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Towards an ISO-accredited fast neutron beam facility at iThemba LABS

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iThemba Laboratories for Accelerator Based Sciences (LABS) is a national facility and one of business units of the National Research Foundation (NRF) in the Republic of South Africa (RSA). It is a multidisciplinary research facility that is based on the development, operation and use of a number of particle accelerators and related research equipment. The largest accelerator at the facility, a K=200 separated sector cyclotron (SSC) powered by two solid-pole injector cyclotrons (SPCs) could accelerates protons to energies of up to 200 MeV and heavier particles to much higher energies.

Over the years, the iThemba LABS fast neutron beam facility has been developed to a unique status with respect to the production of nearly monoenergetic ns-pulsed neutron beams ranging between 30 MeV and 200 MeV. Other available neutron beam facilities with energy range similar to this facility are described in details by the EURADOS (European Radiation Dosimetry) Report [1]. With protons beams available from the SSC, quasi-monoenergetic neutron beams at iThemba LABS can be covered almost continuously via (p,n) reactions using ^{7}Li and ^{9}Be targets of varying thicknesses [2]. We are presently upgrading the facility with the aim of achieving ISO-accreditation as a fast neutron beam reference facility. This came about as a result of the facility being designated by the National Metrology Institute of South Africa (NMISA) as an entity responsible for providing traceability for the medium and high-energy neutron measurements in South Africa. The project of upgrading the facility is ongoing and is currently being realized by a formal collaboration between iThemba LABS, University of Cape Town (UCT), together with international partners Institut de Radioprotection et de Sûreté Nucléaire (IRSN in France), National Physical Laboratory (NPL in UK) and Physikalisch-Technische Bundesanstalt (PTB in Germany).

As part of the project, the iThemba LABS fast neutron beam facility has been redeveloped in an attempt to overcome some of the identified shortcomings, particularly associated with low energy neutron backgrounds and the stability of the proton beam on target. Once the upgrade and development project of the facility is completed, traceability of measurements shall be ensured by setting up a primary standard for neutron measurements in the energy range from 30 MeV to 200 MeV or by using a transfer device which is traceable to one of the primary standards. The ISO-accreditation status will also provide the facility with the ability to participate in international key-comparison studies in the area of neutron metrology for medium to high-energy neutrons. The upgraded facility is set to practically accommodate irradiations of a phantom of up to 30 x 30 cm^2 of beam size. For this contribution, we aim to discuss plans and activities using the fast neutron beam facility at iThemba LABS [3].

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