Contribution ID: **86** Type: **Poster**

Probing ECR Plasmas through Light: Spectroscopic Analysis of Hydrogen, Helium, and Neon Discharges

Monday, 8 September 2025 16:30 (1h 30m)

In this work, electron temperature and density have been estimated for hydrogen, helium and neon plasmas generated in a plasma trap known as the plasma reactor, operating at INFN - Laboratori Nazionali del Sud. Plasma is generated by means of Electron Cyclotron Resonance (ECR) between microwaves at 3.8 GHz frequency and a solenoidal magnetic field. Optical emission spectroscopy has been used to analyze the spectral lines emitted from the plasma for various conditions of microwave power and pressure in the optical domain 300-1100 nm, enabling non-invasive determination of plasma parameters. This methodology provided detailed insights into plasma conditions, contributing to the characterization and development of ion sources and enhancing the understanding of fundamental plasma processes occurring in ECR-generated plasmas.

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Session Classification: Poster Session

Track Classification: Ion source plasma and beam diagnostics