Real Time Three Dimension Radiation Imaging Compton Camera for Radiation Safety of Base of Operations

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INTRODUCTION AND MAIN RESULTS

This work would propose a Compton camera. It could work at room temperature with high detection efficiency and high energy resolution. It provides energy spectrum, radioactive isotope identification and the real time distribution of radioactive materials in the environment. Deployed at several locations of the BoO, they could protect inspectors from radioactive contamination at their office, home and decontamination area,

CdZnTe Portable Compton Camera

Performance:

=== High detection efficiency,

=== High energy resolution,

=== Operation at room temprature,

=== Provide real time energy spectrum of radioactive isotope and identification,

=== the most important is to provide the real time distribution of radioactive matters in inspected environment.

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Principle of CZT Compton camera

Small pixel effect, single polarity charge sensitivity

Pixel array CZT detector
two dimension X, Y location

↓

Multi-channel ASIC
Amplitude and time information from anode and cathode

↓

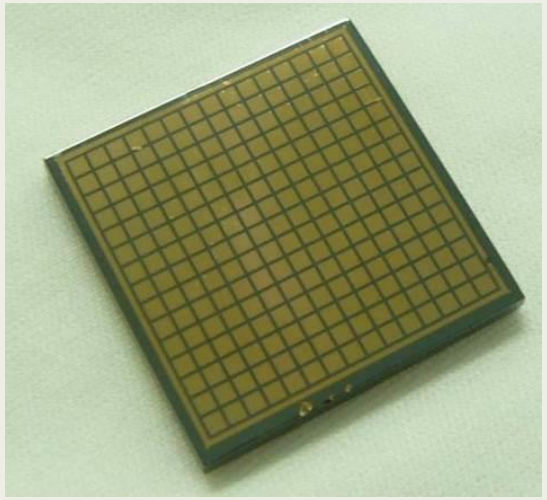
Amplitude ratio and time difference of anode and cathode
The third dimension, Z location

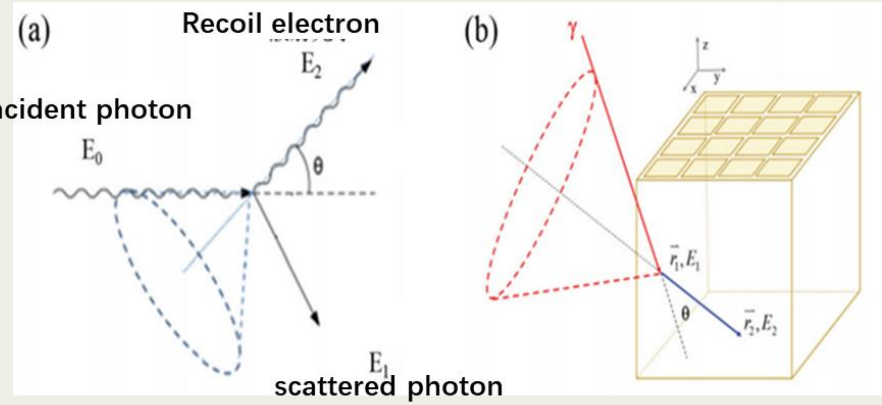
↓

X, Y, Z, and E energy information
Inside CZT

↓

Two hits Compton scattering
Orientation of radioactive source





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Specifications:

*** energy resolution：≤1.2% FWHM@662keV

*** energy range：60keV～3MeV（spectroscopy），250keV～3MeV（imaging）

*** optical camera imaging view: 360° horizontal, 360° vertical

*** radiation imaging view: 4π (360°) view

*** Sensitivity: spectroscopy 30s and imaging 90s @ 0.03μSv/h for 662kev 137Cs

*** localization: GPS

*** Battery Life: >8 hours at 25° C

*** Operating Temp.: -20° C to 50° C

*** Storage Temperature: -20° C to 50° C

*** data display：data transferred to computer by wifi to display

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Real Time Three Dimension Radiation Imaging Compton Camera for Radiation Safety of Base of Operations

User interface Compton camera

Software icon

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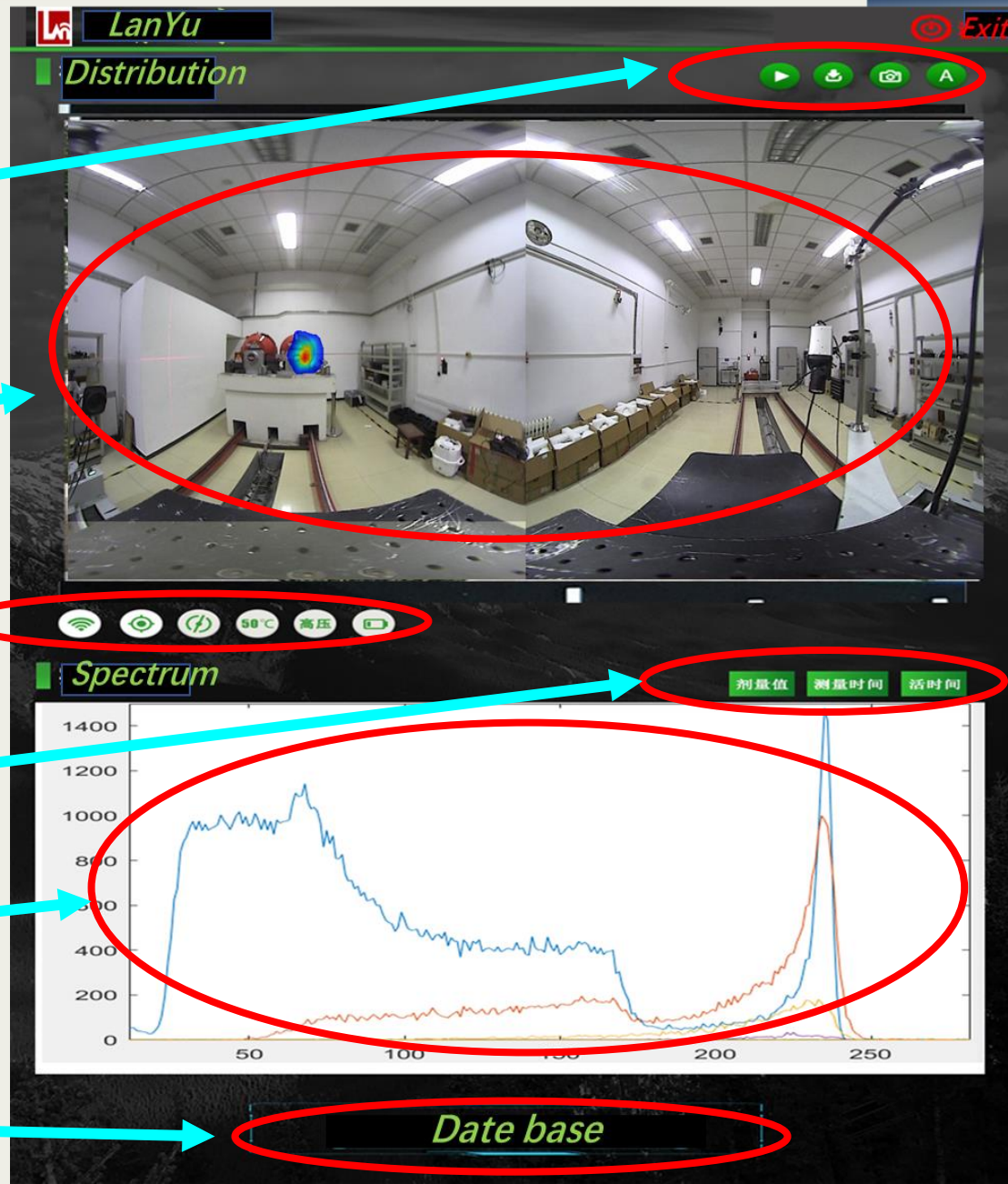
User interface
Six region
Rolling up and down

- operation
- Isotope distribution
- Assistant function
- Detection information
- spectrum
- database



Applications:

1. to find contamination and hot point in nuclear plant,
2. to look for lost radioactive source,
3. to localize radioactive dirty bomb in public terrorist attack,
4. to work for nuclear emergency, nuclear accident, nuclear leakage,
5. to detect and confirm isotope and distribution of nuclear waste and nuclear spent fuel,
6. to monitor environment for radioactive contamination,
7. to monitor the whole process chain of nuclear material,

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Applications in OSI:

1. Inspection base:
==to protect inspection officials from radioactive contamination in working base.
==to choose two or three regions to fix CZT Compton camera, monitor and alarm for the existence of possible radioactive isotope ,

2. decontamination:
==to detect and image people before and after decontamination, ensure cleaning validity,

3. Robot inspection in special area:
== fix the CZT Compton camera on robot, monitor possible radioactive materials,
==to protect officials from possible high radiation damage, through robot inspection results of radiation distribution.

4. Portable CZT camera:
== inspection official could take CZT Compton camera, to check special area.

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