

# Second Experimental Physics Olympiad

## 25 April 2015 Sofia

### The Day of the Photon in the International Year of Light

Within the Bulgarian National Programme for celebrating the 2015 International Year of Light and Light-based Technologies:

<http://www.light2015.org/Home.html>

<http://www.light2015.org/Home/Event-Programme/2015/Competition/Bulgaria-Second-Experimental-Physics-Olympiad--25-April-2015-in-Sofia.-The-Day-of-the-Photon-in-the-International-Year-of-the-Light.html>

<http://live.iop-pp01.agh.sleek.net/2015/02/25/web-life-international-year-of-light-2015-blog/>

<http://www.light2015.org/Home/Event-Programme.html>

[http://www.eps.org/?page=event\\_iyol](http://www.eps.org/?page=event_iyol)

[http://www.phys.uni-sofia.bg/upb/IYL2015/Nacionalna\\_programa\\_na\\_SFB.doc](http://www.phys.uni-sofia.bg/upb/IYL2015/Nacionalna_programa_na_SFB.doc)

[http://www.iau.org/public/videos/detail/cosmiclight\\_trailer/](http://www.iau.org/public/videos/detail/cosmiclight_trailer/)

<http://bgphysics.eu/>

Sofia Branch (SB) of the Union of Physicists in Bulgaria (UPB) organises the Day of the Photon - Experimental Physics Olympiad (EPO) for high school students. At the Olympiad a task for an experimental study of light phenomena will be given. The Bulgarian EPO is open to all high school students and in this context is open to international participants.

Sofia Branch of UPB has organised such competitions since 2011, but so far no collection of typical problems, which could be used for the preparation of students for participation in like competitions has been published. In the Year of Light the task will be related to the physics of light. Therefore, the student should have experience in using a source of light: candle, firefly, night-light, flashlight, LED, lamp or a laser. The student should have some practical skills for working with lenses, prisms, diffraction gratings, mirrors, foil, photodiodes, voltmeters, resistors, potentiometers, batteries etc. To solve the problem the student should assemble an experimental setup, perform measurements and process the experimental data. Let us recall the formulas for speed of light wave  $c=\lambda/T$ , the frequency  $\nu=1/T$ , energy  $E=h\nu$  and momentum of the photon  $p=h/\lambda$ ,  $h$  is the Planck's constant, diffraction angle  $\lambda=d \sin(\theta)$  at normal incidence of light, constant  $d$  is the grating constant, the angles of refraction  $n_1 \sin(\alpha) = n_2 \sin(\beta)$ , the wavelength in transparent medium  $\lambda_n = \lambda/n$  with refractive index  $n$ , the threshold of the photoeffect  $q_e U = h\nu - \text{const}$ , where  $q_e$  is the electron charge, magnification for lenses and mirrors, and black body radiation  $\sigma T^4$  and  $T_{\lambda_{\max}} = \text{const}$ . Confer the corresponding secondary school textbooks.

The organisers of this event are the Sofia Branch of the UPB and the Regional Inspectorate of Education - Sofia in cooperation with the Faculty of Physics of the Sofia University St. Kliment Ohridski. Only online registration for the Olympiad is possible via: <http://goo.gl/forms/GTm6Jbe39V>. **The deadline for the registration is April 9, 2015.** If you have any questions please do not hesitate to contact us via: [epo@bgphysics.eu](mailto:epo@bgphysics.eu) (the abbreviation "epo" stands for Experimental Physics Olympiad).

Applications for participation in the Olympiad will be accepted until the quota, limited by the number of the experimental setups, is exhausted. So far the organisers have received a sponsor's support allowing the preparation of only 100 experimental setups.

## Rules for Participation and Programme:

The Olympiad is individual. Every student works individually on the same experimental task. Experimental setup will be provided by the organisers.

The registration on **April 25, 2015 will take place in auditorium A 315 (auditorium Elisaveta Karamihailova) of the Faculty of Physics from 7:30 to 8:00 am.** Students have to present identity card. After the registration, participants will be accommodated in different rooms of the Faculty of Physics. The Olympiad is held from 8:15 to 12:15. Students are not allowed to leave the auditorium during the first two hours (i.e. until 10:15). At 12:15 all participants must submit their work to the competition jury and will receive a certificate for participation.

In parallel to the Olympiad it will be organized a Seminar for teachers on the following topic: "The light phenomena and the secondary school education in physics". This seminar is open to all interested teachers.

The Jury appointed by the SB of UPB will announce the results next day 26.04.2015 at 11:00 in auditorium A 315 of the Faculty of Physics and on the website of the SB of UPB <http://bgphysics.eu/>. The best ranked students will receive certificates.

Your opinions, comments and recommendations can be sent to the email address of the Experimental Physics Olympiad [epo@bgphysics.eu](mailto:epo@bgphysics.eu).

## **Important:**

Skills and knowledge to be assessed: The participants must have a minimum experience with making experiments with light. They also should be able to work with a multimeter in order to measure different parameters such as the current through the light bulb, the battery voltage, the resistance of a resistor, and to be able to distinguish the polarity of the DC voltage. The student should be able to assemble a setup, perform the requested measurements, present the results in tables and graphics, and analyse the experimental data. Some sub-tasks could be related to graphics. Graphical representation of experimental data is a minimum of skills that every participant should have. It is also important that the participant is capable to connect individual experimental elements in simple electrical circuits, their drawing and analysis. ***To solve the experimental task, participants have to carry with them a digital multimeter with which they are familiar.*** If the multimeter is switched as an ammeter, do not attempt to measure the maximum current that a battery can create! This is not dangerous for the student, but quickly discharged battery and the ammeter can be damaged.

## **Organisational issues:**

1. For recent changes in the programme you should check frequently the website of the Sofia Branch of SFB <http://bgphysics.eu/>; it is highly recommended to check it before your departure for Sofia. The most important thing is to check if your name is on the list of candidates allowed to participate; this list will be published on the site on April 10, 2015.
2. The list of participants in the Olympiad is filled in following the order of receiving of the application forms. The number of the participants is limited to 100 experimental setups. This is why we recommend you to submit your application as early as possible.
3. The organising committee for conducting the Olympiad and assessment of the participants is appointed by the SB of UPB. It consists of the authors of the experimental task and setup, and of other physicists (teachers and university professors).

4. All participants will receive a certificate for participation and the best ranked students will receive a certificate with their ranking.
5. The tasks given at the Experimental Physics Olympiad are original and are not published before the competition.
6. Participation in the Olympiad does not require a specific training. We encourage the participation of all students, who can use a multimeter and optical instruments, regardless of their age. The chance of younger students for success while competing with older students is smaller, but their involvement now will help them to gain experience for participation in future competitions.
7. Students can use a calculator. It is forbidden to take mobile phones into the competition room and this will lead to disqualification.
8. Participants arrange alone their accommodation and trip to Sofia. One possible accommodation which we recommend is:

"Training Center for Students to the Ministry of Education and Science"

21A Dragan Tsankov Blvd, 1113 Sofia, Bulgaria

<http://mon-coo.com>

Contact person: Mr. Kaloyan Yordanov

[kalsii@abv.bg](mailto:kalsii@abv.bg), Tel.: +359-888-870-330

Teaching Center [u.centar@abv.bg](mailto:u.centar@abv.bg) phone/fax: +359-2-873-83-57

The location of the center can be found on the map:

<http://www.bgMaps.com/link/FA9F7A6839D5E719AA1933E567440DFE>

If you use the subway, get off at the stop "Joliot-Curie".

## Feedback

The organisers would highly appreciate the opinion of teachers who are accompanying students at the Olympiad on the problem given at the EPO. Each of these teachers will receive upon request the same experimental setup and can perform and verify the task simultaneously with the students in a separate auditorium of the faculty. The teachers will receive afterwards a certificate for their participation. Their opinion will be taken into account for the next editions of the Olympiad.

Last edition of this announcement 14.03.2015