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Abstract: The state of the art of THz gyrotrons is briefly discussed. The possible optimizations of the magnetron injection gun and electrodynamics system for THz gyrotrons are discussed. The electron optical systems with extraction of reflected electrons are presented. The significant increasing of electrons transverse energy predicted in theory and confirmed by experiments. In order to increase the integral output power, it is suggested using a planar gyrotron scheme with a high oversized factor. The results of nonlinear dynamics simulation show that in such scheme it is possible to reach an output power of several hundred kilowatts at sub-THz band with a fine frequency tuning by changing the distance between plates.

Keywords: Terahertz, Gyrotron, Electron gun with extraction of reflected electrons, Planar scheme