

Interplay between confinement, turbulence and magnetic topology

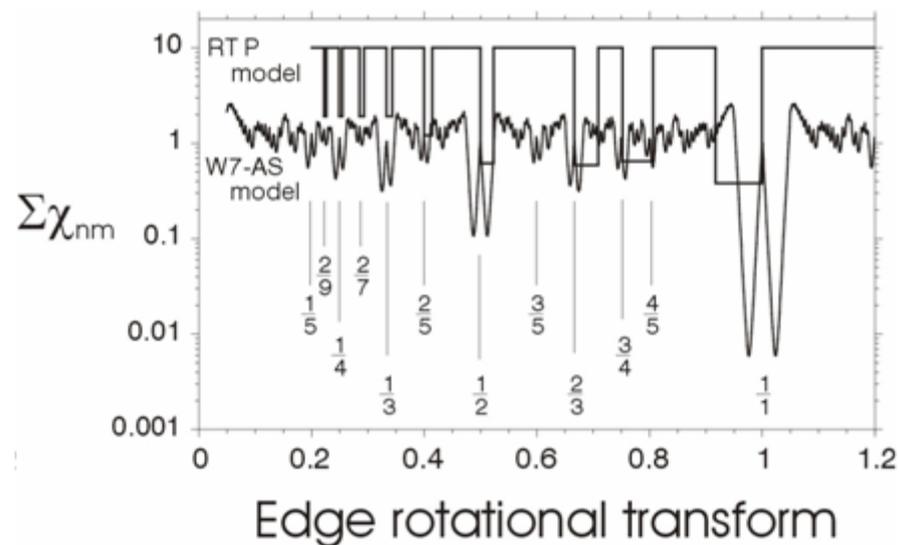
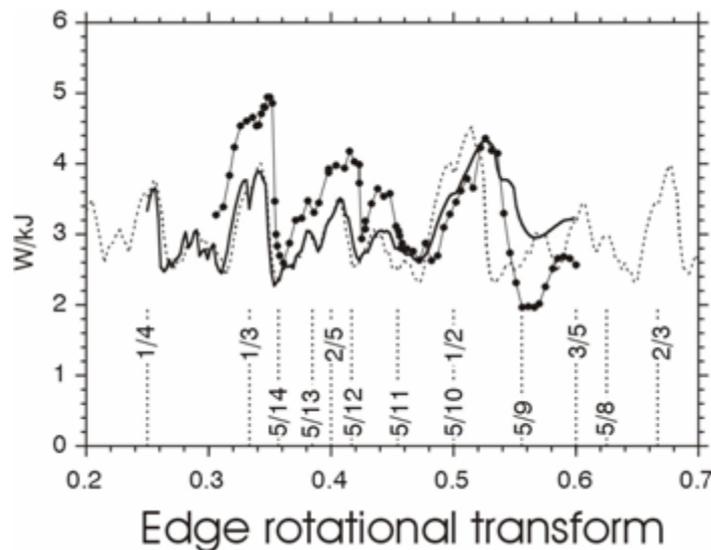
Nils P. Basse, S. Zoletnik¹, W. L. Rowan² et al.

MIT Plasma Science and Fusion Center

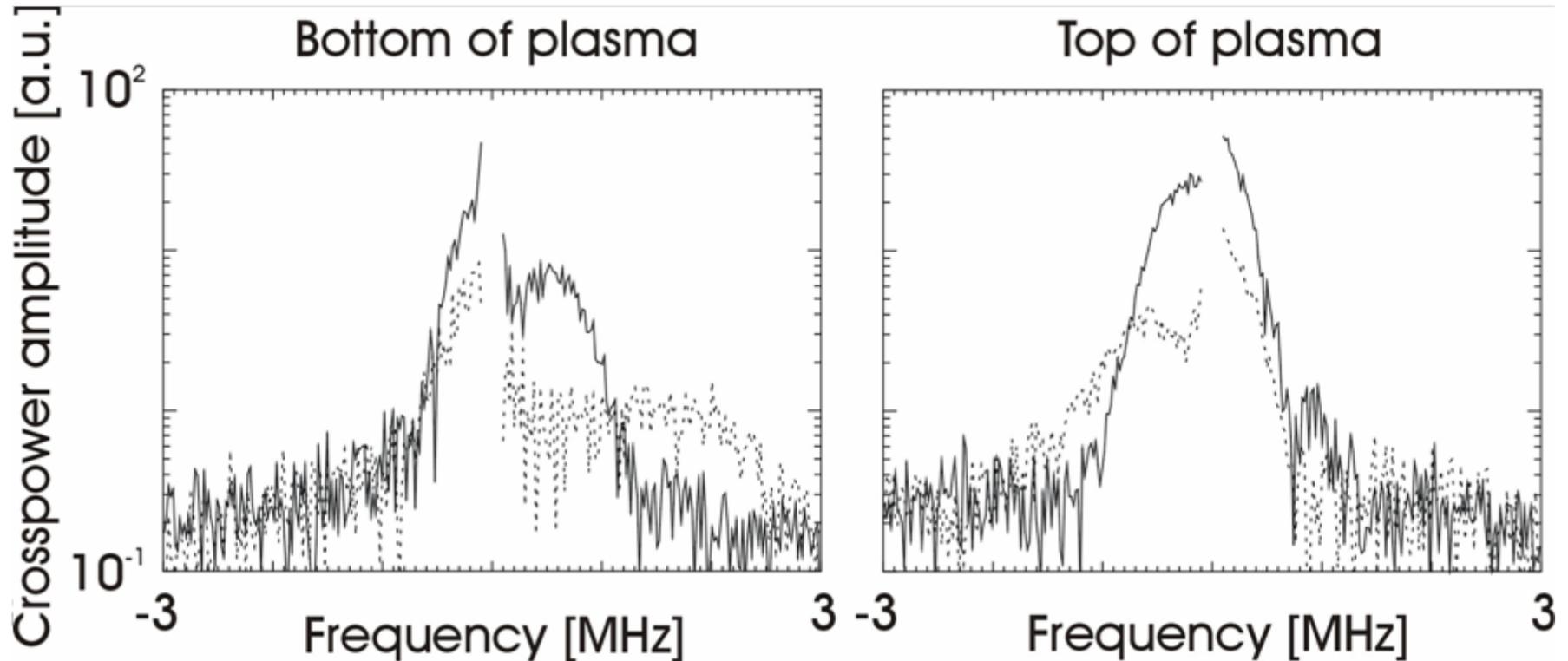
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²Fusion Research Center, University of Texas at Austin

This idea originates from density fluctuation studies of Wendelstein 7-AS plasmas with a small-angle scattering diagnostic.



W7-AS density fluctuations



Wavenumber is 15 cm^{-1}

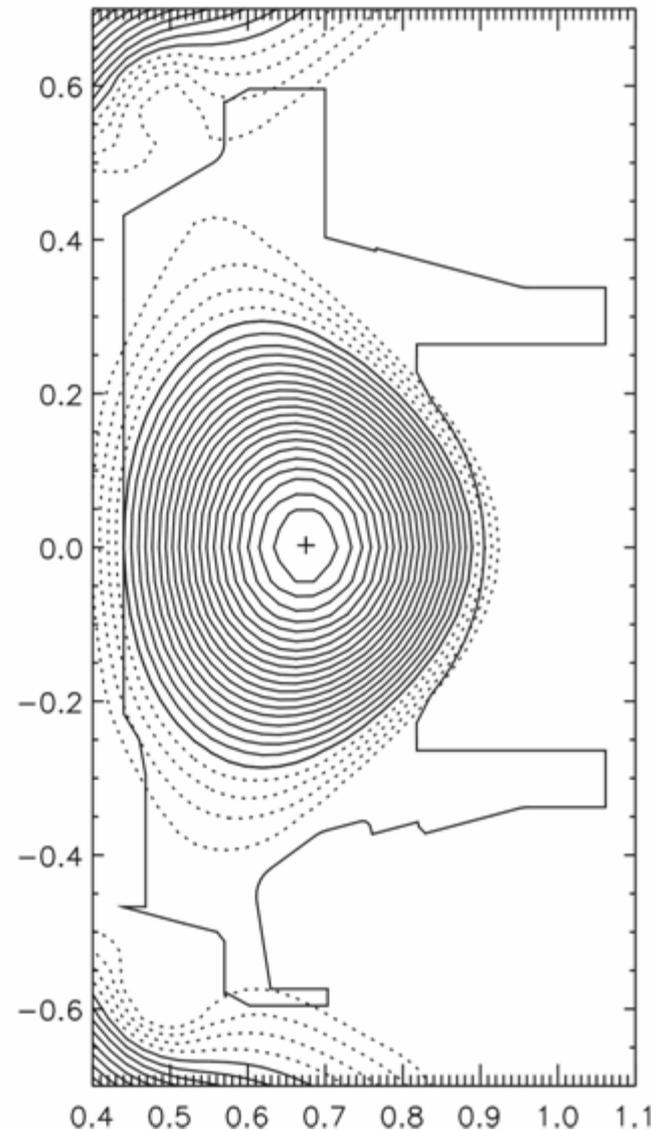
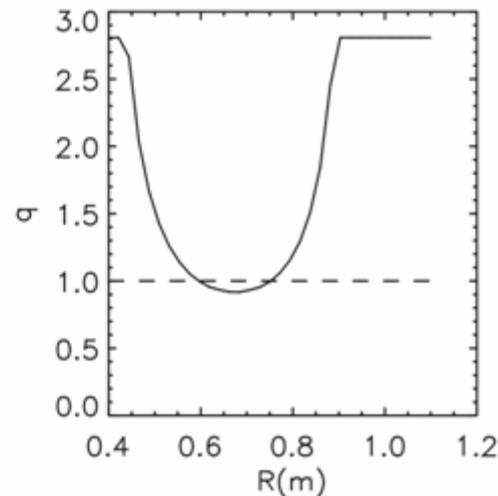
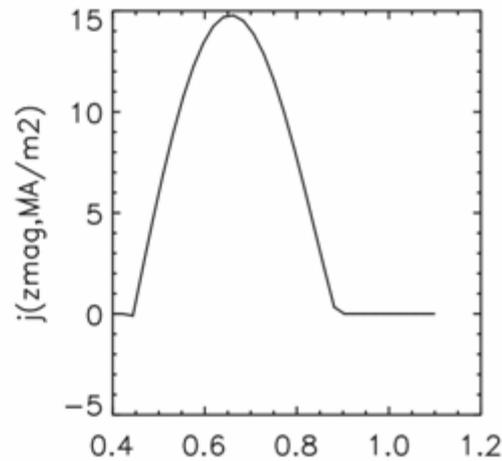
Dotted line is good confinement ($q_a = 2.9$)

Solid line is bad confinement ($q_a = 2.75$)

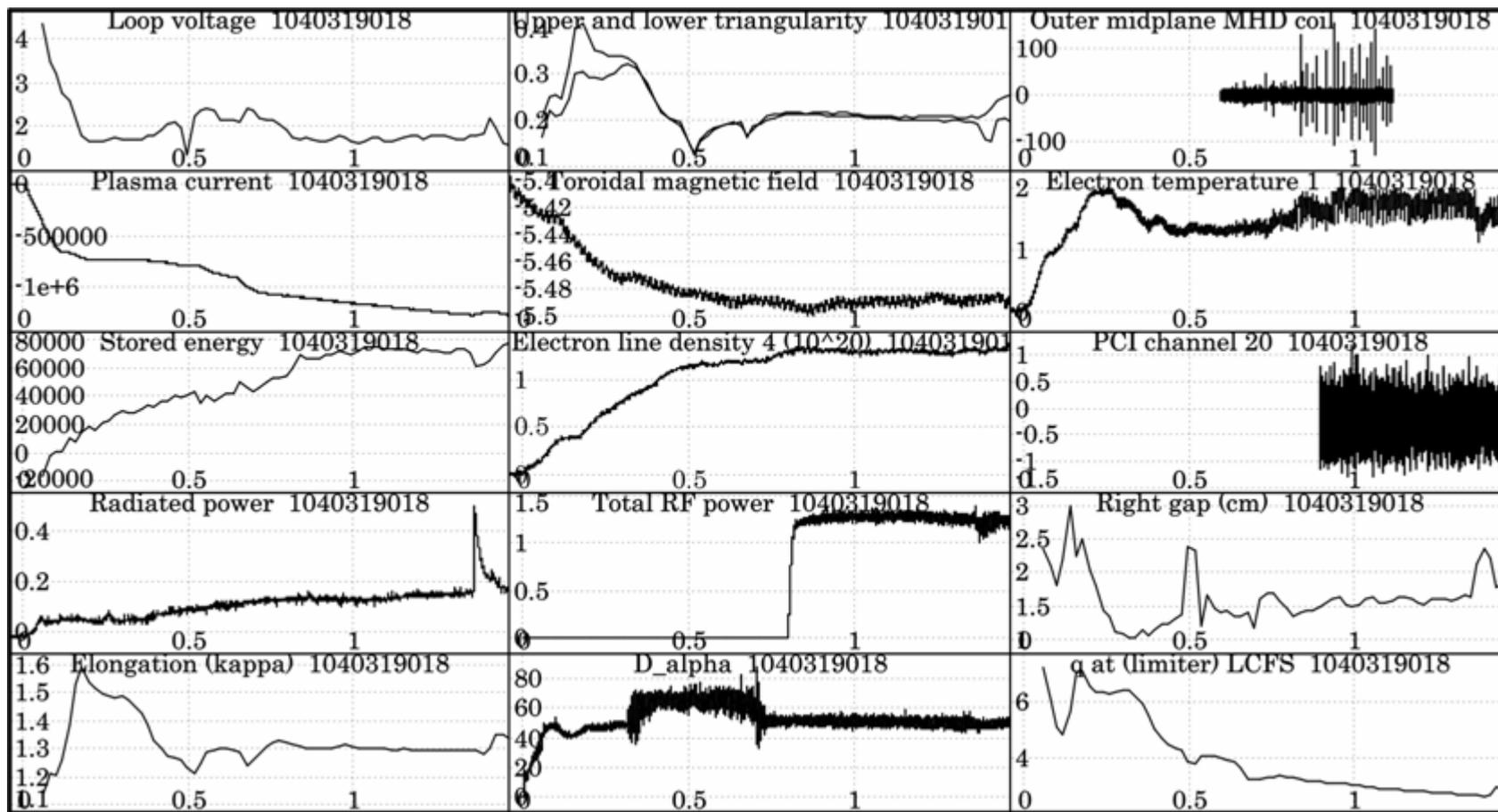
EFIT equilibrium 1040319018

* EFITD 33x33 06/28/2003*

date ran = 19-Mar-04
shot # = 1040319018
time (s) = 1.2000
chi**2 = 19.3
rout(cm) = 66.481
zout(cm) = 0.380
a(cm) = 22.471
elong = 1.292
utriang = 0.207
ltriang = 0.201
indent = 0.000
vol(cm3) = 8.07e+05
energy(J) = 7.04e+04
betat(%) = 0.492
betap = 0.159
li = 1.051
error = 0.00171
q* = 2.783
qout = 2.807
qpsib = 2.442
dsep(cm) = -45.000
rm/rc = 67.5// 66.1
zm/zc = 0.3// 0.3
data used:
ip(kA) = -1222.733
bt0(T) = -5.491

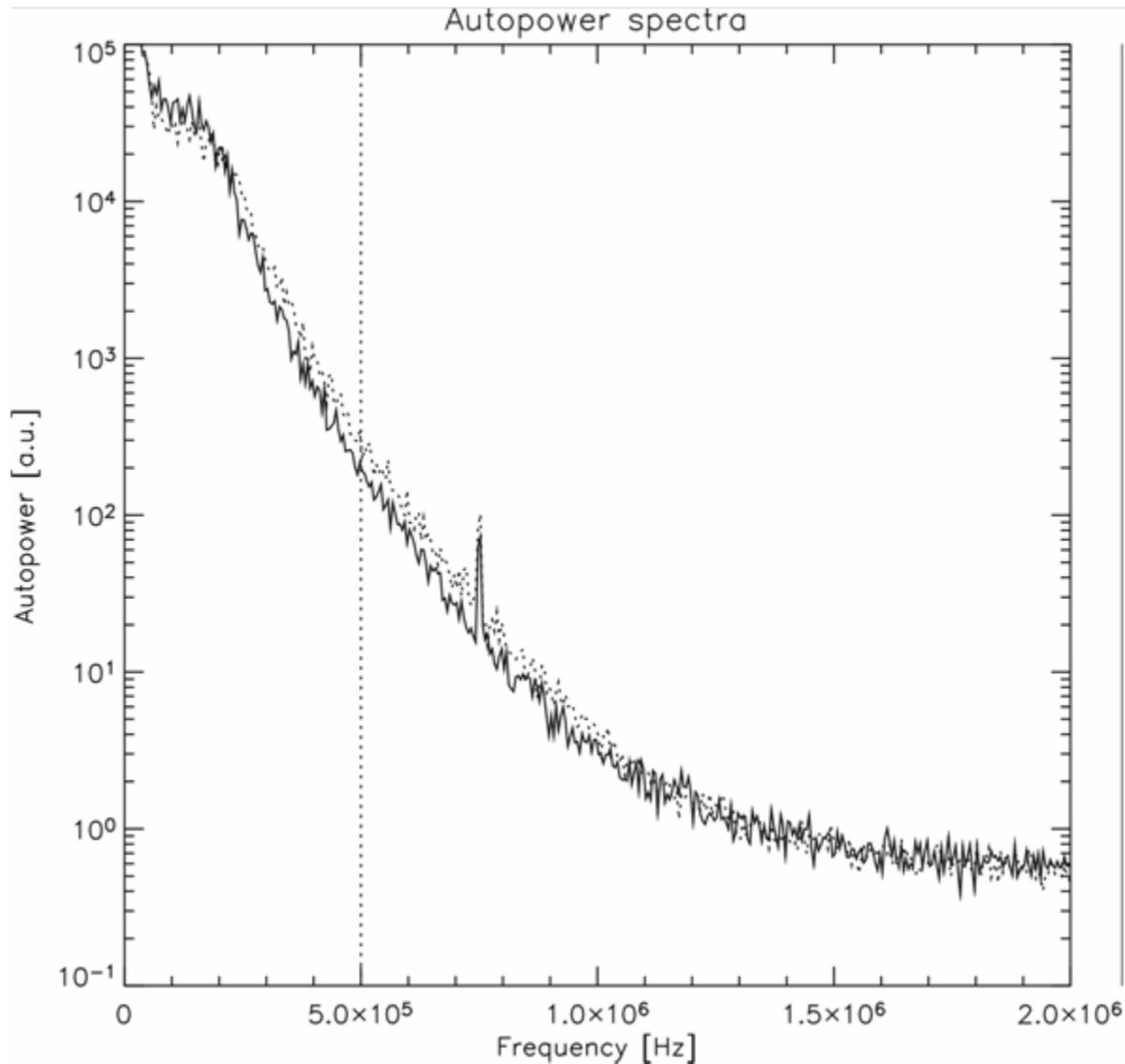


Waveforms shot 1040319018



Scorecard: 9 full length plasmas, 6 early disruptions, 1 fizzle. We had 7 no power shots (cycle and engineering tests, computer and CAMAC problems). We also had breaker faults and transmitter D was lost in shot 7.

PCI fluctuations, central channel



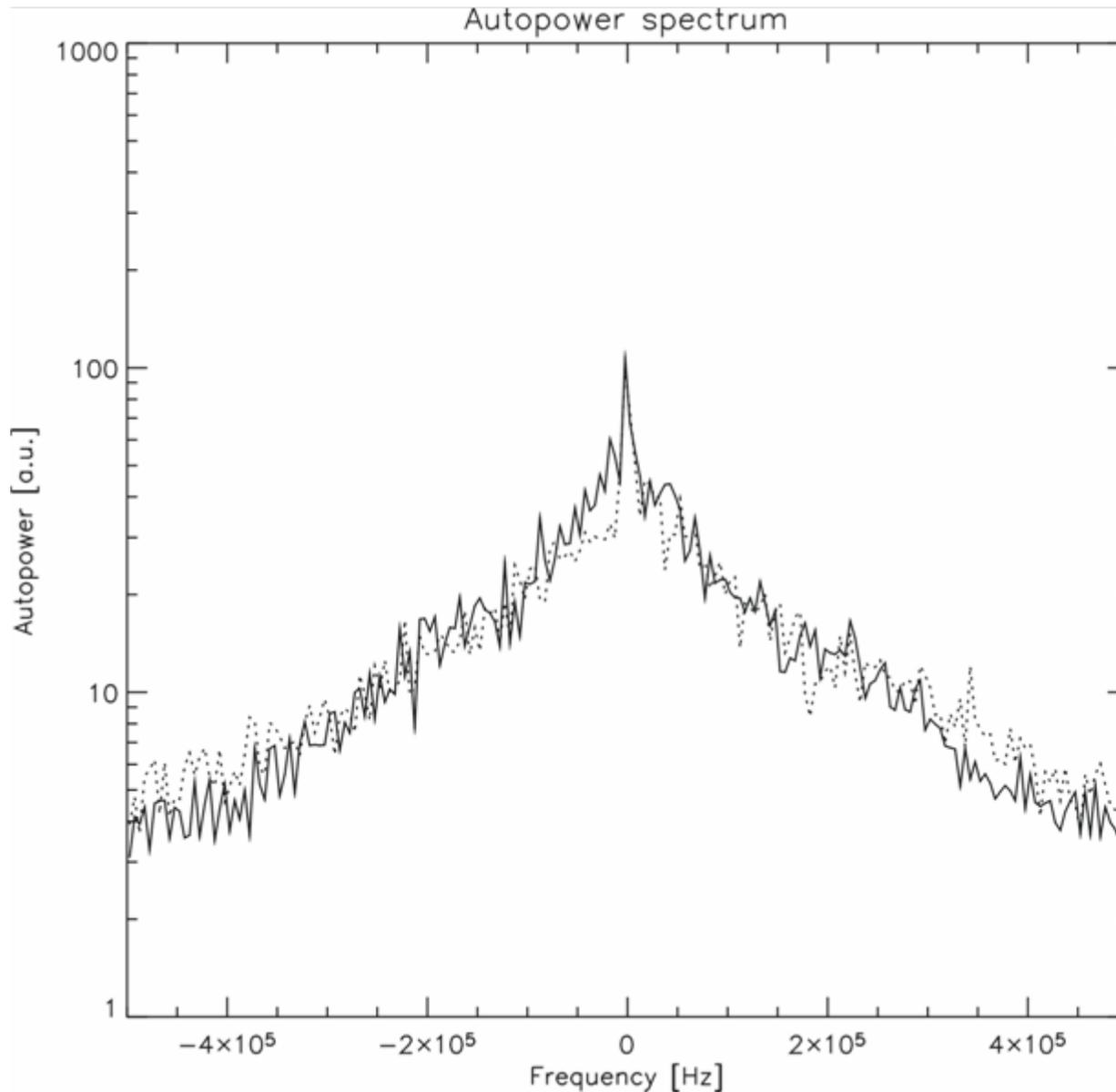
Shot_one: 1040319018
Freq. res.: 5.00 [kHz]
Trange_one:
[1.0800E+00,1.0900E+00] s
Power scale: Logarithmic

Channel_one: 17 (solid)

Shot_two: 1040319018
Freq. res.: 5.00 [kHz]
Trange_two:
[1.2500E+00,1.2600E+00] s
Power scale: Logarithmic

Channel_two: 17 (dotted)

Reflectometry fluctuations, 132 GHz



Shot_one: 1040319018
freq. res.: 5.00 [kHz]
trange:
[1.080E+00,1.090E+00] s
Power scale: logarithmic

132 GHz (solid)

Shot_two: 1040319018
freq. res.: 5.00 [kHz]
trange:
[1.250E+00,1.260E+00] s
Power scale: logarithmic

132 GHz (dotted)

Preliminary conclusions

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- Always takes some shots to obtain density control for these inner wall limited L-mode discharges.
 - Initial analysis of density fluctuation autopower spectra shows that no discernable change is observed as q_a is lowered from 2.9 to 2.75.
 - Correlations between various turbulent fields, e.g. magnetic and density fluctuations, may display some differences. Analysis to be done.
 - Temperature profiles still need to be checked; so far no clear development has been found.
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- If additional experiments are made, I suggest to make a density scan in Ohmic plasmas. The transition was quite sensitive to density in W7-AS: High density lead to a large transition.