

光电系统与工程

光电导天线产生太赫兹波的研究

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摘要:

研究了光电导天线产生太赫兹波的辐射特性, 采用时域有限差分方法(FDTD)来模拟计算光电导偶极天线的辐射特性, 并在计算机上以伪彩色图进行了图形显示. 采用电偶极子天线模型, 以0.1THz电磁波为例计算了天线辐射的特性参数, 得到天线的辐射电阻为790Ω, 方向性系数为1.5. 结果表明, 光电导天线可以采用偶极天线的理论进行计算, 可以通过提高电长度来增大辐射电阻, 从而提高太赫兹的辐射功率.

关键词: 光电子学 THz波辐射特性 光电导天线 时域有限差分法

Terahertz generation with photoconductive antenna

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Abstract:

The terahertz (THz) radiation properties of photoconductive antenna (PCA) were studied. The radiation characteristics of photoconductive antenna were simulated using FDTD; the results calculated were displayed on a computer in pseudo-color graphical. Using electric dipole antenna model and taking 0.1THz as an example, equatorial plane and the meridian plane of the antenna pattern were obtained, the antenna radiation resistance is 790 ohm, and directivity factor is 1.5. The results show that photoconductive antenna can be calculated with dipole antenna theory. Radiation resistance is increased by increasing the electrical length, and the power of terahertz radiation is increased as well.

Keywords: optoelectronics terahertz wave radiation properties photoconductive antenna FDTD

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参考文献:

[1] DRAGOMAN D, DRAGOMAN M. Terahertz fields and applications [J] . Progress in Quantum Electron, 2004,28(1):1-66.

[2] DARROW J T, ZHANG Xi-cheng, AUSTON D H, et al. Saturation properties of large-aperture photoconducting antennas [J] . IEEE J. Quantum Electron,1992,28(6):1607-1616.

[3] TOSHIAKI H, KEIJI T, HIROKI N. Time-resol-ved study of intense terahertz pulses generated by a large-aperture photoconductive antenna [J] .Jpn. J. Appl. Phys.,2001,40(8):4907-4912.

[4] DARROW J T, Zhang X C, AUSTON D H. Power scaling of large-aperture photoconducting antennas [J] . Appl. Phys. Lett.,1991,58(1):25-27.

[5] 贾婉丽,纪卫莉,施卫. 半绝缘GaAs光电导开关产生太赫兹波电场屏蔽效应的二维Monte Carlo模拟 [J] . 物理学报,2007,56(4):2042-2046.

JIA Wan-li,JI Wei-li,SHI Wei.Two-dimensional Monte Carlo simulation of screening of the bias field in terahertz generation from semi-insulated GaAs photoconductors [J] .Acta Physica Sinica,2007,56(4):2042-2046.(in Chinese with an English abstract)

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[6] 施卫,张显斌,贾婉丽,等.用飞秒激光触发GaAs光电导体产生THz电磁波的研究 [J]. 半导体学报,2004,25(12): 1735-1738.

SHI Wei,ZHANG Xian-bin,Jia Wan-li, et al.Investigation on terahertz generation with GaAs photoconductor triggered by femto-second laser pulse [J]. Chinese J. Semiconductors,2004,25(12): 1735-1738.(in Chinese with an English abstract)

[7] 许景周,张希成.太赫兹科学与技术 [M].北京: 北京大学出版社,2007.

XU Jing-zhou,ZHANG Xi-cheng. Terahertz science and technology [M].Beijing: Beijing University Press,2007.(in Chinese)

[8] 葛德彪,闫玉波.电磁波时域有限差分方法 [M].第2版.西安: 西安电子科技大学出版社,2005.

GE De-biao,YAN Yu-bo. Finite-difference time-domain electromagnetic method [M].2nd ed.Xi'an: Xidian University Press, 2005.(in Chinese)

[9] 闻映红.天线与电波传播理论 [M].修订版.北京: 清华大学出版社,2007.

WEN Ying-hong. Antenna and radio wave pro-pagation theory [M]. Revision.Beijing: Tsinghua University Press, 2007.(in Chinese)

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2. 王国政,王蓓,孟海螺,李楠,彭以新,张云琦,刘亮,端木庆铎.915nm泵浦混合掺铒/铥共掺双层光纤放大器[J]. 应用光学, 2010,31(3): 473-477

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