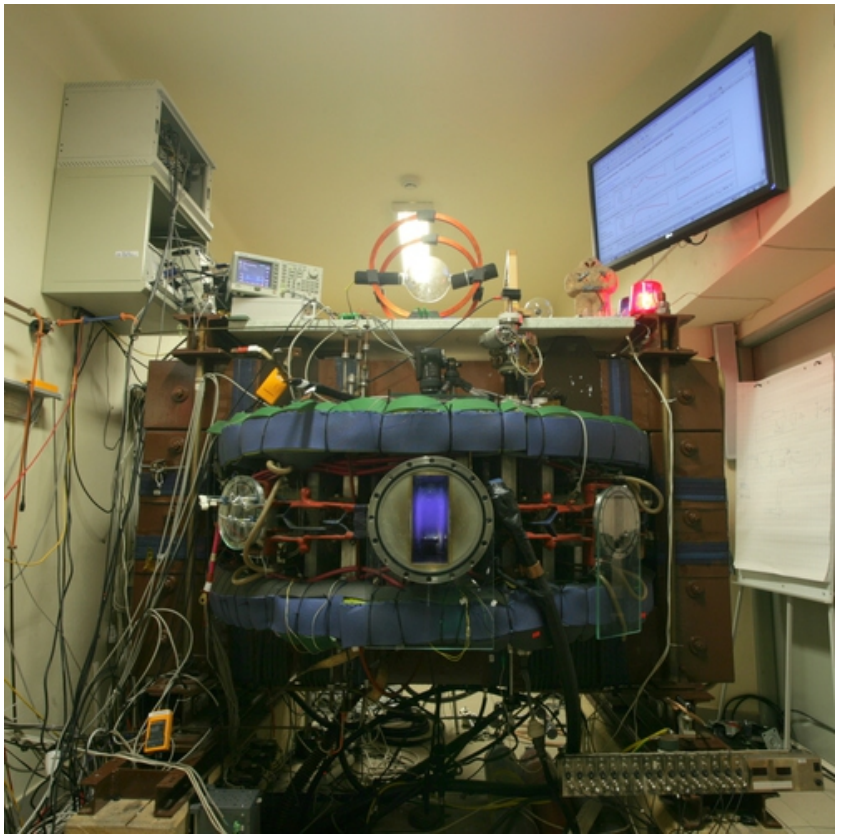
Tomography study on GOLEM tokamak



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Supervisor : Michal Odstrcil

Basic principle

Minimum Fisher regularization also called Tikhononov regularization

We solve the following equation :

$$(Ts' * fs)\,x - TT + \lambda H = 0$$

Which is of the form $ax + b = 0$

The solution is then :

$$x = \frac{(TT + \lambda H)}{Ts' * fs}$$

with λ being a constant that we chose at 10^9 because a higher value doesn't give a better result and the calculation time always stays low.

Plasma parameters

$$\Delta t = 11.4\, ms$$

$$I_p = 4.47\, kA$$

$$U_{lBD} = 10.5\, V$$

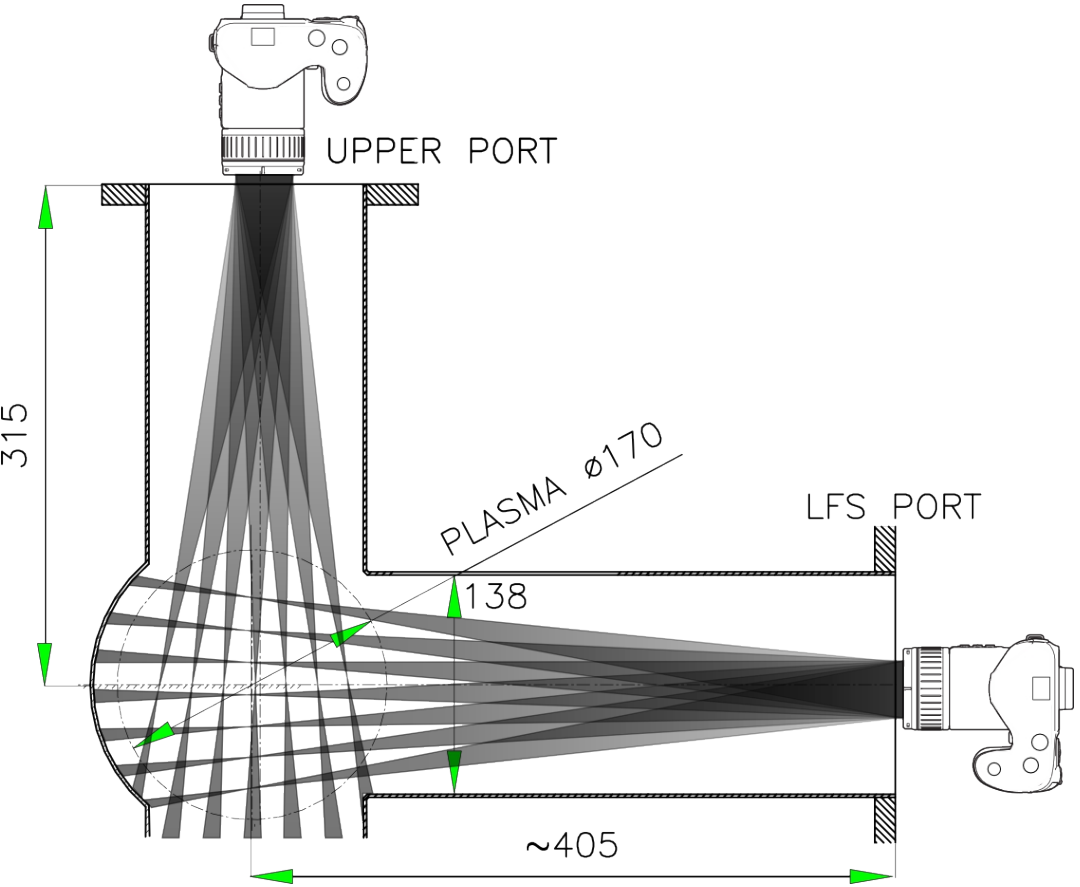
$$U_l = 9.06\, V$$

$$Te = 35.7\, eV$$

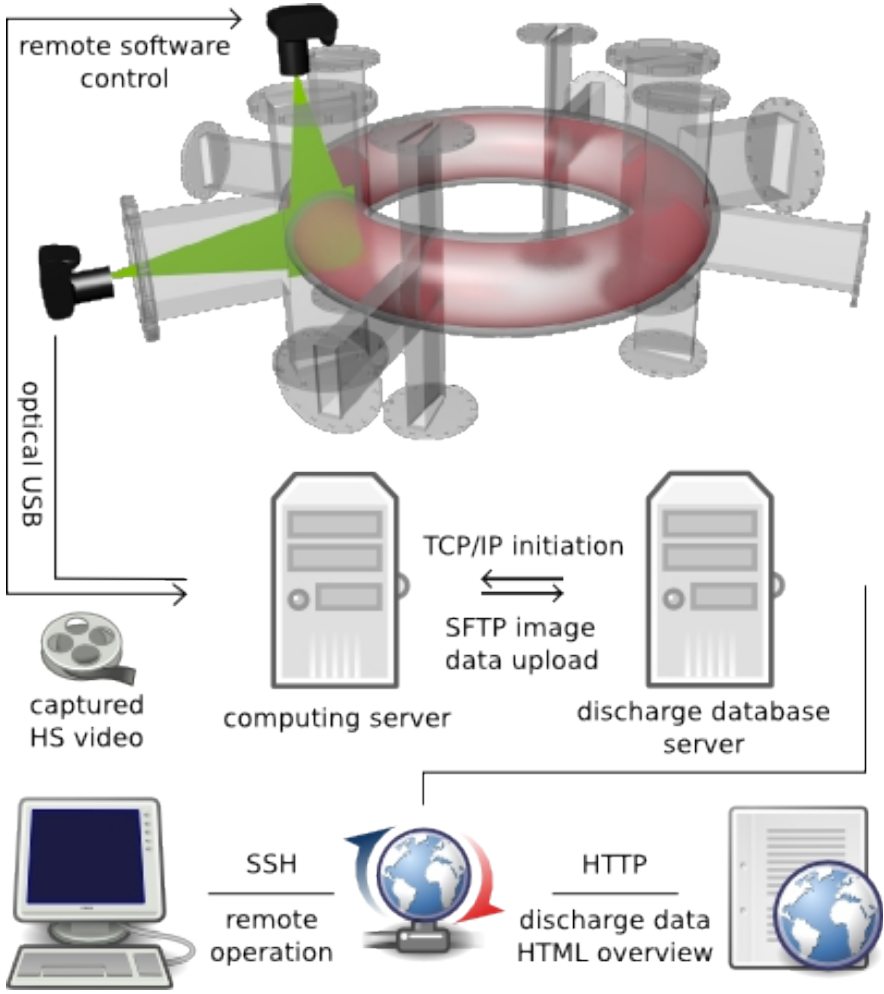
$$P_{OH} = 40.50\, kW$$

$$Q_{ed} = 2.1$$

Experimental setup



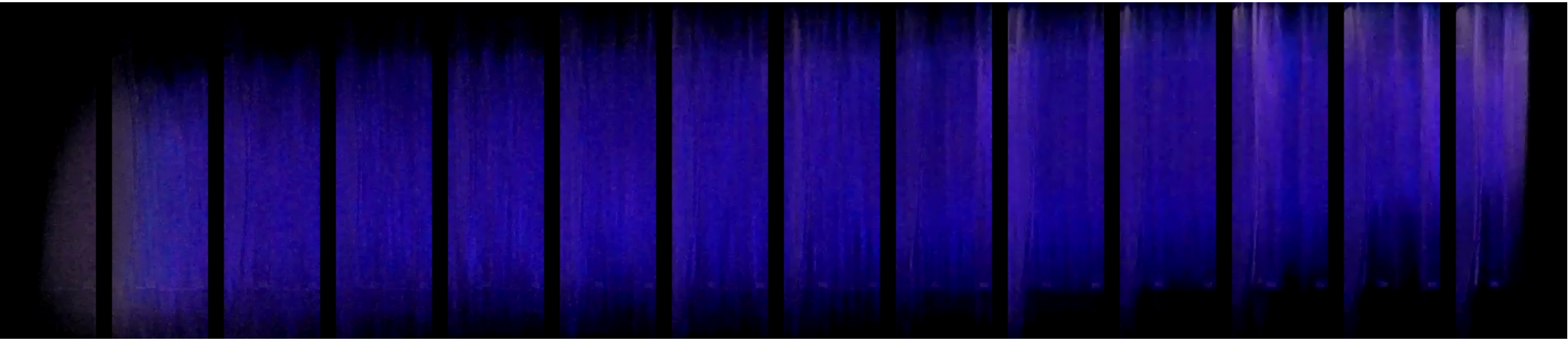
[Golem wiki]



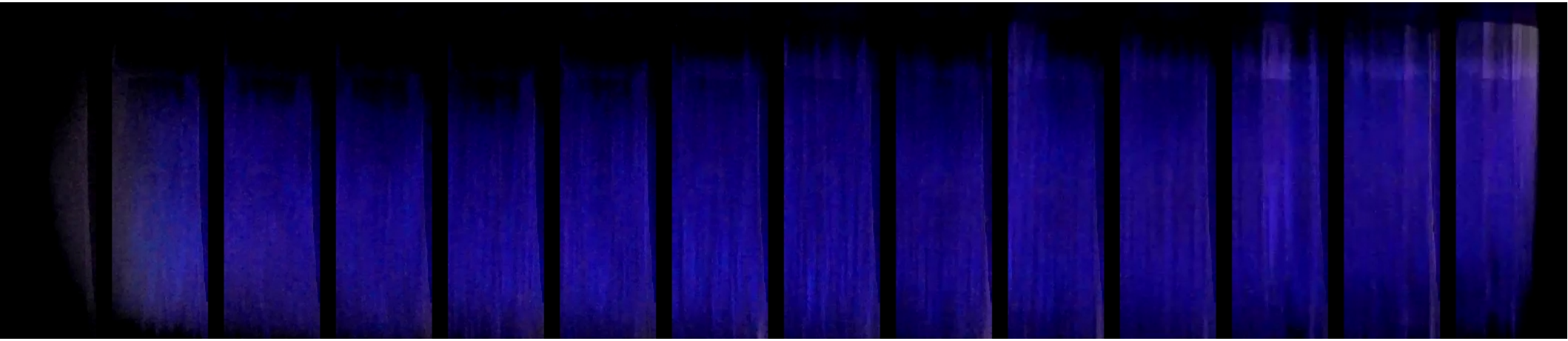
[Golem wiki]

Images

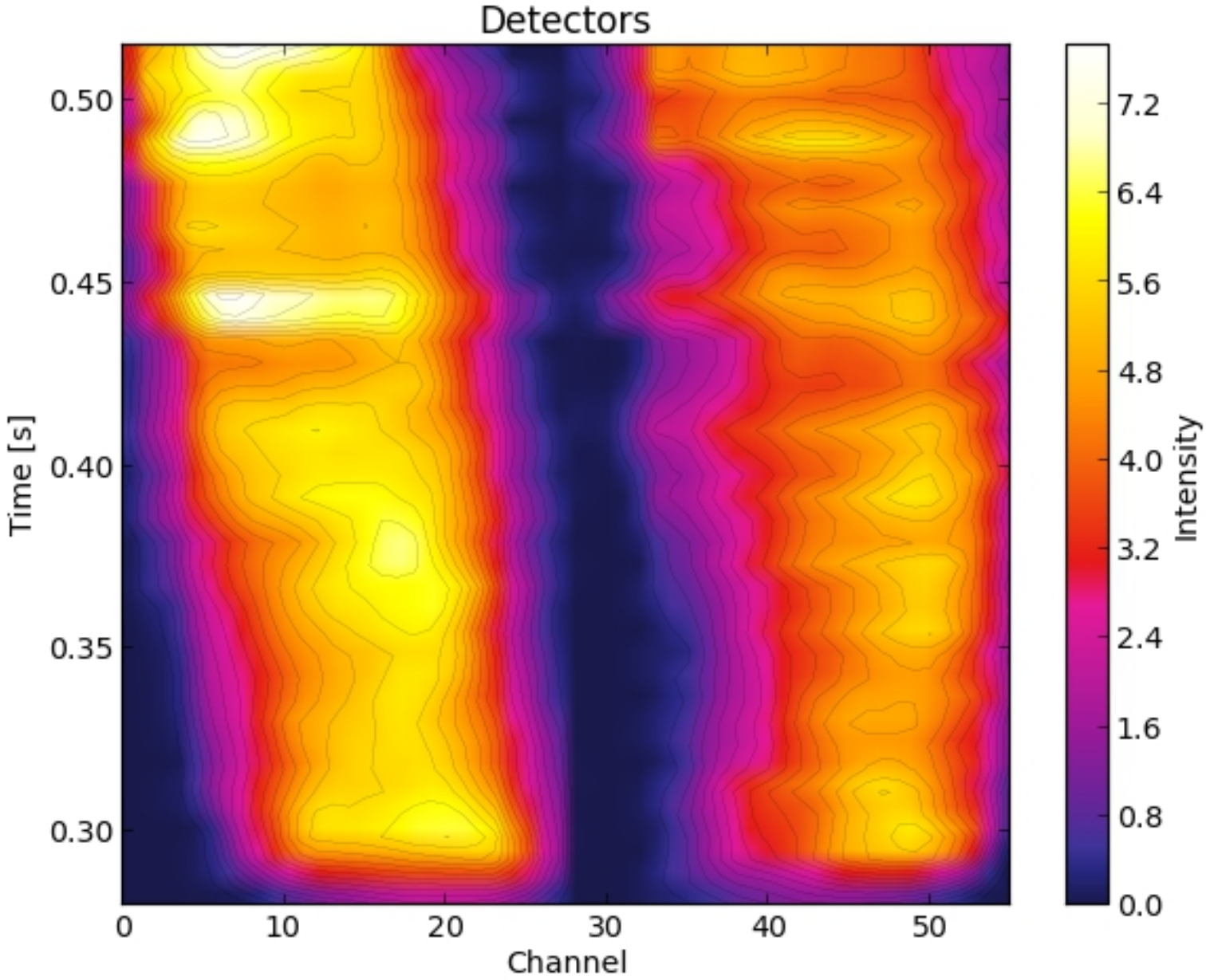
Side



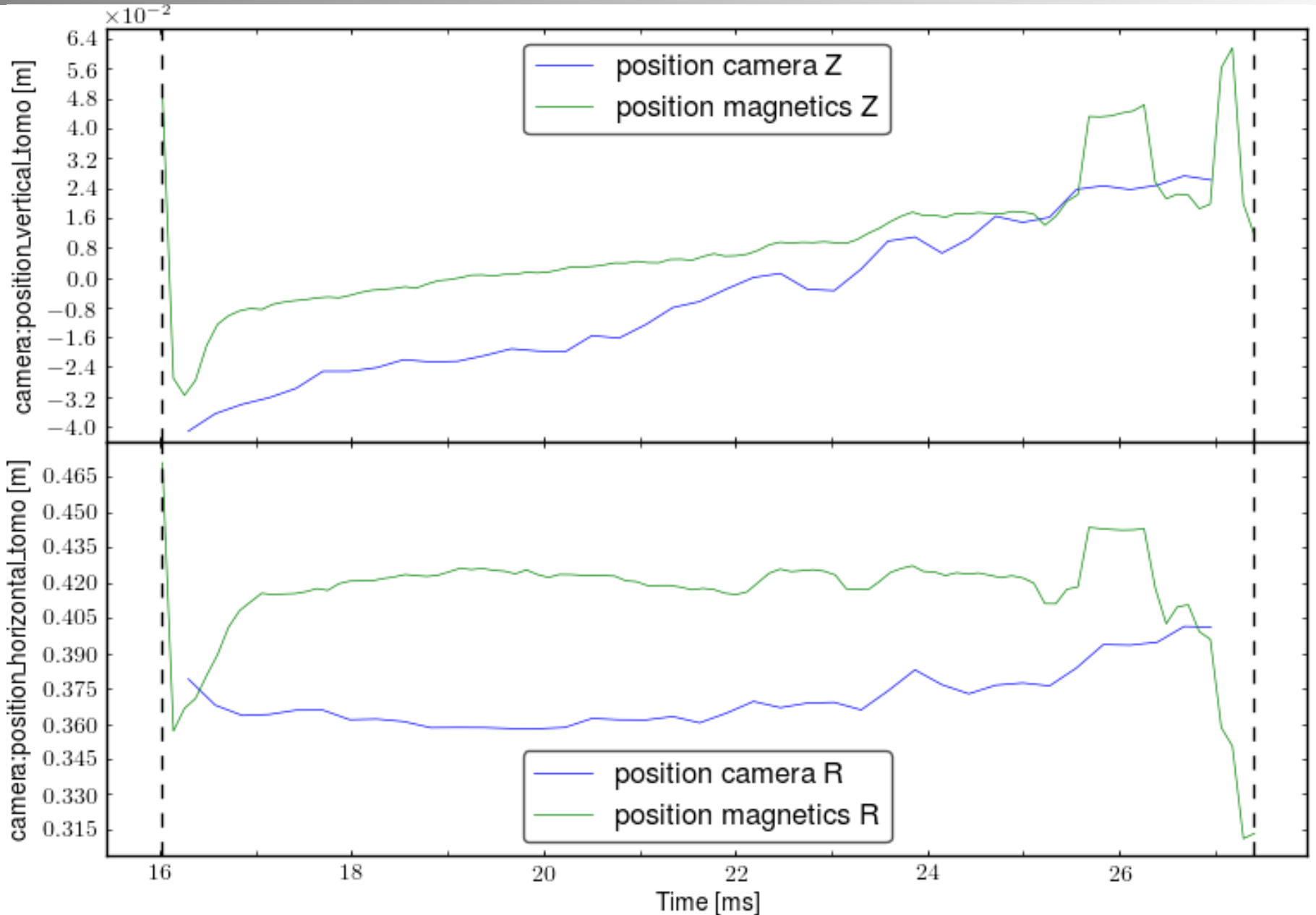
Top



Detectors

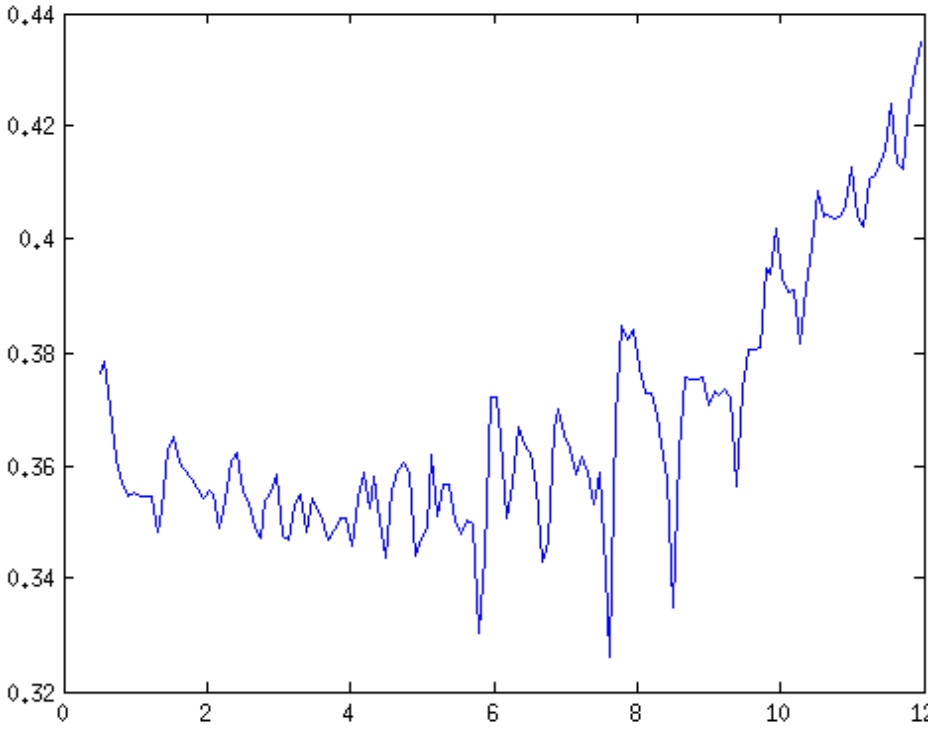

Detectors
Time [s]
0.50
0.45
0.40
0.35
0.30
0
10
20
30
40
50
Channel
Intensity
7.2
6.4
5.6
4.8
4.0
3.2
2.4
1.6
0.8
0.0

Comparison magnetics/cameras

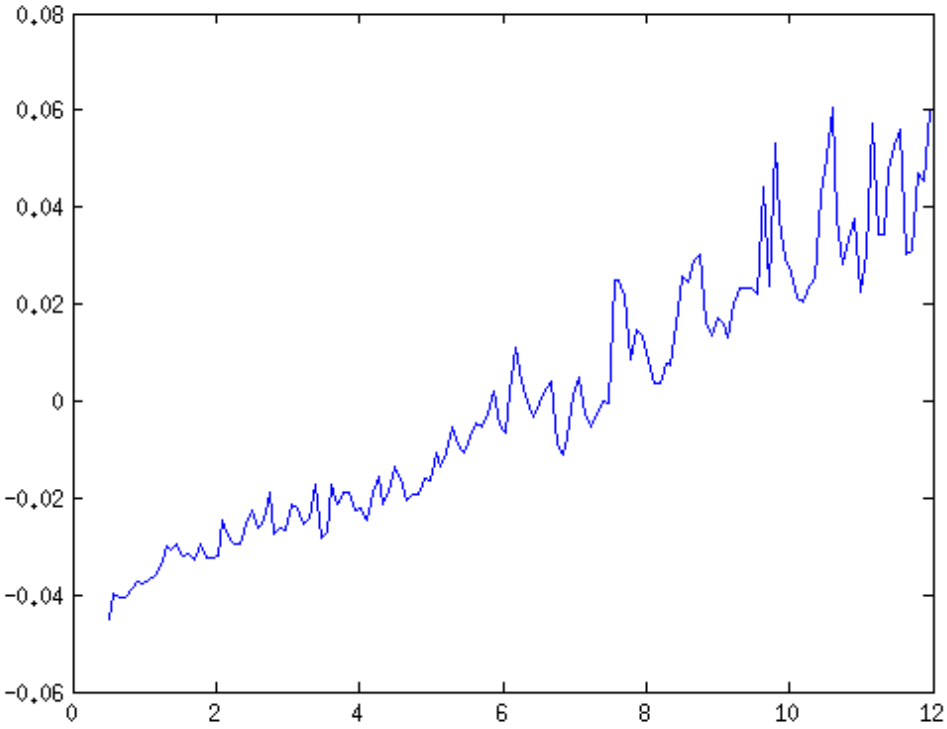


Center of mass position

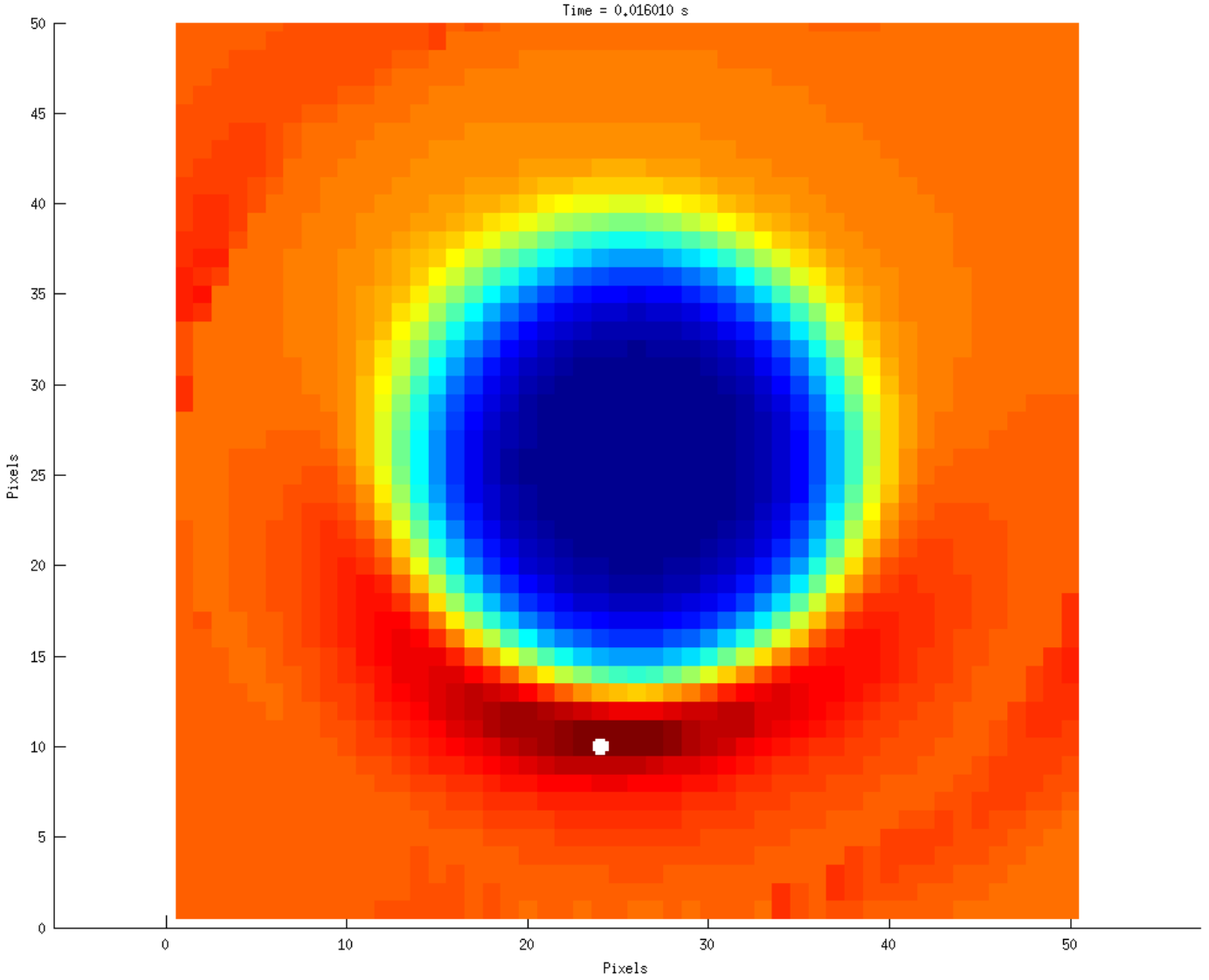
Horizontal position



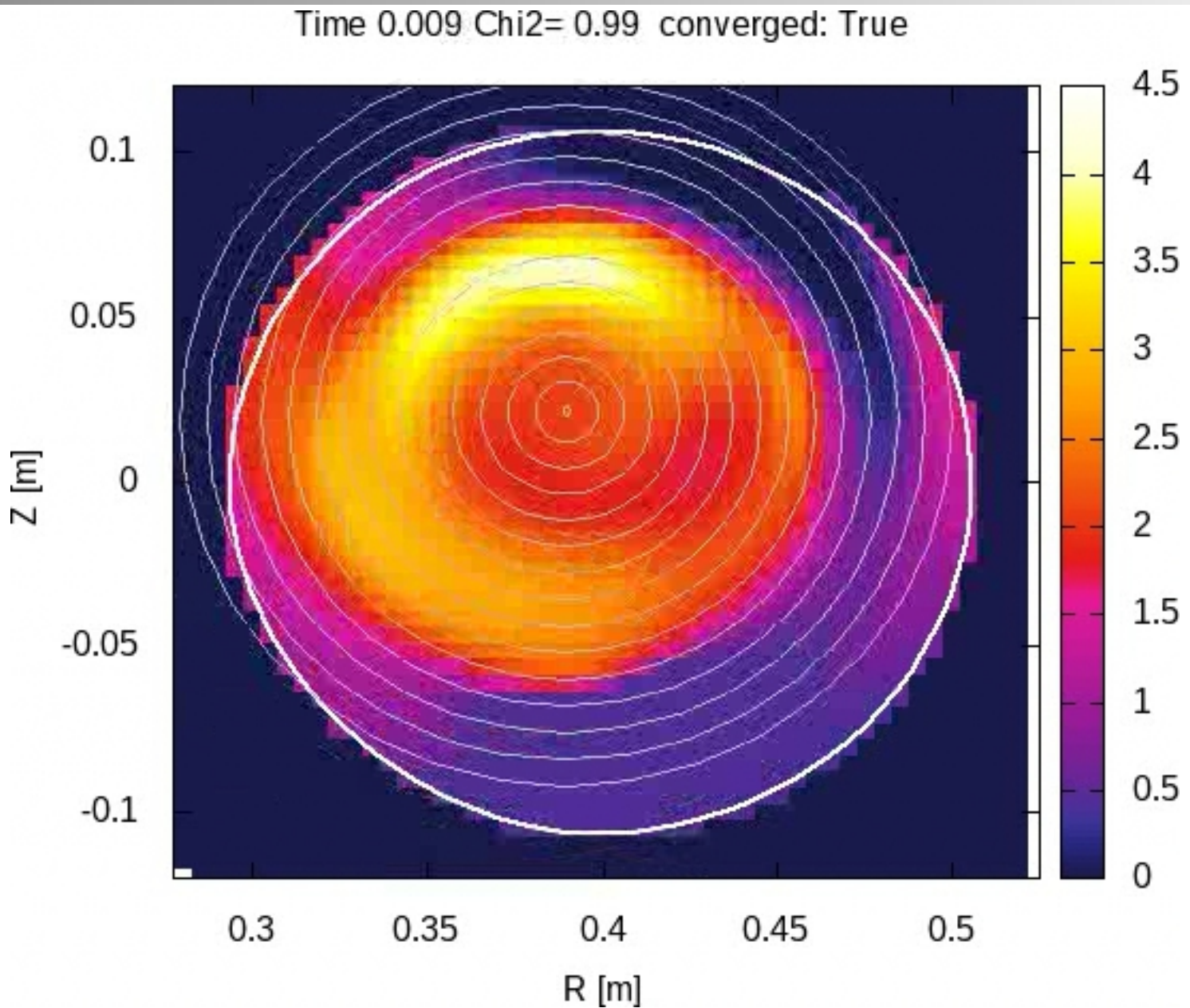
Vertical position



Plasma reconstruction



Polished tomography



Conclusion

- We are able to compare results from different diagnostics (e.g. cameras and magnetics)
- We are able to reconstruct a cross section of the plasma