

Inexpensive, passive gamma-ray sensor



Overview

The RADTELL™ II gamma-ray sensor is a small, inexpensive, virtually passive hardware system designed for individual-item monitoring of radioactive materials. The system provides a method for maintaining 24-hour surveillance of stored radioactive items and recording any gamma-ray change. The system can be retrofitted into existing storage configurations and operated in either a fixed or mobile mode. Applications include nonproliferation monitoring, spent fuel safeguards, and long-term monitoring of stored radioactive wastes.

System Operation

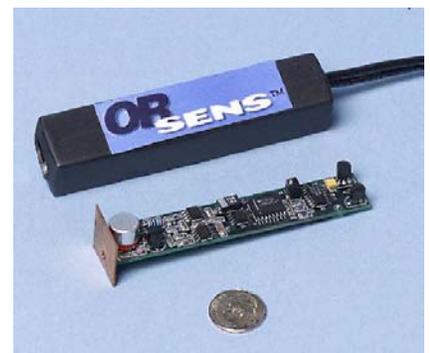
RADTELL™ II sensors monitor the gamma-ray emission from special nuclear materials (SNMs). The sensors are affected by source (SNM) distance, collimation of the source, and the SNM container thickness and material. The count-rate is maximized by placing the sensors as close as possible to the source.

Main elements within the sensor unit are a CdZnTe gamma-ray detector, a low-noise preamplifier, and a pulse-shaping amplifier. Signal levels can be selected by a pulse height discriminator, lower-level adjustment for precise gamma-ray energy band monitoring of uranium-235. The Surface Mount Technology (SMT) circuit board is designed for use with either a silicon-PIN photodiode or a CdZnTe gamma-ray radiation detector.

Pulses resulting from the photon interactions in the RADTELL™ II detector are produced at an approximate rate of 75,000 counts per second per R per hour. Filters in the pulse-shaping amplifier provide an impulse response having a pulse-width of 20 to 50 microseconds. After leaving the pulse-shaping amplifier, the output signals go to a pulse height discriminator where the discriminator lower level is adjusted to correspond to an energy peak of uranium-235 (98 keV) or plutonium-239 (130 keV). The gamma-ray energy band from either the calibrated uranium or plutonium peak to the highest energy from the Compton interaction pulses provides a sensitivity band with a precise region for monitoring either uranium enrichment or plutonium.

Features

- Gamma-ray attribute measurement of each item in storage
- Discriminator lower level adjustment to correspond to an energy peak of uranium-235 (98 keV) or plutonium-239 (130 keV)
- Automatic indication of system problems
- Pulse height discrimination of unwanted noise
- Standard transistor-transistor logic, pulse output



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