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The Particular Problem in the Measurement of Radon Decay Products

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Abstract The Measurement of radon decay products concentration in air has particular problem in two calibration factors: (1) Detection efficiency for a filter sample: It can't be determined by a standard source with a given activity of radon decay products because of the short life of radon decay products. A common α -standard source has to be used as a substitute. (2) Flow rate of air sampling: It should be measured by a flowmeter put on the downstream side of the filter to prevent the radon decay products (aerosol particles) from plate-out in flowmeter before filtering. So, the flowmeter should work in a lower pressure than the ambient air because of the pressure decrease through the filter, and it's readings have to be corrected. In order to accurately determine the calibration factors mentioned above, care has been taken on installation, adjustment, calibration and correction of the sampling and measuring system. A series of tests have also be made to confirm: (1) whether the detection efficiency is independent of the energy of α -particle, (2) the counting loss of the α particle with energy lower than that limited by the instrument threshold is negligible, (3) whether the counting efficiency is equal to the geometry factor. Consequently, the systematic uncertainty of the sampling and measuring system reduced to 2% and the random uncertainty (other than counting statistics) reduced to 1%. This system has been successfully used in our calibration and test facility for radon and radon daughters (RIUM radon chamber).