



*Who We Are
and
What We Do*



U.S. DEPARTMENT OF
ENERGY

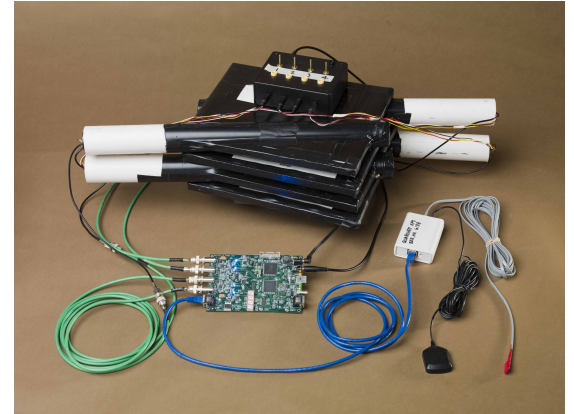
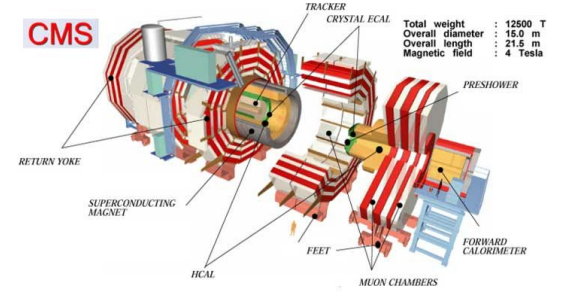
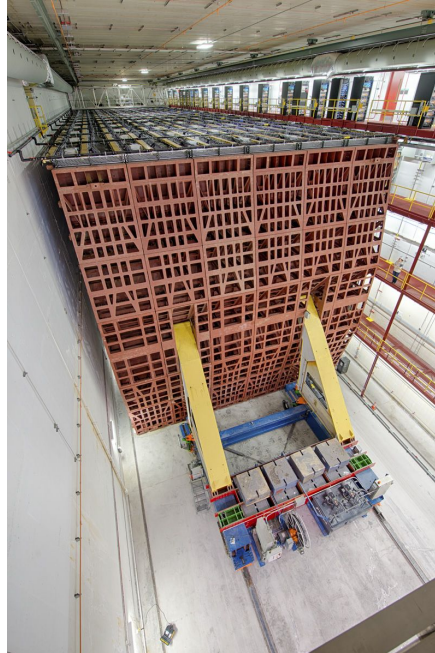
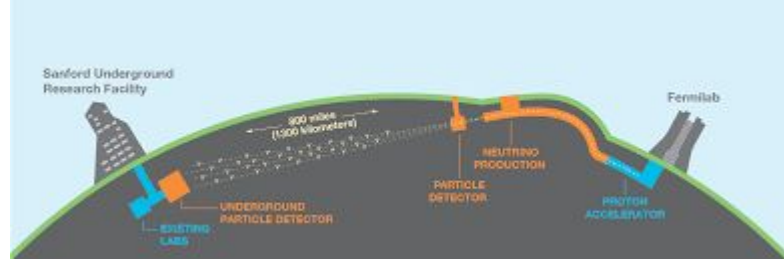
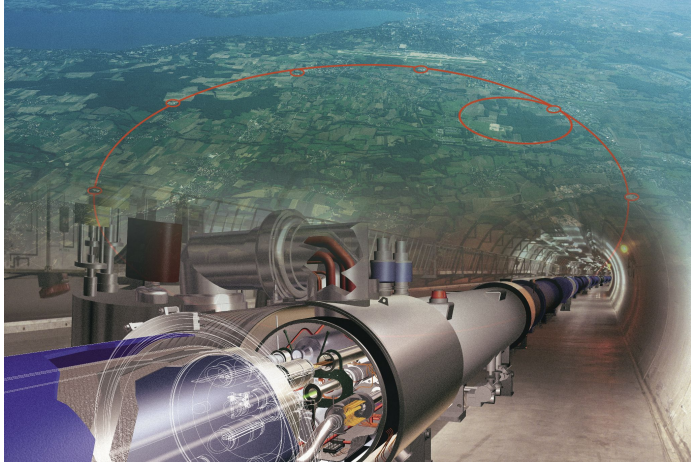
Office of
Science



UNIVERSITY OF
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What is QuarkNet?



A national program at the local level

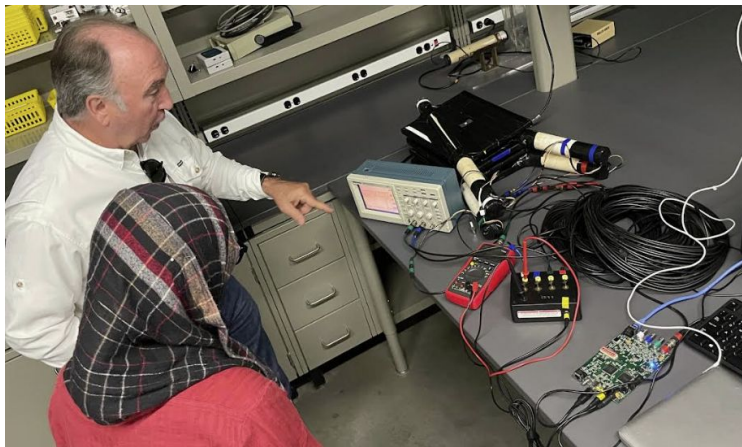
4 co-PI's and 4 national staff

50+ QuarkNet
centers across
the U.S.

500+ teachers



QuarkNet Centers



More...

- Teachers
 - Coding and Data Camps
 - Fellows: Cosmic, Coding, T&L, LHC, Neutrino
- Students and Teachers
 - International Masterclasses in Particle Physics
 - Cosmic Ray Studies
 - Data Activities Portfolio
- quarknet.org

National Opportunities



Resources

← → ↻ <https://quarknet.org/data-portfolio>



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
 Neutrino

Level
 Level 1

Curriculum Topics
 Conservation Laws

NGSS Practices
 - 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: Development	2, 4, 5, 7, 8



International Masterclasses

19th International Masterclasses 2023



← → ↻ <https://www.iu2.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 high-energy 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](#)

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QuarkNet is about...

- Particle physics
 - Physics we teach
 - Methods and skills
 - Ideas and opportunities
- Teamwork and network
- **Teacher Professional Development**

