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Recent developments in delivering mixed helium and carbon ion beams for online treatment monitoring research at MedAustron

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Simultaneous irradiation with mixed helium and carbon ions is being proposed for online range verification in carbon radiotherapy. In 2024, a mixed $^{4}He^{2+}$ and $^{12}C^{6+}$ beam, generated by sequential injection of helium and carbon ions into the synchrotron, was extracted successfully for the first time at the MedAustron ion beam therapy and research center. This double injection scheme comes with challenges concerning the capture, acceleration, and slow extraction, as injection energy offsets and differences in horizontal phase distributions have to be considered in addition to the small offset in charge-to-mass ratio between $^{4}He^{2+}$ and $^{12}C^{6+}$. This proceeding reports on recent developments in the delivery of this mixed ion beam at MedAustron using a double injection scheme, which includes an additional deceleration ramp for helium ions between the injections of helium and carbon, as well as progress towards a measurement setup for the time-resolved quantification of the ion mixing ratio at delivery.

Footnotes

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