



IGFAE

INSTITUTO GALEGO
DE FÍSICA
DE ALTAS ENERXÍAS

25  1999
2024

Galician Institute of High Energy Physics (IGFAE)

Annual Report 2023

Santiago de Compostela

11/07/2024





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Directorate's report

It should be noted that this last year has led to the consolidation of the following achievements:

- Excellent recruitment of scientific talent, especially in junior staff (R3), one of the priorities set in our strategy, but also internationalization in the categories of postdoctoral and predoctoral researcher.
- Success in ERC and other European calls, superior to other international reference centres according to the benchmark analysis.
- The follow-up of the new headquarters project, whose construction started in 2021, opening a completely new phase in the centre's capabilities.
- The implementation of a renewed and structured RRI in the form of IGFAE Labs.
- Maintenance of an unprecedented impact in IGFAE's history in the media, especially international media.
- Important scientific milestones, such as the completion of the LHCb upgrade, where the IGFAE plays an essential role; the consolidation of the gravitational wave line, with some of the best scientific results in recent years; the exploitation of Pier Auger data; the entry into the DUNE collaboration; the consolidation of the NEXT project thanks, in part, to the efficiency demonstrations carried out at the IGFAE; the completion of R3B and its commissioning, and many others.

Santiago de Compostela –2024– Carlos A. Salgado – IGFAE director



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Structure and governance

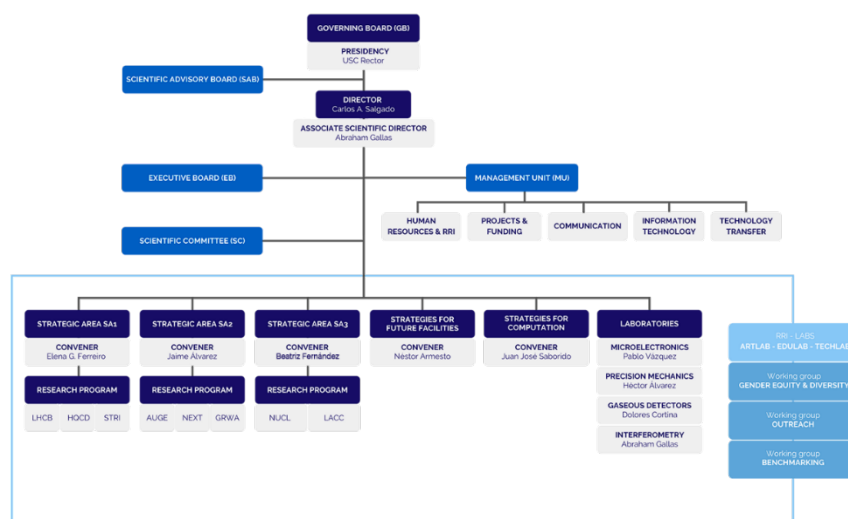
Mision

The IGFAE has the main mission of coordinating and to foster the scientific and technical research in the field of High-Energy Physics, Particle and Nuclear Physics and related areas: Astrophysics, Medical Physics, Instrumentation, etc.

The planning and promotion of relations with large experimental facilities are of particular importance, especially with the European Organization for Nuclear Research (CERN), Helmholtzzentrum für Schwerionenforschung (GSI/FAIR), Pierre Auger Observatory and Laser interferometer Gravitational – Wave Observatory (LIGO).

The main elements that define the recent activity of the Institute are a good performance in terms of scientific production, talent attraction and fundraising, an intense international activity, especially within large experimental collaborations and the activation of a new framework to organize the research in terms of Strategic Research Areas (SA).

Organization



Organization chart of IGFAE



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Composition of the committees

SCIENTIFIC ADVISORY BOARD (SAB)



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Francis Halzen
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Néstor Armesto Pérez
Beatriz Fernández Domínguez
Abraham Gallas Torreira
Elena González Ferreiro
José Á. Hernando Morata
Diego Martínez Santos
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Abraham Gallas Torreira
Elena González Ferreiro
Berta M. Mariño Lavía
Manuel Rey Pan
Ricardo J. Rodríguez Fernández

Composition of the committees



Activity of the research areas

SA1 _The Standard Model To The Limits

Our institute is active in the study of the Standard Model (SM) of particle physics, the best theory currently available to describe microscopic reality. Our research activity plays a fundamental role in this broad field, including the search for new physics beyond the SM in the LHCb experiment (SA1_LHCb), the study of matter in Quantum Chromodynamics (QCD) under extreme conditions (SA1_HQCD) and research in string theory from both a formal and applied point of view (SA1_STRI).

SA2_Cosmic Particles And Fundamental Physics

Astroparticle Physics, and the connections between Particle Physics and Cosmology, are experiencing a new golden age. IGFAE is one of the pioneers in the Pierre Auger Observatory in Argentina, the largest existing air-shower array (SA2_AUGE). IGFAE also participates in searches for Dark Matter and neutrinos in astrophysics and in neutrino physics experiments (SA2_NEXT). Since 2019 a new experimental program on detection of gravitational waves was opened with important contributions in the analysis of Compact Binary Coalescence systems (SA2_GRWA).

SA3_ Nuclear Physics From The Lab To Improve People's Health

The activity carried out at the IGFAE on nuclear physics covers a very broad spectrum, ranging from fundamental research in large international facilities to the development of social applications in the field of natural radioactivity and medical physics (SA3_NUCL). These activities are articulated around three axes: the study of the structure and dynamics of nuclear systems and their astrophysical and cosmological implications, the operation of the Laser Laboratory for Particle Applications and Acceleration (L2A2) and the activity developed around the Radiation Analysis Laboratory (LAR). (SA3_LACC)



Strategies for computation

Our institute continues to serve both local users and their collaborators through a cluster with a condor batch system or interactively accessible servers, and international collaborations through the EGI federation and the OSG serving the LHCb and LIGO experiments, respectively. We also provide storage services through lustre servers and NFS disks.

At the turn of the century a new computing paradigm, the Grid, was being created with the goal of analysing the enormous amount of data expected to be generated by the future (at that time) LHC collider. IGFAE soon joined the project with 6 initial servers and a 1 TB hard disk. Since then, our infrastructure has grown to about 200 servers providing services to our local users and to international collaborations such as LHCb or LIGO, through EGI and OSG, which are the European and US networks, respectively. The amount of disk space has also grown considerably to almost the Petabyte we provide at the moment.

High Lights 2023

SA1 _The Standard Model To The Limits

- On the experimental side, LHCb experiment has completed the analysis of Run1 and Run2 data, with the publication of 31 articles. The new results include a new measurement of the ΔF_s , the observation of the hypertriton, and a measurement of the production of beauty baryons in high-multiplicity collisions. The main lines of analysis in the IGFAE are the measurement of observables sensitive to the violation of lepton universality in hadron decays with b quarks, the measurement of observables that violate CP in Bs decays, the study of very rare decays of mesons with b and s quarks, the measurement of observables in proton-lead collisions and direct searches for new physics.

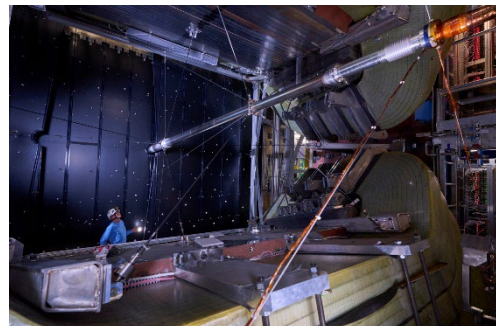


Image of the LHCb experiment



- LHCb experiment has also shown results with 34 pb⁻¹ of data accumulated during the operation of the accelerator (Run3).
- On the phenomenology side, the QCD group is one of the world leaders in the extraction of nuclear parton densities. The most widely used sets of nuclear PDFs which include data from deep inelastic scattering (DIS) experiments and from pA collisions (including those from pPb collisions at the LHC), come from this group, with the most recent set named EPPS21.
- The QCD group has continued the quest for precision in calculations in the Color Glass Condensate framework, with emphasis on NLO calculations applicable for pA in the forward region and their relation to the TMD framework and to azimuthal correlations, with the extension of the techniques of the CGC to include non-eikonal corrections that link CGC calculations with those done in the jet quenching domain. The mechanism of thermalization of quarks and gluons through transport equations and the resulting azimuthal asymmetries were also examined.
- The QCD group has achieved the most precise prediction for azimuthal decorrelation in boson-jet production in pp collisions. Besides, the group is among the firsts to explore the application of quantum computing in jet quenching physics.
- The QCD group is exploring the structure of the potential for quarkonium systems. These studies include not only traditional quarkonium states, but also exotic bound states of heavy quarks whose formation and structure are not yet understood and could be clarified by studying their interaction with the medium.
- Skyrme model and its relationship with bosonic stars has been explored. Moreover, the application of the Skyrme model for gravitational waves enables a relationship between SA₁ and SA₂.
- On the more theoretical side, the theory group has developed its research in formal areas such as string theory, which relates general relativity and quantum mechanics. Three fundamental lines are: Holographic methods, AdS/CFT correspondence and quantum gravity. On the side of strongly coupled quantum field theories, thanks to the AdS/CFT correspondence, models for these quantum physical systems can be reformulated in terms of a classical gravity theory with



matter in a higher-dimensional auxiliary manifold. Placing emphasis on quantum gravity, the use of holography allows, through quantum mechanical models such as the so-called SYK, to scrutinize quantum properties of gravitation such as the evaporation of black holes.

From a more technical perspective:

- IGFAE researchers have worked on updating the LHCb vertex sub-detector (VELO, Vertex Locator), and the highest-level trigger (HLT). The installation of the new VELO was completed in May 2022 with the installation of the second half of the detector in the cavern. All detection modules have been manufactured, and all auxiliary systems have been completed. During 2022 and 2023 this new sub-detector has been commissioned and integrated into the experiment. Installation with all sub-detectors of the new experiment has been completed in March 2023 before the start of LHC operation in 2023 (Run3). Flavor physics measurements will be made with greater precision and over a broader range of observables. The flexibility inherent in the new trigger system will also allow the experimenter to further diversify its physics program in relevant areas beyond flavor.
- Regarding phase 2 of updating the LHCb experiment, the group continues with the R&D&i in detectors highly resistant to radiation and with temporal measurement (4D tracking). The basic technologies are 3D detectors and pixelated I-LGAD detectors. Several tests have been carried out on particle beams and collaboration is underway on the design of the electronic reading system for the new detector.
- The QCD group is strongly involved in proposals for future experiments, as electron-proton/ion: EIC, LHeC, FCC-eh, and hadronic and heavy ion colliders as FCC-hh and HE-LHC and the heavy ion program at the High Luminosity HL-LHC. We participate in the EIC User Group, in the LHeC/FCC-eh Study Group and in the FCC in heavy-ion mode.

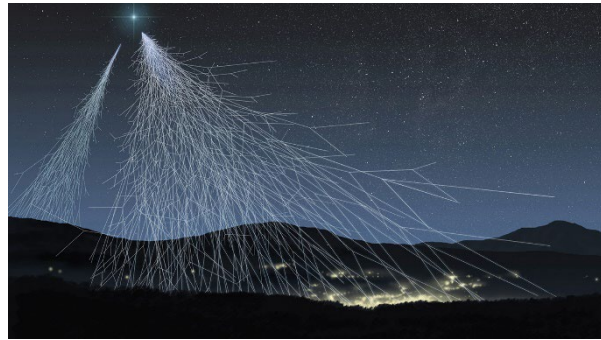


SA2_Cosmic Particles And Fundamental Physics

Extremely energetic cosmic rays and neutrinos – Large exposure experiments

The Pierre Auger Observatory in Malargüe, Mendoza (Argentina), is the world's largest and most accurate detector of ultra-high-energy cosmic rays (UHECRs). The observatory is undergoing an upgrade (AugerPrime) with new scintillation particle detectors being added to the existing Cherenkov detectors in water. In 2023, the Astroparticle Physics group at IGFAE maintained a prominent role within the International Pierre Auger Collaboration (400 scientists from 18 countries), with several activities:

- Reconstruction of cosmic ray (CR) induced cascades reaching Earth at high angles relative to the vertical. A catalogue ([link](#)) of the 100 most energetic CR events detected at the Pierre Auger Observatory was published, including the inclined events, showcasing the excellent quality of the collected data.



Representation of cosmic-ray

IGFAE Marie Curie fellow researcher, Felix Riehn, was responsible for the selection and reconstruction of the most energetic inclined events.

- The procedure for searching for upward-going cascades using the Fluorescence Detector of the Pierre Auger Observatory to identify events compatible with the so-called anomalous events of ANITA (see below) has been completed. A search for upward-going events is reported in a paper led by IGFAE members submitted to Physical Review Letters.
- A paper reporting on the follow-up in UHE neutrinos of Gravitational Wave (GW) events in the LIGO/Virgo GW interferometers O1, O2 and O3 runs has been finalized. Also, for the first time, limits on UHE photons from GW sources have been set with Auger data. Procedures are being adapted to search for UHE



neutrinos in coincidence with GW events detected in the new O4 data-taking period.

- Two papers on the reconstruction of the depth of shower maximum using the radio technique and the data collected with the Auger Engineering Radio Array (AERA) have been published, a proof of concept that with the radio technique this UHECR primary mass-sensitive observable can be determined.
- Several studies on the muonic component of air showers were carried out. Muons are key to understand hadronic interactions in an energy range not probed at terrestrial accelerators. IGFAE member Lorenzo Cazon collaborated with various international groups analyzing and compiling muon measurements across a wide energy range. A measurement of the muon number in inclined events was performed combining data from the AERA and the Surface Detector Array of the Pierre Auger Observatory, a work led by IGFAE member Marvin Gottowik.
- Participation in large-exposure experiments for detecting UHE neutrinos using the radio technique, such as the Beamforming Elevated Array for Cosmic Neutrinos (BEACON), the Antarctic Impulsive Transient Antenna (ANITA) and its successor the PUEO observatory.
- Studies of the dependence of the radio signal on atmospheric density and Earth's magnetic field with Monte Carlo simulations have been published. A new paper challenging the possibility that anomalous ANITA events were caused by transition radiation during the cascade's passage between the air and the ice of the South Pole has been accepted in JCAP. First phenomenological studies of stratospheric showers induced by UHECRs detected at ANITA have been carried out.
- An updated and significantly expanded version of Chapter 30 on Cosmic Rays for the Review of Particle Physics has been co-authored by IGFAE member Jaime Alvarez-Muniz.

From a more technical perspective:

- A large part of the Pierre Auger Observatory upgrade AugerPrime has been completed: all the Scintillator Surface Detectors, Small PMT and new electronics



have been deployed. The Radio Detector and the Underground Muon Detector are in the installation phase and well advanced.

- In November 2023, an International Review Panel, led by Prof. Francis Halzen visited the experimental site in Malargue, Mendoza and assessed the work of the Pierre Auger Collaboration exceptionally positively, proposing to the Finance Board that the international agreement be extended for at least another 10 years. A Report on AugerPrime was previously prepared for the review panel coordinated by IGFAE member Jaime Alvarez-Muniz, with significant contributions by Lorenzo Cazon and other IGFAE members.

Neutrino Programme

The following milestones can be noted during 2023:

- Characterization of Ar/CF₄ (99/1) mixtures towards Full3D optical tracking of DUNE's 10bar argon TPC for Phase-II: spectral analysis, track reconstruction and sensitivity simulations.
- Demonstration of Full3D optical tracking on dual-phase LAr on 2m x 2m scale for Phase-II.
- Development of two new resistive-protected technologies for dual phase LAr operation (RPWELL, RWELL), superior to previous GEM-based technologies.
- Development of a new wavelength-shifting amplification structure for electroluminescence-based chambers (FAT-GEM), at the level of existing techniques (meshes) but scalable and sagging-free.
- Assessment of the impact of cross-section uncertainties in Supernova analysis.

From a more technical perspective:

- Release of the Technical Design Report of the Far Detector Vertical Drift Technology.
- Release of the Conceptual Report of the DUNE Offline Computing.
- Application of the PANDORA reconstruction software to the analysis of data from protoDUNE detectors (single-phase).



NEXT Project

Search for neutrino-less double beta decay in a 100 kg ^{136}Xe High Pressure Gas TPC using Electro Luminescence at the Canfranc Underground Laboratory.

- Study of the NEXT-100 performance at 15 bars with a detailed MC production of 40 years exposure.
- Estimation of the requirements of the low and high energy calibration of NEXT-100 * Estimation of the performance of NEXT-100 at Low Pressure (5 bars)
- From a more technical perspective:
- Technical update of the reconstruction flow of the NEXT-100 data
- Technical update of the calibration code
- Generation of the radiogenic backgrounds of NEXT-100 data (using CESGA computing infrastructure).
- Generation of the calibration data for NEXT-100 at 5 and 15 bars.
- Contribution to the construction of NEXT-100 detector. Installation of the tracking plane at the Canfranc Laboratory.

Gravitational-Wave (GW) Astronomy

During 2023:

- Final publication of LIGO-Virgo-KAGRA (LVK) catalog of compact binary merger (CBC) events from the O3 observing run.
- First O4 observing run detections since May 2023, using the PyCBC Live search pipeline.
- Population analysis of binary black hole (BBH) component mass correlations.
- Study of strong-field phenomena in general relativity: black-hole recoils and environmental effects.
- Search for exotic compact objects (boson/Proca stars).
- Study of thermal effects in binary neutron star post-merger GW emission.



From a more technical perspective:

- Optimization and validation of the PyCBC low latency and offline CBC search pipelines ahead of the O4 run and deployment in O4.
- Novel methods of data-driven inference on the binary BH population and quantification of observation selection effects for binary mergers.
- Novel method of GW data analysis for parameter estimation of heavy BBH mergers, using numerical solutions of general relativity.
- Application of machine learning techniques to glitch detection in GW detector data, signal classification and waveform generation.

SA3_ Nuclear Physics from The Lab To Improve People'S Health

Nuclear Structure and Fission dynamics at Low Energy

- Commissioning of the set-up for fission studies with Thorium beam at GANIL
- Experimental determination of the dissipation energy in fission as a function of the fragment split, for three different fissioning systems shows the effects of particular nuclear shells on the dissipation and fission dynamics.
- Investigation of the low-lying structure of ^{15}C via the neutron-removal $^{16}\text{C}(d,t)$ reaction. First calculations of ^{15}C with the ab initio self-consistent Green's function method employing the NNLOsat interaction show the sensitivity to the size of the $N=8$ shell gap.
- The results of the first transfer reaction experiment with ACTAR TPC demonstrate the potential of active targets.
- New activity has been initiated in the SOLARIS collaborations of the Facility For Rare Isotope Beams (FRIB) at Michigan State University (MSU) and ISOLDE Solenoidal Spectrometer (ISS) at CERN.
- Several experimental proposals at FRIB and ISOLDE approved by the committees of each facility. The objective is the study of low energy resonances and the study of neutron-proton pairing within the atomic nucleus.



From a more technical perspective:

- Installation of the upgraded ACTAR TPC at LISE spectrometer at GANIL.
- Development of the ACTAR TPC framework for on-line and off-line analysis.
- Upgrade of the ACTAR TPC detector with an array of silicon detectors to increase the angular coverage to backward angles.
- Installation of Optical TPC equipped with ThGEMs. 2D alpha track imaging with the Hamamatsu CMOS camera for low pressure ArCF₄ 90/10 and 3D alpha track imaging with the Timepix camera for low pressure pure CF₄ (50 and 100 Torr).
- Development of radiation detectors for intense heavy ion beams and for the localisation and identification of radioactive material.
- NI was awarded a research project of 40k of budget by the AVTE (Valuation, Transfer and Entrepreneurship Area (AVTE)) for the development of a novel neutron imager with spectroscopic capabilities.

Nuclear physics experiments in high energy and intensity radioactive beams.

Contribution to R3B/FAIR.

- First results and conference publications on the ongoing analysis of fission induced by relativistic ²³⁸U beams on liquid hydrogen (LH₂) target, in quasielastic regime (p,2p fission). The preliminary results show the capability to determine the fission fragments charge distribution and their dependence on the excitation energy measured directly from the proton detection in the CALIFA detector.
- Ongoing analysis of the data from the R3B experiments S509 and S522 on the first characterization of short-range correlations in exotic nuclei, nuclear structure in neutron-rich, light nuclei and cluster formation. Both experiments belong to the FAIR Phase 0 experiments, using GSI SIS18 accelerator and improved detector systems made for FAIR.
- First publication of the HYDRA TPC collaboration, opening a new path for studying hypernuclei from their pion decay in the GLAD superconductor magnet of R3B. Leadership of the simulation and analysis task, including track, momentum, and vertex reconstruction techniques.



- Design of a large-area, high-efficiency cosmic radiation detector for the Qmio Quantum Computer at CESGA, to determine the limits in quantum coherence due to the perturbations induced by the impinging radiation. This is considered the main future limitation for advanced processors and algorithms based on superconductor quantum technologies.

From a more technical perspective:

- Completion of the CEPA (very forward section) of the CALIFA calorimeter, using CsI(Tl) crystals and Large Area Avalanche Photo Diodes (LAAPD), essential for the detection of the most energetic particles arising from knock-out reactions in R3B.
- Installation and support for additional BARREL crystals for the CALIFA calorimeter at R3B, increasing the polar angle coverage for large transverse momentum particles.
- Analysis and publication of CsI(Tl) crystals aging, results of a long-time study realised on CALIFA crystals performance and the dependence on humidity and storage conditions.
- First test with ALPIDE silicon detectors and MOSAIC electronics at the Julich COSY accelerator, as a first step to the new R3B Silicon Tracker.
- Installation of the first prototype of two-arms ALPIDE silicon tracker around the LH2 target at R3B, ready for experiments in 2024.
- Ongoing research on phoswich CsI(Tl)+GAGG (called CEPA_GAGG) with LAAPD readout for the future upgrade of the CALIFA forward region.
- Application of phoswich CsI/GAGG for PET: as a follow-up of a registered procedure (Modelo de Utilidad de la Oficina Nacional de Patentes y Marcas; ES1247974), and under a new MICCIN PoC project, we have improved our prototype with the design of new detecting heads and the development of additional signal separation techniques to improve the depth of interaction evaluation. Completion of the implementation and results are expected for 2024.
- Development and maintenance of the R3BRoot framework, the analysis and simulation code for the R3B collaboration. The team researchers have a leadership position on the release management and CALIFA-related software within the framework.



Laser acceleration and Exploitation of the Laser Laboratory of Acceleration and Applications (L2A2)

- Demonstration of the continuous operation of a laser-driven proton accelerator at 10Hz for >1000 shots at L2A2 (Paper submitted)
- Production of carbon-11 isotope of interest for medical imaging, towards pre-clinical activation levels (Paper submitted)
- Experimental campaign at CLPU of cell irradiation using laser-driven ions in conditions of interest in FLASH radiation therapy.
- Experimental campaign at the DRACO Laser Facility (HZDR, Germany) for studies of (γ, xn) and $(\gamma, xn+yp)$ production using a high-energy, laser-driven Bremsstrahlung source.

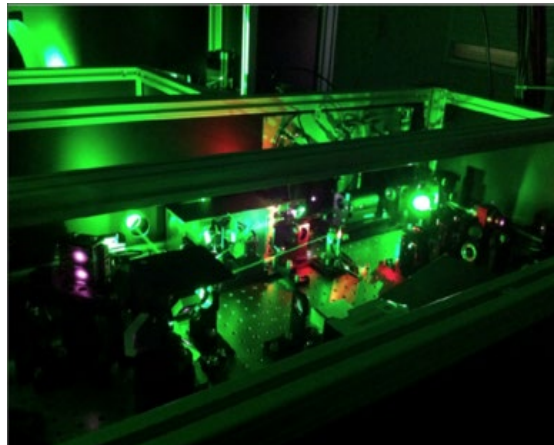


Image of L2A2 Laboratory

From a more technical perspective:

- Installation and commissioning of a deformable mirror at L2A2 to improve laser spatial properties
- Development of a detector based on scintillating optical fibres, tested at the National Centre for Accelerators (CNA)
- Installation of optics to enhance the contrast ratio of the STELA laser system.



Strategies for computation

We currently have the following equipment. The amount of disk space has also grown considerably to almost the Petabyte we now provide in 2023. The breakdown of the computer pool we have is as follows:

- 54 EGI embedded servers serving the LHCb experiment. They provide a computing power of 2.7kSI (for comparison, an Intel i7-9700K has ~85SI).
- 65 servers in our local batch farm with 25kSI.
- 18 servers for interactive use providing 6.3kSI.
- 38 servers serving LIGO through OSG and with a capacity of 21.3kSI.
- 13 servers with a diverse set of GPUs ranging from Nvidia GTX1080 to Nvidia A30.



IGFAE server room in CESGA

In total, our systems provide about 54kSI, or about 635 i7-9700K processor-based computers.

Regarding the usage of our systems, we must mention is that this year the figures are quite low for the infrastructures hosted in our CPD due to a cyber-attack we suffered at the beginning of May. Due to the initial investigation into the origin and depth of the compromise and subsequently the recovery process which, in our case, involved a complete re-installation of all our servers, our systems were offline for several weeks and are still not fully operational. No data was compromised in the attack, which simplified the recovery process.

Finally, we should mention that we are in the process of reconfiguring our system to provide idle resources to our Tier2 and therefore increase our contribution to international collaborations like EGI or OSG. The initial testing will be done in the upcoming weeks, and we expect to have the system running during the first quarter of 2024 or the beginning of the second at the latest.



As mentioned above, the hack provided us with an opportunity to improve the layout of our systems by applying security best practices to the best of our ability and closing the choke points and flaws revealed by the attack. The first major change affected the system design and consisted, firstly, of segregating the various components: file servers, Tier2 servers or work nodes, batch nodes or interactive nodes and, secondly, a more restrictive access policy where users only have access to the interactive nodes and access to the core services is through clients connecting to the core services. The second change has been to provide redundant access to storage servers.

The third has been the implementation of a centralized log system that collects the logs of all the components of our computer infrastructure. Again, this is the initial step on a more ambitious plan in which this server will make use of the intelligence gathered by the logs to act as an early warning system with the use of an elastic search, kibana and other services to analyse mentioned intelligence.

Strategies for the future

Apart from the mentioned implications in future projects (LHCb Upgrade-II, EIC and electron-hadron/nucleus colliders, FCC, DUNE, extension of Auger and NEXT, R3B,...), IGFAE members participate in ECFA (Carlos Salgado as Spanish representative in pECFA) and in the elaboration of the NuPECC 2024 Long Range Plan (Héctor Álvarez and Carlos Salgado as members of the Thematical Working Groups on Open Science and Data and Strongly Interacting Matter under Extreme Conditions, respectively).

Human resources in numbers



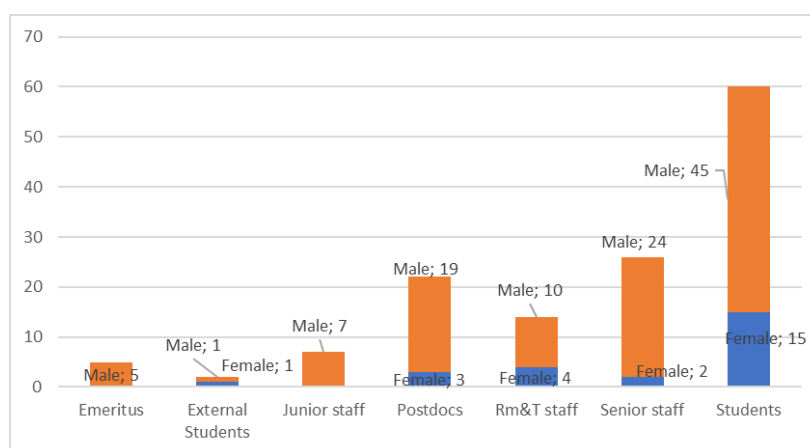
IGFAE group at the retreat 2023



The total number of research personnel assigned to the IGFAE during 2023 is 122 members, 22 women (18%) and 100 men (82%). The distribution of scientific personnel attached to strategic areas by strategic area, research program and gender is:

Area/ Research Project	F	M	Total
SA1 The Standard Model to the Limits			
HQCD	3	26	29
LHCB	6	30	36
STRI	-	10	10
Total SA1	9	66	75
SA2 Cosmic Particles and Fundamental Physics			
AUGE	0	10	10
GRWA	2	2	4
NEXT	1	8	9
Total SA2	3	20	23
SA3 Nuclear Physics from the Lab to improve people's health			
LACC	1	4	5
NUCL	9	10	19
Total SA3	10	14	24
TOTAL IGFAE	22	100	122

Of the 9 people not assigned to strategic areas, management and administration personnel and technical personnel of common services, 33% are women and 66% are men.

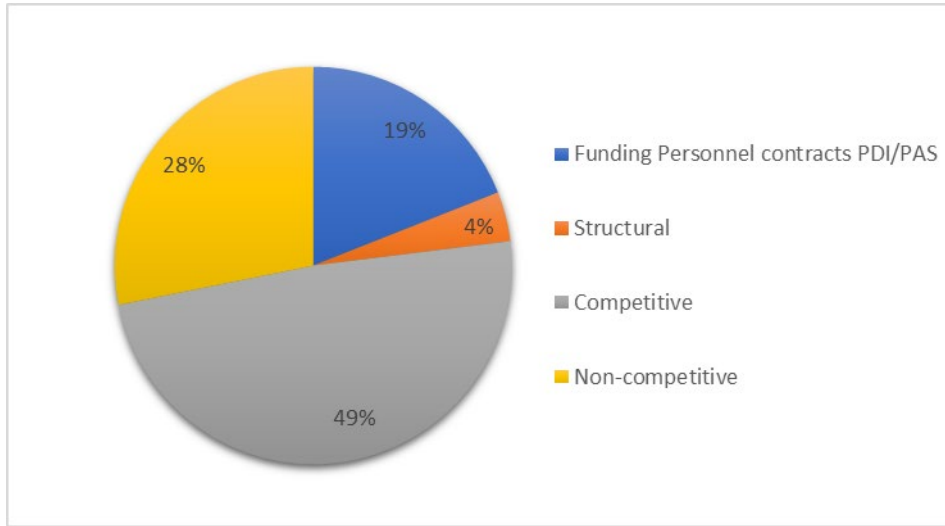


Distribution of IGFAE team



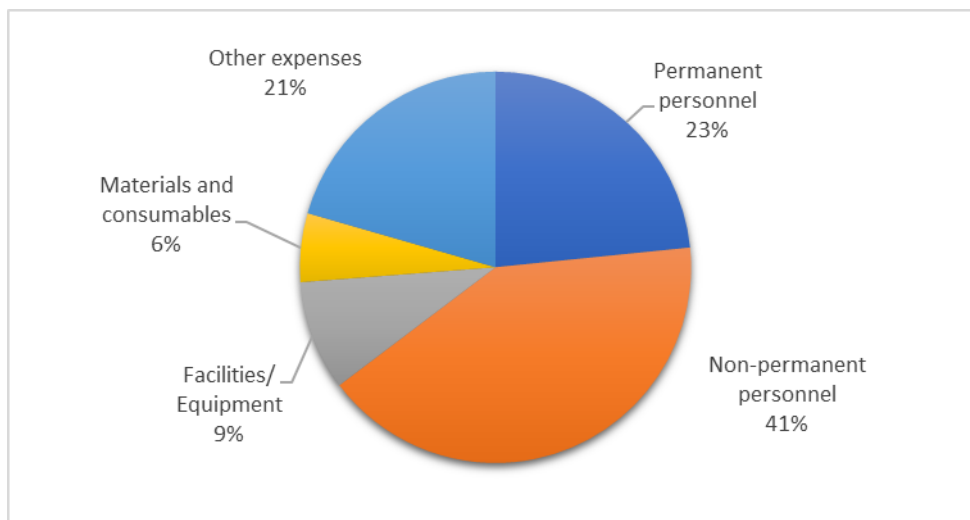
Funding in numbers

Total income for the year was 5.2 M, considering the following income distribution, the highest percentage coming from competitive fundraising (49%):



Income distribution 2023

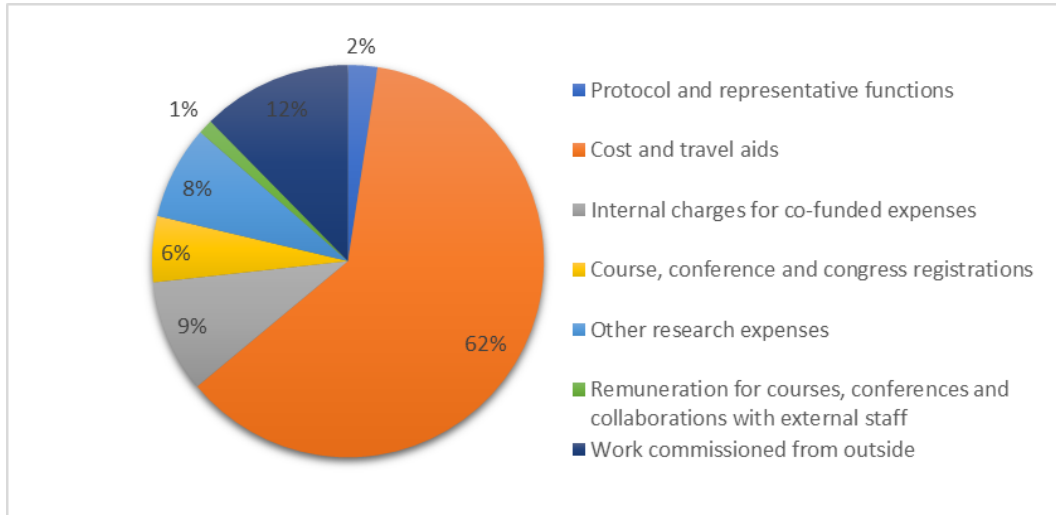
We consider as basal funding the part contributed by the USC to finance permanent personnel contracts (19%) and the part contributed through the USC from “Programa de Xestión de Ingresos” (4%).



Expenditure contribution 2023



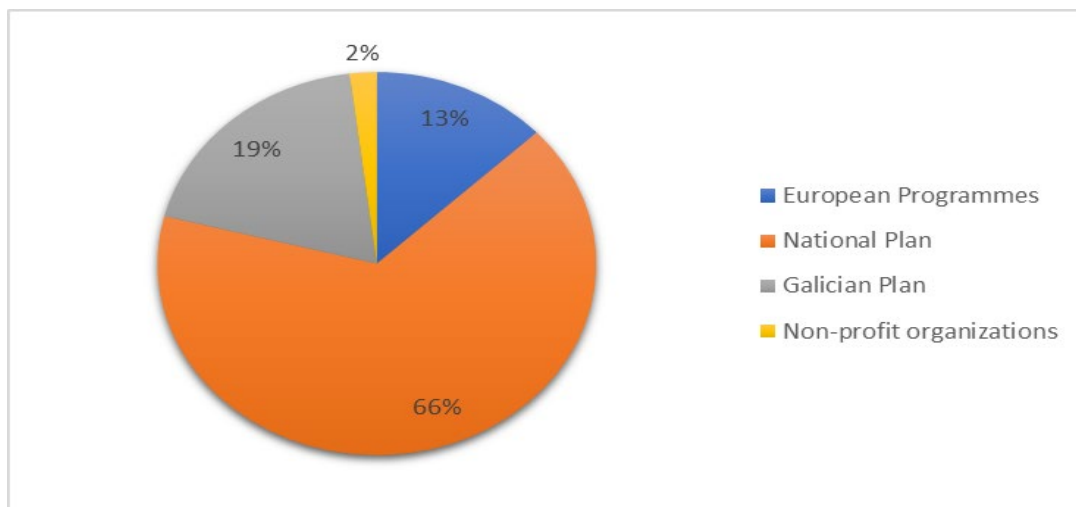
Regarding the expenditure, the highest percentage of expenditure in the year was still in personnel: 41% of the expenses of R&D activities were invested in non-permanent personnel (1,734,007 €) and 23% in permanent personnel and PAS of the IGFAE.



Distribution of other expenses

New research projects 2023

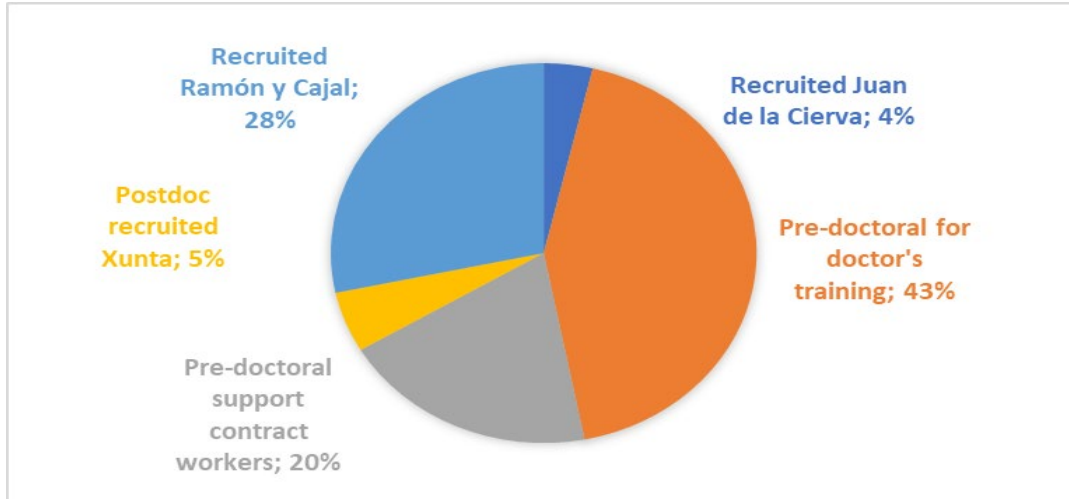
During this year 2023, in addition to the projects already in force, **12 new** projects have been launched with external funding, which have raised a total of **1,872,850,34 euros**. 8 of them are regional in scope, financed by the government of the Autonomous Community, CESGA and GAIN. 3 of the 12 projects are financed by the AEI through the national plan and another one is financed within the framework of the Quantum Spain.



Attraction R+D



Annex 1 includes the details of the research projects attracted with date of award during the year 2023. The total amount raised in human resources calls was 1,860,918.82 euros, with the following distribution:



Attraction HHRR calls

Scientific output in numbers

At the time of writing this report, a total of 147 articles have been published, details of which are given in Annex 2. On the other hand, 101 articles are in the first decile (68,7%) and 125 in the first quartile (85%). The impact Factor is 57. The distribution of articles by research programme:

Research area	Research programme	Nº. articles	No. Cites
SA1 The Standard Model to the Limits	SA1_HQCD	27	49
	SA1_LHCB	63	271
	SA1_STRI	4	10
	Total area SA1	94	330
SA2 Cosmic Particles and Fundamental Physics	SA2_AUGE	11	23
	SA2_GRWA	10	212
	SA2_NEXT	11	9
	Total area SA2	32	244
SA3 Nuclear Physics from the Lab to Improve People's Health	SA3_LACC	1	0
	SA3_NUCL	20	14
Total area SA3		21	14



During 2023, 13 theses were presented, which are listed as follows:

Gonzalo Díaz López (February 13th, 2023)

Sensitivity of NEXT-100 detector to neutrinoless double beta decay. Supervisor: José Ángel Hernando Morata

Marcos Romero Lamas (February 27th, 2023)

Measurement of the bottom-strange meson oscillations at LHCb. Supervisors: Bernardo Adeva Andany, Veronika Chobanova & Diego Martínez Santos

Alessandra Gioventù (April 14th, 2023)

Tests of Lepton Flavour Universality with Semileptonic D and B decays at the LHCb experiment. Supervisors: Cibrán Santamarina Ríos & Antonio Romero Vidal

Julián Lomba Castro (May 29th, 2023)

Lepton universality measurements in semileptonic decays of b-quark hadrons in the LHCb experiment at CERN. Supervisor: Juan José Saborido Silva

Elisabet Galiana Baldó (June 30th, 2023)

Proton induced gamma emission cross sections in $^{35,37}\text{Cl}$ and simulation developments in applied gamma spectroscopy. Supervisor: Héctor Álvarez Pol

Juan Peñas Nadales (July 21st, 2023)

Production of radiotracers for medical imaging using laser-acceleration techniques. Supervisor: José Fernando Benlliure Anaya.

Juan Lois Fuentes (July 27th, 2023)

Complete spectroscopy of ^{16}C and ^{20}O with solid and active targets using transfer reactions. Supervisor: Beatriz Fernández Domínguez

Alberto García Martín-Caro (September 22nd, 2023)

Solitons and effective field theories in the Physics of strong interactions. Supervisor: Christoph Adam

Luigi Bellafronte (October 13th, 2023)

Precision physics at High Luminosity LHC and future colliders. Supervisor: Pier Paolo Giardino



Adrián Casais Vidal (October 27th, 2023)

Boosting the discovery potential of LHCb by developing a new search for diphoton resonances and an alternative muon reconstruction technique using GPUs. Supervisors: Xabier Cid Vidal & Diego Martínez Santos

Alberto Rivadulla Sánchez (November 9th, 2023)

Explorations in higher-derivative gravity: holography and astrophysics. Supervisor: Jose Daniel Edelstein Glaubach

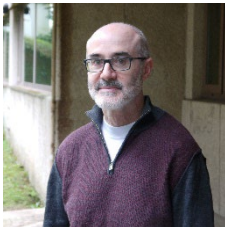
Marcos González Martínez (December 1st, 2023)

Jet quenching for measuring the QCD collectivity temporal structure. Supervisors: Carlota Andrés Casas & Carlos Salgado López

Activity 2023

Key positions & Awards

SA1



Néstor Armesto

PI of Strong 2020 Working Package
LHeC committee
Convener of the eA/small x WG of the LHeC/FCC-eh Study Group
Conveners of the hard probe and small-x. WGs of the FCC in heavy-ion mode



Xabier Cid

Convener of Dark Matter WG with LHCb



Antonio Fernández

VELO SOL40 / ECS coordinator



Abraham Gallas

LHCb Spanish link in the LHCb Finance board and deputy of the LHCb RRB
LHCb VELO Project Collaboration chair



Elena G. Ferreiro

President of the Government Board of the Strong2020 consortium
Electron Ion Collider commission



Edgar Lemos

VELO Run and Commissioning coordinator



Carlos Salgado

Executive Board of the Strong2020 consortium
PI of ERC Advanced Grant “Yoctosecond Imaging of QCD collectivity using jet
observables (YoctoLHC)”

Conveners of the hard probe WGs of the FCC in heavy-ion mode

SA2

Ministry of Science, Innovation, and Universities/Spanish Agency for Research - "Knowledge Generation
Projects" to fund the scientific activities of the IGFAE group for the next 3 years related to the Pierre Auger
Observatory and radio detection, including a PhD fellowship (FPI) for a new student.

Ministry of Science, Innovation, and Universities/Spanish Agency for Research – “International
Cooperation Award” to fund the Operating costs of IGFAE members in the Pierre Auger Collaboration.



Jaime Álvarez

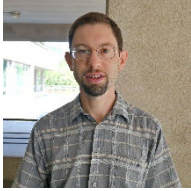
Convener of Pierre Auger Collab. Neutral Particles task



Lorenzo Cazón

Pierre Auger Collab. Physics Coordinator

Coordinator of the Working Group on Hadronic Interactions and Shower Physics (WHISP)



Thomas Dent

Co-chair of working group on compact binary rate & population analysis (up to May 2023)

Leader of task force on CBC properties for low latency alerts (Oct 2023–)



Diego González

Work Package Coordinator (DRD1 collaboration)

Co-founding editor of the journal: *Frontiers in Detector Science and Technology* (launched end of 2023)



Marvin Gottowik

Convener of Auger Data Processing and Analysis task



José Ángel Hernando

NEXT software coordinator and member of the NEXT steering committee



Enrique Zas

Convener of Pierre Auger Collab. Multimessenger task

SA3



Héctor Álvarez

R3B Collaboration Analysis & Simulation convener



Beatriz Fernández

ACTAR TPC Advisory Committee

Chair of the Ganil Users Executive Committee

Responsible for simulations and data analysis in AT TPC

IGNITE Programme

The IGNITE+ program serves to support emerging initiatives, identifying new scientific opportunities, especially for young researchers, another of the scientific pillars of the IGFAE's scientific strengthening strategy.

During the year 2023 no new IGNITE projects were granted, the new call is pending the budget allocations of 2024. 2023 was a transitional year in terms of budget, pending the resolution of the accreditations María de Maeztu and Research Centers of Galicia.

Benchmarking 2023

Within the framework of the candidacy for the renewal of the María de Maeztu 2023 accreditation, the IGFAE benchmarking analysis was updated once again. The analysis was carried out by two specialized companies that have efficient tools for this type of studies¹.

The analysis was carried out comparing 8 European Centres with the IGFAE: Department of Physics of Technical University of Munich (TUM); Helsinki Institute of Physics (HIP); Laboratorio de Instrumentacao e Fisica Experimental de Particulas (LIP); Institut de Fisica d'Altes Energies (IFAE); Laboratoire de Physique Nucleaire et de Hautes Energies (LPNHE); Institut de Physique Theorique (IPhT); Institute for Nuclear Theory, Technical University of Darmstadt; ExtreMe Matter Institute, GSI, Darmstadt.

Among other conclusions, some of the main results of this analysis highlight that although the IGFAE is the second smallest of the centres included, it has:

¹ SIRIS Academics (<https://www.sirisacademic.com>) and Research Marks (<https://www.researchmarks.com>).



- The highest percentage of researchers trained abroad; it is 2nd in terms of publications per permanent researcher.
- The 1st in normalized number of papers in the top 1% of citations, the 2nd in normalized number of papers in the top 10% of citations, the 2nd in normalized citation impact.
- In recruitment, the IGFAE was the first in number of MSCA Individual Fellowships per permanent researcher and the second in number of ERC projects in Panel 2 per permanent researcher. The IGFAE is the first in % of H2020 projects as coordinator.
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This exhaustive analysis with several reference centres in our field of knowledge indicates that the IGFAE can be considered a centre of excellence in Europe in Particle, Astroparticle and Nuclear Physics, as demonstrated by its high impact, excellence, international leadership, and success in specific actions of the H2020 program.

Experimental research line and laboratories

As one of the strategic lines of the IGFAE is the strengthening of the experimental activity, in previous years an important effort was made in expendable material, especially to face the repair of the high-power laser of the L2A2 of the SA3_LACC program. In this year the work was carried out along the same lines. This report details the work carried out from the laboratories in the section describing the scientific areas.

Accreditation "Unit of Excellence - María de Maeztu"

One of the priority objectives within the IGFAE's Strategic Plan is to renew the María de Maeztu accreditation. In the last calls, the scores obtained left the centre at the limit of renewal, even with funding, which allows us to be optimistic. Especially the excellent evaluations obtained by the evaluators.

During 2023, all the IGFAE committees, Director and the management units have been working on the application to define the strategic guidelines of the new proposal.



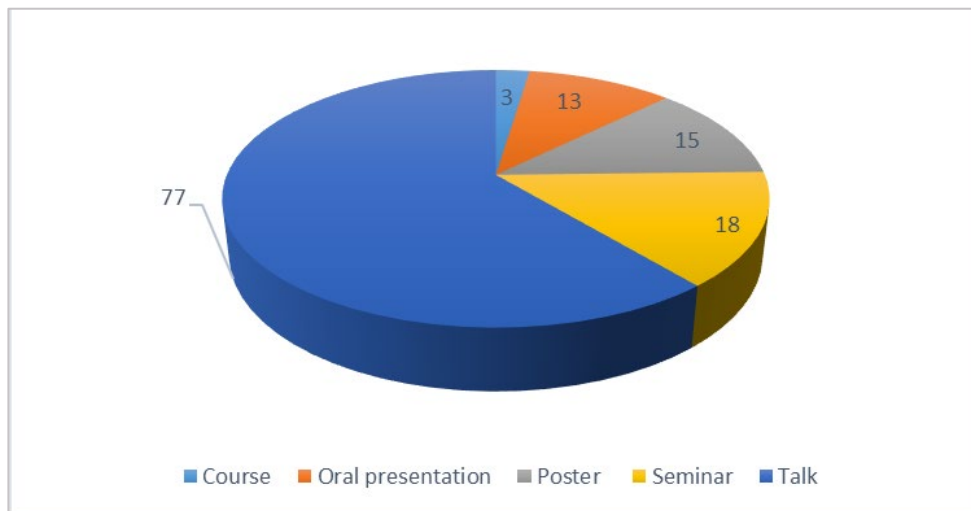
IGFAE visitors and researcher stays programme.

Another of IGFAE's main lines of work is to facilitate the international mobility of the institute's researchers and the hosting of other researchers from reference research centres.

Forty-three grants have been covered, requested within an open internal call of the IGFAE for all its research lines, which have financed the stays of our researchers and the attendance to congresses, conferences and summer schools in the centres listed in the annex 2. The list of visiting research personnel at the IGFAE during 2023 is also included in Annex 3.

Seminars, workshops & courses by IGFAE's organization

During the year 2023, a total of 126 exhibitions of work outside the IGFAE were held in different formats:



Scientific work in foreign institutions

In the case of posters, it is worth mentioning the award and presentation at the LIGO-Virgo_KAGRA collaboration forum of the poster of the predoctoral student Verónica Villa from the IGFAE gravitational waves program. The meeting was held in March 2023 at Northwestern University.

Her paper "Rapid Estimation of Binary Source Properties via Post-Newtonian Parameter Space" won the prize in the category of data/theory analysis among 80 proposals submitted.



To the presentations made in reference institutions all over the world, we must add the seminars organized in IGFAE itself, where scientific relevant profiles are invited. Of the 43 events organized by the institute, 91% were given by invited researchers from other institutions:



Number of events 1



Number of participants 1

Talent & Scientific career

During the call 2022/2023, the IGFAE has offered 7 research initiation contracts for students studying for the master’s degree in physics.

The training offer also includes:

- Academic Training Programme (Academic Training Programme).
- International Postdoctoral Training Programme.



- International PhD programme and professional development plan (International PhD Programme).

One course was organised in the Academic Training Programme for PhD students and postdocs.

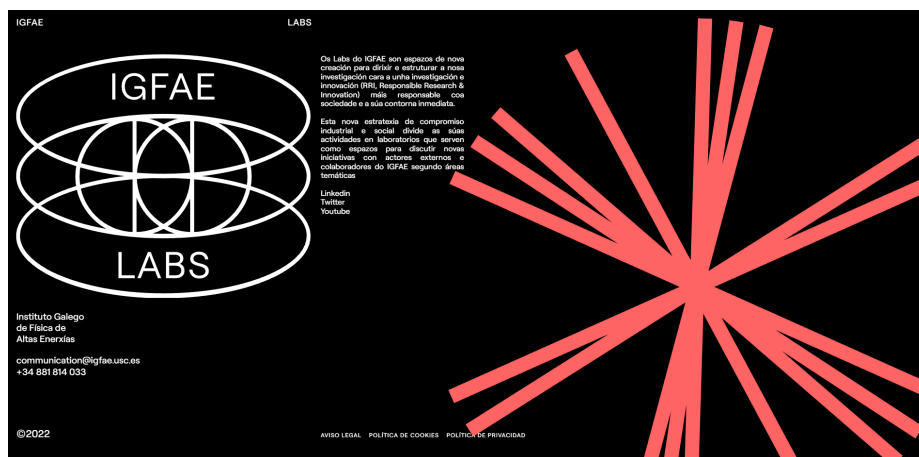
Introductory Course to Tensor Networks

<https://igfae.usc.es/igfae/talk/1037>

As a reinforcement, and as mentioned above, specific support was provided during 2023 to IGFAE candidates preparing MSCA IF, ITN and ERC (Consolidator Grants) proposals. Three applications were submitted to the Consolidator Grants call, two were unsuccessful and one is pending resolution.

Science & Society

The IGFAE-Labs have continued with the programmed activities, which are detailed in the section on Dissemination and Promotion of Scientific Culture. In addition, this year they have a specific website that brings together all the activities and reflects the innovative identity of these labs. (<https://igfae.usc.es/labs/>).



Innovative identity of IGFAE Labs 1



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ArtLAB

The objective of the program is to build bridges and encourage participation between society and the research community through different artistic expressions. In the year 2023 the following activities were carried out within the framework of the Artlab.

Cycle "Transfronteirizas, conversas entre arte e ciencia"

This cycle is a series of virtual dialogues broadcasted live on YouTube in which we invite cultural figures to explore the boundaries between art and science with our research staff, looking for an interdisciplinary approach. This initiative has been carried out since 2020. In 2023 two dialogues have been held, on the one hand the American physicist Alan Sokal, author of the book "*Imposturas intelectuales*" and on the other hand, on the release of the film ¡Salta! We talk with Olga Osorio and Tamar Novas.

To date, the cycle has more than 46,000 views and a maximum of 170 simultaneous viewers, with more than 25,000 interactions. IGFAE's YouTube channel has more than 1,720 subscribers.

EduLab

MEDRA Project: Minipix for Radiation Monitoring and Detection in Classrooms

MEDRA is a new initiative promoted by the IGFAE's educational laboratory, EduLab, for the 2022/2023 academic year, which aim is to give secondary school students from 10 Galician schools their first research experience in particle physics. This will be done using Minipix, hybrid detectors developed by CERN that work like a camera, photographing the traces left by particles from the cosmos or a radioactive source as they pass through the sensor. These tracks indicate what type of particle it is, its energy, electric charge, origin, and trajectory.



First participants of MEDRA 1



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In November 2023, as part of IGFAE's Science Week, the 1st MEDRA project congress was held, where students and teachers presented their projects. The 2nd edition of the project is already underway, with 10 high schools and dozens of students involved.

Working Group Outreach

International Masterclass in Particle Physics

The Institute takes part in this major event, involving more than 13.000 high school students in 60 countries. The IGFAE organizes two masterclasses every year: one is focused on the International Day of Women & Girls in Science, and the other one is offered to high school students with interest in Physics. Both are open to teenagers living on the Galicia region. In total, more than 100 students

VI Science Week & Singular Science 2023

The main event, as in previous years, was the Science Week (November 9th to 15th), especially the Krishna Rajagopal conference (Nov 15th), with more than 300 attendees including a significant proportion of young physics students. In addition, the Nerd Nite outreach event the day before (Nov 14th) was followed by about 100 people.



Main conference of Science Week 2023

The Network of Singular Research Centres (RCSI) of the University of Santiago de Compostela (USC) celebrates all years 'Ciencia Singular' a day of dissemination aimed at showing society the work of excellence carried out by the four centres in the network (CiQUS, CiMUS, CiTIUS and IGFAE). It is a day dedicated to the dissemination of science and technology developed in these research centres, in a fun and festive atmosphere, to offer an entertaining and attractive approach for an audience of all ages and all types of education. This day is mainly financed thanks to the agreement of the *Consellería de Cultura, Educación e Universidades*.



In November, the Open Day (Ciencia Singular) allowed more than 200 people to get to know the IGFAE, through talks and workshops adapted to all ages.

Outreach Training

One of the most common demands of research staff is training in communication and dissemination skills, to facilitate the transmission of their knowledge to the public. On 23 June, Andrea Muras gave a course on dissemination presentations, which was attended by around 30 IGFAE researchers.

Working group: Gender and diversity

Since 2019, the IGFAE counts with a working group focused on Gender & Diversity, that meets monthly. Its actions include the development of the equality strategy (approved on 2021), the organisation of events to promote women's participation in particle physics and training activities for the centre's staff, among other tasks.

International Day of Women and Girls in Science - Master Class

With the occasion of 11 February, International Day of Women and Girls in Science, the IGFAE organised on February 10th, 2023, the fourth edition of the masterclass in particle physics, using real data from CERN experiments. Around 40 female students in the first



Participants of the Masterclass

year of high school (16-17 years old) attended to the event, in which IGFAE researchers shared their daily work with the girls. The masterclass encourages scientific vocations among young women and showcase female scientific references.

Workshop on Diversity with PRISMA

In the framework of Science Week and LGBTQ+ STEM Day (November 18th), the working group organised a workshop on November 16th. It was taught by representatives of PRISMA, a non-profit association that promotes LGBTQIA+ diversity and inclusivity in Science, Technology, Engineering and Mathematics (STEM) through scientific data and



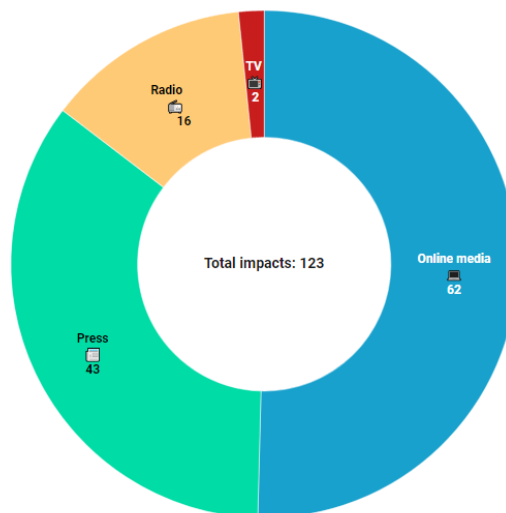
real-life experiences of the community. Around 15 people from IGFAE staff participated in the workshop.



Participants in the PRISMA workshop

Media impact

In 2023, the IGFAE reached 123 impacts in media (press, online, radio, TV, etc.). Among them, several issues stand out for their relevance, such as the Workshop on protontherapy (16 impacts), the results of a paper about a new technique in GW detection, led by Juan Calderón Bustillo (9 impacts), and other issues, such as the institutional visits. IGFAE staff have also been available to the media as expert sources on worldwide physics topics such as cosmic rays' detection, or advances in nuclear fusion.



Social Media Impact 1



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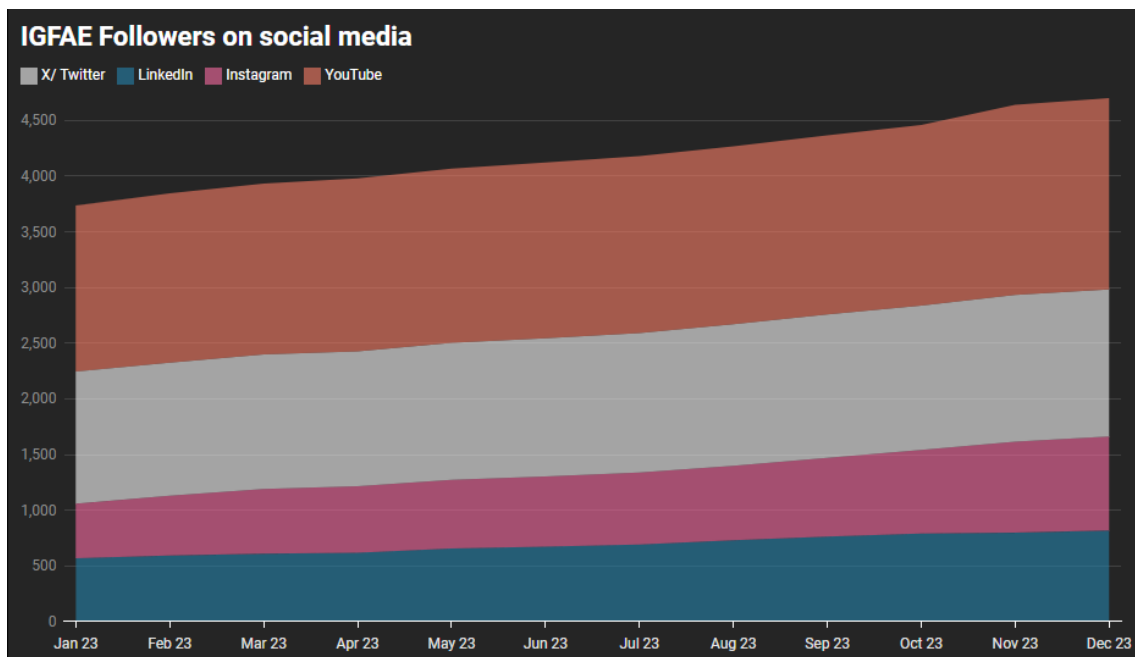
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The IGFAE has consolidated its presence on social media during this year. After the creation of an Instagram account (November 2022), this platform has become one of the main communication channels for the Institute activities, reaching thousands of people.

Another important point for the communication strategy is X / Twitter, where daily activities, scientific results and information about different calls is published. This channel has reached almost 200.000 impressions in 2023.

LinkedIn serves as a communication platform, but also as a bond to connect IGFAE alumni, as well as the community of high-energy physics interested in the work that the IGFAE staff are developing. It is followed by 818 people at the end of the year.

Finally, YouTube represents a cornerstone of outreach activities at the Institute. Events such as ‘Transfronteirizas’ (live talks between IGFAE researchers and artists from different perspectives) increase the visibility of our brand; during 2023, our YouTube channel has been viewed for 2.645 hours.



IGFAE Followers on social media 1



Valorisation and Transfer

During the year 2023, a collaboration agreement has been signed between IGFAE and Futbol Club Barcelona (FCB) for the application of problem-solving methods and algorithms in the optimisation of the FCB's ticket sales processes and other commercial activities. This work has been carried out by the researcher Juan Calderón Bustillo.

As part of the work with companies, work is being done on the preparation of an IGNICIA project between IGFAE, NDA and the company ENERCRAFT S.L. for the joint development of new batteries and autonomous power supply systems based on radioactive isotopes and isomers. On the other hand, work is being carried out with the Galician Technological Institute (ITG) and the companies idDOMOTICA and InBiot in the search for calls for joint development of new domotic systems for radon evaluation in indoor spaces.

In collaboration with the AVTE Transfer Accelerator (USC), a transfer project is being carried out, “Radiografía e tomografía industrial por emisión de neutróns para ensaios non destrutivos”. This project has passed a competitive call of the same AVTE and is endowed with 40,000.00 € for the development of new radiation detectors oriented to industrial radiography equipment.



1Carlos Salgado, Luís Otero (USC), Yassid Ayyad, Diego Suárez (AVTE) and Pablo Cabanelas.

In 2023, the protection of a low-cost and low-maintenance portable fog chamber designed within the framework of the IGFAE Edulab Programme “O Fiouco”, developed by IGFAE researchers to demonstrate the operation of a particle detector, was also requested. It was registered with the entry number 03/2023/210 in the Galician Territorial Register of Intellectual Property.

Another milestone of the year 2023 has been the constitution of a new spin-off from the IGFAE Neutron Insights S.L., a technology-based company whose main activity is the development of detection systems and industrial radiography services by emission and



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detection of neutrons. From 2 of october, two jobs for qualified personnel have already been created.

On 9-10 May has been organized: "*Workshop on Technologies & applied research at the future Galician proton-therapy facility*"

The aim of this workshop was to gather and analyze interests and developments related with proton-therapy accelerators at national and international level for the next years, in a scenario where new public proton-therapy treatment and research facilities will be installed soon in Spain, and more precisely in Santiago de Compostela.

Here it was a meeting point where the treatment facility will be presented to the scientific community and scientists will present their related research to the social agents. Discussion and analysis of the topics at this workshop were steered by different perspectives.

On top of that, this workshop aimed also to ignite a future network for managers, workers, and users of those facilities. As a key speakers and contributions, we counted with representatives, among others, of:

- Health System and Radiotherapy treatment environment
- Technical aspects of proton-therapy infrastructures and facilities
- Scientific community with research focus on proton-therapy related developments.



Annex 1. New projects

Ref.	Title			
2022-CP118	Convenio entre el Barcelona Supercomputing Center - Centro Nacional de Supercomputación y entidades participantes para la colaboración científico - Técnicas en computación cuántica, Quantum Machine Learning y educación y difusión con fines científicos del proyecto Quantum Spain			
LR	Funder	Start	End	Amount
Mas Sole, Javier	Barcelona Supercomputing Centre, Centro Nacional de Supercomputación	07/31/2023	12/31/2025	314.890 €
Ref.	Title			
2023-AD021	Xornadas de portas abertas e bolsas de verán 2023: IGFAE			
LR	Funder	Start	End	Amount
Salgado López, Carlos A.	Consellería de Cultura, Educación, Formación Profesional e Universidades	01/01/2023	11/30/2024	48.000 €
Ref.	Title			
2023-AD055	Acción 8. Apoio Centros Red CIGUS: IGFAE. Convenio Accions I+D			
LR	Funder	Start	End	Amount
Salgado López, Carlos A.	Consellería de Cultura, Educación, Formación Profesional e Universidades	01/01/2023	09/30/2024	477.055 €
Ref.	Title			
2023-CL044	Deseño dun experimento para ver a influencia dos raios cósmicos na infraestrutura de computación cuántica, contrato susceptible de financiamento pola Unión Europea no marco do Eixo REACT UE do programa operativo FEDER Galicia 2014-2020, como parte da resposta da Unión Europea á pandemia da COVID-19			
LR	Funder	Start	End	Amount
Álvarez Pol, Héctor	Fundación Pública Gallega C. Tecnolóxico de Supercomputación de Galicia	06/23/2023	09/22/2024	48.291 €
Ref.	Title			
2023-CP046	Convenio de colaboración entre a Axencia Galega de Innovación, a Consellería de Cultura, Educación, Formación Profesional e Universidades e a Universidade de Santiago de Compostela para fomentar a actividade investigadora do persoal investigador finalista nas convocatorias de axudas do ERC no Marco do Programa Horizon Europe			
LR	Funder	Start	End	Amount
Sadofyev, Andrey	Axencia Galega de Innovación (GAIN)	01/01/2023	11/30/2023	50.000 €



Ref.	Title			
ED431F2023/21	CONSOLIDACIÓN E ESTRUTURACIÓN 2023 - Proxectos de Excelencia (liña emerxente) - Fuentes de neutrones basadas en aceleradores láser-plasma de iones			
LR	Funder	Start	End	Amount
Alejo Alonso, Aarón A.	Consellería de Cultura, Educación, Formación Profesional e Universidades	01/01/2023	11/20/2027	115.000 €
Ref.	Title			
ED431F2023/19	CONSOLIDACIÓN E ESTRUTURACIÓN 2023 - Proxectos de Excelencia (liña emerxente) - Nuevos métodos para las interacciones fundamentales a nivel cuántico.			
LR	Funder	Start	End	Amount
Borsato, Riccardo	Consellería de Cultura, Educación, Formación Profesional e Universidades	01/01/2023	11/20/2027	115.000 €
Ref.	Title			
ED431F2023/10	CONSOLIDACIÓN E ESTRUTURACIÓN 2023 - Proxectos de Excelencia (liña emerxente) - Advancing high-energy nuclear physics in the LHC/HL-LHC era and beyond.			
LR	Funder	Start	End	Amount
Wu, Bin	Consellería de Cultura, Educación, Formación Profesional e Universidades	01/01/2023	11/20/2027	114.994 €
Ref.	Title			
ED481D 2023/013	A teoría das interaccións fortes no límite de $\hbar \rightarrow 0$ -partícula: unha teoría semi-clásica de quarks e gluóns elementais			
LR	Funder	Start	End	Amount
García Feal, Xabier	Consellería de Cultura, Educación, Formación Profesional e Universidades	09/16/2023	04/15/2025	24.720 €
Ref.	Title			
PCI2023-145952-2	Cosmic rays and neutrinos in the multimessenger era: Pierre Auger Observatory - PROYECTOS DE COLABORACIÓN INTERNACIONAL 2023-2			
LR	Funder	Start	End	Amount
Álvarez Muñiz, Jaime	Agencia Estatal de Investigación	09/01/2023	08/31/2026	216.000 €
Ref.	Title			
PCI2023-145965-2	THE SPECTROMETER UPGRADE-II AT LHCb-USC - PROYECTOS DE COLABORACIÓN INTERNACIONAL 2023-2			
LR	Funder	Start	End	Amount
Gallas Torreira, Abraham A.	Agencia Estatal de Investigación	09/01/2023	08/31/2026	276.900 €
Ref.	Title			



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PCI2023-145984-2 LHCb-CERN DATA CHALLENGES-USC - PROXECTOS CONXUNTOS DE I + D + i
INTERNACIONAL 2021

LR	Funder	Start	End	Amount
Cid Vidal, Xabier	Agencia Estatal de Investigación	09/01/2023	08/31/2026	72.000 €



Annex 2 Stays, conference attendance

Researcher	REASON
Lorenzo, Ana	International Max Planck Research School (IMPRS), 1-6 October in Santo Estevo (Spain)
Dent , Thomas	IMPRS Hannover Lecture Week, 26-31 March in Fintel (Germany)
Kumar, Praveen	International Max Planck Research School (IMPRS), 1-6 October in Santo Estevo (Spain)
Salgado, Carlos A.	XV CPAN Days, 2-6 October in Santander (Spain)
Salgado, Carlos A.	Congreso 100xCiencia7, do 23 ao 24 de outubro in Granada (Spain)
Álvarez, Jaime	Auger Review e Collaboration Meeting, 6-16 November in Malargüe (Argentina)
Cid Vidal, Xabier	XV Jornadas CPAN, do 2 ao 6 de outubro in Santander (Spain)
Lozano, Miguel	GANIL Colloque 2023, 25-29 September in Soustons (France)
Cabanelas, Pablo	Congress 100xCiencia7, 23-24 October in Granada (Spain)
Rey Pan, Manuel	Congress 100xCiencia7, 23-24 October in Granada (Spain)
Bembibre, Adrian	Onassis Foundation Summer School, 3-7 July in Heraklion (Grecia)
Bembibre, Adrian	European Advanced Accelerator Concepts Workshop 2023 (EAAC2023), 17-23 September in Elba (Italy)
Alejo, Aaron	European Advanced Accelerator Concepts Workshop 2023 (EAAC2023), 17-23 September in Elba (Italy)
Lorenzo Medina, Ana	First EUCAPT School: Cosmology, 18-22 September in Valencia (Spain)
Pazos, Antonio	Second International KiCad Conference (KICON 2023), 9-10 September in A Coruña (Spain)
Fernandez, Antonio	Second International KiCad Conference (KICON 2023), 9-10 September in A Coruña (Spain)
Lozano, Miguel	Euroschool on Exotic Beams 2023, 27th August-2nd September in Sinaia (Romania)
Ammerman, Juan	38th International Cosmic Ray Conference, 26th July, 3rd August in Nagoya (Japan)
Fernandez Gomez, Miguel	SLAC Summer Institute 2023, 7-18 August in Los Ángeles (United States)
Riehn, Felix	38th International Cosmic Ray Conference, 26th July, 3rd August in Nagoya (Japan)
Martins, Miguel Alexandre	38th International Cosmic Ray Conference, 26th July, 3rd August in Nagoya (Japan)
Gonzalez Díaz, Diego	DUNE Phase II Workshop, 20-22 June in London (United Kingdom)
Leardini, Sara	DUNE Phase II Workshop, 20-22 June in London (United Kingdom)
Fernández, David	DUNE Phase II Workshop, 20-22 June in London (United Kingdom)
Amedo Martínez, Pablo	DUNE Phase II Workshop, 20-22 June in London (United Kingdom)
Padín, Jacobo	DUNE Phase II Workshop, 20-22 June in London (United Kingdom)
Brea Rodriguez, Alexandre	CERN Fermilab School, 22-31 August in Geneve (Switzerland)



Cabanelas Eiras, Pablo	Mindtech Fair, 20-22 June in Vigo (Spain)
Bellafronte, Luigi	Conference Higgs and Effective Field Theory HEFT 2023, 19-21 June in Manchester (United Kingdom)
Vazquez Sierra, Carlos	CODEX-b week & LLP workshop, 19-23 June in Geneve (Switzerland)
Gallas Torreira, Abraham	Meeting with Galician Minister of Culture, Education & Universities, and USC Vicerrector of Scientific Policy, 12-14 March in Geneve (Switzerland)
Rodriguez, Ricardo	SOMMa Meeting, April 17 in Madrid (Spain)
Cabanelas, Pablo	Meeting with Ferrol Industrail Campus & visit to CITENI, 16 May in Ferrol (Spain)
Salgado, Carlos	Meeting with Galician Minister of Culture, Education & Universities, and USC Vicerrector of Scientific Policy, 12-14 March in Geneve (Switzerland)
Mariño, Berta	SOMMa Managers Meeting, 15-17 May in Bilbao (Spain)
Cabo, Cristina	Visit to Alisys facilities, 11-12 May in Gijón (Spain)
Giardino, Pier Paolo	MWdays23, 17-20 April in Geneve (Switzerland)
Cabanelas Eiras, Pablo	IV Joint IGFAE-LIP Workshop, 13-14 April in Lisbon (Portugal)
Bives Tour Sal	Informative Meeting on new LSTI, 17 April in Madrid (Spain)
Dent, Thomas	Rencontres de Moriond Gravitation, 18-25 March in La Thuile (Italy)
Lois Fuentes, Juan	Experimental campaign at Argonne Laboratory, 22nd March-6th April in Chicago (United States)
Regueira, Daniel	Experimental campaign at Argonne Laboratory, 22nd March-6th April in Chicago (United States)
Kumar, Praveen	LIGO-VIRGO-KAGRA Collaboration Meeting, 13-16 March in Chicago (United States)



Annex 3 Visiting researchers at IGFAE

Visit	Course/ Talk/ Conference/Collaboration	SA
Mark Gieles	Star clusters as gravitational wave factories	SA2
Tito dal Canton	Joint searches for transient gravitational waves and high-energy photons	SA2
Miguel Ángel Velasco	The latest low energy measurements with AMS on the ISS	SA3
Varios	IGFAE workshop on technologies and applied research at the future Galician proton-therapy facility	SA3
Óscar García	The soft and direct photon puzzles in Heavy Ion Collisions: two problems, two ideas	SA1
Abderrahim El Allati	Introductory Concepts in Quantum Thermodynamics	SA1
Abderrahim El Allati	Improving Thermodynamic Quantities in Non-Markovian Regime	SA1
Xin-Nian Wang	Jet quenching and medium response in heavy-ion collisions	SA1
Christopher Halcrow	Skymions: ferroelectrics, superconductors and nuclei	SA1
Siggi Hauksson	Jet polarization in an anisotropic medium	SA1
James P. Vary	Bound states in QED and QCD with a light-front Hamiltonian approach	SA1
Florian Lindenbauer	Jet momentum broadening during initial stages in heavy-ion collisions via kinetic theory	SA1
Gloria Platero	Long-Range Quantum State Transfer in Semiconductor Quantum Dots Arrays	SA1
Pietro Vischia	Optimizing experiment design with machine learning	SA1
Clemens Kuhlenkamp	Periodically driving generalized SYK models	SA1
Luisa Jaime	Geometric cosmology	SA1
Luca Tagliacozzo	Introductory Course to Tensor Networks	SA1
Dana Avramescu	Simulating hard probes in the Glasma	SA1
Jorge Zanelli	Local Supersymmetry, an unconventional approach	SA1
Dr. Lata Kh Joshi	Measurements of many-body quantum chaos	SA1
Prof. Nick Manton	Constructing Kinks and Sphalerons in One Dimension	SA1
Bruno Sebastian Scheihing Hitschfeld	Quarkonium transport in weakly and strongly coupled plasmas	SA1
Rachel Lee Steinhorst	Adiabatic hydrodynamization in kinetic theories of gluon gases	SA1
Ricardo Stuardo	Confinement in (1+1) dimensions: a holographic perspective from I-branes	SA1
Ali Fatemiabhar	Wilson loops in 5d and 3d conformal linear quivers	SA1
Andrii Usachov	Revealing light Dark Matter: a dive into Long-Lived particle searches at LHCb	SA1
Alejandro Vilar	Universal black hole microstates with thin shells I - Background	SA1
Alejandro Vilar	Universal black hole microstates with thin shells II - New results	SA1
Michele Galli	Consistent truncations and KK spectra via exceptional field theory	SA1
Adan Cabello	Test of the physical significance of Bell's theorem	SA1
Matt Durham	Mesons, baryons, and tetraquarks in a hadronic medium	SA1
Varios	From hadrons to the Stars and Cosmos: a tribute to Ricardo Vázquez	Xral
Krishna Rajagopal	VI Semana da Ciencia	SA1



Annex 4: Publications

Title: [The cryogenic RWELL: a stable charge multiplier for dual-phase liquid argon detectors](#)

Tesi A.; Leardini S.; Moleri L.; Gonzalez-Diaz D.; Jash A.; Breskin A.; Bressler S. IGFAE Authors:
Leardini S., Gonzalez-Diaz D.

Reference: Eur. Phys. J. C 83 (2023) 979

Research program: SA2_NEXT

DOI 10.1140/epjc/s10052-023-12162-x

Title: [The WASA-FRS project at GSI and its perspective](#)

Saito T.R. et al. (79 authors) IGFAE Authors: Benlliure J., Feijoo-Fontán M., González A.G.,
Rodríguez-Sánchez J.L.

Reference: Nucl Instrum Methods Phys Res Sect B 542 (2023) 22

Research program: SA3_LACC

DOI 10.1016/j.nimb.2023.05.042

Title: [Diverse mechanisms in proton knockout reactions from the Borromean nucleus \$^{17}\text{Ne}\$](#)

Wamers F. et al. (61 authors) IGFAE Authors: Alvarez-Pol H., Beceiro-Novo S., Cortina-Gil D.,
Fernández P.D., Rodriguez-Tajes C.

Reference: Eur. Phys. J. A 59 (2023) 154

Research program: SA3_NUCL

DOI 10.1140/epja/s10050-023-01063-y

Title: [Search for the baryon- and lepton-number violating decays \$B_0 \rightarrow p\mu^-\$ and \$B_{s0} \rightarrow p\mu^-\$](#)

Aaij R. et al. (1063 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea
Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I.,
Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia
Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D.,
Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez



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2024

Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012021

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012021

Title: [First observation and branching fraction measurement of the \$\Lambda_b^0 \rightarrow D_s^- p\$ decay](#)

Aaij R. et al. (1063 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 75

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)075

Title: [Observation of the \$B^+ \rightarrow J\psi\eta'K^+\$ decay](#)

Aaij R. et al. (1067 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E.R.R., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P., Vázquez Sierra C.

Reference: J. High Energy Phys. 2023 (2023) 174

Research program: SA1_LHCB

DOI 10.1007/JHEP08(2023)174



Title: [Open charm production and asymmetry in pNe collisions at \$\sqrt{s_{NN}}=68.5\text{GeV}\$](#)

Aaij R. et al. (1071 authors) IGFAE Authors: Alfonso Albero A., Garcia Moreno P., Garrido L., Gironella Gironell P., Gomez Fernandez S., Graugés E., Lobo Salvia A., Lopez Huertas A., Marin Benito C., Mauricio J., Vazquez Gomez R.

Reference: Eur. Phys. J. C 83 (2023) 541

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11641-5

Title: [A compact dication source for Ba²⁺ tagging and heavy metal ion sensor development](#)

Navarro K.E. et al. (116 authors) IGFAE Authors: Díaz G., Hernando Morata J.A., Hervés Carrete C., Pérez Maneiro M., Renner J.

Reference: J. Instrum. 18 (2023) P07044

Research program: SA2_NEXT

DOI 10.1088/1748-0221/18/07/P07044

Title: [A study of CP violation in the decays \$B_{\pm} \rightarrow \[K+K-\pi+\pi-\]Dh_{\pm}\$ \(\$h=K, \pi\$ \) and \$B_{\pm} \rightarrow \[\pi+\pi-\pi+\pi-\]Dh_{\pm}\$](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Rodriguez P.B., Belin S., Rodriguez A.B., Gonzalo A.B., Vidal A.C., Chobanova V., Vidal X.C., Corredoira I., Dalseno J., Maronas L.D., Orro C.E., Gomez M.F., Torreira A.G., Plana B.G., Gioventù A., Gomez C.L., Castro J.L., Soliño S.L., Santos D.M., Mombächer T., Fernandez J.N., Castro A.P., Casasus M.P., Prouve C., Fernandez E.R., Rodriguez E.R., Lamas M.R., Vidal A.R., Fernandez R.A.R., Silva J.J.S., Rios C.S., Sellam S., Hulse C.B.V., Regueiro P.V.

Reference: Eur. Phys. J. C 83 (2023) 547

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11560-5

Title: [Virgo detector characterization and data quality: Tools](#)

Acernese F. et al. (493 authors) IGFAE Authors: Sadiq J., Villa-Ortega V.

Reference: Classical Quantum Gravity 40 (2023) 185005



Research program: SA2_GRWA

DOI 10.1088/1361-6382/acdf36

Title: [Resolving the Scales of the Quark-Gluon Plasma with Energy Correlators](#)

Andres C.; Dominguez F.; Elayavalli R.K.; Holguin J.; Marquet C.; Moul I. IGFAE Authors:
Dominguez F.

Reference: Phys Rev Lett 130 (2023) 262301

Research program: SA1_HQCD

DOI 10.1103/PhysRevLett.130.262301

Title: [Amplitude analysis of the \$D^+ \rightarrow \pi^- \pi^+ \pi^+\$ decay and measurement of the \$\pi^- \pi^+ S\$ -wave amplitude](#)

Aaij R. et al. (1043 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 44

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)044

Title: [Search for the lepton-flavour violating decays \$B^0 \rightarrow K^{*0} \tau \pm \mu \mp\$](#)

Aaij R. et al. (1066 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.



Reference: J. High Energy Phys. 2023 (2023) 143

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)143

Title: [Energy loss profile measurements using the ACTAR TPC demonstrator active target](#)

Camaiani A. et al. (44 authors) IGFAE Authors: Alvarez-Pol H., Fernández-Domínguez B.

Reference: Nucl Instrum Methods Phys Res Sect B 542 (2023) 188

Research program: SA3_NUCL

DOI 10.1016/j.nimb.2023.07.001

Title: [Measurement of the Z boson production cross-section in proton-lead collisions at \$\sqrt{s_{NN}} = 8.16\$ TeV](#)

Aaij R. et al. (1029 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 22

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)022

Title: [Measurement of the neutron-induced fission cross section of Th 230 at the CERN n_TOF facility](#)

Michalopoulou V. et al. (136 authors) IGFAE Authors: Caamaño M., Durán I., Fernández-Domínguez B.

Reference: Phys. Rev. C 108 (2023) 014616

Research program: SA3_NUCL

DOI 10.1103/PhysRevC.108.014616



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Title: [Elucidating the nature of the proton radioactivity and branching ratio on the first proton emitter discovered \$^{53}\text{mCo}\$](#)

Sarmiento L.G. et al. (51 authors) IGFAE Authors: Alvarez-Pol H., Caamaño-Fresco M., Fernández-Domínguez B., Lois-Fuentes J.

Reference: Nat. Commun. 14 (2023) 5961

Research program: SA3_NUCL

DOI 10.1038/s41467-023-39389-2

Title: [Measurement of the ratio of branching fractions \$B\(\text{Bc}^+ \rightarrow \text{Bs}0\pi^+\)/B\(\text{Bc}^+ \rightarrow \text{J}/\psi\pi^+\)\$](#)

Aaij R. et al. (1069 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casarus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 66

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)066

Title: [Effective no-hair relations for spinning boson stars](#)

Adam C.; Castelo J.; Martín-Caro A.G.; Huidobro M.; Wereszczynski A. IGFAE Authors: Adam C., Castelo J., Martín-Caro A.G., Huidobro M.

Reference: Phy. Rev. D 108 (2023) 043015

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.043015

Title: [Density and magnetic field strength dependence of radio pulses induced by energetic air showers](#)



Ammerman-Yebra J.; Alvarez-Muñiz J.; Zas E. IGFAE Authors: Ammerman-Yebra J., Alvarez-Muñiz J., Zas E.

Reference: J. Cosmol. Astroparticle Phys. 2023 (2023) 015

Research program: SA2_AUGE

DOI 10.1088/1475-7516/2023/08/015

Title: [Measurement of the \$\Lambda_c^+\$ to \$D^0\$ production ratio in periphera PbPb collisions at \$\sqrt{s_{NN}} = 5.02\$ TeV](#)

Aaij R. et al. (1013 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 132

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)132

Title: [Observation of New \$\omega_0\$ States Decaying to the \$\Xi_c^+ K^-\$ Final State](#)

Aaij R. et al. (1059 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 131902

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.131902



Title: [Measurement of the N 14 \(n,p\) C 14 cross section at the CERN n TOF facility from subthermal energy to 800 keV](#)

Torres-Sánchez P. et al. (131 authors) IGFAE Authors: Caamaño M., Durán I., Fernández-Domínguez B.

Reference: Phys. Rev. C 107 (2023) 064617

Research program: SA3_NUCL

DOI 10.1103/PhysRevC.107.064617

Title: [Secondary scintillation properties of multi-layer THGEMs operated in low-pressure CF4 and Ar/5%Xe](#)

Cortesi M.; Sims H.; Pereira J.; Ayyad Y.; Majewski P.A.; Katsioulas I. IGFAE Authors: Ayyad Y.

Reference: J. Instrum. 18 (2023) P08005

Research program: SA3_NUCL

DOI 10.1088/1748-0221/18/08/P08005

Title: [Observation of a Resonant Structure near the Ds+ Ds- Threshold in the B+ → Ds+ Ds- K+ Decay](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 071901

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.071901

Title: [Search for Rare Decays of D0 Mesons into Two Muons](#)



Aaij R. et al. (1072 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 041804

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.041804

Title: [Method to evidence hypernuclear halos from a two-target interaction cross section measurement](#)

Velardita S.; Alvarez-Pol H.; Aumann T.; Ayyad Y.; Duer M.; Hammer H.-W.; Ji L.; Obertelli A.; Sun Y. IGFAE Authors: Alvarez-Pol H., Ayyad Y.

Reference: Eur. Phys. J. A 59 (2023) 139

Research program: SA3_NUCL

DOI 10.1140/epja/s10050-023-01050-3

Title: [\$\Lambda c^+\$ polarimetry using the dominant hadronic mode](#)

Aaij R. et al. (1061 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 228

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)228



Title: [Study of exclusive photoproduction of charmonium in ultra-peripheral lead-lead collisions](#)

Aaij R. et al. (1041 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 146

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)146

Title: [Search for CP violation using \$T^{\pm}\$ -odd correlations in \$B^0 \rightarrow p \bar{p} K^{\pm}\pi^{\pm}\$ decays](#)

Aaij R. et al. (1014 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phys. Rev. D 108 (2023) 032007

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.032007

Title: [Nuclear physics midterm plan at Legnaro National Laboratories \(LNL\)](#)

Ballan M. et al. (180 authors) IGFAE Authors: Caamaño M.

Reference: Eur. Phys. J. Plus 138 (2023) 709

Research program: SA3_NUCL

DOI 10.1140/epjp/s13360-023-04249-x

Title: [First Observation of a Doubly Charged Tetraquark and Its Neutral Partner](#)



Aaij R. et al. (1072 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 041902

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.041902

Title: [Gravitational form factors of nuclei in the Skyrme model](#)

Martín-Caro A.G.; Huidobro M.; Hatta Y. IGFAE Authors: Martín-Caro A.G., Huidobro M.

Reference: Phy. Rev. D 108 (2023) 034014

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.034014

Title: [Measurement of antiproton production from antihyperon decays in pHe collisions at \$\sqrt{s_{NN}}=110\text{GeV}\$](#)

Aaij R. et al. (1014 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Casusus M.P., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Eur. Phys. J. C 83 (2023) 543

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11673-x

Title: [Charmonium production in pNe collisions at \$\sqrt{s_{NN}}=68.5\text{ GeV}\$](#)



Aaij R. et al. (1041 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Maronas L.D., Orro C.E., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Eur. Phys. J. C 83 (2023) 625

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11608-6

Title: [Low projectile density contributions in the dilute-dense CGC framework for two-particle correlations](#)

Kohara A.K.; Marquet C.; Vila V. IGFAE Authors: Vila V.

Reference: J. High Energy Phys. 2023 (2023) 159

Research program: SA1_HQCD

DOI 10.1007/JHEP10(2023)159

Title: [A FPGA-Based Architecture for Real-Time Cluster Finding in the LHCb Silicon Pixel Detector](#)

Bassi G.; Giambastiani L.; Hennessy K.; Lazzari F.; Morello M.J.; Pajero T.; Prieto A.F.; Punzi G.
IGFAE Authors: Prieto A.F.

Reference: IEEE Trans Nucl Sci 70 (2023) 1189

Research program: SA1_LHCB

DOI 10.1109/TNS.2023.3273600

Title: [Measurement of the CKM angle \$\gamma\$ with \$B_{\pm} \rightarrow D\[K^{\mp} \pi^{\pm} \pi^{\pm} \pi^{\mp}\]h^{\pm}\$ decays using a binned phase-space approach](#)

Aaij R. et al. (1063 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D.,



Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 138

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)138

Title: [Reconstruction of interactions in the ProtoDUNE-SP detector with Pandora](#)

Abud A.A. et al. (1225 authors) IGFAE Authors: Amedo P., González Caamaño D., Gonzalez-Diaz D., Leardini S., Saa-Hernandez A.

Reference: Eur. Phys. J. C 83 (2023) 618

Research program: SA2_NEXT

DOI 10.1140/epjc/s10052-023-11733-2

Title: [Amplitude analysis of the \$Ds^+ \rightarrow \pi^- \pi^+ \pi^+\$ decay](#)

Aaij R. et al. (1070 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 204

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)204

Title: [Search for Ultra-high-energy Photons from Gravitational Wave Sources with the Pierre Auger Observatory](#)

Abdul Halim A. et al. (369 authors) IGFAE Authors: Alvarez-Muñiz J., Ammerman Yebra J., Cazon L., Gottowik M., Martins M.A., Parente G., Riehn F., Zas E.



Reference: *Astrophys. J.* 952 (2023) 91

Research program: SA2_AUGE

DOI 10.3847/1538-4357/acc862

Title: [Measurement of \$\tau_L\$ using the \$B_s^0 \rightarrow J/\psi \eta\$ decay mode](#)

Aaij R. et al. (1027 authors) IGFAE Authors: Adeva B., Rodriguez P.B., Belin S., Rodriguez A.B., Vidal A.C., Chobanova V., Vidal X.C., Corredoira I., Dalseno J., Maronas L.D., Torreira A.G., Plana B.G., Gioventù A., Castro J.L., Soliño S.L., Santos D.M., Mombächer T., Castro A.P., Casaus M.P., Prouve C., Rodriguez E.R., Lamas M.R., Vidal A.R., Fernandez R.A.R., Silva J.J.S., Rios C.S., Sellam S., Regueiro P.V.

Reference: *Eur. Phys. J. C* 83 (2023) 629

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11634-4

Title: [A coherent view of the quark-gluon plasma from energy correlators](#)

Andres C.; Dominguez F.; Holguin J.; Marquet C.; Mout I. IGFAE Authors: Dominguez F.

Reference: *J. High Energy Phys.* 2023 (2023) 88

Research program: SA1_HQCD

DOI 10.1007/JHEP09(2023)088

Title: [\$\beta^+\$ Gamow-Teller Strengths from Unstable \$O^{14}\$ via the \$\(d, He^2\)\$ Reaction in Inverse Kinematics](#)

Giraud S. et al. (26 authors) IGFAE Authors: Ayyad Y.

Reference: *Phys Rev Lett* 130 (2023) 232301

Research program: SA3_NUCL

DOI 10.1103/PhysRevLett.130.232301

Title: [Constraints on the Cosmic Expansion History from GWTC-3](#)

Abbott R. et al. (1669 authors) IGFAE Authors: Bustillo J.C., Dent T., Sadiq J., Villa-Ortega V.

Reference: *Astrophys. J.* 949 (2023) 76



Research program: SA2_GRWA

DOI 10.3847/1538-4357/ac74bb

Title: [Multidifferential study of identified charged hadron distributions in Z -tagged jets in proton-proton collisions at s =13 TeV](#)

Aaij R. et al. (1040 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) L031103

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.L031103

Title: [Search for the rare hadronic decay \$B_s0 \rightarrow p p^-\$](#)

Aaij R. et al. (1013 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012007

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012007

Title: NEXT-CRAB-0: a high pressure gaseous xenon time projection chamber with a direct VUV camera based readout

Byrnes N. et al. (117 authors) IGFAE Authors: González-Díaz D., Díaz G., Hernando Morata J., Hervés Carrete C., Pérez Maneiro M., Renner J.



Reference: J. Instrum. 18 (2023) P08006

Research program: SA2_NEXT

DOI 10.1088/1748-0221/18/08/P08006

Title: [Quantum simulation of in-medium QCD jets: Momentum broadening, gluon production, and entropy growth](#)

Barata J.; Du X.; Li M.; Qian W.; Salgado C.A. IGFAE Authors: Du X., Li M., Qian W., Salgado C.A.

Reference: Phy. Rev. D 108 (2023) 056023

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.056023

Title: [Observation of the \$B_s^0 \rightarrow D^{*+} D^{*-}\$ decay](#)

Aaij R. et al. (1072 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 119

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)119

Title: [Simulations and analysis tools for charge-exchange \(\$d, 2\text{He}\$ \) reactions in inverse kinematics with the AT-TPC](#)

Giraud S.; Zamora J.C.; Zegers R.G.T.; Ayyad Y.; Bazin D.; Mittag W.; Carls A.; DeNudt M.; Rahman Z. IGFAE Authors: Ayyad Y.

Reference: Nucl Instrum Methods Phys Res Sect A 1051 (2023) 168213

Research program: SA3_NUCL

DOI 10.1016/j.nima.2023.168213



Title: [Relativistic moduli space and critical velocity in kink collisions](#)

Adam C.; Ciurla D.; Oles K.; Romanczukiewicz T.; Wereszczynski A. IGFAE Authors: Adam C.

Reference: Phys. Rev. E 108 (2023) 024221

Research program: SA1_HQCD

DOI 10.1103/PhysRevE.108.024221

Title: [Measurement of lepton universality parameters in \$B^+ \rightarrow k^+ \ell^+ \ell^-\$ and \$B^0 \rightarrow k^0 \ell^+ \ell^-\$ decays](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 032002

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.032002

Title: [Regeneration of bottomonia in an open quantum systems approach](#)

Brambilla N.; Escobedo M.Á.; Islam A.; Strickland M.; Tiwari A.; Vairo A.; Vander Griend P. IGFAE Authors: Escobedo M.Á.

Reference: Phy. Rev. D 108 (2023) L011502

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.L011502

Title: [Observation of a \$J/\psi \Lambda\$ Resonance Consistent with a Strange Pentaquark Candidate in \$B^- \rightarrow j/\psi \Lambda p^-\$ Decays](#)

Aaij R. et al. (1071 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia



Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 031901

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.031901

Title: [Direct CP violation in charmless three-body decays of B± mesons](#)

Aaij R. et al. (1009 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Fernandez Prieto A., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012008

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012008

Title: [Search for the rare decays and at LHCb](#)

LHCb Collaboration et al. (1071 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Chin. Phys. C 47 (2023) 093002

Research program: SA1_LHCB

DOI 10.1088/1674-1137/aceae9



Title: [On the relation between the soft and hard parts of the transverse momentum distribution](#)

Pajares C.; Ramírez J.E. IGFAE Authors: Pajares C.

Reference: Eur. Phys. J. A 59 (2023) 250

Research program: SA1_HQCD

DOI 10.1140/epja/s10050-023-01170-w

Title: [Open Data from the Third Observing Run of LIGO, Virgo, KAGRA, and GEO](#)

Abbott R. et al. (1740 authors) IGFAE Authors: Calderón Bustillo J., Dent T., Kumar P., Sadiq J., Villa-Ortega V.

Reference: Astrophys. J. Suppl. Ser. 267 (2023) 29

Research program: SA2_GRWA

DOI 10.3847/1538-4365/acdc9f

Title: [Amplitude analysis of the \$\Lambda_c^+ \rightarrow pK^+\pi^+\$ decay and \$\Lambda_c^+\$ baryon polarization measurement in semileptonic beauty hadron decays](#)

Aaij R. et al. (1013 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martínez Santos D., Mombächer T., Pereiro Castro A., Plo Casaus M., Prouve C., Rodríguez Rodríguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012023

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012023

Title: [Medium induced gluon spectrum in dense inhomogeneous matter](#)

Barata J.; Mayo López X.; Sadofyev A.V.; Salgado C.A. IGFAE Authors: Mayo López X., Sadofyev A.V., Salgado C.A.

Reference: Phy. Rev. D 108 (2023) 034018



Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.034018

Title: [Study of the \$B^- \rightarrow \Lambda_c^+ \Lambda^- c^- K^-\$ decay](#)

Aaij R. et al. (1071 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012020

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012020

Title: [Evidence for Modification of b Quark Hadronization in High-Multiplicity pp Collisions at \$\sqrt{s} = 13\$ TeV](#)

Aaij R. et al. (1013 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 061901

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.061901

Title: [Measurement of the Ratios of Branching Fractions \$R\(D^*\)\$ and \$R\(D0\)\$](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia



Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 111802

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.111802

Title: [Nuclear Modification Factor of Neutral Pions in the Forward and Backward Regions in p-Pb Collisions](#)

Aaij R. et al. (1011 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Fernandez Prieto A., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 042302

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.042302

Title: [Impact of cross-section uncertainties on supernova neutrino spectral parameter fitting in the Deep Underground Neutrino Experiment](#)

Abed Abud A. et al. (1317 authors) IGFAE Authors: Amedo P., Gonzalez-Diaz D., Leardini S., Saa-Hernandez A.

Reference: Phy. Rev. D 107 (2023) 112012

Research program: SA2_NEXT

DOI 10.1103/PhysRevD.107.112012

Title: [Search for CP violation in \$D\(s\)^+ \rightarrow K^- K^+ K^+\$ decays](#)

Aaij R. et al. (1059 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I.,



Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 67

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)067

Title: [Cross-shell states in 15C: A test for p-sd interactions](#)

Lois-Fuentes J. et al. (61 authors) IGFAE Authors: Lois-Fuentes J., Fernández-Domínguez B., Pereira-López X., Caamaño M., Ramos D., Regueira-Castro D., Rodríguez-Tajes C.

Reference: Phys Lett Sect B Nucl Elem Part High-Energy Phys 845 (2023) 138149

Research program: SA3_NUCL

DOI 10.1016/j.physletb.2023.138149

Title: [Observation of the decays \$B\(s\)0 \rightarrow Ds1\(2536\)\mp K \pm\$](#)

Aaij R. et al. (1106 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Cambon Bouzas J., Carcedo Salgado L., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Morcillo Gomez A., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P., Vázquez Sierra C.

Reference: J. High Energy Phys. 2023 (2023) 106

Research program: SA1_LHCB

DOI 10.1007/JHEP10(2023)106

Title: [First observation of the \$B^+ \rightarrow Ds^+ Ds^- K^+\$ decay](#)



Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 034012

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.034012

Title: [Virgo detector characterization and data quality: Results from the O3 run](#)

Acernese F. et al. (493 authors) IGFAE Authors: Sadiq J., Villa-Ortega V.

Reference: Classical Quantum Gravity 40 (2023) 185006

Research program: SA2_GRWA

DOI 10.1088/1361-6382/acd92d

Title: [Measurement of the Prompt D0 Nuclear Modification Factor in p-Pb Collisions at sNN =8.16 TeV](#)

Aaij R. et al. (1014 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 102301

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.102301

Title: [Demonstration of neutrinoless double beta decay searches in gaseous xenon with NEXT](#)



Novella P. et al. (113 authors) IGFAE Authors: Díaz G., Hernando Morata J.A., Hervés Carrete C., Pérez Maneiro M., Renner J.

Reference: J. High Energy Phys. 2023 (2023) 190

Research program: SA2_NEXT

DOI 10.1007/JHEP09(2023)190

Title: [Momentum broadening of an in-medium jet evolution using a light-front Hamiltonian approach](#)

Li M.; Lappi T.; Zhao X.; Salgado C.A. IGFAE Authors: Li M., Salgado C.A.

Reference: Phy. Rev. D 108 (2023) 036016

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.036016

Title: [Test of lepton flavor universality using \$B_0 \rightarrow D^* \tau + \nu_\tau\$ decays with hadronic \$\tau\$ channels](#)

Aaij R. et al. (1066 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casaus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P., Vázquez Sierra C.

Reference: Phy. Rev. D 108 (2023) 012018

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012018

Title: [Convolutional neural networks for the classification of glitches in gravitational-wave data streams](#)

Fernandes T.; Vieira S.; Onofre A.; Calderón Bustillo J.; Torres-Forné A.; Font J.A. IGFAE Authors: Calderón Bustillo J.



Reference: Classical Quantum Gravity 40 (2023) 195018

Research program: SA2_GRWA

DOI 10.1088/1361-6382/acf26c

Title: [Single inclusive particle production at next-to-leading order in proton-nucleus collisions at forward rapidities: Hybrid approach meets TMD factorization](#)

Altinoluk T.; Armesto N.; Kovner A.; Lublinsky M. IGFAE Authors: Armesto N.

Reference: Phy. Rev. D 108 (2023) 074003

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.108.074003

Title: [Search for the doubly heavy baryon \$\Xi_{bc}^+\$ decaying to \$J/\psi \Xi_{c}^+\$](#) *

Aaij R. et al. (1012 authors) IGFAE Authors: Adeva B., Rodriguez P.B., Belin S., Garcia O.B., Rodriguez A.B., Vidal A.C., Chobanova V., Vidal X.C., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Plana B.G., Gioventù A., Castro J.L., Soliño S.L., Santos D.M., Mombächer T., Castro A.P., Casasus M.P., Prouve C., Rodriguez E.R., Lamas M.R., Vidal A.R., Fernandez R.A.R., Silva J.J.S., Rios C.S., Sellam S., Regueiro P.V.

Reference: Chin. Phys. C 47 (2023) 093001

Research program: SA1_LHCB

DOI 10.1088/1674-1137/ace9c8

Title: [Observation of sizeable \$\omega\$ contribution to \$\chi_{c1}\(3872\) \rightarrow \pi^+\pi^-J/\psi\$ decays](#)

Aaij R. et al. (1011 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Fernandez Prieto A., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) L011103

Research program: SA1_LHCB



DOI 10.1103/PhysRevD.108.L011103

Title: [Measurement of the Se 77 \(n,γ\) cross section up to 200 keV at the n TOF facility at CERN](#)

Sosnin N.V. et al. (130 authors) IGFAE Authors: Caamaño M., Durán I., Fernández-Domínguez B.

Reference: Phys. Rev. C 107 (2023) 065805

Research program: SA3_NUCL

DOI 10.1103/PhysRevC.107.065805

Title: [Search for the lepton-flavour violating decays \$B^0 \rightarrow K^*0 \mu^\pm e^\mp\$ and \$Bs^0 \rightarrow \phi \mu^\pm e^\mp\$](#)

Aaij R. et al. (1015 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 73

Research program: SA1_LHCB

DOI 10.1007/JHEP06(2023)073

Title: [Amplitude analysis of \$B^0 \rightarrow D^{\mp 0} Ds^+ \pi^-\$ and \$B^+ \rightarrow D^- Ds^+ \pi^+\$ decays](#)

Aaij R. et al. (1072 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012017

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012017



Title: [Measurement of the Branching Fractions \$B\(B^0 \rightarrow p p^- p p^-\)\$ and \$B\(B_s^0 \rightarrow p p^- p p^-\)\$](#)

Aaij R. et al. (1073 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 091901

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.091901

Title: [Search for \$K_S\(L\)0 \rightarrow \mu^+ \mu^- \mu^+ \mu^-\$ decays at LHCb](#)

Aaij R. et al. (1068 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Morcillo Gomez A., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) L031102

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.L031102

Title: [Evidence of a \$J/\psi\$ \$K_S0\$ Structure in \$B^0 \rightarrow j/\psi \phi K_S0\$ Decays](#)

Aaij R. et al. (1063 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez



Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 131901

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.131901

Title: [Study of charmonium decays to \$K S_0 K\pi\$ in the \$B \rightarrow \(K S_0 K\pi\)K\$ channels](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Fernandez E., Rodriguez E.R., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 032010

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.032010

Title: [Novel resistive charge-multipliers for dual-phase LAr-TPCs: towards stable operation at higher gains](#)

Tesi A.; Moleri L.; Leardini S.; Breskin A.; Gonzalez-Diaz D.; Olano-Vegas L.; Jash A.; Bressler S.
IGFAE Authors: Leardini S., Gonzalez-Diaz D., Olano-Vegas L.

Reference: J. Instrum. 18 (2023) C06017

Research program: SA2_NEXT

DOI 10.1088/1748-0221/18/06/C06017

Title: [Search for direct CP violation in charged charmless \$B \rightarrow PV\$ decays](#)

Aaij R. et al. (1010 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Fernandez Prieto A., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M.,



Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 012013

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.012013

Title: [Measurement of the Time-Integrated CP Asymmetry in \$D^0 \rightarrow k-K^+\$ Decays](#)

Aaij R. et al. (1071 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 091802

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.091802

Title: [Model-independent measurement of charm mixing parameters in \$B^- \rightarrow d0 \(\rightarrow K_S^0 \pi^+ \pi^-\) \mu^- \nu^- \mu^x\$ decays](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Solino S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phy. Rev. D 108 (2023) 052005

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.108.052005



Title: [J/ψ and D production in vsNN=68.5GeV PbNe collisions](#)

Aaij R. et al. (1034 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Maronas L.D., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: Eur. Phys. J. C 83 (2023) 658

Research program: SA1_LHCB

DOI 10.1140/epjc/s10052-023-11674-w

Title: [Measurement of Y production in pp collisions at Vs = 5 TeV](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 69

Research program: SA1_LHCB

DOI 10.1007/JHEP07(2023)069

Title: [Measurement of the \$\Lambda_{b}^{0} \rightarrow \Lambda\(1520\)\mu^{+}\mu^{-}\$ Differential Branching Fraction](#)

Aaij R. et al. (1060 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Bizzeti A., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Graziani G., Kotriakhova S., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M.,



Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 151801

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.151801

Title: [Test of Lepton Universality in \$b \rightarrow s\ell + \ell^-\$ Decays](#)

Aaij R. et al. (1064 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Brea Rodriguez A., Brossa Gonzalo A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Eirea Orro C., Fernandez Gomez M., Gallas Torreira A., Garcia Plana B., Gioventù A., Landesa Gomez C., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Novoa Fernandez J., Pereiro Castro A., Plo Casasus M., Prouve C., Rodriguez Fernandez E., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Van Hulse C.B., Vazquez Regueiro P.

Reference: Phys Rev Lett 131 (2023) 051803

Research program: SA1_LHCB

DOI 10.1103/PhysRevLett.131.051803

Title: [Constraining the sources of ultra-high-energy cosmic rays across and above the ankle with the spectrum and composition data measured at the Pierre Auger Observatory](#)

Abdul Halim A. et al. (366 authors) IGFAE Authors: Alvarez-Muñiz J., Ammerman Yebra J., Cazon L., Gottowik M., Martins M.A., Parente G., Riehn F., Zas E.

Reference: J. Cosmol. Astroparticle Phys. 2023 (2023) 024

Research program: SA2_AUGE

DOI 10.1088/1475-7516/2023/05/024

Title: [Highly-parallelized simulation of a pixelated LArTPC on a GPU](#)

Abed Abud A. et al. (1305 authors) IGFAE Authors: Amedo P., Gonzalez-Diaz D., Leardini S., Saa-Hernandez A.

Reference: J. Instrum. 18 (2023) P04034



Research program: SA2_NEXT

DOI 10.1088/1748-0221/18/04/P04034

Title: [New physics searches at kaon and hyperon factories](#)

Goudzovski E. et al. (63 authors) IGFAE Authors: Chobanova V., Santos D.M.

Reference: Rep. Prog. Phys. 86 (2023) 016201

Research program: SA1_LHCB

DOI 10.1088/1361-6633/ac9cee

Title: [Constraint of the Nuclear Dissipation Coefficient in Fission of Hypernuclei](#)

Rodríguez-Sánchez J.L.; Cugnon J.; David J.-C.; Hirtz J.; Kelić-Heil A.; Vidaña I. IGFAE Authors:
Rodríguez-Sánchez J.L.

Reference: Phys Rev Lett 130 (2023) 132501

Research program: SA3_NUCL

DOI 10.1103/PhysRevLett.130.132501

Title: [Diamond-like carbon coatings for cryogenic operation of particle detectors](#)

Leardini S.; Zhou Y.; Tesi A.; Morales M.; González-Díaz D.; Breskin A.; Bressler S.; Moleri L.;
Peskov V. IGFAE Authors: Leardini S., Morales M., González-Díaz D., Peskov V.

Reference: Nucl Instrum Methods Phys Res Sect A 1049 (2023) 168104

Research program: SA2_NEXT

DOI 10.1016/j.nima.2023.168104

Title: [All Jordanian deformations of the AdS5 × S5 superstring](#)

Borsato R.; Driezen S. IGFAE Authors: Borsato R., Driezen S.

Reference: SciPost Phys. 14 (2023) 160

Research program: SA1_STRI

DOI 10.21468/scipostphys.14.6.160



Title: [Neutron-induced fission cross sections of Th 232 and U 233 up to 1 GeV using parallel plate avalanche counters at the CERN n_TOF facility](#)

Tarrío D. et al. (103 authors) IGFAE Authors: Tarrío D., Duran I., Paradela C., Leal-Cidoncha E., Caamaño M., Robles M.S.

Reference: Phys. Rev. C 107 (2023) 044616

Research program: SA3_NUCL

DOI 10.1103/PhysRevC.107.044616

Title: [Reconstruction of charged tracks with Timepix4 ASICs](#)

Akiba K. et al. (17 authors) IGFAE Authors: Lemos Cid E.

Reference: J. Instrum. 18 (2023) P02011

Research program: SA1_LHCB

DOI 10.1088/1748-0221/18/02/P02011

Title: [Experimental evidence of the effect of nuclear shells on fission dissipation and time](#)

Ramos D. et al. (22 authors) IGFAE Authors: Ramos D., Caamaño M., Benlliure J., Cortina D., Fernández-Domínguez B., Paradela C.

Reference: Phys. Rev. C 107 (2023) L021601

Research program: SA3_NUCL

DOI 10.1103/PhysRevC.107.L021601

Title: [Ultra high energy cosmic rays The intersection of the Cosmic and Energy Frontiers](#)

Coleman A. et al. (97 authors) IGFAE Authors: Alvarez-Muñiz J., Cazon L., Zas E.

Reference: Astropart. Phys. 147 (2023) 102794

Research program: SA2_AUGE

DOI 10.1016/j.astropartphys.2022.102794

Title: [QED as a many-body theory of worldlines. II. All-order S -matrix formalism](#)

Feal X.; Tarasov A.; Venugopalan R. IGFAE Authors: Feal X.



Reference: Phy. Rev. D 107 (2023) 096021

Research program: SA1_HQCD

DOI 10.1103/PhysRevD.107.096021

Title: [Medium-induced radiation with vacuum propagation in the pre-hydrodynamics phase](#)

Andres C.; Apolinário L.; Dominguez F.; Martinez M.G.; Salgado C.A. IGFAE Authors:
Dominguez F., Martinez M.G., Salgado C.A.

Reference: J. High Energy Phys. 2023 (2023) 189

Research program: SA1_HQCD

DOI 10.1007/JHEP03(2023)189

Title: [Measurement of CP asymmetries in \$D\(s\)^+ \rightarrow \eta \pi^+\$ and \$D\(s\)^+ \rightarrow \eta' \pi^+\$ decays](#)

Aaij R. et al. (1010 authors) IGFAE Authors: Adeva B., Baladron Rodriguez P., Belin S., Boente Garcia O., Brea Rodriguez A., Casais Vidal A., Chobanova V., Cid Vidal X., Corredoira I., Dalseno J., Dieste Maronas L., Fernandez Prieto A., Gallas Torreira A., Garcia Plana B., Gioventù A., Lomba Castro J., López Soliño S., Martinez Santos D., Mombächer T., Pereiro Castro A., Plo Casusus M., Prouve C., Rodriguez Rodriguez E., Romero Lamas M., Romero Vidal A., Ruiz Fernandez R.A., Saborido Silva J.J., Santamarina Rios C., Sellam S., Vazquez Regueiro P.

Reference: J. High Energy Phys. 2023 (2023) 81

Research program: SA1_LHCB

DOI 10.1007/JHEP04(2023)081

Title: [Direct Determination of Fission-Barrier Heights Using Light-Ion Transfer in Inverse Kinematics](#)

Bennett S.A. et al. (18 authors) IGFAE Authors: Ayyad Y.

Reference: Phys Rev Lett 130 (2023) 202501

Research program: SA3_NUCL

DOI 10.1103/PhysRevLett.130.202501

Title: [Averages of b-hadron, c-hadron, and \$\tau\$ -lepton properties as of 2021](#)



Amhis Y. et al. (40 authors) IGFAE Authors: Chobanova V.

Reference: Phys. Rev. D 107 (2023) 052008

Research program: SA1_LHCB

DOI 10.1103/PhysRevD.107.052008

Title: [Moduli space with a boundary](#)

Adam C.; Oles K.; Romanczukiewicz T.; Wereszczynski A. IGFAE Authors: Adam C.

Reference: Phys Lett Sect B Nucl Elem Part High-Energy Phys 836 (2023) 137611

Research program: SA1_HQCD

DOI 10.1016/j.physletb.2022.137611

Title: [Search for photons above 1019eV with the surface detector of the Pierre Auger Observatory](#)

Abreu P. et al. (366 authors) IGFAE Authors: Alvarez-Muñiz J., Ammerman Yebra J., Cazon L., Martins M.A., Parente G., Zas E.

Reference: J. Cosmol. Astroparticle Phys. 2023 (2023) 021

Research program: SA2_AUGE

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Research program: SA2_AUGE

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