ROCKYRAD: AN EDUCATIONAL TOOL FOR THE MEASUREMENTS OF ROCK RADIOACTIVITY

Ghulam Hasnain [a,b,c*], Matteo Albéri [a,b], Maria Annunziata [a,d], Pierluigi Barba [e], Alessio Barbagli [d], Tommaso Colonna [d], Alessandro Cortopassi [e], Nedime Irem Elek [a,b], Engin Can Esen [a], Fabio Gallorini [a,d], Jacopo Givoletti [e], Enrico Guastaldi [d], Nicola Lopane [d], Fabio Mantovani [a,b], Cristina Mattone [e], Massimo Morichi [e], Dario Petrone [a,d], Nicola Paoli [e], Silvio Pierini [d], Claudio Raffo[e], Kassandra Giulia Cristina Raptis [a,b], Virginia Strati [a,b], Franco Vivaldi [e]

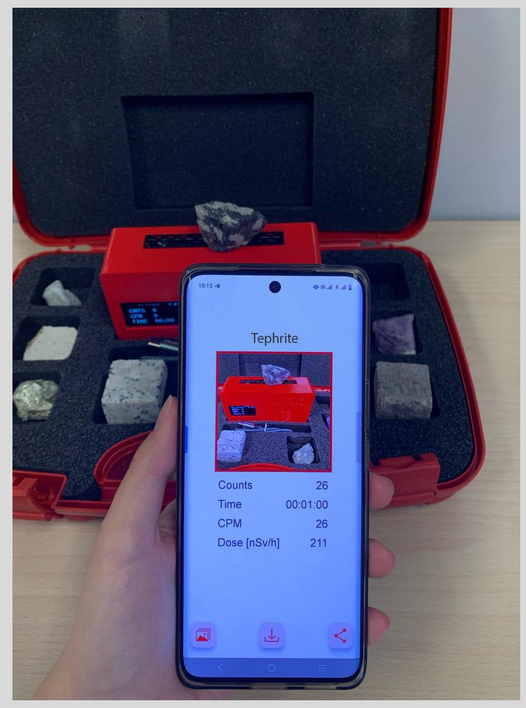
[a]Department of Physics and Earth Sciences, University of Ferrara, Via G. Saragat 1, 44122 Ferrara, Italy | [b]INFN Ferrara Section, Via G. Saragat 1, 44122 Ferrara, Italy – | [c]University of Trento, Via Calepina 14, 38122 Trento, Italy | [d]GeoExplorer Impresa Sociale S.r.l., Arezzo, Italy. | [e]CAEN S.p.A.,Viareggio, Italy

*Corresponding author: hsnglm@unife.it

Motivations

- **Radioactivity** is a natural physical phenomenon of our world found in rocks, air, food, and even inside us. However, many people **misunderstand** it and assume it is always **dangerous**.
  - The RockyRAD measures terrestrial radioactivity, focusing on natural radioelement like **U, Th, and K,** which are found in rocks in typical abundances of 2.5 ppm, 10 ppm, and 2.3%, respectively.
    - U-238, Th-232, and their daughter nuclides produce **alpha**, **beta**, and **gamma** radiation along their decay chains, while K-40 emits beta and gamma rays.
    - The RockyRAD kit include a portable Geiger–Müller counter and diverse **rock and mineral samples**, enabling immediate, **hands-on radiation detection experiments** for students.
    - A custom Android app connects seamlessly with RockyRAD, providing intuitive control, **real-time monitoring**, and efficient **data management**.
  - Students can compare different **rocks radiation** levels or monitor long-term background radiation.

Technical features

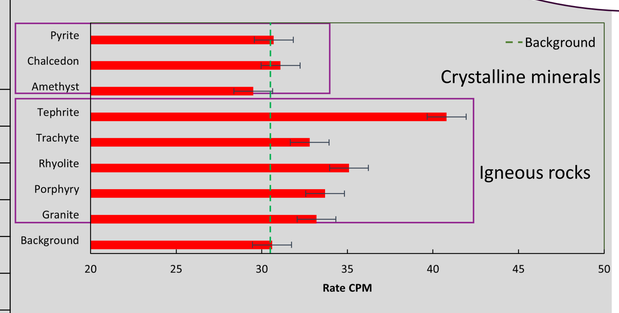


- **Device type:** portable Geiger–Müller counter **with mobile interface control**.
- **Detection:** sensitivity to both **Beta** and **Gamma** radiation (non-discriminating) with **audible particle alerts**.
- **Power: >8 hours** battery life; **USB-C rechargeable** for reliable field use.
- **App connectivity:** Bluetooth for real-time control on **Android devices**.
- **Functionality:** users can set acquisition times, start measurements, and document experimental setups with **photos**.
- **Real-time display:** total counts, count rate in Count Per Minutes (CPM), and equivalent dose rate during acquisition.
  - **Data management:** automatic saving of the results in a gallery with options to export for analysis or share externally.

Measurement and analysis

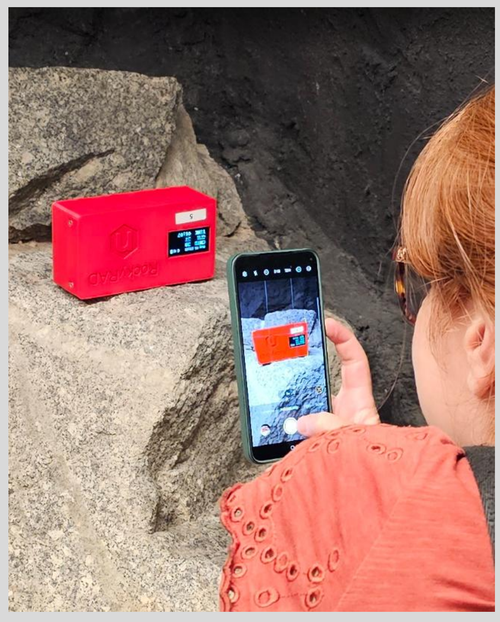
- RockyRAD measures **rock radioactivity** with adjustable acquisition times, ranging from **minutes to hours.**
- Displays both **Counts Per Minute (CPM)** and **equivalent dose rate (nSv/h)** to help students grasp **absorbed dose** concepts.

Geological origin	Sample	Counts per minute (CPM) ± σ
Intrusive igneous rock. Slow solidification within the Earth's crust	**Granite**	33.2 ± 0.6
Extrusive igneous rocks. Rapid cooling of magma near the surface	**Porphyry**	33.7 ± 0.6
	Rhyolite	35.1 ± 0.6
	Trachyte	32.8 ± 0.6
	Tephrite	40.8 ± 0.7
Crystalline minerals	**Amethyst**	29.5 ± 0.6
	Chalcedon	31.1 ± 0.6
	Pyrite	30.7 ± 0.6



Why choose RockyRad?

- **Interactive learning:** user-friendly tool designed for both classroom and fieldwork environments.
- **STEM engagement:** promotes hands-on sessions in Physics, Earth Sciences, Math, Statistics, and Computer Science.
- **Analytical experiments:** encourages critical thinking and data analysis through real-world experimentation
- **Easy to use mobile app:** allows for "on-the-go" radiation monitoring via a custom interface.
- **Affordable solution:** budget-friendly for high schools and universities; ideal for labs and outreach
- In an energy landscape where nuclear power is regaining attention, RockyRAD fosters essential scientific inquiry. By studying environmental radioactivity, students gain the deep understanding needed to support informed perspectives on nuclear energy and future energy choices.



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