DETERMINATION OF VOLT-AMPERE CHARACTERISTIC OF SI-DIODE IN CASSY-LAB2 PROGRAM

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Abstract: We know a lot of semi-conduct diodes. The diodes are used for a plenty of purpose. In this experience, the STE GE-Dioderry AA118 Diode was obtained in the Cassy-lab2 program and analyzed the characteristics of the voltap.
This experiment records and compares the current-voltage characteristics of various diodes (Si, Ge and light-emitting diodes).
Keywords: semiconductor, diod, LED, resistor, p-conducting zones, n-conducting.

The semiconductor diodes are among the simplest semiconductor components. They consist of a semiconductor crystal in which an n-conducting zone meets a p-conducting zone. Recombination of the charge carriers, i.e. the electrons in the n-conducting and the holes in the p-conducting zones, creates a low-conductivity zone at the boundary layer. The conductivity is increased when electrons or holes are removed from the boundary layer by an external electric field. This direction of the electric field is called the reverse direction. Reversing the electric field drives the electrons and holes into the boundary layer, allowing current to flow more easily through the diode.

Types of diodes according to their purpose.

*designed to convert alternating current to direct current.

* has a short transition period and is designed for use in pulsed operating modes.

* Detector diodes are designed for signal detection.

* Mixing diodes are designed to convert high frequency signals into an intermediate frequency signal.

* Switching diodes are designed for use in microwave power level control devices.

* Parametric.

* Limiting diodes are designed to protect radios and household appliances from surges in the mains voltage.

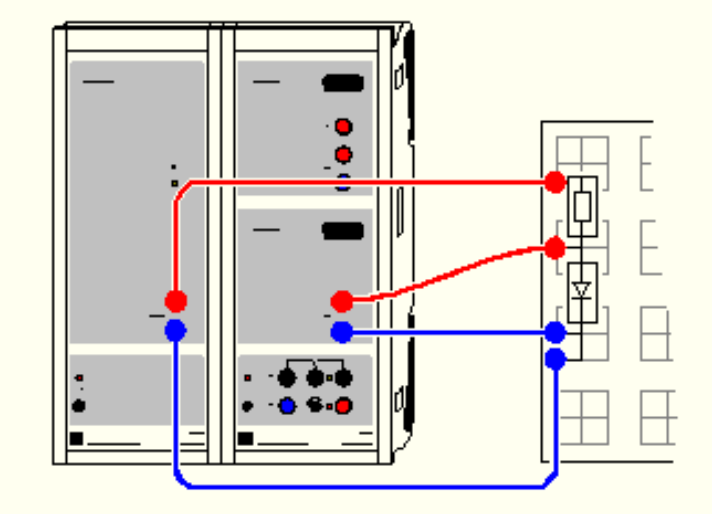
* Increase.

* Adjustment.

* Generator.

Experiment setup (Pic.1). Connect the circuit to Sensor-CASSY inputs A (current) and B (voltage across the diode) as shown in the drawing. The diode is protected by a 100 Ω series resistor.

When using Power-CASSY place this to the left of Sensor-CASSY to supply the circuit and measure the current.



(Pic.1)

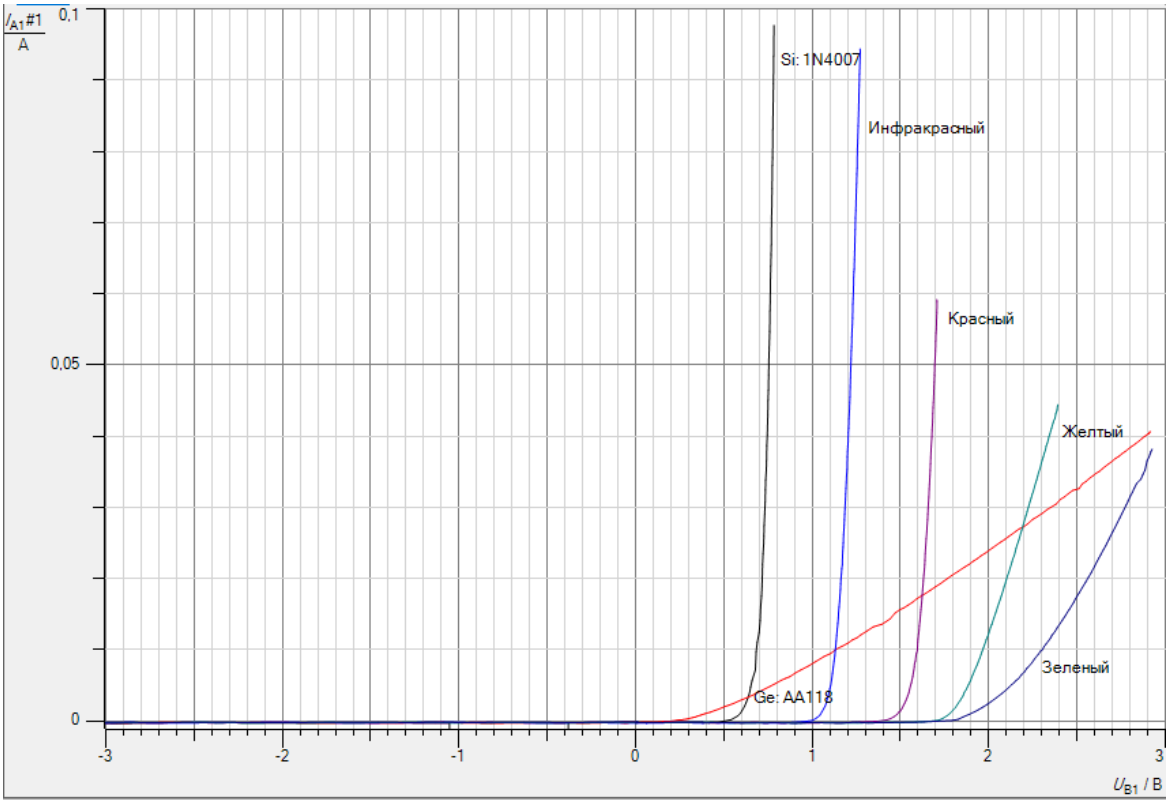
At negative voltages the current is zero regardless of the applied voltage (reverse direction). At positive voltages, a current appears starting at a conducting-state voltage U (conducting direction).

We can compare the conducting-state voltages U of various diodes. For the LEDs, we can use the equation

$$e \cdot U = h \cdot c/\lambda$$

to estimate roughly the wavelength λ of the emitted light. In this example the conducting-state voltage of the red LED is approx. U = 1.4 V. From this we obtain $\lambda = hc/eU = 880$ nm.

Below we have obtained the volt-ampere characteristic of the STE Si-diode 1N4007 diode. Pic(2).



Pic(2)

U [V]	-3.071	-2.940	-2.585	-1.923	-1.475	-1.055	-0.801	-0.381	-0.134
I [A]	-0.0002	-0.0003	-0.0002	-0.0003	-0.0002	-0.0003	-0.0002	-0.0003	-0.0002
U [V]	0.002	0.000	0.380	0.384	0.470	0.540	0.579	0.594	0.603
I [A]	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	0.0002	0.0008	0.0012	0.0015
U [V]	0.617	0.626	0.633	0.641	0.647	0.651	0.659	0.678	0.683
I [A]	0.0021	0.0026	0.0031	0.0036	0.0042	0.0048	0.0057	0.0072	0.0098
U [V]	0.689	0.699	0.705	0708	0.722	0.740	0.755	0.767	0.770
I [A]	0.0111	0.0125	0.0141	0.0161	0.0235	0.0353	0.0509	0.0655	0.0706

It is not possible to precisely determine the wavelength of light emitted by LEDs, as these emit a relatively broad frequency band that is usually filtered through a colored housing. Therefore the above wavelength determination is merely a rough estimate.

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