# *Study of instabilities in cross-field plasma configurations*

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The "closed drift" configuration in cylindrical geometry allows an efficient confinement in a wide variety of low temperature plasmas (ion sources, Hall thrusters, magnetron discharges, Penning gauges etc...). The *E×B* configuration is however responsible for an azimuthal rotation of the plasma which is very favorable for the formation of instabilities leading to "anomalous" (i.e. non collisional) electron transport across the magnetic field. This problem has attracted much attention in the context of fusion plasmas, but little is known about *E×B* instabilities and anomalous transport in low temperature plasmas where the presence of weakly or non-magnetized ions and of collisions between charged and neutral particles leads to specific phenomena. The MISTRAL experiment at the PIIM laboratory is dedicated to the study of such instabilities [1, 2, 3, 4].

m=1 and m=2 instabilities rotating around the central plasma column are observed in MISTRAL with frequency close to a few kHz. During this presentation, I will show their rich and complex physics with different diagnostics: tomography [5, 6], laser induced fluorescence [7], fast camera [3] and numerical simulations. The simple image of a plasma exhibiting a global rotation is always invalidated, but in different ways for the m=1 and 2 cases. The ion trajectories are very different for the two kinds of instabilities. To our knowledge, no linear theory is presently available to describe these experimental results.

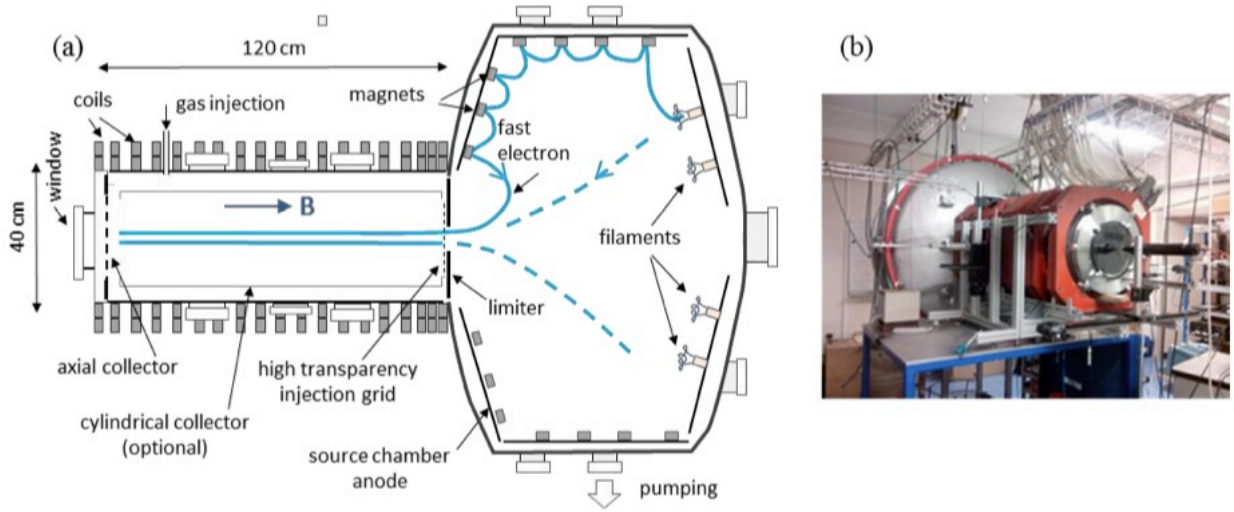


**Fig. 1**: *Schematic of the MISTRAL device. Energetic primary electrons emitted by the 32 and randomized in the source chamber (right part) are injected in the interaction chamber (left part). The primary electrons flowing along the magnetic field lines create the plasma column.*

References

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