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Longitudinal localized kick driven fast extraction method for 3D PBS proton FLASH delivery

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The challenge of delivering FLASH irradiation to large volume targets within 100 ms using 3D pencil beam scanning (PBS) persists. A novel scanning scheme based on a rapid-cycling synchrotron (RCS) is proposed. This work introduces a longitudinal localized kick driven fast extraction method used in the scheme. By applying stripline kicker pulses to specific longitudinal segments of the bunch and dynamically adjusting the kick region based on real-time beam density, accurate spot dose delivery is achieved. Simulations show the results of spot dose accuracy and confirm controlled beam loss ($<10\%$) during fall time, demonstrating the method's feasibility for 3D PBS proton FLASH therapy.

Footnotes

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Yes

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