

- 1. New fast ion turbulence stabilising mechanism:** when the fast ion magnetic-drift frequency is close to the linear ITG frequency significant ions-scale turbulence suppression is observed.
- 2. New transport barrier in fusion plasmas:** theoretical prediction and observation of the formation of a new type of transport barrier in fusion plasmas, called F-ATB (fast ion-induced anomalous transport barrier)
- 3. Numerical evidence:** existence of the F-ATB demonstrated via global gyrokinetic simulations with realistic ion-to-electron mass ratio, collisions, and fast ions modelled with realistic background distributions.
- 4. F-ATB trigger mechanism:** electrostatic resonant interaction between supra-thermal particles and plasma micro-turbulence (point 1).
- 5. Experimental evidence:** beneficial F-ATB effects observed at ASDEX Upgrade on a properly designed scenario to maximise fast ion effects on turbulence in a narrow radial region.

Relevant references:

- [1] A. Di Siena et al., *Nucl. Fusion* **58** 054002 (2018).
 [2] A. Di Siena et al., *Phys. Plasmas* **26** 052504 (2019).
 [3] A. Di Siena et al., *Phys. Rev. Lett.* **125** 105002 (2020).
 [4] A. Di Siena et al., submitted to publication <https://arxiv.org/abs/2010.14839>

