

WHO SAY'S THE SKY'S THE LIMIT?

Working in partnership with the team from Bristol University, we broke the mold with old fashioned Radiation Detection and headed to the skies of Japan.

Summary

To take radioactive measurements of the area surrounding the Fukushima Power Plant, the team at Bristol University solicited the help of Kromek to develop an aerial solution, keeping people out of harms way whilst still obtaining the necessary data. Easily mounting the light-weight and small form factor detectors GR1, SIGMA 50, TN15 and GR05 preamps to drones on various drone flights, in combination with their own mapping software, the team were able to generate accurate 3D maps of the area being surveyed. This has also been achieved in Sellafield and areas around Chernobyl.

Using Kromek detectors to develop flying radiation drones!

The initial idea for aerial mapping of radioactive sites came after the radiation leaks at the Fukushima Daiichi Nuclear Power Plant in Japan following the magnitude 9.0 earthquake and tsunami that hit Japan on 11 March 2011. A team at [Bristol University Interface Analysis Centre](#) saw that the initial radioactive measurements of the area around the disaster were taken by hand, which put the people doing the work in harm's way. The Bristol team led then began to investigate if a flying drone could be used to examine an area for radioactivity.



Radiation map of nuclear storage site, Fukushima

There are many benefits of using a drone to map the radiation levels of an area:

- it keeps humans out of the way of the radiation and other dangers;
- a drone can be deployed very quickly in times of crisis;
- it does not need a radiation specialist to operate as the analysis can be done off-site;
- the size of the drone allows it to be deployed where space is an issue, for example, it can be flown into a structure;
- it is cheaper to fly than an aircraft, and it is very flexible in the way it can be used;
- the drone can be programmed to repeat a search pattern allowing measurements to be built up over time and compared to previous readings;
- it also opens the possibility of using detectors on autonomous drones to automatically patrol a location.

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You need radioactive detectors that are light and powerful for drone flight

There are obvious issues and limits inherent in using a flying drone. The space available in the payload unit is limited, every gramme counts and no power can be wasted. The project needed a small, lightweight, accurate gamma radiation spectrometer with low power requirements so its use did not impact the drone flight time. The Bristol team started by using the [Kromek GR1 gamma spectrometer on the drone](#). The GR1 is a high-performance high-resolution room temperature gamma-ray spectrometer utilising a CZT detector. It is completely self-contained, with built-in preamplifier, shaping amplifier, baseline restorer, pulse height digitiser, and HV supply. The unit is powered entirely from the USB bus, so no external power supply is needed. All of these Kromek detectors have been mounted on drones and used for aerial mapping of sites: [GR1 CZT gamma spectrometer](#), [Sigma 50 scintillator](#), [TN15 room thermal neutron detector](#) and GR05 preamps.

Bristol is using its own analysis software, as well as their own mapping software to develop 3D maps of the area being surveyed.

It is the perfect example of how cadmium zinc telluride (CZT) and Kromek expertise is helping to find new ways to use and deploy radiation detectors.

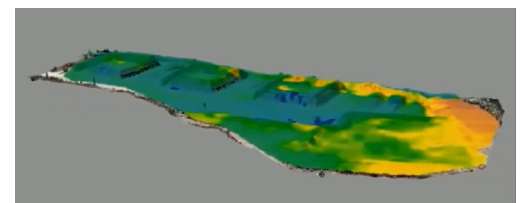
“Kromek detectors were a good solution for the drone. They had the measurement capability we needed in a size that could fit into the payload bay, without having a major impact on the flight time of the vehicle.”

Dr Peter Martin, Bristol University



Where have the drones been deployed?

The drone has been deployed in numerous sites across the globe including the Fukushima area in Japan, Sellafield nuclear fuel reprocessing and nuclear decommissioning site in the UK, the area around the Chernobyl nuclear site in Ukraine, old tin mines in Cornwall UK (an area of high naturally occurring radiation) and various other sites around the globe where nuclear material is stored. Since the initial testing, the drone design has changed, from a six-armed hexacopter to an octocopter with eight rotors which increases power and stability. A ground RadRiver has also been developed.



Radiation map of radioactive soil storage site, Kawamata, Japan

From a research project to a thriving business!

This work led to the creation of IMITEC, a University of Bristol spin-out company that is focussed on developing and manufacturing novel methods for detecting, characterising and mapping radiation. Kromek now sell the complete IMITEC drone radiation mapping and monitoring package, which includes all the material you need including flying training.