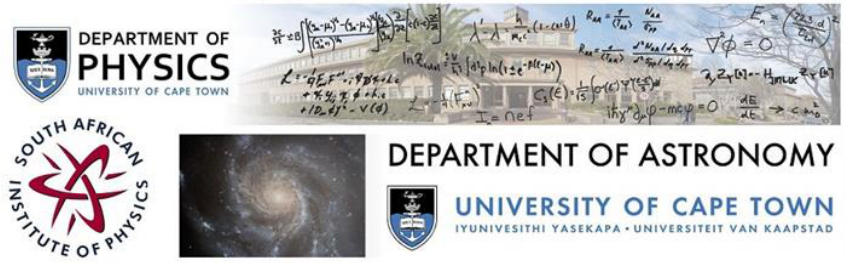

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Tracking Electrons Produced by Compton Scatter within a Prompt Gamma Imaging Device

Friday, 8 July 2016 15:20 (20 minutes)

Abstract content
   (Max 300 words)
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Proton therapy requires precise delivery of the accelerated particles to the cancerous tissue in order to maximize its considerable benefits. Unfortunately, there is no way to directly monitor the actual dose delivered to the patient. Prompt Gamma Imaging (PGI), specifically a Compton camera, is a promising option for in vivo verification of the 3D dose distribution. A Compton camera relies on an incident gamma undergoing multiple Compton scatters within its multiple stages. The information (energy deposited and location) from the Compton scatters (2 or more) can be used to reconstruct a cone of origin. With a sufficient number of cones and appropriate image reconstruction techniques, a 3D image of the dose can be produced. Of course, the accuracy of the image reconstruction relies heavily on the quality of the data measured by the detector, specifically the energy and position of the detected electron.

This work uses the Geant4 Monte Carlo toolkit to track the Compton electrons within the individual stages of the Compton camera in order to better understand the accuracy of the detected election position and energy. The energy and range of the secondary electrons are broken down by direction and scatter sequence order. A number of different detector configurations were also investigated. The work provided some clear indications of the expected accuracy from the energy and position measurements of the electrons in a Compton camera.

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