Preliminary space and time resolved characterization of X-ray emission from an ECR magneto-plasma in the PANDORA project frame

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Theoretical predictions suggest that the behavior of β decays can dramatically change in relation to the ionization state of in-plasma isotopes [1]. The PANDORA project [2] aims at measuring nuclear β-decays in stellar-like conditions in high-temperature plasmas confined in B-minimum magnetic traps, which require a continuous monitoring of plasma parameters. Xray space-resolved emission characterization can provide relevant features of the magnetoplasma [3] in terms of distribution of its density and temperature. We arranged a full-field Xray pin-hole setup consisting in a 400µm hole in a lead disk embedded inside a multi disk collimation system coupled with a 4MP X-ray (2 – 20 keV) CCD camera. For the first time the system was coupled to a Pt-Ir shutter to suppress the readout noise, thus permitting sPhC (single photon counting) acquisitions at low exposure times, $t_e \sim \text{ms}$. During the experiment t_e was varied in a range 30ms-60s. In addition, the shutter enables time-resolved acquisitions during plasma discharge or plasma turbulence. An X-Ray measurement line on the so called Flexible Plasma Trap (used as test bench for the PANDORA project) was arranged. A set of measurements has been performed at different plasma conditions (pumping frequency, RF power, magnetic field profile, gas pressure and composition). First collected images will be processed by an original algorithm [4] to perform space-resolved spectroscopy and spectrally resolved imaging.

References

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