

Wireless Radiation Detection

A low cost, low power, miniature radiation detector capable of energy discrimination and Bluetooth output can be used in applications as diverse as environmental monitoring, security systems and healthcare.



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Energetic Particle Detector (Karen Aplin)

Radioactivity detectors are widely used in society to ensure safe levels of human exposure to potentially dangerous radiation are maintained. Measuring radioactivity in the atmosphere is also of great interest to researchers as its effects on the lower atmosphere are currently poorly understood.

Ionising radiation is abundant in the Earth's atmosphere, originating from both natural and synthetic sources. Radiation detectors, which measure ionising particles such as gamma, X and cosmic rays, are crucial to maintain human safety in settings such as research laboratories and in the environment, however Geiger counters are limited by their inability to determine the energy of the radiation present.

Dr Karen Aplin has successfully produced a radioactivity detector using a scintillator sensor and PiN diode that uses novel circuitry, making it smaller (~100g; 11 x 6 x 3 cm) and more affordable to produce than the traditionally used Geiger counter. The device is also able to provide energy discrimination of incoming particles. Furthermore, Bluetooth technology allows this

device to link to a phone or a computer generating a more convenient way to monitor radioactivity levels. These detectors show promise for environmental radioactivity measurements. Unlike many solid-state sensors, the device runs at ambient temperature and low voltage (12V) and is able to measure count rates, analogous to a Geiger counter, but is also able to identify the different energies of incoming particles.

Dr Aplin's research interests are in instrumentation for, and electrical processes in, atmospheric and space physics and she has seen an increased interest within academia in the effects of radioactivity on weather and the climate, as little is understood about the effects of energetic particles in the lower atmosphere. Cosmic radiation may have a small effect on the weather, hence monitoring this type of radiation may provide crucial data. Elevated levels of radiation, from cosmic rays or during space weather events can also lead to short-term malfunctions in electronics. This is particularly important in electronic equipment at high altitudes such as satellites and aeroplanes.

Further development of this technology is currently underway to utilise this detector on specialist weather balloons for environmental radioactivity measurement. There is also interest in the device for use in radiation dosimetry in healthcare workers or as a radiation hazard warning device, which could be incorporated into clothing or building materials. The device is versatile and can be produced with different interfaces, e.g. Bluetooth or USB, depending on the user's requirements. It is supplied calibrated for count rate, like a Geiger counter, with a full energy calibration available on request.