RADON IN SCHOOLS AND DWELLINGS OF OSIJEK

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Indoor radon concentrations were measured in 10 821 pupils primary schools of Osijek by means of the Radhome silicon detector. The values ranged from 15 to 300 Bq/m³ with the arithmetic and geometric means of 93.4 and 70.6 Bq/m³, respectively. Ten years continuous radon measurements performed with the LR-115 nuclear track detector in three houses of different construction and town area gave means of 27, 96 and 23 Bq/m³; the indoor Rn concentration for a heating period was a factor of 1.5 higher than for the warm season. The average effective dose equivalent for the primary school pupils was 2.8 mSv/y (with occupancy factors of 0.6, 0.2 and 0.2 for home, school and outdoors, respectively). For citizens of Osijek it was 1.7 mSv/y.

In order to estimate a natural dose equivalent for citizens of Osijek (120 000 inhabitants, Eastern Croatia), as well as to point out possible locations of elevated radioactivity in air, radon (222Rn) activity concentrations were measured in dwellings, cellars and kindergartens. Measurements were performed by α-scintillation cells. LR-115 nuclear track detectors and Radhome silicon detector and gave average indoor Rn concentrations (C) in the dwellings and kindergartens of 40 and 47 Bq · m⁻³, respectively.

For similar reasons, radon measurements were undertaken for pupils in primary schools, a large young population spending nearly 6 hours a working day in school. Sixteen primary schools in the Osijek town with a total of 10821 pupils, aged from 6 to 14 years, were investigated.

During 10 years continuous radon measurements were performed in 3 different houses; the indoor C for a heating period (October–March) was near 50% higher than for a warm season, on the average.

Experimental

Radon activity concentration in air was measured with α-scintillation cells calibrated by means of a standard radium chloride solution. The sensitivity of the cells was in the region of 0.0022 Bq⁻¹ · s⁻¹ · m⁻³ and their background was from 0.5 to 1.5 min⁻¹. The
detection limit was from 16 to 30 Bq · m⁻³ for a sample measurement time from 15 to 60 minutes. This instantaneous method measures the Rn concentration by direct sampling of air into scintillation cell and subsequent counting in the laboratory. Continuous measurement of the C was performed by the LR-115 nuclear track detector in the bare and filtered states. The cylindrical detector cup, with a diameter of 9.6 cm and length of 9 cm, was covered with a filter paper of 0.078 kg · m⁻² surface density. Detectors were exposed for 2 or 6 months, then etched in 10% NaOH aqueous solution at 60 °C (333 K) for 120 minutes. Afterwards, detector tracks were counted visually using a microscope of (10 × 16) magnification. The sensitivity coefficient of the filtered detector was 33.5 Bq · m⁻³ · tr⁻¹ · cm⁻² · d with a track density background near 40 tr · cm⁻².

Radon and thoron concentrations were measured with the Radhome silicon detector (CEA, France), that operated in a regime of 100 pulses as a maximum during time up to 36 hours a pulse per hour corresponded to the activity of 50 Bq · m⁻³.