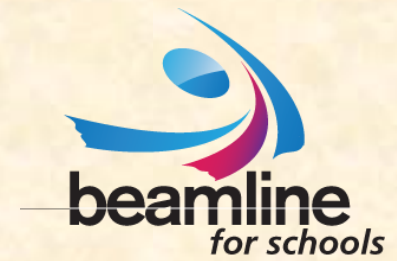


Report on the Beam Line for Schools competition



cern.ch/bl4s

BL4S - Motivation and history

High school students and teachers are interested in CERN's physics program:

- 112'000 visitors per year (70% travel more than 600km), among the visitors are 50'000 school classes and their teachers
- 1'100 teachers per year join the High School Teacher program at CERN
- The idea of a worldwide competition for high schools was born in 2009 at the workshop "New Opportunities in the Physics Landscape at CERN"
- First "Beamline for Schools" competition (BL4S) took place in 2014 as part of CERN 60
 - Two teams were selected to carry out their experiments
 - Coaches of teams that did not win told us that the competition helped a lot to motivate students to learn about modern physics on a voluntary basis

BL4S - taking part

BL4S is a **worldwide competition** for teams of students, aged **16-18 years** and guided by a teacher (or another adult), to use a **fully equipped beam line** at CERN's Proton Synchrotron

- **Teams** have to **propose an experiment** which uses particle beams. They have to submit a proposal (max. 1000 words) and a **one-minute video**
- Launch: Soon...(target: **17 November 2015**), proposal submission: **31 March 2016**
- **Teams** are **not required to be experienced** in particle physics in order to participate.
- They will need **support**:
 - **Central contact**: CERNs BL4S team
 - **Local** (speaking the native language of the team) **contacts**: **Volunteer physicists** from all over the world via IPPOG
- **Equipment** available for the proposed experiment:
 - **a beamline** providing electrons, muons, pions, kaons or protons with momenta between 0.5 and 10 GeV
 - **state-of-the-art particle detectors** (silicon pixel detectors, delay wire chambers, lead glass calorimeters, multi-gap resistive plate chambers, scintillators, Cherenkov detectors)

BL4S - Selection

The proposals and videos are judged based on the **criteria**

- **Feasibility** of the proposal
 - Demonstration of ability to follow the **scientific method**
 - **Motivation** of the students
 - **Creativity**
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- **Step 1:** Volunteers from CERN (including member state universities and laboratories) select the **best 40-50 proposals**
 - **Step 2:** a team of accelerator, beamline, detector and physics experts select **~15 proposals** and carried them forward
 - **Step 3:** CERN's SPS and PS Experiment Committee (**SPSC**) reviews the ~15 shortlisted proposals and selects the winner(s), who then will be invited to CERN for about 10 days to carry out the experiment
 - The teams come to CERN in September
 - If possible CERN will invite two teams

BL4S - The winners

- 2014:

Odysseus' Comrades from Greece: investigating the decay of charged pions to study the weak force, one of the four fundamental forces of nature

Dominicuscollege from the Netherlands: growing their own crystals to make a calorimeter, a detector that measures the energy of particles, and to test and calibrate it with different particles

- 2015:

Leo4G from Italy: using and calibrating a particle detector built from common and low-cost materials, a customized web-cam

Accelerating Africa from South Africa: investigations on the production of high-energy gamma rays using a crystalline undulator



Colleen Henning, coach of accelerating Africa:
"I now have an idea what it must feel like to receive a phone call from Stockholm. Learning the news that we were joint winners of the CERN Beam Line for Schools Competition will be an experience I will always remember"

BL4S – Financial Support

Cost of the project:

- 120 – 140 kCHF per year;
- financed with grants received via the **CERN & Society programme**
 - 2014: ~**10** kCHF
 - 2015: ~**60** kCHF
 - 2016: ~**100** kCHF
 - CERN provides the missing funds
- BL4S **support beyond 2016** in the assessment stage, thanks to the CERN & Society program
- More **support from the HEP** community:
 - The two US highly commended teams were invited to run their experiment in the Fermilab test beam facility
 - An Italian proposal will be chosen by a national jury and carried out at one of the Italian facilities

BL4S - Participation

2014: 290 proposals

2015: 110 proposals

In total: More than 4000 students have participated

- First year benefited from the novelty of the competition
- BL4S was linked to the CERN-60 celebrations
- The teachers are crucial:
 - They have to know about the competition
 - They have to be motivated to coach a team

Teams that participate in BL4S agree to be contacted for other activities. E.g.:

- Invitation to a national lab (INFI, Fermilab)
- Physics master class
- Etc.

BL4S – What is new in 2016?

- The basic concept will not change
- We will have:
 - A ½ page presentation of BL4S in many languages
 - More prizes (e.g. particle detectors and t-shirts for shortlisted teams)
 - Additional prizes may be offered at the national level
 - More verbose documentation
 - To help the team coaches with background information
 - Additional channels for making publicity
 - Just one deadline: 31 March 2016
- We still need:
 - Additional volunteer physicists to act as national / regional contacts
 - Additional channels for making publicity
- We have to point out that:
 - BL4S is a truly world-wide competition
 - Teams are not required to have a large background in particle physics
 - A nice idea (Leo4G: can we “see” the beam with a Web-cam) is sufficient
 - Teams can get support from experienced physicists

BL4S - IPPOG

Potential **IPPOG involvement** in 2016:

- Help to **translate** the ½ page document
- **Make publicity** for the competition: 17 Nov. 2015 – 31 Mar. 2016
- **Assist the teams** with their proposals: Until 31 Mar. 2016
 - One or several **contact persons**(not necessarily all IPPOG members) per nation
 - How to cover nations without IPPOG representative?
- **Participate in the selection** committees in April and May 2016
- Identify potential **donators** and **national prizes / follow up**

BL4S - EPPCN

Potential **EPPCN involvement** in 2016:

- **Make publicity** for the competition: 17 Nov. 2015 – 31 Mar. 2016

BL4S rules in a nutshell

- A team consists of at least **5 high school students and one adult** (ideally a teacher)
- The team has to **propose an experiment** (1000 word proposal and 1 minute video) that can be executed at the Proton Synchrotron with the building blocks (detectors) provided by us
 - A clever idea is sufficient
 - Support (documentation, experts) is available
- The **deadline** for the submission of the proposal is **31 march 2016**
- **Benefits / prizes**
 - The competition **motivates students** to learn (more) about modern physics
 - **Certificates** for all participants
 - A **particle detector** for the short-listed teams
 - <http://theport.ch/the-birth-of-cosmic-pi/>
 - An **invitation** (all expenses paid) to CERN (1-2 teams)
- Main message:
 - **BL4S is for all schools**

Thank you!



M. JOOS, CERN