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Measurement system of alpha and beta emitters with continuous air sampling under different exposure situations

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Content

After Fukushima nuclear accident occurred in 2011, prompt detection of radioactive plume has been required for safe evacuation of general public in the framework of nuclear disaster prevention. As the System for Prediction of Environmental Emergency Dose Information (SPEEDI) was not well functioning at that time, the Nuclear Regulation Authority in Japan decided not to use the system any longer when judging whether the evacuation is needed or not. From such circumstances, many measuring devices for radioactive plume detection need to be widely deployed around nuclear facilities. It is well known that most of artificial radionuclides emit beta particles as well as gamma radiations and therefore a measurement system has been set up so as to detect beta particles promptly with continuous air sampling. This system consists of a silicon semiconductor detector, a pre-amplifier, a linear amplifier and a multi-channel analyzer. The detection head accommodates a filter holder which the detector faces for continuous air sampling. In the present study, the following subjects were discussed: 1) selection of proper filter, 2) Optimization of beta detection, 3) Application to radon progeny measurements. For the selection of proper filter, we examined three types of filter: membrane (Millipore series), glass fiber (Whatmann series) and HE-40T (Japanese standard, JIS Z4601). The geometric arrangement of the detector and filter was optimized. For radon progeny measurements with continuous air sampling, detection of alpha particles was used by the semiconductor detector. In addition, a special algorithm for potential alpha energy concentration (PAEC) was installed in this system (Tokonami et al., Health Phys. 1996).

About the Presenter

Shinji Tokonami, Ph.D. is a professor at Hirosaki University in the Department of Radiation Physics and specializes in radiation measurements and measurement procedures. In 1995 Dr. Tokonami earned his Ph.D. in engineering from Waseda University. Throughout his career he has been involved with radiation research at Waseda University, the National Institute of Radiological Sciences, and Hirosaki University. In addition, he is also a member of several International Organizations for Standards' committees regarding radon and radiation measurements.

Dr. Tokonami also has developed multiple measurement techniques and equipment related to his field. In particular he developed a special algorithm for determining airborne radon decay products with continuous air sampling and established a passive measurement technique for determining two radon isotopes (radon-222 & -220) separately. After the Fukushima nuclear accident, he is currently working on a quick and effective technique to measure radioactivity in the thyroid to determine the dose and quantify the radiological impact due to a nuclear accident.

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