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Monte Carlo simulation of the Co-60 teletherapy unit at iThemba LABS

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TOPAS, a Monte Carlo tool that wraps Geant4, is used to simulate the cobalt-60 teletherapy unit at iThemba LABS to decrease the experimental uncertainty of the radiation dosimetry for the gamma irradiation experiments conducted in the radiation biophysics division.
The Theratron teletherapy machine utilizes a cobalt-60 source emitting gamma rays with energies of 1.173 and 1.332 MeV. The detailed treatment head simulation includes the source and source housing, the primary and secondary collimators, jaws, and phase space sources. Phase space sources are used to decrease computational time in TOPAS.
The dose to cells exposed is calculated per number of source particles and is validated by plotting percentage depth dose curves within a water phantom. The dose to voxels in the phantom is calculated along the central beam axis for various SSDs and field sizes. These curves are then compared to those obtained in comparable studies and relevant protocols.

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