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# XP-1158: HHFW Heating of CHI-Only Discharges

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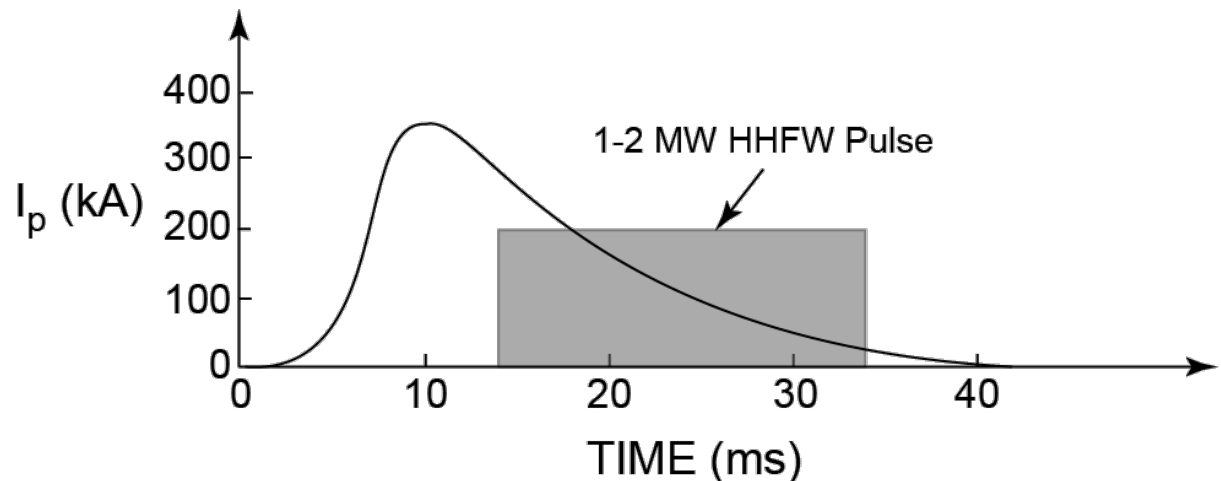
# XP-1158 HHFW Heating of CHI-Only Discharges: Overview/Justification - I

- Aims to heat CHI-only discharge with 20 ms pulses of at least 1 MW of HHFW power
- Assess the effectiveness of HHFW heating to increase  $T_e$  and the current persistence time
- Study changes in the density profile, oxygen and carbon impurity levels with addition of HHFW
- No experiment so far that has had the explicit goal of heating CHI-only discharges with HHFW power:
  - In 2008 a few attempts were made to couple  $k_\phi = -8 \text{ m}^{-1}$  HHFW power into a CHI-initiated discharge
  - Indications of  $T_e$  increase with 10 ms, 550 kW pulse (shot 129612), but HHFW tripped off after 10 ms

# XP1158 HHFW Heating of CHI-Only Discharges: Overview/Justification-II

- Run XP-1158 the day following XP-1157 after HHFW vacuum conditioning during the previous evening
- Start with best discharges from XP-1157
- 0.5 days in FY11 and 0.5-1 day in FY12
- Start with  $-90^\circ$  antenna phasing ( $k_\phi = -8 \text{ m}^{-1}$ ), using settings from 129612
- Then use  $-60^\circ$  antenna phasing ( $k_\phi = -3 \text{ m}^{-1} + -8 \text{ m}^{-1}$ )
  - Use  $k_\phi = -8 \text{ m}^{-1}$  to heat the plasma to increase absorption of  $k_\phi = -3 \text{ m}^{-1}$  closer to the antenna

*Couple 20 ms HHFW pulse into "tail" of CHI discharge*



# XP1158 HHFW Heating of CHI-Only Discharges: Run Plan

## Plan:

1. Setup best discharge from XP-1157
2. Once pulse is reproducible, add  $-90^\circ$  ( $k_\phi = -8 \text{ m}^{-1}$ ) HHFW power, using antenna settings from 129612, and increase  $P_{\text{RF}}$  to  $\sim 1 \text{ MW}$ , adjusting timing of the start of HHFW pulse, antenna tuning, Li evaporation rate to optimize RF coupling [15 shots]
3. If  $T_e$  and pulse length increase significantly and HHFW pulse stays on for 20 ms, raise power to  $\sim 2 \text{ MW}$  [5-10 shots]
4. Run no RF comparison shots
5. Repeat steps 1-4 with  $-60^\circ$  ( $k_\phi = -3 \text{ m}^{-1} + -8 \text{ m}^{-1}$ ) HHFW power (if time permits run some shots with  $-60^\circ$  phasing in step 2 in FY11) [20-25 shots]

**Operational Requirements:**  $P_{\text{RF}} = 2 \text{ MW}$  with  $-60^\circ$  &  $-90^\circ$  antenna phasing and good CHI plasma reproducibility. Run the day after XP-1157 and following HHFW vacuum conditioning previous evening

**Key Diagnostics:** MPTS, SOL reflectometry, ERD, Visible & IR camera imaging of antenna & divertor

**Analysis/Modeling:** GENRAY-ADJ, TRANSP-TORIC