

**Purpose:** To present, G4DBR, a fast Geant4-based Monte Carlo (MC) dosimetry platform for brachytherapy. The special case of low dose rate (LDR) brachytherapy is considered here.

**Methods:** Geant4 9.3 has been used for designing a new MC platform for calculating the dose distribution in brachytherapy called G4DBR. This code is capable of dealing with the DICOM RT format to build a virtual representation of each patient with the full multi-seed configuration. The dose is scored both to medium and to water using track-length estimator. The dose distributions are extracted in 3ddose format for visualization or to calculate the DVHs.

**Results:** One prostate permanent 125I seed (PPSI) and one breast permanent 103Pd seed implant (BPSI) patient have been selected for evaluating the performance of G4DBR on a 2.93 GHz Intel Xeon Nehalem single core. Post-implant dosimetry of those cases are performed in a 2 mm<sup>3</sup> mesh for comparison with BrachyDose and MCPI. 45 seconds were required for G4DBR to reach a statistical uncertainty of 2% on PTV dose in PPSI. Note that for a similar precision, BrachyDose requires 30 seconds on 3 GHz Woodcrest (Thomson et al. Med. Phys. 2010) while MCPI needs 59 seconds on a single 2.4 GHz Pentium 4 CPU (Chibani et al. Med. Phys. 2005). G4DBR takes 114 seconds to attain a statistical uncertainty of less than 2% in the BPSI case.

**Conclusions:** G4DBR is accurate and fast enough for clinical purposes. G4DBR is able to achieve good calculation speeds comparable with BrachyDose and MCPI. Indeed, a statistical uncertainty of less than 2% is attained in 45 seconds in a prostate case while 118 seconds were needed in BPSI to achieve 0.5% of uncertainty. Further developments will include the incorporation of high dose rate (HDR) dosimetry and a user-friendly GUI for G4DBR.