79
标题: Universal phase relation between longitudinal and transverse fields observed in focused terahertz beams
作者: Winnerl, S (Winnerl, S.); Hubrich, R (Hubrich, R.); Mittendorff, M (Mittendorff, M.); Schneider, H (Schneider, H.); Helm, M (Helm, M.)
来源出版物: NEW JOURNAL OF PHYSICS 卷: 14 文献号: 103049 DOI: 10.1088/1367-2630/14/10/103049 出版年: OCT 30 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: We directly observe longitudinal electromagnetic fields in focused freely propagating terahertz (THz) beams of radial and linear polarization. Employing electro-optic detection, which is phase sensitive, allows one to selectively detect longitudinal and transverse field components. A phase shift of pi/2 between the transverse and longitudinal field components is revealed. This phase shift is of universal nature, as it does not depend on the mode, frequency and focusing conditions. We show that the universal phase relation is a direct consequence of the divergence-free nature of electromagnetic waves in vacuum. In the experiments, we observe the phase shift of pi/2 for all frequency components of single-cycle THz radiation pulses of both radial and linear polarization. Additionally, we show that the longitudinal field of a radially polarized THz beam has a smaller spot size as compared with the transverse field of a linearly polarized beam that is focused under the same conditions. For field-sensitive measurements this property can be exploited even for moderate focusing conditions. Furthermore, the phase-sensitive detection of longitudinal electromagnetic fields opens up new possibilities to study their interaction with electronic excitations in semiconductor nanostructures.
入藏号: WOS:000310440100003
语种: English
文献类型: Article
KeyWords Plus: CYLINDRICAL-VECTOR BEAMS; OPTICAL-SYSTEMS; GAUSS BEAMS; POLARIZATION; LIGHT; AZIMUTHAL; PULSES; MODES; SPOT
地址: [Winnerl, S.; Hubrich, R.; Mittendorff, M.; Schneider, H.; Helm, M.] Helmholtz Zentrum Dresden Rossendorf, D-01314 Dresden, Germany
[Mittendorff, M.; Helm, M.] Tech Univ Dresden, D-01062 Dresden, Germany
通讯作者地址: Winnerl, S (通讯作者),Helmholtz Zentrum Dresden Rossendorf, POB 510119, D-01314 Dresden, Germany.
电子邮件地址: s.winnerl@hzdr.de
出版商: IOP PUBLISHING LTD
出版商地址: TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND
Web of Science 类别: Physics, Multidisciplinary
研究方向: Physics
IDS 号: 028RM
ISSN: 1367-2630
29 字符的来源出版物名称缩写: NEW J PHYS
ISO 来源出版物缩写: New J. Phys.
来源出版物页码计数: 12