

# AN ASSESSMENT OF EXTERNAL DOSE FROM NATURAL RADIOACTIVITY IN BUILDING MATERIALS BY USING SIMULATION MONTE CARLO

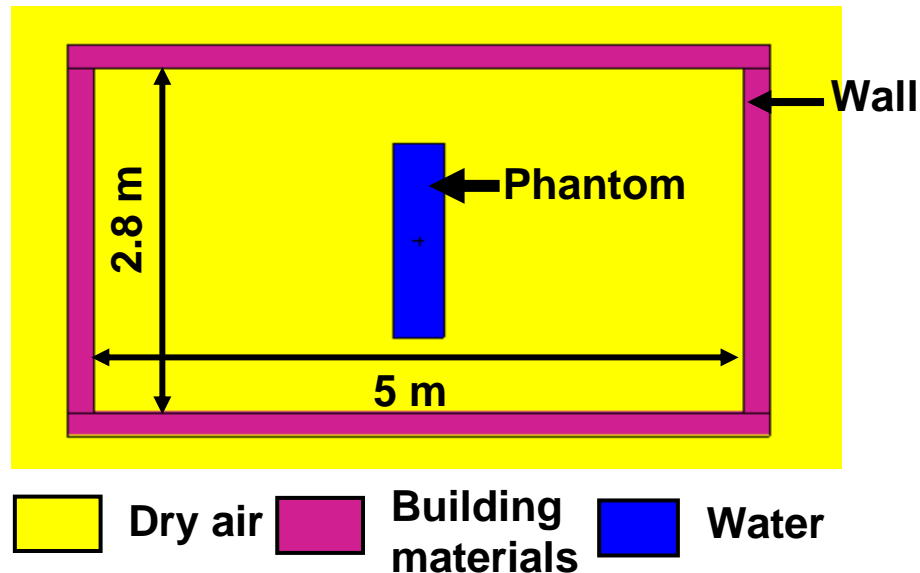
Poster A – ID 32

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## ❖ MATERIALS

Building materials: cement (C1 – C4), brick (B1 – B4), sand (S1 – S5), rock (R)

## ❖ METHODS

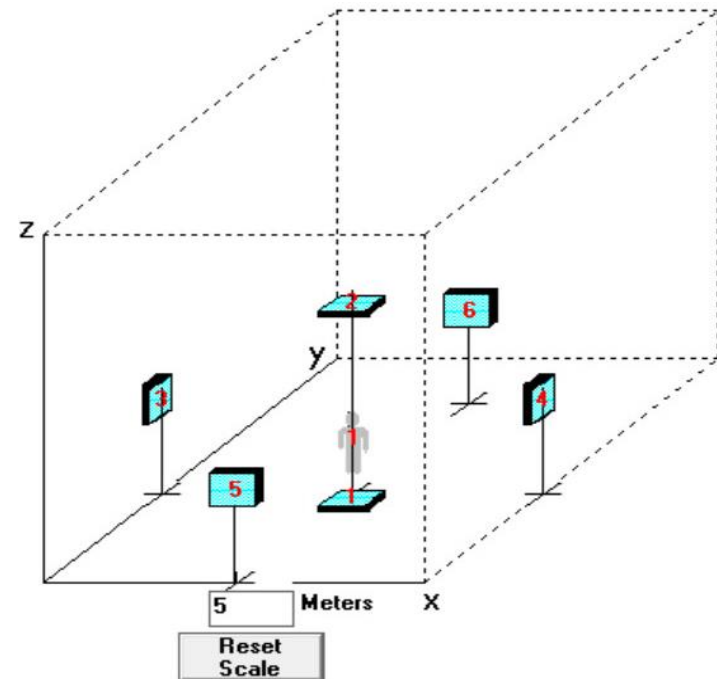


**Figure 1.** A room model built by MCNP6 code

Room:  $5 \times 4 \times 2.8$  m, wall thickness 20 cm.

Water phantom:  $1.68 \times 0.4 \times 0.2$  m.

MODE P, NPS =  $2E10$ , Tally F6.



**Figure 2.** 3D simulation room model in RESRAD-BUILD (use ICRP 38 library)

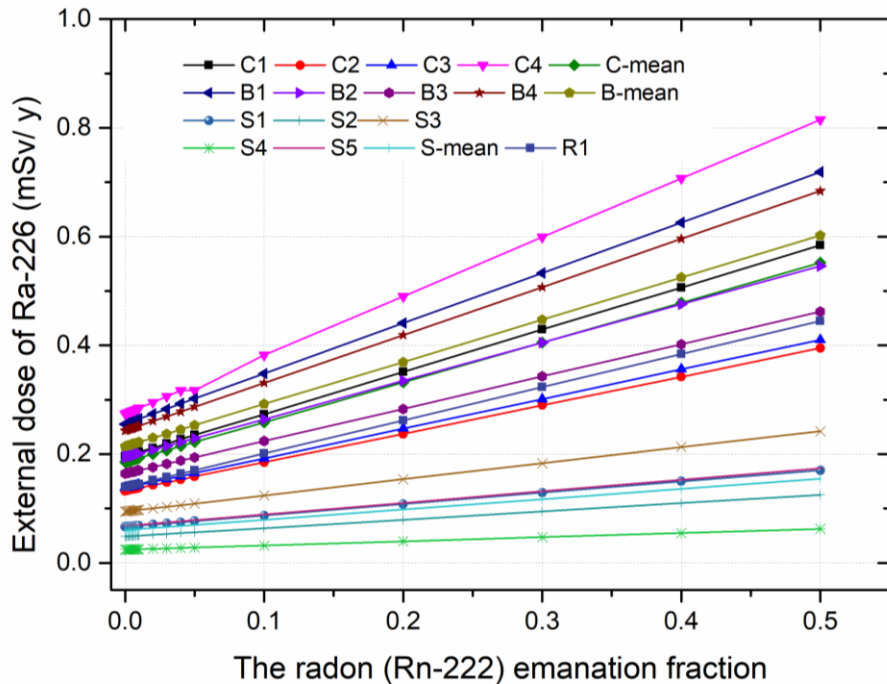
The receptor stands at the center of the room at a height of 1 m.

## ❖ CALCULATION

$$D_{\text{tot}} \text{ (mSv / y)} = D_{\text{Ra}} + D_{\text{Th}} + D_{\text{K}} \quad (1)$$

$$D_x \text{ (Gy / s)} = D \text{ (MeV / g)} \times A \text{ (Bq / kg)} \times N_{\eta d} \times M_{\text{wall}} \text{ (kg)} \times 1.6 \times 10^{-10} \text{ (Gy.g / MeV)} \quad (2)$$

## ❖ RESULTS



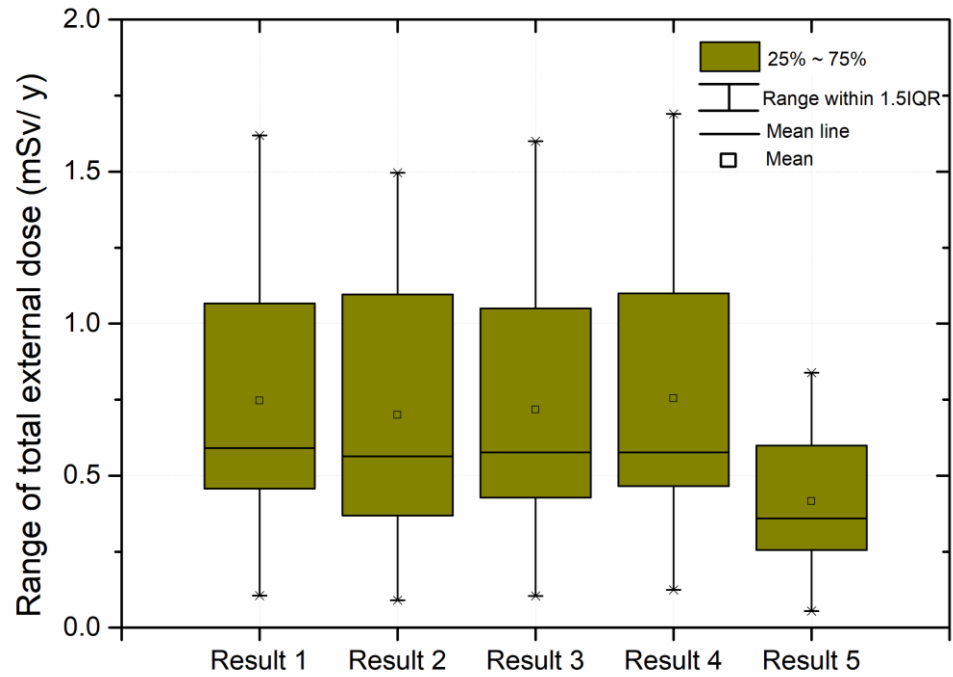
**Figure 3.** Survey radon emanation

**D:** the absorbed dose in water phantom calculated by MCNP6

**A:** the activity concentration of  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ , and  $^{40}\text{K}$  for the variety of building materials.

$N_{\eta d}$ : average number of gamma emitted per disintegration, for  $^{40}\text{K}$ ,  $^{238}\text{U}$  and  $^{232}\text{Th}$  are 0.107, 2.41 and 4.13, respectively.

$M_{\text{wall}}$ : the mass of building material covering the room walls



**Figure 4.** Comparison between MCNP6 code and RESRAD-BUILD