



International Particle
Physics Outreach Group



International Particle Physics Outreach Group

Update on the IPPOG activities

Roumyana Hadjiiska, Bulgarian Academy of Sciences - INRNE
(On behalf of the IPPOG Collaboration)

11th Large Hadron Collider Physics Conference
Belgrade, 22-26 May, 2023



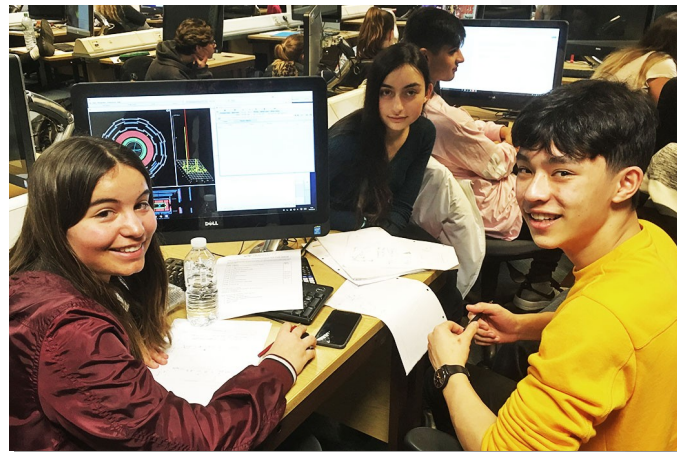


Communications

- **Report Goals and Results** to the public
- **Extend Reach** through methods & networks

Education & Outreach

- **Establish Understanding** of scientific process
- **Instil Appreciation** of fundamental research
- **Engage** with communities
- **Train the Next Generation** of scientists



The Education, Communication & Outreach we do **today** lays the foundation for **tomorrow's** support and secures the **next generation** of scientists.

IPPOG – Timeline



1997 Birth of European Particle Physics Outreach Group (EPOG)
formed under the joint auspices of ECFA and EPS-HEPP
as a forum for exchange of ideas, best practices, tools, etc...

“...the particle physics community has a moral obligation to inform the public on its activities. To do this well, experiences must be shared among countries in view of the need to optimize the use of resources.”

- Chris Llewellyn-Smith, CERN DG



2005 Launch of **IMC** – International MasterClasses in Particle Physics
based on real data from DELPHI and OPAL experiments (experiments at LEP)

2005 EPOG → EPPOG



2011 Real data from ATLAS and CMS experiments at the IMC (International Masterclasses)

2011 Global Expansion “E” => “I” (EPPOG => IPPOG)

Israel, Australia, USA, South Africa, Brazil, India, Mexico,...

2012 ICHEP2012, Melbourne, Australia

Announcement of the Higgs Boson discovery, 1st Outreach Track in a big conference

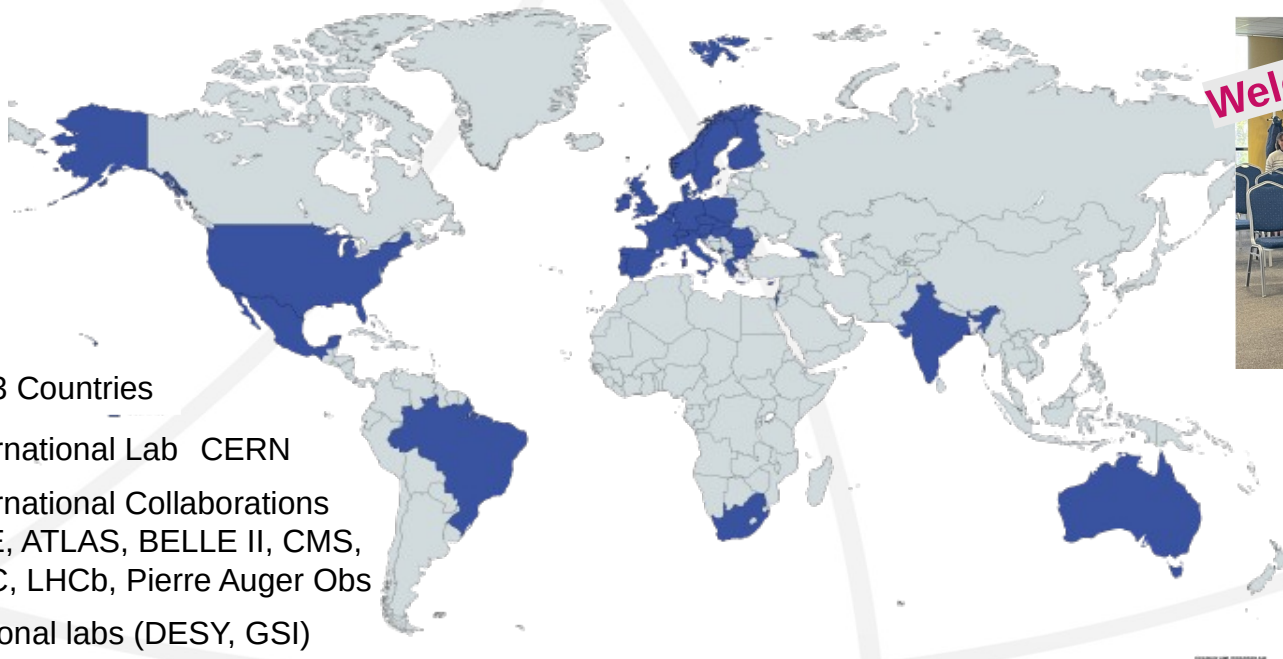
2016 Formalization of an International Collaboration

MoU (Memorandum of Understanding) came into force on December 2016

2017 Launch of the Global Cosmics portal

2022 Celebrating 25 Years of Outreach Excellence

October 29, 2022 at CERN Globe of Science & Innovation



■ 33 Countries

1 International Lab CERN

7 International Collaborations
ALICE, ATLAS, BELLE II, CMS,
HAWC, LHCb, Pierre Auger Obs

2 National labs (DESY, GSI)

Welcome AUGER!





The IPPOG Collaboration



International Scientific Collaboration

- Active researchers with experience in education & public engagement
- Experts in communication & education

Global Network

- 41 members: 33 countries, 7 experiments, 1 intl lab (CERN)
- 2 associate members: 2 national labs (DESY, GSI)

Organise Global Activities

- International Particle Physics Masterclasses
- Global Cosmics Portal
- World-Wide Data Day, International Cosmics Day

Support Local Activities

- Sharing of expertise, best practices, material database
- Resources to support public engagement, kick-start activities

<http://ippog.org> [Find us in the web](#)
<http://facebook.com/ippog>
<http://facebook.com/groups/friends.ippog>
<http://twitter.com/ippogOrg>
<http://instagram.com/ippogOrg>
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ippog-friends@cern.ch



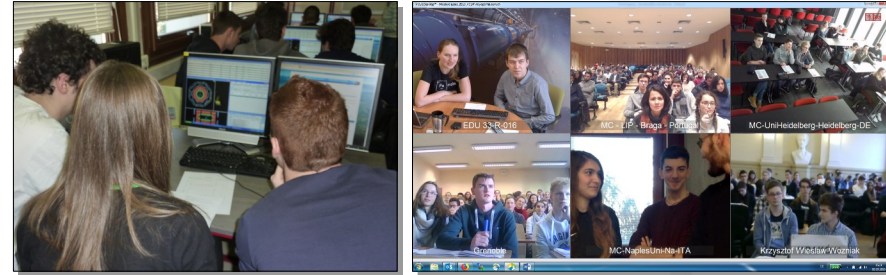


IPPOG – International Masterclasses



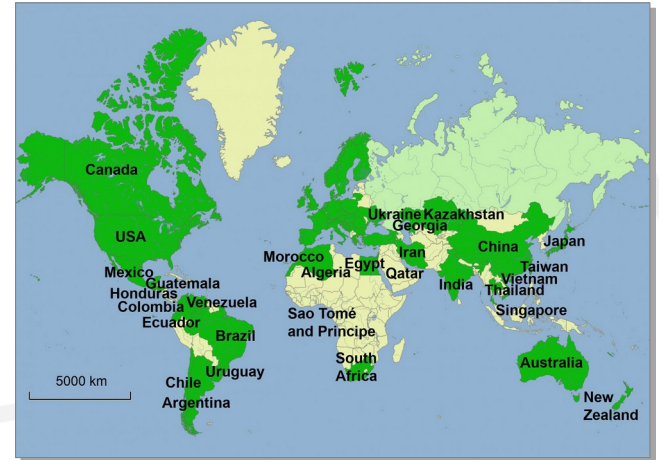
The Flagship Activity of IPPOG

- Students become “Scientists for a Day” at a Research Inst.
- Introduction to Particle Physics, Detectors, etc.
- Analyse real data provided by experiments
- Discuss results via videoconference with other students around the world



Global Reach (2019; recovering after pandemic)

- 60 countries
- 220 research labs
- 14,000 Students
- Videoconferences with moderators at
CERN, FNAL, KEK, GSI, TRIUMF



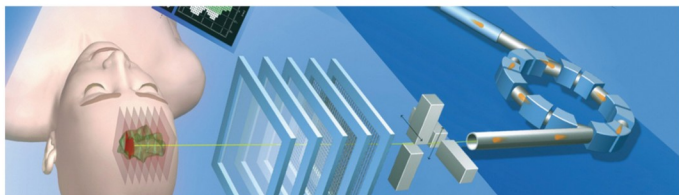


IPPOG – International Masterclasses



physicsmasterclasses.org

Next edition: 2024 from ~11 February to a few days before (catholic) Easter (31 March)



Particle Therapy MasterClass



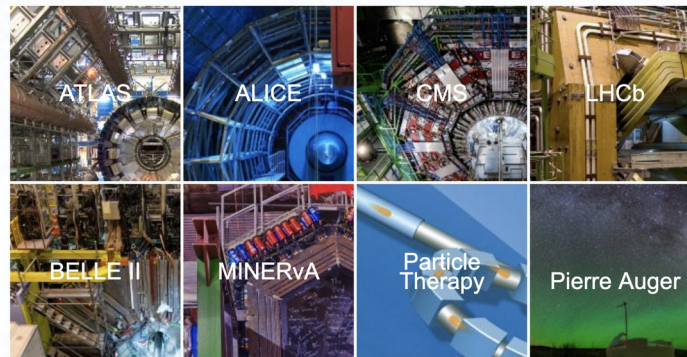
hands on particle physics

- Home
- Information for High School Students
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- Information for Institutes and Physicists
- Schedule
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- My Country
- Physics
- In the Media
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- Contributors
- Contact Us

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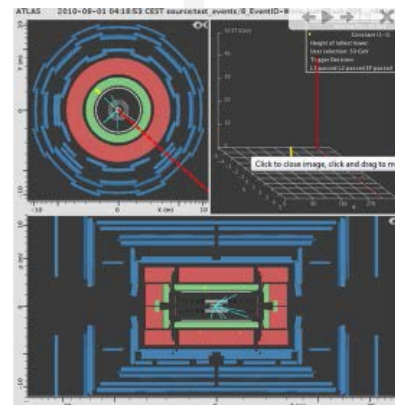
International Masterclasses
19th International Masterclasses 2023





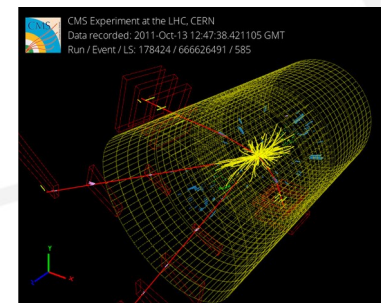
The Measurements

- ATLAS W-Path (Ratio of the W⁺ / W⁻ bosons, with a H → WW taste)
- ATLAS Z-Path (Z boson mass, Higgs search in photons and 4 leptons)
- CMS (Decays of the W, Z, and Higgs bosons, Mass of the Z boson)
- ALICE (Strange particles)
- ALICE (Measurement of Nuclear Properties)
- LHCb (Study of the particle decay: D⁰ → Kπ)
- MINERνA (Neutrino studies)
- Belle II (Particle reconstruction)
- Belle II (Measure quark colours)
- Particle Therapy (GSI/FAIR)
- Pierre Auger Observatory (Cosmic Rays)
- In development
- Darkside, MicroBooNE
- OPERA, DUNE



LHCb experience has 24 institutes involved, EU and US for 2015/2016.

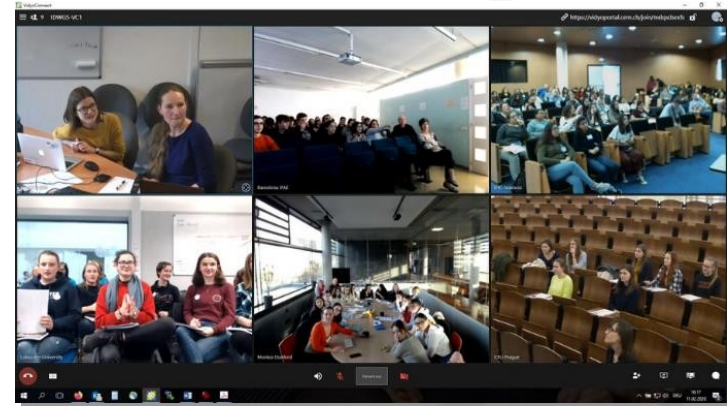
- The experience is twofold:
 - The students search for the D⁰ → Kπ decay using an event display.
 - The students also perform a lifetime measurement at the 1% level.





U.N.'s International Day of Women and Girls in Science 11 Feb => Campaign start
“support and promote the access of girls to science education and research”

- Masterclasses for Women and Girls
 - 14 groups participating
 - 500 students
 - Primarily women lecturers and tutors
 - 5 videoconferences at CERN with women moderators
 - incl. presentation on situation of women in physics
 - **Next: ~11 Feb 2024 (to be confirmed)**



“My institution (Lancaster University in the UK) took part for the first time, last Tuesday on the International Day of Women and Girls in Science. We hosted a school group and had a great day - thanks very much!”



Presence in new regions of the world



Master Classes in
Cape Verde & Mozambique
Sept. 2022

Submitted to the Proceedings
of the African Conference on Fundamental and Applied Physics
Second Edition, ACP2021, March 7-11, 2022 — Virtual Event

Physics Masterclasses in Africa and the World

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IPPOG
@IppogOrg

As a good start for this new working year, we want to share one of the most beautiful photos we received few days ago from the "2nd physics camp for girls" in Karachi, Pakistan for high-school girls

[physicscamp4girls.pk](https://www.instagram.com/physicscamp4girls.pk)

[#ippog](https://www.instagram.com/ippog) [#science](https://www.instagram.com/science) [#GirlsInSTEM](https://www.instagram.com/GirlsInSTEM)





IPPOG – Global Cosmics



Projects for High School Students

Astroparticle physics combines particle physics with astronomy

- Cosmic rays measurements
- Fascinating world of the exploration of the universe
- Students become familiar with scientific work using modern measurement and analysis methods

International Cosmic Day

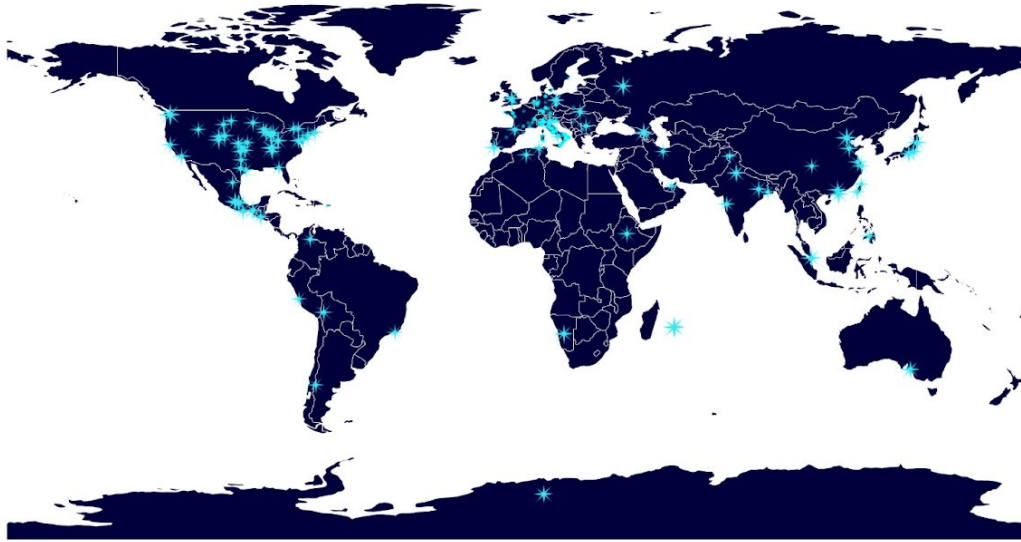
International Muon Week

ippog.org/global-cosmic-rays-portal

Finland	
France	   
Germany	 
Italy	 
Poland	
Japan	
Spain	
Sweden	
Taiwan	
UK	  
USA	



IPPOG – International Cosmic Day



November 22 2022 - 11th International Cosmic Day (ICD)

- More than 60 institutions (schools universities) over 23 countries
- The young people are supervised by scientists and teachers to study the cosmic rays

Discover Cosmic Rays

INTERNATIONAL COSMIC DAY

November 22 | 2022

Cosmic particles, these unnoticed particles that surround us all the time, are the focus of this day. Students, teachers and scientists get together to talk and learn about Cosmic Rays and answer questions like:

**What are cosmic particles?
Where do they come from?
How can they be measured?
And what can we learn from them?**

If you want to know more about the secrets they bring with and to be part of this collaboration, get here more information:

Image Credit: DESY, Science Communication Lab

<https://icd.desy.de>
<https://www.facebook.com/InternationalCosmicDay>

22 May 2023

LHCP 2023 at Belgrade, Serbia



In cooperation with many networks and partners:



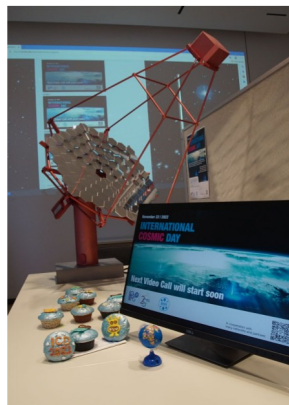


IPPOG – International Cosmic Day



International Cosmic Day 2022

Topic: Investigating the particles from the cosmos



© Heike Prokoph, DESY

98 groups of students, teachers and scientists in 23 countries participated

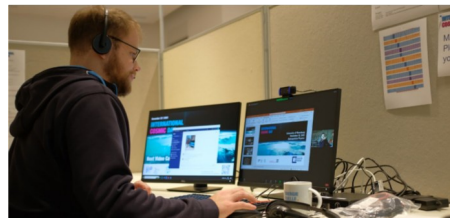


© I.I.S.S. Aldo Moro Margherita

<https://www.facebook.com/InternationalCosmicDay>

Find us in the web:
<https://icd.desy.de>

12 Video Calls throughout the day



© Carolin Gnebner, DESY

Report Global Cosmic Group | Sabine Hemmer, Carolin Gnebner, May 2023

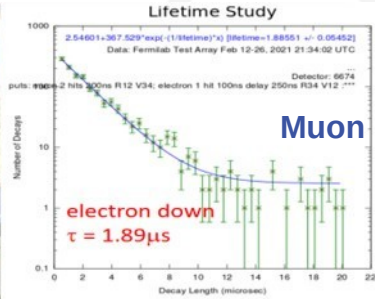


IPPOG – International Muon Week

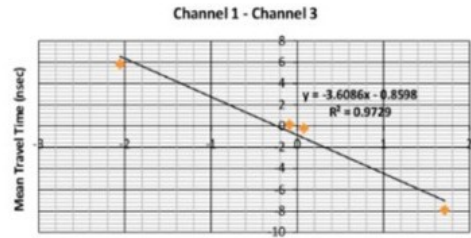
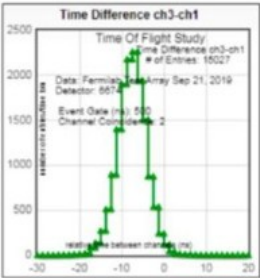


International Muon Week (IMW) is held annually each spring.

<https://quarknet.org/content/international-muon-week>

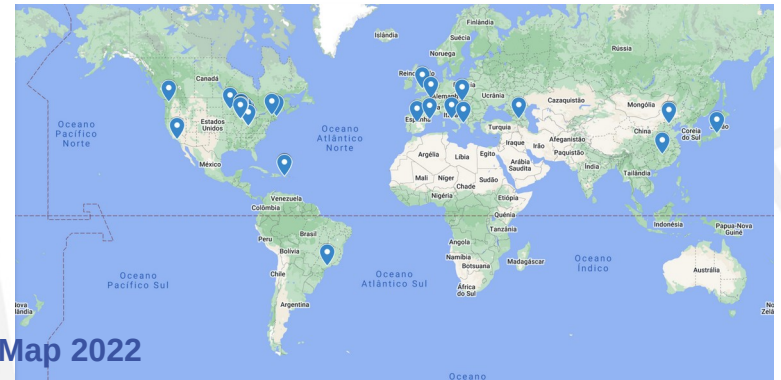
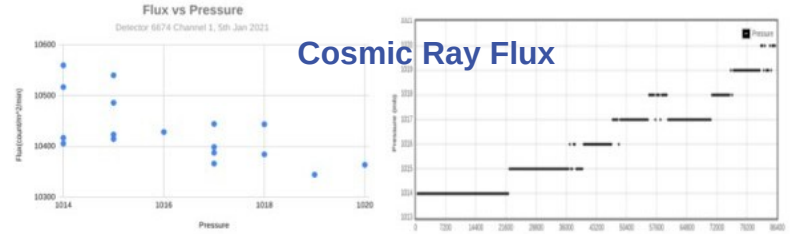


Muon Lifetime



Time of Flight Separation (m)

Variation of flux with Barometric Pressure





IPPOG – World Wide Data Day (W2D2)

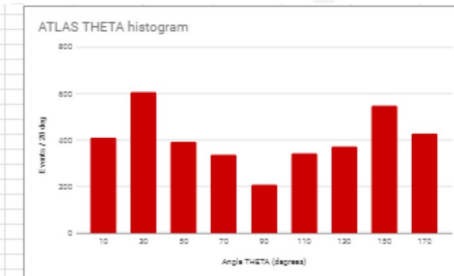
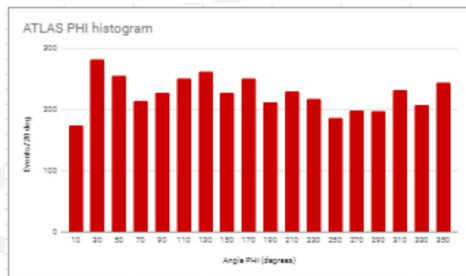
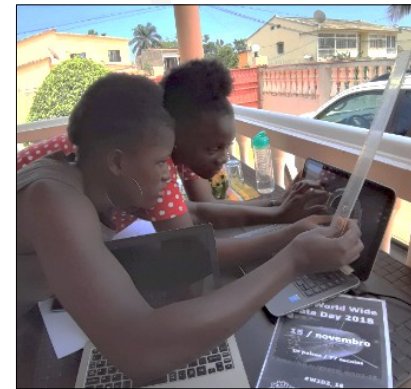


10 November 2022 (24h)

- Participating groups: 42 in 11 countries – 6 from Bulgaria!
- for high school students, guided by physics teachers
- simplified measurement with data from ATLAS and CMS

Measurement

- Students worldwide analyse data from LHC events
- Data analysis at school, physics discussion in Video-Conference (Zoom)



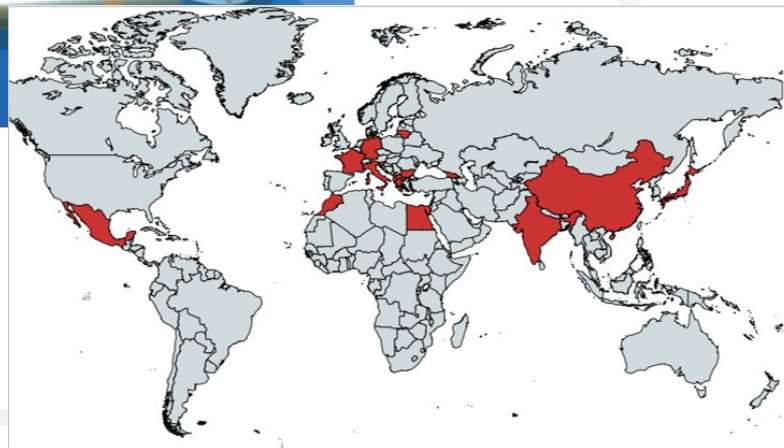
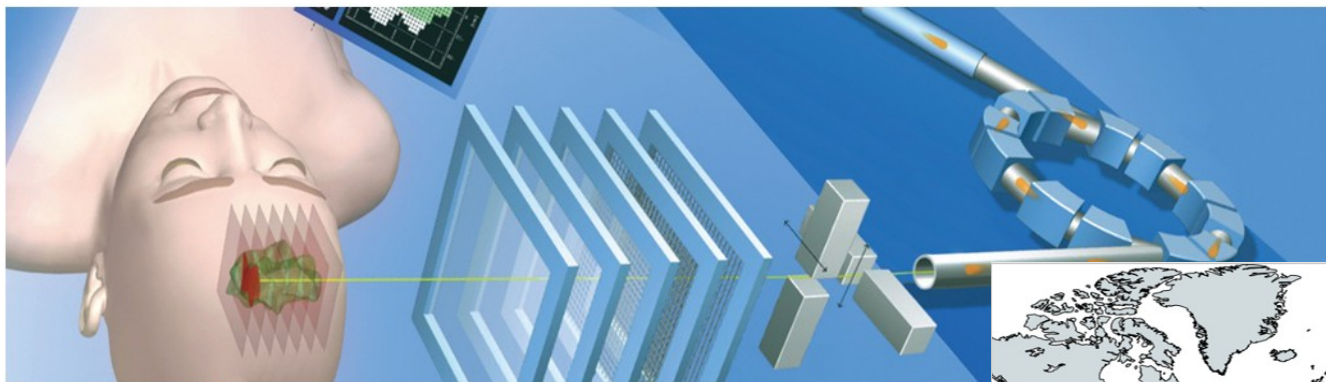
<https://quarknet.org/content/world-wide-data-day>



Next: Oct/Nov 2023



Particle Therapy Masterclasses



From Particle Physics to Particle Therapy

Find the class in the [web](#)



IPPOG – the future...for you!



Many challenges ahead

- Scale of [new] projects (timespan, cost, size, ...)
- Wide[r] recognition of the value of [Fundamental] Science in the Society
- Increase the reach of our activities – geography, diversity, inclusion, age
- Train the trainers – Teachers, Educators, Tutors, Motivators
- Introduce High Energy and Particle Physics in school curricula, either adiabatically or with a swift phase transition (aka revolution)

Education and Outreach are more important than ever.

We need to work on how the public perceive scientific knowledge and the scientific process.



Conclusions



- Education, Communication and Outreach are essential pillars for the development of High Energy and Particle Physics.
- Many scientists/teachers , at different levels of commitment, are already carrying outwards the excitement of the field with many activities.
- Our field needs the support and contribution of **all**,
 - as an active teacher engaging your students in classes and activities,
 - as an active student involved in activities and engaging friends and family,
 - as actively being an ambassador of the field,
 - and/or helping creating the conditions for a better Edu-Comm-OR in PP.

OUTREACH *is not complete without* U



Thank you for your attention!



Thanks!

to all the people collaborating in all these activities!

Any questions?

You can find me at

roumyana.mileva.hadjiiska@cern.ch





Backup Slides

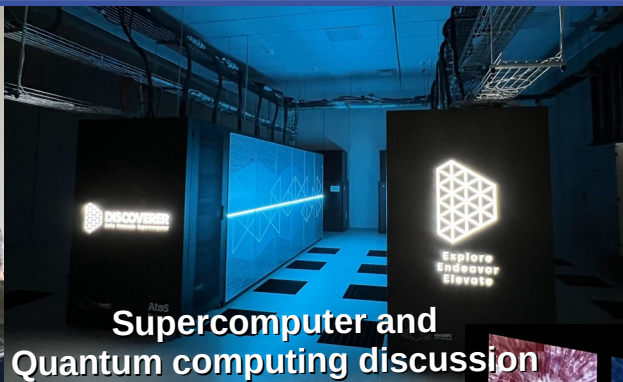




IPPOG Spring Meeting at Sofia Tech Park 9–13 May 2023



Collaboration work



Supercomputer and Quantum computing discussion



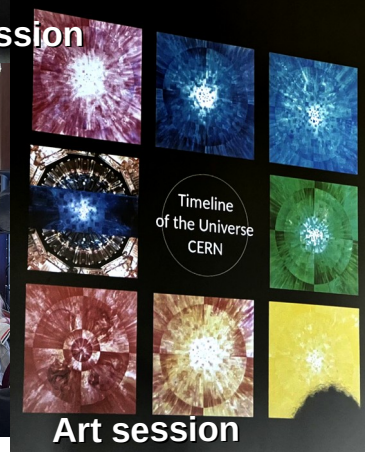
The Music of Physics



Masterclasses for teachers



Timeline of the Universe CERN



Art session



Students session

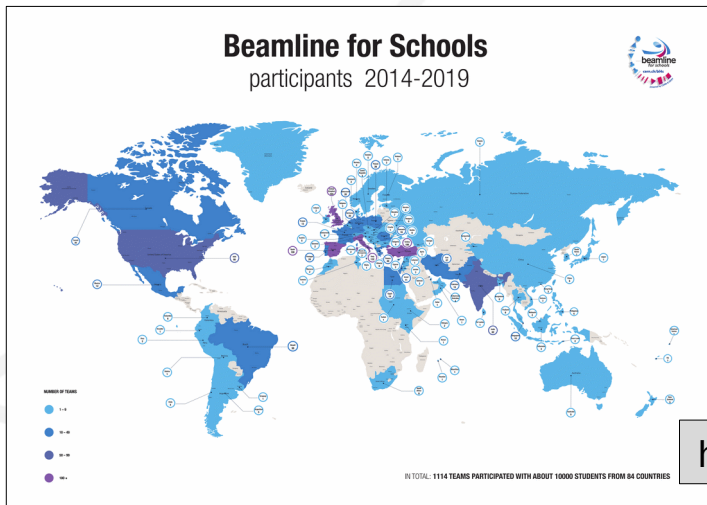


IPPOG – Support to BL4S Competitions



IPPOG Participation

- Local Contacts to Schools
- Help Remove Language Barrier
- Give Guidance for Physics, Feasibility



<http://beamlineforschools.cern>



IPPOG – Public events & Festivals (examples)



Colours of Ostrava
Czech Rep, 2019, 2022

Pohoda Festival
Slovakia, 2019



Universal Science
CHEP, Sofia, Bulgaria, 2018
CHEP, Adelaide, Australia, 2019
ICHEP, Online, 5 Aug 2020
ATLAS Week, Lisboa, 16 Oct 2022



<http://universalscience.web.cern.ch>

