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Design and Preliminary Tests of an Active Plasma Chamber for ECR Ion Sources

An innovative plasma chamber for Electron Cyclotron Resonance Ion Sources has been developed at INFN and will soon be installed and tested with the AISHa (Advanced Ion Source for Hadrontherapy) ion source. It consists in inserting a particular liner into the existing chamber, which allows an electrical segmentation of the internal walls of the chamber. The purpose of this system is to reduce the ion losses induced by the anisotropic diffusion mechanism, improve the plasma confinement and thus increase the overall performance of the ion source. In fact, in ECRIS plasmas, electrons mostly diffuse along magnetic field lines while ions mostly leak across magnetic field lines. In particular, the inner walls of the plasma chamber are covered with 30 tiles, each polarized with a given positive voltage. The tiles are made of Al-6082 and anodized except for the surface directly facing the plasma. The anodizing process makes each tile electrically insulated from the others and from the plasma chamber while preserving the correct operation of the cooling system. The tiles are wrapped by 2 half-cylinders made of Al-6082 acting as shells. Some tiles are equipped with a temperature sensor and machined to allow the wiring of the entire system. In this work the results of the preliminary tests of the thermal and electrical behaviour of the active chamber and the future perspectives are presented.

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Yes

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