



ID de Contribution: 128

Type: POSTER

## Preliminary study on radon level, ambient aerosol, and external gamma radiation dose rate at lung cancer area in Northern, Thailand

*mercredi 29 juin 2022 12:25 (5 minutes)*

Lung cancer is the most common insidious disease worldwide and is the major cause of death from cancer [1]. Thailand is one of those countries in which lung cancer has been the leading cause of mortality and healthcare burden compared to other cancer types, especially in the northern region [2]. Chiang Mai Province, the capital of Northern Thailand, lung cancer also is one of the most common causes of cancer mortality and incidence in males and the third for females [3,4]. Moreover, Chiang Mai, the high-risk districts have a problem with high air pollution from particulate matter with a diameter smaller than  $10\text{ }\mu\text{m}$  (PM10) in northern Thailand [5]. However, the causes of lung cancer in northern Thailand have not been completely understood, but it is strongly believed that they are multi-factorial. The environment is one factor that has played a significant role in lung cancer. Universally, radon is the second leading cause of lung cancer developing after tobacco smoking and the number one cause of lung cancer among nonsmokers, according to World Health Organization (WHO) estimates. Therefore, the initial study of this topic has been obviously carried out in some patients with lung tumors and control case dwellings at Chiang Mai and Lumpang (Thailand).

This study presents the results of indoor radon concentrations using an active detector (AlphaGUARD), ambient aerosol particle size distribution (PAMS Model 3310), and external gamma radiation dose rate using a car-borne survey ( $3^2\times 3^2$  Na(Tl) gamma spectrometry). The results show that the indoor radon levels varied from 11 to 18 Bq/m<sup>3</sup>, with an average of  $15\pm 2$  Bq/m<sup>3</sup>. The maximum, minimum, and geometric mean of the absorbed dose rates in the air by the car-borne survey were estimated to be 47, 171, and  $65\pm 12$  nGy h<sup>-1</sup>, respectively. In the particle size distribution of ambient aerosols, the modal diameter was found in the accumulation mode ( $<100$  nm) with count median diameter (CMD) and geometric standard deviations ( $\sigma_g$ ) values of 55–93 nm, and 0.31–0.35, respectively. This is a preliminary result on a small regional scale; therefore, a further detailed study should be undertaken.

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### Acknowledgments

This work was supported in part by Grant for Environmental Research Projects from The Sumitomo Foundation.

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**Classification de Session:** Nuclear Power Plant Accidents & Risk Communication