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Flash Radiotherapy with the CEPC(Circular Electron-Positron Collider) Synchrotron Radiation

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CEPC can also work as a powerful and excellent synchrotron light source, which can generate high-quality synchrotron radiation. This synchrotron radiation has potential advantages in the medical field, with a broad spectrum, with energies ranging from visible light to X-rays used in conventional radiotherapy, up to several MeV. FLASH radiotherapy is one of the most advanced radiotherapy modalities. It is a radiotherapy method that uses ultra-high dose rate irradiation to achieve the therapeutic dose in an instant; the ultra-high dose rate used is generally greater than 40 Gy/s, and this type of radiotherapy can protect normal tissues well. In this paper, we evaluated the therapeutic effect of CEPC synchrotron radiation for FLASH radiotherapy by simulation. First, we established a physicochemical model of radiotherapy response kinetics, and comprehensively used a large number of radiotherapy experimental data to fit and determine the functional relationship between the treatment effect and the dose rate. Then, we use Geant4 simulation to build a synchrotron radiation radiotherapy beamline station, and then calculate the dose rate that CEPC can produce. Finally, we predicted the macroscopic therapeutic effect of FLASH radiotherapy using CEPC synchrotron radiation light through this dose rate and the above-mentioned functional relationship. The results show that CEPC synchrotron radiation beam is one of the best beams for FLASH radiotherapy.

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Footnotes

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