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Development of a digital data acquisition system for neutron metrology

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Fast neutron fields are found in a wide variety of contexts, for example at accelerator and medical radiation facilities, around nuclear power plants, in aviation and space flight. The essence of neutron metrology is to quantify both the fluence and energy of these fields, which is complicated by the large range of energies, intensities and directional characteristics in each unique scenario [1]. Neutron metrology and spectrometry communities are beginning to adopt modern digital pulse processing systems to complement, and eventually replace, the existing analogue data acquisition systems [1,2]. Digital pulse processing electronics offer several distinct advantages over the existing analogue systems, with a need to rigorously benchmark against the current metrology standards prior to deployment [3].

The standard analogue data acquisition system at the AMANDE fast neutron metrology facility [5] at the IRSN, is compared to a new digital system comprised of a CAEN DT5730 digitizer and the open source QtDAQ software [4]. Measurements were made using a BC-501A scintillator detector for neutron fields with energies between 1.2 MeV and 20.0 MeV over the full range of available beam currents at AMANDE. Uncertainty budgets were constructed and compared for the measurements of energy dependent neutron fluence. The results of the comparison are presented along with recommendations for measurements with a fully digital acquisition system in contexts where metrological considerations are critical.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

Primary author: SOLE, Chloé (University of Cape Town)

Co-authors: BUFFLER, Andy (University of Cape Town); HUTTON, Tanya (University of Cape Town); Dr LEADBEATER, Tom (University of Cape Town); Dr GRESSIER, Vincent (IRSN); Dr BABUT, Richard (IRSN)

Presenter: SOLE, Chloé (University of Cape Town)

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