



U.S. Environmental Protection Agency RadNet CDX Manual

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RadNet Overview

RadNet is a national network of monitoring stations that regularly collect air, precipitation, drinking water, and milk samples for analysis of radioactivity. The network has been operating continuously since 1973 and has been used to track environmental releases of radioactivity from nuclear weapons tests and nuclear accidents and to document the status and trends of environmental radioactivity. Data collected by RadNet and more detailed information on the RadNet system can be found at <http://www.epa.gov/nare/radnet/>. Another source of RadNet data, including a searchable database, is <http://www.epa.gov/enviro/html/erams/>.

RadNet CDX Manual

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Air Monitoring

The RadNet CDX Web site focuses on air monitoring. Air monitoring stations are sited throughout the United States, designed to detect and record various types of airborne radiation. RadNet has been upgraded to provide near real-time monitoring, and EPA continues to expand the network each year. The RadNet air network uses two different types of monitors: fixed (stationary) and deployable (mobile).

1. *Fixed Air Monitors*: Permanently mounted and continuously operating, each fixed monitor contains a high-volume air sampler, gamma and beta radiation detectors, and a computer that controls the monitor and sends data to a central database at least once an hour. The individual detectors within each monitor can discriminate between different types of radiation, including those that are naturally occurring. See the left side of *Figure 1*.
2. *Deployable Air Monitors*: Deployable monitors are portable and can be used for exercises and for rapid deployment in response to real events. The monitors have high- and low-volume air samplers, a gamma radiation level monitor, a data logger, and telecommunication systems that send data to the central database. Although deployable monitors do not discriminate the energy of gamma radiation, they do provide gamma exposure rates. See the right side of *Figure 1*.



Figure 1: Fixed (left) and Deployable (right) Monitors

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Understanding the Data from the Fixed Monitors

Purpose of RadNet. RadNet is designed to provide information to decision makers and other professionals during radiological emergencies. During normal times, RadNet establishes and verifies background levels of radiation and documents any changes that might occur.

What Radiation Is Detected. RadNet fixed air monitors record gamma radiation from both natural and man-made gamma-emitting sources on the ground and in the air. Many forms of natural radiation – such as cosmic radiation and radon gas – fluctuate throughout the day in response to changing weather conditions. These daily and hourly fluctuations in radiation levels are normal.

Specific Radionuclide Detection. Although there are many radionuclides, each radionuclide emits unique radiations (energy), which can be used like a fingerprint to identify it. By studying the radiation energy spectrum, experts can discern which radionuclides are present around a monitor. To make the identification process more efficient, RadNet organizes the gamma energy spectrum into ten contiguous ranges, termed Regions of Interest (ROIs). The fixed monitors report total gamma detections (counts) within each ROI. By tracking the long-term changes of values within each ROI at each monitor, one can roughly determine the increase or decrease of radionuclides at a specific location. These fluctuations may be routine, or they may indicate an abnormality. To precisely identify radionuclides, scientists at NAREL download the entire spectrum and analyze it using additional software. This feature is not available on the CDX Web site.

Data for Most Users. For most users of the RadNet CDX Web site, comparing radiation values from one ROI of one monitor over time will provide the most useful information. Such data will track the long-term fluctuations within a specific energy range at a single location. Comparing values between different locations will not provide useful information – because each reading depends heavily on the natural radioactivity present in each location. Similarly, comparing the count totals within one ROI to the count totals in another ROI at the same location will not provide useful information; each ROI associates with a specific gamma energy range, and little can be understood by comparing the aggregate total of one range to that of another.

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Understanding the Data from the Deployable Monitors

As stated above, radiation levels routinely fluctuate from hour-to-hour and day-to-day. The deployable monitor provides the overall gamma radiation level near the monitor. These levels are expected to vary as they do for the fixed monitors. Typical fluctuations can cause the overall gamma radiation level near a deployable monitor to change by a factor of two or even more.

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