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(CANCELLED) A study of radiation damage in the on—detector electronics of the ATLAS detector using a (p,n) nuclear reaction in the Van Der Graf tandem linear accelerator at iThemba LABS, Gauteng

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Semiconductor materials, such as silicon (Si) and germanium (Ge) form an important part in modern electronics. From these materials, far—reaching electronic devices, transistors and diodes for instance have been realized. The application of these devices span a wide spectrum, from domestic to research (in particle accelerators and detectors, such as the large hadron collider (LHC) and ATLAS, respectively). Particle accelerators are usually areas of considerable doses of nuclear radiation. This means the on—detector electronics of the ATLAS are constantly subjected to high doses of nuclear radiation from the proton—proton collisions at the LHC. Because interaction of nuclear radiation with matter can change the: mechanical, electrical and chemical properties of a material, thereby affecting the long—term performance of the on—detector electronics, transistors, for instance, it is important that a detailed understanding of the performance parameters of the on—detector electronics measured against various nuclear radiation dose and energy exposures is established. In this paper, we propose a method to study the effects of large radiation dose damage on the ATLAS on—detector electronics. We will recreate the radiation conditions at the ATLAS using neutrons generated through suitable quasi mono—energetic neutron sources, using the 7Li(p,n)7Be nuclear reaction or the more prolific source from the 9Be(p,n)9B nuclear reaction in the tandem accelerator facility at iThemba LABS, Gauteng. Together with this reaction, a Monte—Carlo program, such as MCNP will be used to establish a detailed understanding of neutron damage in specific semiconductor structures.

Presenter: KHUMALO, Thokozani (University of the Witwatersrand)