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Measuring prompt gamma cross-section data for Carbon target using AFRODITE clover detectors

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**Abstract content (Max 300 words)
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Over the last few decades remarkable progress has been made in radiotherapy treatment modalities towards effectively delivering a radiation dose to the planning target volume (PTV) while increasing the survival and reducing the side effects of cancer patients. Proton therapy has become an increasingly popular treatment modality due to its superior dose distribution. However, the advantage of proton beams cannot be fully utilized since no proper method is currently available to measure in-patient proton dose. The detection of secondary prompt gamma rays have been proposed as a in-situ method to determine the proton range since the location of the prompt gamma emission is strongly correlated with the proton depth dose profile. Previous work, using Monte Carlo simulations, has shown discrepancies with the production of prompt gamma data particularly in prominent elements found in tissue within the therapeutic range (50-250 MeV).

The goal of this study is to investigate (using simulations and measurements) the prompt gamma cross-section for the element of carbon. Measurements using a thin target of natural Carbon over the energy range of 66-125 MeV were performed at iThemba LABS using the AFRODITE detector system. The experimental setup was then simulated using the Geant4 Monte Carlo toolkit and the results were compared to the measurements. Those comparisons will be discussed.

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Yes

**Level for award
 (Hons, MSc,
 PhD, N/A)?**

PhD

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

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