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P1.1004 The role of the plasma diagnostics in compacttraps: from ion sources to nuclear astrophysics research

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Axis-symmetric magnetic traps have been used for decades asion sourcesfor accelerators. Recent searches, however, revealed that plasma generated in compact traps is also a surprising environment for studies of nuclear astrophysics, includingnuclear beta-decays andplasma instabilities connected to solar flares. Either if used as an ion source or for astrophysics studies, the diagnostics of the magneto-plasma generated in compact traps is a key issue. In both cases, thekey goal of plasma diagnostics is the volumetric knowledge of the electron energy distribution function (EEDF) and the on-line measurementof the charge state distribution (CSD) within the plasma volume. These goals can be achieved by means of the simultaneous use of different diagnostics operating in different energy domains. The developed setup includes an interfero-polarimeter for total plasma density measurements(a back scattering profiling is in a development phase), a multi-X-ray detectors system for X-ray spectroscopy (including time resolved spectroscopy), a X-ray pin-hole camera for high-resolution 2D space resolved spectroscopy and different spectrometers for the plasma-emitted visible light characterization. The development of time resolved diagnostics is being allowed to attain precious information about the non-stationary phases ECRIS plasmas can undergo. Its full development will allow the investigation of plasma ignition, after-glow and Cyclotron-Maser instabilities and it is expected to allow the overcoming the current limitations of existing ion sources. A description of recent results about plasma parameters characterization in quiescent and turbulent Electron Cyclotron Resonance-heated plasmas will be also given. A complete characterization allowed thestudy, in particular, of the time evolution of X-ray spectra. Finally, the experimental setup is going to be further upgraded in order to allow measurements of nuclear decays in magnetoplasmas.

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