Sustained Professional Development for High School Physics Teachers

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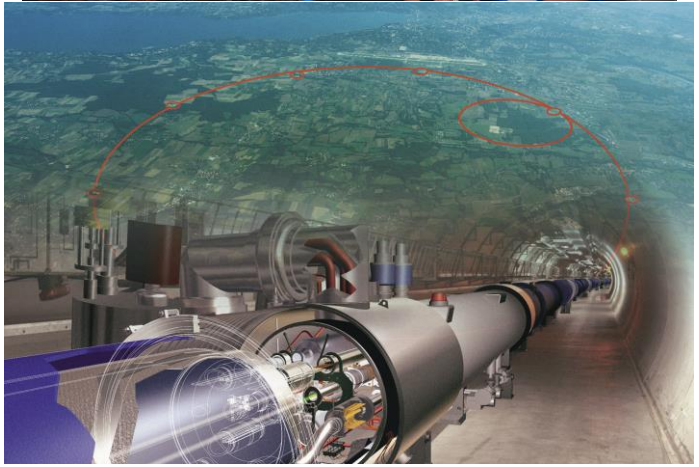
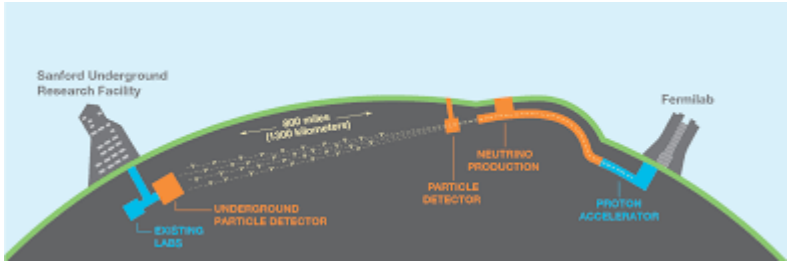
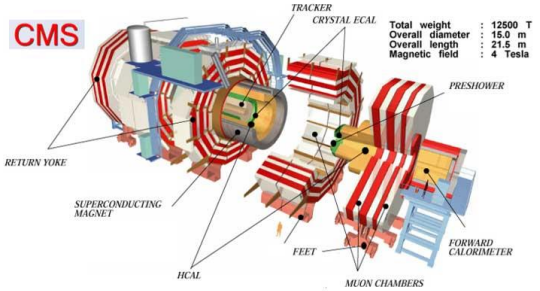
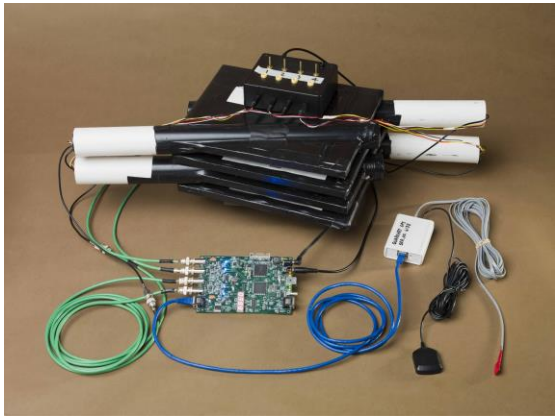
What is QuarkNet?

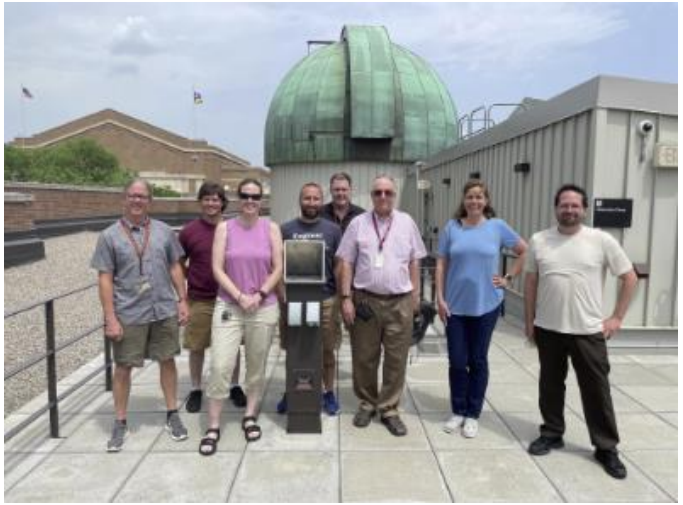








QuarkNet Centers



QuarkNet Centers

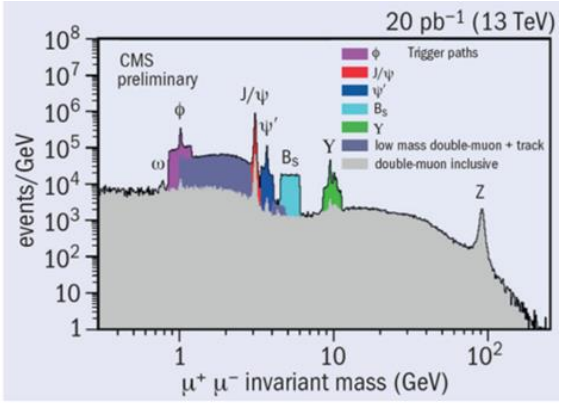
National Opportunities

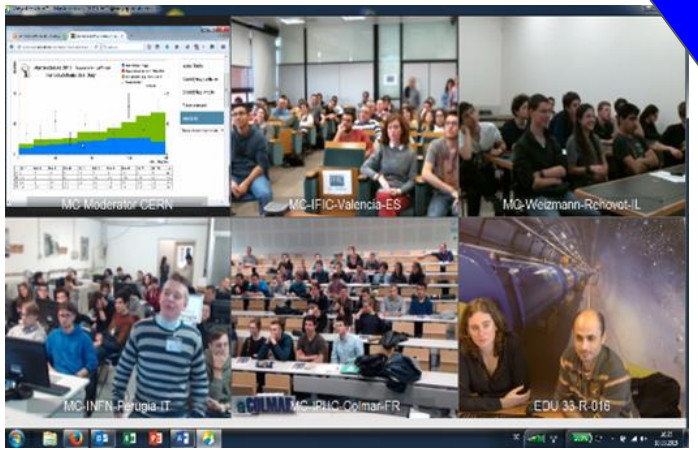
International Opportunities

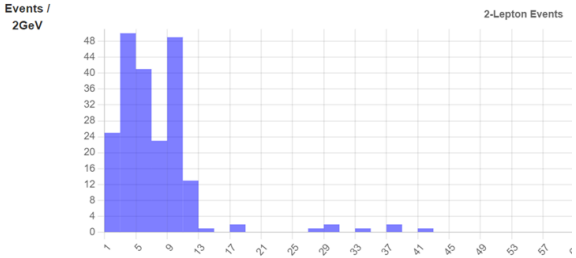
High School Teacher Program and International Teacher Weeks @ CERN - Ongoing

CERN Open Days Student Reporters

International Masterclasses







Resources

https://quarknet.org/data-portfolio

QuarkNet

ABOUT

Data Activities Portfolio

The Data Portfolio is a compendium of particle physics classroom activities organized by data strand and level of student engagement. Follow the links provided for information about using the Data Portfolio to plan your students' experience. **Level descriptions** explain the data analysis skills that students apply at each level: tasks in Level 0 are simpler than those in Levels 1 and 2. While each level can be explored individually, students who start in one level and progress to more complex levels experience increasingly engaging and challenging tasks. These activities are aligned with **NGSS Standards**, particularly **NGSS Practices**.

Your students can follow a path through activities in a data strand to better understand practices that lead to discovery. Each pathway provides connections between topics routinely covered in physics class and particle physics content and methods. Use the pulldown menus (Curriculum Topics and Strand) to find activities related to the content you are currently covering. Watch this **screencast** to learn more about sorting these activities.

We want your feedback on how the activities worked for you. Please complete the **survey** to help us improve our activities.

Data Strand	Level	Curriculum Topics	NGSS Practices	
Neutrino	Level 1	Conservation Laws	- Any -	Apply

ACTIVITY NAME	DATA STRAND	LEVEL	CURRICULUM TOPICS	NGSS PRACTICES
The Case of the Hidden Neutrino Students use momentum conservation to examine the decay of top-antitop pairs to determine what is missing from the event.	LHC, Neutrino	Level 1	Conservation Laws, Special Relativity, Standard Model, Skill: Developing Models, Skill: Uncertainty	2, 4, 5, 6, 7
Energy, Momentum, and Mass Students examine data to find how energy, momentum, and mass are related.	Cosmic Ray, LHC, Neutrino	Level 1	Conservation Laws, Electricity & Magnetism, Special Relativity, Skill: Developing	2, 4, 5, 7, 8

International Masterclasses

19th International Masterclasses 2023

https://www.i2u2.org/elab/cosmic/home/project.jsp

Cosmic Ray e-Lab

e-Labs Home | Teacher Home | Student Home

High school students use cutting-edge tools to do scientific investigations.

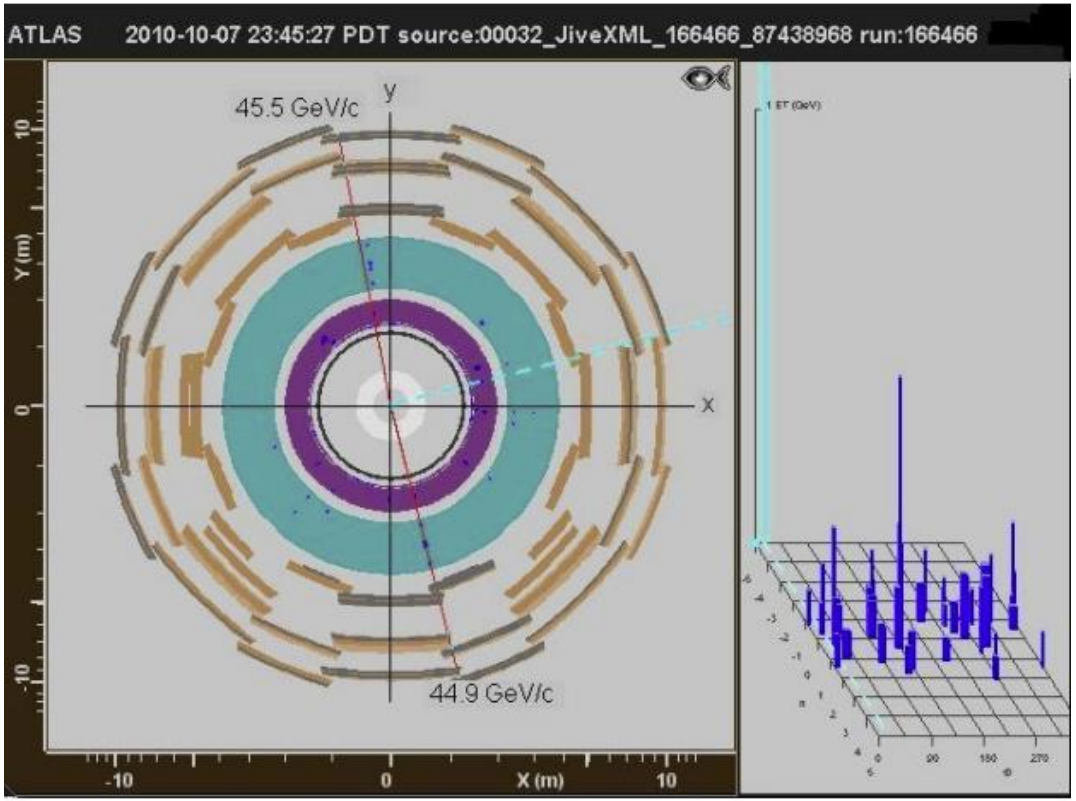
The Cosmic Ray e-Lab provides an online environment in which students experience the excitement of scientific collaboration in this series of investigations into high-energy cosmic rays. Schools with cosmic ray detectors upload data to a "virtual data" portal where ALL the data resides. This approach allows students to analyze a much larger body of data and to share analysis code. Also, it allows schools that do not have cosmic ray detectors to participate in research by analyzing shared data.

Students learn what cosmic rays are, where they come from and how they hit the Earth. While scientists understand cosmic rays with low to moderate energies, some cosmic rays have so much energy that scientists are not sure where they come from. A number of research projects are looking at this question. Students will have a chance to gain their own understanding of cosmic rays and may be fortunate enough to capture a rare highly-energetic cosmic ray shower on their classroom detector and analyze their results with this e-Lab. The Cosmic Ray e-Lab addresses ALL science and engineering practices in the Next Generation Science Standards.

Information common for all e-Labs
Check out our online resources

This project is supported in part by the National Science Foundation and the Office of High Energy Physics in the Office of Science , U.S. Department of Energy. Opinions expressed are those of the authors and not necessarily those of the Foundation or Department.

Resources: Data Activities Portfolio



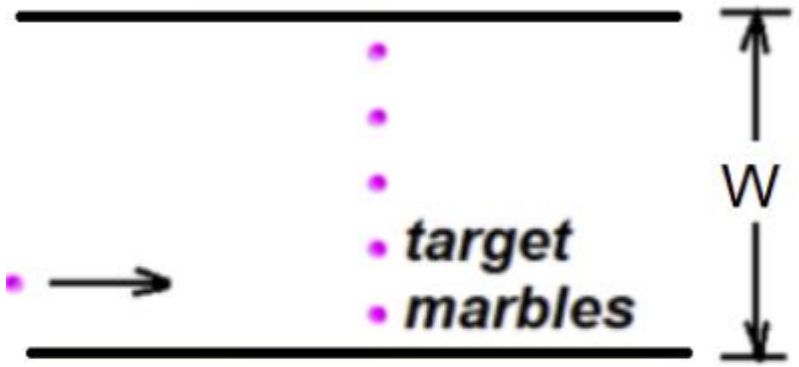
Calculate the size of the marble

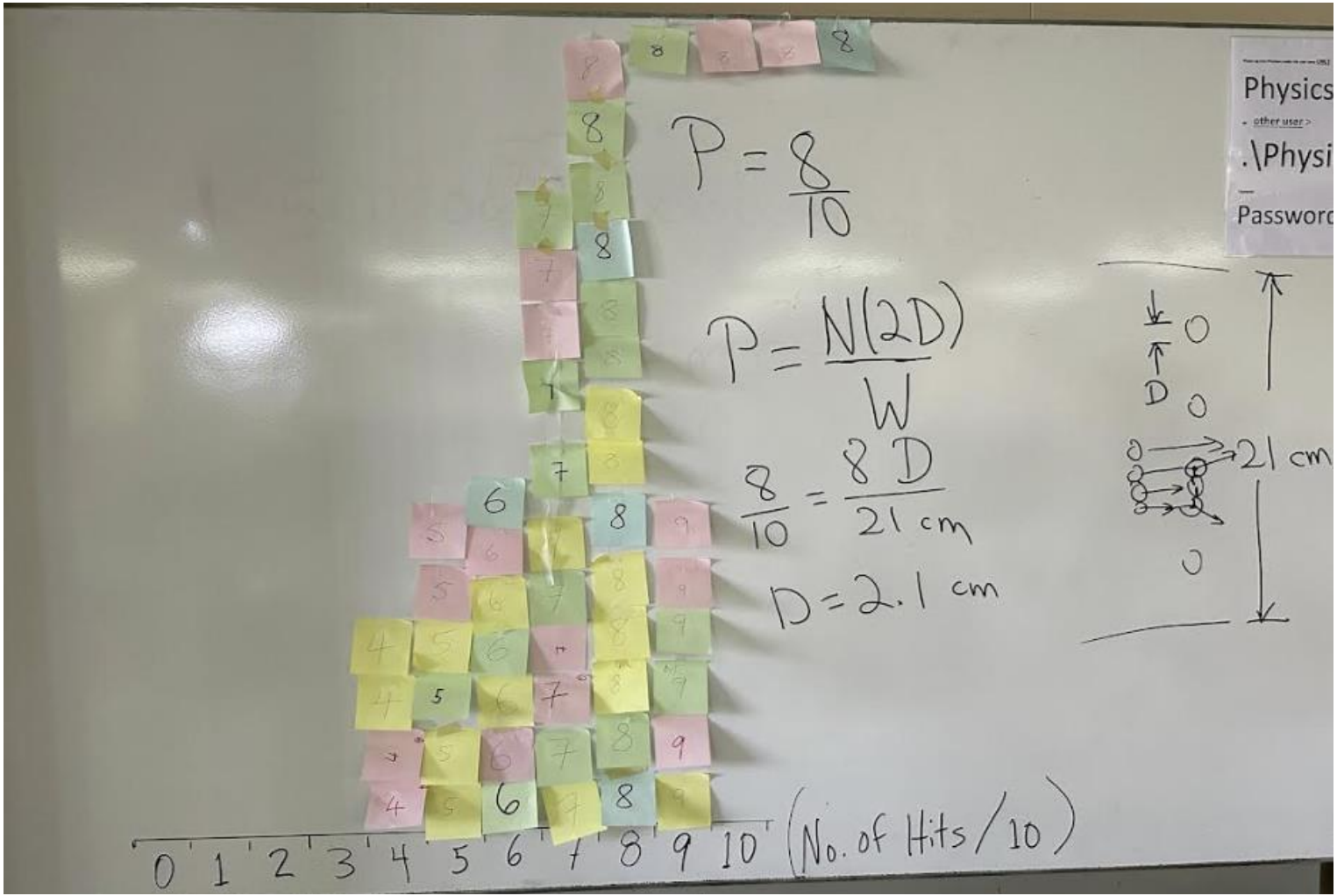
P= probability of a hit

n = number of target marbles

W = width of “beam pipe”

D = diameter of marble




P = 8/10
P = N(2D)/W
8/10 = 8D/21 cm
D = 2.1 cm
D
21 cm
0 1 2 3 4 5 6 7 8 9 10
(No. of Hits / 10)
Physics
Password

Questions?

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