

Golem #17 - from #43696 to #47588

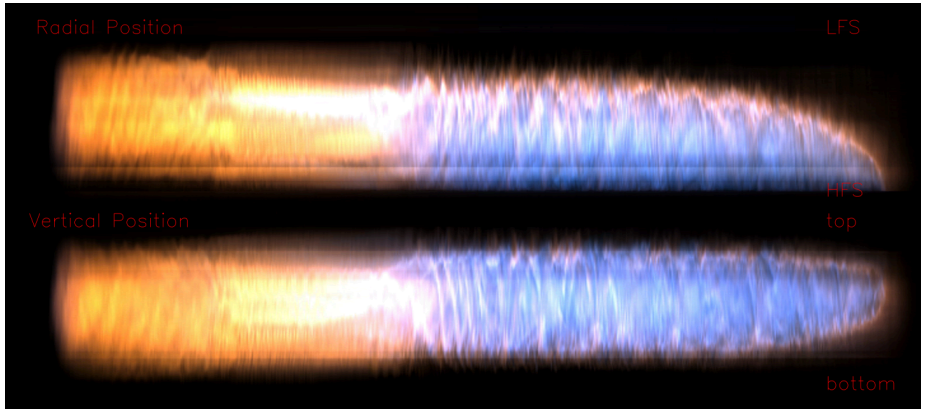
Mariánská 2025

Vojtěch Svoboda

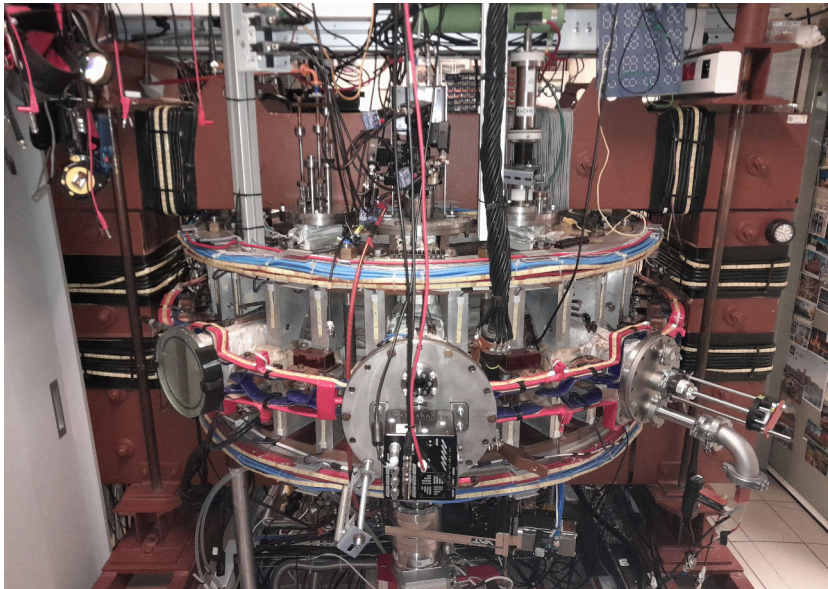
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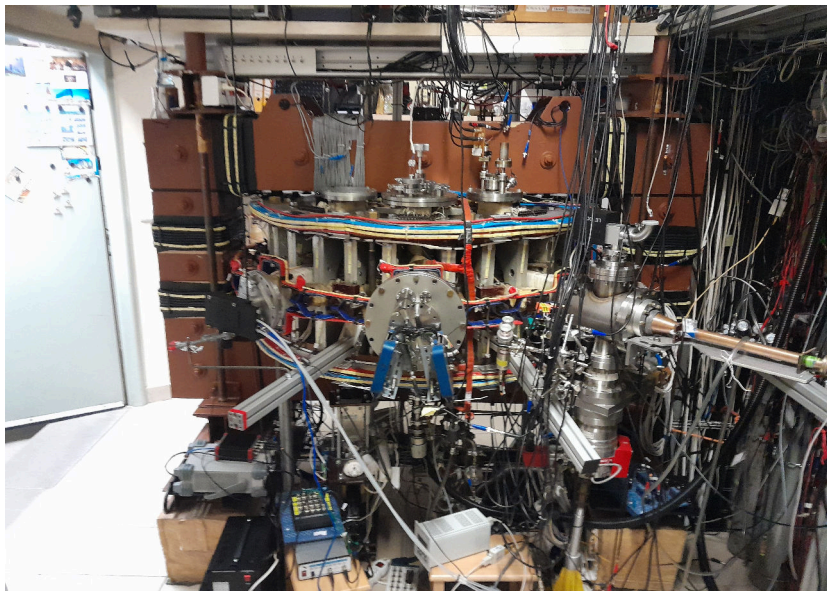
Picture of the year



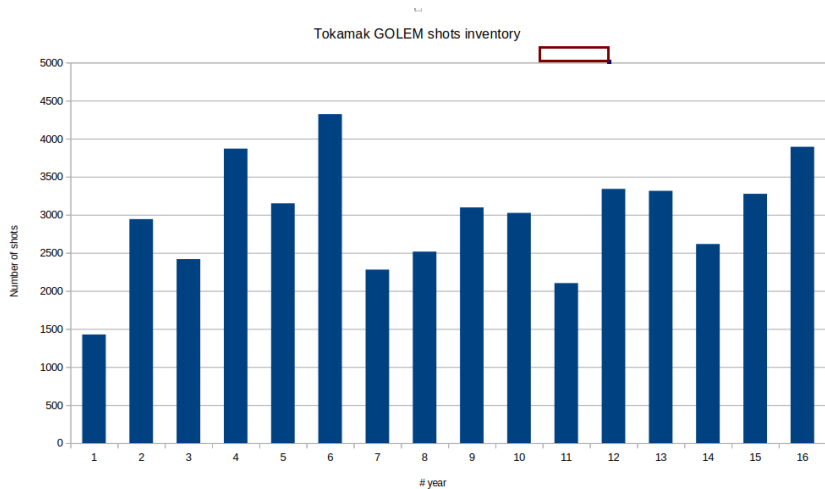
South 01/2025



North 01/2025



Tokamak GOLEM discharges from 2009



- 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>.
- Abbasi, S. *et al.* (Sept. 2024). “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>.

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>.

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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 topic.
- S. Malec et 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

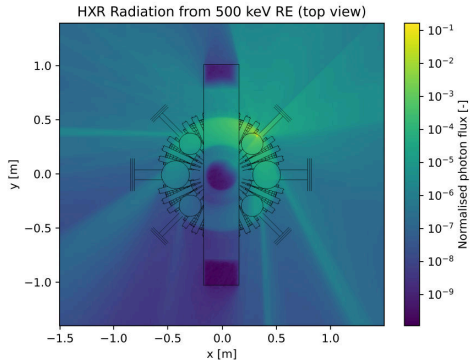
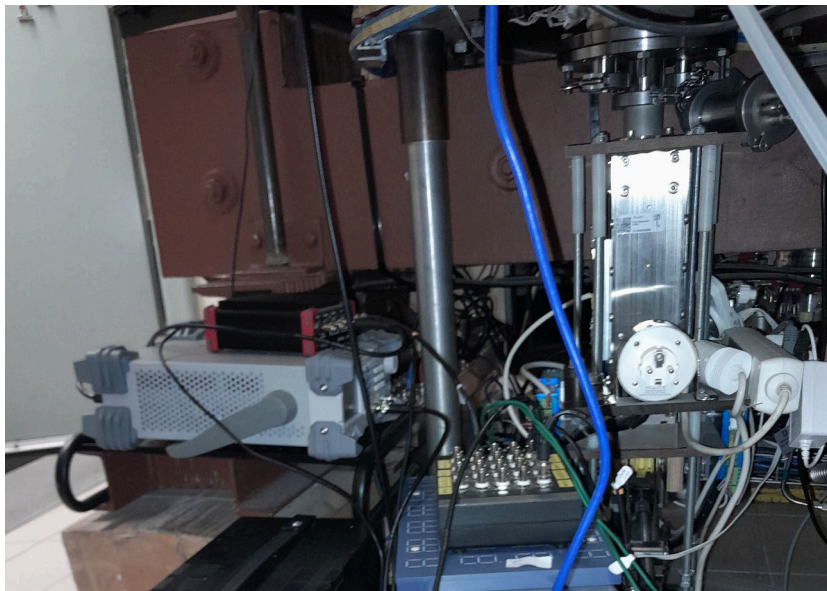


Figure: Distribution of HXR radiation generated from runaway electron interaction with the limiter simulated in Geant4.

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

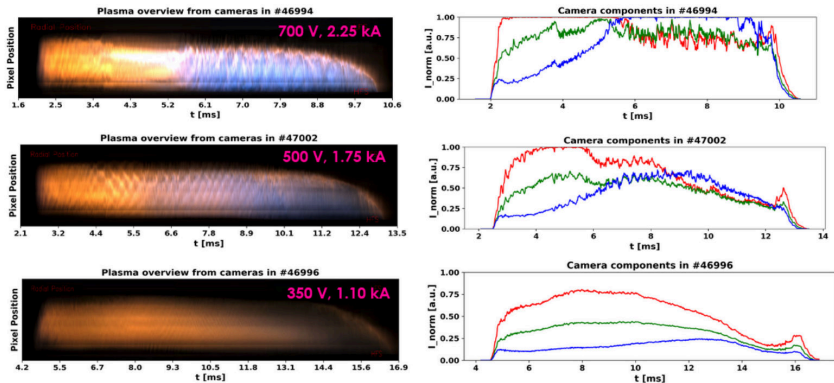


Figure: Images from the fast cameras showing the color transition at different I_p values (left) and the corresponding RGB components (right).

He discharges with transition on GOLEM Spectroscopic Study

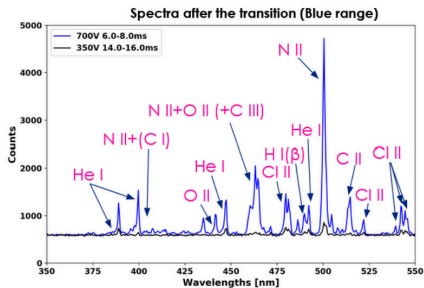
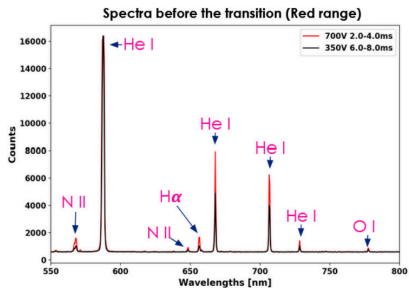
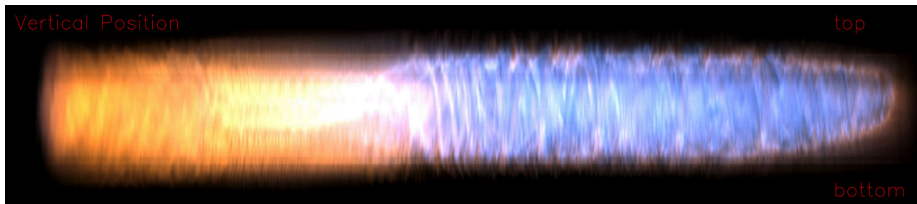
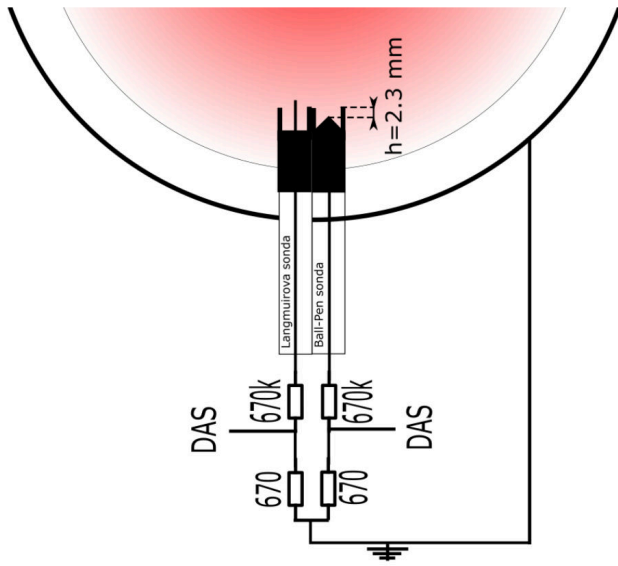


Figure: Spectra before and after the color transition

Study of a transport barrier in GOLEM with probes - setup



Study of a transport barrier in GOLEM with probes

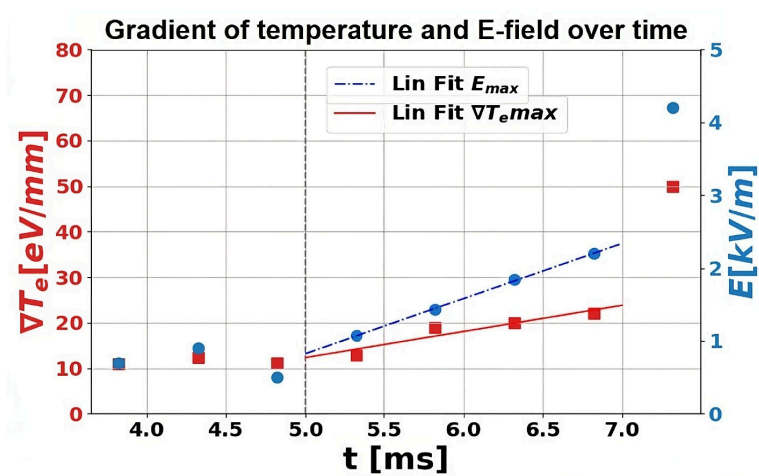


Figure: Evolution of the temperature gradient and radial E-field for $U_{cd} = 450$ V with a linear fit after transition.

Plasma properties in the vicinity of the last closed flux surface in hydrogen and helium fusion plasma discharges

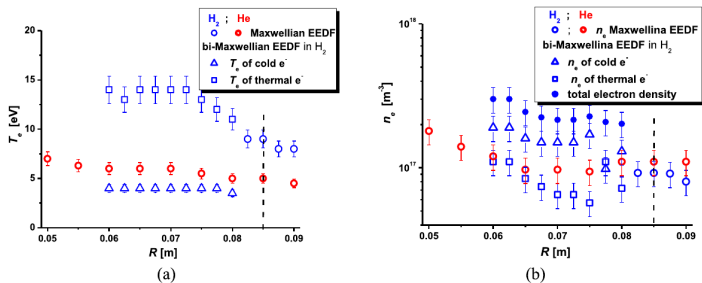


Figure: Radial measurements of the electron temperature (a) and electron density (b) for hydrogen (blue) and helium (red) discharges

New Set of Inner Magnetic Coils at the GOLEM Tokamak

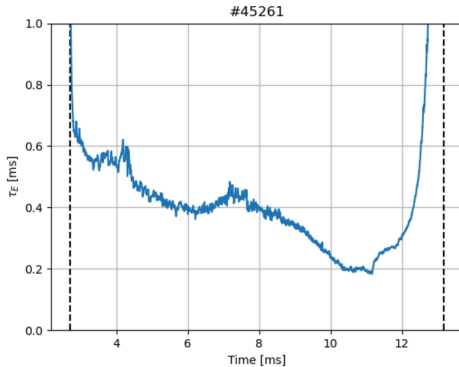
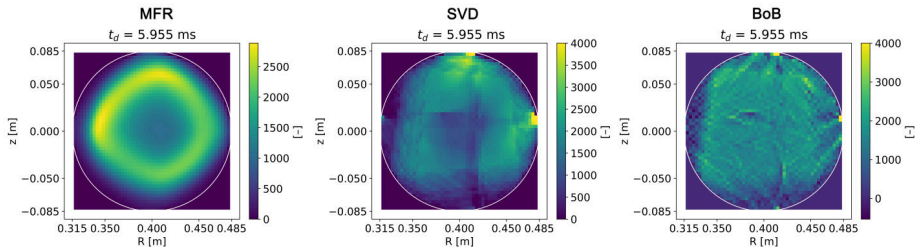


Figure: Time evolution of the energy confinement time evaluated from the thermal energy and the ohmic heating power.

Jakub Chlum & Michal Odložilík (PRPL)



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

Artificial Neural Network-Based Tomography Reconstruction of Plasma Radiation Distribution

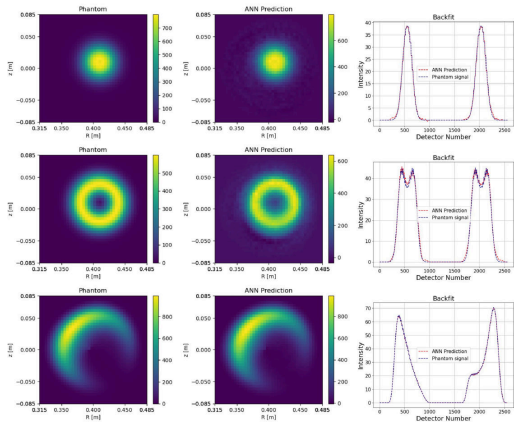
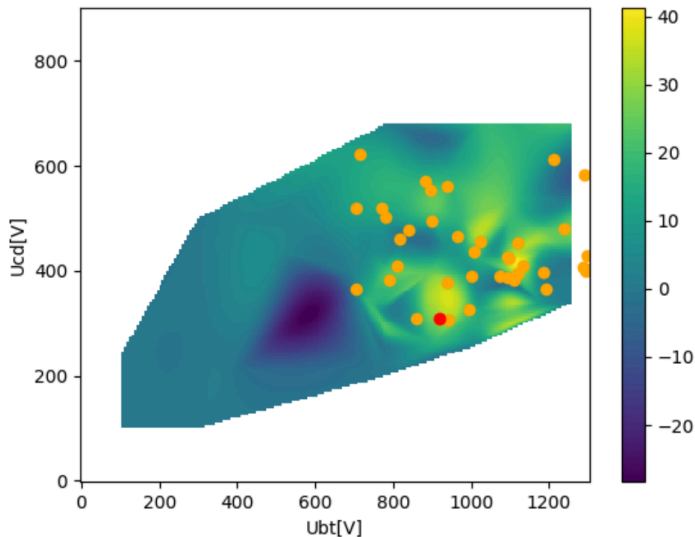


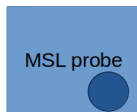
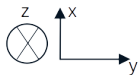
Figure: The phantom sample, the ANN prediction of radiation function and the corresponding backfit of line integrated measurements for three data samples

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

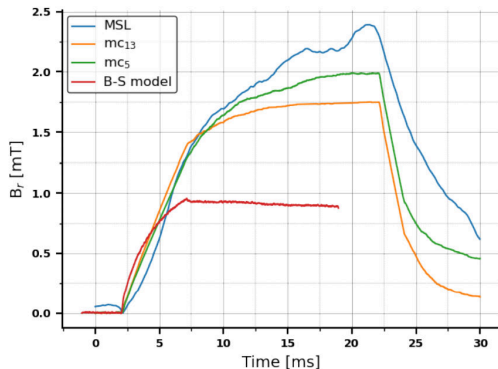


Figure: Radial components of the magnetic field

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Remote Bc. project: Catalina PUC.cl & German Vogel

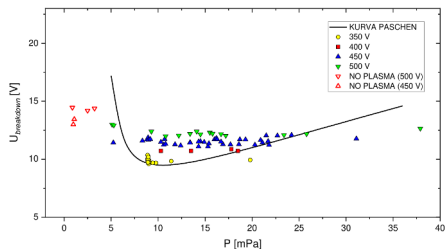


Catalina Vázquez Leiva 2024 Bc. proj.

Estudios de optimización de confinamiento magnético de plasmas en tokamak GOLEM

Remote Bc. project: Derap Pena Mukti Sari

breakdown minimum terjadi pada daerah (7 – 15) mPa, untuk setiap variasi tegangan yang diaplikasikan pada inti transformator ($U_{CD} = 350 - 500$).

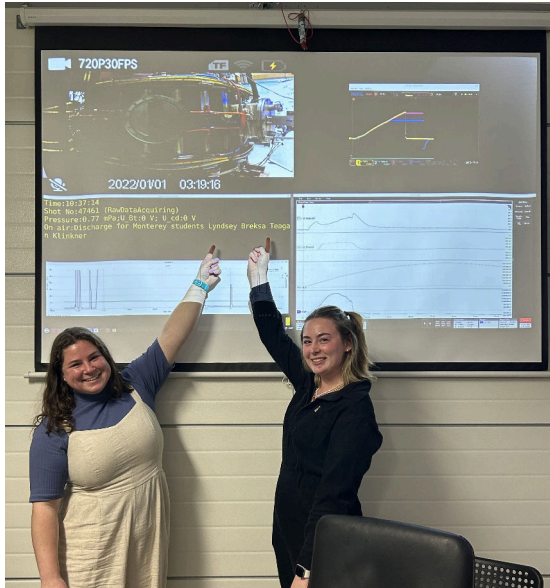


Gambar 4.5 Hubungan antara tegangan *breakdown* ($U_{breakdown}$) dan tekanan pada kurva Paschen untuk setiap jenis U_{CD}

Derap Pena Mukti Sari 2024 Bc. proj.

The Study of The Hydrogen Plasma Breakdown Phase in The GOLEM Tokamak Reactor

Middlebury Institute of International Studies, California, USA



Hackathon 2024 Decin (tG: 2. a 3. místo)



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Plans I

- EMTRAIC, SUMTRAIC
- Gergo Pokol
- 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.
- EPS - ECPP 'Tokamak GOLEM for fusion education, chapter 16' 7.-11. července. Vilnius, Litva. ??
- German Vogel from Chile 4 spectroscopy?
- David Engineering (High school students from USA)

Plans II

- 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.
- Vysoké cíle: doba plazmatu 100 ms a kadence 2 výboje do minuty.
- Tokamak GOLEM dokumentační projekt s pomocí AI (na self hosted Overleaf)
- PRPL Tomáš Plecháček MHDs, Václav Jakubský kalibrace sondy, Daniela Kropáčková Topologie magnetického pole, Jan Buryanec Energetická infrastruktura upgrade.
- Mast. thesis: Jan Buryanec proudová stabilizace s AETechron.

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Acknowledgement

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Students, teachers, technicians (random order):

Honorary Vladimír Fuchs, **Ondřej Grover**, Tomáš Odstrčil, Gergo Pokol, **Gabriel Vondrášek**, **Jan Stockel**, **Jan Mlynář**, Tomáš Markovič

currently **Martin Himmel**, **Petr Mácha**, Filip Papoušek, Jan Buryanec, **Daniela Kropáčková**, Jaroslav Zajac, Jana Brotánková, Lukáš Lobko, **Marek Tunkl**, Jakub Chlum, Sara Abbasi, Matyáš Pokorný, Štěpán Malec, Kateřina Jiráková, Jaroslav Čeřovský, Václav Jakubský, Tomáš Plecháček, Michal Odložilík, Jiří Adámek, Vladimír Weinzettl.

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- 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>.
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References II

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References III

Mácha, Petr *et al.* (Aug. 2023). “Spontaneous formation of a transport barrier in helium plasma in a tokamak with circular configuration”. In: *Nuclear Fusion*. DOI: {10.1088/1741-4326/acf1af}.