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A virtual model of an Elekta Synergy linac for verification of planning system photon beams

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The purpose of this study is to investigate the possibility of verifying the planning system photon beams using EGSnrc Monte Carlo (MC) code. The advantage of MC simulation over conventional measurement is that the linac output can be fine-tuned to eliminate uncertainties with a clear understanding of dose distribution and it's convenient to calculate dose distribution in complex geometries. A virtual model of an Elekta Synergy linac equipped Agility 160 multileaf collimator (MLC) was simulated and validated. The simulated planning system beams were 6, 10 and 15 MV for 1 x 1 up to 30 x 30 cm² square field sizes. This model was validated in the context of a homogeneous water phantom that included beam profiles, depth dose, and relative output factors. The MC calculations and physical measurements agreed to within 2.0% for percentage depth doses (PDDs), profiles and output factors. The virtual linac model is accurate up to 2%/2 mm. It has the potential to be used for dose verification in the advanced radiotherapy treatment planning system.

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