NSTX EBW Research Planning for 2004-8

- Status of EBW Research
- Strawman Schedule & Goals
- Discussion:
  - Goals for 2004-8 (1:40 pm)
  - Experimental Needs (1:55 pm)
  - RF Technology Issues (2:20 pm)
  - Theory & Modeling (2:50 pm)
  - Diagnostic Needs (Tuesday, 8:30 am)
  - Summary Discussion (Tuesday, 8:45 am)

Status of EBW Research

- O-X-B heating and B-X-O emission successfully demonstrated on W-7AS
- ~100% B-X conversion with local limiter on CDX-U, but conversion efficiency fluctuates
- ~ 15% B-X conversion during NSTX H-modes
- Recently used HHFW antenna as local limiter to increase B-X conversion ~ 50% on NSTX
- Installing B-X antenna with adjustable local limiter on NSTX this fall
- Modeling 12 GHz, 1MW for □~12% NSTX gives dimensionless EBWCD efficiency ~ 0.5
  [0.08 A/W, T_{eo}=1 keV, n_{eo}=2x$10^{19}m^{-3}$]
- MAST steerable O-X-B antenna being installed this summer - experiments with 1 MW 60 GHz start in fall

Strawman Schedule & Goals

- Demonstrate ~100% B-X conversion (local limiter) & Model EBW Heating & CD (early 2003)
- Demonstrate ~100% B-X-O conversion (with or without local limiter) (late 2003)
- Complete conceptual design for EBW heating and current drive system (early 2004)
  - Source frequency, f_{ce} or $2f_{ce}$?
  - Local limiter?
  - X-B or O-X-B
  - Power level? 1MW (2006), ~ 5MW (2008)
- Complete ~1MW installation (late 2006)
- Explore Core Heating (~ 1MW, 2006-7)
- Explore EBW Startup (~ 1MW, 2007)
- Complete ~ 5MW installation (2008)
- ~ 400 kA EBW sustained current
  (~ 5MW, late 2008)
- NTM stabilization at $\square\square 40\%$ (~ 5MW, 2008-9)

Some Questions We Need to Answer

- What do we anticipate the state of the EBW heating/current drive technology and theory will be by 2004?

- What capability might EBW heating and current drive provide to NSTX in 2004-8?

- What development needs do we have prior to and during 2004-8? For example, with regard to:

    - Diagnostics
    - RF Technology
    - NSTX facility
    - Experiments
    - Theory & Modeling