

Hands-on at DUDCS25



Can our smartphones be a geiger counter?



8. Miniworkshop difrakce a ultraperiferních srážek

Can our smartphones be a geiger counter?

RadioactivityCounter - Android

This application is a real working radioactivity counter without any extra hardware needed ! Only cover the lenses with a black paper and tape it there (Must be tight and light proof - don't put glue on the camera lenses !). It will turn your phone into a Geiger Müller Counter to measure radioactivity after proper calibration. You can use it as a rough indicator without calibration to distinguish between high and low counting areas. A LITE version is also available as pure Counter. どうか、もしあなたが手助けを必要とするなら、電子メールを書いてください。

Can our smartphones be a geiger counter?

There are actually few paper about it!

The suitability of smartphone camera sensors for detecting radiation

Sci Rep 11, 12653 (2021), <https://doi.org/10.1038/s41598-021-92195-y>

“The advanced image sensors installed on now-ubiquitous smartphones can be used to detect ionising radiation in addition to visible light. Radiation incidents on a smartphone camera’s Complementary Metal Oxide Semiconductor (CMOS) sensor creates a signal which can be isolated from a visible light signal to turn the smartphone into a radiation detector.”

IRadioactivity - Possibilities and Limitations for Using Smartphones and Tablet PCs as Radioactive Counters: Examples for Studying Different Radioactive Principles in Physics Education

Phys. Teach. 52, 351–356 (2014), <https://doi.org/10.1119/1.4893089>

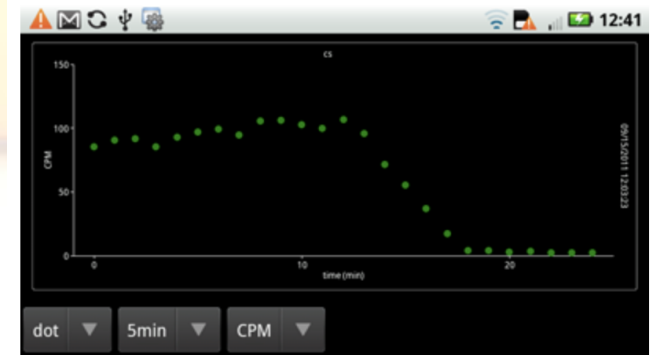
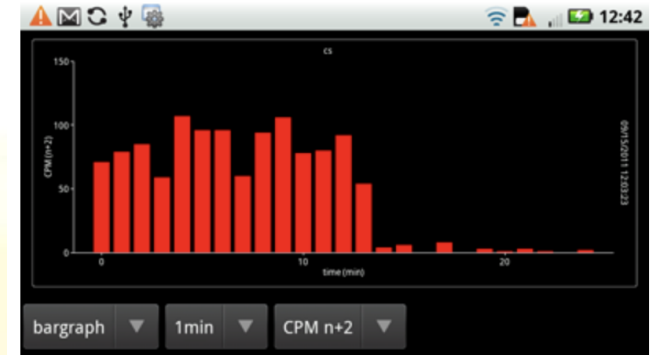
“Camera sensor as radiation detector Ionizing radiation can be detected by smartphones and tablet PCs with their camera sensors, typically CMOS (“complementary metal oxide semiconductor” 18) sensors. Several million sensor cells, which form the pixels, compose images or videos. Each sensor cell is a p-n diode of only a few micrometers in size, which under normal use as a camera leverages the photoelectric effect to produce the image. The semiconductor junction is also sensitive to radiation, though: beta particles and gamma rays ionize individual atoms in the chip, releasing electrons, which are captured by the CMOS and generate a white pixel. 19 CMOS sensors are less sensitive to gradiation, as they do not have an intrinsic layer.”

Instructions

- http://www.hotray-info.de/html/radioa_help.html
- First you need a black tape to cover the lenses, so no light can enter the camera!
- Next the noise level must be found.
- Set Noise can be done using our calibration function. It will measure the sensors and try to find a good level for start.
- The calibration takes around one minute - If you live in a high radiation environment, you should shield the phone with lead !!!
- After the calibration is done the phone can click from time to time which is great. Its should show a rate of around 1-10 CPM.
- If its too high you should increase the noise level to get a reasonable background noise. If you see dots around a circle check the lenses cover light might pass through.

Start saving your data

- Start Log / Stop Log.
 - Once the "Set noise" is done the button changes to a toggle button.
 - If you start a log a text field appears and you can enter a name for the log file.
 - Each minute a value is saved in the log with time stamp and many infos.
 - At the beginning also a location value is saved if the location is enabled in the settings menu.
- Clear
 - You can clear the current CPM (count per minute) value and the measurements restarts. After 5 measurements the CPM value turns green.
- Statistic / Graph
 - This button toggles the graph display between spectrum and the bar graph.



Time to measure anything!!

