

HEP Outreach in Bulgaria

Roumyana Hadjiiska

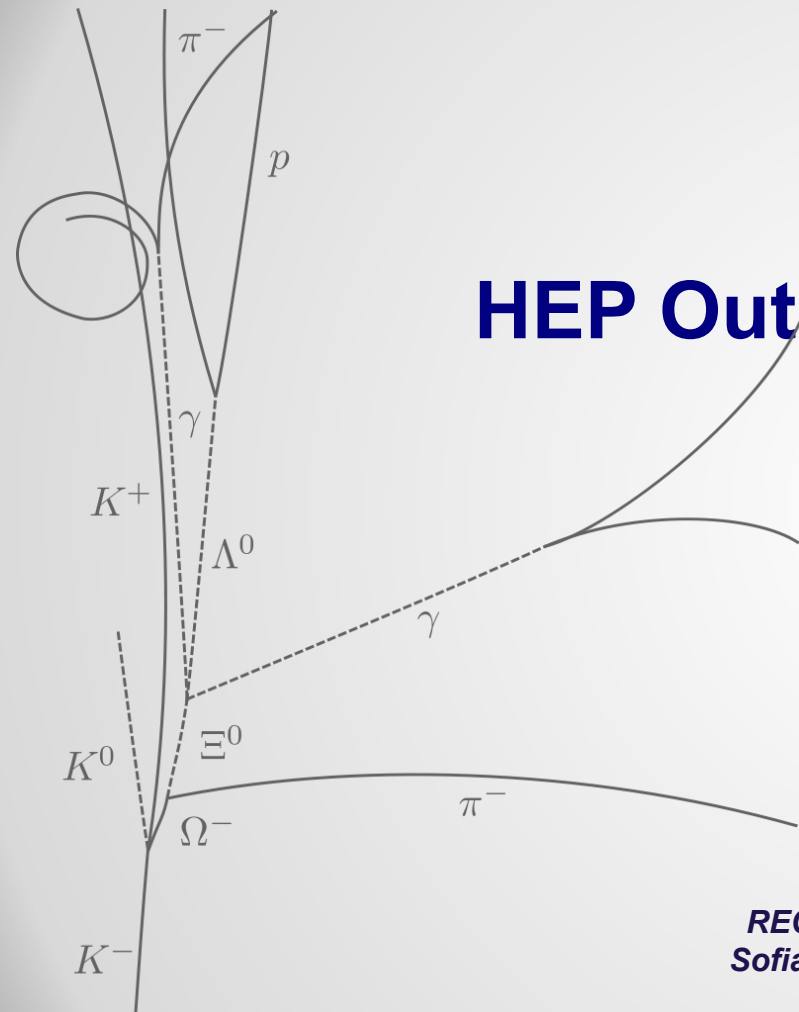
INRNE, Bulgarian Academy of Sciences

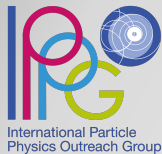
CMS Experiment, CERN

Bulgarian representative to IPPOG

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RECFA VISIT TO BULGARIA
Sofia, Bulgaria, 07 March 2024





IPPOG related activities

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...

...

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

...

2021 Bulgaria joined IPPOG as an official member

IPPOG MoU signed by Sofia Tech Park

Main IPPOG activities with Bulgarian participation:

International masterclasses (IMC) - The Flagship IPPOG Activity

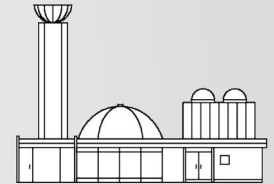
World Wide Data Day - W2D2

Public events

International masterclasses in Bulgaria: 2018 - 2025

Local organizers in Bulgaria:

- Sofia Tech Park
- University of Sofia “St. Kl. Ohridski”
- INRNE-Bulgarian Academy of Sciences
- University of Plovdiv “Paisii Hilendarski
- Astronomical observatory-Varna
- OSOS



Main host institutions:

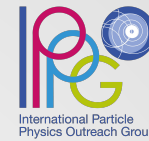
University of Sofia “St. Kl. Ohridski”, Sofia Tech Park, INRNE-Bulgarian Academy of Sciences, Astronomical observatory Nicolaus Copernicus - Varna

Schools at smaller towns:

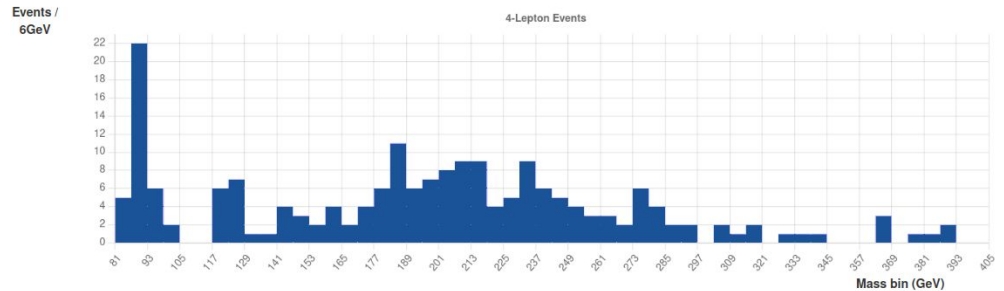
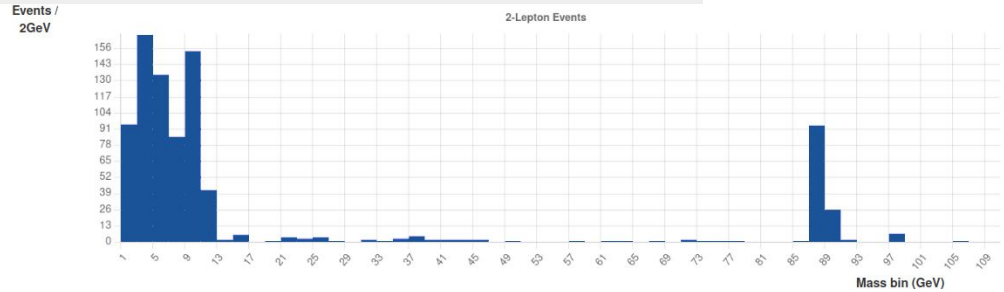
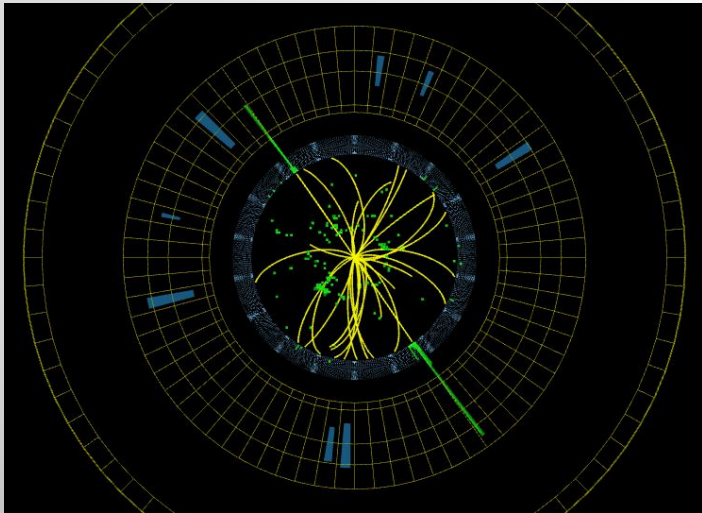
Whenever it is possible we travel to schools in smaller towns in Bulgaria.

Classes at National Gymnasium of Natural Sciences and Mathematics "Academician Lyubomir Chakalov"
Included in the curriculum of advanced physics classes since 2022

International Masterclasses - form of conduct



- Introductory lecture - Introduction to elementary particles theory and the decays to be studied during the class.
- Introduction to detector complex and methodology of the practical measurements;
- Student's work with the help of their mentors and teachers - **Experimental data analysis, event reconstruction and identification of $W^{+,-}$, Z and H bosons, or strange particles identification.**
- Discussion on the obtained results with the CERN moderators and students from other countries.
 - A funny quiz



Particle Therapy Masterclass

Organizers:



International Particle therapy masterclass

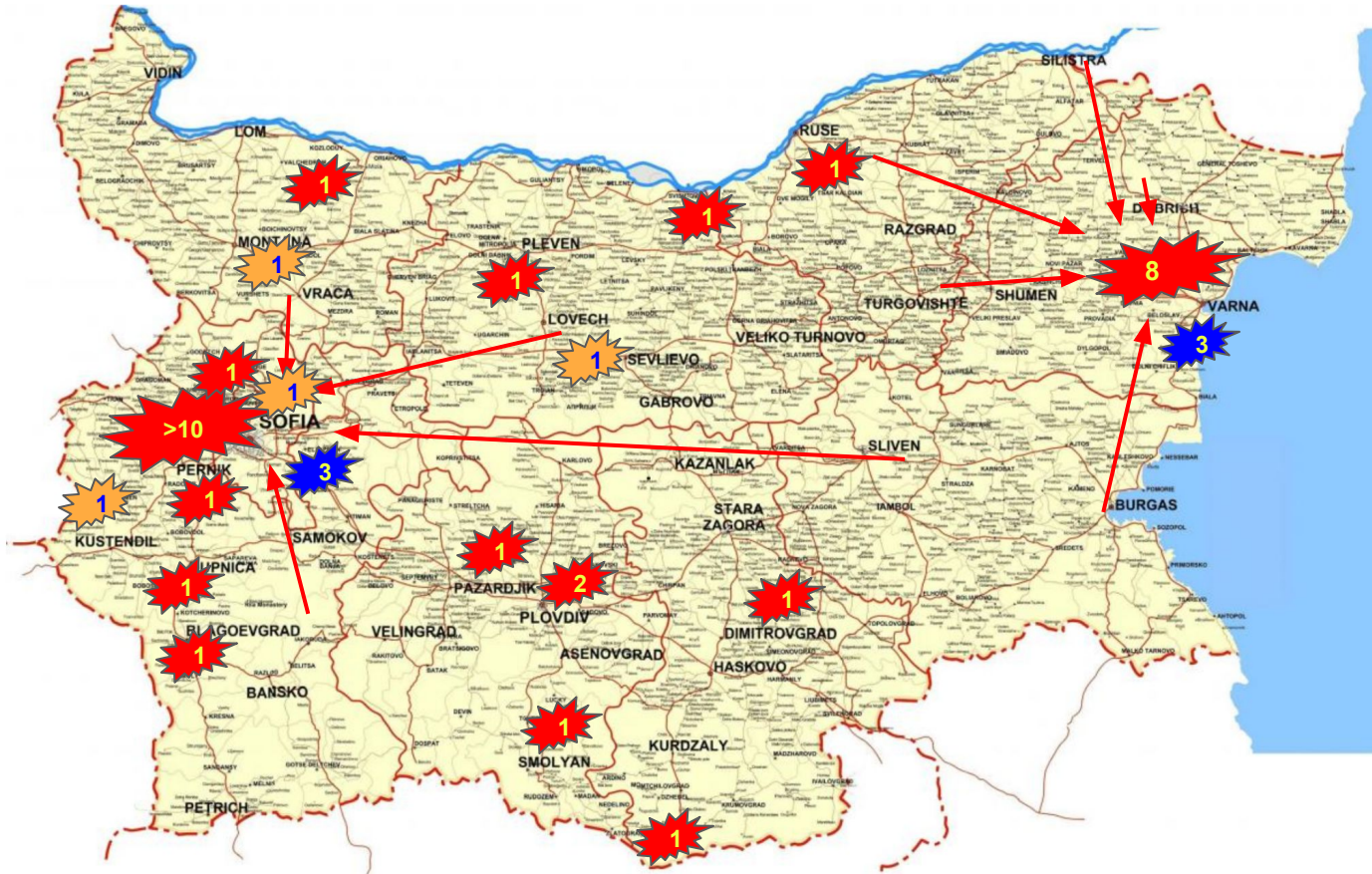
- **Organizers for Bulgaria:** University of Sofia “St. Kl. Ohridski”, Sofia Tech Park
- Clearly shows the importance of fundamental research for medical applications and its benefit to society;
- Introduction to the techniques used for the treatment of oncological diseases, using photon radiation and accelerated beams of charged particles (protons or carbon ions);
- Work with the specialized software [matRad](#) (developed by the German Cancer Research Center DKFZ, Heidelberg, Germany);
- Development of a radiation treatment plan and comparison of the results of irradiation with photons and accelerated beams of charged particles.

IMC in Bulgaria - Brief summary

Year	CMS class	Particle therapy	ALICE class	Number of students/teachers	Comments
2018	1			66 / ~10	First IMC in Bulgaria
2019	5			> 150	First classes at smaller towns
2020	5 planned 3 realized			> 90	Only 3 realized (Covid restrictions) First online class ever in Bulgaria
2021	4	1		> 150	Online + <u>Common public lectures for all the participants and the society</u>
2022	4 + 2 Masterclass parties			> 100	Online and in place at the school, depend on the applied Covid measures at the time of the class; 2 Masterclass parties at Sofia Tech Park after the end of the Covid restrictions - Funny experiments in TechnoMagicLand and visit to the Petascale Supercomputer
2023	3	1	1	> 150	Back to normal schedule and classes in place
2024	7	2		> 180	One class only for girls in the international day of women in science
2025	4	2	3		Main schedule and program - here

IMC in Bulgaria 2018 - 2025

- CMS**
- PT**
Particle therapy
- ALICE**





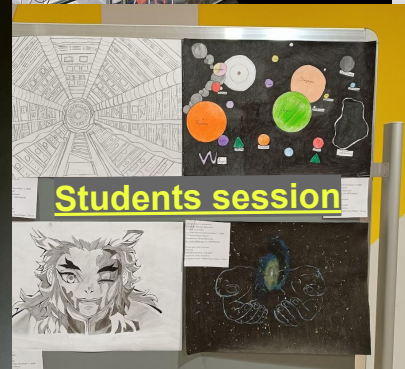
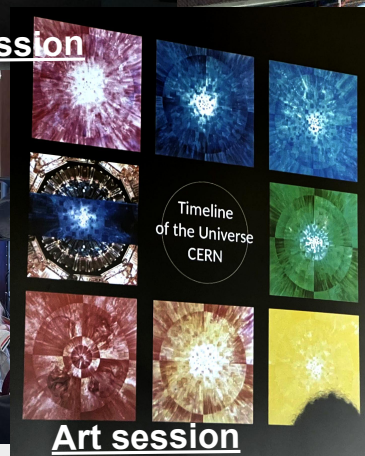
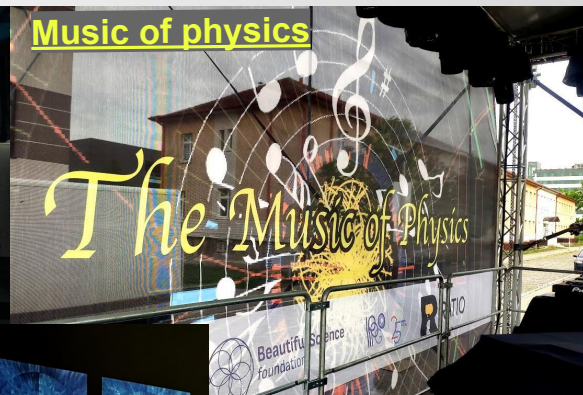
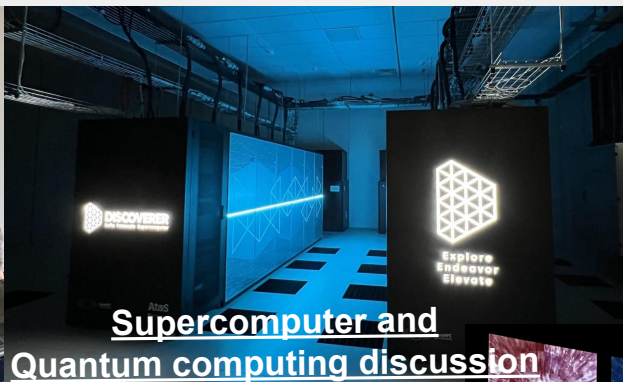
W2D2 (World Wide Data Day) in Bulgaria



- Direct contact between the teachers and CERN organizers. If necessary - we can help to facilitate the communication.
- Analysis of the angular distributions of the particles born in the LHC collisions:
 - Standalone mode of work – either as a homework or as a dedicated school lesson – depend on the teacher choice.
- Video-discussion with CERN and students from other countries.
- 2-3 Bulgarian schools in average per year
 - Maximum participation in 2023 - 6 schools

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

Co-organized with scientists from University of Sofia and Bulgarian Academy of Sciences

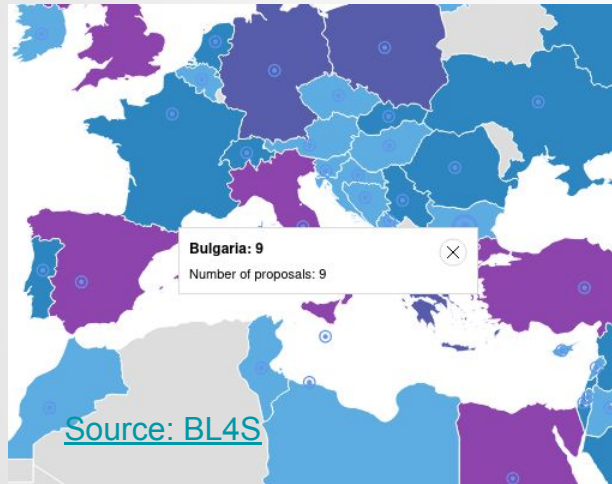


Public event - [link to the students session](#). Please, visit it!

Beam Line For School - BL4S

Numbers of Bulgarian teams participating in BL4S since 2014: **9**

- 2014 - 1
- 2017 - 1
- 2018 - 2
- 2020 - 1** Shortlisted - [Team Crystal from the town of Shumen](#)
- 2021 - 1
- 2022 - 1
- 2024 - 2



BL4S shortlisted teams 2020

The following 23 teams of this year's BL4S competition are shortlisted and will receive BL4S T-shirts and a Cosmic Pi detector. Two of them will be chosen as winning teams and will be invited to DESY in autumn to carry out their experiments.

Team name	Country
ASML Science Worms	Turkey
Beam TAMALES	United States
Cancer fighters	Argentina & Japan
ChDR-CHEESE	Germany
Club de Fisica Enrico Fermi	Spain
Crystonic Channelers	Canada & United States
Fancy Glow Stick Squad	United States
Fission Chips	United Kingdom
Gamma Busters	Turkey
Lionel-Groulx Dream Team	Canada
Mighty Photon and the Life of Matter	Germany & United States
Nations' Flying Foxes	Switzerland
PatoParticles	Poland
Polymer Party	Philippines
QuantumPlators	Australia
SIMES Science Academy	Chile & China & Turkey
Subatomic Storm	United States
<u>Team Crystal</u>	<u>Bulgaria</u>
Team Desertron	United States
Team Particular	United Kingdom
Team Photongal	Portugal
The Lazy Leptons	Netherlands
Universaux	Turkey

No dedicated funding

The applications for BL4S are managed mainly by the school teachers and students

Whenever it was asked, a help or some advisory from scientist was provided on a voluntary basis.

Bulgarian Teacher Programmes at CERN

<https://teacher-programmes.web.cern.ch/bulgarian-teacher-programme>

Collaboration between CERN and Bulgarian educational programme

- 14 Bulgarian teacher programmes for physics and chemistry teachers
 - (since 2008 - 2024), 2025 - planned
- 1 programme for the directors of a high schools of natural sciences and mathematics
- 8 programmes for teachers from IT and engineering
 - (since 2014 - 2024); 2025 - planned
- 40 teachers per programme (before Covid), 30 teachers per programme nowadays
- 2021 - Virtual training (because of the Covid restrictions) for the teachers already participated in the programmes - 152 persons
- With the participation of the Bulgarian scientists at CERN

- Funding by the Ministry of Education and Science
 - 40 000 euro per year for the two programs (Physics/Chemistry and IT/engineering teachers)
 - Under the National [Program](#) "Qualification of Pedagogical Specialists"
 - Covers the costs of travel, overnight stays at CERN and insurance for all participants.
- The costs of the training are covered by the CERN Education Office
 - Overnight stays at CERN, travel and food for up to 3 lecturers + costs for CERN guides.

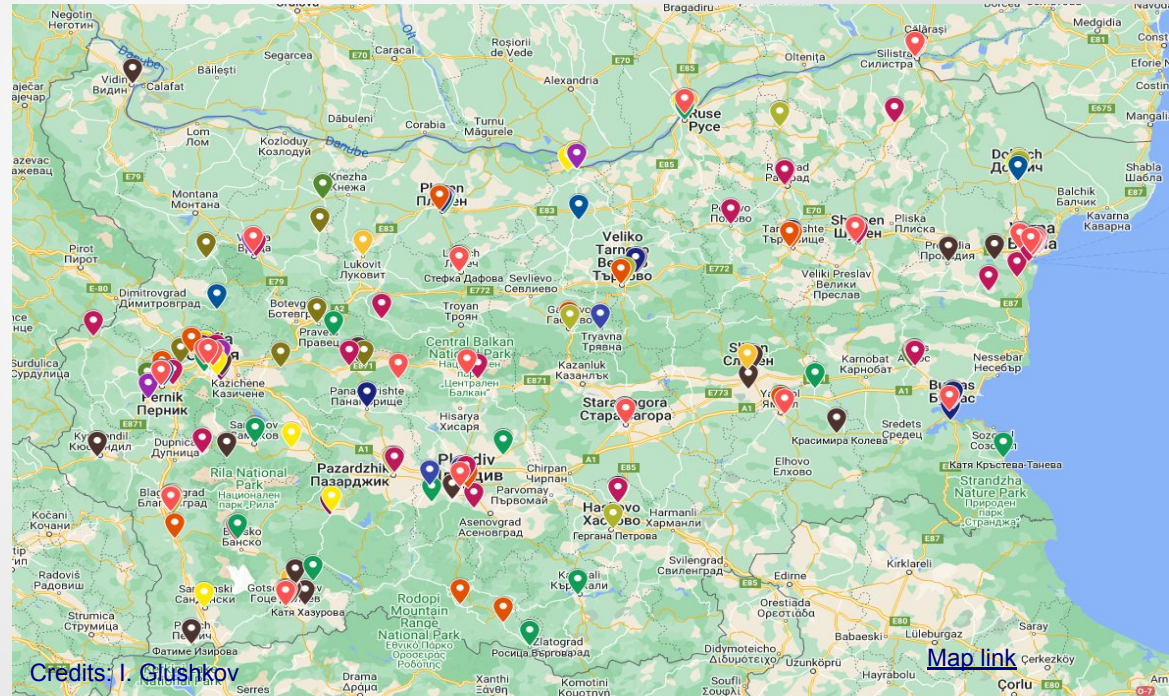


Activities after teacher training programs

- Teacher presentations to their colleagues and students
- Exhibitions about CERN and about the teacher's programme - more than 220 events
- Participation at national concourses and physics conferences
 - Posters, reports, brochures, mackets, drawings...

- Organized students visits to CERN
- Participation in the IPPOG activities - IMC, W2D2, BL4S
- Various students workshops and exhibitions
- Community of teachers, who visited CERN

A strong and friendly relationships between the teachers and scientists participated in the teachers programs!



Virtual tours of CERN

6 Virtual visits to CMS for Bulgaria since 2018 - [link](#)
(10 visits since 2015)

Another virtual visits have been organized every year during the Sofia Science Festival, organized by “Beautiful Science Foundation” and hosted by Sofia Tech Park.

Peak auditory: In 2022 the virtual tour was watched by ~1000 people in Sofia Tech Park and ~ 2000 people on-line



Bulgarian High-School Student Internship Programme - September 2017

<https://indico.cern.ch/event/633914/>

Two-week training for Bulgarian students

2017 The CERN Education Department organized a pilot two-week training for students from only five CERN member countries.

24 Bulgarian students were happy to visit CERN

The program included a 2-week course of lectures, exercises, visits, practical work as interns in the field of Particle Physics and engineering activities carried out at CERN, as well as a social program

The costs of transportation, accommodation, food and training of the students were fully covered by CERN.

Very successful program!

There is a need of national funding for future such programs.

Preliminary estimation for 1 week programme for 24 students - 31 000 CHF



Bulgarian students with Maria Fidecaro at CERN, 2017

CERN 70 - event in Bulgaria 21-28.11.2024

Organized by University of Sofia and INRNE-BAS

Funded by the National roadmap for Research infrastructure
(2020 - 2027) - 20 000 Euro

Anniversary exhibition

Interactive tunnel

Exposition Bulgaria and CERN

Exposition Science and Art

Public lectures every day



70 години ЦЕРН **25 години България в ЦЕРН**

Физически факултет
Софийски университет „Св. Кл. Охридски“
21 – 28 Ноември 2024 г., 10-17 часа

- ❑ ЦЕРН: юбилейна експозиция
- ❑ интерактивен тунел
- ❑ експозиция „България и ЦЕРН“
- ❑ експозиция „Наука и изкуство“
- ❑ лектория - всеки ден от 16 часа

Откриване
21 ноември, 15.00 часа

Изложбата се организира от Физически факултет, СУ "Св. Кл. Охридски" и Институт за ядрени изследвания и ядрена енергетика - БАН

[Source link](#)

Open days and Career days

University of Sofia **Open Door Days:**

Twice a year where prospective students can learn about bachelor's and master's programs, as well as the education offered by the faculty. During these events, attendees also receive information on career opportunities and potential career paths after graduating from various programs.

Career Days:

the students are provided with valuable information about job opportunities, involvement in research groups and experiments, as well as insights into CERN and its groundbreaking experiments. This event offers a chance to explore career pathways and the various professional opportunities available to graduates in the field of physics.



A close-up photograph of several colorful gift bags (light blue, orange, pink, green) tied with natural twine, resting in a brown wicker basket. Each bag has a white circular label with handwritten text in Bulgarian. The text on the labels includes names like 'Хигс-Бозон' and 'Хигс, те получавам майка.' and dates like '125 GeV' and '2012 г. в'.

Thank you for your attention!!

Design credit: professional school "Hristo Botev", Dupnitsa