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Modeling an Elekta Precise linac head using the Monte Carlo code GATE

The Monte Carlo method (MC) has been commonly used in medical physics applications such as radiotherapy, radiation protection and nuclear medicine due to the stochastic nature of radiation and detection processes. In our country, during the last few years, new radiotherapy machines with novel technological advances have been acquired. Among this new equipment, the linear accelerator (linac) has the capability to deliver treatment techniques with high level of complexity. In order to be capable to perform several research activities with a direct impact on the daily clinic our first step was to model the linac head of an Elekta Precise that is commonly used in radiotherapy facilities in Cuba. The MC code employed was GATE, which uses GEANT4 libraries and was adapted for easy implementation in the field of radiotherapy and nuclear medicine. To validate this geometrical model several calculations on a water cube were performed. For each simulations a dose image was obtained. Each dose image was compared with experimental data provided by the medical physics group from the radiotherapy department of the Oncology Institute at Havana using the same beam set up: Source Surface Distance (SSD), Energy, and field sizes of 5x5 cm2, 10x10 cm2, and 20x20 cm2. The uncertainty obtained for each simulation was of 2% for each dose image and the standard deviation with measurements was 3%.

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