Simulasi Monte Carlo untuk Kontaminasi Elektron Pada Berkas Sinar X 6 MV Produksi Pesawat Linac Elekta SL15

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Abstrak

Telah dilakukan studi kontaminasi elektron pada berkas foton 6MV pesawat Linac Elekta SL15 menggunakan simulasi Monte Carlo. Pemodelan kepala Linac menggunakan program BEAMnrc, analisis phase space file menggunakan program BEAMDP dan perhitungan dosis radiasi dalam phantom air menggunakan program DOSXYZnrc. Dalam simulasi ini, energi awal elektron yang optimum adalah 6.3 MeV, dan intensitas radialnya memiliki FWHM 1.0 mm karena diketahui paling sesuai dengan pengukuran. Dalam simulasi diperoleh, semakin besar ukuran lapangan radiasi, dosis kontaminasi elektron mengalami kenaikan. Pada kedalaman 1.0 mm dan ukuran lapangan radiasi 5x5, 10x10, 20x20, 30x30, dan 40x40 cm2, dosis kontaminasi elektron secara berurutan sebesar 3.71, 5.19, 14.39, 18.97 dan 20.89%. Semakin ke dalam, dosis kontaminasi elektron semakin berkurang dan pada kedalaman 15 mm, kontribusinya hanya sekitar 1%. Kontaminasi elektron terutama dihasilkan oleh udara antara Linac dan fantom, mirror dan flattening filter. Bagian lain dari kepala Linac, hanya memberikan kontribusi yang kecil.
.....Study on electron contamination for 6 MV photon beams from Elekta SL15 linac by using Monte Carlo simulation has been done. The linear accelerator head was simulated by BEAMnrc code and the phase-space file then was analyzed by BEAMDP, while the absorbed dose in water phantom was calculated using DOSXYZnrc code. In this simulation, the optimal initial electron beam parameters were 6.3 MeV in energy and 1.0 mm in FWHM (full width at half maximum) on the radial intensity distribution. They were found to be in good agreement with the measured data. It was obtained in this reasearch that the electron contamination increases as the field size increases. At 1.0 mm in depth and the field size 5x5, 10x10, 20x20, 30x30, and 40x40 cm2, the dose from electron cotamination respectively 3.71, 5.19, 14.39, 18.97 and 20.89%. The electron contamination decreases with depth. At 15 mm in depth, the contribution of electron contamination is about 1%. The electron contamination is mainly produced from air volume between the linac head and water phantom, mirror and flattening filter. The other parts of linac head only give small contribution.