



Beamline for Schools 2024

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 organising 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. Yet, there is much more to these laboratories than that. A lot of research and development at CERN and DESY is carried out at beamlines, where beams are available for different types of experiments. In particle physics, the term '**beam**' refers to a large number of particles moving in the same direction. These particles can be accelerated to high energies. Scientists from all over the world are applying to use beamlines at CERN and DESY. Only those that propose the most interesting and promising projects will be accepted. These projects range from probing the mysteries of antimatter to the testing of new generations of particle detectors.

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 a beamline of the PS accelerator at CERN, door to door with senior physicists and engineers. During the technical stop of the accelerators at CERN, from 2019 to 2021, BL4S has moved to DESY. Starting from 2022, BL4S continued in a new format. For the first time, three teams could realise their experiments, two at CERN and one at DESY.

Beamline for Schools 2024, the 10th anniversary of the competition, will have the same format. There will be three winning teams. Two of them will realise their experiments at a beamline at CERN 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 secondary or high school in the academic year 2023/2024.
- Three teams are invited to CERN and DESY to realise their experiments.
- To be eligible to win, a team must consist of 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 consist of students from a single school or from several schools (even from different countries).
- Teams may be single or mixed gender. We highly encourage forming mixed-gender teams.

Preregistration

You can preregister your team for BL4S [here](#)¹. Preregistration is optional. Yet, by preregistering your team, we can contact you via email to send you updates (e.g. additional information and supporting material) and invite you to special events (e.g. online Q&A sessions about the competition and virtual visits to CERN and DESY). Please note that you are not supposed to have a proposal ready when you preregister your team.

For the preregistration you will need:

1. Team name
2. Name(s) of the country(/ies), in which the team members are enrolled in school
3. Email address(es) of the team coach(es)

Proposal submission

The only mandatory step to take part in the competition is submitting a written proposal of your experiment. To prepare your proposal, you should carefully read the information about the [beam and detectors](#)² available for your experiment. When preparing your experiment proposal, we highly encourage you to consult with your teachers, your [BL4S national contacts](#)³ or professional physicists (e.g. at a nearby university). They can help you choose an experiment, assess the feasibility of your experiment ideas, and follow a scientific method. We also encourage you to check out the [example experiments](#)² for inspiration.

We are not expecting you to write a fully developed experiment proposal. Most importantly, your experiment should be feasible and creative. Experience shows that effort will pay out. The main objective of the competition is that the students increase their knowledge about physics while working together on their experiment idea. We also encourage you to reach out to us, the [BL4S team](#)⁴ – **We gladly support you when preparing your experiment proposal!**

Your proposal must consist of a **written proposal** of your **experiment** (up to 1000 words) explaining:

- (1) briefly (approx. 100 words), your motivation to take part in the competition and to choose the specific topic of your experiment;

¹ <https://beamlineforschools.cern/form/preregistration-2024>

² <https://beamline-for-schools.web.cern.ch/resources/useful-documents>

³ <https://beamline-for-schools.web.cern.ch/national-contacts>

⁴ <https://beamline-for-schools.web.cern.ch/bl4s-team-cern>

- (2) in detail (approx. 800 words), your experiment idea and how you would like to use the beam for your experiment; and
- (3) briefly (approx. 100 words), what you hope to take away from the experience.

Optionally, you can also add:

- I. A section to your **written proposal** describing a **science education and outreach activity** (up to 200 words) that you have already organised or that you will organise in your community to share your passion for physics or what you have learnt while participating in the competition. More details are provided below in the section 'outreach award'. Note that adding a section describing a science education and outreach activity is optional. If you add this section, the word limit of your written proposal is 1200 words.
- II. A one-minute **video** that summarizes your written **experiment proposal** in an original, creative, and entertaining way and introduces the members of the team. You can check out the [videos](#)⁵ of previous teams for inspiration. Note that the video proposal is optional.

⇒ For the **selection of the winning teams**, only the written proposal of the experiment will be judged.

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

- Feasibility of the experiment
- Scientific method
- Motivation of the experiment
- Motivation to participate in BL4S
- Creativity of the experiment

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

The submission must be in **English**. However, BL4S provides [national contacts](#)³ in several countries to respond to questions in the national language(s).

The **submission of the proposals** will start in January 2024 and will close on **10 April 2024 at 23:59 CEST**. You will be able to submit your proposal [here](#)⁶. The submitted proposals will be evaluated by a committee of scientists. The winners will be notified in June 2024.

Please take the time to read the [terms and conditions](#)⁷ applicable to the BL4S competition before submitting a proposal.

⁵ <https://beamline-for-schools.web.cern.ch/resources/videos>

⁶ <https://beamlineforschools.cern/competition/how-to-take-part>

⁷ <https://beamline-for-schools.web.cern.ch/competition/terms-and-conditions>

The role of the team coach

The team coach is expected to help the students during their journey, not to prepare the proposal on their behalf. We don't expect the team coach to be the real driving force of a team. The coach will need to **advise** and **support** the students during the proposal preparation and make sure that they will meet the deadline. The team coach should also encourage the students to **form mixed-gender teams**. Moreover, the coach will be the **contact person** for the registration and the proposal submission. ⇒ Please make sure that contact details are correct!

Team coaches can be teachers, university students, researchers, parents, etc. If a team is selected as a winner, the coaches need to take the responsibility to accompany the students to CERN or DESY and to 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 prizes are intended without liability.

Winning teams:

Three teams will be invited to spend approx. two weeks at CERN or DESY to perform their experiments in autumn 2024. Two teams will perform their experiments at CERN and one at DESY. Up to 9 students and 2 team coaches of each winning team can travel to CERN or DESY. BL4S will cover the full costs, including travel, accommodation, and meals.

Shortlisted teams:

Up to 30 teams will be shortlisted, that is, included in a list of best proposals. The proposals of the shortlisted teams can all lead to a feasible experiment and the teams will be awarded with special prizes that may include a portable particle detector for their school and BL4S T-shirts for each team member.

Video award:

The team that will submit the best video proposal will be awarded with special prizes that may include a portable particle detector for their school and BL4S T-shirts for each team member.

Outreach award:

In 2024, the organisers of the “[Stars Shine For Everyone](#)”⁸ (SSVI) project will award optical telescopes to the BL4S teams submitting the best outreach proposals. SSVI is, to use their own words, “an astronomy project for children with disabilities and underserved communities around the world”.

To win one of these telescopes, your team shall organise a science education or outreach activity in its community. Inclusiveness should be a very important component of this activity. The goal is to share your passion for physics with people that are less exposed to science. Your team could, for example, think of a creative way to introduce physics to children coming from a disadvantaged area in your region.

If you would like to be considered for winning a telescope, please write a section (up to 200 words; in addition to the 1000 words limit of your BL4S experiment proposal) describing a science education or outreach activity that the members of your team have already organised or will organise in their community. ⇒ Your initiative to promote science in an inclusive way is crucial! We highly encourage you to realise your activities and we will gladly share the outcomes 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.

Intrigued? Discover the competition and join the adventure!

**We look forward to supporting you when preparing your proposals
and to meeting you virtually or in person soon!**

Useful information about the BL4S competition at a glance:

- Website: <https://www.cern.ch/bl4s>
- BL4S email address: bl4s.team@cern.ch
- Useful documents: <https://www.cern.ch/bl4s/resources/useful-documents>
- Prizes: <https://beamline-for-schools.web.cern.ch/bl4s-competition/prizes>
- How to take part: <https://beamline-for-schools.web.cern.ch/competition/how-to-take-part>

⁸ <https://www.ssvi.be/>