International Particle
Physics Outreach Group

ANNUAL REPORT

2023

Preface

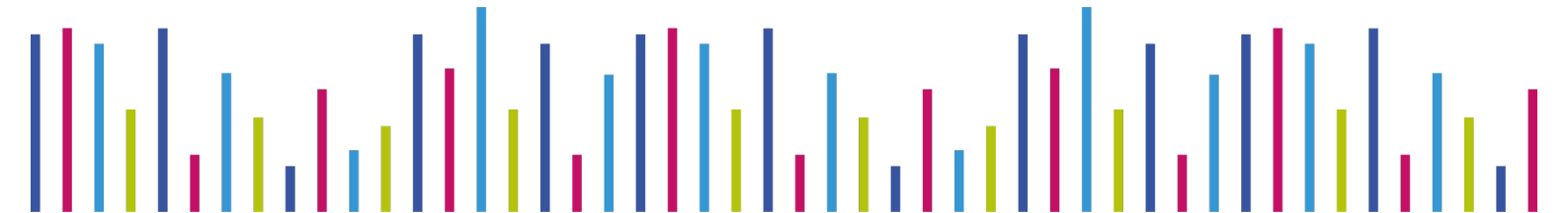
You hold in your hands the 2023 annual report of the IPPOG Collaboration [1]. Formatted in two blocks, these sections are positioned on the left and right sides of a folder in the printed version.

In the initial block, we present an overview of our Collaboration, detailing its core activities and projects.
Moving to the second block, we provide insights into activities undertaken locally and around the world, by IPPOG members and associated members during the year.

We trust that you will find the report engaging, gaining a profound understanding of the extensive and diverse efforts and advancements made by IPPOG collaborators. Each member is dedicated to enhancing scientific literacy in society, inspiring students to pursue STEM careers, popularizing particle physics, and fostering the values of peaceful international collaboration.

Previous reports can be found on the collaboration website.[2]

[1] ippog.org
[2] ippog.org/publications



The need for scientific reasoning!

Pedro Abreu, LIP and IST, Lisboa, IPPOG Co-Chair 2020–2025

In 2023 IPPOG welcomed new members, increasing its reach and globalization, following our worldwide flagship programmes, the International Masterclasses in Particle Physics (IMC) and the Global Cosmics network. Mexico became our 33rd country and Pierre Auger Observatory our 7th experimental international collaboration.

With the help of a dedicated core team, all these activities reach more than 14 000 students from 60 countries. In 2023 the IMC were expanded to more countries, in particular Mozambique and Zambia, in the African continent, and implemented a new measurement proposed by the Pierre Auger Observatory, venturing into the field of extreme energy cosmic rays, a new field in IMC.

But there are still many problems in regions at war or in which particle physics is incipient, and outreach activities cannot or do not take place in a regular manner, delaying the attraction of students to STEM fields or the promotion of science in the communities.
It has also been observed how reactions to the pandemic crisis have promoted ignorance, specially through some social media, and it becomes even more crucial to instil scientific reasoning and evidence-based decisions in societies, starting from the youngest sectors and covering all age groups. It is one of the many challenges ahead of us, for which we need to commit our efforts to address and overcome, in line with our mission and objectives.

Other very important challenges include

- the time span and costs of the projects for the present experiments and future plans in particle physics, requiring strong public support and global participation;
- the increase of the awareness of the importance of fundamental science in present day and all future technologies;
- the need to increase the reach of our activities to diverse audiences, minorities, regions without internet access and/or electricity;
- the need to train the trainers – teachers, educators, tutors, motivators, facilitators, scientific ambassadors;
- the introduction of particle physics concepts in secondary school curricula.

Education, Communication and Outreach are essential pillars in the development of particle and astroparticle physics, as important as the development of new technologies, detectors and methods. IPPOG is working hard and effectively in education and outreach to prepare/guarantee the next generation of scientists, to build up trust in Society for our field, to promote science and scientific reasoning worldwide, and to increase scientific literacy in Society.

It is our responsibility to do our part, let's all work together and constructively to build a better future!

Introduction

Since its establishment in 1997, IPPOG has been reporting its objectives and achievements through formal presentations to the European Committee for Future Accelerators (ECFA[1]) and, starting from 2013, to the CERN Council[2]. It became an international collaboration in 2016 and has experienced steady growth and consolidation since then.

This document is the official yearly report. Following this introduction, it provides a general overview of IPPOG, detailing our organisational structure, major programmes and activities, as well as the core support mechanisms. A part called “IPPOG Digest” then presents some of the most relevant events and activities organised and supported by the collaboration core organisation.

The second block includes one-page reports from our members. Due to various circumstances, some informal education and outreach activities were postponed or cancelled. Consequently, some members were unable to submit reports for 2023. In these cases, we have chosen to include the previous year's country page to convey the typical activities conducted in those countries.

As you navigate through these reports, you will notice a distinct independence in style, reflecting the vibrant diversity within our collaboration. Each member employs methodologies best suited to their region's cultural, social, historical, and pedagogical contexts. Nevertheless, common threads bind us, including our unwavering commitment to continuous development and the advancement of global educational standards. We share a collective determination to expand the reach of our programmes to new audiences worldwide, fostering a profound appreciation for fundamental research and science-based decision-making among young minds and the general public.
These principles resonate throughout our collaborative endeavours in 2023.

1. https://ecfa.web.cern.ch
2. https://council.web.cern.ch

International Particle Physics Outreach Group

Who we are

About IPPOG

IPPOG is a network of scientists, science educators and communication specialists, working across the globe in science education and public engagement for particle physics. Particle physics explores the fundamental aspects of matter, energy, space, and time, aiming to uncover the fundamental building blocks of our universe. IPPOG endeavours to introduce young people to the latest discoveries in this captivating field and communicate to the public the intrinsic beauty of nature manifested in the interactions of its most basic constituents—the elementary particles.

Operating under a Memorandum of Understanding (MoU), IPPOG is an international collaboration. As of the end of 2023, IPPOG consisted of 41 members: 33 countries, 7 experiments, an international laboratory (CERN), with 2 national laboratories (DESY and GSI) acting as associate members. The Collaboration Board (CB), composed of member and associate member representatives, convenes biannually to discuss and vote on IPPOG-related matters (associate members do not have voting rights). Member representatives also act as liaisons to national-level science and education networks and identify a short list of contributing experts who are invited to join the “forum”, the primary discussion body of the collaboration.

Regular forum meetings are organized by IPPOG to facilitate the exchange of ideas and best practices, with the primary objective of elevating the standards of science education and public engagement. Collectively, the forum forms a global network encompassing countries, laboratories, institutions, organizations, and individuals who share interest for particle physics, education and outreach activities.

International Particle Physics Outreach Group

Who we are

List of members and associate members as of 31 December 2023

Country/Lab./ Exp.	Signatory Organization	Representative
ALICE	ALICE Collaboration	Despina Hatzifotiadou
ATLAS	ATLAS Collaboration	Steven Goldfarb
AUSTRALIA	CoEPP	Jackie Bondell
AUSTRIA	HEPHY, ÖAW, ÖPG	Natascha Hoermann
BELGIUM	F.W.O. and F.R.S.-FNRS	Gwenhaël de Wasseige
BELLE II	BELLE II Collaboration	Rok Pestotnik
BRAZIL	RENAFAE	Marcelo Munhoz
BULGARIA	Sofia Techpark	Roumyana Hadjiiska
CERN	CERN	Ana Godinho
CMS	CMS Collaboration	Freya Blekman
CYPRUS	University of Cyprus	Fotios Ptochos
CZECH REPUBLIC	Institute of Physics of the Czech Academy of Sciences	Vojtech Pleskot
DENMARK	Danish CERN Instrumentation Centre, NICE	Ian Bearden
DESY (Associate)	DESY	Thomas Naumann
FINLAND	Helsinki Institute of Physics	Sami Lehti
FRANCE	CNRS / IN2P3	Nicolas Arnaud
GEORGIA	Ministry of Education, Science, Culture and Sport	Alexander Sharmazanashvili
GERMANY	DESY for KET	Christian Klein-Bösing
GREECE	Ministry of Development - General Secretariat of Research, Technology and Innovation	Christine Kourkoumelis
GSI (Associate)	GSI	Ralf Averbeck
HAWC	HAWC Collaboration	Jose Ruben Alfaro Molina
HUNGARY	Wigner Research Centre for Physics	Dezso Horvath
ISRAEL	Weizmann Institute of Science, Technion (Israel Institute of Technology), and Tel Aviv University	Ehud Duchovni
INDIA	National Institute of Science Education and Research	Bedangadas Mohanty
IRELAND	Dublin Institute for Advanced Studies	Jon-Ivar Skullerud
ITALY	INFN	Catia Peduto

Who we are

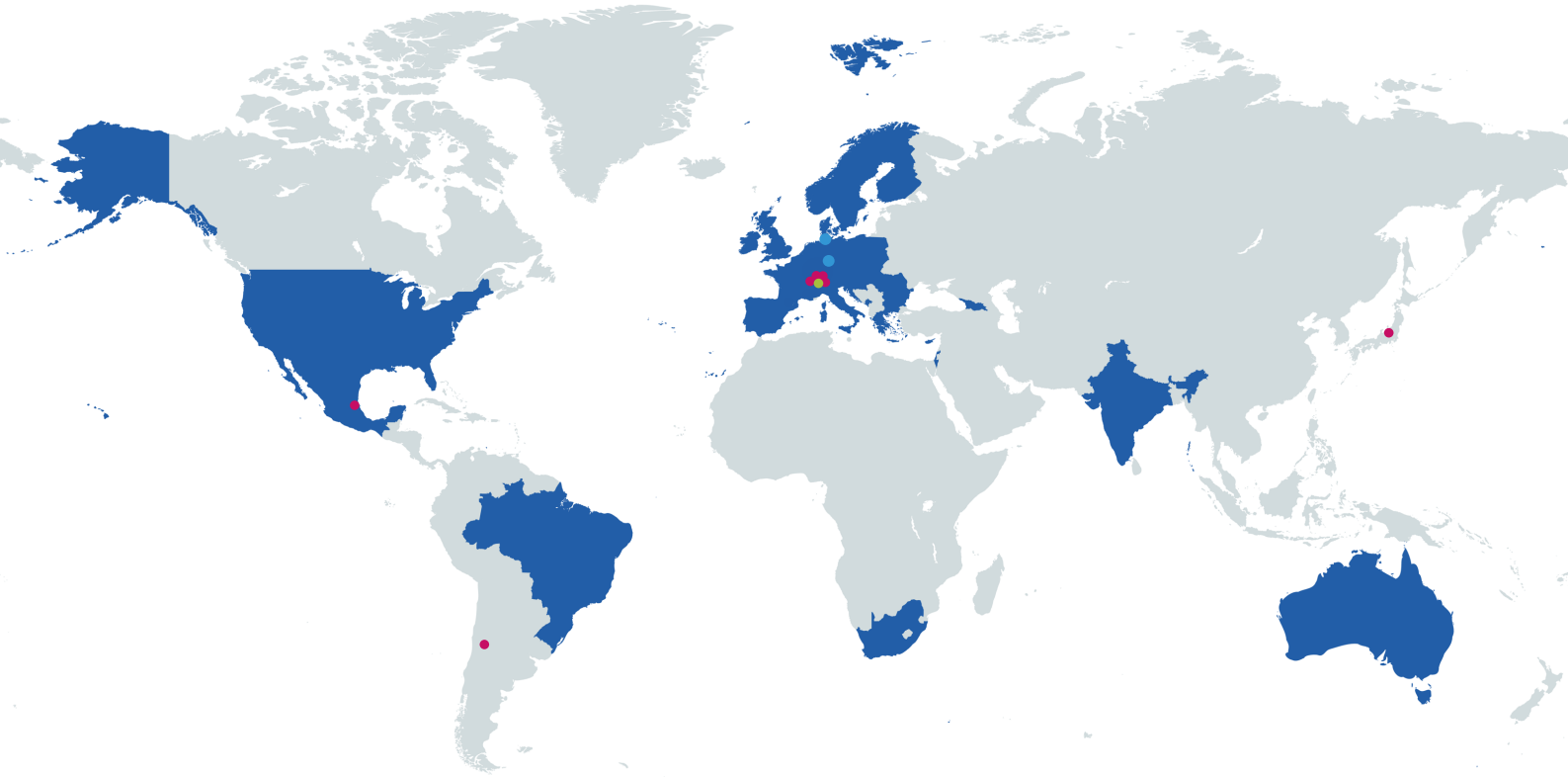
List of members and associate members as of 31 December 2023

Country/Lab./ Exp.	Signatory Organization	Representative
LHCb	LHCb Collaboration	Bolek Pietrzyk
MONTENEGRO	Ministry of Science of Montenegro	Nataša Raičević
NORWAY	Physics Department of the University of Oslo	Farid Ould-Saada
MEXICO	BUAP	Arturo Fernandez Tellez
PIERRE AUGER OBSERVATORY	Pierre Auger Collaboration	Raul Sarmento
POLAND	The Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences	Krzysztof Wozniak
PORTUGAL	LIP	Ricardo Gonçalo
ROMANIA	Institute of Atomic Physics	Paul Gravila
SLOVAK REPUBLIC	Ministry of Education, Science, Research and Sport	Ivan Melo
SLOVENIA	Jôsef Stefan Institute, Ljubljana	Anja Kranjc Horvat
SOUTH AFRICA	iThemba Labs. for the National Research Foundation	Gillian Arendse
SPAIN	Spanish National Particle Physics Programme	Jesús Puerta-Pelayo
SWEDEN	Swedish Physical Society	Jonas Strandberg
SWITZERLAND	CHIPP	Katharina Mueller
THE NETHERLANDS	NIKHEF	Clara Nellist
UK	STFC	Darren Price
USA	Univ. Notre-Dame on behalf of Quarknet	Spencer Pasero

International Particle Physics Outreach Group

Where we are

Map of the member locations (Dec.31st, 2023)

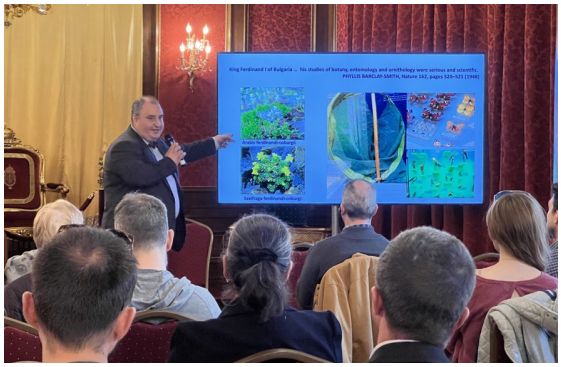


IPPOG MAP

- Countries (Australia, Austria, Belgium, Brazil, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Mexico, Montenegro, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, The Netherlands, United Kingdom, United States of America)
- CERN
- Associated members
- International Experiments (ALICE Collaboration, ATLAS Collaboration, Belle II Collaboration, CMS Collaboration, HAWC Collaboration, LHCb Collaboration, Pierre Auger Observatory)

What we do

IPPOG Activities



IPPOG spring meeting 2023 (Sofia, Bulgaria)

IPPOG autumn meeting 2023 (CERN)

International Masterclass (Italy)

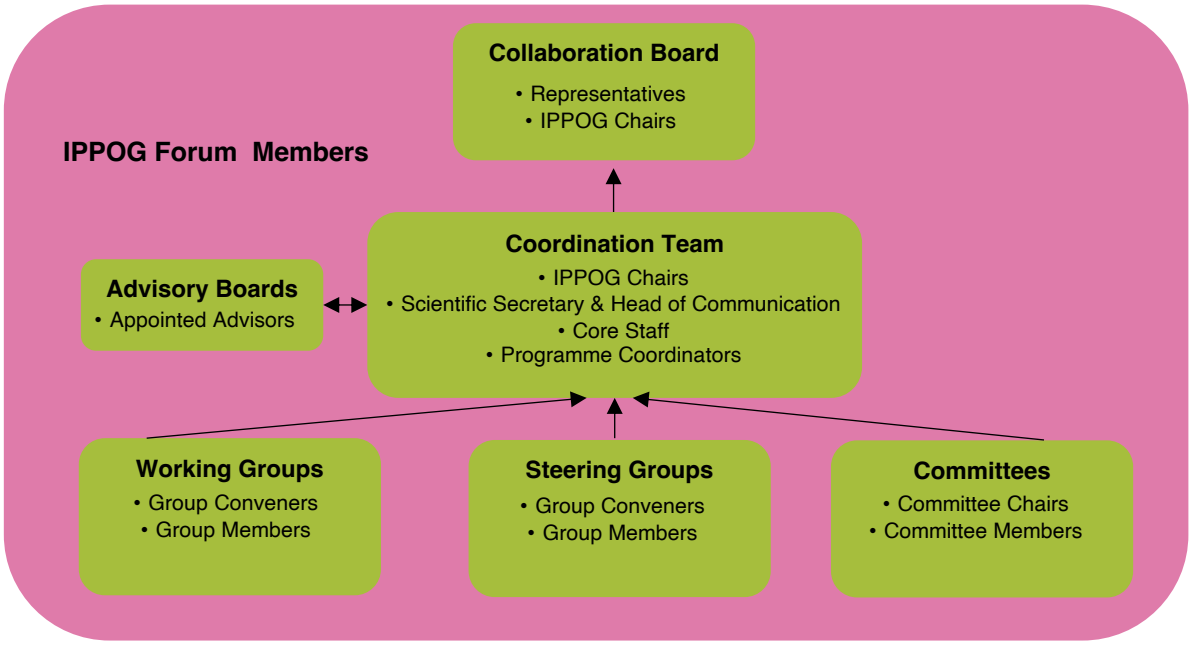
The collaboration forum meets twice a year, holding topical panel sessions, working group discussions and presentations of key activities. The meetings are hosted by a member or aspiring member institutions with the support of the core team. These meetings provide a key platform for the development and sharing of ideas and coordination of the programmes. External participants are invited, including IPPOG partners, experts and teachers.

Well-established IPPOG activities, including International Particle Physics Masterclasses and Global Cosmics, reach thousands of students in dozens of countries around the world, every year. More recent programmes bringing particle physics to music, art, science and other cultural festivals, reach new audiences, including members of the public already interested in science, as well as those who have yet to realise they are.

IPPOG also maintains strong visibility in major particle physics conferences, participating in and convening dedicated sessions in education and outreach, and organising associated public events and exhibitions. These activities increase awareness with both the public and members of the physics community, encouraging and helping young scientists to participate in public engagement.
By an increased presence in international events, IPPOG contributes and encourages a better dialogue and synergy between communities within HEP.

How we do

IPPOG Organization



The MoU establishes the base structure of the IPPOG Collaboration. Activities are planned and coordinated by small groups: the Coordination Team, Working Groups, Steering Groups and Committees. The Advisory Board, constituted by Forum members, advises the Chairs on important matters and decisions.

At the end of 2023 IPPPOG had the following Working Groups:

- Exhibitions and public events
- Explaining particle physics to a lay audience
- Bringing International Masterclasses to new countries
- Outreach of applications to society
- Web and database resources
- Diversity and Inclusion

the following Steering Groups:

- International Masterclasses
- Global Cosmics

the following Committees:

- Speakers and publications
- Finance and Audit Advisory Board

The forum adds to these a list of experts nominated by members representatives.

Coordination Team

Composition 2023

The IPPOG Coordination Team in 2023 comprised Pedro Abreu (LIP and IST, U. Lisbon, Portugal) and Claire Adam (LAPP, France) as elected chairs, Uta Bilow (TU Dresden, Germany) and Kenneth Cecire (U. Notre-Dame, USA) as International Masterclass Coordinators, Carolin Schwerdt (DESY) and Sabine Hemmer (INFN, Italy) as Global Cosmics Coordinators, Fabiola Cacciatore (U. Notre-Dame, USA) as Scientific Secretary and Head of Communications, Lila Mabiala (CERN) as Assistant of the Coordination Team, Hanife Olgunsoy (CERN) in the role of Financial Support, Zoe Nikolaidau (CERN) as Administrative Support, Despina Hatzifotiadou (INFN Bologna) as Head of Speakers and Publications and Jana Fiserova (CERN) as student (from October 2023 to January 2024).

The team is responsible for organising global IPPOG activities, developing infrastructure and activities in support of the collaboration, in line with the strategic vision set forth by the chairs, coordinating the International Masterclasses in particle physics programme and Global Cosmics, coordinating twice-yearly collaboration meetings in cooperation with IPPOG members and proposing and managing the core budget.

Detailed reports on these activities follow.

Pedro Abreu, (Chair)

Claire Adam, (Chair)

Fabiola Cacciatore, (Scientific Secretary and Head of Comms)

Hanife Olgunsoy, (Financial support officer)

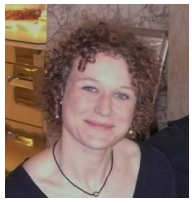
Zoe Nikolaidau, (Administrative support)

Lila Mabiala, (Assistant Coordination Team)

Uta Bilow, (Masterclass Coordinator)

Ken Cecire, (Masterclass Coordinator)

Carolin Schwerdt, (Global Cosmics Coordinator)



Sabine Hemmer, (Global Cosmics Coordinator)

Jana Fiserova, (Master Student)

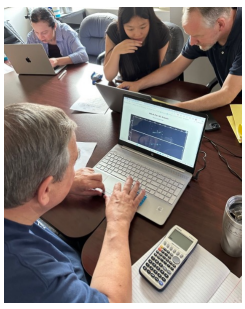
Despina Hatzifotiadou, (Head of Speakers and Publications)

IPPOG Digest

International Particle Physics Outreach Group

NOvA: A new “Nu” Masterclass

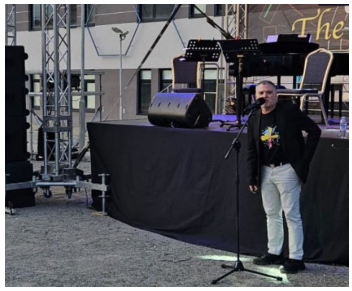
On March 11, 2023, the University of Minnesota hosted a NOvA masterclass with local high school students and teachers, led by Professor Greg Pawloski, QuarkNet staff, and educator Mike Plucinski. The measurement explores neutrino oscillations between NOvA detectors, differing from MINERvA's focus on neutrino interactions with nuclei. Participants use Python notebooks for data analysis, adding a coding dimension. Successful pilots occurred at the University of California, Irvine, and the Sanford Underground Research Facility in South Dakota. Workshops at Fermilab refined the protocol, with feedback integrating into the IMC 2024 offerings for NOvA measurement.



Particle Therapy Masterclass for teachers and Music Festival in Sofia, Bulgaria

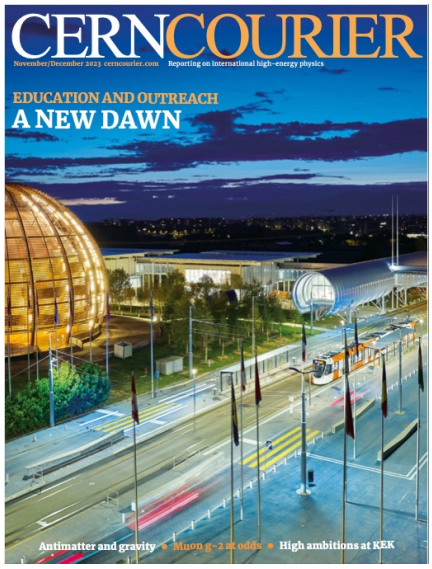
During the 25th IPPOG spring meeting in Sofia, in addition to the regular biennial community meeting of IPPOG, various notable public events took place. These included a CMS masterclass for students and a Particle Therapy Masterclass for Teachers. Throughout these days, students participated in a school contest (video and art works) and they were awarded by the Bulgarian colleagues and IPPOG chairs.

A science festival featured (in the Sofia Tech Park) with the "Music of Physics" events led by the former chair Steven Goldfarb



CERN Courier : A New Dawn

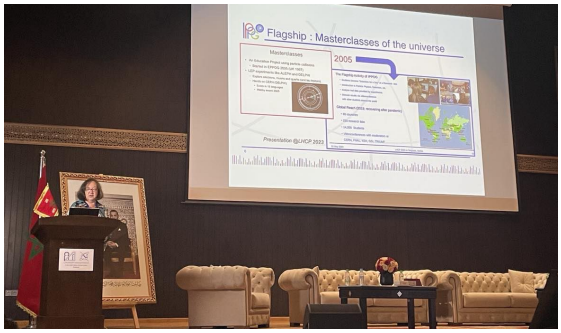
In the context of the CERN Science Gateway's opening (October 2023), the November edition of the CERN Courier was dedicated to outreach activities. In this issue, IPPOG co-chair Claire Adam discussed the increasing importance of communication and education in scientific conferences, with many now incorporating dedicated outreach sessions. Hands-on activities and programmes (such as the International Masterclasses) have gained popularity and are now being extended to global time zones and online platforms. Virtual visits to LHC experiments and community-driven events like Dark Matter Day aim to enhance scientific understanding among a wide audience. Contributions from a number of CERN colleagues highlights recent progress and debate in the evolving landscape of outreach in particle physics.



IPPOG Digest

International Particle Physics Outreach Group

Visits to Morocco and South Africa



The development of HEP activities in Africa is a longstanding priority, in particular via Masterclasses. This year, two international conferences allowed the IPPOG collaboration chairs to meet the Morocco and South Africa scientists and communities:

ACP2023: 3rd African conference on fundamental and applied physics, organised by the Nelson Mandela University in George, South Africa. Pedro Abreu presented IPPOG and, in particular, the connection with the CERN's Portuguese Language Teachers Programmes.

ACHEP2023: very 1st edition of the African conference on High energy physics, organised by the Rabat-Salé-Kénitra university consortium in Morocco. Claire Adam and colleagues discussed the variety and visibility of IPPOG member countries outreach activities.

CMS Masterclass for CERN Personnel

In 2023, the second edition of the masterclass dedicated to non-scientific personnel took place at the CERN Training Centre.
This initiative, born in 2022 from the idea of Fabiola Cacciatore (IPPOG Scientific Secretary), aims to impart basic physics knowledge to CERN employees from departments not directly involved in scientific research such as administration department, safety department, and student administration. These people, with their diverse expertise, play a crucial role in advancing research. For this occasion, the CMS masterclass was selected, presented and monitored by Kenneth Cecire (IMC co-coordinator) and Andres G. Delannoy (CMS scientist). The event garnered significant success, prompting considerations for more frequent occurrences in collaboration with LHC experiments.

Pierre Auger

In 2023, IPPOG welcomed the Pierre Auger Observatory as a member experiment. At the Pierre Auger Observatory, located in Malargüe, Argentina, researchers conduct scientific activities focused on studying ultra-high-energy cosmic rays, collecting and analysing data, and advancing our understanding of particle physics and astrophysics.

The Pierre Auger Observatory, annually hosts International Masterclass events for high-school students worldwide. These events are conducted within the framework of the International Masterclasses Programme.

During these masterclasses, high-school students aged 15-18 spend a full day at universities or research institutes. They receive instruction on particle/astroparticle physics and learn about the Pierre Auger Observatory's mission and technologies. Additionally, students analyse Auger's public data to investigate the origin of ultra-high-energy cosmic rays.

Following their data analysis, students participate in a joint videoconference with their peers at other locations and with scientists at the Pierre Auger Observatory in Malargüe. During this conference, they discuss their findings and engage in a virtual tour of the observatory.

Having the Pierre Auger Observatory as an official member of IPPOG reinforces the link between particle physics at colliders and cosmic rays studies, and opens the door to further enhancement in related outreach activities.

Communication and Social Media

Fabiola Cacciatore (Scientific Secretary & Head of Communications)

International Particle Physics Outreach Group

Articles and publications

Throughout 2023, the IPPOG website published **18 news articles** covering a broad spectrum of topics. These included updates on IPPOG's activities and events, achievements of its members, summaries of key meetings, and general articles on particle physics and outreach. These articles served to inform and engage readers, highlighting the latest developments in particle physics outreach while promoting scientific literacy worldwide.
Also, the **publications** section in the footer at the bottom of the website pages has been optimised and reorganised. Here you can find all publications, including the annual report, produced by the forum and members of IPPOG. Publications are divided by year and colour scheme: purple = annual report, blue = published on behalf of the collaboration, and green = by a forum member.

Collaboration with Social Media Blogger : Simone Ragoni

IPPOG collaborated on Instagram with a science-focused influencer: Simone Ragoni (@quarkastic) to amplify the reach of the audience.
The target was the general public curious about some physics topic.
Topic chosen: the *Higgs Boson*
Name of the campaign: *SUMMER PHYSICS WEEKEND*

12 August 2023 at 12:21 AM

331 2 -- 30

4 July 2023 at 2:02 AM

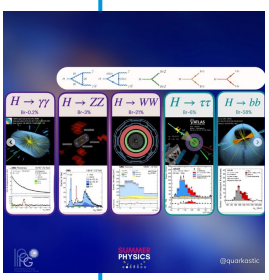
1007 24 -- 217

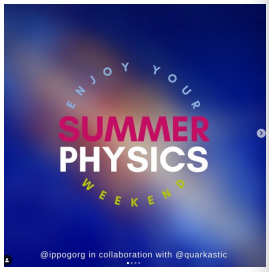
23 July 2023 at 11:33 PM

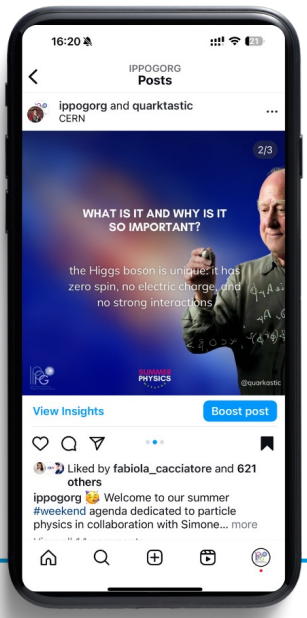
583 9 -- 94

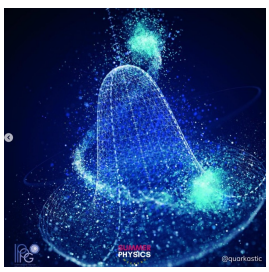
Reach

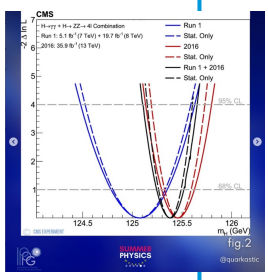
5,641
Accounts reached









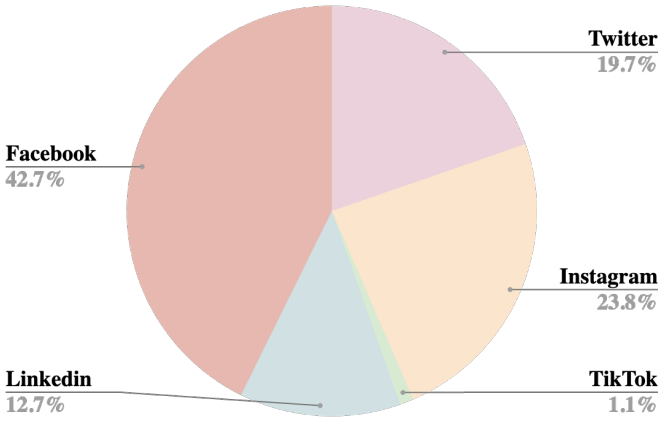


Communication and Social Media

Fabiola Cacciatore (Scientific Secretary & Head of Communications)

Social media report

ENGANGEMENT SHARE

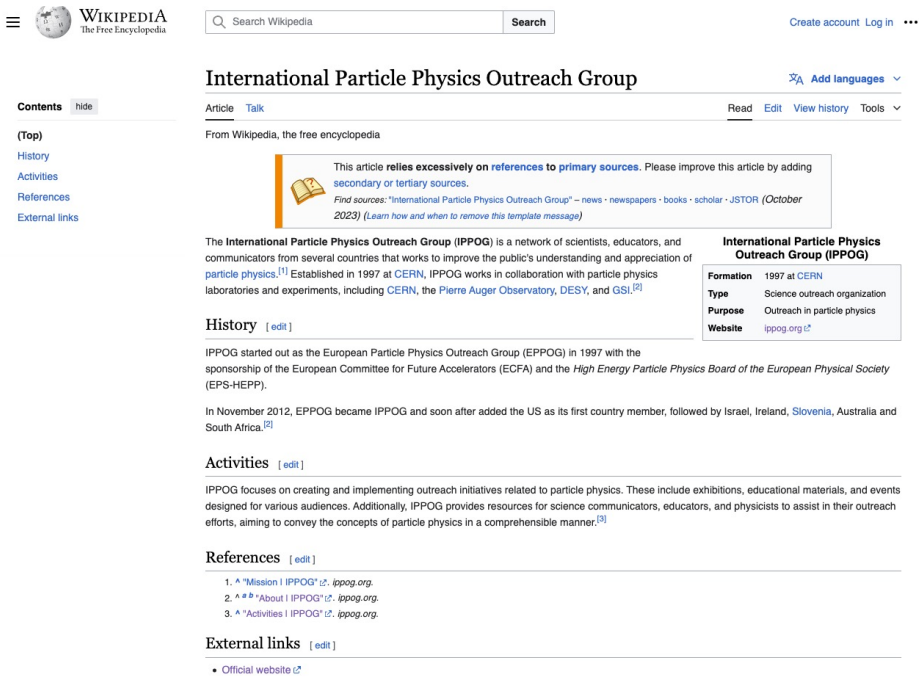


FOLLOWERS

	Dec 2022	Dec 2023	
Instagram:	**2040**	**2550**	**+20%**
Facebook:	**3638**	**4077**	**+10%**
X:	885	962	+8%
LinkedIn:	197	356	+40%
TikTok:	47	86	+45%

IPPOG on Wikipedia

During the summer of 2023, thanks to Abha Phoboo, IPPOG finally made its debut on Wikipedia. The chosen language is English, but members are encouraged to translate and create pages in their respective languages if desired. The page structure includes an introduction, a brief history of IPPOG, and its main activities. You can find the page at https://en.wikipedia.org/wiki/International_Particle_Physics_Outreach_Group.



Wikipedia — The Free Encyclopedia

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International Particle Physics Outreach Group

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History
Activities
References
External links

From Wikipedia, the free encyclopedia

This article **relies excessively on references to primary sources**. Please improve this article by adding secondary or tertiary sources.
Find sources: "International Particle Physics Outreach Group" – news · newspapers · books · scholar · JSTOR (October 2023) (Learn how and when to remove this template message)

The **International Particle Physics Outreach Group** (**IPPOG**) is a network of scientists, educators, and communicators from several countries that works to improve the public's understanding and appreciation of particle physics.[1] Established in 1997 at CERN, IPPOG works in collaboration with particle physics laboratories and experiments, including CERN, the Pierre Auger Observatory, DESY, and GSI.[2]

International Particle Physics Outreach Group (IPPOG)

Formation	1997 at CERN
Type	Science outreach organization
Purpose	Outreach in particle physics
Website	ippog.org

History [edit]

IPPOG started out as the European Particle Physics Outreach Group (EPPOG) in 1997 with the sponsorship of the European Committee for Future Accelerators (ECFA) and the *High Energy Particle Physics Board of the European Physical Society* (EPS-HEPP).

In November 2012, EPPOG became IPPOG and soon after added the US as its first country member, followed by Israel, Ireland, Slovenia, Australia and South Africa.[2]

Activities [edit]

IPPOG focuses on creating and implementing outreach initiatives related to particle physics. These include exhibitions, educational materials, and events designed for various audiences. Additionally, IPPOG provides resources for science communicators, educators, and physicists to assist in their outreach efforts, aiming to convey the concepts of particle physics in a comprehensible manner.[3]

References [edit]

1. ^ "Mission | IPPOG". *ippog.org*.
2. ^ a b "About | IPPOG". *ippog.org*.
3. ^ "Activities | IPPOG". *ippog.org*.

External links [edit]

- Official website

Speakers and Publications Committee (SPC)

Members: Despina Hatzifotiadou, Dezsö Horvath, Farid Ould-Saada, , Jonas Strandberg

The SPC makes a regular survey of conferences of interest for IPPOG participation, such as major conferences in particle physics and specialised conferences in physics education. Abstracts are prepared and sent to these conferences. For the abstracts accepted, speakers are identified and selected to attend the conference and present on behalf of IPPOG (in plenary, parallel, or poster sessions). The committee also checks the presentation, regarding the content and style, and finalises the proceedings and/or other publications.

In 2023 IPPOG was present at the following conferences:

EPS-HEP 2023 21-25 August 2023, Hamburg, Germany
(EPS Conference on High Energy Physics) https://www.eps-hep2023.eu
"The International Particle Physics Outreach Group"
presented by Claire Adam Bourdarios

TAUP2023 22 August-1st September 2023, Vienna, Austria
(International Conference on Topics in Astroparticle and Underground Physics)
https://indico.cern.ch/event/1199289/
"(International Masterclasses – from collider physics to neutrinos and cosmic rays"
presented by Ivan Melo

ACP2023 25-30 September 2023, George, South Africa
(African Conference on Fundamental and Applied Physics)https://indico.cern.ch/event/1229551/
"Engaging Teachers for Informal Education in Modern Physics"
presented by Pedro Abreu

ACHEP2023 23-27 October 2023, Casablanca, Morocco
(The First Edition of the African Conference on High Energy Physics)
https://fs.uit.ac.ma/achep/
"The International Particle Physics Outreach Group: A pillar of particle physics outreachers"
presented by Claire Adam Bourdarios

Conferences on Education in 2023:

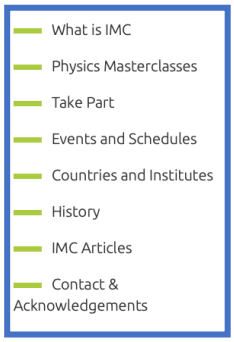
GIREP*-EPEC 2023 3-7 July 2023, Košice, Slovakia
(World Conference on Physics Education) https://indico.cern.ch/event/1162406/
"The IPPOG Resource Database: Making particle physics outreach & education available worldwide"
presented by Barbora Bruant Gulejova

*GIREP : Groupe Internationale de Recherche sur l'Enseignement de la Physique

Masterclasses on the IPPOG website

IMC website on IPPOG

In fall 2023, the master student Jana Fiserova developed a new section in the IPPOG website: https://ippog.org/imc-international-masterclasses.
This section is accessible from the main menu under "Activities" and includes submenus for easier navigation.
The submenus cover topics such as "What is IMC", "Physics Masterclasses", "Take Part", "Events and Schedules", "History", "IMC Articles", and "Contacts and Acknowledgments".



IMC programme spread

Institutes and schools from the entire world can participate.
The list of active countries below shows the projects extension, including areas where particle physics is not usually present.

1. Algeria
2. Argentina
3. Armenia
4. Australia
5. Austria
6. Belgium
7. Bosnia and Herzegovina
8. Bulgaria
9. Brazil
10. Canada
11. Cape Verde
12. Chile
13. China
14. Colombia
15. Croatia
16. Cyprus
17. Czech Republic
18. Denmark
19. Ecuador
20. Egypt
21. Finland
22. France
23. Georgia
24. Germany
25. Greece
26. Honduras
27. Hungary
28. India
29. Iran
30. Ireland
31. Israel
32. Italy
33. Japan
34. Kazakhstan
35. Kenya
36. Lithuania
37. Mexico
38. Montenegro
39. Morocco
40. Netherlands
41. New Zealand
42. Norway
43. Philippines
44. Poland
45. Portugal
46. Qatar
47. Romania
48. São Tomé and Príncipe
49. Serbia
50. Singapore
51. Slovakia
52. Slovenia
53. South Africa
54. Spain
55. Sweden
56. Switzerland
57. Turkey
58. United Arab Emirates
59. United Kingdom
60. Ukraine
61. Uruguay
62. USA
63. Venezuela
64. Zambia

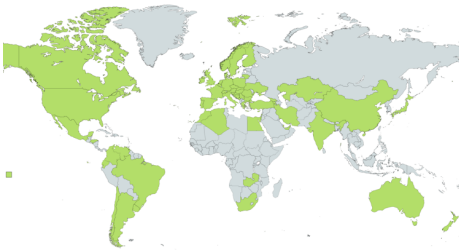
International Masterclasses 2023

Uta Bilow and Kenneth Cecire (IMC coordinators)



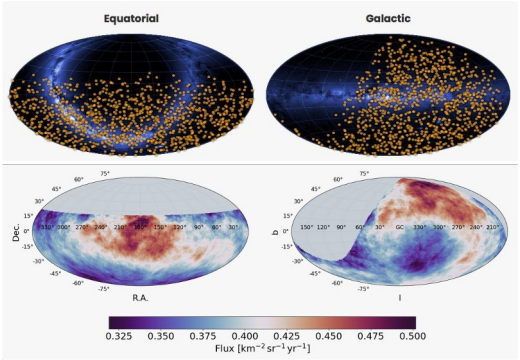
More than 300 Masterclasses during IMC23

- 211 LHC Masterclasses with CERN VC
- 40 LHC + 8 MINERvA + 2 NOvA Masterclasses with Fermilab VC + offshell VCs
- 16 Belle II Masterclasses with KEK VC
- 30 Particle Therapy Masterclasses with GSI VC
- 12 Pierre Auger Masterclasses with Malargue VC



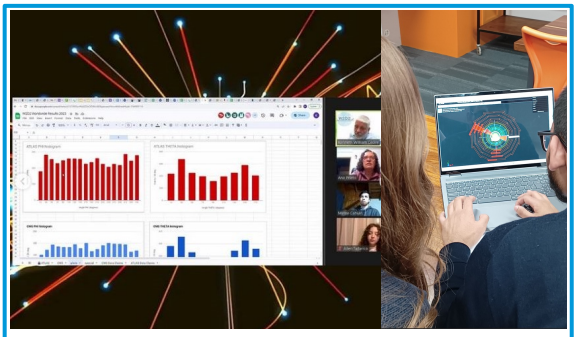
The program ran in 63 countries. New participants came from:

- Zambia (University of Zambia, Lusaka)
- Mozambique (University Eduardo Mondlane, Maputo)



A new Masterclass with data from the Auger experiment was implemented. 550 students analyzed events and created sky maps with reconstructed arrival directions.

14 special LHC Masterclasses with 500 girls were organized on February 10 to celebrate the International Day of Women and Girls in Science.



World Wide Data Day on November 9 enabled students around the world to analyze LHC data in their schools: 27 classes studied CMS and 17 classes went for ATLAS.

Global Cosmics Group and International Cosmic Day 2023

Carolin Gnebner (DESY), Sabine Hemmer (INFN)

The Global Cosmics Group reunites groups active in outreach on subjects related to cosmic ray physics. Its members engage in projects in more than 12 countries all around the world. The group‘s core activity is the participation to the International Cosmic Day (ICD), organized every year by DESY with support from the Global Cosmic Group, scientists and event experts.

The 12th ICD, held on November 21, 2023, connected 2600 students, researchers, and institutions across 19 countries and 4 continents. Through joint video conferences, participants discussed and explored cosmic particles, supported by scientists and teachers. Those unable to attend in person accessed real data remotely provided by the Global Cosmic Group.

Once again, a booklet summarizing the research findings of the youth participants was compiled: https://syncandshare.desy.de/index.php/s/4xmEQbwCAyDbYAq.
There is a lot to discover: great pictures from all over the world, research results from zenith angle measurement to balloon flight data or the effects of smoke from Canadian wildfires. The participating groups consistently demonstrate a remarkable research spirit, delving into a diverse array of topics with enthusiasm. They dedicate significant effort to presenting their research findings with clarity and precision. Swiftly immersing themselves in the scientist's role, the young participants grasp the essence of international cooperation, fostering a deeper understanding of collaborative scientific endeavors.

In addition to the scientific activities, the young people are also invited to take part in a drawing contest, a photo contest and a kahoot quiz. On the left is the winning artwork from the drawing contest, and on the right is the photo from the photo contest.

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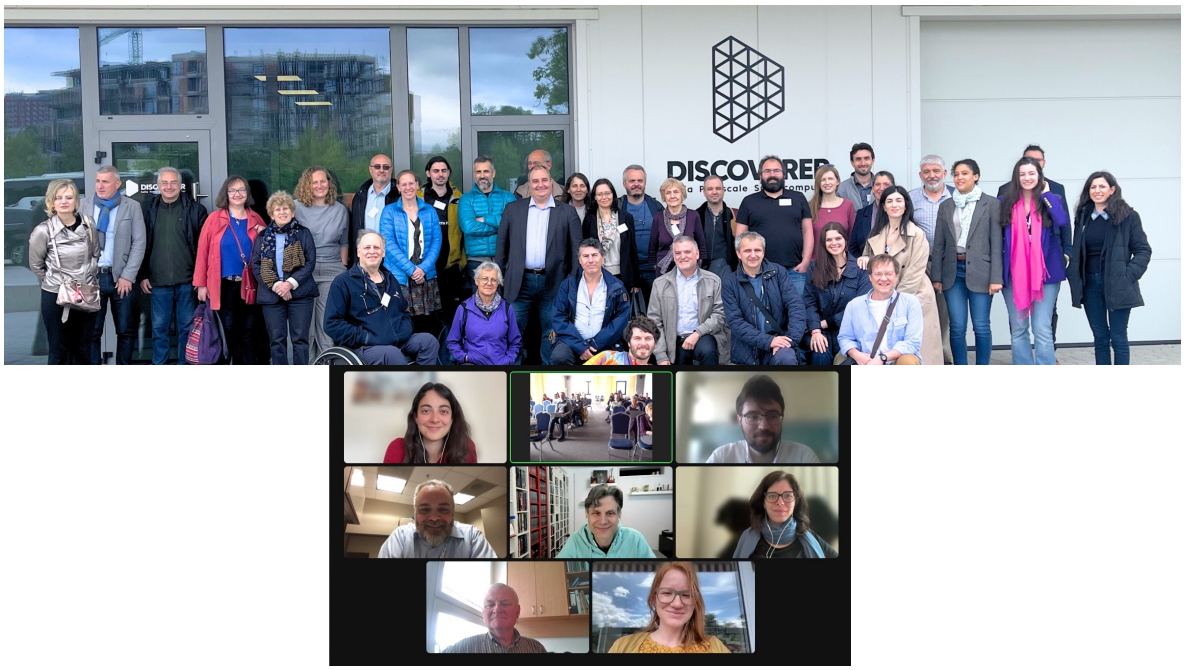
Collaboration meeting – Spring

Indico URL link: https://indico.cern.ch/e/ippog-2023-spring



25th IPPOG meeting – Sofia, Bulgaria 9 – 10 – 11- 12 – 13 May 2023

IPPOG arranges two collaboration meetings each year, one in spring and the other in autumn. In spring 2023, the 25th IPPOG Collaboration Meeting was held in Sofia, Bulgaria, from Tuesday, May 9th to Friday, May 13th with 55 registered participants, including Bulgarian colleagues and high school teachers.

These annual meetings serve as platforms for various activities, including the presentation of reports from Working Groups, Steering Groups, the Speakers and Publications Committee, the Core Team as well as the sharing of Inspiring Success Stories and reports from select members/associated members. One of the notable highlights of these meetings is also the panel discussion which changes topic each time. These biannual meetings can be followed in person and/or by remote connection.

Collaboration Board (CB) Meeting
With 28 members present, alongside 1 associated member, the meeting started with the presentation and discussion of the 2022 Financial Statement, the planning for the 2024 Budget and for future meetings and the introduction of IPPOG's new core team structure.

Collaboration meeting – Spring

Group activity and Quantum Computing Panel

Bulgarian colleagues organised a visit to the Supercomputer (HPC) at Sofia Tech Park.

A panel discussion on Quantum Computing took place at the Royal Palace. The panellists invited were: Dr. Sascha Mehlhase, Munich Quantum Valley; Dr. Federico Meloni, Deutsches Elektronen-Synchrotron (DESY); Dr. Elias Fernandes-Combaro, CERN & University of Oviedo; Dr. Petar Nikolov, Technical University Sofia and Iliya Lingorski as moderator.

Inspirational Success Stories

Sessions dedicated to Inspirational Success Stories showcased initiatives from various countries, highlighting achievements and innovations in science outreach.

- *Congres des Deux Infinis* by Nicolas Arnaud (France representative)
- *Women and Girls in Science Technology* by Melissa Samson (CERN)
- *LHC: Connect the Dots!* by Francois Briard (CERN)
- *Phy6cool Summer School for Undergraduate Physics Students + Avenida de la Física* by Jesus Puerta Pelayo (Spain representative)
- *Particle Physics for Kids + Particle Physics for Teachers* by Michael Gregory
- *German Outreach Network Netzwerk Teilchenwelt* by Christian Klein-Boesing (German representative), Michael Kobel (IPPOG former chair), and Uta Bilow (co-coordinator of the International Masterclasses Program)
- *National Quantum and Dark Matter Road Trip + Dark Matter Schools Program* by Jacqueline Bondell (Australia representative)
- *Online Events for Primary School Students* by Cecilia Colla Ruvolo (Italian forum member)
- *World Quantum Day* by Zlatan Vasović (IAPS)

During the meeting, IPPOG Chair Claire Adam and Zornitsa Zaharieva (CERN-IR representative) had the honour of being interviewed on the radio programme "Cristo Botev - Our Day" by Bulgarian National Radio Editor Nina Tsaneva. This insightful conversation shed light on the significance of particle physics outreach and the collaborative efforts undertaken by IPPOG to advance scientific education on a global scale.

Collaboration meeting – Spring

Public Events

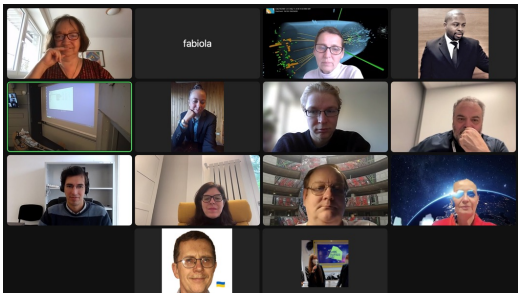
During the last two days of the meeting, our Bulgarian colleagues from IPPOG organised special sessions tailored for both students (Friday) and teachers (Saturday). For detailed insights and comprehensive information, please refer to page 13 of the IPPOG Digest.

The first day was dedicated to students, who participated in the CMS masterclass monitored by Boris Pavlov and Kenneth Cecire. The programme also included a morning session with an introduction to *CERN and Bulgarian participation in CERN's activities*, along with a talk entitled *STEM education programmes and opportunities for Bulgarian students and teachers at CERN* presented by Zornisa Zaharieva. Additionally, there were talks by Boyka Aneva on *OSOS – Open School for Open Societies in Bulgaria* and by Dinko Dinev on *The Smart City*.

The special session dedicated to teachers focused on the Particle Therapy Masterclass, monitored by Yiota Foka and Jennifer Hardt. During this session, there have been two special guests: Joao Seco, who gave a talk on *Underlying Physics/Biology*, and Sandro Rossi, who presented on *Ion Therapy Centre CNAO and HITRIplus Opportunities.*

Collaboration meeting – Autumn

Indico URL link: https://indico.cern.ch/e/ippog-2023-autumn



26th IPPOG autumn meeting at CERN, 28 – 29 – 30 November 2023

The 26th Collaboration Meeting was organized and hosted at CERN. Spanning from November 27 to 30, 2023, the meeting attracted a diverse assembly of 70 registered participants. The sessions were moderated by the co-Chair Pedro Abreu, while Claire Adam, gave a presentation on Communication, Outreach and Citizen Science at the 13th ICFA meeting in Hamburg.

The first days were dedicated to the meetings of various Working Groups: "Application for Society," "Masterclass to New Countries," and "Exhibits and Public Events" and the International Masterclasses Steering Group convened to address pertinent matters.

In the evening of November 28, attendees were offered the optional opportunity to join in the Movie Night featuring "Ghost Particle," a documentary by Geneva Guerin (Director of Cinécoop Productions in Canada), followed by a captivating Medipix Demonstration led by Pinelopi Christodoulou (Doctoral Student at CERN).

Collaboration meeting – Autumn

International Particle Physics Outreach Group

Opening Session

The 26th IPPOG meeting was held at CERN. After the reports from the core team, steering groups, and working groups, the new Neutrino Masterclass was presented, led by Kenneth Cecire, Shane Wood and Spencer Pasero.
Following this, all participants were taken on an active visit to the new Science Gateway at CERN. In addition to visiting the exhibition spaces, they also engaged in an activity in one of the laboratories led by Julia Woithe.

Inspirational Success Stories

The Inspirational Success Stories, featuring a diverse array of speakers and their remarkable experiences:

- *News from the ACHEP Conference in Morocco* by Hassnae El Jarrari (ATLAS)
- *ALICE HEPscape in Finland* by Anna Onnerstad
- *Stories from the Science of CERN* by Connie Potter (CERN)
- *Bad Boy of Science* by Sam Gregson
- *Keeping Young Talents Attached - The Fellow Program of Netzwerk Teilchenwelt* by Andrea Mayer-Houdelet and Christian Klein-Boesing
- *Universal Science Events + Music of Physics Sofia* by Steven Goldfarb (ATLAS representative)
- *Acquiring Feynman Diagrams in a Playful Way* by Robert Valentin Harlander
- *How Physics Masterclasses Can Benefit from Gamification Elements* by Hannes Nitsche
- *From Service to Science: Veteran Transition Initiatives at Fermilab* by Cortez Watkins
- *Looking for New Interactions with Dark Matter* by Maria Belen Lovino
- *IPPOG Inspired Activities in Brazil* by Marcelo Munhoz

Collaboration Board

The final session of the International Meeting was dedicated to the 15th Collaboration Board (CB). With 29 members present—13 online, 16 in person, and 5 proxy—the meeting established a quorum with a total of 34 participants. Key topics discussed included the acceptance of Latvia's accession, approval of the 2024 budget proposal, forum and IPPOG authors list, plans for the Autumn meeting 2024.

ippog.org