NSTX

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Effect of error field on the formation of separatrix splitting and induction of ELMs

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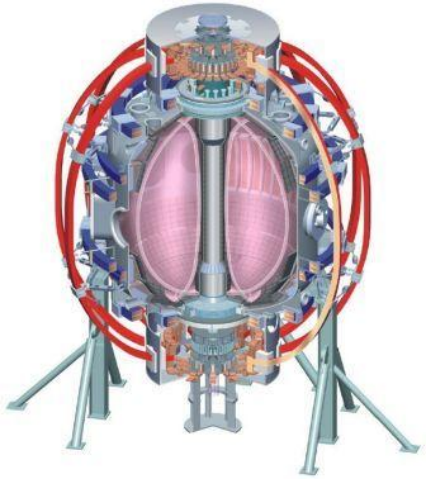


Motivation

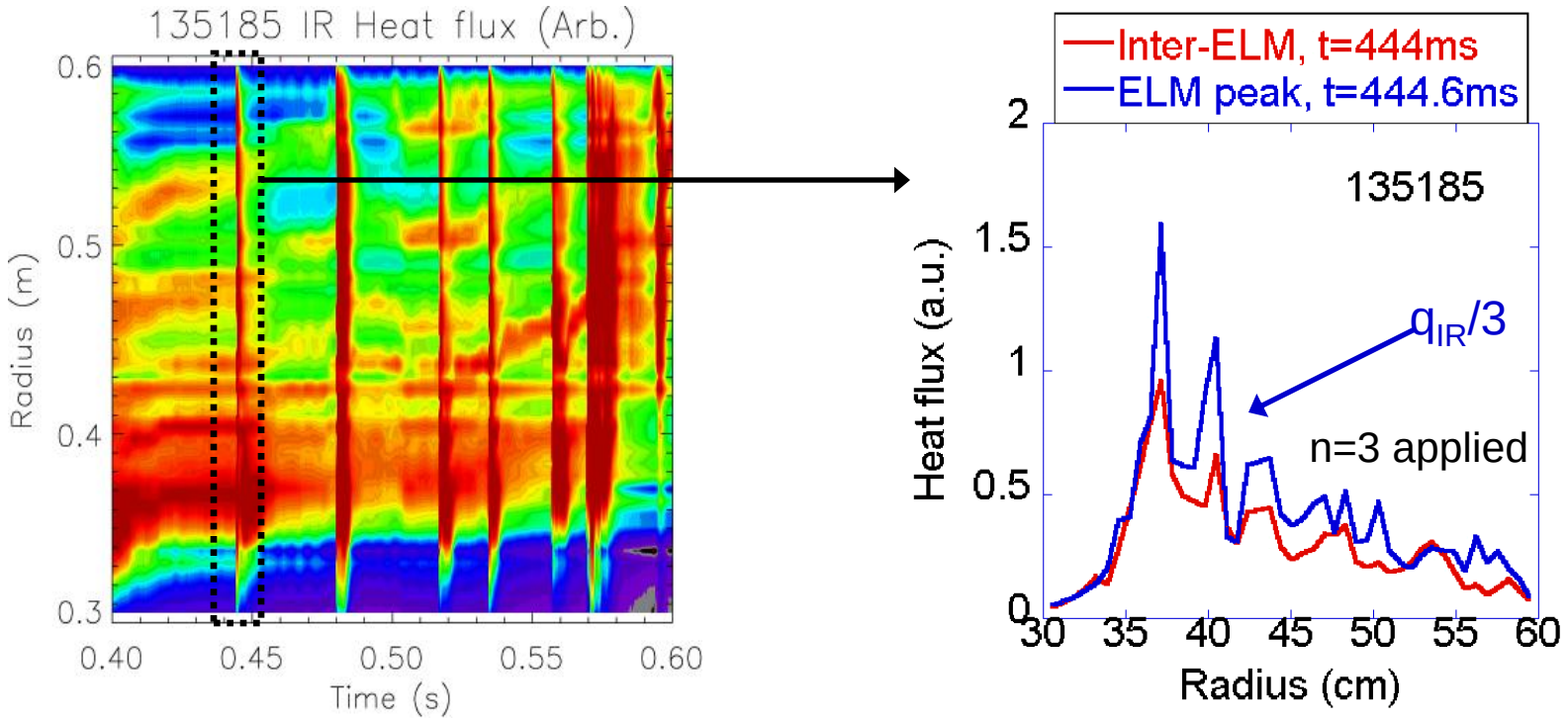
- Recent NSTX results indicate that the spatial structure of divertor footprints caused by ELMs is consistent with that by the application of external magnetic perturbation or by intrinsic error fields

  → Separatrix splitting and ELM filaments can be viewed to have the same origin???

- T. Evans's conceptual ELM model indicates that thermoelectric current caused by small heat flux from P-B mode flows along intrinsically split separatrix and is amplified to develop ELMs.

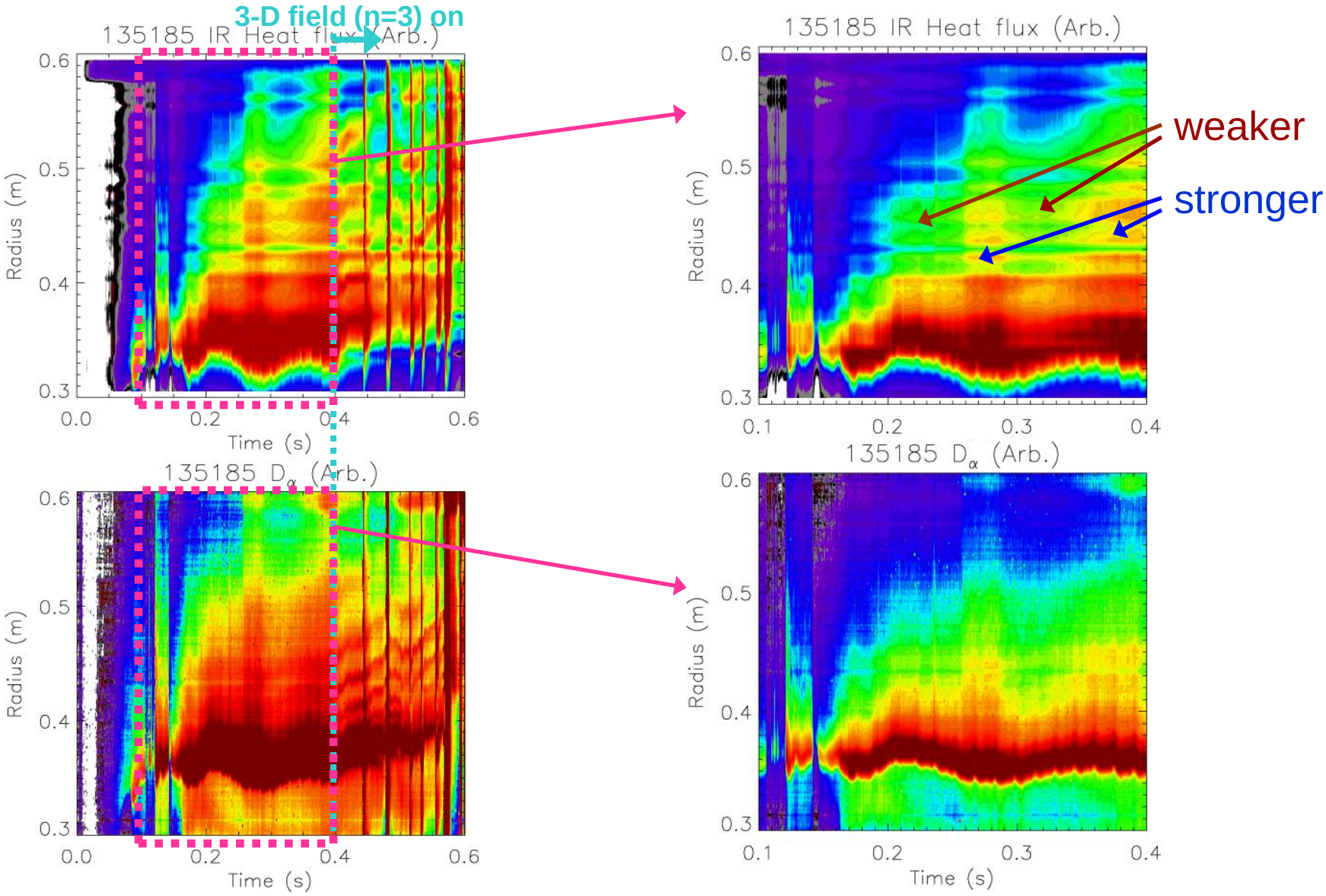
- Possibility of changing the 3-D field ELM triggering threshold by changing the intrinsic separatrix splitting by means of the error field correction coil.

Heat flux profile from ELMs triggered by n=3 fields follows imposed field structure



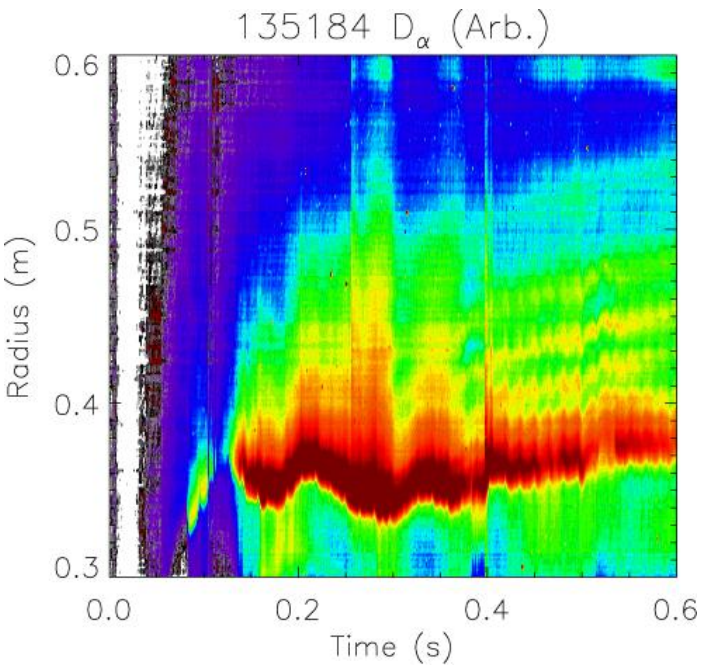
- Striations in the heat flux profile appear in the same locations as was before the ELM
- 3-D field triggered ELMs appear to be phase-locked to the externally applied perturbation structure

Variation of intrinsic separatrix splitting is correlated with the PF5 coil current variation

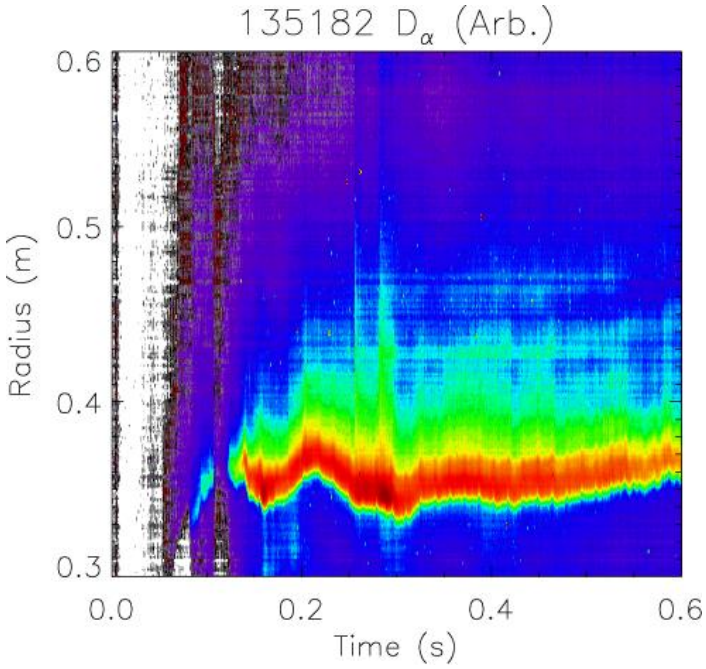


Application of EFCC can reduce intrinsic separatrix splitting in both D_α and heat flux profiles

- Intrinsic separatrix splitting due to n=3 error field (non-circularity of PF5) can be reduced by the application of 200A of EFCC



No EFCC



200A of n=3 EFCC

ELM triggering can be controlled by varying EFCC current?

- If ELMs are really caused by the amplification of intrinsic separatrix splitting, its threshold should be changed by the change in the degree of intrinsic separatrix splitting
- We have confirmed that the application of EFCC can reduce the degree of intrinsic divertor footprint splitting
- Therefore, the threshold of the ELM triggering in the 3-D field coil current might be changed by varying EFCC current around its optimum value, ~200A, eg to scan from 0 to 400A???
- The reference discharge (high δ and κ, long ELM free H-mode) has proved easy to achieve in FY09 and FY10. The experiment will be relatively straight forward.