Investigation of Thermal EBW Emission & Oblique O-Mode Coupling Efficiency in L- & H-Mode Plasmas

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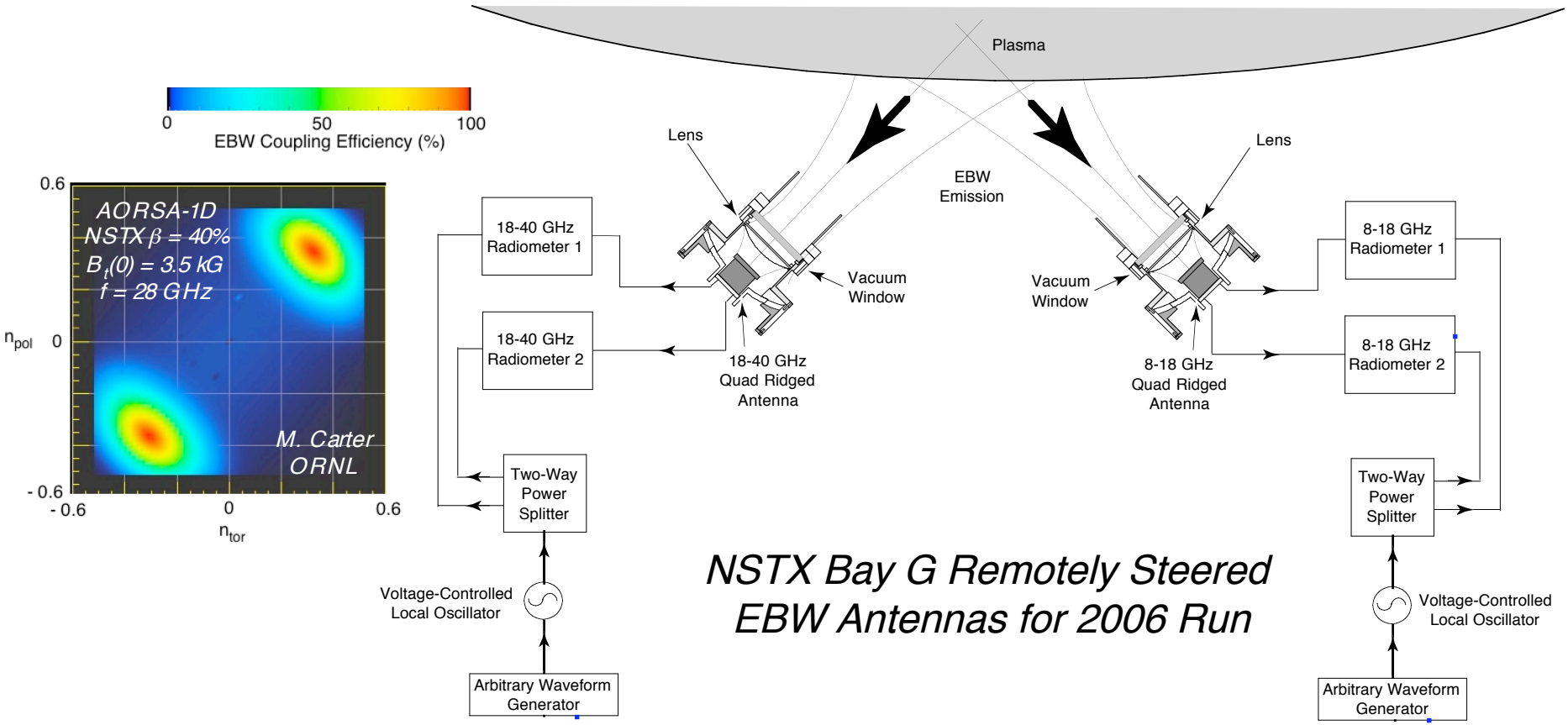
Experiment Supports Long-Term NSTX Goal to Provide EBWCD & Development of EBW $T_e(R,t)$ Diagnostic

- Study 8-40 GHz thermal EBW emission via oblique B-X-O coupling
- Use remotely-steered, quad-ridged antennas and dual-channel radiometry at Bay G
- Study behavior of EBWs emitted from the fundamental, 2nd and 3rd harmonic emission from L-mode and H-mode plasmas
- Experiment has three objectives:
  - Map coupling efficiency as a function of antenna pointing direction & compare to theory
  - Analyze emission polarization & compare to theory
  - Measure $T_e(R,t)$ using thermal EBW emission
- Two dedicated run days, separated by at least one month
- Require $B_t(0)$ from 0.3 to 0.6 T, P_{nbi} up to 6 MW:
  - Thomson scattering n_e and T_e profiles are critical

Remotely-steered B-X-O Antennas Covering 8-40 GHz being Installed on Bay G for 2006 Run



NSTX Bay G Remotely Steered EBW Antennas for 2006 Run

- *EBW emission studies assess coupling resilience over wide range of plasma conditions:*

  - does not test parametric decay or ponderomotive effects

Preliminary Run Plan

- Shot list is based on 2 half-day runs (minimum)

  - Day 1: study B-X-O emission in H-mode discharges (ref. shot #117405, I_p=800 kA, 0.5 s flattop, I_{tf}=-53 kA, P_{nbi}=4 MW)

  - Day 2: study B-X-O emission in L-mode discharges (ref. shot #113544, I_p=800 kA, 0.2 s flattop, I_{tf}=-53 kA, P_{nbi}=2 MW)

- Preliminary shot list:

  (1-3) Shot development

  (4-13) Repeat best shot from (1-3) and scan antenna pointing direction to obtain a B-X-O mode conversion efficiency mapping

  (14-15) Repeat best shot from (4-13) with a toroidal field sweep (10% increase) during I_p flattop

  (16-18) Repeat best shot from (4-13) and introduce gas puffs (at 50, 100, and 165 torr-l/s) from low field side at ~ 0.3 s