



**INSTITUTE OF AUTOMATION AND ELECTROMETRY  
OF THE SIBERIAN BRANCH OF THE RUSSIAN ACADEMY OF SCIENCES  
(IA&E SB RAS)**

**THE INSTRUMENT FOR RESEARCH OF THE NONEQUILIBRIUM  
PHENOMENA IN SEMICONDUCTOR STRUCTURES**

The device is designed to measure the relaxation time capacity, surface potential and the generation current in MOS structures and Schottky diodes that operate in nonequilibrium depletion. Measurement of high-frequency C-V characteristics of semiconductor structures.

In the process of work on investigated structure the regime signal and an impulse of injection of a charge is applied, after which termination measurement of dynamics of change of a current and capacity is carry out.

**The basic characteristics of the device:**

Adjustable bias on the structure	$\pm 30$ V with steps of 0.5 V.
Injection impulse:	
Duration	0.2-5 $\mu$ с with step 0.1 $\mu$ с;
Amplitude	$\pm 12$ V with step 0.1 V ;
The repetition period	10 $\mu$ с-50 $\mu$ с, 14 ranges;
Test signal of measurement of capacity:	
Amplitude	10 mВ;
Frequency	5 MHz;
Speed of measurements	10MГц
Signal of measurement volt-faradnoj of the characteristic of the sawtooth form:	
Amplitude	$\pm 30$ V with step 0.1 V;
Duration of the period	(1-100) sec. with step 1 sec.;
Number of measured readout on a shot	1000;
Scales of measurement of capacity and charge	(10, 100, 1000) пФ; (10, 100, 1000) пКл;
Sensitivity - an average square of noise:	
Scale 10пF/10пКл-	0.03пФ/ 0.02пКл.
Scale 100пФ/100пКл-	0.13пФ/ 0.07пКл.
Scale 1000пF/1000пКл-	0.9пФ/ 0.35 пКл.

Design: a virtual device on your computer's USB bus, external measuring head operates at liquid nitrogen temperature, the power from the AC adapter.

On a device input the capacity 75 пФ is connected, the charge is simulated by a current source 1 $\mu$ кA. Duration of record 100  $\mu$ с, record begins on the end of an impulse of injection. Duration of transient, after end of an impulse of injection, does not exceed 5 $\mu$ с on the channel of capacity and 1.5  $\mu$ с on the charge channel.

**Technical and economic advantages:**

- The device allows simultaneous measurement of the relaxation capacity and generation current of investigated structure and has a high performance due to the high speed real-time measurements.
- Compact.

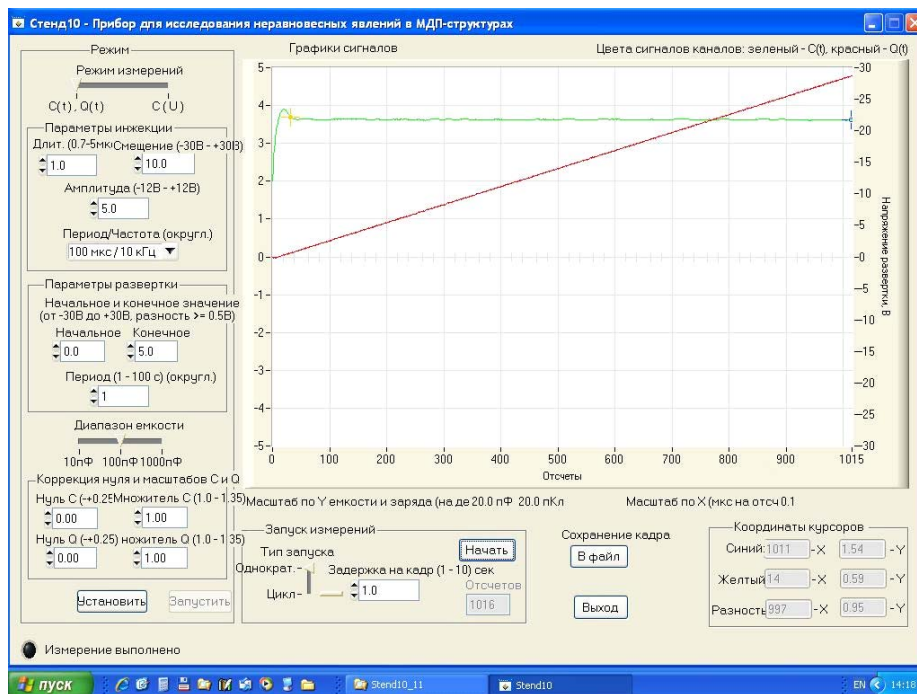


Fig. 1. The virtual front panel of the device and record test signals.

**Scopes:**

Research, testing, control of semiconductor structures.

**Level of practical realisation:**

The prototype.

**Patent protection:**

The patent application is submitted, but the patent is not received

**Offers:**

Joint commercialization, the contract on delivery.

**The Estimated cost** - depending on quantity and specifications.