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Velocity Distributions of Electron Beams Focused by Magnetic Field

Akira NOGUCHI*

An experimental investigation of the d. c. axial velocity distributions of electron beams focused by magnetic fields has been made. The result shows that the velocity distributions of hollow electron beams are distorted by the crossed electric fields formed by beam-forming electrode and lens effect of the first anode, and that the intensity of ordinary focusing magnetic field is no longer regarded as the infinite one. This effect is made sure by the experiment in which the crossed field is applied to pin-hole-beams. It is also found that there are three kinds of modifications from the theoretical cut-off Maxwellian velocity distribution; increase of the equivalent temperature, shift from the theoretical curve and decay near the cut-off point.

Under the condition that the second and the third anodes are operated at low voltage, there exists the hysteresis on the V - I characteristics. But no essential difference is found in the velocity distributions between these electron beams.

On the analysis of the electron beams, the above distortions in the theoretical distributions seem to be no longer negligible.