# Energy calibration of a cosmic-ray detector

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CosmicWatch, a cosmic ray detector used in our research group, converts cosmic ray-derived fluorescence in a plastic scintillator into electrical signals using a semiconductor detector.

Cosmic rays are high-energy radiation from space, and CosmicWatch mainly detects muons.

CosmicWatch detects mainly muons. However, the correspondence between the signal value obtained by CosmicWatch and the energy value has not been investigated.

Therefore, we used Co60 and Cs137 radiation sources to investigate the correspondence between the signal values of the obtained peaks and the energy values.

The energy of the $\gamma$-rays emitted by the decay of radiation sources Co60 and Cs137 are known and are 318 keV and 662 keV, respectively.

Usually, plastic scintillators are used, but in this study, we also investigated using CsI scintillators, which are more specialized for detecting $\gamma$-rays.

CsI scintillators were chosen because they have higher energy sensitivity than plastic scintillators and are relatively inexpensive and easy to handle among inorganic scintillators.

In addition, the CsI scintillator had a larger fluorescence than the plastic scintillator, and the obtained signal value exceeded the upper limit of the analog-to-digital conversion in the circuit.

Therefore, we intentionally attenuated the signal value by delaying the acquisition time of the signal value while measuring.

This method was used to calibrate the energy of CosmicWatch.

In addition to the above, we measured and compared the frequency of radiation exposure when the detector was placed directly on the ground and when it was indoors, and considered the radiation exposure of the ground near our house.

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