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COMPACT RADIOACTIVE AEROSOL PARTICULATE MONITORING DEVICE FOR EARLY WARNING NETWORKS

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Content

In a radiological emergency, early and reliable knowledge of radioactivity concentrations in the air, the assessment of contamination levels in the environment and the dose rate levels in urban areas are of key importance for organizing of efficient countermeasures for protection of the general public from the dangers arising from direct external radiation and from intake of radioactivity by ingestion or inhalation of contaminated food or air. Therefore in 2014, a 3-year EMRP joint research project Metrology for radiological early warning networks in Europe (MetroERM) has been launched, with the aim to improve, optimize and harmonize the metrological foundation of measurements of ambient dose equivalent rate, radioactivity concentrations in air and ground contamination levels in real-time. The aim of this JRP European metrology is to improve the capacity of the early warning networks also by the development of new methods and systems for rapid radioactive air concentration measurements, to efficiently supplement global early warning data with accurate information on airborne radionuclide content. With the development of new modular air sampling systems which can be easily transported to locations for the detection of airborne radioactive particulate the information content provided by early warning networks in real time will be considerably increased. At JSI a novel aerosol sampling device was developed which incorporates a centrally oriented 1 inch CeBr3 scintillation detector, with ~4% FWHM energy resolution at 662 keV, within a concertinaed filter assembly and an improved air pump with stable flow rates up to 200 m3/h which enables low level airborne radioactivity detection. The sensitivity is additionally boosted by careful scintillator choice which has far better energy resolution compared to alkali halides and far lower intrinsic radioactivity than LaBr3. A fully digital signal processing unit was developed in-house, with a 10 bit MCA, which is more than sufficient to achieve the detector energy resolution limits. The temperature compensation is handled on the software side by a microcontroller-based system connected to a digital thermometer that is in good thermal contact with the detector. The same microcontroller unit is used to handle the user interface, via a 5 inch color touch screen and handles all inputs/outputs (I/O), including 3G network communications. The system provides continuously sensitive on-line airborne radioactive particulate monitoring for field station use. Advantages of the system are:

- a compact radioactive aerosol particulate monitoring device with high flow rate incorporated in a heavy duty portable case which is easily transportable to different measurement locations;
- prompt and continuous online detection and 3G networking to enable data relay to a centralized system from remote field stations for evaluation of gamma emitting radionuclides in spectra;
- remote control of the unit settings and functions;
- increased frequency of data transmission during a nuclear emergency enabling remote analysis of plume deposition.

The compact radioactive aerosol particulate monitoring device for early warning networks and first measurements will be presented and discussed.

About the Presenter

Denis Glavič-Cindro works at Jožef Stefan Istitute in the field of radionuclide metrology and measurements since 1994. She is mostly engaged in high resolution gamma ray spectrometry and since 1999 she regularly and active participates at ICRM and ICRM LLRMT conferences with posters or oral presentations. Beside this her main fields of activities are quality assurance, maintaining quality system in the accredited laboratories dealing with radioactivity measurements at Department F-2 at Jožef Stefan Institute, evaluation and participation in comparison measurements...

She is representative of Jožef Stefan Institute at International Committee for Radionuclide Metrology and contact person at Technical Committee for Ionising radiation (TC-IR) at EURAMET, both since 2011.

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