

Search for Reasons of Incidence of Lung Cancers by Measurement of Environmental Radiation based on Cherenkov Detection

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Disclosure of conflict of interest
We have nothing to declare for this study.

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Background Study

When the Cherenkov counter covering Cosmic veto counter is developed for measuring ^{90}Sr radioactivity, the causes of BG signals were searched.

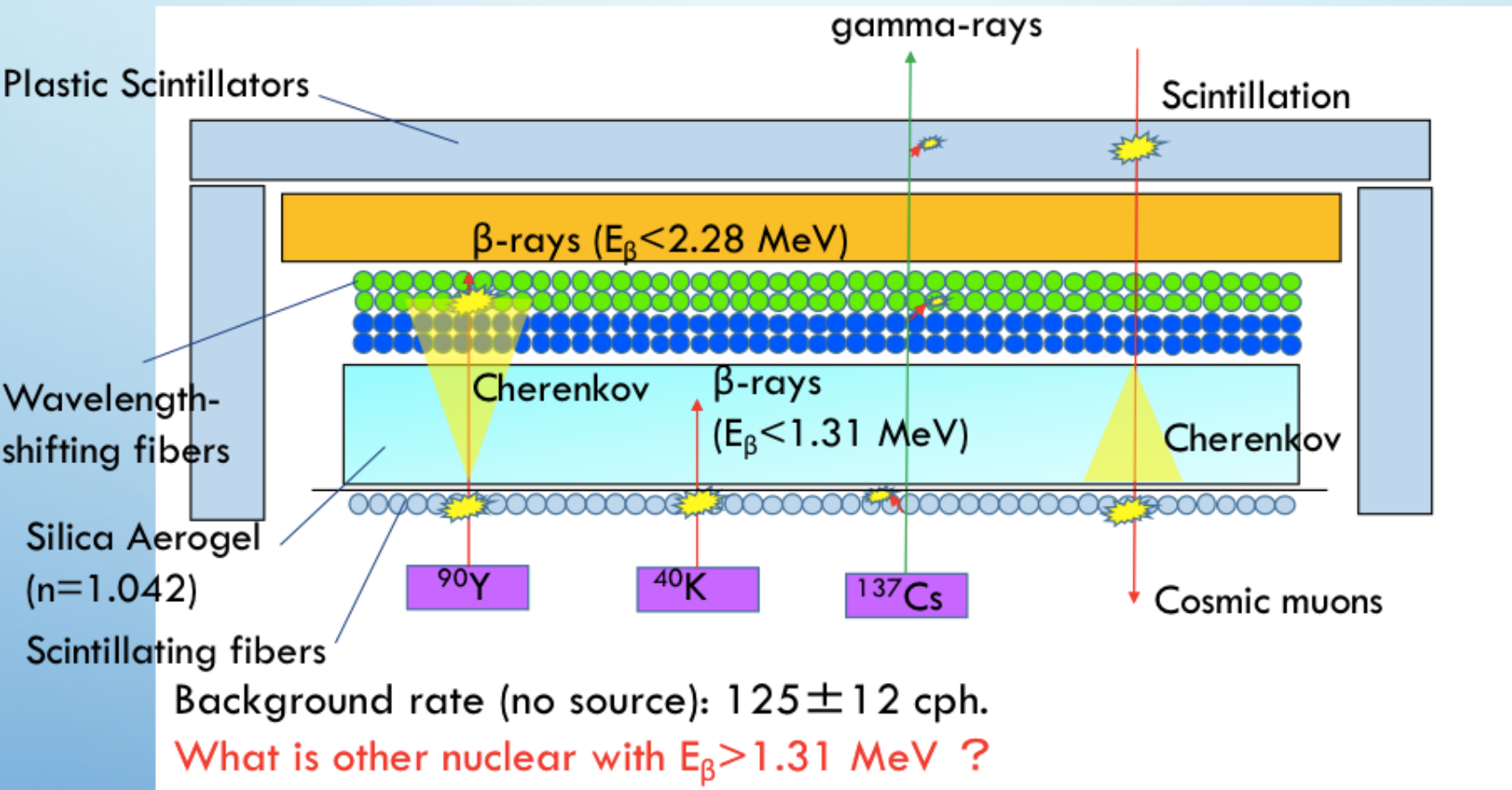
Cherenkov radiation is a kind of shock wave.
When the velocity of charged particle

This threshold energy for β -rays was set to 1.31 MeV.

Background Study

The Cherenkov counter [1]

[1] H. Ito et al., 112th JSMP, O-066.



Background Study

It is considered that ^{214}Bi is the nuclei which emits beta rays with $E_{\beta} > 1.31$ in air.

^{214}Bi is produced by decay for ^{238}U .

The radiative dose by inhalation of ^{222}Rn was known as 1.1 mSv/yr.

The other daughters (^{218}Po , ^{214}Pb , ^{214}Po ...) would be in the air if ^{214}Bi is floating in the air.

If this is really, the natural dose should be re-estimated, and the reason for occurring the lung cancer in never smoker might be found by this factor.

Study Purpose

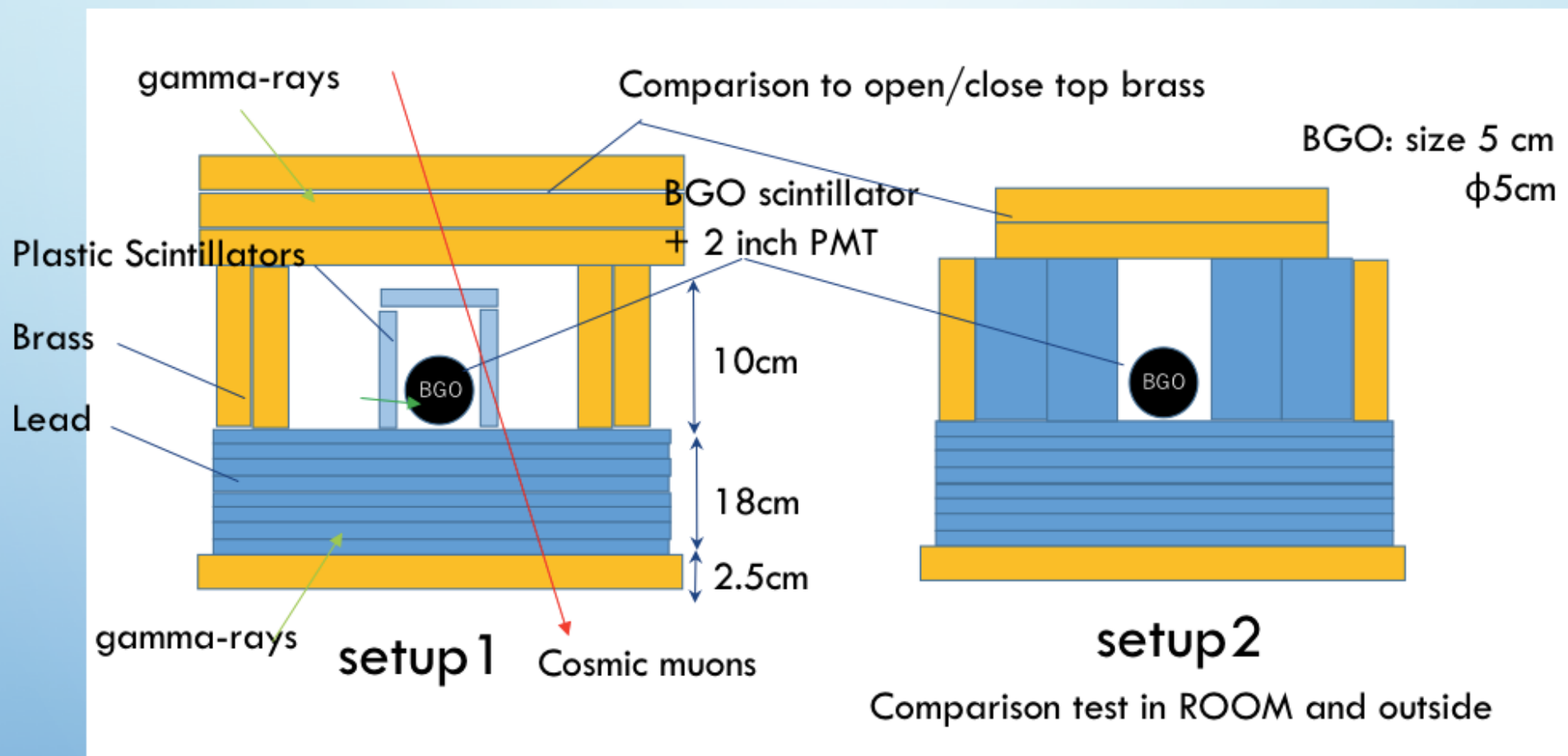
Ascertaining whether ^{214}Bi is present in the air.
A Search for Reasons of Incidence of Lung Cancers

Study Approach

- 1) At first, gamma-ray energy spectroscopy
609 (46%), 1764 (15%), 2204 (5%) keV peaks
- 2) Estimating the contamination of ^{214}Bi in the air
using Monte Carlo Simulation (GEANT4)

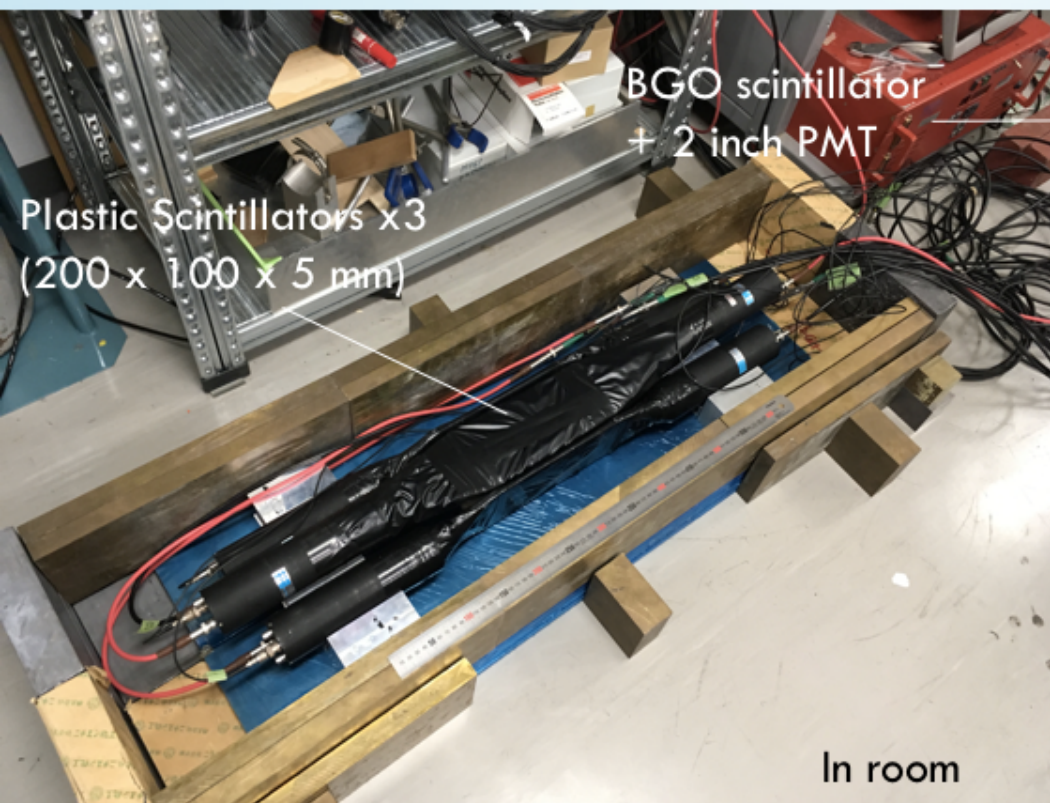
Gamma-ray Energy Spectroscopy

setup



Gamma-ray Energy Spectroscopy

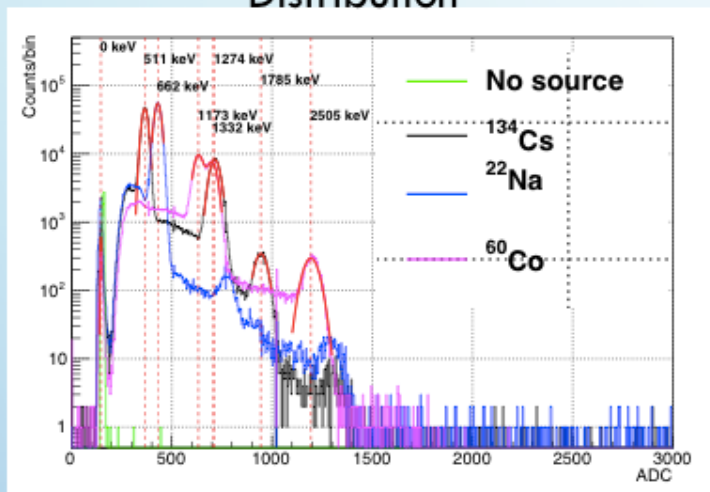
setup



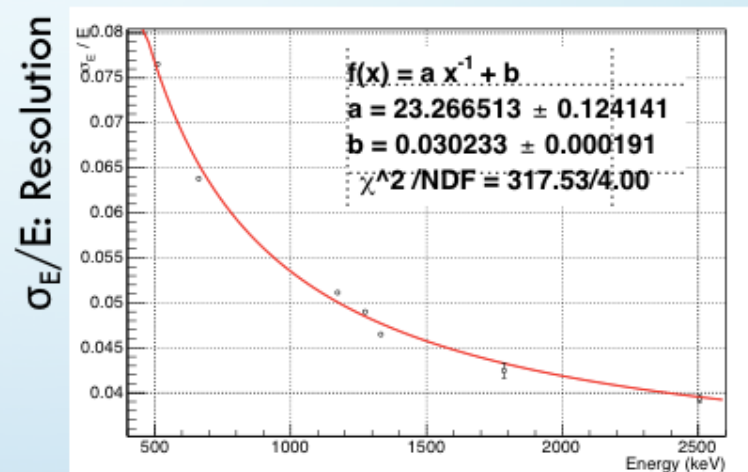
Gamma-ray Energy Spectroscopy

Calibration

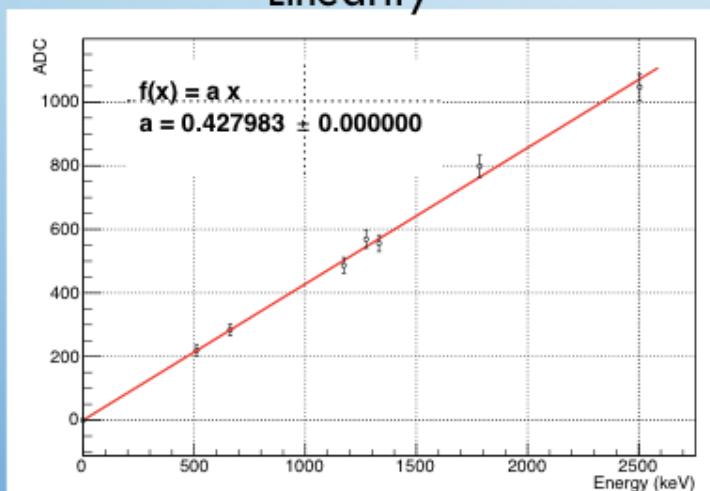
Distribution



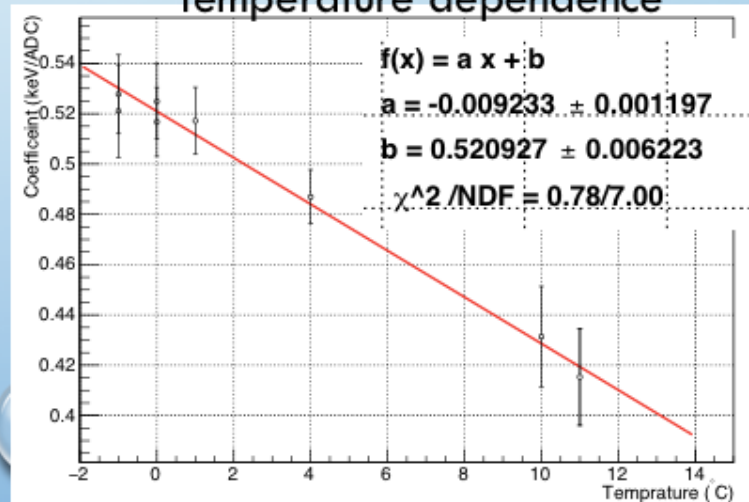
Resolution



Linearity

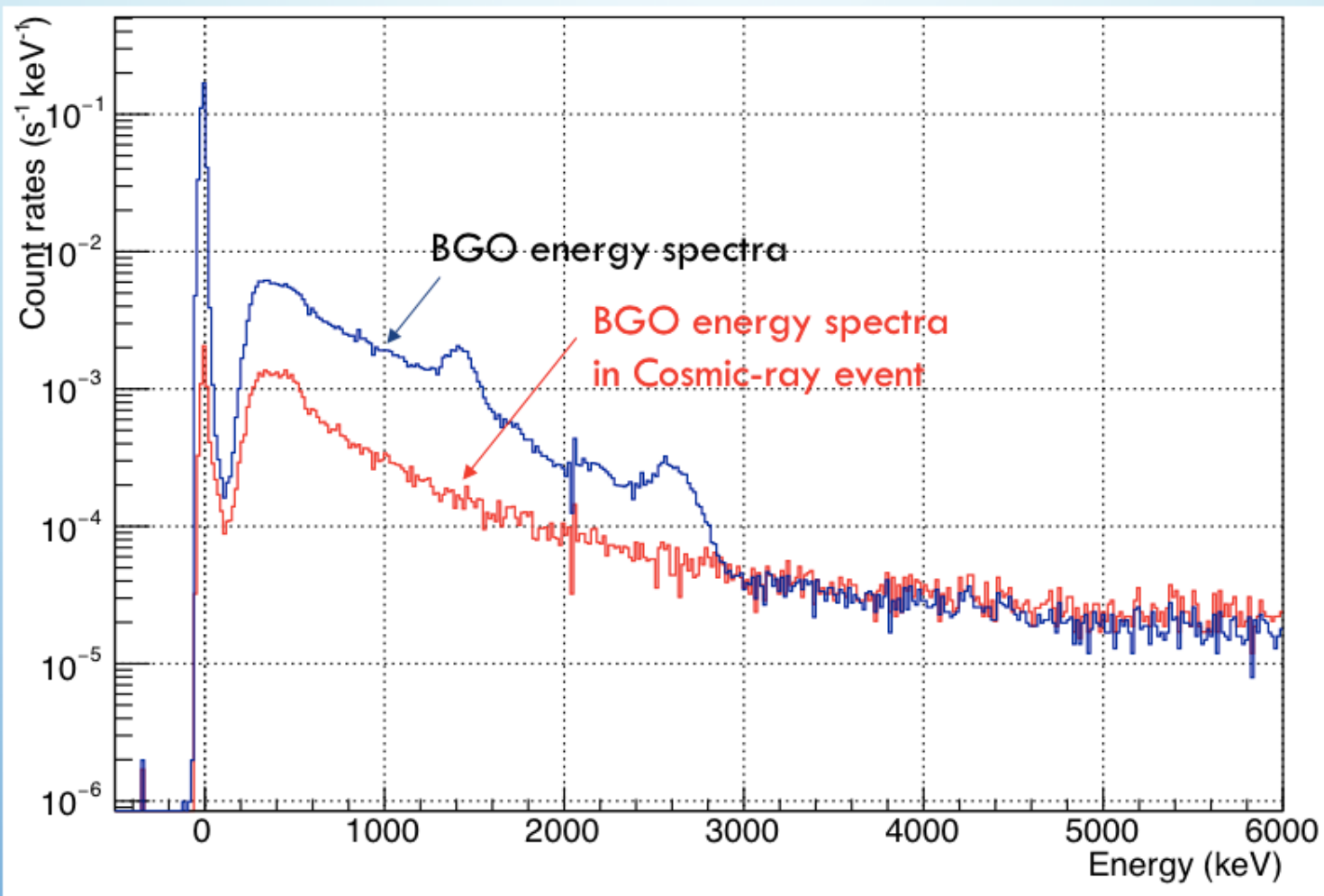


Temperature dependence



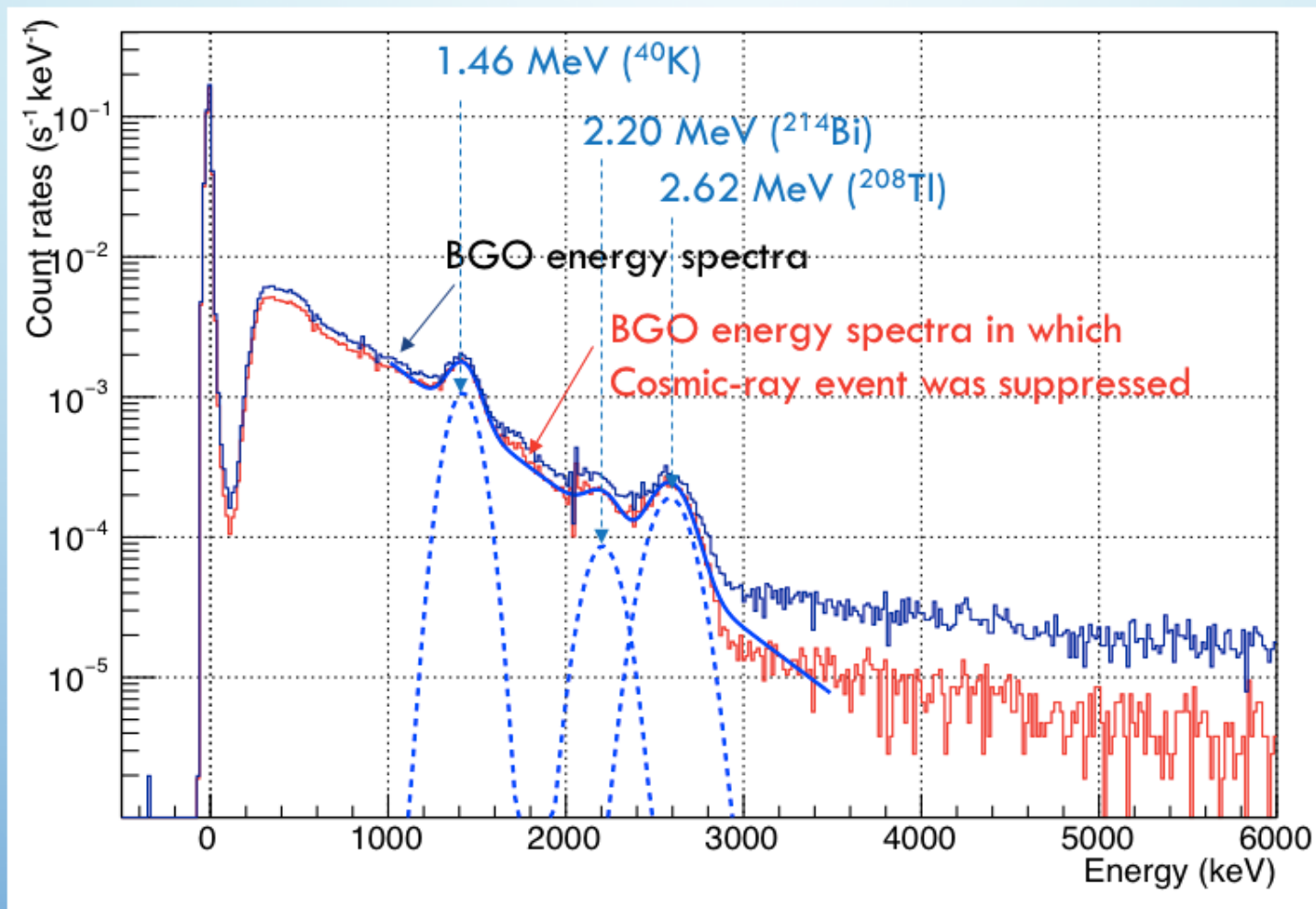
Gamma-ray Energy Spectroscopy

Cosmic ray event in ROOM (setup1)



Gamma-ray Energy Spectroscopy

Cosmic ray event in ROOM (setup1)



Gamma-ray Energy Spectroscopy

Cosmic ray event in ROOM (setup1)

Result1:

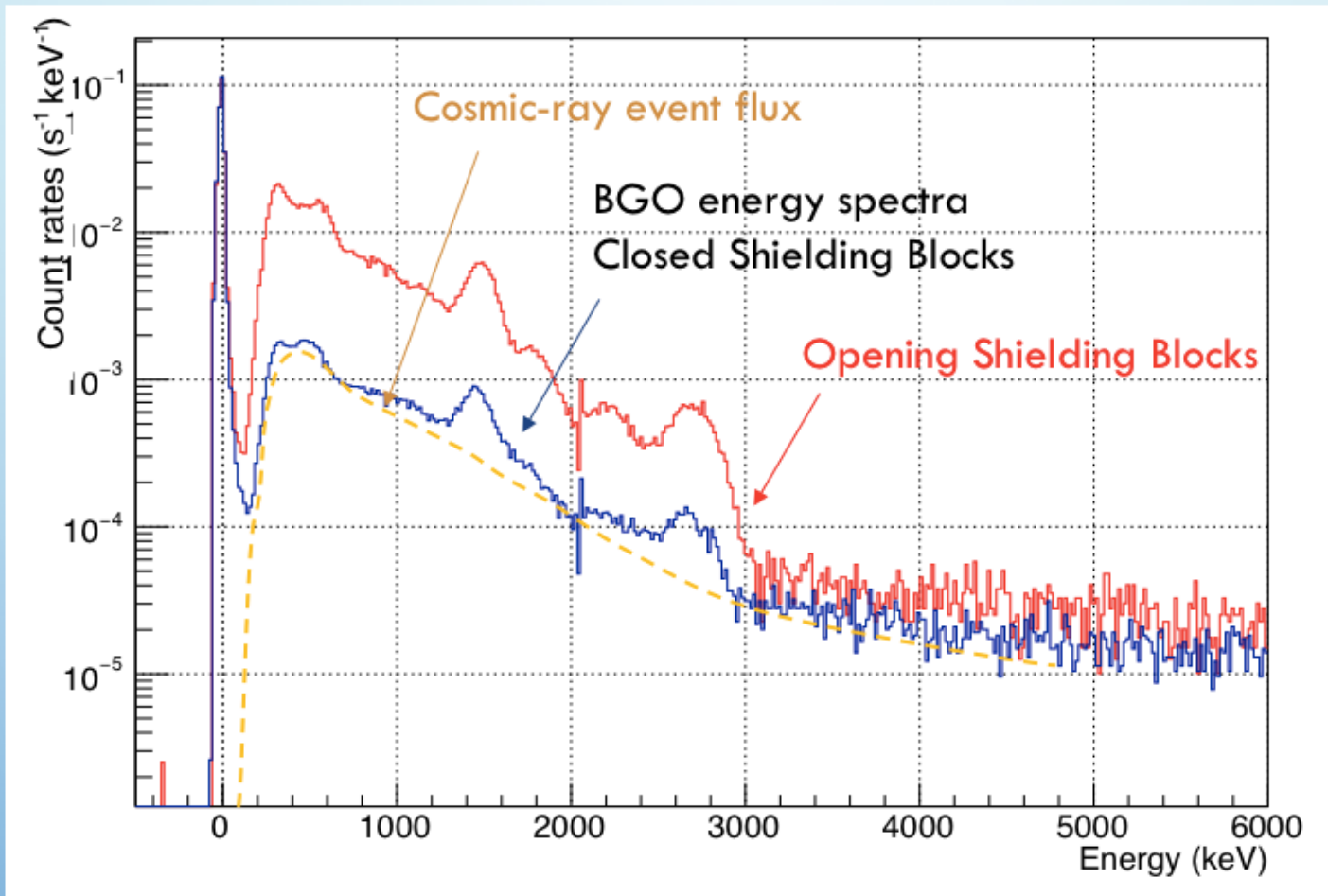
Photoelectric peaks of gamma rays 1.46, 2.20, and 2.62 MeV were observed in room.

Suggestion1:

In this setup1, cosmic-ray event can be negligible.

Gamma-ray Energy Spectroscopy

Comparison to open top blocks in ROOM (setup2)



Gamma-ray Energy Spectroscopy

Comparison to open top blocks in ROOM (setup2)

Result2:

In comparison of closed and opened top shield, **many gamma rays** originated from ^{40}K , ^{214}Bi , and ^{208}Tl was observed from outside of the box.

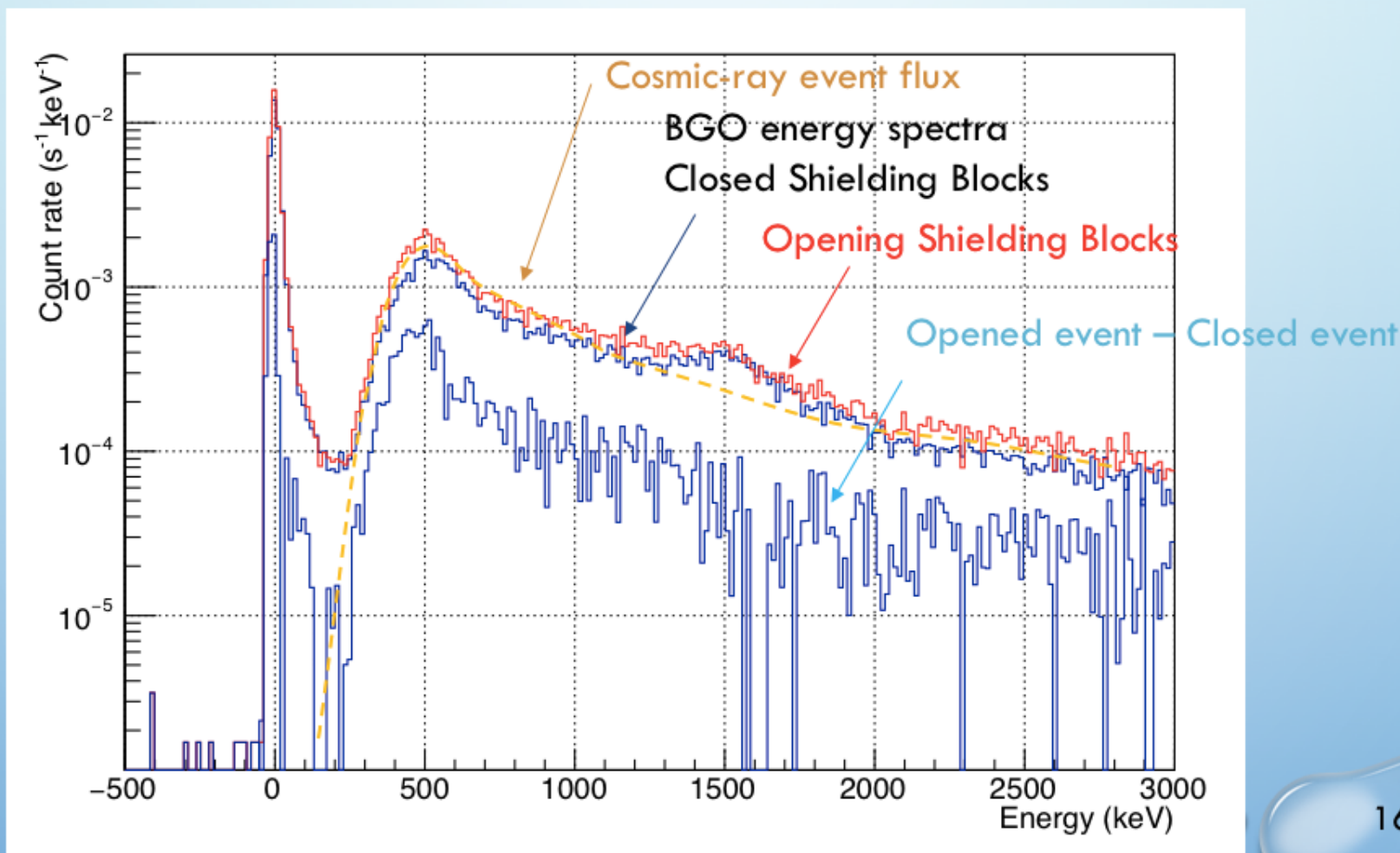
Suggestion2:

It is well known **the concrete has ^{40}K , uranium, and thorium**; this result suggested observation of gamma-rays from the cement mainly.

This gamma rays are background.

Gamma-ray Energy Spectroscopy

Test on the roof of the building (setup2)



Gamma-ray Energy Spectroscopy

Test on the roof of the building (setup2)

Result3:

On the roof, noise of gamma rays originated from concrete was suppressed.

Cosmic-ray event is not negligible.

Suggestion3:

Adding cosmic veto counters.

Discussion & Conclusion

A reason of occurring the lung cancer in never smoker is searched by measuring ^{214}Bi in air. If this fact is really, the natural radiative dose should be re-estimated.

In my session, **We will present new results.** The background is gamma-rays from the concrete for observation of ^{214}Bi in the air.