

Mons, Belgium

November 13<sup>th</sup>, 2024

## Letter to Future Employer

Dear Future Employer,

I'm writing to offer you a high-level view of my career path, highlighting my expertise in photonics, magnetotransport, high-precision measurements, and THz technology.

### Photonics & Magnetotransport at L2C & IPM RAS

I began my career in basic research as a Research Engineer. My Ph.D. work, a collaboration between Laboratoire Charles Coulomb (L2C) and the Institute for Physics of Microstructures (IPM RAS), focused on photonics and magnetotransport in HgTe/HgCdTe quantum wells.

These heterostructures could serve dual purposes depending on their configuration: far-infrared emitters and detectors, or topological insulators with protected edge states. At IPM RAS, I studied their potential as far-infrared emitters and detectors, using photoconductivity and photoluminescence. At L2C, I explored their topological insulator states and transitions, using THz detection and magnetotransport measurements.

This work led to the first observation of a topological phase transition in these heterostructures by magnetotransport, as well as record-breaking laser emission wavelengths, with results published in journals like Nature Communications, PRL, PRB, and APL.

### High-Precision Measurements at LNE

After completing my Ph.D., I moved to applied research and worked for two years at the Laboratoire national de métrologie et d'essais (LNE) as a Research Engineer. Here, I continued to explore magnetotransport properties of 2D systems, and conducted low-noise, high-precision quantum Hall effect measurements in graphene.

My contributions included automating measurements using a Python-based orchestration system, nanofabrication of graphene/hBN stacks, and optimizing cryogenic measurement systems to reduce costs by improving helium recuperation and implementing a reliable dry helium-free cryogenic system.

## THz Innovation at Multitel ASBL

Next, I spent over three years as a Research Engineer at Multitel ASBL, leading THz time-domain spectroscopy (THz-TDS) and imaging activities. There, I developed THz-based solutions for industrial applications such as non-destructive quality control of humidity, thickness, or composition in industries such as pharmaceuticals, polymers, and biotechnology.

As a result, I developed new and improved existing methods for extracting information from THz-TDS data, including computationally cheap preliminary estimation of thickness and refractive index in low-absorption samples and sensitivity curve-shaped filtering with enhanced signal-to-noise ratio.

I also implemented infrastructure for reproducible research, including Python tools for instrument integration, FAIR (findable, accessible, interoperable, and reusable) data management, and automated data analysis pipelines.

Through this work, I gained hands-on experience in software development, including test-driven development, CI/CD pipeline automation, and Docker-based containerization.

## What's Next?

I'm now seeking new opportunities to leverage my skills as a Research Engineer to contribute to impactful projects. Could this be with your team?

Thank you for your time and consideration.

Best regards,  
Aleksandr KADYKOV