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Radiation Shielding Calculation using FLUKA transport code for Radiactive-ion Beam Facility at iThemba LABS.

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Abstract content
   (Max 300 words)
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Most ion-beams used in physics are stable, that is, they are comprised of atoms that occur naturally. However, in both nuclear and material science, increasing attention is being paid to using artificially produced, radioactive atoms to form an ion beam. One method of producing Radioactive-Ion Beams (RIBS) is the Isotope Separation OnLine (ISOL)
method. In this method, a beam from a primary driver accelerator impinges on a RIB production target. By heating the target, the reaction products evaporate out of the target material, migrate down a tube to a region where they are ionized and extracted using a HV potential.

iThemba LABS is planning to build a Radioactive-Ion Beam ISOL facility, by buying a second cyclotron in a project estimated to cost around R1000 M. As a first step, it will use the existing accelerator to produce low-energy radioactive beams in a R25M project to build a RIB target/ion-source test facility.

The target will be placed in a shielded vault, as it will produce a large flux of radiation which must be attenuated for safe operation. Since the design of the vault has changed, new radiation safety calculations must be performed for the vault. Furthermore, neutrons emitted from the target
will "activate" the surrounding material. This induced radioactivity is also a hazard and must also be calculated. The ideal computer code to simulate shielding and activation is FLUktuierende KAscade(FLUKA), which is a fully integrated particle physics MonteCarlo simulation package. It has many applications in high energy experimental physics and engineering, shielding, detector and telescope design, cosmic ray studies, dosimetry, medical physics and radio-biology.

So FLUKA will be used in this project to calculate shielding requirements and the level of activation of the surrounding material.

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MSc

Main supervisor (name and email)
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