

# Development of Geant4 simulation code for eye plaques using detailed eye models

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Eye plaques are widely used methods in ocular brachytherapy to treat eye cancers such as uveal melanoma. In a clinical site, specific plans for eye plaque are established by using advanced treatment planning systems (TPSs). During the last 20 years, several studies have assessed the TPSs using Monte Carlo (MC) simulation, but the evaluation processes had used a simplified eye model, such as a sphere, and they have focused on the dose verifications for tumor and critical targets excluding radiosensitive layers. Recently, the International Commission on Radiological Protection (ICRP) and Hanyang University have released the detailed computational human phantoms, called mesh-type reference computational phantoms (MRCPs) and mesh-type reference Korean phantoms (MRKPs), respectively. The eye models included in MRCPs and MRKPs incorporated detailed radiosensitive structures required for effective dose calculations. In this study, we have developed a Geant4-based MC simulation code based on the detailed eye models extracted from the MRCPs and MRKPs. The developed code could successfully calculate doses not only for tumor and critical organs but also for radiosensitive regions. We expect that detailed information about the simulation code, its related results, and an application example comparing with a patient-specific eye plaque plan will be presented in our presentation on NAT2020 and in our full paper.

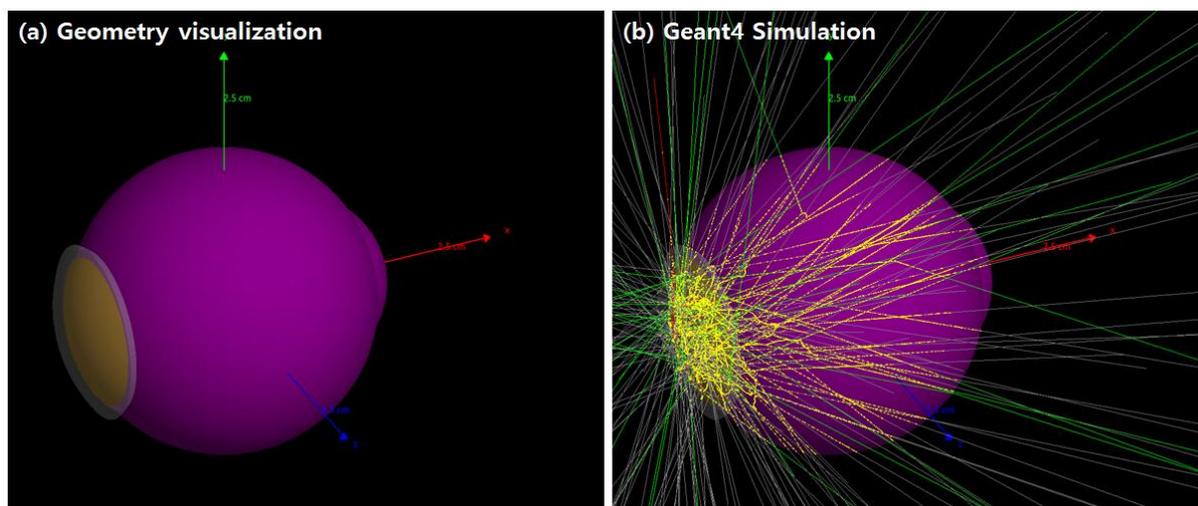


Fig. 1. Geant4-based eye plaque simulation using detailed eye model of MRCPs: (a) geometry visualization, and (b) screenshot of eye plaque simulation with ruthenium-106 source

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