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Perspectives about the production of multiply-charged ions at high intensities: Innovative schemes of microwave-to-plasma matching

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The production of multiply charged ions at medium-high intensity in Electron Cyclotron Resonance Ion Sources requires a trade-off between the plasma density ne and the ion confinement time τi (well known scaling-laws state that I∝ ne / τi while "∝ neτi). Any additional boost of currents with respect to the state of the art (e.g. tens or hundreds μA of Ar14+, Xe34+, etc.), –especially for ions at intermediate charge state –will require a change of paradigm in the plasma generation mechanism. Nowadays the plasma is sustained by an electromagnetic wave resonantly interacting with the plasma electrons, but this implies an intrinsic limitation in density due to the well-known electromagnetic cut-off issue. In the next future, the inner-plasma modal conversion (i.e. microwaves triggering the formation of plasma waves) may support the generation of highly overdense plasmas in simplified magnetostatic field structures. The paper will include recent results obtained at LNS with a compact-size ECRIS prototype in which a highly overdense plasma (ten times the cutoff density) has been generated via O-X-B modal conversion at 3.75 GHz with a low RF power level (<100W). The same techniques may be applied to B-minimum trap with appropriate RF launchers. Advanced diagnostics tools for mastering the conversion mechanism and ensuring the best coupling of the incoming microwave radiation will be described as well.

If a proceedings is prepared,
</br> will you submit a contribution?

No

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