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Mixed carbon and helium ion beams for simultaneous heavy ion radiotherapy and radiography: an ion source perspective

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Within the framework of research on simultaneous heavy ion radiotherapy and radiography, a mixed carbon/helium ion beam with a variable He percentage has been successfully established and investigated at GSI for the first time in order to study this new mode of image guidance for carbon ion beam therapy.

The mixed C/He ion beam was provided by the 14.5 GHz CAPRICE ECR ion source for the subsequent linac-synchrotron accelerator systems at GSI. Prior to that experiment, different ion combinations ($^{12}\text{C}^{3+}/^4\text{He}^+$ or $^{12}\text{C}^{4+}/^3\text{He}^+$) out of CH_4 or CO_2 have been investigated at the ECR test bench in terms of ion beam currents, stability, and C-to-He-fraction quantified by optical spectral lines and mass spectra. From an ion source perspective, it turned out that each of the different combinations comply with all the requirements of the experiments which successfully took place utilizing a $^{12}\text{C}^{3+}/^4\text{He}^+$ ion beam with an energy of 225 MeV/u. Finally, both ions were simultaneously accelerated and extracted and characterised in the biophysics cave.

This paper briefly outlines some of the measurements obtained at the test bench and during the beam time from an ion source perspective.

Footnotes

Funding Agency

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