

# Evaluation of an early warning system for airborne radionuclides

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## Content

An early warning system for detection of increased levels of radioactivity in outdoor air were operative between 2004 and 2011 at the Swedish air sampling stations. The system consisted of a low resolution detector (NaI), positioned directly behind the filter and measurement of the accumulated radioactivity were performed continuously.

An evaluation of the data collected during the period (consisting of more than 200,000 spectra) is presented with emphasize on natural occurring radionuclides and their influence on the detectability of anthropogenic radionuclides. In addition, the stability of the system as well as difference between the stations are discussed.

Spectra were analyzed every 15 minutes and if the count rate increased significantly an alarm was raised. To determine the sensitivity of the early warning system both laboratory and field measurements with radioactive sources have been performed.

Three different measures for increased count rate have been studied and evaluated: total count rate, ratio between low and high energy regions and regions of interest corresponding to gamma energies of anthropogenic radionuclides.

The laboratory measurements have been compared with measurements at the stations and in particular the problem with short lived radon daughters accumulated at the filter during acquisition has been studied. The levels of radon daughters in outdoor air varies significantly in Sweden and a doubled or tripled count rate for the early warning system due to radon was common at the stations. The systems sensitivity for anthropogenic radionuclides is therefore dependent of the radon level in the air. Without any compensation for radon variance the system sensitivity ranges from 1 kBq to 100 kBq accumulated activity at the filter, depending on analysis technique and background of radon daughters. For the Swedish air filter stations with an air flow of about 1000 m<sup>3</sup>/hour this implies that an anthropogenic radionuclide concentration in outdoor air of 1 Bq/m<sup>3</sup> could be detected after some hours (if the radon levels are low). This corresponds to the concentration of anthropogenic radionuclides in ground level air in Sweden after the Chernobyl accident.

## About the Presenter

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