



Beamline for Schools 2023

Great things can happen when high school students get involved with scientific research, and that is exactly what CERN and DESY want to achieve by organizing the Beamline for Schools (BL4S) competition.

CERN is well known for the discovery of the Higgs boson and the invention of the World Wide Web, DESY is well known for its high-quality light source, but there is much more to these laboratories than that. Part of CERN and DESY research and development is carried out at so-called fixed-target beamlines, where particle beams are available for different types of experiments. These projects range from probing the mysteries of antimatter to the testing of new generations of particle detectors. Scientists from all over the world are competing for beam-time at CERN and DESY and only those that propose the most interesting and promising projects will get access to the facilities.

Ten years ago, CERN decided to extend this opportunity to high-school students: Beamline for Schools was born.

Between 2014 and 2018 the winners of the competition performed their experiments at the PS accelerator of CERN, door to door with senior physics and engineers. During the technical stop of the accelerators at CERN from 2019 to 2021, BL4S has moved to DESY

In 2022 BL4S continued with a new format. For the first time, three teams could realize their experiments, two at CERN and one at DESY.

Beamline for Schools 2023, the 10th edition of the competition, will have the same format. There will be three winning teams. Two of them will realize their experiment at the PS CERN accelerator and one at DESY. All winners will be supported by a team of professional scientists.

Rules for the participation

- BL4S is open to high-school students from all over the world. The participants need to be enrolled in high-school in the academic year 2022/2023.
- Three teams are invited to CERN and DESY to run their experiments.
- To be eligible to win, a team must have at least five members. Up to nine students per winning team can be invited to CERN or DESY. The winning teams must be accompanied by an adult coach. A maximum number of two coaches per team can be invited to CERN or DESY.
- Teams may be composed of students from a single school or from multiples schools working together (even from different countries).

Registration

[Online registration, https://cern.ch/bl4s/bl4s-competition/apply-now/registration](https://cern.ch/bl4s/bl4s-competition/apply-now/registration), (optional) is already open. By registering the name of the team, the country, and the email address of the team's coach, you will give us the possibility to provide you with additional information and supporting material and to invite you to special events, such as virtual visits to CERN and DESY, that we are going to organize for you. Please note that you are not supposed to have a proposal ready when you register your team.

Registration will require:

1. Team name
2. Country/countries
3. Email address of the team coach

Proposal submission

Submitting a proposal is the only mandatory step to take part in the competition. To prepare your proposal, you should carefully read the information about the beamline and experimental facilities (<https://www.cern.ch/bl4s/resources/useful-documents>). At any step of the preparation of your proposal, you are encouraged to ask your teachers or professional physicists (e.g. from a nearby university, or from the list provided here: <https://www.cern.ch/bl4s/bl4s-competition/national-contacts>) for help in choosing a subject or/and to discuss with them the feasibility of your ideas. Alternatively, you can pick one of the example experiments (<https://www.cern.ch/bl4s/resources/useful-documents>) and work it out in detail.

We are not expecting to receive fully developed experimental proposals. However, there is no limit for your own ideas and suggestions of alternative experiments. Experience shows that effort will pay out. BL4S will offer support to teams while they are preparing their proposals. The main objective of the competition is that the students increase their knowledge about physics while working together on their idea.

The proposal of the team consists in:

- I. **A written document of up to 1000 (with an optional extension of approximately 200 words) words that explains:**
 - (1) Briefly (around 100 words) your motivation to take part in the competition and for choosing the specific topic.
 - (2) In detail (around 800 words) how you would like to use the particle beamline for your experiment.
 - (3) Briefly (around 100 words) what you hope to take away from the experience.
 - (4) Briefly (around 150 words) a science outreach activity you are planning to organize in your community to share your passion for science and what you learnt through the competition. **This section is optional**, and more

details are provided at the end of this document. Keep in mind that if you add this section, your proposal can reach 1200 words.

- II. A 1-minute video that summarizes your written proposal in an original, creative, entertaining way and introduces the members of the team (get inspired by the videos of previous participants). **Note** that the video is **optional** but encouraged.

Note that for the selection of the winners, only the written proposal will be judged.

The written proposal will be evaluated according to the following criteria:

- Feasibility of the experiment
- Motivation of the experiment and why you want to participate
- Creativity of the experiment
- Your ability to follow the scientific method

When you submit your proposal, you will be asked for additional information that allows us to stay in contact with you and that helps us to evaluate the organization and impact of the competition. **The reference person** for your team must be the **coach**. Make sure the **contact details are correct** (especially the mail address), this will be the only way we have to communicate with you!

The submission must be in **English**. However, BL4S provides contact persons in several countries to respond to questions in the national language(s).

The submission of the proposals will start in **January 2023** and will close at **midnight CET on 12 April 2023**. **The submission will open here:** <https://cern.ch/bl4s/bl4s-competition/apply-now/proposal-submission>.

The proposals will be evaluated by a committee of senior scientists. The winners will be notified in June 2023.

The role of the team coach

The team coach is expected to help the students during their journey, not to do the science on their behalf. The coach will need to advise and support the students during the proposal preparation and make sure that they will meet the deadline. We don't expect the coaches to be the real driving force of a team. The coach will be the reference person for the registration and the proposal submission. Make sure that the contact details are correct.

Coaches don't necessarily need to be teachers, they can be mentors, Master or PhD students, university researchers, parents etc.

Please note that if a team is selected as a winner, the coaches need to take the responsibility to accompany the students at CERN or DESY and be with them for the full duration of their stay.

CERN or DESY?

You don't need to choose where you want to perform your experiments. Have a look at the properties of the beam and of the detectors available for BL4S and create your experiment. Once the winners are selected, we will make sure that each team will be assigned to the laboratory that best matches the requirements of their proposal.

Prizes

We remind you that all the all the prizes are intended without liability.

First prize:

The first prize is a trip of about two weeks to CERN or DESY to carry out your experiment in autumn 2023. Three teams are selected, two will perform their experiments at CERN and one at DESY. Each winning team can have a maximum of 11 people (nine students and two accompanying adults). BL4S will cover the full costs including travel, accommodation, and meals.

Second prize:

A selection of up to 30 teams will be included in the shortlist. The proposals of the shortlisted teams can all lead to a feasible experiment and the teams will be awarded with special prizes that might include: a portable particle detector for their school, and BL4S T-shirts for each team member.

The team that will realize the **best video proposal** will be included in the short list!

Outreach prize

Special prizes are offered by the organizers of the “**Stars Shine for Everyone**” (SSVI) initiative. SSVI is, to use their own words, “An Astronomy Project for children with disabilities and underserved communities around the world”. The organizers of SSVI have donated optical telescopes to us, that we will award to participants of BL4S.

To win one of these telescopes we want you to propose a science education or outreach activity that the members of your team can organize in their community. Inclusiveness shall be a very important component of this activity, and the goal is to share your passion for physics with people that are less exposed to science. You could, for example, think about a creative way to introduce physics to children coming from a disadvantaged area in your environment.

If you want to be considered for winning one of these telescopes, please add an additional section of 100-200 words (in addition to the 1000 words limit of your BL4S proposal) to your submission and let us know about your idea for promoting science in an inclusive way. We encourage the winners of these awards to realize their activities and we will share the outcome on the BL4S Website.

Participation Certificates

All members of a team that submits a complete proposal receive a certificate of participation. All complete proposals submitted on time, or extracts from them, may be showcased on the websites of CERN and DESY and used for their outreach purposes after the competition closes.

Please take the time to read the [terms and conditions](https://cern.ch/bl4s/bl4s-competition/beamline-schools-terms-and-conditions) (<https://cern.ch/bl4s/bl4s-competition/beamline-schools-terms-and-conditions>) applicable to the Beamline for Schools competition.

Intrigued? Discover the competition and join the adventure! Find more inspiring videos in our [Video Section](https://cern.ch/bl4s/resources/bl4s-videos) (<https://cern.ch/bl4s/resources/bl4s-videos>). Enjoy!

Useful information about the BL4S competition at a glance:

- Beamline for Schools Website: <https://www.cern.ch/bl4s>
- Our mail address: bl4s.team@cern.ch
- Information in your own language and other useful documents: <https://www.cern.ch/bl4s/resources/useful-documents>
- Prizes: <https://www.cern.ch/bl4s/prizes>
- How to take part: <https://www.cern.ch/bl4s/how-apply>

Good luck! We are looking forward to meeting you!

