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A Novel Approach for Monitoring Highly Active Wastes

A realistic and reliable monitoring of Highly Active (HA) wastes and infrastructure is one of the most important challenges currently facing the nuclear industry. Despite the constraints and potential dangers imposed by high intensity radiation, there exists an increasing necessity to monitor HA environments in nuclear reprocessing and decommissioning. Gamma imaging has already been proven to be a very successful tool for monitoring medium activity (MA) infrastructure. However, the radiation fields in HA facilities can be thousands of times more intense, and therefore far more harmful both to human resources and sensitive equipment. Monitoring HA environments through gamma imaging remains a technologically challenging area. Inspired by the challenge of the Fukushima-Daiichi accident and given our previous experience regarding MA monitoring through gamma imaging, we have set out to develop a novel imaging system for HA environments. In this report, we provide original results on detector dynamics in high radiation fields and a new approach to HA inspection and monitoring. More specifically, we describe the results of a feasibility study regarding the development of a gamma camera for HA environments with radiation intensity up to 10,000Gy/hr. The development of this lightweight and rapidly imaging gamma camera includes a novel coded aperture imaging approach, a minimal use of electronic components, and an appropriate choice of materials and readouts. This Japanese government funded project is primarily intended to help identifying radioactive debris at the Fukushima establishments and due to its encouraging and pragmatic results, it is expected to have significant applications regarding the surveillance, monitoring and decommissioning of ageing nuclear power stations.

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