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Scope of MHD Database in Stellarator/Heliotron

- Purpose and Plan -

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Motivation



We propose to construct MHD database in stellarator/heliotrons

▶ Common understanding of characteristics of MHD activity and its effects on profiles and confinement

- Empirical scaling of onset parameters
- Parameter dependence of saturation level of the fluctuation
- Validity of linear stability boundary (D_I , D_R , Low- n analysis)

⇒ The experimental knowledge is expected to contribute an extension of free degree of magnetic configurations for reactor design as well as clarification of physical mechanism of MHD instability, especially, pressure driven one.

▶ Objects : the **fluctuation level** (amplitude) and **onset parameters**

MHD database – Fluctuation Level –



1st Step (where to start)

- Addition of MHD data to “existing” database (ISS, High-beta, etc.)
- How about effects of MHD on global and local confinement?

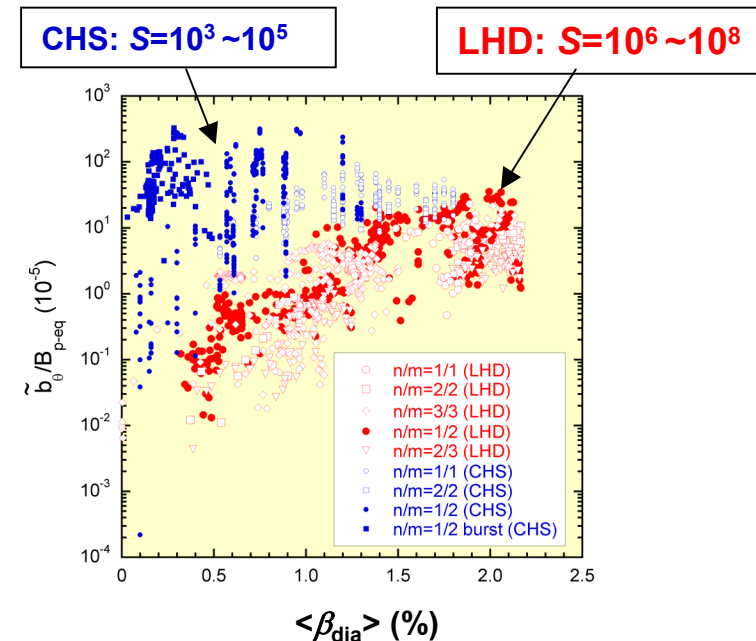
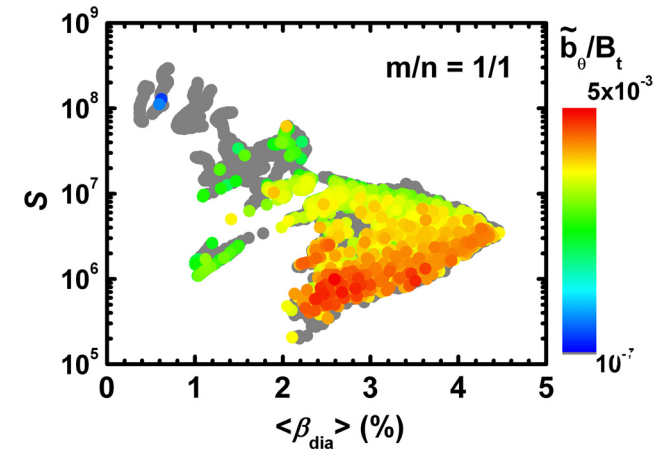
2nd Step (extension)

- Database in the extended parameter range (β , S etc.) for clarifying parameter dependence of the mode

(S , β , $d\beta/dr$, I_p , $a_{eff} \dots$)

3rd Step (specific target)

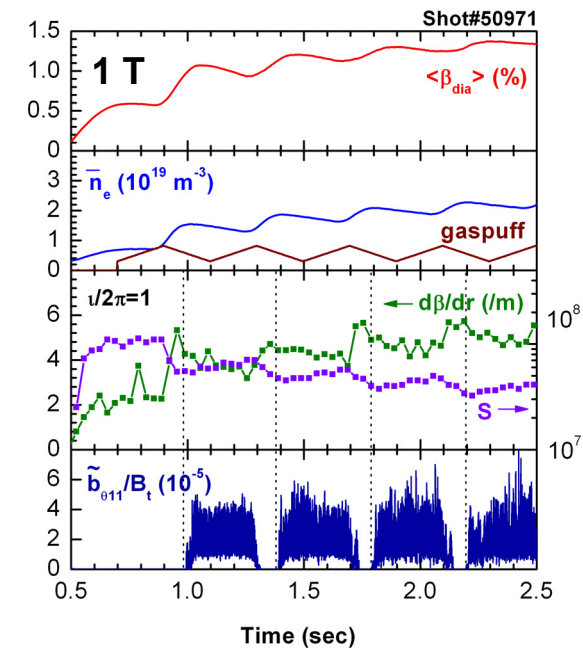
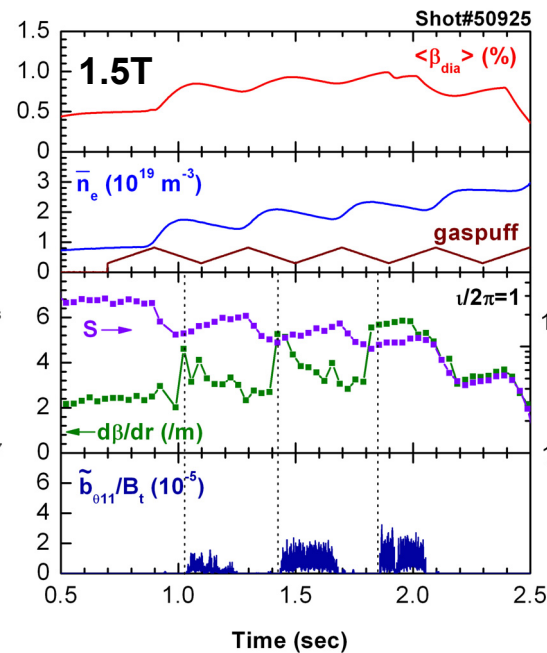
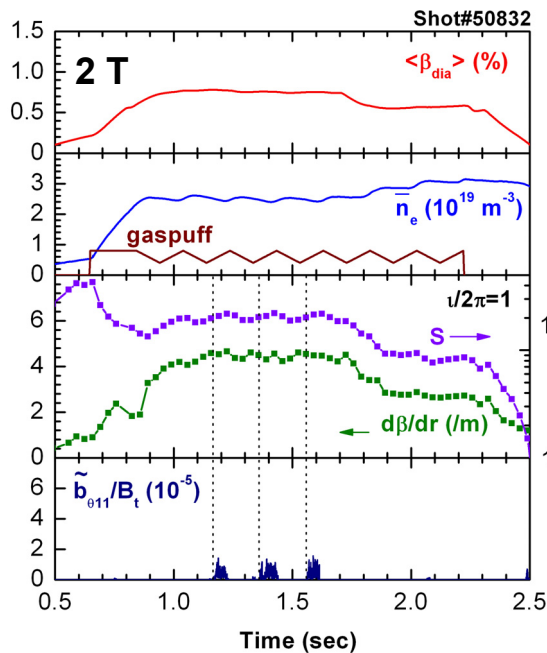
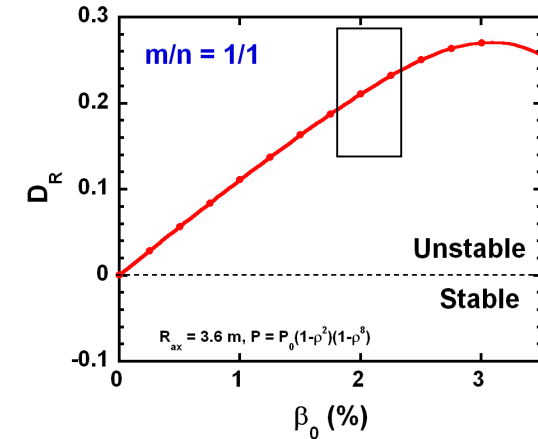
The “unstable” cases in which MHD instability effects the profile



MHD database – Onset Parameters –



- Empirical scaling of plasma and configuration parameters at the onset
- Quantitative estimation of D_I , D_R and low- n at the onset
- Active experiments are useful



Discussion



Fluctuation data?

- magnetic fluctuation, ECE, SX etc.

The index of fluctuations?

- \tilde{b}_p normalized to B_p at boundary? dT_e/T_e ? others?

Plasma and configuration parameters?

- local parameters around resonance in addition to global one

- $\langle \beta \rangle$, β_0 , I_p , S , D_I , D_R , $d\beta/dr$, dI/dr , V' etc.

→ Parameters required for stability calculation should be prepared

→ An item of unknown parameter will be blank

Advanced analysis

- comparison with radial structure and growth rate of the mode

CHS and LHD analyses are in progress