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## **Non-Conventional Microwave Coupling of RF Power in ECRIS Plasmas**

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X-ray imaging and numerical simulations demonstrate that the RF power deposition in ECRIS plasmas is not concentrated in the near-axis region, as it would be desirable in order to maximize the ion beam brilliance. There are different arguments to explain this occurrence as due to the symmetry of the plasma chamber. In this “aperture coupled” cylindrical cavity resonator, in fact, any eigenmode solution of Maxwell equations prefers off-axial concentration of the electromagnetic field. The “aperture-coupling” of the rectangular waveguides with the cylindrical chambers (as it is normally for ECRIS) also suffers of an intrinsic, geometrical impedance mismatch. Both these issues suggest that a major optimization of RF coupling efficiency to ECRIS plasmas is still possible, provided that the overall geometry is changed. A reshaping of both the plasma chamber and related RF launching system - in a plasma microwave absorption oriented scenario - is considered as a possible solution, as well as the design of optimized launchers (taking inspiration from tools adopted in the thermonuclear-fusion) enabling “single-pass” power deposition, i.e. not being affected by cavity walls effects.

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