic therapy. Malnutrition is common in HCC due to the combined impact of cancer and chronic liver disease and is associated with worse clinical outcomes. However, the prognostic relevance of malnutrition and cachexia defined by the Global Leadership Initiative on Malnutrition (GLIM) criteria in patients treated with sorafenib remains poorly established. METHODS: This retrospective single-center cohort study included adult patients with HCC treated with sorafenib between 2010 and 2018. Clinical, laboratory, and imaging data were extracted from electronic medical records. Body composition was assessed on CT images at the L3 level using an automated segmentation algorithm. Malnutrition was defined according to GLIM criteria (≥1 phenotypic and ≥1 etiologic criterion), and cachexia was defined as the coexistence of phenotypic criteria and systemic inflammation (NLR ≥2.3). The primary outcome was overall survival, analyzed using Kaplan-Meier curves and Cox proportional hazards models. All 21 possible GLIM criteria combinations were explored using univariable and multivariable Cox models, with correction for multiple testing using the Benjamini-Hochberg procedure. RESULTS: A total of 99 patients were included. GLIM-defined malnutrition was present in 51.5% and cachexia in 37.4%. Malnourished patients were older and had shorter duration of sorafenib therapy. They also exhibited greater weight loss, lower skeletal muscle index, reduced muscle radiodensity, and higher inflammatory burden (all $p < 0.05$). Cachectic patients showed significantly lower muscle mass, higher prevalence of low muscularity, and elevated NLR. During follow-up (93 deaths), cachexia (HR 1.67, 95% CI 1.09-2.55) and inflammation (HR 1.93, 95% CI 1.28-2.93) were associated with worse survival in univariable analysis. In multivariable models, both malnutrition (HR 1.60, 95% CI 1.00-2.54) and cachexia (HR 1.63, 95% CI 1.03-2.60) were independently associated with shorter overall survival. Exploratory analyses corrected for multiple testing showed the strongest associations for combinations integrating weight loss, low muscularity, and inflammation. CONCLUSION: GLIM-defined malnutrition and cachexia were independently associated with shorter overall survival in patients with hepatocellular carcinoma treated with sorafenib. These findings suggest that integrating nutritional, body-composition, and inflammatory parameters may provide clinically relevant prognostic information in this population.

**CLINICAL NUTRITION ESPEN 76, 105110, 2026. DOI:** 10.1016/j.clnesp.2026.105110. Acesso em**: https://www.sciencedirect.com/science/article/pii/S2405457726022072**

**[P315-2026] "Hardware-Efficient Hamiltonian Simulation via Trotter-Initialized Variational Optimization With Native Placement"**

**Luiz, F. S.*; Ferreira, P. N.*; Oliveira, M. C. de***

Compiling time-evolution operators into hardware-native gate sequences is a bottleneck for digital quantum simulation on noisy intermediate-scale quantum (NISQ) devices. Generic transpilation treats as an arbitrary unitary, discarding the structure of Hamiltonian dynamics and producing circuits exceeding hardware coherence limits.We introduce a structure-aware compilation framework that treats product-formula decompositions as synthesis primitives rather than simulation approximations. The method combines (1) native placement of Hamiltonian terms onto the hardware coupling map, (2) adaptive selection of Trotter blocks via a greedy discretization procedure, and (3) variational refinement using a Trotter-initialized ansatz.Across Heisenberg, Ising, and XY models with - qubits, compiled circuits achieve fidelities with near-linear scaling in entangling gates, while generic synthesis produces circuits orders of magnitude deeper. On IBM Torino hardware, shorter approximate circuits outperform deeper exact decompositions: a 27-CX circuit achieves higher hardware fidelity futher () than a 187-CX exact circuit.These results demonstrate that structure-aware approximate compilation outperforms exact structure-agnostic synthesis, providing a practical pathway for executing Hamiltonian dynamics without pulse-level control.

**ADVANCED QUANTUM TECHNOLOGIES 9[9], e70482, 2026. DOI:** 10.1002/qute.70482. Acesso em: **https://doi.org/10.1002/qute.70482**

**[P316-2026] "Hitherto Unrecognized Intermolecular Coulombic Decay Mechanism in Gases"**

**Falkowski, A. G.***; Kuleff, A. I.; Cederbaum, L. S.

Excited atoms and molecules can utilize their excess energy to ionize a neighboring system by a process named interatomic and intermolecular Coulombic decay (ICD). ICD is ultrafast, in the femtosecond regime, and has many modes of appearance. Ample applications of ICD have been reported spanning a wide range of fields and it is expected to be ubiquitous in nature. Essentially all the investigations on ICD were for weakly bound systems, like clusters and fluids. We demonstrate that, unexpectedly, ICD can be efficiently active in atomic and molecular gases in spite of the very large distances between the units. We uncover the underlying mechanism which is due to retardation and differs from the standard dipole-dipole interaction prevailing in weakly bound systems. The dynamics of ICD in gases is analyzed. The results considerably broaden the impact of ICD and open the gateway to new kinds of applications.

**JOURNAL OF THE AMERICAN CHEMICAL SOCIETY 148[33], p. 35635-35644, 2026. DOI:** 10.1021/jacs.6c06869. Acesso em: **https://doi.org/10.1021/jacs.6c06869**

**[P317-2026] "Hydrothermal modulation of surface chemistry and wettability governs selective HO2- electrogeneration on metal-free carbon catalysts"**

Bimbi Junior, F. E.; Costa Junior, O.; Fiori, I.; Souto, R. da S.; Lei, Y.; Ossonon, B. D.; Tavares, A. C.; **Siervo, A. de***; Rodrigues, L. A.; Barros, W. R. P.; Lanza, M. R. de V.

The electrochemical production of hydroperoxide (HO2-) via the two-electron oxygen reduction reaction (2e- ORR) is a sustainable alternative to the conventional anthraquinone process. Herein, we systematically investigate the influence of hydrothermal treatment on the surface chemistry, wettability, and electrocatalytic performance of three structurally distinct metal-free carbon catalysts: electrochemically exfoliated graphene oxide (EGO), Printex L6 carbon (PL6C), and Printex XE2B carbon (PXE2BC).

Physicochemical characterization revealed material-dependent surface modifications while largely preserving the carbon framework of the Printex-derived materials. In contrast, EGO underwent more pronounced surface restructuring involving partial deoxygenation, increased defect density, and sheet corrugation. Rotating ring-disk electrode (RRDE) measurements demonstrated that hydrothermal treatment enhanced the selectivity of the 2e- ORR pathway, whereas gas diffusion electrode (GDE) experiments showed consistent improvements in HO2- accumulation, faradaic efficiency, and energy consumption by optimizing the balance between electrolyte accessibility and oxygen transport, thereby stabilizing the gas-liquid--solid three-phase interface. Among the evaluated materials, H-PL6C exhibited the best overall performance, achieving 407 mg L-1 of HO2- with a faradaic efficiency of 61.3% and an energy consumption of 31 kWh kg-1 at 50 mA cm-2, while maintaining excellent operational stability over five consecutive electrogeneration cycles. Overall, this work establishes a clear structure-property-performance relationship and identifies interfacial engineering of carbon catalyst layers as the key design strategy for developing efficient, durable, and scalable metal-free GDEs for decentralized HO2- electrogeneration.

**SUSTAINABLE ENERGY & FUELS 10[18], p. 4430-4449, 2026. DOI:** 10.1039/d6se00671j. Acesso em: **https://doi.org/10.1039/d6se00671j**

**[P318-2026] "Improved branching-fraction measurements of B(s)0 --> KS0h+ h'- decays and first observation of Bs0 --> KS0K+ K-"**

Aaij, R.; Abdelfatah, M.; Abdelmotteleb, A. S. W.; **Magalhaes, P. C.*;** et al.

This paper presents a study of the charmless three-body decays B-(s)(0) -> K(S)(0)h(+) h '(-)(where h(()')()) = pi, K), using a sample of pp collision data collected by the LHCb experiment during Runs 1 and 2 of the LHC, corresponding to an integrated luminosity of 9 fb(-1). The decay B-s(0) -> (KSK+)-K-0 K- is observed for the first time, and the following ratios of branching fractions are measured:
B(B-0 -> (KSK+K-)-K-0)/B(B-0 -> K-S(0)pi(+)pi(-)) = 0.578 +/- 0.007 +/- 0.017,
B(B-0 -> (KSK +/-)-K-0 pi(-/+))/B(B-0 -> K-S(0)pi(+) pi(-)) = 0.1363 +/- 0.0035 +/- 0.0051,
B(B-s(0) -> K-S(0)pi(+) pi(-))/B(B-0 -> K-S(0)pi(+) pi(-)) = 0.269 +/- 0.011 +/- 0.015 +/- 0.008,
B(B-s(0) -> (KSK+K-)-K-0)/B(B-0 -> K-S(0)pi(+)pi(-)) = 0.0303 +/- 0.0041 +/- 0.0025 +/- 0.0009,
B(B-s(0) -> (KSK +/-)-K-0 pi(-/+))/B(B-0 -> K-S(0)pi(+)pi(-)) = 1.818 +/- 0.021 +/- 0.031 +/- 0.056,
where the uncertainties are statistical, systematic, and due to knowledge of the ratio of hadronisation fractions of the B-s(0) and B0 mesons, respectively.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 071, 2026. DOI:** 10.1007/JHEP07(2026)071. Acesso em: **https://doi.org/10.1007/JHEP07(2026)071**

**[P319-2026] "Isothermal remanent magnetization measurements of oriented MnP nanoparticles embedded in a GaP epilayer"**

**Cruz, A. S. E.*;** Nateghi, N.; **Beron, F.*;** Lacroix, C.; Menard, D.

Isothermal remanent magnetization (IRM) measurements were conducted on MnP nanoparticles embedded within a GaP epilayer over a temperature range of 5-285 K and under applied magnetic fields up to 640 kA/m. A magnetic energy--based model was employed to estimate the critical volume at which spontaneous magnetization reversal occurs. The distributions of the magnetic diameter derived from IRM data at three temperatures were mutually consistent, but approximately 20% higher than that inferred from cross-sectional TEM micrographs on samples grown in the same conditions. Additionally, IRM measurements revealed a complex magnetization reversal process in MnP nanoparticles at applied fields below 200 kA/m. Magnetic energy calculations suggest that the observed behavior arises from a competition between magnetocrystalline anisotropy and surface anisotropy.

**JOURNAL OF MAGNETISM AND MAGNETIC MATERIALS 656, 174517, 2026. DOI:** 10.1016/j.jmmm.2026.174517. Acesso em: **https://www.sciencedirect.com/science/article/pii/S0304885326007092**

**[P320-2026] "Limits on the chiral magnetic effect from the event shape engineering and pvarticipant-spectator correlation techniques in Pb-Pb collisions at √sNN=5.02 TeV"**

Abdallah, D. A. H.; Abualrob, I. J.; Acharya, S.; **Jahnke, C.*; Liveraro, G. S. S.*; Oliveira, L. A. D.*; Takahashi, J.***; et al.
ALICE Collaboration

The latest experimental studies related to the search for the Chiral Magnetic Effect (CME) in Pb-Pb collisions at root s(NN) = 5.02 TeV recorded with the ALICE detector at the Large Hadron Collider (LHC) are presented. Charge-dependent two-particle correlations relative to the reaction plane are measured for charged particles in the pseudorapidity range |eta| < 0.8 and the transverse-momentum range 0.2 < p(T) < 5 GeV/c. Two approaches have been employed: in the first method, the contribution of the background to the measurement is varied using the event shape engineering (ESE), while the second relies on changing the contribution of the potential CME signal by measuring azimuthal correlations relative to the participant plane, where the background contributions are maximized, and spectator plane, where the CME signal contribution is maximized. Both methods yield results consistent with the absence of a CME signal within the measurement uncertainties. The result obtained from correlations relative to different symmetry planes, a technique applied for the first time at LHC energies, gives the possibility to test independently and confirm the upper limits from previous measurements, while the new limit from the ESE analysis offers improved constraint relative to previous attempts

**PHYSICS LETTERS B 880, 140672, 2026. DOI:** 10.1016/j.physletb.2026.140672. Acesso em: **https://www.sciencedirect.com/science/article/pii/S0370269326005241**

**[P321-2026] "Long-term monitoring of the optical performance of the primary mirrors at the Coihueco and Loma Amarilla sites of the Pierre Auger Observatory"**

Halim, A. A.; Abreu, P.; Aglietta, M.; **Chinellato, J. A.*; Dobrigkeit, C.*; Fauth, A. C.*; Reginatto Akim, J. V.*; Renno, M. Z.***; et al.
Pierre Auger Collaboration

This paper presents the results of an optical performance monitoring campaign for the primary mirrors installed in fluorescence telescopes at the Coihueco and Loma Amarilla sites at the Pierre Auger Observatory in Argentina. Since the end of 2003, this effort has developed into a unique long--term dataset that addresses the performance of the primary mirrors. We have focused on the scattering characteristics and specular reflectance of mirror segments, as well as their evolution over several years of operation. Despite being housed in climate-controlled buildings, dust accumulation, impurities, and natural aging - such as oxidation or other chemical or physical degradation processes - gradually deteriorate the specular reflectivity of the mirror segments. In this paper,

we summarize data collected over eight years of fluorescence telescope operation since the last major cleaning in autumn 2016. During this period, periodic in situ measurements were performed of scattering characteristics using two techniques: (1) specular and diffuse reflectance measurements at a wavelength of 670 nm using a portable scatterometer, and (2) spectral reflectance measurements in the range from 300 nm to 700 nm using an integrating sphere and a spectrometer. This study builds upon a previous monitoring campaign conducted between 2012 and 2017. The measurements show that the primary mirrors remain in acceptable condition after more than 20 years of operation.

**JOURNAL OF INSTRUMENTATION 21[6], P06040, 2026. DOI:** 10.1088/1748-0221/21/06/P06040. Acesso em: **https://iopscience.iop.org/article/10.1088/1748-0221/21/06/P06040**

**[P322-2026] "Machine learning techniques for jet reconstruction at LHCb and application to the search for H --> b(b) over-bar and H --> c(c)over-bar in √s=13 TeV pp collisions"**

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

Two machine learning techniques for jet measurements at the LHCb experiment are presented: a regression-based method for jet-energy calibration and a deep neural network algorithm for jet flavour tagging, distinguishing between b-quark, c-quark, and light parton jets. These techniques are applied to a search for inclusive H -> b (b) over bar and H -> c (c) over bar decays using a LHCb dataset corresponding to an integrated luminosity of 1.6 fb(-1). The observed (expected) 95% confidence level upper limits correspond to 6.6 (11.1) times the SM cross-section for the H -> b (b) over bar process, and 1003 (1834) times the SM cross-section for the H -> c (c) over bar process.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 276, 2026. DOI:** 10.1007/JHEP07(2026)276. Acesso em: **https://doi.org/10.1007/JHEP07(2026)276**

**[P323-2026] "Magnetoelastic coupling across competing ferromagnetic and ferrimagnetic orders in A-site-disordered NdSmNiMnO6"**

Attah-Baah, J. M.; Santos, C. dos; Silva Jr., R. S.; **Carvalho, M. H.***; Jucá, R. F.; Rezende, M. V. S.; Passamani, E. C.; Johnson, R. D.; Ferreira, N. S.

We show that the magnetic ground state of the double perovskite NdSmNiMnO6 is jointly controlled by A-site (Nd/Sm) mixing, B-site (Ni/Mn) ordering, and spin-lattice coupling, with the rare-earth sublattice actively participating in the low-energy magnetic balance. Synchrotron x-ray diffraction (SXRD) and Rietveld refinement establish a monoclinic (P21/n) structure with predominant B-site rocksalt order and measurable antisite disorder, while x-ray absorption near-edge structure identifies Ni2+ and Mn4+ valence states. Magnetometry reveals a ferromagnetic (FM) transition at TC approximate to 175 K driven by Ni2+-O-Mn4+ exchange, followed at lower temperature by a ferrimagneticlike (FiM) regime when the 3d and 4 f sublattices are magnetically ordered. Concomitantly, Raman modes exhibit anomalous hardening below TC and the refined SXRD lattice parameters display clear anomalies at the magnetic transitions, evidencing pronounced magnetoelastic coupling. Spin-polarized density functional theory captures this competition, yielding nearly degenerate FiM and FM solutions (Delta E approximate to 2 meV per 20-atom cell) and indicating that coupling of the rare-earth sublattice to the Ni-O-Mn network sets the energy balance. The ferrimagnetic solution carries local moments of similar to 1.6 & micro;B on Ni and similar to 3.0 & micro;B on Mn and remains insulating, with a gap of 1.6-1.7 eV. With spin-orbit coupling (SOC), the projected Sm3+ spin moment is strongly reduced (4.93 to 0.3 & micro;B), reflecting SOC-driven quenching of the Sm spin polarization, while the gap is nearly unchanged, indicating that the electronic structure is primarily stabilized by Ni/Mn 3d-O 2p hybridization. Our results provide a quantitative framework to disentangle rare-earth A-site magnetism from Ni-O-Mn exchange and to rationalize magnetoelastic responses in A-site-disordered double perovskites near competing magnetic states.

**PHYSICAL REVIEW B 114[9], 094408, 2026. DOI:** 10.1103/qjn8-rfhl. Acesso em: **https://doi.org/10.1103/qjn8-rfhl**

**[P324-2026] "Measurement of B meson production fraction ratios in proton-proton collisions at √s=13 TeV using open--charm and charmonium decays"**

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

Production fraction ratios of B+, B-0, and B-s(0) mesons are measured in proton-proton collisions at root s = 13 TeV using a special dataset recorded in 2018 with high-rate triggers designed to collect an unbiased sample of 10(10) b hadrons with the CMS experiment at the LHC. These data allow the study of the opencharm decays of B mesons (B(s) -> pi D-(s) where the D meson decays into fully hadronic final states. By utilizing known branching fractions and precise theoretical calculations, production fraction ratios as functions of B meson transverse momentum (p(T)) and rapidity (y) are measured using open--charm decays in the kinematic range of 8 < p(T) < 60 GeV and vertical bar y vertical bar < 2.25. In addition, the same dataset is used to measure the relative production fraction ratios with the charmonium decay channels [B-(s) -> XJ/psi with X indicating a K+, K*(892)(0), or phi(1020) meson] where the J/psi meson decays into a pair of muons. The open-charm results are used to normalize the relative production fraction ratios obtained from the charmonium samples. Measurements of the ratios of branching fractions of B meson decays to charmonium and open-charm final states are also reported, which will improve the world-average values of these ratios. Finally, we test isospin invariance in B meson production in proton-proton collisions and observe that it holds within the experimental precision.

**PHYSICAL REVIEW D 114[1], 012005, 2026. DOI:** 10.1103/36cv--vst3. Acesso em: **https://doi.org/10.1103/36cv-vst3**

**[P325-2026] "Measurement of the jet mass in hadronic decays of boosted W bosons at 13 TeV and extraction of the W boson mass"**

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

The jet mass of W bosons decaying to a quark-antiquark pair is measured in W+jets events from proton-proton collisions at a center-of-mass energy of 13 TeV. The data used were collected by the CMS experiment at the CERN LHC and correspond to an integrated luminosity of 138 fb(-1). Hadronic decays of W bosons with high momenta produce strongly collimated decay products due to the large Lorentz boost, and are reconstructed as single large-radius jets. These jets have a characteristic substructure that is exploited to distinguish them from the large background of quark- and gluon-initiated jets. The jet mass is computed using the soft-drop algorithm, which suppresses soft wide-angle radiation that leads to a broadening of the jet mass distribution. For the first time, unfolded measurements are presented of the double-differential W+jets cross section as a function of the jet transverse momentum and soft-drop mass.

From these distributions, the W boson mass is obtained, with a value of 80.83 +/- 0.55 GeV in a scheme with mass--dependent width, achieving the smallest uncertainty available today from an all-jets final state at a hadron collider.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 054, 2026. DOI**: 10.1007/JHEP07(2026)054. Acesso em: **https://doi.org/10.1007/JHEP07(2026)054**

**[P326-2026] "Measurement of the transverse-momentum fraction of strange hadrons from jet-like correlation structures in pp collisions at √s=13 TeV"**

Abdallah, D. A. H.; Abualrob, I. J.; Acharya, S.; **Jahnke, C.*; Liveraro, G. S. S.*; Oliveira, L. A. D.*; Takahashi, J.***; et al. ALICE Collaboration

The first measurements of the average transverse-momentum fraction (< z >) as a function of transverse momentum (p(T)) for strange baryons (Lambda and (Lambda) over bar) and strange mesons (K-S(0)), produced in mini-jets defined through angular correlations in pp collisions at root s = 13 TeV, are reported by the ALICE Collaboration at the LHC. The observable is obtained using a novel method, where the angular correlation between the strange hadrons and inclusive charged hadrons is weighted by the p(T) of correlated particles at small angular distance. As a function of strange particles'. p(T), the results reveal a flat trend for strange mesons and a decreasing trend for strange baryons in the measured p(T) region, indicating distinct hadronization mechanisms for K-S(0) and Lambda ((Lambda) over bar). The measurements are compared to Monte Carlo models, namely PYTHIA 8 (with both Monash and Color Rope tunes) and the AMPT (A Multi-Phase Transport) model with string melting. None of these models provides a satisfactory description of the < z > distributions at low and intermediate p(T).

**PHYSICS LETTERS B 880, 140766, 2026. DOI:** 10.1016/j.physletb.2026.140766. Acesso em: **https://www.sciencedirect.com/science/article/pii/S0370269326006179**

**[P327-2026] "Measurement of the X-ARAPUCA's absolute photon detection efficiency for the deep underground neutrino experiment's vertical drift far detector"**

Botogoske, G.; Bruni, F.; Calvo, E.; **Machado, A. A.*; Mendoca, A. P.*; Pagliuso, L.*; Pimentel, V.*; Segreto, E.*;** et al.

The DUNE experiment will implement a photon detection system composed of X-ARAPUCA (XA) devices. These trap incoming VUV photons by internal reflection in a wavelength shifter light guide to be collected onto silicon photomultiplier arrays, sensitive to visible light. In the baseline design, dichroic filters are used to prevent photons from escaping. The configuration proposed for DUNE's Vertical Drift (VD) (VD) module has been characterised in liquid argon for the first time using dedicated cryogenic setups developed at CIEMAT and INFN Naples. Additionally, several alternative configurations, based on the design optimisation studies of an R&D campaign, have been evaluated. The results show an efficiency of up to (4.5 +/- 0.4)% at 4.5 V overvoltage, representing a significant improvement over previous XA implementations. Most notably, configurations without dichroic filters show an improvement of up to 18%, attributed to transmittance losses in the dichroic filters.

**EUROPEAN PHYSICAL JOURNAL C 86[8], 971, 2026. DOI:** 10.1140/epjc/s10052-026-16190-1. Acesso em: **https://doi.org/10.1140/epjc/s10052-026-16190-1**

**[P328-2026] "Mechanisms Influencing Maximum Joint Range of Motion and Stiffness: A Narrative Review"**

**Lima, C. D.*;** Blazevich, A. J.

Joint 'flexibility' is an encompassing term influenced by both a joint's maximum range of motion (ROMmax) and its resistance to rotation, i.e. its stiffness. A critical amount of flexibility is thought to be important for both sports performance and daily and occupational tasks. Improvements in joint ROMmax, specifically, are often assumed to result from material and mechanical changes in the joint's soft tissue structures; however, they also may result from changes in sensory information relayed from peripheral receptors to the brain, or the interpretation of that information. Changes in psychological state mediated by pain, state arousal and other psychological factors can therefore influence the voluntary capacity of individuals to tolerate a stretch, and thus their ROMmax. Stiffness, on the other hand, may be affected by both muscular and non-muscular tissues, although the most important sources of stiffness are yet to be agreed upon. In this narrative review, we define important terms as well as the factors impacting stiffness and ROMmax. We assert that joint stiffness is affected by the extracellular matrix, intramuscular fat and water as well as fascicle rotation, and that these factors also by extension may affect ROMmax. While sarcomere (and fibre) stiffness is largely regulated by the giant protein titin, it plays a lesser role at the whole muscle level. Alternatively, ROMmax can be influenced by our processing of sensory information and the decisions we make (consciously or subconsciously) about our willingness to stretch further. Thus, cognitive and attention processes can influence an individual's decision to stop a stretch.

**SPORTS MEDICINE, 2026. DOI:** 10.1007/s40279-026-02491-8 Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1007/s40279-026-02491-8**

**[P329-2026] "Molybdenum Disulfide Bilayers Hybridized With Reduced Graphene Oxide Nanosheets for Enhanced Hydrogen Evolution Reaction"**

Brischi, B. F.; Frajtag, G.; Mariano, J. P. da S.; Ruela, L. F. M.; Verçosa, G. D.; **Fernandes, C. D.***; Santhiago, M.; Ferro, L. M. M.; Merces, L.

Two-dimensional (2D) molybdenum disulfide (MoS2) nanosheets have attracted attention as a promising and cost-effective alternative catalyst for the hydrogen evolution reaction (HER). However, its aggregation and poor conductivity limit its catalytic activity. Consequently, researchers are exploring ways to improve the conductivity and density of electroactive edges of MoS2 through hybridization with akin advanced 2D materials. Here, reduced graphene oxide (rGO) nanosheets are added to a liquid-phase-exfoliated MoS2 dispersion to create drop-casting hybrid MoS2@rGO electrodes for HER. The findings reveal the formation of 1.1 nm-thick MoS2 bilayers, with the catalytic performance of MoS2@rGO dependent on the degree of graphene oxide reduction. The rGO moderate reduction prevents the MoS2 bilayers from restacking, improves conductivity, retains oxygenated groups that enhance interlayer spacing, and exposes more electroactive edges. When hybridized with rGO at an optimal reduction time, the resulting system outperforms pristine MoS2 bilayers by attaining the overpotential of ca. 70 mV at 10 mA cm-2 along with a Tafel slope of ca. 46 mV dec-1. This shows that MoS2 bilayers hybridized with rGO offer a promising method for enhancing the electrocatalytic efficiency of MoS2-based electrodes, expanding opportunities for future strain and defect engineering, and high--end twist-angle assemblies for hybrid 2D-material systems.

**ADVANCED MATERIALS INTERFACES, 2026. DOI:** 10.1002/admi.70639. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1002/admi.70639**

**[P330-2026] "Multiplicity dependence of prompt and non-prompt J/ψ production at midrapidity in pp collisions at √s=13 TeV"**

Abdallah, D. A. H.; Abualrob, I. J.; Acharya, S.; **Jahnke, C.*; Liveraro, G. S. S.*; Oliveira, L. A. D.*; Takahashi, J.***; et al.
ALICE Collaboration

The yields of prompt and non-prompt J/psi and the fraction of non-prompt J/. are measured at midrapidity (| y| < 0.9) via the dielectron decay channel as a function of the midrapidity charged-particle multiplicity (|eta| < 0.9) in pp collisions at root s = 13TeV. The J/psi yields and the multiplicity are normalized by their average value in inelastic collisions. The multiplicity-dependent yield ratio between prompt J/psi and D-0 is reported. The multiplicity is further divided into three azimuthal regions with respect to the J/psi momentum: toward the J/psi emission direction, transverse, or opposite to it. A stronger-than-linear increase of the self-normalized yields is observed for both prompt and non-prompt J/. production, with similar trends. This behaviour is also observed in the toward region, while a weaker increase is observed in the transverse and away regions.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 051, 2026. DOI:** 10.1007/JHEP07(2026)051. Acesso em: **https://doi.org/10.1007/JHEP07(2026)051**

**[P331-2026] "Nanoscale Mapping of Magnetic Orientations with Complex X-Ray Magnetic"**

**Raboni-Ferreira, M.*;** Daurer, B. J.; Neethirajan, J.; Apseros, A.; Kaulich, B.; Ruiz-Gómez, S.; Kazemian, M.; Donnelly, C.

Compensated magnets are of increasing interest for both fundamental research and applications, with their net-zero magnetization leading to ultrafast dynamics and robust order. To understand and control this order, nanoscale mapping of local domain structures is necessary. One of the main routes to mapping antiferromagnetic order is x-ray magnetic linear dichroism (XMLD), which probes the local orientation of the Neel vector. However, XMLD imaging typically suffers from weak contrast and has mainly been limited to surface-sensitive techniques. Here, we harness coherent diffractive imaging to map the complex XMLD spectroscopically, and identify the phase linear dichroism as a high-contrast, high-resolution mechanism for imaging magnetic order. By applying x-ray spectroptychography to a model sample, we retrieve the full complex XMLD spectrum. Combining this with hierarchical clustering, we resolve the spatial distribution of probed domains by their distinct spectral signatures, providing a robust method for analyzing magnetic configurations with weak signals. Our results show that phase contrast is significantly stronger than the corresponding absorption contrast, offering higher spatial-resolution magnetic imaging. This approach establishes a reliable element- and orbital-sensitive tool for studying compensated magnets.

**PHYSICAL REVIEW LETTERS 137[12], 126702, 2026. DOI:** 10.1103/xybk-9c9l. Acesso em: **https://doi.org/10.1103/xybk-9c9l**

**[P332-2026] "Observation of a spin-textured nematic Kondo lattice"**

Jiang, Y. X.; Cheng, Z. J.; Xu, Q. Z.; Hossain, M. S.; Yang, X. P.; Yin, J. X.; Litskevich, M.; Cochran, T. A.; Kim, B.; **Miranda, E.***; Ran, S.; Fernandes, R. M.; Hasan, M. Z.

The Kondo lattice model, as one of the most fundamental models in condensed matter physics, has been employed to describe a wide range of quantum materials. Discovering new phases on the Kondo lattice and unveiling their mechanisms are crucial to the understanding of strongly correlated systems. Here, in a layered Kondo magnet USbTe, we observe a spin-textured nematic state and visualize a heavy electronic liquid-crystal phase. Employing scanning tunneling microscopy and spectroscopy (STM/STS), we visualize a tetragonal symmetry breaking of heavy electronic states around the Fermi level, which coincides with the formation of heavy quasi-particles driven by band hybridization. Remarkably, using spin-polarized STM, we demonstrate that the nematic state is spin-polarized, which not only suggests its intrinsically electronic nature but also represents the unique magnetic texture of nematic heavy fermions. Our findings unveil a novel correlation-mediated order whose mechanism is inherently tied to Kondo-lattice physics. The observation of heavy nematic states enriches the phase diagram of correlated systems and provides a rare platform to explore the interplay of Kondo physics, spontaneous symmetry breaking, and quantum criticality.

**NATURE COMMUNICATIONS 17[1], 10433, 2026. DOI:** 10.1038/s41467-026-74841-z. Acesso em: **https://doi.org/10.1038/s41467-026-74841-z**

**[P333-2026] "Observation of CP Violation in B0 --> J/ψρ (770)0 Decays"**

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

The time-dependent CP asymmetry in B-0 -> J/psi rho (770)(0) decays is measured using proton-proton collision data corresponding to an integrated luminosity of 6 fb(-1), collected with the LHCb detector at a center-of-mass energy of 13 TeV during the years 2015-2018. The CP-violation parameters for this process are determined to be 2 beta(eff)(c (c) over bard) = 0.710 +/- 0.084 +/- 0.051 rad and vertical bar lambda vertical bar = 1.019 +/- 0.034 +/- 0.024, where the first uncertainty is statistical and the second systematic. This constitutes the first observation of timedependent CP violation in B-0 -> J/psi rho (770) (0) decays. Assuming approximate SU(3) flavor symmetry, these results are combined with the previous consistent LHCb measurement to set the most stringent constraint on the penguin contribution, Delta phi(s), to the CP-violating phase phi(s) in B-0 -> J/psi phi (1020) decays, yielding Delta phi(s) = 5.0 +/- 4.6 mrad.

**PHYSICAL REVIEW LETTERS 137[3], 031803, 2026. DOI:** 10.1103/6f6r-51br. Acesso em: **https://doi.org/10.1103/6f6r-51br**

**[P334-2026] "Observation of the Doubly Charmed Baryon Ξcc+ with the LHCb Run 3 Detector"**

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

The first observation of the doubly charmed baryon Xi(+)(cc) is reported through its decay to the Lambda(+)(c) K- pi(+) final state, with a statistical significance exceeding seven standard deviations. The observation is made using proton-proton collision data collected in 2024 with the LHCb Run 3 detector at a center-of-mass energy of 13.6 TeV, corresponding to a total integrated luminosity of 6.9 fb(-1). The Xi(+)(cc) mass is measured to be 3619.97 +/- 0.83 +/- 0.26(-1.30)(+1.90) MeV/c(2), where the first uncertainty is statistical, the second is systematic, and the third is due to the unknown Xi(+)(cc) lifetime, which is assumed to lie in the range 15-160 fs with a baseline value of 45 fs. The difference between the masses of the Xi(+)(cc) and Xi(++)(cc) baryons is determined to be -1.77 +/- 0.84 +/- 0.15(-1.30)(+1.90) MeV/c(2). This is the first observation of a new particle made with the LHCb Run 3 detector.

**PHYSICAL REVIEW LETTERS 137[2], 021902, 2026. DOI:** 10.1103/dmv6-7gdv. Acesso em: **https://doi.org/10.1103/dmv6-7gdv**

**[P335-2026] "Optical sensors based on agar-made biodegradable waveguides"**

Fujiwara, E.; Osório, J. H.; **Cordeiro, C. M. B.***

Optical waveguides made of soft biodegradable materials are emerging technologies for illumination, light manipulation, and surveillance in microfluidics, biomedical, and environmental applications. Agar, a renewable and edible phycocolloid, stands out among other hydrogels as a low-cost, moldable, transparent, and thermoreversible alternative to create standard and structured optical devices whose mechanical and optical properties are tailored by the gel composition. Therefore, this paper presents an overview of recent developments and perspectives of agar-made optical fibers for physical and biochemical sensing. Variations in the hydrogel structure and refractive index induced by mechanical, thermal, and chemical stimuli modulate the average intensity or the interference between multiple guided modes, yielding a sensitive response traceable via optical loss or speckle pattern analyses. Surrounding fluids and relative humidity changes also affect the gel characteristics through syneresis and swelling effects, whereas mineral impurities provide electrical conductivity and convey current measurements. Ultimately, one may explore the gel's ability to encapsulate microorganisms for evaluating biochemical parameters throughout degeneration. Discussions on the merits and limitations of agarose waveguides provide insights into the development of practical optical probes for in vivo applications, ensuring biocompatibility and safe absorption/excretion by the organism after accomplishing sensing tasks.

**PHYSICA SCRIPTA 101[34], 342001, 2026. DOI:** 10.1088/1402-4896/ae9b47. Acesso em: **https://iopscience.iop.org/article/10.1088/1402-4896/ae9b47**

**[P336-2026] "Preferential Solvation of Mg2+ in Ethanol-Water Mixtures Probed by Intermolecular Coulombic Decay and Molecular Dynamics Simulations"**

Hafiani, O. H.; Pereira, A. M.; Costa, L. T.; Pugini, M.; Gholami, S.; Velasquez, N.; Trinter, F.; Ismail, I.; Marinho, R.; Mocellin, A.; **Brito, A. N. de***; Caleman, C.; Tomanik, L.; Winter, B.; Bjorneholm, O.; Ohrwall, G.

The microsolvation of Mg2+ ions in ethanol-water mixtures was investigated using intermolecular Coulombic decay (ICD) after Mg 1s ionization, a nonlocal relaxation process involving the ejection of valence electrons from molecules in the first solvation shell. As the solvent composition shifts from pure water to pure ethanol, the ICD spectral shape evolves, and its total intensity decreases by 20% relative to the local Mg KLL Auger decays. Spectral analysis reveals that Mg2+ ions are preferentially solvated by water; a substantial contribution from ethanol is observed only at high ethanol concentrations. Molecular dynamics simulations corroborate the experimental results, and together they provide quantitative understanding for the changes in solvation-shell composition, revealing a substantial enrichment of water in the solvation shell relative to the bulk solvent composition.

**ACS PHYSICAL CHEMISTRY AU 6[5], p. 1062-1069, 2026. DOI:** 10.1021/acsphyschemau.6c00039. Acesso em: **https://doi.org/10.1021/acsphyschemau.6c00039**

**[P337-2026] "Probing Local HER Activity in ZrSe3 Single Nanoribbon Using an On-Chip Microdevice"**

Campos-Mata, A.; Nadarajan, R.; Junior, M. L. P.; Chattopadhyay, S.; Amiri, M.; **Ipaves, B.*; Galvao, D. S.***; Shaijumon, M. M.; Ajayan, P. M.

Quasi-one-dimensional (1D) crystals naturally expose a high fraction of edges, favorable terminations, and unsaturated coordination sites, especially at ribbon edges, which often bind H* more optimally than basal planes, showing advanced intrinsic catalytic activity. Evaluation of the intrinsic hydrogen evolution reaction (HER) activity of such low-dimensional electrocatalysts is often hindered by conventional bulk methodologies. On-Chip Electrocatalytic Microcells (OCEMs) address this limitation by enabling high-precision measurements at the single-nanomaterial level. Herein, we report liquid-phase exfoliation (LPE) to achieve quasi-1D ZrSe3 nanoribbons (NRs), and the intrinsic HER activity of individual NRs were investigated using OCEMs for the first time. OCEM measurements on a single ZrSe3 NR yielded an overpotential of 431 mV at 10 mA cm-2 and a low Tafel slope of 82.3 mV dec-1, which is vastly superior to the activity obtained using conventional bulk methods, showing 730 mV overpotential and 138 mV dec-1 Tafel slope. Our multi-scale structure-property investigation, combining DFT calculations, revealed that the (210) crystallographic facet is more favorable active site over the conventionally expected (001) surface plane. Therefore, these findings demonstrate the potential of OCEMs for evaluating quasi-1D materials and provide the mechanistic detail needed to advance the rational design of low-dimensional electrocatalysts based on precise structure-property relationships.

**ADVANCED FUNCTIONAL MATERIALS 36[78], 2026. DOI:** 10.1002/adfm.77920. Acesso em: **https://doi.org/10.1002/adfm.77920**

**[P338-2026] "Probing the onset of collectivity via scaled particle spectra in ultrarelativistic nuclear collisions"**

Domingues, T. S.; Gardim, F. G.; Chinellato, D. D.; Denicol, G. S.; Giannini, A. V.; Luzum, M.; **Muncinelli, C. D.***; Noronha, J.; Silva, T. N. da; **Takahashi, J.*; Torrieri, G.***

We identify a novel scaling in the transverse momentum spectra of produced particles, obtained by removing the global scales of multiplicity and mean transverse momentum. Hydrodynamic simulations and experimental data reveal an almost universal scaled spectrum across centralities, systems, and even small systems, pointing to its origin in the collective, fluid-like dynamics of the QGP. Comparing this observable with Bayesian a priori distributions shows its independent constraining power on QCD transport properties, while also exposing limitations of current models. A detailed posterior analysis will be pursued in future work, opening a new avenue to refine our understanding of collectivity in heavy-ion collisions.

**EPJ WEB OF CONFERENCES 364, p. 04011-04011, 2026. DOI:** 10.1051/epjconf/202636404011. Acesso em: **https://doi.org/10.1051/epjconf/202636404011**

**[P339-2026] "Quantum optimization algorithms for strongly correlated many-body systems"**

Pexe, G. E. L.; **Rattighieri, L. A. M.***; Prado, P. M.; Fritsch, A. R.; Fanchini, F. F.

This perspective assesses quantum algorithms for phase transitions and low-energy properties of strongly correlated many-body systems in the noisy intermediate-scale quantum era. We compare the variational quantum eigensolver (VQE), the quantum approximate optimization algorithm (QAOA), feedback-based protocols such as Feedback-based ALgorithm for Quantum OptimizatioN (FALQON), adaptive variational methods, and quantum-subspace approaches.

The comparison separates circuit depth, classical processing, and measurement overhead because no single metric establishes uniform superiority. We discuss symmetry-preserving and particle-number-conserving circuits, tensor-network-assisted initialization, variational imaginary-time evolution, Sample--based Krylov quantum diagonalization, and basis-adaptive algorithms. These methods are connected to deconfined quantum criticality, strange metals, many-body localization, topological transitions, and quantum spin liquids, with order--of-magnitude resource windows and measurement bottlenecks stated explicitly. Feedback-guided methods remove a high-dimensional external optimizer and can preserve selected symmetries, but exchange these advantages for layer-by--layer commutator measurements, progressive circuit growth, and sensitivity to noise. The available evidence therefore supports a problem-dependent portfolio of physics-informed, symmetry-aware, and classically assisted algorithms rather than a universal ranking among VQE, QAOA, and FALQON.

**JOURNAL OF PHYSICS-CONDENSED MATTER 38[37], 371501, 2026. DOI:** 10.1088/1361-648X/ae9dd5. Acesso em: **https://iopscience.iop.org/article/10.1088/1361-648X/ae9dd5**

**[P340-2026] "Radiation Effects in p-GaN/AlGaN/GaN HEMTs: A Cross-Source Investigation"**

Vilas-Boas, A. C.; **Alberton, S. G.***; Silva, T. A.; Garcia, P. R.; Medina, N. H.; Aguiar, V. A. P.; Santos, R. B. B.; Giacomini, R. C.; Cavalcante, T. C.; Seixas, L. E.; Finco, S.; Palomo, F. R.; Guazzelli, M. A.

This work presents a comprehensive experimental investigation of radiation effects on p-GaN/AlGaN/GaN high-electron-mobility transistors (HEMTs) under 14 MeV neutrons, 10 keV X-rays, and 1.25 MeV gamma-rays. A comparative assessment distinguishes the contributions of displacement damage (DD), total ionizing dose (TID), and single-event effects (SEE), as well as their possible combined interactions. Distinct degradation trends were observed depending on the irradiation source, revealing different underlying physical mechanisms. The threshold voltage exhibited a maximum negative shift of-0.46 V. The maximum transconductance decreased by approximately 50 mS only under X-ray irradiation, whereas gamma-rays and neutrons produced negligible degradation. Similar degradation trends under neutron and gamma-ray irradiation suggest that the Co-60 gamma-ray source may induce not only TID effects but also a measurable DD contribution, indicating a potential combined TID and DD degradation mechanism under the investigated conditions. The on-state resistance exhibited source-dependent behavior, decreasing by about 55 m Omega under gamma-rays and increasing by about 255 m Omega under neutrons, while remaining nearly unchanged under X-rays. Moreover, the subthreshold slope remained practically unaffected across all irradiation conditions, demonstrating the device's intrinsic radiation robustness. These findings indicate that 1.25 MeV gamma-ray irradiation may not be suitable for isolating TID effects in GaN HEMTs, whereas 10 keV X-rays are identified as the most appropriate irradiation source for exclusive TID investigations in electronics. The results establish practical guidelines for selecting irradiation sources and improving the accuracy and reliability of radiation qualification methodologies for GaN-based electronics intended for space and other radiation-harsh environments.

**IEEE ACCESS 14, p. 144080-144091 , 2026. DOI:** 10.1109/ACCESS.2026.3733606. Aceso em: **https://ieeexplore.ieee.org/document/11690549**

**[P341-2026] "Range of dose enhancement factor for gold nanoparticles in radiotherapy using Monte Carlo simulations"**

Li, W. B.; **Bernal, M. A.***; Francis, Z.

Gold nanoparticles (GNPs) have been widely investigated as radiosensitizers in preclinical radiotherapy studies and are now advancing into clinical trials. To enhance tumour targeting, various molecular vectors are conjugated with GNPs. The localized radiation energy deposited near GNPs mainly originates from photoelectrons, Auger electrons, x-ray fluorescence, and Compton electrons, resulting in higher tumour doses compared to conventional radiotherapy. Due to the nanometer-scale size of GNPs, the energy from secondary low-energy electrons is confined to nanometer to micrometer ranges, making direct dose measurements impractical. Monte Carlo (MC) simulations are therefore commonly employed to estimate absorbed dose distributions around GNPs under different experimental conditions. However, published MC results show significant variability due to diverse simulation parameters. This review presents a quantitative analysis of reported dose distributions and dose enhancement factors (DEFs) from MC simulations. It also discusses the range of physical radiation doses and DEFs for GNPs irradiated by various radiation types, including kV/MV x-rays, synchrotrons, electrons, protons, heavy ions, and therapeutic radionuclides. To support understanding of the dose enhancement mechanisms, the underlying physical interaction processes of these radiation types with water and gold are reviewed. The range of reported DEFs helps bridge the gap between physical dose enhancement and observed biological effects. Finally, we recommend a qualitative estimate of the contribution of chemical species produced by the GNPs interactions to the consequent enhanced biological effects. This allows total dose enhancement from GNPs in radiotherapy, considering physical and chemical aspects, to be estimated using MC simulations as a complement to experiments.

**RADIATION AND ENVIRONMENTAL BIOPHYSICS, 2026. DOI:** 10.1007/s00411-026-01245-4. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1007/s00411-026-01245-4**

**[P342-2026] "Reconstruction of atmospheric neutrinos in DUNE's horizontal-drift far-detector module"**

Abbaslu, S.; Abd Alrahman, F.; Abud, A. A.; **Adriano, C.*; Merlo, R. B.*; Aguiar, R. de*; Holanda, P. C. de*; Mendonca, A. P. A. de*; Gelli, B.*; Gratieri, D. R.*; Guzzo, M. M.*; Kemp, E.*; Machado, A. A.*; Marques, F. das C.*; Peres, O. L. G.*; Pimentel, V. L.*; Paixao, L. G. P.*; Segreto, E.*;** et al.
DUNE Collaboration

This paper reports on the capabilities in reconstructing and identifying atmospheric neutrino interactions in one of the Deep Underground Neutrino Experiment's (DUNE) far detector modules, a liquid argon time projection chamber (LArTPC) with horizontal drift (FD-HD) of ionization electrons. The reconstruction is based upon theworkflow developed for DUNE's long-baseline oscillation analysis, with some necessary machine-learning models' retraining and the addition of features relevant only to atmospheric neutrinos such as the neutrino direction reconstruction. Where relevant, the impact of the detection of the charged particles of the hadronic system is emphasized, and comparisons are carried out between the case when lepton--only information is considered in the reconstruction (as is the case for many neutrino oscillation experiments), versus when all particles identified in the LArTPC were included. Three neutrino direction reconstruction methods have been developed and studied for the atmospheric analyses: using lepton--only information, using all reconstructed particles, and using only correlations from reconstructed hits. The results indicate that incorporatingmore than just lepton information significantly improves the resolution of both neutrino direction and energy reconstruction.The angle reconstruction algorithms developed in this work result in no strong dependence on particle direction for reconstruction efficiencies or neutrino flavor identification. This comprehensive review of the reconstruction of atmospheric neutrinos in DUNE's FD-HD LArTPC is the first step towards developing a first neutrino oscillation sensitivity analysis, which will ready DUNE for its first measurements.

**EUROPEAN PHYSICAL JOURNAL C 86[7], 904, 2026. DOI:** 10.1140/epjc/s10052-026-15911-w. Acesso em: **https://doi.org/10.1140/epjc/s10052-026-15911-w**

**[P343-2026] "Reforma curricular dos laboratórios de ensino básico de Física da Unicamp"**

**Araujo, L. E. E. de*; Barbosa, F. A. S.*; Assis, Pierre-Louis de*; Oliveira, S. G. de*; Deneke, C.*; Marcom, G. S.*; Zagonel, L. F.***

Resumo Disciplinas de física experimental estão tipicamente presentes tanto em cursos de Física quanto em diversas engenharias. Entretanto, o objetivo dessas disciplinas muitas vezes está mais ligado à verificação da física teórica do que à prática da física experimental propriamente dita ou à compreensão da Física como uma ciência experimental e, portanto, associada a conceitos intrínsecos como a incerteza das medidas e a incompletude dos modelos. Neste artigo, descrevemos como foi realizada uma reforma curricular nos laboratórios de ensino básico de Física do Instituto de Física Gleb Wataghin da Universidade Estadual de Campinas (Unicamp). Por meio dessa reforma, o foco das disciplinas passou a ser o desenvolvimento de habilidades relevantes para a física experimental, em oposição ao simples reforço da física teórica. As habilidades foram organizadas em três disciplinas, que compreendem: (1) um núcleo mínimo de habilidades, como a realização e o registro de medidas simples; (2) habilidades básicas, como a calibração de instrumentos; e, por fim, (3) a aplicação das habilidades adquiridas em projetos, de modo a estimular a autonomia dos estudantes. Os experimentos foram escolhidos de forma a evidenciar e trabalhar cada uma dessas habilidades. Essa estrutura é apresentada em detalhes, e uma proposta de implementação é discutida, incluindo exemplos de experimentos para as três disciplinas.

**REVISTA BRASILEIRA DE ENSINO DE FÍSICA 48, e20250548, 2026. DOI:** 10.1590/1806-9126-rbef-2025-0548. Acesso em: **https://doi.org/10.1590/1806-9126-RBEF-2025-0548**

**[P344-2026] "Reversible Structure Formation in 4,4-Bipyridine—Fe 2D Metal-Organic Frameworks on Au(111)"**

Steinbach, S.; Gezmis, A.; Steffen, J.; Ceccatto, A.; **Tonon, I.***; Waleska-Wellnhofer, N.; **Siervo, A. de***; Steinrück, H. P.

Surface-confined metal–organic frameworks (2D MOFs) provide a versatile platform for studying low-dimensional coordination chemistry and tunable molecular architectures at atomic and molecular levels. Here, we investigate the self-assembly of 4,4-bipyridine and Fe on Au(111) and reveal a coverage-dependent phase behavior governed by metal–ligand coordination and surface availability.In the absence of Fe, 4,4-bipyridine forms a weakly substrate-coupled molecular network stabilized by intermolecular interactions. Fe coordination induces a sequence of distinct two-dimensional architectures, ranging from dense three-fold-coordinated tripod networks to open Kagome lattices composed of hexagonally arranged metal centers bridged by molecular linkers. Using scanning probe microscopy, low-energy electron diffraction, and density-functional theory calculations, we identify three thermodynamically stable phases with different coordination numbers, symmetries, and molecular densities. Transformations between these phases are reversible and controlled by the Fe-to-ligand ratio. These findings demonstrate how subtle control over coordination chemistry and surface coverage enables programmable structural transitions in two-dimensional metal–organic frameworks.

**ADVANCED CHARACTERIZATION 1[1], p. 40-58, 2026. DOI:** 10.53941/ac.2026.100004. Acesso em: **https://www.sciltp.com/journals/ac/articles/2605003837**

**[P345-2026] "Review: Determining effective magnetic anisotropy in magnetic nanoparticles systems using DC-magnetometry methods"**

**Menezes, J. R. de*; Gomes, L. G.*;** Fabris, F.; Almeida, A. A. de; Tancredi, P.; **Barbosa, M.*; Silva, G. S. da*; Muraca, D.***

The effective magnetic anisotropy constant controls the thermal stability, relaxation dynamics, and performance of magnetic nanoparticles in applications such as magnetic hyperthermia, sensing, and data storage. However, reliably determining remains difficult because interparticle interactions, surface and interface effects, and structural heterogeneities strongly affect the magnetic response of MNP ensembles. This review critically examines four DC-magnetometry-based approaches to determine : N & eacute;el relaxation analysis, coercive field thermal decay, remanent magnetization decay, and a modified high-field Actis-Z & eacute;lis asymptotic expansion. Using representative magnetite and cobalt-doped ferrite nanoparticles, we systematically compare the assumptions, limitations, and applicability of each method. We show that conventional low-field methods intrinsically mix single-particle anisotropy with collective effects, causing systematic errors in . In contrast, the Actis-Z & eacute;lis high-field approach exploits large Zeeman energies to largely suppress interparticle coupling, enabling a more accurate determination of the intrinsic anisotropy barrier. By defining clear applicability criteria for each method, this work provides a consistent framework for extracting reliable anisotropy values and practical guidelines for interpreting magnetometry data in complex nanoparticle systems.

**JOURNAL OF MATERIALS SCIENCE 61[41], p. 31675-31706, 2026. DOI:** 10.1007/s10853-026-13671-2. Acesso em: **https://doi.org/10.1007/s10853-026-13671-2**

**[P346-2026] "Role of defects in the paramagnetism of Fe-doped Cs2AgBiBr6 double perovskite"**

Vasylkovskyi, V.; Trukhina, O.; Dörflinger, P.; Slipchenko, M.; Schmidt, W. G.; Biktagirov, T.; Sperlich, A.; Kultaeva, A.; **Kopelevich, Y.***; Dyakonov, V.

Transition-metal doping enables the introduction of spin functionality into halide double perovskites, while simultaneously modifying optical properties. Here, we combine controlled single-crystal growth, optical characterization, comprehensive electron paramagnetic resonance (EPR) spectroscopy, and first-principles modeling to identify the microscopic nature of Fe-related centers in Fe-doped Cs2AgBiBr6. Single crystals with nominal Fe3+ concentrations up to 15% in the precursor stage were grown using a controlled-cooling method, yielding reproducible Fe incorporation up to 0.1% with respect to Bi, without secondary phases. Despite this low concentration, Fe doping introduces electronic states that influence optical absorption and photoluminescence. EPR measurements reveal an S = 5/2 Fe3+-related center whose anisotropy follows the cubic-to-tetragonal phase transition below 120 K. Angular-dependent EPR resolves two configurations of this nearly axial spin center, with principal axes rotated by 90 degrees and aligned with the a/b plane of the tetragonal lattice. Density-functional calculations attribute these centers to impurity-vacancy complexes, most likely FeBi-VBr, that stabilize in a basal configuration of the low-temperature phase. This approach resolves vacancy-coupled defect orientations, narrowing possible models to Fe3+-vacancy complexes and establishing them as stable, orientation-sensitive spin probes of structural symmetry in halide double perovskites, while providing a microscopic basis for tuning their magnetic and optical responses.

**PHYSICAL REVIEW MATERIALS 10[8], 084410, 2026. DOI:** 10.1103/dvyv-893w. Acesso em: **https://doi.org/10.1103/dvyv-893w**

**[P347-2026] "Scalar nonstandard neutrino interactions in galactic supernovae"**

Dutta, B.; Karthikeyan, A.; Mishra, N.; **Porto, Y.*;** Strigari, L. E.

We analyze the prospects for studying scalar nonstandard interactions (SNSI) using the neutrino burst from a galactic supernova (SN). SNSI modifies the resonant flavor conversion and, correspondingly, the neutronization burst signal, and may be identifiable in future multi-tonne-scale experiments, such as Deep Underground Neutrino Experiment (DUNE). Notably, in the normal mass ordering, SNSI can lead to an anomalous (re)appearance of the neutronization-burst nu e peak at Earth, a feature otherwise strongly suppressed in the Standard Model. We show that, in the presence of SNSI, neutrinos propagating out of the dense SN environment acquire a density-squared-dependent contribution to their mass-squared differences, which in turn modifies the energy levels of the neutrino matter eigenstates. This density--squared effect is absent in less dense environments such as the Earth or the Sun and is precisely what enables SN neutrinos to probe SNSI parameters up to 4 orders of magnitude below the values accessible to solar or terrestrial neutrino sources.

**PHYSICAL REVIEW D 114[5], 055024, 2026. DOI:** 10.1103/lgkg-tf2y. Acesso em: **https://doi.org/10.1103/lgkg-tf2y**

**[P348-2026] "Search for heavy resonances decaying into two Higgs bosons in the b(b)over-bar τ+τ- final state in proton--proton collisions at √s=13 TeV"**

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

A search is presented for massive narrow-width resonances in the mass range of 1-4.5 TeV, decaying into pairs of Higgs bosons (HH). The search uses proton-proton collision data at a center--of-mass energy of 13 TeV collected with the CMSdetector at the CERN LHC during 2016-2018, corresponding to an integrated luminosity of 138 fb(-1). The analysis targets final states where one Higgs boson decays into a pair of bottom quarks and the other into a pair of tau leptons, X -> HH -> b (b) over bar tau(+) tau(-). It uses a single large radius jet to reconstruct the H -> b (b) over bar decay, while the H -> tau(+)tau(-) decay products can either be contained within a single large radius jet or appear as two isolated tau leptons. The observed data are consistent with standardmodel background expectations. Upper limits at 95% confidence level are set on the production cross section for resonant HHproduction for masses between 1 and 4.5 TeV. This analysis sets the most sensitive limits to date on X -> HH -> b (b) over bar tau(+)tau(-) decays in the mass range of 1.4-4.5 TeV.

**EUROPEAN PHYSICAL JOURNAL C 86[7], 901, 2026. DOI:** 10.1140/epjc/s10052-026-15699-9. Acesso em: **https://doi.org/10.1140/epjc/s10052-026-15699-9**

**[P349-2026] "Search for Higgs boson pair production in the b(b)over-barWW decay channel with two leptons in the final state using proton-proton collision data at √s=13.6 TeV"**

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

A search for Higgs boson pair production is presented, targeting final states where one Higgs boson decays to a bottom quark-antiquark pair and the other Higgs boson decays to two W bosons, both of which decay leptonically, to an electron or a muon, and a neutrino.For the first time, the search is conducted with proton-proton collision data from the LHC at root s = 13.6 TeV, recorded with the CMS detector in 2022 and 2023 and corresponding to an integrated luminosity of 62 fb(-1). The results are consistent with the standard model predictions. An upper limit of 12.0 times the standard model prediction at 95% confidence level is set on the Higgs boson pair production cross section, with an expected limit of 18.5. The results are also used to constrain the strength of the trilinear self-coupling of the Higgs boson, as well as of the quartic coupling between two Higgs bosons and two vector bosons.

**JOURNAL OF HIGH ENERGY PHYSICS [8], 019, 2026. DOI:** 10.1007/JHEP08(2026)019. Acesso em: **https://doi.org/10.1007/JHEP08(2026)019**

**[P350-2026] "Search for Higgs boson production at high transverse momentum in the WW decay channel in proton--proton collisions at √s=13 TeV"**

Hayrapetyan, A.; Tumasyan, A.; Adam, W.; **Chinellato, J. A.*; et al.**
CMS Collaboration

A search for Higgs boson (H) production at high transverse momentum (p(T)) in the WW decay channel is presented. The analysis uses proton-proton collisions at root s = 13TeV recorded by the CMS experiment in 2016-2018, corresponding to an integrated luminosity of 138 fb(-1). The visible decay products of the Higgs boson are reconstructed as a single large-radius jet with one isolated lepton or none (1l and 0l, respectively; l = e, mu). The H-candidate jets are identified using an advanced transformer-based algorithm and are calibrated with the Lund jet plane reweighting technique. The 1 l channel is further split into gluon fusion, vector boson fusion, and associated production with hadronically decaying vector boson categories, while the 0l channel considers all production processes inclusively. The measured cross section times the H -> WW branching fraction relative to the standard model expectation is mu = -0.19(-0.46)(+0.48), indicating no evidence of a signal above the background. This measurement represents the first dedicated study of highly Lorentz-boosted H -> WW decays, complementing earlier searches for high- pT Higgs boson in other decay channels.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 248, 2026. DOI:** 10.1007/JHEP07(2026)248. Acesso em: **https://doi.org/10.1007/JHEP07(2026)248**

**[P351-2026] "Search for single production of a vector-like T quark decaying to a top quark and a neutral scalar boson in the lepton plus jets final state in proton-proton collisions at √s=13 TeV"**

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

A search for single production of a vector-like T quark with charge 2e/3, decaying to a top quark and a neutral scalar boson is presented. The boson can be a standard model Higgs boson (H) or a new scalar boson (phi). In the first case, a branching fraction of 25% is assumed for the decay T -> tH, while in the second case the T quark is assumed to decay exclusively to t phi. The top quark is identified via its lepton+jets decay, and the neutral boson via its decay into a bottom quark-antiquark pair. Final states with Lorentz-boosted topologies are considered and machine-learning techniques are exploited for optimal event classification. The analysis uses data collected by the CMS experiment in proton-proton collisions at a center-of-mass energy of 13 TeV, corresponding to an integrated luminosity of 138 fb(-1) recorded at the CERN LHC in 2016-2018. Upper limits at 95% confidence level are set on the product of cross section and branching fraction for a T quark in a narrow-width approximation. They vary between 14.7 and 0.1 fb, for T quark masses in the range 1.3-3.0TeV and phi boson masses in the range 25-250 GeV.

These are the first exclusion limits set on the production of a single T quark decaying into a top quark and a new neutral scalar boson. For the decay channel into a top quark and a standard model Higgs boson, the results provide the best limits on production cross sections to date, for T quark masses above 2TeV.

**JOURNAL OF HIGH ENERGY PHYSICS [7], 041, 2026. DOI:** 10.1007/JHEP07(2026)041. Acesso em: **https://doi.org/10.1007/JHEP07(2026)041**

**[P352-2026] "Search for the Lepton-Flavor Violating Decays B+ --> π+ μ± e-->"**

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

The first search for the lepton-flavor violating decays B+ -> pi(+) mu(+/-) e(-/+) in proton-proton collisions is presented, using data collected by the LHCb experiment between 2011 and 2018, corresponding to an integrated luminosity of 9 fb(-1). No significant signal is observed and an upper limit on the branching fraction is set at B(B+ -> pi(+) mu(+/-) e(-/+)) < 1.8 x 10(-9) at the 90% confidence level, 2 orders of magnitude more restrictive than the most stringent upper limit to date. This is the first constraint on lepton-flavor violating b -> d quark transitions at the LHC and also sets the most stringent upper limits to date on b -> d mu(+/-)e(-/+) transitions. Limits on left-handed and scalar scenarios beyond the standard model are also reported.

**PHYSICAL REVIEW LETTERS 137[6], 061802, 2026. DOI:** 10.1103/ln8k-mlhr. Acesso em: **https://doi.org/10.1103/ln8k--mlhr**

**[P353-2026] "Strangeness production as a function of charged-particle multiplicity in proton-proton collisions at √s=5.02 TeV"**

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

Multi-)strange particle production rates and transverse momentum distributions are measured at midrapidity (|y| < 0.5) as a function of the charged-particle multiplicity density by the ALICE experiment at the CERN Large Hadron Collider (LHC), using proton-proton collisions at a center-of-mass energy of root s = 5.02 TeV. This study extends similar studies performed at root s = 7 TeV and root s = 13 TeV to a lower-energy regime, improving the statistical precision and extending the measurement to previously unexplored low-multiplicity regions. While K-S(0), Lambda, and Xi yields can be described with a linear multiplicity dependence within uncertainties, the Omega yields follow a significantly faster than linear increasing trend. For all analyzed particles, the overall production rate is consistent with that observed at higher energy and at similar multiplicity densities. Transverse momentum distributions are observed to evolve with multiplicity. Several state-of-the-art QCD-inspired Monte Carlo models have been compared with the data, testing some recently introduced features to address the findings at higher energies. Models can qualitatively describe the transverse momentum spectra and the Lambda/K-S(0) spectral ratio only if collectivity is introduced in the evolution of the system.

**PHYSICAL REVIEW C 114[2], 024901, 2026. DOI:** 10.1103/xtf2-bsc9. Acesso em: **https://doi.org/10.1103/xtf2-bsc9**

**[P354-2026] "Study of the B0 --> Λc+ (Λ)over-barc- KS0 decay"**

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

The decay B-0 -> Lambda(+)(c) (Lambda) over bar (-)(c) K-S(0) is studied at LHCb for the first time using proton-proton collision data recorded by the LHCb experiment at a center-of-mass energy of root s = 13 TeV, corresponding to an integrated luminosity of 5.4 fb(-1). The branching ratio relative to the decay B+ -> Lambda(+)(c) (Lambda) over bar (-)(c) K+ is measured to be [B(B-0 -> Lambda(+)(c) (Lambda) over bar (-)(c) K-S(0))/[B(B+ -> Lambda(+)(c) (Lambda) over bar (-)(c) K+)] = 0.53 +/- 0.05 +/- 0.05 where the first uncertainty is statistical and the second is systematic. Evidence is found for contributions fromtwo resonant states, Xi(c) (2923)(+) and Xi(c) (2939)(+), in the Lambda(+)(c) K-S(0) system. The two states show a significance of 3.9 sigma relative to the nonresonant hypothesis. These two Xi(+)(c) states are consistent with being the isospin partners of the states observed in the Lambda(+)(c) K- system.

**PHYSICAL REVIEW D 114[1], 012012, 2026. DOI:** 10.1103/jrkb-q3w6. Acesso em: **https://doi.org/10.1103/jrkb-q3w6**

**[P355-2026] "Tailoring light emission in colloidal nanocrystals through lattice distortion engineering"**

Park, J. W.; Min, S.; Chae, J. A.; **Lemus, J. C.*; Melo, L. B.*; Scolfaro, D.*; Pieri, L*; Barros, L. W. T.*; Padilha, L. A.*;** et al.

Colloidal semiconductor nanocrystals (quantum dots) exhibit bright, narrowband, and spectrally tunable emission, making them attractive for photonic applications. Their emission properties are governed by closely spaced exciton fine structure, whose thermal mixing complicates control over key characteristics such as color purity, radiative rate, and polarization. Moreover, the lowest-energy excitonic state is typically non-emissive (dark), suppressing emission rates, particularly at cryogenic temperatures. Here we show that these limitations can be addressed by inducing controlled lattice distortion in zinc blende CdSe nanocrystals through pseudomorphic epitaxial growth of a ZnSe shell. This approach modifies the exciton fine structure by placing an emissive (bright) state at the lowest energy and increasing the separation between bright states derived from light- and heavy-hole subbands. These changes reduce thermal mixing, resulting in accelerated emission at low temperatures, sub-thermal linewidths, and polarization. These findings establish lattice distortion engineering as a strategy for controlling emission properties in colloidal nanocrystals.

**NATURE COMMUNICATIONS 17[1], 8464, 2026. DOI:** 10.1038/s41467-026-73031-1. Acesso em: **https://doi.org/10.1038/s41467-026-73031-1**

**[P356-2026] "Topological control of mechanical resilience and tunable thermal transport in 3D boron nitride honeycombs"**

Doan, M. Q.; Nguyen, T. D.; Van, T. N.; **Galvao, D. S.***; Phan, M. H.; Lich, L. V.

The rational assembly of low-dimensional building blocks into three-dimensional (3D) architectures offers an exceptional framework for tailoring macroscopic thermal transport while maintaining structural integrity. In this work, we employ non-equilibrium molecular dynamics simulations to systematically investigate the thermal conductivity and mechanical response of topologically porous 3D boron nitride honeycomb (3D-BNHC) nanostructures. Our results reveal that 3D-BNHCs exhibit an ultralow in-plane thermal conductivity below 5 W mK-1, representing an unprecedented reduction of approximately two orders of magnitude compared to pristine 2D hexagonal boron nitride.

Spectral heat current analysis and spatial flux mapping demonstrate that this severe suppression originates from intense phonon scattering at the monatomic junctions, coupled with localized, closed heat flux trajectories that effectively trap thermal carriers. Furthermore, the continuous yet porous network induces a profound spatial thermal anisotropy. Out-of--plane transport remains highly efficient, scaling linearly with structural density, whereas in-plane propagation obeys a distinct, geometric path-dependent power law characteristic of highly porous macroscopic cellular media. Uniaxial deformation reveals that the network preserves robust structural integrity, displaying stretch-dominated load-bearing capacity under tension and a multi-stage, buckling-driven progressive collapse under compression that provides exceptional energy absorption and mechanical damping. Crucially, this structural flexibility enables robust and reversible dynamic tuning of thermal transport, driven by the competing mechanisms of lattice buckling and transport-axis alignment. Providing a deep microscopic understanding of topology-property relationships, our findings position 3D-BNHCs as premier candidates for extreme-environment thermal insulation, protective mechanical damping, and strain-engineered thermal management systems.

**RSC ADVANCES 16[40], p. 46784-46797, 2026. DOI:** 10.1039/d6ra04965f. Acesso em: **https://doi.org/10.1039/d6ra04965f**

**[P357-2026] "Toward virtual thin-beam ν cross-section measurements: A feasibility study of ν-Ar interaction analysis with DUNE-PRISM"**

Abbaslu, S.; Abud, A. A.; Acciarri, R.; **Adriano, C.*; Merlo, R. B.*; Aguiar, R. de*; Holanda, P. C. de*; Mendonca, A. P. A. de*; Gelli, B.*; Gratieri, D. R.*; Guzzo, M. M.*; Kemp, E.*; Machado, A. A.*; Marques, F. das*; Peres, O. L. G.*; Pimentel, V. L.*; Porto Paixao, L. G.*; Segreto, E.***; et al.
DUNE Collaboration

Neutrino-nucleus cross section measurements are critical for future neutrino oscillation analyses. However, our models to describe them require further refinement, and a deeper understanding of the underlying physics is essential for future neutrino oscillation experiments to realize their ambitious physics goals. Current neutrino cross section measurements provide clear deficiencies in neutrino interaction modeling, but almost all are reported averaged over broad neutrino fluxes, rendering their interpretation challenging. Using the concept of deep underground neutrino experiment-precision reaction independent spectrum measurement (DUNE-PRISM)-a movable near detector that samples multiple off axis positions--neutrino interaction measurements can be used to construct narrow virtual fluxes (less than 100 MeV wide). These fluxes can be used to extract charged-current neutrino-nucleus cross sections as functions of outgoing lepton kinematics within specific neutrino energy ranges. Based on a dedicated simulation with realistic event statistics and flux-related systematic uncertainties, but assuming an almost-perfect detector, we run a feasibility study demonstrating how DUNE-PRISM data can be used to measure muon neutrino charged-current integrated and differential cross sections over narrow fluxes. We find that this approach enables a largely model-independent reconstruction of powerful observables, including energy transfer, typically accessible only in electron scattering measurements, but that large exposures may be required for differential cross section measurements with few-percentage statistical uncertainties.

**PHYSICAL REVIEW D 114[1], 012018, 2026. DOI:** 10.1103/y9tz-sgcs. Acesso em: **https://doi.org/10.1103/y9tz-sgcs**

**[P358-2026] "Unraveling the Fe//β-Ga2O3(100) Interface through a combined XPD and DFT plus U study of strain-induced interdiffusion"**

Medeiros, Y. S. A. de; Pancotti, A.; **Siervo, A. de*; Landers, R.***; Martins, A.; Back, T.

The atomic-scale structure of the Fe//i-Ga2O3(100) interface is investigated through a combined experimental and theoretical approach using X-ray photoelectron diffraction (XPD) and density functional theory with Hubbard correction (DFT+U). The clean /i-Ga2O3 (100) surface is shown to be dominated by the B-termination, characterized by a nearly coplanar arrangement of the outermost atomic layers, as confirmed by XPD and supported by DFT calculations. Deposition of Fe results in significant outward relaxation at the vacuum interface, with interplanar expansions up to +27% relative to bulk Fe. While the DFT coherent interface model predicts strong interfacial strain due to lattice mismatch, experimental XPD data indicate that strain is not accommodated elastically. Instead, multiple-scattering simulations and DFT+U calculations reveal that strain relaxation occurs via Fe-Ga interdiffusion. Substitutional incorporation of Fe into the Ga sublattice reduces the R-factor and is energetically favorable, with an activation barrier of 1.76 eV determined via CI-NEB calculations. This barrier is lower than the demarcation energy of the annealing treatment (2.63 eV), confirming the kinetic feasibility of the process. These findings demonstrate that cationic substitution is one mechanism for plastic relaxation at the Fe//i-Ga2O3(100) interface, providing new insights into the structural and chemical evolution of metal contacts on ultra-wide bandgap semiconductors.

**APPLIED SURFACE SCIENCE 754, 168459, 2026. DOI:** 10.1016/j.apsusc.2026.168459. Acesso em: **https://www.sciencedirect.com/science/article/pii/S0169433226026632**

**[P359-2026] "Weak Lensing Mass Calibration of the ACT DR5 Galaxy Clusters with the DES Year 3 Weak Lensing Data"**

Shin, T.; Baxter, E. J.; Lee, E.; **Alsina, A. N.***; et al.

We use weak gravitational lensing measurements from Year 3 Dark Energy Survey data to calibrate the masses of 443 galaxy clusters selected via the Sunyaev-Zel'dovich effect from Atacama Cosmology Telescope Data Release 5 maps of the cosmic microwave background. We incorporate redshift and SZ measurements for individual clusters into a hierarchical model for the stacked lensing signals and perform Bayesian analyses to constrain the hydrostatic mass bias of the clusters. Our treatment of systematic uncertainties includes a prescription for measuring and accounting for the weak lensing boost factor, consideration of a miscentering effect, as well as marginalization over uncertainties in the source galaxy photometric redshift distributions and shear calibration. The resultant constraints on the normalization of the mass-observable relation have a precision of approximately 7%, with the mean WL halo mass of M500c = 5.4 & times; 1014M circle dot. We measure the bias between the true cluster mass and the mass estimated from the SZ signal based on an X-ray-calibrated scaling relation assuming hydrostatic equilibrium, to be 1-b = 0.74+0.06-0.05 over the full sample. When splitting the clusters into high (z=0.43-0.70) and low (z=0.15-0.43) redshift bins, we measure 1-b = 0.58+0.06-0.05 and 0.81+0.08-0.06, respectively. When introducing additional freedom in redshift and mass to the hydrostatic bias model, we find that 1-b decreases with redshift (with the power law of-1.8+0.5-0.6, 99.95% confidence), consistent with findings from other recent studies, while we do not find any significant trend in mass. We also demonstrate that our result is robust against various systematics such as a scale cut, priors on baryonic and miscentering parameters, and degree of scatter in mass-observable relation. The weak-lensing mass calibration presented in this study will be a useful tool for using the ACT clusters as probes of astrophysics, and as a step towards using their abundance as a cosmological probe.

**JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS [8], 075, 2026. DOI:** 10.1088/1475-7516/2026/08/075. Acesso em: **https://iopscience.iop.org/article/10.1088/1475-7516/2026/08/075**

**[P360-2026] "When weak fields aren't weak: Post-Newtonian effective theory and the dark matter puzzle"**

Galoppo, M.; **Torrieri, G.***

Post-Newtonian theory is considered a reliable effective expansion of General Relativity (GR) in the weak-field and slow-motion limit. We argue that such a belief is misplaced. In generic many-body relativistic dynamics, the absence of globally conserved charges in the region of interest and nonintegrability can drive strong sensitivity to angular-momentum exchange across inhomogeneous curvature, invalidating naive power counting in an effective theory expansion. Building on general lessons from effective field theory, we derive an explicit breakdown criterion that delineates when post-Newtonian truncations become unreliable despite small local potentials and velocities. This supplies a controlled systematic for weak-field mass inference, relevant to the Dark Matter (DM) puzzle in astrophysics and cosmology.

**INTERNATIONAL JOURNAL OF MODERN PHYSICS D, 2026. DOI:** 10.1142/S0218271826410038. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1142/S0218271826410038**

## Eventos publicados

**[P361-2026] "Inference of the Mass Composition of Cosmic Rays with energies between 3 and 100 EeV using the data of the Pierre Auger Observatory and Deep Learning"**

Cermáková, B.; **Chinellato, J. A.*; Dobrigkeit, C.*; Fauth, A. C.*; Akim, J. V. R.***; et al.
SISSA Medialab
Pierre Auger Collaboration

One of the open questions of astrophysics is the mass composition of ultra-high-energy cosmic rays (UHECRs). The flux of UHECRs is extremely low, demanding large observatories for indirect measurements of cosmic-ray air showers, cascades of secondary particles created by interactions of the cosmic ray with the atmosphere. Located in Argentina, the Pierre Auger Observatory is the largest cosmic-ray observatory on Earth. The Observatory is a hybrid detector employing different detection principles to observe multiple components of air showers. The core part of the detector is the Surface Detector (SD), which comprises 1600 water-Cherenkov detectors with 1.5 km spacing in an area of 3000 km(2). The highly sensitive Fluorescence Detector (FD) overlooks the area above the SD. Since the FD can only operate on nights with good atmospheric conditions and low moon fraction, its duty cycle is limited to approximately 15%. The indirect nature of measurements of the Pierre Auger Observatory poses several challenges. For example, estimating the mass of a primary cosmic ray. The atmospheric depth of the shower maximum X-max is a mass-sensitive observable. The FD measures the X-max directly, but the statistic is limited by the duty cycle. On the contrary, the SD of the Pierre Auger Observatory, operating almost at 100% duty cycle, allows for a significant increase in the data. In this contribution, we present the X-max reconstruction based on deep neural networks that extends the energy range and statistics. We probe the energy evolution of the mean and standard deviation of the reconstructed X-max, which reflects the changes in the mass composition. The features found in the average X-max rate suggest a heavier and purer mass composition with increasing energy.

**EUROPEAN PHYSICAL SOCIETY CONFERENCE ON HIGH ENERGY PHYSICS, EPS-HEP 2025, 2026.** Acesso em: **https://doi.org/10.22323/1.485.0095**

2025 European Physical Society Conference on High Energy Physics-EPS-HEP; Marseille, FRANCE; JUL 07-11, 2025; Sponsors European Physical Society Physics Education Division; CPPM; CPT; LAM; Laboratoire Univers et Particules de Montpellier

**[P362-2026] "Nonlinear Dynamics and Stability of Kerr Degenerate Optical Parametric Oscillators"**

**Trinchao, L. O.***; Mazo-Vásquez, J. D.; **Nienstedt, M.*; Peres, L.*; Gonçalves, E. S.***; Ghosh, A.; Pal, A.; Gohsrich, J. T.; Santos, L. F. dos; **Jarschel, P. F.*; Alegre, T. P. M.***; Tomazio, N. B.; Kunst, F. K.; Del'Haye, P.; Hill, L.; **Wiederhecker, G. S.***
Dudley J. M.; Peacock A. C.; Stiller B.; Tissoni G.

We investigate theoretically and experimentally the nonlinear dynamics of degenerate optical parametric oscillators (DOPOs) in a silicon nitride microring resonator driven by two tunable lasers. Our results provide a comprehensive understanding of the DOPO behavior and stability, with implications for the development of compact and reliable photonic devices.

**NONLINEAR OPTICS AND ITS APPLICATIONS 2026. Série de livros: Proceedings of SPIE 14092, 140920P, 2026. DOI:** 10.1117/12.3099540. Acesso em: **https://doi.org/10.1117/12.3099540**

2026 Conference on Nonlinear Optics and its Applications, Strasbourg, FRANCE, 13-15, 2026, Sponsors European Optical Society; Photonics21

**[P363-2026] "Searches for ultra-high-energy photons with the Pierre Auger Observatory"**

González, N.; **Chinellato, J. A.*; Dobrigkeit, C.*; Fauth, A. C.*; Akim, J. V. R.***; et al.
SISSA Medialab
Pierre Auger Collaboration

The Pierre Auger Observatory, the largest air-shower experiment in the world designed to investigate ultra-high-energy (UHE, E greater than or similar to 10(17) eV) cosmic rays, offers unparalleled sensitivity to UHE photons. These are expected from interactions of UHE cosmic rays with background radiation fields, as well as from more exotic scenarios such as the decay of super-heavy dark matter (SHDM) particles. They may also originate in the environment of cosmic-ray sources, making their detection instrumental for multi-messenger studies of cosmic-ray acceleration and transient astrophysical phenomena. In this contribution, we present the search for photons above 10(16.7) eV exploiting high-quality data from the Pierre Auger Observatory. These analyses yield the most stringent upper limits to date on the diffuse flux of UHE photons, placing strong constraints on astrophysical models and exotic scenarios such as SHDM decay. We also report on targeted searches in coincidence with gravitational wave events detected by LIGO/Virgo, underscoring the pivotal role of the Observatory in advancing multi-messenger astronomy at the highest energies. Improved sensitivity is foreseen with the exploitation of the new data from the Pierre Auger Observatory upgrade, AugerPrime.

**EUROPEAN PHYSICAL SOCIETY CONFERENCE ON HIGH ENERGY PHYSICS, EPS-HEP 2025, 2026. DOI:** 10.22323/1.485.0086. Acesso em: **https://doi.org/10.22323/1.485.0086**

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Location Marseille, FRANCE, JUL 07-11, 2025. Sponsors European Physical Society Physics Education Division; CPPM; CPT; LAM; Laboratoire Univers et Particules de Montpellie

**[P364-2026] "The science of ultra-high energy cosmic rays after 20 years of operation of the Pierre Auger Observatory"**

Deligny, O.; **Chinellato, J. A.*; Dobrigkeit, C.*; Fauth, A. C.*; Akim, J. V. R.***; et al.
SISSA Medialab
Pierre Auger Collaboration

For over twenty years, the Pierre Auger Observatory has been at the forefront of ultra-high-energy cosmic ray (UHECR) research. Its emblematic hallmark is a hybrid design: UHECRs are detected through complementary techniques that observe the extensive air showers (EASs) they produce. The combined analysis of multi-detector data has enabled high-precision, high-statistics studies of the energy spectrum, mass composition, and arrival direction distribution of UHECRs. This contribution summarizes the current understanding of UHECRs. While no individual sources have been pinpointed, the extragalactic origin of cosmic rays above 8 EeV has been confirmed, and higher-energy observations are beginning to trace them back to nearby astrophysical sites. Additionally, the stringent upper limits established on ultra-high-energy neutrino and gamma ray fluxes provide important constraints for multi-messenger astrophysics and physics beyond the Standard Model (BSM).

**EUROPEAN PHYSICAL SOCIETY CONFERENCE ON HIGH ENERGY PHYSICS, EPS-HEP 2025, 2026. DOI:** 10.22323/1.485.0104. Acesso em: **https://doi.org/10.22323/1.485.0104**

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## Material Editorial

**[E003-2026] "Emerging panorama of functional near-infrared spectroscopy in Latin America"**

Guevara, E.; **Mesquita, R. C.***; Orihuela-Espina, F.

Neurophotonics Associate Editors Edgar Guevara and Rickson C. Mesquita, along with Felipe Orihuela-Espina, share their perceptions of the evolution of functional near-infrared spectroscopy in Latin America based on a retrospective literature review and the narratives of three other scientists from the region.

**NEUROPHOTONICS 13, p. S13002-S13002, S13002, 2026. DOI:** 10.1117/1.NPh.13.S1.S13002. Acesso em: **https://doi.org/10.1117/1.NPh.13.S1.S13002**

## Correções

**[Co003-2026] "Over Forty Years of Research Towards the Understanding of Quantum Brownian Motion - The Contributions of A. O. Caldeira (vol 56, 209, 2026)"**

**Bonança, M. V. S.*;** Deffner, S.; Ingold, G. L.

**BRAZILIAN JOURNAL OF PHYSICS 56[5], 215, 2026. DOI:** 10.1007/s13538-026-02141-4. Early Access Date: AUG 2026. Acesso em: **https://doi.org/10.1007/s13538-026-02141-4**

***Autores da comunidade IFGW**
**Fonte:** Web of Science on-line (WOS)

## Defesas de dissertações do IFGW

**[D024-2026] "Vórtices magnéticos em sistemas de spins artificiais"**
Aluno: Gabriel Vieira de Oliveira
Orientador: Prof. Dr. Kleber Roberto Pirota
**Data: 29/09/2026**

**[D025-2026] "Métodos computacionais para análise de desordens estruturais em materiais avançados por meio de espalhamento difuso de raios X e ΔPDF"**
Aluno: Stefano Calabrez Mendes
Orientador: Prof. Dr. Guilherme Calligaris de Andrade
**Data: 03/11/2026**

**[D026-2026] "Modelagem numérica de interações de campo próximo com s-SNOM no infravermelho"**
Aluno: João Victor Cunha Roppa
Orientador: Prof. Dr. Raul de Oliveira Freitas
**Data: 10/11/2026**

**[D027-2026] "Otimização bayesiana aplicada ao design das vanes de um quadrupolo de radiofrequência"**
Aluno: Tarik Ventorini de Oliveira
Orientador: Profa. Dra. Fanny Béron
**Data: 18/11/2026**

## Defesas de teses do IFGW

**[T011-2026] "Proposta para geração e caracterização de emaranhamento quântico usando resonadores metamateriais supercondutores"**
Aluno: Alessandro Silva Santana
Orientador: Prof. Dr. Francisco Paulo Marques Rouxinol
**Data: 26/10/2026**

***Fonte:** Portal IFGW/Eventos
**Acesso em:** https://portal.ifi.unicamp.br/a-instituicao/eventos/month.calendar


# Abstracta

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