

## P2.4002 Challenges in controlling perpendicular electric fields for crossed-field rotation

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See full abstract here:

<http://ocs.ciemat.es/EPS2019ABS/pdf/P2.4002.pdf>

The question of how to impose an electric field perpendicular to the magnetic field in a highdensity magnetized plasma is central to a variety of applications with high societal impact. In recent years, it has been shown for instance that “crossed-field” rotating configurations could offer unique opportunities both for developing plasma mass separation techniques [1], as envisioned for nuclear spent fuel reprocessing [2], nuclear waste cleanup [3] and rare earth elements recycling [4], and to design alternative magnetic confinement fusion concepts [5].

Whether it is using biased electrodes or waves, the ability to sustain an electric field perpendicular to the magnetic field in a plasma depends on perpendicular conductivity. Yet, while it is well recognized that many different driving mechanisms (e. g collisions with neutral, instabilities and turbulence, magnetic fluctuations, ion viscosity) can contribute to , a comprehensive picture for perpendicular conductivity is still missing. Importantly, it has recently been shown that the combined effects of inertia and collisions in a fully-ionized rotating plasma lead to a new, non-linear, contribution to perpendicular conductivity [6]. Progress towards the development of plasma processes harnessing crossed-field rotation hence calls for theoretical and experimental investigation of perpendicular conductivity.

In this talk, we review what can be inferred about perpendicular electric field control from past experimental studies, and compare these results to our incomplete theoretical picture for perpendicular conductivity. These findings are then used to provide clues as to what the important next steps are.

### References

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