Aleksandr KADYKOV

cv@kadykov.com | kadykov.com | ○ | ⩔ | in

Research software engineer specializing in data analysis and signal processing, with extensive experience in photonics, solid-state physics and cryogenic measurements.

KNOWLEDGE

- **Data Analysis & Signal Processing**
- **Python Programming**
- **Test-Driven Development (TDD) & CI/CD**
- **Instrumentation Integration & Automation**
- **Experimental Design & Execution**
- **Photonics & Cryogenics Measurements**

EXPERIENCE

Multitel A.S.B.L.   Jul. 2021 – present

A dynamic non-profit innovation center based in Mons, Belgium with ~100 employees, specializing in applied photonics, IoT, AI, and railway certification.

Research Software Engineer in THz Spectroscopy and Imaging

- Developed new methods to process THz-TDS data, extract additional information, and improve the quality of the results within the framework of the TERA4ALL project.
- Significantly improved refraction index profile extraction from THz-TDS data by offloading TMM calculations to a GPU.
- Improved the overall THz laboratory workflow by implementing various Python tools for measurement orchestration, FAIR data management, data analysis, and results presentation.
- Strengthened the codebase by implementing unit tests, CI/CD pipelines, and comprehensive documentation, ensuring robust and maintainable software development practices.
- Led the SAPHIRE project, developing THz-based solutions for *in-situ* pill coating thickness and humidity control.

Laboratoire National de Métrologie et d'Essais (LNE)   Sep. 2018 – Sep. 2020

National Metrological Laboratory, an EPIC company with ~1000 employees, Trappes, France.

Research Engineer in Quantum Hall Effect Metrology

- Implemented a flexible Python software package based on PyMeasure, optimizing scientific equipment orchestration.
- Led low-noise cryogenic quantum Hall measurements in graphene, uncovering its potential use as a resistance standard.
- Participated in the nanofabrication of hBN-encapsulated graphene samples.

Institute for Physics of Microstructures RAS   May 2017 – Sep. 2018

State-owned research institute with ~200 employees based in Nizhny Novgorod, Russia

Research Engineer in Photonics of Narrow-Gap Semiconductors

- Conducted THz and FTIR photoluminescence and photoconductivity cryogenic measurements.
- Achieved laser emission in HgCdTe heterostructures at a record wavelength.

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EDUCATION

Laboratoire Charles Coulomb (L2C) / IPM RAS
Montpellier, France / Nizhny Novgorod, Russia

Sep. 2014 – Dec. 2017

Ph.D. in Physics

Physical properties of HgCdTe-based heterostructures: towards terahertz emission and detection

- Extracted the critical magnetic field in a topological insulator by implementing a double-modulation technique and using non-resonant THz imaging of Landau levels.
- First observed a temperature-driven phase transition in a topological insulator via magnetotransport.

OTHER RELEVANT INFORMATION

- **Additional languages:** French (upper-intermediate), Russian (native)
- **Programming & Data Analysis:** Python, Jupyter, NumPy, Pandas, Xarray, Scipy, Python Array API, PyTest, PyTorch, scikit-learn, MATLAB
- **Data Visualization:** Matplotlib, hvPlot, Plotly, Bokeh, Panel, OriginPro
- **Measurement and Automation:** PyMeasure, Bluesky, yaq, LabVIEW
- **Data Management & Integration:** Intake, SQL
- **Document Preparation:** Quarto, Pandoc, LaTeX
- **Other tools:** VSCode, Git, Linux, Docker, CI/CD, Zotero

REFERENCES

Yves Hernandez
Head of the Applied Photonics Department
at Multitel ASBL

Frédéric Teppe
Head of the THz Spectroscopy Department
of the Charles Coulomb laboratory (L2C)

SELECTED PUBLICATIONS

1. Kadykov, A.M., Torres, J., Krishtopenko, S.S. et al., *Terahertz imaging of Landau levels in HgTe-based topological insulators*, **Applied Physics Letters**, 108(26), *262102*, 2016
2. Teppe, F., Marcinkiewicz, M., Krishtopenko, S.S. et al., *Temperature-driven massless Kane fermions in HgCdTe crystals*, **Nature Communications**, 7, *12576*, 2016
3. Kadykov, A.M., Krishtopenko, S.S., Jouault, B. et al., *Temperature-Induced Topological Phase Transition in HgTe Quantum Wells*, **Physical Review Letters**, 120(8), *086401*, 2018
4. Kadykov, A.M., Teppe, F., Consejo, C. et al., *Terahertz detection of magnetic field-driven topological phase transition in HgTe-based transistors*, **Applied Physics Letters**, 107(15), *152101*, 2015
5. Krishtopenko, S.S., Ruffenach, S., Gonzalez-Posada, F. et al., *Temperature-dependent terahertz spectroscopy of inverted-band three-layer InAs / GaSb / InAs quantum well*, **Physical Review B**, 97(24), *245419*, 2018
6. Ruffenach, S., Kadykov, A.M., Rumyantsev, V.V. et al., *HgCdTe-based heterostructures for terahertz photonics*, **APL Materials**, 5(3), *035503*, 2017
7. Yahniuk, I., Krishtopenko, S.S., Grabecki, G. et al., *Magneto-transport in inverted HgTe quantum wells*, **npj Quantum Materials**, 4(1), *1–8*, 2019
8. Marcinkiewicz, M., Ruffenach, S., Krishtopenko, S.S. et al., *Temperature-driven single-valley Dirac fermions in HgTe quantum wells*, **Physical Review B**, 96(3), *035405*, 2017