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Investigation of ELM heat flux footprints with the variation of ELM regime

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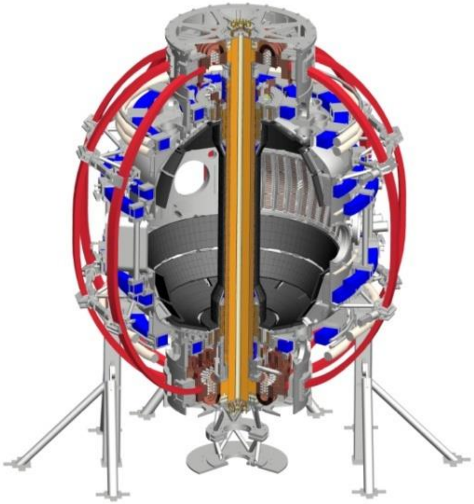

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Broadening of heat flux profile during the ELM is important to alleviate peak heat flux problem

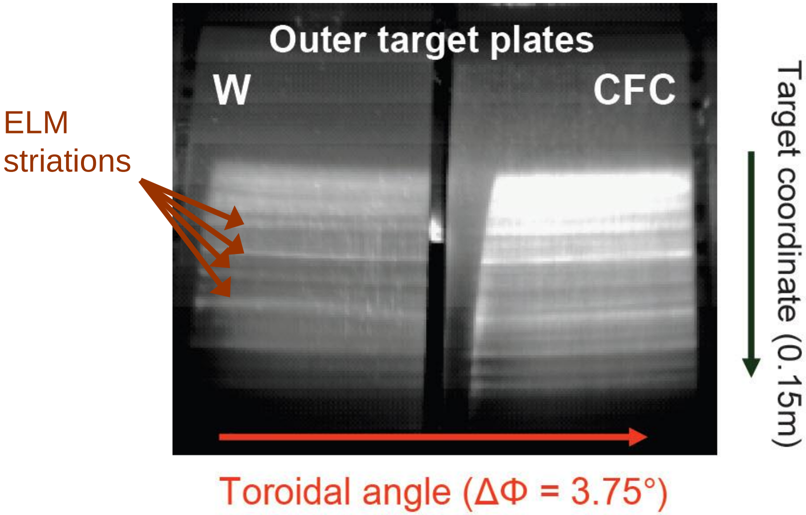
- Relationship of profile broadening to the size of ELM energy loss directly impacts peak heat flux → determines requirement of ELM control system performance in future machines

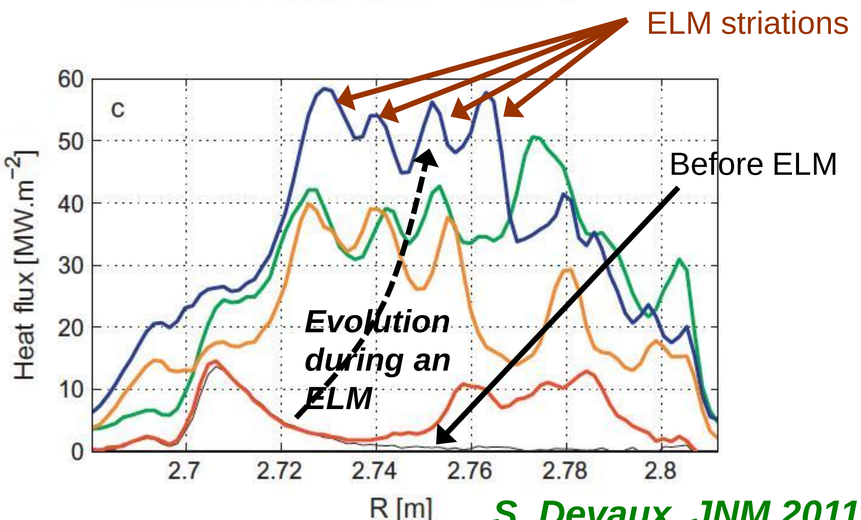
- Some NSTX ELMs showed profile contraction

- ELM regime is believed to be related to the profile broadening/contraction behavior → Investigate ELM footprints with varying ELM regime

ELM Heat flux footprints reveal different number of filaments depending on ELM regime

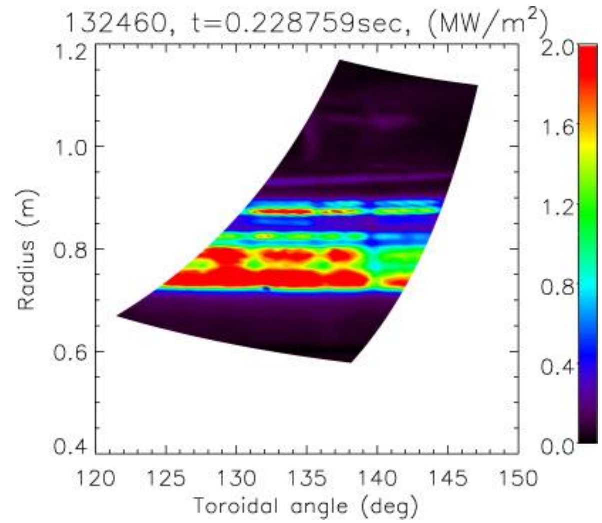
JET, Peeling-ballooning ELMs
15 – 20 ELM filaments

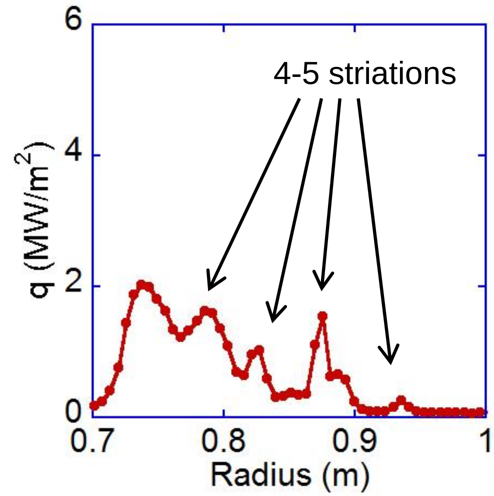




S. Devaux, JNM 2011

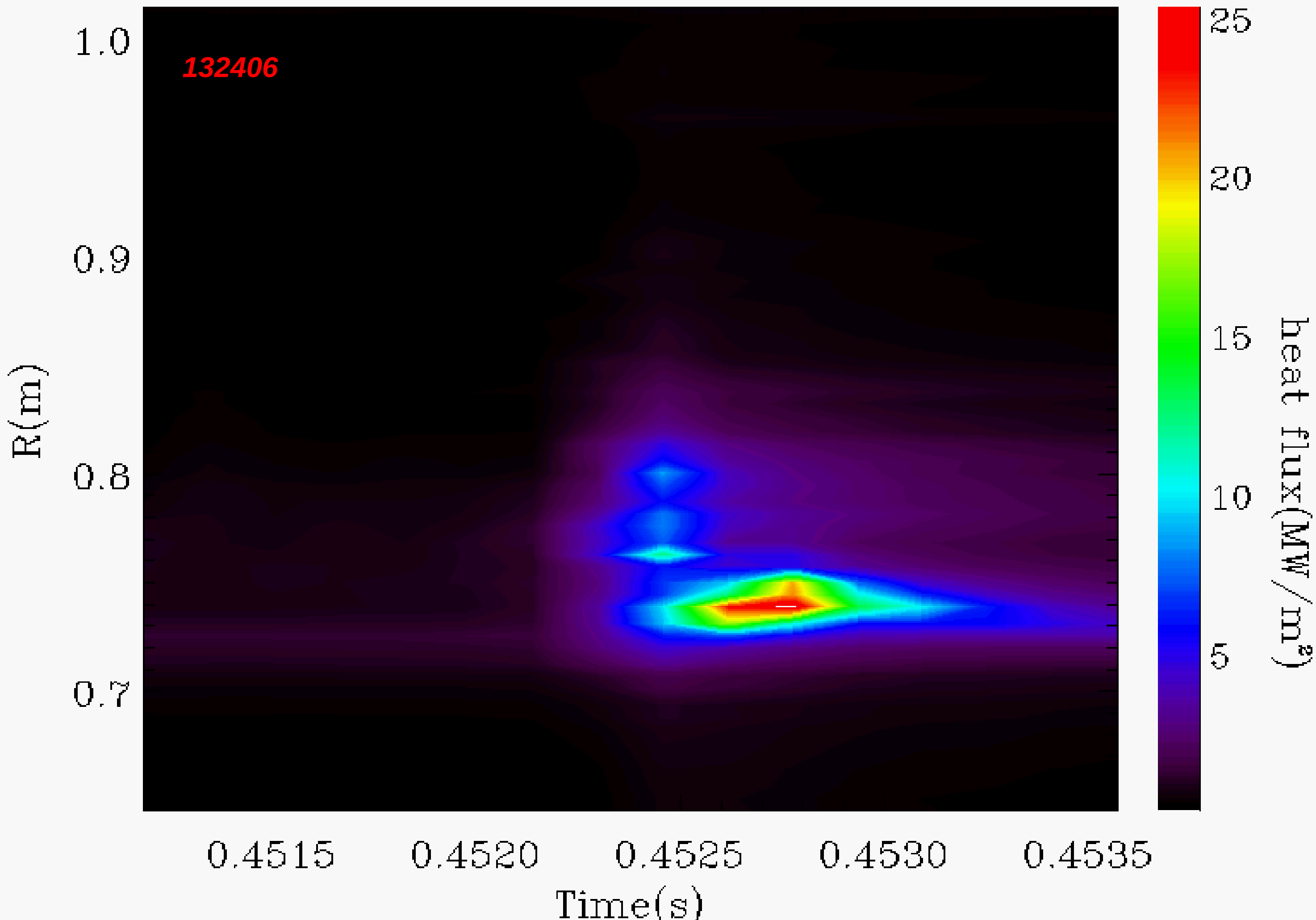
NSTX, Peeling ELMs
4 – 5 ELM filaments





J-W. Ahn, NF 2014

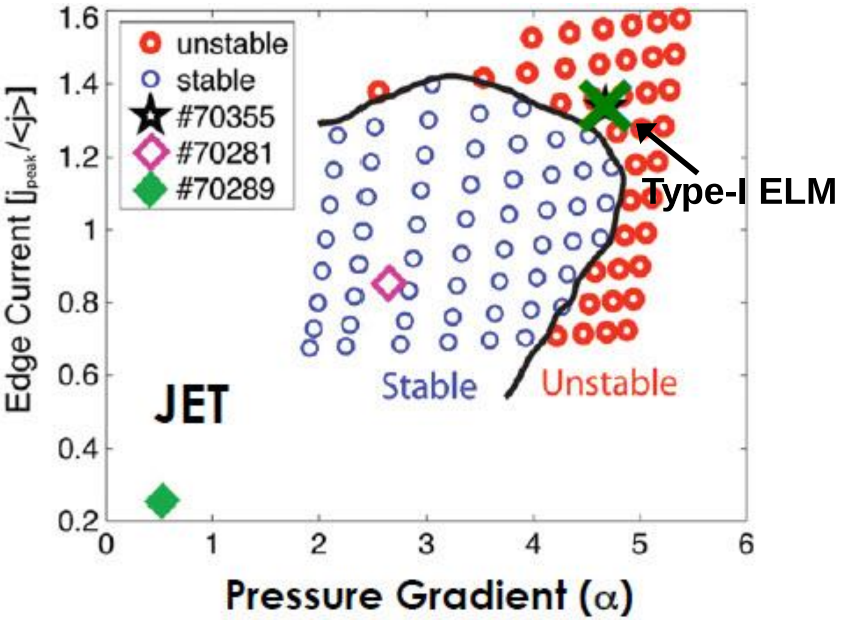
High ELM Heat flux with few filaments



Few filament induce high ELM heat flux

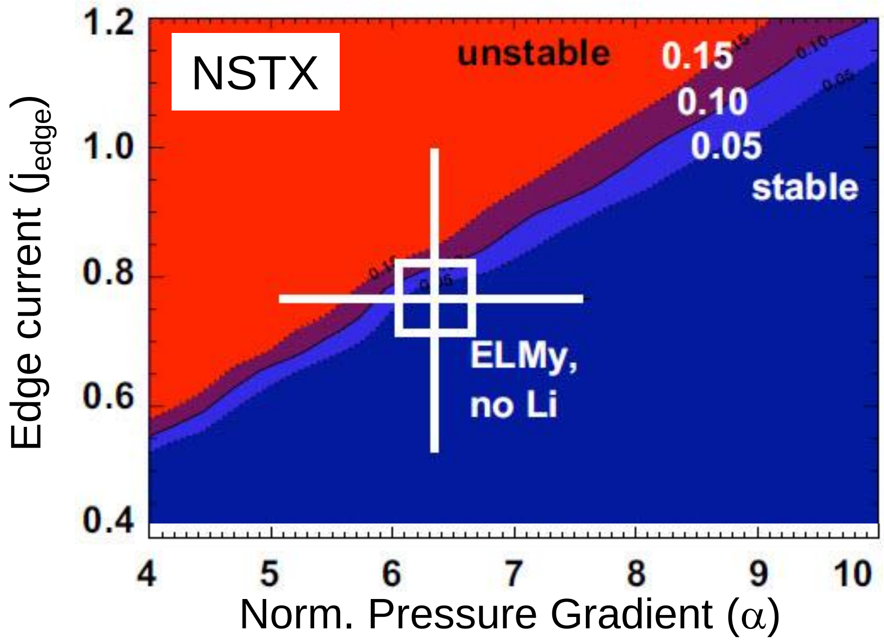
NSTX type-I ELMs are against kink/peeling boundary with lower toroidal mode number n

JET, Peeling-ballooning ELMs



S. Saarelma (PPCF 2009)

NSTX, Peeling ELMs



R. Maingi (PRL 2009), D.P. Boyle (PPCF 2011)

- ELMs in many tokamaks have peeling-ballooning nature (n=10 – 20)
- Stability analysis shows NSTX is most unstable for low n numbers (n=1 – 5)

Experimental plan

- Goal: Investigate ELM heat flux footprints with varring ELM regime (peeling → peeling-ballooning → ballooning)

- Knobs to change ELM regimes
  - Change collisionality: lower collisionality toward more peeling side and higher collisionality toward more ballooning side
  - Change plasma shape: high triangularity expands stability boundary, changing relative location of operation point
  - Request 1 run day in total

- Footprints measurement by fast IR and and visible cameras