

AMPLITUDE MODULATION OF AN ELECTRON BEAM IN A PLASMA TRIODE*

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The work is devoted to the generation of an electron beam in a triode-type electron source with a plasma cathode based on a low-pressure arc discharge [1]. The main purpose of the experiments was to demonstrate the possibility of controlling the beam current and, consequently, its power during a submillisecond pulse. In contrast to known analogs, in this work, the beam amplitude was controlled during a pulse up to 1 ms by applying a modulating voltage to the triode electrodes [2, 3].

The experiments were carried out on the SOLO facility [4, 5]. The scheme of the modernized facility is shown in Figure 1. To ignite the main arc discharge between cathode 2 and anode 3, an auxiliary discharge is used, initiated between the ignition electrode 1 and cathode 2. A redistributing electrode 4 is fixed in the center of anode 3. The redistributing electrode 4 is connected to anode 3 through resistors. A modulating voltage power supply has been developed to control the electron beam current. The modulating voltage is applied between the anode 3, the hole of which is covered with a fine grid 5, and the emission electrode 7, the hole in which is also covered with a fine grid 6. A constant accelerating voltage (up to 25 kV) is applied between the emission electrode 7 and the extraction electrode 8. The extraction electrode 8, drift tube 9 and collector 11 are at ground potential. The accelerated beam electrons are transported to the collector in the magnetic field of two coils 10, 12.

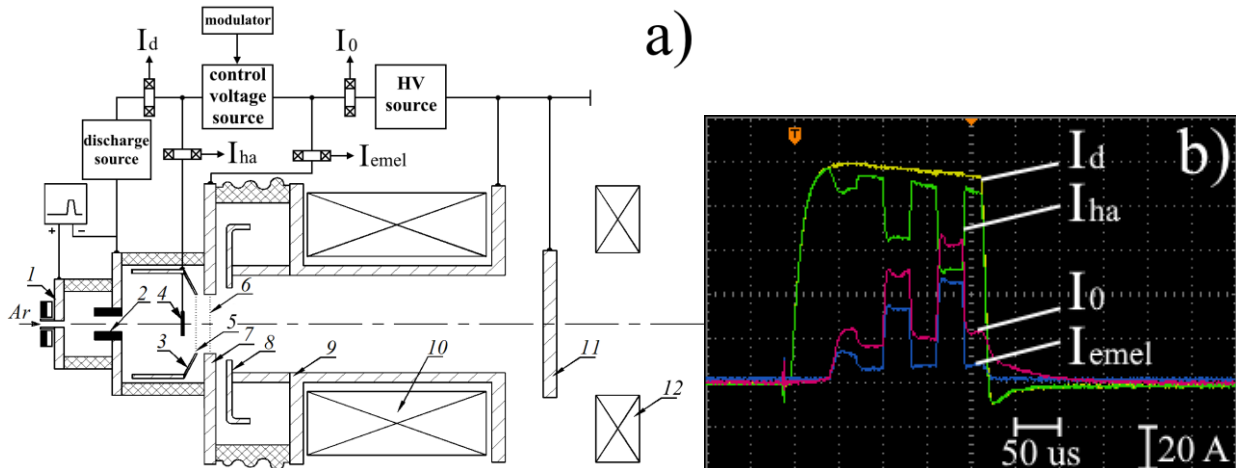


Fig.1. Scheme of electron source SOLO (a) and oscillogram of the main currents of the electron source (b): I_d – arc discharge current, I_{ha} – hollow anode current, I_{emel} – emission electrode current, I_0 – current in accelerating gap.

The dynamics of the main currents of the SOLO electron source, the switching coefficients of the discharge current, the coefficients of current extraction from the discharge are considered.

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