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High Resolution Optical Emission Spectroscopic Study of the ECR Plasma in the GTS-LHC Ion Source

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A high-resolution optical emission spectrometer has been implemented as a non-invasive diagnostic tool to investigate plasma behaviour in the GTS-LHC Electron Cyclotron Resonance Ion Source (ECRIS). This approach aims to establish correlations between spectral features and neutral particle densities, thereby contributing to the development of real-time optical feedback mechanisms for the automation of ECRIS operations. Measurements are conducted in afterglow mode, with the ion source operating in pulsed mode at 14.5 GHz (10 Hz, 50% duty cycle). Optical spectral data from oxygen, neon, and lead plasmas are analysed to examine the relationship between optical emission intensities and source parameters. The practical use of optical diagnostics as a tool for monitoring and controlling the source performance is discussed.

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