NSTX EBW Experiments in 2004

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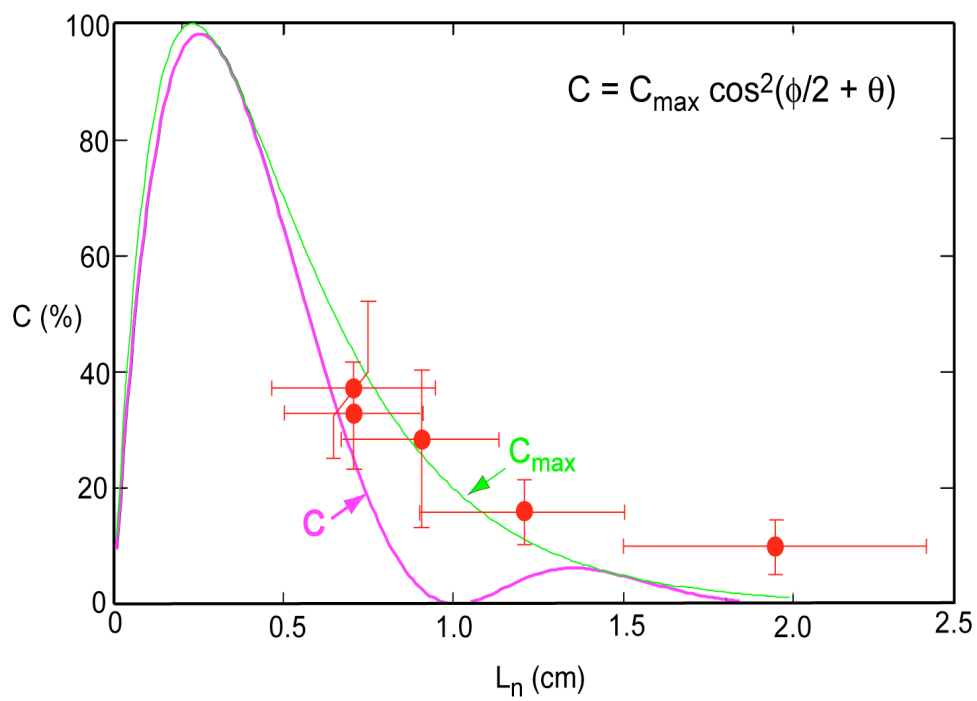
Baseline FY04 Milestone to Measure EBW Emission to Assess Coupling for Heating & CD

- Demonstrate > 80% EBW mode conversion with "B-X" antenna (normal to **B**) and/or "B-X-O" antenna (oblique to **B**)

- Earlier experiments on NSTX, using the HHFW antenna tiles to shorten L_n, achieved ~ 40% B-X conversion:

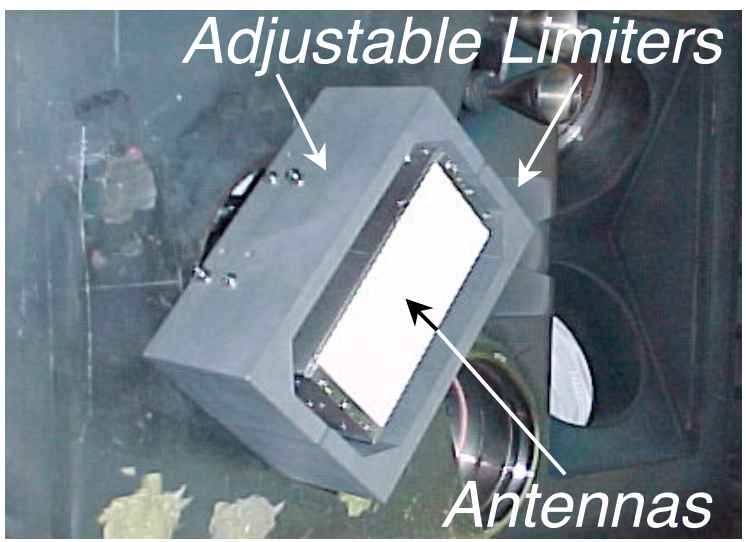


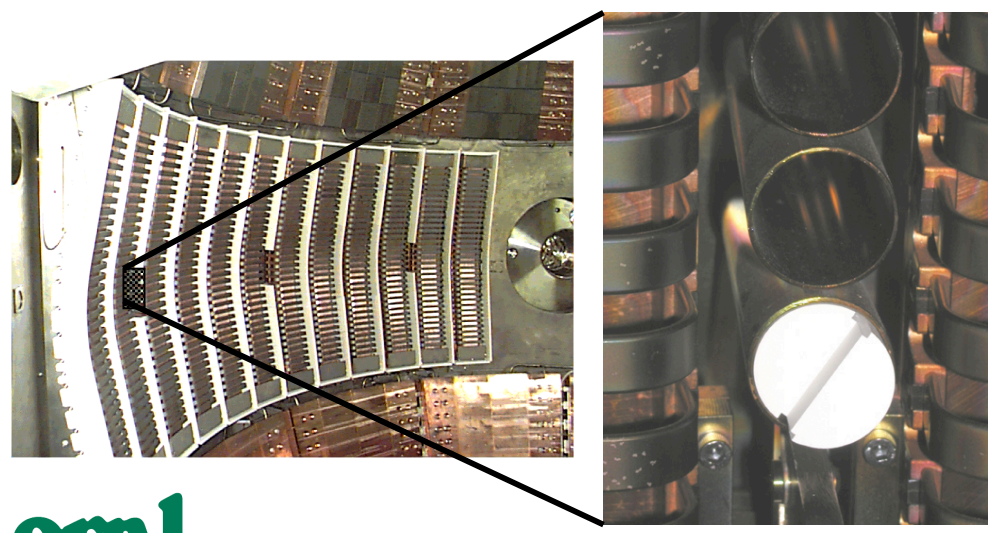
X-Mode & O-Mode EBW Antennas Installed on NSTX for $T_e(R)$ Diagnostic & EBW Coupling Studies

- B-X antenna, with adjustable limiters, designed to achieve > 80% EBW coupling, installed in NSTX:
  - *similar antenna achieved ~ 100% EBW coupling on CDX-U*
- Obliquely viewing, stepped wedge, B-X-O antenna also installed
  - *also planning obliquely viewing, quad-ridged antenna*

B-X-O Antenna

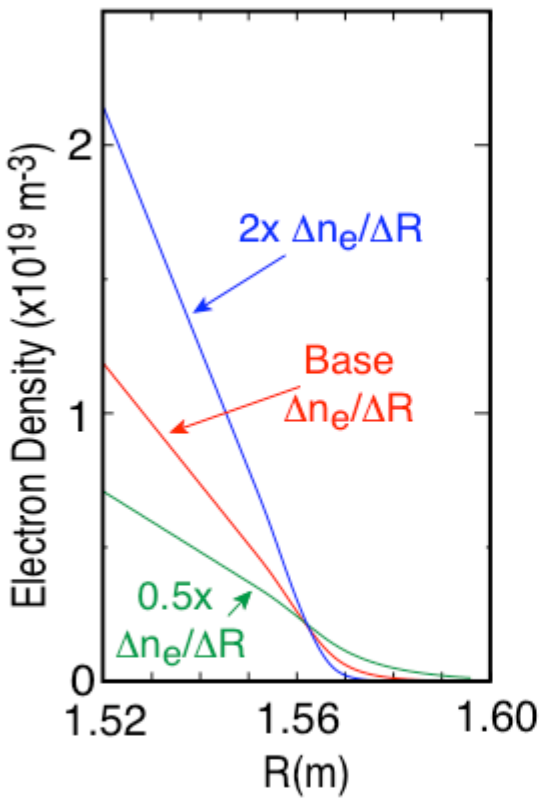
B-X Antenna

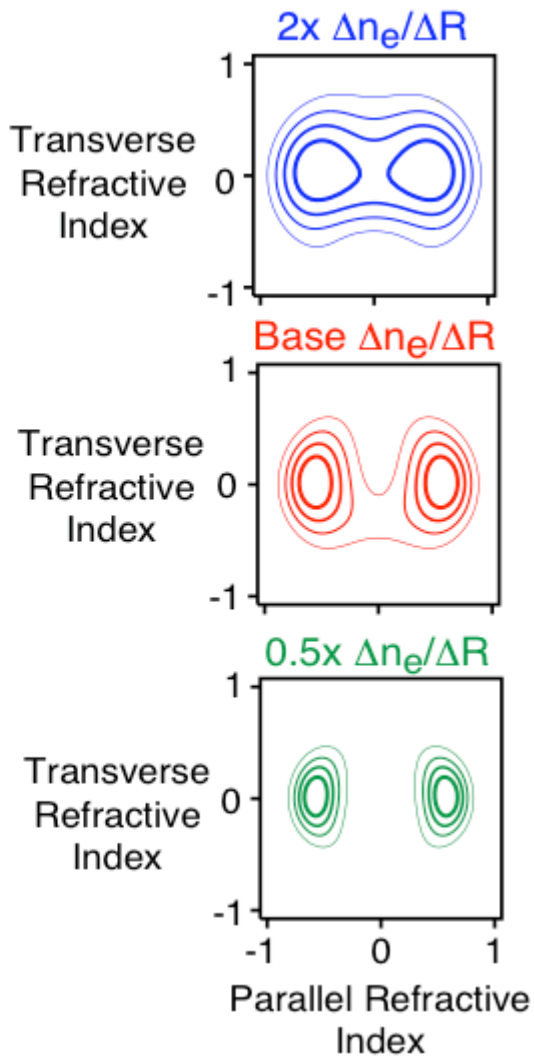




Oblique, "O-X-B", Launch Appears Resilient to Changes in Edge Density Gradient

Frequency = 14 GHz





- Optimum toroidal launch angle ~ 34 degrees from normal
- > 75% coupling for O-X-B antenna with ± 5 degree beam spread

EBW Coupling (%)
80
60
40
20

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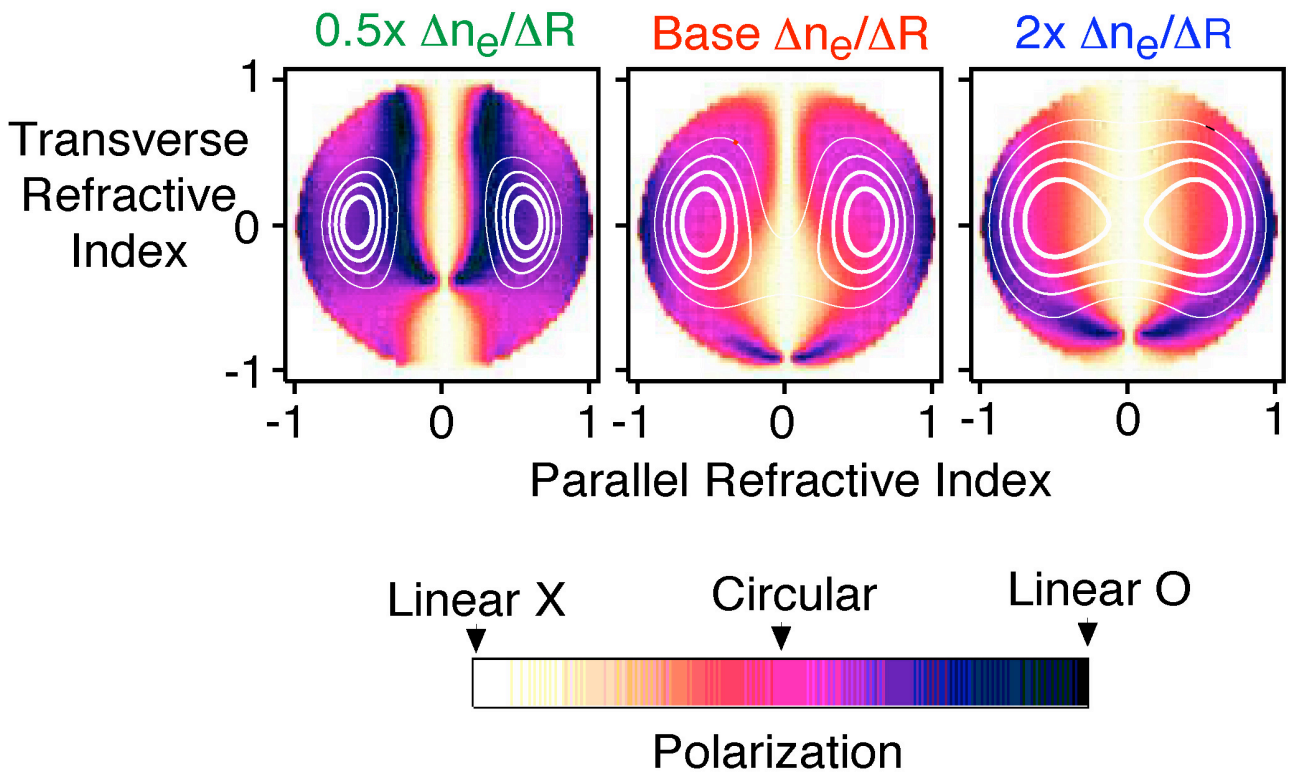
Optimum EBW Coupling Efficiency for Near-Circular Polarized Launch



- Optimum polarization relatively insensitive to edge field pitch variations of up to ± 15 degrees
- Probably need ellipticity control for coupling early in I_p ramp

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Overview of EBW Emission Experiments

B-X EBW:

- *UCLA O-mode reflectometry to measure scrape off density*
- *Remote operation of the radially adjustable carbon limiters*
- *Schedule XP later in campaign*
- *XP requires about 20 plasma shots*

B-X-O EBW:

- *ORNL X-mode reflectometer to measure scrape off density*
- *Steepened L_n with HHFW antenna tiles*
- *Measure EBW B-X-O emission with ORNL EBW antenna*
- *Measure polarization with quad-ridged B-X-O antenna at Bay G*
- *Schedule XP later in campaign*
- *XP requires about 20 plasma shots*