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Time-resolved measurement of ion beam energy spread variation due to kinetic plasma instabilities in CW and pulsed operation of an ECRIS

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The energy spread of ion beams extracted from Electron Cyclotron Resonance (ECR) ion sources is influenced by plasma conditions such as the plasma potential, and effects taking place in the beam formation region. Kinetic plasma instabilities have a significant impact on the plasma properties, and consequently on the ion beam energy spread. We present experimental results of time-resolved energy spread behaviour when kinetic plasma instabilities are present in CW and pulsed operation of the JYFL 14 GHz ECR ion source. It is shown that the instability-induced energy spread variation corresponds to a momentary plasma potential increase up to several kV from the steady-state value of 10–30 V. The method for measuring the time-resolved energy spread variation is presented, and the consequences of the energy spread and the underlying plasma potential variation for ECRIS operation are discussed.

Footnotes

Funding Agency

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Yes

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