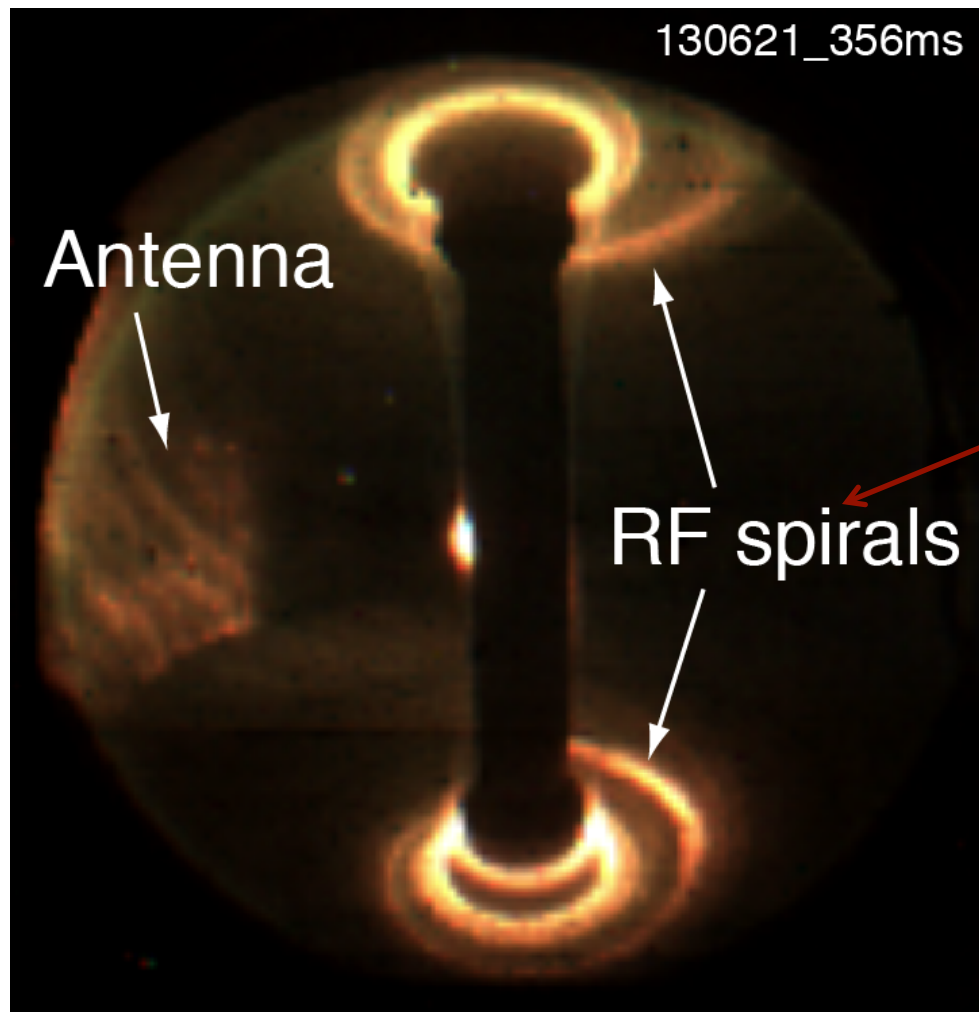


Antenna-Plasma Interactions and HHFW Power Losses on the Antenna Structures

R. J. Perkins

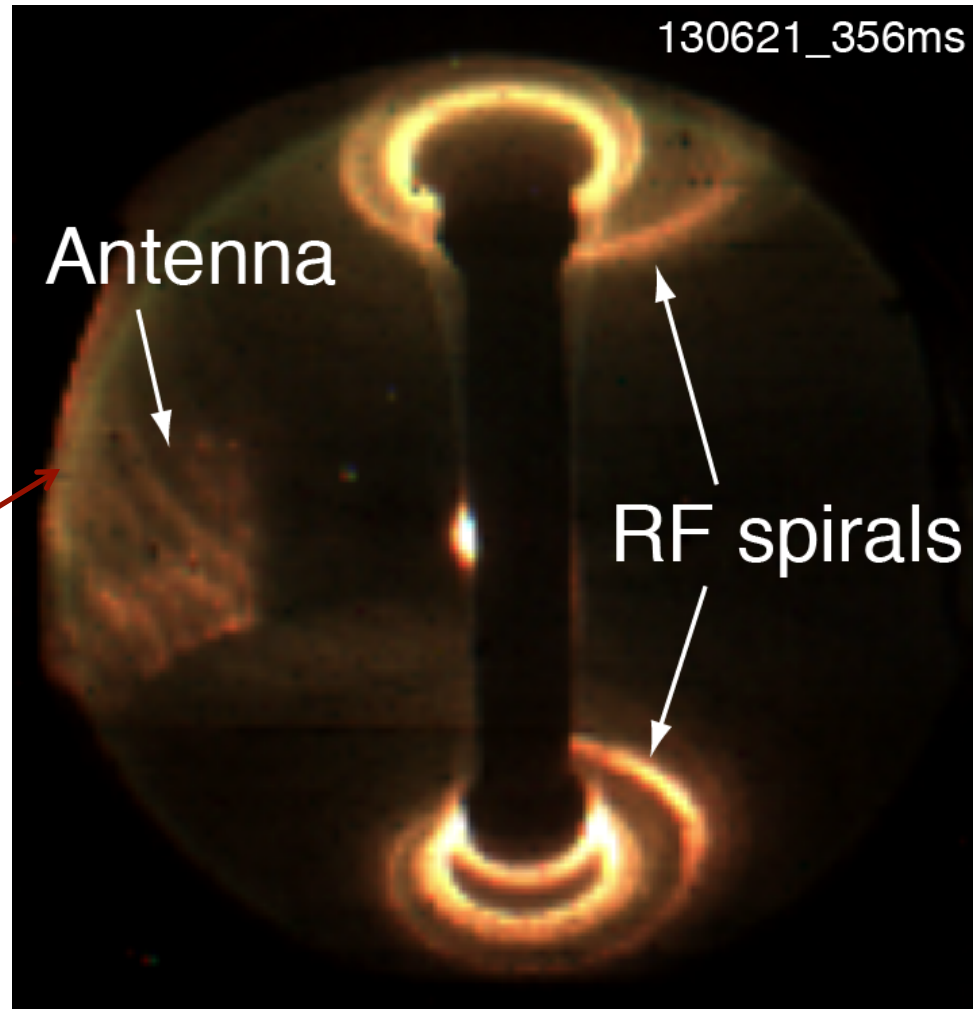
**NSTX-U Research Forum
Wave Heating and Current Drive Session
February 2015**

Lately, most of our attention has been far from the HHFW antenna



**We've
focused our
analysis here**

We would like to turn some attention back to the antenna



Interesting & important processes are occurring here

New IR camera viewing antenna will complement visible-light images

- Camera located at Bay L midplane
- 'Slow' FLIR camera (30 Hz), same as type used for divertor studies
- Does the antenna temperature correlate with interactions observed in visible-light pictures?
 - Or with antenna loading and/or RF spiral intensity in divertor regions??
- What is the heat flux to the antenna, and is it significant in the HHFW power balance?
- What SOL conditions influence antenna-plasma interactions?
- These questions are especially important while gauging interaction of 2nd NB with HHFW antenna

New IR camera viewing antenna will complement visible-light images

- We have developed analysis for the sheath transmission factor in the presence of an RF field

$$Q_{\text{surface}} = \gamma * j_{\text{sat}}^+ * T_e$$

$$\gamma_{\text{noRF}} = -\frac{V_f}{T_e} + \frac{V_{fl-\text{noRF}}}{T_e} + 2.5 \frac{T_i}{T_e} + \frac{2}{1 - \sigma_e} \exp \left[-\frac{V_{fl-\text{noRF}}}{T_e} \right]$$

$$\gamma_{\text{RF}} = -\frac{V_f}{T_e} + \frac{V_{fl-\text{noRF}}}{T_e} + 2.5 \frac{T_i}{T_e} + \frac{2}{1 - \sigma_e} \exp \left[-\frac{V_{fl-\text{RF}}}{T_e} \right]$$

- V_{fl} is the measured floating potential w/ and w/o an RF field
- Analysis has been carried out for LP probes in divertor
 - Want to see what these equations imply for the antenna

While we can achieve a lot of quality data in 'piggyback,' several dedicated shots would help

- Can learn a lot from the parameter scans that will be performed for SOL-Loss and HHFW-Ion Interaction XP's
- However, certain 'maneuvers' require dedicated shots
 - For instance 'jogs' in the plasma vertical position and outer gap