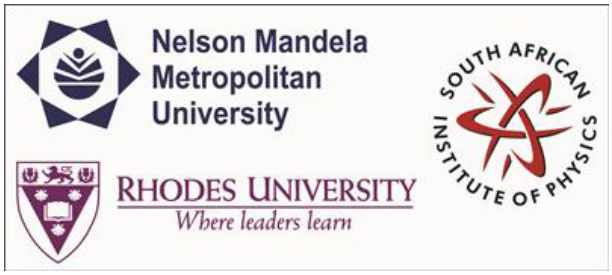

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Investigating prompt gamma cross-section data using a Geant4-simulated AFRODITE detector system

Thursday, 2 July 2015 15:20 (20 minutes)

Abstract content
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In radiation oncology, proton therapy has become an increasingly popular treatment modality due to the superior dose distribution of the proton beam while sparing more surrounding normal healthy tissues and critical organs. To fully utilize the benefits of a proton therapy beam, it is important to monitor in-vivo dose deposition. Due to the fact that the treatment protons stop within the patient as they deliver the dose, secondary radiation is the only way to obtain a dose verification measurement. The measurement of secondary prompt gammas emitted during proton-nucleus collisions has been proposed to verify the dose distribution, particularly since the prompt gamma emission is strongly correlated with the proton depth dose profile. During the design of a prompt gamma imaging device using the Geant4 Monte-Carlo toolkit, discrepancies in the simulated prompt gamma cross-section data has been reported.

The goal of this study is to investigate the prompt gamma cross-section data for protons over the energy range 66 – 110 MeV. The AFRODITE detector system at iThemba LABS was modeled using the Geant4 Monte-Carlo transport code with a Mylar target used to investigate the prompt gamma cross-section for carbon and oxygen, two of the prominent elements found in the human body. The AFRODITE detector system is composed of eight solid-state Germanium clover detectors with BGO Compton suppression. The physics governing the prompt gamma production in the Geant4 model of the AFRODITE detector system was validated against three standard gamma-emitting sources. A comparison of these experimental gamma spectra to the simulated spectra will be discussed. A series of simulated cross-section measurements from the Mylar target will also be discussed.

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PhD

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

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