# Crucial role of electrode dimensions in Josephson SNS bridges

S. V. Bakurskiy[1,*], O. V. Skryabina[2], V. I. Ruzhickiy[1], A. Shishkin[2], N. V. Klenov[1], I. I. Soloviev[1], M. Yu Kupriyanov[1], and V. S. Stolyarov[2]

[1] Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow 119991, Russian Federation

[2] Moscow Institute of Physics and Technology, 141700 Dolgoprudny, Russia;

*email: r4zz@mail.ru

**Key words**: Josephson junction, proximity effect, superconductor electronics

We studied electronic transport in Josephson bridges of variable thickness Superconductor-Normal Metal-Superconductor (SNS) theoretically and experimentally. We found a significant influence of the electrode size on the critical current, current-phase ratio and critical temperature of the Josephson junction. The microscopic description of the Josephson SNS bridge was modified in the framework of the Usadel equations, taking into account inhomogeneous supercurrent spatial distribution in the electrode and phase drop at the boundary between the normal metal region and the superconducting electrode. We have shown that these factors lead to an increase in the characteristic length of the current flow between the superconducting electrode and the normal metal layer.

The work was supported by the Russian Science Foundation (project no. 25-19-00057; https://rscf.ru/project/25-19-00057/).

Bibliography

[1] V. Ruzhickiy, S. Bakurskiy, M. Kupriyanov, N. Klenov, I. Soloviev, V. Stolyarov, and A. Golubov. Contribution of processes in sn electrodes to the transport properties of sn-n-ns josephson junctions. Nanomaterials, 13:1873, 2023

[2] O. V. Skryabina, S. V. Bakurskiy, V. I. Ruzhickiy, A. Shishkin, N. V. Klenov, I. I. Soloviev, M. Yu Kupriyanov, and V. S. Stolyarov. Anomalous influence of electrode width on the critical current of nb/au josephson junctions. Superconductor Science and Technology, 37(12):125018, 2024