

# XP 1016\_ext: HHFW power coupling vs ELMs

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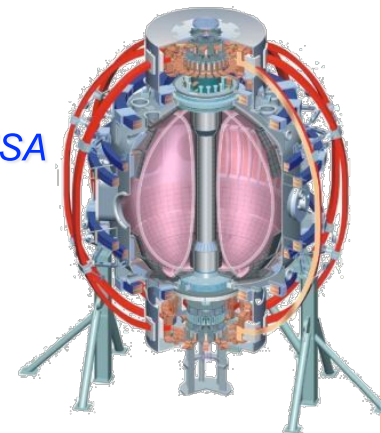
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# XP 1016: HHFW power coupling vs ELMs

## Goals:

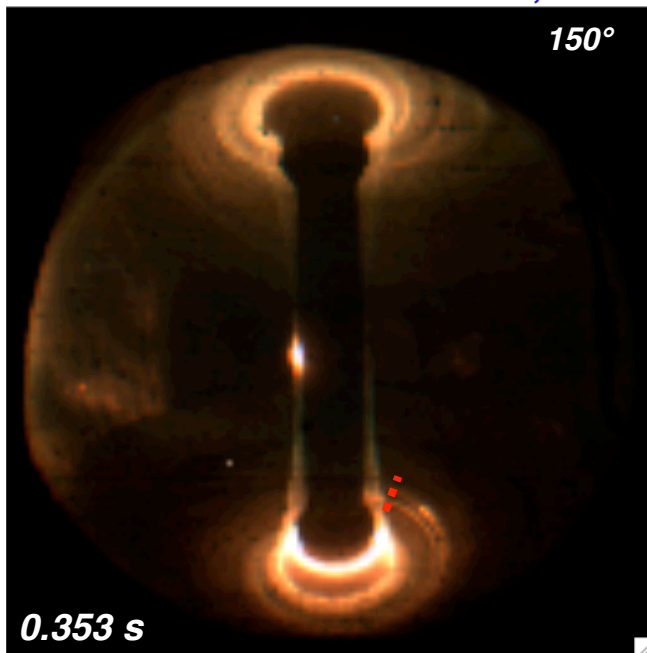
- Understand the effect of ELMs on HHFW heating efficiency and edge losses
- Determine if it is acceptable to power through the ELMs with the HHFW system without blanking or diverting the power during the ELM.

## Objectives:

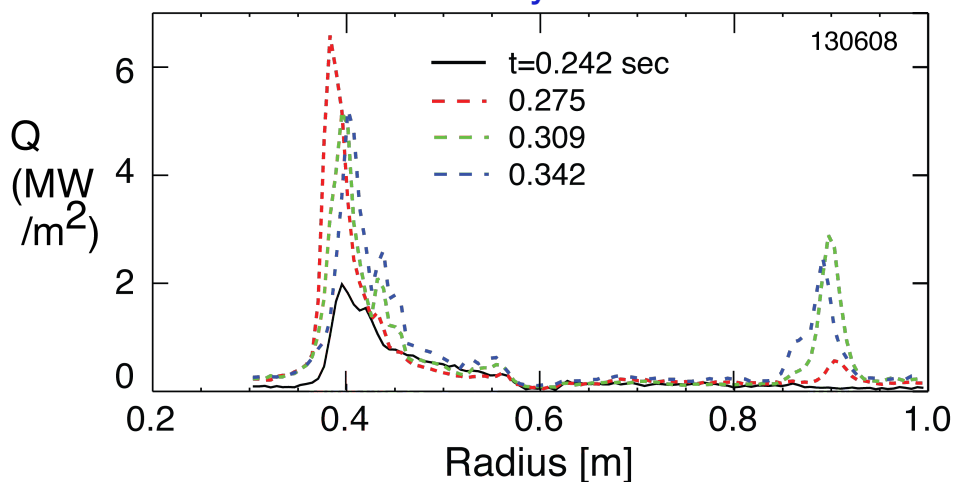
- Compare the ELMy H-mode case to the ELM-free H-mode case in deuterium
  - Quantify the effect of ELMs on the HHFW core energy confinement that is dominated by electron confinement
    - Modulate  $P_{RF}$  to determine  $\tau_E$
  - Determine the effect of ELMs on edge power deposition
    - For edge power deposited in the divertor and on the antenna and for the estimated power loss due to the PDI effect
    - Characterize antenna hot zones with visible and IR cameras, as well as with probes, reflectometer, etc. as for XP 1017
      - \*\* Of particular importance will be the fast IR data

# Heating on outer divertor plate is more intense with ELMs with same field pitch ( $P_{RF} = 1.9$ MW)

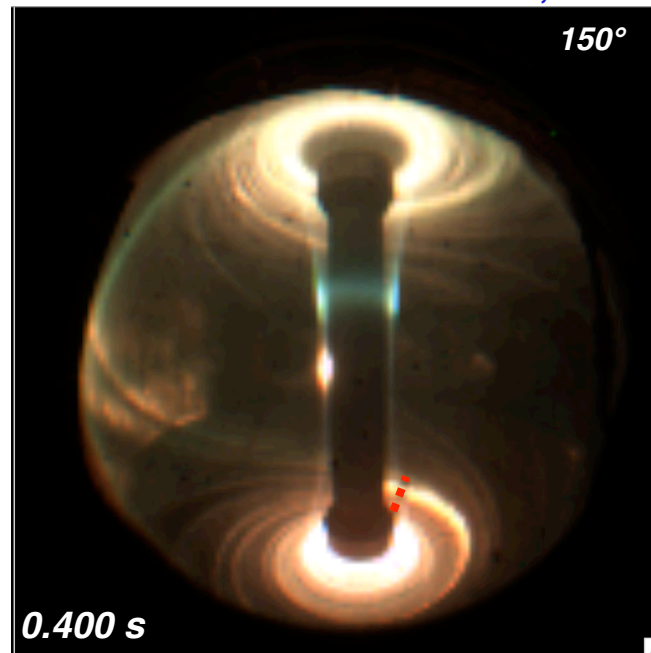
130608 ELM free – 5.5 kG, 1 MA



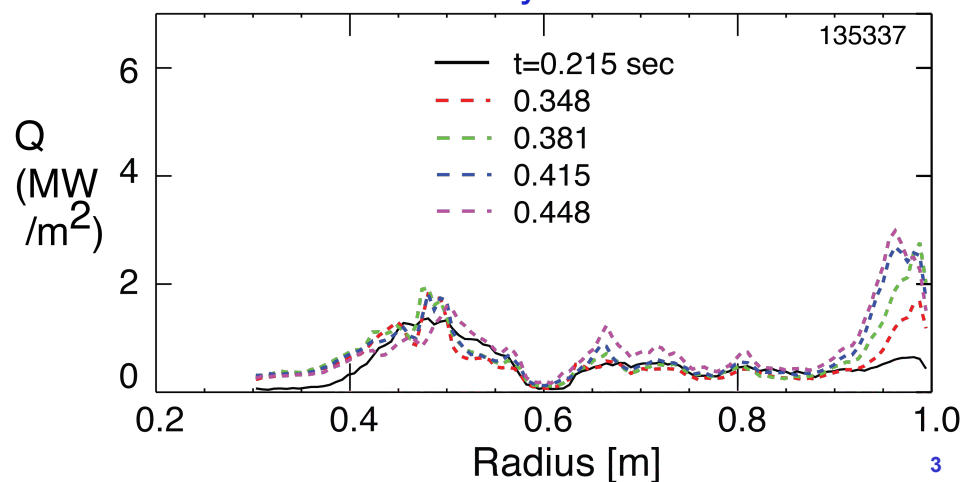
IR Bay I



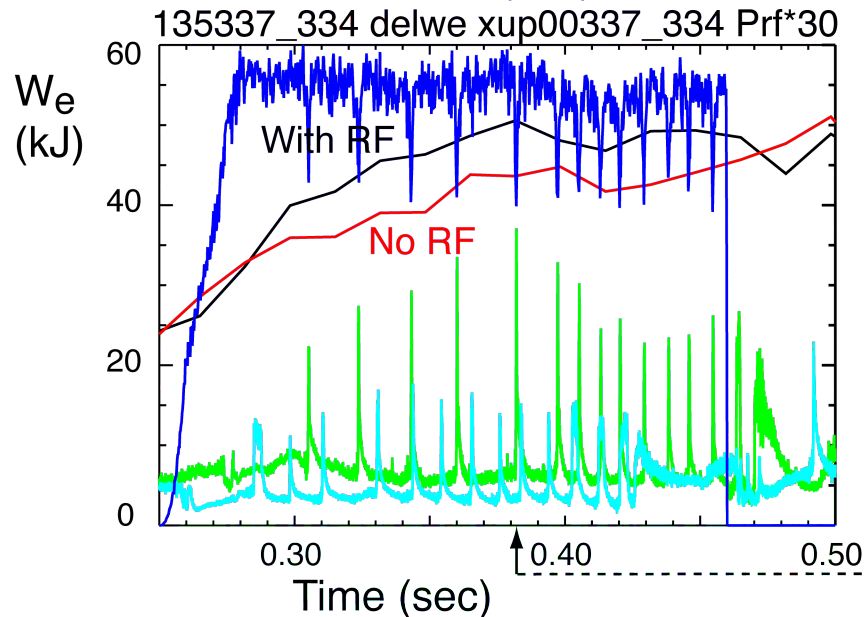
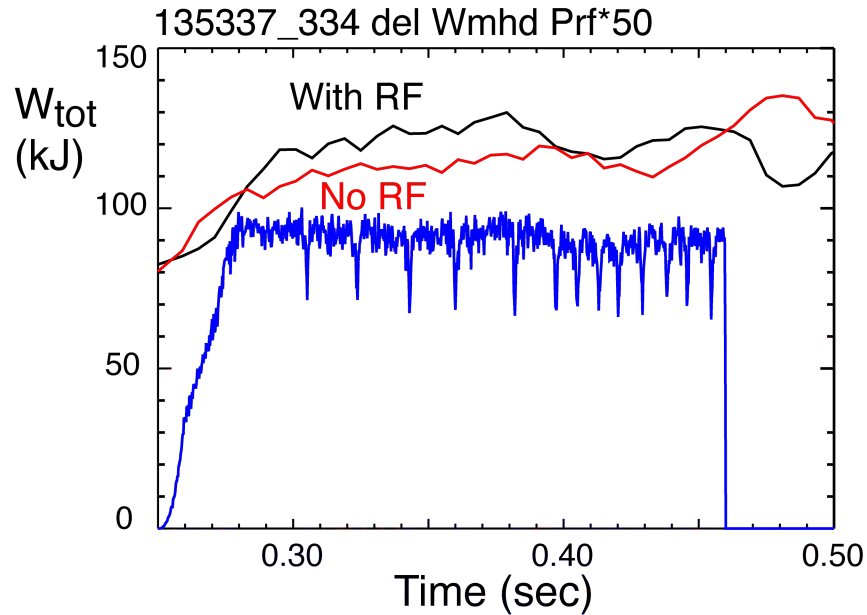
135337 with ELMs – 4.5 kG, 0.8 MA



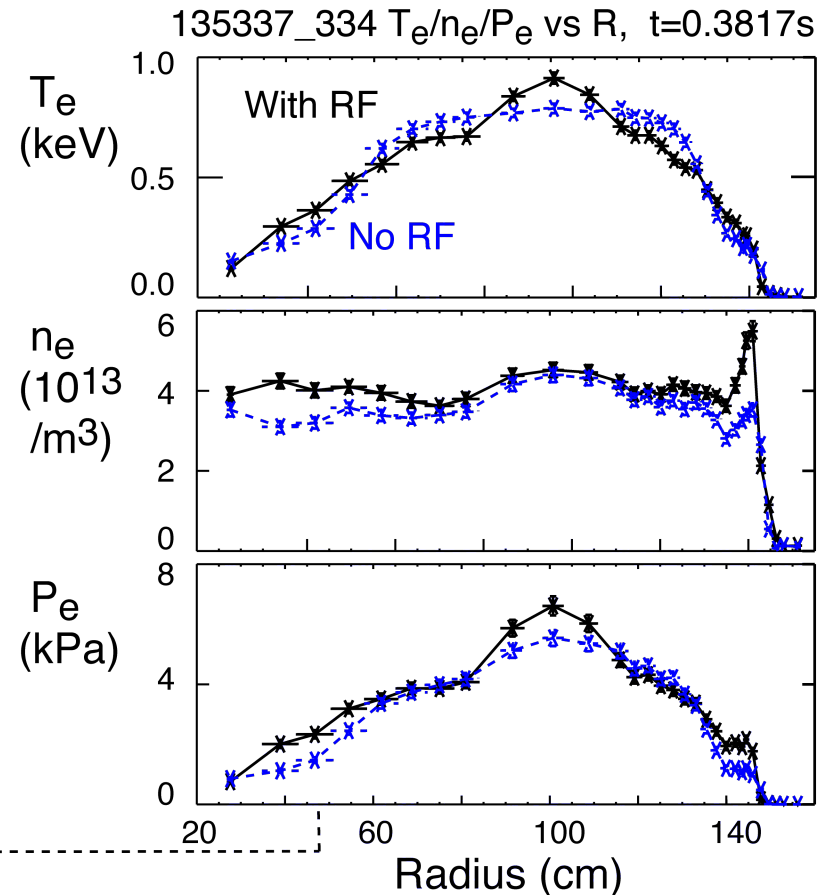
IR Bay I



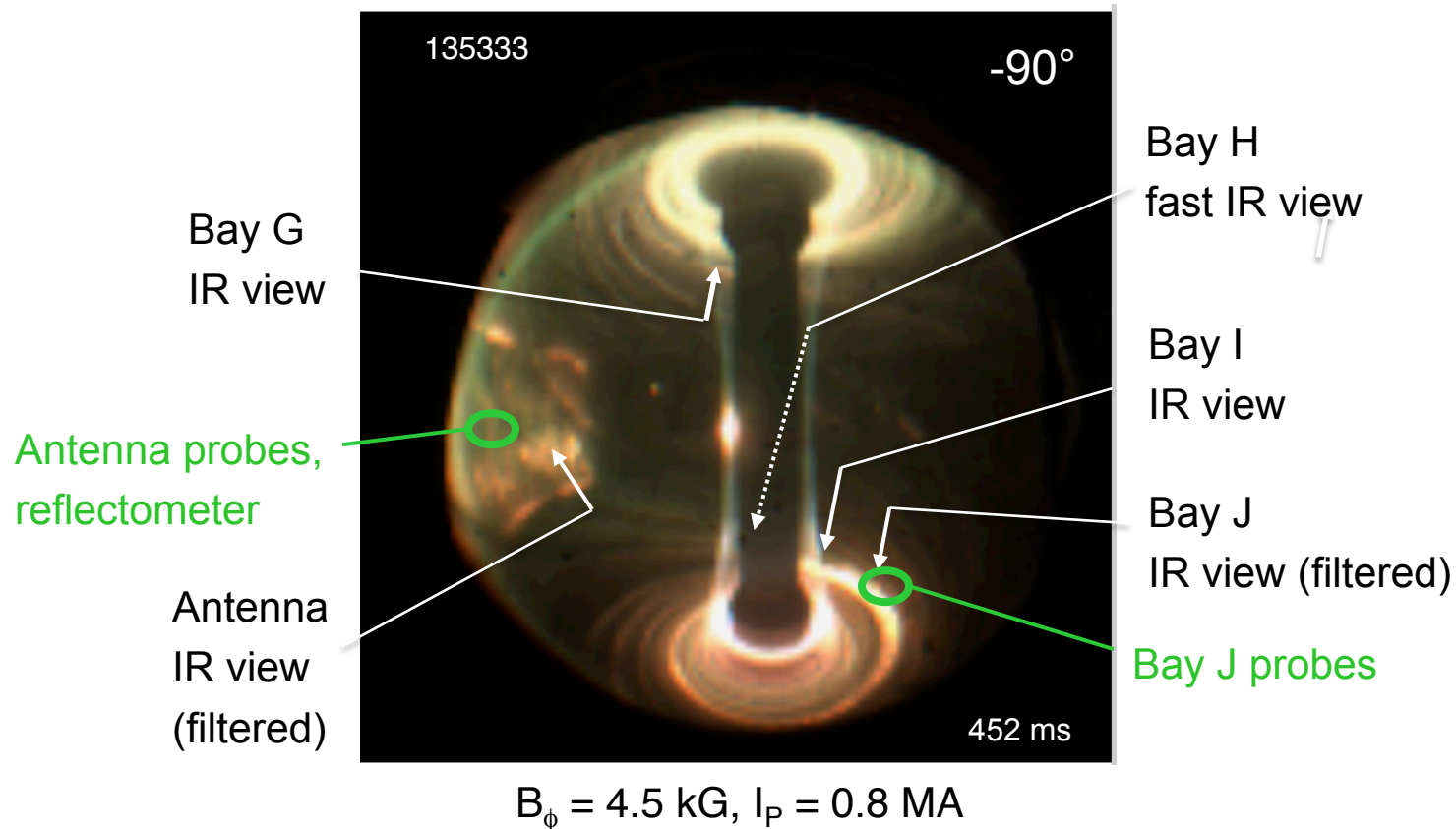
# Power coupled to core is affected by ELMs and/or by higher edge density/steeper density gradient



$\Delta W_{\text{tot}}$  and  $\Delta W_e$  for shot 135337 with ELMs are reduced by  $\sim 50\%$  relative to shot 130608 ELM free case



# IR cameras and probes are critical for documenting effect of ELMs on edge heating



- New IR views of Bay J bottom and of antenna are needed for power deposition measurements
- Field pitch can be varied to pass hot zone over probe at Bay J bottom
- Higher field pitch will permit view of ELM effect on hot zone by fast IR at Bay H