Beamline for Schools
A Physics Competition for High-school Students

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The Competition

**Goal:** bringing young people from all over the world close to the fundamental research in particle physics

**Structure:** teams of high-school students are invited to develop an original experiment to be performed at a testbeam facility. Learning by doing.

**Prizes:** two teams win the opportunity to perform their experiments at a fully equipped beamline with the support of a team of scientists. Additional prizes are awarded to a selection of ~ 20 teams.

**History:**

2014 2018 2021 2024
Team Structure

- Beamline for Schools is run in the Teacher and Student Programmes Section in CERN’s International Relations Sector.

- Core Team
  - Margherita Boselli, Project Manager, CERN
  - Markus Joos, Technical Coordinator, CERN

- Support Scientists
  - Cristovao Beirao da Cruz e Silva, CERN
  - Paul Schütze, DESY

- 48 scientists from different countries contribute as national contacts.
- More than 40 experts from both CERN and DESY are part of the evaluation team.
Taking part in the competition

The participants have to plan an experiment following the requirements of the facility.
• Written proposal: English, ~ 1000 words.
• Video proposal, 1 minute, optional (special prize).

Evaluation criteria:
• Motivation of the team
• Feasibility of the experiment
• Creativity
• Ability to follow the scientific method

Support from the national contacts and BL4S team.
Beam properties

In 2021 BL4S takes place at the DESY II accelerator

- Secondary beam of electrons or positrons
- Energy up to 6.3 GeV
- The users can select the particle type, the energy and the collimation
- Beam spot size: 2x2 cm
Detectors and experimental set-up

Depending on the purpose of the experiment, the teams combine the material available for them:

- Different detectors: Scintillators + Photomultipliers, Delay Wire Chambers, MicroMegas, Beam Telescopes, Lead Crystal Calorimeters
- Magnets, absorbers

Once the winners are selected, the students work on the experimental set-up with the support of the BL4S team. Usually ~2 months to prepare the experiments.
Impact on Participants

Only a tiny fraction of the students taking part in the competition wins.

**What are the participants learning from this experience?**

- Hands-on original and extra-curricular physics project
- Preparation of a scientific document (written proposal)
- Creative communication of their idea (video proposal)
- Team-work
- Deeper knowledge of physics research facilities
- Interaction with scientists (~50% of the teams get in touch with the national contacts)
- International experience (participation of more and more cross-border teams)
The Pandemic: an Opportunity

The pandemic offered an opportunity to increase the impact of the competition on all the participants.

- two online events organized for the participants in the 2021 edition and virtual visits for those who sent a proposal

- More than 300 people took part in each event.
Impact on Winners

Since 2014, more than 100 students came on site to perform their experiments.

- Unique opportunity to conduct an original experiment at a particle physics facility
- Deep understanding of all the steps required to conduct an experiment
- Responsibility and problem solving
- Team-work
- Interaction and exchange with scientists
- Role models for their peers
- Impact on their career choice

Alumni videos available on our website
Scientific Publications

- After the beam time the winning teams are guided during the analysis and interpretation of their data.
- Five winning teams already published their results on peer reviewed journals: *Physics Education* (IOPScience), and *The Physics Educator* (World Scientific).
- One winning team presented its results at the « 8th Beam Telescopes and Test Beams Workshop », 2020.
289 proposals, 57 countries represented
The participation rate is on a very good track. After LS2 the competition will return to CERN. We are currently looking for support scientists for the 2022 edition.
Do not hesitate to get in touch with us if you want to collaborate.

Thank you!

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