

Simulation study of mixed He-2+/C-6+ beam slow extraction for online range-verification

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In recent years, mixed helium (He-2+) and carbon ion (C-6+) irradiation schemes have been proposed to facilitate in-vivo range verification in ion beam therapy. Such a scheme implies accelerating and extracting both ion species simultaneously, with the idea of using C-6+ for tumor treatment, while performing real-time dosimetry with He-2+ in a detector downstream of the patient.

The MedAustron center for ion beam therapy and research, which supplies protons and carbon ions for clinical treatment, is currently being commissioned to additionally provide helium ions for nonclinical research. The availability of both He-2+ and C-6+ beams opens the opportunity for studying the feasibility of the described mixed beam irradiation scheme.

A key aspect in this context is the slow extraction of the ion mix, which is affected by both the relative charge-to-mass ratio offset and possible deviations in the transverse phase space distributions. This talk suggests radio frequency knock-out as extraction mechanism and presents Xsuite simulations to discuss challenges and mitigation for maintaining a constant He/C ratio throughout the spill.

Primary author: RENNEN, Elisabeth (TU Wien)

Co-authors: SCHMITZER, Claus (MedAustron); PROKOPOVICH, Dale (EBG MedAustron GmbH); PLASSARD, Fabien (MedAustron); KÜHTEUBL, Florian (MedAustron); WOLF, Markus (MedAustron); KAUSEL, Matthias (EBG MedAustron and TU Wien); GAMBINO, Nadia (EBG MedAustron); KIRCHWEGER, Valentin (TU Wien)

Presenter: RENNEN, Elisabeth (TU Wien)

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