

XP – Electron Heating with HHFW



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and the usual suspects

HHFW Group Meeting

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Heating XP ideas



Issues:

- Where is the power deposited?
- How does it change as rf parameters (e.g., phasing) are changed?
- How does it change as plasma parameters (e.g., n_e , I_p) are changed?
- Efficiency? How much winds up in the core?

HHFW CD experiment will carry out experiments at different phasings:

- $\pm 90^\circ$, $\pm 30^\circ$, $00\pi\pi 00$, $(0\pi 0\pi 0\pi?)$
 - Mostly at low n_e ($\leq 2e19?$) and low I_p (≤ 500 kA?)

For heating:

- Look at power deposition on these shots *FIRST*
- Expand range in parameter space (higher n_e , I_p) during time allocated to this XP (e.g., $n_e \geq 4e19$, $I_p \approx 1$ MA); look at heating for different rf phases



Things probably NOT covered in this XP



Study of H-mode threshold or operation

- For high power may be difficult to avoid
- Run in He to avoid H-mode?

ITB formation

Run time for this XP is 1 day, plus 1 day later.

Don't have time to study these topics.

Questions



Power deposition measurements:

- Can we get power deposition from USXR array data? *Stutman says yes.*
- How about the new Italian X-ray diagnostic-GEMS? *Stutman says April (?)*
- TS?
- Other ideas?
- Modulation experiments?
 - Amount of modulation (20%, 50%, 100%?)
 - Frequency of modulation? (sources good to “a few kHz)

Ion temperature measurements:

- How necessary are they?
- Argon T_i ?
- Beam blip?

Power

- Scan needed?
- What power to use for experiments?

Other questions



Plasma configuration:

- LSN?
- DN?
- Inner-wall limited?

Need to do same as HHFW CD XP to use their data.

What else?

Strawman run plan



First day (in Feb).

Initial setup:

- He, 0.45T, 900 kA, $\sim 4e19$, LSN
- Phasing -90°
- $P = 2 - 3$ MW (want reproducible shots)
- Modulate rf: $\sim 30\%$ square-wave with ~ 10 -ms period (rough guess)
- Need USXR set for T_e measurements,

Second day (in April?) will depend on results from first day.

Shot list for first day of experiment



Setup initial conditions, get 2 shots alike, check x-ray signals	5 shots
Enough power to change T_e , modulation to get good S/N on USXR	
Change phase to $+90^\circ$, get 2 shots alike	3 shots
Change phase to -30° , get 2 shots alike	4 shots
Change phase to $+30^\circ$, get 2 shots alike	4 shots

Change I_p to ~ 400 kA, repeat above.

It would be very helpful to have a couple of shots before this day to check out modulation and X-ray capability; otherwise will need Plan B.