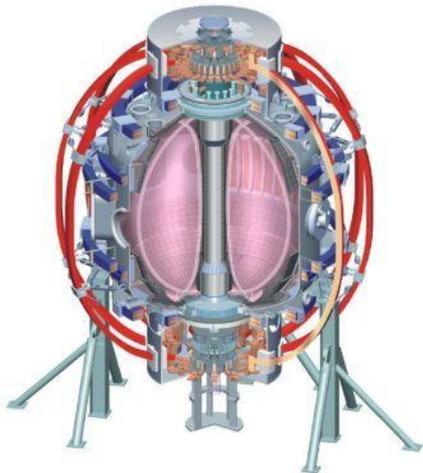


Effect of error field on the formation of separatrix splitting and induction of ELMs

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**NSTX Research Forum
B318, PPPL
March 17, 2011**



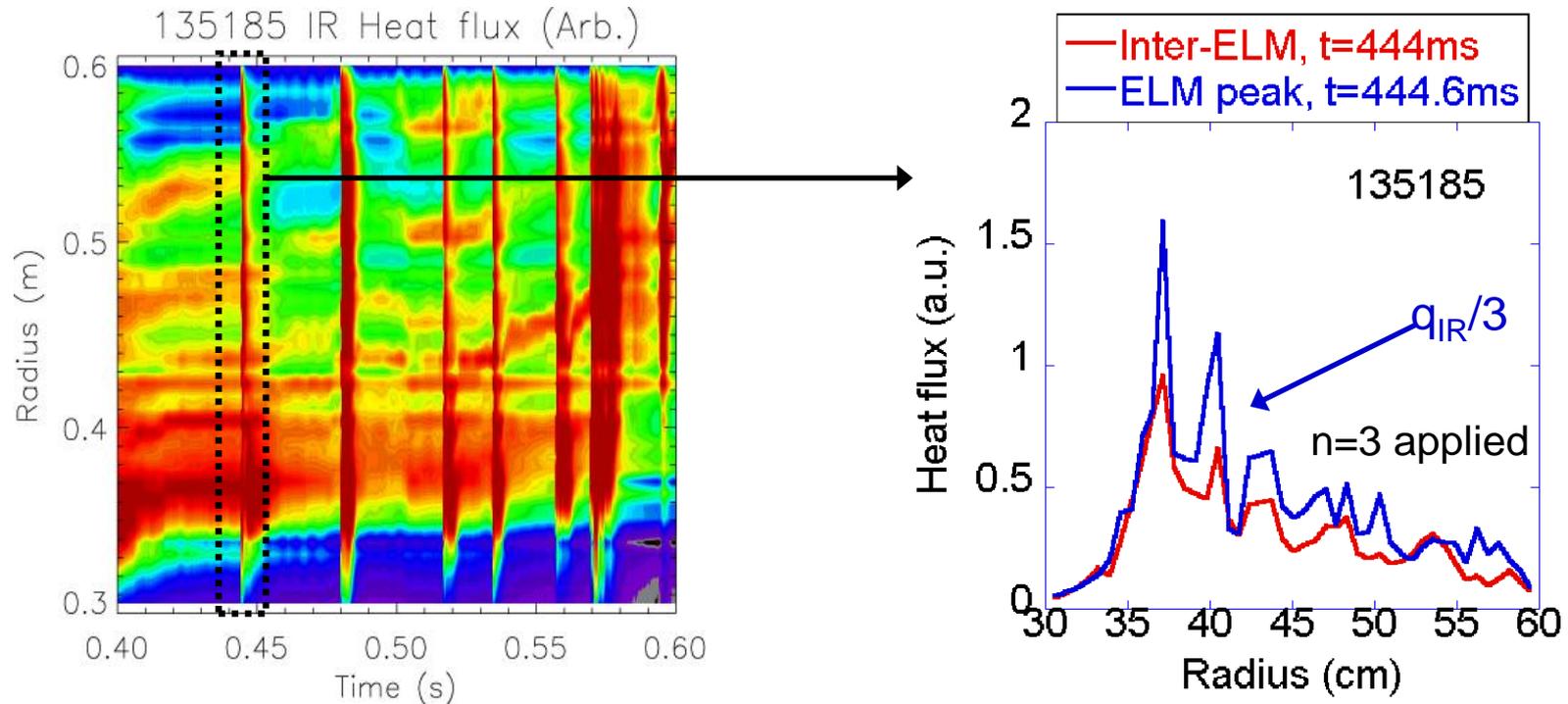
College W&M
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 Old Dominion U
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Motivation

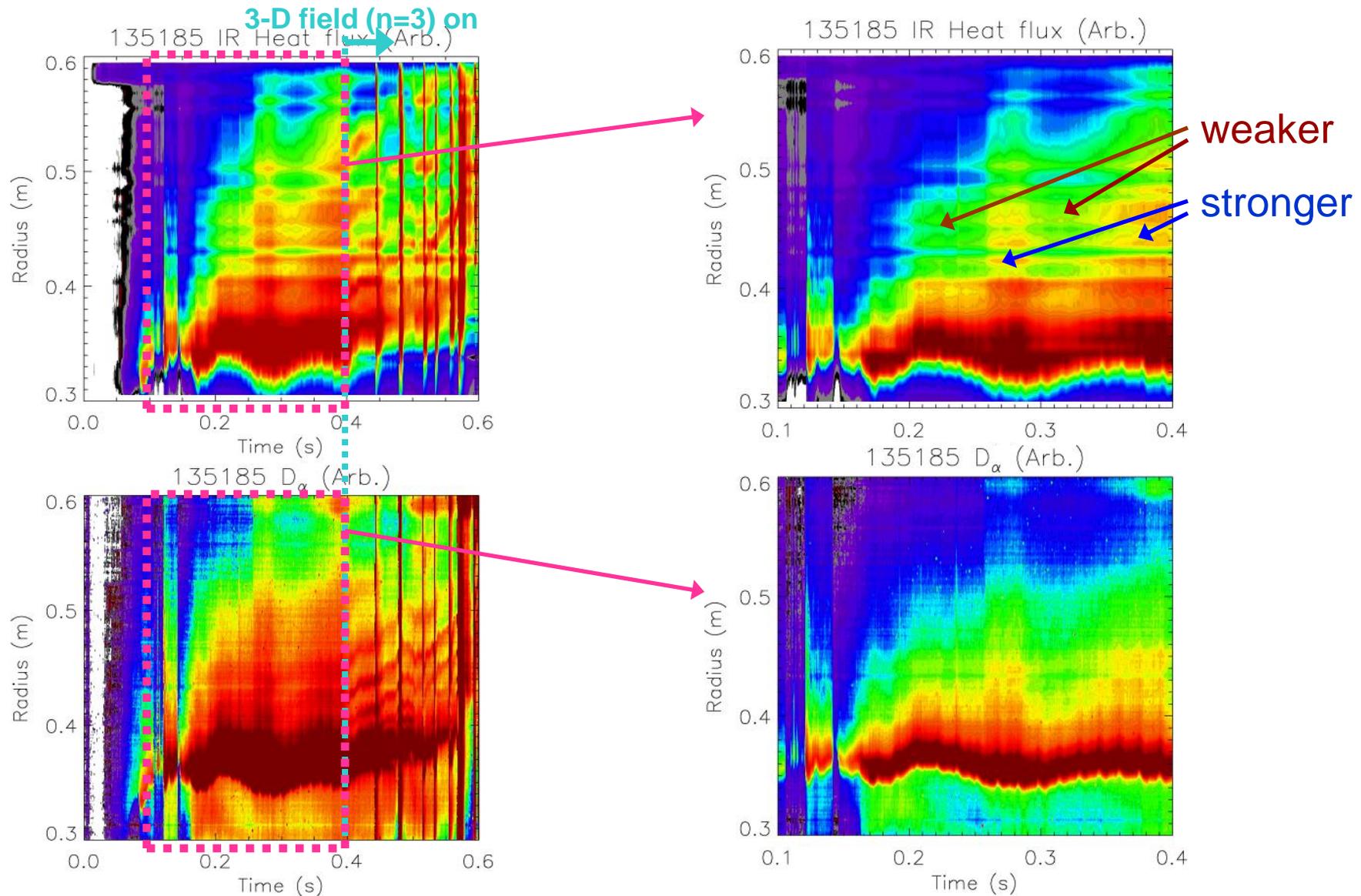
- NSTX data indicates that the spatial structure of divertor footprints caused by ELMs is consistent with that by the application of external magnetic perturbation or **by intrinsic error fields**
 - Separatrix splitting and ELM filaments can be viewed to have the same origin???
- **T. Evans's conceptual 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



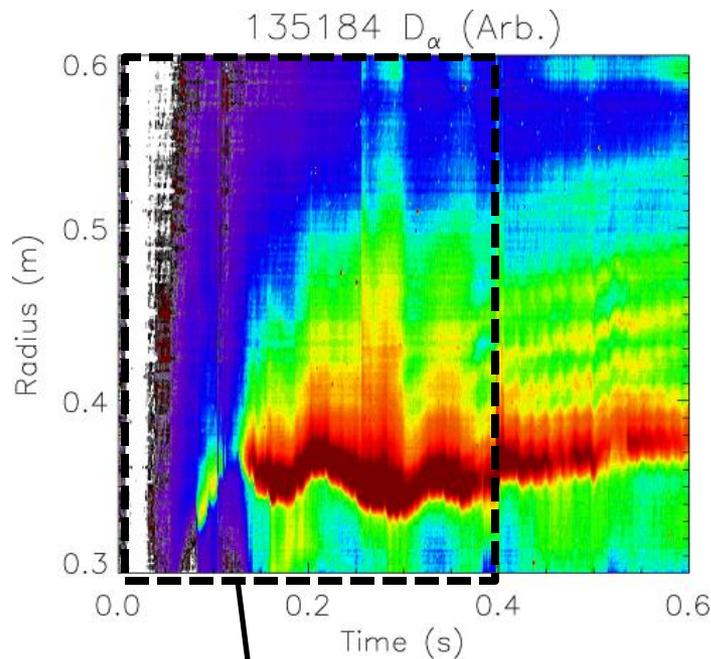
- Striations in the heat flux profile appear in the same locations as was before the ELM
- 3-D field triggered ELMs appear to be phase-locked to the externally applied perturbation structure

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

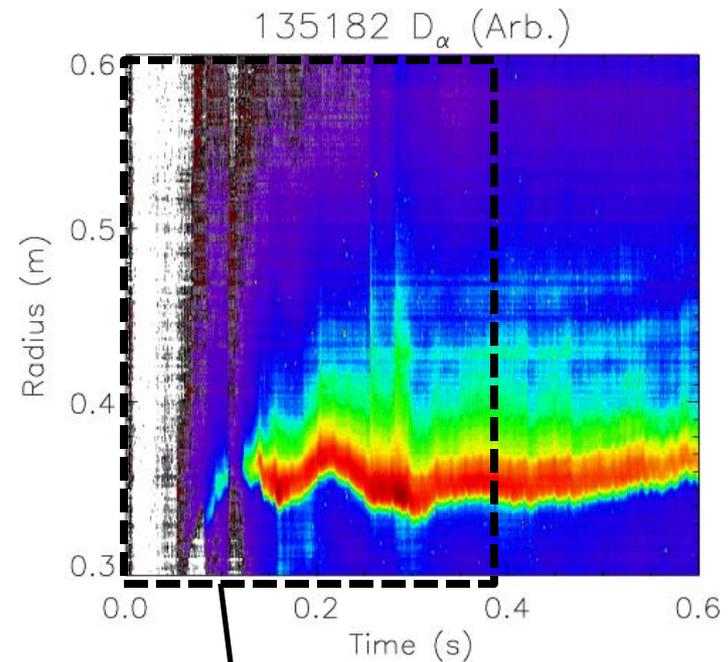


Application of EFCC can reduce intrinsic separatrix splitting in both D_α and heat flux profiles

- Intrinsic separatrix splitting due to $n=3$ error field (non-circularity of PF5) can be reduced by the application of 185A of EFCC



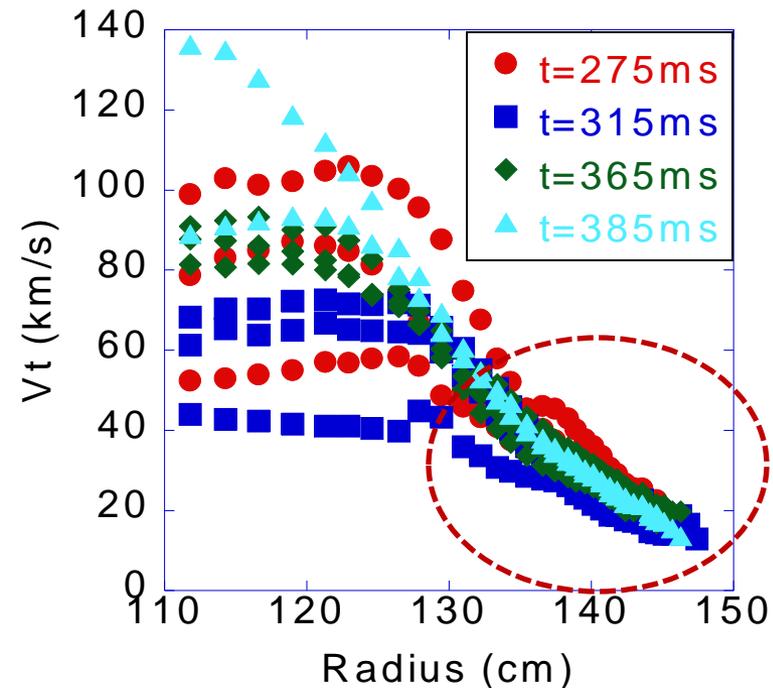
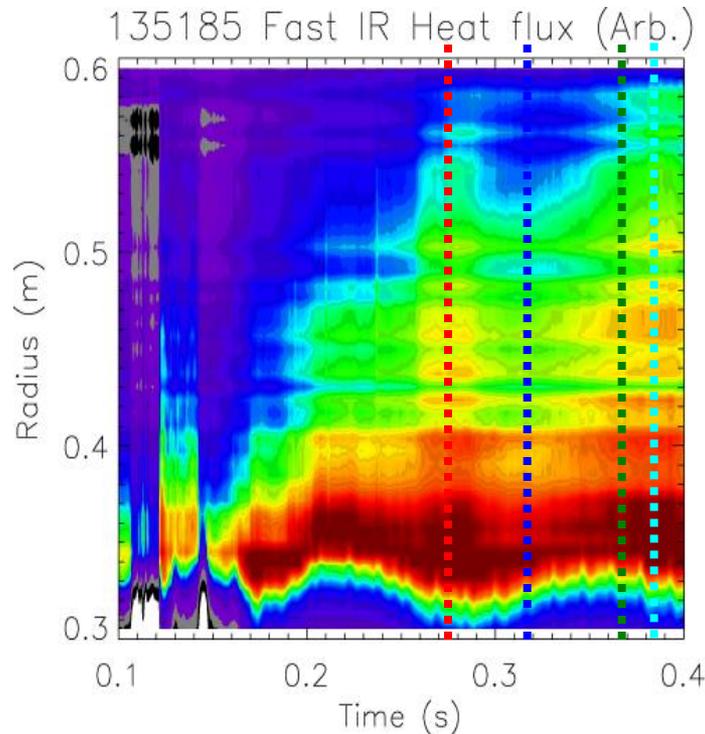
No EFCC



185A of $n=3$ EFCC

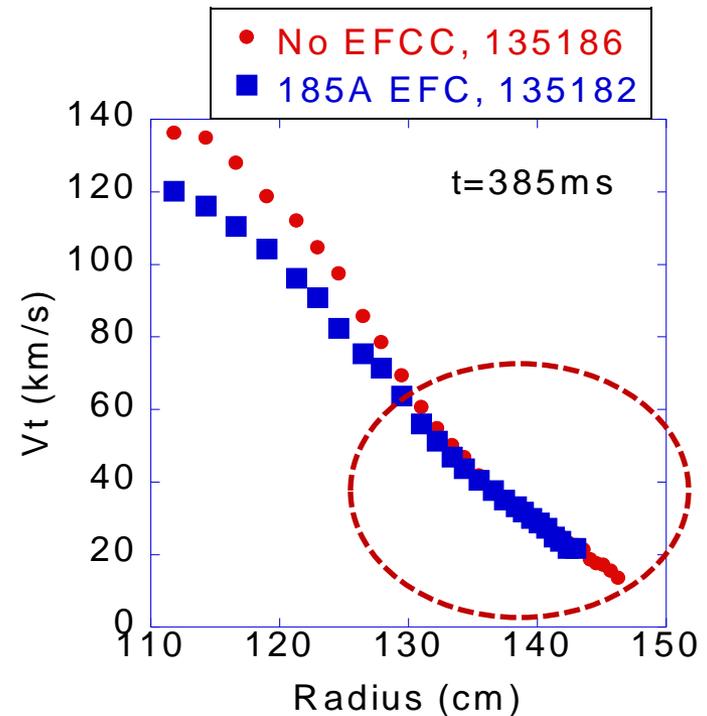
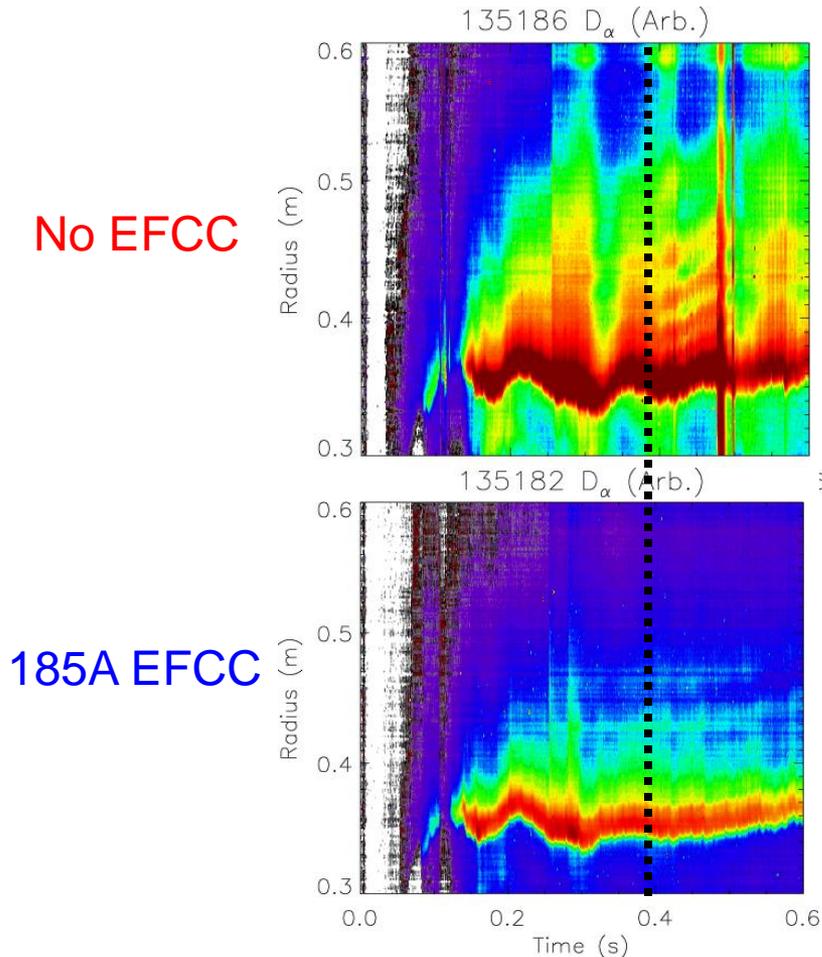
Pedestal rotation profile is not affected by intrinsic separatrix splitting

- **Rotation profile in the pedestal** is very similar irrespective of intrinsic separatrix splitting



Pedestal rotation profile is not affected by EFCC

- Pedestal rotation profile is very similar w/ and w/o EFCC
→ Effect of rotation for ELM triggering threshold is excluded



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, ~185A, eg to scan from 0 to 370A**
- 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.

Experimental plan

- Reference shot (140379, high δ and κ , long ELM free H-mode)
- Background EFC coil current scan around the optimal value (185A)
 - 0 and 90A of I_{EFC} : under-correction
 - 185 A of I_{EFC} : optimal correction
 - 275 and 370A of I_{EFC} : over-correction
 - Identify ELM triggering threshold for each I_{EFC} level (3 shots each)
 - Total of 15 shots

Request 0.5 day of run time
(Minimum of 0.5 day)