

RADON MONITORING IN A HISTORICAL BUILDING IN KOSICE CITY, SLOVAKIA – A CASE STUDY

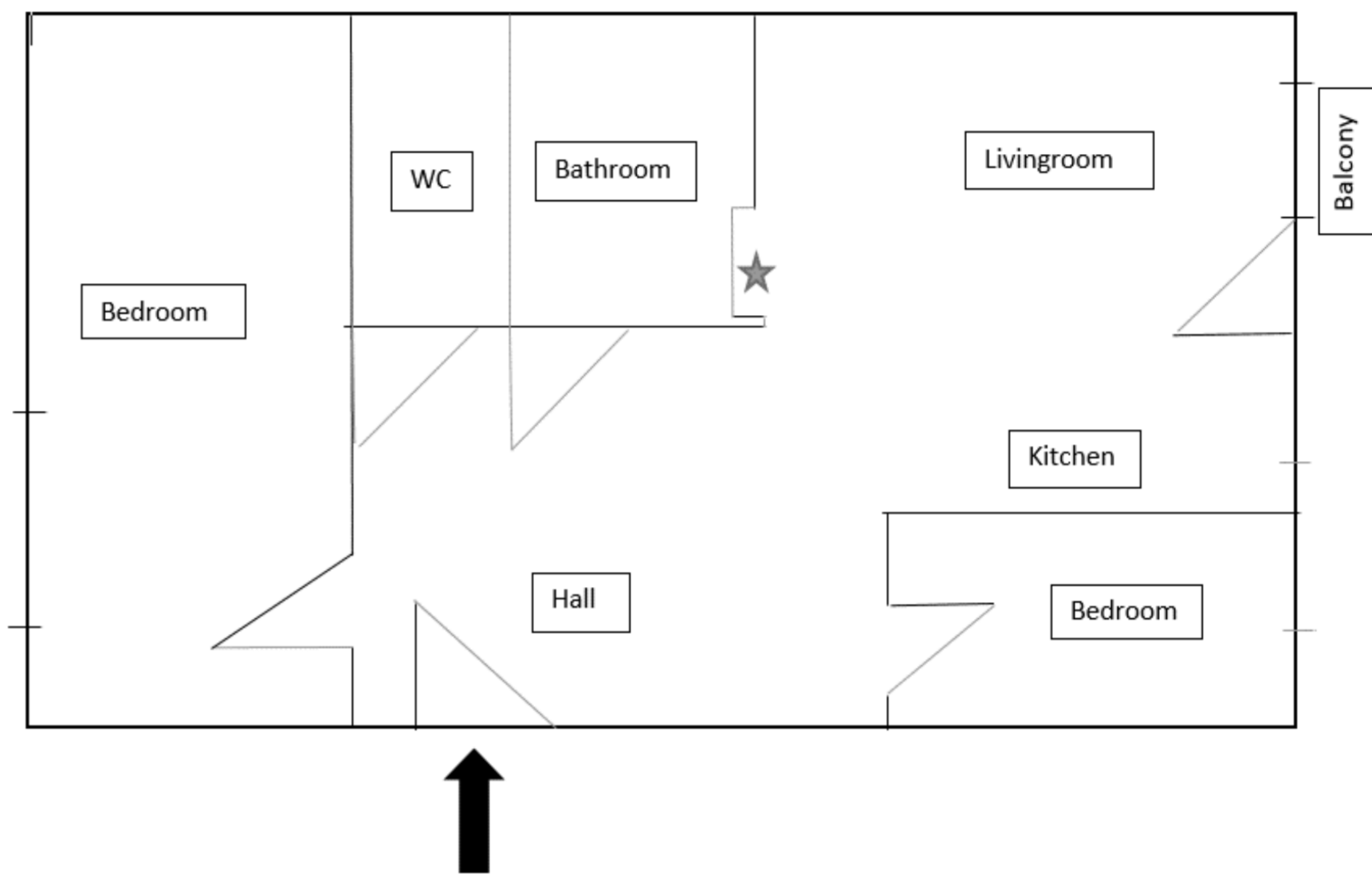
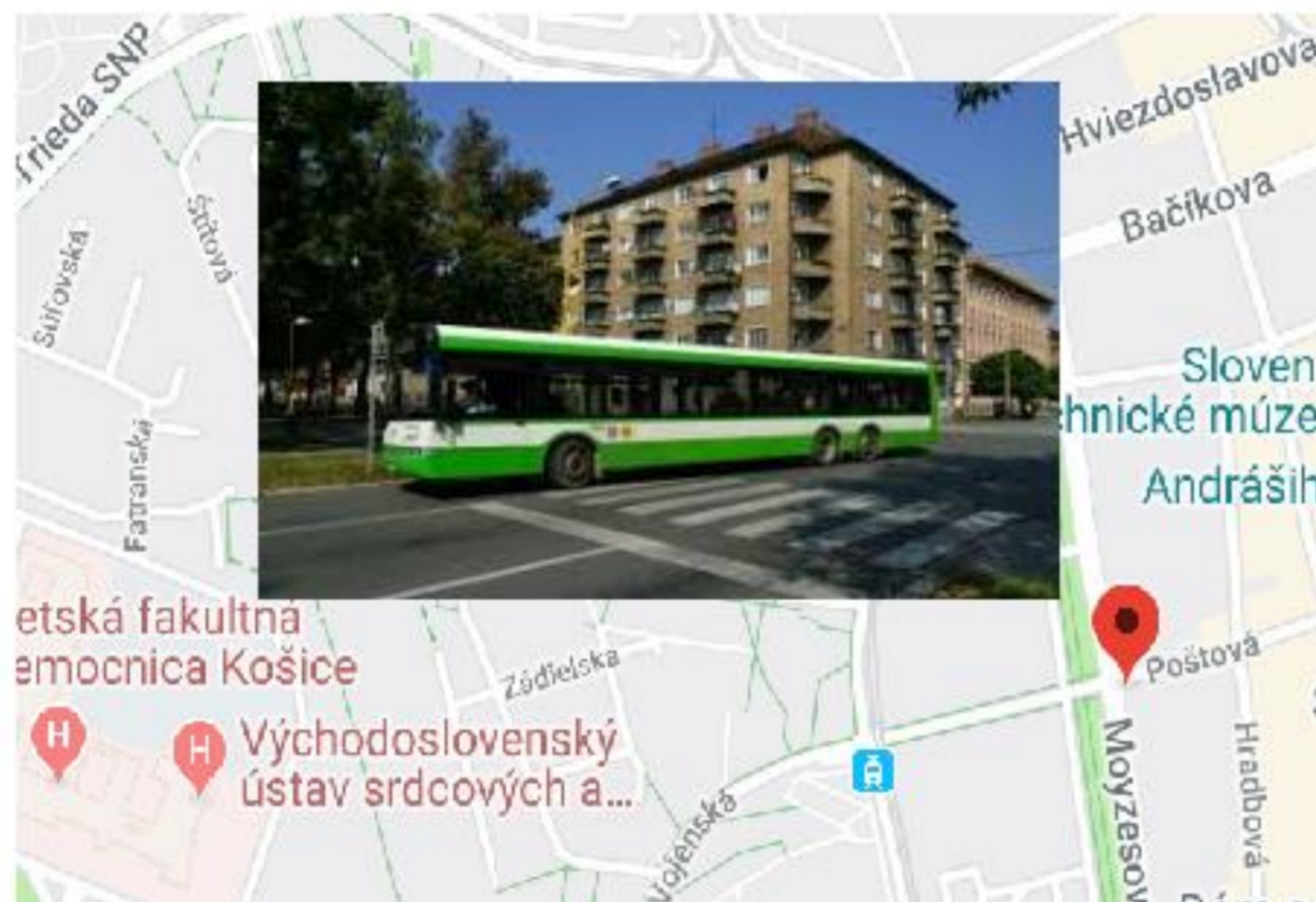
Eva Singovszká, Adriana Ešťoková and Marián Vertaľ

ABSTRACT

It is known that the highest contribution to the yearly radiation dose for population derives from natural radioactivity. About 50% of that is estimated to be caused by exposure to radon (Rn) and its products. Human exposure to indoor Rn is currently considered as a relevant research topic, because of the associated epidemiological aspects. This paper aimed at Rn concentration measurement in a selected building in Kosice city, Slovakia. The continuously monitoring of indoor radon levels was performed over a period of 40 days. The measured concentrations ranged in a wide interval up to 92 Bq/m³. The WHO limit value of 100 Bq/m³ wasn't exceeded.

MONITORED BUILDING

The sampling site was in building located in the downtown of Kosice – Postova Street (Figure 1). The construction was built in 1956 according to the project of architect Ferdinand Zbušek. At present, the building is a residential buildings with several apartments, reconstructed inside. The main bearing walls are original, as the building stands in a historic centre in a protected area and no major renovations were allowed here. Radon activity measurement was performed in an apartment at the 4th floor over a period of 40 days from 1.6.2021 to 9.7.2021. The apartment with an area of 74 square meters had two rooms, living room connected with kitchen, balcony, and bathroom.



METHODS

The measurements were performed under normal operation not excluding the presence and moving of inhabitants and the apartment was naturally ventilated most of the time during the measurement by a USB Radon Probe TSR 4M (Tesla, Czech Republic).

RESULTS AND DISCUSSION

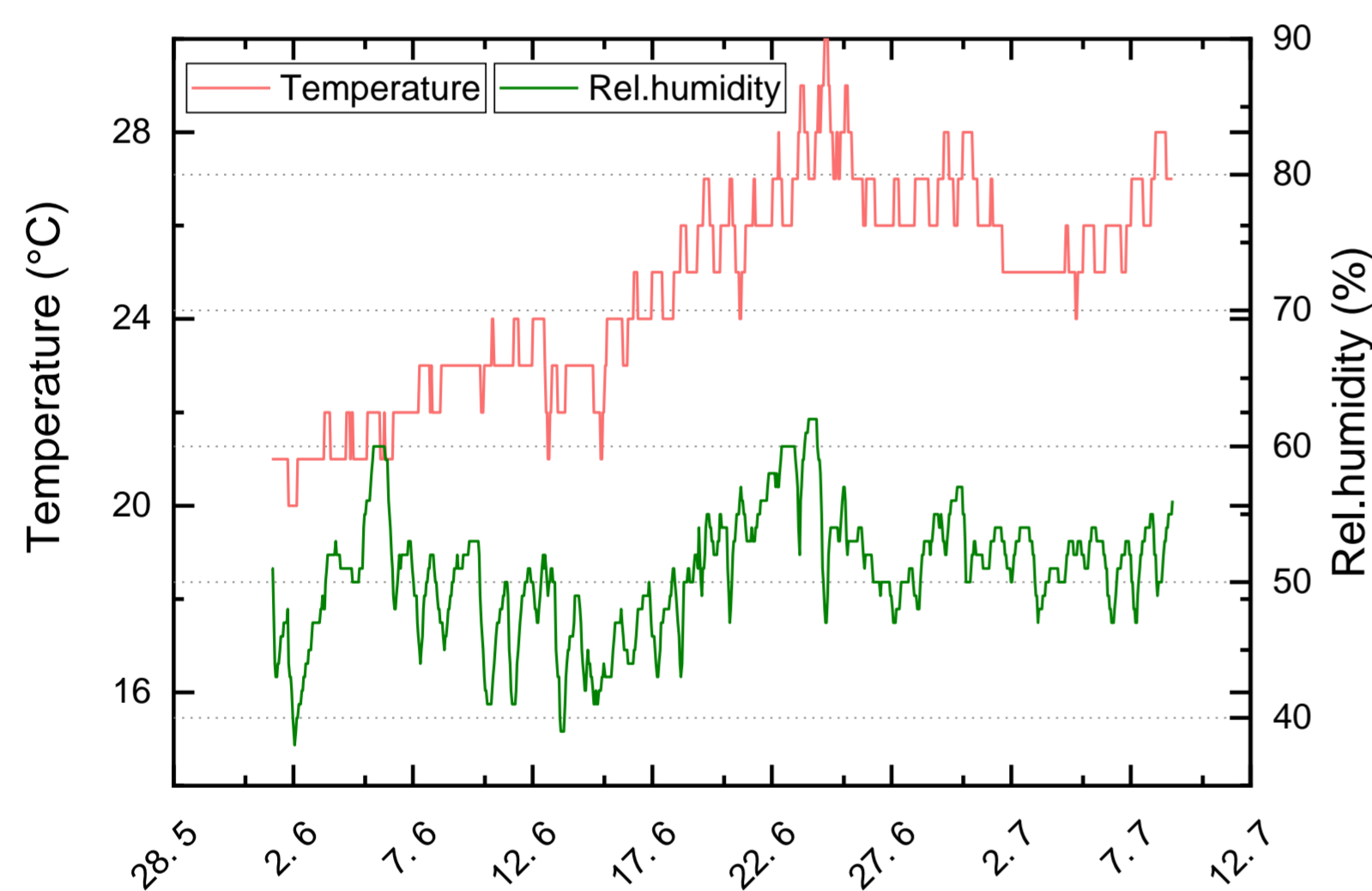


Figure 1. Trends in temperature and humidity during monitoring.

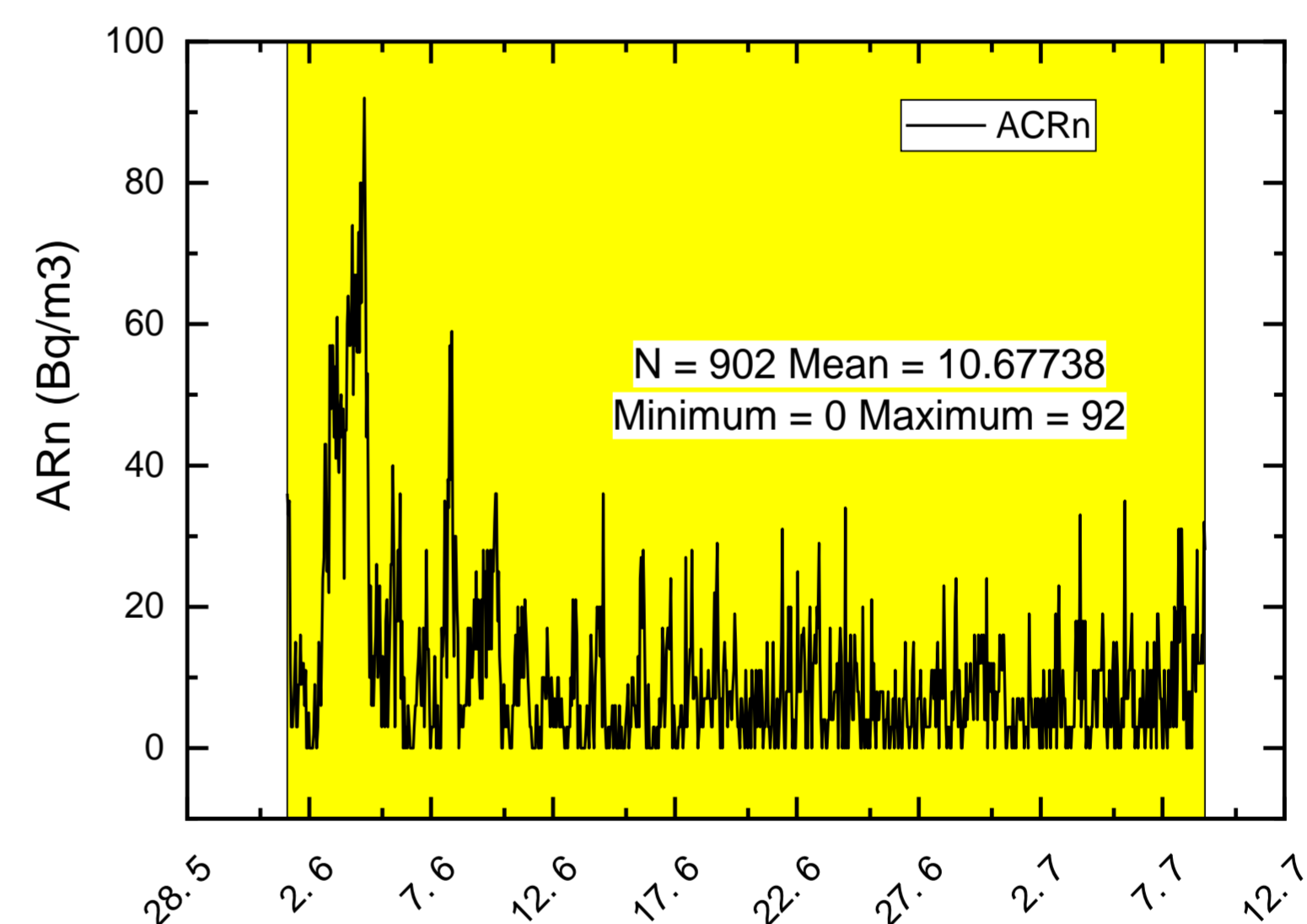


Figure 2. Measured radon volume activities.

The radon concentrations ranged from 0 to 92 Bq/m³ with an average value of 10.73 Bq/m³. Based on our previous monitoring of the building materials mass activities of the main radioisotopes, for the estimation of exposure due to the radon gas emanation from building materials, an alpha index I_α was applied, where A_{Ra} represents a mass activity of radium measured in the material. I_α in our study was calculated to reach the value of 0.05, which is significantly lower than the limit value.

$$I_\alpha = A_{Ra}/200 \text{ Bq/kg}$$

CONCLUSIONS

The radon limit value of 100 Bq/m³ recommended by WHO wasn't exceeded thus no significant health risk regarding the radon exposure was observed for the inhabitants in the monitored apartment. Considering the I_α found from the materials analysis, the average radon activity linked to the emanation from the building materials can be estimated at about 10 Bq/m³. This value, based on radium content in the materials strong correlate to the average value measured in the apartment. The maximum radon level of 92 Bq/m³ can likely originate from the other source, e.g. soil foundation.