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Radiation Shielding calculations using MCNPX transport code for cost optimization of the shielding material to be used at iThemba LABS

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Abstract content
   (Max 300 words)

At iThemba LABS, the shared use of the Separated Sector Cyclotron has reached the point where further advancement of the respective disciplines cannot be realised.
The new facility is proposed to respond to the demands of these, specifically a phased development of Radioactive Ion Beam (RIBs). This facility will include a 70 MeV negative-ion cyclotron with the development of 5 Radioisotope production stations and two production stations for RIBs for nuclear physics and materials science research.
The RIB Demonstrator project is suggested to test and demonstrate the advantages of the overall RIB project. The new cyclotron accelerator, which will provide currents of up to 350 μA of 70 MeV protons, has a potential of producing strong sources of ionising radiation. The most challenging entities, which are part of the indirect ionising radiation, are neutral neutrons and photons.
There is a need to protect humans and materials from ionising radiation by providing adequate shielding to attenuate these particles, thus bringing their fluence-rate to acceptably low levels determined by the International Commission on Radiation Protection (ICRP) for designated personnel accessing this facility.
The Monte Carlo for Neutral Particles eXtended (MCNPX) code was used for the purpose of investigating the correct thickness of the shielding of the cyclotron vault and the RIB Demonstrator vault.
Results obtained confirmed that 4 metre and 3 metre thicknesses of concrete shielding will be adequate in the proposed cyclotron vault and RIB Demonstrator vault respectively.

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

Yes

Level for award
 (Hons, MSc,
   PhD)?

MSc

Main supervisor (name and email)
and his / her institution

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Would you like to
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Yes

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