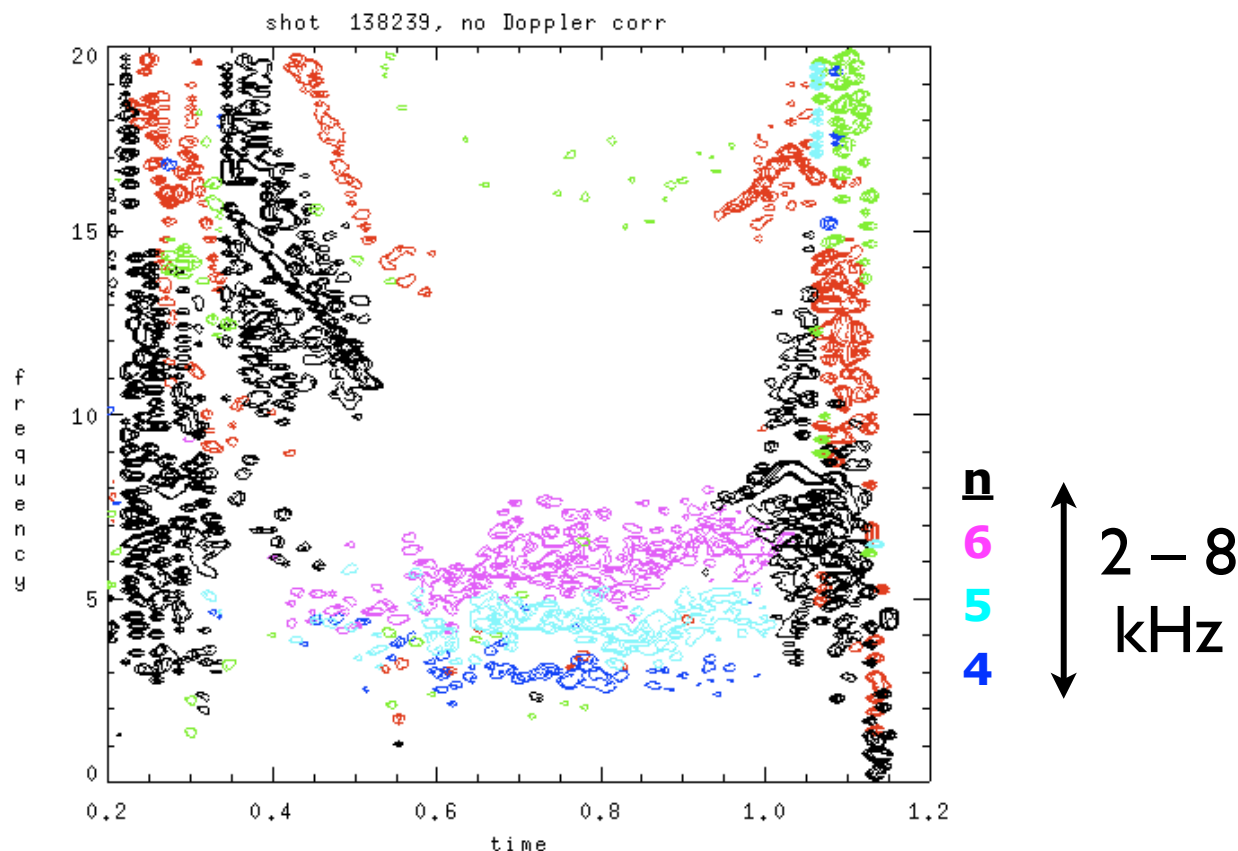


Driving EHO's via Amplitude Modulated HHFW

R. Goldston

EHOs Seen on NSTX Mirnov Coils

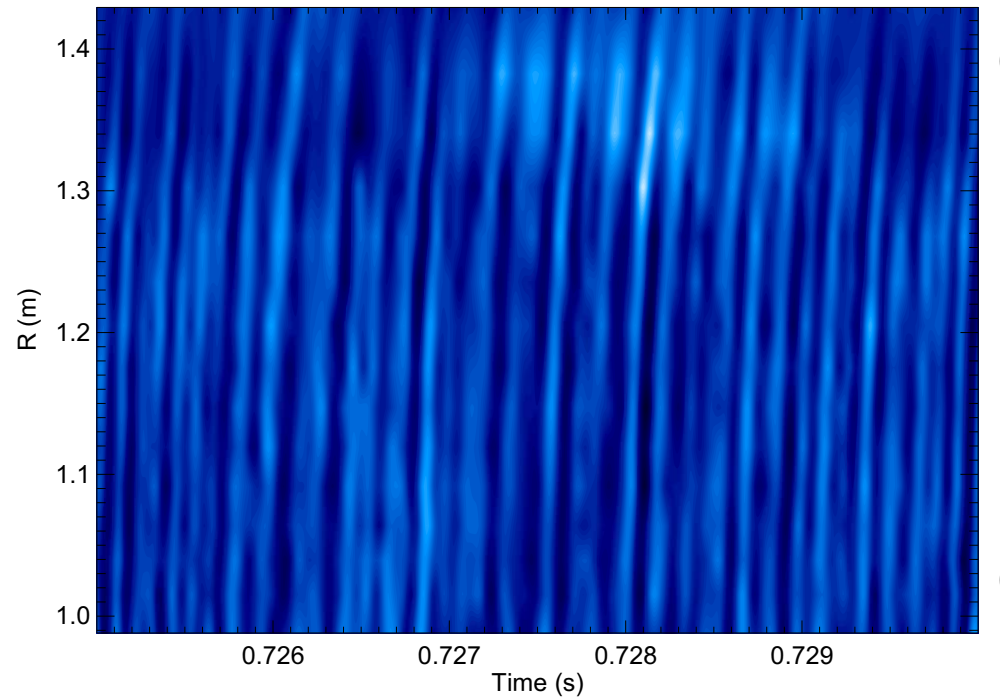
- Eric Fredrickson's MODE code
- Tuned for low frequency (long samples)
- Tuned for low amplitude (measures dB/dt)



- Studied current, field and power scans from Rajesh's SOL study
 - ELM-free, lithiated, steady density rise
- Clearest EHO cases are 4 MW, 800 kA, 4.5 kG
 - Need time window with very low $n = 1$ modes
- EHOs do not obviously reduce density rise in NSTX

EHOs Seen on USXR

Shot# 138239, USXR HUp array, 5um Be filter, 20kHz low-pass f



- **Kevin Tritz / Johns Hopkins**
- **Such clear USXR signals not seen on shots without EHOs on Mirnov signals**
- **FFT by eye gives ~ 6 kHz**

Driving EHOs Using Modulated HHFW

- **Easy to amplitude modulate HHFW**
- **HHFW couples to the edge plasma in ways we don't completely understand**
- **Maybe we can use it to drive EHOs and even control impurity influx.**
 - Evidence of coupling would motivate theory.
 - Theory would allow optimization of experiments. For example what wave numbers should we use?
- **XP approved for last year. But not executed.**
 - HHFW did not exceed 2 MW
- **Propose to try this experiment in FY11**
- **Propose to try resonant mode amplification in FY12**
 - Will provide information for ITER and for NSTX-U

Driving EHO's via Acoustic Frequency Resonant Mode Amplification

R. Goldston, R. Ellis, J.-K. Park,
S. Ramakrishnan

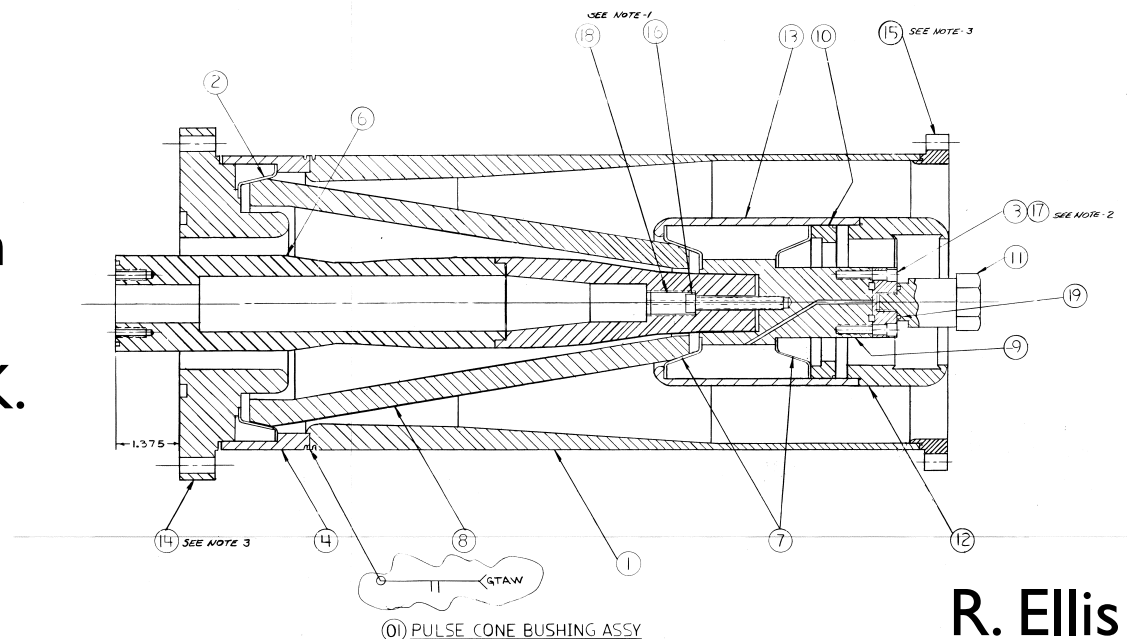
~2 kA, 2 - 8 kHz Looks Doable

S. Ramakrishnan



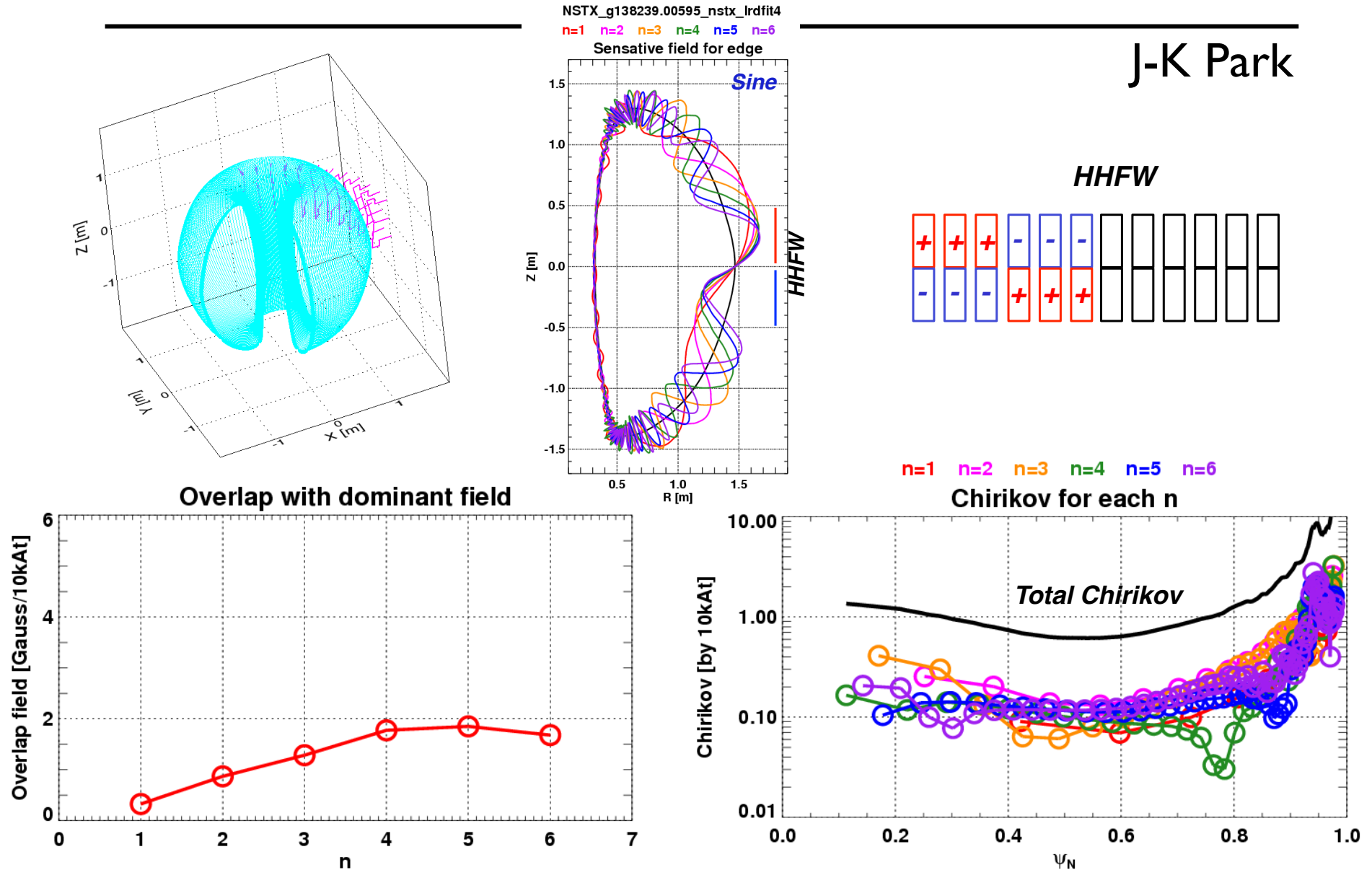
Commercial induction heater.
CW power up to 50 kW,
frequency up to 10 kHz.

By running current through
center pin of RF feedthru,
thermal limits should be OK.



R. Ellis

Edge Chirikov > 1 Looks Doable



Proposed Run Plan(s)

I. Establish conditions similar to 138239

- Establish the presence of EHOs both on the Mirnov and soft X-ray systems
- Measure density rise and impurity accumulation

II. Add EHO Drive (Amplitude Modulated HHFW or Acoustic RMA)

- Determine level of power and pulse length that can be reliably obtained.
- Establish level of amplitude modulation that can be obtained at observed frequency of strongest EHO ~ 4 kHz.
- Sweep frequency of amplitude modulation from 2 – 8 kHz, and determine where maximum amplification occurs.

III. Scan drive power

- Select optimum point for EHO amplification, if some is observed, and scan drive power.
- By looking at the swept results may decide to have some sweeping still in this case.
- Interleave with shots with non-AM HHFW / no acoustic RMA.