

RadNose

Personal Inhalation Dose Monitor

- Personal Inhalation Dose Alarms
- Measurement of Alpha and Beta Aerosols
- Rejection of Natural Aerosols
- Built-In Quiet Pump
- Built-In Alpha Spectroscopy
- Data Logging
- 300 g only
- Battery powered
- Post Exposure Analysis Mode



For artificial airborne Alpha or Beta contamination inhalation is a much more serious risk than the threat from the corresponding external radiation field. Unlike external gamma fields, once you have inhaled radioactive material, it stays with you – even as you leave the area where you were exposed to it. Aerosol concentration can vary strongly from one location to another, therefore personal and multi-location monitoring is key in order to achieve maximum protection and asap warning. The RadNose Personal Inhalation Dose Monitor can detect airborne aerosols of high radiotoxicity at levels that are many orders below the detection capabilities of any other portable instrument. One isotope of concern is Am-241. This isotope is e.g. widely used in industrial gauges. A typical activity is 1.5 GBq (40 mCi) which corresponds to only 10 mg of Am-241. The related gamma exposure to the full amount of unshielded activity (1 m distance, 1 hour) would correspond to an external dose of 3 μ Sv (0.3 mRem) only. On the other hand, the dose related to the inhalation of a 10 million times smaller amount of activity (1 ng corresponding to 150 Bq or 4 nCi) yields a significant total dose of 6 mSv (600 mRem)!

How does the RadNose Personal Inhalation Dose Monitor work?

This light-weight pocket-size instrument is a full-blown spectroscopic aerosol monitor with a miniature pump and aerosol filter, a spectroscopic detector for Alpha and Beta analysis, a microprocessor and a optical and acoustic alarm indication. The filter accumulates the airborne radioactivity – just as the lung of a person exposed to the same atmosphere. Alpha-spectroscopy is mandatory for the purpose of the monitor, since ambient air is full of natural radioactive aerosols (Radon Progeny), which are many orders of magnitude less toxic than long living man-made radioisotopes like Americium, Plutonium or Strontium.

A Windows™ based configuration programm allows the supervisor to modify the preset dose rate factors, alarm levels and eventually the breathing rate of the wearer. Furthermore the spectral information can be downloaded for further analysis.

There are 2 different operation modes of the RadNose:

Online measurement during a mission: The air pump is switched on and the deposited radioactivity on the filter is permanently measured and analyzed with 2 counting times of 1 min and e.g. 60 min in parallel. The RadNose now operates as an aerosol monitor, calculates the inhalation dose for alphas and betas and alarms on pre-selectable dose levels.

Offline analysis after a mission: The pump remains switched off and the RadNose is transformed to a "spectroscopic sample changer". Because of the radioactive decay of the natural radioactivity on the filter, extremely low detection limits can be achieved and even very slight trace of airborne man-made radioactivity can be detected or excluded.

Dose related detection limits

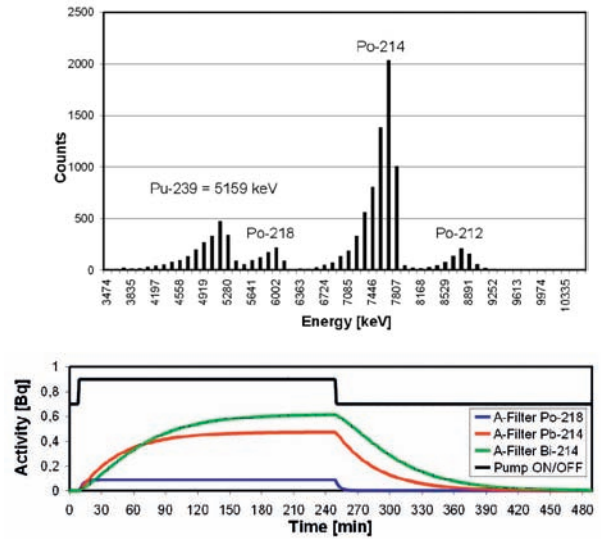
In the 1 min cycle the RadNose can detect a sudden exposure to hazardous aerosol concentration levels corresponding to about 4 mSv (400 mRem) for Alpha-emitters and 0,6 mSv (60 mRem) for Beta emitters. For the 60 min cycle a dose of about 0,2 mSv (20 mRem) for Alpha-emitters and 0,03 mSv (3 mRem) for Beta emitters can be detected. In the off-line mode with a measuring time of e.g. 8 h a inhalation dose as low as 4 µSv (0.4 mRem) for Alphas can be measured.

Interference from high gamma dose rate exposure

When used in high gamma fields, the alpha dose calculation will not be affected. However, the monitor will report a "false" beta dose of 1 mSv at a gamma dose rate of 100 µSv/h. Please note that the dose display will disappear again once the gamma exposure ends.

Monitoring alternatives

For personal dose monitoring the RadNose can be worn in a belt holster. For local air monitoring it can be temporarily placed near e.g. a ventilation outlet or at various representative locations in a building. Optional rf-transmitters allow the integration of multiple RadNose units into Thermo monitoring networks (View Point).



Size	138 x 57 x 32 mm (5.5" x 2.25" x 1.25")	Filter	0.8 µm PTFE for 1 month operation at normal dust conditions
Weight	300 g (0.7 lbs)	Housing	Aluminum, shock resistant, industrial grade
Display	Alpha numerical LCD 3 lines, 12 characters	Pump	Fixed flow rate 0.25 L/min (15 in3/min)
Control	One button soft key pad	Memory	Non volatile, 240 sequential ROI-records
Power	Rechargeable battery, 24 h operation (2 hours recharging)	Time base	Buffered real time clock (RTC)
Interface	Wireless infrared (IrDA)	Ambient conditions	Temperature / Humidity -10 to 50°C (50 to 122°F), 0 - 99% (non condensing)

User settings adjustable by Windows™ Software

- 2nd counting and data storage interval 1 to 255 min (preset to 60 min) for the Online Mode (unlimited time for Offline Mode)
- Independent alarm levels adjustable from 0.1 to 25 mSv (10 to 2500 mRem) for both Alpha and Beta dose: preset to 1 mSv ea.
- Breathing rate: preset to 8100 m³/a
- Dose conversion factors: preset to Pu-239 (47 µSv/Bq) and Sr-90 (0,15 µSv/Bq) according to ICRP 68

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