158
标题: Development of a Magnetic Cusp Gun for Terahertz Harmonic Gyrodevices
作者: Du, CH (Du, C. H.); Chang, TH (Chang, T. H.); Liu, PK (Liu, P. K.); Yuan, CP (Yuan, C. P.); Yu, SJ (Yu, S. J.); Liu, GF (Liu, G. F.); Bratman, VL (Bratman, Vladimir L.); Glyavin, MY (Glyavin, Mikhail Yu.); Kalynov, YK (Kalynov, Yu. K.)
来源出版物: IEEE TRANSACTIONS ON ELECTRON DEVICES 卷: 59 期: 12 页: 3635-3640 DOI: 10.1109/TED.2012.2220547 出版年: DEC 2012
在 Web of Science 中的被引频次: 0
被引频次合计: 0
引用的参考文献数: 29
摘要: A magnetic cusp gun (MCG) is being developed to generate an axis-encircling electron beam, which is called the large orbit beam, which is going to drive a 0.396-THz fourth-harmonic gyrotron. Developing an MCG imposes crucial challenges on a simultaneously minimizing guiding center deviation and velocity spread of the electron beam, particularly because an ultrahigh magnetic compression ratio is unavoidable, as is the case for a terahertz (THz) gyrotron. The study of the electron dynamics in the MCG reveals that, close to the emitter, a pair of focusing electrodes are employed to construct a special focusing and accelerating electric field as a way to balance the space-charge influence and guiding center deviation. Investigation indicates that both the electron-beam generalized-angular-momentum spread and the guiding center distribution are the critical factors contributing to beam parameter spread. Intensive optimization generates a high-power MCG with a pitch factor of 1.5, the highest magnetic field of 4 T, minimum transverse velocity spread of 1.1%, and a beam current of 2 A. The key parameters exhibit excellent stability tuning over a wide range of beam current and magnetic field. These merits enable the harmonic gyrotrons or even the frequency-tunable THz gyrotrons to be developed.
入藏号: WOS:000311680400073
语种: English
文献类型: Article
作者关键词: Gyrotron; harmonic operation; large orbit gyrotron; magnetic cusp gun (MCG); Terahertz (THz) wave
KeyWords Plus: ENCIRCLING ELECTRON-BEAM; VELOCITY SPREAD; GYROTRON; TECHNOLOGY; OPERATION; AMPLIFIER; MASER; BAND
地址: [Du, C. H.; Chang, T. H.; Yuan, C. P.] Natl Tsing Hua Univ, Dept Phys, Hsinchu 300, Taiwan
[Du, C. H.; Liu, P. K.; Yu, S. J.; Liu, G. F.] Chinese Acad Sci, Inst Elect, Key Lab High Power Microwave Sources & Technol, Beijing 100190, Peoples R China
[Bratman, Vladimir L.; Glyavin, Mikhail Yu.; Kalynov, Yu. K.] Russian Acad Sci, Inst Appl Phys, Nizhnii Novgorod 603950, Russia
通讯作者地址: Du, CH (通讯作者),Natl Tsing Hua Univ, Dept Phys, Hsinchu 300, Taiwan.
电子邮件地址: thschang@phys.nthu.edu.tw; pkliu@mail.ie.ac.cn
出版商: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC
出版商地址: 445 HOES LANE, PISCATAWAY, NJ 08855-4141 USA
Web of Science 类别: Engineering, Electrical & Electronic; Physics, Applied
研究方向: Engineering; Physics

IDS 号: 045FM
ISSN: 0018-9383
29 字符的来源出版物名称缩写: IEEE T ELECTRON DEV
ISO 来源出版物缩写: IEEE Trans. Electron Devices
来源出版物页码计数: 6