Golem #17 - from #43696 to #47588

Mariánská 2025

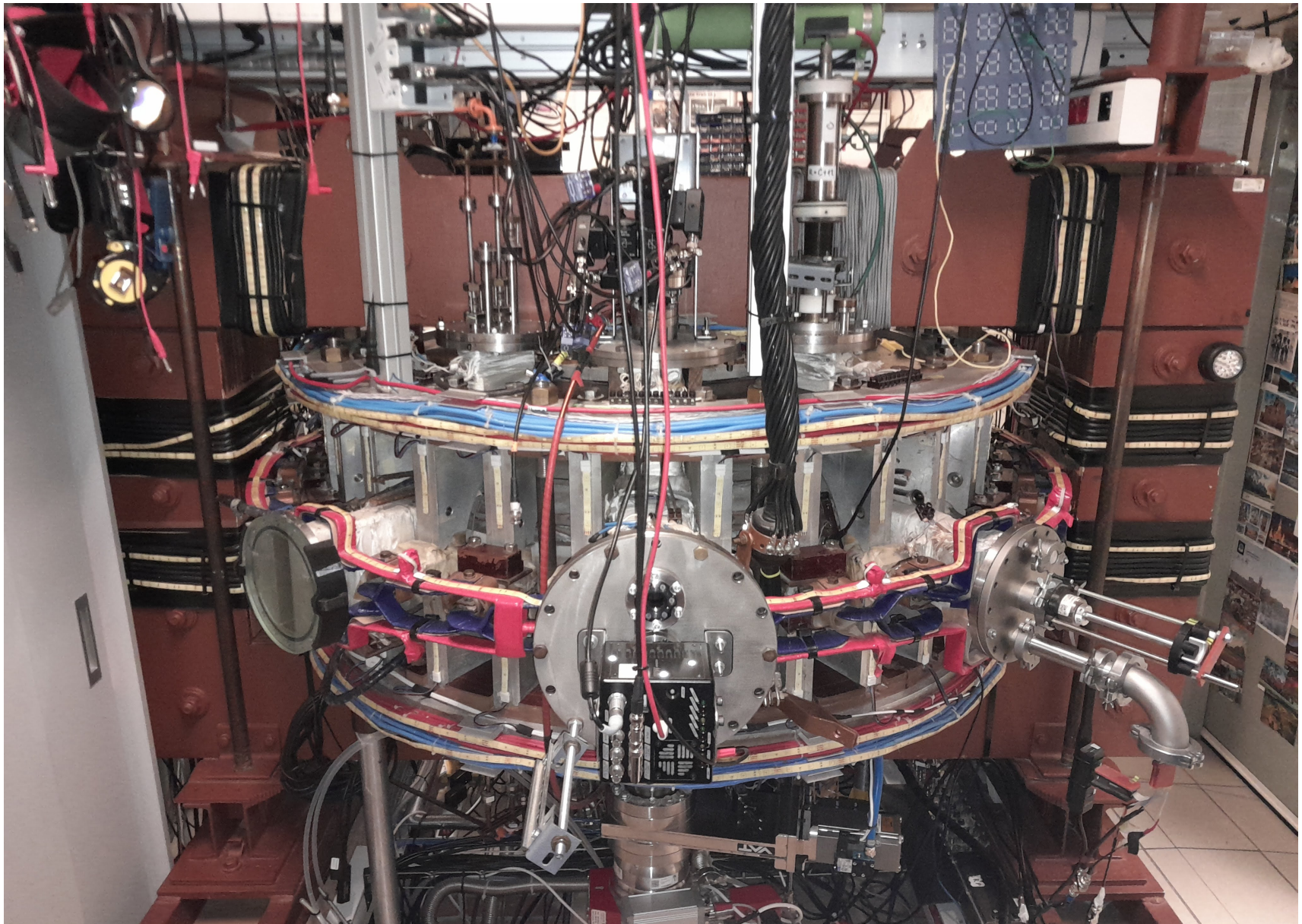
Vojtěch Svoboda

Table of Contents

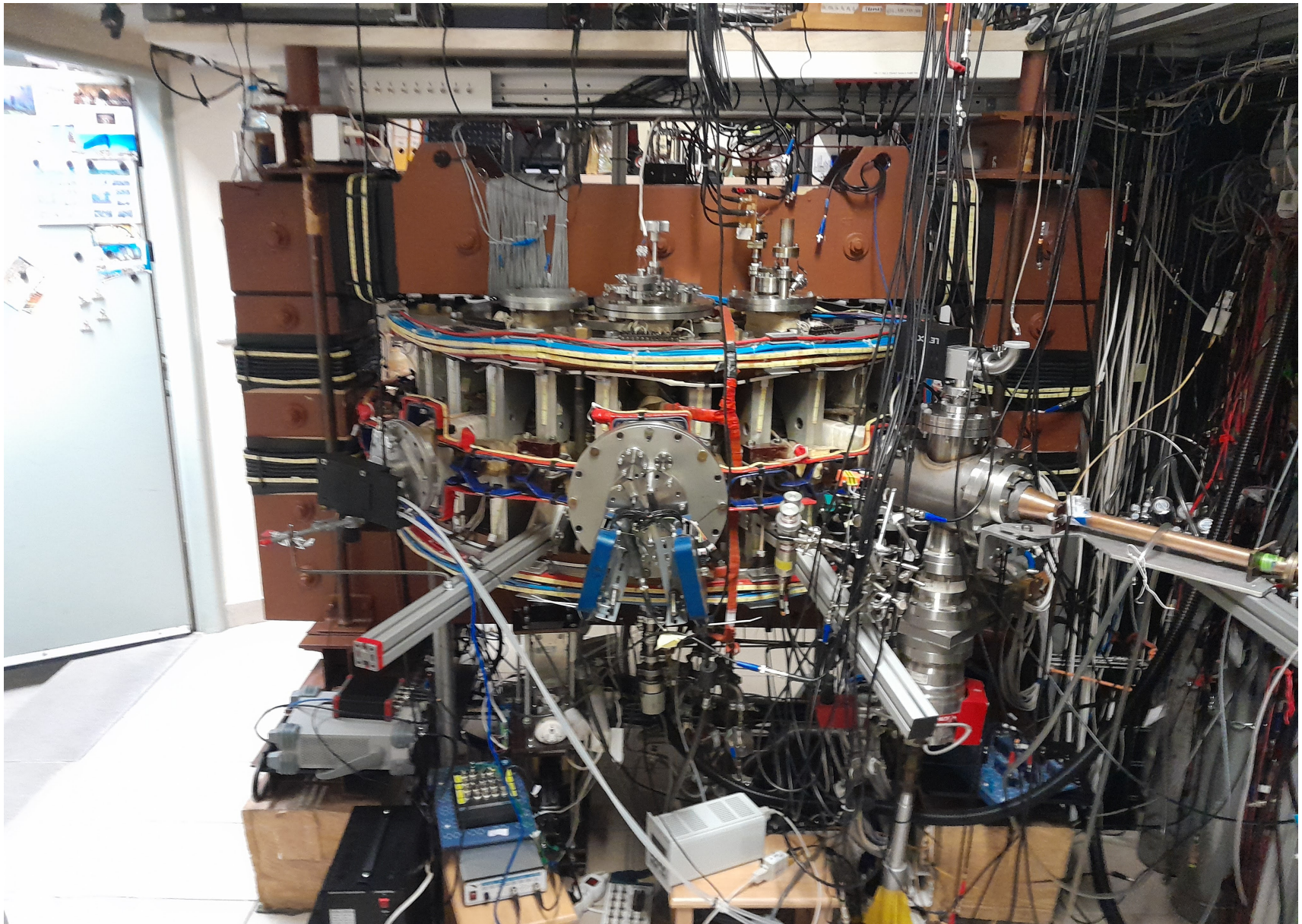
Na úvod

- Jednodenní autobus svodka roku života tokamaku GOLEM #17
- Vodu kážu (griluju), víno piju.

South 01/2025



North 01/2025



Tokamak GOLEM dicharges from 2009

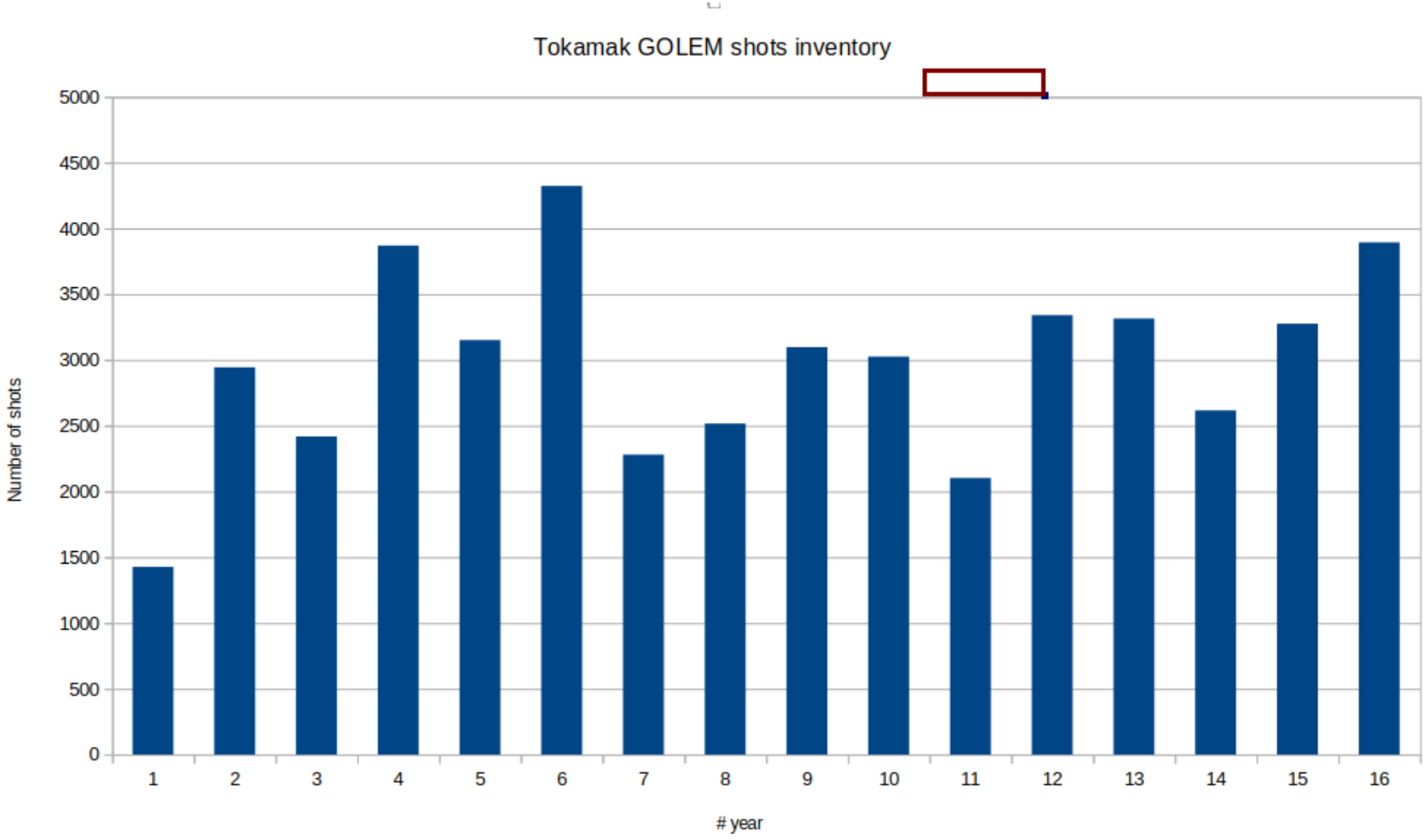


Table of Contents

Articles

- Abbasi, S. *et al.* (Sept. 2024a). "Artificial Neural Network-Based Tomography Reconstruction of Plasma Radiation Distribution at GOLEM Tokamak". In: *Journal of Fusion Energy* 43.2, 64. ISSN: 1572-9591. DOI: 10.1007/s10894-024-00458-z. URL: https://doi.org/10.1007/s10894-024-00458-z.
- Dimitrova, M *et al.* (June 2024). "Plasma properties in the vicinity of the last closed flux surface in hydrogen and helium fusion plasma discharges". In: *Plasma Physics and Controlled Fusion* 66.7, 075022. DOI: 10.1088/1361-6587/ad5377. URL: https://dx.doi.org/10.1088/1361-6587/ad5377.

Proceedings

- Abbasi, S. *et al.* (2024b). "Plasma Tomography at GOLEM Tokamak using Neural Network model". In: vol. 48A. Europhysics conference abstracts. ISBN: 111-22-33333-44-5. URL: https://lac913.epfl.ch/epsppd3/2024/html/PDF/P2-094.pdf.
- Vinklarek, J. *et al.* (2024). "Tokamak GOLEM for fusion education - chapter 15". In: vol. 48A. Europhysics conference abstracts. ISBN: 111-22-33333-44-5. URL: https://lac913.epfl.ch/epsppd3/2024/html/PDF/P2-092.pdf.

Bachelor projects & Master thesis

- Godsfavour Chibueze Amanekwe (2024). "New Set of Inner Magnetic Coils at the GOLEM Tokamak". Master Thesis. URL: http://golem.fjfi.cvut.cz/wiki/Presentations/Students/MasterThesis/Godsfavour-2024-MastThes.pdf.
- Catalina Vásquez Leiva (2024). "Estudios de optimización de confinamiento magnético de plasmas en tokamak GOLEM". Bachelor project. URL: http://golem.fjfi.cvut.cz/wiki/Presentations/Students/FromAbroad/Catalina-2024-BachProj.pdf.
- Derap Pena Mukti Sari (2024). "The Study of The Hydrogen Plasma Breakdown Phase in The GOLEM Tokamak Reactor". Bachelor project. URL: http://golem.fjfi.cvut.cz/wiki/Presentations/Students/FromAbroad/24DerapPenaMuktiSari-English.pdf.

Table of Contents

Table of Contents

RE diagnostics

- M. Tunkl et al. 4 ECPD: Runaway Electron Hard X-ray Diagnostics at the GOLEM Tokamak: A Combined Experimental and Simulation Approach. PhD topis.
- S. Malec at al. 4 ECPD: The Timepix3 semiconductor pixel detector as runaway electron diagnostics at the GOLEM tokamak. PhD topic.
- L. Lobko et al. 4 ECPD: Direct detection of runaway electrons by in-vessel scintillation probe at the GOLEM tokamak. PhD topic.
- & Gergo Pokol

RE simulation 4 tG

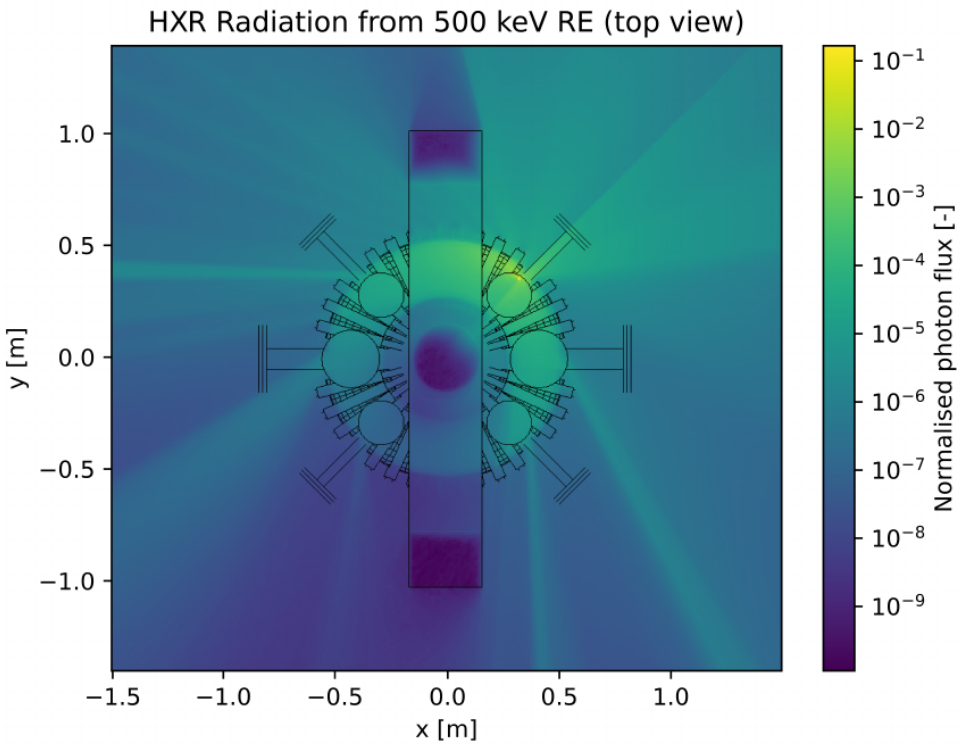


Figure: Distribution of HXR radiation generated from runaway electron interaction with the limiter simulated in Geant4.

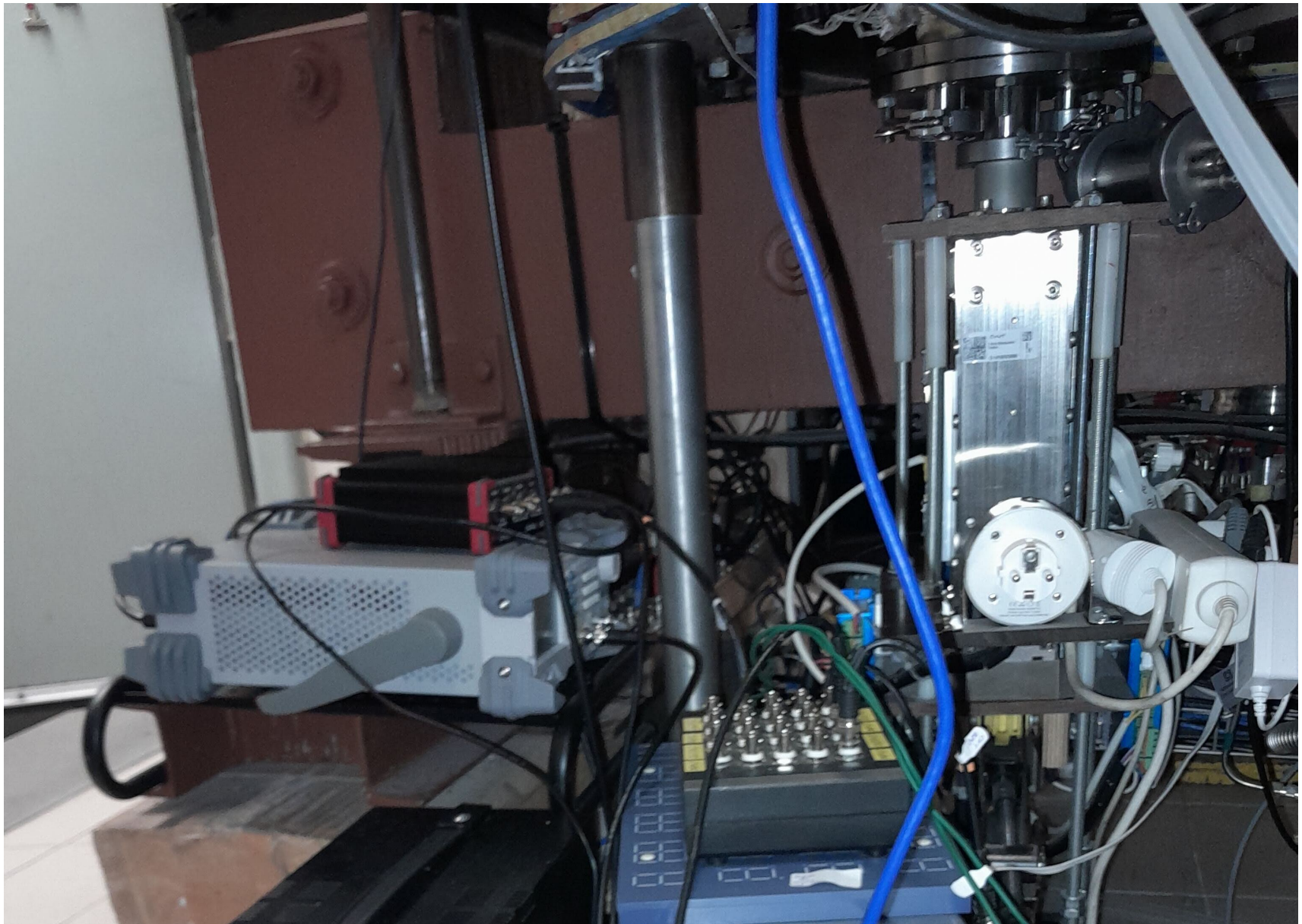
Tunkl, Vinklarek *et al.* 2024 ECPP conf

Table of Contents

Overview

- Kryštof Nosek: Measurement of plasma potential dependence on discharge parameters in the GOLEM tokamak. MSc topic under P. Macha supervision.
- Tomáš Březina: Fast ion temperature measurements on the GOLEM tokamak in different discharge regimes MSc topic under P. Macha supervision.
- Transport barrier formation in He
  - Study of a transport barrier in GOLEM with probes. EMTRAIC under P. Macha supervision.
  - He discharges with transition on GOLEM Spectroscopic Study. EMTRAIC under V. Weinzettl and D. Naydenkova supervision.

HW for fast ion temperature measurements



He discharges with transition on GOLEM Spectroscopic Study

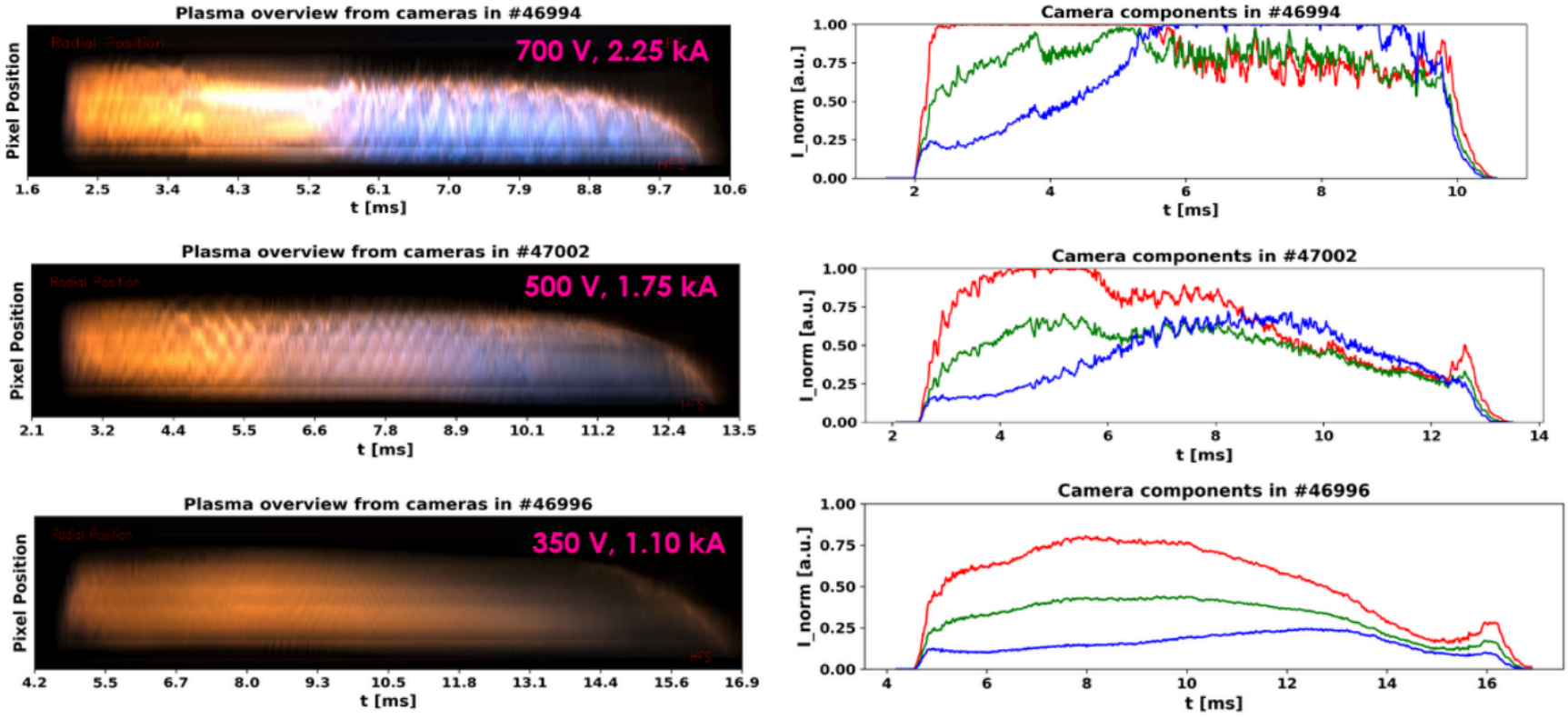


Figure: Images from the fast cameras showing the color transition at different Ip values (left) and the corresponding RGB components (right).

He discharges with transition on GOLEM Spectroscopic Study

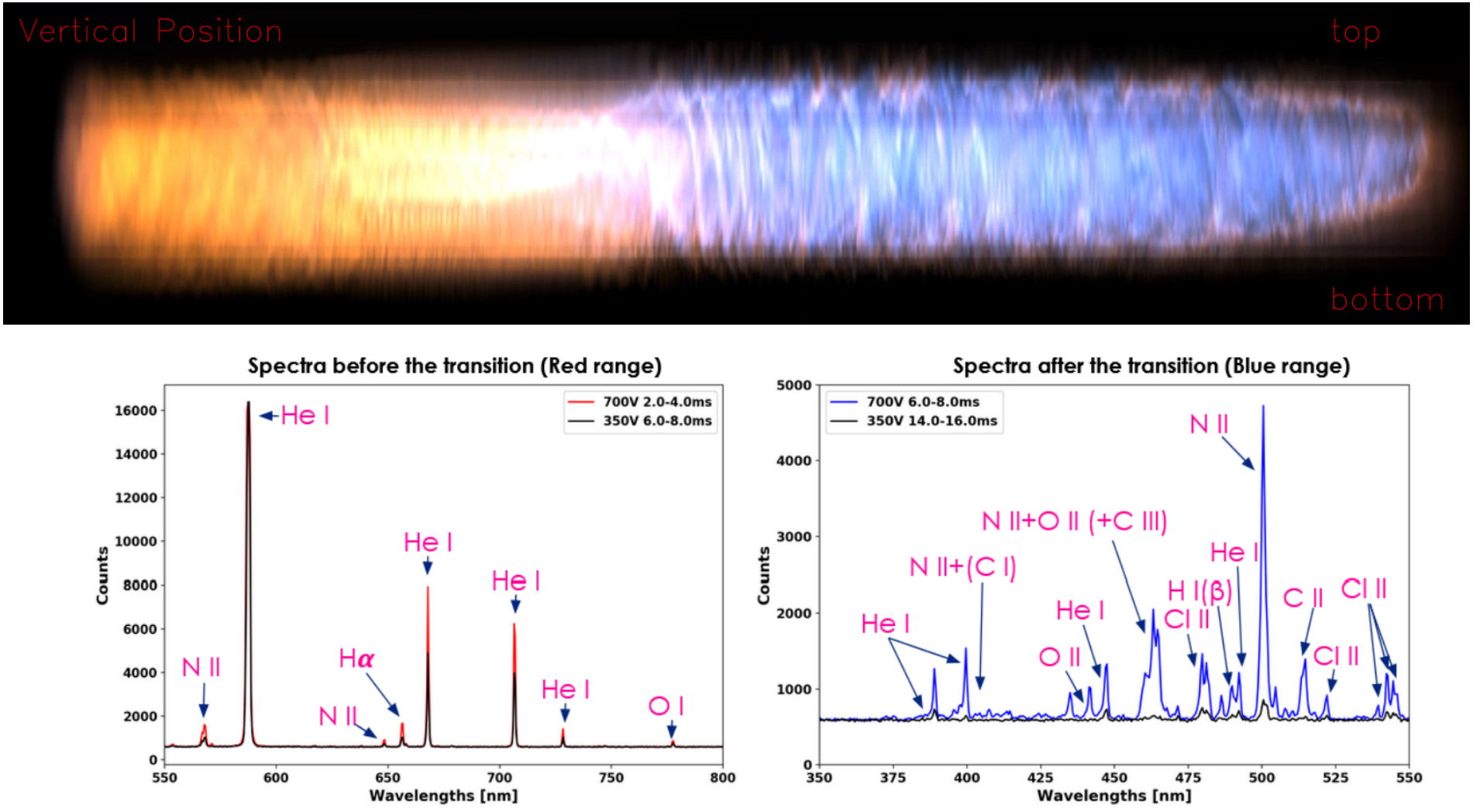
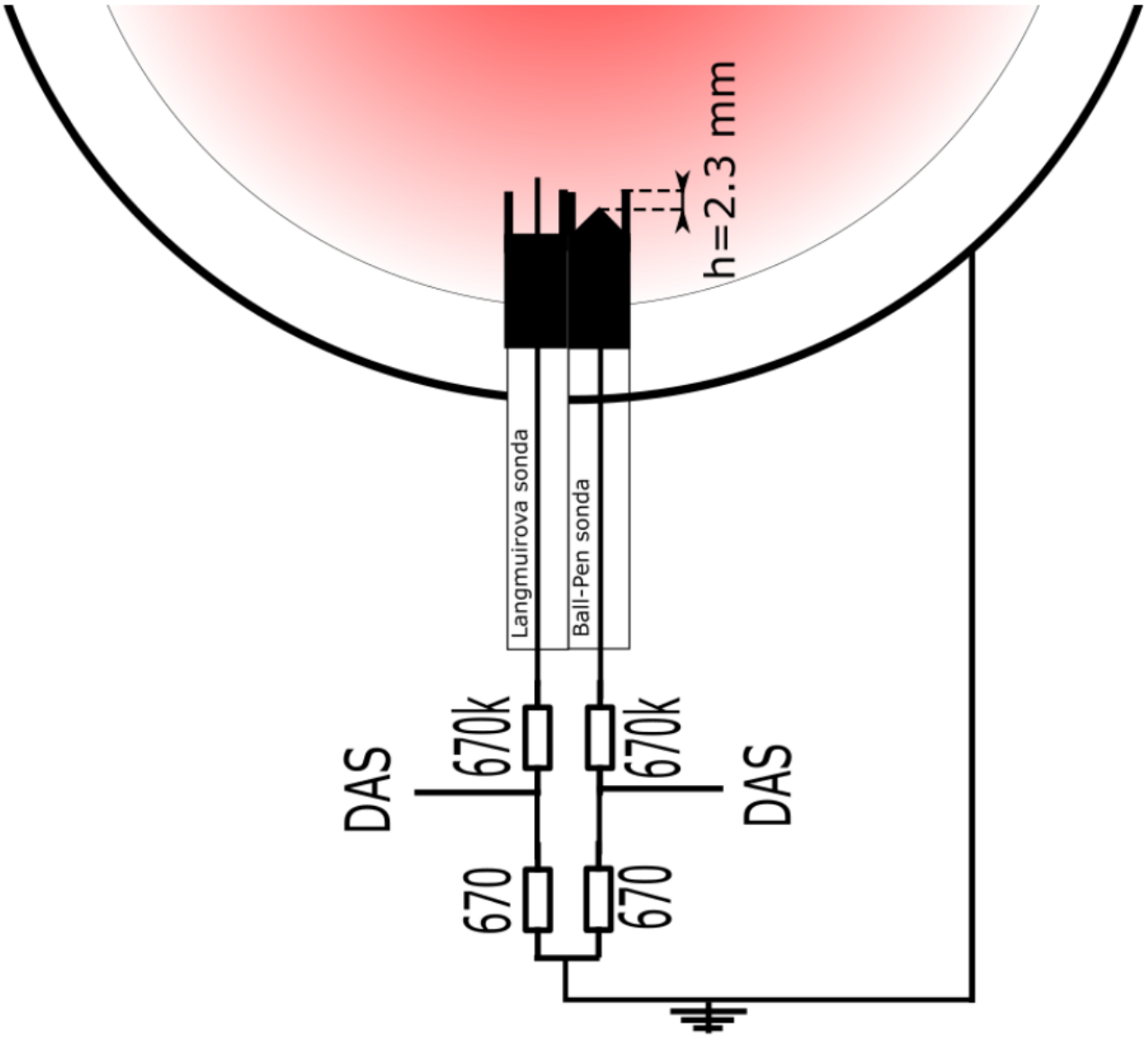


Figure: Spectra before and after the color transition

Study of a transport barrier in GOLEM with probes - setup



Study of a transport barrier in GOLEM with probes

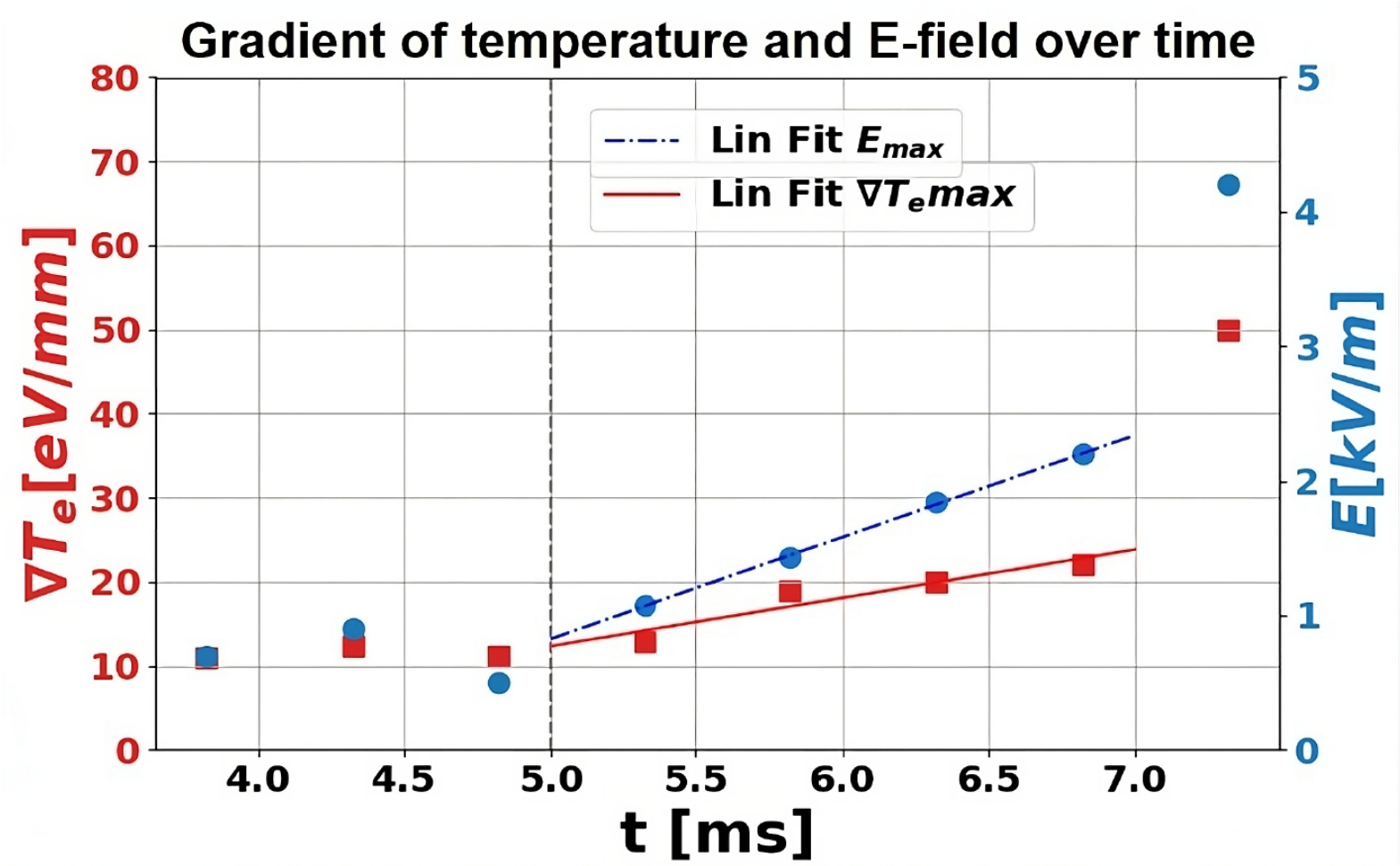


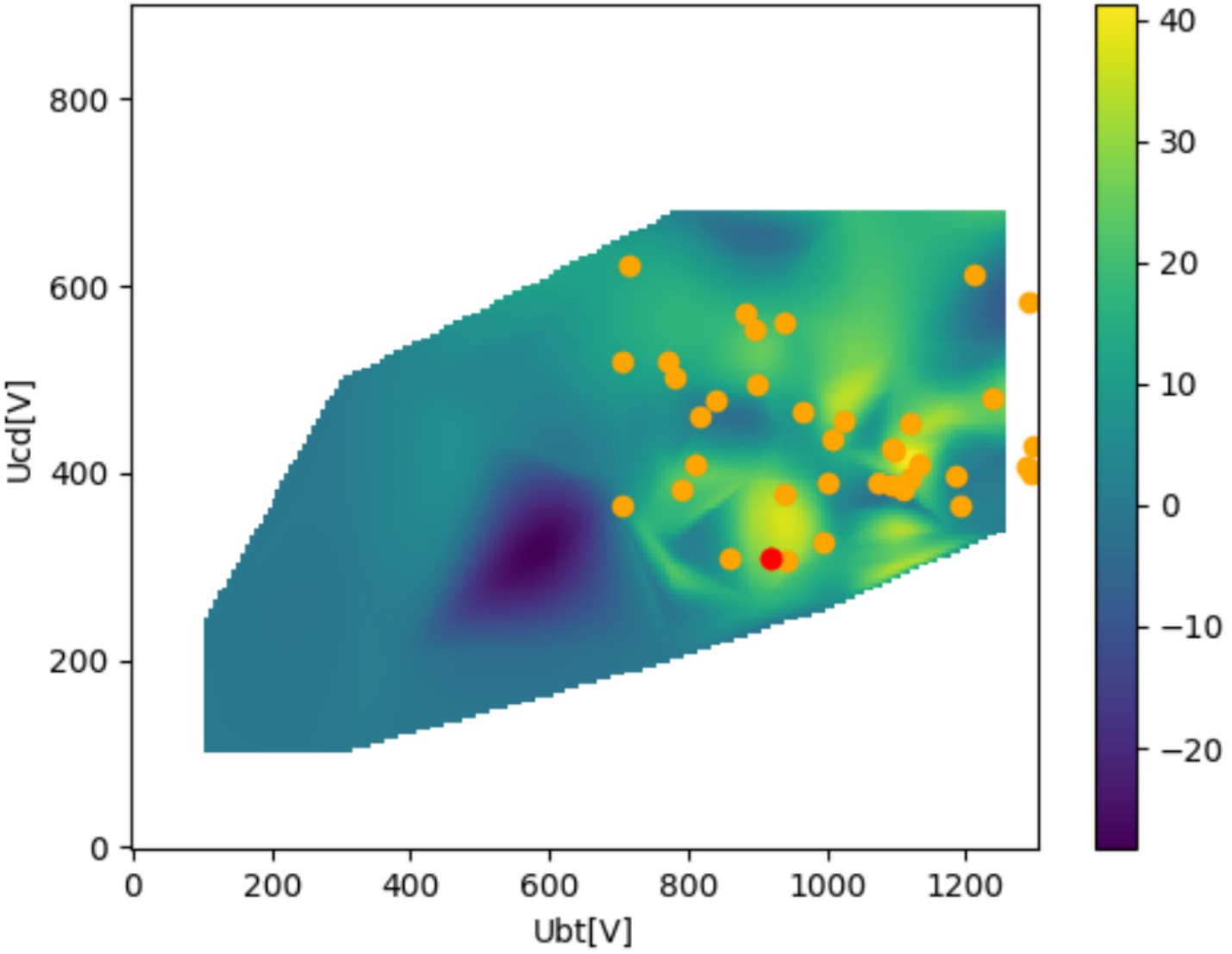
Figure: Evolution of the temperature gradient and radial E-field for $U_{cd} = 450$ V with a linear fit after transition.

Table of Contents

Automated Machine Learning @tG 2024

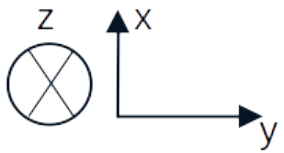
- O. Ficker & FYS 1 :Tokamak přímo řízený Bayesovským optimalizátorem
- S. Abbasi et al.: Tommography & Neural networks

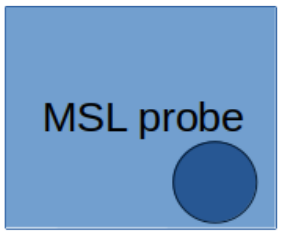
Tokamak přímo řízený Bayesovským optimalizátorem

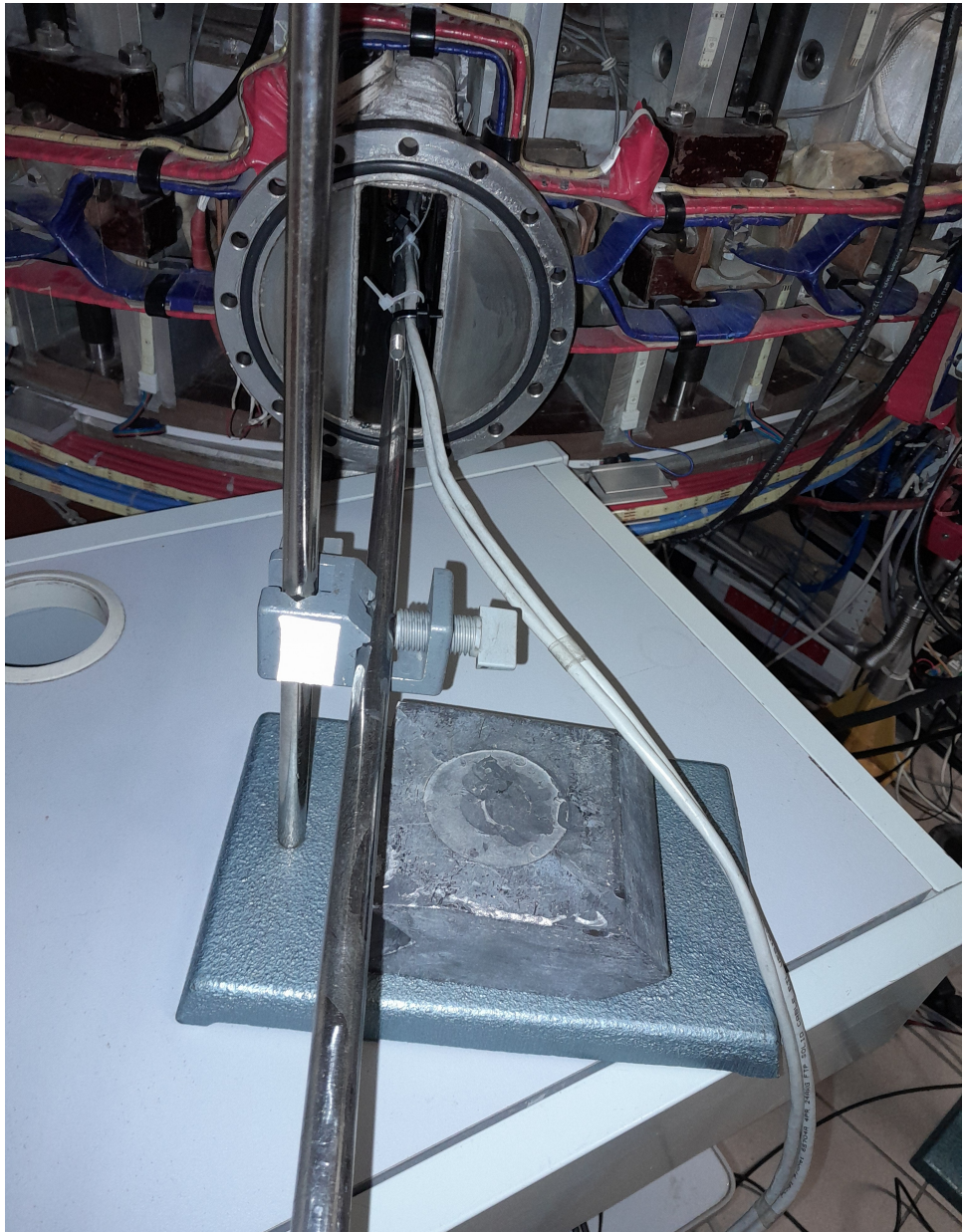


The magnetic field measurements using the 3D MSL probe

MSL probe: fields orientation (port view)







The magnetic field measurements using the 3D MSL probe

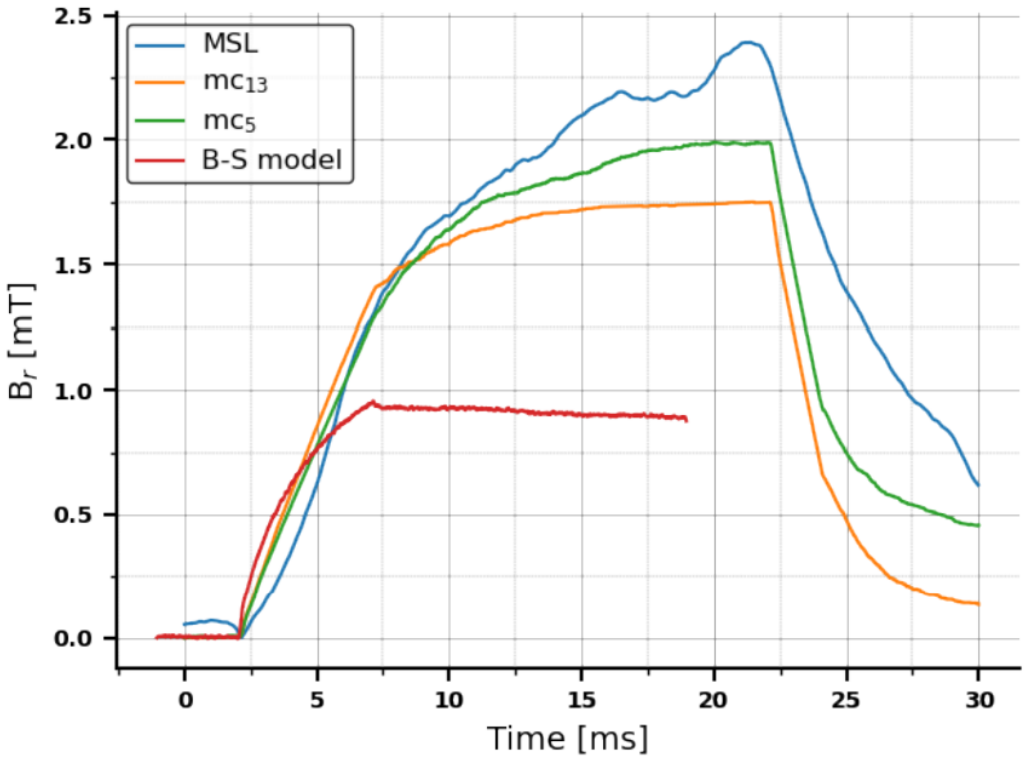


Figure: Radial components of the magnetic field

Kropackova, Vinklarek *et al.* 2024 ECPP conf

Table of Contents

Table of Contents

The longest discharge in the tG history (H_2 glow discharge)

GOLEM » Shot #45912 »

autoreload: previous | next | current

Navigation

Next
Previous
Current

Go to shot
45912 Go

Other

Wiki
Operator's bookmarks

Database operations

General DB querry

Tokamak GOLEM - Shot Database - #45912

The session mission	24-08-20 17:57:33 [Shot logbook]
The session ID	Experiments/PlasmaRegimes/0624OptimizationFull steam
The discharge comment	45875
Discharge command	repeat after GD
	/Dirigent.sh --discharge --operation.discharge "style='standard',vacuum_shot='45832'" --infrastructure.bt_ecd "U_Bt=1100,t_Bt=0,U_cd=325,t_cd=350,O_Bt='CW',O_cd='CW'" --infrastruct ...

Technological parameters

- Working Gas: $p^{discharge,before}_{chamber}$=0.66 mPa; $p^{discharge,pre}_{chamber}$=9.45 mPa ($p^{request}_{WG}$= 10 mPa@$X^{request}_{WG}$=H)
- Toroidal magnetic field: $U^{request}_{B_t}$=1100 V@$t^{request}_{B_t}$=0.0 us
- Current drive field: $U^{request}_{E_{cd}}$=325 V@$t^{request}_{cd}$=350.0 us

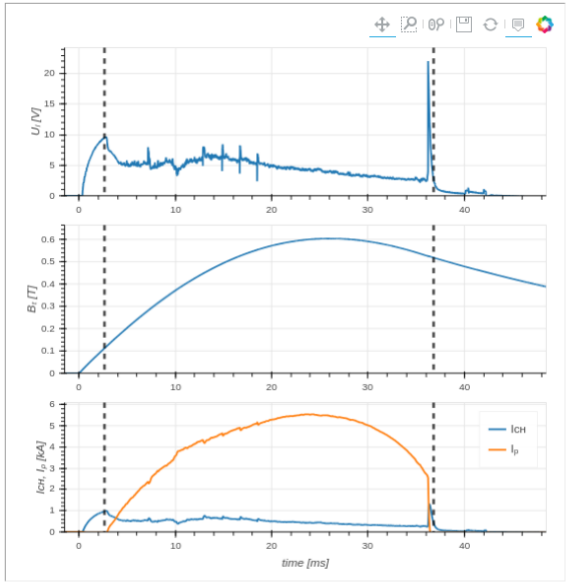
Plasma:

- Plasma: yes or no: ☑
- Time parameters:Δt_p=34.17 ms (from:t_{start}=2.64 ms,to:t_{end}=36.81 ms)

Plasma parameters:

- Loop voltage:$\overline{U_{loop}}$=4.71 ; =9.55 ; =0.00
- Toroidal magnetic field: $\overline{B_t}$=0.54 T; $\max_{\tau\in[discharge]} B_t$=0.60 T
- Plasma current: $\overline{I_p}$=4.59 kA; $\max_{\tau\in[discharge]} I_p$=5.54 kA; t^{max}_{Ip}=0.00 ms

Basic Diagnostics

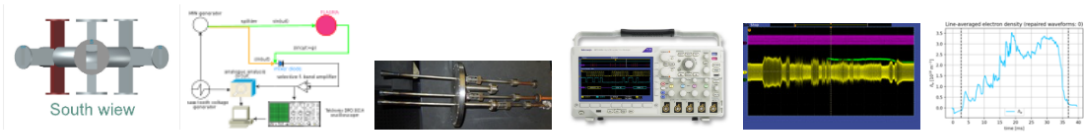


On stage diagnostics

Basic diagnostics Data flow: → → → Documentation:

Off stage diagnostics

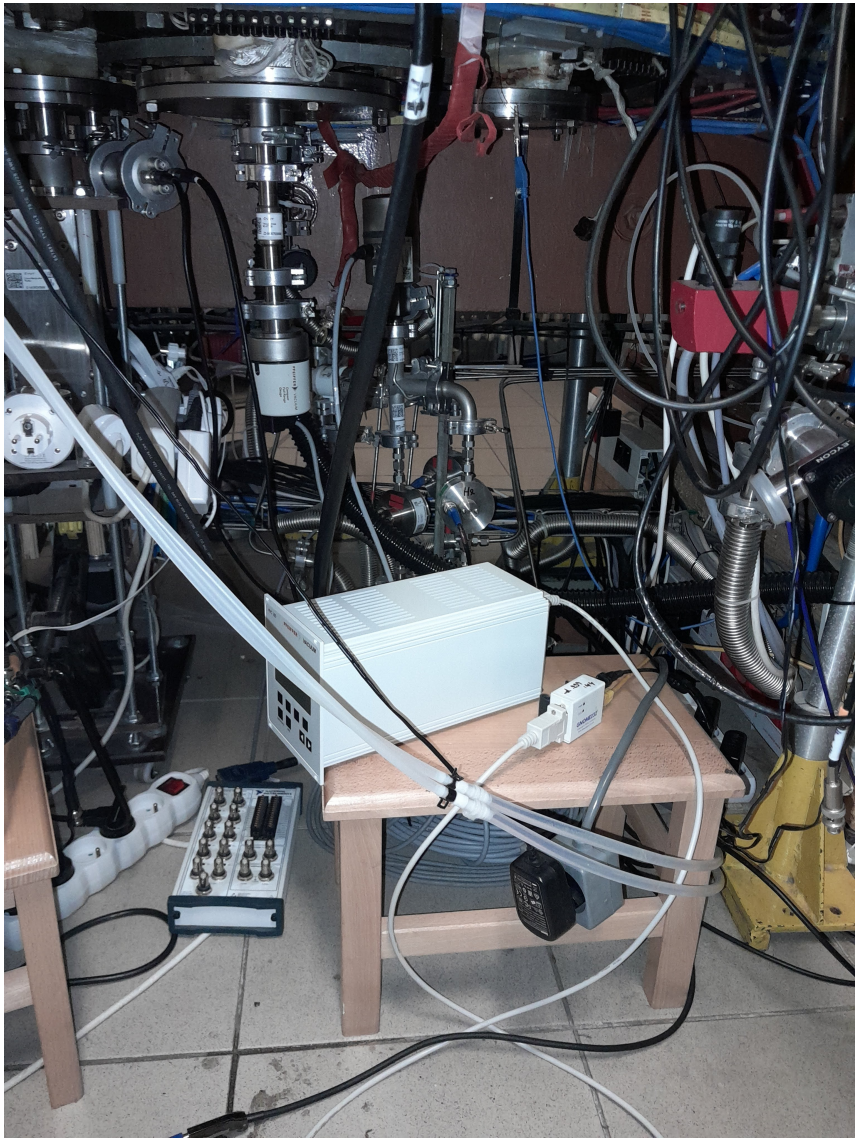
Interferometry Data flow: → → → Documentation:



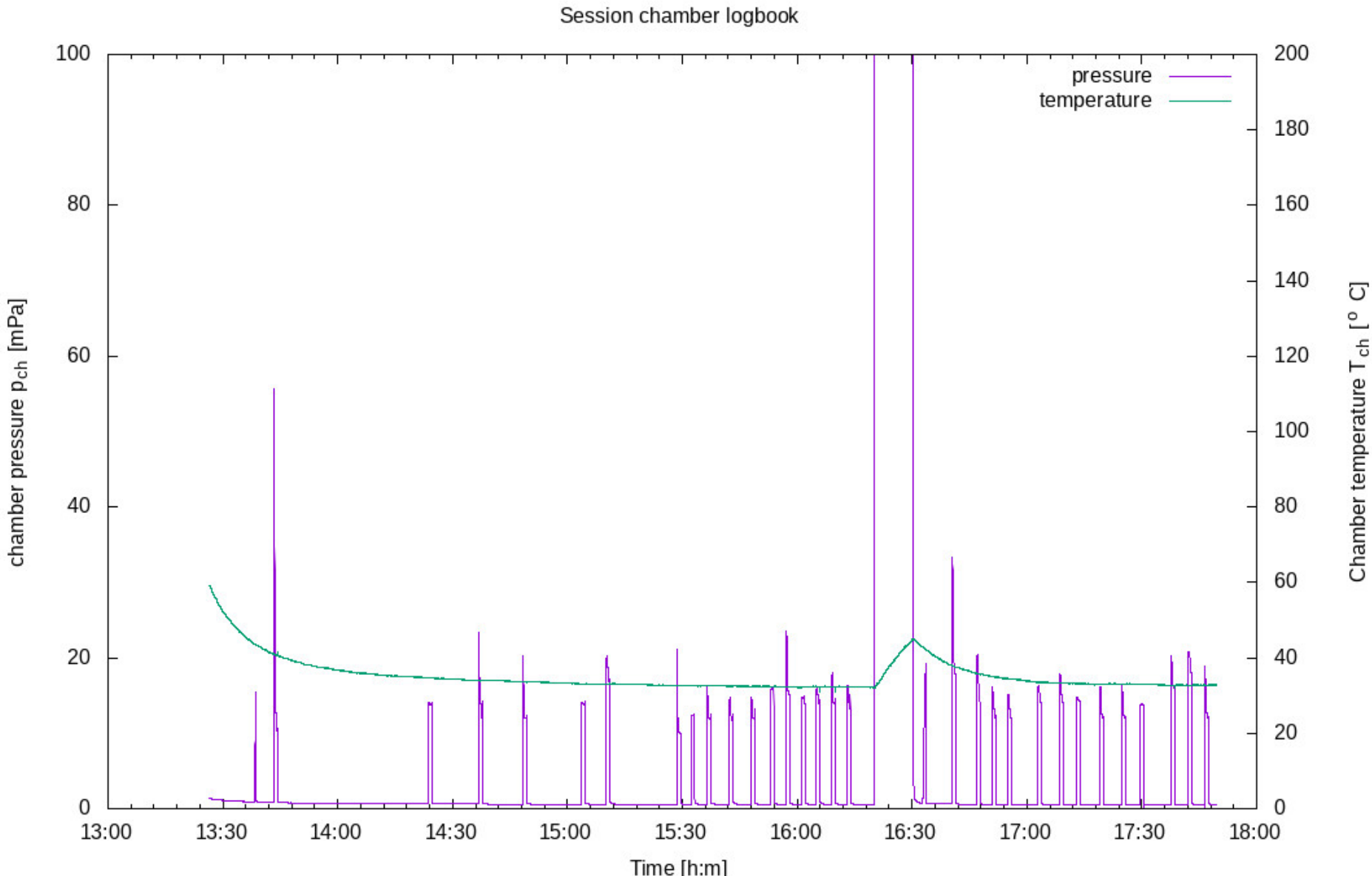
Fast cameras Data flow: → → → Documentation:

Table of Contents

Working gas flow controller (Ufff)



Working gas flow controller



Plasma current stabilization (analog x switching mode amplifier)

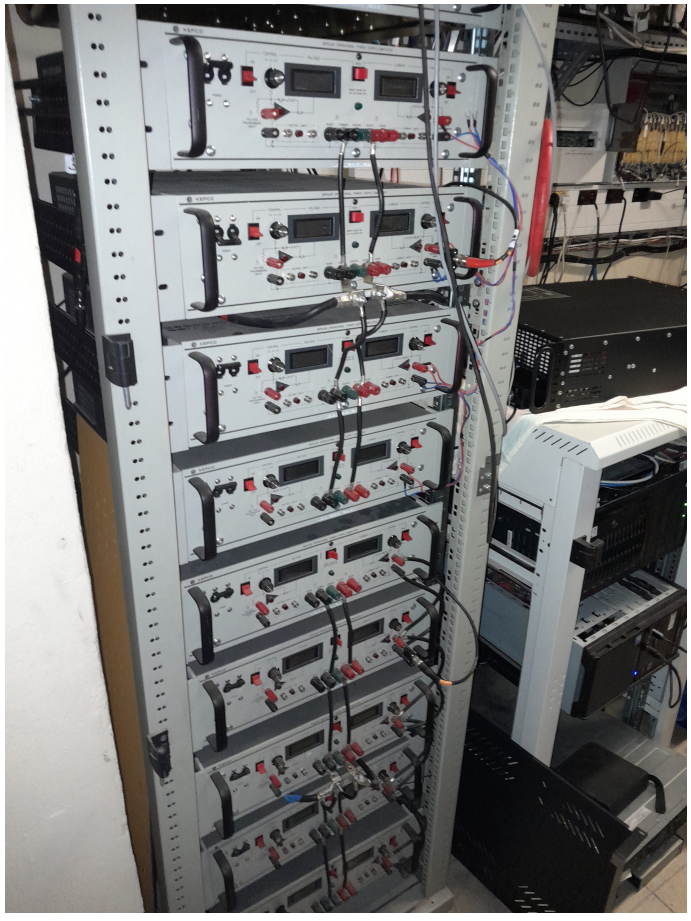
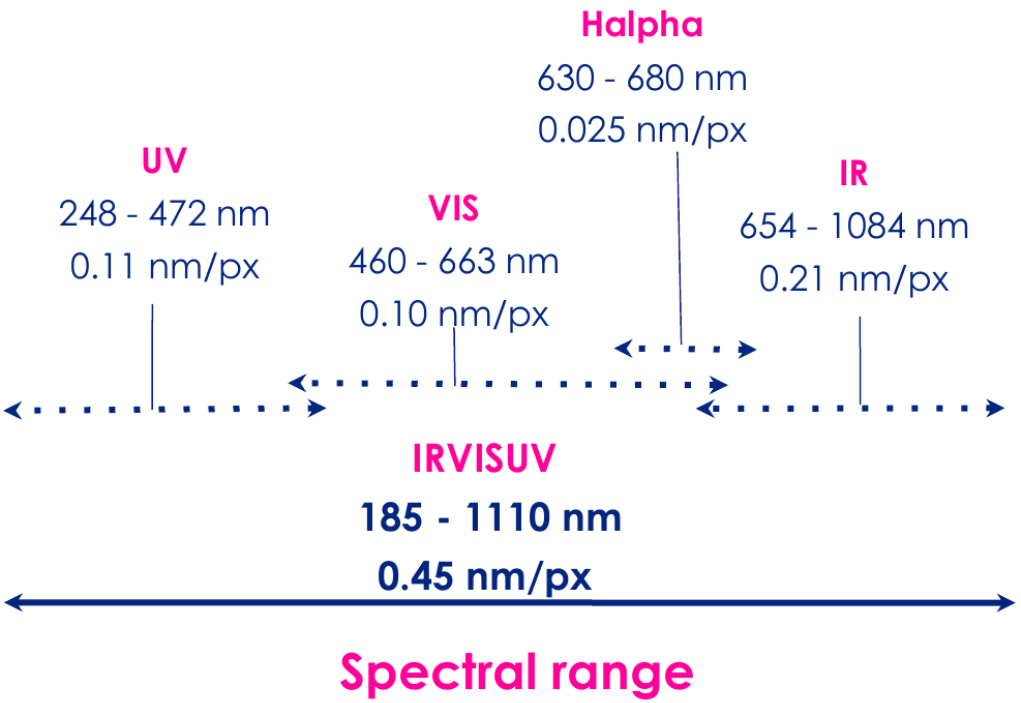


Table of Contents

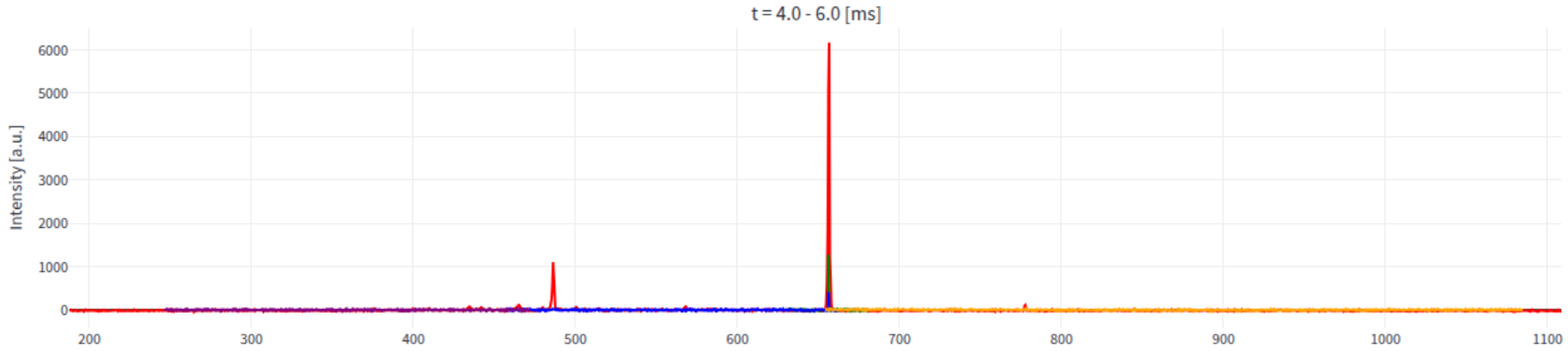
Multi spectrometer

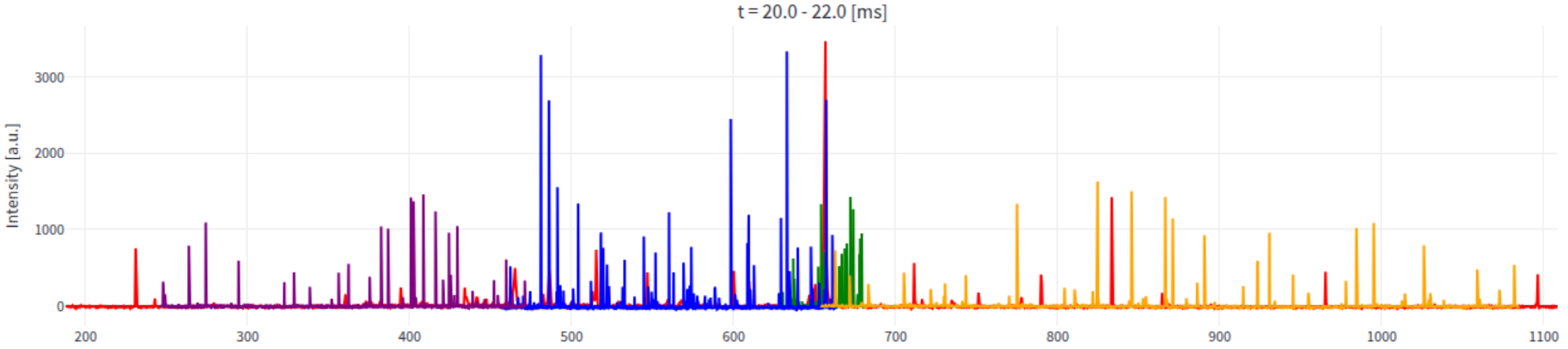
Compact spectrometers (Czerny-Turner type with grating & CCD)



Spectrometers at GOLEM connected with the tokamak via optical fibers

Multi spectrometer





New probe: double Ball pen & Langmuir probe

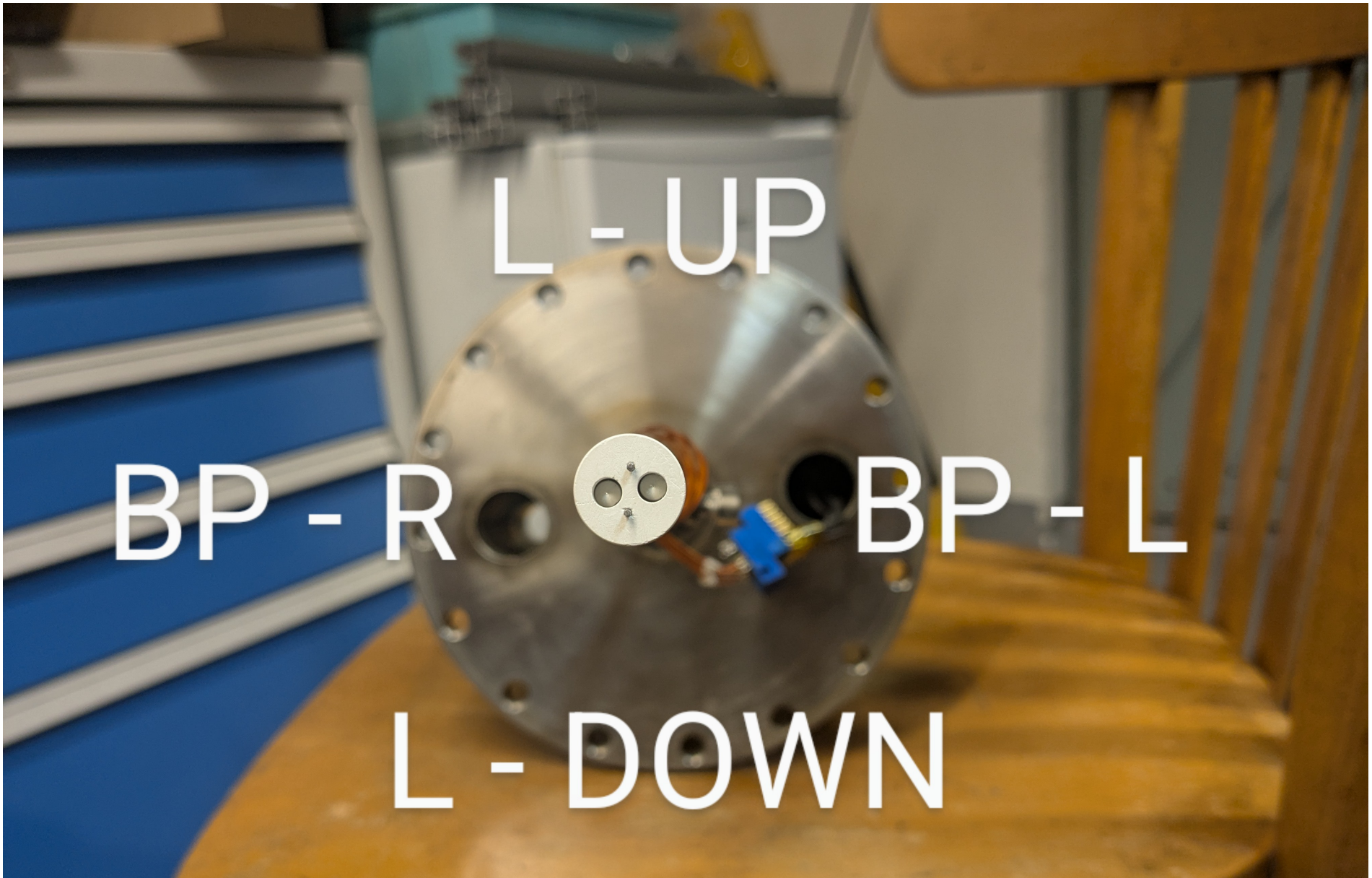


Table of Contents

Generally

- EMTRAIC (with Jana and Tomáš)
- Gergo Pokol

Plans

- Plasma performance with Lithium coated chamber (H. Horacek & H. Cecrdle)
- Turbulence transport in Lithium (J. Adámek a spol.)
- Transport barrier in He@tG Mácha *et al.* 2023 *NF* cont.
- EPS - ECPP 'Tokamak GOLEM for fusion education, chapter 16' 7.-11. července. Vilnius, Litva. ??
- EDU infra: i) CAEN diagnostics 770 tis. Kč, ii) CCD camera-detector 980 tis. Kč, iii) Vysokorychlostní bipolární výkonové zesilovače 1.75 mil. Kč, iv) Manipulátor s rotačním a lineárním posuvem 436 tis. Kč. v) TMP vývěva 694 tis. Kč.
- Vysoké cíle: doba plazmatu 100 ms a kadence 2 výboje do minuty.
- Tokamak GOLEM dokumentační projekt s pomocí AI (na self hosted Overleaf)

Table of Contents

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Acknowledgement

Financial support highly appreciated:

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Students, teachers, technicians (random order):

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currently **Martin Himmel**, **Petr Mácha**, Filip Papoušek, Jan Buryanec, **Daniela Kropáčková**, Jarda Zajac, Jana Brotánková, Lukáš Lobko, **Marek Tunkl**, Jakub Chlum, Sara Abbasi, Matyáš Pokorný, Štepán Malec, Kateřina Jiráková, Jaroslav Čeřovský.