

Development of Electrostatic radon detector of Mobile Radon Calibration System in KRISS

Minji Han^{1,2}, Sanghoon Hwang^{1*}, Yonggeun Seon³, B.J. Kim¹, J.M. Lee^{1,2}, K.B. Lee^{1,2}, D.H. Heo¹, and B.C. Kim¹

¹ Division of Radiation, Korea Research Institute of Standards and Science, Daejeon, Republic of Korea

² Science of Measurements, University of Science and Technology, Daejeon, Republic of Korea

³ Department of Physics, Kyeongpook university, Deagu, Republic of Korea

*E-mail: shhwang@kriss.re.kr

Keywords: radon, radon calibration system, radon detector

Radon is one of the radioactive isotopes in nature and it is the second leading cause of lung cancer. Domestic resident in South Korea has lots of interests due to the recent issues for the radon emitting from living goods in 2018. There are a lot of radon detectors are used in the public and private places and they need to be calibrated for reliable measurements. Korea Research Institute of Standard and Science (KRISS) has built a radon primary system and the uncertainty is estimated to be 0.14 %, which is the best in the world. KRISS only can provide a service for the calibration of Radon detectors by using the CRM from the radon primary system. The calibration, however, takes about 1 month due to the production of the CRM and the calibration time. KRISS is developing a new Mobile Radon Calibration System which can provide the calibration service within a week. The new radon calibration system consists of an ultra-high sensitivity detector, an acrylic air-tighten chamber, and a solid ²²⁶Ra source. This system employs an electrostatic radon detector because this shows very good separations of ²²²Rn and ²²⁰Rn by the alpha spectroscopy. Eight radon cells are connected in series and the analogy signals from each radon cells are combined by the own developed summing board. The combined analog signal is processed by a shaping amplifier and a multi-channel analyzer(MCA). Fig 1 shows the radon spectrum by the ²²²Rn CRM and radon daughter nuclei are clearly shown. The sensitivity of the detector is found to be $(102.2 \pm 0.8) \text{ min}^{-1}/(\text{kBq}/\text{m}^3)$ for ²¹⁸Po and $(128.7 \pm 1.7) \text{ min}^{-1}/(\text{kBq}/\text{m}^3)$ ²¹⁴Po, respectively by CRM from the radon primary system at KRISS. In this presentation, characteristics of the radon detector and the new radon calibration system will be discussed.

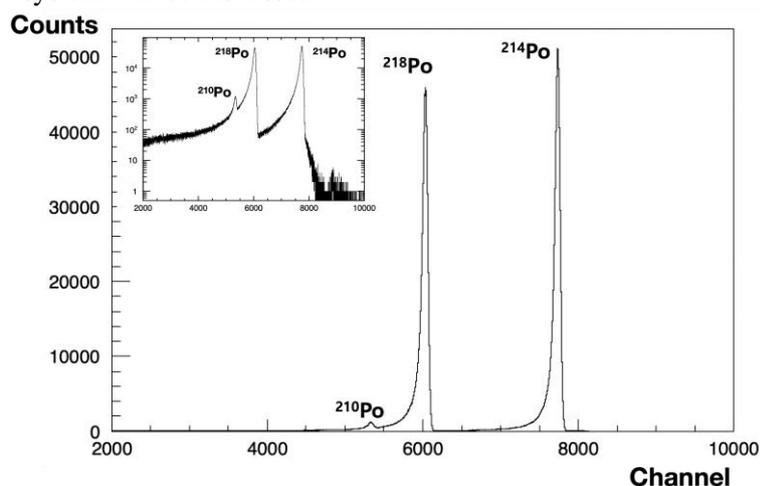


Fig. 1. Radon Spectrum by the ²²²Rn CRM

Acknowledgments

This work was supported in part by the National Research Foundation of Korea (NRF) grant funded by the Korea government (NRF- 2019M2C8A1057065).