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Low cost gamma and neutron radiation sensors for real-time cask monitoring

A low-cost array of modular sensors for online monitoring of radioactive waste was developed at INFN-LNS. We implemented a new kind of gamma counter, based on Silicon PhotoMultipliers and scintillating fibers, that behaves like a cheap scintillating Geiger-Muller counter. Front-end electronics and an FPGA-based counting system were developed to handle the field data, also implementing data transmission, a graphical user interface and a data storage system. Tests in a real radwaste storage site have shown quite encouraging results.

We also developed a low-cost technique for thermal neutron detection not making use of ^3He , also suitable for online real time monitoring of spent fuel casks. As a neutron converter we used ^6LiF , being the neutron capture cross section of ^6Li very well known and with only an alpha and a triton in the exit channel. We can deposit wide and thin layers of converter onto several different substrates, to be placed on top of solid state detectors or scintillators capable of efficiently detecting the decay products. Tests with neutron sources and with neutron beams have proved the full feasibility of these sensors.

A combination of several units of the aforementioned gamma and neutron detectors can be exploited for spent fuel cask monitoring in place and/or during transportation, in order to contribute in the assessment of possible cask ageing with radiation loss, and to prevent possible cask tampering by ensuring the continuity of knowledge.

Battery-operated versions of the sensors, with wireless data transmission, are currently under development.

Country/ int. organization

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