WPTE-WPW7X Experiment Proposal

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Wendelstein 7-X

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The views and opinions expressed herein do not necessarily reflect those of the European Commission.

Impact of magnetic islands on ITBs

Low order rationals and related magnetic islands are suspected to trigger confinement bifurcations within the plasma volume (general notion: ITB)

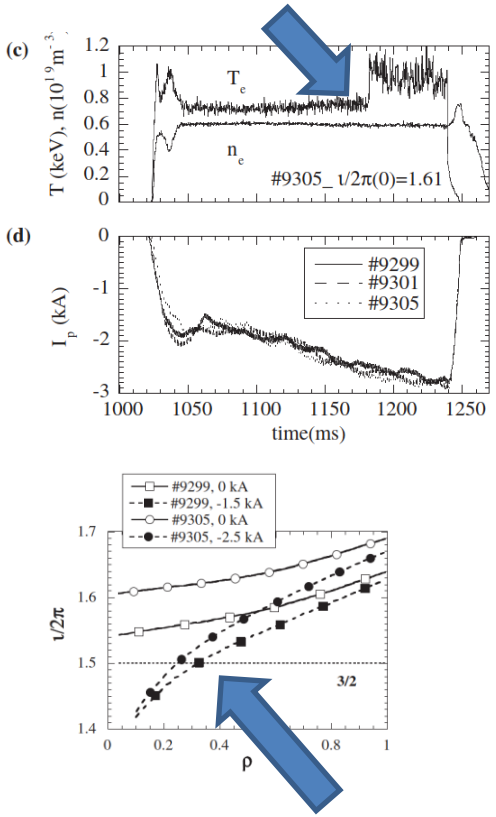
Findings in Tokamaks: triggering of ITBs, control

& Stellarators: phenomenology in H-J, TJ-II, LHD, W7-X

This proposal: ‚control' iota profile (ECCD), study impact of shear (res. MHD), reveal range of control, drive subcritical plasma state intentionally into ITB (e-root)

Knowns

TJ-II
Estrada et al. PPCF 2004



Heliotron-J
Kenochi et al. Sci. Rep. 2020

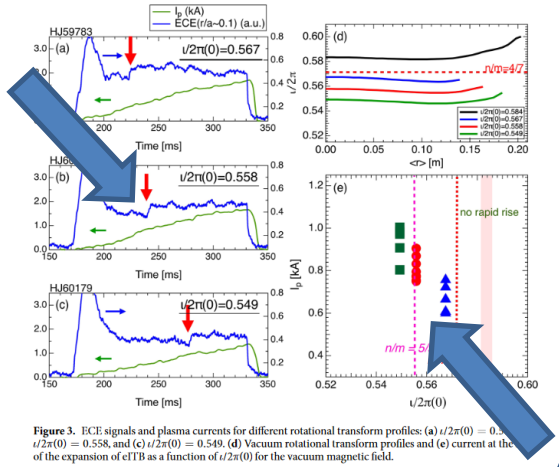
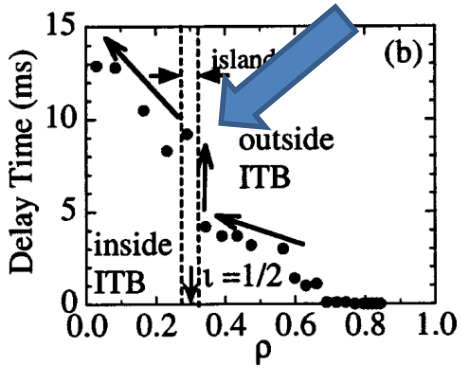


Figure 3. ECE signals and plasma currents for different rotational transform profiles: (**a**) $\iota/2\pi(0) = 0.$ $\iota/2\pi(0) = 0.558$, and (**c**) $\iota/2\pi(0) = 0.549$. (**d**) Vacuum rotational transform profiles and (**e**) current at the of the expansion of eITB as a function of $\iota/2\pi(0)$ for the vacuum magnetic field.

LHD
Ida et al. Phys. Plasmas 2004



W7-X
Guerrero et al. (submitted)

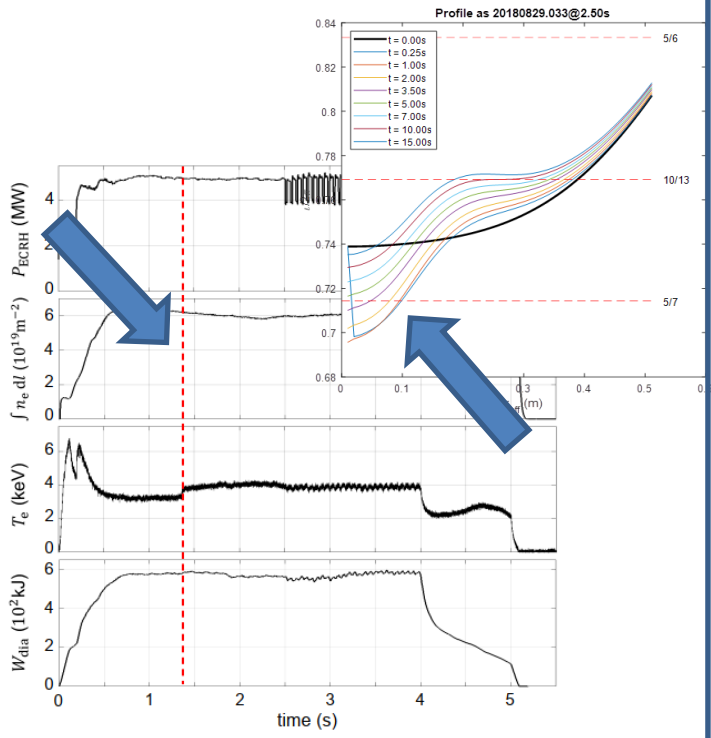
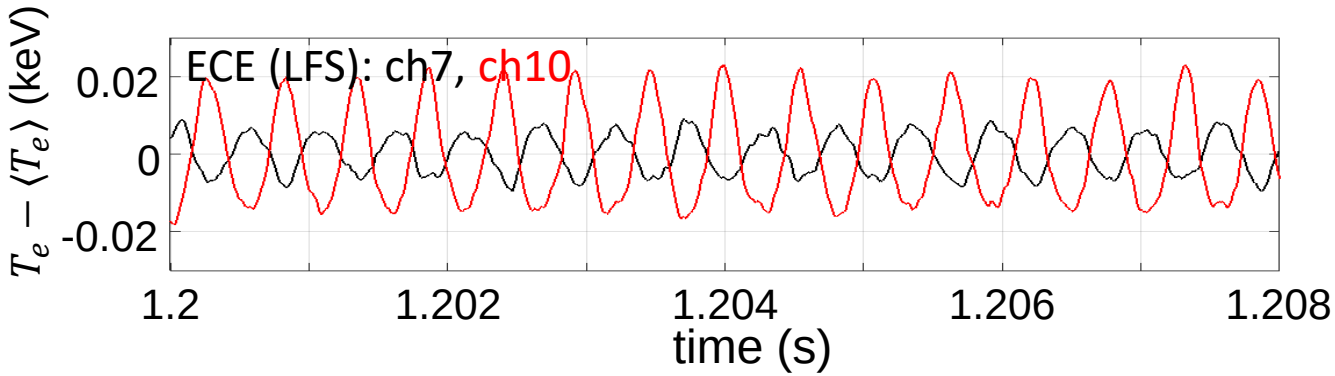


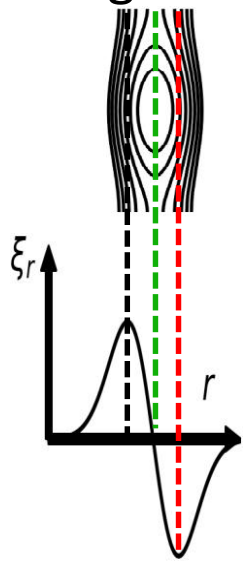
Figure 4. Time traces of low iota configuration plasma discharge 20180829.24 in W7-X (configuration B: DBM, $\langle\beta\rangle = 1.02\,\%$). Top-to-bottom: electron cyclotron heating power P_{ECRH}, line integrated electron density n_{e}, electron temperature T_{e} and diamagnetic energy W_{dia}. Black dashed line pinpoints the instant when a spontaneous T_{e} increase is observed.

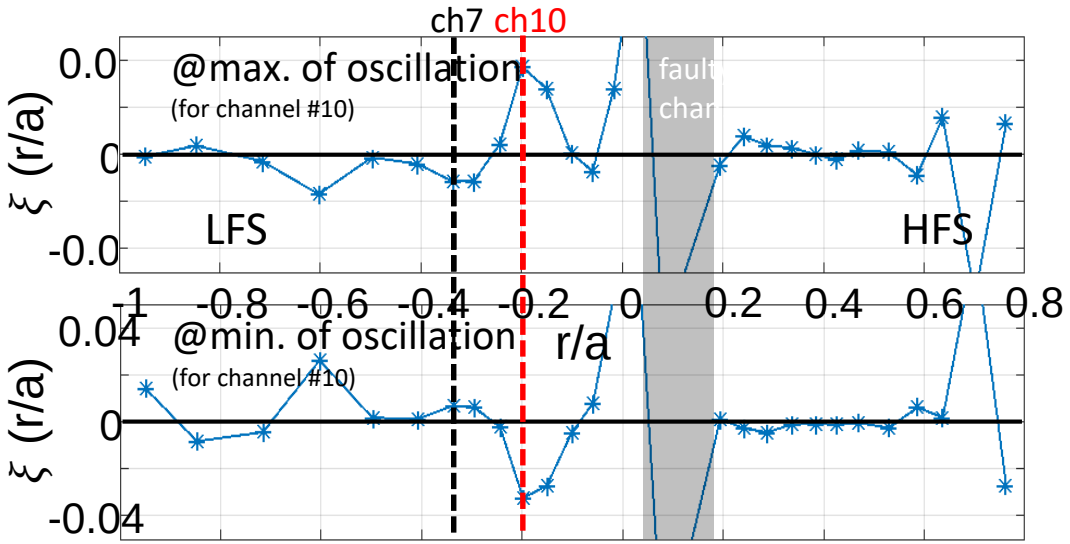
Mechanism: indications for MHD activity

Spatio-temporal dynamics close to the transition



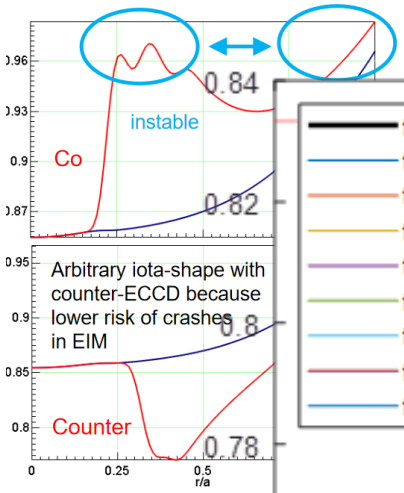
tearing mode





J. Guerrero, M. Zanini et al. (unpublished)

Proposal outline



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