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标题: A study of sub-terahertz and terahertz gyrotron oscillators
作者: Kao, SH (Kao, S. H.); Chiu, CC (Chiu, C. C.); Chu, KR (Chu, K. R.)
来源出版物: PHYSICS OF PLASMAS 卷: 19 期: 2 文献号: 023112 DOI: 10.1063/1.3684663 出版年: FEB 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: 37
摘要: We present a theoretical study on some of the key physics issues associated with over-moded, sub-terahertz, and terahertz (THz) gyrotron oscillators. Simulations of a large number of fundamental and second cyclotron harmonic modes yield a broad database for physics observations as well as a test of relevant scaling laws. Linear properties over a broad magnetic field range exhibit a number of interesting trends. Nonlinearly, despite the possibility of multimode excitation, each mode is found to exist as a dominant single mode in a narrow magnetic field range, and a significant fraction of these modes are due to second cyclotron harmonic interactions. The wall resistivity, while a relatively minor concern for sub-terahertz gyrotrons, is shown to play a radically different role in the THz regime. It affords a linear advantage to the harmonic modes while also significantly degrading their output efficiencies. These results are interpreted in terms of the nature of harmonic mode competition and the scaling laws for the cavity quality factors. (C) 2012 American Institute of Physics. [doi:10.1063/1.3684663]
入藏号: WOS:000301395800053
语种: English
文献类型: Article
KeyWords Plus: MODE COMPETITION; HIGH-POWER; TUNABLE GYROTRON; GYRODEVICES; GAIN
地址: [Kao, S. H.; Chiu, C. C.; Chu, K. R.] Natl Taiwan Univ, Dept Phys, Taipei 106, Taiwan
通讯作者地址: Kao, SH (通讯作者),Natl Taiwan Univ, Dept Phys, Taipei 106, Taiwan
电子邮件地址: krchu@yahoo.com.tw
出版商: AMER INST PHYSICS
出版商地址: CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA
Web of Science 分类: Physics, Fluids & Plasmas
学科类别: Physics
IDS 号: 907CQ
ISSN: 1070-664X
29 字符的来源出版物名称缩写: PHYS PLASMAS
ISO 来源出版物缩写: Phys. Plasmas
来源出版物页码计数: 8