COMPASS
INSTITUTE OF PLASMA PHYSICS ASCR

Some preliminary results from the first RE campaign on COMPASS

food for thought …

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for the 2nd Chalmers meeting on Runaway Electron Modelling
17th June 2014

Status of RE experiments

This 1st campaign: Only circular or elliptical plasmas
Some piggyback experiments in non-RE sessions

What was done:
- density scan
- position scan
- some gas puffs
- some I_p scan
- some shape scan
- I_p reversal
- some B_T scan
- a few disruptions
- one shot with NBI

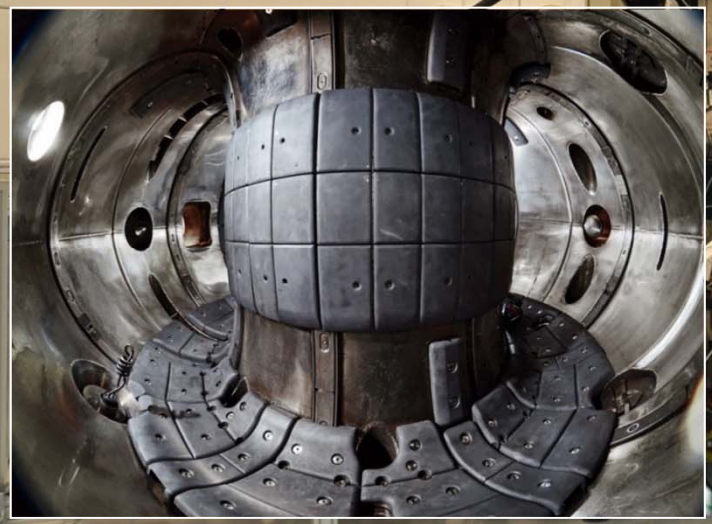
What was not done:
- E_{crit} measurements
- U_{LOOP} modifs in ramp-up
- in general, scenario development
- not enough scans in reversed I_p
- not enough gas puff experiments

The 2nd campaign (November): Disruptions
Gas puff (hydrogen, helium, argon …?)

Motivation for this presentation: To learn (i) What sounds relevant to you?
(ii) How to quantify? (…to move from stamp collection to physics)

Tokamak COMPASS

R = 0.56 m
a = 0.23 m
B_T = 0.9 – 1.25 T
I_p up to 350 kA
ITER-like plasmas
ELMy H-mode



4 NaI(Tl) HXR detectors

Pb shielded plastic „neutron“ detector

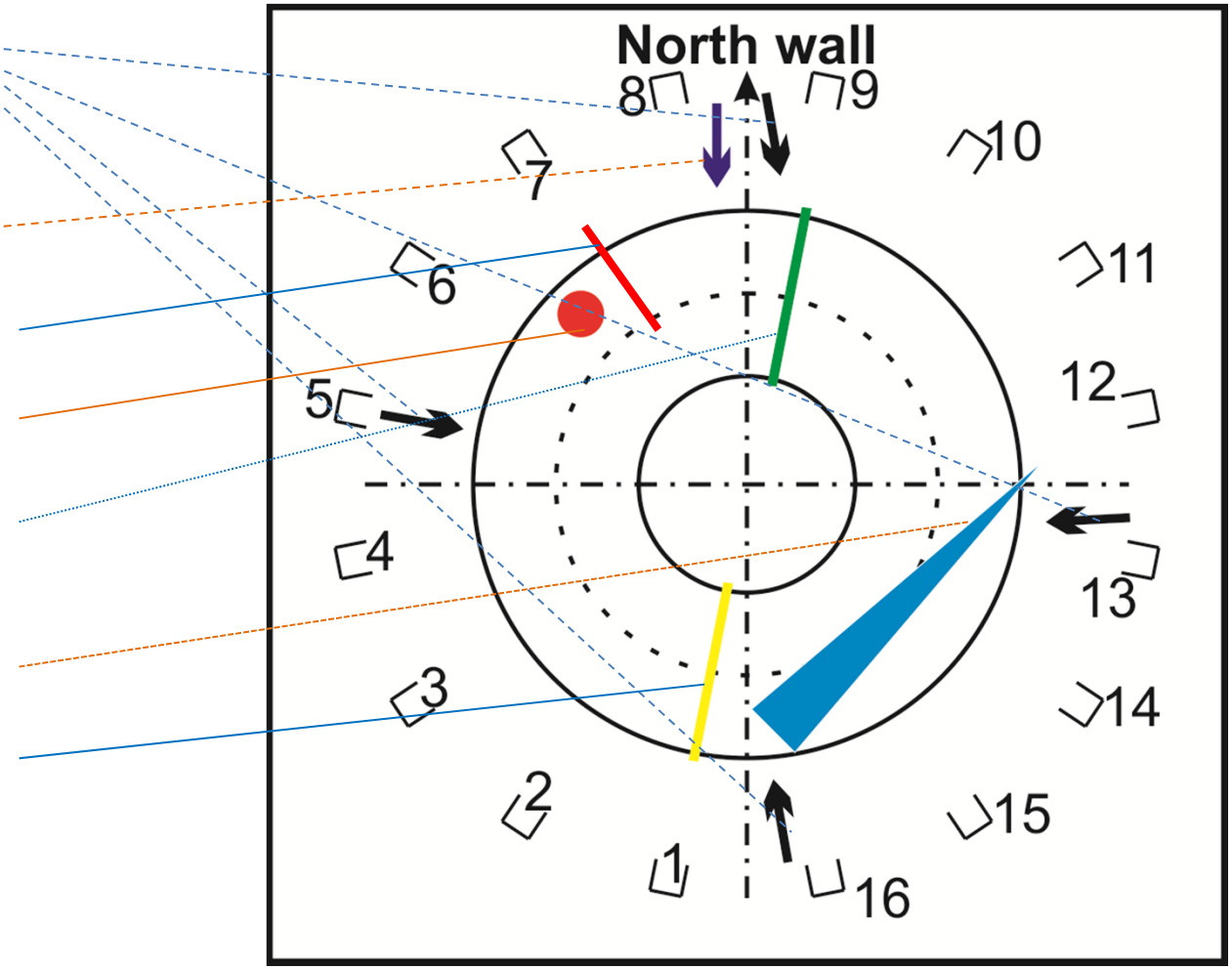
SXR pinhole cameras

Cherenkov detector

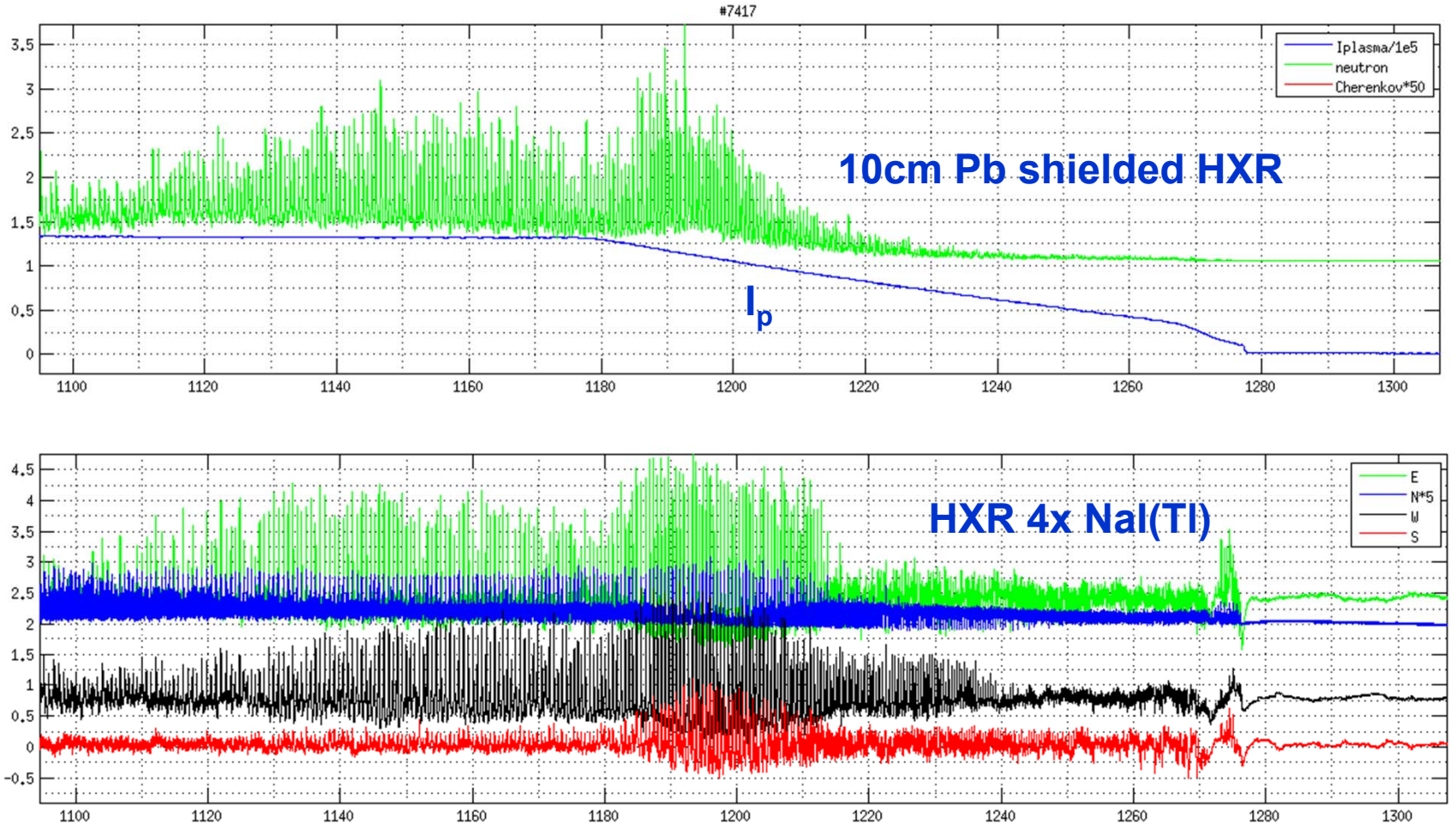
Internal partial Rogowski coils

IR camera

Rogowski coil

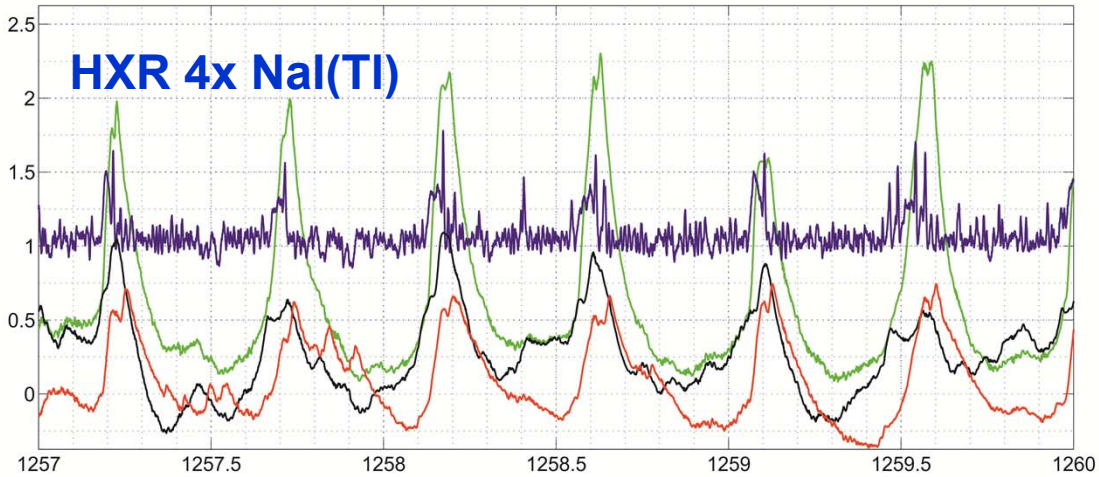


Low density case



Hard X-rays – toroidal phase in instability?

 # 7399



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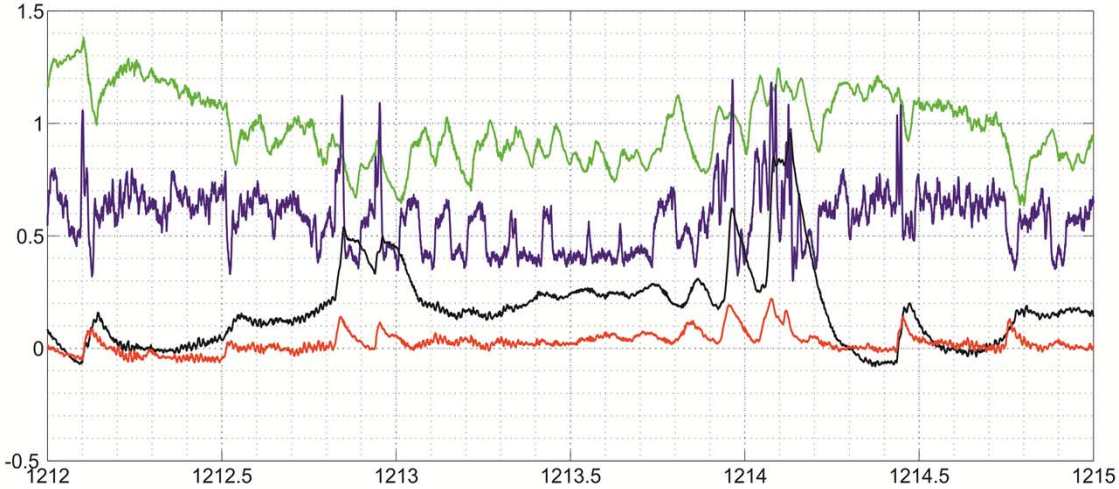
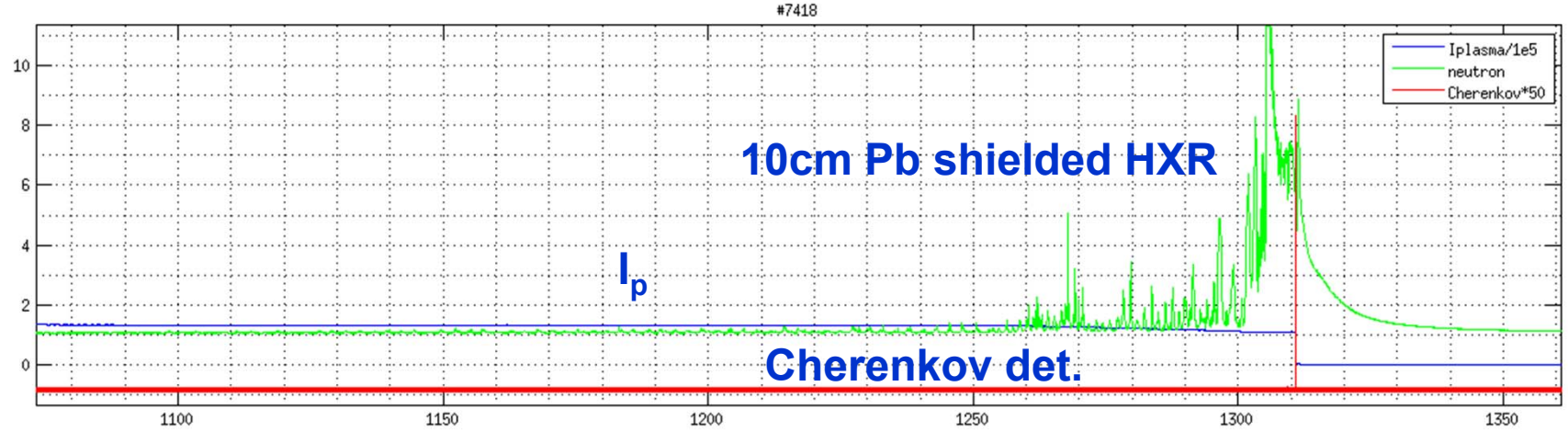
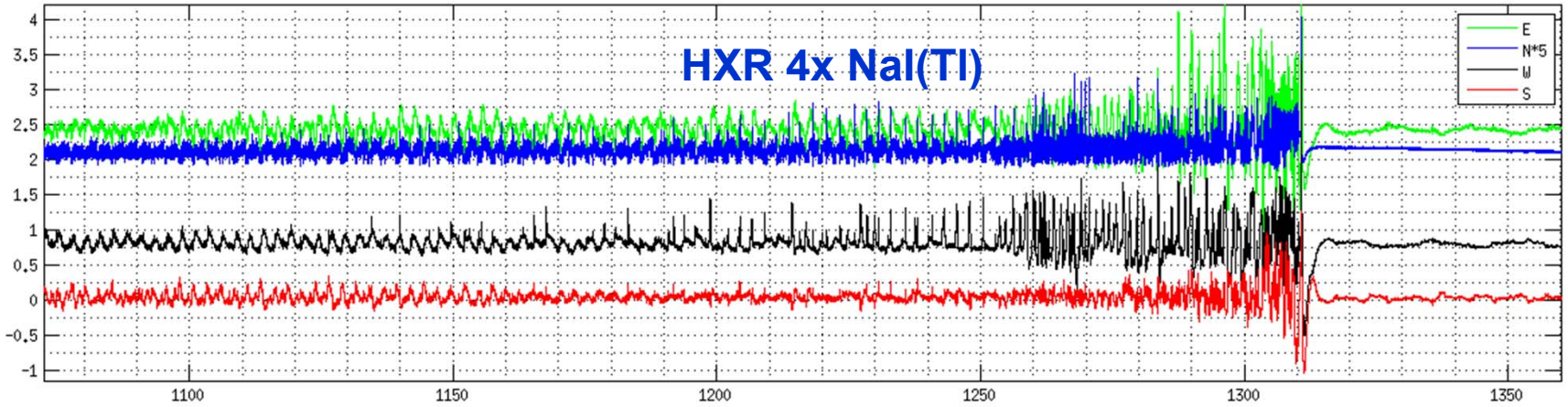
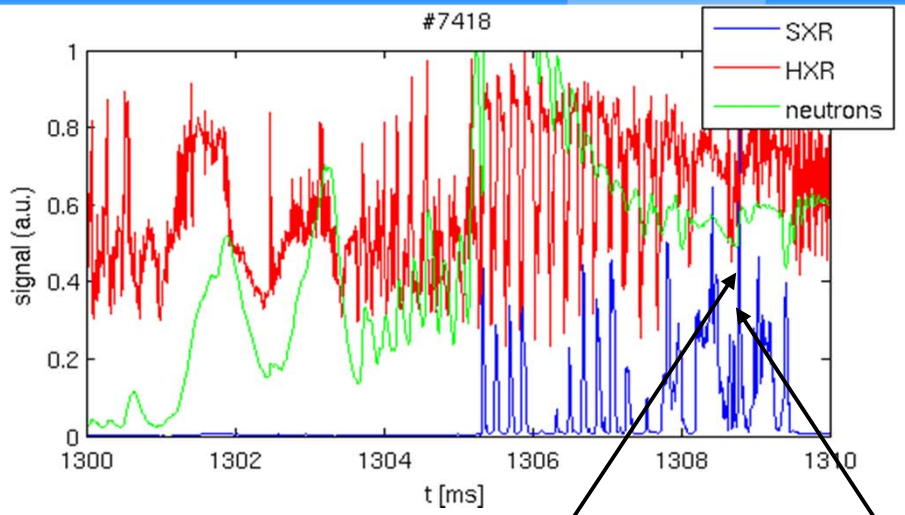


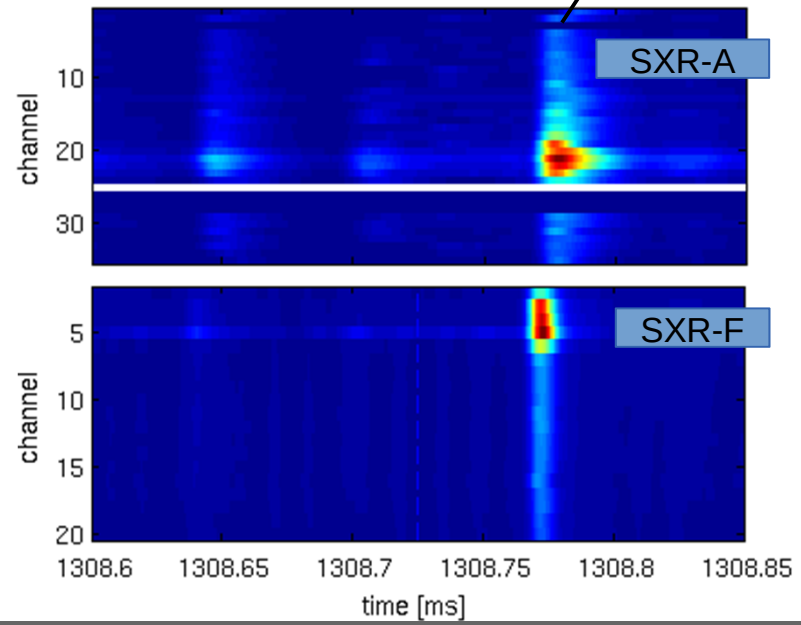
Even lower density case

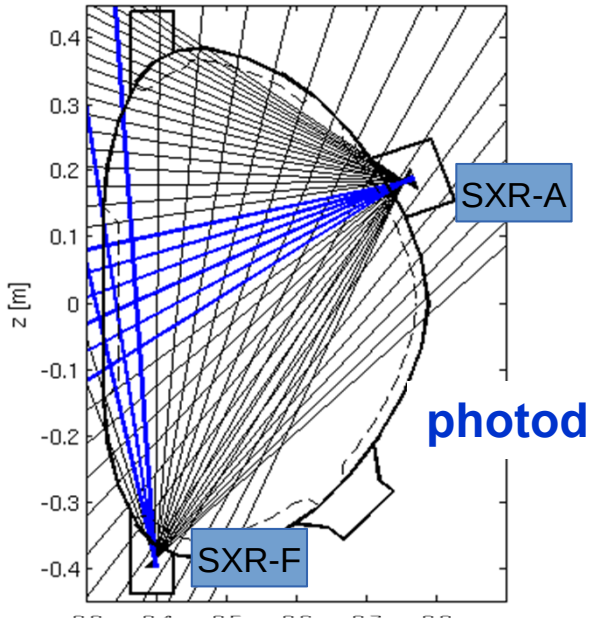




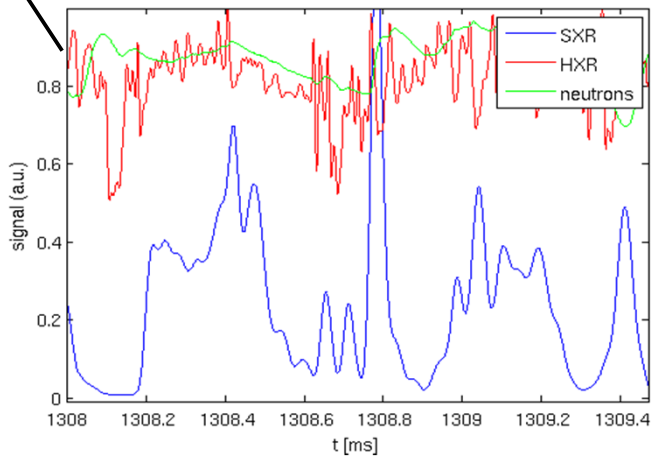
Soft X-ray data



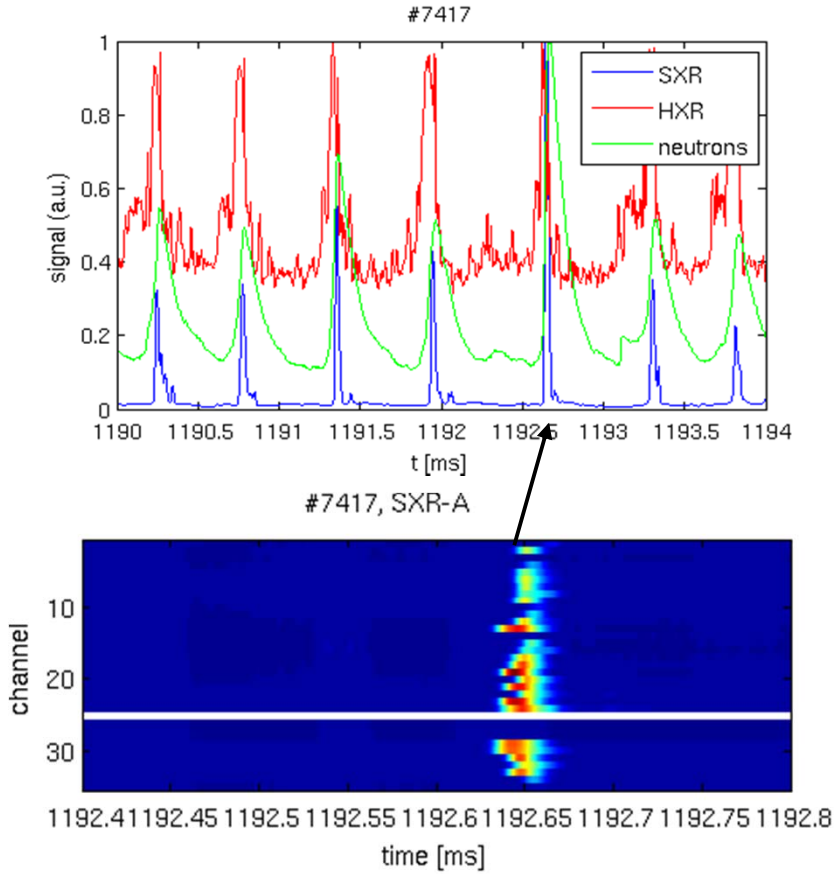


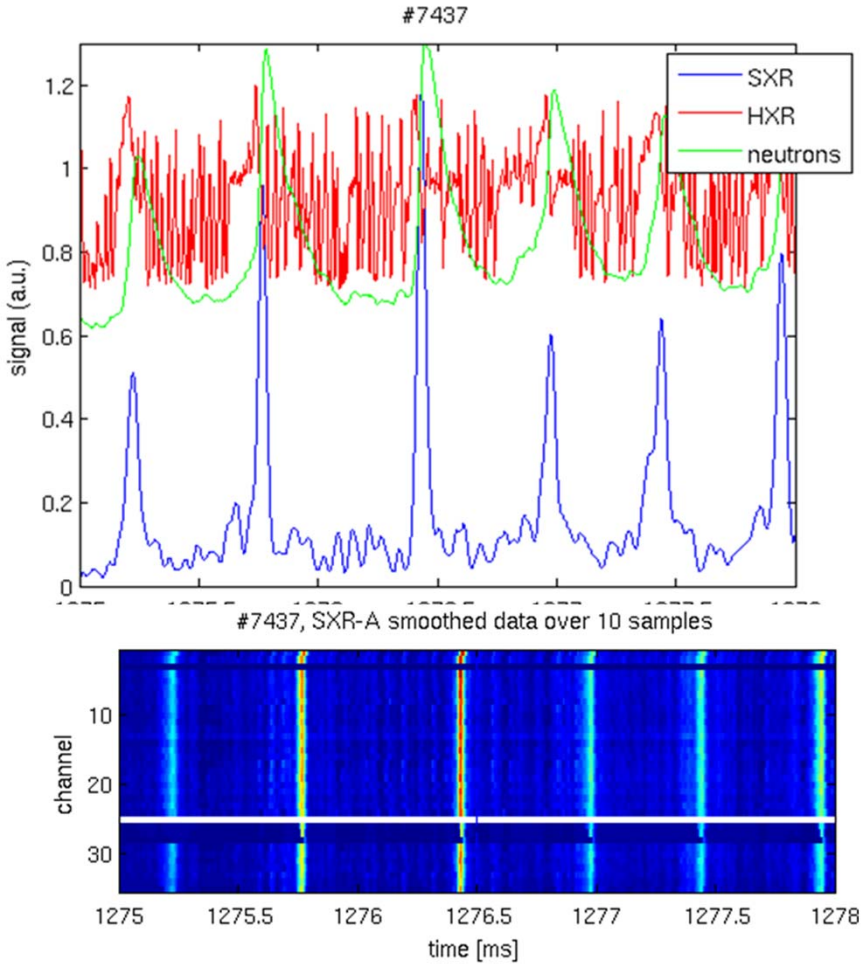


photodiodes

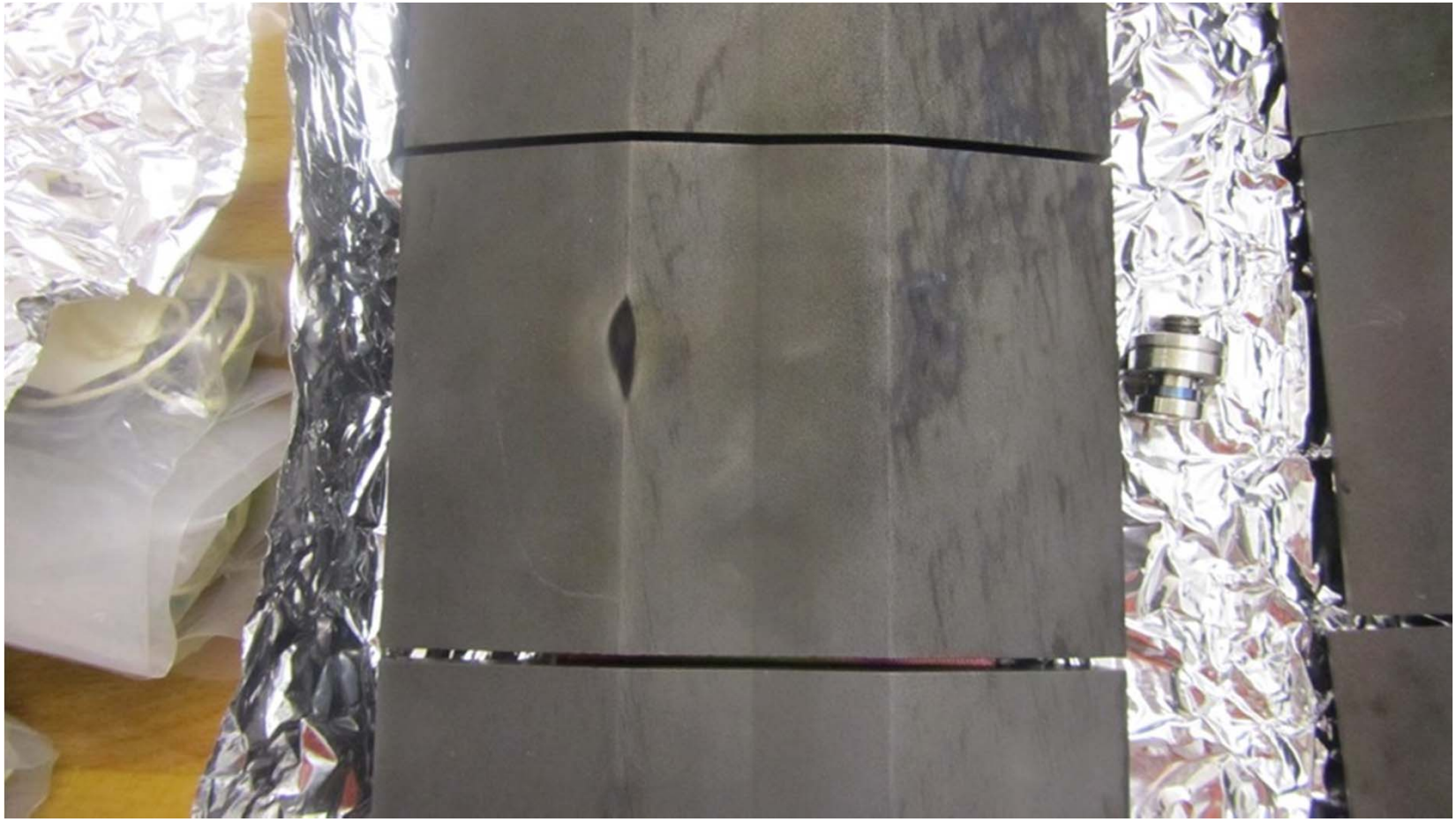


Soft X-rays vs. HXR

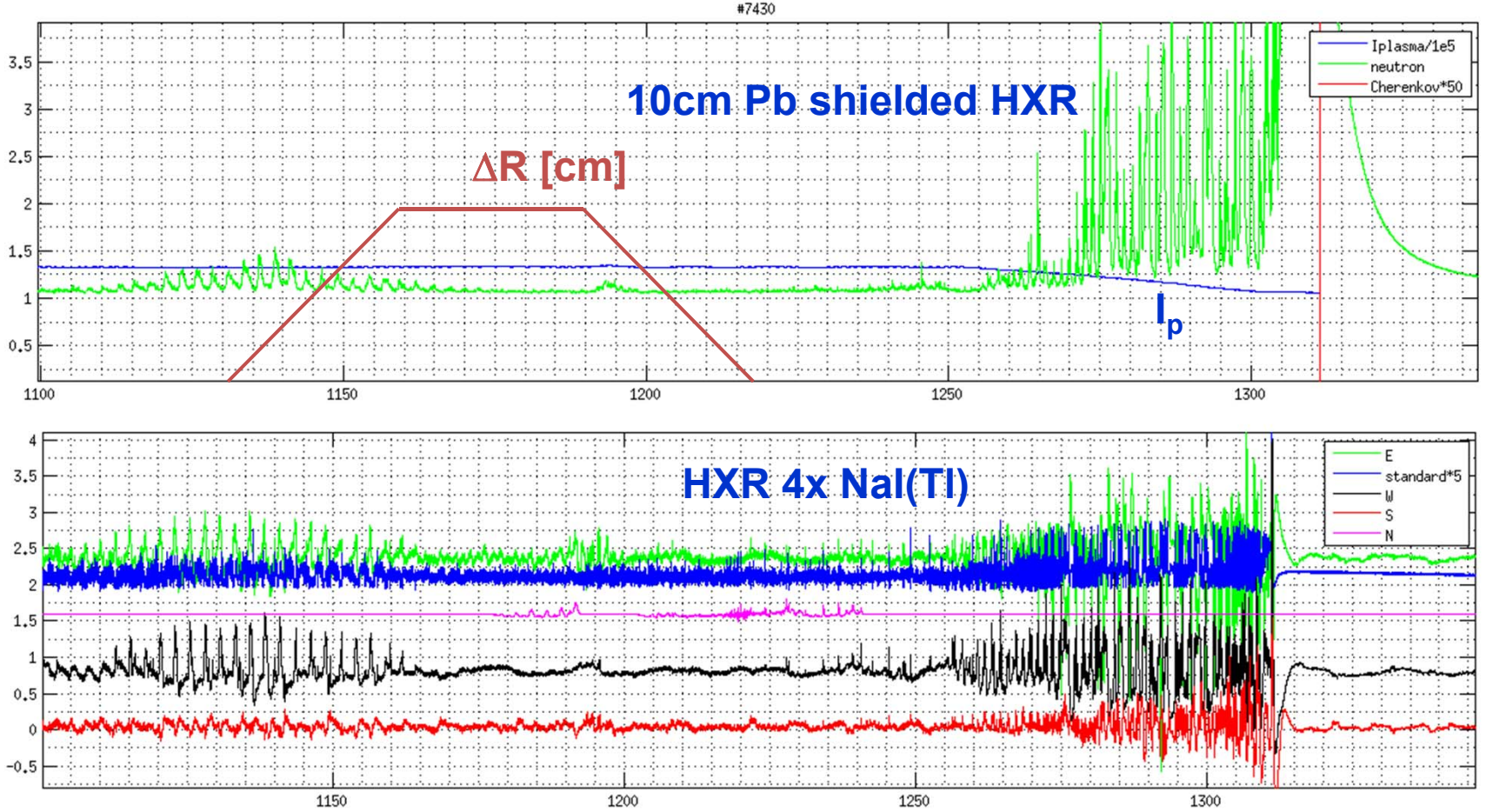




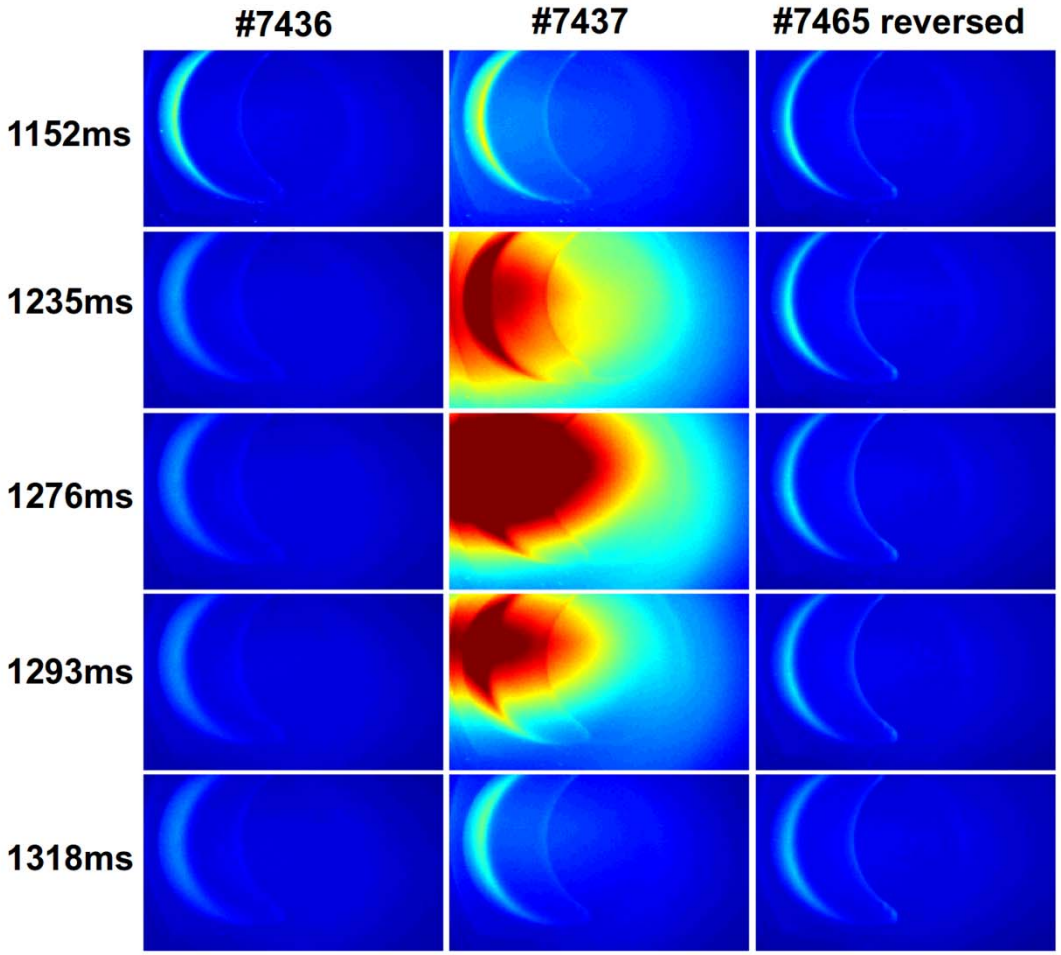
The limiter



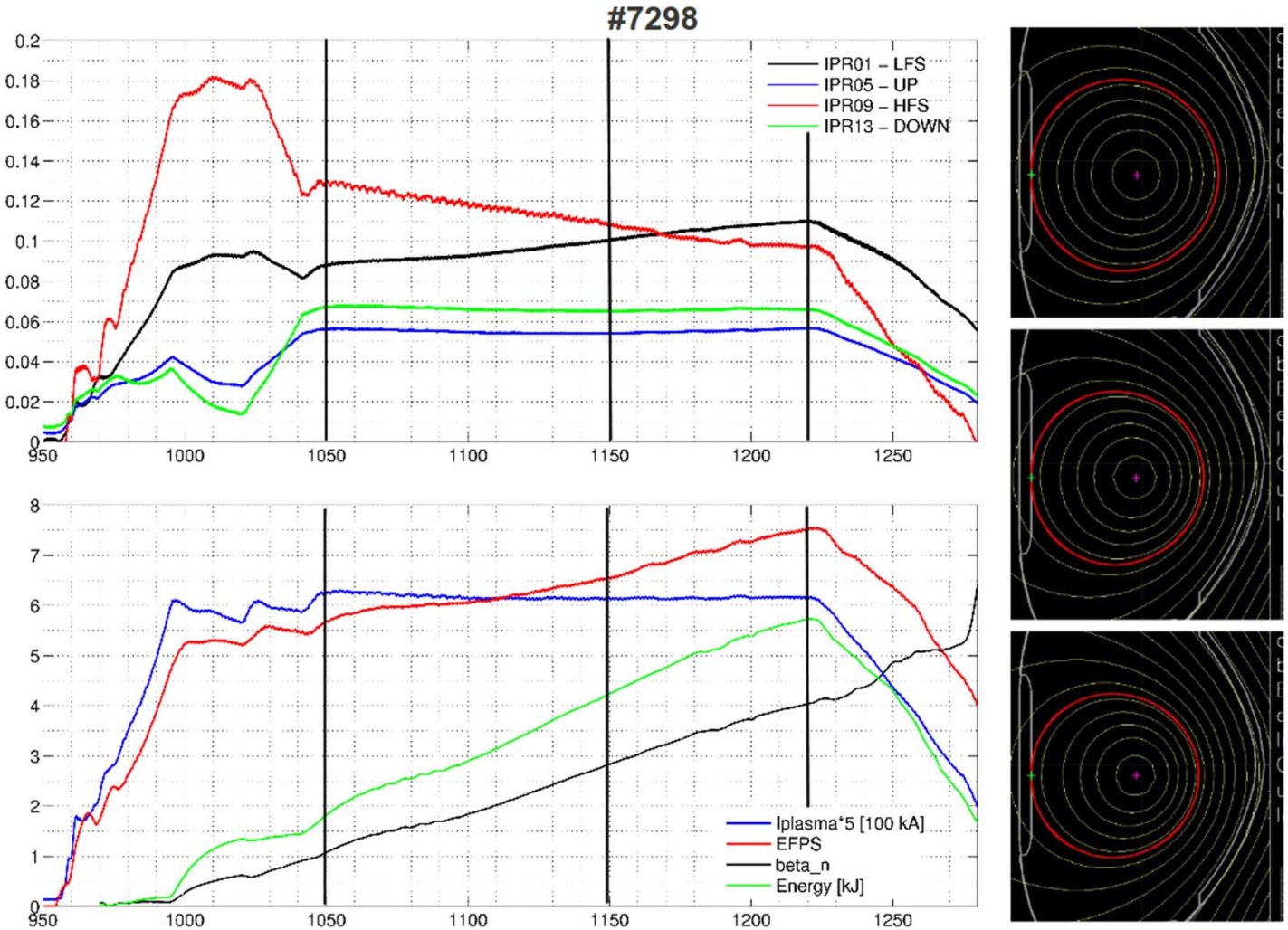
Radial shift towards LFS at 1160-1190ms kills the instability?



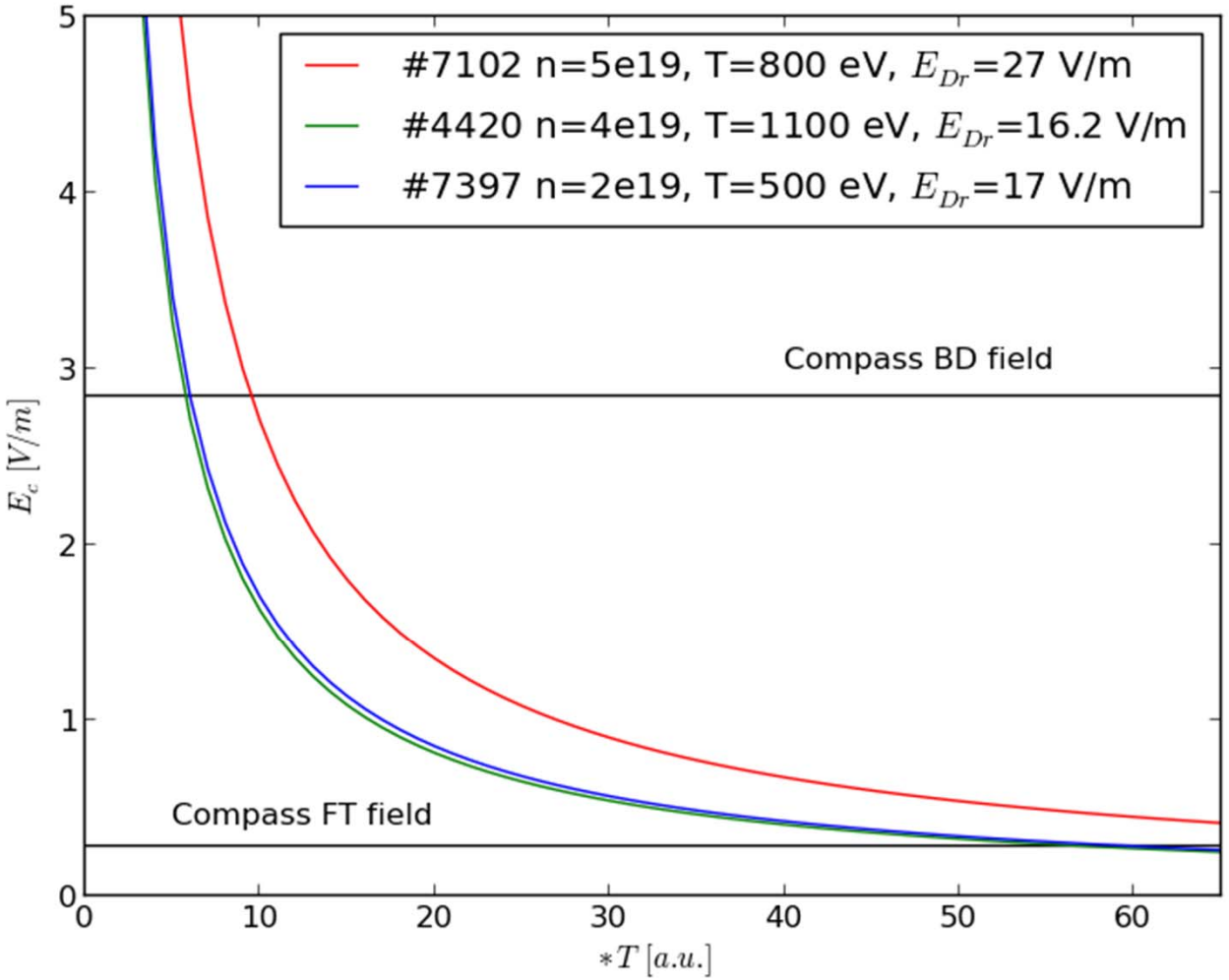
Infrared camera



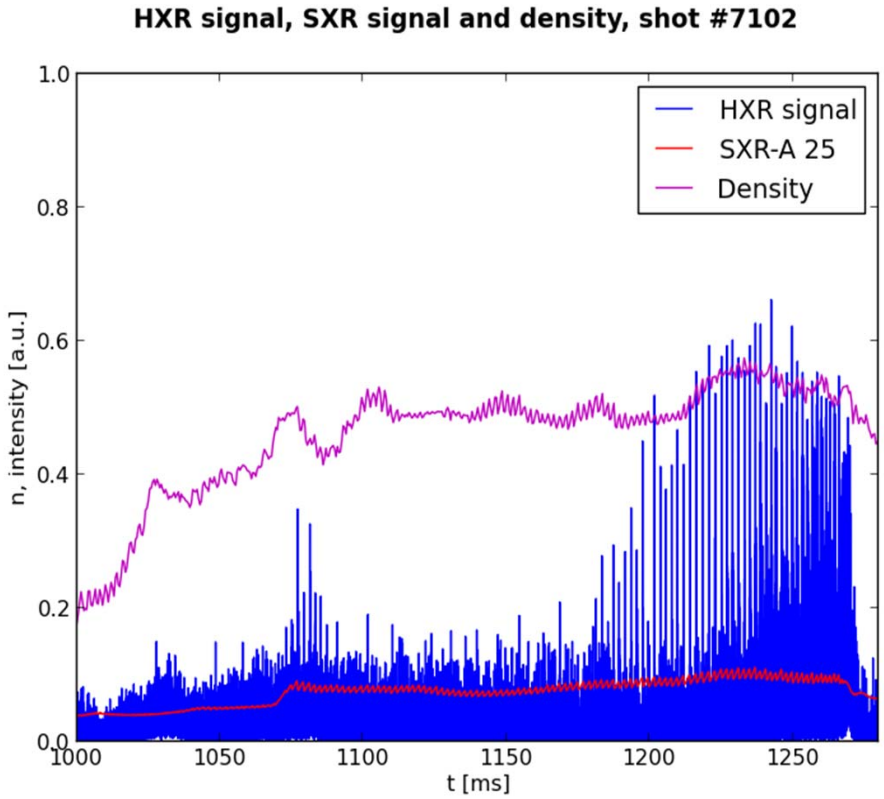
Magnetic consequences



Critical fields

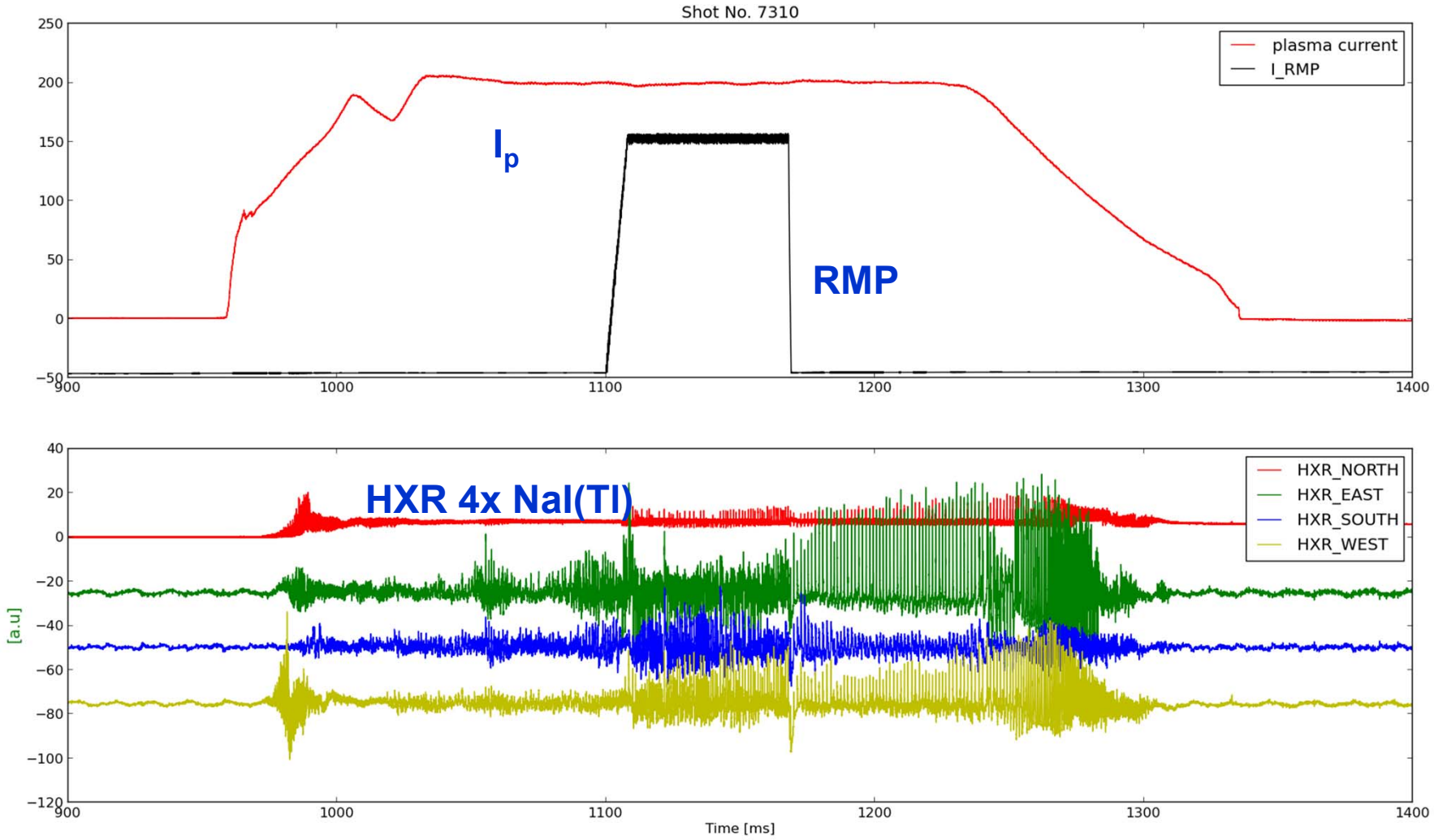


Magnetic consequences

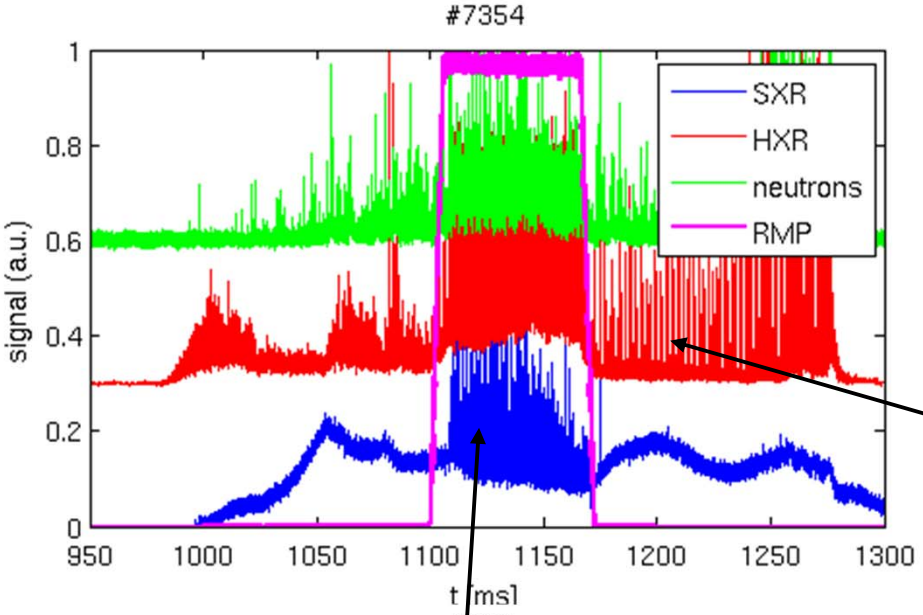


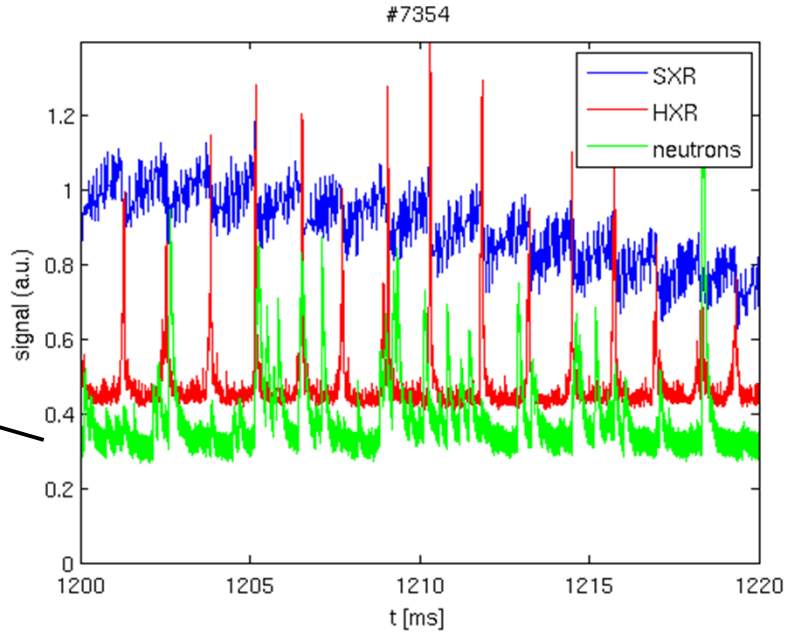
- Very high critical field – almost no „Uloop RE“
- RE bursts following ST crash
- Local reconnection field up to 1000 V/m
- Only in some parts of ST – reason uknown

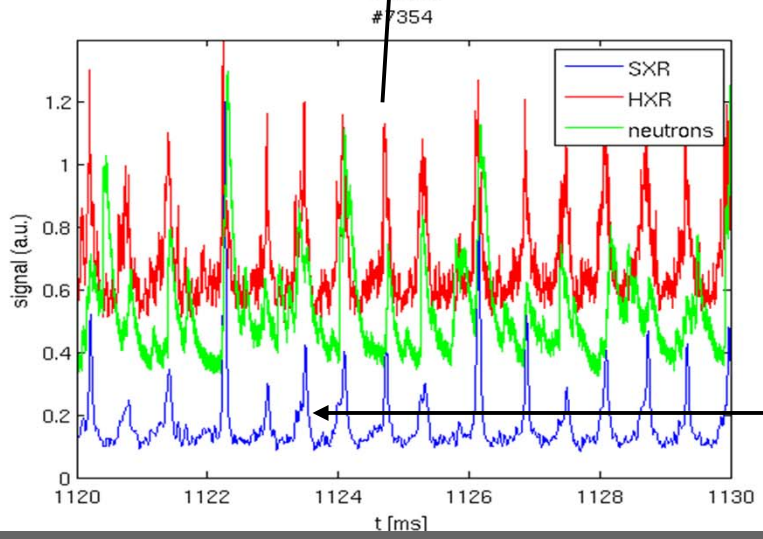
RMP influence

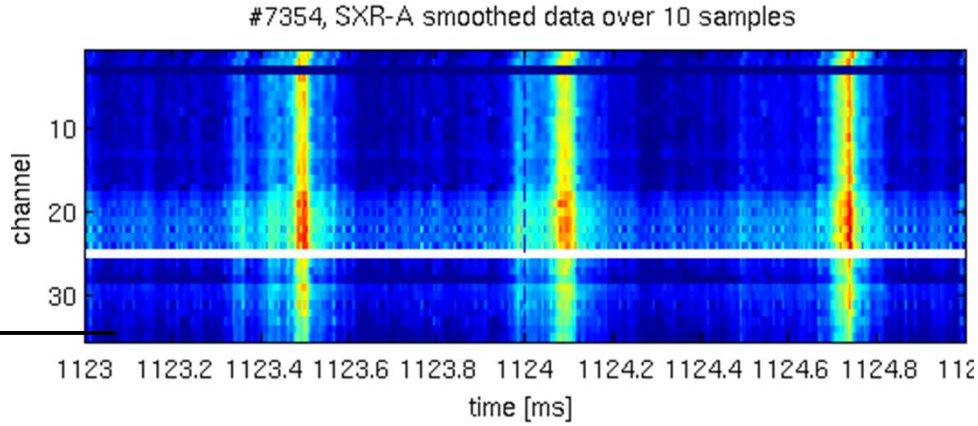


7354 - RMP

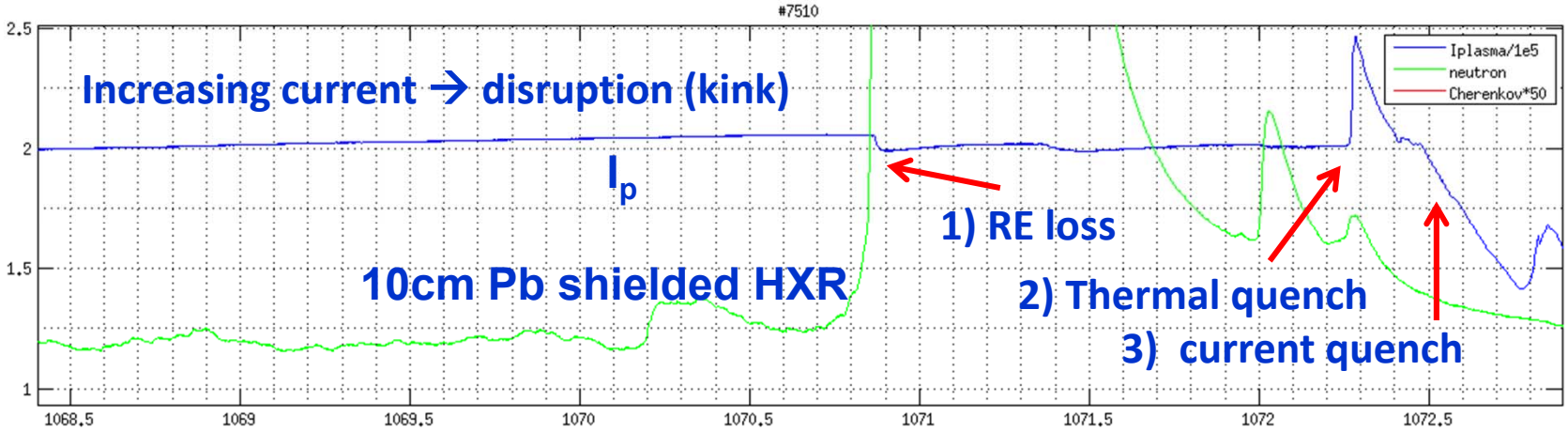

#7354
SXR
HXR
neutrons
RMP
signal (a.u.)
t [ms]

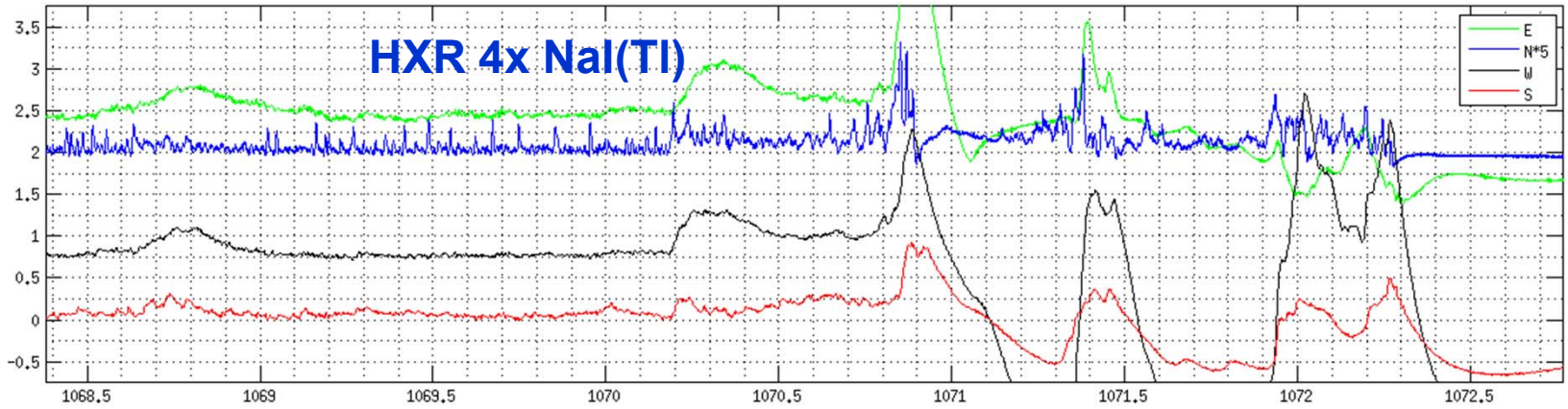

#7354
SXR
HXR
neutrons
signal (a.u.)
t [ms]


#7354
SXR
HXR
neutrons
signal (a.u.)
t [ms]


#7354, SXR-A smoothed data over 10 samples
channel
time [ms]

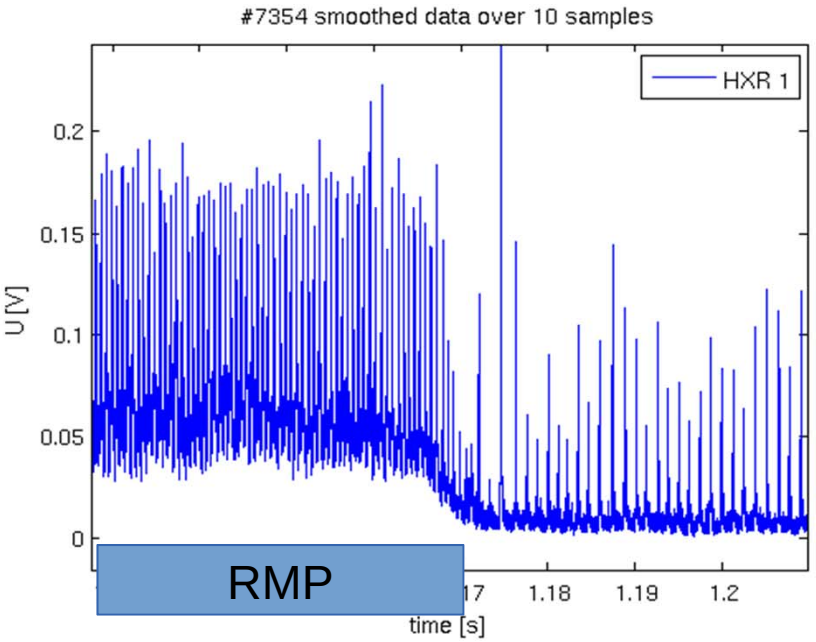
Disruptions

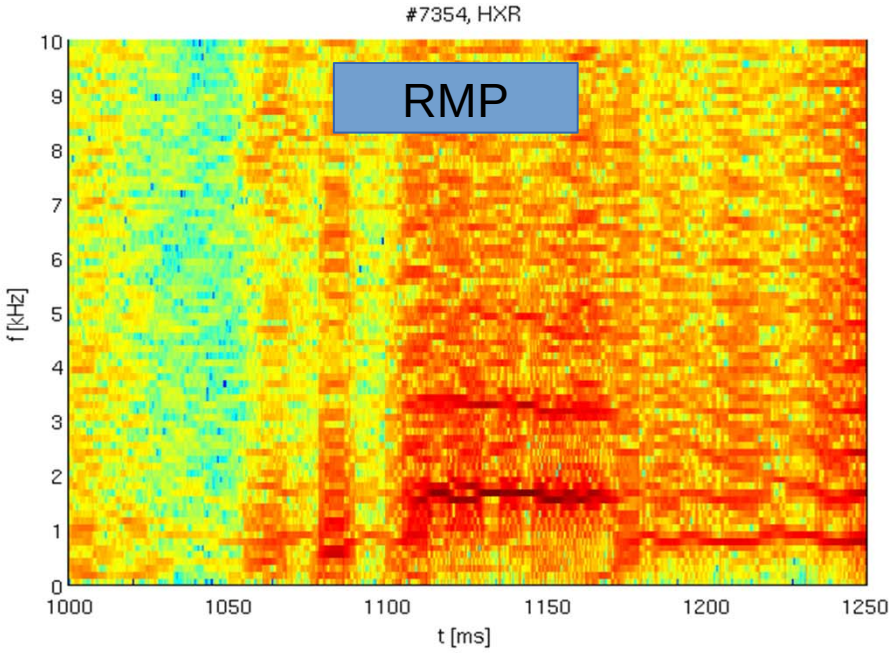




7354 – RMP effects

HXR have both higher frequency and amplitude during RMP





The frequency data correspond to the magnetic data, too

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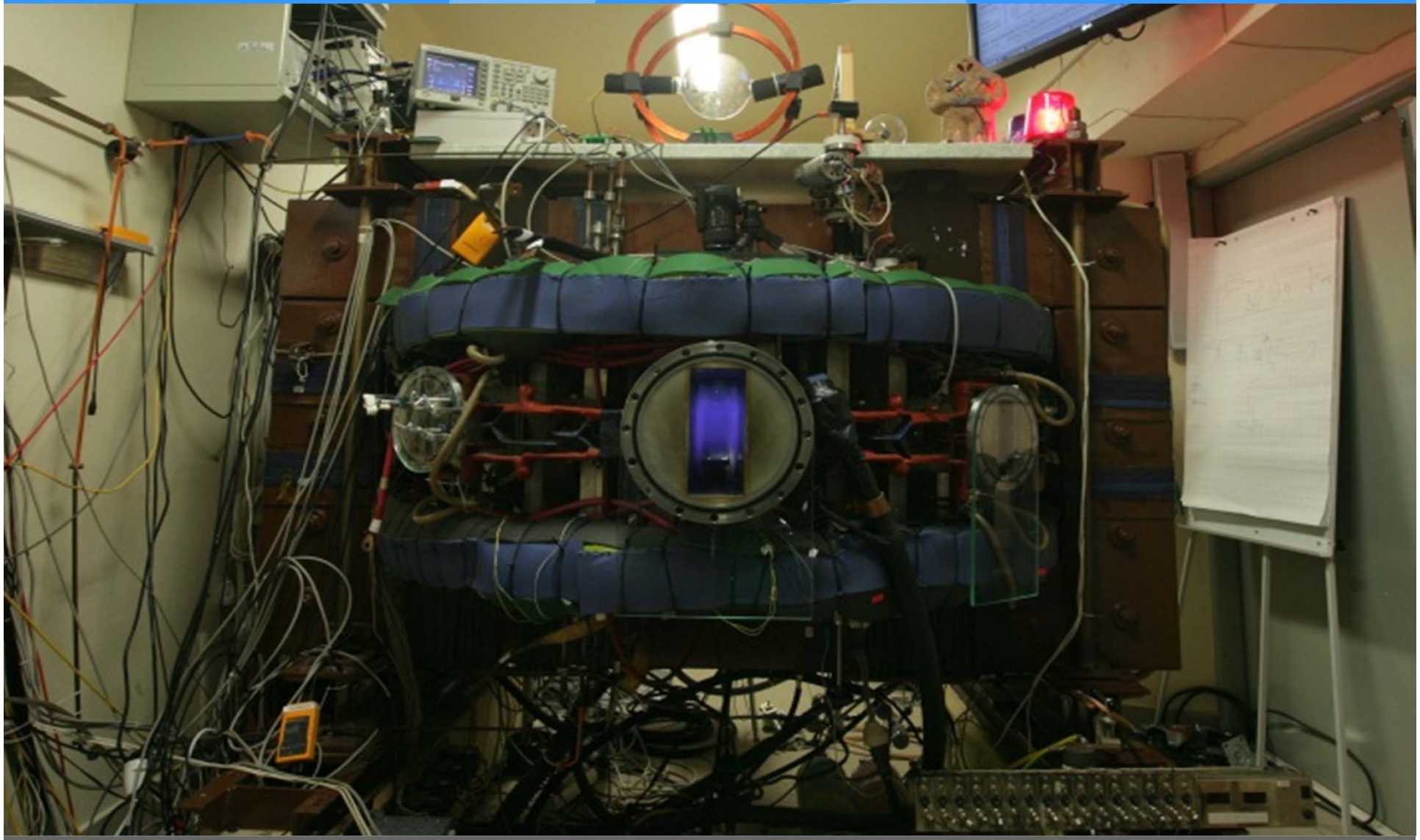
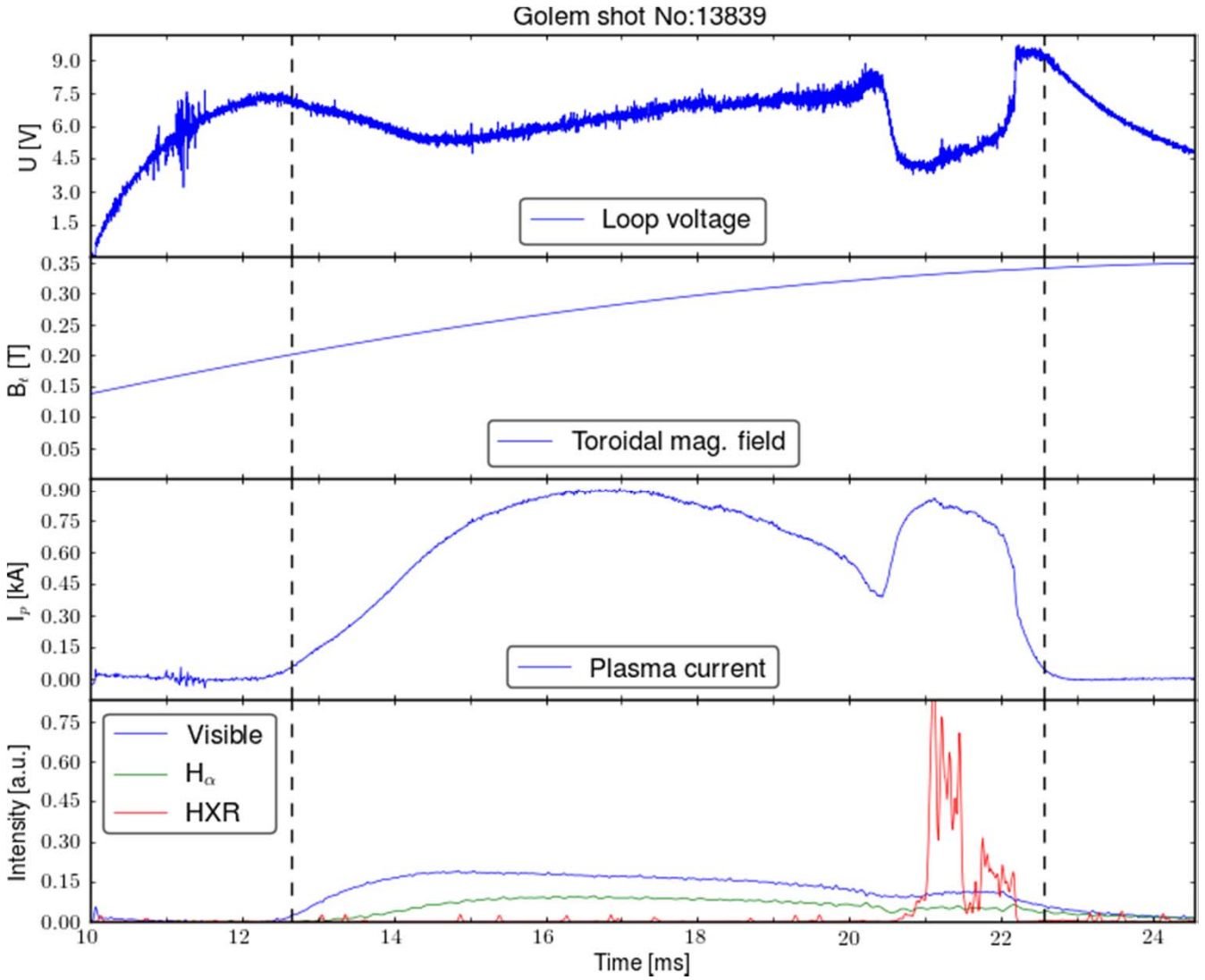
Tokamak GOLEM



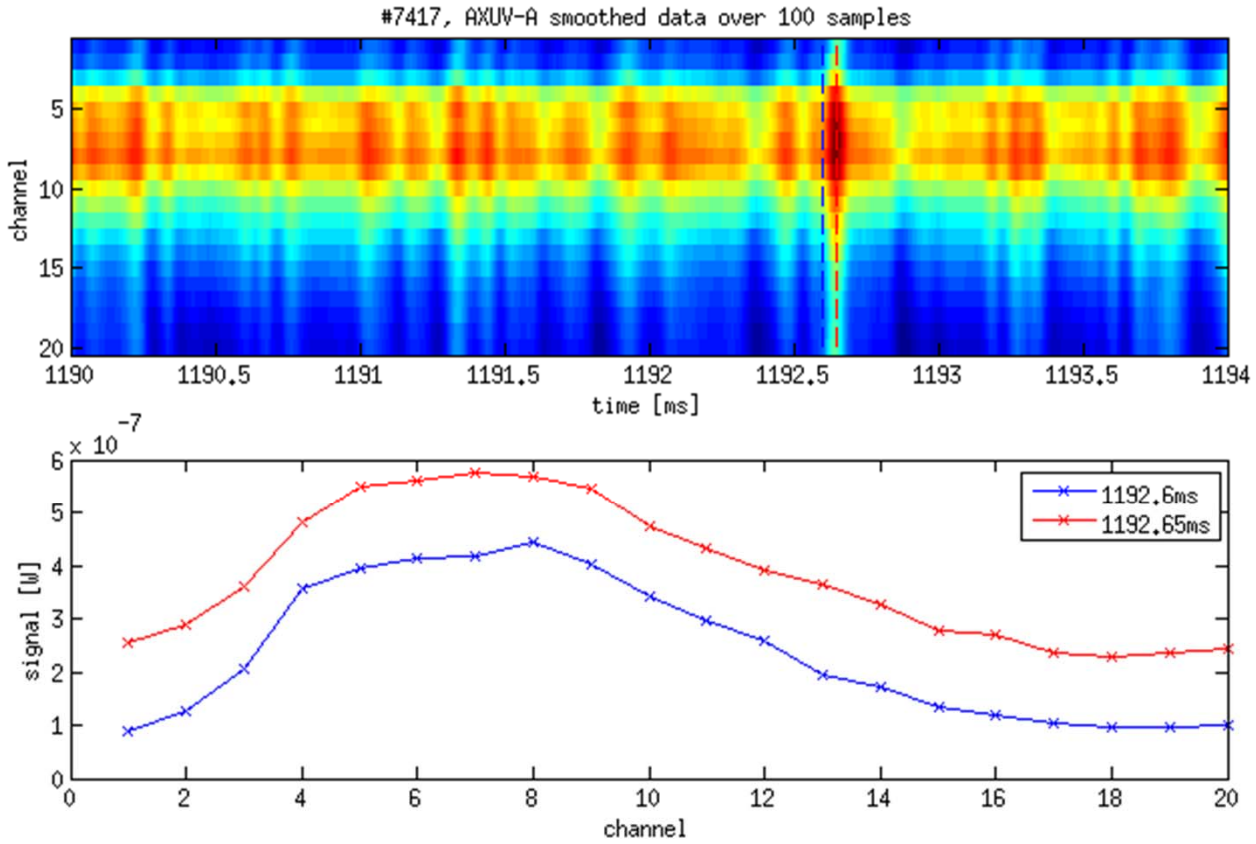
RMP influence

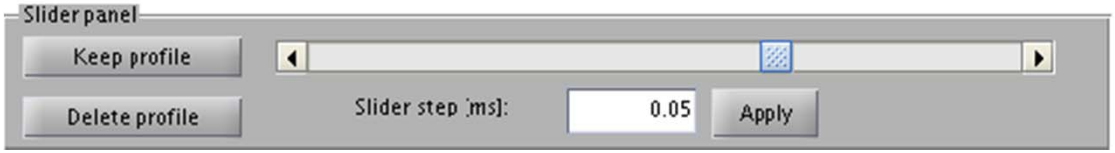


Conclusions

- **It is relatively simple to produce intensive RE in COMPASS**
- **Many options to modify plasma setup**
- **Diagnostics not sufficient**
- **Data are difficult to analyse and to transfer into relevant units**
- **What next? …distruptions and avalanching, …gas puff …ramp up scenarios**

7354 - RMP-pokracovani





RMP influence