

Name of research institute or organization:

Section for Environmental Radioactivity
Swiss Federal Office of Public Health

Title of project:

RADAIR: An Automatic Network for Air Radioactivity Monitoring

Project leader and team:

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Pierre Beuret, Project leader

Project description:

In order to decide rapidly on protective measures for the population in case of increased radioactivity the responsible emergency authorities need a rapid and automatic air-monitoring network. Therefore the Swiss Federal Office of Public Health (FOPH) is operating an automatic national air radioactivity monitoring system. This network, called RADAIR, is a reliable instrument to detect rapidly and automatically any dangerous increase of radioactivity in the air. The artificial gross beta radioactivity is determined with a detection limit of 0.5 Bq/m^3 . 11 automatic monitoring stations of the type «FHT 59S» are operating at the following locations: Fribourg, La Chaux de Fonds/NE, Geneva (CERN), Sion/VS, Lugano/TI, Weissfluhjoch-Davos/GR, Vaduz / FL, Güttingen/TG, Villigen-PSI/AG, Basle and one at the **High Altitude Research Station Jungfrauoch**.

Gross Alpha and Beta radioactivity is measured continuously on aerosols collected on a filter tape and the artificial Beta radioactivity is calculated using the Alpha Beta compensation method. The measuring range is 0.3 to $5 \times 10^5 \text{ Bq/m}^3$ for 30 minutes sampling intervals. The data are transmitted every 30 minutes to the data center at the Environmental Radioactivity Section (SUER) of the FOPH at Fribourg University. If one of the pre-selected warning thresholds (1 , 5 and 30 Bq/m^3) is reached, alarm messages are produced, the highest of them (30 Bq/m^3) being transmitted automatically to the National Emergency Center (NAZ) in Zurich.

Three of the above mentioned locations (Fribourg, Lugano and Villigen-PSI) are equipped additionally with Iodine monitors of the type «FHT 1700» to measure the gaseous ^{131}I in the air (measuring range 1 to $5 \times 10^5 \text{ Bq/m}^3$). One location (Fribourg) is equipped with a spectroscopic monitor of the type «FHT 59N1» using a Ge detector to measure the isotopic composition of the air radioactivity. The minimum detectable activity for a 2 hours sampling and measurement period is 0.01 Bq/m^3 .

Aerosol Monitoring Station FHT59S at the Jungfrauoch

This aerosol monitoring station is, for two reasons, of particular interest:

- to detect artificial radioactivity in the air at high altitude,
- as the Radon concentration is very low at 3400 m a detection limit for artificial radioactivity as low as 100 mBq/m^3 is reached, i.e. five times lower than for monitoring stations in the rest of the country.

Gross Alpha and gross Beta radioactivity of the air is continuously measured and registered. The artificial aerosols radioactivity, i.e. the net Beta radioactivity is

calculated by the so-called α/β compensation technique. For this purpose a certain amount (based on an empirical compensation factor) of the gross Alpha activity, supposed to be natural, is subtracted from the gross Beta radioactivity.

For the Jungfrauoch station a detection limit for artificial Beta radioactivity of 100 mBq/m³ is reached. As shown in the histogram (Figure 1) below, which contains the results of December 2002, 90 % of the values are below 70 mB/ m³.

Due to extreme meteorological conditions at 3400 m, despite a powerful heating device, it happens from time to time that ice obstructs the air aspiration line (Figure 1). As a consequence the Mylar membrane breaks due to the partial vacuum within the line (Figure 2) and air from inside the building showing a higher Radon concentration than outside is collected and measured. Hence the measurements show abrupt increases which can not be compensated by the above mentioned algorithm unless the Mylar membrane is replaced. Remedial actions for this minor technical problem are on the way.

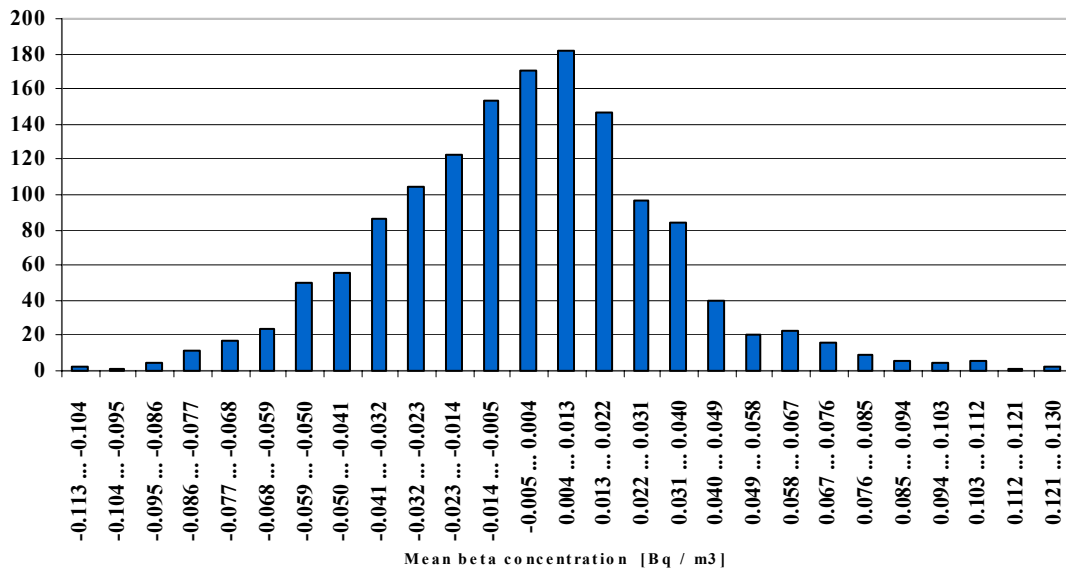


Figure 1: Net Beta radioactivity of the air at the Jungfrauoch Research Station in December 2002 (Histogram)

Due to extreme meteorological conditions at 3400 m, despite a powerful heating device, it happens from time to time that ice obstructs the air aspiration line (Figure 2). As a consequence the Mylar membrane broke due to the partial vacuum within the line (Figure 3) and air from inside the building showing a higher Radon concentration than outside is collected and measured. Hence the measurements show abrupt increases which can not be compensated by the above mentioned algorithm unless the Mylar membrane is replaced. Remedial actions for this minor technical problem are on the way.



Figure 2: Air aspiration device

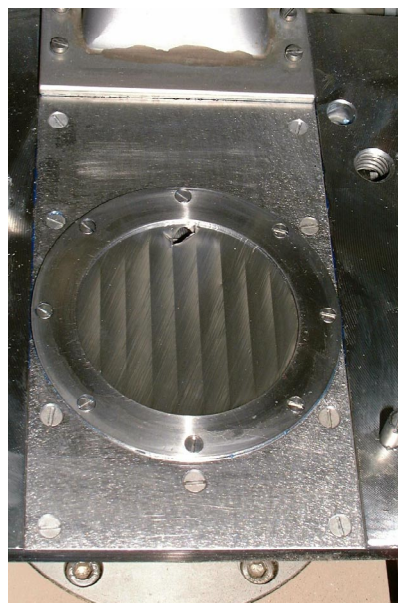


Figure 3: Mylar membrane

Key words:

Aerosol Air Radioactivity

Internet data bases:

Collaborating partners/networks:

H. Völkle, M. Gobet (Editors): Environmental radioactivity and radiation exposure in Switzerland 2001; Federal Office of Public Health, Bern, June 2002

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