

Multi-diagnostics investigation of an ECR plasma confined in a simple mirror trap

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This work presents the multi-diagnostics characterization of the plasma in an axis-symmetric simple mirror trap as a function of magnetic field profile (mirror ratios and magnetic field gradient), neutral gas pressure and microwave power. The simultaneous use of Optical Emission Spectroscopy, Langmuir Probe and X-ray diagnostics allows the characterization of the whole electron energy distribution function from a few eV to hundreds of keV, investigating how the electron heating is affected by magnetic gradients, RF power and neutral pressure. In hydrogen plasmas, the use of the optical emission spectroscopy has permitted to simultaneously evaluate the plasma and electron density and the relative abundances of H and H₂ also. The latter being a key parameter when plasma traps are used such as sources of intense proton beams. Results show non-linear behaviours under small variations of even one source parameter only, demonstrating that plasma density and temperatures span over a wide domain of values.