Contribution ID: **55** Type: **Poster**

In-Situ Indoor and Outdoor Radiation Monitoring and Evaluation of Radiation Risk to Public in Dhaka City, Bangladesh

In-Situ indoor and outdoor environmental gamma radiation monitoring is very essential to generate the baseline database. The baseline database is required for radiological mapping of the nuclear newcomer countries like Bangladesh. The objective of the study is to monitor real-time gamma radiation at indoor & outdoor places of Dhaka City using Portable HPGe detector gamma Spectroscopy system and Portable digital radiation monitoring device (GAMMA SCOUT). The outdoor monitoring places include green field, park, play ground, universities, markets, around large hospitals, radiological facilities, radioactive waste management facilities, industrial radiography facilities, gamma irradiator facilities, etc. The indoor monitoring places include large hospitals, radiological facilities, radioactive waste management facility, industrial radiography facility, etc. The monitoring points (MPs) were marked-out using GARMIN eTrex Global Positioning System (GPS) device. The portable HPGe detector gamma spectroscopy system was placed at 1 meter above the ground on tripod facing downward and spectrum acquisition time for each MP was 2.77 hour. The portable digital radiation monitoring device (GAMMA SCOUT) detector was placed at 1 meter above the ground on tripod and data acquisition time for each MP was 1 hour. Total 500 MPs were selected for collection of gamma-ray spectrum and dose rate in the indoor & outdoor environment of Dhaka City. The radiation monitoring was performed from 2012- 2019. The outdoor measured dose rates of green field, around large hospitals, gamma irradiator, and radiological facility were ranged from 0.103 ± 0.004μSv/hr to 0.168±0.007 μSv/hr, 0.067 ± 0.033μSv/hr to 3.108 ± 0.026μSv/hr, 0.105 ± 0.036 μSv/hr to 0.208 ± 0.106 μSv/hr and 0.132 ± 0.065 μSv/hr to 0.465 ± 0.108 μSv/hr, respectively. Excess Life-time Cancer Risk (ELCR) to public based on annual effective dose is also calculated. The mean ELCR value of the above mentioned outdoor places were found to be 9.949 × 10-4, 1.740 × 10-2, 7.639 × 10-3, and 1.22 × 10-3, respectively. This kind of study is required to detect the presence of natural radionuclides and artificial radionuclides (if any) releasing from nuclear & radiological installations in the country or from neighboring countries in normal operations or in case of accident/incident. This kind of study is also important for calculation of population exposure arising from natural & man-made radiation sources. The radiological mapping of the country is crucial for comparison before and after operation of nuclear installation in the country, especially Rooppur Nuclear Power Plant Project which will be operational in 2023 as per Government of Bangladesh Plan.

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Session Classification: Session IV - Characterization in Industrial Facilities and in the Environment

Track Classification: NORM Characterization, Measurement, Decontamination