

Detector Efficiency Determination of Surface Barrier Detector Considering Geometrical Effect and Radiation Energy

150

373-1

가

background

Ba-133

SBD (Surface Barrier Detector)

EGS4(Electron-Gamma Shower) Code

. Sr-Y

 $\pm 17\%$

가

SBD

Abstract

The reagent vial wastes disposed of in hospital every year are usually polluted by the beta-emitted nuclide having short half-life. Their activities are very low to the extent of background. In case of the beta-emitted nuclide separation, it is so ineffective and complex that more simple method is needed. In this study, new beta-ray measure method to solve these problems is proposed. By using new method, the real activity could be determined by predicting the measurement efficiency of the nuclide from the simulation of detection method and by measuring with ultra low level radioactivity detection system. Result from EGS4(Electron-Gamma Shower) simulation and SBD(Surface Barrier Detector) measurement were compared by using the point source of Ba-133 to verify the adequacy of simulation. About $\pm 17\%$ error between the theoretical simulation and the measurement was observed. The quantity of radiation without measuring the standard source could be determined by using the theoretical detection efficiency and the SBD measurement result.

1.

가

() () HPGe(High Purify Germanium Detector) SBD(Surface Barrier Detector) SBD

가

가

SBD

EGS4

SBD

2.

HPGe SBD가

가

가

가

SBD가

가

HPGe

가

가

X

10cm,

(150

) 5cm

2

가

가

가 0.95g/cm³

가 8.13×10E22 /cm³

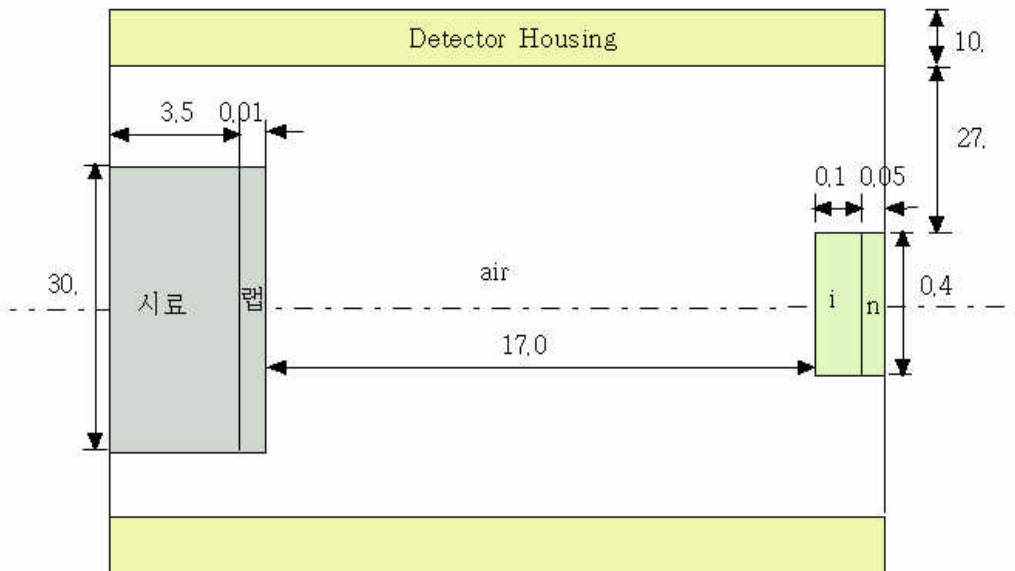
B₄C



3. Simulation Geometry SBD(Surface Barrier Detector)

3.1 Simulation Geometry

SBD EGS4 code Monte Carlo
 1
 1 Geometry
 SBD electron/hole pair Au가 40.4 $\mu\text{g}/\text{cm}^2$
 doping Au film Au film
 SBD spectrum
 SBD , depletion layer, substrate
 1 SBD i electron/hole pair가
 depletion region , n substrate
 Monte Carlo deposition
 SBD SBD 17.0mm 가
 가 가



1. Geometry

3.2 SBD(Surface Barrier Detector)

p-n (depletion layer)
 n Si Au 100 $\mu\text{g}/\text{cm}^2$

50 500 μ m 가 가

SBD EG&G ORTEC 0.1mm Operation Voltage 100
volt Shaping Time 0.5 μ s 40.4 μ g/cm² doping

4. SBD EGS4

4.1 Ba-133 SBD

Ba-133

0.234keV, 0.263keV, 0.316keV, 0.346keV

Ba-133

SBD

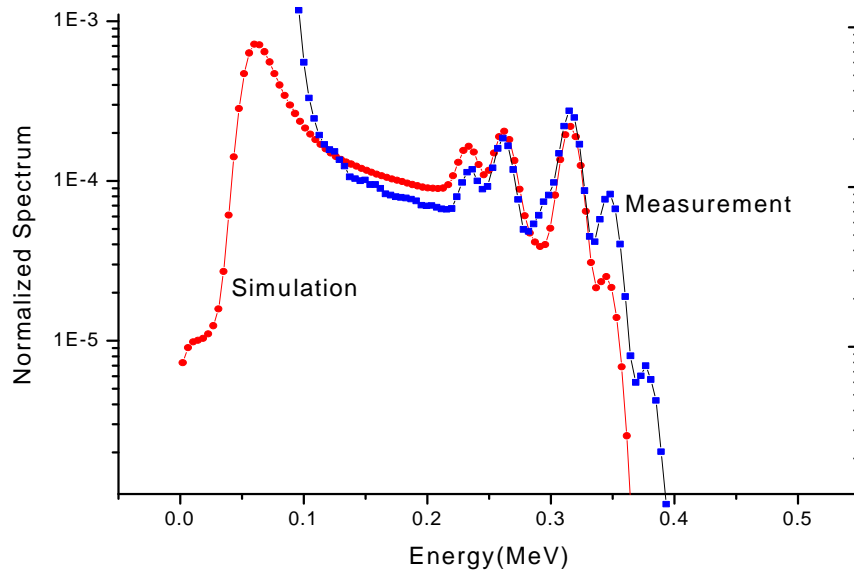
0.1mm

i-layer

SBD

133

Ba-133
Geometry 1



2. Ba-133

Ba-133

SBD Ba-133 point source 20,000 2

FWHM 16keV

SBD Ba-133

SBD 가

EGS4

SBD

peak

가

keV

가

4.2

Sr-Y 가

가 , Vial 가

0.149mm

30mm, 6.5mm

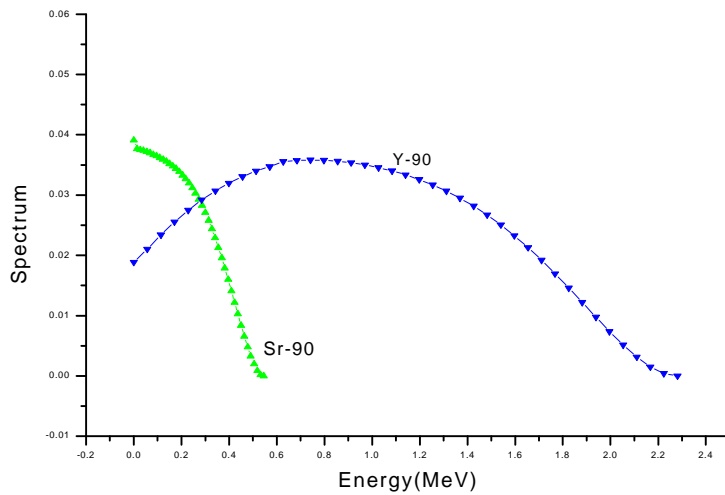
가.

가

ICRU 56(International Commission on Radiation Units and

Measurements 56)

3



3.

Sr-Y

Sr-90 28.79yr

가

가 0.196MeV,

0.546MeV

Y-90

Sr-90

2.281MeV

Sr-90 Y-90

2

Sr-90

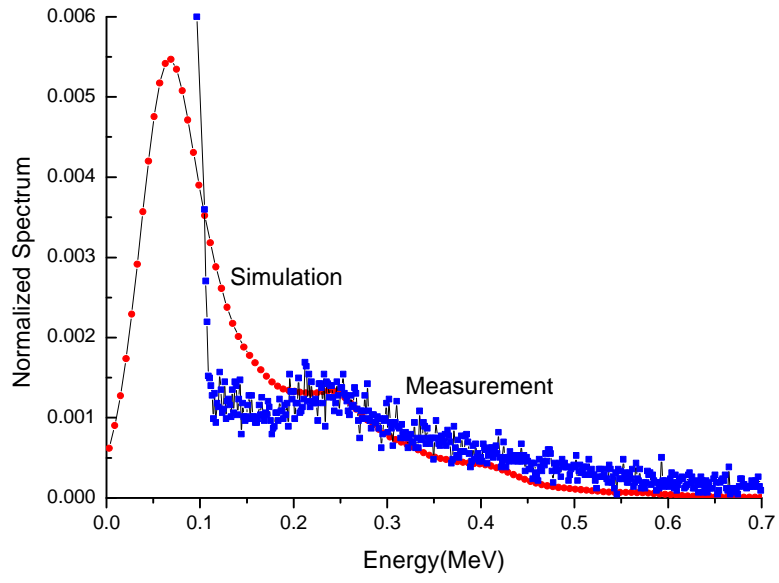
2

4

0.25MeV

peak가

가



4. Sr

5.

Sr

SBD

Count

electron/hole pairs

가

Monte Carlo

Sr-Y total counting efficiency 0.129

가

0.1MeV

가

0.1MeV

0.1MeV

total counting efficiency

0.06419,

0.0547

17%

가

Sr-Y

±

17%

Sr-Y

SBD

6.

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