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Portable African Neutron-Gamma Laboratory for Innovative Nuclear Science

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iThemba LABS has pioneered a mobile gamma-ray detection unit[1] which allows a user to operate in the field and chart the location, strength and energy of gamma radiation. The system incorporates a sensitive scintillation detector[2] typically used for accelerator-based spectroscopy at the SSC laboratory and was integrated into a backpack incorporating a fast 125 MHz digitiser for readout and a GPS enabled Raspberry Pi microprocessor system, allowing in situ measurements of radiation around the Cape Town site, with collected data streamed to the cloud and analysed offline. After conducting a series of rollout radiation measurement tests at Faure site, iThemba LABS has successfully used the gamma-ray detection system in collaboration with local and regional institutions to take radiation monitoring measurements from calibrated sources in the field, including radiation measurements tests conducted at Kruger National Park and at mining areas both in South Africa and in Botswana. It has also been used in the commissioning of the SAIF facility monitoring the performance of the water-cooling circuits.

The Portable African Neutron-Gamma Laboratory for Innovative Nuclear Science (PANGoLINS) project aims to investigate measurements of both gamma rays and neutrons which forms an important component part on site or in transit and the detection of both fissile material for the use in decarbonised energy sources or disposal thereof. A core component of the project is be to miniaturize the weight of the gamma ray detection device and associated infrastructure so that it can be loaded on an unmanned aerial vehicle to enable access to, and enhance performance of radiation monitoring measurements at remote sites leading to autonomous operations.

PANGoLINS incorporates commercial detector assemblies of LaBr3(Ce), SrI2(Eu) and/or CLYC(Ce) for spectroscopy. In addition, the project encompasses the instrumentation of other scintillation detectors with silicon photomultiplier technologies. The coupling of these to readout devices such as high density ADC readout are planned for applications for nuclear science, medical imaging or astronomy.
An overview of the project, its progress and potential outcomes will be presented.

References
[1] Jones, P. et al., IEEE Nuclear Science Symposium (2023) doi: 10.1109/NSSMICRTSD49126.2023.10338129
[2] Msebi, L. et al., NIM-A. 1026 (2022) 166195, doi: 10.1016/j.nima.2021.166195

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