XP720: EBW Emission in H-Mode Plasmas

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XP 720: EBW emission in H-mode plasmas

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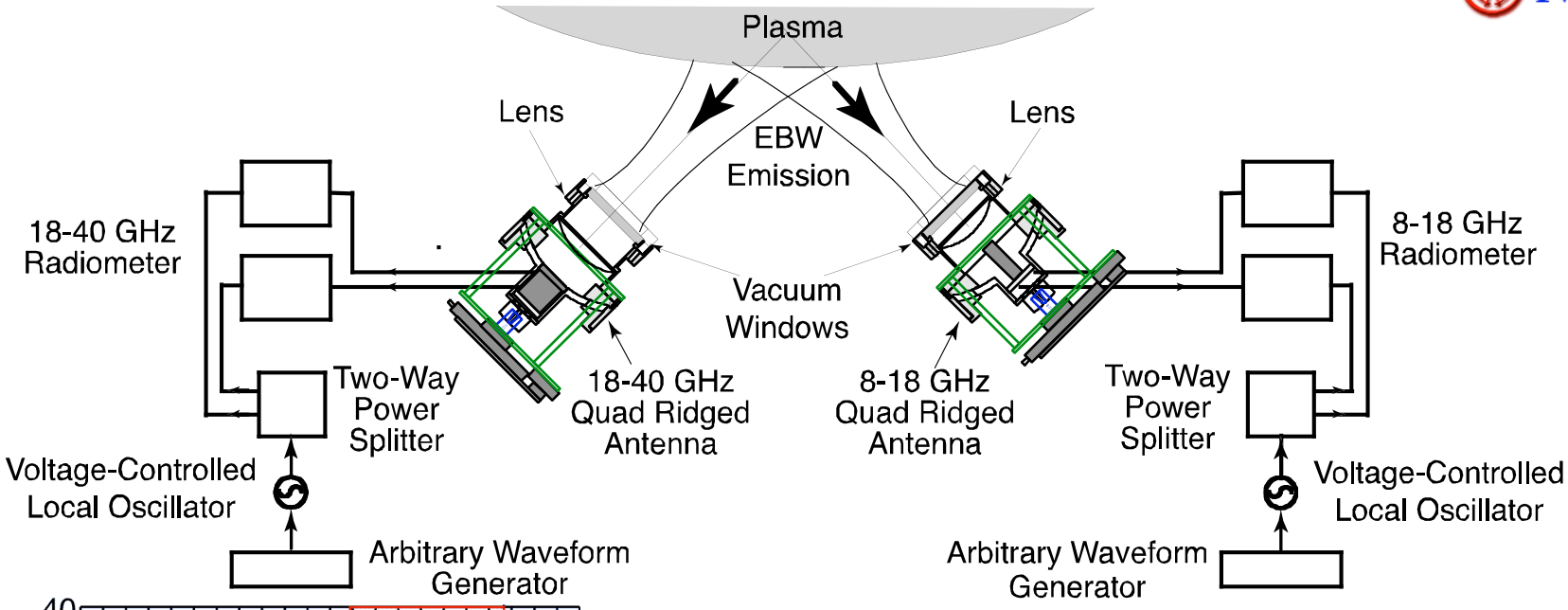
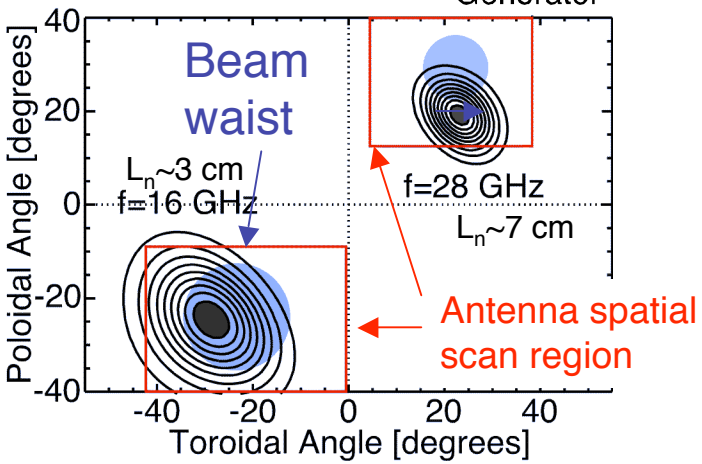
- Measure 8-36 GHz thermal EBW emission via oblique B-X-O coupling

- Study behavior of EBWs emitted from H-mode plasmas at f_{ce}, $2f_{ce}$ and $3f_{ce}$

- Experiment had three objectives:
  - Study effect of collisions on B-X-O mode coupling
  - Investigate dependence of B-X-O coupling on plasma parameters
  - Study how bootstrap current at H-mode pedestal change fields field pitch at UHR

Remotely Steered EBW Antennas Allow Angular Mapping of f_{ce} & 2 f_{ce} B-X-O Coupling Window

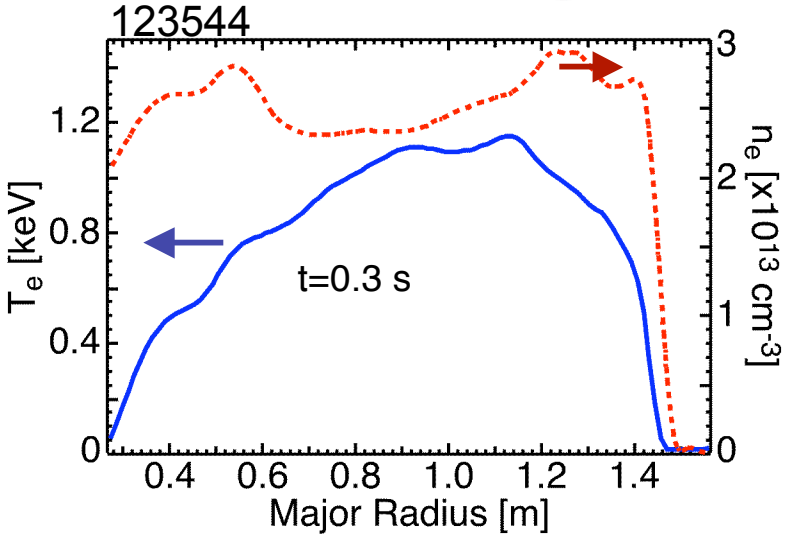


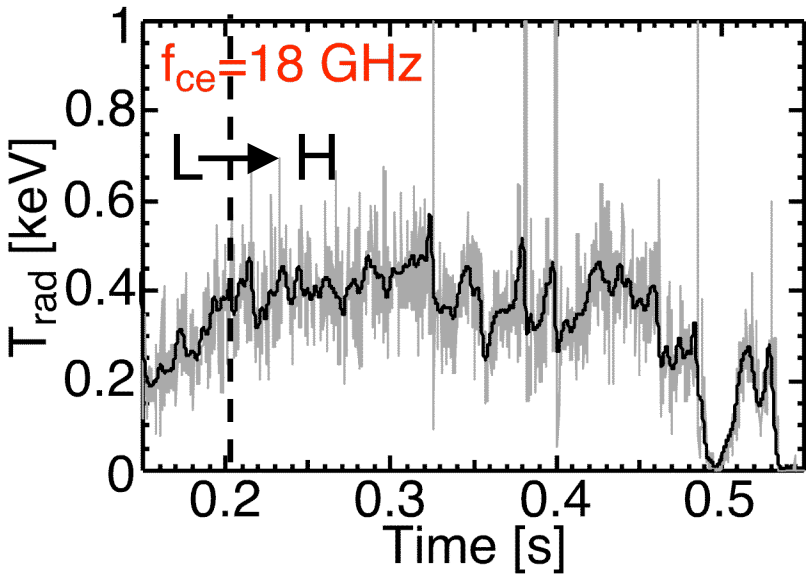


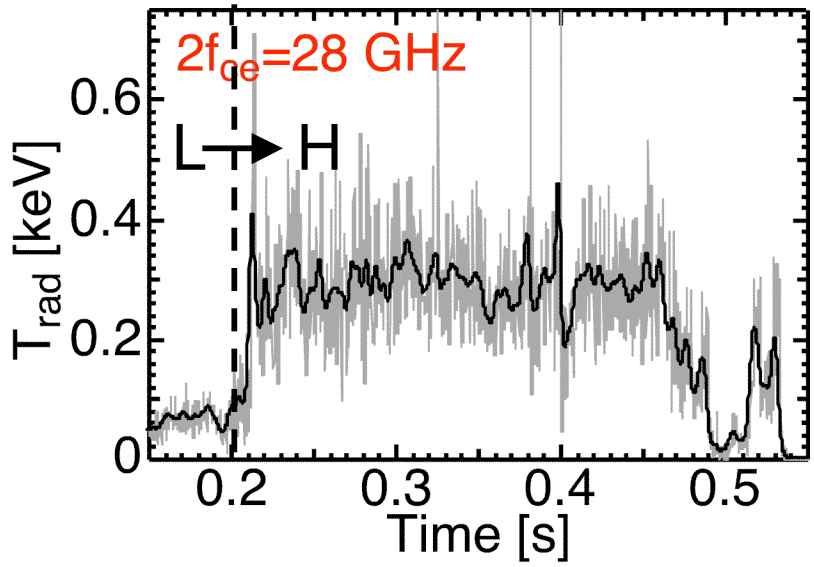
- ±10° scan in poloidal and toroidal directions
- Acceptance angle:
  - 8-18 GHz antenna ~ 22°
  - 18-40 GHz antenna ~ 14°

Preliminary H-mode results show good f_{ce} and $2f_{ce}$ B-X-O coupling in high κ, f_{BS} plasmas

- Target plasma: I_p=0.8 MA, κ~2.5, T_e~1 keV, and $n_e(0)$~2-4x10^{13} cm^{-3}
- Preliminary experimental EBW transmission efficiency given by the ratio $T_{rad}/T_e(0)$:
  - ~30-50% for f_{ce}=18 GHz
  - ~20-40% for $2f_{ce}$=28 GHz

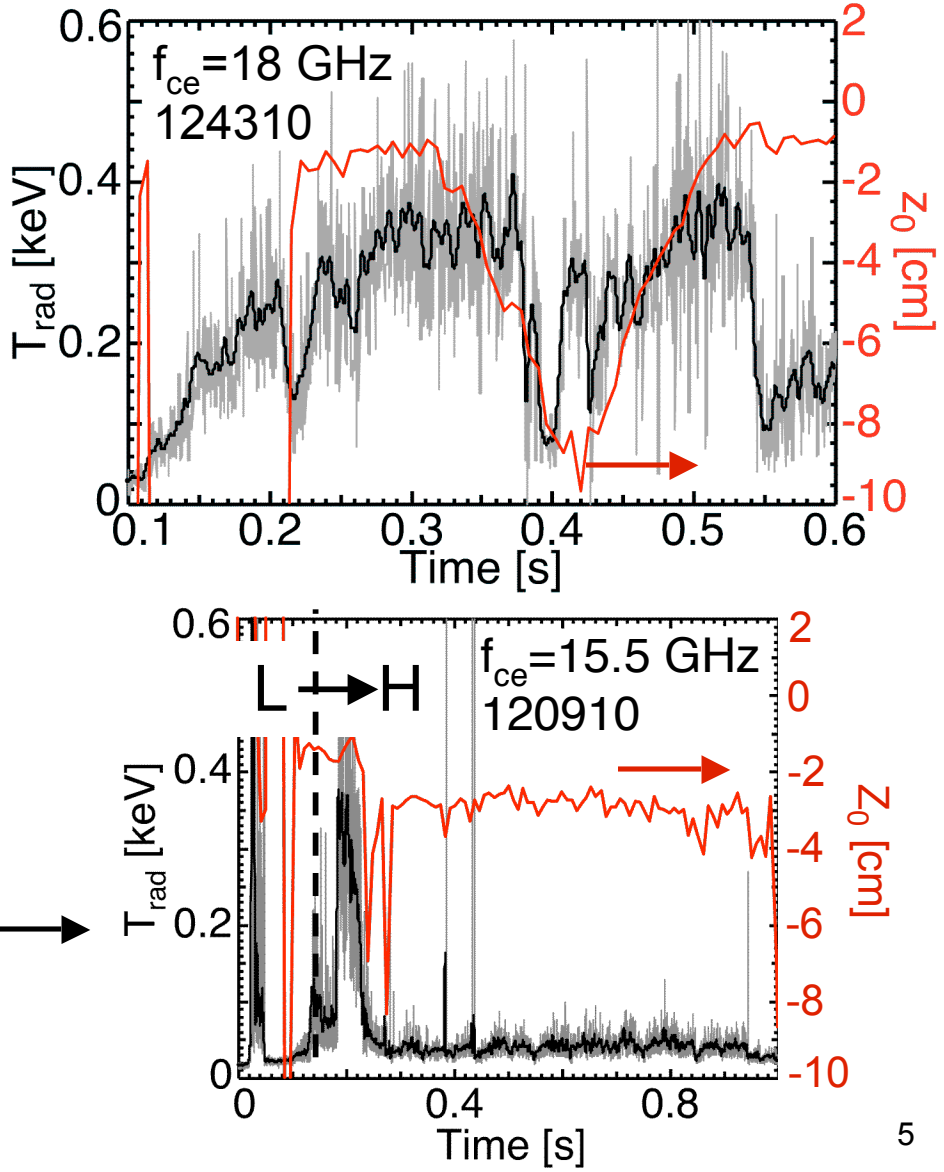






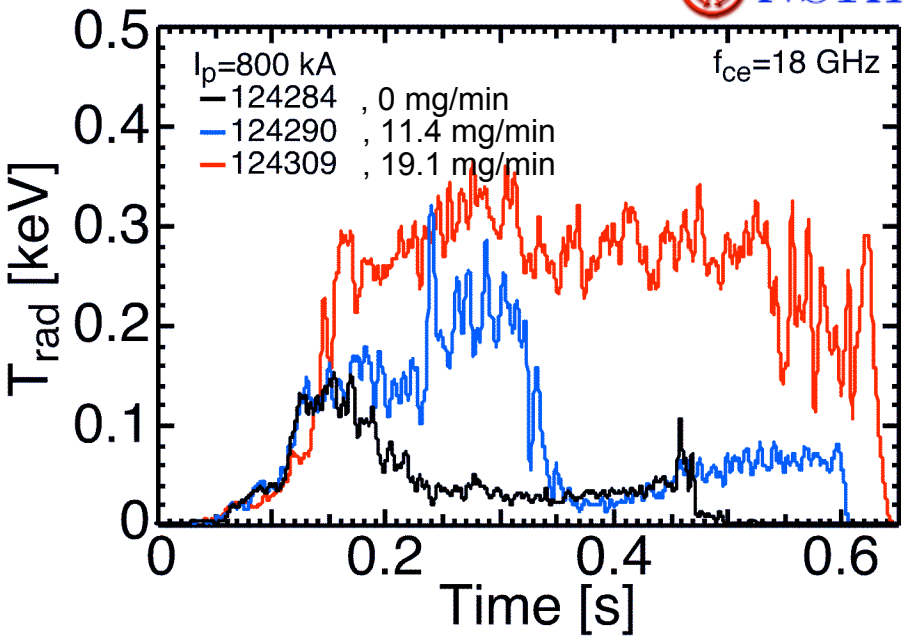
Detected EBW Emission Sensitive to Dr_{sep}

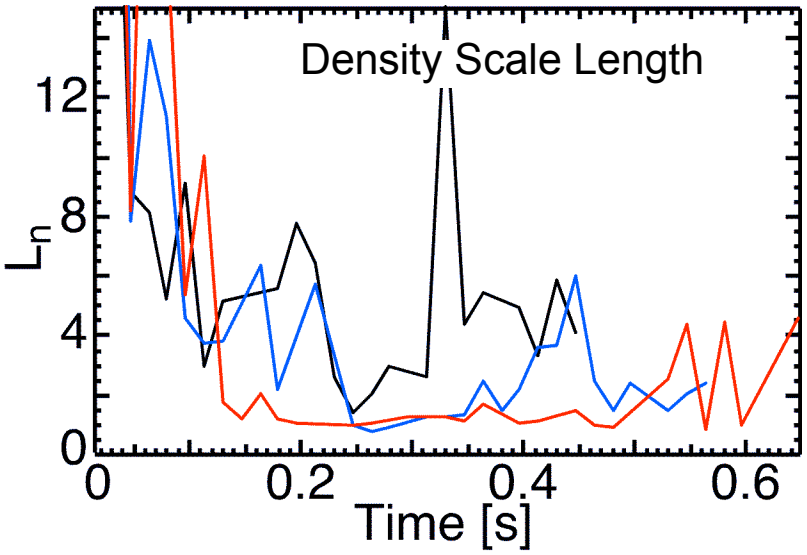
- Dr_{sep} reduction of 2 cm provided controlled z_0 scan
- T_{rad} decreased from ~350 eV to ~100 eV with 8 cm decrease in z_0
- Results similar to rapid EBE decay observed in 2006 H-modes after L→H transition



Increase in EBW transmission efficiency observed with LITER conditioning

- $T_e(0)$~0.8-0.9 keV
- T_{rad} increased from 40 eV (no Li) to ~300 eV for f_{ce}= 18 GHz emission
- Li may decrease L_n at at EBW mode conversion layer, widening EBW transmission window
- Similar trend observed for $2f_{ce}$ frequencies





More work needed to understand EBW mode coupling physics

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- Analyze the following:
  - Antenna scan data
  - Spiral antenna data
- Analyze data from f_{ce} system
  - Do not have an absolute calibration for 8-18 GHz (f_{ce}) radiometer because of damage to microwave amplifiers at the end of run campaign;
  - Relative T_{rad} data trends analysis during run still possible
  - Harmonic system measured absolutely calibrated f_{ce}=16-18 GHz
- Correlation analysis of high time resolution reflectometer data
- Perform comparison of experimental data to EBE simulation code results