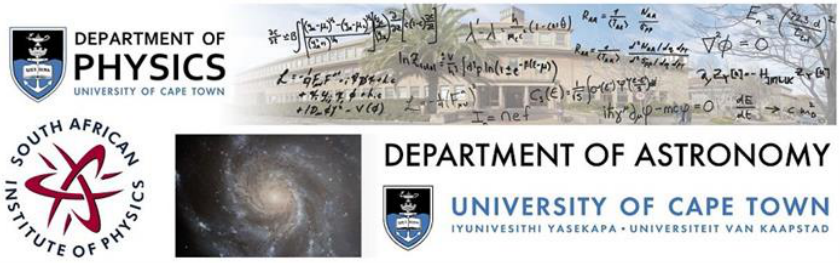

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Using Geant4 to create 3D maps of dosage received within a MinPET diamond sorting facility

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Abstract content
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The MinPET project aims to locate diamonds within kimberlite by activating carbon within kimberlite, then using Positron Emission Tomography (PET) to image carbon density. Although calculations suggest that long-term activation is insignificant, modelling is required to determine the dose received by workers operating close to recently activated material at different positions within a hypothetical MinPET sorting unit.
Two modelling techniques are deployed to investigate received dose. The first is a full simulation of energy absorbed using the CERN created Geant4 particle tracking toolkit. The results for this are validated against a numerical computation of the attenuation of outgoing radiation using a simplified geometry. The result is a set of 3-dimensional dosage maps. These can be used to set guidelines around where and for how long workers could operate, and to identify areas that need additional radiation shielding. The techniques developed are not limited to MinPET, and could prove useful for any situation requiring the simulation of dose received by workers operating near radioactive material.

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