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My research objective is to contribute to the advancement of plasma physics and its applications, in particular the progress of fusion energy by improving reactor performance. The PhD project in fusion energy and plasma physics at Technical University of Denmark (DTU) with its focus on controlled powder injection offers an excellent opportunity for me to pursue this goal and to play a part in advancing future energy technologies. I am now completing the final year of my Master's degree in Plasma Physics at Moscow Institute of Physics and Technology, where my studies on semiconductor devices exposed to radiation and plasma environments have strengthened my interest in plasma physics and its applications. I am especially motivated by the possibility of combining numerical simulations with experimental validation, and I look forward to developing models that integrate plasma turbulence and material interaction in order to investigate how powder injection can enhance the performance of fusion reactors.

I joined Dr. Koveshnikov's laboratory in the Russian Academy of Sciences two years ago to study radiation effects on microelectronic structures, focusing on electrical characterization of semiconductors and SiO_2-based MOS devices. We used thermally stimulated current (TSC), capacitance-voltage (C-V), current-voltage (I-V) and current-time (I-t) measurements to investigate majority and minority carriers and electron states. We studied the impact of electron and gamma irradiation and hydrogen plasma treatment on MOS devices, identified traps by location (oxide, semiconductor, interface) and carrier type (electrons, holes). This work has resulted in a first-author publication[1] and provides insight into device stability under bias stress, radiation immunity, and oxide trap density at the semiconductor interface. I also developed and optimized MATLAB applications to automate the experimental techniques using instruments such as Keithley SourceMeter 2450, Lakeshore Temperature Controller Model 336 and Zurich Instruments MFIA, which reduced runtimes and created robust measurement pipelines. This strengthened my skills in instrument control, automated experiments, management of experimental datasets, and numerical modelling.

After my undergraduate degree, I joined the Design Center for the Development of Microprocessor Technology and the Laboratory of Plasma Systems under the supervision of Dr. Chesnokov and Dr. Vasiliev to develop FPGA-based systems and to study radiation and plasma effects on these structures. At the Design Center I implemented video-processing algorithms by manual Verilog coding and by generating HDL from Simulink models. I also created testbenches and Python automation scripts to verify functionality for the algorithms. In the Plasma Lab I ran experiments where an FPGA board with an attached camera and a synthesized image-processing design was exposed to electron irradiation, a beam-driven electron-beam plasma (EBP) in low-pressure oxygen, and X-rays from a tungsten target. The board's signal was monitored while thermal cycling was applied. I performed functionality checks and preliminary reliability tests to observe the FPGA output under radiation. This work strengthened my skills in FPGA design, working with EBP setups, and electronic hardware evaluation under radiation.

[1] R. Aliasgari Renani, O.A. Soltanovich, M.A. Knyazev, S.V. Koveshnikov, Investigation of low energy electron irradiated SiO_2 based MOS devices by C-V and TSC techniques, Russian Microelectronics, 2023

My experience with plasma systems and radiation effects on electronics has motivated me to continue my PhD studies at DTU to develop and validate predictive models for powder ablation and plasma material interactions. I also have experience with Monte Carlo trajectory simulations of electron beam propagation in gas and solid media, where large sets of simulated electron trajectories were used to compute spatial distributions of absorbed power and temperature fields that guided subsequent experiments. I am enthusiastic to work under the guidance of Dr. Nielsen at DTU and Dr. Ratynskaia at KTH Royal Institute of Technology (KTH) to integrate turbulence, ablation, and surface interaction models and to compare them with results from experimental platforms such as the NORTH tokamak. Having been an international student and having collaborated across multiple scientific institutions, I am comfortable working between partner laboratories and I would welcome the opportunity to split time between DTU and KTH to advance this research. I am driven by research that couples rigorous numerical methods with experiments, and I look forward to developing simulation tools and conducting experiments that lead to the development of clean fusion energy. It would be an honor to work across two internationally recognized institutions in Denmark and Sweden, countries with longstanding traditions of scientific and cultural excellence.