Research & Coordination Activity

N. Vianello

May 21, 2012

Personal research interest

- Actively involved in fusion plasma science since the M.Sci. thesis in 1999
- Personal research interests can be summarized in four main macro-areas
  - (A) Flows & Turbulence induced transport in magnetized plasmas
  - (B) Emerging of electromagnetic structures
  - (C) 3D physics and helical plasmas
  - (D) Statistical characterization of electromagnetic fluctuations

Flows & Turbulence induced transport

A

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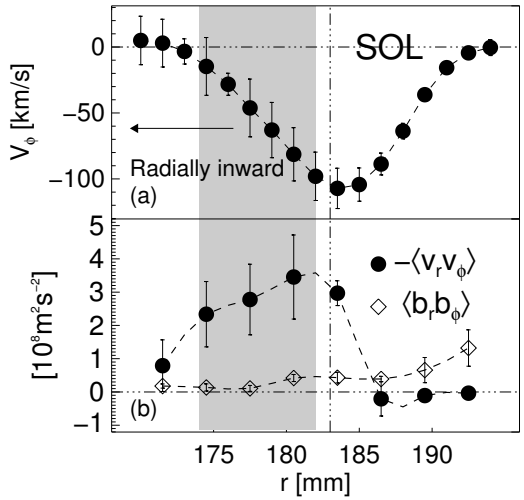

PRL 94 p. 135001, NF 45 p. 761, PPCF 48 p. S193

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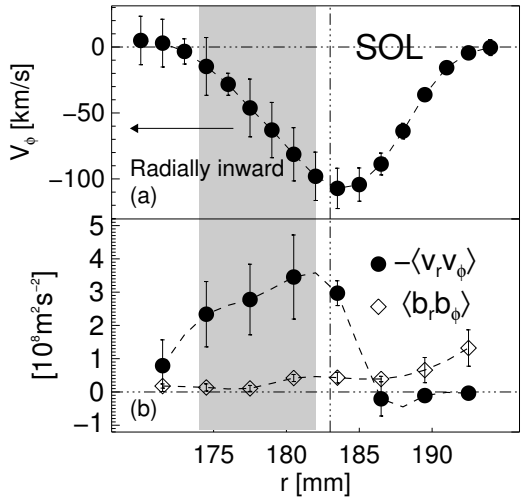

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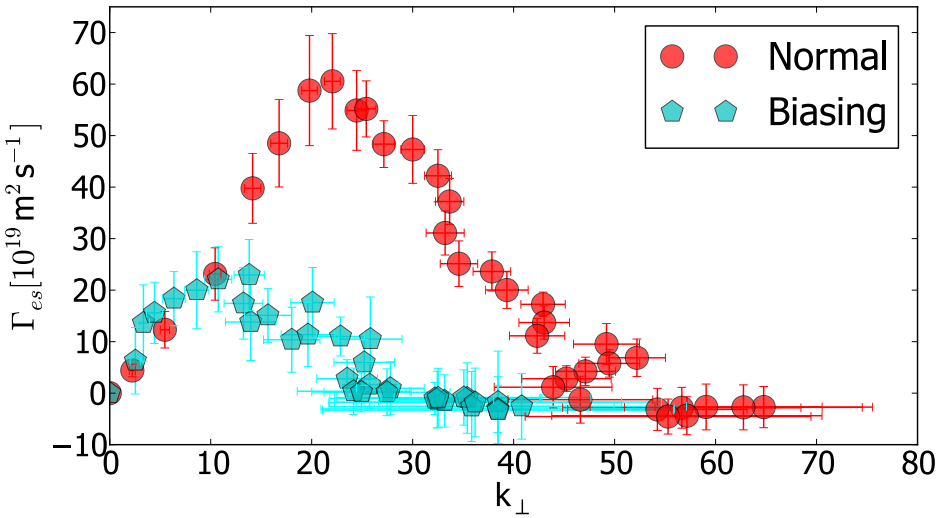
(ii) Transport reduction induced by active modification of sheared flow

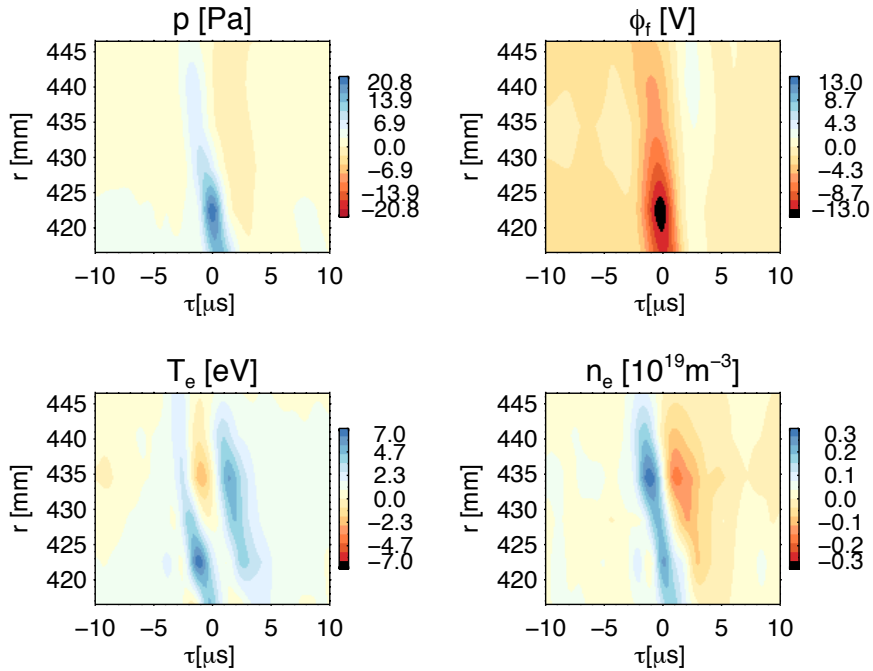


PPCF 42, p. 83

Coherent structures characterization

B

- Complete characterization of coherent structures responsible for intermittency



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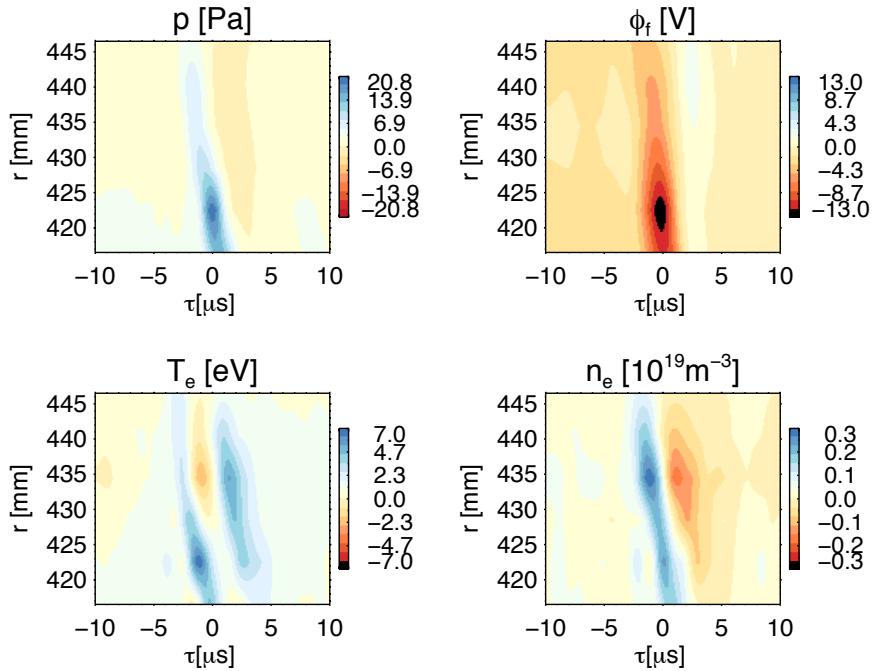
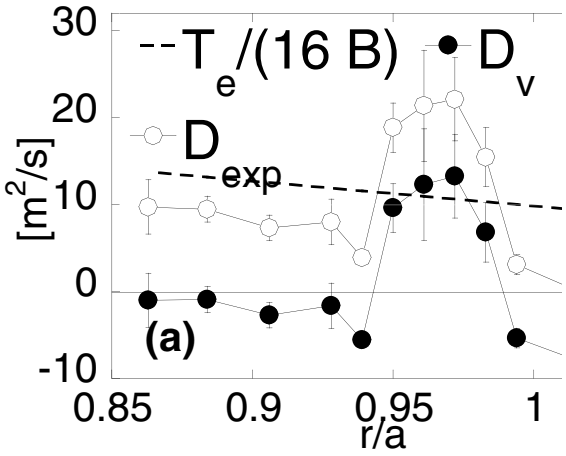


- Evaluation of transport contribution due to coherent structures

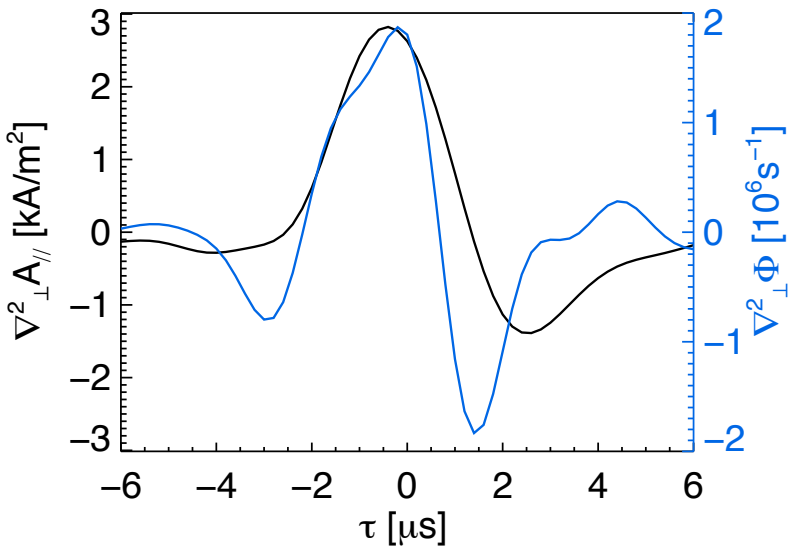


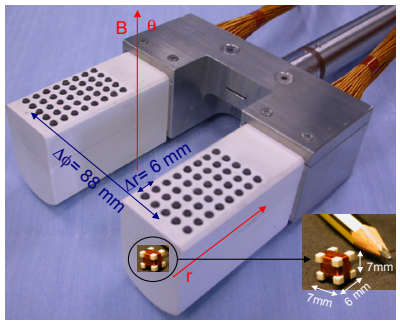
PRL 93 p.215003, PoP 9 p.4110

Current filaments

B

- Measurements of parallel plasma current associated to *blobs* & *filaments* in different experiments with different magnetic configuration





RFX-mod Reversed Field Pinch

- First direct measurements of current filaments associated to plasma blob identified as DKA vortex PRL 102 2009, NF 50 2010

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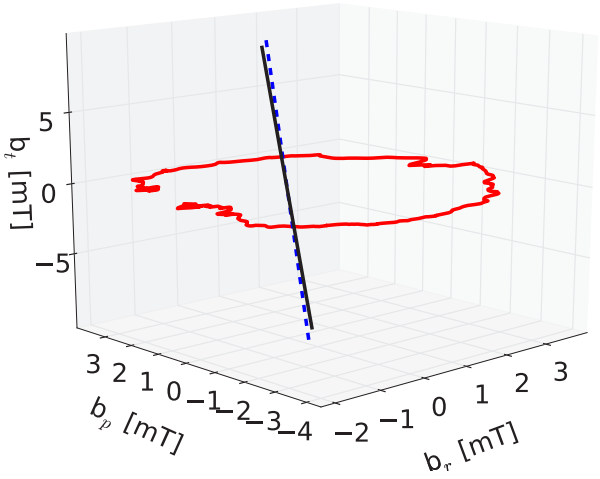

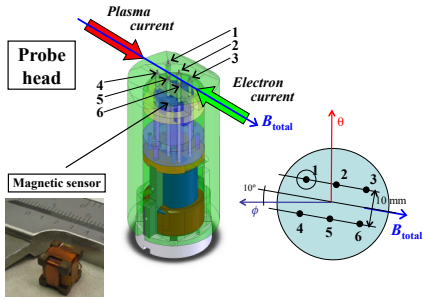

ASDEX-Upgrade Tokamak

- First direct measurements of current asociated to type-I filaments (PRL 106, 2011)

Current filaments

B

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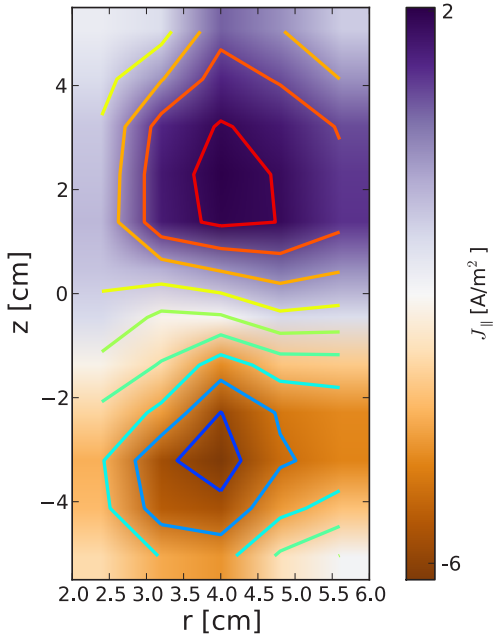
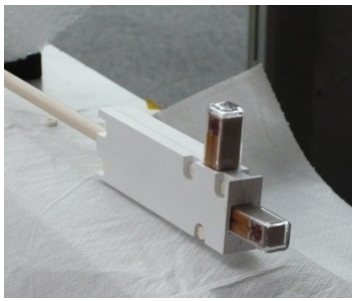




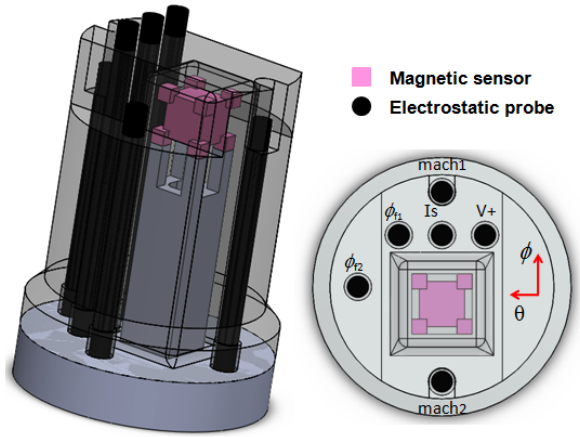
- First direct 2D map of parallel current associated to an interchange-induced plasma blob (PRL 106, 2011)

Current filaments

B

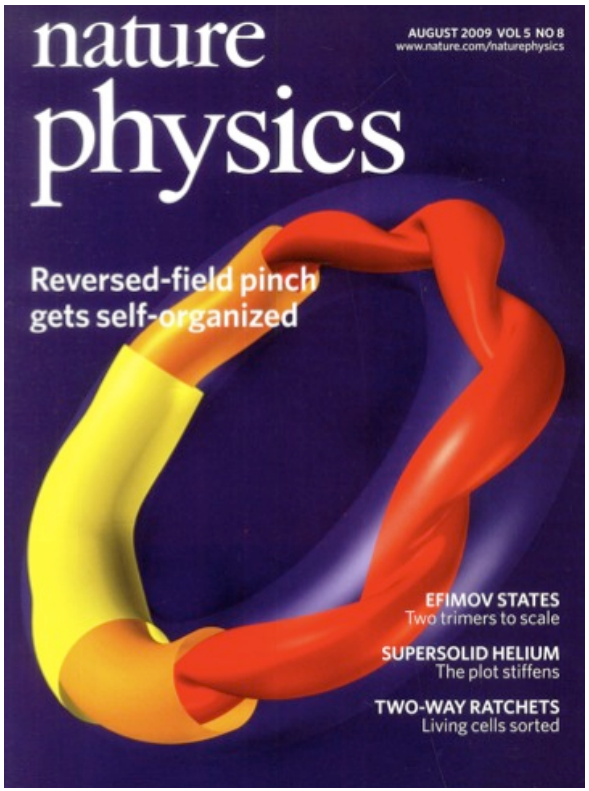
- Collaboration established to extend studies of current filaments to other devices, namely TJ-II stellarator, with a probe which combines vorticity and current measurements and EAST tokamak for the studies of ELMs

TJ-II Stellarator



EAST-Tokamak

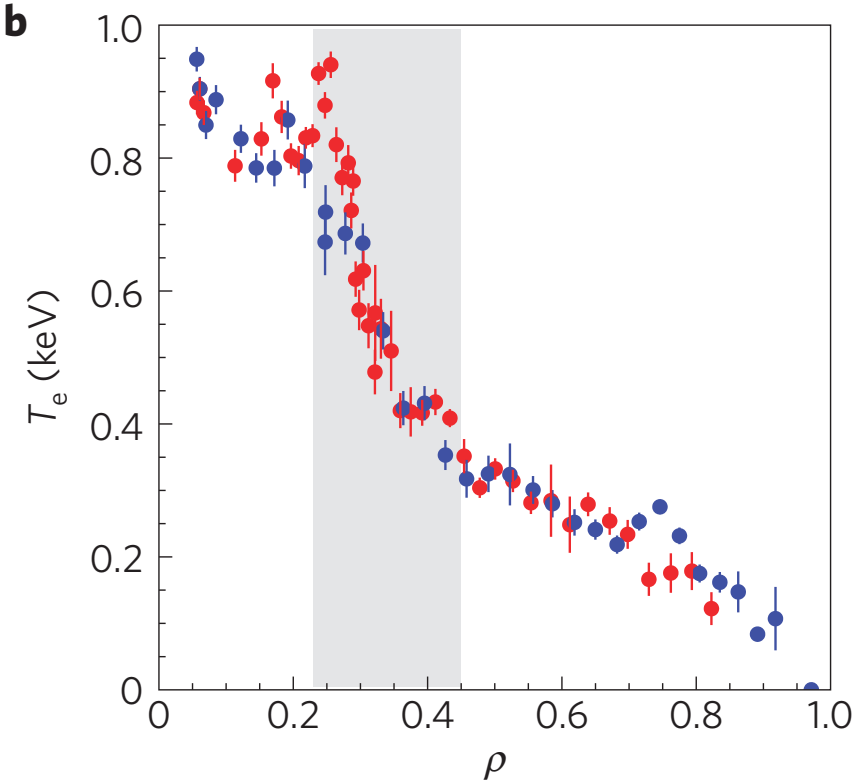
Helical plasmas



- Observation and characterization of spontaneous helical plasmas developing in high current Reversed Field Pinch operation

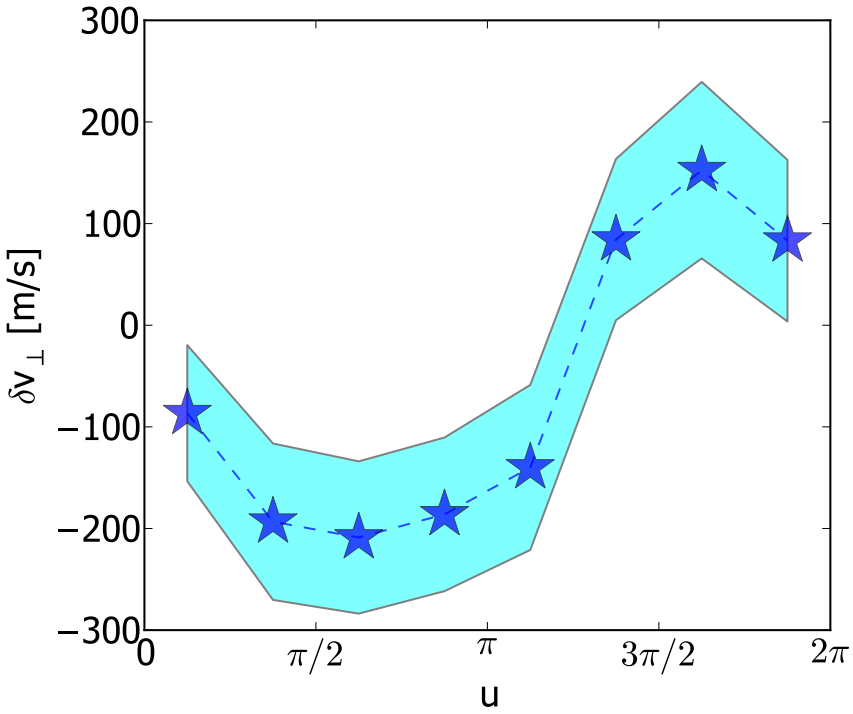
  Nat. Phys. 5 pp. 570

Helical plasmas



- With the appearence of a transport barrier located in the region of a local maxima of q value

Helical plasmas



- Ambipolar electric field builds up as a response to the magnetic perturbation causing a perpendicular flow with the same periodicity of the helical perturbation

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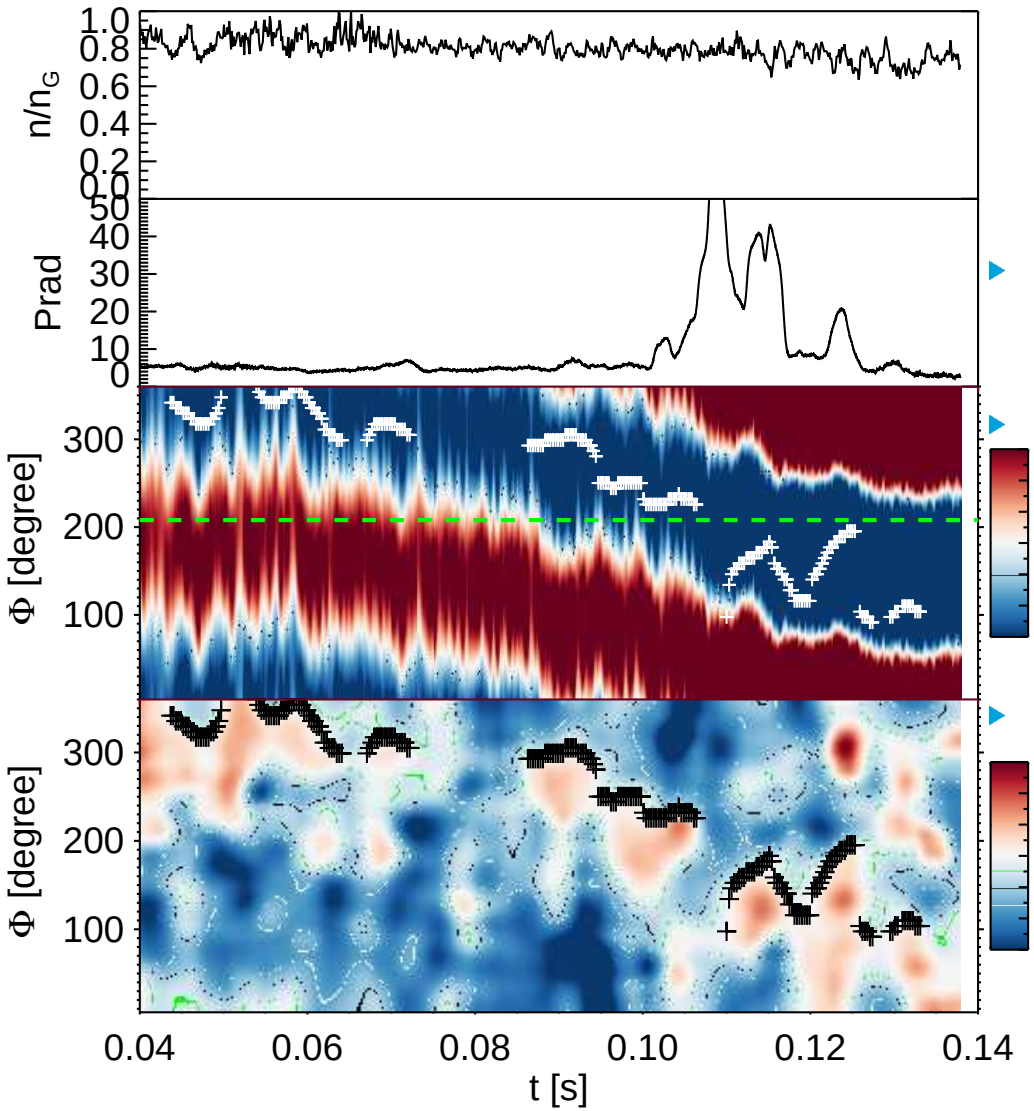

- Similar phenomenology appears in High density regime
- In this case, radiative collapse caused by density accumulation caused by perpendicular flow inversion
- Accumulation point coincides with the X-point of the magnetic islands (asterisks track accumulation point)

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