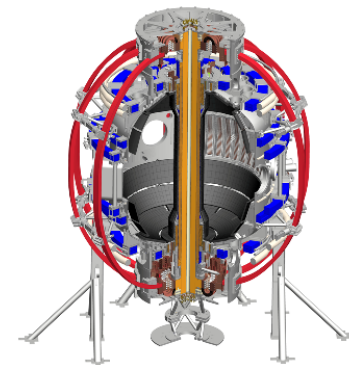




Fast-ion absorption of 30 MHz fast-wave power at 1 and 2 T

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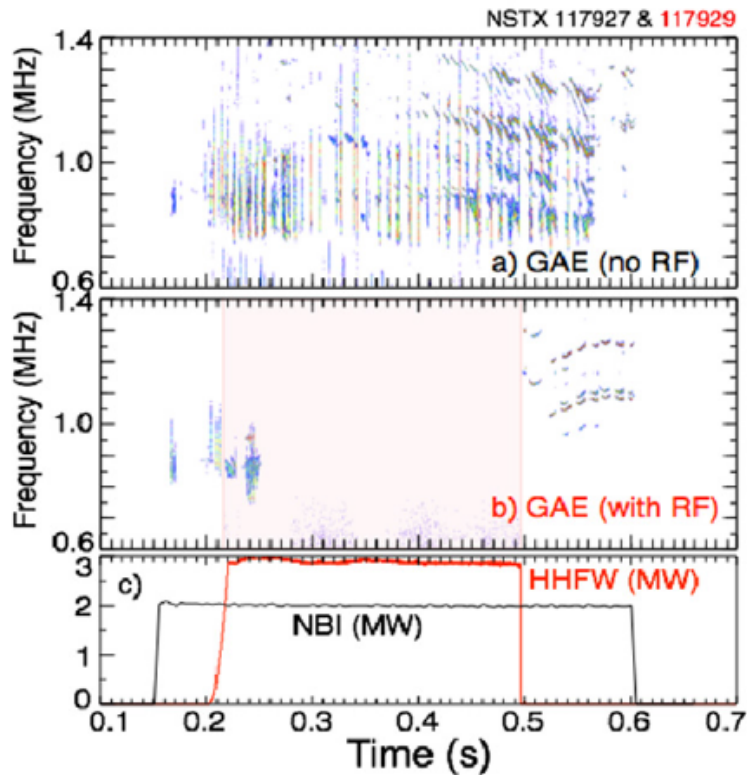


Revive fast-wave (FW) system at 30 MHz for fast-ion studies and more

- FW can be restarted with modest investment
 - “zero degree” antenna still on machine
 - System can be retuned for 30 MHz
 - Reduce impurity problem by recessing antenna
- Investigate FW effects on fast ions & AE at 30 MHz
 - 2 T operation expected to give good absorption on beam ions
 - 1 T operation mimics NSTX-U at full field; valuable information for NSTX-U operation
- Over five years, FW could furnish a number of other valuable experiments

Motivation: FW a potential tool to influence/suppress AE activity

HHFW influences AE activity



(Fredrickson, NF 2015)

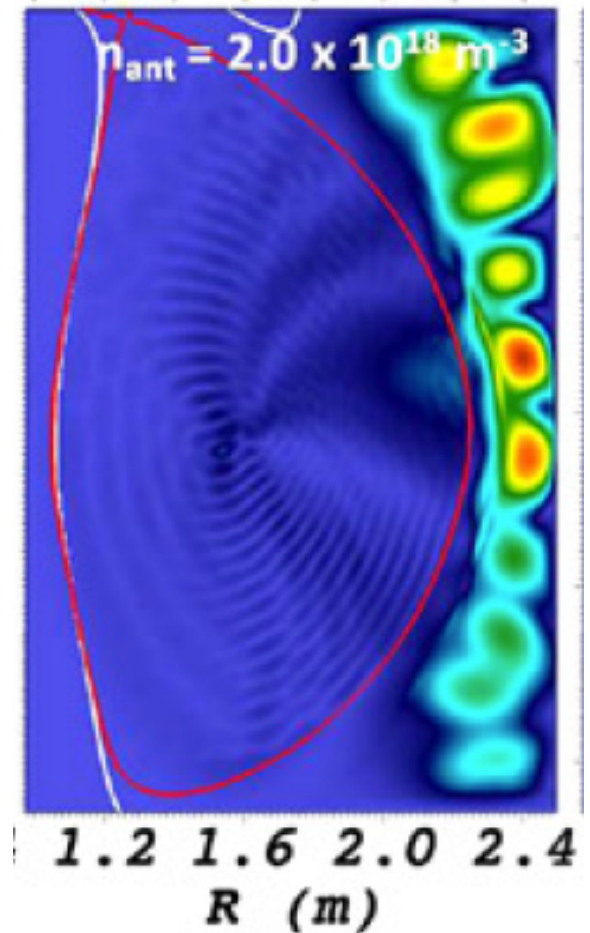
- FW modifies fast-ion profile, increases neutron rates
 - NSTX: D. Liu *Nucl. Fusion* 2010
 - DIII-D: R. Pinsky *Nucl. Fusion* 2006, W. Heidbrink *Nucl. Fusion* 1999
- FW can influence/suppress AE activity on NSTX
 - E. Fredrickson *Nucl. Fusion* 2015
- FW can dramatically impact rotation profile on NSTX
 - J. Hosea *AIP Conf. Proc.* 2008

30 MHz FW at 1 T on DIII-D would give valued information for NSTX-U operation

- Same frequency and field of NSTX-U at full field
- On NSTX, fast-ion absorption is not good
 - Low field means beam ions can be accelerated to loss orbits
- Important to understand partition of absorption between electrons, fast ions, and hydrogen
 - Utilize flexibility of DIII-D neutral beams, including in-shot variations of beam voltage
- Physics of 2 T operation discussed in next talk

Reviving the FW system will open doors to new experiments over five years

- SOL losses of FW power
 - PDI & ion acceleration in SOL
 - NSTX: J. Carlsson *Phys. Plasmas* 2016
 - DIII-D: D. Pace *Nucl. Fusion* 2012
 - Cavity-like modes, predicted for DIII-D as in NSTX
 - N. Bertelli *Nucl. Fusion* 2016
- Half-field ITER-like ICRH in ECH-dominated discharges
- Metallic impurity expulsion with central ICRH



Cavity-like modes predicted in
DIII-D SOL
(N. Bertelli *Nucl Fusion* 2016)

DIII-D can fill the upcoming gap in ICRF experimentation in the US fusion program

- Alcator C-Mod has ceased operation
- NSTX-U is in a recovery phase
- Meanwhile, ICRH remains a central component to ITER, with 20 MW planned
- DIII-D is an excellent facility for fast-wave studies, especially for fast-wave & fast-ion physics
 - Existing FW system that can be restarted
 - Excellent neutral beam capability
 - Strong physics program in fast ions