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**A Portable Quantitative High-Resolution Gamma System for In-Situ Waste, D&D, and  
Emergency Measurements - 18573**

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**ABSTRACT**

The Canberra ISOCS system has been a highly successful and technologically innovative product since its introduction about 22 years ago. The combination of field-portable HPGe detectors, flexible shield/collimator set, and accurate mathematical efficiency calibration software made in-situ gamma spectroscopy measurements very practical. Good quality in-situ measurements are economically beneficial for items that are either large or complex, in comparison to the cost, time and impracticality of extracting a sample for laboratory measurements or producing representative calibration standards. And where the item is not homogeneous [most of the time for in-situ measurement situations] an assay of a large part of the item has been shown to be more accurate than a few widely dispersed extracted samples [the normal case]. However the size, weight, cost and complexity of the full-size ISOCS system limit its usefulness in some situations. A companion device was recently introduced, and is the subject of this document. The gamma sensor is a 1 cm<sup>3</sup> CZT detector. It is surrounded by an optional tungsten shield/collimator set with a tripod for support. The detector is powered solely by a USB connection from a laptop PC. The full power of the ISOCS efficiency calibration software can be used with this detector. This entire package is less than 15kg, needs no cooling, and is quite rugged, in comparison to the 120kg for ISOCS with sensitive HPGe detectors which need Liquid Nitrogen or electro-mechanical cooling. Furthermore this CZT package is about 1/3 the cost. This is a very complementary device for the many current ISOCS users, especially for quick initial evaluations or simple situations where the full energy resolution and sensitivity of the HPGe ISOCS are not needed. Operating nuclear power plants or those in the initial phases of decommissioning are prime examples. Their complex layout often precludes the deployment of the full-sized ISOCS system, whereas the CZT system can be hand-carried there and very quickly setup for a measurement. The small detector size, and therefore low efficiency, is not a disadvantage, and in many cases is an advantage due to the elevated radioactivity of the items. This can be used to assay items in tanks, spills on floors, activity on filters, waste or items in small containers, and waste in drums. In the event of an emergency, it can be quickly deployed to measure gas or liquid effluent streams, air particulate and iodine filters in the field, or even in-vivo thyroid activity. Examples of measurements at nuclear facilities are shown and discussed in further detail, along with estimated detection limits.

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