S1-P-029301

ELECTRON BEAM SOURCE WITH A PLASMA ANODE AND THE BEAM OUTPUT TROUGH A FOIL WINDOW INTO THE ATMOSFERE *

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Experiments were carried out to obtain electron beams of round or rectangular cross section up to 200 cm^2 in an electron beam source with an explosive emission cathode and a plasma anode at an accelerating voltage of 200 kV and the beams extraction through a foil window into the atmosphere. The electron beam current in the source was up to 2.5 kA, and the pulse duration was 5 μs. The beam energy estimated from the heating of the collector with a cross-section area of 74 cm^2 placed in the source behind the plasma anode was 650–850 J/pulse. The maximum beam energy extracted behind a grid with a geometric transparency of 80%, covered with an aluminum-magnesium foil 30-μm-thick, was up to 250–270 J/pulse. The power source was a Marx generator based on long lines, providing the obtaining of rectangular pulses at a constant arbitrary resistive load. Experiments have shown that the use of a plasma anode in an electron beam source with the use of a leading magnetic field makes it possible to increase the current and energy of the electron beam. At the same time, the presence of plasma in the interelectrode gap contributes to the appearance of low-energy electrons in the beam, which leads to a limitation of the energy output beyond the foil. One of the probable causes of energy losses during beam transportation in an electron beam source may be the development of the beam instability as a result of plasma-beam interaction. Data are obtained on the influence of the accelerating voltage and magnetic field on the beam energy.

* The work was supported by RFBR, Grant No. 18-48-700034 “r-a”