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Holistic smart products for nuclear security

Radiation detectors with fully integrated digital readout and Power-over-Ethernet (PoE) connectors enable a whole set of new applications and services. In this paper, neutron and gamma detectors will be presented which are read out by low-power Silicon Photomultipliers (SiPMs) that allow for long autonomy from mains power supply when deployed in the field. This is especially needed in applications where detectors are mounted on unmanned vehicles or drones, or in applications where networked devices are mounted to cars or relocatable detection systems.
The Power-over-Ethernet connector allows direct addressability of each detector by its IP address when several detectors are networked. This information flows into smart software solutions which take advantage of this feature to adjust machine learning algorithms. If GPS is also provided then a simple mapping of an area is obtained within a short timeframe.
Such rapid situational awareness is especially useful in case of a CBRNe incident or for intelligence services to get a clear picture of a site or environment. The information can also be provided to smart city networks.
The presented software ensures that limited training of operators is needed, which has an impact on the cost of an exercise. In addition, as PoE based radiation detectors are designed to be networked, all information can flow into an on-site or remote central alarm station where appropriate measures are taken to react in case of an alarm or anomaly.
The SiPM readout allows the presented gamma detector to be thinner then 2 cm and widely scalable in width. This feature is interesting for applications where limited space is available, for example for airports where the detectors can be integrated into existing layouts and walls to monitor passengers or luggage.
In addition to the many advantages fully digital radiation detectors provide during operations, PoE also allows simple plug and play maintenance concepts which will be presented in this paper.

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