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Application of Optical Emission Spectroscopy to Electron Cyclotron Resonance Ion Sources

Electron Cyclotron Resonance Ion Sources (ECRIS) are widely used to produce highly charged high intensity ion beams for research, medical and industrial applications.

ECRIS performances, namely the charge state distribution and beam intensity, depend critically on the electron energy distribution function. Further improvements of ECRIS performances require a deeper and deeper understanding of the plasma heating mechanisms and ion generation by means of opportune plasma diagnostics. Amongst others, Optical Emission Spectroscopy (OES) is the most remarkable for application in ECRIS: it is a non-invasive diagnostic able to operate also in high-voltage conditions and it requires only small room for operation. OES has been already tested for plasma diagnostics in proton sources.

This work presents the experimental set-up developed for the plasma diagnostic of the Advanced Ion Source for Hadrontherapy (AISHa), an ECRIS for medical applications, together with the strategy used to relate plasma emission lines in the visible and near-infrared domain to plasma parameters for some ions of interest. Preliminary experimental results on a plasma reactor and perspectives will be also discussed.

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Yes

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