

CURRICULUM VITAE

Jakub Cikhardt

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EMPLOYMENT HISTORY

2013 – present: **Researcher, Department of Physics at Czech Technical University in Prague, Faculty of Electrical Engineering.**

The work is devoted to fundamental experimental research of neutron production and ion acceleration principles in deuterium z-pinch discharges. The research is based on experiments on the GIT-12 device at IHCE in Tomsk, PF-1000 plasma focus at IPPLM in Warsaw, and PFZ-200 plasma focus at CTU in Prague. The main focus is neutron spectrometry using time-of-flight detectors and threshold activation diagnostics. The work involves also teaching of university courses and supervising of student BSc theses.

2012 – present: **Research and development worker, Institute of Plasma Physics of the Czech Academy of Sciences.**

The scientific work is focused on the development, operation, and data processing of the laser plasma diagnostics on the 700 J/ 350 ps Prague Asterix Laser System (PALS). The main specialization is the neutron diagnostics (time-of-flight and activation detectors), hard x-ray scintillation detectors, soft x-ray and ultraviolet imaging using fast MCP pinhole camera, and electromagnetic pulse diagnostics including antennas and target current probes.

2010 – 2012: **Undergraduate research, Department of Physics at Czech Technical University in Prague, Faculty of Electrical Engineering.**

The research in frame of the CTU Student Grant Competition includes mostly experiments on PFZ-200 plasma focus at TPU in Prague and internships on PF-1000 plasma focus at IPPLM in Warsaw. The work mostly involved study of deuterium z-pinch implosions and neutron production using various z-pinch configurations.

UNIVERSITY TEACHING ACTIVITIES

Courses: Physics, Physics for electroenergetics

Supervising: BSc thesis - Adam Pavlát: Detector of Nuclear Fusion Neutrons, CTU 2016

EDUCATION

2012 – 2018: **PhD: Plasma Physics**

Czech Technical University in Prague, Faculty of Electrical Engineering

Thesis: High Energy Density Plasma Diagnostics Using Neutron and Gamma Detectors

Thesis presents an experimental research of deuterium Z-pinch gas-puff on the GIT-12 terawatt-class pulsed power generator. The biggest emphasis is put on the neutron diagnostics, especially neutron activation detection. The thesis work includes design of the neutron time-of-flight (ToF) detector with solid-state amplifier, calibration of the neutron ToF detectors and gamma-ray spectrometers, determination of the neutron spectra, neutron emission angular distribution, and estimation of number of neutrons produced by reactions of fast ions with experimental hardware (non-dd neutrons).

Supervisor: Dr. Daniel Klír (*klirdani@fel.cvut.cz*)

2010 – 2012: **MSc: Electronics**

Czech Technical University in Prague, Faculty of Electrical Engineering

Non-core courses taken: Theoretical physics, Plasma Diagnostics, Plasma Waves and Instabilities, Selected Topics of Optics

Thesis: Construction of Fast Bolometer for Measurement of Intensity of Pulsed Soft X-Rays

Thesis work is devoted to design of the < 3 keV x-ray bolometer with the time response of 4 ns for Z-pinch experiments on the GIT-12 terawatt-class generator at IHCE in Tomsk. The work includes complete design of the mechanical components and electrical circuits and processing of the experimental results.

Supervisor: Prof. Pavel Kubeš (*kubes@fel.cvut.cz*)

Study was finished with the red diploma.

2010 – 2011: **MSc Bilateral Exchange: Physical Electronics**

Tomsk Polytechnic University, Institute of High Technology Physics, Russia

Courses taken: Basics of Plasma Physics, Gas Discharge Physics, Experimental Electronics and Diagnostics, Plasma Technology

Project: Design, Construction, and Testing of Fast Bolometer

Supervisor: Dr. Alexander Shishlov (*ash@ovpe2.hcei.tsc.ru*)

2007 – 2010: **BSc: Electronics and Telecommunications**

Czech Technical University in Prague, Faculty of Electrical Engineering

Non-core courses taken: Astrophysics, Selected Topics in Physics, Physics for Electroenergetics, Math in Maple, Fundamentals of Antennas and Microwave Technology

Thesis: Gas-puff Electromagnetic Valve and It's Testing

Thesis is focused on the deuterium Z-pinch gas-puff experiments on the S-300 terawatt-class generator at the Kurchatov Institute. The thesis work includes measurement of opening and gas dynamic characteristics of the gas-puff electromagnetic valve for various gas pressures and supply voltages.

Supervisor: Prof. Pavel Kubeš (*kubes@fel.cvut.cz*)

2003 – 2007: **Secondary school**

Secondary School of Electrical Engineering, Ječná 30, Prague, Czech Republic

Publication Activities

Records in WoS: 43 (March 2018)

h-index by WoS: 8 (March 2018)

Selected Publications

- J. Cikhardt, D. Klir, K. Rezac, A. V. Shishlov, R. K. Cherdizov, et al., *Neutron Spectrum Measured by Activation Diagnostics in Deuterium Gas-Puff Experiments on the 3 MA GIT-12 Z pinch*, IEEE Transactions on Plasma Science **45**, 12, 3209-3217, 2017.
- J. Cikhardt, J. Krása, M. De Marco, M. Pfeifer, A. Velyhan, et al., *Measurement of the target current by inductive probe during laser interaction on terawatt laser system PALS*, Review of Scientific Instruments **85**, 103507, 2014.
- J. Cikhardt, B. Batobolotova, P. Kubes, J. Kravarik, D. Klir, K. Rezac, *Influence of an external magnetic field on the dynamics of a modified plasma focus*, Physica Scripta **T161**, 014042, 2014.
- J. Krasa, M. De Marco, J. Cikhardt, M. Pfeifer, A. Velyhan, et al., *Spectral and temporal characteristics of target current and electromagnetic pulse induced by nanosecond laser ablation*, Plasma Phys. Control. Fusion **59**, 6, 065007, 2017
- D. Margarone, A. Velyhan, J. Dostal, J. Ullschmied, et al., *Acceleration Driven by a Nanosecond Laser from a Cryogenic Thin Solid-Hydrogen Ribbon*, Physical Review X, **6**, 4, 2016.
- D. Klir, A. V. Shishlov, V. A. Kokshenev, P. Kubes, K. Rezac, J. Cikhardt, et al., *Deuterium z-pinch as a powerful source of multi-MeV ions and neutrons for advanced applications*, Phys. Plasmas **23**, 3, 2016.
- D. Klir, J. Krasa, J. Cikhardt, R. Dudzak, E. Krousky, et al., *Efficient neutron production from sub-nanosecond laser pulse accelerating deuterons on target front side*, Phys. Plasmas **22**, 9, 2015.
- D. Klir, A. V. Shishlov, V. A. Kokshenev, P. Kubes, A. Yu. Labetsky, et al., *Efficient generation of fast neutrons by magnetized deuterons in an optimized deuterium gas-puff z-pinch*, Plasma Phys. Control. Fusion **57**, 4, ISSN: 0741-3335, 2015.
- D. Klir, P. Kubes, K. Rezac, J. Cikhardt, et al.: *Efficient Neutron Production from a Novel Configuration of Deuterium Gas-Puff Z-Pinch*, Physical Review Letters **112**, 9, ISSN: 0031-9007, 2014.
- D. Klír, J. Kravárik, P. Kubeš, K. Řezáč, J. Cikhardt, et al.: *Efficient production of 100 keV deuterons in deuterium gas puff Z-pinches at 2MA current*, Plasma Phys. Control. Fusion **52**, 6, 2010.

Internships and International Scientific Cooperation

- **Deuterium Gas-puff Z-pinch Experiments on the GIT-12 Pulsed-power Generator**, Institute of High Current Electronics, Siberian Branch, Russian Academy of Sciences, 2/3 Akademichesky Avenue Tomsk 634055
Responsible person: Dr. Alexander Shishlov (*ash@ovpe2.hcei.tsc.ru*)
- **Deuterium Plasma Focus Experiments on the PF-1000 Device**, Institute of Plasma Physics and Laser Microfusion, Hery Street 23, 01-497 Warsaw
Responsible person: Dr. Marian Paduch (*marian.paduch@ifpilm.pl*)
- **Heavy Ion Stopping in X-ray Heated Low Density Foams Experiments**, GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstraße 1, 64291 Darmstadt,
Responsible person: Dr. Olga Rosmej (*O.Rosmej@gsi.de*)

Technical skills:

Neutron scintillation time-of-flight diagnostics, neutron activation diagnostics and spectrometry, gamma-ray scintillation diagnostics, gamma-ray spectrometry (HPGe, NaI), microchannel plate (MCP) imaging, ion diagnostics (RCF, CR-39), vacuum x-ray diodes, semiconductor detectors, gas/vacuum systems, pulsed power, high-frequency electronics, etc.

Language skills

Czech: Native

English: Speaking, reading, writing

Russian: Fluently speaking, reading, writing, Certificate of 2nd level of Russian ministry of education

Polish: Speaking, reading

Awards

- Dean award for doctoral thesis, 23.4.2018, Prague.
- Awarded conference contribution: *Measurement of target current at laser system PALS using inductive probe* na 12th Kudowa Summer School “Towards Fusion Energy”, 9-13.06.2014, Kudowa Zdrój, Poland.
- Preciosa award for master thesis, 29.11.2012, Prague.
- Dean award for master thesis, 26.6.2012, Prague.
- Awarded conference contribution (1st price): *The noise reduction of the measured signal in plasma diagnostic with adaptive filtration.*, 15th International Student Conference on Electrical Engineering POSTER 2011, May 12, 2011, Prague, Czech Republic.
- Awarded conference contribution (3rd price): *Z-pinch discharges in deuterium gas-puff*, 14th International Student Conference on Electrical Engineering POSTER 2010, May 6, 2010, Prague, Czech Republic.