

EXTRACTION INTO THE ATMOSPHERE OF A FOCUSED ELECTRON BEAM WITH AN ENERGY OF 2.5 MEV

E.V. DOMAROV, D.S.VOROBEV, N.K. KUKSANOV, R.A. SALIMOV, A.I. KORCHAGIN, S.N. FADEEV, V.G. CHEREPKOV, Y.I. GOLUBENKO, I.K. CHAKIN, M.G. GOLKOVSKY

Budker Institute of Nuclear Physics of Siberian Branch Russian Academy of Sciences, Novosibirsk, Russian Federation

For over 30 years, an extraction device has been successfully working in BINP at the ELV-6 accelerator to extract a focused beam of electrons into the atmosphere. The accelerating tube with permanent magnetic lenses was used in this installation. The design of these accelerator tubes with magnetic lenses is rather complicated. Recently, simpler design and high reliability accelerating tubes with big aperture is operating in ELV accelerators. For this reason, the problem number one at present is to develop the extraction device, capable of reliably working with serial accelerator tubes, of the ELV accelerator with power up to 100 kW. We designed the optical scheme shown in Figure 1. The lens L1 is located directly at the lower end of the accelerating tube. Passing the lens L1, the beam is focused near the diaphragm D6 and increases to a diameter of ≤ 10 mm in the diaphragm D5. The walls of the chamber with diaphragms form the steps of the vacuum system. For passing the beam along the axis of the diaphragms, there are corrections coils C1 C2 C3. The diameter of diaphragm hole D1 is the most critical, because it determines the flow of gas that should be pumped out in the following steps of the vacuum system [1].

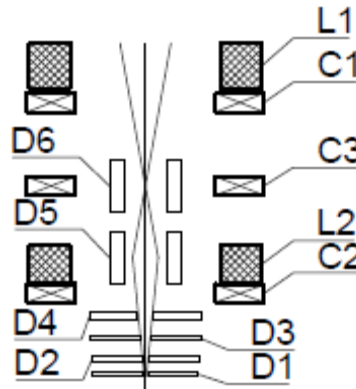


Fig.1. Optical diagram of the extractions device.

Measurements of the parameters of a high-power electron beam were carried out up to a power of 100 kW. Based on the data obtained, a new type of gas-dynamic extraction device was designed and pre-tested, which can efficiently output a focused electron beam to the atmosphere at the energy of 2,5 MeV and the beam current of 30 mA. In addition, this extraction device was tested at energy of 2.5 MeV and the beam current of 40 mA for a short time.

REFERENCES

- [1] E.V. Domarov, D.S. Vorobyov, M.G. Golkovsky, Yu. I. Golubenko, A.I. Korchagin, N.K. Kuksanov, A.V. Lavrukhin, P.I. Nemytov, R.A. Salimov, A.V. Semenov, A.V. Sorokin, S.N. Fadeev, I.K. Chakin, V.G. Cherepkov, " Research of Parameters of the Powerful Electron Beam of Industrial Accelerator ELV," Sib. Jou. Phys., 2019, vol. 14, no. 2, p. 5–20.