

# Phase slip processes in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ single crystals



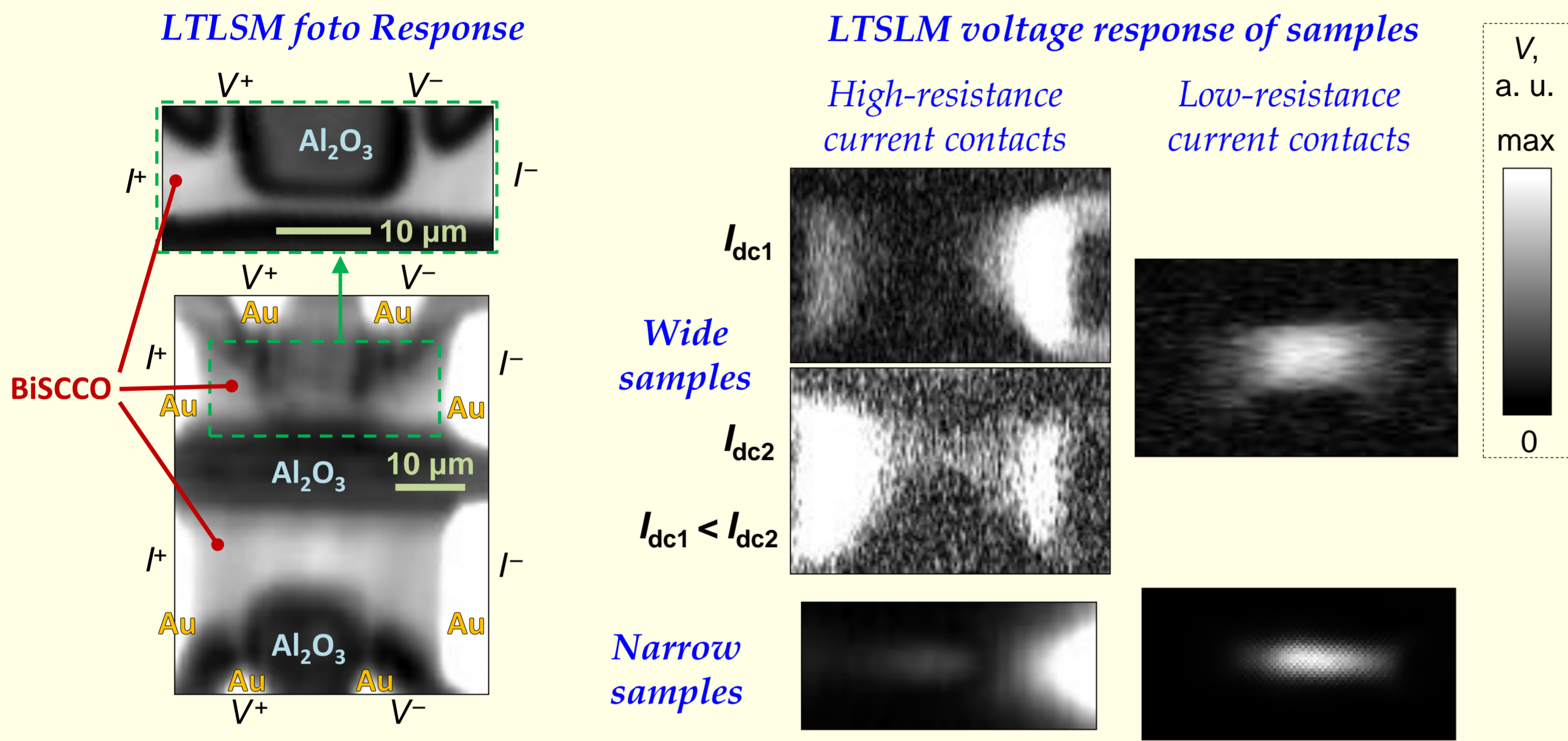
A. G. Sivakov, A. S. Pokhila, A. E. Kolinko

B. Verkin Institute for Low Temperature Physics and Engineering of NAS of Ukraine, Kharkiv, Ukraine

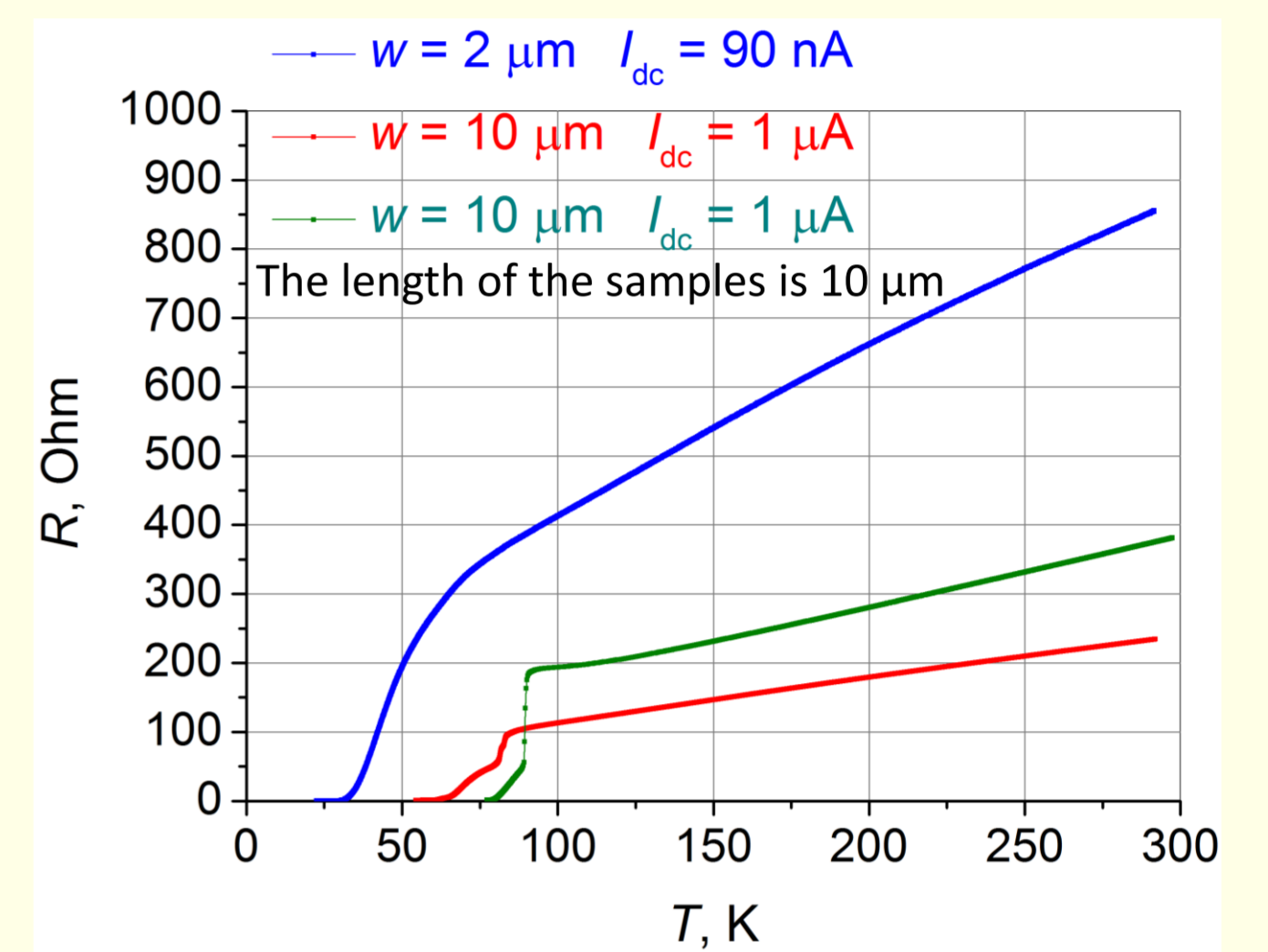
## 1. Introduction

The current-voltage characteristics (IVCs) of 10-micron-long BiSCCO single-crystal bridges were investigated. The use of low-temperature scanning microscopy (LTSLM) enabled the visualization of the development of thermal instability in the resistive state, thereby allowing for an accurate interpretation of the features observed in the IVCs. The influence of microwave radiation on the structure of the IVCs was also studied.

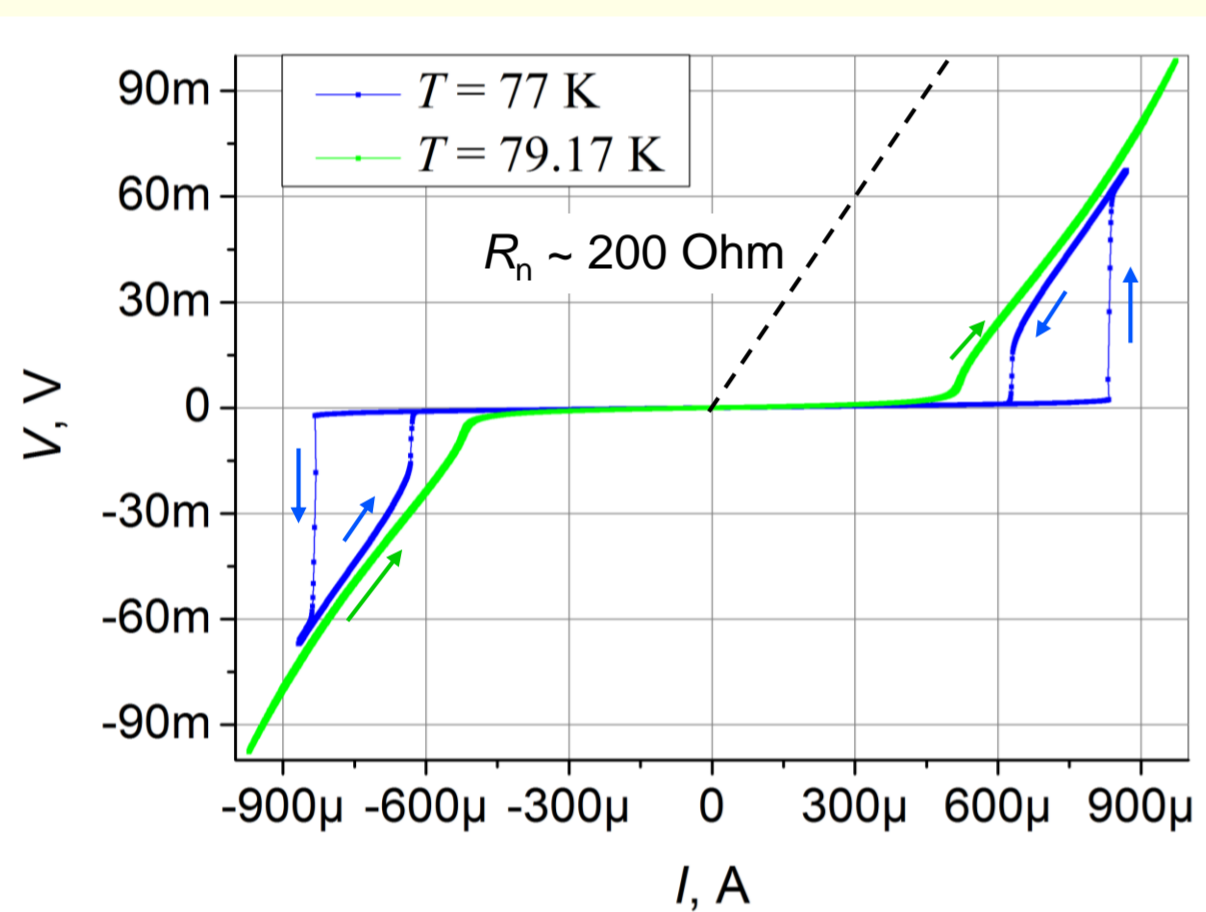
## 2. LTSLM samples characterization



## 3. Superconducting transitions of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ single crystals



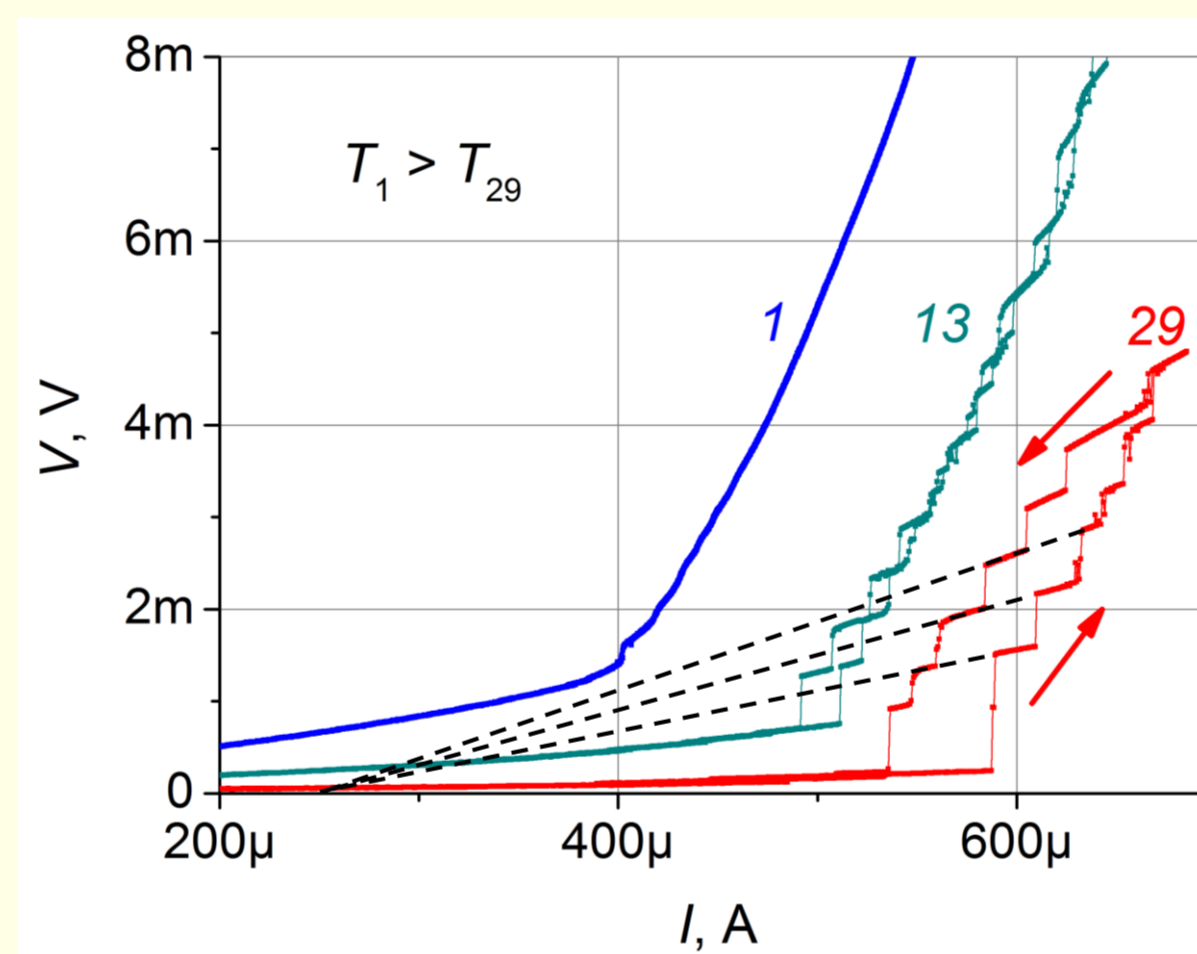
## Voltage Characteristics of BISCO Bridges



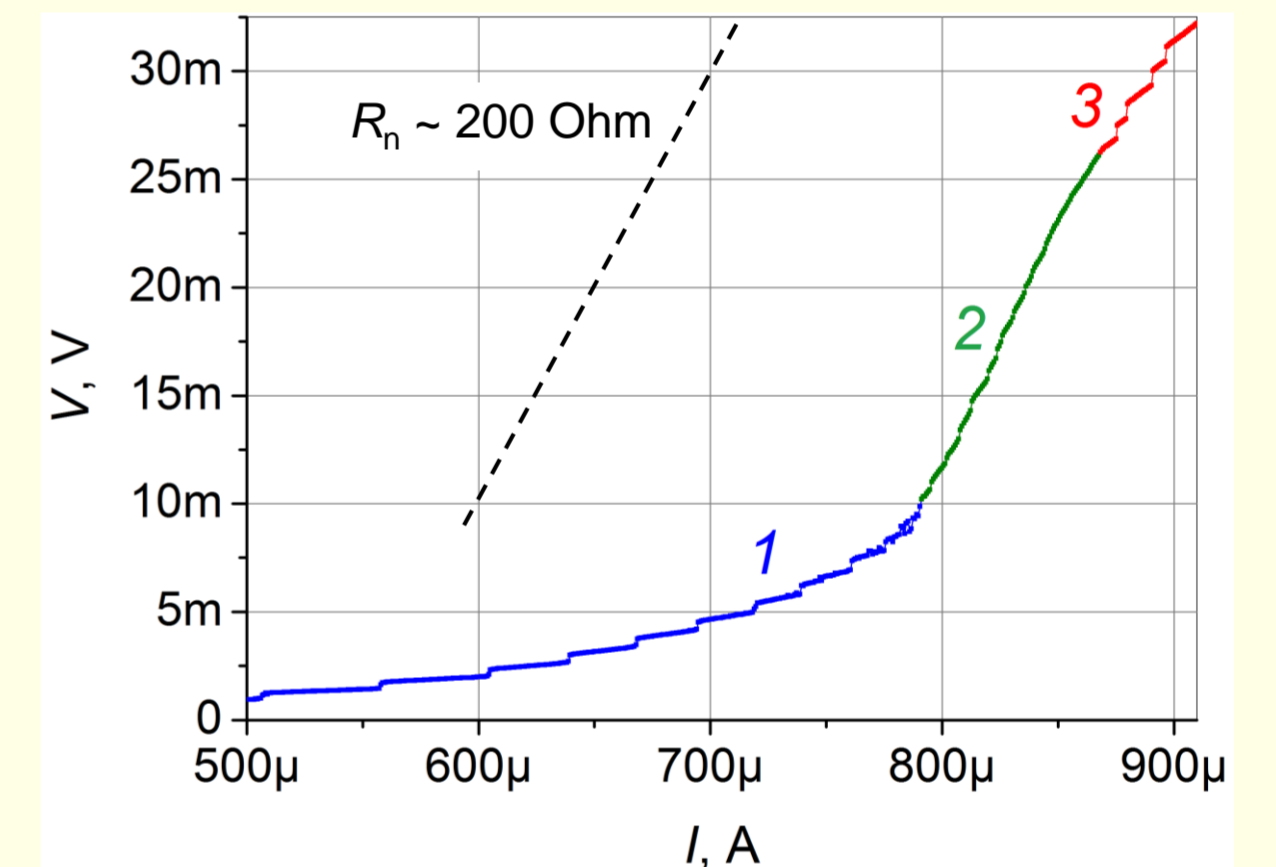
Since all our samples have characteristic dimensions larger than  $\xi$ , and the features of their current-voltage characteristics coincide with those of PSC and PSL, the term "Phase-Slip Surface" (PSS) may be introduced.

## 4. Features of I-V characteristics

Initial segments of current-voltage characteristics with a regular PSS structure, as a function of temperature

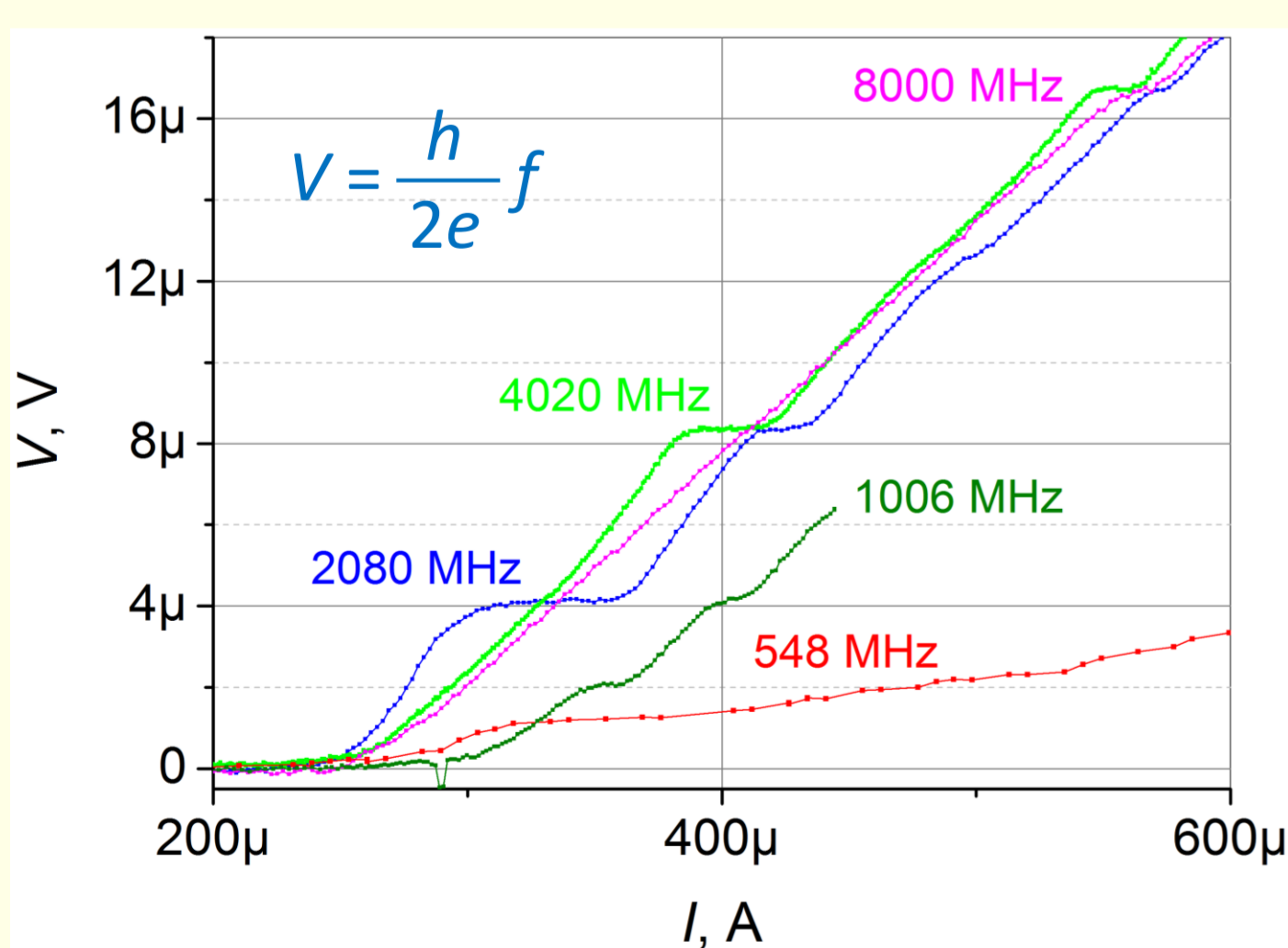


## Resistive regions of I-V characteristics



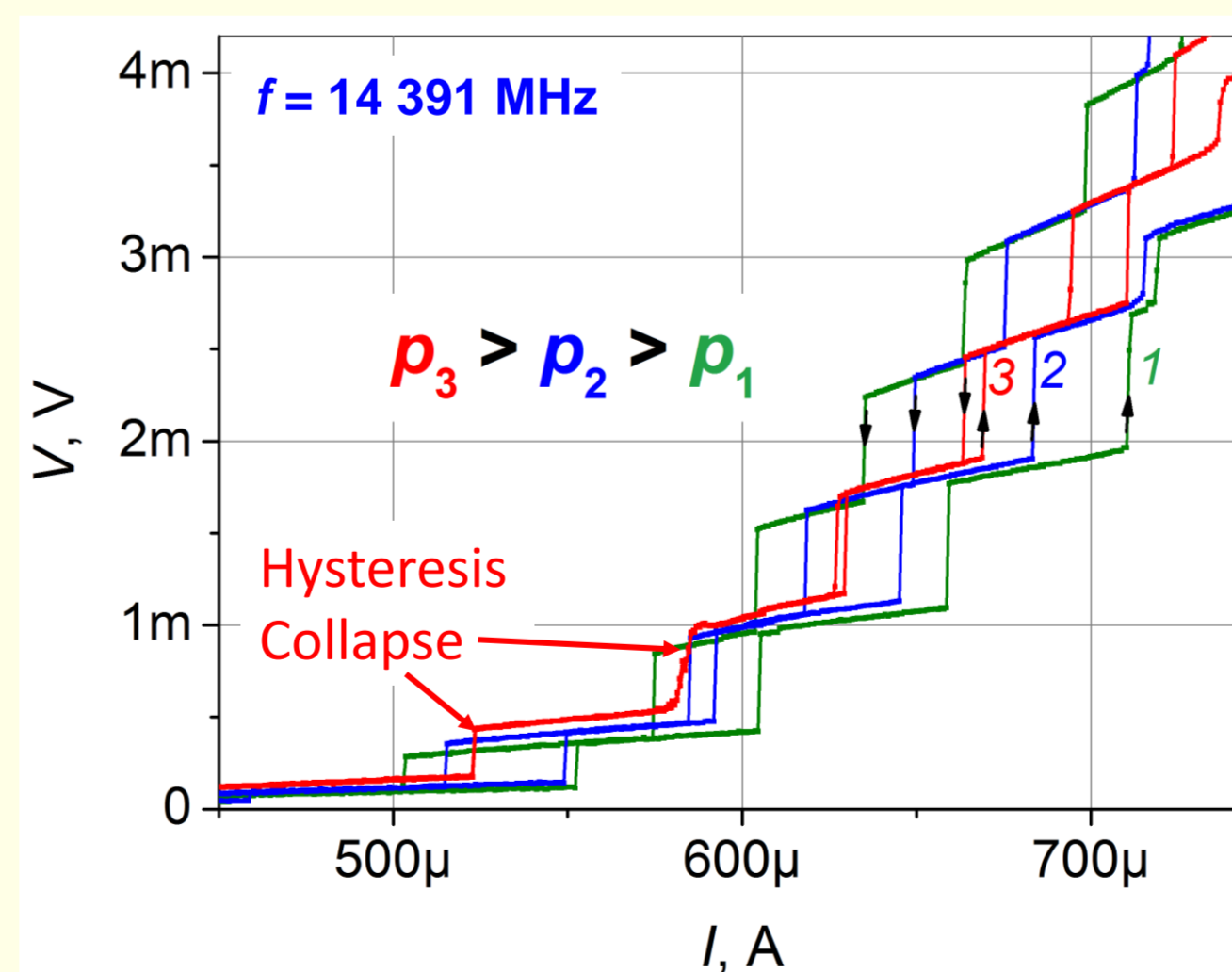
- 1 — Sequential increase in the number of PSS with increasing current.
- 2 — A fully filled specimen containing PSS spaced less than  $2\ell_e$  apart.
- 3 — Stationary localized normal domains (SLND).

## Josephson Properties of PSS. Shapiro Steps

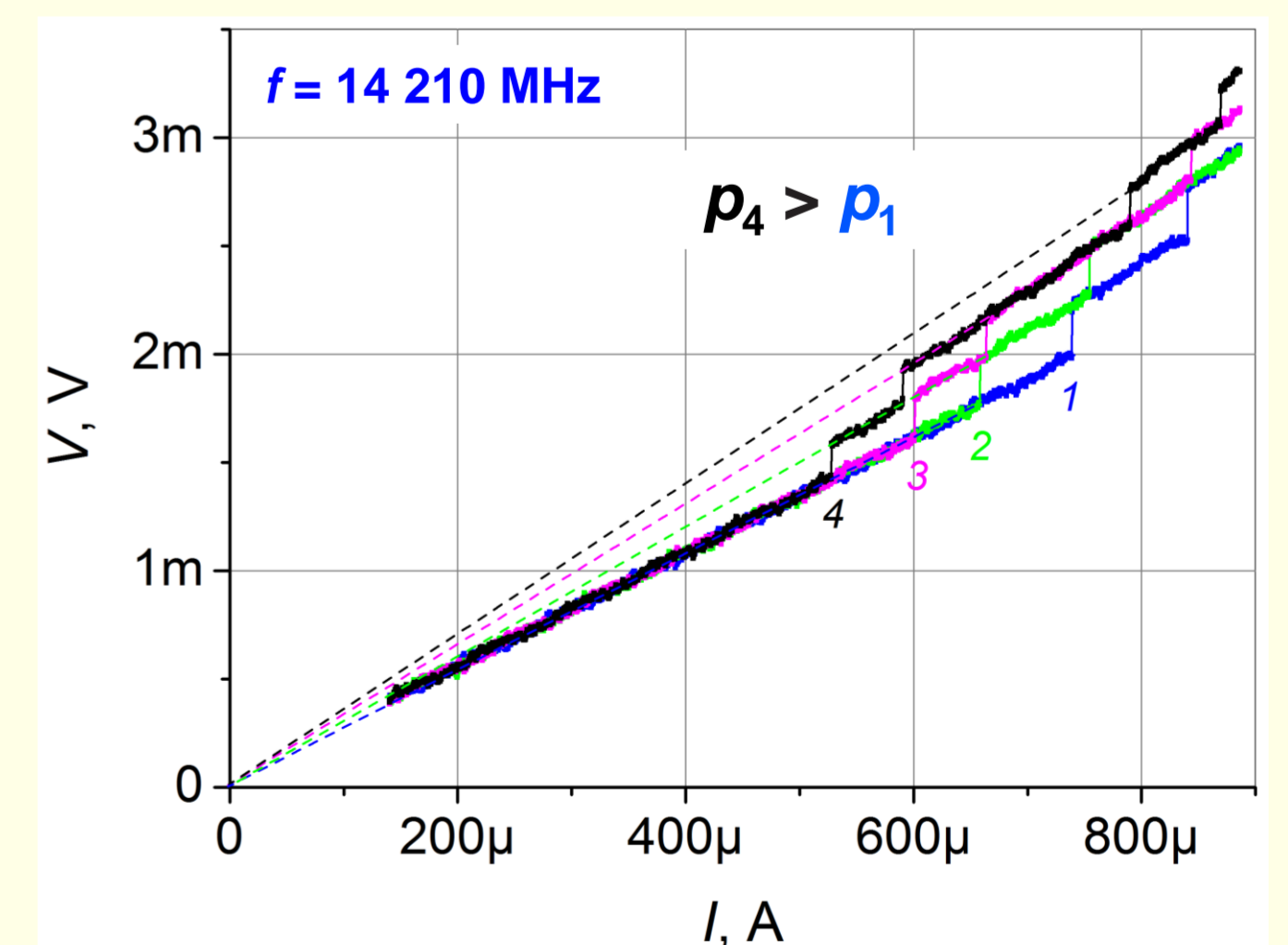


## 5. RF irradiation

Adiabatic Mode of Superposition of Direct and Alternating Currents



## Stationary Localized Normal Domains



## Conclusions

1. Our experiments confirmed the existence of phase-slip surfaces in HTSCs.
2. Josephson behavior of the phase-slip surfaces was demonstrated.
3. The phase-slip mechanism constitutes a fundamental and universal mechanism for the destruction of superconductivity by current.
4. This phase-slip mechanism is observed in objects of any dimensionality, structure, or type of superconductivity, and is linked solely to the properties of the superconducting current.
5. It should be noted that all experiments were conducted at temperatures  $> 77 \text{ K}$ .