Measurement of external gamma dose rates and assessment of seasonal variation and annual effective dose around the radiation monitoring stations in Thailand

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Abstract:

Office of Atoms for Peace (OAP), Thailand's national nuclear and radiation regulatory body, has established and operated the National Radiation Monitoring Network in 17 provinces covering all regions in Thailand to monitor the gamma radiation levels from nuclear activities both in the country and in the region and to assess radiation doses in the public and the environment. A total of 18 radiation monitoring stations consist of 17 NaI(TI) scintillation detectors, ø3×3 inch, and 5 Geiger-Muller (GM) detectors. In this work, the real-time environmental monitoring data were measured and averaged monthly and yearly for each station from January 2020 to September 2023. The gamma radiation levels at all the stations were found to be in a range of 0.010-0.300 μSv/h with averages of 0.052±0.021, 0.052±0.021, 0.052±0.023, and 0.053±0.020 μSv/h for NaI detector-equipped stations in 2020, 2021, 2022, and 2023, respectively. While the average values reported at the GM detector-equipped stations were 0.098±0.028 μSv/h in 2022 and 0.099±0.028 μSv/h in 2023. The seasonal variations can be observed from these measurements, indicating that the higher gamma radiation dose rates were detected in the winter season when compared to other seasons. Additionally, the average Annual Effective Doses (AEDs) received by the populations living nearby each station from external exposures (indoors and outdoors) ranged between 0.084 and 1.420 mSv with the means of 0.368±0.151 mSv/y in 2020, 0.371±0.148 mSv/y in 2021, 0.449±0.221 mSv/y in 2022, and 0.456±0.212 mSv/y in 2023. All the AED values were lower than the average global external terrestrial radiation level of 0.48 mSv/y and well below the average worldwide background radiation level of 2.4 mSv/y or even the level recommended by ICRP at 1 mSv/y. This implies such low radiation levels would not pose observed radiation effects in the exposed population both at the local and national levels. Furthermore, the obtained results would be used as the national reference radiation levels or the baseline data for the public and environmental radiation protection in the future, especially in case of nuclear and radiation emergencies.