

Developing a Gamma-ray Detection System



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Keywords | Experimental studies related to particle-, nuclear-, cosmic ray and astrophysics (15020)

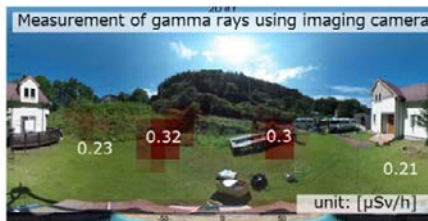
Research Topics

- Developing a Compton camera using scintillators for measuring environments
- Developing of a radioactive inspection system for shiitake mushroom bed logs
- Developing of an electron-tracking Compton camera using SOI pixel sensor
- Origin of ultra-high-energy cosmic rays using multi-wavelength observation
- Simulation of mirror layout for a large size telescope of the Cherenkov Telescope Array

Research Seeds

① Development of a radiation detection system (gamma eye group)

Gamma-ray detection systems have progressed in areas of high-energy physics, gamma-ray astronomy, and nuclear medicine. Since 2011, this detection technology has been used for environmental monitoring because of the Fukushima Daiichi nuclear power plant accident. We have developed a Compton camera to visualize arrival directions of gamma rays for environmental monitoring (Kagaya et al. 2015). We measured gamma rays with an environment of a low-level contaminated area ($\sim 0.1 \mu\text{Sv/h}$) and nuclear medical facilities (Watanabe et al. 2017). Moreover, we developed a Compton camera for high-dose-rate environments and carried out measurements at the Fukushima Daiichi nuclear power plant (Katagiri et al. 2018). Furthermore, we developed a portable radioactive inspection system without a shield for shiitake mushroom bed logs (Japanese patent application No. 2017-04692). We took outdoor measurements at a low-level contaminated area to select safety bed logs ($< 50 \text{ Bq/kg}$) using screening tests.



② Study of gamma-ray astronomy and ultra-high-energy-cosmic rays (UHECRs)

The origin of UHECRs is an important astrophysical problem. The acceleration sites and the acceleration mechanisms of UHECRs remain unsolved since their discovery 50-60 years ago. We have investigated the possibility of acceleration of UHECRs in nearby active galactic nuclei (AGNs) using archival multi-wavelength observational data. Also, I am a member of the Cherenkov Telescope Array (CTA) project: a next generation TeV gamma-ray observatory. The Japan group has been developing the large telescope. I evaluated the weather durability of a mirror and simulated the mirror layout.

Related Technology

- Development of radiation inspection systems