

The Cosmic Watch for Education and Outreach in Africa and the World

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Outline



- What is the Cosmic Watch?
- Testing the Cosmic Watch for the Classroom
- Use cases
- Prospects for Africa and the World

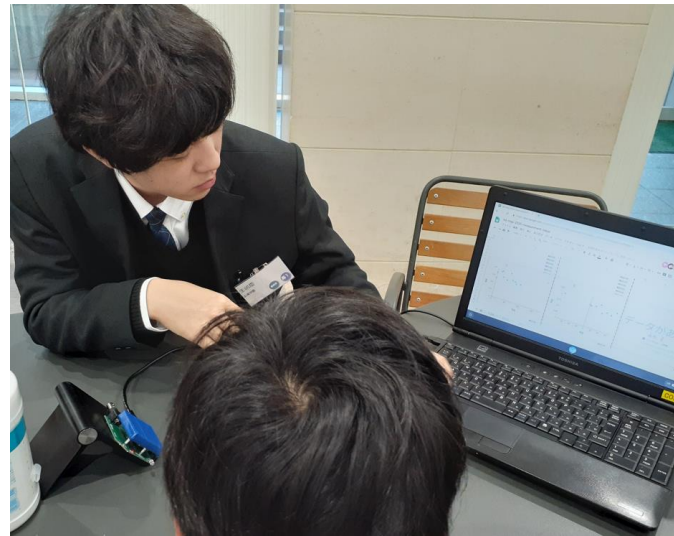


What is the Cosmic Watch (CW)?

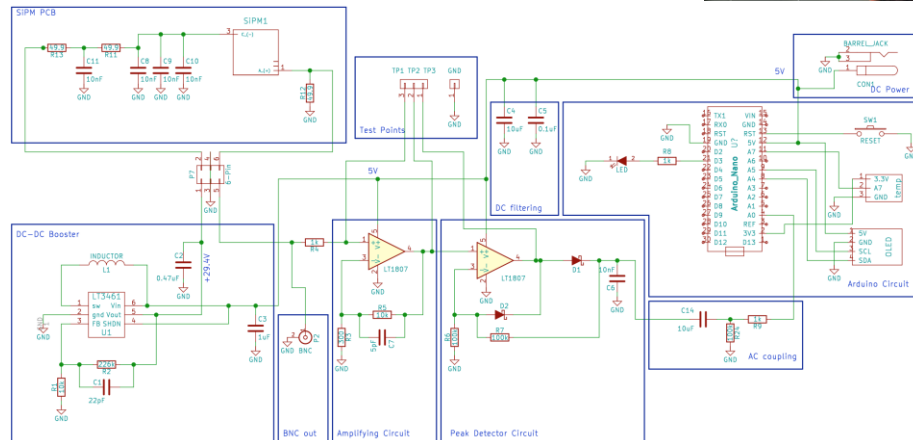
- A SiPM- and Arduino-based Cosmic Ray Detector
- Small
- Capable of two-fold coincidence (CW #1 triggers on CW #2)
- Computer-readable via Arduino
- Developed by Spencer Axani at Massachusetts Institute of Technology
- Open-source and available as DIY project



What is the Cosmic Watch (CW)?



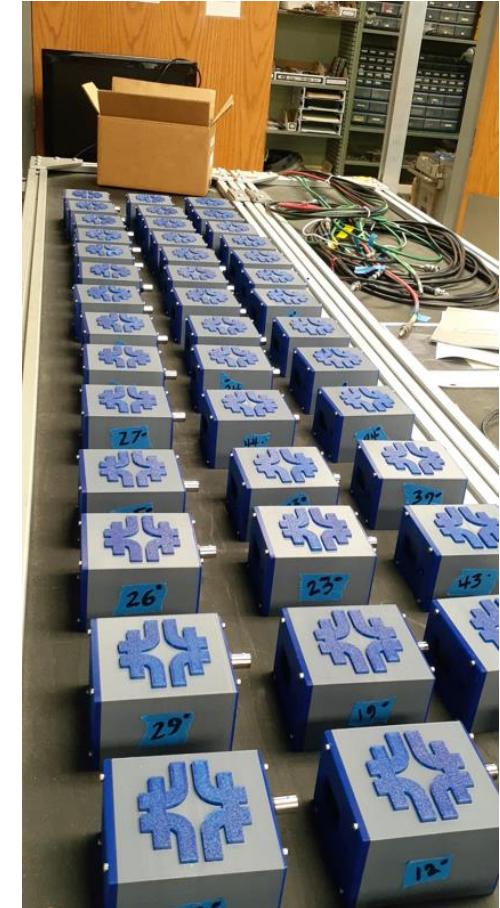
Images above and below from <http://www.cosmicwatch.lns.mit.edu/>.



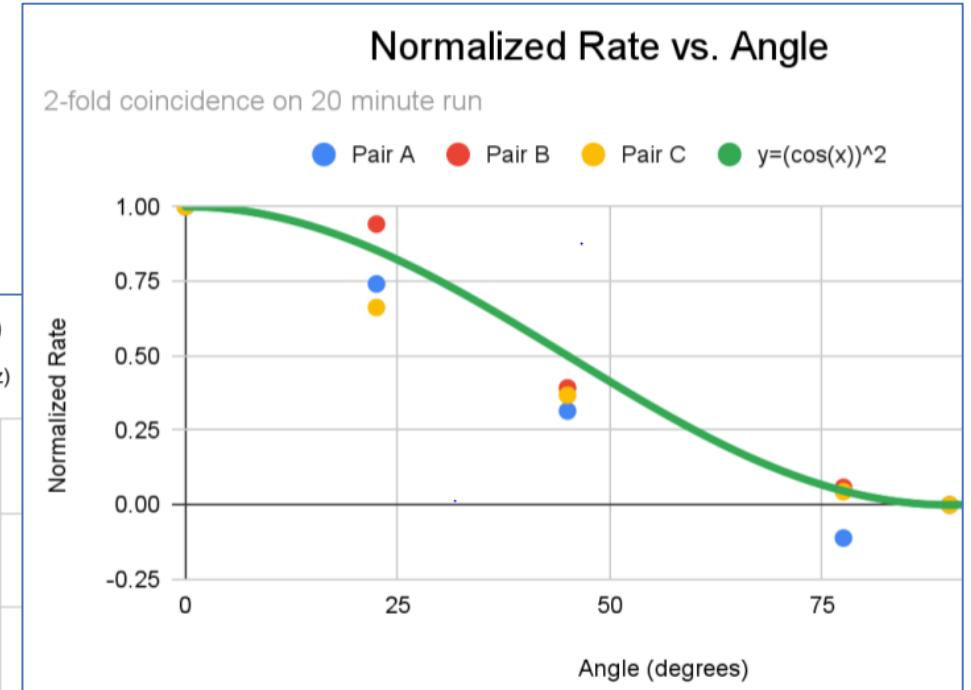
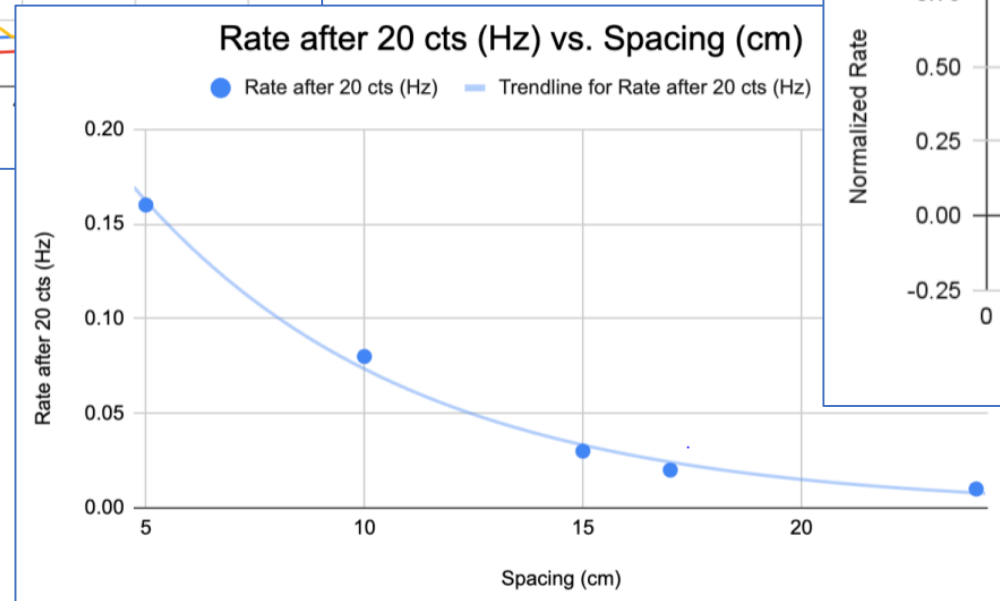
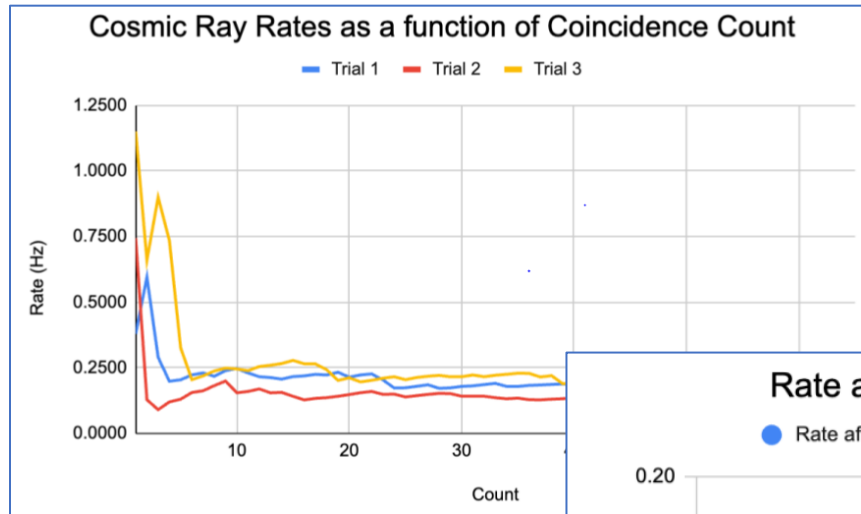


Testing the Cosmic Watch

- June-July 2022: QuarkNet and Fermilab had 48 CWs produced at University of Notre Dame
- September 2022 – May 2023: a few QuarkNet teachers used CWs in classes
- June-July 2023: testing at Notre Dame of characteristics and specific laboratory practical exercises
- September 2023: new, more systematic in-class use



Testing the Cosmic Watch



Use cases

- Lab Practicals
 - Rate vs. Zenith Angle
 - Rate vs. Separation
- Investigations
 - Muography
 - Variations with natural conditions
 - Instrumentation physics
- More



Wegner, Jeremy, and students, *Angular Distribution of Cosmic Rays*, International Cosmic Day 2022



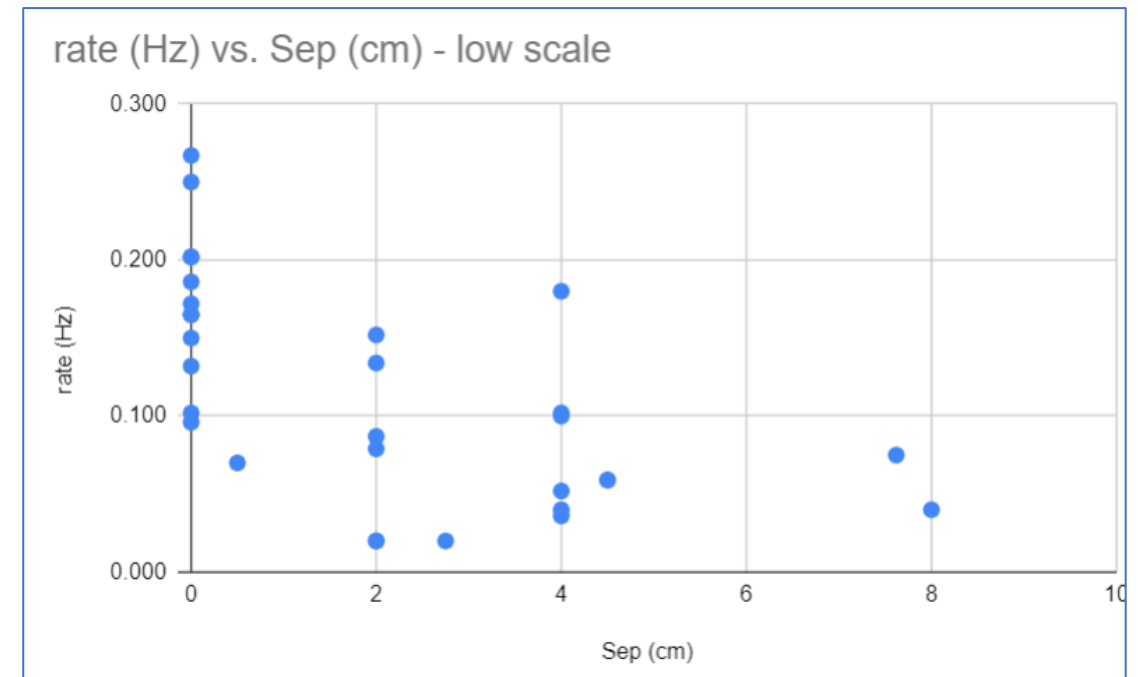
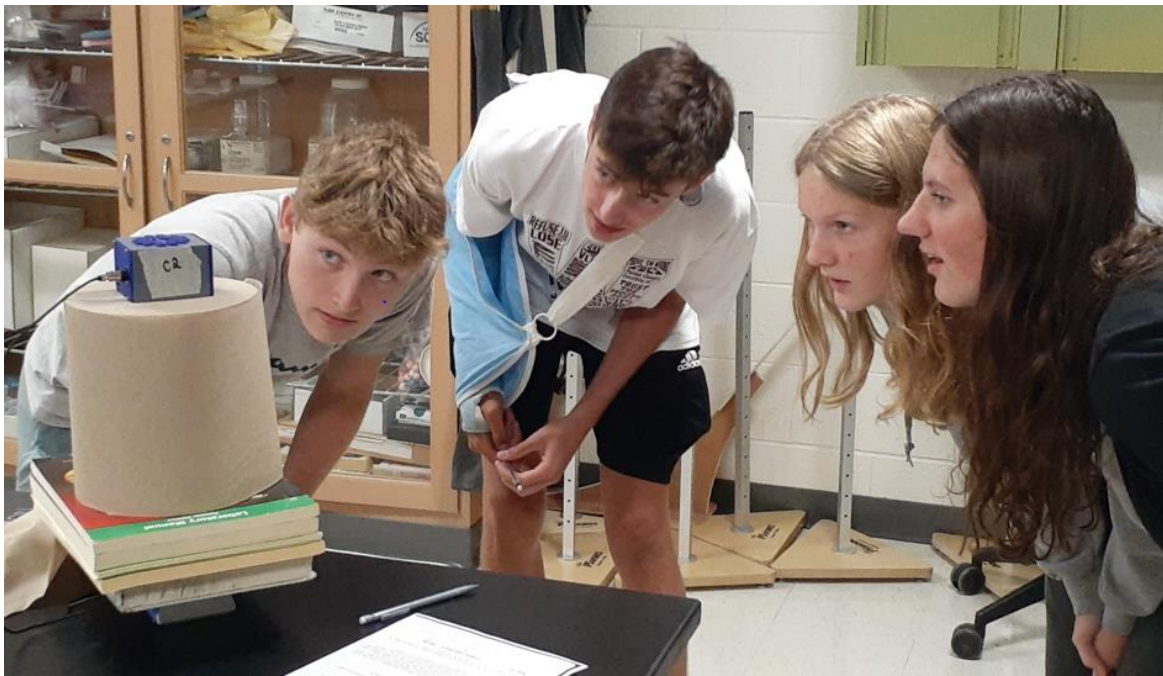
Ohtsuka, Miki, et al, *墳 Q(fun-Q) project : muography of Japanese ancient mounds by high school students*, 38th International Cosmic Ray Conference (ICRC2023)



Use case: Lab at Watervliet High School



- 14 September 2023: Separation of counters at 2-fold coincidence
- We learned a lot from the experience! (e.g. Not plug-and-play.)

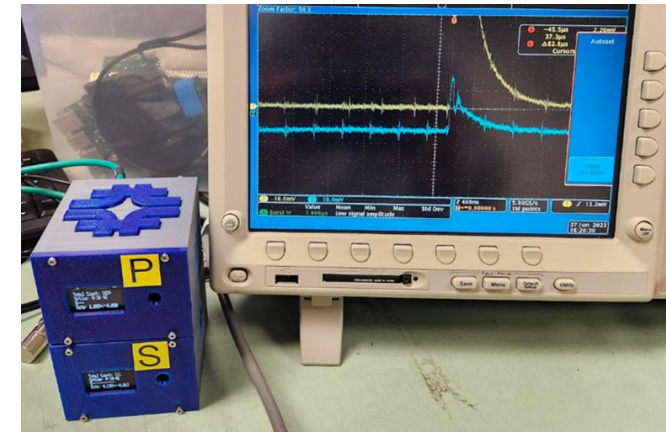


Prospects for Africa and the World



Advantages of use

- Small and inexpensive (~300 USD/pair)
- Easy to bring to schools
- Can be DIY lab practical for university students
- Can create network: 2 or more pairs at university or science centre



Disadvantages

- Units not consistent with each other unless thresholds are adjusted
- 2-fold sometimes unreliable: may be adjustable to work better



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