XP525: HHFW absorption and heating

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The scope of the experiment was to study absorption and heating at 300 kA and 600 kA, that is, at different pitch of the field lines respect the antenna straps.

The main result is that the angle between field lines and antenna straps is not important for coupling and heating.

Nonetheless other important results have been obtained

Review of the main results

Analysis is incomplete

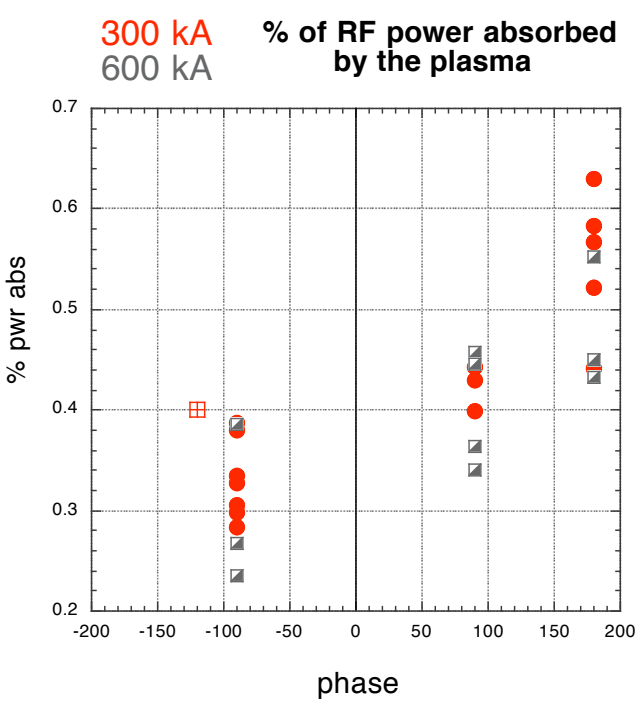
* I_p = 300 and 600 kA cases give pretty much the same results, that is:
  - high $k_{||}$ (180°) has best absorption
  - Low $k_{||}$ (-90°, corresponding to co-CD) has higher confinement time than 180°

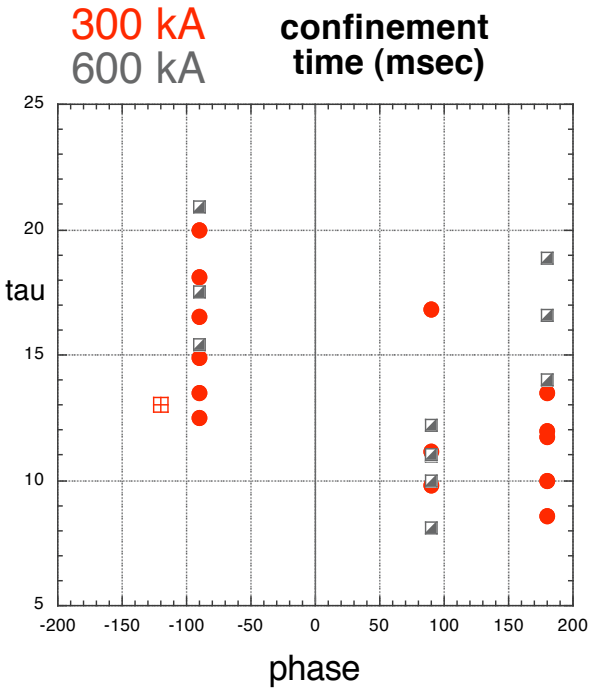
this seems to indicate that (-90°) power is deposited near the center, while (180°) is deposited somewhere at mid-radius)

* Only 40% to 60% of the power launched in is accounted for:
  - Reflection < 5%.
  - Parametric decay instability: strong for -90°, non existent for 180°. Very difficult to estimate power
  - MHD and radiated power.
  - Surface waves.

Need to find this "lost power"---> next year's main program

Heating efficiency and confinement time





As mentioned, co-CD (-90°) has lower heating efficiency in spite of having higher confinement time.

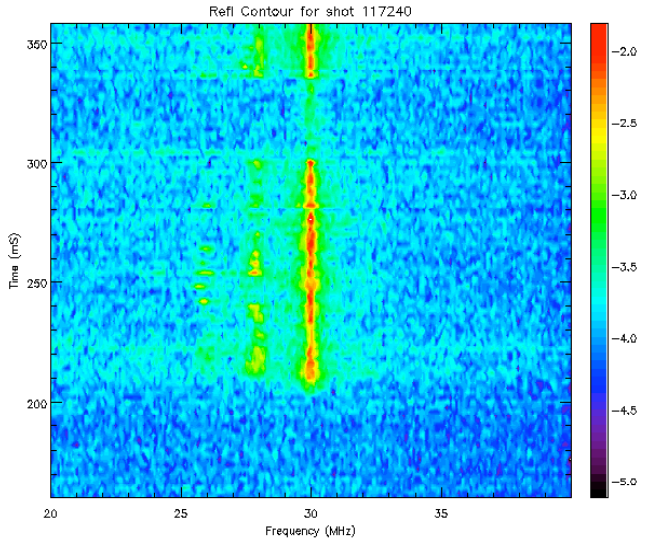
co-CD shows no reflected power and very good loading, but also a strong signal of D-alpha and high power in parametric instabilities, signaling a certain interaction with the surface.

Next year program is to try to detect surface waves with probes far from the antenna.

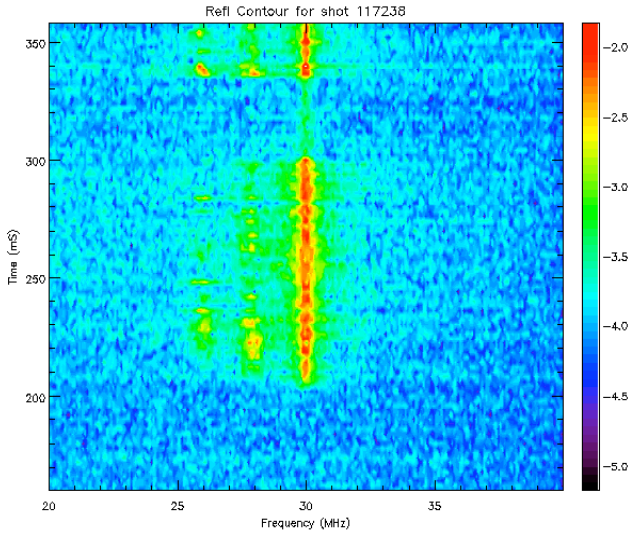
Reversing magnetic field and plasma current might reveal geometry problems, such as obstacles.

Parametric decay instabilities

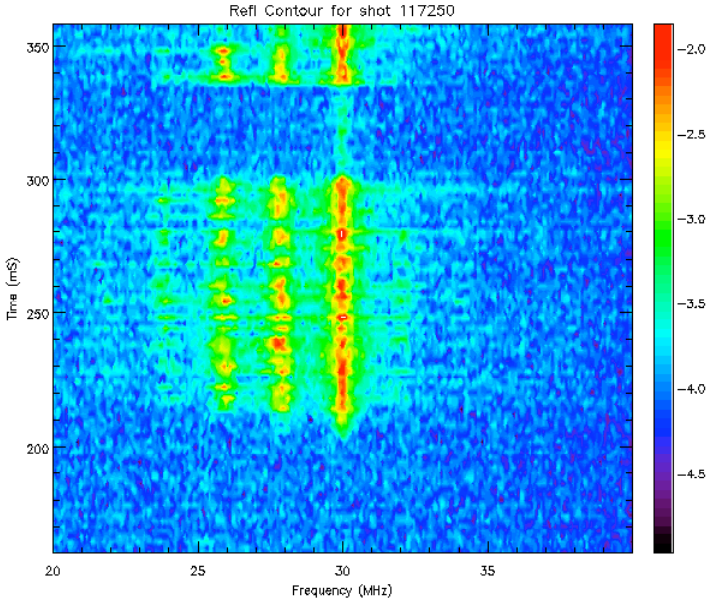
gap=3cm



gap=5cm



gap=8cm

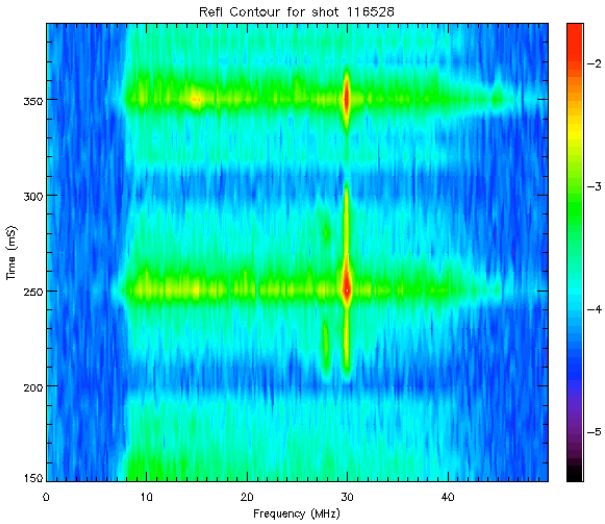


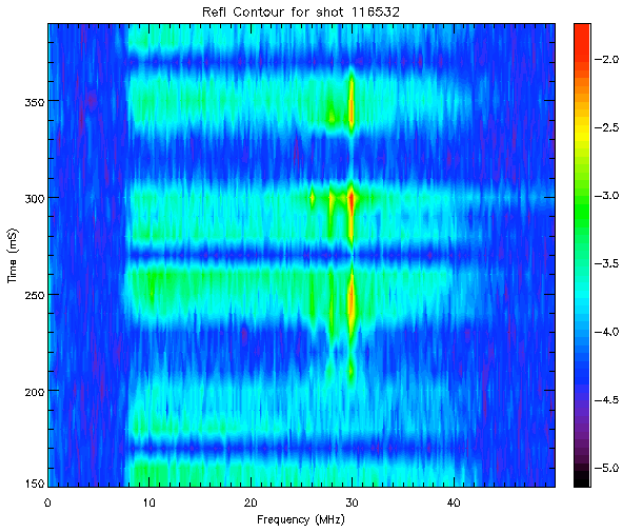
time

frequency --->

Power in instabilities increases with gap.
Perhaps due to the fact that the bigger is the
Gap, the higher could be the voltage on the antenna.

+90° counter-CD





600 kA
2 MW

300 kA
2 MW

Parametric instabilities sidebands are very low as compared with those generated by -90°.

This hints very strongly to PDI importance in "lost power".

Next year's run will focus on PDI and surface waves with added probes far from the ICRF antenna. Asymmetry in the spectrum will be addressed by changing the direction of the toroidal and poloidal fields.