

# TAWARA\_RTM: A complete platform for a real time monitoring of contamination events of drinking water

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## Abstract

The security of drinking water is increasingly being recognized as a major challenge for municipalities and water utilities. In the event of a contamination, water spreads rapidly before the problem is detected. Significant drinking water contamination events pose a serious threat to public and environmental health. Today's laboratory-based contaminant testing systems coupled with the current practice of the use of contingency plans are impractical for daily monitoring usage. They operate too slowly for incident control and prevention since the full extent of the event can be rarely determined timely for efficient mitigation measures.

## The system

- TAWARA\_RTM platform will offer a system for real time on-site monitoring and it will be a three-device inspection system:
- early warning device to monitor a significant change of the radioactive content of the water (EAD);
  - fast alarm device for crossing thresholds that require rapid actions on the tap water distribution system (RTM);
  - spectroscopic investigation to determine the type of contamination and decide the appropriate and effective countermeasures (The determination of the contaminants is needed to establish the effects on the population and produce a full information report to the Civil Security Authorities) (SPEC).
  - ICT Infrastructure: to control the operated devices, to collect data from the diagnostic systems and to manage the alarms.

## TAWARA\_RTM installation at MPWiK North Waterworks Plant in Wieliszew



## Introduction

The system, within the TAp Water RAdioactivity Real Time Monitor (TAWARA\_RTM) project, EU-funded, provide a real time measurement of the activity in the water (measuring the gross alpha and beta activity) to verify whether the distributed water is far from the limits set by the EU legislation reaching thresholds that require rapid actions. TAWARA\_RTM is a continuous inspection system of water processed at water treatment sites and enables instant reaction upon detected radiological threat. Occurrence of such an event could result in long term shutdown of the treatment site and would require to carry on costly decontamination procedures, unless immediate action is taken.

## The method

The early warning is achieved by the Early Alarm Detector which is built using a large volume NaI:TI. The fast alarm device is the Real Time Monitor (RTM), a detection system for gross alpha and beta radioactivity, which is continuously monitoring the water quality. The water flows through the RTM device where a potential alpha or beta emitter will induce scintillation light in the detector foils. If the RTM or the EAD detector count rate exceed the background threshold level, an alarm flag is set and the spectroscopy investigation step, the SPEC, will start, with the aim at identifying the radioisotopes using gamma-ray spectroscopy. The SPEC detector comprises a 74 mm diameter and 76 mm height cylindrical purified raw material CeBr3 scintillator coupled to a spectroscopy photomultiplier and an active anti Compton shield. In order to reduce the measurement time, a concentrator based on selective ion-exchange resins is placed close to the detector front face.

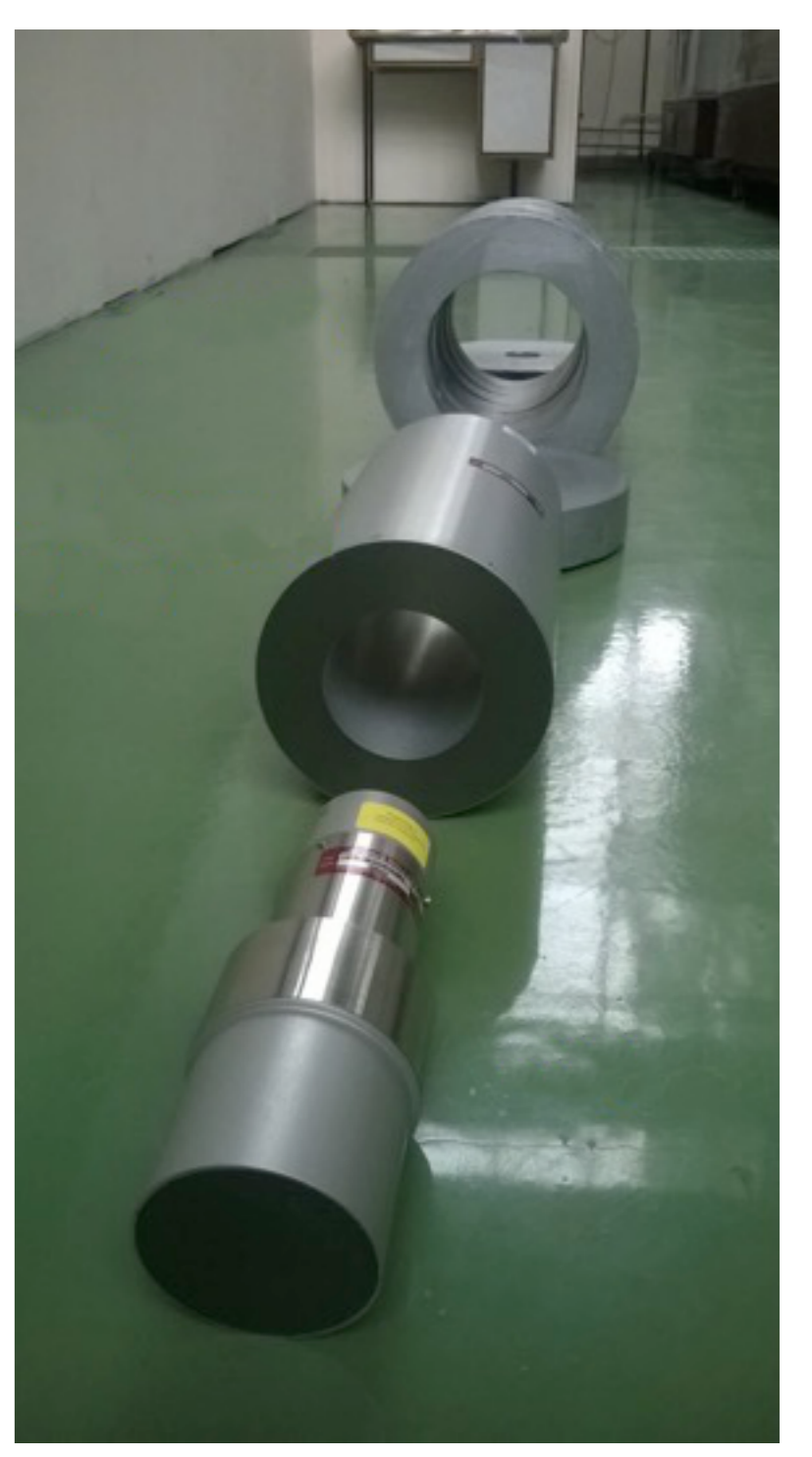


Figure 2. SPEC: (From the top) Lead Shield, Anti Compton Shield, CeBr3 detector.

## ICT Infrastructure

To control the operated devices, to collect data from the diagnostic systems and to manage the alarms.

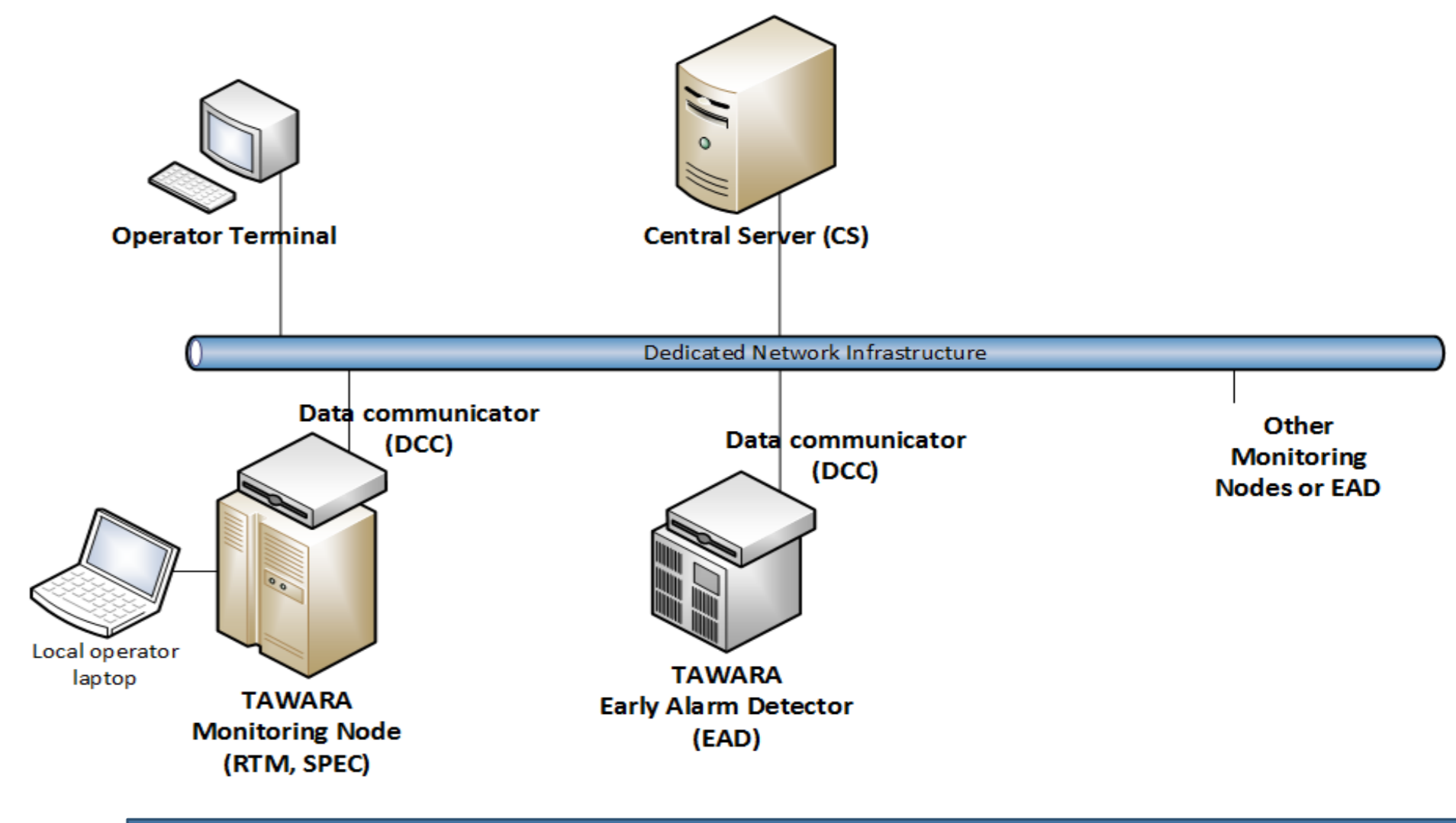


Figure 1. RTM Single Module.

## Results of calibration tests at ENEA

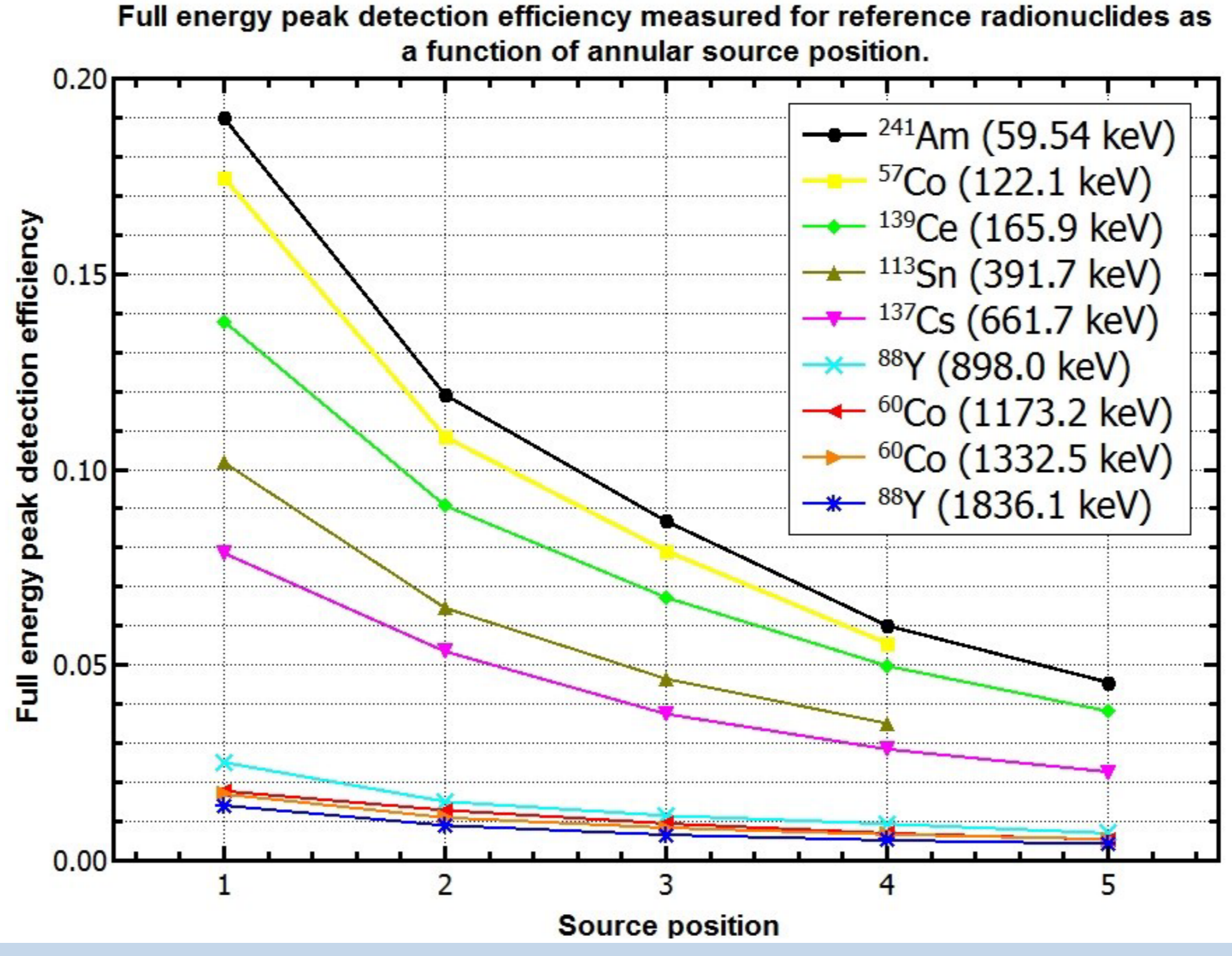
RTM detection efficiency

### Counting efficiency values for the whole RTM measured with selected reference alpha and beta emitters

Source	Counting efficiency (cps/(Bq/kg))
<sup>241</sup> Am	0.01046(32)
<sup>60</sup> Co	0.623(58)
<sup>40</sup> K	0.379(13)
<sup>90</sup> Sr	1.059(74)
<sup>18</sup> F	0.439(3)

## Results of calibration tests at ENEA

SPEC detection efficiency



## Conclusions

- The TAWARA\_RTM platform has been designed, developed and installed in Waterworks Plant.
- The RTM detector sensitivity is at the level of 0.01 cps/Bq for alpha particles and 0.4-1.1 cps/Bq for beta particles.
- The SPEC allows for identification of <1 Bq within 1 hour.

## Acknowledgment

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